REVISION

CENTURION SERIES

1970 THRU 1976
SERVICE MANUAL

REVISION 5

1 JULY 2004

D2004R5-13

INSERT THE FOLLOWING CHANGED PAGES INTO THE BASIC MANUAL

Cessna
A Textron Company

Service Manual

1970 THRU 1976

CENTURION SERIES

Member of GAMA

FAA APPROVAL HAS BEEN OBTAINED ON TECHNICAL DATA IN THIS PUBLICATION THAT AFFECTS AIRPLANE TYPE DESIGN.

REVISION 5 TO THE BASIC MANUAL INCORPORATES SERVICE MANUAL CHANGE NOTICE #76-20 DATED 16 AUGUST 1976, SERVICE MANUAL CHANGE NOTICE #76-21 DATED 5 NOVEMBER 1976, TEMPORARY CHANGE 1 DATED 22 JANUARY 1978, TEMPORARY CHANGE 2 DATED 28 APRIL 1978, TEMPORARY CHANGE 3 DATED 19 DECEMBER 1979, TEMPORARY REVISION 4 DATED 1 APRIL 1992, TEMPORARY REVISION 5 DATED 1 DECEMBER 1992, TEMPORARY REVISION 6 DATED 3 OCTOBER 1994, TEMPORARY REVISION 7 DATED 7 JANUARY 2000, TEMPORARY REVISION 8 DATED 7 OCTOBER 2002, AND TEMPORARY REVISION 9 DATED 5 APRIL 2004.

1 DECEMBER 1972

D2004-5-13

REVISION 5

1 JULY 2004

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Dates of issue for original and revisions are:

Original..........0 ...... 1 December 1972
Change..........1 .....15 September 1973
Change..........2 ...... 1 February 1974
Change.........3....... 1 September 1974
Change.........4....... 1 October 1975
Revision........5........1 July 2004

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1. General.

WARNING: All inspection intervals, replacement time limits, overhaul time limits, the method of inspection, life limits, cycle limits, etc., recommended by Cessna are solely based on the use of new, remanufactured, or overhauled Cessna-approved parts. If parts are designed, manufactured, remanufactured, overhauled, and/or approved by entities other than Cessna, then the data in Cessna's maintenance/service manuals and parts catalogs are no longer applicable and the purchaser is warned not to rely on such data for non-Cessna parts. All inspection intervals, replacement time limits, overhaul time limits, the method of inspection, life limits, cycle limits, etc., for such non-Cessna parts must be obtained from the manufacturer and/or seller of such non-Cessna parts.

A. The information in this publication is based on data available at the time of publication and is updated, supplemented, and automatically amended by all information issued in Service Newsletters, Service Bulletins, Supplier Service Notices, Publication Changes, Revisions, Reissues and Temporary Revisions. All such amendments become part of and are specifically incorporated within this publication. Users are urged to keep abreast of the latest amendments to this publication through information available at Cessna Authorized Service Stations or through the Cessna Propeller Aircraft Product Support subscription services. Cessna Service Stations have also been supplied with a group of supplier publications which provide disassembly, overhaul, and parts breakdowns for some of the various supplier equipment items. Suppliers publications are updated, supplemented, and specifically amended by supplier-issued revisions and service information which may be reissued by Cessna, thereby automatically amending this publication, and are communicated to the field through Cessna's Authorized Service Stations and/or through Cessna's subscription services.

B. Inspection, maintenance and parts requirements for STC installations are not included in this manual. When an STC installation is incorporated on the airplane, those portions of the airplane affected by the installation must be inspected in accordance with the inspection program published by the owner of the STC. Since STC installations may change systems interface, operating characteristics, and component loads or stresses on adjacent structures, Cessna-provided inspection criteria may not be valid for airplanes with STC installation.

C. REVISIONS, REISSUES, and TEMPORARY REVISIONS can be purchased from your Cessna Service Station or directly from Cessna Propeller Aircraft Product Support, Department 751, Cessna Aircraft Company, P.O. Box 7706, Wichita, Kansas 67277-7706.

D. This manual contains factory-recommended procedures and instructions for ground handling, servicing, and maintaining Cessna Model 210-Series aircraft. This includes the Models 210 and T210, which is identical to the Model 210 except that it is turbocharged. Besides serving as a reference for the experienced mechanic, this book also covers step-by-step procedures for the less experienced person. This manual should be kept in a handy place for ready reference. If properly used, it will better enable the mechanic to maintain Cessna 210-Series aircraft and thereby establish a reputation for reliable service.

E. All supplemental service information concerning this manual is supplied to all appropriate Cessna Service Stations so they have the latest authoritative recommendations for servicing these Cessna airplanes. It is recommended that Cessna owners utilize the knowledge and experience of the Cessna Service Station

2. CROSS-REFERENCE LISTING OF POPULAR NAME VS. MODEL NUMBERS AND SERIALS

A. All aircraft, regardless of manufacturer, are certified under model number designations. However, popular names are used for marketing purposes. To provide a consistent method of referring to the various aircraft, model numbers will be used in this publication unless names are required to differentiate between versions of the same basic model. The following table provides a cross-reference listing of popular name vs. model numbers.

POPULAR NAME	MODEL YEAR	MODEL	BEGINNING SERIAL NUMBER	ENDING SERIAL NUMBER
CENTURION	1970	210K	21059200	21059351
TURBO CENTURION	1970	T210K	21059200	21059351
CENTURION	1971	210K	21059352	21059502
CENTURION II	1971	210K	21059352	21059502
TURBO CENTURION	1971	T210K	21059352	21059502
TURBO CENTURION II	1971	T210K	21059352	21059502
CENTURION	1972	210L	21059503	21059719
CENTURION II	1972	210L	21059503	21059719
TURBO CENTURION	1972	T210L	21059503	21059719
TURBO CENTURION II	1972	T210L	21059503	21059719
CENTURION	1973	210L	21059720	21060089
CENTURION II	1973	210L	21059720	21060089
TURBO CENTURION	1973	T210L	21059720	21060089
TURBO CENTURION II	1973	T210L	21059720	21060089
CENTURION	1974	210L	21060090	21060539
CENTURION II	1974	210L	21060090	21060539
TURBO CENTURION	1974	T210L	21060090	21060539
TURBO CENTURION II	1974	T210L	21060090	21060539
CENTURION	1975	210L	21060540	21061039
CENTURION II	1975	210L	21060540	21061039
TURBO CENTURION	1975	T210L	21060540	21061039
TURBO CENTURION II	1975	T210L	21060540	21061039
CENTURION	1976	210L	21061040	21061573
CENTURION II	1976	210L	21061040	21061573
TURBO CENTURION	1976	T210L	21061040	21061573
TURBO CENTURION II	1976	T210L	21061040	21061573

3. Coverage and Format.

A. The Cessna Model 210-Series Service Manual has been prepared to help maintenance personnel in servicing and maintaining the Model 210-Series. This manual provides the necessary information required to enable the mechanic to service, inspect, troubleshoot, remove and replace components or repair systems.

B. Technical Publications are also available for the various components and systems which are not covered in this manual. These manuals must be utilized as required for maintenance of those components and systems, and may be purchased from the manufacturer.

4. Temporary Revisions.

A. Additional information which becomes available may be provided by temporary revision. This service is used to provide, without delay, new information which will assist in maintaining safe flight/ground operations. Temporary revisions are numbered consecutively. Temporary revisions are normally incorporated into the maintenance manual at the next regularly scheduled revision.

5. Material Presentation.

A. This Service Manual is available on paper, aerofiche or Compact Disc (CD/ROM). The CD ROM contains the Service Manuals, Illustrated Parts Catalogs and Avionics Manuals.

SECTION 1

GENERAL DESCRIPTION

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1-1. GENERAL DESCRIPTION.

1-2. MODEL 210-SERIES.

1-3. DESCRIPTION. The Cessna Model 210-Series aircraft, described in this manual, are single-engine, high-wing monoplanes of all-metal, semimonocoque construction. Wings are full cantilever, with a sealed section which forms an integral fuel bay area in each wing. The fully-retractable tricycle landing gear consists of tubular spring-steel main gear struts and a steerable nose gear with an air/hydraulic fluid shock strut. Six-place seating is standard. The Model 210 is powered by a six-cylinder, horizontally opposed, air-cooled, fuel injection Continental engine, driving an all-metal, constant-speed propeller. The Model T210 engine is turbocharged.

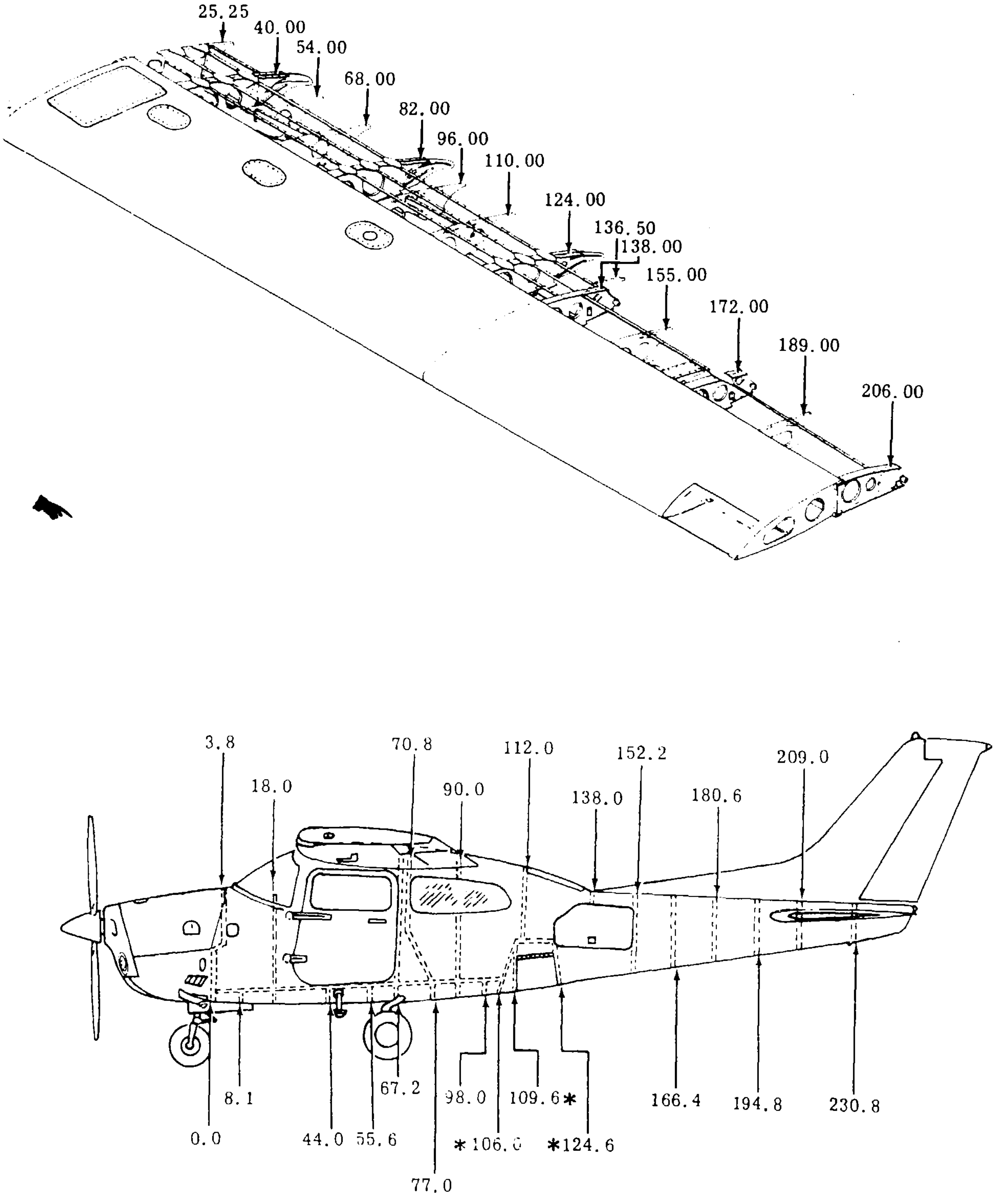
1-4. AIRCRAFT SPECIFICATIONS. Leading particulars of these aircraft, with dimensions based on gross weight, are given in figure 1-1. If these dimensions are used for constructing a hangar or computing clearances, remember that such factors as nose gear strut inflation, tire pressures, tire sizes, and load distribution may result in some dimensions that are considerably different from those listed.

1-5. STATIONS. A station diagram is shown in figure 1-2 to assist in locating equipment when a written description is inadequate or impractical.

1-6. TORQUE VALUES. A chart of recommended nut torque values is shown in figure 1-3. These torque values are recommended for all installation procedures contained in this manual, except where other values are stipulated. They are not to be used for checking tightness of installed parts during service.

GROSS WEIGHT	3800 lb
FUEL CAPACITY	
Total	90 gal
Usable	89 gal
OIL CAPACITY (Detergent Only)	10 qt
With External Oil Filter and All Turbocharged Engines	11 qt
ENGINE MODEL	
210	CONTINENTAL IO-520 SERIES
T210	CONTINENTAL TSIO-520 SERIES
PROPELLER (Constant-Speed)	
(Two Blades)	82" McCAULEY
(Three Blades)	80" McCAULEY
LANDING GEAR (Retractable, Hydraulically-Actuated)	Tricycle
MAIN WHEEL TIRES	6.00 x 6, 8-Ply Rating
Pressure	55 psi
NOSE WHEEL TIRE	5.00 x 5, 6-Ply Rating
Pressure	50 psi
NOSE GEAR STRUT PRESSURE (Strut Extended)	90 psi
WHEEL ALIGNMENT	
Camber	4° ± 1° 30'
Toe-in	0" to .06"
AILERON TRAVEL	
Up	20° ± 2°
Down	15° ± 2°
WING FLAP TRAVEL (Electrically-Actuated)	0° ±0° to 30°, +1° -2°
RUDDER TRAVEL (Measured parallel to water line)	
Right	24° ± 1°
Left	24° ± 1°
RUDDER TRAVEL (Measured perpendicular to hinge line)	
Right	27° 13' ± 1°
Left	27° 13' ± 1°
ELEVATOR TRAVEL	
Up	23° ± 1°
Down	17° ± 1°
ELEVATOR TRIM TAB TRAVEL	
Up	25° ± 1°
Down	10° ± 1°
PRINCIPAL DIMENSIONS	
Wing Span	36'9"
Tail Span	13'
Length	28'-1 3/4"
Fin Height (Maximum with Nose Gear Depressed and Flashing Beacon Installed on Fin)	9'5"
Track Width	8'8"
BATTERY LOCATION	Left Side of Firewall

Figure 1-1. Aircraft Specifications



* INDICATES CANTED BULKHEAD

Figure 1-2. Reference Stations

RECOMMENDED NUT TORQUES

THE TORQUE VALUES STATED ARE POUND-INCHES, RELATED ONLY TO STEEL NUTS ON OIL-FREE CADMIUM PLATED THREADS.

FINE THREAD SERIES

TAP SIZE	TENSION TORQUE STD (NOTE 1)	TENSION TORQUE ALT (NOTE 2)	SHEAR TORQUE STD (NOTE 3)	SHEAR TORQUE ALT (NOTE 2)
8-36	12-15		7-9	
10-32	20-25	20-28	12-15	12-19
1/4-28	50-70	50-75	30-40	30-48
5/16-24	100-140	100-150	60-85	60-106
3/8-24	160-190	160-260	95-110	95-170
7/16-20	450-500	450-560	270-300	270-390
1/2-20	480-690	480-730	290-410	290-500
9/16-18	800-1000	800-1070	480-600	480-750
5/8-18	1100-1300	1100-1600	660-780	660-1060
3/4-16	2300-2500	2300-3350	1300-1500	1300-2200
7/8-14	2500-3000	2500-4650	1500-1800	1500-2900
1-14	3700-5500	3700-6650	2200-3300	2200-4400
1-1/8-12	5000-7000	5000-10000	3000-4200	3000-6300
1-1/4-12	9000-11000	9000-16700	5400-6600	5400-10000

COARSE THREAD SERIES

	(NOTE 4)		(NOTE 5)	
8-32	12-15		7-9	
10-24	20-25		12-15	
1/4-20	40-50		25-30	
5/16-18	80-90		48-55	
3/8-16	160-185		95-100	
7/16-14	235-255		140-155	
1/2-13	400-480		240-290	
9/16-12	500-700		300-420	
5/8-11	700-900		420-540	
3/4-10	1150-1600		700-950	
7/8-9	2200-3000		1300-1800	
1-8	3700-5000		2200-3000	
1-1/8-8	5500-6500		3300-4000	
1-1/4-8	6500-8000		4000-5000	

NOTES

1. Covers AN310, AN315, AN345, AN363, MS20365, MS21042, MS21044, MS21045 and MS21046.
2. When using AN310 or AN320 castellated nuts where alignment between the bolt and cotter pin slots is not reached using normal torque values, use alternate torque values or replace the nut.
3. Covers AN316, AN320, MS20364 and MS21245.
4. Covers AN363, MS20365, MS21042, MS21043, MS21044, MS21045 and MS21046.
5. Covers AN340.

CAUTION

DO NOT REUSE SELF-LOCKING NUTS.

The above values are recommended for all installation procedures contained in this manual, except where other values are stipulated. They are not to be used for checking tightness of installed parts during service.

Figure 1-3. Torque Values

SECTION 2

GROUND HANDLING, SERVICING, CLEANING, LUBRICATION AND INSPECTION

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2-1. GROUND HANDLING.

2-2. TOWING. Moving the aircraft by hand is accomplished by using the landing gear struts as push points. A tow bar attached to the nose gear should be used for steering and maneuvering the aircraft. When no tow bar is available, press down at the horizontal stabilizer front spar, adjacent to the fuselage, to raise the nose wheel off the ground. With the nose wheel clear of the ground, the aircraft can be turned by pivoting it about the main wheels.

CAUTION

When towing the aircraft, never turn the nose wheel more than 35 degrees either side of center or the nose gear will be damaged. Do not push on control surfaces or outboard empennage surfaces. When pushing on the tailcone, always apply pressure at a bulkhead to avoid buckling the skin.

2-3. HOISTING. The aircraft may be hoisted with a hoist of two-ton capacity, either by using hoisting rings (optional equipment) or by using suitable slings. The front sling should be hooked to the engine lifting eye, and the aft sling should be positioned around the fuselage at the first bulkhead forward of the leading edge of the stabilizer. If the optional hoisting rings are used, a minimum cable length of 60 inches for each cable is required to prevent bending of the eyebolt type hoisting rings. If desired, a spreader jig may be fabricated to apply vertical force to the eyebolts.

2-4. JACKING. Refer to figure 2-2 for jacking procedures.

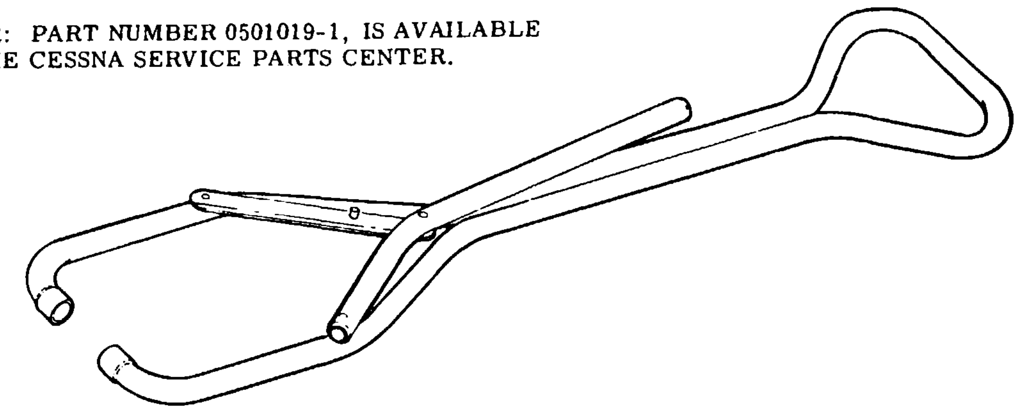


Figure 2-1. Tow Bar

CAUTION

When using the landing gear strut jack pad, flexibility of the gear strut will cause the main wheel to slide inboard as the wheel is raised, tilting the jack. The jack must then be lowered for a second jacking operation. Jacking both wheels simultaneously with landing gear strut jack pad is not recommended.

2-5. PARKING. Parking precautions depend principally on local conditions. As a general precaution, it is wise to set the parking brake or chock the wheels, and install the control lock. In severe weather, and high wind conditions, tie down the aircraft as outlined in paragraph 2-6 if a hangar is not available.

2-6. TIE-DOWN should be accomplished in anticipation of high winds. Tie-down aircraft as follows:

a. Tie ropes or chains to the wing tie-down fittings located on the underside of each wing. Secure the opposite ends of the ropes or chains to ground anchors.

b. Secure a rope (no chains) to the upper trunnion of the nose gear and secure opposite end of rope to a ground anchor.

c. Secure the middle of a rope to tail tie-down ring. Pull each end of rope away at 45-degree angle and secure to ground anchors at each side of tail

d. Install control lock on pilot's control column if available; if control lock is not available, tie pilot's control wheel back with front seat belt.

e. These aircraft are equipped with a spring-loaded steering bungee which affords protection against normal wind gusts. However, if extremely high wind gusts are anticipated, additional external locks may be installed.

2-7. FLYABLE STORAGE. Flyable storage is defined as a maximum of 30 days non-operational storage and/or the first 25 hours of intermittent engine operation.

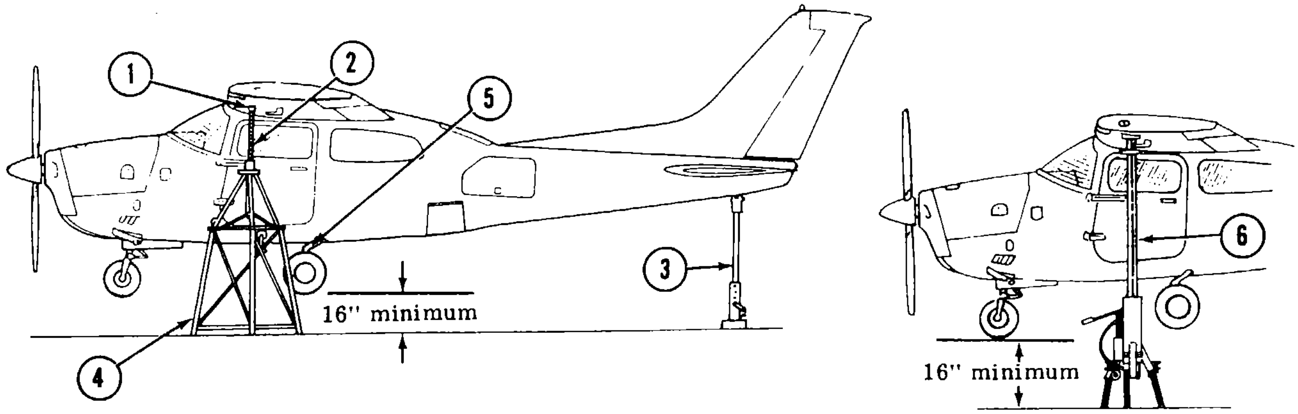
NOTE

The aircraft is delivered from Cessna with a Corrosion Preventive Aircraft Engine Oil (Military Specification MIL-C-6529, Type II Rust Ban). This engine oil is a blend of aviation grade straight mineral oil and a corrosion preventive compound. This engine oil should be used for the first 25 hours of engine operation. Refer to paragraph 2-20 for oil changes during the first 50 hours of engine operation.

During the 30 day non-operational storage or the first 25 hours of intermittent engine operation, the propeller shall be rotated through five revolutions every seventh day, without running the engine. If the aircraft is stored outside, tie it down in accordance with paragraph 2-6. In addition, the pitot tube, static air vents, air vents, openings in the engine cowling, and other similar openings shall have protective covers installed to prevent entry of foreign material. After 30 days, aircraft should be flown for 30 minutes or ground run-up until oil has reached operating temperature.

2-8. RETURNING AIRCRAFT TO SERVICE. After flyable storage, returning the aircraft to service is accomplished by performing a thorough pre-flight inspection. At the end of the first 25 hours of engine operation, drain engine oil, clean oil screens and change external oil filter element. Service engine with correct grade and quantity of engine oil. Refer to figure 2-4 and paragraph 2-20 for correct grade of engine oil.

2-9. TEMPORARY STORAGE. Temporary storage is defined as aircraft in a non-operational status for a maximum of 90 days. The aircraft is constructed of corrosion-resistant alclad aluminum, which will last indefinitely under normal conditions if kept clean. However, these alloys are subject to oxidation. The first indication of corrosion on unpainted surfaces is in the form of white deposits or spots. On painted surfaces, the paint is discolored or blistered. Storage in a dry hangar is essential to good preservation and should be procured, if possible.



ITEM NUMBER	TYPE AND PART NUMBER	REMARKS
1	Block (Jack point not available) Cessna #1200028-1	1 x 4 x 4 padded with 1/4" rubber Jack point (SEE NOTE 1)
2	Jack	Any short jack of capable capacity (SEE NOTE 1)
3	Cessna #SE-767	Universal tail stand (SEE NOTE 2)
4	Cessna #SE-576 (41-1/2" high)	Universal jack stand (FOR USE WITH ITEM 2)
5	Cessna #1200031-1	Jack point (Thru 1971 Models) (SEE NOTE 3)
6	#2-170 Basic jack #2-109 Leg Extension #2-70 Slide tube extension	Closed height: 69-1/2 inches; extended height: 92" (Insert slide tube extension into basic jack)

1. Provisions are furnished on the bottom of each wing for installation of optional 1200028-1 jack points.
2. Weighted adjustable stand attaches to tie-down ring.

   Wing jack points are aft of the aircraft center-of-gravity. This causes the aircraft to be nose heavy when on jacks. Place additional weights (shot bags or sand bags) on the weighted tail stand to hold the tail down. In addition, the base of adjustable tail stand (SE767) is to be filled with concrete for additional weight as a safety factor.

3. Optional 1200031-1 jack point may be used to raise only one wheel. Do not use brake casting as a jack point. Beginning with 1972 Models, use jack point on bottom of step.

4. Items (1), (3), (4), (5) and (6) are available from the Cessna Service Parts Center.

Figure 2-2. Jacking Details (Sheet 1 of 2)

JACKING AIRCRAFT

1. Lower the aircraft tail so that wing jack and stands can be placed at wing jack points.
2. Raise aircraft tail and attach tail stand to tail tie-down ring. BE SURE the tail stand weighs enough to keep the tail down under all conditions and that it is strong enough to support any weight that may be placed upon it.
3. Raise jacks evenly until desired height is reached. When jacking the aircraft, the main landing gear wheels must be a minimum of 16" above shop floor for landing gear retraction.
4. The jack point assembly may be used to raise only one main wheel. Do not use brake casting as a jack point.
5. The nose may be raised by weighting down the tail. Place weight on each side of stabilizer, next to fuselage.
6. Whenever the landing gear is to be operated in the shop, use the wing jack and tail jack points to raise the aircraft.
7. The aircraft may be hoisted as outlined in paragraph 2-3.

REMOVING AIRCRAFT FROM JACKS

1. Place landing gear control handle in gear down position.
2. Operate ground hydraulic power source or aircraft emergency hydraulic hand pump until landing gear is down and locked, the green (DOWN) light is illuminated and landing gear control handle has tripped to down neutral.
3. Disconnect ground hydraulic power source and/or stow emergency hydraulic hand pump handle.
4. Ascertain that green (DOWN) light is illuminated; then place master switch in OFF position.
5. Lower jacks evenly until aircraft rests on the landing gear and remove wing jacks and tail stand.
6. Compress nose landing gear shock strut to static position.

SHOP NOTES:

Figure 2-2. Jacking Details (Sheet 2 of 2)

Varying conditions will alter the measures of preservation, but under normal conditions in a dry hangar, and for storage periods not to exceed 90 days, the following methods of treatment are suggested.

a. Fill fuel bays with correct grade of gasoline.

b. Clean and wax aircraft thoroughly.

c. Clean any oil or grease from tires, and coat tires with a tire preservative. Cover tires to protect against grease or oil.

d. Either block up fuselage to relieve pressure on tires or rotate wheels every 30 days to prevent flat spotting the tires.

e. Lubricate all airframe items and seal or cover all openings which could allow moisture and/or dust to enter.

NOTE

The aircraft battery serial number is recorded in the aircraft equipment list. To assure accurate warranty records, the battery should be reinstalled in the same aircraft from which it was removed. If the battery is returned to service in a different aircraft, appropriate record changes must be made and notification sent to the Cessna Claims Department.

f. Remove battery and store in a cool, dry place; service battery periodically and charge as required.

NOTE

An engine treated in accordance with the following may be considered being protected against normal atmospheric corrosion for a period not to exceed 90 days.

g. Disconnect spark plug leads and remove upper and lower spark plugs from each cylinder.

NOTE

The preservative oil must be Lubricating Oil-Contact and Volatile, Corrosion Inhibited, MIL-L-46002, Grade 1, or equivalent. The following oils are approved for spraying by Teledyne Continental Motors: Nucle Oil 105 - Daubert Chemicals Co., 4700 So. Central Ave., Chicago, Illinois; Petratect VA-Pennsylvania Refining Co., Butler, Pennsylvania, and Ferro-Gard 1009G-Ranco Laboratories, Inc., 3617 Brownsville Road, Pittsburgh, Pennsylvania.

h. Using a portable pressure sprayer, spray preservative oil through the upper spark plug hole of each cylinder with the piston in a down position. Rotate crankshaft as each pair of cylinders is sprayed.

i. After completing step "h," rotate crankshaft so that no piston is at a top position. If the aircraft is to be stored outside, stop two-bladed propeller so that blades are as near horizontal as possible to provide maximum clearance with passing aircraft.

j. Again, spray each cylinder without moving the crankshaft, to thoroughly cover all interior surfaces of the cylinder above the piston.

k. Install spark plugs and connect spark plug leads.

l. Apply preservative oil to the engine interior by spraying approximately two ounces of the preservative oil through the oil filler tube.

m. Seal all engine openings exposed to the atmosphere, using suitable plugs or non-hygroscopic tape. Attach a red streamer at each point that a plug or tape is installed.

n. If the aircraft is to be stored outside, perform the procedures outlined in paragraph 2-6. In addition, the pitot tube, static source vents, air vents, openings in the engine cowling, and other similar openings should have protective covers installed to prevent entry of foreign material.

o. Attach a warning placard to the propeller to the effect that the propeller shall not be moved while the engine is in storage.

2-10. INSPECTION DURING STORAGE.

a. Inspect airframe for corrosion at least once a month. Remove dust collections as frequently as possible. Clean and wax aircraft as required.

b. Inspect the interior of at least one cylinder through the spark plug hole for corrosion at least once each month.

NOTE

Do not move crankshaft when inspecting interior of cylinder for corrosion.

c. If at the end of the 90 day period, the aircraft is to be continued in non-operational storage, repeat the procedural steps "g" thru "o" of paragraph 2-9.

2-11. RETURNING AIRCRAFT TO SERVICE. After temporary storage, use the following procedure to return the aircraft to service.

a. Remove aircraft from blocks. Check tires for proper inflation.

b. Check and install battery.

c. Check that oil sump has proper grade and quantity of engine oil.

d. Service induction air filter and remove warning placard from propeller.

e. Remove materials used to cover openings.

f. Remove, clean and gap spark plugs.

g. While spark plugs are removed, rotate propeller several revolutions to clear excess rust preventive oil from cylinders.

h. Clean, gap and install spark plugs. Torque plugs to value listed in Section 12 or 12A.

i. Check fuel strainer. Remove and clean filter screen, if necessary. Check fuel bays and fuel lines for moisture and sediment. Drain enough fuel to eliminate moisture and sediment.

j. Perform a thorough pre-flight inspection, then start and warm-up engine.

2-12. INDEFINITE STORAGE. Indefinite storage is defined as aircraft in a non-operational status for an indefinite period of time. Engines treated in accordance with the following may be considered protected against normal atmospheric corrosion, provided the procedures outlined in paragraph 2-13 are performed at the intervals specified.

a. Operate engine until oil temperature reaches normal operating range. Drain engine oil sump and reinstall drain plug.
b. Fill oil sump to normal operating capacity with corrosion preventive mixture which has been thoroughly mixed and pre-heated to a minimum of 221°F at the time it is added to the engine.

NOTE

Corrosion preventive mixture consists of one part compound MIL-C-6529, Type I, mixed with three parts new lubricating oil of the grade recommended for service. Continental Motors Corporation recommends Cosmoline No. 1223, supplied by E. F. Houghton & Co., 305 W. LeHigh Avenue, Philadelphia, Pa. During all spraying operation corrosion mixture is pre-heated to 221° to 250°F.

c. Immediately after filling the oil sump with corrosion preventative mixture, fly the aircraft for a period of time not to exceed a maximum of 30 minutes.
d. With engine operating at 1200 to 1500 rpm and induction air filter removed, spray corrosion preventive mixture into induction airbox, at the rate of one-half gallon per minute, until heavy smoke comes from exhaust stack, then increase the spray until the engine is stopped.

CAUTION

Injecting corrosion-preventive mixture too fast can cause a hydrostatic lock.

e. Do not rotate propeller after completing step "d."
f. Remove all spark plugs and spray corrosion-preventive mixture, which as been pre-heated to 221° to 250°F, into all spark plug holes to thoroughly cover interior surfaces of cylinders.
g. Install lower spark plugs or install solid plugs, and install dehydrator plugs in upper spark plug holes. Be sure that dehydrator plugs are blue in color when installed.
h. Cover spark plug lead terminals with shipping plugs (AN4060-1) or other suitable covers.
i. With throttle in full open position, place a bag of desiccant in the induction air intake and seal opening with moisture resistant paper and tape.
j. Place a bag of desiccant in the exhaust tailpipe(s) and seal openings with moisture resistant tape.
k. Seal cold air inlet to the heater muff with moisture resistant tape.
l. Seal engine breather by inserting a protex plug in the breather hose and clamping in place.
m. Seal all other engine openings exposed to atmosphere using suitable plugs or non-hygroscopic tape.

NOTE

Attach a red streamer to each place plugs or tape is installed. Either attach red streamers outside of the sealed area with tape or to the inside of the sealed area with safety wire to prevent wicking of moisture into the sealed area.

n. Drain corrosion-preventive mixture from engine sump and reinstall drain plug.

NOTE

The corrosion-preventive mixture is harmful to paint and should be wiped from painted surfaces immediately.

o. Attach a warning placard on the throttle control knob, to the effect that the engine contains no lubricating oil. Placard the propeller to the effect that it should not be moved while the engine is in storage.
p. Prepare airframe for storage as outlined in paragraph 2-9 thru step "f."

NOTE

As an alternate method of indefinite storage, the aircraft may be serviced in accordance with paragraph 2-9 providing the aircraft is run-up at maximum intervals of 60 days and then reserviced per paragraph 2-9.

2-13. INSPECTION DURING STORAGE. Aircraft in an indefinite storage shall be inspected as follows:
a. Inspect cylinder protex plugs each 7 days.
b. Change protex plugs if their color indicates an unsafe condition.
c. If the dehydrator plugs have changed color in one half of the cylinders, all desiccant material in the engine shall be replaced with new material.
d. Every 6 months respray the cylinder interiors with corrosion-preventive mixture.

NOTE

Before spraying, inspect the interior of one cylinder for corrosion through the spark plug hole and remove at least one rocker box cover and inspect the valve mechanism.

2-14. RETURNING AIRCRAFT TO SERVICE. After indefinite storage, use the following procedure to return the aircraft to service.
a. Remove aircraft from blocks and check tires for correct inflation. Check for correct nose gear strut inflation.
b. Check battery and install.
c. Remove all materials used to seal and cover openings.
d. Remove warning placards posted at throttle and propeller.
e. Remove and clean engine oil screen, then reinstall and safety. On aircraft that are equipped with an external oil filter, install new filter element.
f. Remove oil sump drain plug and drain sump. Install and safety drain plug.

NOTE

The corrosion-preventive mixture will mix with the engine lubricating oil, so flushing the oil system is not necessary. Draining the oil sump will remove enough of the corrosion-preventive mixture.

g. Service and install the induction air filter.
h. Remove dehydrator plugs and spark plugs or plugs installed in spark plug holes and rotate propeller by hand several revolutions to clear corrosion-preventive mixture from cylinders.
i. Clean, gap and install spark plugs. Torque plugs to value listed in Section 12 or 12A.
j. Check fuel strainer. Remove and clean filter screen. Check fuel tanks and fuel lines for moisture and sediment, and drain enough fuel to eliminate.
k. Perform a thorough pre-flight inspection, then start and warm-up engine.
l. Thoroughly clean aircraft and flight test aircraft.

2-15. LEVELING. Longitudinally leveling of the aircraft is accomplished by backing out the two screws on the left side of the fuselage and then placing a level across the screws. Corresponding points on either the upper or lower main door sills may be used to level the aircraft laterally.

2-16. SERVICING.

2-17. Servicing requirements are shown in the Servicing Chart (figure 2-4). The following paragraphs supplement figure 2-4 by adding details not included in the chart.

2-18. FUEL TANKS. An area of each wing is sealed to form an integral fuel tank. Recommended fuel grade is listed in figure 2-4, and fuel capacities are given in figure 1-1.

2-19. FUEL DRAINS are located at various points in the fuel system to provide drainage of water and sediment. Refer to Section 13 for location of drain plugs and valves. The strainer drain control is adjacent to the engine oil dipstick. Access to the control is through the cowling door on the left side of the upper cowl. Also, during daily inspection of the fuel strainer, if water is found in the fuel strainer, there is a possibility that the wing tank sumps, fuel lines, and fuel reservoir tanks contain water. Therefore, all drain plugs or valves should be removed and all water drained from the fuel system. On aircraft equipped with drain valves, to activate the drain valves for fuel sampling, place cup up to valve and depress valve with rod protruding from cup. (Refer to figure 13-2.)

2-20. ENGINE OIL. Check engine lubricating oil with the dipstick five to ten minutes after the engine has been stopped. The aircraft should be in as near a level position as possible when checking the engine oil, so that a true reading is obtained. Engine oil should be drained while the engine is still hot, and the nose of the aircraft should be raised slightly for more positive draining of any sludge which may have collected in the engine oil sump. Engine oil should be changed every six months, even though less than the specific hours have accumulated. Reduce these intervals for prolonged operations in dusty areas, in cold climates where sludging conditions exist, or where short flights and long idle periods are encountered, which cause sludging conditions. Always change oil and clean oil screens whenever oil on the dipstick appears dirty. Ashless dispersant oil, conforming to Continental Motors Specification No. MHS-24A, shall be used in these engines. Multi-Viscosity oil may be used to extend the operating temperature range, improve cold engine starting and lubrication of the engine during the critical warm-up period, thus permitting flight through wider ranges of climate change without the necessity of changing oil. The multi-viscosity grades are recommended for aircraft engines subjected to wide variations in ambient air temperatures when cold starting of the engine must be accomplished at temperatures below 30°F.

NOTE

New or newly-overhauled engines should be operated on aviation grade straight mineral oil until the first oil change. The aircraft is delivered from Cessna with straight mineral oil (MIL-C-6529, Type II RUST BAN.) If oil must be added during the first 25 hours, use only aviation grade straight mineral oil conforming to Specification MIL-6082. After the first 25 hours of operation, drain engine oil sump and clean both the oil suction strainer and the oil pressure screen. If an optional oil filter is installed, change filter element at this time. Refill sump with straight mineral oil and use until a total of 50 hours have accumulated or oil consumption has stabilized, then change to ashless dispersant oil.

When changing engine oil, remove and clean oil screens, or install a new filter element on aircraft equipped with an external oil filter. To drain oil, proceed as follows:
a. Operate engine until oil temperature is at normal operating temperature.
b. Remove oil drain plug from engine sump and allow oil to drain into a container.
c. After engine oil has drained, install and safety drain plug.
d. Remove and clean oil screen.
e. Service engine with correct quantity and grade of engine oil.

NOTE

Refer to inspection charts for intervals for changing oil and filter elements. Refer to figure 2-4 for correct grade of engine oil and refer to figure 1-1 for correct capacities.

2-21. ENGINE INDUCTION AIR FILTERS keep dust and dirt from entering the induction system. Dust entering the intake system is probably the greatest single cause of early engine wear; therefore, the value of maintaining the induction air filter in good clean condition can never be overstressed. The frequency with which the filter should be removed and cleaned will be determined primarily by aircraft operating conditions. Some operators prefer to hold a spare filter(s) at their home base of operation so that a clean filter(s) is always readily available for use. Under extreme dusty conditions, daily maintenance of the filter is recommended. A dry type filter is used on the aircraft.

NOTE

Model T210 has one filter located at the upper right aft baffle. Model 210 has two filters located at the upper aft baffle on each side of the engine.

To service the dry type filter, proceed as follows:

a. Remove the filter as outlined in Section 12 and 12A.

b. Clean filter by blowing with compressed air (not over 100 psi) from direction opposite of normal air flow. Arrows on the filter frame indicate direction of normal air flow.

NOTE

Use care to prevent damage to filter element when cleaning with compressed air. Never use air pressure greater than 100 psi to clean filter.

c. After cleaning as outlined in step "b," filter may be washed, if necessary, in a solution of warm water and a mild household detergent. A cold water solution may be used.

CAUTION

Do not use solvent or cleaning fluids to wash filter. Use only a water and household detergent solution when washing the filter.

NOTE

The dry type filter may be cleaned with compressed air a maximum of 30 times or it may be washed a maximum of 20 times. The filter should be replaced after 500 hours of engine operating time or one year, whichever should occur first. However, the filter should be replaced at anytime it is damaged. A damaged filter may have sharp or broken edges in the filtering panels which would allow unfiltered air to enter the induction system. Any filter that appears doubtful should be replaced.

d. After washing, rinse filter with clear water until rinse water runs clear from filter. Allow water to drain from filter and dry with compressed air (not over 100 psi).

NOTE

The filtering panels of the filter may become distorted when wet, but they will return to their original shape when dry.

e. Be sure induction air box and air inlet ducts to the engine are clean, inspect filter and install new filter if old filter is damaged.

f. Install filter as outlined in Section 12 and 12A.

2-22. VACUUM SYSTEM AIR FILTER. The vacuum system central air filter keeps dust and dirt from entering the vacuum operated instrument. Inspect the filter element every 200 hours for damage. Change the central air filter element every 500 hours of operating time and whenever the suction gage reading drops below 4.6 inches of mercury. Also, do not operate the vacuum system with the filter element removed or a vacuum line disconnected as particles of dust or other foreign matter may enter the system and damage the vacuum operated instruments.

2-23. BATTERY. Battery servicing involves adding distilled water to maintain the electrolyte level even with the horizontal baffle plate or split ring at the bottom of the filler holes, checking cable connections, and neutralizing and cleaning off any spilled electrolyte or corrosion. Use bicarbonate of soda (baking soda) and clean water to neutralize electrolyte or corrosion. Follow with a thorough flushing with clean water. Do not allow bicarbonate of soda to enter battery. Brighten cable and terminal connection with a wire brush, then coat with petroleum jelly before connecting. Check the battery every 50 hours (or at least every 30 days), oftener in hot weather. Add only distilled water, not acid or "rejuvenators," to maintain electrolyte level in the battery. Inspect the battery box and clean and remove any evidence of corrosion.

2-24. TIRES should be maintained at the air pressure specified in figure 1-1. When checking tire pressure, examine tire for wear, cuts, bruises, and slippage.

NOTE

Recommended tire pressure should be maintained. Especially in cold weather, remember that any drop in temperature of the air inside a tire causes a corresponding drop in pressure.

2-25. NOSE GEAR STRUT. The nose gear strut requires periodic checking to ascertain that the strut is filled with hydraulic fluid and is inflated to the correct air pressure. To fill the nose gear strut with hydraulic fluid and air, proceed as follows:

a. Weight tail to raise nose wheel off ground.

b. Remove filler valve cap from filler valve, and depress valve core to completely deflate nose strut.

c. Remove valve core from filler valve.

d. Attach a rubber hose to the filler valve.

e. With other end of rubber hose in a container of clean hydraulic fluid, compress and extend strut several times. This will draw fluid from container into the strut, filling strut with hydraulic fluid.

f. After strut has been cycled several times, allow strut to extend. Holding end of rubber hose above fluid level in container, slowly compress strut, allowing excess fluid to be drained into container.

g. While strut is compressed, remove hose and install valve core in filler valve.

h. Inflate strut to the pressure specified in figure 1-1.

NOTE

The nose landing gear shock strut will normally require only a minimum amount of service. Maintain the strut extension pressure as shown in figure 1-1. Lubricate landing gear as shown in figure 2-5. Check the landing gear daily for general cleanliness, security of mounting, and for hydraulic fluid leakage. Keep machined surfaces wiped free of dirt and dust, using a clean lint-free cloth saturated with hydraulic fluid (MIL-H-5606) or kerosene. All surfaces should be wiped free of excessive hydraulic fluid.

2-26. NOSE GEAR SHIMMY DAMPENER. The shimmy dampener should be serviced at least every 100 hours. The dampener must be filled completely with hydraulic fluid, free of entrapped air with the compensating piston bottomed in the rod. Check that piston is completely bottomed as follows:

a. Remove shimmy dampener from the aircraft.

b. While holding the shimmy dampener in a vertical position with the filler plug pointed upward, loosen the filler plug.

c. Allow the spring to bottom out the floating piston inside the shimmy dampener rod.

d. When the fluid stops flowing, insert a length of stiff wire through the air bleed hole in the setscrew at the end of the piston rod until it touches the floating piston. The depth of insertion should be 3-13/16 inches.

NOTE

If the wire insertion is less than 3-13/16 inches, the floating piston is lodged in the shaft. If the wire cannot be used to free the piston, the rod assembly and piston should be replaced.

Service the shimmy dampener as follows:

a. Remove filler plug from dampener.

b. Move piston completely to opposite end from filler plug.

c. Fill dampener with clean hydraulic fluid completely full.

d. Reinstall filler plug and safety.

e. Wash dampener in solvent and wipe dry with a cloth.

f. Reinstall shimmy dampener in aircraft.

NOTE

Keep shimmy dampener, especially the exposed portions of the dampener piston shaft, clean to prevent collection of dust and grit which could cut the seals in the dampener barrel. Keep machined surfaces wiped free of dirt and dust, using a clean lint-free cloth saturated with hydraulic fluid (MIL-H-5606) or kerosene. All surfaces should be wiped free of excessive hydraulic fluid.

2-27. HYDRAULIC BRAKE SYSTEMS should be checked for the correct amount of fluid at least every 200 hours. Add hydraulic fluid at the brake master cylinders. Bleed the brake system of entrapped air whenever there is spongy response to the brake pedals. Refer to Section 5 for the bleeding procedure.

2-28. HYDRAULIC RESERVOIR. (Thru 21059502) The hydraulic reservoir should be filled as necessary whenever the fluid level in the reservoir sight window shows low. Filling is accomplished by using a pressure brake bleeder or Hydro Fill unit attached to the filler fitting, located on the right firewall. Hydraulic fluid should be pumped into the filler fitting until fluid flows from the reservoir vent line. Refer to figure 2-3 for procedures for filling the hydraulic power pack beginning with 21059503.

2-29. HYDRAULIC FILTER. (Thru 21059502) The hydraulic filter, located on the right firewall in the hydraulic in the hydraulic pump pressure line, uses a fine-mesh screen to filter the hydraulic fluid. The filter screen should be removed and cleaned at the first 25, first 50 hours, or thereafter, at 100-hour intervals or whenever improper fluid circulation is suspected.

2-30. HYDRAULIC FLUID SAMPLING AND CONTAMINATION CHECK. At the first 50 and first 100 hour-inspection, thereafter at each 500-hour inspection or one year, whichever should occur first, a sample of fluid should be taken and examined for sediment and discoloration. This may be done as follows:

a. Place aircraft master switch in OFF position.

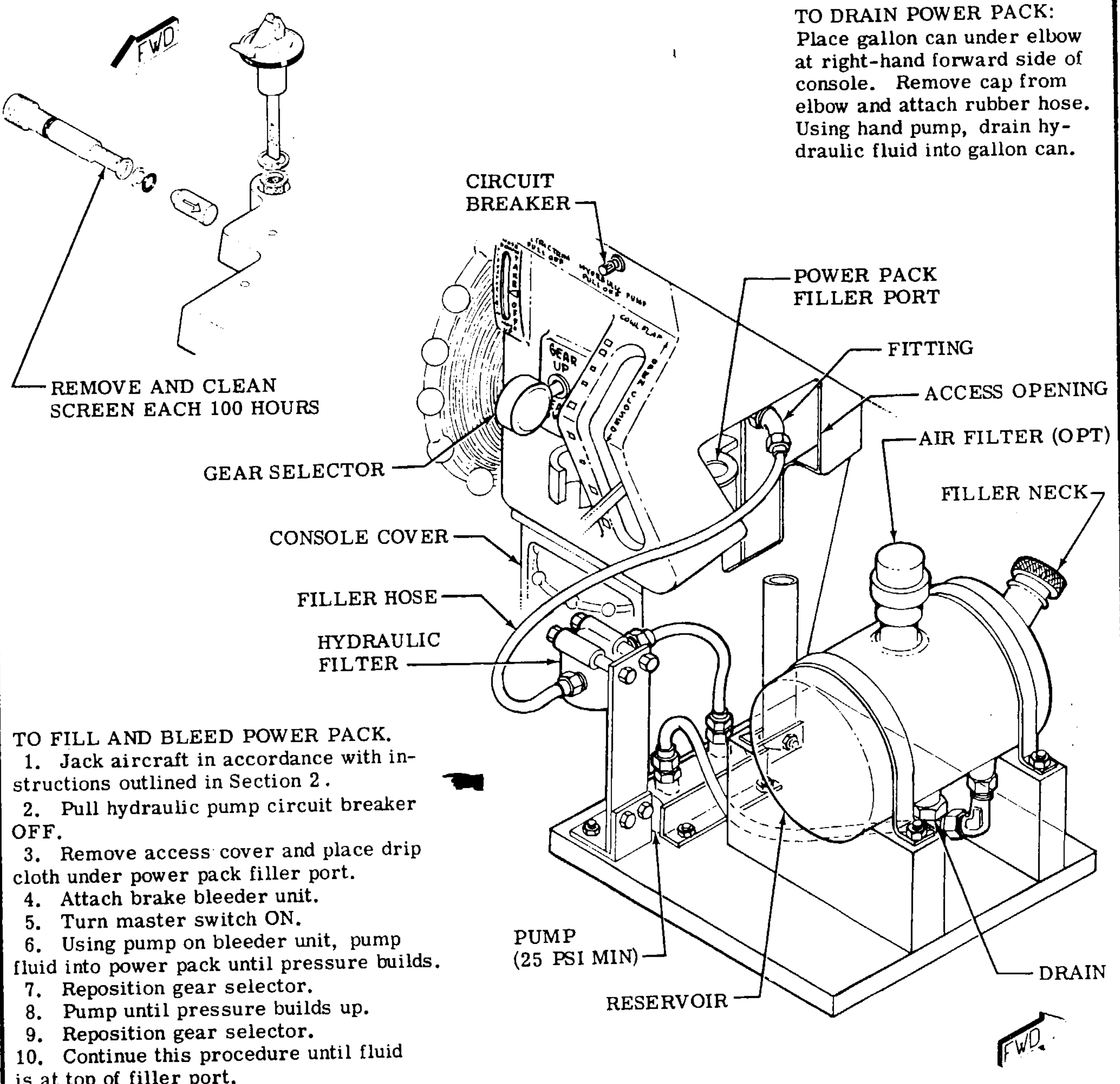
b. With landing gear control handle in down-neutral, actuate hydraulic hand pump to supply pressure to open landing gear doors.

c. Disconnect door open line from nose gear door actuator cylinder. Using the hydraulic hand pump, drain a small sample of hydraulic fluid into a nonmetallic container.

d. Connect nose gear door actuating cylinder line and analyze fluid sample.

e. If the drain fluid is clear and is not appreciably darker in color than new fluid, continue to use the present fluid.

f. If the fluid color is doubtful, place fluid sample



TO DRAIN POWER PACK:
Place gallon can under elbow at right-hand forward side of console. Remove cap from elbow and attach rubber hose. Using hand pump, drain hydraulic fluid into gallon can.

TO FILL AND BLEED POWER PACK.

1. Jack aircraft in accordance with instructions outlined in Section 2.
2. Pull hydraulic pump circuit breaker OFF.
3. Remove access cover and place drip cloth under power pack filler port.
4. Attach brake bleeder unit.
5. Turn master switch ON.
6. Using pump on bleeder unit, pump fluid into power pack until pressure builds.
7. Reposition gear selector.
8. Pump until pressure builds up.
9. Reposition gear selector.
10. Continue this procedure until fluid is at top of filler port.
11. Power pack should be filled and completely bled; remove filler hose.
12. Turn OFF master switch and replace access cover.
13. Remove aircraft from jacks.

Figure 2-3. Servicing Hydraulic Power Pack

in a non-metallic container and insert a strip of polished copper in the fluid.

g. Keep copper in the fluid for six hours at a temperature of 70°F or more. A slight darkening of the copper is permissible, but there should be no pitting or etching visible up to 20X magnification.

2-31. OXYGEN SYSTEM. Refer to Section 15.

2-32. FACE MASKS. Refer to Section 15.

2-33. CLEANING.

2-34. Keeping the aircraft clean is important. Besides maintaining the trim appearance of the aircraft, cleaning reduces the possibility of corrosion and makes inspection and maintenance easier.

2-35. UPHOLSTERY AND INTERIOR cleaning prolongs the life of upholstery fabrics and interior trim. To clean the interior, proceed as follows:

a. Empty all the ash trays.
b. Brush out or vacuum clean the upholstery and carpeting to remove dirt.
c. Wipe leather and plastic surfaces with a damp cloth.
d. Soiled upholstery fabrics and carpet may be cleaned with a foam-type detergent, used according to the manufacturer's instructions.
e. Oily spots and stains may be cleaned with household spot removers, used sparingly. Before using any solvent, read the instructions on the container and test it on an obscure place in the fabric to be cleaned. Never saturate the fabric with a volatile solvent; it may damage the packing and backing material.
f. Scrape off sticky materials with a dull knife, then spot clean the area.

2-36. PLASTIC TRIM. The instrument panel, plastic trim and control knobs need only be wiped off with a damp cloth. Oil and grease on the control wheel and control knobs can be removed with a cloth moistened with Stoddard solvent.

CAUTION

Do not use gasoline, alcohol, benzene, acetone, carbon tetrachloride, fire extinguisher fluid, deicer fluid, lacquer thinner or glass window cleaning spray. These solvents will soften and craze the plastic.

2-37. WINDSHIELD AND WINDOWS should be cleaned carefully with plenty of fresh water and a mild detergent, using the palm of the hand to feel and dislodge any caked dirt or mud. A sponge, soft cloth, or chamois may be used, but only as a means of carrying water to the plastic. Rinse thoroughly, then dry with a clean moist chamois. Do not rub the plastic with a dry cloth since this builds up an electrostatic charge which attracts dust. Oil and grease may be removed by rubbing lightly with a soft cloth moistened with Stoddard solvent. Volatile solvents, such as mentioned in paragraph 2-36, must never be used since they soften and craze the plastic. After washing, the plastic windshield and windows should be cleaned with an aircraft windshield cleaner. Apply the cleaner with soft cloths, and rub with moderate pressure. Allow the cleaner to dry, then wipe it off with soft flannel cloths. A thin, even coat of wax, polished out by hand with clean soft flannel cloths, will fill in minor scratches and help prevent further scratching. Do not use a canvas cover on the windshield or windows unless freezing rain or sleet is anticipated since the cover may scratch the plastic surface. After cleaning if any scratches, "bulls eyes" or other damage is detected, refer to Section 3 for repair or replacement of windows or windshield.

2-38. ALUMINUM SURFACES. The aluminum surfaces require a minimum of care, but should never be neglected. The aircraft may be washed with clean water to remove dirt and may be washed with non-alkaline grease solvents to remove oil and/or grease. Household-type detergent soap powders are effective cleaners, but should be used cautiously since some of them are strongly alkaline. Many good aluminum cleaners, polishes and waxes are available from commercial suppliers of aircraft products.

2-39. PAINTED SURFACES. The painted exterior surfaces of the aircraft, under normal conditions, require a minimum of polishing or buffing. Approximately 15 days are required for acrylic or lacquer paint to cure completely and approximately 90 days are required for vinyl paint to cure completely; in most cases, the curing period will have been completed prior to delivery of the aircraft. In the event that polishing or buffing is required within the curing period, it is recommended that the work be done by an experienced painter. Generally, the painted surfaces can be kept bright by washing with water and mild soap, followed by a rinse with water and drying with cloths or a chamois. Harsh or abrasive soaps or detergents which cause corrosion or make scratches should never be used. Remove stubborn oil and grease with a cloth moistened with Stoddard solvent. After the curing period, the aircraft may be waxed with a good automotive wax. A heavier coating of wax on the leading edges of the wings and tail and on the engine nose cap will help reduce the abrasion encountered in these areas.

2-40. ENGINE COMPARTMENT cleaning is essential to minimize any danger of fire, and for proper inspection of engine components. The engine and engine compartment may be washed down with a suitable solvent, then dried thoroughly.

CAUTION

Particular care should be given to electrical equipment before cleaning. Solvent should not be allowed to enter magnetos, starters, alternators, voltage regulators, and the like. Hence, these components should be protected before saturating the engine with solvent. Any oil, fuel, and air openings on the engine and accessories should be covered before washing the engine with solvent. Caustic cleaning solutions should be used cautiously and should always be properly neutralized after their use.

2-41. PROPELLERS should be wiped occasionally with an oily cloth to remove grass and bug stains from the propeller blades. In salt water areas this will assist in corrosion-proofing the propeller.

2-42. WHEELS should be washed periodically and examined for corrosion, chipped paint, and cracks or dents in the wheel castings. Sand smooth, prime, and repaint minor defects.

2-42A. LANDING GEAR AND DOOR MANIFOLD SOLENOIDS. Beginning with 21060961, disassemble, clean and reassemble every 1000 hours or 5 years.

2-43. LUBRICATION.

2-44. Lubrication requirements are shown in figure 2-5. Before adding grease to grease fittings, wipe off all dirt. Lubricate until new grease appears around parts being lubricated, and wipe off excess grease. The following paragraphs supplement this figure by adding details.

2-45. NOSE GEAR TORQUE LINKS. Lubricate nose gear torque links every 50 hours. When operating in dusty conditions, more frequent lubrication is recommended.

2-46. TACHOMETER DRIVE SHAFT. Refer to Section 16 for lubrication.

2-47. WHEEL BEARING LUBRICATION. Clean and repack wheel bearings at the first 100-hour inspection and at each 500-hour inspection thereafter. If more than the usual number of take-off and landings are made, extensive taxiing is required, or the aircraft is operated in dusty areas or under seacoast conditions, clean and lubricate wheel bearings at each 100-hour inspection.

2-48. WING FLAP ACTUATOR.

a. On aircraft prior to 21059471 which have not been modified by Service Kit SK210-68, proceed as follows:

1. At each 100 hour inspection, inspect wing flap actuator jack screw and ball retainer assembly for lubrication, and lubricate if required. Also, remove, clean and lubricate jack screw whenever actuator slippage is experienced. If lubrication is required, proceed as follows:

a. Gain access to actuator by removing appropriate inspection plates on lower surface of wing.

b. Expose jack screw by operating flaps to full-down position.

c. Wipe a small amount of lubricant from jack screw with a rag and examine for condition. Lubricant should not be dirty, sticky, gummy or frothy in appearance.

d. Inspect wiped area on jack screw for presence of hard scale deposit. Previous wiping action, will have exposed bare metal if no deposit is present.

e. If any of the preceding conditions exist, clean and relubricate jack screw as outlined in steps "f" thru "n".

f. Remove actuator from aircraft in accordance with procedures outlined in Section 7.

g. Remove all existing lubricant from jack screw and torque tube by running the nut assembly to the end of the jack screw away from the gearbox, and soaking the nut assembly and jack screw in Stoddard solvent. Care must be taken to prevent solvent from entering gearbox. The gearbox lubricant is not affected and should not be disturbed.

h. After soaking, clean entire length of jack screw with a wire brush, rinse with solvent and dry with compressed air.

NOTE

Do not disassemble nut and ball retainer assembly.

i. Relubricate jack screw with MIL-G-21164 (Molybdenum Disulfide Grease) as outlined in steps "j" thru "m".

j. Rotate nut down screw toward the motor.

k. Coat screw and thread end of nut with grease and run nut to full extension.

l. Repeat the process and pack lubricant in the cavity between the nut and ball retainer at the threaded end of the nut.

m. Repeat the process and work nut back and forth several times.

n. Remove excess grease.

o. Reinstall actuator in aircraft in accordance with instructions outlined in Section 7.

b. On aircraft prior to 21059471 which have been modified by Service Kit SK210-68, proceed as follows:

1. At each 100-hour inspection, expose jack screw by operating flaps to full-down position, and inspect wing flap actuator jack screw for proper lubrication. If lubrication is required, proceed as follows:

a. Clean jack screw with solvent rag, if necessary, and dry with compressed air.

b. Relubricate jack screw with MIL-G-21164 (Molybdenum Disulfide Grease) as required.

c. On aircraft beginning with 21059471, clean and lubricate wing flap actuator jack screw as follows each 100 hours:

1. Expose jack screw by operating flaps to full-down position.

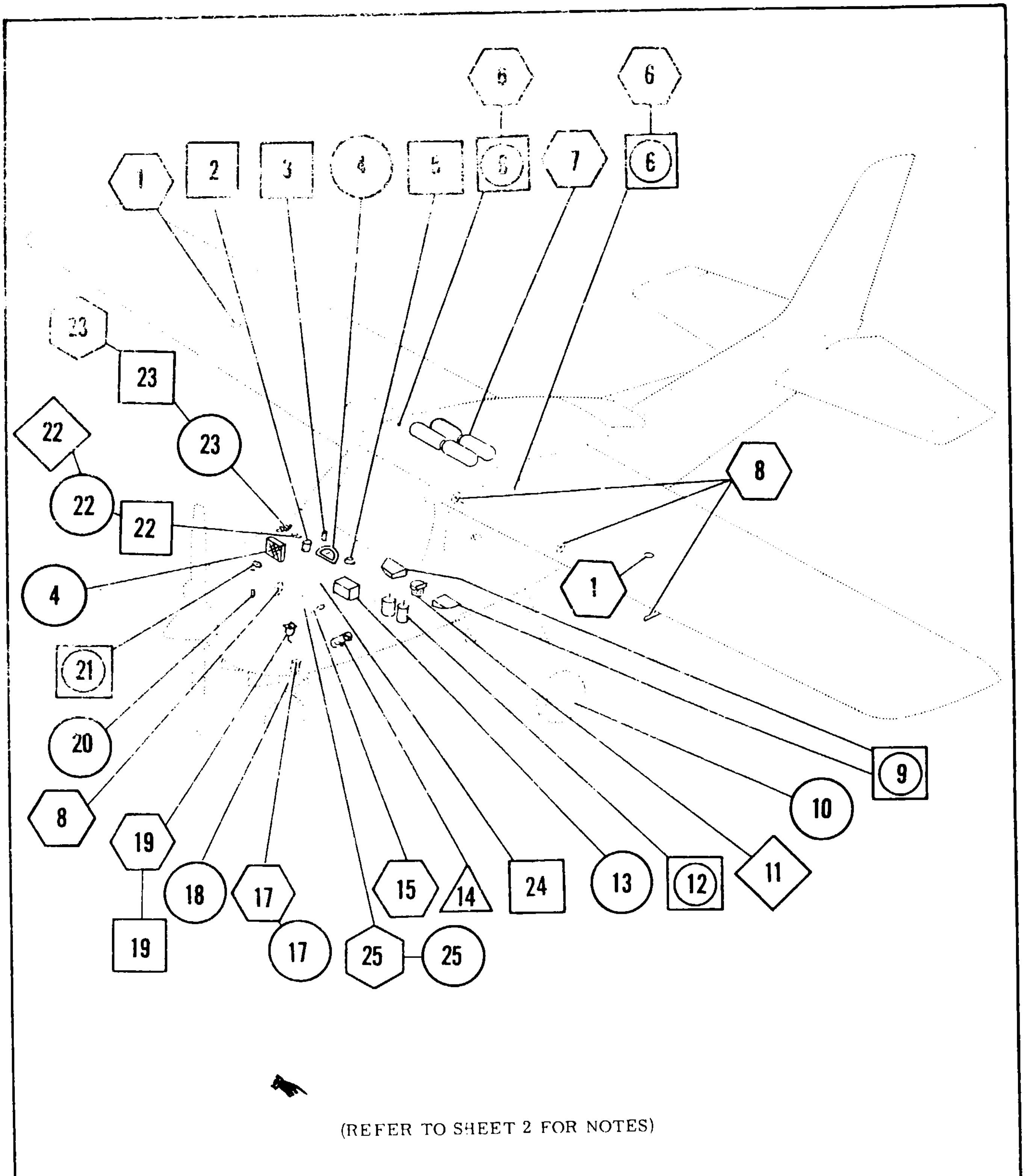
2. Clean jack screw threads with solvent rag and dry with compressed air.

NOTE

It is not necessary to remove actuator from aircraft to clean or lubricate threads.

3. With oil can, apply light coat of No. 10 weight, non-detergent oil to threads of jack screw.

2-49. ROD END BEARINGS. Periodic inspection and lubrication is required to prevent corrosion of the bearing in the rod end. At each 100-hour inspection, disconnect the control rods at the aileron and inspect each rod end for corrosion. If no corrosion is found, wipe the surface of the rod end balls with general purpose oil and rotate ball freely to distribute the oil over its entire surface and connect the control rods to the aileron. If corrosion is detected during inspection, install new rod ends.



(REFER TO SHEET 2 FOR NOTES)

Figure 2-4. Servicing (Sheet 1 of 4)

HYDRAULIC FLUID:
SPEC. NO. MIL-H-5606
OXYGEN:
SPEC. NO. MIL-O-27210

RECOMMENDED FUEL:

ENGINE MODEL IO-520 Series CONTINENTAL

Compliance with conditions stated in Continental aircraft engine Service Bulletins M74-6 and M75-2 and supplements or revisions thereto, are recommended when using alternate fuel.

1. MINIMUM: 100/130 Aviation Grade
2. ALTERNATE:
a. 115/145 Aviation Grade (with lead content limited to a maximum of 4.6 cc Tetraethyl lead per gallon.)

RECOMMENDED ENGINE OIL:

ENGINE MODEL IO-520 Series CONTINENTAL

AVIATION GRADE:

40° F	SAE 50
40° F	SAE 30

Aviation grade ashless dispersant oil, conforming to Continental Motors Specification MHS-24 and all revisions and supplements thereto, must be used except as noted in paragraph 2-20. Refer to Continental aircraft Engine Service Bulletin M75-2 and any superseding bulletins, revisions or supplements thereto, for further recommendations.

DAILY

1 FUEL BAYS:
Service after each flight. Keep full to retard condensation. Refer to paragraph 2-18 for details.

6 FUEL BAY SUMP DRAINS:
Drain off any water and sediment before first flight of the day.

19 FUEL STRAINER:
Drain off any water and sediment before first flight of the day.

15 OIL DIPSTICK:
Check on preflight. Add oil as necessary. Refer to paragraph 2-20 for details. Check that filler cap is tight and oil filler is secure.

8 PITOT AND STATIC PORTS:
Check for obstructions before first flight of the day.

7 OXYGEN CYLINDERS:
Check for anticipated requirements before each flight. Refer to Section 15 for details.

17 NOSE GEAR SHOCK STRUT:
Check on preflight. Check inner barrel showing below outer barrel to be 1.00-2.00 (approximately 1.20) inches after bouncing. Deviation from these dimensions is cause to check and service strut per paragraph 2-25.

Figure 2-4. Servicing (Sheet 2 of 4)

FIRST 25 HOURS

25 ENGINE OIL SYSTEM:
Refill with straight mineral oil, non-detergent, and use until a total of 50 hours have accumulated or oil consumption has stabilized, then change to ashless dispersant oil.

23 HYDRAULIC FILTER:
Check and clean screen at first 25 and 50 hours, thereafter at each 100 hours.

50 HOURS

4 INDUCTION AIR FILTER:
Clean filter per paragraph 2-21. Replace as required.

13 BATTERY:
Check electrolyte level and clean battery compartment each 50 hours or each 30 days.

25 ENGINE OIL SYSTEM:
Change oil each 50 hours if engine is NOT equipped with external filter; if equipped with external oil filter, change filter element each 50 hours and oil at least at each 100 hours, or every 6 months.

18 SHIMMY DAMPENER:
Check fluid level and refill as required in accordance with paragraph 2-26.

10 TIRES:
Maintain correct tire inflation as listed in figure 1-1. Refer to paragraph 2-24 for details.

17 NOSE GEAR SHOCK STRUT:
Keep strut filled and inflated to correct pressure. Refer to paragraph 2-25 for details.

20 SPARK PLUGS:
Remove, clean and re-gap all spark plugs. Refer to Section 12 for details.

23 HYDRAULIC FILTER:
Check and clean screen at first 25 and 50 hours, thereafter at each 100 hours.

22 HYDRAULIC FLUID RESERVOIR:
At first 50 and first 100 hours, thereafter at each 500 hours or one year, whichever comes first, a sample of hydraulic fluid should be examined for sediment and discoloration as outlined in paragraph 2-30.

100 HOURS

2 VACUUM SYSTEM OIL SEPARATOR:
Remove, flush with solvent, and dry with compressed air.

3 FUEL/AIR CONTROL UNIT SCREEN:
Remove and clean screen.

23 HYDRAULIC FILTER:
Check and clean screen at first 25 and 50 hours, thereafter at each 100 hours.

22 HYDRAULIC FLUID RESERVOIR:
At first 50 and first 100 hours, thereafter at each 500 hours or one year, whichever comes first, a sample of hydraulic fluid should be examined for sediment and discoloration as outlined in paragraph 2-30.

Figure 2-4. Servicing (Sheet 3 of 4)

100 HOURS (Cont).

19 FUEL STRAINER:
Disassemble and clean strainer bowl and screen.

24 ALTERNATOR SUPPORT BRACKET:
Check alternator support bracket for security and cracking. (Refer to Service Letter SE71-42.)

5 VACUUM RELIEF VALVE FILTER SCREEN:
Remove, flush with solvent and dry with compressed air.

200 HOURS

21 VACUUM RELIEF VALVE FILTER:
Change each 1000 hours or to coincide with engine overhauls.

6 FUEL BAY SUMP DRAINS:
Drain off any water or sediment.

9 FUEL RESERVOIR TANK DRAIN:
Remove plugs and drain off water and sediment. Some aircraft are equipped with drain valves.

12 BRAKE MASTER CYLINDERS:
Check fluid level and fill as required with hydraulic fluid.

500 HOURS

11 VACUUM SYSTEM CENTRAL AIR FILTER:
Replace every 500 hours.

22 HYDRAULIC FLUID RESERVOIR:
At first 50 and first 100 hours, thereafter at each 500 hours or one year, whichever comes first, a sample of hydraulic fluid should be examined for sediment and discoloration as outlined in paragraph 2-30.

AS REQUIRED

14 GROUND SERVICE RECEPTACLE
Thru 1971 Models, connect to 12-volt, D.C. negative-ground power unit. Beginning with 1972 Models, connect to 24-volt, D.C. negative-ground power unit for cold weather starting and lengthy ground maintenance of the aircraft's electrical equipment with the exception of electronic equipment. Master switch should be turned on before connecting a generator-type or battery-type external power source. Refer to Section 17.

NOTE

The ground power receptacle circuit incorporates a polarity reversal protection. Power from the external power source will flow only if the ground service plug is connected correctly to the aircraft.

Figure 2-4. Servicing (Sheet 4 of 4)

FREQUENCY (HOURS)

50 100 500 1000

METHOD OF APPLICATION

HAND GREASE GUN OIL CAN SYRINGE (FOR POWDERED GRAPHITE)

WHERE NO INTERVAL IS SPECIFIED, LUBRICATE AS REQUIRED AND WHEN ASSEMBLED OR INSTALLED.

NOTE

The military specifications listed below are not mandatory, but are intended as guides in choosing satisfactory materials. Products of most reputable manufacturers meet or exceed these specifications.

LUBRICANTS

PG	SS-G-659	POWDERED GRAPHITE
GR	MIL-G-81322A	GENERAL PURPOSE GREASE
GH	MIL-G-23827A	AIRCRAFT AND INSTRUMENT GREASE
GL	MIL-G-21164C	HIGH AND LOW TEMPERATURE GREASE
OG	MIL-L-7870A	GENERAL PURPOSE OIL
PL	VV-P-236	PETROLATUM
GT		NO. 10WT NON-DETERGENT OIL

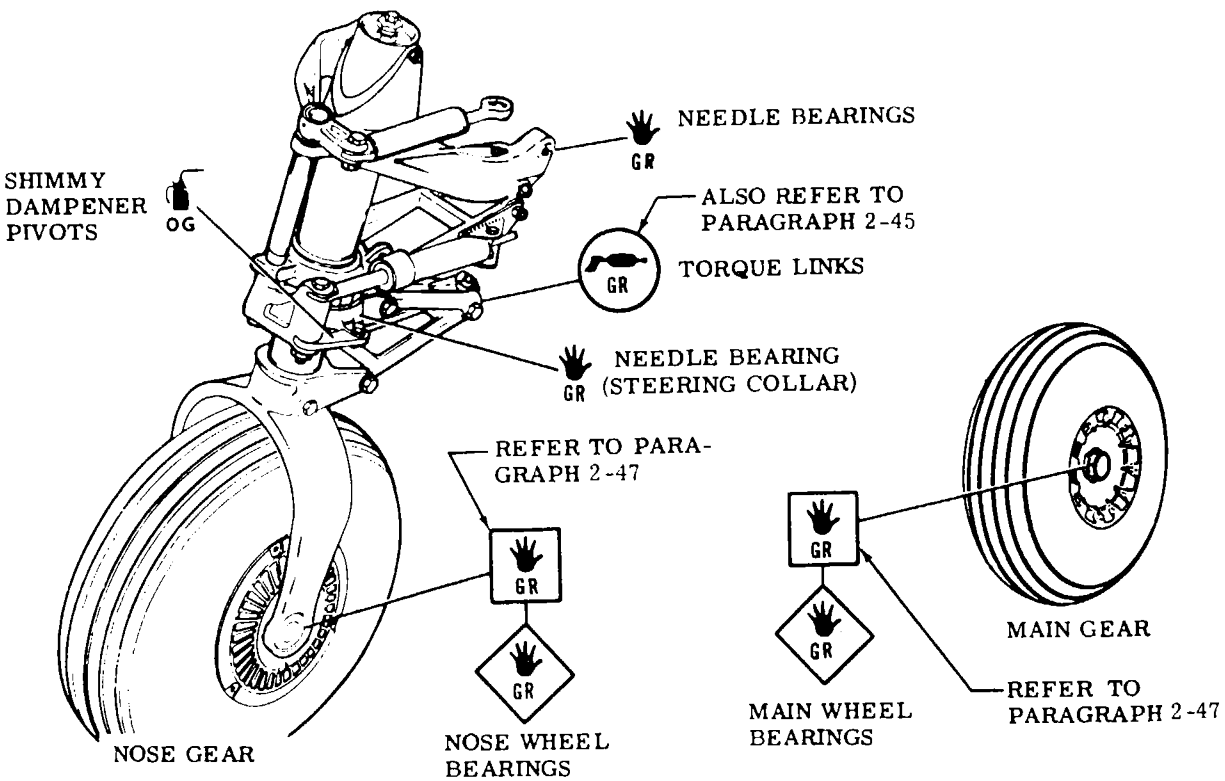


Figure 2-5. Lubrication (Sheet 1 of 4)

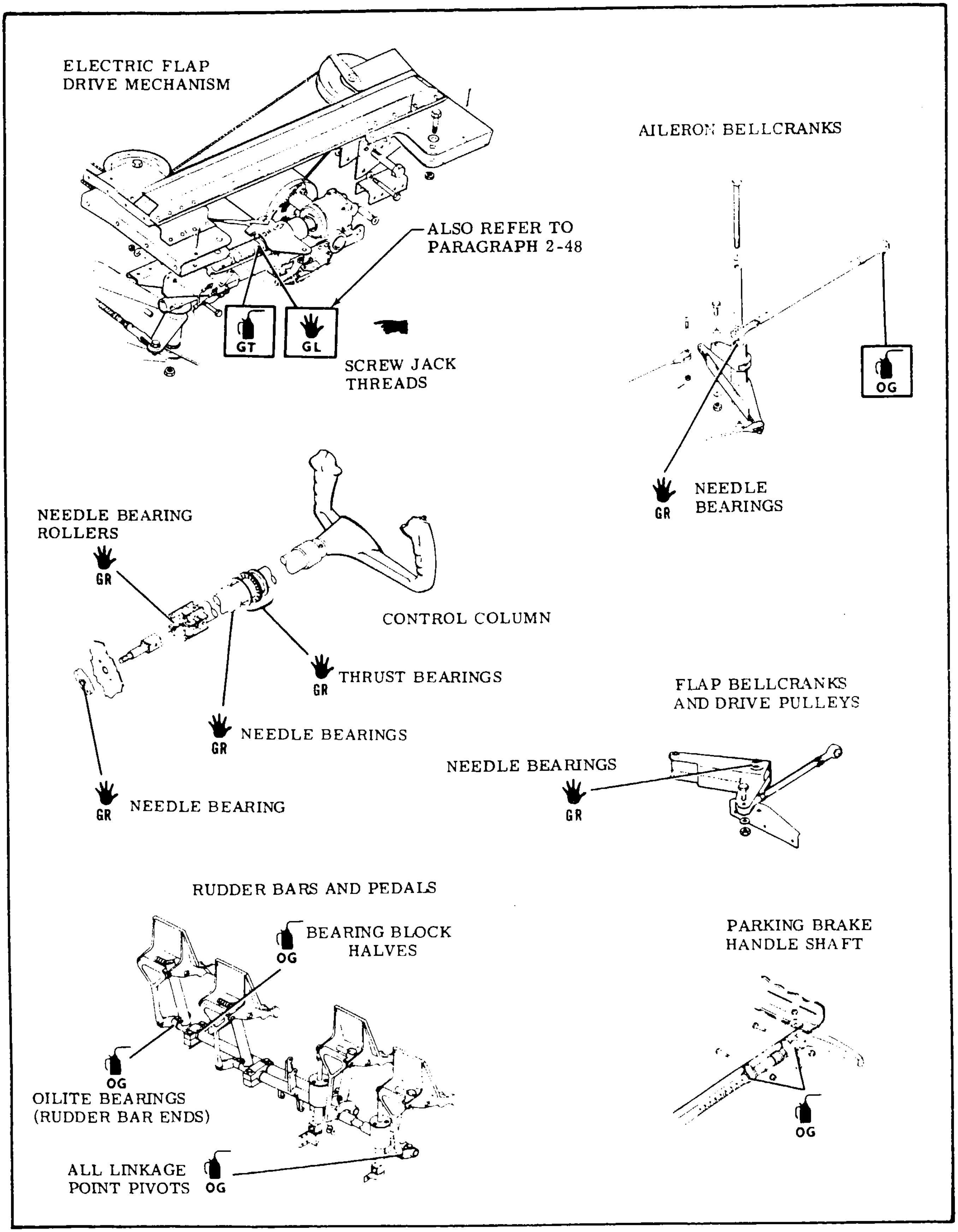


Figure 2-5. Lubrication (Sheet 2 of 4)

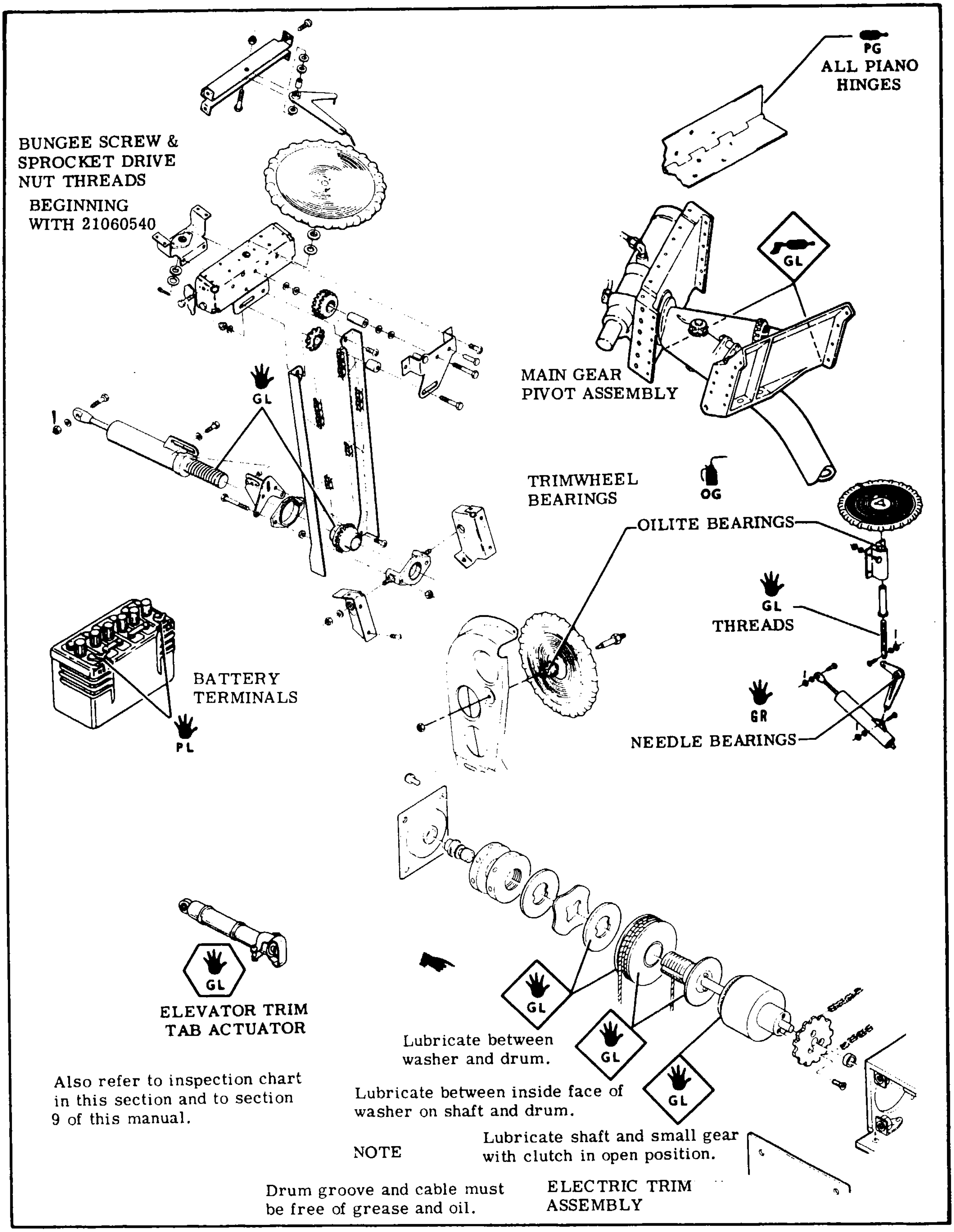
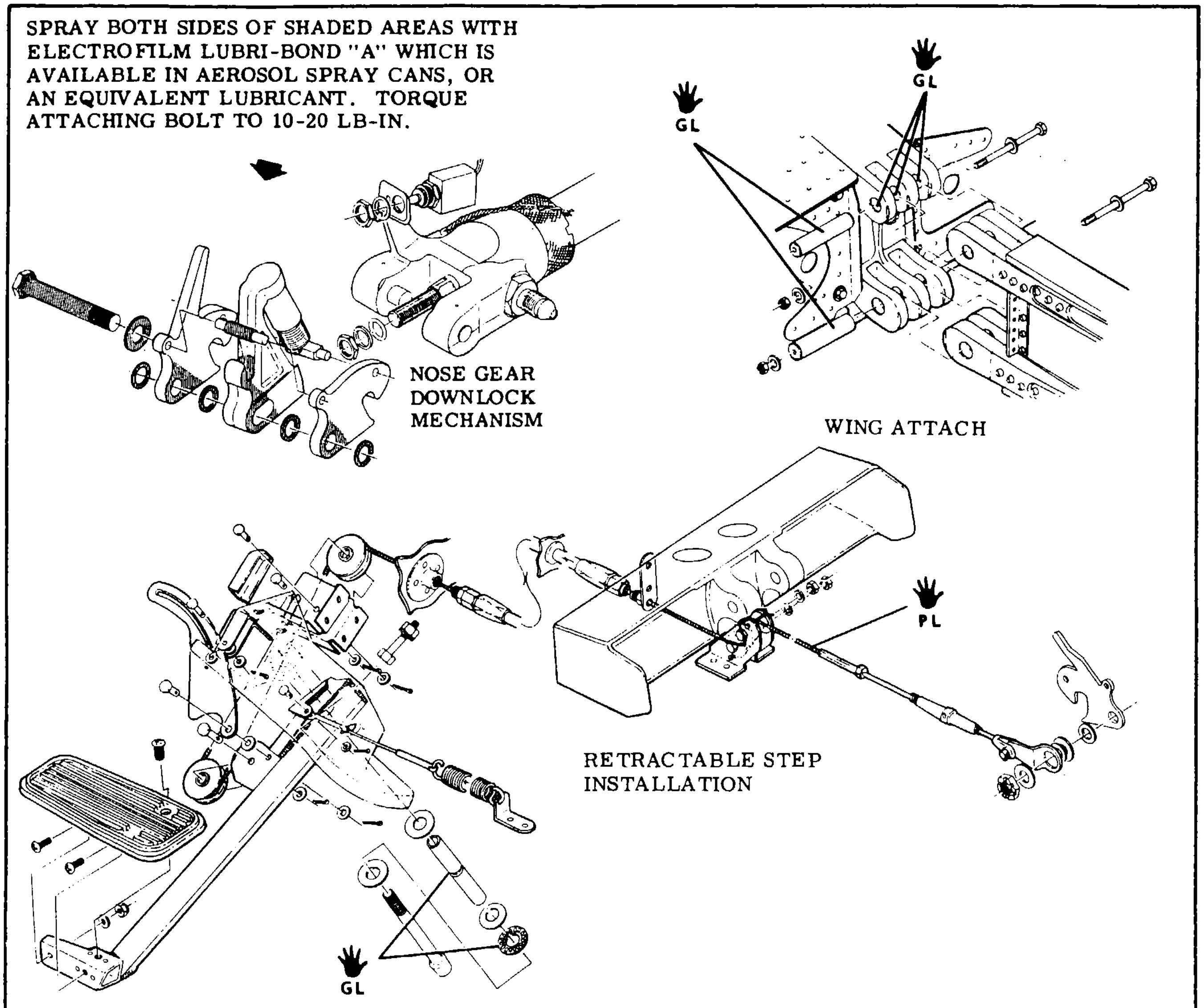


Figure 2-5. Lubrication (Sheet 3 of 4)



NOTES

Sealed bearings require no lubrication.

McCauley propellers are lubricated at overhaul and require no other lubrication.

Do not lubricate roller chains or cables except under seacoast conditions. Wipe with a clean, dry cloth.

Lubricate unsealed pulley bearings, Oilite bearings, pivot and hinge points, and any other friction point obviously needing lubrication, with general purpose oil every 1000 hours or oftener, if required.

Paraffin wax rubbed on seat rails will ease sliding the seats fore and aft.

Lubricate door latching mechanism with MIL-S-8660 silicone compound or equivalent lubricant, applied sparingly to friction points, every 1000 hours or oftener if binding occurs.
No lubrication is recommended for the rotary clutch.

Figure 2-5. Lubrication (Sheet 4 of 4)

I INSPECTION REQUIREMENTS.

As required by Federal Aviation Regulations, all civil aircraft of U.S. registry must undergo a COMPLETE INSPECTION (ANNUAL) each twelve calendar months. In addition to the required ANNUAL inspection, aircraft operated commercially (for hire) must also have a COMPLETE AIRCRAFT INSPECTION every 100 hours of operation.

In lieu of the above requirements, an aircraft may be inspected in accordance with a progressive inspection schedule, which allows the work load to be divided into smaller operations that can be accomplished in shorter time periods.

Therefore, the Cessna Aircraft Company recommends PROGRESSIVE CARE for aircraft that are being flown 200 hours or more per year, and the 100 HOUR inspection for all other aircraft.

II INSPECTION CHARTS.

The following charts show the recommended intervals at which items are to be inspected.

As shown in the charts, there are items to be checked each 50 hours, each 100 hours, each 200 hours, and also Special Inspection items which require servicing or inspection at intervals other than 50, 100 or 200 hours.

a. When conducting an inspection at 50 hours, all items marked under EACH 50 HOURS would be inspected, serviced or otherwise accomplished as necessary to insure continuous airworthiness.

b. At each 100 hours, the 50 hour items would be accomplished in addition to the items marked under EACH 100 HOURS as necessary to insure continuous airworthiness.

c. An inspection conducted at 200 hour intervals would likewise include the 50 hour items and 100 hour items in addition to those at EACH 200 HOURS.

d. The numbers appearing in the SPECIAL INSPECTION ITEMS column refer to data listed at the end of the inspection charts. These items should be checked at each inspection interval to insure that applicable servicing and inspection requirements are accomplished at the specified intervals.

e. A COMPLETE AIRCRAFT INSPECTION includes all 50, 100 and 200 hour items plus those Special Inspection Items which are due at the time of the inspection.

III INSPECTION PROGRAM SELECTION.

AS A GUIDE FOR SELECTING THE INSPECTION PROGRAM THAT BEST SUITS THE OPERATION OF THE AIRCRAFT, THE FOLLOWING IS PROVIDED.

1. **IF THE AIRCRAFT IS FLOWN LESS THAN 200 HOURS ANNUALLY.**

a. IF FLOWN FOR HIRE

An aircraft operating in this category must have a COMPLETE AIRCRAFT INSPECTION each 100 hours and each 12 calendar months of operation. A COMPLETE AIRCRAFT INSPECTION consists of all 50, 100, 200 and Special Inspection Items shown in the inspection charts as defined in paragraph II above.

b. IF NOT FLOWN FOR HIRE

An aircraft operating in this category must have a COMPLETE AIRCRAFT INSPECTION each 12 calendar months (ANNUAL). A COMPLETE AIRCRAFT INSPECTION consists of all 50, 100, 200 and Special Inspection Items shown in the inspection charts as defined in paragraph II above. In addition, it is recommended that between annual inspections, all items be inspected at the intervals specified in the inspection charts.

2. **IF THE AIRCRAFT IS FLOWN MORE THAN 200 HOURS ANNUALLY.**

Whether flown for hire or not, it is recommended that aircraft operating in this category be placed on the CESSNA PROGRESSIVE CARE PROGRAM. However, if not placed on Progressive Care, the inspection requirements for aircraft in this category are the same as those defined under paragraph III 1. (a) and (b).

Cessna Progressive Care may be utilized as a total concept program which insures that the inspection intervals in the inspection charts are not exceeded. Manuals and forms which are required for conducting Progressive Care inspections are available from the Cessna Service Parts Center.

IV INSPECTION GUIDE LINES.

(a) MOVABLE PARTS for: lubrication, servicing, security of attachment, binding, excessive wear, safetying, proper operation, proper adjustment, correct travel, cracked fittings, security of hinges, defective bearings, cleanliness, corrosion, deformation, sealing and tension.

(b) FLUID LINES AND HOSES for: leaks, cracks, dents, kinks, chafing, proper radius, security, corrosion, deterioration, obstruction and foreign matter.

(c) METAL PARTS for: security of attachment, cracks, metal distortion, broken spotwelds, corrosion, condition of paint and any other apparent damage.

(d) WIRING for: security, chafing, burning, defective insulation, loose or broken terminals, heat deterioration and corroded terminals.

(e) BOLTS IN CRITICAL AREAS for: correct torque in accordance with torque values given in the chart in Section 1, when installed or when visual inspection indicates the need for a torque check.

NOTE

Torque values listed in Section 1 are derived from oil-free cadmium-plated threads, and are recommended for all installation procedures contained in this book except where other values are stipulated. They are not to be used for checking tightness of installed parts during service.

(f) FILTERS, SCREENS & FLUIDS for: cleanliness, contamination and/or replacement at specified intervals.

(g) AIRCRAFT FILE.

Miscellaneous data, information and licenses are a part of the aircraft file. Check that the following documents are up-to-date and in accordance with current Federal Aviation Regulations. Most of the items listed are required by the United States Federal Aviation Regulations. Since the regulations of other nations may require other documents and data, owners of exported aircraft should check with their own aviation officials to determine their individual requirements.

To be displayed in the aircraft at all times:
1. Aircraft Airworthiness Certificate (FAA Form 8100-2).
2. Aircraft Registration Certificate (FAA Form 8050-3).
3. Aircraft Radio Station License, if transmitter is installed (FCC Form 556).

To be carried in the aircraft at all times:
1. Weight and Balance, and associated papers (Latest copy of the Repair and Alteration Form, FAA Form 337, if applicable).
2. Aircraft Equipment List.

To be made available upon request:
1. Aircraft Log Book and Engine Log Book.

(h) ENGINE RUN-UP.

Before beginning the step-by-step inspection, start, run up and shut down the engine in accordance with instructions in the Owner's Manual. During the run-up, observe the following, making note of any discrepancies or abnormalities:

1. Engine temperatures and pressures.
2. Static rpm. (Also refer to Section 12 or 12A of this Manual.)
3. Magneto drop. (Also refer to Section 12 or 12A of this Manual.)
4. Engine response to changes in power.
5. Any unusual engine noises.
6. Fuel selector and/or shut-off valve; operate engine(s) on each tank (or cell) position and OFF position long enough to ensure shut-off and/or selector valve functions properly.
7. Idling speed and mixture; proper idle cut-off.
8. Alternator and ammeter.
9. Suction gage.
10. Fuel flow indicator.

After the inspection has been completed, an engine run-up should again be performed to determine that any discrepancies or abnormalities have been corrected.

SHOP NOTES:

	EACH 50 HOURS	EACH 100 HOURS	EACH 200 HOURS	SPECIAL INSPECTION ITEM
PROPELLER				
1. Spinner	●			
2. Spinner bulkheads			●	
3. Blades	●			
4. Bolts and nuts			●	
5. Hub			●	
6. Governor and control			●	
7. Anti-Ice electrical wiring	●			
8. Anti-Ice brushes, slip ring and boots	●			
ENGINE COMPARTMENT				
Check for evidence of oil and fuel leaks, then clean entire engine and compartment, if needed, prior to inspection.				
1. Engine oil screen filler cap, dipstick, drain plug and external filter element	●			1
2. Oil cooler		●		
3. Induction air filter	●			2
4. Induction airbox, air valves, doors and controls		●		
5. Cold and hot air hoses			●	
6. Engine baffles	●			
7. Cylinders, rocker box covers and push rod housings		●		
8. Crankcase, oil sump, accessory section and front crankshaft seal		●		
9. Hoses, metal lines and fittings	●			3
10. Intake and exhaust systems	●			4
11. Ignition harness		●		
12. Spark plugs		●		
13. Compression check			●	
14. Crankcase and vacuum system breather lines		●		
15. Electrical wiring		●		
16. Vacuum pump		●		
17. Vacuum relief valve filter		●		5
18. Engine controls and linkage	●			6
19. Engine shock mounts, mount structure and ground straps			●	
20. Cabin heat valves, doors and controls			●	
21. Starter, solenoid and electrical connections		●		

Item	EACH 50 HOURS	EACH 100 HOURS	EACH 200 HOURS	SPECIAL INSPECTION ITEM
22. Starter brushes, brush leads and commutator			•	
23. Alternator and electrical connections		•		
24. Alternator brushes, brush leads, commutator or slip ring				7
25. Voltage regulator mounting and electrical leads		•		
26. Magnetos (external) and electrical connections		•		
27. Magneto timing				8
28. Fuel-air (metering) control unit			•	
29. Firewall			•	
30. Fuel injection system	•			
31. Engine cowl flaps and controls	•			
32. Engine cowling		•		
33. Turbocharger			•	9
34. All oil lines to turbocharger, waste gate and controller		•		
35. Waste gate, actuator and controller		•		
36. Turbocharger pressurized vent lines to fuel pump, discharge nozzles and fuel flow gage	•			
37. Turbocharger mounting brackets and linkage	•			
38. Alternator support bracket for security	•			
39. Turbocharger oil line check valves				23
40. Fuel injection nozzles				26

FUEL SYSTEM

Item	EACH 50 HOURS	EACH 100 HOURS	EACH 200 HOURS	SPECIAL INSPECTION ITEM
1. Fuel strainer, drain valve and control, bay vents, caps and placards	•			
2. Fuel strainer screen and bowl			•	
3. Fuel injection screen	•			
4. Fuel reservoir(s)			•	
5. Drain fuel and check bay interior, attachment and outlet screens	•			
6. Fuel bays and sump drains			•	

Item	EACH 50 HOURS	EACH 100 HOURS	EACH 200 HOURS	SPECIAL INSPECTION ITEM
7. Fuel selector valve and placards	•			
8. Auxiliary fuel pump		•		
9. Engine-driven fuel pump		•		
10. Fuel quantity indicators and sensing units	•			
11. Fuel lines, check valve, and vapor return line		•		22
12. Turbocharger vent system		•		
13. Engine primer		•		
14. Perform a fuel quantity indicating system operational test. Refer to Section 16 for detailed accomplishment instructions.				25

LANDING GEAR

Item	EACH 50 HOURS	EACH 100 HOURS	EACH 200 HOURS	SPECIAL INSPECTION ITEM
1. Brake fluid, lines and hose, linings, discs, brake assemblies and master cylinders			•	19
2. Main gear wheels	•			
3. Wheel bearings				10
4. Main gear springs			•	
5. Tires	•			
6. Torque link lubrication	•			
7. Parking brake system			•	
8. Nose gear strut and shimmy dampener (service as required)	•			
9. Nose gear wheel	•			
10. Nose gear fork			•	
11. Nose gear steering system			•	
12. Parking brake and toe brakes operational check	•			

LANDING GEAR RETRACTION SYSTEM

NOTE: When performing an inspection of the landing gear retraction system, the aircraft must be placed on jacks and an external power source of at least 60 Amps should be used to prevent drain on the aircraft battery when operating the system.

Item	EACH 50 HOURS	EACH 100 HOURS	EACH 200 HOURS	SPECIAL INSPECTION ITEM
1. Operate the landing gear through five fault-free cycles, noting cycle time. (9 seconds down; 11 seconds up)			•	
2. Check landing gear doors for positive clearance with any part of the landing gear during operation, and for proper fit when closed	•			
3. Check all hydraulic system components for security, hydraulic leaks and any apparent damage to components or mounting structure			•	

	EACH 50 HOURS	EACH 100 HOURS	EACH 200 HOURS	SPECIAL INSPECTION ITEM
4. Check doors, hinges, hinge pins and linkage for evidence of wear, other damage and security of attachment.			•	
5. Inspect internal wheel well structure for cracks, dents, loose rivets, bolts and nuts, corrosion or other damage.			•	
6. Check electrical wiring and switches for security of connections, switch operation and check gear position indicator lights for proper operation. Check wiring for proper routing and support			•	
7. Perform operational check and insure proper rigging of all systems and components including downlocks, uplocks, doors, snubbers, switches, actuators and power pack, observing cycle time noted in item 1.			•	
8. Check main gear strut-to-pivot attachment		•		
9. Check condition of all springs		•		
10. Check hydraulic filter		•		11
11. Hydraulic fluid contamination check				12
12. Power pack inlet check valve screen cleaned		•		
13. Check emergency check valve operation			•	
14. Landing gear and door manifold solenoids (mounted on power pack)				20
AIRFRAME				
1. Aircraft exterior	•			
2. Aircraft structure			•	
3. Windows, windshield, doors and seals	•			
4. Seat stops, seat rails, upholstery, structure and mounting			•	
5. Seat belts and shoulder harnesses	•			
6. Control column bearings, sprockets, pulleys, cables, chains and turnbuckles			•	
7. Control lock, control wheel and control column mechanism			•	
8. Instruments and markings	•			
9. Gyro central air filter			•	13
10. Magnetic compass compensation				5
11. Instrument wiring and plumbing			•	
12. Instrument panel, shock mounts, ground straps, cover, decals and labeling			•	
13. Defrosting, heating and ventilating systems and controls	•			
14. Cabin upholstery, trim, sunvisors and ash trays			•	
15. Area beneath floor, lines, hoses, wires and control cables			•	

	EACH 50 HOURS	EACH 100 HOURS	EACH 200 HOURS	SPECIAL INSPECTION ITEM
16. Lights, switches, circuit breakers, fuses and spare fuses	●			
17. Exterior lights	●			
18. Pitot and static systems			●	
19. Stall warning unit and pitot heater			●	
20. Radios, radio controls, avionics and flight instruments	●			
21. Antennas and cables			●	
22. Battery, battery box and battery cables	●			
23. Battery electrolyte				14
24. Emergency locator transmitter		●		15
25. Oxygen system			●	
26. Oxygen supply, masks and hose	●			16
27. De-Ice system plumbing			●	
28. De-Ice system components			●	
29. De-Ice system boots			●	

CONTROL SYSTEMS

In addition to the items listed below, always check for correct direction of movement, correct travel and correct cable tension

	EACH 50 HOURS	EACH 100 HOURS	EACH 200 HOURS	SPECIAL INSPECTION ITEM
1. Cables terminals, pulleys, pulley brackets, cable guards, turnbuckles and fairleads			●	
2. Chains, terminals, sprockets and chain guards			●	
3. Trim control wheels, indicators, actuator and bungee	●			
4. Travel stops			●	
5. Decals and labeling			●	
6. Flap control switch, flap rollers and flap position indicator	●			
7. Flap motor, transmission, limit switches, structure, linkage, bellcranks etc			●	
8. Flap actuator jackscrew threads				17
9. Elevators, trim tab, hinges and push-pull tube	●			
10. Elevator trim tab actuator lubrication and tab free-play inspection				18
11. Rudder pedal assemblies and linkage			●	
12. External skins of control surfaces and tabs	●			

Item	EACH 50 HOURS	EACH 100 HOURS	EACH 200 HOURS	SPECIAL INSPECTION ITEM
13. Aileron hinges, and control rods	•			24
14. Internal structure of control surfaces			•	
15. Balance weight attachment			•	

SPECIAL INSPECTION ITEMS

1. First 25 hours refill with straight mineral oil (non-detergent) and use until a total of 50 hours have accumulated or oil consumption has stabilized then change to ashless dispersant oil. Change oil each 50 hours if the engine is NOT equipped with external oil filter; if equipped with external oil filter, change filter element each 50 hours and oil at each 100 hours, or every 6 months.
2. Clean filter per paragraph 2-21. Replace as required.
3. Replace hoses at engine overhaul or after 5 years, whichever comes first.
4. General inspection every 50 hours. Refer to Sections 12 and 12A for 100-hour inspection.
5. Each 1000 hours, or to coincide with engine overhaul.
6. Each 50 hours for general condition and freedom of movement. These controls are not repairable. Replace as required at each engine overhaul.
7. Each 500 hours.
8. Internal timing and magneto-to-engine timing limits are described in detail in paragraph 12-79.
9. Remove insulation blanket or heat shields and inspect for burned area, bulges or cracks. Remove tailpipe and ducting; inspect turbine for coking, carbonization, oil deposits and turbine impeller for damage.
10. First 100 hours and each 500 hours thereafter. More often if operated under prevailing wet or dusty conditions.
11. At first 25 hours, first 50 hours and each 100 hours thereafter.
12. At first 50 hours, first 100 hours, and thereafter each 500 hours or one year, whichever comes first.
13. Replace each 500 hours.
14. Check electrolyte level and clean battery compartment each 50 hours or each 30 days.
15. Refer to Section 17 of this Manual.
16. Inspect masks, hose and fittings for condition, routing and support. Test operate and check for leaks.
17. Refer to paragraph 2-48 for detailed instructions for various serial ranges.
18. Lubrication of the actuator is required each 1000 hours and/or 3 years, whichever comes first. Refer to Figure 2-5 for grease specifications.

    Refer to Section 9 of this Manual for free-play limits, inspection, replacement and/or repair.
19. Each 1000 hours or 5 years, inspect and replace as required, all rubber hydraulic hoses in both the retraction and brake systems. Overhaul all retraction and brake system components. Check for wear, and replace all rubber packings and back-ups.

SPECIAL INSPECTION ITEMS (Continued)

20. Beginning with 21060961, disassemble, clean and reassemble every 1000 hours or 5 years, and whenever the solenoid is accessible. (Refer to Section 5 for procedures.)
21. Beginning with 21061040, T210 airplanes only, when modified by SK210-93. Check fuel strainer insulation for security.
22. Beginning with 21061040, T210 airplanes only, when modified by SK210-93. Check fuel line insulation in the nose gear tunnel to maintain good condition. All fuel lines and vapor return lines are to be as far from exhaust components as the installation will permit.
23. Replace turbocharger oil line check valves every 1000 hours.
24. Refer to paragraph 2-49 for ball rod end inspection.
25. Fuel quantity indicating system operational test is required every 12 months. Refer to Section 16 for detailed accomplishment instructions.
26. At the first 100-hour inspection on new, rebuilt or overhauled engines, remove and clean the fuel injection nozzles. Thereafter, the fuel injection nozzles must be cleaned at 300-hour intervals or more frequently if fuel stains are found.

SHOP NOTES:

2-50. COMPONENT TIME LIMITS

1. General

A. Most components listed throughout Section 2 should be inspected as detailed elsewhere in this section and repaired, overhauled or replaced as required. Some components, however, have a time or life limit, and must be overhauled or replaced on or before the specified time limit.

NOTE: The terms overhaul and replacement as used within this section are defined as follows:

Overhaul - Item may be overhauled as defined in FAR 43.2 or it can be replaced.

Replacement - Item must be replaced with a new item or a serviceable item that is within its service life and time limits or has been rebuilt as defined as FAR 43.2.

B. This section provides a list of items, which must be overhauled or replaced at specific time limits. Table 1 lists those items which Cessna has mandated must be overhauled or replaced at specific time limits. Table 2 lists component time limits which have been established by a supplier to Cessna for the supplier's product.

C. In addition to these time limits, the components listed herein are also inspected at regular time intervals set forth in the Inspection Charts, and may require overhaul/replacement before the time limit is reached, based on service usage and inspection results.

2. Cessna-Established Replacement Time Limits

A. The following component time limits have been established by Cessna Aircraft Company.

Table 1: Cessna-Established Replacement Time Limits

COMPONENT	**REPLACEMENT TIME**	**OVERHAUL**
Restraint Assembly Pilot, Copilot, and Passenger Seats	10 years	NO
Trim Tab Actuator	1,000 hours or 3 years, whichever occurs first	YES
Vacuum System Filter	500 hours	NO
Vacuum System Hoses	10 years	NO
Pitot and Static System Hoses	10 years	NO
Vacuum Relief/Regulator Valve Filter (If installed)	500 hours	NO
Engine Compartment Flexible Fluid-Carrying Teflon Hoses (Cessna-Installed) Except Drain Hoses (Drain hoses are replaced on condition)	10 years or engine overhaul, whichever occurs first (Note 1)	NO
Landing Gear Power Pack	5 Years (Replace Rubber Components)	YES

COMPONENT	REPLACEMENT TIME	OVERHAUL
Engine Compartment Flexible Fluid-Carrying Rubber Hoses (Cessna-Installed) Except Drain Hoses (Drain hoses are replaced on condition)	5 years or engine overhaul, whichever occurs first (Note 1)	NO
Engine Air Filter	500 hours or 36 months, whichever occurs first (Note 9)	NO
Engine Mixture, Throttle, and Propeller Controls	At engine TBO	NO
Check Valve (Turbocharger Oil Line Check Valve)	Every 1,000 hours of operation (Note 10)	NO
Oxygen Bottle - Lightweight Steel (ICC-3HT, DOT-3HT)	Every 24 hours or 4380 cycles whichever occurs first	NO
Oxygen Bottle - Composite (DOT-E8162)	Every 15 years	NO
Engine-Driven Dry Vacuum Pump Drive Coupling (Not lubricated with engine oil)	6 years or at vacuum pump replacement, whichever occurs first	NO
Engine-Driven Dry Vacuum Pump (Not lubricated with engine oil)	500 hours (Note 11)	NO
Standby Dry Vacuum Pump	500 hours or 10 years, whichever occurs first (Note 11)	NO

3. Supplier-Established Replacement Time Limits

A. The following component time limits have been established by specific suppliers and are reproduced as follows:

Table 2: Supplier-Established Replacement Time Limits

COMPONENT	REPLACEMENT TIME	OVERHAUL
ELT Battery	(Note 3)	NO
Vacuum Manifold	(Note 4)	NO
Magnetos	(Note 5)	YES
Engine	(Note 6)	YES
Engine-Flexible Hoses (TCM-Installed)	(Note 2)	NO
Auxiliary Electric Fuel Pump	(Note 7)	YES
Propeller	(Note 8)	YES

NOTES:

Note 1: This life limit is not intended to allow flexible fluid-carrying Teflon or rubber hoses in a deteriorated or damaged condition to remain in service. Replace engine compartment flexible Teflon (AE3663819BXXXX series hose) fluid-carrying hoses (Cessna-installed only) every ten years or at engine overhaul, whichever occurs first. Replace engine compartment flexible rubber fluid-carrying hoses (Cessna-installed only) every five years or at engine overhaul, whichever occurs first (this does not include drain hoses). Hoses which are beyond these limits and are in a serviceable condition, must be placed on order immediately and then be replaced within 120 days after receiving the new hoses from Cessna.

Note 2: For TCM engines, refer to Teledyne Continental Service Bulletin SB97-6, or latest revision.

Note 3: Refer to 14 CFR 91.207 for battery replacement time limits.

Note 4: Refer to Airborne Air & Fuel Product Reference Memo No. 39, or latest revision, for replacement time limits.

Note 5: For airplanes equipped with Slick magnetos, refer to Slick Service Bulletin SB2-80C, or latest revision, for time limits.

For airplanes equipped with TCM/Bendix magnetos refer to Teledyne Continental Motors Service Bulletin No. 643, or latest revision, for time limits.

Note 6: Refer to Teledyne Continental Service Information Letter SIL98-9, or latest revision, for time limits.

Note 7: Refer to Cessna Service Bulletin SEB94-7 Revision 1/Dukes Inc. Service Bulletin No. 0003, or latest revision.

Note 8: Refer to the applicable McCauley Service Bulletins and Overhaul Manual for replacement and overhaul information.

Note 9: The air filter may be cleaned. Refer to Section 2 of this Service Manual. For airplanes equipped with an air filter manufactured by Donaldson, refer to Donaldson Aircraft Filters Service Instructions P46-9075 for detailed servicing instructions.

The address for Donaldson Aircraft Filters is:

Customer Service
115 E. Steels Corners RD
Stow OH 44224

Do not overservice the air filter. Overservicing increases the risk of damage to the air filter from excessive handling. A damaged/worn air filter may expose the engine to unfiltered air and result in damage/excessive wear to the engine.

Note 10: Replace the turbocharger oil line check valve every 1,000 hours of operation (refer to Cessna Service Bulletin SEB91-7 Revision 1, or latest revision).

Note 11: Replace engine-driven dry vacuum pump not equipped with a wear indicator every 500 hours of operation, or replace according to the vacuum pump manufacturer's recommended inspection and replacement interval, whichever occurs first.

Replace standby vacuum pump not equipped with a wear indicator, every 500 hours of operation or 10 years, whichever occurs first, or replace according to the vacuum pump manufacturer's recommended inspection and replacement interval, whichever occurs first.

For a vacuum pump equipped with a wear indicator, replace pump according to the vacuum pump manufacturer's recommended inspection and replacement intervals.

SECTION 3

FUSELAGE

TABLE OF CONTENTS Page

3-1. FUSELAGE.

3-2. WINDSHIELD AND WINDOWS.

3-3. DESCRIPTION. The windshield and windows are single-piece acrylic plastic panels set in sealing strips and held in place by formed retaining strips secured to the fuselage with screws and rivets. Presstite No. 579.6 sealing compound used in conjunction with a felt seal, is applied to all edges of the windshield and windows with exception of the wing root area. The wing root fairing has a heavy felt strip which completes the windshield sealing.

3-4. CLEANING. (Refer to Section 2.)

3-5. WAXING. Waxing will fill in minor scratches in clear plastic and help protect the surface from further abrasion. Use a good grade of commercial wax applied in a thin, even coat. Bring the wax to a high polish by rubbing lightly with a clean dry flannel cloth.

3-6. REPAIRS. Damaged window panels and windshield may be removed and replaced if damage is extensive. However, certain repairs as prescribed in the following paragraphs can be made successfully without removing the damaged part from aircraft. Three types of temporary repairs for cracked plastic are possible. No repairs of any kind are recommended on highly-stressed or compound curves where repair would be likely to affect the pilot's field of vision. Curved areas are more difficult to repair than flat areas and any repaired area is both structurally and optically inferior to the original surface.

3-7. SCRATCHES. Scratches on clear plastic surfaces can be removed by hand-sanding operations followed by buffing and polishing, if steps below are followed carefully.

A. Wrap a piece of No. 320 (or finer) sandpaper or abrasive cloth around a rubber pad or wood block. Rub surface around the scratch with a circular motion, keeping abrasive constantly wet with clean water to prevent scratching the surface further. Use

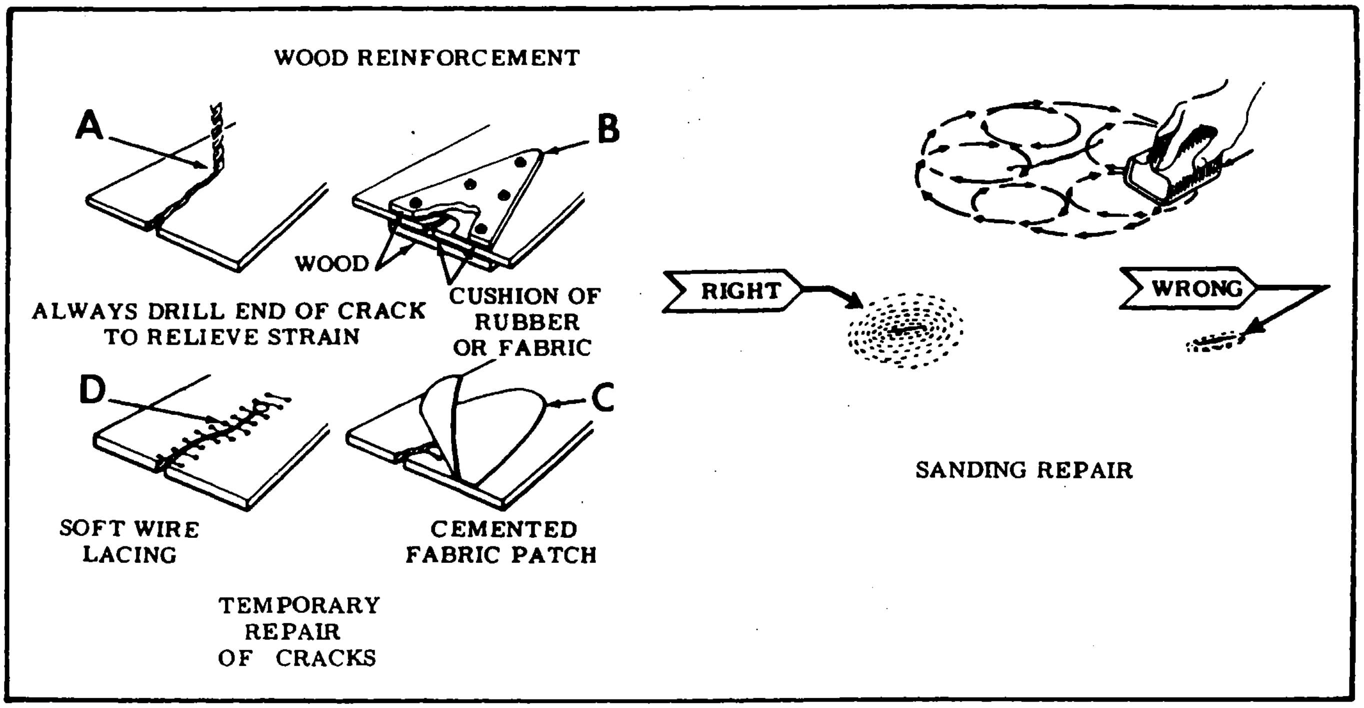


Figure 3-1. Repair of Windshield and Windows

minimum pressure and cover an area large enough to prevent the formation of "bull's-eyes" or other optical distortions.

CAUTION

Do not use a coarse grade of abrasive. No. 320 is of maximum coarseness.

b. Continue sanding operation, using progressively finer grade abrasives until the scratches disappear.
c. When the scratches have been removed, wash area thoroughly with clean water to remove all the gritty particles. The entire sanded area will be clouded with minute scratches which must be removed to restore the transparency.
d. Apply fresh tallow or buffing compound to a motor-driven buffing wheel. Hold wheel against plastic surface, moving it constantly over the damaged area until cloudy appearance disappears. A 2000-foot-per-minute surface speed is recommended to prevent overheating and distortion. (Example: 750 rpm polishing machine with a 10 inch buffing bonnet.)

NOTE

Polishing can be accomplished by hand but will require a considerabley longer period of time to attain the same result as produced by a buffing wheel.

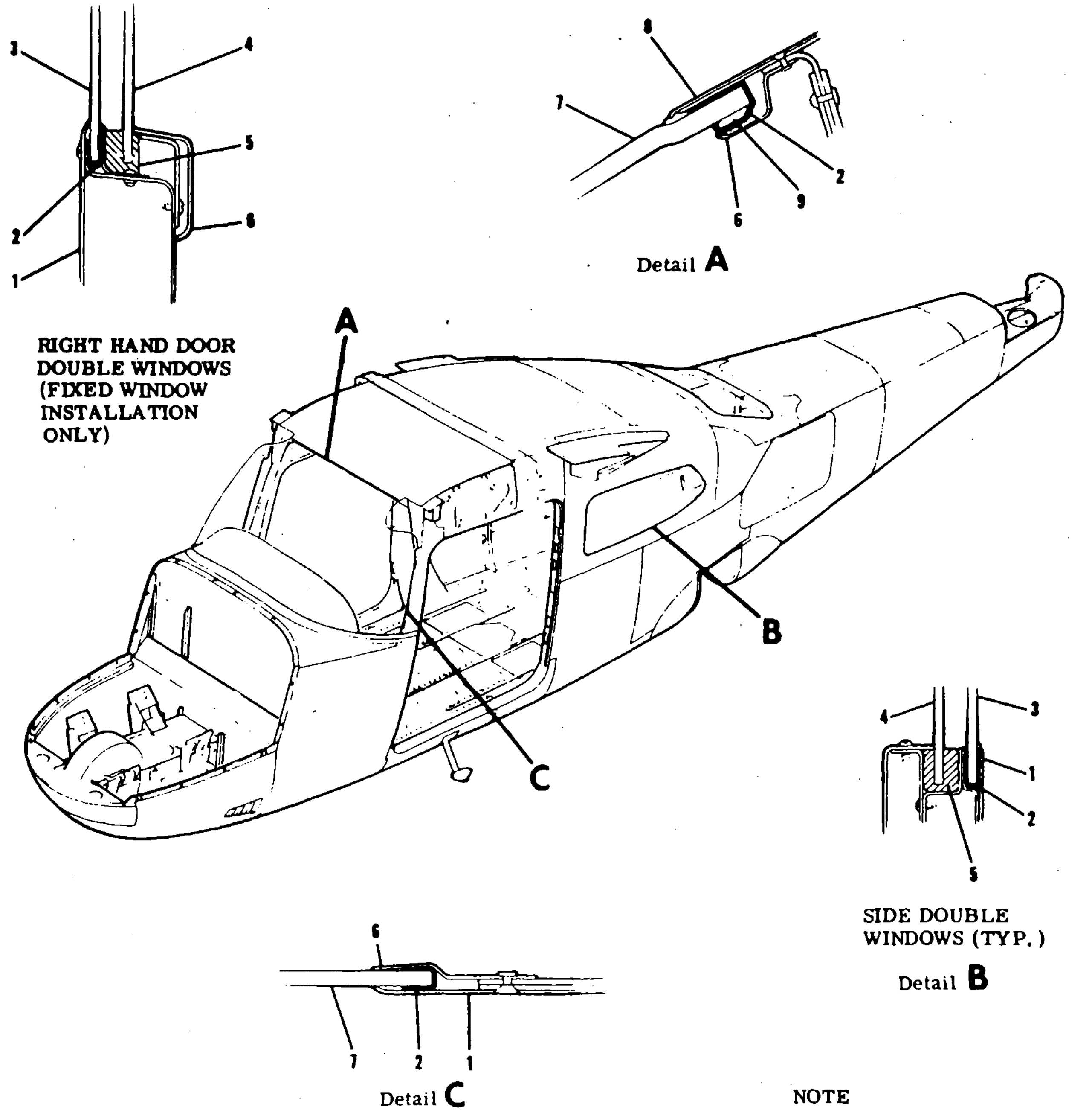
e. When buffing is finished, wash the area thoroughly and dry with a soft flannel cloth. Allow surface to cool and inspect the area to determine if full transparency has been restored. Apply a thin coat of hard wax and polish the surface lightly with a clean flannel cloth.

NOTE

Rubbing the plastic surface with a dry cloth will build up an electrostatic charge which attracts dirt particles and may eventaully cause scratching of surface. After wax has hardened, dissipate this charge by rubbing the surface with a slightly damp chamois. This will also remove dust particles which have collected while the wax is hardening.

f. Minute hairline scratches can often be removed by rubbing with commercial automobile body cleaner or fine-grade rubbing compound. Apply with a soft, clean, dry cloth or imitation chamois.

3-8. CRACKS. (Refer to figure 3-1.)
a. When a crack appears in a panel, drill a hole at the end of crack to prevent further spreading. The hole should be approximately 1/8 inch in diameter, depending on length of the crack and thickness of the material.
b. Temporary repairs to flat surfaces can be accomplished by placing a thin strip of wood over each side of the surface and inserting small bolts through the wood and plastic. A cushion of sheet rubber or aircraft fabric should be placed between the wood and plastic on both sides.
c. A temporary repair can be made on a curved surface by placing fabric patches over the affected areas. Secure the patches with aircraft dope, Specification No. MIL-D-5549: or lacquer, Specification No. MIL-L-7178. Lacquer thinner, Specification No. Mil-T-6094 can also be used to secure the patch.
d. A temporary repair can be made by drilling small holes along both sides of the crack 1/4 to 1/8 inch apart and lacing the edges together with soft wire. Small-stranded antenna wire makes a good



1. Outer Retainer
2. Felt Seal
3. Outer Window
4. Inner Window
5. Seal
6. Inner Retainer
7. Windshield
8. Cabin Top Skin
9. Strip

NOTE

Presstite No. 579.6 sealer should be applied to all edges of windshield and windows when felt sealing strip (2) is used.

NOTE

Except for the left door, the rear window and windshield, the aircraft is equipped with double windows.

Figure 3-2. Windshield and Fixed Window Installation temporary lacing material. This type of repair is used as a temporary measure ONLY, and as soon as facilities are available, the panel should be replaced.

3-9. WINDSHIELD. (Refer to Figure 3-2.)

3-10. REMOVAL.

A. Drill out rivets securing top retainer strip.

B. Remove screws securing front retainer strip.

C. Remove wing fairings over windshield edges.

NOTE: Remove and tape compass and outside air temperature gage clear of work area. Do not disconnect electrical wiring.

D. Pull windshield straight forward, out of side and top retainers.

3-11. INSTALLATION.

A. Apply felt strip and sealing compound or sealing tape to all edges of windshield to prevent leaks.

B. Reverse steps in preceding paragraph for reinstallation.

C. When installing a new windshield, check fit and carefully file or grind away excess plastic.

D. Use care not to crack windshield when installing. Starting at upper corner and gradually working windshield into position is recommended.

3-12. WINDOWS.

3-13. MOVABLE. (Refer to Figure 3-3.) A movable window, hinged at the top, is installed in the left cabin door thru serial 21061039 and beginning with 21061040, and may also be installed in the right door.

3-14. REMOVAL AND INSTALLATION.

A. Disconnect window stop (5).

B. Remove pins from window hinges (6).

C. Reverse preceding steps for reinstallation. To remove frame from plastic panel, drill out blind rivets at frame splice. When replacing plastic panel in frame, ensure sealing strip and an adequate coating of Presstite No. 579.6 sealing compound is used around all edges of panel.

3-15. WRAP AROUND REAR. The rear window is a one-piece acrylic plastic panel set in sealing strips and held in place by retaining strips.

3-16. REMOVAL AND INSTALLATION.

A. Remove upholstery as necessary to expose retainer strips inside cabin.

B. Drill out rivets as necessary to remove the retainers on both sides and the lower edge of window.

C. Remove window by starting at aft edge and pulling window into the cabin area.

D. Reverse preceding steps for reinstallation. Apply sealing strips and an adequate coating of sealing compound to prevent leaks. When installing a new window, check fit and carefully file or grind away excess plastic.

E. Use care not to crack the window when installing.

3-17. FIXED. (Refer to Figure 3-2.) Fixed windows, mounted in sealing strips and sealing compound, are held in place by various retainer strips. To replace the side windows, remove upholstery and trim panels as necessary and drill out the rivets securing retainers. Except for the left door, rear window and windshield, the aircraft is equipped with double windows. Apply felt strip and sealing compound to all edges of the window to prevent leaks. Check fit and carefully file or grind away excess plastic. Use care not to crack the window when installing.

3-18. CABIN DOORS. (Refer to Figure 3-3.)

3-19. REMOVAL AND INSTALLATION. Removal of the cabin door is accomplished either by removing the screws which attach hinges and door stop or by removing the hinge pins attaching hinges and door stop. If the permanent hinge pins are removed, they may be replaced by clevis pins secured with cotter pins or new hinge pins may be installed and "spin-bradded".

3-20. ADJUSTMENT. Cabin doors should be adjusted so the skin fairs with the fuselage skin. Slots at latch plate permit repositioning of the striker plate. Depth of latch engagement may be changed by adding or removing washers or shims between the striker plate and doorpost.

3-21. WEATHERSTRIP. Weatherstrip is bonded around the edges of the cabin door and the movable window opening. Beginning with serial 21060805, a new hollow center, fluted type seal is used. When replacing door seals, ensure mating surfaces are clean, dry and free of oil and grease. Position butt ends of seal at door low point and cut a small notch in the hollow type seal for drainage. Apply a thin, even coat of EC-880 adhesive (3-M Co.) or equivalent to each surface and allow to dry until tacky before pressing into place.

3-22. WEDGE ADJUSTMENT. Wedges at upper forward edge of the door aid in preventing air leaks at this point. They engage as the door is closed. Several attaching holes are located in the wedges and the set of holes giving best results should be selected.

3-23. LATCHES. (Refer to Figure 3-4.)

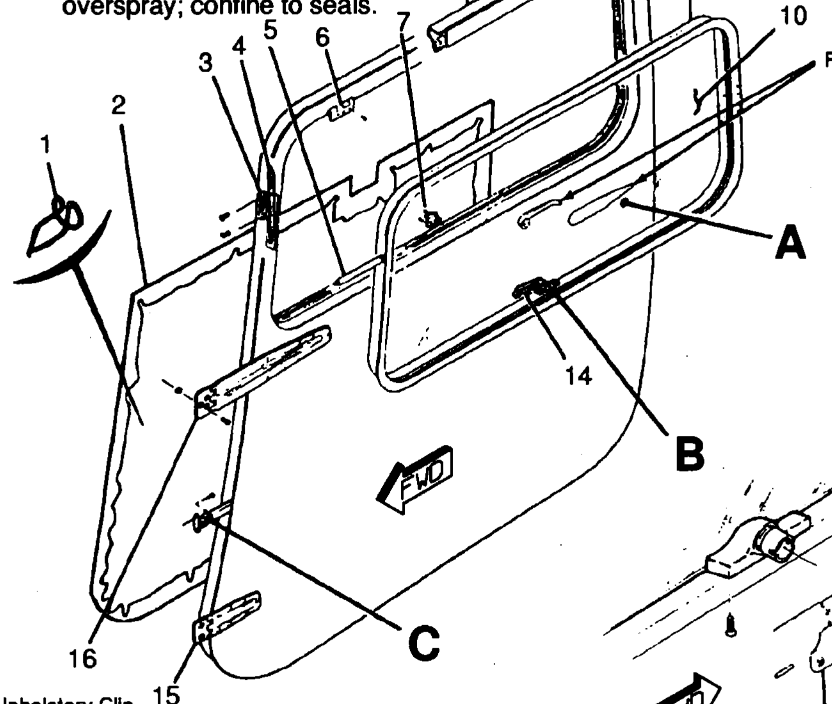
3-24. DESCRIPTION. The cabin door latch is a push-pull bolt type, utilizing a rotary clutch for positive bolt engagement. As the door is closed, teeth on the underside of bolt engage gear teeth on the clutch. The clutch gear rotates in one direction only and holds the door until the handle is moved to LOCK position, driving bolt into the slot.

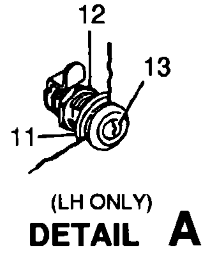
3-25. ADJUSTMENT. Vertical adjustment of the rotary clutch is afforded by slotted holes which ensures sufficient gear-to-bolt engagement and proper alignment. Adjustment for bolt extension (item 2) is accomplished by loosening the 4 screws (item 26) sufficiently to move the bolt guide (item 3) forward in the slotted holes to retract the bolt and aft to extend the bolt. Carefully close door after adjustment to check bolt extension and clearance with door jamb and alignment with clutch assembly.

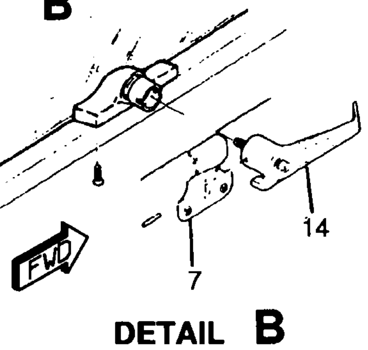
B3682

NOTE: Spray cabin window seals with MS-122 (Miller-Stephenson Chem. Corp., Danbury, Conn.) or equivalent. Caution, do not overspray; confine to seals.

NOTE: Forming the flange of a bonded door is not permissable as it could cause material separation.

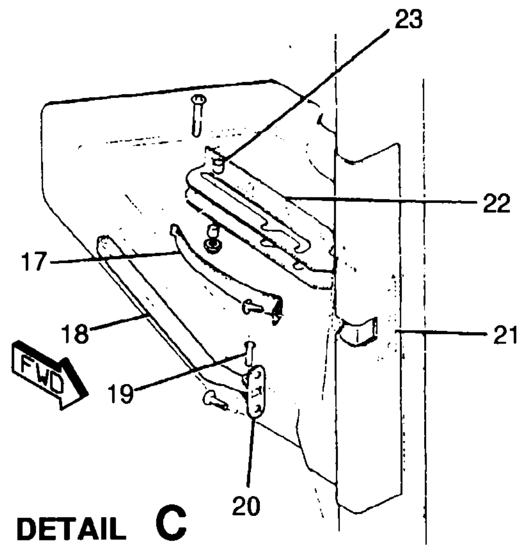






1. Upholstery Clip
2. Upholstery Panel
3. Wedge
4. Spring
5. Window Stop
6. Window Hinge
7. Latch Plate
8. Cabin Door
9. Window Frame
10. Window
11. Washer
12. Nut
13. Lock Assembly
14. Latch Handle
15. Lower Hinge
16. Upper Hinge
17. Spring
18. Door Stop Arm
19. Pin or Rivet
20. Hinge
21. Reinforcement
22. Stop Assembly
23. Spacer
24. Window Seal
25. Screw
26. Pull Handle
27. Clamp Cover
28. Clamp
29. Window Moulding

NOTE: The right hand door is equipped with a double paned fixed window.

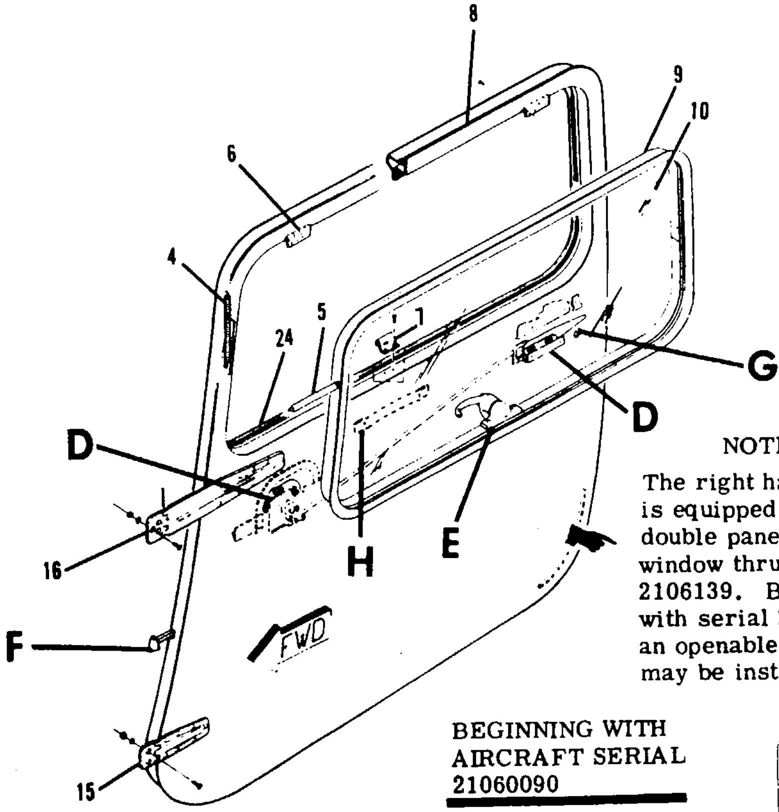


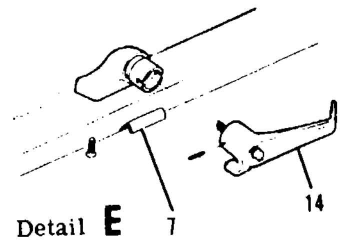
THRU AIRCRAFT SERIAL 21060089

AIRCRAFT SERIAL THRU 21059223

Figure 3-3. Cabin Door Installation (Sheet 1 of 2)

For Detail D
Refer to Figure 3-4 (sheet 2)





Detail E

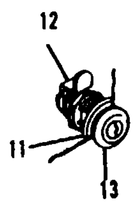
NOTE

The right hand door is equipped with a double paned fixed window thru serial 2106139. Beginning with serial 21061040 an openable window may be installed.

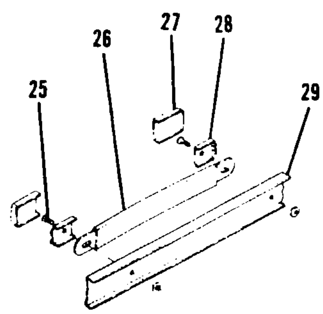
NOTE

Forming the flange of a bonded door is not permissable as it could cause material separation.

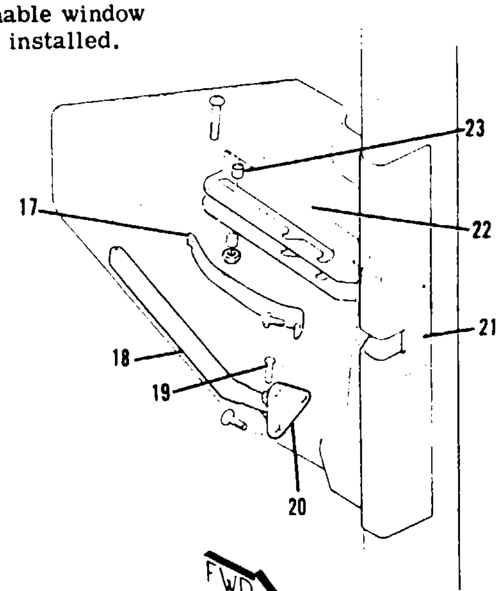
BEGINNING WITH AIRCRAFT SERIAL 21060090



Detail G
(left hand door only)



Detail H
DOOR PULL HANDLE BEGINNING WITH AIRCRAFT SERIAL 21060269



Detail F
BEGINNING WITH AIRCRAFT SERIAL 21059224

NOTE

Spray cabin and window seals with MS-122 (Miller-Stephenson Chem. Corp., Danbury, Conn.) or equivalent. Caution, do not overspray; confine to seals.

NOTE

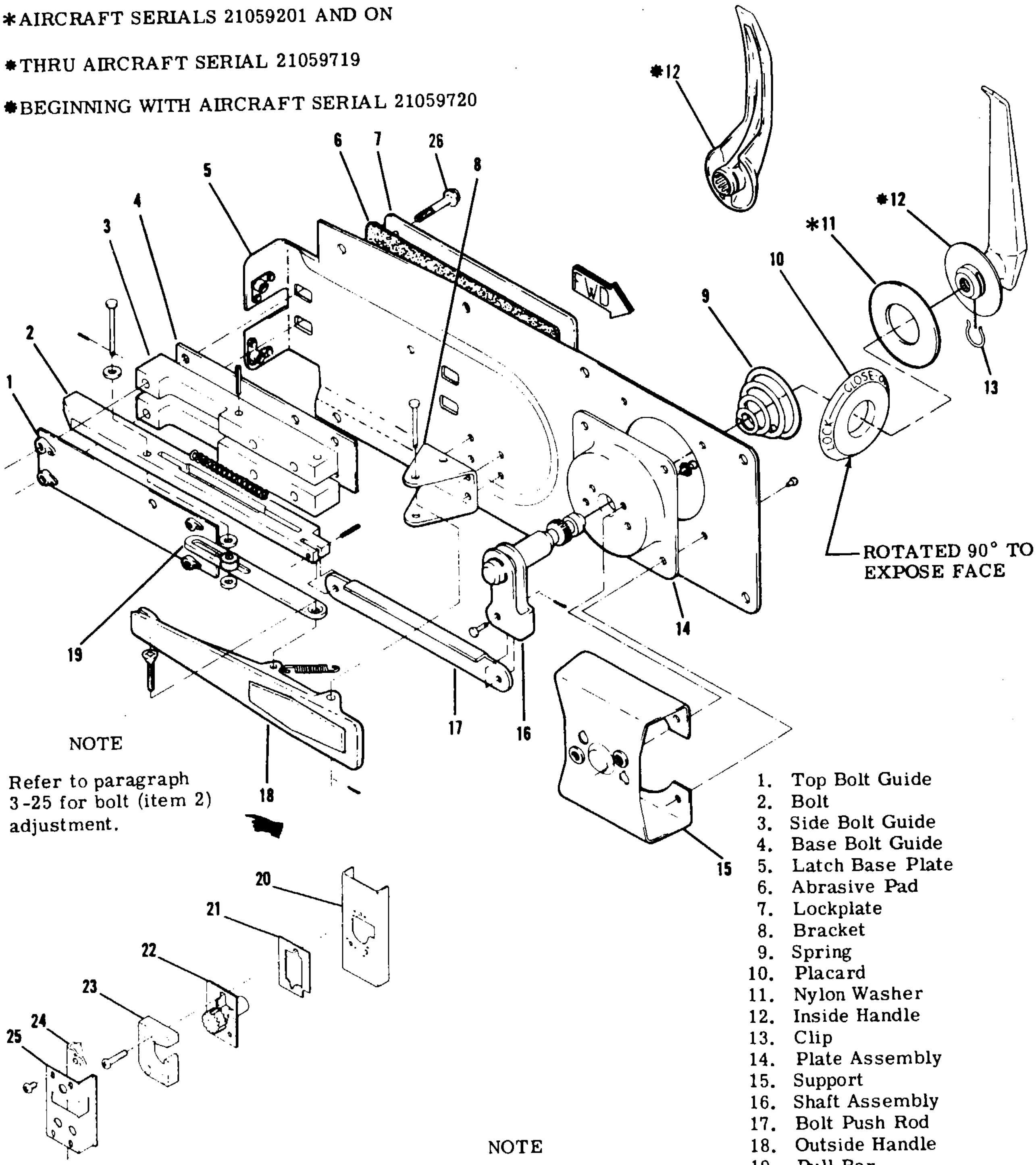
The cutout in the inner door pan may be trimed to maintain a .10" minimum clearance with the door stop arm. After tightening, spacers (23) must roll freely. Lubricate surface of spring in contact with spacers with silicone grease.

Figure 3-3. Cabin Door Installation (Sheet 2 of 2)

*AIRCRAFT SERIALS 21059201 AND ON

*THRU AIRCRAFT SERIAL 21059719

*BEGINNING WITH AIRCRAFT SERIAL 21059720



NOTE

Refer to paragraph 3-25 for bolt (item 2) adjustment.

NOTE

Rotary clutch components are matched upon assembly. The clutch mechanism, if defective, should be replaced as a unit.

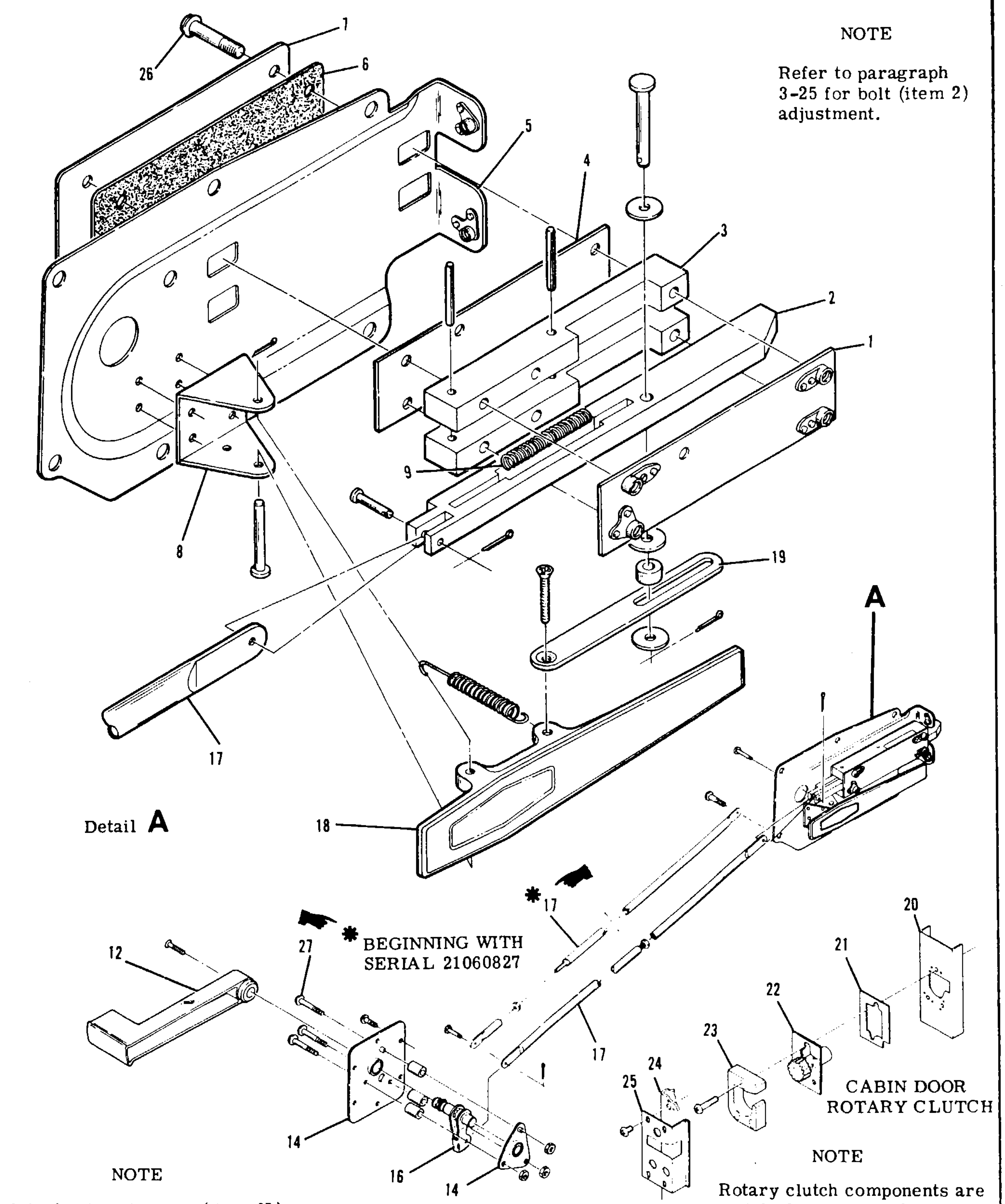
THRU AIRCRAFT SERIAL 21060089

1. Top Bolt Guide
2. Bolt
3. Side Bolt Guide
4. Base Bolt Guide
5. Latch Base Plate
6. Abrasive Pad
7. Lockplate
8. Bracket
9. Spring
10. Placard
11. Nylon Washer
12. Inside Handle
13. Clip
14. Plate Assembly
15. Support
16. Shaft Assembly
17. Bolt Push Rod
18. Outside Handle
19. Pull Bar
20. Doubler
21. Shim
22. Rotary Clutch Assembly
23. Guide
24. Door Post
25. Cover
26. Bolt Adjustment Screws (4)
27. Inside Handle Adjust Screw

Figure 3-4. Door Latch (Sheet 1 of 2)

NOTE

Refer to paragraph 3-25 for bolt (item 2) adjustment.



NOTE

Set adjustment screw (item 27) in slot to maintain the handle parallel to C/L of handle axis (WL 5.58) in the locked position.

BEGINNING WITH AIRCRAFT SERIAL 21060090

NOTE

Rotary clutch components are matched upon assembly. The clutch mechanism, if defective, should be replaced as a unit.

Figure 3-4. Door Latch (Sheet 2 of 2)

NOTE

Lubricate the door latch per Section 2. No lubrication is recommended for the rotary clutch.

3-26. LOCK. In addition to interior locks, a cylinder and key type lock is installed on the left door. If the lock is to be replaced, the new one may be modified to accept the original key. This is desirable, as the same key is used for the ignition switch and the cabin door lock. After removing the old lock from door, proceed as follows:

a. Remove the lock cylinder from new housing.

b. Insert the original key into the new cylinder and file off any protruding tumblers flush with cylinder. Without removing key, check that cylinder rotates freely in the housing.

c. Install the lock assembly in door and check lock operation with the door open.

d. Destroy the new key and disregard the code number on cylinder.

3-27. INDEXING INSIDE HANDLE. (Refer to figure 3-4.) When the inside door handle is removed, reinstall in relation to position of bolt (2) which is spring-loaded to CLOSE position. The following procedure may be used:

a. Temporarily install handle (12) on shaft assembly (16) approximately vertical.

b. Move handle (12) back and forth until handle centers in spring-loaded position.

c. Without rotating shaft assembly (16), remove handle and install placard (10) with CLOSE index at top and press placard to seat prongs.

d. Install nylon washer (11).

e. Install handle (12) to align with CLOSE index on placard (10) and install clip (13).

f. Ensure bolt (2) clears doorpost and teeth engage clutch gear when handle (12) is in CLOSE position. Refer to Figure 3-3. (Sheet 2) for instructions for the inside handle alignment for aircraft serial beginning with 21060090.

3-27A. DOOR PULL HANDLE (Refer to figure 3-3)

3-27B. REMOVAL AND INSTALLATION. Figure 3-3, sheet 2, may be used as a guide for removal and installation of the door pull handle.

3-28. BAGGAGE DOOR. (Refer to figure 3-5.)

3-29. REMOVAL AND INSTALLATION.

a. Disconnect door stop.

b. Remove hinge pin.

c. Reverse preceding steps for reinstallation.

3-30. SEATS. (Refer to figure 3-6.)

3-31. PILOT.

a. ARTICULATING RECLINE/VERTICAL ADJUST.

3-32. COPILOT.

a. ARTICULATING RECLINE.

b. ARTICULATING RECLINE/VERTICAL ADJUST.

3-33. 3RD AND 4TH.

a. ARTICULATING RECLINE.

3-34. DESCRIPTION. These seats are manually-operated throughout their full range of operation. Seat stops are provided to limit fore-and-aft travel.

3-35. REMOVAL AND INSTALLATION.

a. Remove seat stops.

b. Disengage the seat adjustment pin.

c. Slide seat fore-and-aft to disengage seat rollers from rails.

d. Lift seat out.

e. Reverse preceding steps for reinstallation. Ensure all seat stops are reinstalled.

WARNING

It is extremely important that the pilot's seat stops are installed. Acceleration and deceleration could possibly permit seat to become disengaged from the seat rails and create a hazardous situation, especially during take-off and landing.

3-36. BENCH. (5TH AND 6TH.)

a. DOUBLE-WIDTH BOTTOM/DOUBLE-WIDTH BACK.

3-37. DESCRIPTION. These seats are permanently bolted to the cabin structure and incorporate no adjustment provisions. The seat back folds down to provide additional stowage space on top of the main gear wheel well and the seat back.

3-38. REMOVAL AND INSTALLATION.

a. Pull up on knob (1) to unlatch seat back.

b. Remove pin (10) from guide (8) on each side of seat back.

c. Remove bolts (14) from the three seat legs.

d. Remove bolts (9) from both sides of seat bottom.

NOTE

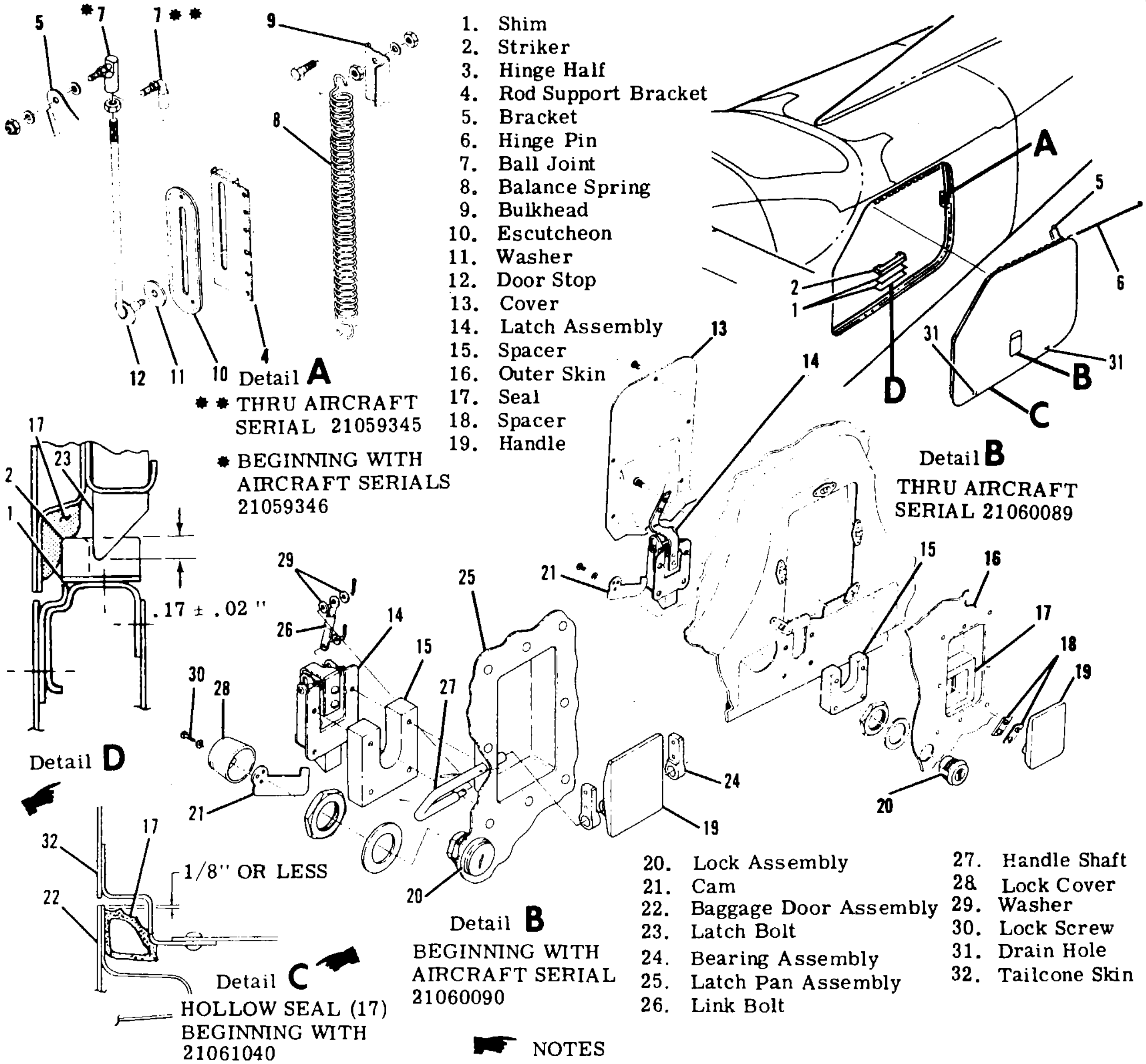
Bolts (9) are located inside the main gear wheel well.

e. With the seat back folded down, use care and slide the two inside seat belts out from between the seat back and bottom. Remove seat from aircraft.

f. Reverse preceding steps for reinstallation.

3-39. REPAIR. Replacement of defective parts is recommended in repair of seats. However, a cracked framework may be welded, provided the crack is not in an area of stress concentration (close to a hinge or bearing point). The square-tube framework is 6061 aluminum, heat-treated to a T-6 condition. Use a heliarc weld on these seats, as torch welds will destroy heat-treatment of frame structure.

3-40. CABIN UPHOLSTERY. Due to the wide selection of fabrics, styles and colors, it is impossible to depict each particular type of upholstery. The following paragraphs describe general procedures which will serve as a guide in removal and replacement of upholstery. Major work, if possible, should be done



1. Shim
2. Striker
3. Hinge Half
4. Rod Support Bracket
5. Bracket
6. Hinge Pin
7. Ball Joint
8. Balance Spring
9. Bulkhead
10. Escutcheon
11. Washer
12. Door Stop
13. Cover
14. Latch Assembly
15. Spacer
16. Outer Skin
17. Seal
18. Spacer
19. Handle
20. Lock Assembly
21. Cam
22. Baggage Door Assembly
23. Latch Bolt
24. Bearing Assembly
25. Latch Pan Assembly
26. Link Bolt
27. Handle Shaft
28. Lock Cover
29. Washer
30. Lock Screw
31. Drain Hole
32. Tailcone Skin

NOTES

- Install hinge pin (6) from aft end of door assembly (22) with end bend inboard of hinge.
- Install shims (1) as required to obtain engagement shown in Detail D between striker plate (2) and baggage door latch bolt (23).
- Install washers (29) as required to align link (26) perpendicular to handle shaft (27). At least one washer must be installed between link and cotter pin.
- Bond seal (17) around baggage door with EC-880 (3M Co.) or equivalent. Locate butt ends of seal at door low point, no closer than 2.00 inches to latch assembly.
- Cut small notch in one end of hollow seal (17) to allow for drainage. Do not cement butt ends together.
- Seal lock screw (30) to cap (28) and area where cam (21) passes thru cap with RTV-102 (General Electric Co.) or equivalent.
- Ensure drain holes (31) are clear.
- Use spacers (18) as required to align handle flush with outside skin.
- Refer to Service Letters SE74-13 (June 14, 1974) and SE74-13, Suppl. 1 (May 16, 1975) for additional baggage door sealing information.
- Beginning with serial 21061040, the baggage door is of bonded construction. Reforming of this door is not permissible as material separation may occur in the flange area.

Figure 3-5. Baggage Door Installation

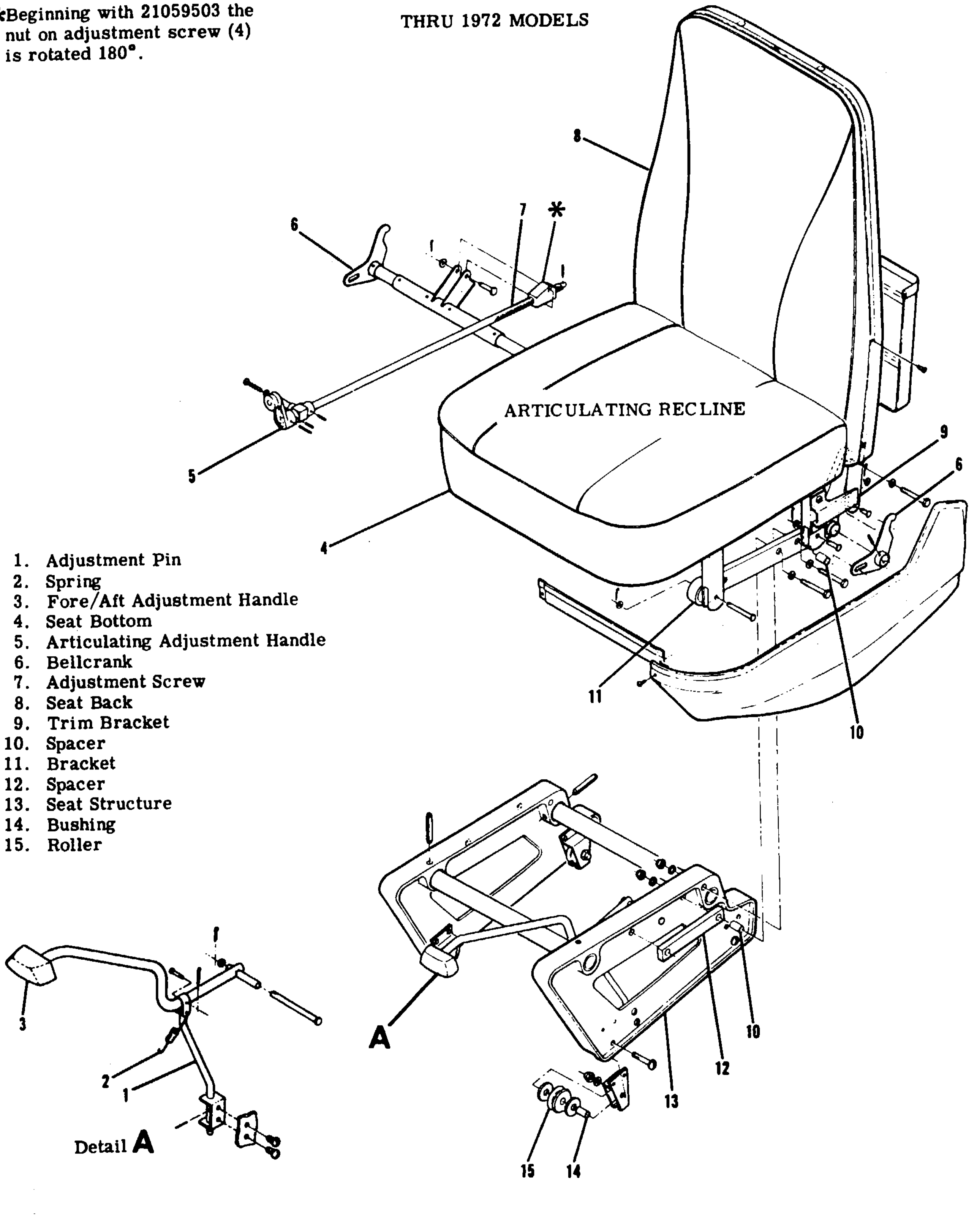
NOTE

*Beginning with 21059503 the nut on adjustment screw (4) is rotated 180°.

COPILOT

(STANDARD)

THRU 1972 MODELS



1. Adjustment Pin
2. Spring
3. Fore/Aft Adjustment Handle
4. Seat Bottom
5. Articulating Adjustment Handle
6. Bellcrank
7. Adjustment Screw
8. Seat Back
9. Trim Bracket
10. Spacer
11. Bracket
12. Spacer
13. Seat Structure
14. Bushing
15. Roller

Figure 3-6. Seat Installation (Sheet 1 of 7)

PILOT AND COPILOT

(STANDARD- PILOT)
(OPTIONAL-COPILOT)
THRU 1972 MODELS

NOTE

*Beginning with 21059503 the nut on adjustment screw (8) is rotated 180°.

1. Vertical Adjustment Handle
2. Adjustment Pin
3. Spring
4. Fore/Aft Adjustment Handle
5. Seat Bottom
6. Articulating Adjustment Handle
7. Bellcrank
8. Adjustment Screw
9. Seat Back
10. Trim Bracket
11. Spacer
12. Bracket
13. Channel
14. Torque Tube
15. Seat Structure
16. Bushing
17. Roller
18. Trust Beraing Inst

✱ BEGINNING WITH AIRCRAFT SERIAL 21059440

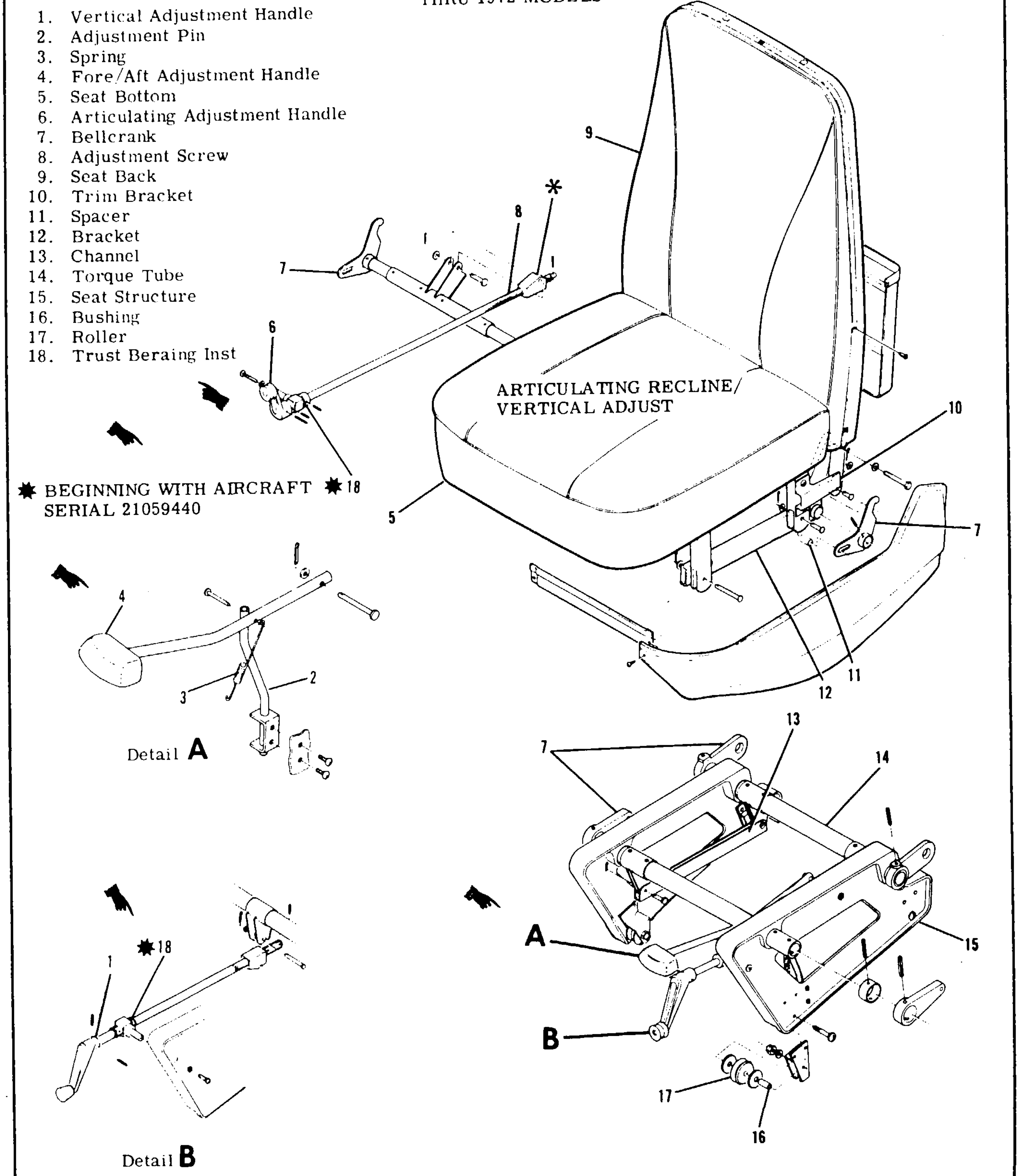
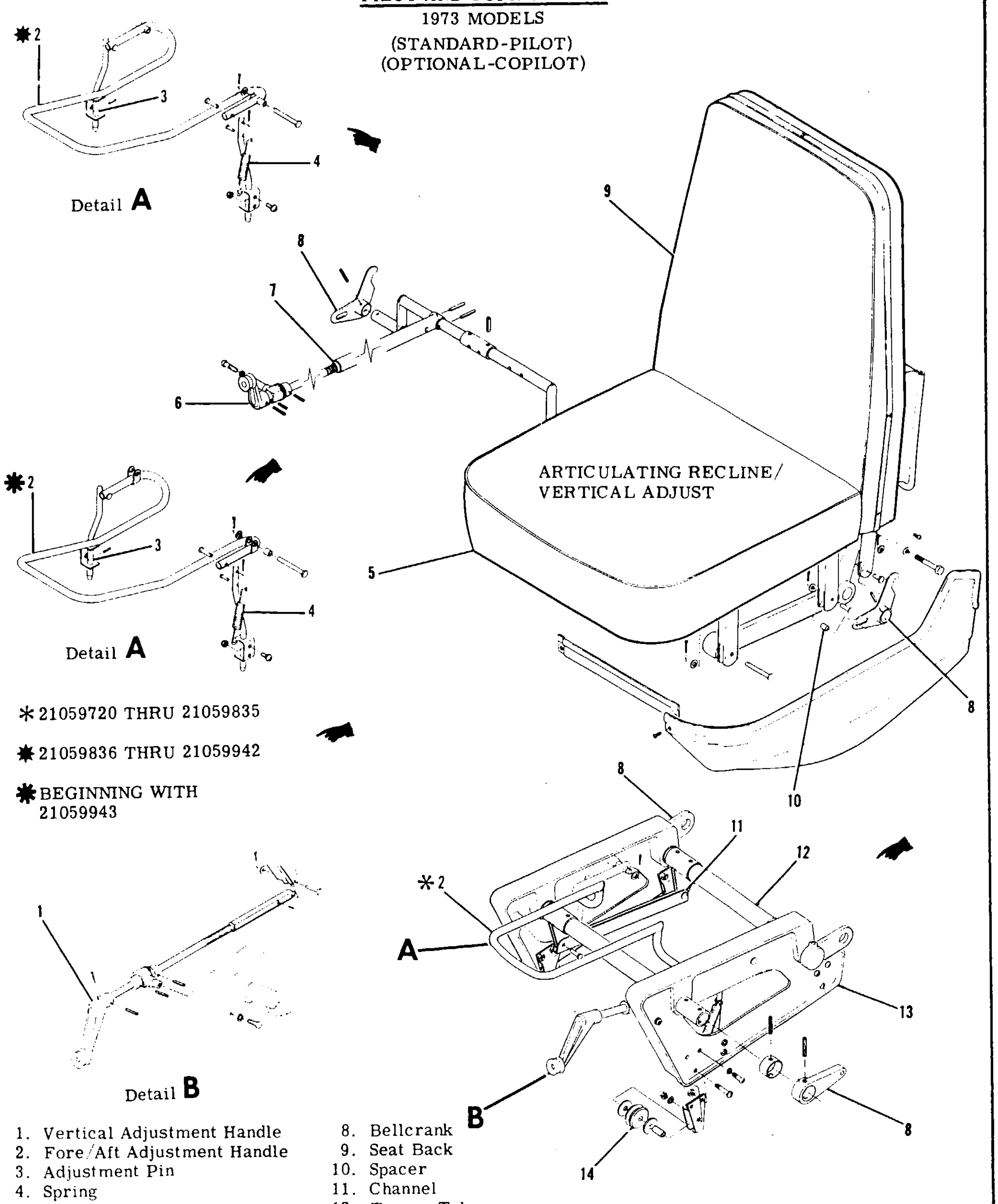


Figure 3-6. Seat Installation (Sheet 2 of 7)

PILOT AND COPILOT SEAT

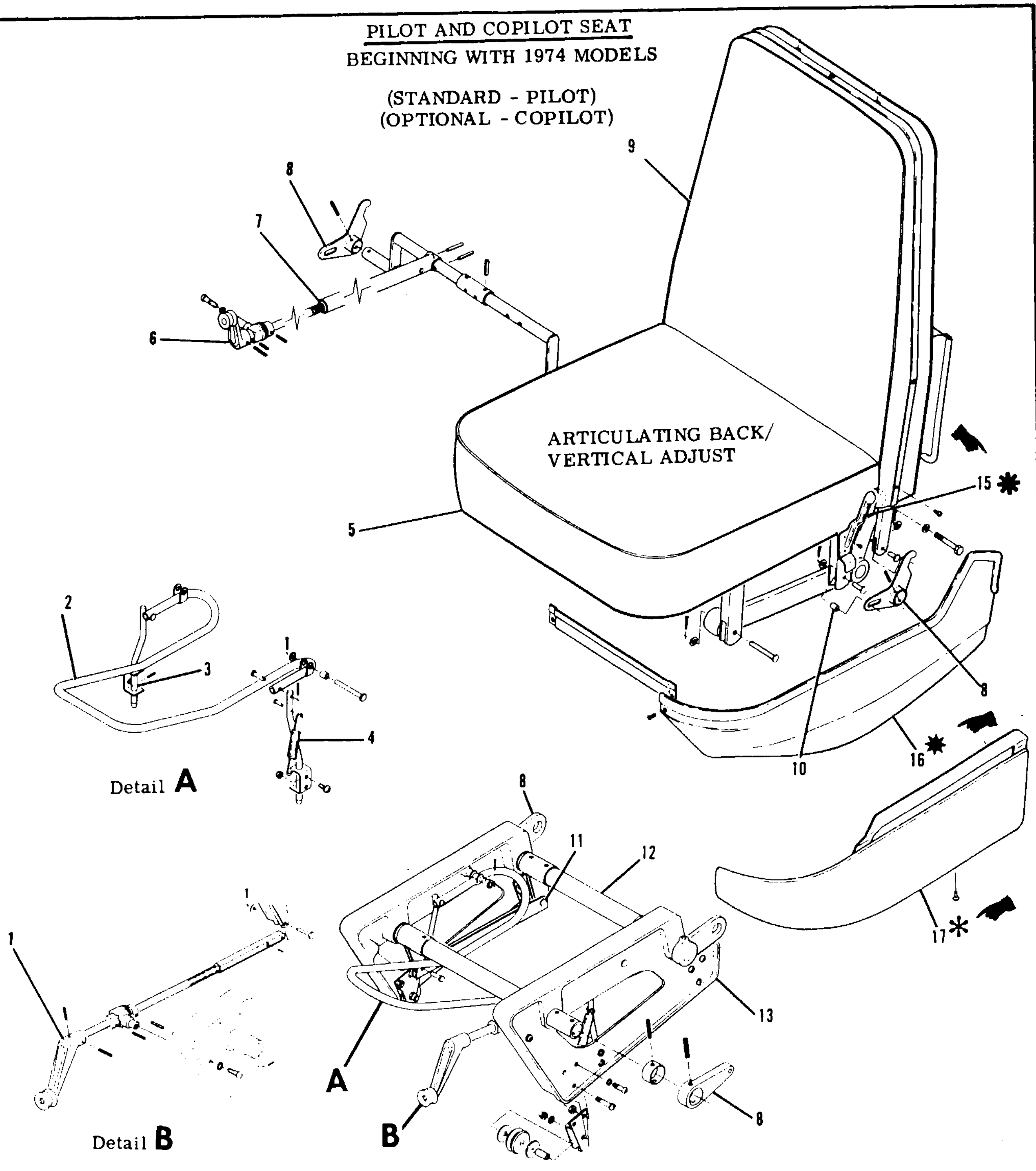
1973 MODELS

(STANDARD-PILOT)
(OPTIONAL-COPILOT)



1. Vertical Adjustment Handle
2. Fore/Aft Adjustment Handle
3. Adjustment Pin
4. Spring
5. Seat Bottom
6. Articulating Adjustment Handle
7. Adjustment Screw
8. Bellcrank
9. Seat Back
10. Spacer
11. Channel
12. Torque Tube
13. Seat Structure
14. Roller

Figure 3-6. Seat Installation (Sheet 3 of 7)



1. Vertical Adjustment Handle
2. Fore/Aft Adjustment Handle
3. Adjustment Pin
4. Spring
5. Seat Bottom
6. Articulating Adjustment Handle
7. Adjustment Screw
8. Bellcrank
9. Seat Back
10. Spacer
11. Channel
12. Torque Tube
13. Seat Structure
14. Roller
15. Stiffner
16. Trim
17. Seat Belt Retainer

✱ SERIALS 21060430 THRU 21061039

✱ THRU SERIAL 21061039

✱ BEGINNING WITH SERIAL 21061040

Figure 3-6. Seat Installation (Sheet 4 of 7)

NOTE

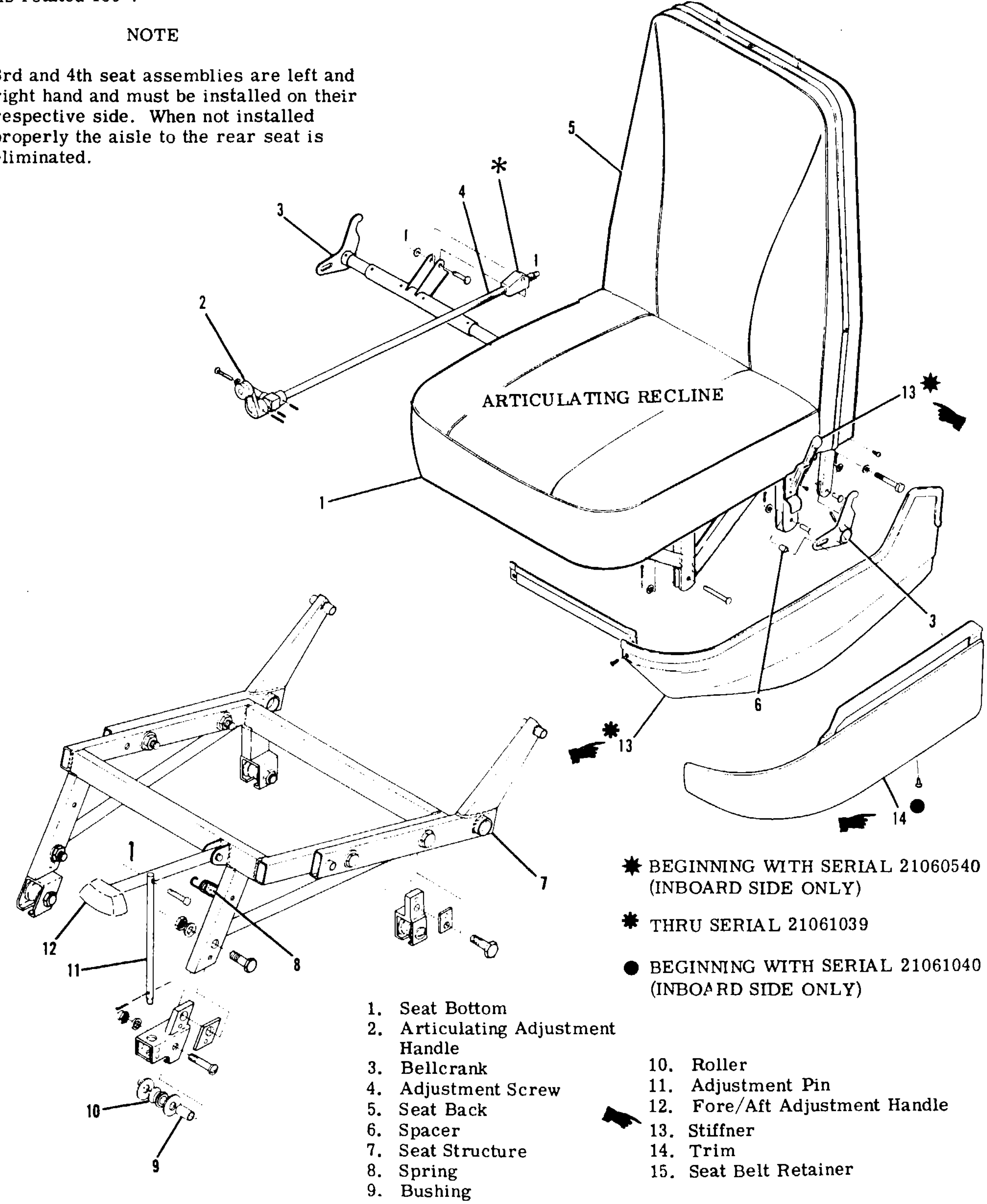
*Beginning with 21059503 the nut on adjustment screw (4) is rotated 180°.

NOTE

3rd and 4th seat assemblies are left and right hand and must be installed on their respective side. When not installed properly the aisle to the rear seat is eliminated.

3RD AND 4TH

(STANDARD)



✱ BEGINNING WITH SERIAL 21060540 (INBOARD SIDE ONLY)

✱ THRU SERIAL 21061039

● BEGINNING WITH SERIAL 21061040 (INBOARD SIDE ONLY)

1. Seat Bottom
2. Articulating Adjustment Handle
3. Bellcrank
4. Adjustment Screw
5. Seat Back
6. Spacer
7. Seat Structure
8. Spring
9. Bushing
10. Roller
11. Adjustment Pin
12. Fore/Aft Adjustment Handle
13. Stiffner
14. Trim
15. Seat Belt Retainer

Figure 3-6. Seat Installation (Sheet 5 of 7)

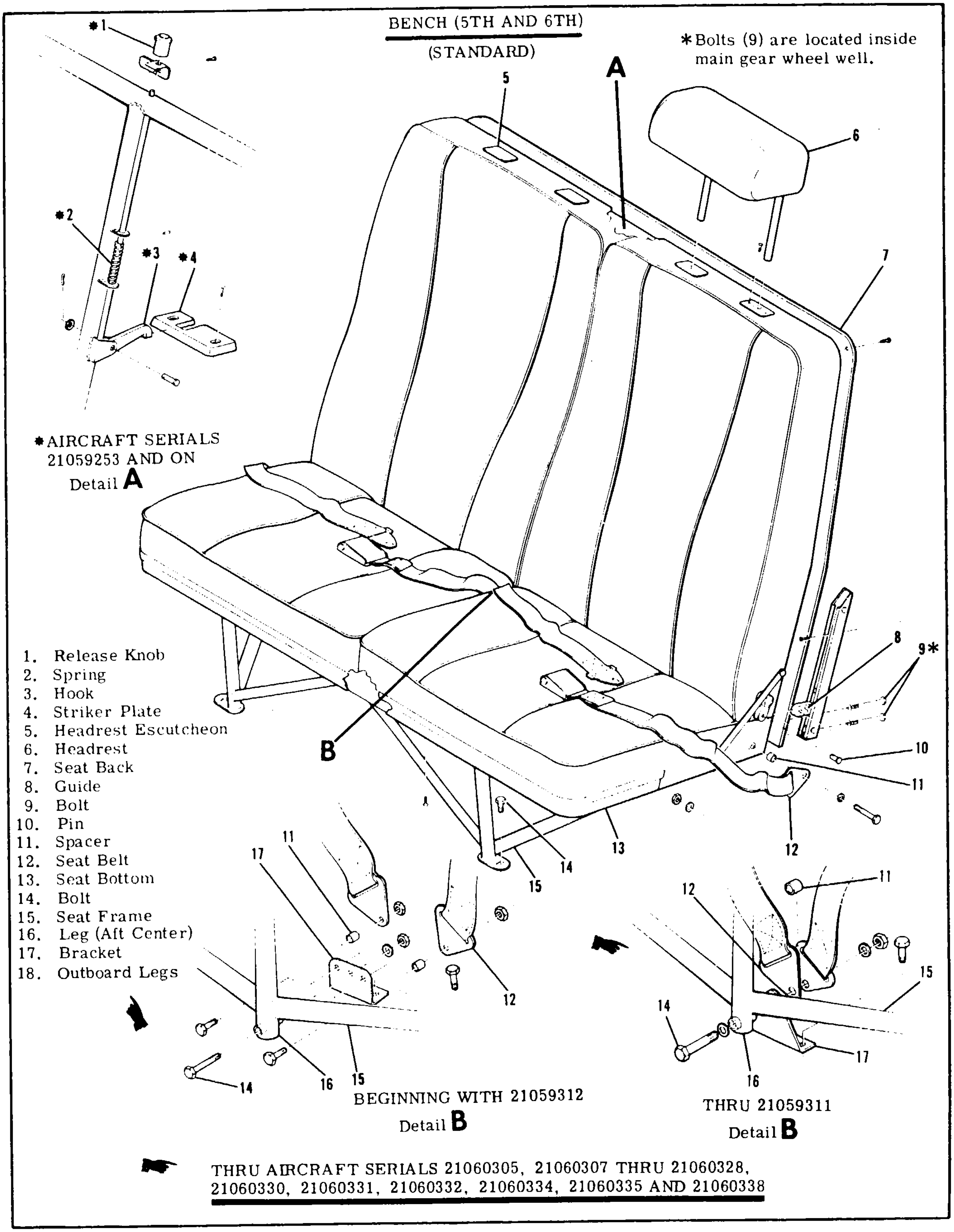


Figure 3-6. Seat Installation (Sheet 6 of 7)

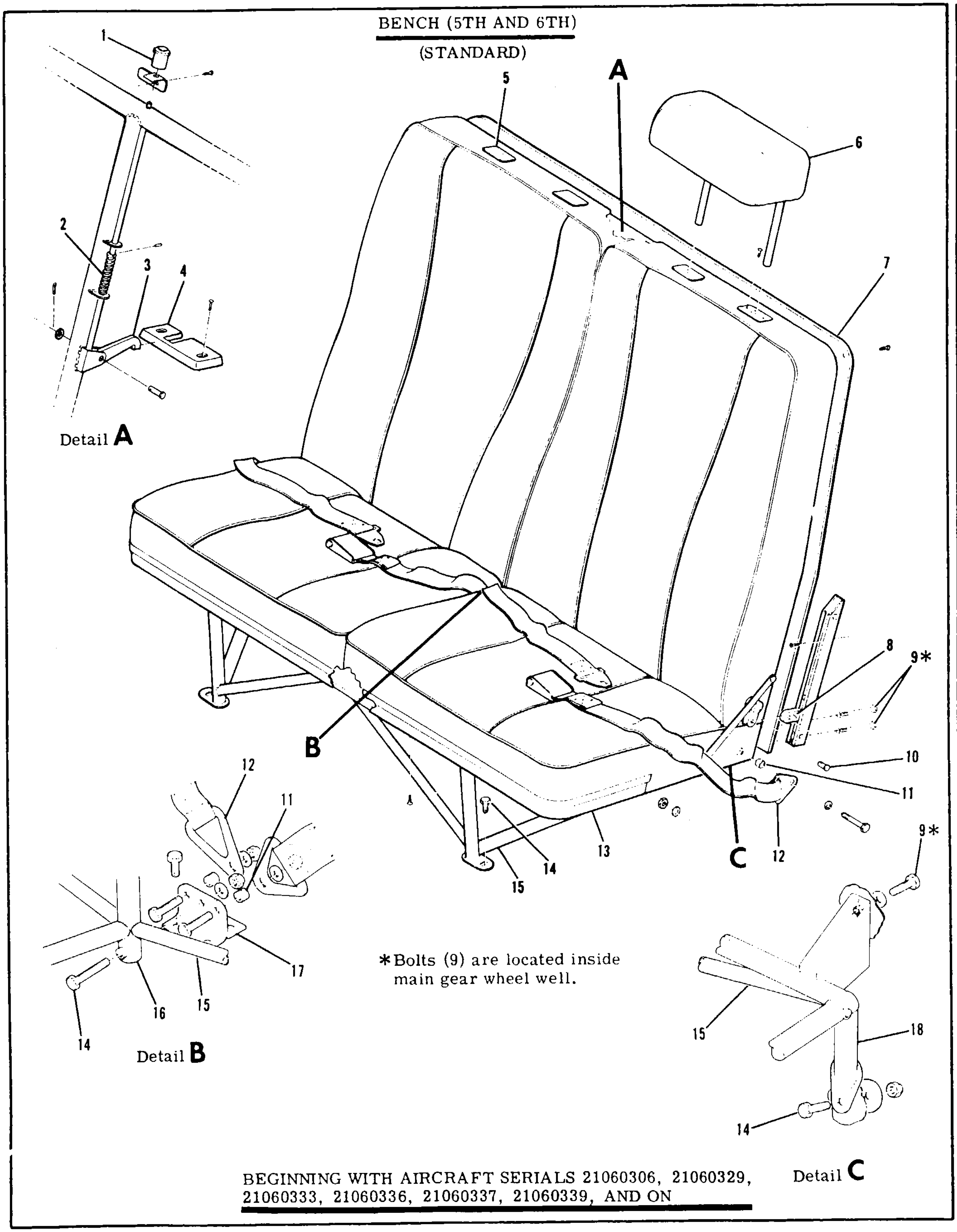


Figure 3-6. Seat Installation (Sheet 7 of 7)

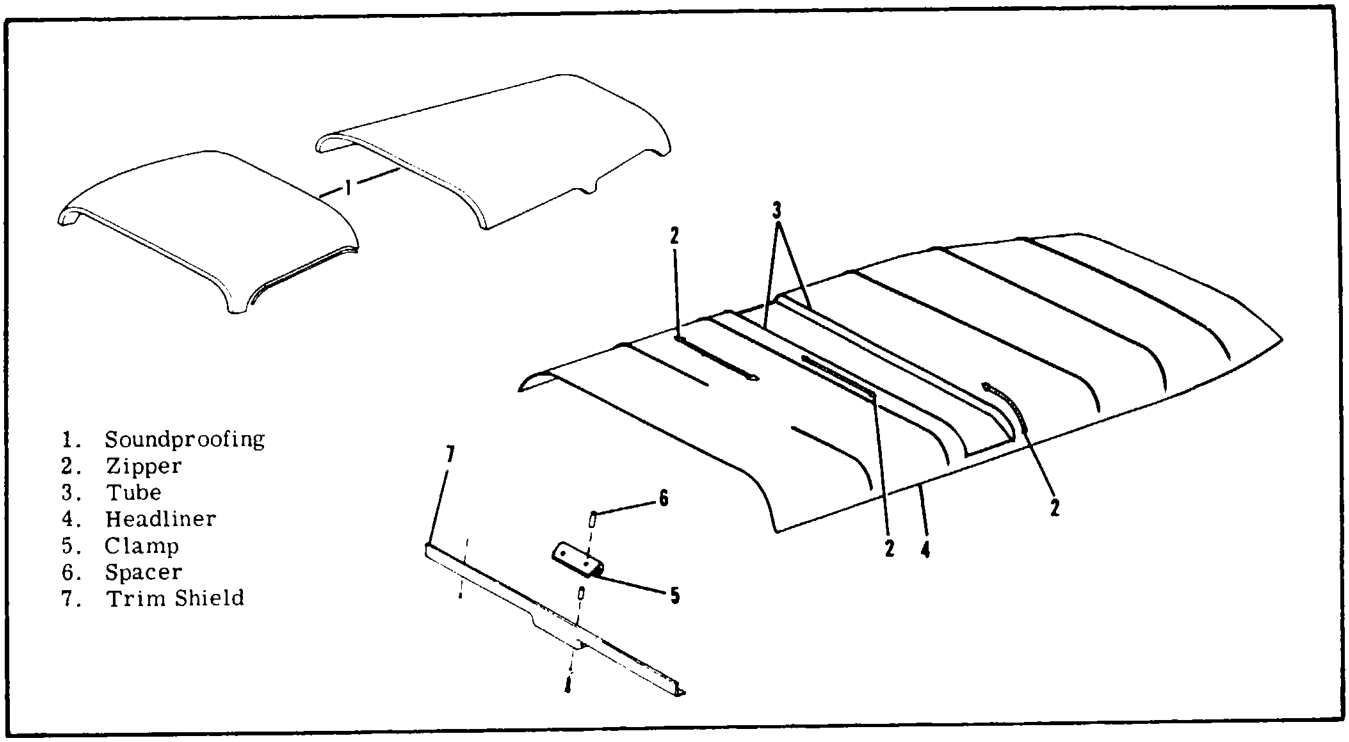


Figure 3-7. Cabin Headliner Installation

by an experienced mechanic. If the work must be done by a mechanic unfamiliar with upholstery practices, the mechanic should make careful notes during removal of each item to facilitate replacement later.

3-41. MATERIALS AND TOOLS. Materials and tools will vary with the job. Scissors for trimming upholstery to size and a dull-bladed putty knife for wedging material beneath retainer strips are the only tools required for most trim work. Use industrial rubber cement to hold soundproofing mats and fabric edges in place. Refer to Section 18 for thermoplastic repairs.

3-42. SOUNDPROOFING. The aircraft is insulated with spun glass mat-type insulation and a sound deadener compound applied to inner surfaces of the skin in most areas of the cabin and baggage compartment. All soundproofing material should be replaced in its original position any time it is removed. A soundproofing panel is placed in the gap between wing and fuselage and held in place by the wing root fairings.

3-43. CABIN HEADLINER. (Refer to figure 3-7.)

3-44. REMOVAL.
a. Remove all overhead oxygen, ventilating and light consoles, sun visors, dome lights, all inside finish strips and plates and any other visable retainers securing headliner.
b. Work edges of headliner free from metal teeth which hold fabric.
c. Starting at the front of headliner and working toward the rear, work headliner down, removing screws through the metal tabs which hold the wire bows to cabin top. Pry loose outer ends of the bows from retainers above doors. Detach each wire bow in succession.
d. Remove headliner assembly and bows from the aircraft.

NOTE

Due to the difference in length and contour of wire bows, each bow should be tagged to assure proper location in the headliner.

e. Remove the spun glass soundproofing panels.

NOTE

The lightweight soundproofing panels are held in place with industrial rubber cement.

3-45. INSTALLATION.
a. Before installation, check all items concealed by headliner for security. Use wide cloth tape to secure loose wires to the fuselage and to seal any openings in the wing roots. Straighten tabs bent during removal of headliner.
b. Apply cement to inside of skin in the areas where soundproofing panels are not supported by wire bows and press soundproofing in place.
c. Insert wire bows into headliner seams and secure the two bows at rear of headliner. Stretch the material along edges to properly center, but do not stretch it tight enough to destroy ceiling contours or distort wire bows. Secure edges of headliner with the metal teeth.

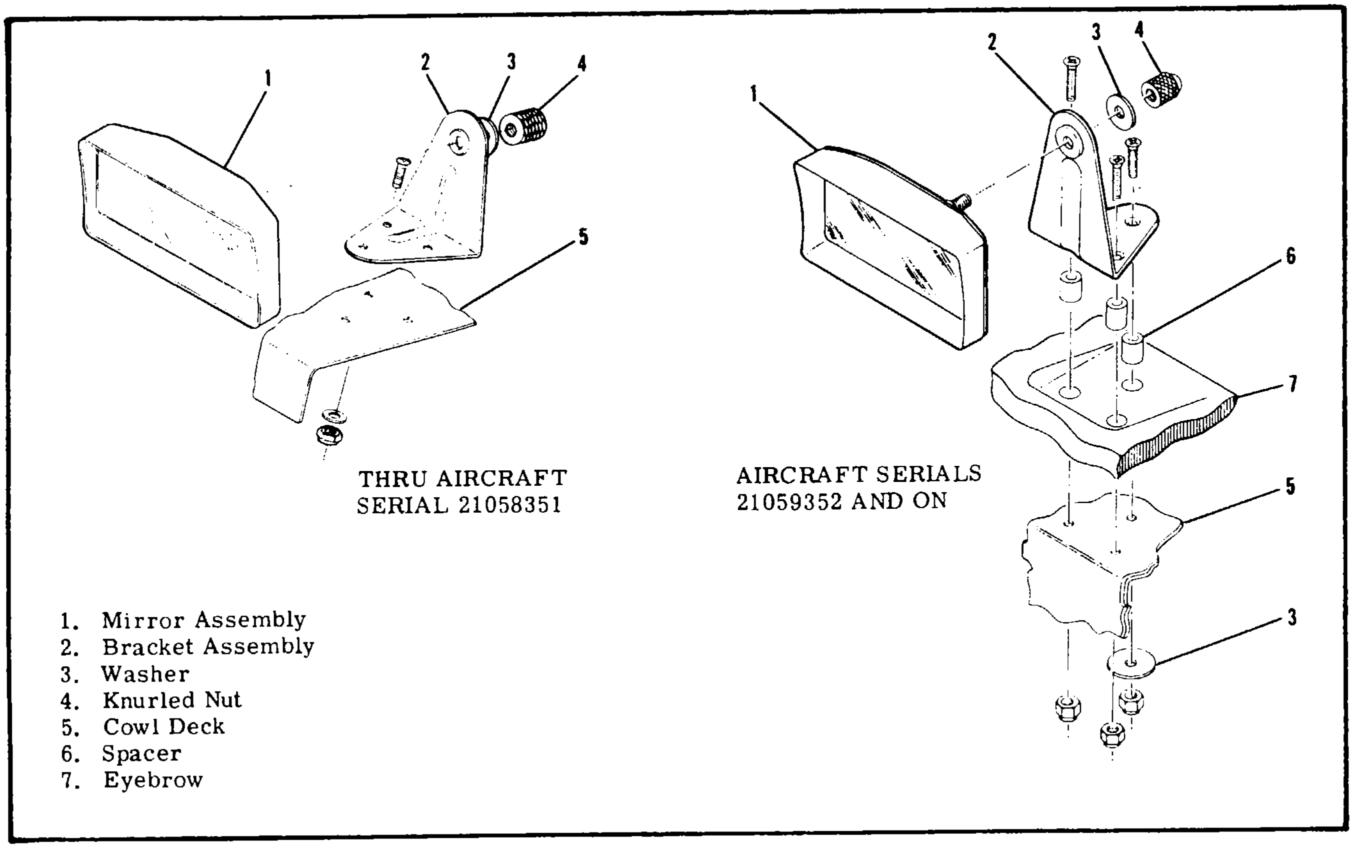


Figure 3-8. Rear View Mirror Installation

d. Work headliner forward, installing each wire bow in place with the metal tabs. Wedge ends of wire bows into the retainer strips. Stretch headliner just taut enough to avoid wrinkles and maintain a smooth contour.

e. When all bows are in place and fabric edges are secured, trim off excess fabric and reinstall all items removed.

3-46. UPHOLSTERY PANELS.

3-47. REMOVAL AND INSTALLATION. Removal of the upholstery side panels is accomplished by removing the seats for access and removing screws, retaining strips and ash trays as required to free the panels. When reinstalling side panels, do not overtighten screws. Larger screws may be used in enlarged holes as long as the area behind the hole is checked for wiring, fuel lines and other components which might be damaged by using a longer screw. Automotive type spring clips attach the door panels and a dull putty knife makes an excellent tool for prying the clips loose. The rear baggage panel is secured to the aft cabin wall with cloth retaining strips for easy removal.

3-48. CARPETING.

3-49. REMOVAL AND INSTALLATION. Cabin area and baggage compartment carpeting is held in place by rubber cement, small sheet metal screws and retaining strips. Cloth retaining strips are also installed on some aircraft near access plate locations for quick-removal of the carpeting and inspection in these areas. When fitting a new carpet, use the old one as a pattern for trimming and marking screw holes.

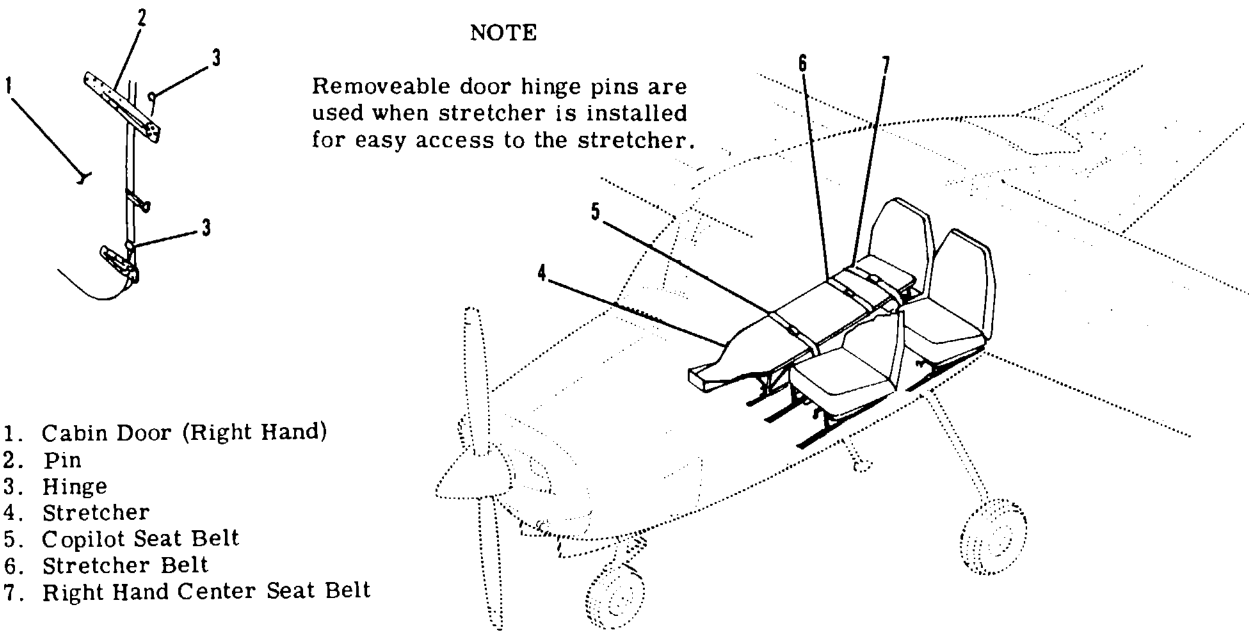
3-50. SAFETY PROVISIONS.

3-51. BAGGAGE RETAINING NET.

3-52. DESCRIPTION. A nylon baggage net having six tie-down straps is provided to secure baggage in the area aft of the wheel well and on the backs of the fifth and sixth seats when they are used for stowing baggage. When using the baggage net to secure baggage stowed aft of the wheel well, only four of the net tie-down straps are usually used. They are fastened to the two tie-down rings located on the forward edge of the wheel well and two rings at the bottom edge of the rear cabin window. If the fifth and sixth seats are not occupied, the seat backs may be folded forward to create more baggage area. If this area is used, all six tie-down straps must be used. Tie the front straps of the net to the front legs of the fifth and sixth seats and the remaining four straps to the tie-down rings provided.

3-53. SAFETY BELTS.

3-54. DESCRIPTION. (Refer to figure 3-6 and 3-10). Safety belts should be replaced if frayed or cut, latches are defective or stiching is broken. Attaching parts should be replaced if excessively worn or defective. The pilot and copilot seat safety belts are attach-



NOTE

Removeable door hinge pins are used when stretcher is installed for easy access to the stretcher.

1. Cabin Door (Right Hand)
2. Pin
3. Hinge
4. Stretcher
5. Copilot Seat Belt
6. Stretcher Belt
7. Right Hand Center Seat Belt

Figure 3-9. Stretcher Installation

ed to brackets bolted to the cabin floor. The 3rd and 4th seat belts are attached to brackets bolted to the cabin floor and fuselage structure. The bench seat belts are attached to a bracket bolted to the cabin floor and to the seats themselves.

NOTE

Through 1970 model aircraft, when installing safety belts be sure the belt half with the buckle is installed on the inboard side of the seat. Beginning with 1971 models the belt half with the buckle should be installed on the outboard side of the seat to ensure proper operation of the shoulder harness.

3-55. SHOULDER HARNESS.

3-56. DESCRIPTION. (Refer to figure 3-10). Individual shoulder harnesses may be installed for each seat. Through 1970 model aircraft each harness is attached to a clip bolted to the upper fuselage structure. Beginning with 1971 model aircraft the pilot and copilot harnesses are bolted to the upper rear doorposts and the 3rd, 4th and bench seat harnesses are bolted to the aft cabin structure. Component parts should be replaced as outlined in paragraph 3-54.

3-56A. INERTIA REEL HARNESS.

3-56B. DESCRIPTION. (Refer to Figure 3-10.) Beginning with 1974 model aircraft, a inertia reel harness assembly may be installed for the Pilot and Co-Pilot positions. The inertia reels are installed in a mounting base located in the aft center overhead console. The shoulder and lap belt are one assembly with an adjuster to position the shoulder harness.

The reel is designed to lock and hold when a 2 to 3 "g" force is applied and 12 inches of webbing remain on the reel. The reel can be checked for proper operation by giving webbing a quick tug, the reel should lock and hold.

3-56C. REMOVAL AND INSTALLATION.

a. Remove the screws retaining the escutcheon on aft center console and remove the oxygen outlet covers by rotating counter-clockwise if installed.
b. Remove screws in mounting bracket and remove (2) screws in each reel assembly and pull belt through bracket.
c. Re-install by reversing the procedure.

3-57. GLIDER TOW-HOOK.

3-58. DESCRIPTION. A glider tow-hook, which is mounted in place of the tail tie-down ring, is available for all models.

3-59. REAR VIEW MIRROR.

3-60. DESCRIPTION. A rear view mirror may be installed on the cowl deck above the instrument panel. Figure 3-8 shows details of the rear view mirror installation.

3-61. STRETCHER.

3-62. DESCRIPTION. A portable stretcher may be installed in the aircraft. The stretcher is installed by removing the copilot seat and utilizing the copilots seat belt and the right hand center seat and seat belt. (Refer to figure 3-9).

3-63. REMOVAL AND INSTALLATION.

a. Remove copilot's seat and store in baggage com-

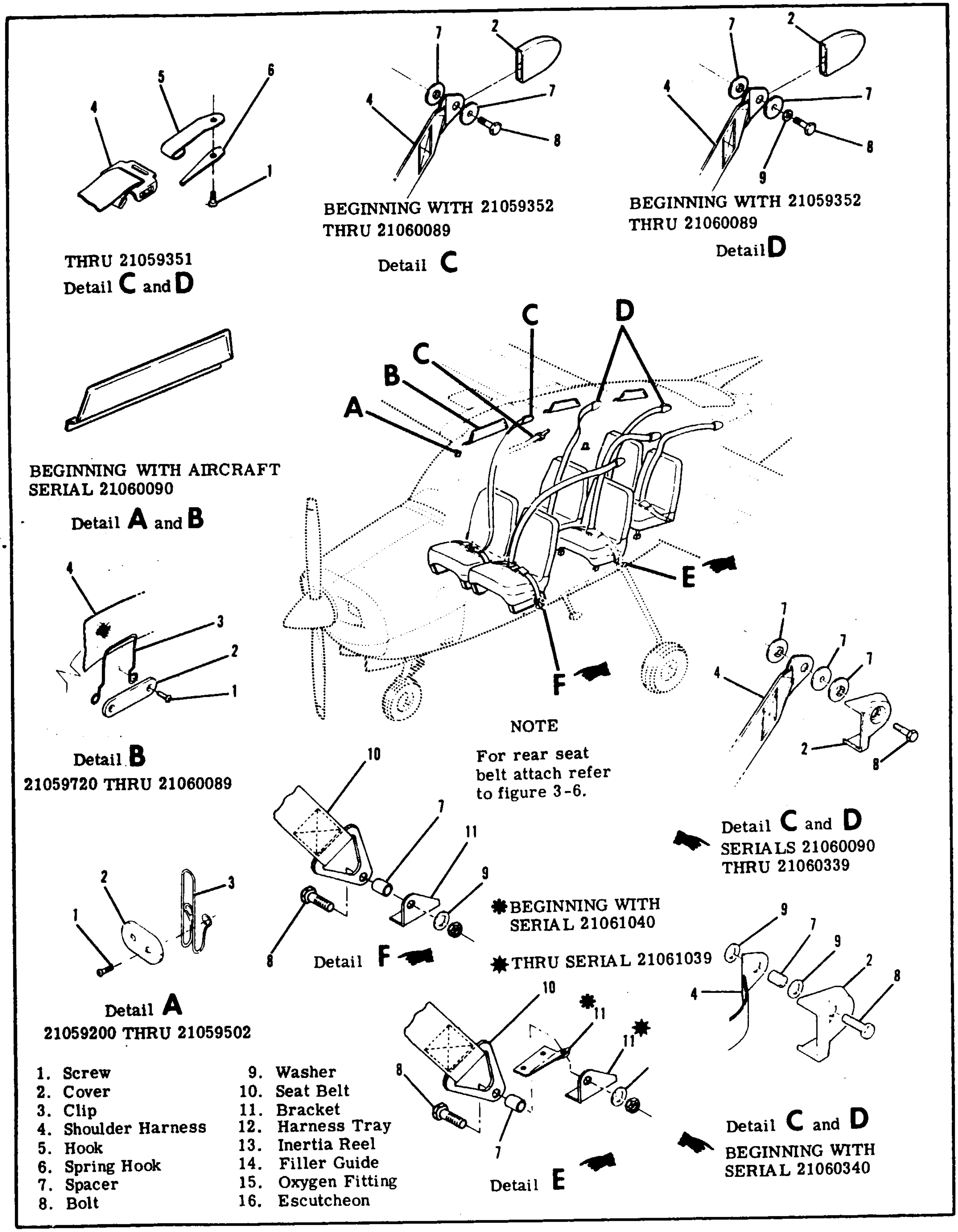


Figure 3-10. Seat Belt and Shoulder Harness Installation (Sheet 1 of 2).

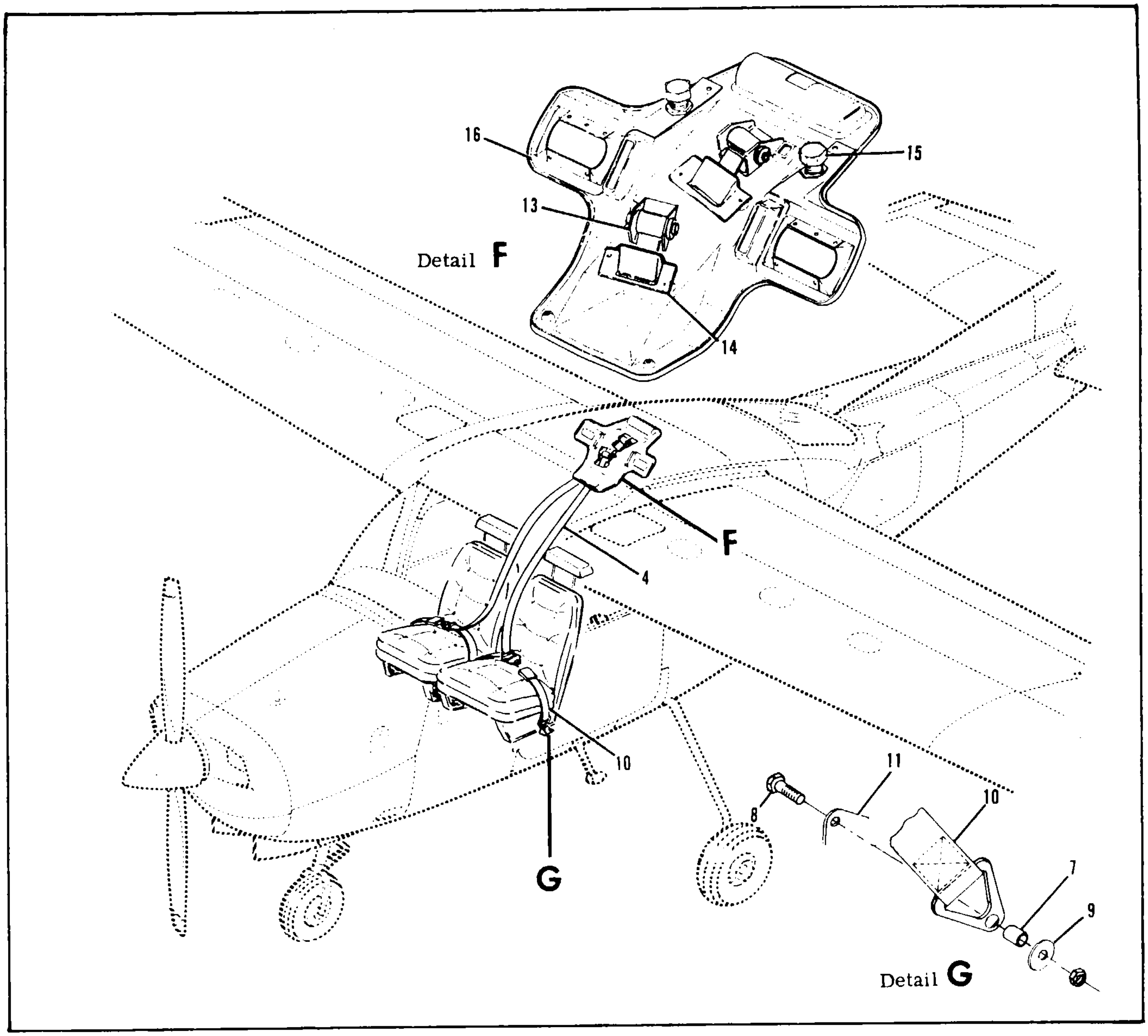


Figure 3-10. Seat Belt and Shoulder Harness Installation (Sheet 2 of 2).

partment.

b. Replace right hand cabin door hinge pins with removable hinge pins.

c. Replace right hand cabin door stop hinge rivet with a pin, washer and cotter pin.

d. Pass stretcher thru cabin door,, head end first. Rotate stretcher until head end rests on the right hand center seat. Engage legs at the foot of the stertcher with copilot seat rails and secure locking pin on inboard leg.

e. Secure head end of stretcher with right hand center seat belt.

f. For removal reverse the preceding steps.

3-64. CABIN STEP INSTALLATION.

3-65. DESCRIPTION. To facilitate entry and exit from the aircraft, a retractable step is installed. The step is operated by a cable assembly attached to the nose gear actuator and is extended and retracted with the nose gear.

3-66. REMOVAL AND INSTALLATION. (Refer to figure 3-11.)

a. Remove the co-pilot seat, carpeting, inspection covers and step cover as required to gain access to the step assembly.

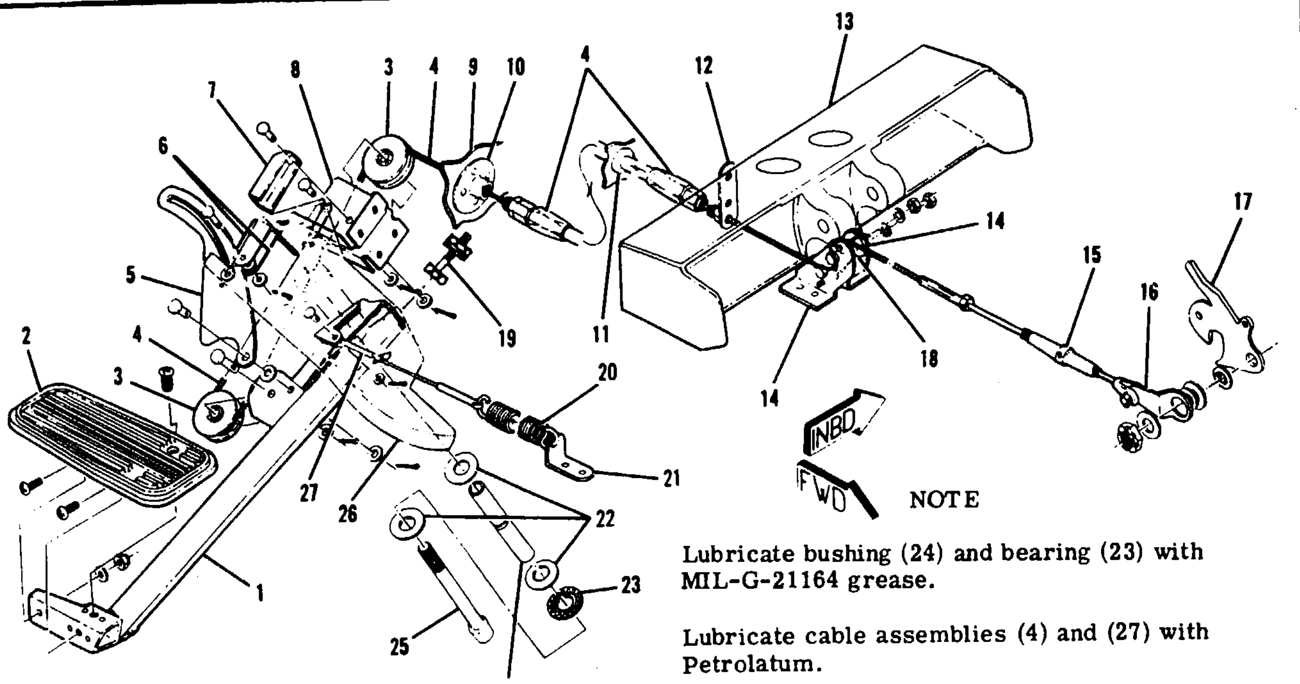
b. Disconnect cable (27) by removing the cotter pin and the attaching pin located at the end of the cable.

c. Disconnect cable (4) by removing pulley (3) from the step assembly. Retain the pulley for reinstallation.

d. Remove the attaching pin from the cable cover (5) and bracket (6).

e. Remove bolt (25) and remove the step assembly from the aircraft.

f. To install cabin step, reverse the preceding steps.



NOTE

Lubricate bushing (24) and bearing (23) with MIL-G-21164 grease.

Lubricate cable assemblies (4) and (27) with Petrolatum.

Refer to Service Letter SE75-16 (August 8, 1975) for incorporation of a cable guard to step attach assembly (1) on certain early 1975 model aircraft.

Washers may be added or deleted from stop bolt (19) to adjust travel of step attach assembly (1). No specific measurement is required; only to facilitate entry and exit from aircraft.

NOTE

Step tread (2) is bonded to step assembly with EC-1300 L (3M Company, St. Paul Minnesota, 55101) or equivalent.

Cover seal (7) is bonded to pulley bracket (8) with EC-1300L or EC-880 (3M Company, St. Paul, Minn. 55101) or equivalent adhesive and sealed with RTV102 white adhesive sealant (General Electric, Waterford, New York) or equivalent sealant.

1. Step Attach Assembly
2. Step Assembly
3. Pulley
4. Cable Assembly
5. Cable Cover Assembly
6. Bracket
7. Cover Seal
8. Pulley Bracket
9. Bulkhead Station 44.0
10. Adapter
11. Grommet
12. Fitting Assembly
13. Nose Gear Drag Fitting
14. Pulley Bracket
15. Turnbuckle
16. Spring Clip
17. Nose Gear Actuator Hook
18. Pulley
19. Stop Bolt
20. Spring
21. Bracket
22. Race
23. Bearing
24. Bushing
25. Internal Wrenching Bolt
26. Support
27. Cable Assembly

Figure 3-11. Cabin Step Installation

NOTE

For cable rigging instructions refer to Section 5. When rigging procedure is complete, safety wire turnbuckle (15).

g. Refer to Section 5 for removal and installation of components not specifically called out in the preceding steps.

SECTION 4

WINGS AND EMPENNAGE

TABLE OF CONTENTS Page

4-1. WINGS AND EMPENNAGE.

4-2. WINGS. (See figure 4-1.)

4-3. DESCRIPTION. Each all-metal wing panel is a full cantilever type, with a single main spar, two fuel spars, formed ribs and stringers. The front fuel spar also serves as an auxiliary spar and provides the forward attachment point for the wing. An inboard section of the wing, forward of the main spar, is sealed to form an integral fuel bay area. Stressed skin is riveted to the spars, ribs and stringers to complete the structure. An all-metal, balanced aileron, flap, and a detachable wing tip are part of each wing assembly. A navigation light is mounted in each wing tip.

4-4. REMOVAL. Wing panel removal is most easily accomplished if four men are available to handle the wing. Otherwise, the wing should be supported with a sling or maintanance stand when the fastenings are loosened.

a. Remove wing gap fairings and fillets.
b. Drain fuel from wing being removed. (Observe precautions outlined in Section 13.)
c. Remove cabin headliner in accordance with procedures outlined in Section 3.

WARNING

Oil, grease or other lubricants in contact with high-pressure oxygen, create a serious fire hazard and such contact should be avoided. Do not permit smoking or open flame in or near aircraft while work is performed on oxygen systems.

d. (Refer to figure 15-9.) Rotate valves on three cylinders clockwise to shut off filler line pressure; the quick-release adapter on the cylinder-regulator assembly will retain pressure within the cylinder. Disconnect oxygen filler line at first tee upstream from filler valve.

e. Disconnect:
1. Electrical wires at wing root disconnects.
2. Fuel lines at wing root.
3. Pitot line (left wing only) at wing root.
4. Cabin ventilator hose at wing root.
5. Aileron carry-thru cable and aileron direct cables of wing being removed, at turnbuckles behind headliner front shield and doorpost shield.

NOTE

To ease rerouting the cables, a guide wire may be attached to each cable before it is pulled free from the wing. Then disconnect cable from wire and leave the guide wire routed through the wing; it may be attached again to the cable during reinstallation and used to pull the cable into place.

f. If right wing is being removed, disconnect flap cables from right flap drive pulley, and remove cable guards and/or pulleys as required to pull flap cables into right wing root area.
g. If left wing is being removed, relieve tension on right flap cables at right flap drive pulley. Disconnect right flap cables at flap actuator in left wing and remove pulleys to pull flap cables into left wing root area.

NOTE

Rigging of flap actuator and components in left wing need not be disturbed to remove either wing. It is recommended that flap be secured in streamlined position with tape during wing removal to prevent damage, since flap will swing freely.

h. Remove nut, washer and bolt attaching front fuel spar to fuselage.
i. Remove bolts, washers and retainers holding main spar dowel pins in position.
j. Support wing at inboard and outboard ends, and

remove dowel pins that attach main wing spar to fuselage. It is recommended to remove the top dowel pin first, then lower outboard end of wing before removing bottom dowel pin.

NOTE

It may be necessary to use a long punch to drive out main wing spar attaching dowel pins, or to rock wing slightly while removing pins. Care must be taken not to damage dowel pins, spar fittings or spar carry-thru fittings as these are reamed holes and close tolerance dowel pins.

k. Remove wing and lay on padded stand.

4-5. REPAIR. A damaged wing panel may be repaired in accordance with instructions outlined in Section 18. Extensive repairs of wing skin or structure are best accomplished by using the wing repair jig, which may be obtained from Cessna. The jig serves not only as a holding fixture, making work on the wing easier, but also assures absolute alignment of the repaired wing.

4-6. INSTALLATION.

NOTE

Refer to figure 4-1 for lubrication of dowel pins prior to installation.

a. Hold wing in position with wing tip low.
b. Install:
   1. Dowel pins attaching main spar to fuselage. (Install bottom pin first, then rotate wing tip up, and install top pin.)
   2. Bolts, washers and nuts that hold main spar attach dowel pins in position.
   3. Front fuel spar attach bolt, washer and nut.
c. Route flap and aileron cables and make proper connections.
d. Connect:
   1. Electric wires at wing root disconnects.
   2. Fuel lines at wing root.
   3. Pitot line (if left wing is being installed.)
   4. Cabin ventilator hose at wing root.
   5. Oxygen filler line at tee in cabin top area.

CAUTION

Be sure to turn valves counterclockwise on three oxygen cylinders to turn on filler line pressure. Refer to Section 15 for a complete oxygen system leak test prior to installing headliner.

e. Rig aileron system (Section 6).
f. Rig flap system (Section 7).
g. Refill wing fuel bays and check all connections for leaks.

NOTE

If a new wing is being installed, it will be necessary to calibrate the fuel control monitor in the cabin ceiling area. Refer to Section 16 for calibration procedure.

h. Check operation of navigation, courtesy and landing lights.
i. Check operation of fuel quantity indicator.
j. Install wing gap fairings and fillets.

NOTE

Be sure to install soundproofing panel in wing gap before replacing fairing.

k. Install headliner, interior panels, upholstery and inspection plates.
l. Test operation of flap and aileron systems.

4-7. ADJUSTMENT (CORRECTING "WING-HEAVY" CONDITION). If considerable control wheel pressure is required to keep the wings level in normal flight, a wing-heavy condition exists. Refer to Section 6 for adjustment of aileron tabs.

4-8. VERTICAL FIN. (See figure 4-2.)

4-9. DESCRIPTION. The fin is primarily of metal construction, consisting of ribs and spars covered with skin. Fin tips are glass fiber/ABS construction. Hinge brackets at the rear spar attach the rudder.

4-10. REMOVAL. The fin may be removed without first removing the rudder. However, for access and ease of handling, the rudder may be removed if desired, following the procedures outlined in Section 10.
a. Remove fairings on both sides of fin.
b. Disconnect flashing beacon lead, tail navigation light lead, antennas and antenna leads and rudder cables if rudder has not been removed.
c. Remove screws attaching dorsal fin to fuselage.
d. Remove bolts attaching fin front and rear spars to fuselage.
e. Remove fin.

4-11. REPAIR. A damaged fin may be repaired in accordance with applicable instructions outlined in Section 18.

4-12. INSTALLATION. Reverse procedures outlined in paragraph 4-10 to install the fin. Be sure to check and reset rudder and elevator travel if any stop bolts were removed or settings distrubed. Refer to Sections 8 and 10 respectively for setting elevator and rudder travel. Refer to figure 1-1 for control surface travels.

4-13. HORIZONTAL STABILIZER. (See figure 4-3.)

4-14. DESCRIPTION. The horizontal stabilizer is primarily of metal construction, consisting of ribs and a front and rear spar which extends throughout the full span of the stabilizer. The skin is riveted to both spars and ribs. Stabilizer tips are constructed of ABS. The elevator tab actuator screw is contained within the horizontal stabilizer assembly, and is supported by a bracket rivited to the rear spar. The underside of the stabilizer contains an opening which provides access to the elevator tab actuator screw. Hinges on the rear spar support the elevator.

4-15. REMOVAL.

a. Remove elevators and rudder in accordance with procedures outlined in Sections 8 and 10.

b. Remove vertical fin in accordance with procedures outlined in paragraph 4-10.

c. Disconnect elevator trim control cables at clevis, turnbuckle and clamps inside tailcone, remove pulleys which route the aft cables into horizontal stabilizer, and pull cables out of tailcone.

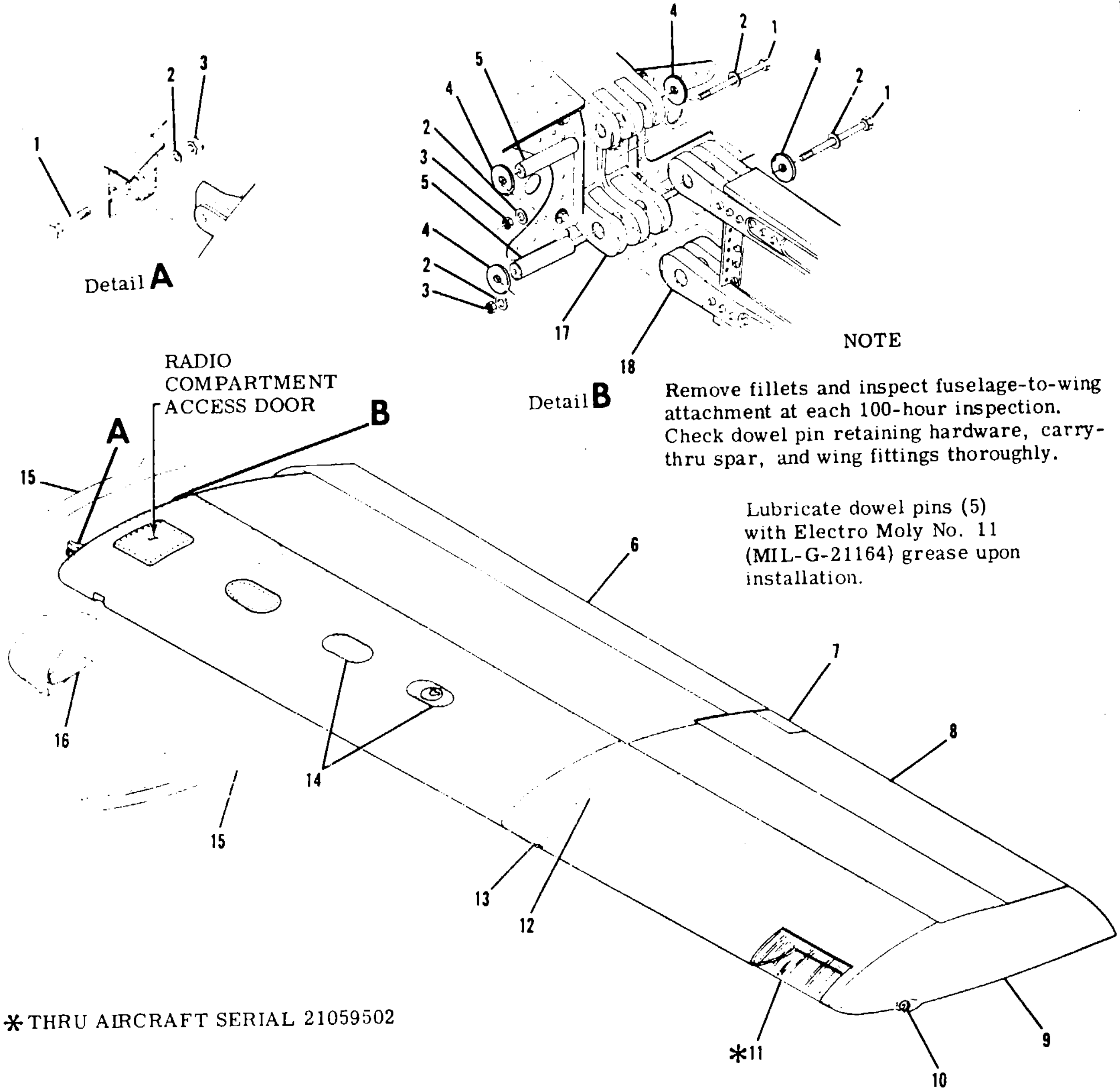
d. Remove bolts securing horizontal stabilizer to fuselage.

e. Remove horizontal stabilizer.

4-16. REPAIR. A damaged horizontal stabilizer may be repaired in accordance with applicable instructions outlined in Section 18.

4-17. INSTALLATION. Reverse the procedures outlined in paragraph 4-15 to install the horizontal stabilizer. Rig the control systems as necessary, following instructions outlined in applicable sections. Set control surface travels to values listed in figure 1-1.

SHOP NOTES:



NOTE

Remove fillets and inspect fuselage-to-wing attachment at each 100-hour inspection. Check dowel pin retaining hardware, carry-thru spar, and wing fittings thoroughly.

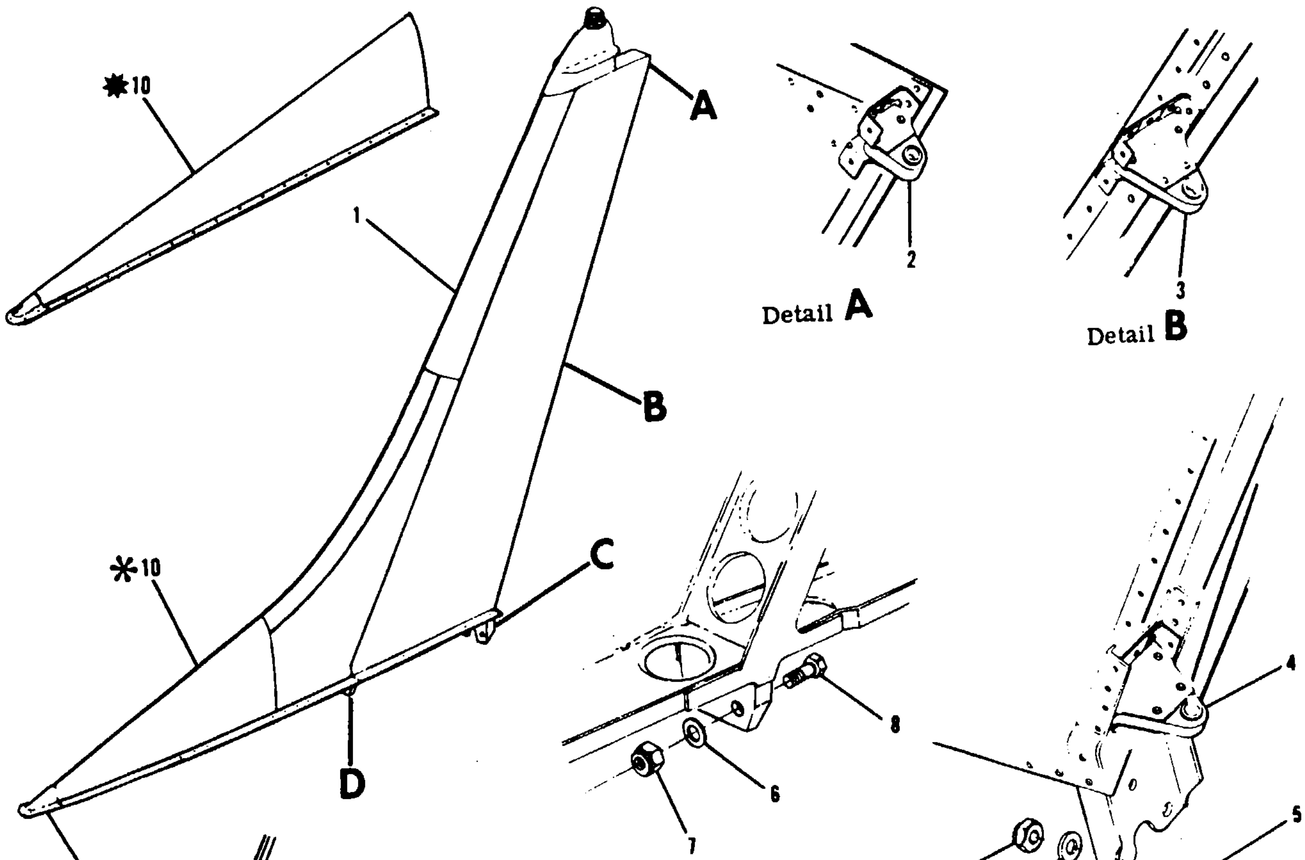
Lubricate dowel pins (5) with Electro Moly No. 11 (MIL-G-21164) grease upon installation.

NOTE

If there is damage to bushings in fittings (17) or (18), notify factory before anticipating replacement, as these are critical areas.

1. Bolt
2. Washer
3. Nut
4. Retainer
5. Dowel Pin
6. Flap
7. Trim Tab
8. Aileron
9. Tip Assembly
10. Navigation Light
11. Landing and Taxi Lights
12. Pitot Tube
13. Stall Warning Unit
14. Access Plate
15. Fillet
16. Fairing
17. Fuselage Fitting
18. Wing Fitting

Figure 4-1. Wing Installation

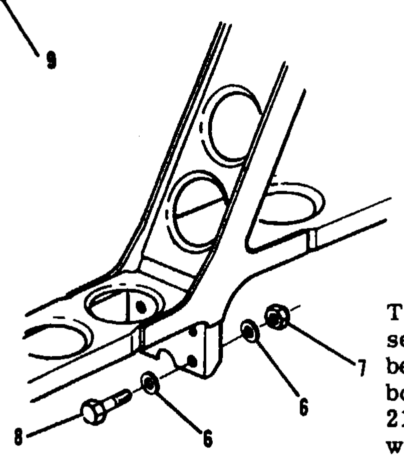


THRU 21059739

Detail D

THRU 21059739

Detail C



BEGINNING WITH 21059740

Detail D

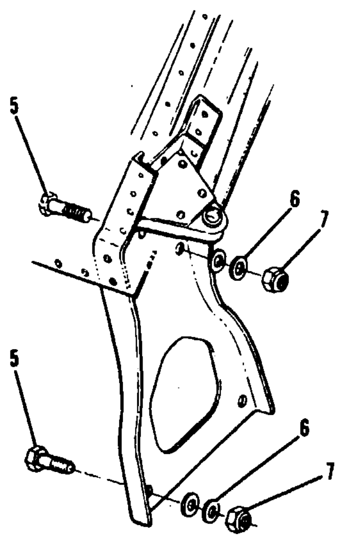
1. Fin Assembly
2. Upper Rudder Hinge
3. Center Rudder Hinge
4. Lower Rudder Hinge
5. Bolt
6. Washer
7. Nut
8. Bolt
9. Fairing

NOTE

Torque bolts (5) to 190-390 lb. inches thru serial 21059739, and 140-225 lb inches beginning with serial 21059740. Torque bolts (8) 140-225 lb inches thru serial 21059739 and 70-100 lb inches beginning with serial 21059740.

NOTE

Beginning with 1962 Models Single-engine Service Letter, SE72-3 Dated February 11, 1972 should be complied with.



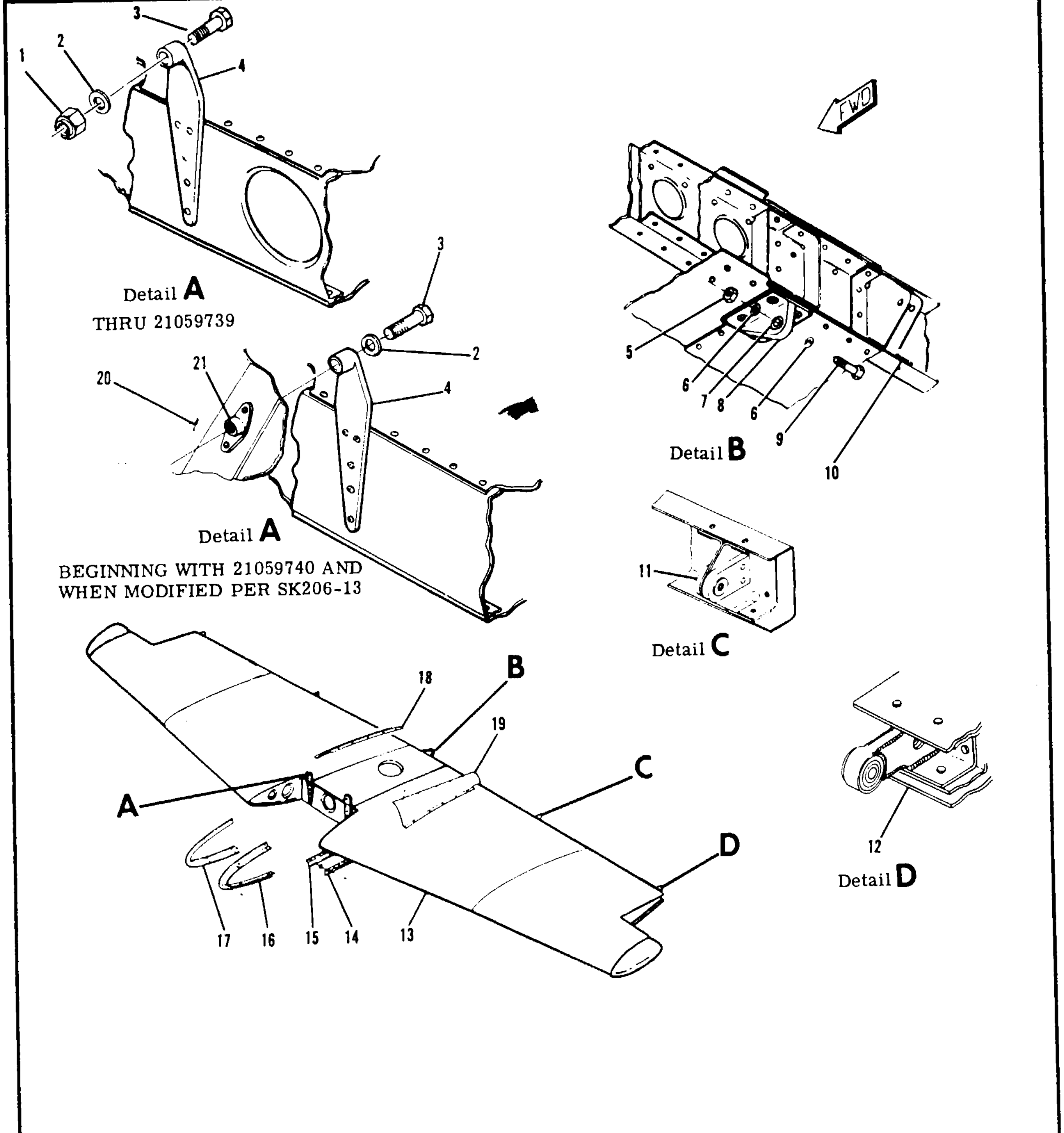
BEGINNING WITH 21059740

Detail C

✱THRU AIRCRAFT SERAIL 21059739

✸BEGINNING WITH AIRCRAFT SERAIL 21059740

Figure 4-2. Vertical Fin Installation



1. Nut
2. Washer
3. Bolt
4. Bracket
5. Nut
6. Washer
7. Bushing
8. Bracket
9. Bolt
10. Elevator Pylon Bracket
11. Elevator Inboard Hinge
12. Elevator Outboard Hinge
13. Stabilizer Assembly
14. Lower Left Fairing
15. Lower Right Fairing
16. Forward Left Fairing
17. Forward Right Fairing
18. Upper Right Fairing
19. Upper Left Fairing
20. Bulkhead
21. Nutplate

Figure 4-3. Horizontal Stabilizer Installation

SECTION 5

LANDING GEAR, BRAKES AND HYDRAULIC SYSTEM

TABLE OF CONTENTS Page

NOTE: Position of the master switch for gear door operation is easily remembered y the following rule: OPEN circuit = OPEN doors; CLOSED circuit = CLOSED doors.

It is sometimes necessary to open or close the landing gear door while the aircraft is on the ground with the engine stopped. Operate the doors with the landing gear handle in the "down" or "down-neutral" position. To open the doors, turn off the master switch and operate hand pump until doors open. To close the doors, turn the master switch on and operate the hand pump.

NOTE

This Section is divided into two parts. Part 1 covers the landing gear system for aircraft through Serial No. 21059502. Part 2 covers the landing gear system for aircraft beginning with Serial No. 21059503. Part 1 contains information which is also applicable to aircraft described in Part 2. To avoid repetition of information, the reader is referred back to this information in Part 1. A separate set of hydraulic schematic diagrams is provided for aircraft described in each Part of this Section. These diagrams may be found at the end of each Part of this Section.

PART 1

(THRU SERIAL NO. 21059502)

5-1. LANDING GEAR SYSTEM.

5-2. DESCRIPTION. A hydraulically-operated, retractable landing gear is employed on the aircraft. The hydraulic power system includes equipment required to provide a flow of pressurized hydraulic fluid to the landing gear system. Main components of the hydraulic system include the engine-driven hydraulic pump, located on the right rear accessory pad of the engine; the hydraulic filter, located on the upper right side of the firewall in the engine compartment; the hydraulic power pack, located in the control pedestal; and the emergency hand pump, internally mounted in the power pack. A gear select handle is also contained in the power pack assembly.

5-3. OPERATION.

NOTE

Refer to the hydraulic schematic diagrams to trace the flow of hydraulic fluid as outlined in the following steps.

a. Fluid from the hydraulic pump enters the power pack where a passage connects to the primary relief valve. With the landing gear control lever in neutral, hydraulic fluid circulates back through the pump (unloaded).

b. When the landing gear control lever is moved out of neutral, fluid flows through a check valve to the solenoid - operated door control valve and to the gear priority valve.

c. Fluid flows through the door control valve (which is in the door - open position when the control lever is moved out of neutral) and opens the doors. The gear priority valve remains closed while the door system is being operated because the door system operates at less pressure than is required to open the priority valve.

d. After the doors are open, pressure builds up until the gear priority valve opens and permits fluid first to unlock, then to move the landing gear to either the up or down position, depending on the position selected by the landing gear control lever.

e. During the up-cycle of the landing gear, a metering pin in each main gear actuator causes a snubbing action in the actuator near the end of the gear-up travel.

f. After the landing gear is in full-up or full-down position, limit switches are actuated to cause the door control valve to move to the door-closed position, and fluid then flows through the valve to close the doors.

g. After the doors are closed, pressure builds up in the system until the 3 to 9 second time - delay valve, operated by pressure from the door - close line, opens and permits fluid to flow to the handle release valve, returning the handle to neutral.

h. As the handle returns to neutral, it moves a shaft which again permits fluid to circulate back through the pump (unloaded).

i. When extending the landing gear with the hand pump, fluid flows directly to the door control valve and the priority valve, where it first opens the doors then extends the landing gear through the same passages and lines used by the regular system. A check valve prevents fluid from entering the inlet passage from the engine-driven hydraulic pump.

j. In case of an electrical failure, the door control valve will move to the door-open position and remain in this position.

k. A valve in the Power Pack relieves any pressure from thermal expansion in the door system, to keep the doors closed while the aircraft is parked.

5-4. MAIN GEAR SYSTEM.

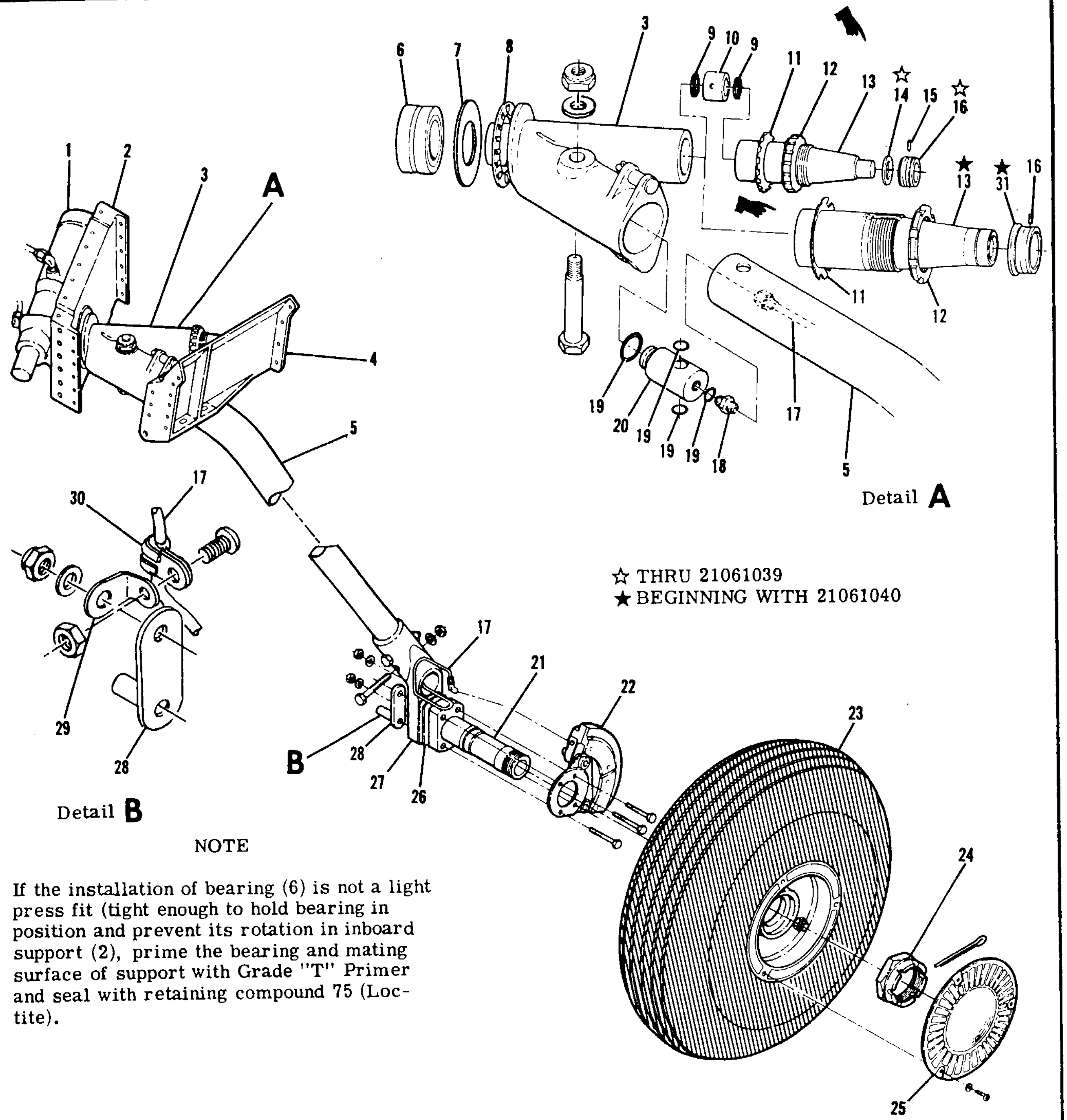
5-5. DESCRIPTION. The tubular main landing gear struts rotate aft and inboard to stow the main wheels below the baggage compartment. Struts are downlocked by an overcenter lock, actuated by a hydraulic cylinder for each strut. Uplocks are located on the main wheel stowage bay forward bulkhead. Uplocking the gear pawls here, hold the struts in the stowed position. Rotation of the landing gear to extend or retract the struts is achieved through pivot assemblies, which are in turn bolted, through a splined shaft, to the hydraulic rotary actuators.

5-6. TROUBLE SHOOTING.

TROUBLE	PROBABLE CAUSE	REMEDY
ENGINE PUMP WILL NOT OPERATE GEAR BUT EMERGENCY HAND PUMP WILL OPERATE GEAR.	Fluid level low in reservoir.	Refill reservoir.
	Engine pump or pump line failure.	Repair, replace pump or broken pump line.
	Faulty primary relief valve.	Remove Power Pack, repair or replace primary relief valve.
ENGINE PUMP OR EMERGENCY PUMP WILL NOT BUILD PRESSURE IN SYSTEM.	No fluid in reservoir.	Refill reservoir.
	Broken gear or door line.	Repair or replace hydraulic line.
	Door solenoid valve jammed or sticking at mid travel.	Repair or replace door solenoid valve.
DOORS WILL NOT CLOSE, GEAR INDICATOR LIGHT NOT ILLUMINATED.	Master switch not on.	Turn master switch on.
	Defective limit switch circuit	Repair defective component in limit switch circuit.
	Circuit breaker tripped.	Reset circuit breaker.
DOORS WILL NOT CLOSE, GEAR INDICATOR LIGHT IS ILLUMINATED.	Defective handle up-down (pre-select) switch or wiring circuit.	Repair or replace defective switch or wiring.
	Defective door solenoid.	Replace solenoid.
	Door solenoid valve stuck.	Remove Power Pack; repair or replace solenoid valve.
GEAR OPERATES PROPERLY BUT INDICATOR LIGHT DOES NOT ILLUMINATE.	Lamp burned out.	Replace lamp.
GEAR OPERATES BUT DOORS WILL NOT OPEN.	Solenoid valve jammed or stuck in door-closed position.	Repair or replace solenoid valve. Repair any damage to doors and linkage.
GEAR UNLOCKS BEFORE DOORS ARE FULL OPEN.	Priority valve setting too low.	Adjust valve setting.
	Priority valve leaking or stuck open.	Remove Power Pack and repair or replace valve.
GEAR CONTROL HANDLE WILL NOT LOCK IN UP OR DOWN DETENT.	Handle release valve plunger setting too low or incorrect return spring adjustment.	Adjust handle release valve and return springs.
GEAR CONTROL HANDLE TO NEUTRAL BEFORE DOORS CLOSE.	Fluid low in reservoir causing air in time-delay valve.	Fill reservoir and purge air from time-delay valve.

TROUBLE	PROBABLE CAUSE	REMEDY
GEAR CONTROL HANDLE RETURNS TO NEUTRAL BEFORE DOORS CLOSE.	Time-delay valve stuck or will not hold fluid charge due to faulty time-delay valve ball seat.	Remove Power Pack, repair or replace time-delay valve.
GEAR CONTROL HANDLE FAILS TO RETURN TO NEUTRAL AFTER DOORS CLOSE (3 to 9 SECONDS).	Gear control handle release pressure too high.	Adjust handle release pressure.
	Gear control handle return springs setting too low.	Adjust return springs.
	Gear control handle linkage binding.	Remove Power Pack; repair or replace handle shaft.
	Gear selector spool binding.	Remove Power Pack and replace manifold, selector spool, and time-delay valve plunger as an assembly only.
NOTE Extremely cold temperatures will cause a longer time delay before gear control handle trips after the doors close. This is normal. If gear control handle does not return to neutral properly, Power Pack overheating will result.		
HAND PUMP DOES NOT BUILD UP PRESSURE, BUT ENGINE PUMP OPERATES GEAR PROPERLY.	Faulty hand pump plunger check valve or O-ring.	Remove and inspect hand pump plunger - replace parts as needed.
	Faulty system inlet check valve or hand pump inlet check valve.	Remove Power Pack and repair or replace check valves.
LANDING GEAR OPERATION EXTREMELY SLOW.	Reservoir fluid level low.	Refill reservoir.
	Engine-driven pump failure or internal leakage.	Repair or replace engine pump.
	Air leakage in engine pump suction line.	Repair or replace suction line or fittings.
	Fluid leak in door or gear line.	Tighten or replace lines.
	Defective piston seal in gear or door cylinder.	Repair or replace defective parts.
	Excessive internal Power Pack leakage.	Remove and repair or replace Power Pack.
POWER PACK EXTERNAL LEAKAGE.	(Sliding Seals) Handle release plunger.	Remove plunger and replace O-rings.
	Hand pump plunger gland.	Remove hand pump plunger and replace O-rings.
	Gear selector spool.	Remove Power Pack and replace O-rings on spool in manifold.

TROUBLE	PROBABLE CAUSE	REMEDY
POWER PACK EXTERNAL LEAKAGE (Cont).	(Sliding Seals) Priority valve.	Remove Power Pack and replace priority valve seals.
	(Static Seals) All fittings.	Remove and replace O-rings and back-up rings as needed.
	Hand pump gland.	Remove hand pump and replace O-rings.
	Door solenoid.	Replace O-ring.
	Transfer tubes between manifold and Power Pack body.	Remove Power Pack, disassemble and replace O-rings.
	Reservoir cover.	Remove Power Pack and remove cover. Replace seals.
POWER PACK LOSES FLUID WITH NO EVIDENCE OF LEAKAGE.	Air leak at engine pump shaft seal.	Repair or replace engine pump.
	Air leak in suction line to engine pump.	Repair or replace suction line or fittings.
NOTE Hydraulic fluid will foam if air is pumped into system, causing fluid to be blown overboard through the Power Pack vent line.		
UNEVEN OR EXCESSIVE TIRE WEAR.	Incorrect tire inflation.	Inflate to correct pressure.
	Wheels out of alignment.	Align wheels.
	Wheels out of balance.	Balance wheels.
	Sprung main gear strut.	Replace strut.
	Bent axle.	Replace axle.
	Dragging brake.	Jack wheel and check brake.
	Wheel bearings not adjusted properly.	Tighten axle nut properly.
	Loose torque links.	Add shim washers and replace parts as needed.
AIRCRAFT LEANS TO ONE SIDE.	Incorrect tire inflation.	Inflate to correct pressure.
	Incorrect shimming of landing gear support.	Shim correctly.
	Damaged gear strut.	Replace gear strut.
	Bent axle.	Replace axle.



NOTE

If the installation of bearing (6) is not a light press fit (tight enough to hold bearing in position and prevent its rotation in inboard support (2), prime the bearing and mating surface of support with Grade "T" Primer and seal with retaining compound 75 (Loctite).

1. Main Gear Actuator
2. Inboard Support
3. Pivot Assembly
4. Outboard Support
5. Strut
6. Bearing
7. Bearing Race
8. Bearing
9. O-Ring
10. Collar
11. Tab Washer
12. Nut
13. Shaft (Pivot)
14. Spacer
15. Setscrew
16. Bearing
17. Brake Line
18. Brake Line Fitting
19. O-Ring
20. Plug
21. Axle
22. Brake Assembly
23. Wheel and Tire Assembly
24. Nut
25. Hub Cap
26. Shims
27. Fitting
28. Stud (Uplock)
29. Bracket
30. Clamp
31. Bushing

Figure 5-1. Main Landing Gear

5-7. STRUT REMOVAL. (Refer to figure 5-1.)

a. Jack aircraft in accordance with procedures outlined in Section 2.

b. Disconnect brake line at wheel cylinder and drain brake system of strut being removed.

c. Place landing gear handle up, with master switch off, and operate emergency hand pump until main gear downlocks release.

d. Remove bolt and nut securing strut to pivot assembly.

e. Work strut and wheel from pivot assembly.

5-8. STRUT INSTALLATION. (Refer to figure 5-1.)

NOTE

Petrolatum or MIL-H-5606 hydraulic fluid shall be applied to O-rings and attach bolt before installation.

a. Using new O-rings on and in end plug (20), position plug aligning pin (Special tool No. SE934) through end plug.

NOTE

Special tool No. SE934 is available from the Cessna Service Parts Center.

b. Work strut and wheel assembly into pivot assembly, aligning attach hole in strut and pivot assembly.

c. With threaded end of attach bolt in counterbore of plug aligning pin, push pin from pivot assembly with bolt.

d. Install nut and washer on bolt; tighten nut.

e. Connect brake line at wheel cylinder. Fill and bleed brake system in accordance with applicable paragraph in this Section.

f. Check rigging of main landing gear per applicable paragraph.

g. Remove aircraft from jacks and check wheel alignment.

5-9. MAIN LANDING GEAR ACTUATOR.

5-10. REMOVAL.

a. Remove seats and peel back carpet as necessary to gain access to plate above actuator; remove access plate.

b. Remove access plate from bulkhead forward of actuator.

c. Disconnect and drain hydraulic brake line at wheel brake cylinder.

d. Place landing gear control handle UP, with master switch off, and operate emergency hand pump until main gear downlocks release.

e. Disconnect and cap or plug all hydraulic lines at actuator.

f. Remove bolts attaching actuator mounting flange to bulkhead forging.

g. Work actuator free of forging and pivot assembly; remove actuator.

5-11. DISASSEMBLY. (Thru 21059550) (Refer to figure 5-2. sheet 1).

NOTE

Leading particulars of the actuator are as follows:

Cylinder Bore Diameter	2.125 in.
Piston Diameter	2.122 in.
Piston Rod Diameter	0.934 in.
Cylinder Stroke	2.970 in.

a. Remove screw (10). Remove end gland (13) and metering pin (11) by unscrewing end gland from cylinder body (6).

b. Remove end cap (22). Remove cap (3) by pulling from cylinder body (6). Using a small rod, push piston (8) from cylinder body (6).

c. Remove cap (3) from shaft (17) by removing retainer (1) and washer (2).

d. Remove shaft (17), sector (18) and washer (20) from cylinder body (6).

e. Remove setscrew (19) from sector (18). Remove sector from shaft (17).

NOTE

Unless defective, do not remove name plate, bearings (4 and 21), or roller (5).

f. Remove and discard O-ring (7) from cylinder body (6).

g. Remove retainer ring (16). Loosen locknut (12), and remove metering pin (11) from end gland. Remove and discard O-rings (14 and 15) from end gland.

h. Remove and discard O-ring (9) from piston (8).

i. Thoroughly clean all parts in cleaning solvent (Federal Specification P-S-661, or equivalent).

5-12. INSPECTION OF PARTS.

a. Inspect all threaded surfaces for cleanliness and freedom of cracks and wear.

b. Inspect cap (3), washers (2 and 20), sector (18), shaft (17), piston (8), roller (5) and cylinder body (6) for cracks, chips, scratches, scoring, wear or surface irregularities which may affect their function or the overall operation of the actuator.

c. Inspect bearings (4 and 21) for freedom of motion, scores, scratches and Brinnel marks.

5-13. PARTS REPAIR/REPLACEMENT. Repair of small parts of the main landing actuator is impractical. Replace all defective parts. Minor scratches or score marks may be removed by polishing with abrasive crocus cloth (Federal Specification P-C-458), providing their removal does not affect operation of the unit. During assembly, install all new O-rings.

5-14. ASSEMBLY. (Refer to figure 5-2.)

NOTE

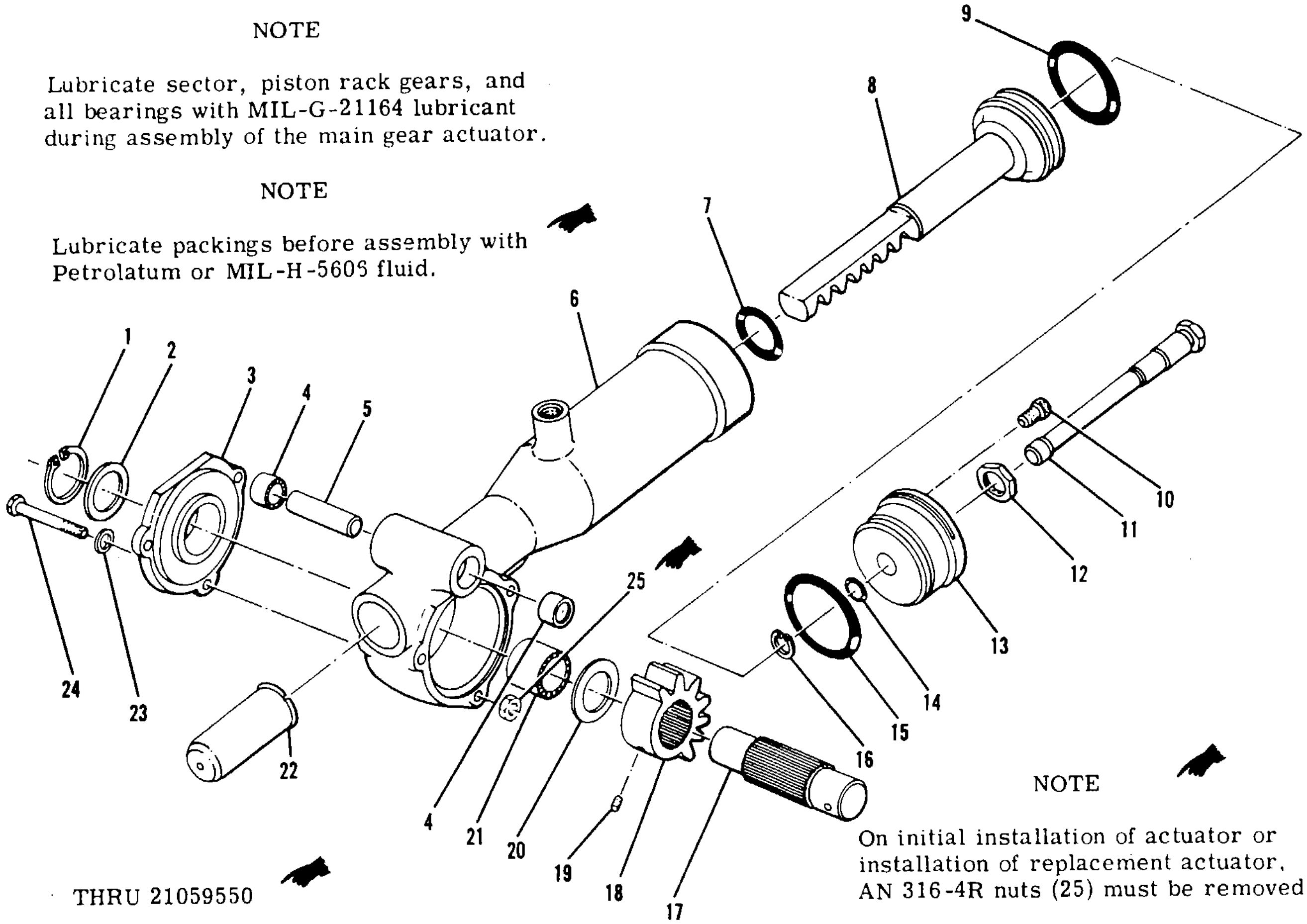
Use MIL-G-21164C lubricant on roller (5), bearings (4 and 21) and sector (18) when installing in cylinder body (6).

NOTE

Lubricate sector, piston rack gears, and all bearings with MIL-G-21164 lubricant during assembly of the main gear actuator.

NOTE

Lubricate packings before assembly with Petrolatum or MIL-H-5606 fluid.



NOTE

On initial installation of actuator or installation of replacement actuator, AN 316-4R nuts (25) must be removed.

THRU 21059550

1. Retainer
2. Washer
3. Cap
4. Bearing
5. Roller
6. Cylinder Body
7. O-Ring
8. Piston
9. O-Ring
10. Screw
11. Metering Pin
12. Nut
13. End Gland
14. O-Ring
15. O-Ring
16. Retainer
17. Shaft
18. Sector
19. Setscrew
20. Washer
21. Bearing
22. End Cap
23. Washer
24. Bolt
25. AN 316-4R Nut
26. Back-Up Ring
27. Back-Up Ring
28. Back-Up Ring

Figure 5-2. Main Landing Gear Actuator (Sheet 1 of 3)

a. Press one bearing (4) into cylinder body until it is flush. Install roller (5) and press second bearing (4) in place to hold roller. Use care to prevent damage to bearings and roller.

b. Press bearing (21) in cap (3) until flush.

c. Assemble sector (18) on shaft (17), aligning index marks on shaft and sector. Install setscrew (19), making sure that setscrew enters shaft.

d. Position washer (20) and cap (3) on shaft (17). Install washer (2) and retainer (1) on shaft.

e. Using AN316-4R nuts, install cap and shaft assembly on cylinder body.

f. Install new O-ring (7) in cylinder body bore. Install new O-ring (9) on piston (8).

NOTE

Lubricate all O-rings with Petrolatum or MIL-H-5606 hydraulic fluid during assembly.

g. Rotate shaft (17) so that teeth on sector (18) are toward cylinder body.

h. Slide piston (8) into cylinder body, rotating shaft (17) as necessary to engage first tooth on sector (18) with first tooth on piston rack. Use care to prevent damage to O-rings in cylinder bore and on piston.

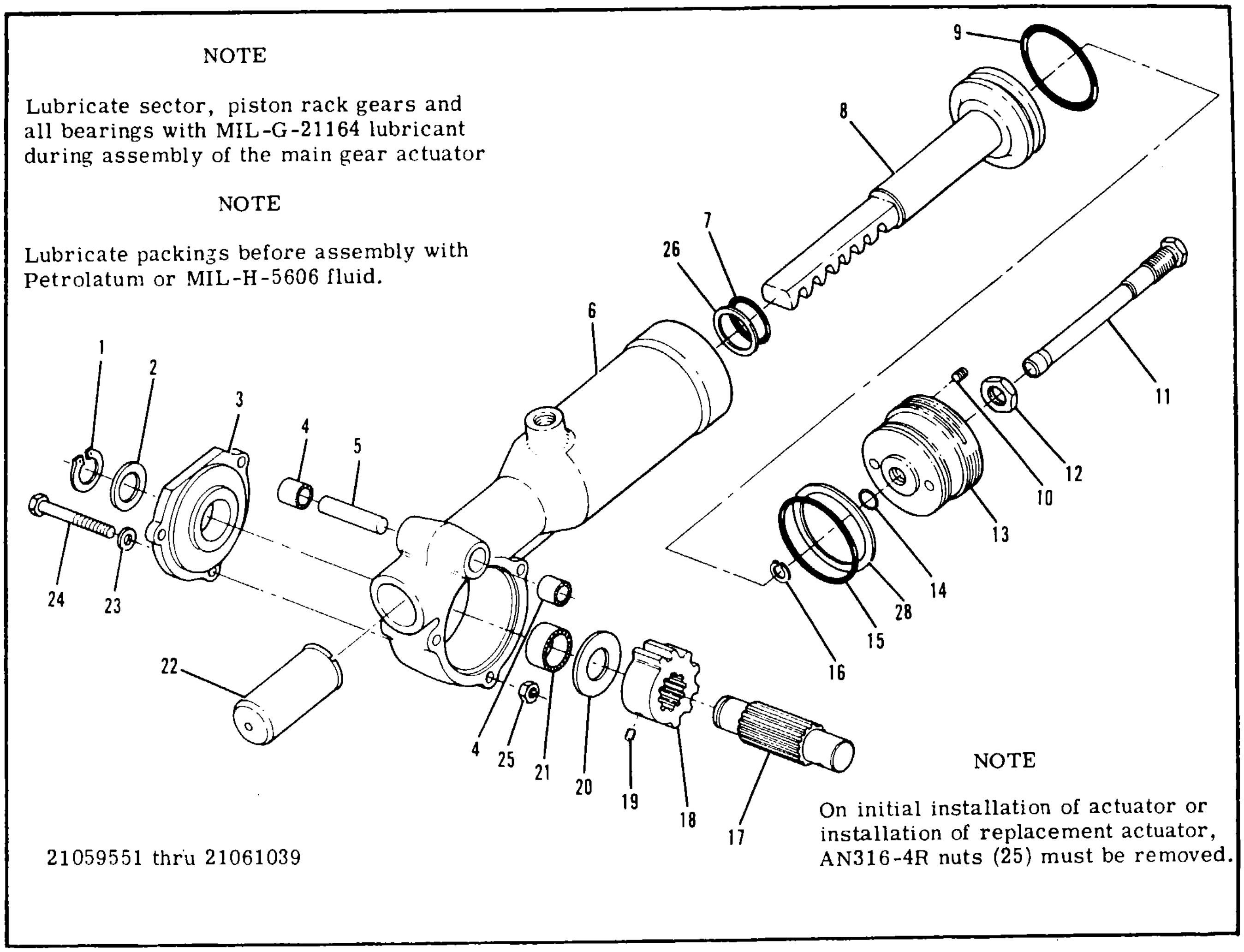


Figure 5-2. Main Landing Gear Actuator (Sheet 2 of 3)

NOTE

Lubricate sector and piston rack gears with MIL-G-21164C lubricant. Apply lubricant sparingly. Over-greasing might cause contamination of hydraulic cylinder assembly with grease, which might work past O-ring (7).

i. Install new O-rings (14 and 15) on end gland (13).
j. Install metering pin (11) in end gland (13). Install retainer (16) on metering pin.
k. Install end gland and metering pin assembly in cylinder and tighten until end of gland is flush with end of cylinder body. Install and tighten screw (10).
l. Install end cap (22) at end of actuator assembly.

5-14A. DISASSEMBLY. (21059551 thru 21061039.) (Refer to figure 5-2, sheet 2).

NOTE

Leading particulars of the actuator are as follows:

Cylinder Bore Diameter. . . . . 2.250 in.
Piston Rod Diameter . . . . . . .998 in.
Piston Stroke . . . . 2.970 in.

a. Remove screw (10). Remove end gland (13) and metering pin (11) by unscrewing end gland from cylinder body (6).
b. Remove end cap (22). Remove AN316-4R nuts (25), if installed, and remove cap (3) by pulling from cylinder body (6). Using a small rod, push piston (8) from cylinder body (6).
c. Remove cap (3) from shaft (17) by removing retainer (1) and washer (2).
d. Remove shaft (17), sector (18) and washer (20) from cylinder body (6).
e. Remove setscrew (19) from sector (18). Remove sector from shaft (17).

NOTE

Unless defective, do not remove name plate, bearings (4 and 21) or roller (5).

f. Remove packing (7) and ring (26) from cylinder body (6). Discard packing (7).
g. Remove retainer ring (16). Loosen locknut (12),

and remove metering pin (11) from end gland (13). Remove packings (14) and (15) and ring (28) from end gland (13). Discard packings (14 and 15).

h. Remove packing (9) from piston (8). Discard packing (9).

5-14B. INSPECTION OF PARTS.

a. Thoroughly clean all parts in cleaning solvent (Federal Specification P-S-661, or equivalent.)

b. Inspect all threaded surfaces for cleanliness, cracks and wear.

c. Inspect cap (3), washers (2 and 20), sector (18), shaft (17), piston (8), roller (5) and cylinder body (6) for cracks, chips, scratches, scoring, wear or surface irregularities which may affect their function or the overall operation of the actuator.

d. Inspect bearings (4 and 21) for freedom of motion, scores, scratches and Brinnel marks.

5-14C. PARTS REPAIR/REPLACEMENT. Repair of small parts of the main landing gear actuator is impractical. Replace all defective parts. Minor scratches or score marks may be removed by polishing with abrasive crocus cloth (Federal Specification P-C-458), providing their removal does not affect operation of the unit. During assembly, install all new packings.

5-14D. ASSEMBLY. (21059551 thru 21061039). (Refer to figure 5-2, sheet 2).

NOTE

Use MIL-G-21164 lubricant on roller (5), bearings (4 and 21) if removed, and sector (18) when installing in cylinder body (6).

a. If bearings (4) and roller (5) were removed, press one bearing (4) into cylinder body until it is flush. Install roller (5) and press second bearing (4) in place to hold roller. Use care to prevent damage to bearings and roller.

b. If bearing (21) was removed, press bearing in cap (3) until flush.

c. Assemble sector (18) on shaft (17), aligning index marks on shaft and sector. Install setscrew (19), making sure that setscrew enters shaft.

d. Position washer (20) and cap (3) on shaft (17). Install washer (2) and retainer (1) on shaft.

e. If actuator is to be installed in aircraft, install cap and shaft assembly on cylinder body with bolts (24) and washers (23). If aircraft is not to be installed in aircraft, install cap and shaft assembly on cylinder body with bolts (24), washers (23) and AN316-4R nuts (25).

f. Install ring (26) and new packing (7) in cylinder body bore. Install new packing (9) in goove of piston (8).

NOTE

Lubricate all packings with Petrolatum or MIL-H-5606 hydraulic fluid during assembly.

g. Rotate shaft (17) so that teeth on sector (18) are toward cylinder body.

h. Slide piston (8) into cylinder body, rotating shaft (17) as necessary to engage first tooth on sector (18) with first tooth on piston rack. Use care to prevent damage to packings in cylinder bore and on piston.

NOTE

Lubricate sector and piston rack gears with MIL-G-21164C lubricant. Apply lubricant sparingly. Over-greasing might cause contamination of hydraulic cylinder assembly with grease, which might work past packing (7).

i. Install ring (28) and new packings (14 and 15) end gland (13).

j. Install metering pin (11) in end gland (13). Install retainer (16) on metering pin.

k. Install end gland and metering pin assembly in cylinder and tighten until end of gland is flush with end of cylinder body. Install and tighten screw (10).

l. Install end cap (22) at end of actuator assembly.

5-14E. DISASSEMBLY. (Beginning with 21061040) Refer to figure 5-2, sheet 3).

NOTE

Leading particulars of the actuator are as follows:

Cylinder Bore Diameter.	2.250 in.
Piston Rod Diameter	.998 in.
Piston Stroke	2.970 in.

a. Remove screw (10). Remove end gland (13) by unscrewing end gland from cylinder body (6).

b. Remove end cap (22). Remove AN316-4R nuts (25), if installed, and remove cap (3) by pulling from cylinder body (6). Using a small rod, push piston (8) from cylinder body (6).

c. Remove cap (3) from shaft (17) by removing retainer (1) and washer (2).

d. Remove shaft (17), sector (18) and washer (20) from cylinder body (6).

e. Remove setscrew (19) from sector (18). Remove sector from shaft (17).

NOTE

Unless defective, do not remove name plate, bearings (4 and 21) or roller (5).

f. Remove packing (7) and ring (26) from cylinder body (6). Discard packing (7).

g. Remove packing (15) and ring (27) from end gland (13). Discard packing (15).

h. Remove and discard packing (9) from piston (8).

5-14F. INSPECTION OF PARTS.

a. Thoroughly clean all parts in cleaning solvent (Federal Specification P-S-661, or equivalent.)

b. Inspect all threaded surfaces for cleanliness, cracks and wear.

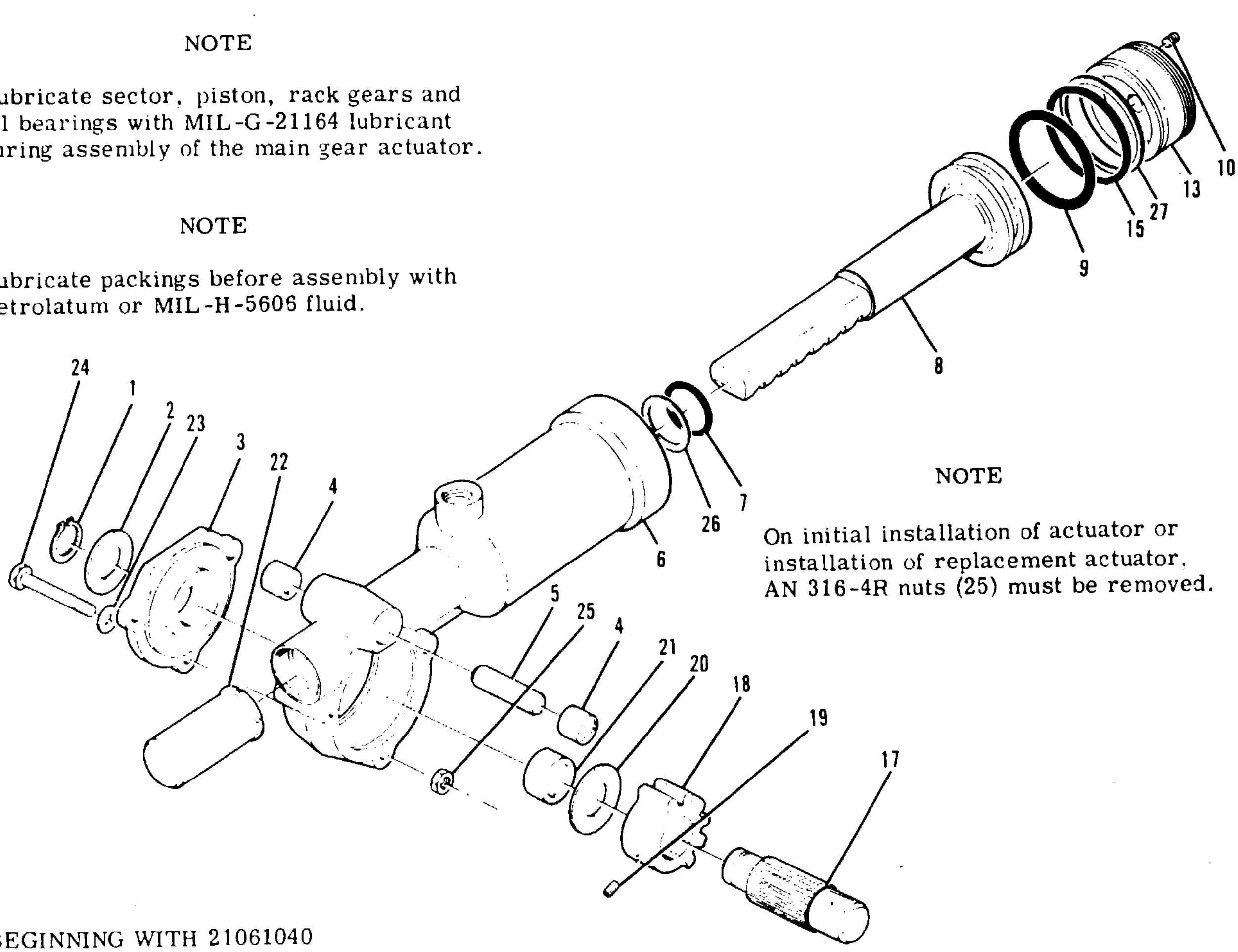
c. Inspect cap (3), washers (2 and 20), sector (18), shaft (17), piston (8), roller (5), if removed, and cylinder body (6) for cracks, chips, scratches, scor-

NOTE

Lubricate sector, piston, rack gears and all bearings with MIL-G-21164 lubricant during assembly of the main gear actuator.

NOTE

Lubricate packings before assembly with Petrolatum or MIL-H-5606 fluid.



NOTE

On initial installation of actuator or installation of replacement actuator, AN 316-4R nuts (25) must be removed.

BEGINNING WITH 21061040

Figure 5-2. Main Landing Gear Actuator (Sheet 3 of 3)

ing, wear or surface irregularities which may affect their function or the overall operation of the actuator.

d. Inspect bearings (4 and 21), if removed, for freedom of motion, scores, scratches and Brinnel marks.

5-14G. PARTS REPAIR/REPLACEMENT. Repair of small parts of the main landing gear actuator is impractical. Replace all defective parts. Minor scratches or score marks may be removed by polishing with abrasive crocus cloth (Federal Specification P-C-458), providing their removal does not affect operation of the unit. During assembly, install all new packings.

5-14H. ASSEMBLY. (Beginning with 21061040) (Refer to figure 5-2, sheet 3.)

NOTE

Use MIL-G-2116 C lubricant on roller (5), bearings (4 and 21), if removed, and sector (18) when installing in cylinder body (6).

a. If bearings (4) and roller (5) were removed, press one bearing (4) into cylinder body (6) until it is flush. Install roller (5) and press second bearing (4) in place to hold roller. Use care to prevent damage to bearings and roller.

b. If bearing (21) was removed, press bearing into cap (3) until flush.

c. Assemble sector (18) on shaft (17), aligning index marks on shaft and sector. Install setscrew (19), making sure that setscrew enters shaft.

d. Position washer (20) and cap (3) on shaft (17). Install washer (2) and retainer (1) on shaft.

e. If actuator is to be installed in aircraft, install cap and shaft assembly on cylinder body with bolts (24) and washers (23). If actuator is not to be installed in aircraft, install cap and shaft assembly on cylinder body with bolts (24), washers (23) AN316-4R nuts (25).

f. Install ring (26) and new packing (7) in cylinder body bore. Install new packing (9) on pistion (8).

NOTE

Lubricate all packings with Petrolatum or MIL-H-5606 hydraulic fluid during assembly.

g. Rotate shaft (17) so that teeth on sector (18) are toward cylinder body.

h. Slide piston (8) into cylinder body, rotating shaft (17) as necessary to engage first tooth on sector (18) with first tooth on piston rack. Use care to prevent damage to packings in cylinder bore and on piston.

NOTE

Lubricate sector and piston rack gears with MIL-G-21164C lubricant. Apply lubricant sparingly. Over-greasing might cause contamination of hydraulic cylinder assembly with grease which might work past packing (7).

i. Install ring (27) and new packing (15) on end gland (13).
j. Install end gland in cylinder and tighten until end of gland is flush with end of cylinder body. Install and tighten screw (10).
k. Install end cap (22) at end of actuator assembly.

5-15. INSTALLATION.
a. With main gear pivot assembly rotating freely, match pivot and actuator shaft markings together and slide actuator into place. Make sure that index marks are aligned.
b. Install bolts attaching mounting flange to bulkhead forging. Torque bolts to 50-70 lb-in.
c. Connect hydraulic lines to actuator.
d. Install access plate on bulkhead forward of actuator.
e. Connect brake line at wheel cylinder. Fill and bleed brake system.
f. Check rigging of main landing gear in accordance with applicable paragraphs in this Section.
g. Remove aircraft from jacks and install access covers, carpeting and seats removed for access.

5-16. MAIN LANDING GEAR SNUBBER. (Thru 210-61039.) An adjustable metering pin is installed in each main landing gear actuator cylinder. This metering pin causes a snubbing in the actuator, the final .5 to 1.0 second of up-travel of the main landing gear.

5-17. SNUBBER ADJUSTMENT. (Thru 21061039.) With the landing gear rigged, and the limit switches adjusted in accordance with applicable paragraphs in this Section, adjust main landing gear actuator snubbers so that snubbing action occurs during the final .5 to 1.0 second of main gear up-travel. This adjustment may be made as follows:
a. Jack aircraft in accordance with procedures outlined in Section 2.
b. Using either a Hydro Test unit or the aircraft power system, retract landing gear and determine that both main gears lock at the same time in the up position.
c. If the main gears are not locking at the same time, but both main gears are snubbing, adjust the slower gear as follows:
1. Loosen gear-up line and locknut at end of the actuator.

NOTE

When adjusting metering pin, wait a minimum of 30 seconds between up or down cycle of the landing gear. This allows time for the time-delay valve cavity to refill.

2. Adjust metering pin in clockwise, facing the cylinder head end of actuator, until main gears lock simultaneously in the up position. Cycle landing gear after each adjustment.

d. If one main gear is not snubbing, adjust the faster main gear as follows:
1. Loosen gear-up line and locknut at end of the actuator.

CAUTION

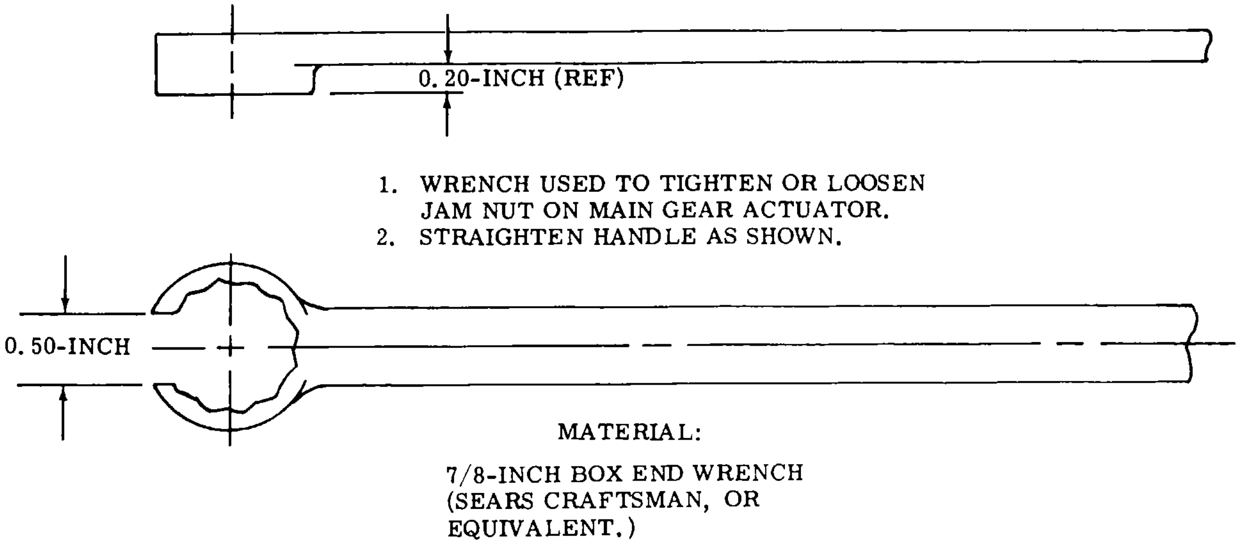
When adjusting metering pin out, use care to prevent damage to the snap ring on the metering pin. Adjust out only until snap ring bottoms against actuator cylinder head. DO NOT FORCE. Approximately five threads will be showing through the locknut with snap ring against cylinder head of actuator.

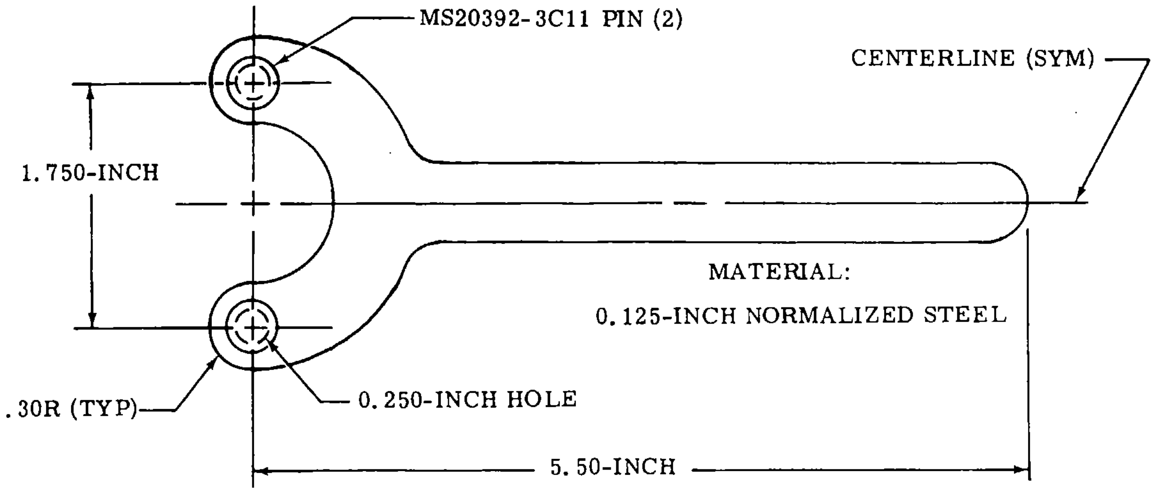
2. Adjust metering pin out counterclockwise, facing cylinder head of actuator, until main gears lock simultaneously in the up position. Cycle landing gear after each adjustment.
e. After adjustments are completed, tighten locknut and door line on actuators and resafety metering pin locknut.

NOTE

Snubbing time is determined by observing the Hydro Test pressure gage, if a unit is available. A sudden increase in pressure during the gear-up cycle indicates the start of the snubbing action, and a sudden decrease indicates that the gear is up and locked.

SHOP NOTES:





1. WRENCH USED TO INSTALL OR REMOVE END GLAND ON MAIN GEAR ACTUATOR.
2. INSERT PINS THROUGH HOLES IN WRENCH AND TORCH BRAZE USING BRAZING ROD (SIL-BOND 45, UNITED WIRE AND SUPPLY) OR EQUIVALENT.

TORCH BRAZING - Flux joint and filler material thoroughly. Filler material may be either pre-positioned or hand fed. The torch shall be adjusted for a non-oxidizating flame, and manipulated in such a manner as to braze in the direction the flame is pointing. This will tend to prevent flux inclusion and entrapment of foreign particles. After the assembly has solidified the excess flux shall be removed with hot water. (180° F. approximately.)

Figure 5-3. Tool Fabrication

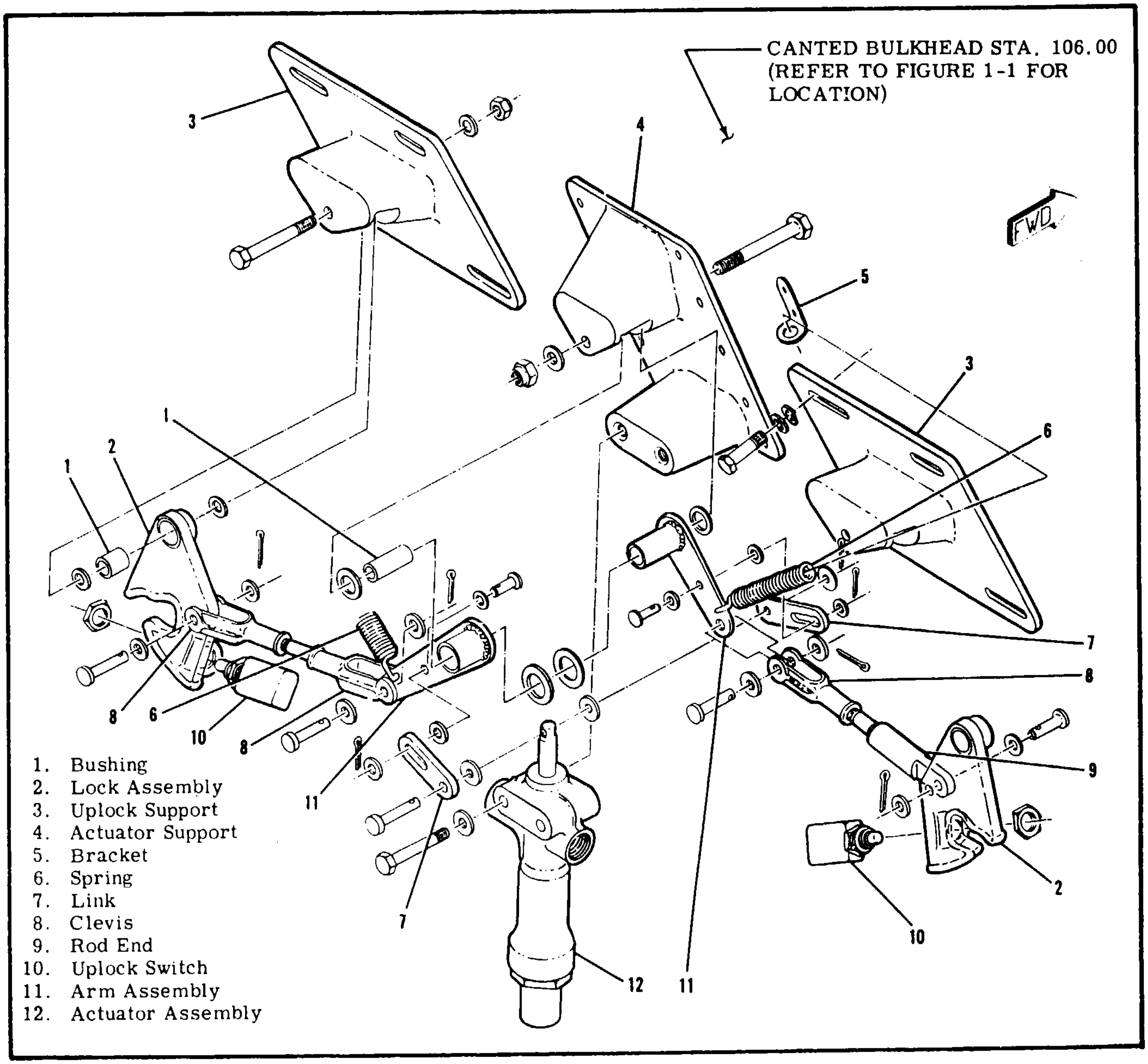


Figure 5-4. Main Landing Gear Uplock Installation

5-18. LINKAGE. (Refer to figure 5-1.)

5-19. DESCRIPTION. Each main landing gear actuator attaches directly to a pivot assembly, which in turn, is attached to, and rotates its own main landing gear strut.

5-20. PIVOT ASSEMBLY REMOVAL.
(Refer to figure 5-1.)

a. Remove main landing gear strut as outlined in paragraph 5-7.

b. Loosen nut (12) and telescope pivot shaft (13) inboard to free pivot assembly (3) from bearing (6) in inboard support (2).

c. Remove pivot assembly (3), bearing (8), bearing race (7) and spacer (14).

5-21. PIVOT ASSEMBLY INSTALLATION.
(Refer to figure 5-1.)

a. Install bearing (8) and race (7) on shaft of pivot assembly (3); install spacer (14) on pivot shaft (13).

b. Position shaft of pivot assembly (3) into bearing (6) in inboard support (2). Lubricate bearing (6) with MIL-G-21164 grease. Be sure thrust bearing and race are correctly positioned.

c. Telescope pivot shaft (13) inboard and fit shaft (13) into bearing (16) in outboard support (4).

d. Tighten nut (12) firmly and safety in place, bending corresponding tang. Pivot assembly shall rotate freely.

e. Install strut (5) in accordance with procedures outlined in paragraph 5-8.

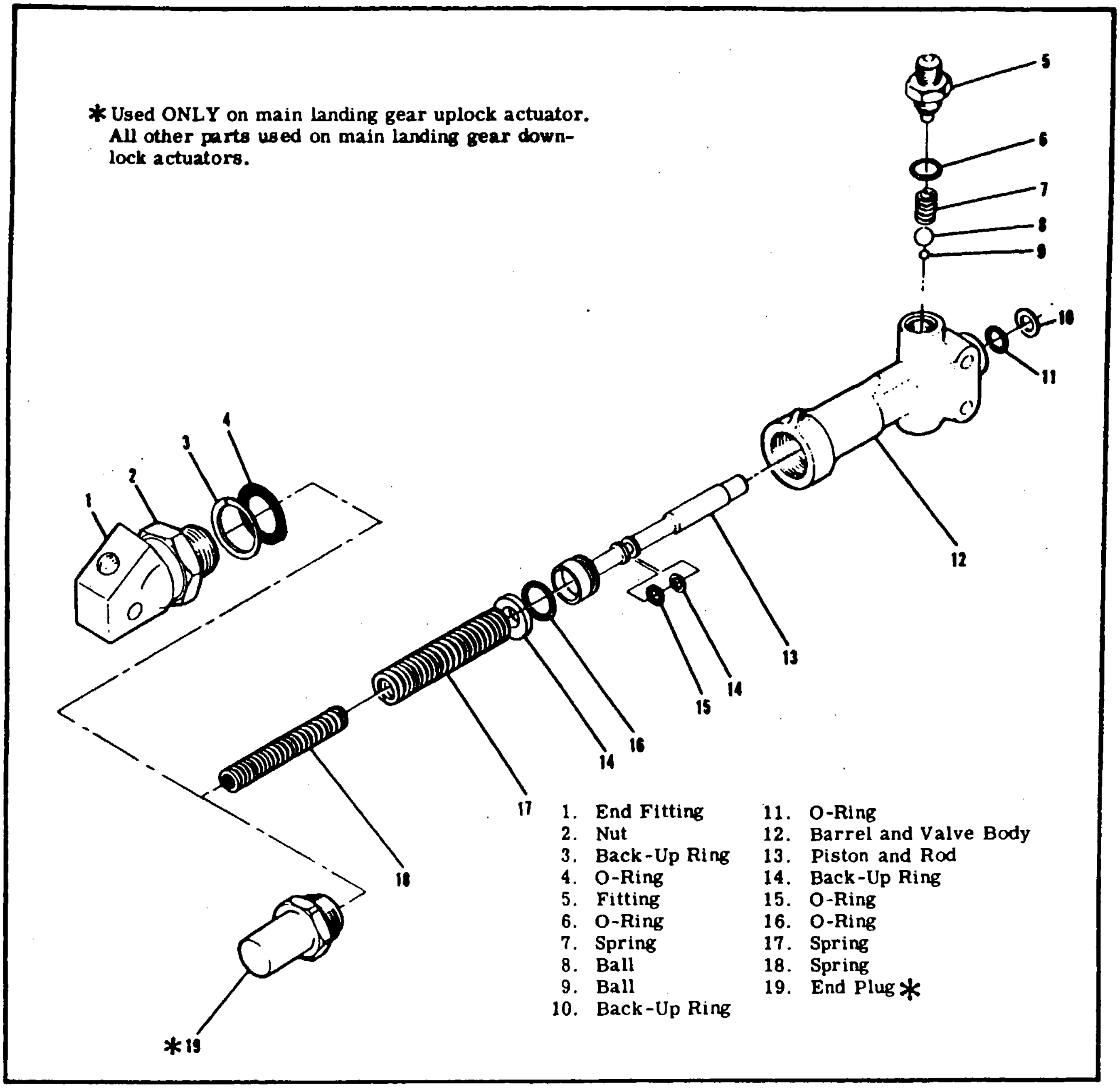


Figure 5-5. Lock and Unlock Actuators

5-22. UPLOCK MECHANISM. (Refer to figure 5-4.)

5-23. DESCRIPTION. The uplock actuator cylinder and latches for the main landing gear are located on the aft side of canted bulkhead station 106. The latches are controlled by a single actuator, located on the aircraft centerline, by means of bellcrank and linkage assemblies.

5-24. REMOVAL AND INSTALLATION.

a. Turn master switch OFF and, using hand pump, open landing gear doors.

b. Components of the main landing gear uplock system are readily accessible on the aft side of canted bulkhead station 106.00.

c. Components may be removed or installed using figure 5-4 as a guide.

d. Upon installation, rig uplocks in accordance with applicable paragraph.

5-25. UPLOCK ACTUATOR DISASSEMBLY. (Refer to figure 5-5.)

NOTE

Leading particulars of the actuators are as follows:

Cylinder Bore Diameter........ 0.749+0.002,-0.000 inch
Piston Diameter.................... 0.747+0.002,-0.000 inch
Piston Rod Diameter .... 0.436+0.002,-0.000 inch
Stroke .... 1.13±0.06 inch
Stroke (to unseat valve)........ 0.72±0.03 inch

A. Remove fitting (5), spring (7) and balls (8 and 9).

B. Cut safety wire and unscrew end plug (19) from barrel and valve body (12).

C. If end fitting (1) is installed, loosen nut (2) and remove end fitting from barrel and valve body.

D. Remove springs (18 and 17) and push piston (13) from barrel and valve body.

E. Remove and discard all O-rings and back-up rings.

5-26. INSPECTION OF PARTS.

A. Inspect all threaded surfaces for cleanliness and for freedom of cracks and excessive wear.

B. Inspect ball spring (7) for evidence of breaks and distortion.

C. Inspect inner and outer piston springs (18 and 17) for evidence of breaks and distortion.

D. Inspect end fitting, piston and rod, barrel, valve body, balls and ball seats for cracks, scratches, scoring, wear or surface irregularities which may affect their function or the overall function of the unit.

E. Repair of most parts of the uplock cylinder is impractical. Replace defective parts. Minor scratches and scores may be removed by polishing with fine abrasive crocus cloth (Federal Specification PC-458), providing their removal does not affect operation of the unit.

5-27. UPLOCK ACTUATOR ASSEMBLY. (Refer to Figure 5-5.)

NOTE: Install all new O-rings and back-up rings during assembly of the cylinder.

A. Install O-rings and back-up rings in grooves of piston and rod (13).

B. Install new O-ring and back-up ring in groove of barrel and valve body (12).

C. Slide piston and rod into barrel and valve body. Use care to prevent damage to O-rings and back-up rings.

D. Insert piston springs (18 and 17), then install end fitting (1) or end plug (19) to barrel and valve body.

E. Insert balls (8 and 9) and spring (7) in barrel and valve body.

F. Install new O-ring (6) on fitting (5). Install and tighten fitting.

5-28. DOWNLOCK MECHANISM. (Refer to Figure 5-6.)

5-29. DESCRIPTION. The downlock mechanism is comprised of hydraulic actuators connected to arm assemblies, which trip downlock hooks, releasing the main landing gear struts. Figure 5-6 illustrates the downlock mechanism and may be used as a guide for determining relationship of parts. A locator illustration is also provided, which shows station numbers, bulkheads, ribs and parts of the downlock mechanism.

5-30. REMOVAL AND INSTALLATION.

A. Turn master switch OFF, and using hand pump, open gear doors.

B. Components of the main landing gear downlock system are readily accessible with the main gear doors open.

C. Components may be removed or installed using Figure 5-6 as a guide.

D. Upon installation, rig downlocks in accordance with applicable paragraph.

5-31. DISASSEMBLY, INSPECTION OF PARTS AND ASSEMBLY OF MAIN GEAR DOWNLOCK ACTUATOR. Main gear uplock and downlock actuators are identical except for end fittings. Refer to Figure 5-5 and paragraphs 5-25 thru 5-27 for disassembly, inspection of parts and assembly of downlock actuators.

5-32. MAIN GEAR DOOR SYSTEM.

5-33. DESCRIPTION. Main gear doors open for main gear retraction or extension and return to closed positions at the completion of either cycle. The strut doors are opened and closed by a double-acting hydraulic actuator. The wheel doors are actuated by a double-actuating hydraulic actuator for each door. The actuators are held closed by pressure trapped in the line by the door lockout valve. For maintenance purposes, the doors are opened by pumping aircraft hand pump with master switch in "OFF" position.

5-34. REMOVAL AND INSTALLATION OF MAIN WHEEL DOORS. (Refer to Figure 5-7). Master switch in "OFF" position.

A. Open landing gear doors.

B. Disconnect door from actuator linkage by removing pin or bolt.

C. Remove door hinge pins or bolts.

D. Install doors by reversing preceding steps.

E. Rig doors in accordance with applicable paragraph.

5-35. REMOVAL AND INSTALLATION OF MAIN WHEEL DOOR ACTUATOR.

A. Open landing gear doors.

B. Disconnect and cap or plug hydraulic hoses at actuator.

C. Disconnect actuator rod by removing attaching nut and bolt at door.

D. Remove nut and bolt attaching actuator to fuselage bracket and remove actuator.

E. Install actuator by reversing preceding steps.

NOTE: Fill actuator with clean hydraulic fluid before installing.

F. After installation of actuator, rig doors and actuator in accordance with applicable paragraph.

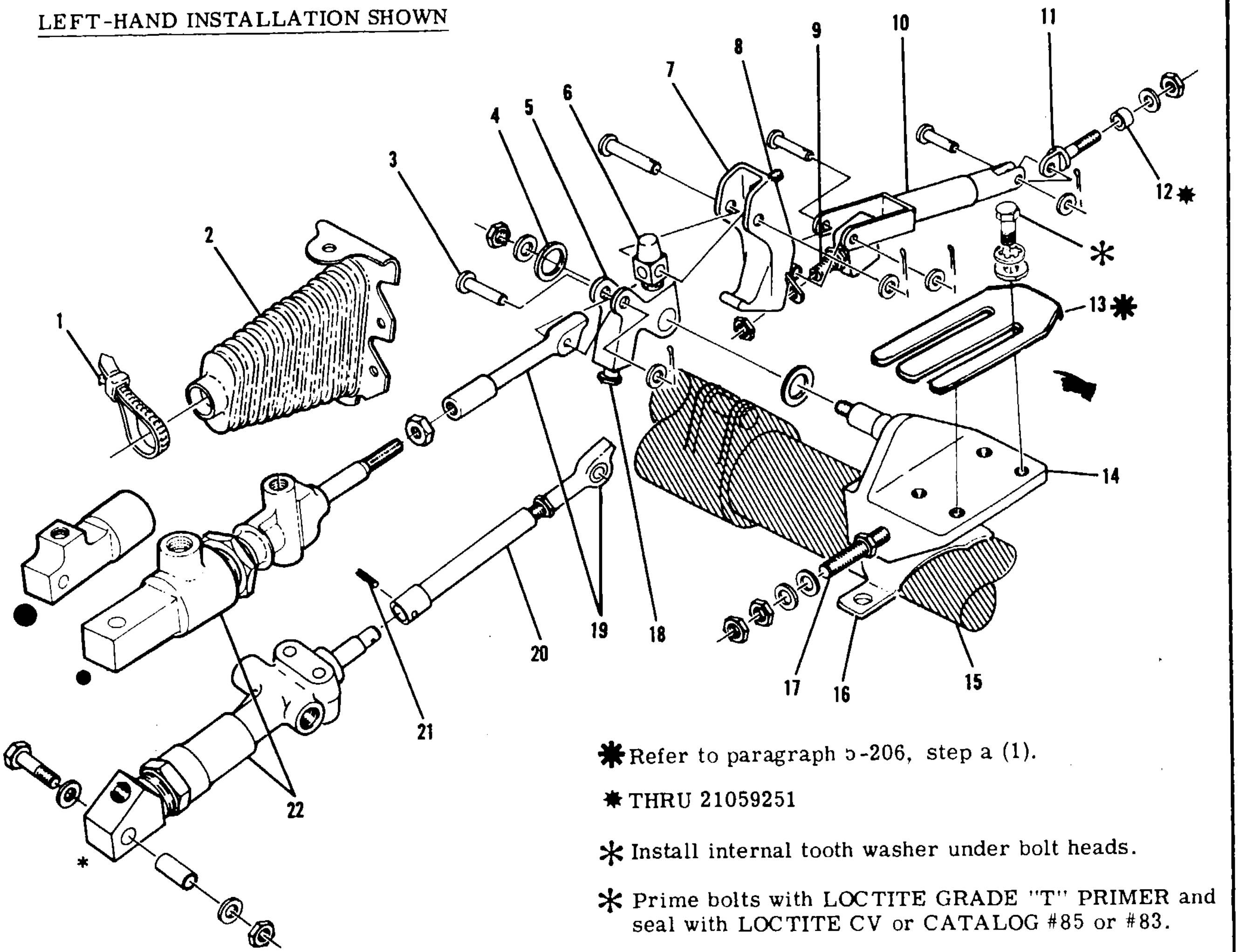
5-36. DISASSEMBLY. (Refer to Figure 5-8.)

A. Loosen locknut (2) and remove rod end (1).

B. Remove retaining ring (3) from cylinder (10).

C. Pull piston rod (8), gland (6 or 7) from cylinder (10). A sharp blast of air applied to the hydraulic

LEFT-HAND INSTALLATION SHOWN

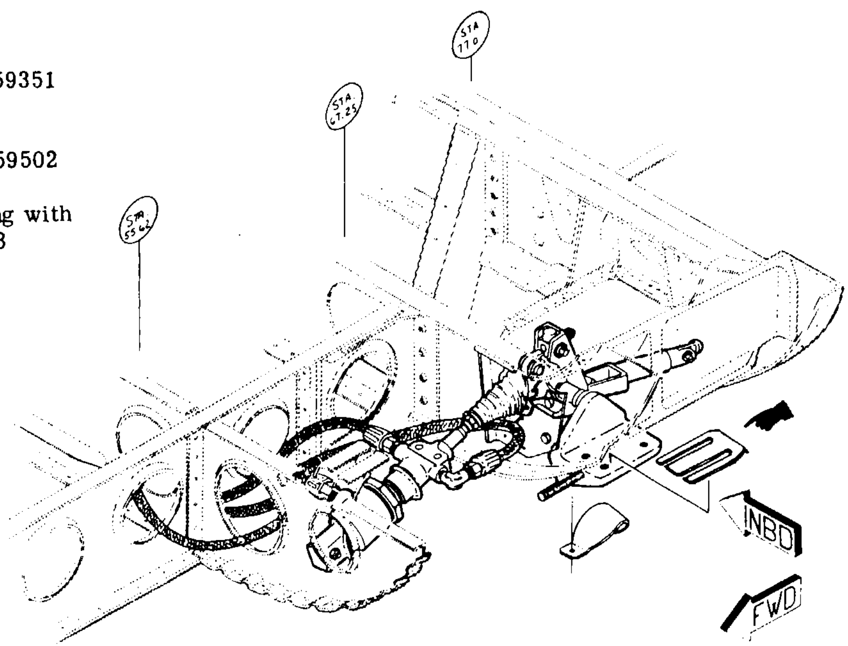


✱ Refer to paragraph 5-206, step a (1).

✱ THRU 21059251

✳ Install internal tooth washer under bolt heads.

✳ Prime bolts with LOCTITE GRADE "T" PRIMER and seal with LOCTITE CV or CATALOG #85 or #83.



1. Sta-Strap
2. Boot
3. Pin
4. Spacer
5. Arm Assembly
6. Adjusting Screw
7. Hook
8. Setscrew
9. Downlock Switch
10. Spring Assembly
11. Eyebolt
12. Spacer
13. Shim
14. Support Assembly
15. Landing Gear Strut
16. Shell Assembly
17. Stud
18. Bolt
19. Rod End
20. Actuator Rod
21. Roll Pin
22. Actuator

* 21059200 thru 21059351

● 21059352 thru 21059502

● Beginning with 21059503

Figure 5-6. Main Landing Gear Downlock Installation

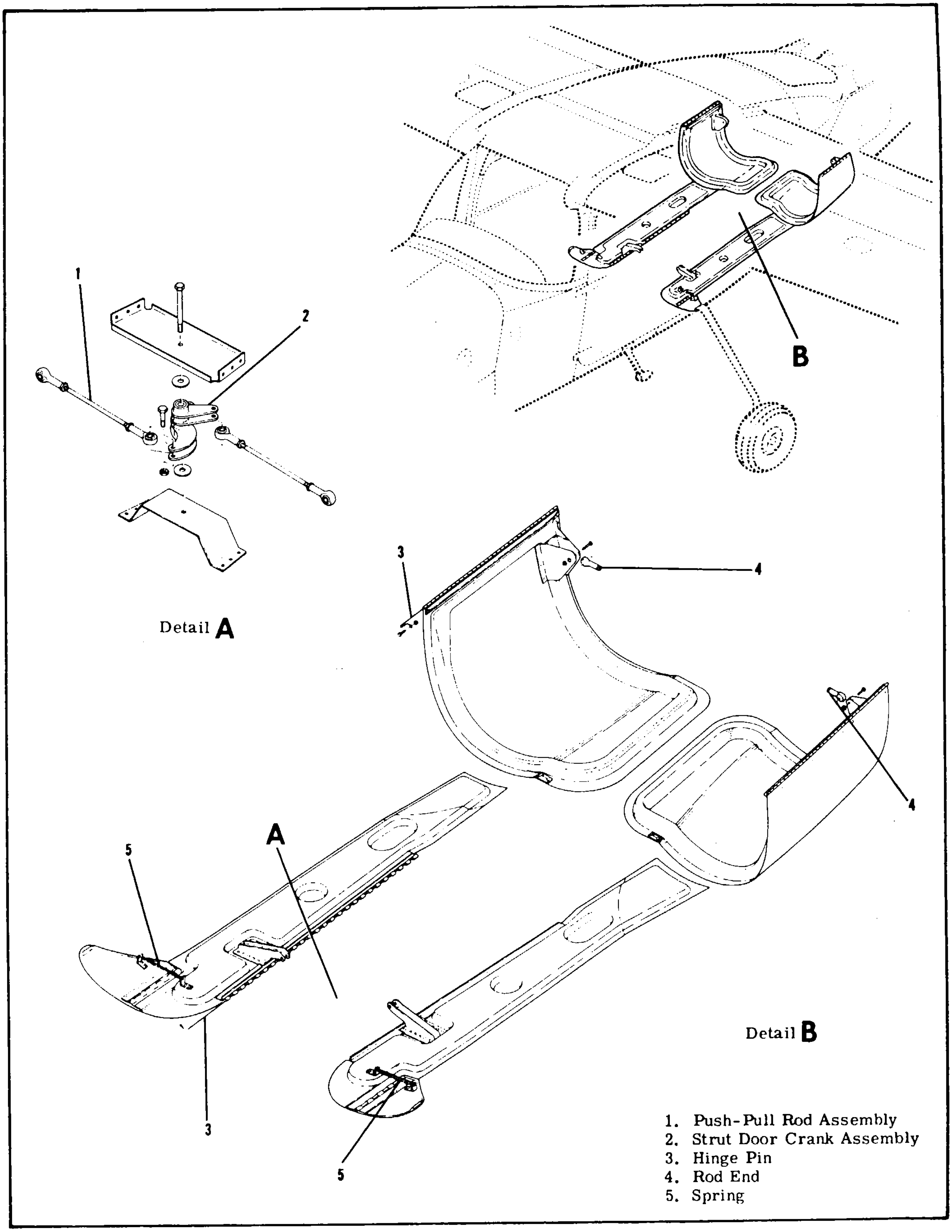


Figure 5-7. Main Landing Gear Doors

port at bearing end of cylinder may be used to remove piston rod.

d. Remove gland (6 or 7) from piston rod (8).

e. Remove and discard back-up rings and O-rings from gland and piston rod.

f. Do not remove bearing (9) unless it is defective.

5-37. INSPECTION OF PARTS. Make the following inspection to ascertain that all parts are in a serviceable condition.

a. Inspect all threaded surfaces for cleanliness and for freedom of cracks and excessive wear or damage.

b. Inspect gland (6 or 7), piston rod (8), cylinder (10) for cracks, chips, scratches, scoring, wear, or surface irregularities which may affect their function or the overall function of the door actuator cylinder.

5-38. ASSEMBLY. (Refer to figure 5-8.) Repair of most parts of the landing gear door actuator assembly is impractical. Replace defective parts with serviceable parts. Minor scratches may be removed by polishing with fine abrasive crocus cloth (Federal Specification P-C-458) providing their removal does not affect the operation of the unit. Install all new O-rings and back-up rings during reassembly of the actuator.

a. If bearing (9) was removed, install and stake six places, three each side.

NOTE

Lubricate all O-rings and back-up rings with petrolatum or MIL-H-5606 hydraulic fluid during assembly.

b. Install new O-ring and back-up ring in gland and install gland on piston rod. Use care to prevent damage to O-rings and back-up rings.

c. Install new O-rings and back-up rings on piston and on gland.

d. Install piston rod and gland into cylinder and install retaining ring. Use care to prevent damage to O-rings and back-up rings.

e. Install locknut and rod end.

5-39. MAIN WHEEL AND TIRE ASSEMBLY.

5-39A. DESCRIPTION. The aircraft may be equipped with either Cleveland or McCauley wheel and tire assemblies. Separate disassembly, inspection and reassembly instructions are provided for each type. Basic differences of the two types are discussed in paragraph 5-43D, and thru-bolt nut and capscrew torque values are listed in figure 5-9A.

CAUTION

Use of recapped tires is not recommended. However, if recapped tires are used on the aircraft, make sure there is sufficient clearance between tire and wheel well structure when landing gear is in retracted position.

5-40. REMOVAL OF MAIN WHEEL AND TIRE ASSEMBLY. (Refer to figure 5-9.)

NOTE

It is not necessary to remove the main wheel to reline brakes or remove brake parts, other then the brake disc or torque plate.

a. Using the universal jack point, jack the wheel as outlined in Section 2.

b. Remove hub caps.

c. Remove cotter pin and axle nut.

d. Remove bolts and washers attaching back plate and remove back plate.

e. Pull wheel from axle.

5-41. DISASSEMBLY OF CLEVELAND MAIN WHEEL AND TIRE ASSEMBLY. (Refer to figure 5-9.)

a. Deflate tire and break tire beads loose.

CAUTION

Avoid damaging wheel flanges when breaking tire beads loose. A scratch, gouge, or nick may cause wheel failure.

b. Remove thru-bolts and separate wheel halves, removing tire, tube, and brake disc.

c. Remove the grease seal rings, felts, and bearing cones from the wheel halves.

NOTE

The bearing cups are a press fit in the wheel halves and should not be removed unless replacement is necessary. To remove the bearing cups, heat the wheel half in boiling water for 15 minutes. Using an arbor press, if available, press out the bearing cup and press in the new cup while wheel is still hot.

5-42. INSPECTION AND REPAIR OF CLEVELAND MAIN WHEEL AND TIRE ASSEMBLY. (Refer to figure 5-9.)

a. Clean all metal parts and the grease seal felts in solvent and dry thoroughly.

b. Inspect wheel halves for cracks. Cracked wheel halves should be replaced. Sand out nicks, gouges, and corroded areas. When the protective coating has been removed, the area should be cleaned thoroughly, primed with zinc chromate and repainted with aluminum lacquer.

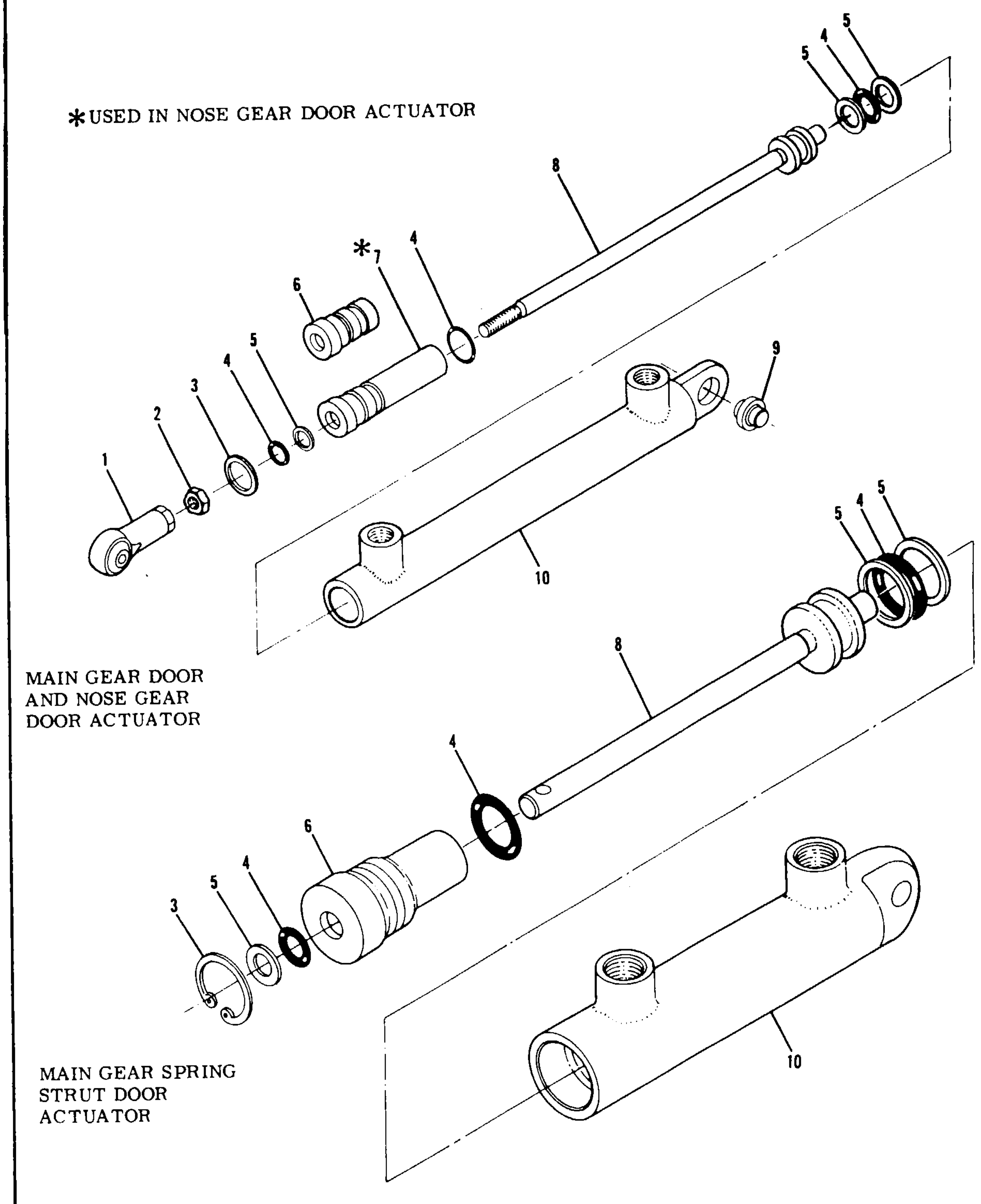
c. Brake disc should be replaced if excessively scored or warped. Small nicks and scratches should be sanded smooth.

d. Bearing cups and cones should be inspected carefully for damage and discoloration. After cleaning, repack cones with clean aircraft wheel bearing grease (Section 2) before installation in the wheel.

5-43. REASSEMBLY OF CLEVELAND MAIN WHEEL AND TIRE ASSEMBLY. (Refer to figure 5-9.)

a. Insert thru-bolts through brake disc and position in the inner wheel half, using the bolts to guide disc. Assure that the disc is bottomed in wheel half.

b. Position the tire and tube with the inflation valve through hole in outboard wheel half. Place the inner wheel half in position. Apply a light force to bring wheel halves together. Maintaining the light



1. Rod End
2. Check Nut
3. Retaining Ring
4. O-Ring
5. Back-Up Ring
6. Gland
*7. Gland
8. Piston Rod
9. Bearing
10. Cylinder

Figure 5-8. Door Actuators

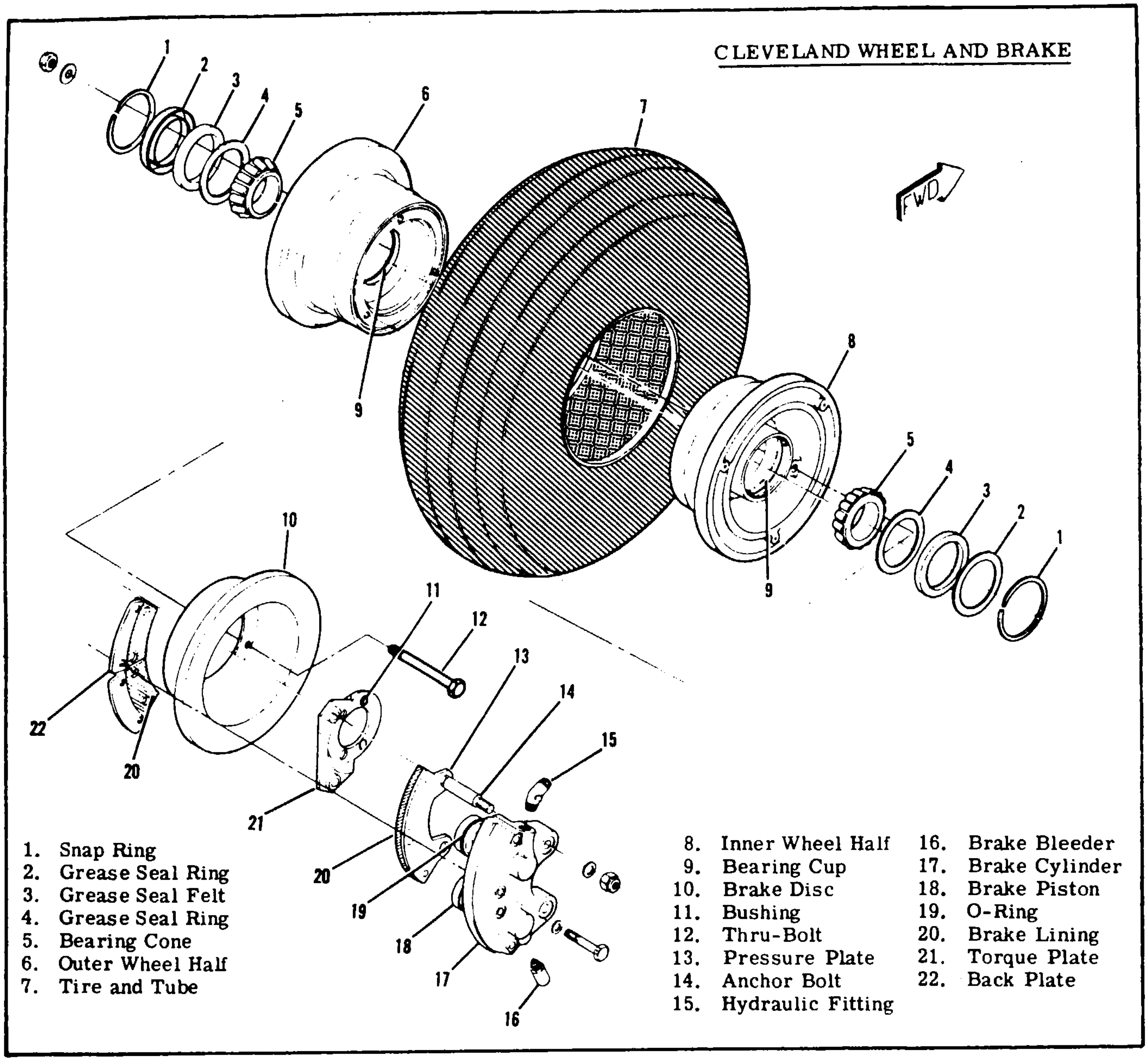


Figure 5-9. Wheel and Brake (Sheet 1 of 2)

force, assemble a washer and nut on one thru-bolt and tighten snugly. Assemble the remaining nuts and washers on the thru-bolts and torque to value stipulated in figure 5-9A.

CAUTION

Uneven or improper torque of thru-bolt nuts may cause failure of bolts, with resultant wheel failure.

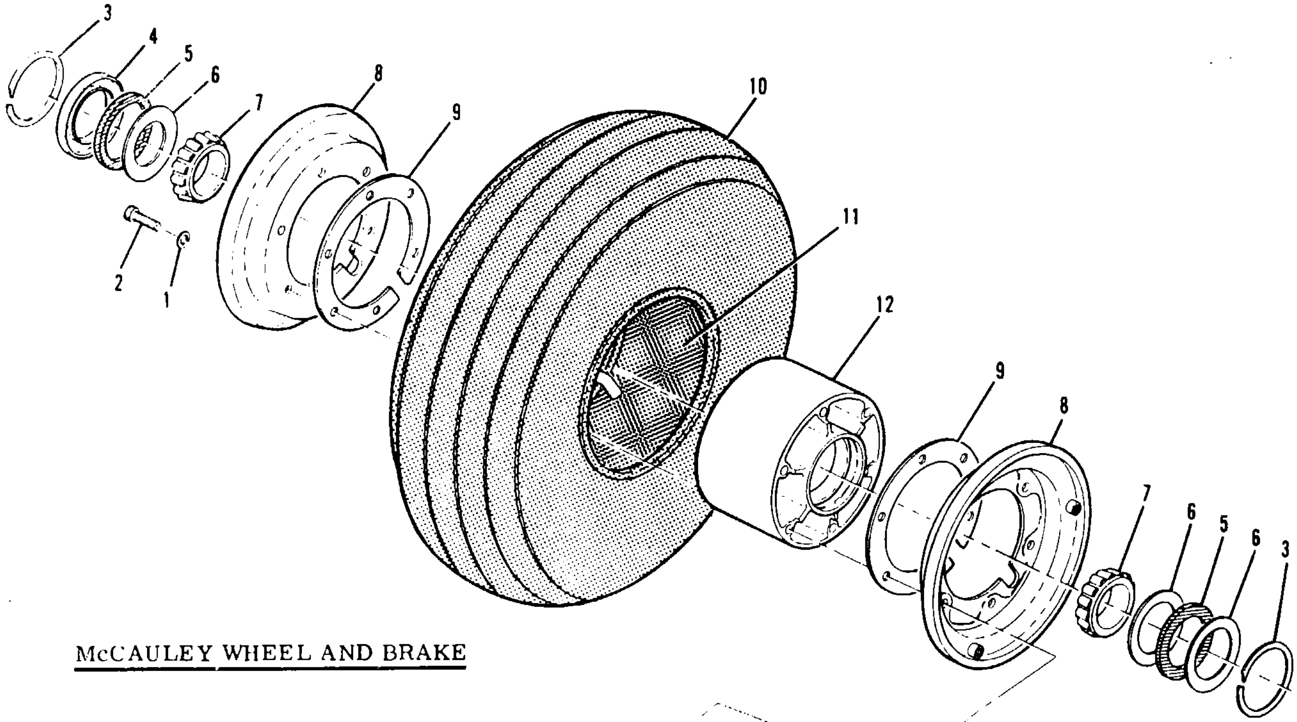
c. Clean and repack bearing cones with clean aircraft wheel bearing grease (Section 2).
d. Assemble the bearing cones, grease seal felts, and rings into the wheel halves.
e. Inflate tire to seat tire beads, then adjust to correct pressure.

5-43A. DISASSEMBLY OF McCAULEY MAIN WHEEL AND TIRE ASSEMBLY. (Refer to figure 5-9.)
a. Remove screws attaching hub cap; remove hub cap.

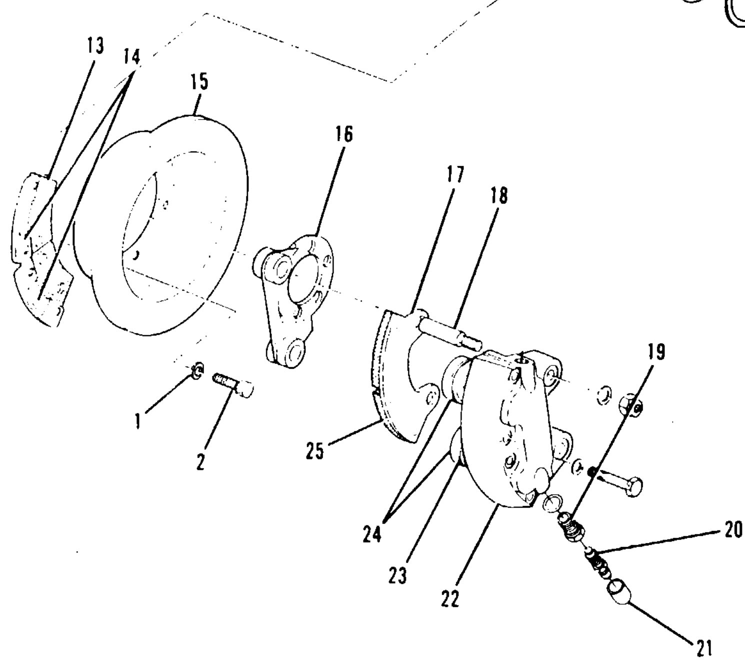
WARNING

Injury can result from attempting to remove wheel flanges with the tire and tube inflated. Avoid damaging wheel flanges when breaking tire beads loose. A scratch, gouge or nick in wheel flanges could cause wheel failure.

b. Remove valve core and deflate tire and tube. Break tire beads loose from wheel flanges.
c. Remove cap screws.
d. Remove brake disc.
e. Separate wheel flanges from wheel hub. Retain



McCAULEY WHEEL AND BRAKE



1. Washer
2. Cap Screw
3. Retainer Ring
4. Grease Seal Retainer
5. Grease Seal Felt
6. Grease Seal Retainer
7. Bearing Cone
8. Wheel Flange
9. Spacer
10. Tire
11. Tube
12. Hub Assembly
13. Lining
14. Back Plate Assembly
15. Disc Assembly
16. Torque Plate
17. Pressure Plate
18. Guide Pin
19. Bleeder Fitting
20. Bleeder Screw
21. Dust Cap
22. Cylinder
23. O-Ring
24. Piston
25. Lining

Figure 5-9. Wheel and Brake (Sheet 2 of 2)

MAIN GEAR	NOSE GEAR	WHEEL NUMBER	SIZE	MANUFACTURER	NUT/CAPSCREW TORQUE	WHEEL HALF OR FLANGE
X		C163001-0301	6.00 X 6	CLEVELAND	150 lb-in.	MAGNESIUM
X		C163002-0103	6.00 X 6	McCAULEY	90-100 lb-in.	ALUMINUM
X		C163004-0102	6.00 X 6	McCAULEY	190-200 lb-in.	STEEL
	X	1241156-12	5.00 X 5	CLEVELAND	90 lb-in.	MAGNESIUM
	X	C163002-0201	5.00 X 5	McCAULEY	90-100 lb-in.	ALUMINUM
	X	C163003-0201	5.00 X 5	McCAULEY	90-100 lb-in.	STEEL
	X	C163003-0401	5.00 X 5	McCAULEY	190-200 lb-in.	STEEL

Figure 5-9A. Landing Gear Wheel Thru-Bolt Nut or Capscrew Torque Values

spacers on each side of wheel hub.

f. Remove wheel hub from tire.

g. Remove retainer rings and remove grease seal retainers, grease seal felts and bearing cones.

NOTE

The bearing cups (races) are a press-fit in the wheel hub and should not be removed unless a new part is to be installed. To remove the bearing cup, heat wheel in boiling water for 30 minutes, or in an oven not to exceed 121°C (250°F). Using an arbor press, if available, press out the bearing cup and press in the new bearing cup while the wheel hub is still hot.

5-43B. INSPECTION AND REPAIR OF McCAULEY MAIN WHEEL AND TIRE ASSEMBLY. (Refer to figure 5-9.)

a. Clean all metal parts, grease seal felts and mylar spacers in cleaning solvent and dry thoroughly.

b. Inspect wheel flanges and wheel hub for cracks. Cracked wheel flanges or hub shall be discarded and new parts installed. Sand out smooth nicks, gouges and corroded areas. When the protective coating has been removed, the area should be cleaned thoroughly, primed with zinc chromate and painted with aluminum lacquer.

c. If excessively warped or scored, or worn to a thickness of 0.190-inch, brake disc should be replaced with a new part. Sand smooth small nicks and scratches.

d. Carefully inspect bearing coves and cups for damage and discoloration. After cleaning, pack bearing coves with clean aircraft wheel bearing grease (refer to Section 2) before installing in the wheel hub.

5-43C. REASSEMBLY OF McCAULEY WHEEL AND TIRE ASSEMBLY. (Refer to figure 5-9.)

a. Place wheel hub in tire and tube with tube inflation stem in cutout of wheel hub.

b. Place spacer and wheel flange on inboard side of wheel hub (opposite of tube inflation stem), then place washer under head of each capscrew and start capscrews into wheel hub threads.

c. Place spacer and wheel flange on other side and align valve stem in cutout in wheel flange.

d. Place washer under head of each capscrew and start capscrews into hub threads.

CAUTION

Be sure that spacers and wheel flanges are seated on flanges of wheel hub. Uneven or improper torque of capscrews can cause failure of the capscrews or hub threads with resultant wheel failure.

e. Tighten capscrews evenly and torque to the value specified in figure 5-9A.

f. Clean and pack bearing cones with clean aircraft wheel bearing grease. (Refer to Section 2 for grease type.)

g. Assemble bearing cones, grease seal felts and retainer into wheel hub.

h. Inflate tire to seat tire beads, then adjust to correct pressure specified in figure 1-1.

5-43D. LANDING GEAR WHEEL THRU-BOLT NUT OR CAP SCREW TORQUE VALUES (Refer to figure 5-9A.) During assembly of the main or nose wheel, the thru-bolt nuts or cap screws should be tightened evenly and torqued to the value stipulated in figure 5-9A. To facilitate identification of wheel manufacturers, solid wheels are manufactured by Cleveland Aircraft Products Co., and webbed wheels are manufactured by McCauley Industrial Corporation. Cleveland wheels are also identified by having two wheel halves as shown in figure 5-9 (Sheet 1 of 2) and figure 5-22. McCauley wheels are identified by having two wheel flanges and a hub as shown in figure 5-9 (Sheet 2 of 2) and figure 5-22.

5-44. INSTALLATION OF MAIN WHEEL AND TIRE ASSEMBLY.

a. Place wheel on axle.

b. Install axle nut and tighten until a slight bearing drag is obvious when the wheel is rotated. Back off nut to nearest castellation and install cotter pin.

c. Place brake back plate in position and secure with bolts and washers. Safety wire the bolts.

d. Install hub caps.

5-45. MAIN WHEEL AND AXLE REMOVAL.

a. Remove hub caps.

b. Remove wheel from axle in accordance with paragraph 5-40.

c. Disconnect, drain, and plug the hydraulic brake line at the brake cylinder.

d. Remove bolts, washers, nuts and stud securing axle and brake components to fitting at lower end of strut.

NOTE

When removing axle from strut fitting, note number and position of the wheel alignment shims. Mark these shims or tape together carefully so they can be reinstalled in exactly the same position to ensure that wheel alignment is not disturbed. Also, note position of stud attaching axle to fitting so that the stud may be installed in the same position. Stud is the uplock for the main gear.

5-46. MAIN WHEEL AND AXLE INSTALLATION.

a. Secure axle and brake components to strut fitting, making sure that wheel alignment shims and stud are reinstalled in their original position.

b. Install wheel assembly on axle in accordance with paragraph 5-44.

c. Connect hydraulic brake line to brake cylinder.

d. Fill and bleed affected brake system.

e. Install hub caps.

f. Check wheel alignment.

5-47. MAIN WHEEL ALIGNMENT. Correct main wheel alignment is obtained through the use of tapered shims between the gear strut and the flange of the axle. Refer to figure 5-10 for procedures to use in checking alignment. Wheel shims, and the correction imposed on the wheel by the various shims, are listed in the illustration.

NOTE

Failure to obtain acceptable wheel alignment through the use of the shims indicates a deformed main gear strut or a bent axle.

5-48. WHEEL BALANCING. Since uneven tire wear is usually the cause of wheel unbalance, replacing the tire probably will correct this condition. Tire and tube manufacturing tolerances permit a specified amount of static unbalance. The lightweight point of the tire is marked with a red dot on the tire sidewall and the heavyweight point of the tube is marked with a contrasting color line (usually near the valve stem). When installing a new tire, place these marks adjacent to each other. If a wheel becomes unbalanced during service, it may be statically rebalanced. Wheel balancing equipment is available from the Cessna Service Parts Center.

5-49. BRAKE SYSTEM.

5-50. DESCRIPTION. The hydraulic brake system consists of two master cylinders, brake lines, connecting each master cylinder to its corresponding wheel brake cylinder, and the single-disc type brake assembly, located at each main landing gear wheel.

5-51. TROUBLE SHOOTING.

TROUBLE	PROBABLE CAUSE	REMEDY
DRAGGING BRAKES.	Brake pedal binding.	Check and adjust properly.
	Parking brake linkage holding brake pedal down.	Check and adjust properly.
	Worn or broken piston return spring. (In master cylinder.)	Repair or replace master cylinder.
	Insufficient clearance at Lock-O-Seal in master cylinder.	Adjust as shown in figure 5-21.

5-51. TROUBLE SHOOTING (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
DRAGGING BRAKES (Cont).	Restriction in hydraulic lines or restriction in compensating port in master brake cylinder.	Drain brake lines and clear the inside of the brake line with filtered compressed air. Fill and bleed brakes. If cleaning the lines fail to give satisfactory results, the master cylinder may be faulty and should be repaired.
	Worn, scored, or warped brake discs.	Replace brake disc and linings.
	Damage or accumulated dirt restricting free movement of wheel brake parts.	Clean and repair or replace parts as necessary.
BRAKES FAIL TO OPERATE.	Leak in system.	Check entire system for leaks If brake master cylinders or wheel assemblies are leaking, they should be repaired or replaced.
	Air in system.	Bleed system.
	Lack of fluid in master cylinders.	Fill and bleed systems.
	Master cylinder defective.	Repair or replace master cylinder.

5-52. BRAKE MASTER CYLINDERS. The brake master cylinders, located just forward of the pilot's rudder pedals, are actuated by applying toe prèssure at the top of the rudder pedals. A small reservoir is incorporated into each master cylinder to supply it with fluid. Where dual brakes are installed, mechanical linkage permits the copilot's pedals to operate the master cylinders.

5-53. REMOVAL AND INSTALLATION OF BRAKE MASTER CYLINDERS.

a. Remove bleeder screw at wheel brake assembly and drain hydraulic fluid from brake system.

b. Remove front seats and rudder bar shield for access to brake master cylinders.

c. Disconnect parking brake linkage and brake master cylinders from rudder pedals.

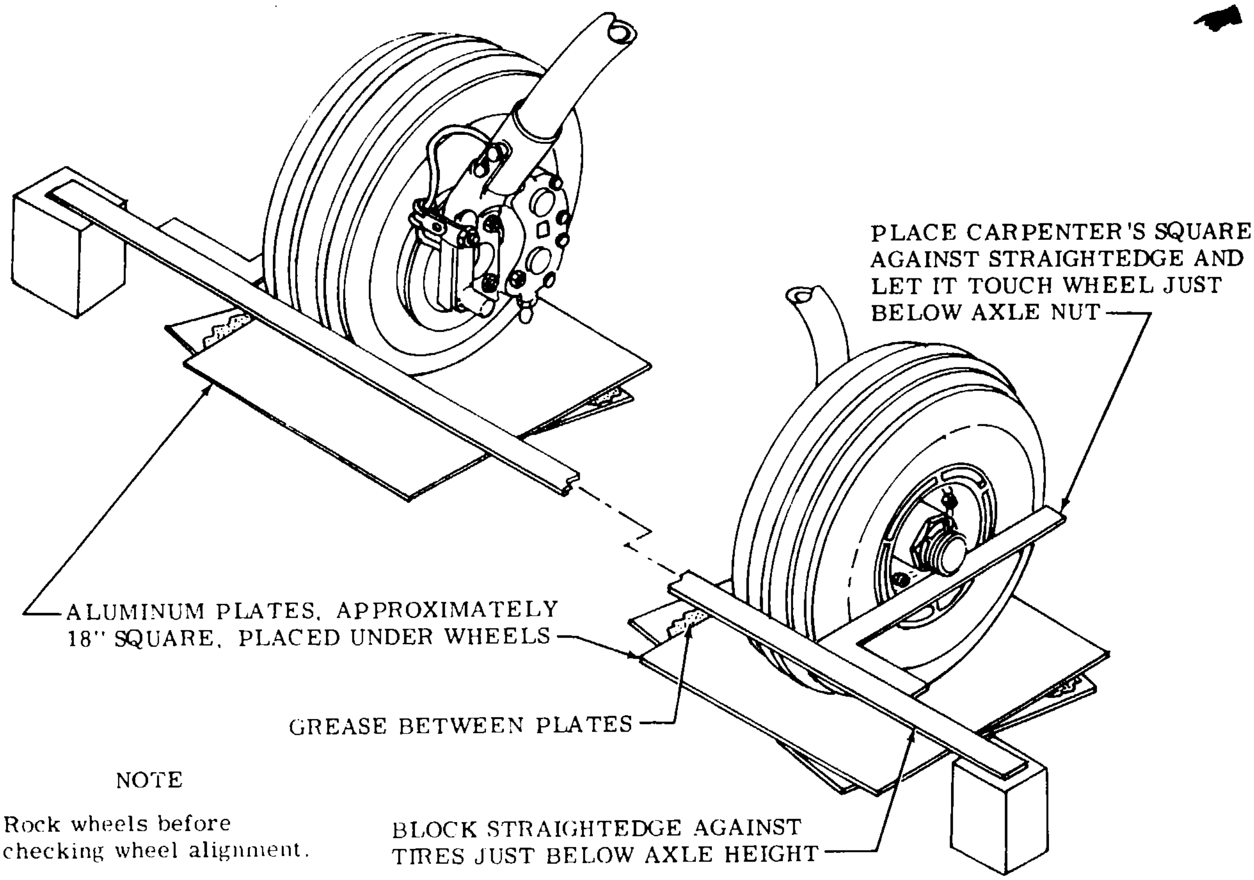
d. Disconnect brake master cylinders at bottom attach points.

e. Disconnect hydraulic hose from brake master cylinders and remove cylinders.

f. Plug or cap hydraulic fittings, lines, and hose to prevent entry of foreign materials.

g. Reverse the preceding steps to install brake master cylinders, then fill and bleed brake system in accordance with applicable paragraph.

5-54. DISASSEMBLY AND REPAIR OF BRAKE MASTER CYLINDERS. Figure 5-11 may be used as a guide during disassembly and assembly of the brake master cylinders. Repair is limited to replacement of parts, cleaning and adjustment. Use clean hydraulic fluid as a lubricant during assembly of the cylinder.

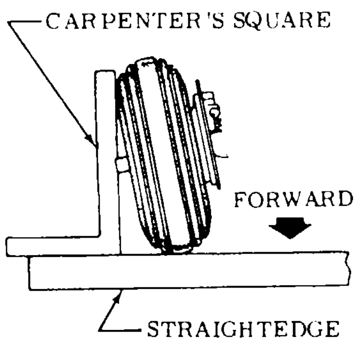


NOTE

Rock wheels before checking wheel alignment.

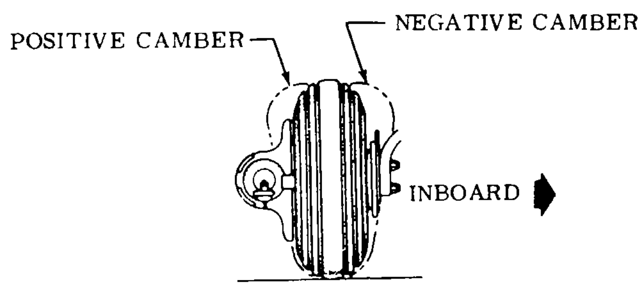
TOP VIEW OF TOE-IN CHECK

Measure toe-in at edges of wheel flange. Difference in measurements is toe-in for one wheel. (half of toe-in.)



FRONT VIEW OF CAMBER CHECK

Measure camber by reading protractor level held vertically against outboard flanges of wheel.



NOTE

Setting toe-in and camber within these tolerances while the cabin and fuel tanks are empty will give approximately zero toe-in and zero camber at gross weight. Ideal setting is zero toe-in and zero camber at normal operating weight. Therefore, if normally operated at less than gross weight and abnormal tire wear occurs, realign the wheels to attain the ideal setting for the load conditions under which the airplane normally operates. Refer to the following page for shims available and their usage. Always use the least number of shims possible to obtain the desired result.

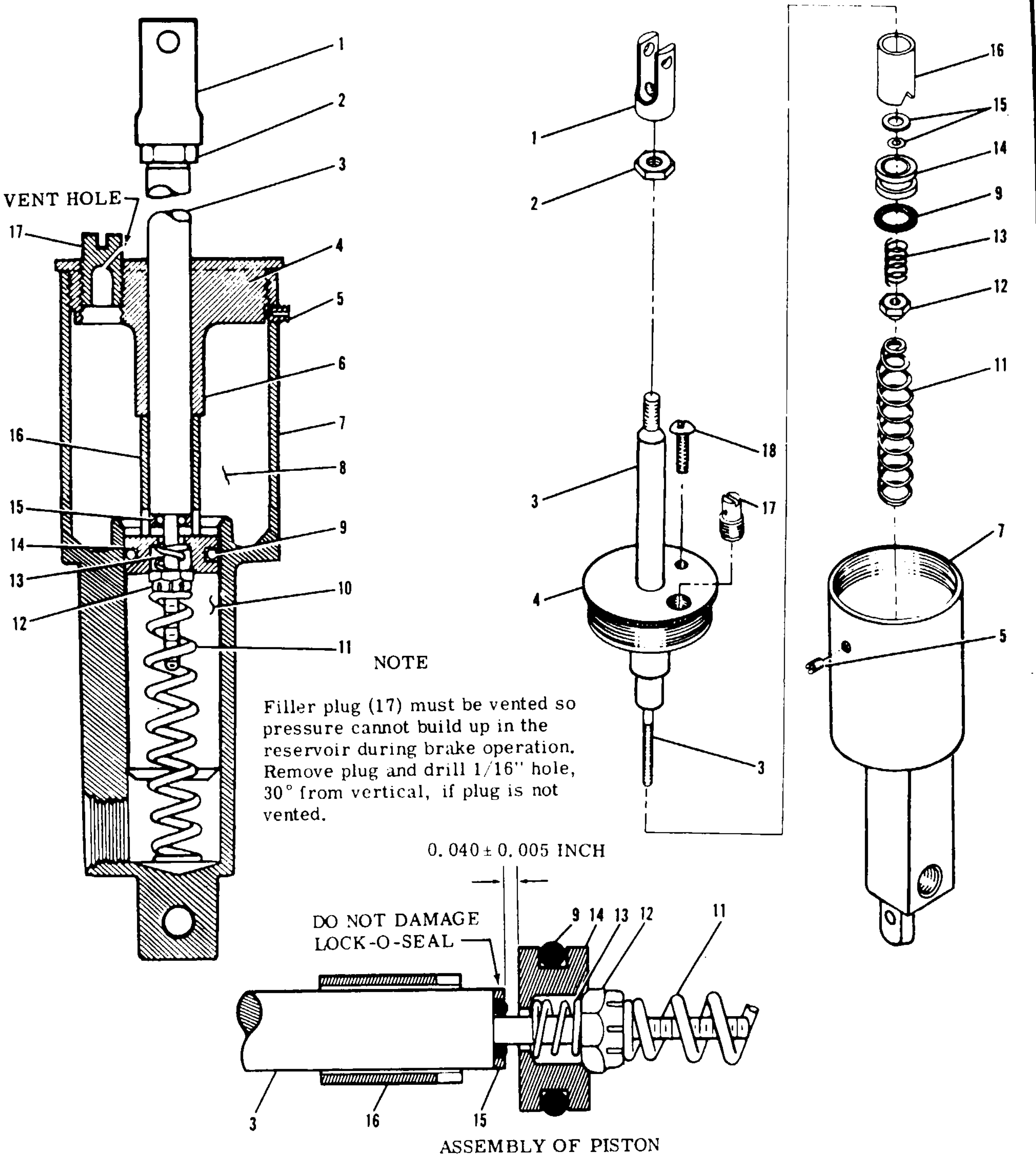
Figure 5-10. Wheel Alignment (Sheet 1 of 2)

SHIM CHART

SHIM PART NO.	POSITION OF THICKEST CORNER OR EDGE OF SHIM	CORRECTION IMPOSED ON WHEEL			
		TOE-IN	TOE-OUT	POS. CAMBER	NEG. CAMBER
0541157-1	AFT FWD	.06" ----	---- .06"	---- 0°3'	0°3' ----
0541157-2	UP DOWN	.006" ----	---- .006"	0°30' ----	---- 0°30'
1241061-1	UP & FWD UP & AFT DOWN & FWD DOWN & AFT	.03" .06" ---- ----	---- ---- .06" .03"	2°50' 2°49' ---- ----	---- ---- 2°49' 2°50'
0411139-5	UP & FWD UP & AFT DOWN & FWD DOWN & AFT	---- .12" ---- .11"	.11" ---- .12" ----	0°25' 0°11' ---- ----	---- ---- 0°11' 0°25'
0441139-6	UP & FWD UP & AFT DOWN & FWD DOWN & AFT	---- .24" ---- .22"	.22" ---- .24" ----	0°50' 0°22' ---- ----	---- ---- 0°22' 0°50'
0541157-3	AFT FWD	.12" ----	---- .12"	---- 0°7'	0°7' 0°7'

	1241061-1	0441139-6	0441139-5	0541157-2	0541157-1	0541157-3
1241061-1	0	0	0	0	0	0
0441139-6	0	0	0	1	1	0
0441139-5	0	0	1	1	2	0
0541157-2	0	1	1	2	2	0
0541157-1	0	1	1	2	2	0
0541157-3	0	0	1	2	1	0
SHIM NO.	Max. number of shims to be used with shims in column 1.					
COLUMN 1	COLUMN 2					

Figure 5-10. Wheel Alignment (Sheet 2 of 2)



1. Clevis
2. Jamb Nut
3. Piston Rod
4. Cover
5. Setscrew
6. Cover Boss
7. Body
8. Reservoir
9. O-Ring
10. Cylinder
11. Piston Return Spring
12. Nut
13. Piston Spring
14. Piston
15. Lock-O-Seal
16. Compensating Sleeve
17. Filler Plug
18. Screw

Figure 5-11. Brake Master Cylinder

5-55. BLEEDING BRAKE SYSTEM. (Refer to figures 5-9 and 5-11.) Standard bleeding, with a clean hydraulic pressure source connected to the wheel cylinder bleeder valve, is recommended.

a. Remove master cylinder filler plug and install a flexible hose with a suitable fitting in the filler hole. Immerse free end of hose in a can containing enough hydraulic fluid to cover end of hose.

b. Remove protective cover from bleeder valve.

c. Connect a clean hydraulic pressure source, such as a hydraulic hand pump, to the bleeder valve.

d. Loosen bleeder valve and unscrew bleeder valve approximately one turn.

e. As fluid is pumped into the brake system, observe the immersed end of the hose at the master cylinder for evidence of air being forced from the brake system. When air bubbling has ceased, tighten bleeder valve.

f. Remove hydraulic source and install protective cover on wheel cylinder bleeder valve.

g. Remove hose from master cylinder and install filler plug.

5-56. REMOVAL OF WHEEL BRAKES. Wheel brake assemblies are a floating type and can be removed after disconnecting the brake line and removing the back plates.

NOTE

The brake disc can be removed after wheel removal and disassembly. To remove the torque plate, remove the wheel and axle in accordance with applicable paragraph.

5-57. INSPECTION AND REPAIR OF WHEEL BRAKES.

a. Clean all parts except brake linings and O-rings in dry cleaning solvent and dry thoroughly.

b. O-rings are usually replaced at each overhaul. If their re-use is necessary, they should be wiped with a clean cloth soaked in hydraulic fluid and inspected for damage.

NOTE

Thorough cleaning is important. Dirt and chips are the greatest single cause of malfunctions in the hydraulic brake system.

c. Check brake linings for deterioration and maximum permissible wear. Refer to applicable paragraph.

d. Inspect brake cylinder bore for scoring. A scored cylinder may leak or cause rapid O-ring wear. A scored brake cylinder should be replaced.

e. If the anchor bolts on the brake assemblies are nicked or gouged, they should be sanded smooth to prevent binding with the pressure plate or torque plate. When the anchor bolts are replaced they should be pressed out. New bolts can be installed by tapping in place with a soft hammer.

f. Inspect wheel brake disc for a minimum thickness of 0.340-inch. If brake disc is below minimum thickness, warped, or out of round, install a new part.

5-58. ASSEMBLY OF WHEEL BRAKES. Lubricate parts with hydraulic fluid and assemble components with care to prevent damage to O-rings. Refer to figure 5-9 during wheel brake assembly.

5-59. INSTALLATION OF WHEEL BRAKES. Place the brake assembly in position with pressure plate in place, then install back plate and safety the attaching bolts. If the torque plate was removed, install as the wheel and axle are installed. If the brake disc was removed from the wheel, install as the wheel is assembled.

5-60. BRAKE LINING WEAR. The brake linings should be replaced when they are worn to a minimum thickness of 3/32 inch. Visually compare a 3/32-inch strip of material held adjacent to each lining to measure the thickness of the lining. The shank end of correct size drill bits make excellent tools for checking minimum thickness of brake linings.

5-61. BRAKE LINING REPLACEMENT. (Refer to figure 5-9.)

a. Remove bolts, washers, and back plate.

b. Pull the brake cylinder out of torque plate and slide pressure plate off anchor bolts.

c. Place back plate on a table with lining side down flat. Center a 9/64-inch (or slightly smaller) punch in the rolled rivet, and hit the punch crisply with a hammer. Punch out all rivets securing the linings to the back plate and pressure plate in the same manner.

NOTE

A rivet setting kit, Part No. R561, is available from the Cessna Service Parts Center. This kit consists of an anvil and punch.

d. Clamp the flat sides of the anvil in a vise.

e. Align new lining on back plate and place brake rivet in hole with the rivet head in the lining. Place rivet head against the anvil.

f. Center the rivet setting punch on the lips of the rivet. While holding the back plate down firmly against the lining, hit the punch with a hammer to set the rivet. Repeat blows on the punch until lining is firmly against the back plate.

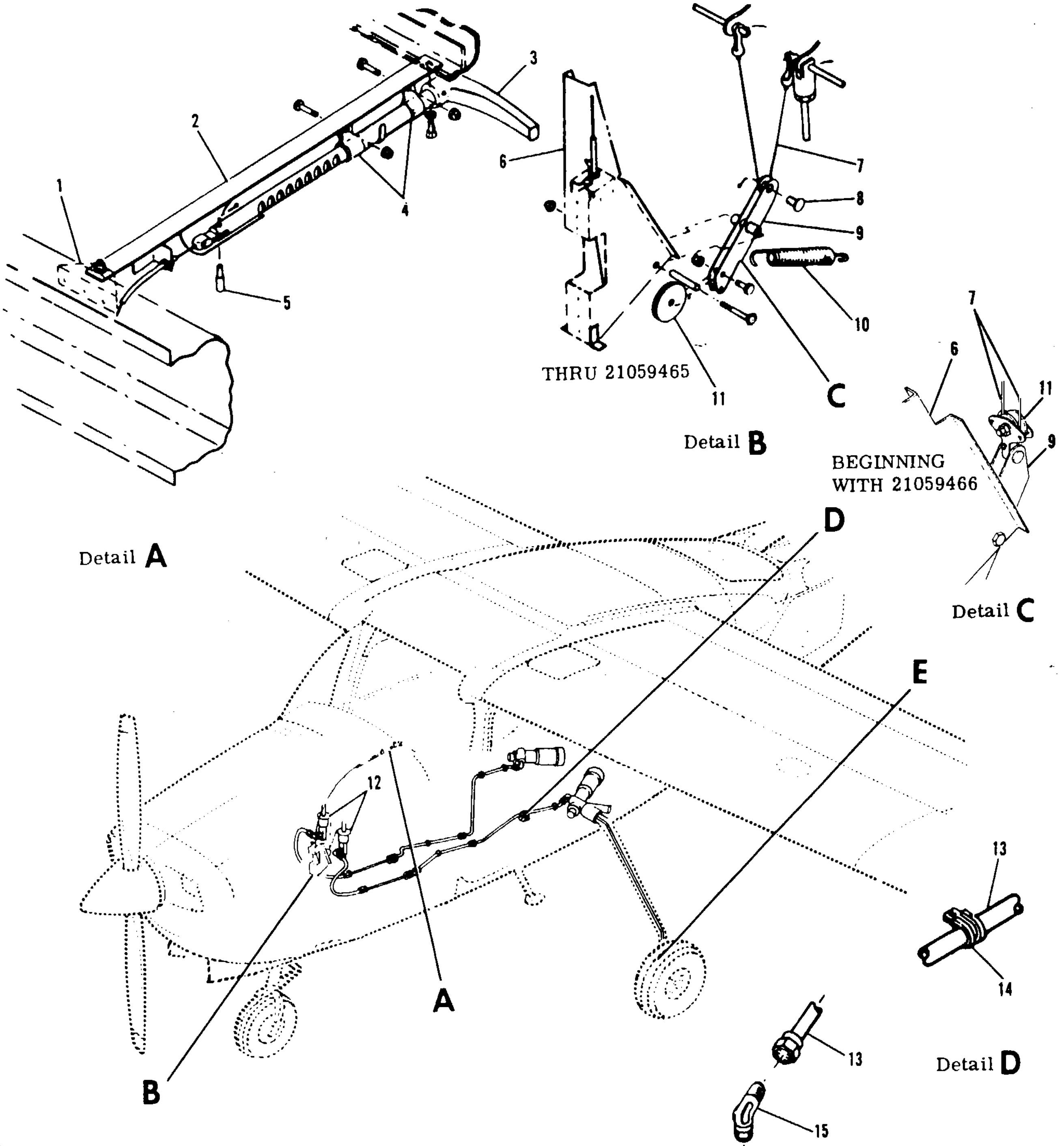
g. Realign the lining on the back plate and install rivets in remaining holes.

h. Install a new lining on pressure plate in the same manner.

i. Position pressure plate on anchor bolts, and place cylinder in position so the anchor bolts slide into torque plate.

j. Install the back plates with bolts and washers. Safety wire the bolts.

5-62. PARKING BRAKE SYSTEM. (Refer to figure 5-12.)
The parking brake system uses a handle and ratchet mechanism connected by a cable to linkage at the master cylinders. Pulling out on the handle depresses both cylinder piston rods and the ratchet locks the handle in this position until handle is turned and released.



1.	Attaching Angle	10.	Spring
2.	Stiffener Angle	11.	Pulley
3.	Parking Brake Handle	12.	Brake Master Cylinders
4.	Clamp	13.	Brake Line
5.	Positioning Pin	14.	Clamp
6.	Bracket	15.	Fitting
7.	Cable Assembly	16.	Nut
8.	Clevis Pin	17.	O-Ring
9.	Bellcrank Assembly		

Figure 5-12. Brake Systems

5-63. NOSE GEAR SYSTEM.

5-64. DESCRIPTION. The nose gear consists of a pneudraulic shock strut assembly, mounted in a trunnion assembly, a steering arm and bungee, shimmy dampener, uplock mechanism, nose wheel, tire and tube, hub cap, bearings, seals and a double-acting hydraulic actuator for extension and retraction. A claw-like hook on the actuator serves as a downlock for the nose gear.

5-65. OPERATION. The nose gear shock strut is pivoted just forward of the firewall. Retraction and extension of the nose gear is accomplished by a double-acting hydraulic cylinder, the forward end of which contains the nose gear downlock. Initial action of the cylinder disengages the downlock before retraction begins. A separate single-acting hydraulic cylinder unlocks the nose gear uplock hook.

5-66. TROUBLE SHOOTING.

TROUBLE	PROBABLE CAUSE	REMEDY
HYDRAULIC FLUID LEAKAGE FROM NOSE STRUT.	Defective strut seals and/or defects in lower strut.	Replace defective seals; stone out small defects in lower strut. Replace lower strut if badly scored or damaged.
NOSE STRUT WILL NOT HOLD AIR PRESSURE.	Defective filler valve or valve not tight.	Check gasket and tighten loose valve. Replace defective valve.
	Defective O-ring at top of strut.	Replace O-ring.
	Result of fluid leakage at bottom of strut.	Replace defective seals; stone out small defects in lower strut. Replace lower strut if badly scored or damaged.
NOSE WHEEL SHIMMY.	Nose strut attachment loose.	Secure attaching parts.
	Shimmy dampener lacks fluid.	Service shimmy dampener.
	Defective shimmy dampener.	Repair or replace dampener.
	Loose or worn steering components.	Tighten loose parts; replace if defective.
	Loose torque links.	Add shim washers and replace parts as necessary.
	Loose wheel bearings.	Replace bearings if defective; tighten axle nut properly.
	Nose wheel out of balance.	Refer to applicable paragraph.

SHOP NOTES:

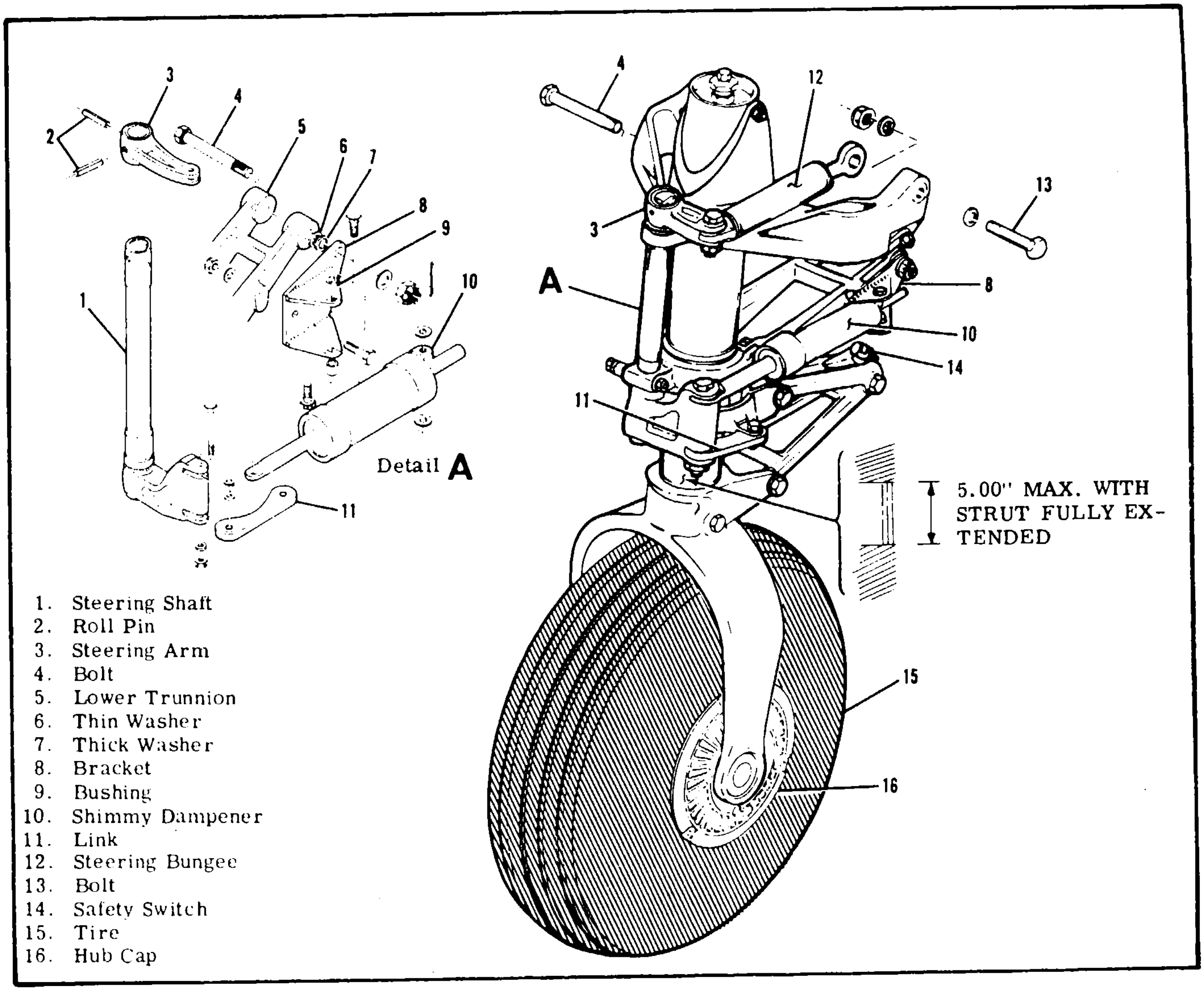


Figure 5-13. Nose Landing Gear

5-67. REMOVAL AND INSTALLATION OF NOSE GEAR ASSEMBLY.

a. Jack aircraft or weight the tail of aircraft to raise nose wheel off the ground.

WARNING

Beginning with Serial 21059503, before working in landing gear wheel wells, PULL-OFF hydraulic pump circuit breaker. Circuit breaker knob is located on console. The hydro-electric power pack system is designed to pressurize the landing gear "DOOR-CLOSE" system to 1500 psi at any time the master switch is turned on. Injury might occur to someone working in wheel well area if master switch is turned on for any reason.

b. Open landing gear doors and disconnect nose wheel doors push-pull rods.

c. Tag for identification and disconnect electrical wires at gear-down microswitch located on forward end of nose gear actuator at bracket on bearing end (refer to figure 5-19).

d. Tag for identification and disconnect electrical wires at nose gear safety switch on torque links (refer to figure 5-16) and remove clamps attaching wires to nose strut.

e. Disconnect steering bungee from steering bellcrank.

f. Disconnect nose gear actuator from strut by removing cotter pin, castellated nut (aircraft equipped with retractable step, remove spring clip, after removing safety wire from turnbuckle and loosening turnbuckle barrel), washers and bolt.

NOTE

Retain spacer washers between downlock hooks on end of actuator.

g. Disconnect nose gear strut door tie rods from nose gear.

h. Remove trunnion bolts.

NOTE

Trunnion bolts are accessible from inside the cabin, at the very forward end of the tunnel cover at the firewall. Two men will be required to remove these bolts, one working inside the cabin, the other working in the nose wheel well.

i. Work entire nose gear assembly free of the aircraft.
j. Install nose gear by reversing preceding steps.

NOTE

On aircraft equipped with retractable step, install right-hand tie rod on outboard side of eyebolt only, when connecting nose gear strut doors. Left-hand tie rod should be installed in normal manner.

k. When connecting nose gear actuator to strut, lubricate and torque bolt as outlined in Section 2. On aircraft equipped with retractable step, rig cable as outlined in applicable paragraph. Be sure to safety turnbuckle after rigging step cable.
l. Rig nose gear and nose gear doors as outlined in applicable paragraphs in this Section.

5-68. DISASSEMBLY OF NOSE GEAR STRUT. (Refer to figure 5-14.) The following procedure applies to the nose gear shock strut after it has been removed from the aircraft, and the nose wheel has been removed. In many cases, separating the upper and lower struts will permit inspection and parts replacement without removal or complete strut disassembly.

WARNING

Deflate strut completely before removing bolt (33), lock ring (31), or bolt (2). Also deflate strut before disconnecting torque links.

a. Remove torque links. Note position of washers, shims, spacers, and bushings.
b. Remove shimmy dampener and steering bungee.
c. Remove link from steering shaft and collar.
d. Remove lock ring from groove inside of lower end of upper strut. A small access hole is provided at the lock ring groove to facilitate removal of lock ring.

NOTE

Hydraulic fluid will drain from strut as lower strut is pulled from the upper strut.

f. Using a straight, sharp pull, remove lower strut from upper strut. Invert lower strut and drain hydraulic fluid from strut.
g. Remove lock ring and bearing from lower strut.
h. Slide shims, if used, packing support ring, scraper ring, retaining ring, and lock ring, from lower strut. Note number of shims, relative position, and top side of each ring and bearing to aid in reassembly.
i. Remove and discard O-rings and back-up rings from packing support ring.
j. Remove metering pin and base plug by removing bolt from lower strut and fork assembly.

NOTE

Lower strut and fork are a press fit, drilled on assembly. Separation of these parts is not recommended, except for replacement of parts.

k. Remove and discard O-rings from metering pin and base plug.
l. Remove orifice support by removing bolt at top of strut. Remove and discard O-ring from orifice support.
m. Remove collar from upper strut. To remove collar, remove bolt and tab washer. Remove washers, shims, if installed, and steering collar.
n. Bushings and bearings in upper trunnion and lower trunnion may be replaced as required. Needle bearing in collar should not be replaced; replace the steering collar if needle bearing is defective.

NOTE

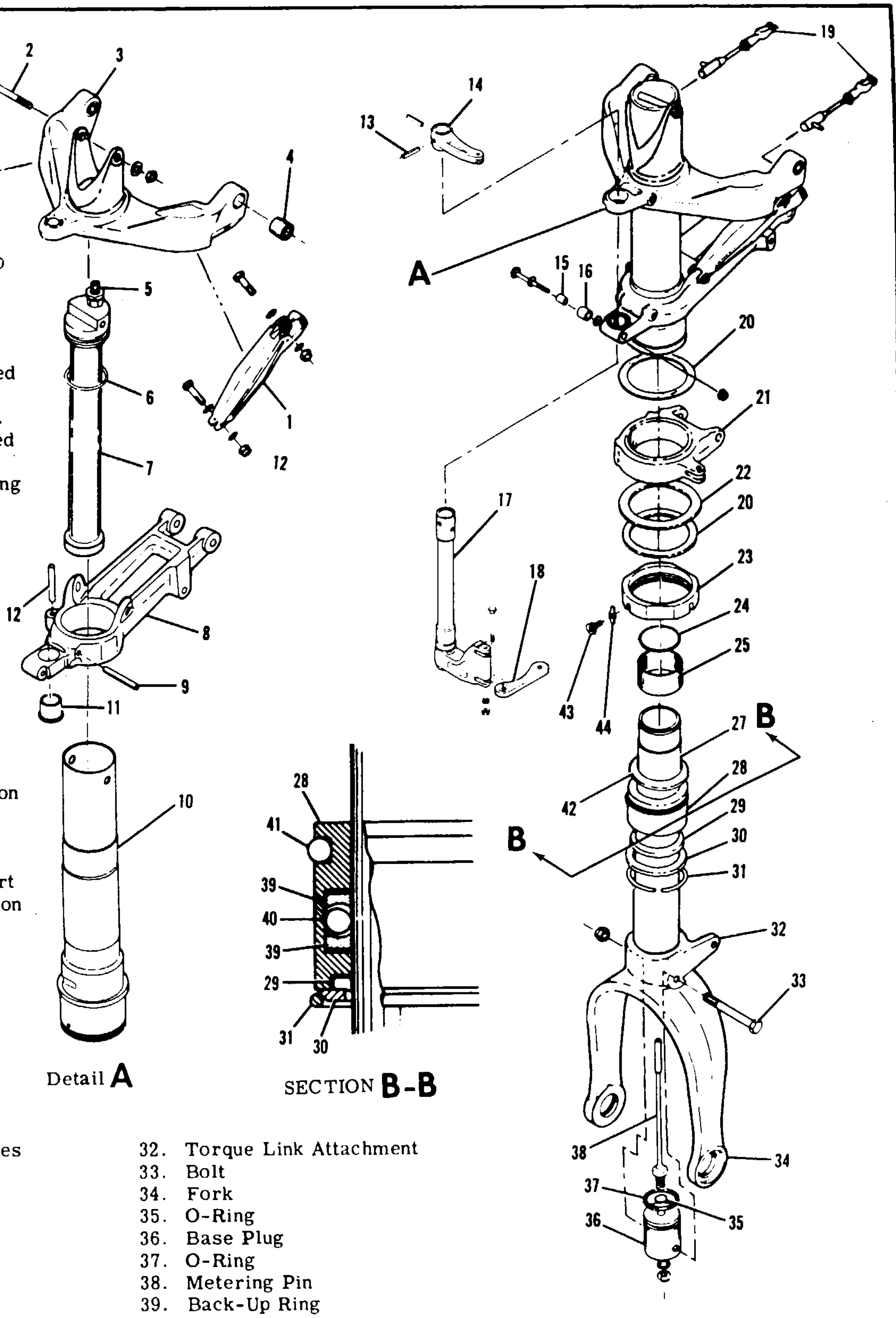
Upper and lower trunnions are press-fitted to the upper strut with braces installed during assembly. Pin is also press-fitted to the lower trunnion.

5-69. ASSEMBLY OF NOSE GEAR STRUT. (Refer to figure 5-14.)
a. Thoroughly clean all parts in solvent and inspect them carefully. Replace all worn or defective parts and all O-rings, seals, and back-up rings with new parts.
b. Assemble the strut by reversing the order of the procedures outlined in paragraph 5-68 with the exception that special attention must be paid to the following procedures.
c. Sharp metal edges should be smoothed with No. 400 emery paper, then thoroughly cleaned with solvent.
d. Used sparingly, Dow Corning DC-4 compound is recommended for O-ring lubrication. All other internal parts should be liberally coated with hydraulic fluid during assembly.

NOTE

Cleanliness and proper lubrication, along with careful workmanship are important during assembly of the shock strut.

e. Lubricate needle bearings as shown in figure 2-4 before installing.
f. When installing collar, screw it onto the upper



NOTE

Shims (22) are used as required above lower washer (20). Shims (42) are used as required above packing support ring (28).

1. Brace
2. Bolt
3. Upper Trunnion
4. Bushing
5. Filler Valve
6. O-Ring
7. Orifice Support
8. Lower Trunnion
9. Roll Pin
10. Upper Strut
11. Bearing
12. Dowel Pin
13. Roll Pin
14. Steering Arm
15. Bushing
16. Roller
17. Steering Shaft
18. Link
19. Rod Assemblies
20. Washer
21. Collar
22. Shim
23. Collar
24. Lock Ring
25. Bearing
26. Deleted
27. Lower Strut
28. Packing Support Ring
29. Scraper Ring
30. Retaining Ring
31. Lock Ring
32. Torque Link Attachment
33. Bolt
34. Fork
35. O-Ring
36. Base Plug
37. O-Ring
38. Metering Pin
39. Back-Up Ring
40. O-Ring
41. O-Ring
42. Shim
43. Bolt
44. Tab Washer

Figure 5-14. Nose Gear Shock Strut

strut until it is flush with bottom ends of strut, to the nearest one-third turn. Use shims as required above lower washer to fill gap between collars. Use a new tab washer to safety bolt. Shims are available from the Cessna Service Parts Center as follows:

1243030-5 . . . . 0.006"
-6 . . . . 0.012"
-7 . . . . 0.020"

g. Install the contoured back-up rings, one on each side of O-ring with concave surface of back-up ring next to the O-ring.
h. If new parts are being installed, place packing support ring, scraper ring, retaining ring, in the upper strut and install lock ring. Measure the up-down movement of the packing support ring in the upper strut. Shims are used as required above packing support ring to eliminate up-down movement of the packing support ring. Remove packing support ring from upper strut.
i. Slide lock ring, retaining ring, scraper ring, packing support ring, and required shims on lower strut.
j. When installing bearing at top of the lower strut, be sure that beveled edge of bearing is installed up next to lock ring.
k. When installing lock ring, position lock ring so that one of its ends covers the small access hole in the lock ring groove in the botton of the upper strut.
l. When installing shimmy dampener, do not tighten attaching bolts to a torque value in excess of 10 lb-in.
m. Tighten torque link center bolt snug, then tighten to next castellation and install cotter pin.
n. Service the shock strut with hydraulic fluid and compressed air and install strut in aircraft.

NOTE

It is easier to service the shock strut just before installation, although it may be serviced after installation if desired. Refer to Section 2.

o. When assembling and attaching the nose gear actuator and downlock mechanism, lubricate and torque attaching bolt as shown in Section 2.

5-70. SHIMMY DAMPENER. (Refer to figure 5-15.)

5-71. DESCRIPTION. The shimmy dampener is a self-contained hydraulic cylinder which acts as a restrictor. When the steering system reacts too rapidly, the shimmy dampener maintains pressure against the steering arm by means of a piston which permits a restricted flow of hydraulic fluid from either end of the cylinder to the other through an orifice in the piston.

5-72. REMOVAL. (Refer to figure 5-13.)
a. Remove bolt securing shimmy dampener (10) to steering shaft (1).
b. Remove bolt attaching dampener to bracket (8).
c. Remove shimmy dampener from aircraft.

5-73. DISASSEMBLY AND ASSEMBLY. (Refer to figure 5-15.) The figure may be used as a guide for disassembly and assembly of the shimmy dampener. Replace any parts found defective. When assembling dampener, use new O-rings and back-up rings. Lubricate parts during assembly with clean hydraulic fluid. Refer to Section 2 for servicing procedures. When installing dampener, do not tighten attaching bolts to a torque value in excess of 10 lb-in.

5-74. INSTALLATION. (Refer to figure 5-13.)
a. Position cylinder mounting lug into support bracket (8). Install bushings (9), and bolts.
b. Position rod end of cylinder into steering shaft (1). Install bolt, washers and nut.
c. Check for clearance between cylinder and structure while turning nose gear wheel from side to side.

5-75. TORQUE LINKS. (Refer to figure 5-16.)

5-76. DESCRIPTION. The torque links align the lower strut with the nose gear steering system, but permit shock strut action. The nose gear squat switch, which is electrically-connected to the landing gear handle lockout solenoid, is operated by an actuator attached to the nose gear lower torque link.

5-77. REMOVAL AND INSTALLATION.

WARNING

DEFLATE NOSE GEAR SHOCK STRUT COMPLETELY.

a. Remove washers, shims, spacers, bolts and nuts. Note position of attaching hardware for reinstallation.
b. Reverse preceding steps to install the torque links. Tighten center bolt snug, then tighten to next castellation and install cotter pin.

5-78. DISASSEMBLY AND ASSEMBLY. (Refer to figure 5-16.) The figure may be used as a guide for disassembling and assembling the torque links. Bushings should not be removed except for replacement of parts. Replace any parts if excessivley worn.

5-79. UPLOCK MECHANISM. (Refer to figure 5-17.)

5-80. DESCRIPTION. The nose gear uplock mechanism, located at the top of the nose wheel well, is a hydraulically-unlocked hook that is spring-loaded to the locked position. The nose gear up indicator switch is attached to a bracket welded to the uplock hook.

5-81. REMOVAL AND INSTALLATION. (Refer to figure 5-17.)
a. With master switch OFF, pump landing gear doors open.
b. With doors open, all components are readily accessible at the top forward of the nose wheel well.
c. Disconnect links (11) from actuator (10).
d. Disconnect spring (9) from aircraft structure or from hook on bellcrank assembly (3).
e. Unscrew nut attaching uplock switch (5).
f. Remove bolt (1) through right-hand tunnel wall.

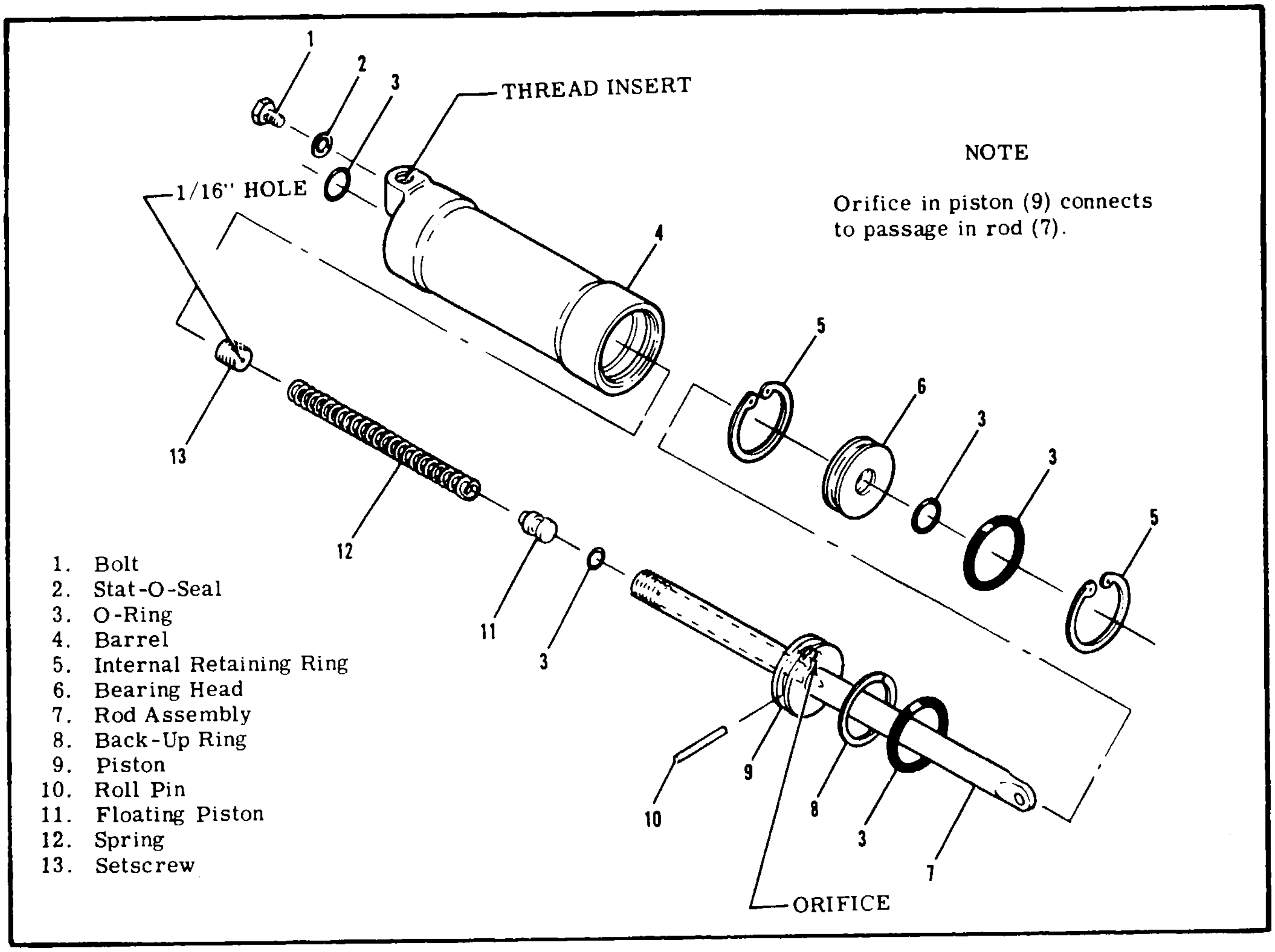


Figure 5-15. Shimmy Dampener

g. Reverse the preceding steps to install the nose gear uplock mechanism, rigging in accordance with applicable paragraph.

5-82. DOWNLOCK MECHANISM. (Refer to figure 5-18.)

5-83. DESCRIPTION. The nose gear downlock is a hook at the piston rod end of the nose gear actuator.

5-84. REMOVAL AND INSTALLATION. Refer to figure 5-18 and paragraph 5-87, which describes procedures for removing the nose gear actuator. Components of the downlock mechanism will be freed as the actuator is removed.

5-85. NOSE GEAR ACTUATOR. (Refer to figure 5-19.)

5-86. DESCRIPTION. The nose gear actuator extends and retracts the nose gear and serves as a rigid drag strut in the gear-down position. The claw-like hook on the actuator serves as the downlock for the nose gear. On 1970 Models, an internal lock position-locks the piston within the cylinder until hydraulic pressure of approximately 125 psi is applied to the gear-up port of the actuator. Beginning with 1971 Models, the internal lock is not installed in the actuator. Beginning with 1975 Models, the direction of the bolt through the hook assembly portion of the actuator is reversed, and a spring clip is added under the castellated nut and washer. The spring clip attaches the retractable step cable turnbuckle to the nose gear actuator.

5-87. REMOVAL.

a. Tag for identification and disconnect electrical wires at the gear-down switch located at the forward end of the actuator.

b. Open doors and jack aircraft or weight tail down to raise nose wheel off the ground.

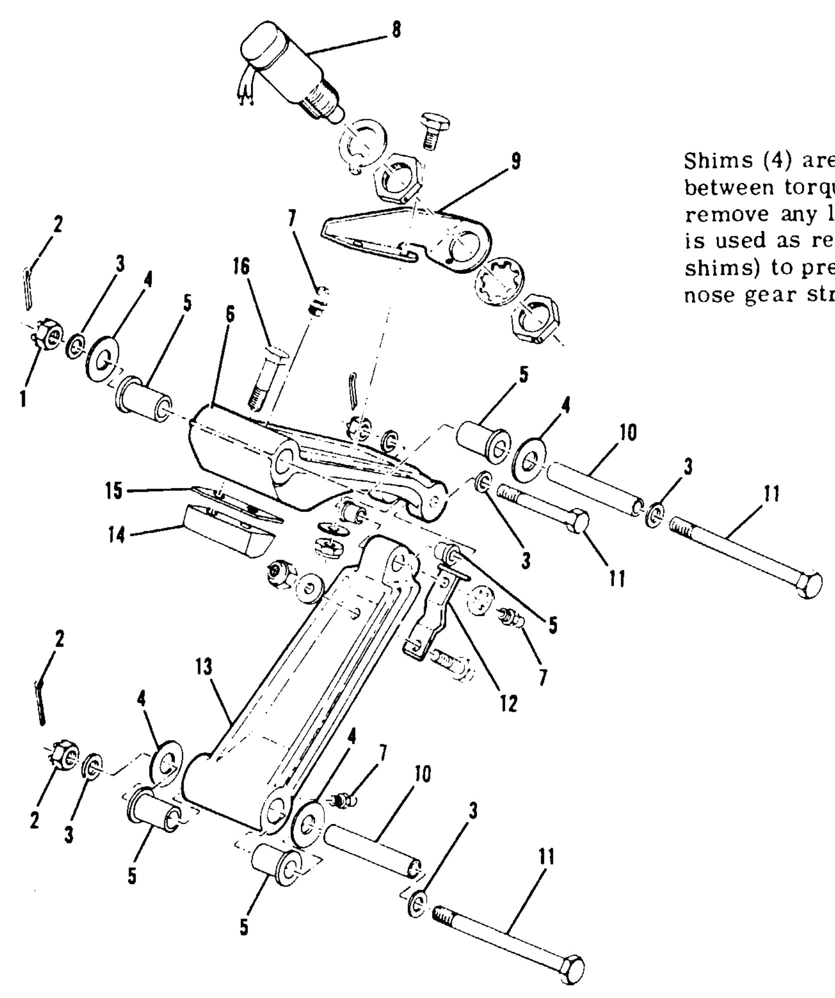
c. Disconnect hydraulic hoses from actuator. Cap or plug hose and fitting openings to prevent entry of foreign material.

d. Disconnect actuator from lower trunnion by removing cotter pin, castellated nut, washers and bolt. Retain components of downlock mechanism which will be freed by removing the bolt.

5-88. DISASSEMBLY. (1970 Models) (Refer to figure 5-19.)

a. Unlock cylinder by applying hydraulic pressure to port in head (25).

b. Loosen locknut (12) at end of piston rod and unscrew parts (1 thru 11) as an assembly from piston



NOTE

Shims (4) are available to use as required between torque link and nose gear fork to remove any looseness. Also, shim (15) is used as required (maximum of three shims) to prevent over extension of the nose gear strut. Refer to figure 5-13.

1. Nut
2. Cotter Pin
3. Washer
4. Shim
5. Bushing
6. Upper Torque Link
7. Grease Fitting
8. Safety Switch
9. Bracket
10. Spacer
11. Bolt
12. Switch Actuator
13. Lower Torque Link
14. Centering Lug
15. Shim
16. Bolt

Figure 5-16. Nose Gear Torque Links

rod. Remove locknut (12) from piston rod.

c. Mark barrel (33) and head (25) so that same end of barrel may be reinstalled in head (25) when reassembling actuator. Remove safety wire from locknuts (32 and 35).

d. Remove setscrew (18) in bearing end (17) and loosen locknut (35). While using a strap wrench on barrel (33), remove bearing end (17) from barrel.

e. Pull piston (20) from barrel using care to prevent loss of balls (23) as piston is removed from barrel.

f. Remove setscrew (18) from head (25) and loosen locknut (32). Using a strap wrench on barrel (33), remove head (25) from barrel.

g. Remove O-ring (19) from head (25) and remove plunger (29) and parts (26 thru 31) by applying a sharp blast of air in the vent hole located in head (25).

h. Remove all O-rings and backup rings.

i. Disassemble hook assembly.

5-89. INSPECTION OF PARTS. Make the following inspections to ascertain that all parts are in a serviceable condition.

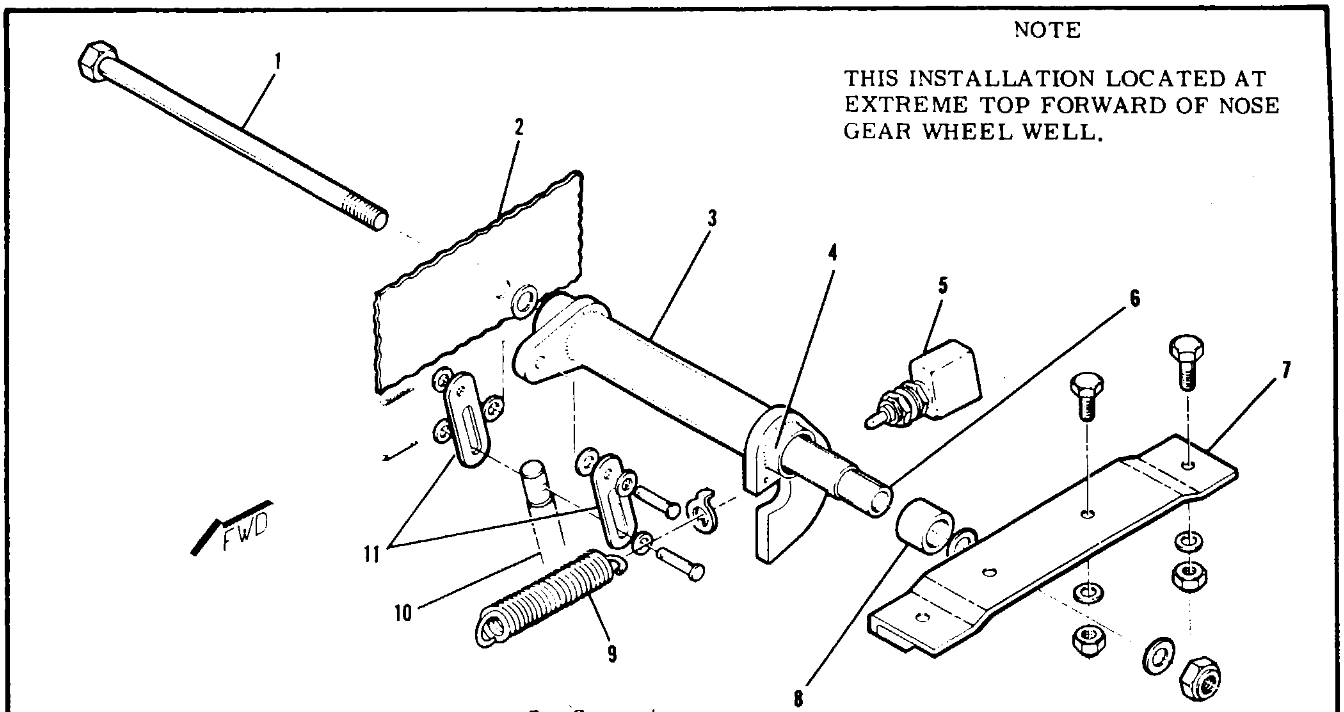
a. Inspect all threaded surfaces for cleanliness and for freedom from cracks and excessive wear.

b. Inspect spring (6) for evidence of breaks and distortion. The free length of the spring must be 2.460±.080 inches and compress to 2.00 inches under a 19.5±1.95 pound load.

c. Inspect spring (26) for evidence of breaks and distortion. The free length of the spring must be 1.055 inches and compress to .875 inch under a 35±3.5 pound load.

d. Inspect hooks (4 and 10), spring guide (5), bearing end (17), piston and stop assembly (20), barrel (33), head (25) and bushing (24) for cracks, chips, scratches, scoring, wear, or surface irregularities which may affect their function or the overall function of the nose landing gear actuator.

5-90. ASSEMBLY. Repair of most parts of the nose gear actuator assembly is impractical. Replace defective parts with serviceable parts. Minor scratches and scores may be removed by polishing with fine abrasive crocus cloth (Federal Specifica-



1. Bolt
2. RH Tunnel Wall
3. Bellcrank and Hook Assembly
4. Bracket (on opposite side of hook)
5. Uplock Switch
6. Inner Bearing Race
7. Support
8. Bearing
9. Spring
10. Actuator
11. Links

Figure 5-17. Nose Gear Uplock Installation

tion P-C-458) providing their removal does not affect the operation of the unit. Install all new O-rings and backup rings during reassembly of the actuator.

a. Install O-ring (28) and backup ring (27) in groove on plunger (29).

b. Insert spring (26) and plunger (29) into head (25). Install stop washer (30) and race (31) over end of plunger (29) and install O-ring (19) in groove in head (25).

c. With locknut (32) on barrel, screw barrel (33) into head (25) until tapped hole in head is aligned with hole in barrel.

NOTE

Be sure that marked end of barrel is installed in head (25). Barrel should tighten against race to prevent any movement between stop washer and race.

d. Install and tighten set screw (18) in head (25). Tighten locknut (32).

e. Install O-ring (22) and backup rings (21) in groove on piston and install balls (23) in holes of piston.

f. Insert piston into barrel. Be sure all six balls are in place in piston.

g. Install O-rings (19 and 14) and backup rings (13) in grooves in bearing end (17).

h. With locknut (35) on barrel, screw bearing end (17) on barrel until tapped hole in bearing end is aligned with hole in barrel. Install and tighten setscrew in bearing head (17). Tighten locknut (35).

NOTE

Centerline of hook pins and centerline of bushing hole must align within .005 inch with cylinder locked at a length of 11.580 ±.031 inches from centerline of hookpins to centerline of bushing (24) in head (25).

i. Install locknut (12) on end of piston. Assemble and install hook assembly on piston.

NOTE

When assembling hook assembly, lubricate as shown in Section 2.

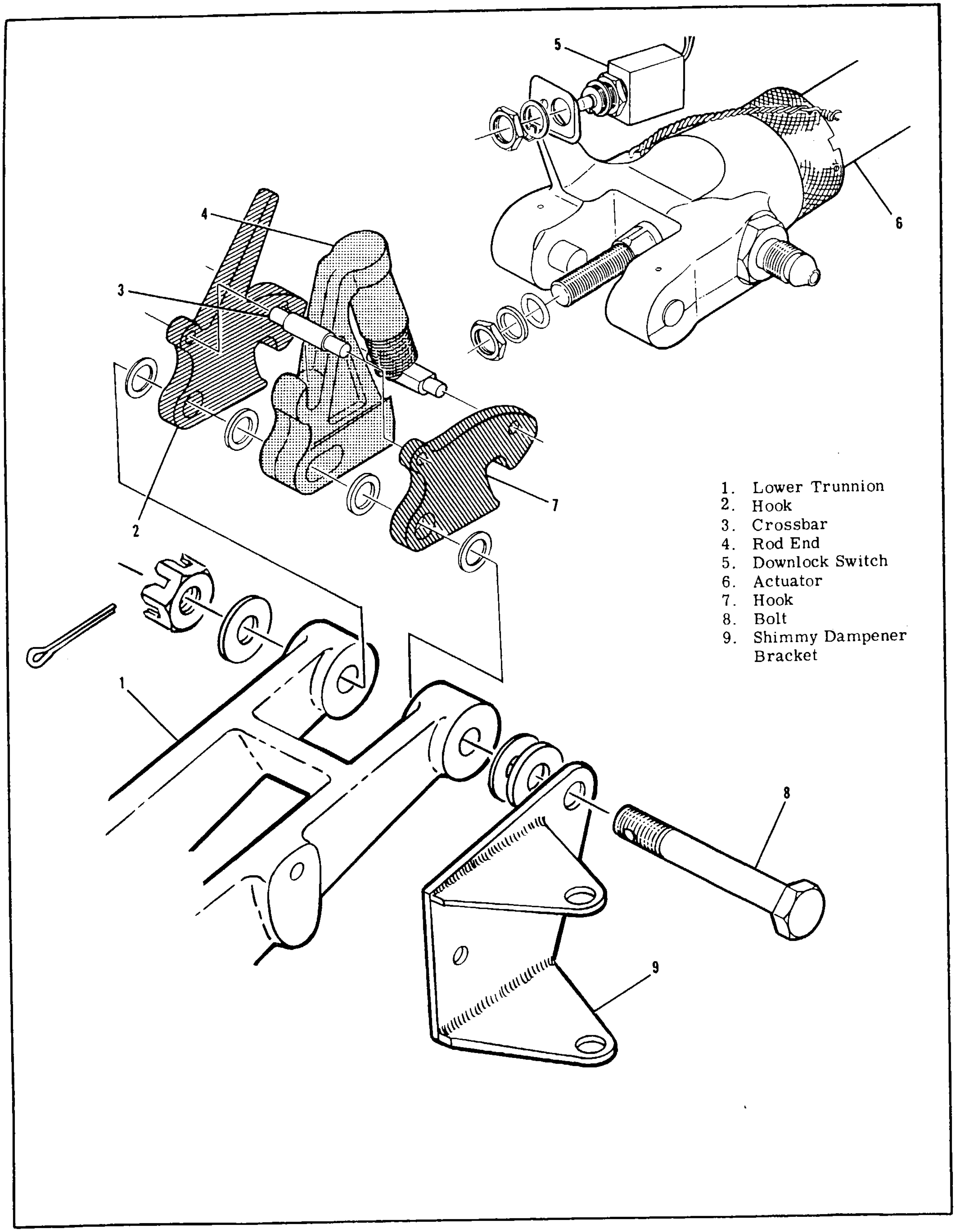
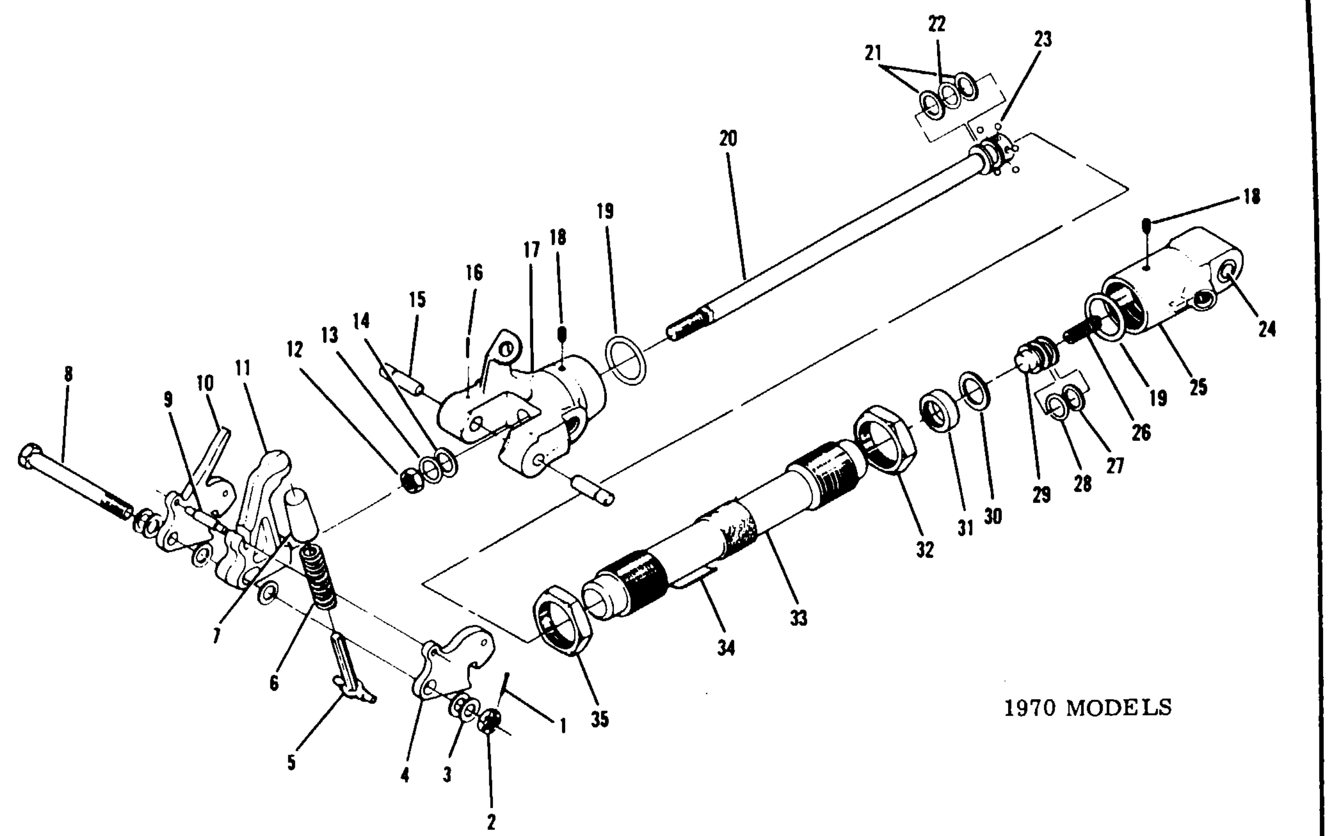


Figure 5-18. Nose Gear Downlock Installation



1. Cotter Pin
2. Nut
3. Washers
4. Hook
5. Spring Guide
6. Spring
7. Shield
8. Bolt
9. Crossbar
10. Hook
11. Rod End
12. Nut
13. Back-Up Ring
14. O-Ring
15. Pin
16. Pin
17. Bearing End
18. Setscrew
19. O-Ring
20. Piston
21. Back-Up Rings
22. O-Ring
23. Balls
24. Bushing
25. Head
26. Spring
27. Back-Up Ring
28. O-Ring
29. Plunger
30. Washer
31. Race
32. Nut
33. Barrel
34. Nameplate
35. Nut

Figure 5-19. Nose Gear Actuator (Sheet 1 of 3)

5-91. DISASSEMBLY. (1971 THRU 1974 MODELS) (Refer to figure 5-19, sheet 2.)

a. Loosen lock nut at end of piston rod and remove rod end and associated parts as an assembly. Remove lock nut from piston rod.

b. Remove safety wire from knurled nut and loosen knurled nut.

c. Remove bearing end from cylinder and remove nut from cylinder.

d. Pull piston from cylinder.

e. Remove O-rings and back-up rings from bearing end and piston.

f. Disassemble hook assembly.

5-92. INSPECTION OF PARTS. Make the following inspections to ascertain that all parts are in a serviceable condition.

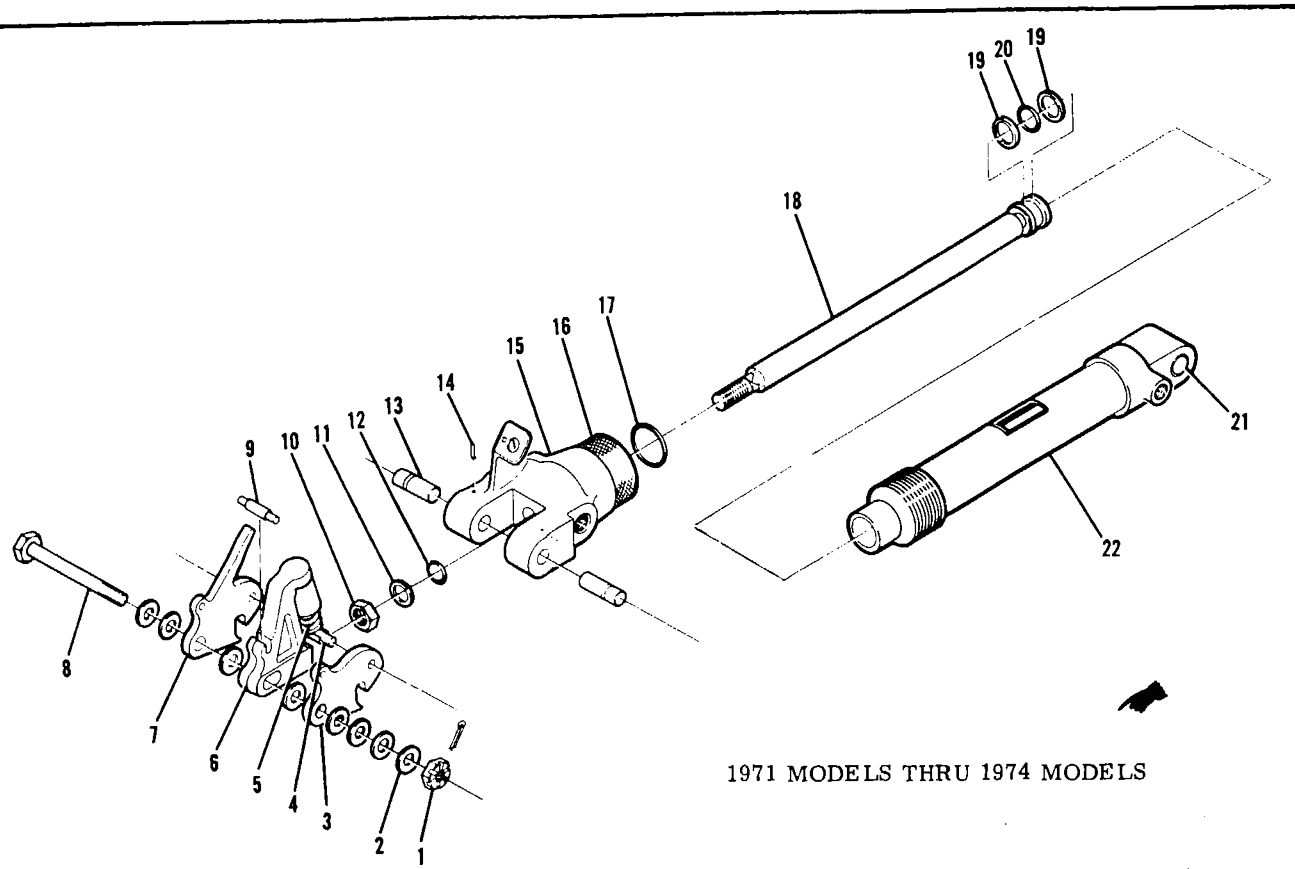
a. Inspect all threaded surfaces for cleanliness and for freedom of cracks and excessive wear.

b. Inspect the downlock hook spring for evidence of breaks and distortion. The free length of the spring must be 2.406 ± 0.080 inches and compressed to 2.00 inches under a 19.80 ± 2.0 pound load.

c. Inspect hooks, spring guide, bearing end, piston, cylinder, and bushing for cracks, chips, scratches, scoring, wear, or surface irregularities which may affect their function or the overall function of the nose landing gear actuator.

5-93. ASSEMBLY. Repair of most parts of the nose gear actuator assembly is impractical. Replace defective parts with serviceable parts. Minor scratches and scores may be removed by polishing with fine abrasive crocus cloth (Federal Specification P-C-458) providing their removal does not affect the operation of the unit. Install all new O-rings and back-up rings during reassembly of the actuator.

a. Install O-rings and back-up ring in bearing end.



1. Nut
2. Washers
3. Hook
4. Spring Guide
5. Downlock Hook Spring
6. Rod End
7. Hook
8. Bolt
9. Crossbar
10. Lock Nut
11. Back-Up Ring
12. O-Ring
13. Hook Pins
14. Roll Pin
15. Bearing End
16. Knurled Nut
17. O-Ring
18. Piston
19. Back-Up Ring
20. O-Ring
21. Bushing
22. Cylinder

Figure 5-19. Nose Gear Actuator (Sheet 2 of 3)

b. Install O-ring and back-up rings on piston.
c. Insert piston into cylinder. Do not damage back-up rings and O-ring when inserting piston.
d. With knurled nut on cylinder, install bearing end on cylinder. Use care and avoid damage to O-rings and back-up ring when installing bearing end on cylinder.

NOTE

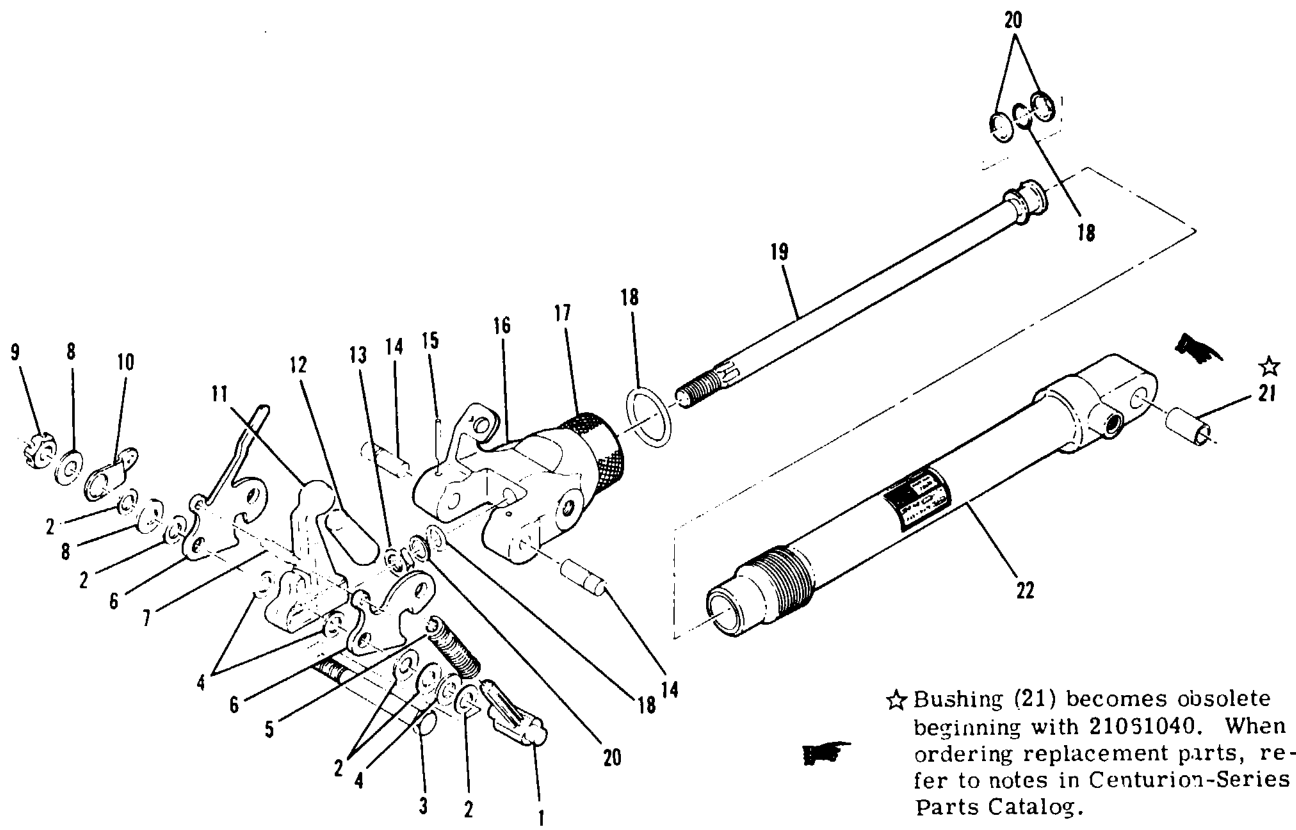
Centerline of hook pins and centerline of bushing hole must align within 0.005 inch with cylinder assembled at a length of 11.580 ± 0.03 inches measured from centerline of hook pins to centerline of bushing in cylinder anchor end.

e. Tighten and safety wire knurled nut.
f. Install lock nut on end of piston. Assemble and install hook assembly on piston.

NOTE

When assembling hook assembly, lubricate as shown in Section 2.

5-93A. DISASSEMBLY. (BEGINNING WITH 1975 MODELS (Refer to figure 5-19, sheet 3.)
a. Loosen lock nut at end of piston rod and remove rod end assembly as a unit; remove lock nut from piston rod.
b. Remove safety wire from knurled nut, and loosen knurled nut.
c. Remove bearing end from cylinder, and remove nut from cylinder.
d. Pull piston from cylinder.
e. Remove O-rings and back-up rings from bearing end and piston.
f. Disassemble hook assembly.



1. Spring Guide
2. Thin Washer
3. Bolt
4. Thick Washer
5. Spring
6. Hook
7. Crossbar
8. Large Washer
9. Nut
10. Spring Clip
11. Rod End
12. Shield
13. Nut
14. Pin
15. Roll Pin
16. Bearing End
17. Knurled Nut
18. Packing
19. Piston
20. Back-Up Ring
21. Bushing
22. Cylinder

Figure 5-19. Nose Gear Actuator (Sheet 3 of 3)

NOTE

Direction of bolt through hook assembly is reverse of that of previous Models. Note that spring clip is installed under castellated nut and washer.

5-93B. INSPECTION OF PARTS. Make the following inspections to ascertain that all parts are in a serviceable condition.

a. Inspect all threaded surfaces for cleanliness and for freedom of cracks and excessive wear.

b. Inspect downlock hook spring for evidence of breaks and distortion. Free length of the spring must be 2.406±0.080 inches and compressed to 2.00 inches under a 19.80±2.0 pound load.

c. Inspect hooks, spring guide, bearing end, piston, cylinder and bushing for cracks, chips, scratches, scoring, wear or surface irregularities which may affect their function or the overall function of the nose gear actuator.

5-93C. ASSEMBLY. Repair of most parts of the nose gear actuator assembly is impractical. Replace defective parts with serviceable parts. Minor scratches and scores may be removed by polishing with fine abrasive crocus cloth (Federal Specification P-C-458), providing their removal does not affect the operation of the unit. Install all new O-rings and back-up rings during reassembly by the actuator.

a. Install packings and back-up ring in bearing end.

b. Install packing and back-up rings on piston.

c. Insert piston into cylinder. Do not damage back-up rings and packing when inserting piston.

d. With knurled nut on cylinder, install bearing end on cylinder. Use care to avoid damage to packings and back-up ring when installing bearing end on cylinder.

NOTE: Centerline of hook pins and centerline of bushing hole must align within 0.005 inch with cylinder assembled at a length of 11.580±0.03 inches, measured from centerline of hook pins to centerline of bushing in cylinder anchor end.

E. Tighten and safety wire knurled nut.

F. Install lock nut on end of piston. Assemble and install hook assembly on piston.

NOTE: While assembling hook assembly, lubricate as stipulated in Figure 2-5. Note that direction of bolt through hook assembly is reverse of that of previous models. Note that spring clip is installed under castellated nut and washer.

5-94. INSTALLATION.

NOTE: Before installing nose gear actuator, check condition of fit and attaching bolts and bushings. Replace any defective parts. Fill actuator with hydraulic fluid.

A. Attach aft end of actuator to fuselage structure with bolt, washer and nut. Safety nut with a cotter pin.

B. Assemble and attach nose gear downlock mechanism to lower trunnion as shown in Figure 5-18. On aircraft equipped with retractable step, be sure spring clip is installed in position shown on Sheet 3 of Figure 5-19. Torque nut to value stipulated in Figure 2-5.

C. Attach hydraulic hoses to actuator.

D. Connect electrical wires at gear-down switch, located at forward end of actuator.

E. Attach retractable step cable turnbuckle, if installed, and rig in accordance with instructions outlined in applicable paragraph. Be sure to safety turnbuckle after rigging step cable.

5.95. REMOVAL AND INSTALLATION OF NOSE GEAR UPLOCK AND RELEASE ACTUATOR.

A. Disconnect uplock spring.

B. Disconnect and cap or plug hydraulic lines at actuator.

C. Disconnect and tag up-limit switch electrical wires.

D. Remove cotter pin and clevis pin attaching actuator link to bellcrank arm. Note position of spacer washers and direction of clevis pin.

E. Remove nuts, washers, and bolts attaching actuator to wheel well tunnel wall. Note and retain shims between actuator and tunnel wall.

F. Remove bolt, washer, and nut attaching bellcrank at top of nose wheel well. Use care to avoid dropping bearings in bellcrank assembly. Retain washers used as shims at each end of bellcrank.

G. Install uplock mechanism and actuator by reversing the preceding steps. Install shims and washers as noted during removal.

5-96. DISASSEMBLY, INSPECTION OF PARTS AND ASSEMBLY. Refer to Figure 5-5 and paragraphs 5-25 thru 5-27.

5-97. NOSE GEAR DOOR SYSTEM. (Refer to Figure 5-20.)

5-98. DESCRIPTION. The nose gear door system consists of a right and left forward door, actuated by push-pull rods and a torque tube assembly, and a right and left aft door, mechanically linked to the nose gear trunnion.

5-99. OPERATION. The nose gear forward doors open for nose gear retraction or extension and close again when the cycle is completed. These doors are held in the closed position by the door lockout valve, trapping fluid in the door lines. Actuation of the nose gear forward doors is accomplished by a double-acting hydraulic cylinder. The nose gear aft doors are mechanically linked to the nose gear trunnion. These doors open as the nose gear extends and close as it is retracted. For maintenance purposes, the doors are opened by pumping the aircraft hand pump with the master switch in "OFF" position.

5-100. REMOVAL AND INSTALLATION OF NOSE WHEEL DOORS. (Refer to Figure 5-20.)

A. Open landing gear doors.

B. Remove engine cowl.

C. Disconnect push-pull rod from bracket on door by removing nut, bolt and washers.

D. Remove nuts and bolts attaching each hinge pivot. Work from upper side of cowl opening to remove bolts. Retain bushings in hinge pivot.

E. To replace the nose wheel doors, reverse the preceding steps.

5-101. REMOVAL AND INSTALLATION OF NOSE WHEEL DOOR MECHANISM. (Refer to Figure 5-20.)

A. Open landing gear doors.

B. Disconnect actuator at torque tube by removing nut, washer, and bolt.

C. Disconnect and cap or plug hydraulic hose at actuator.

D. Remove nut, washer, and bolt attaching actuator to its mounting bracket in nose wheel well.

E. Disconnect door push-pull rods at door bracket.

F. Remove torque tube by removing nuts, washer and bolts securing it to its mounting brackets.

G. For installation, reverse the preceding steps.

5-102. REMOVAL AND INSTALLATION OF NOSE GEAR STRUT DOORS. (Refer to Figure 5-20.)

A. Disconnect tie rod assemblies from door.

B. Remove screw, washer and nut securing door hinge pin and pull hinge pin from door hinge, allowing door to be removed.

C. To remove tie rod assemblies, remove ball end stud securing tie rod to nose gear trunnion. Do not change length of rod assembly unless necessary. Changing rod assembly length will make readjustment necessary on installation.

D. Install strut doors and linkage by reversing the preceding steps.

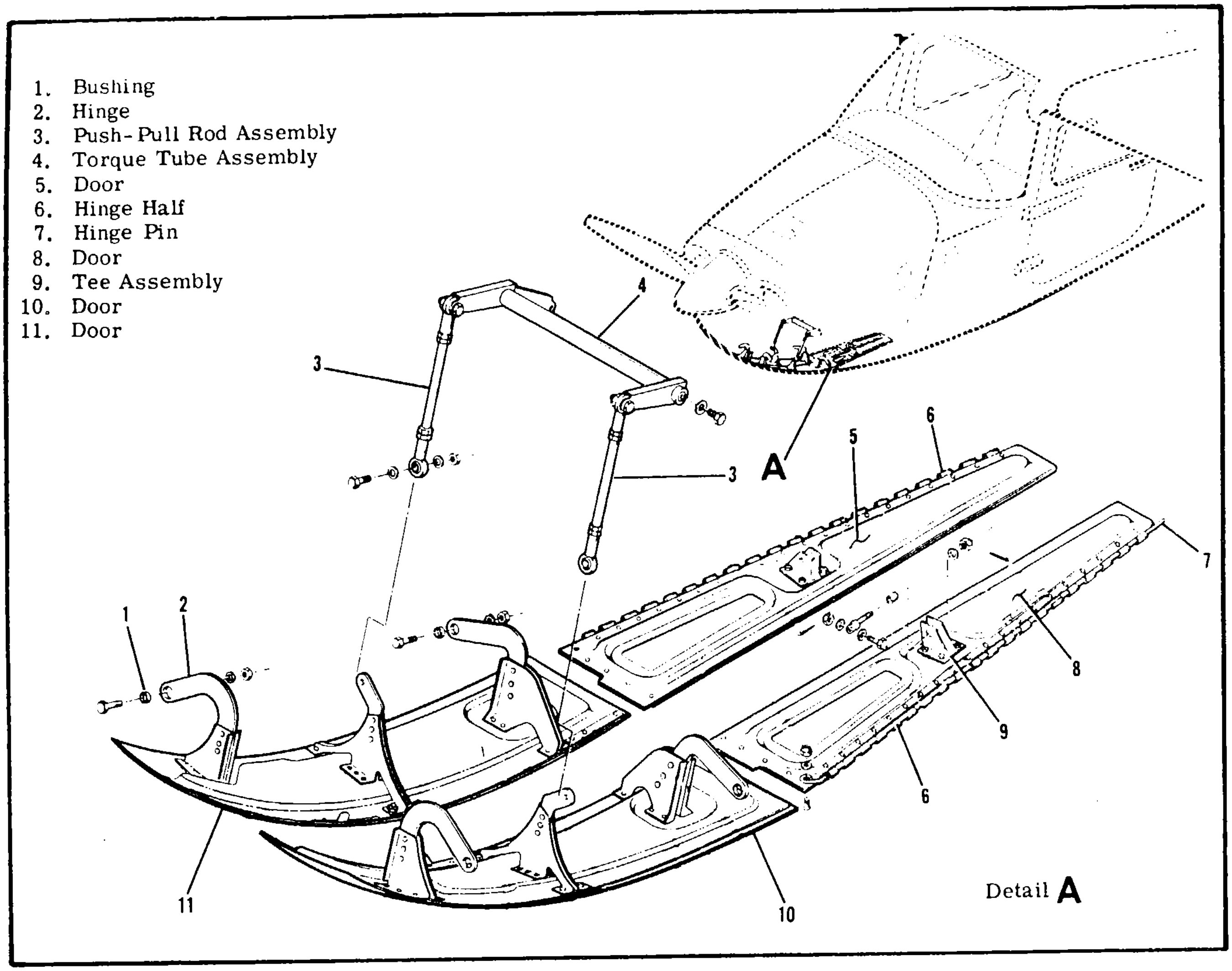


Figure 5-20. Nose Landing Gear Doors

NOTE

On aircraft equipped with retractable step, install right-hand tie rod on outboard side of eyebolt only, when connecting nose gear strut doors. Left-hand tie rod should be installed in normal manner.

5-103. NOSE WHEEL STEERING SYSTEM. (Refer to figure 5-21.)

5-104. DESCRIPTION. The nose wheel steering system links the rudder pedals to the nose wheel fork, affording steering control through use of the rudder pedals. The nose gear torque links straighten the nose wheel as the landing gear is retracted.

5-105. REMOVAL AND INSTALLATION. Figure 5-21 illustrates details of the nose wheel steering system, and may be used as a guide in determining relationship of system components.

5-106. RIGGING. Since the nose wheel steering system is connected to the rudder control system, an adjustment to one system would directly affect the other. Refer to Section 10 for rigging instructions for the rudder system and the nose wheel steering system.

5-107. TROUBLE SHOOTING. (Refer to paragraph 5-66.)

5-108. NOSE WHEEL AND TIRE ASSEMBLY.

5-109. DESCRIPTION. The aircraft may be equipped with either Cleveland or McCauley wheel assemblies. Separate disassembly, inspection and reassembly instructions are provided for each type. Basic differences of the two types are discussed in paragraph 5-43D, and thru-bolt nut and capscrew torque values are listed in figure 5-9A.

CAUTION

Use of recapped tires is not recommended. However, if recapped tires are used on the aircraft, make sure there is sufficient clearance between tire and wheel well structure when landing gear is in retracted position.

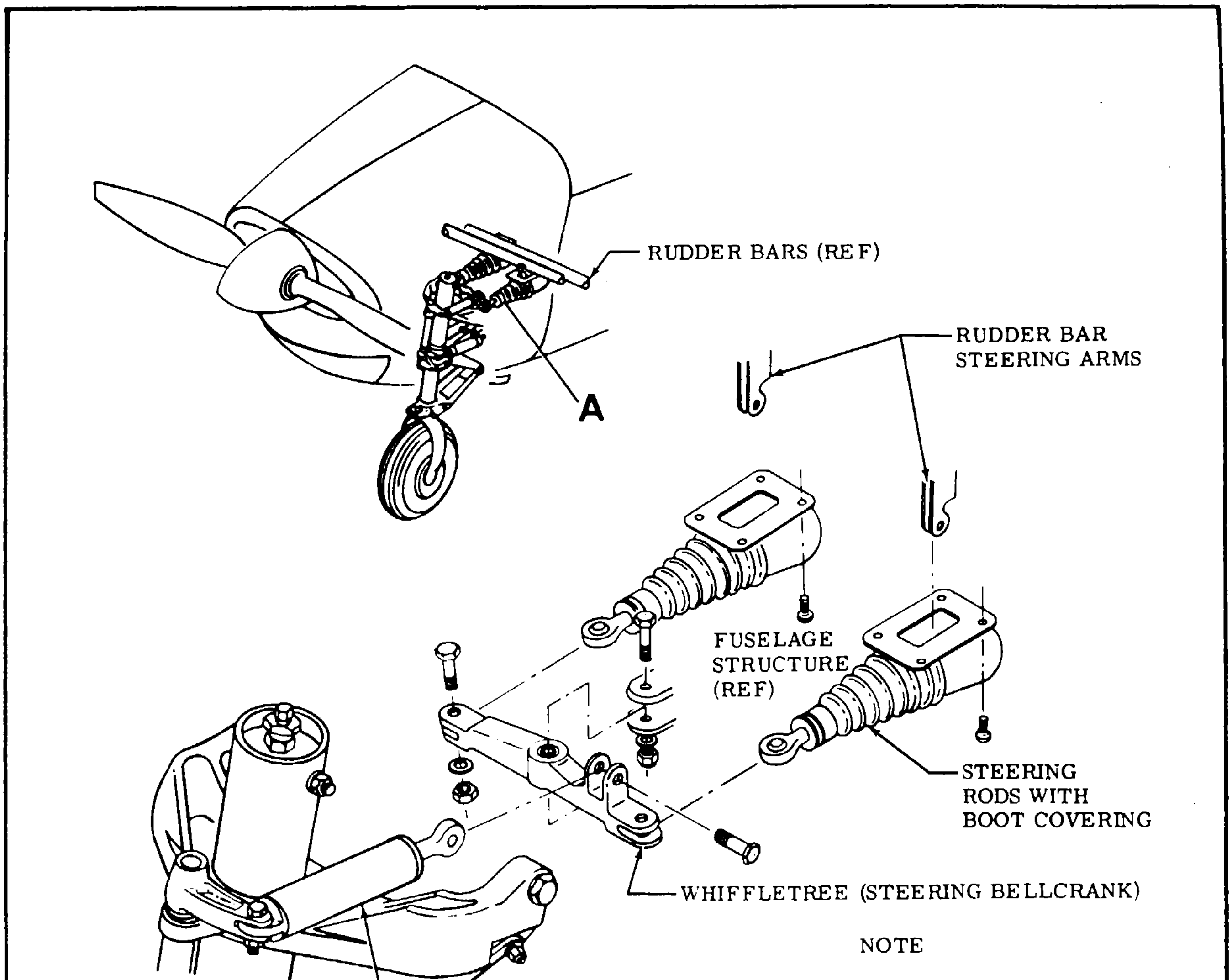


Figure 5-21. Nose Wheel Steering System

5-110. OPERATION. The nose gear wheel is free rolling on an independent axle and is used to steer the aircraft while taxiing by means of the nose gear steering system.

5-111. REMOVAL OF NOSE WHEEL AND TIRE ASSEMBLY.

a. Weight the tail of the aircraft to raise the nose wheel off the ground.
b. Remove nose wheel axle bolt.
c. Use a rod or long punch inserted in ferrule to tap the opposite ferrule out of the nose wheel fork. Remove both ferrules and pull nose wheel from fork.
d. Remove spacers, axle tube and hub caps before disassembling the nose wheel.
e. Reverse the preceding steps to install the nose wheel. Tighten the axle bolt until a slight bearing drag is obvious when the wheel is turned. Back off the nut to the nearest castellation and install the cotter pin.

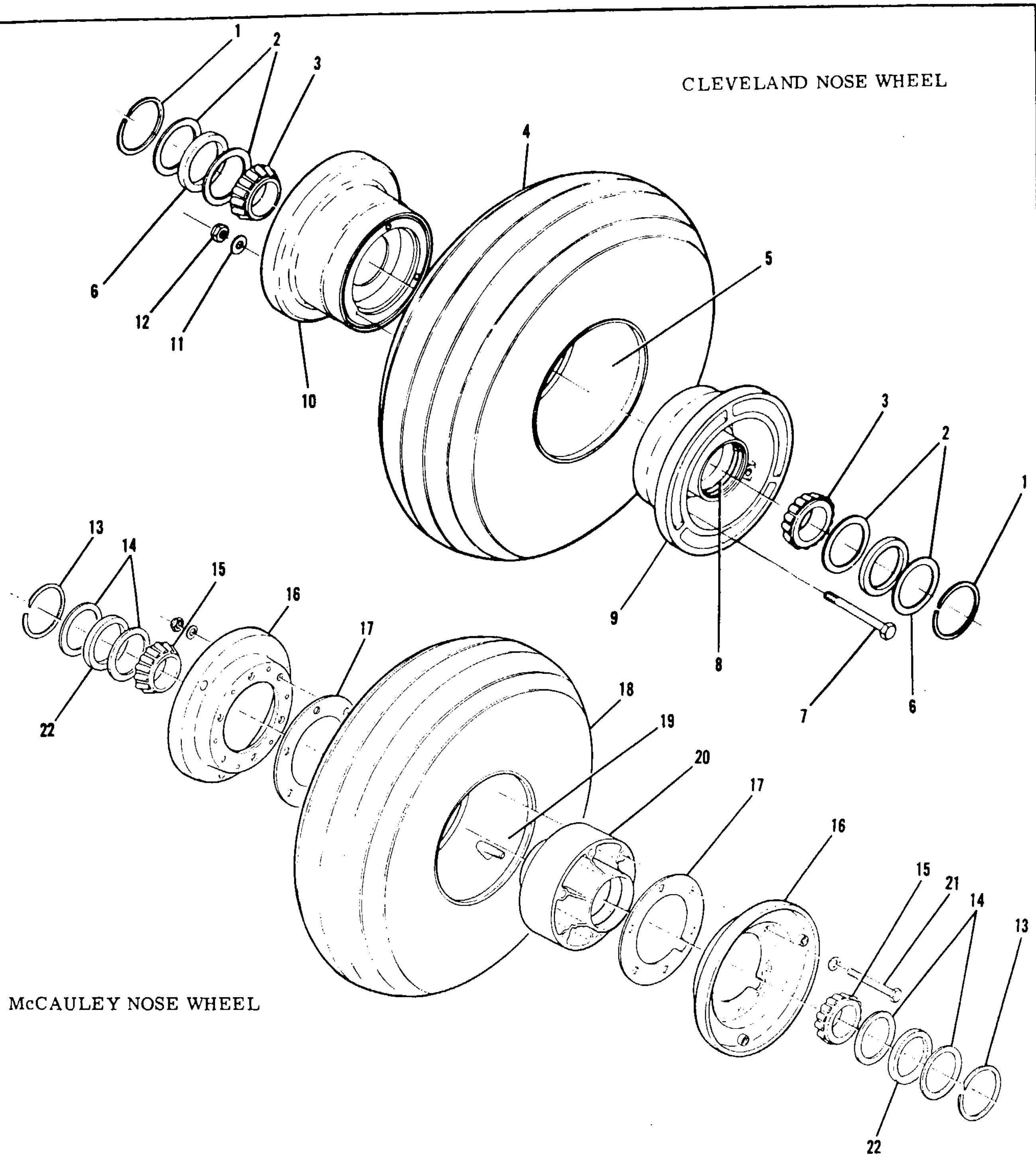
5-112. DISASSEMBLY OF CLEVELAND NOSE WHEEL AND TIRE ASSEMBLY (Refer to figure 5-22.)

a. Remove valve core, completely deflate tire, and break tire beads loose.

WARNING

Injury can result from attempting to separate the wheel halves with the tire inflated. Avoid damaging the wheel flanges when breaking the tire beads loose.

b. Remove thru-bolts and separate wheel halves.
c. Remove tire and tube.
d. Remove bearing retaining rings, grease seals, and bearing cones.



1. Snap Ring
2. Grease Seal Ring
3. Bearing
4. Tire
5. Tube
6. Grease Seal Felt
7. Thru-Bolt
8. Bearing Cup
9. Male Wheel Half
10. Female Wheel Half
11. Washer
12. Nut
13. Retaining Ring
14. Grease Seal Ring
15. Bearing
16. Wheel Flange
17. Spacer
18. Tire
19. Tube
20. Hub Assembly
21. Thru-Bolt
22. Grease Seal Felt

Figure 5-22. Nose Wheels

NOTE

The bearing cups are a press fit in the wheel halves and should not be removed unless replacement is necessary. To remove, heat wheel half in boiling water for 15 minutes. Using an arbor press, if available, press out bearing cup and press in the new one while the wheel is still hot.

5-113. INSPECTION AND REPAIR OF CLEVELAND NOSE WHEEL AND TIRE ASSEMBLY. Procedures outlined in paragraph 5-42 for the main wheel and tire assemblies may be used as a guide for inspection and repair of the nose wheel and tire assembly.

5-114. REASSEMBLY OF CLEVELAND NOSE WHEEL AND TIRE ASSEMBLY. (Refer to figure 5-22.)

a. Place tube inside tire and align balance marks on tire and tube.

b. Place tire and tube on wheel half with tube valve stem through hole in wheel half.

CAUTION

Uneven or improper torque of the thru-bolt nuts may cause bolt failure with resultant wheel failure.

c. Insert thru-bolts, position other wheel half, and secure with nuts and washers. Torque bolts to value stipulated in figure 5-9A.

d. Clean and repack bearing cones with clean wheel bearing grease.

e. Assemble bearing cones, seals, and retainers into wheel half.

f. Inflate tire to seat tire beads, then adjust to correct pressure.

5-115. DISASSEMBLY OF McCAULEY NOSE WHEEL AND TIRE ASSEMBLY. (Refer to figure 5-22.)

a. Remove screws attaching hub caps; remove hub caps.

CAUTION

Injury can result from attempting to remove wheel flanges with tire and tube inflated. Avoid damaging wheel flanges when breaking tire beads loose. A scratch, gouge or nick in wheel flange could cause wheel failure.

b. Completely deflate tire and break tire beads loose at wheel flanges.

c. If the wheel and tire assembly is equipped with thru-bolts, remove thru-bolt nuts and washers, remove thru-bolts and separate wheel flanges from wheel hub. Retain spacers between wheel flanges and wheel hub.

d. If the wheel and tire assembly is equipped with capscrews, remove capscrews and washers and separate wheel flanges from wheel hub. Retain spacers on each side of wheel hub.

e. Remove wheel hub from tire and tube.

f. Remove retainer rings and remove grease seal retainers, grease seal felts and bearing cones from wheel hub.

NOTE

The bearing cups (races) are a press-fit in the wheel hub and should not be removed unless a new part is to be installed. To remove the bearing cup, heat wheel hub in boiling water for 30 minutes, or in an oven not to exceed 121° (250°F). Using an arbor press, if available, press out the bearing cup and press in the new bearing cup while the wheel hub is still hot.

5-116. INSPECTION AND REPAIR OF McCAULEY NOSE WHEEL AND TIRE ASSEMBLY. (Refer to figure 5-22.)

a. Clean all metal parts, grease seal felts and mylar spacers in cleaning solvent and dry thoroughly.

b. Inspect wheel flanges and wheel hub for cracks. Cracked wheel flanges or hubs shall be discarded and new parts will be installed. Sand out smooth nicks, gouges and corroded areas. When the protective coating has been removed, the area should be cleaned thoroughly, primed with zinc chromate and painted with aluminum lacquer.

c. Carefully inspect bearing cones and cups for damage and discoloration. After cleaning, pack bearing cones with clean aircraft wheel bearing grease before installing in the wheel hub. (Refer to Section 2 for grease type.)

5-117. REASSEMBLY OF McCAULEY NOSE WHEEL AND TIRE ASSEMBLY. (Refer to figure 5-22.)

a. Install tube in tire, aligning index marks on tire and tube.

b. Place wheel hub in tire with valve stem in cutout of wheel hub.

c. If the wheel and tire assembly is equipped with thru-bolts, place spacer and wheel flange on one side of wheel hub. With washer under head of thru-bolt, insert bolt through wheel flange and wheel hub. Place spacer and wheel flange on other side and align valve stem in cutout in wheel flange. Install washers and nuts on thru-bolts.

d. If the wheel and tire assembly is equipped with capscrews, place spacer and wheel flange on one side of wheel hub. Place washer under head of each capscrew, insert capscrew through wheel flange and spacer and start capscrews into wheel hub threads. Place spacer and wheel flange on other side of wheel hub and align valve stem in cutout in wheel flange. Place washer under head of each capscrew, insert capscrew through wheel flange and spacer and start capscrews into wheel hub threads.

CAUTION

Be sure that spacers and wheel flanges are seated on flange of wheel hub. Uneven or improper torque of thru-bolts or capscrews can cause failure of the thru-bolts, capscrews or hub threads with resultant wheel failure.

e. Tighten thru-bolts or capscrews evenly and torque to the value specified in figure 5-9A.

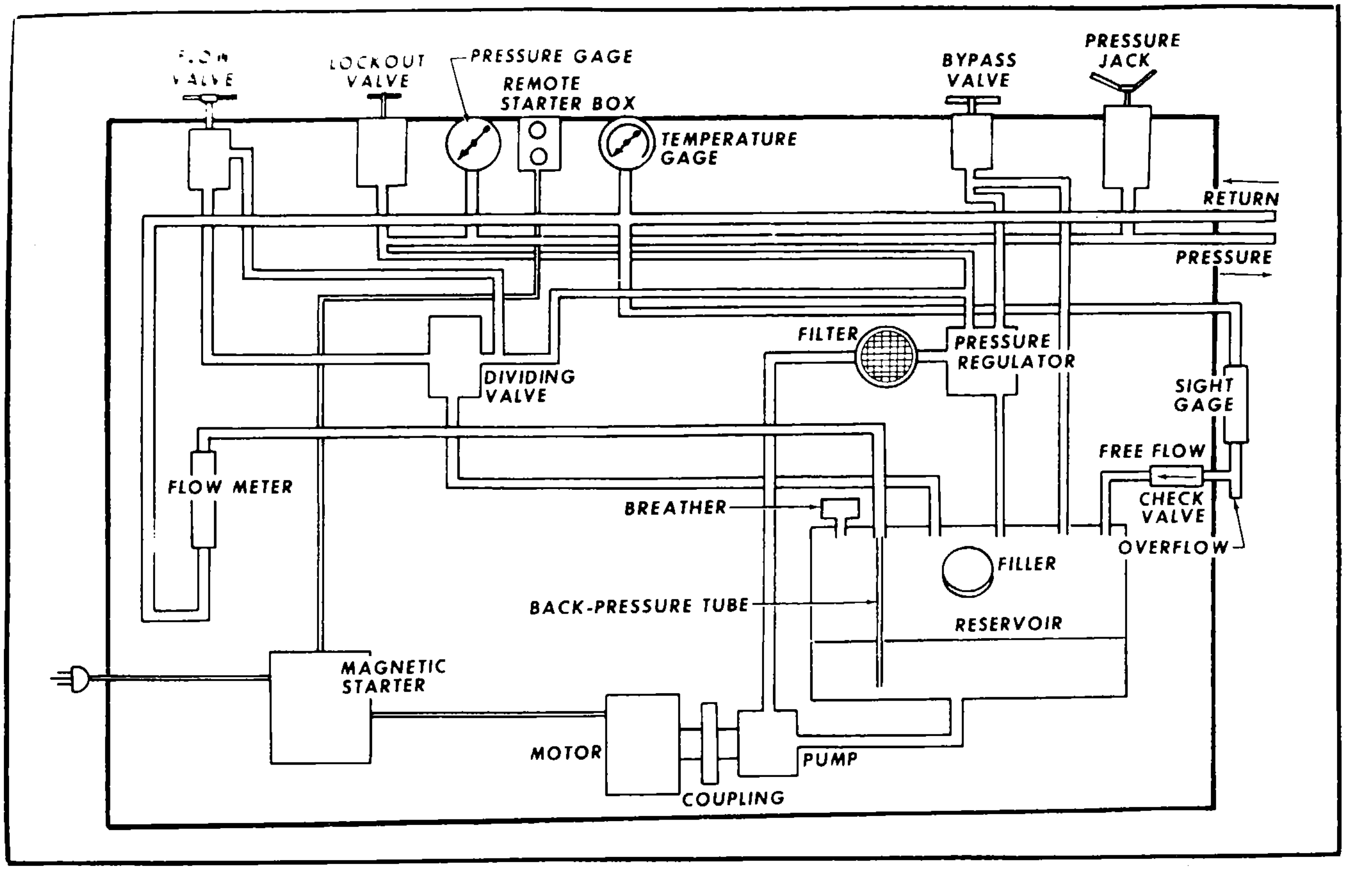


Figure 5-23. Simplified Schematic of Hydro Test Unit

Prior to using hydro-test unit with power pack, remove and dry off filler plug and dipstick. Adjust cap tension so that no movement of cap is apparent. Failure to accomplish these procedures could result in filler cap coming loose from power pack.

f. Clean and pack bearing cones with clean aircraft wheel bearing grease. (Refer to Section 2 for grease type.)
g. Assemble bearing cones, grease seal felts and retainer into wheel hub.
h. Inflate tire to seat tire beads, then adjust to correct pressure specified in figure 1-1.

5-118. LANDING GEAR HYDRAULIC POWER.

5-119. DESCRIPTION. (Refer to paragraph 5-2.)

5-120. OPERATION. (Refer to paragraph 5-3.)

5-121. HYDRAULIC TOOLS AND EQUIPMENT.

5-122. HYDRO TEST UNIT. A special portable hydrauiic servicing unit is available from the Cessna Service Parts Center. The Hydro Test unit combines a motor-driven pump, pressure jack, pressure gage, reservoir and controls into a compact unit. The Hydro Test, or its equivalent, is indispensible for servicing, testing and rigging of the landing gear system.

WARNING

When using the Hydro Test, make sure personnel are in the clear before cycling the landing gear. Apply hydraulic pressure carefully; gear and door operations are rapid when hydraulic flow is set near the full capacity of the Hydro Test unit.

A hydraulic test unit may be assembled locally if desired. Specifications for a test unit are listed in the following chart:

1. Flow	1.25 - .50 gpm
2. Reservoir	1 gallon
3. Check Valve	Aft of Pump in pressure line.
4. Filter	3 gpm, 10 micro in pressure line after pump and before relief valve.
5. Relief Valve	Pressure line after filter and discharging to reservoir.
6. Relief Valve Setting	1700 - 00 crack to 1500 psi (min) reseat.
7. Pressure Gage	2000 psi dial on pressure line and snubbed.

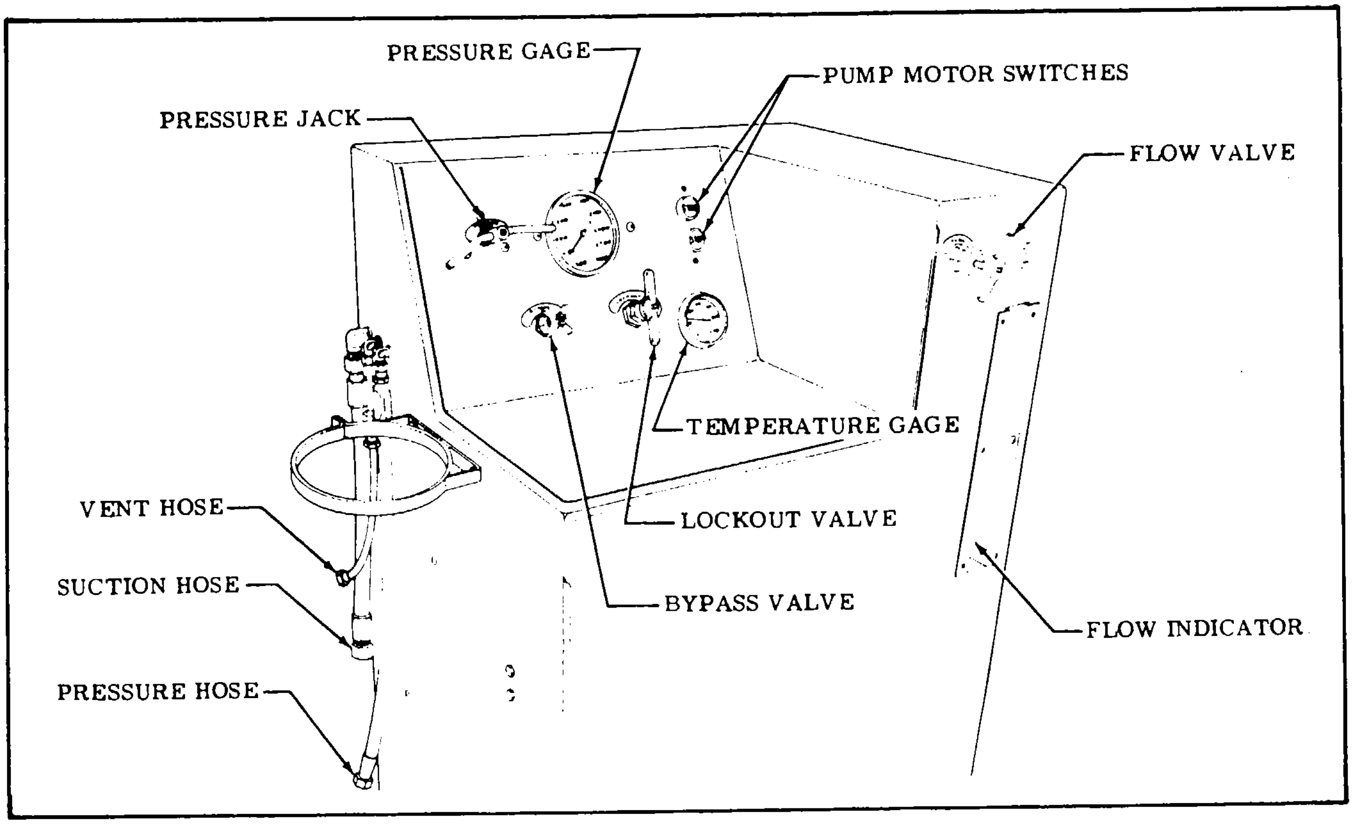


Figure 5-24. Hydro Test Unit

8.	Temperature Gage	50 to 200° at pump outlet.
9.	Suction Hose and Lines	-8 (1/2 inch tube size) (min)
10.	Pressure Hose and Line	-4 (1/4 inch tube size) (min)
11.	Power Input	3 hp (desired) 2 hp (min)

CAUTION

Means should be provided to keep connections to aircraft system clean and free of foreign material at all times.

5-123. OPERATION.

a. Always open bypass valve before starting test stand motor. This will permit motor to start under a no-load condition and will contribute to the service life of the test stand unit.

b. Operation of the test stand with bypass and lockout valves closed at the same time should not be continued for more than one minute.

c. Avoid continuous operation of the test stand under high pressure-low flow conditions; this will cause rapid heating of the fluid supply. When pressure is no longer needed, open bypass valve to relieve pressure.

d. Cap all hoses and stow on rack when not in use.

e. Avoid contamination of test stand fluid by checking condition of fluid in aircraft system before connecting test stand.

f. Before disconnecting test stand, check that aircraft reservoir is full; fluid may siphon from aircraft reservoir to test stand if idle for a period of time.

NOTE

The Hydro Test unit is a precision test instrument as well as a hydraulic power source. The retention of its accuracy and the length of its service life depend on good care and proper operation.

5-124. FLOW REGULATION. The following procedure is used to adjust the Hydro Test flow to any value desired for a specific operation, with the Hydro Test connected to the aircraft hydraulic system and the aircraft on jacks.

a. Open bypass valve and lockout valve.

b. Start Hydro Test pump motor.

c. Close bypass valve.

d. Open flow valve, then slowly close it until indicator in flow gage sight glass aligns with mark indicating desired flow. To read flow indicator, match line on widest part of indicator with fixed line on external part of gage.

5-125. CONNECTING HYDRO TEST.

a. Remove engine cowling from right side of engine.

b. Disconnect hydraulic pump suction (larger) hose from firewall fitting and connect Hydro Test suction (larger) hose to firewall fitting. Cap or plug disconnected pump hose.

c. Disconnect hydraulic pump pressure (smaller) hose from fitting in filter at firewall and connect Hydro Test pressure (smaller) hose to the fitting. Cap or plug disconnected hose.

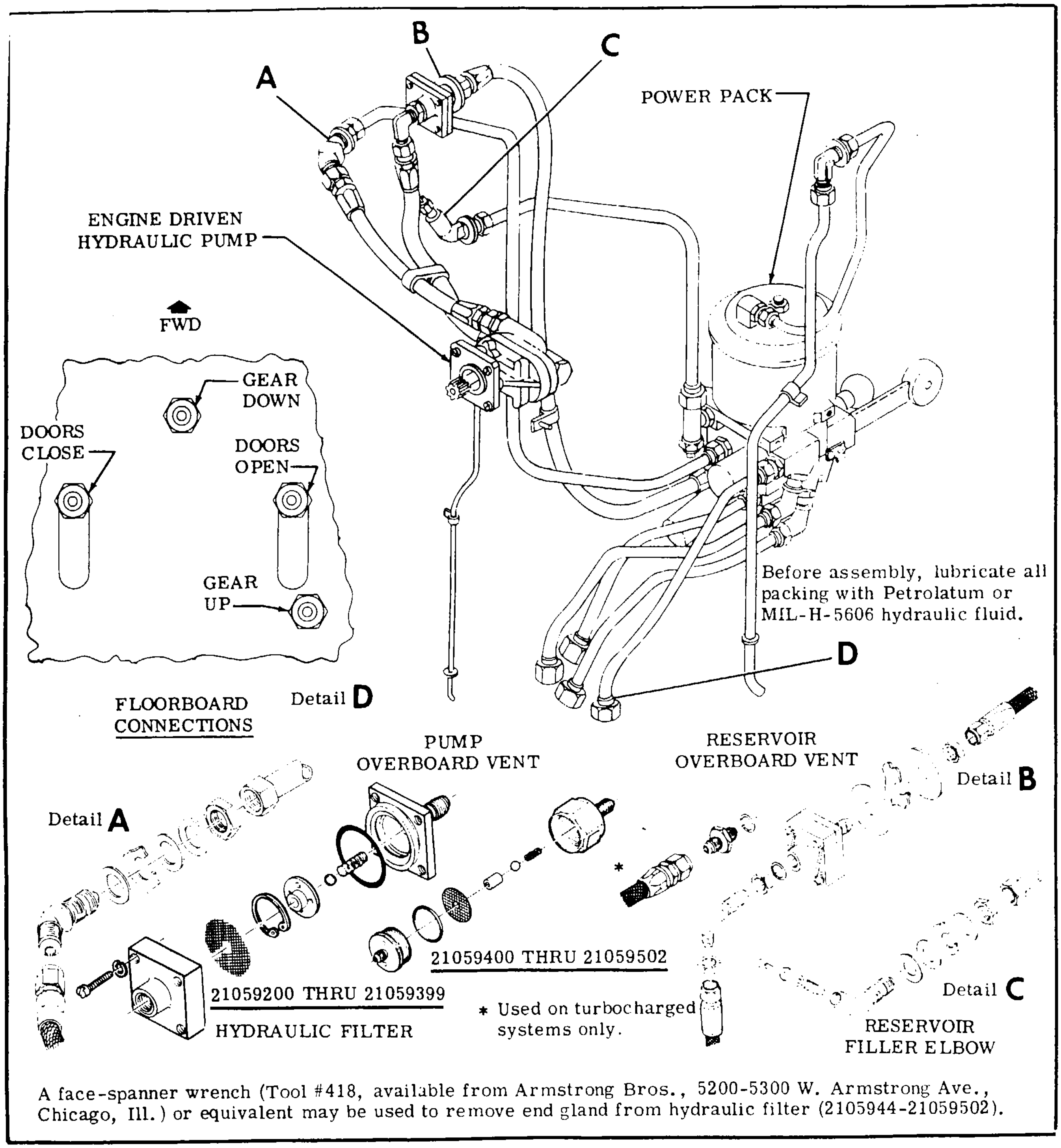


Figure 5-25. Hydraulic Power Pack Installation

d. Connect Hydro Test vent hose to aircraft reservoir vent line protruding below lower edge of firewall.

NOTE

Before making this connection, be certain the line is wiped clean and free of any dirt or foreign material which might have worked into the line. If the line is dirty internally, remove and flush with solvent, then dry with compressed air and reinstall.

e. Connect Hydro Test electric cable to appropriate electrical power source.

5-126. DISCONNECTING HYDRO TEST.

a. Be sure landing gear is down and locked, and doors are closed.

b. With bypass closed, and lockout valve open, operate Hydro Test until aircraft reservoir is full, then open bypass valve and stop Hydro Test pump motor.

c. Disconnect all Hydro Test hose from aircraft immediately, beginning with the suction hose. If the suction hose remains connected for any length of time after Hydro Test is shut down, fluid will transfer from aircraft reservoir into Hydro Test reservoir.

d. Connect all aircraft hose and install cowling.

5-127. BLEEDING AIRCRAFT HYDRAULIC SYSTEM. Bleeding may be accomplished by jacking the aircraft and using the Hydro Test to cycle the landing gear and door system through several complete cycles. Refer to applicable paragraph for instructions for bleeding the time-delay valve inside the power pack. Use only clean, filtered hydraulic fluid in the hydraulic system. Hydraulic fluid preservative (MIL-H-6083) may be used for flushing and storage of hydraulic components.

NOTE

There is only one reason to have to bleed the hydraulic system. The entrance of considerable air into the hydraulic system. The most probable means of air getting into the system are: permitting reservoir fluid level to become low, air leaks in the engine-driven pump or pump suction line, and poor maintenance procedures when connecting lines and installing actuators, etc.

5-128. USE OF TEST STAND TO LEAK TEST HYDRAULIC SYSTEM AND COMPONENTS. (Refer to figures 5-24 and 5-25.)

a. Jack aircraft in accordance with procedures outlined in Section 2.

CAUTION

When testing any actuator by applying pressure to one port of the cylinder, always have the opposite port open to atmospheric pressure. Otherwise, excessive pressure may be built up due to the differential in piston areas. The rod end of the piston has less area than the head side. All lines, fittings, actuators and any other parts subjected to hydraulic dead-end pressure in excess of 2275 psi for any length of time shall be considered faulty due to overstressing, and shall be replaced.

b. Connect test stand pressure hose to system or component to be tested. Use suitable fittings to make connections.

NOTE

The power pack must be bypassed.

c. Set flow valve for minimum flow.

d. Set lockout valve cracked open.

e. Set bypass valve open.

f. Set pressure jack out approximately 1-1/2 inches.

g. Start test stand pump motor.

h. Slowly close bypass valve until pressure reaches 1950 psi.

i. Close lockout valve to trap fluid, then stop test stand pump motor immediately.

j. Using pressure jack, increase pressure to 2200 psi and hold for five minutes.

k. Check system or component being tested for leaks while under pressure.

l. After completion of tests, open test stand lockout valve to relieve pressure and disconnect test stand from system or component. (Refer to paragraph 5-126.)

m. Connect aircraft hydraulic lines or cap open ports of component being tested.

NOTE

When the Hydro Test is employed to power the hydraulic system, landing gear operation can be slowed down to a "slow-motion" during which, hydraulic pressure can be noted precisely and mechanical action can be observed.

WARNING

Before performing maintenance in any of the wheel or strut well, always disconnect the doors to avoid injury from unintentional actuation of the doors. They close rapidly and with considerable force.

5-129. CYCLING LANDING GEAR.

a. Jack aircraft in accordance with instructions outlined in Section 2.

b. Connect test stand in accordance with paragraph 5-125.

c. Observe color of hydraulic fluid through sight gage in aircraft reservoir. If fluid appears discolored, or any other reason exists to suspect fluid contamination, draw off a sample as outlined in Section 2.

NOTE

Fluid sampling is necessary only when good reason exists to suspect contamination. If examination of fluid reveals contamination, flush complete hydraulic system with clean hydraulic fluid and examine seals and cylinder bores for damage.

d. Set test stand flow valve closed, lockout valve open open and bypass valve open.

e. Start test stand pump motor.

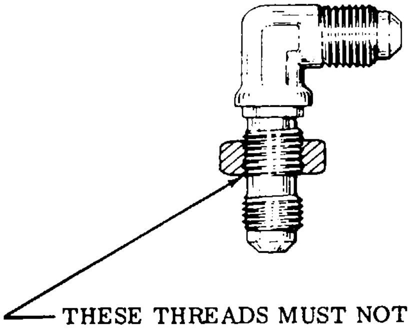
f. Slowly close bypass valve completely.

g. Observe fluid flowing through test unit sight gage. When all air bubbles have disipated, operations may be continued.

h. Using landing gear control handle in aircraft, operate as desired.

1

INSTALL NUT



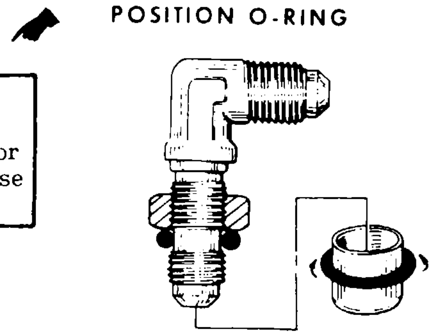
THESE THREADS MUST NOT PROTRUDE BELOW NUT. POSITION NUT EXACTLY AT TOP OF NON-THREADED AREA.

NOTE

Refer to figure 1-3 for torque values for these fittings.

2

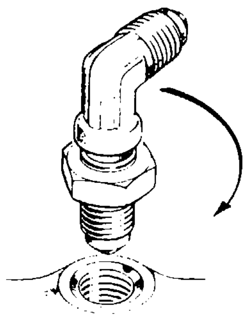
POSITION O-RING



COVER THREADS WITH A PLASTIC THIMBLE OR TAPE, APPLY PETROLATUM TO O-RING, THEN ROLL IT UP INTO POSITION AGAINST NUT. REMOVE THIMBLE OR TAPE AFTER O-RING IS IN POSITION.

3

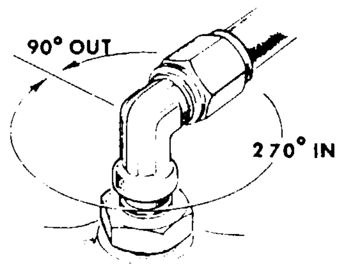
INSTALL ELBOW IN THREADS UNTIL O-RING CONTACTS CHAMFER, AND NUT CONTACTS FACE OF BOSS



ROTATE NUT AND FITTING TOGETHER TO RETAIN THE ORIGINAL POSITION OF THE NUT ON THE FITTING.

4

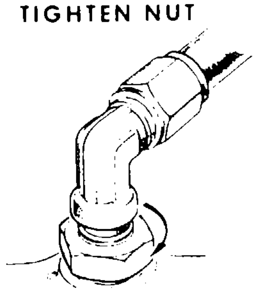
ATTACH LINE TO ELBOW (ELBOW MAY BE TURNED TO LIMITS SHOWN TO ALIGN WITH HOSE OR LINE)



HOLD NUT STATIONARY, TURN FITTING TO DESIRED POSITION.

5

TIGHTEN NUT

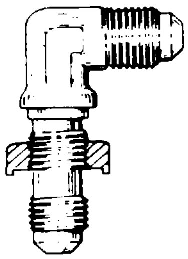


INSTALL O-RINGS CAREFULLY. MOST HYDRAULIC LEAKS ARE CAUSED BY CARELESS INSTALLATION.

Figure 5-26. Installation of Hydraulic Fittings (Sheet 1 of 2)

1

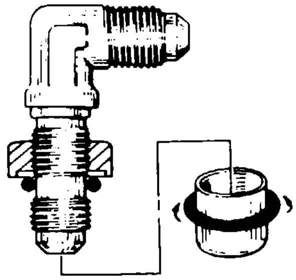
INSTALL NUT



POSITION NUT WITH RECESS DOWN.

2

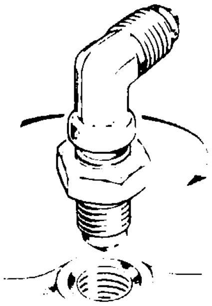
POSITION BACK-UP RING & O-RING



APPLY PETROLATUM TO BACK UP RING AND O-RING, THEN WORK THEM UP INTO POSITION AGAINST NUT. TURN NUT DOWN UNTIL O-RING IS PUSHED DOWN FIRMLY AGAINST LOWER THREADS.

3

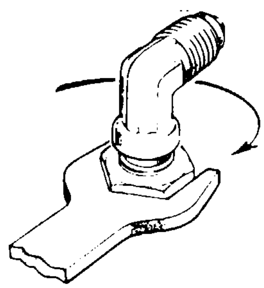
INSTALL ELBOW IN THREADS UNTIL O-RING CONTACTS FACE OF BOSS



ROTATE NUT AND FITTING TOGETHER TO RETAIN THE ORIGINAL POSITION OF THE NUT ON THE FITTING.

4

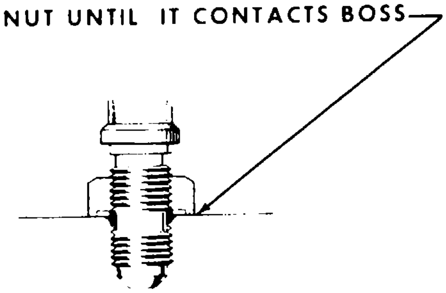
WITH NUT HELD, TURN FITTING IN 1½ TURNS



ATTACH LINE TO FITTING.

5

TIGHTEN NUT UNTIL IT CONTACTS BOSS



INSTALL O-RINGS CAREFULLY. MOST HYDRAULIC LEAKS ARE CAUSED BY CARELESS INSTALLATION.

Figure 5-26. Installation of Hydraulic Fittings (Sheet 2 of 2)

NOTE

Gear cycling time can be prolonged by slowly opening the test unit bypass valve part way. This will bleed off part of the pump flow.

i. After completion of cycling, open test unit bypass valve and stop pump motor.
j. Disconnect test unit in accordance with paragraph 5-126.
k. Assure landing gear is down and locked, then remove aircraft from jacks.

5-130. INSTALLATION OF HYDRAULIC FITTINGS. (Refer to figure 5-26.) Most hydraulic leaks are caused by careless installation of O-rings and fittings. The figure illustrates correct methods of installing hydraulic fittings and may be used as a guide during removal and installation of hydraulic system components.

5-131. HYDRAULIC POWER SYSTEM COMPONENTS.

5-132. GENERAL DESCRIPTION. The hydraulic power system includes equipment required to provide a flow of pressurized hydraulic fluid to the retractable landing gear system. Main components of the hydraulic system are listed in the following chart.

ITEM	PURPOSE	LOCATION AND ACCESS
ENGINE-DRIVEN HYDRAULIC PUMP.	To provide a flow of pressurized hydraulic fluid to the system.	Right rear accessory pad on engine. Remove upper cowling.
HYDRAULIC FILTER.	To filter fluid from the pump before entering remainder of system.	Upper right side of firewall in engine compartment. Remove upper cowling.
HYDRAULIC POWER PACK.	To load the engine-driven pump when landing gear handle is moved out of neutral.	At top of pedestal. Partially accessible for adjustment with the decorative cover and pedestal front panels removed.
	To provide a reservoir of hydraulic fluid.	
	To afford control of gear and door systems through use of valves and appropriate passages.	
EMERGENCY HAND PUMP.	To provide emergency hydraulic pressure through use of hand pump in the Power Pack.	Integral with Power Pack.
DOOR CLOSE LOCK VALVE.	To hold wheel door actuators in the closed position by pressure trapped in the door close line.	Inside pedestal. Accessible when pedestal cover is removed.

NOTE

Some of the early 1971 Models are equipped with 1970 Model hydraulic components. When performing maintenance, as certain which model year components are used and refer to the appropriate paragraph for the instructions applicable to the components used.

A hydraulic system component location illustration is shown in figure 5-27. This figure may be used as a guide to generally locate system components and determine their relationship with the remainder of the system. A detailed description and removal, disassembly, assembly and installation procedure for each component is included in the following paragraphs.

5-133. HYDRAULIC COMPONENT REPAIR. Since emphasis here is on repair and not overhaul of the basic components of the hydraulic system, it is unlikely that the mechanic will go through all of the procedures outlined. Instead, he will repair the particular item which is causing the difficulty.

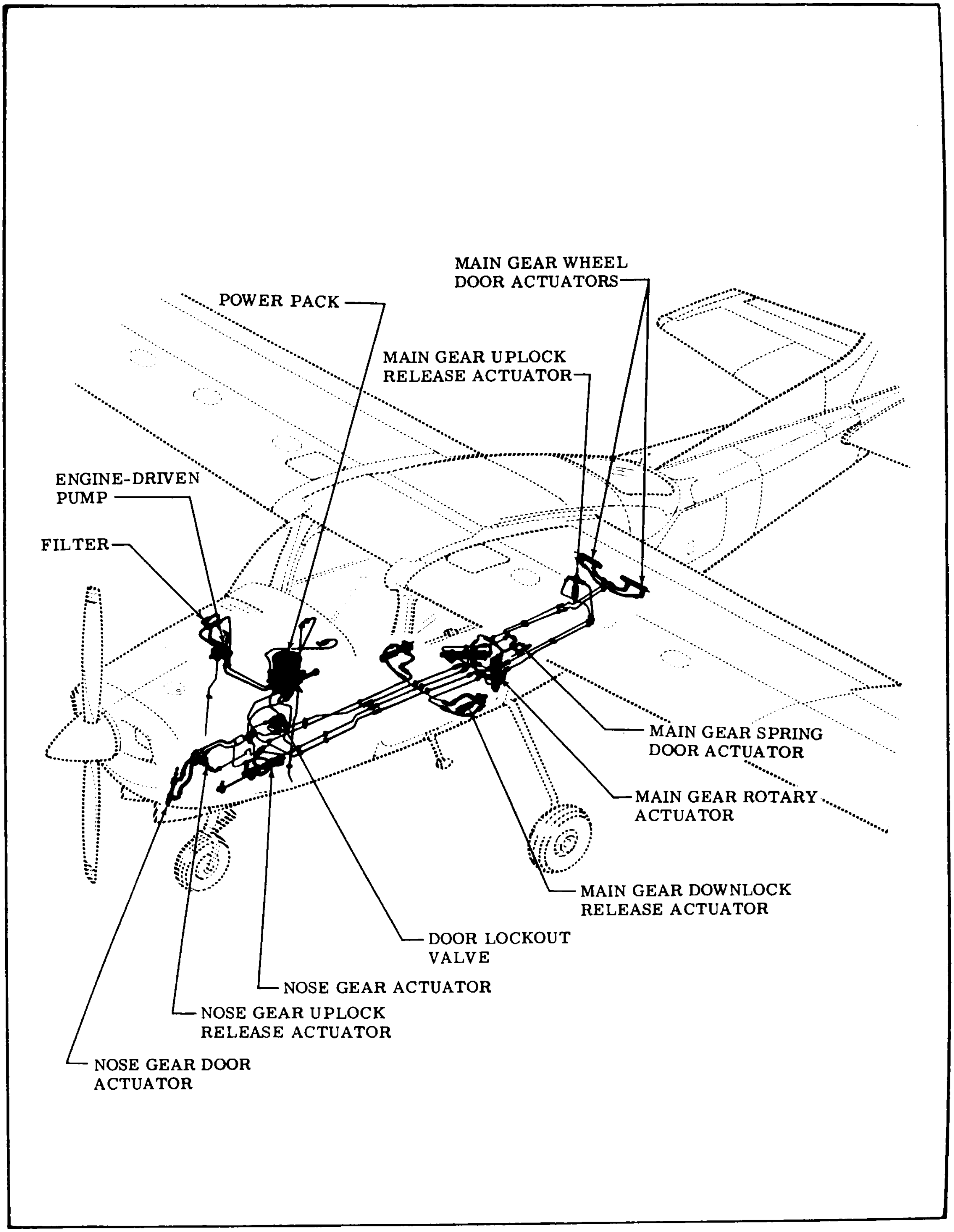
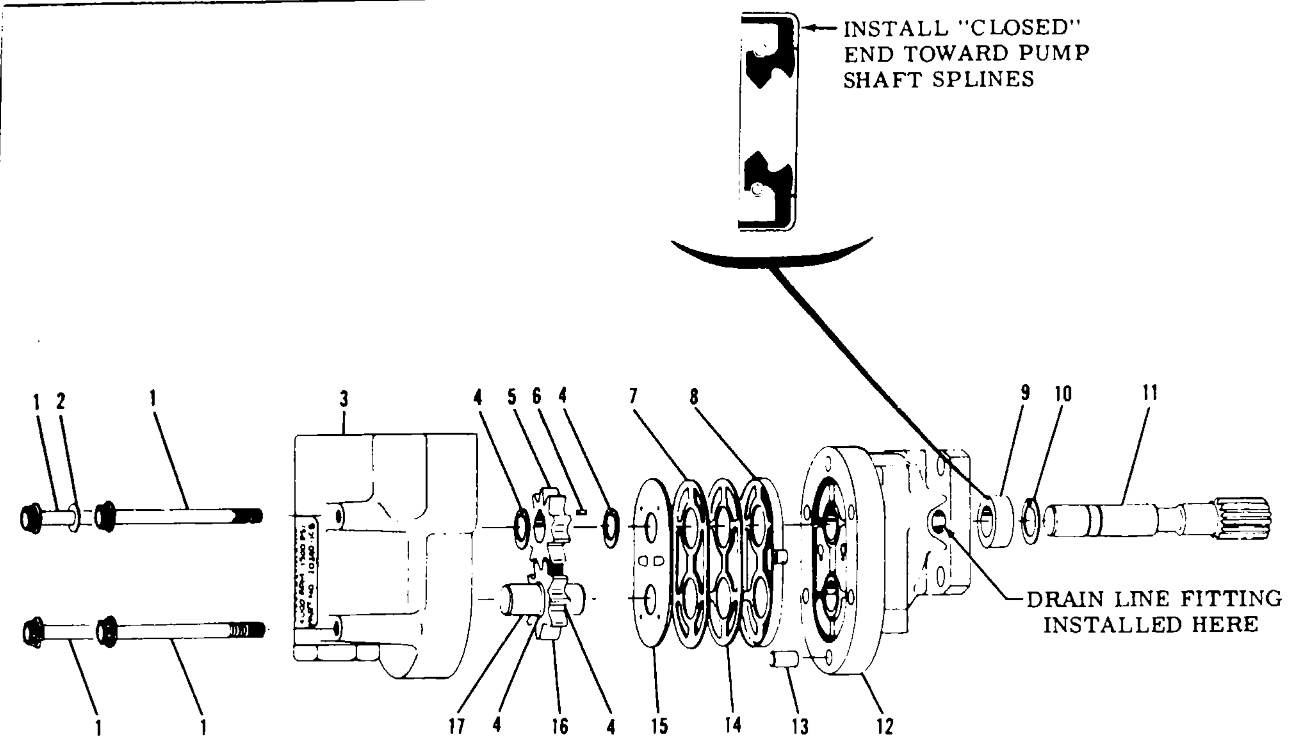


Figure 5-27. Hydraulic System Component Location



1. Cap Screw
2. Copper Crush Gasket
3. Rear Housing Assembly
4. Snap Ring
5. Gear
6. Key
7. Phenolic Back-Up Gasket
8. Diaphragm Seal
9. Shaft Seal
10. Snap Ring
11. Drive Shaft
12. Front Plate Assembly
13. Dowel Pin
14. Protector Gasket
15. Diaphragm
16. Idler Gear
17. Idler Gear Shaft

Figure 5-28. Engine-Driven Hydraulic Pump

NOTE

To isolate the item causing the malfunction, refer to the trouble shooting charts in paragraph 5-6, and if possible, check with a test stand.

5-134. REPAIR VERSUS REPLACEMENT.
Often the moderate trade-in price for a factory-rebuilt component is less than the accumulated cost of labor, parts, and (often time consuming) trial and error adjustment. Repair or replacement of a component will depend on the time, equipment, and skilled labor that is locally available.

5-135. REPAIR PARTS AND EQUIPMENT.
Repair parts may be ordered from the applicable Parts Catalog. Test equipment may be ordered from The Special Tools and Support Equipment Catalog. Both publications are available from the Cessna Service Parts Center.

5-136. EQUIPMENT AND TOOLS.

5-137. HAND TOOLS. The following had tools are necessary for repair work on the Power Pack and other hydraulic components:

Snap Ring Pliers
Strap Wrench (for removing door solenoid and various cylinder barrels of the hydraulic actuators)
Needle-nose Pliers
Pin Punches
Duck-bill Pliers
Box and Open Wrenches

Locally fabricated items, handy for Power Pack repair, are various 1/4" aluminum rods ground to a gradual taper and hooks formed from brass welding rod to extricate small plungers from hydraulic ports. Hook formed on brass welding rod must not be over 1/16-inch in length so as not to scratch or score the bore. Various sizes of Allen wrenches may be welded or brazed to "T" handles for use when removing, installing, or adjusting the various internal wrenching plugs or valves.

5-138. COMPRESSED AIR. The easiest way to remove some hydraulic parts in inaccessible galleries of the power pack is a quick blast of compressed air from behind. Parts can be blown out in seconds, which would otherwise take endless "fishing" operations to extricate. An air hose and nozzle are common-sense tools.

5-139. ENGINE-DRIVEN HYDRAULIC PUMP. (Refer to figure 5-28.)

5-140. DESCRIPTION. The gear-type hydraulic pump is mounted on the right rear accessory pad of the engine. Driven at approximately 1-1/2 times engine crankshaft speed, the pump supplies a controlled flow of hydraulic fluid to the power pack and hydraulic system whenever the landing gear control handle is operated. While the control handle is in neutral, the pump bypass in the power pack allows the pump to cycle the hydraulic fluid. Pump flow is controlled to approximately one gallon-per-minute.

5-141. REMOVAL AND INSTALLATION.

a. Remove upper cowling. Except on the T210, remove induction airbox.

b. Disconnect hydraulic lines and hoses from pump and cap or plug open fittings, lines and hose.

c. Remove four nuts securing pump to accessory case and pull pump aft to remove. Retain washers.

d. To install pump, install a new mounting gasket, grease pump drive splines lightly with general purpose grease, and slide pump into position. Rotate pump shaft as necessary for smooth meshing of splines, and reverse the preceding steps.

e. To prevent initial dry-running of the pump:

1. Loosen suction hose fitting at pump inlet fitting.
2. Remove Power Pack reservoir overboard vent line from fitting at top of firewall.
3. Connect suitable pressure filler unit to reservoir filler line fitting on right side of firewall.
4. Hold finger over open end of overboard vent line fitting and fill hydraulic reservoir until fluid is forced from loosened end of the suction hose.
5. Tighten suction hose, reconnect reservoir vent line, and disconnect filler unit.

5-142. DISASSEMBLY. (Refer to figure 5-28.)

a. Plug all ports and clean outside of pump with solvent.

b. Clamp pump in vise, shaft down and remove cap screws and washers (1 and 2).

c. Remove rear housing (3) by rocking from side to side and sliding it off the gear shafts and dowel pins. In case of sticking, gently tap, with either plastic or rubber hammer, from side to side. Do not pry sections apart with a screwdriver. Scratches caused by pry tool will prevent sealing of mating surfaces.

NOTE

Do not disassemble rear housing (3).

d. Remove idler gear assembly (16).

e. Remove snap ring (4) from drive shaft, being careful not to scratch bearing surface of drive shaft.

f. Remove gear (5) and key (6) from drive shaft (11).

g. Remove remaining snap ring (4) from drive shaft (11).

h. Remove drive shaft (11) from front housing (12) by pulling it out of housing by splined end.

i. Remove diaphragm (15) from front plate (12) by prying with a sharp tool.

j. Remove phenolic back-up gasket (7) and protector gasket (14) from front plate (12).

k. Remove diaphragm seal (8) from front plate (12).

l. Remove snap ring (10) and drive shaft seal (9) from bore in front plate (12).

5-143. INSPECTION OF PUMP. Clean all metal parts with cleaning solvent and dry with filtered compressed air. Prior to reassembly of the pump, inspect all parts as follows:

ITEM	INSPECTION	REPAIR
GEARS AND SHAFTS	Inspect drive gear shaft for broken splines.	Install new drive gear shaft.
	Inspect drive gear shaft at bearing points and shaft seal areas for rough surfaces and excessive wear. If the shaft measures less than 0.4360-in. in bearing area, it should be replaced.	Install new drive gear shaft.
	Inspect idler gear shaft ar bearing points and shaft seal areas for rough surfaces and excessive wear. If the shaft measures less than 0.4360-in. in bearing area, it should be replaced.	Install new idler gear shaft.
	Inspect snap rings in grooves of idler gear shaft.	Install snap rings in grooves.
	Inspect edges of gear teeth to see if they are too sharp.	Break sharp edge with emery paper.

ITEM	INSPECTION	REPAIR
FRONT PLATE ASSEMBLY	Inspect bearings for scratches or scoring. Measure inside diameter of bearings. If inside diameter of bearings measures more than 0.4400-in., front plate assembly should be replaced.	Install new front plate assembly. Bearings are not available as separate items.
	Inspect bearings for proper positioning. Bearings should be flush with islands in groove pattern. Splits in bearings should be in line with dowel pin holes and in position closest to the respective dowel pin hole.	Install new front plate assembly. Bearings are not available as separate item.
REAR HOUSING	Inspect inside gear pockets for excessive scoring or wear. Measure inside diameter and depth of gear pockets. Inside diameter of gear pockets should not exceed 1.691-inch and depth of pockets should not exceed 0.1972-inch.	Install new rear housing assembly.
	Inspect bearings for scratches or scoring. Measure inside diameter of bearings. If inside diameter of bearing measures more than 0.4400-inch rear housing should be replaced.	Install new rear housing assembly. Bearings are not available as separate items.
	Inspect bearings for proper positioning. Splits in bearings should be in line with dowel pins and in position closest to the respective dowel pin.	Install new rear housing assembly. Bearings are not available as separate items.

5-144. ASSEMBLY. (Refer to figure 5-28.)

NOTE

The diaphragm (15), phenolic gasket (7), protector gasket (14), diaphragm seal (8), drive gear snap rings (4), shaft seal (9), snap ring (10), copper crush washer (2), and key (6) should be replaced with new parts when reassembling hydraulic pump. Major Seal Repair Kit No. 20240-77 consisting of the above parts is available from the Cessna Service Parts Center.

a. Install new shaft seal (9) in front plate with flat metal side of seal in front plate and the tapered internal part of seal toward pump shaft splines. Install snap ring (10) in groove in front plate with sharp edge of snap ring toward shaft splines.
b. Place diaphragm seal (8) on front plate (12) with flat side of seal down (cup side of seal up). Using a dull pointed tool, work diaphragm seal to bottom of grooves in front plate. Be sure that seal is all the way down in grooves of front plate.
c. Press protector gasket (14) and phenolic back-up gasket (7) into cup of diaphragm seal.
d. Place diaphragm (15) on top of phenolic back-up gasket with bronze face of diaphragm up, next to the gears. The two small depressions on the bronze face must match the two depressed areas in the rear housing.

NOTE

Protector gasket (14), phenolic back-up gasket (7), and diaphragm (15) must fit inside cup of diaphragm seal (8).

e. Coat drive shaft (12) with grease to prevent damage to seal (9) as drive shaft is installed.
f. Work drive shaft (12) through shaft seal (9) and into position.
g. Install snap ring (4) in groove on shaft next to diaphragm.
h. Place key (6) in slot in drive shaft and install gear (5) over key in shaft.
i. Install snap ring (4) in groove of shaft (11) next to gear (5).

j. Install idler gear assembly (16).
k. Slide rear housing assembly (3) over gear shafts until dowel pins (13) are engaged.
l. Install cap screws (1) with copper crush washer (2) on the 1-3/4 inch long screw which passes through the suction port of the pump. Tighten cap screws evenly to torque value of 7-10 lb ft.
m. Rotate pump shaft by hand. Pump will have small amount of drag, but should turn freely after short period of use.

5-145. HYDRAULIC FILTER.

5-146. DESCRIPTION. A hydraulic filter is installed in the pump pressure line at the firewall to filter the hydraulic fluid before it enters the power pack. The filter screen disc is capable of passing hydraulic fluid at the rate of approximately 1.12 gallons-per-minute.

5-147. DISASSEMBLY, CLEANING AND ASSEMBLY. (Refer to figure 5-25.) The figure shows details of the filter assembly for different serialled aircraft, and may be used as a guide during disassembly and assembly. The filter screen should be removed and cleaned with solvent (Federal Specification P-S-661, or equivalent) at the first 25 hours, the first 50 hours and at each 100-hour inspection thereafter. Also, the screen should be removed and cleaned whenever improper fluid circulation is suspected.

5-148. HYDRAULIC POWER PACK. (Refer to figure 5-29.)

5-149. DESCRIPTION. The hydraulic power pack, located in the pedestal, is a multi-purpose control unit in the hydraulic system. It contains a hydraulic fluid reservoir, valves which control flow of pressurized fluid to the various actuators in the retractable landing gear and door systems, and an electrical switch, connected to a gear warning horn and indicator lights. An emergency hand pump, integral with the power pack, uses reservoir fluid to permit extension of the landing gear if hydraulic pressure should fail.

5-150. REMOVAL.

NOTE

As hydraulic lines are disconnected or removed, plug or cap all openings to prevent entry of foreign material into the lines or fittings.

a. Remove front seats and spread drip cloth over forward carpet.
b. Remove landing gear control lever knob and remove decorative cover from pedestal.
c. Position a gallon can under fill-and-drain tee fitting, then remove pressure cap on tee and drain reservoir fluid into can. A funnel with attached hose will simplify draining.
d. Cut safety wire and disconnect electrical plug from door solenoid valve.
e. Disconnect and cap or plug all hydraulic lines from the Power Pack.
f. Remove upper panel assembly from pedestal.
g. Remove the three studs and one bolt securing the Power Pack to the pedestal side members, then work Power Pack aft out of the pedestal.

NOTE

The two studs on the left side of the Power Pack serve also as pivots for the elevator trim wheel and pointer. The studs may be unscrewed from the Power Pack threads without major disturbance to the elevator trim system components by using an open end wrench to remove them. The stud on the right side of the Power Pack is the pivot for the cowl flap control arm. The cowl flap control must be removed from the pedestal side structure to remove this stud.

5-151. DISASSEMBLY. (Refer to figure 5-29.)
a. Remove reservoir cover retaining nut and O-ring. Cover is a snug fit on reservoir. Use a soft mallet and tap cover lightly to remove. Remove large O-ring.
b. Remove spacer from center bolt, cut safety wire and remove baffle from reservoir. Drain remaining hydraulic fluid from reservoir.
c. Remove reservoir cover attaching stud (center). This stud may be removed by using a double lock nut at top of stud. Use care to prevent damage to stud threads.
d. Turn Power Pack upside down so that top of reservoir serves as a support base.

NOTE

A holding fixture (Part No. HF-1025) may be used instead of removing the center stud if desired. This is a plate type fixture for use in a vise. The fixture is available from the Cessna Service Parts Center.

e. Remove pivot clevis pin and forward clevis pin from hand pump handle linkage, and remove hand pump handle assembly.
f. Remove screws attaching electrical wires to terminal strip and Power Pack. Remove small capacitor from beneath electrical wires and remove terminal strip.

NOTE

All electrical wires are coded with color stripes. Disregard color of wire terminals or plastic sleeving. If color codes are matched when wires are reinstalled, the wires will be connected correctly.

g. Cut safety wire and remove screws attaching landing gear up-down switch and bracket. Retain washers between bracket and Power Pack.
h. Cut safety wire and remove four Allen head screws attaching hand pump bracket, and remove bracket.
i. Remove lock-out solenoid retaining nut from hand pump bracket and remove solenoid from bracket. Use care to prevent damage to solenoid electrical wires.
j. Turn Power Pack over and cut safety wire at time-delay valve.

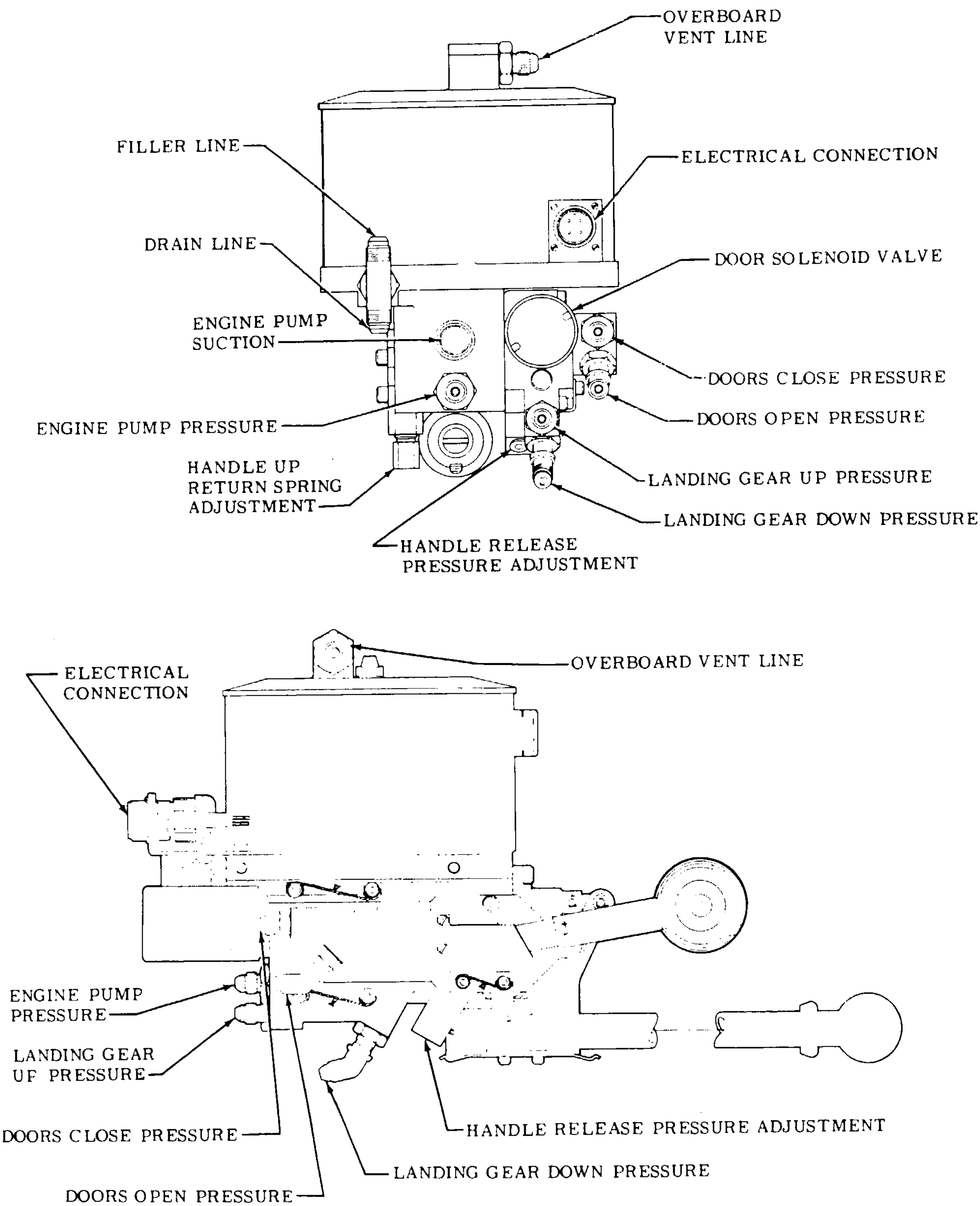


Figure 5-28A. Hydraulic Power Pack (Sheet 1 of 2)

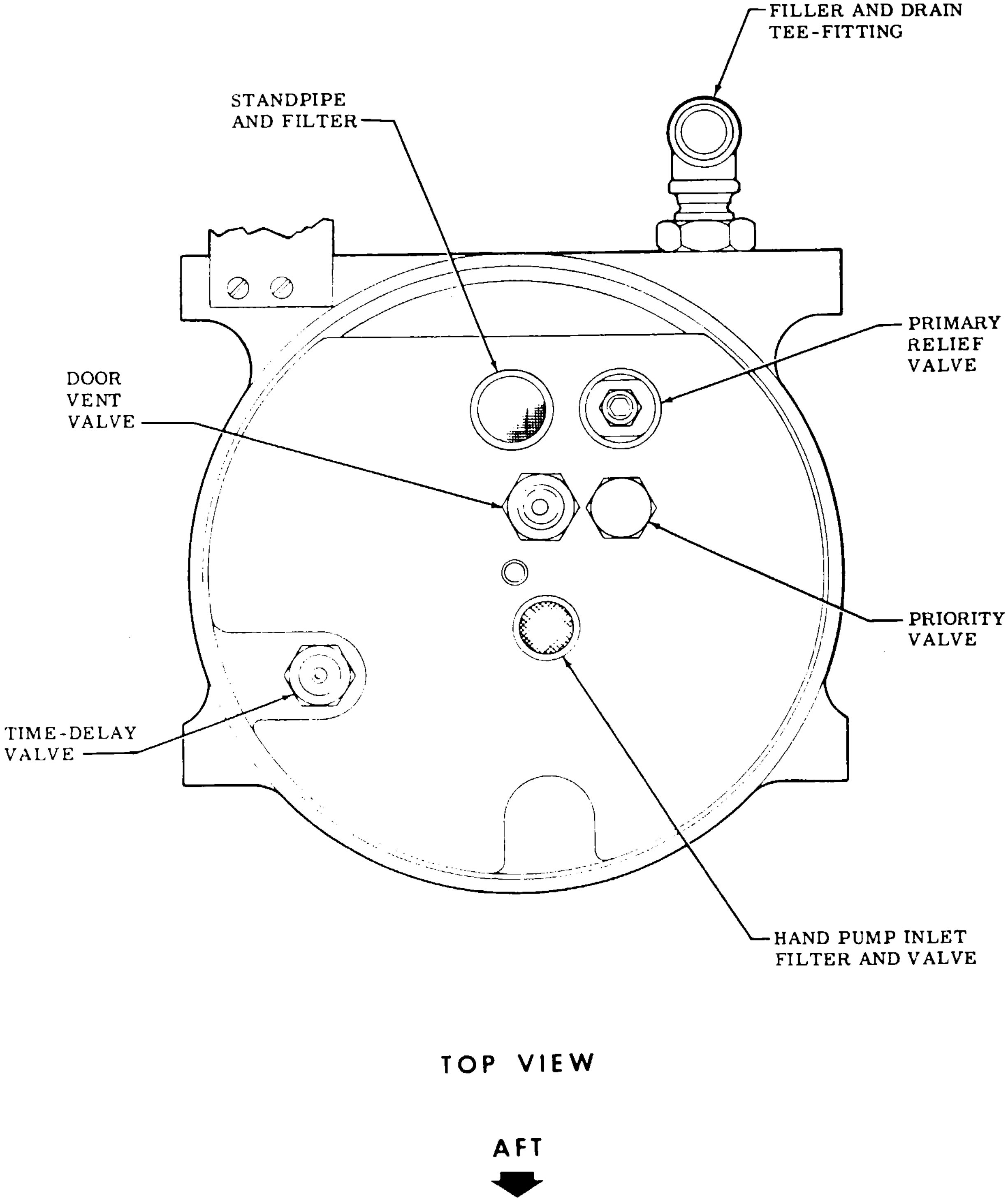


Figure 5-28A. Hydraulic Power Pack (Sheet 2 of 2)

k. Remove time-delay valve ball, spring, spacer, and spring by removing time-delay valve retainer.

NOTE

Do not remove time-delay valve plunger until after manifold assembly has been removed.

l. Cut safety wire and remove screws attaching gear and rack protective cover. Remove cover.
m. Remove clamp attaching electrical wires to door solenoid valve and remove safety wire from door solenoid valve.
n. Cut safety wire and remove four screws attaching manifold assembly. Work manifold assembly from Power Pack, taking care to prevent loss of transfer tubes between manifold and Power Pack.
o. Remove the seven transfer tubes from manifold or Power Pack.

CAUTION

As the manifold is separated from the Power Pack body, the rack on the landing gear selector spool becomes disengaged from the gear on the handle. This will permit the selector spool to move. Do NOT move the selector spool from its position. Never move it to a position that is more than flush with the manifold body at the end opposite the selector spool rack. If moved beyond this position, an O-ring will become caught and the selector spool will then be extremely difficult to remove.

5-152. MANIFOLD DISASSEMBLY. (Refer to figure 5-30.)
a. Remove door solenoid by unscrewing from manifold. This solenoid is hand tightened. Use strap wrench or strip of sandpaper to grip door solenoid for removal. Remove plunger return spring.
b. Remove plunger and spool by carefully pulling from manifold.
c. Using a hook formed from brass welding rod and inserted into oil hole in transfer sleeve, withdraw sleeve from manifold.

NOTE

Be sure that end of hook is not over 1/16-inch long, and use with care to prevent scratching the bore in manifold. The sleeve will be hard to withdraw due to O-ring friction.

d. Remove time-delay valve plunger, using a small wooden dowel inserted in center of plunger. The plunger should slide out of manifold easily.
e. Remove landing gear selector spool by grasping rack end of spool and carefully pulling from manifold.

NOTE

Do not bend selector spool. Pull straight out. Do not remove gear rack from selector spool unless it is necessary to replace selector spool and manifold. The landing gear selector spool, time-delay plunger, and manifold are matched, lapped parts. If it is necessary to replace any one of these three parts, replace them as an assembly only.

f. Remove landing gear handle-release retainer (adjusting plug), spring, and poppet from manifold. The end of the poppet has a ball which should remain in the poppet. If it doesn't, remove ball from manifold.
g. Remove caps from fittings and wash manifold in cleaning solvent (Federal Specification P-S-661, or equivalent) and dry with filtered compressed air. Be sure internal passages are clean, then reinstall caps on fittings.

5-153. COMPONENTS. DISASSEMBLY. (Refer to figure 5-29.)

5-154. HAND PUMP VALVE. (Refer to figure 5-29.)
a. Pull hand pump plunger from Power Pack body.
b. Using snap ring pliers, remove snap ring at inboard end of hand pump plunger.
c. Remove gland and scraper from plunger.
d. Inside reservoir, remove snap ring, spacer, and filter screen. Use a brass hook to remove seat, ball, and spring.

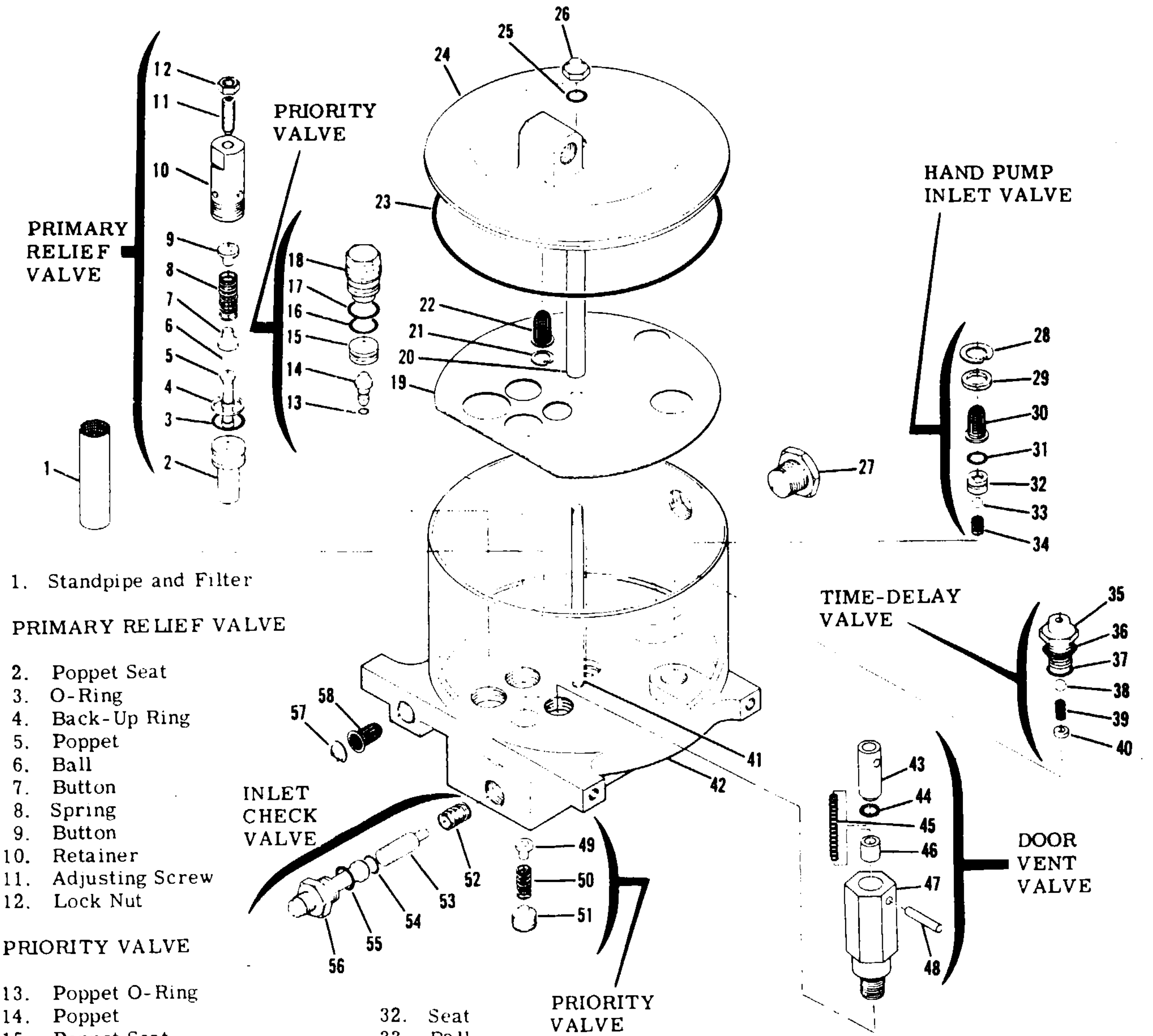
5-155. PRIMARY RELIEF VALVE. (Refer to figure 5-29.
a. Loosen lock nut at top of primary relief valve.
b. Remove adjusting screw and lock nut from top of relief valve.
c. Unscrew retainer.
d. Remove two buttons, spring, and ball.
e. Remove poppet from poppet seat by lifting out of poppet assembly. The poppet and poppet seat are matched parts.
f. Using a brass hook not over 1/8-inch long, pull poppet seat up out of body. Hook through holes in side of seat and use care not to damage bore in body.

5-156. PRIORITY VALVE. (Refer to figure 5-29.)
a. Remove priority retainer from reservoir.
b. Turn Power Pack upside down and remove retainer (adjusting plug), spring, and button from bottom of Power Pack.
c. While Power Pack is upside down, push poppet and poppet seat into reservoir, using a punch of 1/8 inch maximum diameter. Make sure that face of punch is square and flat.

5-157. SYSTEM INLET CHECK VALVE. (Refer to figure 5-29.)
a. Remove system pressure port fitting.
b. Remove O-ring, plunger, and spring. Spring and plunger should fall out of Power Pack after O-ring is removed. Use hook, if necessary, to remove O-ring.

5-158. STANDPIPE AND FILTER. (Refer to figure 5-29.)
a. The standpipe and filter assembly should not be removed unless it is damaged, since it is a press fit in the reservoir.
b. Remove vent filter by removing the snap ring.
c. Remove fill line filter by removing the fitting and snap ring.

5-159. DOOR VENT VALVE. (Refer to figure 5-29.)
a. Remove door vent valve from reservoir. The door vent valve should not be disassembled except



1. Standpipe and Filter

PRIMARY RELIEF VALVE

2. Poppet Seat
3. O-Ring
4. Back-Up Ring
5. Poppet
6. Ball
7. Button
8. Spring
9. Button
10. Retainer
11. Adjusting Screw
12. Lock Nut

PRIORITY VALVE

13. Poppet O-Ring
14. Poppet
15. Poppet Seat
16. Poppet Seat O-Ring
17. Retainer O-Ring
18. Retainer

19. Baffle
20. Spacer
21. Snap Ring
22. Vent Filter
23. Reservoir Cover O-Ring
24. Reservoir Cover
25. O-Ring
26. Cap Nut
27. Sight Gage

HANDPUMP INLET VALVE

28. Snap Ring
29. Spacer
30. Filter
31. Seat O-Ring
32. Seat
33. Ball
34. Spring

TIME-DELAY VALVE

35. Retainer
36. Retainer Hex O-Ring
37. Retainer Body O-Ring
38. Ball
39. Spring
40. Spacer
41. Center Bolt
42. Reservoir and Body Assembly

DOOR VENT VALVE

43. Retainer
44. O-Ring
45. Spring
46. Poppet
47. Body
48. Pin

PRIORITY VALVE ADJUSTMENT

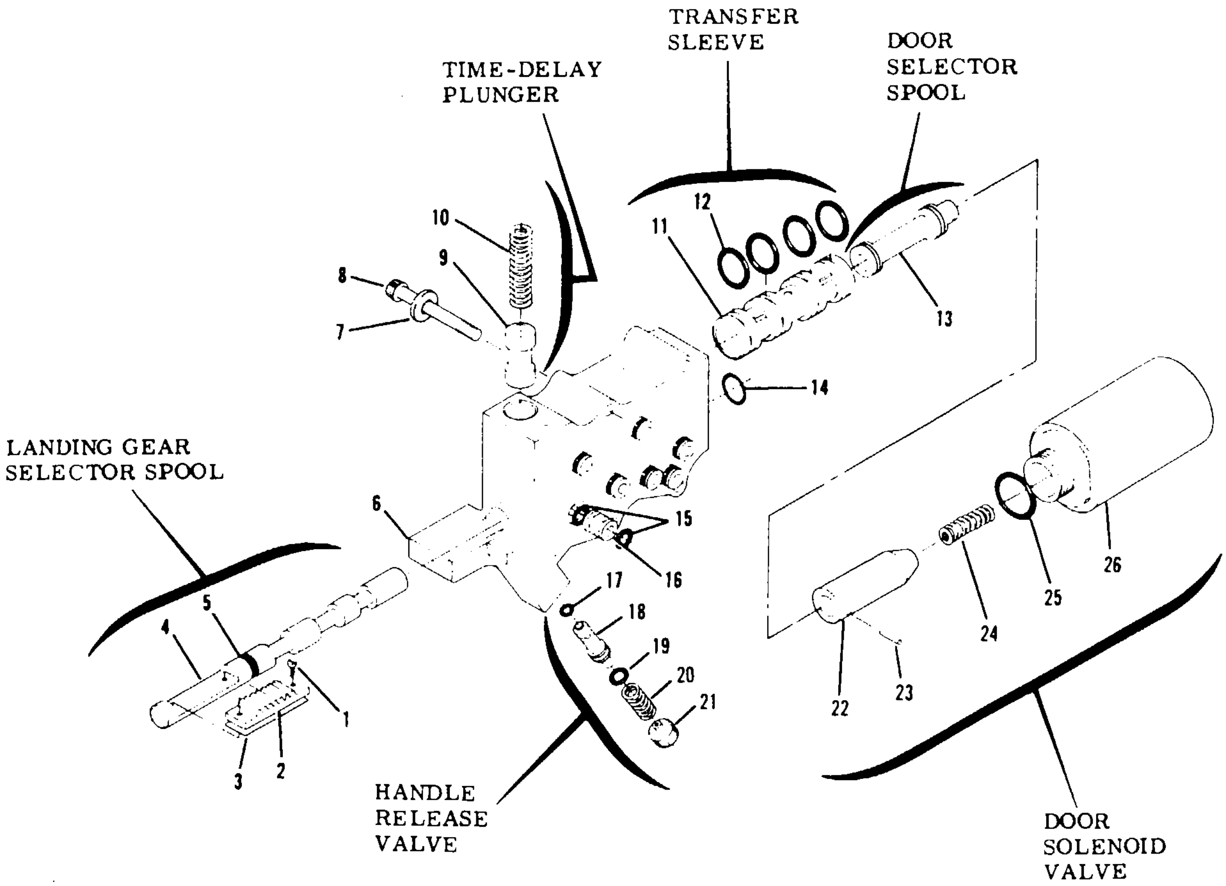
49. Button
50. Spring
51. Retainer (Adjusting Plug)

INLET CHECK VALVE

52. Spring
53. Plunger
54. O-Ring
55. Fitting O-Ring
56. Pressure Inlet Fitting

57. Snap Ring
58. Filler Line Filter

Figure 5-29. Hydraulic Power Pack Components Breakdown



LANDING GEAR SELECTOR SPOOL

1. Screw
2. Rack
3. Laminated Shim
4. Spool
5. Spool O-Ring

6. Manifold
7. Washer
8. Allen Screw

TIME-DELAY PLUNGER

9. Plunger
10. Spring

TRANSFER SLEEVE

11. Sleeve
12. Sleeve O-Ring

13. Spool
14. O-Ring

15. Transfer Tube O-Rings
16. Transfer Tubes

HANDLE RELEASE VALVE

17. O-Ring
18. Poppet
19. Poppet O-Ring
20. Spring
21. Retainer (Adjusting Plug)

DOOR SOLENOID VALVE

22. Plunger
23. Pin
24. Spring
25. Solenoid O-Ring
26. Solenoid

Figure 5-30. Manifold Assembly

for replacement of parts.

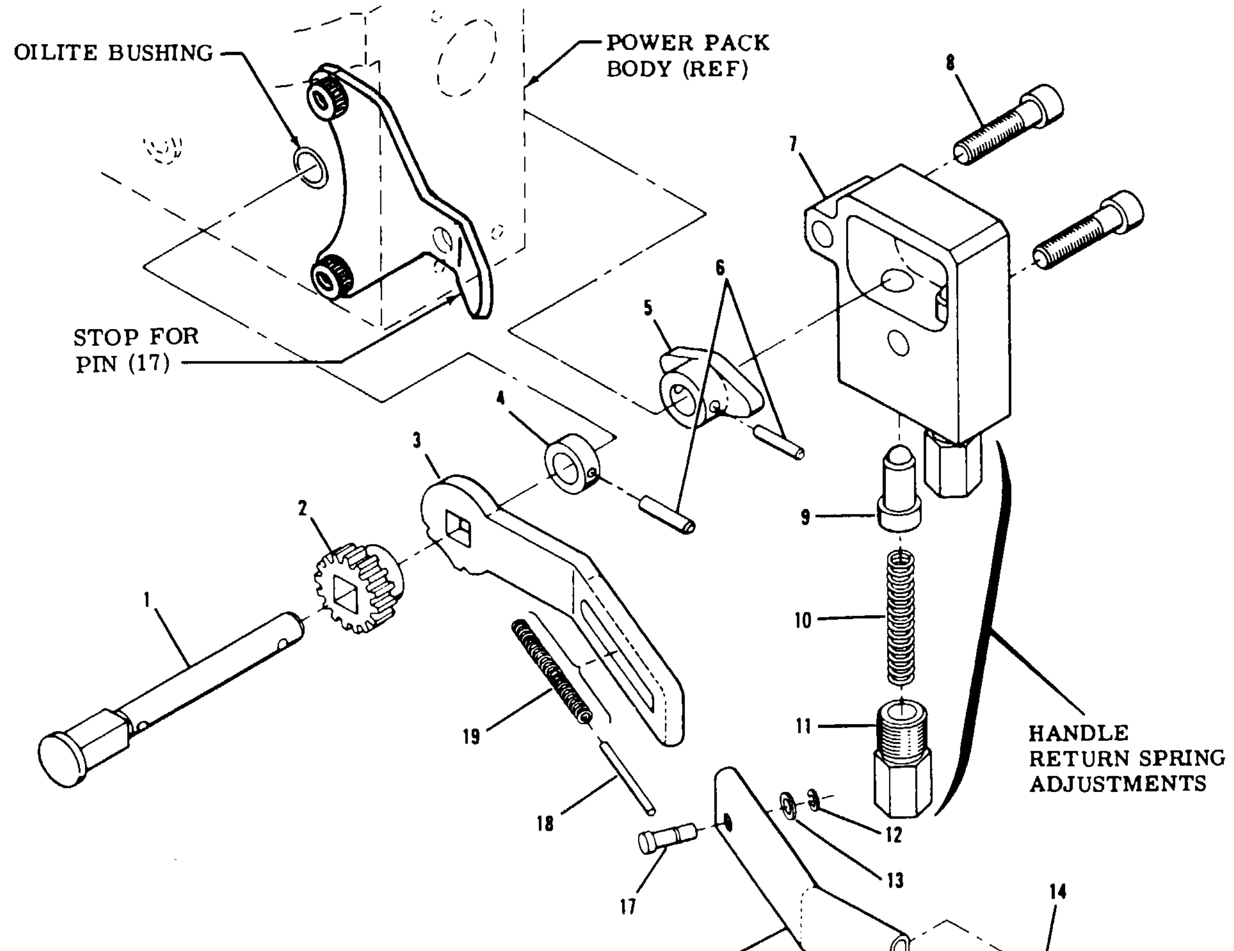
b. Remove pin from valve body and retainer. Use care when removing pin, as the spring is under a slight load.

c. Remove retainer, O-ring, and poppet from valve body.

5-160. LANDING GEAR HANDLE AND HANDLE RELEASE MECHANISM. (Refer to figure 5-31.)

a. Remove two hex-head retainers (adjusting plugs), springs, and plungers from handle return housing.

b. Cut safety wire and remove two screws attaching handle release housing to Power Pack, and remove the housing.



1. Shaft
2. Gear
3. Handle
4. Spacer
5. Return Cam
6. Pin
7. Housing
8. Allen Screw

HANDLE RETURN
SPRING ADJUSTMENTS

9. Plunger
10. Spring
11. Retainer (Adjusting Plug)
12. Snap Ring
13. Washer
14. Handle Knob
15. Pin
16. Handle Sleeve
17. Pin
18. Pin
19. Spring

Figure 5-31. Landing Gear Handle and Handle-Release Mechanism

c. Using a punch, drive roll pin from cam, and remove cam from landing gear handle shaft.

d. Pull handle assembly from Power Pack.

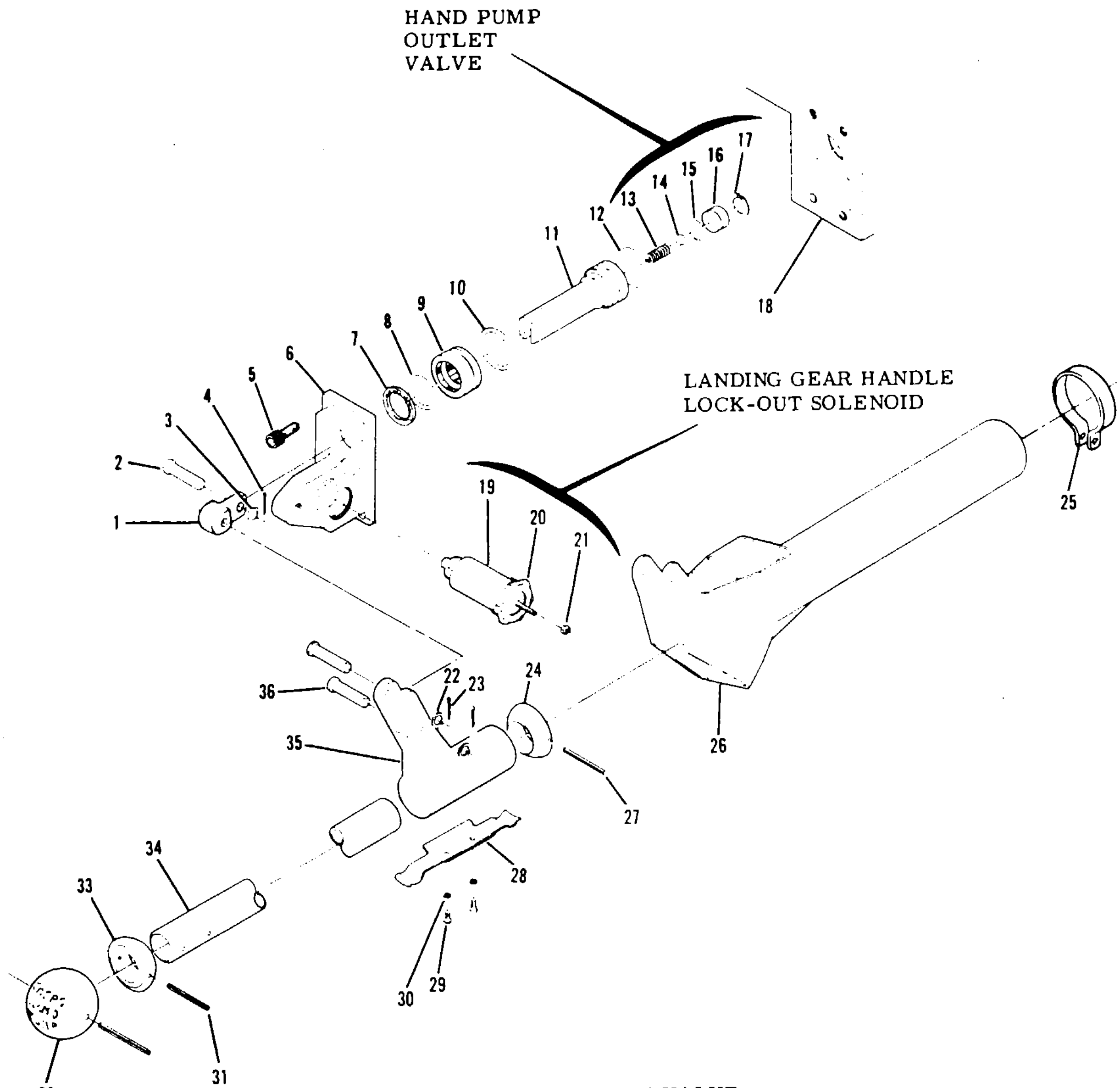
NOTE

Do not remove spacer, handle, or gear from handle shaft except for replacement of parts.

e. Landing gear handle may be disassembled as illustrated in figure 5-31.

5-161. EMERGENCY HAND PUMP. (Refer to figure 5-32.)

5-162. DESCRIPTION. The emergency hand pump is internally mounted in the power pack. The pump supplies a flow of pressurized hydraulic fluid to open the doors and extend the landing gear if hydraulic pressure should fail. The hand pump receives a reserve supply of fluid from the power pack reservoir and pumps the fluid directly to the door control valve. then into passages and lines used by the regular system.



1. Link
2. Pin
3. Washer
4. Cotter Pin
5. Allen Screw
6. Hand Pump Bracket
7. Scraper
8. Gland O-Ring (Internal)
9. Gland
10. Gland O-Ring (External)
11. Hand Pump Plunger
12. Plunger O-Ring

HAND PUMP OUTLET VALVE

13. Spring
14. Ball
15. Seat O-Ring
16. Seat
17. Snap Ring

18. Power Pack Body

LANDING GEAR HANDLE
LOCK-OUT SOLENOID

19. Solenoid
20. Retaining Nut
21. Stroke Adjusting Nut

22. Washer
23. Cotter Pin
24. Handle Stop
25. Clamp
26. Handle Guard
27. Pin
28. Handle Latch Spring
29. Screw
30. Washer
31. Pin
32. Handle Knob
33. Handle Stop
34. Handle
35. Lever Assembly
36. Pin

Figure 5-32. Emergency Hand Pump

5-163. REMOVAL AND INSTALLATION. Since the emergency hand pump is internally mounted in the power pack, removal and installation would involve disassembly and assembly, discussed in the following paragraph.

5-164. DISASSEMBLY AND ASSEMBLY. (Refer to figures 5-28 and 5-32.) Paragraph 5-151, which outlines procedures for disassembly of the power pack, includes instructions for disassembling the emergency hand pump.

5-165. ASSEMBLY OF HYDRAULIC POWER PACK. (Refer to figure 5-29.)

NOTE

After power pack has been completely disassembled, remove and discard all O-rings and gaskets. Wash all parts in dry cleaning solvent (Feferal Specification P-S-661, or equivalent) and dry with filtered compressed air. Inspect all threaded surfaces for serviceable condition and cleanliness. Inspect all parts for scratches, scores, chips, cracks and indications of excessive wear. Use new O-rings and gaskets during assembly. Lubricate all O-rings with Dow Corning DC-4 compound during assembly. Lubricate all threaded surfaces on the various valves in the power pack with MIL-G-81322 grease, or equivalent, before installing.

The following paragraphs describe assembly of the various components associated with and mounted in the power pack.

5-166. DOOR VENT VALVE. (Refer to figure 5-29.)
a. Install poppet in body and insert spring in body. Be sure that spring enters poppet.
b. Lubricate and install O-ring on retainer and insert retainer in valve body. Align holes in retainer with holes in valve body.
c. Install pin through valve body and retainer.
d. Lubricate threads on valve body (MIL-G-81322) and install assembly in reservoir: tighten securely.

5-167. STANDPIPE AND FILTER. (Refer to figure 5-29.)
a. If standpipe and filter assembly was removed, press into body until standpipe bottoms.
b. Replace vent filter and snap ring.
c. Install filler line filter and secure with snap ring.
d. Install back-up ring and O-ring on fill and drain tee, and install tee.

5-168. SYSTEM INLET CHECK VALVE. (Refer to figure 5-29.)
a. With pressure port up, drop spring into port.
b. Drop in plunger, making sure that small end of plunger goes into spring. Check freeness of plunger in body by depressing plunger against spring. Use small wood dowel or plastic rod to depress plunger when checking freedom of movement. Plunger must move freely in body bore.
c. Lubricate and install O-rings on flange of fitting and at end of fitting. Lubricate threads (MIL-G-81322), insert fitting, start the threads and tighten securely.

5-169. PRIORITY VALVE. (Refer to figure 5-29.)
a. Lubricate and install O-ring on poppet and insert poppet in body through reservoir. Push poppet down firmly. Either surface may be used as seating surface.
b. Inspect poppet seat for sharp seating edge. Lap as necessary to obtain a sharp seating edge. Lubricate and install O-ring on poppet seat.
c. Install poppet seat in body through reservoir, with sharp seating edge toward poppet. Push poppet seat down firmly against poppet.
d. Lubricate and install O-ring on retainer assembly, lubricate retainer threads (MIL-G-81322), and install retainer. Tighten securely.
e. Turn power pack upside down, lubricate spring and button (MIL-G-81322), and install body. Apply lubricant to hold button in spring and install with button in hole first.
f. Lubricate (MIL-G-81322) threads on retainer (adjusting plug) and install. This plug provides adjustment for the priority valve. Install flush at this time.

5-170. PRIMARY RELIEF VALVE. (Refer to figure 5-29.)
a. Inspect poppet and poppet seat for pitting or scoring. Since they are matched parts, if either or both are pitted or scored, replace as an assembly only.
b. Lubricate and install O-ring and back-up ring on seat, insert poppet in seat, and install assembly in body.
c. Lubricate ball, buttons and spring (MIL-G-81322). Install with ball entering hole first. Ensure that ball enters cavity at top of poppet.
d. Lubricate threads on retainer (MIL-G-81322) and install over button and spring; tighten securely.
e. Lubricate threads of adjusting screw (MIL-G-81322) and install at top of retainer. Turn adjusting screw full-down to lock primary relief valve closed, but do not tighten lock nut.

5-171. HAND PUMP VALVE. (Refer to figure 5-29.)
a. Insert spring and ball in body through reservoir.
b. Inspect seating surface of seat. It should have a very sharp edge. Seat may be lapped if necessary to obtain a sharp edge.
c. Lubricate and install O-ring on seat and install seat in body through reservoir.
d. Install filter screen, spacer, and snap ring in body through reservoir.
e. Install spring and ball in hand pump plunger.
f. Inspect seating surface. It should have a very sharp edge. Seat may be lapped if necessary to obtain a sharp edge.
g. Lubricate and install O-ring on seat and install seat in hand pump plunger. Secure with snap ring.
h. Lubricate and install O-ring on plunger, and internal and external O-rings on bronze gland.
i. Install gland on plunger, and insert plunger and gland into body.
j. Install scraper ring in counterbore of gland. Install so that flat surface of scraper is in counterbore

d gland and inner protruding part of scraper faces outward.

k. Thread lock-out solenoid wires through hand pump bracket, position solenoid, and install retainer nut. Do not tighten lock-out solenoid retainer nut at this time.

l. Attach hand pump bracket to Power Pack. Shift bracket so that lock-out solenoid plunger does not bind in any way with the landing gear handle barrier, then tighten bracket attaching screws, but do not safety at this time.

m. Install hand pump handle with pivot and linkage pins. Secure with cotter pins.

5-172. ASSEMBLY OF MANIFOLD. (Refer to figure 5-30.)

a. Lubricate and install the O-ring on landing gear selector spool, and the O-ring in manifold at the opposite end.

NOTE

If landing gear selector spool, manifold, and time-delay plunger are being replaced, install rack with a new laminated shim on selector spool. The landing gear selector spool, time-delay valve plunger, and manifold are matched, lapped parts. If necessary to replace, replace as an assembly only.

b. Insert selector spool in manifold from landing gear handle end of manifold. Insert only until end of selector spool is flush with solenoid end of manifold.

CAUTION

If the selector spool is moved much more than flush with the manifold at the end opposite the rack (before the manifold is installed and the rack engaged properly with the gear on the landing gear handle), an O-ring will become caught. The selector spool will then have to be removed, the manifold cleaned to remove all O-ring particles, and a new O-ring installed. The selector spool then must be reinstalled correctly.

c. Check that spool slides freely.

d. Inspect door solenoid spool for freedom of movement within the transfer sleeve assembly.

NOTE

Spool and sleeve are matched parts. If necessary to replace, replace as an assembly only.

e. Lubricate and install O-rings on transfer sleeve and install sleeve in manifold.

f. Attach plunger to door selector spool with pin.

g. Lubricate and install O-ring on solenoid.

h. Lubricate solenoid threads and spring (MIL-G-81322) and insert into plunger, then install solenoid over spring and plunger. Screw solenoid into manifold. Do not overtighten solenoid, but tighten securely by hand. Safety the solenoid to adjacent power pack mounting lug.

5-173. LANDING GEAR HANDLE AND HANDLE-RELEASE MECHANISM.

a. Assemble emergency hand pump handle as illustrated in figure 5-32.

b. If the landing gear handle was disassembled, assemble as illustrated in figure 5-31. When assembling gear handle, insert pin in spring and place in slot of handle. Using a small punch, compress spring slightly to install clevis pin.

c. If the landing gear handle shaft or gear was removed, the parts must be indexed and assembled as shown in figure 5-33.

d. Lubricate shaft (MIL-G-81322), install spacer on shaft with roll pin and insert shaft into power pack.

e. Install cam with roll pin. Both sides of cam surfaces are identical. Check landing gear handle for freedom of movement in Power Pack. Check for slight end play in shaft. If handle binds, remove cam and lap inside boss of cam to obtain slight end play in shaft with cam installed.

f. Install handle-release housing and safety attaching screws. Check landing gear handle for freedom of movement.

NOTE

Do not install plungers, springs, and hex-head retainers (adjusting plugs) at this time.

5-174. INSTALLATION OF MANIFOLD.

a. Lubricate and install O-rings on the seven transfer tubes.

b. Insert transfer tubes into Power Pack body.

c. Install time-delay valve plunger in manifold. Plunger must move freely in manifold without binding.

d. Mate manifold to Power Pack body, using care to prevent damage to O-rings on transfer tubes. Align dowel pin in Power Pack with dowel hole in manifold.

NOTE

When installing manifold, time the landing gear handle assembly to rack on selector spool as shown in figure 5-33. Refer to the following steps if binding occurs.

e. Install four manifold attaching screws and washers. Torque screws to 35 pound-inches and safety. Do not over-torque screws, as this will cause binding in the movement of landing gear handle.

NOTE

If a new landing gear selector spool, time-delay plunger, and manifold (a matched assembly) are being installed, the rack on the selector spool must be shimmed properly to provide a slight backlash (free movement) between the teeth of the rack and the teeth of the gear on the handle. This adjustment is provided by a laminated shim. If excessive backlash exists, a new shim must be used. If no backlash exists, or if a new shim is being installed, the "trial-and-error" method should be used, since the backlash is determined after manifold attaching screws are

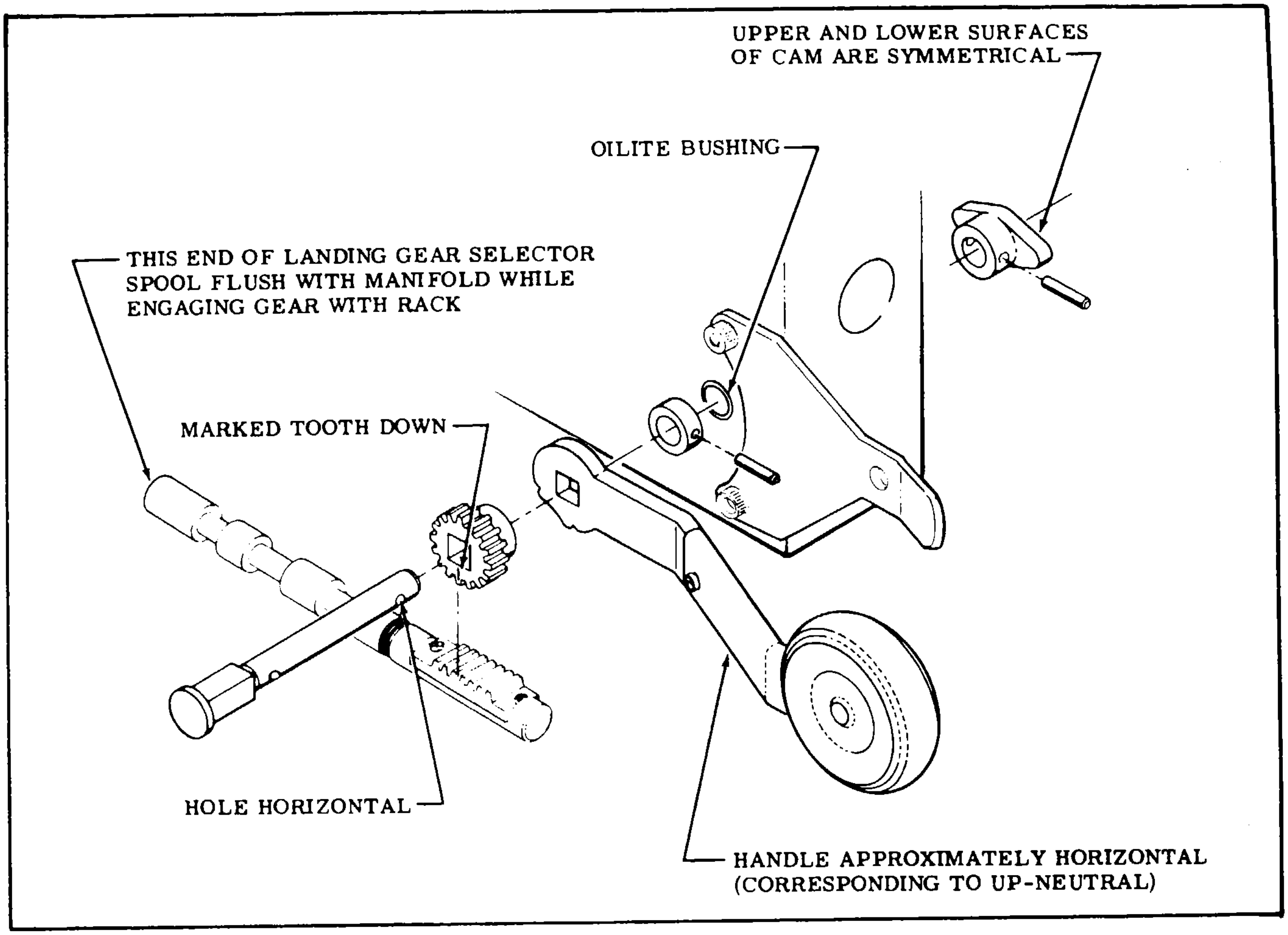


Figure 5-33. Indexing of Landing Gear Handle and Selector Spool

installed and torqued. Remove one lamination at a time until backlash exists when screws are torqued properly, then do not remove any more laminations. Apply Loctite to rack retainer screws only after final adjustment of shim has been determined and screws are being installed for the last time.

f. Lubricate and install two O-rings on time-delay valve retainer.

g. Lubricate (MIL-G-81322) and insert larger spring and spacer in body through reservoir.

h. Lubricate (MIL-G-81322) and insert ball and smaller spring in time-delay valve retainer (ball next to top of retainer).

i. Lubricate threads on time-delay valve retainer (MIL-G-81322) and install retainer in body through reservoir. Do not overtighten time-delay valve retainer, as this will cause the landing gear selector to bind in the manifold. After tightening time-delay valve retainer, check for freedom of movement of landing gear handle and selector spool.

j. Thoroughly lubricate handle return springs and plungers (MIL-G-81322) and install in housing with hex-head retainers. Do not tighten retainers at this time.

k. Lubricate and install two O-rings on landing gear handle release plunger and insert plunger in body.

l. Lubricate landing gear handle release spring and retainer (MIL-G-81322) and install in body. Tighten retainer (adjusting plug) until almost flush with body.

m. Install gear and rack protective cover. Safety attaching screws.

n. Install landing gear up-down switch and the switch attaching bracket. Note that washers are used between bracket and power pack. Switch bracket has slotted holes for switch adjustment.

NOTE

With landing gear handle at centerline of barrier, adjust up-down switch so that switch clicks at an equal distance up and down from centerline of barrier as landing gear handle is moved up and down.

o. Install terminal strip and place capacitor alongside the strip. Connect electrical wires to terminal strip and ground, clamping wires to door solenoid valve. If the wires from the handle lock-out solenoid are not long enough, rotate the lock-out solenoid until the wires will reach their connections. Tighten the lock-out solenoid retainer nut, and safety the retainer nut and hand pump bracket attaching screws together.

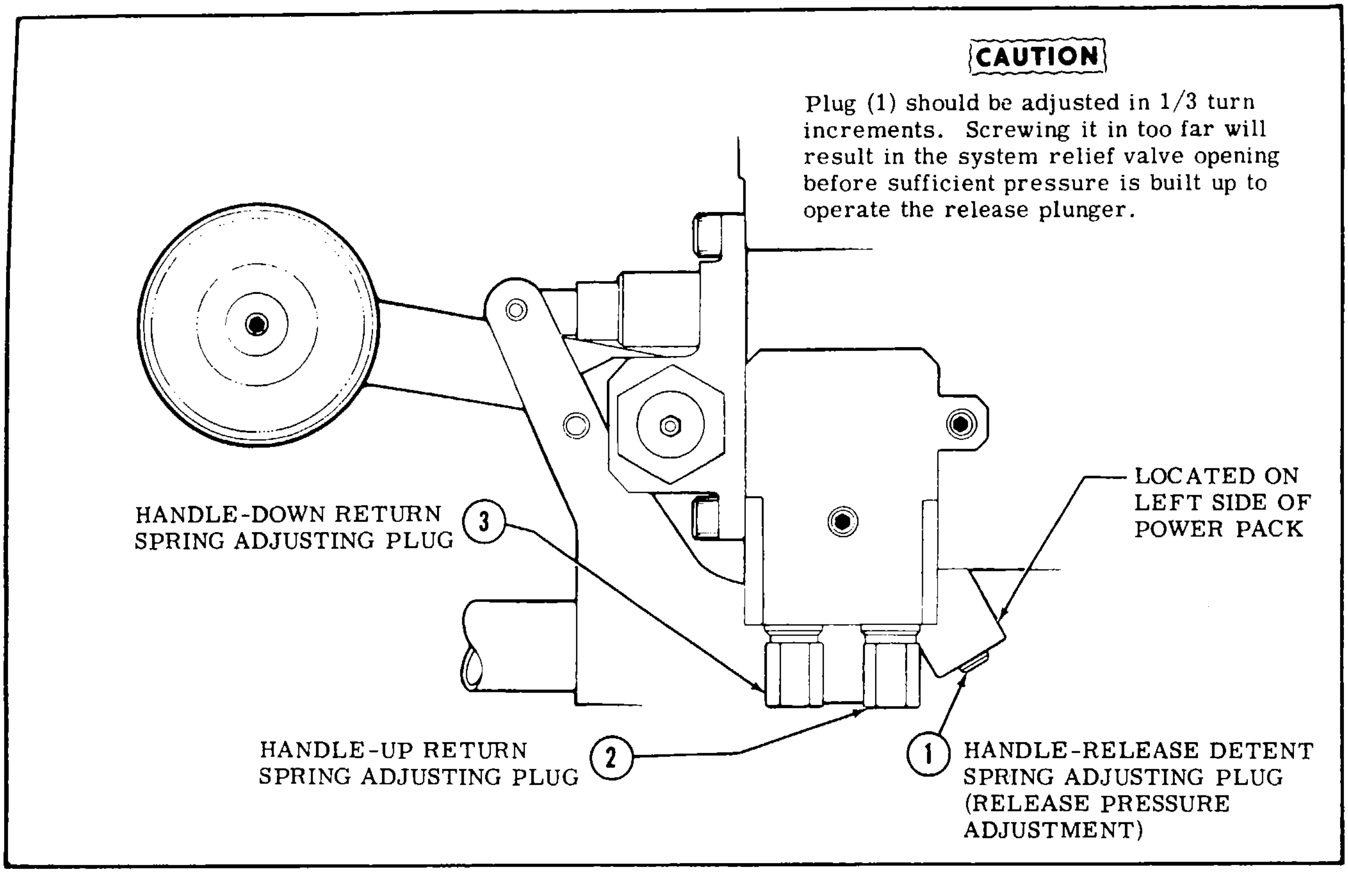


Figure 5-34. Landing Gear Handle Release Adjustment

NOTE

Electrical wires are coded with color stripes. Disregard color of wire terminals or plastic sleeving. If color codes are matched when wires are installed, the wires will be connected correctly.

p. A small nut is provided at the handle lock-out solenoid to adjust the stroke of the solenoid plunger. Adjust the nut so that the solenoid plunger fully engages the handle detent when released, but clears the handle when it is actuated, even when slight side-pressure is exerted manually on the handle.

q. Continue reassembly of Power Pack after pressure adjustments have been completed.

5-175. BENCH-TESTING THE HYDRAULIC POWER PACK.

NOTE

These procedures require a minimum of test equipment and are intended for bench-testing the power pack and its components after field repair.

5-176. PRESSURE ADJUSTMENTS.

NOTE

A chart of hydraulic system pressures is provided immediately following bench-testing procedures. The values contained in the chart may be used to check opening and reseating pressures of the power pack valves.

5-177. TEST EQUIPMENT. The following equipment is necessary for bench-testing the hydraulic power pack and its components.

a. One hydraulic hand pump of 2000 psi capacity.
b. One hydraulic pressure gage of 2000 psi capacity.
c. One hydraulic pressure gage of 150 psi capacity.
d. High pressure hose to attach hand pump to Power Pack inlet fitting.
e. Drain hose to connect to Power Pack reservoir drain fitting.

5-178. CONNECTING TEST UNIT. Use only clean hydraulic fluid (MIL-H-5606). Install a tee at the hand pump pressure outlet, and attach the 2000psi pressure gage and the pressure hose to the tee. Con-

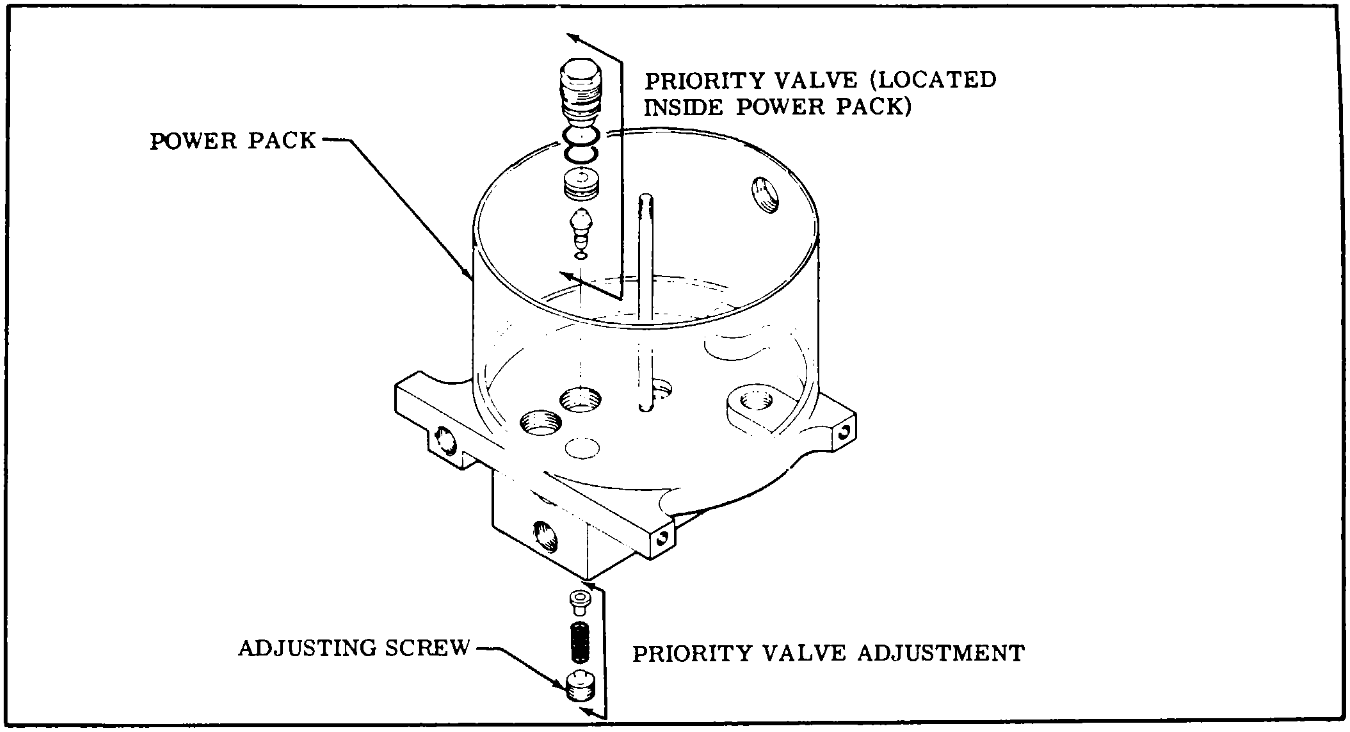


Figure 5-35. Priority Valve Adjustment

nect the hose from the hand pump to the power pack pressure inlet fitting, labeled "PUMP." Connect drain hose to power pack reservoir fill and drain tee. Cap all other fittings with high-pressure caps.

NOTE

Some test units are equipped with a hand pump, and others are provided with a pressure jack and provisions to install a hand pump.

5-179. BENCH-TESTING THE HANDLE RELEASE MECHANISM. (Refer to figure 5-34.)

a. With handle-return spring adjusting plugs (2 and 3) not tightened, screw in detent spring adjusting plug (1) until it is approximately flush. The spring, however, must not bottom out.

b. Place handle in up-detent position, then hold it beyond this position (in overtravel).

c. Tighten forward handle-return spring adjusting plug (2) until handle just starts to move out of overtravel, then loosen the adjusting plug one turn.

d. Place handle in down-detent position, then hold it beyond this position (in overtravel).

e. Tighten aft handle-return spring adjusting plug (3) until handle just starts to move out of overtravel, then loosen the adjusting plug one turn.

f. Place handle in up-detent position and tighten handle-release detent spring adjusting plug (1) until the spring bottoms out, then back the adjusting plug out two turns.

g. Handle must hold in both detent positions, but must return with a positive snap when manually released from either detent position. Handle-release detent spring adjusting plug (1) may be readjusted slightly more or slightly less than the two turns specified in the preceding step if necessary.

5-180. BENCH-TESTING THE PRIMARY RELIEF VALVE. (Refer to the chart following bench-testing procedures.)

a. Loosen lock nut and back adjusting screw at top of valve out until very little load is left on spring.

b. With landing gear handle in neutral, apply pressure until fluid flows from primary relief valve.

c. Adjust primary relief valve until valve cracks at 1700 psi. Adjusting this valve to 1700 psi cracking pressure will give approximately 1800 psi when valve is in a flow condition. Bleed pressure after each adjustment by cracking cap on door-open fitting. Tighten lock nut on adjusting screw after obtaining correct adjustment.

5-181. BENCH-TESTING THE PRIORITY VALVE. (Refer to figure 5-35 and the chart following bench-testing procedures.)

a. Place landing gear handle in up position and remove cap from gear-up fitting.

b. Apply pressure and note priority valve cracking pressure by observing pressure gage when fluid first starts to flow from gear-up port.

c. Adjust priority valve to crack at 750 psi. Bleed pressure after each adjustment by cracking cap on door-open fitting.

d. Disconnect test pump and cap all open fittings.

5-182. BENCH-TESTING THE DOOR SOLENOID VALVE. (Refer to figure 5-36.)

a. Remove caps from door-open and door-close fittings on power pack.

b. Connect Test Harness as shown in figure 5-36.

c. With Test Harness switch in OFF position, and landing gear handle in either up or down neutral, apply pressure and note that fluid flows from door-open fitting.

d. With Test Harness switch in either gear up or down position, landing gear handle in either up or down neutral, apply pressure and note that fluid flows from door-close fitting.
e. Disconnect test equipment and cap all open fittings.

5-183. BENCH-TESTING THE DOOR VENT VALVE.
a. Remove cap from door-open fitting on Power Pack, and attach pressure hose from hand pump with 150 psi pressure gage to door-open fitting.
b. Slowly apply 50 psi pressure and check to see that fluid flows from door vent valve.
c. Increase pressure to 100 psi minimum and check to see that door vent valve shuts off fluid flow, except for slight fluid seepage through the valve.
d. Relieve pressure by cracking hose fitting from hand pump.
e. Disconnect test pump and cap all open fittings.

To complete the reassembly of the Power Pack, proceed as follows:
a. Install reservoir cover attaching stud. Install with longer threaded end down, and screw in until stud bottoms in reservoir.
b. Install baffle and center stud spacer. Safety wire primary relief valve lock nut to screened standpipe.
c. Lubricate and install O-ring in groove of reservoir cover.
d. Position reservoir cover on reservoir, aligning index marks on reservoir and cover. Vent fitting in cover points to the left with Power Pack in aircraft.

CAUTION

Be sure that the large O-ring is positioned properly in the groove of the reservoir cover and that the O-ring is not pinched as the cover is installed.

e. Lubricate and install O-ring at top of cover around center stud.
f. Install cover retaining nut (cap nut), tighten, and safety.

5-184. HYDRAULIC SYSTEM PRESSURES (FOR BENCH OR FIELD TESTING).

COMPONENT	OPENING PRESSURE	RESEATING PRESSURE
Handle Release Valve.	750 to 1250 psi.	-------
Priority Valve.	750 to 800 psi @ 1.12 GPM*	-------
Primary Relief Valve.	1800 psi. @ 1.12 GPM*	1450 psi @ 10 DPM✱
Inlet Check Valve.	10 psi. (Max.)	2 psi. (Min.)
Hand Pump Check Valves.	10 psi. (Max.)	2 psi. (Min.)

* gallons-per-minute ✱ drops-per-minute

5-185. INSTALLATION OF POWER PACK.

NOTE

When installing a new power pack, leave the bulkhead nuts loose on the tubing fittings. This will allow proper positioning of these fittings, making it easier to align and connect the hydraulic lines.

a. Work power pack into position and install the three studs and one bolt that wecure it to the pedestal sides.

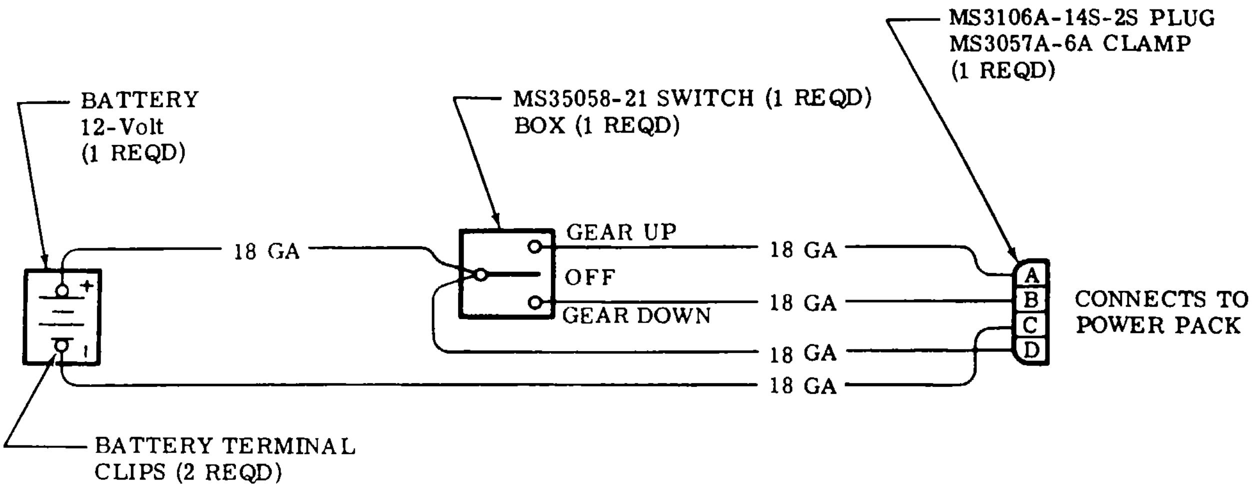
NOTE

The three studs serve as pivots for the elevator trim wheel, trim wheel pointer, and the cowl flap control arm. Adjust these systems and controls as necessary, according to instructions contained in appropriate sections of this manual, before installing the pedestal decorative cover.

b. Connect all hydraulic lines to Power Pack fittings. Make sure fittings are properly installed, with jam nuts tight, after lines are tightened.
c. Connect and safety electrical plug at door solenoid valve.
d. Install upper panel assembly on pedestal.
e. Connect filler unit and fill reservoir with clean hydraulic fluid.
f. With aircraft on jacks, use Hydro Test to operate landing gear through several cycles to bleed system. Check for proper operation and any signs of hydraulic fluid leakage.
g. Check elevator trim operation and cowl flap operation, and rig as required.
h. Install decorative cover and landing gear control lever knob.

5-185A. FIELD-TESTING THE HYDRAULIC POWER PACK (INSTALLED IN AIRCRAFT.)

5-186. ADJUSTMENT OF PRIMARY RELIEF VALVE. If the primary relief valve should get out of adjustment, or if fluid contamination, parts wear or defective parts should be suspected, the power pack



NOTE

SK210-42, Hydraulic Power Pack Bench Test Harness, is available from the Cessna Service Parts Center.

Figure 5-36. Power Pack Bench Test Harness Schematic Diagram

should be removed, disassembled and adjusted in accordance with applicable paragraphs in this Section.

5-187. ADJUSTMENT OF PRIORITY VALVE.

a. Jack aircraft and connect test unit in accordance with applicable paragraphs.

b. Cycle landing gear through two complete cycles.

c. With landing gear down, turn master switch OFF to open gear doors. Leave switch OFF to permit doors to remain open.

d. Open test unit bypass valve.

e. Place landing gear full-up. Close bypass valve very slowly, observing test unit pressure gage and test unit flow gage, until priority valve opens. Valve should open at pressure of 750 to 800 psi.

NOTE

As priority valve opens, nose gear downlock starts to release. Read test unit pressure gage at this point. The test unit flow gage will also aid in positively establishing opening of the priority valve. As pressure slowly builds up in the door system, there is practically no flow of fluid, and the flow indicator will be resting on the bottom of the sight glass. As the priority valve opens, the sudden increase in flow will cause the indicator to rise in the sight glass.

f. If adjustment is required, turn priority valve adjustment screw (refer to figure 5-35) IN to increase pressure at which priority valve opens. Adjust so that the valve opens at 750 to 800 psi as noted on the test unit gage. (Refer also to paragraph 5-184.)

g. Cycle landing gear to check for proper operation, then lower landing gear.

h. Assure landing gear is down and locked, then disconnect test unit.

i. Remove aircraft from jacks.

5-188. HANDLE-RELEASE ADJUSTMENT. (Refer to figure 5-34.) Correct adjustment of the landing gear handle-release mechanism is necessary because incorrect adjustments can cause excessive pressures in the Power Pack and can prevent free circulation of fluid, resulting in damage to the Power Pack. If the mechanism releases too soon, the landing gear handle may return to neutral before the landing gear doors are closed, if the time-delay should function improperly. Pressure build-up after the doors are closed operates the time-delay valve. After the valve opens, pressure then disengages a spring-loaded plunger from a detent and a handle return spring then pushes the handle back to neutral. The spring load on the detent plunger and the spring load on each handle return spring are adjustable. To adjust the handle-release mechanism, proceed as follows:

a. Jack the aircraft, then connect test unit in accordance with applicable paragraphs.

b. Remove pedestal decorative cover to gain access to adjusting plugs at bottom of Power Pack.

c. If Power Pack is being installed or if reservoir

c. If power pack is being installed or if reservoir fluid level has been low, fill reservoir and bleed time-delay valve in accordance with applicable paragraph.
d. Using Hydro Test, cycle landing gear through at least two full cycles, unless handle will not hold or fails to release.

NOTE

If the handle will not hold, either the detent spring load adjustment is set too low, the handle-return spring load adjustments are set too high, or the handle-return springs are bottoming out and not permitting the handle-release plunger to reach the detent positions. Check that the handle can be moved manually into the detent positions. If it cannot, loosen handle-return spring adjusting plugs (2 and 3) until the handle will engage the detents. If the handle will not release, either the detent spring load adjustment is set too high (forcing the detent plunger partially into the detent and making it mechanically impossible for the plunger to move completely out of the detent) or the handle-return spring load adjustments are set too low. Tighten detent spring load adjusting plug (1) until detent plunger bottoms out in detent, then loosen plug (1) approximately two full turns, until handle will release.

e. Using the Hydro Test, check the pressure at which the handle-release plunger disengages the detents, and readjust handle-release detent spring adjusting plug (1) as necessary to obtain a release pressure of approximately 1000 psi. Tolerance is 750 psi to 1250 psi. Use a very slow flow, and be sure time is allowed for time-delay valve to open. Cycle the landing gear between each adjustment.
f. Readjust handle-return spring adjusting plugs (2 and 3) until handle trips back from up and down positions with a positive snap. Again, cycle the landing gear between each adjustment.
g. Recheck the handle-release pressure specified in step "e."
h. Operate landing gear through several cycles, lower the landing gear, and remove aircraft from jacks.
i. Disconnect Hydro Test and install decorative cover on pedestal.

5-189. CHECKING HANDLE-RELEASE TO NEUTRAL.
a. Cycle the landing gear through two complete cycles, ending with the gear down and locked, and doors open.
b. Set test unit bypass valve full-open.
c. Place landing gear handle to full down.
d. Very slowly close bypass valve until handle trips back to neutral. Read gage at point of handle trip. This pressure should be 750 to 1250 psi. Be sure to allow time for time-delay valve to open.

NOTE

One release valve serves to release the handle from both the gear down and the gear up positions. If the handle-return springs are adjusted correctly, the release valve should release the handle from both positions at the same pressure. The foregoing procedure checks the release pressure from the gear down position, and the following procedure checks the release pressure from the gear up position. This is performed only to assure satisfactory operation of other equipment relative to handle release operations.

e. Set Hydro Test bypass valve full open.
f. Place landing gear handle full up.
g. Very slowly close bypass valve until handle trips back to neutral. Read gage at point of handle trip. This pressure should be 750 to 1250 psi. Be sure to allow time for time-delay valve to open.
h. Refer to paragraph 5-188 for handle-release adjustment.
i. Ensure landing gear is down and locked, then disconnect test unit.
j. Remove aircraft from jacks.

5-190. CHECKING FOR SUCTION AIR LEAKAGE.
a. Remove engine cowling as necessary for access.
b. Disconnect hydraulic pump suction (larger) hose from pump and connect Hydro Test suction (larger) hose to the aircraft suction hose, using a suitable fitting.
c. Disconnect hydraulic pump pressure (smaller) hose from pump and connect Hydro Test pressure (smaller) hose to aircraft pressure hose, using a suitable fitting.

NOTE

Before making this connection, be certain the line is wiped clean and is free of any dirt or foreign material which might have worked into the line. If the line is dirty internally, remove and flush with solvent, then dry with compressed air and reinstall.

d. Connect Hydro Test vent hose to aircraft reservoir vent line, protruding below lower edge of firewall.
e. Connect Hydro Test electrical cable to appropriate electrical power source.
f. Jack the aircraft and cycle the landing gear through five complete cycles. No air should be visible in Hydro Test sight gage.
g. Air visible in sight glass indicages leakage in suction line, hose, or fittings. Replace defective parts.

NOTE

If replacement of parts stops any visible air in Hydro Test sight glass but air still enters hydraulic system, engine-driven pump may have a suction leak.

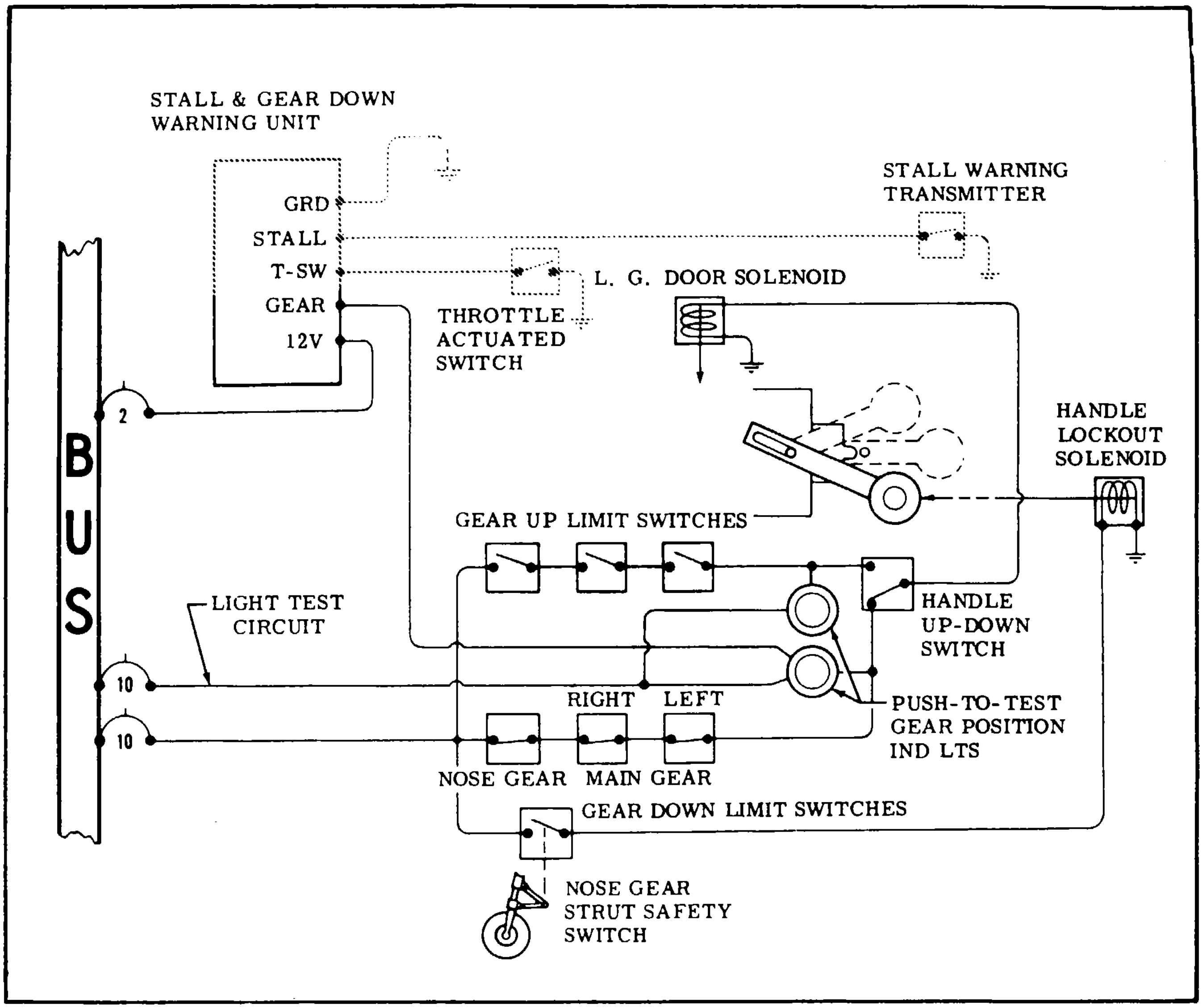


Figure 5-37. Landing Gear Electrical Circuit Schematic Diagram

h. Make sure landing gear is down and locked, and remove aircraft from jacks.

i. Disconnect Hydro Test

5-191. CHECKING LANDING GEAR CYCLE TIME. When the hydraulic system or aircraft pump is suspected of malfunction or disorder because of slow gear cycle time, it could be caused by low fluid in the aircraft reservoir, causing system to be full of air. The following procedure will purge air from system and fill the reservoir.

a. Cycle landing gear through two complete cycles.

b. With landing gear extended, place gear handle in full-up position and record time required for gear to retract and doors to close. Time should not exceed 10.5 seconds (+ 5 seconds, -0 seconds), plus the time required for the time-delay valve to operate.

c. With landing gear retracted, place gear handle in full-down position and record time required for gear to extend and doors to close. Time should not exceed 7.5 seconds (+9 seconds, -2 seconds), plus the time required for the time-delay valve to operate.

NOTE

If time is within limit when operated by Hydro Test, but exceeds limit when operated by engine-driven pump, there is internal leakage in pump. Repair or replace pump. If time exceeds limit when operated either by Hydro Test or engine-driven pump, internal leakage is in hydraulic system. Check actuators for internal leakage. Refer to paragraph 5-128. Repair or replace actuators as required. If actuators are not defective, Power Pack internal leakage is indicated. Repair or replace Power Pack.

5-192. LANDING GEAR ELECTRICAL CIRCUITS.

5-193. DESCRIPTION. Landing gear electrical circuits are shown in figure 5-37, which shows the switches in the gear-down and locked, weight-on-gear condition. The following chart describes what each electrical component in the circuit does.

5-194. LANDING GEAR ELECTRICAL COMPONENTS.

ITEM	OPERATED BY	FUNCTION
UP INDICATOR SWITCHES.	Gear in up and locked position.	Closes circuit to gear-up indicator light, handle up-down switch, and door solenoid valve.
DOWN INDICATOR SWITCHES.	Gear in down and locked position.	Closes circuit to gear down indicator light, handle up-down switch, and door solenoid valve.
HANDLE UP-DOWN SWITCH.	Power Pack selector spool.	"Preselects" up or down circuit. (Completes up or down circuit to door solenoid valve when gear reaches up or down position.)
DOOR SOLENOID VALVE.	Completion of up or down circuit. (Handle up-down switch and all gear indicator switches closed.)	Shifts valve to door-close position when energized. Spring-loaded to door-open position. Thus, with an electrical failure, the solenoid valve will remain in the door-open position and doors cannot be closed.

NOTE

Remember this rule: CLOSED circuit = CLOSED doors; OPEN circuit = OPEN doors. Applying this rule, the doors can be opened or closed at will by placing handle in down or down neutral, turning master switch on or off, and supplying pressure with the hand pump.

ITEM	OPERATED BY	FUNCTION
NOSE GEAR SAFETY SWITCH.	Actuating arm on lower torque link.	When aircraft weight causes shock strut to compress, switch opens circuit to handle lock-out solenoid, which is spring-loaded to lock position. When airborne, strut extends and closes switch, to unlock handle from gear-down range.
HANDLE LOCK-OUT SOLENOID.	Nose gear safety switch.	Prevents handle from being moved out of gear-down range while aircraft is on the ground.

CAUTION

Since a fully extended strut (too much air pressure, extremely aft weight distribution, etc.) simulates an airborne condition, be especially careful not to move gear handle from gear-down range under these conditions, or nose gear will retract.

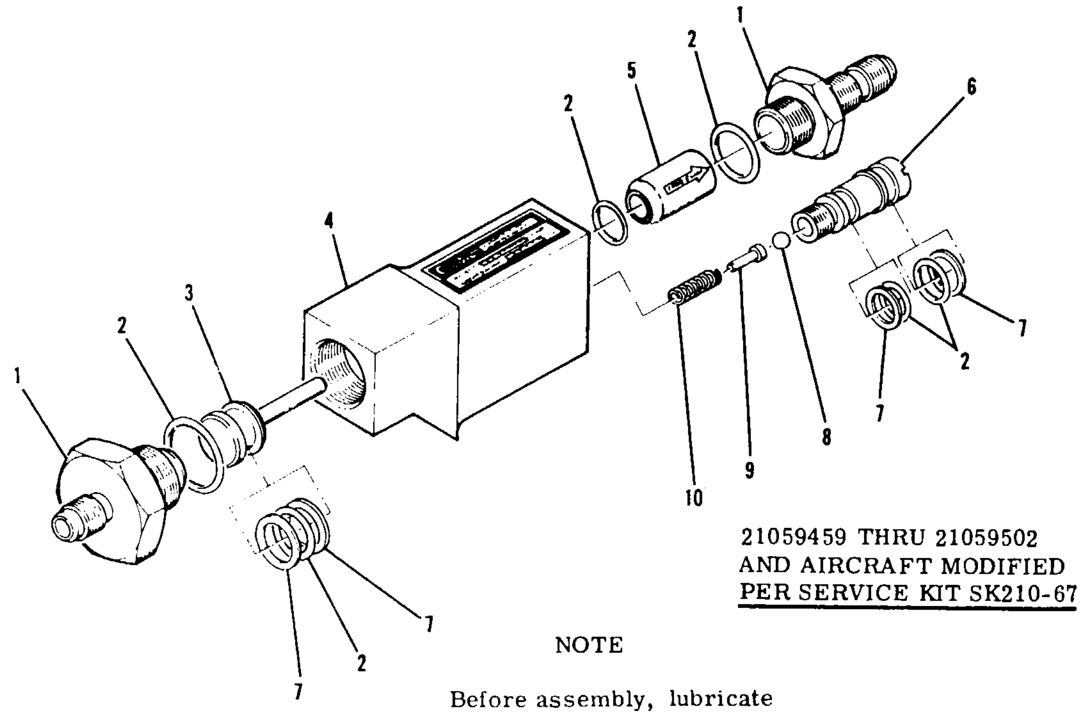
5-195. SWITCH ADJUSTMENTS. Landing gear up indicator switches, down indicator switches, nose gear safety switch and handle up-down switches may be adjusted as outlined in the rigging procedures. Adjustment of the throttle-operated switch is outlined in paragraph 5-290A.

5-196. DOOR CLOSE LOCK VALVE. (Refer to figure 5-38.)

5-197. DESCRIPTION. Wheel door actuators are held in the closed position by pressure trapped in the door close line by the door close lock valve. This enables the doors to remain in the closed position. The valve is located in the pedestal.

NOTE

The doors might come open as a result of changes in ambient temperature. The valve has no provisions for changes in pressure due to changes in ambient temperature. If doors open, check for leakage or damage prior to removing valve.



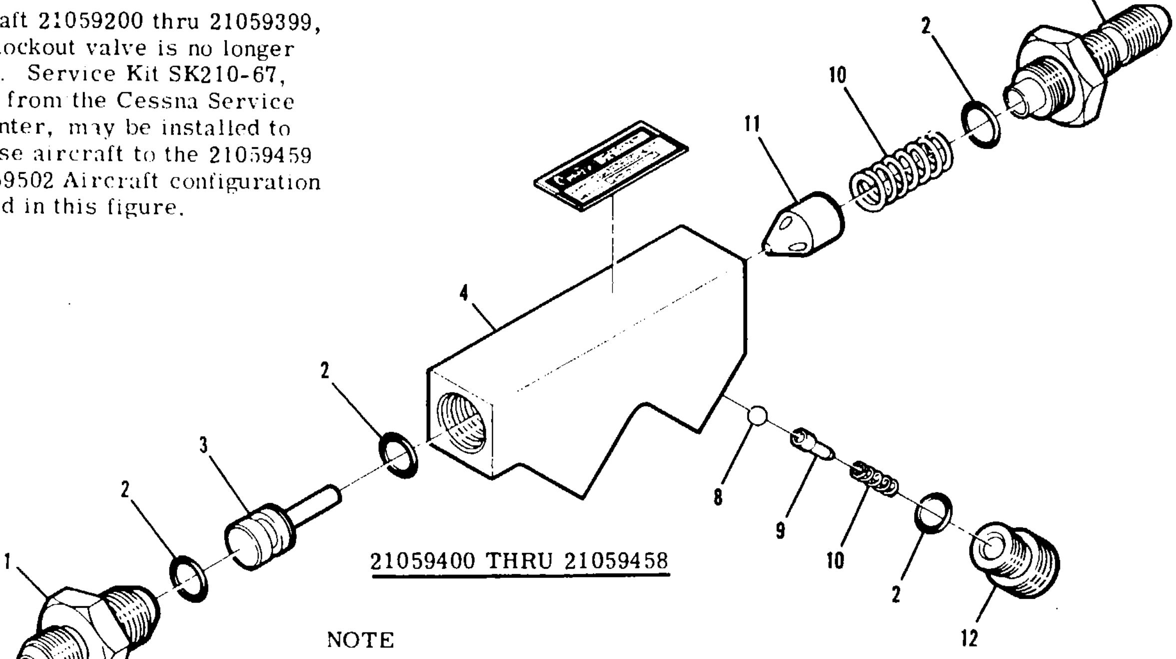
21059459 THRU 21059502
AND AIRCRAFT MODIFIED
PER SERVICE KIT SK210-67

NOTE

Before assembly, lubricate all packing with Petrolatum or MIL-H-5606 hydraulic fluid.

NOTE

On Aircraft 21059200 thru 21059399, existing lockout valve is no longer available. Service Kit SK210-67, available from the Cessna Service Parts Center, may be installed to bring these aircraft to the 21059459 thru 21059502 Aircraft configuration illustrated in this figure.



21059400 THRU 21059458

NOTE

Seat for poppet (11) is an integral part of housing (4). If seat is damaged, housing will have to be replaced.

1. Fitting
2. Packing
3. Piston
4. Housing
5. Check Valve
6. Seat
7. Back-Up Ring
8. Ball
9. Guide
10. Spring
11. Poppet
12. Retainer

Figure 5-38. Door Close Lock Valve (Sheet 1 of 2)

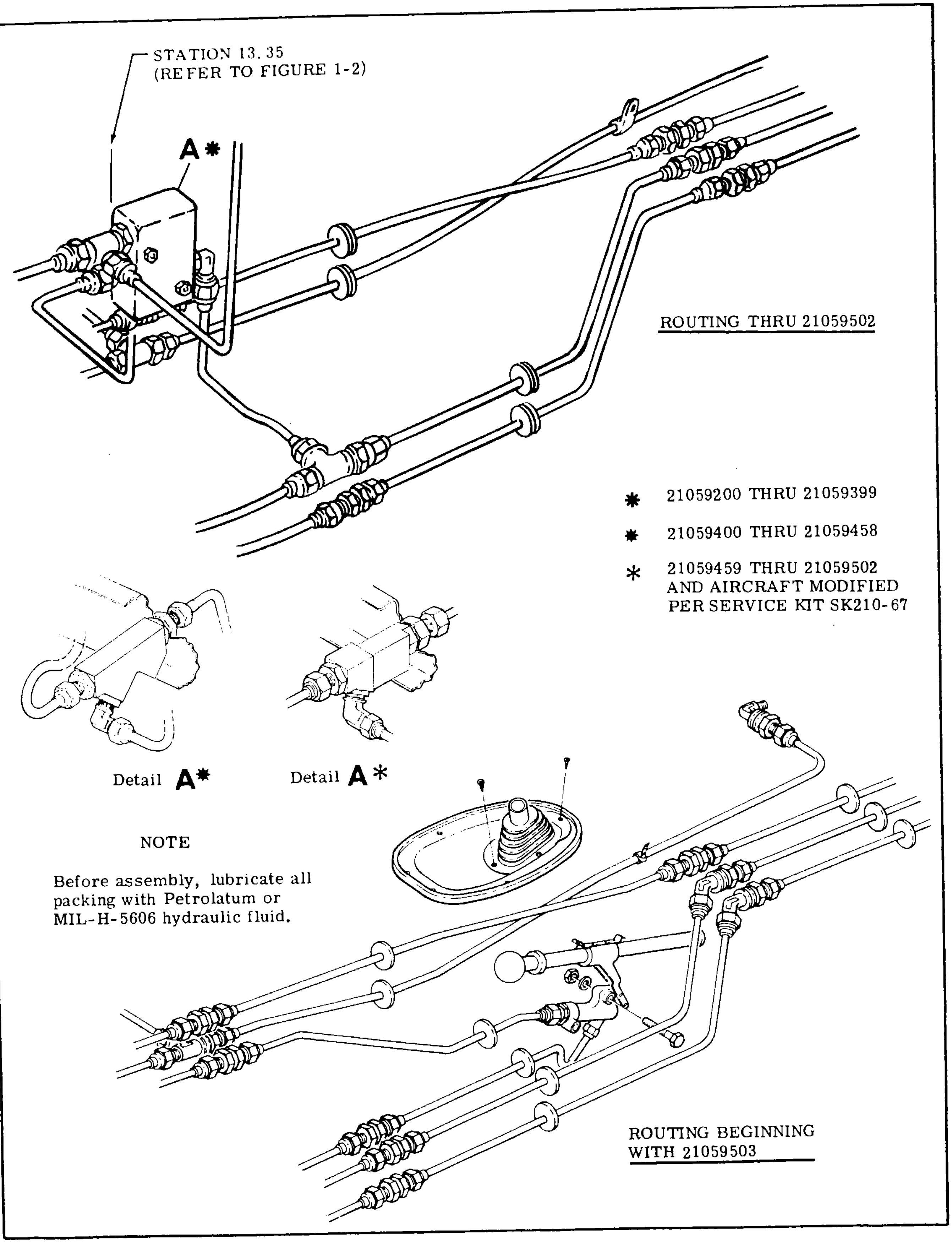


Figure 5-38. Door Close Lock Valve (Sheet 2 of 2)

5-198. REMOVAL.

a. Remove pedestal cover in accordance with procedures outlined in Section 9.
b. Remove lower pedestal cover.
c. Turn master switch ON.
d. Disconnect and cap or plug door open line.
e. Turn master switch OFF.
f. Remove valve.

NOTE

On aircraft 21059200 thru 21059399, existing lockout valve is no longer available, and is considered non-repairable. Service Kit SK210-67, available from the Cessna Service Parts Center, may be installed to bring these aircraft to the 21059459 thru 21059502 aircraft configuration. This Service Kit may also be used on aircraft 21059400 thru 21059458.

5-199. DISASSEMBLY. (Aircraft 21059400 thru 21059458) (Refer to figure 5-38.)

a. Remove end fittings (1) and packing (2).
b. Remove piston (3) and packing (2).
c. Remove spring (10) and poppet (11).
d. Remove retainer (12), packing (2) spring (10), guide (9) and ball (8).

5-200. INSPECTION. Perform the following inspections to ascertain that all parts are in a serviceable condition.

a. Inspect threaded surfaces for cleanliness and for freedom of cracks and excessive wear or damage.
b. Inspect poppet seat for sharp seating edge or cracks. Lap as necessary to obtain a sharp seating edge. If seat is cracked, housing must be replaced with new part.
c. Inspect ball seat in retainer (12).
d. Inspect piston (3) and guide (9) for cracks, scoring, wear or surface irregularities which may affect their function or the overall function of the door close lock valve.

5-201. ASSEMBLY. Repair of most parts of the door close lock valve assembly is impractical. Replace defective parts with serviceable parts. Minor scratches may be removed by polishing with fine abrasive crocus cloth (Federal Specification P-C-458), providing their removal does not affect the operation of the unit. Install all new packing during reassembly.

NOTE

Lubricate all packing with petrolatum or MIL-H-5606 hydraulic fluid during assembly.

a. Install new packings on piston (3) and install piston and end fitting (1). Use care to prevent damage to packing.
b. Install new packing along with poppet (11), spring (10) and end fitting (1). Use care to prevent damage to packing.
c. Install ball (8), guide (9) and spring (10); install packing and retainer (12).

5-202. DISASSEMBLY. (Aircraft 21059459 thru 21059502) (Refer to figure 5-38.)

a. Remove end fitting (1), packing (2), piston (3) and back-up rings (7) from housing (4).
b. Remove end fitting (1), packings (2) and check valve (5) from housing (4).
c. Remove seat (6) along with packings (2) and back-up rings (7).
d. Remove ball (8), guide (9) and spring (10).

5-203. INSPECTION. Perform the following inspections to ascertain that all parts are in a serviceable condition.

a. Inspect threaded surfaces for cleanliness and freedom of cracks and excessive wear or damage.
b. Inspect seat (6) for sharp seating edge with ball (8). Lap as necessary to obtain a sharp seating edge.
c. Inspect piston (3) and guide (9) for cracks, scoring, wear or surface irregularities which may affect their function or the overall function of the door close lock valve.

NOTE

Repair of most parts of the door close lock valve assembly is impractical. Replace defective parts with serviceable parts. Minor scratches may be removed by polishing with fine abrasive crocus cloth (Federal Specification P-C-458), providing their removal does not affect the operation of the unit. Install all new packing and back-up rings during reassembly.

5-204. ASSEMBLY.

NOTE

Lubricate all packing and back-up rings with petrolatum or MIL-H-5606 hydraulic fluid during assembly.

a. Install new packing (2) and back-up rings (7) on piston (3); install in housing (4) with end fitting (1). Use care to prevent damage to packing and back-up rings.
b. Install packings and check valve into housing (4) with end fitting (1).

NOTE

Install check valve with flow arrow pointing toward end fitting.

c. Install ball (8), guide (9), spring (10), packing (2) and retainer (12).

5-205. INSTALLATION. Reverse procedures outlined in paragraph 5-198 for installation of door close lock valve.

5-206. RIGGING OF MAIN LANDING GEAR. (Refer to figure 5-39.)

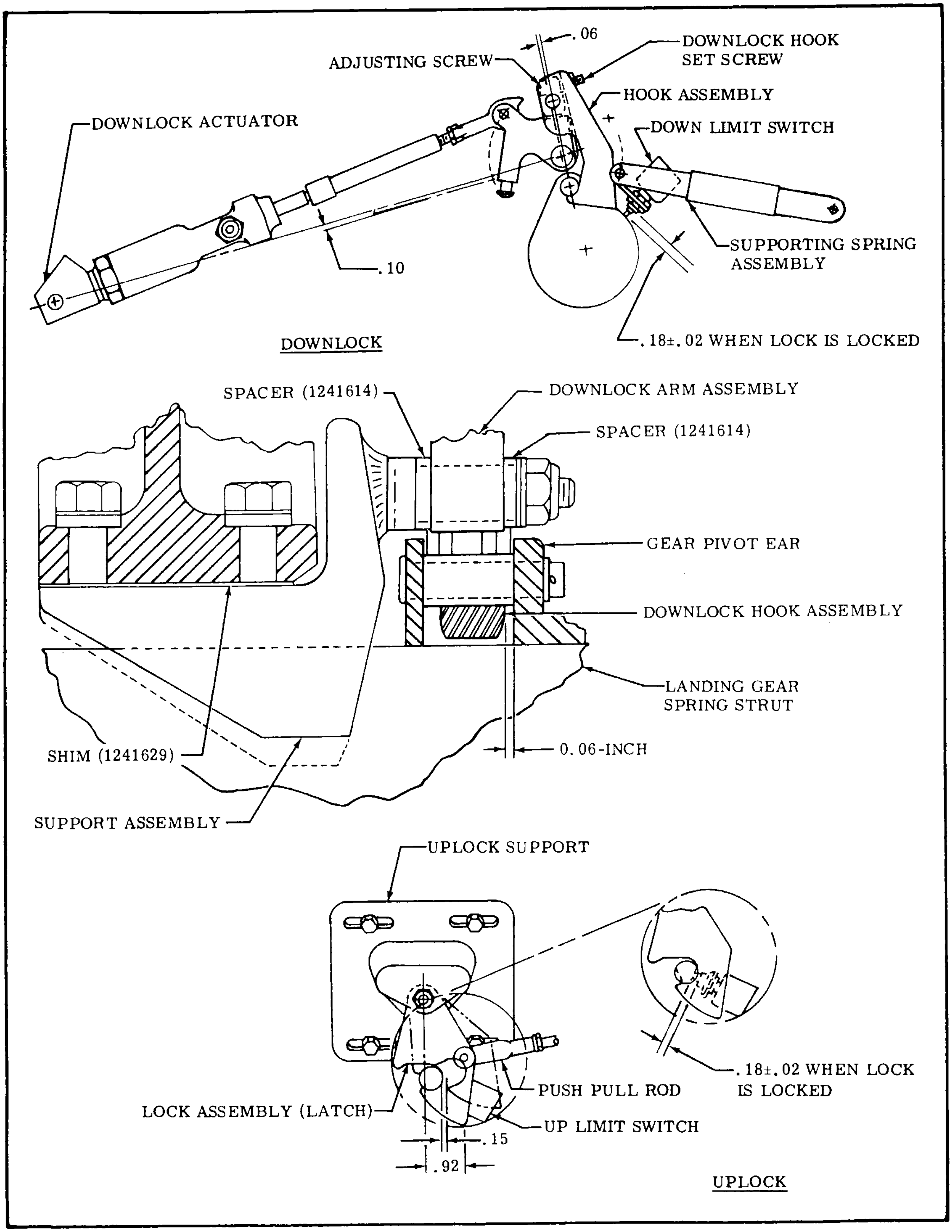
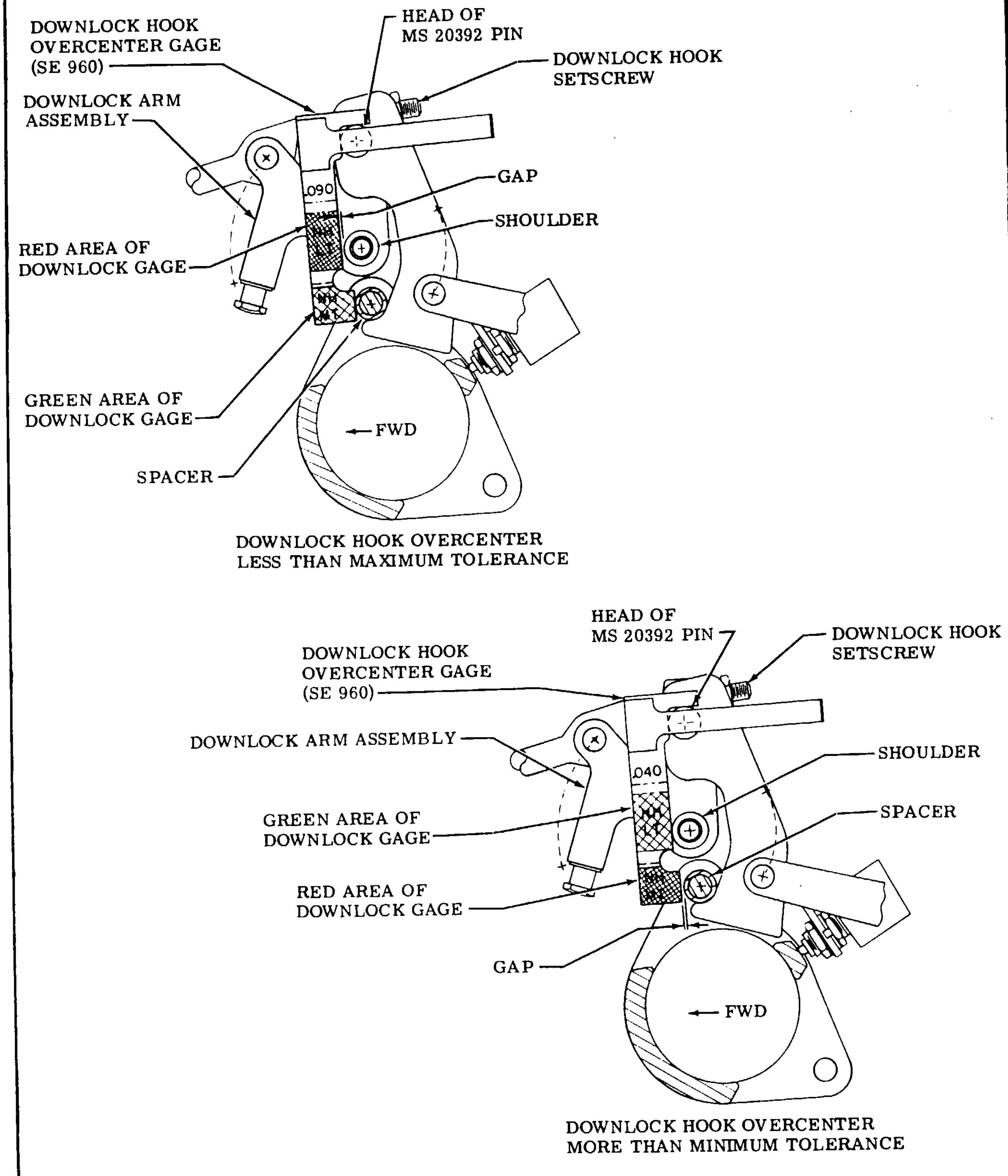


Figure 5-39. Main Landing Gear Uplock and Downlock Rigging (Sheet 1 of 2)



ABBREVATIONS ON GAGES
NHLT - NOT HITTING, LESS THAN DIMENSION STAMPED ON GAGE
NHMT - NOT HITTING, MORE THAN DIMENSION STAMPED ON GAGE

Figure 5-39. Main Landing Gear Uplock and Downlock Rigging (Sheet 2 of 2)

NOTE

All of the following rigging adjustments shall be accomplished with the aircraft on jacks and in a level condition. Since the engine-driven hydraulic pump cannot be used to supply pressure for these rigging procedures, a Hydro Test unit or other ground power source shall be used.

a. With the main landing gear unlocked and main landing gear downlock support forging assembled loosely to the outboard support assembly, bring main landing gear strut into down position and adjust main gear downlock support assembly as follows:

1. Center and shim simultaneously main landing gear support, using shims (P/N 1241629) between outboard forging and landing gear support assembly. The following shims are available from the Cessna Service Parts Center.

1241629-1	0.016 inch
1241629-2	0.025 inch
1241629-3	0.050 inch
1241629-4	0.071 inch

2. Use shims between downlock support assembly and outboard support assembly, to level wings and assure that end points of main landing gear wheel axle points are within ±0.25 inch.

NOTE

This measurement may be made from a point beneath the wing main spar on the upper door sill to the top bolt attaching ankle bone to the spring strut. Make measurements from corresponding points on the upper door sills. Shim thickness between downlock support and outboard support assembly shall not exceed 0.075 inch with a minimum thickness of 0.025 inch for either main gear.

3. Before installing downlock hook assembly, adjusting screw, and downlock arm assembly, adjust downlock hook set screw to stop hook assembly 0.06 + 0.03, - 0.02 inch overcenter as shown in figure 5-39.

4. Adjust downlock hook to clear inboard side of the gear pivot ear a minimum of 0.06 inch as shown in figure 5-39.

NOTE

On the 1970 Model use (NAS43HT8-4) spacers as required on inboard side of downlock arm assembly. On the 1971 Model and on, a (1241614-1) spacer is installed on each side of the downlock arm assembly and either spacer may be relocated to the inboard or outboard side of the downlock arm assembly to obtain the 0.06 inch clearance between hook assembly and the inboard of the gear pivot ear. Therefore, after adjustment, both (1241614-1) spacers may end up on either the inboard or outboard side of the downlock arm assembly.

b. (1970 Model). With the downlock actuator overcenter in the gear unlocked position, adjust downlock actuator rod end to bottom out actuator piston in the retracted position, then back off rod end two and one-half turns and tighten locknut. Some minor adjustment may need to be made to the rod end later in this rigging procedure.

c. (1971 Model). With downlock actuator at free position, adjust actuator rod end to obtain a length of 12.45 inches between centerlines of attach bolts.

NOTE

A new actuator is received with a preassemble length of 12.45 inch and the three hydraulic ports in the same plane. Before installing the actuator, loosen the actuator assembly jam nut and back the end cap out 3/4 turn for the left hand side or back the end cap out 1/4 turn for the right hand side to align the hydraulic ports with their hydraulic lines. Tighten jam nut. Then, adjust actuator rod end to obtain the 12.45 inches between centerlines of the attach bolts.

d. With main landing gear unlocked, Power Pack gear handle in down neutral, and downlock in position shown in figure 5-39, swing gear into the down position and adjust adjusting screw as follows:

1. If the downlock locks, remove pin and turn adjusting screw 1/4 turn OUT at a time until downlock will not lock; then turn adjusting screw IN 1/4 turn and secure pin.

2. If the downlock does not lock, remove pin and turn adjusting screw 1/4 turn IN at a time until downlock will lock and secure pin.

e. Readjust downlock hook setscrew to stop hook assembly 0.06 + 0.03, - 0.02 inch overcenter as shown in figure 5-39.

f. When checking the overcenter measurement of the downlock arm assembly, the landing gear should be as shown in figure 5-39 with nut, washer and spacer removed which retians the downlock arm assembly. Use the downlock overcenter gages (P/N SE960) to determine if the downlock hook assembly is still within tolerance as shown in sheet 2 of figure 5-39. Use the gages as follows:

NOTE

The SE960 gages are available from the Cessna Service Parts Center.

1. Remove nut, washer, and spacer which attaches the downlock arm assembly to the downlock support.

2. Install the 0.090 downlock gage (SE960) on inboard side of the downlock hook as shown in figure 5-39. The upper portion of the gage should rest against head of the pin attaching the adjusting screw. If downlock hook is under maximum overcenter tolerance, green area of gage will contact spacer on gear pivot ear while red area of gage will not make contact with downlock arm assembly pivot shaft as shown in figure 5-39. When downlock hook is on maximum overcenter tolerance both green and red areas of the gage will make contact. If red area

makes contact and green area does not make contact, adjust downlock hook set screw IN to bring overcenter dimensions to within tolerance.

3. Install the 0.040 downlock gage (SE960) on inboard side of the downlock hook as shown in figure 5-39. If the downlock hook is over minimum over-center tolerance, the green area of the gage will not make contact with spacer on gear pivot ear.

4. When downlock hook is on minimum over-center tolerance, both green and red areas of the gage will make contact.

5. If the overcenter tolerance is less than 0.040, the red area of the gage will make contact while the green area of the gage will not. If this condition exists the next step is to determine if the downlock hook adjusting screw is making contact with the down-lock hook set screw. This is accomplished by lifting the landing gear spring upward off the downlock hook assembly and checking for possible rotation of the downlock hook assembly, by hand, with the hydraulic pressure off.

6. If a slight rotation is possible, the downlock hook set screw is not contacting the downlock hook adjusting screw, therefore, the downlock actuator will have to be readjusted by backing off the actuator rod end one-half turn at a time (one and one-half turn is the maximum adjustment) until the downlock hook assembly is 0.040 or more overcenter and contact is being made between downlock hook assembly set screw and downlock hook adjusting screw.

NOTE

Maximum adjustment of actuator rod end at this time is one and one-half turns.

7. If the downlock hook adjusting screw and the downlock hook set screw are making contact, the downlock hook set screw should be adjusted outward to increase the overcenter tolerance.

NOTE

For correct rigging, the downlock hook set screw must make contact with the adjusting screw and the green areas of both gages must contact as shown in figure 5-39 for the over-center tolerance to be in tolerance.

g. With the main gear in the up-locked position and system pressure released, adjust the uplock supports so that the end of the lock hooks are 0.92-inch in-board of the lock hook attach bolt as shown in figure 5-39.

h. Adjust uplock system push-pull rods so that when the uplock latches are disengaged, both main gear struts are released simultaneously and the uplock studs clear the latches a minimum of 0.15-inch as shown in figure 5-39.

i. (1971 Model). Make a malfunction check of the downlock actuator rod end adjustment as follows:

1. Ascertain that hydraulic system is purged of air.

2. With the landing gear in the down and lock position and Hydro Test stand operating, move the gear selector handle to the gear up position and note the actuation of the main gear downlock hooks.

3. As soon as the left downlock hook is actuated to unlock the left gear, move the gear selector handle back to the gear down position to simulate what would happen if the pilot were to select gear down before the gear was fully retracted. If the downlock hooks had cocked in the unlock position so that the gear could go back to the down position and trip the down-lock actuator rod end, adjustment is satisfactory.

4. If the downlock hook did not cock in the un-locked position, thereby preventing the gear from going back to the downlock position, shorten the downlock actuator rod end one turn at a time until the malfunction does not occur.

5. If the downlock actuator rod end required readjustment, perform checks outlined in step "f."

5-207. RIGGING OF MAIN LANDING GEAR WHEEL AND STRUT DOORS. After jacking the aircraft, main landing gear door adjustments are accomplished by adjusting push-pull rod ends and actuator rod ends as required to cause the doors to close snugly. With the doors closed, and 1500 psig applied to the closed port of the actuator, the doors shall not be deformed. When installing new doors, some trimming and forming at edges of the doors may be necessary to achieve a good fit. When actuator is fully extended, the doors shall be equally open and clear the gear a minimum of 0.50 inch at closest point.

5-208. RIGGING OF MAIN LANDING GEAR LIMIT SWITCHES. Rig main landing gear down indicator and up indicator limit switches as shown in figure 5-39.

5-209. RIGGING OF NOSE GEAR. (Refer to figure 5-40. The nose gear downlock mechanism is basically a claw hook at the end of the piston rod end of the nose gear actuator. On the 1970 model, the actuator contains an internal lock to hold the claw hook mechanism overcenter. Beginning with the 1971 model the actuator no longer contains the internal lock. Jack the aircraft and rig the nose gear as follows:

NOTE

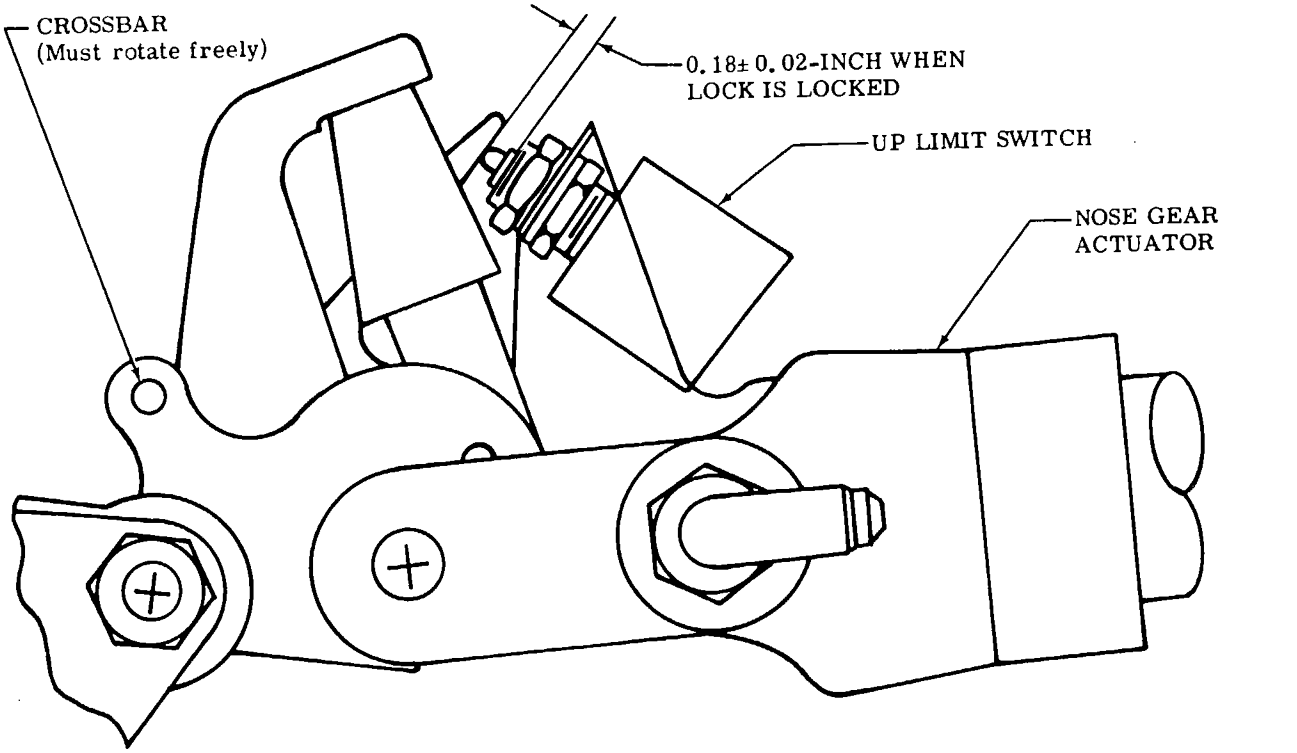
The nose gear shock strut must be correctly inflated prior to rigging of the nose gear. Refer to figure 1-1 for correct nose gear shock strut inflation.

a. (1970 Model). With the internal locks engaged, the external claw hooks shall completely engage lock pins without drag, and cross bar shall rotate freely to indicate it is not bearing on either side of slot in rod end. Adjust rod end of actuator as required.

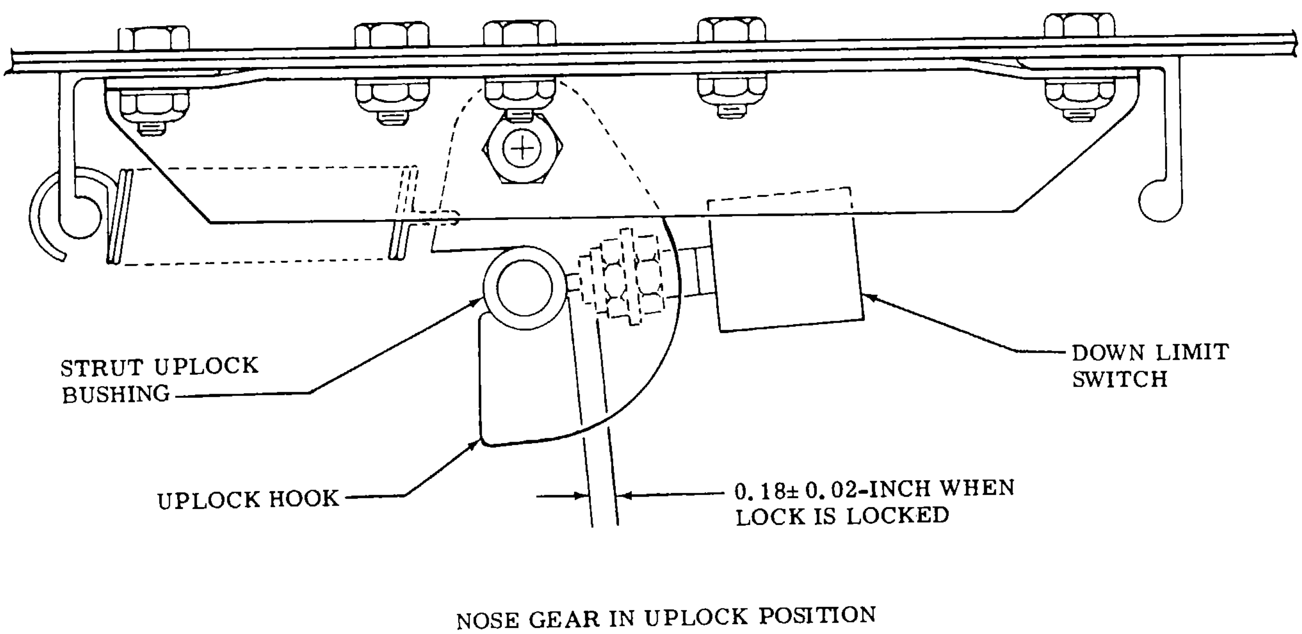
NOTE

On the 1970 Model, locking of internal lock is indicated by inability to lift and disengage external claw lock manually. Locks shall release only when hydraulic pressure is applied at anchor end part of actuator.

b. (1971 Model). The external claw locks on the nose gear actuator shall completely engage lock pins



NOSE GEAR IN DOWNLOCK POSITION



NOSE GEAR IN UPLOCK POSITION

Figure 5-40. Rigging of Nose Gear Limit Switches without drag, and cross bar shall rotate freely to indicate it is not bearing on either side of slot in rod end. Adjust rod end of actuator as required.

CAUTION

The piston rod is flattened near the threads to provide a wrench pad. Do not grip the piston rod with pliers, as tool marks will cut the O-ring seal in the actuator.

5-210. RIGGING OF NOSE GEAR DOORS. After jacking aircraft, nose landing gear door adjustments are accomplished by adjusting push-pull rod ends and actuator rod ends as required to cause the door to close snugly. Doors must fair when the actuator is in the close position. Link rods shall be adjusted so that the door in open position clears any part of the nose gear assembly a minimum of 0.25-inches during retraction or extension. Nose gear strut doors shall fair when nose gear lock bushing is fully engaged with the uplock hook. When installing new doors, some trimming and forming at edges may be necessary to achieve a good fit.

5-211. RIGGING OF NOSE GEAR LIMIT SWITCHES. The nose gear down indicator switch is operated by an arm on the downlock mechanism. The nose gear up indicator switch is attached to the uplock hook in the top of the nose wheel well. After jacking the aircraft, adjust the switches as shown in figure 5-40.

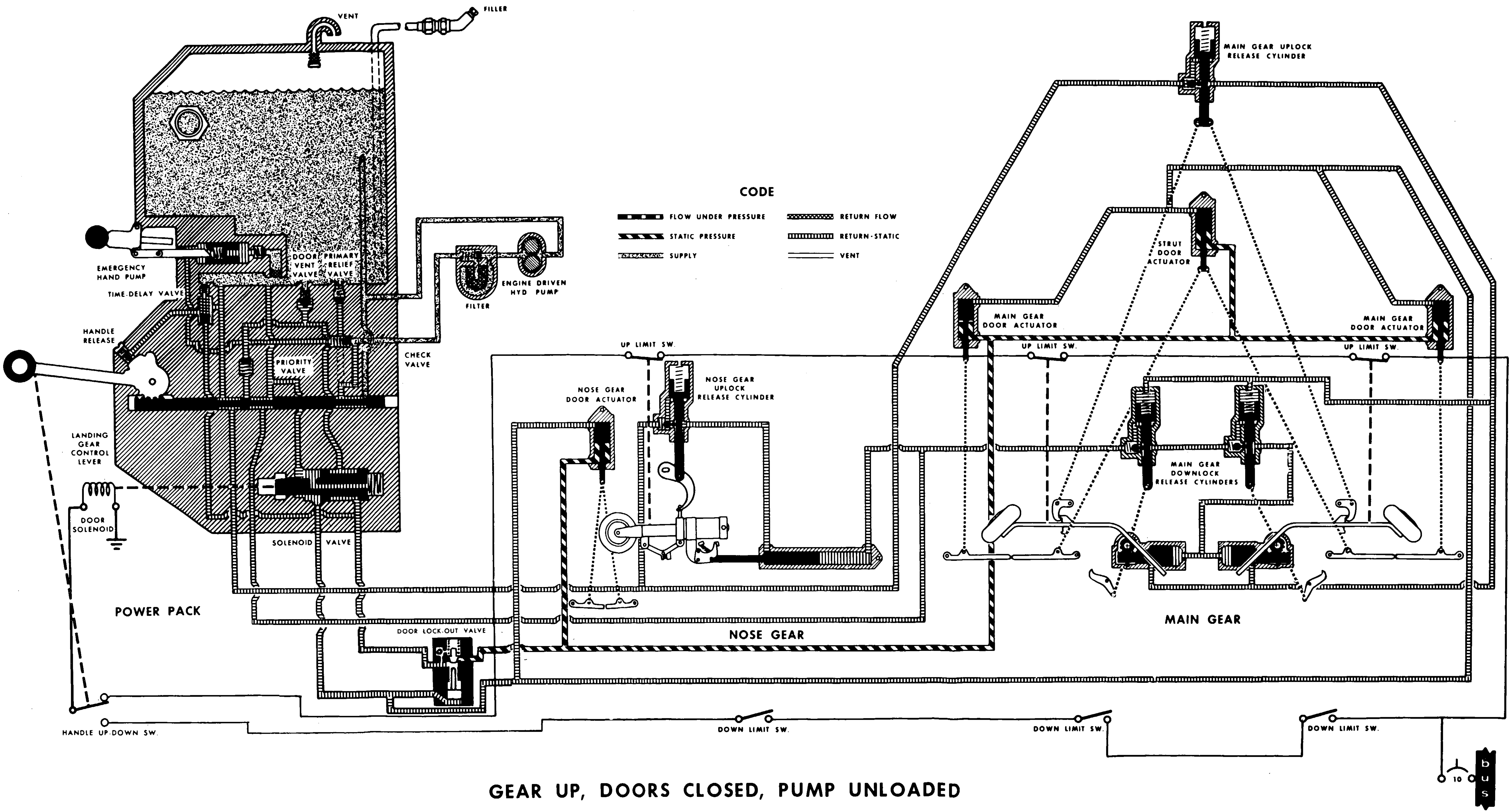
5-212. RIGGING OF NOSE GEAR SQUAT SWITCH. The nose gear squat switch, electrically-connected to the landing gear lockout solenoid, is operated by an actuator, attached to the nose gear lower torque link. Adjust the squat switch contacts to close when the strut is between 0.12 and 0.25-inch from fully extended position.

5-213. RIGGING POWER PACK UP-DOWN SWITCH. The handle up-down switch is located on the power pack, and is normally rigged during assembly of the power pack. With landing gear handle at centerline of barrier, adjust up-down switch so that switch clicks at an equal distance up and down from centerline of barrier, as landing gear handle is moved up and down.

5-214. RIGGING OF GEAR HANDLE LOCKOUT. The handle lockout solenoid contains a plunger which prevents the handle from being moved upward from the gear down range. Adjust the small nut on the solenoid plunger so the plunger fully locks the handle, but clears the handle when actuated, even with slight side-pressure exerted manually on the handle.

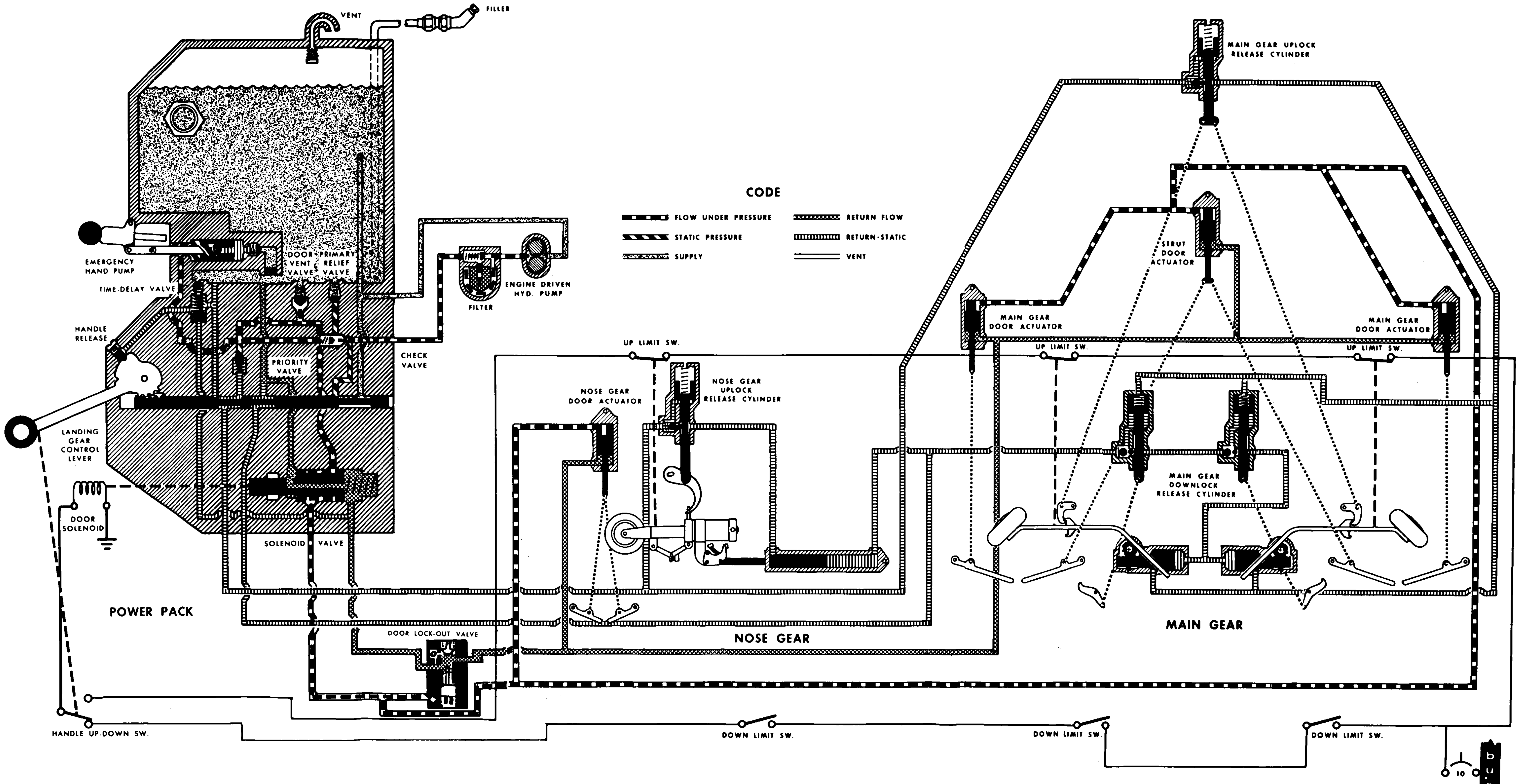
HYDRAULIC SYSTEM SCHEMATICS

The 10 following fold-out pages contain coded schematic diagrams of the hydraulic system. Sheet 1 shows the system "at rest" with the landing gear up. Sheets 2 through 5 show various stages of the gear-down cycle, after which the system is again "at rest" with the landing gear down. Sheets 6 through 9 show various stages of the gear-up cycle, after which the system returns to the condition shown on sheet 1. Sheet 10 shows the landing gear being extended with the emergency hand pump without electrical power.



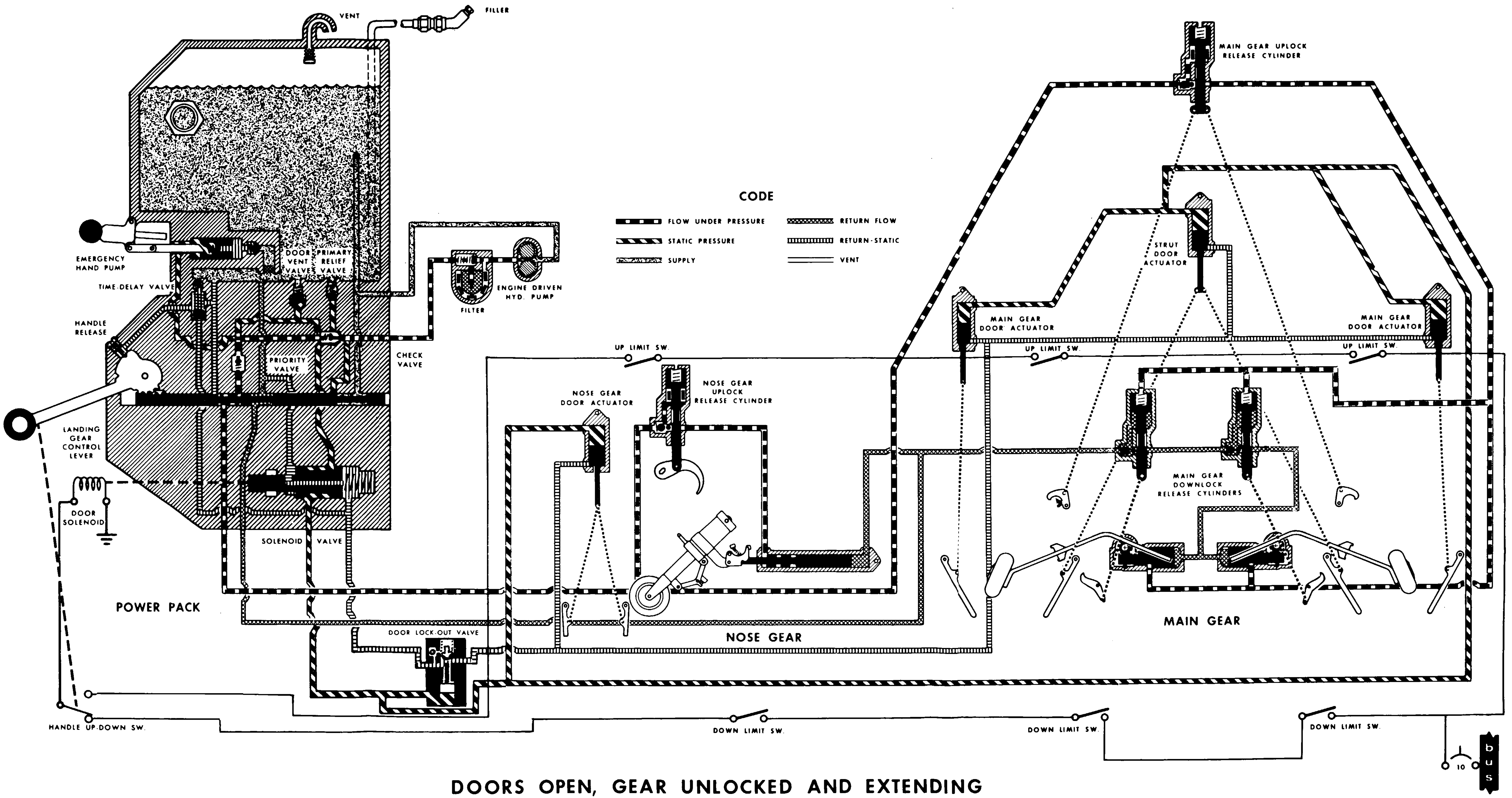
GEAR UP, DOORS CLOSED, PUMP UNLOADED

Part 1. Hydraulic System Schematics (Sheet 1 of 10)



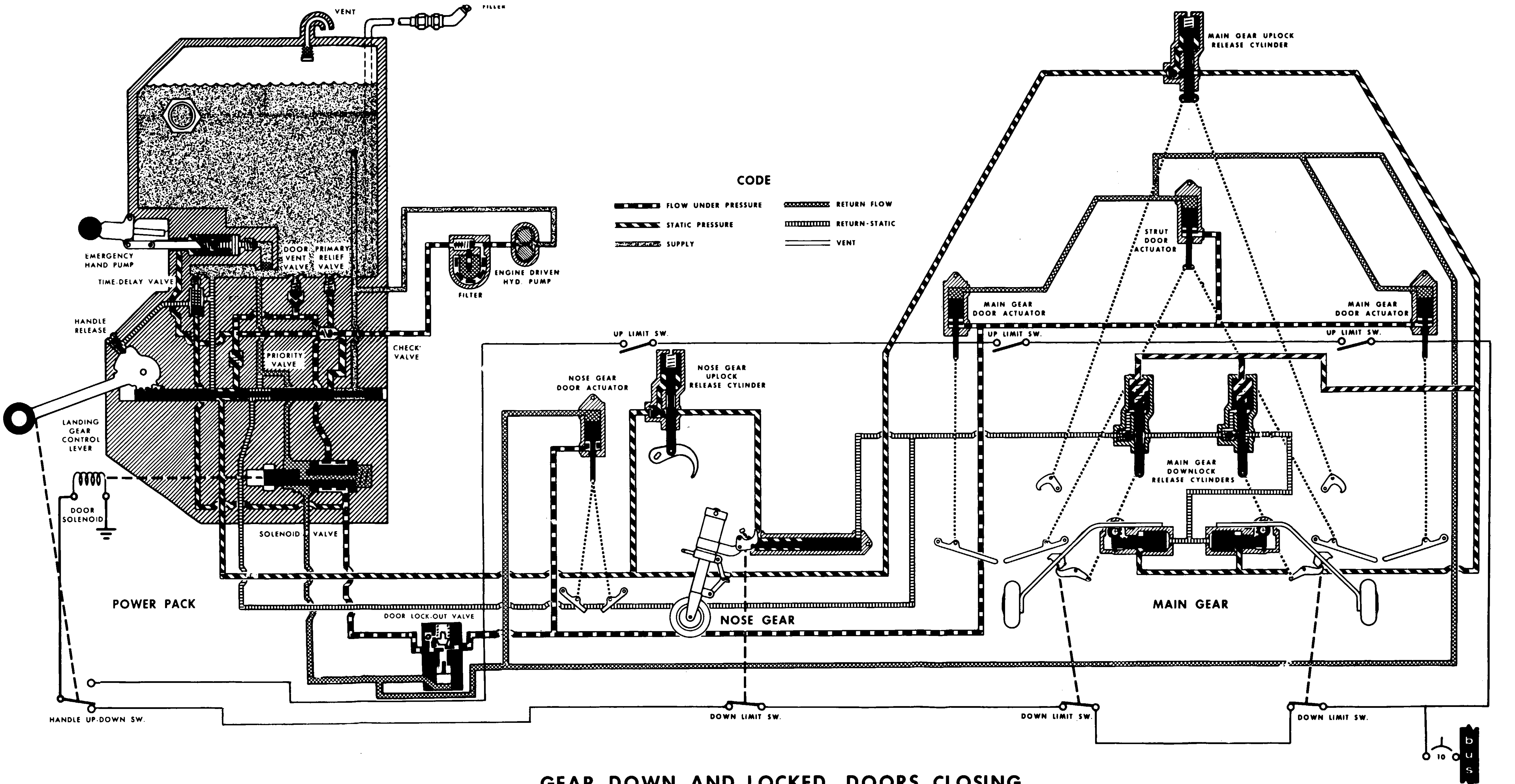
LANDING GEAR CONTROL JUST PLACED DOWN, DOORS OPENING

Part 1. Hydraulic System Schematics (Sheet 2 of 10)



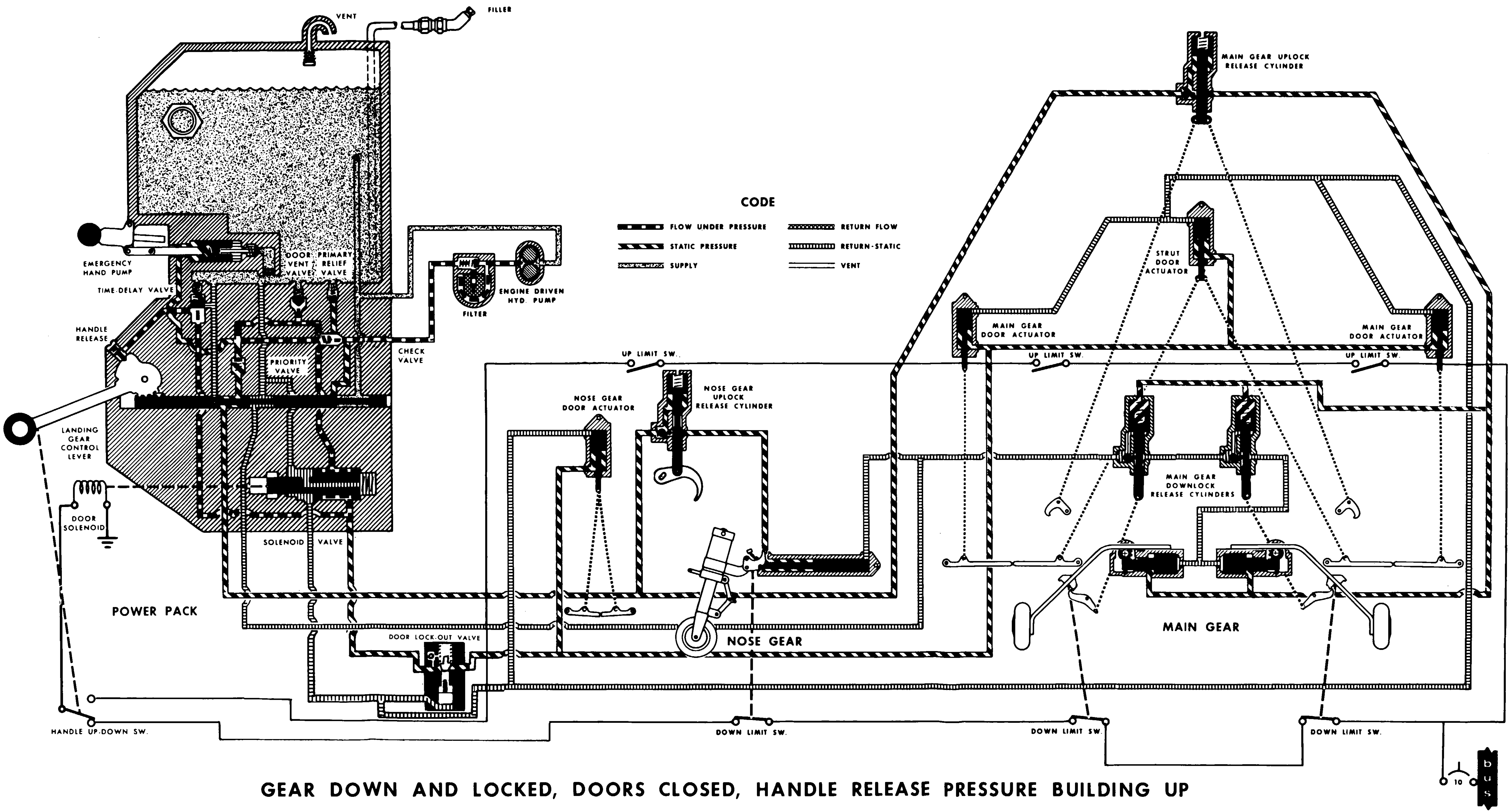
DOORS OPEN, GEAR UNLOCKED AND EXTENDING

Part 1. Hydraulic System Schematics (Sheet 3 of 10)



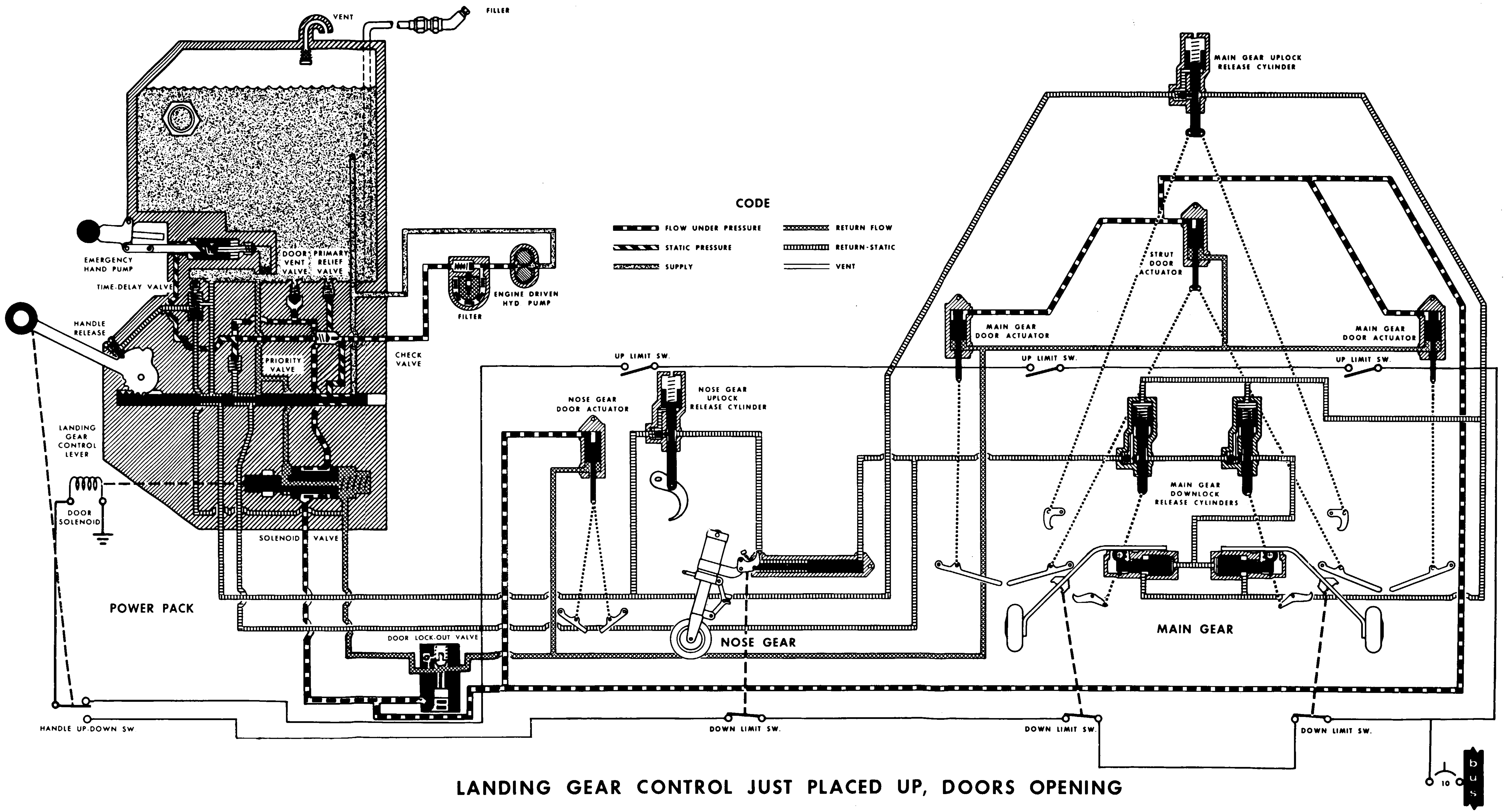
GEAR DOWN AND LOCKED, DOORS CLOSING

Part 1. Hydraulic System Schematics (Sheet 4 of 10)

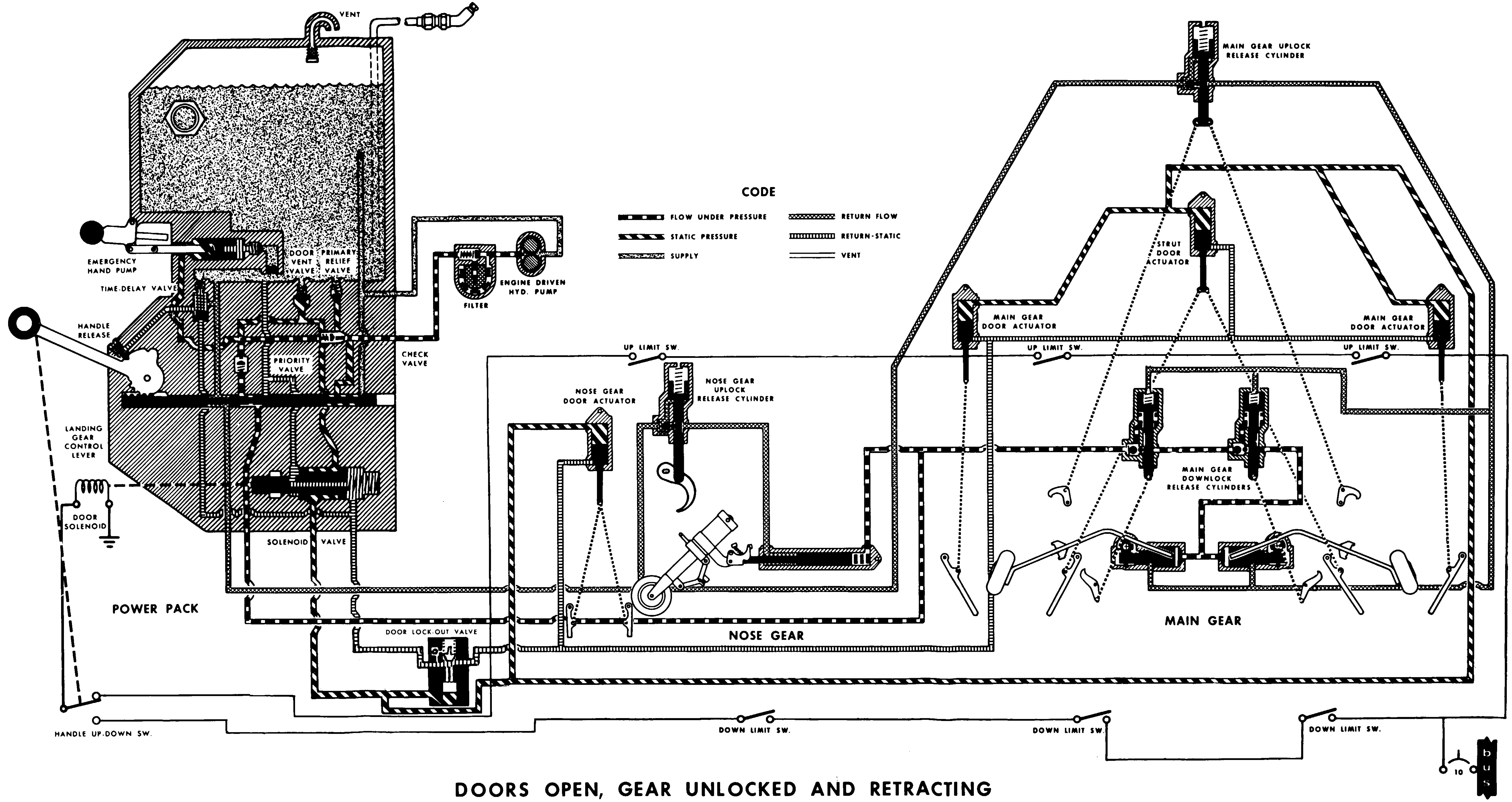


GEAR DOWN AND LOCKED, DOORS CLOSED, HANDLE RELEASE PRESSURE BUILDING UP

Part 1. Hydraulic System Schematics (Sheet 5 of 10)

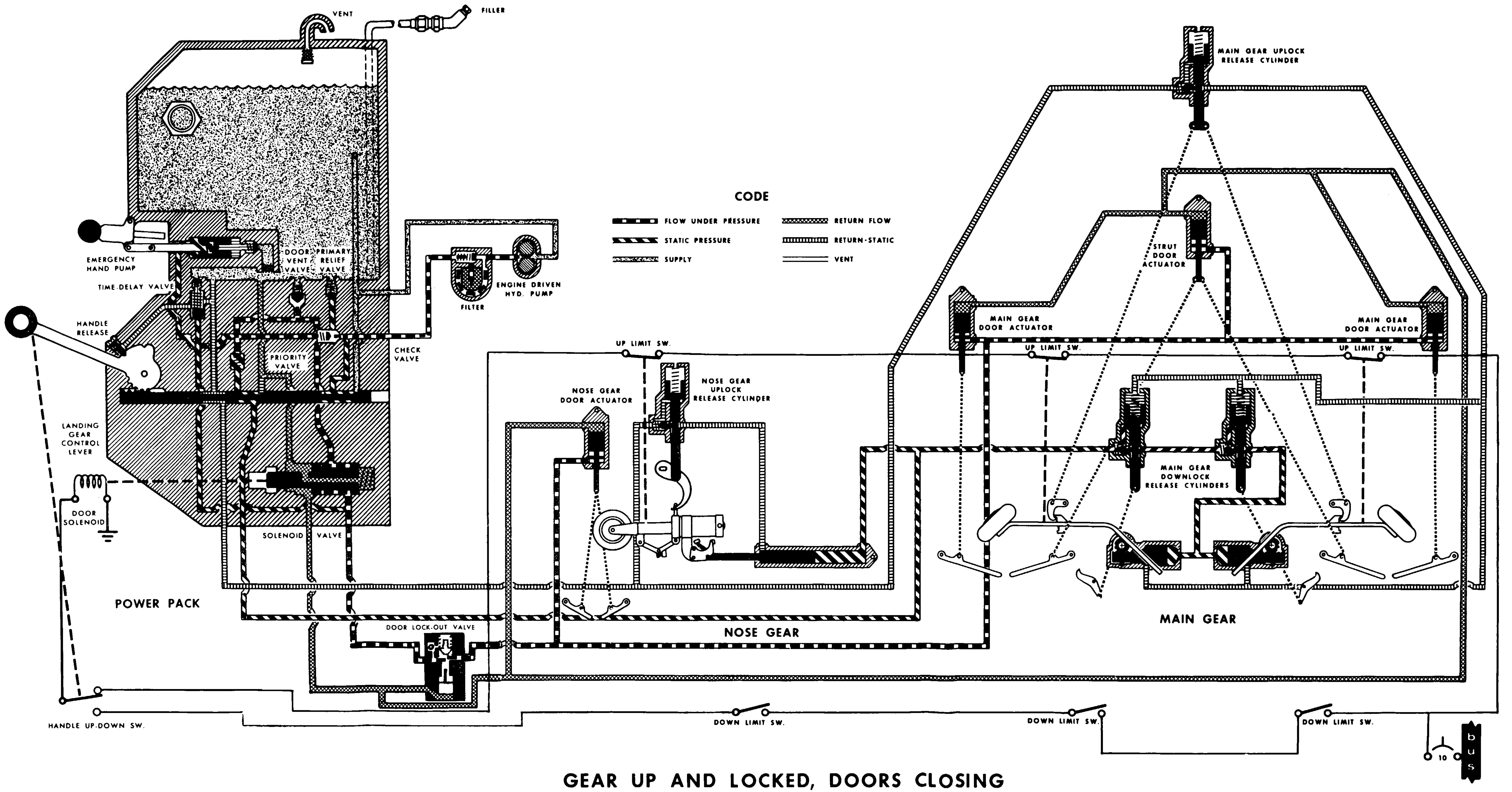


LANDING GEAR CONTROL JUST PLACED UP, DOORS OPENING

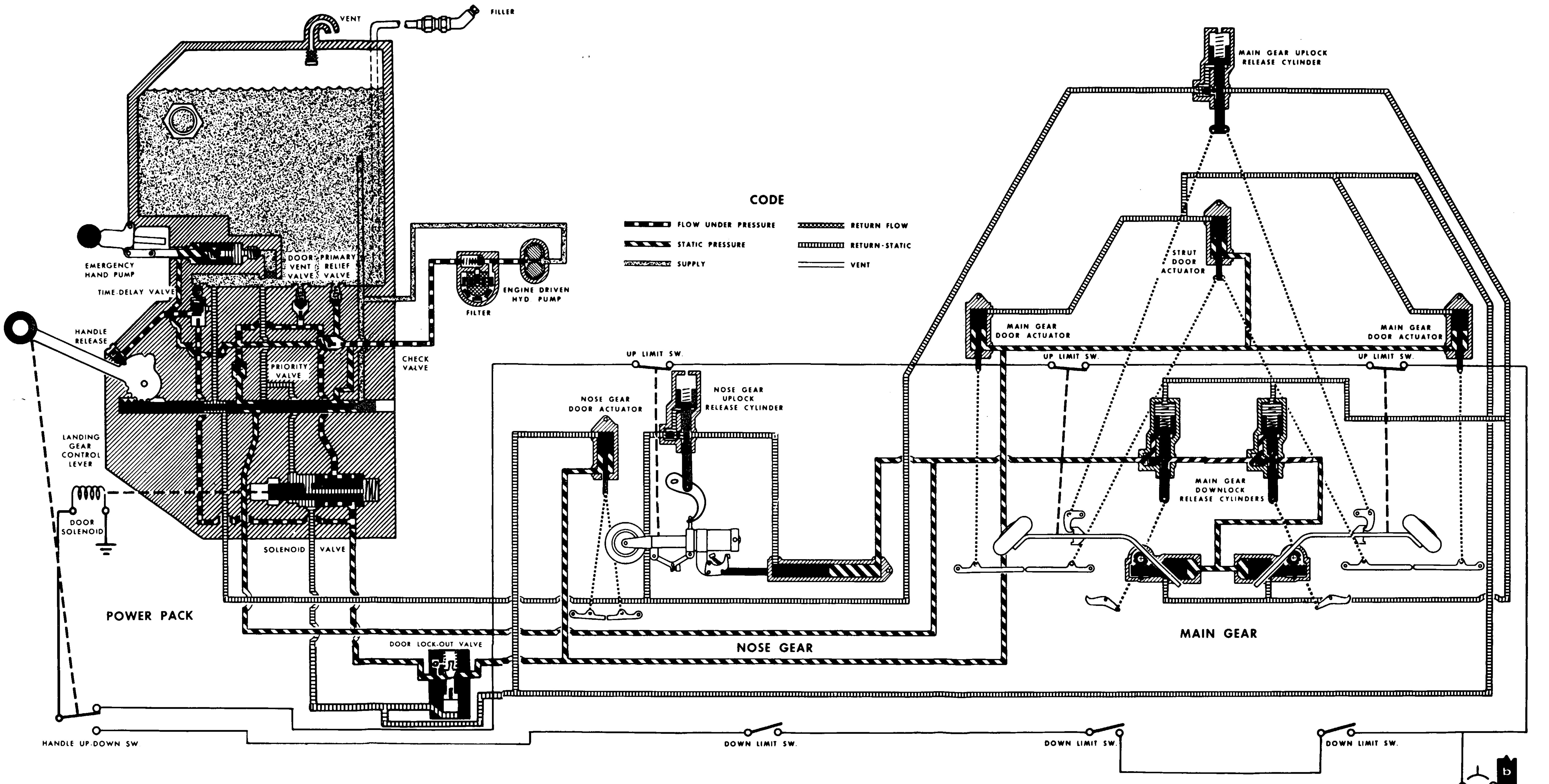


DOORS OPEN, GEAR UNLOCKED AND RETRACTING

Part 1. Hydraulic System Schematics (Sheet 7 of 10)

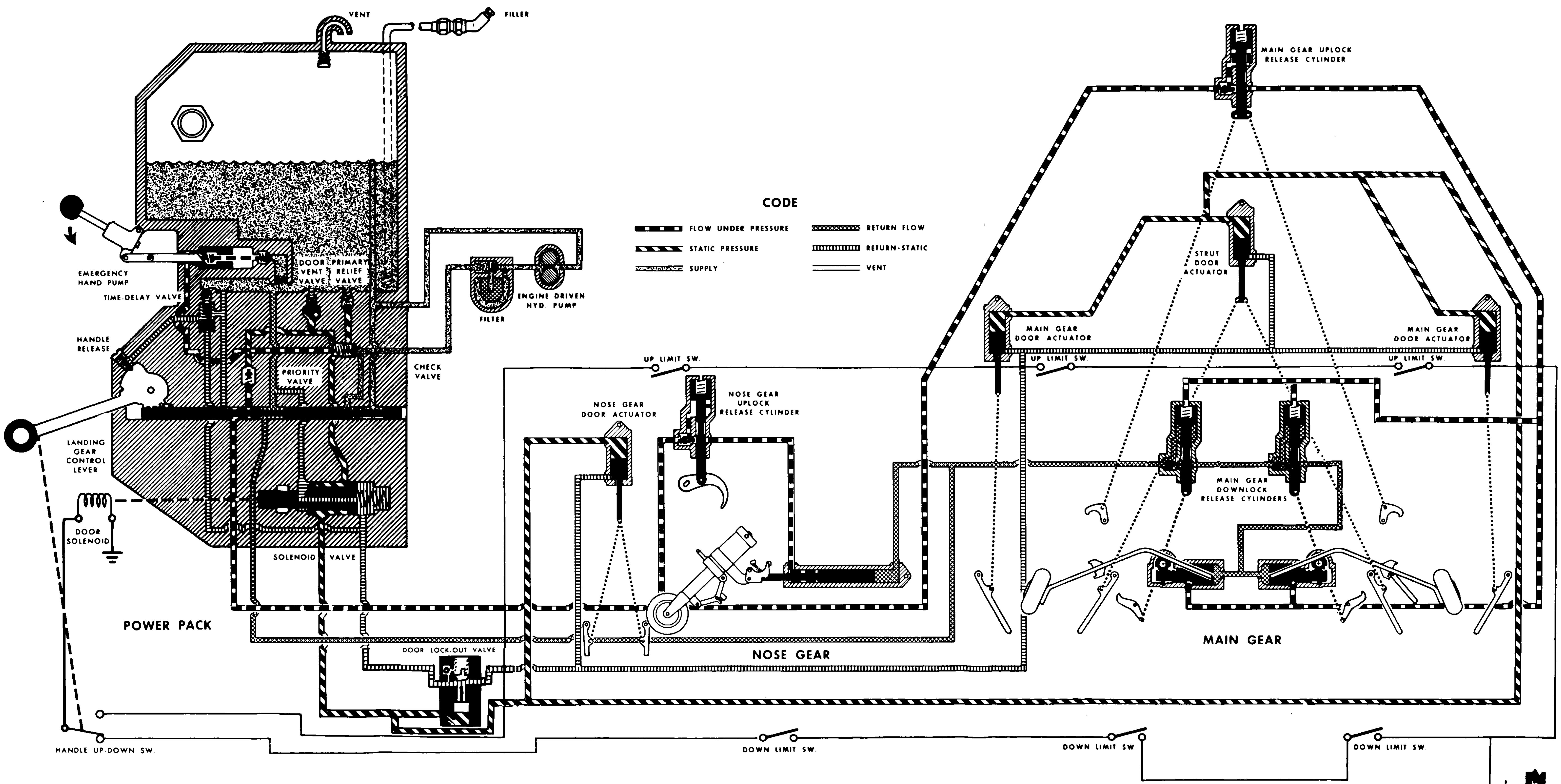


GEAR UP AND LOCKED, DOORS CLOSING



GEAR UP AND LOCKED, DOORS CLOSED, HANDLE RELEASE PRESSURE BUILDING UP

Part 1. Hydraulic System Schematics (Sheet 9 of 10)



EMERGENCY CONDITION. ENGINE PUMP FAILURE, NO ELECTRICAL POWER. DOORS OPENED, GEAR UNLOCKED AND BEING EXTENDED BY HAND PUMP PRESSURE

Part 1. Hydraulic System Schematics (Sheet 10 of 10)

PART 2

(BEGINNING WITH SERIAL 21059503)

WARNING

Before working in landing gear wheel wells, PULL-OFF hydraulic pump circuit breaker. Circuit breaker knob is at top center of console. The hydro-electric power pack system is designed to pressurize the landing gear "DOOR CLOSE" system to 1500psi at any time the master switch is turned on. Injury might occur to someone working in wheel well area if master switch is turned on for any reason.

5-215. LANDING GEAR SYSTEM

5-216. DESCRIPTION. A hydraulically-operated, retractable landing gear is employed on the aircraft. The hydraulic power system includes equipment required to provide a flow of pressurized hydraulic fluid to the landing gear system. The Cessna-Manufactured, self-contained, hydro-electric pack is located in the pedestal with the hand pump remotely located between the two front seats on the floorboard. The gear select switch is located on the pedestal. A circuit breaker is added above the switch for the power pack electric motor. It is necessary to pull out on the gear selector switch prior to moving the handle up or down. The switch is fitted with a small wheel for easy identification and assisting in holding the switch in rough air. The right side of the pedestal cover is fitted with a quick-removable access door for checking and servicing the hydraulic fluid level.

5-217. OPERATION.

NOTE

Refer to the hydraulic schematic diagrams to trace the flow of hydraulic fluid as outlined in the following paragraph.

When the aircraft master switch is closed, the hydraulic power pack is ready to operate. When the gear-up position is selected with the selector switch, the gear valve solenoid connects the gear-up line to system pressure, and the gear-down line to return. At the same time, the electric motor that powers the hydraulic pump is turned on. The hydraulic pressure is passed through a filter, and is then divided to the gear valve and door valve. Before hydraulic pressure can reach the gear valve, a priority valve must open. The priority valve can open only under two conditions:

1. There can be no pressure in the door close line, because door close pressure is applied to a piston to hold priority valve closed.
2. System pressure must build up to 750 psig before the valve can open.

Pressure therefore, must go to the door-open line. Pressure in door-close line is prevented from returning by the door-close lock check valve, and the valve is opened by a piston that senses door-open pressure. When the pressure reaches 400 psig, the door-close lock check valve opens and the doors on the aircraft open. At 750 psig, the priority valve opens and the landing gear begins to retract. As soon as the landing gear is locked into the UP position, the landing gear up limit switches sequence the door solenoid valve to the door close position. When pressure in the door-close line reaches 1500 psig, the pressure switch shuts off the motor, and the GEAR-UP cycle is complete. The GEAR-DOWN cycle is similar to the GEAR-UP cycle, except the gear solenoid is not energized during the gear-down cycle. The system has been designed so that at anytime during system operation, the direction of system operation may be reversed. Under these conditions, the first operation of the system after the selector switch is moved, is to completely open the doors, and then move the gear into the newly-selected position, after which, the doors will close again. There is no danger of interference between the gear and doors of the aircraft, since the gear does not receive hydraulic pressure unless the doors are in the fully-opened position.

5-218. TROUBLE SHOOTING.

Just because this chart lists a probable cause, proper checkout procedures cannot be deleted and the replacement of a part is not necessarily the proper solution to the problem. The mechanic should always look for obvious problems such as loose or broken parts, external leaks, broken wiring, etc. To find the exact cause of a problem, a mechanic should use a hand pump, pressure gage and a voltmeter to isolate each item in the system. Hydraulic fluid will foam if air is pumped into system, causing fluid to be blown overboard thru pack vent line.

The problems listed are all with the systems controls in their normal operating position: Master switch ON, hydraulic pump breaker IN and landing gear breaker IN. During landing gear system servicing, a power supply capable of maintaining 27.5 volts throughout the gear cycle must be used to augment the ship's battery.

CAUTION

Prior to using Hydro-Test unit with power pack, remove and dry off filler plug and dipstick. Adjust cap tension so that no movement of cap is apparent. Failure to accomplish these procedures could result in filler cap coming loose from power pack.

TROUBLE	PROBABLE CAUSE	REMEDY
MOTOR PUMP WILL NOT OPERATE GEAR BUT EMERGENCY HAND PUMP WILL OPERATE GEAR.	Low voltage (in flight).	Check alternator and wiring.
	Fluid level low in reservoir.	Refill reservoir.
	Motor pump failure.	Replace pump.
	Faulty outlet check valve.	Refer to figure 5-41, items (1) thru (6). Replace valve.
	Loose or clogged suction screen assembly in power pack (figure 5-41, item 39).	Remove power pack, disassemble and clean suction screen, observing caution in paragraph 5-264. Check screen for O-ring particles or contamination. Determine cause of contamination and remedy. Replace screen assembly or seal existing assembly as follows: Prime parts to be assembled with Grade T Primer, using care to avoid getting primer on screen. Seal with hydraulic sealant (Catalog #69; Loctite Corp.) upon installation. Allow 15-30 minutes cure time if primed; 2-4 hours if unprimed.
	NOTE Motor and pump are not repairable and must be replaced.	
	Pump frozen.	Remove motor and coupling from top of power pack and replace pump.
	Broken pump or motor drive shaft or coupling.	Remove motor and pump from top of power pack and replace motor, pump and coupling.

TROUBLE SHOOTING (Cont.)

TROUBLE	PROBABLE CAUSE	REMEDY
MOTOR PUMP WILL NOT OPERATE GEAR BUT EMERGENCY HAND PUMP WILL OPERATE GEAR (Cont).	If motor was not turning, check wiring and motor.	Check motor for loose or broken connections; check for frozen pump or coupling. Check circuit breaker in pedestal.
	Bad pump shaft seal.	Replace pump.
	External leakage around top of pump assembly (reference item 10, figure 5-41).	Remove motor and pump assemblies from top of power pack and replace upper packing and/or back-up rings (reference items 2 and 5 at upper end of pump assembly 10, figure 5-41).
	Air lock in pump (new pack installation or pump replacement.	Remove filter (item 4, figure 5-41), intermittently bump start switch until fluid flows. Replace filter per periodic instructions.
	Bad pump body O-rings (reference items 2 and 5 at lower end of pump assembly. figure 5-41).	Remove motor and pump assemblies from top of power pack and replace lower packing and/or back-up rings (reference items 2 and 5 at lower end of pump assembly 10, figure 5-41).
PUMP OR EMERGENCY PUMP WILL NOT BUILD PRESSURE IN SYSTEM.	No fluid in reservoir.	Refill reservoir.
	Broken hydraulic line.	Check for evidence of leakage and repair or replace line. Flush out system and refill reservoir.
	Filter in outlet check valve improperly positioned in filter body, or seal between filter and check valve improperly positioned.	Replace seal and position filter in retainer with Petrolatum.
	Bad O-ring actuator piston; O-ring left out after repair.	Disconnect line upstream from actuator and check for pressure. Perform this check for all actuators in system.
	Bad O-ring on priority valve in gear manifold assembly. O-ring left out or damaged during repair of valve.	Disassemble manifold and replace O-ring, observing caution outlined in paragraph 5-273.
	Bad O-ring on gear or door control valve.	Replace O-ring.
	Thermal relief valve stuck open.	Replace valve.
DOORS WILL NOT CLOSE GEAR INDICATOR LIGHT NOT ILLUMINATED.	Master switch not on.	Turn master switch on.
	Broken or loose door close hydraulic line.	Locate and repair or replace defective line.

TROUBLE SHOOTING (Cont)

TROUBLE	PROBABLE CAUSE	REMEDY
DOORS WILL NOT CLOSE GEAR INDICATOR LIGHT NOT ILLUMINATED. (Cont)	Defective limit switch circuit.	Check limit switch settings per figure 5-48; locate and repair or replace limit switch circuit. (Refer to wiring diagrams in figure 5-49 or Section 20.
	Landing gear did not lock into position.	Check landing gear uplock and/or downlock mechanism for proper operation.
	Broken ground wire at socket or lamp not making contact in socket.	Repair or replace wire; check lamp contact.
GEAR AND DOORS OPERATE PROPERLY BUT INDICATOR LIGHT IS NOT ILLUMINATED.	Lamp burned out.	Replace lamp.
	Defective wiring.	Check circuit and repair wiring.
	NOTE If press-to-test operates, pull wire bundle toward lamp socket.	
DOORS WILL NOT CLOSE GEAR INDICATOR LIGHT IS ILLUMINATED.	Improper wiring at gear control switch.	Check circuitry and repair or rewire.
	Door control valve stuck.	Repair or replace control valve unit.
	Broken or loose door lines.	Tighten or replace lines.
PUMP OPERATES BUT DOORS WILL NOT OPEN	Refer to second listed trouble in this chart.	Use same remedies.
	Improper wiring installation.	Check door control valve wiring circuitry.
	Door solenoid valve jammed or stuck in door - close position.	Disassemble valve and replace defective parts.
	Crossed hydraulic lines in aircraft belly.	Most common place is aft and left of hand pump.
GEAR UNLOCKS BEFORE DOORS ARE FULLY OPEN.	Priority valve setting too low.	Check for weak spring, dull seat or replace entire valve.
	Binding in door system.	Disconnect door actuators and manually move doors and check for binding in linkage. (Refer to detail A in figure 5-7).
	Stiff operation of door actuators.	Check operation of actuator piston and rod.

TROUBLE SHOOTING (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
GEAR UNLOCKS BEFORE DOORS ARE FULLY OPEN.	Restriction in door open or door close line.	Using pressure gage, check pressure in door open or door close line, when gear unlocks. If pressure is greater than 700 psi, check for restrictions. Locate restrictions and remove. If contaminates are in line, investigate cause and remedy; flush system.
DOORS OPEN BUT GEAR DOES NOT OPERATE.	Improper wiring.	Check circuitry, using wiring diagrams in this Section or Section 20.
	Gear solenoid jammed or stuck in position.	Disassemble valve and replace defective parts.
	Shorted gear control switch.	Check switch circuitry.
	Priority valve setting too high or stuck closed.	Check for dull seat, weak spring and contaminates. Replace valve if necessary.
	Faulty O-rings downstream of priority valve (anywhere in system).	Locate faulty unit and replace O-rings.
DOORS OPEN BUT GEAR DOES NOT OPERATE (DOWN AND LOCKED ONLY).	Faulty or stuck squat switch.	Check switch wiring or setting.
HAND PUMP DOES NOT BUILD PRESSURE, BUT ELECTRIC PUMP OPERATES PROPERLY.	Check valve in hand pump sticking.	Inspect check valve. (Refer to item 8 in figure 5-43.)
	Defective hand pump outlet check valve.	Replace valve.
	Main gear or downlock actuator O-ring leaking.	Disassemble actuator and replace O-rings.
LANDING GEAR OPERATION EXTREMELY SLOW.	Fluid level low in reservoir.	Refill reservoir.
	Downlock rod adjustment incorrect (mainly LH rod).	Adjust rod end to lengthen actuator one turn.
	Pump failure.	Replace pump.
	Low voltage in electrical system.	Check alternator and wiring.
	Pump motor brushes worn.	Replace pump motor.
	Downlocks not in full unlock position.	Adjust downlocks.
	Fluid leak in door or gear line.	Locate and repair or replace broken line or fitting.

TROUBLE SHOOTING (Cont)

TROUBLE	PROBABLE CAUSE	REMEDY
LANDING GEAR OPERATION EXTREMELY SLOW (Cont)	Air leakage around pump suction screen assembly.	Either replace suction screen assembly or seal and install existing assembly as follows: Prime parts to be assembled with Grade T Primer, using care to avoid getting primer on screen. Seal with hydraulic sealant (Catalog #69; Loctite Corp.) upon installation. Allow 15-30 minutes cure time if primed; 2-4 hours if unprimed.
	Defective piston seal in gear or door cylinder.	Replace with new seal.
	Excessive internal power pack leakage.	Remove and repair or replace power pack.
PUMP OPERATES, DOORS OPEN AND GEAR STARTS TO EXTEND. DOORS CLOSE BEFORE GEAR IS COMPLETELY EXTENDED; HAND PUMP WILL NOT PUMP GEAR DOWN.	Downlock switch makes contact before gear is down and locked.	Reset downlock actuator switches; replace if damaged.
	Interference between downlock and gear saddle clamp bolt head.	Remove interference.
POWER PACK EXTERNAL LEAKAGE.	Static seals (all fittings).	Remove and replace O-rings and/or back-up rings as required. Check tubing flares for leaks.
	Gear or door solenoid.	Replace O-rings.
	Transfer tubes between manifold and power pack body.	Disassemble power pack and replace O-rings.
	Reservoir cover.	Remove power pack and remove cover; replace seals.
GEAR DOWN-LOCK WILL NOT RETURN TO FULL-LOCK POSITION.	Binding in spring and tube assemblies.	Check operation to locate binding and eliminate.
DOORS CLOSE BEFORE ALL GEARS ARE FULLY LOCKED.	Faulty limit switch.	Replace switch.
	Short in wiring.	Check wiring continuity.
	Cracked terminal block.	Replace terminal block.
DOORS WILL OPEN BUT GEAR WILL NOT RETRACT.	Lines between downlock actuators crossed.	Properly route lines.
	Lines crossed at gear uplock valve.	Properly route lines.
	Gear uplock valve installed backward.	Install properly.

TROUBLE	PROBABLE CAUSE	REMEDY
DOORS WILL OPEN BUT GEAR WILL NOT RETRACT (Cont).	Improper setting of right and left downlock actuators.	Reset in accordance with applicable paragraph in this Section.
NOSE GEAR WILL NOT UPLOCK IN FLIGHT.	Restricted line.	Blow out line.
	Faulty nose gear actuator.	Replace actuator.
	Improper setting of downlock.	Reset in accordance with applicable paragraph in this Section.
	NOTE On ground test, nose gear should have constant movement from downlock to uplock position.	
NOSE WHEEL DOOR AND MAIN WHEEL DOORS OPERATE IN REVERSE.	Crossed lines.	Check main gear door lines in wheel well at forward bulkhead; lines are very easy to cross at this location.
NOSE GEAR HITS HARD IN UPLOCK POSITION.	RH downlock actuator improperly rigged.	Reset RH downlock actuator.
RH GEAR UNLOCKS BUT LH GEAR WILL NOT UNLOCK.	Improper setting of RH downlock actuator rod.	Check rigging procedures outlined in this Section.
BOTH RH AND LH MAIN GEAR UNLOCK BUT ONLY NOSE GEAR WILL RETRACT.	Improper setting of LH downlock actuator rod.	Check rigging procedures outlined in this Section.
MOTOR PUMP TURNS OFF AFTER GEARS UNLOCK; WILL NOT TURN ON BY WORKING SELECTOR SWITCH. HAND PUMP WILL PUT GEAR DOWN.	Defective pressure switch circuit.	Check circuit continuity.
		Check switch adjustment per paragraph 5-268.
POWER PACK WILL OPERATE SYSTEM AFTER BEING STARTED BY HAND PUMP.	Broken diode wire or defective diode in wire number F-GD18 from DOWN side of gear selector switch to contactor. (Refer to wiring diagrams in this Section or in Section 20.)	Replace diode. Repair or replace wiring.
SET SCREW ON CAM NOT EXTENDED ENOUGH FOR GEAR TO MOVE CAM OVER CENTER.	Check washers under bolt on downlock arm assembly.	Add AN960-10 washer under bolt downlock arm assembly as shown in Detail A in figure 5-48, sheet 1.
MAIN GEAR WILL NOT LOCK OVER CENTER.	Main gear not centered in support.	Rerig saddle as outlined in paragraph 5-291.
MAIN GEARS HIT UPLOCK HOOK VERY HARD.	Insufficient main gear actuator snubbing action.	Reset snubbers per paragraph 5-17. Check rubber pad in strut tunnel.

5-218. TROUBLE SHOOTING. (Continued)

TROUBLE	PROBABLE CAUSE	REMEDY
MALFUNCTION OF GEAR INDICATOR LIGHTS	1. Both lights on at same time. 2. Light will change from green to amber or in reverse when gear control switch is moved.	Check ground wire for proper connection.
SYSTEM WORKS NORMALLY EXCEPT MOTOR TURNS ON AND OFF AT REGULAR INTERVALS. (GEAR IN EITHER UP OR DOWN POSITION). GEAR DOORS SAG WHILE AIRCRAFT IS ON GROUND. ENGINE AND ELECTRICITY OFF.	Leak in door close system.	Refer to the following procedures and to Figure 5-41.

WARNING: Before working in wheel well area, pull hydraulic pump circuit breaker off.

1. Jack aircraft in accordance with procedures outlined in Section 2 of this manual.
2. With master switch OFF, pump hand pump to open gear doors and relieve system pressure.
3. Remove console cover and sheet metal cover from power pack support.
4. Referring to Figure 5-41, remove cap and install pressure gage to fitting A. (Prior to 21060540 only).
5. Remove hand pump pressure line from power pack at fitting B.
6. Disconnect door close line from power pack at fitting C and using flex line, connect hand pump pressure line to power pack at fitting C. (Beginning with 21060540, flex line must have "Tee" fitting with pressure gage installed.)
7. Using hand pump, pressurize system to 1500 PSI and observe gage for leak-down. Pressure should hold for not less than 10 minutes during each of the following checks.
   - (a) Master switch OFF - if leakage comes from hand pump fitting (open) 3 or 4 drops - thermal relief valve is leaking, replace.
   - (b) If no leaks above - pull hydraulic circuit breaker out. With master switch ON - repressurize system with hand pump to 1500 PSI.
     1. If hand pump port leaks in this configuration, lock out valve is leaking.
8. With the preceding check completed, and whether or not leaks were found, make this final check while working in this area.

   Remove flex line from door fitting and attach to door line and apply pressure to system. There might be a slight bleed-down on first application of pressure pump to 1500 PSI a second time. Pressure should hold.
9. The preceding procedure checks the door cylinders for leakage. If the system does not bleed down, disconnect added equipment and reconnect lines and pressure cap to pressure port and reinstall console covers. If, on this last test, pressure does not hold, one or more of the door cylinders are leaking. They will have to be checked individually. TEST SYSTEM BEFORE FLIGHT.

TROUBLE SHOOTING (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
UNEVEN FALL OF MAIN GEAR.	Air in system.	Bleed system of air.
	Cold operating temperatures.	Operate power pack until fluid has reached operating temperature.
	Improper snubber adjustment.	Adjust main gear actuator snubber in accordance with paragraph 5-17.

NOTE

Refer to the trouble shooting chart in paragraph 5-6 for additional procedures not covered in paragraph 5-218.

SHOP NOTES:

5-219. MAIN LANDING GEAR STRUT REMOVAL AND INSTALLATION. Refer to figure 5-1 and paragraphs 5-7 thru 5-8 for removal and installation of the main landing gear struts.

5-220. MAIN LANDING GEAR ACTUATOR. For instructions to remove, disassemble, inspect, replace parts for, assemble and install the main landing gear actuator, refer to figures 5-2 and 5-3 and paragraphs 5-9 thru 5-15.

5-221. MAIN LANDING GEAR SNUBBER. Refer to paragraphs 5-16 and 5-17 thru 21061039. Beginning with 21061040, refer to paragraph 5-273D for adjusting priority valve, located in the Power Pack.

5-222. MAIN LANDING GEAR STRUT-TO-ACTUATOR LINKAGE. To remove or install main landing gear pivot assemblies, refer to figure 5-1 and paragraphs 5-18 thru 5-21.

5-223. MAIN LANDING GEAR UPLOCK SYSTEM. To remove or install main gear uplock system components, refer to paragraphs 5-22 thru 5-24 and figure 5-4. To disassemble, inspect or assemble the uplock actuator, refer to paragraphs 5-25 thru 5-27 and figure 5-5.

5-224. MAIN LANDING GEAR DOWNLOCK SYSTEM. To remove or install main gear downlock system components, refer to paragraphs 5-28 thru 5-30 and figure 5-6. To disassemble, inspect or assemble the downlock actuator, refer to paragraph 5-25 thru 5-27 and 5-31 and figure 5-5.

5-225. MAIN LANDING GEAR DOOR SYSTEM. To remove or install main wheel doors, refer to paragraphs 5-32 thru 5-34 and figure 5-7.

5-226. MAIN WHEEL DOOR ACTUATOR. To remove, disassemble, inspect, assemble or install main wheel door actuators, refer to paragraphs 5-35 thru 5-38 and figure 5-8.

5-226A. MAIN WHEEL DOOR CLOSE SYSTEM ACCUMULATOR (Refer to figure 5-41.)

5-226B. DESCRIPTION. The accumulator serves two purposes. This unit maintains pressure in the door-close system, keeping the main wheel doors up and closed. The accumulator also dampens pressure surge and serves as a reservoir to offset normal leak-down in the system.

WARNING

BEFORE WORKING IN WHEEL WELL AREA, PULL HYDRAULIC PUMP CIRCUIT BREAKER OFF.

5-226C. REMOVAL (Refer to figure 5-41.)

WARNING

Valve (8) does not contain a core. To release accumulator pressure, loosen nut on end of valve. If the valve installed contains a core, the valve should be replaced with a valve which does not contain a core. Injury can occur if pressure is not released properly.

a. Open main gear doors. This will drop hydraulic pressure to zero.
b. Relieve accumulator pressure by turning nut on end of valve approximately 1/4 turn.
c. Disconnect and plug or cap hydraulic line at accumulator.
d. Remove bolt, washer, spacer and nut at outboard end and remove clamp, screw and nut at inboard end; remove accumulator.

5-226D. DISASSEMBLY AND ASSEMBLY (Refer to figure 5-41.)
a. Remove retainer (18) only after insuring that pressure has been relieved. Remove gland (19), piston (20) and valve (8) if required.
b. Remove and discard packings (22) and back-up rings (23).
c. Reverse the preceding steps, using new packings and back-up rings, for reassembly of the accumulator.

NOTE

Lubricate all packings and back-up rings with Petrolatum or MIL-H-5605 hydraulic fluid during assembly.

5-226E. INSTALLATION (Refer to figure 5-41.)

WARNING

BEFORE WORKING IN WHEEL WELL AREA, PULL HYDRAULIC PUMP CIRCUIT BREAKER OFF.

a. Install bolt, washer, spacer and nut at outboard end and clamp, screw and nut at inboard end.
b. Connect hydraulic line at accumulator.
c. Pressurize accumulator with nitrogen or dry air to 500 ± 50 psig. Hydraulic pressure should be zero.

NOTE

Adapter hose and fitting kit (nitrogen bottle to accumulator) number ZN216, available from the Cessna Service Parts Center, can be used to charge the accumulator.

5-227. MAIN GEAR WHEELS AND TIRES. To remove, disassemble, inspect, repair, assemble or install main landing gear wheels and tires, refer to paragraphs 5-39 thru 5-44 and figures 5-9 and 5-9A.

5-228. MAIN WHEEL AND AXLE REMOVAL AND INSTALLATION. To remove or install main wheels and axles, refer to paragraphs 5-45 and 5-46.

5-229. MAIN WHEEL ALIGNMENT. For information regarding main wheel alignment, refer to paragraph 5-47 and figure 5-10.

5-230. WHEEL BALANCING. For wheel balancing information, refer to paragraph 5-48.

5-231. BRAKE SYSTEM. For information regarding system trouble shooting, master cylinder removal, disassembly, repair and installation; brake system bleeding; wheel brake removal, inspection, repair, assembly and installation and brake lining checking and replacement, refer to paragraphs 5-49 thru 61 and figure 5-11.

5-232. PARKING BRAKE SYSTEM. For information regarding the parking brake system, refer to paragraph 5-62 and figure 5-12.

5-233. NOSE GEAR SYSTEM. For a description, operational description and nose gear trouble shooting, refer to paragraphs 5-63 thru 5-66 and figure 5-13.

5-234. REMOVAL AND INSTALLATION OF NOSE GEAR ASSEMBLY. For complete instructions, refer to paragraph 5-67.

5-235. DISASSEMBLY AND ASSEMBLY OF NOSE GEAR STRUT. Refer to paragraphs 5-68 thru 5-69 and figure 5-14.

5-236. SHIMMY DAMPENER. To remove, disassemble, assemble and install nose gear shimmy dampener, refer to paragraphs 5-70 thru 5-74 and figure 5-15.

5-237. TORQUE LINKS. For information regarding removal, disassembly, assembly and installation of nose gear torque links, refer to paragraphs 5-75 thru 5-78 and figure 5-16.

5-238. NOSE GEAR UPLOCK MECHANISM. To remove or install nose gear uplock system components, refer to paragraphs 5-79 thru 5-81 and figure 5-17.

5-239. NOSE GEAR DOWNLOCK MECHANISM. To remove and install components of the nose gear downlock system, refer to paragraphs 5-82 thru 5-84 and figure 5-18.

5-240. NOSE GEAR ACTUATOR. To remove, disassemble, inspect assemble and install nose gear actuators, refer to paragraphs 5-85 thru 5-94 and figure 5-19.

5-241. REMOVAL AND INSTALLATION OF NOSE GEAR UPLOCK AND RELEASE ACTUATOR. Refer to paragraph 5-95

5-242. DISASSEMBLY, INSPECTION OF PARTS AND ASSEMBLY. Refer to paragraphs 5-96, 5-26 thru 5-27 and figure 5-5.

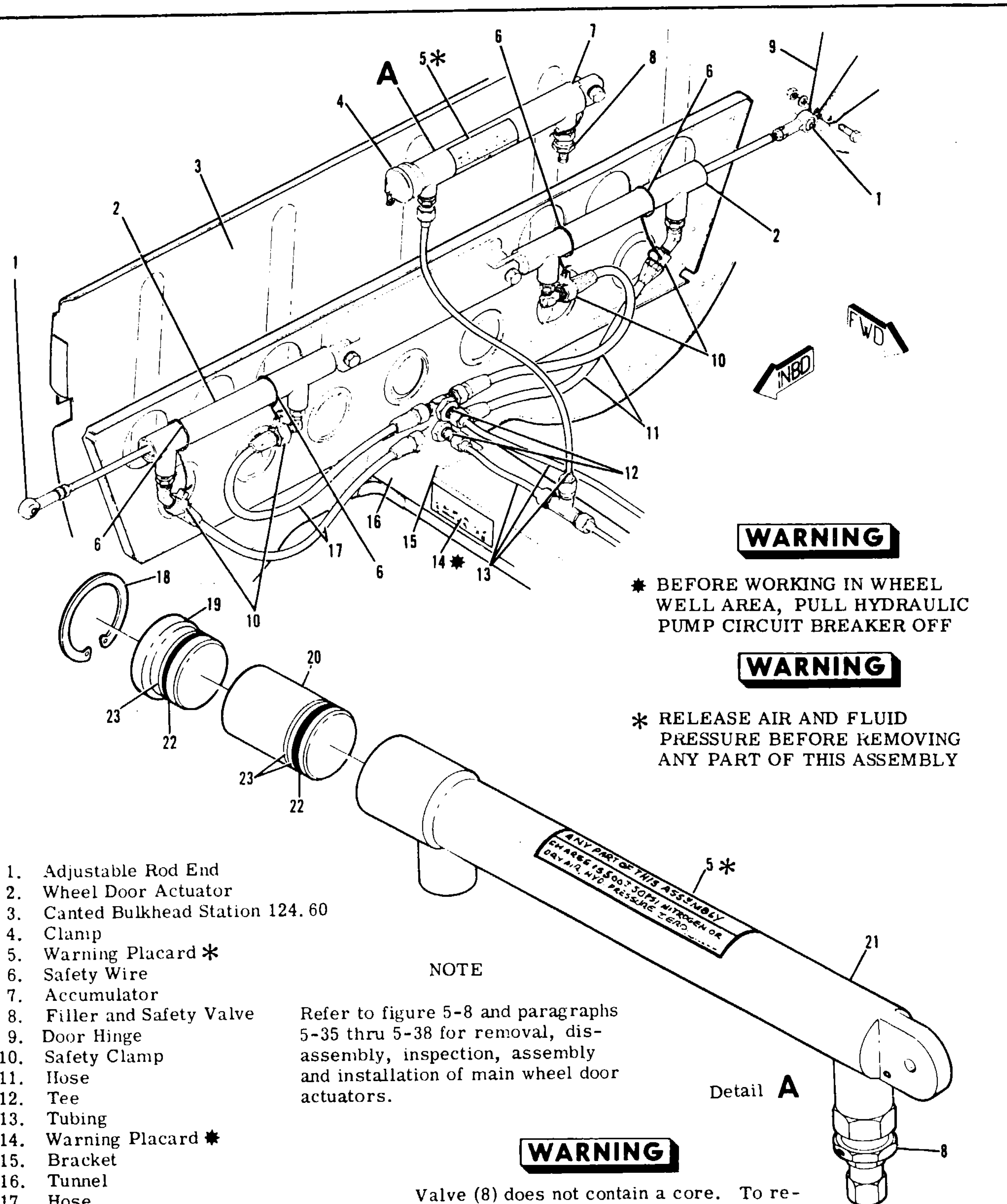
5-243. NOSE GEAR DOOR SYSTEM. For a description and operational information, refer to paragraphs 5-97 thru 5-99.

5-244. REMOVAL AND INSTALLATION OF NOSE WHEEL DOORS. Refer to paragraph 5-100 and figure 5-20 for procedures for removing and installing and installing nose wheel doors.

5-245. REMOVAL AND INSTALLATION OF NOSE WHEEL DOOR MECHANISM. Refer to paragraph 5-101 and figure 5-20 to remove or install components of the nose wheel door mechanism.

5-246. REMOVAL AND INSTALLATION OF NOSE GEAR STRUT DOORS. Refer to paragraph 102 and figure 5-20 to remove or install nose gear strut doors.

SHOP NOTES:



WARNING

✱ BEFORE WORKING IN WHEEL WELL AREA, PULL HYDRAULIC PUMP CIRCUIT BREAKER OFF

WARNING

* RELEASE AIR AND FLUID PRESSURE BEFORE REMOVING ANY PART OF THIS ASSEMBLY

1. Adjustable Rod End
2. Wheel Door Actuator
3. Canted Bulkhead Station 124.60
4. Clamp
5. Warning Placard *
6. Safety Wire
7. Accumulator
8. Filler and Safety Valve
9. Door Hinge
10. Safety Clamp
11. Hose
12. Tee
13. Tubing
14. Warning Placard ✱
15. Bracket
16. Tunnel
17. Hose
18. Retainer
19. Gland
20. Piston
21. Cylinder
22. Packing
23. Back-Up Ring

NOTE

Refer to figure 5-8 and paragraphs 5-35 thru 5-38 for removal, disassembly, inspection, assembly and installation of main wheel door actuators.

WARNING

Valve (8) does not contain a core. To release accumulator pressure, loosen nut on end of valve. If the valve installed contains a core the valve should be replaced with a valve which does not contain a core. Injury can occur if pressure is not released properly.

Figure 5-41. Main Wheel Door Close System Accumulator

5-247. NOSE WHEEL STEERING SYSTEM. Refer to paragraphs 5-103 thru 5-106 and figure 5-21 for description, removal, installation and rigging of components of the nose wheel steering system. Refer to paragraphs 5-107 and 5-66 for trouble shooting.

5-248. NOSE GEAR WHEEL AND TIRE ASSEMBLY. For removal, disassembly, inspection, repair and installation, refer to paragraphs 5-108 thru 5-117 and figure 5-22.

5-249. LANDING GEAR HYDRAULIC POWER. Refer to paragraphs 5-216 and 5-217 for a description and operational information.

5-250. HYDRAULIC TOOLS AND EQUIPMENT. Refer to paragraphs 5-122 thru 5-130 for description and operational procedures while using hydraulic system test equipment. Refer to figures 5-23 and 5-24 for Hydro Test Unit information.

5-251. HYDRAULIC POWER SYSTEM COMPONENTS.

5-252. GENERAL DESCRIPTION. The hydraulic power system includes equipment required to provide a flow of pressurized hydraulic fluid to the retractable landing gear system. Main components of the hydraulic power system include the power pack and the emergency hand pump.

5-253. HYDRAULIC COMPONENT REPAIR. Since emphasis here is on repair and not overhaul of the basic components of the hydraulic system, it is unlikely that the mechanic will go through all of the procedures outlined. Instead, he will repair the particular item which is causing the difficulty.

5-254. REPAIR VERSUS REPLACEMENT. Often, the moderate trade-in price for a factory-rebuilt component is less than the accumulated cost of labor, parts and (often time consuming) trial and error adjustment. Repair or replacement of a component will depend on the time, equipment and skilled labor that is locally available.

5-255. REPAIR PARTS AND EQUIPMENT. Repair parts may be ordered from the applicable Parts Catalog. Test equipment may be ordered from The Special Tools and Support Equipment Catalog. Both publications are available from the Cessna Service Parts Center.

2-256. EQUIPMENT AND TOOLS.

2-257. HAND TOOLS. The following hand tools are necessary for repair work on the power pack and other hydraulic components:

Snap Ring Pliers
Strap Wrench (for removing door solenoids and various cylinder barrels of the hydraulic actuators)
Needle-nose Pliers
Pin Punches
Duck-bill Pliers
Box and Open-end Wrenches

Locally-fabricated items, handy for power pack repair, are various 1/4-inch aluminum rods, ground to a gradual taper, and hooks formed from brass welding rod, to extricate small plungers from hydraulic ports. Hooks formed on brass welding rod must not be over 1/16-inch in length, so as not to scratch or score the bore. Various sizes of Allen wrenches may be welded to "T" handles for use when removing, installing or adjusting the various internal wrenching plugs or valves.

5-258. COMPRESSED AIR. The easiest method of removing some hydraulic parts in inaccessible galleries of the power pack is a quick blast of compressed air from behind. Parts can be blown out in seconds, which would otherwise take endless "fishing" operations to extricate. An air hose and nozzle are common-sense tools.

5-259. POWER PACK.

5-260. DESCRIPTION. The hydraulic power pack, located in the pedestal, is a multi-purpose control unit in the hydraulic system. It contains a hydraulic reservoir and valves which control flow of pressurized fluid to the various actuators in the door and landing gear system.

5-261. REMOVAL. (Thru 21060539).

NOTE

As hydraulic lines are disconnected or removed, plug or cap all openings to prevent entry of foreign material in the lines or fittings.

a. Remove front seats and spread drip cloth over forward carpet.
b. Remove decorative cover from pedestal as outlined in Section 9.
c. Position gallon container under drain elbow at right-hand forward side of pedestal.
d. Remove cap from elbow and attach drain hose.
e. Using hand pump, drain reservoir fluid into container.
f. Disconnect and cap or plug all hydraulic lines at power pack.
g. Disconnect wiring from pressure switch.
h. Remove three mounting bolts, one on each side of pedestal, and one through mounting bracket on forward side of pedestal.

NOTE

It is not necessary to disturb the studs on the left and right sides of the pedestal to remove the power pack.

i. Remove upper panel assembly from pedestal.
j. Work power pack aft out of pedestal.

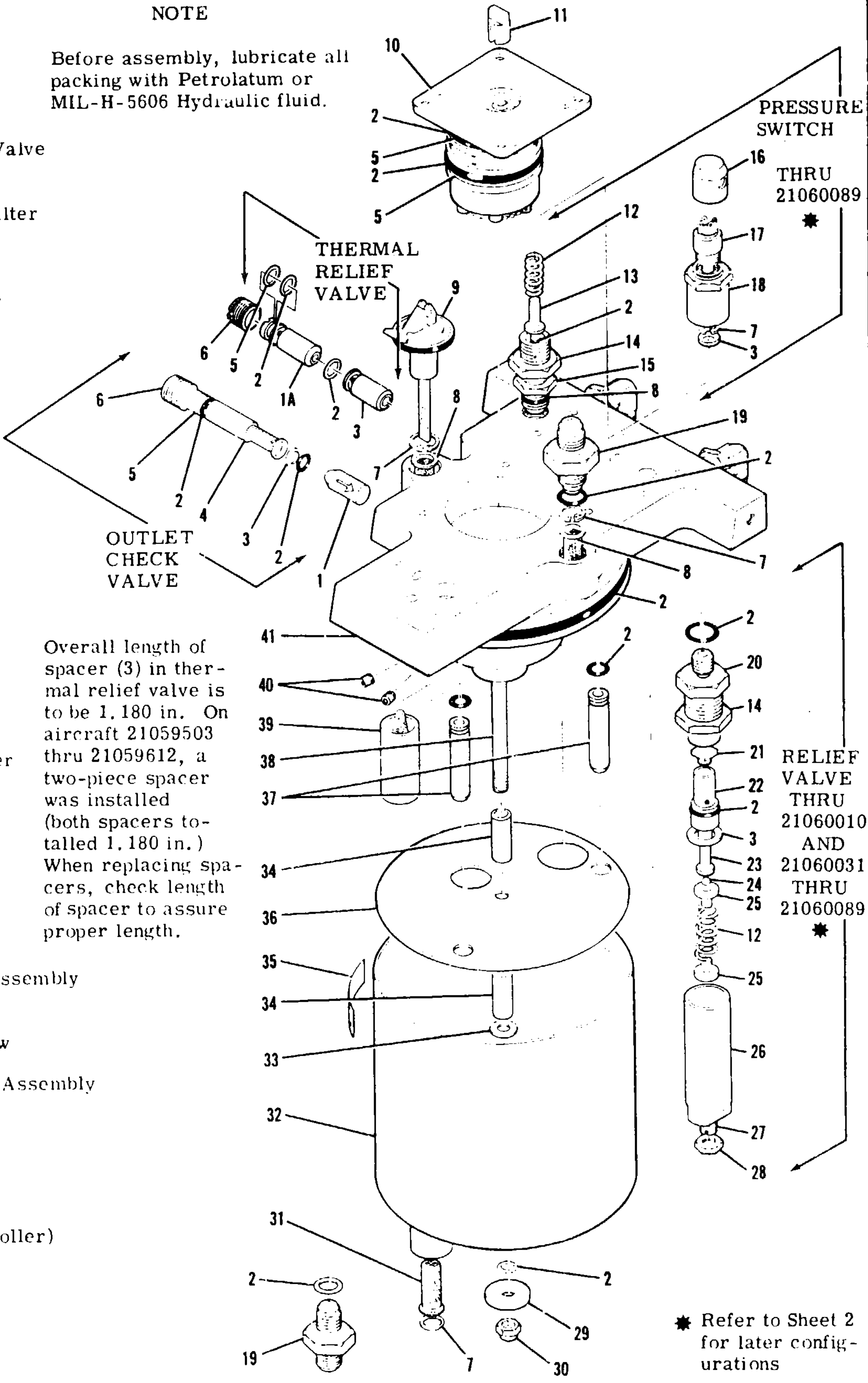
5-261A. REMOVAL (Beginning with 21060540). (Refer to figure 5-41B.)

NOTE

Before assembly, lubricate all packing with Petrolatum or MIL-H-5606 Hydraulic fluid.

1. Check Valve
1A. Thermal Relief Valve
2. Packing
3. Spacer
4. Self-Relieving Filter
5. Back-Up Ring
6. Retainer
7. Retainer Ring
8. Screen Assembly
9. Dipstick
10. Pump Assembly
11. Coupling
12. Spring
13. Piston
14. Nut
15. Fitting
16. Cap
17. Switch
18. Housing
19. Union
20. Adapter
21. Orifice
22. Seat
23. Poppet
24. Ball
25. Spring Guide
26. Housing
27. Setscrew
28. Nut
29. Reservoir Washer
30. Nut
31. Screen
32. Reservoir
33. Washer
34. Spacer
35. Nameplate
36. Baffle
37. Return Tube
38. Stud
39. Suction Screen Assembly
40. Plug
41. Body Assembly
42. Adjustment Screw
43. Fitting
44. Cap and Housing Assembly
45. Pin
46. Spring
47. Shim
48. Stop
49. Guide
50. Packing
51. Piston (Needle Roller)
52. Packing
53. Fitting
54. Snubber

Overall length of spacer (3) in thermal relief valve is to be 1.180 in. On aircraft 21059503 thru 21059612, a two-piece spacer was installed (both spacers totalled 1.180 in.) When replacing spacers, check length of spacer to assure proper length.



✱ Refer to Sheet 2 for later configurations

Figure 5-41A. Hydraulic Power Pack Disassembly (Sheet 1 of 2)

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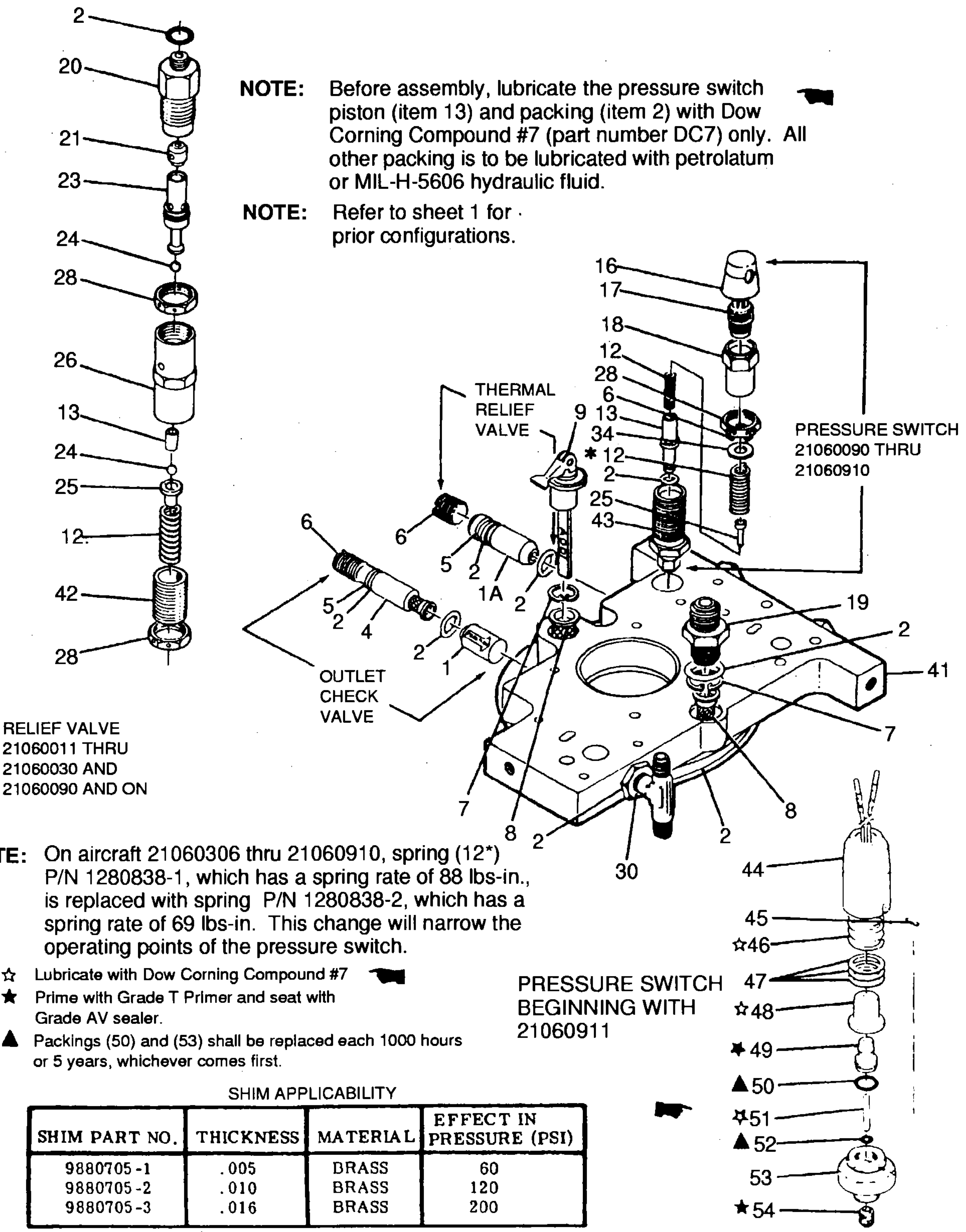


NOTE: Before assembly, lubricate the pressure switch piston (item 13) and packing (item 2) with Dow Corning Compound #7 (part number DC7) only. All other packing is to be lubricated with petrolatum or MIL-H-5606 hydraulic fluid.

NOTE: Refer to sheet 1 for prior configurations.

NOTE: On aircraft 21060306 thru 21060910, spring (12*) P/N 1280838-1, which has a spring rate of 88 lbs-in., is replaced with spring P/N 1280838-2, which has a spring rate of 69 lbs-in. This change will narrow the operating points of the pressure switch.

☆ Lubricate with Dow Corning Compound #7

★ Prime with Grade T Primer and seat with Grade AV sealer.

▲ Packings (50) and (53) shall be replaced each 1000 hours or 5 years, whichever comes first.

SHIM APPLICABILITY

SHIM PART NO.	THICKNESS	MATERIAL	EFFECT IN PRESSURE (PSI)
9880705-1	.005	BRASS	60
9880705-2	.010	BRASS	120
9880705-3	.016	BRASS	200

Figure 5-41A. Hydraulic Power Pack Disassembly (Sheet 2 of 2)

NOTE

As hydraulic lines are connected or removed. plug or cap all openings to prevent entry of foreign material in the lines or fittings.

a. Remove front seats and spread drip cloth over front carpet.
b. Remove decorative cover from pedestal as outlined in Section 9.
c. Remove upper panel assembly from aft face of panel.
d. Remove screws attaching indicator assembly at top of pedestal; remove indicator assembly.
e. Remove four bolts attaching wheel and gear box assembly; remove wheel and gear box assembly.
f. Loosen idler sprocket assembly by loosening bolt and sliding sprocket inboard in slot.
g. Disconnect chain at connecting link.
h. Remove left-hand and right-hand chain guards.
i. Allow chain to remain on gimbal assembly in lower pedestal area.
j. Position gallon container under drain elbow at right-hand forward side of pedestal.
k. Remove cap from elbow and attach drain hose.
l. Using hand pump, drain reservoir fluid into container.
m. Disconnect and cap or plug all hydraulic lines at power pack.
n. Disconnect wiring from pressure switch.
o. Remove three mounting bolts, one on each side of pedestal, and one through mounting bracket on forward side of pedestal.

NOTE

It is not necessary to disturb the studs on the left and right sides of the pedestal to remove the power pack.

5-262. DISASSEMBLY. (Refer to figure 5-41A.)
a. Remove elbow fittings from body assembly and place body assembly in vise.
b. Remove nut (30), washer (29) and packing (2) at attaching stud (38) at bottom of reservoir; remove reservoir.

NOTE

If reservoir will not disengage from body assembly, replace elbow fittings and cap or plug all fittings except vent fitting. Attach air hose at vent fitting and apply pressure (not to exceed 15 psi: reservoir proof pressure); remove reservoir. A strap clamp is not recommended as clamp may damage reservoir.

c. Remove door manifold assembly and gear manifold assembly from body assembly of power pack.
d. Remove pressure switch and dipstick from body assembly.
e. Remove large packing from bottom of body assembly.
f. Remove baffle (36), spacers (34) and washer (33).
g. Remove union (19), packing, retainer ring (7) and screen (31).
h. Remove motor and pump assembly (10) from body assembly.
i. Remove packings and back-up ring from pump assembly (10); remove coupling (11).
j. Remove return tubes (37) and packings from body assembly.
k. Remove relief valve assembly from body assembly.

NOTE

Suction screen assembly (39) need not be removed from body assembly to be cleaned. However, if screen assembly is damaged, it should be removed in accordance with step "l" of this paragraph, observing the following caution.

CAUTION

Use extreme caution in removing suction screen assembly. Damage to screen assembly or clearance between screen assembly and body will cause slow landing gear retraction.

l. Working through center hole in top of body assembly, and using a drift or punch made of soft material, tap out suction screen assembly (39).
m. Remove elbow fittings, if still installed, union (19), packing, retainer ring (7) and screen (8) from body assembly.
n. Remove thermal relief valve and inlet check valve from body assembly.

NOTE

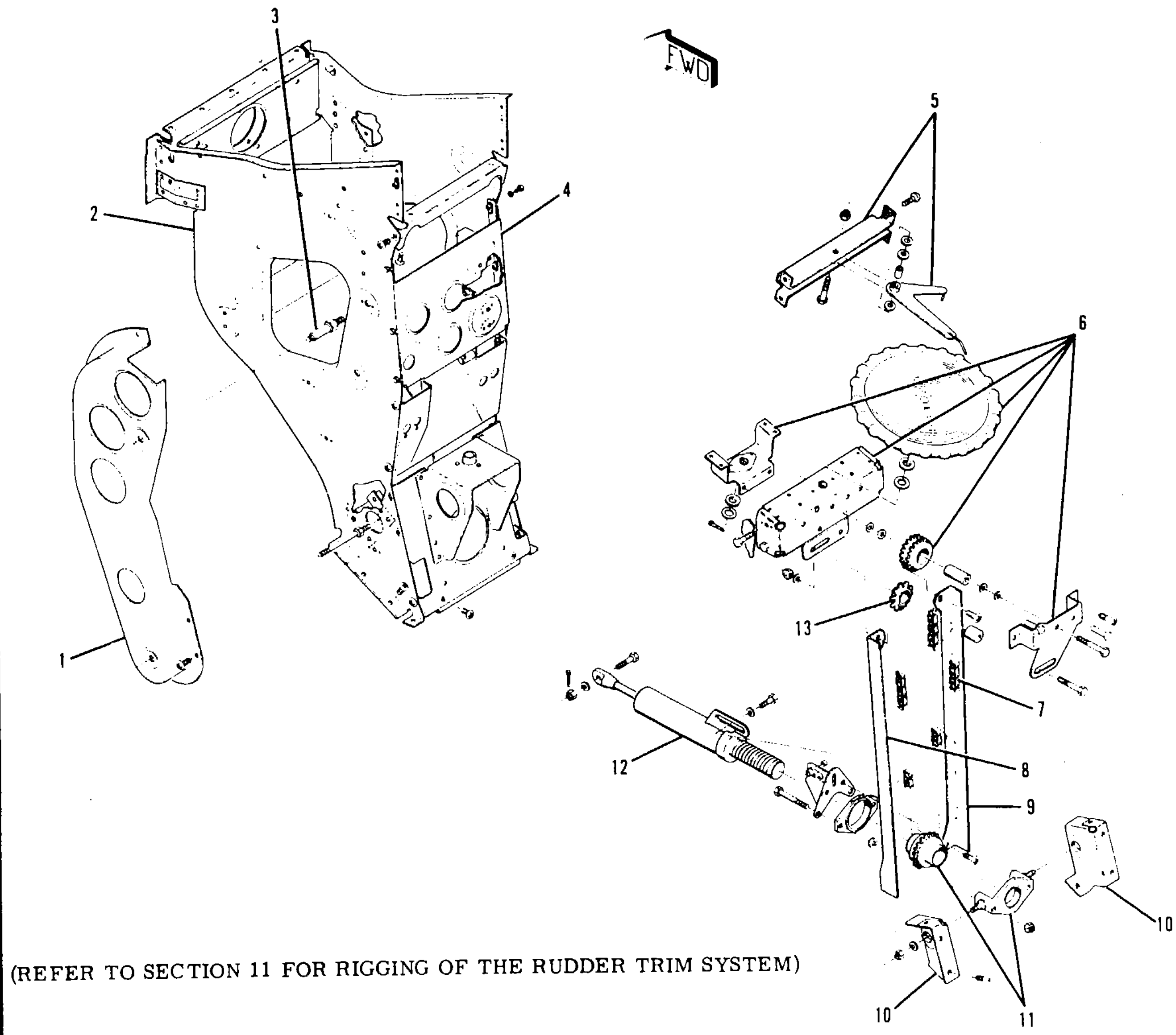
To remove thermal relief valve, remove retainer (6). While holding your hand to catch valve, gently pump hand pump. Valve will be ejected out into your hand. Be careful not to pump hand pump too hard.

5-263. INSPECTION.
a. Wash all parts in cleaning solvent (Federal Specification P-S-661, or equivalent) and dry with filtered air.
b. Inspect seating surfaces. They should have very sharp edges. Seats may be lapped, if necessary, to obtain sharp edges.
c. Inspect all threaded surfaces for serviceable condition and cleanliness.
d. Inspect all parts for scratches, scores, chips, cracks and indications of excessive wear.

5-264. ASSEMBLY. (Refer to figure 5-41A.)

NOTE

Use all new packing and back-up rings for reassembly. Before assembly, lubricate all packings and back-up rings with MIL-H-5606 hydraulic fluid or Petrolatum. Lubricate all threads with Petrolatum.



(REFER TO SECTION 11 FOR RIGGING OF THE RUDDER TRIM SYSTEM)

BEGINNING WITH 21060540

1. Chain Guard
2. Pedestal
3. Stud
4. Upper Panel
5. Indicator Assembly
6. Wheel and Gearbox Assembly
7. Chain
8. Left-Hand Chain Guard
9. Right-Hand Chain Guard
10. Bearing Bracket
11. Gimbal and Sprocket Assembly
12. Bungee
13. Idler Sprocket

5-41B. Power Pack Removal

a. Assemble and install thermal relief valve and inlet check valve in body assembly.

b. Install screen (8), retainer ring (7), packing and union (19) in body assembly.

c. Install suction screen (39), if removed.

CAUTION

Use extreme caution when installing suction screen assembly. Damage to screen assembly or clearance between screen assembly and body will cause slow landing gear retraction.

d. Install relief valve assembly in body assembly.

e. Install packing and return tubes (37) in body assembly.

f. Install packings and back-up ring on pump assembly (10): install coupling (11).

g. Install pump assembly (10) and motor on body assembly.

h. Install screen (31), retainer ring (7), packing and union (19).

i. Install washer (33), spacers (34) and baffle (36).

j. Install large packing on bottom of body assembly.

k. Install dip stick, pressure switch, door manifold assembly and gear mainfold assembly on body assembly.

l. Attach reservoir (32) to body assembly with packing, washer (29) and nut (30).

5-265. INSTALLATION. (Thru 21060539)

a. Work power pack into position and install three bolts that secure power pack to pedestal.

b. Connect all hydraulic lines to power pack fittings. Make sure fittings are properly installed, with jam nuts tight, after lines are tightened.

c. Install elevator trim chain and chain guard.

d. Connect ground wire to pressure switch and wire to motor.

e. Connect power pack wiring to plug.

f. Install upper panel assembly on pedestal.

g. Fill reservoir on right-hand side of power pack with clean hydraulic fluid in accordance with procedures outlined in Section 2.

h. Jack airplane in accordance with instructions outlined in Section 2.

i. Using Hydro Test unit or ship's power pack operate gear through several cycles to bleed system. Check for proper operation and any signs of hydraulic fluid leakage.

NOTE

If ships power pack is used, a ground electrical power source may be used.

j. Remove airplane from jacks.

k. Rig elevator trim control system and install pedestal decorative cover in accordance with procedures outlined in Section 9.

5-265A. INSTALLATION (Beginning with 21060540).

a. Work power pack into position and install three bolts that secure power pack to pedestal.

b. Connect all hydraulic lines to power pack fittings. Ensure that all fittings are properly installed, with jam nuts tight, after lines are tightened.

c. Install wheel and gear box assembly and indicator assembly in top of pedestal.

d. Install left-hand and right-hand chain guards for rudder trim chain.

e. Connect chain at connecting link after stringing chain over idler sprocket.

f. Tighten idler sprocket assembly by sliding sprocket outboard in slot and tightening bolt.

g. Connect ground wire to pressure switch and wire to motor

h. Connect power pack wiring to plug.

i. Install upper panel assembly on pedestal.

j. Fill reservoir on right-hand side of power pack with clean hydraulic fluid in accordance with procedures outlined in Section 2.

k. Jack airplane as outlined in Section 2.

l. Using Hydro Test or ship's power pack, operate gear through several cycles to bleed system. Check for proper operation and any signs of hydraulic fluid leakage.

NOTE: If the airplane's power pack is used, a ground electrical power source may be used.

5-266. PRESSURE SWITCH. (Refer to Figure 5-41A.)

5-267. DESCRIPTION. When installed in the airplane, the pressure switch is mounted on the right-hand side of the power pack in the console. This switch opens the electrical circuit to the pump solenoid when the landing gear doors close and pressure in the system increases to approximately 1500 psi. The pressure switch will continue to hold the electrical circuit open until pressure in the system drops to a preset value, at which time, the pump will again operate to build up pressure to approximately 1500 psi as long as the gear handle is in the UP position.

5-268. ADJUSTMENT. (Thru 21060910.) (Refer to Figure 5-41A.)

A. Jack airplane in accordance with procedure outlined in Section 2.

B. Attach external power source and install pressure gage in landing gear UP line. (Refer to Figure 5-46.)

C. Loosen jam nut on switch and back off switch housing (18).

D. Retract landing gear and apply pressure to 1500 ± 50 psi.

E. Tighten switch housing until snap action switch actuates, then tighten jam nut against housing.

F. Recheck operating point of 1500 ± 50 psi, and reset, if required.

G. Lower landing gear, remove external power source and remove airplane from jacks.

5-268A. PRESSURE SWITCH. (Beginning with 21060911.) (Refer to Figure 5-41A.)

5-268B. DISASSEMBLY. (Beginning with 21060911.)

A. Remove pin (45).

B. Unscrew cap and housing assembly (44) from fitting (53).

C. Remove spring (46).

D. Remove shims (47) from flange of stop (48).

NOTE: Chart in Figure 5-41A lists shims (47) by part number, thickness and effect on operating pressure (psi).

E. Unscrew guide (49) from fitting (53).

Do not damage lip of guide (49). Guide threads and threads of fitting (53) are primed with Loctite Grade T primer and sealed with Loctite Grade AV sealer.

F. Remove piston (51).

G. Remove packings (50) and (52).

H. Remove snubber (54) from fitting (53).

Threads of snubber (54) and fitting (53) are primed with Loctite Grade T primer and sealed with Loctite Grade AV sealer.

5-268C. PRESSURE SWITCH CLEANING, INSPECTION AND REPAIR. (Beginning with 21060911.) (Refer to Figure 5-41A.)

A. Clean sealant from threads of snubber (54), fitting (53), and guide (49) with wire brush.

B. Clean all parts with cleaning solvent (Federal Specification P-S-661, or equivalent) and dry thoroughly.

C. Discard all removed packings (50) and (52) and replace with new packings.

D. Inspect all pressure switch parts for scratches, scores, chips, cracks and indications of wear.

E. All damaged parts shall be replaced with new parts.

NOTE: Thorough cleaning is important. Dirt and chips are the greatest single cause of malfunctions in hydraulic systems. Carefulness and proper handling of parts to prevent damage must be observed at all times.

F. Snubber (54) can be cleaned with solvent, then blown out with high pressure compressed air.

G. Assure that 0.062 inch vent hole is open in stop (48).

5-268D. ASSEMBLY OF PRESSURE SWITCH. (Beginning with 21060911.) (Refer to Figure 5-41A.)

A. Prime threads of snubber (54) and internal threads of fitting (53) with Loctite Grade T primer and apply Loctite Grade AV sealer to threads of snubber (54). Install snubber into fitting with a slotted screwdriver.

NOTE: Lubricate packings (50) and (52) with clean hydraulic fluid during reassembly.

B. Install packing (52) in fitting (53).

C. Install packing (50) in guide (49).

D. Lubricate guide (49) with Dow Corning Compound #7 (excluding threads). Prime threads of guide and internal threads of fitting (53) with Loctite Grade T primer and apply Loctite Grade AV sealant to threads of guide (49). Install guide in fitting (53) and lightly snug into place.

E. Apply Loctite Grade T primer to threads of snubber (54) and internal threads of fitting (53). Apply Loctite Grade AV sealant to snubber and install snubber in fitting (53) and snug into place.

F. Ensure that sealant on guide (49) and snubber (54) is dry and install fitting (53) on body assembly (41).

G. Pump emergency hand pump just enough for fluid to seep from top of guide (49).

H. Lubricate piston (51) with Dow Corning Compound #7 and insert piston into hole in guide (49).

I. Lubricate stop (48) with Dow Corning Compound #7 and install over guide (49).

J. Install exact number and thickness of shims (47) that were removed.

NOTE: If same number of shims (47) are installed as were removed, pressure switch should not require adjustment. If readjustment is necessary, a chart of shim part numbers, thickness and effect in pressure adjustment is shown in Figure 5-41A.

K. Lubricate spring (46) with Dow Corning Compound #7 and install over shims.

L. Screw cap and housing assembly on fitting (53).

5-268E. ADJUSTMENT OF PRESSURE SWITCH. (Beginning with 21060911.) (Refer to Figure 5-41A).

A. Jack aircraft in accordance with procedures outlined in Section 2.

B. Screw cap and housing assembly (44) on fitting (53) enough to bottom piston (51) out in stop (48).

C. Turn cap and piston assembly back from full thread engagement one turn, plus 0, minus one-fourth turn to locate hole in fitting (53) in slot in skirt of cap and piston assembly.

D. Attach electrical connections to pressure switch and attach external power source.

E. Turn on master switch.

F. Pump hand pump to obtain 1500 psi on test gage.

G. The switch should open the electrical circuit to the pump solenoid when pressure in the system increases to approximately 1500 psi.

H. If switch opens electrical circuit to solenoid prematurely, disassemble pressure switch down to shims (47) and add shims as necessary to obtain desired pressure; repeat steps "B" and "C".

NOTE: The chart in Figure 5-41A lists shims by part number, thickness and the effect in psi each shim will have on switch operation.

I. If switch opens electrical circuit to solenoid later than 1500 ± 50 psi, disassemble pressure switch down to shims (47) and remove shims as necessary to obtain desired pressure; repeat steps "B" and "C".

J. Turn off master switch.

K. Drive new pin (45) through slot in housing skirt and hole in fitting (53).

L. Remove aircraft from jacks.

5-269. DOOR SYSTEM RELIEF VALVE. (Refer to Figure 5-41A.) The relief valve is located in the power pack assembly. The valve is preset at the factory to open at 1650 ± 50 psi. No further adjustment should be required.

5-269A. LANDING GEAR AND DOOR MANIFOLD ASSEMBLIES. (Refer to Figure 5-42.)

5-269B. DESCRIPTION. The manifolds are mounted on the power pack in the console. Refer to the schematic diagrams in Figure 5-49 for system operation.

5-269C. SOLENOIDS. The solenoids are mounted on top of the gear and door manifolds and beginning with 21060961 & all Service Parts, should be disassembled, cleaned and reassembled every 1000 hours or 5 years, and whenever the solenoid is accessible.

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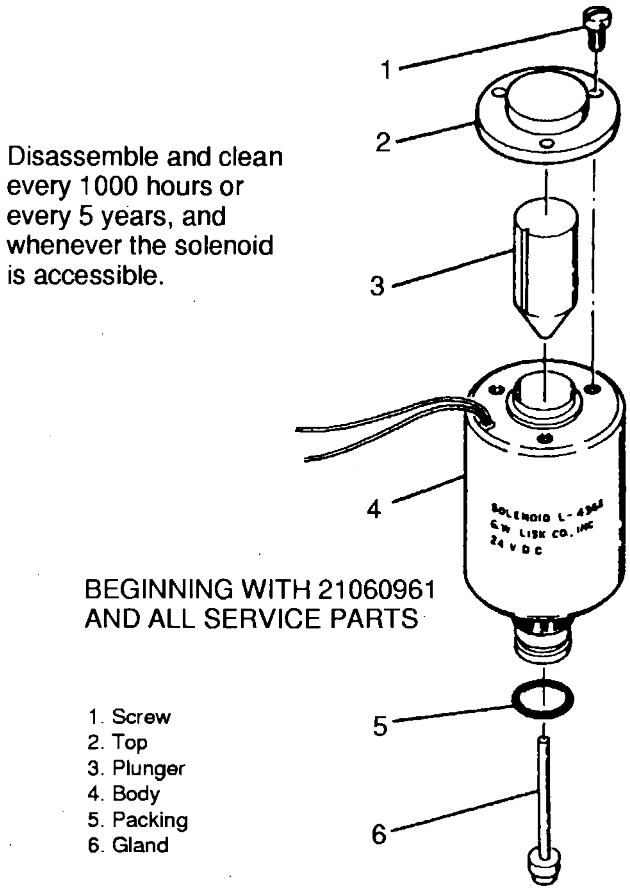


Figure 5-42A. Disassembly of Manifold Solenoid

5-269D. DISASSEMBLY. (Beginning with 21060961.) (Refer to Figure 5-42A.)

A. Cut safety wire and remove solenoid from manifold.

B. Remove screws (1).

C. Remove top (2).

D. Remove plunger (3).

E. Remove gland (6).

F. Remove and discard packing (5).

5-269E. INSPECTION AND CLEANING. Wash all parts in solvent (Federal Specification P-S-661, or equivalent) and dry with filtered air. If any parts are found defective or worn replace the entire solenoid assembly. Replace packing (5).

5-269F. ASSEMBLY. (Refer to figure 5-42A.)

A. Install new packing (5).

b. Install plunger (3).
c. Install top (2).
d. Install screws (1).
e. Install gland (6).

5-270. LANDING GEAR MANIFOLD. (Refer to figure 5-42.)

5-271. DISASSEMBLY. (Thru 21061039.)

NOTE

After the manifold has been removed from the body assembly of the power pack, seat (2) will remain in body assembly. Ball (4) will fall free.

a. Remove seat (2) from body assembly of power pack; remove two packings from seat.

NOTE

Difficulty may be encountered in removing poppet (5) and spring (6). It might be necessary to apply air pressure at port "A" (View A-A) to force spring and poppet from port "B".

b. Remove back-up rings and packing from grooves in poppet.
c. Remove packing from bottom of manifold assembly; remove spring (6).
d. Cut safety wire and remove solenoid (9).
e. Using a hook formed from brass welding rod, and inserted into oil hole in selector valve (8), withdraw selector valve from manifold.

CAUTION

Be sure that end of hook is not over 1/16-inch long. Use with care to prevent scratching bore in manifold. Removal of selector valve will be difficult due to friction caused by packings.

f. Remove packings from selector valve.

5-272. INSPECTION.
a. Wash all parts in cleaning solvent (Federal Specification P-S-661, or equivalent) and dry with filtered air.
b. Inspect seating surfaces. They should have very sharp edges. Seats may be lapped, if necessary, with No. 1200 lapping compound.
c. Inspect all threaded surfaces for serviceable condition and cleanliness.
d. Inspect all parts for scratches, scores, chips, cracks and indications of excessive wear.

5-273. ASSEMBLY. (Refer to figure 5-42.)

NOTE

Use all new packing and back-up rings for reassembly. Before assembly, lubricate all packings and back-up rings with MIL-H-5606 hydraulic fluid or Petrolatum. Lubricate all threads with Petrolatum.

a. Install packings on selector valve (8).
b. Install packings in bottom of manifold.
c. Install spring and selector valve (8) in manifold.
d. Install packing on solenoid (9), install solenoid on manifold and safety wire as shown in view A-A.
e. Install spring in bottom of manifold.

SHOP NOTES:

f. Install packing and back-up rings on poppet (5).
g. Install poppet in manifold.

CAUTION

Use extreme caution when installing poppet (5). Shoulder, referenced in view A-A will cut packings on poppet.

h. Install packings on seat (2); install ball (4) and seat (2) in manifold.

5-273A. DISASSEMBLY. (Beginning with 21061040.) (Refer to figure 5-42.)

a. As gear manifold assembly is removed from body of power pack, transfer valve (16) will fall free. Remove packing from bottom of manifold.
b. Remove packings from transfer tube.
c. Remove retainer (21) from gear manifold assembly.

NOTE

Retainer (21) is sealed in manifold assembly with Loctite Hydraulic Sealant or STA-LOK No. 550, or equivalent sealant.

d. Remove AN316-4R nut (18) and remove screw (17).
e. Using a blunt tool or welding rod, push flow valve assembly (20 and 22), spring (6) and spring guide (19) through bottom of manifold assembly.

NOTE

Use care to prevent damage to spring guide (19), flow valve spool (22) or flow valve sleeve (20).

f. Remove flow valve spool (22) from sleeve (20).
g. Remove packings and back-up rings from sleeve (20).
h. Remove packing from spool (22).
i. Remove packing and back-up ring from spring guide (19).
j. Cut safety wire and remove solenoid (9).
k. Using a hook formed from brass welding rod, and inserted into oil hole in selector valve (8), withdraw selector valve from manifold.

CAUTION

Be sure that end of hook is not over 1/16-inch long. Use care to prevent scratching bore in manifold. Removal of selector valve will be difficult due to friction caused by packings.

l. Remove packings from selector valve.
m. Remove spring (6).

5-273B. INSPECTION.

a. Wash all parts in cleaning solvent (Federal Specification P-S-661, or equivalent) and dry with filtered air.
b. Inspect seating surfaces. They should have very sharp edges. Seats may be lapped, if necessary, with No. 1200 lapping compound.
c. Inspect all threaded surfaces for serviceable condition and cleanliness. Clean sealant from retainer threads.
d. Inspect all parts for scratches, scores, chips, cracks and indications of excessive wear.

5-273C. ASSEMBLY. (Beginning with 21061040.) (Refer to figure 5-42.)

NOTE

Use all new packing and back-up rings for reassembly. Before assembly, lubricate all packings and back-up rings with MIL-H-5606 hydraulic fluid or Petrolatum. Lubricate all threads with Petrolatum.

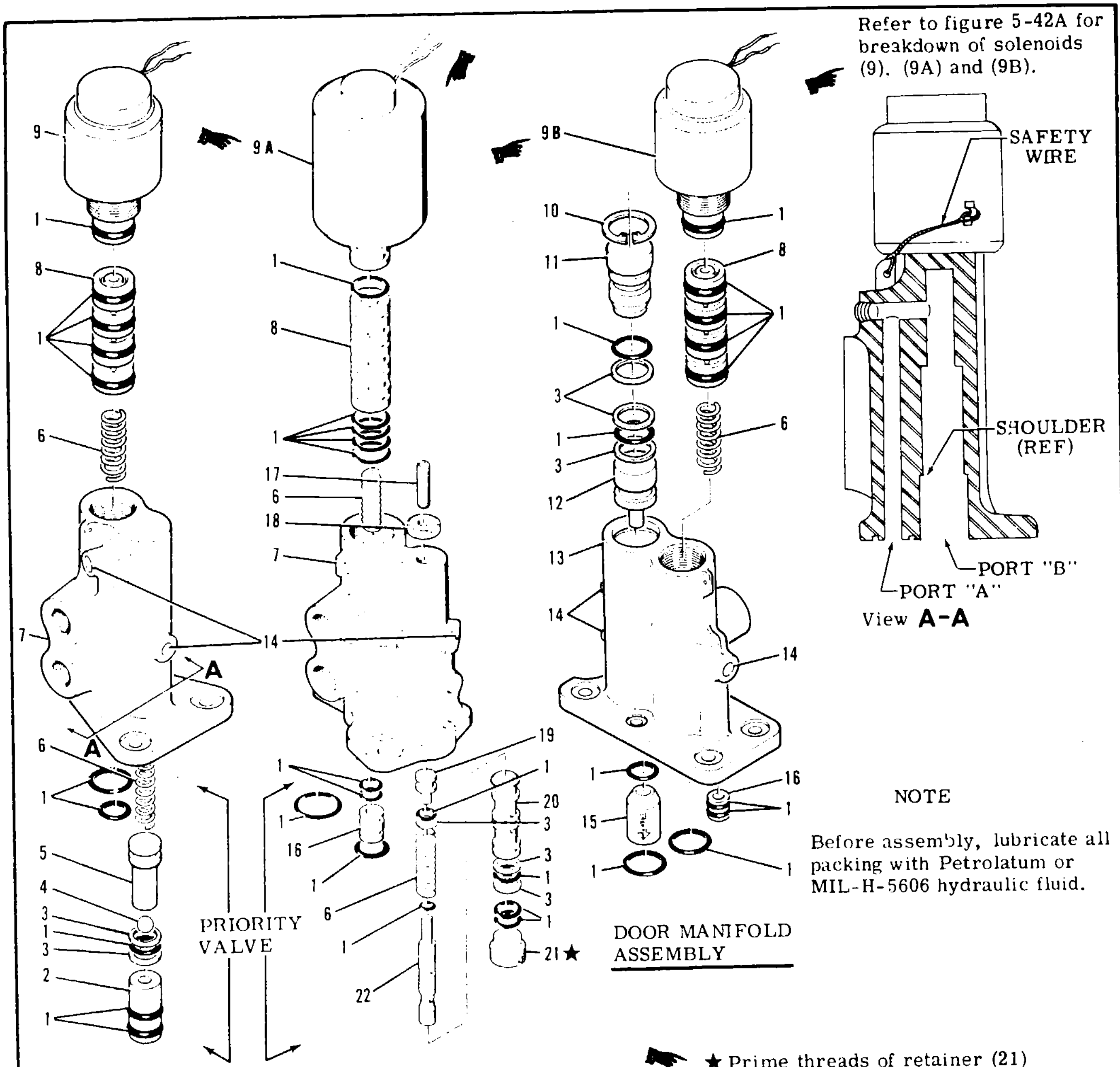
a. Install packings on selector valve (8).
b. Install packing in bottom of manifold.
c. Install spring (6) and selector valve (8) in manifold.
d. Install packing on solenoid (9); install solenoid on manifold and safety wire as shown in view A-A.
e. Install screw (17) and AN316-4R nut (18) in top of manifold.
f. Install packing and back-up ring on spring guide (19).
g. Install spring guide.
h. Install spring (6).
i. Install packings and back-up rings on flow valve sleeve (20).
j. Install spool (22) in sleeve (20); install assembly in bottom of manifold.
k. Install packing on retainer (21).
l. Prime threads of retainer with Grade T Primer and seal with Loctite Hydraulic Sealant or STA-LOK No. 550, or equivalent sealant.
m. Install retainer (21).
n. Install packings on transfer tube (16).
o. Prior to installing manifold on body of power pack, install transfer tube (16) in body of power pack.

5-273D. ADJUSTMENT. (Beginning with 21061040.) (Refer to figure 5-42.) With manifolds installed on power pack and power pack installed on aircraft (refer to paragraph 5-265A.), if main landing gear moves into the up or down locks with sufficient force to jar the aircraft, the flow control valve in the landing gear manifold should be adjusted as follows:

a. Jack aircraft as outlined in Section 2 and attach external power source.
b. Loosen locknut (18).
c. Back off screw (17) counterclockwise to maximum snub position.
d. Rotate screw (17) clockwise to increase speed of gear rotation and counterclockwise to slow speed of gear rotation. Make necessary adjustments to obtain desired cycling time.

NOTE

Desired cycling time is specified in inspection charts in Section 2 under LANDING GEAR RETRACTION SYSTEM.



NOTE

Before assembly, lubricate all packing with Petrolatum or MIL-H-5606 hydraulic fluid.

★ Prime threads of retainer (21) with Grade T Primer and seal with Loctite Hydraulic Sealant or STA-LOK No. 550, or equivalent sealant.

1. Packing
2. Seat
3. Back-Up Ring
4. Ball
5. Poppet
6. Spring
7. Gear Solenoid Assembly
8. Selector Valve
9. Gear Up-Down Solenoid
9A. Gear Up-Down Solenoid
9B. Door Open-Close Solenoid
10. Retainer Ring
11. End Gland
12. Piston
13. Door Manifold Assembly
14. Plug
15. Door Lock Valve
16. Transfer Tube
17. Screw
18. AN 316-4R Nut
19. Spring Guide
20. Flow Valve Sleeve
21. Retainer
22. Flow Valve Spool

Figure 5-42. Power Pack Manifold Assemblies

e. When desired setting has been achieved, tighten locknut (18).

5-274. DOOR MANIFOLD ASSEMBLY. (Refer to figure 5-42.)

5-275. DISASSEMBLY.

a. As door manifold assembly is removed from body of power pack, transfer valve (16) will fall free.
b. Remove packings from transfer tube.
c. Remove packings from bottom of manifold, and remove door lock valve (15).
d. Remove spring (6).
e. Cut safety wire and remove solenoid (9); remove packing from solenoid.
f. Using a hook formed from brass welding rod, and inserted into oil hole in selector valve (8), withdraw selector valve from manifold.

CAUTION

Be sure that end of hook is not over 1/16-inch long. Use with care to prevent scratching bore in manifold. Removal of selector valve will be difficult due to friction caused by packings.

g. Remove packings from selector valve.
h. Remove retainer ring (10).
i. Remove end gland (11).
j. Remove piston (12).
k. Remove packings and back-up rings from end gland and piston.

5-276. INSPECTION.

a. Wash all parts in cleaning solvent (Federal Specification P-S-661, or equivalent) and dry with filtered air.
b. Inspect seating surfaces. They should have very sharp edges. Seats may be lapped, if necessary, to obtain sharp edges.
c. Inspect all threaded surfaces for serviceable condition and cleanliness.
d. Inspect all parts for scratches, scores, chips, cracks and indication of excessive wear.

5-277. ASSEMBLY. (Refer to figure 5-42.)

NOTE

Use all new packing and back-up rings for reassembly. Before assembly, lubricate all packings and back-up rings with MIL-H-5606 hydraulic fluid or Petrolatum. Lubricate all threads with Petrolatum.

a. Install new packings and back-up rings on end gland (11), piston (12), selector valve (8) and transfer tube (16).
b. Install packings and door lock valve (15) in bottom of manifold.
c. Install spring (6) and selector valve (8) in manifold.
d. Install packing on solenoid (9).
e. Install solenoid on manifold and safety wire as shown in view A-A
f. Install piston (12) and end gland (11) in manifold.
g. Install retainer ring (10).
h. Prior to installing manifold on body of power pack, install transfer tube (16) in body of power pack.

5-278. LANDING GEAR HAND PUMP. (Refer to figure 5-43.)

5-279. DESCRIPTION. The hand pump is located in the cabin floor area between the pilot and copilot seats. The pump supplies a flow of pressurized hydraulic fluid to open the doors and extend the landing gear if hydraulic pressure should fail.

5-280. REMOVAL.

a. Peel back carpet on both sides of hand pump to expose access plates; remove plates.
b. Remove hand pump pan by removing attaching screws.
c. Pull boot up over hand pump handle knob.
d. Drain power pack as outlined in Section 2.
e. Spread drip cloth under line fittings at hand pump and remove lines; cap or plug lines upon removal.
f. Remove bolts attaching hand pump to aircraft structure.

5-281. DISASSEMBLY. (Refer to figure 5-43.)

NOTE

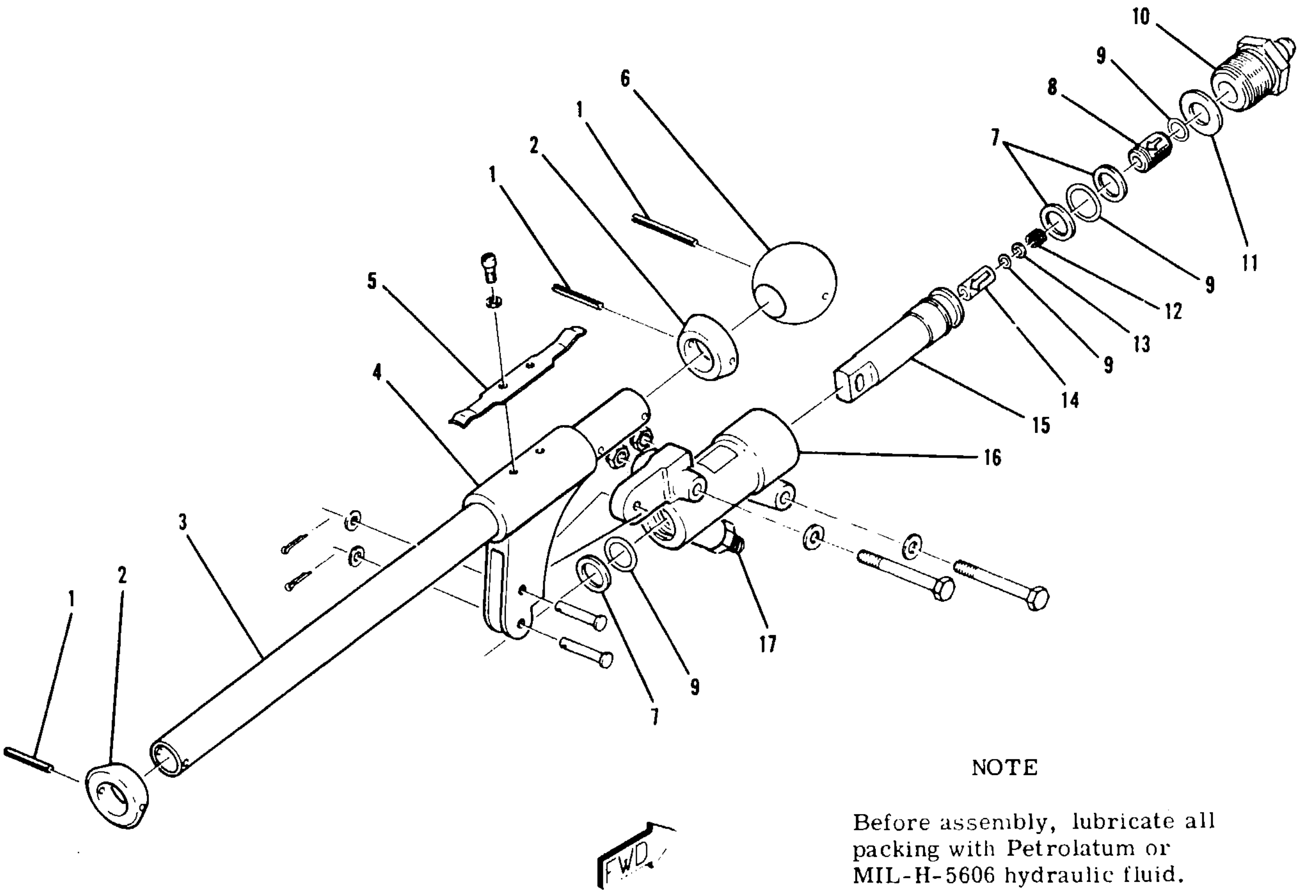
After hand pump has been removed from aircraft, and ports are capped or plugged, spray with cleaning solvent (Federal Specification P-S-661, or equivalent) to remove all accumulated dust or dirt. Dry with filtered compressed air. To disassemble, inspect and reassemble the unit, proceed as follows:

a. Remove handle (3) by removing pivot pins and washers after removing cotter pins.
b. Place pump in vise with fitting (10) at top.
c. Unscrew fitting (10) and remove, along with washer (11).

NOTE

Use caution when removing fitting (10) as check valve (8) will fall free.

d. Remove pump from vise and push piston (15) out of pump body (16). Push from handle end of piston. A slight drag will be experienced until piston clears back-up ring and packing inside pump body.
e. Remove setscrew (12) from piston (15) and remove spacer (13), packing (9) and Kep-O-Seal valve



NOTE

Before assembly, lubricate all packing with Petrolatum or MIL-H-5606 hydraulic fluid.

1. Roll Pin
2. Stop
3. Handle
4. Fork
5. Spring
6. Knob
7. Back-Up Ring
8. Check Valve
9. Packing
10. Fitting
11. Washer
12. Setscrew
13. Spacer
14. KEP-O-SEAL Valve
15. Piston
16. Pump Body
17. Union and Gasket

Figure 5-43. Landing Gear Hand Pump

(14).

f. Remove union and gasket (17).

g. Remove and discard back-up ring and packing from inside pump body and fitting (10).

5-282. INSPECTION.

a. Inspect seating surfaces. They should have very sharp edges. Seats may be lapped, if necessary, to obtain sharp edges.

b. Inspect piston (15) for scores, burrs or scratches which could cut packings. This is a major cause of external leakage. The piston may be polished with extremely fine emery paper. Never use paper coarser than No. 600 to remove scratches or burrs. If defects do not polish out, replace piston.

c. The threads on fitting (10) and in pump body (16) are coated with Loctite Catalog No. 69 sealant. This sealant should be cleaned from the threads with a wire brush. After threads are cleaned out, inspect for damage.

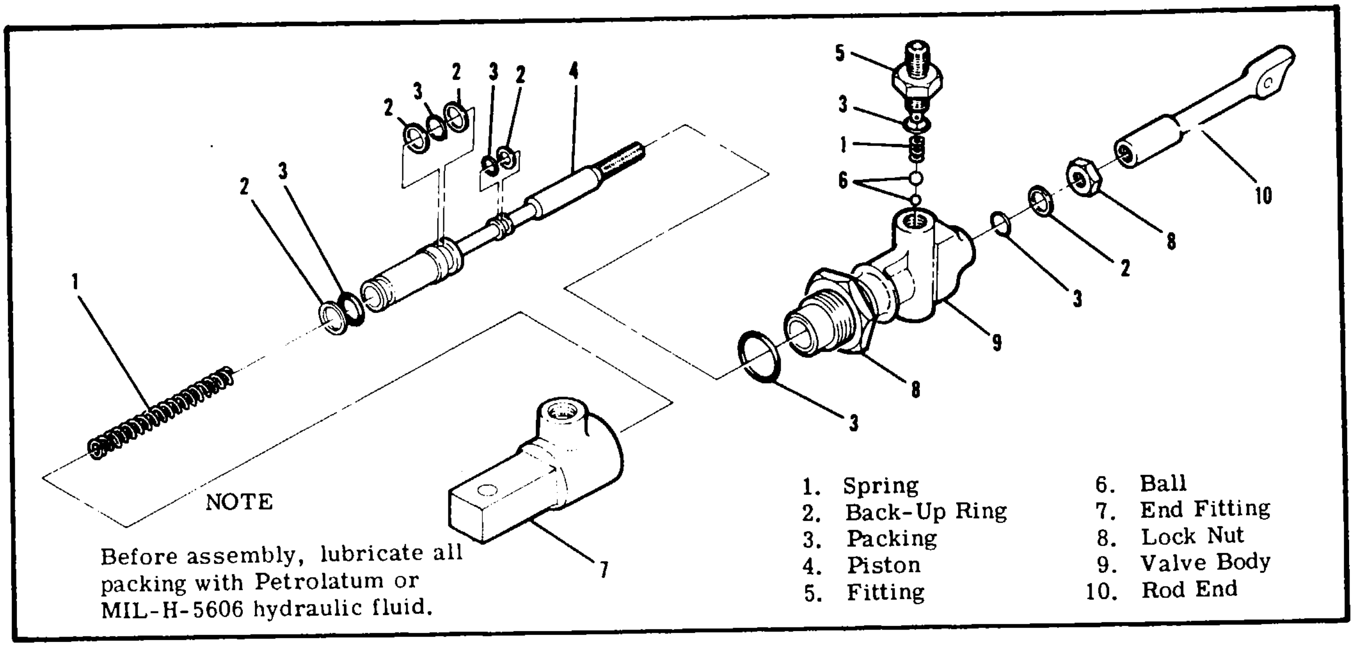


Figure 5-44. Main Landing Gear Downlock Actuator

5-283. ASSEMBLY. (Refer to figure 5-43.)

NOTE

Lubricate packings and back-up rings with petrolatum or MIL-H-5606 hydraulic fluid before assembly.

a. Using all new packings and back-up rings, install back-up ring and packing inside pump body (16).

NOTE

Assure that check valve is inserted correctly in order to seat inside fitting.

b. Insert Kep-O-Seal (14), packing and spacer (13) into piston. Install setscrew (12). Install back-up rings and packing in grooves on piston.
c. Line up piston in pump body (16). Carefully insert piston into pump body. Use extreme caution to avoid cutting packing inside pump body.

NOTE

A "pumping", back and forth motion must be employed to get piston positioned inside pump body.

d. Install washer (11).
e. Coat threads of fitting (10) with Loctite Catalog No. 69 sealant, and screw fitting into pump body.
f. Install union and gasket (17).
g. Line up holes in piston (15) and pump body (16) with holes in fork (4). Install pins, washers and cotter pins.

5-284. INSTALLATION.
a. Place hand pump in position in cutout in cabin floor.
b. Attach pump to aircraft with mounting bolts.
c. Connect hydraulic lines to pump.
d. Fill and bleed power pack in accordance with procedures outlined in Section 2.
e. Pull boot down over pump handle.
f. Install pan with attaching screws.
g. Install access plates and carpet.
h. Check operation of hand pump.

5-285. MAIN LANDING GEAR DOWNLOCK ACTUATOR. (Refer to figure 5-44.)

5-286. LEADING PARTICULARS.

Operating Pressure	1500 PSI
Total Stroke	1.10±.09 in.
Stroke (to unseat valve)	0.75 in.

5-287. DISASSEMBLY. (Refer to figure 5-44.)
a. Remove fitting (5), packing (3), spring (1) and balls (6).
b. Loosen lock nut and remove rod end (10) and lock nut from piston rod (4). Mark position of end fitting (7) to valve body (9).
c. Loosen lock nut and remove end fitting (7) from valve body (9); remove lock nut. (End fitting is under a slight load.)
d. Remove spring (1) from valve body.
e. Push piston (4) from valve body.
f. Remove and discard packings and back-up rings.

5-288. INSPECTION. Make the following inspections to assure that all parts are in a serviceable condition.
a. Inspect all threaded surfaces for cleanliness and for freedom of cracks and excessive wear.
b. Inspect springs for evidence of breaks and distortion.
c. Inspect end fitting (7), piston (4), valve body (9), balls and ball seats for cracks, scratches, scoring, wear or surface irregularities which may affect their function or overall function of the actuator.
d. Repair of most parts of actuator is impractical.

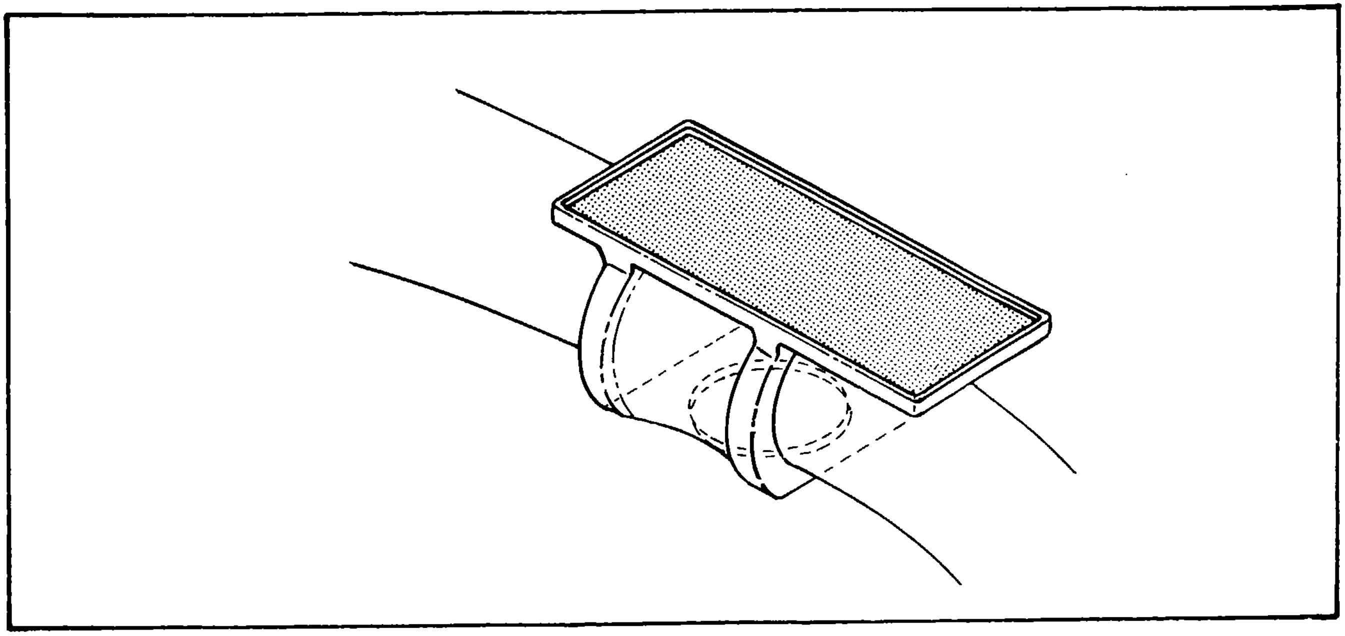


Figure 5-45. Landing Gear Strut Step Installation.

Replace defective parts.

e. Minor scratches and scores may be removed by polishing with fine abrasive crocus cloth (Federal Specification PC-458), providing their removal does not affect the operation of the actuator.

5-289. ASSEMBLY. (Refer to figure 5-44.)

NOTE

Use all packing and back-up rings for reassembly. Before assembly, lubricate all packings and back-up rings with MIL-H-5606 hydraulic fluid or Petrolatum. Lubricate all threads with Petrolatum.

a. Install new packings and back-up rings on piston (4).
b. Install new packings and back-up ring in valve body (9).
c. Slide piston (4) into valve body (9). Use care to prevent damage to packing and back-up ring.
d. Insert spring (1) into valve body, then install end fitting (7) on valve body.
e. Insert balls (6) and spring (1) into valve body.
f. Install packing on fitting (5), then install and tighten fitting.
g. Install rod end (10) on piston (4).

5-290. STEP INSTALLATION. (Refer to figure 5-45.)

NOTE

The step assembly is bonded to the landing gear spring strut with EC-2216, or equivalent.

a. Remove wheel, axle and fitting in accordance with paragraph 5-45.
b. Mark position on inboard side of step that was removed so that new step assembly will be installed in as nearly the same position on the strut.
c. Remove all traces of the original bracket and adhesive as well as any rust, paint or scale, with a wire brush and coarse sandpaper.
d. Leave surfaces of strut slightly roughened or abraded, but deep scratches or nicks should be avoided. Also, roughen bonding surface of the new step.
e. Clean surfaces to be bonded together thoroughly. If a solvent is used, remove all traces of the solvent with a clean, dry cloth. It is important that the bonding surfaces be clean and thoroughly dry.
f. Mix adhesive (EC-2216, or equivalent) in accordance with the manufacturer's directions.
g. Spread a coat of mixed adhesive on bonding surfaces of strut and step assembly.
h. Slide new step up strut as far as it will go, then use soft mallet to drive step to mark on strut. Be sure step is level.

CAUTION

It is important to install step in as nearly the same location as old step. If step is not installed high enough on strut, during landing gear retraction, step will contact top of strut well wall.

i. Remove excess adhesive with lacquer thinner.
j. Allow adhesive to thoroughly cure according to the manufacturer's recommendations before flexing gear spring strut or apply loads to the step.
k. Paint gear spring and step after curing is completed.
l. Install wheel, axle and fitting.

5-290A. RIGGING THROTTLE-OPERATED MICRO-SWITCHES. (Refer to figure 5-45A.) These aircraft are equipped with a throttle-operated microswitch which operates the landing gear warning horn when the throttle is retarded while the gear is not down and locked. The landing gear warning microswitch should cause the horn to blow as the throttle is retarded to approximately 12 inches of mercury manifold pressure.

a. Start engine and set throttle to obtain 12 inches of mercury manifold pressure, then shut down engine.

b. Referring to figure 5-45A, note that microswitch is located at the engine throttle shaft lever. Adjust the landing gear warning horn microswitch to sound the warning horn as the throttle is retarded to 12±.5 inches of mercury manifold pressure.

NOTE

Because the landing gear is down and locked, it will be necessary to keep the gear-down (green indicator light depressed approximately half its travel distance, with the master switch turned ON, in order to determine when the gear warning microswitch actuates the warning horn system.

c. Perform a flight test to check gear warning system at 2500 feet pressure altitude as follows:

1. Set propeller control at 2300 rpm.
2. Slowly reduce throttle until warning horn blows and note manifold pressure at which horn blows. Horn should blow between 11.5 and 12.5 inches of mercury manifold pressure.
3. If horn actuation does not fall within this tolerance, mark throttle at 12 inches of mercury manifold pressure for ground reference.

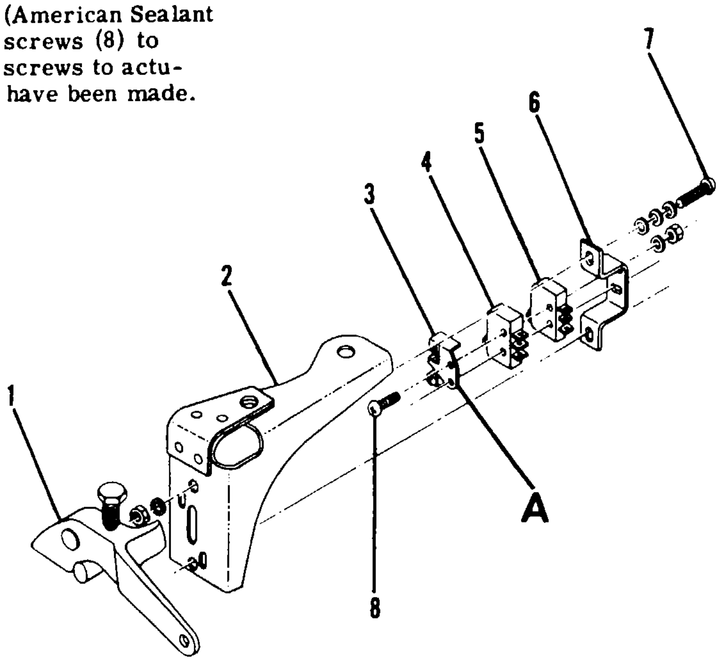
NOTE

After flight testing, if required results were not obtained, set throttle at the marked position and readjust micro-switch to actuate horn at this setting. Repeat flight test until desired results are obtained.

SHOP NOTES:

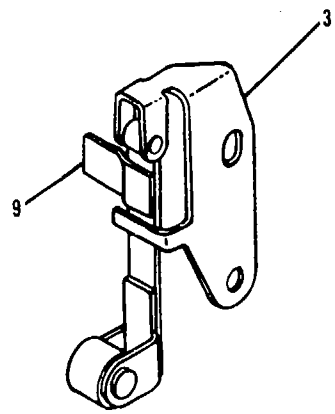
NOTE

Use LOCTITE sealant Grade C (American Sealant Co., Hartford, Conn.) to bond screws (8) to attaching nuts and heads of the screws to actuator (3) after final adjustments have been made.



NOTE

Slotted and oversize holes are provided in microswitches and attaching brackets for adjustment. Extension tab (9) may be bent for additional adjustment, if necessary to obtain proper adjustment of switches (4 and 5), since they are attached with the same mounting screws. Identity of the gear warning and fuel pump switches (4 and 5) may be established by noting that the ground wire is always attached to the gear warning switch.



Detail **A**

1. Throttle Shaft Lever Cam
2. Airbox Bracket
3. Microswitch Actuator
4. Landing Gear Warning Microswitch
5. Electric Fuel Pump Microswitch
6. Switch Mounting Bracket
7. Mounting Bracket Screw
8. Switch Mounting Screw
9. Microswitch Actuator Extension Tab

THRU 21060558

Figure 5-45A. Rigging Throttle-Operated Microswitches (Sheet 1 of 2)

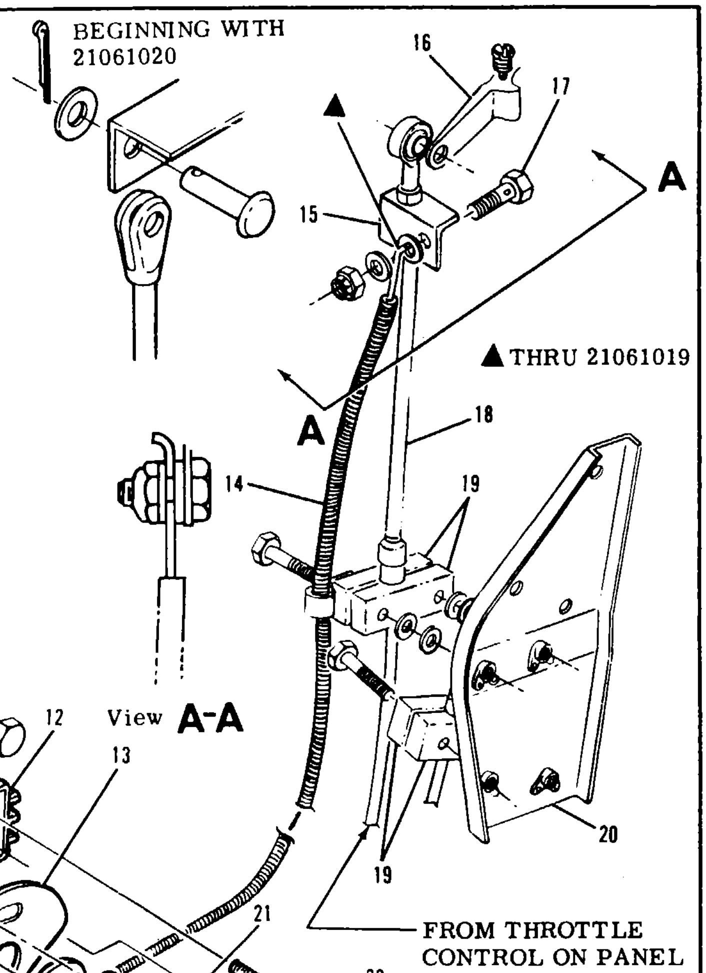
SETTING THROTTLE SWITCHES

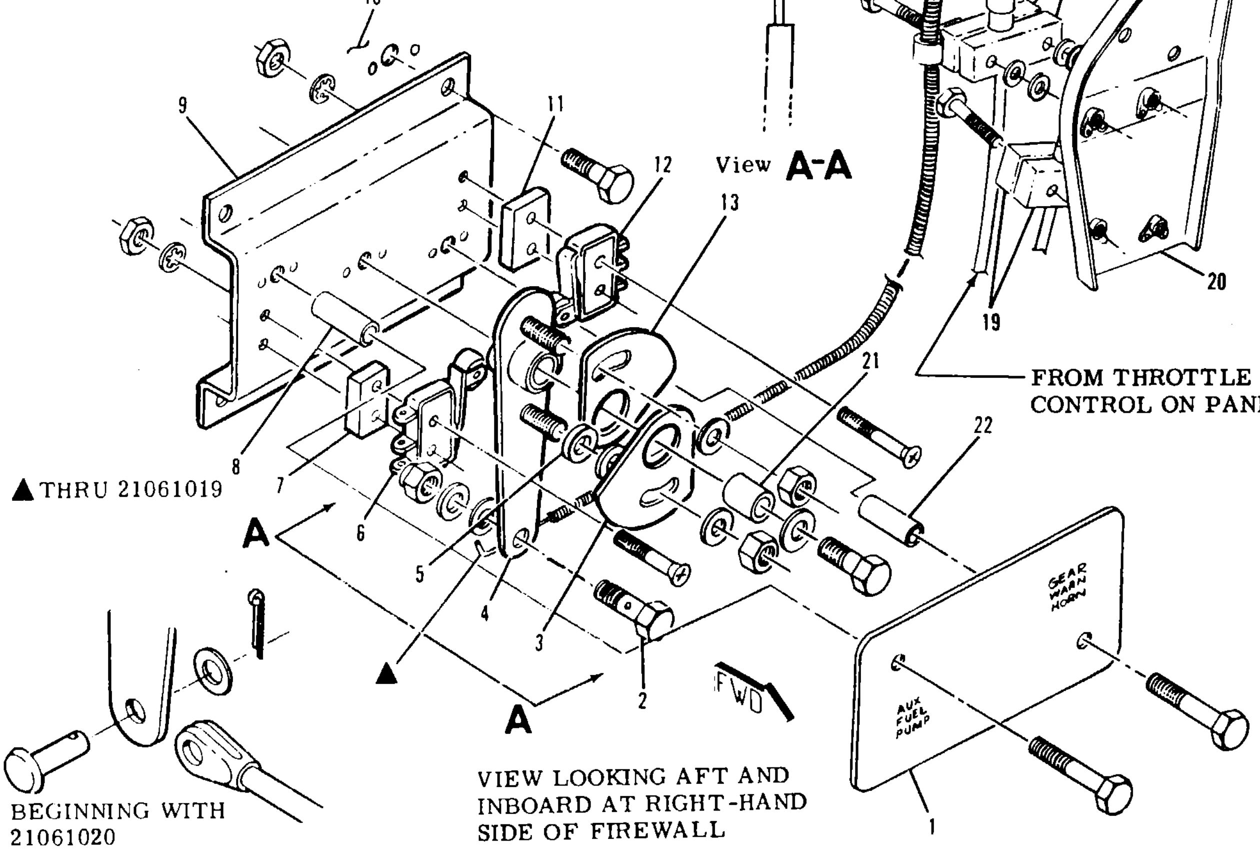
1. During flight at 120 MPH (IAS), 2500', prop control full forward for maximum RPM, and with the gear and flaps up, mark the throttle control position corresponding to the following manifold pressures:

Model 210L	12.0" ± .5"
Model T210L	15.0" ± 1.0"

2. Then adjust the gear warning horn throttle switch on the ground to activate at the throttle control position as marked in flight.

"For each 1000 feet above 2500' MSL, decrease the manifold pressure at which the throttle control position is marked by 0.5 inches."





1. Cover
2. Clamp Bolt
3. Fuel Pump Cam
4. Arm Assembly
5. Thick Washer
6. Fuel Pump Switch
7. Spacer
8. Spacer
9. Mounting Bracket
10. Firewall
11. Spacer
12. Gear Warning Switch
13. Gear Warning Cam
14. Throttle Control (Secondary)
15. Cable Clamp Mount
16. Throttle Lever
17. Clamp Bolt
18. Cabin Throttle Control
19. Clamp Half
20. Clamp Assembly
21. Bushing
22. Spacer

BEGINNING WITH 21060559

Figure 5-45A. Riggign Throttle-Operated Microswitches (Sheet 2 of 2)

NOTE

If it is planned to use the aircraft power system during rigging procedures, outlined in the following paragraphs, the following steps should be considered.

IMPORTANT POINTS CONCERNING ELECTRO-HYDRAULIC SYSTEM INTERRELATIONSHIP (Beginning with 21059503)

1. The electrical system is a 24-28 volt system (24 volt battery and 28 volt alternator). The alternator is regulated to 27.7 volts, so bus voltage during engine operation will be 27.5 ± 0.5 volts.

2. The electro-hydraulic power pack motor requires a nominal 20 amps at 27.5 volts during gear operation with starting current peaking out at 30 amps.

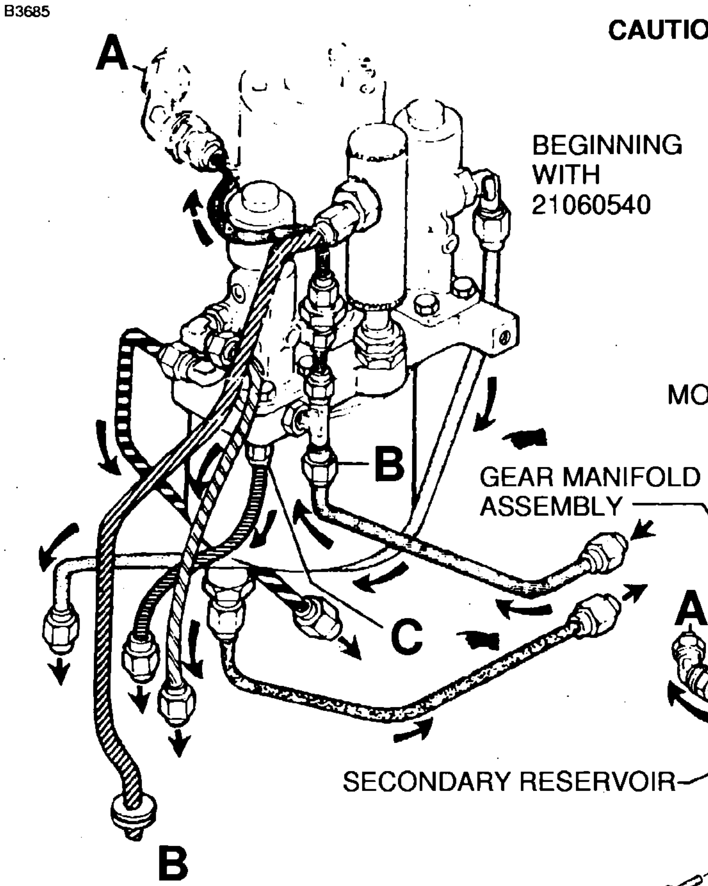
   If the motor is operated in the shop on the ship's battery (engine not running), then system voltage is only 22 to 24 volts during first and second gear cycles. It may be even less if the ship's battery is old or partially discharged.

   During landing gear system servicing, a power supply capable of maintaining 27.5 volts throughout the gear cycle must be used to augment the ship's battery.

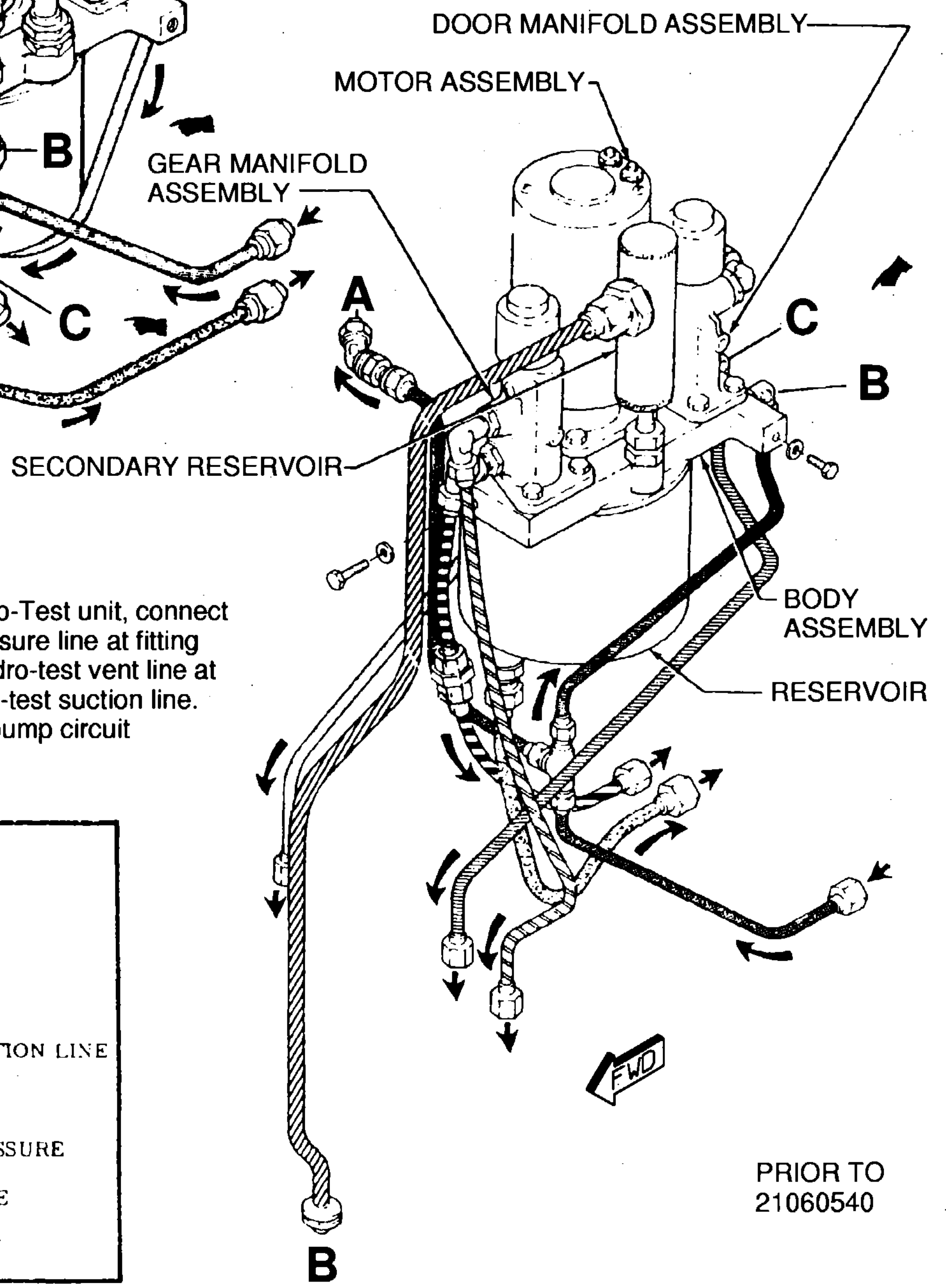
3. The power pack includes an electrically-driven pump and two electric solenoid shuttle valves. These valves are normally energized during flight (gear retracted, doors closed). The door valve is de-energized during the doors open and gear cycling action. The door valve is re-energized at the end of the gear extension or retraction cycle, causing the doors to close.

   The pump motor is putting forth its maximum effort at about the same time the door valve is energized. If the battery-alternator combination is not maintaining 27.5 volts, the gear valve may not shuttle. The doors remain open and the pump continues to run.

   The typical door solenoid will operate at 21.0 to 21.5 volts when hot. In a service shop, when cycling the gear using a limited capability power source, the voltage required to energize the door solenoid may not be developed.



CAUTION: Prior to using hydro-test unit with power pack, remove and dry off filler plug and dipstick. Adjust cap tension so that no movement of cap is apparent. Failure to accomplish these procedures could result in filler cap coming loose from power pack.



NOTE: To attach Hydro-Test unit, connect hydro-test pressure line at fitting "A". Attach hydro-test vent line at "B". Plug hydro-test suction line. Pull hydraulic pump circuit breaker OFF.

LINE CODE

- DOOR OPEN LINE
- VENT TUBE
- GEAR UP LINE
- HAND PUMP SUCTION LINE
- GEAR DOWN LINE
- HAND PUMP PRESSURE
- DOOR CLOSE LINE
- FLOW DIRECTION

Figure 5-46. Hydraulic Power Pack Installation

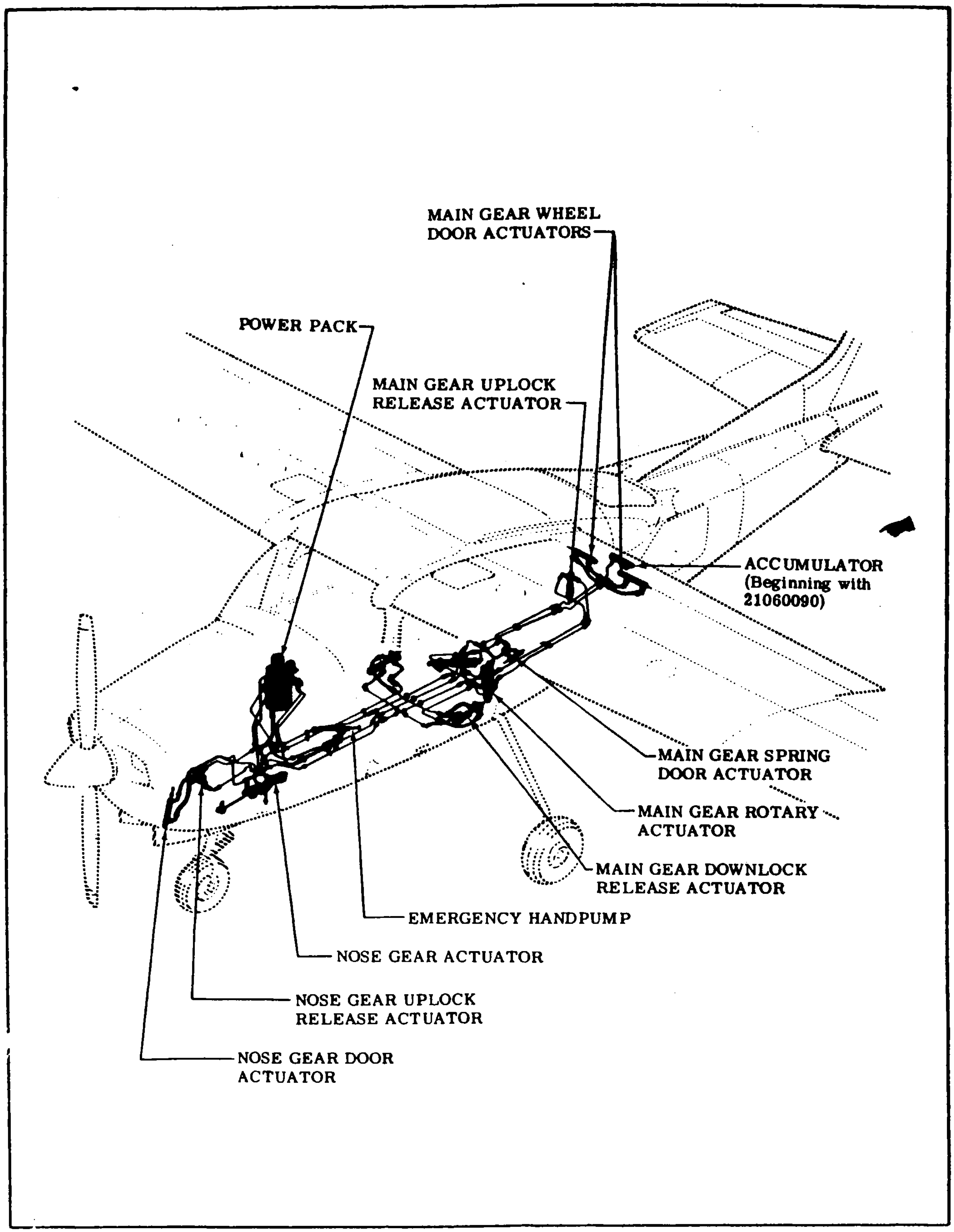


Figure 5-47. Hydraulic System Component Location

5-291. RIGGING OF MAIN LANDING GEAR. (Refer to figure 5-48.)

NOTE

All of the following rigging adjustments shall be accomplished with the aircraft on jacks and in a level condition. A Hydro Test unit or other ground power source should be used to supply pressure.

a. With main gear unlocked and main landing gear support forging assembled loose to the outboard support assembly, bring main landing gear strut into "DOWN" position and adjust as follows:

1. Center and shim simultaneously main landing gear support, using shims (P/N 1241629) between outboard forging and landing gear support assembly. The following shims are available from the Cessna Service Parts Center.

1241629-1	0.016 inch
1241629-2	0.025 inch
1241629-3	0.050 inch
1241629-4	0.071 inch

2. Use shims between downlock support assembly and outboard support assembly, to level wings and assure that end points of main landing gear wheel axle points are within ±0.25 inch.

NOTE

This measurement may be made from a point beneath the wing main spar on the upper door sill to the top bolt attaching ankle bone to the spring strut. Make measurements from corresponding points on the upper door sills. Shim thickness between downlock support and outboard support assembly shall not exceed 0.075 inch with a minimum thickness of 0.025 inch for either main gear.

3. Before installing downlock hook assembly, adjusting screw and arm assembly, adjust downlock setscrew to stop hook assembly .06+.03, -.02 inch overcenter, as shown in figure 5-48.

4. Adjust downlock hook to clear inboard side of gear pivot ear to a minimum of 0.06 inch.

NOTE

A spacer (P/N 1241614-1) is installed on each side of the downlock arm assembly. Spacer may be relocated to the inboard or outboard side of the downlock arm assembly to obtain the 0.06 inch clearance between hook assembly and the inboard of gear pivot ear. After adjustment, both spacers MIGHT end up on either the inboard or outside of downlock arm assembly.

b. A new downlock actuator assembly is received with a preassembled length of 12.45 inches, and the three hydraulic ports in the same plane. Install actuator assembly, attaching it to fuselage structure and downlock hook arm assembly.

c. With landing gear free, hydraulic pressure off, and downlock system in position shown in figure 5-48, swing gear into "DOWN" position and adjust adjusting screw as follows:

NOTE

To relieve hydraulic pressure, pull hydraulic pump circuit breaker off, and move gear selector switch up and down two or three times.

1. If downlock locks, turn adjusting screw 1/4 turn OUT at a time until lock will not lock; then turn IN 1/4 turn and secure pin.

2. If downlock does not lock, turn adjusting screw 1/4 turn IN at a time until lock will lock, and secure pin.

d. Readjust downlock hook setscrew to stop hook assembly .06+.03, -.02 inch overcenter as shown in figure 5-48.

e. When checking overcenter measurement of downlock arm assembly, landing gear should be as shown in figure 5-48, with nut, washer and spacer removed, which retains downlock arm assembly. Use downlock overcenter gages (P/N SE960) to determine if downlock hook assembly is still within tolerance as shown on sheet 2 of figure 5-48. Use gages as follows:

NOTE

Gages (P/N SE960) are available from the Cessna Service Parts Center.

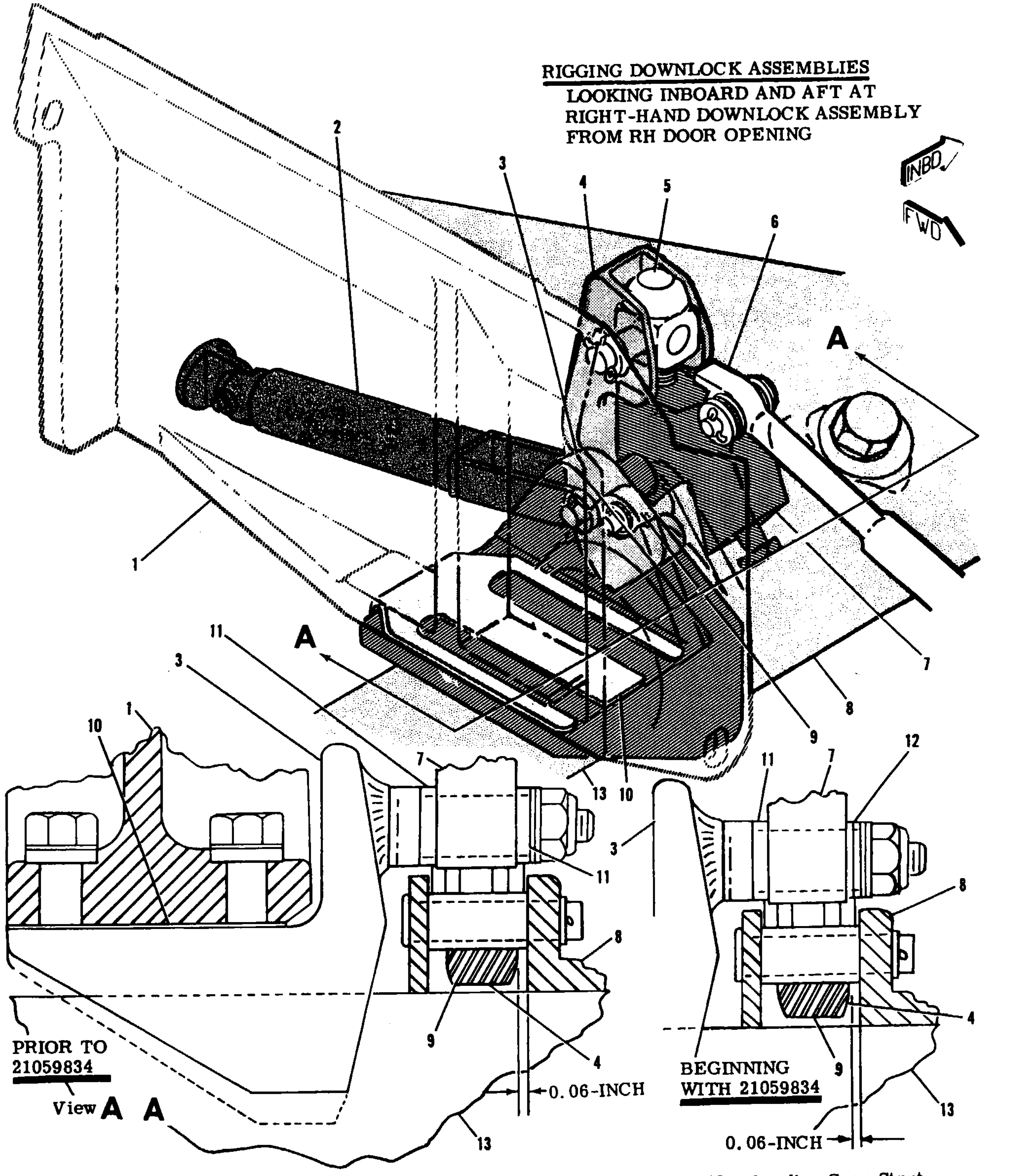
1. Remove nut, washer and spacer which retain arm assembly to support assembly.

2. Install 0.090 downlock gage (SE960) on inboard side of downlock hook as shown in figure 5-48. Upper portion of gage should rest against head of pin attaching adjusting screw. If downlock hook is under maximum overcenter tolerance, green area of gage will contact spacer on gear pivot, while red area will not make contact with 0.50-inch diameter shoulder, as shown in figure 5-48. When downlock hook is on maximum overcenter tolerance, both green and red areas will make contact. If red area makes contact and green area does not, the downlock hook setscrew should be adjusted INWARD to bring overcenter dimension to within tolerance.

3. Install 0.040 downlock gage (SE960) on inboard side of downlock hook as shown in figure 5-48. If downlock hook is over minimum overcenter tolerance, green area of gage will contact shoulder, while red area will not make contact with spacer. [illegible] minimum overcenter tolerance, both green and red areas will make contact.

5. If overcenter tolerance is less than 0.040 inch, the red area will make contact, while the green area will not. If this condition exists, the next step is to determine if the downlock hook adjusting screw is making contact with the setscrew. This is accomplished by lifting the landing gear spring upward off the hook assembly and checking for possible rotation of the hook assembly, by hand, with hydraulic pressure off.

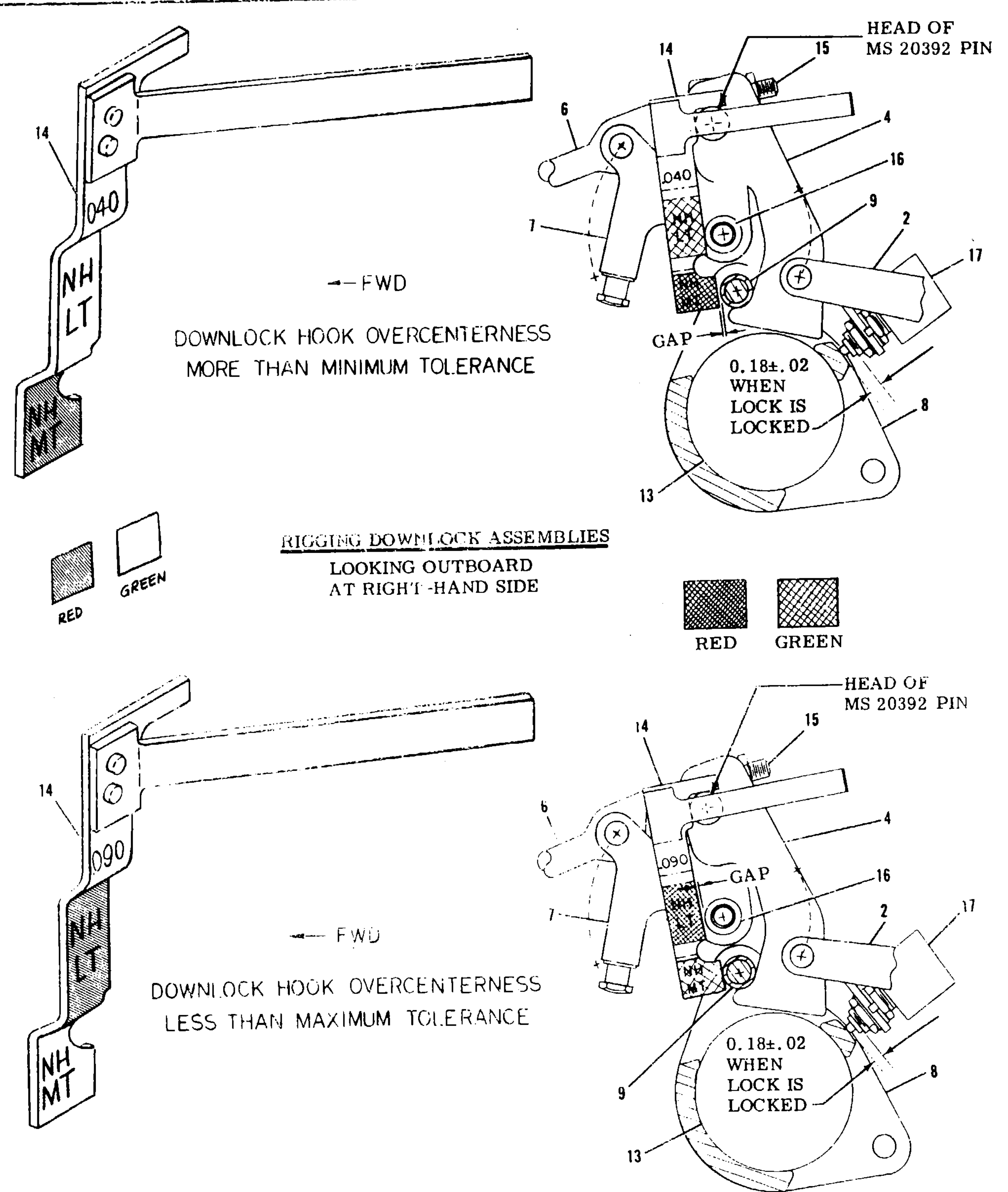
6. If a slight rotation is possible, setscrew is



1. Outboard Support	7. Arm Assembly
2. Spring Assembly	8. Pivot Assembly
3. Support Assembly	9. Spacer
4. Hook	10. Shim
5. Adjusting Screw	11. Spacer (1241614)
6. Downlock Actuator Rod	12. Spacer (NAS 43HT8-3)

13. Landing Gear Strut
14. Downlock Hook Overcenter Gage (SE960)
15. Hook Setscrew
16. Shoulder
17. Down Limit Switch

Figure 5-48. Main Landing Gear Uplock and Downlock Rigging (Sheet 1 of 4)

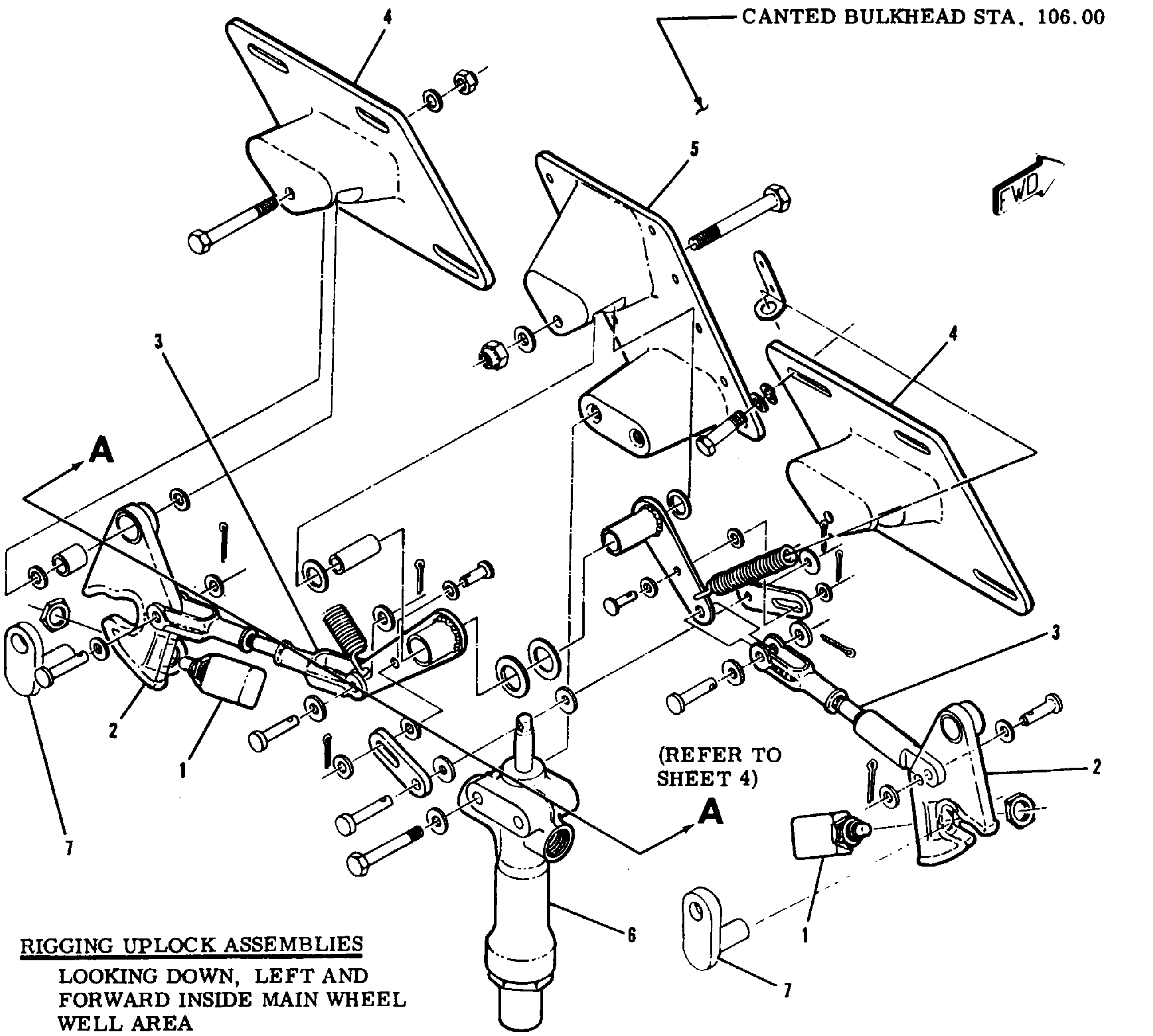


ABBREVIATIONS ON GAGES:

NHLT - NOT HITTING, LESS THAN DIMENSION STAMPED ON GAGE

NHMT - NOT HITTING, MORE THAN DIMENSION STAMPED ON GAGE

Figure 5-48. Main Landing Gear Uplock and Downlock Rigging (Sheet 2 of 4)



RIGGING UPLOCK ASSEMBLIES
LOOKING DOWN, LEFT AND FORWARD INSIDE MAIN WHEEL WELL AREA

1. Up Limit Switch
2. Lock Assembly
3. Push-Pull Rod
4. Uplock Support
5. Support
6. Actuator
7. Uplock Stud

WARNING

Before working in landing gear wheel wells, PULL-OFF hydraulic pump circuit breaker. Circuit breaker knob is at top center of console. The hydro-electric power pack system is designed to pressurize the landing gear "DOOR CLOSE" system to 1500 psi at any time the master switch is turned on. Injury may occur to someone working in wheel well area if master switch is turned on for any reason.

Figure 5-48. Main Landing Gear Uplock and Downlock Rigging (Sheet 3 of 4)

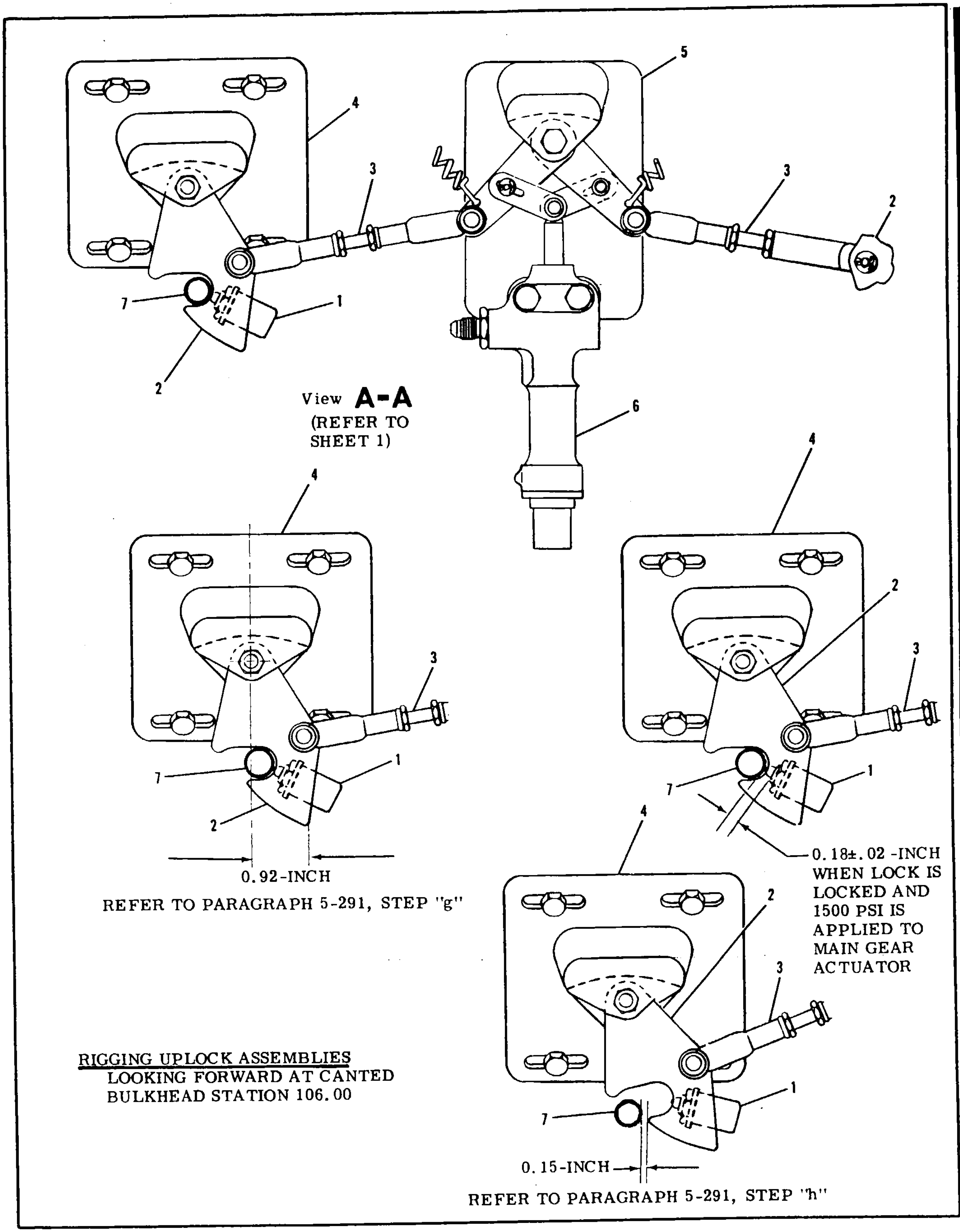


Figure 5-48. Main Landing Gear Uplock and Downlock Rigging (Sheet 4 of 4)

not contacting adjusting screw. If contact is not being made, downlock actuator will have to be readjusted by backing off actuator's rod end one-half turn at a time (one and one-half turn maximum adjustment) until hook assembly is 0.040 inch or more overcenter and contact is being made between setscrew and adjusting screw. If contact is being made, the setscrew should be adjusted outward to increase overcenterness within tolerance.

NOTE

For correct rigging, downlock hook setscrew must make contact with adjusting screw and green areas of both gages must contact as shown in figure 5-48 for overcenterness to be within tolerance.

f. Now that downlock hook adjusting screw has been adjusted, and downlock hook setscrew has been set to stop hook at .06+.03, -.02 overcenter, check downlock actuator rod end adjustment as follows:

1. Connect all hydraulic lines, fill system with MIL-H-5606 hydraulic fluid and purge system of air by using Hydro Test stand.

NOTE

Hydro Test stand to be connected to drain elbow on right-hand forward side of pedestal in aircraft, and vent line port on power pack.

2. Pull hydraulic pump circuit breaker off.

NOTE

After system has been purged of air with Hydro Test stand, system may be run with Hydro Test stand disconnected.

3. With gear in the down and locked position, move the gear selector handle to the "GEAR UP" position and note the actuation of main gear downlock hooks.
4. As soon as left downlock hook is actuated to unlock left gear, move gear selector handle back to "GEAR DOWN" position to simulate what would occur if the pilot were to select gear down before the gear was fully retracted.
5. If downlock hooks do not lock the gear in the down position, check downlock system for misalignment.

g. With main gear in up-locked position, and system pressure released, adjust uplock supports such that ends of lock hooks are 0.92 inch inboard of lock hook attach bolt. (Refer to figure 5-48.)
h. Adjust uplock system push-pull rods such that when uplock latches are disengaged, both main gear struts are released simultaneously and uplock studs clear latches 0.15 inch minimum.

5-292. RIGGING OF NOSE GEAR. Refer to paragraph 5-209 for nose gear rigging procedures.

5-292A. RIGGING RETRACTABLE STEP CABLE ASSEMBLY. (Refer to figure 5-48A.)

NOTE

Refer to WARNING preceding paragraph 5-215.

a. Rig nose gear in accordance with procedures outlined in paragraph 5-209.
b. Rig nose gear doors in accordance with procedures outlined in paragraph 5-210.
c. Rig nose gear limit switches and nose gear squat switch as outlined in paragraphs 5-211 and 5-212 respectively.
d. While aircraft is still on jacks, extend landing gear and disconnect strut door tie rods. DO NOT DISTURB ROD ADJUSTMENT.
e. Attach retractable step assembly cable turnbuckle to spring clip at hook assembly on forward end of nose gear actuator, if not previously attached.
f. Retract landing gear to up and locked position.
g. Adjust retractable step assembly cable turnbuckle to hold cabin step in its best faired condition; safety wire turnbuckle.
h. Extend landing gear and attach tie rods to strut doors.

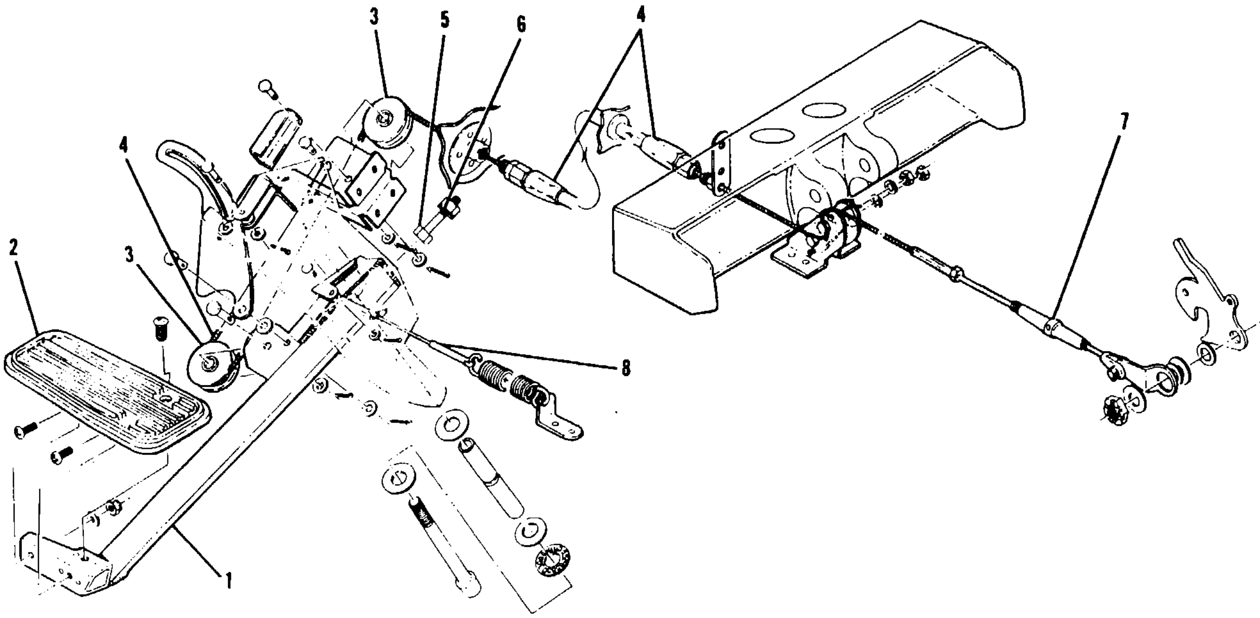
NOTE

Install right-hand tie rod on outboard side of eyebolt only, when connecting nose gear strut doors. Left-hand tie rod should be installed in normal manner.

i. Remove aircraft from jacks.
j. Washers may be added or deleted from stop bolt (19) to adjust travel of step attach assembly (1). No specific measurement is required; only to facilitate entry and exit from aircraft.

5-293. HYDRAULIC AND ELECTRICAL SYSTEM SCHEMATICS. (Refer to figure 5-49.) The following seven pages contain coded schematic diagrams of the aircraft hydraulic system. A complete gear-down cycle is illustrated, from selecting the gear down position to the condition where the gear is down and locked and the master switch is OFF. Incorporated into the hydraulic system schematic is the electrical wiring diagram which shows switch positions, lights, solenoids and other components of the system, and their condition during the gear down cycle.

SHOP NOTES:



NOTE

Rig step in accordance with procedures outlined in paragraph 5-292A. For removal and installation procedures, refer to Section 3.

Washers (6) may be added or deleted from stop bolt (5) to adjust travel of step attach assembly (1). No specific measurement is required; only to facilitate entry and exit from aircraft.

Refer to Section 2 for lubrication.

When rigging procedures are complete, safety wire turnbuckle(7).

1. Step Attach Assembly
2. Step Assembly
3. Pulley
4. Cable Assembly
5. Stop Bolt
6. Washers
7. Turnbuckle
8. Cable Assembly

Figure 5-48A. Rigging Retractable Step

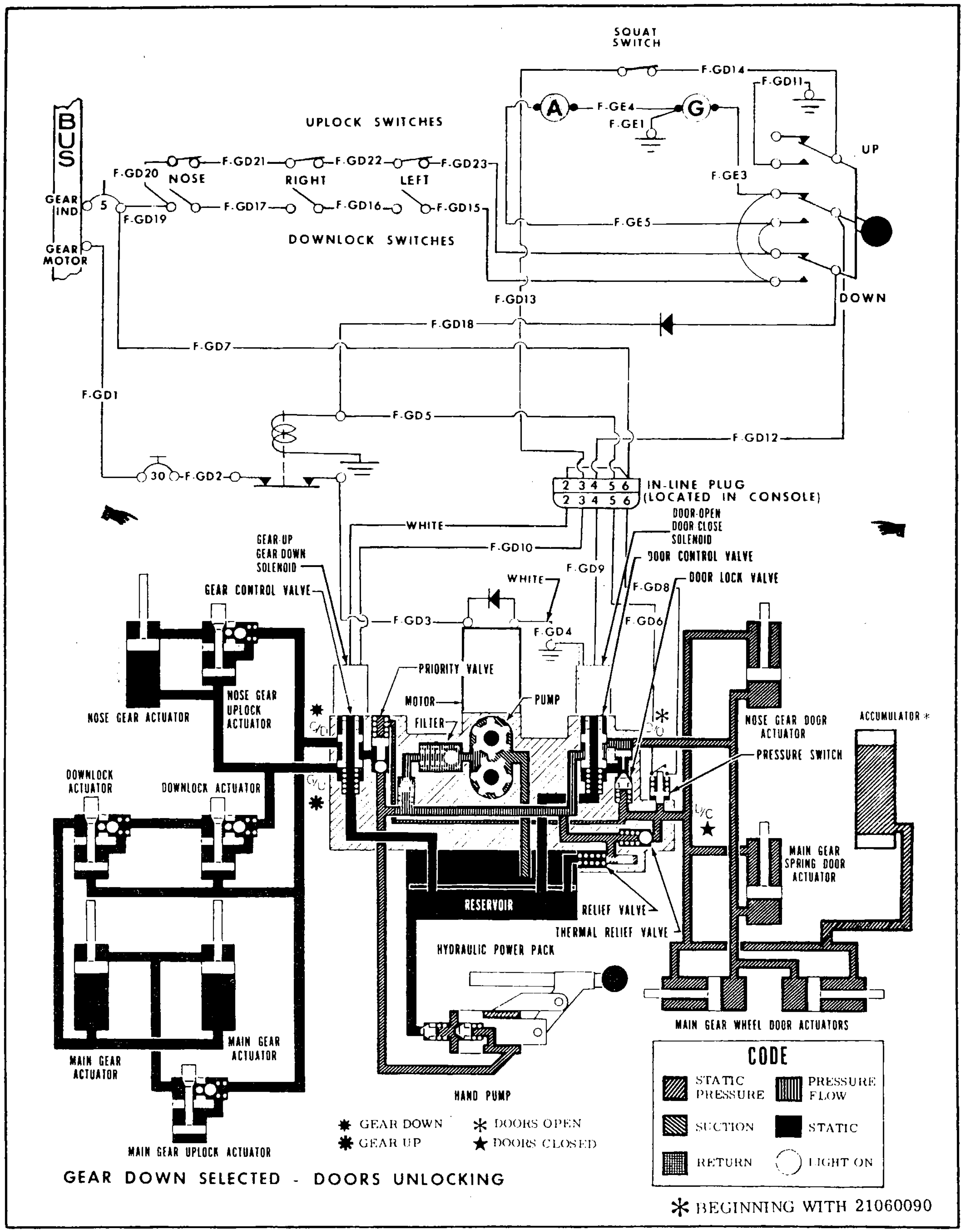


Figure 5-49. Hydraulic and Electric System Schematic (Sheet 1 of 7)

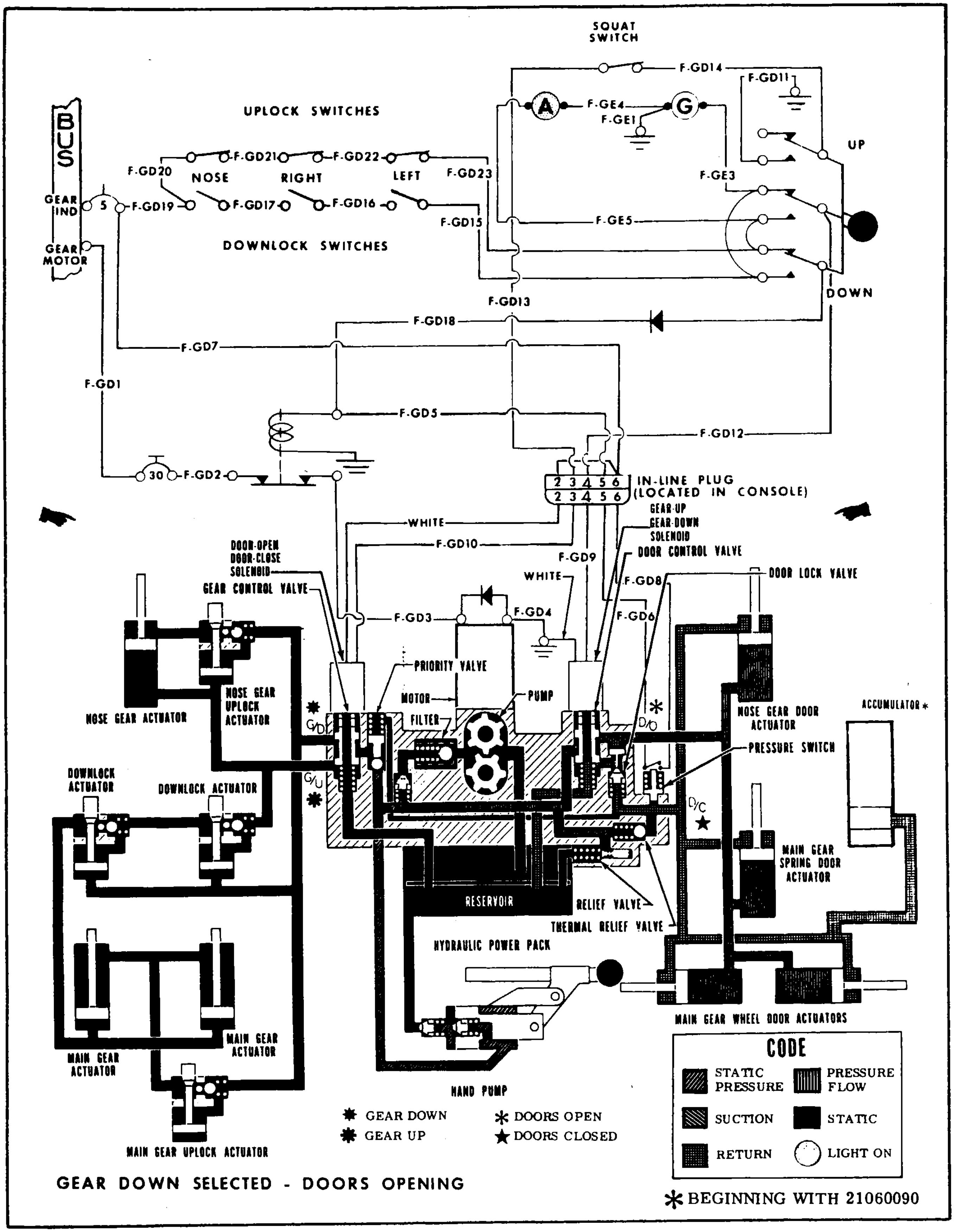


Figure 5-49. Hydraulic and Electric System Schematic (Sheet 2 of 7)

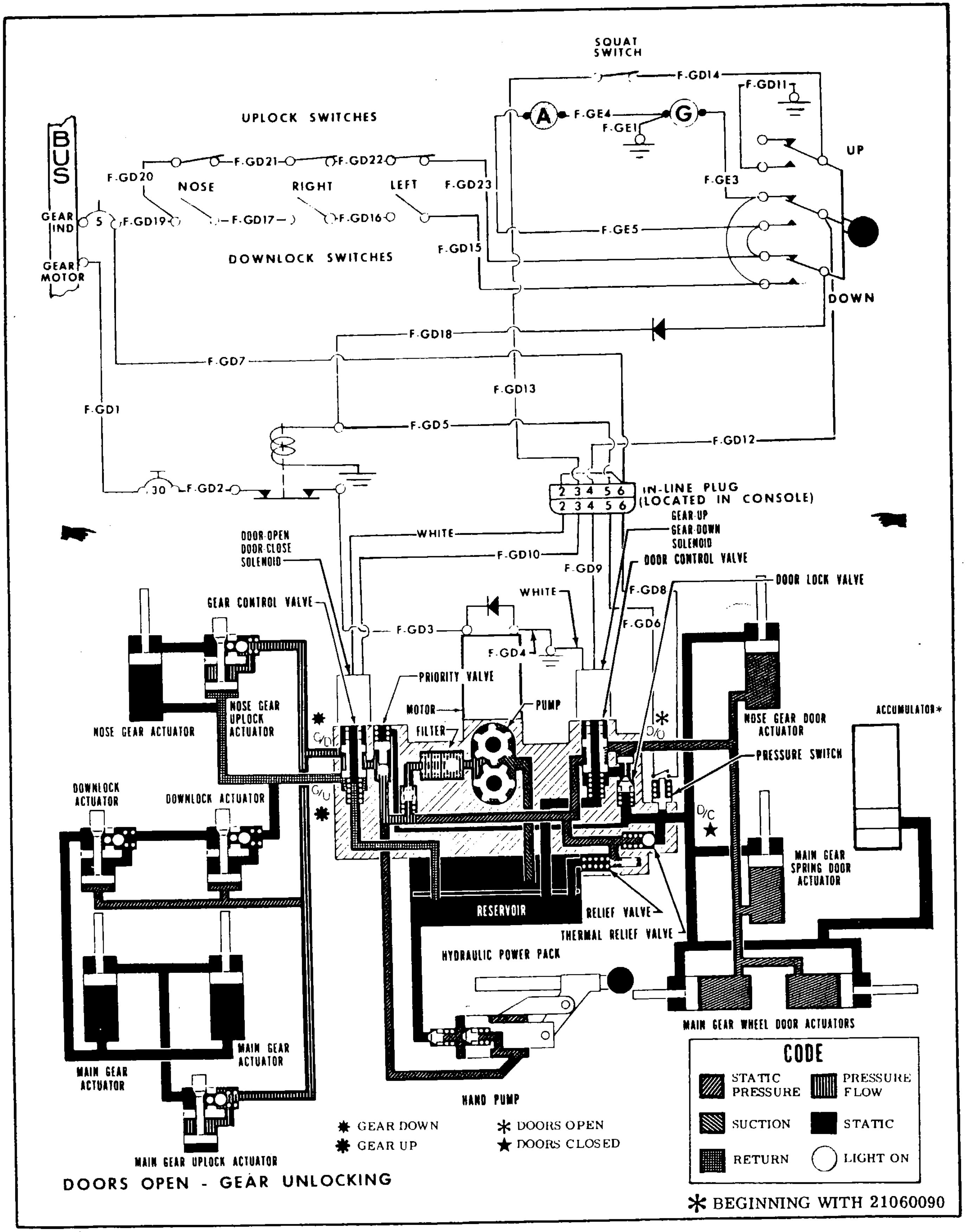


Figure 5-49. Hydraulic and Electric System Schematic (Sheet 3 of 7)

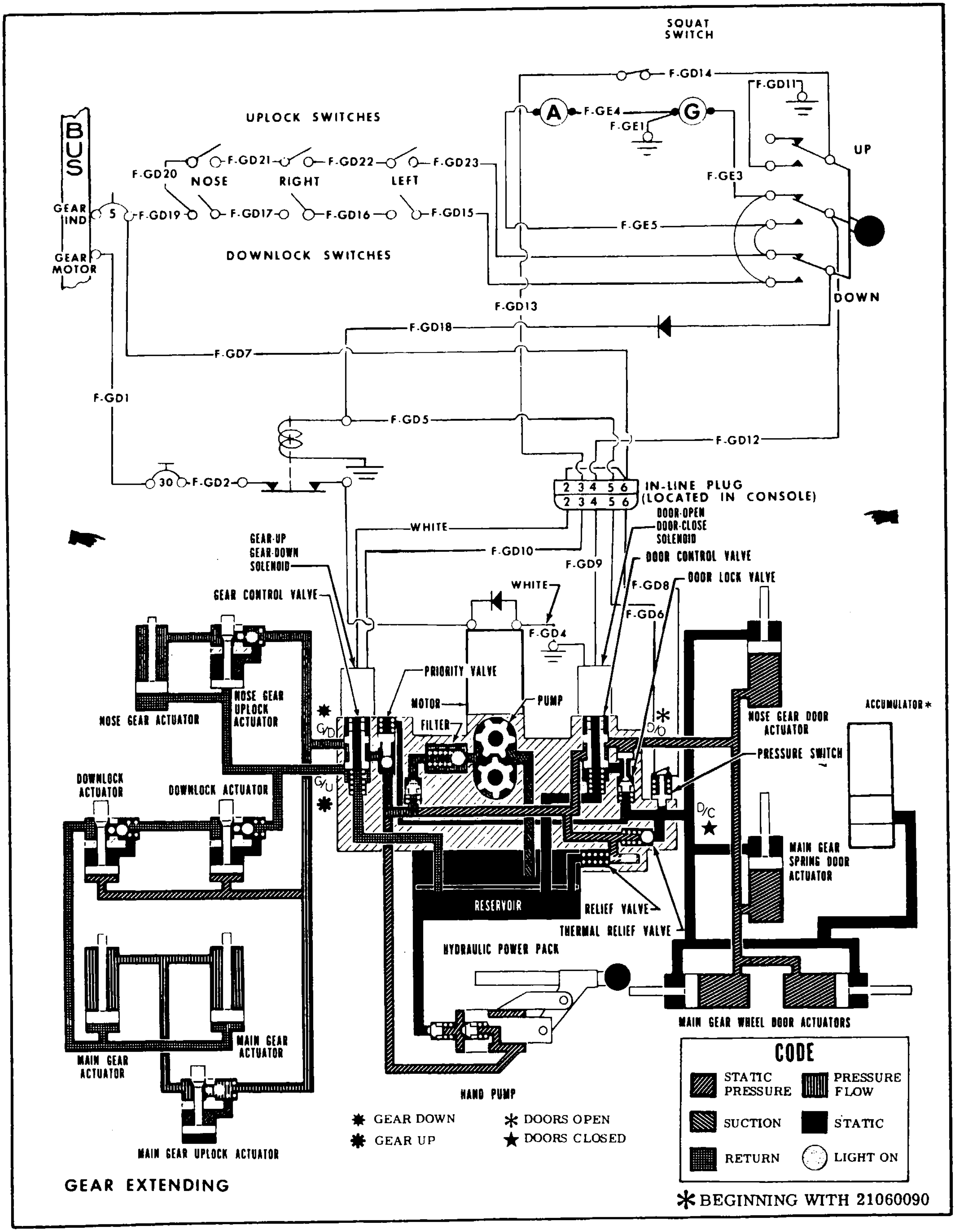


Figure 5-49. Hydraulic and Electric System Schematic (Sheet 4 of 7)

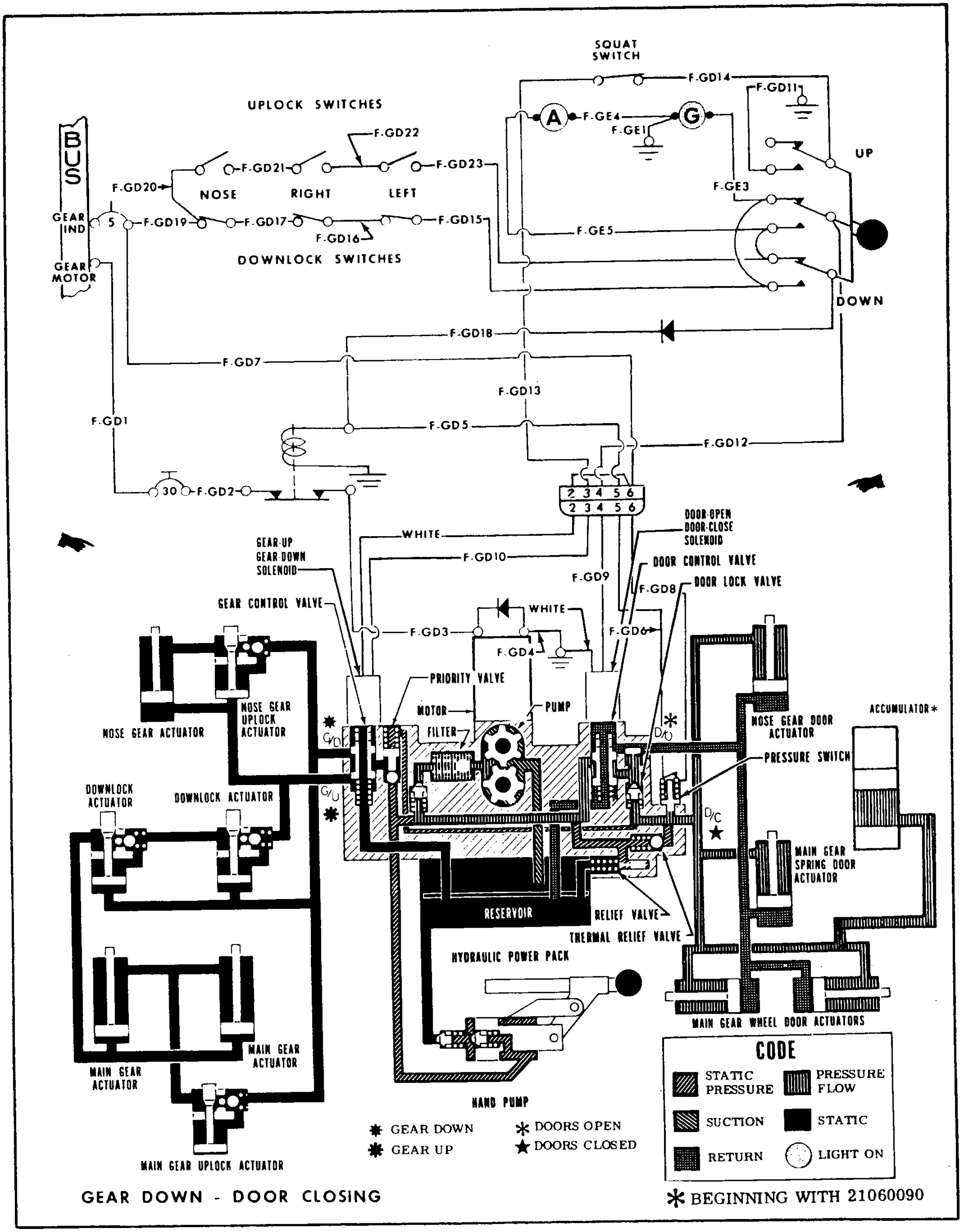


Figure 5-49. Hydraulic and Electric System Schematic (Sheet 5 of 7)

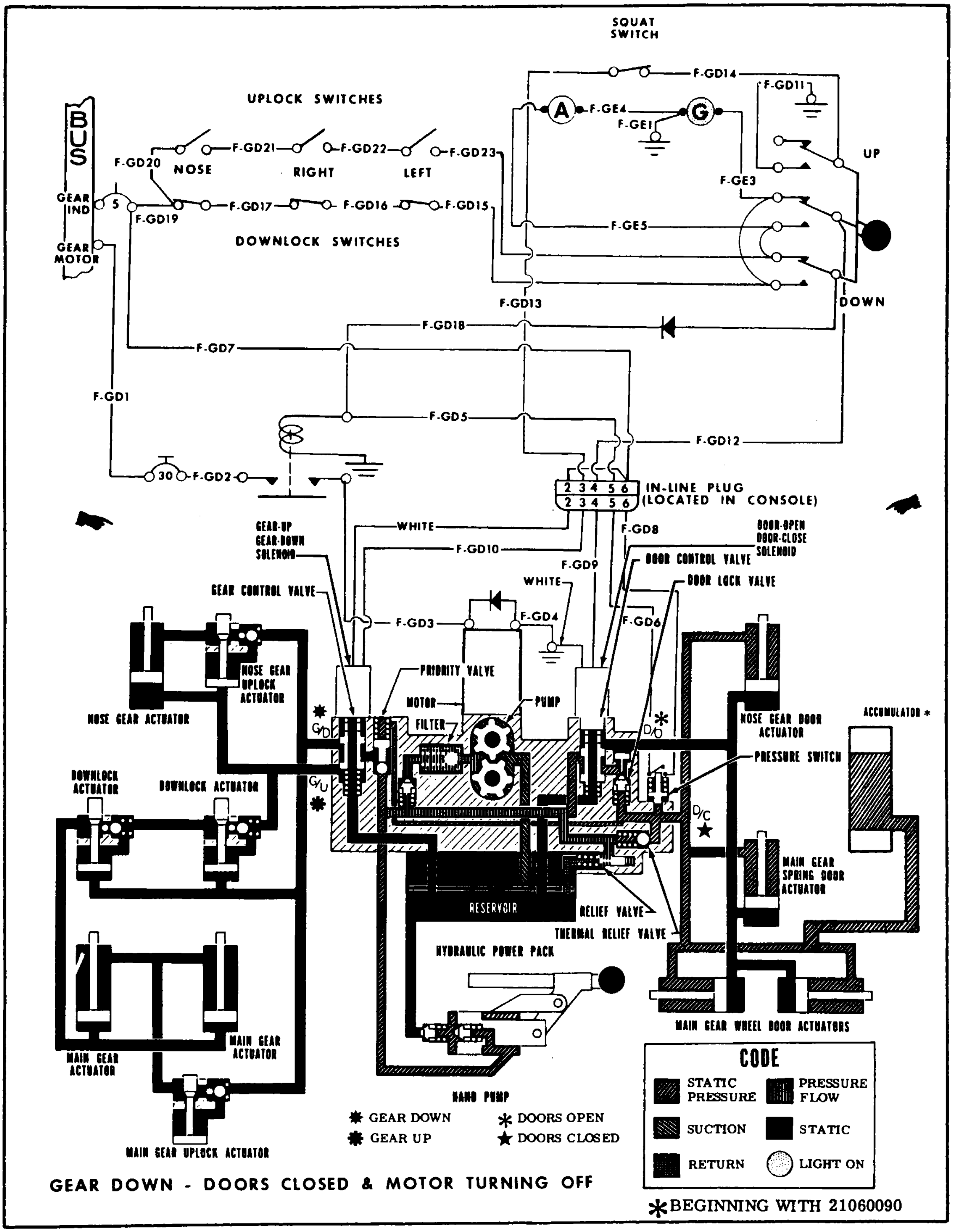


Figure 5-49. Hydraulic and Electric System Schematic (Sheet 6 of 7)

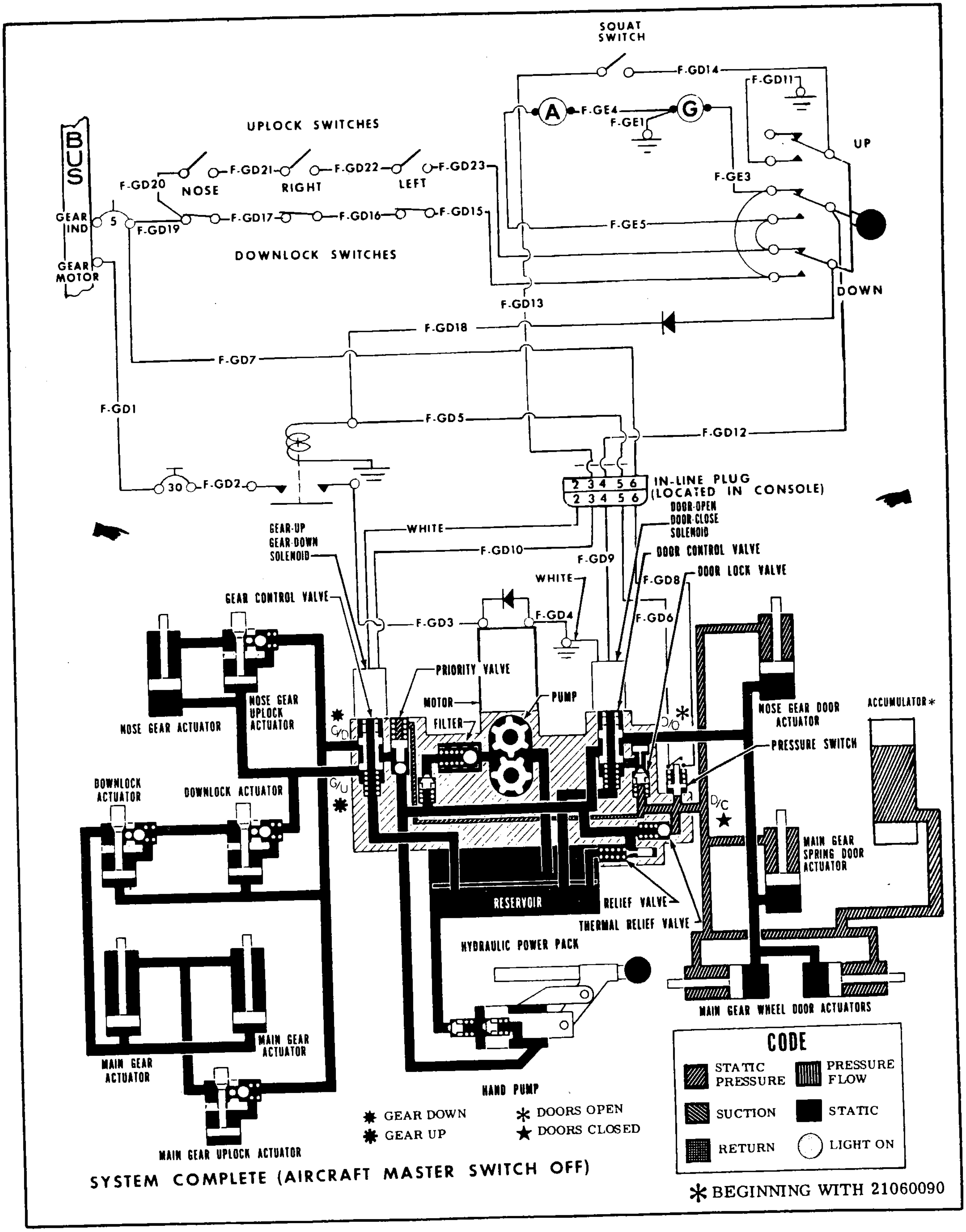


Figure 5-49. Hydraulic and Electric System Schematic (Sheet 7 of 7)

SECTION 6

AILERON CONTROL SYSTEM

TABLE OF CONTENTS

6-1. AILERON CONTROL SYSTEM. (Refer to figure 6-1.)

6-2. DESCRIPTION. The aileron control system is comprised of push-pull rods, bellcranks, cables, pulleys, quadrants and components forward of the instrument panel, all of which, link the control wheels to the ailerons.

6-3. TROUBLE SHOOTING.

NOTE

Due to remedy procedures in the following trouble shooting chart it may be necessary to re-rig system, refer to paragraph 6-21.

TROUBLE	PROBABLE CAUSE	REMEDY
LOST MOTION IN CONTROL WHEEL.	Loose control cables.	Check cable tension. Adjust cables to proper tension.
	Broken pulley or bracket, cable off pulley or worn rod end bearings.	Check visually. Replace worn or broken parts, install cables correctly.
RESISTANCE TO CONTROL WHEEL MOVEMENT.	Cables too tight.	Check cable tension. Adjust cables to proper tension.
	Pulleys binding or cable off.	Observe motion of the pulleys. Check cables visually. Replace defective pulleys. Install cables correctly.
	Bellcrank distorted or damaged.	Check visually. Replace defective bellcrank.
	Defective quadrant assembly.	Check visually. Replace defective quadrant.
	Clevis bolts in system too tight.	Check connections where used. Loosen, then tighten properly and safety.

6-3. TROUBLE SHOOTING (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
CONTROL WHEELS NOT LEVEL WITH AILERONS NEUTRAL.	Improper adjustment of cables.	Refer to paragraph 6-21.
	Improper adjustment of aileron push-pull rods.	Adjust push-pull rods to obtain proper alignment.
DUAL CONTROL WHEELS NOT COORDINATED.	Cables improperly adjusted.	Refer to paragraph 6-21.
INCORRECT AILERON TRAVEL.	Push-pull rods not adjusted properly.	Refer to paragraph 6-21.
	Incorrect adjustment of travel stop bolts.	Refer to paragraph 6-21.

6-4. CONTROL COLUMN. (Refer to figure 6-2.)

6-5. DESCRIPTION. Rotation of the control wheel rotates four bearing roller assemblies (15) on the end of the control wheel tube (14), which in turn, rotates a square control tube assembly (20) inside and extending from the control wheel tube (14). Attached to this square tube (20) is a quadrant (29) which operates the aileron system. This same arrangement is provided for both control wheels. Synchronization of the control wheels is obtained by the interconnect cable (32), turnbuckle (33) and adjustable terminals (28). The forward end of the square control tube (20) is mounted in a bearing block (31) on firewall (34) and does not move fore-and-aft, but rotates with the control wheel. The four bearing roller assemblies (15) on the end of the control wheel tube reduce friction as the control wheel is moved fore-and-aft for elevator system operation. A sleeve weld assembly (11), containing bearings which permit the control wheel tube to rotate within it, is secured to the control wheel tube by a sleeve and retaining ring in such a manner it moves fore-and-aft with the control wheel tube. This movement allows the push-pull tube (22) attached to the sleeve weld assembly (11) to operate an elevator arm assembly (23), to which one elevator cable (24) is attached. A torque tube (37) connects this arm assembly (23) to the one on the opposite end of the torque tube (37), to which the other elevator cable is attached. When dual controls are installed, the copilot's control wheel is linked to the aileron and elevator control systems in the same manner as the pilot's control wheel.

6-6. REMOVAL AND INSTALLATION.

a. THRU AIRCRAFT SERIAL 21059502. (Refer to figure 6-2, sheet 1.) Remove screws attaching control wheel (1) to control wheel tube assembly (14) and remove wheel. Disconnect electrical wiring to map light and mike switch, if installed.

b. BEGINNING WITH AIRCRAFT SERIAL 210-59503. (Refer to figure 6-2, sheet 2.) Slide cover (2) toward instrument panel to expose adapter (3). Remove screws securing adapter (3) to control wheel tube assembly (1) and remove control wheel assembly. Disconnect electrical wiring to map light, mike switch and electric trim switch at connector (18), if installed. Slide cover (2) off control wheel tube assembly (1).

c. (Refer to figure 6-2, sheet 1.) Remove decorative cover from instrument panel.

d. Remove screw securing adjustable glide plug (18) to control tube assembly (20) and remove plug (18) and glide (19).

e. Disconnect push-pull tube (22) at sleeve weld assembly (11).

f. Remove screws securing cover plate (5) at instrument panel.

g. Using care, pull control wheel tube assembly (14) aft and work assembly out through instrument panel.

NOTE

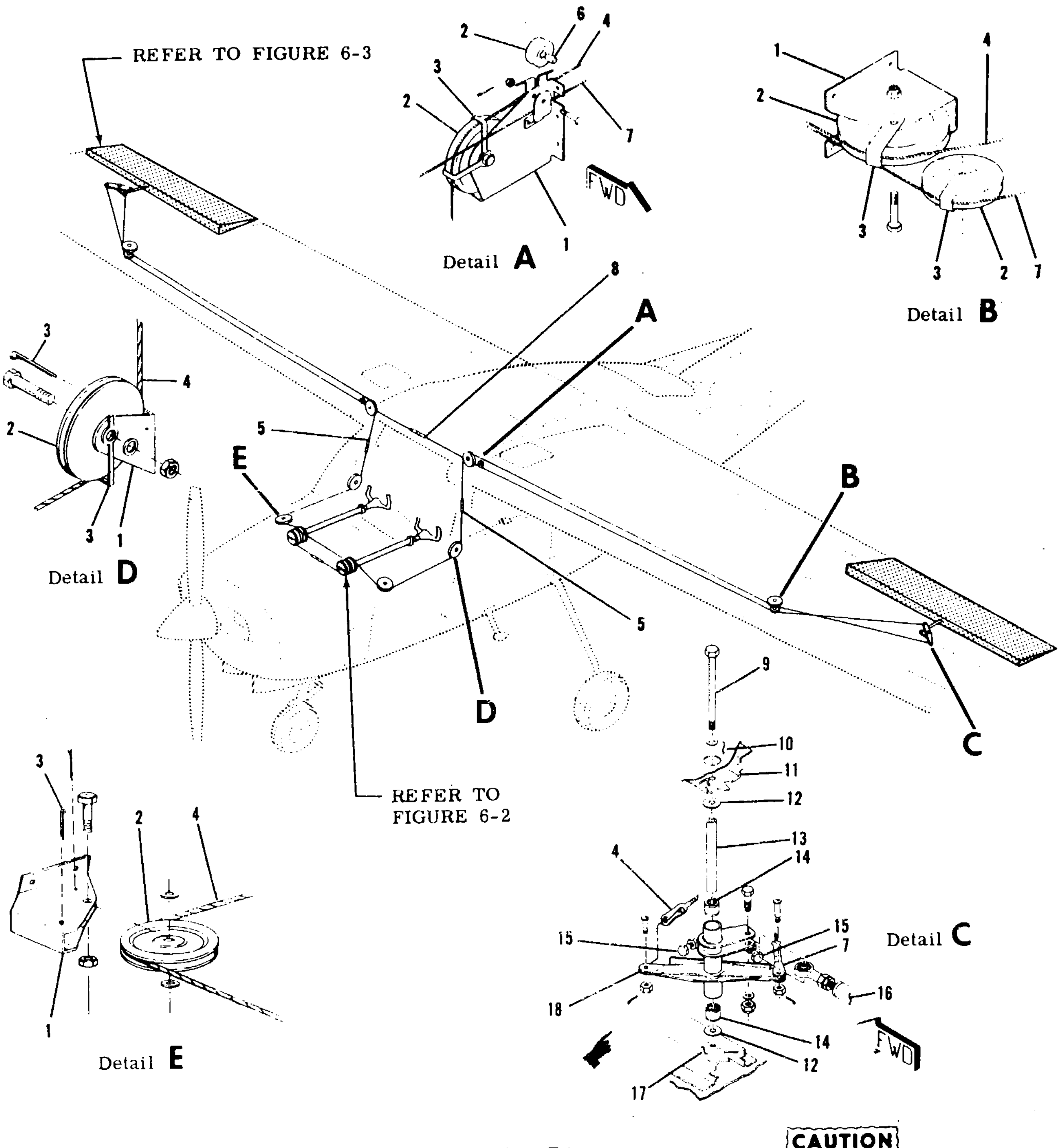
To ease removal of control wheel tube assembly (14), snap rings (7) may be removed from their locking grooves to allow sleeve weld assembly (11) additional movement.

- If removal of control tube assembly (20) or quadrant (29) is necessary, proceed to step "h."

h. Remove safety wire and relieve direct cable tension at turnbuckles (index 5, figure 6-1).

i. Remove safety wire, relieve interconnect cable tension at turnbuckle (33) and remove cables from quadrant (29).

j. Remove safety wire and remove roll pin (25) through quadrant (29) and control tube assembly (20).



1. Bracket
2. Pulley
3. Cable Guard
4. Cable (Direct)
5. Turnbuckle (Direct Cable)
6. Bushing
7. Cable (Carry-Thru)
8. Turnbuckle (carry-Thru Cable)
9. Pivot Bolt
10. Upper Wing Skin
11. Upper Support
12. Brass Washer
13. Bushing
14. Needle Bearing
15. Travel Stop Bolt
16. Push-Pull Rod
17. Lower Support
18. Bellcrank

CAUTION

MAINTAIN PROPER CONTROL CABLE TENSION.

CABLE TENSION:
40 LBS ± 10 LBS ON AILERON CARRY-THRU CABLE (AT AVERAGE TEMPERATURE FOR THE AREA.)
REFER TO FIGURE 1-1 FOR TRAVEL.

Figure 6-1. Aileron Control System

NOTE

Washers (39) are of various thicknesses and are used to obtain a clearance between rollers (15) and control tube assembly (20) of 0.002 " maximum on any one side or 0.004 " maximum total between any two rollers on opposite sides.

Allow 0.030 " maximum clearance between bearing block (31) and nut (30) after tightening.

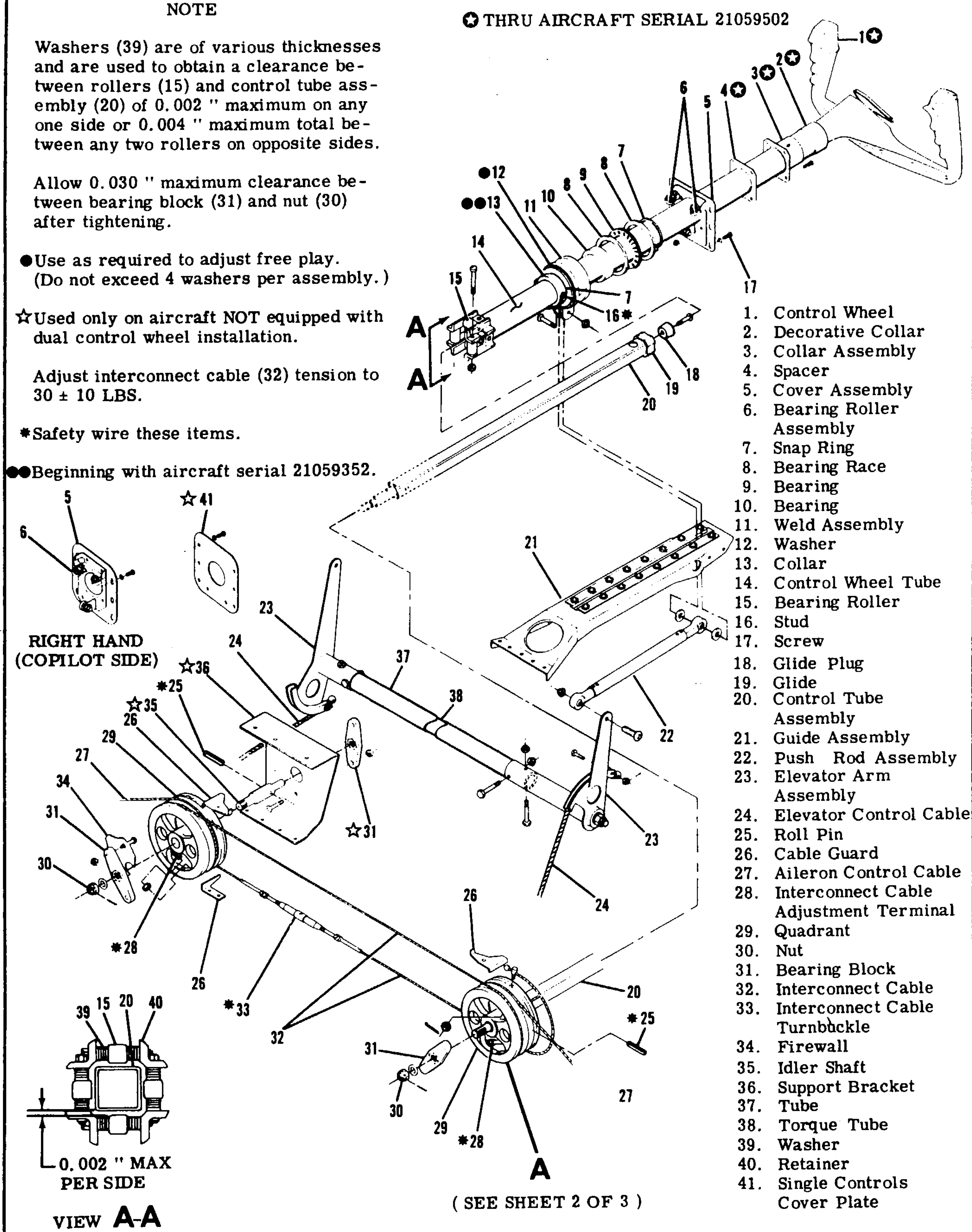
●Use as required to adjust free play. (Do not exceed 4 washers per assembly.)

☆Used only on aircraft NOT equipped with dual control wheel installation.

Adjust interconnect cable (32) tension to 30 ± 10 LBS.

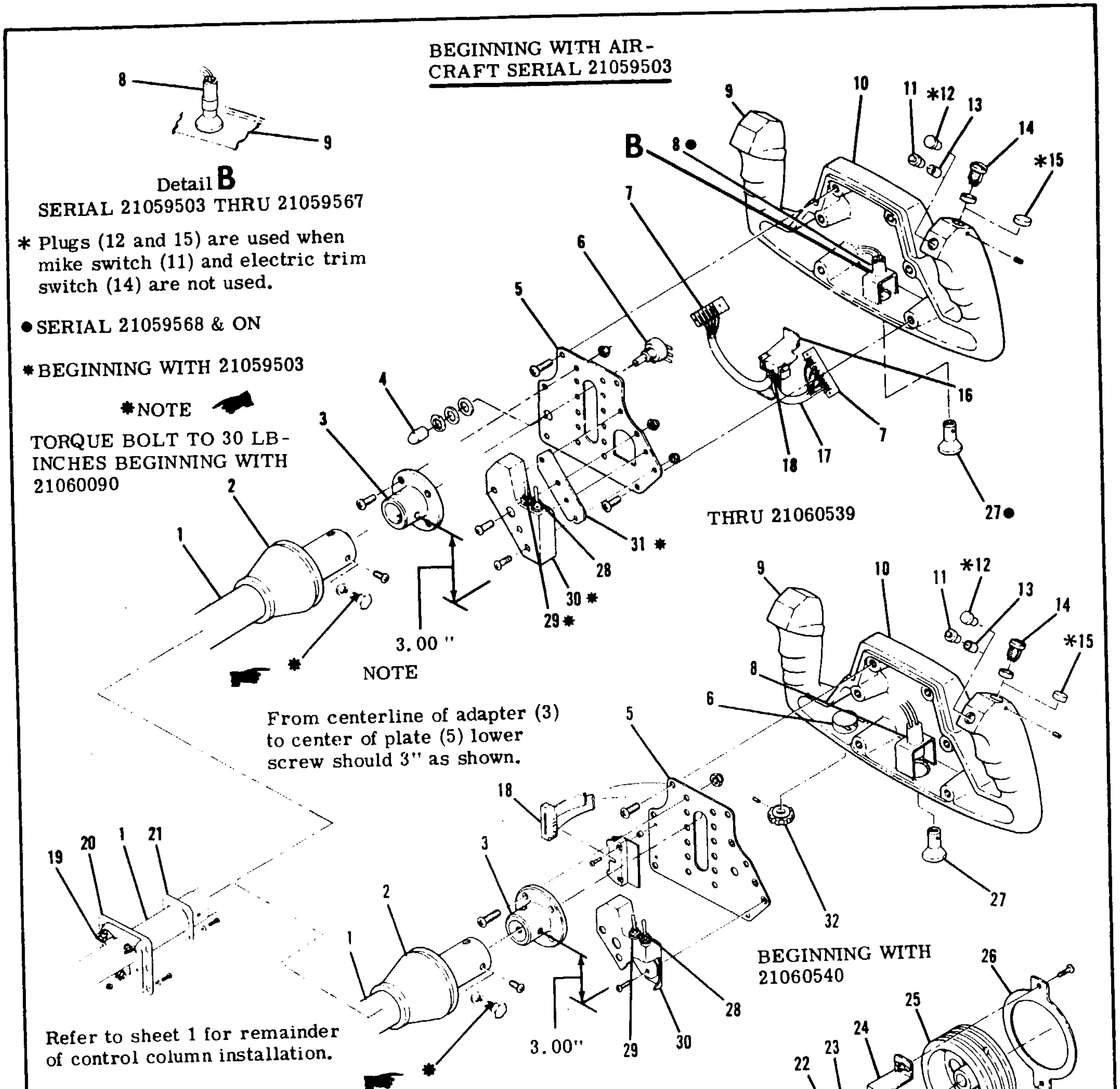
*Safety wire these items.

●●Beginning with aircraft serial 21059352.



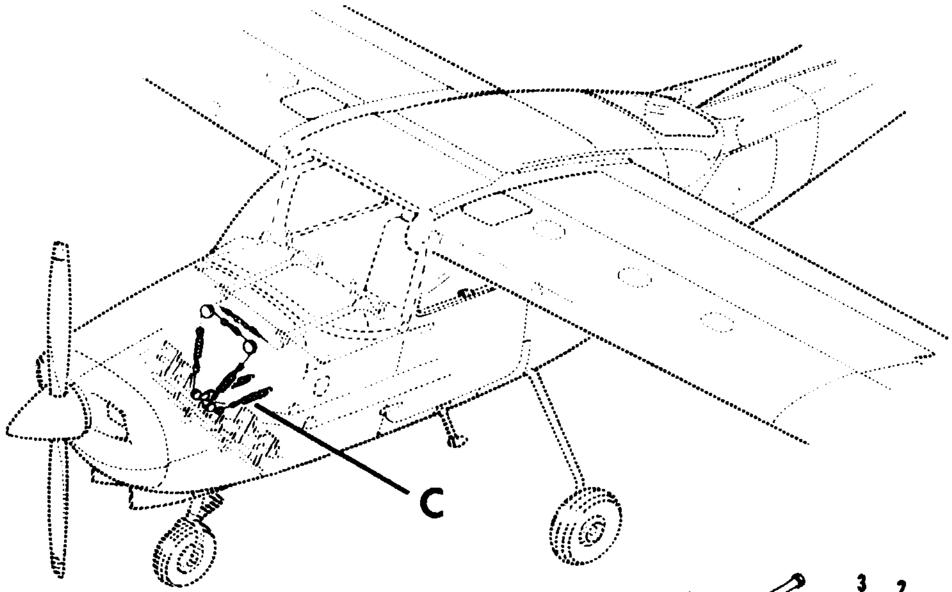
1. Control Wheel
2. Decorative Collar
3. Collar Assembly
4. Spacer
5. Cover Assembly
6. Bearing Roller Assembly
7. Snap Ring
8. Bearing Race
9. Bearing
10. Bearing
11. Weld Assembly
12. Washer
13. Collar
14. Control Wheel Tube
15. Bearing Roller
16. Stud
17. Screw
18. Glide Plug
19. Glide
20. Control Tube Assembly
21. Guide Assembly
22. Push Rod Assembly
23. Elevator Arm Assembly
24. Elevator Control Cable
25. Roll Pin
26. Cable Guard
27. Aileron Control Cable
28. Interconnect Cable Adjustment Terminal
29. Quadrant
30. Nut
31. Bearing Block
32. Interconnect Cable
33. Interconnect Cable Turnbuckle
34. Firewall
35. Idler Shaft
36. Support Bracket
37. Tube
38. Torque Tube
39. Washer
40. Retainer
41. Single Controls Cover Plate

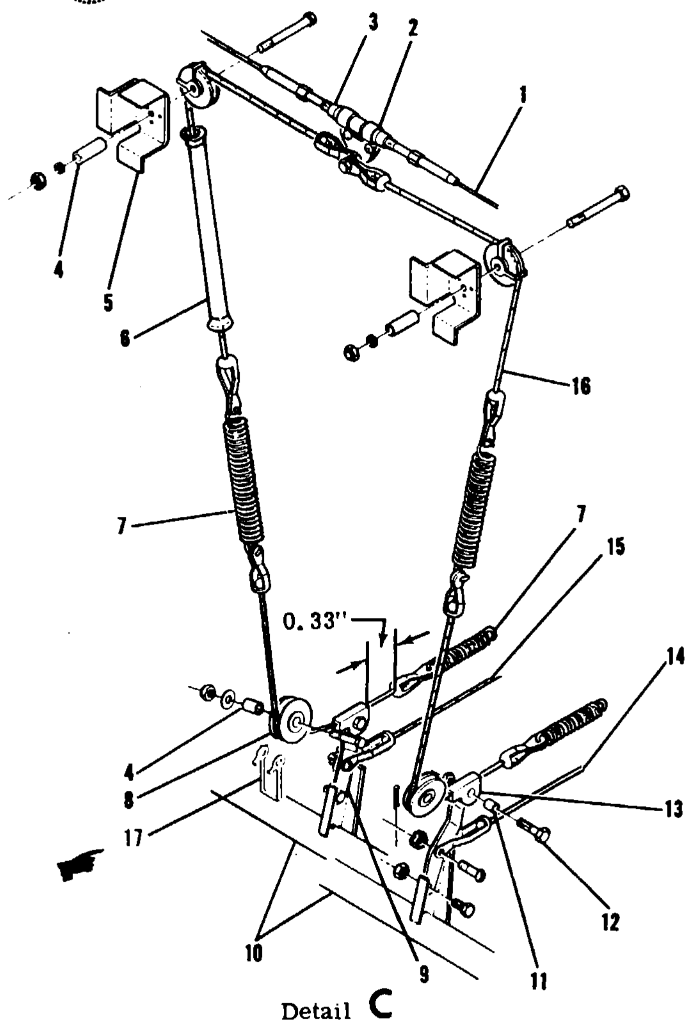
Figure 6-2. Control Column Installation (Sheet 1 of 3)



1. Control Wheel Tube Assembly
2. Cover
3. Adapter
4. Rubber Cover
5. Plate
6. Map Light Rheostat
7. Terminal Block
8. Map Light Assembly
9. Control Wheel
10. Pad
11. Mike Switch
12. Plug
13. Insulator
14. Electric Trim Switch
15. Plug
16. Bracket
17. Cable
18. Connector
19. Bearing Assembly
20. Cover Plate
21. Collar
22. Bearing Block
23. Firewall
24. Guard Assembly
25. Quadrant
26. Cover Strap
27. Lamp
28. Disengage Switch-Electric Trim
29. Disengage Switch-Autopilot
30. Switch Housing
31. Switch Housing Support
32. Knob

Figure 6-2. Control Column Installation (Sheet 2 of 3)





1. Cable (Aileron Interconnect)
2. Clamp
3. Turnbuckle
4. Spacer
5. Bracket
6. Tube
7. Spring
8. Pulley
9. Strap
10. Rudder Bar
11. Bushing
12. Bolt
13. Fitting
14. Cable (Left Rudder)
15. Cable (Right Rudder)
16. Cable (Rudder Interconnect)
17. Cable Guard

NOTE

The aileron-rudder interconnect cables do not require adjustment. The cable slack is removed by the springs aft of the rudder bar attachment.

The 0. 33 " dimension shown applies only with the aileron and rudder controls in the neutral position.

Fitting (13) must be free to rotate with bolt (12) tightened.

Figure 6-2. Control Column Installation (Sheet 3 of 3)

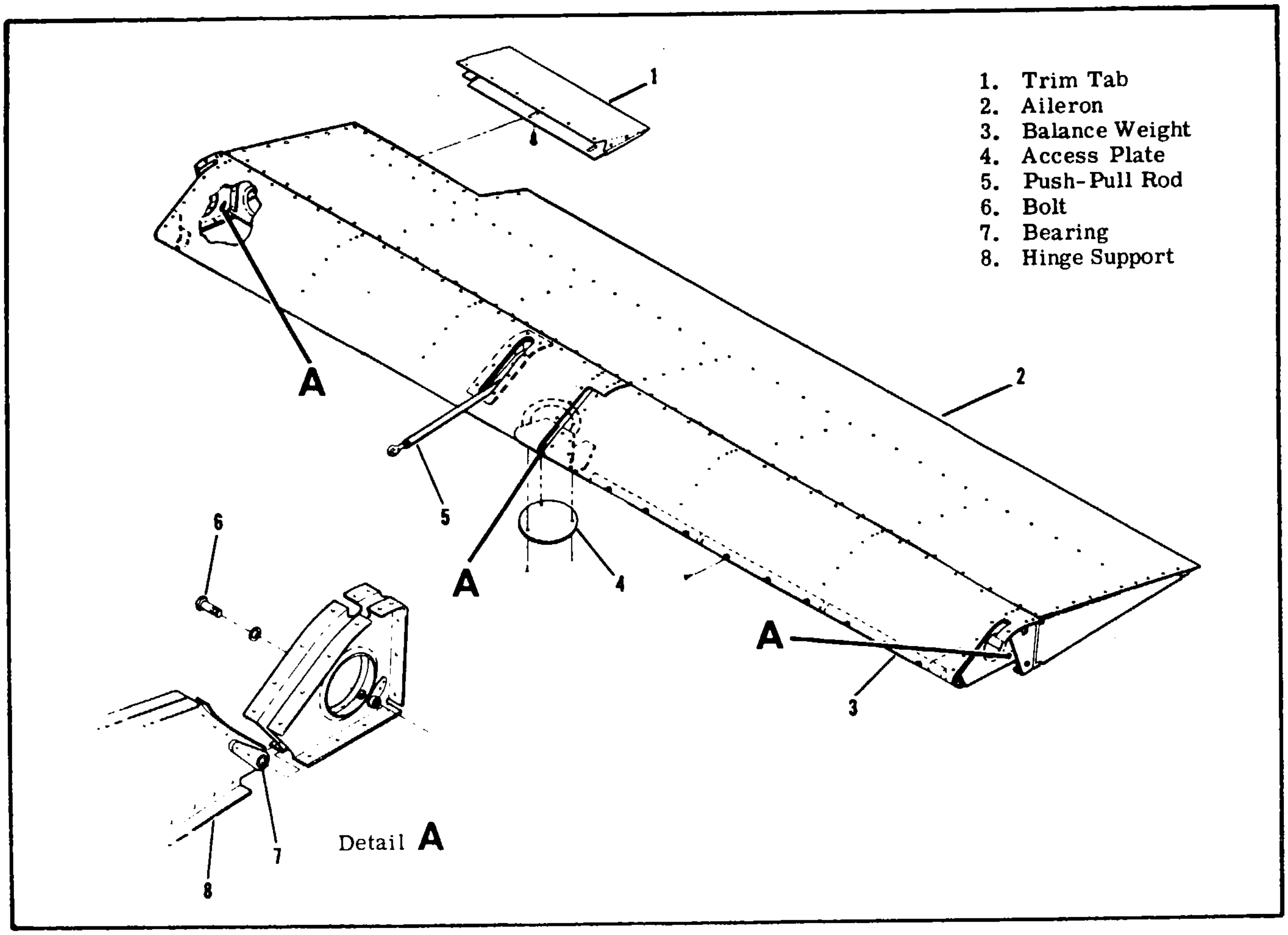


Figure 6-3. Aileron Installation

k. Remove pin, nut (30) and washer from control tube assembly (20) protruding through bearing block (31) on forward side of firewall (34).

l. Using care, pull control tube assembly (20) aft and remove quadrant (29).

m. Reverse the preceding steps for reinstallation. Rig aileron, interconnect and elevator control systems in accordance with paragraphs 6-21 and 8-14 respectively. Safety turnbuckles and all other items previously safetied. Tighten nut (30) securing control tube assembly (20) to firewall snugly, then loosen nut to 0.030" maximum clearance between nut and bearing block, align cotter pin hole and install pin.

6-7. REPAIR. Worn, damaged or defective shafts, bearings, quadrants, cables or other components should be replaced. Refer to Section 2 for lubrication requirements.

6-8. BEARING ROLLER ADJUSTMENT. (Refer to figure 6-2.) Each bearing assembly (6) has an 0.062" eccentric adjustment when installed, for aligning the control tube weld assembly and push-pull tube (22) with the guide assembly (21). For alignment, proceed as follows:

a. Remove control wheel assembly in accordance with paragraph 6-6.

b. Install cover plate (5) backwards (bearings on aft side) and leave loose with instrument panel.

c. Align control wheel tube assembly (14) for free travel of push-pull tube (22) along full length of guide assembly (21).

d. Center cover plate (5) over tube and bearing assembly and secure plate to instrument panel.

e. Adjust each bearing (6) to control wheel tube assembly and tighten bearings in place.

f. Remove cover plate and reinstall with bearings facing forward.

6-9. AILERON BELLCRANK. (Refer to figure 6-1.)

6-10. REMOVAL.

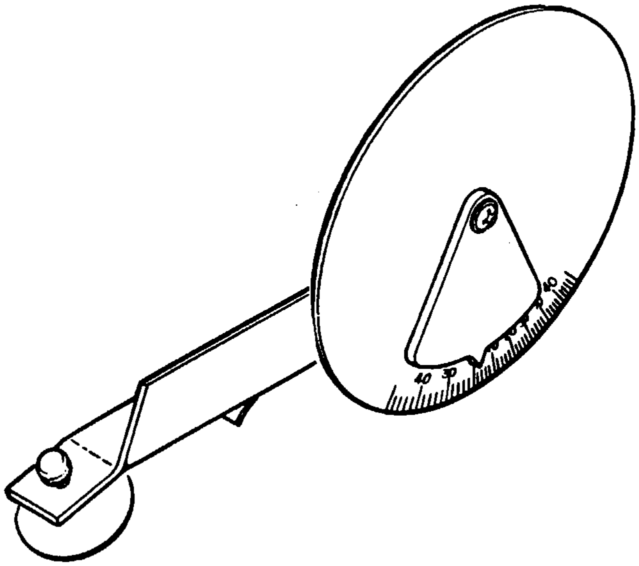
a. Remove access plate inboard of each bellcrank (18) on underside of wing.

b. Remove safety wire and relieve cable tension at turnbuckles (5).

c. Disconnect control cables from bellcrank (18).

d. Disconnect push-pull tube (16) at bellcrank (18).

e. Remove bolts (9) securing bellcrank to wing structure.



AVAILABLE FROM CESSNA SERVICE PARTS CENTER (TOOL NO. SE 716)

Figure 6-4. Inclinometer for Measuring Control Surface Travel

f. Remove bellcrank through access opening, using care that bushing (13) is not dropped from bellcrank.

NOTE

Brass washers (12) may be used as shims between each end of bellcrank and supports (11 and 17). Retain these shims. Tape open ends of bellcrank to prevent dust and dirt from entering bellcrank needle bearings (14).

6-11. INSTALLATION.

a. Connect control cables (4 and 7) to bellcrank (18) prior to installing bellcrank.
b. Place bushing (13) in bellcrank and position bellcrank in wing.
c. Install brass washers (12) as required between upper and lower end of bellcrank and wing supports to shim out excess clearance.
d. Install bellcrank pivot bolt (9).
e. Connect push-pull rod (16) to bellcrank.
f. Re-rig aileron system in accordance with paragraph 6-21, safety turnbuckles and reinstall all items removed for access.

6-12. REPAIR. Repair of bellcranks consists of replacement of defective parts. If needle bearings are dirty or in need of lubrication, clean thoroughly and lubricate as outlined in Section 2.

6-13. AILERONS. (Refer to figure 6-3.)

6-14. REMOVAL AND INSTALLATION

a. Remove access plate (4) and disconnect push-pull rod (5) at aileron.
b. Remove wing tip for access to outboard hinge bolt.
c. Run flaps to full down position for access to inboard hinge bolt.
d. Remove hinge bolts (6) securing aileron and carefully remove aileron from wing.
e. Reverse the preceding steps for reinstallation. Rig system, if necessary, in accordance with paragraph 6-21 and reinstall all items removed for access.

NOTE

If rigging was correct and push-pull rod adjustment was not disturbed, it should not be necessary to re-rig system.

6-15. REPAIR. Aileron repair and static balance may be accomplished in accordance with instructions outlined in Section 18. Before installation, ensure balance weights and hinges are securely attached.

6-16. AILERON TRIM TAB. (Refer to figure 6-3.)

6-17. REMOVAL AND INSTALLATION.

a. Remove screws on lower side of tab.
b. Drill out rivets on upper side of tab and remove tab.
c. Reverse the preceding steps for reinstallation.

6-18. ADJUSTMENT. Adjustment is accomplished by loosening the screws, shifting tab trailing edge up to correct for a wing-heavy condition or down to correct for a wing-light condition. Divide correction equally on both tabs. When installing a new wing or aileron, set tab in neutral and adjust as necessary after flight test.

6-19. CABLES AND PULLEYS. (Refer to figure 6-1.)

6-20. REMOVAL AND INSTALLATION.

a. Remove access plates, wing root fairings and upholstery as required.

b. Remove safety wire and relieve cable tension at turnbuckles (5 and 8).

c. Disconnect cables from aileron bellcranks (18) and quadrants (index 29, figure 6-2).

d. Remove cable guards and pulleys as necessary to work cables free of aircraft.

NOTE

To ease routing of cables, a length of wire may be attached to end of the cable before being withdrawn from aircraft. Leave wire in place, routed through structure; then attach the cable being installed and use to pull cable into position.

e. Reverse the preceding steps for reinstallation.

f. After cables are routed in position, install pulleys and cable guards. Ensure cables are positioned in pulley grooves before installing guards.

g. Re-rig aileron system in accordance with paragraph 6-21, safety turnbuckles and install access plates, fairings and upholstery removed in step "a."

6-17. RIGGING.

a. (Refer to figure 6-1.) Remove access plates and upholstery as required.

b. Remove safety wire and relieve all cable tension at turnbuckles (5 and 8).

c. Disconnect push-pull rods (16) at bellcranks (18).

d. (Refer to figure 6-2.) Adjust turnbuckle (33) and adjustment nuts (28) on interconnect cable (32) to remove slack, acquire proper tension (30±10 pounds) and position both control wheels level (synchronized).

e. Tape a bar across both control wheels to hold them in neutral position.

f. (Refer to figure 6-1.) Adjust direct cable turnbuckles (5) and carry-thru cable turnbuckle (8) to position bellcranks (18) approximately in neutral while maintaining 40±10 pounds tension on carry-thru cable (7).

f. Streamline ailerons with reference to flaps (flaps full UP and disregarding aileron trim tabs), then adjust push-pull rods (16) to fit and install.

g. With ailerons streamlined, mount an inclinometer on trailing edge of aileron and set pointer to 0°.

NOTE

An inclinometer for measuring control surface travel is available from the Cessna Service Parts Center. Refer to figure 6-4.

h. Remove bar from control wheels and adjust travel stop bolts (15) to degree of travel specified in figure 1-1.

i. Ensure all turnbuckles are safetied, all cables and cable guards are properly installed, all jam nuts are tight and replace all parts removed for access.

WARNING

Be sure ailerons move in correct direction when operated by the control wheels.

SECTION 7

WING FLAP CONTROL SYSTEM

TABLE OF CONTENTS

7-1. WING FLAP CONTROL SYSTEM. (Refer to figure 7-1.)

7-2. DESCRIPTION. The wing flap control system consists of an electric motor and transmission assembly, drive pulleys, synchronizing push-pull tubes, bellcranks, push-pull rods, cables, pulleys and a follow-up control. Power from the motor and transmission assembly is transmitted to the flaps by a system of drive pulleys, cables and synchronizing tubes. Electrical power to the motor is controlled by two microswitches mounted on a "floating" arm, a control lever and a follow-up control. As the control lever is moved to the desired flap setting, a switch is tripped actuating the flap motor. As the flaps move, the floating arm is rotated by the follow-up control until the active switch clears the control lever cam, breaking the circuit. To reverse the direction of flap travel, the control lever is moved in the opposite direction. When the control lever cam contacts the second switch the flap motor is energized in the opposite direction. Likewise, the follow-up control moves the floating arm until the second switch is clear of the control lever cam.

7-3. OPERATIONAL CHECK.

a. Operate flaps through their full range of travel, observing for uneven or jumpy motion, binding, and lost motion in the system. Ensure flaps are moving together through their full range of travel.

b. THRU AIRCRAFT SERIAL 21059470 WHEN NOT MODIFIED IN ACCORDANCE WITH SK210-68. Check for positive shut-off of motor at the flap travel extremes, the motor should NOT continuously freewheel at travel extremes.

c. BEGINNING WITH AIRCRAFT SERIAL 21059471 AND ALL AIRCRAFT MODIFIED IN ACCORDANCE WITH SK210-68. Check for positive shut-off of motor at the flap travel extremes, FLAP MOTOR MUST STOP OR DAMAGE WILL RESULT.

d. Check wing flaps for sluggishness in operation. On the ground with engine running, the flaps should extend in approximately 5.25 seconds and retract in approximately 6.25 seconds.

e. With flaps full UP, mount an inclinometer on one flap and set to 0°. Lower flaps to full DOWN position and check flap angle as specified in figure 1-1. Check approximate mid-range percentage setting against degrees as indicated on inclinometer. Repeat the same procedure for the opposite flap.

NOTE

An inclinometer for measuring control surface travel is available from the Cessna Service Parts Center. Refer to figure 6-4.

f. Remove access plates and attempt to rock drive pulleys and bellcranks to check for bearing wear.

g. Inspect flap rollers and tracks for evidence of binding and defective parts.

7-4. TROUBLE SHOOTING.

NOTE

Due to remedy procedures in the following trouble shooting chart it may be necessary to re-rig system, refer to paragraph 7-21.

TROUBLE	PROBABLE CAUSE	REMEDY
BOTH FLAPS FAIL TO MOVE.	Popped circuit breaker.	Reset and check continuity. Replace breaker if defective.
	Defective switch.	Place jumper across switch. Replace switch if defective.
	Defective motor.	Remove and bench test. Replace motor if defective.
	Broken or disconnected wires.	Run continuity check of wiring. Connect or repair wiring as necessary.
	Disconnected or defective transmission.	Connect transmission. Remove, bench test and replace transmission if defective.
	Defective limit switch.	Check continuity of switches. Replace switches found defective.
	Follow-up control disconnected or slipping.	Secure control or replace if defective.
BINDING IN SYSTEM AS FLAPS ARE RAISED AND LOWERED.	Cables not riding on pulleys.	Open access plates and observe pulleys. Route cables correctly over pulleys.
	Bind in drive pulleys.	Check drive pulleys in motion. Replace drive pulleys found defective.
	Broken or binding pulleys.	Check pulleys for free rotation or breaks. Replace defective pulleys.
	Frayed cable.	Check condition of cables. Replace defective cables.
	Flaps binding on tracks.	Observe flap tracks and rollers. Replace defective parts.
LEFT FLAP FAILS TO MOVE.	Disconnected or broken cable.	Check cable tension. Connect or replace cable.
	Disconnected push-pull rod.	Attach push-pull rod.
FLAPS FAIL TO RETRACT.	Disconnected or defective UP limit switch.	Check continuity of switch. Connect or replace switch.

7-4. TROUBLE SHOOTING (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
FLAPS FAIL TO EXTEND.	Disconnected or defective DOWN limit switch.	Check continuity of switch. Connect or replace switch.
INCORRECT FLAP TRAVEL.	Incorrect rigging.	Refer to paragraph 7-21.
	Defective limit switch.	Check continuity of switches. Replace switches found defective.

7-5. FLAP MOTOR, TRANSMISSION AND ACTUATOR ASSEMBLY. (Refer to figure 7-1, sheet 2.)

7-6. REMOVAL AND INSTALLATION.

a. Run flaps to full DOWN position.

b. Disconnect battery cables at the battery and insulate cable terminals as a safety precaution.

c. Remove access plates from under actuator assembly on left wing and adjacent to the drive pulleys on both wings.

d. Relieve cable tension at turnbuckles (indexes 6, 7, 8 and 9, sheet 1.)

NOTE

Remove motor (3), transmission (18), actuator assembly (17) and lower support as a unit.

e. Disconnect cables from actuator cable drive assembly (17).

f. Remove bolt (11) securing follow-up control bellcrank (10) to actuator assembly (17). Retain spacer (9).

g. Disconnect flap motor and microswitch wiring and tag for reference on reinstallation.

h. Remove bolts (12 and 20) securing lower support to upper support. Retain spacer (9), bushing (19) and washers.

i. Remove bolt (21) securing motor and transmission assembly to upper support (7).

NOTE

Although not required, nuts (2) securing motor (3) to transmission (18) may be removed to swing motor clear of working area for easier removal of bolt (21).

j. Using care, work assembly out of wing through access opening.

k. Reverse the preceding steps for reinstallation. Rig system in accordance with paragraph 7-21, safety turnbuckles and reinstall all items removed for access.

7-7. REPAIR. Repair consists of replacement of motor, transmission or coupling. Lubricate in accordance with Section 2.

7-8. FLAP CONTROL LEVER. (Refer to figure 7-1, sheet 2.)

7-9. REMOVAL AND INSTALLATION.

a. Remove follow-up control (8) from switch mounting arm (30).

b. Remove flap operating switches (28 and 29) from switch mounting arm (30). DO NOT disconnect electrical wiring at switches.

c. Remove knob (27) from control lever (26).

d. Remove remaining items by removing bolt (32). Use care not to drop parts into tunnel area.

e. Reverse the preceding steps for reinstallation. Do not overtighten bolt (32) causing lever (26) to bind. Rig system in accordance with paragraph 7-21.

7-10. DRIVE PULLEYS. (Refer to figure 7-1, sheet 1.)

7-11. REMOVAL AND INSTALLATION.

a. Run flaps to full DOWN position.

b. Remove access plates adjacent to drive pulley (11).

c. Relieve cable tension at turnbuckles (7 and 8) for removal of left hand drive pulley and relieve cable tension at turnbuckles (6 and 9) for removal of right hand drive pulley.

d. Remove bolt securing flap push-pull rod (17) to drive pulley.

e. Remove bolt securing synchronizing push-pull tube (13) to drive pulley.

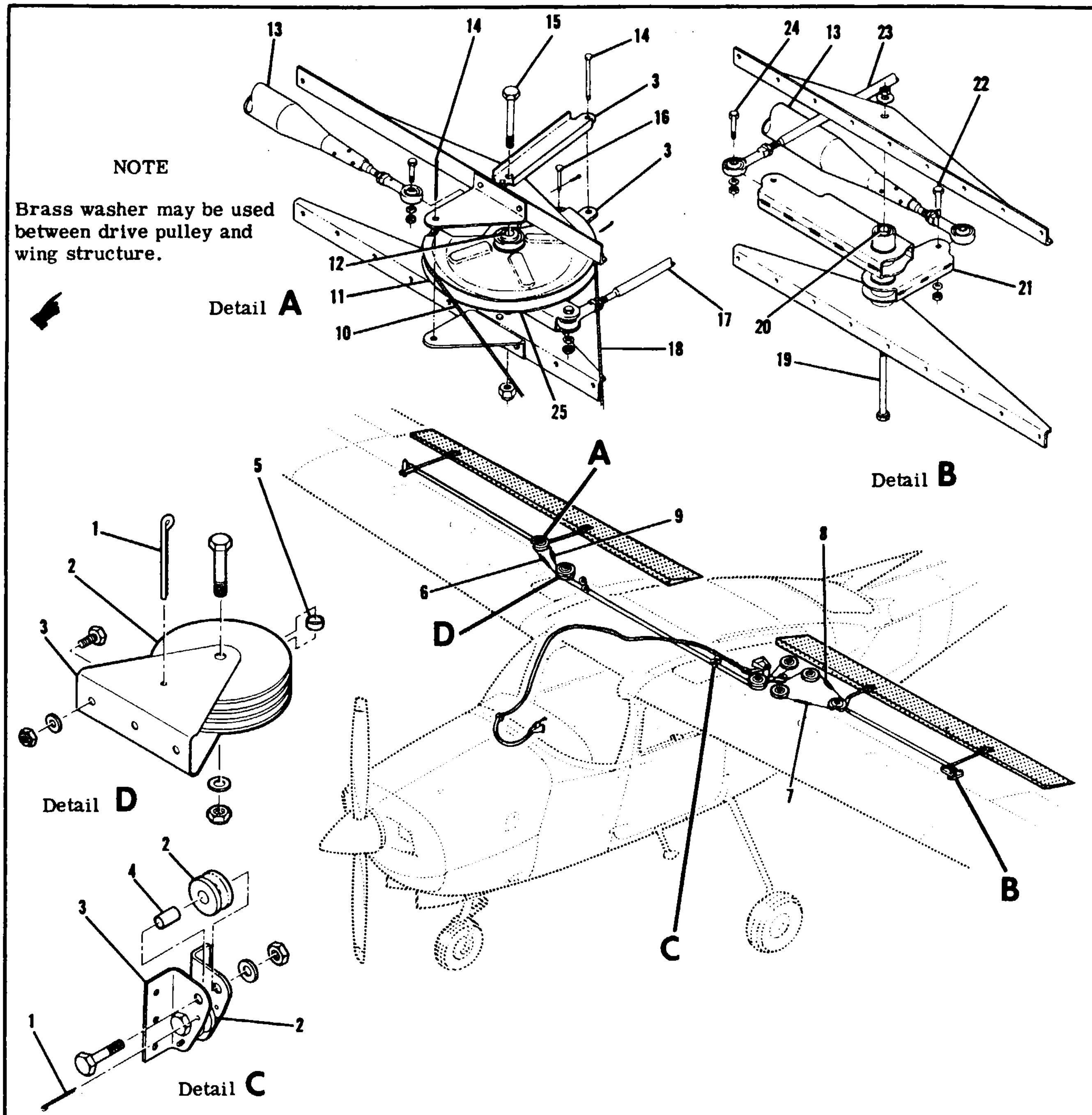
f. Remove cable guards (14).

g. Remove cable lock pins (16) and disconnect cables (10 and 18) from drive pulley. Tag cables for reference on reinstallation.

h. Remove pivot bolt (15) attaching drive pulley to wing structure.

i. Remove drive pulley (11) through access opening, using care not to drop bushing (12). Retain brass washer between drive pulley and wing structure. Tape open ends of pulley to protect bearings.

j. Reverse the preceding steps for reinstallation. Rig system in accordance with paragraph 7-21, safety turnbuckles and reinstall all items removed for access.



1. Cable Guard
2. Pulley
3. Bracket
4. Bushing
5. Spacer
6. Turnbuckle (Right Direct)
7. Turnbuckle (Left Direct)
8. Turnbuckle (Left Retract)
9. Turnbuckle (Right Retract)
10. Cable (Direct)
11. Drive Pulley
12. Bushing
13. Synchronizing Push-Pull Tube
14. Cable Guard
15. Pivot Bolt
16. Lock Pin
17. Inboard Push-Pull Rod
18. Cable (Retract)
19. Pivot Bolt
20. Bushing
21. Bellcrank
22. Bolt
23. Outboard Push-Pull Rod
24. Bolt
25. Brass Washer

CAUTION

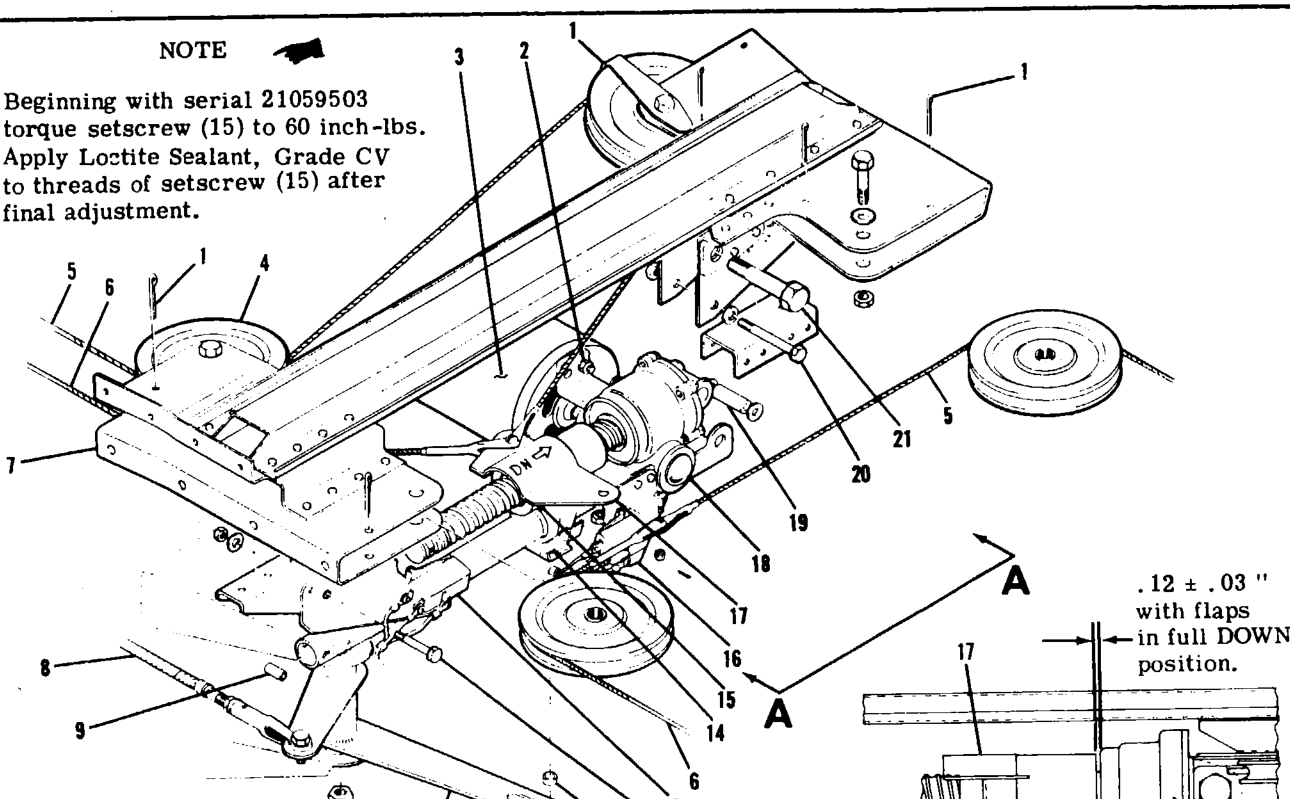
MAINTAIN PROPER CONTROL CABLE TENSION.

CABLE TENSION:
50 LBS ± 10 LBS (AT THE AVERAGE TEMPERATURE FOR THE AREA.)
REFER TO FIGURE 1-1 FOR TRAVEL.

Figure 7-1. Wing Flap Control System (Sheet 1 of 2)

NOTE

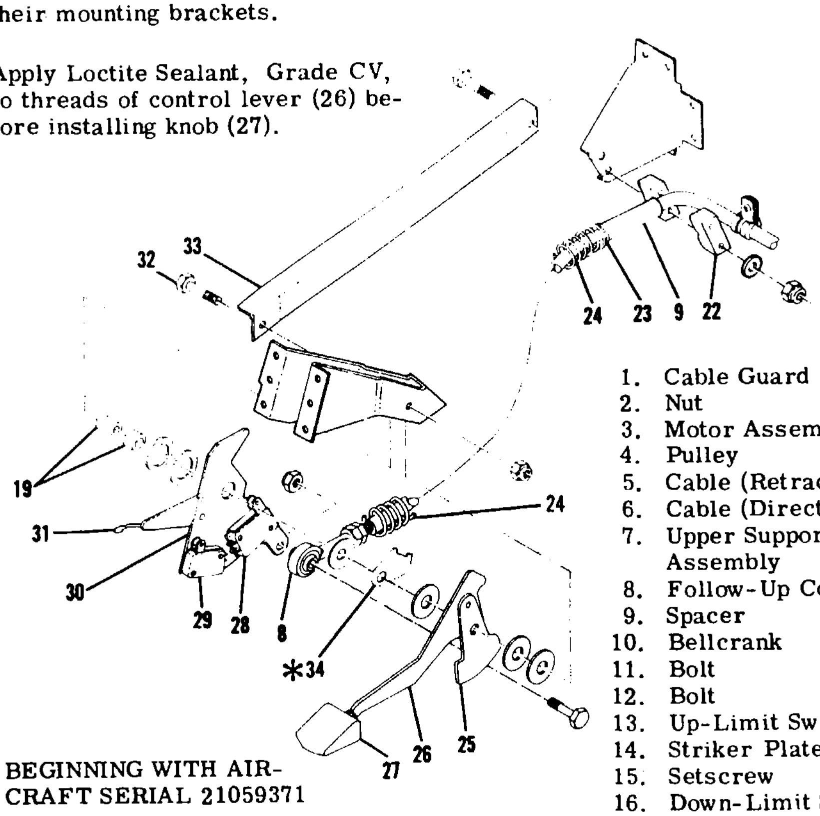
Beginning with serial 21059503 torque setscrew (15) to 60 inch-lbs. Apply Loctite Sealant, Grade CV to threads of setscrew (15) after final adjustment.

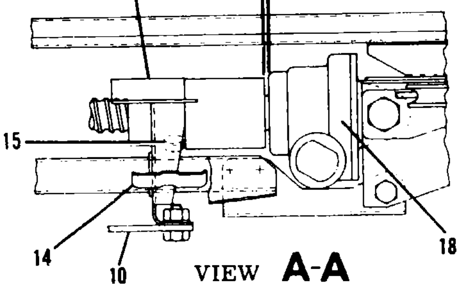


NOTE

Insulators are installed between switches (13, 16, 28 and 29) and their mounting brackets.

Apply Loctite Sealant, Grade CV, to threads of control lever (26) before installing knob (27).





VIEW A-A

BEGINNING WITH AIRCRAFT SERIAL 21059471
AIRCRAFT SERIALS 21059200 THRU 21059470 WHEN MODIFIED IN ACCORDANCE WITH SK210-68

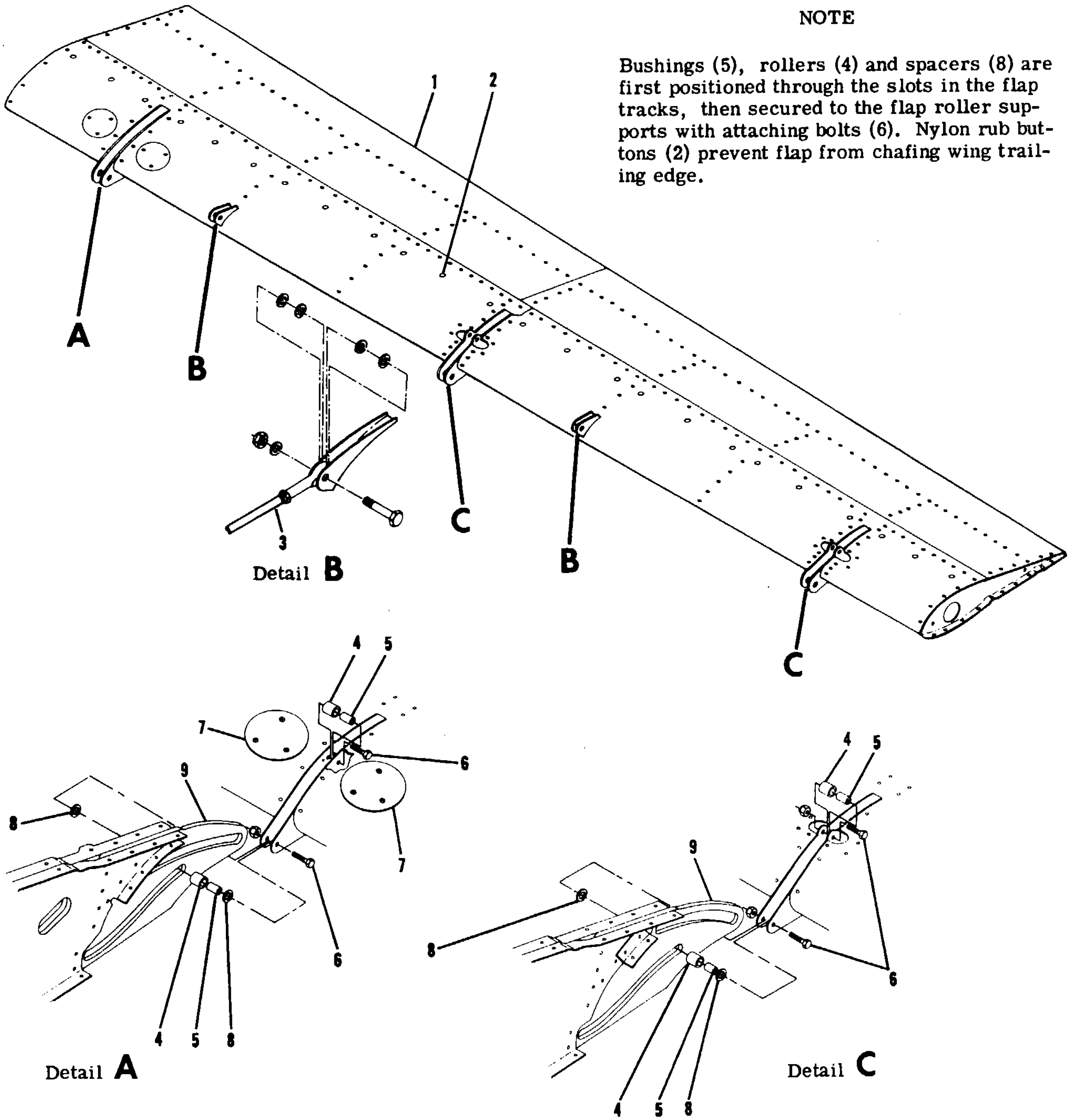
1. Cable Guard
2. Nut
3. Motor Assembly
4. Pulley
5. Cable (Retract)
6. Cable (Direct)
7. Upper Support Assembly
8. Follow-Up Control
9. Spacer
10. Bellcrank
11. Bolt
12. Bolt
13. Up-Limit Switch
14. Striker Plate (Cam)
15. Setscrew
16. Down-Limit Switch
17. Actuator Cable Drive Assembly
18. Actuator
19. Bushing
20. Bolt
21. Bolt
22. Clamp
23. Washer
24. Spring
25. Cam
26. Control Lever
27. Knob
28. Flaps Down Operating Switch
29. Flaps Up Operating Switch
30. Switch Mounting Arm
31. Position Indicator
32. Bolt
33. Stiffener
34. Bracket

* BEGINNING WITH AIRCRAFT SERIAL 21059371

Figure 7-1. Wing Flap Control System (Sheet 2 of 2)

NOTE

Bushings (5), rollers (4) and spacers (8) are first positioned through the slots in the flap tracks, then secured to the flap roller supports with attaching bolts (6). Nylon rub buttons (2) prevent flap from chafing wing trailing edge.



1. Flap Assembly
2. Nylon Rub Button
3. Push-Pull Rod
4. Roller
5. Bushing
6. Bolt
7. Access Plate
8. Spacer
9. Flap Track

Figure 7-2. Flap Installation

7-12. REPAIR. Repair is limited to replacement of bearings. Cracked, bent or excessively worn drive pulleys must be replaced. Lubricate drive pulley bearings as outlined in Section 2.

7-13. BELLCRANKS. (Refer to figure 7-1, sheet 1.)

7-14. REMOVAL AND INSTALLATION.
a. Run flaps to full DOWN position.
b. Remove access plates adjacent to bellcrank (21).
c. Remove bolt (24) securing push-pull rod (23) to bellcrank (21).
d. Remove bellcrank pivot bolt (19) and position bellcrank as necessary to expose synchronizing push-pull tube attach point.
e. Remove bolt (22) securing synchronizing push-pull tube (13) to bellcrank (21) and work bellcrank out through access opening using care not to drop bushing (20). Tape open ends of bellcrank to protect needle bearings.

NOTE

To remove synchronizing push-pull tube (13), disconnect tube at bellcrank (21) and drive pulley (11). Position tube through lightening holes until removal is possible through access opening.

f. Reverse the preceding steps for reinstallation. If the push-pull rod and synchronizing tube adjustments are not disturbed, re-rigging of the system should not be necessary. Check flap travel and rig in accordance with paragraph 7-21, if necessary, and reinstall all items removed for access.

7-15. REPAIR. Repair is limited to replacement of bearings. Cracked, bent or excessively worn bellcranks must be replaced. Lubricate in accordance with Section 2.

7-16. FLAPS. (Refer to figure 7-2.)

7-17. REMOVAL AND INSTALLATION
a. Run flaps to full DOWN position.
b. Remove access plate (7) outboard of the inboard flap track.
c. Disconnect push-pull rod (3) at both flap attach points.
d. Remove bolt (6) at each aft flap track, pull flap aft and remove remaining bolts. As flap is removed from wing, all washers, rollers and bushings will fall free. Retain these for reinstallation.
f. If the push-pull rod adjustment is not disturbed, re-rigging of the system should not be necessary. Check flap travel and rig in accordance with paragraph 7-21, if necessary.

7-18. REPAIR. Flap repair may be accomplished in accordance with instructions outlined in Section 18.

7-19. CABLES AND PULLEYS. (Refer to figure 7-1, sheet 1.)

7-20. REMOVAL AND INSTALLATION.
a. Remove access plates, fairings and upholstery as required for access.
b. Relieve cable tension at turnbuckles (6, 7, 8 and 9).
c. Disconnect cables at drive pulleys (11).
d. Disconnect cables at actuator cable drive assembly (index 17, sheet 2).
e. Remove cable guards and pulleys as necessary to work cables free of aircraft.

NOTE

To ease routing of cables, a length of wire may be attached to the end of cable being withdrawn from the aircraft. Leave wire in place, routed through structure; then attach the cable being installed and use wire to pull cable into position.

f. After cable is routed in position, install pulleys and cable guards. Ensure cable is positioned in pulley grooves before installing guards.
g. Re-rig flap system in accordance with paragraph 7-21, safety turnbuckles and reinstall all items removed in step "a."

7-21. RIGGING.
a. (Refer to figure 7-1, sheet 1.) Using care, run flaps to full DOWN position.
b. Disconnect cables at turnbuckles (6, 7, 8 and 9).
c. Disconnect push-pull rods (17) at drive pulleys (11).
d. Disconnect push-pull rods (23) at bellcranks (21).
e. Disconnect synchronizing push-pull tubes (13) from drive pulleys (11) and bellcranks (21).
f. If cables are being replaced, with drive pulleys (11) installed, rotate drive pulleys beyond their normal range of travel to permit cable attachment. If drive pulleys are not installed, it may be easier to attach the cables prior to installing the drive pulleys in the wings.
f. Attach the 1/8" direct cable to the forward side of drive pulleys and the 3/32" retract cable to the aft side of drive pulleys. (Refer to figure 7-3.)
h. Adjust synchronizing push-pull tubes (13) to 41.87" between centers of rod end holes, tighten jam nuts and install.
i. Adjust inboard push-pull rods (17) to 10.81" and outboard push-pull rods (23) to 10.39" between centers of rod end holes, tighten jam nuts and install.
j. Ensure cables are properly routed and in pulley grooves and adjust turnbuckles to obtain specified cable tension.
k. (Refer to figure 7-1, sheet 2.) THRU AIRCRAFT SERIAL 21059470 WHEN NOT MODIFIED IN ACCORDANCE WITH SK210-68. Carefully run flaps to full UP position and adjust UP-LIMIT switch to operate and shut-off motor at degree of travel specified in figure 1-1.
l. BEGINNING WITH AIRCRAFT SERIAL 21059471 AND ALL AIRCRAFT MODIFIED IN ACCORDANCE WITH SK210-68.

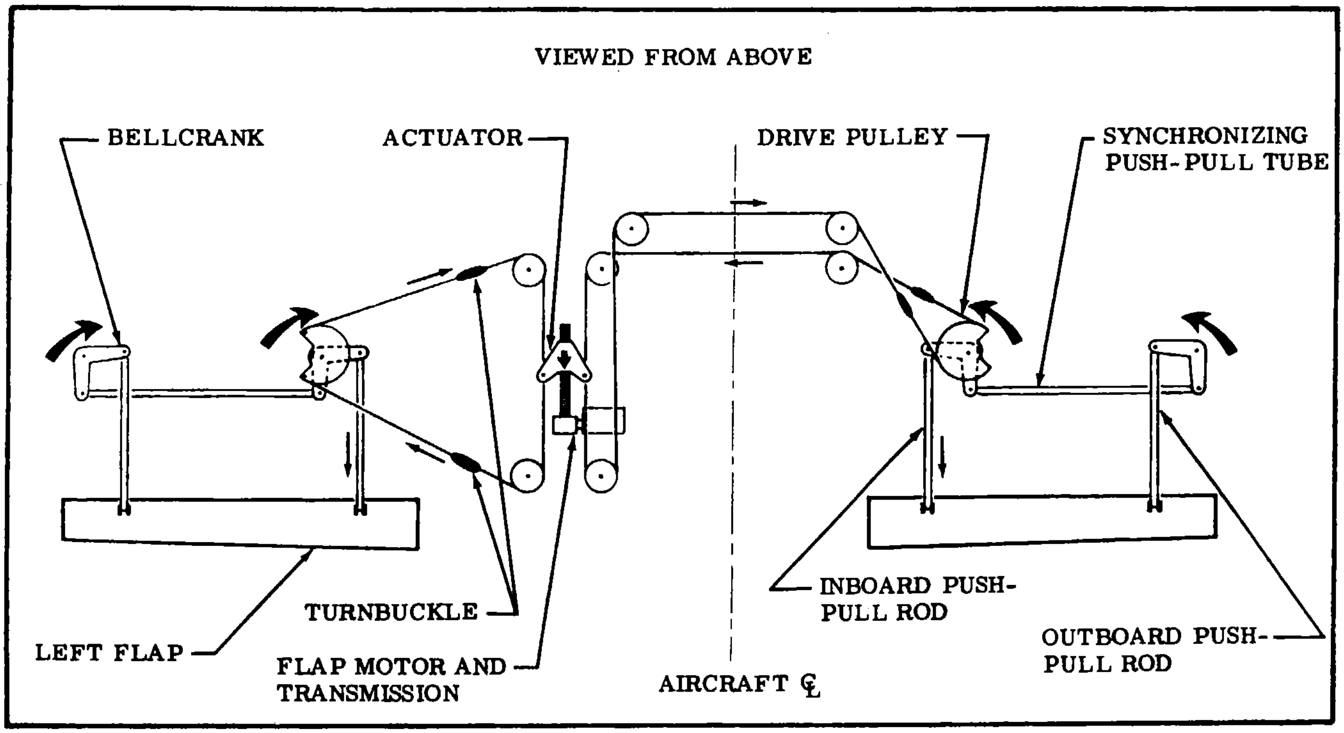


Figure 7-3. Flap System Schematic

NOTE

The ball screw assembly does not have a free-wheeling feature. Therefore, the flap actuator motor MUST be shut-off at travel extremes or structural deformation will occur.

Carefully run flaps to full UP position and adjust UP-LIMIT switch to operate and shut-off motor at degree of travel specified in figure 1-1.

m. Mount an inclinometer on one flap and set to 0°.

NOTE

An inclinometer for measuring control surface travel is available from the Cessna Service Parts Center. Refer to figure 6-4.

n. THRU AIRCRAFT SERIAL 21059470 WHEN NOT MODIFIED IN ACCORDANCE WITH SK210-68. Carefully run flaps to DOWN position and adjust DOWN-LIMIT switch (16) to operate and shut-off motor to degree of travel specified in figure 1-1.

o. BEGINNING WITH AIRCRAFT SERIAL 21059471 AND ALL AIRCRAFT MODIFIED IN ACCORDANCE WITH SK210-68. Carefully run flaps to DOWN position and adjust DOWN-LIMIT switch (16) to operate and shut-off motor to .12±.03 inches between cable drive assembly (17) and transmission (18) as illustrated in VIEW A-A.

p. Operate control lever (26) and run flaps to full UP position.

q. Disconnect follow-up control (8) at switch mounting arm (30).

r. Without moving control lever (26), move arm (30) until cam (25) is centered between switches (28 and 29). Ensure switches are centered in their respective adjustment slots prior to centering cam (25).

s. Adjust flaps DOWN operating switch (28) in slotted holes until roller just clears cam (25) and secure. This adjustment should provide flaps down operation to 10°+0°-2° and 20°±2°. If not, readjust switch (28) as necessary.

NOTE

The flaps must NEVER exceed 10° when the control lever (26) is moved from the 0° to 10° position.

t. Adjust flaps UP operating switch (29) in slotted holes to 0.062" clearance between switch roller and cam (25) when the DOWN operating switch has just opened in the 10° and 20° position.

NOTE

Flap travel on UP cycle may deviate a maximum of 4° from indicated position.

u. Turn master switch ON and run flaps through several cycles, stopping at various mid-range settings, and checking that cable tension is within limits.

Retract cable tension may increase to 90 pounds when flaps are fully retracted.

NOTE

Since flap rollers may not bottom in tracks with flaps fully extended, some free play may be noticed in this position.

v. Check all rod ends and clevis ends for sufficient thread engagement, all jam nuts are tight and reinstall all items removed for access.

w. Flight test aircraft and check that follow-up control does not cause automatic cycling of flaps. If cycling occurs, readjust operating switches as necessary per steps "s" and "t."

SHOP NOTES:

SECTION 8

ELEVATOR CONTROL SYSTEM

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8-1. ELEVATOR CONTROL SYSTEM. (Refer to Figure 8-1.)

8-2. DESCRIPTION. The elevators are operated by power transmitted through fore-and-aft movement of the pilot or copilot control wheels. The system is comprised of control columns, an elevator torque tube, cables and pulleys. The elevator control cables, at their aft ends, are attached to a bellcrank mounted on a bulkhead in the tailcone. A push-pull tube connects this bellcrank to the elevator arm assembly, installed between the elevators. An elevator trim tab is installed in the trailing edge of the right elevator and is described in Section 9.

8-3. TROUBLE SHOOTING.

NOTE: Due to remedy procedures in the following troubleshooting chart it may be necessary to re-rig system, refer to paragraph 8-14.

TROUBLE	PROBABLE CAUSE	REMEDY
NO RESPONSE TO CONTROL WHEEL FORE AND AFT MOVEMENT.	Forward and aft end of push-pull tube disconnected.	Check visually. Attach push-pull tube correctly.
	Cables disconnected.	Check visually. Attach cables and rig system in accordance with paragraph 8-14.

8-3. TROUBLE SHOOTING (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
BINDING OR JUMPY MOTION FELT IN MOVEMENT OF ELEVATOR SYSTEM.	Defective bellcrank or arm assembly pivot bearings or push-pull tube attach bearings.	Move bellcrank or arm to check for play or binding. Disconnect push-pull tube and check that bearings rotate freely. Replace defective parts.
	Cables slack.	Check and adjust to tension specified in figure 8-1.
	Cables not riding correctly on pulleys.	Check visually. Route cables correctly over pulleys.
	Defective control column bearing rollers.	Check visually. Replace defective rollers.
	Defective control column torque tube bearings.	Disconnect necessary items and check that bearings rotate freely. Replace defective bearing.
	Control guide on aft end of control square tube adjusted too tightly.	Loosen screw and tapered plug in end of control tube enough to eliminate binding.
	Defective elevator hinges.	Disconnect push-pull tube and move elevators by hand. Replace defective hinges.
	Defective pulleys or cable guards.	Check visually. Replace defective parts and install guards properly.
ELEVATORS FAIL TO ATTAIN PRESCRIBED TRAVEL.	Stops incorrectly set.	Rig in accordance with paragraph 8-14.
	Cables tightened unevenly.	Rig in accordance with paragraph 8-14.
	Interference at instrument panel.	Rig in accordance with paragraph 8-14.

8-4. CONTROL COLUMN. (Refer to figure 6-2.) Section 6 outlines removal, installation and repair of control column.

8-5. ELEVATORS. (Refer to figure 8-2.)

8-6. REMOVAL AND INSTALLATION.

a. Remove stinger.

b. Disconnect trim tab push-pull tube at tab actuator. (Refer to Section 9.)

NOTE

If trim system is not moved and actuator screw is not turned, re-rigging of trim system should not be necessary after reinstallation of elevator.

c. Remove bolts (13) securing elevator torque tubes (7) to arm assembly (8).

d. Remove bolts (6) from elevator hinges (5).

e. Using care, remove elevator.

f. To remove left elevator use same procedure, omitting step "b".

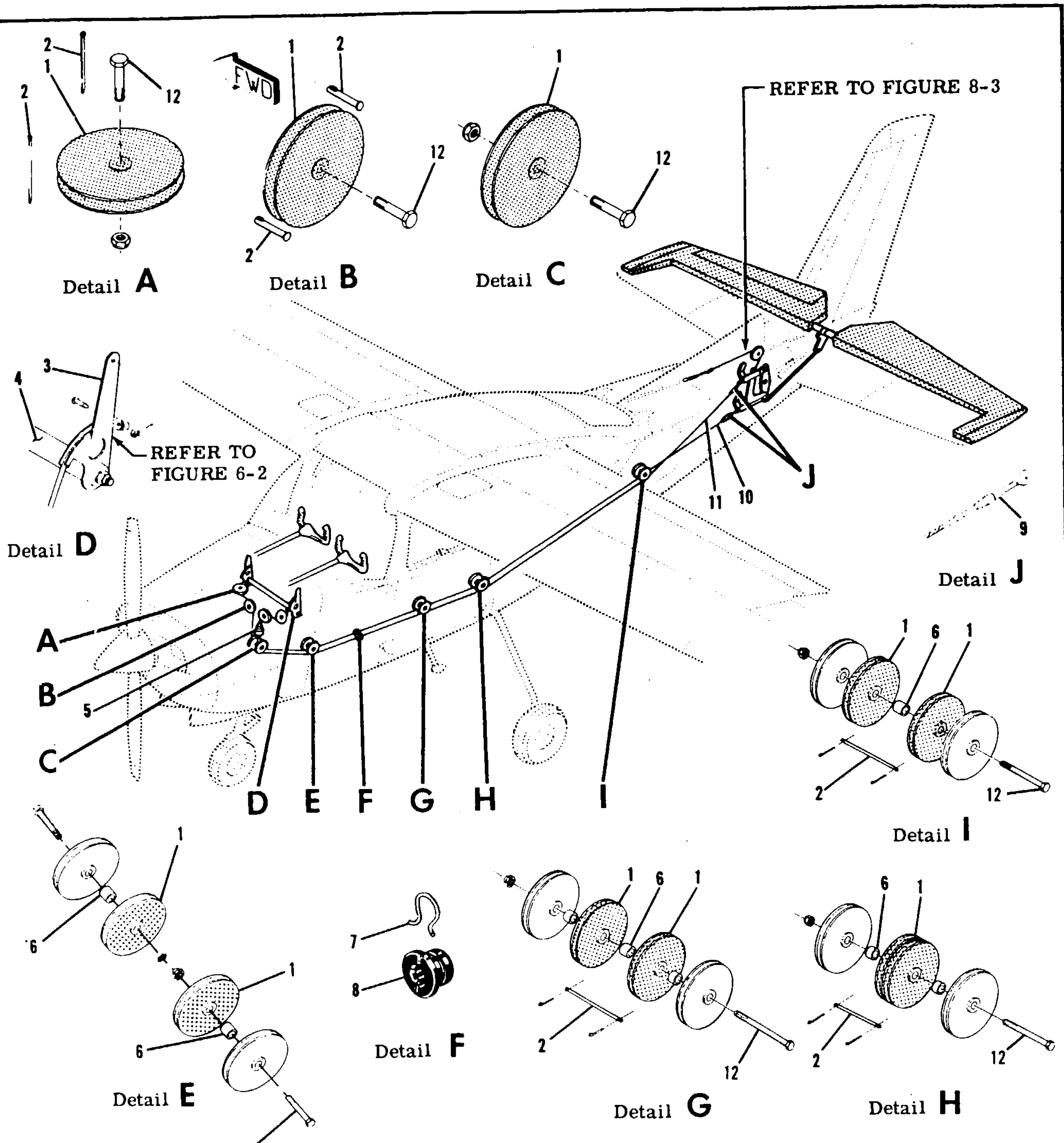
g. Reverse the preceding steps for reinstallation.

8-7. REPAIR. Repair may be accomplished as outlined in Section 18. Hinge bearings may be replaced as necessary. If repair has affected static balance, check and rebalance as required.

8-8. BELLCRANK. (Refer to figure 8-3.)

8-9. REMOVAL AND INSTALLATION.

a. Remove access plate below bellcrank on tailcone.



NOTE

Only pulleys used in this system are shaded.

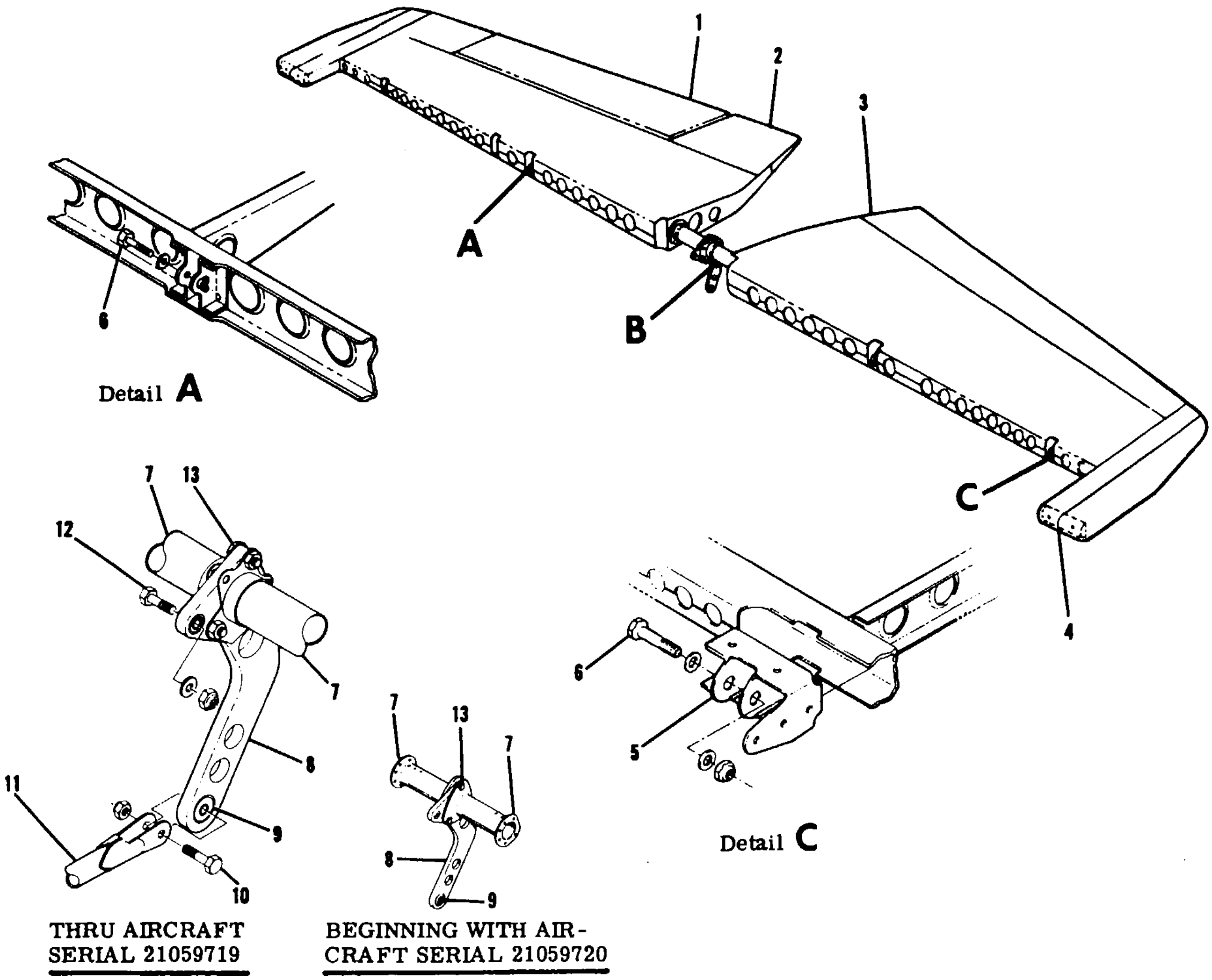
CAUTION

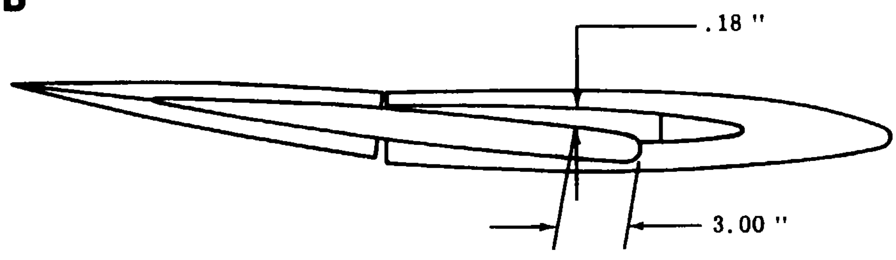
MAINTAIN PROPER CONTROL CABLE TENSION.

1. Pulley
2. Cable Guard
3. Arm Assembly
4. Elevator Torque Tube
5. Balance Weight
6. Spacer
7. Clip
8. Fairlead
9. Turnbuckle
10. Elevator DOWN Cable
11. Elevator UP Cable
12. Bolt

CABLE TENSION:
30 LBS ± 10 LBS (AT THE AVERAGE TEMPERATURE FOR THE AREA.)
REFER TO FIGURE 1-1 FOR TRAVEL.

Figure 8-1. Elevator Control System





THIS VIEW APPLIES TO THE RIGHT HAND ELEVATOR WHEN THE LEFT HAND ELEVATOR IS STREAMLINED

1. Trim Tab
2. Right Elevator
3. Left Elevator
4. Balance Weight
5. Hinge Assembly
6. Bolt
7. Torque Tube
8. Arm Assembly
9. Needle Bearing
10. Bolt
11. Push-Pull Tube
12. Pivot Bolt
13. Bolt

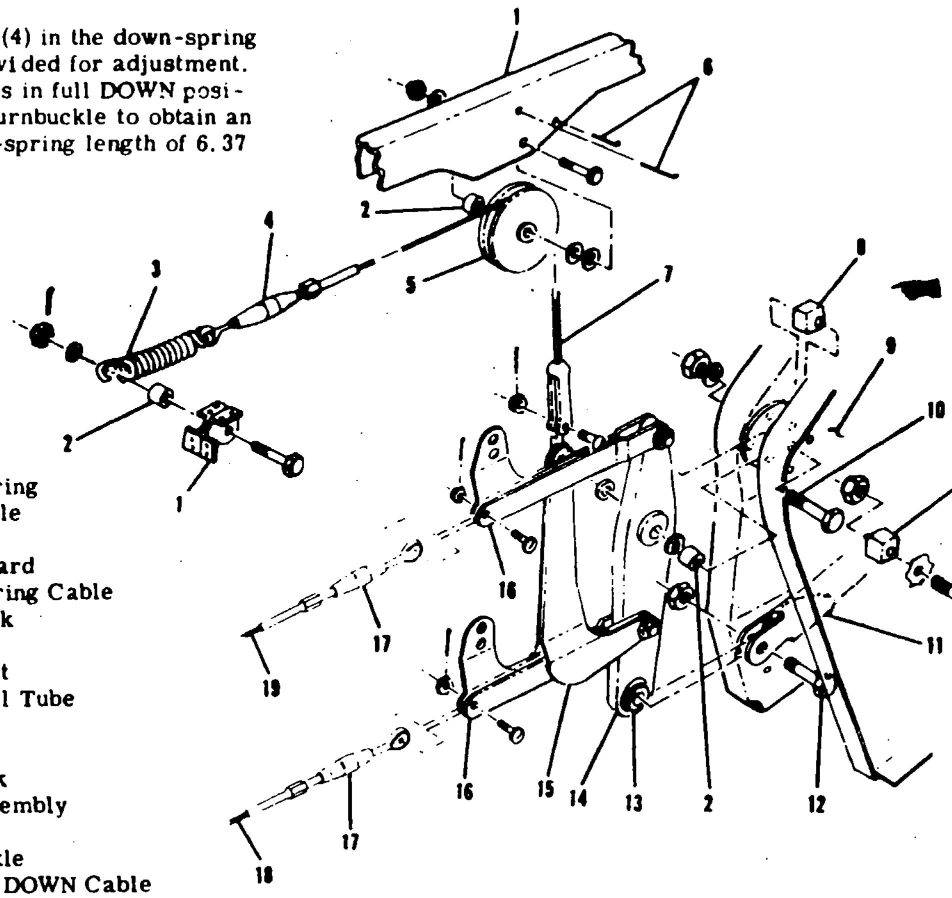
NOTE

Do not attempt to align the elevator trailing edges as there is a 0° 54' twist designed into the connecting torque tube. This twist causes the right elevator to be higher than the left.

Figure 8-2. Elevator Installation

NOTE

A turnbuckle (4) in the down-spring cable, is provided for adjustment. With elevators in full DOWN position, adjust turnbuckle to obtain an overall down-spring length of 6.37 inches.



1. Bracket
2. Spacer
3. Down-Spring
4. Turnbuckle
5. Pulley
6. Cable Guard
7. Down-Spring Cable
8. Stop Block
9. Bracket
10. Pivot Bolt
11. Push-Pull Tube
12. Bolt
13. Bearing
14. Bellcrank
15. Link Assembly
16. Link
17. Turnbuckle
18. Elevator DOWN Cable
19. Elevator UP Cable

Figure 8-3. Elevator Bellcrank Installation

NOTE

Holes are drilled off center in bellcrank stops to provide elevator travel adjustments. 90° rotation of bellcrank stop provides approximately 1° of elevator travel.

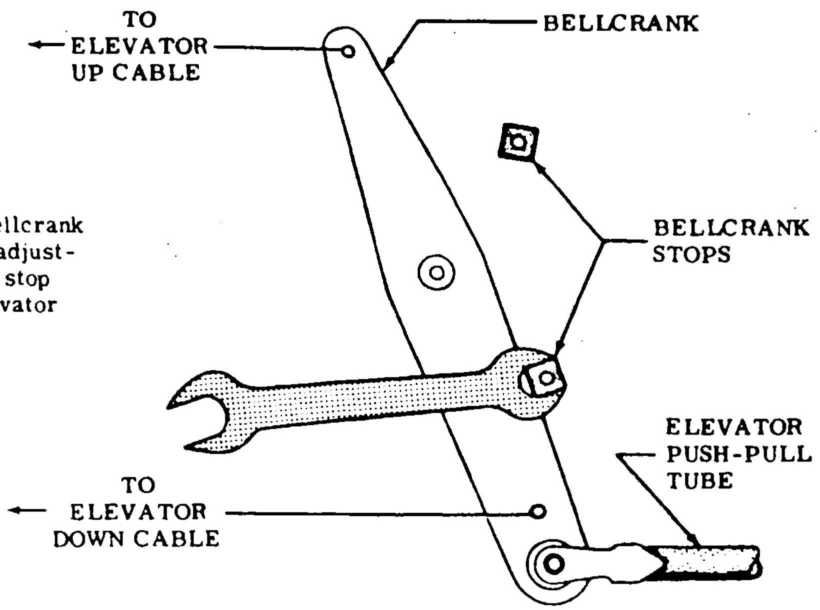


Figure 8-4. Elevator Bellcrank Travel Stop Adjustment

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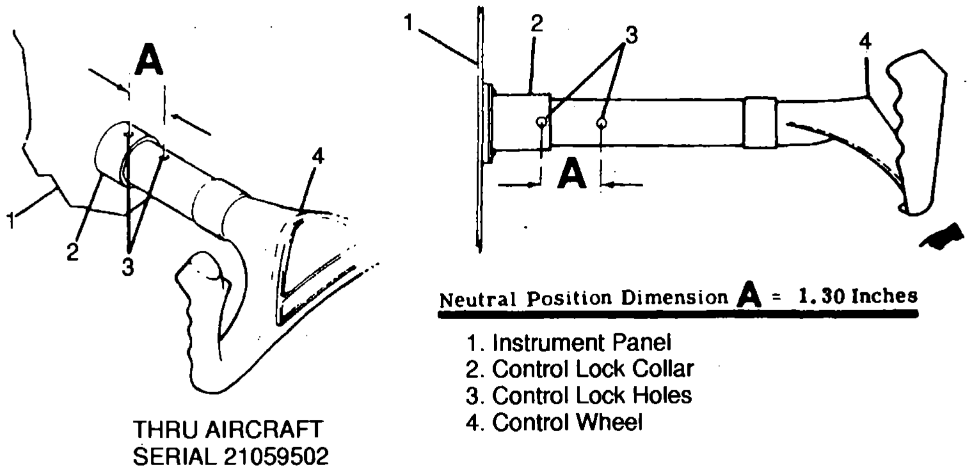


Figure 8-5. Control Column Neutral Rigging Position

CAUTION: Position a support stand under tail tie-down ring to prevent the tailcone from dropping while working inside.

B. Remove safety wire, relieve cable tension at turnbuckles (17) and disconnect turnbuckle eyes at bellcrank links (16).

C. Remove safety wire, relieve cable tension at turnbuckle (4) and disconnect cable (7) at link assembly (15).

D. Remove bolt (12) securing push-pull tube (11) to bellcrank (14).

E. Remove pivot bolt (10) attaching bellcrank (14) to brackets (9) and remove bellcrank.

F. Reverse the preceding steps for reinstallation. Rig system in accordance with paragraph 8-14, safety turnbuckles and reinstall all items removed for access.

8-10. ARM ASSEMBLY. (Refer to Figure 8-2).

8-11. REMOVAL AND INSTALLATION.

A. Remove stinger.

B. Remove bolt (10) securing push-pull tube (11) to arm assembly (8).

C. Remove bolts (13) attaching elevator torque tubes (7) to arm assembly (8).

D. Remove pivot bolt (12) securing arm assembly (8) and slide assembly from between elevator torque tubes.

E. Reverse the preceding steps for reinstallation and reinstall all items removed for access.

8-12. CABLES AND PULLEYS. (Refer to Figure 8-1).

8-13. REMOVAL AND INSTALLATION.

CAUTION: Position a support stand under tail tie-down ring to prevent the tailcone from dropping while working inside.

A. Remove seats, upholstery and access plates as necessary.

B. Remove safety wire and relieve cable tension at turnbuckles (9).

C. Disconnect cables at control column arm assemblies (3) and disconnect balance weight (5).

D. Disconnect cables at bellcrank links Index 16, Figure 8-3).

E. Remove fairleads, cable guards and pulleys as necessary to work cables free of aircraft.

NOTE: To ease routing of cables, a length of wire may be attached to the end of cable being withdrawn from aircraft. Leave wire in place, routed through structure; then attach the cable being installed and pull cable into position.

F. Reverse the preceding steps for reinstallation.

G. After cables are routed in position, install fairleads, pulleys and cable guards. Ensure cables are positioned in pulley grooves before installing guards.

h. Re-rig system in accordance with paragraph 8-14, safety turnbuckles and reinstall all items removed in step "a".

8-14. RIGGING. (Refer to figure 8-3.)

CAUTION

Position a support stand under tail tie-down ring to prevent the tailcone from dropping while working inside.

a. Lock control column in neutral position. (Refer to figure 8-5.)
b. Adjust turnbuckles (17) equally to streamline LEFT elevator with horizontal stabilizer (RIGHT elevator will be higher than the left as illustrated in figure 8-2) and to obtain 30±10 lbs cable tension. Safety turnbuckles.

NOTE

Disregard counterweight areas of elevators when streamlining. These areas are contoured to be streamlined at cruising speed (elevators approximately 3° down).

c. With LEFT elevator streamlined, mount an inclinometer on elevator and set to 0°.

NOTE

An inclinometer for measuring control surface travel is available from the Cessna Service Parts Center. Refer to figure 6-4.

d. Adjust bellcrank travel stop blocks (8) to obtain degree of elevator travel as specified in figure 1-1.

NOTE

The bellcrank stop blocks (8) are four-sided bushings, drilled off-center so they may be rotated to any one of four positions to attain correct elevator travel. Each 90-degree rotation of the stop, changes the elevator travel approximately one degree.

e. Move control wheel through full range of travel and check cable tension in various positions. Tension should not be less than 20 pounds or more than 40 pounds in any position.
f. Check all turnbuckles are safetied and all parts are secured, then reinstall all parts removed for access.

WARNING

Be sure elevators move in the correct direction when operated by the control wheels.

SHOP NOTES:

SECTION 9

ELEVATOR TRIM TAB CONTROL SYSTEM

TABLE OF CONTENTS

9-1. ELEVATOR TRIM TAB CONTROL SYSTEM. (Refer to figure 9-1.)

9-2. DESCRIPTION. The elevator trim tab, located on the trailing edge of the right elevator, is controlled by a trim wheel mounted in the pedestal. Power to operate the tab is transmitted from the trim control wheel by means of roller chains, cables, an actuator and a push-pull tube. A mechanical pointer, adjacent to the trim wheel indicates nose attitude of the aircraft. Forward rotation of the wheel trims the nose down and aft rotation of the wheel trims the nose up. An electric trim assist may be installed and is described in paragraph 9-16. When de-energized the electric trim assist has no effect on manual operation.

9-3. TROUBLE SHOOTING.

NOTE

Due to remedy procedures in the following trouble shooting chart it may be necessary to re-rig system, refer to appropriate rigging paragraphs.

TROUBLE	PROBABLE CAUSE	REMEDY
TRIM CONTROL WHEEL MOVES WITH EXCESSIVE RESISTANCE.	Cable tension too high.	Check cable tension and adjust.
	Pulleys binding or rubbing.	Check pulleys visually. Repair or replace as necessary.
	Cables not in place on pulleys.	Check visually. Install cables correctly.
	Trim tab hinge binding.	Disconnect actuator and move tab up and down to check hinge resistance. Lubricate or replace hinge as necessary.
	Defective trim tab actuator.	Remove chain from actuator sprocket and operate actuator manually. Replace defective actuator.
	Rusty chain.	Check visually. Replace rusty chain.

9-3. TROUBLE SHOOTING (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
TRIM CONTROL WHEEL MOVES WITH EXCESSIVE RESISTANCE (CONT).	Damaged sprocket.	Check visually. Replace damaged sprockets.
	Bent sprocket shaft.	Observe motion of sprockets. Replace defective shafts.
LOST MOTION BETWEEN CONTROL WHEEL AND TRIM TAB.	Cable tension too low.	Check cable tension and adjust.
	Broken pulley.	Check visually. Replace defective pulley.
	Cables not in place on pulleys.	Check visually. Install cables correctly.
	Worn trim tab actuator.	Disconnect trim tab and check for play in actuator. Replace defective actuator.
	Actuator attachment loose.	Check actuator for security and tighten.
TRIM INDICATION INCORRECT.	Indicator incorrectly engaged on wheel track.	Check visually. Reset indicator.
INCORRECT TRIM TAB TRAVEL.	Stop blocks loose or incorrectly adjusted.	Adjust stop blocks on cables. Refer to figure 9-5.
	Incorrect rigging.	Refer to paragraph 9-18.

9-4. TRIM TAB. (Refer to figure 9-2.)

9-5. REMOVAL AND INSTALLATION.

a. Disconnect push-pull tube (9) from horn assembly (6).

NOTE

If trim system is not moved and actuator screw is not turned, re-rigging of system should not be necessary after reinstallation of tab.

b. Remove screw (11) securing hinge pin (10), pull pin until free of tab and remove tab.

NOTE

It is not necessary to completely remove hinge pin.

c. Reverse the preceding steps for reinstallation. Rig system, if necessary, in accordance with paragraph 9-14.

9-6 TRIM TAB ACTUATOR, THRU SERIALS 21060089, (Refer to figure 9-1)

9-7. REMOVAL AND INSTALLATION.

a. Relieve cable tension at turnbuckle (8).
b. Disconnect push-pull tube (15) at actuator (19).
c. Remove access plate beneath actuator.
d. Remove chain guard (21) and disengage roller chain (23) from actuator sprocket (20).
e. Remove screws attaching clamps (22) or bracket (24) to bracket (18) and remove actuator (19) through access opening.
f. Reverse the preceding steps for reinstallation. Rig system in accordance with paragraph 9-14, safety turnbuckle and reinstall all items removed for access.

9-7A. DISASSEMBLY, THRU SERIALS 21060089 (Refer to figure 9-3, Sheet 1 of 2).

a. Remove actuator in accordance with paragraph 9-7.

b. Disassemble actuator assembly (1) as illustrated in Detail A as follows:

1. Remove chain guard (3) if not previously removed in step "e" of paragraph 9-7.
2. Using suitable punch and hammer, remove roll pins (8) securing sprocket (5) to screw (9) and remove sprocket from screw.
3. Unscrew threaded rod end (15) and remove rod end from actuator.
4. Remove roll pins (10) securing bearings (6 and 14) at the housing ends.
5. Lightly tap screw (9) toward the sprocket end of housing, remove bearing (6) and collar (7).
6. Lightly tap screw (9) in the opposite direction from sprocket end, remove bearing (14), O-ring (13) and collar (7).
7. It is not necessary to remove retaining rings (11).

9-7B. CLEANING, INSPECTION AND REPAIR, THRU SERIAL 21060089, (Refer to figure 9-3, Sheet 1 of 2).

a. DO NOT remove bearing (16) from threaded rod end (15) unless replacement of bearing is necessary.

b. Clean all component parts, except bearing (16), by washing in Stoddard solvent or equivalent. Do not clean sealed bearing (16).

c. Inspect all component parts for obvious indications of damage such as stripped threads, cracks, deep nicks and dents.

d. Check bearings (6 and 14), screw (9) and threaded rod end (15) for excessive wear and scoring. Dimensions of the parts are as follows:

BEARING (6)	
INSIDE DIAMETER	0.370" MIN.
INSIDE DIAMETER	0.373" MAX.
BEARING (14)	
INSIDE DIAMETER	
SMALL HOLE	0.248" MIN.
SMALL HOLE	0.253" MAX.
LARGE HOLE	0.373" MIN.
LARGE HOLE	0.380" Max.
THREADED ROD END (15)	
OUTSIDE DIAMETER	
(SHANK)	0.242" MIN.
	0.246" MAX.
SCREW (9)	
OUTSIDE DIAMETER	0.367" MIN.
	0.370" MAX.

NOTE

Relative linear movement between internal threaded screw (9) and bearing (14) should be 0.004 to 0.010 inch at room temperature.

e. Examine threaded rod end (15) and screw (9) for damaged threads or dirt particles that may impair smooth operation.

f. Check sprocket (5) for broken, chipped and/or worn teeth.

g. Check bearing (16) for smoothness of operation.

h. DO NOT attempt to repair damaged or worn parts of the actuator assembly. Discard all defective items and install new parts during reassembly.

9-7C. REASSEMBLY, THRU SERIAL 21060089 (Refer to figure 9-3, Sheet 1 of 2).

a. Always discard the following items and install new parts during reassembly.

1. Bearings (6 and 14)
2. Roll Pins (8 and 10)
3. O-Ring (13)
4. Nuts (2).

b. During reassembly, lubricate collars (7), screw (9) and threaded rod end (15) in accordance with Section 2.

c. Press sprocket (5) into the end of screw (9), align roll pin holes and install new roll pins (8).

d. Slip bearing (6) and collar (7) on screw (9) and slide them down against sprocket (5).

e. Insert screw (9), with assembled parts, into housing (12) until bearing (6) is flush with the end of housing.

NOTE

When inserting screw (9) into housing (12), locate the sprocket (5) at the end of housing which is farther away from the groove for retaining ring (11).

The bearings (6 and 14) are not pre-drilled and must be drilled on assembly. The roll pins (10) are 1/16 inch in diameter, therefore, requiring a 1/16 (0.0625) inch drill.

f. With bearing (6) flush with end of housing (12), carefully drill bearing so the drill will emerge from the hole on the opposite side of housing (12). DO NOT ENLARGE HOLES IN HOUSING.

g. Press new roll pins (10) into pin holes.

h. Insert collar (7), new O-ring (13) and bearing (14) into opposite end of housing (12).

i. Complete steps "f" and "g" for bearing (14).

j. If a new bearing (16) is required, a new bearing may be pressed into the boss. Be sure force bears against the outer race of bearing.

k. Screw the threaded rod end (15) into screw (9).

l. Install retaining rings (11), if they were remove.

m. Test actuator assembly by rotating sprocket (5) with fingers while holding threaded rod end (15). The threaded rod end should travel in and out smoothly, with no indication of binding.

n. Reinstall actuator assembly in accordance with paragraph 9-7.

9-7D. TRIM TAB ACTUATOR, BEGINNING WITH SERIAL 2100090. (Refer to figure 9-3, Sheet 2).

a. A newly designed actuator is utilized in the trim tab system beginning at the above serials.

b. Disassembly, cleaning, inspection & repair is limited to replacement of guard (5), sprocket (4 & 7), screw (2), zerk (6), and bearing (1).

c. The actuator is equipped with a grease zerk and shall be lubricated as specified in section 2 of this manual.
d. Replace the entire actuator if other than those items (in step b. above) are encountered.

9-7E. TRIM TAB FREE-PLAY INSPECTION.
a. Place elevators and trim tab in the neutral position.
b. Using moderate pressure, move the trim tab trailing edge up and down by hand to check free-play.
c. A maximum of .166",(total motion up and down) measured at the trim tab trailing edge is permissible.
d. If the trim tab free-play is less then .166", the system is within prescribed limits.
e. If the trim tab free-play is more than .166", check the following items for looseness while moving the trim tab up and down.

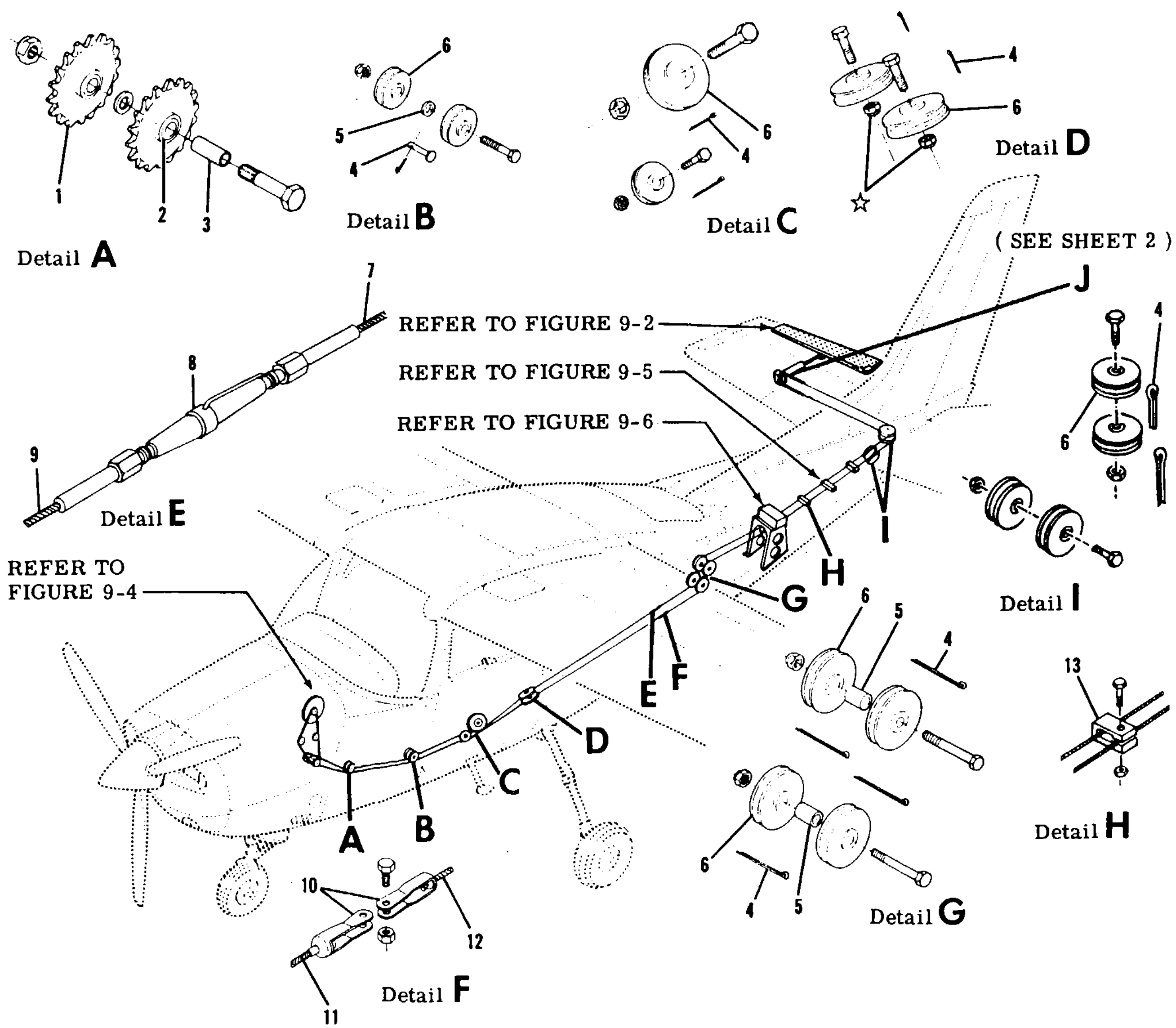
1. Check push-pull tube to trim tab horn assembly attachment for looseness.
2. Check push-pull tube to actuator assembly threaded rod end attachment for looseness.
3. Check actuator assembly threaded rod end for looseness in the actuator assembly with push-pull tube disconnected.

f. If looseness is apparent while checking steps e-1 and e-2, repair by installing new parts.
g. If looseness is apparent while checking step e-3, refer to paragraphs 9-6 through 9-7C. Recheck trim tab free-play.

9-8. TRIM TAB CONTROL WHEEL. (Refer to figure 9-4.)

9-9. REMOVAL AND INSTALLATION.
a. Remove pedestal cover as outlined in paragraph 9-13.
b. Remove screws (8) and nuts (6) securing chain guard (7) to pedestal structure (9).
c. THRU AIRCRAFT SERIAL 21059502. Remove nut (4) securing indicator (2) to pivot stud (1). Retain washers (3) for reinstallation.
d. BEGINNING WITH AIRCRAFT SERIAL 21059503. Remove bolt (22) securing indicator (2) to pedestal structure (9). Retain washers (3) and spacer (23) for reinstallation.

SHOP NOTES:



☆ Nutplates are installed beginning with aircraft serial 21059365

1. Sprocket
2. Bearing
3. Bushing
4. Cable Guard
5. Spacer
6. Pulley
7. Right Aft Cable
8. Turnbuckle
9. Right Forward Cable
10. Cable Ends
11. Left Forward Cable
12. Left Aft Cable
13. Travel Stop Block
14. Bracket Assembly
15. Tube Assembly
16. Brace
17. Stabilizer Rear Spar
18. Support Bracket
19. Actuator
20. Sprocket
21. Chain Guard
22. Clamp
23. Chain
24. Mounting Bracket
25. Trim Tab
26. Sprocket (Electric Trim)

CAUTION

MAINTAIN PROPER CONTROL CABLE TENSION.

CABLE TENSION:
10 TO 15 LBS THRU AIRCRAFT SERIAL 21060089, 20 + 0 - 5 LBS BEGINNING WITH AIRCRAFT SERIAL 21060090 (AT AVERAGE TEMPERATURE FOR THE AREA.)
REFER TO FIGURE 1-1 FOR TRAVEL.

Figure 9-1. Elevator Trim Tab Control System (Sheet 1 of 2)

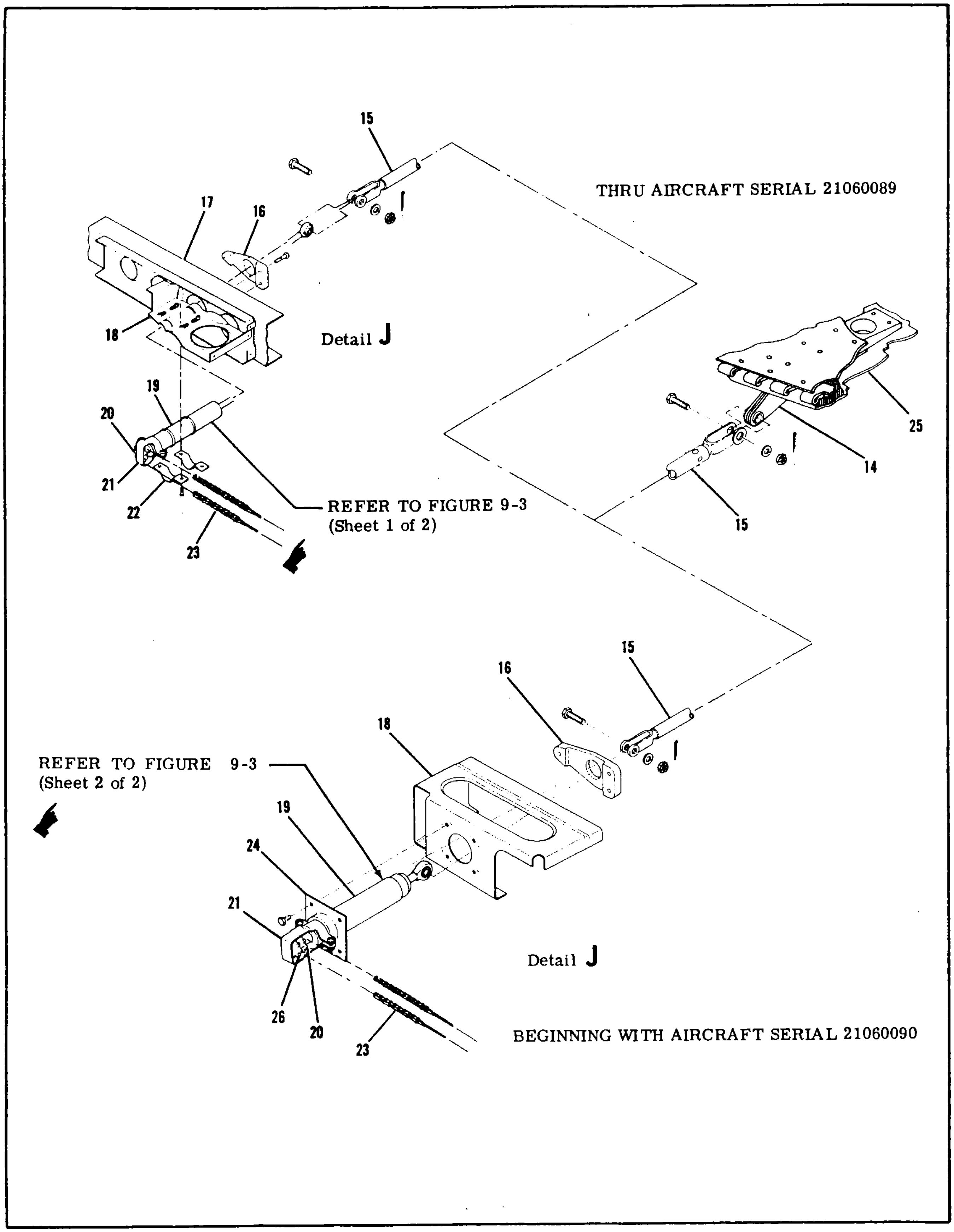


Figure 9-1. Elevator Trim Tab Control System (Sheet 2 of 2)

e. Loosen bolts (12) securing idler sprockets (11) to pedestal structure (9), slide idler sprockets in slotted holes and disengage chain (13) from sprockets.

f. Remove bolts (12), chain guard (7) and indicator (2), using care not to bend indicator or drop parts into tunnel area.

g. Remove roller chain (13) from trim wheel sprocket and carefully slide wheel (5) from pivot stud (20).

h. Reverse the preceding steps for reinstallation. Remove roller chain (13) slack by adjusting idler sprockets (11) in slotted holes and reinstall all items removed for access.

9-10. CABLES AND PULLEYS.

9-11. REMOVAL AND INSTALLATION.

a. FORWARD CABLE. (Refer to figure 9-1.)

1. Peel back carpeting as necessary to expose access plates in cabin and baggage areas and remove plates.

2. Remove safety wire, relieve cable tension and disconnect turnbuckle (8).

3. Disconnect cable ends (10).

4. (Refer to figure 9-4.) Remove pedestal cover as outlined in paragraph 9-13.

5. Remove lower pedestal panel (19) and disengage roller chain (15) from drive sprocket assembly (16).

6. Remove cable guards and pulleys as necessary to work cable free of aircraft.

NOTE

To ease routing of cable, a length of wire may be attached to the end of cable before being withdrawn from aircraft. Leave wire in place, routed through structure; then attach the cable being installed and pull cable into position.

7. Reverse the preceding steps for reinstallation

8. After cable is routed in position, install pulleys and cable guards. Ensure cable is positioned in pulley grooves before installing guards. Ensure roller chain (15) is positioned correctly over drive sprocket (16).

9. Re-rig system in accordance with paragraph 9-14, safety turnbuckle (index 8, figure 9-1) and reinstall all items removed for access.

b. AFT CABLE. (Refer to figure 9-1.)

1. Peel back carpeting as necessary to expose access plates in baggage area and remove plates.

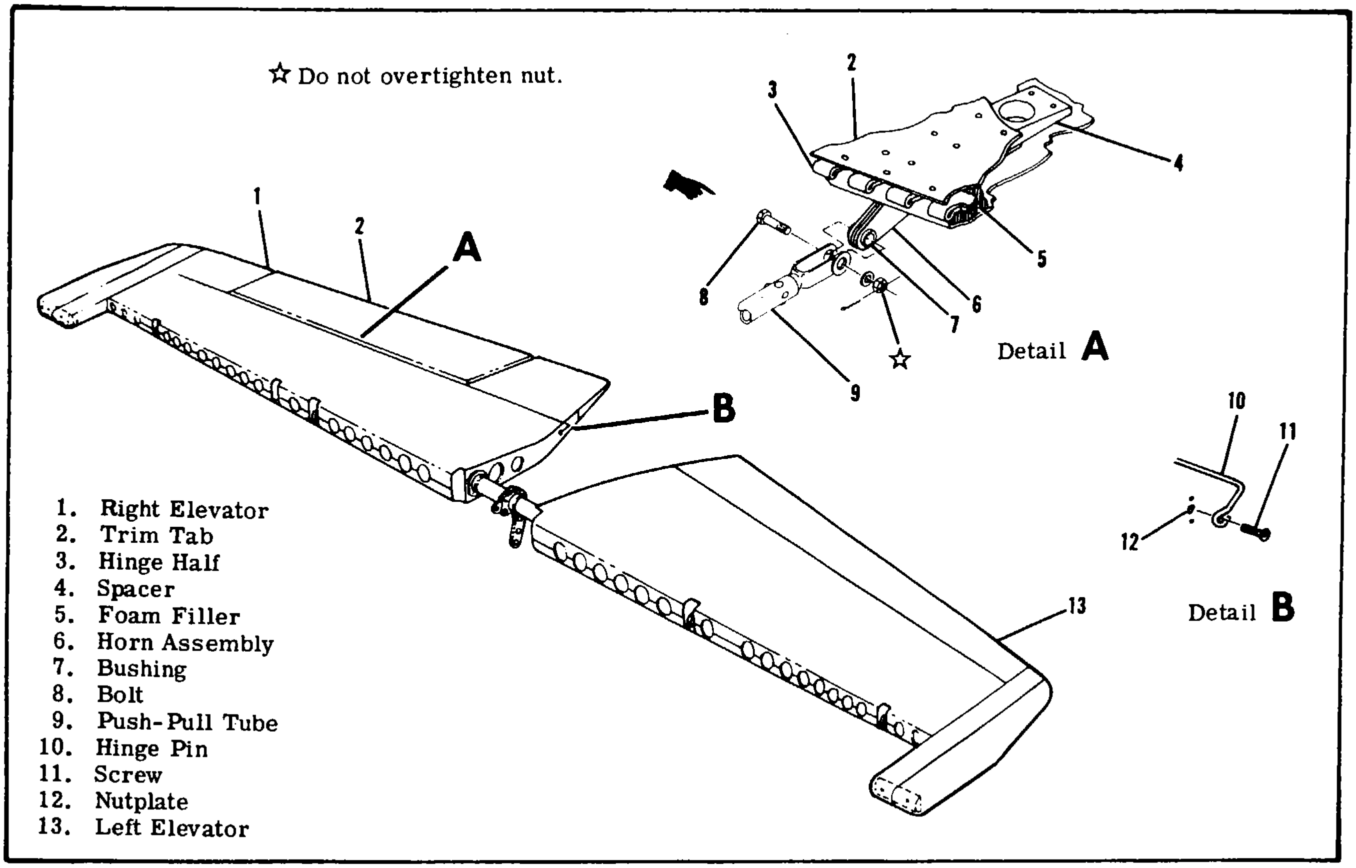
2. Remove rear baggage compartment wall.

3. Remove safety wire, relieve cable tension and disconnect turnbuckle (8).

CAUTION

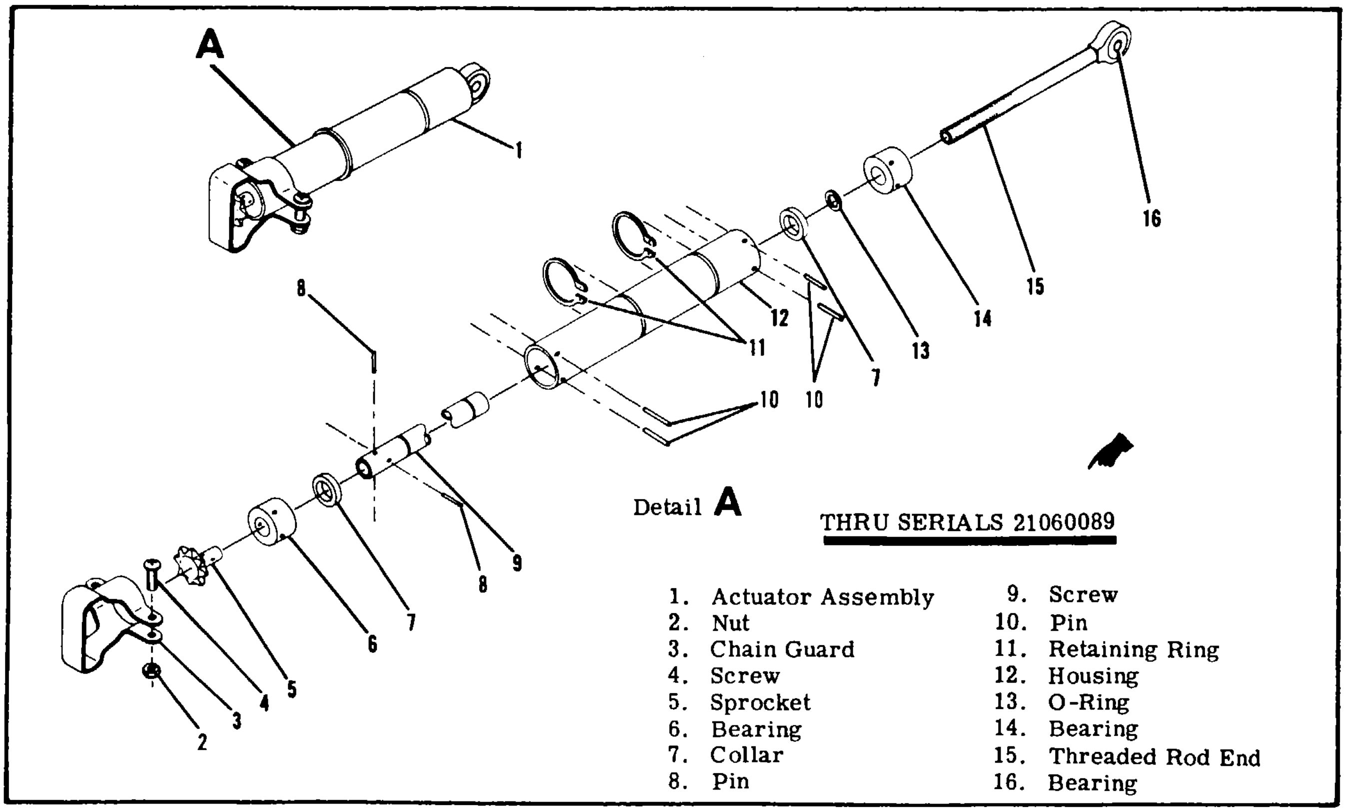
Position a support stand under tail tie-down ring to prevent tailcone from dropping while working inside.

SHOP NOTES:



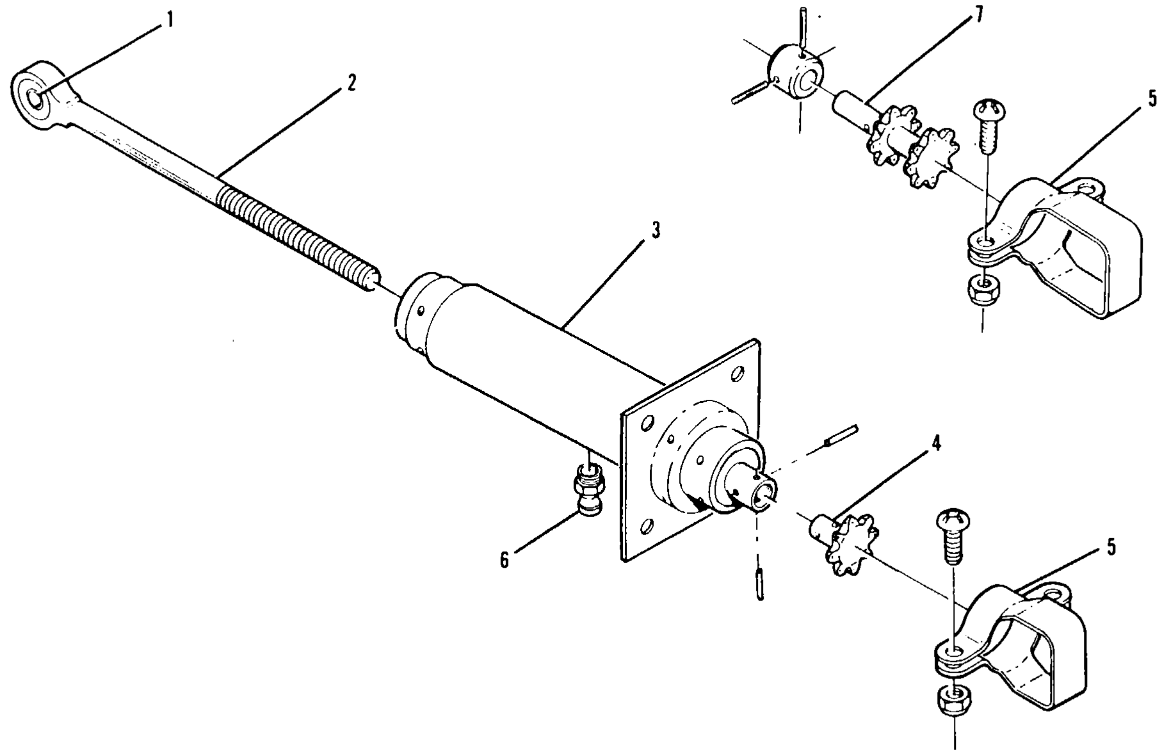
1. Right Elevator
2. Trim Tab
3. Hinge Half
4. Spacer
5. Foam Filler
6. Horn Assembly
7. Bushing
8. Bolt
9. Push-Pull Tube
10. Hinge Pin
11. Screw
12. Nutplate
13. Left Elevator

Figure 9-2. Elevator Trim Tab Installation

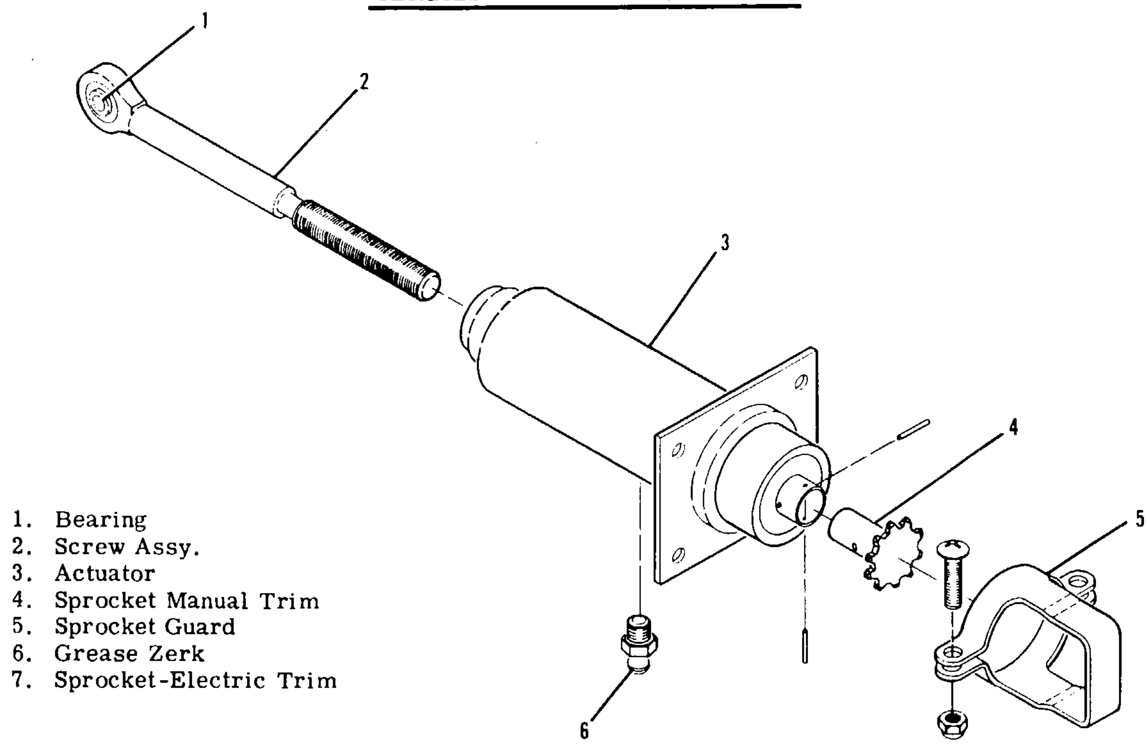


1. Actuator Assembly
2. Nut
3. Chain Guard
4. Screw
5. Sprocket
6. Bearing
7. Collar
8. Pin
9. Screw
10. Pin
11. Retaining Ring
12. Housing
13. O-Ring
14. Bearing
15. Threaded Rod End
16. Bearing

Figure 9-3. Elevator Trim Tab Actuator Assembly (Sheet 1 of 2)

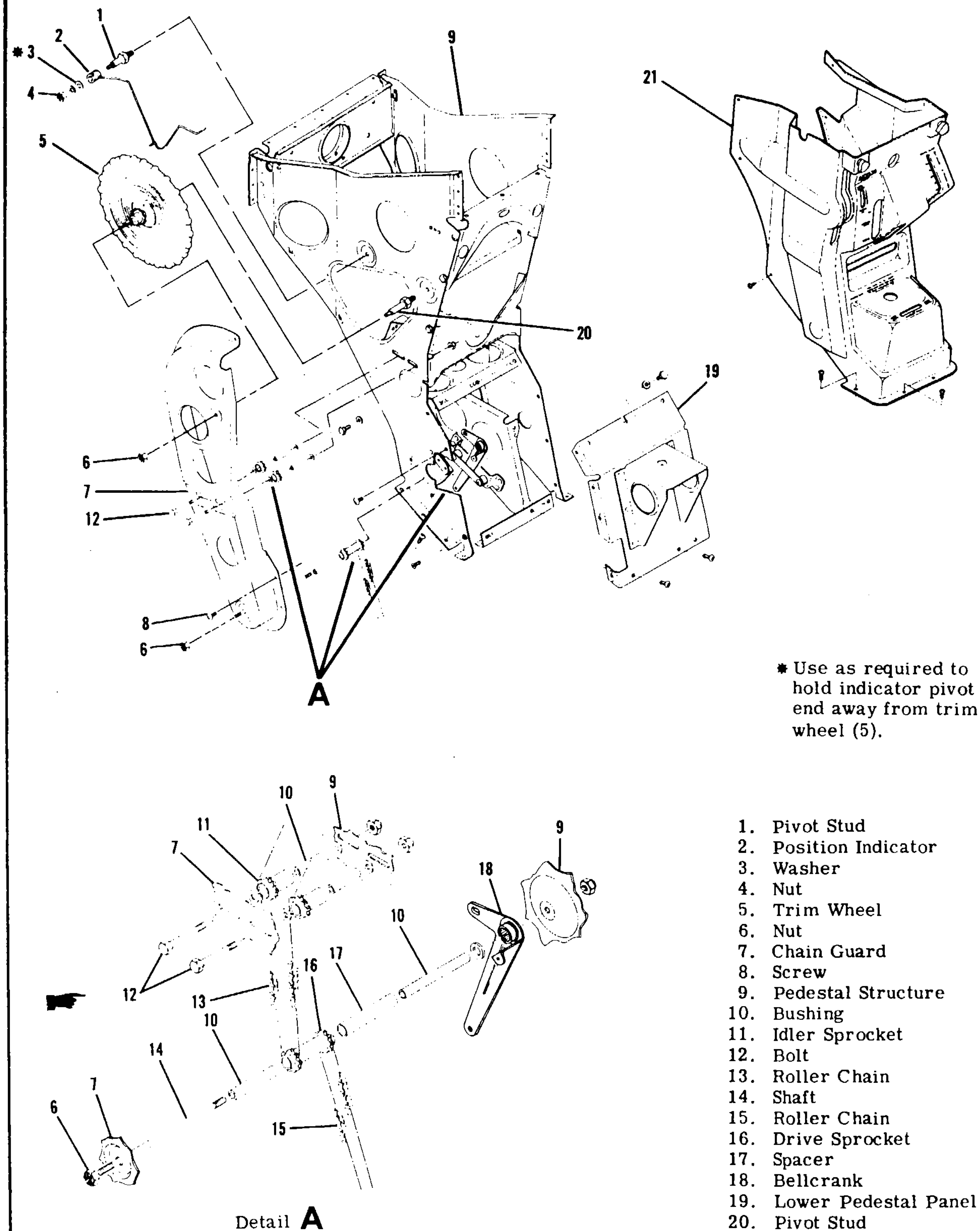


SERIALS 21060089 THRU 21060539



SERIALS 21060540 & ON

Figure 9-3. Elevator Trim Tab-Actuator (Sheet 2 of 2)



* Use as required to hold indicator pivot end away from trim wheel (5).

1. Pivot Stud
2. Position Indicator
3. Washer
4. Nut
5. Trim Wheel
6. Nut
7. Chain Guard
8. Screw
9. Pedestal Structure
10. Bushing
11. Idler Sprocket
12. Bolt
13. Roller Chain
14. Shaft
15. Roller Chain
16. Drive Sprocket
17. Spacer
18. Bellcrank
19. Lower Pedestal Panel
20. Pivot Stud
21. Pedestal Cover
22. Bolt
23. Spacer

THRU AIRCRAFT SERIAL 21059502

Figure 9-4. Elevator Trim Wheel Installation (Sheet 1 of 3)

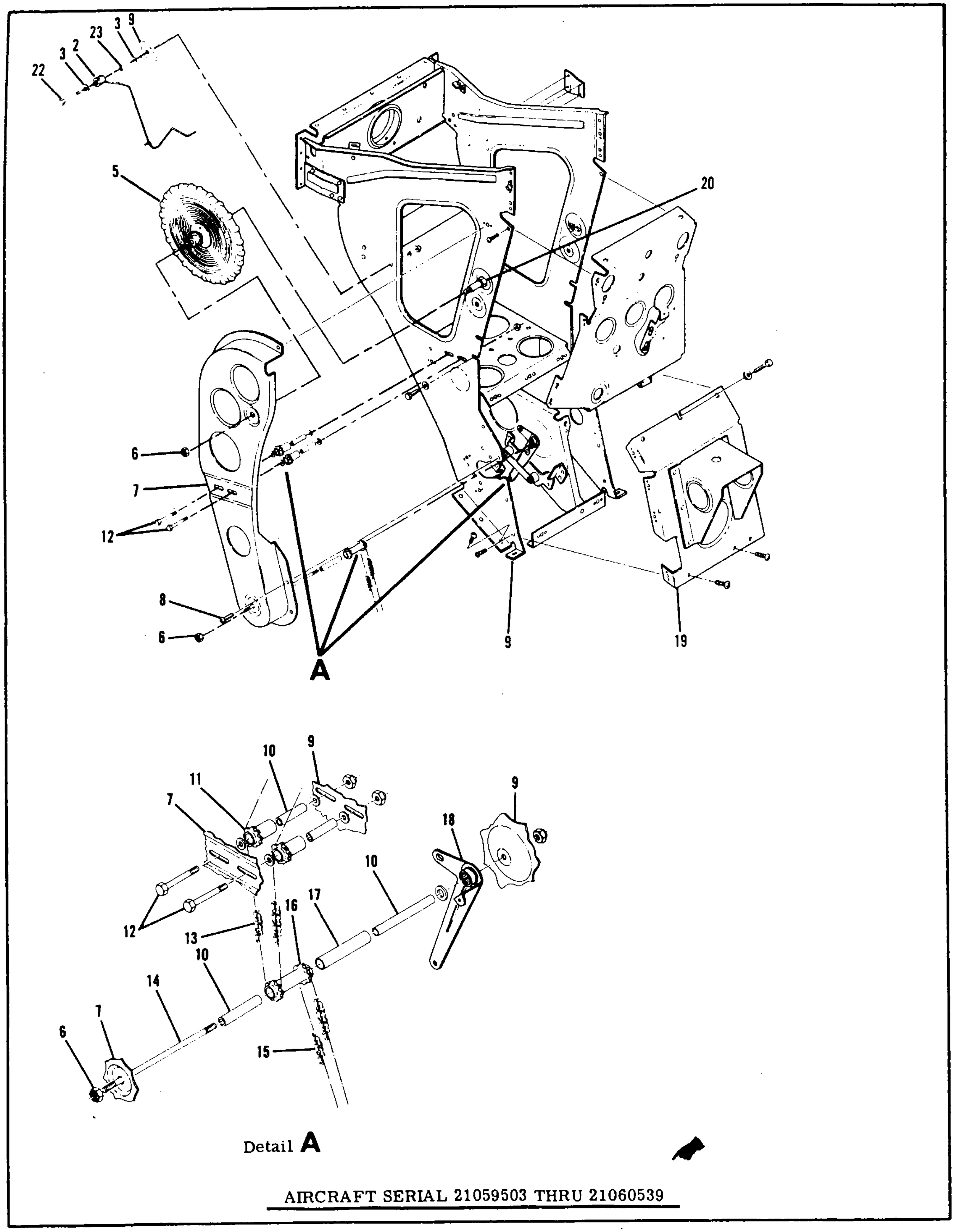
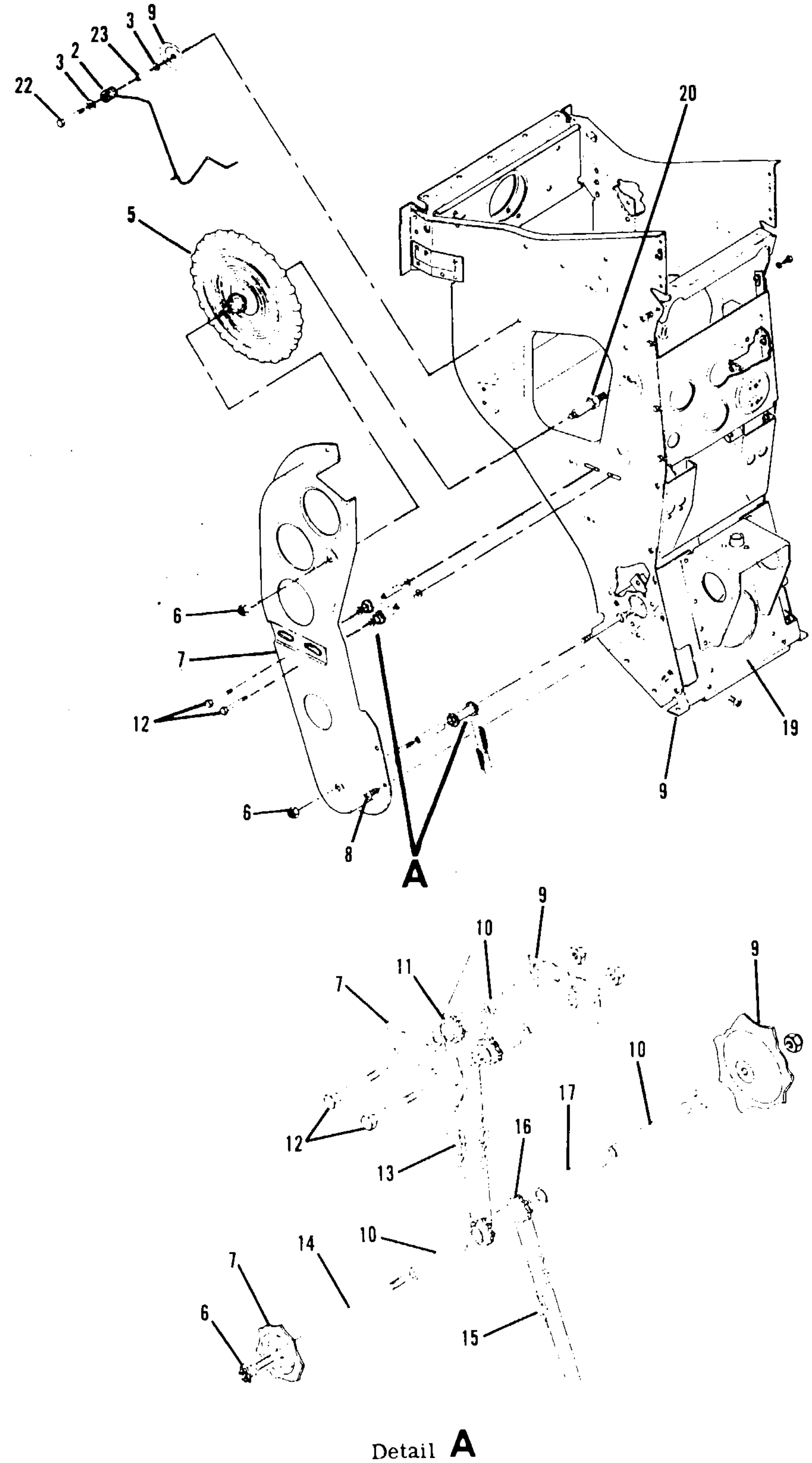
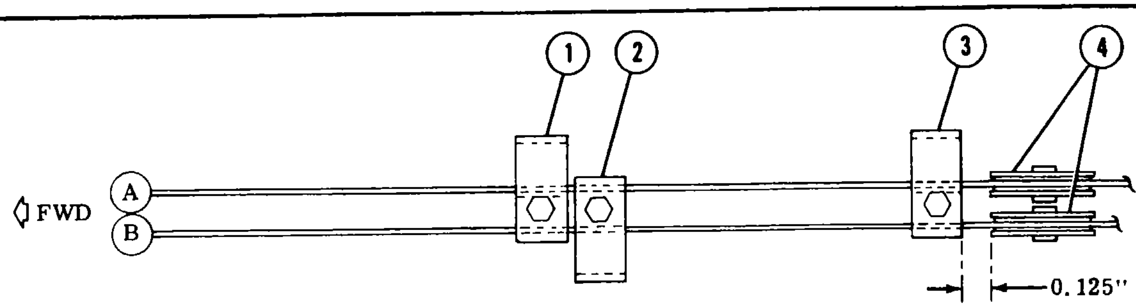


Figure 9-4. Elevator Trim Wheel Installation (Sheet 2 of 3)



BEGINNING WITH AIRCRAFT SERIAL 21060540

Figure 9-4. Elevator Trim Wheel Installation (Sheet 3 of 3)



1. With elevators in neutral, set trim tab to neutral (streamlined).

2. Place inclinometer on trim tab, adjust inclinometer to 0° and lower tab to degree of travel specified in figure 1-1.

3. Position stop block (3) on cable B, maintain 0.125 " between stop block (3) and pulleys (4) when elevator tab is in full down position and secure stop block (3) to cable B.

4. Raise trim tab to specified degree, place stop block (2) against stop block (3) and secure to cable A.

5. Place trim tab in full down position maintaining 0.125 " between stop block (3) and pulleys (4), place stop block (1) against stop block (2) and secure to cable B. (Recheck travel.)

Figure 9-5. Elevator Trim Tab Travel Stop Adjustment

4. Disconnect cable ends (10).
5. Remove travel stop blocks (13).
6. Disconnect electric trim clamps and keepers (indexes 15 and 16, figure 9-6), if installed.
7. Remove access plate beneath trim tab actuator (19) and remove chain guard (21).
8. Disengage roller chain (23) from actuator sprocket (20).
9. Remove cable guards and pulleys as necessary to work cable free of aircraft.

NOTE

To ease routing of cable, a length of wire may be attached to the end of cable before being withdrawn from aircraft. Leave wire in place, routed through structure; then attach the cable being installed and pull cable into position.

10. Reverse the preceding steps for reinstallation.
11. After cable is routed in position, install pulleys and cable guards. Ensure cable is positioned in pulley grooves before installing guards. Ensure roller chain (23) is positioned correctly over actuator sprocket (20).
12. Re-rig system in accordance with paragraph 9-14, safety turnbuckle (8) and reinstall all items removed for access.

9-12. PEDESTAL COVER.

9-13. REMOVAL AND INSTALLATION.

a. Turn fuel selector valve to OFF position and drain fuel from strainer and lines.
b. Remove knurled nut from engine primer if installed and pull plunger from primer body. Protect primer from dirt.
c. Remove fuel selector handle and placard.
d. Remove cowl flap handle knob.
e. Remove electric trim circuit breaker nut and microphone mounting bracket, if installed.
f. Fold carpet back as necessary and remove screws securing cover to floor and pedestal.
g. Disconnect electrical wiring to pedestal lights.
h. Carefully work cover from pedestal to prevent damage.
i. Reverse the preceding steps for reinstallation.

9-14. RIGGING MANUAL TRIM. (Refer to figure 9-1.)

CAUTION

Position a support stand under tail tie-down ring to prevent tailcone from dropping while working inside.

a. Remove rear baggage compartment wall and access plates as necessary.
b. Loosen travel stop blocks (13) on trim tab cables (7 and 12).

c. Disconnect push-pull tube (15) from actuator (19).

d. AIRCRAFT THRU SERIAL 21060089 check cable tension for 10-15 pounds. AIRCRAFT SERIALS 21060090 & on check cable tension for 20+0 -5 pounds. and readjust turnbuckle (8), if necessary.

NOTE

If roller chains and/or cables are being installed, permit actuator screw to rotate freely as roller chains and cables are connected. Adjust cable tension and safety turnbuckle (8).

e. (Refer to figure 9-4.) Rotate trim control wheel (5) full forward (nose down). Ensure pointer (2) does not restrict wheel movement. If necessary to reposition pointer, proceed as follows:

1. Remove pedestal cover as outlined in paragraph 9-13.
2. Loosen nut (6) at trim wheel pivot stud (20).
3. Loosen screws (8) securing chain guard (7) far enough that trim wheel (5) can be moved approximately 1/8 inch, then reposition pointer (2) using a thin screwdriver to pry trailing leg of pointer out of groove in trim wheel. Reposition pointer as required.
4. Tighten nut (6) and screws (8), but do not reinstall pedestal cover until rigging is complete.

NOTE

Full forward (nose down) position of trim wheel is where further movement is prevented by the roller chain or cable ends contacting sprockets or pulleys.

f. With elevator and trim tab both in neutral (streamlined), mount an inclinometer on trim tab and set to 0°. Disregard counterweight areas of elevators when streamlining. These areas are contoured so they will be approximately 3° down when the elevators are streamlined.

NOTE

An inclinometer for measuring control surface travel is available from the Cessna Service Parts Center. Refer to figure 6-4.

g. Rotate actuator screw in or out as required to place trim tab up with a maximum of 2° overtravel, with actuator screw connected to push-pull tube (index 15, figure 9-1).

h. Rotate trim wheel to position trim tab up and down, readjusting actuator screw as required to obtain overtravel in both directions.

i. Position stop blocks and adjust as illustrated in figure 9-5 to degree of trim tab travel specified in figure 1-1.

j. Install pedestal cover and adjust trim tab pointer (2) as follows:

1. Rotate trim control wheel (5) to place tab at 10° up position.
2. Locate the pointer (2) at the TAKE-OFF triangle as viewed from the pilot seat. (Refer to step "e," and reposition pointer if necessary.)
3. Bend pointer (2) as required to clear pedestal cover. (Pointer must NOT rub against pedestal cover or clear cover more than .125 inch maximum.)

k. Safety turnbuckle and reinstall all items removed in step "a".

WARNING

Be sure trim tab moves in correct direction when operated by trim control wheel. Nose down trim corresponds to tab up position.

SHOP NOTES:

9-15. ELECTRIC TRIM ASSIST INSTALLATION. (Refer to figure 9-6.)

9-16. DESCRIPTION. AIRCRAFT SERIAL THRU 21060089. The electric trim assist is operated by a control wheel-mounted switch. The servo unit includes a motor and a chain driven, solenoid-operated, adjustable clutch. The trim tab UP cable enters the servo housing and double wraps around a drive drum. When the clutch is not energized, the drive drum "free wheels" and has no effect on manual operation.

AIRCRAFT BEGINNING WITH SERIAL 21060090. (Refer to figure 9-6. The electric trim assist is operated by two switches mounted on control wheel, one switch operating the disengage switch, the other switch operating electric trim assist. The electric trim circuit breaker is mounted on pedestal cover, the electrical wiring is routed thru cabin and fuselage to Sta. 209.00 then routed UP thru elevator to voltage regulator and drive assembly. The drive assembly includes a gear motor and two sprockets that operate a chain driven, solenoid-operated, adjustable clutch. The actuator assembly has dual sprockets. The manual trim tab UP cable connects to the actuator around the AFT sprocket. The drive assembly connects to the actuator by a chain around the FWD sprocket. When the clutch is not energized, the drive drum "free wheels" and has no effect on manual operation.

9-17. TROUBLE SHOOTING.

TROUBLE	PROBABLE CAUSE	REMEDY
SYSTEM INOPERATIVE.	Circuit breaker out.	Check visually. Reset breaker.
	Defective circuit breaker.	Check continuity. Replace defective breaker.
	Defective wiring.	Check continuity. Repair wiring.
	Defective trim switch.	Check continuity. Replace defective switch.
	Defective trim motor.	Remove and bench test. Replace defective motor.
TRIM MOTOR OPERATING - TRIM TAB FAILS TO MOVE.	Defective clutch solenoid.	Check continuity. Replace solenoid.
	Improperly adjusted clutch tension.	Check and adjust spanner nuts for proper tension.
	Disconnected or broken cable.	Operate manual trim wheel. Connect or replace cable.
	Defective actuator.	Check actuator operation. Replace actuator.

9-18. REMOVAL AND INSTALLATION.

a. Remove aft baggage compartment wall.

NOTE

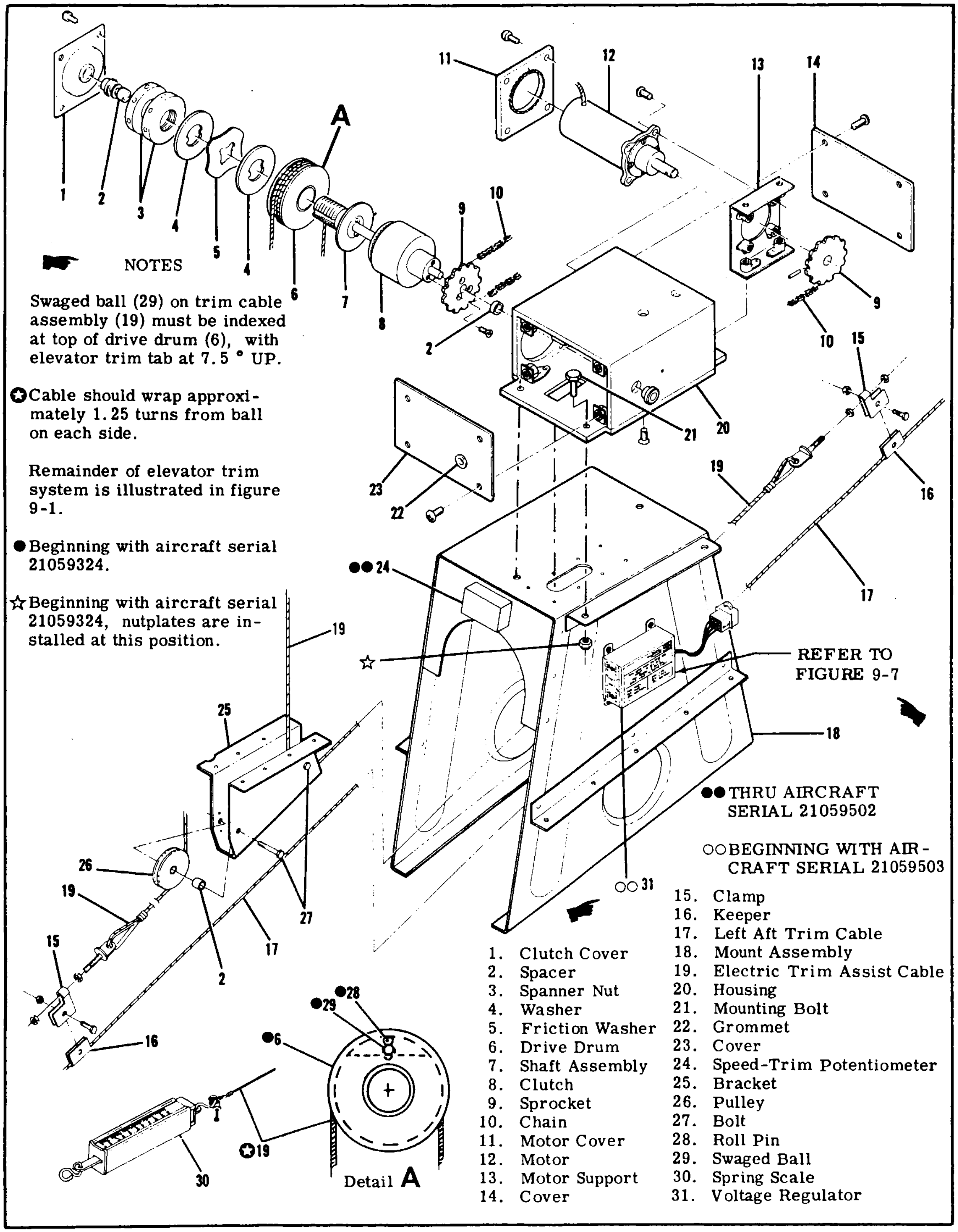
Position a support stand under tail tie-down ring to prevent the tailcone from dropping while working inside.

b. THRU AIRCRAFT SERIAL 21060089. (Refer to figure 9-6, sheet 1)

1. Disconnect electric trim assist cable (19) at both ends by removing clamps (15) from keepers (16).
2. Disconnect electrical wiring form servo unit.
3. Remove bolts (27) securing pulleys (26). Retain spacers (2).
4. Remove mounting bolts (21) and remove unit from aircraft.
5. Reverse preceding steps for reinstallation. Check system rigging in accordance with paragraph 9-19 and re-rig, if necessary.

c. BEGINNING WITH AIRCRAFT SERIAL 21060090. (Refer to figure 9-6, sheet 2)

1. Remove cover (29) below drive assembly (6).
2. Remove cover (28) with voltage regulator attached and carefully disconnect wiring at connectors.
3. Remove sprocket guard (Index 5, figure 9-3, sheet 2) from trim tab actuator (3).
4. Remove mounting bolts from drive assembly and tab actuator and remove from aircraft.
5. Reverse preceding steps for reinstallation. Check system rigging in accordance with paragraph 9-24.



NOTES

Swaged ball (29) on trim cable assembly (19) must be indexed at top of drive drum (6), with elevator trim tab at 7.5 ° UP.

✪ Cable should wrap approximately 1.25 turns from ball on each side.

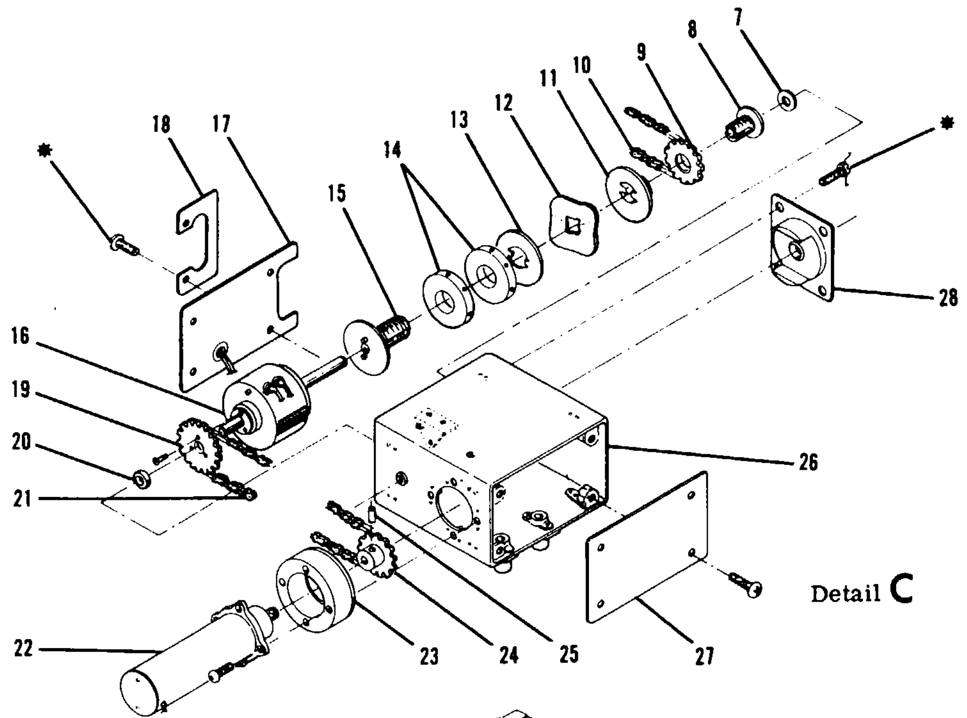
Remainder of elevator trim system is illustrated in figure 9-1.

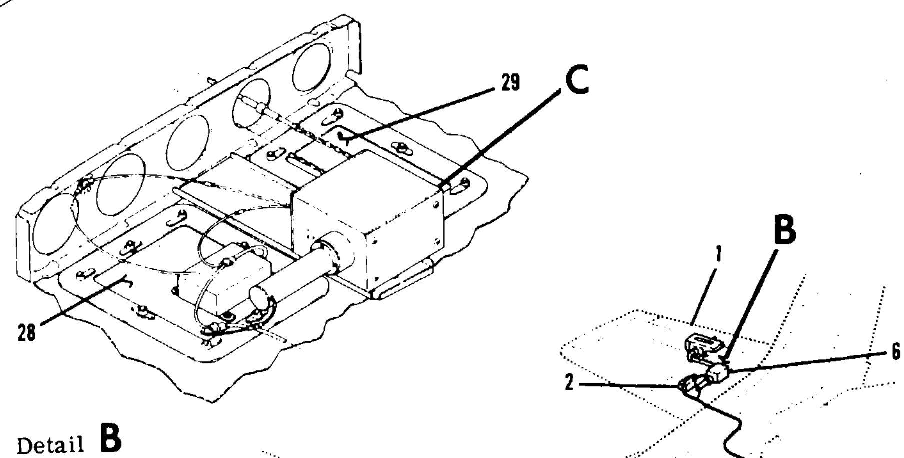
● Beginning with aircraft serial 21059324.

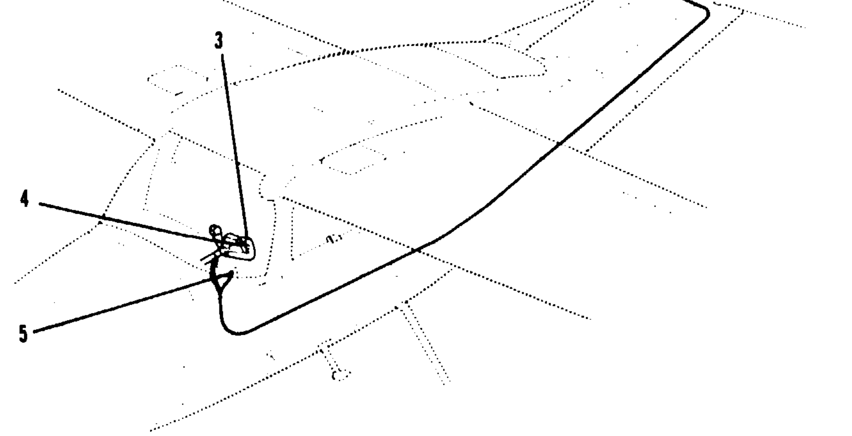
☆ Beginning with aircraft serial 21059324, nutplates are installed at this position.

1. Clutch Cover
2. Spacer
3. Spanner Nut
4. Washer
5. Friction Washer
6. Drive Drum
7. Shaft Assembly
8. Clutch
9. Sprocket
10. Chain
11. Motor Cover
12. Motor
13. Motor Support
14. Cover
15. Clamp
16. Keeper
17. Left Aft Trim Cable
18. Mount Assembly
19. Electric Trim Assist Cable
20. Housing
21. Mounting Bolt
22. Grommet
23. Cover
24. Speed-Trim Potentiometer
25. Bracket
26. Pulley
27. Bolt
28. Roll Pin
29. Swaged Ball
30. Spring Scale
31. Voltage Regulator

Figure 9-6. Electric Elevator Trim Assist Installation (Sheet 1 of 2)





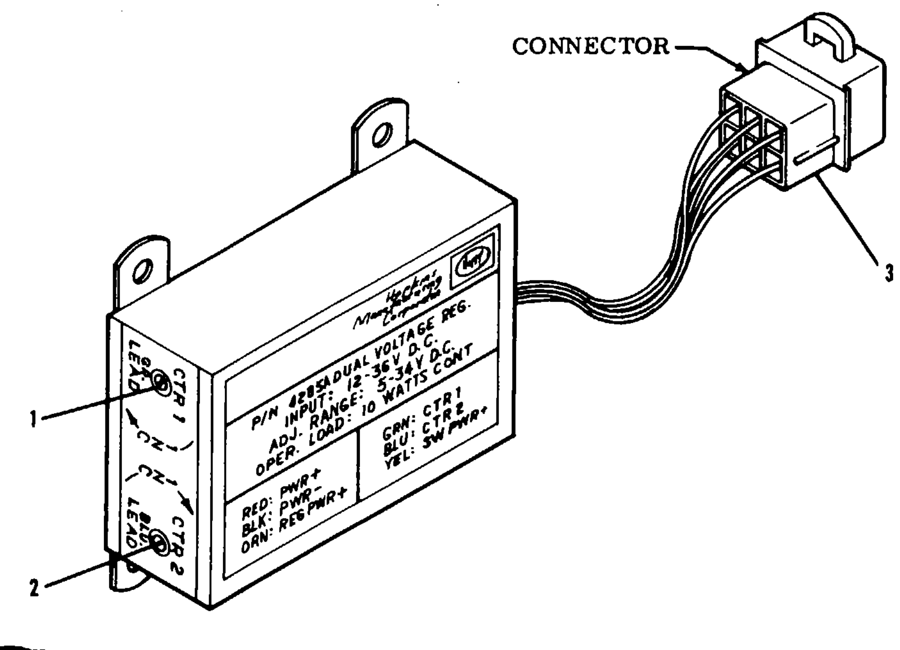


1. Trim Tab
2. Voltage Regulator
3. Trim Switch
4. Disengage Switch
5. Circuit Breaker
6. Drive Assembly
7. Washer
8. Shaft
9. Sprocket
10. Chain Assembly
11. Washer Assembly
12. Spring Washer
13. Washer
14. Nut
15. Shaft Assembly
16. Clutch
17. Cover Assembly
18. Rub Strip
19. Sprocket
20. Bushing
21. Chain
22. Gear Motor
23. Mounting Plate
24. Sprocket
25. Pin
26. Housing Assembly
27. Cover
28. Mounting Plate Assembly
29. Cover
30. Cover

* SAFETY WIRE THESE ITEMS

BEGINNING WITH AIRCRAFT SERIAL 21060090

Figure 9-6 Electric Elevator Trim Assist Installation (Sheet 2 of 2)



1. CTR1 Adjustment
2. CTR2 Adjustment
3. Connector

Figure 9-7. Dual Voltage Regulator

9-19. RIGGING. AIRCRAFT SERIALS THRU 21060089. (Refer to figure 9-6)

NOTE

The manual elevator trim control system MUST be properly rigged in accordance with paragraph 9-14 prior to rigging the electric trim assist system.

a. With elevator and trim tab both in neutral position (streamlined), mount an inclinometer on tab and set to 0°. Disregard counterweight areas of elevators when streamlining. These areas are contoured to be streamlined at crusing speed. (elevators approximately 3° down)

NOTE

An inclinometer for measuring control surface travel is available from the Cessna Service Parts Center. Refer to figure 6-4.

b. Rotate trim control wheel (index 5, figure 9-4), to obtain elevator trim tab mid-travel of 7.5° UP.
c. THRU AIRCRAFT SERIAL 21059323. Ensure the electric trim assist cable (19) has a minimum of 2 1/2 turns around cable drum (6).
d. BEGINNING WITH AIRCRAFT SERIAL 21059324. Rotate drive drum (6) until swaged ball (29) on electric trim assist cable (19) is indexed at the top of drive drum with at least 2 1/2 turns of cable remaining on drum at all times.
e. Attach keepers (16) and clamps (15) to trim control cable (17) and tighten snugly. Ensure cable (19) is in pulley (26) grooves.
f. Slide keepers (16) along trim control cable (17) until tension on trim assist cable (19) matches tension on trim control cable (17). Tension should be 10-15 pounds.
g. THRU AIRCRAFT SERIAL 21059502. Adjust potentiometer (24) to obtain a 24-second travel time from full nose down (tab up) trim to full nose up (tab down) trim. This test and adjustment must be made with engine running to obtain normal operating voltage.

CAUTION

Do not exceed maximum engine temperature.

9-20. CLUTCH ADJUSTMENT. THRU AIRCRAFT SERIALS 21060089 (Refer to figure 9-6.)
a. Remove aft baggage compartment wall.
b. Disconnect electric trim assist cable (19) at both ends by removing clamps (15) from keepers (16).
c. Disconnect electrical power to the motor assembly (12) by unplugging the connector installed in the RED wire leading to the motor assembly.

NOTE

Step "c" isolates the motor assembly from the remainder of the electric trim system so it cannot be engaged during clutch adjustment.

d. Remove screws securing cover (23) to housing (20) and slide cover down over electrical wiring far enough to expose the clutch assembly.
e. Ensure the electric trim circuit breaker on the pedestal is pushed IN and place master switch in ON position.
f. Operate control wheel-mounted switch UP or

DOWN to energize the clutch solenoid (8).

g. Attach the spring scale (30) into the forward eye of trim cable (19) and pull scale slowly until slippage is noticed.

h. Repeat steps "f" and "g" several times to break the initial friction of the clutch, making sure that cable (19) is rewound on drive drum (6) after each slippage test.

i. Repeat steps "f" and "g" very slowly, carefully watching the indicator on spring scale (30). Slippage should occur between 45 and 50 pounds.

j. If tension is not within tolerance, loosen OUTSIDE spanner nut (3) which acts as a lock. Tighten INSIDE spanner nut to increase clutch tension and loosen nut to decrease clutch tension.

NOTE

Spanner nuts (3) may be loosened or tightened with suitable hammer and punch.

k. Repeat steps "i" and "j" until tension is between 45 and 50 pounds, then tighten outside spanner nut against inside nut.

l. Connect electrical wiring to motor assembly which was removed in step "c", re-rig trim system in accordance with paragraph 9-19 and reinstall all items removed for access.

BEGINNING WITH AIRCRAFT SERIAL 21060090 (Refer to figure 9-6.)

1. Remove access plate below actuator and covers (28) & (29).
2. Remove safety wire and relieve cable tension and chain tension at turnbuckles.
3. Disconnect electric motor by unplugging the three Mate-N-Lok connectors leading to the motor assembly.
4. Remove mounting bolts from drive assembly. It is necessary to remove from elevator to make the necessary adjustments to clutch.

NOTE

Step 3 isolates the motor assembly from the remainder of the electric trim system so it cannot be engaged during clutch adjustment.

5. Remove screws securing covers (18) and (17) to housing (26) and slide the cover down over electrical wiring far enough to expose the clutch assembly.
6. Ensure the electric trim circuit breaker on the pedestal cover is pushed in and place master switch in the ON position.
7. Operate control wheel-mounted switch UP or DOWN to energize the solenoid clutch (16).
8. Attach the spring scale to chain and pull scale slowly until slippage is noticed.
9. Repeat Steps 7 & 8 several times to break the initial friction of the clutch.
10. Repeat Steps 8 and 9 very slowly, carefully watching the indicator on the spring scale. Slippage should occur between 38.6 to 42.5 lbs. on 12 and 24 volt aircraft systems.
11. IF tension is not within tolerance, loosen OUTSIDE spanner nut (14) which acts as a lock. Tighten INSIDE spanner nut to increase clutch tension and loosen nut to decrease clutch tension.

NOTE

Spanner nut (14) may be loosened or tightened with a suitable hammer and punch.

12. Repeat Steps 10 and 11 until tension is in accordance with 10. then tighten outside spanner nut against inside nut.
13. Connect electrical wiring to motor assembly which was removed in Step 3, re-rig trim system in accordance with paragraphs 9-14 and 9-24 and reinstall all items removed for access.

SHOP NOTES:

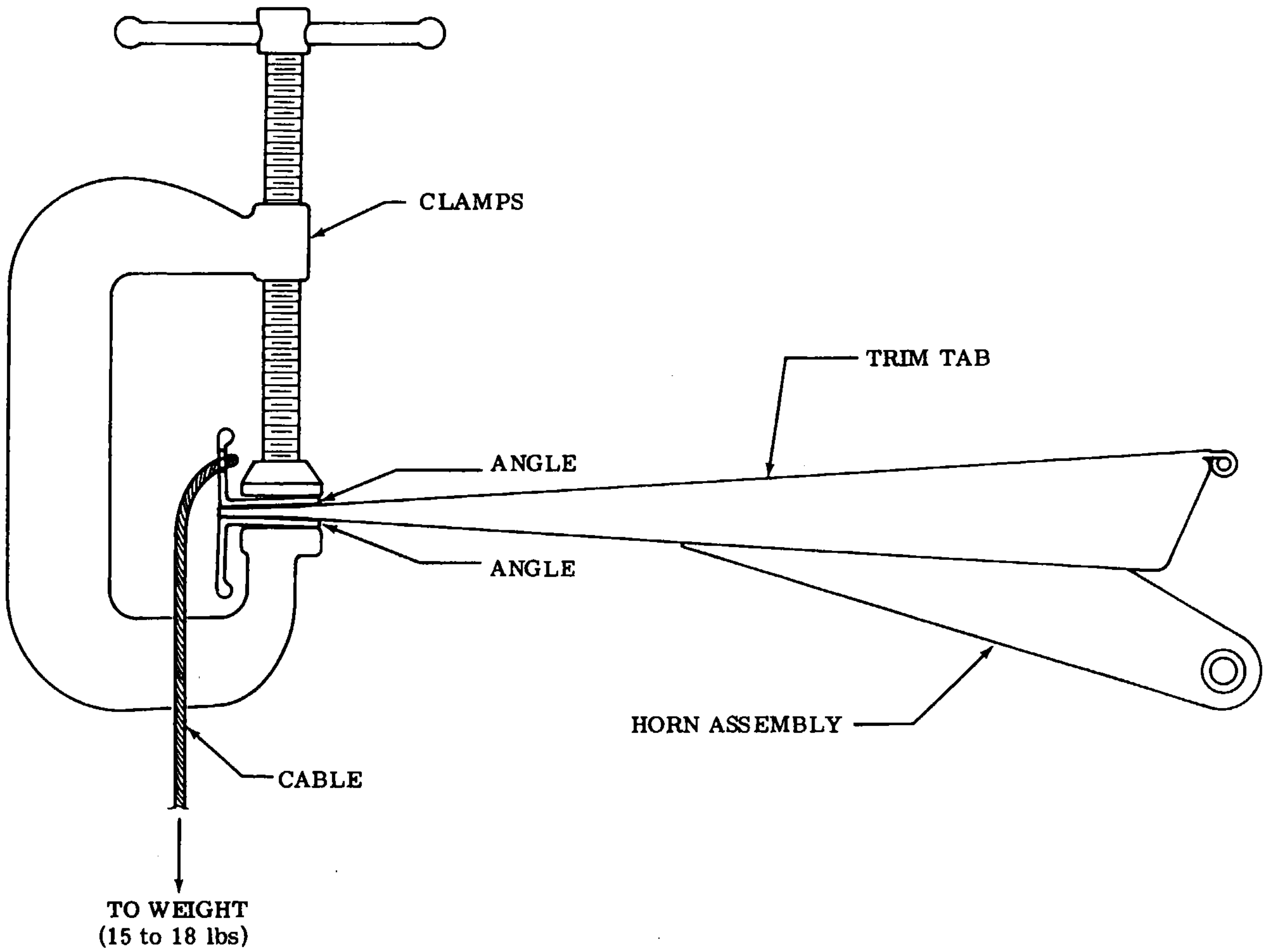


Figure 9-9. Trim Tab Simulated Air Load Test

9-21. TRIM TAB SIMULATED AIR LOAD TEST. ALL AIRCRAFT WITH ELECTRIC TRIM INSTALLATION (Refer to figure 9-9.)

NOTE

The manual elevator trim control system must be properly rigged, the aircraft electrical operating voltage must be normal, the electric trim assist clutch must be properly adjusted and the elevator must be in neutral position prior to completing the following steps.

a. Attach two angles approximately 18 inches in length to the trailing edge of the trim tab with clamps as illustrated to prevent bending of tab trailing edge.

b. Attach a cable directly aft of the trim tab horn assembly.

c. Attach 15 pounds minimum to 18 pounds maximum of weight (including the angles, clamps and cable) to the cable and operate the trim switch to place the tab in the UP position. The clutch MUST lift 15 pounds weight to the FULL UP position but must slip at 18 pounds.

NOTE

If the electric trim clutch slips prior to lifting the required weight to the full up position, DO NOT READJUST CLUTCH, refer to step "d" or step 5 to locate and remove the reason for excessive friction in the elevator trim control system.

d. Check the trim tab hinge and linkage for binding, check the trim system cables and chains for proper tension, check system pulleys and actuator for binding.

e. After the trim system has been thoroughly checked and excessive friction removed, repeat step "c", or step 3.

9-22. SPEED-TRIM POTENTIOMETER ADJUSTMENT. THRU AIRCRAFT SERIAL 21059502. (Refer to Figure 9-6.)

1. Remove aft baggage compartment wall.

2. Connect an external power source of 13.75 volts (aircraft equipped with 12 volt electrical systems) dc continuous to the aircraft electrical system, or if an external power supply is not available, run the aircraft engine at approximately 1000 RPM to maintain the normal operating aircraft voltage.

3. Disconnect the electrical power leads to the motor by unplugging the connector installed in the RED and BLACK wires leading to the motor assembly.

4. Operate the electric trim switch to the NOSE UP and NOSE DOWN positions and check voltage present at the RED and BLACK wires.

5. For adjustment, in accordance with paragraph 9-19 step g.

9-23. DUAL VOLTAGE REGULATOR ADJUSTMENT AIRCRAFT SERIALS 21059503 THRU 21060089 WHEN EQUIPPED WITH ELECTRIC TRIM INSTALLED. (Refer to figure 9-7.)

a. Connect an external power source of 27.5 volts dc continuous to the aircraft electrical system, or if an external power supply is not available, run the aircraft engine at approximately 1000 rpm to maintain the normal operating aircraft voltage.

b. Adjust CTR 1 and CTR 2 adjustment screws on the regulator counterclockwise (CCW) to prevent the possibility of an overvoltage being applied to the trim motor.

c. Actuate the trim control switch to place the trim pointer in the full NOSE DOWN position, then record the time required to actuate the trim tab from full NOSE DOWN position to full NOSE UP position.

d. Adjust CTR 1 on the regulator clockwise (CW) and repeat step "c" until 24±1 second NOSE UP trim is obtained.

CAUTION

The trim motor should be allowed to cool between voltage regulator adjustments for approximately 5 minutes if several actuations of the motor becomes necessary during adjustment.

e. Actuate the trim control switch to place the trim pointer in the full NOSE UP position, then record the time required to actuate the trim tab from full NOSE UP position to full NOSE DOWN position. The elapsed time should be 19±1 second.

f. If the elapsed time is incorrect, adjust CTR 2 on the regulator clockwise (CW) and repeat step 5 until 19±1 second NOSE DOWN trim is obtained.

NOTE

Steps "c" through "f" are to be performed under no-load conditions (no loads placed on the trim tab). If problems are encountered in flight with the electric trim unable to trim the aircraft up to red line speed, check and readjust clutch if necessary.

DUAL VOLTAGE REGULATOR ADJUSTMENT. (ALL AIRCRAFT EQUIPPED WITH ELECTRIC TRIM ASSIST.) AIRCRAFT SERIAL 21060090 & ON (Refer to figure 9-6.)

1. Remove access cover (28).

2. Connect an external power source of 27.5 volts (aircraft equipped with 24 volt electrical systems) dc continuous to the aircraft electrical system, or if an external power supply is not available, run the aircraft engine at approximately 1000 RPM to maintain the normal operating aircraft voltage.

3. Disconnect the electrical power leads to the motor by unplugging the connectors installed in the RED and BLACK wire leading to the motor assembly.

4. Connect one lead of a dc voltmeter capable of measuring the aircraft voltage to either the RED or BLACK wire leading to the motor and the other voltmeter lead to a good aircraft ground.

5. Operate the electric trim switch to the NOSE UP and NOSE DOWN positions and check voltage present at the RED and BLACK wires.

6. Adjust CTR 1 and CTR 2 adjustment screws on the voltage regulator counterclockwise (CCW), then slowly turn adjustment screws clockwise (CW) until a 10 volt output is obtained for both (RED and BLACK) lead.

7. Check to see if full "NOSE UP" to full "NOSE DOWN" and full "NOSE DOWN" to full "NOSE UP" is 39±1 on 24 volt system.

8. Remove voltmeter and reconnect the motor assembly power leads. Be sure to connect RED to RED and BLACK to BLACK when reconnecting leads.

9. Check trim system for proper operation and reinstall all items removed for access.

CAUTION

The trim motor should be allowed to cool between voltage regulator adjustments for approximately 5 minutes if several actuations of the motor becomes necessary during adjustment.

9-24. RIGGING - ELECTRIC TRIM ASSIST. BEGINNING WITH AIRCRAFT SERIAL 21060090 (Refer to figure 9-8.)

1. The standard manual elevator trim control system MUST be rigged in accordance with paragraph 9-14 prior to rigging the electric trim assist.

2. Move elevator trim tab to full "NOSE UP" position.

3. Locate NAS288 on upper side of chain at a point 0.70 inches form drive assembly housing.

4. Adjust AN155 barrel until chain deflection between sprockets is approximately 0.25 inch.

5. Resafety turnbuckle and reinstall all items removed for access.

SECTION 10

RUDDER CONTROL SYSTEM

TABLE OF CONTENTS

10-1. RUDDER CONTROL SYSTEM. (Refer to figure 10-1.)

10-2. DESCRIPTION. Rudder control is maintained through use of conventional rudder pedals which also control nose wheel steering. The system is comprised of the rudder pedals installation, cables and pulleys, all of which link the pedals to the rudder and nose wheel steering. When dual controls are installed, stowable rudder pedals are provided at the copilot's position.

10-3. TROUBLE SHOOTING.

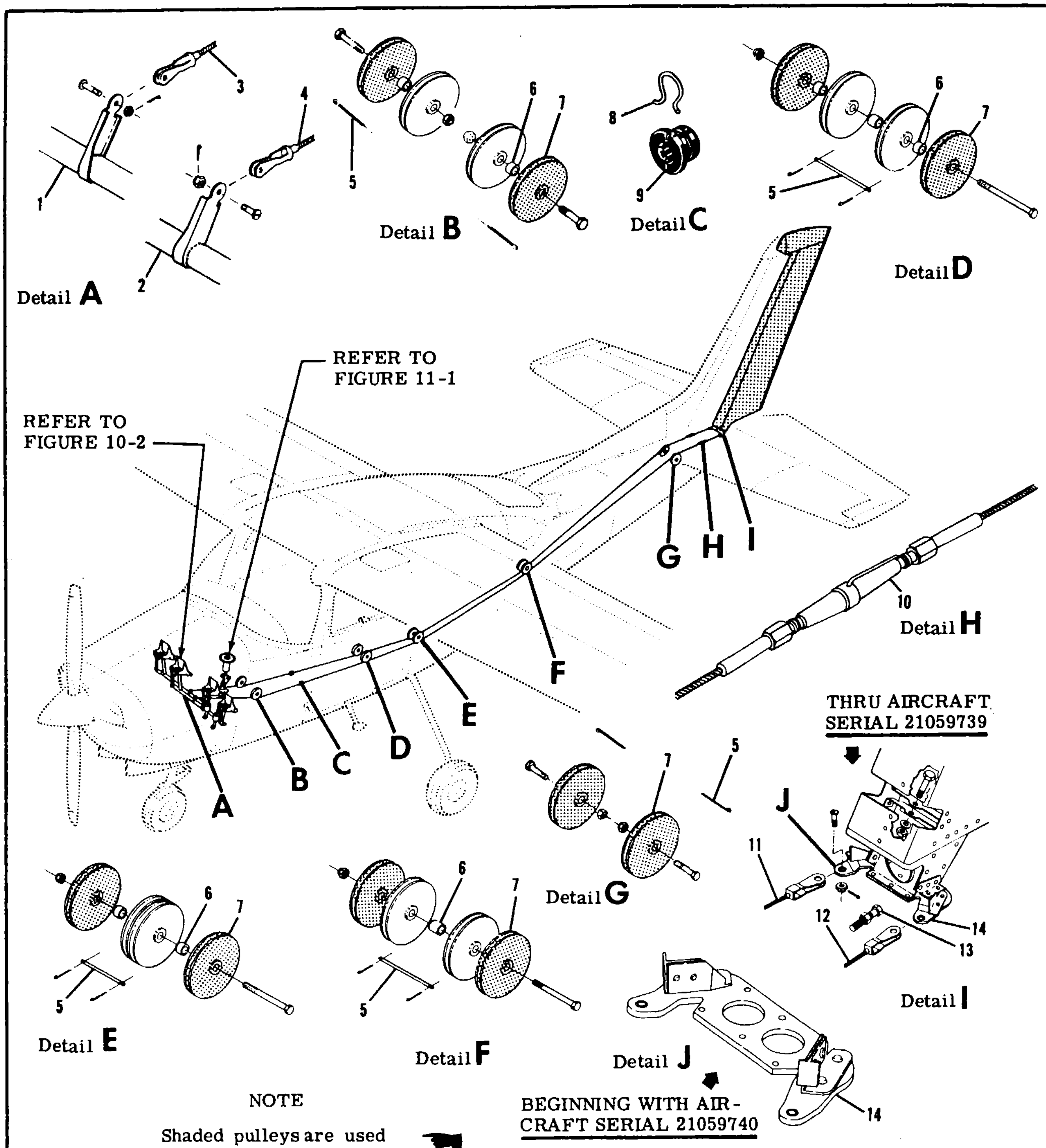
NOTE

Due to remedy procedures in the following trouble shooting chart it may be necessary to re-rig system, refer to paragraph 10-11.

TROUBLE	PROBABLE CAUSE	REMEDY
RUDDER DOES NOT RESPOND TO PEDAL MOVEMENT.	Broken or disconnected cables.	Open access plates and check visually. Connect or replace cables.

10-3. TROUBLE SHOOTING (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
BINDING OR JUMPY MOVEMENT OF RUDDER PEDALS.	Cables too tight.	Refer to figure 10-1 for cable tension. Rig system in accordance with paragraph 10-11.
	Cables not riding properly on pulleys.	Open access plates and check visually. Route cables correctly over pulleys.
	Binding, broken or defective pulleys or cable guards.	Open access plates and check visually. Replace defective pulleys and install guards properly.
	Pedal bars need lubrication.	Refer to Section 2.
	Defective rudder bar bearings.	If lubrication fails to eliminate binding. Replace bearing blocks.
	Defective rudder hinge bushings.	Check visually. Replace defective bushings.
	Clevis bolts too tight.	Check and readjust bolts to eliminate binding.
	Steering rods improperly adjusted.	Rig system in accordance with paragraph 10-11.
LOST MOTION BETWEEN RUDDER PEDALS AND RUDDER.	Insufficient cable tension.	Refer to figure 10-1 for cable tension. Rig system in accordance with paragraph 10-11.
INCORRECT RUDDER TRAVEL.	Incorrect rigging.	Rig in accordance with paragraph 10-11.
STOWABLE PEDALS DO NOT DISENGAGE.	Broken or defective control.	Disengage control and check manually. Replace control.
STOWABLE PEDALS DO NOT STOW.	Defective cover, catch or latch pin.	Check visually. Replace defective parts.
STOWABLE PEDALS DO NOT RE-ENGAGE.	Binding control.	Check control operation. Repair or replace control.
	Misaligned or bent mechanism.	Check visually. Repair or replace defective parts.



NOTE

Shaded pulleys are used for this system only.

CAUTION

MAINTAIN PROPER CONTROL CABLE TENSION.

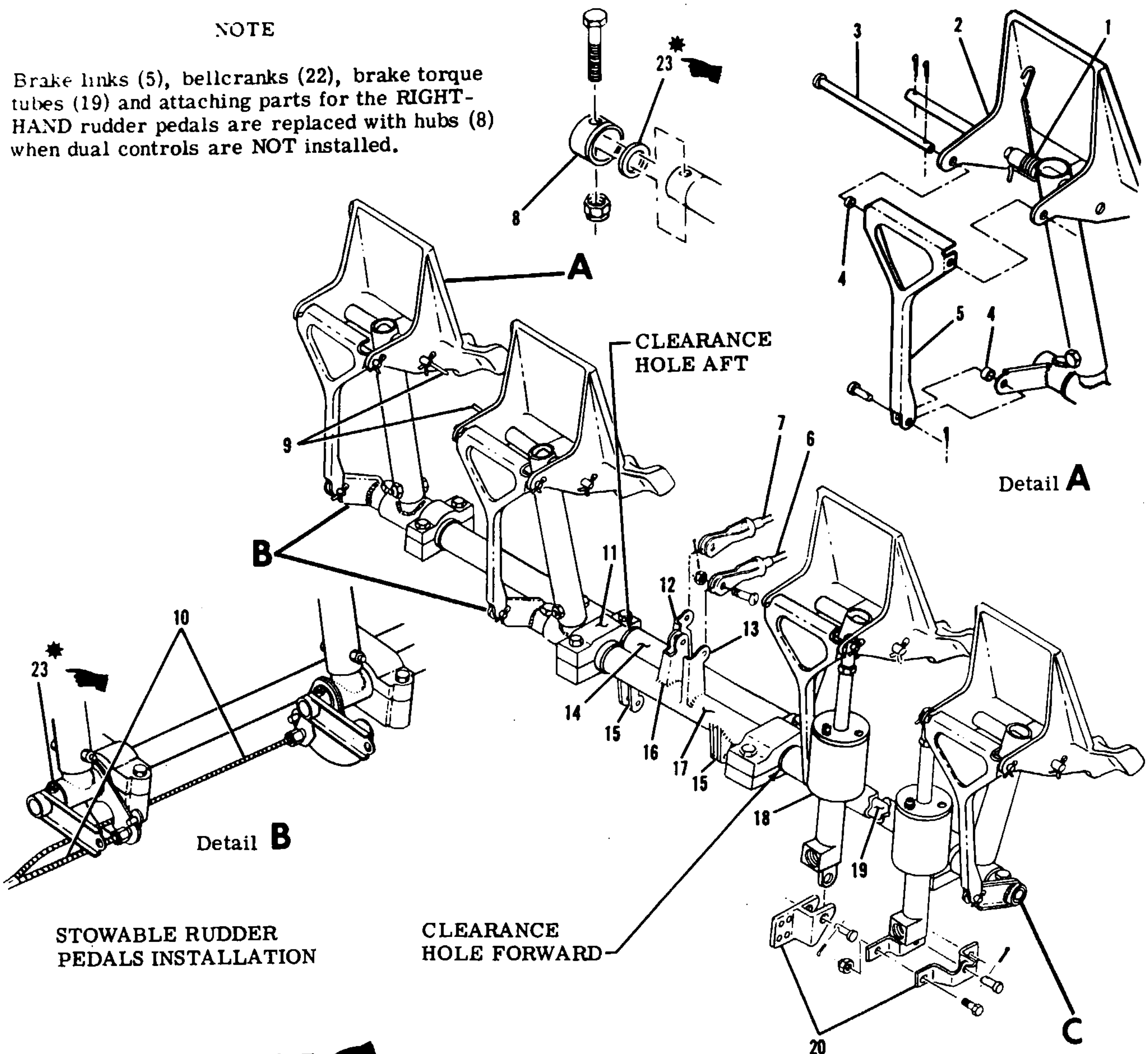
1. Right Rudder Bar
2. Left Rudder Bar
3. Right Forward Cable
4. Left Forward Cable
5. Cable Guard
6. Spacer
7. Pulley
8. Clip
9. Fairlead
10. Turnbuckle
11. Right Rear Cable
12. Left Rear Cable
13. Stop Bolt
14. Bellcrank

CABLE TENSION: 30 LBS ± 10 LBS (AT AVERAGE TEMPERATURE FOR THE AREA.) REFER TO FIGURE 1-1 FOR TRAVEL.

Figure 10-1. Rudder Control System

NOTE

Brake links (5), bellcranks (22), brake torque tubes (19) and attaching parts for the RIGHT-HAND rudder pedals are replaced with hubs (8) when dual controls are NOT installed.



NOTE

At least one washer (23) must be installed at the location shown.

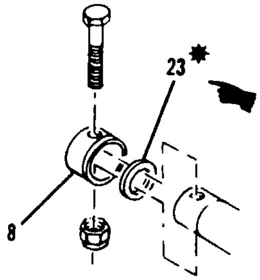
1. Anti-Rattle Spring
2. Pedal
3. Shaft
4. Spacer
5. Brake Link
6. Cable (Left Forward)
7. Cable (Right Forward)
8. Single Controls Hub
9. Pin (Stowable Pedals Only)
10. Stowable Pedals Controls
11. Bearing Block
12. Right Rudder Cable Arm
13. Left Rudder Cable Arm
14. Aft Rudder Bar
15. Nosewheel Steering Arm
16. Rudder Trim Bungee Arm
17. Forward Rudder Bar
18. Master Cylinder
19. Brake Torque Tube
20. Bracket
21. Bearing
22. Bellcrank
23. Washer

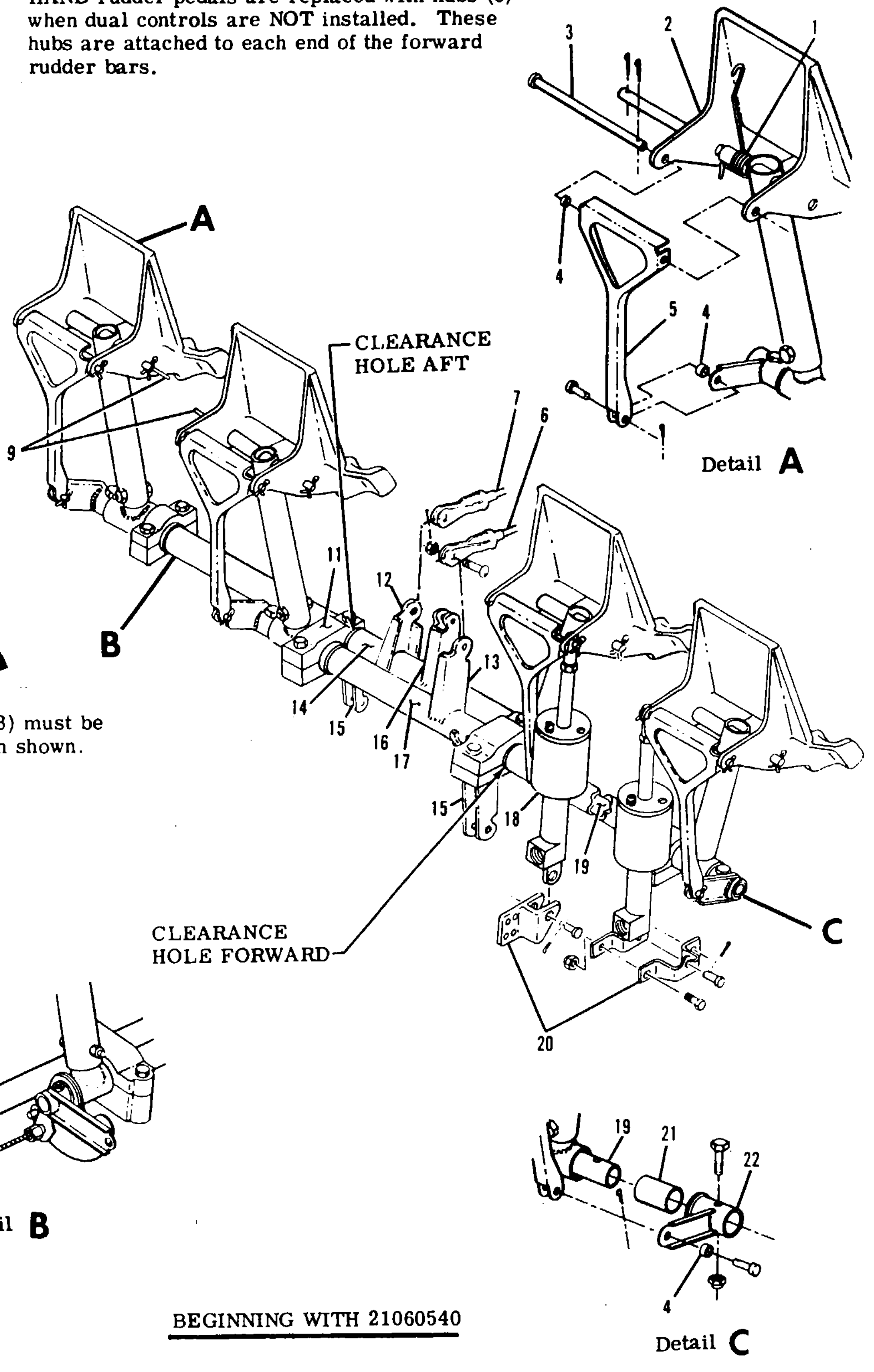
THRU 21050539

Figure 10-2. Rudder Pedals Installation (Sheet 1 of 2)

NOTE

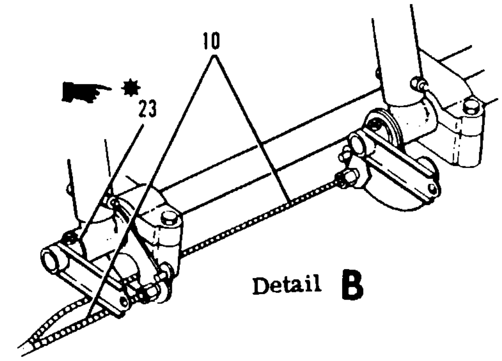
Brake links (5), bellcranks (22), brake torque tubes (19) and attaching parts for the RIGHT-HAND rudder pedals are replaced with hubs (8) when dual controls are NOT installed. These hubs are attached to each end of the forward rudder bars.





* NOTE

At least one washer (23) must be installed at the location shown.



STOWABLE RUDDER PEDALS INSTALLATION

BEGINNING WITH 21060540

Figure 10-2. Rudder Pedals Installation (Sheet 2 of 2)

1. Steering Arm
2. Steering Bungee
3. Adjustable Rod End
4. Whiffletree (Steering Bellcrank)
5. Link Rod Assembly
6. Clamp
7. Boot
8. Boot Retainer
9. Right Rudder Bar Arm
10. Left Rudder Bar Arm

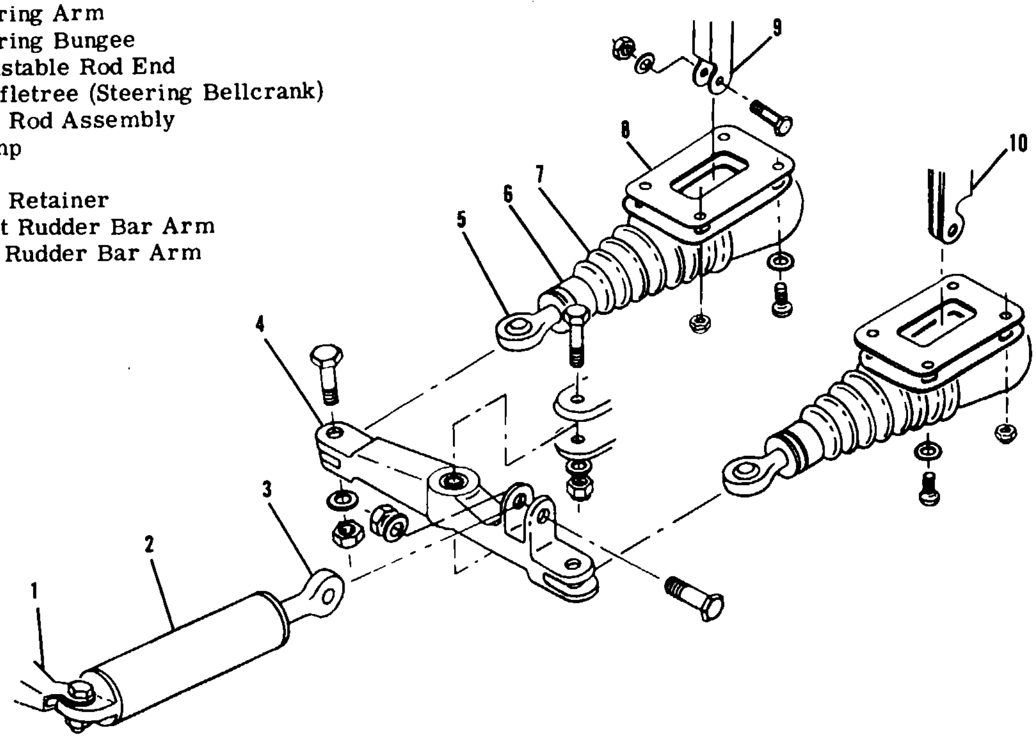


Figure 10-3. Nose Gear Steering Installation

10-4. RUDDER PEDAL ASSEMBLY.

10-5. REMOVAL AND INSTALLATION. (Refer to figure 10-2.)

a. Remove carpeting, shields and soundproofing from the rudder pedal and tunnel areas as necessary for access.

b. Disconnect brake master cylinders (18) and parking brake cables at pilot's rudder pedals.

c. Remove rudder pedals (2) and brake links (5).

d. Disconnect stowable rudder pedal controls (10).

e. Remove fairing from either side of vertical fin, remove safety wire and relieve cable tension by loosening turnbuckles (index 10, figure 10-1).

f. Disconnect cables (6 and 7) from rudder bar arms (12 and 13).

g. Disconnect rudder trim bungee from rudder bar arm (16).

h. (Refer to figure 10-3.) Disconnect whiffletree link rod assemblies (5) at rudder bar arms (9 and 10).

i. (Refer to figure 10-2.) Remove bolts securing bearing blocks (11) and carefully work rudder bars out of tunnel area.

NOTE

The two inboard bearing blocks contain clearance holes for the rudder bars at one end and a bearing hole at the other. Tag these bearing blocks for reference on reinstallation.

j. Reverse the preceding steps for reinstallation. Lubricate rudder bar assemblies as outlined in Section 2. Rig system in accordance with paragraph 10-11, safety turnbuckles and reinstall all items removed for access.

10-6. RUDDER. (Refer to figure 10-4.)

10-7. REMOVAL AND INSTALLATION.

a. Remove stinger.

b. Disconnect tail navigation light wire.

c. Remove fairing from either side of vertical fin, remove turnbuckles (index 10, figure 10-1.)

d. Disconnect cables (4 and 6) from rudder bellcrank (3).

e. With rudder supported, remove all hinge bolts (2) and using care, lift rudder free of vertical fin.

f. Reverse the preceding steps for reinstallation. Rig system in accordance with paragraph 10-11, safety turnbuckles and reinstall all items removed for access.

10-8. REPAIR. Repair may be accomplished as outlined in Section 18.

10-9. CABLES AND PULLEYS. (Refer to figure 10-1.)

10-10. REMOVAL AND INSTALLATION.

a. Remove seats, upholstery and access plates as necessary.

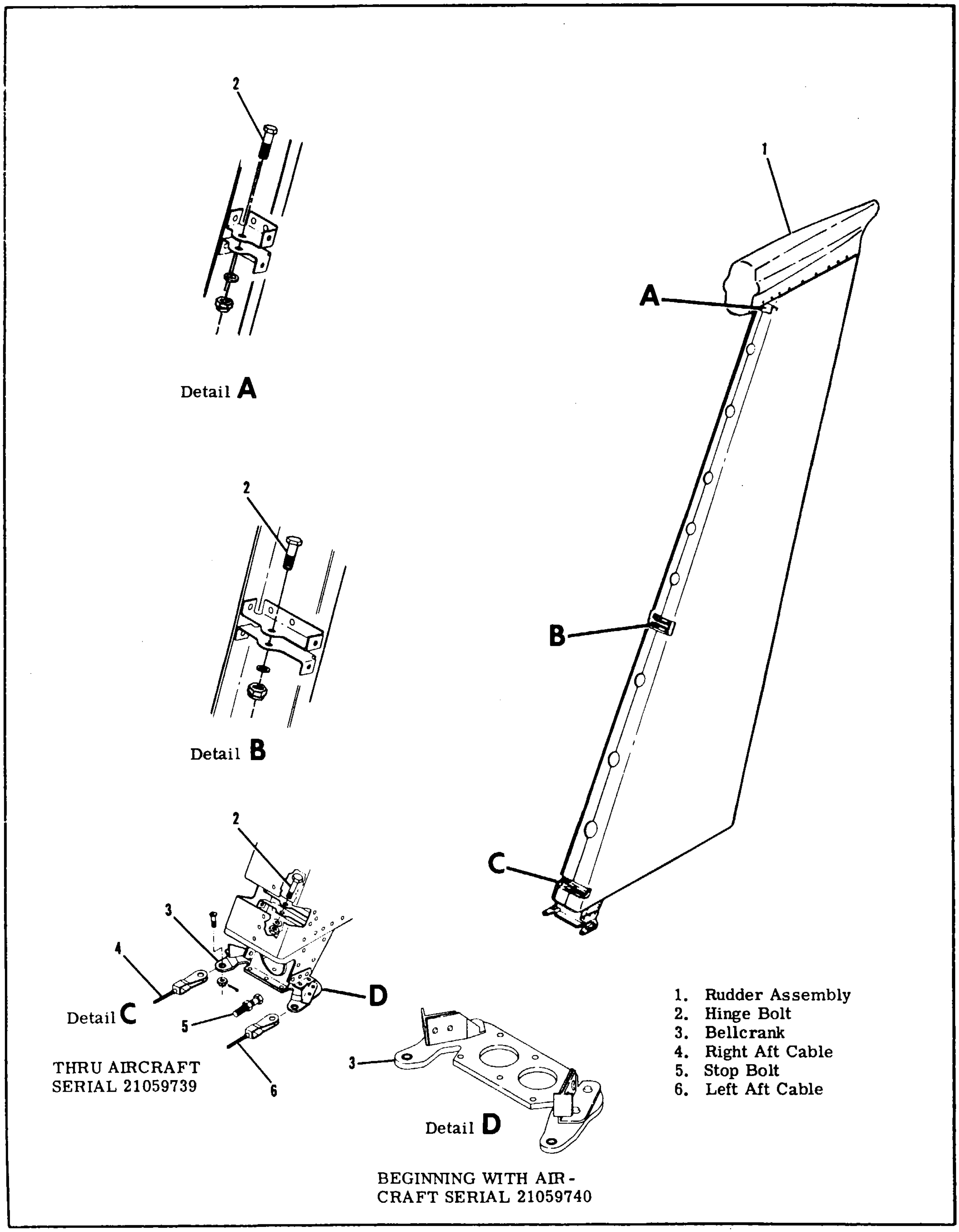
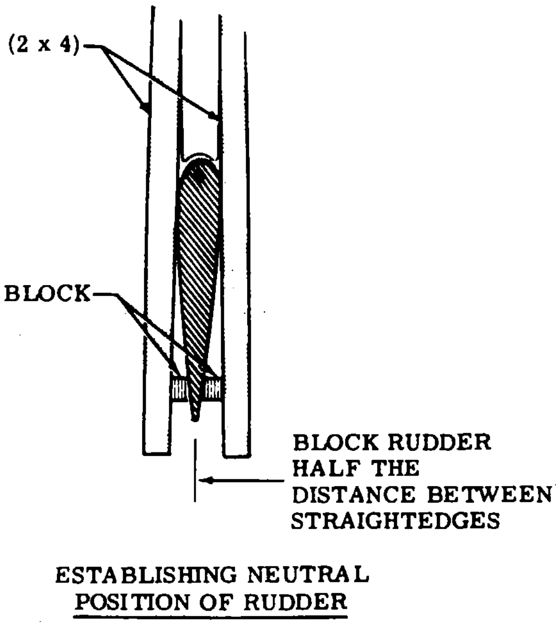
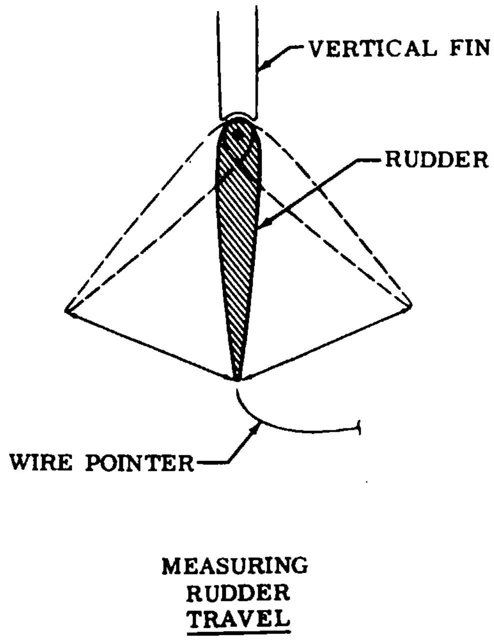


Figure 10-4. Rudder Installation





1. Establish neutral position of rudder by clamping straightedge (such as wooden 2 × 4) on each side of fin and rudder and blocking trailing edge of rudder half the distance between straightedges as shown.

2. Tape a length of soft wire to the stinger in such a manner that it can be bent to index at the lower corner of the rudder trailing edge.

3. Using soft lead pencil, mark rudder at point corresponding to soft wire indexing point (neutral).

4. Remove straightedges and blocks.

5. Hold rudder against right, then left, rudder stop. Measure distance from pointer to pencil mark on rudder in each direction of travel. Distance should be between 8.12" and 8.72".

Figure 10-5. Checking Rudder Travel

b. Remove safety wire, relieve cable tension and disconnect cables at turnbuckles (10).
c. Disconnect cables (3 and 4) at rudder bar arms.
d. Remove cable guards, pulleys and fairleads as necessary to work cables free of aircraft.

NOTE

To ease routing of cables, a length of wire may be attached to end of the cable before being withdrawn from aircraft. Leave wire in place, routed through structure; then attach cable being installed and pull the cable into position.

e. Reverse the preceding steps for reinstallation.
f. After cable is routed in position, install pulleys, fairleads and cable guards. Ensure cable is positioned in pulley grooves before installing guards.
g. Re-rig system in accordance with paragraph 10-11, safety turnbuckles and reinstall all items removed in step "a".

10-11. RIGGING.
a. Remove fairing from either side of vertical fin, remove safety wire and relieve cable tension at turnbuckles (index 10, figure 10-1).
b. Open landing gear doors. (Refer to Section 5.)
c. Tie down or weight tail to raise nosewheel free of ground.
d. Extend strut and ensure nose gear is centered against the external centering lug. (Neutral position.)
e. (Refer to figure 10-3.) Disconnect steering bungee adjustable rod end (3) from whiffletree (4).
f. Remove pedestal cover in accordance with Section 9.
g. Remove lower pedestal panel (index 19, figure 9-4).
h. Disconnect rudder trim bungee from rudder bar arm (index 16, figure 10-2).
i. Clamp rudder pedals in neutral position.
j. Adjust turnbuckles (index 10, figure 10-1) to streamline rudder with 30±10 lbs tension on cables.
k. Remove clamps from rudder pedals.
l. Adjust travel stop bolts (index 13, figure 10-1) to obtain degree of travel specified in figure 1-1. Figure 10-5 illustrates correct travel and one method of checking.
m. Adjust length of rod end (3) to align with whiffletree (4) and install bolt. DO NOT PRELOAD BUNGEE.
n. Connect rudder trim bungee and rig trim system as outlined in Section 11.
o. Operate rudder system, checking for ease of movement and full travel. Check cable tension with rudder in various positions. Cable tension should not be less than 20 pounds or more than 40 pounds in any position.
p. Check that all turnbuckles are safetied and reinstall all items removed for access.
q. Lower nosewheel to ground.

WARNING

Be sure rudder moves in the correct direction when operated by the rudder pedals.

SHOP NOTES:

SECTION 11

RUDDER TRIM CONTROL SYSTEM

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11-1. RUDDER TRIM CONTROL SYSTEM. (Thru 21060539). (Refer to figure 11-1.)

11-2. DESCRIPTION. The rudder trim system is comprised of a trim control wheel, screwjack, bell-crank and a trim bungee which is connected to the left rudder bar. The rudder control system, rudder trim control system and nosewheel steering system are interconnected and adjustments to any one system will affect the others.

11-3. TROUBLE SHOOTING.

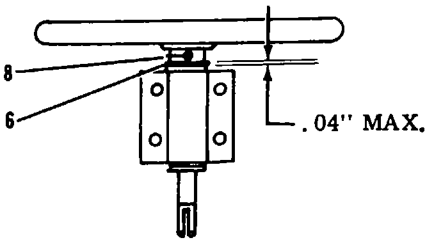
NOTE

This trouble shooting chart should be used in conjunction with the trouble shooting chart in paragraph 10-3.

NOTE

Due to remedy procedures in the following trouble shooting chart, it may be necessary to re-rig the system. Refer to paragraph 11-8 for aircraft thru 21060539 and paragraph 11-13 for aircraft beginning with 21060540.

TROUBLE	PROBABLE CAUSE	REMEDY
FALSE READING ON TRIM POSITION INDICATOR.	Improper rigging.	Refer to note above.
	Worn, bent or disconnected linkage.	Check visually. Repair or replace parts as necessary.
HARD OR SLUGGISH OPERATION OF TRIM WHEEL.	Worn, bent or binding linkage.	Check visually. Repair or replace parts as necessary.
	Incorrect rudder cable tension.	Check and adjust rudder cable tension.
FULL TRIM TRAVEL NOT OBTAINED.	Rudder trim system improperly rigged.	Refer to note above.



Detail A

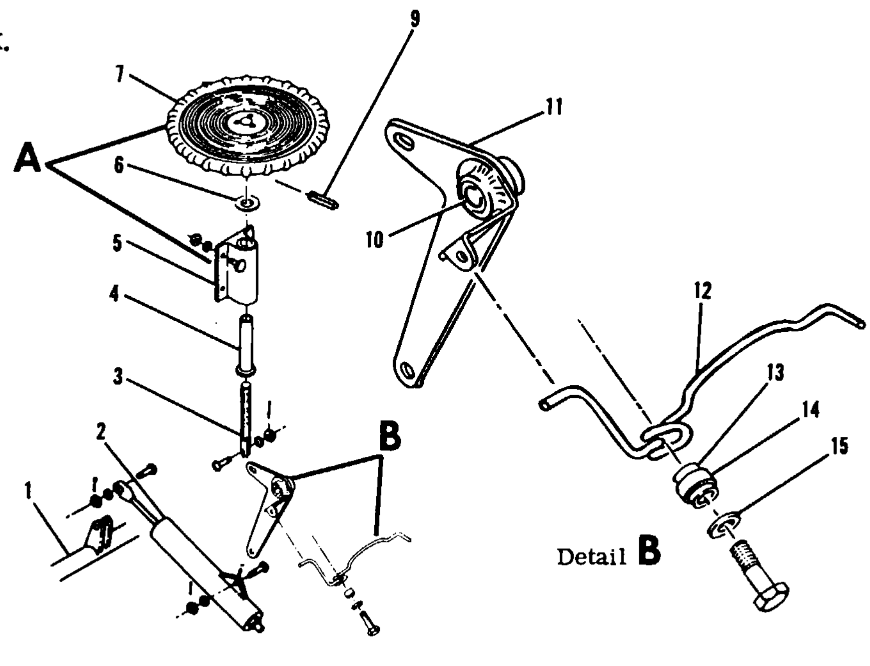
NOTE

Install indicator with rudder pedals in neutral position. Bend pointer left or right as required to line up with aircraft centerline. Also ensure pointer is approximately .030" from top of fuel control bracket by bending pointer up or down as required, this will give proper travel and visibility after pedestal is installed.

.005", .010" and .020" thick washers are used as required to obtain .04" maximum clearance as shown in detail "A".

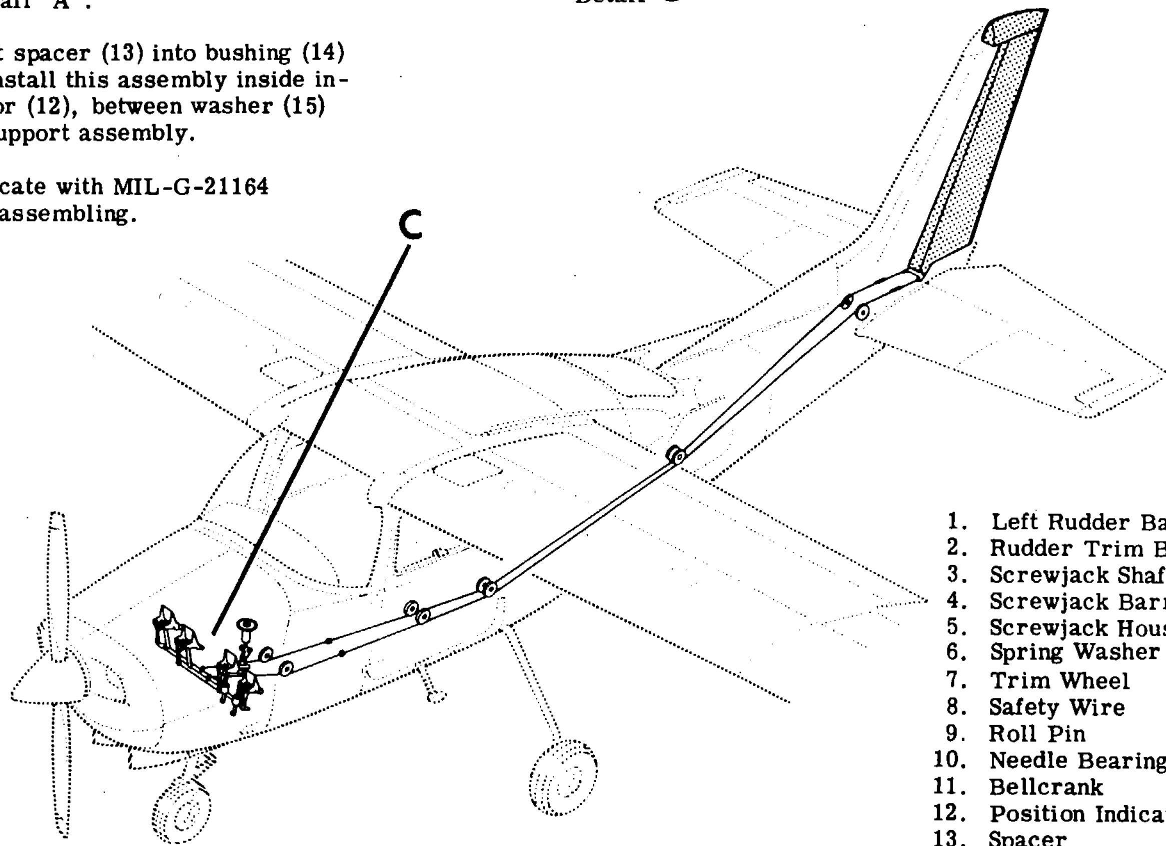
Insert spacer (13) into bushing (14) and install this assembly inside indicator (12), between washer (15) and support assembly.

Lubricate with MIL-G-21164 when assembling.



Detail B

Detail C



THRU 21060539

1. Left Rudder Bar
2. Rudder Trim Bungee
3. Screwjack Shaft
4. Screwjack Barrel
5. Screwjack Housing
6. Spring Washer
7. Trim Wheel
8. Safety Wire
9. Roll Pin
10. Needle Bearing
11. Bellcrank
12. Position Indicator
13. Spacer
14. Bushing
15. Washer

Figure 11-1. Rudder Trim Control System

11-4. TRIM CONTROL WHEEL. (Refer to figure 11-1.)

11-5. REMOVAL AND INSTALLATION

a. Remove pedestal cover as outlined in Section 9.
b. Remove lower pedestal panel (index 19, figure 9-4).
c. Remove safety wire and remove roll pin (9).
d. Remove trim wheel (7) using care not to drop washers (6) into tunnel area.
e. Reverse the preceding steps for reinstallation.

11-6. RUDDER TRIM BUNGEE. (Refer to figure 11-1.)

11-7. REMOVAL AND INSTALLATION.

a. Remove pedestal cover as outlined in Section 9.
b. Remove lower pedestal panel (index 19, figure 9-4).
c. Disconnect bungee (2) from bellcrank (11) and left rudder bar (1).
d. Using care, remove bungee from tunnel area.
e. Reverse the preceding steps for reinstallation, rig trim system in accordance with paragraph 11-8 and reinstall all items removed for access.

11-8. RIGGING. (Refer to figure 11-1.)

NOTE

The rudder control system and nose wheel steering bungee MUST be correctly rigged prior to rigging the rudder trim system.

a. Remove pedestal cover as outlined in Section 9.
b. Remove lower pedestal panel (index 19, figure 9-4).
c. Disconnect screwjack shaft (3) from bellcrank (11).
d. Tie down or weight tail to raise nose wheel free of ground.
e. Ensure rudder pedals and rudder are in neutral position.
f. Rotate trim wheel (7) until screwjack shaft (3) aligns with bellcrank (11) and install bolt. Bend position indicator (12) left or right as required to line up with aircraft centerline.
g. Rotate trim wheel (7) to run position indicator through its full range of travel, checking that there is a corresponding response of rudder.
h. Lower nose wheel to the ground and reinstall all items removed for access.

WARNING

Be sure rudder moves in the correct direction when operated by the trim control wheel.

11-9. RUDDER TRIM CONTROL SYSTEM (Beginning with 21060540) (Refer to figure 11-2.)

11-10. DESCRIPTION. The rudder trim system is comprised of a trim control wheel and gear box assembly located in the upper control pedestal, which is connected by a chain assembly to a gimbal assembly in the lower pedestal. The gimbal assembly is attached to a stop bracket, which is attached to the rudder trim bungee. The bungee's push-rod assembly is attached to the right-hand rudder bar assembly. The rudder control system, rudder trim control system and the nosewheel steering system are interconnected and adjustments to any one system will affect the other.

11-11. TROUBLE SHOOTING. Refer to paragraph 11-3 for trouble shooting procedures.

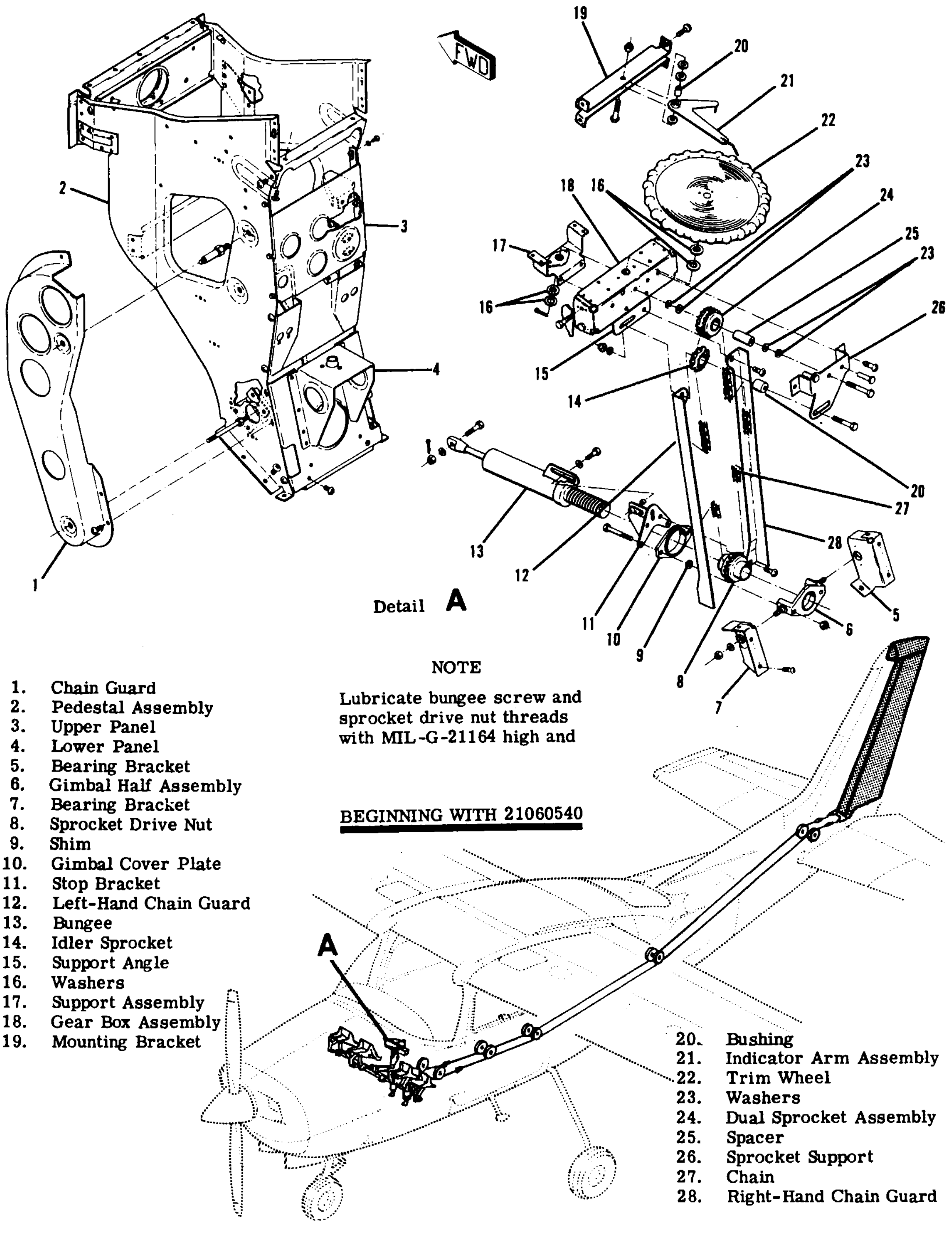
11-12. REMOVAL AND INSTALLATION OF SYSTEM COMPONENTS. (Refer to figure 11-2.)

a. INDICATOR ASSEMBLY.
   1. Remove pedestal cover in accordance with procedures outlined in Section 9.
   2. Remove four screws attaching mounting bracket assembly (19) to pedestal assembly (2).
   3. Remove indicator assembly as a unit.
   4. Reverse preceding steps for installation.
b. WHEEL AND GEAR BOX ASSEMBLY.
   1. Remove pedestal cover as outlined in Section 9.
   2. Loosen chain (27) by loosening bolt securing idler sprocket (11) and sliding sprocket inboard in slot in support angle (15).
   3. Remove upper panel (3) and disconnect chain (27) at connecting link.
   4. Remove four bolts attaching gear box assembly (18) to pedestal assembly (2).
   5. Remove bolts attaching idler sprocket (14) and chain guards (12) and (28).
   6. Remove wheel and gear box assembly as a unit.

NOTE

If wheel and gear box assembly is disassembled, install washers (16) and (23) as required to nest sprockets and prevent end play.

   7. Reverse preceding steps for installation.
c. CHAIN ASSEMBLY.
   1. Remove pedestal cover as outlined in Section 9.
   2. Remove upper panel (3).
   3. Remove access cover directly below and aft of pedestal in floor.
   4. Remove fuel selector shaft, then remove lower panel (4).
   5. Loosen chain (27) by loosening bolt securing idler sprocket (14) and sliding sprocket inboard in slot in support angle (15).
   6. Disconnect chain at connecting link.
   7. Remove bolt attaching bungee (13) to stop bracket (11).
   8. Pull gimbal assembly (items 5, 6, 7, 8, 9, 10 and 11) aft away from bungee (13).
   9. Remove chain (27) from sprocket drive nut (8).
   10. Reverse preceding steps for installation.
d. GIMBAL ASSEMBLY.
   1. Remove pedestal cover as outlined in Section 9.
   2. Remove access cover directly below and aft of pedestal in floor.
   3. Remove fuel selector shaft, then remove



NOTE

Lubricate bungee screw and sprocket drive nut threads with MIL-G-21164 high and

BEGINNING WITH 21060540

1. Chain Guard
2. Pedestal Assembly
3. Upper Panel
4. Lower Panel
5. Bearing Bracket
6. Gimbal Half Assembly
7. Bearing Bracket
8. Sprocket Drive Nut
9. Shim
10. Gimbal Cover Plate
11. Stop Bracket
12. Left-Hand Chain Guard
13. Bungee
14. Idler Sprocket
15. Support Angle
16. Washers
17. Support Assembly
18. Gear Box Assembly
19. Mounting Bracket
20. Bushing
21. Indicator Arm Assembly
22. Trim Wheel
23. Washers
24. Dual Sprocket Assembly
25. Spacer
26. Sprocket Support
27. Chain
28. Right-Hand Chain Guard

Figure 11-2. Rudder Trim Control System

lower panel (4).

4. Loosen chain (27) by loosening bolt securing idler sprocket (14) and sliding sprocket inboard in slot in support angle (15).

5. Disconnect chain at connecting link.

6. Remove bolt attaching bungee (13) to stop bracket (11).

7. Pull gimbal assembly (items 5, 6, 7, 8, 9, 10 and 11) aft; remove from aircraft.

NOTE

If gimbal assembly is to be disassembled, upon reassembly, shims (9) should be installed between gimbal half assembly (6) and cover plate assembly (10) to maintain .002 to .004-inch end play on sprocket.

8. Reverse preceding steps for installation.

c. BUNGEE ASSEMBLY.

1. Remove pedestal cover as outlined in Section 9.

2. Remove upper panel (3).

3. Remove access cover directly below and aft of pedestal in floor.

4. Remove fuel selector shaft, then remove lower panel (4).

5. Loosen chain (27) by loosening bolt securing idler sprocket (14) and sliding sprocket inboard in slot in support angle (15).

6. Disconnect chain at connecting link.

7. Remove bolts attaching idler sprocket (14) and chain guards (12) and (28) to support angle (15).

8. Remove bolts attaching chain guard to stop bracket (11); remove chain guards.

9. Remove bolt attaching bungee (13) to stop bracket (11).

10. Pull gimbal assembly (items 5, 6, 7, 8, 9, 10 and 11) aft; remove from aircraft.

11. Disconnect bungee push-rod assembly from right-hand rudder bar assembly.

12. Using care, remove bungee from tunnel area, aft, through pedestal.

13. Reverse preceding steps for installation.

NOTE

Upon installation, lubricate bungee screw and sprocket drive nut threads with MIL-G-21164 high and low temperature grease.

11-13. RIGGING RUDDER TRIM SYSTEM. (Refer to figure 11-2.)

NOTE

Rudder control system and nose wheel steering system must be correctly rigged prior to rigging the rudder trim system.

a. Remove pedestal cover as outlined in Section 9.
b. Remove upper pedestal panel.
c. Remove access cover directly below and aft of pedestal in floor.
d. Remove fuel selector shaft, then remove lower pedestal panel.
e. Loosen chain by loosening bolt securing idler sprocket, and sliding sprocket inboard in slot in support angle; disconnect chain.
f. Remove bolt attaching bungee to stop bracket; unscrew gimbal assembly from actuator drive screw.
g. Disconnect bungee push-pull rod from right-hand rudder bar assembly.
h. Tie down or weight tail to raise nose wheel free of ground.
i. Ensure rudder pedals and rudder are in neutral position.
j. Attach bungee push-pull rod to right-hand rudder bar assembly.
k. Install lower panel assembly and bearing brackets.
l. Screw gimbal assembly onto bungee drive screw until studs on gimbal half assembly align with holes in bearing brackets and nutplate on stop bracket aligns with center of slot in bungee stop arm.
m. Install and tighten bolts, washers and nuts.
n. String chain over idler sprocket and sprocket in wheel and gear box assembly; connect chain at connecting link.

NOTE

Indicator assembly should be installed with rudder pedals in neutral position. If indicator does not line up with centerline of aircraft, bend indicator left or right as required.

o. Tighten chain by moving idler sprocket outboard in slot in support angle.
p. Install full selector shaft.
q. Install upper panel.
r. Install floor access covers and pedestal cover.
s. Remove blocking from rudder and pedals.
t. Lower aircraft.

WARNING

Be sure rudder moves in correct direction when operated by the trim control wheel.

SECTION 12

ENGINE
(NORMALLY ASPIRATED)
REFER TO SECTION 12A FOR TURBOCHARGED ENGINE

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12-1. ENGINE COWLING.

12-2. DESCRIPTION. The engine cowling is divided into four major removable segments. The left upper cowling segment has two access doors, one at the upper front provides access to the oil filler neck and one at the left aft side provides access to the oil dipstick. The right and left nose caps are fastened to the lower engine nacelle and to each other with screws. The right and left upper cowl segments are secured with quick-release fasteners and either segment may be removed individually. The lower engine nacelle is an extension of the fuselage and provides fairing for the nose wheel in its retracted position.

12-3. REMOVAL AND INSTALLATION.
a. Release the quick-release fasteners attaching the cowling to the fuselage and at the parting surfaces of the left and right segments.
b. Remove screws securing the left and right nose cap together and to the lower engine nacelle.
c. Disconnect air ducts from nose caps and remove caps.
d. Reverse the preceding steps for reinstallation. Ensure the baffle seals are turned in the correct direction to confine and direct air flow around the engine. The vertically installed seals must fold forward and the side seals must fold upwards.

12-4. CLEANING AND INSPECTION. Wipe the inner surfaces of the cowling segments with a clean cloth saturated with cleaning solvent (Stoddard or equivalent). If the inside surface of the cowling is coated heavily with oil or dirt, allow solvent to soak until foreign material can be removed. Wash painted surfaces of the cowling with a solution of mild soap and water and rinse thoroughly. After washing, a coat of wax may be applied to the painted surfaces to prolong paint life. After cleaning, inspect cowling for dents, cracks, loose rivets and spot welds. Repair all defects to prevent spread of damage.

12-5. REPAIR. If cowling skins are extensively damaged, new complete sections of the cowling should be installed. Standard insert-type patches may be used for repair if repair parts are formed to fit contour of cowling. Small cracks may be stop-drilled and small dents straightened if they are reinforced on the inner surface with a doubler of the same material as the cowling skin. Damaged reinforcement angles should be replaced with new parts. Due to their small size, new reinforcement angles are easier to install than to repair the damaged part.

12-6. COWL FLAPS.

12-7. DESCRIPTION. Cowl flaps are provided to aid in controlling engine temperature. Two cowl flaps, operated by a single control in the cabin, are located at the lower aft end of the engine nacelle. The engine exhaust tailpipes extend through cutouts in the aft portion of each cowl flap.

12-8. REMOVAL AND INSTALLATION. (Refer to figure 12-1.)
a. Place control lever (2) in the OPEN position.
b. Disconnect control clevises (13) from shock-mounts (14).
c. Remove safety wire securing hinge pins (9) to cowl flaps, pull pins from hinges and remove flaps.
d. Reverse the preceding steps for reinstallation. Rig cowl flaps, if necessary, in accordance with paragraph 12-9.

12-9. RIGGING. (Refer to figure 12-1.)
a. Disconnect control clevises (13) from shock-mounts (14).
b. Check to make sure that the flexible controls reach their internal stops in each direction. Mark controls so that full travel can be readily checked and maintained during the remaining rigging procedures.
c. Place control lever (2) in the CLOSED position. If the control lever cannot be placed in the closed position, loosen clamp (5) at upper end of controls and slip housings in clamp or adjust controls at upper clevis (4) to position control lever in bottom hole of position bracket (3).
d. With the control lever in CLOSED position, hold one cowl flap closed (against the rubber bumpers on the fuselage), loosen jam nut and adjust clevis (13) on the control to hold cowl flap in this position and install bolt.

NOTE

If the lower control clevis (13) cannot be adjusted far enough to streamline flap and still maintain sufficient thread engagement, loosen the lower control housing clamp (8) and slide housing in clamp as necessary. Be sure threads are visible in clevis inspection holes.

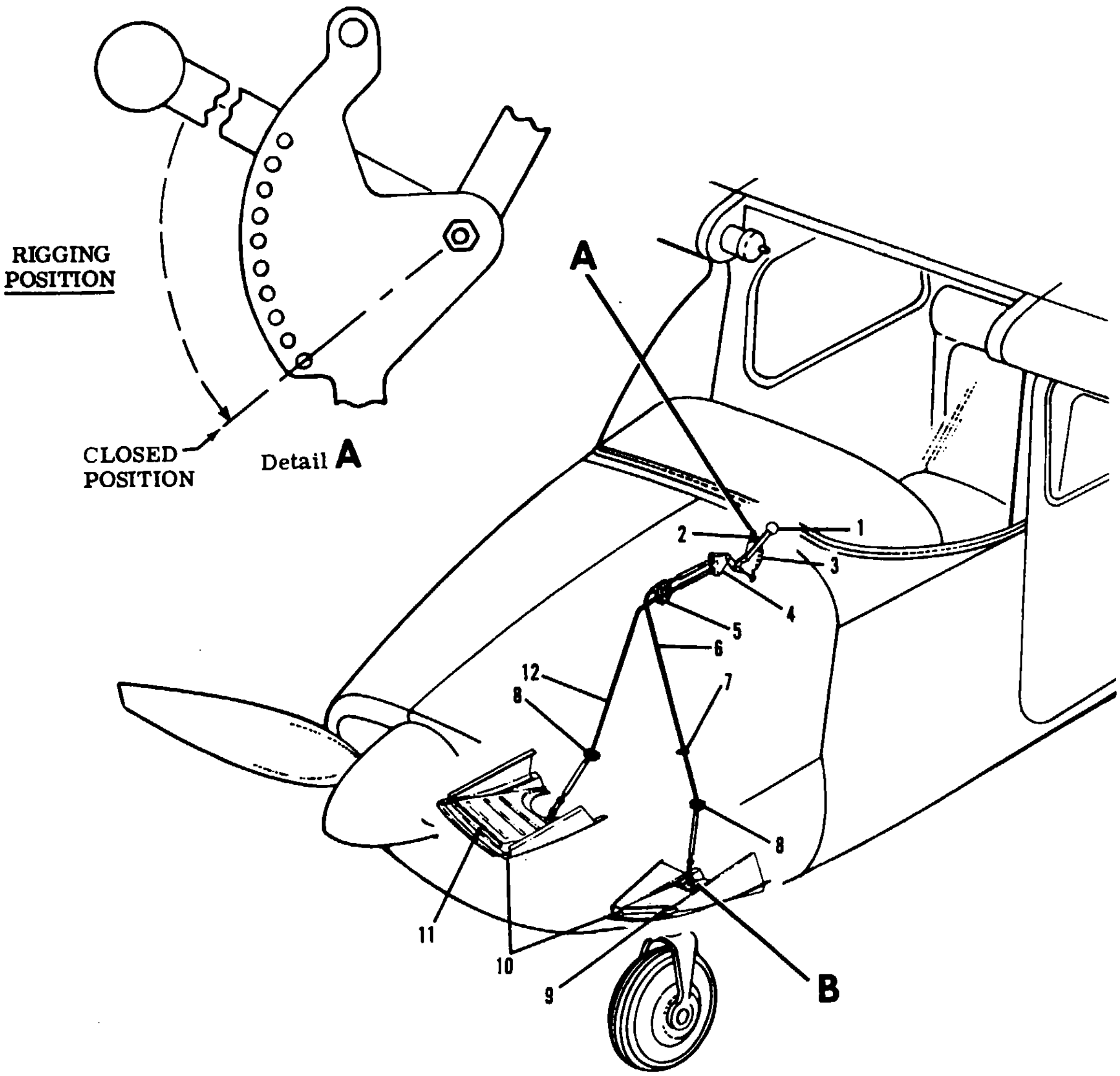
e. Repeat the preceding step for the opposite cowl flap. Cowl flaps should open approximately 5.00 inches when measured in a straight line from the aft edge of door to firewall.
g. Check that all clamps and jam nuts are tight.

12-10. ENGINE.

12-11. DESCRIPTION. An air cooled, wet-sump, six-cylinder, horizontally-opposed, direct-drive, fuel injected, Continental IO-520 series engine driving a constant-speed propeller is used to power the aircraft. The cylinders, numbered from rear to front are staggered to permit a separate throw on the crankshaft for each connecting rod. The right rear cylinder is number 1 and cylinders on the right side are identified by odd numbers 1, 3 and 5. The left rear cylinder is number 2 and the cylinders on the left side are identified as numbers 2, 4 and 6. Refer to pargraph 12-12 for engine data. For repair and overhaul of the engine, accessories and propeller, refer to the appropriate publications issued by their manufacturer's. These publications are available from the Cessna Service Parts Center.

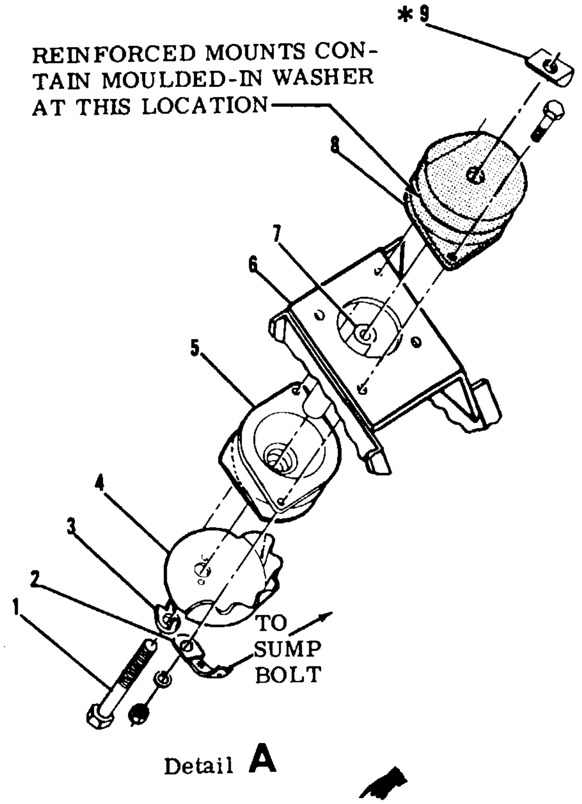
12-12. ENGINE DATA.

Aircraft Series	210
Model (Continental)	IO-520-L
BHP Maximum for Take-Off (5 Minutes) at RPM	300 2850
BHP Maximum Except Take-Off RPM (Max. Continuous)	285 2700
Number of Cylinders	6-Horizontally Opposed
Displacement	520 Cubic Inches
Bore	5.25 Inches
Stroke	4.00 Inches
Compression Ratio	8.5:1
Magnetos	Slick Model No. 662
Right Magneto	Fires 22° BTC Upper Right and Lower Left
Left Magneto	Fires 22° BTC Upper Left and Lower Right
Firing Order	1-6-3-2-5-4
Spark Plugs	18 MM X.750-20 (Refer to currect Continental active factory approved spark plug chart.)
Torque	
Fuel Metering System	Continental Fuel Injection
Unmetered Fuel Pressure	9.0 to 11.0 PSI at 600 RPM 31.0 to 33.0 PSI at 2850 RPM
Oil Sump Capacity	10 U.S. Quarts
With External Filter	11 U.S. Quarts
Tachometer	Mechanical Drive
Oil Pressure (PSI)	
Minimum Idling	10
Normal	30 to 60
Maximum (Cold Oil Starting)	100
Connection Location	Between No. 2 and No. 4 Cylinders
Oil Temperature	
Normal Operating	Within Green Arc
Maximum Permissible	Red Line (240°F)
Probe Location	Below Oil Cooler
Cylinder Head Temperature	
Normal Operating	Within Green Arc
Maximum	Red Line (460°F.)
Probe Location	Lower side of Number 3 Cylinder
Approximate Dry Weight	471 LB. (Weight is approximate and will vary with optional accessories installed.)



1. Knob
2. Control Lever
3. Position Bracket
4. Clevis
5. Clamp
6. Left Cowl Flap Control
7. Clamp (Left Side Only)
8. Clamp
9. Hinge Pin
10. Cowl Flap
11. Hinge Half
12. Right Cowl Flap Control
13. Clevis
14. Shock-Mount

Figure 12-1. Cowl Flaps Installation



Detail A

NOTE

It is important that the correct engine mounts be installed in the correct positions. Install upper mounts with beveled edges at the top and lower mounts with beveled edges at the front, except as noted below for turbocharged engines. In addition, be sure that the two reinforced mounts are used at the upper, forward positions.

To determine which two of the eight mounts are the reinforced ones, use fingernail to feel whether moulded in washer is present.

Torque bolts (1) to 300 + 50 - 00 lb-in.

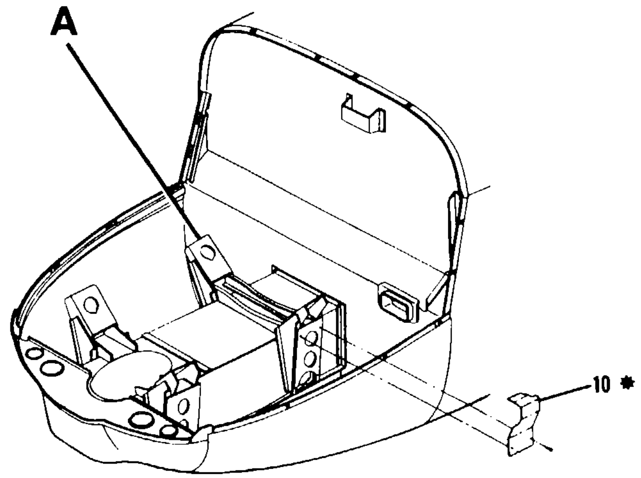
ON TURBOCHARGED ENGINES:

*Barrel nuts (9) are replaced with turbine support shafts at the right mounts on turbocharged engines.

Install left, forward, lower mount with beveled edges at the front and at the top on turbocharged engines.

If shock-mounts will be reused, mark each one so it will be reinstalled in exactly the same position. If new shock-mounts will be installed, position them as noted above.

*ALL TURBOCHARGED ENGINES AND BEGINNING WITH AIRCRAFT SERIAL 21059200 ON NON-TURBOCHARGED ENGINES.



1. Bolt
2. Ground Strap
3. Tab Lockwasher
4. Heat Deflector
5. Lower Mount
6. Engine Mount Support
7. Spacer
8. Upper Mount
9. Barrel Nut
10. Heat Shield

Figure 12-2. Engine Mount Installation

12-13. TROUBLE SHOOTING.

TROUBLE	PROBABLE CAUSE	REMEDY
ENGINE FAILS TO START.	Improper use of starting procedure.	Review starting procedure. Refer to Owner's Manual.
	Defective aircraft fuel system.	Refer to Section 13.
	Spark plugs fouled.	Remove and clean. Check gaps and insulators. Use new gaskets. Check cables to persistently fouled plugs.
	Defective magneto switch or grounded magneto leads.	Check continuity, repair or replace switch or leads.
	Defective ignition system.	Refer to paragraph 12-79.
	Excessive induction air leaks.	Check visually. Correct cause of air leaks.
	Dirty screen in fuel control unit or defective fuel control unit.	Check screen visually. Check fuel flow through control unit. Replace defective fuel control unit.
	Defective electric fuel pump.	Refer to Section 13.
	Defective fuel manifold valve or dirty screen.	Check fuel flow through valve. Remove and clean. Replace if defective.
	Clogged fuel injection lines or discharge nozzles.	Check fuel through lines and nozzles. Clean lines and nozzles. Replace if defective.
	Fuel pump not permitting fuel from auxiliary pump to bypass.	Check fuel flow through engine-driven fuel pump. Replace engine-driven pump.
	Vaporized fuel in system.	Refer to paragraph 12-101.
	Fuel tanks empty.	Visually inspect tanks. Fill with proper grade and quantity of gasoline.
	Fuel contamination or water in fuel system.	Open fuel strainer drain and check for water. Drain all fuel and flush out fuel system. Clean all screens, fuel lines, strainer, etc.
	Mixture control in the IDLE CUT-OFF position.	Move control to the full RICH position.
	Engine flooded.	Refer to paragraph 12-101.
	Fuel selector valve in OFF position.	Place selector valve in the ON position to a cell known to contain gasoline.

12-13. TROUBLE SHOOTING (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
ENGINE STARTS BUT DIES, OR WILL NOT IDLE.	Idle stop screw or idle mixture incorrectly adjusted.	Refer to paragraph 12-46.
	Spark plugs fouled or improperly gapped.	Remove, clean and regap plugs. Replace if defective.
	Water in fuel system.	Open fuel strainer drain and check for water. If water is present, drain fuel tank sumps, lines and strainer.
	Defective ignition system.	Refer to paragraph 12-79.
	Vaporized fuel. (Most likely to occur in hot weather with a hot engine.)	Refer to paragraph 12-101.
	Induction air leaks.	Check visually. Correct the cause of leaks.
	Manual primer leaking.	Disconnect primer outlet line. If fuel leaks through primer, repair or replace primer.
	Dirty screen in fuel control unit or defective fuel control unit.	Check screen visually. Check fuel flow through control unit. Clean screen. Replace fuel control unit if defective.
	Defective manifold valve or clogged screen.	Check fuel flow through valve. Replace if defective. Clean screen.
	Defective engine-driven fuel pump.	If engine continues to run with electric pump turned on, but stops when it is turned off, the engine-driven pump is defective. Replace pump.
	Defective engine.	Check compression. Listen for unusual engine noises. Engine repair is required.
	Propeller control set in high pitch position (low rpm).	Use low pitch (high rpm) position for all ground operation.
	Defective aircraft fuel system.	Refer to Section 13.
	Restricted fuel injection lines or discharge nozzles.	Check fuel flow through lines and nozzles. Clean lines and nozzles. Replace if defective.
ENGINE RUNS ROUGHLY, WILL NOT ACCELERATE PROPERLY, OR LACKS POWER.	Propeller control in high pitch (low rpm) position.	Use low pitch (high rpm) for all ground operations.
	Restriction in aircraft fuel system.	Refer to Section 13.
	Restriction in fuel injection system.	Clean system. Replace any defective units.

TROUBLE	PROBABLE CAUSE	REMEDY
ENGINE RUNS ROUGHLY WILL NOT ACCELERATE PROPERLY. OR LACKS POWER (Cont.)	Engine-driven fuel pump pressure improperly adjusted.	Refer to paragraph 12-61.
	Worn or improperly rigged throttle or mixture control.	Check visually. Rig properly. Replace worn linkage.
	Spark plugs fouled or improperly gapped.	Clean and regap. Replace if defective.
	Defective ignition system.	Refer to paragraph 12-79.
	Defective engine.	Check compression. Listen for unusual engine noises. Engine repair is required.
POOR IDLE CUT-OFF.	Worn or improperly rigged mixture control.	Rig properly. Replace worn linkage.
	Defective or dirty manifold valve.	Operate electric fuel pump and check that no fuel flows through manifold valve with mixture control in IDLE CUT-OFF. Remove and clean. Replace if defective.
	Fuel leakage through primer.	Repair or replace primer.
	Auxiliary fuel pump ON.	Turn to OFF position.
	Defective fuel control unit.	If none of the preceding causes corrects the problem, the control unit is probably at fault. Replace control unit.

12-13A. STATIC RUN-UP PROCEDURES. In a case of suspected low engine power, a static RPM run-up should be conducted as follows:

a. Run-up engine, using take-off power and mixture settings, with the aircraft facing 90° right and then left to the wind direction.

b. Record the RPM obtained in each run-up position.

NOTE

Daily changes in atmospheric pressure, temperature and humidity will have a slight effect on static run-up.

c. Average the results of the RPM obtained. It should be within 50 RPM of 2780 RPM (two bladed propeller) and 2825 RPM (three bladed propeller).

d. If the average results of the RPM obtained are lower than stated above, the following recommended checks may be performed to determine a possible deficiency.

1. Check governor control for proper rigging. It should be determined that the governor control arm travels to the high RPM stop on the governor and that the high RPM stop screw is adjusted properly. (Refer to Section 14 for procedures).

NOTE

If verification of governor operation is necessary the governor may be removed from the engine and a flat plate installed over the engine pad. Run-up engine to determine that governor was adjusted properly.

2. Check carburetor heat control (carburetor equipped engines) for proper rigging. If partially open it would cause a slight power loss. On fuel injected engines check operation or alternate air door spring or magnetic lock to make sure door will remain closed in normal operation.

3. Check magneto timing, spark plugs and ignition harness for settings and conditions.

4. On fuel injection engines, check fuel injection nozzles for restriction and check for correct unmetered fuel flow.

5. Check condition of induction air filter. Clean if required.

6. Perform an engine compression check (Refer to engine Manufacturer's Manual).

12-14. REMOVAL. If an engine is to be placed in storage or returned to the manufacturer for overhaul, proper preparatory steps should be taken for corrosion prevention prior to beginning the removal procedure. Refer to Section 2 for storage preparation. The following engine removal procedure is based upon the engine being removed from the aircraft with the lines and hoses being disconnected at the firewall.

NOTE

Tag each item when disconnected to aid in identifying wires, hoses, lines and control linkages when engine is reinstalled. Likewise, shop notes made during removal will often clarify reinstallation. Protect openings, exposed as a result of removing or disconnecting units, against entry of foreign material by installing covers or sealing with tape.

a. Place all cabin switches in the OFF position.
b. Place fuel selector valve in the OFF position.
c. Remove engine cowling in accordance with paragraph 12-3.
d. Disconnect battery cables and insulate terminals as a safety precaution.
e. Drain fuel strainer and lines with strainer drain control.

NOTE

During the following procedures, remove any clamps or lacings which secure controls, wires, hoses or lines to the engine, engine nacelle or attached brackets, so they will not interfere with engine removal. Some of the items listed can be disconnected at more than one place. It may be desirable to disconnect some of these items at other than the places indicated. The reason for engine removal should be the governing factor in deciding at which point to disconnect them. Omit any of the items which are not present on a particular engine installation.

f. Drain the engine oil sump and oil cooler.
g. Disconnect magneto primary lead wires at magnetos.

WARNING

The magnetos are in a SWITCH ON condition when the switch wires are disconnected. Ground the magneto points or remove the high tension wires from the magnetos or spark plugs to prevent accidental firing.

h. Remove the spinner and propeller in accordance with Section 14. Cover exposed end of crankshaft flange and propeller flange to prevent entry of foreign material.
i. Disconnect throttle, mixture and propeller controls from their respective units. Remove clamps attaching controls to engine and pull controls aft clear of engine. Use care to avoid bending controls too sharply. Note EXACT position, size and number of attaching washers and spacers for reference on reinstallation.
j. Disconnect all hot and cold air flexible ducts and remove.
k. Remove exhaust system in accordance with paragraph 12-97.
l. Disconnect wires and cables as follows:
   1. Disconnect tachometer drive shaft at adapter.

CAUTION

When disconnecting starter cable do not permit starter terminal bolt to rotate. Rotation of the bolt could break the conductor between bolt and field coils causing the starter to be inoperative.

   2. Disconnect starter electrical cable at starter.
   3. Disconnect cylinder head temperature wire at probe.
   4. Disconnect oil temperature wire at probe below oil cooler.
   5. Disconnect electrical wires and wire shielding ground at alternator.
   6. Disconnect exhaust gas temperature wires at quick-disconnects.
   7. Disconnect electrical wires at throttle microswitches.
   8. Remove all clamps and lacings attaching wires or cables to engine and pull wires and cables aft to clear engine.
m. Disconnect lines and hoses as follows:
   1. Disconnect hydraulic lines at pump. (THRU AIRCRAFT SERIAL 21059502.)
   2. Disconnect vacuum hose at firewall.
   3. Disconnect oil breather and vacuum system oil separator vent lines where secured to the engine.

WARNING

Residual fuel and oil draining from disconnected lines and hoses constitutes a fire hazard. Use caution to prevent accumulation of such fuel and oil when lines or hoses are disconnected.

   4. Disconnect fuel supply and vapor return hoses at fuel pump.
   5. Disconnect primer line at firewall fitting.
   6. Disconnect fuel-flow gage hose at firewall.
   7. Disconnect oil pressure line at firewall fitting.
   8. Disconnect manifold pressure hose at firewall.
   9. Disconnect manifold and balance tube drain lines.
n. Carefully check the engine again to ensure ALL hoses, lines, wires, cables, clamps and lacings are disconnected or removed which would interfere with the engine removal. Ensure all wires, cables and engine controls have been pulled aft to clear the engine.

CAUTION

Place a suitable stand under tail tie-down ring before removing engine. The loss of engine weight will cause the aircraft to be tail heavy.

o. Attach a hoist to the lifting lug at the top center of the engine crankcase. Lift engine just enough to relieve the weight from the engine mounts.
p. Remove bolts, ground strap and heat deflectors.
q. Slowly hoist engine out of nacelle and clear of aircraft checking for any items which would interfere with the engine removal. Balance the engine by hand and carefully guide the disconnected parts out as the engine is removed.
r. Remove engine shock-mounts and ground strap.

NOTE

If shock-mounts will be re-used, mark each one so it will be reinstalled in exactly the same position. If new shock-mounts will be installed, position them as illustrated in figure 12-2.

12-15. CLEANING. The engine may be cleaned with Stoddard solvent or equivalent, then dried thoroughly.

CAUTION

Particular care should be given to electrical equipment before cleaning. Cleaning fluids should not be allowed to enter magnetos, starter, alternator, etc. Protect these components before saturating the engine with solvent. All other openings should also be covered before cleaning the engine assembly. Caustic cleaning solutions should be used cautiously and should always be properly neutralized after their use.

12-16. ACCESSORIES REMOVAL. Removal of engine accessories for overhaul or for engine replacement involves stripping the engine of parts, accessories and components to reduce it to the bare engine. During the removal process, removed items should be examined carefully and defective parts should be tagged for repair or replacement with new components.

NOTE

Items easily confused with similar items should be tagged to provide a means of identification when being installed on a new engine. All openings exposed by the removal of an item should be closed by installing a suitable cover or cap over the opening. This will prevent entry of foreign material. If suitable covers are not available, tape may be used to cover the openings.

12-17. INSPECTION. For specific items to be inspected, refer to the engine manufacturer's manual.
a. Visually inspect the engine for loose nuts, bolts, cracks and fin damage.
b. Inspect baffles, baffle seals and brackets for cracks, deterioration and breakage.
c. Inspect all hoses for internal swelling, chafing through protective plys, cuts, breaks, stiffness, damaged threads and loose connections. Excessive heat on hoses will cause them to become brittle and easily broken. Hoses and lines are most likely to crack or break near the end fittings and support points.
d. Inspect for color bleaching of the end fitting or severe discoloration of the hoses.

NOTE

Avoid excessive flexing and sharp bends when examining hoses for stiffness.

e. All flexible fluid carrying hoses in the engine compartment should be replaced at engine overhaul or every five years, whichever occurs first.
f. For major engine repairs, refer to the manufacturer's overhaul and repair manual.

12-18. BUILD-UP. Engine build-up consists of installation of parts, accessories and components to the basic engine to build up an engine unit ready for installation on the aircraft. All safety wire, lockwashers, nuts, gaskets and rubber connections should be new parts.

12-19. INSTALLATION. Before installing the engine on the aircraft, install any items which were removed from the engine or aircraft after the engine was removed.

NOTE

Remove all protective covers, plugs, caps and identification tags as each item is connected or installed. Omit any items not present on a particular engine installation.

a. Hoist the engine to a point just above the nacelle.
b. Install engine shock-mounts and ground strap as illustrated in figure 12-2.
c. Carefully lower engine slowly into place on the engine mounts. Route controls, lines, hoses and wires in place as the engine is positioned on the engine mounts.

NOTE

Be sure engine shock-mounts, spacers and washers are in place as the engine is lowered into position.

d. Install engine-to-mount bolts, then remove the hoist and support stand placed under tail tie-down fitting. Torque bolts to 300+50-00 lb-in.
e. Route throttle, mixture and propeller controls to their respective units and connect. Secure controls in position with clamps.

NOTE

Throughout the aircraft fuel system, from the fuel bays to the engine-driven fuel pump, use NS-40 (RAS-4) (Snap-On Tools Corp., Kenosha, Wisconsin), MIL-T-5544 (Thread Compound, Antiseize, Graphite Petrolatum), USP Petrolatum or engine oil as a thread lubricant or to seal a leaking connection. Apply sparingly to male threads only, omitting the first two threads, exercising extreme caution to avoid "stringing" sealer across the end of the fitting. Always ensure that a compound, the residue from a previously used compound, or any other foreign material cannot enter the system. Throughout the fuel injection system, from the engine-driven fuel pump through the discharge nozzles, use only a fuel-soluble lubricant, such as engine oil, on fitting threads. Do not use any other form of thread compound on the injection system.

f. Connect lines and hoses as follows:
1. Connect manifold and balance tube drain lines.
2. Connect hydraulic lines at pump. (THRU AIRCRAFT SERIAL 21059503.)
3. Connect manifold pressure hose at firewall.
4. Connect oil pressure line at firewall fitting.
5. Connect fuel-flow gage hose at firewall.
6. Connect primer line at firewall fitting.
7. Connect fuel supply and vapor return hose at pump.
8. Connect oil breather and vacuum system oil separator vent lines where secured to the engine.
9. Connect vacuum hose at firewall.
10. Install clamps and lacings securing hoses and lines to the engine to prevent chafing.

g. Connect wires and cables as follows:
1. Connect electrical wires and wire shielding ground at alternator.
2. Connect cylinder head temperature wire at probe.

CAUTION

When connecting starter cable, do not permit starter terminal bolt to rotate. Rotation of the bolt could break the conductor between bolt and field coils causing the starter to be inoperative.

3. Connect starter electrical cable at starter.
4. Connect tachometer drive shaft at adapter. Be sure drive cable engages drive in adapter. Torque housing attach nut to 100-lb.in.
5. Connect exhaust gas temperature wires at quick-disconnects.
6. Connect electrical wires at throttle microswitches.
7. Connect oil temperature wire to probe below oil cooler.
8. Install clamps and lacings securing wires and cables to engine, engine mount and brackets.

h. Install exhaust system in accordance with paragraph 12-97.
i. Connect all hot and cold air flexible ducts.
j. Install propeller and spinner in accordance with instructions outlined in Section 14.
k. Complete a magneto switch ground-out and continuity check, then connect primary lead wires to the magnetos. Remove the temporary ground or connect spark plug leads, whichever procedure was used during removal.

WARNING

Be sure magneto switch is in OFF position when connecting switch wires to magnetos.

l. Clean and install induction air filter in accordance with Section 2.
m. Service engine with proper grade and quantity of engine oil. Refer to Section 2 if engine is new, newly overhauled or has been in storage.
n. Check all switches are in the OFF position and connect battery cables.
o. Rig engine controls in accordance with paragraphs 12-85, 12-86, 12-87 and 12-88.
p. Inspect engine installation for security, correct routing of controls, lines, hoses and electrical wiring, proper safetying and tightness of all components.
q. Install engine cowling in accordance with paragraph 12-3.
r. Perform an engine run-up and make final adjustments on the engine controls.

12-20. FLEXIBLE FLUID HOSES.

12-21. PRESSURE TEST.

a. After each 50 hours of engine operation, all flexible fluid hoses in the engine compartment should be pressure tested as follows:
1. Place mixture control in the idle cut-off position.
2. Operate the auxiliary fuel pump in the high position.
3. Examine the exterior of hoses for evidence of leakage or wetness.
4. Hoses found leaking should be replaced.
5. After pressure testing fuel hoses, allow sufficient time for excess fuel to drain overboard from the engine manifold before attempting an engine start.
6. Refer to paragraph 12-17 for detailed inspection procedures for flexible hoses.

12-22. REPLACEMENT.

a. Hoses should not be twisted on installation. Pressure applied to a twisted hose may cause failure or loosening of the nut.
b. Provide as large a bend radius as possible.
c. Hoses should have a minimum of one-half inch clearance from other lines, ducts, hoses or surrounding objects or be butterfly clamped to them.
d. Rubber hoses will take a permanent set during extended use in service. Straightening a hose with a bend having a permanent set will result in hose cracking. Care should be taken during removal so that hose is not bent excessively, and during reinstallation to assure hose is returned to its original position.
e. Refer to AC 43.13, Chapter 10, for additional installation procedures for flexible fluid hose assemblies.

12-23. ENGINE BAFFLES.

12-24. DESCRIPTION. The sheet metal baffles installed on the engine direct the flow of air around the cylinders and other engine components to provide optimum cooling. These baffles incorporate rubber-asbestos composition seals at points of contact with the engine cowling and other engine components to help confine and direct the airflow to the desired area. It is very important to engine cooling that the baffles and seals are in good condition and installed correctly. The vertical seals must fold forward and the side seals must fold upwards. Removal and installation of the various baffle segments is possible with the cowling removed. Be sure that any new baffles seal properly.

12-25. CLEANING AND INSPECTION. The engine baffles should be cleaned with a suitable solvent to remove oil and dirt.

NOTE

The rubber-asbestos seals are oil and grease resistant but should not be soaked in solvent for long periods.

Inspect baffles for cracks in the metal and for loose and/or torn seals. Repair or replace any defective parts.

12-26. REMOVAL AND INSTALLATION. Removal and installation of the various baffle segments is possible with the cowling removed. Be sure that any replaced baffles and seals are installed correctly and that they seal to direct the airflow in the correct direction. Various lines, hoses, wires and controls are routed through some baffles. Make sure that these parts are reinstalled correctly after installation of baffles.

12-27. REPAIR. Repair of an individual segment of engine baffle is generally impractical, since, due to the small size and formed shape of the part, replacement is usually more economical. However, small cracks may be stop-drilled and a reinforcing doubler installed. Other repairs may be made as long as strength and cooling requirements are met. Replace sealing strips if they do not seal properly.

12-28. ENGINE OIL SYSTEM. (Refer to figure 12-3.)

12-29. DESCRIPTION. A wet-sump, pressure-lubricating oil system is employed in the engine. Oil under pressure from the oil pump is fed through drilled crankcase passages which supply oil to the crankshaft main bearings and camshaft bearings. Connecting rod bearings are pressure-lubricated through internal passages in the crankshaft. Valve mechanisms are lubricated through the hollow push-rods, which are supplied with oil from the crankcase oil passages. The propeller is supplied oil, boosted by the governor through the forward end of the crank-shaft. Oil is returned by gravity to the engine oil sump. Cylinder walls and piston pins are spray-lubricated by oil escaping from connecting rod bearings. The engine is equipped with an oil cooler and a thermostat valve to regulate engine oil temperature. A pressure relief valve is installed to maintain proper oil pressure at higher engine speeds. Removable oil filter screens are provided within the oil system. An external, replaceable element oil filter is available as optional equipment. The engine may also be equipped with a non-congealing oil cooler.

SHOP NOTES:

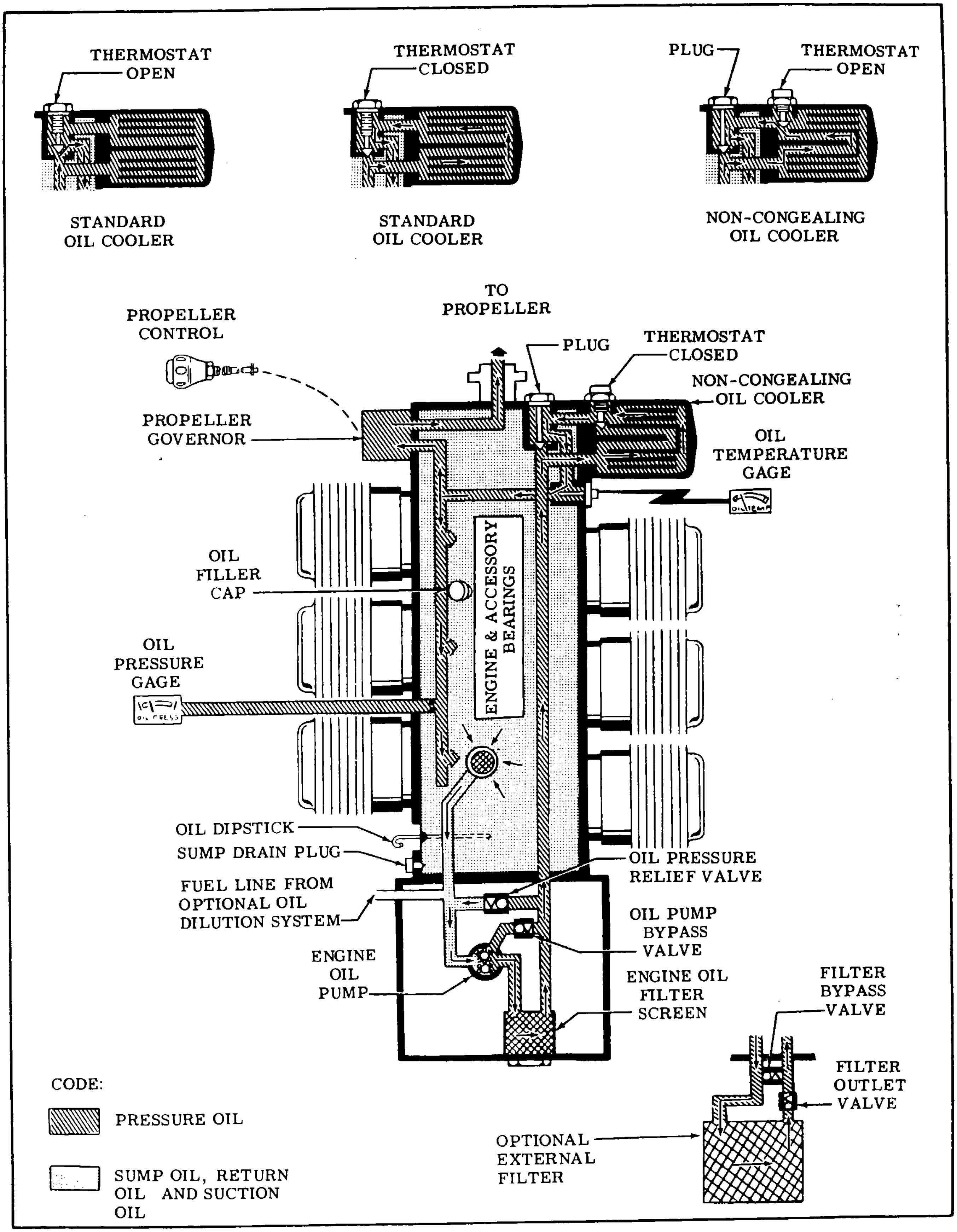


Figure 12-3. Oil System Schematic

12-30. TROUBLE SHOOTING.

TROUBLE	PROBABLE CAUSE	REMEDY
NO OIL PRESSURE.	No oil in sump.	Check with dipstick. Fill sump with proper grade and quantity of oil. Refer to Section 2.
	Oil pressure line broken, disconnected or pinched.	Inspect pressure lines. Replace or connect lines as required.
	Oil pump defective.	Remove and inspect. Examine engine. Metal particles from damaged pump may have entered engine oil passages.
	Defective oil pressure gage.	Check with a known good gage. If second reading is normal, replace gage.
	Oil congealed in gage line.	Disconnect line at engine and gage; flush with kerosene. Pre-fill with kerosene and install.
	Relief valve defective.	Remove and check for dirty or defective parts. Clean and install; replace valve if defective.
LOW OIL PRESSURE.	Low oil supply.	Check with dipstick. Fill sump with proper grade and quantity of oil. Refer to Section 2.
	Low viscosity oil.	Drain sump and refill with proper grade and quantity of oil.
	Oil pressure relief valve spring weak or broken.	Remove and inspect spring. Replace weak or broken spring.
	Defective oil pump.	Check oil temperature and oil level. If temperature is higher than normal and oil level is correct, internal failure is evident. Remove and inspect. Examine engine. Metal particles from damaged pump may have entered oil passages.
	Secondary result of high oil temperature.	Observe oil temperature gage for high indication. Determine and correct reason for high oil temperature.
	Dirty oil screens.	Remove and clean oil screens.

12-30. TROUBLE SHOOTING (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
HIGH OIL PRESSURE.	High viscosity oil.	Drain sump and refill with proper grade and quantity of oil.
	Relief valve defective.	Remove and check for dirty or defective parts. Clean and install; replace valve if defective.
	Defective oil pressure gage.	Check with a known good gage. If second reading is normal, replace gage.
LOW OIL TEMPERATURE.	Defective oil temperature gage or temperature bulb.	Check with a known good gage. If second reading is normal, replace gage. If reading is similar, the temperature bulb is defective.
	Oil cooler thermostatic bypass valve defective or stuck.	Remove valve and check for proper operation. Replace valve if defective.
HIGH OIL TEMPERATURE.	Oil cooler air passages clogged.	Inspect cooler core. Clean air passages.
	Oil cooler oil passages clogged.	Attempt to drain cooler. Inspect for sediment. Remove cooler and flush thoroughly.
	Thermostatic bypass valve damaged or held open by solid matter.	Feel front of cooler core with hand. If core is cold, oil is bypassing cooler. Remove and clean valve and seat. If still inoperative, replace.
	Low oil supply.	Check with dipstick. Fill sump with proper grade and quantity of oil. Refer to Section 2.
	Oil viscosity too high.	Drain sump and refill with proper grade and quantity of oil.
	Prolonged high speed operation on the ground.	Hold ground running above 1500 rpm to a minimum.
	Defective oil temperature gage.	Check with a known good gage. If second reading is normal. Replace gage.
	Defective oil temperature bulb.	Check for correct oil pressure, oil level and cylinder head temperature. If they are correct, check oil temperature gage for being defective; if similar reading is observed, bulb is defective. Replace bulb.

12-30. TROUBLE SHOOTING (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
HIGH OIL TEMPERATURE (Cont.)	Secondary effect of low oil pressure.	Observe oil pressure gage for low indication. Determine and correct reason for low oil pressure.
	Oil congealed in cooler.	This condition can occur only in extremely cold temperatures. If congealing is suspected, use an external heater or a heated hangar to warm the congealed oil.
OIL LEAK AT FRONT OF ENGINE.	Damaged crankshaft seal.	Replace.
OIL LEAK AT PUSH ROD HOUSING.	Damaged push rod housing oil seal.	Replace.

12-31. FULL-FLOW OIL FILTER.

12-32. DESCRIPTION. An external oil filter may be installed on the engine. The filter and filter adapter replace the regular engine oil pressure screen. The filter adapter incorporates a bypass valve which will open allowing pressure oil from the oil pump to flow to the engine oil passages if the filter element should become clogged.

12-33. REMOVAL AND INSTALLATION. (Refer to figure 12-4.)

NOTE

Filter element replacement kits are available from the Cessna Service Parts Center.

a. Remove engine cowling in accordance with paragraph 12-3.
b. Remove both safety wires from filter can and unscrew hollow stud (1) to detach filter assembly from adapter (12) as a unit. Remove filter assembly from aircraft and discard gasket (10). Oil will drain from filter as assembly is removed from adapter.
c. Press downward on hollow stud (1) to remove from filter element (5) and can (4). Discard metal gasket (2) on stud (1).
d. Lift lid (7) off filter can (4) and discard lower gasket (6).
e. Pull filter element (5) out of filter can (4).

NOTE

Before discarding removed filter element (5), remove the outer perforated paper cover; using a sharp knife, cut through the folds of the filter element at both ends. Then, carefully unfold the pleated element and examine the material trapped in the element for evidence of internal engine damage, such as chips or particles from bearings. In new or newly overhauled engines, some small particles or metallic shavings might be found, these are generally of no consequence and should not be confused with particles produced by impacting, abrasion or pressure. Evidence of internal damage found in the oil filter element justifies further examination to determine the cause.

f. Wash lid (7), hollow stud (1) and filter can (4) in solvent and dry with compressed air.

NOTES

When installing a new filter element (5), it is important that all gaskets are clean, lubricated and positioned properly, and that the correct amount of torque is applied to the hollow stud (1). If the stud is under-torqued, oil leakage will occur. If the stud is over-torqued, the filter can might possibly be deformed, again causing oil leakage.

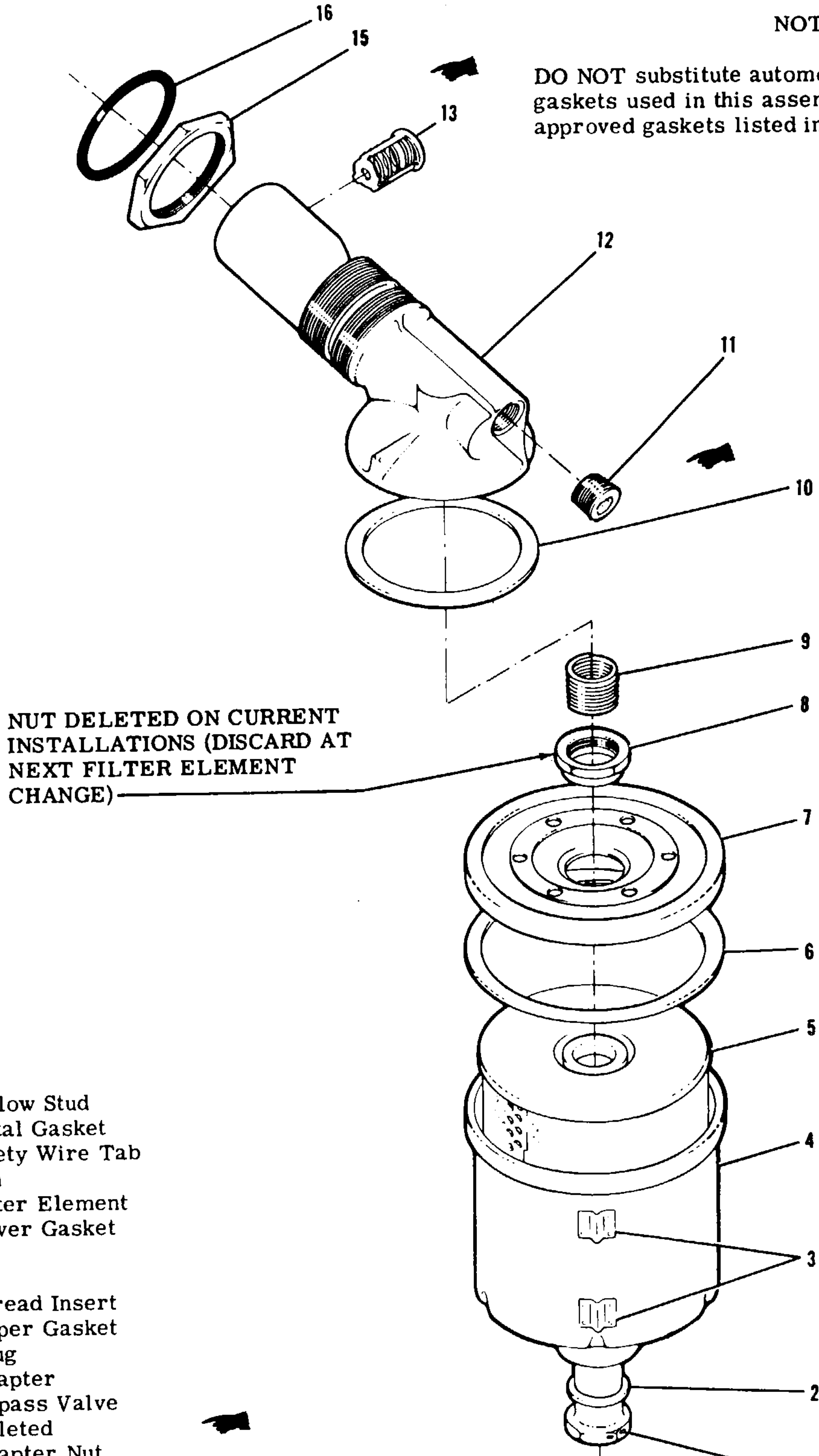
- Lubricate all rubber grommets in the new filter element, lid gaskets and metal gasket with clean engine oil or general purpose grease before installation. Dry gaskets may cause false torque readings, again resulting in oil leakage.

- Before assembly, place a straightedge across bottom of filter can. Check for distortion or out-of-flat condition greater than 0.010 inch. Install a new filter can if either of these conditions exist.

- After installing a new gasket on lid, turn lid over. If gaskets falls, try a different gasket and repeat test. If this gasket falls off, install a new lid.

NOTE

DO NOT substitute automotive gaskets for any gaskets used in this assembly. Use only approved gaskets listed in the Parts Catalogs.



1. Hollow Stud
2. Metal Gasket
3. Safety Wire Tab
4. Can
5. Filter Element
6. Lower Gasket
7. Lid
8. Nut
9. Thread Insert
10. Upper Gasket
11. Plug
12. Adapter
13. Bypass Valve
14. Deleted
15. Adapter Nut
16. O-Ring

Figure 12-4. Full-Flow Oil Filter

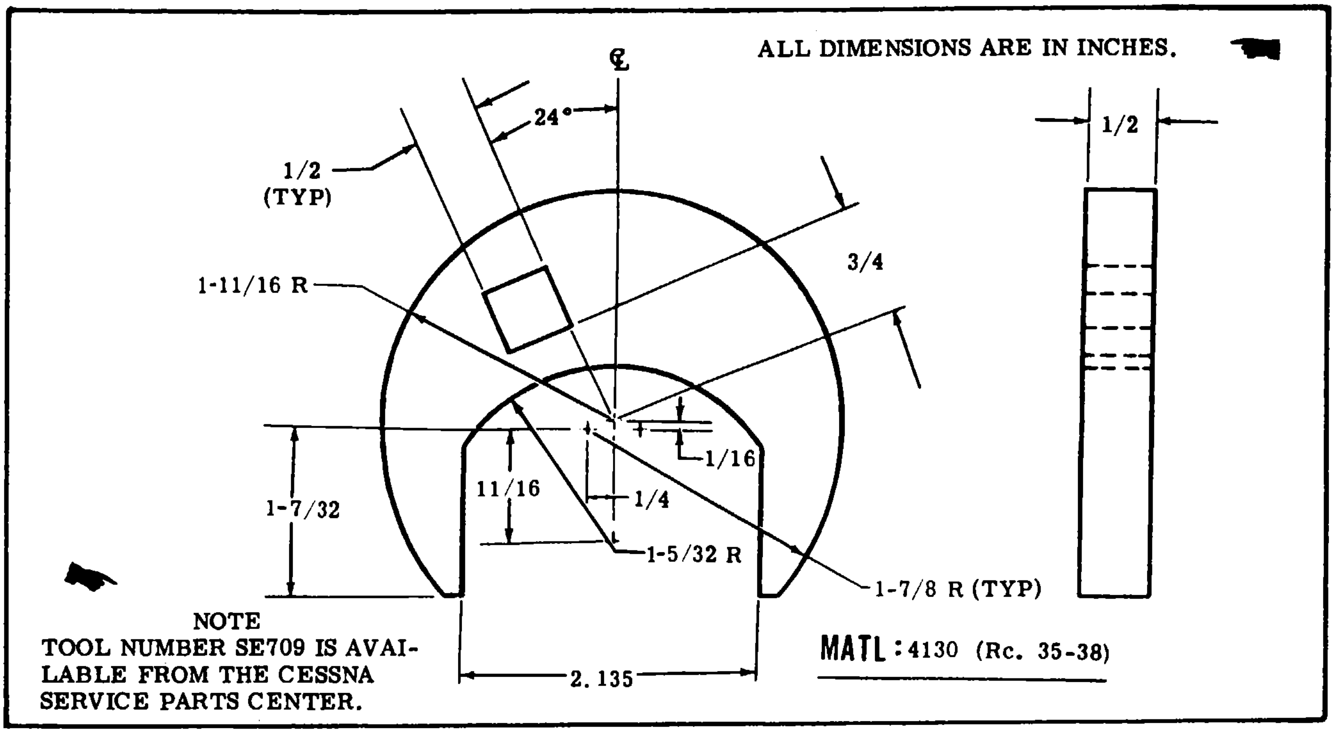


Figure 12-5. Oil Filter Adapter Wrench Fabrication

g. Inspect the adapter gasket seat for gouges, deep scratches, wrench marks and mutilation. If any of these conditions are found, install a new adapter.

h. Place a new filter element (5) in can (4) and insert the hollow stud (1) with a new metal gasket (2) in place, through the filter can and element.

i. Position a new gasket (6) inside flange of lid (7) and place lid in position on filter can.

j. With new gasket (10) on face of lid, install filter can assembly on adapter (12). While holding filter can to prevent turning, tighten hollow stud (1) and torque to 20-25 lb-ft (240-300 lb-in), using a torque wrench.

k. Install all parts removed for access and service the engine with the proper grade and quantity of engine oil. One additional quart of oil is required each time the filter element is changed.

l. Start engine and check for proper oil pressure. Check for oil leakage after warming up the engine.

m. Again check for oil leakage after engine has been run at high power setting (preferably a flight around the field).

n. Check to make sure filter can has not been making contact with any adjacent parts due to engine torque.

o. While engine is still warm, recheck torque on hollow stud (1) then safety stud to lower tab (3) on filter can and safety adapter (12) to upper tab on filter can.

12-34. FILTER ADAPTER.

12-35. REMOVAL. (Refer to figure 12-4.)

a. Remove filter assembly in accordance with paragraph 12-33.

NOTE

A special wrench adapter for adapter nut (15) (Part No. SE-709) is available from the Cessna Service Parts Center, or one may be fabricated as shown in figure 12-5. Remove any engine accessory that interferes with removal of the adapter.

b. Note angular position of adapter (12), then remove safety wire and loosen adapter nut (15).

c. Unscrew adapter and remove from engine. Discard adapter O-ring (16).

12-36. DISASSEMBLY, INSPECTION AND REASSEMBLY. Figure 12-4 shows the relative position of the internal parts of the filter adapter and may be used as a guide during installation of parts. The bypass valve is to be installed as a complete unit, with the valve being staked three places. The heli-coil type insert (9) in the adapter may be replaced, although special tools are required. Follow instructions of the tool manufacturer for their use. Inspect threads

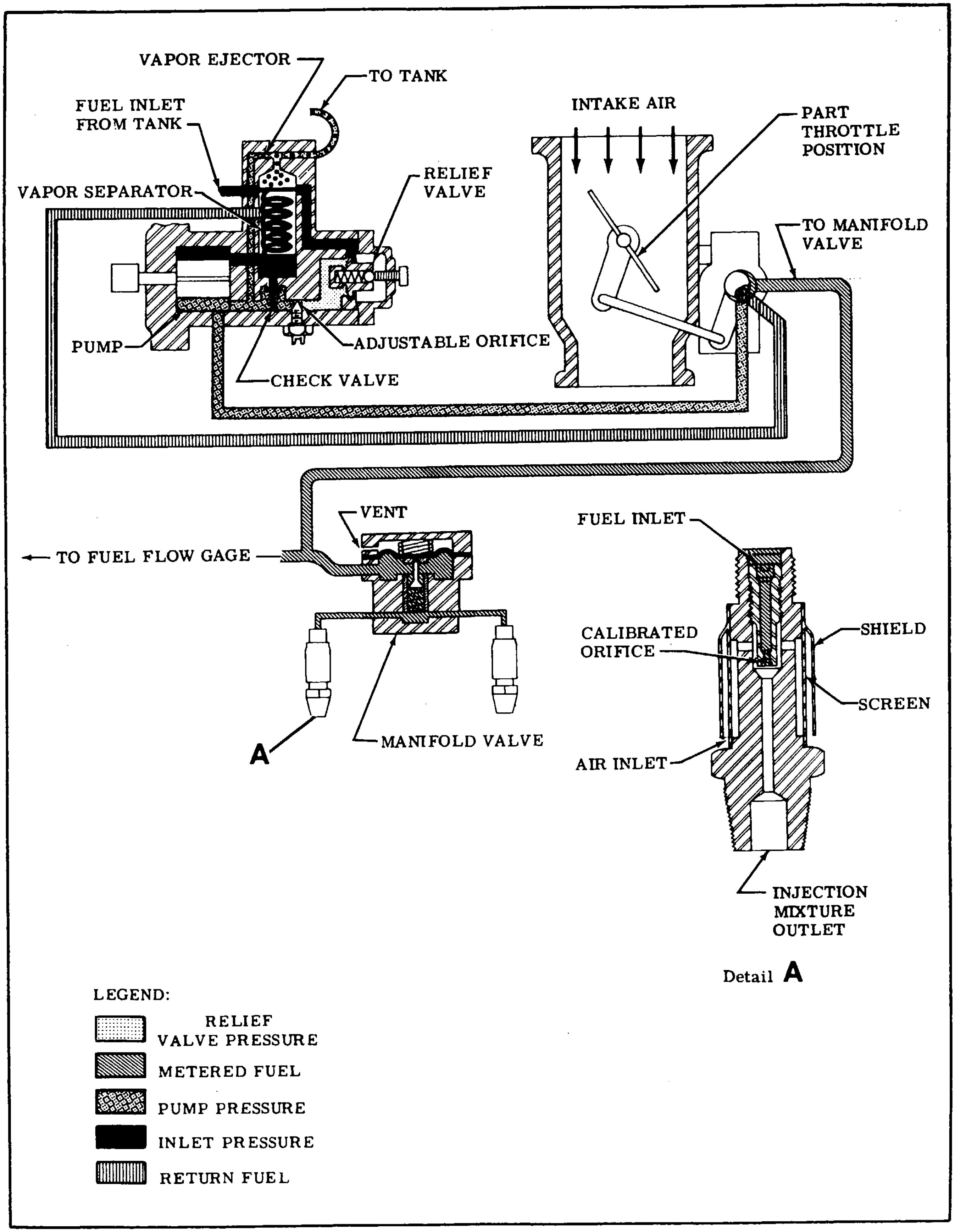


Figure 12-6. Fuel Injection Schematic

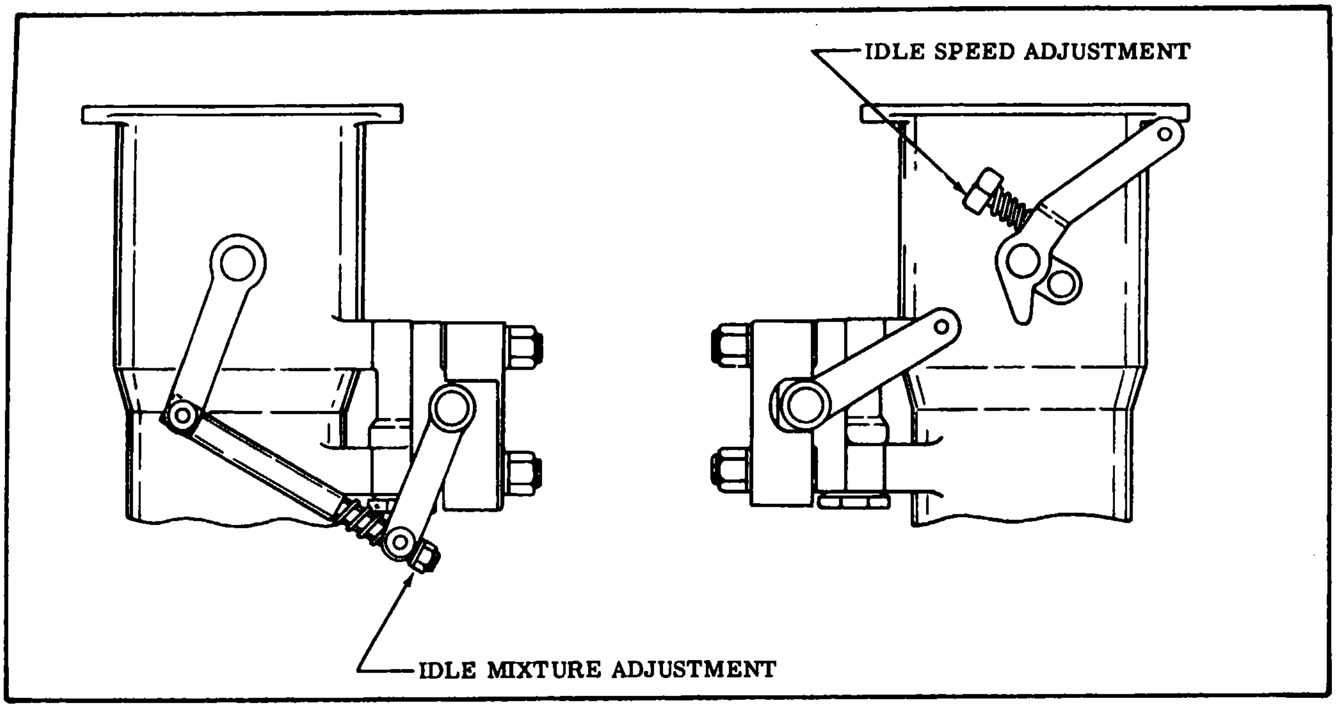


Figure 12-7. Idle Speed and Idle Mixture Adjustment

on adapter and in engine for damage. Clean adapter in solvent and dry with compressed air. Ascertain that all passages in the adapter are open and free of foreign material. Also, check that bypass valve is seated properly.

12-37. INSTALLATION.

a. Assemble adapter nut (15) and new O-ring (16) on adapter (12) in sequence illustrated in figure 12-4.

b. Lubricate O-ring on adapter with clean engine oil. Tighten adapter nut until O-ring is centered in its groove on the adapter.

c. Apply anti-seize compound sparingly to the adapter threads, then simultaneously screw adapter and adapter nut into engine until O-ring seats against engine boss without turning adapter nut (15). Rotate adapter to approximate angular position noted during removal. Do not tighten adapter nut at this time.

d. Temporarily install filter assembly on adapter, and position so adequate clearance with adjacent parts is attained. Maintaining this position of the adapter, tighten adapter nut to 50-60 lb-ft (600-720 lb-in.) and safety. Use a torque wrench, extension and adapter as necessary when tightening adapter nut.

e. Using new gaskets, install filter assembly as outlined in paragraph 12-33. Be sure to service the engine oil system.

12-38. OIL COOLER.

12-39. DESCRIPTION. A non-congealing oil cooler may be installed on the aircraft. The cooler is mounted on the right forward side of the engine crankcase directly in front of number five cylinder and has no external oil lines. Ram air passes through the oil cooler and is discharged into the engine compartment. Oil circulating through the engine is allowed to circulate continuously through warm-up passages to prevent the oil from congealing when operating in low temperatures. On the standard and non-congealing oil coolers, as the oil increases to a certain temperature, the thermostat valve closes, causing the oil to be routed to all of the cooler passages for cooling. Oil returning to the engine from the cooler is routed through the internally drilled oil passages.

12-40. ENGINE FUEL SYSTEM. (Refer to figure 12-6.)

12-41. DESCRIPTION. The fuel injection system is a low pressure system of injecting fuel into the intake valve port of each cylinder. It is a multi-nozzle, continuous-flow type which controls fuel flow to match engine airflow. Any change in throttle position, engine speed, or a combination of both, causes changes in fuel flow in the correct relation to engine airflow. A manual mixture control and a fuel flow indicator are provided for leaning at any combination of altitude and power setting. The fuel flow indicator is calibrated in gallons per hour and indicates approximately the gallons of fuel consumed per hour. The continuous-flow system uses a typical rotary vane fuel pump. There are no running parts in this system except for the engine-driven fuel pump.

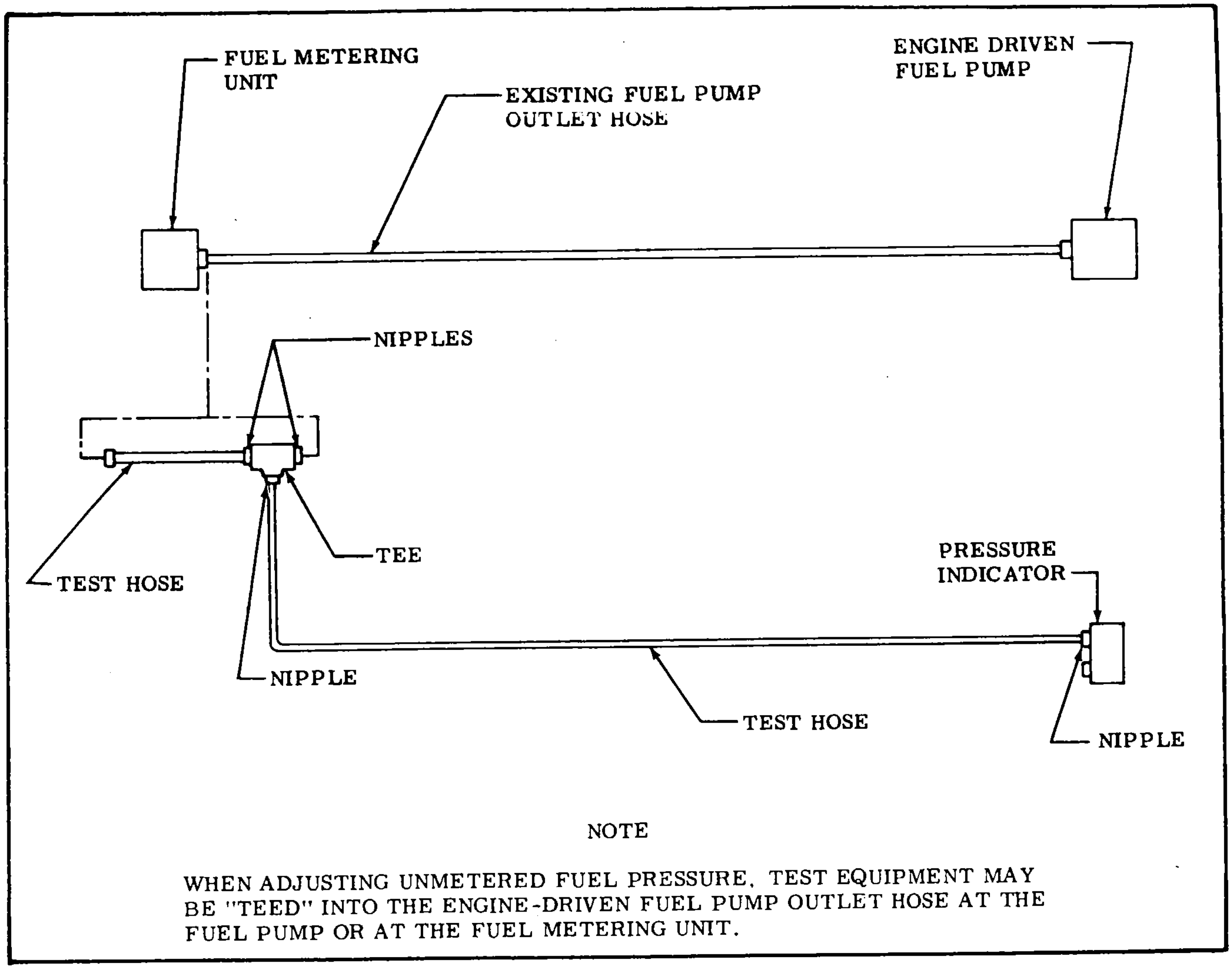


Figure 12-8. Fuel Injection Pump Adjustment Test Harness

NOTE

Throughout the aircraft fuel system, from the fuel bays to the engine-driven fuel pump, use RAS-4 (Snap-On Tools Corp., Kenosha, Wisconsin), MIL-T-5544 (Thread Compound, Antiseize, Graphite-Petrolatum) or equivalent, as a thread lubricant or to seal a leaking connection. Apply sparingly to male fittings only, omitting the first two threads. Always ensure that a compound, the residue from a previously used compound or any other foreign material cannot enter the system. Throughout the fuel injection system, from the engine-driven fuel pump through the discharge nozzles, use only a fuel soluble lubricant, such as engine lubricating oil, on the fitting threads. Do not use any other form of thread compound on the injection system fittings.

12-42. FUEL-AIR CONTROL UNIT.

12-43. DESCRIPTION. This unit occupies the position ordinarily used for a carburetor, at the intake manifold inlet. The function of this unit is to control engine air intake and to set the metered fuel pressure for proper fuel-air ratio. There are three control elements in this unit, one for air and two for fuel. One of the fuel control elements is for fuel mixture and the other is for fuel metering. Fuel enters the control unit through a strainer and passes to the metering valve. The position of the metering valve controls this fuel passed to the manifold valve and nozzles. A linkage connecting the metering valve to the air throttle proportions airflow to fuel flow. The position of the mixture valve determines the amount of fuel returned to the fuel pump. The fuel control portion of the fuel-air control unit is enclosed in a shroud and is blast-air cooled to help prevent vapor lock.

12-44. REMOVAL AND INSTALLATION.

a. Place all cockpit switches and fuel shut-off valve in the OFF position.
b. Remove cowling in accordance with para. 12-3.
c. Remove induction airbox in accordance with paragraph 12-65.
d. Disconnect engine controls at throttle and mixture control arms.

NOTE

Cap all disconnected hoses, lines and fittings.

e. The three fuel lines which attach to the fuel control unit are routed inside flexible tubing to help cool the fuel. Loosen tubing clamps at control unit and slide tubing back to gain access to the fuel line fittings.
f. Disconnect fuel lines at control unit.
g. Loosen hose clamps which secure the control unit to the right and left intake manifolds.
h. Remove control unit.
i. Cover the open ends of the intake manifold piping to prevent entry of foreign matter.
j. Reverse the preceding steps for reinstallation. Use new gaskets when installing control unit. Rig throttle and mixture controls in accordance with paragraphs 12-85 and 12-86 respectively. Rig throttle-operated microswitch in accordance with Section 13.

12-45. CLEANING AND INSPECTION.

a. Check control connections, levers and linkage for security, safetying and for lost motion due to wear.
b. Remove the fuel screen assembly and clean in solvent (Stoddard or equivalent). Reinstall and safety.
c. Check the air control body for cracks and control unit for overall condition.

12-45A. RIGGING THROTTLE-OPERATED MICROSWITCH. Refer to Section 13.

12-45B. AUXILIARY ELECTRIC FUEL PUMP FLOW RATE ADJUSTMENT. Refer to Section 13.

12-45C. LANDING GEAR WARNING HORN. Refer to Section 5.

12-46. ADJUSTMENTS. (Refer to figure 12-7.) The idle speed adjustment is a conventional spring-loaded screw located in the air throttle lever. The idle mixture adjustment is the locknut at the metering valve end of the linkage. Tightening the nut to shorten the linkage provides a richer mixture. A leaner mixture is obtained by backing off the nut to lengthen the linkage. Idle speed and mixture adjustment should be accomplished after the engine has been warmed up. Since idle rpm may be affected by idle mixture adjustment, it may be necessary to readjust idle rpm after setting the idle mixture correctly.

a. Set throttle stop screw to obtain 600 ± 25 rpm, with throttle control pulled full out against idle stop.

NOTE

Engine idle speed may vary among different engines. An engine should idle smoothly, without excessive vibration and the idle speed should be high enough to maintain idling oil pressure and to preclude any possibility of engine stoppage in flight when the throttle is closed.

b. Advance throttle to increase engine speed to 1000 rpm.
c. Pull mixture control knob slowly and steadily toward the idle cut-off position, observing tachometer, then return control full IN (RICH) position before engine stops.
d. Adjust mixture adjusting nut to obtain a slight and momentary gain of approximately 50 rpm at 1000 rpm engine speed as mixture control is moved from full IN (RICH) toward idle cut-off position. Return control to full IN (RICH) to prevent engine stoppage.
e. If mixture is set too LEAN, engine speed will drop immediately, thus requiring a richer mixture. Tighten adjusting nut (clockwise) for a richer mixture.
f. If mixture is set too RICH, engine speed will increase above 50 rpm, thus requiring a leaner mixture. Back off adjusting nut (counterclockwise) for a leaner mixture.

NOTE

After each adjustment to the idle mixture, run engine up to approximately 2000 rpm to clear engine of excess fuel to obtain a correct idle speed.

12-47. FUEL MANIFOLD VALVE (FUEL DISTRIBUTOR).

12-48. DESCRIPTION. Metered fuel flows to the fuel manifold valve, which provides a central point for distributing fuel to the individual cylinders. An internal diaphragm, operated by fuel pressure, raises or lowers a plunger to open and close the individual cylinder supply ports simultaneously. A needle valve in the plunger ensures that the plunger fully opens the outlet ports before fuel flow starts and closes the ports simultaneously for positive engine shut-down. A fine-mesh screen is included in the fuel manifold valve.

NOTE

The fuel manifold valves are supplied in two flow ranges. When replacing a valve assembly, be sure the replacement valve has the same suffix letter as the one stamped on the cover of the valve removed.

12-49. REMOVAL.

NOTE

Cap all disconnected lines, hoses and fittings.

a. Disconnect all fuel and fuel injection lines at the fuel manifold.
b. Remove bolts which secure fuel manifold and remove manifold.

12-50. CLEANING.

a. Remove manifold valve from engine in accordance with paragraph 12-49 and remove safety wire from cover attaching screws.

b. Hold the top cover down against internal spring until all four cover attaching screws have been removed, then gently lift off the cover. Use care not to damage the spring-loaded diaphragm below cover.
c. Remove the upper spring and lift the diaphragm assembly straight up.

NOTE

If the valve attached to the diaphragm is stuck in the bore of the body, grasp the center nut, rotate and lift at the same time to work gently out of the body.

CAUTION

Do not attempt to remove needle or spring from inside plunger valve. Removal of these items will disturb the calibration of the valve.

d. Using clean gasoline, flush out the chamber below the screen.
e. Flush above the screen and inside the center bore making sure that outlet passages are open. Use only a gentle stream of compressed air to remove dust and dirt and to dry.

CAUTION

The filter screen is a tight fit in the body and may be damaged if removal is attempted. It should be removed only if a new screen is to be installed.

f. Clean diaphragm, valve and top cover in the same manner. Be sure the vent hole in the top cover is open and clean.
g. Carefully replace diaphragm and valve. Check that valve works freely in body bore.
h. Position diaphragm so that horizontal hole in plunger valve is 90 degrees from the fuel inlet port in the valve body.
i. Place upper spring in position on diaphragm.
j. Place cover in position so that vent hole in cover is 90 degrees from inlet port in valve body. Install cover attaching screws and tighten to 20±1 lb-in. Install safety wire on cover screws.
k. Install fuel manifold valve assembly on engine in accordance with paragraph 12-51 and reconnect all lines and hoses to valve.
l. Inspect installation and install cowling.

12-51. INSTALLATION.
a. Secure the fuel manifold to the crankcase with the two crankcase bolts.
b. Connect the fuel lines and the six fuel injection lines. Inspect completed installation and install cowling.

12-52. FUEL DISCHARGE NOZZLES.

12-53. DESCRIPTION. From the fuel manifold valve, individual, identical size and length fuel lines carry metered fuel to the fuel discharge nozzles located in the cylinder heads. The outlet of each nozzle is directed into the intake port of each cylinder. The nozzle body contains a drilled central passage with a counterbore at each end. The lower end is used as a chamber for fuel-air mixture before the spray leaves the nozzle. The upper bore contains an orifice for calibrating the nozzles. Near the top, radial holes connect the upper counterbore with the outside of the nozzle body for air admission. These radial holes enter the counterbore above the orifice and draw outside air through a cylindrical screen fitted over the nozzle body. This screen prevents dirt and foreign material from entering the nozzle. A press-fit shield is mounted on the nozzle body and extends over the greater part of the filter screen, leaving a small opening at the bottom of the shield. This provides an air bleed into the nozzle which aids in vaporizing the fuel by breaking the high vacuum in the intake manifold at idle rpm and keeps the fuel lines filled. The nozzles are calibrated in several ranges. All nozzles furnished for one engine are the same range and are identified by a number and a suffix letter stamped on the flat portion of the nozzle body. When replacing a fuel discharge nozzle be sure it is of the same calibrated range as the rest of the nozzles in the engine. When a complete set of nozzles is being installed, the number must be the same as the one removed, but the suffix letters may be different, as long as they are the same for all nozzles being installed on a particular engine.

12-54. REMOVAL.

NOTE

Plug or cap all disconnected lines and fittings.

a. Disconnect the fuel injection lines at the fuel discharge nozzles. Remove nozzles with a 1/2 inch deep well socket wrench.

12-55. CLEANING AND INSPECTION. To clean nozzles, immerse in clean solvent and use compressed air to dry them. When cleaning, direct air through the nozzle in the direction opposite of normal fuel flow Do not remove the nozzle shield or distort it in any way. Do not use a wire or other metal object to clean the orifice or metering jet. After cleaning, check the shield height from the hex portion of the nozzle. The bottom of the shield should be approximately 1/16 inch above the hex portion of the nozzle.

12-56. INSTALLATION.
a. Install nozzles in the cylinders and tighten to a torque value of 60 to 80 lb-in.
b. Connect the fuel lines at discharge nozzles.
c. Check installation for crimped lines, loose fittings, etc.

12-57. FUEL INJECTION PUMP.

12-58. DESCRIPTION. The fuel pump is a positive-displacement, rotating vane type, connected to the accessory drive section of the engine. Fuel enters the pump at the swirl well of the pump vapor separator. Here, vapor is separated by a swirling motion so that only liquid fuel is fed to the pump. The vapor is drawn from the top center of the swirl well by a small pressure jet of fuel and is fed into the vapor return line, where it is returned to the aircraft fuel system. Since the pump is engine driven, changes in engine speed affects total pump flow proportionally. A check valve allows the auxiliary fuel pump pressure to bypass the engine-driven fuel pump for starting, or in the event of engine-driven fuel pump failure. The pump supplies more fuel than is required by the engine, therefore, a spring-loaded, diaphragm type relief valve is provided, with an adjustable orifice installed in the fuel passage to the relief valve to maintain desired fuel pressure for engine power setting. The adjustable orifice allows the exact desired pressure setting at full throttle. The fuel pump is equipped with a manual mixture control to provide positive mixture control throughout the range required by the injection system. This control limits output of the pump from full rich to idle cut-off. Non-adjustable mechanical stops are located at these positions. The fuel pump is ram-air cooled to help prevent high fuel temperatures. The ram air is picked up at the upper left engine baffle and directed through a flexible tube to the fuel pump shroud. The fuel supply and return lines from the fuel pump to the control unit are routed inside flexible tubes to help prevent vaporized fuel at these points.

12-59. REMOVAL.

A. Place fuel shut-off valve in OFF position and mixture control in IDLE CUT-OFF position.

B. Remove cowling in accordance with paragraph 12-3.

C. Loosen the clamps and slide the flexible tubes free of the horns on the fuel pump shroud to gain access to the fuel lines.

D. Remove the alternator drive belt.

E. Tag and disconnect all lines and fittings attached to the fuel pump.

NOTE: Plug or cap all disconnected lines, hoses and fittings.

F. Remove the shroud surrounding the fuel pump.

G. Remove the nuts and washers attaching the fuel pump to the engine.

H. Remove fuel pump and gasket.

WARNING: Residual fuel draining from lines and hose constitutes a fire hazard. Use caution to prevent accumulation of fuel when lines or hoses are disconnected.

I. If a replacement pump is not being installed immediately, a temporary cover should be installed on the fuel pump mount pad.

12-60. INSTALLATION.

A. Position a new gasket and fuel pump on the mounting studs with fuel pump inlet to the left. Be sure pump drive aligns with drive in the engine.

B. Secure pump to engine with plain washers, internal tooth lock washers and nuts. Tighten nuts evenly.

C. Install cooling shroud on fuel pump.

D. Install all fittings and connect all lines.

E. Install the flexible ram air tube on the air horn of the fuel pump shroud and install clamp.

F. Replace the alternator drive belt and tighten the nuts on the adjusting arm so that the drive belt has proper tension. Refer to Section 17.

G. Inspect completed installation.

12-61. ADJUSTMENT. The full rich performance of the fuel injection system is controlled by manual adjustment of the air throttle, fuel mixture and pump pressure at idle and only by pump pressure at full throttle. To make full rich adjustment, proceed as follows:

A. Remove engine cowling in accordance with paragraph 12-3.

NOTE: Inspect the slot-headed adjustable orifice needle valve (located just below the fuel pump inlet fitting) to see if it is epoxy sealed or safety wired to the brass nut. If the needle valve is epoxy sealed, Continental Aircraft Engine Service Bulletin No. 70-10 must be complied with before calibration of the unit can be performed.

B. Disconnect the engine-driven fuel pump outlet fitting or the fuel metering unit inlet fitting and "tee" the test gage into the fuel injection system as illustrated in Figure 12-8.

NOTE: Cessna Service Kit No. SK320-2J provides a test gage, line and fittings for connecting the test gage into the system to perform accurate calibration of the engine-driven fuel pump.

C. The test gage MUST be vented to atmosphere and MUST be held as near to the level of the engine-driven fuel pump as possible. Bleed air from test gage line prior to taking readings.

NOTE: The test gage should be checked for accuracy at least every 90 days or anytime an error is suspected. The tachometer accuracy should also be determined prior to making any adjustments to the pump.

D. Start engine and warm-up thoroughly. Set mixture control to full rich position and propeller control full forward (low pitch, high rpm).

e. Adjust engine idle speed to 600±25 rpm and check test gage for 9-11 PSI. Refer to figure 12-7 for idle mixture adjustment.

NOTE

Do not adjust idle mixture until idle pump pressure is obtained.

WARNING

DO NOT make fuel pump pressure adjustments while engine is operating.

f. If the pump pressure is not 9 to 11 PSI, stop engine and turn the fuel pump relief valve adjustment, on the centerline of the fuel pump clockwise (CW) to increase pressure and counterclockwise (CCW) to decrease pressure.

g. Maintaining idle pump pressure and idle RPM, obtain correct idle mixture in accordance with paragraph 12-46.

h. Completion of the preceding steps have provided:

1. Correct idle pump pressure.
2. Correct fuel flow.
3. Correct fuel metering cam to throttle plate orientation.

i. Advance to full throttle and maximum rated engine speed with the mixture control in full rich position and propeller control in full forward (low pitch, high rpm).

j. Check test gage for pressures specified in paragraph 12-12. If pressure is incorrect, stop engine and adjust pressure by loosening locknut and turning the slotheaded needle valve located just below the fuel pump inlet fitting clockwise (CW) to increase pressure and counterclockwise (CCW) to decrease pressure.

NOTE

If at static run-up, rated RPM cannot be achieved at full throttle, adjust pump pressure slightly below limits making certain the correct pressures are obtained when rated RPM is achieved during take-off roll.

k. After correct pressures are obtained, safety adjustable orifice and orifice lockout.

l. Remove test equipment, run engine to check for leaks and install cowling.

12-62. INDUCTION AIR SYSTEM.

12-63. DESCRIPTION. Ram air enters the induction air system through filters at the upper left and upper right engine baffles. A spring-loaded alternate air door is incorporated in the airbox and will open by engine suction if the air filters should become clogged. This permits unfiltered induction air to be drawn from within the engine compartment.

12-64. AIRBOX.

12-65. REMOVAL AND INSTALLATION.

a. Remove cowling in accordance with paragraph 12-3.

b. Remove induction air filters.

c. Disconnect electrical wiring at throttle-operated micro-switches and tape terminals as a safety precaution.

d. Remove clamps attaching lines, wires and controls to airbox.

e. Remove bolts securing airbox to fuel-air control unit and engine and remove airbox and gasket.

f. Install a cover over fuel-air control opening.

g. Reverse the preceding steps for reinstallation. Adjust throttle operated switches in accordance with paragraph 12-87.

12-66. CLEANING AND INSPECTION. Clean metal parts of the induction airbox with Stoddard solvent or equivalent. Inspect for cracks, dents, loose rivets, etc. Minor cracks may be stop-drilled. In case of continued or severe cracking, replace airbox. Inspect alternate spring-loaded door for freedom of operation and complete closing.

12-67. INDUCTION AIR FILTERS.

12-68. DESCRIPTION. Induction air filters, mounted at the airbox inlets, remove dust particles from the ram air entering the engine.

12-69. REMOVAL AND INSTALLATION.

a. Remove cowling in accordance with paragraph 12-3.

b. Remove bolts securing filters to the upper left and right engine baffles and induction airbox inlets.

c. Reverse the preceding steps for reinstallation. Make sure the gaskets are in place between the filter and airbox intakes.

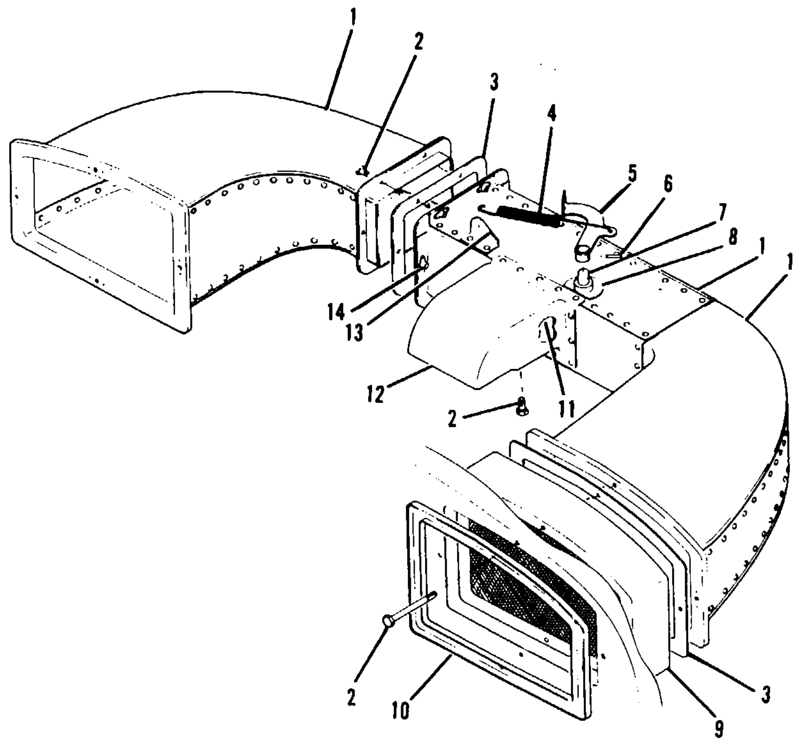
12-70. CLEANING AND INSPECTION. Clean and inspect filters in accordance with instructions in Section 2.

12-71. IGNITION SYSTEM.

12-72. DESCRIPTION. The ignition system is comprised of two magnetos, two spark plugs in each cylinder, an ignition wiring harness, an ignition switch mounted on the instrument panel and required wiring between the ignition switch and magnetos.

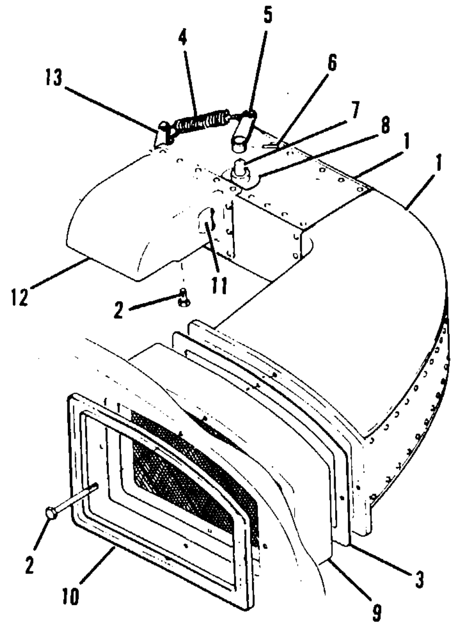
12-78. TROUBLE SHOOTING.

TROUBLE	PROBABLE CAUSE	REMEDY
ENGINE FAILS TO START.	Defective ignition switch.	Check switch continuity. Replace if defective.
	Spark plugs defective, improperly gapped or fouled by moisture or deposits.	Clean, regap and test plugs. Replace if defective.
	Defective ignition harness.	If no defects are found by a visual inspection, check with a harness tester. Replace defective parts.
	Magneto "P" lead grounded.	Check continuity. "P" lead should not be grounded in the ON position, but should be grounded in OFF position. Repair or replace "P" lead.
	Failure of impulse coupling.	Impulse coupling pawls should engage at cranking speeds. Listen for loud clicks as impulse couplings operate. Remove magnetos and determine cause. Replace defective magneto.
	Defective magneto.	Refer to paragraph 12-79.
	Broken drive gear.	Remove magneto and check magneto and engine gears. Replace defective parts. Make sure no pieces of damaged parts remain in engine or engine disassembly will be required.
ENGINE WILL NOT IDLE OR RUN PROPERLY.	Spark plugs defective, improperly gapped or fouled by moisture or deposits.	Clean, regap and test plugs. Replace if defective.
	Defective ignition harness.	If no defects are found by a visual inspection, check with a harness tester. Replace defective parts.
	Defective magneto.	Refer to paragraph 12-79.
	Impulse coupling pawls remain engaged.	Listen for loud clicks as impulse coupling operates. Remove magneto and determine cause. Replace defective magneto.
	Spark plugs loose.	Check and install properly.



THRU 21061039

1. Duct
2. Bolt
3. Gasket
4. Spring
5. Arm
6. Pin
7. Shaft
8. Bushing Assembly
9. Air Filter
10. Retainer
11. Door Assembly
12. Adaptor
13. Bracket
14. Nutplate



BEGINNING WITH 21061040

Figure 12-8A. Airbox Installation

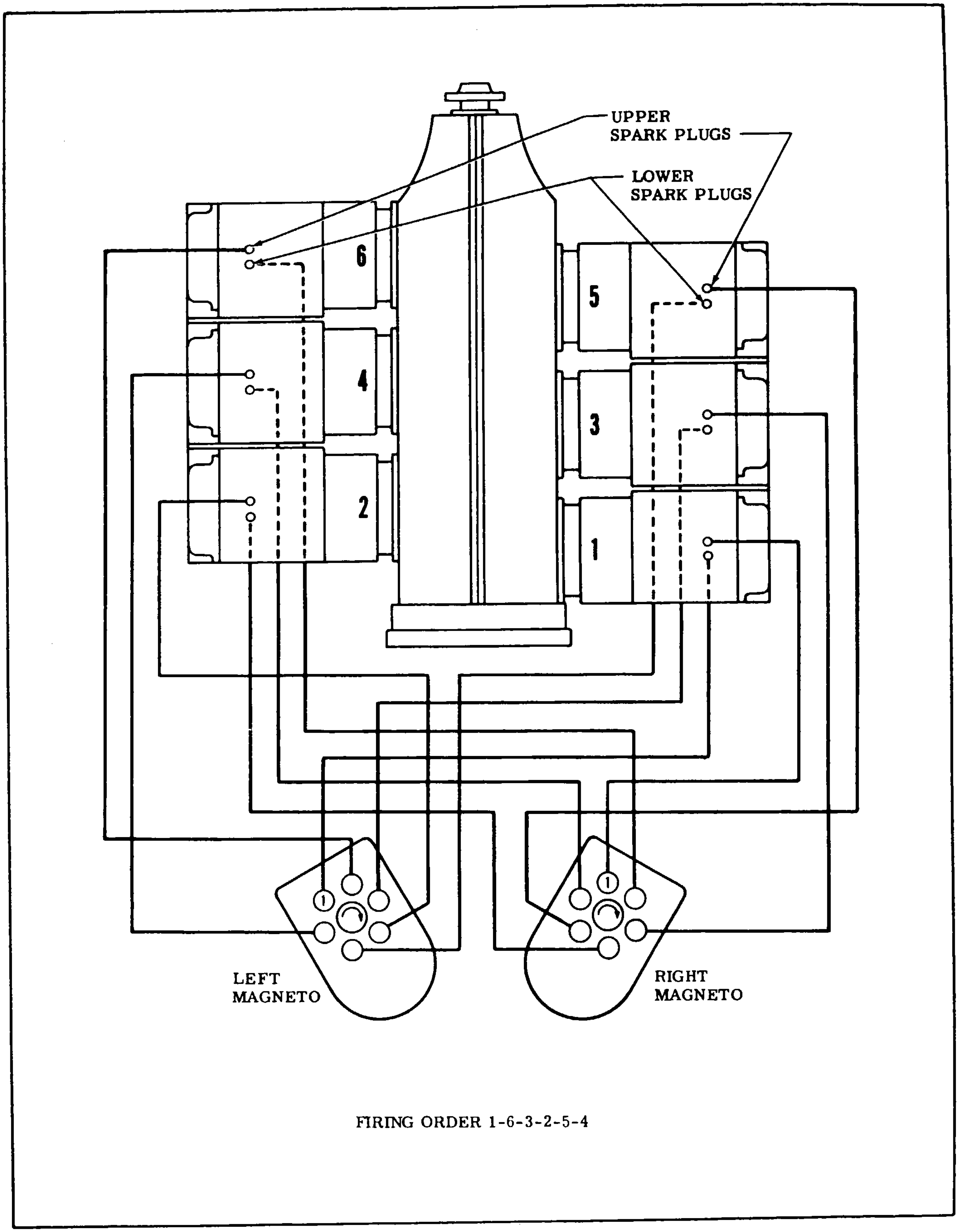


Figure 12-9. Ignition Schematic

12-74. MAGNETOS.

12-75. DESCRIPTION. The magnetos contain a conventional two-pole rotating magnet (rotor), mounted in ball bearings. Driven by the engine through an impulse coupling at one end, the rotor shaft operates the breaker points at the other end of the shaft. The nylon rotor gear drives a nylon distributor gear which transfers high tension current from the wedge-mounted coil to the proper outlet in the distributor block. A coaxial capacitor is mounted in the distributor block housing to serve as the condenser as well as a radio noise suppressor. Both nylon gears are provided with timing marks for clockwise or counterclockwise rotation. The distributor gear and distributor block have timing marks, visible through the air vent holes, for timing to the engine. A timing hole is provided in the bottom of the magneto adjacent to the magneto flange. A timing pin or 6-penny nail can be inserted through this timing hole into the mating hole in the rotor shaft to lock the magneto approximately in the proper firing position. The breaker assembly is accessible only after removing the screws fastening the magneto halves together and disconnecting the capacitor slip terminal. Do not separate magneto halves while it is installed on the engine.

12-76. REMOVAL.

a. Remove engine cowling in accordance with paragraph 12-3.
b. Tag for identification and remove high tension wires from the magneto being removed.

WARNING

The magneto is in a SWITCH ON condition when the switch wire is disconnected. Remove the high tension wires from magneto or disconnect spark plug leads from the spark plugs to prevent accidental firing.

c. Disconnect switch wire from condenser terminal at magneto. Tag wire for identification so it may be installed correctly.
d. Rotate propeller in direction of normal rotation until No. 1 cylinder is coming up on its compression stroke.

NOTE

To facilitate the installation of a replacement magneto, it is good practice to position the crankshaft at the advanced firing angle for No. 1 cylinder during step "d." Any standard timing device or method can be used, or if the magneto being removed is correctly timed to the engine, the crankshaft can be rotated to a position at which the breaker points will be just opening to fire No. 1 cylinder.

e. Remove magneto retainer clamps, nuts and washers and pull magneto from crankcase mounting pad.

NOTE

As the magneto is removed from its mounting, be sure that the drive coupling rubber bushing and retainer do not become dislodged from the gear hub and fall into the engine.

NOTE

For inspection of impluse coupling on aircraft serials 21058221 THRU 21060368, refer to Cessna Single-engine Service Letter SE74-21, dated September 27, 1974.

12-77. INTERNAL TIMING.

a. Whenever the gear on the rotor shaft or the cam (which also serves as the key for the gear) has been removed, be sure that the gear and cam are installed so the timing mark on the gear aligns with the "O" etched on the rotor shaft.
b. When replacing breaker assembly or adjusting contact breaker points, place a timing pin (or 0.093 inch 6-penny nail) through the timing hole in the bottom of the magneto next to the flange and into the mating hole in the rotor shaft. Adjusting contact breaker points so they are just starting to open in this position will give the correct point setting. Temporarily assemble the magneto halves and capacitor slip terminal and use a timing light to check that the timing marks, visible through the ventilation plug holes are approximately aligned.

NOTE

The side of the magneto with the manufacturer's insignia has a red timing mark and the side opposite to the insignia has a black timing mark viewed through the vent plug holes. The distributor gear also has a red timing mark and a black timing mark. These marks are used for reference only when installing magneto on the engine. Do not place red and black lines together on the same side.

c. Whenever the large distributor gear and rotor gear have been disengaged, they must be engaged with their timing marks aligned for correct rotation. Align the timing mark on the rotor gear with the "RH" on the distributor gear. Care must be taken to keep these two gears meshed in this position until the magneto halves are assembled.

12-78. INSTALLATION AND TIMING TO ENGINE. The magneto MUST be installed with its timing marks correctly aligned, with the number one cylinder on its compression stroke and with number one piston at its advanced firing position. Refer to paragraph 12-12 for the advanced firing position of number one piston.

WARNING

The magneto is grounded through the ignition switch, therefore, any time the switch (primary) wire is disconnected from the magneto, the magneto is in a switch ON or HOT condition. Before turning the propeller by hand, remove the high tension wires from the magneto or disconnect all spark plug leads to prevent accidental firing of the engine.

To locate the compression stroke of number one cylinder, remove the lower spark plugs from each cylinder except number one cylinder. Remove the top plug from number one cylinder. Place thumb of one hand over the number one cylinder spark plug hole and rotate the crankshaft in the direction of normal rotation until the compression stroke is indicated by positive pressure inside the cylinder lifting the thumb off the spark plug hole. After the compression stroke is obtained, locate number one piston at its advanced firing position. Locating the advanced firing position of number one cylinder may be obtained by use of a timing disc and pointer, Timrite, protractor and piston locating gage or external engine timing marks alignment.

NOTE

External engine timing marks are located on a bracket attached to the starter adapter, with a timing mark on the alternator drive pulley as the reference point.

In all cases, it must be definitely determined that the number one cylinder is at the correct firing position and on the compression stroke, when the crankshaft is turned in its normal direction of rotation. After the engine has been placed in the correct firing position, install and time the magneto to the engine in the following manner.

NOTE

Install the magneto drive coupling retainer and rubber bushings into the magneto drive gear hub slot. Insert the two rubber bushings into the retainer with the chamfered edges facing toward the front of the engine.

a. Turn the magneto shaft until the timing marks visible through the ventilation plug holes are aligned (red-to-red or black-to-black) and insert a timing pin (or 0.093 inch 6-penny nail) through the timing hole in the bottom of the magneto next to the flange and into the mating hole in the rotor shaft. This locks the magneto approximately in the firing position while installing on the engine.

NOTE

If the magneto drive gear was disengaged during magneto removal, hold the magneto in the horizontal position it will occupy when installed, make certain that the drive gear coupling slot is aligned with the magneto coupling lugs. If it is not aligned, pull the magneto drive gear out of mesh with its drive gear and rotate it to the aligned angle, then push it back into mesh. DO NOT WITHDRAW THE MAGNETO DRIVE GEAR FROM ITS OIL SEAL.

b. After magneto gasket is in place, position the magneto on the engine and secure, then remove the timing pin from the magneto. Be sure to remove this pin before turning the propeller.

c. Connect a timing light to the capacitor terminal at the front of the magneto and to a good ground.

d. Turn propeller back a few degrees (opposite of normal rotation) to close the contact points.

NOTE

Do not turn the propeller back far enough to engage the impulse coupling or the propeller will have to be turned in normal direction of rotation until the impulse coupling releases, then backed up to slightly before the firing position.

e. Slowly advance the propeller in the normal direction of rotation until the timing light indicates the contact points breaking. Magneto mounting clamps may be loosened so that the magneto may be shifted to break the points at the correct firing position.

f. Tighten magneto mounting nuts and recheck timing.

g. Repeat steps "a" through "f" for the other magneto.

h. After both magnetos have been timed, check synchronization of both magnetos. Magnetos must fire at the same time.

i. Remove timing devices from magneto and engine.

j. Connect spark plug leads to their correct magneto outlets.

NOTE

The No. 1 magneto outlet is the one closest to the ventilation plug on the side of the magneto having the manufacturer's insignia. The magneto fires at each successive outlet in clockwise direction. Connect No. 1 magneto outlet to No. 1 cylinder spark plug lead, No. 2 outlet to the next cylinder to fire, etc. Engine firing order is listed in paragraph 12-12.

k. Connect ignition switch (primary) leads to the capacitor terminals on the magnetos.

l. Inspect magneto installation and install engine cowling in accordance with paragraph 12-3.

12-79. MAINTENANCE. At the first 25-hour inspection and at each 100-hour inspection thereafter, the breaker compartment should be inspected. Magneto-to-engine timing should be checked at the first 25-hour inspection, first 50-hour inspection, first 100-hour inspection and thereafter at each 100-hour inspection. If timing is as specified in paragraph 12-12, internal timing need not be checked. If timing is out of tolerance, remove magneto and set internal timing, then install and time to the engine. In the event the magneto internal timing marks are off more than plus or minus five degrees when the breaker points open to fire number one cylinder, remove the magneto and check the magneto internal timing. Whenever the magneto halves are separated the breaker point assembly should always be checked. As long as internal timing and magneto-to-engine timing are within the preceding tolerances, it is recommended that the magneto be checked internally only at 500 hour intervals. It is normal for contact points to burn and the cam to wear a comparable amount so the magneto will remain in time within itself. This is accomplished by having a good area making contact on the surface between the points and the correct amount of spring pressure on the cam. The area on the points should be twenty-five percent of the area making contact. The spring pressure at the cam should be 10.5 to 12.5 ounces. When the contact points burn, the area becomes irregular, which is not detrimental to the operation of the points unless metal transfer is too great which will cause the engine to misfire. Figure 12-10 illustrates good and bad contact points. A small dent will appear on the nylon insulator between the cam follower and the breaker bar. This is normal and does not require replacement.

NOTE

If ignition trouble should develop, spark plugs and ignition wiring should be checked first. If the trouble definitely is associated with a magneto, use the following to help disclose the source of trouble without overhauling the magneto.

a. Moisture Check.

1. Remove magneto from engine and remove screws securing the magneto halves together, disconnect capacitor slip terminal and remove distributor. Inspect for moisture.

2. Check distributor gear finger and carbon brush for moisture.

3. Check breaker point assembly for moisture, especially on the surfaces of the breaker points.

4. If any moisture is evident in the preceding places, wipe with a soft, dry, clean, lint-free cloth.

b. Breaker Compartment Check.

1. Check all parts of the breaker point assembly for security.

2. Check breaker point surface for evidence of excessive wear, burning, deep pits and carbon deposits. Breaker points may be cleaned with a hard-finish paper. If breaker point assembly is defective, install a new assembly. Make no attempt to stone or dress the breaker points. Clean new breaker points with clean, unleaded gasoline and hard-finish paper before installing.

3. Check capacitor mounting bracket for cracks or looseness.

4. Check the carbon brush on the distributor gear for excessive wear. The brush must extend a minimum of 1/32 inch beyond the end of the gear shaft. The spring which the carbon brush contacts should be bent our approximately 20 degrees from vertical, since spring pressure on the brush holds the distributor gear shaft against the thrust bearing in the distributor block.

5. Oil the bearings at each end of the distributor gear shaft with a drop of SAE 20 oil. Wipe excess oil from parts.

6. Make sure internal timing is correct and reassemble magneto. Install and properly time magneto to engine.

12-80. MAGNETO CHECK. Advanced timing settings in some cases, is the result of the erroneous practice of bumping magnetos up in timing in order to reduce RPM drop on single ignition. NEVER ADVANCE TIMING BEYOND SPECIFICATIONS IN ORDER TO REDUCE RPM DROP. Too much importance is being attached to RPM drop on single ignition. RPM drop on single ignition is a natural characteristic of dual ignition design. The purpose of the following magneto check is to determine that all cylinders are firing. If all cylinders are not firing, the engine will run extremely rough and cause for investigation will be quite apparent. The amount of RPM drop is not necessarily significant and will be influenced by ambient air temperature, humidity, airport altitude, etc. In fact, absence of RPM drop should be cause for suspicion that the magneto timing has been bumped up and is set in advance of the setting specified. Magneto checks should be performed on a comparative basis between individual right and left magneto performance.

a. Start and run engine until the oil and cylinder head temperature is in the normal operating range.

b. Place the propeller control in the full low pitch (high rpm) position.

c. Advance engine speed to 1700 rpm.

d. Turn the ignition switch to the "R" position and note the rpm drop, then return the switch to the "BOTH" position to clear the opposite set of plugs.

e. Turn the switch to the "L" position and note the rpm drop, then return the switch to the "BOTH" position.

f. The rpm drop should not exceed 150 rpm on either magneto or show greater than 50 rpm differential between magnetos. A smooth rpm drop-off past normal is usually a sign of a too lean or too rich mixture. A sharp rpm drop-off past normal is usually a sign of a fouled plug, a defective harness lead or a magneto out of time. If there is doubt concerning operation of the ignition system, rpm checks at a leaner mixture setting or at higher engine speeds will usually confirm whether a deficiency exists.

NOTE

An absence of rpm drop may be an indication of faulty grounding of one side of the ignition system, a disconnected ground lead at magneto or possibly the magneto timing is set too far in advance.

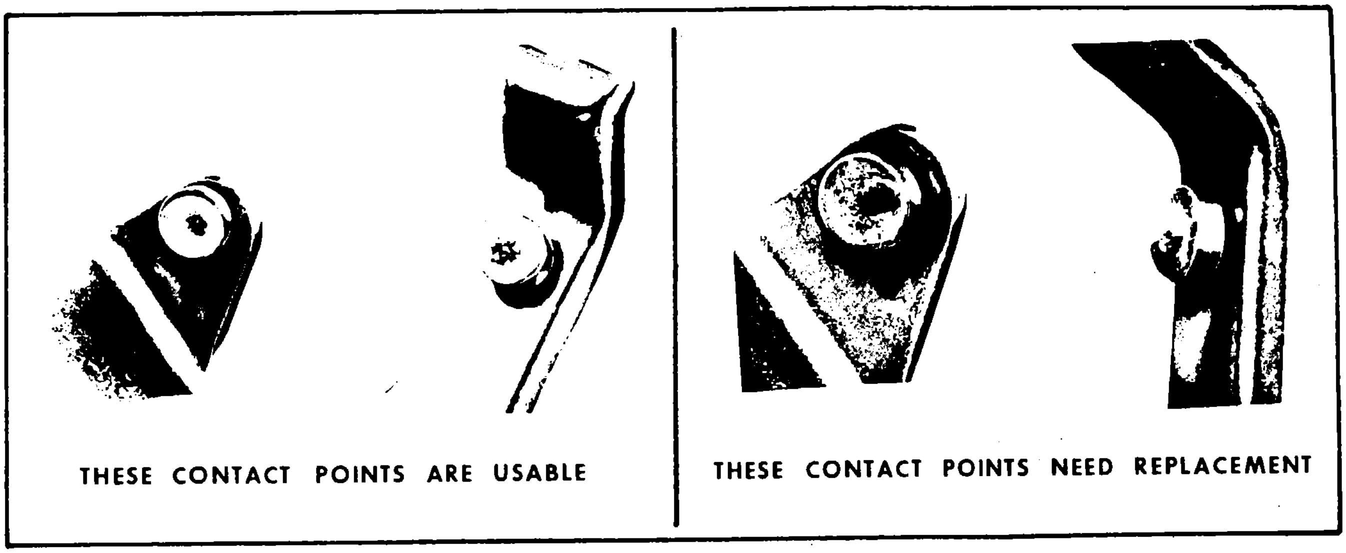


Figure 12-10. Magneto Contact Breaker Points

12-81. SPARK PLUGS. Two spark plugs are installed in each cylinder and screw into helicoil type thread inserts. The spark plugs are shielded to prevent spark plug noise in the radios and have an internal resistor to provide longer terminal life. Spark plug service life will vary with operating conditions. A spark plug that is kept clean and properly gapped will give better and longer service than one that is allowed to collect lead deposits and is improperly gapped.

NOTE

At each 100-hour inspection, remove, clean, inspect and regap all spark plugs. Install lower spark plugs in upper portion of cylinders and install upper spark plugs in lower portion of cylinders. Since deterioration of lower spark plugs is usually more rapid than that of the upper spark plugs, rotating helps prolong spark plug life.

■ 12-82. ENGINE CONTROLS. Refer to figure 12-10A.

12-83. DESCRIPTION. The throttle, mixture and propeller controls are of the push-pull type. The propeller and mixture controls are equipped to lock in any position desired. To move the control, the spring-loaded button, located in the end of the control knob, must be depressed. When the button is released, the control is locked. The propeller and mixture controls also have a vernier adjustment. Turning the control knob in either direction will change the control setting. The vernier is primarily for precision control setting. The throttle control has neither a locking button nor a vernier adjustment, but contains a knurled friction knob which is rotated for more or less friction as desired. The friction knob prevents vibration induced "creeping" of the control. A "Palnut" type locknut is installed in back of the existing locknut at the engine end of the throttle, mixture and propeller controls.

12-84. RIGGING. When adjusting any engine control, it is important to check that the control slides smoothly throughout its full travel, that it locks securely if equipped with a locking device and the arm or lever which it operates moves through its full arc of travel.

CAUTION

Some engine controls have a small retaining ring brazed (or attached with epoxy resin) in a groove .97 inch from the threaded end of the control. The purpose of these retaining ring is to prevent inadvertent withdrawal and possible damage to the knob end of the controls while jam nuts and rod ends are removed.

- Whenever engine controls are being disconnected, pay particular attention to the EXACT position, size and number of attaching washers and spacers. Be sure to install attaching parts as noted when connecting controls.

12-85. THROTTLE CONTROL.

a. Push throttle control full in, then pull control out approximately 1/8 inch for cushion.

b. Check that throttle control arm is against the mechanical stop. If necessary, loosen locknut and screw rod end IN or OUT as necessary to align with attachment hole while throttle arm is against the mechanical stop.

c. Pull control full out and check that throttle arm contacts the idle stop.

d. The throttle arm must contact the stops in each direction and the control should have approximately 1/8 inch cushion when pushed full in.

NOTE

Refer to the inspection chart in Section 2 for inspection and/or replacement interval for the throttle control.

12-86. MIXTURE CONTROL.

a. Push mixture control full in, then pull control out approximately 1/8 inch for cushion.

b. Check that mixture control arm is in full rich position (against stop). If necessary, loosen locknut and screw rod end IN or OUT as necessary to align with attachment hole while mixture arm is against the mechanical stop.

c. Pull control full out and check that mixture arm contacts the idle cut-off stop.

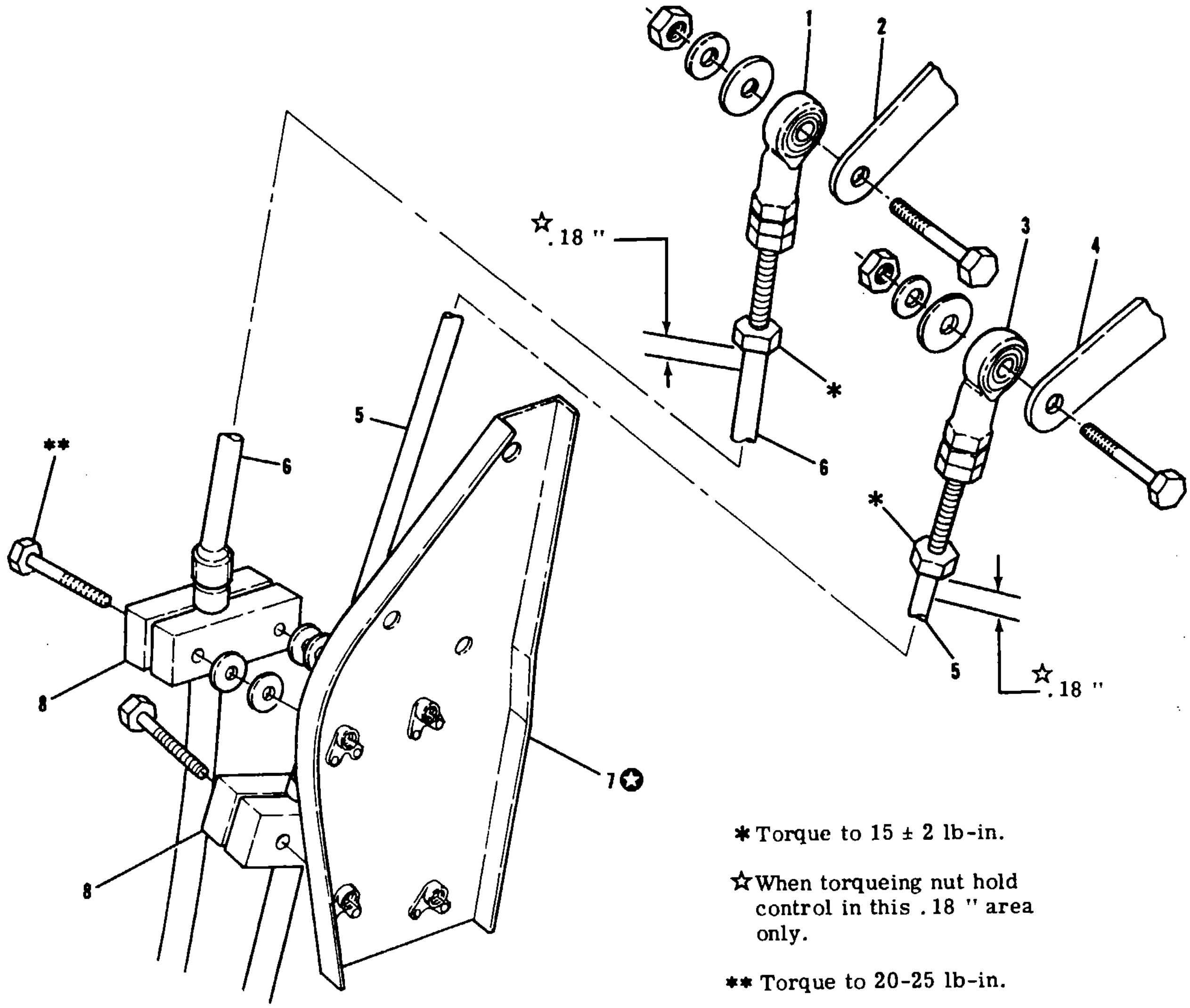
d. The mixture arm must contact the stops in each direction and the control should have approximately 1/8 inch cushion when pushed full in.

NOTE

Refer to the inspection chart in Section 2 for inspection and/or replacement interval for the mixture control.

12-87. Deleted

SHOP NOTES:



* Torque to 15 ± 2 lb-in.

☆When torqueing nut hold control in this .18 " area only.

** Torque to 20-25 lb-in.

Safety wire bracket-to-engine mounting bolts to each other.

1. Rod End (Throttle Control)
2. Throttle Control Arm
3. Rod End (Mixture Control)
4. Mixture Control Arm
5. Mixture Control
6. Throttle Control
7. Bracket (Typical)
8. Clamp

✪ The turbocharged engine control bracket (7) is illustrated, the non-turbocharged bracket is shorter and does not use the washers between clamp (8) and bracket (7).

Figure 12-10A. Engine Controls

12-88. PROPELLER CONTROL. Refer to Section 14.

12-89. STARTING SYSTEM.

12-90. DESCRIPTION. The automatically-engaged starting system employs an electrical starter motor mounted to a 90-degree adapter. A solenoid is activated by the ignition switch on the instrument panel. When the solenoid is activated, its contacts close and electrical current energizes the motor. Initial rotation of the motor engages the starter through an overrunning clutch in the starter adapter, which incorporates worm reduction gears. The starter motor is located just aft of the right rear cylinder.

CAUTION

Never operate the starter motor more than 12 seconds at a time. Allow starter motor to cool between cranking periods to avoid overheating. Longer cranking periods without cooling time will shorten the life of the starter motor.

12-91. TROUBLE SHOOTING.

TROUBLE	PROBABLE CAUSE	REMEDY
STARTER WILL NOT OPERATE.	Defective master switch or circuit.	Check continuity. Install new switch or wires.
	Defective starter switch or switch circuit.	Check continuity. Install new switch or wires.
	Defective starter motor.	Check electrical power to motor. Repair or replace starter motor.
STARTER MOTOR RUNS, BUT DOES NOT TURN CRANKSHAFT.	Defective overrunning clutch or drive.	Check visually. Install new starter adapter.
	Starter motor shaft broken.	Check visually. Install new starter motor.
STARTER MOTOR DRAGS.	Low battery.	Check battery. Charge or install new battery.
	Starter switch or relay contacts burned or dirty.	Install serviceable unit.
	Defective starter motor power cable.	Check visually. Install new cable.
	Loose or dirty connections.	Remove, clean and tighten all terminal connections.
	Defective starter motor.	Check starter motor brushes, brush spring tension, thrown solder on brush cover. Repair or install new starter motor.
	Dirty or worn commutator.	Check visually. Clean and turn commutator.
STARTER EXCESSIVELY NOISY.	Worn starter pinion.	Remove and inspect. Replace starter drive.
	Worn or broken teeth on crankshaft gears.	Check visually. Replace crankshaft gear.

12-92. PRIMARY MAINTENANCE. The starting circuit should be inspected at regular intervals, the frequency of which should be determined by the amount of service and conditions under which the equipment is operated. Inspect the battery and wiring. Check battery for fully charged condition, proper electrolyte level with approved water and terminals for cleanliness. Inspect wiring to be sure that all connections are clean and tight and that the wiring insulation is sound. Check that the brushes slide freely in their holders and make full contact on the commutator. When brushes are worn to one-half of their original length, install new brushes (compare brushes with new brushes). Check the commutator for uneven wear, excessive glazing or evidence of excessive arcing. If the commutator is only slightly dirty, glazed or discolored, it may be cleaned with a strip of No. 00 or No. 000 sandpaper. If the commutator is rough or worn, it should be turned in a lathe and the mica undercut. Inspect the armature shaft for rough bearing surfaces. New brushes should be properly seated when installing by wrapping a strip of No. 00 sandpaper around the commutator (with sanding side out) 1-1/4 to 1-1/2 times maximum. Drop brushes on sandpaper covered commutator and turn armature slowly in the direction of normal rotation. Clean sanding dust from motor after sanding operations.

12-93. STARTER MOTOR.

12-94. REMOVAL AND INSTALLATION.

a. Remove engine cowling in accordance with paragraph 12-3.

CAUTION

When disconnecting starter electrical cable, do not permit terminal bolt to rotate. Rotation of the bolt could break the conductor between bolt and field coils causing the starter to be inoperative.

b. Disconnect battery cables and insulate as a safety precaution.

c. Disconnect electrical cable at starter motor.

d. Remove nuts and washers securing motor to starter adapter and remove motor. Refer to engine manufacturer's overhaul manual for adapter removal.

e. Reverse the preceding steps for reinstallation. Install a new O-ring seal on motor, then install motor. Be sure motor drive engages with the adapter drive when installing.

12-95. EXHAUST SYSTEM.

12-96. DESCRIPTION. The exhaust system consists of two exhaust stack assemblies, for the left and right bank of cylinders. Each cylinder has a riser pipe attached to the exhaust port. The three risers at each bank of cylinders are joined together into a collector pipe forming an exhaust stack assembly. The center riser on each bank is detachable, but the front and aft risers are welded to the collector pipe. The left muffler is enclosed in a shroud which captures exhaust heat which is used to heat the cabin.

12-97. REMOVAL AND INSTALLATION. (Refer to figure 12-12.)

a. Remove engine cowling in accordance with paragraph 12-3.

b. Disconnect ducts from heater shroud on left muffler assembly and EGT wires at quick-disconnects.

c. Disconnect tailpipe braces from shock-mounts at firewall brackets.

d. Remove nuts, springs and bolts attaching tailpipe and muffler to collector pipe and remove muffler and tailpipe assemblies.

e. Remove nuts attaching exhaust stack assemblies to the cylinders and remove exhaust stacks and gaskets.

f. Reverse the preceding steps for reinstallation Install a new copper-asbestos gasket between each riser and its mounting pad on each cylinder, regardless of apparent condition of those removed. Torque exhaust stack nuts at cylinders to 100-110 pound-inches.

12-98. INSPECTION. Since exhaust systems of this type are subject to burning, cracking and general deterioration from alternate thermal stresses and vibrations, inspection is important and should be accomplished every 100 hours of operation. Also, a thorough inspection of the engine exhaust system should be made to detect cracks causing leaks which could result in loss of engine power. To inspect the engine exhaust system, proceed as follows:

a. Remove engine cowling as required so that ALL surfaces of the exhaust assemblies can be visually inspected.

NOTE

Especially check the areas adjacent to welds and slip joints. Look for gas deposits in surrounding areas, indicating that exhaust gases are escaping through a crack or hole or around the slip joints.

b. After visual inspection, an air leak check should be made on the exhaust system as follows:

1. Attach the pressure side of an industrial vacuum cleaner to the tailpipe opening, using a rubber plug to effect a seal as required.

NOTE

The inside of the vacuum cleaner hose should be free of any contamination that might be blown into the engine exhaust system.

2. With vacuum cleaner operating, all joints in the exhaust system may be checked manually by feel, or by using a soap and water solution and watching for bubbles. Forming of bubbles is considered acceptable, if bubbles are blown away system is not considered acceptable.

c. Where a surface is not accessible for a visual inspection, or for a more positive test, the following procedure is recommended.

1. Remove exhaust stack assemblies.
2. Use rubber expansion plugs to seal openings.
3. Using a manometer or gage, apply approxi-

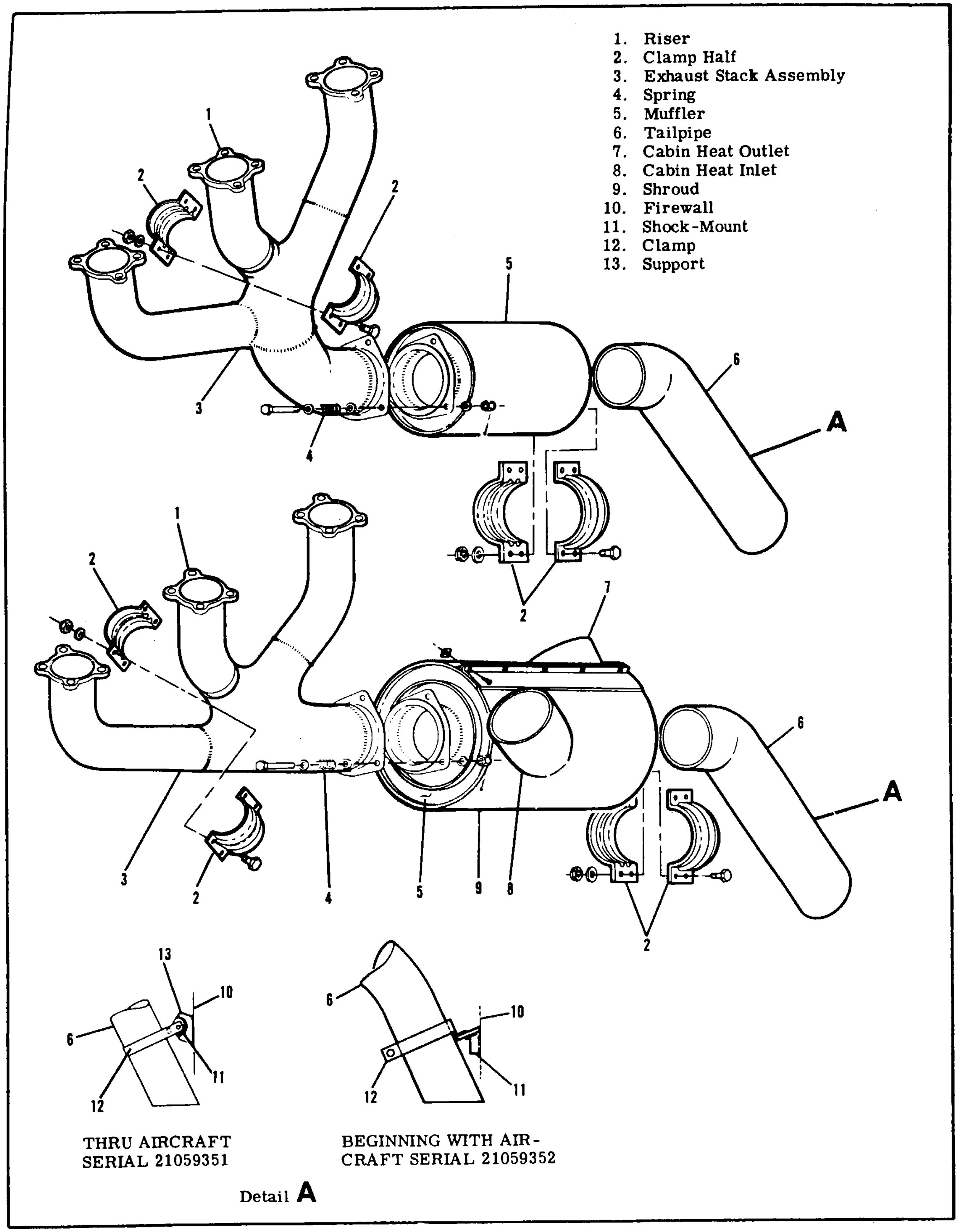


Figure 12-12. Exhaust System

mately 1-1/2 psi (3 inches of mercury) air pressure while each stack assembly is submerged in water. Any leaks will appear as bubbles and can be readily detected.

4. It is recommended that exhaust stacks found defective be replaced before the next flight.

d. After installation of exhaust system components perform the inspection in step "b" of this paragraph to ascertain that system is acceptable.

b. 200 HOUR INSPECTION. (AFTER THE MUFFLERS HAVE ACCUMULATED MORE THAN 1000 HOURS TIME IN SERVICE.)

1. Remove engine cowling in accordance with paragraph 12-3.
2. Remove the mufflers from the collector assemblies.
3. Remove the tailpipes from the mufflers.
4. Using a flashlight and mirror, inspect the baffles and cones from both ends of the mufflers. Check for general deterioration and to ensure that the baffles are intact and not separated from the support rods.
5. If any of these defects are found, replace the muffler before further flight.
6. If no defects are found, reinstall the mufflers and tailpipes.

12-99. EXTREME WEATHER MAINTENANCE.

12-100. COLD WEATHER. Cold weather starting will be made easier by the installation of an oil dilution system, an engine primer system and a ground service receptacle. The primer system is manually-operated from the cabin. Fuel is supplied by a line from the fuel strainer to the plunger. Operating the primer forces fuel to the engine. With an external power receptacle installed, an external power source may be connected to assist in cold weather or low battery starting. Refer to paragraph 12-104 for use of the external power receptacle.

The following may also be used to assist engine starting in extreme cold weather. After the last flight of the day, drain the engine oil into a clean container so the oil can be preheated. Cover the engine to prevent ice or snow from collecting inside the cowling. When preparing the aircraft for flight or engine runup after these conditions have been followed, preheat the drained engine oil.

WARNING

Do not heat the oil above 121°C (250°F). A flash fire may result. Before pulling the propeller through, ascertain that the magneto switch is in the OFF position to prevent accidental firing of the engine.

After preheating the engine oil, gasoline may be mixed with the heated oil in a ratio of 1 part gasoline to 12 parts engine oil before pouring into the engine oil sump. If the free air temperature is below minus 29°C (-20°F), the engine compartment should be preheated by a ground heater. After the engine compartment has been preheated, inspect all engine drain and vent lines for presence of ice. After this procedure has been complied with, pull propeller through several revolutions by hand before attempting to start the engine.

CAUTION

Due to the desludging effect of the diluted oil, engine operation should be observed closely during the initial warm-up of the engine. Engines that have considerable amount of operational hours accumulated since their last dilution period may be seriously affected by the dilution process. This will be caused by the diluted oil dislodging sludge and carbon deposits within the engine. This residue will collect in the oil sump and possibly clog the screened inlet to the oil sump. Small deposits may actually enter the oil sump and be trapped by the main oil filter screen. Partial or complete loss of engine lubrication may result from either condition. If these conditions are anticipated after oil dilution, the engine should be run for several minutes at normal operating temperatures and then stopped and inspected for evidence of sludge and carbon deposits in the oil sump and oil filter screen. Future occurrence of this condition can be prevented by diluting the oil prior to each engine oil change. This will also prevent the accumulation of the sludge and carbon deposits.

12-101. HOT WEATHER. Engine starting in hot weather or with a hot engine is sometimes hampered by vapor formation in the fuel lines. To purge the vapor, move the mixture control to full rich, open the throttle 1-1/2 inches and prime with the auxiliary fuel pump switch in the HI position until the fuel flow indicator reads 4-6 gal/hr. Then shut off the fuel pump switch and engage the starter. As the flooded mixture becomes progressively leaner, reaching a combustible mixture, the engine will start. If the engine tends to die, turn the auxiliary fuel pump switch momentarily to HI at appropriate intervals until vapor is fully cleared and the engine runs smoothly.

CAUTION

Never operate the starting motor more than 12 seconds at a time. Allow starter motor to cool between cranking periods to avoid overheating. Longer cranking periods will shorten the life of the starter motor.

12-102. SEACOAST AND HUMID AREAS. In salt water areas special care should be taken to keep the engine, accessories and airframe clean to prevent oxidation. In humid areas, fuel and oil should be checked frequently and drained of condensation to prevent corrosion.

12-103. DUSTY AREAS. Dust induced into the intake system of the engine is probably the greatest single cause of early engine wear. When operating in high dust conditions, service the induction air filters daily as outlined in Section 2. Also change engine oil and lubricate airframe items more often than specified.

12-104. GROUND SERVICE RECEPTACLE. With the ground service receptacle installed, the use of an external power source is recommended for cold weather starting, low battery starting and lengthy maintenance of the aircraft electrical system. Refer to Section 17 for additional information.

12-105. HAND-CRANKING. A normal hand-cranking procedure may be used to start the engine.

SHOP NOTES:

SECTION 12A

ENGINE
(TURBOCHARGED)

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12A-1. ENGINE COWLING.

12A-2. DESCRIPTION. The engine cowling is similar to that described in Section 12, except it is wider at the front, with additional ram air openings in the right and left nose caps. The opening in the right side supplies ram air to the turbocharger. The opening in the left side supplies ram air to the cabin heating system.

12A-3. REMOVAL AND INSTALLATION. Refer to paragraph 12-3.

12A-4. CLEANING AND INSPECTION. Refer to paragraph 12-4.

12A-5. REPAIR. Refer to paragraph 12-5.

12A-6. COWL FLAPS.

12A-7. DESCRIPTION. The cowl flaps are similar to that described in Section 12, except the overboard exhaust tube for the cabin heater extends through the cutout in the aft portion of the left cowl flap.

12A-8. REMOVAL AND INSTALLATION. Refer to paragraph 12-8.

12A-9. RIGGING.

a. Disconnect cowl flap control clevises from cowl flaps.

b. Check to make sure that the flexible controls reach their internal stops in each direction. Mark controls so that full control travel can readily be checked and maintained during the remaining rigging procedures.

c. Place cowl flap control lever in the OPEN position, which is the top hole in the bracket. Be sure that correct hole in bracket is used. If control lever cannot be placed in correct hole in bracket, loosen clamp at upper end of controls and slip housings in clamp or adjust controls at upper clevis to position control lever in correct hole in bracket.

d. THRU 21061039.

1. Adjust clevis at lower end of control to open cowl flap 6.00 in the OPEN position and to remain open 1.00 inch in the CLOSED position. This measurement is made in a straight line from centerline of the aft edge of the cowl flap to the lower edge of the firewall. Do not measure from aft corners of cowl flaps. Repeat for other cowl flap. If either control needs to be lengthened or shortened, the lower clamp may be loosened and housing slipped in the clamp, or lower clevis may be adjusted. Maintain sufficient thread engagement of clevis.

e. BEGINNING WITH 21061040.

1. Adjust clevis at lower end of control so cowl flaps are streamlined with the cowl in the closed position. If full travel of the control is obtained the open position will be correct.

f. Check that locknuts are tight, clamps are secure and all bolts and nuts are installed.

NOTE

In all cases, the flexible controls must reach their internal stops in each direction to assure full travel of the controls.

12A-10. ENGINE.

12A-11. DESCRIPTION. An air-cooled, horizontally-opposed, direct-drive, fuel-injected, six-cylinder, turbocharged, Continental TSIO-520 series engine, driving a constant-speed propeller, is used to power the aircraft. The cylinders, numbered from rear to front, are staggered to permit a separate throw on the crankshaft for each connecting rod. The right rear cylinder is number 1 and cylinders on the right side are identified by odd numbers 1, 3 and 5. The left rear cylinder is number 2 and the cylinders on the left side are identified as 2, 4 and 6. Refer to paragraph 12A-12 for engine data. For repair and overhaul of the engine, accessories and propeller, refer to the appropriate publications issued by their manufacturer's. These publications are available from the Cessna Service Parts Center.

12A-12. ENGINE DATA.

Aircraft Series	T210
Model (Continental)	TSIO-520-H
BHP at RPM	285 at 2700
Limiting Manifold Pressure (Sea Level)	32.5 Inches Hg.
Number of Cylinders	6-Horizontally Opposed
Displacement	520 Cubic Inches
Bore	5.25 Inches
Stroke	4.00 Inches
Compression Ratio	7.5:1
Magnetos	Slick Model No. 662
Right Magneto	Fires 20° BTC Upper Right and Lower Left
Left Magneto	Fires 20° BTC Upper Left and Lower Right
Firing Order	1-6-3-2-5-4
Spark Plugs	18MM x 0.750-20 (Refer to current Continental factory approved spark plug chart.)
Torque	330±30 Lb-In.
Fuel Metering System	Continental Fuel Injection
Unmetered Fuel Pressure	6.0 to 7.0 PSI at 600 RPM 29 to 32 PSI at 2700 RPM
Oil Sump Capacity	10 U.S. Quarts
With Fuel Element Change	11 U.S. Quarts
Tachometer	Mechanical Drive
Oil Pressure (PSI)	
Minimum Idling	10
Normal	30 to 60
Maximum (Cold Oil Starting)	100
Connection Location	Between No. 2 and No. 4 Cylinders
Oil Temperature	
Normal Operating	Within Green Arc
Maximum Permissible	Red Line (240° F)
Probe Location	Below Oil Cooler
Cylinder Head Temperature	Red Line (460° F) Max.
Probe Location	Lower Side No. 5 Cylinder thru 1973 Models and Lower side No. 1 Cylinder Beginning with 1974 Models.
Approximate Dry Weight With Accessories (Excluding Turbocharger System)	483 Lb. (Weight is approximate and will vary with optional accessories installed.)

12A-13. TROUBLE SHOOTING.

TROUBLE	PROBABLE CAUSE	REMEDY
ENGINE FAILS TO START.	Engine flooded or improper use of starting procedure.	Use proper starting procedure. Refer to Owner's Manual.
	Defective aircraft fuel system.	Refer to Section 13.
	Fuel tanks empty.	Service fuel tanks.
	Spark plugs fouled or defective.	Remove, clean, inspect and regap. Use new gaskets. Check cables to presistently fouled plugs. Replace if defective.
	Magneto impulse coupling failure.	Repair or install new coupling.
	Defective magneto switch or grounded magneto leads.	Repair or replace switch and leads.
	Defective ignition system.	Refer to paragraph 12-79.
	Induction air leakage.	Correct cause of air leakage.
	Clogged fuel screen in fuel control unit or defective unit.	Remove and clean. Replace defective unit.
	Clogged fuel screen in fuel manifold valve or defective valve.	Remove and clean screen. Replace defective valve.
	Clogged fuel injection lines or discharge nozzles.	Remove and clean lines and nozzles. Replace defective units.
	Defective auxiliary fuel pump.	Refer to Section 13.
	Engine-driven fuel pump not permitting fuel from auxiliary pump to bypass.	Install new engine-driven fuel pump.
	Vaporized fuel in system. (Most likely to occur in hot weather with a hot engine.)	Refer to paragraph 12A-115.
ENGINE STARTS BUT DIES, OR WILL NOT IDLE PROPERLY.	Propeller control in high pitch (low rpm) position.	Use low pitch (high rpm) position for all ground operations.
	Improper idle speed or idle mixture adjustment.	Refer to paragraph 12-46.
	Defective aircraft fuel system.	Refer to Section 13.
	Spark plugs fouled or defective.	Remove, clean, inspect and regap. Use new gaskets. Check cables to persistently fouled plugs. Replace if defective.
	Water in fuel system.	Drain fuel tank sumps, lines and fuel strainer.
	Defective ignition system.	Refer to paragraph 12-79.

TROUBLE	PROBABLE CAUSE	REMEDY
ENGINE STARTS BUT DIES, OR WILL NOT IDLE PROPERLY (CONT).	Induction air leakage.	Correct cause of air leakage.
	Clogged fuel screen in fuel control unit or defective unit.	Remove and clean. Replace defective unit.
	Clogged fuel screen in fuel manifold valve or defective valve.	Remove and clean. Replace defective valve.
	Restricted fuel injection lines or discharge nozzles.	Remove, clean lines and nozzles. Replace defective units.
	Defective engine-driven fuel pump.	Install and calibrate new pump.
	Vaporized fuel in system. (Most likely to occur in hot weather with a hot engine.)	Refer to paragraph 12A-115.
	Manual engine primer leaking.	Disconnect primer outlet line. If fuel leaks through primer, repair or replace primer.
	Obstructed air intake.	Remove obstruction; service air filter, if necessary.
	Discharge nozzle air vent manifolding restricted or defective.	Check for bent lines or loose connections. Tighten loose connections. Remove restrictions and replace defective components.
	Defective engine.	Check compression and listen for unusual engine noises. Check oil filter for excessive metal. Repair engine as required.
ENGINE HAS POOR ACCELERATION, RUNS ROUGHLY AT SPEEDS ABOVE IDLE OR LACKS POWER.	Idle mixture too lean.	Refer to paragraph 12-46.
	Propeller control in high pitch (low rpm) position.	Use low pitch (high rpm) position for all ground operations.
	Incorrect fuel-air mixture, worn control linkage or restricted air filter.	Replace worn elements of control linkage. Service air filter.
	Defective ignition system.	Refer to paragraph 12-79.
	Malfunctioning turbocharger.	Check operation, listen for unusual noise. Check operation of wastegate valve and for exhaust system defects. Tighten loose connections.
	Improper fuel-air mixture.	Check intake manifold connections for leaks. Tighten loose connections. Check fuel controls and linkage for setting and adjustment.

12A-13. TROUBLE SHOOTING (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
ENGINE HAS POOR ACCELERATION, RUNS ROUGHLY AT SPEEDS ABOVE IDLE OR LACKS POWER (CONT).	Spark plugs fouled or defective.	Remove, clean, inspect and regap. Use new gaskets. Check cables to persistently fouled plugs. Replace if defective.
	Fuel pump pressure improperly adjusted.	Refer to paragraph 12A-62.
	Restriction in fuel injection system.	Clean out restriction. Replace defective items.
	Propeller out of balance.	Check and balance propeller.
	Defective engine.	Check compression, check oil filter for excessive metal. Listen for unusual noises. Repair engine as required.
	Exhaust system leakage.	Refer to paragraph 12A-100.
	Turbocharger wheels rubbing.	Replace turbocharger.
	Improperly adjusted or defective waste-gate controller.	Refer to paragraph 12A-112.
	Leak in turbocharger discharge pressure system.	Correct cause of leaks. Repair or replace damaged parts.
	Manifold pressure overshoot. (Most likely to occur when engine is accelerated too rapidly.)	Move throttle about two-thirds open. Let engine accelerate and peak. Move throttle to full open.
	Engine oil viscosity too high for ambient air.	Refer to Section 2 for proper grade of oil.
POOR IDLE CUT-OFF.	Mixture control linkage improperly rigged.	Refer to paragraph 12-86.
	Defective or dirty fuel manifold valve.	Remove and clean manifold valve.
	Fuel contamination.	Drain all fuel and flush out fuel system. Clean all screens, fuel strainers, fuel manifold valves, nozzles and fuel lines.
	Defective mixture control valve in fuel pump.	Replace fuel pump.
ENGINE LACKS POWER, REDUCTION IN MAXIMUM MANIFOLD PRESSURE OR CRITICAL ALTITUDE.	Incorrectly adjusted throttle control, "sticky" linkage or dirty air filter.	Check movement of linkage by moving control through range of travel. Make proper adjustments and replace worn components. Service air filter.

12A-13. TROUBLE SHOOTING (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
ENGINE LACKS POWER, REDUCTION IN MAXIMUM MANIFOLD PRESSURE OR CRITICAL ALTITUDE (CONT).	Defective ignition system.	Inspect spark plugs for fouled electrodes, heavy carbon deposits, erosion of electrodes, improperly adjusted electrode gaps and cracked porcelains. Test plugs for regular firing under pressure. Replace damaged or misfiring plugs.
	Improperly adjusted waste-gate valve.	Refer to paragraph 12A-112.
	Loose or damaged exhaust system.	Inspect entire exhaust system to turbocharger for cracks and leaking connections. Tighten connections and replace damaged parts.
	Loose or damaged manifolding.	Inspect entire manifolding system for possible leakage at connections. Replace damaged components, tighten all connections and clamps.
	Fuel discharge nozzle defective.	Inspect fuel discharge nozzle vent manifolding for leaking connections. Tighten and repair as required. Check for restricted nozzles and lines and clean and replace as necessary.
	Malfunctioning turbocharger.	Check for unusual noise in turbocharger. If malfunction is suspected, remove exhaust and/or air inlet connections and check rotor assembly, for possible rubbing in housing, damaged rotor blades or defective bearings. Replace turbocharger if damage is noted.
BLACK SMOKE EXHAUST.	Turbo coking, oil forced through seal of turbine housing.	Clean or change turbocharger.
HIGH CYLINDER HEAD TEMPERATURE.	Defective cylinder head temperature indicating system.	Refer to Section 16.
	Improper use of cowl flaps.	Refer to Owner's Manual.
	Engine baffles loose, bent or missing.	Install baffles properly. Repair or replace if defective.
	Dirt accumulated on cylinder cooling fins.	Clean thoroughly.
	Incorrect grade of fuel.	Drain and refill with proper fuel.

TROUBLE	PROBABLE CAUSE	REMEDY
HIGH CYLINDER HEAD TEMPERATURE (CONT).	Incorrect ignition timing.	Refer to paragraph 12-78.
	Improper use of mixture control.	Refer to Owner's Manual.
	Defective engine.	Repair as required.
HIGH OR LOW OIL TEMPERATURE OR PRESSURE.		Refer to paragraph 12-30.

NOTE

Refer to paragraph 12A-107 for trouble shooting of controller and waste-gate actuator.

12A-13A. STATIC RUN-UP PROCEDURES. In a case of suspected low engine power, a static run-up should be conducted as follows:

a. Run-up engine, using take-off power and mixture settings, with the aircraft facing 90° right and then left to the wind direction.

b. Record the RPM obtained in each run-up position.

NOTE

Daily changes in atmospheric pressure, temperature and humidity will have a slight effect on static run-up.

c. Average the results of the RPM obtained. It should be within 50 RPM of 2670 RPM (two bladed propl ler) and 2650 RPM (three bladed propeller).

d. If the average results of the RPM obtained are lower than stated above, the following recommended checks may be performed to determine a possible deficiency.

1. Check governor control for proper rigging. It should be determined that the governor control arm travels to the high RPM stop on the governor and that the high RPM stop screw is adjusted properly. (Refer to Section 14 for procedures).

NOTE

If verification of governor operation is necessary the governor may be removed from the engine and a flat plate installed over the engine pad. Run-up engine to determine that governor was adjusted properly.

2. Check carburetor heat control (carburetor equipped engines) for proper rigging. If partially open it would cause a slight power loss. On fuel injected engines check operation or alternate air door spring or magnetic lock to make sure door will remain closed in normal operation.

3. Check magneto timing, spark plugs and ignition harness for settings and conditions.

4. On fuel injection engines, check fuel injection nozzles for restriction and check for correct unmetered fuel flow.

5. Check condition of induction air filter. Clean if required.

6. Perform an engine compression check (Refer to engine Manufacturer's Manual).

12A-14. REMOVAL. If an engine is to be placed in storage or returned to the manufacturer for overhaul, proper preparatory steps should be taken for corrosion prevention prior to beginning the removal procedure. Refer to Section 2 for storage preparation. The following engine removal procedure is based upon the engine being removed from the aircraft as a complete unit with the turbocharger and accessories installed.

NOTE

Tag each item when disconnected to aid in identifying wires, hoses, lines and control linkages when engine is reinstalled. Likewise, shop notes made during removal will often clarify reinstallation. Protect openings, exposed as a result of removing or disconnecting units, against entry of foreign material by installing covers or sealing with tape.

a. Place all cabin switches in the OFF position.

b. Place fuel selector valve in the OFF position.

c. Remove engine cowling in accordance with paragraph 12-3.

d. Disconnect battery cables and insulate terminals as a safety precaution. Remove battery and battery box for additional clearance, if desired.

e. Drain fuel strainer and lines with strainer drain control.

NOTE

During the following procedures, remove any clamps or lacings which secure controls, wires, hoses or lines to the engine, engine nacelle or attached brackets, so they will not interfere with engine removal. Some of the items listed can be disconnected at more than one place. It may be desirable to disconnect some of these items at other than the places indicated. The reason for engine removal should be the governing factor in deciding at which point to disconnect them. Omit any of the items which are not present on a particular engine installation.

f. Drain the engine oil sump and oil cooler.
g. Disconnect magneto primary lead wires at magnetos.

WARNING

The magnetos are in a SWITCH ON condition when the switch wires are disconnected. Ground the magneto points or remove the high tension wires from the magnetos or spark plugs to prevent accidental firing.

h. Remove the spinner and propeller in accordance with Section 14. Cover exposed end of crankshaft flange and propeller flange to prevent entry of foreign material.
i. Disconnect throttle, mixture and propeller controls from their respective units. Remove clamps attaching controls to engine and pull controls aft clear of engine. Use care to avoid bending controls too sharply. Note EXACT position, size and number of attaching washers and spacers for reference on reinstallation.
j. Disconnect wires and cables as follows:
1. Disconnect tachometer drive shaft at adapter.

CAUTION

When disconnecting starter cable do not permit starter terminal bolt to rotate. Rotation of the bolt could break the conductor between bolt and field coils causing the starter to be inoperative.

2. Disconnect starter electrical cable at starter.
3. Disconnect cylinder head temperature wire at probe.
4. Disconnect oil temperature wire at probe below oil cooler.
5. Disconnect electrical wires and wire shielding ground at alternator.
6. Disconnect exhaust gas temperature wires at quick-disconnects.
7. Disconnect electrical wires at throttle microswitches.
8. Remove all clamps and lacings attaching wires or cables to engine and pull wires and cables aft to clear engine.

k. Disconnect lines and hoses as follows:
1. Disconnect the hydraulic supply and pressure lines at pump. Disconnect and remove hydraulic pump vent line. (THRU AIRCRAFT SERIAL 210-59502.)
2. Disconnect vacuum hose at vacuum pump and remove oil separator vent line.

WARNING

Residual fuel and oil draining from disconnected lines and hoses constitutes a fire hazard. Use caution to prevent accumulation of such fuel and oil when lines or hoses are disconnected.

3. Disconnect fuel supply and vapor return hoses at fuel pump. Disconnect and remove fuel pump drain line.
4. Disconnect manifold pressure line at intake manifold.
5. Disconnect the fuel-flow gage line at firewall.
6. Disconnect the oil pressure line at the engine.
7. Disconnect and remove the right and left manifold drain lines and the balance tube drain line.
8. Disconnect air and oil lines at the waste-gate controller, located on the firewall.
9. Disconnect the air vent line to fuel-flow gage, at firewall.
10. Disconnect engine primer lines at right and left intake manifolds.
11. Disconnect the oil drain line from oil deflector under external oil filter.

l. Disconnect flexible ducting from heater shroud and cabin valve.
m. Carefully check the engine again to ensure ALL hoses, lines, wires, cables, clamps and lacings are disconnected or removed which would interfere with the engine removal. Ensure all wires, cables and engine controls have been pulled aft to clear the engine.

CAUTION

Place a suitable stand under tail tie-down ring before removing engine. The loss of engine weight will cause the aircraft to be tail heavy.

n. Attach a hoist to the lifting lug at the top center of the engine crankcase. Lift engine just enough to relieve the weight from the engine mounts.
o. Remove mount bolts, ground strap and heat shields.
p. Slowly hoist engine out of nacelle and clear of aircraft checking for any items which would interfere with the engine removal. Balance the engine by hand and carefully guide the disconnected parts out as the engine is removed.
q. Remove engine shock-mounts.

NOTE

If shock-mounts will be re-used, mark each one so it will be reinstalled in exactly the same position. If new shock-mounts will be installed, position them as illustrated in figure 12-2.

12A-15. CLEANING. Refer to paragraph 12-15.

12A-16. ACCESSORIES REMOVAL. Refer to paragraph 12-16.

12A-17. INSPECTION. Refer to paragraph 12-17.

12A-18. BUILD-UP. Refer to paragraph 12-18.

12A-19. INSTALLATION. Before installing the engine on the aircraft, install any items which were removed from the engine or aircraft after the engine was removed.

NOTE

Remove all protective covers, plugs, caps and identification tags as each item is connected or installed. Omit any items not present on a particular engine installation.

a. Hoist the engine to a point just above the nacelle.
b. Install engine shock-mounts and ground strap as illustrated in figure 12-2.
c. Carefully lower engine slowly into place on the engine mounts. Route controls, lines, hoses and wires in place as the engine is positioned on the engine mounts.

NOTE

Be sure engine shock-mounts, spacers and washers are in place as the engine is lowered into position.

d. Attach ground strap under engine sump bolt and install engine mount bolts. Torque bolts to 300+50-00 lb-in. Bend tab washers to form lock for mount bolts. Install heat shields.
e. Remove support stand placed under tail tie-down fitting and remove hoist.

NOTE

If the exhaust system was loosened or removed, refer to paragraph 12A-99.

f. Connect flexible ducting on heater shroud and cabin valve.
g. Route propeller governor control along left side of engine and secure with clamps.

SHOP NOTES:

NOTE

Throughout the aircraft fuel system, from the fuel bays to the engine-driven fuel pump, use NS-40 (RAS-4) (Snap-On Tools Corp., Kenosha, Wisconsin), MIL-T-5544 (Thread Compound, Antiseize, Graphite Petrolatum), USP Petrolatum or engine oil as a thread lubricant or to seal a leaking connection. Apply sparingly to male threads only, omitting the first two threads, exercising extreme caution to avoid "stringing" sealer across the end of the fitting. Always ensure that a compound, the residue from a previously used compound, or any other foreign material cannot enter the system. Throughout the fuel injection system, from the engine-driven fuel pump through the discharge nozzles, use only a fuel-soluble lubricant, such as engine oil, on fitting threads. Do not use any other form of thread compound on the injection system.

h. Connect lines and hoses as follows:

1. Install and connect the hydraulic pump vent line. Connect the hydraulic supply and pressure lines at pump. (THRU AIRCRAFT SERIAL 210-59502.)

2. Install and connect the left and right manifold drain lines and the balance tube drain line.

3. Connect the oil pressure line at its fitting.

4. Connect the fuel-flow gage line at firewall.

5. Connect the fuel supply and the vapor return lines at the fuel pump. Connect and install fuel pump drain line.

6. Connect manifold pressure line at intake manifold.

7. Connect vacuum line at the vacuum pump, and install oil separator vent line.

8. Connect air and oil lines at waste-gate controller on firewall.

9. Connect air vent line to fuel-flow gage line at firewall.

10. Connect engine primer lines at right and left intake manifolds.

11. Connect oil drain line to oil deflector under external oil filter.

12. Install all clamps securing lines and hoses to engine or structure.

i. Connect wires and cables as follows:

1. Connect oil temperature wire at probe below oil cooler.

2. Connect tachometer drive to adapter and torque to 100 lb-in.

WARNING

When connecting starter cable, do not permit starter terminal bolt to rotate. Rotation of the bolt could break conductor between terminal and field coils causing starter to be inoperative.

3. Connect starter electrical lead.

4. Connect cylinder head temperature wire at probe.

5. Connect electrical wires and wire shielding ground to alternator.

6. Connect electrical wiring to throttle switches.

7. Connect exhaust gas temperature wires at quick-disconnects.

8. Install clamps that attach wires or cables, to engine or structure.

j. Connect engine controls and install block clamps.

k. Rig engine controls in accordance with paragraphs 12-85, 12-86, 12-87 and 12-88.

l. Install propeller and spinner in accordance with instructions outlined in Section 14.

m. Complete a magneto switch ground-out and continuity check, then connect primary lead wires to the magnetos. Remove the temporary ground or connect spark plug leads, whichever procedure was used during removal.

WARNING

Be sure magneto switch is in OFF position when connecting switch wires to magnetos.

n. Clean and install induction air filter in accordance with Section 2.

o. Service engine with proper grade and quantity of engine oil. Refer to Section 2 if engine is new, newly overhauled or has been in storage.

p. Check all switches are in the OFF position and connect battery cables.

q. Inspect engine installation for security, correct routing of controls, lines, hoses and electrical wiring, proper safetying and tightness of all components.

NOTE

When installing a new or newly overhauled engine, and prior to starting the engine, disconnect the oil inlet line at the controller and the oil outlet line at the controller. Connect these oil lines to a full-flow oil filter, allowing oil to bypass the controller. With filter connected, operate engine approximately 15 minutes to filter out any foreign particles from the oil. This is done to prevent foreign material from entering the controller.

r. Install engine cowling in accordance with paragraph 12-3.

s. Perform an engine run-up and make final adjustments on the engine controls.

12A-20. FLEXIBLE FLUID HOSES. Refer to paragraph 12-20.

12A-21. PRESSURE TEST. Refer to paragraph 12-21.

12A-22. REPLACEMENT. Refer to paragraph 12-22.

12A-23. ENGINE BAFFLES. Refer to paragraph 12-23.

12A-24. DESCRIPTION. Refer to paragraph 12-24.

12A-25. CLEANING AND INSPECTION. Refer to paragraph 12-25.

12A-26. REMOVAL AND INSTALLATION. Refer to paragraph 12-26.

12A-27. REPAIR. Refer to paragraph 12-27.

12A-28. ENGINE OIL SYSTEM. Refer to figure 12A-1.

12A-29. DESCRIPTION. The engine lubrication system is a full-pressure, wet-sump type. Lubricating oil is drawn from the engine sump to the oil pump through a suction screen and tube. From the pump, oil under pressure is passed to the full-flow oil filter, where it is filtered before entering the passages of the engine. Bypass valves are provided. Oil from the filter is routed through drilled and cored passages to all moving parts requiring lubrication. Oil furnished to the propeller governor for propeller operation is also routed through internal passages. Oil pressure is maintained by an adjustable, spring-loaded relief valve mounted in the lower portion of the pump body. Oil temperature is automatically regulated by an oil cooler and a thermostat control valve. When the oil temperature reaches a predetermined temperature the thermostat valve closes, causing the oil to be routed through the externally mounted cooler. Engine oil is also used to control the waste-gate and lubricate the turbocharger bearings. Oil is returned to the engine sump from the turbocharger by a scavenger pump, which is integral with the engine oil pump. The oil filler neck is located on top of the engine and is reached through an access door in the top of the left cowl. The oil level in the sump is checked on a dipstick at the rear of number two cylinder and is reached through an access door in the side of the left cowl.

12A-30. TROUBLE SHOOTING. Refer to paragraph 12-30.

12A-31. FULL-FLOW OIL FILTER. Refer to paragraph 12-31.

12A-32. DESCRIPTION. Refer to paragraph 12-32.

12A-33. REMOVAL AND INSTALLATION. Refer to paragraph 12-33.

12A-34. FILTER ADAPTER. Refer to paragraph 12-34.

12A-35. REMOVAL. Refer to paragraph 12-35.

12A-36. DISASSEMBLY, INSPECTION AND REASSEMBLY. Refer to paragraph 12-36.

12A-37. INSTALLATION. Refer to paragraph 12-37.

12A-38. OIL COOLER. Refer to paragraph 12-38.

12A-39. DESCRIPTION. Refer to paragraph 12-39.

12A-40. ENGINE FUEL SYSTEM. Refer to figure 12A-2.

12A-41. DESCRIPTION. The fuel injection system is a low pressure system of injecting fuel into the intake valve port of each cylinder. It is a multi-nozzle, continuous-flow type which controls fuel flow to match engine airflow. Any change in throttle position, engine speed, or a combination of both, causes changes in fuel flow in the correct relation to engine airflow. A manual mixture control and a fuel flow indicator are provided for leaning at any combination of altitude and power setting. The fuel flow indicator is calibrated in gallons per hour and indicates approximately the gallons of fuel consumed per hour. The continuous-flow system uses a typical rotary vane fuel pump. There are no running parts in this system except for the engine-driven fuel pump. The four major components of the system are: the fuel injection pump, fuel-air control unit, fuel manifold valve and the fuel discharge nozzles. The fuel injection pump incorporates an adjustable aneroid sensing unit which is pressurized from the discharge side of the turbocharger compressor. Turbocharger discharge air pressure is also used to vent the fuel discharge nozzles and the vent port of the fuel-flow gage.

NOTE

Throughout the aircraft fuel system, from the fuel bays to the engine driven fuel pump, use RAS-4 (Snap-On Tools Corp., Kenosha, Wisconsin), MIL-T-5544 (Thread Compound, Antiseize, Graphite-Petrolatum) or equivalent, as a thread lubricant or to seal a leaking connection. Apply sparingly to male fittings only, omitting the first two threads. Always ensure that a compound, the residue from a previously used compound or any other foreign material cannot enter the system. Throughout the fuel injection system, from the engine-driven fuel pump through the discharge nozzles, use only a fuel soluble lubricant, such as engine lubricating oil, on the fitting threads. Do not use any other form of thread compound on the injection system fittings.

12A-42. FUEL-AIR CONTROL UNIT. Refer to paragraph 12-42.

12A-43. DESCRIPTION. Refer to paragraph 12-43.

12A-44. REMOVAL.

a. Place all cabin switches and fuel shut-off valve in the OFF position.
b. Remove cowling in accordance with paragraph 12-3.
c. Loosen clamp and disconnect flexible duct from elbow at top of air throttle.
d. Tag and disconnect electrical wiring from microswitches.
e. Disconnect throttle and mixture control rod ends at fuel-air control unit.

NOTE

Cap or plug all disconnected hoses, lines and fittings.

f. Disconnect cooling air blast tube from fuel control valve shroud.
g. Disconnect and tag all fuel lines at the fuel control valve.
h. Remove nuts and washers securing triangular brace to fuel-air control unit and engine, at lower end of control unit. Remove brace.

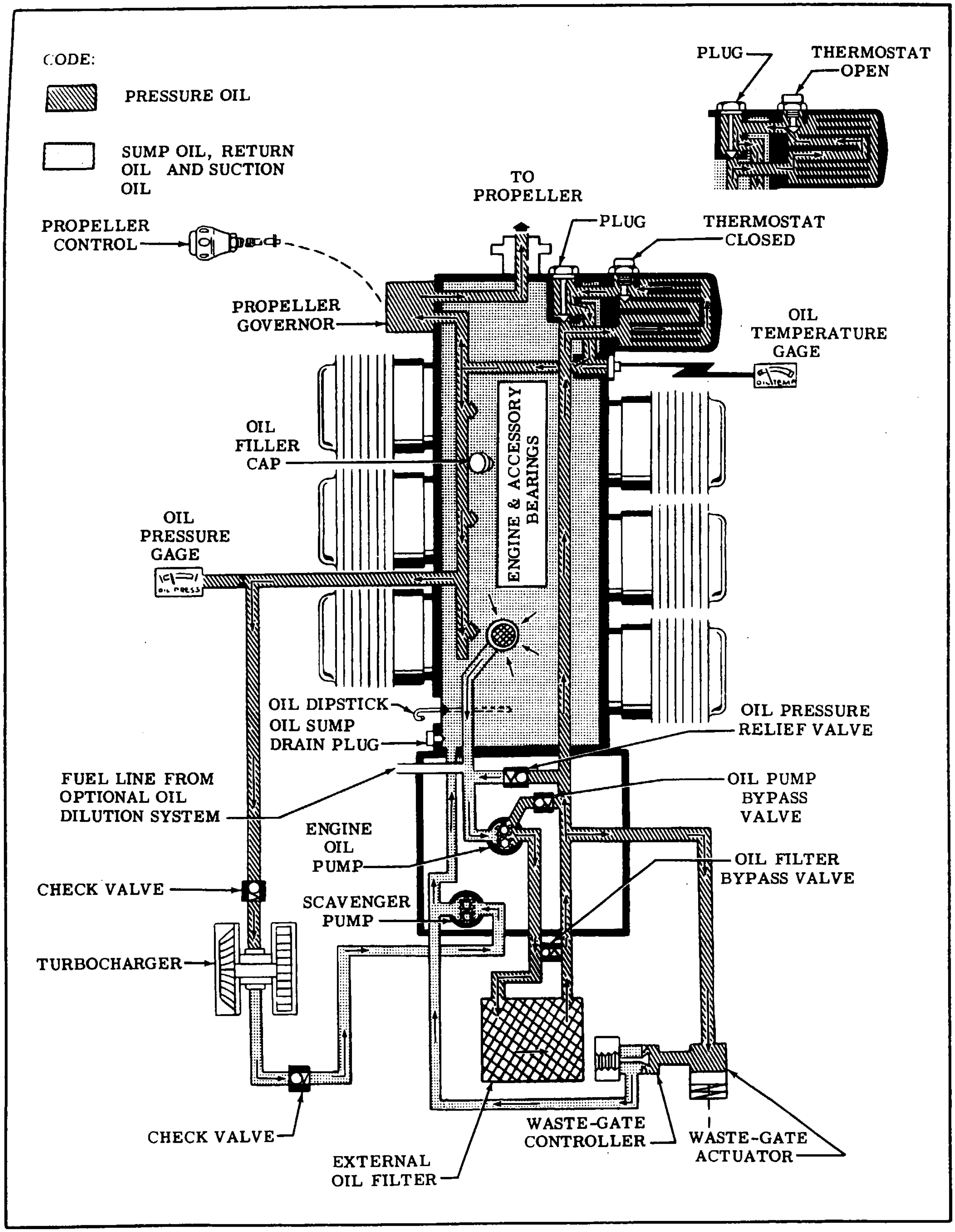


Figure 12A-1. Oil System Schematic

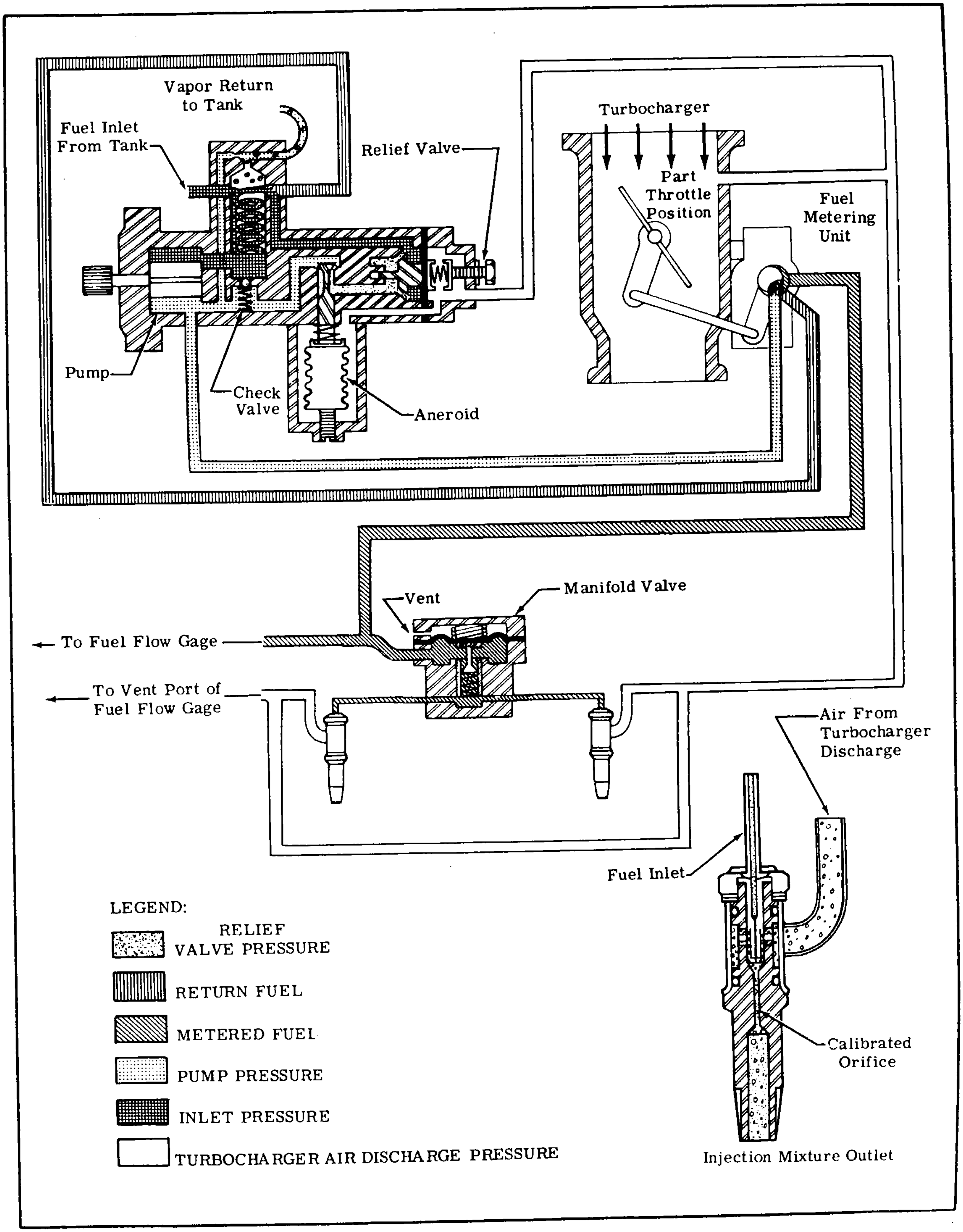


Figure 12A-2. Fuel System Schematic

i. Remove bolt attaching fuel-air control unit to brace at top of control unit.
j. Loosen hose clamps which secure fuel-air control unit to right and left intake manifold assemblies and slip hoses from fuel-air control unit.
k. Remove fuel-air control unit.

12A-45. CLEANING AND INSPECTION. Refer to paragraph 12-45.

12A-46. INSTALLATION.
a. Place control unit in position at rear of engine.
b. Install bolt attaching control unit to brace at top of unit. Ascertain that shock-mount is in place and in good condition.
c. Install triangular brace at lower end of control unit.
d. Install hoses and clamps which secure control unit to right and left intake manifold assemblies. Tighten hose clamps.
e. Connect fuel lines to unit and connect air blast tube at fuel control shroud.
f. Connect throttle and mixture control rod ends to control unit.
g. Connect electrical wiring to throttle-operated microswitch. Check switch rigging in accordance with Section 13.
h. Install induction air duct to elbow at top of control unit.
i. Inspect installation and install cowling.

12A-47. ADJUSTMENTS. Refer to paragraph 12-46.

12A-48. FUEL MANIFOLD VALVE (FUEL DISTRIBUTOR). Refer to paragraph 12-47.

12A-49. DESCRIPTION. Refer to paragraph 12-48.

12A-50. REMOVAL. Refer to paragraph 12-49.

12A-51. CLEANING. Refer to paragraph 12-50.

12A-52. INSTALLATION. Refer to paragraph 12-51.

12A-53. FUEL DISCHARGE NOZZLES.

12A-54. DESCRIPTION. From the fuel manifold valve, individual, identical size and length fuel lines carry metered fuel to the fuel discharge nozzles located in the cylinder heads. The outlet of each nozzle is directed into the intake port of each cylinder. An air bleed and nozzle pressurization arrangement is incorporated in each nozzle to aid in vaporization of the fuel. The nozzles are calibrated in several ranges. All nozzles furnished for one engine are of the same calibrated range and are identified by a number and suffix letter stamped on the flat portion of the nozzle body. When replacing a fuel discharge nozzle, be sure that it is of the same calibrated range as the rest of the nozzles in that engine. When a complete set of nozzles is being replaced, the number must be the same as the one removed but the suffix letter may be different, as long as they are the same for all nozzles being installed in a particular engine.

12A-55. REMOVAL.
a. Remove engine cowling in accordance with paragraph 12-3.

NOTE

Plug or cap all disconnected lines and fittings.

b. Disconnect nozzle pressurization line at nozzles and disconnect pressurization line at "tee" fitting so that pressurization line may be moved away from discharge nozzles.
c. Disconnect fuel injection line at fuel discharge nozzle.
d. Using care to prevent damage or loss of washers and O-rings, lift sleeve assembly from fuel discharge nozzle.
e. Using a standard 1/2-inch deep socket, remove fuel discharge nozzle from cylinder.

12A-56. CLEANING AND INSPECTION. Refer to paragraph 12-55.

12A-57. INSTALLATION.
a. Using a standard 1/2-inch deep socket, install nozzle body in cylinder and tighten to a torque value of 60-80 lb-in.
b. Install O-rings, sleeve assembly and washers.
c. Align sleeve assembly and connect pressurization line to nozzles. Connect pressurization line to "tee" fitting.
d. Install O-ring and washer at top of discharge nozzle and connect fuel injection line to nozzle.
e. Inspect installation for crimped lines and loose fittings.
f. Inspect nozzle pressurization vent system for leakage. A tight system is required, since turbocharger discharge pressure is applied to various other components of the injection system.
g. Install cowling.

12A-58. FUEL INJECTION PUMP.

12A-59. DESCRIPTION. The fuel pump is a positive displacement, rotating vane type. It has a splined shaft for connection to the accessory drive section of the engine. Fuel enters the pump at the swirl well of the pump vapor separator. Here, vapor is separated by a swirling motion so that only liquid fuel is fed to the pump. The vapor is drawn from the top center of the swirl well by a small pressure jet of fuel and is fed into the vapor return line where it is returned to the fuel tank. Since the pump is engine-driven, changes in engine speed affect total pump flow proportionally. A check valve allows the auxiliary fuel pump pressure to bypass the engine-driven pump for starting, or in the event of engine-driven fuel pump failure in flight. The pump supplies more fuel than is required by the engine; therefore, a relief valve is provided to maintain a constant fuel pump pressure. The engine-driven fuel pump is equipped with an aneroid. The aneroid and relief valve are pressurized from the discharge side of the turbocharger compressor to maintain a proper fuel/air ratio at altitude. The aneroid is adjustable for fuel pump outlet pressure at full throttle and the relief valve is adjustable for fuel pump outlet pressure at idle.

12A-60. REMOVAL.

A. Place fuel selector valve handle in OFF position.

B. Remove engine cowling in accordance with paragraph 12-3.

C. Remove alternator and left rear intake elbow.

D. Hoist engine far enough to remove weight from engine mount and remove left rear engine mount leg, shock-mount and alternator bracket.

E. Remove flexible duct and shroud, removing fuel lines and fittings as necessary. Tag each fitting and line for identification and cap or seal to prevent entry of foreign material. Flanges of shroud may be straightened to facilitate removal and installation, but must be re-formed after installation. Note angular position of fittings before removal.

F. Remove nuts and washers attaching fuel pump to engine and pull pump aft to remove. Remove thin gasket.

G. Place temporary cover on pump mounting pad.

12A-61. INSTALLATION.

A. Install and align any fittings removed after pump removal.

B. Using new thin gasket, install pump with aneroid chamber down.

C. Install cooling shroud and remainder of fittings, bending flanges of shroud to their original positions and aligning fittings as noted during removal.

D. Connect all fuel lines and shroud flexible duct.

E. Install alternator bracket, shock-mount and engine mount leg. Remove hoist, then adjust alternator drive belt tension. Refer to Section 17.

F. Install intake elbow.

G. Start engine and perform an operational check, adjusting fuel pump if required.

H. Install cowling.

12A-62. ADJUSTMENT. Adjustments of the fuel injection pump requires special equipment and procedures. Adjustment to the aneroid applies only to the full throttle setting. Adjustment of the idle position is obtained through the relief valve. To adjust the pump to the pressures specified in paragraph 12A-12, proceed as follows:

A. Remove engine cowling in accordance with paragraph 12-3.

B. Disconnect the existing engine-driven fuel pump pressure hose at the fuel metering unit. Connect the test gage pressure hoses and fittings into the fuel injections system as illustrated in Figure 12A-9. Gage MUST be vented to atmosphere.

NOTE: Cessna Service Kit No. K320-2J provides a test gage, line and fittings for connecting the test gage into the system to perform accurate calibration of the engine-driven fuel pump.

C. The test gage MUST be held as near to the level of the engine driven fuel pump as possible. Bleed air from the test gage line prior to taking readings.

NOTE: The test gage should be checked for accuracy at least every 90 days or anytime an error is suspected. The tachometer accuracy should also be determined prior to making any adjustments to the pump.

D. Start engine and warm-up thoroughly. Set mixture control to full rich position and propeller control full forward (low pitch, high rpm).

E. Adjust engine idle speed to 600 ± 25 rpm and check test gage for 5.5 – 6.5 PSI. Refer to Figure 12 - 7 for idle mixture adjustment.

NOTE: Do not adjust idle mixture until idle pump pressure is obtained.

WARNING: Do not make fuel pump pressure adjustments while engine is operating.

F. If the pump pressure is not 5.5 – 6.5 PSI, stop engine and turn the pump relief valve adjustment on the centerline of the fuel pump clockwise (CW) to increase pressure and counterclockwise (CCW) to decrease pressure.

G. Maintaining idle pump pressure and idle RPM, obtain correct idle mixture in accordance with paragraph 12-46.

H. Completion of the preceding steps have provided:

1. Correct idle pump pressure.
2. Correct fuel flow.
3. Correct fuel metering cam to throttle plate orientation.

I. Advance to full throttle and maximum rated engine speed with the mixture control in full rich position and propeller control in full forward (low pitch, high rpm)

J. Check test gage for pressures specified in paragraph 12A-12. If pressure is incorrect, stop engine and adjust pressure by loosening locknut and turning the adjusting screw located at rear of aneroid counterclockwise (CCW) to increase pressure and clockwise (CW) to decrease pressure.

NOTE: If at static run-up, rated RPM cannot be achieved at full throttle, adjust pump pressure slightly below limits making certain the correct pressures are obtained when rated RPM is achieved during take-off roll.

K. After correct pressures are obtained, tighten locknut.

L. Remove test equipment, run engine to check for leaks and install cowling.

12A-63. INDUCTION AIR SYSTEM.

12A-64. DESCRIPTION. Ram air to the engine enters an induction air duct at the right side of the nose cap. The air is filtered through a dry filter, located in the induction airbox. From the filter, the air passes through a flexible duct to the inlet of the turbocharger compressor. The pressurized air is then routed through a duct to the fuel-air control unit mounted behind the engine and is then supplied to the cylinders through the intake manifold piping. The fuel-air control unit is connected to the cylinder intake manifold by elbows, hoses and clamps. The intake manifold is attached to each cylinder by four bolts through a welded flange, which is sealed by a gasket. A balance tube passes around the front side of the engine to complete the manifold assembly. An alternate air door, mounted in the duct between the filter and the turbocharger compressor, is held closed by a small magnet. If the induction air filter should become clogged, suction from the turbocharger compressor will open the door permitting the compressor to draw heated, unfiltered air from within the engine compartment. The alternate air door should be checked periodically for freedom of operation and complete closing. The induction air filter should be removed and cleaned at each 50-hour inspection, more often when operating under dusty conditions. Refer to Section 2.

12A-65. AIRBOX.

12A-66. REMOVAL AND INSTALLATION.

a. Remove engine cowling in accordance with paragraph 12-3.
b. Loosen clamp at lower end of airbox and remove flexible duct.
c. Remove two screws, washers and nuts attaching airbox to upper rear engine baffle.
d. Remove four screws attaching airbox to induction air duct and work airbox and filter from duct.
e. Remove screws attaching clips on duct to clips on rocker box covers.
f. Remove screws attaching lower side of induction air duct to the two front cylinder rocker box covers.
g. Loosen clamp and remove air duct from flexible inlet air duct and remove duct.
h. Reverse the preceding steps for reinstallation.

NOTE

Clean filter and ascertain that induction air ducts and airbox are clean when installing.

12A-67. CLEANING AND INSPECTION. Refer to paragraph 12-66.

12A-68. INDUCTION AIR FILTER.

12A-69. DESCRIPTION. An induction air filter, mounted in the aft end of the airbox removes dust particles from the ram air entering the engine.

12A-70. REMOVAL AND INSTALLATION.

a. Remove right half of engine cowling in accordance with paragraph 12-3.
b. Remove screws attaching airbox to upper rear baffle.
c. Loosen clamp and disconnect flexible air duct to airbox.
d. Remove four screws attaching airbox to forward air duct and work airbox and filter from aircraft.
e. Remove four bolts, washers and nuts attaching filter between airbox halves.

NOTE

When installing filter, note direction of air flow. Inspect and install gasket at aft face of filter assembly. Also, when tightening bolts fastening filter, push inward on lower end of the upper duct (where turbocharger inlet connects to the upper duct). This is done so that inlet hose doesn't chafe against the cowling.

f. Reverse the preceding steps for reinstallation.

12A-71. CLEANING AND INSPECTION. Clean and inspect filter in accordance with Section 2.

12A-72. IGNITION SYSTEM. Refer to paragraph 12-71.

12A-73. DESCRIPTION. Refer to paragraph 12-72.

12A-74. TROUBLE SHOOTING. Refer to paragraph 12-73.

12A-75. MAGNETOS. Refer to paragraph 12-74.

12A-76. DESCRIPTION. Refer to paragraph 12-75.

12A-77. REMOVAL. Refer to paragraph 12-76.

12A-78. INTERNAL TIMING. Refer to paragraph 12-77.

12A-79. INSTALLATION AND TIMING-TO-ENGINE. Refer to paragraph 12-78.

12A-80. MAINTENANCE. Refer to paragraph 12-79.

12A-81. MAGNETO CHECK. Refer to paragraph 12-80.

12A-82. SPARK PLUGS. Refer to paragraph 12-81.

12A-83. ENGINE CONTROLS. Refer to paragraph 12-82.

12A-84. DESCRIPTION. Refer to paragraph 12-83.

12A-85. RIGGING. Refer to paragraph 12-84.

12A-86. THROTTLE CONTROL. Refer to paragraph 12-85.

12A-87. MIXTURE CONTROL. Refer to paragraph 12-86.

12A-88. PROPELLER CONTROL. Refer to Section 14.

12A-89. RIGGING THROTTLE-OPERATED MICRO-SWITCH. Refer to Section 13.

12A-89A. AUXILIARY ELECTRIC FUEL PUMP FLOW ADJUSTMENT. Refer to Section 13.

12A-89B. LANDING GEAR WARNING HORN. Refer to Section 5.

12A-90. STARTING SYSTEM. Refer to paragraph 12-89.

12A-91. DESCRIPTION. Refer to paragraph 12-90.

12A-92. TROUBLE SHOOTING. Refer to paragraph 12-91.

12A-93. PRIMARY MAINTENANCE. Refer to paragraph 12-92.

12A-94. STARTER MOTOR.

12A-95. REMOVAL AND INSTALLATION.
a. Remove cowling in accordance with paragraph 12-3.
b. Remove induction airbox in accordance with paragraph 12A-66.
c. Disconnect electrical power cable at starter and insulate terminal as a safety precaution.
d. Remove nuts securing starter and remove starter.
e. Reverse the preceding steps for reinstallation. Install a new O-ring and be sure the starter drive engages with the drive in the adapter.

12A-96. EXHAUST SYSTEM. Refer to figure 12A-3.

12A-97. DESCRIPTION. The exhaust system consists of two exhaust stack assemblies, one for the left and one for the right bank of cylinders. These exhaust stack assemblies are joined together to route the exhaust from all cylinders through the waste-gate or turbine. The three risers on the left bank of cylinders are joined together into a common pipe to form the left stack assembly. The right rear cylinder exhaust is routed down and aft to the rear of the engine where it connects to the left stack assembly. The risers on the two right front cylinders are connected to a common pipe to form the right stack assembly. The right stack assembly connects to the left stack assembly at the front of the engine. Mounting pads for the waste-gate and turbine are provided on the right stack assembly. From the exhaust port of the turbine, a tailpipe routes the exhaust overboard through the lower fuselage. The exhaust port of the waste-gate is routed into the tailpipe so the exhaust gas can be expelled from the system when not needed at the turbine. The waste-gate is actuated by the waste-gate actuator which, in turn, is controlled by the waste-gate controller. Also, sleeving is installed on the fuel hose from the engine-driven pump to the fuel metering body and on the hose from the auxiliary fuel pump to the engine-driven pump. This is to prevent excessive heat on these fuel hoses as they route close to the exhaust stack.

12A-98. REMOVAL.
a. Remove engine cowling and right and left nose caps in accordance with paragraph 12-3.
b. Remove intake manifold balance tube from front of engine.
c. Remove heat shield at front of engine.
d. Loosen clamp and disconnect flexible duct at aft end of cabin heater shroud on left exhaust stack assembly.
e. Remove clamps and bolts securing rear heat shield to engine and remove heat shield.
f. Remove clamps attaching left exhaust stack assembly to riser pipes and to rear crossover pipe on left side of engine.
g. Work left exhaust stack assembly down from risers and out of crossover pipes at front and rear of engine.
h. Remove four nuts and washers attaching exhaust riser pipe to each cylinder on left bank of cylinders and remove riser pipes and gaskets.
i. Remove clamp attaching exhaust tailpipe to exhaust port of turbine.
j. Remove bolts attaching waste-gate to right exhaust stack assembly. Work tailpipe from turbine and lower waste-gate and tailpipe into cowling.
k. Remove bolts attaching turbocharger to mounting brackets.
l. Remove bolts and nuts attaching turbocharger to right exhaust stack assembly. Lower turbocharger into cowling.
m. Remove bolts, nuts and clamps attaching right exhaust stack assembly to riser pipes on right side of engine.
n. Work right exhaust stack assembly down from risers and remove.
o. Remove nuts and washers attaching riser pipes to front two cylinders on right side of engine and remove riser pipes and gaskets.
p. Remove nuts and washers attaching exhaust pipe to rear cylinder on right side of engine and remove pipe and gasket.

12A-99. INSTALLATION.

NOTE

It is important that the complete exhaust system, including the turbocharger and waste-gate, be installed without pre-loading any section of the exhaust stack assembly.

a. Use new gaskets between exhaust stacks and engine cylinders, at each end of waste-gate and between turbocharger and exhaust stack.
b. Place all sections of exhaust stacks in position and torque nuts attaching them to the cylinders evenly to 100-110 lb-in., while riser clamps are loose.
c. Manually check that front and rear crossover pipe slip-joints do not bind. Tighten clamps attaching left risers to left stack assembly. Tighten the clamp attaching right stack to right front riser.
d. Raise turbocharger into position and install bolts and nuts attaching turbocharger to right exhaust stack and those attaching turbocharger to front and rear turbocharger supports (figure 12A-5). Tighten bolts securely.

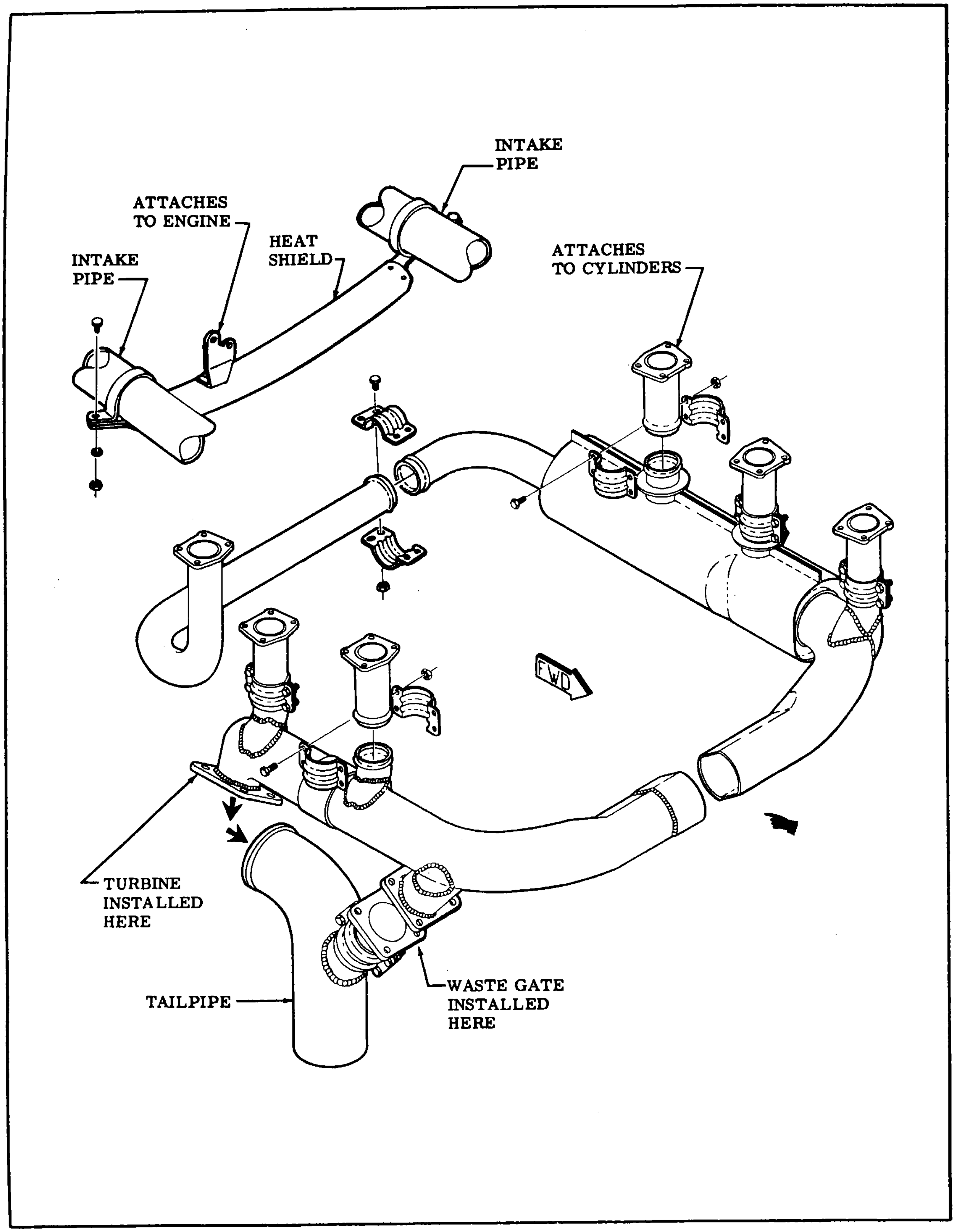
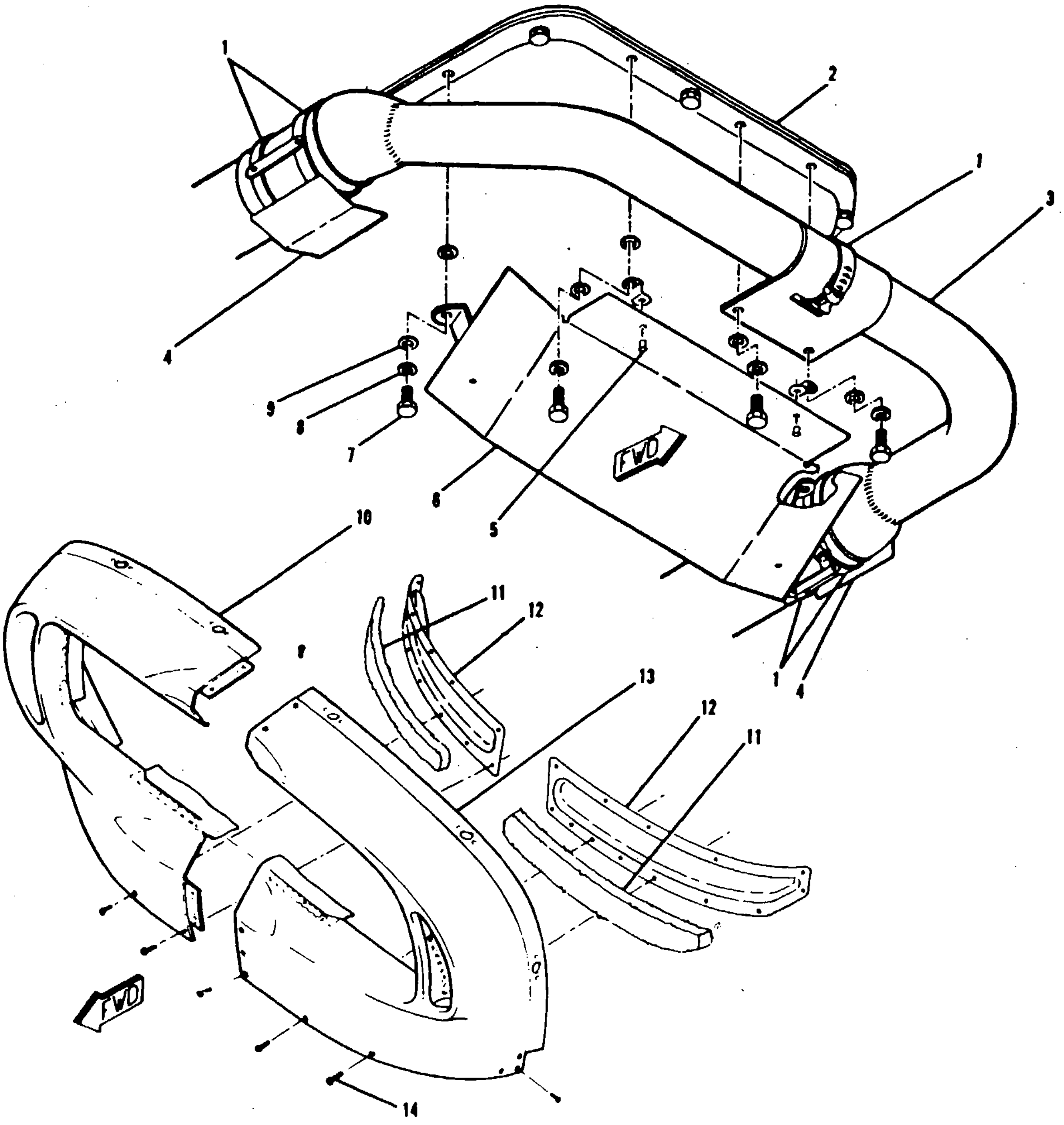


Figure 12A-3. Exhaust System (Sheet 1 of 2)



HEAT DEFLECTORS AND INSULATORS

1. Clamp
2. Crankcase
3. Intake Manifold Balance Tube
4. Heat Deflector
5. Rivet
6. Heat Shield
7. Bolt
8. Lockwasher
9. Washer
10. Right Nosecap
11. Insulation
12. Retaining Skin
13. Left Nosecap
14. Screw

Figure 12A-3. Exhaust System (Sheet 2 of 2)

E. Install bolts and nuts attaching waste-gate to right hand exhaust stack and tighten securely.

F. While applying an upward force of one G to counteract weight of turbocharger and waste-gate assembly, tighten clamp attaching exhaust stack to riser.

G. Tighten clamp securing tailpipe to turbocharger.

H. Be sure all parts are secure and safetied as required, then perform step "B" of paragraph 12A-100 to check for air leaks.

I. Install heater shroud duct and heat shields.

J. Install intake manifold balance tube at front of engine and install heat shields at front of engine, then install nose caps and cowling.

NOTE: The lower sections of turbocharger supports (Index 8, Figure 12A-5) are supplied as service parts with their upper holes omitted. These undrilled parts are also supplied when a new turbocharger inlet stack, right front stack, or either of the two right front risers is ordered. The following steps outline the proper procedure for drilling and installing the supports.

K. Install all parts but do not tighten attaching clamps or bolts.

L. Torque nuts attaching risers to cylinders evenly to 100-110 lb-in.

M. Tighten bolts and clamps per steps "D" through "G".

NOTE: It is important that weight of turbocharger and waste-gate assembly be counteracted, as listed in step "F", when tightening clamps attaching stacks to risers.

N. Make hole locations in undrilled supports to match existing holes in upper supports.

O. Remove lower supports, leaving all other parts tight.

P. Drill the marked holes with a 3/8-inch drill.

Q. Reinstall supports, install bolts fastening upper and lower supports together, then tighten all bolts securely. If any exhaust system bolts or clamps were loosened while lower supports were not installed, loosen all clamps and bolts and repeat the installation procedure to be sure no pre-loading is present.

R. Be sure all parts are secure and safetied as required, reinstall any parts removed for access, then install nose caps and cowling.

12A-100. INSPECTION. Since exhaust systems of this type are subject to burning, cracking and general deterioration from alternate thermal stresses and vibrations, inspection is important and should be accomplished every 50 hours of operation. Also, a thorough inspection of the engine exhaust system should be made to detect cracks causing leaks which could result in loss of optimum turbocharger efficiency and engine power. To inspect the engine exhaust system, proceed as follows:

A. Remove engine cowling as required so that ALL surfaces of the exhaust assemblies can be visually inspected.

NOTE: Especially check the areas adjacent to welds and slip joints. Look for gas deposits in surrounding areas, indicating that exhaust gases are escaping through a crack or hole or around the slip joints.

B. After visual inspection, an air leak check should be made on the exhaust system as follows:

1. Attach the pressure side of an industrial vacuum cleaner to the tailpipe opening, using a rubber plug to effect a seal as required.

   NOTE: The inside of the vacuum cleaner hose should be free of any contamination that might be blown into the engine exhaust system.

2. With vacuum cleaner operating, all joints in the exhaust system may be checked manually by feel, or by using a soap and water solution and watching for bubbles. Forming of bubbles is considered acceptable, if bubbles are blown away system is not considered acceptable. Bubbles will also appear at the waste gate bearings and at the joint of the turbocharger turbine and compressor bearing housing.

C. Where a surface is not accessible for a visual inspection, or for a more positive test, the following procedure is recommended.

1. Remove exhaust stack assemblies.

2. Use rubber expansion plugs to seal opening.

3. Using a monometer or gage, apply approximately 1-1/2 psi (3 inches of mercury) air pressure while each stack assembly is submerged in water. Any leaks will appear as bubbles and can be readily detected.

4. It is recommended that exhaust stacks found defective be replaced before the next flight.

D. After installation of exhaust system components, perform the inspection in step "B" of this paragraph to ascertain that the system is acceptable.

12A-101. TURBOCHARGER.

12A-102. DESCRIPTION. The turbocharger is an exhaust gas-driven compressor, or air pump, which provides high velocity air to the engine intake manifold. The turbocharger is composed of a turbine wheel, compressor wheel, turbine housing and compressor housing. The turbine, compressor wheel and interconnecting drive shaft comprise one complete assembly and are the only moving parts in the turbocharger. Turbocharger bearings are lubricated with filtered oil supplied from the engine oil system. Engine exhaust gas enters the turbine housing to drive the turbine wheel. The turbine wheel, in turn, drives the compressor wheel, producing a high velocity of air entering the engine induction intake manifold. Exhaust gas is then dumped overboard through the exhaust outlet of the turbine housing and exhaust tailpipe. Air is drawn into the compressor through the induction air filter and is forced out of the compressor housing through a tangential outlet to the intake manifold. The degree of turbocharging is varied by means of a waste-gate valve, which varies the amount of exhaust gas allowed to bypass the turbine.

12A-103. REMOVAL AND INSTALLATION.

a. Remove engine cowling as required.
b. Remove waste-gate to tailpipe clamp.
c. Loosen clamp at turbine exhaust outlet and work tailpipe from turbine outlet.
d. Loosen clamps and remove air inlet and outlet ducts from turbocharger compressor.
e. Disconnect oil pressure and scavenger lines from turbocharger. Plug or cap open oil lines and fittings. Remove clamp on oil supply line to the turbocharger.
f. Loosen clamp and remove induction air inlet elbow at turbocharger compressor.
g. Remove right cowl flap by disconnecting control at cowl flap and removing hinge pin.
h. Cut safety wire and remove two bolts attaching turbine to forward mounting bracket.
i. Remove three bolts attaching turbine to turbine rear mounting bracket.
j. Remove three remaining bolts, washers and nuts attaching turbine to exhaust manifold.
k. Work turbocharger from aircraft through cowl flap opening in lower cowling.
l. Reverse the preceding steps for reinstallation. When installing the turbocharger, install a new gasket between exhaust manifold and turbine exhaust inlet. Reinstall safety wire.

12A-104. CONTROLLER AND WASTE-GATE ACTUATOR.

12A-105. FUNCTIONS. The waste-gate actuator and controller uses engine oil for power supply. The turbocharger is controlled by the waste-gate, waste-gate actuator, the absolute pressure and overboost control valve. The waste-gate bypasses engine exhaust gas around the turbocharger turbine inlet. The waste-gate actuator, which is physically connected to the waste-gate by mechanical linkage, controls the position of the waste-gate butterfly valve. The absolute pressure controller controls the maximum turbocharger compressor discharge pressure, the overboost control valve prevents an excessive pressure increase from the turbocharger compressor.

12A-106. OPERATION. The waste-gate actuator is spring-loaded to position the waste-gate to the normally open position when there is not adequate oil pressure in the waste-gate actuator power cylinder during engine shut down. When the engine is started, oil pressure is fed into the waste-gate actuator power cylinder through the capillary tube. This automatically fills the waste-gate actuator power cylinder and lines leading to the controllers, blocking the flow of oil by normally closed metering and/or poppet valves. As oil pressure builds up in the waste-gate actuator power cylinder, it overcomes the force of the waste-gate open spring, closing the waste-gate. When the waste-gate begins to close, the exhaust gases are routed through the turbocharger turbine. As the engine increases its power and speed, the increase of

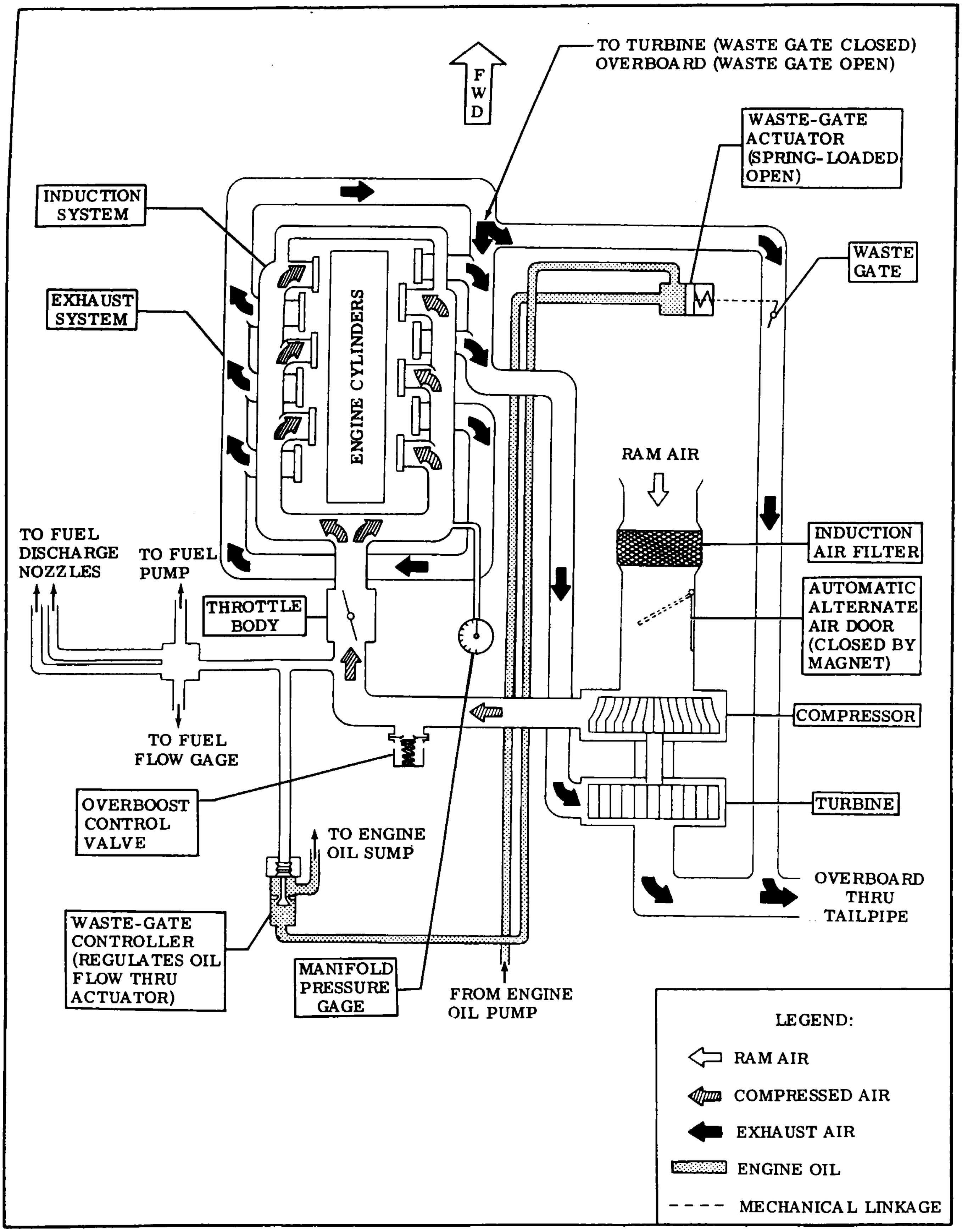


Figure 12A-4. Turbocharger System Schematic temperature and pressure of the exhaust gases causes the turbocharger to rotate faster, raising the turbocharger compressor outlet pressure. As the compressor outlet pressure rises, the aneroid bellows and the absolute pressure controller sense the increase in pressure. When at high engine speed and load and the proper absolute pressure is reached, the force on the aneroid bellows opens the normally closed metering valve. When the oil pressure in the waste-gate actuator power cylinder is lowered sufficiently, the waste-gate actuator open spring forces the mechanical linkage to open the waste-gate. A portion of the exhaust gases then bypasses the turbocharger turbine, thus preventing further increase of turbocharger speed and holding the compressor discharge absolute pressure to the desired valve. Conversely, at engine idle, the turbocharger runs slowly with low compressor pressure output; therefore, the low pressure applied to aneroid bellows is not sufficient to affect the unseating of the normally closed metering valve. Consequently; engine oil pressure keeps the waste-gate closed. The overboost control valve acts as a pressure relief valve and will open to prevent an excessive pressure increase from the turbocharger compressor. Above 19,000 feet, the absolute pressure controller will continue to maintain 32.5±.5 inches of mercury manifold pressure at full throttle. It is necessary to reduce manifold pressure with the throttle to follow the maximum manifold pressure versus altitude schedule shown on the instrument panel placard.

CAUTION: All turbocharged engine installations on Cessna aircraft are equipped with controller systems which automatically control the engine within prescribed manifold pressure limits. Although these automatic controller systems are very reliable and eliminate the need for manual control through constant throttle manipulation, they are not infallible. For instance, such things as rapid throttle manipulation (especially with cold oil), momentary waste-gate sticking, air in the oil system of the controller, etc., can cause overboosting.

Consequently, it is still necessary that the pilot observe and be prepared to control the manifold pressure, particularly during take-off and power changes in flight.

The slight overboosting of manifold pressure beyond established minimums, which is occasionally experienced during initial take-off roll or during a change to full throttle operation in flight, is not considered detrimental to the engine as long as it is momentary. Momentary overboost is generally in the area of 2 to 3 inches and can usually be controlled by slower throttle movement. No corrective action is required where momentary overboosting corrects itself and is followed by normal engine operation. However, if overboosting of this nature persists, or if the amount of overboost goes as high as 6 inches, the controller and overboost control should be checked for necessary adjustment or replacement of the malfunctioning component.

Overboost exceeding 6 inches beyond established minimums is excessive and can result in engine damage. It is recommended that overboosting of this nature be reported to your Cessna dealer, who will be glad to determine what, if any, corrective action needs to be taken.

12A-107. TROUBLE SHOOTING.

TROUBLE	PROBABLE CAUSE	REMEDY
UNABLE TO GET RATED POWER BECAUSE MANIFOLD PRESSURE IS LOW.	Controller not getting enough oil pressure to close the waste-gate.	Check oil pump outlet pressure, oil filter and external lines for obstructions. Clean lines and replace if defective. Replace oil filter.
	Controller out of adjustment or defective.	Refer to paragraph 12A-110. Replace controller if defective.
	Defective actuator.	Refer to paragraph 12A-112. Replace actuator if defective.
	Leak in exhaust system.	Check for cracks and other obvious defects. Replace defective components. Tighten clamps and connections.
	Leak in intake system.	Check for cracks and loose connections. Replace defective components. Tighten all clamps and connections.
ENGINE SURGES OR SMOKES.	Defective controller.	Refer to paragraph 12A-110. Replace if not adjustable.
	Waste-gate actuator linkage binding.	Refer to paragraph 12A-112.
	Waste-gate actuator leaking oil.	Replace actuator.
TURBOCHARGER NOISY WITH PLENTY OF POWER.	Turbocharger overspeeding from defective or improperly adjusted controller.	Refer to paragraph 12A-110. Replace if defective.
	Waste-gate sticking closed.	Correct cause of sticking. Refer to paragraph 12A-110. Replace defective parts.
	Controller drain line (oil return to engine sump) obstructed.	Clean line. Replace if defective.
ENGINE POWER INCREASES SLOWLY OR SEVERE MANIFOLD PRESSURE FLUCTUATIONS WHEN THROTTLE ADVANCED RAPIDLY.	Overboost control valve out of adjustment or defective.	Replace if defective.
	Waste-gate operation is sluggish.	Refer to paragraph 12A-112. Replace if defective. Correct cause of sluggish operation.
ENGINE POWER INCREASES RAPIDLY AND MANIFOLD PRESSURE OVERBOOSTS WHEN THROTTLE ADVANCED RAPIDLY.	Overboost control valve out of adjustment or defective.	Replace if defective.
	Waste-gate operation is sluggish.	Refer to paragraph 12A-112. Replace if defective. Correct cause of sluggish operation.

12A-107. TROUBLE SHOOTING (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
FUEL PRESSURE DECREASES DURING CLIMB, WHILE MANIFOLD PRESSURE REMAINS CONSTANT.	Compressor discharge pressure line to fuel pump aneroid restricted.	Check and clean out restrictions.
	Leaking or otherwise defective engine-driven fuel pump aneroid.	Replace engine-driven fuel pump.
MANIFOLD PRESSURE DECREASES DURING CLIMB AT ALTITUDES BELOW NORMAL PART THROTTLE CRITICAL ALTITUDE, OR POOR TURBOCHARGER PERFORMANCE INDICATED BY CRUISE RPM FOR CLOSED WASTE-GATE. (Refer to paragraph 12A-107.)	Leak in intake system.	Check for cracks and other obvious defects. Tighten all hose clamps and fittings. Replace defective components.
	Leak in exhaust system.	Check for cracks and other obvious defects. Tighten all clamps and fittings. Replace defective components.
	Leak in compressor discharge pressure line to controller.	Check for cracks and other obvious defects. Tighten all clamps and fittings. Replace defective components.
	Controller seal leaking.	Replace controller.
	Waste-gate actuator leaking oil.	Replace actuator.
	Waste-gate butterfly - closed gap is excessive.	Refer to paragraph 12A-112.
	Intake air filter obstructed.	Service air filter. Refer to Section 2 for servicing instructions.
FUEL FLOW DOES NOT DECREASE AS MANIFOLD PRESSURE DECREASES AT PART-THROTTLE CRITICAL ALTITUDE.	Defective engine-driven fuel pump aneroid mechanism.	Replace engine-driven fuel pump.
	Obstruction or leak in compressor discharge pressure line to engine-driven fuel pump.	Check for leaks or obstruction. Clean out lines and tighten all connections.
FUEL FLOW INDICATOR DOES NOT REGISTER CHANGE IN POWER SETTINGS AT HIGH ALTITUDES.	Moisture freezing in indicator line.	Disconnect lines, thaw ice and clean out lines.
SUDDEN POWER DECREASE ACCOMPANIED BY LOUD NOISE OF RUSHING AIR.	Intake system air leak from hose becoming detached.	Check hose condition. Install hose and hose clamp securely.
MANIFOLD PRESSURE GAGE INDICATION WILL NOT REMAIN STEADY AT CONSTANT POWER SETTINGS.	Defective controller.	Replace controller.
	Waste-gate operation is sluggish.	Refer to paragraph 12A-112. Replace if defective. Correct cause of sluggish operation.

12A-108. CONTROLLER AND TURBOCHARGER OPERATIONAL FLIGHT CHECK. The following procedure details the method of checking the operation of the absolute controller overboost control valve, and a performance check of the turbocharger.

(1) TAKE-OFF-ABSOLUTE CONTROLLER CHECK.
a. Cowl Flaps - Open.
b. Airspeed - 110 MPH IAS.
c. Oil Temperature - Middle of green arc.
d. Engine Speed - 2700 ± 25 RPM.
e. Fuel Flow - 28.0 to 29.5 GPH (168.0 to 177.0 LBS/HR) (Full Rich Mixture).
f. Full Throttle M. P. - Absolute controller should maintain 32.5 ± .5 in. Hg (stabilized).

Climb 2000 feet after take-off to be sure manifold pressure has stabilized. It is normal on the first take-off of the day for full throttle manifold pressure to decrease 1/2 to 1.0 inch of mercury within one minute after the initial application of full power. Refer to paragraph 12A-110 for absolute controller adjustment.

(2) CLIMB - ABSOLUTE CONTROLLER AND TURBOCHARGER PERFORMANCE CHECK.
a. Cowl Flaps - Open.
b. Airspeed - 120 MPH IAS.
c. Engine Speed - 2500 RPM.
d. Fuel Flow - Adjust mixture for 20 GPH (120.0 LBS/HR).
e. Part - Throttle M. P. - 27.5 in. Hg.
f. Climb to 20,000 feet - Check part-throttle critical altitude during climb.

This part-throttle critical altitude is where manifold pressure starts decreasing during the climb at a rate of approximately 1.0 inch of mercury per 1000 feet. After noting this altitude and the outside air temperature, the desired manifold pressure should be maintained by advancing the throttle during the remainder of the climb.

Once the climb power setting is established after take-off, the controller should maintain a steady manifold pressure up to the part-throttle critical altitude indicated in the following chart. If part-throttle critical altitude has not been reached by 20,000 feet, discontinue check and proceed to cruise check.

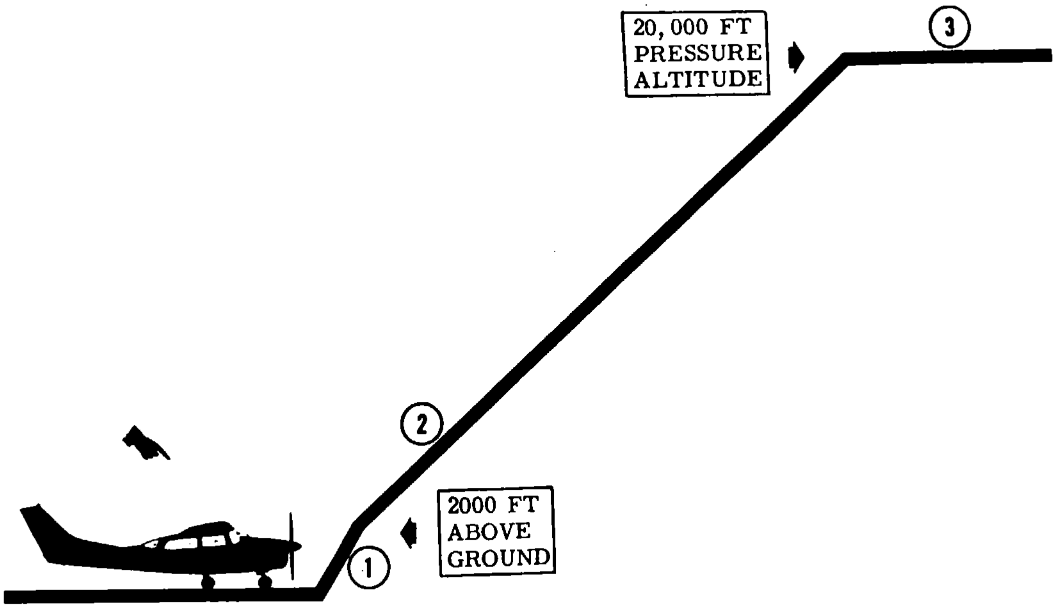
Outside Air Temperature	Part-Throttle Critical Altitude (75% Power)
Standard or Colder	Above 24,000 feet
20°F Above Standard	16,000 to 22,000 feet
40°F Above Standard	10,000 to 16,000 feet

Part-throttle critical altitudes lower than those listed indicate the turbocharger system is not operating properly (refer to the trouble shooting chart in paragraph 12A-107). Critical altitudes above those listed indicate turbocharger performance better than normal. Also check that fuel flow decreases as manifold pressure decreases at critical altitude. Refer to the trouble shooting chart if fuel flow does not decrease.

(3) CRUISE - TURBOCHARGER PERFORMANCE CHECK.
a. Cowl Flaps - Closed.
b. Airspeed - Level flight.
c. Pressure Altitude - 20,000 feet.
d. Engine Speed - 2700 RPM.
e. Part-Throttle M. P. - 27.5 in. Hg.
f. Fuel Flow - Lean to 18 GPH (108.0 LBS/HR).
g. Propeller Control -
   (1) Slowly decrease RPM until manifold pressure starts to drop, indicating waste-gate is closed.
   (2) Note outside air temperature and RPM as manifold pressure starts to drop, which should be in accordance with the following chart.
   (3) After noting temperature and RPM, increase engine speed 50 RPM to stabilize manifold pressure, with the waste-gate modulating exhaust flow to control compressor output.

Outside Air Temperature	RPM where M. P. Starts to Decrease
40°F Above Standard	2700 to 2550
20°F Above Standard	2600 to 2450
Standard Temperature	2500 to 2350
20°F Below Standard	2400 to 2550
40°F Below Standard	2300 to 2150

If the waste-gate is closed at engine speeds higher than those listed, refer to the trouble shooting chart in paragraph 12A-107. Closing of the waste-gate at engine speeds lower than those listed indicates turbocharger performance better than normal.



NOTE

Circled numbers refer to corresponding flight checks required in preceding text.

12A-109. REMOVAL AND INSTALLATION OF TURBOCHARGER CONTROLLER.

a. Disconnect and tag oil lines from controller and plug or cap open lines and fittings.

b. Disconnect compressor outlet pressure sensing line from controller and plug or cap open line and fitting.

c. Remove two bolts attaching controller to mounting bracket on firewall.

d. Remove controller from aircraft, being careful not to drop controller unit.

e. Installation of the controller may be accomplished by reversing the preceding steps. Resafety bolts attaching controller to bracket.

12A-110. ABSOLUTE CONTROLLER ADJUSTMENTS. (Refer to figure 12A-6.)

a. With engine oil temperature at middle of green arc, slowly open throttle and note maximum manifold pressure obtainable. Do not exceed 32.5±.5 in. Hg.

b. Cut safety wire and remove plug from bottom of absolute controller (the vertical unit).

c. Using a flat-bladed screwdriver, rotate metering valve seat clockwise to increase manifold pressure and counterclockwise to decrease manifold pressure. Lightly tap the unit after each adjustment to seat internal parts.

NOTE

When adjusting, rotate in VERY small increments as this is an extremely sensitive adjustment. Approximately 13 degrees rotation will change the manifold pressure reading about one inch Hg.

d. Install and safety plug in absolute unit, then operate engine as in step "a" to ascertain that adjustment has not caused radical change in manifold pressure.

NOTE

When making adjustment on the ground, the hotter the engine gets, the lower the manifold pressure will be.

e. After each adjustment, the aircraft must be flight tested to check results.

f. Repeat this procedure until desired results are obtained.

12A-111. REMOVAL AND INSTALLATION OF WASTE-GATE AND ACTUATOR.

a. Disconnect and tag oil lines from actuator and plug or cap open lines and fittings.

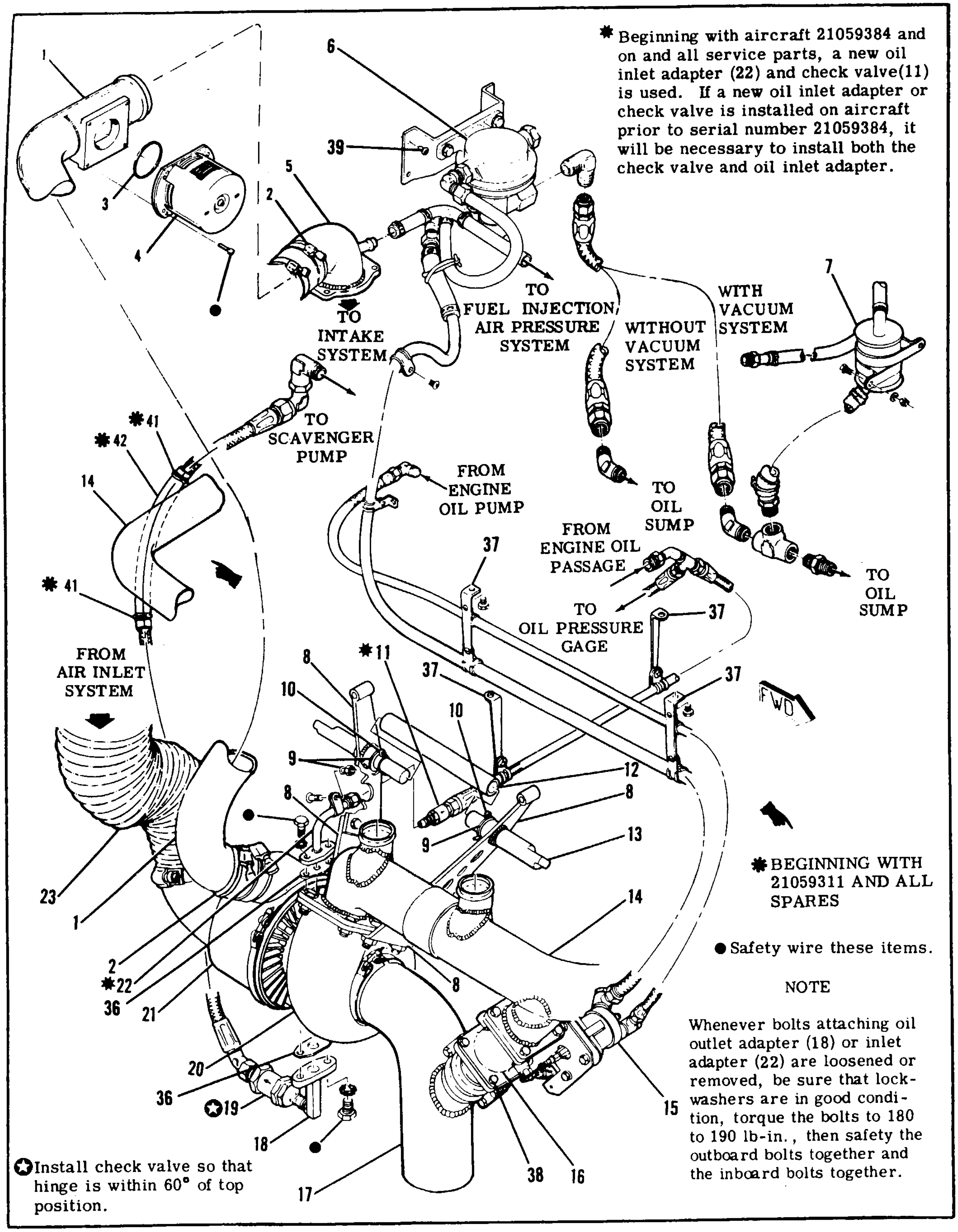
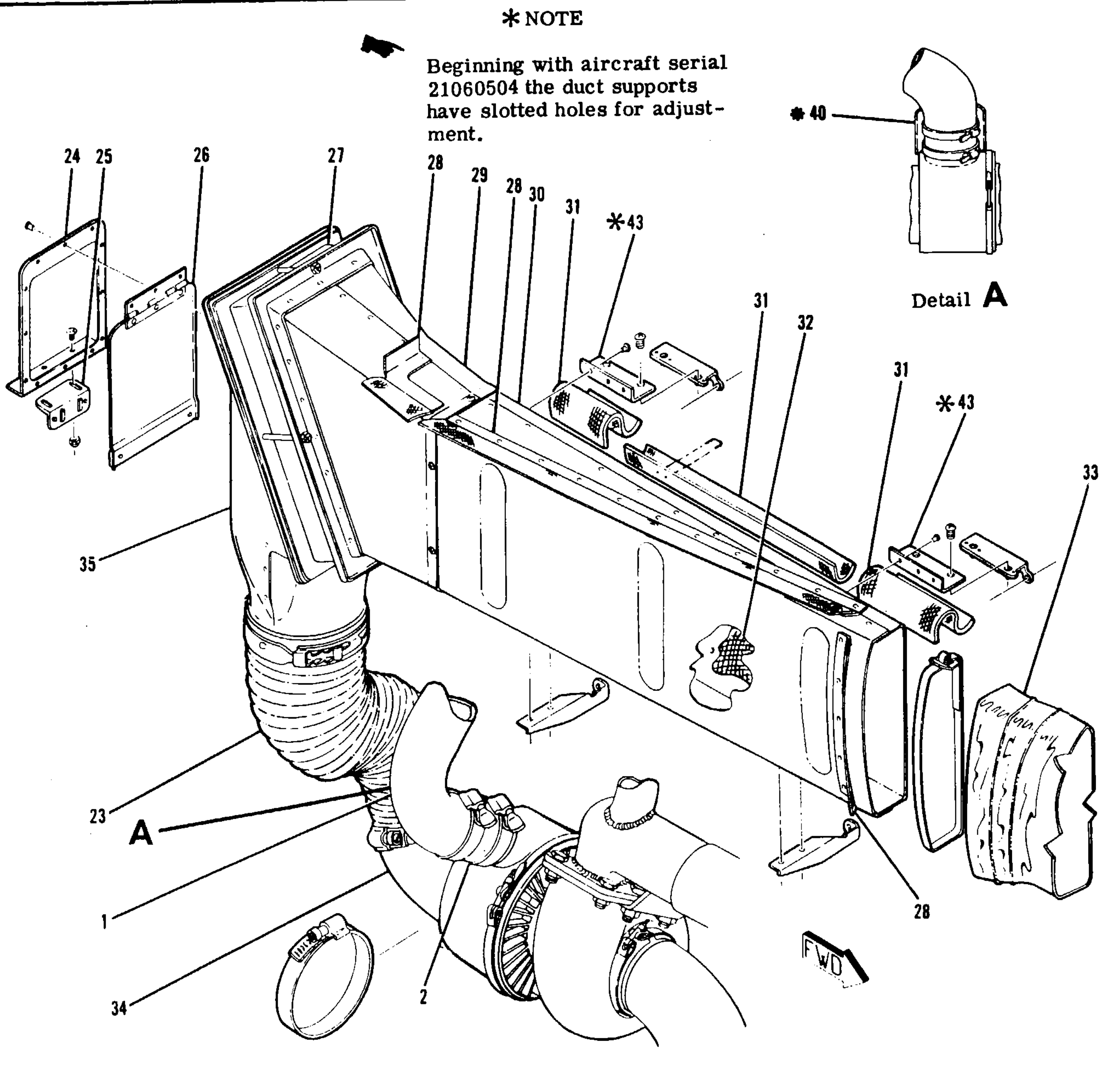


Figure 12A-5. Turbocharger System (Sheet 1 of 2)



1. Turbocharger Discharge Duct
2. Coupler
3. O-Ring Seal
4. Overboost Control Valve
5. Throttle Body Adapter
6. Absolute Controller
7. Vacuum System Oil Separator
8. Turbocharger Support (FWD &AFT)
9. Washer
10. Cotter Pin
11. Check Valve
12. Tube
13. Shaft Assembly
14. Exhaust System
15. Waste-Gate Actuator
16. Waste-Gate
17. Tail Pipe
18. Oil Outlet Adapter Assembly
19. Check Valve
20. Turbine Housing
21. Compressor Housing
22. Oil Inlet Adapter Assembly
23. Turbocharger Inlet Hose
24. Doubler
25. Magnet
26. Door
27. Induction Air Filter
28. Baffle Assembly
29. Center Duct
30. Forward Duct
31. Seal
32. Wire Guard
33. Nose Cap Flexible Duct
34. Turbocharger Inlet Elbow
35. Aft Duct
36. Gasket
37. Support
38. Bolt
39. Screw
40. Shield Assembly
41. Clamp
42. Sleeve
43. Support

*BEGINNING WITH AIRCRAFT SERIAL 21059827 & ON

Figure 12A-5. Turbocharger System (Sheet 2 of 2)

b. Remove bolts, washers and nuts attaching waste-gate and actuator assembly to tailpipe.
c. Loosen clamp attaching tailpipe to turbine exhaust outlet and work tailpipe from turbine.
d. Remove bolts, washers and nuts attaching the assembly to the exhaust manifold.
e. Remove the assembly from aircraft, being careful not to drop the unit.
f. Installation may be accomplished by reversing the preceding steps.

NOTE

When installing the assembly, be sure the gaskets at inlet and outlet of valve are installed and are in good condition. Replace gaskets if damaged.

12A-112. ADJUSTMENT OF WASTE-GATE ACTUATOR. (Refer to figure 12A-7.)
a. Remove waste-gate actuator in accordance with paragraph 12A-111.
b. Plug actuator outlet port and apply a 50 to 60 psig air pressure to the inlet port of the actuator.
c. Check for 0.010 + 0-.005 inch gap between butterfly and waste-gate body as shown in figure 12A-7.
d. If adjustment is required, remove pin from actuator shaft.
e. Hold clevis end and turn shaft clockwise to increase gap or counterclockwise to decrease gap of butterfly. Install pin through clevis and shaft, securing pin with washer and cotter pin.
f. After adjusting closed position and with zero pressure in cylinder, check butterfly for a clearance of 1.100 + .000 -.125 inch in the full-open position as shown in figure 12A-7.
g. If adjustment is required, loosen locknut and turn stop screw clockwise to decrease or counterclockwise to increase clearance of butterfly.
h. Recheck butterfly in the closed position to ascertain that gap tolerance has been maintained.

NOTE

To assure correct spring loads, actuate butterfly with air pressure. Actuator shaft and butterfly should move freely. Actuator shaft should start to move at 15±2 psig and fully extend at 35±2 psig. Two to four psi hysteresis is normal, due to friction of O-ring against cylinder wall.

i. Remove air pressure line and plug from actuator.
j. Install waste-gate and actuator as outlined in paragraph 12A-111.

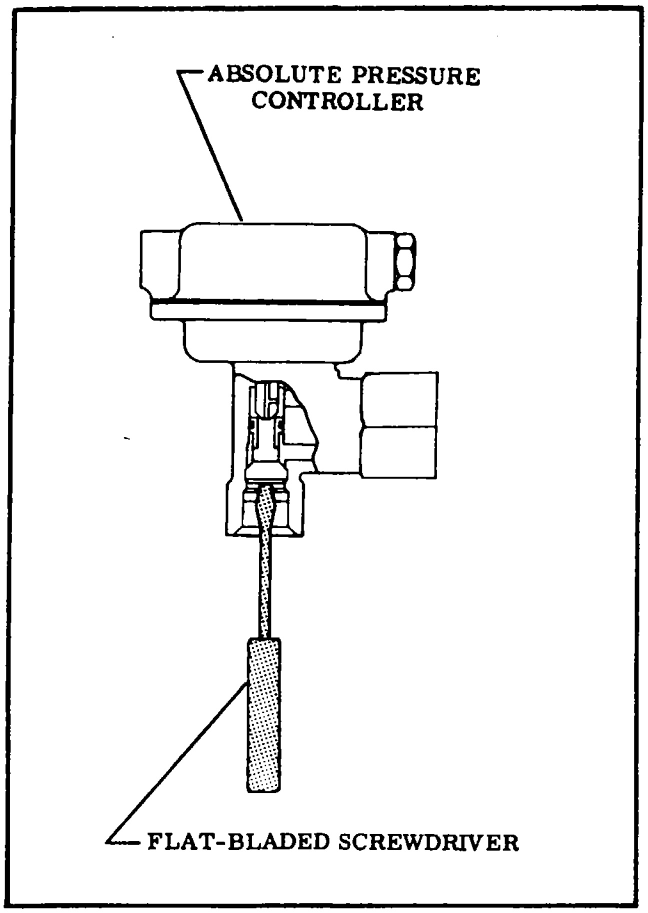


Figure 12A-6. Controller Adjustment

12A-113. EXTREME WEATHER MAINTENANCE. Refer to paragraph 12-99.

12A-114. COLD WEATHER. Refer to paragraph 12-100.

12A-115. HOT WEATHER. When the engine is hot or the outside air temperature is high, the engine may die after running several seconds because the mixture became either too lean due to fuel vapor or too rich due to excessive prime fuel. The following procedure will prevent over-priming and take care of fuel vapor in the system.
a. Set the throttle 1/3 to 1/2 open.
b. When the ignition key is on BOTH and you are ready to engage the starter, turn the fuel pump on HI until the fuel flow comes up to 4-6 gal/hr (24-36 lbs/hr) and then turn the pump off.

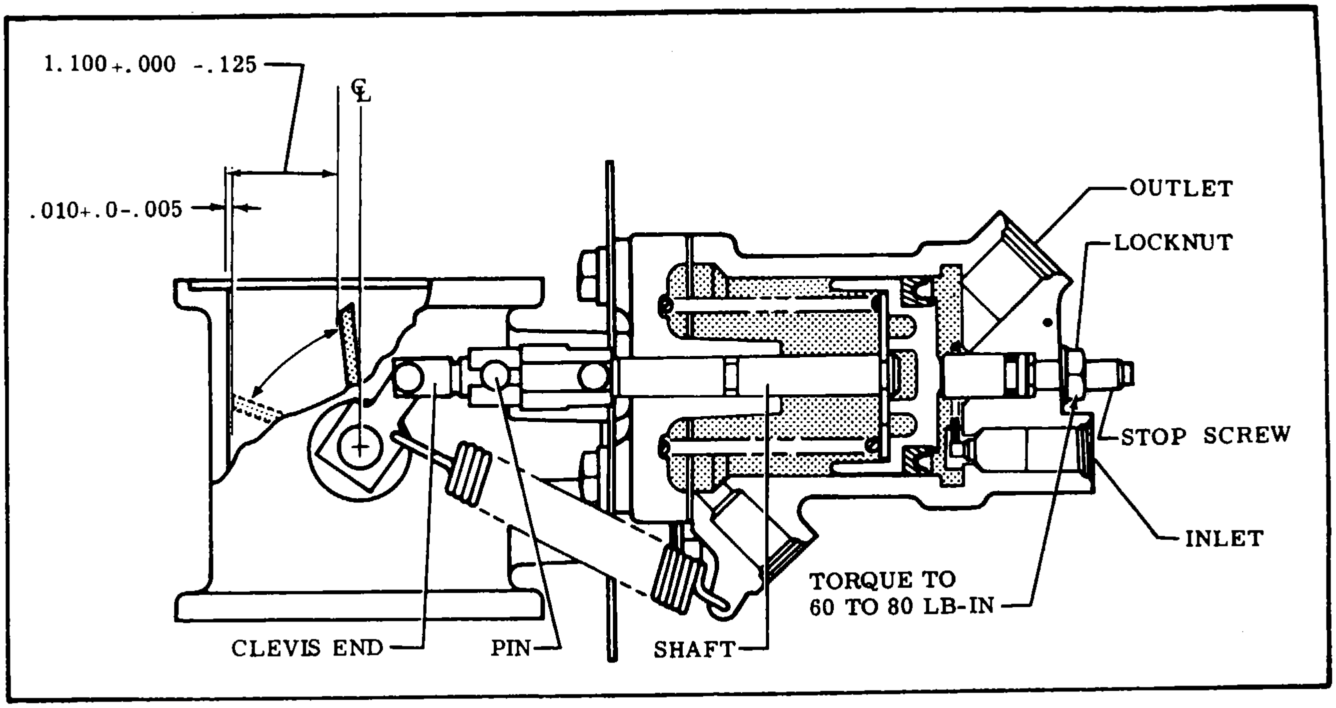


Figure 12A-7. Waste-Gate Adjustment

NOTE

During a restart after a brief shut-down in extremely hot weather, the presence of fuel vapor may require the pump to run on HI for up to 1 minute or more before the vapor is cleared sufficiently to obtain 4-6 gal/hr (24-36 lbs/hr) for starting.

c. Without hesitation, engage the starter and the engine should start in 3 to 5 revolutions. Adjust the throttle for 1200-1400 RPM.

d. If there is fuel vapor in the lines, it will pass into the injector nozzles in 2 to 3 seconds and the engine will gradually slow down and stop. When engine speed starts to decrease, turn the fuel pump on HI for approximately one second to clear out the vapor. Intermittent use of HI boost is needed since prolonged use of HI pump after the vapor is cleared will flood out the engine.

e. Let the engine run at 1200 to 1400 RPM until the vapor is eliminated and the engine idles normally. If prolonged cranking is necessary, allow the starter motor to cool at frequent intervals, since excessive heat may damage the armature.

12A-116. SEACOAST AND HUMID AREAS. Refer to paragraph 12-102.

12A-117. DUSTY AREAS. Refer to paragraph 12-103.

12A-118. GROUND SERVICE RECEPTACLE. Refer to paragraph 12-104.

12A-119. HAND CRANKING. Refer to paragraph 12-105.

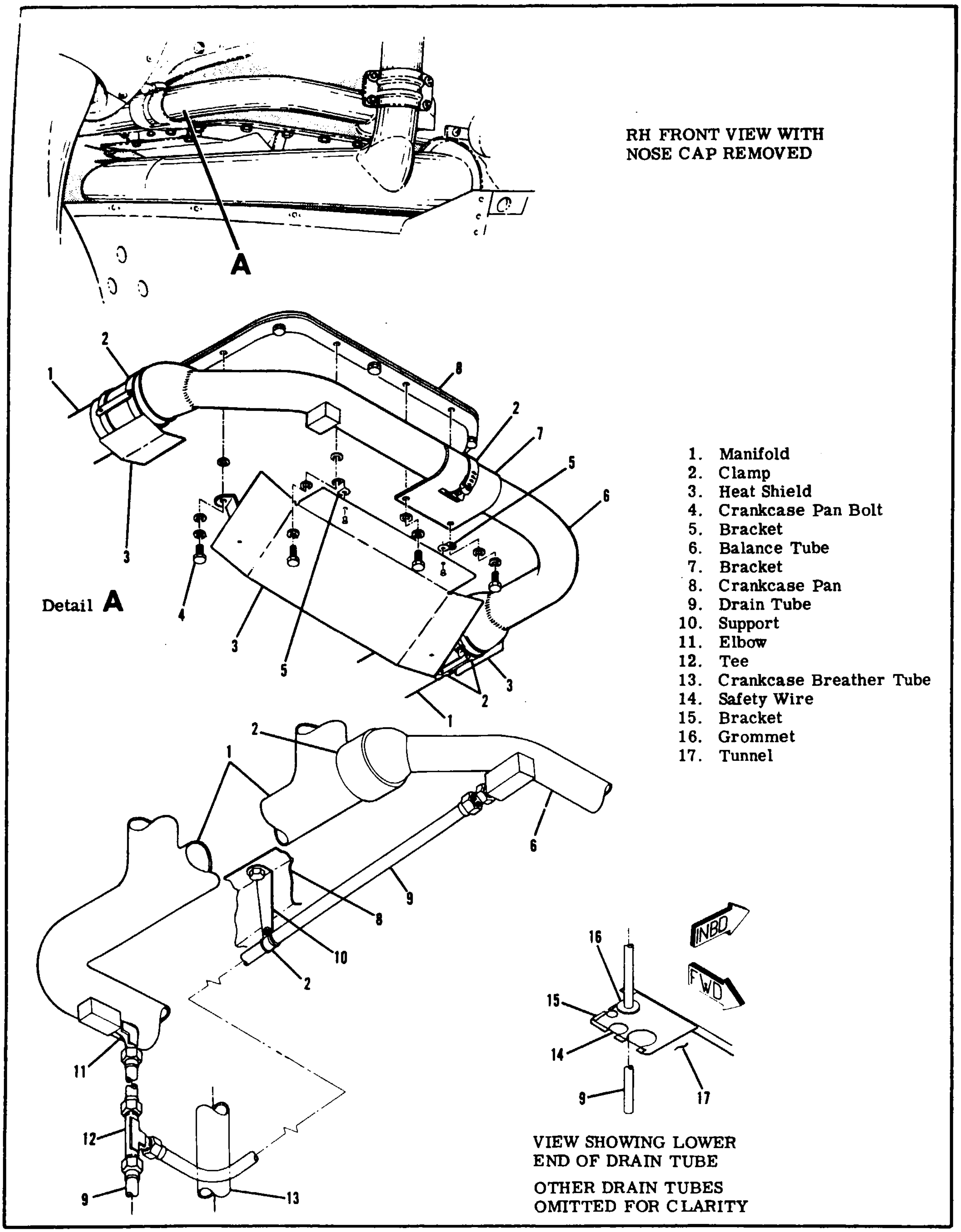


Figure 12A-8. Balance Tube and Manifold Drain Installation

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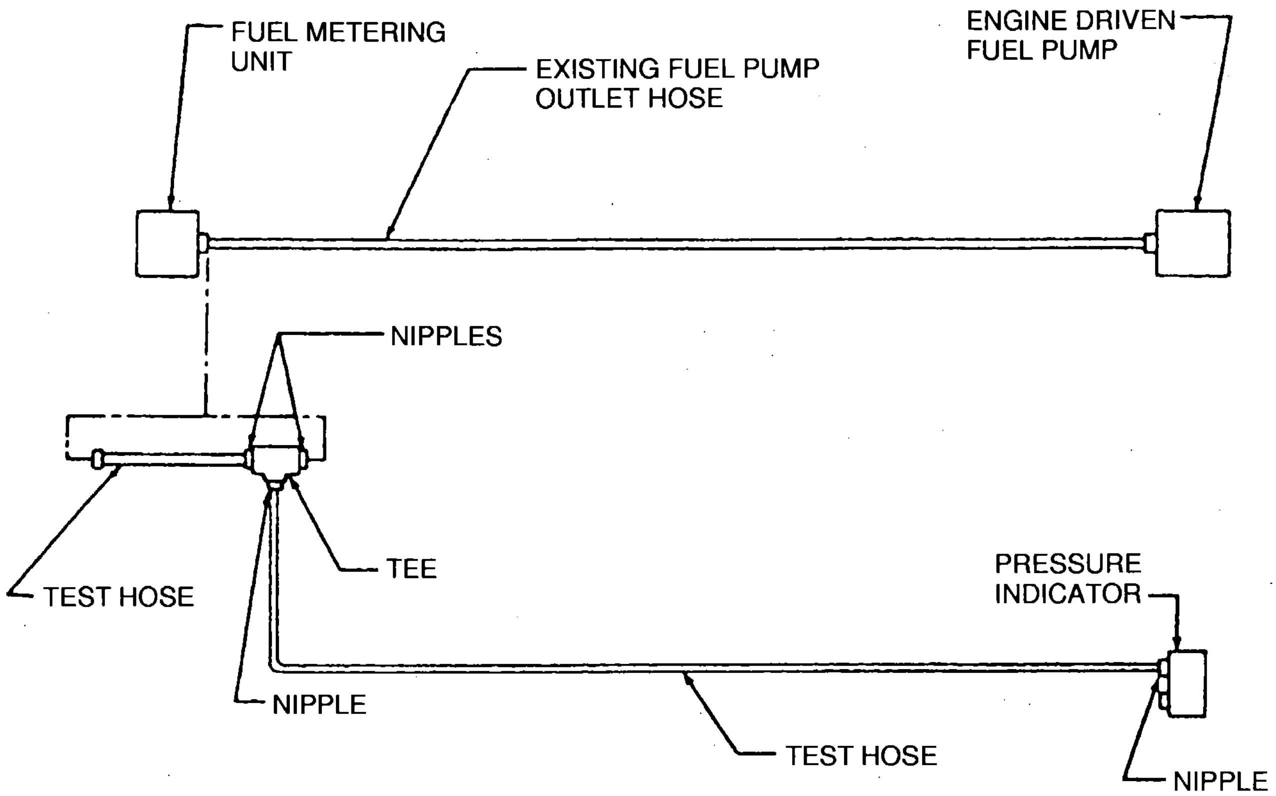

NOTE: WHEN ADJUSTING UNMETERED FUEL PRESSURE, TEST EQUIPMENT MAY BE "TEED" INTO THE ENGINE-DRIVEN FUEL PUMP OUTLET HOSE AT THE FUEL PUMP OR AT THE FUEL METERING UNIT.

SHOP NOTES:

SECTION 13

FUEL SYSTEM

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13-1. FUEL SYSTEM. The fuel system as defined by this manual includes all components up to and including the fuel line connecting to the engine-driven pump inlet. Engine-mounted components are covered in Section 12 of 12A.

13-2. DESCRIPTION. The fuel system is essentially a gravity-flow system from the bay outlets to the selector valve and a pump augmented system from the selector valve to the engine. The fuel system is composed of the wing bays, reservoir tanks, selector valve, auxiliary fuel pump, fuel strainer, engine driven fuel pump and associated plumbing. The fuel bay outlets are located at the inboard end of the bays with lines subsequently routed down the front and rear doorposts, under the floorboard, to the reservoir tanks. The fuel line from the lower forward corner of each bay to the reservoir tanks serves as a combination fuel feed and vapor return line. Fuel bypasses the auxiliary pump when the pump is not in operation. The bays are individually vented overboard through vent lines with a check valve located at each wing tip. Beginning with the 1976 Model T210 aircraft modified by SK210-93, the following changes have been made: The fuel lines from the firewall to the strainer and the strainer to the tunnel fitting will be changed from aluminum to stainless steel with insulating sleeving. The fuel hose from the fuel pump to the check valve and from the check valve to the firewall and fuel pump to tunnel fitting are fire-sleeved. The check valve is also fire-sleeved.

13-3. PRECAUTIONS.

NOTE: There are certain general precautions and rules concerning the fuel system which should be observed when performing the operations and procedures in this section. These are as follows:

A. During all fueling, defueling, purging, repairing or disassembly, ground the aircraft to a suitable ground stake.

B. Residual fuel draining from lines and hoses constitutes a fire hazard. Use caution to prevent the accumulation of fuel when lines or hoses are disconnected.

C. Cap open lines and cover connections to prevent thread damage and the entrance of foreign matter.

NOTE: Throughout the aircraft fuel system, from the fuel bays to the engine-driven fuel pump, use NS-40 (RAS-4) (Snap On Tools Corp., Kenosha, Wisconsin), MIL-T-5544 (Thread Compound, Antiseize, Graphite Petrolatum), USP Petrolatum or engine oil as a thread lubricant or to seal a leaking connection. Apply sparingly to male threads only, omitting the first two threads, exercising extreme caution to avoid "stringing" sealer across the end of the fitting. Always ensure that a compound, the residue from a previously used compound, or any other foreign material cannot enter the system. Throughout the fuel injection system, from the engine-driven fuel pump through the discharge nozzles, use only a fuel-soluble lubricant, such as engine oil, on fitting threads. Do not use any other form of thread compound on the injection system.

13-4. TROUBLE SHOOTING.

Use this trouble shooting chart in conjunction with the engine trouble shooting chart in Section 12 or 12A.

TROUBLE	PROBABLE CAUSE	REMEDY
NO FLOW TO ENGINE-DRIVEN FUEL PUMP.	Fuel selector valve not turned on.	Turn selector valve on.
	Fuel bays empty.	Service with proper grade and amount of fuel.
	Fuel line disconnected or broken.	Connect or repair fuel lines.
	Fuel bay outlet screens plugged.	Remove and clean screens and flush out fuel bays.
	Defective fuel selector valve.	Repair or replace selector valve.
	Plugged fuel strainer.	Remove and clean strainer and screen.
	Defective check valve in electric fuel pump.	Repair or replace pump.
	Fuel line plugged.	Clean or replace fuel line.
FUEL STARVATION AFTER STARTING.	Partial fuel flow from the preceding causes.	Use the preceding remedies.
	Malfunction of engine-driven fuel pump or fuel injection system.	Refer to Section 12 or 12A.
	Plugged fuel vent.	Refer to paragraph 13-19.
	Water in fuel.	Drain fuel bay sumps, lines and strainer.
NO FUEL FLOW WHEN ELECTRIC PUMP OPERATED.	Defective fuel pump switch.	Replace defective switch.
	Loose connections or open circuit.	Tighten connections; repair or replace wiring.
	Defective electric fuel pump.	Replace defective pump.
	Defective engine-driven fuel pump bypass or defective fuel injection system.	Refer to Section 12 or 12A.
NO FUEL QUANTITY INDICATION.	Fuel bays empty.	Service with proper grade and amount of fuel.
	Open or defective circuit breaker.	Reset. Replace if defective.
	Loose connections or open circuit.	Tighten connections; repair or replace wiring.
	Defective fuel quantity indicator or transmitter.	Refer to Section 16.
FLUCTUATING FUEL PRESSURE INDICATIONS. (T210).	Obstructed filter in fuel inlet strainer of metering unit.	Remove and clean.
	Manifold valve.	Replace.
	Fuel flow indicator.	Replace.

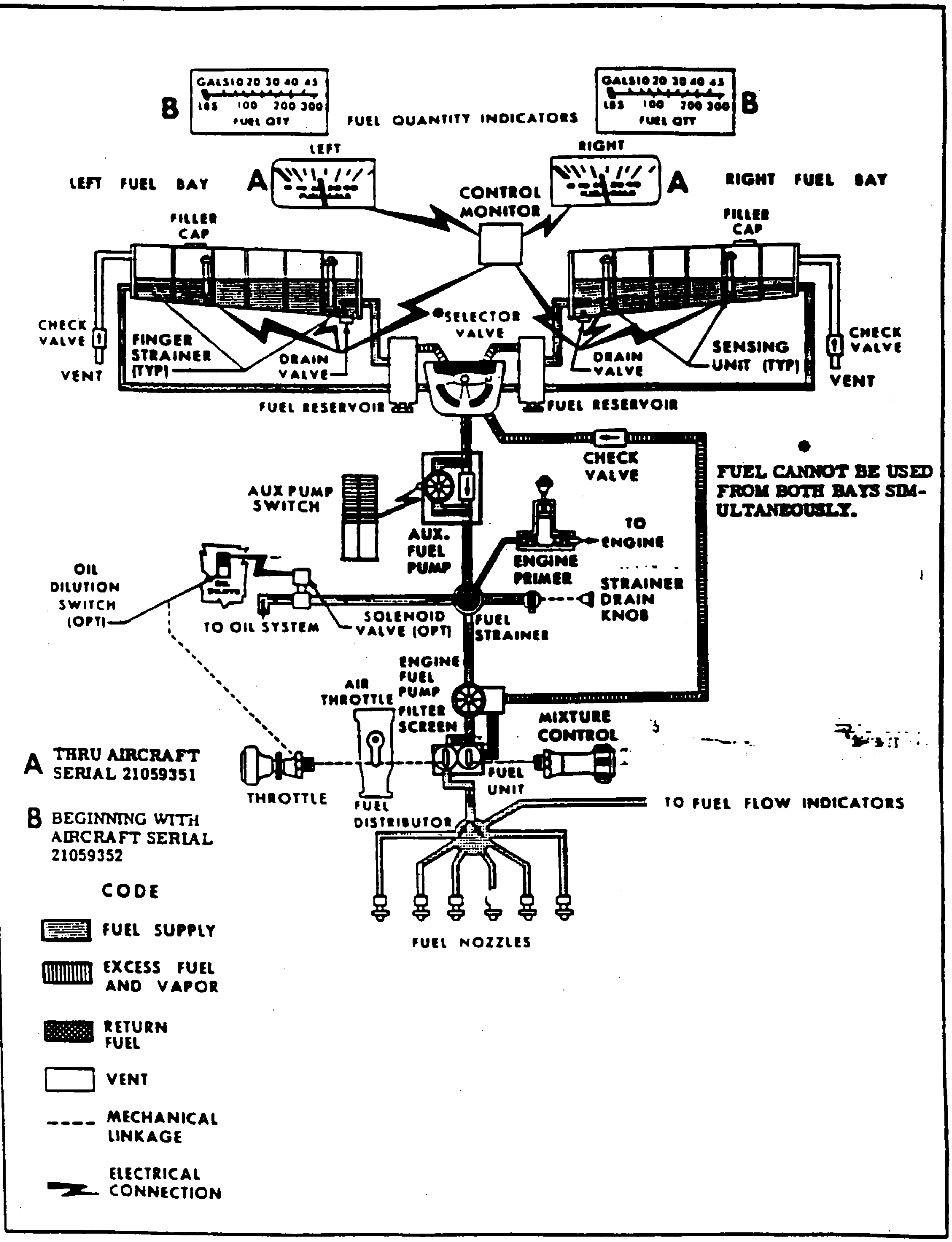
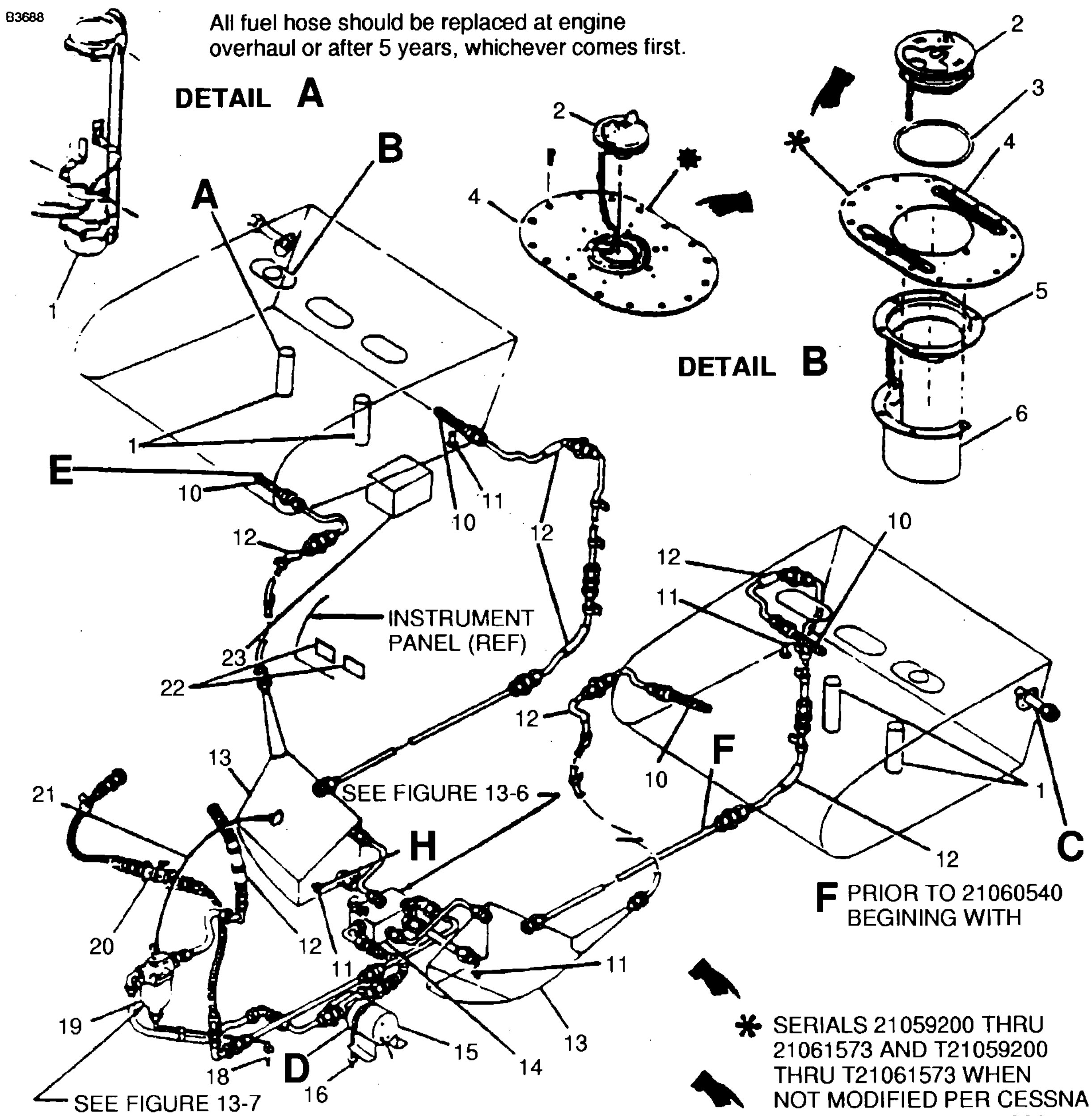


Figure 13-1. Fuel System Schematic



1. Sensing Unit
2. Filler Cap
3. O-Ring
4. Plate
5. Adaptor
6. Indicator
7. Fuel Vent Fitting
8. Union
9. Vent Line
10. Finger Strainer
11. Drain Valve
12. Sleeving
13. Reservoir Tank
14. Fuel Selector Valve
15. Electric Fuel Pump
16. Pump Drain Line
17. O-Ring
18. Strainer Drain Line
19. Fuel Strainer
20. Check Valve
21. Strainer Drain Control
22. Fuel Quality Indicators
23. Control Monitor
24. Fuel Outlet Fitting
25. Copper-Asbestos Gasket
26. Packing

Figure 13-2. Fuel System (Sheet 1 of 2)

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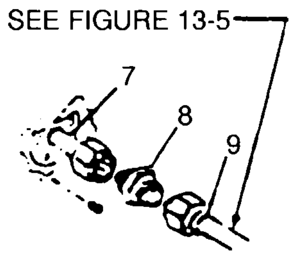
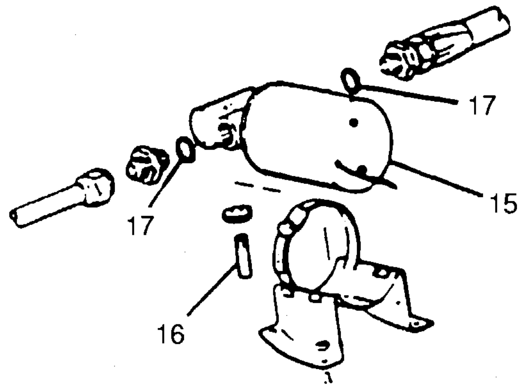
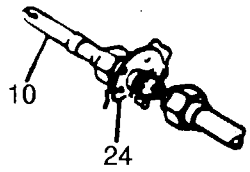


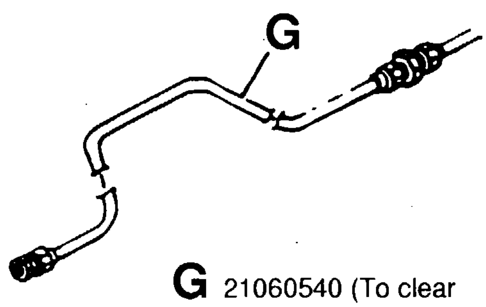
DETAIL C



DETAIL D

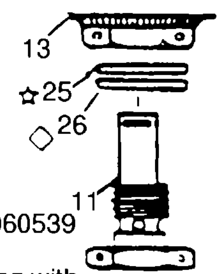


DETAIL E



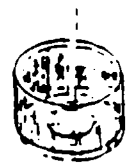
G 21060540 (To clear retractable step installation).

WHEN MODIFIED BY SK210-138 AN ADDITIONAL FUEL DRAIN VALVE IS INSTALLED IN THE OUTBOARD END OF EACH FUEL BAY.



◇Thru 21060539

☆ Beginning with 21060540



FUEL SAMPLE CUP (for use with drain valves (11). (refer to paragraph 2-19.)

DETAIL H

◇ Copper-asbestos gasket (25) should be lightly oiled and installed with asbestos against the hex head of the valve. The valve should be torqued to 90-95 lb-in.

Figure 13-2. Fuel System (Sheet 2 of 2)

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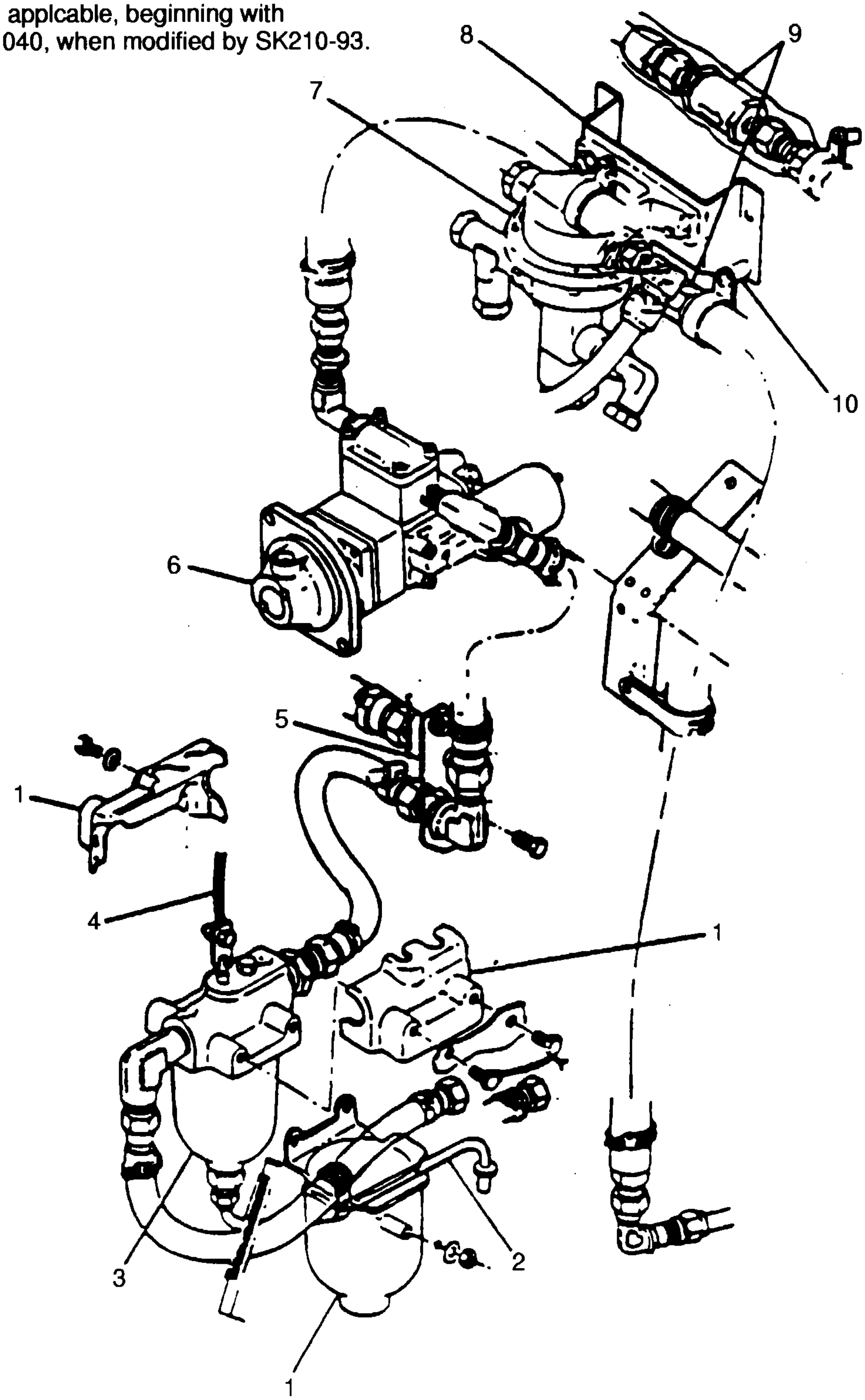
NOTE: This detail is applcable, beginning with T210, 21061040, when modified by SK210-93.



1. Insulator
2. Strainer Drain Line
3. Fuel Strainer
4. Strainer Drain Control
5. Bracket
6. Fuel Pump
7. Controller
8. Bracket
9. Check Valve
10. Spacer

Figure 13-2A. Fuel System

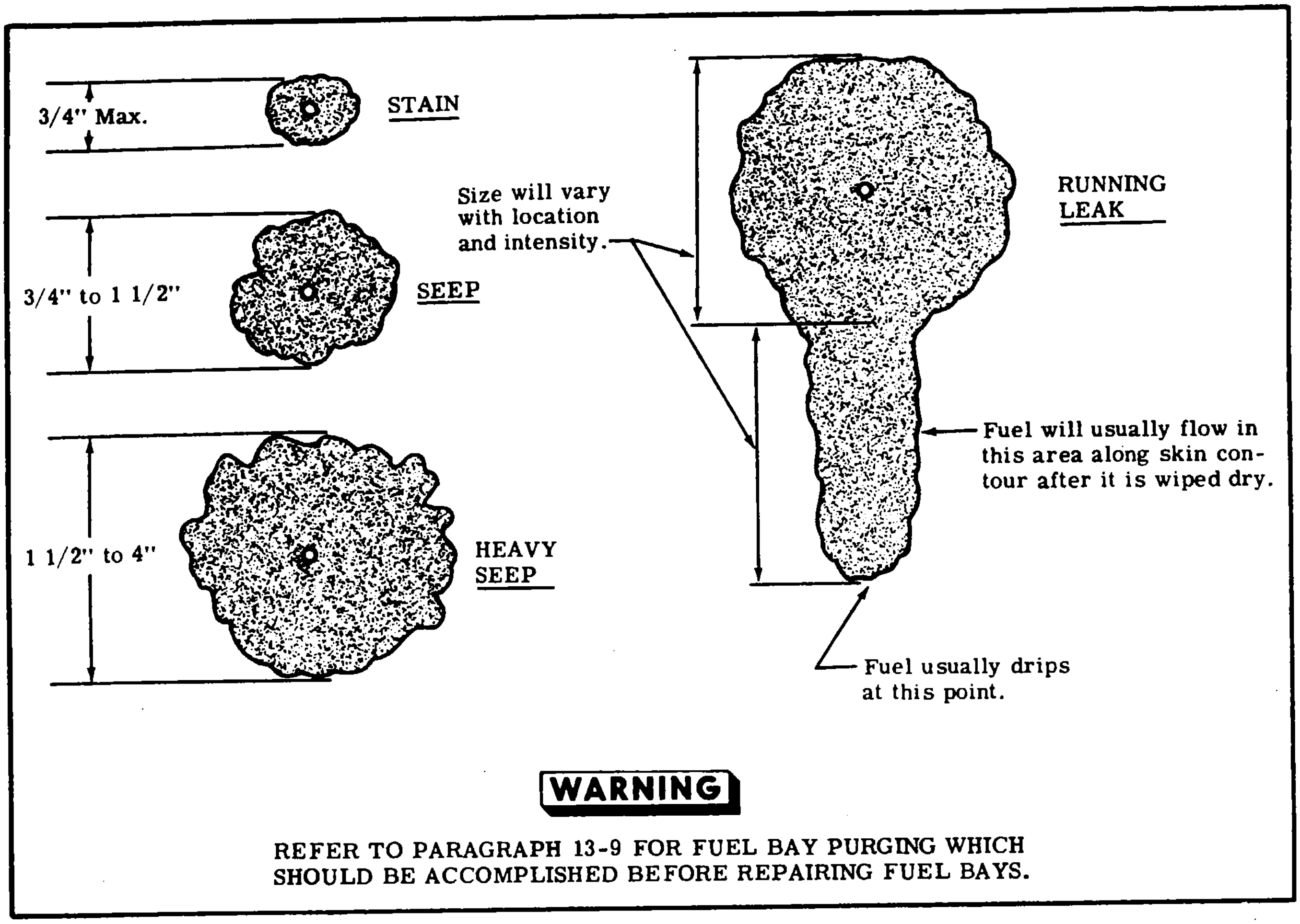


Figure 13-3. Classification of Fuel Leaks

13-5. FUEL BAYS.

13-6. DESCRIPTION. Aircraft with cantilever wings have an inboard section of each wing forward of the main spar sealed to form an integral fuel bay area. The bay consists of a front and rear fuel spar, inboard, outboard and intermediate ribs and stringers. Usable fuel in each bay is 44.5 gallons when completely filled. A standpipe at the bay filler acts as a visual aid, when loading fuel, to indicate quantity of fuel in the bay. For a reduced fuel load of 32 gallons of usable fuel in each bay, fill each bay to the bottom edge of the filler collar.

13-7. FUEL BAY LEAKS.

13-8. CLASSIFICATION OF FUEL LEAKS. Fuel leaks which do not constitute a flight hazard are stains, seeps and heavy seeps NOT in an enclosed area. However, they should be repaired when the aircraft is grounded for other maintenance. Fuel leaks which constitute a flight hazard are running leaks in any area, seeps, heavy seeps or stains in an enclosed area, such as the wing leading edge, the sections of wing inboard and outboard of the fuel bay and the area between the rear fuel spar and the main spar. These leaks must be repaired before that bay is used for another flight. The wet or stained spot on the wing in the area of the bay is an indication of the intensity of the leak. Fuel leak classifications are shown in figure 13-3.

NOTE

Stains and seeps that are not considered a flight hazard must be inspected after each flight to ensure that they have not grown in intensity to the point of causing a flight hazard.

If a leak causing a flight hazard should occur at a place where there are no facilities available to make an acceptable repair, it is recommended that the leaking bay be drained and some suitable material placed over the leak, if it is within an enclosed area of the wing, to eliminate escaping of fumes. By switching the fuel selector valve to the other bay, the aircraft can then be flown to a base where the fuel leak can be repaired.

13-9. FUEL BAY PURGING.

WARNING

To reduce the possibility of an explosion while repairing integral fuel bays which have been fueled, the bay may be purged with an inert gas.

The following procedure may be used to purge the bay with argon or carbon dioxide.

a. Ground the aircraft to a suitable ground stake.

b. Set fuel selector valve handle in "OFF" position.

c. Drain all fuel from bay being repaired. (Observe the precautions in paragraph 13-3.)

d. Remove access doors and insert hose to each end of bay simultaneously.

e. Allow inert gas to flow into bay for several minutes (time dependent upon hose size, rate of flow, etc.) to remove all fuel vapors.

Since argon or carbon dioxide are heavier than air, these gases will remain in the bay during the repair. The repair shall be made using non-sparking tools (air motors, plastic scrapers, etc.)

NOTE

Portable vapor detectors are available to determine presence of explosive mixtures and are calibrated for leaded fuel. These detectors can be used to determine when it is safe to make repairs.

13-10. INTEGRAL FUEL BAY SEALANT. Two kinds of sealants are used, one to seal the fuel bay area, and the other to seal the access doors. The access door sealant is more pliable and will not adhere to metal as firmly as the bay sealant does. This permits the access doors to be removed without damage to them. Service Kit SK210-56, available from the Cessna Service Parts Center, contains these sealants with the proper quantity of accelerator for each sealant. The sealants and accelerators can be identified by the color of the material.

WARNING

Keep sealants away from heat and flame. Use only in a well ventilated area. Avoid skin and eye contact. WEAR EYE SHIELDS. In case of eye contact, flush with copious amounts of water and get prompt medical attention.

13-11. MIXING SEALANT. Mix sealant in accordance with instructions supplied with Service Kit SK210-56.

13-12. SEALING DURING AND AFTER STRUCTURAL REPAIR.

CAUTION

Protect drain holes and fuel outlet screens when applying sealants.

Any repair that breaks the fuel bay seal will necessitate resealing of that area of the bay. Repair parts that need sealing must be installed and riveted during the sealing operation. All joints within the boundary of the bay, but which do not provide a direct fuel path out of the bay, such as stringers and rib flanges within the bay, must be fay surface sealed only. Joints which provide a direct fuel path out of the bay area, such as fuel spar flanges and inboard and outboard rib flanges, must be fay surface sealed and fillet sealed on the fuel side. Fay surface sealing is applying sealant to one mating part before assembly. Enough sealant must be applied so it will squeeze out completely around the joint when the parts are riveted or fastened together. The fillet seal is applied after the joint is fay surface sealed and riveted or fastened together. Fillet sealing is applying sealant to the edge of all riveted joints, joggles, bend reliefs, voids, rivets or fasteners through the boundary of the bay and any place that could produce a fuel leak. The fay sealant need not be cured before the fillet seal is applied, but the squeezed out sealant, to which the fillet sealant is applied, must be free of dirt and contamination. Fillets laid on intersecting joints shall be joined together to produce a continuous fillet. Filler sealant must be pressed into the joint, working out all entrapped air. The best method of applying sealant is with an extrusion gun. Then work the sealant into the joint with a small paddle, being careful to eliminate all air bubbles.

NOTE

During structural repair, parts must be predrilled, countersunk or dimpled and cleaned before being sealed and positioned for final installation.

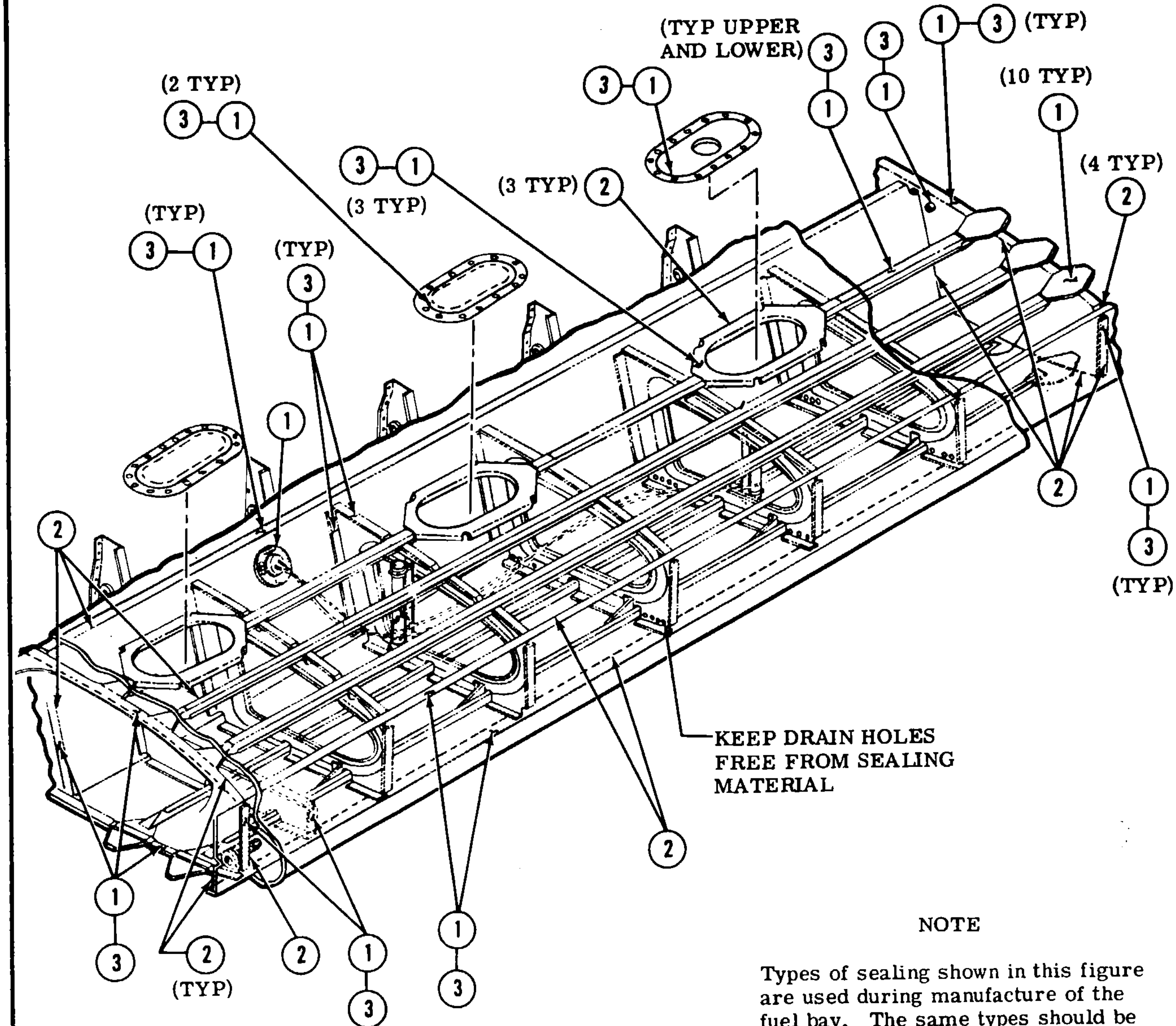
a. Remove all existing sealant from area to be sealed, leaving a taper on the remaining sealant. The taper will allow a scarf bond and a continuous seal when the new sealant is applied.

NOTE

The best method of removing sealant is with a chisel-like tool made of hard fiber. Remaining sealant may then be removed with aluminum wool. Steel wool or sandpaper must not be used.

b. Vacuum thoroughly to remove all chips, filings, dirt, etc., from the bay area.

c. All surfaces and areas to be sealed shall be thoroughly cleaned by wiping with a clean cloth dampened with Methyl Ethyl Ketone (MEK), acetone or similar solvent and dried with a clean cloth before the solvent evaporates. Always pour the solvent on the cloth. Never use contaminated solvent. The cloth shall not be so saturated that dripping occurs.



NOTE

Types of sealing shown in this figure are used during manufacture of the fuel bay. The same types should be used when making a structural repair to the fuel bay area and when reinstalling the access doors or the fuel quantity sending unit.

CODE

1 FAYING SURFACE SEAL

2 FILLET SEAL

3 RIVET AND FASTENER SEAL

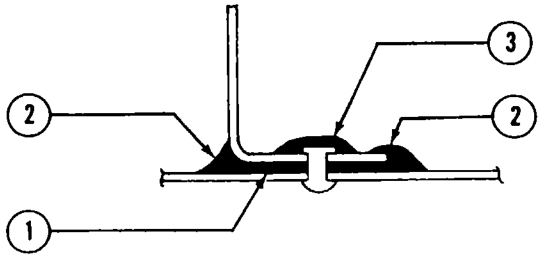
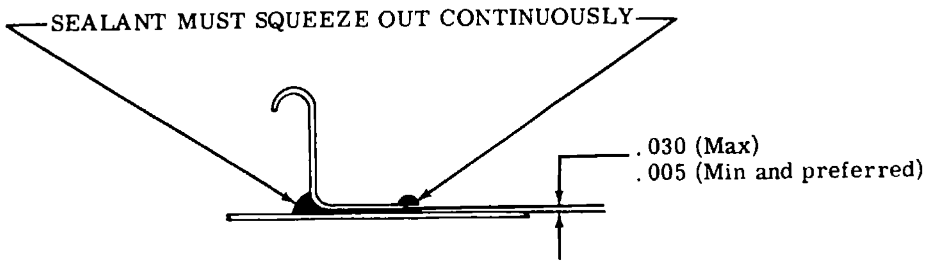
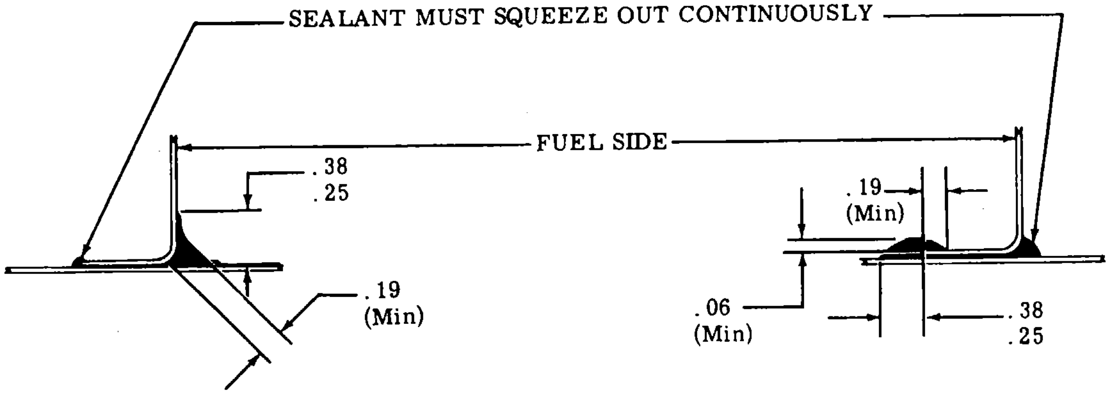


Figure 13-4. Fuel Bay Sealing (Sheet 1 of 2)



FAY SURFACE SEALING



FILLET SEALING (With fay surfaces sealed)

FASTENER SEALING

Figure 13-4. Fuel Bay Sealing (Sheet 2 of 2)

NOTE

Allowable work life of Tank Area Sealant is two hours from the starting time of mixing. Allowable work life of Access Cover Sealant is two hours. These apply to standard conditions of 77° Fahrenheit and 50% relative humidity. An increase in temperature or a decrease in humidity will shorten the work life of the sealant.

d. Apply fay surface sealant to one mating part and install rivets or fasteners while sealant is still within its allowable work life.

NOTE

During the sealing operation, sealant must be checked at various times to determine that it has not exceeded its allowable work life. Use a small wood paddle, such as a tongue depressor to gather some sealant. Touch the sealant to a piece of clean sheet metal. If the sealant adheres to the sheet metal, it is still within its allowable work life. If the sealant does not adhere to the sheet metal, it is beyond its allowable work life and must not be used.

e. Apply a fillet seal to the repaired area on the inside of the bay.
f. Apply fay surface door sealant to access doors and adapter plate, if removed, and install the doors and adapter.
g. Allow the sealant to cure. Refer to paragraph 13-14 for curing time.
h. Clean stains from outside of bay area.
i. Test fuel bay for leaks as described in paragraph 13-15.

13-13. SEALING FUEL LEAKS. First determine the source of the fuel leaks. Fuel can flow along a seam or the structure of the wing for several inches, making the leak source difficult to find. A stained area is an indication of the leak source. Fuel leaks can be found by testing the complete bay as described in paragraph 13-15. Another method of detecting the source of a fuel leak is to remove access doors and blow with an air nozzle from the inside of the bay in the area of the leak while a soap bubble solution is applied to the outside of the bay. After the leak source has been found, proceed as follows:
a. Remove existing sealant in the area of the leak as described in paragraph 13-12 step "a."
b. Clean the area and apply a fillet seal. Press sealant into leaking area with a small paddle, being sure to work out all entrapped air.
c. If a leak occurs around a rivet or bolt, restrike the rivet or torque the bolt to the maximum allowable torque and repair any damaged sealant.
d. Apply fay surface door sealant to access doors or adapter plate, if removed, and install the doors and adapter plate.
e. Test fuel bay for leaks as described in paragraph 13-15.

13-14. CURING TIME. Service Kit 210-56 contains Fuel Bay Area Sealant and Access Door Sealant. Normal curing time for fuel bay area sealant is 72 hours. Normal curing time for access door sealant is 24 hours. These values are based on a standard condition of 77° Fahrenheit and 50% humidity. Curing time may be accelerated as shown in the following chart.

NOTE

Fuel bay must be vented to relieve pressure during accelerated curing.

Temperature of Sealant °F.	Time in Hours
160	3
140	4
120	7

WARNING

Access door sealant must not be heated above 90° until sealant is cured for 24 hours based on a standard condition of 77° Fahrenheit and 50% relative humidity. Harmful vapors are released if sealant is heated above 90°F.

13-15. TESTING INTEGRAL FUEL BAY.
a. Remove vent line from vent fitting and cap the fitting.
b. Remove forward and aft fuel lines from bay.
c. An air or inert gas source regulated at 0.8 psig (max.) shall be attached to the bay with a suitable water manometer or other pressure measuring device. All other openings shall be closed off and a positive pressure of .5 psig applied to the fuel bay. The system shall then be closed so that no further pressure is applied. After 5 minutes, no pressure drop shall be observed.

NOTE

Thermal instability will result in variation in the pressure readings. Time should be allowed as required to permit stabilization of the system prior to testing.

d. Make sure filler cap is installed and sealed.

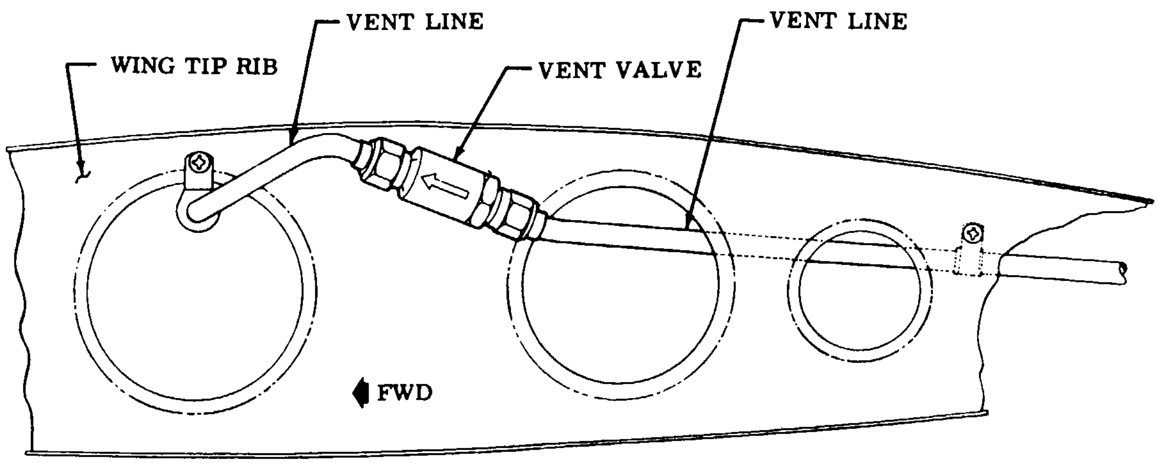
CAUTION

Do not attempt to apply pressure to the bay without a good regulator and a positive shut-off in the supply line. Do not pressurize the fuel bay to more than .5 psig, or damage may occur.

e. Reseal and retest if any leaks are found.

13-16. FUEL VENTS.

13-17. DESCRIPTION. The fuel bay vent line extends from the upper aft outboard corner of each fuel bay to the wing tip. This vent line contains a check valve to prevent fuel drainage through the vent line, but



NOTE

Hinge for vent valve must be at top and vent valve installed with arrow in direction shown.

Figure 13-5. Fuel Bay Vents

still allow the positive pressure from expanding fuel to escape from the bays. Check all fittings and clamps for tightness and vent line for clearance to prevent chafing against inner wing structure. The fuel vent line at the trailing edge of the wing tip should be checked daily for evidence of foreign matter.

13-18. REMOVAL AND INSTALLATION.

a. Remove wing tip and access covers on underside of wing as necessary for access.

b. Disconnect vent line at fuel bay and disconnect clamps attaching vent line to wing structure.

c. Disconnect vent line from the check valve at wing tip.

d. Remove vent line by carefully pulling it from the outboard end of the wing.

e. Reverse the preceding steps for installation.

CAUTION

The vent line check valve must be installed as shown in figure 13-5.

13-19. CHECKING. Field experience has demonstrated that the vents can become plugged, causing possible fuel starvation of the engine. Also, the bleed hole in the vent valve assembly could possibly become plugged, allowing pressure from expanding fuel to pressurize the bay areas. The following procedure may be used to check the vent and bleed hole in the vent valve assembly.

a. Cover .040 drilled holes approximately 6 inches from end of vent lines at trailing edges of wing tips.

b. Attach a rubber tube to the end of the vent line at the trailing edge of one wing tip.

c. Turn off fuel selector valve and check that both fuel filler caps are securely installed.

d. Blow into tube to slightly pressurize the fuel bay. If air can be blown into bay, the vent line is open.

e. After the fuel bay is slightly pressurized, insert end of rubber tube into a container of water and watch for a continuous stream of bubbles, which indicates the bleed hole in valve assembly is open and relieving pressure.

f. Repeat this procedure for fuel vent at opposite wing tip.

NOTE

Remember that a plugged vent line or bleed hole can cause either fuel starvation or the pressurizing of the bay by fuel expansion. Therefore, any fuel vent found plugged or restricted must be corrected before returning aircraft to service.

CAUTION

Be sure to uncover drilled holes in vent lines at wing tips after completion of check.

13-20. FUEL QUANTITY INDICATING SYSTEM.

13-21. DESCRIPTION. The system is comprised of two sensing units located in each fuel bay, control monitor located inside the right cabin wing root area, two quantity indicators located in a cluster on the instrument panel and associated wiring. Refer to Section 16 for operation, removal, installation and calibration.

13-22. REMOVAL AND INSTALLATION OF SYSTEM COMJPONENTS. Refer to Section for procedures.

13-23. FUEL RESERVOIR TANKS

13-24. DESCRIPTION. There are two reservoir tanks installed in the lower fuselage, one on each side of the aircraft, immediately outboard of the selector valve. Each tank has four fuel line connections; two from the fuel bay, one to the selector valve and one from the selector valve, utilized for vapor return. A drain valve is installed in the bottom of each tank for draining trapped water and sediment from the fuel system.

13-25. REMOVAL AND INSTALLATION.

A. Place selector valve in "OFF" position.

B. Drain all fuel from the wing bay, reservoir and lines for the tank being removed. (Observe precautions in paragraph 13-3.)

C. Remove front seat, carpeting and plates as necessary to gain access to reservoir.

D. Disconnect and cap or plug all fuel lines at reservoir.

E. Remove screws securing tank mounting legs to fuselage structure.

F. Lift reservoir out.

G. Reverse the preceding steps for installation. Prior to reinstalling equipment removed for access, service fuel bays and check for leaks.

13-26. FUEL SELECTOR VALVE.

13-27. DESCRIPTION. A three position fuel selector valve is located in the lower fuselage between the pilot and copilot positions. The positions on the placard are labeled "OFF, LEFT ON and RIGHT ON." Valve repair consists of replacement of seals, springs, balls and other detail parts. Figure 13-6 illustrates the proper relationship of parts and may be used as a guide during disassembly and assembly.

13-28. REMOVAL AND INSTALLATION.

A. Confirm orientation of the selector using the selector valve lever:
   1. Mark cover to indicate the lever position left "L", right "R" and off "O".

B. Drain all fuel from wing bays, reservoir tanks, strainer and lines. (Observe precautions in paragraph 13-3.)

C. Remove selector valve handle.

D. Remove pedestal cover.

E. Remove access plates in floorboard and fuselage skin in area of selector valve.

F. Disconnect and cap or plug all fuel lines at valve.

G. Disconnect square shaft from valve by removing attached roll pin.

H. Remove bolts or screws attaching valve to support bracket and remove valve.

I. Check selector valve lever operation.
   1. Place the selector lever to the off position, blow air into the left and right fuel intake and check engine fuel inlet port to make sure air is not passing through.
   2. Blow air into the left fuel inlet, place the lever to the left position and confirm airflow through the engine outlet port.

3. With the selector lever in the left position, block off the engine outlet port and confirm airflow through the left vent port.
4. Blow air into the right fuel inlet, place the lever to the right position and confirm airflow through the engine outlet port.

J. Reverse steps 13-28 B. through H. above for installation. Prior to reinstalling equipment removed for access, service fuel bays and check for leaks.

13-29. REPAIR. (See Figure 13-6.) The fuel selector valve may be repaired by disassembly, replacement of defective parts and reassembly as follows:

A. Mark sump plate (23) and body (1) to ensure correct reassembly, then remove sump plate (23) and O-ring (22) after removing four screws.

B. Drive out roll pin (5) securing yoke (6) to rotor shaft (21). As yoke is lifted off, balls (8) and springs (7) are free. Retain them.

C. Lift off brass washer (9).

D. Mark cover (4) and body to assure later alignment of parts and remove screws (3).

E. With fine emery paper, sand off any burrs or sharp edges on rotor shaft (21). Apply petrolatum to rotor shaft as a lubricant, then work cover off shaft.

F. Drive back roll pin (13) and remove rotor(12). Teflon seal (14), O-rings (15), washers (16) and springs (17) are now free to be removed. Check all parts carefully for defects.

G. Remove burrs or sharp edges on rotor shaft (21), lubricate and slide it down, out of body (1). Remove Teflon seals (20) and O-rings (19).

H. Remove O-ring (18) within body and O-ring (10) within cover.

I. Replace all O-rings, lap or replace Teflon seals and lubricate O-rings before installation.

CAUTION: Install all parts in the relative position illustrated in Figure 13-6, otherwise the valve will not operate correctly.

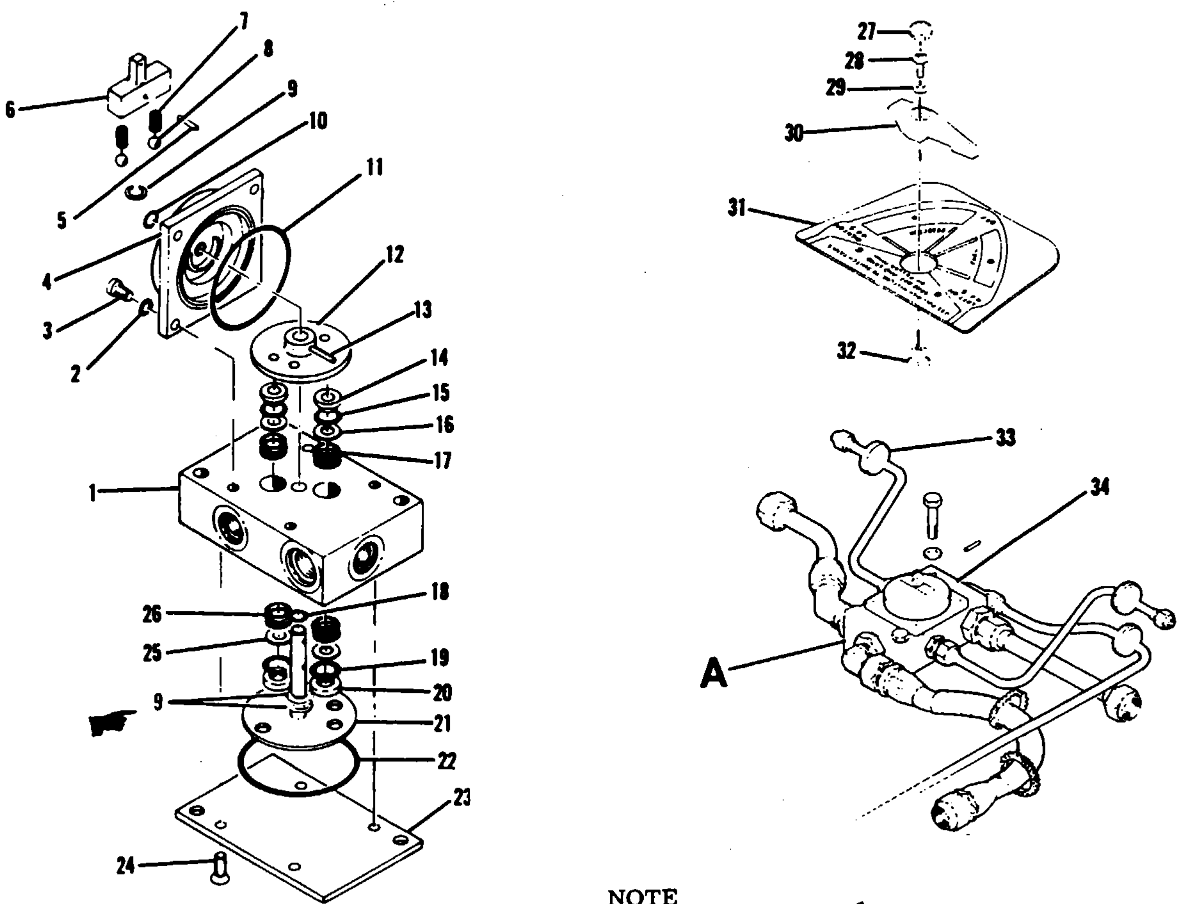
J. Install O-ring (18) in body rotor shaft hole. Install O-rings (19) and Teflon seals (20), then slide rotor shaft into place. Position rotor in exact relative position shown in Figure 13-6, then install O-ring (22) and sump plate (23).

K. Install 0.169 inch diameter pins in body ports, then slide springs (17), washers (16), O-rings (15) and Teflon seals over pins. Slide rotor (21) over shaft. Remove 0.169 inch diameter pins and, readjusting rotor (12) vs. rotor shaft (21) position as necessary, tap roll pin (13) into place, letting it protrude on the side illustrated.

NOTE: This roll pin (13) serves also as a stop, limiting valve rotor shaft travel.

L. Install O-ring (10) in cover (4), lubricate rotor shaft (21) with petrolatum, install large O-ring (11) in cover (4) and slide down into place.

CAUTION: Make sure cover (4) is installed in relative position illustrated. A lug on the cover serves as a stop detent and if the cover is not installed correctly, the valve will not operate properly.



NOTE

Lubricate springs (17) with Petrolatum.

Detail A

1. Valve Body
2. Lockwasher
3. Screw
4. Cover
5. Roll Pin
6. Yoke
7. Spring
8. Ball
9. Brass Washer
10. O-Ring
11. O-Ring
12. Rotor
13. Roll Pin
14. Seal
15. O-Ring
16. Washer
17. Spring
18. O-Ring
19. O-Ring
20. Seal
21. Shaft
22. O-Ring
23. Sump Plate
24. Screw
25. Washer
26. Spring
27. Cap
28. Screw
29. Washer
30. Handle
31. Placard
32. Selector Shaft
33. Grommet
34. Selector Valve

Figure 13-6. Fuel Selector Valve Assembly

m. Install brass washer (9) and yoke (6). Note the position of the small hole in the squared, upper portion of the yoke. If this is reversed, the valve linkage will not attach properly.

13-30. AUXILIARY FUEL PUMP.

13-31. DESCRIPTION. An electric auxiliary fuel pump is located immediately forward of the left fuel reservoir. An integral bypass and check valve incorporated in the pump assembly permits fuel flow through the pump even when inoperative but prevents reverse flow. A separate overboard drain line from the pump prevents entry of fuel into the electric motor, in the event of pump internal leakage. The auxiliary pump is used in engine starting and in the event of engine-driven pump malfunction.

13-32. REMOVAL AND INSTALLATION.

a. Place fuel selector valve in "OFF" position.

b. Drain fuel from pump, lines and strainer with quick-drain control.

c. Ensure master switch and pump switch are in "OFF" position.

d. Remove pilot's seat, carpeting and plates at left side of pedestal as necessary for access to pump.

e. Disconnect and cap or plug all fuel lines and electrical connections at pump. (Observe precautions in paragraph 13-3.)

f. Loosen the two securing clamps and lift pump out.

g. Reverse the preceding steps for installation. Prior to reinstalling equipment removed for access, place selector valve to "ON" position and check for leaks and proper pump operation.

13-33. AUXILIARY FUEL PUMP CIRCUIT (Thru 21059351.) The right half of the auxiliary fuel pump switch, labeled "LO", is used for starting. With the switch in the "LO" position, and the ignition-starter switch turned to "START," the auxiliary fuel pump will operate at a low flow rate (providing proper fuel mixture for starting) as the engine is being turned over with the starter.

NOTE

The auxiliary fuel pump will not operate in the "LO" position until the ignition switch is turned to the "START" position.

The left half of the switch, labeled "HI," is used for engine operation if the engine-driven pump should fail. When the switch is in this position, the pump operates at one of two flow rates depending upon the setting of the throttle. With the throttle at a cruise setting, the pump is operating at maximim capacity, supplying sufficient fuel flow to maintain flight. When the throttle is moved toward the closed position (as during letdown, landing and taxiing), the auxiliary fuel pump flow rate is automatically reduced, preventing an excessively rich mixture during these periods of reduced engine speed. When the engine-driven fuel pump is functioning and the auxiliary fuel pump is turned on "HI," a fuel/air ratio considerably richer than best power is produced unless the mixture is leaned. If the auxiliary fuel pump switch is accidently on "HI" (with master switch on) with the engine stopped, the intake manifolds will be flooded. A throttle shaft-operated microswitch adds a resistance to the high circuit to slow down the pump when the throttle is retarded to prevent an excessively rich mixture. Refer to paragraph 13-33C for rigging of the microswitch.

13-33A. AUXILIARY FUEL PUMP CIRCUIT (21059352 thru 21060089). The fuel pump switch is a split-rocker type; the right half positions are "HI," "LO" and off and the left half positions are "MAX HI" and off. The right half of the switch incorporates an intermediate "LO" position used for normal starting, and a "HI" position (when the top of the switch is fully depressed) for vapor purging during hot engine starts. Maximum fuel flow is produced when the left half of the switch is held in the spring-loaded "MAX HI" position. In the "MAX HI" position, an interlock within the switch automatically trips the right half of the switch to its "HI" position. When the spring-loaded left half of the switch is released, the right half will remain in the "HI" position until manually returned to the off position. With the right half of the switch in the "LO" position, and the ignition-starter switch turned to "START," the auxiliary fuel pump will operate at a low flow rate (providing proper fuel mixture for starting) as the engine is being turned over with the starter.

NOTE

The auxiliary fuel pump will not operate in the "LO" position until the ignition switch is turned to "START."

With the right half of the switch in the "HI" position, the pump operates at one of two flow rates that are dependent upon the setting of the throttle. With the throttle open to a cruise setting, the pump is operating at a high capacity to supply sufficient fuel to maintain flight. When the throttle is moved toward the closed position (as during letdown, landing and taxiing), the fuel pump flow rate is automatically reduced, preventing an excessively rich mixture during these periods of reduced engine speed. When the engine-driven fuel pump is functioning and the auxiliary fuel pump is turned on "HI," a fuel/air ratio considerably richer than best power is produced unless the mixture is leaned. If the auxiliary fuel pump switch is accidentally on "HI" (with the master switch on) with the engine stopped, the intake manifolds will be flooded. A throttle shaft-operated microswitch adds a resistance to the high circuit to slow down the pump when the throttle is retarded to prevent an excessively rich mixture. Refer to figure 13-33C for rigging of the microswitch.

13-33B. AUXILIARY FUEL PUMP CIRCUIT (Beginning with 21060090.) The auxiliary fuel pump switch is a yellow and red split-rocker type switch. The yellow right half of the switch is labeled "START," and its upper "ON" position, is used for normal starting and minor vapor purging during taxi. The red left half of the switch is labeled "EMERG," and its upper "HI" position is used in the event of an engine-driven fuel pump failure during take-off or high power operation. The "HI" position may also be used for extreme vapor purging. With the right half of the switch in the "ON" position, the pump operates at one of two flow rates that are dependent upon the setting of the throttle. With the throttle open to a cruise setting, the pump operates at a high capacity to supply sufficient fuel flow to maintain flight. When the throttle is moved toward the closed position (as during letdown, landing and taxiing), the fuel pump flow rate is automatically reduced, preventing an excessively rich mixture during these periods of reduced engine speed. Maximum fuel flow is produced when the left half of the switch is held in the spring-loaded "HI" position. In the "HI" position, an interlock within the switch automatically trips the right half of the switch to the "ON" position. When the spring-loaded left half of the switch is released, the right half will remain in the "ON" position until manually returned to the off position. When the engine-driven fuel pump is functioning and the auxiliary fuel pump is placed in the "ON" position, a fuel/air ratio considerably richer than best power is produced unless the mixture is leaned. If the auxiliary fuel pump switch is accidentally placed in the "ON" position with the master switch "ON" and the engine stopped, the intake manifolds will be flooded. A throttle shaft-operated microswitch adds a resistance to the high circuit to slow down the pump when the throttle is retarded to prevent an excessively rich mixture. Refer to paragraphs 13-33C and 13-33D for rigging instructions.

13-33C. RIGGING THROTTLE-OPERATED MICROSWITCHES. (Thru 21060525 and T21060543.) (Refer to figure 13-6A.) These aircraft are equipped with a throttle-operated microswitch which slows down the auxiliary electric fuel pump whenever the throttle is retarded while the electric fuel pump is being used. The electric fuel pump microswitch should slow down the pump as the throttle is retarded to approximately 16 inches of mercury manifold pressure.

a. Start engine and set throttle to obtain 16 inches of mercury manifold pressure. Mark position of throttle control at instrument panel, then shut down engine.

b. Referring to figure 13-6A, note that microswitch is located at the engine throttle shaft lever.

c. Adjust microswitch at the engine throttle shaft lever as required to cause electric fuel pump to slow down as the throttle is retarded to the marked position.

d. With mixture control in "IDLE CUT-OFF," electrical fuel pump switch in "HI," and master switch in "ON" position, listen for change in sound of electric fuel pump as the throttle is retarded to the marked position.

13-33D. RIGGING THROTTLE-OPERATED MICROSWITCHES. (Beginning with 21060526 and T21060544.) (Refer to figure 13-6A.) These aircraft are equipped with a throttle-operated microswitch which slows down the electric fuel pump whenever the throttle is retarded while the electric pump is being used. The electric fuel pump microswitch should slow down the pump as the throttle is retarded to approximately 19 inches of mercury manifold pressure (sea level aircraft) and 23 inches of mercury manifold pressure (turbocharged aircraft).

NOTE

These settings must be established during ground run-up only. These values will not apply in flight.

a. Start engine and set throttle to obtain 19 inches of mercury manifold pressure (sea level aircraft) or 23 inches of mercury manifold pressure (turbocharged aircraft).

b. Mark position of throttle control at instrument panel and shut down engine.

c. Adjust microswitch at the engine throttle shaft lever as required to cause electric fuel pump to slow down as the throttle is retarded to the marked position.

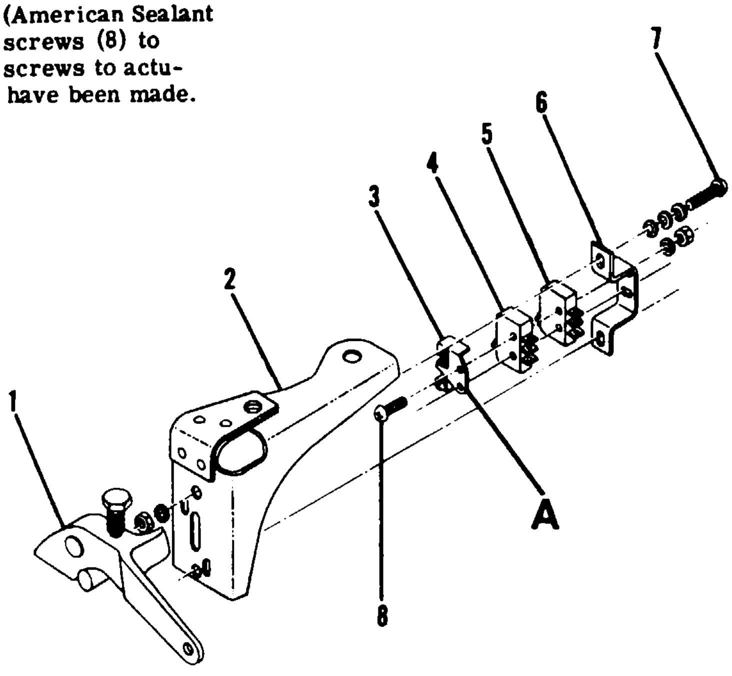
d. With mixture control in "IDLE CUT-OFF," electrical fuel pump switch in "HI," and master switch in "ON" position, listen for change in sound of electric fuel pump as the throttle is retarded to the marked position.

13-33E. AUXILIARY ELECTRIC FUEL PUMP FLOW RATE ADJUSTMENT. (Refer to figure 13-6B.)

SHOP NOTES:

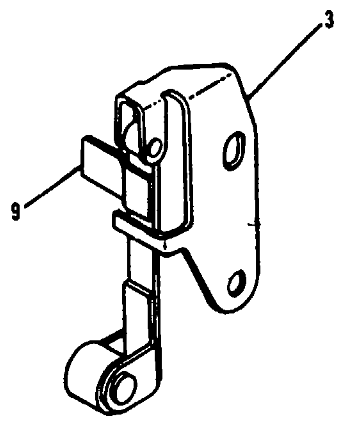
NOTE

Use LOCTITE sealant Grade C (American Sealant Co., Hartford, Conn.) to bond screws (8) to attaching nuts and heads of the screws to actuator (3) after final adjustments have been made.



NOTE

Slotted and oversize holes are provided in microswitches and attaching brackets for adjustment. Extension tab (9) may be bent for additional adjustment, if necessary to obtain proper adjustment of switches (4 and 5), since they are attached with the same mounting screws. Identity of the gear warning and fuel pump switches (4 and 5) may be established by noting that the ground wire is always attached to the gear warning switch.

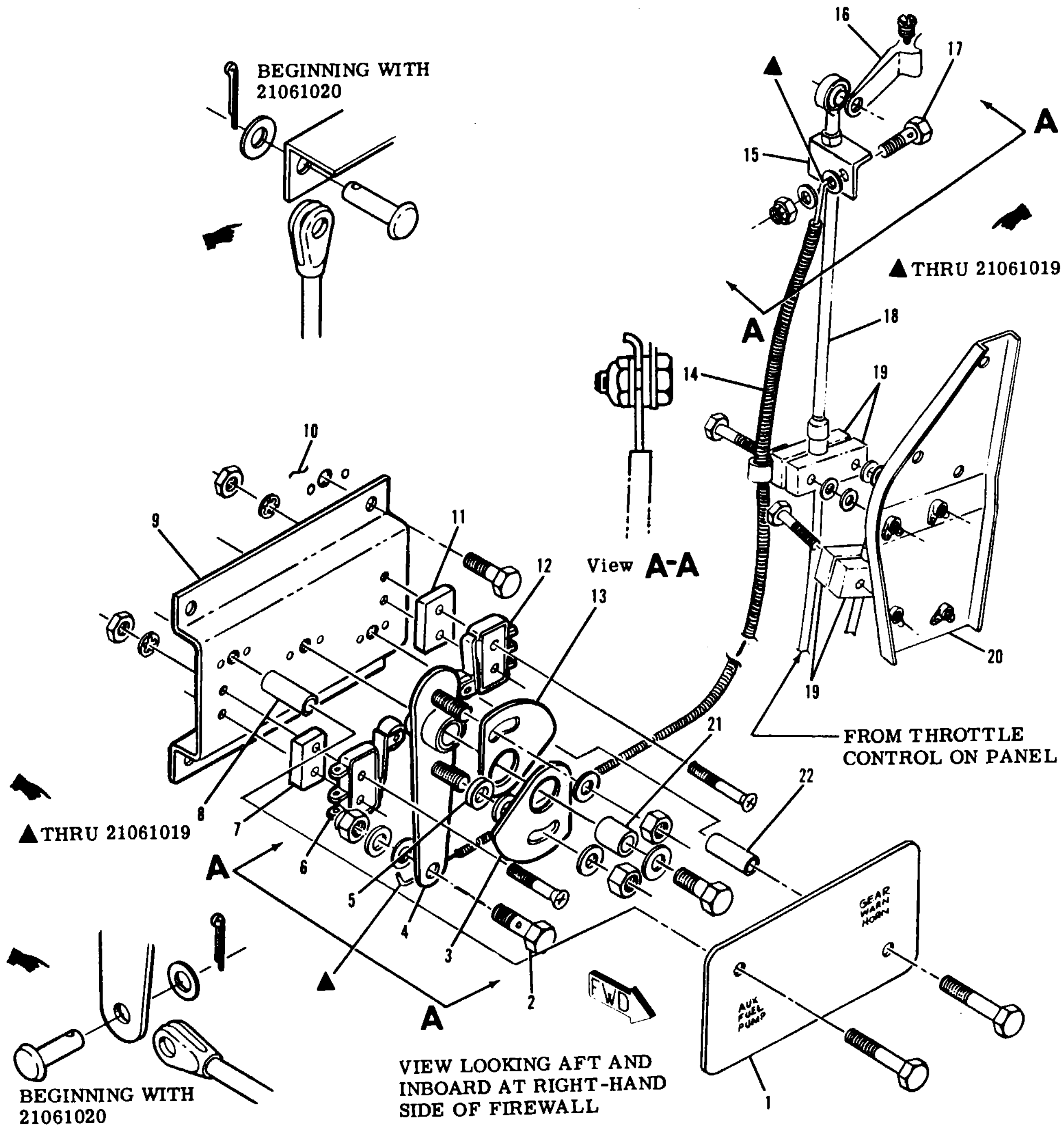


Detail **A**

1. Throttle Shaft Lever Cam
2. Airbox Bracket
3. Microswitch Actuator
4. Landing Gear Warning Microswitch
5. Electric Fuel Pump Microswitch
6. Switch Mounting Bracket
7. Mounting Bracket Screw
8. Switch Mounting Screw
9. Microswitch Actuator Extension Tab

THRU 21060558

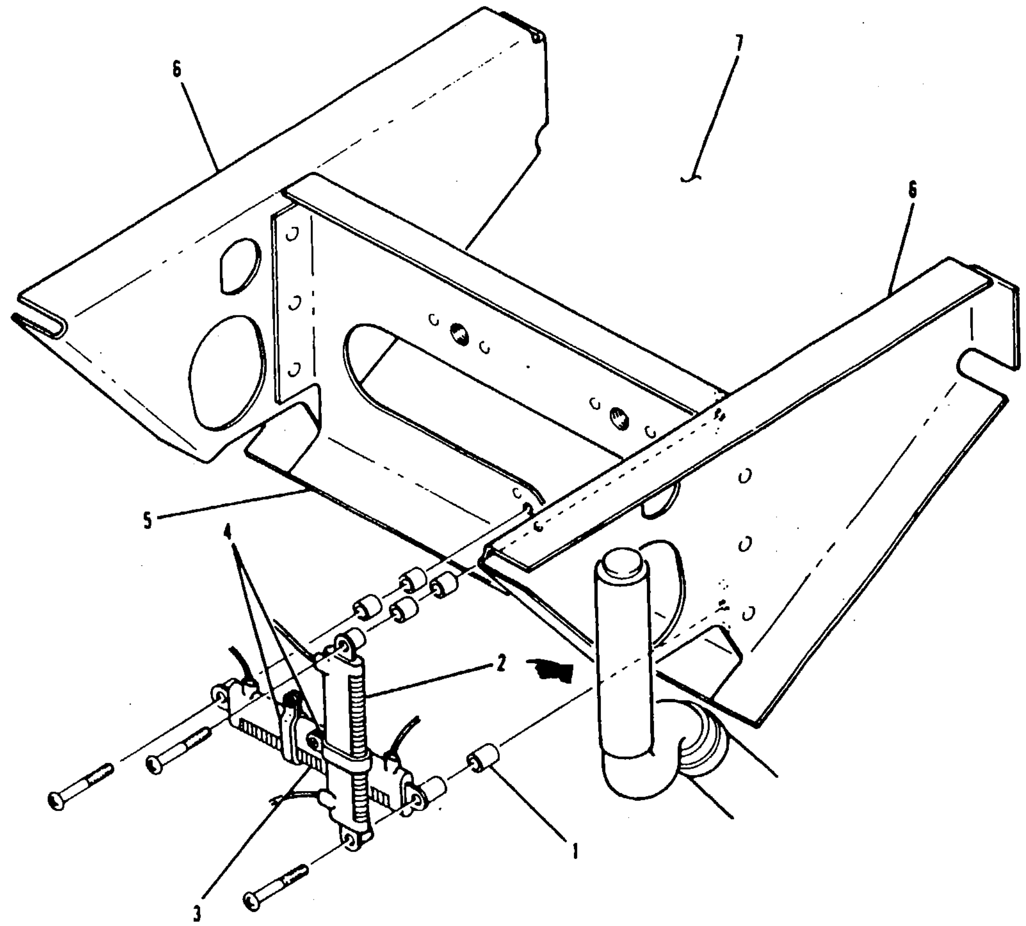
Figure 13-6A. Rigging Throttle Microswitches (Sheet 1 of 2)



1. Cover
2. Clamp Bolt
3. Fuel Pump Cam
4. Arm Assembly
5. Thick Washer
6. Fuel Pump Switch
7. Spacer
8. Spacer
9. Mounting Bracket
10. Firewall
11. Spacer
12. Gear Warning Switch
13. Gear Warning Cam
14. Throttle Control (Secondary)
15. Cable Clamp Mount
16. Throttle Lever
17. Clamp Bolt
18. Cabin Throttle Control
19. Clamp Half
20. Clamp Assembly
21. Bushing
22. Spacer

BEGINNING WITH 21060559

Figure 13-6A. Rigging Throttle Microswitches (Sheet 2 of 2)



1. Spacer (Typical)
2. Low-Boost Resistor (#2)
3. High-Boost Resistor (#1)
4. Adjustable Slide
5. Bracket Assembly
6. Battery Box Support
7. Firewall

Figure 13-6B. Adjusting Fuel Pump Resistors

NOTE

These tests are to be conducted with the engine stopped and external power supplied to the aircraft bus.

a. Apply 13.75VDC±.25V or 27.75VDC±.25V) to aircraft bus.
b. Set mixture control at "FULL RICH."
c. Turn master switch "ON," and fuel pump rocker switch "ON."
d. Advance throttle to full open position.
e. Check metered fuel pressure/flow on ship's gage for a flow of 88-96 pounds/hour (14.7 - 16.0 gallons/hour).
f. Adjust number one resistor (3) if required.
g. Retard throttle slowly from the full "OPEN" position until the speed of the fuel pump can be audibly detected to change due to microswitch activation.
h. Wait momentarily for the fuel flow gage to respond.
i. The metered fuel pressure/flow on the ship's gage should read on the low end red line or approximately one red line width above.
j. Adjust number two resistor (2) if required.

13-33F. MAXIMUM HIGH BOOST CHECK. To verify high position function, momentarily depress spring-loaded rocker and verify a noticeable increase in indicated fuel flow on the fuel flow gage.

13-34. FUEL STRAINER.

13-35. DESCRIPTION. The fuel strainer is located in the nose wheel well and is readily accessible with the nose gear doors open. The strainer is equipped with a quick-drain valve which provides a means of draining trapped water and sediment from the fuel system. The quick-drain control is located adjacent to the oil dipstick.

NOTE

The fuel strainer can be disassembled, cleaned and reassembled without removing the assembly from the aircraft.

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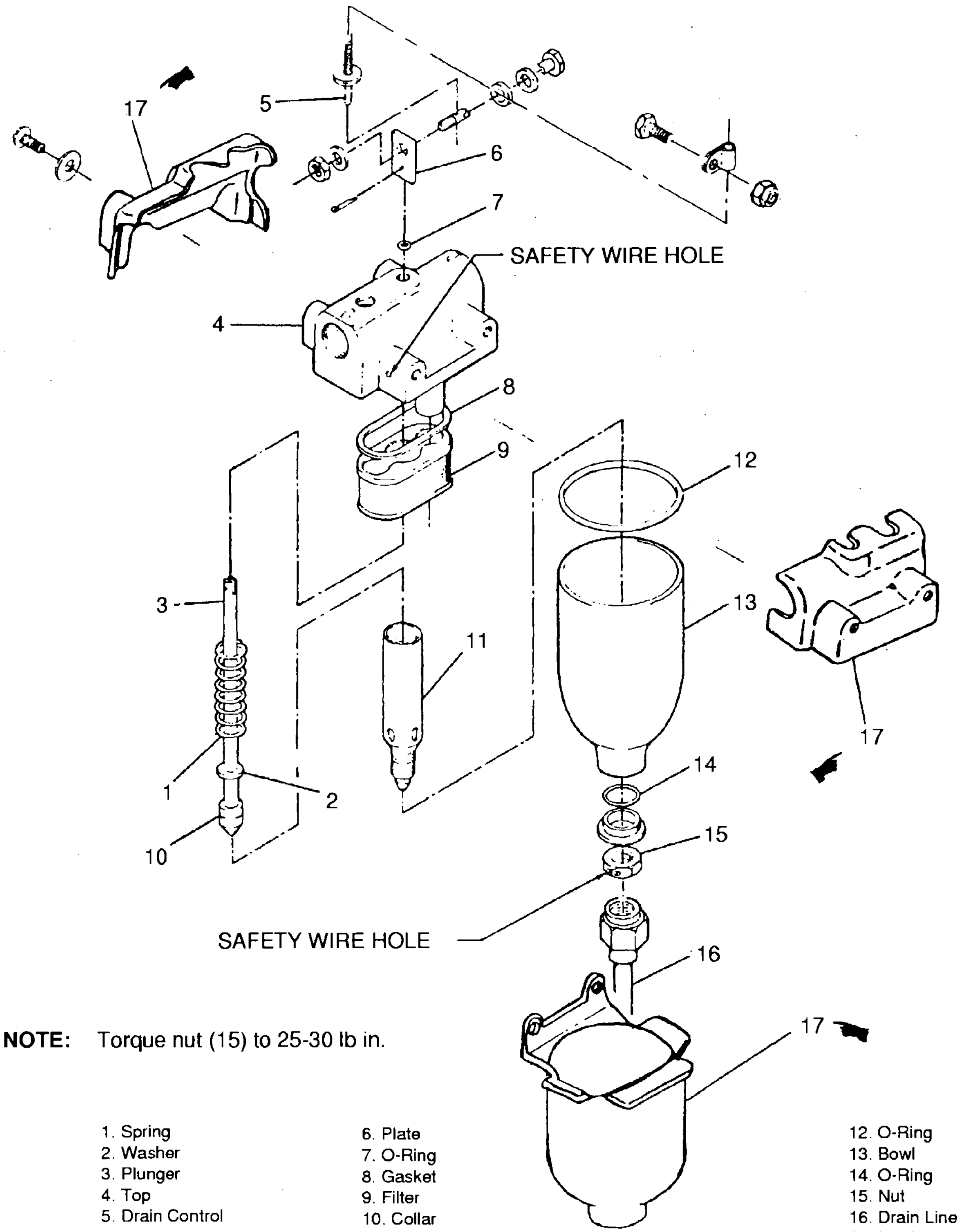

NOTE: Torque nut (15) to 25-30 lb in.

1. Spring
2. Washer
3. Plunger
4. Top
5. Drain Control
6. Plate
7. O-Ring
8. Gasket
9. Filter
10. Collar
11. Standpipe
12. O-Ring
13. Bowl
14. O-Ring
15. Nut
16. Drain Line
17. Insulator

Figure 13-7. Fuel Strainer

13-36. DISASSEMBLY AND ASSEMBLY. (Refer to figure 13-7.)

a. Place fuel selector valve in "OFF" position.
b. Open landing gear doors.
c. Drain fuel from strainer with quick-drain control. (Observe precautions in paragraph 13-3.)
d. Disconnect strainer drain tube and remove safety wire, nut and washer at bottom of filter bowl and remove bowl.
e. Carefully unscrew standpipe and remove.
f. Remove filter screen and gasket. Wash filter screen and bowl in solvent (Federal Specification P-S-661 or equivalent) and dry with compressed air.
g. Using a new gasket between filter screen and top assembly, install screen and standpipe. Tighten standpipe only finger tight.
h. Using all new O-rings, install bowl. Note that step-washer at bottom of bowl is installed so that step seats against O-ring. Connect strainer drain tube.
i. Place selector valve in "ON" position, close strainer drain and check for leaks and proper operation.
j. Safety wire bottom nut to top assembly. Wire must have right hand wrap, at least 45 degrees.

13-37. REMOVAL AND INSTALLATION.

a. Place selector valve in "OFF" position.
b. Open landing gear doors.
c. Drain fuel from strainer and lines with quick-drain control.
d. Disconnect and cap or plug all fuel lines at strainer. (Observe precautions in paragraph 13-3.)
e. Loosen clamp and clamp bolt attaching quick-drain control.
f. Disconnect primer line. (If installed.)
g. Remove attaching bolts and remove strainer.
h. Reverse preceding steps for installation. Place selector valve to "ON" position and check for leaks and proper operation of quick-drain valve.

SHOP NOTES:

SECTION 14

PROPELLERS AND PROPELLER GOVERNORS

TABLE OF CONTENTS Page

14-1. PROPELLERS

14-2. DESCRIPTION. The aircraft is equipped with an all-metal, constant-speed, governor-regulated propeller. The constant-speed, propeller is single-acting, in which engine oil pressure, boosted and regulated by the governor is used to obtain the correct blade pitch for the engine load. Engine lubricating oil is supplied to the power piston in the propeller hub through the crankshaft. The amount and pressure of the oil supplied is controlled by the engine-driven governor. Increasing engine speed will cause oil to be admitted to the piston, thereby decreasing the blade pitch. Conversely, decreasing engine speed will result in oil leaving the piston, thus increasing the blade pitch.

14-3. REPAIR. Metal propeller repair first involves evaluating the damage and determining whether the repair will be a major or minor one. Federal Aviation Regulations, Part 43 (FAR 43), and Federal Aviation Agency, Advisory Circular No. 43.13 (FAA AC No. 43.13), define major and minor repairs, alterations and who may accomplish them. When making repairs or alterations to a propeller, FAR 43, FAA AC No. 43.13 and the propeller manufacturer's instructions must be observed.

14-4. TROUBLE SHOOTING.

TROUBLE	PROBABLE CAUSE	REMEDY
FAILURE TO CHANGE PITCH.	Governor control disconnected or broken.	Check visually. Connect or replace control.
	Governor not correct for propeller. (Sensing wrong.)	Check that correct governor is installed. Replace governor.
	Defective governor.	Refer to paragraph 14-9.
	Defective pitch changing mechanism inside propeller or excessive propeller blade friction.	Propeller repair or replacement is required.
FAILURE TO CHANGE PITCH FULLY.	Improper rigging of governor control.	Check that governor control arm and control have full travel. Rig control and arm as required.
	Defective governor.	Refer to paragraph 14-9.
SLUGGISH RESPONSE TO PROPELLER CONTROL.	Excessive friction in pitch changing mechanism inside propeller or excessive blade friction.	Propeller repair or replacement is required.
STATIC RPM TOO HIGH OR TOO LOW.	Improper propeller governor adjustments.	Perform static RPM check. Refer to Section 12 and 12A for procedures.
ENGINE SPEED WILL NOT STABILIZE.	Sludge in governor.	Refer to paragraph 14-9.
	Air trapped in propeller actuating cylinder.	Trapped air should be purged by exercising the propeller several times prior to take-off after propeller has been reinstalled or has been idle for an extended period.
	Excessive friction in pitch changing mechanism inside propeller or excessive blade friction.	Propeller repair or replacement is required.
	Defective governor.	Refer to paragraph 14-9.

SHOP NOTES:

14.4 TROUBLESHOOTING (Continued)

TROUBLE	PROBABLE CAUSE	REMEDY
OIL LEAKAGE AT PROPELLER MOUNTING FLANGE.	Damaged O-ring and seal between engine crankshaft flange and propeller.	Check visually. Remove propeller and install O-ring seal.
	Foreign material between engine crankshaft flange and propeller mating surfaces or mounting nuts not tight.	Remove propeller and clean mating surfaces; install new O-ring and tighten mounting nuts evenly to torque value in Figure 14-1.
OIL LEAKAGE AT ANY OTHER PLACE	Defective seals, gaskets, threads, etc., or incorrect assembly.	Propeller repair or replacement is required.

14-5. REMOVAL. (Refer to Figure 14-1.)

A. Remove spinner attaching screws (2) and remove spinner (1), spinner support (3) and spacers (4). Retain spacers (4).

B. Remove cowling as required for access to mounting nuts (9).

C. Loosen all mounting nuts (9) approximately 1/4 inch and pull propeller (15) forward until stopped by nuts.

NOTE: As the propeller (15) is separated from the engine crankshaft flange, oil will drain from the propeller and engine cavities.

D. Remove all propeller mounting nuts (9) and pull propeller forward to remove from engine crankshaft (10).

E. If desired, the spinner bulkhead (11) can be removed by removing bolts (14) attaching bulkhead (11) to propeller.

14-6. INSTALLATION.

A. If the spinner bulkhead (11) was removed, position bulkhead so the propeller blades will emerge from the spinner (1) with ample clearance and install spinner bulkhead attaching bolts (19) and nuts attaching spinner bulkhead to propeller.

CAUTION: AVOID SCRAPING METAL FROM BORE OF SPINNER BULKHEAD AND WEDGING SCRAPINGS BETWEEN ENGINE FLANGE AND PROPELLER. TRIM THE INSIDE DIAMETER OF THE BULKHEAD AS NECESSARY WHEN INSTALLING A NEW SPINNER BULKHEAD.

B. Clean propeller hub cavity and mating surfaces of propeller and crankshaft.

C. Lightly lubricate a new O-ring (12) and the crankshaft pilot with clean engine oil and install the O-ring in the propeller hub.

D. Align propeller mounting studs and dowel pins with proper holes in engine crankshaft flange and slide propeller carefully over crankshaft pilot until mating surfaces of propeller and crankshaft flange are approximately 1/4 inch apart.

E. Install propeller attaching washers and nuts (9) and work propeller aft as far as possible, then tighten nuts evenly and torque. (Refer to the latest revision of McCauley Service Bulletin 227.)

F. Install any spacers (4) used between spinner support and propeller cylinder, then install spinner support and spinner. The spacers are used as required to cause a snug fit between the spinner (1) and the spinner support (3).

14-7. PROPELLER GOVERNORS.

14-8. DESCRIPTION. The propeller governor is a single-acting, centrifugal type, which boosts oil pressure from the engine and directs it to the propeller where the oil is used to increase blade pitch. A single-acting governor uses oil pressure to effect a pitch change in one direction only; a pitch change in the opposite direction results form a combination of centrifugal twisting moment of rotating blades and compressed springs. Oil pressure is boosted in the governor by a gear type oil pump. A pilot valve, flyweight and speeder spring act together to open and close governor oil passages as required to maintain a constant engine speed.

NOTE: Outward physical appearance of specific governors is the same, but internal parts determine whether it uses oil pressure to increase or decrease blade pitch. The propellers used on these aircraft require governors, which "sense" in a certain manner. "Sensing" is determined by the type pilot valve installed inside the governor. Since the basic governor may be set to "sense" oppositely, it is important to ascertain that the governor is correct for the propeller being used.

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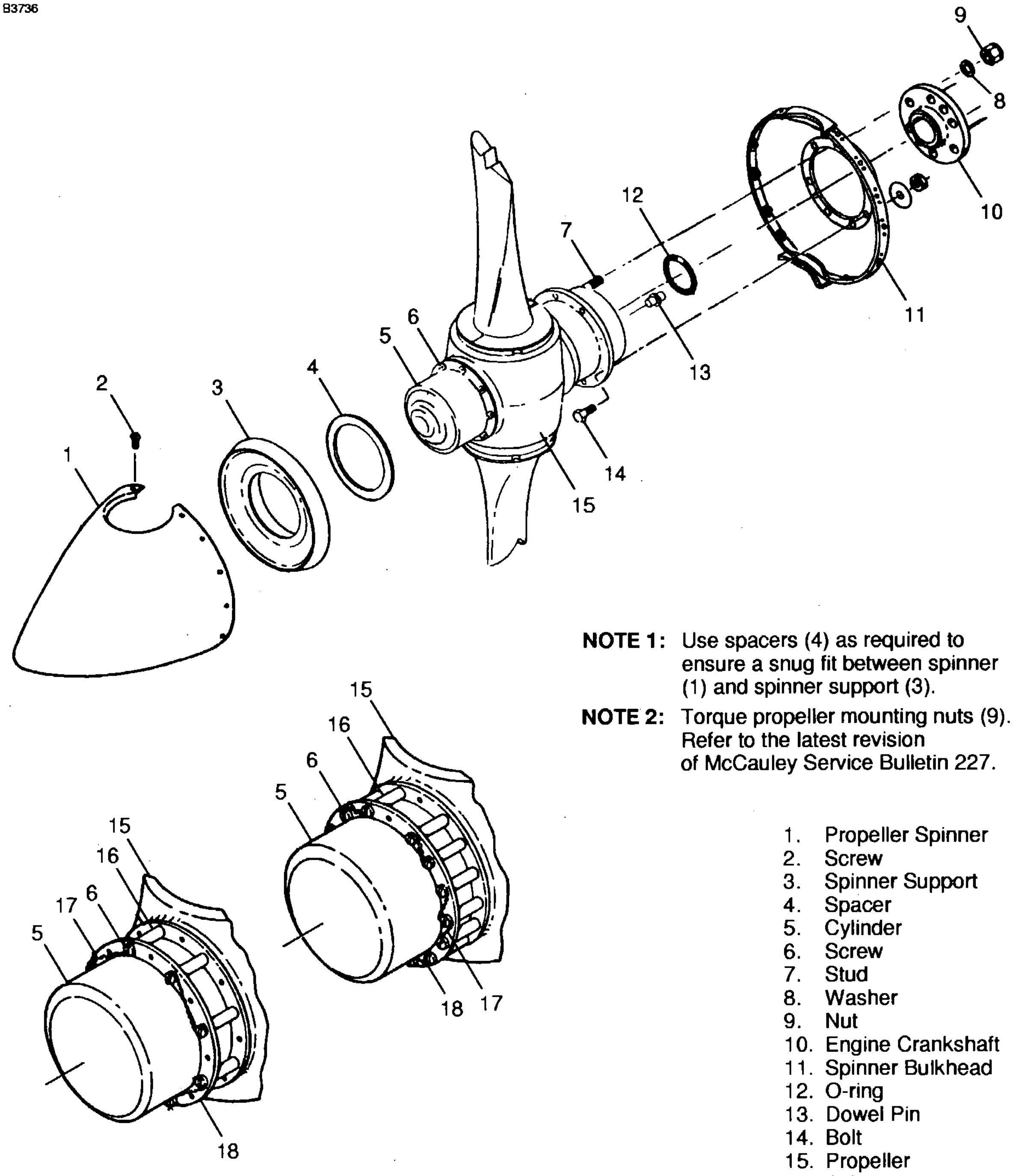


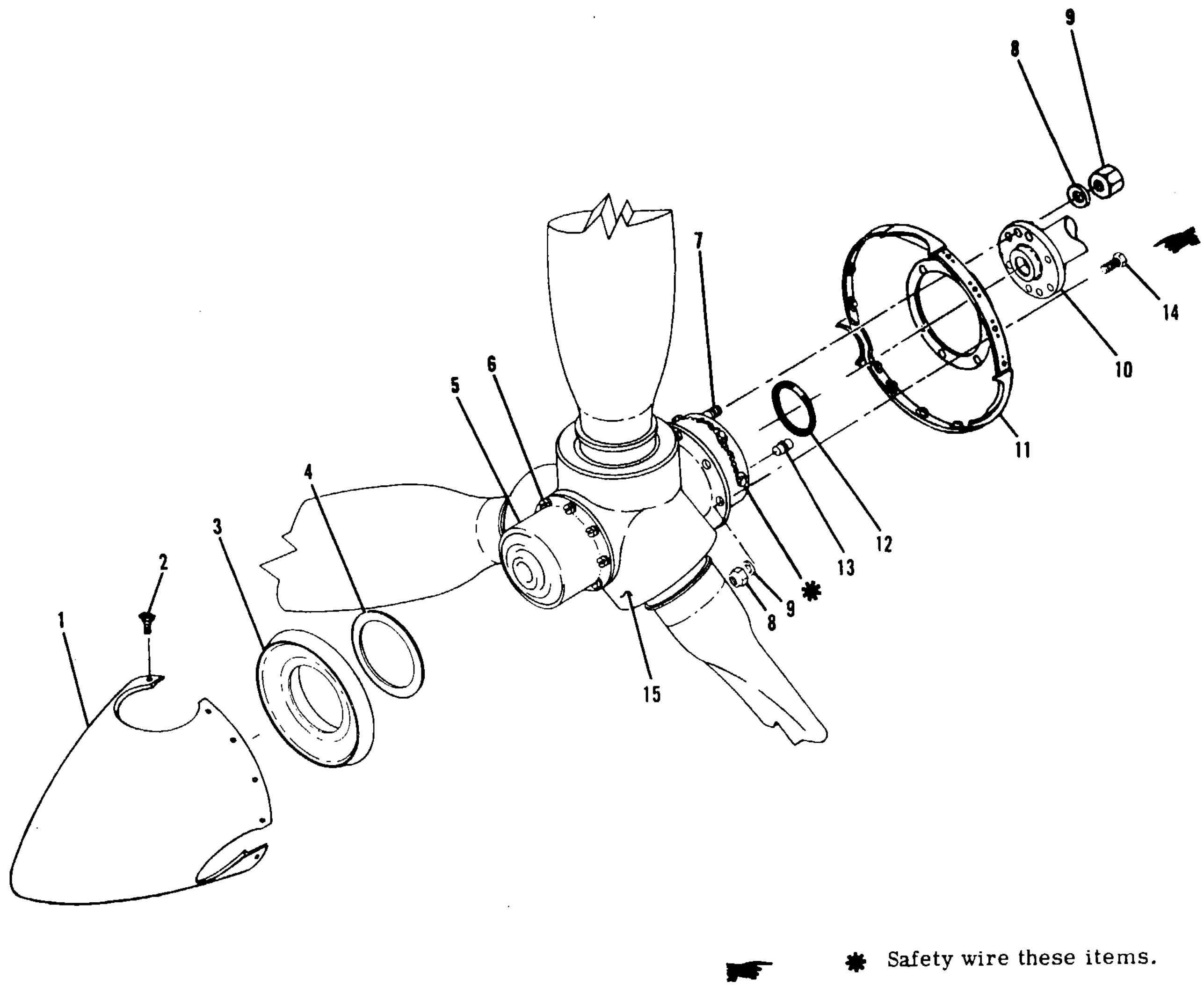
NOTE 1: Use spacers (4) as required to ensure a snug fit between spinner (1) and spinner support (3).

NOTE 2: Torque propeller mounting nuts (9). Refer to the latest revision of McCauley Service Bulletin 227.

1. Propeller Spinner
2. Screw
3. Spinner Support
4. Spacer
5. Cylinder
6. Screw
7. Stud
8. Washer
9. Nut
10. Engine Crankshaft
11. Spinner Bulkhead
12. O-ring
13. Dowel Pin
14. Bolt
15. Propeller
16. Tube
17. Safety Wire
18. Ring

TWO-BLADED, EXTENDED HUB PROPELLER

Figure 14-1 Propeller Installation (Sheet 1 of 2)



THREE BLADED, EXTENDED HUB PROPELLER

Figure 14-1. Propeller Installation (Sheet 2 of 2)

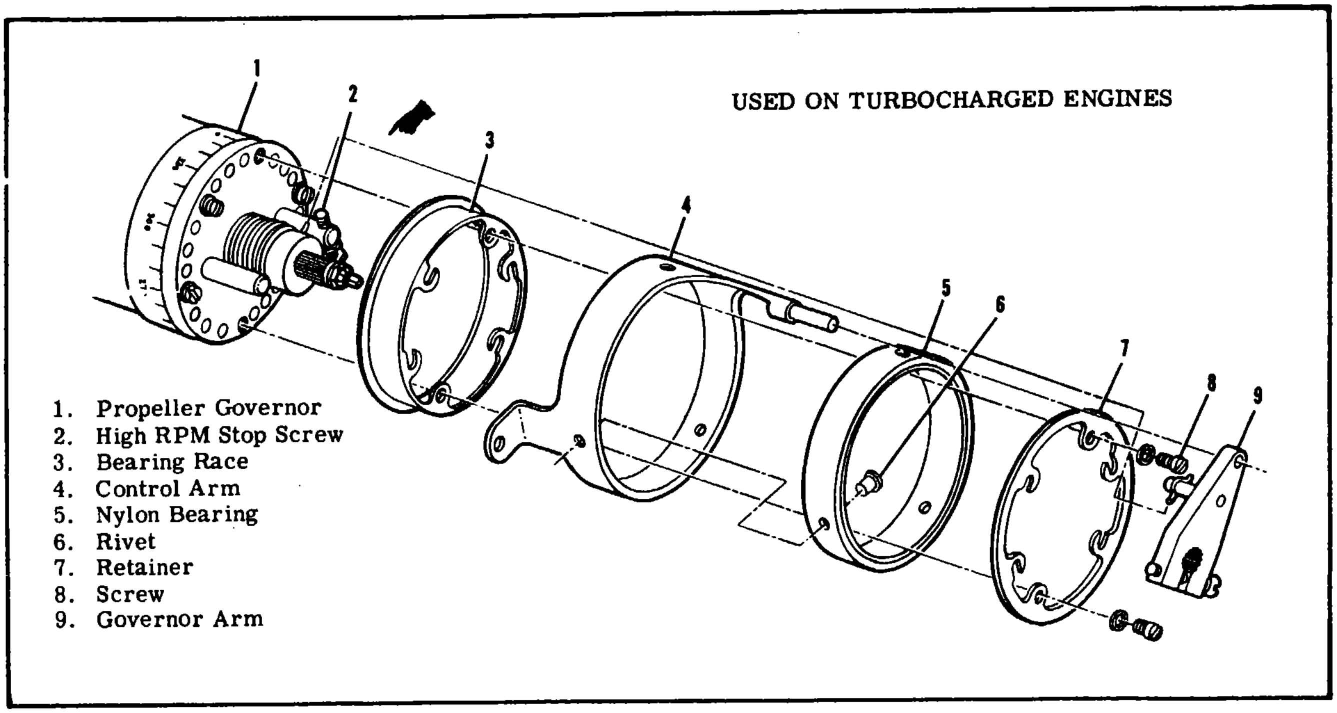


Figure 14-2. Governor Control Arm and Bearing Assembly

14-9. TROUBLE SHOOTING. When trouble shooting the propeller-governor combination, it is recommended that a governor known to be in good condition be installed to check whether the propeller or the governor is at fault. Removal and replacement, rigging, high-speed stop adjustment, desludging and replacement of the governor mounting gasket are not major repairs and may be accomplished in the field. Repairs to propeller governors are classed as propeller major repairs in Federal Aviation Regulations, which also define who may accomplish such repairs.

14-10. REMOVAL.
a. Remove cowling, nose cap and engine baffles as required for access to governor.
b. Disconnect governor control from governor.

NOTE

Note EXACT position of all washers so that washers may be installed in the same position on reinstallation.

c. Disconnect intake manifold balance tube at front of engine and move as required for clearance.
d. Remove nuts and washers securing governor to engine and pull governor from mounting studs.
e. Remove gasket from between governor and engine mounting pad.

14-11. CONTROL ARM AND BEARING ASSEMBLY. Refer to figure 14-2.

14-12. REMOVAL AND INSTALLATION.
a. Using a scribe, make aligning index marks on governor arm (9) and end of governor serrated shaft.

NOTE

The governor arm (9) must be installed on the governor shaft in the same serration or the governor speed will be changed approximately 200 rpm.

b. Remove safety wire from governor arm screw and from screws attaching governor head to governor.
c. Remove screws (8) that pass through the non-notched holes in the retainer (7).
d. Loosen, but do not remove, the four remaining screws so that retainer (7) may be rotated.
e. Loosen screw in governor arm (9) so that arm may be slipped toward end of serrated shaft.
f. Slip governor arm toward end of serrated shaft and work retainer (7) and control arm (9) from governor (1).

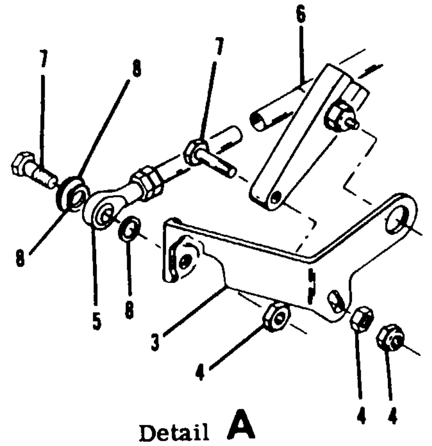
NOTE

If governor arm (9) becomes disengaged from serrated shaft, align index marks and install arm on serrated shaft. The control arm spring has approximately 1-1/2 turns preload.

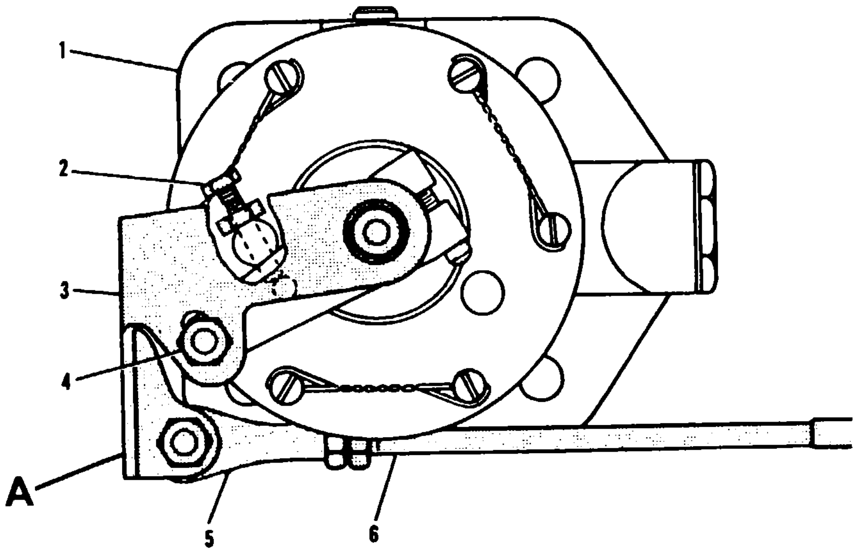
g. Rotate and remove bearing race (3) from governor (1).

TYPE A

USED ON NON-TURBOCHARGED ENGINES



Detail A



1. Propeller Governor
2. High-RPM Stop Screw
3. Governor Arm Extension
4. Nut
5. Control Rod End
6. Governor Control
7. Bolt
8. Washer

TYPE B

USED ON TURBOCHARGED ENGINES

1. Propeller Governor
2. High-RPM Stop Screw
3. Arm and Bearing Assembly
4. Nut
5. Control Rod End
6. Governor Control

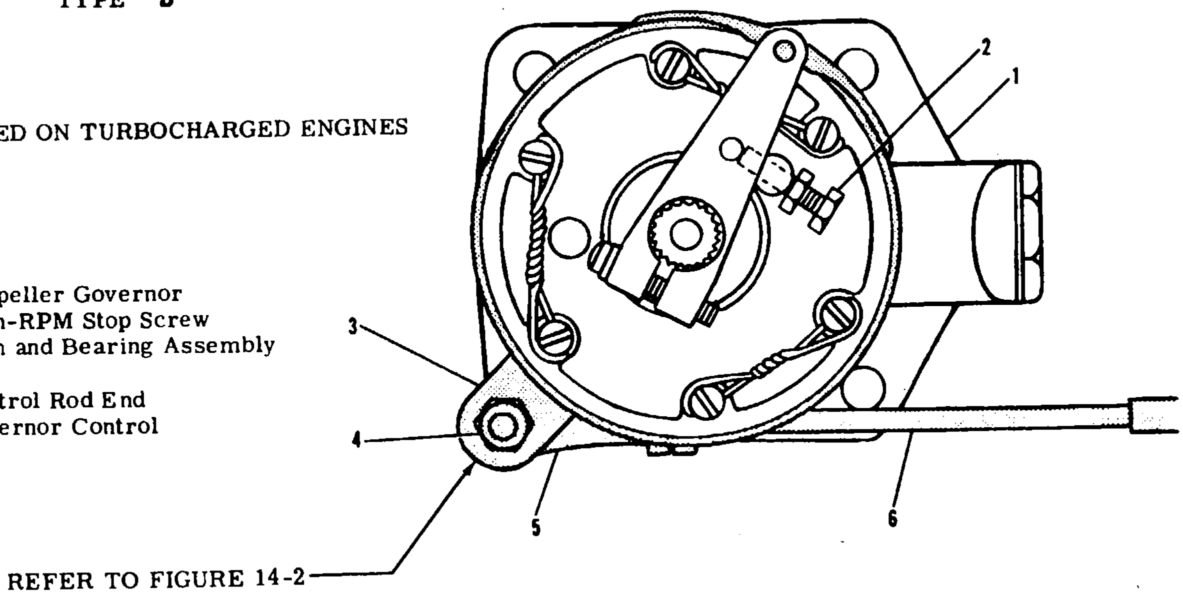


Figure 14-3. Governor and Control Adjustments

h. Reverse the preceding steps for reinstallation.

14-13. INSTALLATION.

a. Wipe governor and engine mounting pad clean.

b. Install a new gasket on the mounting studs. Install gasket with raised surface of the gasket screen toward the governor.

c. Position governor on mounting studs, aligning governor drive splines with splines in the engine and install mounting nuts and washers. Do not force spline engagement. Rotate engine crankshaft slightly and splines will engage smoothly when properly aligned.

d. Connect governor control to governor and rig control as outlined in paragraph 14-15.

e. Connect intake manifold balance tube, if removed. Ensure all clamps are tight.

f. Reinstall all items removed for access.

14-14. HIGH-RPM STOP ADJUSTMENT. Refer to figure 14-3.

a. Remove engine cowling.

b. (TYPE B.) Disconnect cabin heater inlet air duct from nose cap.

c. (TYPE A.) Remove plug button from left front baffle.

d. Remove safety wire and loosen the high-speed stop screw locknut.

e. Turn the stop screw IN to decrease maximum rpm and OUT to increase maximum rpm. One full turn of the stop screw causes a change of approximately 25 rpm.

f. Tighten stop screw locknut, safety wire stop screw and make propeller control linkage adjustment as necessary to maintain full travel.

g. Install cabin heater inlet air duct or plug button and install cowling.

h. Test operate propeller and governor.

NOTE

It is possible for either the propeller low pitch (high-rpm) stop or the governor high-rpm stop to be the high-rpm limiting factor. It is desirable for the governor stop to limit the high-rpm at the maximum rated rpm for a particular aircraft. Due to climatic conditions, field elevation, low-pitch blade angle and other considerations, an engine may not reach rated rpm on the ground. It may be necessary to readjust the governor stop after test flying to obtain maximum rated rpm when airborne.

14-15. RIGGING PROPELLER GOVERNOR CONTROL.

a. Disconnect control end (5) from governor (1).

b. Place propeller control in cabin, full forward, then pull it back approximately 1/8 inch and lock in this position. This will allow "cushion" to assure full contact with governor high-rpm stop screw.

c. Place governor arm against high-rpm stop screw.

d. Loosen jam nuts and adjust control rod end until attaching holes align while governor arm is against high-rpm stop screw. Be sure to maintain sufficient thread engagement of the control and rod end. If necessary, shift control in the clamps to achieve this.

e. Attach rod end to the governor. Be sure all washers are installed correctly.

f. Operate the control to see that the governor arm bottoms out against the low pitch stop and bottoms out against the high pitch stop on the governor before reaching the end of control cable travel.

NOTE

Non-turbocharged engines on the Model 210 are equipped with an offset extension to the governor arm. The offset extension has an elongated slot to permit further adjustment. The preceding steps may still be used as an outline in the rigging procedure. The result of rigging, in all cases, is full travel of the governor arm (bottom out against both high and low pitch stops) with some "cushion" at both ends of control travel.

- Refer to the inspection chart in Section 2 for inspection and/or replacement interval for the propeller control.

SECTION 15

UTILITY SYSTEMS

TABLE OF CONTENTS Page

15-1. UTILITY SYSTEMS.

15-2. HEATING SYSTEM.

15-3. DESCRIPTION. On non-turbocharged aircraft, the heating system is comprised of the heat exchange section of the left exhaust muffler, a heater valve, mounted on the left forward side of the firewall, a duct across the aft side of the firewall, a push-pull control on the instrument panel, and flexible ducts connecting the system. On aircraft with turbocharged engines, the heating system consists of an opening in the left side of the nose cap, an exhaust shroud, a heater valve, mounted on the left forward side of the firewall, to which is attached an adapter and a tube extending downward and overboard. The system also includes a duct across the aft side of the firewall, a push-pull control on the instrument panel, and flexible ducts connecting the system.

15-4. HEATER OPERATION. On aircraft with non-turbocharged engines, ram air is ducted through an engine baffle and the heat exchange section of the left exhaust muffler, to the heater valve at the firewall. On aircraft with turbocharged engines, ram air is ducted through an opening in the left side of the nose cap, through an exhaust shroud, to the heater valve at the firewall. On both models, heated air flows from the heater valve into a duct across the aft side of the firewall, where it is distributed into the cabin. The heater valve, operated by a push-pull control marked "CABIN HEAT", located on the instrument panel, regulates the volume of heated air entering the system. Pulling the heater control full out supplies maximum flow, and pushing it in gradually decreases flow, shutting off flow completely when the control is pushed full in.

15-5. TROUBLE SHOOTING. Most of the operational troubles in the heating system are caused by sticking or binding air valves and their controls, damaged air ducting, or defects in the exhaust muffler. In most cases, valves or controls can be freed by proper lubrication. Damaged or broken parts should be repaired or replaced. When checking controls, be sure valves respond freely to control movement, that they move in the correct direction, and that they move through their full range of travel and seal properly. Check that hose are properly secured and replace hose that are burned, frayed or crushed. If fumes are detected in the cabin, a very thorough inspection of the exhaust muffler should be accomplished. Refer to the applicable paragraph in Section 12 for the non-turbocharged engine exhaust system inspection, or for the turbocharged engine, refer to Section 12A. Since any holes or cracks may permit exhaust fumes to enter the cabin, replacement of defective parts is imperative because fumes constitute an extreme danger. Seal any gaps in heater ducts across the firewall with Pro-Seal #700 (Coast Pro-Seal Co., Los Angeles, California) compound, or equivalent compound.

15-6. REMOVAL AND INSTALLATION OF COMPONENTS. Figure 15-1 may be used as a guide for removal and installation of components of the heater system. Cut replacement hose to length and install in the original routing. Trim hose winding shorter than the hose to allow hose clamps to be fitted. Defective heater valves should be repaired or replaced. Check for proper operation of valves and their controls after installation or repair.

15-7. DEFROSTER SYSTEM.

15-8. DESCRIPTION. The system is composed of a duct across the aft side of the firewall, a defroster outlet, mounted in the left side of the cowl deck immediately aft of the windshield, a defroster control knob on the instrument panel, and flexible ducting connecting the system.

15-9. DEFROSTER OPERATION. Air from the duct across the aft side of the firewall flows through a flexible duct to the defroster outlet. The defroster control operates a damper in the outlet to regulate the amount of air deflected across the inside surface of the windshield. The temperature and volume of this air is controlled by the settings of the cabin heating system control.

15-10. TROUBLE SHOOTING. Most of the operational troubles in the defrosting system are caused by sticking or binding of the damper in the defroster outlet or its control. Since the defrosting system depends on proper operation of the cabin heating system, refer to paragraph 15-5 for trouble shooting the heating and defrosting system.

5-11. REMOVAL AND INSTALLATION OF COMPONENTS. Figure 15-1 may be used as a guide for removal and installation of components of the defrosting system. Cut replacement hose to length and install in the original routing. Trim hose winding shorter than the hose to allow hose clamps to be fitted. A defective defroster outlet should be repaired or replaced. Check for proper operation of defroster outlet and its control after installation or repair.

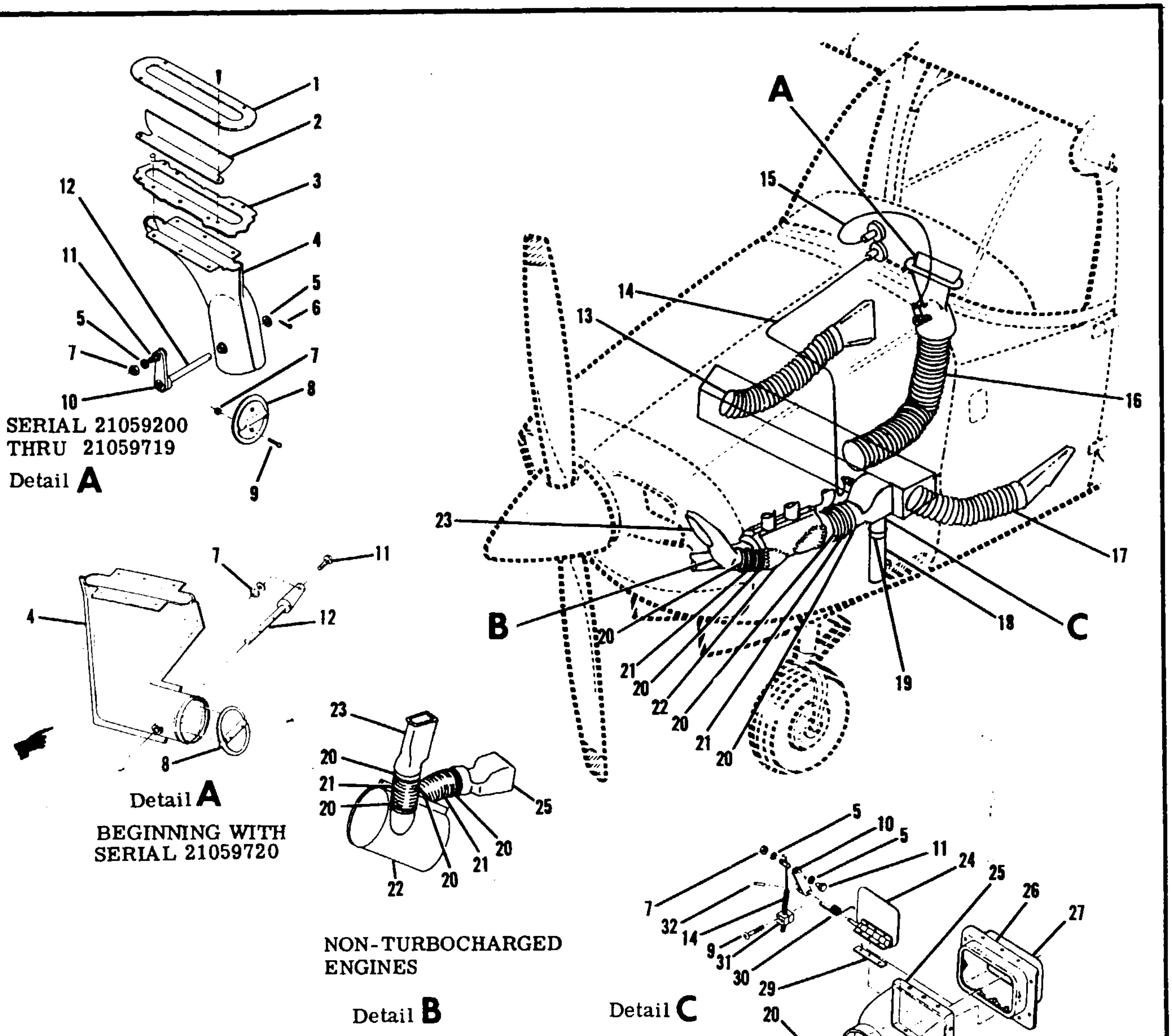
15-12. VENTILATING SYSTEM.

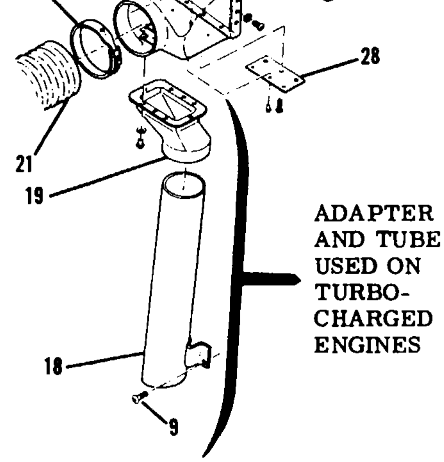
15-13. DESCRIPTION. The system is comprised of an airscoop mounted in the inboard leading edge of each wing, two plenum chambers, mounted in each of two overhead consoles, located on the aircraft centerline, a plenum chamber, mounted in a console, located above each rear door post, two fresh air scoop doors, one on each side of the fuselage, just forward of the front seats, a control on the instrument panel for each of these scoop doors, and flexible ducting connecting the systems. Beginning with aircraft serial 21060090 the following changes are made in the system. The plenum chambers in the consoles have been deleted and a new type outlet control valve is installed in the consoles. (figure 15-3.) The filtering elements which were located in the plenum chambers are now installed in the duct connections at the pilot and copilot's console only. Beginning with aircraft serial 21059352 new radio cooling inlet scoops are installed in the lower forward cabin (item 17) which have ducts connecting to radio equipment and ducts that deliver air under the cabin floor area to sub pressurize and keep out exhaust fumes. The scoops do not have controls.

15-14. VENTILATING SYSTEM OPERATION. Air received from scoops mounted in the inboard leading edges of the wings is ducted to six individually-controlled plenum chambers, two of which are mounted in each of two overhead consoles and one mounted in a console located above each rear door post. Each plenum chamber is equipped with a valve which meters the incoming cabin ventilation air. This provides a chamber for the expansion of cabin air which greatly reduces inlet air noise. Filters at the air inlets are primarily noise reduction filters. Beginning with aircraft serial 21060090 the new outlet control valves use a wheel to rotate the chamber to control volume of air delivered through the valve and is directional controlled manually. Forward cabin ventilation is provided by two fresh air scoop doors, one on each side of the fuselage, just forward of the front seats. The left scoop door is operated by a control in the instrument panel marked "CABIN AIR," and the right scoop door is operated by a control in the instrument panel marked "AUX CABIN AIR." Fresh air from the scoop doors is routed to the duct across the aft side of the firewall, where it is distributed into the cabin. As long as the "CABIN HEAT" control is pushed full in, no heated air can enter the firewall duct; therefore, when the "CABIN AIR" or "AUX CABIN AIR" controls are pulled out, only fresh air from the scoops will flow through the duct into the cabin. As the "CABIN HEAT" control is gradually pulled out, more and more heated air will blend with the fresh air from the scoops, and be distributed into the cabin. All of the controls may be set at any position from full open to full closed.

15-15. TROUBLE SHOOTING. Most of the operational troubles in the ventilating system are caused by sticking or binding of the lever in the inlet scoop door or its control. The spring or plate in the plenum chambers could also bind or stick, requiring repair or replacement of the plenum chambers. Check the filter elements in the airscoops in the leading edges of the wings for obstructions. The elements may be removed and cleaned or replaced. Since air passing through the filters is emitted into the cabin, do not use a cleaning solution which would contaminate cabin air. The filters may be removed to increase air flow. However, their removal will cause a slight increase in noise level.

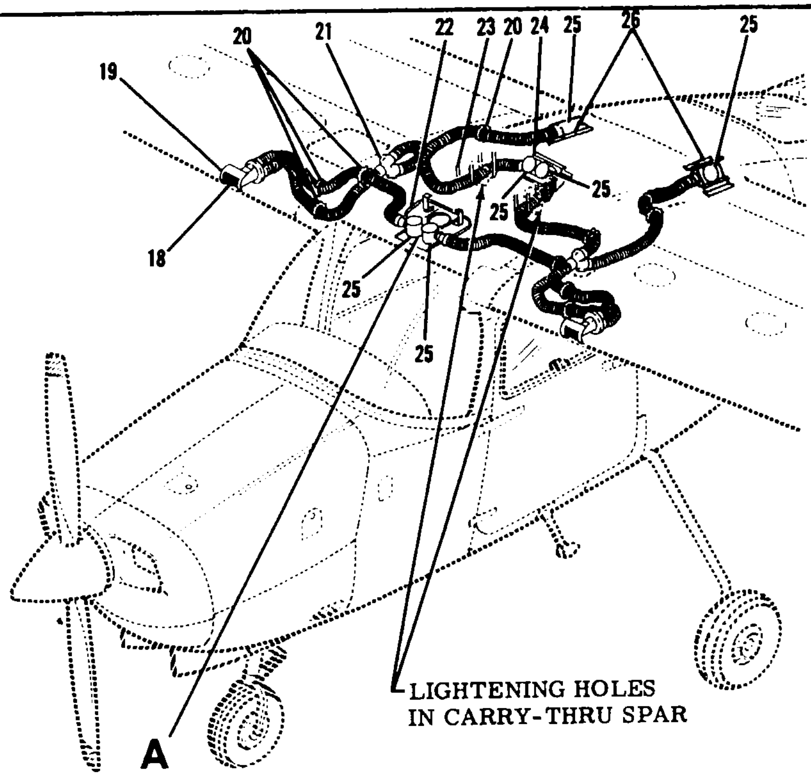
15-16. REMOVAL AND INSTALLATION OF COMPONENTS. Figures 15-2 and 15-3 may be used as

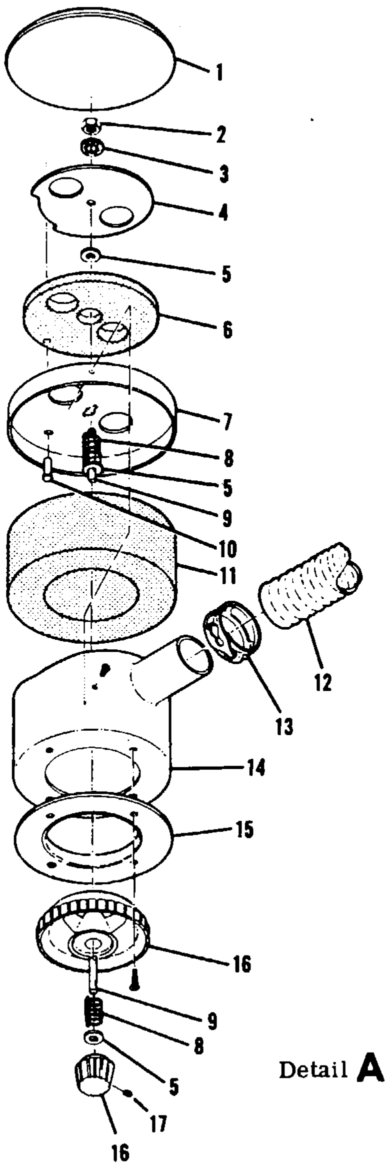




1. Retainer
2. Defroster Deflector
3. Cowl Deck
4. Defroster Outlet
5. Washer
6. Cotter Pin
7. Nut
8. Valve
9. Screw
10. Arm
11. Clamp Bolt
12. Shaft
13. Right Air Duct
14. Cabin Heat Control
15. Defroster Control
16. Defroster Hose
17. Left Air Duct
18. Tube
19. Adapter
20. Clamp
21. Hose
22. Shroud
23. Ram Air Intake
24. Valve Plate
25. Valve Body
26. Valve Seat
27. Valve Extension
28. Reinforcement
29. Shim
30. Spring
31. Block
32. Roll Pin

Figure 15-1. Heating and Defrosting System





Detail A

NOTE

Tighten nut (2) securely, and cement to plate (4) with an epoxy base adhesive. Dome (1) is sealed to body (14) at final assembly with an epoxy base adhesive.

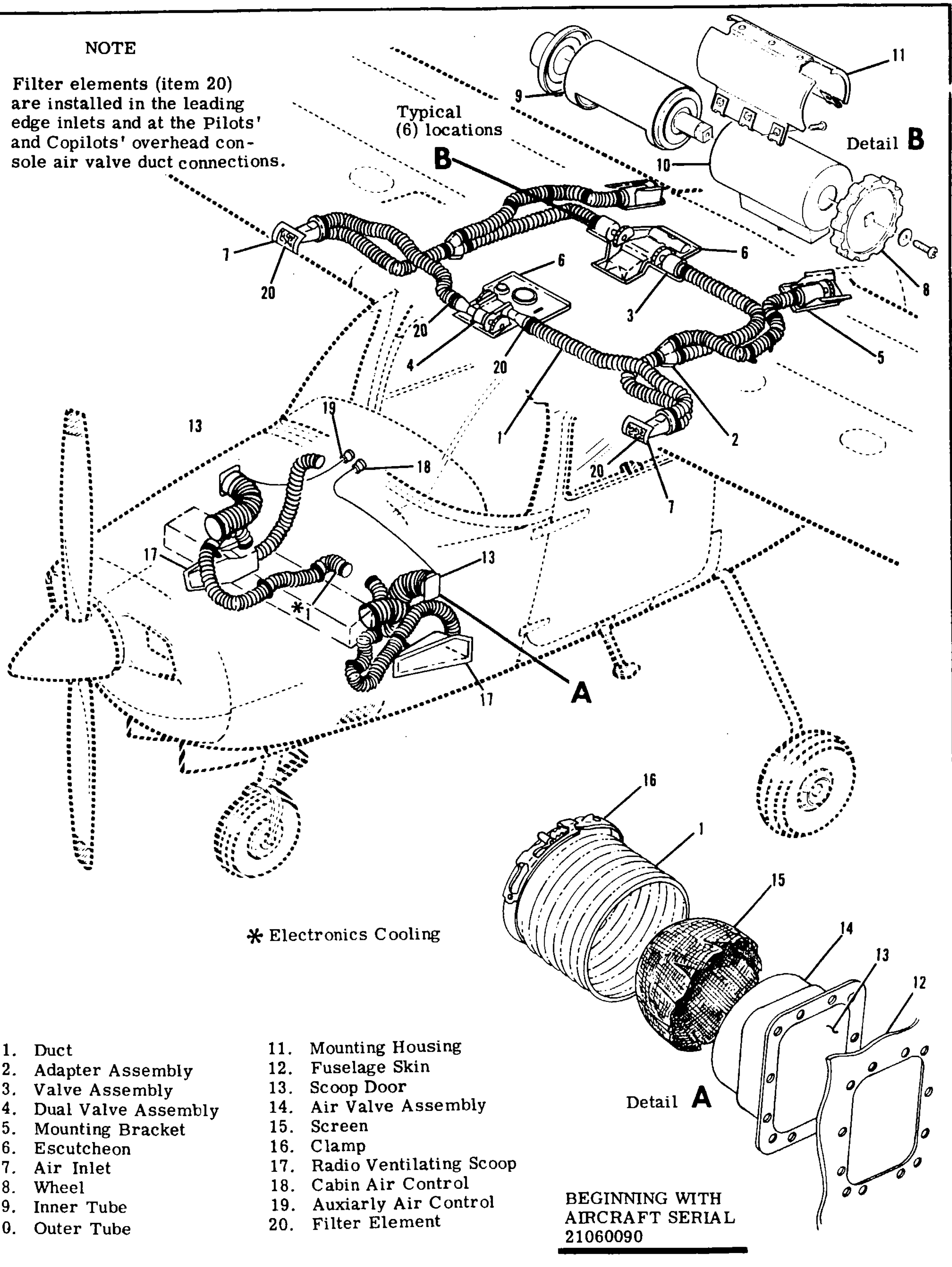
1. Dome
2. Nut
3. Star Washer
4. Plate
5. Washer
6. Seal
7. Cap
8. Spring
9. Shaft
10. Spacer
11. Insulator
12. Hose
13. Clamp
14. Valve Body
15. Escutcheon
16. Knob
17. Setscrew
18. Filter Element
19. Scoop
20. Grommet
21. Fitting
22. Forward Console
23. Strap Hangers
24. Center Console
25. Plenum Chamber
26. Rear Console

THRU AIRCRAFT
SERIAL 21060089

Figure 15-2. Overhead Ventilating System

NOTE

Filter elements (item 20) are installed in the leading edge inlets and at the Pilots' and Copilots' overhead console air valve duct connections.



1. Duct
2. Adapter Assembly
3. Valve Assembly
4. Dual Valve Assembly
5. Mounting Bracket
6. Escutcheon
7. Air Inlet
8. Wheel
9. Inner Tube
10. Outer Tube
11. Mounting Housing
12. Fuselage Skin
13. Scoop Door
14. Air Valve Assembly
15. Screen
16. Clamp
17. Radio Ventilating Scoop
18. Cabin Air Control
19. Auxiarly Air Control
20. Filter Element

15-3. Ventilating System

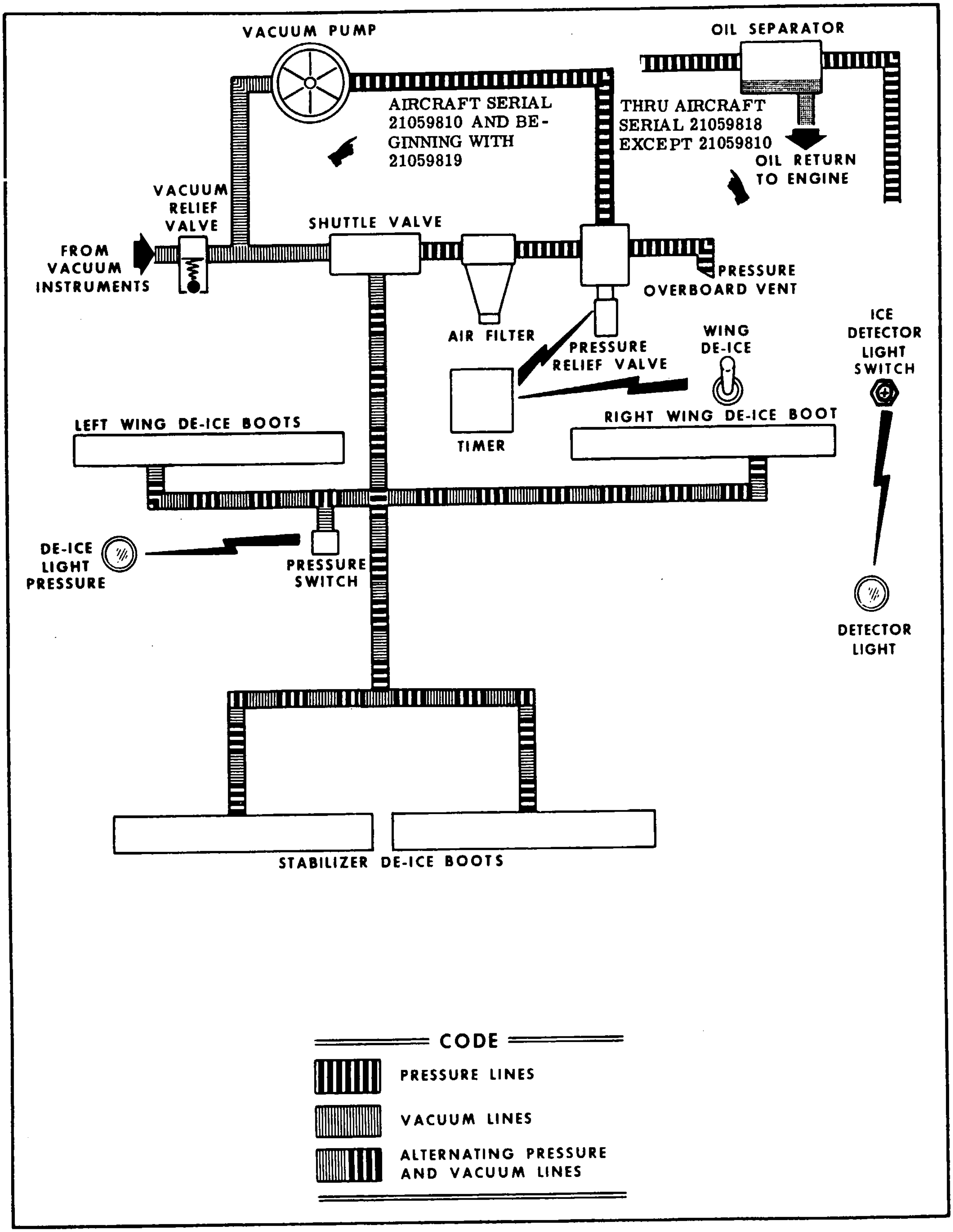
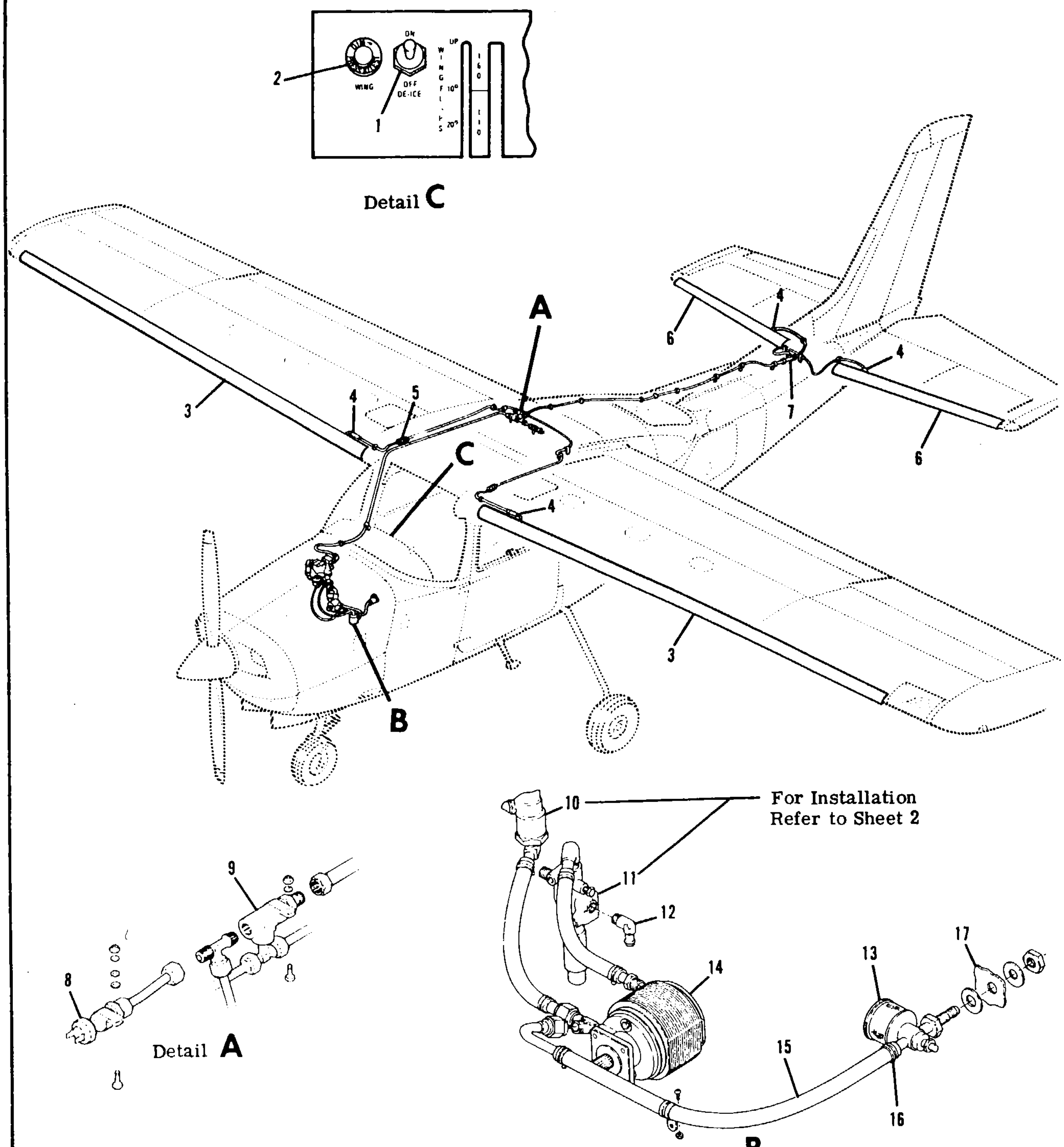


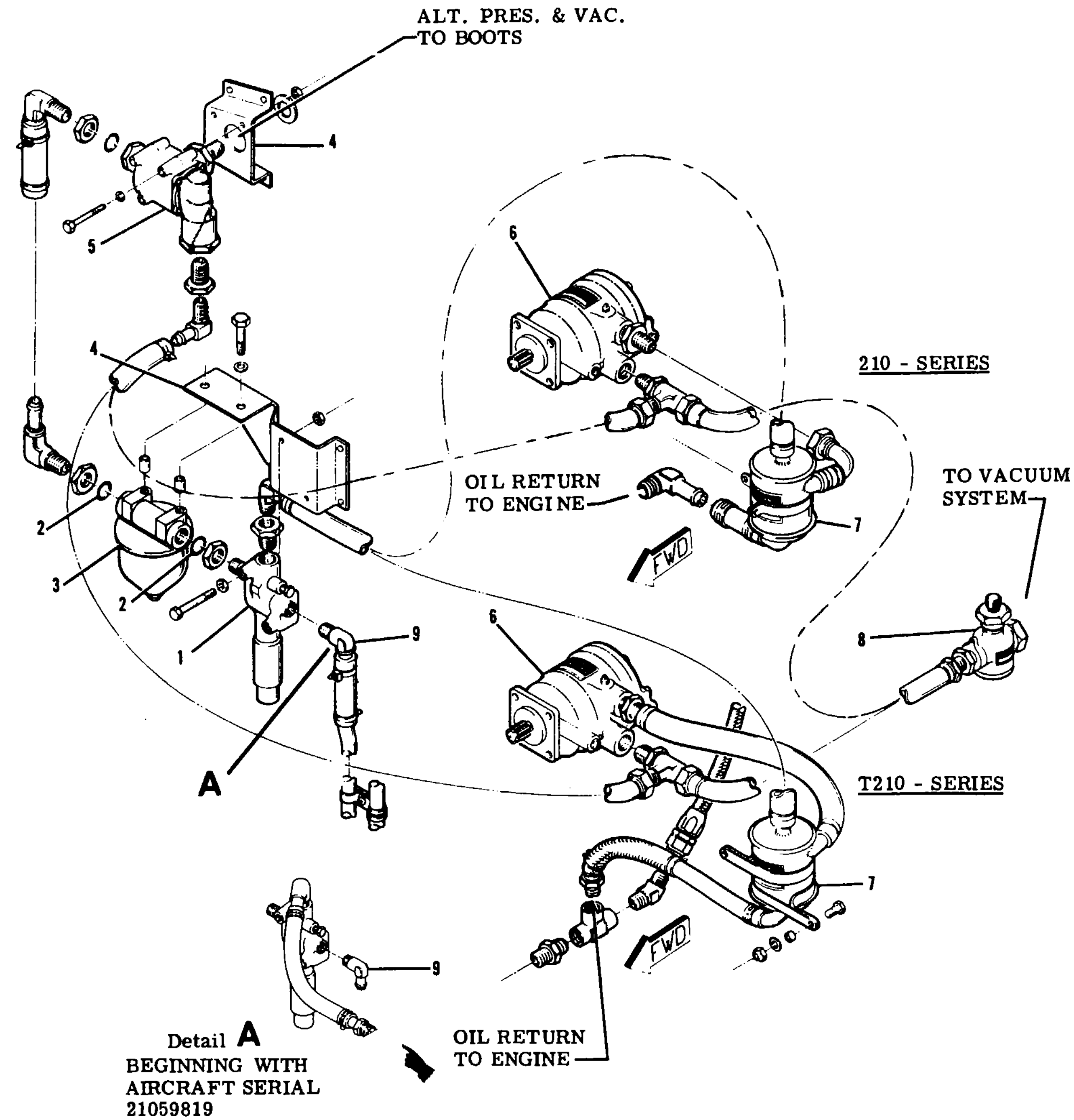
Figure 15-4. Wing and Horizontal Stabilizer De-Ice System Schematic



1. Timer and control Switch
2. Press to test Lamp
3. Wing De-Ice Boot
4. Coupling
5. Union
6. Stabilizer De-Ice Boot
7. Tee
8. Pressure Switch
9. Fitting
10. Shuttle Valve
11. Pressure Control Valve
12. Pressure Discharge Fitting
13. Vacuum Relief Valve
14. Vacuum Pump
15. Hose Assy.
16. Sta-Strap
17. Firewall

AIRCRAFT SERIAL 21059810 AND BEGINNING WITH 21059819

Figure 15-5. Wing and Horizontal Stabilizer De-Ice System (Sheet 1 of 2)



1. Pressure Relief Valve
2. O-Ring
3. Filter
4. Bracket
5. Shuttle Valve
6. Engine Driven Pump
7. Oil Separator
8. Vacuum Relief Valve
9. Pressure Discharge Vent

THRU AIRCRAFT
SERIAL 21059818
EXCEPT 21059810

Figure 15-5. Wing and Horizontal Stabilizer De-Ice System (Sheet 2 of 2) a guide for removal and installation of components of the ventilating system. Cut replacement hose to length and install in the original routing. Trim hose winding shorter than the hose to allow hose clamps to be fitted. A defective plenum chamber should be repaired or replaced. Check for proper operation of ventilating controls after installation or repair.

15-17. WING AND HORIZONTAL STABILIZER DE-ICE SYSTEM.

15-18. DESCRIPTION. De-Icing of the wing and horizontal stabilizer is accomplished by inflation and deflation of rubber boots attached to these surfaces. The duration of each inflation and deflation cycle is controlled by valves which in turn, are controlled by an electronic timer.

CAUTION

Always allow sufficient ice build-up for efficient ice removal before actuating the de-ice system. If de-ice system is actuated continuously or before ice has reached sufficient thickness, the ice will build up over the boots instead of cracking off.

The de-ice system consists of an engine-driven vacuum pump with an oil separator. Beginning with Aircraft Serial 21059819 a dry type vacuum system is installed, which eliminates the oil separator components from the system. The other components, pressure relief valve, air filter, and shuttle valve are unchanged. A pressure switch, timer, a boot on the leading edge of each wing, and a boot on the leading edge of each horizontal stabilizer complete the system. The vacuum system components also serve the de-ice vacuum system and the vacuum relief adjustment should be maintained in the manner outlined in the Relief Valve Adjustment paragraph in Section 16. The standard vacuum pump is replaced with a larger capacity vacuum pump. An ice detector light is incorporated in the left side of the cowl deck below the windshield to aid checking for ice formations during night operation.

NOTE

If the vacuum relief valve to the gyros is set too low, suction to the gyros will drop momentarily during the boot inflation cycle. This suction variation can be corrected with proper vacuum relief valve adjustment.

15-19. DE-ICE SYSTEM OPERATION. An engine-driven vacuum pump is mounted on the top center of the engine accessory housing and provides both pressure and vacuum for the inflation and deflation of the de-ice boots. Air from the outlet (pressure) side of the vacuum pump and passes across the pressure relief and overboard when the system is not operating.

When the de-ice switch is turned on, the timer closes the pressure relief valve overboard line and directs the air from the pressure side of the vacuum pump through a filter, shuttle valve, and into the de-ice boots for the inflation cycle. Inflation time of the boots is approximately six seconds and the de-ice light on the switch panel should be illuminated during the inflation cycle. At the completion of the inflation cycle, the timer opens the pressure relief valve, returning vacuum pump pressure overboard. Pressure in the boots is returned through the system and overboard through the pressure relief valve. When the shuttle valve has less than one psi against it, it closes and the vacuum side of the vacuum pump holds the boots in a deflated position. The cabin de-ice switch must be engaged to initiate a new cycle each time.

15-20. REMOVAL AND INSTALLATION OF DE-ICE SYSTEM. For removal and installation of de-ice system components, refer to figure 15-5. Refer to figure 15-6 for ice detector light.

15-21. TROUBLE SHOOTING.

TROUBLE	PROBABLE CAUSE	REMEDY
DE-ICE BOOTS DO NOT INFLATE OR INFLATE SLOWLY.	Loose or faulty wiring.	Repair or replace wiring.
	Loose or damaged hose.	Tighten or replace hose.
	Loose or missing gasket.	Tighten fitting and/or replace gasket.
	Shuttle valve malfunction.	Replace shuttle valve.
	Pressure relief valve set too low.	Reset or replace valve.
	Pressure relief valve malfunction.	Replace pressure relief valve.
	Defective timer.	Replace timer.
DE-ICE BOOTS DO NOT DEFLATE OR DEFLATE SLOWLY.	Pressure relief valve malfunction.	Replace pressure relief valve.
	Shuttle valve malfunction.	Replace shuttle valve.
	Defective timer.	Replace timer.

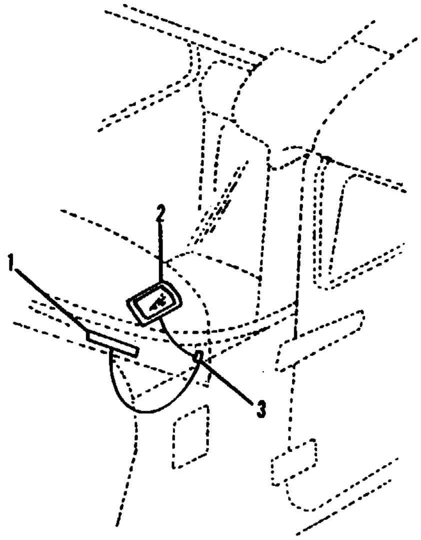


Figure 15-6. Ice Detector Light System

15-22. DE-ICE SYSTEM OPERATIONAL CHECK.

a. Electrical Test:

1. Turn WING DE-ICE switch to off position.
2. Place master switch in ON position.
3. Press WING DE-ICE indicator light to check light circuit and bulb. Make sure dimming lens on indicator is open.
4. Turn WING DE-ICE switch on and repeat step 3.
5. If indicator light does not function in steps 3 and 4, the circuit breaker may have opened. Check for short in the system. Reset circuit breaker and repeat step 3.

b. Air Leakage Test:

1. This test can be performed in the engine compartment.
2. Disconnect pressure hose from pressure relief valve inlet port.
3. Disconnect vent tube from overboard port, and cap port.
4. Connect a source of clean air to the pressure relief valve inlet port. It is necessary that the inlet pressure be a minimum of 18-20 psi to perform this test. Include a pressure gage in the air line to observe the system pressures.
5. Apply 18 psi pressure to the system and, by means of a hand-operated valve, trap the pressure in the de-ice system. Observe the system for leakage. The leakage rate should not exceed a pressure drop of 4.0 psi per minute.
6. If the leakage exceeds 4.0 psi per minute, use a soap and water solution to locate leaks. Tighten connections as required.
7. To check the pressure switch, place master switch on while de-ice system is pressurized. The indicator light should illuminate.
8. Remove test equipment, lubricate all threads and connect all system components disconnected.

c. Vacuum Relief Valve Adjustment and System Test:

1. Adjust vacuum relief valve as outlined in paragraph 16-32.
2. With vacuum relief valve adjusted and engine operating at 2400 rpm, place WING DE-ICE switch to ON position and observe de-ice system operation. System is functioning satisfactorily if the WING DE-ICE indicator light illuminates within 4.0 seconds after turning WING DE-ICE switch on.

d. Timer Cycle Check:

1. The timer cycle can be checked with the engine operating at 2100 rpm. Place WING DE-ICE switch to ON position and note time elapsed when WING DE-ICE indicator light goes out. This should be 6 seconds. Indicator light will not come on for 3 or 4 seconds after the switch is activated and will remain on until the DE-ICE control valve is deactivated by the automatic timer and control switch.

NOTE

The de-icing switch is a three position switch, spring-loaded to the normal off (center) position. When pushed to the ON (up) position and released, it will activate one de-icing cycle. Each time a cycle is desired, the switch must be pushed to the ON position and released. When pushed to the OFF (down) position and released, the switch will stop the system at any point in its cycle.

2. If it appears that the timer is defective, apply 14 vdc to pins #1 and #2 and listen for action of stepping switch.

CAUTION

The negative ground must be applied to pin #1; pin #2 is positive. A reverse voltage will ruin the timer diode. The 14 vdc must be filtered if it is rectifed from ac; a battery should be used.

15-23. DE-ICE BOOT REPAIR (COLD PATCH).

NOTE

B.F. Goodrich "cold patch" Repair Kit No. 74-451C, for surface ply de-ice boot repair, is available from the Cessna Service Parts Center.

15-24. There are four types or areas of damage that are most common to the de-ice boots. The following procedures describe the damage and technique for the repair.

NOTE

When repairing the de-ice boots and replacement layers are being installed, exercise care to prevent trapping air beneath the replacement layers. If air blisters appear after material is applied, remove them with a hypodermic needle.

Scuffed or Damaged Surface:

This type of damage is the most commonly encountered and is usually caused by scuffing the outer surface of the de-ice boots while using scaffolds, refueling hose, ladders, etc. Repair is generally not necessary because the thick outer veneer provides protection to the natural rubber underneath. If the damage is severe and has caused removal of the entire thickness of veneer (exposing the brown natural rubber underneath), the damage should be repaired as follows:

a. Select a patch (Part Number 3306-1, 3306-2, or 3306-3) large enough to cover the damaged area.
b. Using a clean cloth dampened with solvent, thoroughly clean the damaged area.
c. Buff the area around the damage with steel wool so that the area is moderately but completely roughened.
d. Wipe the buffed area clean with a cloth slightly dampened with solvent to remove all loose particles.
e. Apply one even coat of EC-1403 cement to the patch and corresponding damaged area of the de-ice boot and allow cement to dry completely.
f. Reactivate cemented surfaces with solvent. Apply patch to the de-ice boot with an edge or the center adhering first, and work the remainder of the patch down, being careful to avoid air pockets between patch and boot.
g. Roll the patch thoroughly with a stitcher-roller (Part Number 3306-10) and allow to set for 10 to 15 minutes.
h. Wipe the patch and surrounding area, from the center of the patch outward, with a cloth slightly dampened with solvent.
i. Apply one light coat of A-56-B conductive cement (Part Number 3306-13) to the patched area to restore conductivity.

NOTE

Satisfactory adhesion should be obtained in four hours; however, if the patch is allowed to cure for a minimum of 20 minutes, the de-ice boots may be inflated to check the repair.

Damage to Tube Area:

This type of damage consists of cuts, tears, or ruptures to the inflatable tube area and a fabric reinforced patch must be used for this repair. Damage to the tube area should be repaired as follows:

a. Select a patch (Part Number 3306-4, 3306-5, or 3306-6) of ample size to extend at least 5/8-inch beyond the damage area.

NOTE

If none of these patches are of proper size, one may be cut to the size desired from one of the larger patches. If this is done, the edge should be beveled by cutting with the shears at an angle. These patches are manufactured so they will stretch in one direction only. Be sure to cut patch selected so that the stretch is in the widthwise direction of the inflatable tubes.

b. Using a clean cloth dampened with solvent, thoroughly clean the area to be repaired.
c. Buff the area around the damage with steel wool so that the area is moderately but completely roughened.
d. Wipe the buffed area clean with a cloth slightly dampened with solvent to remove all loose particles.
e. Apply one even, thorough coat of EC-1403 cement to the patch and the corresponding damaged area of the de-ice boot. Allow cement to dry completely.
f. Reactivate cemented surfaces with solvent. Apply patch to de-ice boot with the stretch in the widthwise direction of the inflatable tubes, sticking edge of patch in place first and working remainder down with a very slight pulling action so the injury is closed. Use care to avoid air pockets between patch and de-ice boot surface.
g. Roll the patch thoroughly with a stitcher-roller and allow to set for 10 to 15 minutes.
h. Wipe the patch and surrounding area, from the center of the patch outward, with a cloth slightly dampened with solvent.
i. Apply one light coat of A-56-B conductive cement to restore conductivity.

NOTE

Satisfactory adhesion of patch to de-ice boot should be reached in four hours; however, if the patch is allowed to cure for a minimum of 20 minutes, the de-ice boots may be inflated to check the repair.

Damage to Fillet Area:

This includes any tears or cuts to the tapered area aft of the inflatable tubes. Damage to the fillet area should be repaired as follows:

a. Trim damaged area square and remove excess material. Cut must be sharp and clean to permit a good butt joint of the inlay.

b. Cut an inlay from tapered filler (Part Number 3306-7) to match cutout area.
c. Using solvent, loosen edges of de-ice boot around cutout area approximately 1-1/2 inches from all edges.
d. Thoroughly clean the area to be repaired, using a cloth dampened with solvent.
e. Lift edges of loosened boot around cutout, and apply one coat of EC-1403 cement to underneath side of boot.
f. Apply one coat of EC-1403 cement to the wing skin underneath the loosened edges of de-ice boot, allowing cement to extend 1-1/2 inches beyond edges of boot into cutout area.
g. Apply a second coat of EC-1403 cement to underneath side of boot as outlined in step "e."
h. Apply one coat of EC-1403 cement to one side of a 2-inch wide, neoprene-coated fabric tape (Part Number 3306-8) and allow cement to dry. Trim the tape to size of cutout. This tape is necessary to reinforce splice.

i. Reactivate cemented surface of tape and wing skin with solvent and apply tape to wing skin. Use care to center tape under all edges of cutout.
j. Roll down tape on wing skin with stitcher-roller to assure good adhesion, being careful to avoid air pockets between tape and wing skin.
k. Apply one coat of EC-1403 cement to top surface of tape and allow cement to dry approximately 5 to 10 minutes.
l. Reactivate cemented surfaces of boot wing skin and tape with solvent. Working toward the cutout, roll down carefully the edges of the loosened boot to prevent trapping air. The boot edges should overlap the tape approximately 1 inch.
m. Roughen back surface of inlay repair material (Part Number 3306-7, previously cut to size) with steel wool. Thoroughly clean with solvent and apply one coat of EC-1403 cement.
n. Apply one coat of EC-1403 cement to wing skin inside cutout area and allow to dry.
o. Apply the second coat of EC-1403 cement to inlay repair material and allow to dry.
p. Reactivate cemented surfaces with solvent and carefully insert inlay material with feathered edge of inlay aft. Working from forward edge aft, carefully roll down the inlay to avoid trapping air.
q. Roughen area on outer surface of de-ice boot and inlay with steel wool 1-1/2 inch on either side of splice. Clean with solvent and apply one coat of EC-1403 cement.
r. Apply one coat of EC-1403 cement to one side of 2-inch wide, neoprene-coated fabric tape (Part Number 3306-8), trim to size, and center tape over splice on three sides.
s. Roll down tape on de-ice boot and inlay with stitcher-roller to assure good adhesion, being careful to avoid trapping air.
t. Apply one light coat of A-56-B conductive cement to restore conductivity.

Veneer Loose From De-Ice Boot:

If the veneer should become loose from the de-ice boot, repair should be made as follows:
a. Peel and trim the loose veneer to a point where the adhesion of veneer to the de-ice boot is good.
b. Roughen area in which veneer is removed with steel wool. Motion must be parallel to cut edge of veneer ply, to prevent loosening it.
c. Taper edges of veneer down to the tan rubber ply by rubbing parallel to cut edge of veneer with steel wool and solvent.
d. Cut a piece of veneer material (Part Number 3306-9) large enough to cover the damaged area and extend at least 1 inch beyond in all directions.
e. Mask off the damaged boot area 1/2-inch larger in width and length than the patch.
f. Apply one coat of EC-1403 cement to damaged boot area and allow to dry.
g. Apply second coat of EC-1403 cement to damaged boot area and allow to dry.
h. Reactivate cement surface with solvent. Peel the backing from the veneer, and for 6 inches of its length, and roll the veneer to the boot with a 2-inch roller. Roll edges with stitcher-roller.
i. Continue stripping the backing from the veneer as the rolling progresses, applying a slight tension on the veneer ply to prevent wrinkling.
j. Be careful to prevent trapping air. If air blisters appear after veneer is applied, remove them with a hypodermic needle.
k. Wipe the patch and surrounding area, from the center of the patch outward, with a cloth slightly dampened with solvent.
l. Apply one light coat of A-56-B conductive cement to restore conductivity.

15-25. MATERIALS REQUIRED FOR INSTALLATION OF DE-ICE BOOTS.

1. No. EC-1300L (EC-1403) Cement, Minnesota Mining & Manufacturing Company.
2. Methyl-Isobutyl Ketone (MIBK).
3. Cleaning Solvent - Toluol.
4. Cleaning Solvent - Hexane.
5. Clean, lint-free cleaning cloths.
6. Four yards clean, heavy canvas duck fabric 48 inches wide.
7. Several empty tin cans.
8. Three-inch paint brushes.
9. Two-inch rubber hand rollers.
10. 1/4-inch metal hand stitcher roller, B. F. Goodrich Company (Part Number 3306-10).
11. Carpenters' chalk line.
12. One-inch masking tape.
13. Steel measuring tape.
14. Sharp knives.
15. Fine sharpening stone.
16. No. EC-539 Sealing Compound, Minnesota Mining & Manufacturing Company.
17. No. A-56-B Cement, B. F. Goodrich Company (Part Number 3306-15).

15-26. REPLACEMENT OF DE-ICE BOOTS. To remove or loosen installed de-ice boots, use toluol or toluene to soften the "cement" line. Apply a minimum amount of this solvent to the cement line as tension is applied to peel back the boot. Removal should be slow enough to allow the solvent to undercut the cement so that parts will not be damaged. To install a wing de-icer boot, proceed as follows:

a. Clean the metal surfaces and the bottom side of the de-icer thoroughly with Methyl Ethyl Ketone or Methyl Isobutal Ketone. This shall be done by wiping the surfaces with a clean, lint-free rag soaked with the solvent and then wiping dry with a clean, dry, lint-free rag before the solvent has time to dry.

b. Place one inch masking tape on wing to mask off boot area allowing 1/2 inch margin. Take care to mask accurately so that clean-up time will be reduced.

c. Stir EC-1300L (EC-1403) cement thoroughly before using. Apply one even brush coat to the metal and to the rough side of the boot, brushing well into the rubber. Allow cement to air dry for a minimum of 30 minutes and then apply a second coat to each of the surfaces. Allow at least 30 minutes, preferably one hour, for drying.

d. Snap a chalk line along the leading edge line of the wing and a corresponding line on the inside of the de-icer if it does not have a centerline. Securely attach hoses to the de-icer connections. Position the centerline of the boot with the leading edge of the wing, and using a clean, lint-free cloth heavily moistened with toluol, reactivate the surface of the cement on the wing and the boot in small spanwise areas about six inches wide. Avoid excess rubbing of the cement, which would remove it from the surface. Have enough help to hold boot in a vertical plane. Place the chalk lines in alignment, and starting at one end of the boot, tack it to the wing along the leading edge line. Hold the rest of the boot clear of the wing. Roll along the leading edge line with a rubber roller, and an inch or two on either side. Taking approximately six inches of chord at a time, roll from the leading edge aft in firm, overlapping chordwise strokes of the rubber roller until the entire boot is in contact with the airfoil. It is important that all air be removed from between the rubber and the metal, and that the boots be distorted to a minimum amount. If any air is trapped between the rubber and the metal, it may be removed by the careful use of a small hypodermic needle, except in the tube area. Use the metal stitcher roller around the edges of the boot and connections. Fill any gaps between adjoining boots with EC-539 sealer. Apply a brush coat of A-56-B cement to exposed surfaces of cement and along trailing edges of boot to form a neat straight line. Remove masking tape and clean surfaces with toluol.

15-27. PROPELLER DE-ICE SYSTEM. The system is of an electrothermal type, consisting of electrically heated de-icers bonded to each propeller blade, a slip ring assembly for power distribution to the propeller de-icers, a brush block assembly to transfer electrical power to the rotating slip ring, a timer to cycle electric power to the de-icers in proper sequence, an ammeter, mounted in the instrument panel, a switch and a circuit breaker. The de-ice system applies heat to the surfaces of the propeller blades where ice normally would adhere. This heat, plus centrifugal force and the blast from the airstream, removes accumulated ice. Each de-icer has two separate electrothermal heating elements, an inboard and an outboard section. When the switch is turned on, the timer provides power through the brush block and slip ring to outboard elements for approximately 34 seconds, reducing ice adhesion in these areas. Then the timer switches power to inboard heating elements for approximately 34 seconds (Thru 21061141). Beginning with 21061142, the same cycle takes place, except that the time intervals are changed to 20 seconds rather than 34. It then returns to the outer elements and continues cycling action. This outboard-inboard sequence is very important since the loosened ice, through centrifugal force, moves outboard. Heating may begin at any phase in the cycle, depending on the timer position when the switch was turned off from previous use. Ground checkout of the system is permitted with the engine not running. System components may be removed and replaced, using figure 15-7 as a guide. Propeller removal is necessary before de-ice system components, except brush block assembly, can be installed or removed.

15-28. SLIP RING ALIGNMENT. After installation, the slip ring assembly must be checked for run-out, and adjustments made, if necessary.

NOTE

Excessive slip ring run-out will result in severe arcing between the slip ring and brushes, and cause rapid brush wear. If allowed to persist, this condition will result in rapid deterioration of the slip ring and brush contact surfaces, and lead to the eventual failure of the De-Icing System.

a. Securely attach dial indicator gauge to the engine, and place the pointer on the slip ring.

b. Rotate propeller slowly by hand, noting the deviation of the slip ring from a true plane as indicated on the gauge.

c. Check that total run-out does not exceed 0.005 inch (±0.0025 inch) for the Model 210, or 0.008 inch (±0.004 inch) for the Model T210. Also check that run-out does not exceed 0.002 inch within any 4 inches of slip ring travel for either type of engine.

CAUTION

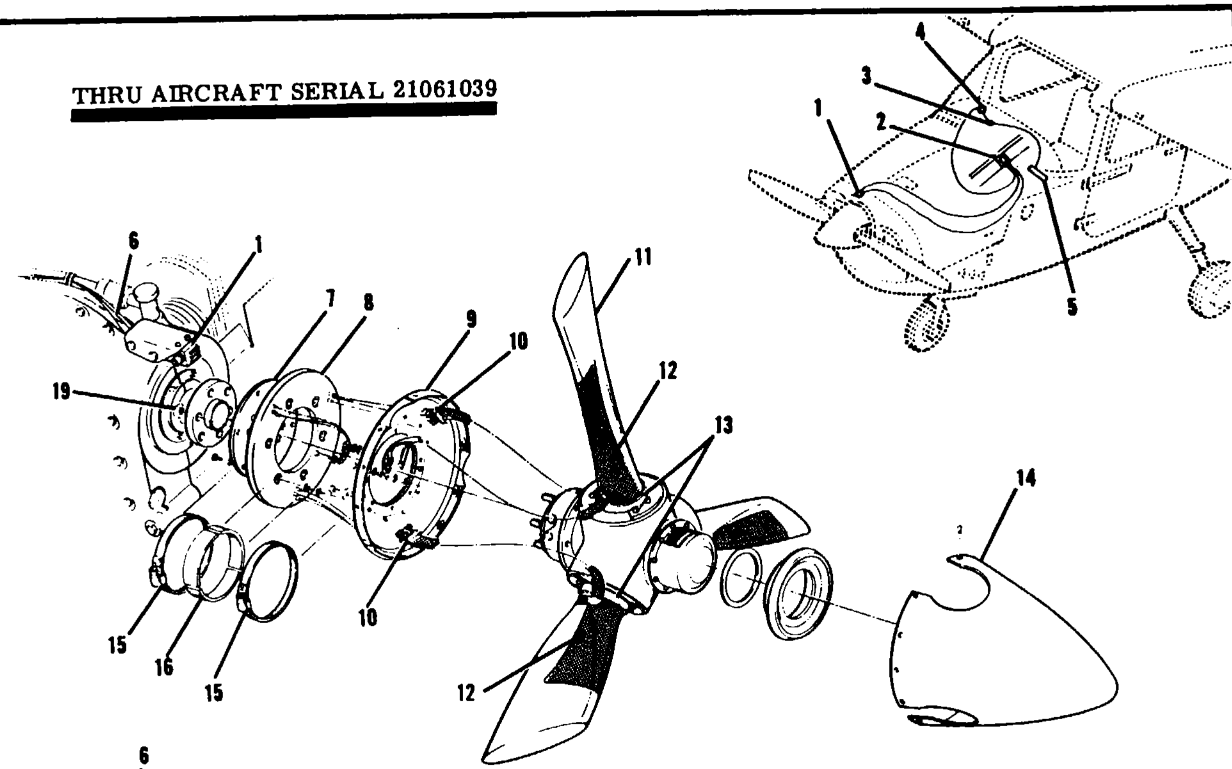
Due to the loose fit of some propeller bearings, a considerable error may be indicated in the readings by pushing in or pulling out on the propeller while rotating it. Care must be taken to exert a uniform push or pull on the propeller to hold this error to a minimum.

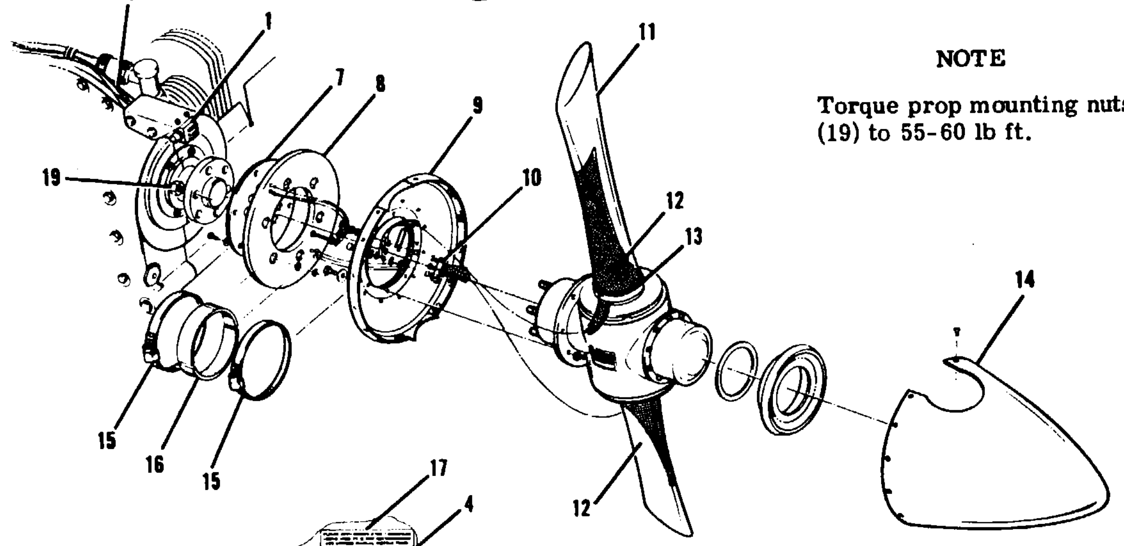
d. If slip ring run-out is within the limits specified, no corrective action is required. A small amount of run-out may be corrected by varying the torque of the attachment bolts within the limits specified by the propeller manufacturer.

e. If the procedure outlined in step "d" does not produce acceptable run-out, fabricate small washer-shaped shims (approximately .010 inch), and place on attachment bolts, limit one washer per bolt, between slip ring and spinner bulkhead or mounting plate.

f. Recheck run-out. Adjust shim thickness and vary torque of attachment bolts until slip ring runs true within the prescribed tolerance.

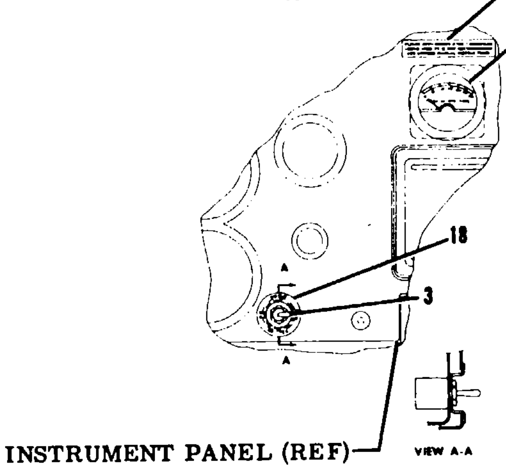
THRU AIRCRAFT SERIAL 21061039





NOTE

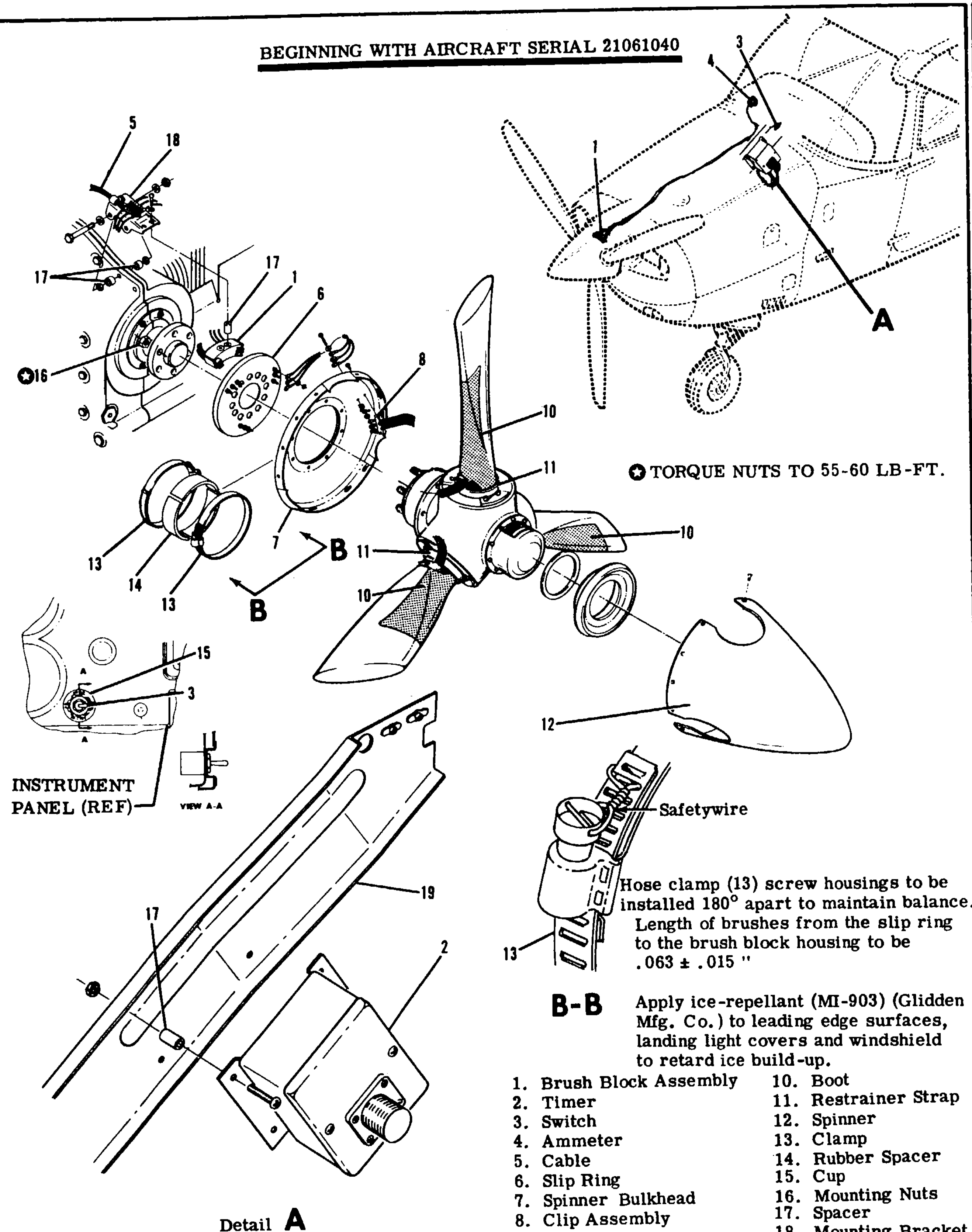
Torque prop mounting nuts (19) to 55-60 lb ft.



1. Brush Block Assembly
2. Timer
3. Switch
4. Ammeter
5. Bus Bar
6. Cable
7. Mounting Plate
8. Slip Ring
9. Spinner Bulkhead
10. Clip Assembly
11. Prop
12. Boot
13. Restrainer Strap
14. Spinner
15. Clamp
16. Rubber Spacer
17. Placard
18. Cup
19. Mounting Nuts

Figure 15-7. Propeller De-Ice System (Sheet 1 of 2)

BEGINNING WITH AIRCRAFT SERIAL 21061040



✪ TORQUE NUTS TO 55-60 LB-FT.

Hose clamp (13) screw housings to be installed 180° apart to maintain balance. Length of brushes from the slip ring to the brush block housing to be .063 ± .015 "

Apply ice-repellant (MI-903) (Glidden Mfg. Co.) to leading edge surfaces, landing light covers and windshield to retard ice build-up.

1. Brush Block Assembly
2. Timer
3. Switch
4. Ammeter
5. Cable
6. Slip Ring
7. Spinner Bulkhead
8. Clip Assembly
9. Prop
10. Boot
11. Restrainer Strap
12. Spinner
13. Clamp
14. Rubber Spacer
15. Cup
16. Mounting Nuts
17. Spacer
18. Mounting Bracket
19. Support

Figure 15-7. Propeller De-Ice System (Sheet 2 of 2)

15-29. TROUBLE SHOOTING.

NOTE

The propeller anti-ice ammeter may be used while trouble shooting the system. The ammeter needle should rest within the shaded band except for "flickers" approximately 34 seconds apart, as the step switch of the timer operates. The ammeter will also reflect a bad connection or open circuit by reading below normal or zero. A high reading indicates a short circuit.

TROUBLE	PROBABLE CAUSE	REMEDY
ELEMENTS DO NOT HEAT.	Circuit breaker out or defective.	Reset circuit breaker. If it pops out again, determine cause and correct. Replace defective parts.
	Defective wiring.	Repair or replace wiring.
	Defective switch.	Replace switch.
	Defective timer.	Replace timer.
	Defective brush-to-slip ring connection.	Check alignment. Replace defective parts.
SOME ELEMENTS DO NOT HEAT.	Incorrect wiring.	Correct wiring.
	Defective wiring.	Repair or replace wiring.
	Defective timer.	Replace timer.
	Defective brush-to-slip ring connection.	Check alignment. Replace defective parts.
	Defective element.	Replace element.
CYCLING SEQUENCE NOT CORRECT OR NO CYCLING.	Crossed connections.	Correct wiring.
	Defective timer.	Replace timer.
RAPID BRUSH WEAR, FREQUENT BREAKAGE, SCREECHING OR CHATTERING.	Brush block or slip ring out of alignment.	Align properly.

15-30. TIMER TEST.

a. Remove connector plug of wire harness from timer and jump power input socket of wire harness to timer input pins. (Refer to chart following this step for pin identification.)

Timer P/N	Power Input Pin & Socket	Ground Pin	Output Sequence, Time, Voltage	Total Repeat Cycle Time (minutes)
▲ 3E1540-1 ● C165020-0101	B (14 VDC)	A (14 VDC)	▲ C, D 34 seconds each, ● C, D 20 seconds each, then repeats (14VDC)	1.1

b. Jump timer ground pin to ground.

c. Turn on De-Icing System.

d. Check timer operation per the chart preceding step "b." (Use a voltmeter.)

e. Check volts to ground in each case. If engine is not running, and auxiliary power is not used, voltage will be battery voltage and cycle time may be slightly longer than indicated.

f. Hold voltmeter probe on the pin until the voltage drops to 0. Move the probe to the next pin in the sequence shown in the chart. Check voltage at each pin in sequence. When correctness of the cycling sequence is established, turn propeller De-Icing switch off at the beginning of one of the on-time periods, and record the letter of the pin at which the voltage supply is present.

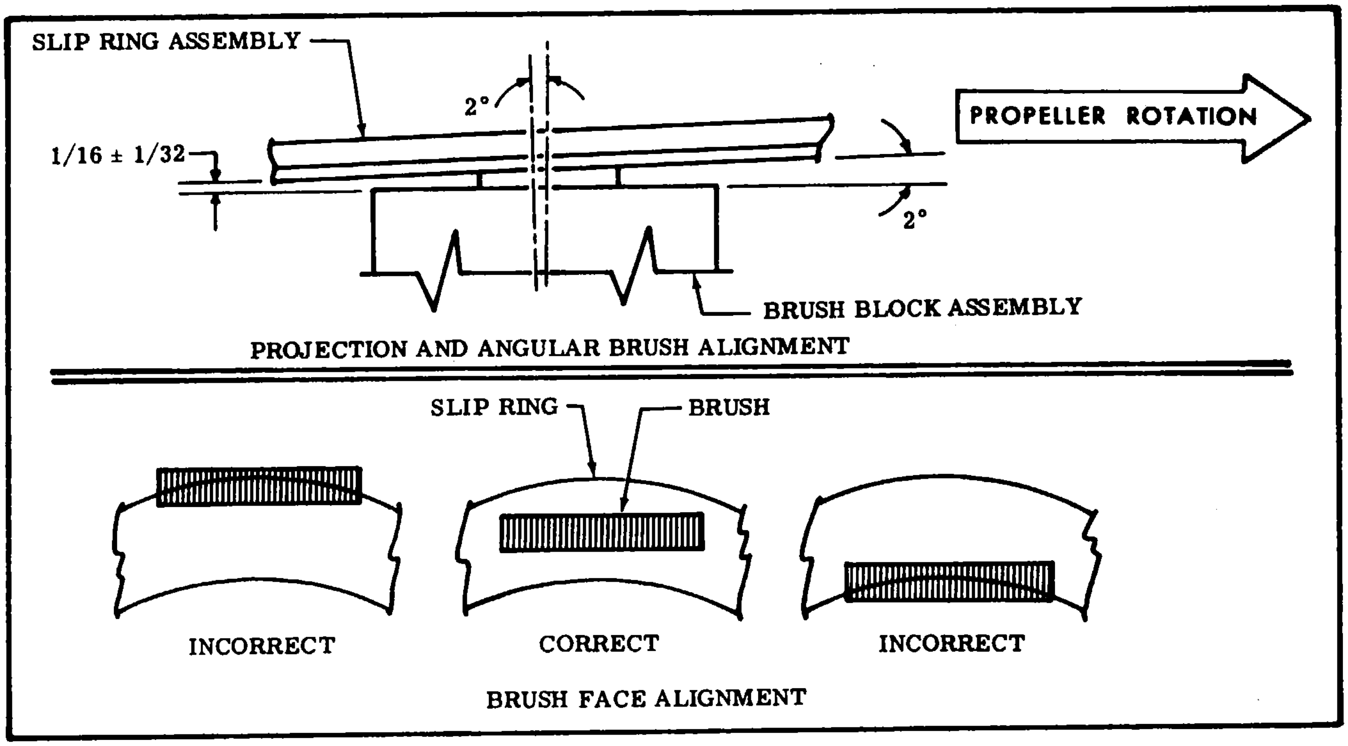


Figure 15-8. Brush Face Alignment and Projection and Angular Brush Alignment

NOTE

Timers do not home to pin "C" when turned off.

13-17. INSTALLATION AND ALIGNMENT OF BRUSH BLOCK ASSEMBLY. (Refer to Figure 15-8.)

NOTE

Installation of the brush block should be deferred, when possible, until after the slip ring, propeller, and related components are installed. However, the brush block assembly may be replaced without removing the propeller. To avoid breakage when installing the brush block assembly, keep brushes retracted in brush block until slip ring and propeller assemblies have been installed.

CAUTION

Make sure that slip ring run-out has been corrected before attempting to align brushes on slip ring.

a. In order to get smooth, efficient and quiet transfer of electric power from the brushes to the slip ring, brush alignment must be checked and adjusted, if necessary to meet the following requirements.

1. Projection must be such that the distance between the brush block and the slip ring is .06" ± .03".

2. The brushes must be lined up with the slip ring so that the entire face of each brush is in contact with the slip ring throughout the full 360° of slip ring rotation.

3. The brushes must contact the slip ring at an angle of approximately 2° from perpendicular to the slip ring surface, measured toward the direction of rotation of the slip ring.

b. Brush projection can normally be adjusted by loosening hardware attaching the brush block and holding the brushes in the desired location while retightening the hardware. Slotted holes are provided.

c. One method for face alignment is described in step "b". Another is to use shims between brush block and bracket. Laminated metal shims are generally provided. Layers of metal .003" are used to make up shims which are approximately 0.20" thick overall. Shims may be fabricated locally.

d. Loosen mounting bolts and twist block while tightening to attain proper angular adjustment.

CAUTION

Use care not to disturb other adjustments when adjusting angular alignment.

15-32. REPLACEMENT OF DE-ICE BOOTS. To remove or loosen installed de-ice boots, use toluol to soften the "cement line." Apply a minimum amount of this solvent to the cement line as tension is applied to peel back the boot. Removal should be slow enough to allow the solvent to undercut the cement so that parts will not be damaged. To install a propeller anti-ice boot, proceed as follows:

a. Clean the metal to be bonded with Methyl Ethyl

Ketone, (MEK). For final cleaning, wipe the solvent film off quickly with a clean, dry cloth before it has time to dry.

b. Prepare a pattern the size of the boot, including three inches of the boot strap. Draw a centerline (lengthwise) through the pattern.

c. Draw a line on the centerline of the leading edge of the blade. Position the pattern centerline over the leading edge centerline. Position pattern so bottom of boot is 1/2" below spinner cutout. Draw a line on the propeller hub on each side of the pattern boot strap where it crosses the hub. Check boot strap position by fitting restraining strap on the hub and comparing its position with the marked position of the strap.

d. Mask off an area 1/2" from each side and outer end of the pattern, and remove the pattern.

e. Mix EC-1300L cement (Minnesota Mining & Mfg. Co.) thoroughly and apply one even coat to the cleaned metal surface. Allow to dry for a minimum of one hour, then apply a second coat of the cement.

f. Moisten a clean cloth with Methyl Ethyl Ketone and clean the unglazed back surface of the boot, changing cloths frequently to avoid contamination of the cleaned area.

g. Apply one even coat of EC-1300L cement to back surface of boot. It is not necessary to cement more than 1/2" of the boot strap.

h. Using a silver-colored pencil, mark a centerline along the leading edge of the propeller blade and a corresponding centerline on the cemented side of the boot.

i. Reactivate the surface of the cement using a clean, link-free cloth, heavily moistened with toluol. Avoid excessive rubbing of cement, which would remove the cement.

j. Position the boot centerline on the propeller leading edge, starting at the hub end at the position marked. Make sure that boot strap will fall in the position marked. Tack the boot centerline to the leading edge of the propeller blade. If the boot is allowed to get off-center, pull up with a quick motion and replace properly. Roll firmly along centerline with a rubber roller.

k. Gradually tilting the roller, work the boot carefully over either side of the blade contour to avoid trapping air in pockets.

l. Roll outwardly from the centerline to the edges. If excess material at the edges tends to form wrinkles, work them out smoothly and carefully with fingers.

m. Apply one even coat of EC-539 (Minnesota Mining & Mfg. Co.), mixed per manufacturer's instructions, around the edges of the installed boot.

n. Remove masking tape from the propeller and clean the surface of the propeller by wiping with a clean cloth dampened with toluol.

o. Place restraining strap in position and secure with screws, washers and sleeves.

15-33. OXYGEN SYSTEM.

WARNING

Under NO circumstances should the ON-OFF control on the oxygen regulator be turned to the "ON" position with the outlet (low pressure) ports open to atmosphere. Operation of these units in this manner will induce serious damage to the regulators and have the following results:

1. Loss of outlet set pressure.
2. Loss of oxygen flow through the regulator which will result in inadequate oxygen being fed through the aircraft system.
3. Internal leakage of oxygen through regulator.

Opening of the control lever with the outlet ports open to atmosphere, results in an "overshoot" of the regulator metering device due to the extreme flow demand through the regulator. After overshooting, the metering poppet device goes into oscillation, creating serious damage to the poppet seat and diaphragm metering probe. This condition can occur even by turning the control lever on and then turning it quickly off.

A potential hazard exists to aircraft in the field where inexperienced personnel might remove the cylinder and regulator assembly from the aircraft and for some reason, attempt to turn the regulator to the "ON" position with the outlet ports open. Unfortunately, after the units have been improperly operated as noted, there is no outward appearance indicating that damage has occurred.

Testing these regulators should be accomplished only after installation in the aircraft, with the "downstream" low pressure line attached.

15-34. DESCRIPTION. The system is comprised of four oxygen cylinders, mounted in the cabin top area, in front of and behind the main carry-thru spar. Of the four cylinders, only one is a cylinder-regulator assembly. Remaining components of the system include a filler valve, located in the lower inboard surface of the right wing, cabin outlets, mask assemblies, and a pressure gage at the pilot's position. The pilot's supply line is designed to receive a greater flow of oxygen than the passengers. The pilot's mask is equipped with a microphone, keyed by a switch button on the pilot's control wheel. An ON-OFF control is provided at the pilot's position.

WARNING

Oil, grease or other lubricants in contact with high-pressure oxygen, create a serious fire hazard and such contact should be avoided. Do not permit smoking or open flame in or near aircraft while work is performed on oxygen systems.

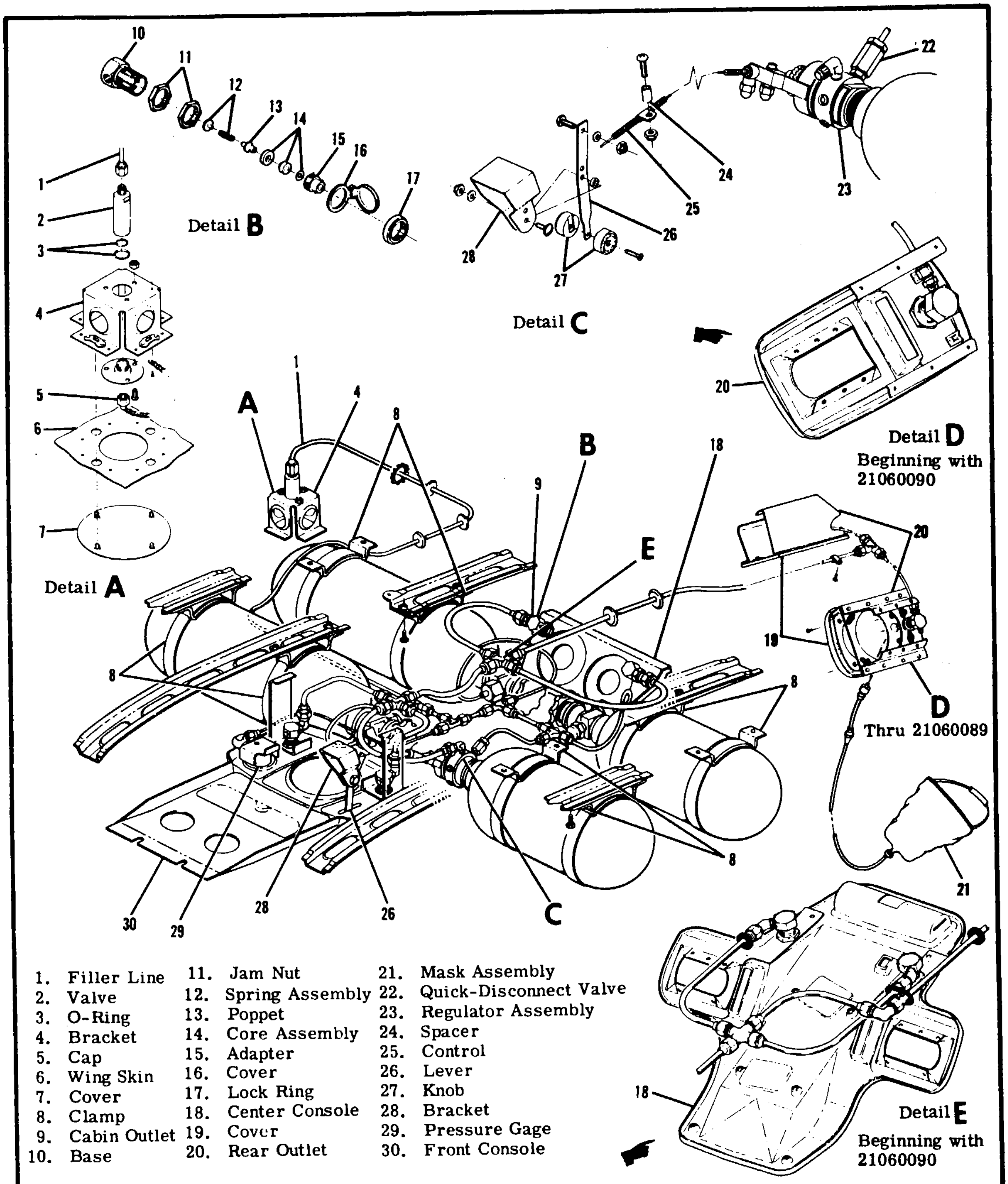
15-35. MAINTENANCE PRECAUTIONS.

a. Working area, tools and hands must be clean.

b. Keep oil, grease, water, dirt, dust and all other foreign matter from system.

c. Keep all lines dry and capped until installed.

d. Use only MIL-T-5542 thread compound or teflon lubricating tape on threads of oxygen valves, tubing connectors, fittings, parts of assemblies which might under any conditions, come in contact with oxygen. The thread compound must be applied sparingly and



1. Filler Line
2. Valve
3. O-Ring
4. Bracket
5. Cap
6. Wing Skin
7. Cover
8. Clamp
9. Cabin Outlet
10. Base
11. Jam Nut
12. Spring Assembly
13. Poppet
14. Core Assembly
15. Adapter
16. Cover
17. Lock Ring
18. Center Console
19. Cover
20. Rear Outlet
21. Mask Assembly
22. Quick-Disconnect Valve
23. Regulator Assembly
24. Spacer
25. Control
26. Lever
27. Knob
28. Bracket
29. Pressure Gage
30. Front Console

Figure 15-9. Oxygen System

carefully to only the first three threads of the male fitting. No compound shall be used on aluminum flared fittings or on the coupling sleeves or on the outside of the tube flares. The teflon tape shall be used in accordance with the instructions listed following this step. Extreme care must be exercised to prevent the contamination of the thread compound or teflon tape with oil, grease or other lubricant.

1. Lay tape on threads close to end of fitting. Clockwise on standard threads, opposite on left hand threads.
2. Apply enough tension while winding so tape forms into thread grooves.
3. After wrap is complete, maintain tension and tear tape by pulling apart in direction it was applied. Resulting ragged end is the key to the tape staying in place. (If sheared or cut, tape may unwind.)
4. Press tape well into threads.
5. Make connections.

e. Fabrication of oxygen pressure lines is not recommended. Lines should be replaced by part numbers called out in the aircraft Parts Catalog.

f. Lines and fittings must be clean and dry. One of the following methods may be used.

1. Clean by degreasing with stabilized trichlorethylene, conforming to Federal Specifications O-T-634 or MIL-T-27602. These items can be obtained from American Mineral Spirits of Houston, Texas.

NOTE

Most air compressors are oil lubricated, and a minute amount of oil may be carried by the airstream. If only an oil lubricated air compressor is available, drying must be accomplished by heating at a temperature of 250° to 300°F for a suitable period.

2. Flush with naphtha, conforming to Specification TT-N-95 (aliphatic naphtha). Blow clean and dry off all solvents with clean, dry, oil-free, filtered air. Flush with anti-icing fluid conforming to Specification TT-T-735 or anhydrous ethyl alcohol. Rinse thoroughly with fresh water. Dry thoroughly with a stream of clean, dry, oil-free, filtered air.

3. Flush with hot inhibited alkaline cleaner until free from oil and grease. Rinse with fresh water and dry with clean, dry, filtered air.

NOTE

Cap lines at both ends immediately after drying to prevent contamination.

15-36. REPLACEMENT OF COMPONENTS. Removal, disassembly, assembly and installation of system components may be accomplished while using figure 15-9 as a guide.

CAUTION

The pressure regulator, pressure gage and line and filler valve should be removed and replaced only by personnel familiar with high-pressure fittings. Observe the maintenance precautions listed in the preceding paragraph.

NOTE

Oxygen cylinder and regulator assemblies may not always be installed in the field exactly as illustrated in figure 15-9, which shows factory installation. Important points to remember are as follows.

a. Before removing cylinder, release low-pressure line by opening cabin outlets. Disconnect push-pull control cable, filler line, pressure gage line and outlet line from regulator. CAP ALL LINES IMMEDIATELY.

b. If it is necessary to replace filler valve O-rings, remove parts necessary for access to filler valve. Remove line from quick-disconnect valve at the regulator, then disconnect chain, but do not remove cap from filler valve. Remove screws securing valve and disconnect pressure line. Referring to applicable figure, cap pressure line and seat. Disassemble valve, replace O-rings and reassemble valve. Install filler valve by reversing procedures outlined in this step.

c. A cabin outlet is illustrated in figure 15-9. Repair kit, (part no. C166006-0108), available from the Cessna Service Parts Center, may be used for replacement of components of the outlet assembly.

d. To remove entire oxygen system, headliner must be lowered and soundproofing removed to expose lines. Refer to Section 3 for headliner removal.

15-37. OXYGEN CYLINDER GENERAL INFORMATION. The following information is permanently steel stamped on the shoulder, top head or neck of each oxygen cylinder:

a. Cylinder specification, followed by service pressure (e.g. "ICC-3AA1800" and "ICC-3HT1850" for standard and light weight cylinders respectively).

NOTE

Effective 1 January 1970, all newly- manufactured cylinders are stamped "DOT" (Department of Transportation), rather than "ICC" (Interstate Commerce Commission). An example of the new designation would be: "DOT-3HT1850".

b. Cylinder serial number is stamped below or directly following cylinder specification. The symbol of the purchaser, user or maker, if registered with the Bureau of Explosives, may be located directly below or following the serial number. The cylinder serial number may be stamped in an alternate location on the cylinder top head.

c. Inspector's official mark near serial number.

d. Date of manufacture: This is the date of the first hydrostatic test (such as 4-69 for April 1969). The dash between the month and the year figures may be replaced with the mark of the testing or inspection agency (e.g. 4L69).

e. Hydrostatic test date: The dates of subsequent hydrostatic tests shall be steel stamped (month and year) directly below the original manufacture date. The dash between the month and year figures can be replaced with the mark of the testing agency.

f. A Cessna identification placard is located near the center of the cylinder body.

g. Halogen test stamp: "Halogen Tested", date of test (month, day and year) and inspector's mark appears directly underneath the Cessna identification placard.

15-38. OXYGEN CYLINDER SERVICE REQUIREMENTS.

a. Hydrostatic test requirements:

1. Standard weight (ICC or DOT-3AA1800) cylinders must be hydrostatically tested to 5/3 their working pressure every five years commencing with the date of the last hydrostatic test.

2. Light weight (ICC or DOT-3HT1850) cylinders must be hydrostatically tested to 5/3 their working pressure every three years commencing with the date of the last hydrostatic test.

b. Service life requirements:

1. Standard weight (ICC or DOT-3AA1800) cylinders have no age life limitations and may continue to be used until they fail hydrostatic test.

2. Light weight (ICC or DOT-3HT1850) cylinders must be retired from service after 15 years or 4,380 filling cycles after date of manufacture, whichever occurs first.

NOTE

These test periods and life limitations are established by Federal Aviation Regulations, Part 43 Advisory Circular 43.13-1.

15-39. OXYGEN CYLINDER INSPECTION REQUIREMENTS.

a. Inspect the entire exterior surface of the cylinder for indication of abuse, dents, bulges and strap chafing.

b. Examine the neck of cylinder for cracks, distortion or damaged threads.

c. Check the cylinders to determine if markings are legible.

d. Check date of last hydrostatic test. If the periodic retest date is past, do not return the cylinder to service until the test has been accomplished.

e. Inspect the cylinder mounting bracket, bracket hold-down bolts and cylinder holding straps for cracks, deformation, cleanliness, and security of attachment.

f. In the immediate area where the cylinder is stored or secured, check for evidence of any types of interference, chafing, deformation or deterioration.

15-40. OXYGEN SYSTEM COMPONENT SERVICE REQUIREMENTS.

a. PRESSURE REGULATOR. The regulator shall be removed and overhauled by manufacturer or an FAA approved facility during hydrostatic testing.

b. FILLER VALVE. The valve should be disassembled, inspected and the O-rings replaced, regardless of condition, every 3 years or 3000 flight hours, whichever occurs first.

c. QUICK-RELEASE COUPLING. The coupling shall be functionally tested every two years and overhauled every five years or at time of hydrostatic test.

d. PRESSURE GAGE. The gage shall be checked for accuracy and cleaned by the manufacturer every 3 years or 3000 flight hours, whichever occurs first.

e. INDIVIDUAL OUTLETS. The outlets shall be disassembled and inspected and the O-rings replaced, regardless of condition, every 3 years or 3000 flight hours, whichever occurs first.

15-41. OXYGEN SYSTEM COMPONENT INSPECTION REQUIREMENTS.

a. Examine all parts for cracks, nicks, damaged threads or other apparent damage.

b. Actuate regulator controls and valve to check for ease of operation.

c. Determine if the gage is functioning properly by observing the pressure build-up and the return to zero when the system oxygen is bled off.

d. Replace any oxygen line that is chafed, rusted, corroded, dented, cracked or kinked.

e. Check fittings for corrosion around the threaded area where lines are joined together. Pressurize the system and check for leaks.

15-42. MASKS AND HOSE.

a. Check oxygen masks for fabric cracks and rough face seals. If the mask is a full-faced model, inspect glass or plastic for cleanliness and state of repair.

b. Flex the mask hose gently over its entirety and check for evidence of deterioration or dirt.

c. Examine mask and hose storage compartment for cleanliness and general condition.

15-43. MAINTENANCE AND CLEANING.

a. Clean and disinfect mask assemblies after use, as appropriate.

NOTE

Use care to avoid damaging microphone assembly while cleaning and sterilizing.

b. Wash mask with a mild soap solution and rinse it with clear water.

c. To sterilize, swab mask thoroughly with a gauze or sponge soaked in a water/merthiolate solution. This solution should contain 1/5 teaspoon of merthiolate per one quart of water. Wipe the mask with a clean cloth and let air dry.

d. Observe that each mask breathing tube end is free of nicks and that the tube end will slip into the cabin oxygen receptacle with ease and will not leak.

e. If a mask assembly is defective (leaks, does not allow breathing or contains a defective microphone) it is advisable to return the mask assembly to the manufacturer or a repair station.

f. Replace hose if it shows evidence of deterioration.

g. Hose may be cleaned in the same manner as the mask.

15-44. SYSTEM PURGING. Whenever components have been removed and reinstalled or replaced, it is advisable to purge the system. Charge oxygen system in accordance with procedures outlined in paragraph 15-47. Plug masks into all outlets and turn the pilot's control to ON position and purge system by allowing oxygen to flow for at least 10 minutes. Smell oxygen flowing from outlets and continue to

NOTE

Each interconnected series of oxygen cylinders is equipped with a single gage. The trailer type cascade may also be equipped with a nitrogen cylinder (shown reversed) for filling landing gear struts, accumulators, etc. Cylinders are not available for direct purchase, but are usually leased and refilled by a local compressed gas supplier.

Service Kit SK310-32 (available from the Cessna Service Parts Center) contains an adapter, a pressure gage, hose, lines, and fittings for equipping two oxygen cylinders to service oxygen systems. As noted in the Service Kit, a tee (Part No. 11844) and a pigtail (Part No. 1243-2) should be ordered for each additional cylinder to be used in the cascade of cylinders. Be sure to ground the airplane and ground servicing equipment before use.

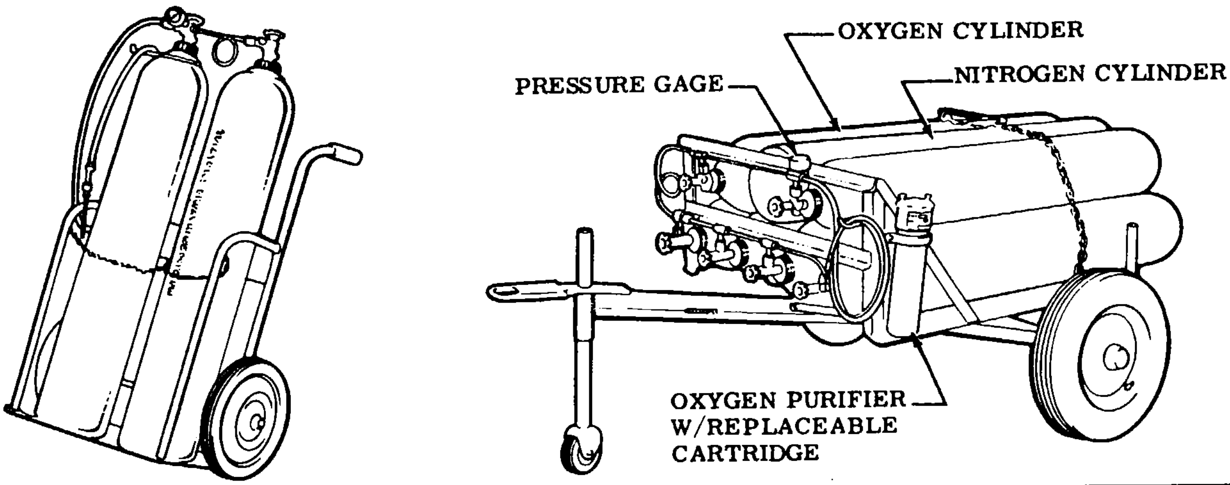


Figure 15-10. Typical Portable Oxygen Cascades

purge until system is odorless. Refill cylinders as required during and after purging.

15-45. FUNCTIONAL TESTING. Whenever the regulator and cylinder assembly has been replaced or overhauled, perform the following flow and internal leakage tests to check that the system functions properly.

a. Fully charge oxygen system in accordance with procedures outlined in paragraph 15-47.

b. Disconnect line and fitting assembly from pilot's mask and line assembly. Insert outlet end of line and fitting assembly into cabin outlet and attach opposite end of line to a pressure gage (gage should be calibrated in one-pound increments from 0 to 100 PSI). Place control lever in ON position. Gage pressure should read 70±10 PSI.

c. Insert mask and line assemblies into all remaining cabin outlets. With oxygen flowing from all outlets, test gage pressure should still be 70±10 PSI.

d. Place oxygen control lever in OFF position and allow test gage pressure to fall to 0 PSI. Remove all adapter assemblies except the one with the pressure gage. The pressure must not rise above 0 PSI when observed for one minute. Remove pressure gage and adapter from oxygen outlet.

NOTE

If pressures specified in the foregoing procedures are not obtained, the oxygen regulator is not operating properly. Remove and replace cylinder-regulator assembly with another unit and repeat test procedure.

e. Connect mask and line assemblies to each cabin outlet and check each mask for proper operation.

f. Check pilot's mask microphone and control wheel switch for proper operation. After checking, return all masks to mask case.

g. Recharge oxygen system in accordance with procedures outlined in paragraph 15-47.

15-46. SYSTEM LEAK TEST. When oxygen is being lost from a system through leakage, a sequence of steps may be necessary to locate the opening. Leakage may often be detected by listening for the distinct hissing of escaping gas. If this check proves negative, it will be necessary to soap-test all lines and connections with a castile soap and water solution or specially compounded leak-test material. Make the solution thick enough to adhere to the contours of the fittings. At the completion of the leakage test, remove all traces of the leak detector or soap and water solution.

CAUTION

Do not attempt to tighten any connections while the system is charged.

15-47. SYSTEM CHARGING.

WARNING

BE SURE TO GROUND AIRCRAFT AND GROUND SERVICING EQUIPMENT BEFORE CHARGING OXYGEN SYSTEM.

a. Do not attempt to charge oxygen cylinders if servicing equipment fittings or filler valve are corroded or contaminated. If in doubt, clean with stabilized trichlorethylene and let air dry. Do not allow solvent to enter any internal parts.

b. If cylinder is completely empty, do not charge, as the cylinder must then be removed, inspected and cleaned.

CAUTION

A cylinder which is completely empty may well be contaminated. The regulator and cylinder assembly must then be disassembled, inspected and cleaned by an FAA approved facility, before filling. Contamination, as used here, means dirt, dust or any other foreign material, as well as ordinary air in large quantities. If a gage line or filler line is disconnected and the fittings capped immediately, the cylinder will not become contaminated unless temperature variation has created a suction within the cylinder. Ordinary air contains water vapor which could condense and freeze. Since there are very small orifices in the system, it is very important that this condition not be allowed to occur.

c. Connect cylinder valve outlet or outside filler valve to manifold or portable oxygen cascade.

d. Slowly open valve on cascade cylinder or manifold with lowest pressure, as noted on pressure gage, allow pressure to equalize, then close cascade cylinder valve.

e. Repeat this procedure, using a progressively higher pressure cascade cylinder, until system has been charged to the pressure indicated in the chart immediately following step "f" of this paragraph.

f. Ambient temperature listed in the chart is the air temperature in the area where the system is to be charged. Filling pressure refers to the pressure to which aircraft cylinders should be filled. This table gives approximations only and assumes a rise in temperature of approximately 25°F. due to heat of compression. This table also assumes the aircraft cylinders will be filled as quickly as possible and that they will only be cooled by ambient air; no water bath or other means of cooling be used.

Example: If ambient temperature is 70°F., fill aircraft cylinders to approximately 1,975 psi or as close to this pressure as the gage may read. Upon cooling, cylinders should have approximately 1,850 psi pressure.

TABLE OF FILLING PRESSURES

Ambient Temp. °F	Filling Press. psig	Ambient Temp. °F	Filling Press. psig
0	1650	70	1975
10	1700	80	2000
20	1725	90	2050
30	1775	100	2100
40	1825	110	2150
50	1875	120	2200
60	1925	130	2250

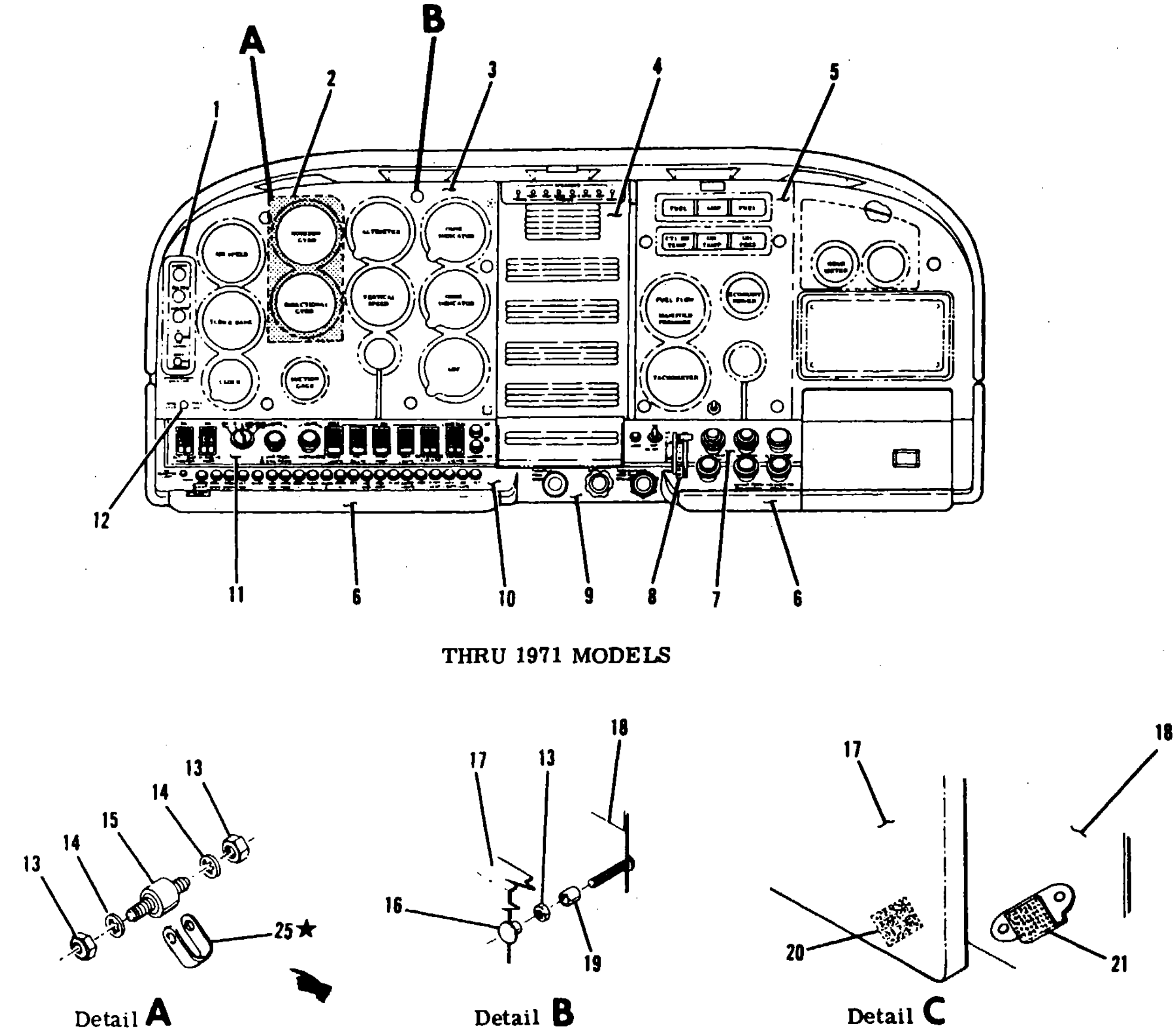
SECTION 16

INSTRUMENTS AND INSTRUMENT SYSTEMS

TABLE OF CONTENTS Page

16-1. INSTRUMENTS AND INSTRUMENT SYSTEMS.

16.2. GENERAL. This section describes typical instrument installations and their respective operating systems. Emphasis is placed on trouble shooting and corrective measures only. It does NOT deal with specific instrument repairs since this usually requires special equipment and data and should be handled by instrument specialists. Federal Aviation Regulations require malfunctioning instruments be sent to an approved instrument overhaul and repair station or returned to manufacturer for servicing. Our concern here is with preventive maintenance on various instrument systems and correction of system faults which result in instrument malfunctions. The descriptive material, maintenance and trouble shooting information in this section is intended to help the mechanic determine malfunctions and correct them, up to the defective instrument itself, at which point an instrument technician should be called in. Some instruments, such as fuel quantity and oil pressure gages, are so simple and inexpensive, repairs usually will be more costly than a new instrument. On the other hand, aneroid and gyro instruments usually are well worth repairing. The words "replace instrument" in the text, therefore, should be taken only in the sense of physical replacement in the aircraft. Whether replacement is to be with a new instrument, an exchange one, or the original instrument is to be repaired must be decided on basis of individual circumstances.



★ BEGINNING WITH 21060569

1. Marker Beacon Controls
2. Shock-Mounted Panel
3. Removeable Flight Instrument Panel
4. Radio and Switch Panel
5. Fuel and Engine Instruments
6. Protection Pad
7. Heating and Ventilating Controls
8. Wing Flap Controls
9. Engine Controls
10. Circuit Breaker Panel
11. Ignition and Switch Panel
12. Wing Leveler Controls
13. Nut
14. Lock Washer
15. Shock-Mount
16. Button
17. Decorative Cover
18. Stationary Panel
19. Spacer
20. Pile
21. Hook
22. Locating Pin
23. Shim
24. Grommet
25. Ground Strap

Figure 16-1. Instrument Panel (Typical) (Sheet 1 of 2)

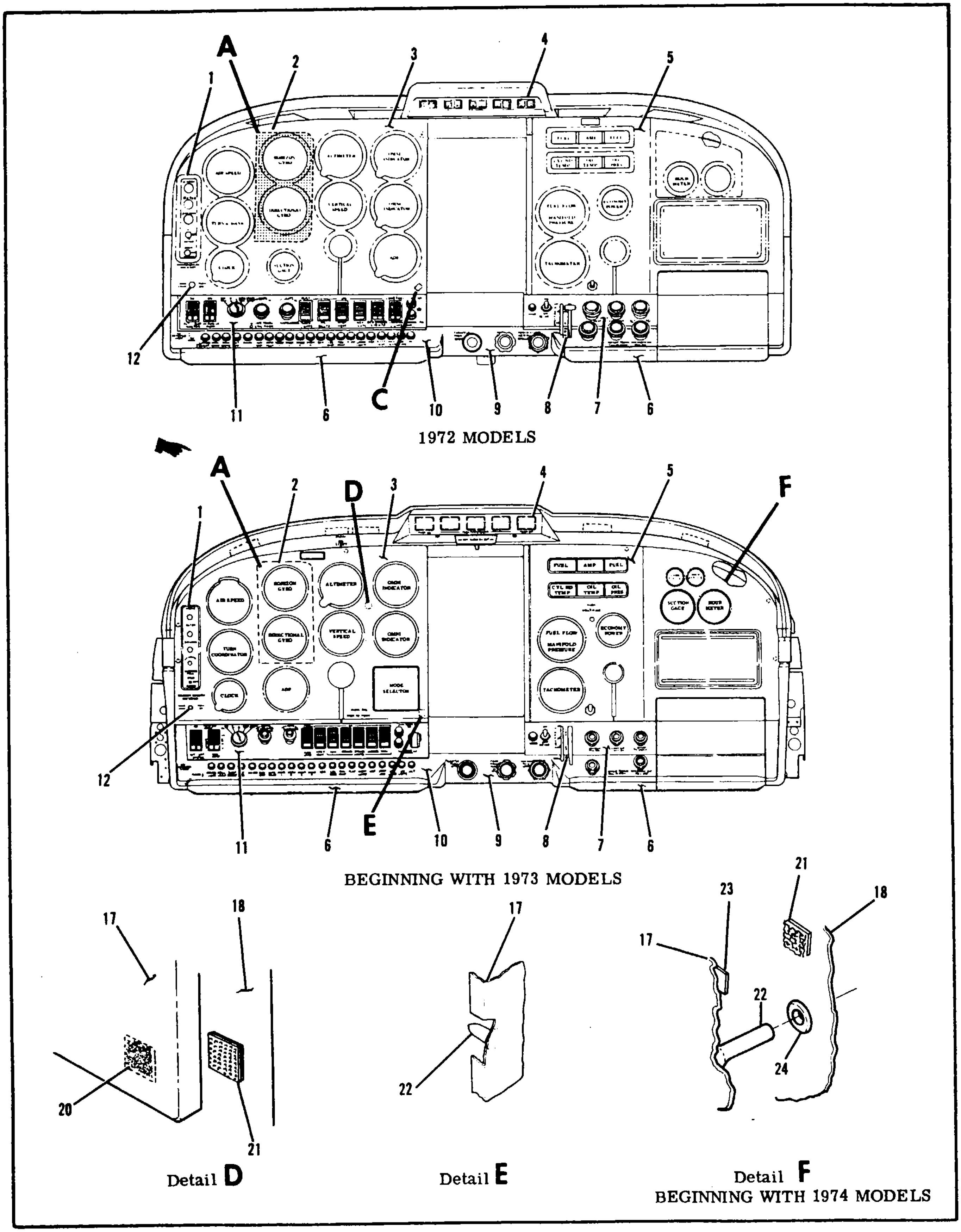


Figure 16-1. Instrument Panel (Typical) (Sheet 2 of 2)

16-3. INSTRUMENT PANEL. (Refer to figure 16-1.)

16-4. DESCRIPTION. The instrument panel assembly consists of a stationary panel, a removable flight instrument panel and a shock-mounted panel. The stationary panel, containing fuel and engine instruments is secured to the engine mount stringers and a forward fuselage bulkhead. The removable panel, containing flight instruments such as airspeed, vertical speed and altimeter is secured to the stationary panel with screws. The shock-mounted panel, containing major flight instruments such as the horizontal and directional gyros is secured to the removable panel with rubber shock-mounted assemblies. Most of the instruments are screw mounted on the panel backs.

16-5. REMOVAL AND INSTALLATION.

a. FLIGHT INSTRUMENT PANEL.

1. Thru 1971 Models remove retainer clips securing decorative cover by carefully prying under clip buttons. Do not drop spacers attached to the clips. On 1972 Models decorative covers are installed with Velcro fasteners and are removed by pulling on the cover at the fastener.
2. Remove switch mounting nuts and switches as necessary and remove decorative cover.
3. Tag and disconnect plumbing and wiring.
4. Remove screws securing flight instrument panel to stationary panel and pull panel straight back.
5. Reverse preceding steps for reinstallation.

b. SHOCK-MOUNTED PANEL.

NOTE

Due to the difficulty encountered when removing the shock-mounted panel with the gyros installed, it is recommended that the directional gyro be disconnected and removed prior to removal of the shock-mounted panel.

1. Complete steps 1 and 2 above.
2. Tag and disconnect gyro plumbing.
3. Remove directional gyro mounting screws and remove gyro from shock-mounted panel.
4. Remove shock-mount nuts and work shock-mounted panel out from behind flight instrument panel. The horizontal gyro may also be removed from shock-mounted panel, if desired.
5. Reverse preceding steps for reinstallation.

16-6. SHOCK-MOUNTS. Service life of shock-mounted instruments is directly related to adequate shock-mounting of the panel. If removal of shock-mounted panel is necessary, check mounts for deterioration and replace as necessary.

16-7. INSTRUMENTS. (Refer to figure 16-1.)

16-8. REMOVAL. Most instruments are secured to the panel with screws inserted through the panel face, under the decorative cover. To remove an instrument, remove decorative cover, disconnect wiring or plumbing to instrument, remove mounting screws and take instrument out from behind, or in some cases, from front of panel. Instrument clusters are installed as units and are secured by a screw at each end. A cluster must be removed from the forward side of the stationary panel to replace an individual gage. In all cases when an instrument is removed, disconnected lines or wires should be protected. Cap open lines and cover pressure connections on instrument to prevent thread damage and entrance of foreign matter. Wire terminals should be insulated or tied up to prevent accidental grounding or short-circuiting.

16-9. INSTALLATION. Generally, installation procedure is the reverse of removal procedure. Ensure mounting screw nuts are tightened firmly, but do not over-tighten, particularly on instruments having plastic cases. The same rule applies to connecting plumbing and wiring.

NOTE

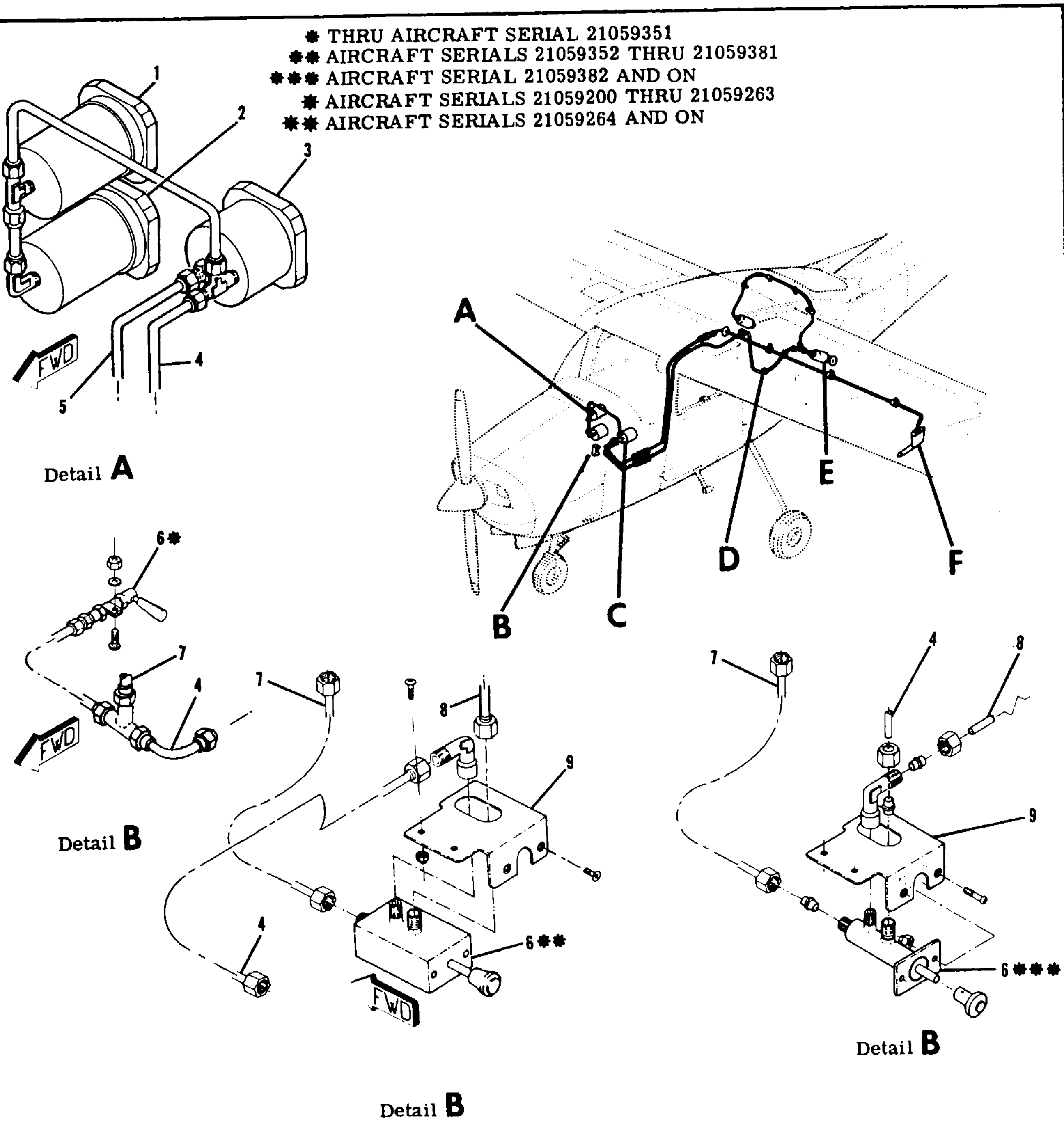
All instruments (gages and indicators), requiring a thread seal or lubricant, shall be installed using teflon tape on male fittings only. This tape is available through the Cessna Service Parts Center.

When replacing an electrical gage in an instrument cluster assembly, avoid bending pointer or dial plate. Distortion of dial or back plate could change the calibration of gages.

16-10. PITOT AND STATIC SYSTEMS. (Refer to figure 16-2.)

16-11. DESCRIPTION. The pitot system conveys ram air pressure to the airspeed indicator. The static system vents vertical speed indicator, altimeter and airspeed indicator to atmospheric pressure through plastic tubing connected to the static ports. A static line sump is installed at each source button to collect condensation in the static system. A pitot tube heater and stall warning heater may be installed. The heating elements are controlled by a switch at the instrument panel and powered by the electrical system. A static pressure alternate source valve may be installed in the static system for use when the external static source is malfunctioning. This source is to be used only in emergencies. When used as a static source, cabin pressure is substituted for atmospheric pressure, causing the instrument readings to vary from normal. This valve also permits draining condensate from the static lines. Refer to Owner's Manual for flight operation using alternate static source pressure.

16-12. MAINTENANCE. Proper maintenance of the pitot and static system is essential for proper operation of altimeter, vertical speed and airspeed indicators. Leaks, moisture and obstructions in the pitot system will result in false airspeed indications, while static system malfunctions will affect the readings of all three instruments. Under instrument flight conditions, these instrument errors could be hazardous. Cleanliness and security are the principal rules for system maintenance. The pitot tube and static ports MUST be kept clean and unobstructed.



1. Altimeter
2. Vertical Speed Indicator
3. Airspeed Indicator
4. Static Line (To Sump)
5. Pitot Line (To Pitot Tube)
6. Alternate Static Source Valve
7. Line (To Airspeed)
8. Line (Alternate Air)
9. Bracket
10. Spacer
11. Instrument Panel
12. True Airspeed Ring
13. Retainer
14. Mounting Screw
15. Decorative Cover
16. Sump
17. Heater Element (Heated Pitot Only)
18. Pitot Tube Mast Body
19. Connector
20. Static Port
21. Second Altimeter

NOTE

Do not overtighten screws (14), and do not lubricate any parts.

Use spacers (10) as required for adequate friction on ring assembly (12).

Figure 16-2. Pitot-Static System (Sheet 1 of 2)

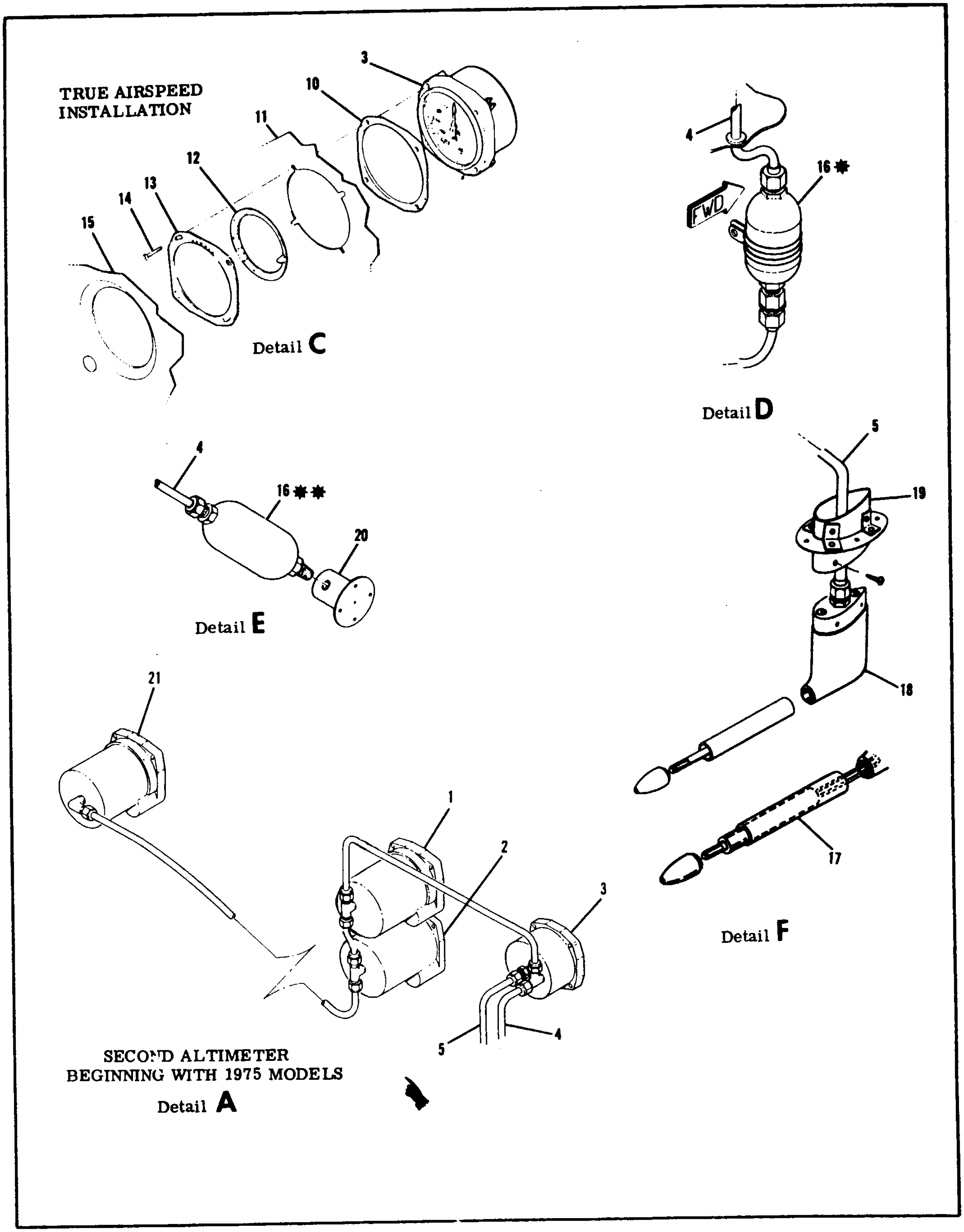


Figure 16-2. Pitot-Static System (Sheet 2 of 2)

16-13. STATIC PRESSURE SYSTEM INSPECTION AND LEAKAGE TEST. The following procedure outlines inspection and testing of the static pressure system, assuming the altimeter has been tested and inspected in accordance with current Federal Aviation Regulations.

a. Ensure that the static system is free from entrapped moisture and restrictions.

b. Ensure that no alterations or deformations of the airframe surface have been made which would affect the relationship between air pressure in the static pressure system and true ambient static air pressure for any flight configuration.

c. Seal one static source port with pressure sensitive tape. This seal must be air tight.

d. Close the static pressure alternate source valve, if installed.

e. Attach a source of suction to the remaining static pressure source opening. Figure 16-3 shows one method of obtaining suction.

f. Slowly apply suction until the altimeter indicates a 1000-foot increase in altitude.

CAUTION

When applying or releasing suction, do not exceed the range of vertical speed indicator or airspeed indicator.

g. Cut off the suction source to maintain a "closed" system for one minute. Leakage shall not exceed 100 feet of altitude loss as indicated on the altimeter.

h. If leakage rate is within tolerance, slowly release the suction source and remove the tape from static port.

NOTE

If leakage rate exceeds the maximum allowable, first tighten all connections, then repeat leakage test. If leakage rate still exceeds the maximum allowable, use the following procedure.

i. Disconnect the static pressure lines from airspeed indicator and vertical speed indicator. Use suitable fittings to connect the lines together so the altimeter is the only instrument still connected into the static pressure system.

j. Repeat the leakage test to check whether the static pressure system or the bypassed instruments are the cause of leakage. If the instruments are at fault, they must be repaired by an "appropriately rated repair station" or replaced. If the static pressure system is at fault, use the following procedure to locate leakage.

k. Attach a source of positive pressure to the static source opening. Figure 16-3 shows one method of obtaining positive pressure.

CAUTION

Do not apply positive pressure with the airspeed indicator or vertical speed indicator connected to the static pressure system.

l. Slowly apply positive pressure until the altimeter indicates a 500-foot decrease in altitude and maintain this altimeter indication while checking for leaks. Coat line connections and static source flange with LEAK-TEC or a solution of mild soap and water, watching for bubbles to locate leaks.

m. Tighten leaking connections. Repair or replace parts found defective.

n. Reconnect the airspeed and vertical speed indicators into the static pressure system and repeat leakage test per steps "c" thru "h".

16-14. PITOT SYSTEM INSPECTION AND LEAKAGE TEST. To check the pitot system for leaks, place a piece of tape over the small hole in the lower aft end of pitot tube, fasten a piece of rubber or plastic tubing over pitot tube, close opposite end of tubing and slowly roll up tube until airspeed indicator registers in cruise range. Secure tube and after a few minutes recheck airspeed indicator. Any leakage will have reduced the pressure in system, resulting in a lower airspeed indication. Slowly unroll tubing before removing it, so pressure is reduced gradually. Otherwise instrument may be damaged. If test reveals a leak in system, check all connections for tightness.

16-15. BLOWING OUT LINES. Although the pitot system is designed to drain down to the pitot tube opening, condensation may collect at other points in the system and produce a partial obstruction. To clear the line, disconnect it at the airspeed indicator. Using low pressure air, blow from the indicator end of line toward the pitot tube.

CAUTION

Never blow through pitot or static lines toward the instruments.

Like the pitot lines, static pressure lines must be kept clear and connections tight. Static source sumps collect moisture and keeps system clear. However, when necessary, disconnect static line at first instrument to which it is connected, then blow the line clear with low pressure air.

NOTE

On aircraft equipped with an alternate static source, use the same procedure, opening the alternate static source valve momentarily to clear line, then close valve and clear the remainder of system.

Check all static pressure line connections for tightness. If hose or hose connections are used, check them for general condition and clamps for security. Replace hose which have cracked, hardened or show other signs of deterioration.

16-16. REMOVAL AND INSTALLATION OF COMPONENTS. (Refer to figure 16-2). To remove the pitot mast, remove the four mounting screws on the side of connector (19) and pull mast out of connector far enough to disconnect pitot line (5). Electrical connections to the heater assembly (if installed) may be disconnected through the wing access opening just inboard of mast. Pitot and static lines are removed in the usual manner, after removing wing access plates, lower wing fairing strip and upholstery as required. Installation of tubing will be simpler if a guide wire is drawn in as tubing is removed from wing. The tubing may be removed intact by drawing it out through cabin and right door. When replacing components of pitot and static pressure systems, use anti-seize compound sparingly on male threads on both metal and plastic connections. Avoid excess compound which might enter lines. Tighten connections firmly, but avoid overtightening and distorting fittings. If twisting of plastic tubing is encountered when tightening fittings, VV-P-236 (USP Petrolatum), may be applied sparingly between tubing and fittings.

16-17. TROUBLE SHOOTING--PITOT-STATIC SYSTEM.

TROUBLE	PROBABLE CAUSE	REMEDY
LOW OR SLUGGISH AIRSPEED INDICATION. Normal altimeter and vertical speed.	Pitot tube deformed, leak or obstruction in pitot line.	Straighten tube, repair or replace damaged line.
INCORRECT OR SLUGGISH RESPONSE. All three instruments.	Leaks or obstruction in static line.	Repair or replace line.
	Alternate static source valve open.	Close for normal operation.

16-18. TRUE AIRSPEED INDICATOR. A true airspeed indicator may be installed. This indicator, equipped with a conversion ring, may be rotated until pressure altitude is aligned with outside air temperature, then airspeed indicated on the instrument is read as true airspeed on the adjustable ring. Refer to figure 16-2 for removal and installation. Upon installation, before tightening mounting screws (14), calibrate the instrument as follows: Rotate ring (12) until 120 mph on adjustable ring aligns with 120 mph on indicator. Holding this setting, move retainer (13) until 60°F aligns with zero pressure altitude, then tighten mounting screws (14) and replace decorative cover (15).

NOTE

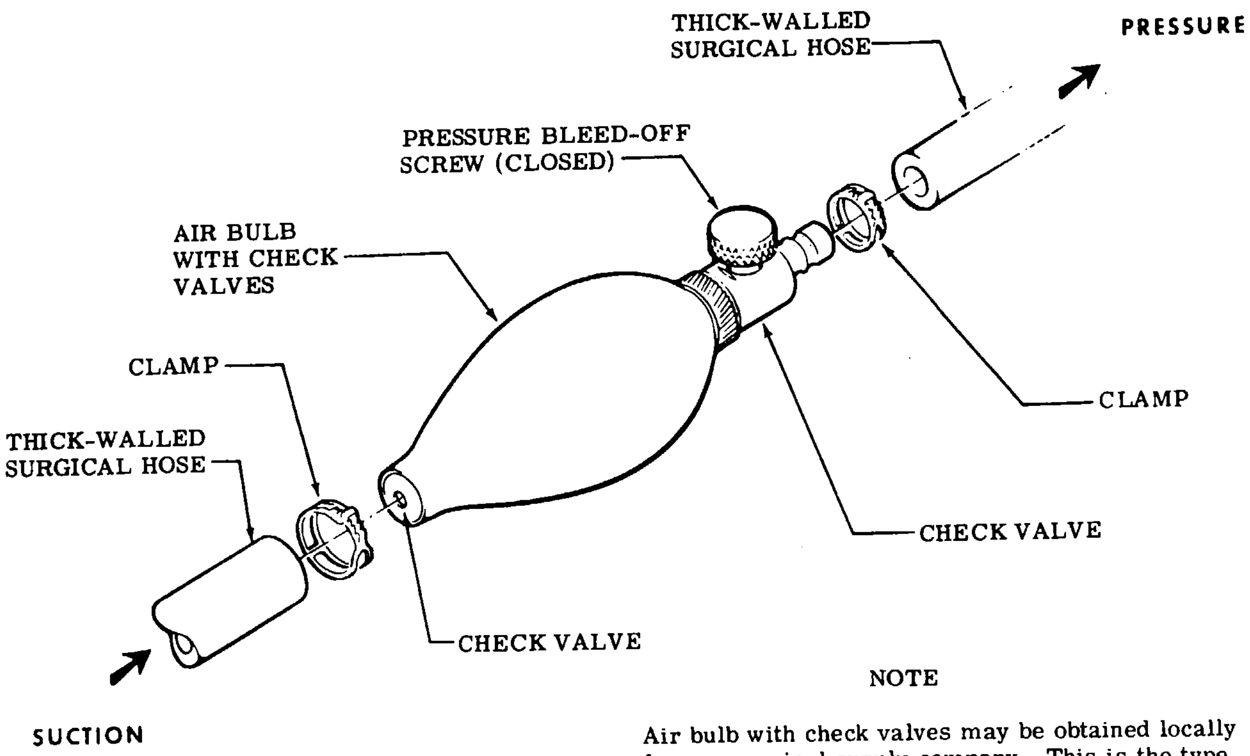
Beginning with aircraft serial 21061040, true airspeed indicators are graduated in knots. Therefore, use 105 knots instead of 120 miles per hour in the above calibration procedure.

16-19. TROUBLE SHOOTING.

NOTE

Refer to paragraph 16-15 before blowing out pitot or static lines.

TROUBLE	PROBABLE CAUSE	REMEDY
HAND FAILS TO RESPOND.	Pitot pressure connection not properly connected to pressure line from pitot tube.	Repair or replace damaged line, tighten connections.
	Pitot or static lines clogged.	Blow out lines.
INCORRECT INDICATION OR HAND OSCILLATES.	Leak in pitot or static lines.	Repair or replace damaged lines, tighten connections.
	Defective mechanism.	Replace instrument.
	Leaking diaphragm.	Replace instrument.
	Alternate static source valve open.	Close for normal operation.



NOTE

Air bulb with check valves may be obtained locally from a surgical supply company. This is the type used in measuring blood pressure.

TO APPLY SUCTION:

1. Squeeze air bulb to expel as much air as possible.
2. Hold suction hose firmly against static pressure source opening.
3. Slowly release air bulb to obtain desired suction, then pinch hose shut tightly to trap suction in system.
4. After leak test, release suction slowly by intermittently allowing a small amount of air to enter static system. To do this, tilt end of suction hose away from opening, then immediately tilt it back against opening. Wait until vertical speed indicator approaches zero, then repeat. Continue to admit this small amount of air intermittently until all suction is released, then remove test equipment.

TO APPLY PRESSURE:

CAUTION

Do not apply positive pressure with airspeed indicator or vertical speed indicator connected into static system.

1. Hold pressure hose firmly against static pressure source opening.
2. Slowly squeeze air bulb to apply desired pressure to static system. Desired pressure may be maintained by repeatedly squeezing bulb to replace any air escaping through leaks.
3. Release pressure by slowly opening pressure bleed-off screw, then remove test equipment.

Figure 16-3. Static System Test Equipment

16-19. TROUBLE SHOOTING (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
HAND VIBRATES.	Excessive vibration caused by loose mounting screws.	Tighten mounting screws.
	Excessive tubing vibration.	Tighten clamps and connections, replace tubing with flexible hose.

16-20. TROUBLE SHOOTING -- ALTIMETER.

NOTE

Refer to paragraph 16-15 before blowing out pitot or static lines.

TROUBLE	PROBABLE CAUSE	REMEDY
INSTRUMENT FAILS TO OPERATE.	Static line plugged.	Blow out lines.
	Defective mechanism.	Replace instrument.
INCORRECT INDICATION.	Hands not carefully set.	Reset hands with knob.
	Leaking diaphragm.	Replace instrument.
	Pointers out of calibration.	Replace instrument.
HAND OSCILLATES.	Static pressure irregular.	Blow out lines, tighten connections.
	Leak in airspeed or vertical speed indicator installations.	Blow out lines, tighten connections.

16-21. TROUBLE SHOOTING--VERTICAL SPEED INDICATOR.

NOTE

Refer to paragraph 16-15 before blowing out pitot or static lines.

TROUBLE	PROBABLE CAUSE	REMEDY
INSTRUMENT FAILS TO OPERATE.	Static line plugged.	Blow out lines.
	Static line broken.	Repair or replace damaged line, tighten connections.
INCORRECT INDICATION.	Partially plugged static line.	Blow out lines.
	Ruptured diaphragm.	Replace instrument.
	Pointer off zero.	Reset pointer to zero.

16-21. TROUBLE SHOOTING (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
POINTER OSCILLATES.	Partially plugged static line.	Blow out lines.
	Leak in static line.	Repair or replace damaged lines, tighten connections.
	Leak in instrument case.	Replace instrument.

16-22. TROUBLE SHOOTING--PITOT TUBE HEATER.

NOTE

Refer to paragraph 16-15 before blowing out pitot or static lines.

TROUBLE	PROBABLE CAUSE	REMEDY
TUBE DOES NOT HEAT OR CLEAR ICE.	Switch turned "OFF."	Turn switch "ON."
	Popped circuit breaker.	Reset breaker.
	Break in wiring.	Repair wiring.
	Heating element burned out.	Replace element.

16-23. VACUUM SYSTEM. (Refer to figure 16-4.)

16-24. DESCRIPTION. Suction to operate the gyros is provided by an engine-driven vacuum pump, gear-driven through a spline-type coupling mounted on the engine accessory section. The pump discharge air passes through an oil separator, where the oil, which passes through the pump for lubrication, is returned to the engine sump and the air is expelled overboard. A suction relief valve, to control system pressure, is connected between the pump inlet and the instruments. In the cabin, the vacuum line is routed from the gyro instruments to the relief valve. A central air filtering system is utilized. The reading of the suction gage indicates net difference in the suction before and after the air passes through a gyro. This differential pressure will gradually decrease as the central air filter becomes dirty, causing a lower reading on the suction gage. Beginning with Aircraft Serial 210-59819 a dry vacuum system is installed. The vacuum pump is a sealed bearing unit which eliminates the oil separator components, the separator, discharge line and engine oil return line from the system. Description of the system and components are otherwise unchanged.

16-25. TROUBLE SHOOTING -- VACUUM SYSTEM.

TROUBLE	PROBABLE CAUSE	REMEDY
HIGH SUCTION GAGE READINGS. (Gyros function normally.)	Relief valve screen clogged, relief valve malfunction.	Clean screen, reset valve. Replace gage.
LOW SUCTION GAGE READINGS.	Leaks or restriction between instruments and relief valve, relief valve out of adjustment, defective pump.	Repair or replace lines, adjust or replace relief valve, repair or replace pump.
	Restriction in oil separator or pump discharge line. (wet system)	Clean oil separator. (Thru 21059818)

16-25. TROUBLE SHOOTING (Cont).

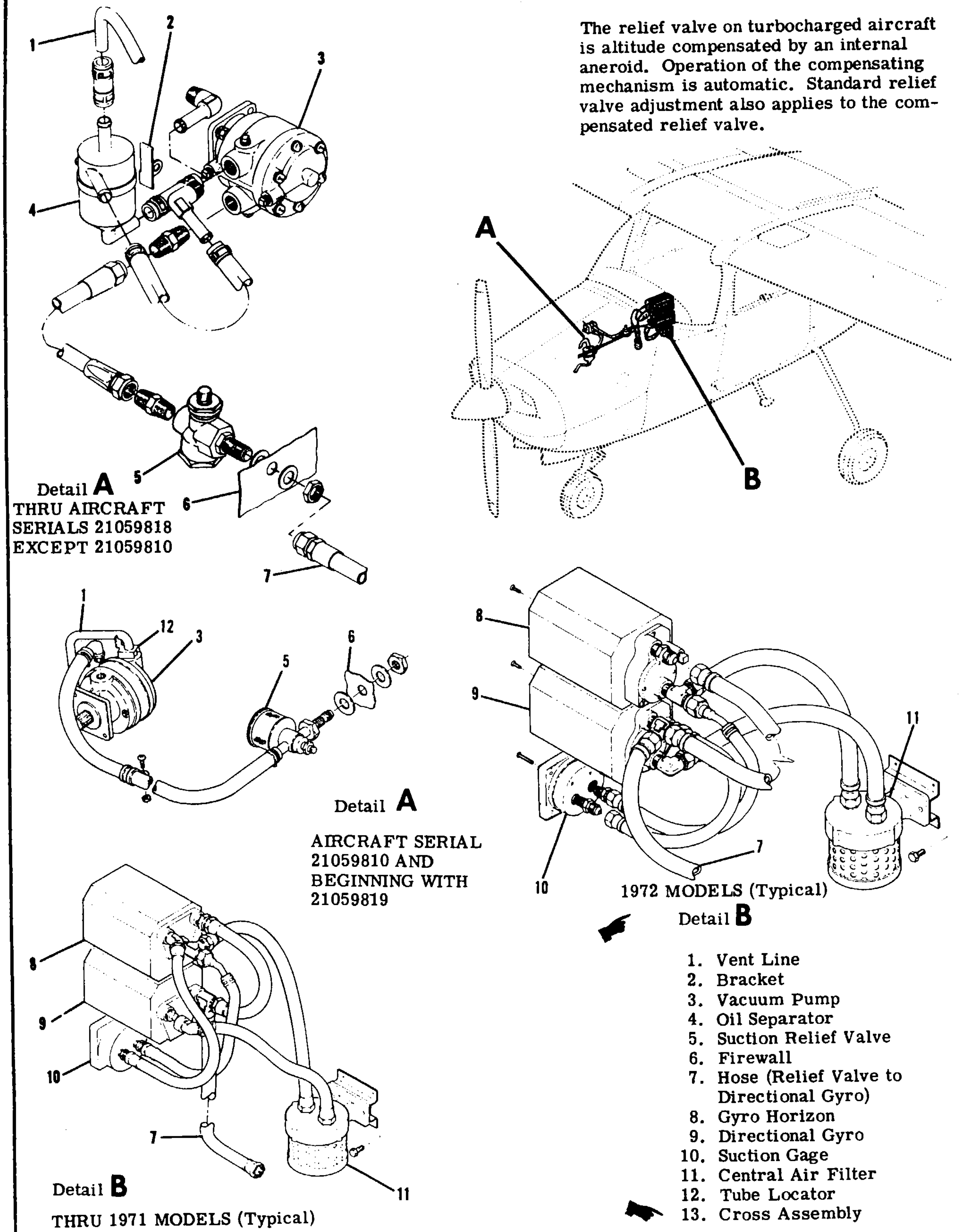
TROUBLE	PROBABLE CAUSE	REMEDY
SUCTION GAGE FLUCTUATES.	Defective gage or sticking relief valve.	Replace gage. Clean sticking valve with Stoddard solvent. Blow dry and test. If valve sticks after cleaning, replace it.

16-26. TROUBLE SHOOTING -- GYROS.

TROUBLE	PROBABLE CAUSE	REMEDY
HORIZON BAR FAILS TO RESPOND.	Central air filter dirty.	Clean or replace filter.
	Suction relief valve improperly adjusted.	Adjust or replace relief valve.
	Faulty suction gage.	Replace suction gage.
	Vacuum pump failure.	Replace pump.
	Vacuum line kinked or leaking.	Repair or replace damaged lines, tighten connections.
HORIZON BAR DOES NOT SETTLE.	Defective mechanism.	Replace instrument.
	Insufficient vacuum.	Adjust or replace relief valve.
	Excessive vibration.	Replace defective shock panel mounts.
HORIZON BAR OSCILLATES OR VIBRATES EXCESSIVELY.	Central air filter dirty.	Clean or replace filter.
	Suction relief valve improperly adjusted.	Adjust or replace relief valve.
	Faulty suction gage.	Replace suction gage.
	Defective mechanism.	Replace instrument.
	Excessive vibration.	Replace defective shock panel mounts.
EXCESSIVE DRIFT IN EITHER DIRECTION.	Central air filter dirty.	Clean or replace filter.
	Low vacuum, relief valve improperly adjusted.	Adjust or replace relief valve.
	Faulty suction gage.	Replace suction gage.
	Vacuum pump failure.	Replace pump.
	Vacuum line kinked or leaking.	Repair or replace damaged lines, tighten connections.
DIAL SPINS IN ONE DIRECTION CONTINUOUSLY.	Operating limits have been exceeded.	Replace instrument.
	Defective mechanism.	Replace instrument.

NOTE

The relief valve on turbocharged aircraft is altitude compensated by an internal aneroid. Operation of the compensating mechanism is automatic. Standard relief valve adjustment also applies to the compensated relief valve.



1. Vent Line
2. Bracket
3. Vacuum Pump
4. Oil Separator
5. Suction Relief Valve
6. Firewall
7. Hose (Relief Valve to Directional Gyro)
8. Gyro Horizon
9. Directional Gyro
10. Suction Gage
11. Central Air Filter
12. Tube Locator
13. Cross Assembly

Figure 16-4. Vacuum System (Sheet 1 of 2)

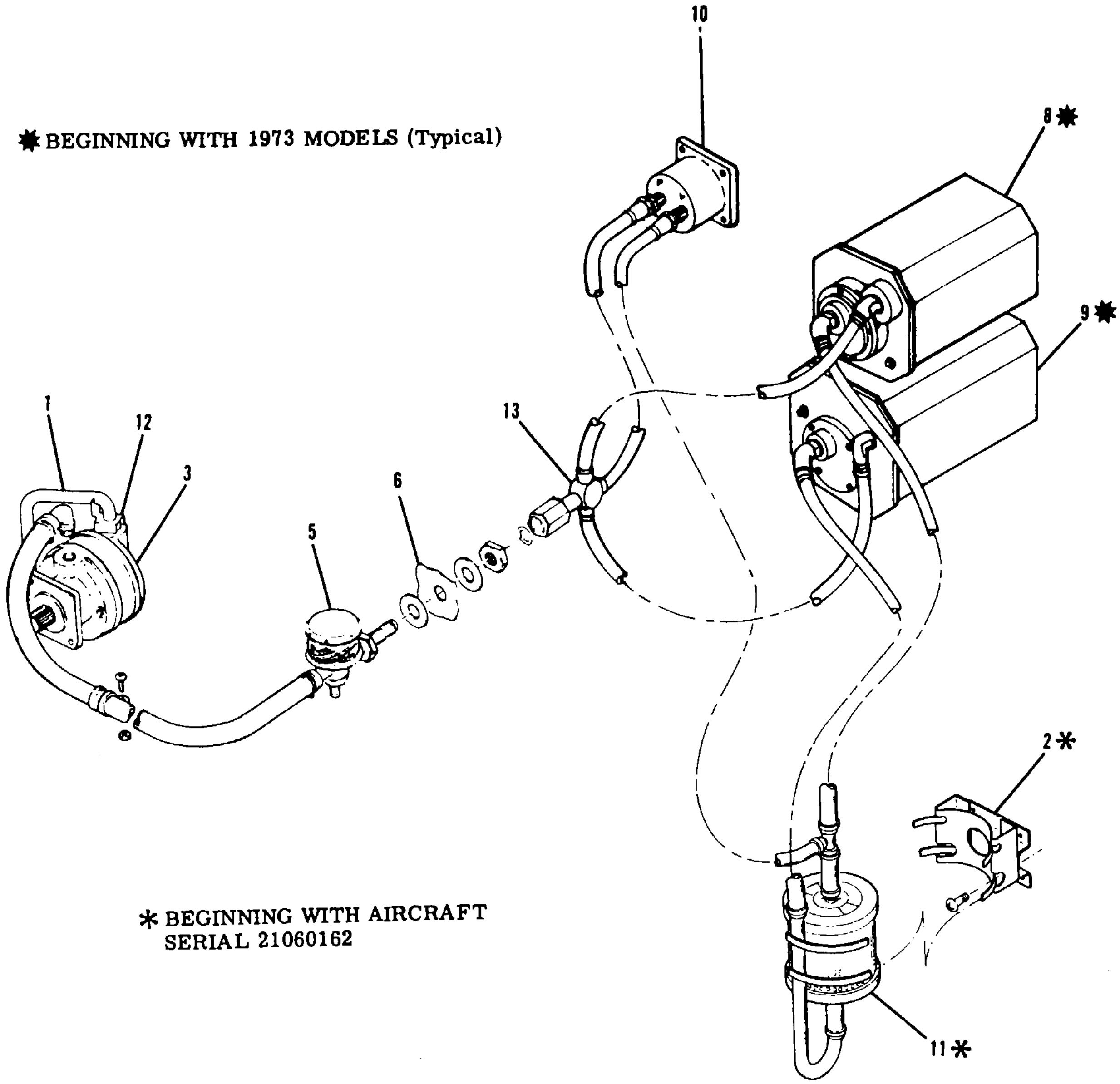


Figure 16-4. Vacuum System (Sheet 2 of 2)

TROUBLE SHOOTING GYRO'S (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
DIAL SPINS IN ONE DIRECTION CONTINUOUSLY.	Operating limits have been exceeded.	Replace instrument.
	Defective mechanism.	Replace instrument.

16-27. TROUBLE SHOOTING--VACUUM PUMP (Wet System)

TROUBLE	PROBABLE CAUSE	REMEDY
EXCESSIVE OIL IN DISCHARGE.	Damaged engine drive seal.	Replace gasket.
	Oil separator clogged, oil return line obstructed, excessive oil flow through pump.	Clean oil separator with Stoddard solvent, then blow dry. Blow out lines. If pump oil consumption is excessive, replace oil metering pin in pump.
HIGH SUCTION.	Suction relief valve screen clogged.	Clean or replace screen.
LOW SUCTION.	Relief valve leaking.	Replace relief valve.
	Vacuum pump failure.	Replace vacuum pump.

16-27A. TROUBLE SHOOTING -- VACUUM PUMP (Dry System)

TROUBLE	PROBABLE CAUSE	REMEDY
OIL IN DISCHARGE.	Damaged pump drive seal.	Replace gasket.
HIGH SUCTION.	Suction relief valve screen clogged.	Clean or replace screen.
LOW SUCTION.	Relief valve leaking.	Replace relief valve.
	Vacuum pump failure.	Replace vacuum pump.

16-28. REMOVAL AND INSTALLATION OF COMPONENTS. (Wet System) Aircraft serial thru 21059818 except 21059810. The various components of the vacuum system are secured by conventional clamps, mounting screws and nuts. To remove a component, remove mounting screws and disconnect inlet and discharge lines. When replacing a vacuum system component, ensure connections are made correctly. Use thread lubricant sparingly and ONLY on male threads. Avoid over-tightening connections. Before reinstalling a vacuum pump, probe the oil passages in pump and engine, to ensure they are open. Place the mounting pad gasket in position over studs and ensure it does not block the oil passages. Coat pump drive splines lightly with a high-temperature grease such as Dow Silicone #30 (Dow-Corning Co., Midland, Mich.). After installing pump, before connecting the plumbing, start the engine and hold a piece of paper over the pump discharge to check for proper lubrication. Proper oil flow through the pump is one to four fluid ounces per hour.

16-28A. REMOVAL AND INSTALLATION OF COMPONENTS (Dry System) Aircraft serial 21059810 and beginning with 21059819. Removal and installation of the components are the same as in paragraph 16-28, except the items pertaining to the oil separation components and lubrication. The dry system is assembled without the use of any lubrication on any of the components. The case of the vacuum pump is sealed at the mounting base and is lubricated by sealed bearings. Check that rotation arrows denote a clockwise rotation, when installing a new pump.

16-29. CLEANING. In general, low-pressure, dry compressed air should be used in cleaning the vacuum system components. The oil separator and suction relief valve which are exposed to engine oil and dirt, should be washed with Stoddard solvent, then dried with low-pressure air. Check hoses for collapsed inner liners as well as external damage.

CAUTION

Never apply compressed air to lines or components installed in the aircraft. The excessive pressures will damage gyros. If an obstructed line is to be blown out, disconnect the line at both ends and blow from the instrument panel out.

16-30. VACUUM RELIEF VALVE ADJUSTMENT. A suction gage reading of 5.3 inches of mercury is desirable for the gyro instruments. However, a range of 4.6 to 5.4 inches of mercury is acceptable. To adjust the relief valve, remove the central air filter, run the engine to 2200 rpm on the ground and adjust relief valve to 5.3 ± .1 inches of mercury.

CAUTION

Do not exceed maximum engine temperature.

Be sure the filter element is clean before installing. If reading drops noticeably, install a new filter element.

16-31. ENGINE INDICATORS.

16-32. TACHOMETER.

16-33. DESCRIPTION. The tachometer is a mechanical indicator driven at half crankshaft speed by a flexible shaft. Most tachometer difficulties will be found in the drive-shaft. To function properly, the shaft housing must be free of kinks, dents and sharp bends. There should be no bend on a radius shorter than six inches and no bend within three inches of either terminal. If a tachometer is noisy or the pointer oscillates, check the cable housing for kinks, sharp bends and damage. Disconnect cable at tachometer and pull it out of housing. Check cable for worn spots, breaks and kinks.

NOTE

Before replacing a tachometer cable in the housing, coat the lower two thirds with AC Type ST-640 speedometer cable grease or Lubriplate No. 110. Insert the cable in housing as far as possible, then slowly rotate cable to make sure it is seated in the engine fitting. Insert cable in tachometer, making sure it is seated in drive shaft, then reconnect housing and torque to 50 pound-inches (at instrument).

SHOP NOTES:

16-34. MANIFOLD PRESSURE/FUEL FLOW INDICATOR.

16-35. DESCRIPTION. The manifold pressure and fuel flow indicators are in one instrument case, however, each instrument operates independently. The manifold pressure gage is a barometric instrument which indicates absolute pressure in the intake manifold in inches of mercury. The fuel flow indicator is a pressure instrument calibrated in gallons per hour, through 1970 model aircraft. Beginning with 1971 model aircraft the instrument is calibrated in pounds per hour, indicating approximate pounds of fuel metered per hour to the engine. Pressure for operating the indicator is obtained through a hose from the fuel manifold valve. The fuel flow indicator is vented to atmospheric pressure on standard engine installations and to the turbocharger outlet pressure on turbocharged engine installations.

16-36. TROUBLE SHOOTING--MANIFOLD PRESSURE INDICATOR.

TROUBLE	PROBABLE CAUSE	REMEDY
EXCESSIVE ERROR AT EXISTING BAROMETRIC PRESSURE.	Pointer shifted.	Replace instrument.
	Leak in vacuum bellows.	Replace instrument.
	Loose pointer.	Replace instrument.
	Leak in pressure line.	Repair or replace damaged line, tighten connections.
	Condensate or fuel in line.	Blow out line.
JERKY MOVEMENT OF POINTER.	Excessive internal friction.	Replace instrument.
	Rocket shaft screws tight.	Replace instrument.
	Link springs too tight.	Replace instrument.
	Dirty pivot bearings.	Replace instrument.
	Defective mechanism.	Replace instrument.
	Leak in pressure line.	Repair or replace damaged line. tighten connections.
SLUGGISH OPERATION OF POINTER.	Foreign matter in line.	Blow out line.
	Damping needle dirty.	Replace instrument.
	Leak in pressure line.	Repair or replace damaged line, tighten connections.
EXCESSIVE POINTER VIBRATION.	Tight rocker pivot bearings.	Replace instrument.
IMPROPER CALIBRATION.	Faulty mechanism.	Replace instrument.
NO POINTER MOVEMENT.	Faulty mechanism.	Replace instrument.
	Broken pressure line.	Repair or replace damaged line.

16-37. TROUBLESHOOTING - FUEL FLOW INDICATOR.

TROUBLE	PROBABLE CAUSE	REMEDY
DOES NOT REGISTER.	Pressure line clogged.	Blow out line.
	Pressure line broken.	Repair or replace damaged line.
	Fractured bellows or damaged mechanism.	Replace instrument.
	Clogged snubber orifice.	Replace instrument.
	Pointer loose on staff.	Replace instrument.
POINTER FAILS TO RETURN TO ZERO.	Foreign matter in line.	Blow out line.
	Clogged snubber orifice.	Replace instrument.
	Damaged bellows or mechanism.	Replace instrument.
INCORRECT OR ERRATIC READING.	Damaged or dirty mechanism.	Replace instrument.
	Pointer bent, rubbing on dial or glass.	Replace instrument.
	Leak or partial obstruction in pressure or vent line.	Blow out dirty line, repair or tighten loose connections.

16-38. CYLINDER HEAD TEMPERATURE GAGE.

16-39. DESCRIPTION. The temperature sending unit regulates power through the cylinder head temperature gage. The gage and sending unit require little or no maintenance other than cleaning, making sure lead is properly supported and all connections are clean, tight and properly insulated. When replacing a sending unit, install as a matched pair. The Rochester and Stewart Warner gages are connected the same, but the Rochester gage does not have a calibration pot and cannot be adjusted. Refer to Table 2, on page 16-18B when troubleshooting the cylinder head temperature gage.

NOTE: A Cylinder Head Temperature Gage Calibration Unit, (SK182-43) is available and may be ordered through the Cessna Supply Division.

16-40. TROUBLESHOOTING.

TROUBLE	PROBABLE CAUSE	REMEDY
GAGE INOPERATIVE.	No current to circuit, defective gage, bulb or circuit.	Repair electrical circuit.
	Pressure line broken.	Repair or replace defective items.
GAGE FLUCTUATES RAPIDLY.	Loose or broken wire permitting alternate make and break of gage circuit.	Repair or replace defective wire.
GAGE READS TOO HIGH ON SCALE.	High voltage.	Check "A" terminal.
	Gage off calibration.	Replace gage and bulb.

16-40. TROUBLE SHOOTING (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
GAGE READS TOO LOW ON SCALE.	Low voltage.	Check voltage supply and "D" terminal.
	Gage off calibration.	Replace gage and bulb.
GAGE READS OFF SCALE AT HIGH END.	Break in bulb.	Replace bulb and gage.
	Break in bulb lead.	Replace bulb and gage.
	Internal break in gage.	Replace gage and bulb.
OBVIOUSLY INCORRECT READING.	Defective gage mechanism.	Replace gage and bulb.
	Incorrect calibration.	Calibrate system.

16-41. OIL PRESSURE GAGE.

16-42. DESCRIPTION. The Bourdon tube-type oil pressure gage is a direct-reading instrument, operated by a pressure pickup line connected to the engine main oil gallery. The oil pressure line from the instrument to the engine should be filled with kerosene, especially during cold weather operation, to attain an immediate oil indication.

16-43. TROUBLE SHOOTING.

TROUBLE	PROBABLE CAUSE	REMEDY
GAGE DOES NOT REGISTER.	Pressure line clogged.	Clean line.
	Pressure line broken.	Repair or replace damaged line.
	Fractured Bourdon tube.	Replace instrument.
	Gage pointer loose on staff.	Replace instrument.
	Damaged gage movement.	Replace instrument.
GAGE POINTER FAILS TO RETURN TO ZERO.	Foreign matter in line.	Clean line.
	Foreign matter in Bourdon tube.	Replace instrument.
	Bourdon tube stretched.	Replace instrument.
GAGE DOES NOT REGISTER PROPERLY.	Faulty mechanism.	Replace instrument.

16-43. TROUBLESHOOTING (Continued)

TROUBLE	PROBABLE CAUSE	REMEDY
GAGE HAS ERRATIC OPERATION.	Worn or bent movement.	Replace instrument.
	Foreign matter in Bourdon tube.	Replace instrument.
	Dirty or corroded movement.	Replace instrument.
	Pointer bent and rubbing on dial, dial screw or glass.	Replace instrument.
	Leak in pressure line.	Repair or replace damaged line.

16-44. OIL TEMPERATURE GAGE.

16-45. DESCRIPTION. On some airplanes, the oil temperature gage is a Bourdon tube-type pressure instrument connected by armored capillary tubing to a temperature bulb in the engine. The temperature bulb, capillary tube and gage are filled with fluid and sealed. Expansion and contraction of fluid in the bulb with the temperature changes operates the gage. Checking capillary tube for damage and fittings for security is the only maintenance required. Since the tubes inside diameter is small, small dents and kinks, which would be acceptable in larger tubing, may partially or completely close off the capillary, making the gage inoperative. Some airplanes are equipped with gages that are electrically actuated and are not adjustable. Refer to Table 2, on page 16-18B when troubleshooting the oil temperature gage.

16-46. FUEL QUANTITY INDICATING SYSTEM. (See Figure 13-2.)

16-47. INDICATORS. Two fuel quantity indicators, graduated in gallons through 1970 model aircraft and pounds/gallons beginning with 1971 model aircraft are located in the instrument cluster. These electromagnetic type indicators are used in conjunction with a control monitor and capacitance type sensing units. Refer to paragraph 16-8 for removal of indicators.

16-48. SENDING UNITS. Two fuel quantity sending units are located in each fuel bay. These sending units are basically tubular capacitors with two electrodes fixed in one position. Any change in fuel quantity between full and empty produces a corresponding change in the capacitance of the electrodes. These changes in capacitance are amplified by the control monitor and actuate the fuel quantity indicators.

16-48A. REMOVAL AND INSTALLATION. (See Figure 13-2.)

1. Completely drain all fuel from wing bays at bay sump drain valves. (Observe precautions in Section 13).
2. Remove plates on top of wing bays for access to sensing units. (Refer to Section 13.)
3. Remove safety wire from probe clips.
4. Disconnect probe electrical connection and lift probe out.
5. Reverse the preceding steps for installation. Prior to reinstalling access plates, calibrate system in accordance with procedures outlined in paragraph 16-51.

CAUTION: Access plates must be resealed after removal. Refer to Section 13 for sealing instructions.

16-49. CONTROL MONITOR. The control monitor is located above the right hand cabin door behind the headliner. A zipper is installed in the headliner for easy access. The monitor incorporates adjustment provisions for system calibration.

16-50. REMOVAL AND INSTALLATION.

A. Open zipper in headliner above right door and remove insulation as necessary.

B. Disconnect all wiring and tag connections for reference on installation.

C. Remove mounting screws and remove monitor.

D. Reverse preceding steps for reinstallation and calibrate system in accordance with paragraph 16-51.

16-51. CALIBRATION. (See Figure 13-2.)

WARNING: Use extreme caution while working with electrical components of the fuel system. The possibility of electrical sparks around an "empty" fuel bay creates a hazardous situation.

A. Drain all fuel bays at fuel bay drain valves. (Observe precautions in Section 13.)

B. Reinstall and safety bay drain valves after completion of step "A".

C. Open zipper above right door and remove insulation as necessary for access to control monitor.

D. Turn master switch "ON" and allow a few seconds for indicators to stabilize.

Table 1

NOTE: Select the oil temperature sending unit part number that is used in your aircraft from the left column and the temperature from the column headings. Read the ohms value under the appropriate temperature column.

Part Number	Type	72°F	120°F	165°F	220°F	250°F
S1630-1	Oil Temp				46.4	
S1630-3	Oil Temp		620.0			52.4
S1630-4	Oil Temp		620.0			52.4
S1630-5	Oil Temp			192.0		
S2335-1	Oil Temp	990.0				34.0

Table 2

NOTE: Select the cylinder head temperature sending unit part number that is used in your aircraft from the left column and the temperature from the column headings. Read the ohms value under the appropriate temperature column.

Part Number	Type	200°F	220°F	450°F	475°F
S1372-1	CHT		310.0	34.8	
S1372-2	CHT		310.0	34.8	
S1372-3	CHT			113.0	
S1372-4	CHT			113.0	
S2334-3	CHT	745.0			38.0
S2334-4	CHT	745.0			38.0

16-51B. FUEL QUANTITY INDICATING SYSTEM OPERATIONAL TEST.

WARNING: Remove all ignition sources from the airplane and vapor hazard area. Some typical examples of ignition sources are static electricity, electrically powered equipment (tools or electronic test equipment - both installed on the airplane and ground support equipment), smoking, and sparks from metal tools.

WARNING: Observe all standard fuel system fire and safety practices.

1. Disconnect all electrical power from the airplane. Attach maintenance warning tags to the battery connector and external power receptacle stating:

   DO NOT CONNECT ELECTRICAL POWER, MAINTENANCE IN PROGRESS.

2. Electrically ground the airplane.
3. Level the airplane and drain all fuel from wing fuel tanks.
4. With the fuel selector valve in the "OFF" position, add unusable fuel to each fuel tank.
5. Apply electrical power as required to verify each fuel quantity indicator indicates "EMPTY".
   A. If "EMPTY" is not indicated, adjust, troubleshoot, repair and/or replace fuel indicating components as required until the "EMPTY" indication is achieved.

      NOTE: Refer to paragraph 16-51 for instructions for calibrating the fuel quantity indicating system.

6. Fill tanks to capacity, apply electrical power as required, and verify each fuel quantity indicator indicates "FULL".
   A. If "FULL" is not indicated, adjust, troubleshoot, repair and/or replace fuel indicating components as required until the "FULL" indication is achieved.

      NOTE: Refer to paragraph 16-51 for instructions for calibrating the fuel quantity indicating system.

7. Install any items and/or equipment removed to accomplish this procedure, remove maintenance warning tags and connect the airplane battery.

CAUTION

All adjustments made to control monitor are to be made with a small insulated screwdriver. Using a metallic shank screwdriver increases the possibility of shorting the potentiometer to ground and damaging control monitor circuitry.

e. Adjust LEFT and RIGHT bay "EMPTY ADJ" for "0" indication on the fuel quantity indicators.
f. Turn master switch "OFF" and completely fill left and right bays with fuel.
g. Turn master switch "ON" and allow indicators to stabilize.
h. Adjust LEFT and RIGHT bay "FULL ADJ" for 44.5 gallons indication on the fuel quantity indicators.

NOTE

Unusable fuel in each of the bays is approximately 1/2 gallon.

i. Reinstall all items removed for access to control monitor.

16-51A. TROUBLE SHOOTING.

TROUBLE	PROBABLE CAUSE	REMEDY
NO FUEL QUANTITY INDICATION.	Fuel bays empty.	Service with proper grade and amount of fuel.
	Circuit breaker open or defective.	Reset. Replace if defective.
	Defective fuel quantity indicator or sending unit.	Substitute known-good indicator or sending unit. Replace the instrument if defective.
	Loose connections or open circuit.	Tighten connections; repair or replace wiring.

16-52. HOURMETER.

16-53. DESCRIPTION. The hourmeter is an electrically operated instrument, actuated by a pressure switch in the oil pressure gage line. Electrical power is supplied through a one-amp fuse from the electrical clock circuit, and therefore will operate independent of the master switch.

16-54. ECONOMY MIXTURE INDICATOR.

16-55. DESCRIPTION. The economy mixture indicator is an exhaust gas temperature (EGT) sensing device which is used to aid the pilot in selecting the most desirable fuel-air mixture for cruising flight at less than 75% power. Exhaust gas temperature (EGT) varies with ratio of fuel-to-air mixture entering the engine cylinders. Refer to the Owner's Manual for operating procedure of the system.

16-56. TROUBLE SHOOTING.

TROUBLE	PROBABLE CAUSE	REMEDY
GAGE INOPERATIVE	Defective gage, probe or circuit.	Repair or replace defective part.
INCORRECT READING.	Indicator needs calibrating.	Calibrate indicator in accordance with paragraph 16-57.
FLUCTUATING READING.	Loose, frayed or broken lead, permitting alternate make and break of circuit.	Tighten connections and repair or replace defective leads.

16-57. CALIBRATION. A potentiometer adjustment screw is provided behind the plastic cap at the back of the instrument for calibration. This adjustment screw is used to position the pointer over the reference increment line (4/5 of scale) at peak EGT. Establish 75% power in level flight, then carefully lean the mixture to peak EGT. After the pointer has peaked, using the adjustment screw, position pointer over reference increment line (4/5 of scale).

NOTE

This setting will provide relative temperature indications for normal cruise power settings within range of the instrument.

Turning the screw clockwise increases the meter reading and counterclockwise decreases the meter reading. There is a stop in each direction and damage can occur if too much torque is applied against stops. Approximately 600°F total adjustment is provided. The adjustable yellow pointer on the face of the instrument is a reference pointer only.

16-58. REMOVAL AND INSTALLATION. Removal of the indicator is accomplished by removing the mounting screws and disconnecting the leads. Tag leads to facilitate installation. The thermocouple probe is secured to the exhaust stack with a clamp. When installing probe, tighten clamp to 45 pound-inches and safety as required.

16-59. MAGNETIC COMPASS. (Refer to figure 16-5.)

16-60. DESCRIPTION. The magnetic compass is liquid-filled, with expansion provisions to compensate for temperature changes. It is equipped with compensating magnets adjustable from the front of the case. The compass is internally lighted, controlled by the instrument lights rheostat switch. No maintenance is required on the compass except an occasional check on a compass rose and replacement of the lamp. The compass mount is attached by three screws to a base plate which is bonded to the windshield with methylene chloride. A tube containing the compass light wires is attached to the metal strip at the top of the windshield. Removal of the compass is accomplished by removing the screw at the forward end of the compass mount, unfastening the metal strip at the top of the windshield and cutting the two wire splices. Removal of the compass mount is accomplished by removing the outside air temperature probe and removing the three screws attaching mount to the base plate. Access to the inner screw is gained through a hole in the bottom of mount, through which a thin screwdriver may be inserted. When installing the compass, it will be necessary to splice the compass light wires.

16-61. STALL WARNING HORN AND TRANSMITTER.

16-62. DESCRIPTION. The stall warning horn is contained in the dual warning unit mounted on the right side of the firewall behind the glove box. It is electrically operated and controlled by a stall warning transmitter mounted on the leading edge of the left wing. For further information on the warning horn and transmitter, refer to Section 17.

16-63. TURN COORDINATOR.

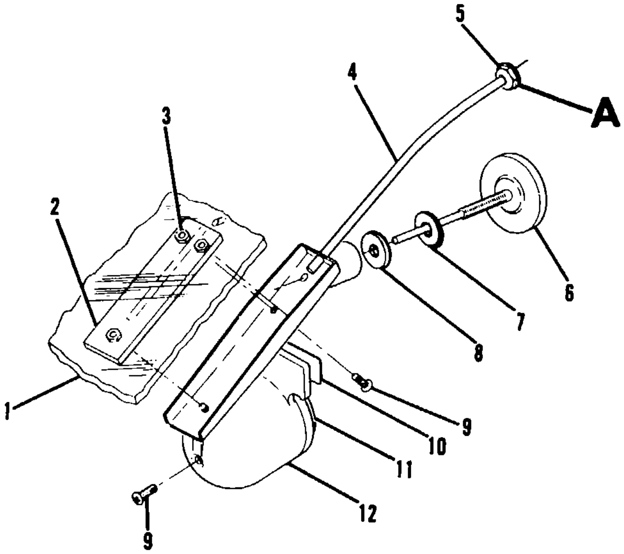
16-64. DESCRIPTION. The turn coordinator is an electrically operated, gyroscopic, roll-turn rate indicator. Its gyro simultaneously senses rate of motion roll and yaw axis which is projected on a single indicator. The gyro is a non-tumbling type requiring no caging mechanism and incorporates an ac brushless spin motor with a solid state inverter.

16-65. TROUBLE SHOOTING.

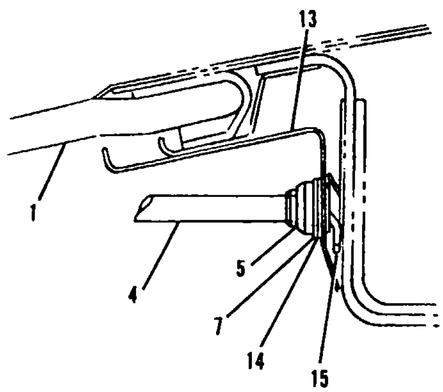
TROUBLE	PROBABLE CAUSE	REMEDY
INDICATOR DOES NOT RETURN TO CENTER.	Friction caused by contamination in the indicator dampening.	Replace instrument.
	Friction in gimbal assembly.	Replace instrument.
DOES NOT INDICATE A STANDARD RATE TURN (TOO SLOW).	Low voltage.	Correct voltage.
	Inverter frequency changed.	Replace instrument.
NOISY MOTOR.	Faulty bearings.	Replace instrument.
ROTOR DOES NOT START.	Faulty electrical connection.	Correct voltage or replace faulty wire.
	Inverter malfunctioning.	Replace instrument.
	Motor shorted.	Replace instrument.
	Bearings frozen.	Replace instrument.

NOTE

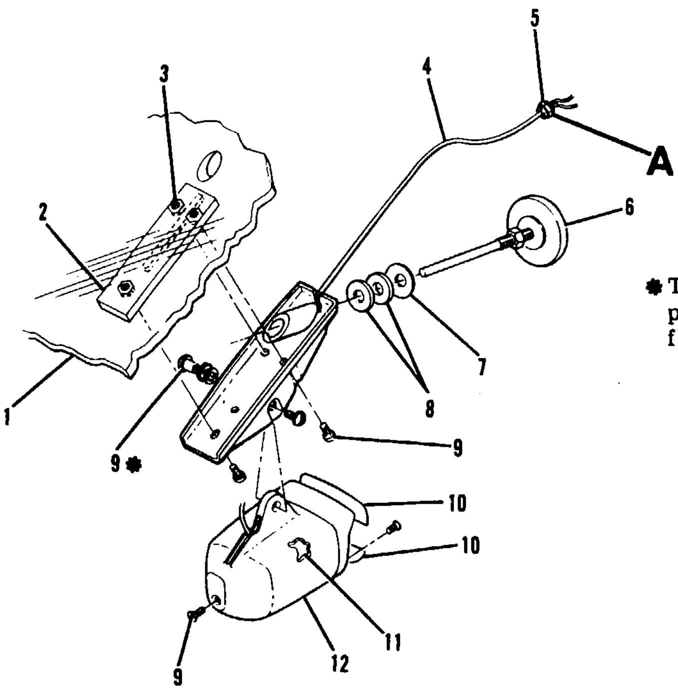
Seal temperature probe at windshield with General Electric RTV 103 sealant. All sealant must be between phenolic tube and windshield. Ensure no sealant touches shaft.



THRU AIRCRAFT SERIAL 21059719



Detail A



BEGINNING WITH AIRCRAFT SERIAL 21059720

NOTE

* Torque to 10-15 lb inches to prevent compass rotation in flight.

1. Windshield
2. Base Plate
3. Insert
4. Tube
5. Nut
6. Outside Air Temperature Gage
7. Washer
8. Rubber Washer
9. Screw
10. Compass Card
11. Compass
12. Compass Mount
13. Metal Strip
14. Lockwasher
15. Electrical Wire

Figure 16-5. Magnetic Compass

16-65. TROUBLE SHOOTING (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
IN COLD TEMPERATURES, HAND FAILS TO RESPOND OR IS SLUGGISH.	Oil in indicator becomes too thick.	Replace instrument.
	Insufficient bearing end play.	Replace instrument.
	Low voltage.	Correct voltage.

16-66. TURN-AND-SLIP INDICATOR.

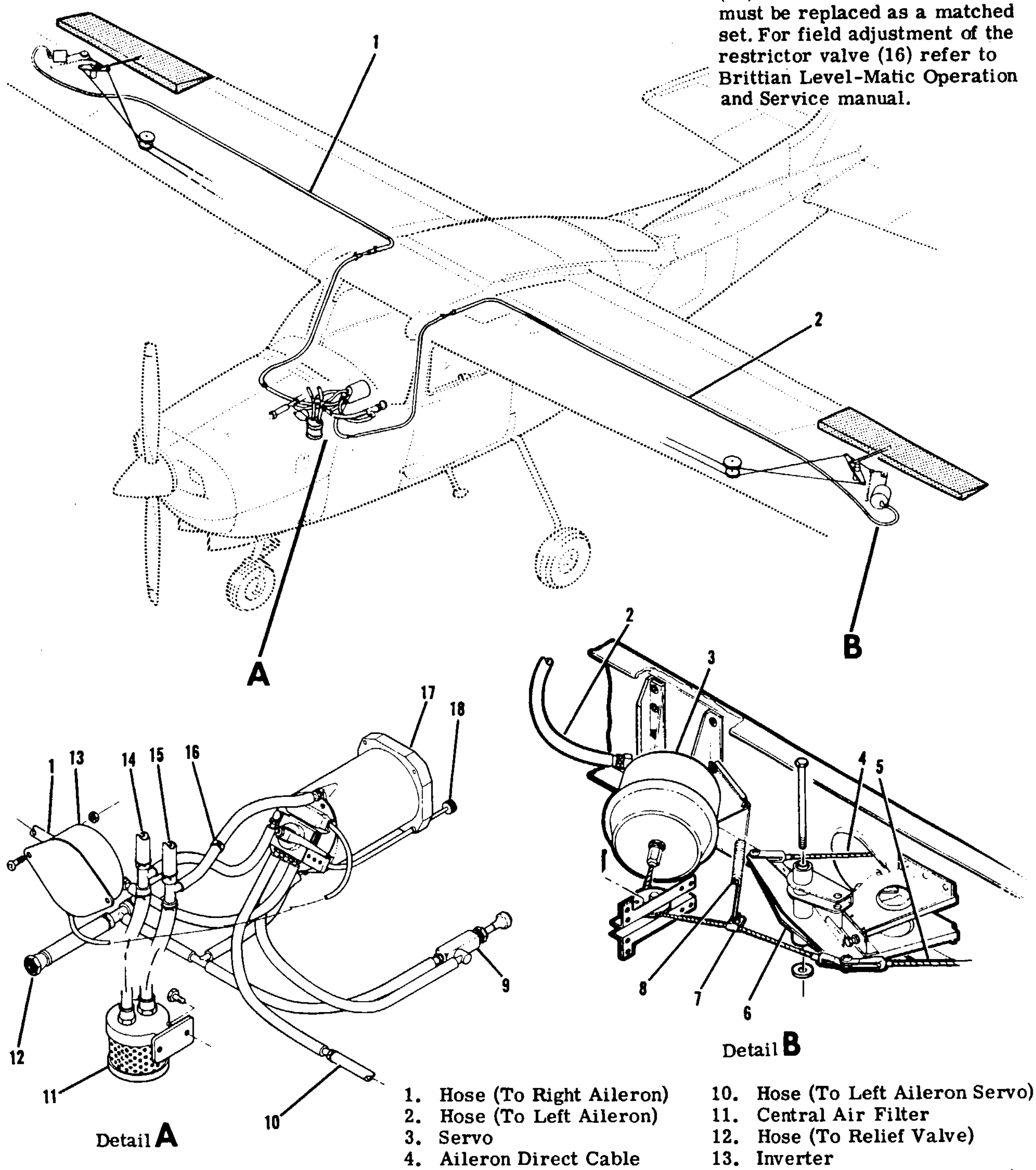
16-67. DESCRIPTION. The turn-and-slip indicator is operated by the aircraft electrical system and operates ONLY when the master switch is on. Its circuit is protected by an automatically-resetting circuit breaker.

16-68. TROUBLE SHOOTING.

TROUBLE	PROBABLE CAUSE	REMEDY
INDICATOR POINTER FAILS TO RESPOND.	Automatic resetting circuit breaker defective.	Replace circuit breaker.
	Master switch "OFF" or switch defective.	Replace defective switch.
	Broken or grounded lead to indicator.	Repair or replace defective wiring.
	Indicator not grounded.	Repair or replace defective wire.
	Defective mechanism.	Replace instrument.
HAND SLUGGISH IN RETURNING TO ZERO.	Defective mechanism.	Replace instrument.
	Low voltage.	Correct voltage.
POINTER DOES NOT INDICATE PROPER TURN.	Defective mechanism.	Replace instrument.
HAND DOES NOT SIT ON ZERO.	Gimbal and rotor out of balance.	Replace instrument.
	Hand incorrectly sits on rod.	Replace instrument.
	Sensitivity spring adjustment pulls hand off zero.	Replace instrument.
IN COLD TEMPERATURES, HAND FAILS TO RESPOND OR IS SLUGGISH.	Oil in indicator becomes too thick.	Replace instrument.
	Insufficient bearing end play.	Replace instrument.
	Low voltage.	Correct voltage.

NOTE

Restrictor valve (16), inverter (13) and turn coordinator (17) must be replaced as a matched set. For field adjustment of the restrictor valve (16) refer to Brittian Level-Matic Operation and Service manual.



1. Hose (To Right Aileron)
2. Hose (To Left Aileron)
3. Servo
4. Aileron Direct Cable
5. Aileron Carry-Thru Cable
6. Bellcrank
7. Clamp
8. Spring
9. ON-OFF Control Valve
10. Hose (To Left Aileron Servo)
11. Central Air Filter
12. Hose (To Relief Valve)
13. Inverter
14. Hose (To Directional Gyro)
15. Hose (To Gyro Horizon)
16. Restrictor Valve
17. Turn Coordinator
18. Roll Trim Knob

THRU AIRCRAFT SERIAL 21060089

Figure 16-6. Wing Leveler Control System

16-68. TROUBLE SHOOTING (Cont).

TROUBLE	PROBABLY CAUSE	REMEDY
NOISY GYRO.	High voltage.	Correct voltage.
	Loose or defective rotor bearings.	Replace instrument.

16-69. ELECTRIC CLOCK.

16-70. DESCRIPTION. The electric clock is connected to the battery through a one-ampere fuse mounted adjacent to the battery box. The electrical circuit is separate from the aircraft electrical system and will operate when the master switch is "OFF."

16-71. WING LEVELER. (Refer to figure 16-6.) (Thru Aircraft Serial 21060089)

16-72. DESCRIPTION. A wing leveler control system, consisting of a turn coordinator (17), pneumatic servos (3), connecting cables and hose (1 and 2) may be installed. The turn coordinator gyro senses changes in roll attitude, then electrically meters vacuum power from the engine-driven vacuum pump to the cylinder-piston servos, operating the ailerons for lateral stability. Manual control of system is afforded by the roll trim knob (18). The roll trim should not be used to compensate for faulty rigging or "wing heaviness". Manual override of the system may be accomplished without damage to the aircraft or system. The ON-OFF valve (9) controls vacuum supply to the distributor valve, but does not affect the electrically operated turn coordinator gyro. Installation of the wing leveler does not change the vacuum relief valve settings. Refer to the appropriate publication issued by the manufacturer for trouble shooting procedures.

SHOP NOTES:

SECTION 17

ELECTRICAL SYSTEMS

TABLE OF CONTENTS Page

17-1. ELECTRICAL SYSTEMS.

17-2. GENERAL. This section contains service information necessary to maintain the Aircraft Electrical Power Supply System, Battery and External Power Supply System, Alternator Power System, Aircraft Lighting System, Pitot Heater, Stall Warning, Cigar Lighter, and Electrical Load Analysis.

17-3. ELECTRICAL POWER SUPPLY SYSTEM.

17-4. DESCRIPTION. Thru aircraft serial 21059502 energy for the aircraft is supplied by a 14-volt, direct-current, single wire, negative ground electrical system. A single 12-volt battery supplies power for starting and furnishes a reserve source of power in the event of alternator failure. Beginning with aircraft serial 21059503 energy is supplied by a 28-volt, direct current, single wire, negative ground electrical system. A 24-volt battery supplies power for starting and furnishes a reserve source of power in the event of alternator failure. On both systems an engine-driven alternator is the normal source of power during flight and maintains a battery charge controlled by a voltage regulator. An external power source receptacle is offered as optional equipment to supplement the battery alternator system for starting and ground operation.

17-5. SPLIT BUS BAR.

17-6. DESCRIPTION. Electrical power is supplied through three bus bars. Two sides of the bus bar are jumpered together and supplies power to the electrical equipment. The other bar powers the electronic installations. When the master switch is closed the battery contactor engages and battery power is supplied to the electrical side of the split bus bar. The electrical bus feeds power to the electronics bus through a normally-closed relay, this relay opens when the starter switch is engaged or when an external power source is used, preventing transient voltages from damaging the semiconductor circuitry in the electronic installations. (Refer to figure 17-1).

17-7. SPLIT BUS POWER RELAY.

17-8. DESCRIPTION. A power relay is installed behind the instrument panel on all airplanes utilizing a split bus bar. The relay is a normally-closed type, opening when external power is connected or when the starter is engaged, thus removing battery power from the electronic side of the split bus bar and preventing transient voltages from damaging the electronic installations. (Refer to figure 17-1).

17-9. MASTER SWITCH.

17-10. DESCRIPTION. The operation of the battery and alternator systems is controlled by a master switch. The switch is an interlocking split rocker with the battery mode on the right-hand side and the alternator mode on the left-hand side. This arrangement allows the battery to be on the line without the alternator, however, operation of the alternator without the battery on the line is not possible. The switch is labeled "BAT" and "ALT" below the switch and is located on the left-hand side of the switch panel.

17-11. AMMETER.

17-12. DESCRIPTION. The ammeter is connected between the battery and the aircraft bus. The meter indicates the amount of current flowing either to or from the battery. With a low battery and the engine operating at cruise speed the ammeter will show the full alternator output when all electrical equipment is off. When the battery is fully charged and cruise RPM is maintained with all electrical equipment off, the ammeter will show a minimum charging rate.

17-13. BATTERY POWER SYSTEM.

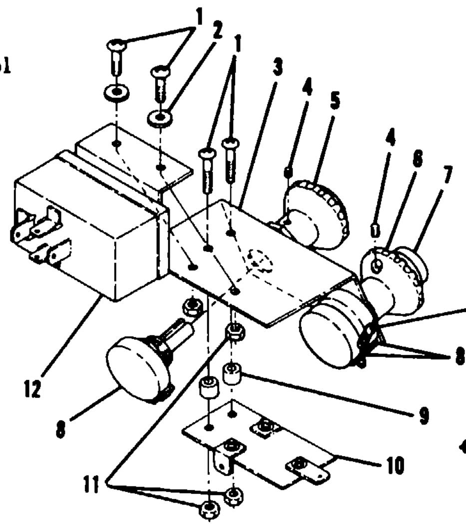
17-14. BATTERY.

17-15. DESCRIPTION. Thru aircraft serial 210-59502 the battery is 12-volts and approximately 33 ampere-hour in capacity. Beginning with aircraft serial 21059502 a 24-volt battery with an approximate 17 ampere-hour capacity is utilized. The battery is mounted on the forward left side of the firewall and is equipped with non-spill type filler caps.

17-16. TROUBLE SHOOTING.

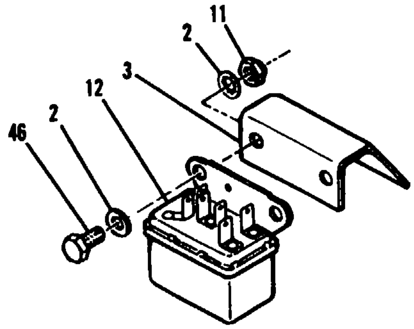
TROUBLE	PROBABLE CAUSE	REMEDY
BATTERY WILL NOT SUPPLY POWER TO BUS OR IS INCAPABLE OF CRANKING ENGINE	Battery discharged.	1. Measure voltage at "BAT" terminal of battery contactor with master switch and a suitable load such as a taxi light turned on. Normal battery will indicate 11.5 volts or more on a 14 volt system or 23 volts or more on a 28 volt system. If voltage is low proceed to step 2. If voltage is normal, proceed to step 3.
	Battery faulty.	2. Check fluid level in cells and charge 12-volt battery at 14 volts or 24-volt battery at 28 volts for approximately 30 minutes or until battery voltage rises to 14 volts on 12-volt battery or 28 volts on 24-volt battery. If tester indicates a good battery, the malfunction may be assumed to be a discharged battery. If the tester indicates a faulty battery, replace the battery.
	Faulty contactor or wiring. between contactor and master switch.	3. Measure voltage at master switch terminal (smallest) on contactor with master switch closed. Normal indication is zero volts. If voltage reads zero, proceed to step 4. If a voltage reading is obtained, check wiring between contactor and master switch. Also check master switch.
	Open coil on contactor.	4. Check continuity between "BAT" terminal and master switch terminal of contactor. Normal indication on 14 volt aircraft is 16-24 ohms. Normal indication on 28 volt aircraft is 50-70 ohms. If ohmmeter indicates an open coil, replace contactor. If ohmmeter indicates a good coil, proceed to step 5.
	Faulty contactor contacts.	5. Check voltage on "BUS" side of contactor with master switch closed. Meter normally indicates battery voltage. If voltage is zero or intermittent, replace contactor. If voltage is normal, proceed to step 6.
	Faulty wiring between contactor and bus.	6. Inspect wiring between contactor and bus. Repair or replace wiring.

1. Screw
2. Washer
3. Bracket - Relay Mounting
4. Set Screw
5. Instrument Light Control
6. Engine - Radio Light Control
7. Lower Panel Light Control
8. Rheostat
9. Spacer
10. Diode Assembly Board
11. Nut
12. Split Bus Power Relay
13. Master Switch
14. Fuel Pump Switch
15. Magneto Switch
16. Console Light Switch (Opt)
17. Oil Dilution Switch (Opt)
18. Pitot Heat Switch (Opt)
19. Navigation Light Switch
20. Beacon Light Switch (Opt)



THRU 1970 MODELS ONLY

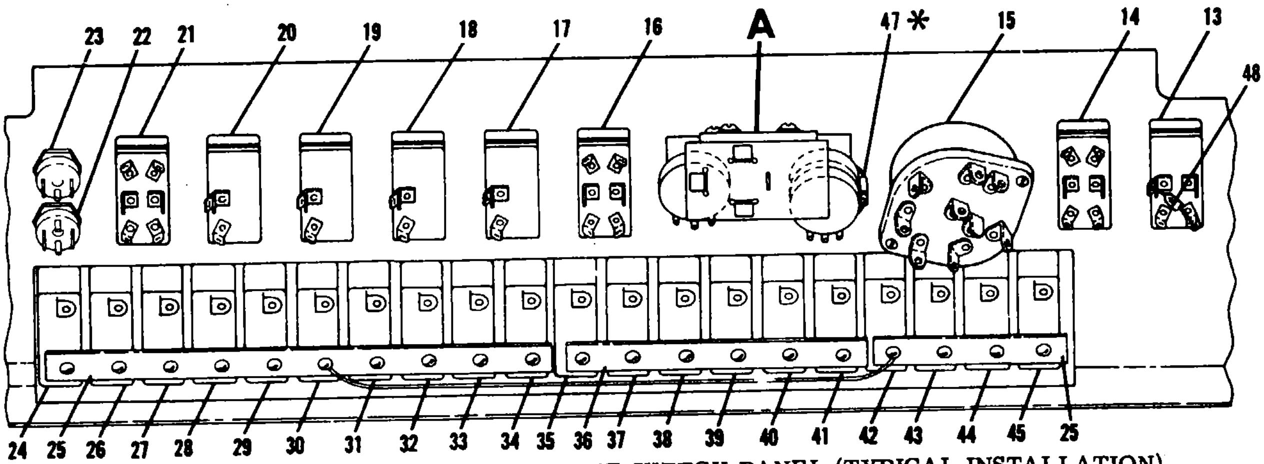
Detail A



1971 & ON MODELS ONLY

Detail A

*BEGINNING WITH 21059297



VIEWED FROM THE BACK SIDE OF THE SWITCH PANEL (TYPICAL INSTALLATION)

21. Landing Light Switch
22. Landing Gear Down Warning Light
23. Landing Gear Up Warning Light
24. Alternator Circuit Breaker
25. Primary Bus Bar
26. Landing Light Circuit Breaker
27. Navigation Light Circuit Breaker
28. Pitot Heat Circuit Breaker (Opt)
29. Instrument Circuit Breaker
30. Cabin Lights Circuit Breaker
31. Flap Circuit Breaker
32. Fuel Pump Circuit Breaker
33. Landing Gear Circuit Breaker
34. Beacon Light Circuit Breaker (Opt)
35. Radio #4 Circuit Breaker (Opt)
36. Electronics Bus Bar
37. Radio #3 Circuit Breaker (Opt)
38. Radio #2 Circuit Breaker (Opt)
39. Radio #1 Circuit Breaker (Opt)
40. Auto Pilot Circuit Breaker (Opt)
41. Audio Amp Circuit Breaker (Opt)
42. De-Ice Circuit Breaker (Opt)
43. Alt - Reg Circuit Breaker
44. Turn Coordinator Circuit Breaker
45. Stall Warning Circuit Breaker
46. Bolt
47. Resistor
48. Diode
49. Landing Light Switch
50. Taxi Light Switch

THRU AIRCRAFT SERIAL 21059719

Figure 17-1. Split Bus Bar and Split Bus Power Relay Installation (Sheet 1 of 2)

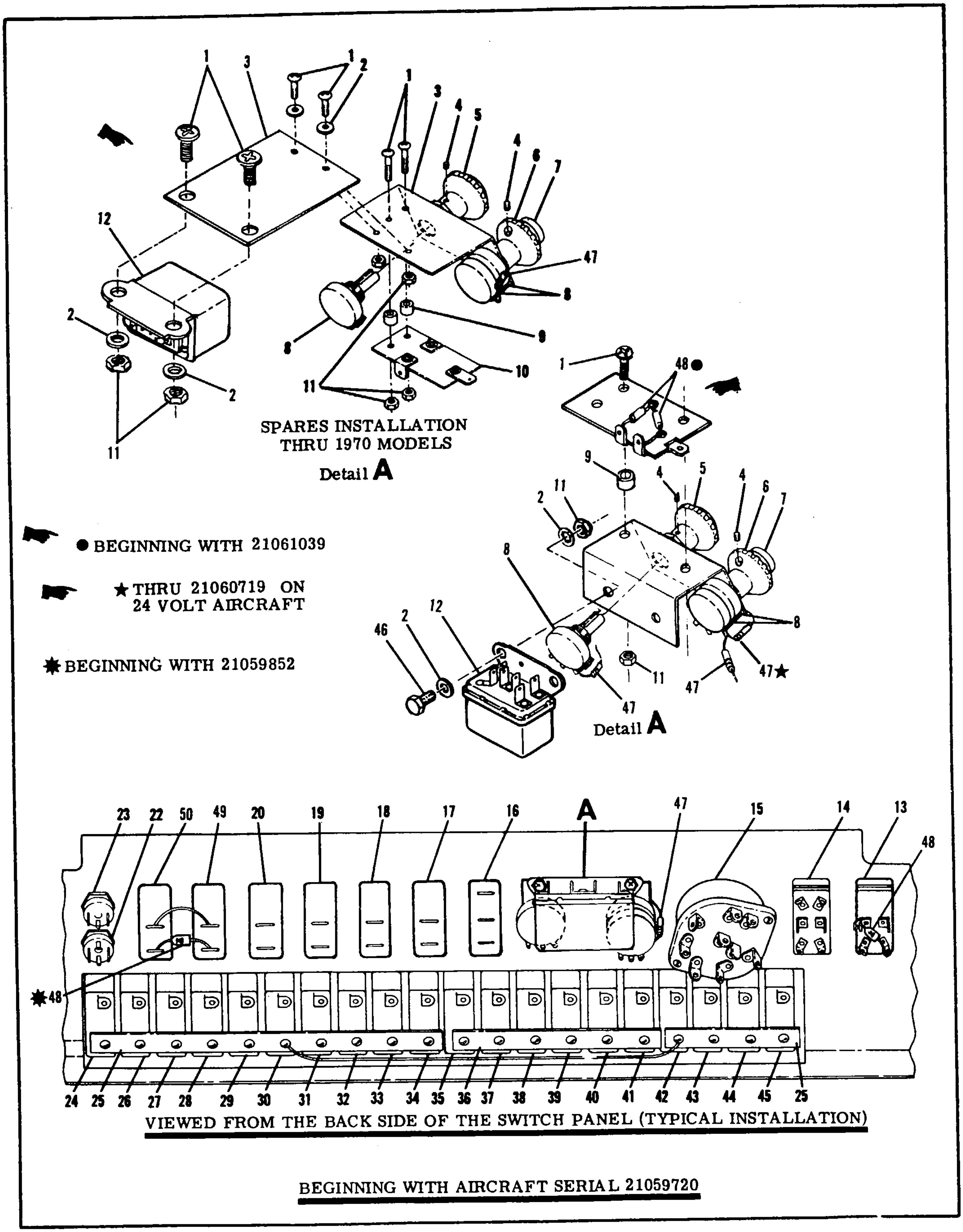


Figure 17-1. Split Bus Bar and Split Bus Power Relay Installation (Sheet 2 of 2)

17-17. REMOVAL AND INSTALLATION OF THE BATTERY. (Refer to figure 17-2).

a. To gain access to the battery, remove the upper left half of cowling.

b. Remove the battery box lid and disconnect the battery ground cable.

CAUTION

Always remove the ground cable first and connect it last to prevent accidentally shorting the battery to the airframe with tools.

c. Disconnect the positive cable from the battery and remove the battery from the aircraft.

d. To install a battery, reverse this procedure.

17-18. CLEANING THE BATTERY. For maximum efficiency, the battery and connections should be kept clean at all times.

a. Remove the battery in accordance with preceding paragraph.

b. Tighten battery cell filler caps to prevent the cleaning solution from entering the cells.

c. Wipe battery cable ends, battery terminals and entire surface of the battery with a clean cloth moistened with a solution of bicarbonate of soda (baking soda) and water.

d. Rinse with clear water, wipe off excess water and allow battery to dry.

e. Brighten up cable ends and battery terminals with emery cloth or a wire brush.

f. Install the battery according to the preceding paragraph.

g. Coat the battery terminals and the cable ends with petroleum jelly.

17-19. ADDING ELECTROLYTE OR WATER TO THE BATTERY. A battery being charged and discharged with use will decompose the water from the electrolyte by electrolysis. When the water is decomposed, hydrogen and oxygen gases are formed which escape into the atmosphere through the battery vent system. The acid in the solution chemically combines with the plates of the battery during discharge or is suspended in the electrolyte solution during charge. Unless the electrolyte has been spilled from a battery, acid should not be added to the solution. The water will decompose into gases and should be replaced regularly. Add distilled water as necessary to maintain the electrolyte level even with the horizontal baffle plate inside the battery. When "dry charged" batteries are put into service, fill as directed with electrolyte. However, as the electrolyte level falls below normal with use add only distilled water to maintain the proper level. The battery electrolyte contains approximately 25% sulphuric acid by volume. Any change in this volume will hamper the proper operation of the battery.

CAUTION

Do not add any type of "battery rejuvenator" to the electrolyte. When acid has been spilled from a battery, the acid balance may be adjusted by following instructions published by the Association of American Battery Manufacturers.

17-20. TESTING THE BATTERY. The specific gravity check method of testing the battery is preferred when the condition of the battery is in a questionable state-of-charge. However, when the aircraft has been operated for a period of time with an alternator output voltage which is known to be correct, the question of battery capability may be answered more correctly with a load type tester. If testing the battery is deemed necessary, the specific gravity should be checked first and compared with the following chart.

BATTERY HYDROMETER READINGS

1.280 Specific Gravity	100% Charged
1.250 Specific Gravity	75% Charged
1.220 Specific Gravity	50% Charged
1.190 Specific Gravity	25% Charged
1.160 Specific Gravity	Practically Dead

NOTE

All readings shown are for an electrolyte temperature of 80° Fahrenheit. For higher temperatures the readings will be slightly lower. For cooler temperatures the readings will be slightly higher. Some hydrometers have a built-in temperature compensation chart and a thermometer. If this type tester is used, disregard this chart.

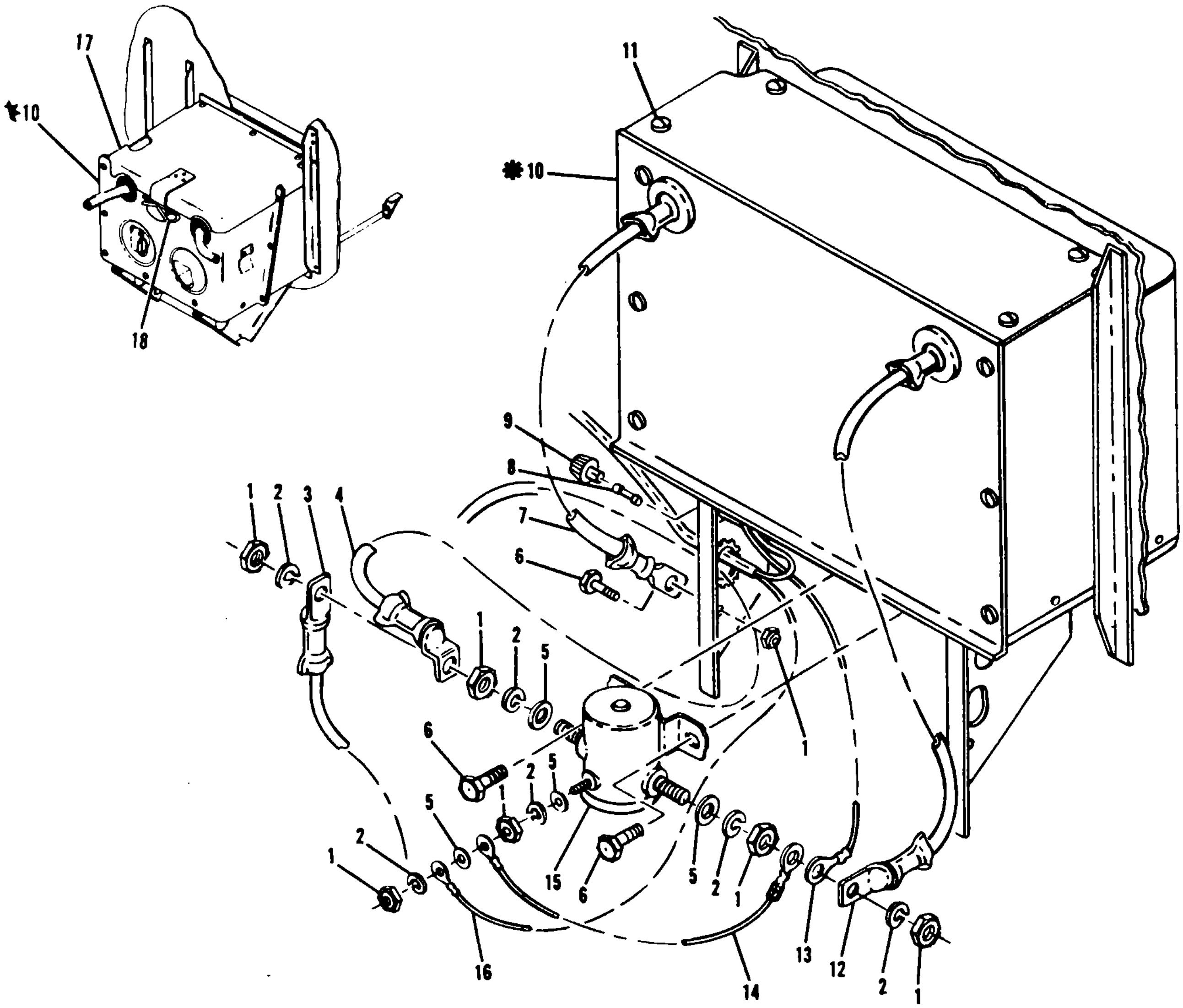
Thru aircraft serial 21059502 if a specific gravity reading indicates the battery is not fully charged the battery should be charged at approximately 20 amperes for 30 minutes or until the battery voltage rises to 15-volts. For aircraft 21059503 and on, (24-volt battery) the battery should be charged at approximately 10 amperes for 30 minutes or until the battery voltage rises to 29-volts.

17-21. CHARGING THE BATTERY. When the battery is to be charged, the level of electrolyte should be checked and adjusted by adding distilled water to cover the tops of the internal battery plates. The battery cables and connections should be clean.

WARNING

When a battery is charging, hydrogen and oxygen gases are generated. Accumulation of these gases can create a hazardous explosive condition. Always keep sparks and open flame away from the battery. Allow unrestricted ventilation of the battery area during charging.

The main points of consideration during a battery charge are excessive battery temperature and violent gassing. Under a reasonable rate of charge (12-volt battery, 20 amperes or less) (24-volt battery, 15 amperes or less) the battery temperature should not rise over 120°F, nor should gassing be so violent that acid is blown from the vents.



✱ THRU AIRCRAFT SERIAL 21059502

✱ BEGINNING WITH AIRCRAFT SERIAL 21059503

1. Nut
2. Lockwasher
3. Gnd Ser Recpt Cable
4. Starter Contactor Cable
5. Washer
6. Bolt
7. Ground Cable
8. Fuse
9. Cap-Fuse
10. Battery Box
11. Fasteners
12. Power Cable
13. Clock Wire
14. Diode Wire
15. Battery Contactor
16. Master Switch Wire
17. Battery Box Cover
18. Clip

Figure 17-2. Battery Installation

17-22. BATTERY BOX.

17-23. DESCRIPTION. The battery is completely enclosed in a box which is painted with acid proof paint. The box has a vent tube which protrudes through the bottom of the aircraft allowing battery gases and spilled electrolyte to escape. The battery box is riveted to the left forward side of the firewall.

17-24. REMOVAL AND INSTALLATION. (Refer to figure 17-2). The battery box is riveted to the firewall. The rivets must be drilled out to remove the box. When a battery box is installed and riveted into place, all rivets and scratches inside the box should be painted with acid-proof lacquer, Part No. CES1054-381, available from the Cessna Service Parts Center.

17-25. MAINTENANCE. The battery box should be inspected and cleaned periodically. The box and cover should be cleaned with a strong solution of bicarbonate of soda (baking soda) and water. Hard deposits may be removed with a wire brush. When all corrosive deposits have been removed from the box, flush it thoroughly with clean water.

WARNING

Do not allow acid deposits to come in contact with skin or clothing. Serious acid burns may result unless the affected area is washed immediately with soap and water. Clothing will be ruined upon contact with battery acid.

Inspect the cleaned box and cover for physical damage and for areas lacking proper acid proofing. A badly damaged or corroded box should be replaced. If the box or lid require acid proofing, paint the area with acid-proof black lacquer, Part No. CES1054-381, available from the Cessna Service Parts Center.

17-26. BATTERY CONTACTOR.

17-27. DESCRIPTION. The battery contactor is bolted to the firewall below the battery box. The contactor is a solenoid plunger type, which is actuated by turning the master switch on. When the master switch is off, the battery is disconnected from the electrical system. A silicon diode is used to eliminate spiking of the transistorized radio equipment. The cathode (+) terminal of the diode connects to the battery terminal of the battery contactor. The anode (-) terminal of the diode connects to the same terminal of the diode connects to the same terminal on the contactor as the master switch wire. This places the diode directly across the contactor solenoid coil so that inductive spikes originating in the coil are clipped when the master switch is opened. (Refer to figure 17-2).

17-28. REMOVAL AND INSTALLATION. (Refer to figure 17-2).

a. Open battery box and disconnect ground cable from negative battery terminal. Pull cable clear of battery box.
b. Remove the nut, lockwasher and the two plain washers securing the battery cables to the battery contactor.
c. Remove the nut, lockwasher and the two plain washers securing the wire which is routed to the master switch.
d. Remove the bolt, washer and nut securing each side of the battery contactor to the firewall. The contactor will now be free for removal.
e. To replace the contactor, reverse this procedure.

17-29. BATTERY CONTACTOR CLOSING CIRCUIT. (Refer to figure 17-3). This circuit consists of a 5-amp fuse, a resistor and a diode mounted on the ground service receptacle bracket. This serves to shunt a small charge around the battery contactor so that ground power may be used to close the contactor when the battery is too dead to energize the contactor by itself.

17-30. GROUND SERVICE RECEPTACLE.

17-31. DESCRIPTION. A ground service receptacle is installed to permit the use of external power for cold weather starting or when performing lengthy electrical maintenance. A reverse polarity protection system is utilized whereby ground power must pass through an external power contactor to be connected to the bus. A silicon junction diode is connected in series with the coil on the external power contactor so that if the ground power source is inadvertently connected with a reversed polarity, the external power contactor will not close. This feature protects the diodes in the alternator, and other semiconductor devices used in the aircraft, from possible reverse polarity damage.

NOTE

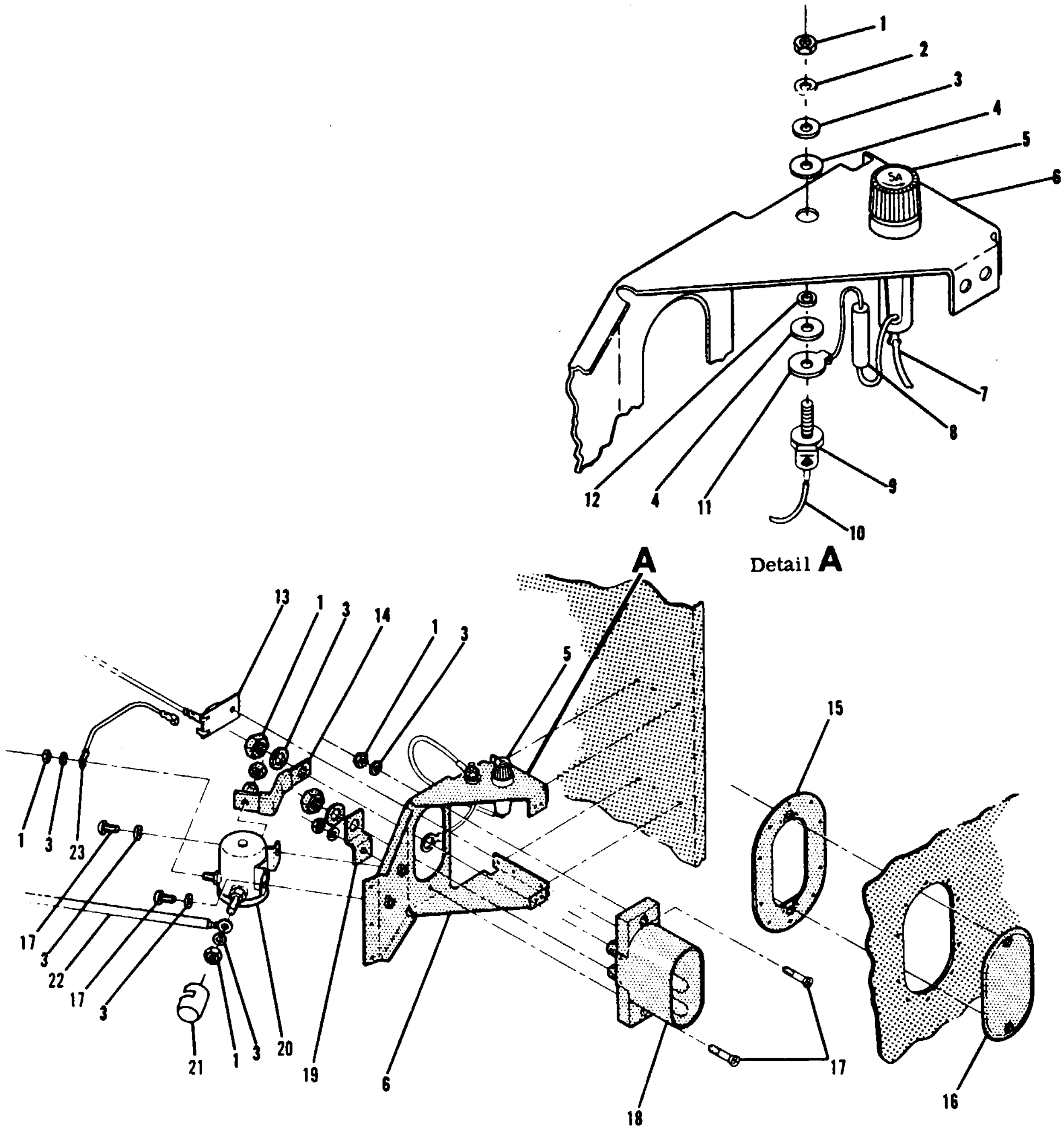
Maintenance of the electronic installations cannot be performed when using external power. Application of external power opens the relay supplying voltage to the electronics bus. For lengthy ground testing of electronic systems, connect a well regulated and filtered power supply directly to the battery side of the battery contactor. Adjust the supply for (14-volts) on 14-volt system and (28-volts) on 28-volt system, and close the master switch.

NOTE

When using ground power to start the airplane, close the master switch before removing the ground power plug. This will ensure closure of the battery contactor and excitation of the alternator field in the event that the battery is completely dead.

CAUTION

Failure to observe polarity when connecting an external power source directly to the battery or directly to the battery side of the battery contactor, will damage the diodes in the alternator and other semiconductor devices in the aircraft.



1. Nut
2. Lockwasher
3. Washer
4. Insulating Washer
5. Fuse
6. Bracket
7. Wire to Battery Contactor
8. Resistor-.75 ohm
9. Diode
10. Wire to Ext. Pwr. Recept.
11. Solder Terminal
12. Spacer
13. Diode Board
14. Bus Bar
15. Doubler
16. Cover Plate
17. Screw
18. Receptacle
19. Ground Strap
20. Ext. Power Contactor
21. Cover
22. Power Cable
23. Contactor Control Wire

Figure 17-3. Ground Service Receptacle Installation

WARNING

External power receptacle must be functionally checked after wiring, or after replacement of components of the external power or split bus systems. Incorrect wiring or malfunctioned components can cause immediate engagement of starter when ground service plug is inserted.

17-32. TROUBLE SHOOTING.

TROUBLE	PROBABLE CAUSE	REMEDY
STARTER ENGAGES WHEN GROUND POWER IS CONNECTED.	Shorted or reversed diode in split bus-bar system.	Check wiring to, and condition of diode mounted on the split bus relay bracket adjacent to the magneto switch. Correct wiring. Replace diode board assembly.
GROUND POWER WILL NOT CRANK ENGINE.	Ground service connector wired incorrectly.	1. Check for voltage at all three terminals of external power contactor with ground power connected and master switch off. If voltage is present on input and coil terminals but not on the output terminal, proceed to step 4. If voltage is present on the input terminal but not on the coil terminal, proceed to step 2. If voltage is present on all three terminals, check wiring between contactor and bus.
		2. Check for voltage at small terminal of ground service receptacle. If voltage is not present, check ground service plug wiring. If voltage is present, proceed to step 3.
	Open or mis-wired diode on ground service diode board assembly.	3. Check polarity and continuity of diode on diode board at rear of ground service receptacle. If diode is open or improperly wired, replace diode board assembly.
	Faulty external power contactor.	4. Check resistance from small (coil) terminal of external power contactor to ground (master switch off and ground power unplugged). Normal indication is 16-24 ohms. on 12-volt system or 50-70 ohms on the 24-volt systems. If resistance indicates an open coil, replace contactor. If resistance is normal, proceed to step 5.
	Faulty contacts in external power contactor.	5. With master switch off and ground power applied, check for voltage drop between two large terminals of external power (turn on taxi light for a load). Normal indication is zero volts. If voltage is intermittently present or present all the time, replace contactor.

17-33. REMOVAL AND INSTALLATION. (Refer to figure 17-3).

a. Open the battery box and disconnect the ground cable from the negative terminal of the battery and pull the cable free of the box.

b. Remove the nuts, washers, ground strap, bus bar and diode board from the studs of the receptacle and remove battery cable.

c. Remove the screws and nuts holding the receptacle; ground strap will then be free from the bracket.

d. To install a ground service receptacle, reverse this procedure.

17-34. ALTERNATOR POWER SYSTEM.

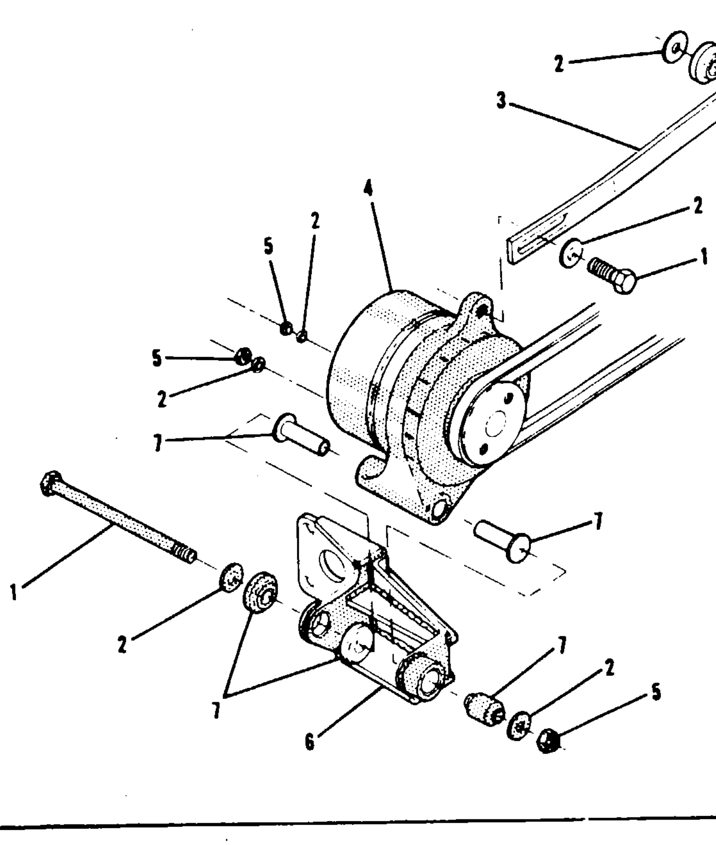
17-35. DESCRIPTION. The alternator system consists of an engine driven alternator, a voltage regulator and a circuit breaker located on the instrument panel. The system is controlled by the left hand portion of the split rocker, master switch labeled ALT. Beginning with 1972 Models an over-voltage sensor switch and red warning light, labeled HIGH VOLTAGE are incorporated to protect the system. The aircraft battery supplies the source of power for excitation of the alternator.

17-36. ALTERNATOR.

17-37. DESCRIPTION. The 60-ampere alternators are three phase, delta connected with integral silicon diode rectifiers. The alternator is rated at 14-volts at 60-amperes (thru 21059502) and 28-volts at 60-amperes (beginning with 21059503) continuous output. The moving center part of the alternator (rotor) consists of an axial winding with radial interlocking poles which surround the winding. With excitation applied to the winding through slip rings the pole pieces assume magnetic polarity. The rotor is mounted in bearings and rotates inside the stator which contains the windings in which the ac current is generated. The stator windings are three-phase, delta connected and are attached to two diode plates, each of which contains three silicon diodes.

The diode plates are connected to accomplish full-wave, rectification of the ac. The resulting dc output is applied to the aircraft bus and sensed by the voltage regulator. The regulator controls the excitation applied to the alternator field thus controlling the output voltage of the alternator.

17-38. ALTERNATOR REVERSE VOLTAGE DAMAGE. The alternator is very susceptible to reverse polarity damage due to the very low resistance of the output windings and the low resistance of the silicon diodes in the output. If a high current source, such as a battery or heavy duty ground power cart is attached to the aircraft with the polarity inadvertently reversed, the current through the alternator will flow almost without limit and the alternator will be immediately damaged.



NOTE

When replacement of the alternator support bracket is required, Single-engine Service Letter SE71-42 dated December 10, 1971 should be complied with.

1. Bolt
2. Washer
3. Adjusting Bracket
4. Alternator
5. Nut
6. Support Assembly
7. Bushing

Figure 17-4. Alternator Installation

17-39. TROUBLE SHOOTING.

TROUBLE	PROBABLE CAUSE	REMEDY
AMMETER INDICATES HEAVY DISCHARGE WITH ENGINE NOT RUNNING OR ALTERNATOR CIRCUIT BREAKER OPENS WHEN MASTER SWITCH IS TURNED ON.	Shorted field in alternator.	1. Remove plug from regulator with master switch on and observe if heavy drain persists. If heavy drain is reduced, proceed to step 2. If heavy drain is not reduced, proceed to step 3. 2. Check resistance from terminal "F" on alternator to the alternator case. Normal indication on 12-volt systems is 6-7 ohms of 11-12 ohms on 24-volt systems. If resistance is too low, repair or replace alternator.
	Shorted radio noise filter or shorted wire.	3. Remove cable from output terminal of alternator. Check resistance from end of cable to ground (MASTER SWITCH MUST BE OFF). If resistance does not indicate a direct short, proceed to step 6. If resistance indicates a direct short, proceed to step 4.
		4. Remove cable connections from radio noise filter. Check resistance from the filter input terminal to ground. Normal indication is infinite resistance. If reading indicates a direct short, replace filter. If no short is evident, proceed to step 5. 5. Check resistance from ground to the free ends of the wires which were connected to the radio noise filter (or alternator if no noise filter is installed). Normal indication does not show a direct short. If a short exists in wires, repair or replace wiring.
	Shorted diodes in alternator.	6. Check resistance from output terminal of alternator to alternator case. Reverse leads and check again. Resistance reading may show continuity in one direction but should show an infinite reading in the other direction. If an infinite reading is not obtained in at least one direction, repair or replace alternator.

17-39. TROUBLE SHOOTING (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
ALTERNATOR SYSTEM WILL NOT KEEP BATTERY CHARGED.	Regulator faulty or improperly adjusted.	1. Start engine and adjust for 1500 RPM. Ammeter should indicate a heavy charge rate with all electrical equipment turned off. Rate should taper off in 1-3 minutes. On 12-volt aircraft a voltage check at the bus should indicate a reading consistant with the voltage vs temperature chart on page 17-19. If charge rate tapers off very quickly and voltage is normal, check battery for malfunction. If ammeter shows a low charge rate or any discharge rate, and voltage is low, proceed to step 2. 2. Stop engine, remove cowl, and remove cover from voltage regulator. Turn master switch ON/OFF several times and observe field relay in regulator. Relay should open and close with master switch and small arc should be seen as contacts open. If relay is inoperative, proceed to step 3. If relay operates, proceed to step 4. 3. Check voltage at "S" terminal of regulator with master switch closed. Meter should indicate bus voltage. If voltage is present, replace regulator. If voltage is not present, check wiring between regulator and bus. 4. Remove plug from regulator and start engine. Momentarily jumper the "A+" and "F" terminals together on the plug. Aircraft's ammeter should show heavy rate of charge. If heavy charge rate is observed, replace regulator. If heavy charge rate is not observed, proceed to step 5.
	Faulty wiring between alternator and regulator, or faulty alternator.	5. Check resistance from "F" terminal of regulator to "F" terminal of alternator. Normal indication is a very low resistance. If reading indicates no, or poor continuity, repair or replace wiring from regulator to alternator.

17-3. TROUBLESHOOTING (Continued)

TROUBLE	PROBABLE CAUSE	REMEDY
ALTERNATOR SYSTEM WILL NOT KEEP BATTERY CHARGED. (Cont.)	Faulty wiring between alternator and regulator, or faulty alternator. (Cont.)	6. Check resistance from "F" terminal of alternator to alternator case. Normal indication on 12-volt systems is 6-7 ohms or 11-12 ohms on 24-volt systems. If resistance is high or low, repair or replace alternator.
		7. Check resistance from case of alternator to airframe ground. Normal indication is very low resistance. If reading indicates no, or poor continuity, repair or replace alternator ground wiring.
ALTERNATOR OVERCHARGES BATTERY - BATTERY USES EXCESSIVE WATER.	Regulator faulty or improperly adjusted.	Check bus voltage with engine running. Normal indication agrees with voltage vs. temperature chart on page 17-14. Observe aircraft's ammeter, ammeter should indicate near zero after a few minutes of engine operation. Replace regulator.
OVERVOLTAGE WARNING LIGHT STAYS ON. (24-VOLT).	Faulty regulator.	1. Reset overvoltage sensor by turning master switch (ALT side) OFF and ON. If warning light stays on, check regulator by substituting a known good regulator. If warning light stays on, proceed to step 2.
	Faulty overvoltage sensor.	2. Substitute a known good sensor. If warning light does not light, replace sensor. If light stays on, proceed to step 3.
	Faulty field wiring.	3. Test wiring, look for field wire shorted to primary voltage. Repair or replace wire.
OVERVOLTAGE WARNING LIGHT ON. (12-VOLT).	Regulator faulty or improperly adjusted. Faulty sensor switch.	1. With engine running, turn off and on battery portion of the master switch. If the light stays on, shut down engine, then turn on the "BAT" and "ALT" portions of the master switch. Check for voltage at the "S" terminal of the voltage regulator. If voltage is present, adjust or replace regulator. If voltage is not present, check master switch and wiring for short or open condition. If wiring and switch are normal, replace sensor.

17-40. REMOVAL AND INSTALLATION. (Refer to figure 17-4).

a. Make sure that the master switch remains in the off position or disconnect the negative lead from the battery.
b. Disconnect the wiring from the alternator.
c. Remove the safety wire from the upper adjusting bolt and remove the bolt from the alternator.
d. Remove the nut and washer from the lower mounting bolt.
e. Remove the alternator drive belt and lower mounting bolt to remove the alternator.
f. To replace the alternator, reverse this procedure.
g. Adjust belt tension to obtain 3/8" deflection at the center of the belt when applying 12 pounds of pressure to the belt. After the belt is adjusted and the bolt is safety wired, tighten the bottom bolt to 100-140 lb.-in. torque to remove any play between the alternator mounting foot and the U-shaped support assembly.

CAUTION

Whenever a new belt is installed, belt tension should be checked within 10 to 25 hours of operation.

NOTE

When tightening the alternator belt, apply pry bar pressure only to the end of the alternator nearest to the belt pulley.

17-41. ALTERNATOR VOLTAGE REGULATOR. (12-VOLT AIRCRAFT).

17-42. DESCRIPTION. The alternator voltage regulator contains two relays. One relay is actuated by the aircraft master switch and connects the regulator to the battery. The second relay is a two-stage, voltage sensitive device which is used to control the current applied to the field winding of the alternator. When the upper set of contacts on the voltage regulator relay are closed, full bus voltage is applied to the field. This condition will exist when the battery is being heavily charged or when a very heavy load is applied to the system. When the upper contacts open, as the voltage begins to rise toward normal bus voltage, the voltage at the alternator field is reduced through a resistor network in the base of the regulator thus reducing the output from the alternator. As the voltage continues to rise, assuming a very light load on the system, the lower contacts will close and ground the alternator field and shut the alternator completely off. Under lightly loaded conditions the voltage relay will vibrate between the intermediate charge rate and the lower (completely off) contacts. Under a moderate load, the relay will vibrate between the intermediate charge rate and the upper (full output) contacts.

The voltage relay is temperature compensated so that the battery is supplied with the proper charging voltage for all operating temperatures. With the battery fully charged (ship's ammeter indicating at or near zero) and a moderate load applied to the system (a taxi light turned on) the voltage at the bus bar should be within the range shown according to the air temperature on the following chart:

TEMPERATURE	BUS VOLTAGE
60 - 74°F	13.8 - 14.1
75 - 90°F	13.7 - 14.0
91 - 100°F	13.6 - 13.9

The voltage regulator is adjustable but adjustments on the airplane is not recommended. A bench adjustment procedure is outlined in the Cessna Alternator Charging Systems Service/Parts Manual.

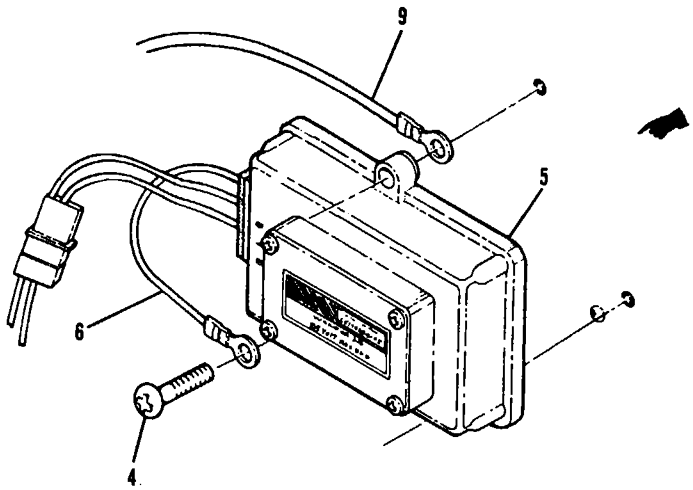
17-43. TROUBLE SHOOTING THE VOLTAGE REGULATOR. For trouble shooting the voltage regulator, refer to paragraph 17-39.

17-44. REMOVAL AND INSTALLATION OF VOLTAGE REGULATOR. (Refer to figure 17-5).

a. Make sure that the master switch is off or disconnect the negative lead from the battery.
b. Remove the connector plug from the regulator.
c. Remove two screws holding the regulator on the firewall.
d. To reinstall the regulator, reverse this procedure. Be sure that the connections for grounding the alternator, wiring shields and the base of the regulator are clean and bright before assembly. Otherwise, poor voltage regulation and/or excessive radio noise may result.

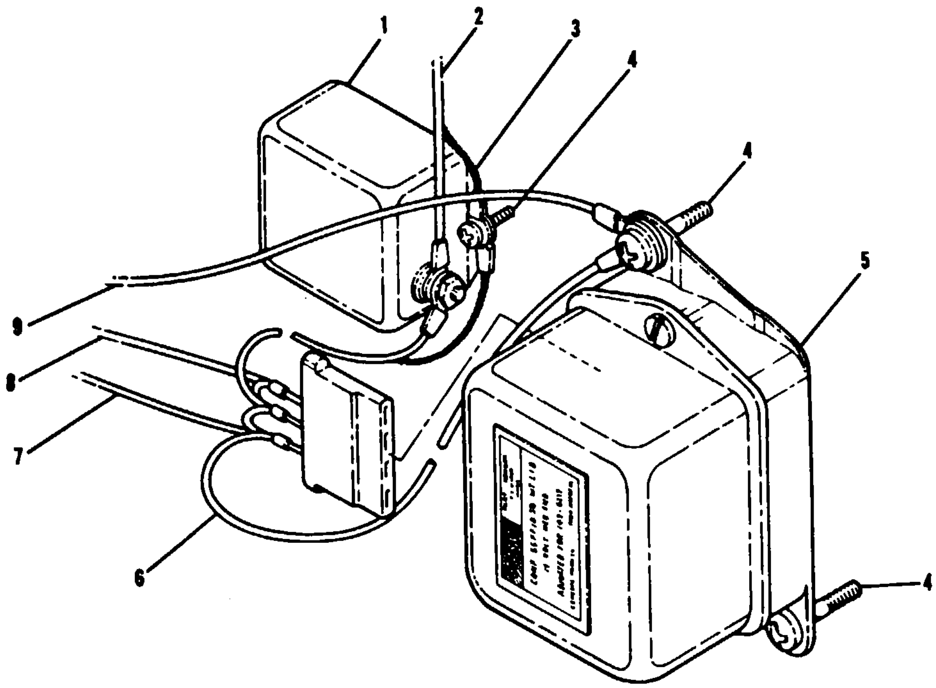
17-45. VOLTAGE REGULATOR (TRANSISTORIZED) (24-VOLT AIRCRAFT). The transistorized voltage regulator controls the alternator output in a similar manner to a mechanical voltage regulator; by regulating the alternator field current. The regulation is accomplished electronically with the use of transistors and diodes rather than by a vibrating armature relay. The voltage sensing component is a zener diode which has the characteristic of suddenly changing its resistance when a specified voltage is reached.

When the engine is started, battery current is supplied to the field through a "bias" diode, and power transistor. The bias diode aids high temperature stability of the power transistor. A second diode, connected from the field terminal to common ground, absorbs undesirable field voltage peaks more efficiently than the resistor used in electro-mechanical regulators. As the alternator begins to supply current, battery voltage will increase. When battery voltage reaches approximately 28 volts, the zener diode suddenly reduced its resistance and turns on the driver transistor. When the driver transistor turns on, the power transistor is caused to turn off. Battery voltage is reduced slightly because the alternator output was reduced when the power transistor turned off the field current. Zener diode voltage is reduced at the same time as battery voltage, causing the zener diode to increase its resistance and turn off the driver transistor. The power transistor is



24-VOLT

BEGINNING WITH AIRCRAFT SERIAL 21059503



12-VOLT

THRU AIRCRAFT SERAIL 12059502

1. Filter - Radio Noise
2. Wire to Master Switch
3. Shield - Ground
4. Screw
5. Voltage Regulator
6. Wire Shields to Ground
7. Wire to Alternator "F"
8. Wire to Alternator "A+"
9. Wire to Alternator Ground

Figure 17-5. Voltage Regulator Installation caused to turn on again, resulting in a complete cycle of events. The transistors alternate in the on-off action. When the driver transistor turns on the power transistor turns off.

The temperature compensating resistor is made of a special material that changes its resistance with temperature in such a manner that during cold weather the battery charging voltage is increased. This resistor performs the same function as the bimetal hinge on the voltage limiter armature of a mechanical regulator.

Transistor regulator calibration can be changed by screwdriver adjustment of potentiometer. Adjusting the potentiometer performs the same function as adjusting the voltage limiter armature spring tension on a mechanical regulator.

A capacitor, in series with two resistors, causes the driver transistor and the power transistor to switch on and off faster, for proper flip-flop action.

The remaining resistors in the unit provide proper operating voltages for the zener diode and the two transistors.

17-46. ADJUSTMENT. (24-VOLT). Regulator voltage limiter adjustments. The only adjustment on the transistorized alternator regulator is the voltage limiter adjustment. The voltage setting can be tailored to meet the requirements of a given aircraft in order to maintain proper battery specific gravity. Never shift the voltage setting by more than 0.3 volt from the previous setting. Always allow an adequate time interval between each new voltage setting in order to obtain an accurate reading of battery specific gravity.

NOTE

Clockwise adjustment decreases voltage and counterclockwise adjustment increases voltage. Refer to the Cessna Alternator Charging Systems Manual for bench testing.

17-47. TROUBLE SHOOTING. (Refer to paragraph 17-30 for trouble shooting).

17-48. REMOVAL AND INSTALLATION. (Refer to figure 17-5).

a. Ensure that the master switch is off.
b. Remove upper cowl to gain access to the regulator.
c. Remove the connector plug from the regulator.
d. Remove the three bolts holding the regulator on the firewall.
e. To reinstall the regulator, reverse the preceding steps.

17-49. OVER-VOLTAGE SENSOR AND WARNING LIGHT. (BEGINNING WITH 1972 MODELS).

17-50. DESCRIPTION. The over-voltage system consists of a over-voltage sensor switch and a red warning light labeled, HIGH VOLTAGE, on the instrument panel. When an over-voltage tripoff occurs the over-voltage sensor turns off the alternator system and the red warning light comes on. The ammeter will show a discharge. Turn off the alternator portion of the master switch to recycle the over-voltage sensor. If the over-voltage condition was transient, the normal alternator charging will resume and no further action is necessary. If the over-voltage tripoff recurs, then a generating system malfunction has occured such that the electrical accessories must be operated from the aircraft battery only. Conservation of electrical energy must be practiced until the flight can be terminated. The over-voltage red warning light filament may be tested at any time by turning off the , alternator portion of the master switch and leaving the battery portion turned on. This test does not induce an over-voltage condition on the electrical system.

NOTE

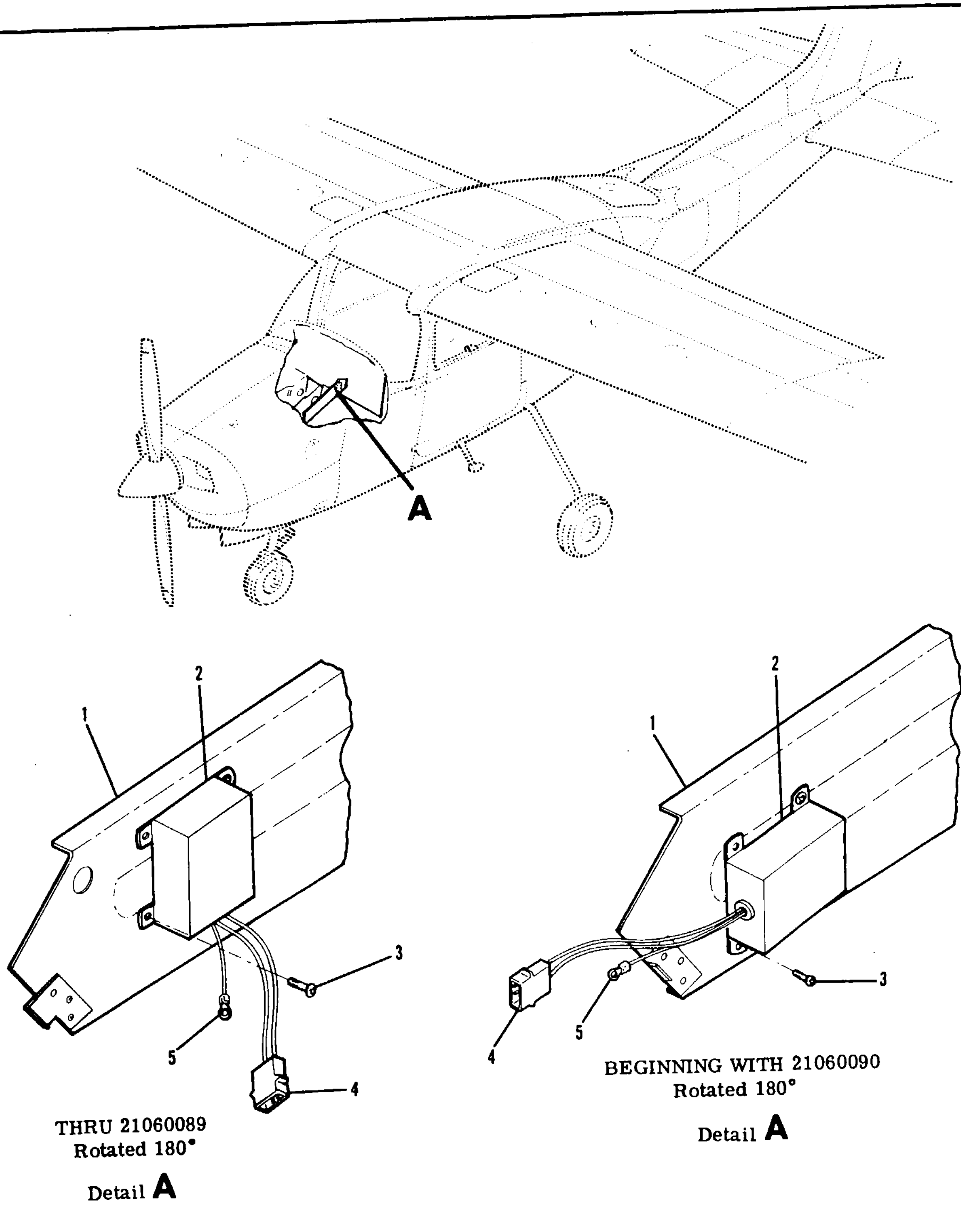
Should nuisance trip-outs occur on aircraft prior to 21059553, Single-engine Service Letter SE72-15, Dated April 21, 1972 should be complied with.

17-50A. REMOVAL AND INSTALLATION. Figure 17-5A may be used as a guide for removal and installation of the over-voltage sensor.

17-50B. RIGGING THROTTLE-OPERATED MICRO-SWITCH. Refer to Section 13.

17-50C. AUXILIARY FUEL PUMP FLOW RATE ADJUSTMENT. Refer to Section 13.

SHOP NOTES:



1. Support
2. Sensor
3. Screw
4. Housing - Cap
5. Ground Wire

Figure 17-5A. Over-Voltage Sensor Installation

17-51. AIRCRAFT LIGHTING SYSTEM.

17-52. DESCRIPTION. The aircraft lighting system consists of landing and taxi lights, navigation lights, flashing beacon light, anti-collision strobe lights, interior and instrument panel flood lights, electroluminescent panel lighting, instrument post lighting, pedestal lights, oxygen lights, courtesy lights, de-ice light, control wheel map light, baggage compartment light, compass and radio dial lights.

17-53. SWITCHES.

17-54. DESCRIPTION. The instrument panel switches used are snap-in type rocker switches. These switches have a design feature which permits them to snap into the panel from the panel side and can subsequently be removed for easy maintenance. These switches also feature spade type slip-on terminals.

17-55. TROUBLE SHOOTING.

TROUBLE	PROBABLE CAUSE	REMEDY
LANDING AND TAXI LIGHTS OUT.	Short circuit in wiring.	1. Inspect circuit breaker. If circuit breaker is open, proceed to step 2. If circuit breaker is OK, proceed to step 3.
	Defective wiring.	2. Test each circuit separately until short is located. Repair or replace wiring.
	Defective switch.	3. Check voltage at lights with master and landing and taxi light switches ON. Should read battery voltage. Replace switch.
LANDING OR TAXI LIGHT OUT.	Lamp burned out.	1. Test lamp with ohmmeter or new lamp. Replace lamp.
	Open circuit in wiring.	2. Test wiring for continuity. Repair or replace wiring.
FLASHING BEACON DOES NOT LIGHT.	Short circuit in wiring.	1. Inspect circuit breaker. If circuit breaker is open, proceed to step 2. If circuit breaker is OK, proceed to step 3.
	Defective wiring.	2. Test circuit until short is located. Repair or replace wiring.
	Lamp burned out.	3. Test lamp with ohmmeter or a new lamp. Replace lamp. If lamp is good, proceed to step 4.
	Open circuit in wiring.	4. Test circuit from lamp to flasher for continuity. If no continuity is present, repair or replace wiring. If continuity is present, proceed to step 5.
	Defective switch.	5. Check voltage at flasher with master and beacon switch on. Should read battery voltage. Replace switch. If voltage is present, proceed to step 6.
	Defective flasher.	6. Install new flasher.
FLASHING BEACON CONSTANTLY LIT.	Defective flasher.	1. Install new flasher.

17-55. TROUBLE SHOOTING (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
ALL NAV LIGHTS OUT.	Short circuit in wiring.	1. Inspect circuit breaker. If circuit breaker is open, proceed to step 2. If circuit breaker is OK, proceed to step 3.
	Defective wiring.	2. Isolate and test each nav light circuit until short is located. Repair or replace wiring.
	Defective switch.	3. Check voltage at nav light with master and nav light switches on. Should read battery voltage. Replace switch.
ONE NAV LIGHT OUT.	Lamp burned out.	1. Inspect lamp. Replace lamp.
	Open circuit in wiring.	2. Test wiring for continuity. Repair or replace wiring.
ONE ANTI-COLLISION STROBE LIGHT WILL NOT LIGHT. THRU 1972 MODELS.	Flash tube burned out.	Test with new flash tube. Replace flash tube.
	Faulty wiring.	Test for continuity. Repair or replace.
	Faulty trigger head.	Test with new trigger head. Replace trigger head.
BOTH ANTI-COLLISION STROBE LIGHTS WILL NOT LIGHT. THRU 1972 MODELS.	Circuit breaker open.	Inspect. Reset.
	Faulty power supply.	Listen for whine in power supply to determine if power is operating.
	Faulty switch.	Test for continuity. Repair or replace.
	Faulty wiring.	Test for continuity. Repair or replace.

WARNING

The anti-collision system is a high voltage device. Do not remove or touch tube assembly while in operation. Wait at least 5 minutes after turning off power before starting work.

BOTH ANTI-COLLISION STROBE LIGHTS WILL NOT LIGHT. BEGINNING WITH 1973 MODELS.	Open circuit breaker.	1. Check, if open reset. If circuit breaker continues to open proceed to step 2.

TROUBLE	PROBABLE CAUSE	REMEDY
BOTH ANTI-COLLISION STROBE LIGHTS WILL NOT LIGHT. BEGINNING WITH 1973 MODELS. Cont.	Open circuit breaker. Cont.	2. Disconnect red wire between aircraft power supply (battery/external power) and strobe power supplies, one at a time. If circuit breaker opens on one strobe power supply, replace strobe power supply. If circuit breaker opens on both strobe power supplies proceed to step 3. If circuit breaker does not open proceed to step 4.
		3. Check aircraft wiring. Repair or replace as necessary.
		4. Inspect strobe power supply ground wire for contact with wing structure.

CAUTION

Extreme care should be taken when exchanging flash tube. The tube is fragile and can easily be cracked in a place where it will not be obvious visually. Make sure the tube is seated properly on the base of the nav light assembly and is centered in the dome.

NOTE

When checking defective power supply and flash tube, units from opposite wing may be used. Be sure power leads are protected properly when unit is removed to prevent short circuit.

ONE ANTI-COLLISION STROBE LIGHT WILL NOT LIGHT. BEGINNING WITH 1973 MODELS.	Defective Strobe Power Supply, or flash tube.	1. Connect voltmeter to red lead between aircraft power supply (battery/external power) and strobe power supply, connecting negative lead to wing structure. Check for 12/24 volts. If OK proceed to step 2. If not, check aircraft power supply (battery/external power).
		2. Replace flash tube with known good flash tube. If system still does not work, replace strobe power supply.

17-55. TROUBLE SHOOTING (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
DOME LIGHT TROUBLE.	Short circuit in wiring.	1. Inspect circuit breaker. If circuit breaker is open, proceed to step 2. If circuit breaker is OK, proceed to step 3.
	Defective wiring.	2. Test circuit until short is located. Repair or replace wiring.
		3. Test for open circuit. Repair or replace wiring. If no short or open circuit is found, proceed to step 4.
	Lamp burned out.	4. Test lamp with ohmmeter or new lamp. Replace lamp.
	Defective switch.	5. Check for voltage at dome light with master and dome light switch on. Should read battery voltage. Replace switch.
ELECTROLUMINESCENT PANELS WILL NOT LIGHT.	Short circuit in wiring.	1. Inspect circuit breaker. If circuit breaker is open, proceed to step 2. If circuit breaker is OK, proceed to step 3.
	Defective wiring.	2. Test circuit until short is located. Repair or replace wiring.
		3. Test for open circuit. Repair or replace wiring. If no open or short circuit is found, proceed to step 4.
	Defective resistor.	4. Check resistor for continuity. (Located in line between rheostat and inverta-pak.) Replace resistor.
	Defective rheostat.	5. Check input voltage at inverta-pak with master switch on. Voltmeter should give a smoothly varied reading over the entire control range of the rheostat. If no voltage is present or voltage has a sudden drop before rheostat has been turned full counterclockwise, replace rheostat.
	Defective inverta-pak.	6. Check output voltage at inverta-pak with ac voltmeter. Should read about 125 volts ac with rheostat set for full bright. Replace inverta-pak.

17-55. TROUBLE SHOOTING (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
INSTRUMENT LIGHTS WILL NOT LIGHT.	Short circuit wiring.	1. Inspect circuit breaker. If circuit breaker is open, proceed to step 2. If circuit breaker is OK, proceed to step 3.
	Defective wiring.	2. Test circuit until short is located. Repair or replace wiring. 3. Test for open circuit. Repair or replace wiring. If no short or open circuit is found, proceed to step 4.
	Faulty section in dimming potentiometer.	4. Lights will work when control is placed in brighter position. Replace potentiometer.
	Faulty light dimming transistor.	5. Test both transistors with new transistor. Replace faulty transistor.
	Faulty selector switch.	6. Inspect. Replace switch.
INSTRUMENT LIGHTS WILL NOT DIM.	Open resistor or wiring in minimum intensity end of potentiometer.	1. Test for continuity. Replace resistor or repair wiring.
	Shorted transistor.	2. Test transistor by substitution. Replace defective transistor.
CONTROL WHEEL MAP LIGHT WILL NOT LIGHT.	Nav light switch turned off.	1. Nav light switch has to be ON before map light will light.
	Short circuit in wiring.	2. Check lamp fuse on terminal board located on back of stationary panel with ohmmeter. If fuse is open, proceed to step 3. If fuse is OK, proceed to step 4.
	Defective wiring.	3. Test circuit until short is located. Repair or replace wiring. 4. Test for open circuit. Repair or replace wiring. If a short or open circuit is not found, proceed to step 5.
	Defective map light assembly.	5. Check voltage at map light assembly with master and nav switches on. If battery voltage is present, replace map light assembly.

17-56. LANDING AND TAXI LIGHTS.

17-57. DESCRIPTION. Thru aircraft serial 210-59502 the landing and taxi lights are mounted in the leading edge of the left wing. A clear plastic cover provides weather protection for the lamps and is shaped to maintain the leading edge curvature of the wing. The landing lamp is mounted on the inboard side and is adjusted to throw its beam further forward than the taxi lamp. Both lights are controlled by a split rocker switch. Beginning with aircraft serial 21059503 the landing and taxi lights are mounted in the lower nose cap. Both lamps are used for landing and only the right hand for taxi. Lamps are controlled by a interlocking, split rocker switch. Beginning with 21059852 lamps are controlled by two rocker switches with a diode assembly installed which enables the landing light switch to turn on both landing and taxi lamps.

17-58. REMOVAL AND INSTALLATION. (THRU AIRCRAFT SERIAL 21059502). (Refer to figure 17-6).

a. Remove screws holding wing tip to wing, disconnect navigation light wire and remove wing tip.
b. Remove screws holding seal on rib to gain access to lights through the lightening hole in rib.
c. Using a short screwdriver, reach in through the lightening hole and remove the four attaching screws (8) from the bracket assembly and remove the bracket.

NOTE

Do not reposition the landing and taxi light adjustment screws (7). If readjustment is required, refer to figure 17-6.

d. Remove the two screws securing the wiring to the lamp contacts and remove the lamp.
e. Install new lamp and reassemble.
f. To replace plastic window, remove screws holding leading edge of rib to wing and remove leading edge of rib.
g. Slide the plastic window out of the retainer, install new window and reassemble.

17-59. REMOVAL AND INSTALLATION. (BEGINNING WITH AIRCRAFT SERIAL 21059503). (Refer to figure 17-6).

a. Remove screws securing retainer (2) to nose cap.
b. Pull light assembly forward from nose cap and disconnect lamp wires.
c. Remove tinnerman screws (6) from bracket (5) and remove bracket and lamp.
d. Install new lamp and reassemble.

17-60. NAVIGATION LIGHTS.

17-61. DESCRIPTION. The navigation lights are located on each wing tip and the stinger. Operation of the lights is controlled by a single two position switch. A plastic light detector on each wing tip allows the pilot to determine if the lamps are working properly during flight.

17-62. REMOVAL AND INSTALLATION. Figure 17-7 shows in detail all components of the navigation lights. Use this figure as a guide for removal and installation.

17-63. ANTI-COLLISION STROBE LIGHTS.

17-64. DESCRIPTION. A white strobe light may be installed on each wing tip with the navigation light. These lights are vibration resistant and operate on the principle of a capacitor discharge into a zenon tube, producing an extremely high intensity flash. Thru aircraft serial 21059719, energy was supplied to the strobe lights from a power supply mounted inside the right wing, on the rib at wing station 26.00. Beginning with aircraft serial 21059720 each strobe light has its own power supply mounted on the wing tip ribs.

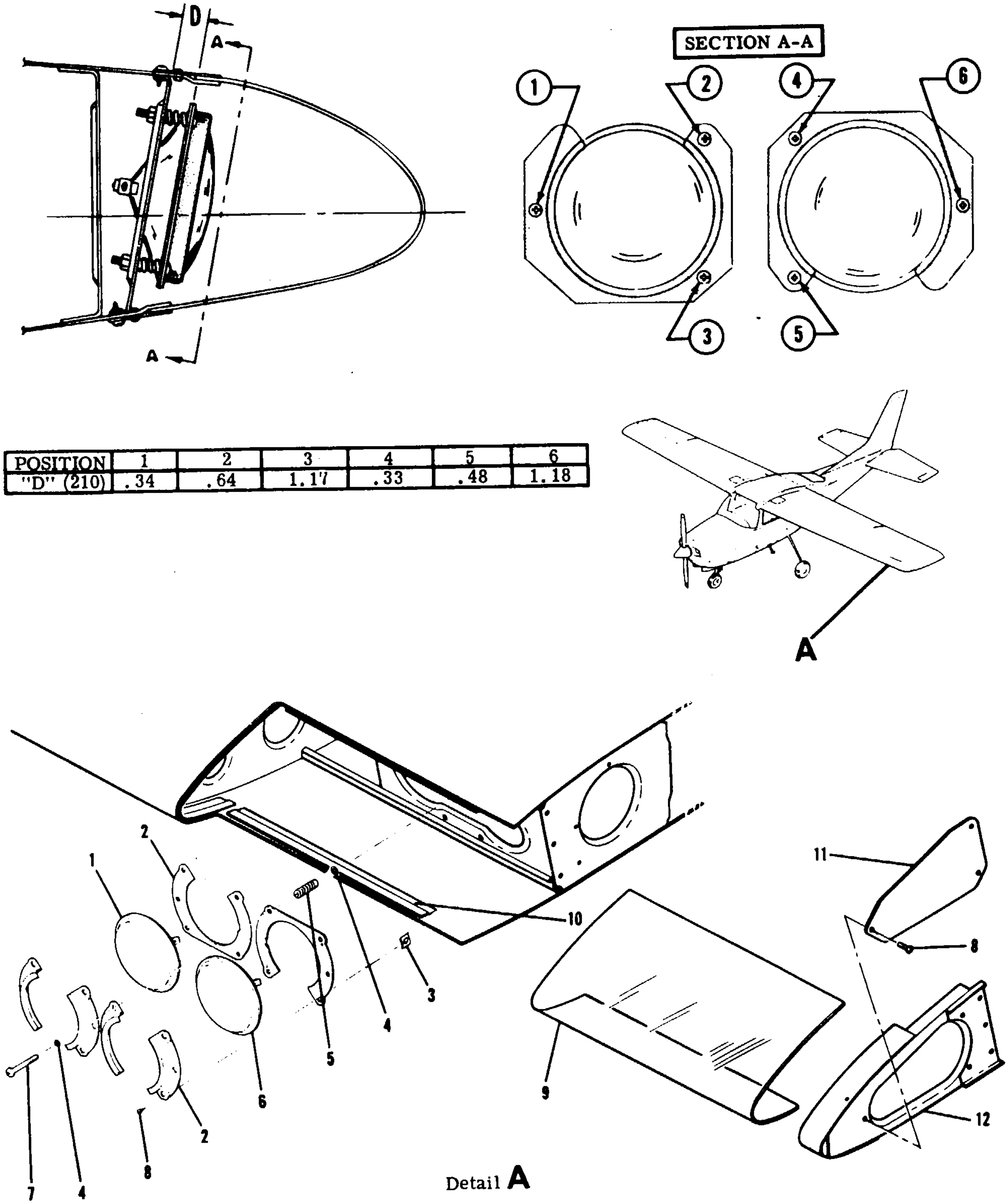
17-64A. OPERATIONAL REQUIREMENTS.

WARNING

The capacitors in the strobe light power supplies must be reformed if not used for a period of six (6) months. The following procedure must be used.

Connect the power supply, red wire to plug, black to ground to 6 volt DC source. Do Not connect strobe tube. Turn on 6 volt supply. Note current draw after one minute. If less than 1 ampere, continue operation for 24 hours. Turn off DC power source. Then connect to the proper voltage, 12 volt. Connect tube to output of strobe power supply and allow to operate, flashing, for 15 minutes. Remove strobe tube. Operating power supply at 12 volts, note the current drain after one minute. If less than 0.5 amperes, operate for 6 hours. If current draw is greater than 0.5 amperes, reject the unit.

17-65. REMOVAL AND INSTALLATION. Use figure 17-7 as a guide when removing and installing strobe lights.



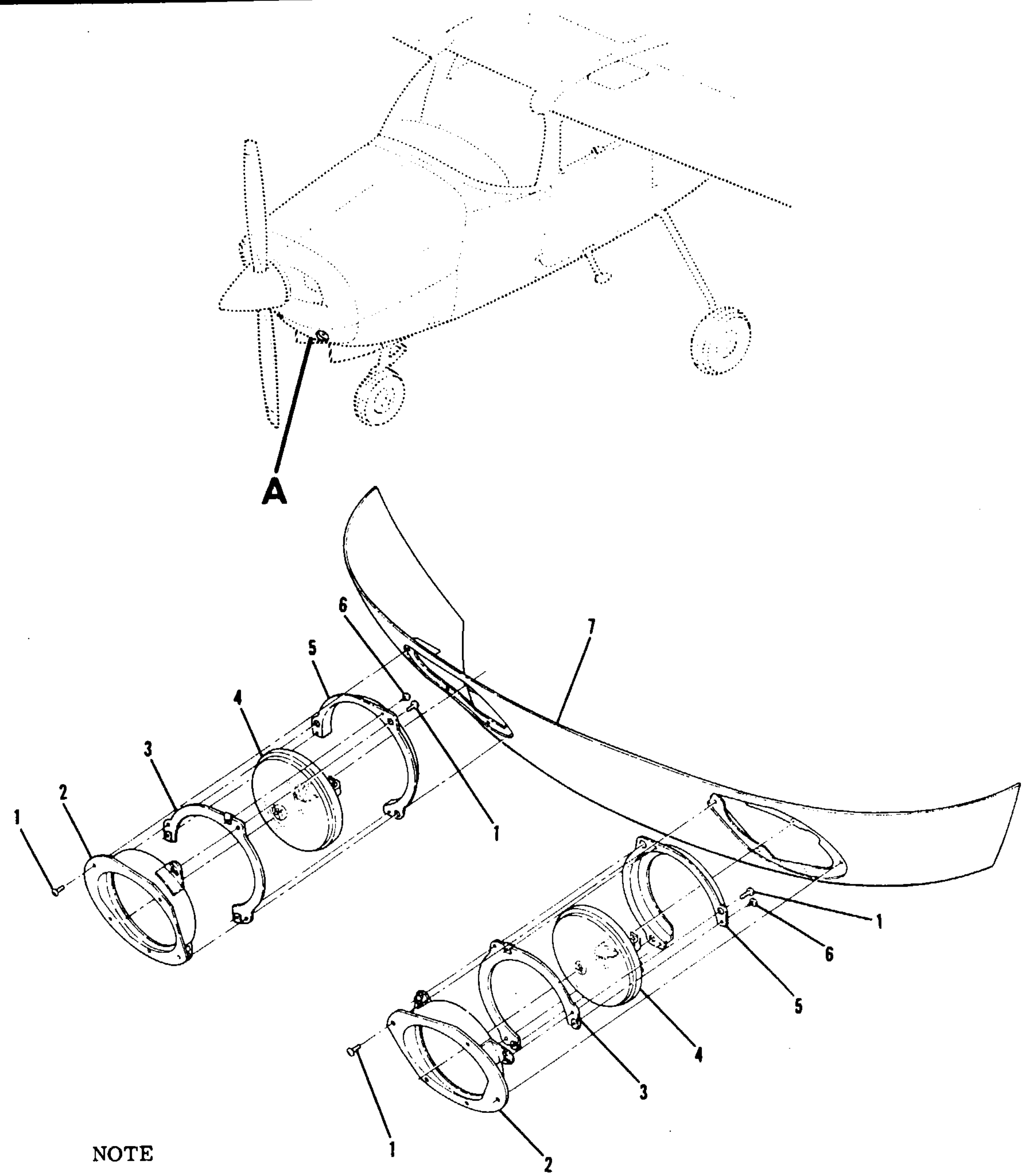
POSITION	1	2	3	4	5	6
"D" (210)	.34	.64	1.17	.33	.48	1.18

Detail **A**

THRU AIRCRAFT SERAIL 21059502

1. Landing Lamp
2. Bracket
3. Tinnerman Nut
4. Washer
5. Spring
6. Taxi Lamp
7. Adjusting Screw
8. Screw
9. Window
10. Retainer
11. Seal
12. Rib

Figure 17-6. Landing and Taxi Light Installation (Sheet 1 of 3)



NOTE

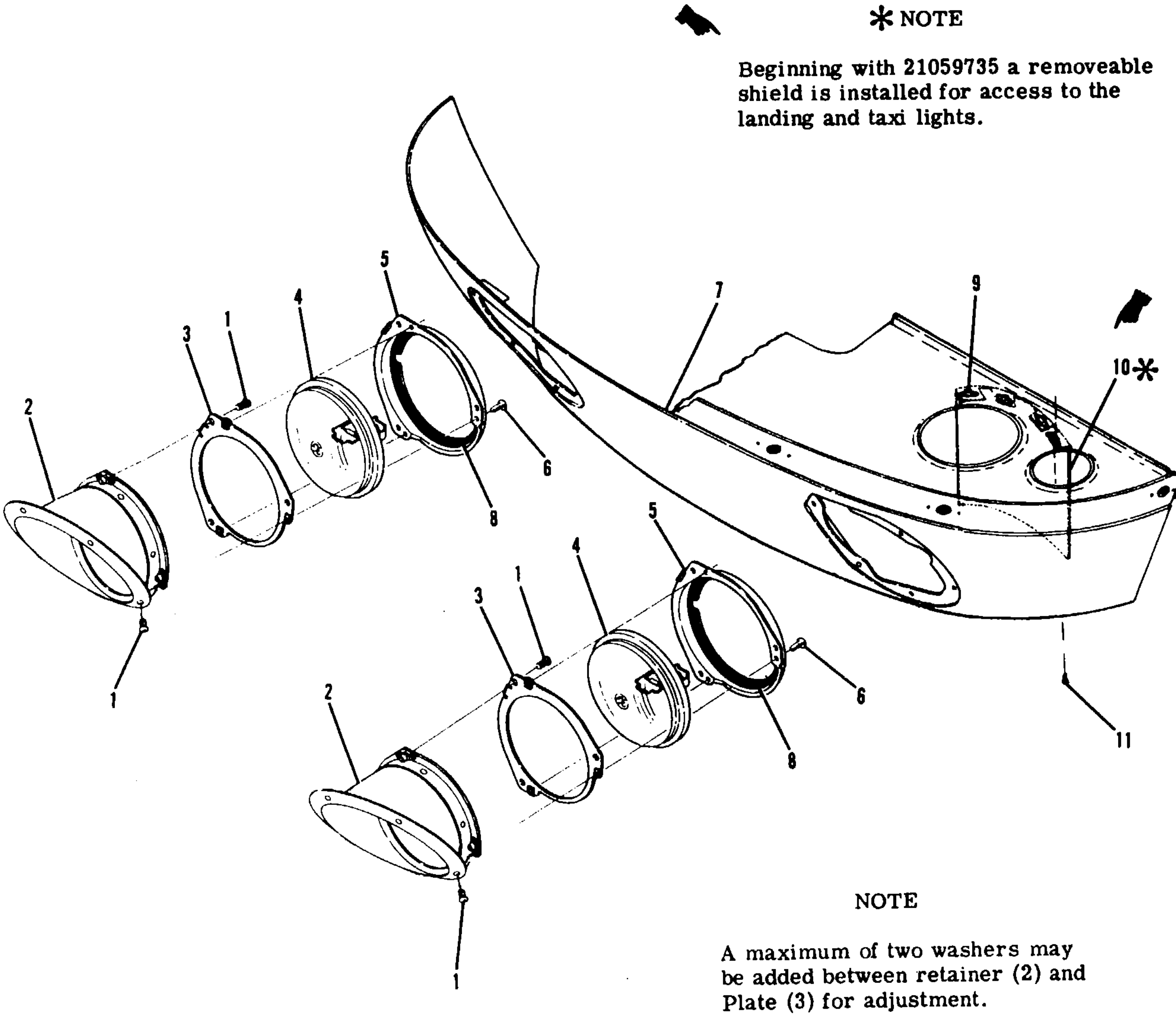
A maximum of two washers may be added between retainer (2) and plate (3) for adjustment.

Detail **A**

AIRCRAFT SERIAL 21059503 THRU 21059735

1. Screw
2. Retainer
3. Plate
4. Lamp
5. Bracket
6. Tinnerman Screw
7. Nose Cap

Figure 17-6. Landing and Taxi Light Installation (Sheet 2 of 3)



NOTE

A maximum of two washers may be added between retainer (2) and Plate (3) for adjustment.

BEGINNING WITH AIRCRAFT SERIAL 21059736

1. Screw
2. Retainer
3. Plate
4. Lamp
5. Bracket
6. Screw
7. Nose Cap
8. Gasket
9. Nutplate
10. Shield
11. Screw

Figure 17-6. Landing and Taxi Light Installation (Sheet 3 of 3)

WARNING

This anti-collision system is a high voltage device. Do not remove or touch tube assembly while in operation. Wait at least 5 minutes after turning off power before starting work.

Also refer to figure 17-7 when removing or installing the power supply. Thru aircraft serial 21059719 remove power supply as follows:

a. Remove the inspection plate on the bottom side of the wing at wing station 26.00.

b. Disconnect wires to power supply.

c. Remove the four mounting bolts and remove the power supply through the inspection plate opening.

d. To reinstall reverse the preceding steps.

Beginning with aircraft serial 21059720 remove the power supply as follows:

a. Remove wing tip disconnecting navigation and strobe light wires.

b. Disconnect power supply wires.

c. Remove the four mounting screws and remove power supply.

d. To reinstall reverse the preceding steps.

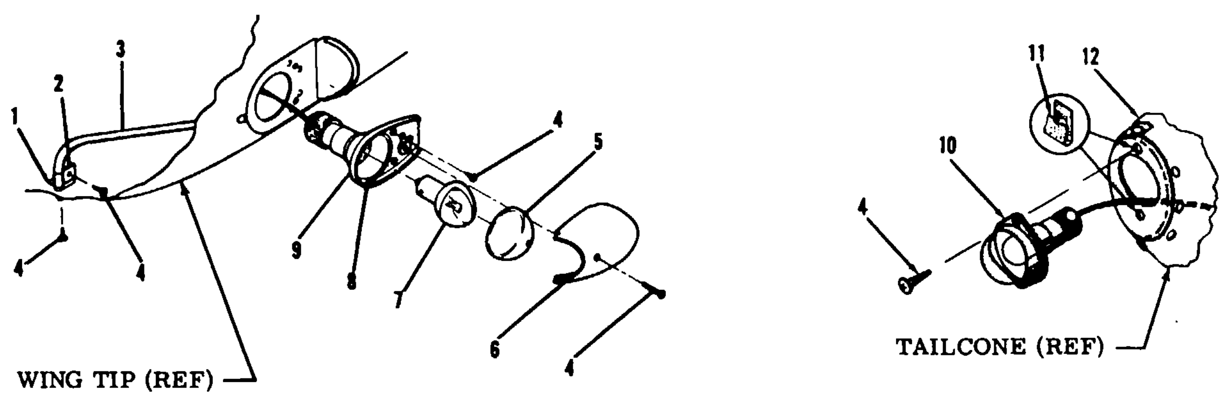
17-66. FLASHING BEACON.

17-67. DESCRIPTION. The flashing beacon light is attached to a thermoformed plastic mounting on the vertical fin tip. The flashing beacon is an iodine-vapor lamp electrically switched by a solid-state flasher assembly. The flasher assembly is mounted inside the fin tip. The switching frequency of the flasher assembly operates at approximately 45 flashes per minute. On late 1970 models and thru 1971 models, a 1.5 ohm, 75 watt resistor was added to the unused duel flasher lead to provide a dummy load which is designed to eliminate a pulsing effect on the cabin lighting and ammeter. Beginning with 1972 models (28-volt system) a 6 ohm 97 watt resistor has been installed.

17-68. REMOVAL AND INSTALLATION. For removal and installation of the flashing beacon refer to figure 17-8.

17-69. INSTRUMENT PANEL LIGHTING. (Refer to figures 17-9 and 17-10.)

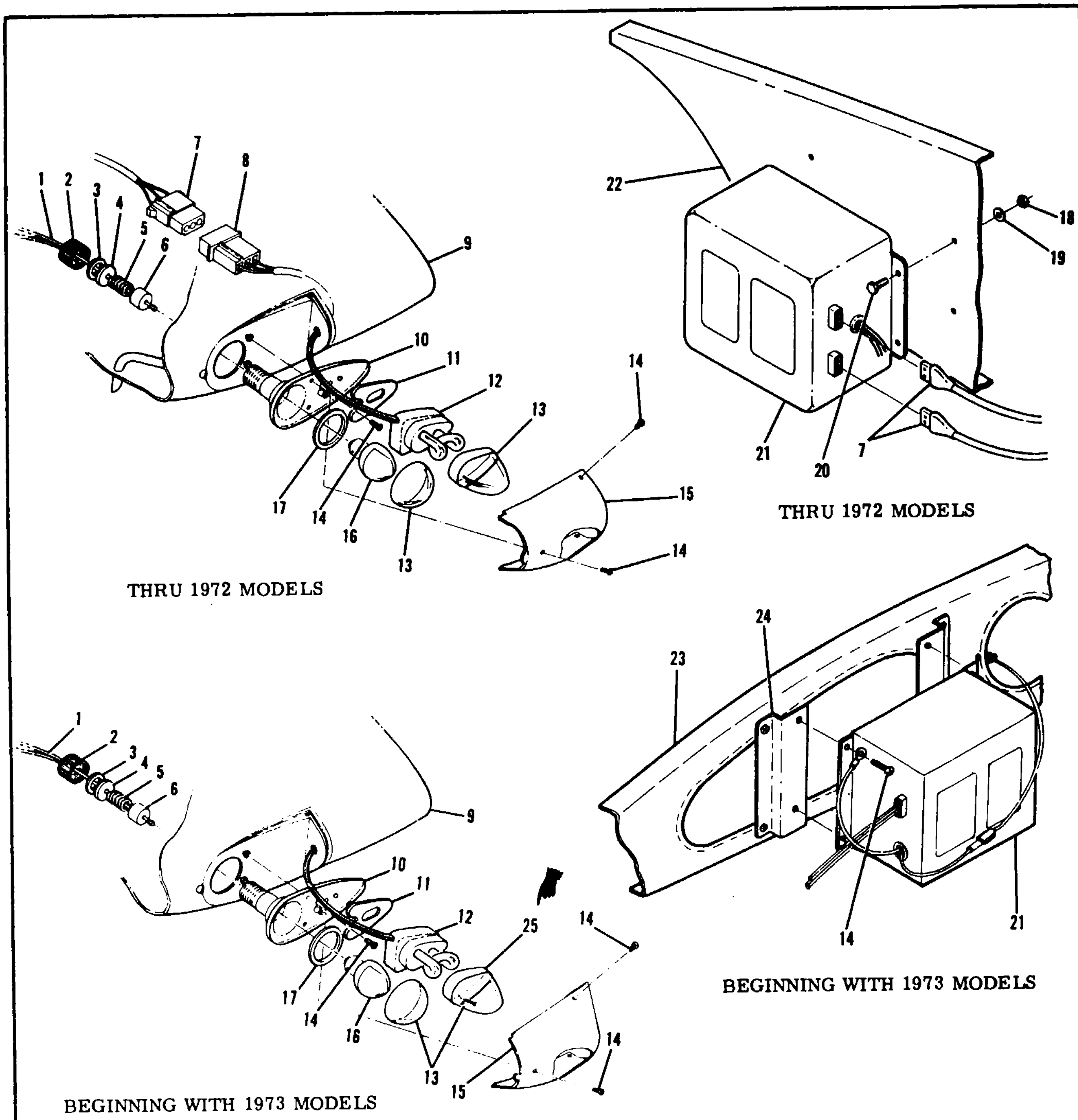
17-70. DESCRIPTION. Instrument panel lighting is divided in two separate sections. The lower two thirds of the panel is illuminated by two red lights mounted in the overhead console. The upper one-third of the panel is illuminated by lights mounted in the instrument glare shield. On 1970 and 1971 models the center light in the glare shield illuminates the radio switch panel, beginning with 1972 models the radio switches are internally lighted. Thru 1972 models the radio switch panel light is controlled by the engine radio light dimming rheostat switch located on the switch panel, beginning with 1973 models the switch lighting is controlled by the audio rheostat switch located on the radio switch panel. The lights in the glare shield are controlled



THRU 1970 MODELS ONLY

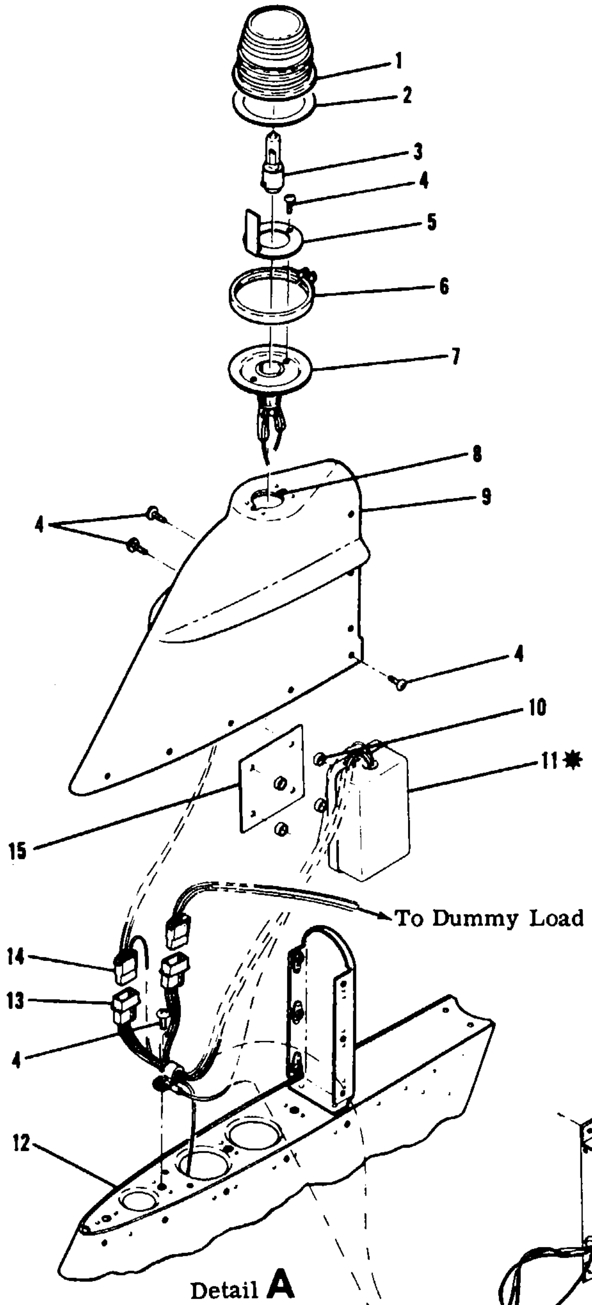
1. Bracket
2. Clamp
3. Detector - Light
4. Screw
5. Lens
6. Shield
7. Lamp
8. Gasket
9. Base - Lamp
10. Tail Light
11. Tinnerman Nut
12. Stinger

Figure 17-7. Navigation and Anti-Collision Strobe Lights Installation (Sheet 1 of 2)

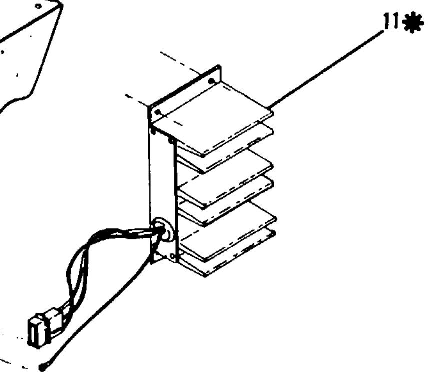


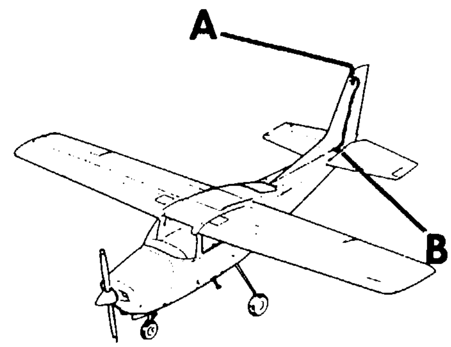
1. Electrical Leads
2. Cap
3. Washer
4. Insulated Washer
5. Spring
6. Insulator
7. Housing - Plug
8. Housing - Cap
9. Wing Tip
10. Wing Navigation Light
11. Spacer
12. Flash Tube Assembly
13. Lens
14. Screw
15. Lens Retainer
16. Bulb
17. Seal
18. Nut
19. Washer
20. Bolt
21. Power Supply
22. Wing Rib (Station 26.00)
23. Wing Tip Rib
24. Bracket
25. Gasket

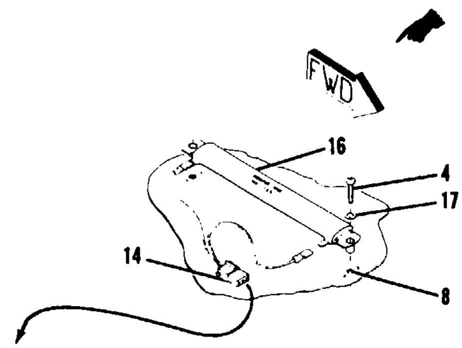
Figure 17-7. Navigation and Anti-Collision Strobe Lights Installation (Sheet 2 of 2)



Detail **A**







Connects to unused side of dual flasher assembly to eliminate "pulsing" on cabin lights and ammeter. Used on late 1970 models and on.

Detail **B**

CAUTION

When inserting lamp into socket always use a handkerchief or a tissue to prevent getting fingerprints on the lamp.

NOTE

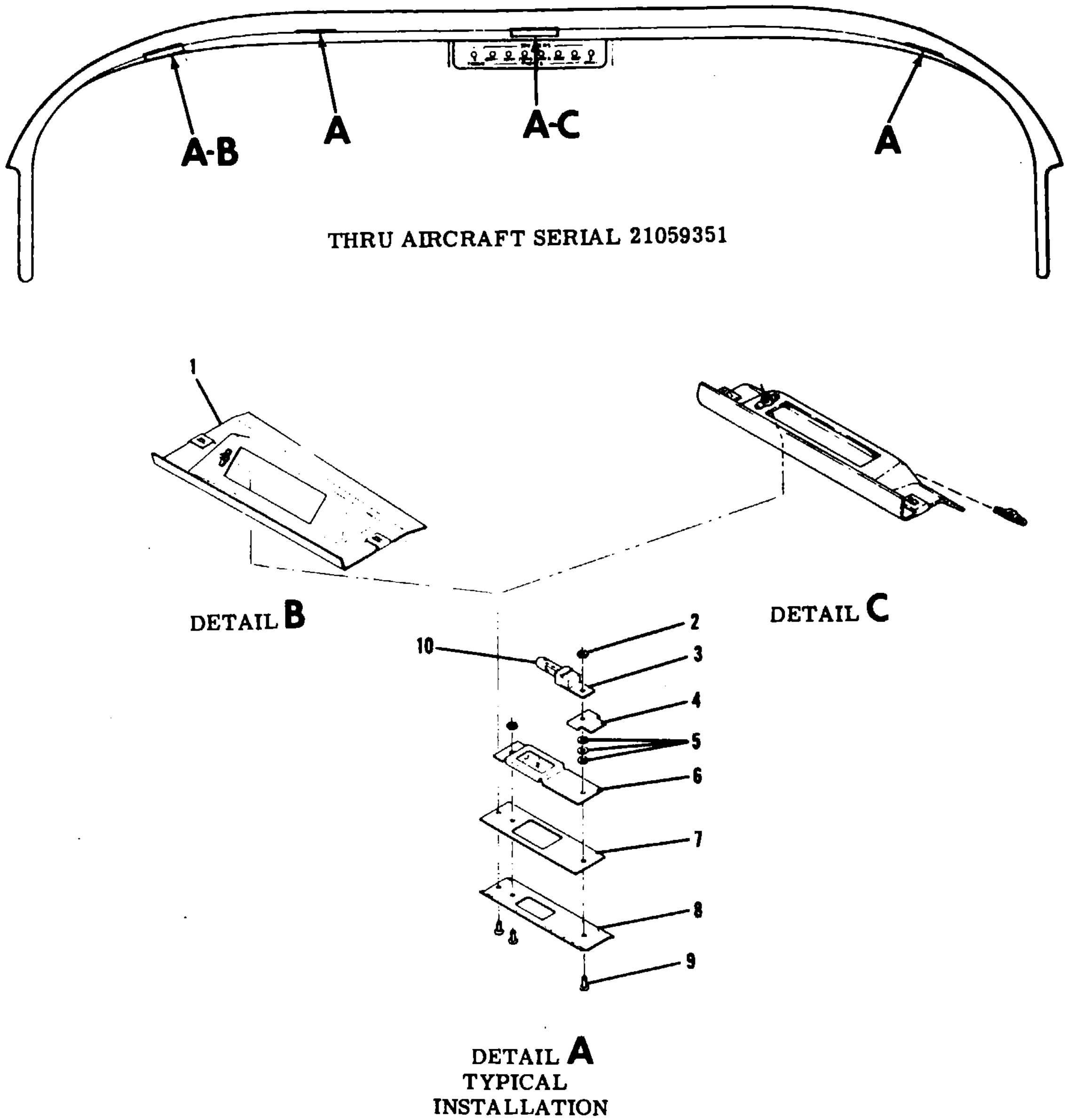
Fingerprints on lamp may shorten the life of the lamp.

✱ THRU 1972 MODELS

✱ BEGINNING WITH 1973 MODELS

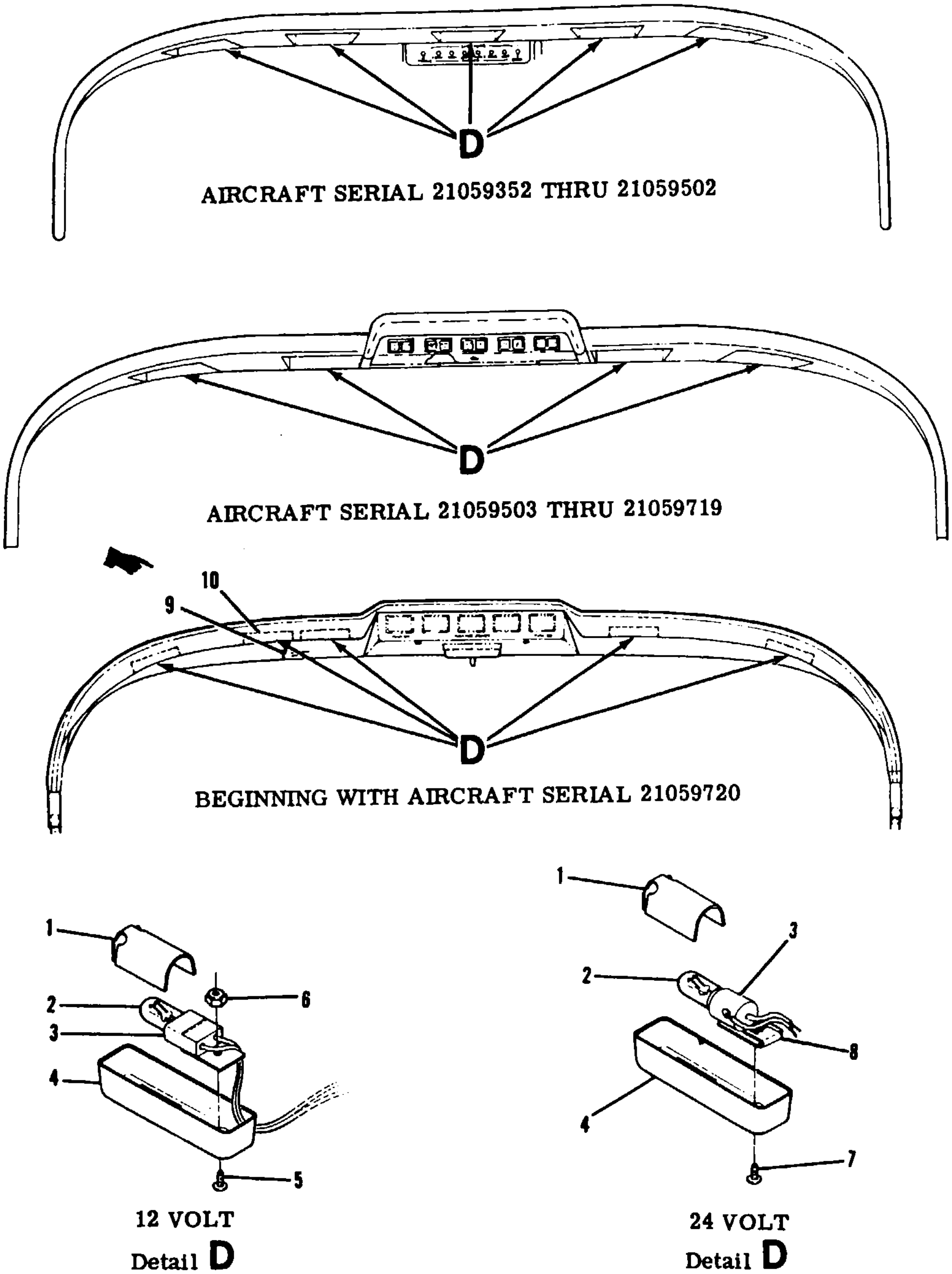
1. Dome
2. Gasket
3. Lamp
4. Screw
5. Baffle
6. Clamp Assembly
7. Socket Assembly
8. Nutplate
9. Tip Assembly
10. Spacer
11. Flasher
12. Fin Assembly
13. Housing - Cap
14. Housing - Plug
15. Plate
16. Dummy Load (1.5 Ohm Resistor)
17. Washer

Figure 17-8. Flashing Beacon Light Installation



1. Light Fitting Assembly
2. Nut
3. Light Assembly
4. Retainer
5. Washer
6. Bracket
7. Gasket
8. Cover
9. Screw
10. Bulb

Figure 17-9. Instrument Brow Light Installation (Sheet 1 of 2)



1. Reflector
2. Lamp
3. Lamp Socket
4. Housing
5. Screw
6. Nut
7. Tinnerman Screw
8. Tinnerman Nut
9. Map Light Switch
10. Map Light

Figure 17-9. Instrument Brow Light Installation (Sheet 2 of 2) by the instrument panel light dimming rheostat on the switch panel.

17-71. REMOVAL AND INSTALLATION. Figure 17-9 illustrates in detail all components of the instrument panel brow lights. Use this figure as a guide for removal and installation.

17-72. REMOVAL AND INSTALLATION OF OVERHEAD CONSOLE INSTRUMENT PANEL LIGHTS. (Refer to figure 17-10).

a. Unscrew metal oxygen port covers, if installed.
b. Unscrew oxygen gage lens, if installed.
c. Thru 1973 models, remove the cabin ventilation knobs by loosening the allen-head type screw on the outer knob.

NOTE

Caution should be taken to make sure you do not lose the washer and spring installed between the two control knobs. These items will fall free when the outer knob is removed.

d. Thru 1973 models remove the screws securing the fresh air escutcheon ring and the escutcheon will then be free for removal.
e. Beginning with 1974 models remove the screws in the recess area of the fresh air vents.
f. Pull out the two oxygen post lights, if installed.
g. Remove the remaining screws attaching the overhead console cover and remove the cover.
h. Twist bulb for removal from light socket assembly.
i. For reinstallation of the overhead console, and associated equipment, reverse this procedure.

17-73. VERTICAL ADJUSTMENT OF OVERHEAD CONSOLE INSTRUMENT PANEL LIGHTS. (Refer to figure 17-10).

a. Pry the plug button from the overhead console cover to gain access to the adjustment screw.
b. Turn the screw clockwise to advance the light beam up the panel.
c. Turn the screw counterclockwise to advance the light down the panel.
d. Upon completing adjustment, reinstall plug button.

17-74. LATERAL ADJUSTMENT OF OVERHEAD CONSOLE INSTRUMENT PANEL LIGHTS. (Refer to figure 17-10).

a. To gain access to the lights, remove the overhead console cover as outlined in paragraph 17-72.
b. Slide the light sockets inboard along the mounting bracket to advance the light beam outboard on the instrument panel. To advance the light beam inboard on the instrument, slide the light socket outboard along the mounting bracket.

NOTE

Should sliding the light sockets along the mounting bracket prove difficult, the screws attaching the light socket assembly to the mounting bracket may be loosened to permit the light socket assembly to slide along the mounting bracket. Once the adjustment is completed, ensure that the screws are tight enough to resist vibrating out of adjustment.

17-75. ELECTROLUMINESCENT PANEL LIGHTING.

17-76. DESCRIPTION. The electroluminescent lighting consists of two "EL" panels; the switch panel and the comfort control panel. The ac voltage required to drive the "EL" panels is supplied by a small inverta-pak (power supply) located behind the instrument panel. The intensity of the "EL" panel lighting is controlled by a rheostat located on the instrument panel. These "EL" panels have an expected life of over 16,000 hours and no replacement should be necessary during the life of the aircraft.

17-77. TRANSISTORIZED LIGHT DIMMING.

17-78. DESCRIPTION. A remotely located two-circuit, transistorized dimmer is installed as standard equipment to control the instrument panel lighting on 1970 and on models. Panel lighting dimming controls are increased from two to three. This is accomplished by concentric knob arrangement on one of the existing control knobs. Transistor light dimming is used on two of three circuits, thereby allowing greater dimming load variation and better linearity of control. One circuit controls the engine instruments and radio lights while the other circuit controls the instrument flood lights and post lights.

17-79. REMOVAL AND INSTALLATION. For removal and installation of transistorized dimming, refer to figure 17-11.

17-80. PEDESTAL LIGHTS.

17-81. DESCRIPTION. The pedestal lights consist of three post type lights mounted on the pedestal to illuminate the fuel selector handle, rudder and elevator trim controls. The pedestal lights are controlled by the instrument light rheostat.

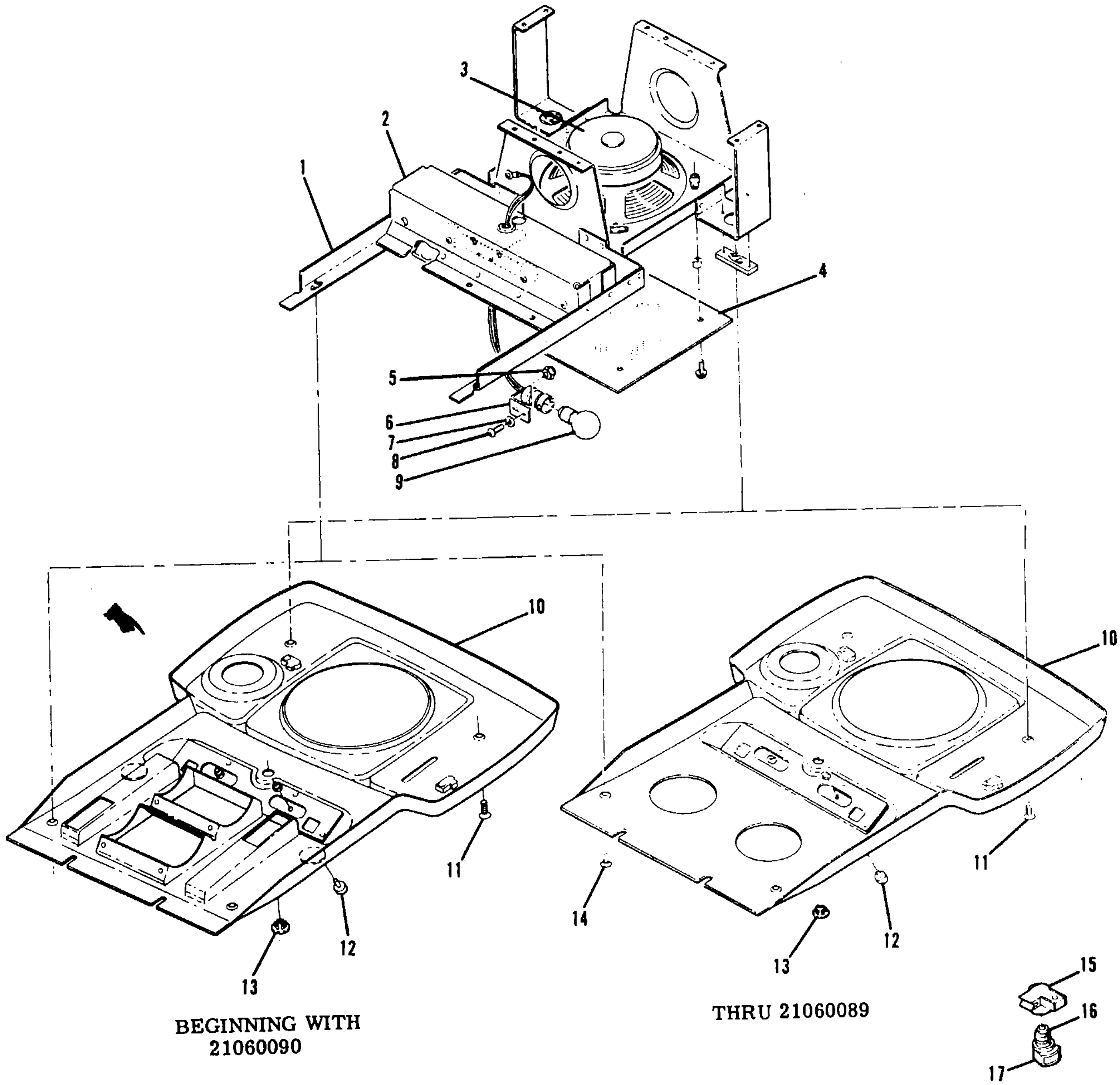
17-82. REMOVAL AND INSTALLATION. For removal and installation of pedestal lamps, slide the cap and lens assembly from the base. Slide the lamp from the socket and replace.

17-83. INSTRUMENT POST LIGHTING.

17-84. DESCRIPTION. Individual post lighting may be installed as optional equipment to provide for nonglare instrument lighting. The post light consists of a cap and a clear lamp assembly with a tinted lens. The intensity of the instrument post lights is controlled by the instrument light dimming rheostat located on the switch panel.

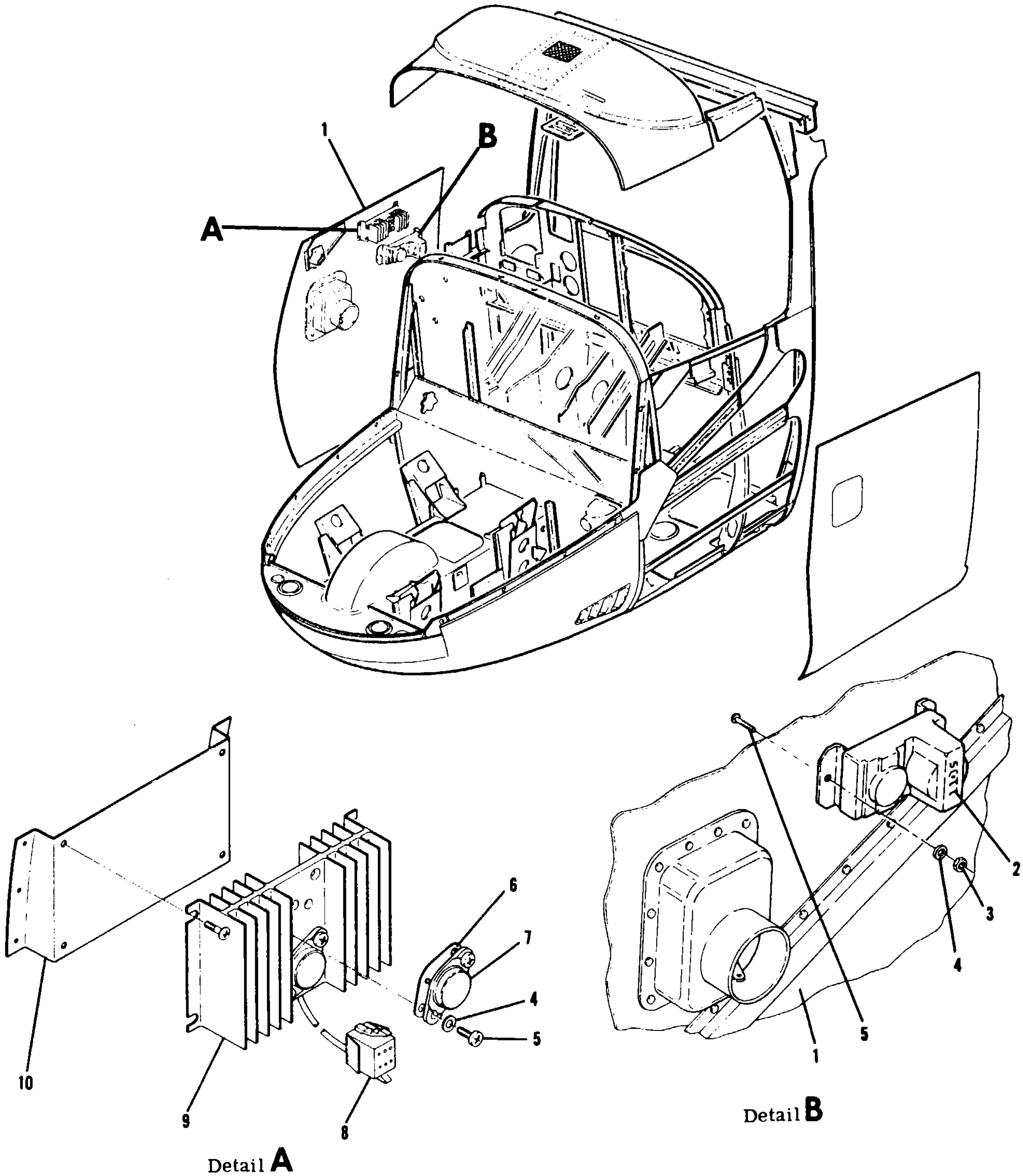
17-85. REMOVAL AND INSTALLATION. For removal and replacement of the instrument post lamps, slide the cap and the lens assembly from the base. Slide the lamp from the socket and replace.

17-86. OXYGEN LIGHTS.



1. Bracket
2. Housing Assembly - Panel Lights
3. Speaker
4. Speaker Grill
5. Nut
6. Socket
7. Washer
8. Screw
9. Lamp
10. Overhead Console Cover
11. Screw
12. Slide Knob
13. Plug Button
14. Screw
15. Mounting Base
16. Lamp
17. Cap and Prism

Figure 17-10. Instrument Panel Light - Overhead Console



1. Left-hand Skin
2. Inverter
3. Nut
4. Washer
5. Screw
6. Mica Washer
7. Transistor
8. Housing - Socket
9. Heat Sink
10. Mounting Bracket

Figure 17-11. Transistorized Light Dimming and Electroluminescent Inverter Installations

17-87. DESCRIPTION. The oxygen lights consist of two post type lights installed in the overhead oxygen console. The intensity of the oxygen lights is controlled by the radio light dimming rheostat located on the switch panel.

17-88. REMOVAL AND INSTALLATION. For removal and installation refer to paragraph 17-85 and figure 17-10.

17-89. COURTESY LIGHTS.

17-90. DESCRIPTION. The lights consist of one light located on the underside of each wing to provide ground lighting around the cabin area. The courtesy lights have clear lens and are controlled by a single slide switch labeled "Utility Lights," located on the left rear door post. The switch also operates the dome lights thru 1971 models.

17-91. REMOVAL AND INSTALLATION. Figure 17-12 illustrates in detail all components of the courtesy light installation. Use this figure as a guide for removal and installation.

17-92. BAGGAGE COMPARTMENT LIGHT.

17-93. DESCRIPTION. The baggage compartment is illuminated by a lamp mounted in the top of the baggage compartment. The light is controlled by the "Utility Lights" switch located on the left door post.

17-94. REMOVAL AND INSTALLATION. (Refer to figure 17-15).

a. Ensure that the master switch is "OFF".
b. To gain access to the baggage compartment lamp, remove the screws attaching the retainer and lens to the reflector assembly.
c. Twist the lamp from the socket.
d. To replace the bulb, reverse this procedure.

17-95. INTERIOR LIGHTING.

17-96. DESCRIPTION. Thru 1971 models the cabin interior is illuminated by two dome lights, one on each side of the cabin. The lights are controlled by a single slide switch labeled, Utility Lights, located on the left door post. Beginning with 1972 models a single light installed in the overhead console located aft of the rear spar is used for interior lighting.

17-97. REMOVAL AND INSTALLATION.

a. Thru 1971 Models.
   1. Pry dome light out of retainer.
   2. Pry socket out of dome light assembly.
   3. Install new bulb and reassemble.
b. Beginning 1972 Models.
   1. Snap lens out of cover.
   2. Remove lamp and replace with new lamp.
   3. Reinstall lens.

17-98. CONTROL WHEEL MAP LIGHT. Thru aircraft serial 21059502 the control wheel map light

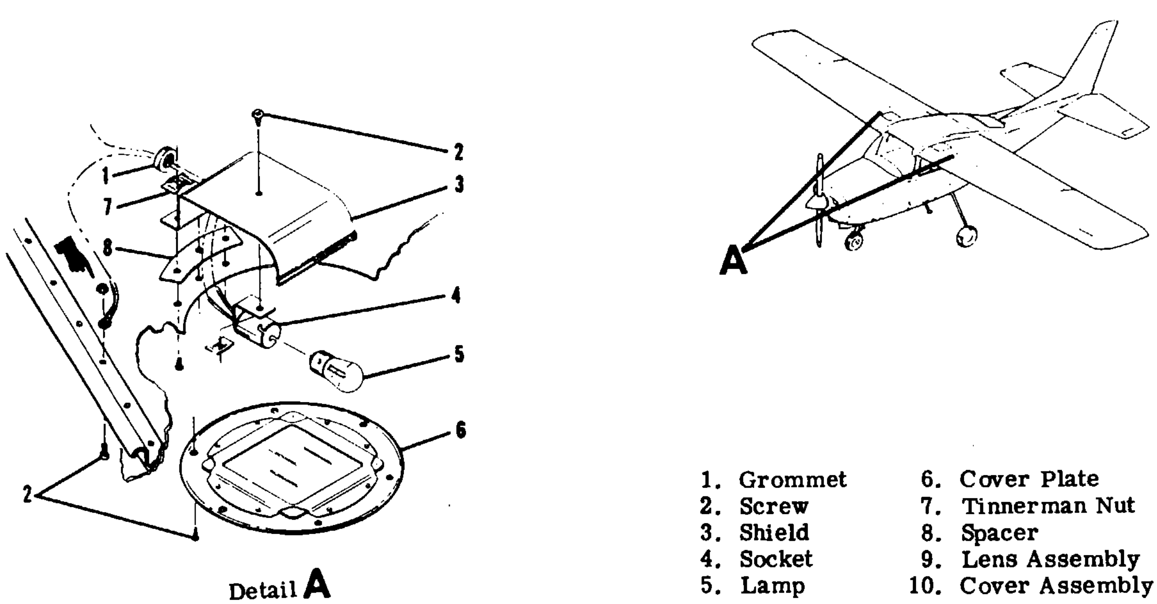
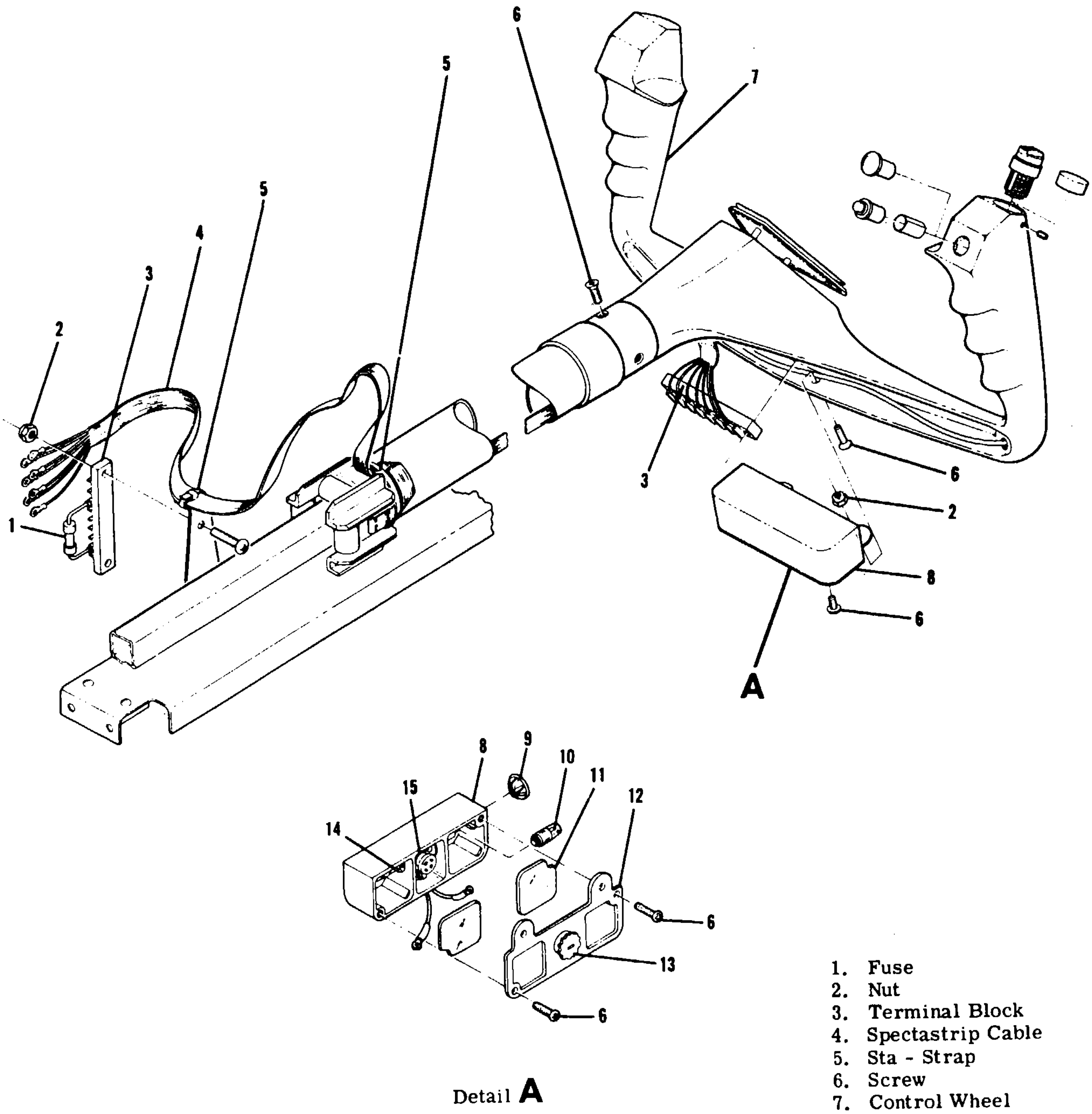


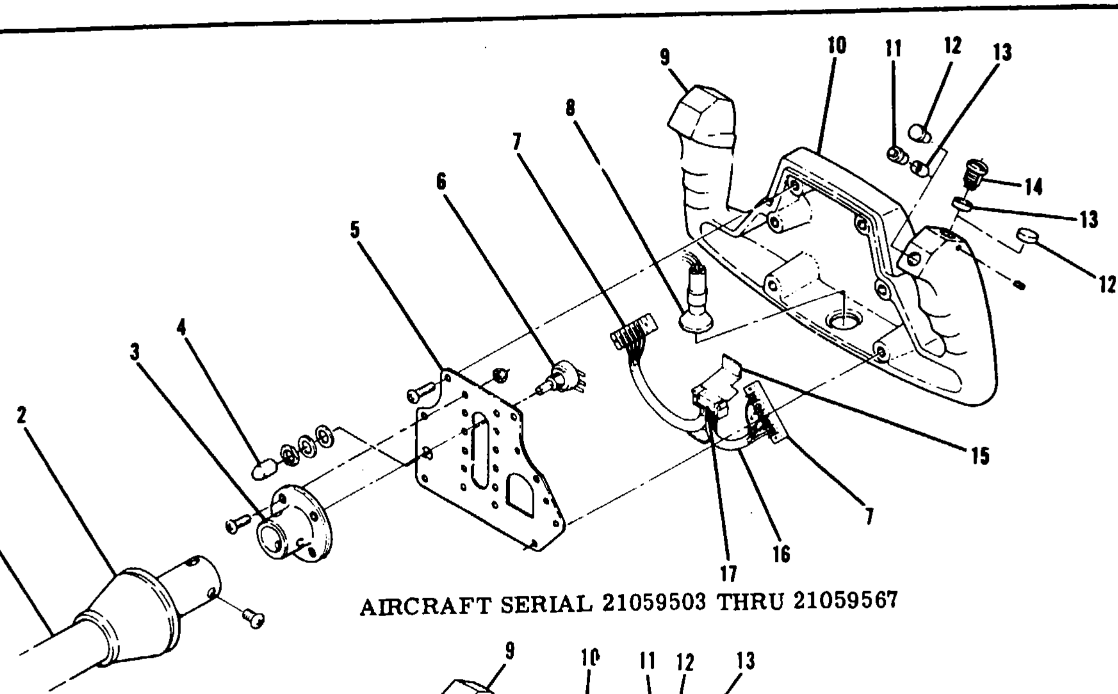
Figure 17-12. Courtesy Light Installation

THRU AIRCRAFT SERIAL 21059502

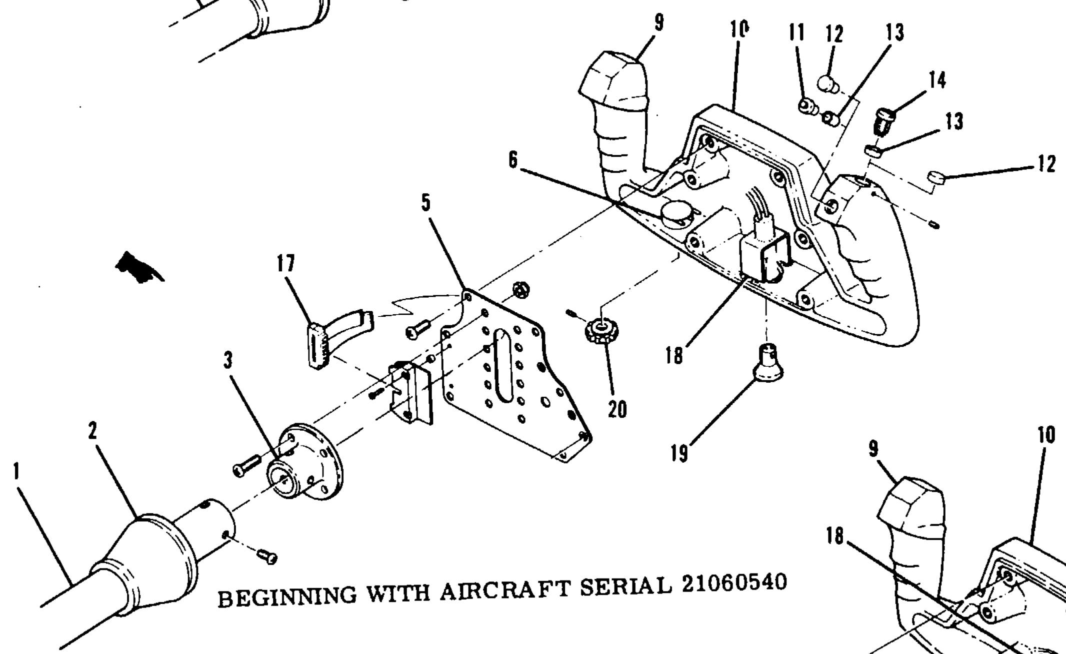


1. Fuse
2. Nut
3. Terminal Block
4. Spectastrip Cable
5. Sta - Strap
6. Screw
7. Control Wheel
8. Housing
9. Plug Button
10. Lamp
11. Lens
12. Cover
13. Rheostat
14. Socket - Lamp
15. Socket - Rheostat

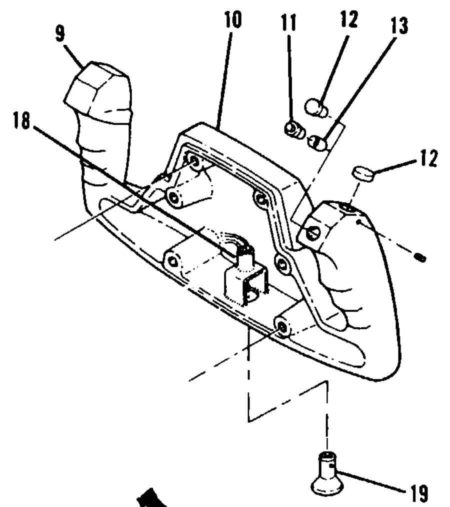
Figure 17-13. Control Wheel Map Light Installation (Sheet 1 of 2)



AIRCRAFT SERIAL 21059503 THRU 21059567



BEGINNING WITH AIRCRAFT SERIAL 21060540



AIRCRAFT SERIAL 21059568 THRU 21060539

1. Control Tube Assembly
2. Cover
3. Adapter
4. Rubber Cover
5. Plate
6. Map Light Rheostat
7. Terminal
8. Map Light Assembly
9. Control Wheel
10. Pad
11. Mike Switch
12. Plug
13. Insulator
14. Trim Switch
15. Bracket
16. Cable
17. Connector
18. Socket and Bracket Assembly
19. Reflector and Lamp Assembly
20. Knob

Figure 17-13. Control Wheel Map Light Installation (Sheet 2 of 2) consists of a rectangle shaped housing containing two small lamps and a small rheostat switch mounted on the under side of the control wheel. Beginning with aircraft serial 21059503 the control wheel map light is internally mounted in the control wheel. A rheostat switch located on the forward side of the wheel controls the map light.

17-99. REMOVAL AND INSTALLATION. (THRU AIRCRAFT SERIAL 21059502). (Refer to figure 17-13).

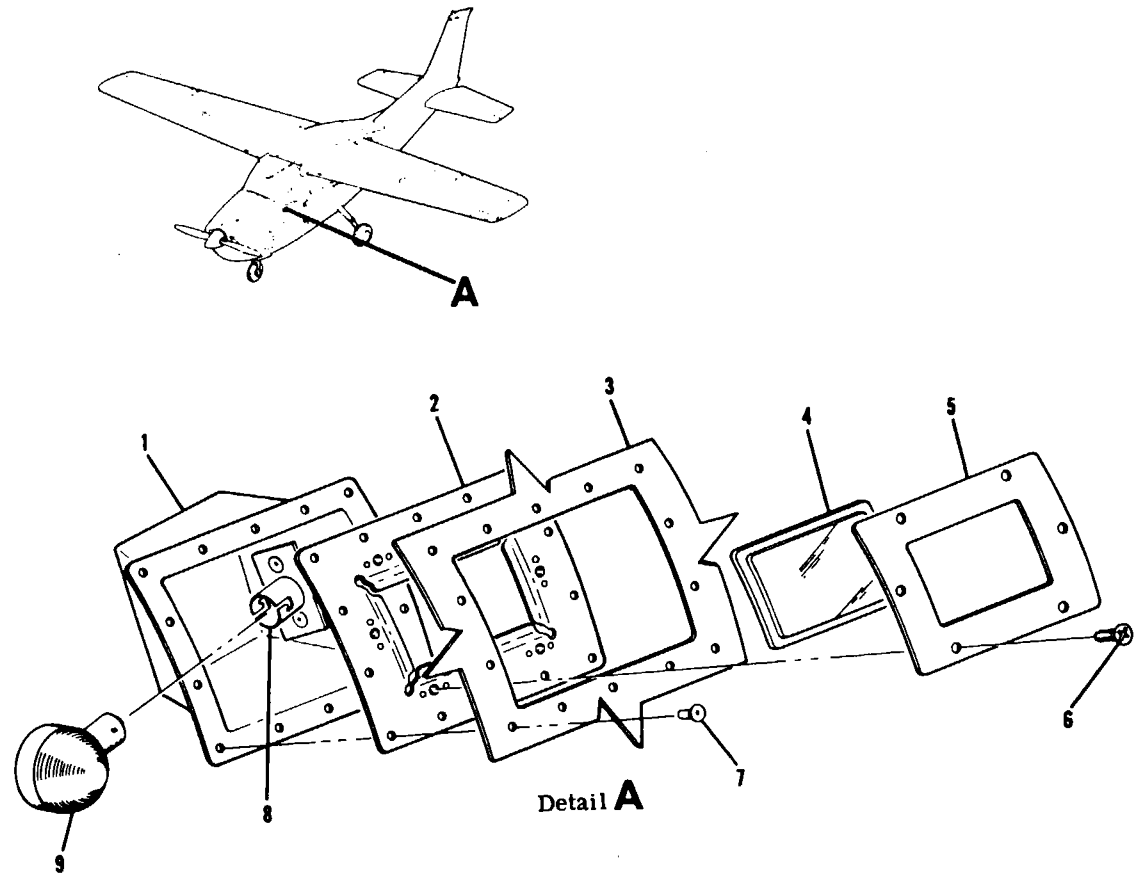
a. Rotate the control wheel 90° to the left to gain access to the underside of the wheel.
b. Remove two screws and nuts holding map light assembly to control wheel.
c. Detach two wires from the terminal strip above the map light. Note the connection and mark for reference when replacing the wires.
d. To install the control wheel map light reverse this procedure.
e. For replacement of defective lamps, remove two screws holding map light cover in place and unplug rheostat to remove cover.
f. Unsnap lamp sockets and replace lamps.
g. To reassemble, reverse this procedure.

17-100. REMOVAL AND INSTALLATION. (AIRCRAFT SERIAL 21059503 THRU 21059567). (Refer to figure 17-13).

a. Disconnect electrical cable connector of aft side of control wheel.
b. Remove screws securing control wheel back plate to control wheel tube adapter.
c. Remove screws securing plate to control wheel.
d. Disconnect socket from map light lamp and reflector unit.
e. Remove lamp and reflector unit.

NOTE

Lamp and reflector unit are bonded to control wheel.



1. Bracket Assembly
2. Doubler Assembly
3. Skin - Cowl Deck
4. Lens
5. Cover
6. Screw
7. Rivet
8. Socket
9. Lamp

Figure 17-14. Ice Detector Light Installation

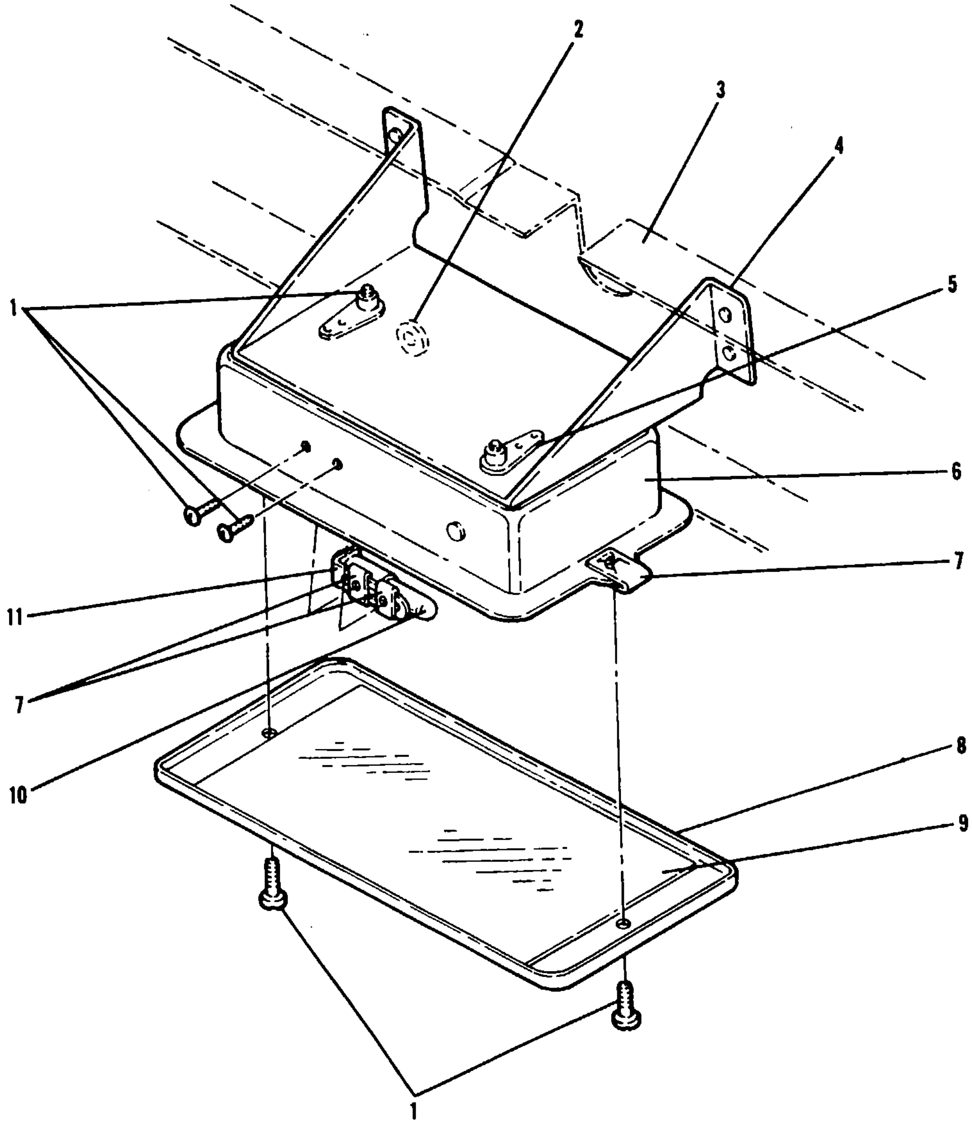
CAUTION

Care must be taken in removing excess bonding material, (do not hammer on control wheel) as control wheel could be damaged.

f. Using Conley Weld C1 and C2 or Hysol 5095 and 3673, bond new lamp and reflector unit.

g. To reassemble, reverse this procedure.

17-101. REMOVAL AND INSTALLATION. (BEGINNING WITH AIRCRAFT SERIAL 21059568). (Refer to figure 17-13). To remove, push upward on the lamp and turn. The lamp and reflector is replaced as a unit.



1. Screw
2. Grommet
3. Sta. 138 Bulkhead
4. Bracket
5. Nutplate
6. Reflector
7. Nut
8. Retainer
9. Lens
10. Lamp
11. Socket

Figure 17-15. Baggage Compartment Light Installation

17-102. COMPASS AND RADIO DIAL LIGHTS.

17-103. DESCRIPTION. The compass and radio dial lights are contained within the individual units. The light intensity is controlled by the instrument light simming rheostat mounted on the lower left side of the instrument panel.

17-104. ICE DETECTOR LIGHT.

17-105. DESCRIPTION. An optional ice detector light may be installed on the left hand side of the fuselage forward of the cabin door. The ice detector light will illuminate the leading edge of the left wing so the pilot can visually detect ice formation on the wing. A push-botton switch located below the master switch controls the ice detector light.

17-106. REMOVAL AND INSTALLATION. Refer to figure 17-14 for removal and installation.

17-107. STALL WARNING UNIT.

17-108. DESCRIPTION. THRU AIRCRAFT SERIAL 21061039, the stall warning unit is mounted on the aft, right hand side of the firewall. The unit has a dual purpose. It contains a gear warning horn. The stall warning horn is actuated by a stall warning switch on the left wing leading edge. BEGINNING WITH AIR-CRAFT SERIAL 21061040 a solid state warning unit is installed on the right hand wing root rib. The warning is transmitted through the radio speaker in the overhead console.

17-109. REMOVAL AND INSTALLATION. Refer to figure 17-16 for removal and installation.

17-110. STALL WARNING SWITCH.

17-111. DESCRIPTION. The stall warning switch is installed in the leading edge of the left wing and is actuated by airflow over the surface of the wing. The switch will close as a stall condition is approached, actuating the stall warning horn. The horn should sound at approximately five to ten miles per hour above the actual stall speed. Initial installation of the switch should be with the lip of the warning switch approximately one sixteenth of an inch below the center line of the wing skin cutout. Test fly the aircraft to determine if the horn sounds at the desired speed. If the horn sounds too soon, move the unit down slightly; if too late, move the unit up slightly.

17-112. REMOVAL AND INSTALLATION. Refer to figure 17-17 for removal and installation.

17-113. PITOT AND STALL WARNING HEATERS.

17-114. DESCRIPTION. Electrical heater units are incorporated in some pitot tubes and stall warning switch units. The heaters offset the possibility of ice formation on the pitot tube and stall warning actuator switch. The heaters are integrally mounted in the pitot tube and stall warning actuator switch. Both heaters are controlled by the pitot heat switch.

17-115. REMOVAL AND INSTALLATION. Refer to figures 17-17 and 17-18 for removal and installation.

17-116. LANDING GEAR INDICATOR LIGHTS.

17-117. DESCRIPTION. The position of the landing gear is indicated by two press-to-test lamp assemblies mounted on the right side of the switch panel. The green light is on when all the wheels are down and locked; the amber is on when all the wheels are

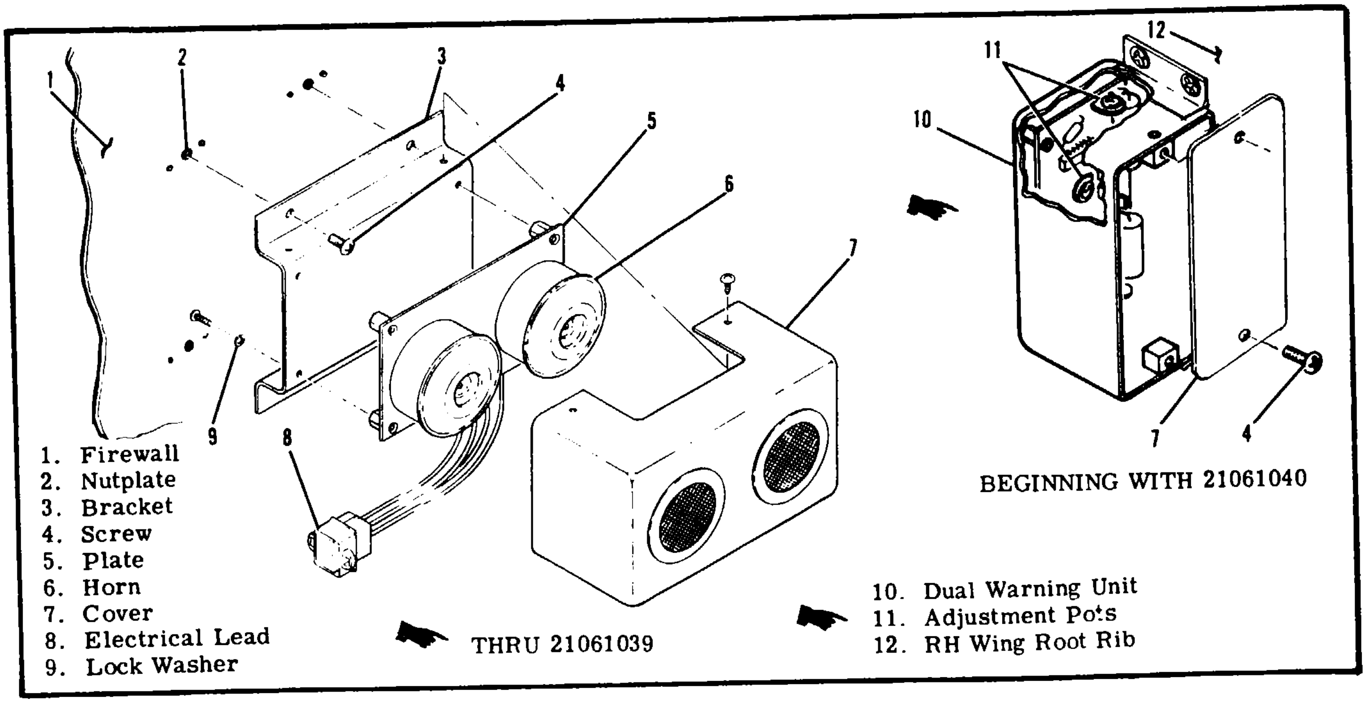


Figure 17-16. Stall Warning Unit

up and locked. If any wheel assumes an intermediate position of neither up and locked or down and locked, both lights will be dark. The hood of each light is removable for bulb replacement, and has a dimming shutter.

17-118. REMOVAL AND INSTALLATION.

a. Remove the hood on either light by unscrewing counterclockwise. The lamp bulb is in the hood and may be replaced by pulling it out and inserting a new lamp.

b. To remove the lamp socket assembly, remove the nut from the assembly on the front side of the panel.

c. Tag and unsolder the wires from the socket assembly.

d. To replace a lamp socket assembly, reverse the above procedure.

17-118A. LANDING GEAR WARNING HORN. Refer to Section 5.

17-119. CIGAR LIGHTER.

17-120. DESCRIPTION. A special circuit breaker is contained in a small cylinder screwed directly on the back of the cigar lighter socket. The circuit breaker is a bi-metallic type and is resettable. To reset a breaker, make sure that the master switch is off, then insert a small diameter pin (end of a paper clip works) into the hole in the phenolic back plate of the breaker and apply pressure. A small click will be heard when the breaker resets.

CAUTION

Make sure the master switch is "OFF" before inserting probe into the circuit breaker on cigar lighter to reset.

17-121. REMOVAL AND INSTALLATION. (Refer to figure 17-19).

a. Ensure that the master switch is "OFF."

b. Remove cigar lighter element.

c. Disconnect wire on back of lighter.

d. Remove shell that screws on socket back of panel.

e. The socket will then be free for removal.

f. To install a cigar lighter, reverse this procedure.

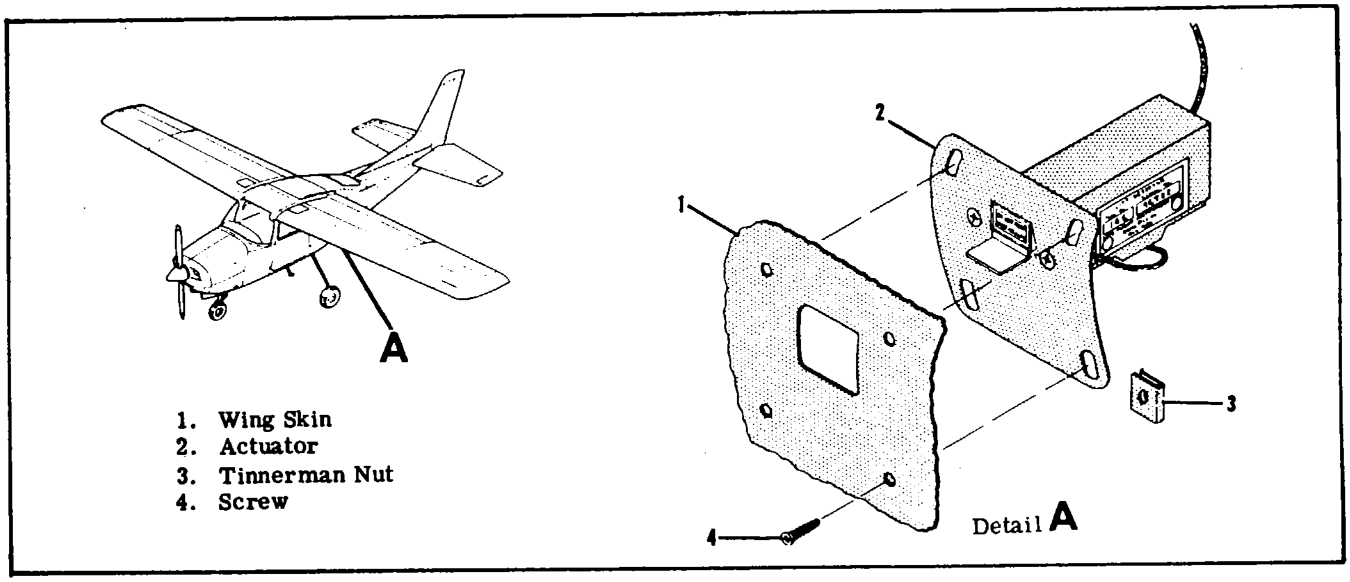


Figure 17-17. Stall Warning Switch

SHOP NOTES:

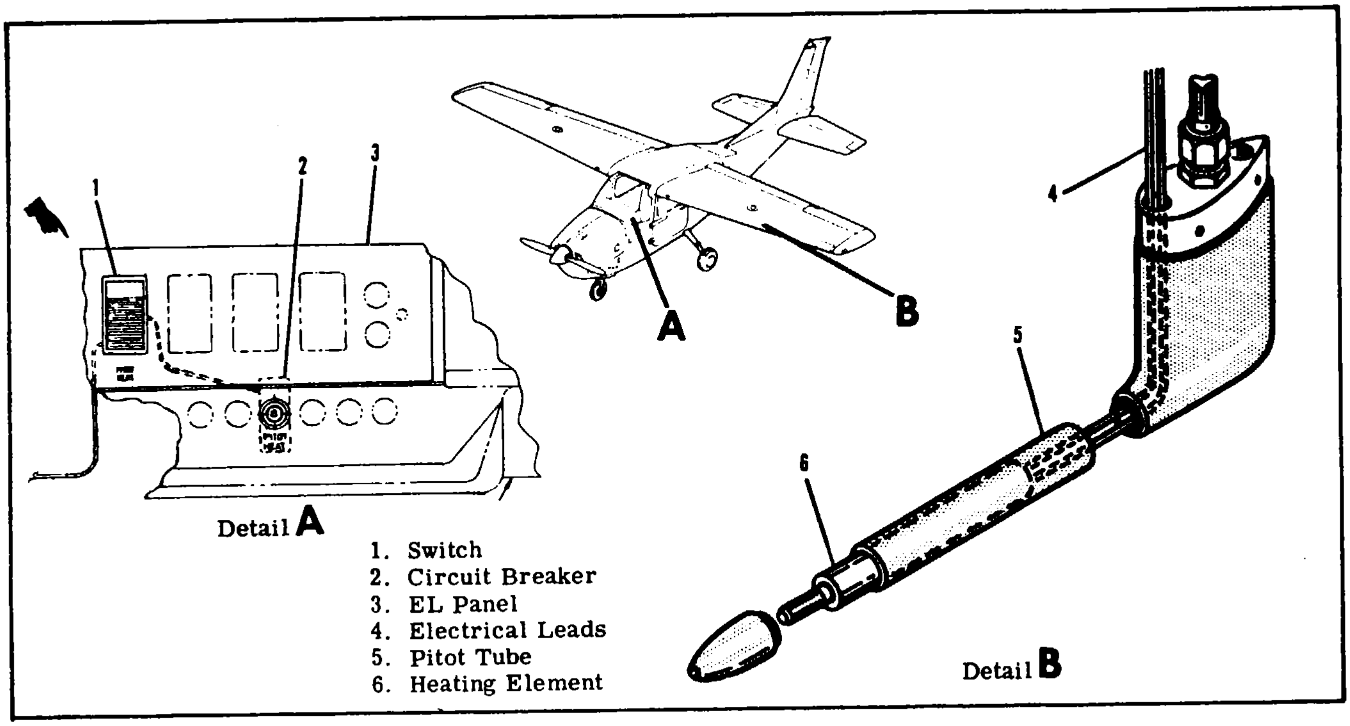


Figure 17-18. Pitot Heater

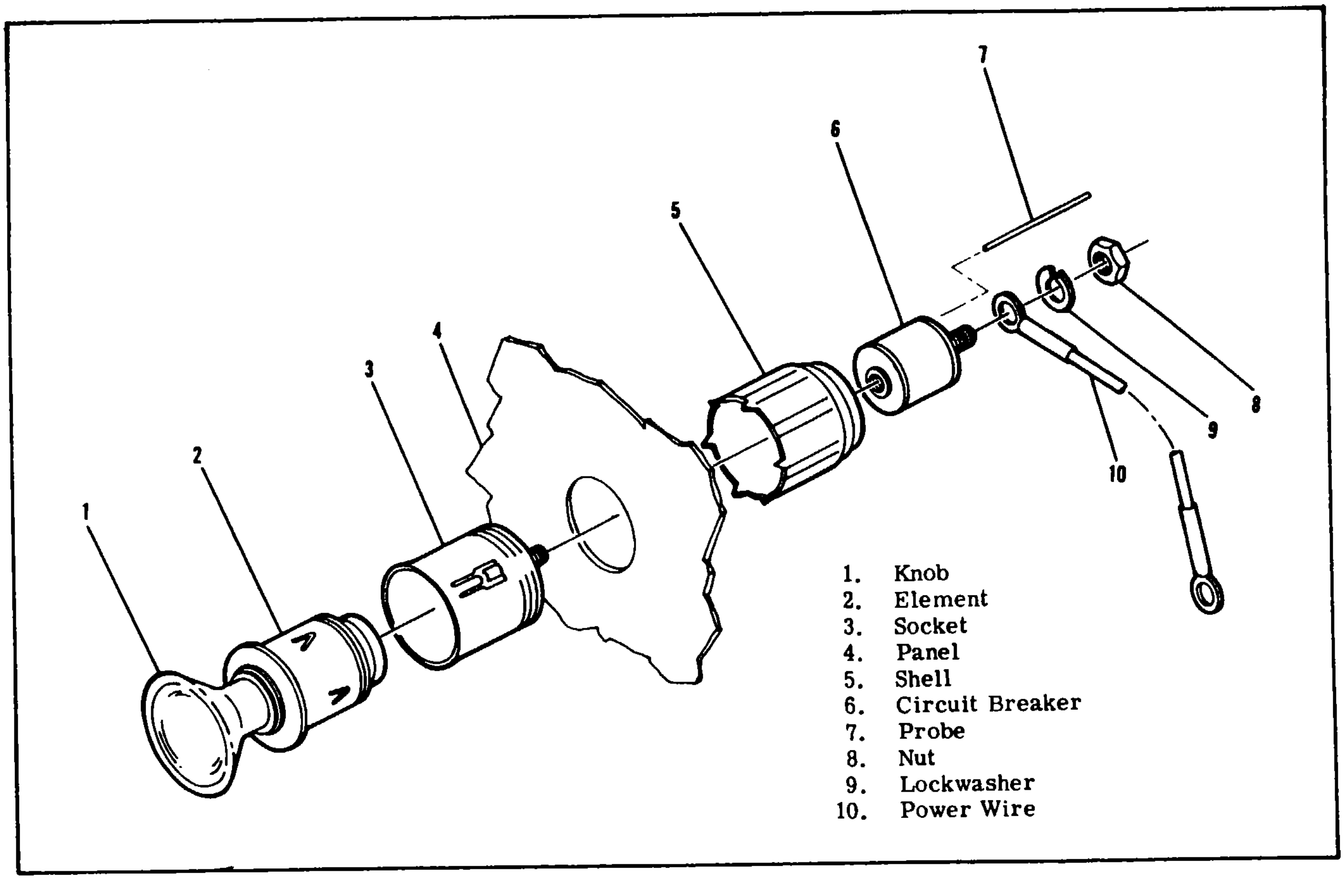


Figure 17-19. Cigar Lighter Installation

17-121A. HEATED WINDSHIELD PANEL

17-121B. DESCRIPTION. The panel is constructed of two sheets of plate glass covering a layer of vinyl. Imbedded in the vinyl is a fine resistance wire which provides the heat for windshield de-icing. The lower edge of the panel is mounted on the deck skin just forward of thw windshield. The upper end of the panel is supported by a rubber bumper which holds the panel off the windshield. The lower mounting bracket is hinged for easy cleaning between the panel and windshield. The hinge pins are spring loaded so the panel may be easily removed. Power to the windshield panel is provided through a plug located in a housing assembly just left of the lower support bracket. A drain tube is provided for the housing assembly also a plug button is provided, which is painted the same color as the deck skin, to plug connector hole in the deck skin when the anti-ice assembly is removed. A circuit breaker switch located on the instrument panel is a off-on switch and a circuit breaker to protect the system.

17-121C. REMOVAL AND INSTALLATION. Refer to figure 16-19A for removal and installation of components.

17-121D. OPERATIONAL CHECK.

a. Connect external power source capable of constant 27.5 volts.

b. Raise nose of aircraft to close nose gear squat switch.

c. Turn master switch on.

d. Turn De-Ice switch on.

e. Check voltage between bus and pin "B" of plug on heating unit, should read approximately 24 volts.

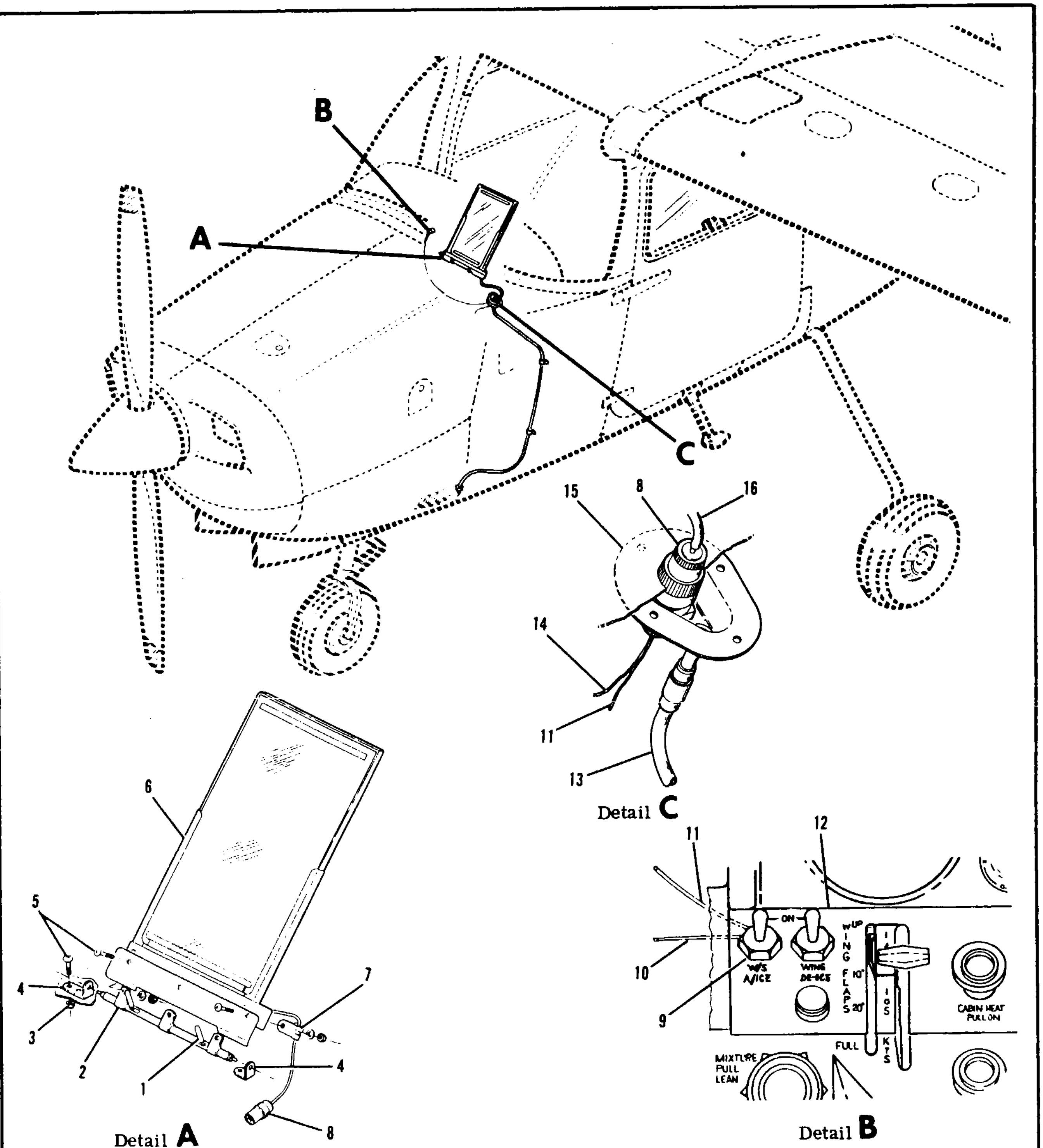
1. If not reading 24 volts, disconnect external power source and check resistance between pin "B" on plug and ground wire. Should read "0" resistance. If "0" resistance is not found, check ground for good contact.

2. Proceeding thru circuitry, check all connections and grounds.

3. If reading 24 volts check across "A" and "B" terminals on plug. The reading should be approximately 8 ohms.

4. If 8 ohms are not read and balance of circuitry checks ok, replace unit.

SHOP NOTES:



1. Release Assembly
2. Stop Assembly
3. Nut
4. Bracket
5. Screw
6. Panel Assembly
7. Clamp
8. Connector
9. Switch
10. Wire (to Bus Bar)
11. Wire (to Connector)
12. EL Panel
13. Drain Tube
14. Wire (to Ground)
15. Housing Assembly
16. Lead to Anti-Ice Panel

Figure 17-19A. Windshield Anti-Ice Panel Installation

17-122. EMERGENCY LOCATOR TRANSMITTER.

17-123. DESCRIPTION. The ELT is a self-contained, solid state unit, having its own power supply, with an externally mounted antenna. The C589510-0209 transmitter is designed to transmit simultaneously on dual emergency frequencies of 121.5 and 243.0 Megahertz. The C589510-0211 transmitter used for Canadian registry, operates on 121.5 only. The unit is mounted in the tailcone, aft of the baggage curtain on the right hand side. The transmitters are designed to provide a broadcast tone that is audio modulated in a swept manner over the range of 1600 to 300 Hz in a distinct, easily recognizable distress signal for reception by search and rescue personnel and others monitoring the emergency frequencies. Power is supplied to the transmitter by a battery-pack which has the service life of the batteries placarded on the batteries and also on the outside end of the transmitter. ELT's thru early 1974 models, were equipped with a battery-pack containing six magnesium "D" size dry cell batteries wired in series. (See figure 17-21) Mid 1974 thru early 1975, ELT's are equipped with a battery pack containing four "in-line" lithium "D" batteries wired in series. Early 1975 and on ELT's are equipped with a battery-pack containing four lithium "D" size batteries which are stacked in two's (See figure 17-20). The ELT exhibits line of sight transmission characteristics which correspond approximately to 100 miles at a search altitude of 10,000 feet. When battery inspection and replacement schedules are adhered to, the transmitter will broadcast an emergency signal at rated power (75 MW-minimum), for a continuous period of time as listed in the following table.

TRANSMITTER LIFE
TO 75 MILLIWATTS OUTPUT

Temperature	6 Cell Magnesium Battery Pack	4 Cell Lithium Battery Pack
+130°F	89 hrs	115 hrs
+ 70°F	95 hrs	115 hrs
- 4°F	49 hrs	95 hrs
- 40°F	23 hrs	70 hrs

Battery-packs have a normal shelf life of five to ten (5-10) years and must be replaced at 1/2 of normal shelf life in accordance with TSO-C91. Cessna specifies 3 years replacement of magnesium (6-cell) battery-packs and 5 years replacement of lithium (4-cell) battery packs.

17-124. OPERATION. A three position switch on the forward end of the unit controls operation. Placing the switch in the ON position will energize the unit to start transmitting emergency signals. In the OFF position, the unit is inoperative. Placing the switch in the ARM position will set the unit to start transmitting emergency signals only after the unit has received a 5g (tolerances are +2g and -0g) impact force, for a duration of 11-16 milliseconds.

CAUTION

Do not leave the emergency locator transmitter in the ON position longer than 5 seconds or you may activate downed aircraft procedures by C. A. P., D. O. T. or F. A. A. personnel.

WARNING

Magnesium (6-cell) battery-packs (excluding 4 cell lithium battery-packs) after prolonged continuous use (1 hour) in a sealed environment give off explosive gas. If your ELT has operated for this time period or longer, as a precautionary measure, loosen the ELT cover screws. lift the cover to break air tight seal and let stand for 15 minutes before tightening screws. Keep sparks, flames and lighted cigarettes away from battery-pack.

NOTE

After relatively short periods of inactivation, the magnesium (6-cell) battery-pack develops a coating over its anode which drastically reduces self discharge and thereby gives the cell an extremely long storage life. This coating will exhibit a high resistance to the flow of electric current when the battery is first switched on. After a short while (less than 15 seconds), the battery current will completely dissolve this coating and enable the battery to operate normally. If this coating is present when your ELT is activated, there may be a few seconds delay before the transmitter reaches full power.

17-125. CHECKOUT INTERVAL:

100 HOURS.

a. Turn aircraft master switch ON.
b. Turn aircraft transceiver ON and set frequency on receiver to 121.5 MHz.
c. Remove the ELT's antenna cable from the ELT unit.
d. Place the ELT's function selector switch in the ON position for 5 seconds or less. Immediately replace the ELT function selector switch in the ARM position after testing ELT.
e. Test should be conducted only within the time period made up of the first five minutes after any hour.

CAUTION

Tests with the antenna connected should be approved and confirmed by the nearest control tower.

NOTE

Without its antenna connected, the ELT will produce sufficient signal to reach your receiver, yet it will not disturb other communications or damage output circuitry.

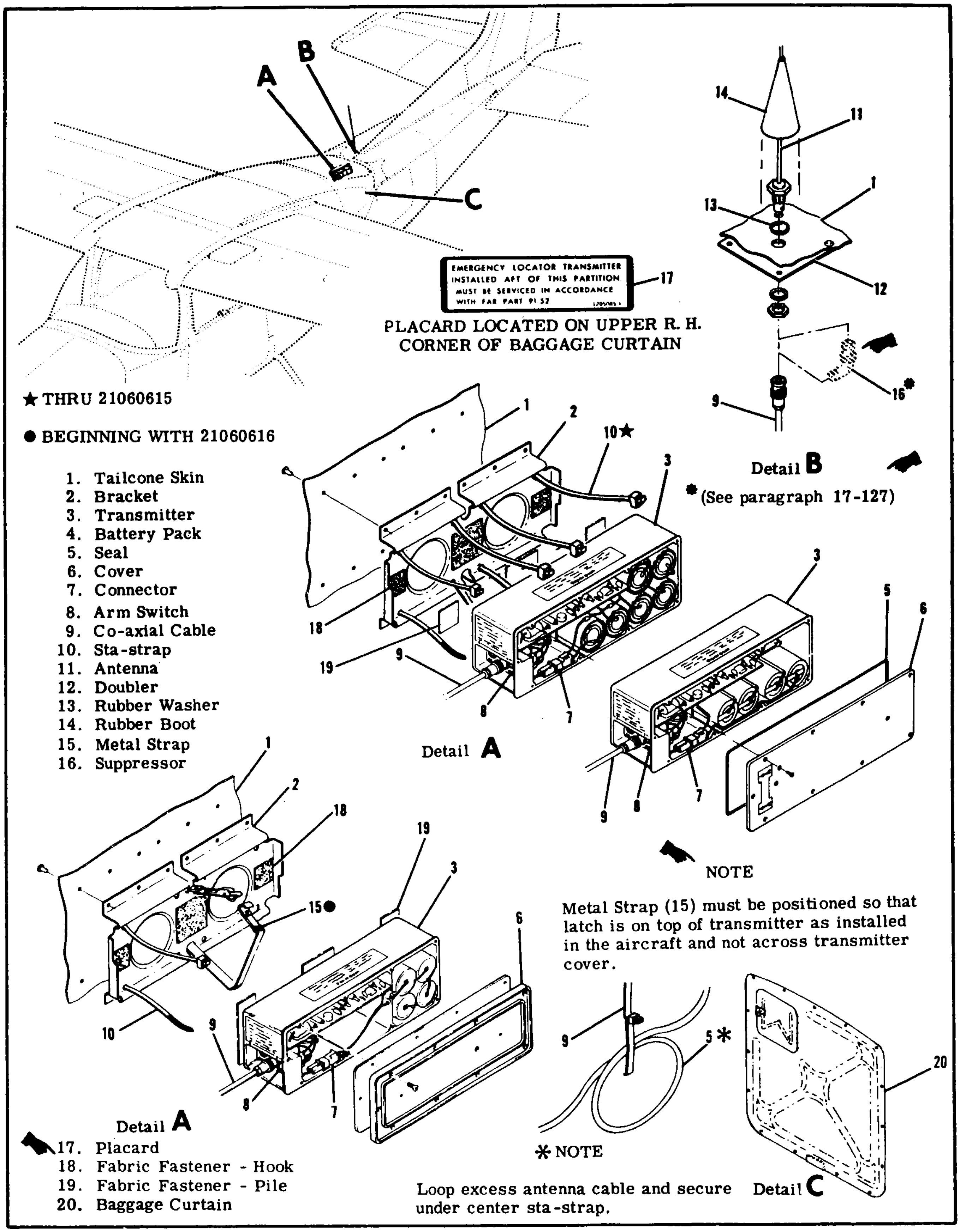


Figure 17-20. Emergency Locator Transmitter Installation

NOTE

After accumulated test or operation time equals 1 hour, battery-pack replacement is required.

f. Check calendar date for replacement of battery-pack. This date is supplied on a sticker attached to the outside of the ELT case and to each battery.

17-126. REMOVAL AND INSTALLATION OF TRANSMITTER. (Refer to figure 17-20.)
a. Remove the baggage curtain to gain access to the transmitter and antenna.
b. Disconnect co-axial cable from end of transmitter.
c. Depending upon the particular installation, either cut four sta-straps and remove transmitter or cut sta-strap securing antenna cable and unlatch metal strap to remove transmitter.

NOTE

Transmitter is also attached to the mounting bracket by velcro strips; pull transmitter to free from mounting bracket and velcro.

NOTE

To replace velcro strips, clean surface thoroughly with clean cloth saturated in one of the following solvents: Trichloric thylene, Aliphatic Napthas, Methyl Ethyl Ketone or Enmar 6094 Lacquer Thinner. Cloth should be folded each time the surface is wiped to present a clean area and avoid redepositing of grease. Wipe surface immediately with clean dry cloth, do not allow solvent to dry on surface. Apply Velcro #40 adhesive to each surface in a thin even coat and allow to dry until quite tacky, but no longer transfers to the finger when touched (usually between 5 and 30 minutes). Porous surfaces may require two coats. Place the two surfaces in contact and press firmly together to insure intimate contact. Allow 24 hours for complete cure.

e. To reinstall transmitter, reverse preceding steps.

NOTE

An installation tool is required to properly secure sta-straps on units installed with sta-straps. This tool may be purchased locally or ordered from the Pandiut Corporation, Tinley Park, Ill., part number GS-2B (Conforms to MS90387-1).

CAUTION

Ensure that the direction of flight arrows (placarded on the transmitter) are pointing towards the nose of the aircraft.

17-127. REMOVAL AND INSTALLATION OF ANTENNA. (Refer to figure 17-20.)
a. Disconnect co-axial cable from base of antenna.
b. Remove the nut and lockwasher attaching the antenna base ot the fuselage and the antenna will be free for removal.
c. To reinstall the antenna, reverse the preceding steps.

NOTE

Upon reinstallation of antenna, cement rubber boot (14) using RTV102, General Electric Co. or equivalent, to antenna whip only; do not apply adhesive to fuselage skin or damage to paint may result.

CAUTION

In-service 6 cell magnesium battery-pack powered ELT's require the installation of a static electricity suppressor in the antenna cable to prevent the possibility of damage to the case of the ELT. Refer to Cessna Avionics Service Letter AV74-16 and figure 17-20.

17-128. REMOVAL AND INSTALLATION OF MAGNESIUM SIX (6) CELL BATTERY-PACK. (Refer to figure 17-21.)

NOTE

On aircraft incorporating Cessna ELT's manufactured by Leigh (Shark 7 series), when replacing battery-pack refer to Cessna Avionics Service Letter AV75-5, dated July 3, 1975.

NOTE

Since replacement 6 cell magnesium battery-packs are no longer available, when in-service units require replacement, use the 4 cell lithium battery-pack. Refer to paragraph 17-129.

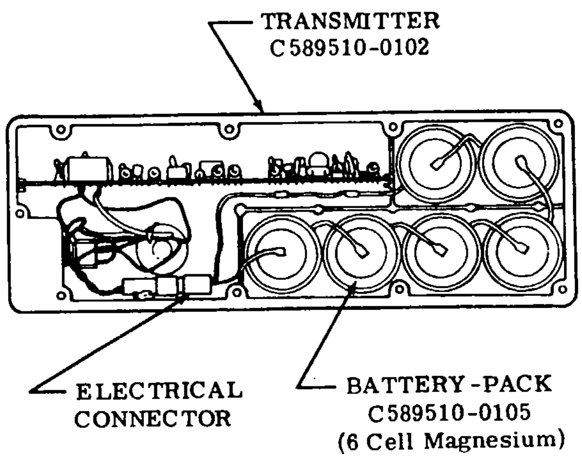


Figure 17-21. Magnesium 6 Cell Battery-Pack Installation

17-129. REMOVAL AND INSTALLATION OF LITHIUM FOUR (4) CELL BATTERY-PACK. (Refer to figure 17-22.)

NOTE

Transmitters equipped with the 4 cell battery-pack can only be replaced with another 4 cell battery-pack.

a. After the transmitter has been removed from aircraft in accordance with para. 16-92, place the transmitter switch in the OFF position.
b. Remove the nine screws attaching the cover to the case and then remove the cover to gain access to the battery-pack.

NOTE

Retain the rubber "O" ring gasket, rubber washers and screws for reinstallation.

c. Disconnect the battery-pack electrical connector and remove battery-pack.
d. Place new battery-pack in the transmitter with four batteries as shown in the case in figure 17-22.
e. Connect the electrical connector as shown in figure 17-22.

NOTE

Before installing the new 4 cell battery-pack, check to ensure that its voltage is 11.2 volts or greater.

CAUTION

If it is desireable to replace adhesive material on the 4 cell battery-pack, use only 3M Jet Melt Adhesive #3738. Do not use other adhesive materials since other materials may corrode the printed circuit board assembly.

f. Replace the transmitter cover by positioning the rubber "O" ring gasket, if installed, on the cover and pressing the cover and case together. Attach cover with nine screws and rubber washers.
g. Remove the old battery-pack placard from the end of transmitter and replace with new battery-pack placard supplied with the new battery-pack.

CAUTION

Be sure to enter the new battery-pack expiration date in the aircraft records. It is also recommended this date be placed in your ELT Owner's Manual for quick reference.

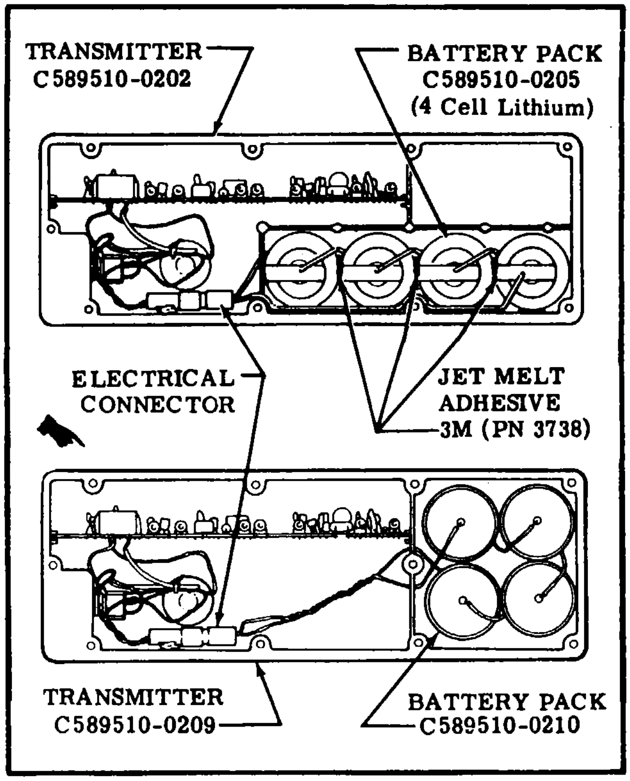


Figure 17-22. Lithium 4 Cell Battery Pack Installations

17-130. TROUBLE SHOOTING. Should your Emergency Locating Transmitter fail the 100 Hours performance checks, it is possible to a limited degree to isolate the fault to a particular area of the equipment. In performing the following trouble shooting procedures to test peak effective radiated power, you will be able to determine if battery replacement is necessary or if your unit should be returned to your dealer for repair.

SHOP NOTES:

TROUBLE	PROBABLE CAUSE	REMEDY
*POWER LOW	Low battery voltage.	1. Set toggle switch to off. 2. Remove plastic plug from the remote jack and by means of a Switchcraft #750 jackplug, connect a Simpson 260 model voltmeter and measure voltage. If the battery-pack voltage on the 6-cell magnesium battery pack transmitter is 10.8 volts or less, and on the 4-cell lithium battery pack transmitters is 11.2 volts or less, the battery pack is below specification.
	Faulty transmitter.	3. If the battery-pack voltage meets the specifications in step 2, the battery-pack is O.K. If the battery is O.K., check the transmitter as follows: a. Remove the voltmeter. b. By means of a switchcraft 750 jackplug and 3 inch maximum long leads, connect a Simpson Model 1223 ammeter to the jack. c. Set the toggle switch to ON and observe the ammeter current drain. If the current-drain is in the 85-100 ma range, the transmitter or the co-axial cable is faulty.
	Faulty co-axial antenna cable.	4. Check co-axial antenna cable for high resistance joints. If this is found to be the case, the cable should be replaced.

*This test should be carried out with the co-axial cable provided with your unit.

SHOP NOTES:

ELECTRICAL LOAD ANALYSIS CHART

24 VOLT ALL MODELS

STANDARD EQUIPMENT (RUNNING LOAD)	AMPS REQD 1972	1973	1974	1975	1976
Battery Contactor	.41	.41	.41	.41	.41
Clock	†	†	†	†	†
Cylinder Head Temperature Indicator	.039	.039	.05	.05	.05
Fuel Quantity Indicators	.12	.12	.11	.11	.11
Flashing Beacon	6.0	6.0	6.0	6.0	6.0
Instrument Lights					
a. Electroluminescent Panel	.03	.03	.02	.02	.02
b. Cluster	0.2	0.2	.16	.16	.16
c. Console *	1.0	1.0	1.14	1.14	1.14
d. Compass	.04	.04	.04	.04	.04
Lamp - Gear Up or Gear Down	.04	.04	.04	.04	.04
Position Lights	1.97	1.07	1.97	1.97	1.97
✱Solenoid Valve - Door Opening	2.0	2.0	2.0	2.0	2.0
✱Solenoid Valve - Gear Handle Lock	2.0	2.0	2.0	2.0	2.0
Turn Coordinator	.28	.28	.28	.28	.28
OPTIONAL EQUIPMENT (RUNNING LOAD)					
Heated-Pitot and Stall Warning Heaters	5.80	5.80	5.80	5.80	5.80
Strobe Lights	2.0	2.0	2.0	2.0	2.0
Post Lighted Panel	2.0	2.0	.76	.76	.76
Cessna 200A Navomatic (Type AF-295A)	—	—	1.5	—	—
Cessna 200A Navomatic (Type AF-295B)	—	—	—	1.5	2.5
Cessna 300 ADF (Type R-546A)	1.0	1.0	1.0	1.0	—
Cessna 300 ADF (Type R-546E)	1.0	1.0	1.0	1.0	1.0
Cessna 300 Marker Beacon (Type R-502B)	.02	.02	.02	—	—
Cessna 300 Nav/Com (100 Channel-Type RT-508A)	1.9	1.9	—	—	—
Cessna 300 Nav/Com (360 Channel-Type RT-308C)	—	—	1.5	1.5	1.5
Cessna 300 Nav/Com (360 Channel-Type RT-528A)	1.9	1.9	—	—	—
Cessna 300 Nav/Com (360 Channel-Type RT-528E)& RT-528E-1)	—	1.9	1.9	1.9	1.9
Cessna 300 Nav/Com (360 Channel-Type RT-328A)	—	1.9	—	—	—
Cessna 300 Nav/Com (360 Channel-Type RT-328C)	—	—	1.5	—	—
Cessna 300 Nav/Com (720 Channel-Type RT-328D)	—	—	—	1.5	—
Cessna 300 Nav/Com (RT-328T)	—	—	—	—	1.5
Cessna 300 Transceiver (Type RT-524A)	2.1	2.1	2.1	2.1	2.1
Cessna 300 HF Transceiver (Type PT-10A)	1.0	1.0	1.0	—	—
Cessna 300 Transponder (Type KT-75R)	0.7	—	—	—	—
Cessna 300 Transponder (Type KT-76 & KT-78)	1.3	1.3	—	—	—
Cessna 300 Transponder (Type RT-359A)	—	—	1.0	1.0	2.0
Cessna 300 Navomatic (Type AF-512D)	1.8	—	—	—	—
Cessna 300 Navomatic (Type AF-394A)	—	1.75	1.8	—	—
Cessna 300A Navomatic (Type AF-395A)	—	—	—	2.0	2.5
Cessna 300 Intergrated Flight Control System (Type AF-530FD)	—	3.2	3.2	3.2	—
Cessna 300 DME (Type KN-60C)	3.0	3.0	2.4	—	—
Cessna 400 ADF (Type R-346A)	1.0	1.0	1.0	—	—
Cessna 400 ADF (Type R-446A)	—	—	—	1.0	1.0
Cessna 300 Glideslope (Type R-543B)	0.4	0.4	0.4	0.4	—
Cessna 400 Glideslope (Type R-443A)	—	0.4	—	—	—
Cessna 400 Glideslope (Type R-443B)	—	—	0.32	0.32	0.32
Cessna 400 Nav/Com (Type RT-522A)	3.0	3.0	3.0	3.0	—
Cessna 400 Nav/Com (Type RT-422A)	—	2.5	1.7	—	—
Cessna 400 Transceiver (Type RT-532A)	2.2	—	—	—	—
Cessna 400 Transceiver (Type RT-432A)	—	1.7	1.4	—	—
Cessna 400 Nav/Com (RT-428A)	—	—	—	—	1.5
Cessna 400 DME (RT-476A)	—	—	—	—	2.5
Cessna 400 Transponder (Type RT-506A)	1.5	1.5	—	—	—
Cessna 400 Transponder (Type RT-459A)	—	—	1.0	1.0	2.0
Cessna 400 Nav-O-Matic (Type AF-520C)	1.2	—	—	—	—
Cessna 400 Nav-O-Matic (Type AF-420A)	—	1.2	1.2	1.2	1.2
Cessna 400A Nav-O-Matic (Type AF-530A)	—	2.7 ✱	2.7 ✱	2.7 ✱	3.0 ✱

* Includes .2 amp Sor gyro slaving ✱ in flight running load

ELECTRICAL LOAD ANALYSIS CHART (Cont.)

24 VOLT ALL MODELS

OPTIONAL EQUIPMENT (RUNNING LOAD) (Cont.)	AMPS REQD 1972	1973	1974	1975	1976
Cessna 400 Integrated Flight Control System (Type FD-400)	—	3.2	3.2	—	—
Cessna 400 Integrated Flight Control System (Type FD-400A)					5.0
(Includes HSI)	—	—	—	—	2.0
HSI System (IN-830A/IG-830A)	—	—	—	—	0.5
Cessna 400 R-Nav (RN-478A)	—	—	—	—	0.1
Slaved Directional Gyro (G-502B)	—	—	—	—	.07
Cessna 400 Encoding Altimeter (EA-401A)	—	—	—	—	0.10
Bendix GM-247A Marker Beacon	—	—	—	—	1.3
King KT-76 Transponder	—	—	—	—	.10
Cessna 400 Marker Beacon (Type R-402A)	—	—	—	—	1.5
King KN-65 DME	—	—	1.5	1.5	2.5
Sunair SSB Transceiver (Type ASB-125)	2.5	2.5	2.5	2.5	8.0 to 12.0
Propeller Anti-Icing (Two Bladed Propeller)	8.0 to 12.9	8.0 to 12.0	8.0 to 12.0	8.0 to 12.0	
Propeller Anti-Icing (Three Blade Propeller)	14.0 to 18.0	14.0 to 18.0	14.0 to 18.0	14.0 to 18.0	14.0 to 18.0
King KN-60C DME	—	—	—	2.4	2.4
Pantronics PT-10A HF Transceiver	—	—	—	1.5	1.5
ITEMS NOT CONSIDERED AS PART OF RUNNING LOAD					
Auxiliary Fuel Pump	3.0	3.0	3.0	3.0	3.0
Cigarette Lighter	7.0	7.0	7.0	7.0	7.0
Flap Motor	8.5	8.5	8.5	8.5	8.5
Landing Lights (Each)	3.57	3.57	3.57	3.57	3.57
Oil Dilution System	1.0	1.0	1.0	1.0	1.0
Stall Warning Horn	.25	.25	.28	.28	.28
Wing Courtesy Lights and Cabin Lights	1.2	1.2	1.2	1.2	1.2
Ice Detector Light	1.43	1.43	1.43	1.43	1.43
Hydroelectric Power Pack	8.0 ✱ 40.0	8.0 ✱ 40.0	8.0 ✱ 40.0	8.0 ✱ 40.0	8.0 ✱ 40.0

*Console lights not used with post lights.
Only one or the other may be used at one time.
†Negligible ✱in flight running load

12 VOLT ALL MODELS

STANDARD EQUIPMENT (RUNNING LOAD)	AMPS REQD 1970	1971
Battery Contactor	0.6	0.6
Clock	†	†
Cylinder Head Temperature Indicator	0.2	0.2
Fuel Quantity Indicators	0.4	0.4
Instrument Lights		
a. Electroluminescent Panel	0.5	0.5
b. Cluster	0.3	0.3
c. Console*	2.0	2.0
d. Compass	0.1	0.1
Position Lights	5.6	5.6
Turn Coordinator	0.8	0.8
✱Solenoid Valve - Door Opening	2.7	2.7
Solenoid Valve - Gear Handle Lock	0.6	0.6
Lamp - Gear Up or Gear Down	0.1	0.1
OPTIONAL EQUIPMENT (RUNNING LOAD)		
Heaters, Stall Warning and Pitot	10.0	10.0
Strobe Lights	4.0	4.0
*Post Lighted Panel	0.03	00.03

ELECTRICAL LOAD ANALYSIS CHART (Cont.)

12 VOLT ALL MODELS

OPTIONAL EQUIPMENT (RUNNING LOAD) (CONT.)	AMPS REQD 1970	1971
Propeller Anti-Icing (Two Bladed Propeller)	24.0	24.0
Propeller Anti-Icing (Three Blade Propeller)	34.0	34.0
Cessna 300 ADF (Type R-521B)	1.6	1.6
Cessna 300 Marker Beacon (Type R-502B)	.02	.02
Cessna 300 Nav/Com (90 Channel-Type RT-517R)	4.5	4.5
Cessna 300 Nav/Com (360 Channel-Type RT-540A)	4.5	4.5
Cessna 300 Transceiver (Type RT-524A)	3.2	3.2
Cessna 300 HF Transceiver (Type PT-10A)	1.5	—
Cessna 300 Transponder (Type KT-75R)	1.5	1.5
Cessna 300 Navomatic (Type AF-512C)	3.5	3.5
Cessna 300 DME (Type KN-60B)	3.0	3.0
Cessna 400 ADF (Type R-324A)	2.0	2.0
Cessna 400 Glideslope (Type R-543B)	0.5	0.5
Cessna 400 Nav/Com (Type RT-522A)	3.0	3.0
Cessna 400 Transceiver (Type RT-532A)	1.5	1.5
Cessna 400 Transponder	3.0	3.0
Cessna 400 Nav-O-Matic (Type AF-520C)	2.4	—
Sunair SSB Transceiver (Type ASB-125)	5.0	5.0
Flashing Beacon	7.0	7.0
Narco Mark 12B Nav/Com with VOA-40 or VOA-50	4.6	4.6
Narco UGR-2 Glideslope Receiver	.23	.23

ITEMS NOT CONSIDERED AS PART OF RUNNING LOAD	AMPS REQD 1970	1971
Auxilary Fuel Pump	3.0	3.0
Cigarette Lighter	10.0	10.0
Flap Motor	15.0	15.0
Landing Lights	15.6	15.6
Oil Dilution System	1.0	1.0
Stall Warning Horn	0.25	0.25
Wing Courtesy Lights and Cabin Lights	3.3	3.3

*Console lights not used with post lights. Only one or the other may be used at one time

†Negligible

✱In flight running load only.

SECTION 18

STRUCTURAL REPAIR

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18-1. STRUCTURAL REPAIR.

18-2. REPAIR CRITERIA. Although this section outlines repair permissible on structure of the aircraft, the decision of whether to repair or replace a major unit of structure will be influenced by such factors as time and labor available and by a comparison of labor costs with the price of replacement assemblies. Past experience indicates that replacement, in many cases, is less costly than major repair. Certainly, when the aircraft must be restored to its airworthy condition in a limited length of time, replacement is preferable. Restoration of a damaged aircraft to its original design strength, shape and alignment involves careful evaluation of the damage, followed by exacting workmanship in performing the repairs. This section suggests the extent of structural repair practicable on the aircraft and supplements Federal Aviation Regulation, Part 43. Consult the factory when in doubt about a repair not specifically mentioned here.

18-3. EQUIPMENT AND TOOLS.

18-4. SUPPORT STANDS. Padded, reinforced sawhorse or tripod type support stands, sturdy enough to support any assembly placed upon them, must be used to store a removed wing or tailcone. Plans for local fabrication of support stands are contained in figure 18-1. The fuselage assembly, from the tailcone to the firewall, must NOT be supported from the underside, since the skin bulkheads are not designed for this purpose. Adapt support stands to fasten to the wing-attach points or landing gear attach-points when supporting a fuselage.

18-5. FUSELAGE REPAIR JIGS. Whenever a repair is to be made which could affect structural alignment, suitable jigs must be used to assure correct alignment of major attach points, such as fuselage, firewall, wing and landing gear. These fuselage repair jigs are obtainable from the factory.

18-6. WING JIGS. These jigs serve as a holding fixture during extensive repair of a damaged wing, and locates the root rib, leading edge and tip rib of the wing. These jigs are also obtainable from the factory.

18-7. REPAIR MATERIALS. Thickness of a material on which a repair is to be made can easily be determined by measuring with a micrometer. In general, material used in Cessna aircraft covered in this manual is made from 2024 aluminum alloy, heat treated to a -T3, -T4, or -T42 condition. If the type of material cannot readily be determined, 2024-T3 may be used in making repairs, since the strength of -T3 is greater than -T4 or -T42 (-T4 and -T42 may be used interchangeably, but they may not be substituted for -T3. When necessary to form a part with a smaller bend radius than the standard cold bending radius for 2024-T4, use 2024-0 and heat treat to 2024-T42 after forming. The repair material used in making a repair must equal the gauge of the material being repaired unless otherwise noted. It is often practical to cut repair pieces from service parts listed in the Parts Catalog. A few components (empennage tips, for example) are fabricated from thermo-formed plastic or glass fiber constructed material.

18-8. WING AND STABILIZER ANGLE-OF-INCIDENCE. Angle-of-incidence and wing twist are listed in the following chart. Stabilizers do not have twist. The cantilever wing has a uniform twist from the root rib to the tip rib. The amount of twist between these two ribs is the difference between the angle-of-incidence at the root and the angle-of-incidence at the tip. (Refer to figure 18-2.)

WING	
Angle-of-incidence, Root	+1°30'
Angle-of-incidence, Tip	-1°30'
Twist (Washout)	3°
STABILIZER	
Angle-of-incidence	-3°±15'

18-9. WING.

18-10. DESCRIPTION. The wing is sheet-metal constructed, with a single main spar, two fuel spars, formed ribs and stringers. The front fuel spar also serves as an auxiliary spar and is the forward wing attaching point. An inboard section forward of the main spar is sealed to form an integral fuel bay area. The main spar consists of milled spar caps and attaching fittings joined by a web section. The aft fuel spar is a formed channel. The front fuel spar is a built-up assembly consisting of a formed channel, doubler, attach strap and support angle. Stressed skin, riveted to the ribs, spars and stringers, completes the wing structure. Access openings (hand holes with removable cover plates) are located in the underside of the wing between the wing root and tip section. These openings afford access to the flap and aileron bellcranks, flap drive pulleys, flap actuator in left wing, flap and aileron control cable disconnect points, fuel adapter plate, air scoop connectors and electrical wiring.

18-11. WING SKIN.

18-12. NEGLIGIBLE DAMAGE. Any smooth dents in the wing skin that are free from cracks, abrasions and sharp corners, which are not stress wrinkles and do not interfere with any internal structure or mechanism, may be considered as negligible damage in any area of the wing. Outboard of wing station 40.00 in areas of low stress intensity, cracks, deep scratches or sharp dents, which after trimming or stop drilling can be enclosed by a two-inch circle, can be considered negligible if the damaged area is at least one diameter of the enclosing circle away from all existing rivet lines and material edges. The area on the lower surface of the wing between the two stringers adjacent to the main spar is not considered low stress intensity. Stop drilling is considered a temporary repair and a permanent repair should be made as soon as practicable.

18-13. REPAIRABLE DAMAGE. Repairs must not be made to the upper or lower wing skin inboard of station 40.00 without factory approval. However, an entire skin may be replaced without factory approval. Refer to Section 1 for wing station locations. Figure 18-4 outlines typical repairs to be employed in patching skin. Before installing a patch, trim the damaged area to form a rectangular pattern, leaving at least a one-half inch radius at each corner and deburr. The sides of the hole should lie span-wise or chord-wise. A circular patch may also be used. If the patch is in an area where flush rivets are used, make a flush patch type of repair; if in an area where flush rivets are not used, make an overlapping type of repair. Where optimum appearance and airflow are desired, the flush patch may be used. Careful workmanship will eliminate gaps at butt-joints; however, an opoxy type filler may be used at such joints.

18-14. DAMAGE NECESSITATING REPLACEMENT OF PARTS. If a skin is badly damaged, repair must be made by replacing an entire skin panel, from one structural member to the next. Repair seams must be made to lie along existing structural members and each seam must be made exactly the same in regard to rivet size, spacing and pattern as the manufactured seams at the edges of the original sheet. If the manufactured seams are different, the stronger must be copied. If the repair ends at a structural member where no seam is used, enough repair panel must be used to allow an extra row of staggered rivets, with sufficient edge margin, to be installed.

18-15. WING STRINGERS.

18-16. NEGLIGIBLE DAMAGE. Refer to paragraph 18-12.

18-17. REPAIRABLE DAMAGE. Figure 18-5 outlines a typical wing stringer repair. Two such repairs may be used to splice a new section of stringer material in position, without the filler material.

18-18. DAMAGE NECESSITATING REPLACEMENT OF PARTS. If a stringer is so badly damaged that more than one section must be spliced, replacement is recommended.

18-19. WING RIBS.

18-20. NEGLIGIBLE DAMAGE. Refer to paragraph 18-12.

18-21. REPAIRABLE DAMAGE. Figure 18-6 illustrates typical wing rib repairs.

18-22. DAMAGE NECESSITATING REPLACEMENT OF PARTS. Any wing rib damaged extensively should be replaced. However, due to the necessity of disassembling so much of the wing in order to replace a rib, especially in the fuel bay area which involves sealing, wing ribs should be repaired if practicable.

18-23. WING SPAR.

18-24. NEGLIGIBLE DAMAGE. Due to the stresses which the wing spar encounters, very little damage can be considered negligible. Smooth dents, light scratches and abrasions may be considered negligible.

18-25. REPAIRABLE DAMAGE. All cracks, stress wrinkles, deep scratches and sharp dents must be repaired. However, repairs must not be made to the main wing spar inboard of wing station 155.00 without factory approval. Refer to Section 1 for wing station locations. Figure 18-7 outlines a typical main wing spar repair.

18-26. DAMAGE NECESSITATING REPLACEMENT OF PARTS. An entire wing spar may be replaced without factory approval.

18-27. WING FUEL BAY SPARS AND RIBS.

18-28. NEGLIGIBLE DAMAGE. Any smooth dents in the fuel spars that are free from cracks, abrasions and sharp corners, which are not stress wrinkles and do not interfere with any internal structure or mechanism, may be considered as negligible damage in any area of the spar.

18-29. REPAIRABLE DAMAGE. The type of repair outlined in figure 18-7 also applies to fuel bay spars outboard of wing station 124.0. Inboard of station 124.0, factory approval of proposed repairs is required. Refer to Section 13 for sealing procedures when working in fuel bay areas.

18-30. DAMAGE NECESSITATING REPLACEMENT OF PARTS. Due to the amount of fuel bay sealant which must be removed from fuel bay components to facilitate repair, individual parts are not available to replace fuel bay spars or ribs. The entire fuel bay area must be replaced as a unit.

18-31. AILERONS.

18-32. NEGLIGIBLE DAMAGE. Refer to paragraph 18-12.

18-33. REPAIRABLE DAMAGE. The repair shown in figure 18-8 may be used to repair damage to aileron leading edge skins. The flush-type skin patches shown in figure 18-4 may be used to repair damage to the remaining skins. Following repair, the aileron must be balanced. Refer to paragraph 18-35 and figure 18-3 for balancing the aileron.

18-34. DAMAGE NECESSITATING REPLACEMENT OF PARTS. If the damage would require a repair which could not be made between adjacent ribs, complete skin panels must be replaced. Ribs and spars may be repaired, but replacement is generally preferable. Where extensive damage has occurred, replacement of the aileron assembly is recommended. After repair or replacement, balance aileron in accordance with paragraph 18-35 and figure 18-3.

18-35. AILERON BALANCING. Following repair, replacement or painting, the aileron must be balanced. Complete instructions for fabricating balancing fixtures and mandrels and their use are given in figure 18-3.

18-36. WING FLAPS.

18-37. NEGLIGIBLE DAMAGE. Refer to paragraph 18-12.

18-38. REPAIRABLE DAMAGE. Flap repairs should be similar to aileron repairs discussed in paragraph 18-33. A flap leading edge repair is shown in figure 18-9.

18-39. DAMAGE NECESSITATING REPLACEMENT OF PARTS. Flap repairs which require replacement of parts should be similar to aileron repairs discussed in paragraph 18-34. Since the flap is not considered a movable control surface, no balancing is required.

18-40. WING LEADING EDGE.

18-41. NEGLIGIBLE DAMAGE. Refer to paragraph 18-12.

18-42. REPAIRABLE DAMAGE. A typical leading edge skin repair is shown in figure 18-8. Also, wing skin repairs, outlined in paragraph 18-13, may be used to repair leading edge skins, although the flush-type patches should be used. Extra access holes, described in figure 18-10, must not be installed in the wing without factory approval. Where extreme damage has occured, replace complete skin panels.

18-43. DAMAGE NECESSITATING REPLACEMENT OF PARTS. An entire leading edge skin may be replaced without factory approval.

18-44. ELEVATORS AND RUDDER.

18-45. NEGLIGIBLE DAMAGE. Refer to paragraph 18-12. The exception to negligible damage on the elevator surfaces is the front spar, where a crack appearing in the web at the hinge fittings or in the structure which supports the overhanging balance weight is not considered negligible. Cracks in the overhanging tip rib, in the area at the front spar intersection with the web of the rib, also cannot be considered negligible.

18-46. REPAIRABLE DAMAGE. Skin patches illustrated in figure 18-4 may be used to repair skin damage. Following repair, the elevators and rudder must be balanced. Refer to paragraph 18-48 and figure 18-3 for balancing the elevators and rudder. If damage would require a repair which could not be made between adjacent ribs, see the following paragraph.

18-47. DAMAGE NECESSITATING REPLACEMENT OF PARTS. If the damaged area would require a repair which could not be made between adjacent ribs, complete skin panels must be replaced. Ribs and spars may be repaired, but replacement is generally preferable. Where extensive damage has occured, replacement of the entire assembly is recommended. After repair and/or replacement, balance elevators and rudder in accordance with paragraph 18-48 and figure 18-3.

18-48. ELEVATOR AND RUDDER BALANCING. Following repair, replacement or painting, the elevators and rudder must be balanced. Complete instructions for fabricating balancing fixtures and mandrels and their use are given in figure 18-3.

18-49. FIN AND STABILIZER.

18-50. NEGLIGIBLE DAMAGE. Refer to paragraph 18-12.

18-51. REPAIRABLE DAMAGE. Skin patches illustrated in figure 18-4 may be used to repair skin damage. Access to the dorsal area of the fin may be gained by removing the horizontal closing rib at the bottom of the fin. Access to the internal fin structure is best gained by removing skin attaching rivets on one side of the rear spar and ribs, and springing back the skin. Access to the stabilizer structure may be gained by removing skin attaching rivets on one side of the rear spar and ribs, and springing back the skin. If the damaged area would require a repair which could not be made between adjacent ribs, or a repair would be located in an area with compound curves, see the following paragraph.

18-52. DAMAGE NECESSITATING REPLACEMENT OF PARTS. If the damaged area would require a repair which could not be made between adjacent ribs, or the repair would be located in an area with compound curves, complete skin panels must be replaced. Ribs and spars may be repaired, but replacement is generally preferable. Where damage is extensive, replacement of the entire assembly is recommended.

18-52A. BONDED DOORS.

18-52B. REPAIRABLE DAMAGE. Bonded doors may be repaired by the same methods used for riveted structure. Rivets are a satisfactory substitute for bonded seams on these assemblies. The strength of the bonded seams in doors may be replaced by a single 3/32, 2117-AD rivet per running inch of bond seam. The standard repair procedures outlined in AC43.13-1 are also applicable to bonded doors.

18-53. FUSELAGE.

CAUTION

Repairs must not be made to the main wing spar carry-thru section of the cantilever wing without factory approval.

18-54. DESCRIPTION. The fuselage is of semi-monocoque construction consisting of formed bulkheads, longitudinal stringers, reinforcing channels and skin platings.

18-55. NEGLIGIBLE DAMAGE. Refer to paragraph 18-12. Mild corrosion appearing upon alclad surfaces does not necessarily indicate incipient failure of the base metal. However, corrosion of all types must be carefully considered and approved remedial action taken. Small cans appear in the skin structure of all metal aircraft. It is strongly recommended, however, that wrinkles which appear to have originated from other sources, or which do not follow the general appearance of the remainder of the skin panels, be thoroughly investigated. Except in the landing gear bulkhead area, wrinkles occuring over stringers which disappear when the rivet pattern is removed may be considered negligible. However, the stringer rivet holes may not align perfectly with the skin holes because of a permanent "set" in the stringer. If this is apparent, replacement of the stringer will usually restore the original strength characteristics of the area.

NOTE

Wrinkles occuring in the skin of the main landing gear bulkhead areas must not be considered negligible. The skin panel must be opened sufficiently to permit a thorough examination of the lower portion of the landing gear bulkhead and its tie-in structure.

Wrinkles occuring on open areas which disappear when the rivets at the edge of the sheet are removed, or a wrinkle which is hand removable, may often be repaired by the addition of a 1/2 x 1/2 x .060 inch 2024-T4 extruded angle, riveted over the wrinkle and extended to within 1/16 to 1/8 inch of the nearest structural members. Rivet pattern must be identical to the existing manufactured seam at the edge of the sheet.

18-56. REPAIRABLE DAMAGE. Fuselage skin repairs may be accomplished in the same manner as wing skin repairs outlined in paragraph 18-13. Stringers, formed skin flanges, bulkhead channels and similar parts may be repaired as shown in figure 18-5.

18-57. DAMAGE NECESSITATING REPLACEMENT OF PARTS. Fuselage skin major repairs may be accomplished in the same manner as wing skin repairs outlined in paragraph 18-14. Damaged fittings must be replaced. Seat rails serve as structural parts of the fuselage and must be replaced if damaged.

18-58. BULKHEADS.

18-59. LANDING GEAR BULKHEADS. Since these bulkheads are highly stressed members irregularly formed to provide clearance for control lines, actuators, fuel lines, etc., patch type repairs will be, for the most part, impractical. Minor damage consisting of small nicks or scratches may be repaired by dressing out the damaged area, or by replacement of rivets. Any other such damage must be repaired by replacing the landing gear support assembly as an aligned unit.

18-60. REPAIR AFTER HARD LANDING. Buckled skin or floorboards and loose or sheared rivets in the area of the main gear support will give evidence of damage to the structure from an extremely hard landing. When such evidence is present, the entire support structure must be carefully examined and all support forgings must be checked for cracks, using a dye penetrant and proper magnification. Bulkheads in the area of possible damage must be checked for alignment and a straightedge must be used to determine deformation of the bulkhead webs. Damaged support structure, buckled floorboards and skins and damaged or questionable forgings must be replaced.

18-61. REPLACEMENT OF HI-SHEAR RIVETS. Hi-shear rivet replacement with close tolerance bolts or other commercial fasteners of equivalent strength properties is permissible. Holes must not be elongated, and the Hi shear substitute must be a smooth push fit. Field replacement of main landing gear forgings on bulkheads may be accomplished by using:

a. NAS464P* Bolt, MS21042-* Nut and AN960-* washer in place of Hi-Shear Rivets for forgings with machined flat surface around attachment holes.

b. NAS464P* Bolt, ESNA 2935* Mating Base Ring, ESNA LH 2935* Nut for forgings (with draft angle of up to a maximum of 8°) without machined flat surface around attachment holes.

*Dash numbers to be determined according to the size of the holes and the grip lengths required. The bolts grip length should be chosen so that no threads remain in the bearing area.

18-62. FIREWALL DAMAGE. Firewalls may be repaired by removing the damaged material and splicing in a new section. The new portion must be lapped over the old material, sealed with Pro-Seal #700 (Coast Pro-Seal Co., Chemical Division, 2235 Beverly Blvd., Los Angeles, California) compound, or equivalent and secured with stainless steel rivets. Damaged or deformed angles and stiffeners may be repaired as shown in figure 18-11, or they may be replaced. A severely damaged firewall must be replaced as a unit.

18-63. DELETED.

18-64. DELETED.

18-65. DELETED.

18-66. DELETED.

18-67. DELETED.

18-68. BAFFLES. Baffles ordinarily require replacement if damaged or cracked. However, small plate reinforcements riveted to the baffle will often

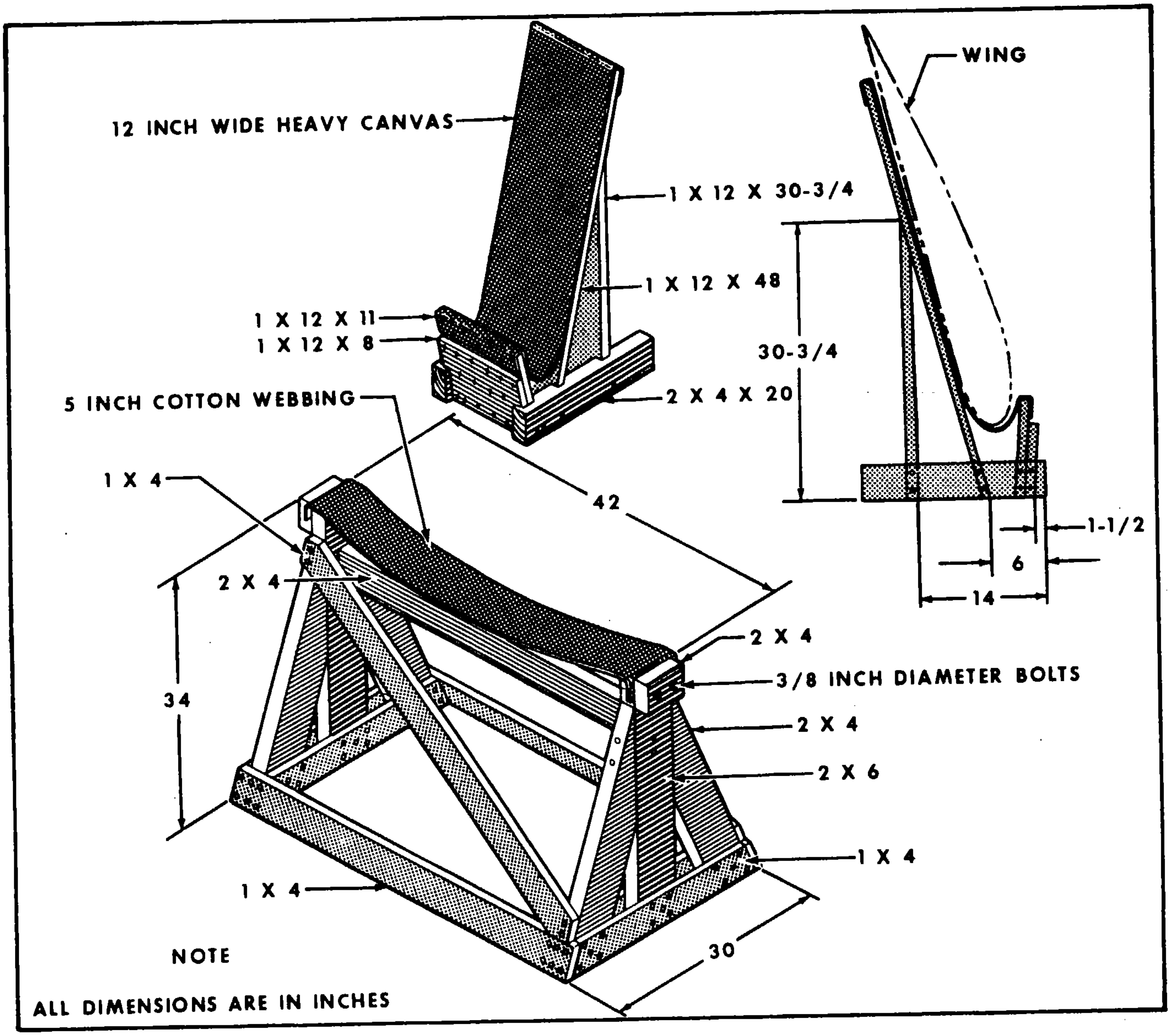


Figure 18-1. Wing and Fuselage Support Stands

prove satisfactory both to the strength and cooling requirements of the unit.

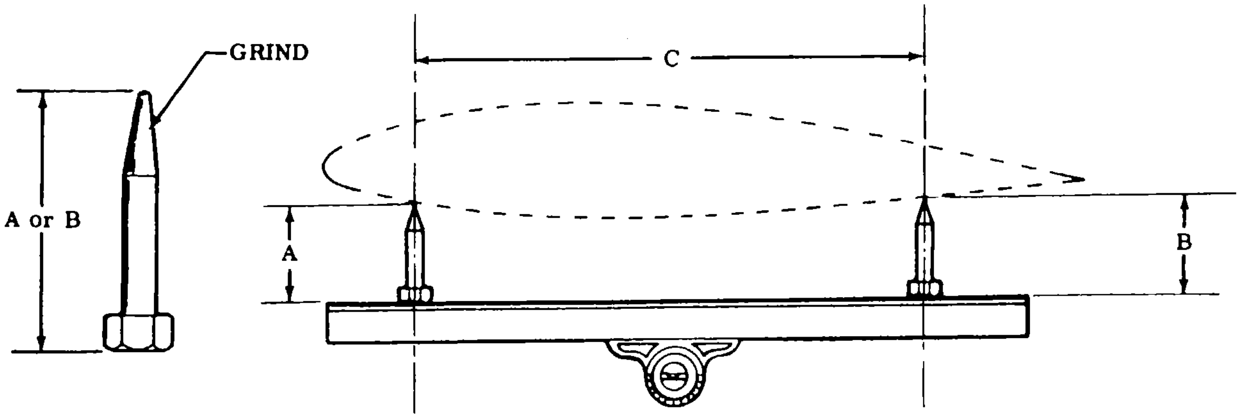
18-69. ENGINE COWLING.

18-70. REPAIR OF COWLING SKINS. If extensively damaged, complete sections of cowling must be replaced. Standard insert-type patches, however, may be used if repair parts are formed to fit. Small cracks may be stop-drilled and dents straightened if they are reinforced on the inner side with a doubler of the same material. Bonded cowling may be repaired by the same methods used for riveted structure. Rivets are a satisfactory substitute for bonded seams on these assemblies. The strength of the bonded seams in cowling may be replaced by a single 3/32, 2117-AD rivet per running inch of bond seam. The standard repair procedures outlined in AC43.13-1 are also applicable to cowling.

18-71. REPAIR OF REINFORCEMENT ANGLES. Cowl reinforcement angles, if damaged, must be replaced. Due to their small size they are easier to replace than to repair.

18-72. REPAIR OF ABS COMPONENTS. Rezolin Repair Kit, Number 404 may be obtained from the Cessna Service Parts Center for repair of ABS Components.

18-73. REPAIR OF GLASS-FIBER CONSTRUCTED COMPONENTS. Glass-fiber constructed components on the aircraft may be repaired as stipulated in instructions furnished in SK182-12. Observe the resin manufacturer's recommendations concerning mixing and application of the resin. Epoxy resins are preferable for making repairs, since epoxy compounds are usually more stable and predictable than polyester and give better adhesion.



A	B	C	WING STATION
2.00	2.00	40.50	26.50
.75	2.00	25.50	205.00

ALL WING TWIST OCCURS BETWEEN STA. 26.50 AND STA. 205.00.
(Refer to paragraph 18-8 for angle of incidence).

CHECKING WING TWIST

If damage has occured to a wing, it is advisable to check the twist. The following method can be used with a minimum of equipment, which includes a straightedge (42" minimum length of angle or equivalent), three modified bolts and a protractor head with level.

1. Check chart for applicable dimension for bolt length (A or B).
2. Grind bolt shanks to a rounded point as illustrated, checking length periodically.
3. Tape two bolts to straightedge according to dimension C.
4. Locate inboard wing station to be checked and make a pencil mark approximately one-half inch aft of first lateral row of rivets, aft of wing leading edge.
5. Holding straightedge parallel to wing station, (staying as clear as possible from "cans"), place bolt on pencil mark and set protractor head against lower edge of straightedge.
6. Set bubble in level to center and lock protractor to hold this reading.
7. Omitting step 6, repeat procedure for outboard wing station, using dimensions specified in chart. Check to see that protractor bubble is still centered.
8. Proper twist is present in wing if protractor readings are the same (parallel). Forward or aft bolt may be lowered from wing .10 inch maximum to attain parallelism.

Figure 18-2. Checking Wing Twist

GENERAL NOTES

1. Balance control surfaces in a draft-free area.

2. Place hinge bolts through control surface hinges and position on knife edge balancing mandrels.

3. Make sure all control surfaces are in their final flight configuration: painted (if applicable), trim tabs installed, all foreign matter removed from inside of control surface, elevator trim tab push-pull rod installed and all tips installed.

4. Place balancing mandrels on a table or other suitable flat surface.

5. Adjust trailing edge support to fit control surface being balanced while center of balancing beam is directly over hinge line. Remove balancing beam and balance the beam itself by adding washers or nuts as required at end opposite the trailing edge support.

6. When positioning balancing beam on control surface, avoid rivets to provide a smooth surface for the beam and keep the beam 90° to the hinge line of the control surface.

7. Paint is a considerable weight factor. In order to keep balance weight to a minimum, it is recommended that existing paint be removed before adding paint to a control surface. Increase in balance weight will also be limited by the amount of space available and clearance with adjacent parts. Good workmanship and standard repair practices should not result in unreasonable balance weight.

8. The approximate amount of weight needed may be determined by taping loose weight at the balance weight area.

9. Lighten balance weight by drilling off part of weight.

10. Make balance weight heavier by fusing bar stock solder to weight after removal from control surface. The ailerons should have balance weight increased by ordering additional weight and gang channel, listed in applicable Parts Catalog and installing next to existing inboard weight the minimum length necessary for correct balance, except that a length which contains at least two attaching screws must be used. If necessary, lighten new weight or existing weights for correct balance.

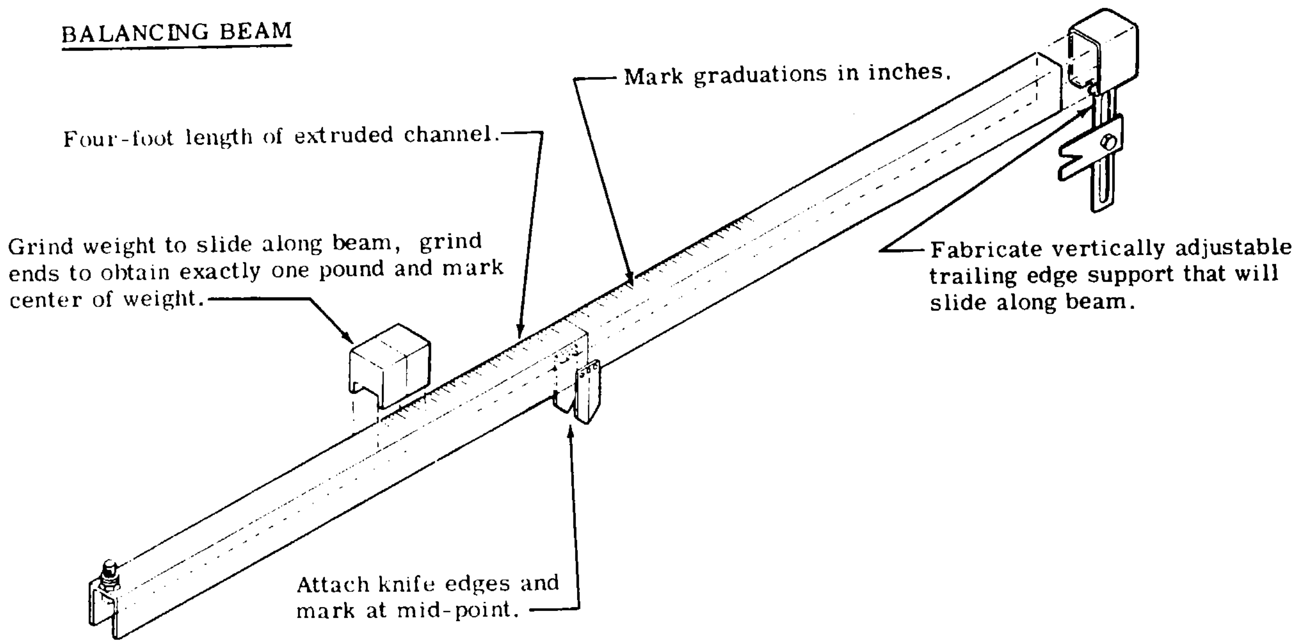


Figure 18-3. Control Surface Balancing (Sheet 1 of 4)

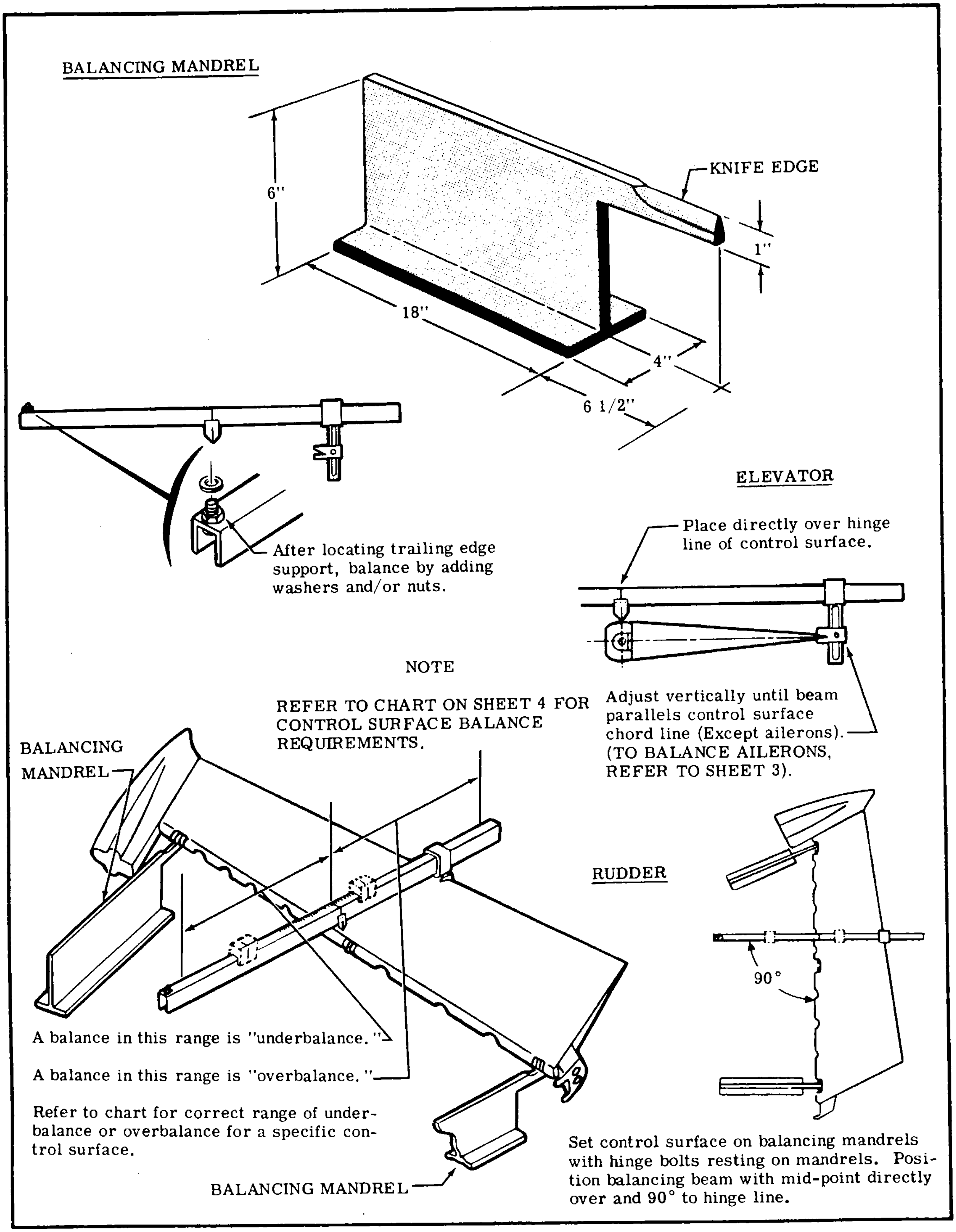
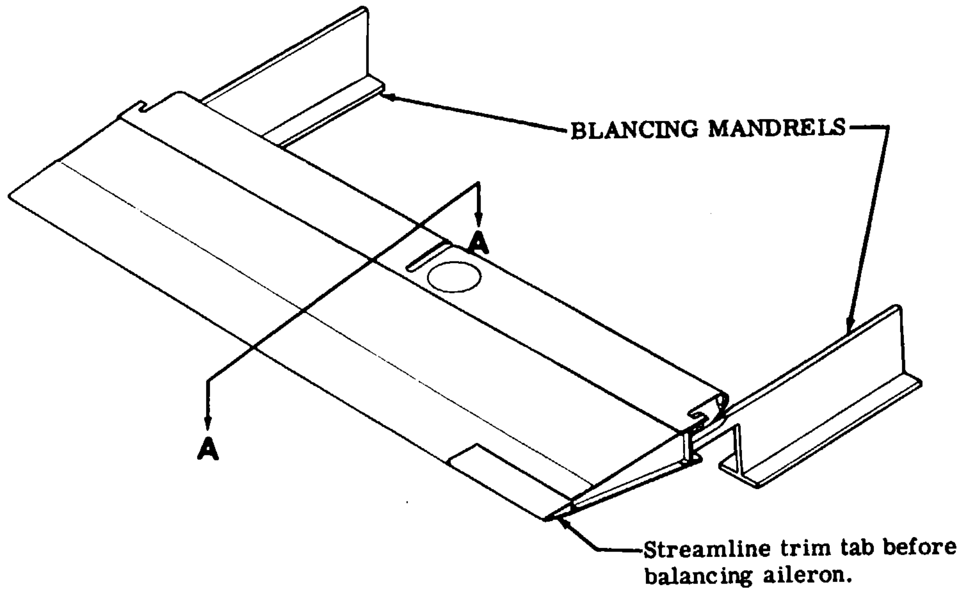
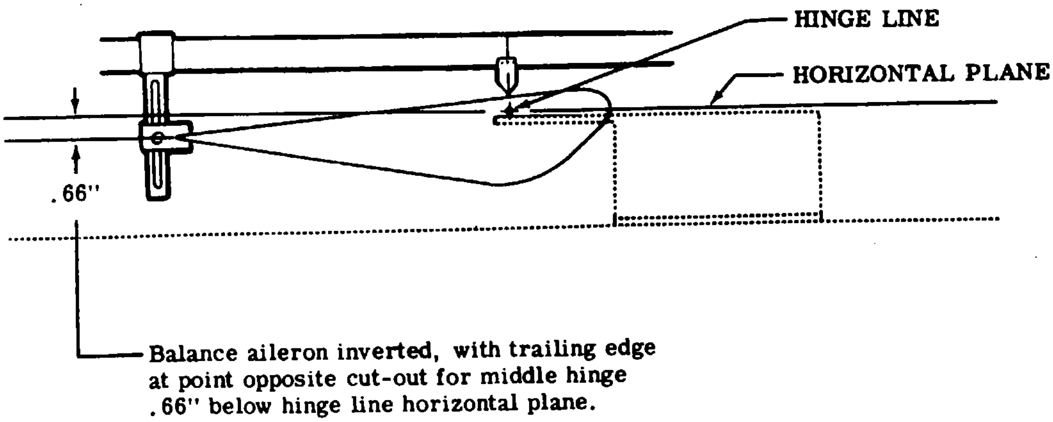


Figure 18-3. Control Surface Balancing (Sheet 2 of 4)

AILERONS



DETAIL **A-A**



Refer to chart for correct range of underbalance.

Figure 18-3. Control Surface Balancing (Sheet 3 of 4)

CONTROL SURFACE BALANCE REQUIREMENTS

NOTE

Unpainted values are not limits which must be met. They are given as guides, in order that the unbalance of the control surface in the final aircraft configuration may be predicted. If the control surface in the unpainted condition falls within the unpainted limit, the mechanic may feel confident that the control surface will be acceptable after painting. However, if the surface in the unpainted condition exceeds the unpainted limit, the balance must be checked again after final painting to assure that the control surface falls within the painted unbalance limit. Refer to GENERAL NOTES on sheet 1 for specific conditions.

DEFINITIONS:

UNDERBALANCE is defined as the condition that exists when the control surface is trailing edge heavy, and is symbolized by a plus (+).

OVERBALANCE is defined as the condition that exists when the control surface is leading edge heavy, and is symbolized by a minus (-).

NOTE

The "Balance Limits" columns list the moment tolerances within which the control surface must balance. These tolerances must never be exceeded in the final flight configuration.

CONTROL: AILERON

PAINTED (Inch-Pounds)	UNPAINTED (Inch-Pounds)
BALANCE LIMITS	BALANCE LIMITS
+7.00 to +11.16	+4.25 to +8.41

UNPAINTED (CORROSION-PROOFING ONLY) (Inch-Pounds)
BALANCE LIMITS
+5.17 to +9.33

CONTROL: RUDDER

PAINTED (Inch-Pounds)	UNPAINTED (Inch-Pounds)
BALANCE LIMITS	BALANCE LIMITS
-1.87 to +1.50	-2.85 to -1.1

CONTROL: RIGHT ELEVATOR

PAINTED (Inch-Pounds)	UNPAINTED (Inch-Pounds)
BALANCE LIMITS	BALANCE LIMITS
0.0 to +12.1	0.0 to +8.5 THRU 21060955
	0.0 to +5.5 BEGINNING WITH 21060956

CONTROL: LEFT ELEVATOR

PAINTED (Inch-Pounds)	UNPAINTED (Inch-Pounds)
BALANCE LIMITS	BALANCE LIMITS
0.0 to +12.1	0.0 to +8.5 THRU 21060955
	0.0 to +5.0 BEGINNING WITH 21060956

Figure 18-3. Control Surface Balancing (Sheet 4 of 4)

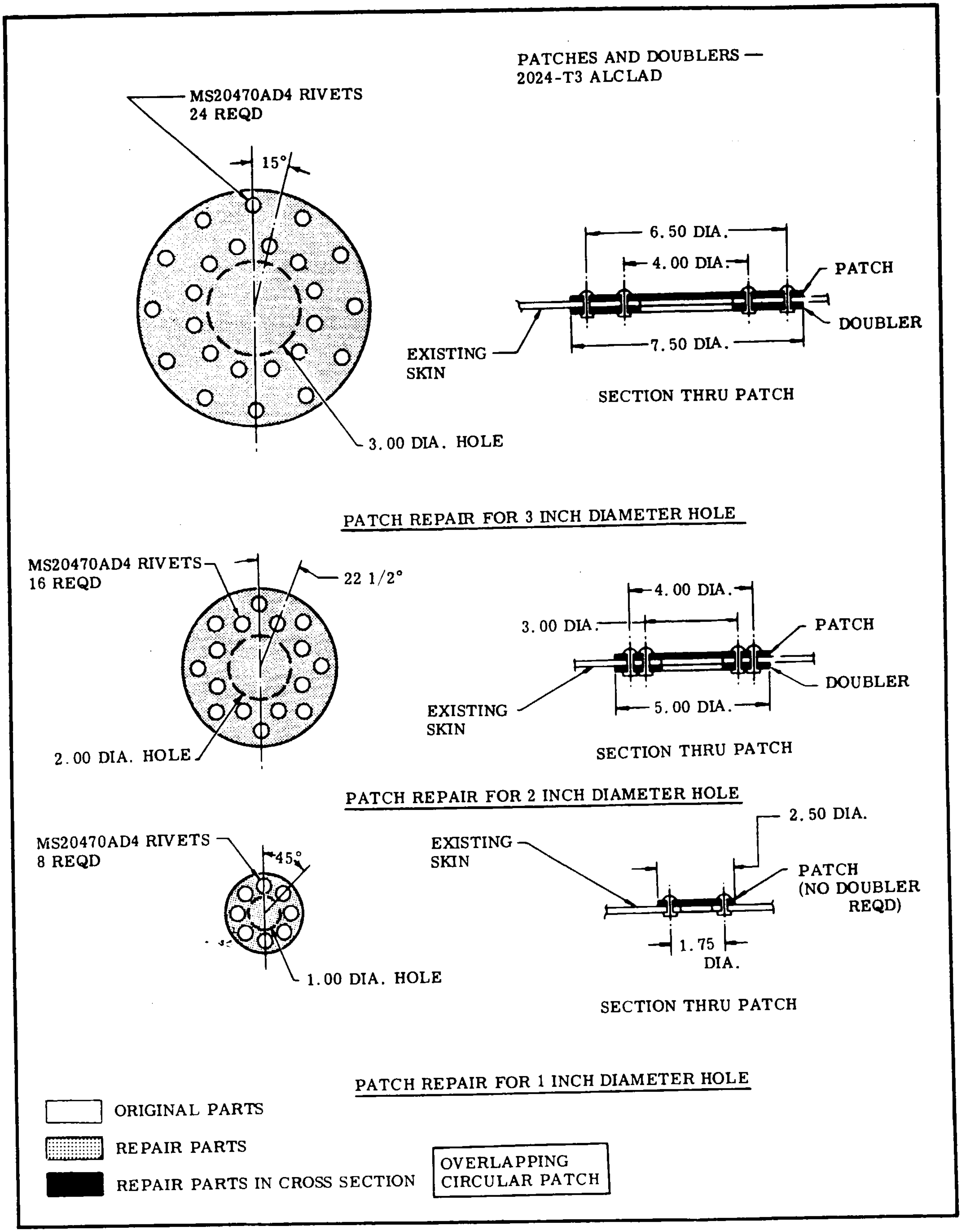
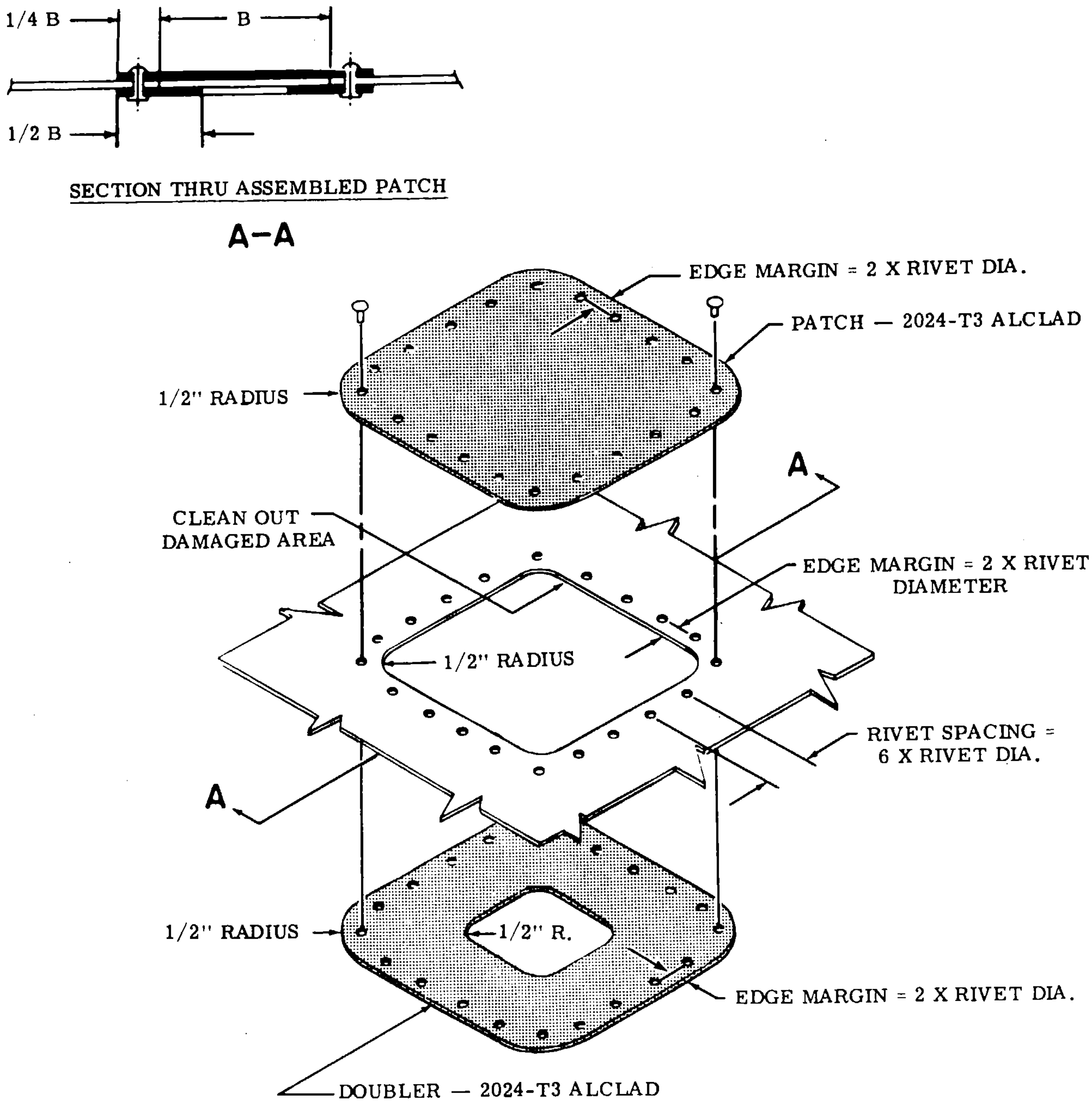


Figure 18-4. Skin Repair (Sheet 1 of 6)



ORIGINAL PARTS

REPAIR PARTS

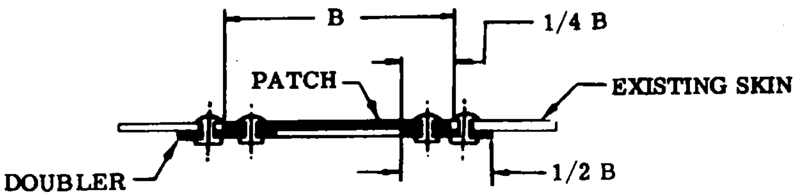
REPAIR PARTS IN CROSS SECTION

OVERLAPPING REC-TANGULAR PATCH

RIVET TABLE

SKIN GAGE	RIVET DIA.
.020	1/8
.025	1/8
.032	1/8
.040	1/8
.051	5/32

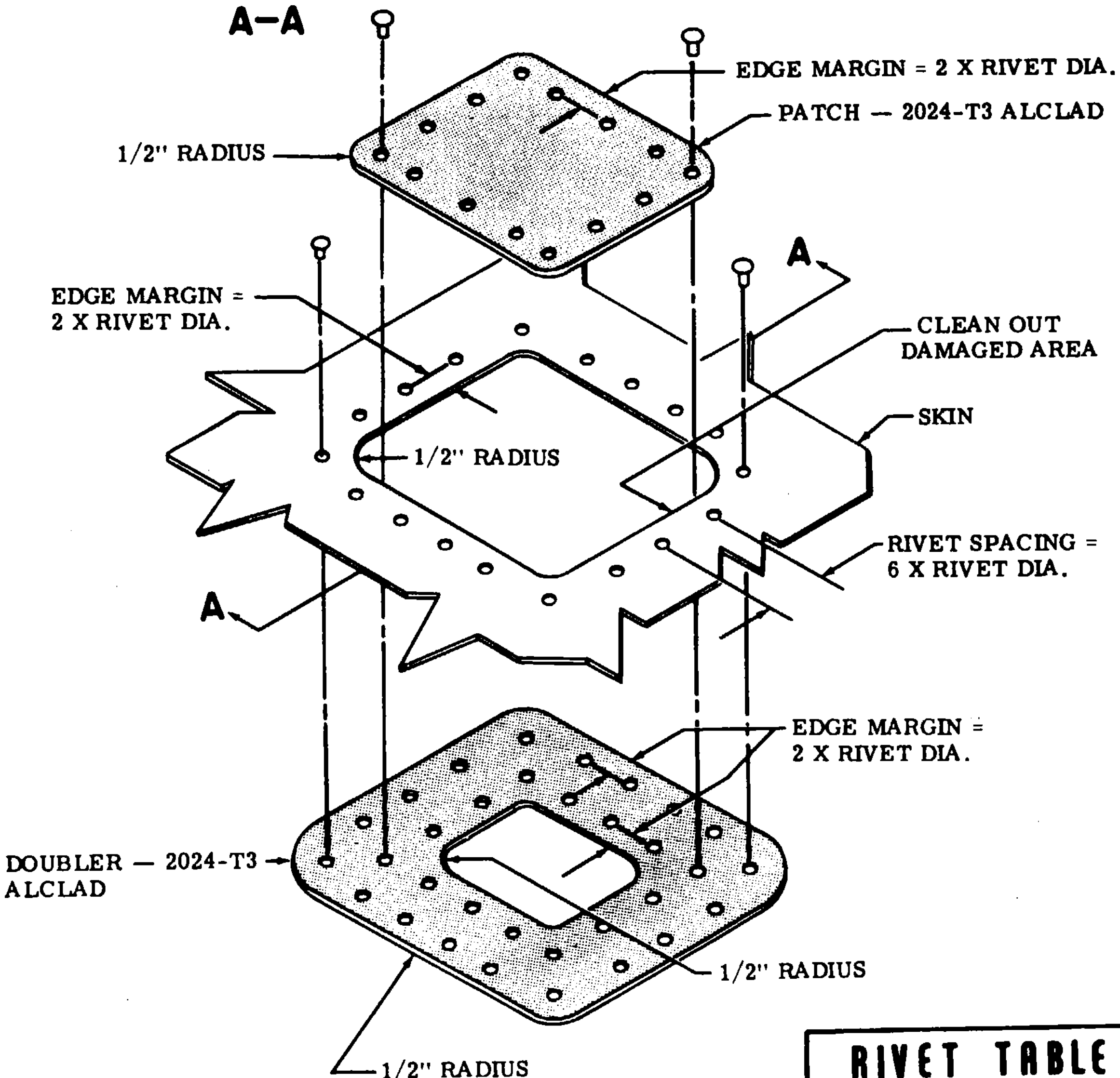
Figure 18-4. Skin Repair (Sheet 2 of 6)



SECTION THRU ASSEMBLED PATCH

NOTE

For optimum appearance and airflow, use flush rivets, dimpled skin and patch and countersunk doubler.



ORIGINAL PARTS

REPAIR PARTS

REPAIR PARTS IN CROSS SECTION

FLUSH RECTANGULAR PATCH (CIRCULAR FLUSH PATCH IS SIMILAR)

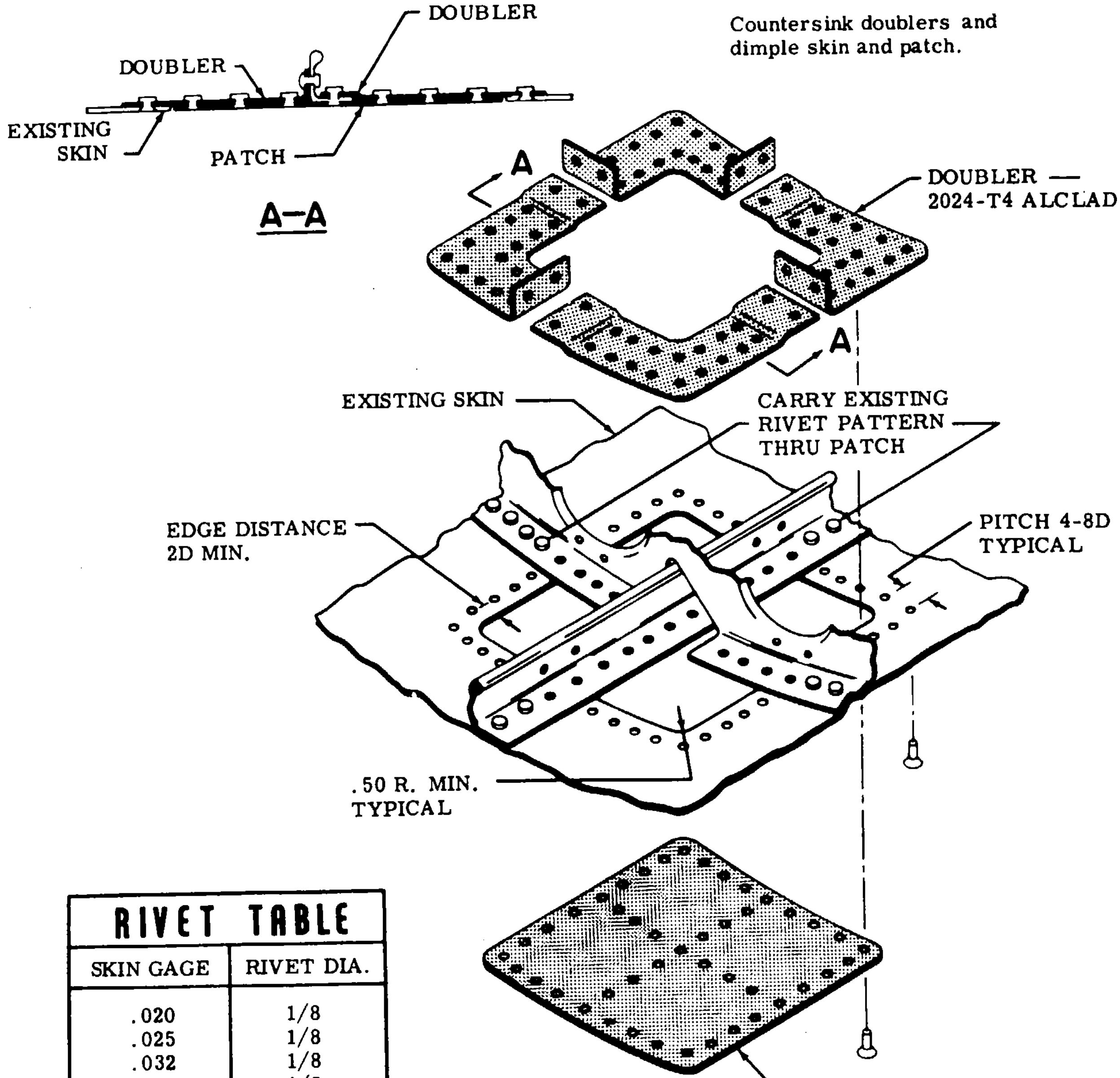
RIVET TABLE

SKIN GAGE	RIVET DIA.
.020	1/8
.025	1/8
.032	1/8
.040	1/8
.051	5/32

Figure 18-4. Skin Repair (Sheet 3 of 6)

NOTE

Countersink doublers and dimple skin and patch.



RIVET TABLE	
SKIN GAGE	RIVET DIA.
.020	1/8
.025	1/8
.032	1/8
.040	1/8
.051	5/32

FLUSH PATCH AT STRINGER/BULKHEAD INTERSECTION

ORIGINAL PARTS

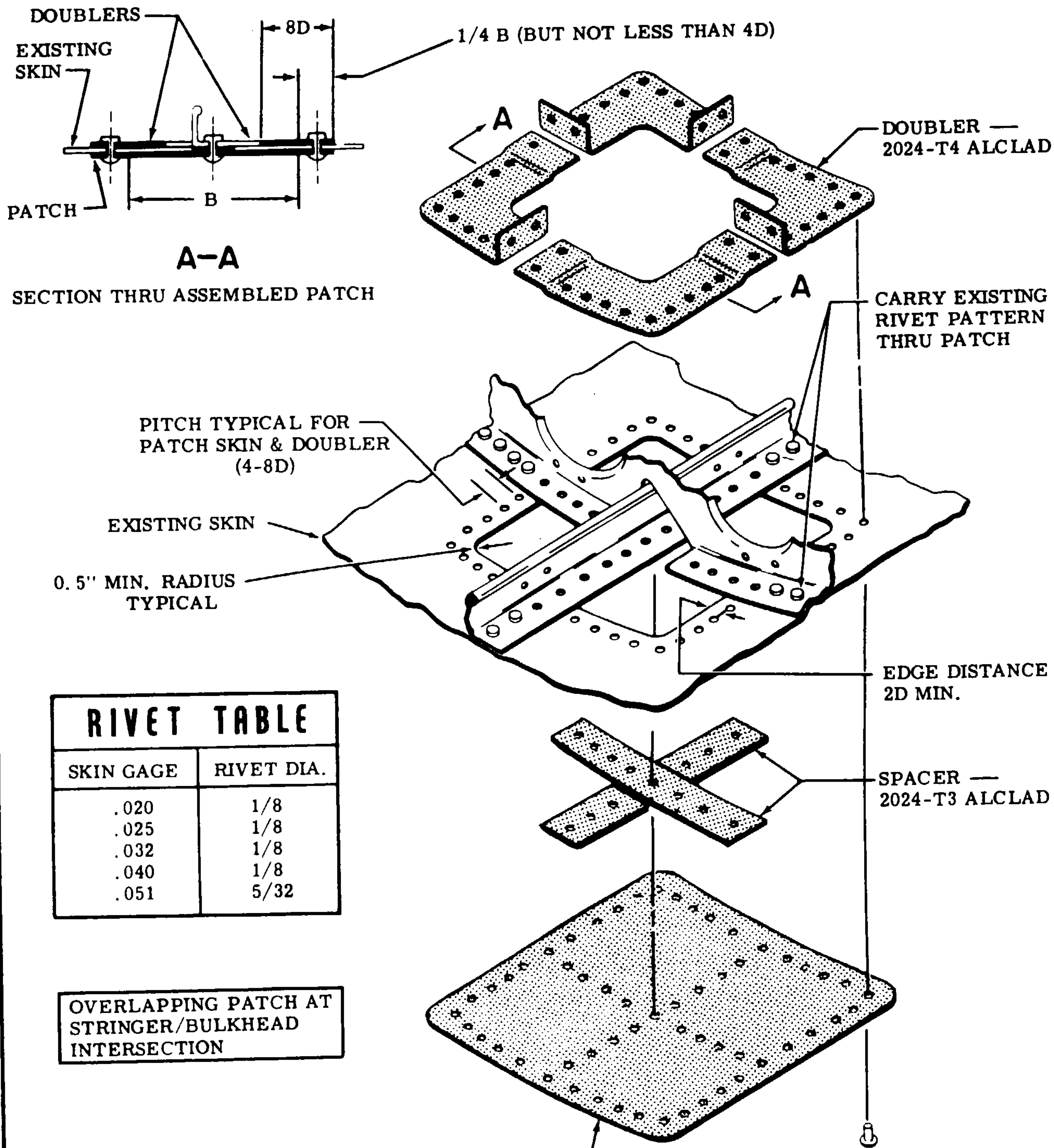
REPAIR PARTS

REPAIR PARTS IN CROSS SECTION

NOTE

This procedure is not recommended in areas where stringers are riveted to bulkheads.

Figure 18-4. Skin Repair (Sheet 4 of 6)



RIVET TABLE

SKIN GAGE	RIVET DIA.
.020	1/8
.025	1/8
.032	1/8
.040	1/8
.051	5/32

OVERLAPPING PATCH AT STRINGER/BULKHEAD INTERSECTION

ORIGINAL PARTS

REPAIR PARTS

REPAIR PARTS IN CROSS SECTION

Figure 18-4. Skin Repair (Sheet 5 of 6)

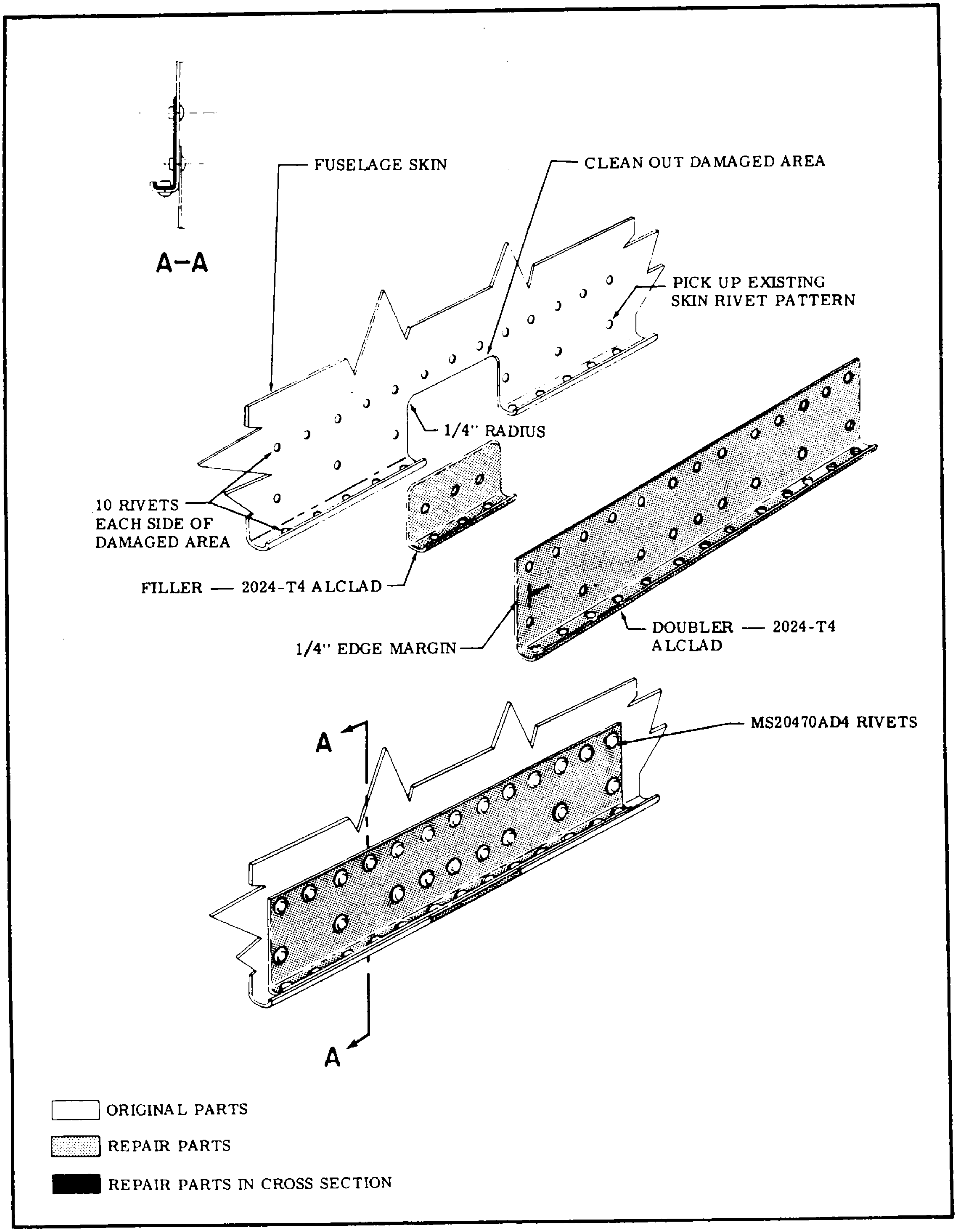


Figure 18-4. Skin Repair (Sheet 6 of 6)

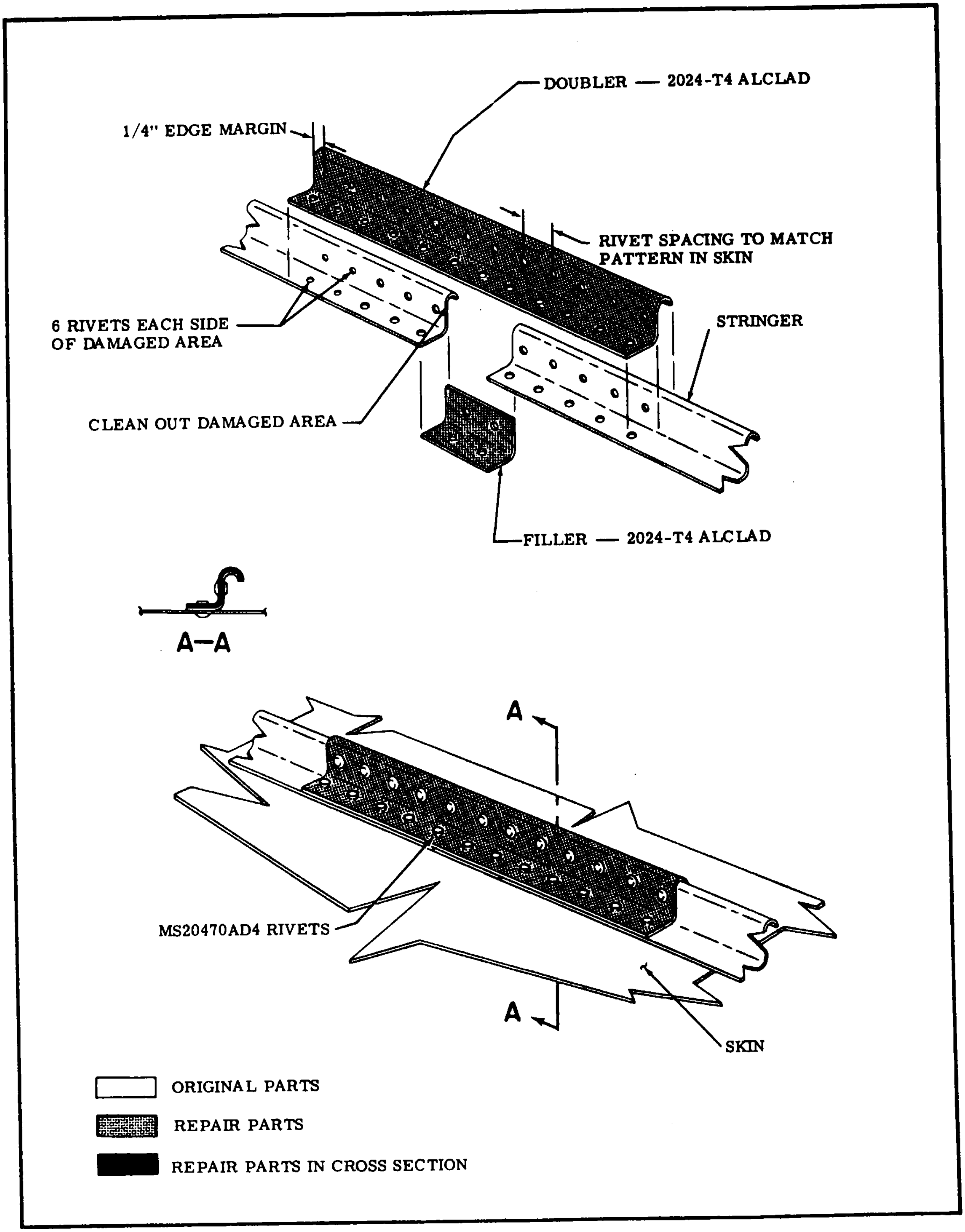


Figure 18-5. Stringer and Channel Repair (Sheet 1 of 4)

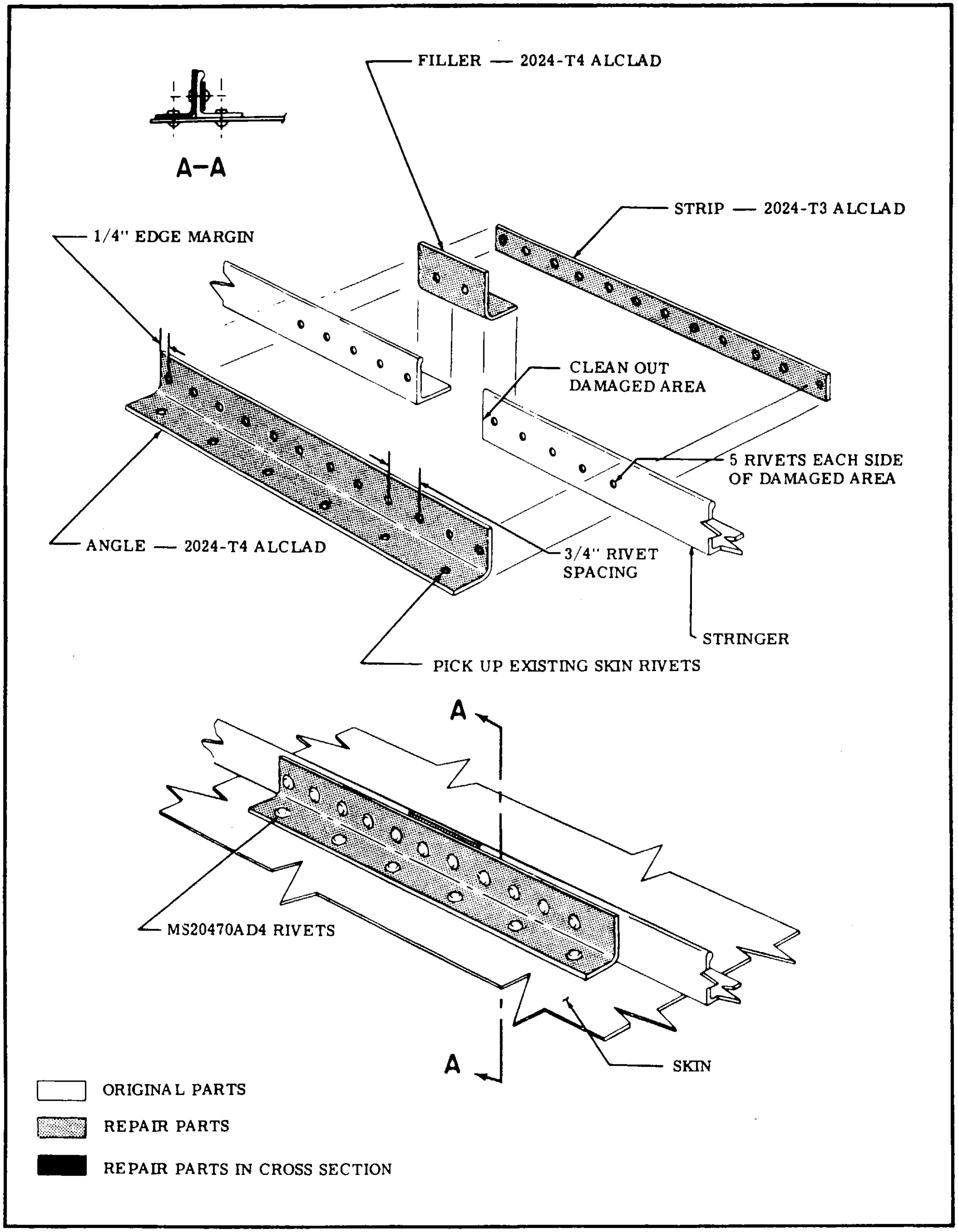


Figure 18-5. Stringer and Channel Repair (Sheet 2 of 4)

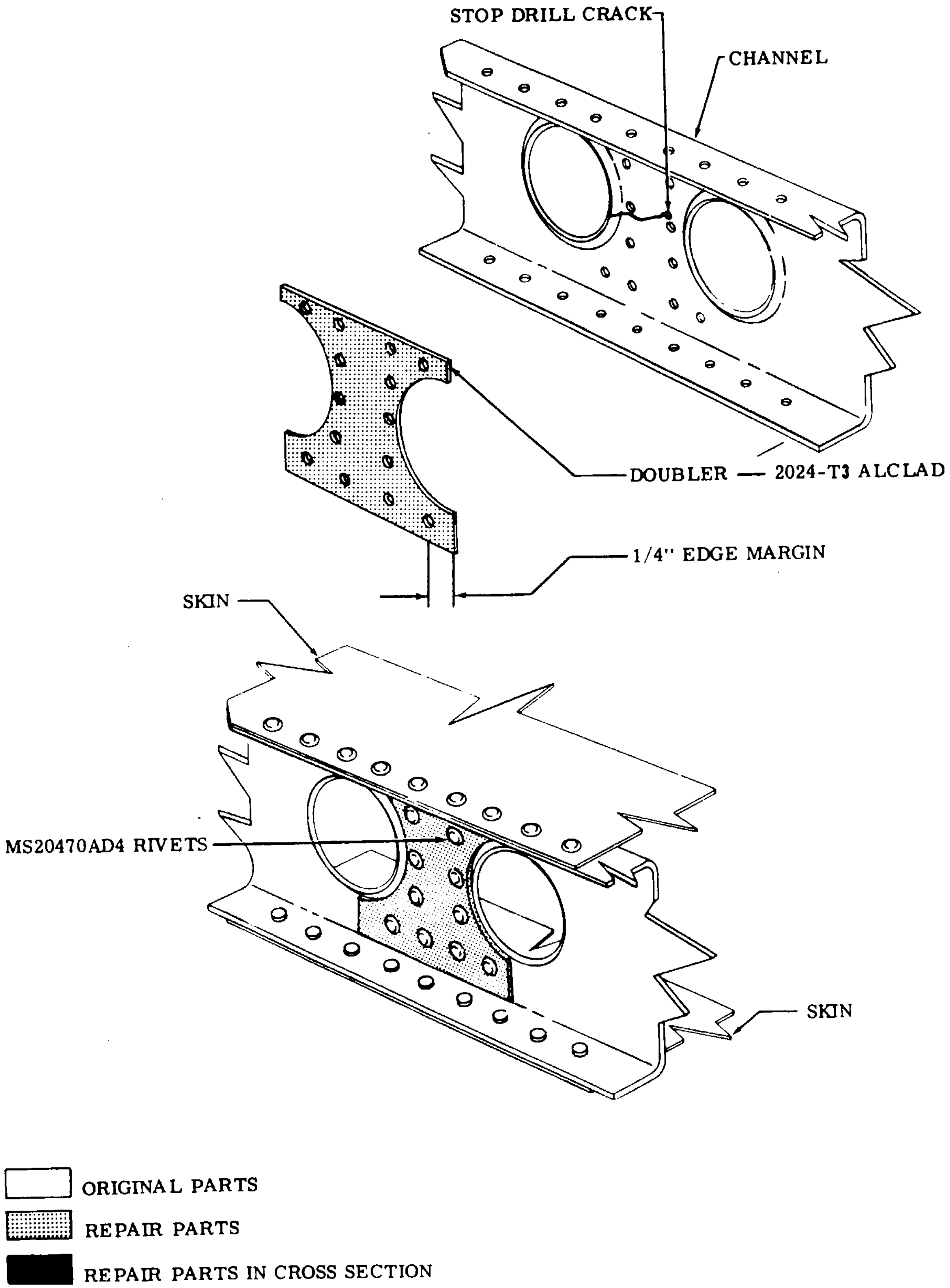


Figure 18-5. Stringer and Channel Repair (Sheet 3 of 4)

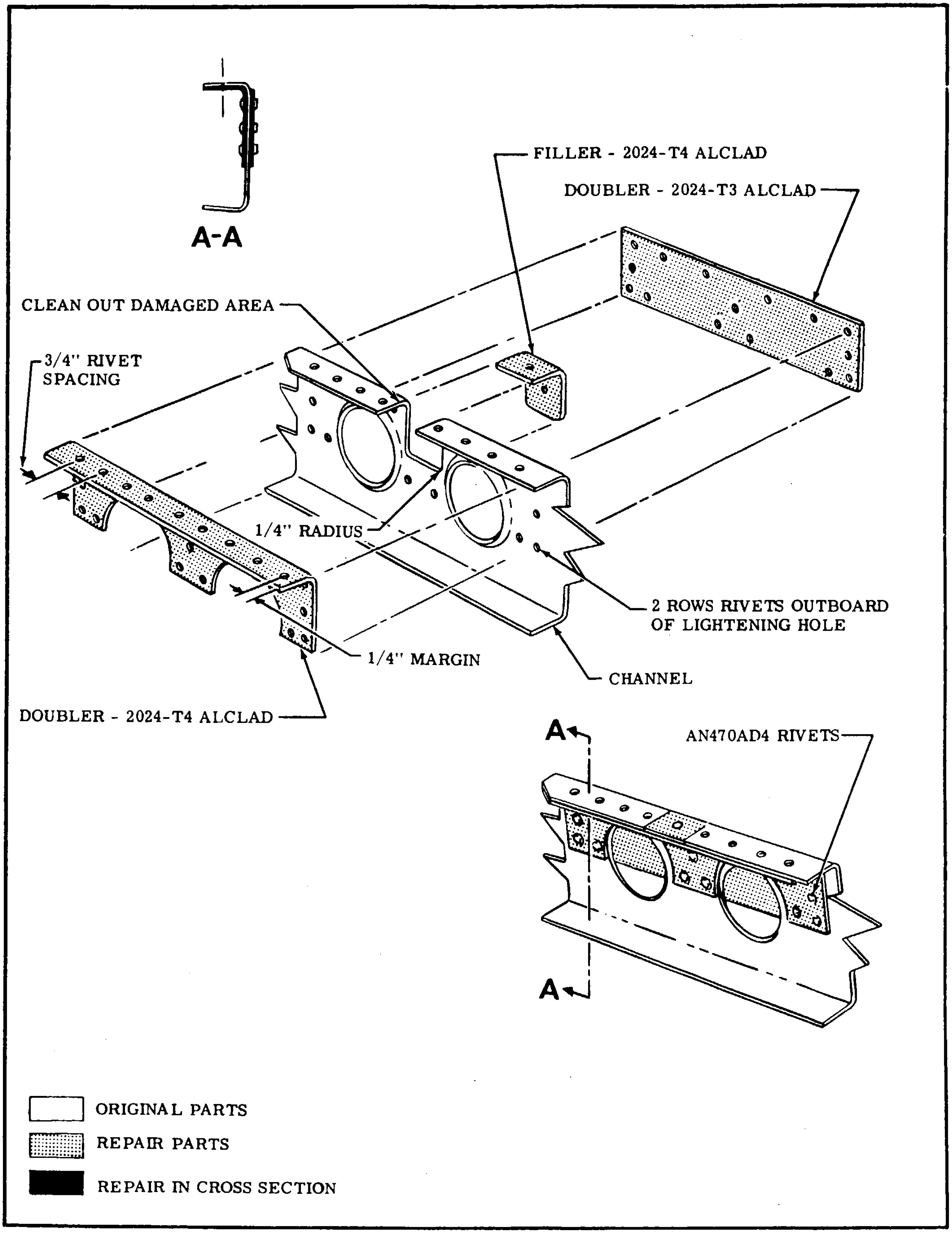


Figure 18-5. Stringer and Channel Repair (Sheet 4 of 4)

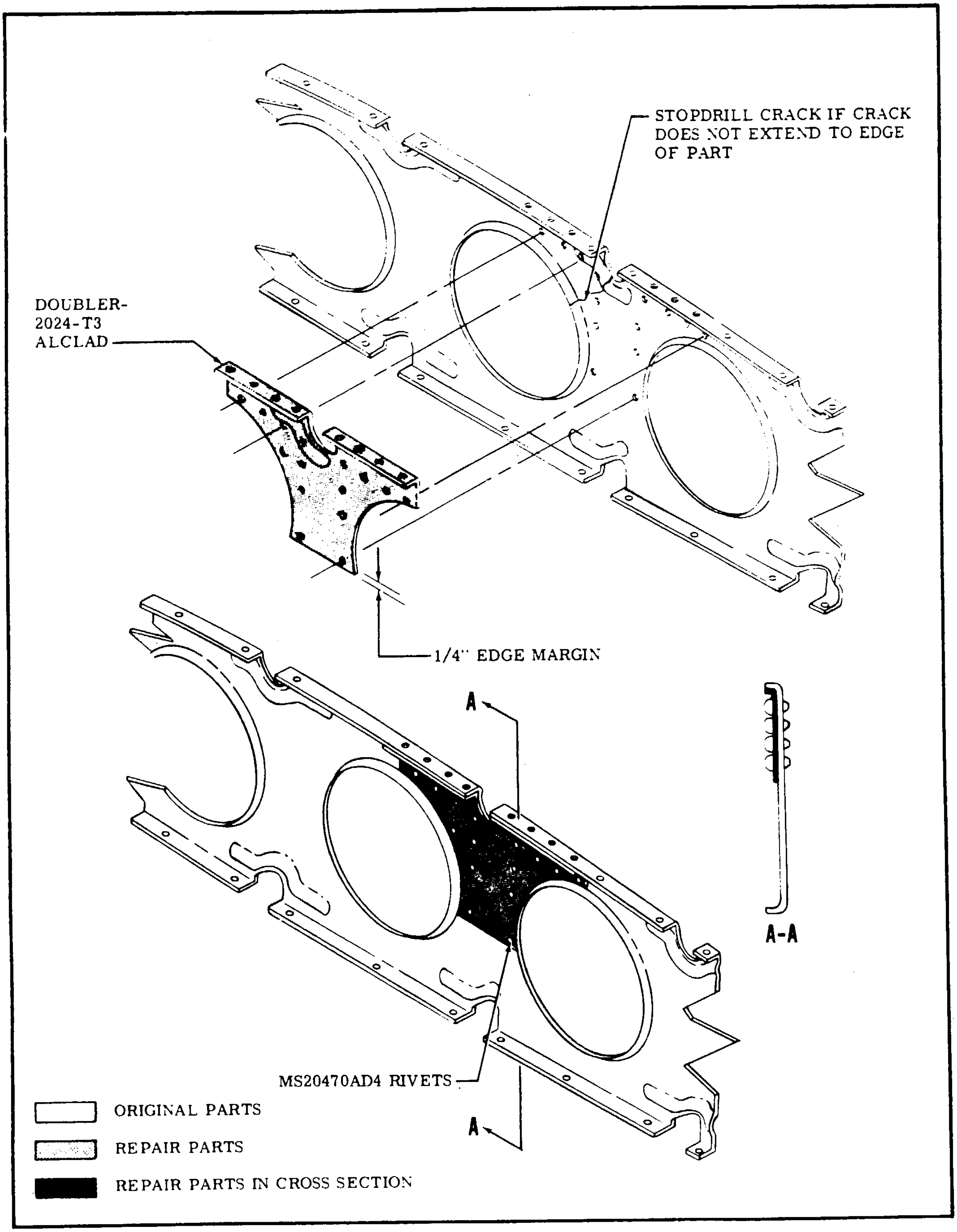


Figure 18-6. Rib Repair (Sheet 1 of 2)

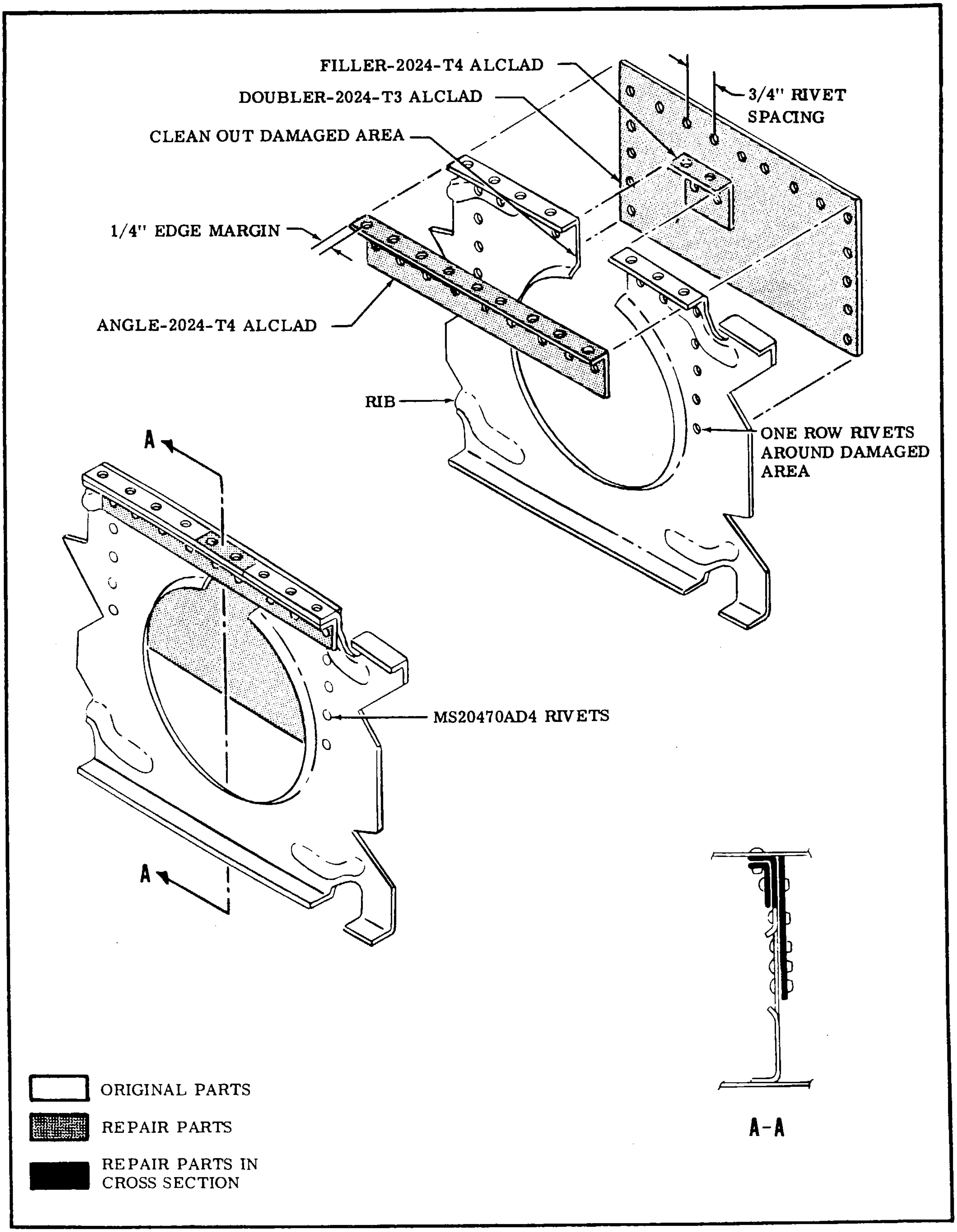
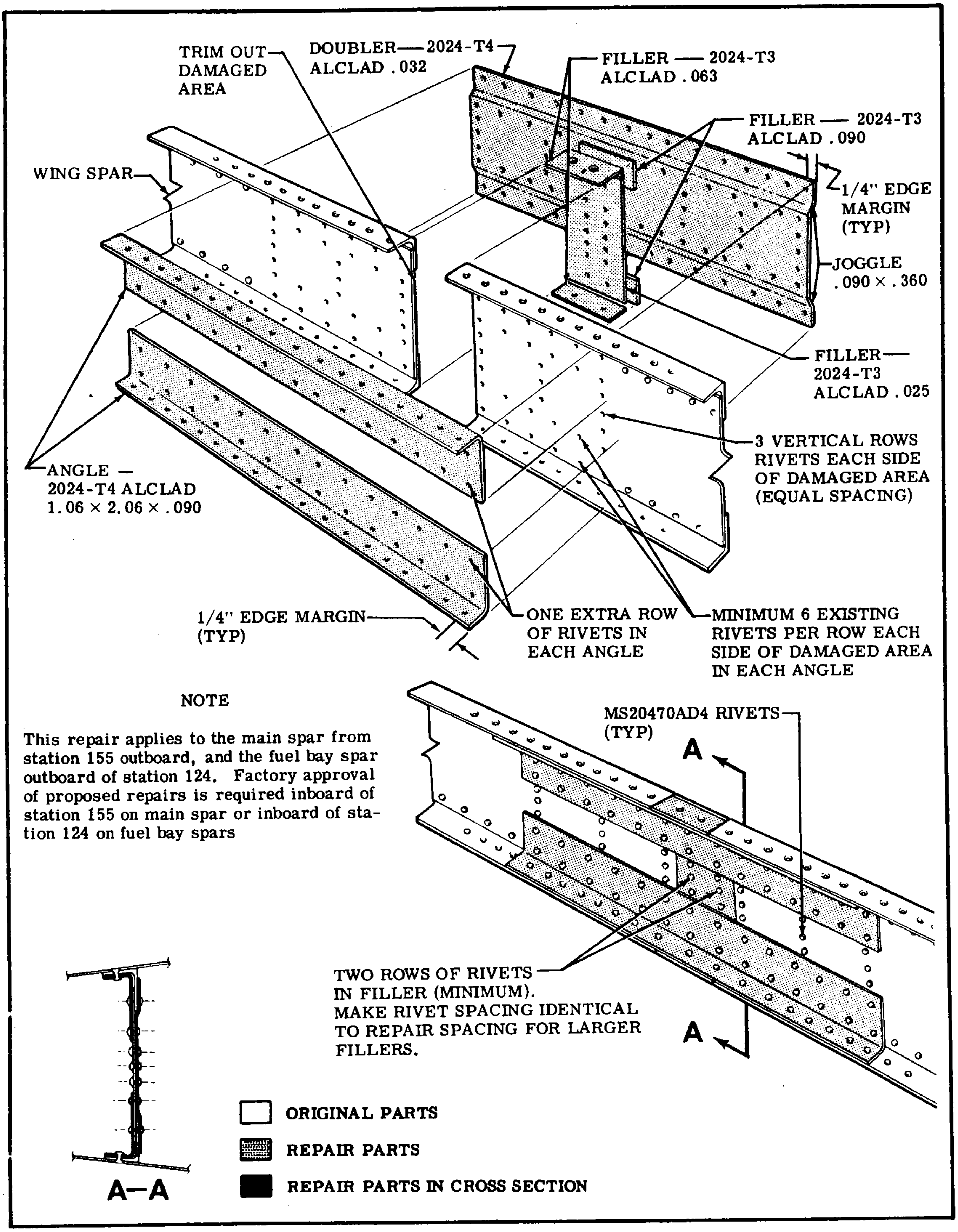


Figure 18-6. Rib Repair (Sheet 2 of 2)



NOTE

This repair applies to the main spar from station 155 outboard, and the fuel bay spar outboard of station 124. Factory approval of proposed repairs is required inboard of station 155 on main spar or inboard of station 124 on fuel bay spars

Figure 18-7. Wing Spar Repair

NOTES:

1. Dimple leading edge skin and filler material; countersink the doubler.
2. Use MS20426AD4 rivets to install doubler.
3. Use MS20426AD4 rivets to install filler, except where bucking is impossible. Use CR162-4 Cherry (blind) rivets where regular rivets cannot be bucked.
4. Contour must be maintained; after repair has been completed, use epoxy filler as necessary and sand smooth before painting.
5. On cantilever wing, vertical size is limited by ability to install doubler clear of front fuel spar or stringers outboard of spar. On flaps and ailerons, vertical size is limited by ability to install doubler clear of front spar. (Also refer to figure 18-9.)
6. Lateral size is limited to seven inches across trimmed out area.
7. Number of repairs is limited to one in each bay. On cantilever wings, consider a bay in the area forward of front fuel spar as if ribs extended to leading edge.

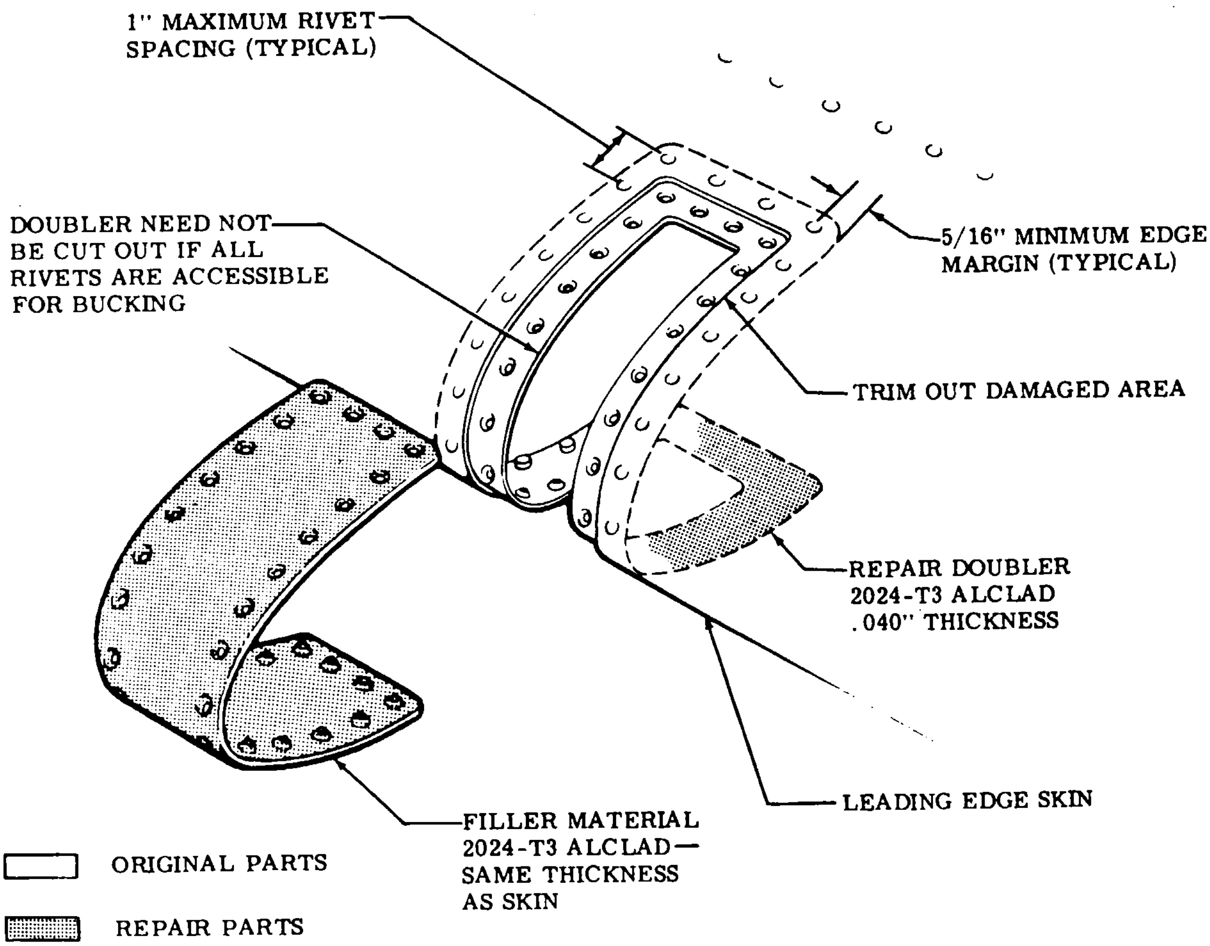


Figure 18-8. Leading Edge Repair

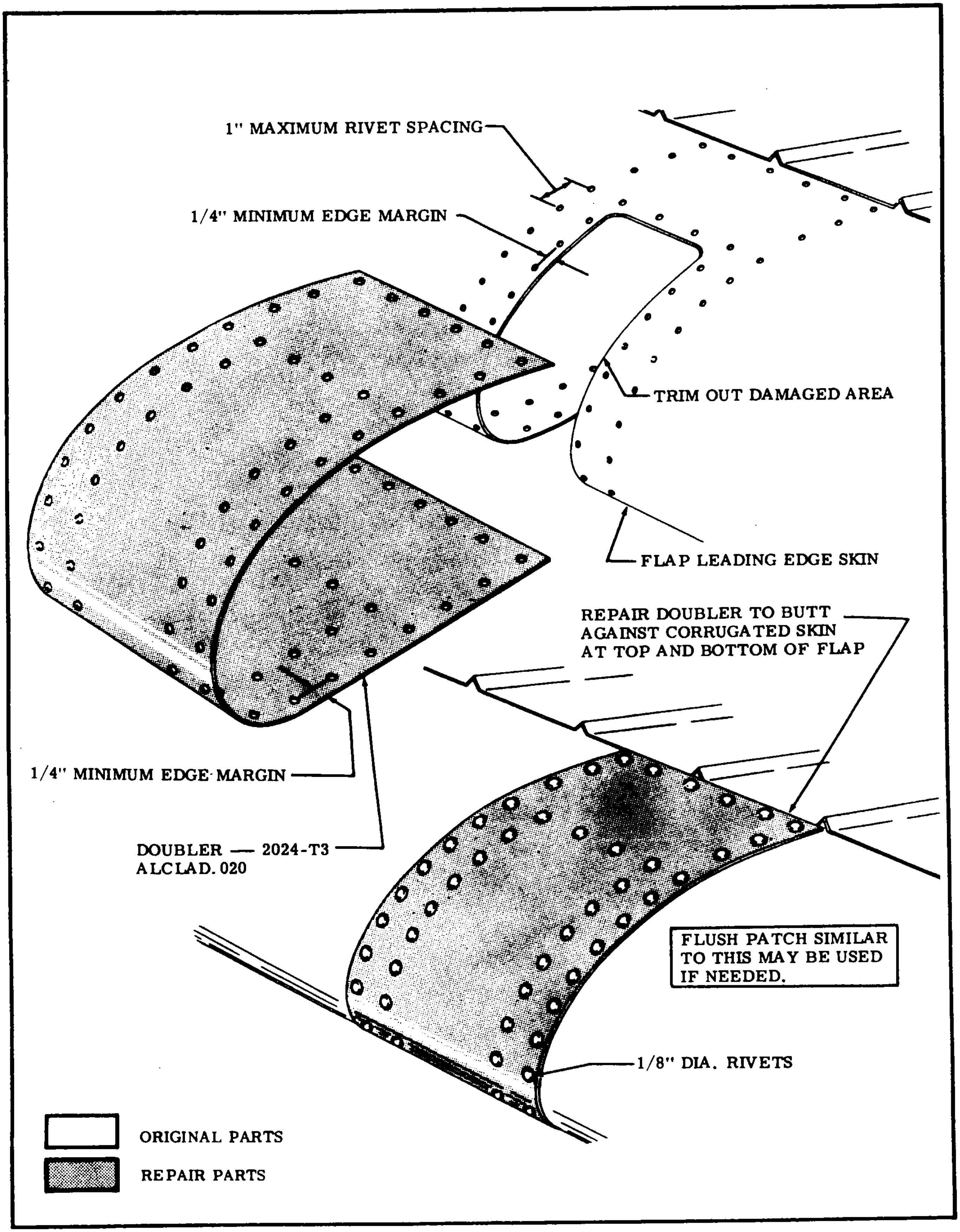
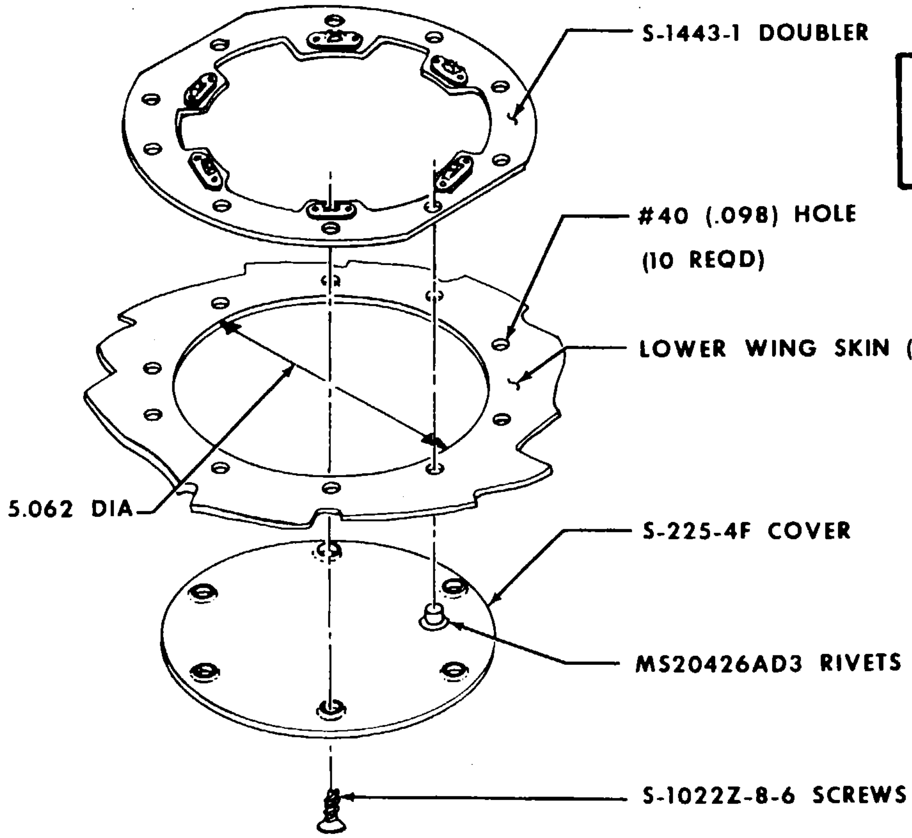


Figure 18-9. Flap Leading Edge Repair



VIEWED FROM INSIDE WING LOOKING DOWN AT TOP OF LOWER WING SKIN.

CAUTION

Do not install on cantilever wing without factory approval.

NOTE

PARTS ARE AVAILABLE FROM THE CESSNA SERVICE PARTS CENTER.

PRECAUTIONS

1. Add the minimum number of access holes necessary.
2. Any circular or rectangular access hole which is used with approved optional equipment installations may be added in lieu of the access hole illustrated.
3. Use landing light installations instead of adding access holes where possible. Do not add access holes at outboard end of wing; remove wing tip instead.
4. Do not add an access hole in the same bay where one is already located.
5. Locate new access holes near the center of a bay (spanwise).
6. Locate new access holes forward of the front spars as close to the front spar as practicable.
7. Locate new access holes aft of the front spar between the first and second stringers aft of the spar. When installing the doubler, rotate it so the two straight edges are closest to the stringers.
8. Alternate bays, with new access holes staggered forward and aft of the front spar, are preferable.
9. A maximum of five new access holes in each wing is permissible; if more are required, contact the Cessna Service Department.
10. When a complete leading edge skin is being replaced, the wing should be supported in such a manner so that wing alignment is maintained.

a. Establish exact location for inspection cover and inscribe centerlines.

b. Determine position of doubler on wing skin and center over centerlines. Mark the ten rivet hole locations and drill to size shown.

c. Cut out access hole, using dimension shown.

d. Flex doubler and insert through access hole and rivet in place.

e. Position cover and secure, using screws as shown.

Figure 18-10. Access Hole Installation

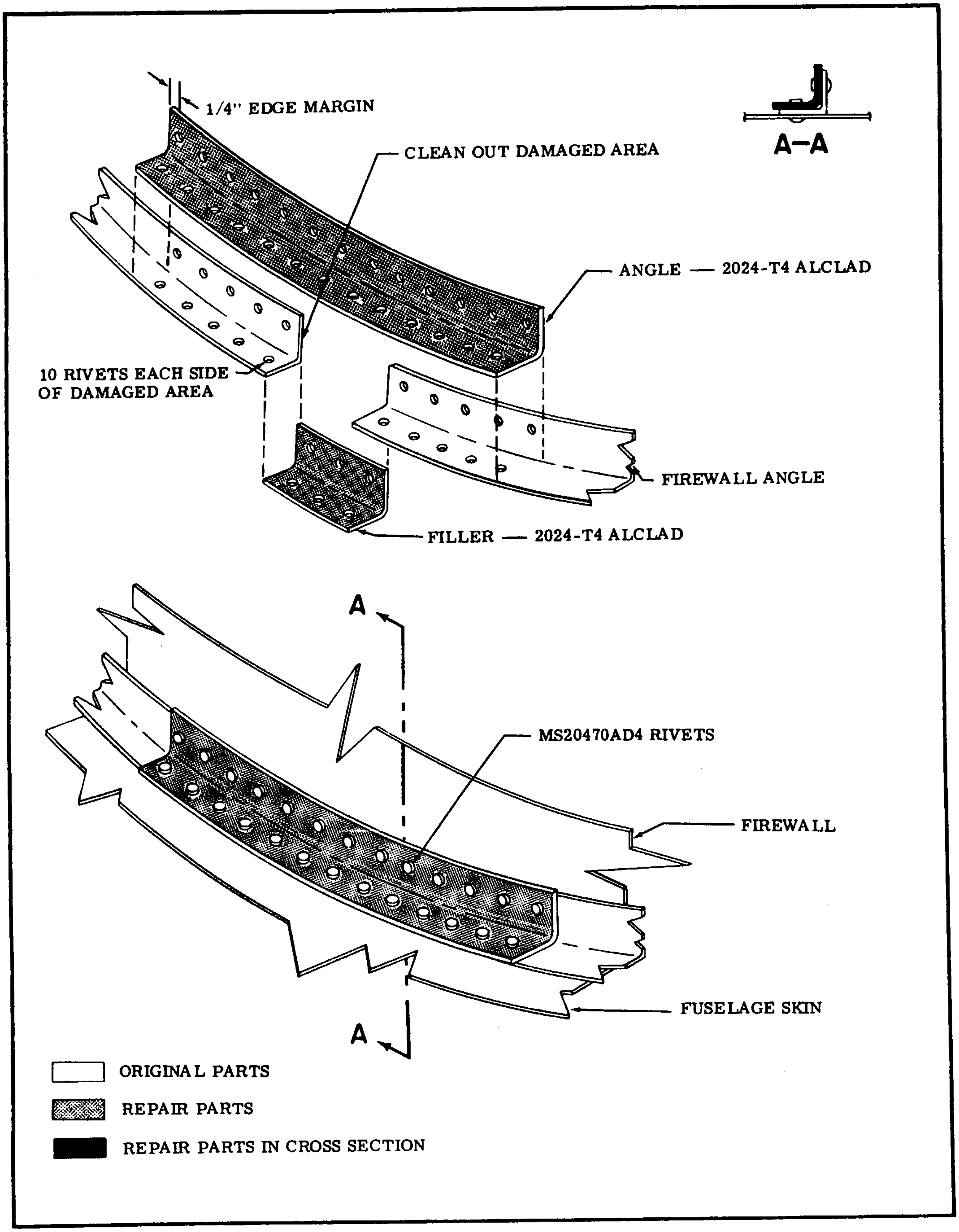


Figure 18-11. Firewall Angle Repair

SECTION 19

EXTERIOR PAINTING

NOTE

This section contains standard factory materials listing and area of application. For paint number and color, refer to Aircraft Trim Plate and Parts Catalog. In all cases determine the type of paint on the aircraft as some types of paint are not compatible. Materials may be obtained from the Cessna Service Parts Center.

MATERIAL	NO /TYPE	AREA OF APPLICATION
PAINT	ACRYLIC LACQUER	Used on exterior airframe.
PRIMER	ER-7 WITH ER-4 ACTIVATOR	Used with acrylic lacquer.
PRIMER	P60G2 WITH R7K44 ACTIVATOR	Used with acrylic lacquer.
THINNER	T-8402A	Used to thin acrylic lacquer and for burndown.
SOLVENT	#2 SOLVENT	Used to clean aircraft exterior prior to priming.

NOTE

Do not paint Pitot Tube, Gas Caps or Antenna covers which were not painted at the factory.

CAUTION

When stripping aircraft of paint, use caution to avoid stripper coming in contact with ABS parts.

19-1. INTERIOR PARTS (Finish Coat of Lacquer)

a. Painting of Spare Parts.

1. Ensure a clean surface by wiping with Naphtha to remove surface contamination.

CAUTION

Do not use strong solvents such as Xylol, Toluol or Lacquer Thinner since prolonged exposure can soften or embrittle ABS.

2. After the part is thoroughly dry it is ready for the lacquer topcoat. Paint must be thinned with lacquer thinner and applied as a wet coat to ensure adhesion.

b. Touch Up of Previously Painted Parts.

1. Light sanding is acceptable to remove scratches and repair the surface but care must be exercised to maintain the surface texture or grain.

2. Ensure a clean surface by wiping with Naphtha to remove surface contamination.

CAUTION

Do not use strong solvents such as Xylol, Toluol or Lacquer Thinner since prolonged exposure can soften or embrittle ABS.

3. After the part is thoroughly dry it is ready for the lacquer topcoat. Paint must be thinned with lacquer thinner and applied as a wet coat to ensure adhesion.

NOTE

Lacquer paints can be successfully spotted in.

19-2.

a. Painting of Spare Parts.

1. Lightly scuff sand to remove scratches and improve adhesion.

2. Ensure a clean surface by wiping with Naphtha to remove surface contamination.

CAUTION

Do not use strong solvents such as Xylol, Toluol or Lacquer Thinner since prolonged exposure can soften or embrittle ABS.

3. After the part is thoroughly dry it is ready for the topcoat. Paint must be thinned with appropriate acrylic thinner and applied as a wet coat to ensure adhesion.

b. Touch Up of Previously Painted Parts.

1. Lightly scuff sand to remove scratches and improve adhesion.

2. Ensure a clean surface by wiping with Naphtha to remove surface contamination.

CAUTION

Do not use strong solvents such as Xylol, Toluol or Lacquer Thinner since prolonged exposure can soften or embrittle ABS.

3. Apply a compatible primer - surfacer and sealer.

4. After the part is thoroughly dry it is ready for the topcoat. Paint must be thinned and applied as a wet coat to ensure adhesion.

NOTE

Acrylic topcoats can be successfully spotted in.

19-3. EXTERIOR PARTS (Epoxy or Polyurethane Topcoat)

a. Painting of Spare Parts and Touch Up of Painted Parts.

1. Lightly scuff sand to remove scratches and improve adhesion.

2. Ensure a clean surface by wiping with Naphtha to remove surface contamination.

CAUTION

Do not use strong solvents such as Xylol, Toluol or Lacquer Thinner since pro exposure can soften or embrittle ABS.

3. Apply a primer compatible with Epoxy or Polyurethane topcoat.

4. After the part is thoroughly dry it is ready for the topcoat.

NOTE

Epoxy or Polyurethane topcoats cannot be successfully spotted in - finish should be applied in areas with natural breaks such as skin laps or stripe lines.

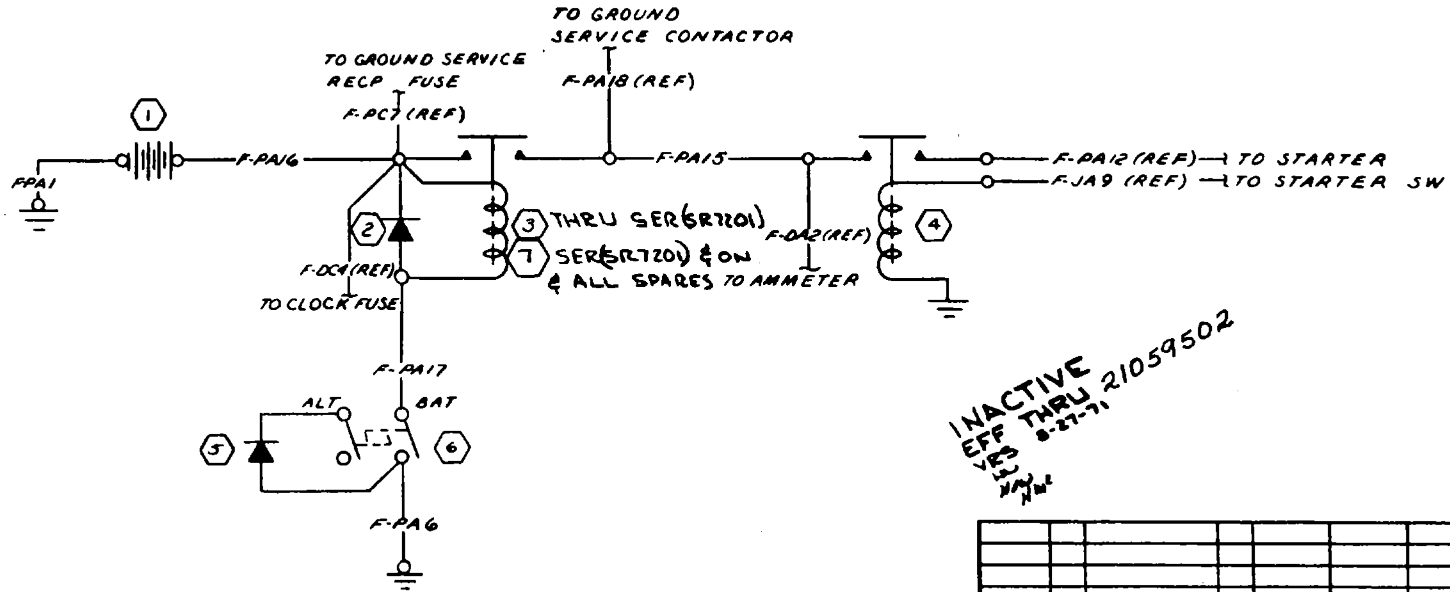
When painting interior and exterior polycarbonate parts, or where the part material is questionable, a "barrier primer" should be applied prior to the Enamel, Lacquer, Epoxy or Polyurethane topcoat.

SECTION 20
WIRING DIAGRAMS (12-VOLT)

TABLE OF CONTENTS — Page

24 - VOLT

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: SER OUT S-1579-1 & ADD S-1579-2 (SR7201)	BPH 8-26-72	LKW NEW MTE JMM BPH



INACTIVE EFF THRU 21059502 8-27-71 VES NEW NWC

F-PA17	18			S-1367-1-6	S-1493-1		
F-PA16	2			S-1367-7-13	S-1367-7-13		
F-PA15	2			S-1367-7-14	S-1606-1		
F-PA6	18			S-1493-1	S-1367-1-8		
F-PA1	2			S-1367-7-12	S-1367-7-13		
WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS

WIRE TABLE

ITEM NO.	PART NO.	DESCRIPTION	
7	S-1579-2	CONTACTOR	
6	S-1994-1-1	MASTER SWITCH	
5	0770719-2	DIODE ASSY	
4	S-1991-1-1	STARTER CONTACTOR	
3	S-1579-1	BAT CONTACTOR	
2	0770728-1	DIODE ASSY	
1	0712605-1	BATTERY	

EQUIPMENT TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES: 12210-864

SUPERSEDED BY: 1270709

CONTRACT NO:

	NAME	DATE
DESIGN	PLUMMER	
GROUP	H. Wise	7-19-69
DRAWN	J.R. CONLEY	7-11-69
CHECK	R YOUNGERS	7-12-69
STRESS	R.F. GEIDE	7-17-69
PROJ	W. McCaitr	7-23-69
APPD	McAfoney	7-5-69
OTHER		

Cessna AIRCRAFT CO. COMMERCIAL AIRCRAFT DIV. 5800 E. PAWNEE WICHITA, KANSAS

TITLE
WIRING DIAGRAM — BATTERY CIRCUIT

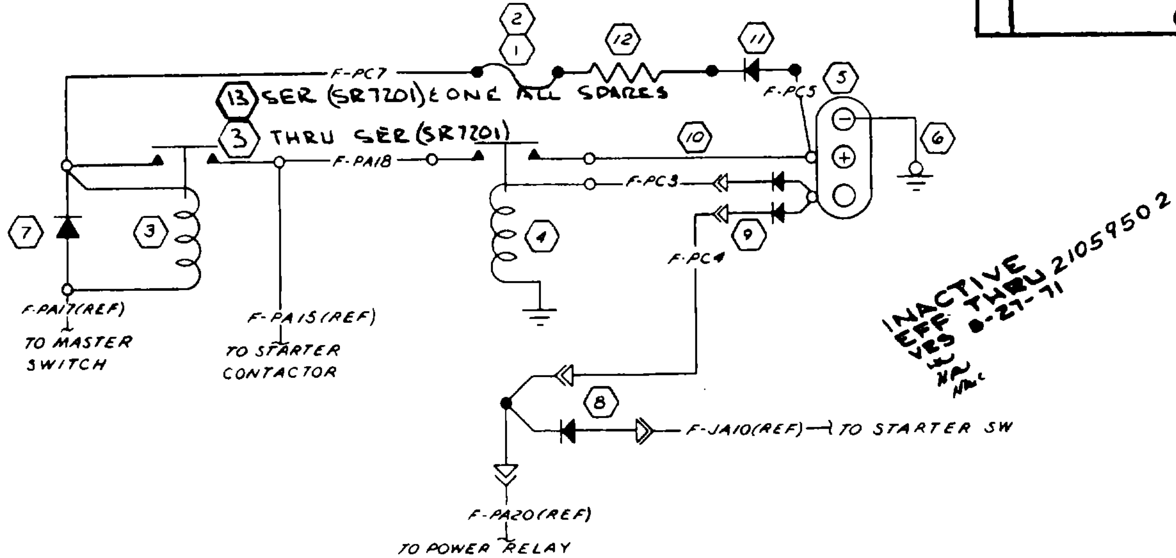
SIZE	CODE IDENT. NO.	DWG NO
C	71379	1270701

SCALE: NONE | 210 | PAGE: 1.1

FORM NO. 80-2159

(SR6031) II

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: SER OUT S-1579-1 & ADD S-1579-2 (SR7201)	BPH 2-26-72	WW WW PAH PAH



ITEM NO	PART NO.	DESCRIPTION	VENDOR
13	S-1579-2	CONTACTOR	
12	X26263	RESISTOR .75Ω	(94310)
11	20H3P	DIODE	(81970)
10	1270653-1	BUS BAR	
9	1570043-3	DIODE ASSY	
8	1570043-1	DIODE ASSY	
7	0770728-1	DIODE ASSY	
6	0312155-10	GROUND STRAP	
5	AN2552-3A	RECEPTACLE	
4	S-1660-1	CONTACTOR	
3	S-1579-1	BAT CONTACTOR	
2	S-1090-2	FUSEHOLDER	
1	S-1091-5	FUSE	

EQUIPMENT TABLE

WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS
F-PC7	18			SOLDER	S-1367-15		
F-PC5	18			S-1367-14	SOLDER		
F-PC4	18			S-1493-1	S-1493-1		
F-PC3	18			S-1367-1-10	S-1493-1		
F-PA18	2			S-1367-7-14	S-1367-7-C		

WIRE TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA STD. NO

SUPERSEDES: 12210-864

SUPERSEDED BY: 1270709

CONTRACT NO:

	NAME	DATE
DESIGN	PLUMMER	
GROUP	H Wine	7-19-69
DRAWN	J R CONLEY	7-11-69
CHECK	R. YOUNGERS	7-12-69
STRESS	R.F.G.E.D.	
PROJ		7-23-69
APPD		7-15-69
OTHER		

Cessna AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

TITLE
WIRING DIAGRAM — GROUND SERVICE RECEPTACLE (OPT)

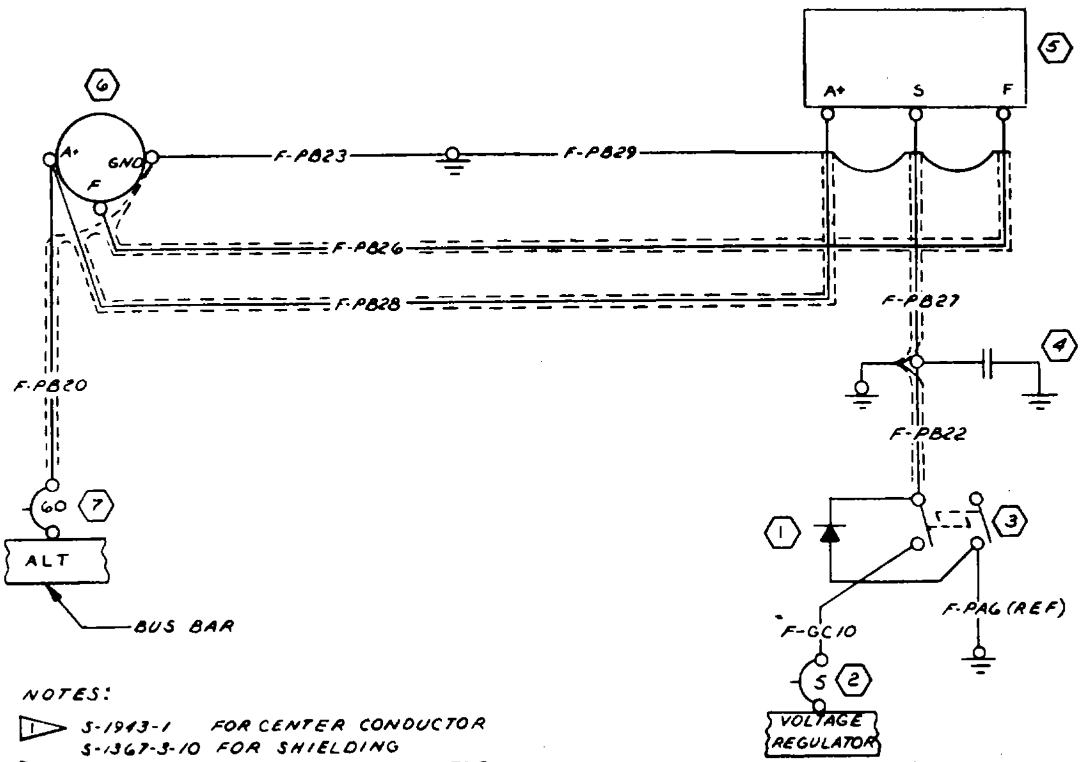
SIZE C | CODE IDENT NO. 71379 | DWG NO 1270701

SCALE: NONE | 210 | PAGE: 4.2

(SR 6031) IX

FORM NO. 80-2158

REVISION			
LET	DESCRIPTION	DATE	APPD



INACTIVE EFF THRU 21059502 VES 8-27-71

NOTES:

1. S-1943-1 FOR CENTER CONDUCTOR
   S-1367-3-10 FOR SHIELDING
2. S-1367-1-6 FOR CENTER CONDUCTOR
   S-1367-2-8 FOR SHIELDING
3. S-1367-1-10 FOR CENTER CONDUCTOR
   S-1367-2-10 FOR SHIELDING
4. AMP TERMINAL 42281-2 ON CONDUCTOR AMP TERMINAL 2-323931-2 ON SHIELD & GROUND WIRE
5. S-1367-1-12 FOR CENTER CONDUCTOR
   S-1367-2-8 FOR SHIELDING

WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS
F-PB29	18			S-1367-2-12	4		
F-PB28	18S			5	4		
F-PB27	18S			2	4		
F-PB26	18S			3	4		
F-PB25	10			S-1367-3-10	S-1367-3-12		
F-PB22	18S			S-1493-1	2		
F-PB20	8S	S-1534-8-9		1	S-1367-4-10		
F-GC10	18			S-1367-1-6	S-1493-1		

WIRE TABLE

ITEM NO.	PART NO.	DESCRIPTION
7	S-1596-60	CIRCUIT BKR
6	C611501-0101	ALTERNATOR ASSY
5	C611001-0101	REGULATOR
4	0770038-2	FILTER
3	S-1994-1-1	MASTER SWITCH
2	S-1360-5	CIRCUIT BKR
1	0770719-2	DIODE ASSY

EQUIPMENT TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES: 12210-864

SUPERSEDED BY: 1270709

CONTRACT NO:

	NAME	DATE
DESIGN	PLUMMER	
GROUP	H. Wine	7-19-69
DRAWN	J.R CONLEY	7-11-69
CHECK	R. YOUNGERS	7-12-69
STRESS	R.F. GEIDE	7-17-69
PROJ	[illegible]	7-23-69
APPD	[illegible]	7-15-69
OTHER		

Cessna AIRCRAFT CO. COMMERCIAL AIRCRAFT DIV. 5800 E. PAWNEE WICHITA, KANSAS

TITLE

WIRING DIAGRAM — ALTERNATOR SYSTEM

SIZE	CODE IDENT. NO.	DWG NO
C	71379	1270701

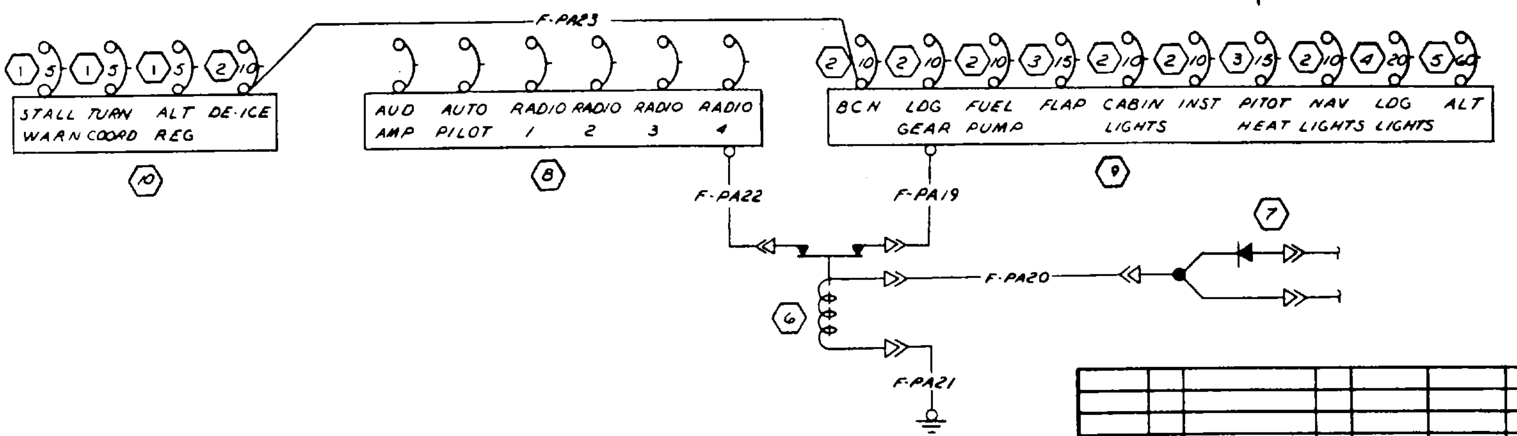
SCALE: NONE | 210 | PAGE: 4.3

(SR6031) II

FORM NO 60-215B

REVISION			
LET	DESCRIPTION	DATE	APPD

INACTIVE
EFF THEW 21059502
YRS 8-27-71



10	1270704-3	BUS BAR-PRIMARY 2	
9	1270704-2	BUS BAR-PRIMARY 1	
8	1270704-1	BUS BAR-ELECTRONIC	
7	1570043-1	DIODE ASSY	
6	S-1668-1	RELAY-POWER	
5	S-1596-60	CIRCUIT BREAKER	
4	S-1360-20	CIRCUIT BREAKER	
3	S-1360-15	CIRCUIT BREAKER	
2	S-1360-10	CIRCUIT BREAKER	
1	S-1360-5	CIRCUIT BREAKER	
ITEM NO.	PART NO.	DESCRIPTION	

EQUIPMENT TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES: 12210-864

SUPERSEDED BY: 1270709

WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS
F-PA23	14			S-1367-2-6	S-1367-2-6		
F-PA22	14			S-1493-2	S-1367-2-6		
F-PA21	18			S-1493-1	S-1367-1-8		
F-PA20	18			S-1493-1	S-1493-1		
F-PA19	14			S-1493-2	S-1367-2-6		

WIRE TABLE

CONTRACT NO:

	NAME	DATE
DESIGN	PLUMMER	
GROUP	H. Wine	7-19-69
DRAWN	JR CONLEY	7-11-69
CHECK	R. YOUNGERS	7-15-69
STRESS	K.F. GEIDE	7-17-69
PROJ	[illegible] Carter	7-23-69
APPD	[illegible]	7-25-69
OTHER		

Cessna AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

TITLE
WIRING DIAGRAM — CIRCUIT BREAKERS

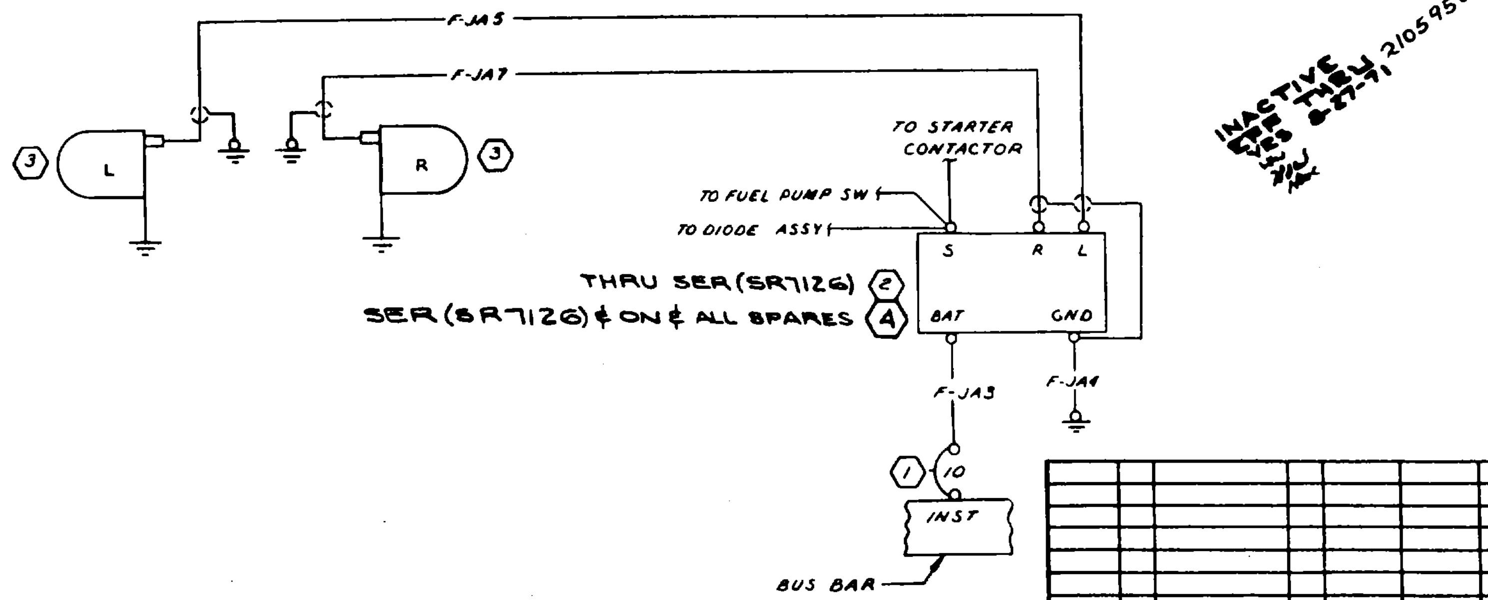
SIZE: C | CODE IDENT. NO. 71379 | DWG NO 1270701

SCALE: NONE | 210 | PAGE: 4.4

(SR6031) IX

FORM NO 80 215B

LET	DESCRIPTION	DATE	APPD
A	BY REV: C292501-0105 SUPERSEDES C292501-0101 FOR ALL SPARES (SR7126)	RLY 2-29-72	



NOTES:

1. S-1367-1-6 FOR CENTER CONDUCTOR
   S-1367-2-6 FOR SHIELDING
2. S-1367-1-10 FOR CENTER CONDUCTOR
   S-1367-3-10 FOR SHIELDING

WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS
F-JA7	18S			1	2		
F-JA5	18S			1	2		
F-JA4	18			S-1367-1-8	S-1367-1-6		
F-JA3	18			S-1367-1-6	S-1367-1-8		

WIRE TABLE

ITEM NO.	PART NO.	DESCRIPTION	VENDOR
4	C292501-0105	SWITCH	
3	SLICK #662	MAGNETO	(09033)
2	C292501-0101	SWITCH	
1	S-1360-10	CIRCUIT BREAKER	

EQUIPMENT TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES: 12210-8GA

SUPERSEDED BY: 1270709

CONTRACT NO:

	NAME	DATE
DESIGN	PLUMMER	
GROUP	H Wine	7-19-69
DRAWN	J A CONLEY	7-11-69
CHECK	R. YOUNGERS	7-12-69
STRESS	R.F.GEIDT	7-17-69
PROJ	N. McCarty	7-23-69
APPD	M Ldway	7-25-69
OTHER		

Cessna AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

TITLE: WIRING DIAGRAM — MAGNETO SYSTEM

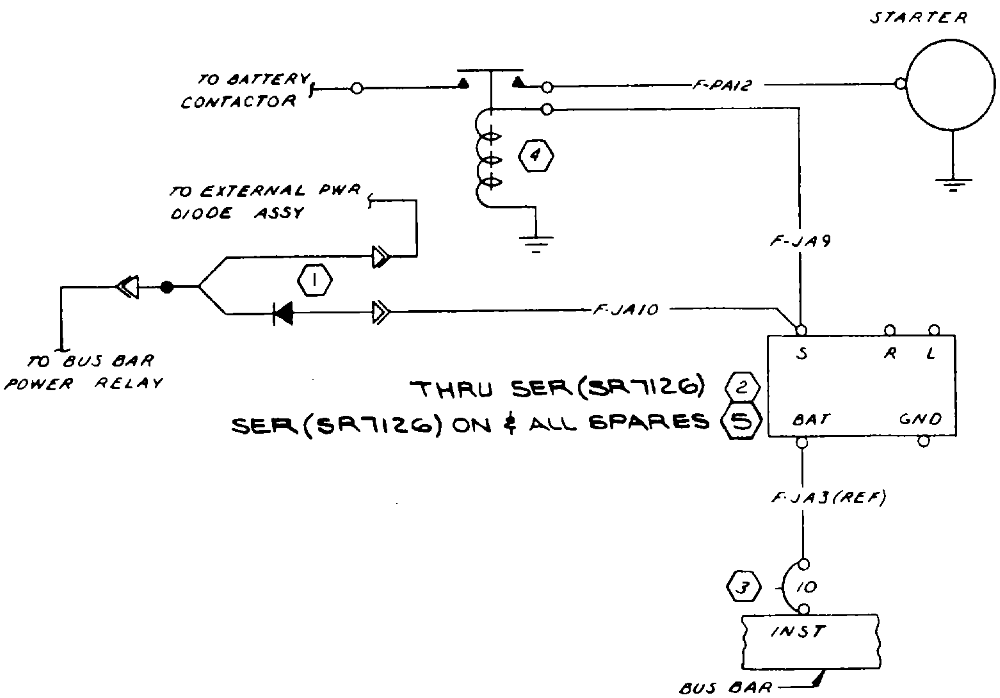
SIZE: C | CODE IDENT. NO.: 71379 | DWG NO: 1270701

SCALE: NONE | 210 | PAGE: 5.1

(SR 6031) IX

FORM NO 80-2188

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: C292501-0105 SUPERSEDES C292501-0101 FOR ALL SPARES (SR7126)	RLY 2-29-72	NRW NMC



INACTIVE EFF THRU 21059502 VRS 8-27-71 NRW NMC

WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS
F-PA12	2	S-1562-2-9		S-1367-7-16	S-1367-7-14		
F-JA10	18			S-1367-1-6	S-1493-1		
FJA9	18			S-1367-1-6	S-1367-1-10		

WIRE TABLE

ITEM NO	PART NO.	DESCRIPTION	
5	C292501-0105	SWITCH	
4	S-1991-1-1	STARTER CONTACTOR	
3	S-1360-10	CIRCUIT BREAKER	
2	C292501-0101	SWITCH	
1	1570093-1	DIODE ASSY	

EQUIPMENT TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA STD. NO

SUPERSEDES: 12210-864

SUPERSEDED BY: 1270709

CONTRACT NO:

Cessna AIRCRAFT CO. COMMERCIAL AIRCRAFT DIV. 5800 E. PAWNEE WICHITA, KANSAS

	NAME	DATE
DESIGN	PLUMMER	
GROUP	N. Wise	7-19-69
DRAWN	VR CONLEY	7-11-69
CHECK	R. YOUNGERS	7-12-69
STRESS	K.F. GLIDE	7-17-69
PROJ	N. McCarter	7-13-69
APPD	McElvany	7-15-69
OTHER		

TITLE: WIRING DIAGRAM — STARTER SYSTEM

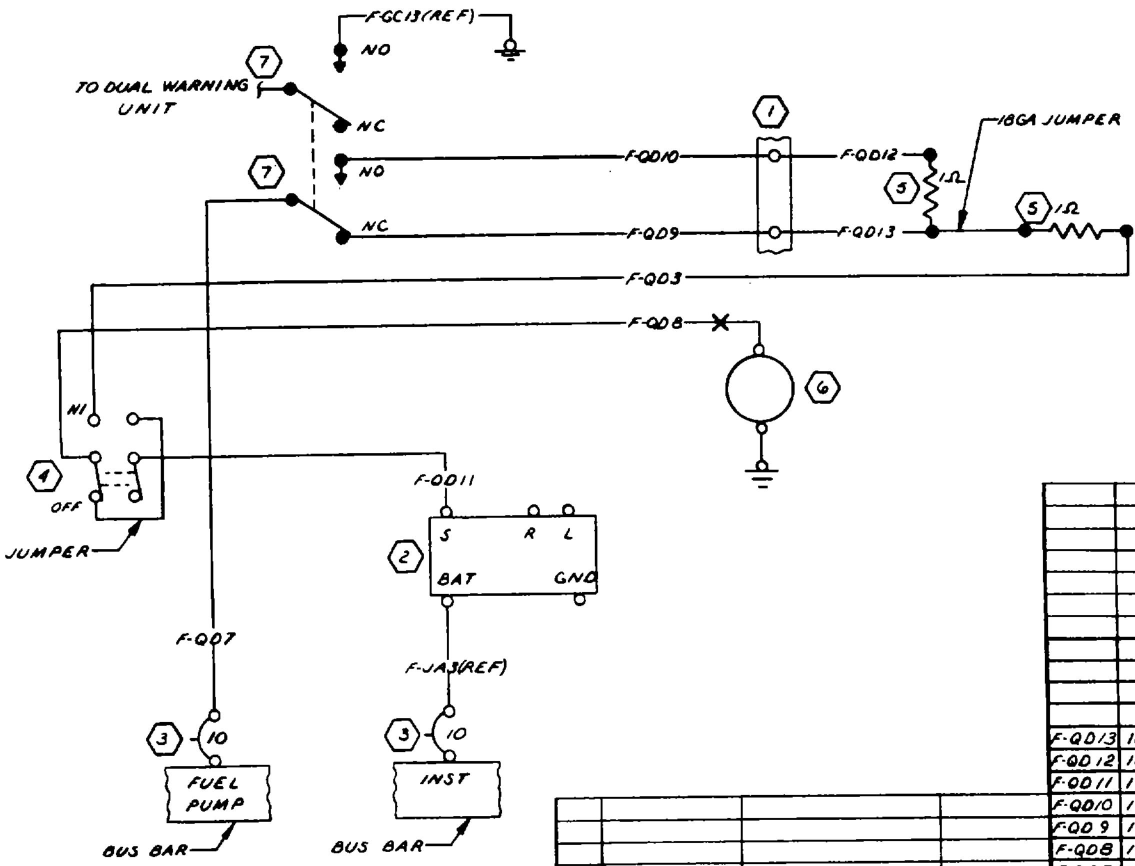
SIZE: C | CODE IDENT. NO. 71379 | DWG NO 1270701

SCALE: NONE | 210 | PAGE: 6.1

(SR6031) II

FORM NO 80 2158

REVISION			
LET	DESCRIPTION	DATE	APPD



INACTIVE:
EFF SER 21059200
THRU SER 21059351
1-9-70 ED & RR 10852
JDB

F-QD13	18			S-1367-1-6	SOLDER		
F-QD12	18			S-1367-1-6	SOLDER		
F-QD11	18			S-1493-1	S-1367-1-6		
F-QD10	18			S-1367-1-6	SOLDER		
F-QD9	18			S-1367-1-6	SOLDER		
F-QD8	18			S-1493-1	S-1370-1		
F-QD7	18			S-1367-1-6	SOLDER		
F-QD3	18			S-1493-1	SOLDER		
WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS

WIRE TABLE

ITEM NO.	PART NO.	DESCRIPTION	VENDOR
7	USM5-8	SWITCH	(80207)
6	4140-00-1	FUEL PUMP	(09445)
5	MX0020-031AV	RESISTOR	(94310)
4	S-1846-1-2	SWITCH	
3	S-1360-10	CIRCUIT BREAKER	
2	C292501-0101	SWITCH	
1	AN3436-2-6	TERMINAL BLOCK	

EQUIPMENT TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES: 12210-864

SUPERSEDED BY: P 7.1.1

CONTRACT NO.

	NAME	DATE
DESIGN	PLUMMER	
GROUP	H. Wick	7-19-69
DRAWN	JA CONLEY	7-11-69
CHECK	R.YOUNGERS	7-12-69
STRESS	[illegible]	7-17-69
PROJ	[illegible]	7-23-69
APPD	[illegible]	7-25-69
OTHER		

Cessna. AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

TITLE
WIRING DIAGRAM — FUEL PUMP SYSTEM

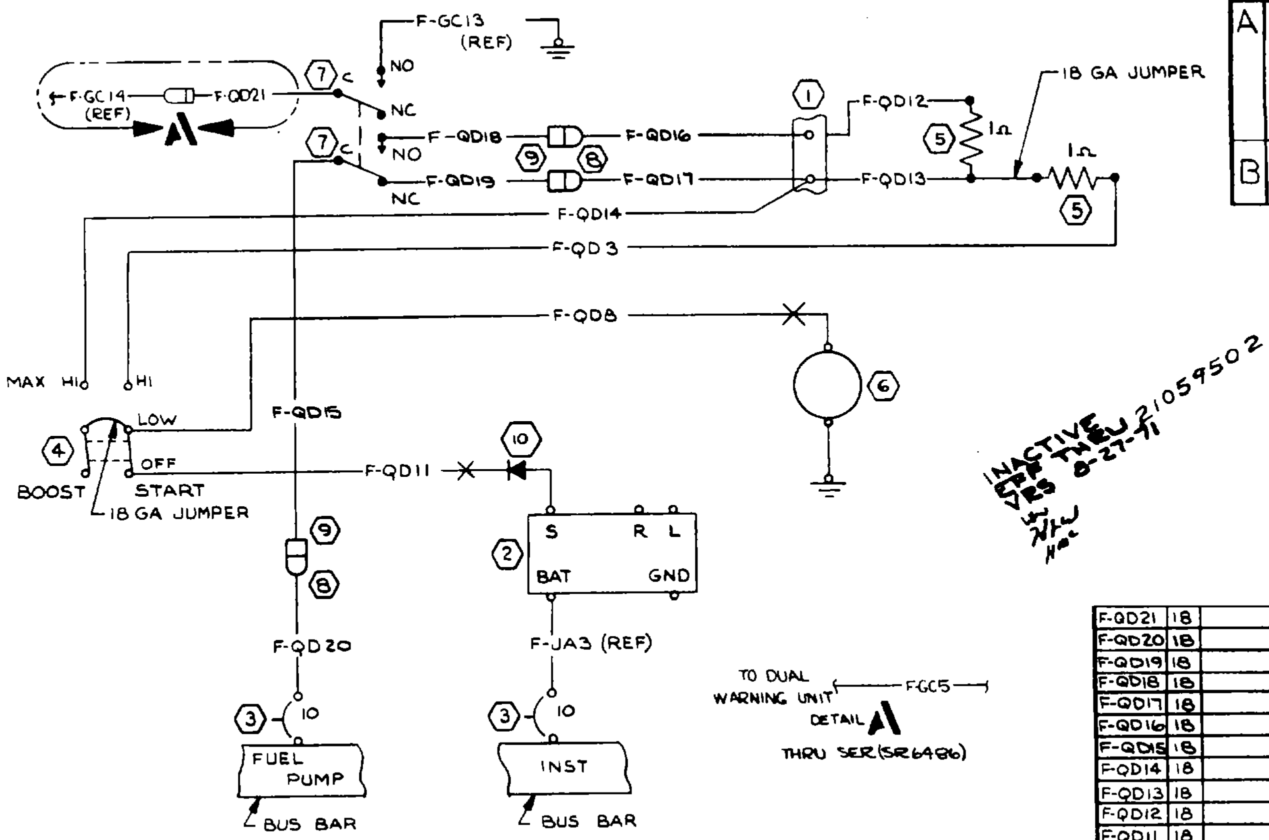
SIZE	CODE IDENT. NO.	DWG NO
C	71379	1270701

SCALE: NONE | 210 | PAGE: 7.1.0

SER 21059200 & ON

FORM NO. 80-2158

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: ADD F-QD15, F-QD16, F-QD17, F-QD18, F-QD19 & F-QD20; DELETE F-QD7, F-QD9 & F-QD10; ADD S-1637-1 & S-1637-2; 1250706-1 WAS S-1866-1; ADD 3AF4; S-1370-1 WAS S-1367-1-8/F-QD11 EDRR 10941 (SR6486)	RLY 3-17-70	HW RLY NRW HMC
B	BY REV: ADD F-GC14 (REF) & DETAIL A, SER IN F-QD21 EDRR 10011 (SR6486)	J.C. 5-6-70	HW RLY NRW VRD HMC



WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS
F-QD21	18			S-1636-1	SOLDER		SER(SR 6486) & ON
F-QD20	18			S-1635-1	S-1367-1-6		
F-QD19	18			S-1636-1	SOLDER		
F-QD18	18			S-1636-1	SOLDER		
F-QD17	18			S-1635-1	S-1367-1-6		
F-QD16	18			S-1635-1	S-1367-1-6		
F-QD15	18			S-1636-1	SOLDER		
F-QD14	18			S-1493-1	S-1367-1-6		
F-QD13	18			S-1367-1-6	SOLDER		
F-QD12	18			S-1367-1-6	SOLDER		
F-QD11	18			S-1493-1	S-1370-1		
F-QD8	18			S-1493-1	S-1370-1		
F-QD3	18			S-1493-1	SOLDER		

WIRE TABLE

ITEM NO	PART NO.	DESCRIPTION	VENDOR
10	3AF4	DIODE	(15ES)
9	S-1637-2	HOUSING	
8	S-1637-1	HOUSING	
7	1250706-1	SWITCH	
6	4140-00-1	FUEL PUMP	(09445)
5	MZ-0020-031AV	RESISTOR	(94310)
4	S-2055-1-1	SWITCH	
3	S-1360-10	CIRCUIT BREAKER	
2	C292501-0101	SWITCH	
1	MS27212-2-6	TERMINAL BLOCK	

EQUIPMENT TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES: P 7.1.0

SUPERSEDED BY: 1270709

CONTRACT NO:

	NAME	DATE
DESIGN	BURKE	3-30-70
GROUP	H. Wise	1-15-70
DRAWN	BLURTON	1-9-70
CHECK	HARRIS	1-12-70
STRESS		
PROJ	N.H. Cath	1-20-70
APPD	R.YOUNGERS	1-13-70
OTHER		

Cessna AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

TITLE
WIRING DIAGRAM — FUEL PUMP SYSTEM

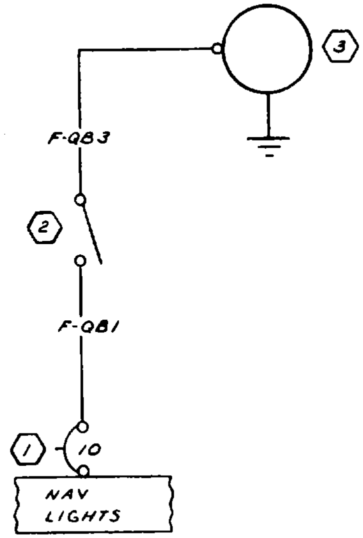
SIZE	CODE IDENT. NO.	DWG NO
C	71379	1270701

SCALE: NONE | 210 | PAGE: 7.1.1

FORM NO. 80-2158

EDRR 10852 (SR6486)

REVISION			
LET	DESCRIPTION	DATE	APPD



INACTIVE
EFF THRU 8-27-71
21059502

WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS
F-QB3	18			S-1493-1	S-1367-1-10		
F-QB1	18			S-1367-1-6	S-1493-1		

WIRE TABLE

ITEM NO.	PART NO.	DESCRIPTION	
3	AN4078-1	OIL DILUTION VALVE	
2	S-1845-2-2	SWITCH	
1	S-1360-10	CIRCUIT BREAKER	

EQUIPMENT TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA
STD. NO.

SUPERSEDES: 12210-864

SUPERSEDED BY: 1270709

CONTRACT NO:

	NAME	DATE
DESIGN	PLUMMER	
GROUP	H. Wise	7-19-69
DRAWN	JR CONLEY	7-11-69
CHECK	R. YOUNGERS	7-12-69
STRESS	R.F.GFIDE	7-17-69
PROJ	N. McFarla	7-23-69
APPD	[illegible]	7-15-69
OTHER		

Cessna AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

TITLE
WIRING DIAGRAM — OIL DILUTION SYSTEM (OPT)

SIZE	CODE IDENT. NO.	DWG NO
C	71379	1270701

SCALE: NONE | 210 | PAGE: 7.2

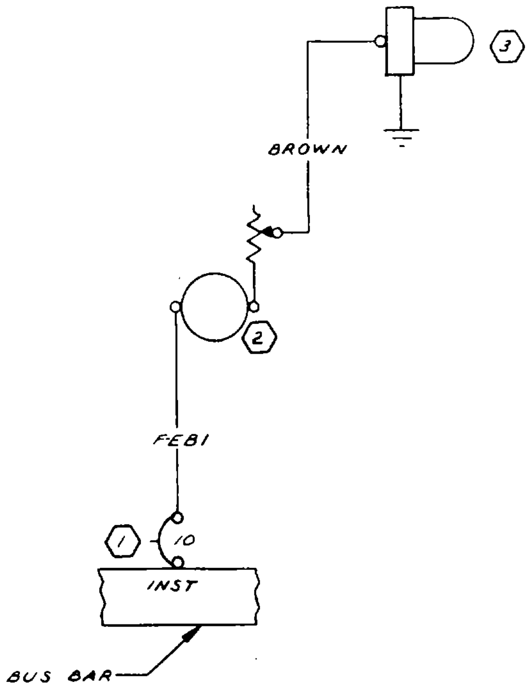
(SR 6031) IX

FORM NO. 80-2158

NOTES:

1. MATERIAL IS PRESTOLITE NO. 110691 18 GAGE, TEFLON INSULATED CONDUCTOR

REVISION			
LET	DESCRIPTION	DATE	APPD



INACTIVE EFF THRU SER 21059502 8-27-71

WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS
BROWN	18	1		S-1367-1-8	S-1367-1-6		
FEBI	18			S-1367-1-6	S-1367-1-8		

WIRE TABLE

ITEM NO	PART NO.	DESCRIPTION	
3	S-1372-1	BULB-CYL HEAD TEMP	
2	C669502-0301	INST CLUSTER	
1	S-1360-10	CIRCUIT BREAKER	

EQUIPMENT TABLE

CES-1000 IS APPLICABLE VENDOR CODES PER S-1400 CES-XXXX=CESSNA SPEC. NO. S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES: 12210-864

SUPERSEDED BY: 1270709

CONTRACT NO:

	NAME	DATE
DESIGN	PLUMMER	
GROUP	H. Wise	7-19-69
DRAWN	J R CONLEY	7-11-69
CHECK	R YOUNGERS	7-12-69
STRESS	K.F.GEIDE	7-17-69
PROJ	N. McCarter	7-23-69
APPD	M Delvany	7-15-67
OTHER		

Cessna AIRCRAFT CO. COMMERCIAL AIRCRAFT DIV. 5800 E. PAWNEE WICHITA, KANSAS

TITLE
WIRING DIAGRAM — CYLINDER HEAD TEMP

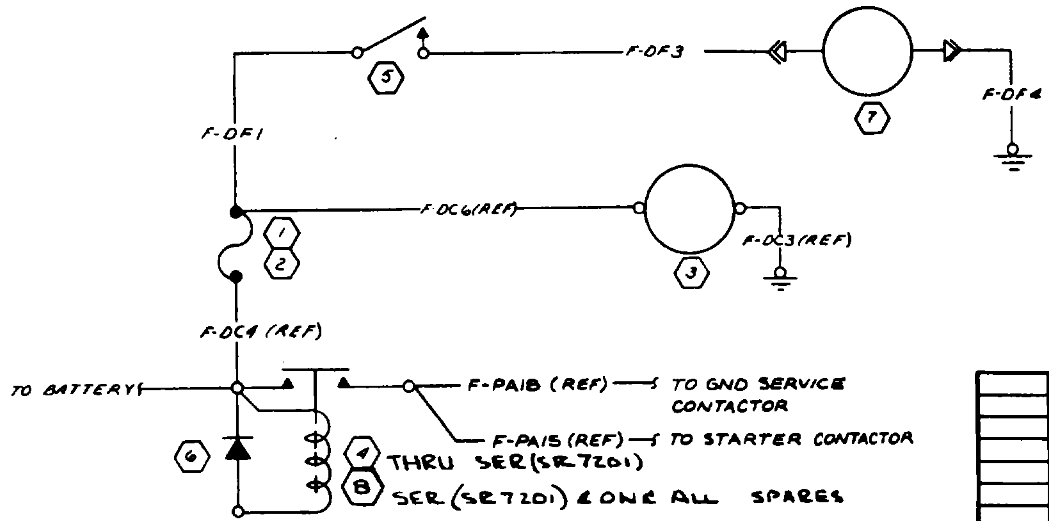
SIZE	CODE IDENT. NO.	DWG NO
C	71379	1270701

SCALE: NONE | 210 | PAGE: 8.1

(SR 6031) IX

FORM NO 80-215B

LET	DESCRIPTION	DATE	APPD
	REVISION		
A	BY REV: SER OUT S-1579-1 & ADD S-1579-2 (SR7201)	BPH 7-26-72	HLW DATE BLH NMC



INACTIVE EFF THRU 21059502 VES 8-27-71 HLW NMC

8	S-1579-2	CONTACTOR
7	C664501-0101	HOURMETER
6	0770728-1	DIODE ASSY
5	S-1711-1	OIL PRESS. SWITCH
4	S-1579-1	BATTERY CONTACTOR
3	S-1317-N2	CLOCK
2	S-1091-1	FUSE
1	S-1090-22	FUSEHOLDER
ITEM NO.	PART NO.	DESCRIPTION

EQUIPMENT TABLE

WIRE CODE NO	GA	MATERIAL	LG	TERMINALS		SERIALS
F-DF4	18			S-1493-1	S-1367-1-6	
F-DF3	18			S-1367-1-6	S-1493-1	
F-DF1	18			SOLDER	S-1367-1-6	

WIRE TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES: 12210-864

SUPERSEDED BY: 1270709

CONTRACT NO:

	NAME	DATE
DESIGN	PLUMMER	
GROUP	H. Wine	7-19-69
DRAWN	J.R CONLEY	7-11-69
CHECK	R.YOUNGERS	7-12-69
STRESS	R.F. GEIDE	7-11-69
PROJ	N.M'Carter	7-23-69
APPD	[illegible]	7-15-69
OTHER		

Cessna AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

TITLE
WIRING DIAGRAM — HOURMETER (OPT)

SIZE C | CODE IDENT. NO. 71379 | DWG NO 1270701

SCALE: NONE | 210 | PAGE: 8.2

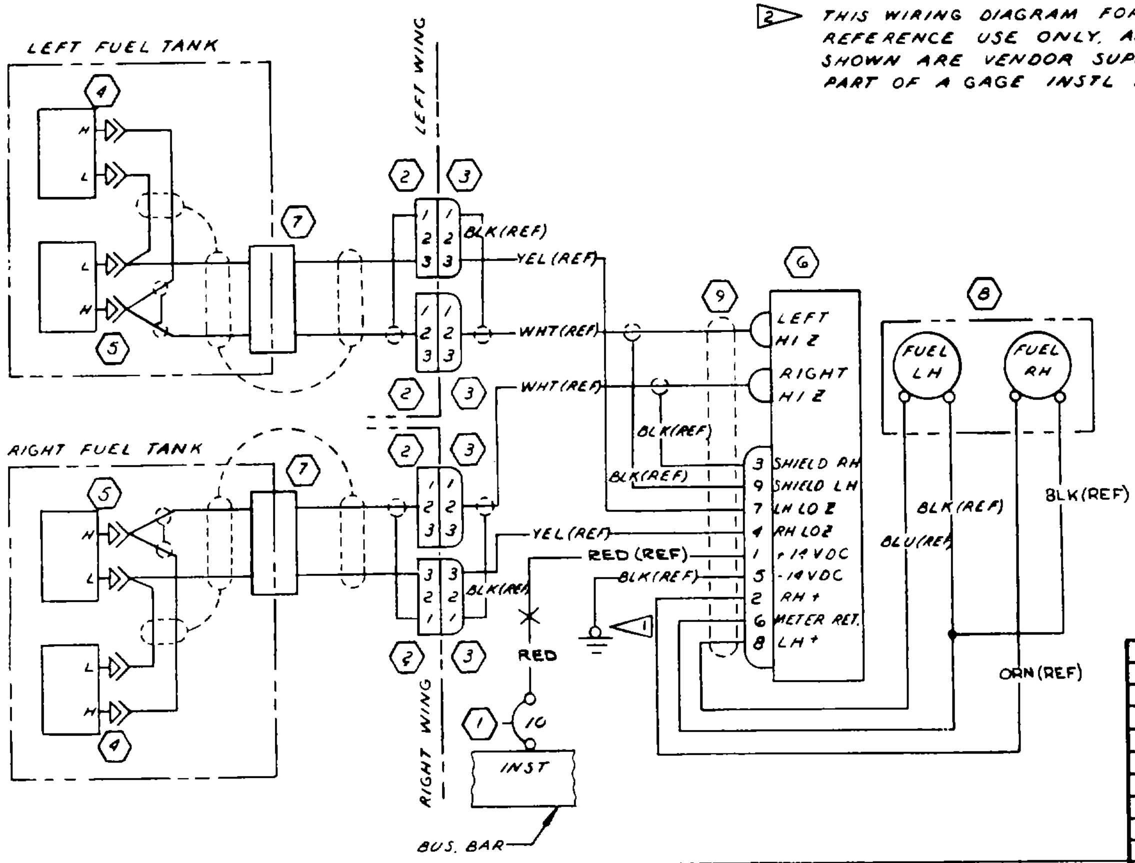
(SR6031) II

FORM NO. 80-2159

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: ON INST CLUSTER BLK(REF) WAS ORN(REF) & ORN(REF) WAS BLK(REF) ADD RED WIRE ED&RR 10762 (SR6031) II	RAINES 10/14/69	DLB
B	BY REV: 2381 WAS 7383 ED&RR 19205	RLY 3-26-70	

NOTES

1. S-1367-1-6 TERMINAL ON EXISTING WIRE
2. THIS WIRING DIAGRAM FOR CIRCUIT REFERENCE USE ONLY. ALL WIRES SHOWN ARE VENDOR SUPPLIED AS PART OF A GAGE INSTL KIT.



INACTIVE EFF THRU 21059502 YES 8-27-71

ITEM NO	PART NO.	DESCRIPTION	VENDOR
9	2381	CABLE ASSY	(05808)
8	C669502-0301	INST CLUSTER	
7	C668005-0101	FLANGE & CABLE ASSY	
6	C668004-0101	MONITOR - FUEL	
5	C668003-0102	SENSOR - INBD	
4	C668003-0101	SENSOR - OUTBD	
3	S-1638-2	HOUSING - CAP	
2	S-1638-1	HOUSING - PLUG	
1	S-1360-10	CIRCUIT BREAKER	

EQUIPMENT TABLE

WIRE CODE NO	GA	MATERIAL	LG	TERMINALS		SERIALS
RED	18	-18-2	2.5	S-1367-1-6	S-1370-1	

WIRE TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES: 12210-864

SUPERSEDED BY: 1270709

CONTRACT NO:

	NAME	DATE
DESIGN	PLUMMER	
GROUP	H. Wine	7-19-69
DRAWN	JR CONLEY	7-11-69
CHECK	R.YOUNGERS	7-12-69
STRESS	K.F. GEIDE	7-17-69
PROJ		
APPD		7-15-69
OTHER		

Cessna AIRCRAFT CO. COMMERCIAL AIRCRAFT DIV. 5800 E. PAWNEE WICHITA, KANSAS

TITLE WIRING DIAGRAM — FUEL GAGE SYSTEM

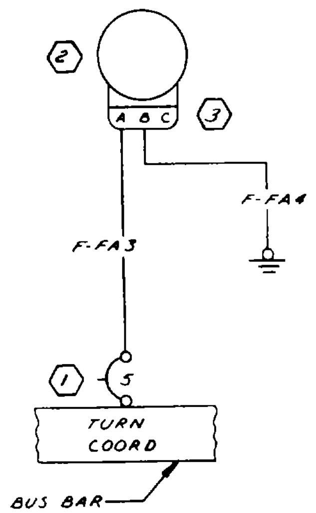
SIZE C | CODE IDENT. NO. 71379 | DWG NO 1270701

SCALE: NONE | 210 | PAGE: 8.3

(SR 6031, II)

FORM NO 80-2158

REVISION			
LET	DESCRIPTION	DATE	APPD



INACTIVE
EFF THRU 21059502
VRS 8-27-71

WIRE TABLE

WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS
F-FA4	18			SOLDER	S-1367-1-14		
F-FA3	18			S-1367-1-8	SOLDER		

EQUIPMENT TABLE

ITEM NO	PART NO.	DESCRIPTION	
3	MS3106A10SL3S	CONNECTOR	
2	C661003-0501	TURN COORDINATOR	
1	S-1360-5	CIRCUIT BREAKER	

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA
STD. NO.

SUPERSEDES: 12210-864

SUPERSEDED BY: 1270709

CONTRACT NO:

	NAME	DATE
DESIGN	PLUMMER	
GROUP	H Wine	7-19-69
DRAWN	JR CONLEY	7-11-69
CHECK	R. YOUNGERS	7-12-69
STRESS	R.F. GEIDE	7-17-69
PROJ	H. McCarter	7-25-69
APPD	McElhoney	7-12-69
OTHER		

Cessna. AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

TITLE
WIRING DIAGRAM — TURN COORDINATOR

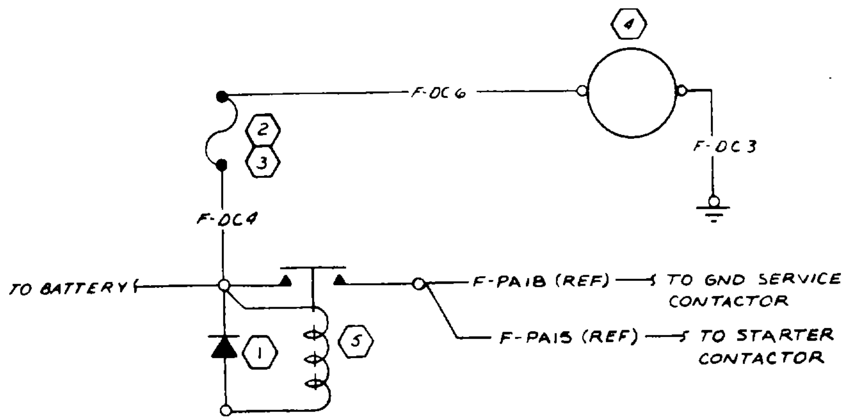
SIZE	CODE IDENT. NO.	DWG NO
C	71379	1270701

SCALE: NONE 210 PAGE: 9.1

(SR6031) IX

FORM NO. 80-2159

REVISION			
LET	DESCRIPTION	DATE	APPD



5 THRU SER (SR7201)

6 SER (SR7201) & ON & ALL SPARES

INACTIVE EFF THRU 21059502
YRS 8-27-71

WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS
F-DC 6	18			SOLDER	S-1367-1-6		
F-DC 4	18			SOLDER	S-1367-1-4		
F-DC 3	18			S-1367-1-6	S-1367-1-8		

WIRE TABLE

ITEM NO	PART NO.	DESCRIPTION	
6	S-1579-2	CONTACTOR	
5	S-1579-1	BATTERY CONTACTOR	
4	S-1317-N2	CLOCK	
3	S-1091-1	FUSE	
2	S-1090-22	FUSEHOLDER	
1	0770728-1	DIODE ASSY	

EQUIPMENT TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES: 12210-864

SUPERSEDED BY: 1270709

CONTRACT NO:

	NAME	DATE
DESIGN	PLUMMER	
GROUP	N Wise	7-19-69
DRAWN	J.R. CONLEY	7-11-69
CHECK	R. YOUNGERS	7-12-69
STRESS	[illegible]	[illegible]
PROJ	[illegible]	[illegible]
APPD	[illegible]	7-15-69
OTHER		

Cessna AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

TITLE
WIRING DIAGRAM — CLOCK

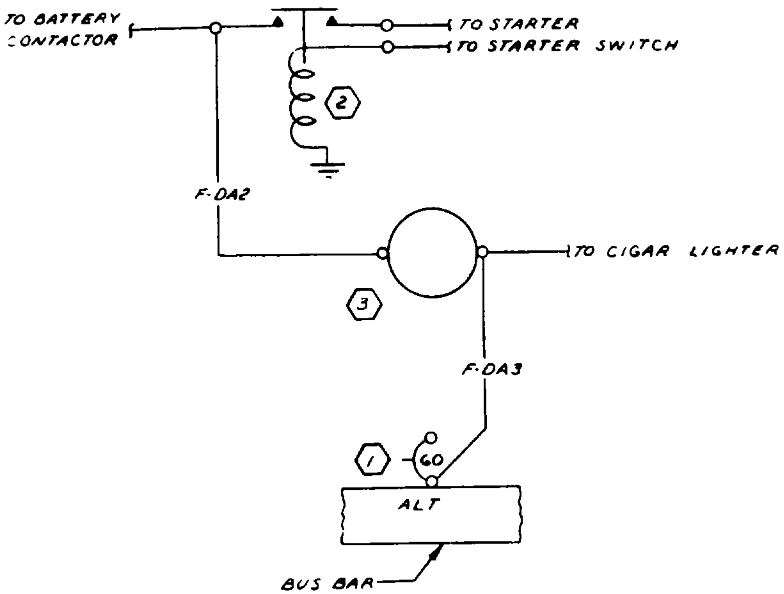
SIZE	CODE IDENT NO.	DWG NO
C	71379	1270701

SCALE: NONE | 210 | PAGE: 10.1

(SR6031) II

FORM NO. 80-2158

REVISION			
LET	DESCRIPTION	DATE	APPD



INACTIVE EFF THRU 21059502
VRS 8-27-71

WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS
F-DA3	8			S-1367-4-10	S-1367-4-10		
F-DA2	8			S-1367-4-10	S-1367-4-10		

WIRE TABLE

ITEM NO.	PART NO.	DESCRIPTION	
3	C669502-0301	INST CLUSTER	
2	S-1991-1	STARTER CONTACTOR	
1	S-1596-60	CIRCUIT BREAKER	

EQUIPMENT TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES: 12210-864
SUPERSEDED BY: 1270709

CONTRACT NO:

	NAME	DATE
DESIGN	PLUMMER	
GROUP	H. Wise	7-19-69
DRAWN	J.R CONLEY	7-11-69
CHECK	R. YOUNGERS	7-12-69
STRESS	K.F. GEIDE	7-17-69
PROJ	H. McCartin	7-23-69
APPD		7-5-69
OTHER		

Cessna AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

TITLE
WIRING DIAGRAM — AMMETER

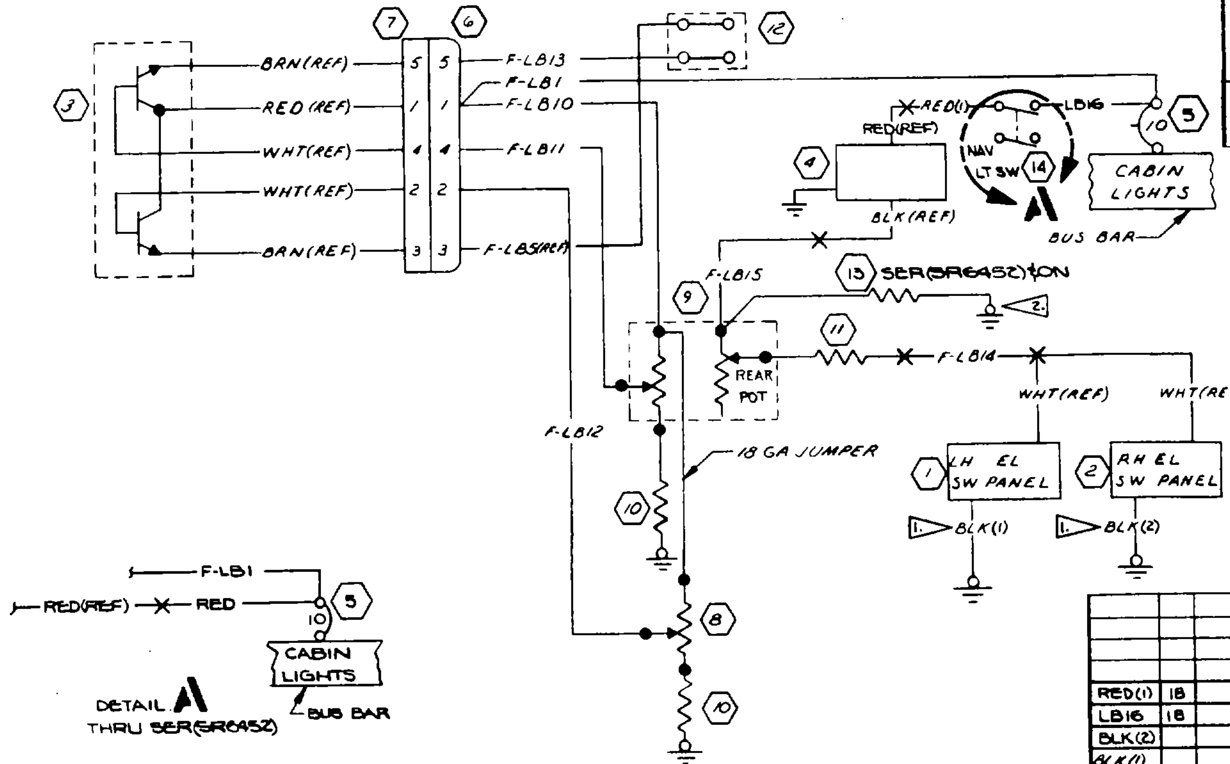
SIZE	CODE IDENT. NO.	DWG NO
C	71379	1270701

SCALE: NONE | 210 | PAGE: 10.2

(SR6031)

FORM NO. 80-2158

LET	DESCRIPTION	DATE	APPD
A	BY REV: ADD NOTES, VAL-5-6000, S-1844-1-2, LB16, RED(1), DETAIL "A" & SER; SER OUT RED(1) BLK(1) & BLK(2) WAS BLK(REF) EDRR 10828 (SR6452)	DLP 1-3-70	WH RLY HPW
B	BY REV: 27 OHM ½ W RESISTOR WAS 47 OHM ½ W RESISTOR (ITEM 10) ED&RR 10997 (NOW SHOP PRACTICE)	J.G. 5-6-70	WH RLY HPW



INACTIVE EFF THRU SER 21059502 8-27-71

NOTES:

1. THESE WIRES VENDOR FURNISHED
2. THIS END OF RESISTOR TERMINATED WITH S-1367-1-14 TERMINAL AND INSTALLED ON SHAFT OF TANDEM POT ASSY. DUE TO HEAT DISSIPATION RESISTOR MUST BE KEPT FROM WIRE BUNDLE

WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS
RED(1)	18			S-1493-1	S-1310-1		SER(SR6452)&ON
LB16	18			S-1493-1	S-1367-1-8		SER(SR6452)&ON
BLK(2)				S-1367-1-8		1.	
BLK(1)				S-1367-1-8		1.	
RED	18	-18-2		S-1370-1	S-1367-1-6		THRU SER(SR6452)
F-LB15	18			S-1370-1	SOLDER		
F-LB14	18			S-1370-1	S-1370-2		
F-LB13	18			S-1635-2	S-1829-1		
F-LB12	18			S-1635-2	SOLDER		
F-LB11	18			S-1635-2	SOLDER		
F-LB10	18			SEE F-LB1	SOLDER		
F-LB1	18			S-1635-3	S-1367-1-6		

WIRE TABLE

ITEM NO	PART NO.	DESCRIPTION	VENDOR
14	S-1844-1-2	SWITCH	
13	VAL-5-6000	RESISTOR	
12	34002-55	TERMINAL BOARD	(ETNC)
11	56K 2W	RESISTOR	
10	27 OHM ½ W	RESISTOR	
9	S-2008-1	POT ASSY	
8	S-1904-3	POT ASSY	
7	S-1641-6	HOUSING-SOCKET	
6	S-1640-6	HOUSING-PIN	
5	S-1360-10	CIRCUIT BREAKER	
4	C613001-0201	POWER SUPPLY	
3	1570166-1	DIMMING ASSY	
2	1213192-1	EL PANEL	
1	1213307-7	EL PANEL	

EQUIPMENT TABLE

CES-1000 IS APPLICABLE VENDOR CODES PER S-1400 CES-XXXX=CESSNA SPEC. NO. S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES: 12210-864

SUPERSEDED BY: 1270709

CONTRACT NO:

	NAME	DATE
DESIGN	PLUMMER	
GROUP	H Wise	7-19-69
DRAWN	J R CONLEY	7-11-69
CHECK	R YOUNGERS	7-12-69
STRESS	R.F. GEIDE	7-17-69
PROJ	H. M'Gill	7-23-69
APPD		7-25-69
OTHER		

Cessna AIRCRAFT CO. COMMERCIAL AIRCRAFT DIV. 5800 E. PAWNEE WICHITA, KANSAS

TITLE: WIRING DIAGRAM — ELECTRO LUMINESCENT PANEL

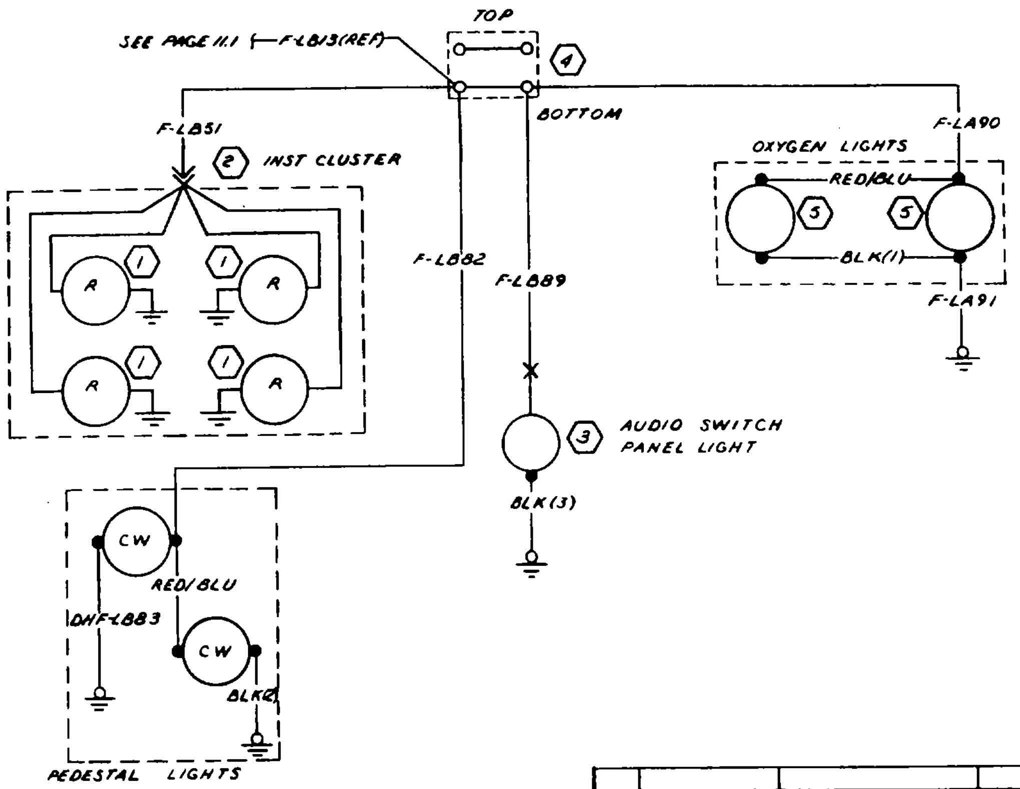
SIZE	CODE IDENT. NO.	DWG NO
C	71379	1270701

SCALE: NONE | 210 | PAGE: 11.1

SER 21059520 & ON

FORM NO 80-2158

REVISION			
LET	DESCRIPTION	DATE	APPD



INACTIVE EFF THRU 21059502 YES 8-27-71

NOTES:

OXYGEN LIGHTS ARE STANDARD ON T210, OPTIONAL ON 210

WIRE CODE NO	GA	MATERIAL	LG	TERMINALS		SERIALS	
RED/BLU	18	-18-2-6		SOLDER	SOLDER		
RED/BLU	18	-18-2-6		SOLDER	SOLDER		
BLK(3)	18	-18-0		SOLDER	S-1367-1-8		
BLK(2)	18	-18-0		SOLDER	S-1367-1-8		
BLK(1)	18	-18-0		SOLDER	SOLDER		
DHF-LB83	18			SOLDER	S-1367-1-8		
F-LB89	18			S-1829-1	S-1370-1		
F-LB82	18			S-1829-1	SOLDER		
F-LB51	18			S-1829-1	S-341-2		
F-LA91	18			SOLDER	S-1367-1-8		
F-LA90	18			S-1829-1	SOLDER		

WIRE TABLE

ITEM NO.	PART NO.	DESCRIPTION	VENDOR
5	S-1899-1	LIGHT ASSY	
4	34002-55	TERMINAL BOARD	(ETNC)
3	23-288	LIGHT ASSY	(95263)
2	C669502-0301	INST CLUSTER KIT	
1	1270479-1	LIGHT ASSY	

EQUIPMENT TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES: R210-864

SUPERSEDED BY: 1270709

CONTRACT NO:

	NAME	DATE
DESIGN	PLUMMER	
GROUP	N Wise	7-19-69
DRAWN	J R CONLEY	7-11-69
CHECK	R. YOUNGERS	7-12-69
STRESS	R.F. GEIDE	7-17-69
PROJ	N. McCarty	7-23-69
APPD	M D Ferrey	7-15-69
OTHER		

Cessna AIRCRAFT CO. COMMERCIAL AIRCRAFT DIV. 5800 E. PAWNEE WICHITA, KANSAS

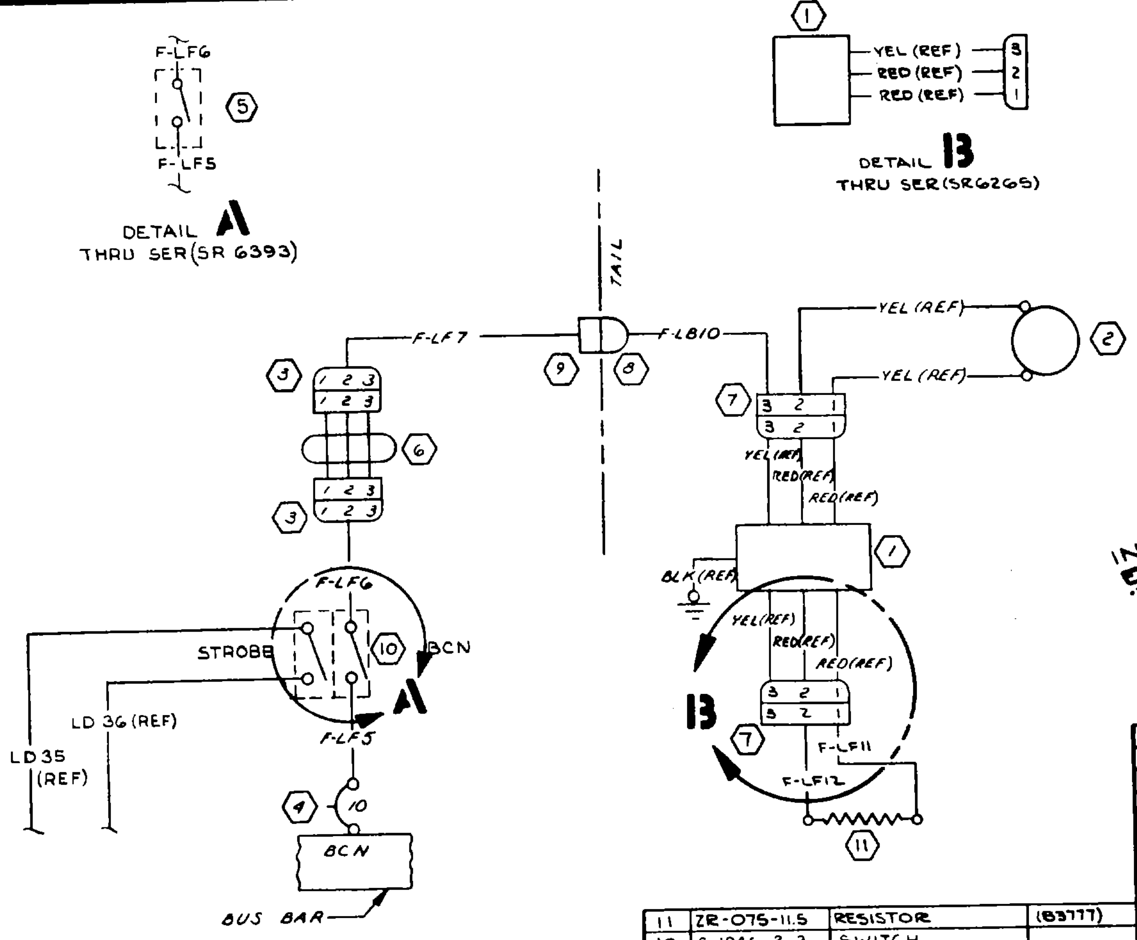
TITLE WIRING DIAGRAM — INSTRUMENT LIGHTS

SIZE	CODE IDENT. NO.	DWG NO
C	71379	1270701

SCALE: NONE 210 PAGE: 11.2

FORM NO. 80-3158

(SR6031) II



INACTIVE EFF THRU 21059502
VES 8-27-71

LET	DESCRIPTION	DATE	APPD
A	BY REV: ADD DETAIL "A", S-1846-2-3, & SER ED & RR 10826 (SR6393) IX	JDB 12-17-69	
B	BY REV: ADD DETAIL B, F-LF11, F-LF12 & 2R-075-11.5 ED & RR 10883 (SR6265)	RLY 3-6-70	
C	BY REV: PIN3 WAS PIN1 & PIN1 WAS PIN3 ED & RR 10049 SER 21059200	RLY 5-27-70	

NOTES:
1. INSTALL A 1270695-1 CLIP ON "STROBE" SIDE OF S-1846-2-3 SWITCH WHEN WING TIP STROBE LIGHTS ARE NOT INSTALLED.

EQUIPMENT TABLE

ITEM NO	PART NO.	DESCRIPTION	
11	2R-075-11.5	RESISTOR	(83777)
10	S-1846-2-3	SWITCH	
9	S-1637-2	HOUSING-PLUG	
8	S-1637-1	HOUSING-CAP	
7	S-1638-1	HOUSING-PLUG	
6	1270705-1	CABLE ASSY	
5	S-1845-1-2	SWITCH	
4	S-1360-10	CIRCUIT BREAKER	
3	S-1638-2	HOUSING-CAP	
2	C621001-0101	LIGHT ASSY	
1	C594501-0203	FLASHER UNIT	

WIRE TABLE

WIRE CODE NO	GA	MATERIAL	LG	TERMINALS		SERIALS
F-LF12	16			S-1636-2	S-1493-2	SER(SR6265) & ON
F-LF11	16			S-1636-2	S-1493-2	SER(SR6265) & ON
F-LB10	16			S-1635-2	S-1636-2	
F-LF7	16			S-1635-2	S-1636-2	
F-LF6	16			S-1493-2	S-1635-2	
F-LF5	16			S-1367-2	S-1493-2	

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES: 12210-864

SUPERSEDED BY: 1270709

CONTRACT NO:

	NAME	DATE
DESIGN	PLUMMER	
GROUP	H. Wise	7-19-69
DRAWN	J.R. CONLEY	7-11-69
CHECK	R. YOUNGERS	7-15-69
STRESS	R.F. GEIDC	7-17-69
PROJ		
APPD		7-15-69
OTHER		

Cessna AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

TITLE
WIRING DIAGRAM — FLASHING BEACON LIGHT

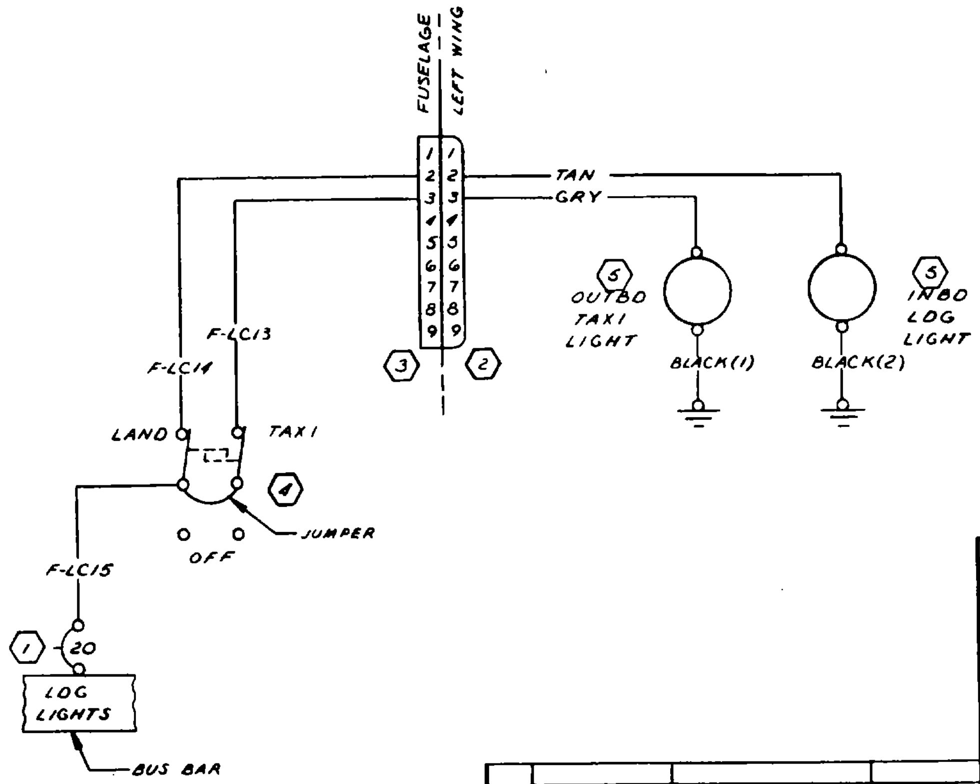
SIZE: C | CODE IDENT. NO.: 71379 | DWG NO: 1270701

SCALE: NONE | 210 | PAGE: 11.3

SER 21059200 & ON

FORM NO 80-2158

REVISION			
LET	DESCRIPTION	DATE	APPD



INACTIVE EFF THRU 21059502
VRS 8-27-71

WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS
TAN	14	-14-10		S-1635-2	S-1367-2-8		
GRAY	14	-14-8		S-1635-2	S-1367-2-8		
BLK (2)	16	-16-0		S-1367-2-8	S-1367-2-8		
BLK(1)	16	-16-0		S-1367-2-8	S-1367-2-8		
F-LC15	14			S-1493-2	S-1367-2-6		
F-LC14	14			S-1493-2	S-1636-2		
F-LC13	14			S-1636-2	S-1493-2		

WIRE TABLE

ITEM NO.	PART NO.	DESCRIPTION
5	0523118-1	LIGHT
4	S-1846-1-3	SWITCH
3	S-1641-9	HOUSING-SOCKET
2	S-1640-9	HOUSING-PIN
1	S-1360-20	CIRCUIT BREAKER

EQUIPMENT TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES: 12210-864

SUPERSEDED BY: 1270709

CONTRACT NO:

	NAME	DATE
DESIGN	PLUMMER	
GROUP	H. Wise	7-19-69
DRAWN	JR CONLEY	7-11-69
CHECK	R. YOUNGERS	7-12-69
STRESS	R.E.G. JF	7-11-69
PROJ	[illegible]	7-23-69
APPD	[illegible]	8-15-69
OTHER		

Cessna AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

TITLE
WIRING DIAGRAM — LANDING LIGHTS

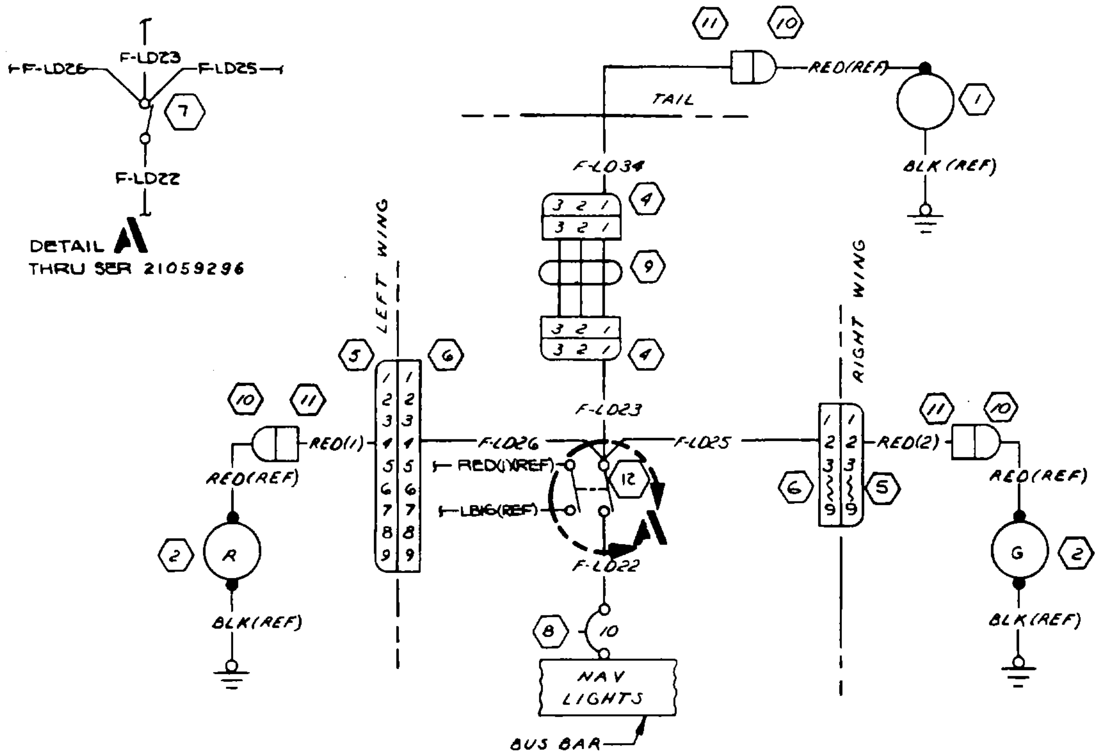
SIZE	CODE IDENT. NO.	DWG NO
C	71379	1270701

SCALE: NONE | 210 | PAGE: 11.4

(SR6031) IX

FORM NO. 80-2158

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: OBSOLETE: NEVER USED LD29 ED & RR 10782 SR21059220	J. D. R. 10/22/69	DLB
B	BY REV: ADD DETAIL "A", S-1844-1-2 & SER; ADD RED(1)(REF) & LB16(REF) EDRR 10828 (SR6452)	DLP 1-5-70	



INACTIVE EFF THRU 21059502 VRS 8-27-71

RED(2)	18	-18-2		S-1635-2	S-1636-2		
RED(1)	18	-18-2		S-1635-2	S-1636-2		
F-LD34	18			S-1635-2	S-1636-2		
F-LD29	18			S-1636-2	S-1636-2	OBSOLETE (NEVER USED)	
F-LD26	18			SEE F-LD25	S-1636-2		
F-LD25	18			S-1493-2	S-1636-2		
F-LD23	18			S-1493-1	S-1635-2		
F-LD22	18			S-1367-1-6	S-1493-1		
WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS

WIRE TABLE

12	S-1844-1-2	SWITCH	
11	S-1637-2	HOUSING - PLUG	
10	S-1637-1	HOUSING - CAP	
9	1270705-1	CABLE ASSY	
8	S-1360-10	CIRCUIT BREAKER	
7	S-1845-1-2	SWITCH	
6	S-1641-9	HOUSING-SOCKET	
5	S-1640-9	HOUSING-PIN	
4	S-1638-2	HOUSING-CAP	
3			
2	C622001-0202	LIGHT ASSY	
1	C622001-0102	LIGHT ASSY	
ITEM NO.	PART NO.	DESCRIPTION	

EQUIPMENT TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES: 12210-864

SUPERSEDED BY: 1270709

CONTRACT NO:

	NAME	DATE
DESIGN	PLUMMER	
GROUP	H. Wise	7-19-69
DRAWN	J R CONLEY	7-11-69
CHECK	R. YOUNGERS	7-15-69
STRESS	K. FEGEIDE	7-17-69
PROJ	H. McCarter	7-23-69
APPD	McAlvany	7-5-69
OTHER		

Cessna AIRCRAFT CO. COMMERCIAL AIRCRAFT DIV. 5800 E. PAWNEE WICHITA, KANSAS

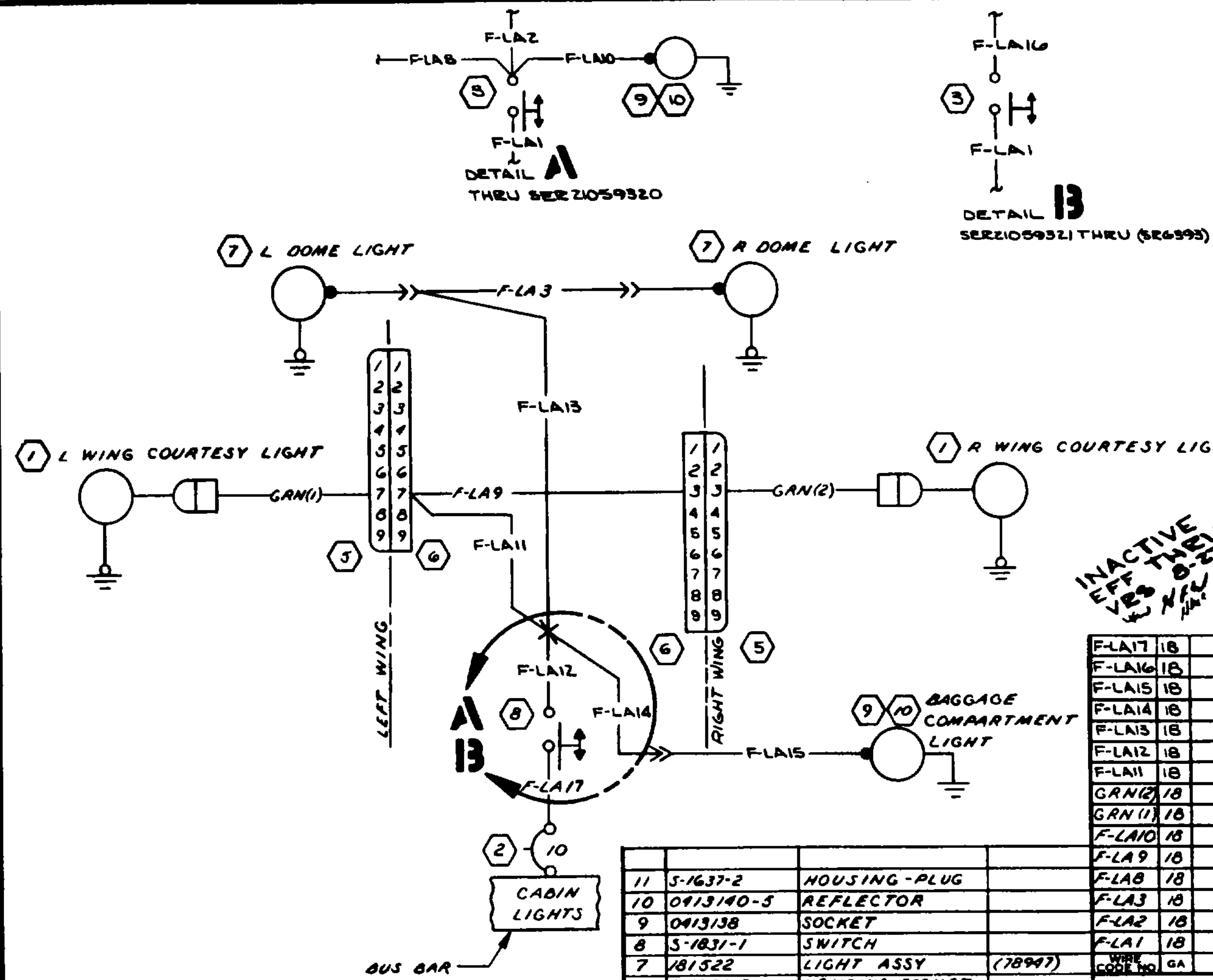
TITLE **WIRING DIAGRAM — NAVIGATION LIGHTS**

SIZE C | CODE IDENT. NO. 71379 | DWG NO 1270701

SCALE: NONE | 210 | PAGE: 11.5

SER 21059200 & ON

FORM NO 80-2158



REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: S-1641-9 WAS S-1638-1 & S-1640-9 WAS S-1638-2 & REROUTE LA2 FROM R DOME LIGHT TO L DOME LIGHT ED & RR 10767 (SR6031) IX	J.D.R. 10/20/69	DLB
B	BY REV: S-1830-1 WAS S-1367-1-6/F-LA10; SEE OUT F-LA2, F-LA8 & F-LA10; SEE IN F-LA11, F-LA12, F-LA13, F-LA14 & F-LA15 ED & RR 10017 & 10020 SER 21059321	RLY 5-4-70	
C	BY REV: ADD 0713029; 0713029 WAS S-1831-1 IN DETAIL "A"; S-1367-1-6 WAS S-1830-1/F-LA1, F-LA2, F-LA8 & F-LA10; SEE IN & OUT DETAIL "B"; SEE IN F-LA17 ED & RR 10078 (SR6395) IX	RLY 6-23-70	

WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS
F-LA17	18			S-1367-1-6	S-1830-1		SER SR6395 & ON
F-LA16	18			S-1367-1-6	SEE F-LA11	SER 21059321 THRU SER (SR6395)	
F-LA15	18			SEE F-LA14	SOLDER		SER 21059321 & ON
F-LA14	18			SEE F-LA11	S-341-2		SER 21059321 & ON
F-LA13	18			SEE F-LA11	SEE F-LA3		SER 21059321 & ON
F-LA12	18			S-1830-1	SEE F-LA11		SER 21059321 & ON
F-LA11	18			S-1370-1	S-1636-3		SER 21059321 & ON
GRN(2)	18	-18-5		S-1635-2	S-1636-2		
GRN(1)	18	-18-5		S-1635-2	S-1636-2		
F-LA10	18			S-1367-1-6	SOLDER		THRU SER 21059320
F-LA9	18			S-1636-2	SEE F-LA8		
F-LA8	18			SEE F-LA10	S-1636-5		THRU SER 21059320
F-LA3	18			S-341-2	S-341-1		
F-LA2	18			SEE F-LA10	SEE F-LA3		THRU SER 21059320
F-LA1	18			S-1367-1-6	S-1367-1-6		THRU SER (SR6395)

WIRE TABLE

ITEM NO.	PART NO.	DESCRIPTION	
11	S-1637-2	HOUSING-PLUG	
10	0413140-5	REFLECTOR	
9	0413138	SOCKET	
8	S-1831-1	SWITCH	
7	181522	LIGHT ASSY	(78947)
6	S-1641-9	HOUSING-SOCKET	
5	S-1640-9	HOUSING-PIN	
3	0713029	SWITCH	
2	S-1360-10	CIRCUIT BREAKER	
1	0700615-5	LIGHT ASSY	

EQUIPMENT TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES: 12210-864
SUPERSEDED BY: 1270709

CONTRACT NO:

	NAME	DATE
DESIGN	PLUMMER	
GROUP	H. Wise	7-19-69
DRAWN	JR CONLEY	7-11-69
CHECK	R. YOUNGERS	7-12-69
STRESS	RF GEIDE	7-17-69
PROJ		
APPD		7-15-69
OTHER		

Cessna AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

TITLE
WIRING DIAGRAM — DOME, COURTESY & BAGGAGE LIGHTS

SIZE: C | CODE IDENT. NO. 71379 | DWG NO 1270701

SCALE: NONE | 210 | PAGE: 11.6

(SR6031) IX

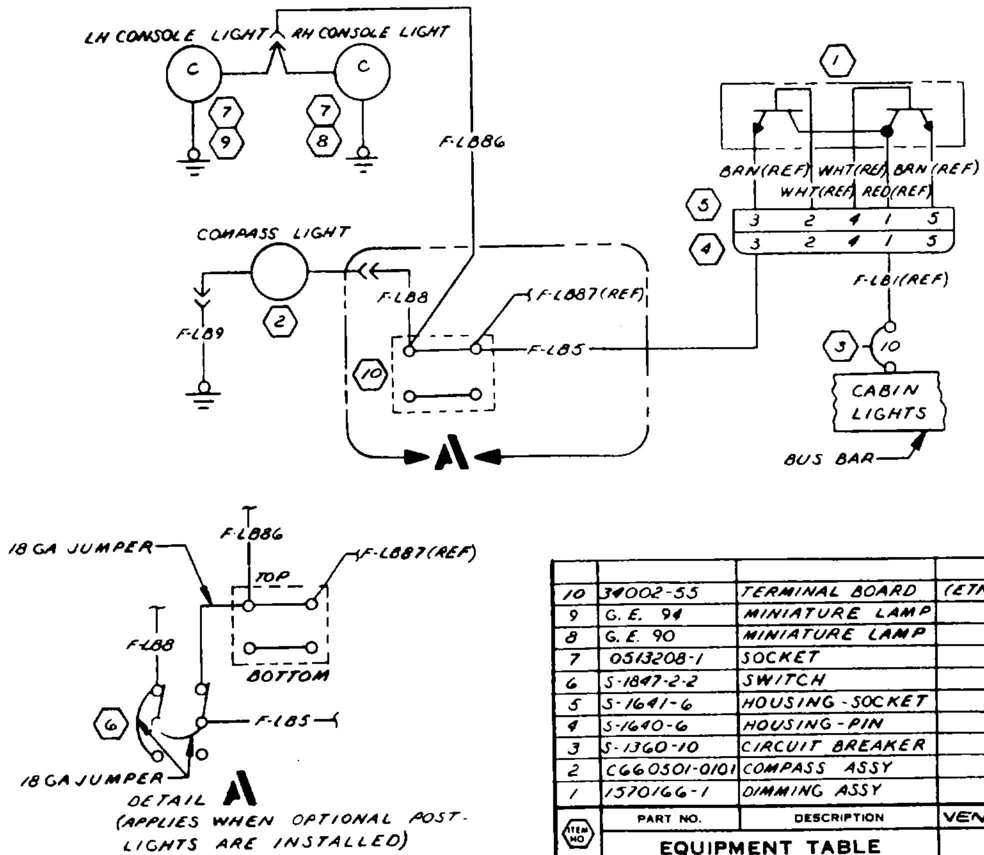
FORM NO. 80-2158

REVISION			
LET	DESCRIPTION	DATE	APPD

NOTES:

1. S-1493-1 TERMINAL REPLACES S-1829-1 WHEN OPT POST LIGHTS ARE INSTALLED

INACTIVE EFF THRU 21059502
VES 8-27-71



ITEM NO	PART NO.	DESCRIPTION	VENDOR
10	34002-55	TERMINAL BOARD	(ETNC)
9	G.E. 94	MINIATURE LAMP	
8	G.E. 90	MINIATURE LAMP	
7	0513208-1	SOCKET	
6	S-1847-2-2	SWITCH	
5	S-1641-6	HOUSING-SOCKET	
4	S-1640-6	HOUSING-PIN	
3	S-1360-10	CIRCUIT BREAKER	
2	C660501-0101	COMPASS ASSY	
1	1570166-1	DIMMING ASSY	

EQUIPMENT TABLE

WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS
F-LB86	18			S-341-2	S-1829-1		
F-LB9	18			S-341-2	S-1367-1-8		
F-LB8	18			S-1829-1	S-341-2	1	
F-LB5	18			S-1829-1	S-1636-2	1	

WIRE TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES: 12210-864

SUPERSEDED BY: 1270709

CONTRACT NO:

	NAME	DATE
DESIGN		
GROUP		
DRAWN	J R CONLEY	7-11-69
CHECK	R. YOUNGERS	7-12-69
STRESS	[illegible]	[illegible]
PROJ.	[illegible]	[illegible]
APPD	[illegible]	7-8-69
OTHER		

Cessna AIRCRAFT CO. COMMERCIAL AIRCRAFT DIV. 5800 E. PAWNEE WICHITA, KANSAS

TITLE: WIRING DIAGRAM — CONSOLE & COMPASS LIGHTS

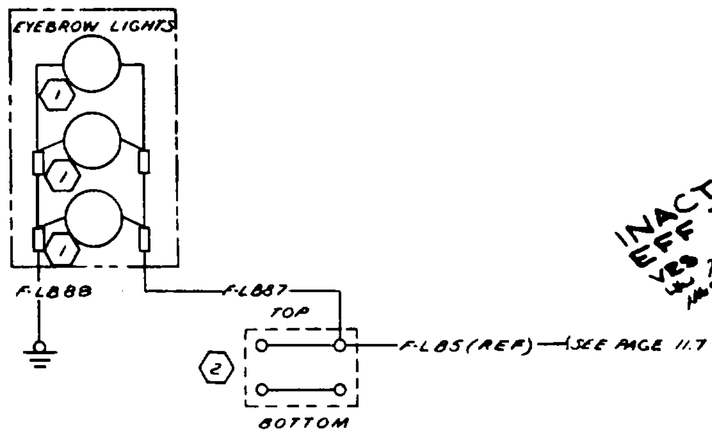
SIZE	CODE IDENT. NO.	DWG NO
C	71379	1270701

SCALE: NONE 210 PAGE: 11.7

(SR6031) II

FORM NO 80-2158

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: LB-88 WAS LB-87 ED & RR 14111 SER 21059200 & ON	J.D.R. 10/22/69	[illegible] DLB



INACTIVE EFF THRU 21059502
VES 9-27-71

F-LB88	18			S-1370-1	S-1367-1-6		
F-LB87	18			S-1370-1	S-1829-1		
WIRE CODE NO.	GA	MATERIAL	LG	TERMINALS			SERIALS

WIRE TABLE

2	S4002-5S	TERMINAL BOARD	(ETNC)
1	23-288	LIGHT ASSY	(95263)
ITEM NO.	PART NO.	DESCRIPTION	

EQUIPMENT TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES: 12210-864

SUPERSEDED BY: 1270709

CONTRACT NO:

	NAME	DATE
DESIGN	PLUMMER	
GROUP	[illegible]	7-21-69
DRAWN	J.R. CONLEY	7-11-69
CHECK	R. YOUNGERS	7-15-69
STRESS	[illegible]	7-17-69
PROJ	[illegible]	7-23-69
APPD	[illegible]	7-15-69
OTHER		

Cessna AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

TITLE
WIRING DIAGRAM — EYEBROW LIGHTS

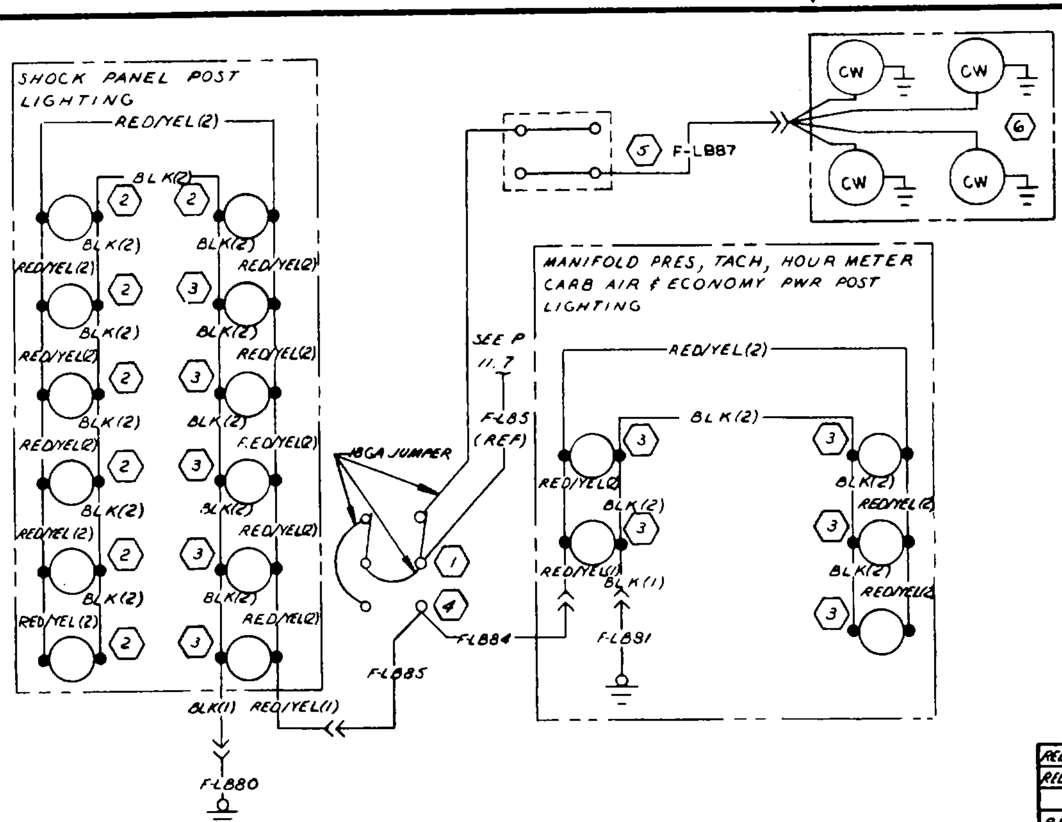
SIZE	CODE IDENT. NO.	DWG NO
C	71379	1270701

SCALE: NONE | 210 | PAGE: 11.8

(SR 6031) IX

FORM NO. 60-2158

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: ADD 1270479-2, F-LB87 & NOTE 3 ED & RR 10742 (SR6031) IX	RAINES 9/29/69	



INACTIVE EFF THRU 21059502 VES 8-27-71

NOTES:

1. TYPICAL 2 PLACES
2. TYPICAL 15 PLACES
3. WHEN POST LIGHTS ARE INSTALLED, F-LB87 IS CONNECTED TO S-1847-2-2 SWITCH. AN 18GA JUMPER IS INSTALLED BETWEEN SWITCH AND 34002-55 TERMINAL BOARD. SWITCH SIDE OF JUMPER HAS S-1493-1 TERMINAL. TERMINAL BOARD SIDE OF JUMPER HAS S-1829-1 TERMINAL. REPLACE S-1829-1 TERMINAL ON F-LB87 WITH AN S-1493-1

WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS
RED/YEL(2)	22			SOLDER	SOLDER	2	
RED/YEL(1)	22			SOLDER	S-341-2	1	
BLK(2)	22			SOLDER	SOLDER	2	
BLK(1)	22			SOLDER	S-341-2	1	
F-LB87	22			S-341-2	S-1829-1	3	
F-LB85	18			S-1493-1	S-341-1		
F-LB84	18			S-1493-1	S-341-1		
F-LB81	18			S-13671-8	S-341-1		
F-LB80	18			S-13671-8	S-341-1		

WIRE TABLE

ITEM NO.	PART NO.	DESCRIPTION	
6	1270479-2	LIGHT ASSY	
5	34002-55	TERMINAL BOARD	(ETNC)
4	S-2023-1	TERM. ADAPTER	
3	S-1899-2	POST LIGHT ASSY	
2	S-1899-1	POST LIGHT ASSY	
1	S-1847-2-2	SWITCH	

EQUIPMENT TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES: 12210-864

SUPERSEDED BY: 1270709

CONTRACT NO:

	NAME	DATE
DESIGN	PLUMMER	
GROUP	H Wise	7-21-69
DRAWN	J R CONLEY	7-11-69
CHECK	R YOUNGERS	7-12-69
STRESS	R.F. GEIDE	7-17-69
PROJ		7-13-69
APPD		7-25-69
OTHER		

Cessna AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

TITLE
WIRING DIAGRAM — POST LIGHTING (OPT)

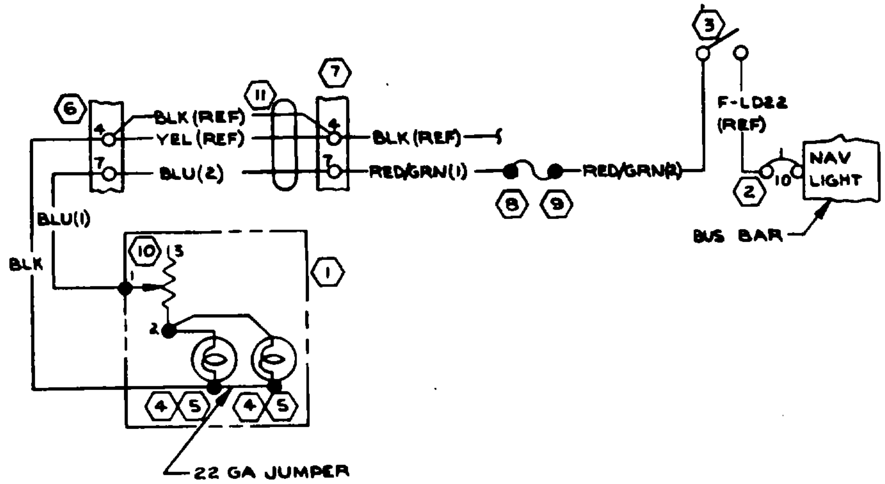
SIZE	CODE IDENT. NO.	DWG NO
C	71379	1270701

SCALE: NONE 210 PAGE: 11.9

(SR6031) II

FORM NO 80-2158

REVISION			
LET	DESCRIPTION	DATE	APPD



INACTIVE:
EFF THRU SER 21059351
6-30-70
EDRR 10907

NOTES:

1. PART OF SF-1030-BX (08261) CABLE
2. 329636 (00779) TERMINAL

WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS
BLU(2)		1		2	2		
BLU(1)	22	-22-6		SOLDER	2		
RED/GRN(2)	22	-22-2-5		SOLDER	S-1493-1		
RED/GRN(1)	22	-22-2-5		2	SOLDER		
BLK	22	-22-0		SOLDER	2		

WIRE TABLE

ITEM NO.	PART NO.	DESCRIPTION	
11	SF-1030-BX	CABLE	08261
10	K-350	POT	10582
9	HHJ-A	FUSEHOLDER	71400
8	AGC-1/2	FUSE	71400
7	351-11-08-001	TERMINAL BLOCK	71785
6	351-11-07-001	TERMINAL BLOCK	71785
5	S-1902-1	SOCKET	
4	S-1894-1	LAMP	
3	S-1845-1-2	SWITCH	
2	S-1360-10	CKT BKR	
1	1270686-1	MAP LIGHT ASSY	

EQUIPMENT TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA
STD. NO.

SUPERSEDES:

SUPERSEDED BY: P 11.12

CONTRACT NO:

	NAME	DATE
DESIGN	HARDEN	5-8-69
GROUP	H. Wme	9-6-69
DRAWN	MARIO	9/3/69
CHECK	J. HARRIS	9.4.69
STRESS	RFGEIVE	9-5-69
PROJ	N.M. Fata	9-8-69
APPD	SWANEY	9-5-69
OTHER		

Cessna AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

TITLE
WIRING DIAGRAM — MAP LIGHT, CONTROL WHEEL (12 VOLT)

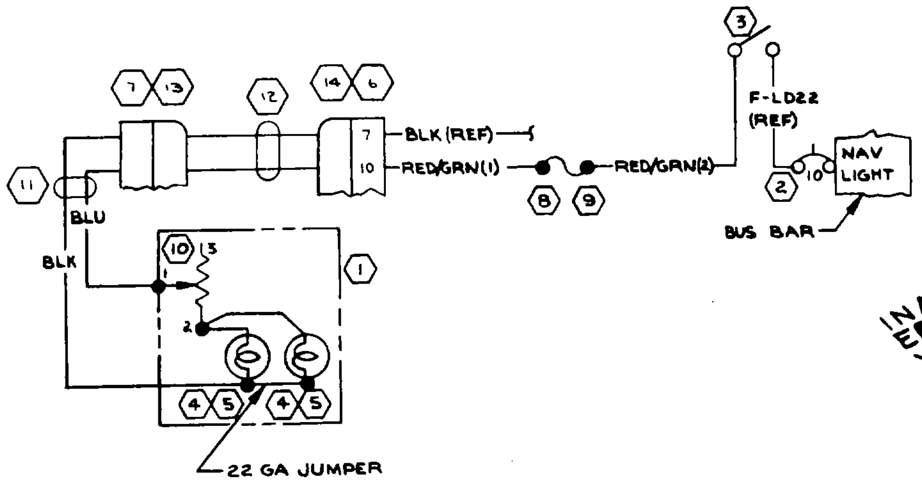
SIZE	CODE IDENT. NO.	DWG NO
C	71379	1270701

SCALE: NONE | 2.10 | PAGE: 11.11

ED/RR 10655 SER 21059200 & ON

FORM NO. 80 2158

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: PIN 7 WAS PIN 6 (SR 6393)	9-16-70	VRS



INACTIVE
EFF THRU 21059502
VRS 8-27-11

NOTES:

1. 60215-4LP (00779) TERMINAL

ITEM NO	PART NO.	DESCRIPTION	
14	1270062-1	CKT BOARD	
13	1270061-1	CKT BOARD	
12	1270060-1	CABLE ASSY	
11	SF-1030-BX	CABLE	08261
10	K-350	POT	10582
9	HHJ-A	FUSEHOLDER	71400
8	AGC-1/2	FUSE	71400
7	255 10 30 190	CONNECTOR	71785
6	582384-9	SOCKET	00779
5	S-1902-1	SOCKET	
4	S-1894-1	LAMP	
3	S-1845-1-2	SWITCH	
2	S-1360-10	CKT BKR	
1	1270686-1	MAP LIGHT ASSY	

EQUIPMENT TABLE

WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS
BLU	22	-22-6		SOLDER	SOLDER		
RED/GRN(2)	22	-22-2-5		SOLDER	~~S-1493-1~~		
RED/GRN(1)	22	-22-2-5		◁1	SOLDER		
BLK	22	-22-0		SOLDER	SOLDER		

WIRE TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES: P 11.11

SUPERSEDED BY: 1270709

CONTRACT NO:

	NAME	DATE
DESIGN	[illegible]	7-1-[illegible]
GROUP	[illegible]	7-2-70
DRAWN	PAPE	6-30-70
CHECK	L.K. WHITE	7-1-70
STRESS		
PROJ	[illegible]	7-1-70
APPD		
OTHER		

Cessna AIRCRAFT CO. COMMERCIAL AIRCRAFT DIV. 5800 E. PAWNEE WICHITA, KANSAS

TITLE: WIRING DIAGRAM — MAP LIGHT, CONTROL WHEEL (12 VOLT)

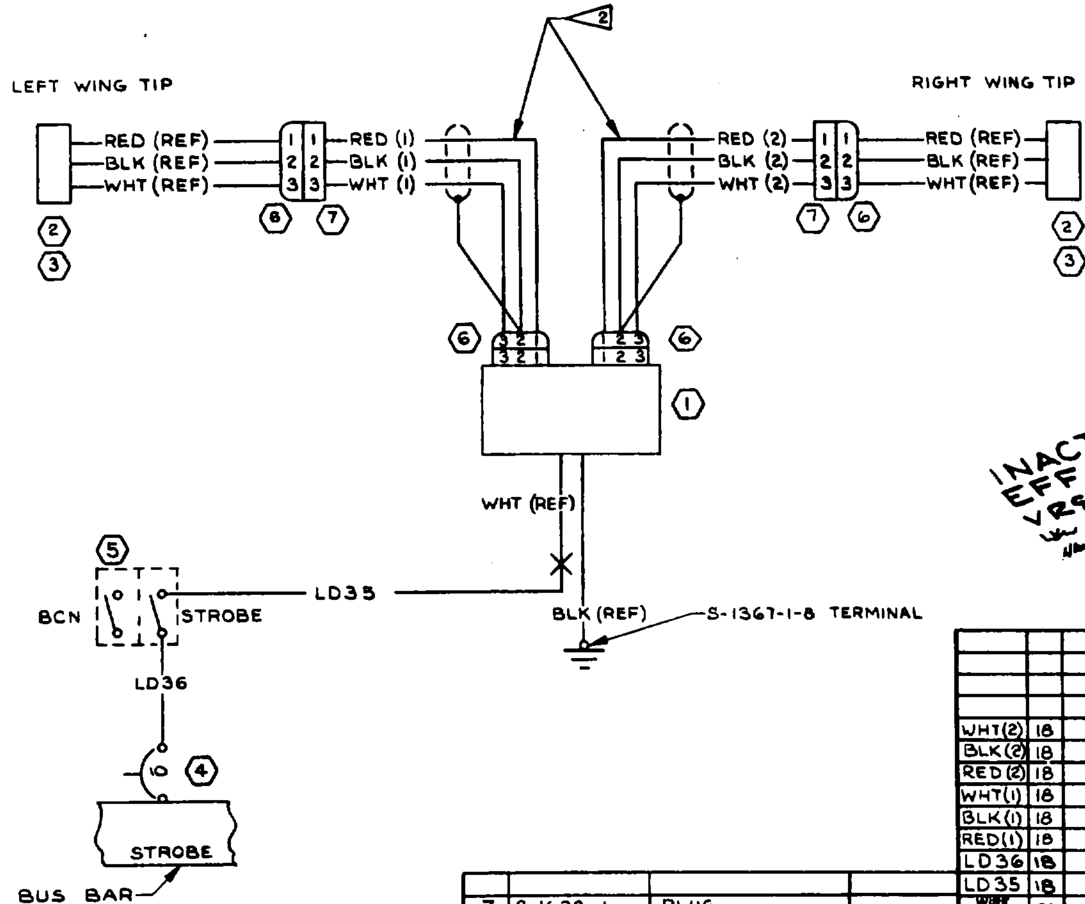
SIZE	CODE IDENT. NO.	DWG NO
C	71379	1270701

SCALE: NONE 210 PAGE: 11.12

ED/RR 10907 (SR6353)IX

FORM NO 80-2158

LET	DESCRIPTION	DATE	APPD
A	BY REV: 18 GA WAS 20 GA/LD35 & LD36 ED & RR 10087	RLY 6-23-70	
B	BY REV: C622004-0103 WAS C622004-0101 (NOW SHOP PRACTICE)	RLY 8-21-70	RLY



INACTIVE
EFF THRU 21059502
VRS 8-27-71

NOTES:

1. INSTALL A 1270695-1 CLIP ON "BCN" SIDE OF S-1846-2-3 WHEN FLASHING IS NOT INSTALLED.

2. THREE CONDUCTOR CABLE, BELDEN (70903) PART NO. 8770 OR EQUIVALENT TO BE USED.

WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS
WHT(2)	18	2		S-1636-1	S-1635-1		
BLK(2)	18	2					
RED(2)	18	2					
WHT(1)	18	2					
BLK(1)	18	2					
RED(1)	18	2		S-1636-1	S-1635-1		
LD36	18			S-1367-1-8	S-1493-1		
LD35	18			S-1370-1	S-1493-1		

WIRE TABLE

ITEM NO.	PART NO.	DESCRIPTION
7	S-1638-1	PLUG
6	S-1638-2	CAP
5	S-1846-2-3	SWITCH
4	S-1360-10	CKT BREAKER
3	C622003-0104	LENS
2	C622003-0101	LIGHT
1	C622004-0103	POWER SUPPLY

EQUIPMENT TABLE

CES-1000 IS APPLICABLE VENDOR CODES PER S-1400 CES-XXXX=CESSNA SPEC. NO. S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES:

SUPERSEDED BY: 1270709

CONTRACT NO:

	NAME	DATE
DESIGN	D.L. Burke	12-19-69
GROUP	H. Wise	12-18-69
DRAWN	BLURTON	12-17-69
CHECK	HARRIS	12-18-69
STRESS		
PROJ	N. McCarter	12-18-69
APPD	R. YOUNGERS	12-18-69
OTHER		

Cessna AIRCRAFT CO. COMMERCIAL AIRCRAFT DIV. 5800 E. PAWNEE WICHITA, KANSAS

TITLE

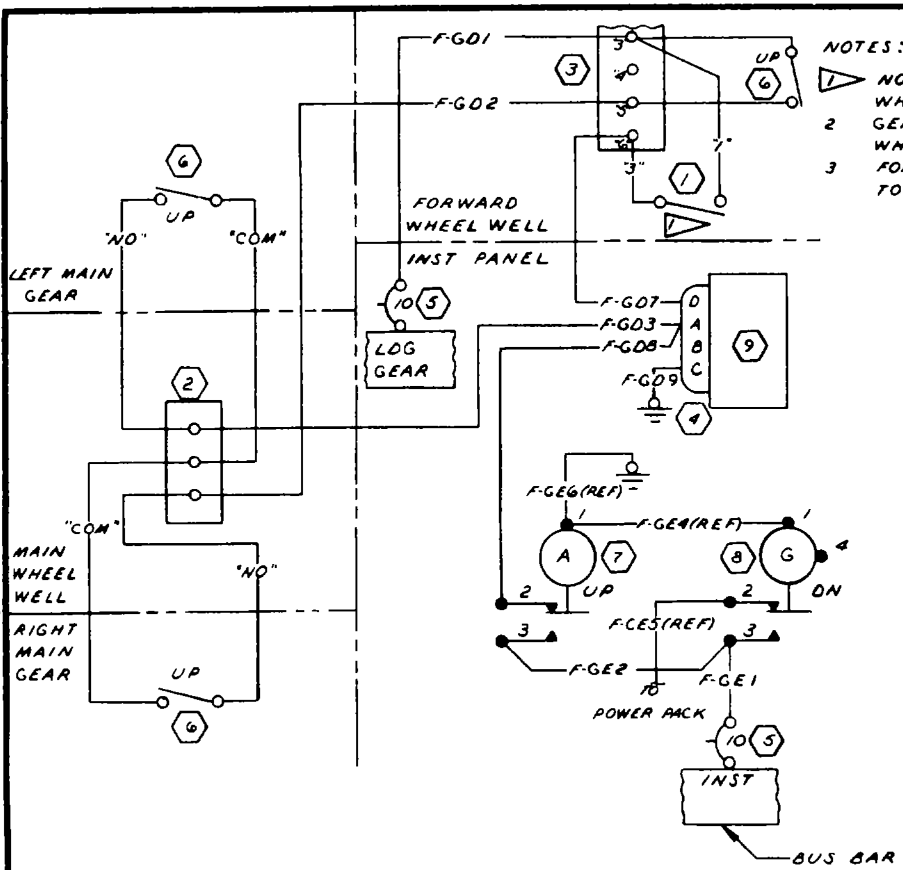
WIRING DIAGRAM — WING TIP STROBE LIGHTS (OPTIONAL)

SIZE C | CODE IDENT. NO. 71379 | DWG NO 1270701

SCALE: NONE | 210 | PAGE: 11.15

FORM NO. 80-3159

ED & RR 10826 (SR6393) IX



NOTES:

1. NOSE GEAR SQUAT SWITCH CLOSED WHEN STRUT IS EXTENDED
2. GEAR UP SWITCHES ARE CLOSED WHEN GEAR IS LOCKED.
3. FOR GEAR DOWN SWITCHES REFER TO 1270701 PAGE 15.2

INACTIVE EFF THRU 8-27-71 VRS 21059502

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: MS27212-2-6 WAS AN3436-2-6 & MS27212-2-3 WAS AN3436-2-3 & 1270034-4 WAS -1 ED&RR 10767 (SR6031) IX	J.D.R. 10/20/69	DLB

F-GD9	18			SOLDER	S-1367-1-8		
F-GD8	18			SOLDER	SOLDER		
F-GD7	18			S-1367-1-6	SOLDER		
F-GD3	18			S-1367-1-6	SOLDER		
F-GD2	18			S-1367-1-6	S-1367-1-6		
F-GD1	18			S-1367-1-6	S-1367-1-8		
F-GE2	18			SOLDER	SOLDER		
F-GE1	18			S-1367-1-6	SOLDER		
WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS

WIRE TABLE

ITEM NO.	PART NO.	DESCRIPTION	VENDOR
9	2940-1	POWER PACK	(04330)
8	VM920M-3	LIGHT ASSY	(87034)
7	VM911M-4A	LIGHT ASSY	(87034)
6	S-1377-1	SWITCH	
5	S-1360-10	CIRCUIT BREAKER	
4	MS3106A-14S2S	PLUG	
3	MS27212-2-6	TERMINAL BOARD	
2	MS27212-2-3	TERMINAL BOARD	
1	1270034-4	SWITCH	

EQUIPMENT TABLE

CES-1000 IS APPLICABLE VENDOR CODES PER S-1400 CES-XXXX=CESSNA SPEC. NO. S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES: 12210-864

SUPERSEDED BY: 1270709

CONTRACT NO:

	NAME	DATE
DESIGN	PLUMMER	
GROUP	H WISE	7-21-69
DRAWN	J.R. CONLEY	7-11-69
CHECK	R. YOUNGERS	7-12-69
STRESS	[illegible]	[illegible]
PROJ	[illegible]	7-13-69
APPD	[illegible]	7-15-69
OTHER		

Cessna AIRCRAFT CO.

COMMERCIAL AIRCRAFT DIV. 5800 E. PAWNEE WICHITA, KANSAS

TITLE

WIRING DIAGRAM — LANDING GEAR DOOR CONTROL SYSTEM

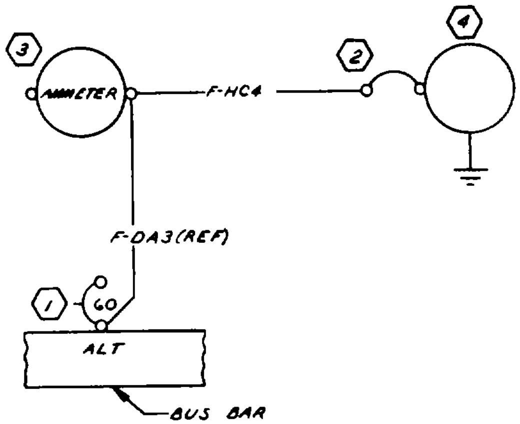
SIZE	CODE IDENT. NO.	DWG NO
C	71379	1270701

SCALE: NONE 210 PAGE: 12.1

(SR6031) IX

FORM NO. 80-2158

REVISION			
LET	DESCRIPTION	DATE	APPD



INACTIVE
EFF THRU 21059502
VRS 8-27-71

WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS
F-HC4	16			S-1367-2-10	S-1367-2-8		

WIRE TABLE

ITEM NO.	PART NO.	DESCRIPTION	
4	0513052-3	CIGAR LIGHTER	
3	C669502-0301	INST CLUSTER	
2	60232-1	CIRCUIT BREAKER	(15472)
1	S-1596-60	CIRCUIT BREAKER	

EQUIPMENT TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA
STD. NO.

SUPERSEDES: 12210-864

SUPERSEDED BY: 1270709

CONTRACT NO:

	NAME	DATE
DESIGN		
GROUP		
DRAWN	J R CONLEY	7-11-69
CHECK	R. YOUNGERS	7-15-69
STRESS	R.F. GEIDE	7-17-69
PROJ	H. McCarter	7-23-69
APPD	[illegible]	7-15-69
OTHER		

Cessna AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

TITLE
WIRING DIAGRAM — CIGAR LIGHTER

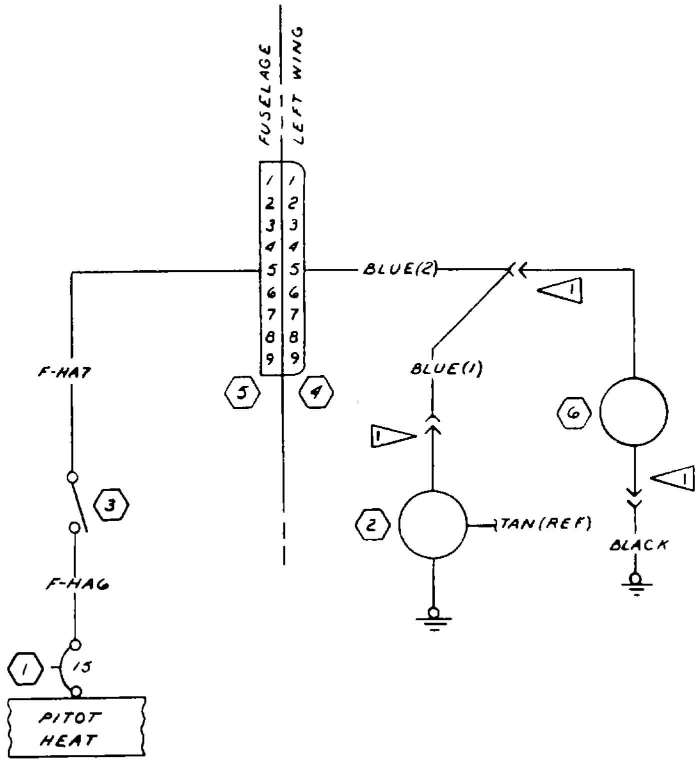
SIZE: C | CODE IDENT. NO. 71379 | DWG NO 1270701

SCALE: NONE | 210 | PAGE: 13.1

(SR6031) IX

FORM NO. 80-2188

REVISION			
LET	DESCRIPTION	DATE	APPD



INACTIVE EFF THRU 2105 9502
VES 8-27-71

NOTES:

1. S-1369-3 TERMINAL ADDED TO VENDOR SUPPLIED WIRE
2. HEATER CIRCUIT SHOWN ONLY, FOR STALL WARNING CIRCUIT SEE PAGE 15.1

ITEM NO.	PART NO.	DESCRIPTION	
6	0721105-15	PITOT TUBE, HEATED	
5	S-1641-9	HOUSING-SOCKET	
4	S-1640-9	HOUSING-PIN	
3	S-1845-1-2	SWITCH	
2	S-1672-2	HEATED STALL DETECTOR	
1	S-1360-15	CIRCUIT BREAKER	

EQUIPMENT TABLE

WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS
BLACK	18	S-1460-18-0		S-1369-1	S-1367-1-8		
BLU(2)	16	S-1460-16-6		S-1635-2	S-1369-2		
BLU(1)	16	S-1460-16-6		SEE BLU(2)	S-1369-2		
F-HA7	16			S-1493-2	S-1636-2		
F-HA6	16			S-1367-2-6	S-1493-2		

WIRE TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES: 12210-864

SUPERSEDED BY: 1270709

CONTRACT NO:

	NAME	DATE
DESIGN	PLUMMER	
GROUP	H Wise	7-21-69
DRAWN	JR CONLEY	7-11-69
CHECK	R.YOUNGERS	7-12-69
STRESS	K.I. [illegible]	7-17-69
PROJ	[illegible]	7-13-69
APPD	[illegible]	7-15-69
OTHER		

Cessna AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

TITLE
WIRING DIAGRAM — HEATED PITOT TUBE & HEATED STALL WARNING SYSTEM

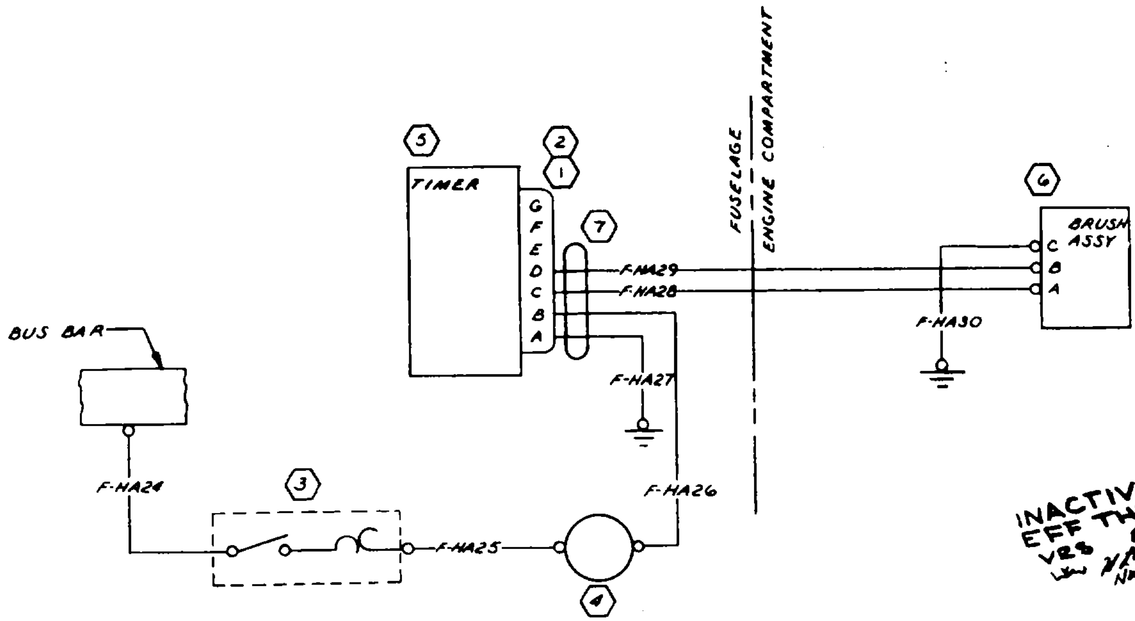
SIZE: C | CODE IDENT. NO: 71379 | DWG NO: 1270701

SCALE: NONE | 210 | PAGE: 13.2

(SR6031) II

FORM NO 80-215B

REVISION			
LET	DESCRIPTION	DATE	APPD



INACTIVE
EFF THRU 21059502
VRS 8-27-71

WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS
F-HA30	12			S-1367-3-10	S-1367-3-13		
F-HA29	12			SOLDER	S-1367-3-10		
F-HA28	12			SOLDER	S-1367-3-10		
F-HA27	12			SOLDER	S-1367-3-8		
F-HA26	12			S-1367-3-10	SOLDER		
F-HA25	12			S-1367-3-10	S-1367-3-10		
F-HA24	12			S-1367-3-10	S-1367-3-10		

WIRE TABLE

ITEM NO.	PART NO.	DESCRIPTION	VENDOR
7	1201013-5	CABLE ASSY	
6	4E1387-4	BRUSH BLOCK ASSY	(25472)
5	3E1540-1	TIMER	(25472)
4	3E1219-6	AMMETER	(25472)
3	1E1140	SWITCH	(25472)
2	MS3106A20-15S	PLUG	
1	MS3057-12A	CLAMP	

EQUIPMENT TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES: 12210-864

SUPERSEDED BY: 1270709

CONTRACT NO:

	NAME	DATE
DESIGN	PLUMMER	
GROUP	H. Wise	7-21-69
DRAWN	J R CONLEY	7-11-69
CHECK	R. YOUNGERS	7-12-69
STRESS	R.F. GEIDE	7-17-69
PROJ	H. McCarter	7-23-69
APPD	[illegible]	7-25-69
OTHER		

Cessna AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

TITLE
WIRING DIAGRAM — PROP DE-ICING SYSTEM 2 BLADE (OPTIONAL)

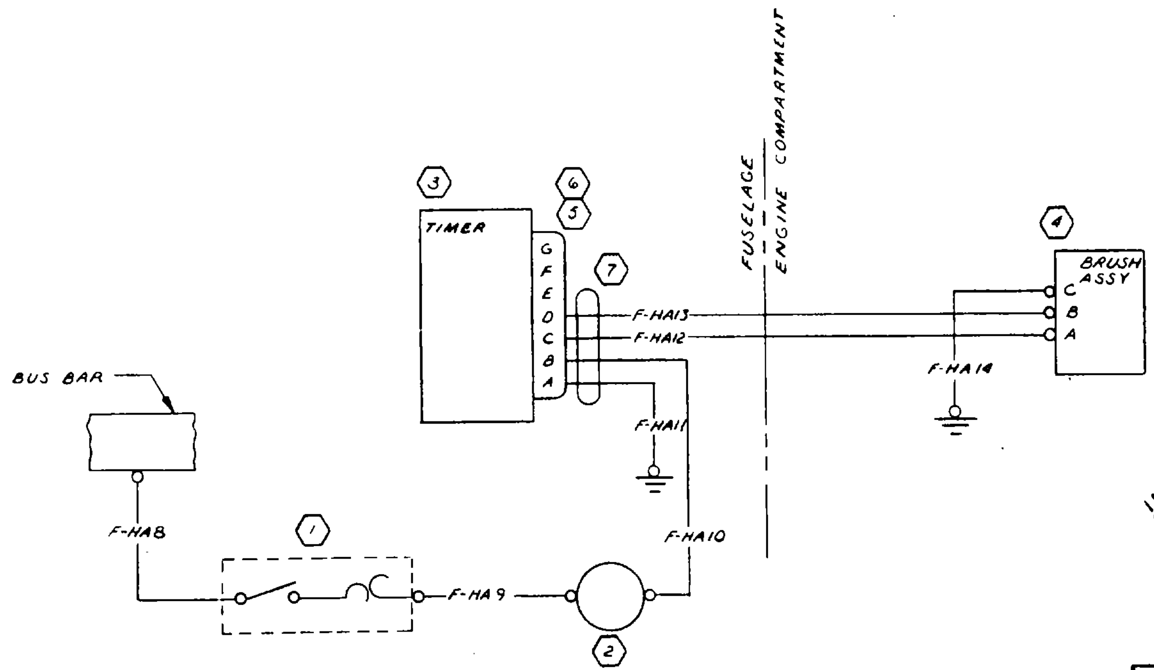
SIZE	CODE IDENT. NO.	DWG NO
C	71379	1270701

SCALE: NONE | 210 | PAGE: 13.3

(SR6031) IX

FORM NO. 80-3158

REVISION			
LET	DESCRIPTION	DATE	APPD



INACTIVE
EFF THRU
VRS 8-27-71
21059502

WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS
F-HA14	10			S-1367-3-10	S-1367-3-13		
F-HA13	10			SOLDER	S-1367-3-10		
F-HA12	10			SOLDER	S-1367-3-10		
F-HA11	10			SOLDER	S-1367-3-8		
F-HA10	10			S-1367-3-10	SOLDER		
F-HA9	10			S-1367-3-10	S-1367-3-10		
F-HA8	10			S-1367-3-10	S-1367-3-10		

WIRE TABLE

ITEM NO	PART NO.	DESCRIPTION	
7	1201013-6	CABLE ASSY	
6	MS3106A020-15S	PLUG	
5	MS3057-12A	CLAMP	
4	4E1387-4	BRUSH BLOCK ASSY	
3	3E1540-1	TIMER	
2	3E1219-7	AMMETER	
1	1E1324	SWITCH	

EQUIPMENT TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA
STD. NO.

SUPERSEDES: 12210-864

SUPERSEDED BY: 1270709

CONTRACT NO:

	NAME	DATE
DESIGN	PLUMMER	
GROUP	H Wise	7-21-69
DRAWN	J R CONLEY	7-11-69
CHECK	R. YOUNGERS	7-12-69
STRESS	R. F. GEIDE	7-17-69
PROJ	W. McCaffrey	7-13-69
APPD	M. Deaney	7-15-69
OTHER		

Cessna AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

TITLE
WIRING DIAGRAM — PROP DE-ICING SYSTEM 3 BLADE (OPTIONAL)

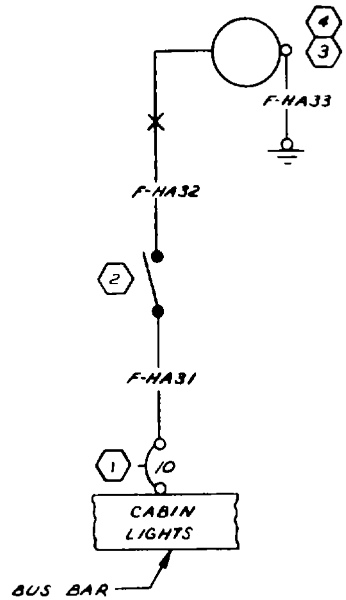
SIZE	CODE IDENT. NO.	DWG NO
C	71379	1270701

SCALE: NONE 210 PAGE: 13.4

(SR6031) II

FORM NO. 80 215B

REVISION			
LET	DESCRIPTION	DATE	APPD



INACTIVE
EFF THRU 21059502
VES 8-27-71

WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS
F-HA33	18			S-1367-1-4	S-1367-1-4		
F-HA32	18			SOLDER	S-1370-1		
F-HA31	18			S-1367-1-6	SOLDER		

WIRE TABLE

ITEM NO	PART NO.	DESCRIPTION	VENDOR
4	A-70798-12	LAMP	(72914)
3	#11-225	LAMPHOLDER	(95263)
2	S-1284-1	SWITCH	
1	S-1360-10	CIRCUIT BREAKER	

EQUIPMENT TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES: R210-864

SUPERSEDED BY: 1270709

CONTRACT NO:

	NAME	DATE
DESIGN	PLUMMER	
GROUP	H. Wise	7-21-69
DRAWN	J R CONLEY	7-11-69
CHECK	R. YOUNGERS	7-12-69
STRESS	H.F. GEIDE	7-17-69
PROJ	W McCarter	7-23-69
APPD	[illegible]	7-15-69
OTHER		

Cessna AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

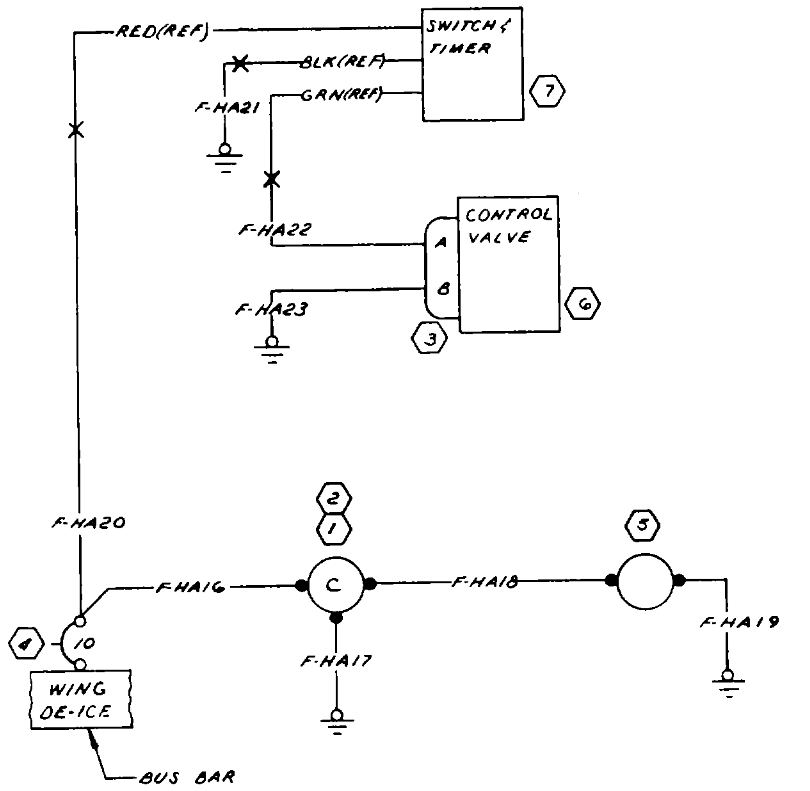
TITLE
WIRING DIAGRAM — LIGHT, ICE DETECTOR (OPT)

SIZE	CODE IDENT. NO.	DWG NO
C	71379	1270701

SCALE: NONE | 210 | PAGE: 13.5

(SR6031) II

FORM NO. 80-2158



INACTIVE EFF THRU 21059502
VRS 8-27-71

REVISION			
LET	DESCRIPTION	DATE	APPD

WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS
F-HA23	18			S-1367-1-8	SOLDER		
F-HA22	18			S-1370-1	SOLDER		
F-HA21	18			S-1370-1	S-1367-1-8		
F-HA20	18			S-1367-1-6	S-1370-1		
F-HA19	18			SOLDER	S-1367-1-8		
F-HA18	18			SOLDER	SOLDER		
F-HA17	18			SOLDER	S-1367-1-8		
F-HA16	18			S-1367-1-6	SOLDER		

WIRE TABLE

ITEM NO.	PART NO.	DESCRIPTION	VENDOR
7	301772-01	SWITCH & TIMER	(25472)
6	301726	CONTROL VALVE	(25472)
5	101194-1	PRESSURE SWITCH	(25472)
4	S-1360-10	CIRCUIT BREAKER	
3	MS3106A-12S-3S	CONNECTOR	
2	MS25041-3	INDICATOR LIGHT	
1	MS25237-330	LAMP	

EQUIPMENT TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES: 12210-864

SUPERSEDED BY: 1270709

CONTRACT NO:

	NAME	DATE
DESIGN		
GROUP	H. Wise	7-21-69
DRAWN	J R CONLEY	7-11-69
CHECK	R. YOUNGERS	7-12-69
STRESS	R.F. GEIDE	7-17-69
PROJ	H. McCarta	7-13-69
APPD	M D Sweeney	7-15-69
OTHER		

Cessna AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

TITLE
WIRING DIAGRAM — WING DE-ICING SYSTEM (OPTIONAL)

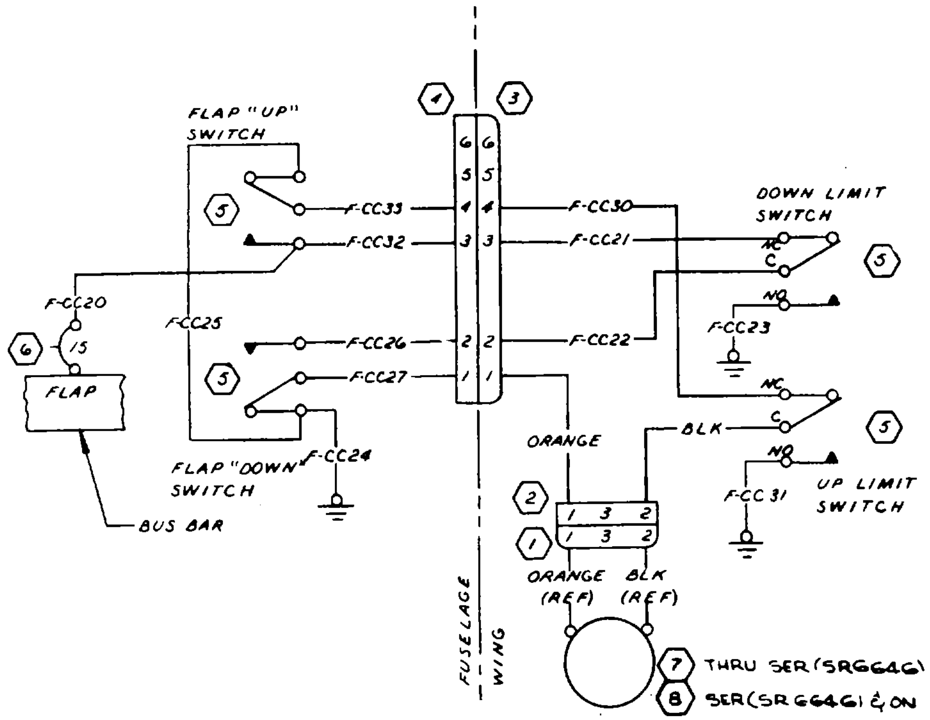
SIZE	CODE IDENT. NO.	DWG NO
C	71379	1270701

SCALE: NONE | 210 | PAGE: 13.6

(SR 6031) II

FORM NO. 80-2158

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: SER OUT C301001-0701 ADD C301002-0201 (SER 6646)	WRC 2-1-71	NEW



INACTIVE EFF THRU 21059502
VRB 8-27-71

WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS
ORN	16			S-1635-2	S-1636-2		
BLK	16			S-1635-2	S-1636-2		
F-CC33	16			S-1367-2-6	S-1636-2		
F-CC32	16			S-1367-2-6	S-1636-2		
F-CC31	16			S-1367-2-6	S-1367-2-8		
F-CC30	16			S-1635-2	S-1367-2-6		
F-CC27	16			S-1367-2-6	S-1636-2		
F-CC26	16			S-1367-2-6	S-1636-2		
F-CC25	16			S-1367-2-6	S-1367-2-6		
F-CC24	16			S-1367-2-6	S-1367-2-8		
F-CC23	16			S-1367-2-6	S-1367-2-8		
F-CC22	16			S-1635-2	S-1367-2-6		
F-CC21	16			S-1635-2	S-1367-2-6		
F-CC20	16			S-1367-2-8	S-1367-2-6		

WIRE TABLE

ITEM NO.	PART NO.	DESCRIPTION	
9			
8	C301002-0201	FLAP ACTUATOR	
7	C301001-0704	FLAP MOTOR	
6	S-1360-15	CIRCUIT BREAKER	
5	S-1906-1	SWITCH	
4	S-1641-6	HOUSING-SOCKET	
3	S-1640-6	HOUSING-PIN	
2	S-1638-2	HOUSING-SOCKET	
1	S-1638-1	HOUSING-PLUG	

EQUIPMENT TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES: 12210-864

SUPERSEDED BY: 1270709

CONTRACT NO:

	NAME	DATE
DESIGN	PLUMMER	
GROUP	H. Wise	7-21-69
DRAWN	J R CONLEY	7-11-69
CHECK	R YOUNGERS	7-12-69
STRESS	R.F. GEIDE	7-17-69
PROJ	N McCarty	7-23-69
APPD	[illegible]	7-15-69
OTHER		

Cessna AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

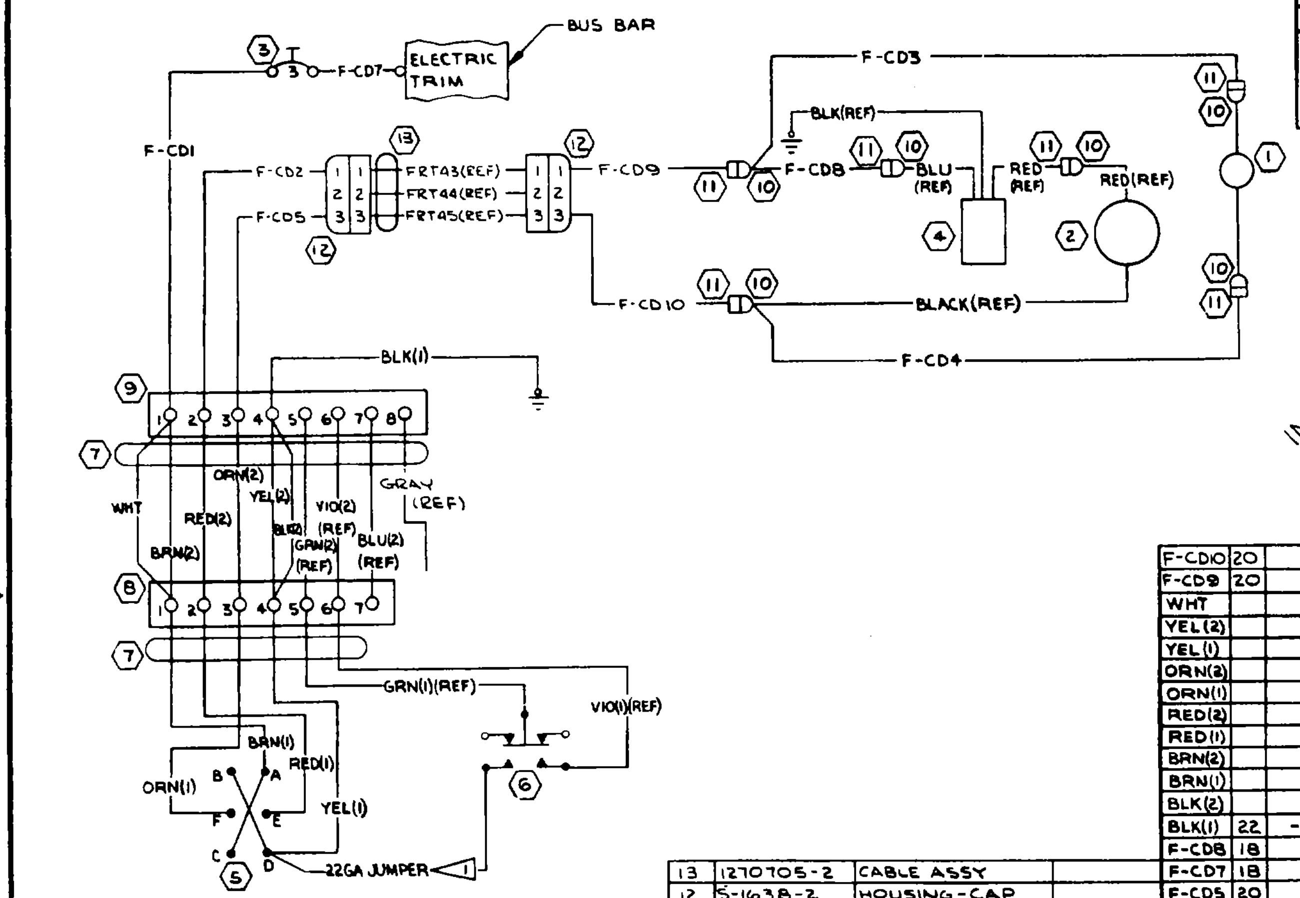
TITLE
WIRING DIAGRAM — WING FLAPS

SIZE	CODE IDENT. NO.	DWG NO
C	71379	1270701

SCALE: NONE 210 PAGE: H.1

(SR6031) IX

FORM NO. 80-2158



LET	DESCRIPTION	DATE	APPD
A	BY REV: ADD 1270705-2, S-1638-2, F-CD9 & F-CD10; S-1635-1 WAS S-1636-1 / F-CD2 & F-CD5 ED & RR 10749 (SR6031) IX	RLY 10-8-69	JWH DKM DLB

INACTIVE: EFF THRU SER 21059351 6-30-70
EDRR 10907

F-CD10	20			S-1635-1	S-1636-1		
F-CD9	20			S-1635-1	S-1636-1		
WHT		◁4		◁2	◁2		
YEL(2)		◁4		◁2	◁2		
YEL(1)		◁4		SOLDER	◁2		
ORN(2)		◁4		◁2	◁2		
ORN(1)		◁4		SOLDER	◁2		
RED(2)		◁4		◁2	◁2		
RED(1)		◁4		SOLDER	◁2		
BRN(2)		◁4		◁2	◁2		
BRN(1)		◁4		SOLDER	◁2		
BLK(2)		◁4		◁2	◁2		
BLK(1)	22	-22-0		◁2	S-1367-1-8		
F-CD8	18			S-1635-1	S-1636-1		
F-CD7	18			S-1367-1-8	S-1367-1-8		
F-CD5	20			◁2	S-1635-1		
F-CD4	20			S-1635-1	S-1636-1		
F-CD3	20			SEE F-CD8	S-1636-1		
F-CD2	20			◁2	S-1635-1		
F-CD1	20			◁2	S-1367-1-8		
WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS

WIRE TABLE

ITEM NO	PART NO.	DESCRIPTION	
13	1270705-2	CABLE ASSY	
12	S-1638-2	HOUSING-CAP	
11	S-1637-2	HOUSING-PLUG	
10	S-1637-1	HOUSING-CAP	
9	351-11-08-001	TERMINAL BLOCK	(71785)
8	351-11-07-001	TERMINAL BLOCK	(71785)
7	SF-1030-BX	CABLE	(08261)
6	S-1985-1	MIKE SW	
5	S-2030-1	PITCH TRIM SW	
4	1409	VOLTAGE REG	◁3
3	7271-8-3	CKT BKR	(82647)
2	1560322-25	MOTOR ASSY	
1	1560321-12	CLUTCH	

EQUIPMENT TABLE

NOTES:

1. IF MIKE SWITCH IS INSTALLED WITH ELECTRIC TRIM SWITCH, DELETE YELLOW WIRE TO PIN "D" OF TRIM SWITCH & ADD JUMPER TO MIKE SWITCH. REFER TO 1270700 PG 2.33 FOR MIKE SWITCH WIRING
2. PART NO. IS 529636, VENDOR CODE IS 00779
3. VENDOR FOR 1409 VOLTAGE REGULATOR IS ADVANCED AVIONICS 1806 W. SECOND WICHITA, KANSAS
4. PART OF SF-1030-BX (08261) CABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC NO.
S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES

SUPERSEDED BY: P 14.5

CONTRACT NO:

	NAME	DATE
DESIGN	HARDEN	9-8-69
GROUP	H Wise	9-6-69
DRAWN	MARIO	9-3-69
CHECK	J. HARRIS	9-4-69
STRESS	[illegible]	[illegible]
PROJ	[illegible]	[illegible]
APPD	SWANEY	9-5-69

OTHER

Cessna AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

TITLE
WIRING DIAGRAM — ELECTRIC ELEVATOR TRIM (OPTIONAL)

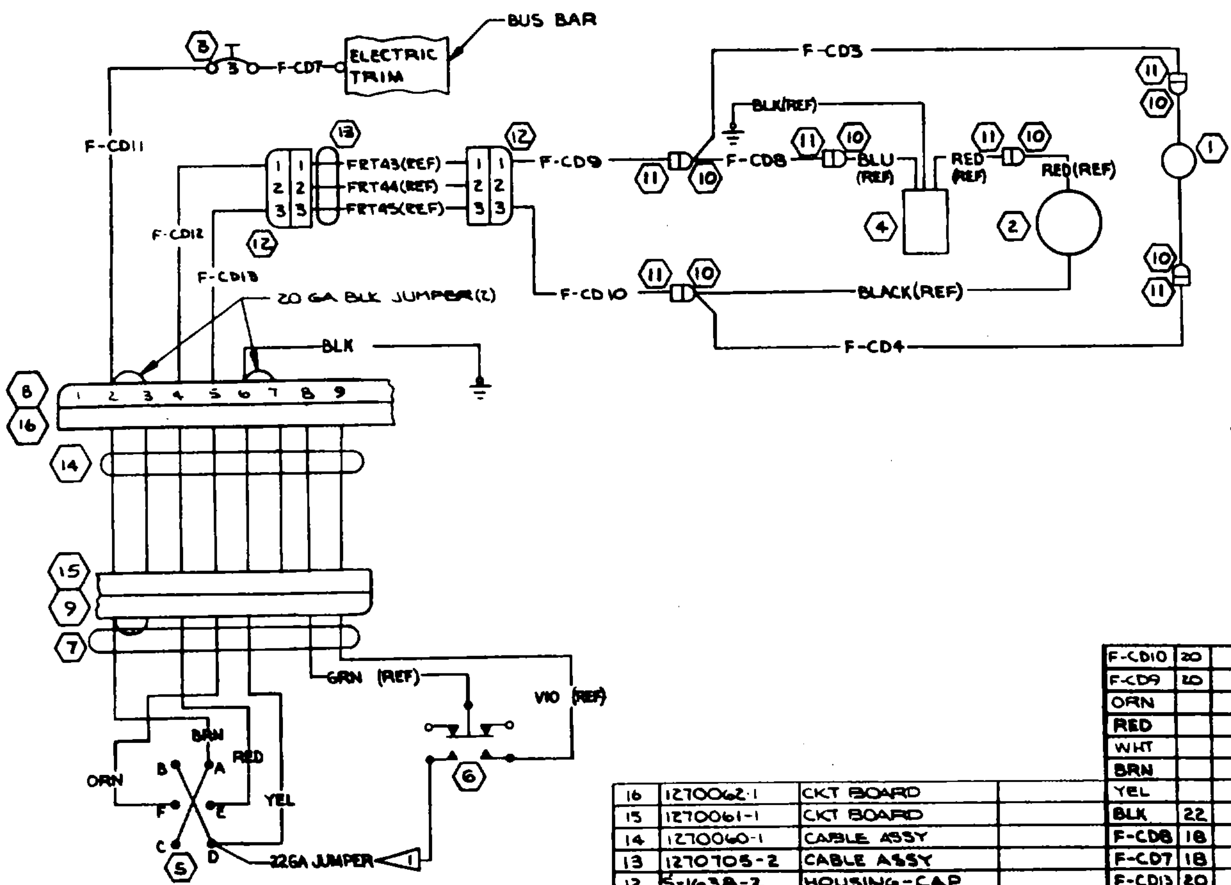
SIZE C | CODE IDENT. NO 71379 | DWG NO 1270701

SCALE: NONE | 210 | PAGE: 14.4

ED & RR 10655 SER 21058200 & ON

FORM NO 80 21-B

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: RED WIRE WAS CONNECTED TO PIN 3, ORN WIRE WAS CONNECTED TO PIN 4, YEL WIRE WAS CONNECTED TO PIN 5, GRN WIRE WAS CONNECTED TO PIN 6, VIO WIRE WAS CONNECTED TO PIN 7. (SR6393)	9-16-70	VRS



INACTIVE
EFF THRU 21059502
VRS 8-27-71

NOTES:

1. IF MIKE SWITCH IS INSTALLED WITH ELECTRIC TRIM SWITCH, DELETE YELLOW WIRE TO PIN "D" OF TRIM SWITCH & ADD JUMPER TO MIKE SWITCH. REFER TO 1270700 FOR MIKE SWITCH WIRING
2. PART NO. 6015-4LP ,VENDOR CODE IS 00779
3. VENDOR FOR 1409 VOLTAGE REGULATOR IS ADVANCED AVIONICS 1806 W.SECOND WICHITA, KANSAS
4. PART OF SF-1030-BX(08261) CABLE

ITEM NO.	PART NO.	DESCRIPTION	
16	1270062-1	CKT BOARD	
15	1270061-1	CKT BOARD	
14	1270060-1	CABLE ASSY	
13	1270705-2	CABLE ASSY	
12	S-1638-2	HOUSING-CAP	
11	S-1637-2	HOUSING-PLUG	
10	S-1637-1	HOUSING-CAP	
9	255 10 30 190	CONNECTOR	(71785)
8	582384-9	SOCKET	(00779)
7	SF-1030-BX	CABLE	(08261)
6	S-1985-1	MIKE SW	
5	S-2030-1	PITCH TRIM SW	
4	1409	VOLTAGE REG	3
3	7271-8-3	CKT BKR	(82647)
2	1560322-25	MOTOR ASSY	
1	1560321-12	CLUTCH	

EQUIPMENT TABLE

WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS
F-CD10	20			S-1635-1	S-1636-1		
F-CD9	20			S-1635-1	S-1636-1		
ORN		4		SOLDER	SOLDER		
RED		4					
WHT		4					
BRN		4					
YEL		4		SOLDER	SOLDER		
BLK	22	-22-0		2	S-1367-1-8		
F-CD8	18			S-1636-1	S-1636-1		
F-CD7	18			S-1367-1-8	S-1367-1-8		
F-CD13	20			2	S-1635-1		
F-CD4	20			S-1635-1	S-1636-1		
F-CD3	20			SEE F-CD8	S-1636-1		
F-CD12	20			2	S-1635-1		
F-CD11	20			2	S-1367-1-8		

WIRE TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES: P 14.4

SUPERSEDED BY: 1270709

CONTRACT NO:

	NAME	DATE
DESIGN	[illegible]	7-2-70
GROUP	H. Wise	7-2-70
DRAWN	PAPE	6-30-70
CHECK	L.K. WHITE	7-1-70
STRESS		
PROJ	[illegible]	7-2-70
APPD		
OTHER		

Cessna AIRCRAFT CO. COMMERCIAL AIRCRAFT DIV. 5800 E. PAWNEE WICHITA, KANSAS

TITLE
WIRING DIAGRAM — ELECTRIC ELEVATOR TRIM (OPTIONAL)

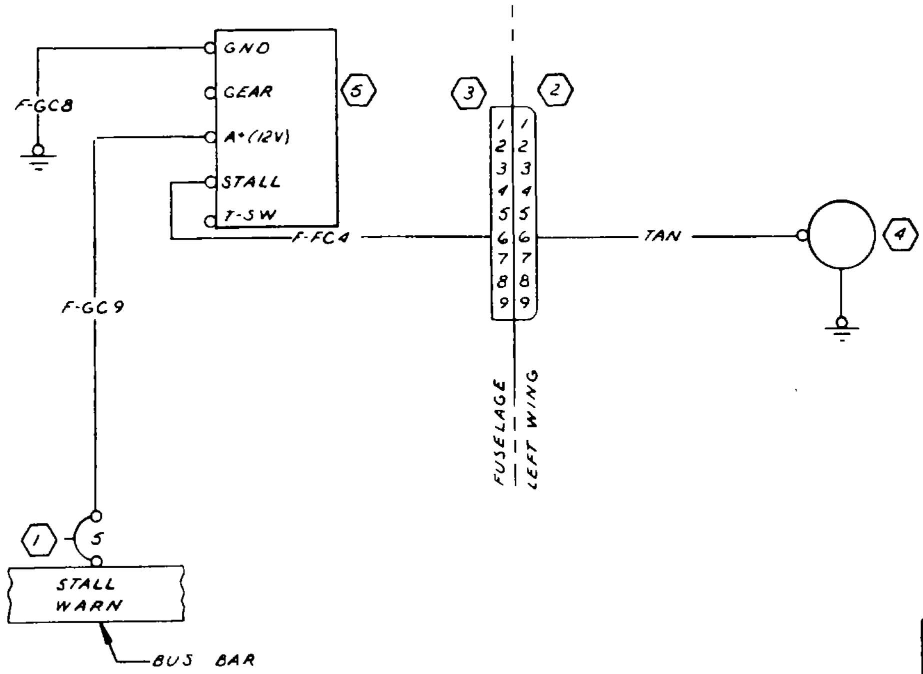
SIZE C | CODE IDENT. NO. 71379 | DWG NO 1270701

SCALE: NONE | 210 | PAGE: 14.5

ED(RR 10907 (SR6393)IX

FORM NO. 80-3150

REVISION			
LET	DESCRIPTION	DATE	APPD



INACTIVE
EFF THRU 21059502
VES 8-27-71

WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS
TAN	18			S-1635-2	S-1367-1-6		
F-GC 9	18			S-1367-1-6	S-1367-1-6		
F-GC 8	18			S-1367-1-6	S-1367-1-8		
F-FC 4	18			S-1636-2	S-1367-1-6		

WIRE TABLE

ITEM NO	PART NO.	DESCRIPTION	
5	R13242-1	WARNING UNIT	
4	S-1672-1	STALL DETECTOR	
3	S-1641-9	HOUSING-SOCKET	
2	S-1640-9	HOUSING-PIN	
1	S-1360-5	CIRCUIT BREAKER	

EQUIPMENT TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO
S-XXX OR CMXXXX=CESSNA
STD. NO.

SUPERSEDES: R210-864

SUPERSEDED BY: 1270709

CONTRACT NO:

	NAME	DATE
DESIGN	PLUMMER	
GROUP	H. Wise	7-21-69
DRAWN	J.R. CONLEY	7-11-69
CHECK	R. YOUNGERS	7-12-69
STRESS	R.F. GEIDE	7-11-69
PROJ	H. McCarten	7-13-69
APPD	[illegible]	7-15-69
OTHER		

Cessna AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

TITLE
WIRING DIAGRAM — STALL WARNING SYSTEM

SIZE	CODE IDENT. NO.	DWG NO
C	71379	1270701

SCALE: NONE | 210 | PAGE: 15.1

ISR 6031, II

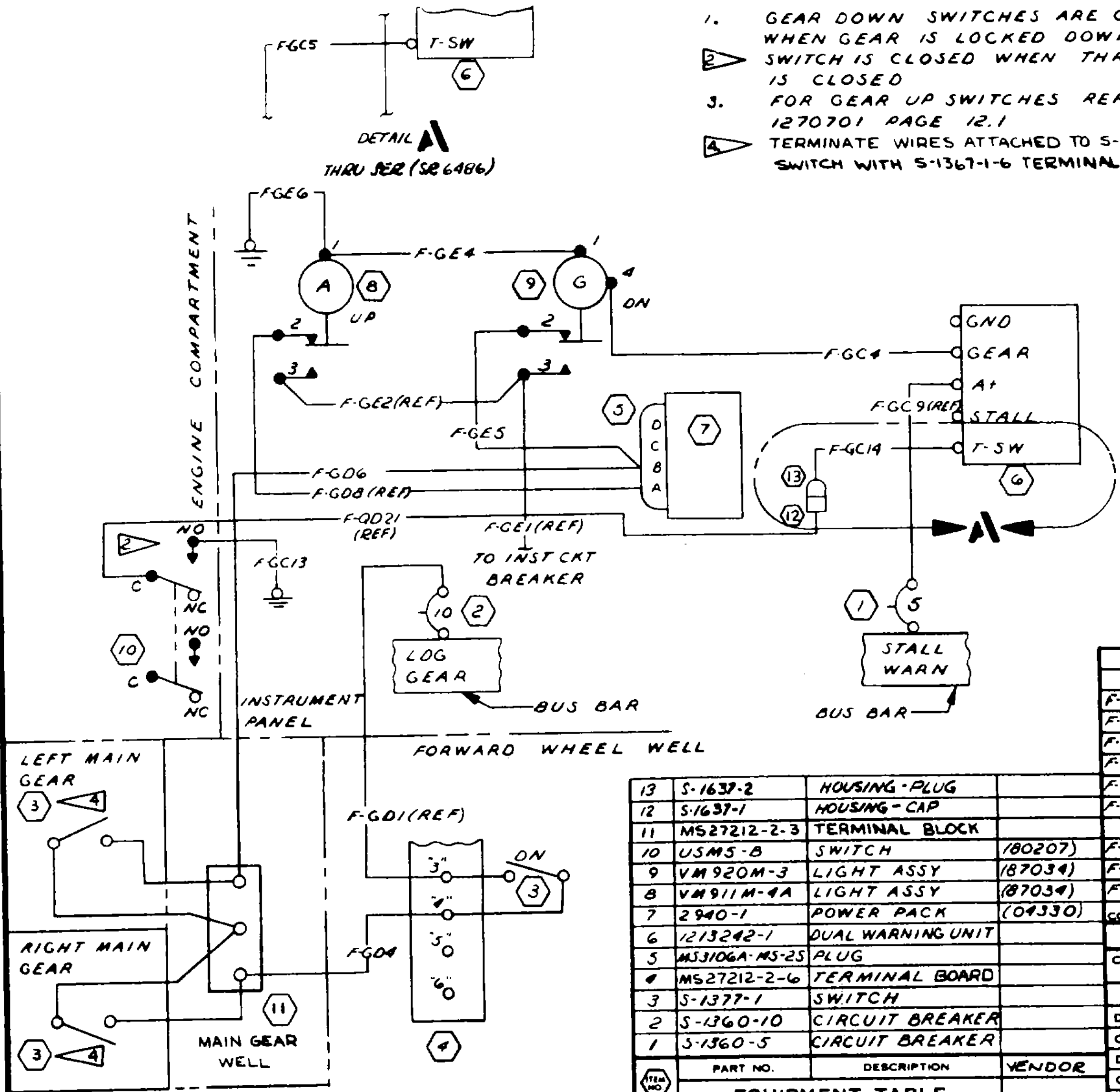
FORM NO 80 215B

NOTES:

1. GEAR DOWN SWITCHES ARE CLOSED WHEN GEAR IS LOCKED DOWN
2. SWITCH IS CLOSED WHEN THROTTLE IS CLOSED
3. FOR GEAR UP SWITCHES REFER TO 1270701 PAGE 12.1
4. TERMINATE WIRES ATTACHED TO S-1377-1 SWITCH WITH S-1367-1-6 TERMINAL

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REF: ADD MS27212-2-3 & NOTE 4; S-1367-1-6 WAS S-1370-1 & MS27212-2-6 WAS AN 3436-2-6; ED & RR 10767 (SR6031) IX	J.D.R.	DLB
B	BY REV: ADD ITEMS 12 & 13 & F-QD21 (REF); SER IN F-GC14; SER OUT F-GC5; ED&RR10011 (SR6986)	JG 5-6-70	

INACTIVE EFF THRU 21059502 YES 8-27-71



F-GC14	18			S-1367-1-6	SOLDER	SER(SR6986) & ON
F-GC13	18			SOLDER	S-1367-1-6	
F-GE6	18			S-1367-1-6	SOLDER	
F-GE5	18			SOLDER	SOLDER	
F-GE4	18			SOLDER	SOLDER	
F-GD6	18			S-1367-1-6	SOLDER	
F-GD4	18			S-1367-1-6	S-1367-1-6	
F-GC5	18			S-1367-1-6	SOLDER	THRU SER(SR6986)
F-GC4	18			S-1367-1-6	SOLDER	
WIRE CODE NO	GA	MATERIAL	LG	TERMINALS		SERIALS

WIRE TABLE

13	S-1637-2	HOUSING-PLUG	
12	S-1637-1	HOUSING-CAP	
11	MS27212-2-3	TERMINAL BLOCK	
10	USM5-B	SWITCH	(80207)
9	VM920M-3	LIGHT ASSY	(87034)
8	VM911M-4A	LIGHT ASSY	(87034)
7	2940-1	POWER PACK	(04330)
6	1213242-1	DUAL WARNING UNIT	
5	MS3106A-MS-2S	PLUG	
4	MS27212-2-6	TERMINAL BOARD	
3	S-1377-1	SWITCH	
2	S-1360-10	CIRCUIT BREAKER	
1	S-1360-5	CIRCUIT BREAKER	
ITEM NO	PART NO.	DESCRIPTION	VENDOR

EQUIPMENT TABLE

CES-1000 IS APPLICABLE VENDOR CODES PER S-1400 CES-XXXX=CESSNA SPEC. NO. S-XXX OR CMXXXX=CESSNA STD NO.

SUPERSEDES: 12210-864

SUPERSEDED BY: 1270709

CONTRACT NO.

	NAME	DATE
DESIGN	PLUMMER	
GROUP	H Wise	7-21-69
DRAWN	JR CONLEY	7-11-69
CHECK	R.YOUNGERS	7-12-69
STRESS	KF GEIDE	7-17-69
PROJ		7-23-69
APPD		7-15-69
OTHER		

Cessna AIRCRAFT CO. COMMERCIAL AIRCRAFT DIV. 5800 E. PAWNEE WICHITA, KANSAS

TITLE WIRING DIAGRAM — GEAR WARNING SYSTEM

SIZE C | CODE IDENT NO. 71379 | DWG NO 1270701

SCALE: NONE | 210 | PAGE: 15.2

(SR6031) IX

FORM NO. 80-2155

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: S-1962-2-4 WAS S-1692-2-4, S-1962-2-2 WAS S-1692-2-2, S-1962-2-0 WAS S-1692-2-0 ED&RR 10802 SER 21059200	J.D.R. 11/11/69	JWH DLB
B	BY REV: SER OUT 1270705-4; SER IN 1270705-8; ADD FT 48 ED&RR 10966 (SR6520)	DGP 4-7-70	RLY JWA WKB
C	BY REV: SER OUT FRT14, FRT26, FRT27 & FRT39; SER IN FRT49, FRT50, FRT51 & FRT52; ADD DETAIL A, B, C & D ED&RR 10027 SER21059816	RLY 5-11-70	RLY VRS WKB

INACTIVE EFF THRU 21059502 VRS 8-27-71

WIRE CODE NO	GA	MATL	LG	TERMINALS		
FRT 52	18			S-1963-2	S-1963-2	SER21059316 & ON
FRT 51	18			S-1963-2	S-1963-2	SER21059316 & ON
FRT 50	18			S-1963-2	S-1963-2	SER21059316 & ON
FRT 49	18			S-1963-2	S-1963-2	SER21059316 & ON
FRT 48		RG-8/U		S-2067-1	S-2067-1	SER(SR6520) & ON
FRT 47		RG-58A/U		SOLDER	SOLDER	THRU SER(SR6520)
FRT 46		RG-58A/U		SOLDER	SOLDER	
FRT 45	16			S-1636-2	S-1636-2	
FRT 44	16					
FRT 43	16					
FRT 42	16					
FRT 41	16					
FRT 40	16			S-1636-2	S-1636-2	
FRT 39	18S			S-1963-2	S-1963-2	THRU SER21059315
FRT 38	18					
FRT 37	18					
FRT 36	18					
FRT 35	18					
FRT 34	18					
FRT 33	18					
FRT 32	18					
FRT 31	18					
FRT 30	18					
FRT 29	18					
FRT 28	18					
FRT 27	18S					THRU SER21059315
FRT 26	18S					THRU SER21059315
FRT 25	18					
FRT 24	18					
FRT 23	18					
FRT 22	18					
FRT 21	18					
FRT 20	18			S-1963-2	S-1963-2	

ITEM NO	PART NO.	DESCRIPTION	
16	S-2067-1	PLUG	
15	1270705-8	CABLE ASSY	
14	S-1962-2-4	HOUSING	
13	S-1962-2-2	HOUSING	
12	S-1962-2-0	HOUSING	
11	S-1638-3	HOUSING	
10	S-1638-1	HOUSING	
9	1-331694-0	PANEL JACK	00779
8	2-331351-1	JACK	00779
7	1270705-5	CABLE ASSY	
6	1270705-6	CABLE ASSY	
5	1270705-7	CABLE ASSY	
4	1270705-1	CABLE ASSY	
3	1270705-2	CABLE ASSY	
2	1270705-3	CABLE ASSY	
1	1270705-4	CABLE ASSY	

EQUIPMENT TABLE

WIRE CODE NO	GA	MATERIAL	LG	TERMINALS		SERIALS
FRT 19	18			S-1963-2	S-1963-2	
FRT 18	18					
FRT 17	18					
FRT 16	18					
FRT 15	18					
FRT 14	18S					THRU SER21059315
FRT 13	18S					
FRT 12	18					
FRT 11	18					
FRT 10	18					
FRT 9	18					
FRT 8	18					
FRT 7	18					
FRT 6	18					
FRT 5	18					
FRT 4	18					
FRT 3	18					
FRT 2	18					
FRT 1	18S			S-1963-2	S-1963-2	

WIRE TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES: 12210-857(-1,-3,-4,-5,-6,-7&-8)

SUPERSEDED BY: 1270709

CONTRACT NO:

	NAME	DATE
DESIGN	PLUMMER	
GROUP	H. Wise	8-26-69
DRAWN	HOVORAK	8-15-69
CHECK	R. YOUNGERS	8-15-69
STRESS	K.F. GEIDE	[illegible]
PROJ	[illegible]	[illegible]
APPD	McSherry	8-20-69
OTHER		

Cessna AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

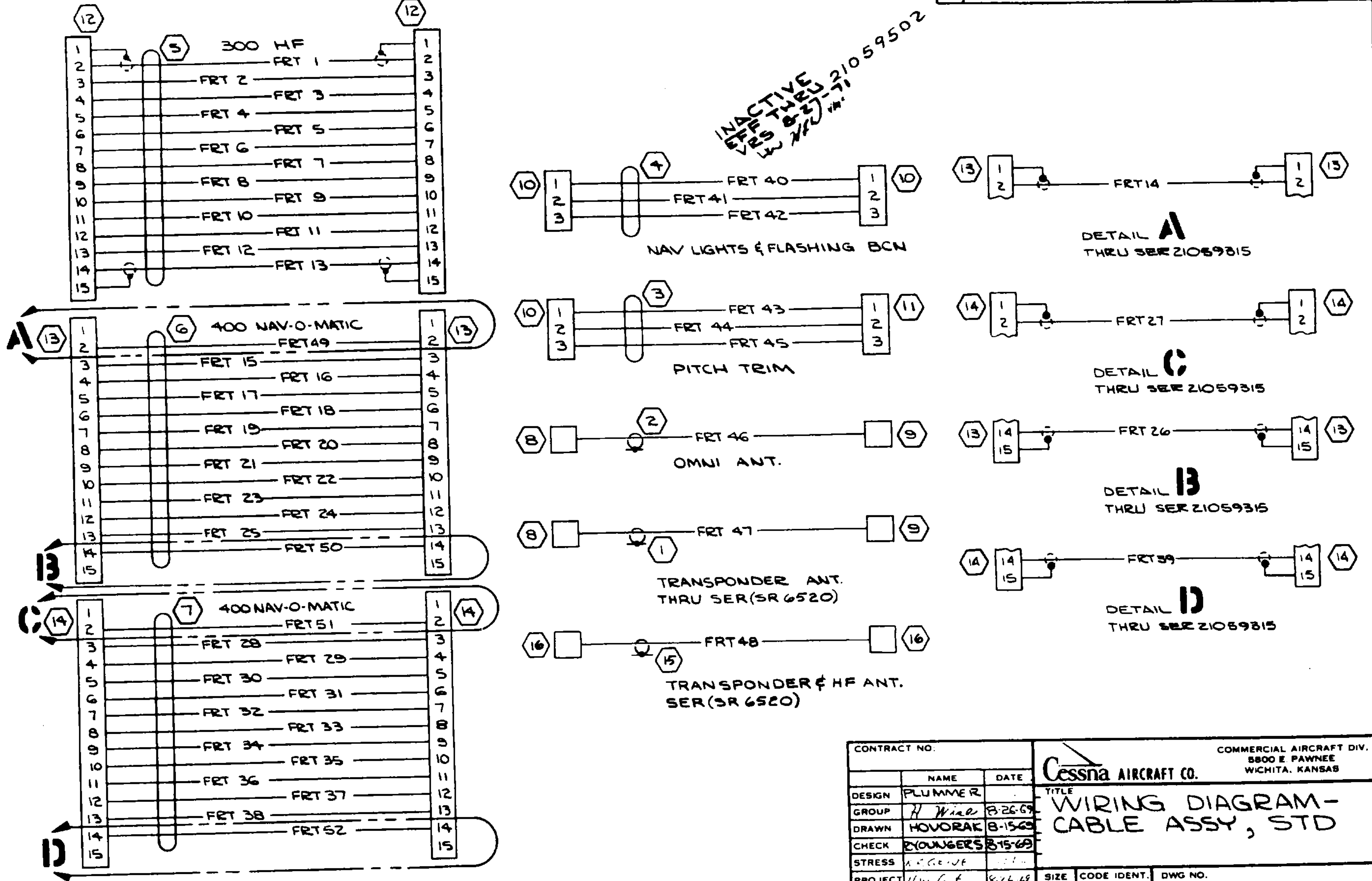
TITLE
WIRING DIAGRAM — CABLE ASSY, STD

SIZE	CODE IDENT. NO.	DWG NO	
C	71379	1270701	
SCALE: NONE		210	PAGE: 16.1.0

(SR6031)

FORM NO 80 2158

LTR	DESCRIPTION	DATE	APPROVED
C	REFER TO P 16.1.0 FOR REV		



CONTRACT NO.	NAME	DATE
DESIGN	PLUMMER	
GROUP	H. Wise	8-26-69
DRAWN	HOVORAK	8-15-69
CHECK	ZYOUNGERS	8-15-69
STRESS	[illegible]	
PROJECT	[illegible]	8-26-69
APPD	[illegible]	8-20-69

SUPERSEDED BY 1270709

Cessna AIRCRAFT CO. — COMMERCIAL AIRCRAFT DIV., 5800 E. PAWNEE, WICHITA, KANSAS

TITLE: WIRING DIAGRAM - CABLE ASSY, STD

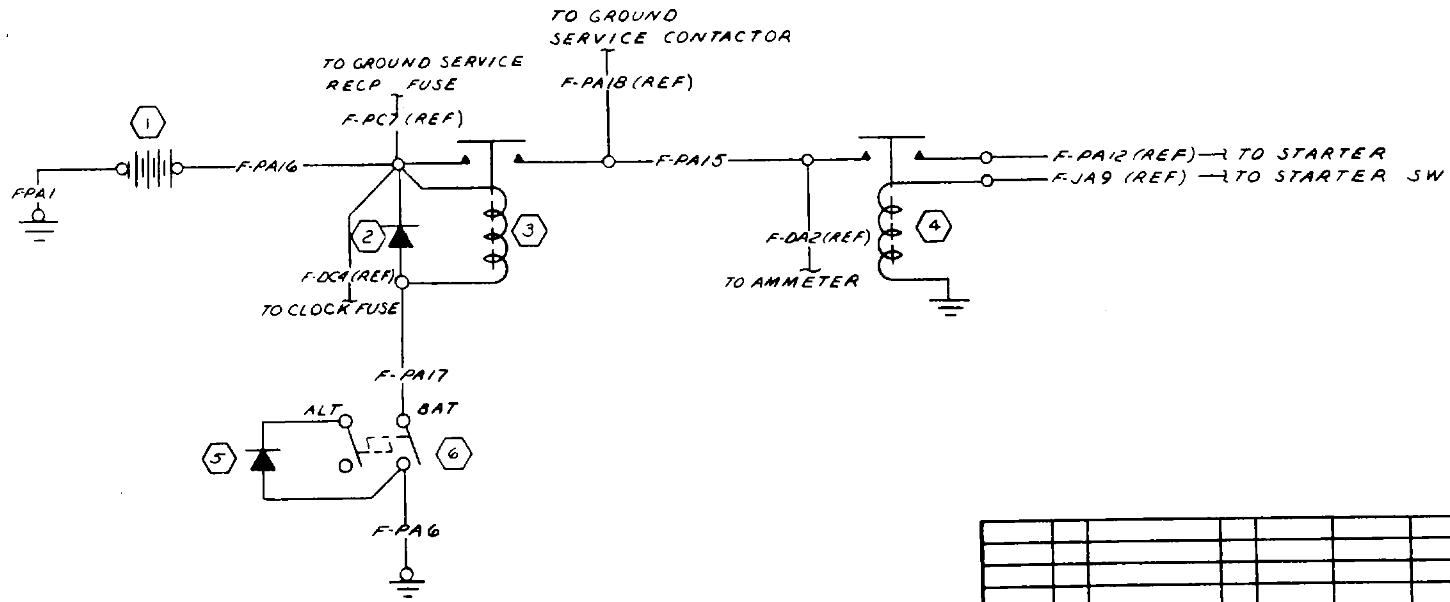
SIZE	CODE IDENT. NO.	DWG NO.
C	71379	1270701

SCALE: NONE | 210 | PAGE: 16.1.1

(SR 6031)

FORM NO. 80-216

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: ADD WIRE LENGTHS (NOW SHOP PRACTICE)	JLO 5-3-73	[illegible]



F-PA17	18		50	S-1367-1-10	S-1493-1	
F-PA16	2		15	S-1367-7-13	S-1367-7-13	
F-PA15	2		44	S-1367-7-13	S-1606-1	
F-PA6	18		6	S-1493-1	S-1367-1-8	
F-PA1	2		14	S-1367-7-12	S-1367-7-13	
WIRE CODE NO	GA	MATERIAL	LG	TERMINALS		SERIALS

WIRE TABLE

ITEM NO.	PART NO.	DESCRIPTION
6	S-1994-1-1	MASTER SWITCH
5	0770719-2	DIODE ASSY
4	S-1577-1	STARTER CONTACTOR
3	S-1580-1	BAT CONTACTOR
2	0770728-1	DIODE ASSY
1	0870060-1	BATTERY

EQUIPMENT TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES: 12210-1073

SUPERSEDED BY:

CONTRACT NO:

	NAME	DATE
DESIGN	V R SIPES	1-28-71
GROUP	H. Wise	2-26-71
DRAWN	V R SIPES	2-18-71
CHECK	L K WHITE	2-24-71
STRESS		
PROJ	N. McCarter	2-27-71
APPD	[illegible]	
OTHER		

Cessna AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

TITLE
WIRING DIAGRAM — BATTERY CIRCUIT

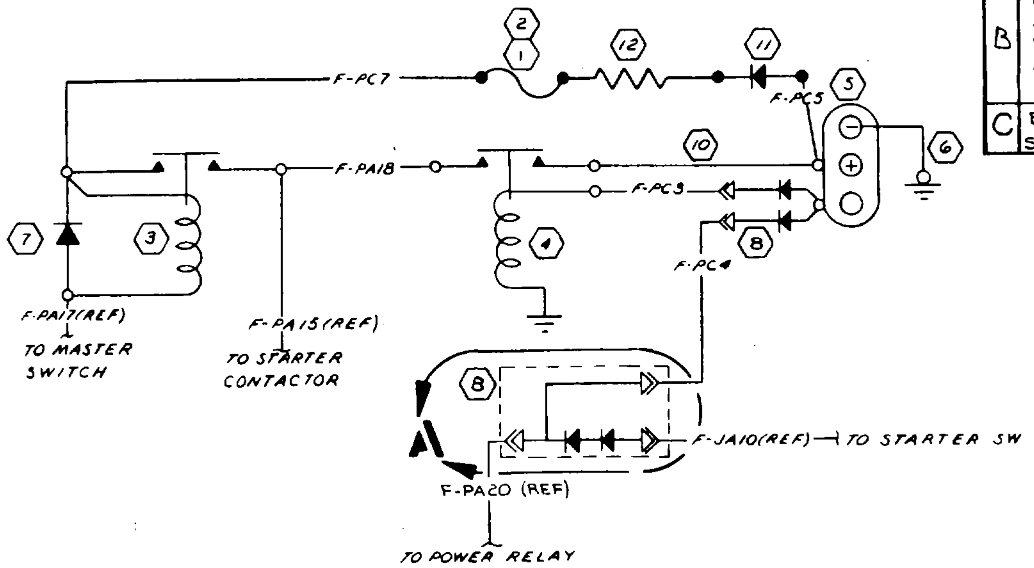
SIZE	CODE IDENT. NO.	DWG NO
C	71379	1270709

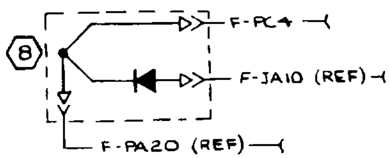
SCALE: NONE | 210 | PAGE: 4.1

(SR6755) II

FORM NO. 80.215B

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: ADD WIRE LENGTHS (NOW SHOP PRACTICE)	DLO 5-3-73	
B	BY REV: S-1367-6-13/PA18 WAS S-1367-7-13/PA18; S-1367-6-14/PA18 WAS S-1367-7-13/PA18 ADD WIRE LENGTH/ F-PA18 (NOW SHOP PRACTICE)	JEF 11-8-73	DLP
C	BY REV: ADD DETAIL "A" & SER & SECOND DIODE (SR8259)	RS 6-11-75	





DETAIL A
THRU SER (SR8259)
(21061038)

12	X26263	RESISTOR .73Ω	(94310)	F-PC7	18		20	SOLDER	S-1367-1-15
11	20H3P	DIODE	(81970)	F-PC5	18		5	S-1367-1-14	SOLDER
10	1270653-1	BUS BAR		F-PC4	18		65	S-1493-1	S-1493-1
		DIODE ASSY		F-PC3	18		5	S-1367-1-10	S-1493-1
8	1570043	DIODE ASSY		F-PA18	4		15	S-1367-6-13	S-1367-6-14
7	0770728-1	DIODE ASSY		WIRE CODE NO	GA	MATERIAL	LG	TERMINALS	SERIALS
6	0312155-10	GROUND STRAP		WIRE TABLE					
5	AN2552-3A	RECEPTACLE							
4	S-1577-1	CONTACTOR							
3	S-1580-1	BAT CONTACTOR							
2	S-1090-2	FUSEHOLDER							
1	S-1091-5	FUSE							
ITEM NO.	PART NO.	DESCRIPTION	VENDOR						

EQUIPMENT TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES: 12210-1073
SUPERSEDED BY:

CONTRACT NO.

	NAME	DATE
DESIGN	VR SIPES	1-28-71
GROUP	H Wise	2-26-71
DRAWN	VR SIPES	2-18-71
CHECK	L.K. WHITE	2-24-71
STRESS		
PROJ		2-27-71
APPD		
OTHER		

Cessna AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

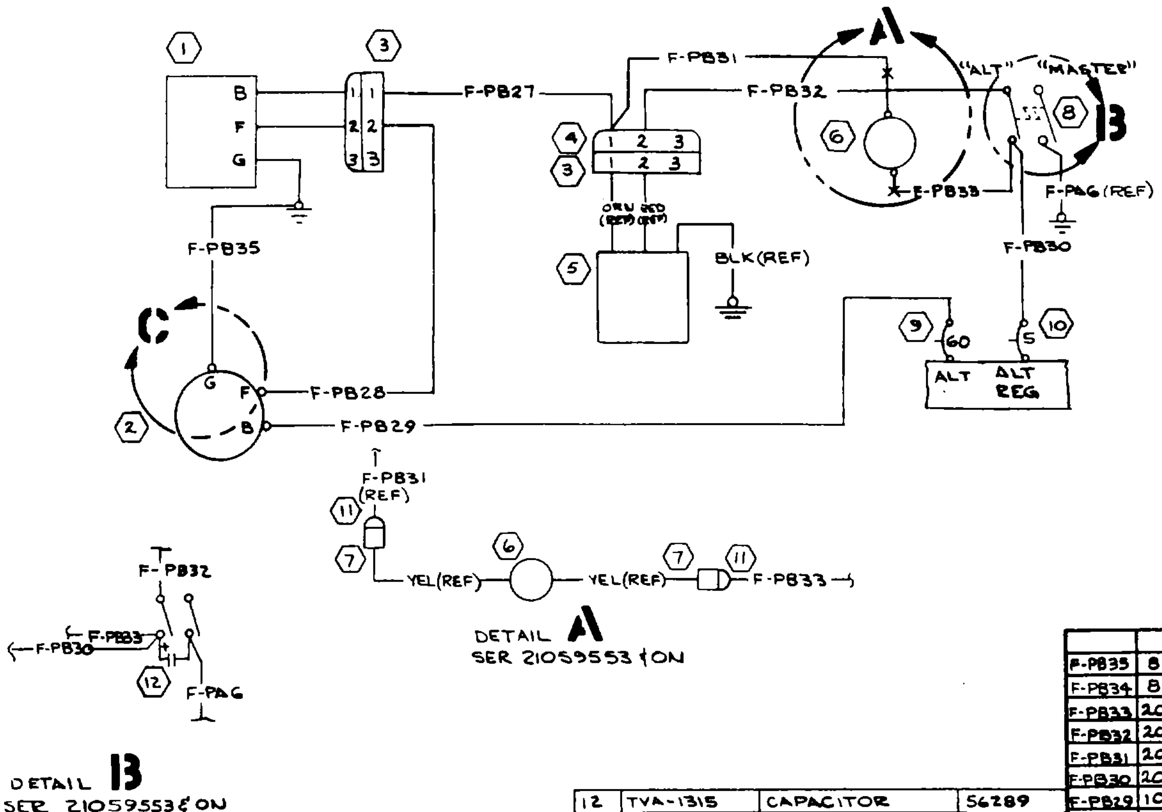
TITLE
WIRING DIAGRAM — GROUND SERVICE RECEPTACLE (OPT)

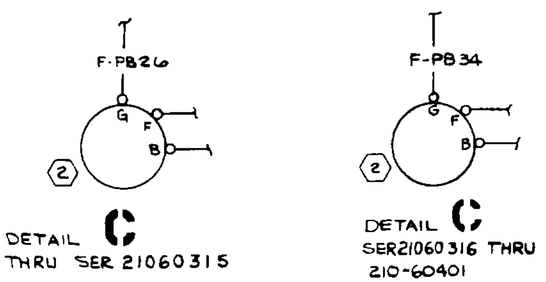
SIZE	CODE IDENT. NO.	DWG NO
C	71379	1270709

SCALE: NONE 210 PAGE: 4.2

(SA 6755) II (21059508)

FORM NO. 80-2159





REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: DELETE YEL (REF), 0770719-2 ADD BLK (REF), RE-ROUTE F-PB31 (REF) (SR6755) IX	RLY 10-1-71	
B	BY REV: ADD DETAIL "A & B", ITEMS 7, 11 & 12 TO F/D & E/T, S-1635-2 WAS S-1370-0 IN W/T. SER 21059553 & ON	VRS 11/22/71	
C	BY REV: PA6 (REF) WAS PA6, ADD WIRE LENGTHS (NOW SHOP PRACTICE)	DLO 5-3-73	
D	BY REV: ADD DETAIL "C", PB34 & SER; SER OUT PB26 (SR7639)	RAM 7-31-73	
E	BY REV: C593003-0101 WAS 0353 (NOW SHOP PRACTICE)	JEF 11-8-73	
F	BY REV: S-1367-3-12 WAS S-1943-1, S-1367-3-10 WAS S-1367-4-12 (MER 210-E00108)	MEM 4-25-74	
G	BY REV: SER IN F-PB35, SER OUT F-PB35 ADD DETAIL "C" SER (210-60401) MER 177-E0105	BRF 6-19-74	

WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS
F-PB35	8	S-1562-8-9	24	S-1943-2	S-1367-4-12		SER 210-60401 & ON
F-PB34	8	S-1562-8-9	24	S-1943-3	S-1367-4-12		SER 21060316 THRU 210-60400
F-PB33	20		60	S-1635-2	S-1493-1		
F-PB32	20		26	S-1635-2	S-1493-1		
F-PB31	20		60	S-1635-2	SEE F-PB27		
F-PB30	20		10	S-1361-1-6	S-1493-1		
F-PB29	10		60	S-1367-3-12	S-1367-3-10		
F-PB28	20		23	S-1636-2	S-1367-3-10		
F-PB27	20		64	S-1636-2	S-1635-2		
F-PB26	10		24	S-1367-3-10	S-1367-3-12		THRU SER21060315

WIRE TABLE

ITEM NO	PART NO.	DESCRIPTION	VENDOR
12	TVA-1315	CAPACITOR	56289
11	S-1637-1	HOUSING-PIN	
10	S-1360-5L	CIRCUIT BREAKER	
9	S-1596-60L	CIRCUIT BREAKER	
8	S-1994-1-1	MASTER SWITCH	
7	S-1637-2	HOUSING-SOCKET	
6	S-2135-2	LIGHT	
5	C593003-0101	OVER VOLT UNIT	
4	S-1638-2	HOUSING-CAP	
3	S-1638-1	HOUSING-PLUG	
2	C611503-0102	ALTERNATOR	
1	C611002-0105	VOLTAGE REGULATOR	

EQUIPMENT TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES: 12210-1073

SUPERSEDED BY:

CONTRACT NO:

	NAME	DATE
DESIGN	V R SIPES	1-28-71
GROUP	H. Wise	2-26-71
DRAWN	V R SIPES	2-18-71
CHECK	L.K. WHITE	2-24-71
STRESS		
PROJ	N. McCarty	2-27-71
APPD		
OTHER		

Cessna AIRCRAFT CO. COMMERCIAL AIRCRAFT DIV. 5800 E. PAWNEE WICHITA, KANSAS

TITLE
WIRING DIAGRAM — ALTERNATOR SYSTEM

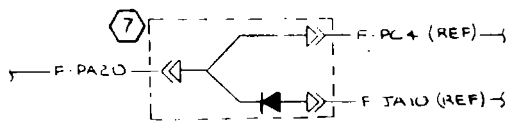
SIZE	CODE IDENT. NO.	DWG NO
C	71379	1270709

SCALE: NONE | 210 | PAGE: A.3

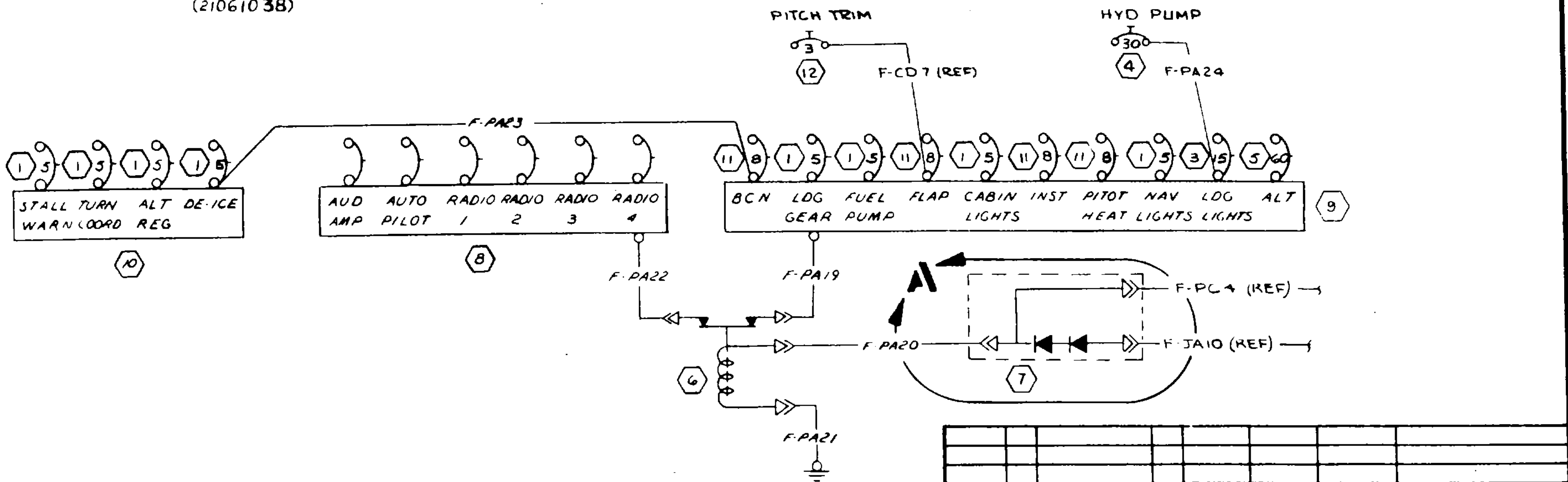
(SR 6755) IX

FORM NO 80-2158

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: ADD WIRE LENGTHS (NOW SHOP PRACTICE)	DLO 5-3-73	
B	BY REV: ADD DETAIL "A" & SER & SECOND DIODE (SRA259)	RS 6-11-75	JRS



DETAIL A
THRU SER (SR8259)
(21061038)



WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS
F-PA24	12		30	S-1367-2-6	S-1367-2-8		
F-PA23	14		15	S-1367-2-6	S-1367-2-6		
F-PA22	14		12	S-1493-2	S-1367-2-6		
F-PA21	20		10	S-1493-1	S-1367-1-8		
F-PA20	20		6	S-1493-1	S-1493-1		
F-PA19	14		12	S-1493-2	S-1367-2-6		

WIRE TABLE

ITEM NO	PART NO.	DESCRIPTION	VENDOR
12	7271-8-3	CIRCUIT BREAKER	(82647)
11	S-1360-8L	CIRCUIT BREAKER	
10	1270704-3	BUS BAR-PRIMARY 2	
9	1270704-2	BUS BAR-PRIMARY 1	
8	1270704-1	BUS BAR-ELECTRONIC	
7	1570043	DIODE ASSY	
6	S-1917-2	RELAY-POWER	
5	S-1596-60L	CIRCUIT BREAKER	
4	S-1232-30	CIRCUIT BREAKER	
3	S-1360-15L	CIRCUIT BREAKER	
2	S-1360-10L	CIRCUIT BREAKER	
1	S-1360-5L	CIRCUIT BREAKER	

EQUIPMENT TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES: 12210-1073

SUPERSEDED BY:

CONTRACT NO:

	NAME	DATE
DESIGN	V R SIPES	1-28-71
GROUP	H Wise	2-26-71
DRAWN	V R SIPES	2-18-71
CHECK	L.K. WHITE	2-24-71
STRESS		
PROJ		
APPD		
OTHER		

Cessna AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

TITLE
WIRING DIAGRAM — CIRCUIT BREAKERS

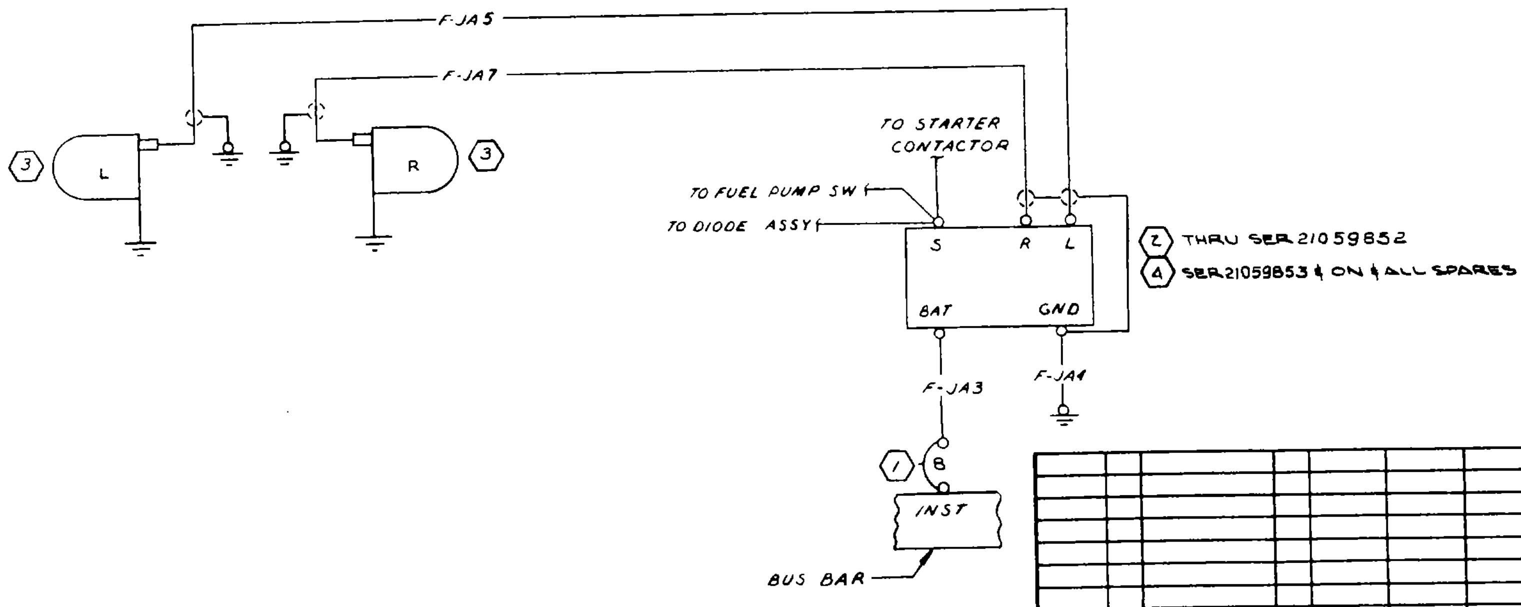
SIZE	CODE IDENT. NO	DWG NO
C	71379	1270709

SCALE: NONE | 210 | PAGE 4.4

(SR6755) II (21059503)

FORM NO. 80 2158

LET	DESCRIPTION	DATE	APPD
A	BY REV: SER OUT C292501-0101; SER IN C292501-0105 (SR7126)	RLY 2-29-72	LKW HKW
B	BY REV: ADD WIRE LENGTHS (NOW SHOP PRACTICE)	JLO 5-3-73	BY HKW PLH NG



NOTES:

1. S-1367-1-6 FOR CENTER CONDUCTOR
   S-1367-2-6 FOR SHIELDING
2. S-1367-1-10 FOR CENTER CONDUCTOR
   S-1367-3-10 FOR SHIELDING

WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS
F-JA7	18S		66	1	2		
F-JA5	18S		65	1	2		
F-JA4	20		7	S-1367-1-8	S-1367-1-6		
F-JA3	20		13	S-1367-1-6	S-1367-1-6		

WIRE TABLE

ITEM NO	PART NO.	DESCRIPTION	VENDOR
4	C292501-0105	IGNITION SWITCH	
3	SLICK #662	MAGNETO	(09033)
2	C292501-0101	SWITCH	
1	S-1360-8L	CIRCUIT BREAKER	

EQUIPMENT TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES: 12210-1073

SUPERSEDED BY:

CONTRACT NO:

	NAME	DATE
DESIGN	VR SIPES	1-28-71
GROUP	H. Wise	2-26-71
DRAWN	VR SIPES	2-18-71
CHECK	LK WHITE	2-24-71
STRESS		
PROJ	N McCarter	2-27-71
APPD	HKW	
OTHER		

Cessna AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

TITLE WIRING DIAGRAM — MAGNETO SYSTEM

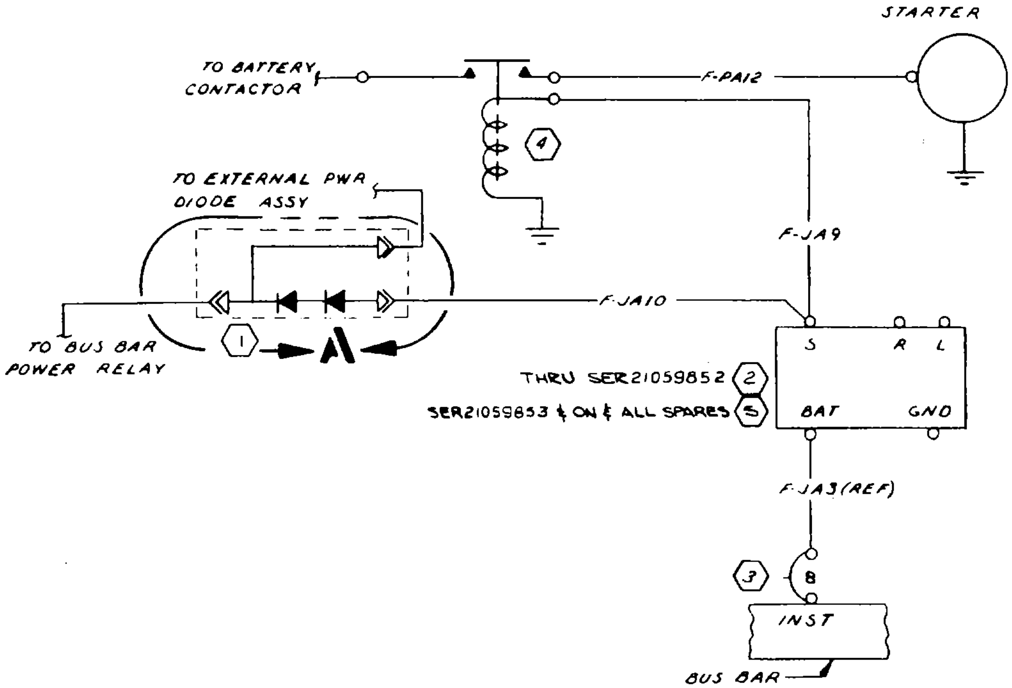
SIZE C | CODE IDENT. NO. 71379 | DWG NO 1270709

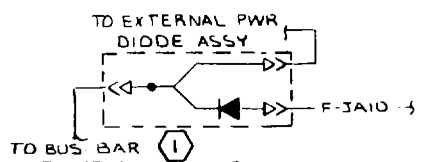
SCALE: NONE | 210 | PAGE: 5.1

(SR 6755) IX

FORM NO. 80-2158

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: SER OUT C292501-0101; SER IN C292501-0105 (SR7126)	RLY 2-29-72	
B	BY REV: ADD WIRE LENGTHS (NOW SHOP PRACTICE)	JLO 5-3-73	
C	BY REV: ADD DETAIL "A" & SER & SECOND DIODE (SR8259)	RS 6-11-75	





DETAIL A
THRU SER(SR8259)
(21061038)

WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS
F-PA12	4	S-1562-4-9		S-1367-7-13	S-1367-7-13		
F-JA10	20		7	S-1367-1-6	S-1493-1		
F-JA9	20		75	S-1367-1-6	S-1367-1-10		

WIRE TABLE

ITEM NO	PART NO.	DESCRIPTION	
5	C292501-0105	IGNITION SWITCH	
4	S-1577-1	STARTER CONTACTOR	
3	S-1360-8L	CIRCUIT BREAKER	
2	C292501-0101	SWITCH	
1	1570043	DIODE ASSY	

EQUIPMENT TABLE

CES-1000 IS APPLICABLE VENDOR CODES PER S-1400 CES-XXXX=CESSNA SPEC. NO. S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES: 12210-1073

SUPERSEDED BY:

CONTRACT NO:

	NAME	DATE
DESIGN	V R SIPES	1-28-71
GROUP	H. Wise	2-26-71
DRAWN	V R SIPES	2-18-71
CHECK	L.K. WHITE	2-24-71
STRESS		
PROJ	N. McFate	2-27-71
APPD		
OTHER		

Cessna AIRCRAFT CO. COMMERCIAL AIRCRAFT DIV. 5800 E PAWNEE WICHITA, KANSAS

TITLE **WIRING DIAGRAM — STARTER SYSTEM**

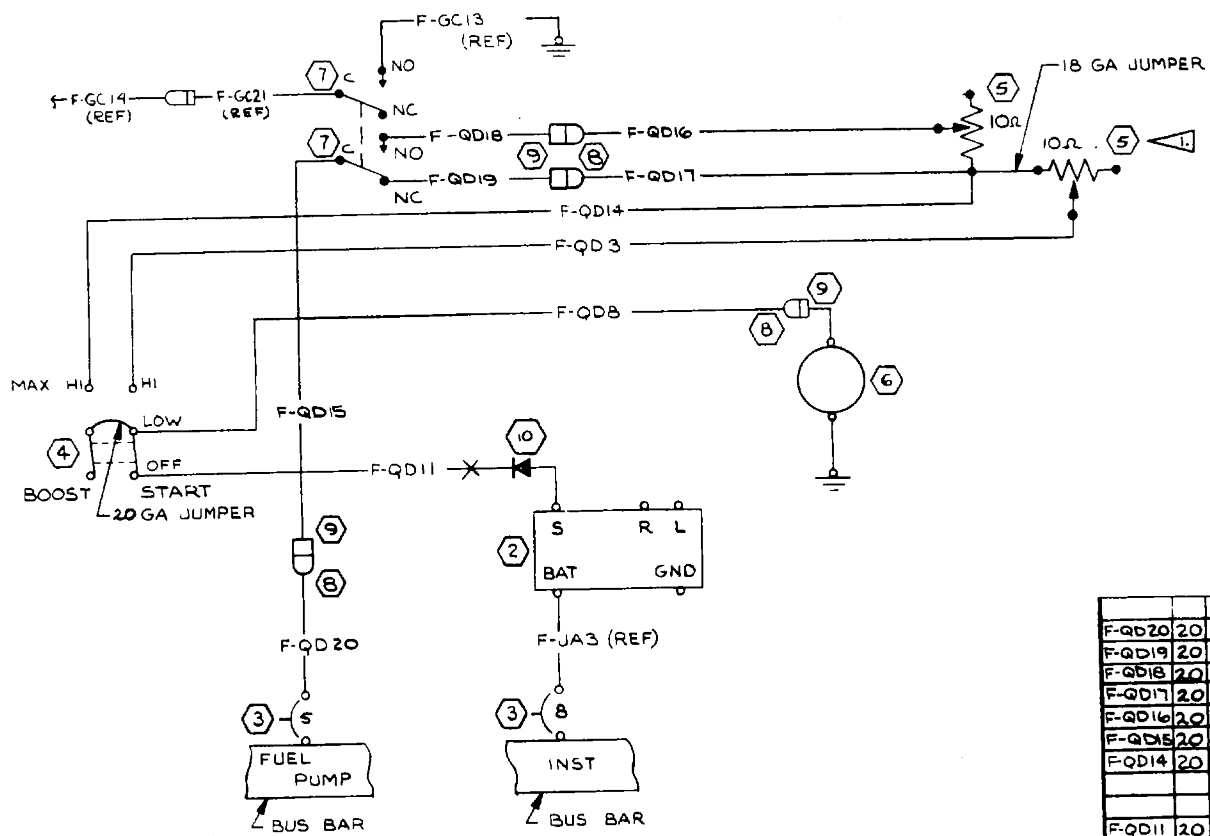
SIZE	CODE IDENT NO	DWG NO
C	71379	1270709

SCALE: NONE | 210 | PAGE: 6.1

FORM NO. 80-215B

(SR6755) II (21059503)

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: DELETE MS27212-2-6, F-QD12 & F-QD13; SOLDER WAS S-1367-1-10/F-QD14, F-QD16 & F-QD17; AMOR20-10 WAS AMOR20-15; ADD NOTE 1 (SR6755) IX	RLY 9-2-71	LKW HJW NMC
B	BY REV: ADD WIRE LENGTHS (NOW SHOP PRACTICE)	DLO 5-3-73	HBY HJW NMC



INACTIVE: EFF THRU SER 21060089 IX 12-28-72

DLP RLY HJW NMC

F-QD20	20		90	S-1635-1	S-1367-1-6		
F-QD19	20		15	S-1636-1	SOLDER		
F-QD18	20		15	S-1636-1	SOLDER		
F-QD17	20		136	S-1635-1	SOLDER		
F-QD16	20		136	S-1635-1	SOLDER		
F-QD15	20		15	S-1636-1	SOLDER		
F-QD14	20		86	S-1493-1	SOLDER		
F-QD11	20		8	S-1493-1	S-1370-1		
F-QD8	20		60	S-1493-1	S-1635-1		
F-QD3	20		48	S-1493-1	SOLDER		
WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS

WIRE TABLE

NOTES:

1. PLACE YELLOW ROCKER SWITCH IN HIGH BOOST POSITION. ADJUST RESISTORS WITH ENGINE OFF & 27.5 VDC APPLIED TO BUS. OPEN TO FULL THROTTLE AND ADJUST 1ST RESISTOR TO PRODUCE 125 LBS/HR INDICATION ON FUEL FLOW METER. ADJUST 2ND RESISTOR WITH THROTTLE CLOSED TO PRODUCE 40 LBS/HR INDICATION ON FUEL FLOW METER. RESISTORS ARE IN SERIES WHEN THROTTLE IS CLOSED.

10	SAF4	DIODE	(84970)
9	S-1637-2	HOUSING	
8	S-1637-1	HOUSING	
7	1280706-1	SWITCH ASSY	
6	C291504-0201	FUEL PUMP	
5	AMOR20-10	RESISTOR	(94310)
4	S-2035-1-1	SWITCH	
3	S-1360-5L	CIRCUIT BREAKER	
2	C292501-0101	SWITCH	
1			
ITEM NO	PART NO.	DESCRIPTION	VENDOR

EQUIPMENT TABLE

CES-1000 IS APPLICABLE VENDOR CODES PER S-1400 CES-XXXX=CESSNA SPEC. NO. S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES:

SUPERSEDED BY: P 7.1.1

CONTRACT NO:

	NAME	DATE
DESIGN	VR SIPES	1-28-71
GROUP	H. Wiel	2-26-71
DRAWN	VR SIPES	2-18-71
CHECK	L.K. WHITE	2-24-71
STRESS		
PROJ	N. McCarter	2-27-71
APPD	WKB	
OTHER		

Cessna AIRCRAFT CO.

COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

TITLE

WIRING DIAGRAM — FUEL PUMP SYSTEM

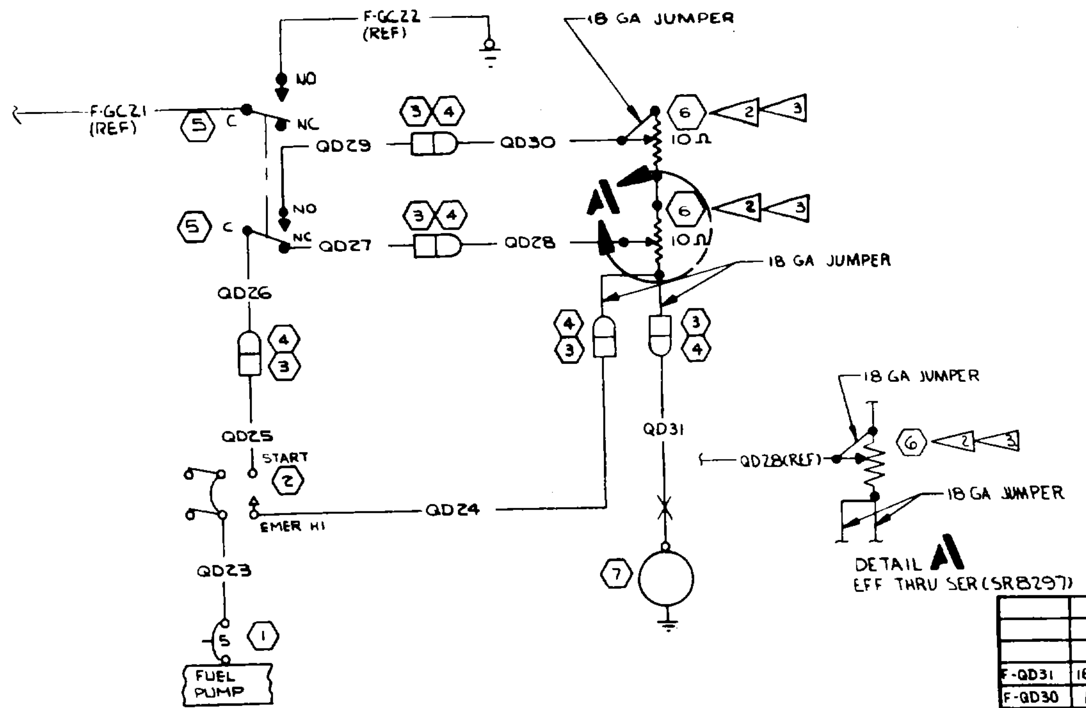
SIZE	CODE IDENT. NO.	DWG NO
C	71379	1270709

SCALE: NONE 210 PAGE: 7.1

(SR6755) IX

FORM NO 80-215B

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: ADDED NOTE 1	3-19-73	[illegible]
B	BY REV: "F" PREFIX WAS "H", ADD F-GC21 (REF), F-GC13 (REF) & 1250706 (NOW SHOP PRACTICE)	DLO 6-20-73	[illegible]
C	BY REV: S-1370-1/QD31 WAS SEE QD24, SOLDER/QD24 WAS S-1370-1 (MER E0034) (NOW SHOP PRACTICE)	JEF 2-8-74	[illegible]
D	BY REV: S-1856-1 WAS 1250706-1 F-GC22 (REF) WAS F-GC13 (REF) (SR7597)	DLO 6-25-74	[illegible]
E	BY REV: DELETE NOTE 1; ADD NOTE 2 & 3; ADD JUMPERS AT RESISTOR AMOR-20-10 (SR8082)	BLA 11-26-74	[illegible]
F	BY REV: ADD S-1637-1 & -2 TO QD24 & QD31, ALL WIRE LENGTHS; S-1635-1/QD31 & S-1636-1/QD24 WERE SOLDER NOW SHOP PRACTICE MER E0408	TMS 2-28-75	[illegible]
G	BY REV: REVISE NOTE 2 AND ADD DETAIL 'A' (SR8297)	GW 7-30-75	[illegible]



NOTES:

1. ~~PLACE YELLOW ROCKER SWITCH IN HIGH BOOST POSITION, ADJUST RESISTORS WITH ENGINE OFF & 27.5 VDC APPLIED TO BUS. OPEN TO FULL THROTTLE & ADJUST 1ST RESISTOR TO PRODUCE 125 LBS/HR INDICATION ON FUEL FLOW METER. ADJUST 2ND RESISTOR WITH THROTTLE CLOSED TO PRODUCE 40 LBS/HR INDICATION ON FUEL FLOW METER. RESISTORS ARE IN SERIES WHEN THROTTLE IS CLOSED.~~

2. ADJUST AMOR-20-10 TO 3.5 ± .5 OHMS PRIOR TO INSTALLATION

3. READJUST RESISTANCE AS REQUIRED AFTER INSTL TO COMPLY WITH FUEL FLOW REQUIREMENTS PER CES 1243

ITEM NO	PART NO.	DESCRIPTION	
7	C291504-0201	PUMP	
6	AMOR20-10	RESISTOR	
5	S-1856-1	SWITCH	
4	S-1637-1	HOUSING	
3	S-1637-2	HOUSING	
2	S-1846-3-2	SWITCH	
1	S-1360-5L	CKT BKR	

EQUIPMENT TABLE

WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS
F-QD31	18		54	S-1635-1	S-1370-1		
F-QD30	↑		60	S-1635-1	SOLDER		
F-QD29			12	SOLDER	S-1636-1		
F-QD28			60	S-1635-1	SOLDER		
F-QD27			12	SOLDER	S-1636-1		
F-QD26			12	S-1635-1	SOLDER		
F-QD25			90	S-1493-1	S-1636-1		
F-QD24	↓		60	S-1493-1	S-1636-1		
F-QD23	18		17	S-1367-1-6	S-1493-1		

WIRE TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES: P 7.1

SUPERSEDED BY:

CONTRACT NO:

	NAME	DATE
DESIGN	V R SIPES	11-30-72
GROUP	H Wise	1-3-73
DRAWN	PAPE	12-28-72
CHECK	R. YOUNGERS	12-30-72
STRESS		
PROJ	N McCarter	1-3-73
APPD	PLH	
OTHER		

Cessna AIRCRAFT CO. COMMERCIAL AIRCRAFT DIV. 5800 E. PAWNEE WICHITA, KANSAS

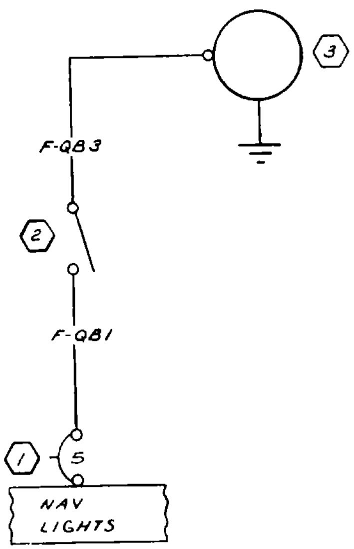
TITLE: WIRING DIAGRAM — FUEL PUMP SYSTEM

SIZE	CODE IDENT NO	DWG NO
C	71379	1270709
SCALE: NONE	210	PAGE: 7.1.1

(SR7381) I (210G0090)

FORM NO 80-2158

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: ADD WIRE LENGTHS; INACT DWG. (NOW SHOP PRACTICE) SER21059719	DLO 5-3-73	



INACTIVE
EFF THRU SER21059719
5-7-73

WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS
F-QB3	18		9	S-1493-1	S-1367-1-10		
F-QB1	18		7	S-1367-1-6	S-1493-1		

WIRE TABLE

ITEM NO	PART NO.	DESCRIPTION	
3	AN4078-1	OIL DILUTION VALVE	
2	S-1845-2-2	SWITCH	
1	S-1360-5L	CIRCUIT BREAKER	

EQUIPMENT TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES: 12210-1073

SUPERSEDED BY:

CONTRACT NO:

	NAME	DATE
DESIGN	V R SIPES	1-28-71
GROUP	H. Wise	2-26-71
DRAWN	V R SIPES	2-18-71
CHECK	L.K.WHITE	2-25-71
STRESS		
PROJ	H. McCarter	2-27-71
APPD		
OTHER		

Cessna. AIRCRAFT CO.

COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

TITLE
WIRING DIAGRAM — OIL DILUTION SYSTEM (OPT)

SIZE	CODE IDENT. NO.	DWG NO
C	71379	1270709

SCALE: NONE | 210 | PAGE: 7.2

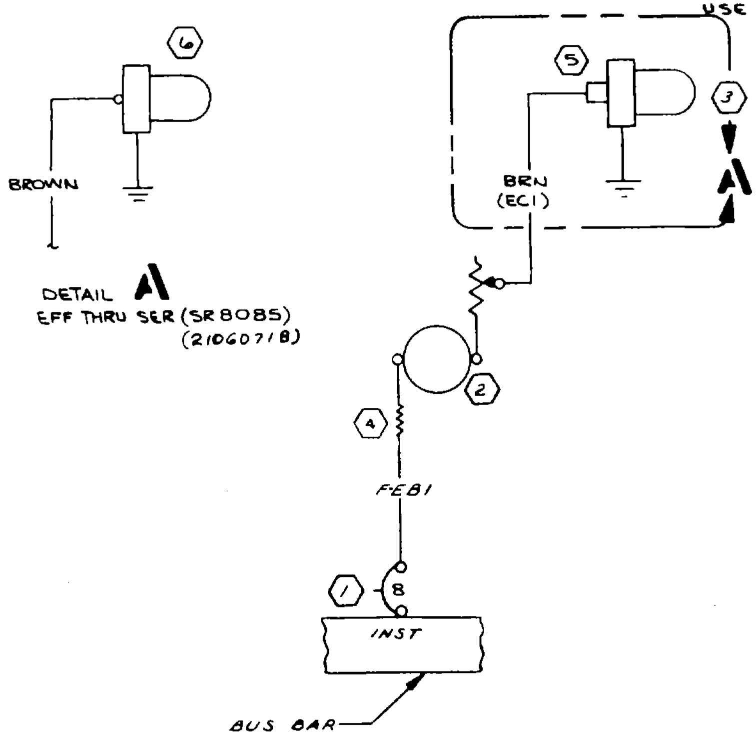
(SR 6755) II

FORM NO 80-215B

NOTES:

1. MATERIAL IS PRESTOLITE NO. 110691 18 GAGE, TEFLON INSULATED CONDUCTOR
2. CRIMP S-1636-5 TERMINAL AROUND WIRE INSULATION, BEND .25 OF STRIPPED WIRE BACK OVER CRIMP & SOLDER PER CES 1040. USE MOLEX HT-1719-C CRIMPING TOOL ONLY

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: ADD WIRE LENGTHS (NOW SHOP PRACTICE)	DLO 5-3-73	
B	BY REV: (SR8065) WAS (SR7650) (SR8311)	RAM 9-25-74	
C	BY REV: SER OUT BROWN & S-1372-1, SER IN EC1 & S-1372-2, ADD DETAIL "A" & NOTE 2 (SR8085)	RAM 11-12-74	JCY
D	BY REV: (SR7913) WAS (SR8065) PER REV B (SR8311)	CJH 1-27-75	JCY WHH
E	BY REV: (SR8311) WAS (SR7913) PER REV B, D & INACTIVATION (SR8311)	GS 8-27-75	JCY WHH JRS



INACTIVE: EFF THRU SER (SR8311)
BAH 2-1-74
JCY JRS

BRN (EC1)	18	-18-4	66	S-1367-1-8	S-1636-5	2	SER (SR8085) & ON
BROWN	18	1	66	S-1367-1-8	S-1367-1-4		THRU SER (SR8085)
FEB1	18		44	S-1367-1-6	S-1367-1-8		
WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS

WIRE TABLE

6	S-1372-1	BULB-CYL HD TEMP	
5	S-1637-4	HOUSING - PLUG	
4	6-1810958	RESISTOR	(57533)
3	S-1372-2	BULB-CYL HEAD TEMP	
2	C669502-0301	INST CLUSTER	
1	S-1360-8L	CIRCUIT BREAKER	
ITEM NO	PART NO.	DESCRIPTION	VENDOR

EQUIPMENT TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES: 12210-1073

SUPERSEDED BY: P.8.4

CONTRACT NO:

	NAME	DATE
DESIGN	V R SIPES	1-28-71
GROUP	H. Wise	2-26-71
DRAWN	V R SIPES	2-18-71
CHECK	L.K. WHITE	2-24-71
STRESS		
PROJ	N. McCarter	2-27-71
APPD		
OTHER		

Cessna AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

TITLE
WIRING DIAGRAM — CYLINDER HEAD TEMP

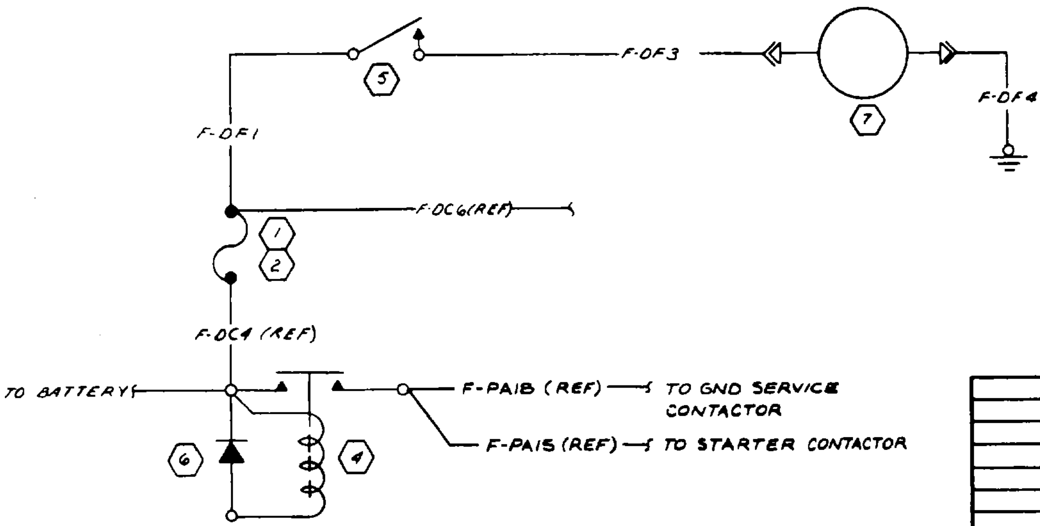
SIZE	CODE IDENT. NO.	DWG NO
C	71379	1270709

SCALE: NONE | 210 | PAGE: 8.1

(SR6755) II (21069503)

FORM NO. 80-2198

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: ADD WIRE LENGTHS (NOW SHOP PRACTICE)	DLO 5-3-73	[illegible]



WIRE CODE NO	GA	MATERIAL	LG	TERMINALS		SERIALS
F-OF4	20		15	S-1493-1	S-1367-1-6	
F-OF3	20		50	S-1367-1-6	S-1493-1	
F-OF1	20		80	SOLDER	S-1367-1-6	

WIRE TABLE

ITEM NO	PART NO.	DESCRIPTION
7	C664501-0103	HOURMETER
6	0770728-1	DIODE ASSY
5	S-1711-1	OIL PRESS. SWITCH
4	S-1580-1	BATTERY CONTACTOR
2	S-1091-1	FUSE
1	S-1090-22	FUSEHOLDER

EQUIPMENT TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES: 12210-1073

SUPERSEDED BY:

CONTRACT NO:

	NAME	DATE
DESIGN	V R SIPES	1-28-71
GROUP	H. Wise	2-26-71
DRAWN	V R SIPES	2-18-71
CHECK	L.K. WHITE	2-24-71
STRESS		
PROJ	N. McCarter	2-27-71
APPD		
OTHER		

Cessna AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

TITLE
WIRING DIAGRAM — HOURMETER (OPT)

SIZE	CODE IDENT. NO.	DWG NO
C	71379	1270709

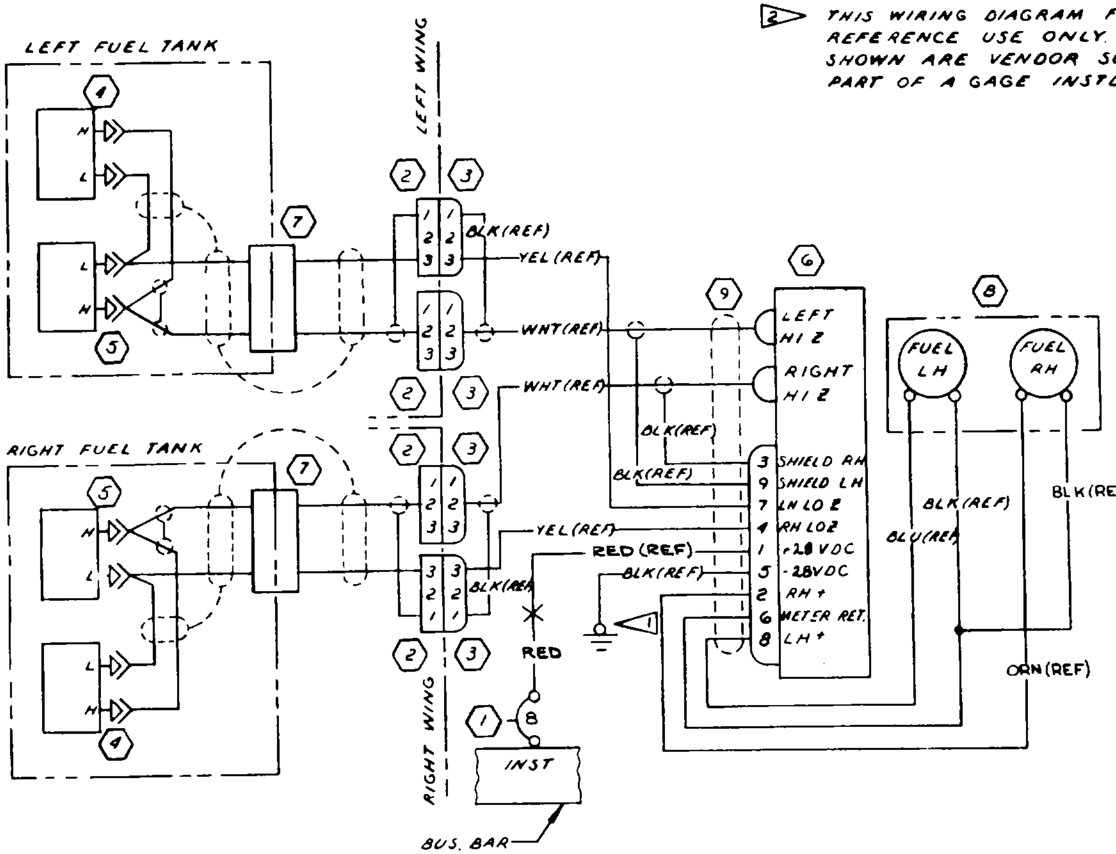
SCALE: NONE 210 (SR 6755) PAGE: 8.2

FORM NO 80-2159

NOTES

1. S-1367-1-6 TERMINAL ON EXISTING WIRE
2. THIS WIRING DIAGRAM FOR CIRCUIT REFERENCE USE ONLY. ALL WIRES SHOWN ARE VENDOR SUPPLIED AS PART OF A GAGE INSTL KIT.

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: RED 6 65 WAS 2.5 (NOW SHOP PRACTICE)	JLO 5-3-73	
B	BY REV: (SR8065) WAS (SR7630) PER INACTIVATION (SR7913)	RAM 7-25-74	
C	BY REV: (SR7913) WAS (SR8065) PER REV "B" & INACTIVATION (SR7913)	CJH 1-27-75	
D	BY REV: (SR8311) WAS (SR7913) PER REV "B, C" & INACTIVATION (SR8311)	GS 8-27-75	JAB



INACTIVE: EFF THRU SER (SR8311) BAH 2-1-74 SCY JRG VRS 7114

9	2381	CABLE ASSY	(05808)
8	C669502-0301	INST CLUSTER	
7	C668005-0101	FLANGE & CABLE ASSY	
6	C668004-0107	MONITOR-FUEL	
5	C668003-0102	SENSOR-INBD	
4	C668003-0101	SENSOR-OUTBD	
3	S-1638-2	HOUSING-CAP	
2	S-1638-1	HOUSING-PLUG	
1	S-1360-8L	CIRCUIT BREAKER	
ITEM NO	PART NO.	DESCRIPTION	VENDOR

EQUIPMENT TABLE

WIRE CODE NO	GA	MATERIAL	LG	TERMINALS		SERIALS
RED	18	-18-2	65	S-1367-1-6	S-1370-1	

WIRE TABLE

CES-1000 IS APPLICABLE VENDOR CODES PER S-1400 CES-XXXX=CESSNA SPEC. NO. S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES: 12210-1073

SUPERSEDED BY: P. 8.4

CONTRACT NO.

	NAME	DATE
DESIGN	V R SIPES	1-28-71
GROUP	H. Wied	2-26-71
DRAWN	V R SIPES	2/18/71
CHECK	L.K. WHITE	2-24-71
STRESS		
PROJ	H. McCarth	
APPD		
OTHER		

Cessna AIRCRAFT CO. COMMERCIAL AIRCRAFT DIV. 5800 E. PAWNEE WICHITA, KANSAS

TITLE WIRING DIAGRAM — FUEL GAGE SYSTEM

SIZE C | CODE IDENT NO 71379 | DWG NO 1270709

SCALE: NONE | 210 | PAGE: 8.3

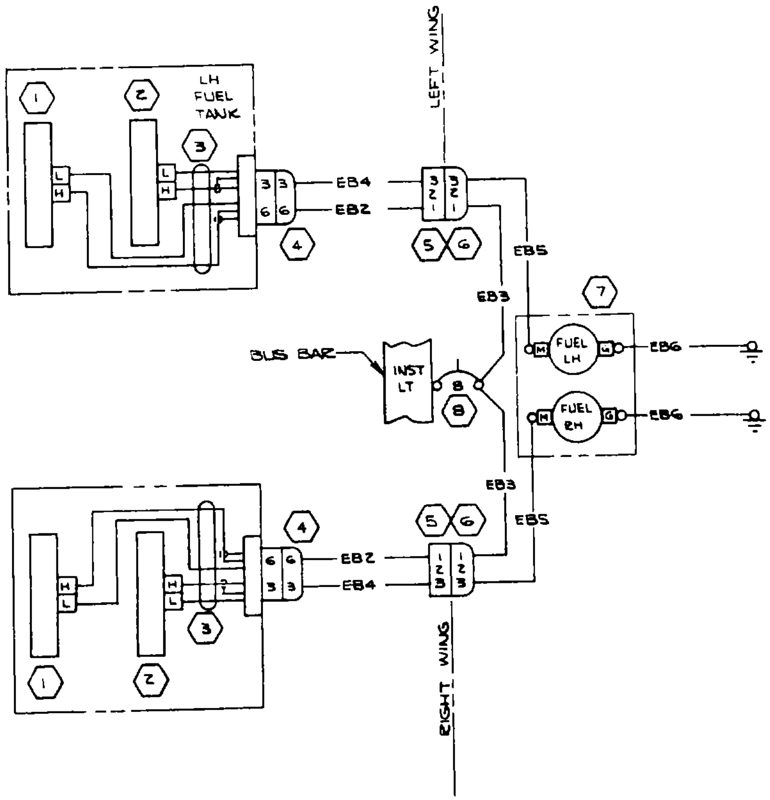
(SR6755) II (21059503)

FORM NO. 80-2158

NOTES:

1. THIS WIRING IS FOR ALTERNATE FUEL GAGE SYSTEM. REFER TO P 8.3 FOR STANDARD FUEL GAGE SYSTEM

REVISION			
LET	DESCRIPTION	DATE	APPD



WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS
EB6	20			S-1367-1-4	S-1367-1-6		
EB5	20			S-1636-1	S-1367-1-4		
EB4	20			S-1635-1	S-1636-1		
EB3	20			S-1636-1	S-1367-1-6		
EB2	20			S-1635-1	S-1636-1		

WIRE TABLE

ITEM NO	PART NO.	DESCRIPTION
8	S-1360-8L	CKT BKR
7	C669502-0308	INSTRUMENT CLUSTER
6	S-1638-2	HOUSING - CAP
5	S-1638-1	HOUSING - PLUG
4	S-1640-6	HOUSING - PIN
3	C668005-0101	FLANGE & CABLE ASSY
2	C668003-0102	SENSOR - INBD
1	C668003-0101	SENSOR - OUTBD

EQUIPMENT TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES:

SUPERSEDED BY:

CONTRACT NO:

	NAME	DATE
DESIGN		
GROUP	H. Wine	1-27-73
DRAWN	PAPE	1-25-73
CHECK	R.YOUNGERS	1-24-73
STRESS		
PROJ	H. McCarter	1-27-73
APPD	PLH	
OTHER		

Cessna AIRCRAFT CO. COMMERCIAL AIRCRAFT DIV. 5800 E. PAWNEE WICHITA, KANSAS

TITLE WIRING DIAGRAM — FUEL GAGE SYSTEM (ALT)

GULL

SIZE	CODE IDENT. NO.	DWG NO
C	71379	1270709

SCALE: NONE 210 PAGE: 8.3.1

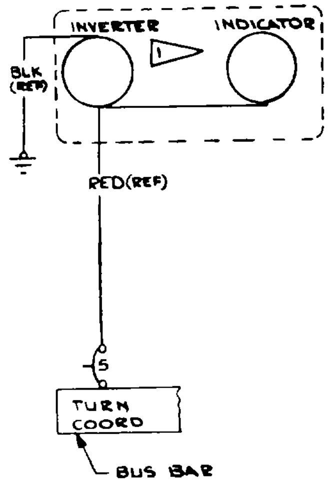
(SR7491)

FORM NO. 80-2158

NOTES:

1. TURN COORDINATOR INDICATOR INCLUDES ALL WIRES & CABLES BETWEEN INVERTER, INDICATOR & CIRCUIT BREAKER.

REVISION			
LET	DESCRIPTION	DATE	APPD



INACTIVE: EFF THRU SER 21060089 5-16-73
DLP 6DA
NKW
PLH
NM

WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS

WIRE TABLE

ITEM NO	PART NO.	DESCRIPTION	
2	604-200-250	TURN COORDINATOR	
1	S-1360-5L	CIRCUIT BREAKER	

EQUIPMENT TABLE

CES-1000 IS APPLICABLE VENDOR CODES PER S-1400 CES-XXXX=CESSNA SPEC. NO. S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES: 1210-1073

SUPERSEDED BY:

CONTRACT NO.

	NAME	DATE
DESIGN	VR SIPES	2-18-71
GROUP	H. Wise	2-26-71
DRAWN	VR-SIPES	2-18-71
CHECK	L.K. WHITE	2-24-71
STRESS		
PROJ	H. McCaster	2-27-71
APPD	WKB	
OTHER		

Cessna AIRCRAFT CO. COMMERCIAL AIRCRAFT DIV. 5800 E. PAWNEE WICHITA, KANSAS

TITLE WIRING DIAGRAM — BRITTAIN WING LEVELER (OPT)

SIZE	CODE IDENT. NO.	DWG NO
C	71379	1270709

SCALE: NONE | 210 | PAGE: 9.1

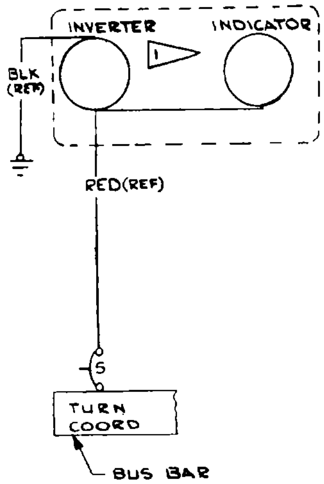
(SR 6755) II

FORM NO. 80-2188

NOTES:

1. TURN COORDINATOR INDICATOR INCLUDES ALL WIRES & CABLES BETWEEN INVERTER, INDICATOR & CIRCUIT BREAKER.

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: (SR7650) WAS (SR7555) (SR7650)II	RJP 4-25-74	



INACTIVE: EFF THRU SER (SR7650)(21060539) 5-16-73
DLP GDA
50 111 0901

WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS

WIRE TABLE

ITEM NO	PART NO.	DESCRIPTION
2	604-200-250	TURN COORDINATOR
1	S-1360-5L	CIRCUIT BREAKER

EQUIPMENT TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES: 1221O-1073

SUPERSEDED BY:

CONTRACT NO:

	NAME	DATE
DESIGN	VR SIPES	2-18-71
GROUP	H. Wise	2-26-71
DRAWN	VR-SIPES	2-18-71
CHECK	L.K. WHITE	2-24-71
STRESS		
PROJ	N. McCarter	2-27-71
APPD		
OTHER		

Cessna AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

TITLE: WIRING DIAGRAM — BRITTAIN WING LEVELER (OPT)

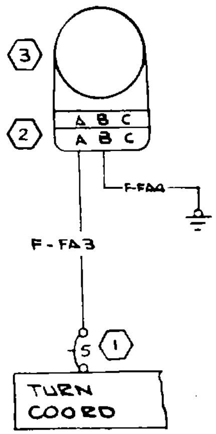
SIZE	CODE IDENT. NO.	DWG NO
C	71379	1270709

SCALE: NONE 210 PAGE: 9-1

(SR6755)II (21059:03)

FORM NO 80 2158

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: ADD WIRE LENGTHS (NOW SHOP PRACTICE)	DLO 5-3-73	



WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS
FA4	20		20	SOLDER	S-1367-1-16		
FA3	20		16	S-1367-1-8	SOLDER		

WIRE TABLE

ITEM NO	PART NO.	DESCRIPTION
3	C661003-0505	TURN COORDINATOR
2	MS3106A10SL3S	CONNECTOR
1	S-1360-5L	CIRCUIT BREAKER

EQUIPMENT TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES: 12210-1073

SUPERSEDED BY:

CONTRACT NO:

	NAME	DATE
DESIGN	V R SIPES	2-18-71
GROUP	H. Wise	2-26-71
DRAWN	V R SIPES	2-18-71
CHECK	L.K. WHITE	2-24-71
STRESS		
PROJ	H. McCarter	2-27-71
APPD	wke	
OTHER		

Cessna. AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

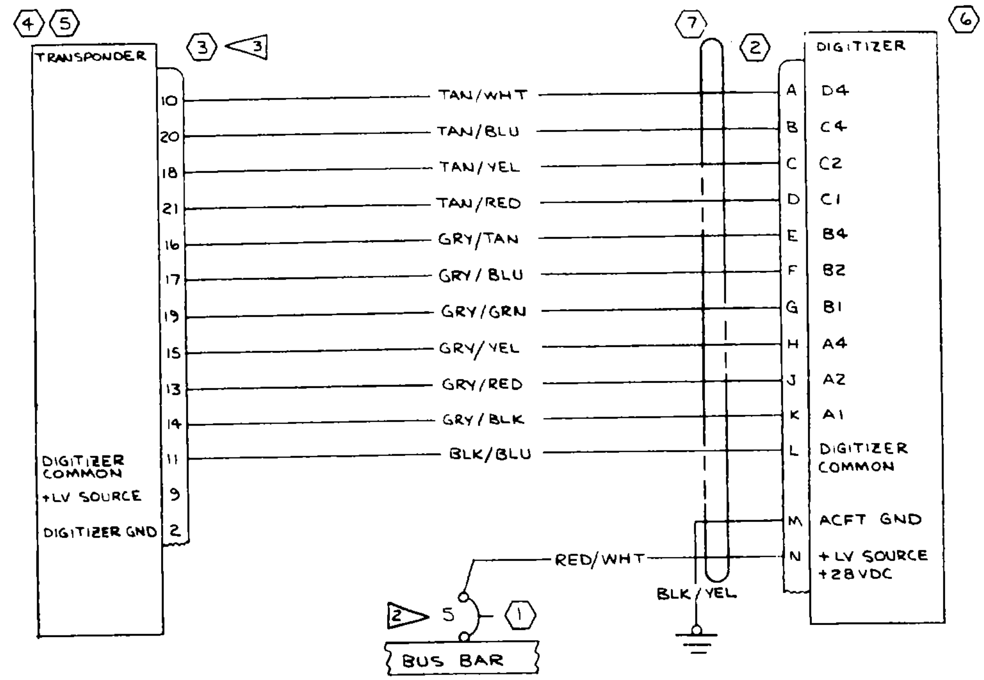
TITLE
WIRING DIAGRAM— TURN COORDINATOR

SIZE	CODE IDENT. NO	DWG NO
C	71379	1270709
SCALE: NONE	210	PAGE: 9.2

(SR6755) IX (21059503)

FORM NO 80-2158

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: REVISED NOTE 2;(SR 7922) WAS (SR 7962). ADD 1570312-1 (SR 7922)	M.E.M. 3-5-74	DLO PLH



NOTES:

1. FOR WIRE & WIRE TERMINALS REFER TO 1571000 PAGE 9.2
2. CONNECT TRANSPONDER AND ENCODING ALTIMETER TO NO. 4 RADIO CIRCUIT BREAKER.
3. TRANSPONDER CONNECTOR HOUSING IS PART OF TRANSPONDER CABLE ASSY
4. FOR WIRING DIAGRAM OF 300 & 400 TRANSPONDER REFER TO 3920143

ITEM NO	PART NO.	DESCRIPTION	
7	1570312-1	CABLE ASSY	
6	EA-401A	ALT DIGITIZER	
5	RT-359A	TRANSPONDER	
4	RT-459A	TRANSPONDER	
3	S-2189-1	CONNECTOR	
2	42816	CONNECTOR	
1	S-1360-5L	CKT BKR	

EQUIPMENT TABLE

WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS

WIRE TABLE

CES-1000 IS APPLICABLE VENDOR CODES PER S-1400 CES-XXXX=CESSNA SPEC. NO. S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES:

SUPERSEDED BY:

CONTRACT NO:

	NAME	DATE
DESIGN		
GROUP	H. Wise	9-25-73
DRAWN	MERRICK	9-24-73
CHECK	J. Youel	9-24-73
STRESS		
PROJ	W. McGill	9-26-73
APPD	PLH	
OTHER		

Cessna AIRCRAFT CO. COMMERCIAL AIRCRAFT DIV. 5800 E. PAWNEE WICHITA, KANSAS

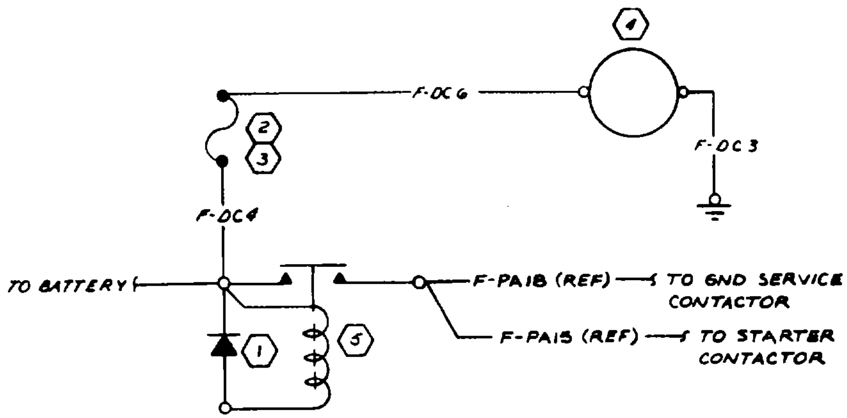
TITLE WIRING DIAGRAM — ENCODING ALTIMETER

SIZE C | CODE IDENT. NO. 71379 | DWG NO 1270709

SCALE: NONE | (SR 7922) | PAGE: 9.3

FORM NO. 80-2158

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: ADD WIRE LENGTHS (NOW SHOP PRACTICE)	DLO 5-3-73	



WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS
F-DC 6	20		64	SOLDER	S-1367-1-6		
F-DC 4	20		6	SOLDER	S-1367-1-5		
F-DC 3	20		18	S-1367-1-6	S-1367-1-8		

WIRE TABLE

ITEM NO.	PART NO.	DESCRIPTION
5	S-1580-1	BATTERY CONTACTOR
4	C664508-0101	CLOCK
3	S-1091-1	FUSE
2	S-1090-22	FUSEHOLDER
1	0770728-1	DIODE ASSY

EQUIPMENT TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES: 12210-1073

SUPERSEDED BY:

CONTRACT NO:

	NAME	DATE
DESIGN	VR SIPES	1-28-71
GROUP	H. Wise	2-26-71
DRAWN	VR SIPES	2-18-71
CHECK	L.K. WHITE	2-24-71
STRESS		
PROJ	H. McCarter	2-27-71
APPD		
OTHER		

Cessna AIRCRAFT CO. COMMERCIAL AIRCRAFT DIV. 5800 E. PAWNEE WICHITA, KANSAS

TITLE WIRING DIAGRAM — CLOCK

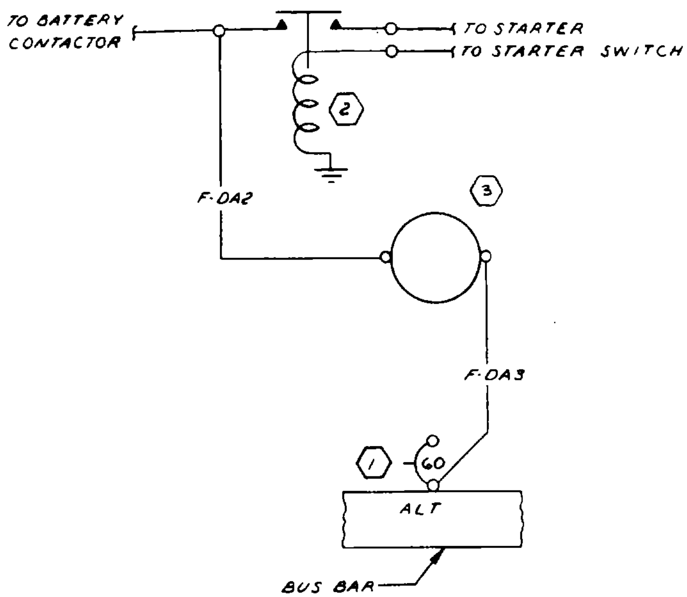
SIZE	CODE IDENT. NO.	DWG NO
C	71379	1270709

SCALE: NONE 210 PAGE: 10.1

(SR 6755) A

FORM NO. 80-2159

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: S1367-4-14 WAS S1367-4-13, ADD WIRE LENGTHS (NOW SHOP PRACTICE)	DLO 5-3-73	RLY VRW TJH NMP
B	BY REV: C669520-0102 WAS C669502-0301 (SR8311)	BAH 1-30-74	JCY PRS RAM BMC
C	BY REV: (SR8065) WAS (SR7650) PER REV "B" (SR8311)	RAM 9-25-74	DLP PRS PLH BMC
D	BY REV (SR7913) WAS (SR8065) PER REV "B" & "C"; (SR8311)	CJH 1-27-75	JCY VRS WHH
E	BY REV: (SR8311) WAS (SR7913) PER REV "B, C" & "D" (SR8311)	GS 8-27-75	JCY WHH JH



WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS
F-DA3	8		40	S-1367-4-10	S-1367-4-10		
F-DA2	8		21	S-1367-4-10	S-1367-4-14		

WIRE TABLE

ITEM NO.	PART NO.	DESCRIPTION	
3	C669520-0102	INST CLUSTER	
2	S-1577-1	STARTER CONTACTOR	
1	S-1596-60L	CIRCUIT BREAKER	

EQUIPMENT TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA STD. NO

SUPERSEDES: 12210-1073

SUPERSEDED BY:

CONTRACT NO:

	NAME	DATE
DESIGN	V R SIPES	1-28-71
GROUP	H. Wise	2-26-71
DRAWN	V R SIPES	2-18-71
CHECK	L.K. WHITE	2-24-71
STRESS		
PROJ	N. McCoti	2-27-71
APPD	WKB	
OTHER		

Cessna AIRCRAFT CO.

COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

TITLE

WIRING DIAGRAM — AMMETER

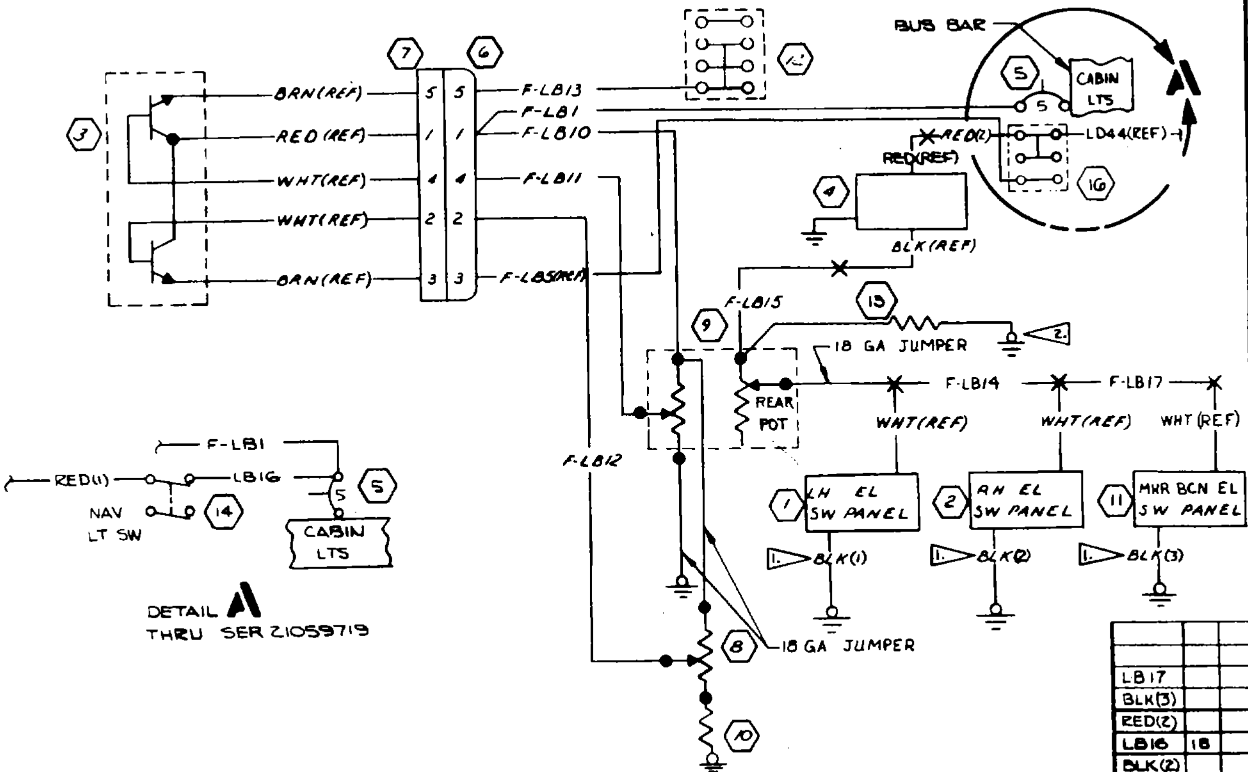
SIZE	CODE IDENT. NO.	DWG NO
C	71379	1270709

SCALE: NONE 210 PAGE: 10.2

(SR6755) (21059503)

FORM NO 80-2158

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: ADD S2160-1, RED(2) & SER, SER OUT S-1844-1-2, LB16 & RED(1) SER 21059720	DLP 1-9-73	
B	BY REV: ADD WIRE LENGTHS, 270 OHM ½W WAS 27OHM ½W : ADD ORIENT TERM BOARD (NOW SHOP PRACTICE)	JLO 7-28-73	
C	BY REV: S-1904-2 WAS S-1904-3, S-2091-3 WAS S-2091-7, 200 OHM 1W WAS 270 OHM ½ W (NOW SHOP PRACTICE)	BAH 10-25-73	
D	BY REV: DELETE 56K-2W ADD: 18 GA JUMPERS S-1370-2 WAS S-1370-1 / LB14; DELETE 270HM ½W ON FRONT RHEOSTAT; ADD: 1213757-1/ITEM 11, & LB17 WIRING; 1213722-1 WAS 1213192-20; 1213723-1 WAS 1213307-7; 18 GA JUMPER WAS 200 OHM 1 WATT SER 21060012 (SR8153) MERED362 SER (SR7913)	CJH 1-4-75	
E	BY REV: 34003-817 WAS 34002-55 (INBD) 34004-818 WAS 34002-55 (OUT BD) (SR7913)	GW 9-17-75	



13-136-0905

LB17				S-1370-2	S-1370-2		SER21061040 & ON
BLK(3)				S-1367-1-8		1.	
RED(2)			65	S-1370-1	S-1829-1		SER 21059720 & ON
LB16	18		65	S-1493-1	S-1367-1-8		THRU SER21059719
BLK(2)				S-1367-1-8		1.	
BLK(1)				S-1367-1-8		1.	
RED(1)	18	-18-2	65	S-1370-1	S-1493-1		THRU SER21059719
F-LB15	18		65	S-1370-1	SOLDER		
F-LB14	18		62	S-1370-2	S-1370-2		
F-LB13	18		72	S-1635-2	S-1829-1		
F-LB12	18		65	S-1635-2	SOLDER		
F-LB11	18		65	S-1635-2	SOLDER		
F-LB10	18		65	SEE F-LB1	SOLDER		
F-LB1	18		65	S-1635-3	S-1067-1-6		
WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS

WIRE TABLE

ITEM NO	PART NO.	DESCRIPTION	
16	34003-817	TERMINAL BLOCK	
15	S-2160-1	SWITCH	
14	S-1844-1-2	SWITCH	
13	VAL-5-6000	RESISTOR	
12	34004-818	TERMINAL BLOCK	
11	1213757-1	EL PANEL	
10	200OHM 1W	RESISTOR	
9	S-2091-3	POT ASSY	
8	S-1904-2	POT ASSY	
7	S-1641-6	HOUSING-SOCKET	
6	S-1640-6	HOUSING-PIN	
5	S-1360-5L	CIRCUIT BREAKER	
4	C613001-0101	POWER SUPPLY	
3	1570166-1	DIMMING ASSY	
2	1213722-1	EL PANEL	
1	1213723-1	EL PANEL	

EQUIPMENT TABLE

NOTES:

1. THESE WIRES VENDOR FURNISHED

2. THIS END OF RESISTOR TERMINATED WITH S-1367-1-14 TERMINAL AND INSTALLED ON SHAFT OF TANDEM POT ASSY. DUE TO HEAT DISSIPATION RESISTOR MUST BE KEPT FROM WIRE BUNDLE

CES-1000 IS APPLICABLE VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES: 12210-1073

SUPERSEDED BY:

CONTRACT NO:

	NAME	DATE
DESIGN	V R SIPES	1-28-71
GROUP	H. Wise	2-26-71
DRAWN	V R SIPES	2-18-71
CHECK	L.K. WHITE	2-24-71
STRESS		
PROJ	H. McCarter	2-27-71
APPD		
OTHER		

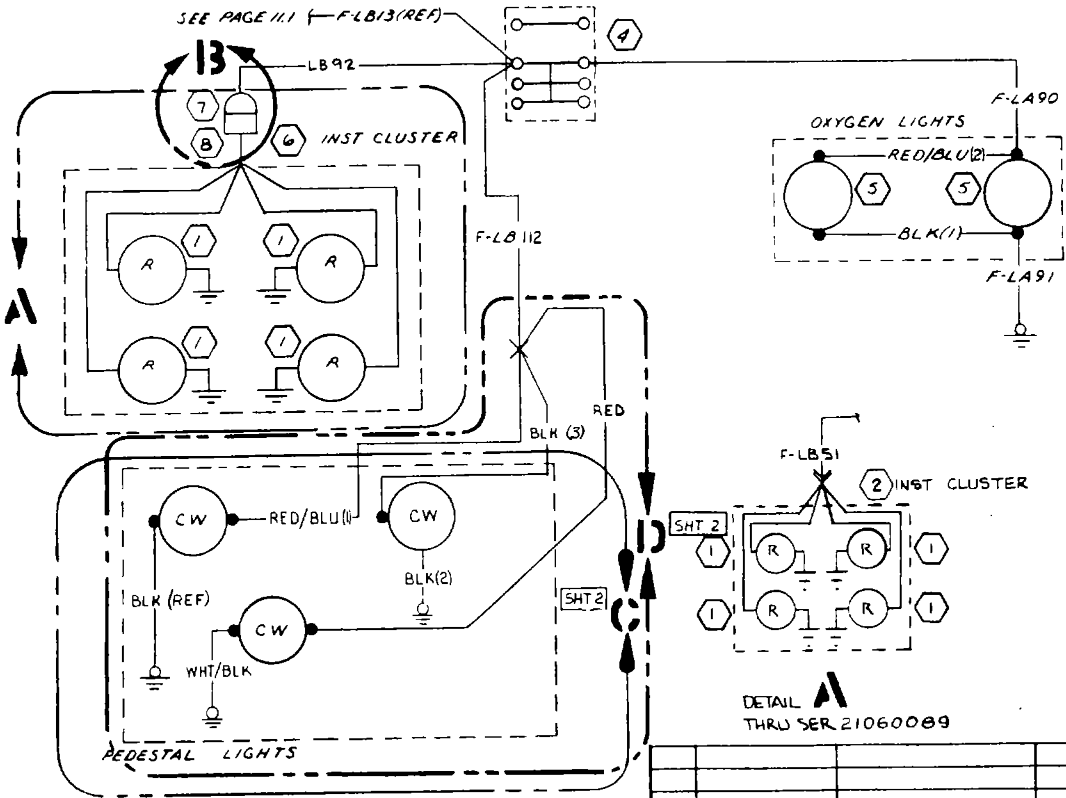
Cessna AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

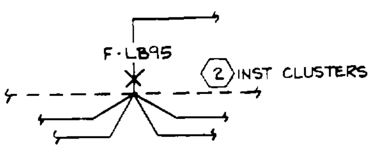
TITLE
WIRING DIAGRAM — ELECTRO LUMINESCENT PANEL

SIZE	CODE IDENT. NO	DWG NO
C	71379	1270709
SCALE: NONE	210	PAGE: 11.1

(SR6755) IX (21059503)

FORM NO. 60-2188





DETAIL B
SER 21060090 THRU SER (SR7913)

NOTES:

1. OXYGEN LIGHTS ARE STANDARD ON T210, OPTIONAL ON 210

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: ADD WIRE LENGTHS, DELETE LB89, BLK(3) & 1213319-10. SER OUT F-LB51; SER IN F-LB95 (SR7381)	JLO 7-28-73	DLP HJW
B	BY REV: ADD DETAIL "B", LB92, S-1637-1, S-1637-2, C669520-0102. (SR8311)	BAH 1-30-74	JCY
C	BY REV: ADD DETAIL "C" & SERIAL, WHT/BLK, 18 GA. JUMPER & POST LIGHT. (SR7650)	RJP 4-30-79	JCY
D	BY REV: (SR8065) WAS (SR7650) PER REV "B" (SR8311)	RAM 9-25-74	DLP
E	BY REV: 34003-55 WAS 34002-55; ADD S-1370-2. RED WIRE: BLK(REF) WAS DHF-LB83; DELETE 18GA JUMPER; ADD DETAIL D; RED/BLU (1) & RED/BLU (2) WAS RED/BLU; ADD SHT 2; F-LB112 MER-210E0397 (SR 7913) SER 21060585	CJH 11-27-74	JCY
F	BY REV (SR7913) WAS (SR8065) PER REV "B & D" (SR8311)	CJH 1-27-75	JCY VRS
G	BY REV: 34004-818 WAS 34003-817, (SR8311) WAS (SR7913) PER REV "B, D & F" (SR7913) (SR8311)	GW GS 8-27-75	JCY

13-196-0905

WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS
BLK(3)	18	-18-0		SOLDER	S-1370-2		SER 21060585 & ON
F-LB112	18			S-1829-1	S-1370-2		SER 21060585 & ON
LB92	18			S-1829-1	S-1635-2		
RED/BLU(2)	18	-18-2-6		SOLDER	SOLDER		
RED/BLU(1)	18	-18-2-6		SOLDER	S-1370-2		
RED	18	-18-2		S-1370-2	SOLDER		SER 21060585 & ON
BLK(2)	18	-18-0	25	SOLDER	S-1367-1-8		
BLK(1)	18	-18-0	25	SOLDER	SOLDER		
DHF-LB83	18		35	SOLDER	S-1367-1-8		
F-LB95	18		50	S-1829-1	S-1370-1		SER 21060090 & ON
F-LB82	18		35	S-1829-1	SOLDER		THRU SER 21060584
F-LB51	18		50	S-1829-1	S-341-2		THRU SER 21060088
F-LA91	18		10	SOLDER	S-1367-1-8		
F-LA90	18		190	S-1829-1	SOLDER		

WIRE TABLE

ITEM NO	PART NO.	DESCRIPTION
8	S-1637-2	HOUSING
7	S-1637-1	HOUSING
6	C669520-0102	INSTRUMENT CLUSTER
5	S-1899-7	LIGHT ASSY
4	34004-818	TERMINAL BOARD
2	C669502-0304	INST CLUSTER KIT
1	1270479-4	LIGHT ASSY

EQUIPMENT TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES: 12210-1073

SUPERSEDED BY:

CONTRACT NO:

	NAME	DATE
DESIGN	V R SIPES	1-28-71
GROUP	H. Wise	2-26-71
DRAWN	V R SIPES	2-18-71
CHECK	L.K. WHITE	2-24-71
STRESS		
PROJ	McCarter	2-27-71
APPD		
OTHER		

Cessna AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

TITLE
WIRING DIAGRAM — INSTRUMENT LIGHTS

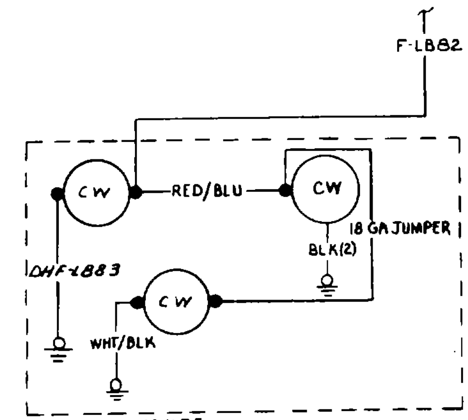
SIZE	CODE IDENT. NO.	DWG NO
C	71379	1270709

SCALE: NONE | 210 | PAGE: 11.2

(SR67:5) II (21059503)

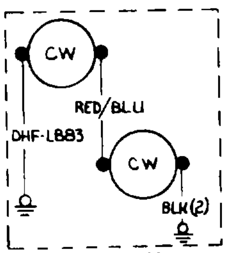
FORM NO 80-215B

REVISION			
LET	DESCRIPTION	DATE	APPD
G	SEE SHEET 1 FOR REVISION		



PEDESTAL LIGHTS

DETAIL D
THRU SER 21060585



DETAIL C
THRU SER (SR7650) 21060539

13-196-0905

WIRE CODE NO	GA	MATERIAL	LG	TERMINALS		SERIALS

WIRE TABLE

CONTRACT NO:		
	NAME	DATE
DESIGN		
GROUP		
DRAWN	CJ HESSMAN	11-27-74
CHECK	J. Youel	11-27-74
STRESS		
PROJ		
APPD		
OTHER		

Cessna AIRCRAFT CO. COMMERCIAL AIRCRAFT DIV. 5800 E. PAWNEE WICHITA, KANSAS

TITLE
WIRING DIAGRAM —
INSTRUMENT LIGHTS

SIZE	CODE IDENT. NO.	DWG NO
C	71379	1270709

SCALE: NONE 2/0 PAGE: 11.2.1

ITEM NO.	PART NO.	DESCRIPTION

EQUIPMENT TABLE

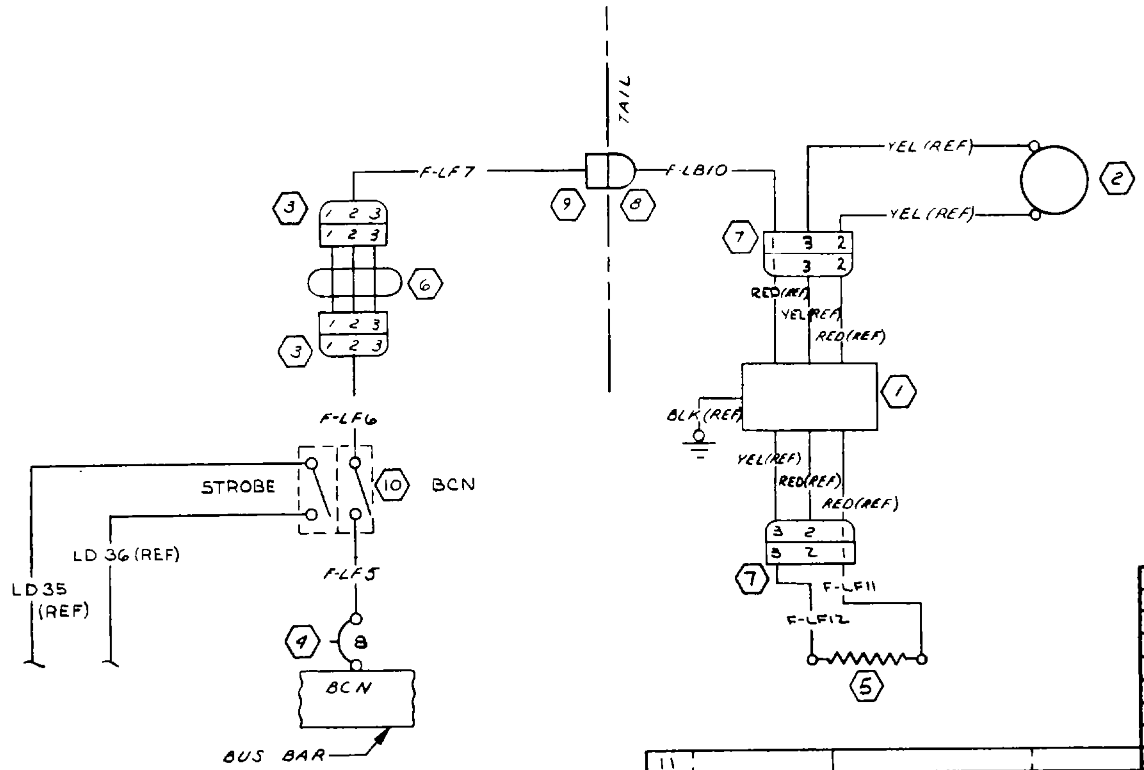
CES-1000 IS APPLICABLE VENDOR CODES PER S-1400 CES-XXXX=CESSNA SPEC. NO. S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES:

SUPERSEDED BY:

FORM NO. 80-2158

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: ADD WIRE LENGTHS (NOW SHOP PRACTICE)	DLO 5-3-73	HW NMC



INACTIVE: EFF THRU 21059719 VRS 3-25-72 LKW HW NMC

NOTES:

1. INSTALL A 1270695-1 CLIP ON "STROBE" SIDE OF S-1846-2-3 SWITCH WHEN WING TIP STROBE LIGHTS ARE NOT INSTALLED.

EQUIPMENT TABLE

ITEM NO	PART NO.	DESCRIPTION	
11			
10	S-1846-2-3	SWITCH	
9	S-1637-2	HOUSING-PLUG	
8	S-1637-1	HOUSING-CAP	
7	S-1638-1	HOUSING-PLUG	
6	1270705-1	CABLE ASSY	
5	ZR-0095-1600	RESISTOR	(83777)
4	S-1360-8L	CIRCUIT BREAKER	
3	S-1638-2	HOUSING-CAP	
2	C621001-0102	LIGHT ASSY	
1	C594501-0204	FLASHER UNIT	

WIRE TABLE

WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS
F-LF12	16		75	S-1636-2	S-1493-2		
F-LF11	16		75	S-1636-2	S-1493-2		
F-LB10	16		65	S-1635-2	S-1636-2		
F-LF7	16		75	S-1635-2	S-1636-2		
F-LF6	16		125	S-1493-2	S-1635-2		
F-LF5	16		7	S-13672-6	S-1493-2		

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES: 12210-1073

SUPERSEDED BY: 11.13

CONTRACT NO:

	NAME	DATE
DESIGN	V R SIPES	1-28-71
GROUP	H Wine	2-26-71
DRAWN	V R SIPES	2-18-71
CHECK	L.K. WHITE	2-24-71
STRESS		
PROJ	N. McCarter	2-27-71
APPD	WAT	
OTHER		

Cessna AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

TITLE
WIRING DIAGRAM — FLASHING BEACON LIGHT

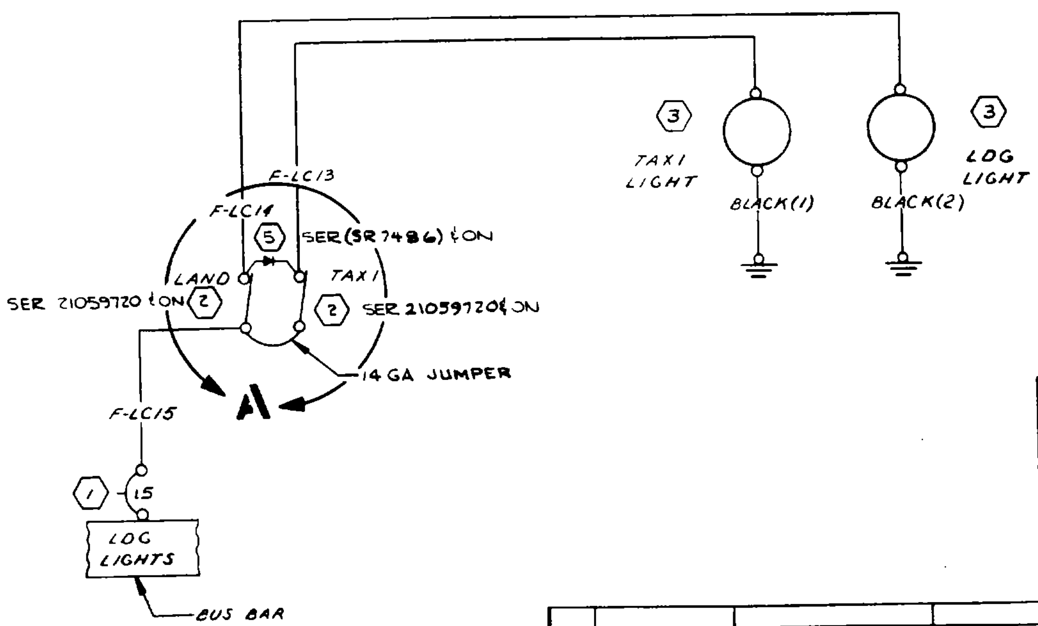
SIZE C | CODE IDENT NO. 71379 | DWG NO 1270709

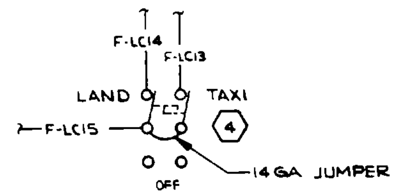
SCALE NONE | 210 | PAGE: 11.3

(526755) I (21059503)

FORM NO 80 215B

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: DELETE S-2094-1, GRAY, TAN, BLK (3) & BLK (4); 16 GA WAS 18 GA / F-LC13 & F-LC14; 16 GA WAS 14GA / F-LC15; S-1367-2-B WAS S-1493-3 / F-LC13, F-LC14, BLK(1) & BLK (2) (SR6755) II	RLY 9-2-71	
B	BY REV: ADD S-2160-1, 1270082-1 & SER; SER OUT S-1846-1-3; SER (SR7486)	DLP 1-9-73	
C	BY REV: ADD WIRE LENGTHS (NOW SHOP PRACTICE)	DLO 5-3-73	





DETAIL A
THRU SER 21059120

WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS
BLK (2)	16	-16-0	16	S-1367-2-8	S-1367-2-8		
BLK (1)	16	-16-0	16	S-1367-2-8	S-1367-2-8		
F-LC15	16		6	S-1493-2	S-1367-2-6		
F-LC14	16		175	S-1493-2	S-1367-2-8		
F-LC13	16		175	S-1493-2	S-1367-2-8		

WIRE TABLE

ITEM NO	PART NO.	DESCRIPTION	
5	1270082-1	DIODE ASSY	
4	S-1846-1-3	SWITCH	
3	GE 4591	LIGHT	
2	S-2160-1	SWITCH	
1	S-1360-15L	CIRCUIT BREAKER	

EQUIPMENT TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES: 12210-1073

SUPERSEDED BY:

CONTRACT NO:

	NAME	DATE
DESIGN	V R SIPES	1-28-71
GROUP	H. Wiel	2-26-71
DRAWN	V R SIPES	2-19-71
CHECK	L.K. WHITE	2-24-71
STRESS		
PROJ	J. McCarter	2-27-71
APPD		
OTHER		

Cessna AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

TITLE
WIRING DIAGRAM — LANDING LIGHTS

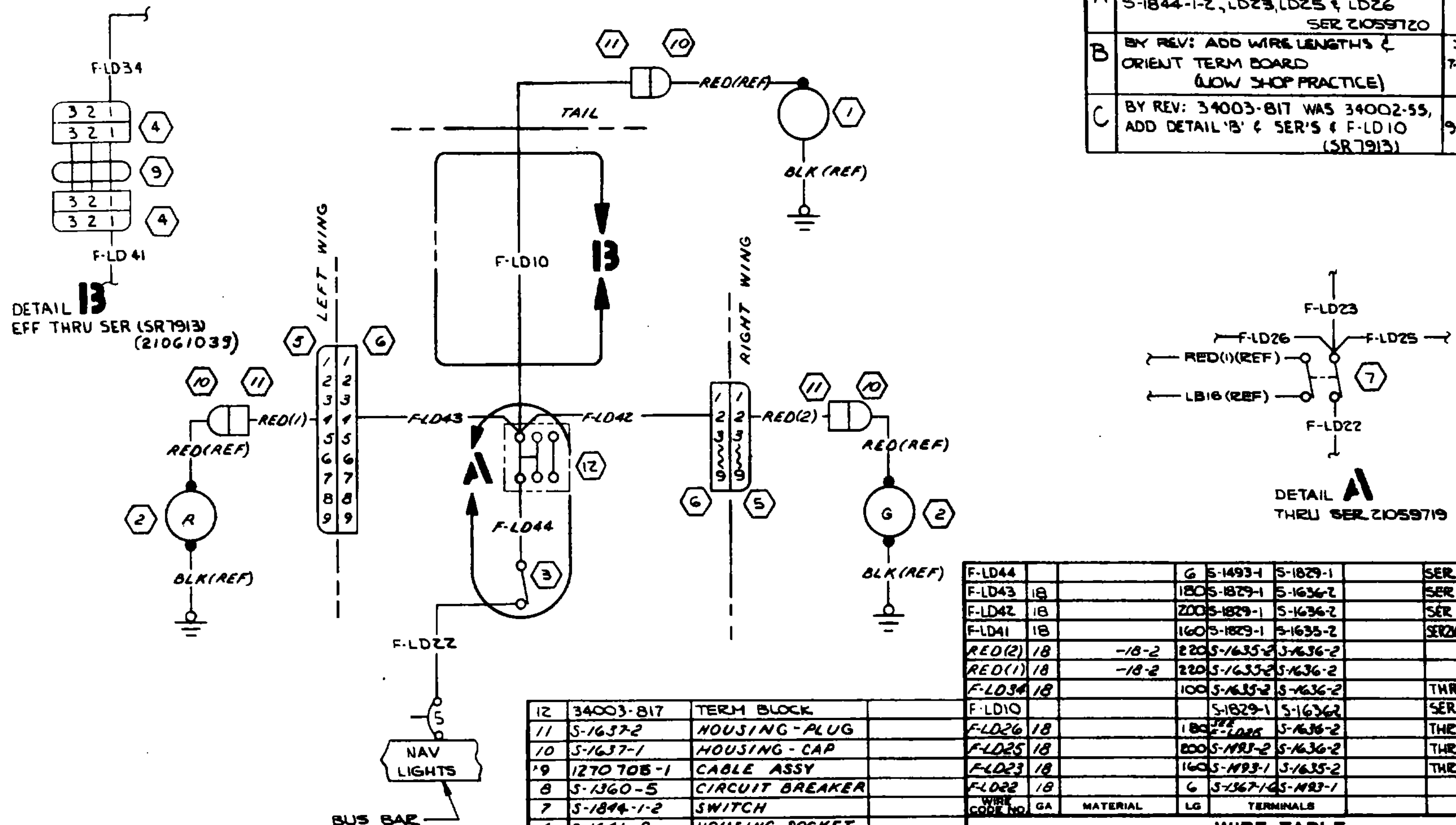
SIZE C | CODE IDENT. NO. 71379 | DWG NO 1270709

SCALE: NONE | 2/0 | PAGE: 11.4

(SR6755) II

FORM NO. 80-2158

LET	DESCRIPTION	DATE	APPD
REVISION			
A	BY REV: ADD S-2160-1, 34002-55, LD41, LD42, LD43, LD44 & SER; SER OUT S-1844-1-2, LD23, LD25 & LD26 SER 21059720	DLP 1-9-73	
B	BY REV: ADD WIRE LENGTHS & ORIENT TERM BOARD (NOW SHOP PRACTICE)	DLO 7-28-73	D.P.
C	BY REV: 34003-817 WAS 34002-55, ADD DETAIL 'B' & SER'S & F-LD10 (SR7913)	GW 9-17-75	



ITEM NO.	PART NO.	DESCRIPTION	
12	34003-817	TERM BLOCK	
11	S-1637-2	HOUSING-PLUG	
10	S-1637-1	HOUSING-CAP	
9	1270708-1	CABLE ASSY	
8	S-1360-5	CIRCUIT BREAKER	
7	S-1844-1-2	SWITCH	
6	S-1641-9	HOUSING-SOCKET	
5	S-1640-9	HOUSING-PIN	
4	S-1638-2	HOUSING-CAP	
3	S-2160-1	SWITCH	
2	C622001-0202	LIGHT ASSY	
1	C622001-0102	LIGHT ASSY	

EQUIPMENT TABLE

WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS
F-LD44			6	S-1493-1	S-1829-1		SER 21059720 & ON
F-LD43	18		180	S-1829-1	S-1636-2		SER 21059720 & ON
F-LD42	18		200	S-1829-1	S-1636-2		SER 21059720 & ON
F-LD41	18		160	S-1829-1	S-1635-2		SER21059720 THRU SER 2106108[illegible]
RED(2)	18	-18-2	220	S-1635-2	S-1636-2		
RED(1)	18	-18-2	220	S-1635-2	S-1636-2		
F-LD34	18		100	S-1635-2	S-1636-2		THRU SER 21061089
F-LD10				S-1829-1	S-16362		SER 21061090 & ON
F-LD26	18		180	SEE F-LD26	S-1636-2		THRU SER 21059719
F-LD25	18		200	S-1493-2	S-1636-2		THRU SER 21059719
F-LD23	18		160	S-1493-1	S-1635-2		THRU SER 21059719
F-LD22	18		6	S-1367-1-6	S-1493-1		

WIRE TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES: 12210-1073

SUPERSEDED BY:

CONTRACT NO:

	NAME	DATE
DESIGN	V R SIPES	1-28-71
GROUP	H. Wiel	2-26-71
DRAWN	V R SIPES	2-18-71
CHECK	L.K. WHITE	2-25-71
STRESS		
PROJ	N. McCarter	2-27-71
APPD		
OTHER		

Cessna AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

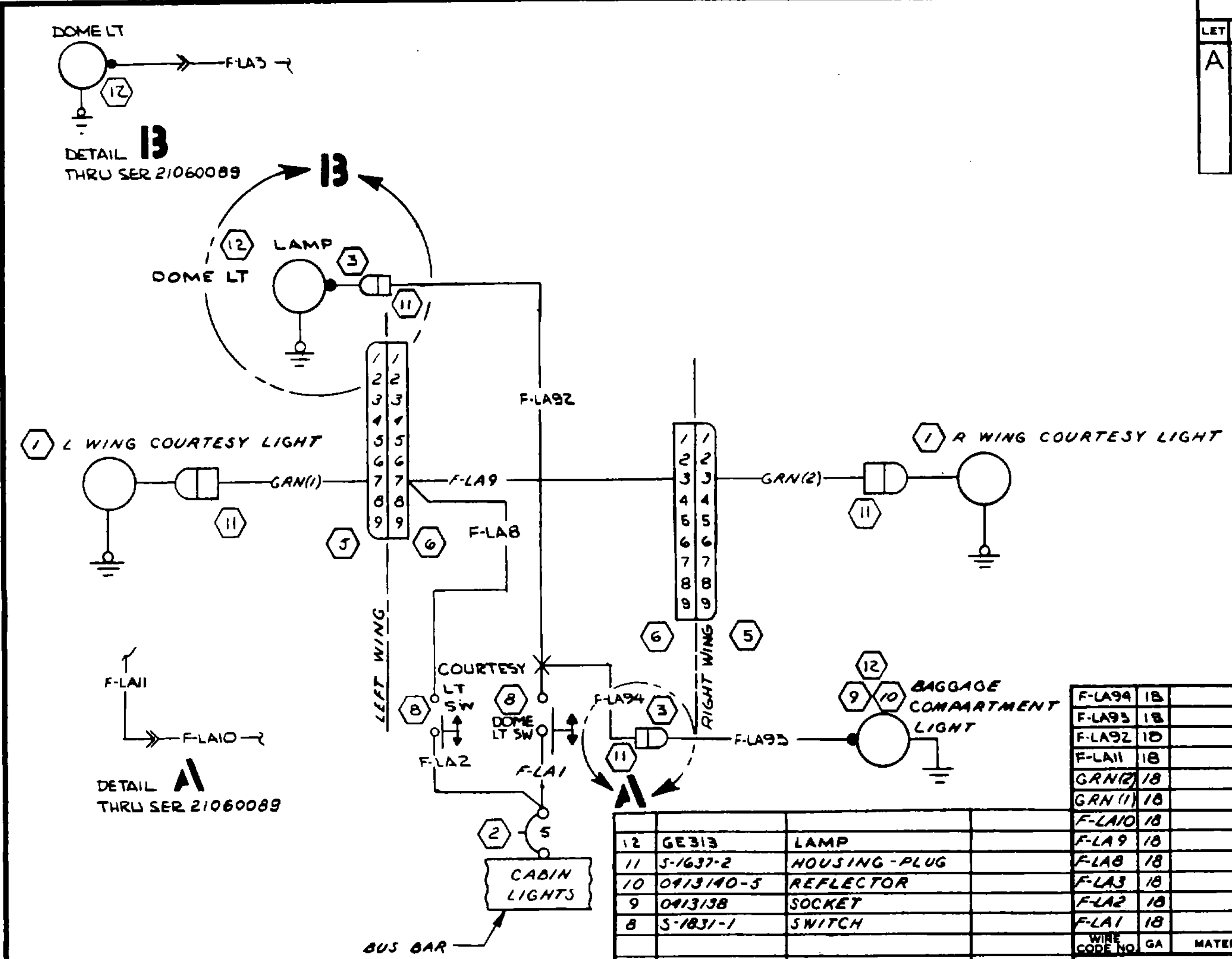
TITLE
WIRING DIAGRAM — NAVIGATION LIGHTS

SIZE	CODE IDENT. NO.	DWG NO
C	71379	1270709

SCALE: NONE | 210 | PAGE: 11.5

FORM NO. 80-2158

(SR6755) II (21059503)



REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: ADD S1637-2 TO FIELD & WIRE LENGTHS & S-1637-1; SER OUT F-LA3, F-LA10 & F-LA11; SER IN F-LA92, F-LA93 & F-LA94: 1221103-2 WAS 0700615-5 (NOW SHOP PRACTICE) (SR6755) (SR7381)	SLO 7-28-75	DLP HKW STO

WIRE CODE NO.	GA	MATERIAL	LG	TERMINALS			SERIALS
F-LA94	18		97	S-1830-1	S-1636-1		SER 21060090 & ON
F-LA93	18		8	S-1635-1	SOLDER		SER 21060090 & ON
F-LA92	18		43	S-1636-1	S-1370-1		SER 21060090 & ON
F-LA11	18		97	S-1830-1	S-341-1		THRU SER 21060089
GRN(2)	18	-18-5	20	S-1635-2	S-1636-2		
GRN(1)	18	-18-5	18	S-1635-2	S-1636-2		
F-LA10	18		8	S-341-1	SOLDER		THRU SER 21060088
F-LA9	18		88	S-1636-2	SEE F-LA8		
F-LA8	18		33	S-1830-1	S-1636-5		
F-LA3	18		43	S-341-2	S-1370-1		THRU SER 21060088
F-LA2	18		186	S-1830-1	S-1367-6		
F-LA1	18		196	S-1367-6	S-1830-1		

WIRE TABLE

ITEM NO.	PART NO.	DESCRIPTION	
12	GE313	LAMP	
11	S-1637-2	HOUSING-PLUG	
10	0413140-5	REFLECTOR	
9	0413138	SOCKET	
8	S-1831-1	SWITCH	
6	S-1641-9	HOUSING-SOCKET	
5	S-1640-9	HOUSING-PIN	
4	S-1831-1	SWITCH	
3	S-1367-1	HOUSING-PIN	
2	S-1360-5L	CIRCUIT BREAKER	
1	1221103-2	LIGHT ASSY	

EQUIPMENT TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES: 12210-1073

SUPERSEDED BY:

CONTRACT NO:

	NAME	DATE
DESIGN	VR SIPES	1-28-71
GROUP	H. Wise	2-26-71
DRAWN	VR SIPES	2-18-71
CHECK	L.K. WHITE	2-24-71
STRESS		
PROJ	N. McCarter	2-27-71
APPD		
OTHER		

Cessna AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

TITLE
WIRING DIAGRAM — DOME, COURTESY & BAGGAGE LIGHTS

SIZE C | CODE IDENT. NO. 71379 | DWG NO 1270709

SCALE: NONE | 210 | PAGE: 77.6

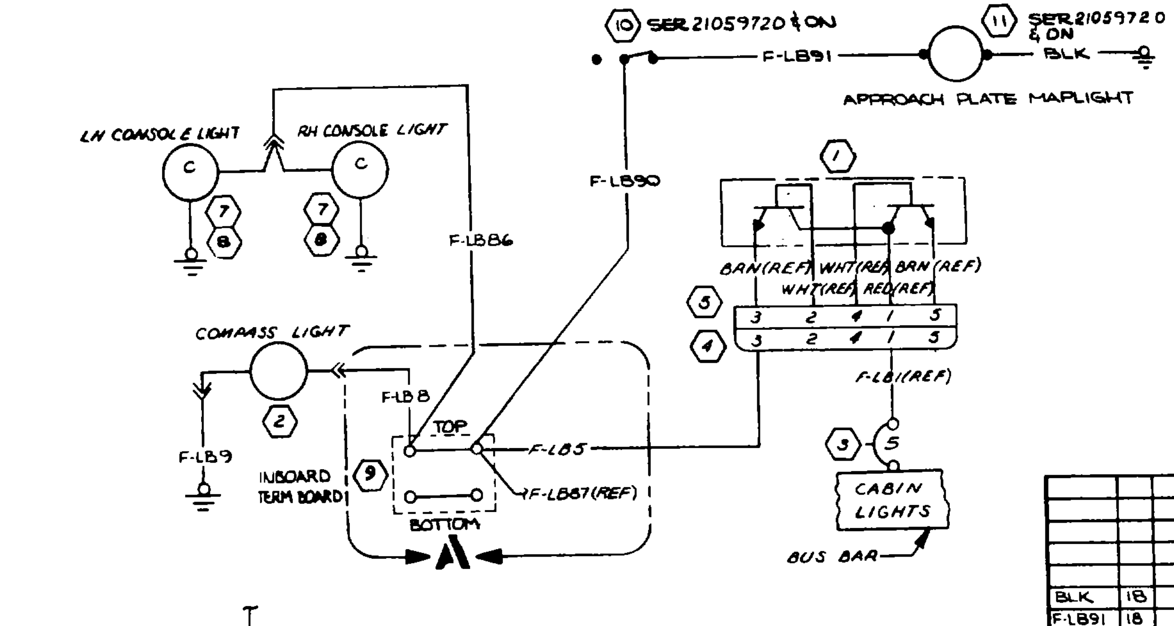
(SR 6755) II

FORM NO 80-2158

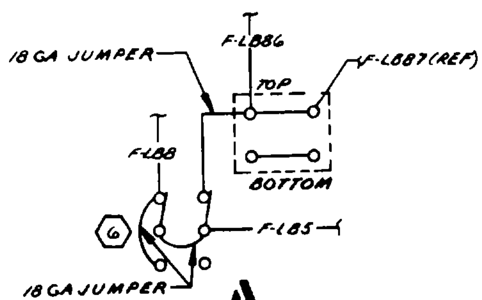
NOTES:

⟨1⟩ S-1493-1 TERMINAL REPLACES S-1829-1 WHEN OPT POST LIGHTS ARE INSTALLED

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: ADD LB90, LB91, BLK, S-1695-2, 1213319-13 & SER (SR7038) II	DLP 9 20 72	BLY HLW
B	BY REV: ADD S-2160-2 & SER; SER OUT S-1847-2-2 SER 21059720	DLP 10-30-72	BLY HLW PLA
C	BY REV: ADD WIRE LENGTHS & ORIENT TERM BOARD; SER OUT F-LB8, F-LB9 & F-LB86; SER IN F-LB100 F-LB101 & F-LB102 (SR 7381) IX (NOW SHOP PRACTICE)	JLO 7-28-73	DLP HLW
D	BY REV: INACT DWG; CHANGE DWG TO "B" CONFIGURATION (SR 7381) IX (REF)	JEF 2-8-74	ARG



INACTIVE: EFF THRU SER (SR 7381) IX (REF) (21060089) JEF 2-6-74 KCY ARG



DETAIL A
(APPLIES WHEN OPTIONAL POST LIGHTS ARE INSTALLED)
THRU SER 21059719

ITEM NO.	PART NO.	DESCRIPTION	VENDOR
12	S-2160-2	SWITCH	
11	1213319-13	LIGHT ASSY	
10	S-1695-2	SWITCH	
9	34002-55	TERMINAL BOARD	(ETNC
8	MS15584-8	MINIATURE LAMP	
7	0513208-1	SOCKET	
6	S-1847-2-2	SWITCH	
5	S-1641-6	HOUSING-SOCKET	
4	S-1640-6	HOUSING-PIN	
3	S-1360-5L	CIRCUIT BREAKER	
2	C660501-0102	COMPASS ASSY	
1	1570166-1	DIMMING ASSY	

EQUIPMENT TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES: 12210-1073

SUPERSEDED BY: 1270709 II.T.I

WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS
BLK	18	-18-0		SOLDER	S-1367-1-8		SER 21059720 & ON
F-LB91	18			SOLDER	SOLDER		SER 21059720 & ON
F-LB90	18		75	S-1829-1	SOLDER	⟨1⟩	SER 21059720 & ON
F-LB86	18		190	S-341-2	S-1829-1		THRU SER 21060089
F-LB9	18		220	S-341-2	S-1367-1-8		THRU SER 21060089
F-LB8	18		220	S-1829-1	S-341-2	⟨1⟩	THRU SER 21060089
F-LB5	18		65	S-1829-1	S-1635-2	⟨1⟩	

WIRE TABLE

CONTRACT NO:

	NAME	DATE
DESIGN	V R SIPES	1-28-71
GROUP	H. Wied	2-26-71
DRAWN	V R SIPES	2-18-71
CHECK	L.K. WHITE	2-25-71
STRESS		
PROJ	H. McCarter	2-27-71
APPD		
OTHER		

Cessna AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

TITLE
WIRING DIAGRAM — CONSOLE & COMPASS LIGHTS

SIZE	CODE IDENT. NO.	DWG NO
C	71379	1270709
SCALE: NONE	210	PAGE: 11.7

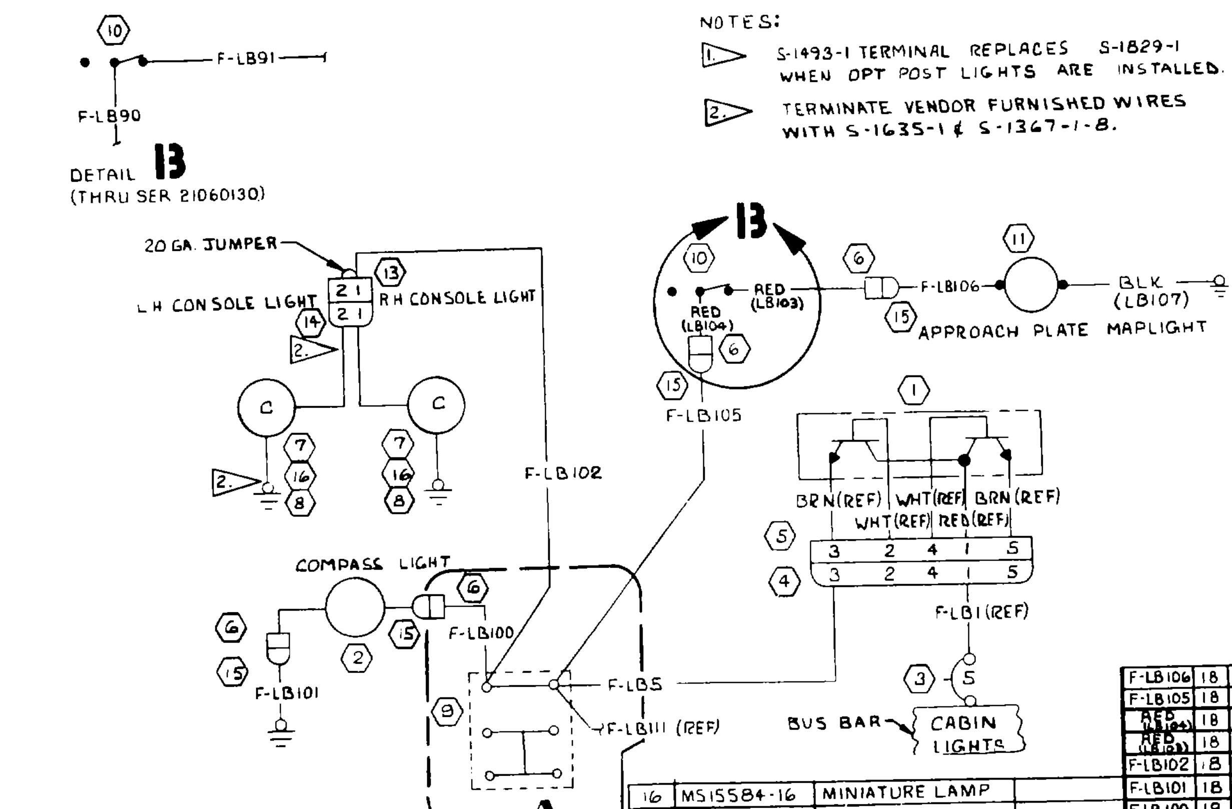
(SR 6755) II

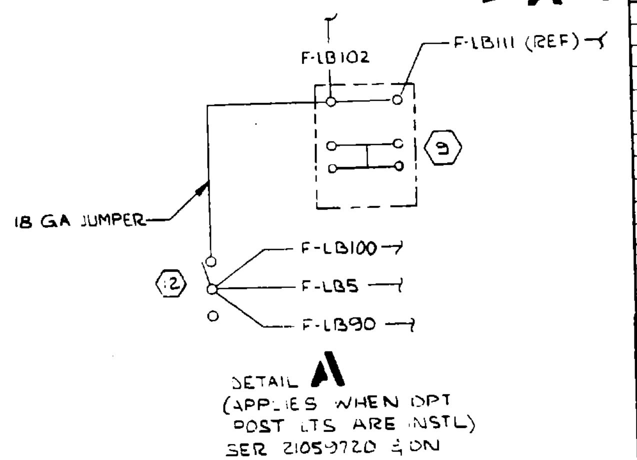
FORM NO 90-2159

LET	DESCRIPTION	DATE	APPD
REVISION			
A	BY REV: ADD MS15584-16 & NOTE 2; 0513208-3 WAS 0513208-1 (SR7650) IX	MEM 5-14-74	JLO JRS
B	BY REV: 34003-55 WAS 34002-55; SER (SR 7913)	CJH 11-27-74	JCY JRS
C	BY REV: ADD RED TO LB103 & LB104 & WIRE LENGTHS MER E0404	TMS 2-25-75	JCY JRS
D	BY REV: 34003-817 WAS 34003-55 (SR7913)	GW 9-17-75	JRS DS

NOTES:

1. S-1493-1 TERMINAL REPLACES S-1829-1 WHEN OPT POST LIGHTS ARE INSTALLED.
2. TERMINATE VENDOR FURNISHED WIRES WITH S-1635-1 & S-1367-1-8.





ITEM NO	PART NO.	DESCRIPTION
16	MS15584-16	MINIATURE LAMP
15	S-1637-1	HOUSING
14	S-2035-1	HOUSING-CAP
13	S-2035-2	HOUSING-PLUG
12	S-2160-2	SWITCH
11	1213319-13	LIGHT ASSY
10	S-1695-2	SWITCH
9	34003-817	TERMINAL BLOCK
8	MS15584-8	MINIATURE LAMP
7	0513208-3	SOCKET
6	S-1637-2	HOUSING
5	S-1641-6	HOUSING-SOCKET
4	S-1640-6	HOUSING-PIN
3	S-1360-5L	CIRCUIT BREAKER
2	C660501-0102	COMPASS ASSY
1	1670166-1	DIMMING ASSY

EQUIPMENT TABLE

WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS
F-LB106	18			S-1635-1	SOLDER		
F-LB105	18			S-1829-1	S-1635-1		
RED (LB104)	18	-18-2	20	S-1636-2	SOLDER		
RED (LB103)	18	-18-2	20	SOLDER	S-1636-2		
F-LB102	18		190	S-1636-1	S-1829-1		
F-LB101	18		220	S-1635-1	S-1367-1-8		
F-LB100	18		220	S-1829-1	S-1636-1	1.	
BLK (LB107)	18	-18-0		SOLDER	S-1367-1-8		
F-LB91	18			SOLDER	SOLDER		
F-LB90	18		75	S-1829-1	SOLDER	1.	
F-LB5	18		65	S-1629-1	S-1635-2	1.	

WIRE TABLE

CONTRACT NO:

	NAME	DATE
DESIGN	VR SIPES	2-28-74
GROUP		2-27-74
DRAWN	J. FINCH	2-8-74
CHECK	J. YOUEL	2-13-74
STRESS		
PROJ		3-1-74
APPD		
OTHER		

Cessna AIRCRAFT CO.

COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

TITLE
WIRING DIAGRAM — CONSOLE & COMPASS LIGHTS

SIZE C | CODE IDENT. NO. 71379 | DWG NO 1270709

SCALE: NONE | 210 | PAGE: 11.7.1

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES: PAGE 11.7

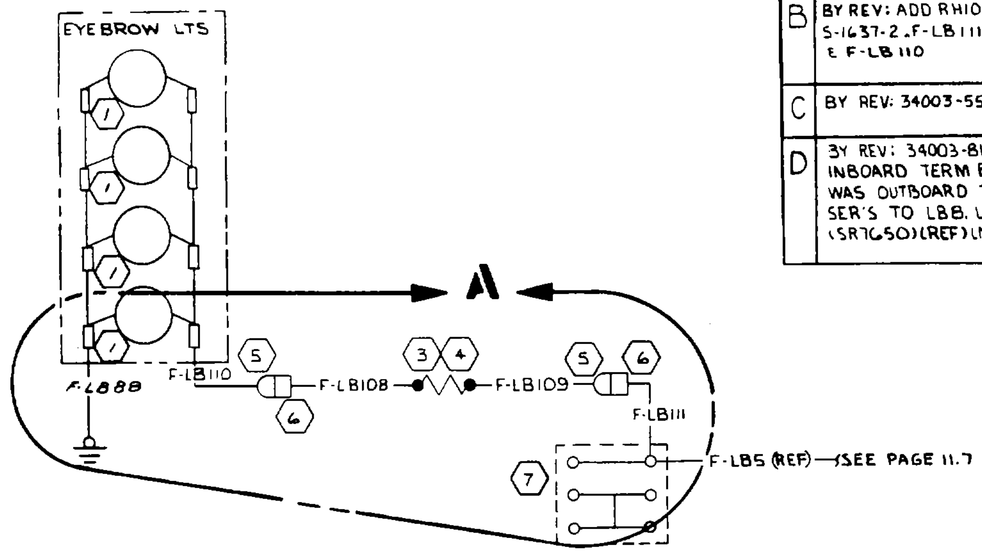
SUPERSEDED BY:

(SR 7381) IX (REF) (21060090)

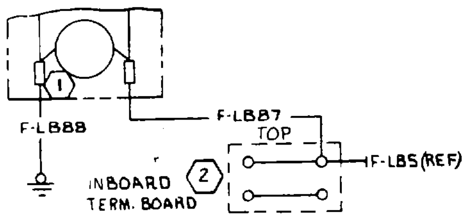
13 196 0905

FORM NO 80-2150

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: ADD WIRE LENGTHS & ORIENT TERM BOARD (NOW SHOP PRACTICE)	DLO 7-28-73	DLP HAW STD NMC
B	BY REV: ADD RH10-10, HF-10-10, S-1637-1, S-1637-2, F-LB111, F-LB108, F-LB109 & F-LB110 (SR7650) IX	MEM 5-17-74	DLO JRS STD NMC
C	BY REV: 34003-55 WAS 34002-55; SER (SR 7913)	CJH 11-27-74	JCY JRS
D	BY REV: 34003-817 WAS 34003-55, INBOARD TERM BLOCK / DETAIL 'A' WAS OUTBOARD TERM BLOCK; ADD SER'S TO LB8, LB9, LB10, LB11 (SR7650)(REF)(NOW SHOP PRACTICE) (SR7913)	GW 9-17-75	DS JRS



13 196 0905



DETAIL **A**
THRU SER (SR7650) (21060539)

WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS
F-LB110	18			S-1370-1	S-1635-1		SER 21060540 & ON
F-LB109	18		6	SOLDER	S-1635-1		SER 21060540 & ON
F-LB108	18		6	S-1636-2	SOLDER		SER 21060540 & ON
F-LB111	18			S-1636-2	S-1829-1		SER 21060540 & ON
F-LB88	18		90	S-1370-1	S-1367-1-8		
F-LB87	18		90	S-1370-1	S-1829-1		THRU SER 21060539

WIRE TABLE

ITEM NO	PART NO.	DESCRIPTION	
7	34003-817	TERMINAL BLOCK	(ETNC)
6	S-1637-2	HOUSING-SOCKET	
5	S-1637-1	HOUSING	
4	HF-10-10	RESISTER (OMNI)	ALTERNATE
3	RH-10-10	RESISTER (DALE)	
2	34002-55	TERMINAL BLOCK	(ETNC)
1	1213319-9	LIGHT ASSY	

EQUIPMENT TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO
S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES: 12210-1073

SUPERSEDED BY:

CONTRACT NO:

	NAME	DATE
DESIGN	VR SIPES	1-28-71
GROUP	H. Wise	2-26-71
DRAWN	VR SIPES	2-18-71
CHECK	L.K. WHITE	2-24-71
STRESS		
PROJ	N. McCarter	2-27-71
APPD	WKB	
OTHER		

Cessna AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

TITLE
WIRING DIAGRAM — EYEBROW LIGHTS

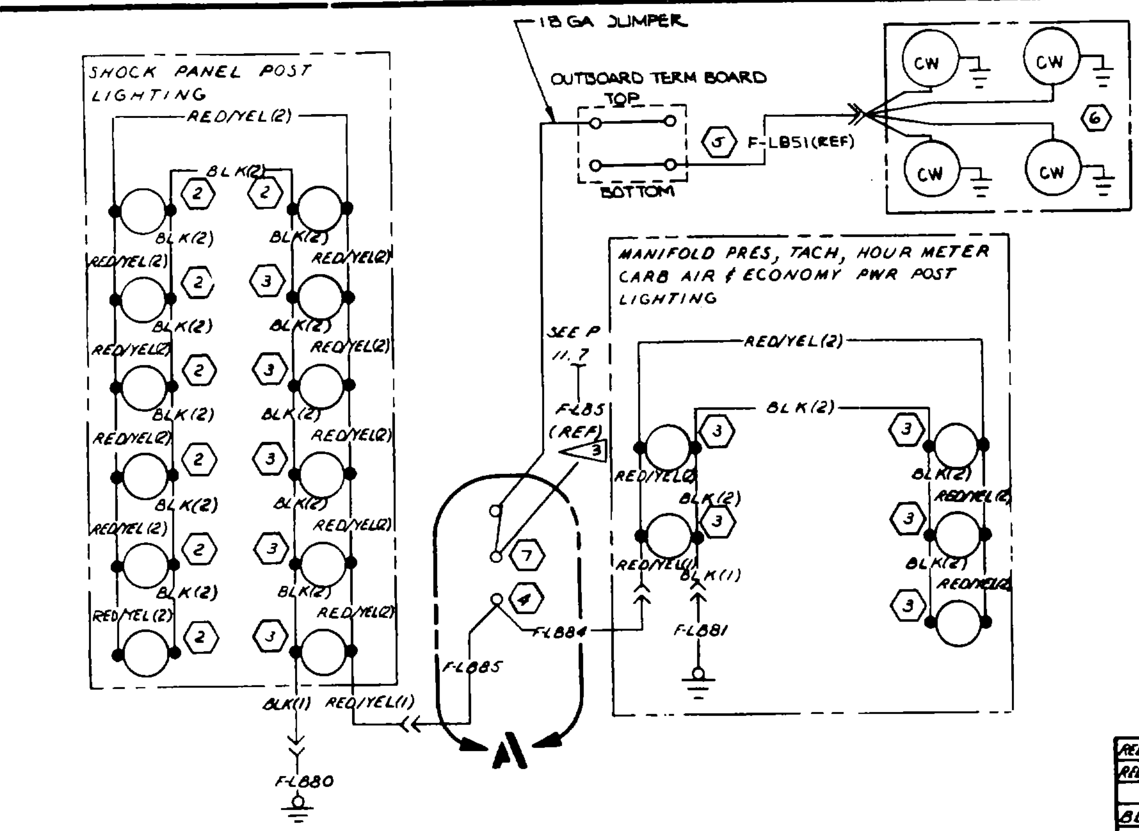
SIZE	CODE IDENT. NO.	DWG NO
C	71379	1270709

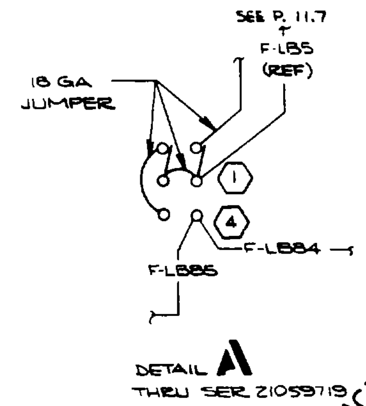
SCALE: NONE | 210 | PAGE: 11.8

(SR 6755) IX (21059503)

FORM NO. 80-215B

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: ADD S-2160-2; SER OUT S-1847-2-2, SER 21059720	DLP 10-30-72	BY NRW PCH NAC
B	BY REV: ADD WIRE LENGTHS; LB5 IN NOTE 3 WAS LB87; LB51(REF, WAS LB87 INACTIVATE DWG: ORIENT TERM BOARD (SR7381)II	JLO 7-28-75	NRW





INACTIVE: EFF THRU SER 21060089 II 7-28-75 JLO DLP NRW

NOTES:

1. TYPICAL 2 PLACES
2. TYPICAL 15 PLACES
3. WHEN POST LIGHTS ARE INSTALLED, F-LB IS CONNECTED TO S-1847-2-2 SWITCH. AN 18GA JUMPER IS INSTALLED BETWEEN SWITCH AND 34002-55 TERMINAL BOARD. SWITCH SIDE OF JUMPER HAS S-1493-1 TERMINAL. TERMINAL BOARD SIDE OF JUMPER HAS S-1829-1 TERMINAL. REPLACE S-1829-1 TERMINAL ON F-LB5 WITH AN S-1493-1

WIRE CODE NO	GA	MATERIAL	LG	TERMINALS				SERIALS
RED/YEL(2)	22	-22-2-4		SOLDER	SOLDER	2		
RED/YEL(1)	22	-22-2-4		SOLDER	S-341-2	1		
BLK(2)	22	-22-0	8	SOLDER	SOLDER	2		
BLK(1)	22	-22-0	8	SOLDER	S-341-2	1		
F-LB85	18		25		S-341-1			
F-LB84	18		65	S-1493-1	S-341-1			
F-LB81	18		12	S-1367-1-8	S-341-1			
F-LB80	18		15	S-1367-1-8	S-341-1			

WIRE TABLE

ITEM NO	PART NO.	DESCRIPTION	
7	S-2160-2	SWITCH	
6	1270479-5	LIGHT ASSY	
5	34002-55	TERMINAL BOARD (ETNC)	
4	S-2023-1	TERM. ADAPTER	
3	S-1899-4	POST LIGHT ASSY	
2	S-1899-3	POST LIGHT ASSY	
1	S-1847-2-2	SWITCH	

EQUIPMENT TABLE

CES-1000 IS APPLICABLE VENDOR CODES PER S-1400 CES-XXXX=CESSNA SPEC. NO. S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES: 12210-1073

SUPERSEDED BY: PG 11.14

CONTRACT NO:

	NAME	DATE
DESIGN	VR SIPES	1-28-71
GROUP	H. Wise	2-26-71
DRAWN	VR SIPES	2-18-71
CHECK	L.K. WHITE	2-24-71
STRESS		
PROJ	N. McCarter	2-27-71
APPD	WEB	
OTHER		

Cessna AIRCRAFT CO. COMMERCIAL AIRCRAFT DIV. 5800 E. PAWNEE WICHITA, KANSAS

TITLE WIRING DIAGRAM — POST LIGHTING (OPT)

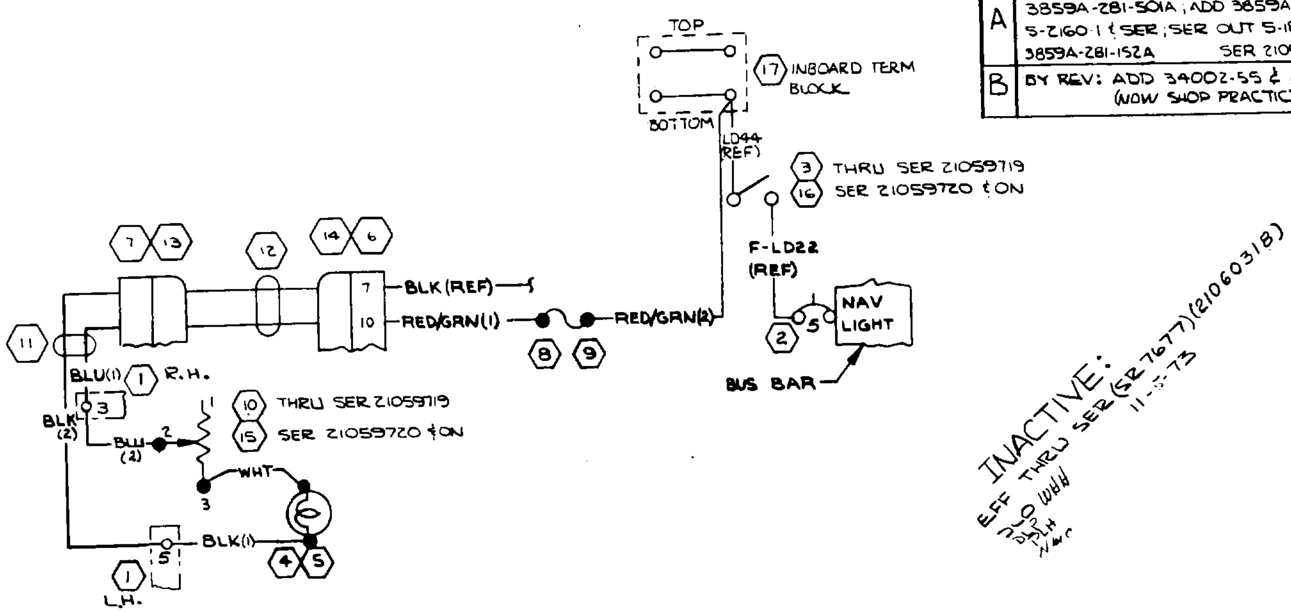
SIZE	CODE IDENT. NO.	DWG NO
C	71379	1270709

SCALE: NONE 210 PAGE: 11.9

(SR6755) II

FORM NO. 80-215B

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: 3859A-281-152A WAS 3859A-281-501A ; ADD 3859A-282-152A, S-2160-1 & SER ; SER OUT S-1844-1-2 & 3859A-281-152A SER 21059720	DLP 1-9-73	BY NEW PLH Nwe
B	BY REV: ADD 34002-55 & LD44 REF (NOW SHOP PRACTICE)	DLO 7-28-73	DLP NEW STD Nwe



NOTES:

1. 60215-4LP (00779) TERMINAL
2. 329636 (00779) TERMINAL

ITEM NO	PART NO.	DESCRIPTION	
17	34002-55	TERMINAL BLOCK	
16	S-2160-1	SWITCH	
15	3859A-282-152A	POT	BITD
14	1270062-1	CKT BOARD	
13	1270061-1	CKT BOARD	
12	1270060-1	CABLE ASSY	
11	SF-1030-BX	CABLE	08261
10	3859A-281-152A	POT	BITD
9	HHJ-A	FUSEHOLDER	71400
8	AGC-1/2	FUSE	71400
7	255 10 30 190	CONNECTOR	71785
6	582384-9	SOCKET	00779
5	4157-001	SOCKET	72765
4	24RB	LAMP	00011
3	S-1844-1-2	SWITCH	
2	S-1360-5L	CKT BKR	
1	351-11-05-001	TERMINAL BOARD	71785

EQUIPMENT TABLE

WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS
WHT	22	-22-9		SOLDER	SOLDER		
BLK(2)	22	-22-0		SOLDER	2		
BLU(1)	22	-22-6		SOLDER	2		
BLU (2)	22	-22-6		SOLDER	2		
RED/GRN(2)	22	-22-2-5		SOLDER	S-1829-1		
RED/GRN(1)	22	-22-2-5		1	SOLDER		
BLK(1)	22	-22-0		SOLDER	2		

WIRE TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES: 12210-1073

SUPERSEDED BY: P11.15

CONTRACT NO:

	NAME	DATE
DESIGN	V R SIPES	1-28-71
GROUP	H Wiel	2-26-71
DRAWN	V R SIPES	2-18-71
CHECK	L.K. WHITE	2-24-71
STRESS		
PROJ	J McCarter	2-27-71
APPD		
OTHER		

Cessna AIRCRAFT CO. COMMERCIAL AIRCRAFT DIV. 5800 E. PAWNEE WICHITA, KANSAS

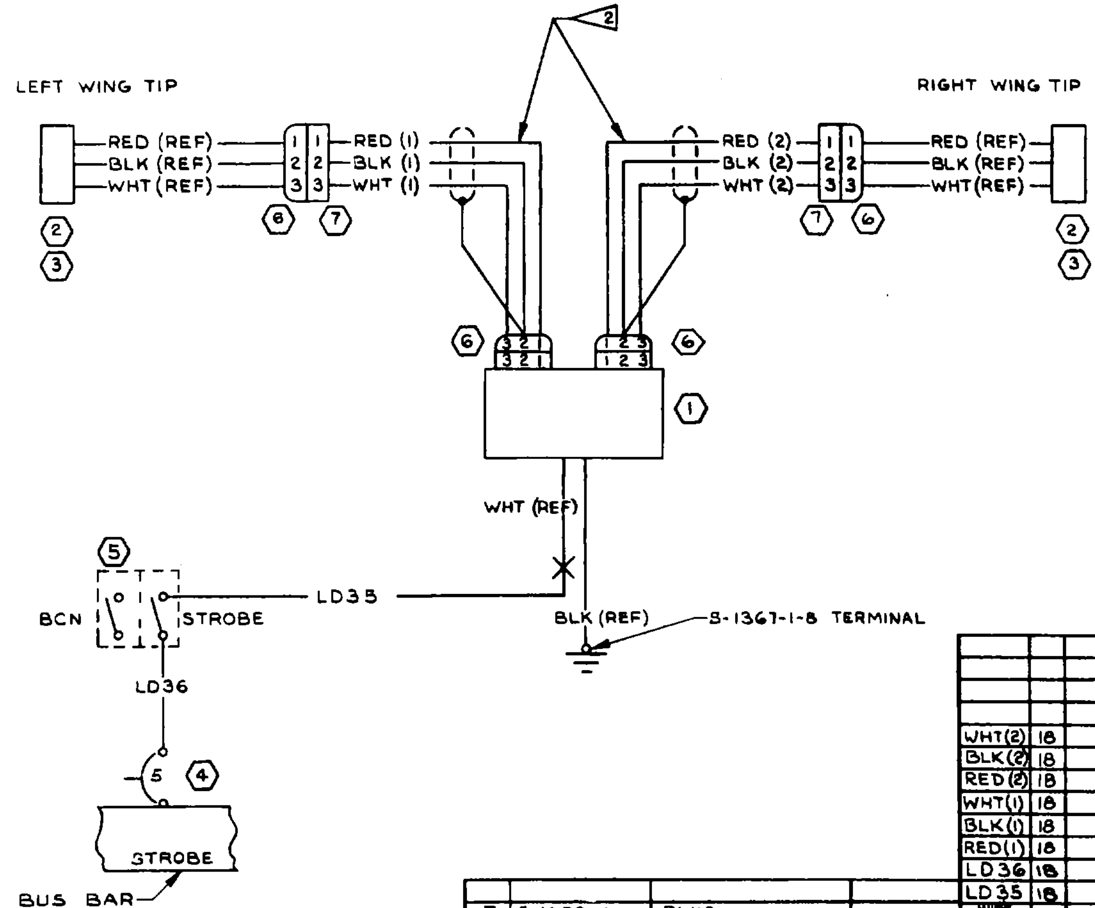
TITLE: WIRING DIAGRAM — MAP LIGHT, CONTROL WHEEL

SIZE	CODE IDENT. NO.	DWG NO
C	71379	1270709

SCALE: NONE | 210 | PAGE: 11.10

(SR67:55)IX

REVISION			
LET	DESCRIPTION	DATE	APPD



INACTIVE
EFF THRU 21059718
YRS 3-25-72

NOTES:

1. INSTALL A 1270695-1 CLIP ON "BCN" SIDE OF S-1846-2-3 WHEN FLASHING IS NOT INSTALLED.

2. THREE CONDUCTOR CABLE, BELDEN (70903) PART NO. 8770 OR EQUIVALENT TO BE USED.

ITEM NO.	PART NO.	DESCRIPTION
7	S-1638-1	PLUG
6	S-1638-2	CAP
5	S-1846-2-3	SWITCH
4	S-1360-5L	CKT BREAKER
3	C622003-0104	LENS
2	C622003-0101	LIGHT
1	C622004-0104	POWER SUPPLY

EQUIPMENT TABLE

WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS
WHT(2)	18	2		S-1636-1	S-1635-1		
BLK(2)	18	2					
RED(2)	18	2					
WHT(1)	18	2					
BLK(1)	18	2					
RED(1)	18	2		S-1636-1	S-1635-1		
LD36	18			S-1367-1-6	S-1493-1		
LD35	18			S-1370-1	S-1493-1		

WIRE TABLE

CONTRACT NO:

	NAME	DATE
DESIGN	VR SIPES	1-28-71
GROUP	H. Wise	2-26-71
DRAWN	VR SIPES	2-18-71
CHECK	L.K. WHITE	2-24-71
STRESS		
PROJ	H. McCarter	2-27-71
APPD	WKS	
OTHER		

Cessna AIRCRAFT CO. COMMERCIAL AIRCRAFT DIV. 5800 E. PAWNEE WICHITA, KANSAS

TITLE: WIRING DIAGRAM — WING TIP STROBE LIGHTS (OPTIONAL)

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES: 12210-1073

SUPERSEDED BY: 11.12

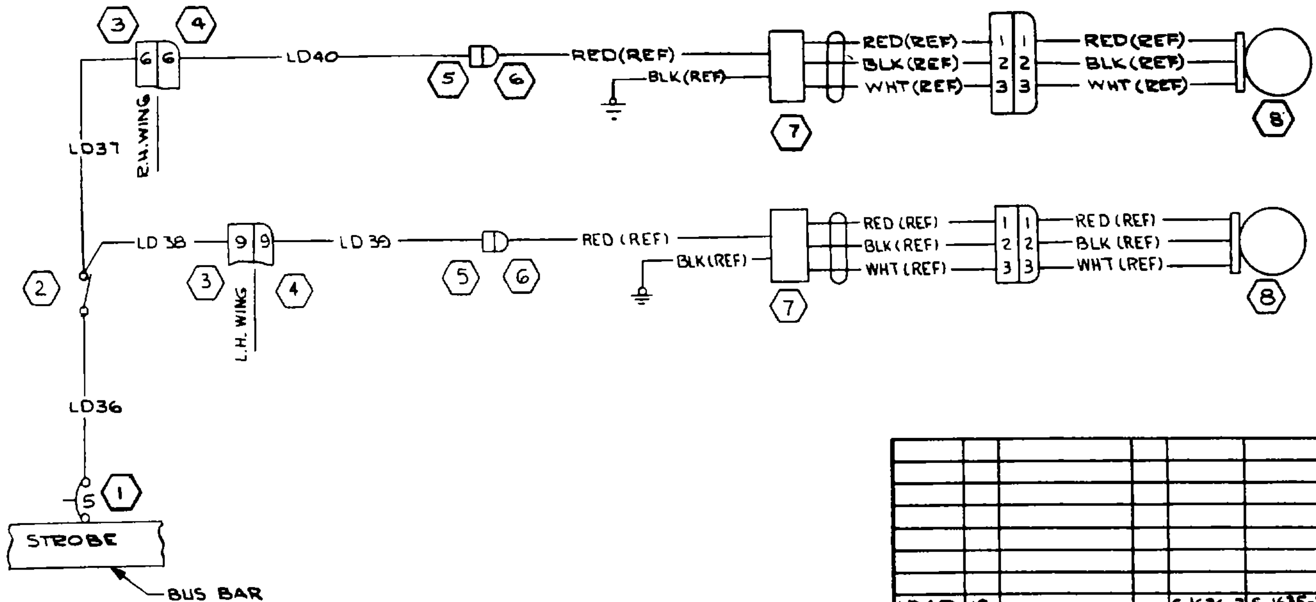
SIZE	CODE IDENT. NO.	DWG NO
C	71379	1270709

SCALE: NONE | 210 | PAGE: 11.16

FORM NO. 80-2158

(SR6755)12

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: ADD WIRE LENGTHS (NOW SHOP PRACTICE)	DLO	
B	BY REV: REACTIVATE DWG (SR7913)	GW 6-12-75	



13 196 0905

WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS
LD40	18			S-1636-2	S-1635-2	STD	
LD39	18			S-1636-2	S-1635-2	STD	
LD38	18		180	S-1635-2	S-1493-1		
LD37	18		200	S-1635-2	S-1493-1		
LD36	18		18	S-1367-1-6	S-1493-1		

WIRE TABLE

ITEM NO	PART NO.	DESCRIPTION	
8	C622006-0101	LAMP ASSY	
7	C622007-0103	POWER SUPPLY	
6	S-1637-1	HOUSING	
5	S-1637-2	HOUSING	
4	S-1640-6	HOUSING	
3	S-1641-6	HOUSING	
2	S-2160-1	SWITCH	
1	S-1360-5L	CIRCUIT BREAKER	

EQUIPMENT TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES: PG 11.11

SUPERSEDED BY:

CONTRACT NO:

	NAME	DATE
DESIGN	VR SIPES	3/25/72
GROUP	H. Wi...	5-22-72
DRAWN	VR SIPES	5/22/72
CHECK	L.K. WHITE	5-22-72
STRESS		
PROJ	N. McGa...	5-23-72
APPD		
OTHER		

Cessna AIRCRAFT CO. COMMERCIAL AIRCRAFT DIV. 5800 E. PAWNEE WICHITA, KANSAS

TITLE WIRING DIAGRAM — WING TIP STROBE LIGHTS (OPT)

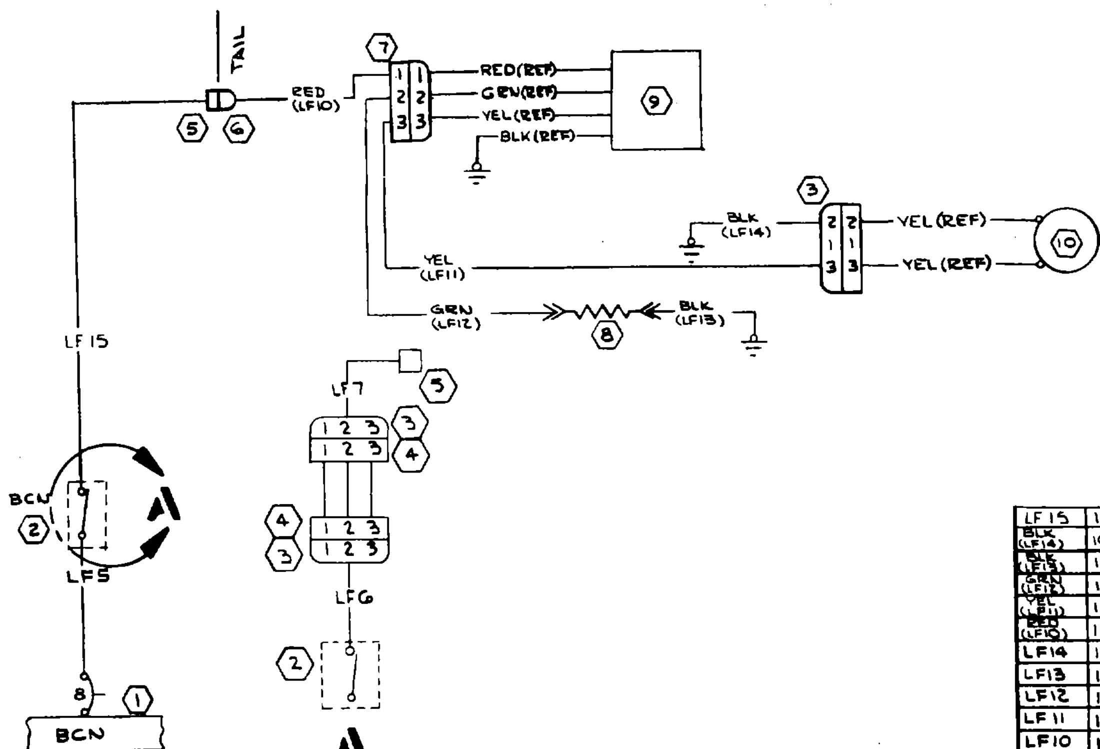
SIZE C | CODE IDENT. NO. 71379 | DWG NO 1270709

SCALE: NONE | 210 | PAGE: 11.12

(SE 7038) II (21059720)

FORM NO 80 21 B

	REVISION		
LET	DESCRIPTION	DATE	APPD
A	BY REV: ADD RED,YEL,GRN,BLK & SER; SER OUT LF10,LF11,LF12,LF13 & LF14; ADD NOTE 1 (SR7473)	DLP 1-10-73	
B	BY REV: ADD WIRE LENGTHS (NOW SHOP PRACTICE)	DLO 5-3-73	
C	BY REV: ADD DETAIL 'A' & SER'S: SER OUT LF6 & LF7, SER IN LF15 (SR7913)	GW 9-17-75	DS



DETAIL A
EFF THRU SER (SR7913)
(21061039)

13-196-0303

LF15	16			S-1493-2	S-1636-2		SER 21061040 & ON
BLK (LF14)	16			S-1635-2	S-1367-2-8		SER 21059882 & ON
BLK (LF13)	16			S-1493-2	S-1367-2-8		SER 21059882 & ON
GRN (LF12)	16		75	S-1636-2	S-1493-2		SER 21059882 & ON
YEL (LF11)	16		75	S-1636-2	S-1635-2		SER 21059882 & ON
RED (LF10)	16		65	S-1635-2	S-1636-2		SER 21059882 & ON
LF14	16			S-1635-2	S-1367-2-8		THRU SER 21059881
LF13	16			S-1493-2	S-1367-2-8		THRU SER 21059881
LF12	16		75	S-1636-2	S-1493-2		THRU SER 21059881
LF11	16		75	S-1636-2	S-1635-2		THRU SER 21059881
LF10	16		65	S-1635-2	S-1636-2		THRU SER 21059881
LF7	16		75	S-1635-2	S-1636-2		THRU SER 21061039
LF6	16		125	S-1493-2	S-1635-2		THRU SER 21061039
LF5	16		7	S-1367-2-6	S-1493-2		
WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS

WIRE TABLE

10	C621001-0102	LIGHT ASSY	
9	C594502-0101	FLASHER ASSY	
8	OR95-6	RESISTOR	83777
7	S-1638-1	HOUSING-PLUG	
6	S-1637-1	HOUSING-CAP	
5	S-1637-2	HOUSING-PLUG	
4	1270705-1	CABLE ASSY	
3	S-1638-2	HOUSING-CAP	
2	S-2160-1	SWITCH	
1	S-1360-8L	CIRCUIT BREAKER	
ITEM NO.	PART NO.	DESCRIPTION	VENDOR

EQUIPMENT TABLE

NOTES:

1. COLORED WIRES BEARING CES1100 CODING IN PARENTHESIS SHALL NOT BE STAMPED. CES1100 CODING ON THESE WIRES IS FOR PARTS LIST USE ONLY

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES: PG 11.3

SUPERSEDED BY:

CONTRACT NO:

	NAME	DATE
DESIGN	V R SIPES	3/25/72
GROUP	H. Wiese	5-22-72
DRAWN	V R SIPES	5-22-72
CHECK	WHITE	5-22-72
STRESS		
PROJ	H. McCarter	5-23-72
APPD		
OTHER		

Cessna AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

TITLE
WIRING DIAGRAM — FLASHING BEACON LIGHT

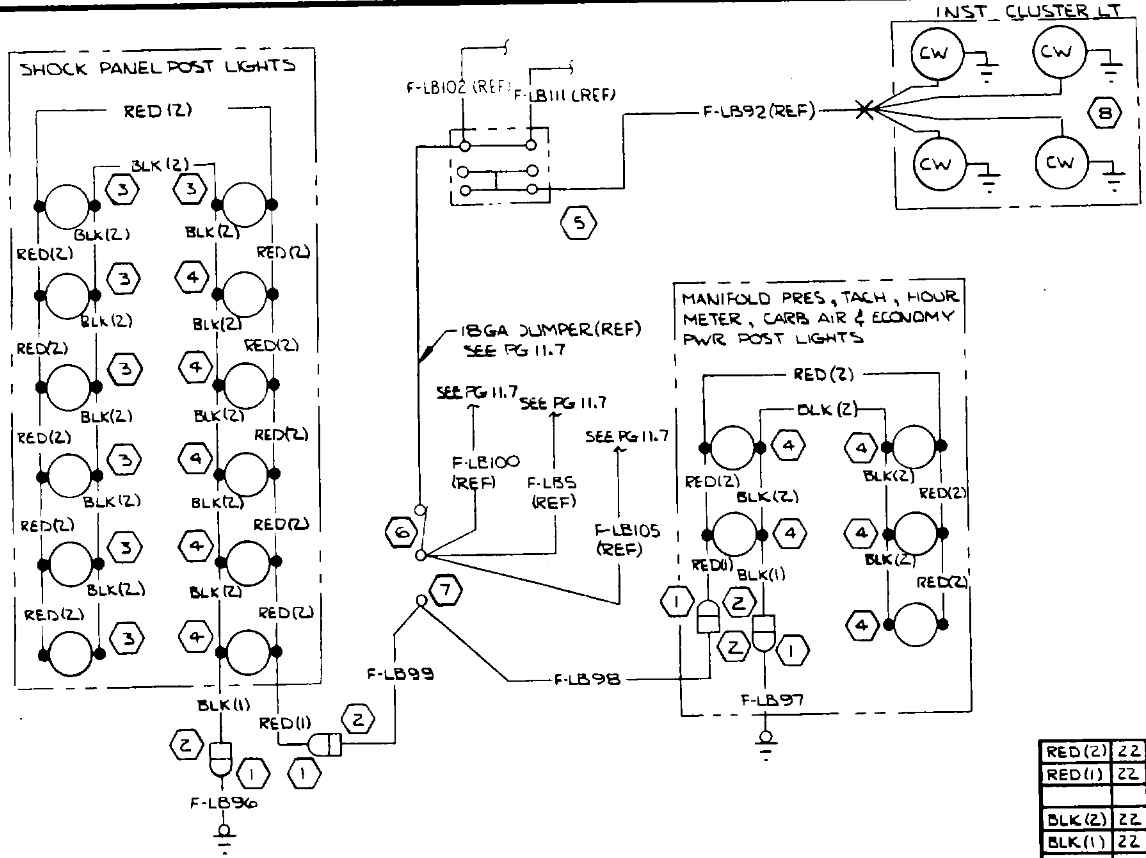
SIZE C | CODE IDENT. NO. 71379 | DWG NO 1270709

SCALE: NONE | 210 | PAGE: 11.13

(SR7038) TK (21059720)

FORM NO 80-2198

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: CHANGE ROUTING OF 18 GA. JUMPER. NOW SHOP PRACTICE	RJP 4-26-74	JCY JRG
B	BY REV: 34003-55 WAS 34002-55; SER (SR7913)	CJH 11-27-74	JCY JRG
	BY REV: 34003-817 WAS 34003-55 (SR 7913)	GW 9-17-75	JRG DS



13 196 0905

NOTES:

1. TYP 2 PLACES
2. TYP 15 PLACES
3. WHEN POST LIGHTS ARE INSTALLED, F-LB100, F-LB5 & F-LB90 ARE CONNECTED TO S-2160-2 SWITCH. AN 18GA JUMPER IS INSTALLED BETWEEN SWITCH & OUTBOARD TERM BOARD. SWITCH SIDE OF JUMPER HAS AN S-1493-1 TERMINAL. TERMINAL BOARD SIDE OF JUMPER HAS AN S-1829-1 TERMINAL. REPLACE S-1829-1 TERMINAL ON F-LB5, F-LB100 & F-LB105 WITH AN S-1493-1

WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS
RED(2)	22		8	SOLDER	SOLDER	2	
RED(1)	22		8	SOLDER	S-1635-1	1	
BLK(2)	22		8	SOLDER	SOLDER	2	
BLK(1)	22		8	SOLDER	S-1636-1	1	
F-LB99	18		25	S-1493-1	S-1636-1		
F-LB98	18		65	S-1493-1	S-1636-1		
F-LB97	18		12	S-1367-1-8	S-1635-1		
F-LB96	18		15	S-1367-1-8	S-1635-1		

WIRE TABLE

ITEM NO.	PART NO.	DESCRIPTION
8	1270479-5	LIGHT ASSY
7	S-2023-1	TERM. ADAPTER
6	S-2160-2	SWITCH
5	34003-817	TERMINAL BLOCK
4	S-1899-4	POST LIGHT ASSY
3	S-1899-3	POST LIGHT ASSY
2	S-1637-2	HOUSING
1	S-1637-1	HOUSING

EQUIPMENT TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES: PG 11.9

SUPERSEDED BY:

CONTRACT NO:

	NAME	DATE
DESIGN		
GROUP	H. Wise	8-13-73
DRAWN	JL OLLER	7-28-73
CHECK	PAPE	7-28-73
STRESS		
PROJ		8-13-73
APPD	STD	
OTHER		

Cessna AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

TITLE
WIRING DIAGRAM — POST LIGHTING (OPT)

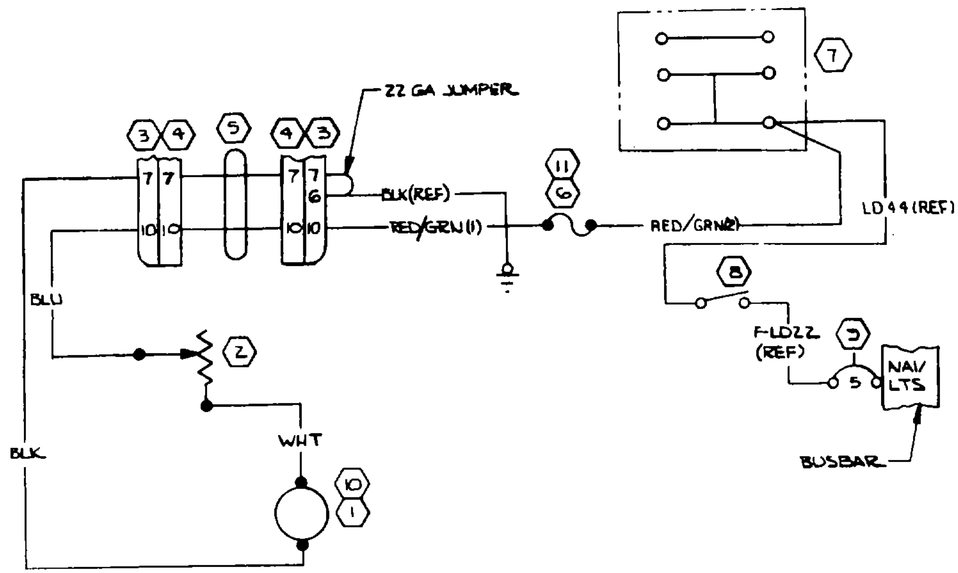
SIZE C | CODE IDENT. NO. 71379 | DWG NO 1270709

SCALE: NONE (SR7381) PAGE: 11.14

(21060090)

FORM NO. 80-2188

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: 34003-55 WAS 34002-55; SER(SR7913)	CJH 11-27-74	JCY
B	BY REV: 34003-817 WAS 34003-55 (SR7913)	GW 9-17-75	



13 196 0905

WHT	22	-22-9		SOLDER	SOLDER		
BLK	22	-22-0		SOLDER	SOLDER		
BLU	22	-22-6		SOLDER	SOLDER		
RED/GRN(2)	22	-22-2-5		SOLDER	S-1829-1		
RED/GRN(1)	22	-22-2-5		SOLDER	SOLDER		
WIRE CODE NO.	GA	MATERIAL	LG	TERMINALS			SERIALS

WIRE TABLE

ITEM NO.	PART NO.	DESCRIPTION
11	AGC-1/2	FUSE
10	24RB	LAMP
9	S-1360-5L	CIRCUIT BREAKER
8	S-2160-1	SWITCH
7	34003-817	TERM BLOCK
6	HHJ-A	FUSEHOLDER
5	1570308-1	CABLE ASSY
4	3421-0000	SOCKET
3	1570307-1	CONNECTOR ASSY
2	3859AK61-152A	RHEOSTAT
1	4157-001	SOCKET

EQUIPMENT TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES: P11.10

SUPERSEDED BY:

CONTRACT NO:

	NAME	DATE
DESIGN		
GROUP	W. Harden	11-12-73
DRAWN	SLOLLER	11-2-73
CHECK	PAPE	11-5-73
STRESS		
PROJ	W. McCarter	11-19-73
APPD		
OTHER		

Cessna AIRCRAFT CO. COMMERCIAL AIRCRAFT DIV. 5800 E. PAWNEE WICHITA, KANSAS

TITLE

WIRING DIAGRAM — MAP LIGHT, CONTROL WHEEL

SIZE	CODE IDENT. NO.	DWG NO
C	71379	1270709

SCALE: NONE | SR7677 | PAGE: 11.15

(21060319)

FORM NO. 80-2159

REVISION			
LET	DESCRIPTION	DATE	APPD
C	BY REV: REVISED & REDRAWN	DLP 7-30-73	
D	BY REV: ADD COLOR CODES TO GD-9, GD-10, & GD-24 SER OUT: GD-8 & GD-6 (NOW SHOP PRACTICE) (SRT124) (REF)	RS 11-28-73	
E	BY REV: RED(REF) WAS WHT(REF)/2 PLCS BLK(REF) WAS WHT(REF)/2 PLCS (NOW SHOP PRACTICE)	MEM 4-2-74	

NOTES:

1. INSTALL 1270717-1 DIODE ASSY WITH SYMBOL POINTING TO POSITIVE TERM. ON MOTOR

WIRE TABLE

WIRE CODE NO.	GA	MATERIAL	LG	TERMINALS		SERIALS
WHITE GD-24	20	-20-9	10	S-1370-1	S-1635-2	
F-GD23	20		230	S-1367-1-6	S-1367-1-6	
F-GD21	20		240	S-1367-1-6	S-1367-1-6	
F-GD19	20		110	S-1367-1-8	S-1367-1-6	
F-GD18	20		35	S-1370-1	S-1367-1-10	
F-GD17	20		240	S-1367-1-6	S-1367-1-6	
F-GD15	20		155	S-1367-1-6	S-1367-1-6	
F-GD14	18		77	S-1367-1-6	S-1367-1-6	
F-GD13	18		47	S-1367-1-6	S-1636-2	
F-GD12	18		40	S-1367-1-6	S-1636-2	
F-GD11	18		30	S-1367-1-6	S-1367-1-8	
BLACK GD-10	18	-18-0	10	S-1635-2	S-1370-1	
TAN GD-9	18	-18-10	13	S-1635-2	S-1370-1	
F-GD8	20		27	S-1635-2	SOLDER	THRU SER 21060129
F-GD7	20		30	S-1367-1-8	S-1636-2	
F-GD6	20		27	S-1635-2	SOLDER	THRU SER 21060129
F-GD5	20		15	S-1367-1-10	S-1636-2	
F-GD4	12		8	S-1367-3-10	S-1367-3-8	
F-GD3	12		12	S-1367-3-10	S-1367-3-13	
F-GD2	12		46	S-1367-3-13	S-1367-3-13	
F-GD1	12		33	S-1367-3-8	S-1367-3-8	

EQUIPMENT TABLE

ITEM NO.	PART NO.	DESCRIPTION	
18	1280800	POWER PACK ASSY	
17	MS27212-1-3	TERM. BOARD	
16	MS27212-1-6	TERM. BOARD	
15 (1.)	1270717-1	DIODE ASSY	
14	1N2070	DIODE	
13	1280840-1	PRESSURE SWITCH	
12	1280811-1	MOTOR	
11	1280830-1	SOLENOID	
10	S-1641-9	HOUSING	
9	S-1640-9	HOUSING	
8	1270034-1	SQUAT SWITCH	
7	S-1377-1	SWITCH	
6	8859K44	SWITCH	
5	VM920M-3	LIGHT	
4	VM911M-4A	LIGHT	
3	S-1577-1	CONTACTOR	
2	S-1232-30	CKT BKR	
1	S-1360-5L	CKT BKR	

WIRE TABLE

WIRE CODE NO.	GA	MATERIAL	LG	TERMINALS		SERIALS
F-GE6	20		21	S-1367-1-8	SOLDER	
F-GE5	↑		24	SOLDER	S-1367-1-6	
F-GE4			4	SOLDER	SOLDER	
F-GE3			24	SOLDER	S-1367-1-6	
F-GE2	↓		4	SOLDER	SOLDER	
F-GE1	20		24	SOLDER	S-1367-1-8	

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES: REV "B"

SUPERSEDED BY:

	NAME	DATE
CONTRACT NO:		
DESIGN	V.R. SIPES	3-22-71
GROUP	H. WISE	5-11-71
DRAWN	V.R. SIPES	5-7-71
CHECK	L.K. WHITE	5-11-71
STRESS		
PROJ	H. McCARTER	5-11-71
APPD		
OTHER		

Cessna AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

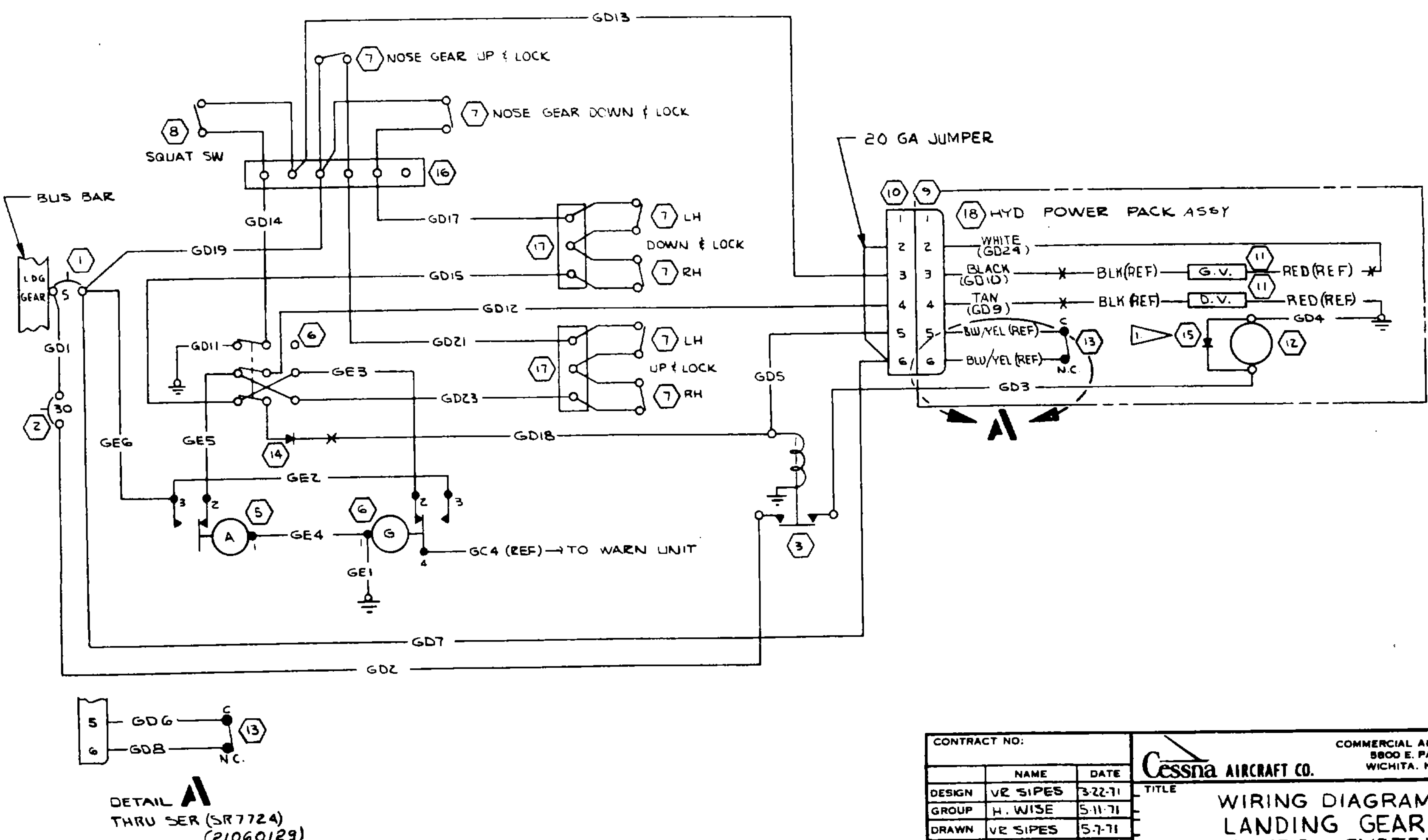
TITLE
WIRING DIAGRAM — LANDING GEAR CONTROL SYSTEM

SIZE	CODE IDENT. NO.	DWG NO
C	71379	1270709
SCALE: NONE	210	PAGE: 12.2.0

SER 21059503

FORM NO. 80-215B

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED
E	SEE P 12.2.0 FOR REVISION		



CONTRACT NO:		
	NAME	DATE
DESIGN	VR SIPES	3-22-71
GROUP	H. WISE	5-11-71
DRAWN	VR SIPES	5-7-71
CHECK	L.K. WHITE	5-11-71
STRESS		
PROJECT	H. McCARTER	5-11-71
APPD		

Cessna AIRCRAFT CO.

COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

TITLE
WIRING DIAGRAM — LANDING GEAR CONTROL SYSTEM

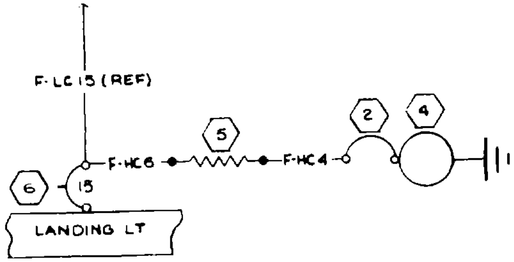
SIZE	CODE IDENT. NO.	DWG NO.
C	71379	1270709

SCALE: NONE | 210 | PAGE: 12.2.1

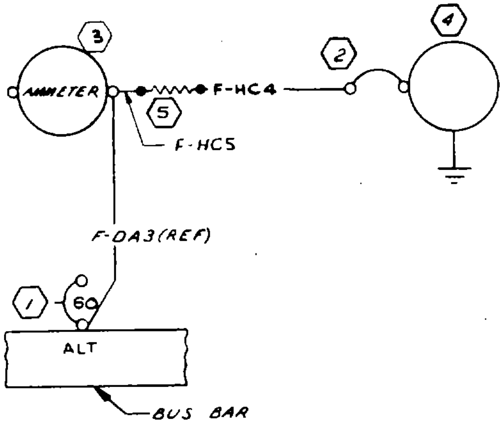
SER 2 0595[illegible]3

FORM NO. 80-316

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: ADD WIRE LENGTH (NOW SHOP PRACTICE)	DLO 5-3-73	
B	BY REV: C669520-0102 WAS C669502-0301 (SR7913)	BAH 1-30-74	JCY JRS
C	BY REV: S-2041-50-1.6 WAS RH-50; DELETE 16 GA JUMPER; 17 WAS 15/F-HC4 ADD F-HC5 (NOW SHOP PRACTICE) (MER 210-E0102)	MEM 4-3-74	JRS
D	BY REV: (SR8065) WAS (SR7650) PER REV "B" (SR7913)	RAM 9-25-74	JRS
E	BY REV: SER IN F-HC6 S-1360-15L; SER OUT F-HC5 (SR7913)(MER E0820)	BLA 10-30-74	JCY JRS
F	BY REV: (SR7913) WAS (SR8065) PER REV 'B,E,D' (SR7913)	CJH 1-27-75	JCY VRS
G	BY REV: C669502-0301 WAS C669520-0102 (SR7913)	GS 8-27-75	JCY JRS



SER (SR7913) ℄ ON



THRU SER (SR7913) (21061039)

13-196-0905

WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS
F-HC6	16			SOLDER	S-1367-2-8		SER 21061090 ℄ ON
F-HC5	16		10	S-1367-2-10	S-1367-2-8		THRU SER 21061039
F-HC4	16		17	SOLDER	S-1367-2-8		

WIRE TABLE

ITEM NO	PART NO.	DESCRIPTION
6	S-1360-15L	CIRCUIT BREAKER
5	S-2041-50-1.6	RESISTOR
4	0513052-3	CIGAR LIGHTER
3	C669502-0301	INST CLUSTER
2	60232-1	CIRCUIT BREAKER
1	S-1596-20L	CIRCUIT BREAKER

EQUIPMENT TABLE

CES-1000 IS APPLICABLE VENDOR CODES PER S-1400 CES-XXXX=CESSNA SPEC. NO. S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES: 12210-1073

SUPERSEDED BY:

CONTRACT NO:

	NAME	DATE
DESIGN	VR SIPES	1-28-71
GROUP	H. Wise	2-26-71
DRAWN	VR SIPES	2-18-71
CHECK	L.K. WHITE	2-24-71
STRESS		
PROJ	N. McCarter	2-27-71
APPD		
OTHER		

Cessna AIRCRAFT CO.

COMMERCIAL AIRCRAFT DIV. 5800 E. PAWNEE WICHITA, KANSAS

TITLE WIRING DIAGRAM — CIGAR LIGHTER

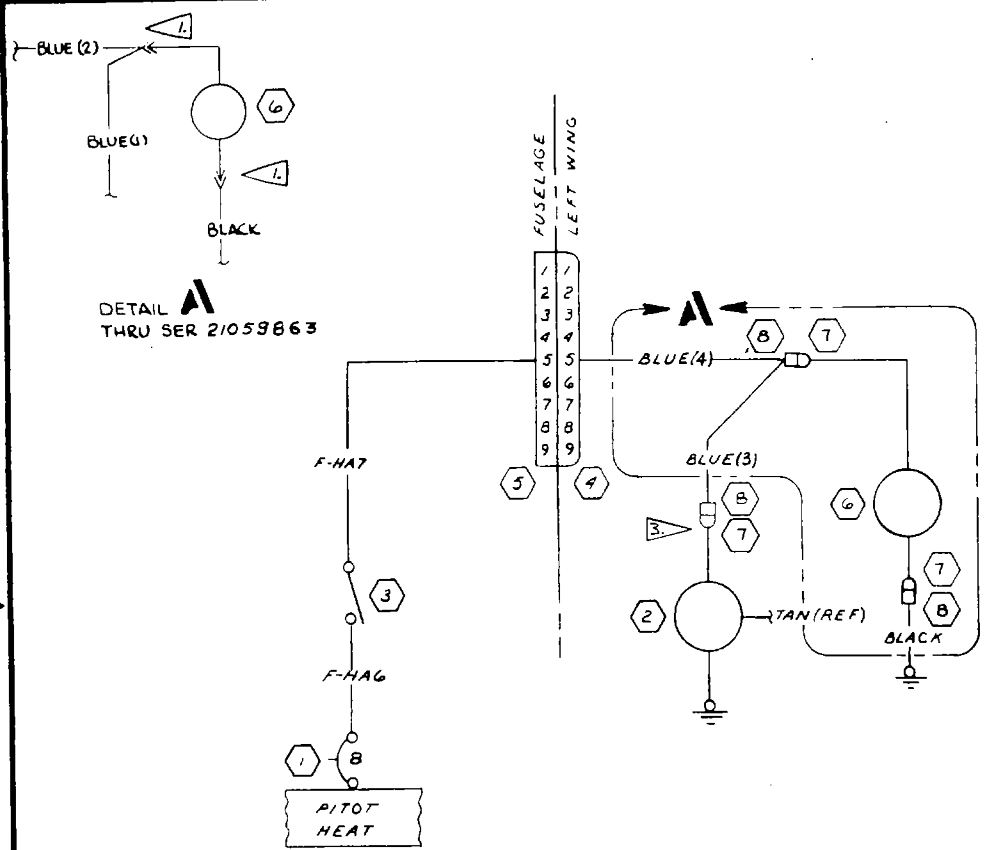
SIZE C | CODE IDENT. NO. 71379 | DWG NO 1270709

SCALE: NONE | 210 | PAGE: 13.1

(SR6755) ℄ (21059503)

FORM NO. 80-215B

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: SER OUT BLU(1), BLU(2) & BLK; SER IN BLU (3), BLU (4) & BLK (1); ADD DETAIL "A" & SER (SR7320)	XY 11-6-72	
B	BY REV: ADD NOTE 3; S-1636-2 WAS S-1369-2 (BLU(3)); (NOW SHOP PRACTICE)	MEM 5-9-74	STD



NOTES:

1. S-1369-3 TERMINAL ADDED TO VENDOR SUPPLIED WIRE
2. HEATER CIRCUIT SHOWN ONLY, FOR STALL WARNING CIRCUIT SEE PAGE 15.1
3. S-1637-1 HOUSING & S-1635-1 PIN ADDED TO VENDOR SUPPLIED WIRE.

EQUIPMENT TABLE

ITEM NO	PART NO.	DESCRIPTION
8	S-1637-2	HOUSING-PLUG
7	S-1637-1	HOUSING-CAP
6	0721105-18	PITOT TUBE, HEATED
5	S-1641-9	HOUSING-SOCKET
4	S-1640-9	HOUSING-PIN
3	S-845-1-2	SWITCH
2	1221095-3	HEATED STALL DETECTOR
1	S-1360-8L	CIRCUIT BREAKER

WIRE TABLE

WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS
BLK (1)	18	S-1460-18-0		S-1636-2	S-1367-1-8		SER 21059864 & ON
BLU (4)	16	S-1460-16-6		S-1635-2	S-1636-2		SER 21059864 & ON
BLU (3)	16	S-1460-16-6		SEE BLU (4)	S-1636-2		SER 21059864 & ON
BLACK	18	S-1460-18-0		S-1369-1	S-1367-1-8		THRU SER 21059863
BLU(2)	16	S-1460-16-6		S-1635-2	S-1369-2		THRU SER 21059863
BLU(1)	16	S-1460-16-6		SEE BLU(2)	S-1369-2		THRU SER 21059863
F-HA7	16			S-1493-2	S-1636-2		
F-HA6	16			S-1367-2-6	S-1493-2		

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES: 1221O-1073

SUPERSEDED BY:

CONTRACT NO:

	NAME	DATE
DESIGN	V R SIPES	1-28-71
GROUP	H. Weil	2-26-71
DRAWN	V R SIPES	2-18-71
CHECK	L.K. WHITE	2-24-71
STRESS		
PROJ		2-27-71
APPD		
OTHER		

Cessna AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

TITLE
WIRING DIAGRAM — HEATED PITOT TUBE & HEATED STALL WARNING SYSTEM

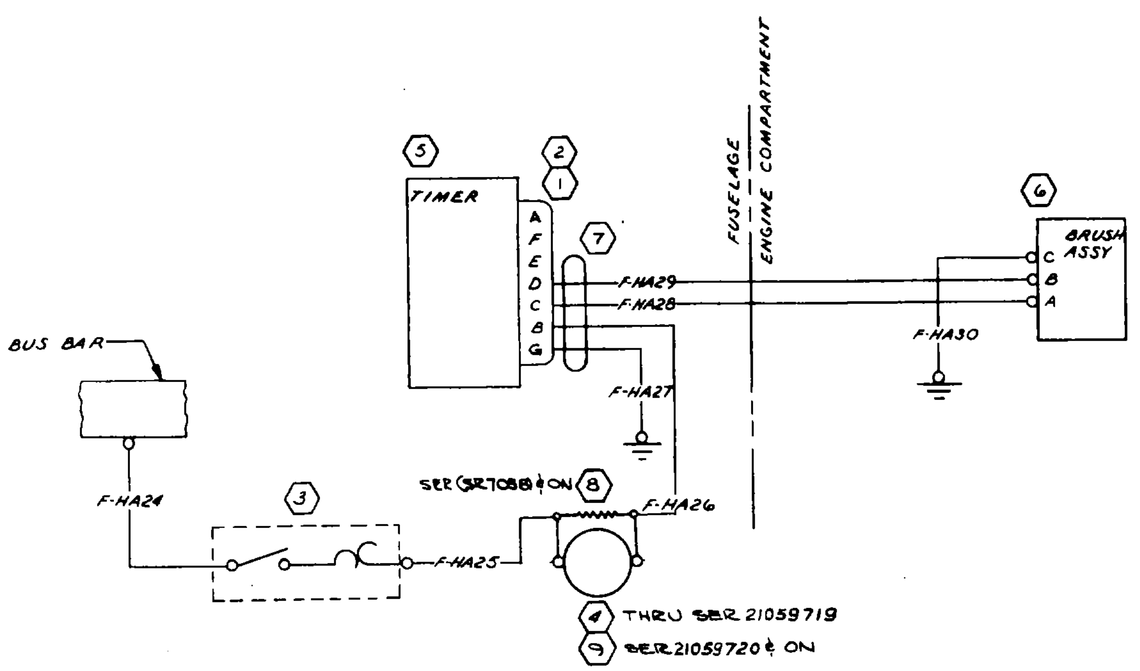
SIZE C | CODE IDENT NO. 71379 | DWG NO 1270709

SCALE: NONE | 210 | PAGE: 13.2

(SR6755) II

FORM NO 80-2159

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: 1E1193 SWITCH WAS 1E1 40 3E1219-1 WAS 3E1219-6; SER CUT 3E1219-1; SER IN C662503-0104 & 22-370-20 (SR 7038 XREF)	11-14-72 VRS	VRS
B	BY REV: CHNG TERMINATION OF F-HA26 TO S-1367-3-12 WAS S-1367-3-10, HA25 WAS S-1361-3-10 (SR 7038 XREF)	11-29-72 VRS	



F-HA30	12			S-1367-3-10	S-1367-3-13		
F-HA29	12			SOLDER	S-1367-3-10		
F-HA28	12			SOLDER	S-1367-3-10		
F-HA27	12			SOLDER	S-1367-3-8		
F-HA26	12			S-1367-3-12	SOLDER		
F-HA25	12			S-1367-3-10	S-1367-3-12		
F-HA24	12			S-1367-3-10	S-1367-3-10		
WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS

WIRE TABLE

ITEM NO	PART NO.	DESCRIPTION	VENDOR
9	C662503-0104	AMMETER	
8	22-370-20	SHUNT	
7	1201013-5	CABLE ASSY	
6	4E1387-4	BRUSH BLOCK ASSY	(25472)
5	3E1555-1	TIMER	(25472)
4	3E1219-1	AMMETER	(25472)
3	1E1193	SWITCH	(25472)
2	MS3106A20-15S	PLUG	
1	MS3057-12A	CLAMP	

EQUIPMENT TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES: 12210-1073

SUPERSEDED BY:

CONTRACT NO:

	NAME	DATE
DESIGN	V R SIPES	1-28-71
GROUP	H Wise	2-25-71
DRAWN	V R SIPES	2-18-71
CHECK	L.K. WHITE	2-24-71
STRESS		
PROJ	H McCarter	2-27-71
APPD		
OTHER		

Cessna AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

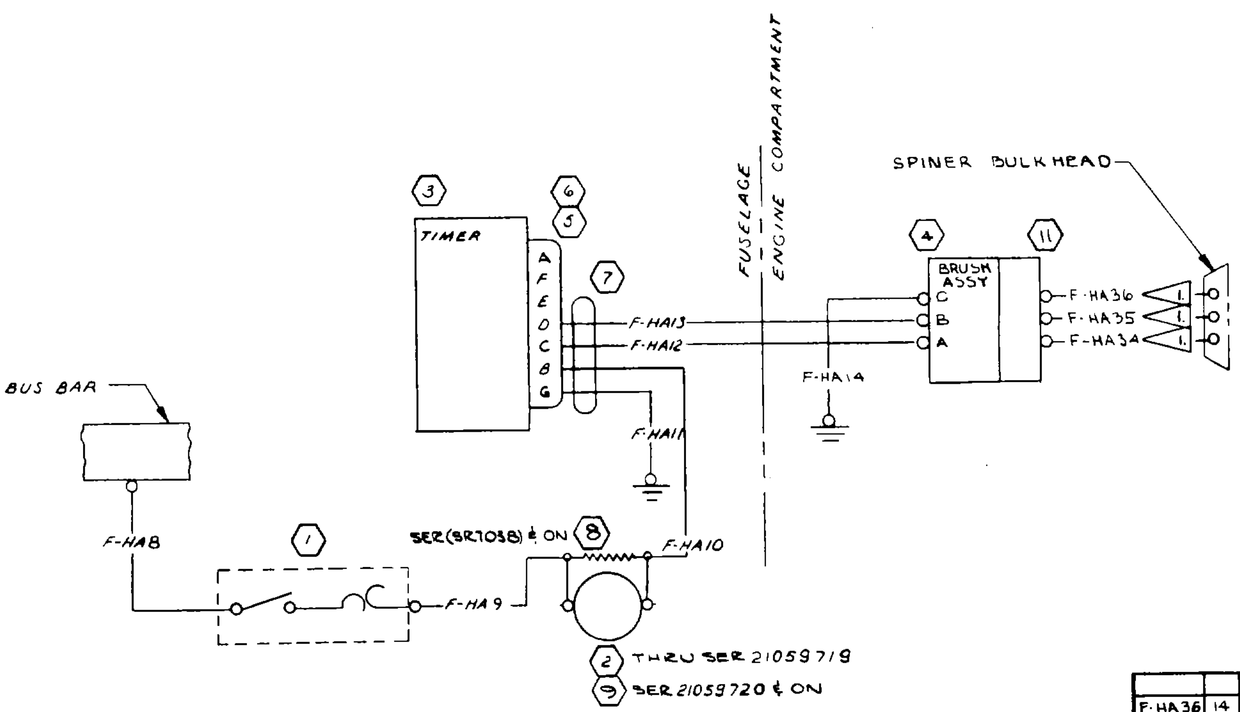
TITLE
WIRING DIAGRAM — PROP DE-ICING SYSTEM 2 BLADE (OPTIONAL)

SIZE: C | CODE IDENT NO: 71379 | DWG NO: 1270709

SCALE: NONE | 210 | PAGE: 13.3

(SR 6755) IX

FORM NO 80-215B



REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: 1E1110-1 SWITCH WAS 1E1324, 3E1219-4 WAS 3E1219-7; SER OUT 3E1219-4; SER IN 22-370-20, C662503-0103 (SR7038)(REF)	11-9-72 VRS	VRS
B	BY REV: TERMINATION OF F-HA10 WAS S-1367-3-10, HAS WAS S-1367-3-10 (SR7038)(REF)	11-29-72 VRS	
C	BY REV: ADD WIRE LENGTHS (NOW SHOP PRACTICE)	DLO 5-3-73	
D	BY REV: C662503-0106 WAS C662503-0103, C40010 WAS 4E1387-4, C165020-0101 WAS 3E1555-1 & 112-220-101 WAS 1E1110-1; ADD D40106, HA34, HA35 & HA36 (SR8298)	RS 7-21-75	

NOTES:

1. FOR COMPLETE INSTL (3) THREE EACH OF THESE WIRES ARE REQUIRED

WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS
F-HA36	14			S1367-2-6	S-1367-2-6		SER 21061142 & ON
F-HA35	14			S1367-2-6	S-1367-2-6		SER 21061142 & ON
F-HA34	14			S-1367-2-6	S-1367-2-6		SER 21061142 & ON
F-HA14	10			S-1367-3-10	S-1367-3-13		
F-HA13	10		105	SOLDER	S-1367-3-10		
F-HA12	10		105	SOLDER	S-1367-3-10		
F-HA11	10		25	SOLDER	S-1367-3-8		
F-HA10	10		70	S-1367-3-12	SOLDER		
F-HA9	10		27	S-1367-3-10	S-1367-3-12		
F-HA8	10		32	S-1367-3-10	S-1367-3-10		

WIRE TABLE

ITEM NO	PART NO.	DESCRIPTION
11	D40106	SLIP RING ASSY
9	C662503-0106	AMMETER
8	22-370-20	SHUNT
7	1201013-6	CABLE ASSY
6	MS3106A020-15S	PLUG
5	MS3057-12A	CLAMP
4	C40010	BRUSH BLOCK ASSY
3	C165020-0101	TIMER
2	3E1219-4	AMMETER
1	112-220-101	SWITCH

EQUIPMENT TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES: 12210-1073

SUPERSEDED BY:

CONTRACT NO:

	NAME	DATE
DESIGN	VR SIPES	1-28-71
GROUP	H. Wise	2-26-71
DRAWN	VR SIPES	2-18-71
CHECK	L.K. WHITE	2-24-71
STRESS		
PROJ	H. McCarty	2-27-71
APPD		
OTHER		

Cessna AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

TITLE
WIRING DIAGRAM — PROP DE-ICING SYSTEM 3 BLADE (OPTIONAL)

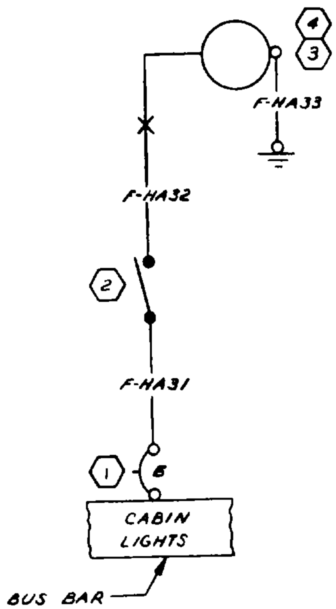
SIZE C | CODE IDENT. NO. 71379 | DWG NO 1270709

SCALE: NONE | 210 | PAGE: 13.4

(SR6755) II (21059503)

FORM NO 80-215B

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: ADD WIRE LENGTHS (NOW SHOP PRACTICE)	SLO 5-3-73	



WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS
F-HA33	18		12	S-1367-1-4	S-1367-1-4		
F-HA32	18		24	SOLDER	S-1370-1		
F-HA31	18		18	S-1367-1-6	SOLDER		

WIRE TABLE

ITEM NO	PART NO.	DESCRIPTION	VENDOR
4	MS25338-7079	LAMP	
3	#11-225	LAMPHOLDER	(95263)
2	S-1284-1	SWITCH	
1	S-1360-6L	CIRCUIT BREAKER	

EQUIPMENT TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES: 1210-1073

SUPERSEDED BY:

CONTRACT NO:

	NAME	DATE
DESIGN	V R SIPES	1-28-71
GROUP	H. Wied	2-26-71
DRAWN	V.R. SIPES	2-18-71
CHECK	L.K. WHITE	2-24-71
STRESS		
PROJ	H. McCarter	2-27-71
APPD		
OTHER		

Cessna AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

TITLE
WIRING DIAGRAM — LIGHT, ICE DETECTOR (OPT)

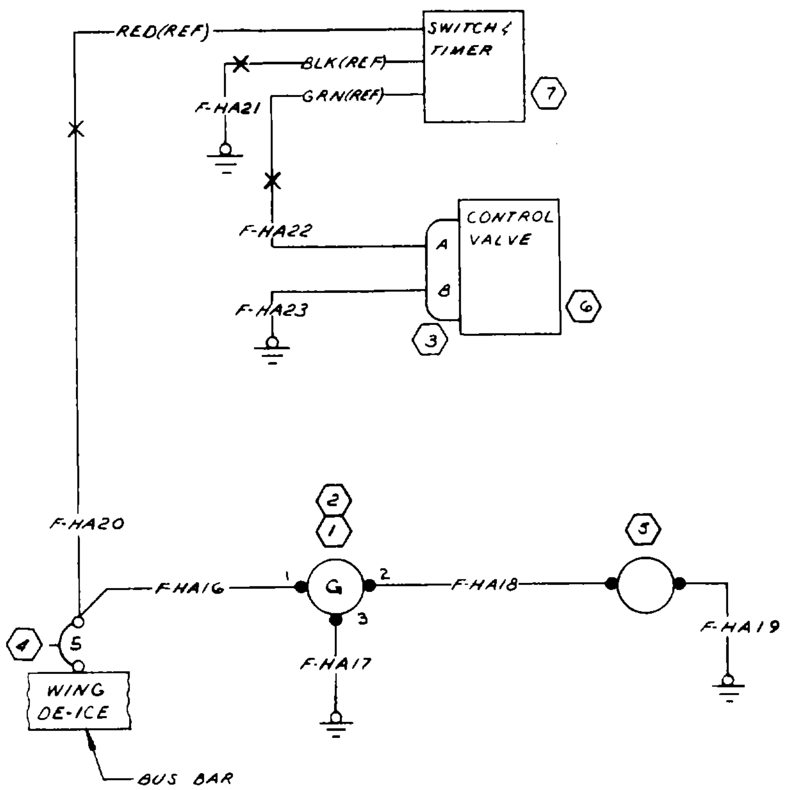
SIZE: C | CODE IDENT. NO. 71379 | DWG NO 1270709

SCALE: NONE | 210 | PAGE: 13.5

(SR6755) II

FORM NO. 80-2158

REVISION			
LET	DESCRIPTION	DATE	APPD



F-HA23	18			S-1367-1-8	SOLDER		
F-HA22	18			S-1370-1	SOLDER		
F-HA21	18			S-1370-1	S-1367-1-8		
F-HA20	18			SEE HA16	S-1370-1		
F-HA19	18			SOLDER	S-1367-1-8		
F-HA18	18			SOLDER	SOLDER		
F-HA17	18			SOLDER	S-1367-1-8		
F-HA16	18			S-1367-2-6	SOLDER		
WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS

WIRE TABLE

7	301748-2	SWITCH & TIMER	(25472)
6	301542-03	CONTROL VALVE	(25472)
5	101194-1	PRESSURE SWITCH	(25472)
4	S-1360-5L	CIRCUIT BREAKER	
3	MS3106A-12S-3S	CONNECTOR	
2	MS25041-3	INDICATOR LIGHT	
1	MS25237-327	LAMP	
ITEM NO	PART NO.	DESCRIPTION	VENDOR

EQUIPMENT TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA
STD. NO.

SUPERSEDES: 12210-1073

SUPERSEDED BY:

CONTRACT NO:

	NAME	DATE
DESIGN	VR SIPES	1-18-71
GROUP	H. Wise	2-26-71
DRAWN	VR SIPES	2-18-71
CHECK	L.K. WHITE	2-24-71
STRESS		
PROJ	H. McCarter	2-27-71
APPD	WEB	
OTHER		

Cessna AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

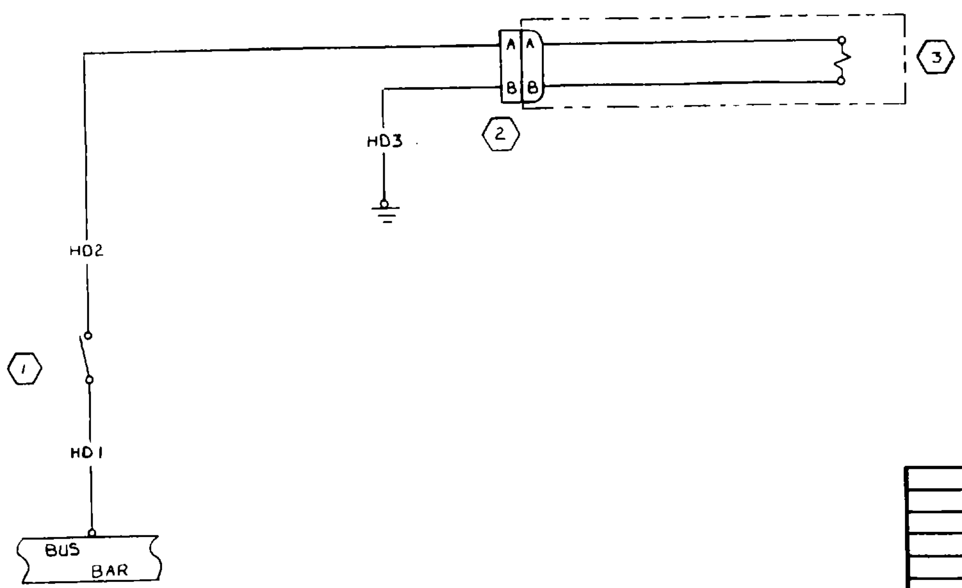
TITLE
WIRING DIAGRAM — WING DE-ICING SYSTEM (OPTIONAL)

SIZE	CODE IDENT. NO.	DWG NO
C	71379	1270709

SCALE: NONE | 210 | PAGE: 13.6

(SR 6755) II

REVISION			
LET	DESCRIPTION	DATE	APPD



13 196 0905

HD 3	18			SOLDER	S-1367-1-10		
HD 2	18			S-1367-1-6	SOLDER		
HD 1	18			S-1367-1-6	S-1367-1-6		
WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS

WIRE TABLE

ITEM NO	PART NO.	DESCRIPTION
3	1513460	HEATER
2	KPT07E8-2S	RECEPTABLE
1	112-507-101	CIRCUIT BREAKER SW

EQUIPMENT TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES:

SUPERSEDED BY:

CONTRACT NO:

	NAME	DATE
DESIGN	VR SIPES	12-11-74
GROUP	W Warden	12-12-74
DRAWN	CJ HESSMAN	12-3-74
CHECK	J YOUEL	12-10-74
STRESS		
PROJ	H. McCarter	12-18-74
APPD	RK AH	
OTHER		

Cessna AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

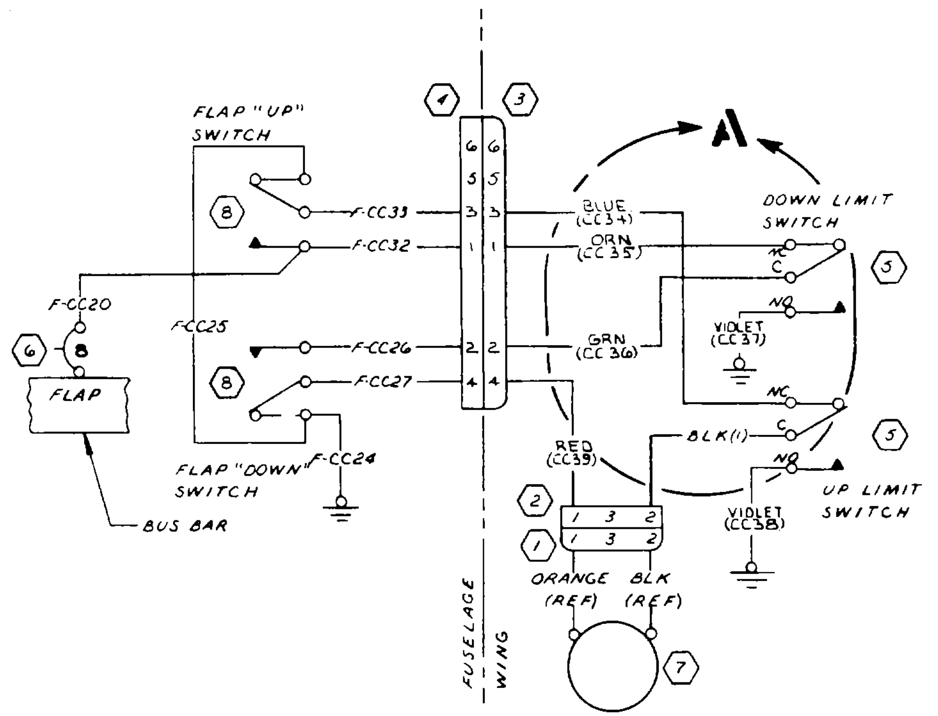
TITLE
WIRING DIAGRAM — WINDSHIELD ANTI-ICE SYSTEM (OPT)

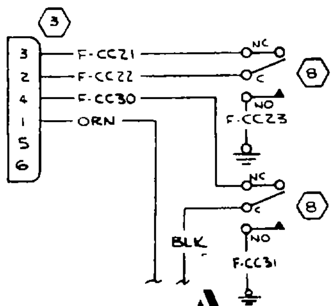
SIZE	CODE IDENT. NO.	DWG NO
C	71379	1270709

SCALE: NONE | 210 (SR 7913) | PAGE: 13.7

(21061040)

FORM NO. 80-2158





DETAIL A
THRU SER 21060089

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: ADD WIRE LENGTHS (NOW SHOP PRACTICE)	DLO 5-3-73	
B	BY REV: ADD DETAIL "A" & SER (SR7381) IX	DLP 6-22-73	
C	BY REV: ADD COLOR TO CC34, CC35, CC36, CC37, CC38 & CC39 & REVISED WIRE LENGHTS (NOW SHOP PRACTICE)	RS 4-4-75	JCYWHH

WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS
BLK(1)	16	-16-0	13	S-1493-2	S-1636-2		SER 21060090 & ON
VIOLET (CC38)	16	-16-7	19	S-1493-2	S-1367-2-8		
VIOLET (CC37)	16	-16-7	19	S-1493-2	S-1367-2-8		
GREEN (CC36)	16	-16-5	13	S-1635-2	S-1493-2		
ORANGE (CC35)	16	-16-3	13	S-1635-2	S-1493-2		
BLUE (CC34)	16	-16-6	13	S-1635-2	S-1493-2		SER 21060090 & ON
RED (CC39)	16	-16-2	13	S-1635-2	S-1636-2		
BLK	16	-16-0	13	S-1367-2-4	S-1636-2		THRU SER 21060089
F-CC33	16		220	S-1367-2-4	S-1636-2		
F-CC32	16		220	S-1367-2-4	S-1636-2		
F-CC31	16		4	S-1367-2-4	S-1367-2-8		THRU SER 21060089
F-CC30	16		18	S-1635-2	S-1367-2-4		THRU SER 21060089
F-CC27	16		220	S-1367-2-4	S-1636-2		
F-CC26	16		220	S-1367-2-4	S-1636-2		
F-CC25	16		4	S-1367-2-4	S-1367-2-6		
F-CC24	16		10	S-1367-2-4	S-1367-2-8		
F-CC23	16		4	S-1367-2-4	S-1367-2-8		THRU SER 21060089
F-CC22	16		20	S-1635-2	S-1367-2-4		THRU SER 21060089
F-CC21	16		20	S-1635-2	S-1367-2-4		THRU SER 21060089
F-CC20	16		36	S-1367-2-8	S-1367-2-4		

WIRE TABLE

ITEM NO.	PART NO.	DESCRIPTION	
8	S-1906-1	SWITCH	
7	C301002-0202	FLAP MOTOR	
6	S-1360-8L	CIRCUIT BREAKER	
5	S-1906-2	SWITCH	
4	S-1641-6	HOUSING-SOCKET	
3	S-1640-6	HOUSING-PIN	
2	S-1638-2	HOUSING-SOCKET	
1	S-1638-1	HOUSING-PLUG	

EQUIPMENT TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES: 12210-1073

SUPERSEDED BY:

CONTRACT NO:

	NAME	DATE
DESIGN	V R SIPES	3-5-71
GROUP	H Wiie	3-5-71
DRAWN	V R SIPES	3-5-71
CHECK	L.K. WHITE	3-5-71
STRESS		
PROJ		
APPD		
OTHER		

Cessna AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

TITLE
WIRING DIAGRAM — WING FLAPS

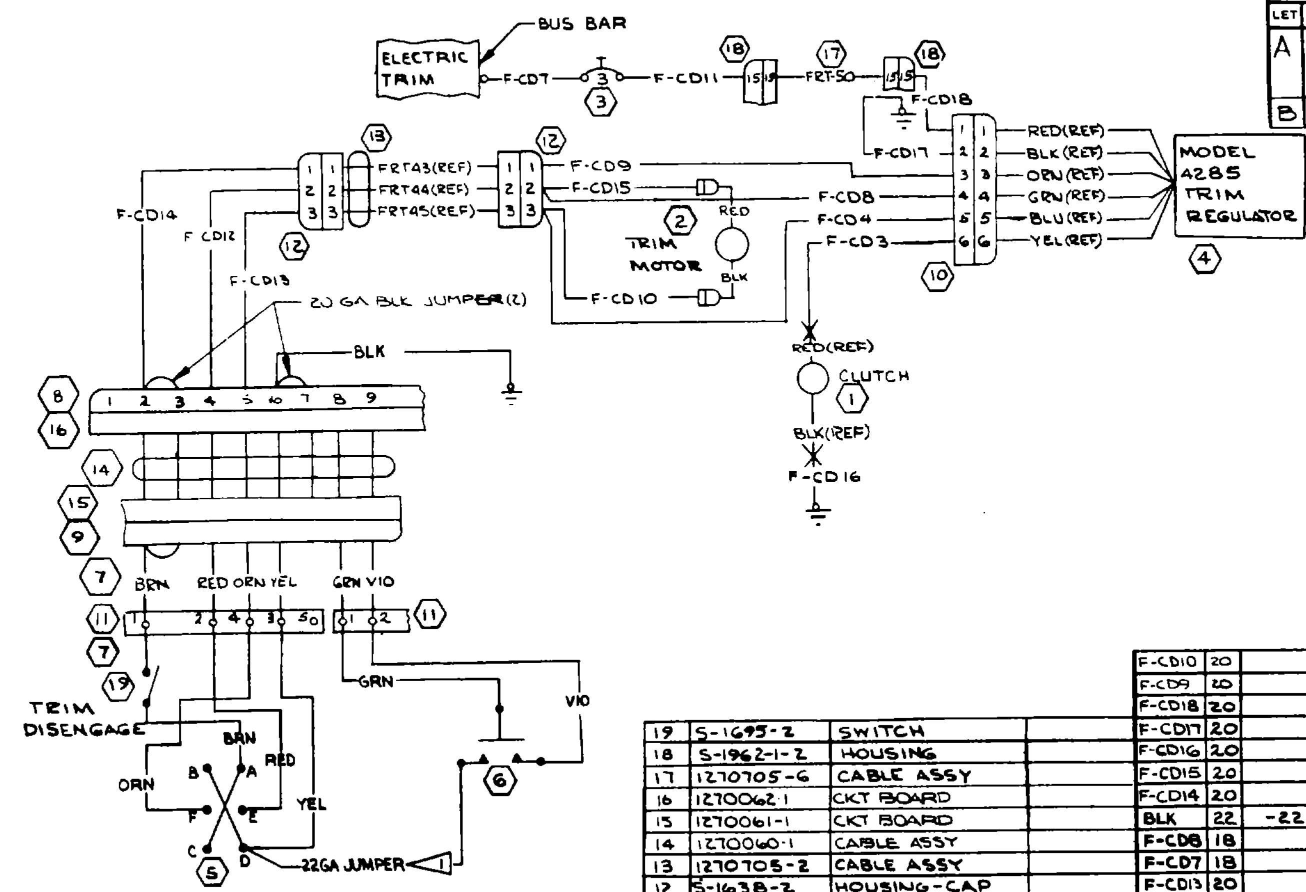
SIZE	CODE IDENT. NO.	DWG NO
C	71379	1270709

SCALE: NONE 210 PAGE: 4.1

FORM NO 80-2158

(SR6755) IX (21059503)

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: ADD CD18 WIRE 1270705 AND S1962-1-2 HOUSING, S1963-1/CD11 WAS S1636-1. "NOW SHOP PRACTICE"	5-18-72	VRS
B	BY REV: ADD WIRE LENGTHS (NOW SHOP PRACTICE)	5-3-73	



INACTIVE: EFF THRU SER 21060089 12-28-72

NOTES:

1. IF MIKE SWITCH IS INSTALLED WITH ELECTRIC TRIM SWITCH, DELETE YELLOW WIRE TO PIN "D" OF TRIM SWITCH & ADD JUMPER TO MIKE SWITCH. REFER TO 1270700 FOR MIKE SWITCH WIRING
2. PART NO. 60215-4LP, VENDOR CODE IS 00779
3. VENDOR FOR 4285 VOLTAGE REGULATOR IS HOPKINS MFG. CORP. 428 PEYTON, EMPORIA, KANSAS, 66801.
4. PART OF SF-1030-BX (08261) CABLE

ITEM NO.	PART NO.	DESCRIPTION	
19	S-1695-2	SWITCH	
18	S-1962-1-2	HOUSING	
17	1270705-6	CABLE ASSY	
16	1270062-1	CKT BOARD	
15	1270061-1	CKT BOARD	
14	1270060-1	CABLE ASSY	
13	1270705-2	CABLE ASSY	
12	S-1638-2	HOUSING-CAP	
11	351-11-05-001	TERM. BD	(71785)
10	S-1641-6	HOUSING	
9	255 10 30 190	CONNECTOR	(71785)
8	382384-9	SOCKET	(00779)
7	SF-1030-BX	CABLE	(08261)
6	S-1985-1	MIKE SW	
5	S-2030-1	PITCH TRIM SW	
4	4285	VOLTAGE REG	3
3	7271-8-3	CKT BKR	(82647)
2	C610502-0101	MOTOR ASSY	
1	1560323-1	CLUTCH	

EQUIPMENT TABLE

WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS
F-CD10	20		10	S-1635-1	S-1636-1		
F-CD9	20		8	S-1635-1	S-1636-1		
F-CD18	20		18	S-1636-1	S-1963-1		
F-CD17	20		18	S-1636-1	S-1367-1-8		
F-CD16	20		18	S-1370-1	S-1367-1-8		
F-CD15	20		18	S-1635-1	S-1636-1		
F-CD14	20		137	2	S-1635-1		
BLK	22	-22-0		2	S-1367-1-8		
F-CD8	18		8	S-1635-1	S-1636-1		
F-CD7	18		35	S-1367-1-8	S-1367-1-8		
F-CD13	20		137	2	S-1635-1		
F-CD4	20		8	S-1635-1	S-1636-1		
F-CD3	20		137	S-1370-1	S-1636-1		
F-CD12	20		137	2	S-1635-1		
F-CD11	20		147	S-1963-1	S-1367-1-8		

WIRE TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES: 12210-1073

SUPERSEDED BY: P 14.4.1

CONTRACT NO:

	NAME	DATE
DESIGN	V R SIPES	1-28-71
GROUP	J Wise	2-26-71
DRAWN	V R SIPES	2-18-71
CHECK	L.K.WHITE	2-24-71
STRESS		
PROJ	J. McFarlen	3-4-71
APPD		
OTHER		

Cessna AIRCRAFT CO. COMMERCIAL AIRCRAFT DIV. 5800 E. PAWNEE WICHITA, KANSAS

TITLE: WIRING DIAGRAM — ELECTRIC ELEVATOR TRIM (OPTIONAL)

SIZE	CODE IDENT. NO.	DWG NO
C	71379	1270709
SCALE: NONE	210	PAGE: 14.4

(SR6755) IX

FORM NO 80-215B

REVISION			
LET	DESCRIPTION	DATE	APPD
F	BY REV: ADD DETAIL 'A' & SER'S: SER OUT CD-19, CD-29, CD 30, & CD31, SER IN CD50, CD51, CD52, CD53 (SR7913)	GW 9-17-75	
C	BY REV: ADD WIRE COLORS ORN(F-CD9), RED (F-CD24), GRN(F-CD8), BLU(F-CD4), YEL(F-CD3), BLK(F-CD17) C611003-0101 WAS 4285A (SR 7381) (REF)	DEF 1-14-74	
D	BY REV: ADD SHT. 14.4.3 & 1570307-2; S-1963-2 WAS SOLDER /F-CD29, F-CD30, F-CD31 & F-CD28; ADD S-1370-5 (SR7677) (SR7650)	MEM 5-14-74	
E	BY REV: ADD S-1637-1; S-1636-1 WAS S-1370-1/F-CD3 (MER 206-E0361)(NOW SHOP PRACTICE)	RJP 1-23-75	
A	BY REV: ADD WIRE LENGTHS (NOW SHOP PRACTICE)	DLO 5-3-73	
B	BY REV: C611003-0101 WAS 4285; ADD DETAIL 'A'; SER OUT 582384-9, 1270062-1, 1270060-1, 1270061-1, 255-10-30-190, SF-1030-BX, 351-11-05-001, CD12, CD13, CD14, CD25, BRN(1), BRN(2), BRN(3), RED(1), RED(2), ORN(1), ORN(2), YEL(1), YEL(2), GRN(1), GRN(2), VIO(1), VIO2; SER IN 1570307-1, 1570308-1, 3421-0000, CD28, CD29, CD30, CD31, BRN(4), BRN(5), RED(3), YEL(3), ORN(3), GRN(3) & VIO(3): ADD PG 14.4.2 (NOW SHOP PRACTICE) (SR7677)	DLO 11-6-73	

13-196-0905

WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS
F-CD23	20			S-1635-1	S-1636-1		
F-CD22	20			S-1635-1	S-1636-1		
F-CD21	20			S-1635-1	S-1636-1		
F-CD20	20			S-1635-1	S-1636-1		
VIO(2)		4		SOLDER	3		THRU SER21060318
VIO(1)							
GRN(2)							
GRN(1)							
YEL(2)							
YEL(1)							
ORN(2)							
ORN(1)							
RED(2)							
RED(1)							
BRN(3)							
BRN(2)							
BRN(1)		4		SOLDER	3		THRU SER21060318
(F-CD26) BLK(1)	20	-20-0		S-1635-1	S-1636-1		
ORN (F-CD9)	20		8	S-1635-1	S-1636-1		
RED (F-CD24)	20			S-1635-1	S-1636-1		
BLK (F-CD17)	20		18	S-1367-18	S-1636-1		
F-CD16	20		18	S-1370-1	S-1367-1-8		
(F-CD27) RED	20	-20-2		S-1635-1	S-1636-1		
F-CD14	20		137	2	S-1635-1		THRU SER21060318
(F-CD25) BLK	22	-22-0		2	S-1367-1-8		THRU SER21060318
GRN (F-CD8)	18		8	S-1635-1	S-1636-1		
F-CD7	18		35	S-1367-1-8	S-1367-1-6		
F-CD13	20		137	2	S-1635-1		THRU SER21060318
BLU (F-CD4)	20		8	S-1635-1	S-1636-1		
YEL (F-CD3)	20		137	S-1636-1	S-1636-1		
F-CD12	20		137	2	S-1635-1		THRU SER 21060318
F-CD19	20			S-1635-1	S-1367-1-6		EFF THRU SER (SR7913)

NOTES:

1. 329636 TERMINAL (00779)
2. PART OF SF-1030-BX CABLE (08261)
3. IF MIKE SWITCH IS INSTALLED WITH ELECTRIC TRIM SWITCH, DELETE YELLOW WIRE TO PIN D OF TRIM SWITCH & ADD JUMPER TO MIKE SWITCH. REFER TO 1270708 FOR MIKE SWITCH WIRING
4. PART NO. 60215-4LP, VENDOR CODE IS 00779

WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS
F-CD53	20			S-1963-2	S-1636-1		SER21061040 & ON
F-CD52	20			S-1963-2	S-1636-1		
F-CD51	20			S-1963-2	S-1636-1		
F-CD50	20			S-1636-1	S-1367-1-6		SER21061040 & ON
VIO (3)	20	-20-7		SOLDER	SOLDER		SER21060319 & ON
GRN (3)	20	-20-5					
ORN (3)	20	-20-3					
YEL (3)	20	-20-4					
RED (3)	20	-20-2					
BRN (5)	20	-20-1					
BRN (4)	20	-20-1		SOLDER	SOLDER		SER21060319 & ON
F-CD31	20		137	S-1963-2	S-1635-1		SER21060319 THRU SER21061039
F-CD30	20		131	S-1963-2	S-1635-1		SER21060319 THRU SER21061039
F-CD29	20		137	S-1963-2	S-1635-1		SER21060319 THRU SER21061039
(F-CD28) BLK	20	-20-0		S-1963-2	S-1637-1-8		SER21060319 & ON

FORM NO. 80-2158

WIRE TABLE

EQUIPMENT TABLE

ITEM NO.	PART NO.	DESCRIPTION	
29	S-1637-1	HOUSING	
28	S-1370-5L	CKT. BKR.	
27	1570307-2	CABLE ASSY	
26	S-1962-2-0	HOUSING	
25	S-1962-1-0	HOUSING	
24	S-1960-2-0	HOUSING	
23	S-1960-1-0	HOUSING	
22	1570308-1	CABLE ASSY	
21	3421-0000	SOCKET	
20	1570307-1	CONNECTOR ASSY	
19	S-1695-2	SWITCH	
18	1270706-11	CABLE ASSY	
17	S-1637-2	HOUSING	
16	1270062-1	CKT BOARD	
15	1270061-1	CKT BOARD	
14	1270060-1	CABLE ASSY	
13	1270705-10	CABLE ASSY	
12	351-11-05-001	TERM. BD	(71785)
11	S-1641-6	HOUSING	
10	S-1640-6	HOUSING	
9	255 10 30 190	CONNECTOR	(71785)
8	582384-9	SOCKET	(00779)
7	SF-1030-BX	CABLE	(08261)
6	S-1985-1	MIKE SW	
5	S-2030-1	PITCH TRIM SW	
4	C611003-0101	VOLTAGE REG	(HOPK)
3	7271-8-3	CKT BKR	(82647)
2	C610502-0101	MOTOR ASSY	
1	TCS-208	CLUTCH	

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES: P 14.4

SUPERSEDED BY:

CONTRACT NO:

	NAME	DATE
DESIGN	VR SIPES	
GROUP	H Wise	1-9-73
DRAWN	PAPE	12-28-72
CHECK	R YOUNGERS	12-30-72
STRESS		
PROJ	H. McCarter	1-15-73
APPD		
OTHER		

Cessna AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

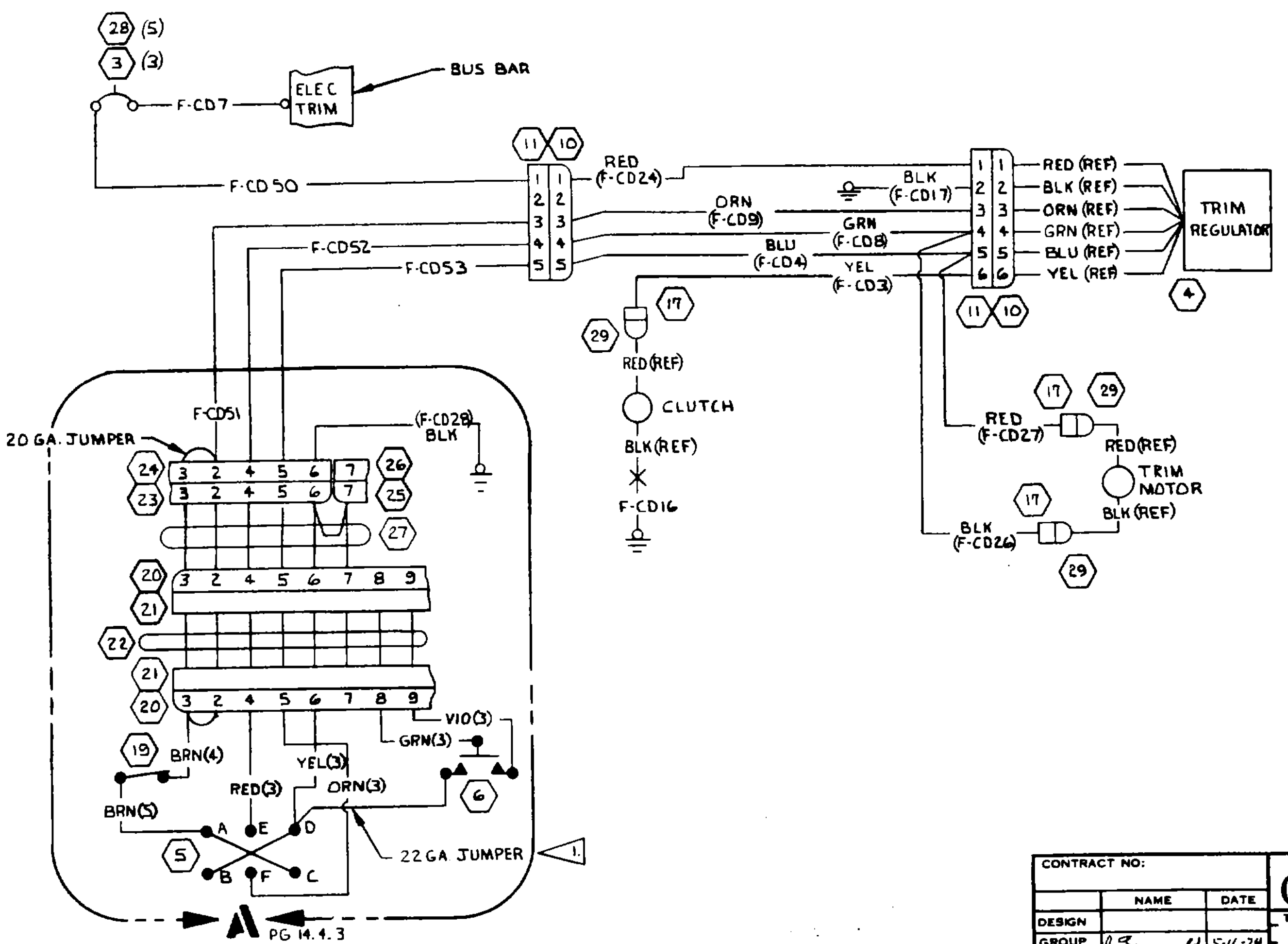
TITLE
WIRING DIAGRAM — ELECTRIC ELEVATOR TRIM (OPTIONAL)

SIZE	CODE IDENT. NO.	DWG NO
C	71379	1270709

SCALE: NONE | 210 | PAGE: 14.4.1

(SR7381) II (21060090)

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED
F	SEE PAGE 14.4.1 FOR REVISION		



CONTRACT NO:		
	NAME	DATE
DESIGN		
GROUP		5-16-74
DRAWN	MCBRIDE	5-14-74
CHECK	J YOUEL	5-15-74
STRESS		
PROJECT		
APPD		

Cessna AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

TITLE
WIRING DIAGRAM— ELECTRIC ELEVATOR TRIM (OPTIONAL)

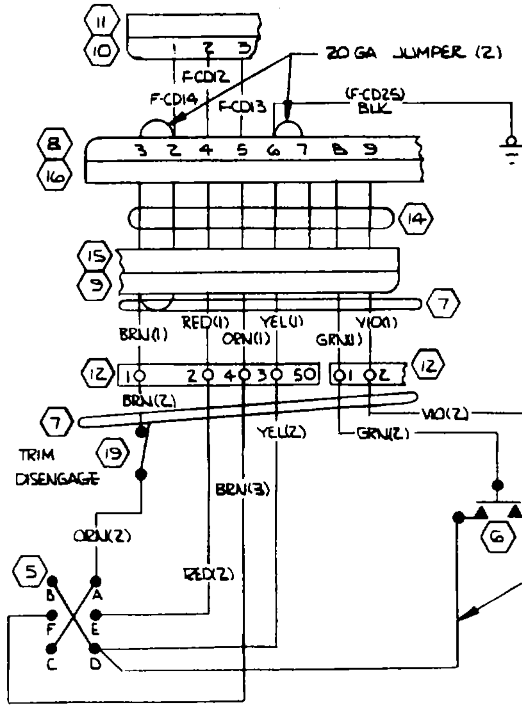
SIZE	CODE IDENT. NO.	DWG NO.
C	71379	1270709

SCALE: NONE | 210 (SR7677) | PAGE: 14.4.2

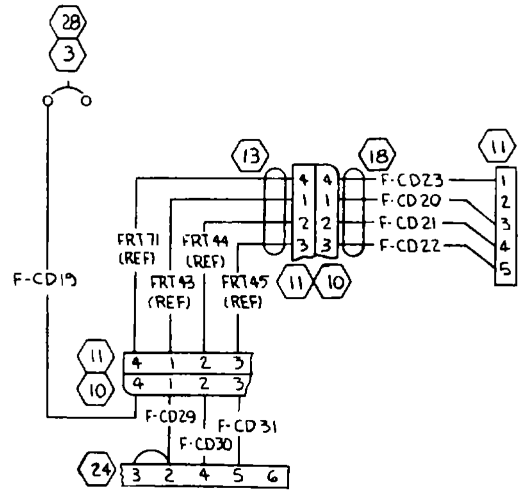
(21060319)

FORM NO. 90-218

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED
F	SEE PAGE 14.4.1 FOR REV		



DETAIL A PG 14.4.2
EFF THRU SER(SR7677)
(21060318)



DETAIL A PG 14.4.2
SER(SR7677) THRU SER(SR7913)
(21060319) (21061039)

CONTRACT NO:		
	NAME	DATE
DESIGN		
GROUP	PLHEDRICK	11-17-73
DRAWN	DLOLLER	11-6-73
CHECK	PAPE	11-7-73
STRESS		
PROJECT	N. McCarter	11-11-73
APPD		

Cessna AIRCRAFT CO. COMMERCIAL AIRCRAFT DIV. 5800 E. PAWNEE WICHITA, KANSAS

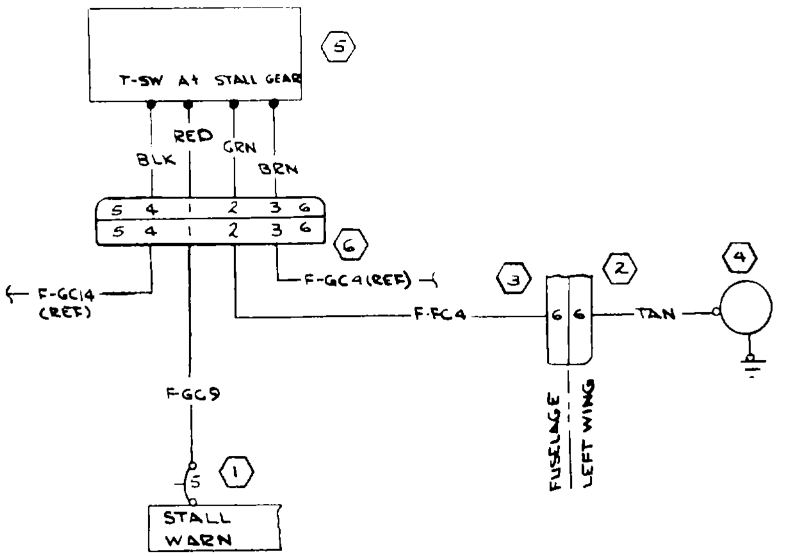
TITLE
WIRING DIAGRAM
ELECTRIC ELEVATOR TRIM
(OPTIONAL)

SIZE	CODE IDENT. NO.	DWG NO.
C	71379	1270709

SCALE: NONE 210 PAGE: 14.4.3

FORM NO. 80-216

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: ADD WIRE LENGTHS (NOW SHOP PRACTICE)	DLO 5-3-73	



INACTIVE: EFF THRU SER (SR 7913) IX (21061039) 11-11-74

13-196-0905

WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS
GC9	20		75	S-1636-2	S-1367-1-6		
FC4	20		232	S-1636-2	S-1636-2		
TAN	18	-18-	145	S-1635-2	S-1367-1-6		

WIRE TABLE

ITEM NO	PART NO.	DESCRIPTION
6	S-1641-6	HOUSING-SOCKET
5	2070005-7	WARNING UNIT
4	S-1672-1	STALL DETECTOR
3	S-1641-9	HOUSING-SOCKET
2	S-1640-9	HOUSING-PIN
1	S-1360-5L	CIRCUIT BREAKER

EQUIPMENT TABLE

CES-1000 IS APPLICABLE VENDOR CODES PER S-1400 CES-XXXX=CESSNA SPEC. NO. S-XXX OR CMXXXX=CESSNA STD NO.

SUPERSEDES: 12210-1073

SUPERSEDED BY: PG 15.5

CONTRACT NO:

	NAME	DATE
DESIGN	V.R. SIPES	2-18-71
GROUP	H. Wiese	2-26-71
DRAWN	V.R. SIPES	2-18-71
CHECK	L.K. WHITE	2-24-71
STRESS		
PROJ	H. McCarter	2-27-71
APPD		
OTHER		

Cessna AIRCRAFT CO. COMMERCIAL AIRCRAFT DIV. 5800 E. PAWNEE WICHITA, KANSAS

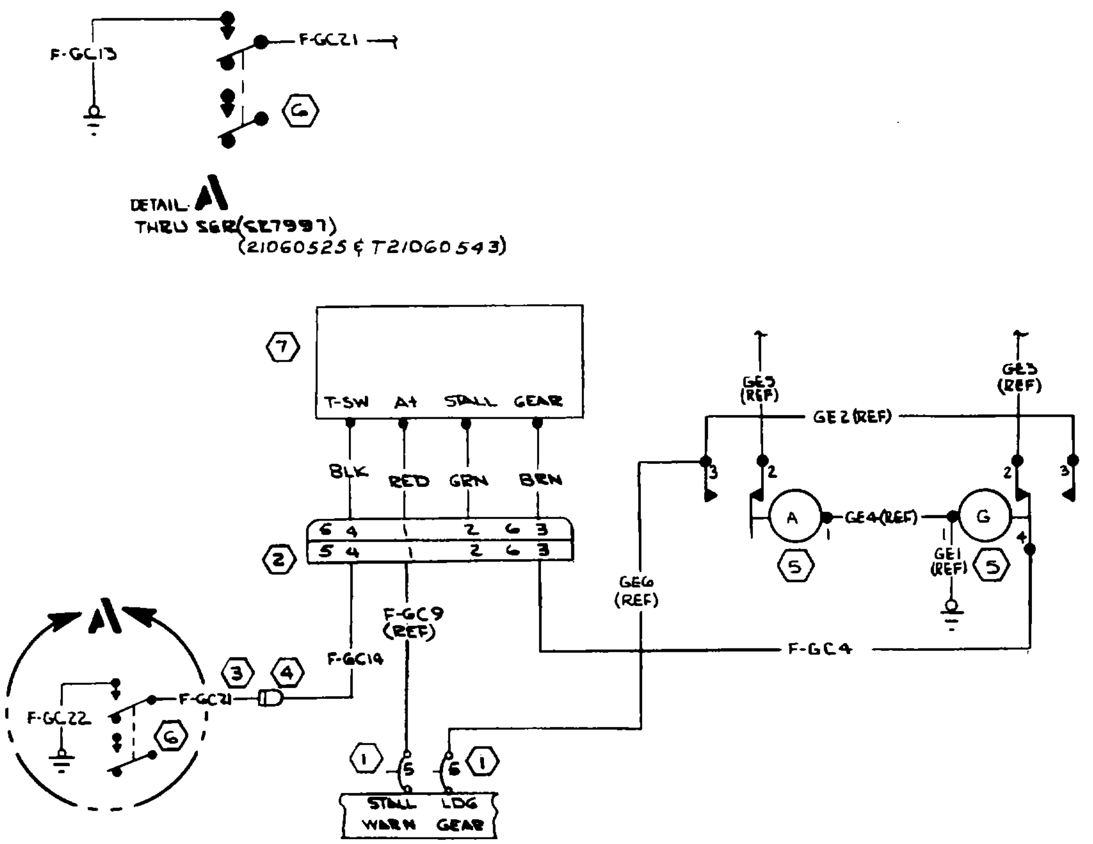
TITLE WIRING DIAGRAM — STALL WARNING SYSTEM

SIZE C | CODE IDENT. NO. 71379 | DWG NO 1270709

SCALE: NONE | 210 | PAGE: 15.1

(SR6755 IX (21059503

FORM NO 80-2158



REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: ADD WIRE LENGTHS (NOW SHOP PRACTICE)	DLO 5-3-73	
B	BY REV: F-GC13 WAS F-GC13 (REF) AND F-GC21 WAS F-GD21 (REF) (NOW SHOP PRACTICE)	RJL 7-29-73	
C	BY REV: S-1856-1 WAS USM5-B ADD DETAIL "A" & FGC22: GE6(REF) WAS GD9: DELETE GD9 ADD VM920M-3 NOW SHOP PRACTICE (SE7997)	DLO 6-25-74	JRG

INACTIVE:
EFF THRU SER(SR7913)(21061039)
G W 11-11-74
JRG

13-196-0905

GC22	20			SOLDER	S-1367-1-10	SER 21060525 & T21060543 ON
GC21	20			SOLDER	S-1635-1	
GC13	20			SOLDER	S-1367-1-8	THRU 21060525 & T21060543
GC14	20		95	S-1635-2	S-1636-2	
GC4	20		65	SOLDER	S-1636-2	
WIRE CODE NO	GA	MATERIAL	LG	TERMINALS		SERIALS

WIRE TABLE

ITEM NO	PART NO.	DESCRIPTION	
7	2050005-1	WARNING UNIT	
6	S-1856-1	SWITCH	
5	VM920M-3	LIGHT ASSY	(87034)
4	S-1637-2	HOUSING-PLUG	
3	S-1637-1	HOUSING-CAP	
2	S-1691-6	HOUSING-SOCKET	
1	S-1360-5L	CIRCUIT BREAKER	

EQUIPMENT TABLE

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES: 12210-1073

SUPERSEDED BY:

CONTRACT NO:

	NAME	DATE
DESIGN	VR SIPES	2-18-71
GROUP	H. Wise	2-26-71
DRAWN	VR SIPES	2-18-71
CHECK	LIK, WHITE	2-24-71
STRESS		
PROJ	N. McCarty	2-27-71
APPD		
OTHER		

Cessna AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

TITLE
WIRING DIAGRAM — GEAR WARNING SYSTEM

SIZE C | CODE IDENT. NO. 71379 | DWG NO 1270709

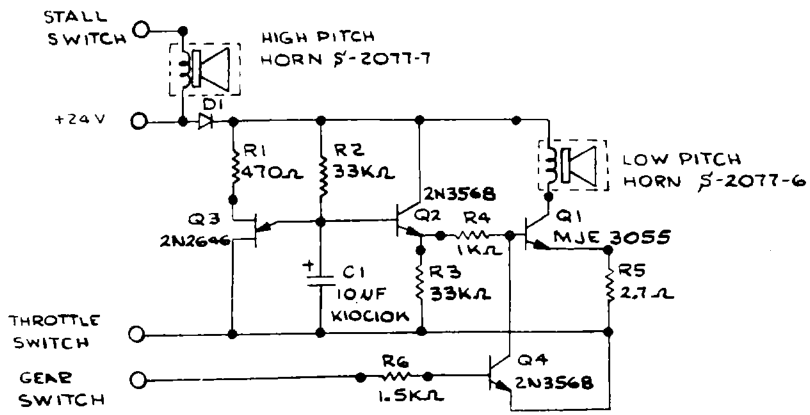
SCALE: NONE | 210 | PAGE: 15.2

FORM NO 80-2158

(SR6755) IX (21059503)

NOTES:
1. DIODE D1 MAY BE IN2070, IN4004 OR F4.
2. ALL RESISTORS MAY BE AMPEREX OR ANY CURRENT RESISTOR SUPPLIER.

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED
A	BY REV: REVISED & REDRAWN	4-19-71 VRS	



INACTIVE:
EFF THRU SER (SR7913) IX (21061039)
SUPERSEEDED BY: PG 15.4
GLW 11-9-74
JCY
RGS

13-180-D122

CONTRACT NO:		
	NAME	DATE
DESIGN	VR SIPES	12/23/70
GROUP	H. Wise	3-2-71
DRAWN	VR SIPES	2-24-71
CHECK	L.C. WHITE	2-24-71
STRESS		
PROJECT		3-3-71
APPD		

Cessna AIRCRAFT CO.
COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

TITLE
SCHEMATIC DIAGRAM-
DUAL WARNING UNIT
24 VDC

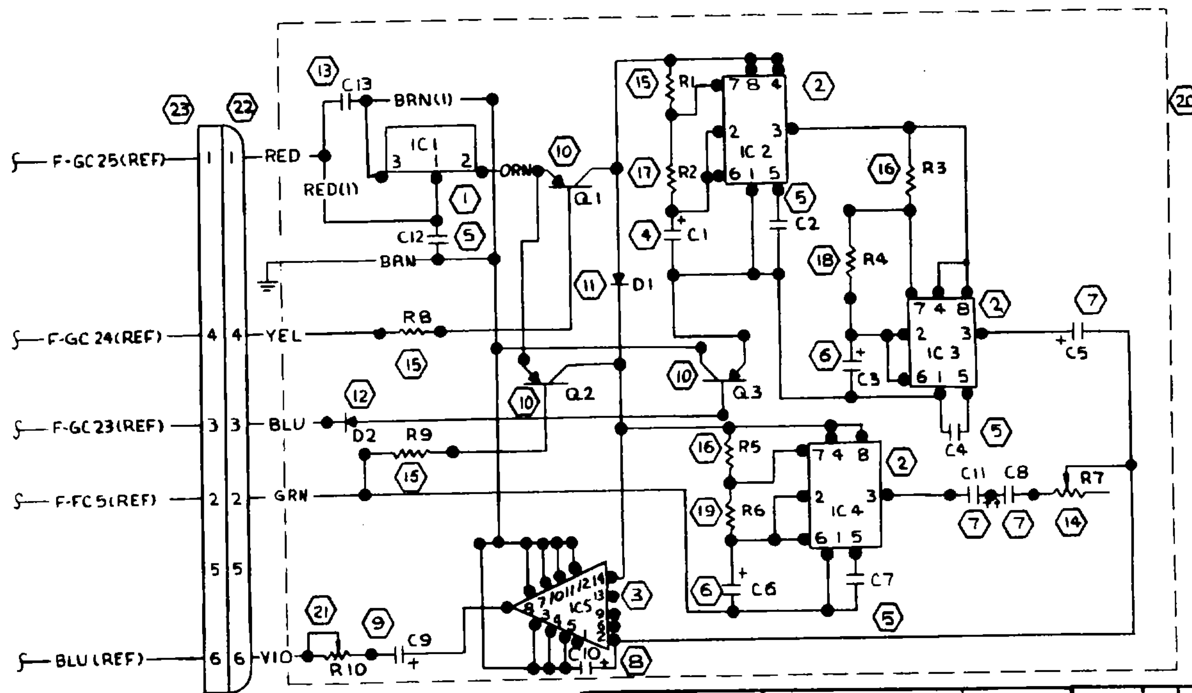
SIZE	CODE IDENT. NO.	DWG NO.
C	71379	1270709

SCALE: NONE | 210 | PAGE: 15.3

(SR6755) IX (21059503)

FORM NO. 80-216

REVISION			
LET	DESCRIPTION	DATE	APPD
A	BY REV: ET470X063A6 WAS C462AR/G50; SER (SR7913)	CJH 12-20-74	



13-180-0122

NOTES:

1. LM340-12 VENDOR CODE 27014 MAY BE SUBSTITUTED FOR PN MC7812-CP

2. SG555CN VENDOR CODE 34333, LM555CN VENDOR CODE 27014, OR SN72555P VENDOR CODE 01295 MAY BE SUBSTITUTED FOR PN MC1455-P1

ITEM NO.	PART NO.	DESCRIPTION	
19	S2000A122J	RESISTOR	
18	S2000A242J	RESISTOR	
17	S2000A393J	RESISTOR	
16	S2000A471J	RESISTOR	
15	S2000A102J	RESISTOR	
14	2322-410-03308	POT	
13	ET470X063A6	CAPACITOR	
12	IN34A	DIODE	
11	IN4001	DIODE	
10	2N4918	TRANSISTOR	
9	GE62F405	CAPACITOR	
8	T310B225K035AS	CAPACITOR	
7	T330B104K035AS	CAPACITOR	
6	T330B564K035AS	CAPACITOR	
5	UK25-103	CAPACITOR	
4	T330C106K025AS	CAPACITOR	
3	LM380N	INTEGRATED CKT	
2	MC1455-P1	INTEGRATED CKT	2
1	MC7812-CP	INTEGRATED CKT	1

EQUIPMENT TABLE

ITEM NO.	PART NO.	DESCRIPTION	
23	S-1641-6	HOUSING-SOCKET	
22	S-1640-6	HOUSING-PIN	
21	232241005002	POT	
20	1270730-1	PC BOARD	

EQUIPMENT TABLE

WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS
ORN	22	BELDEN 8568		SOLDER	SOLDER		
RED(1)					SOLDER		
BRN(1)					SOLDER		
VIO			6		S-1635-1		
RED			6				
BRN			6				
YEL			6				
BLU			6				
GRN	22	BELDEN 8568		SOLDER	S-1635-1		

WIRE TABLE

CES-1000 IS APPLICABLE VENDOR CODES PER S-1400 CES-XXXX=CESSNA SPEC. NO. S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES: PAGE 15.3

SUPERSEDED BY:

CONTRACT NO:

	NAME	DATE
DESIGN	VR SIPES	11-19-74
GROUP		11-19-74
DRAWN	G. WHITSON	11-6-74
CHECK	J. YOUEL	11-8-74
STRESS		
PROJ		11-21-74
APPD		
OTHER		

Cessna AIRCRAFT CO. COMMERCIAL AIRCRAFT DIV. 5800 E. PAWNEE WICHITA, KANSAS

TITLE

WIRING DIAGRAM — SCHEMATIC DUAL WARNING UNIT

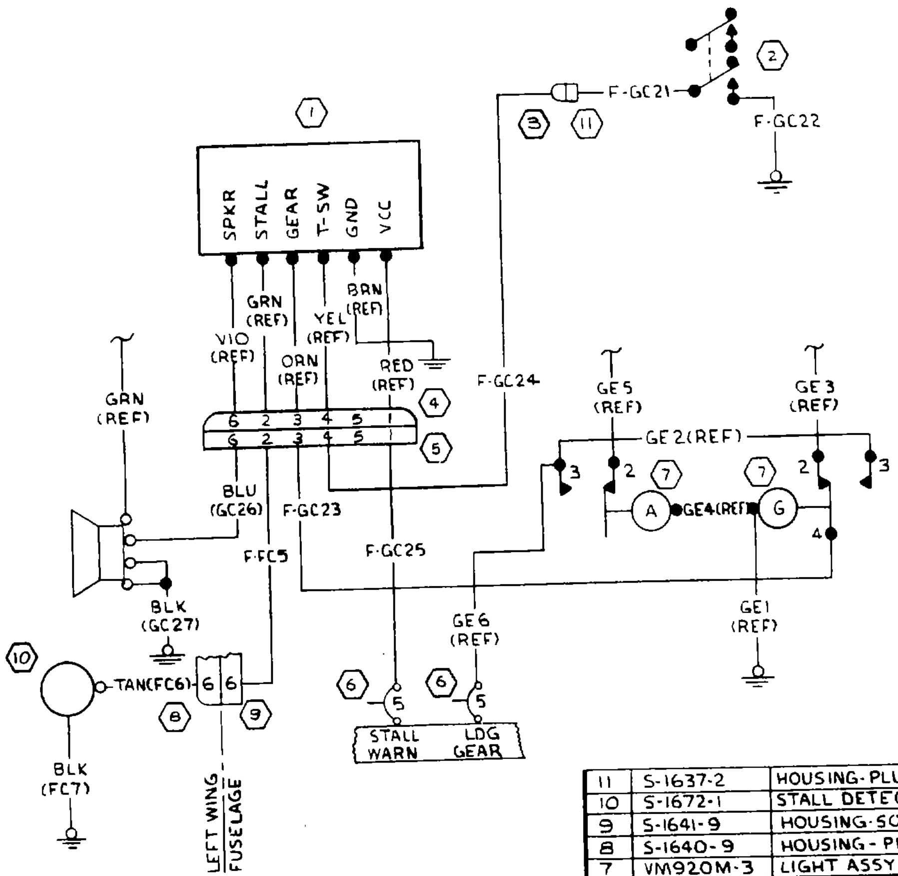
SIZE	CODE IDENT. NO.	DWG NO
C	71379	1270709

SCALE: NONE | 210 | PAGE: 15.4

(SR7913)(21061040)

FORM NO. 80-2158

REVISION			
LET	DESCRIPTION	DATE	APPD



13-196-0905

ITEM NO.	PART NO.	DESCRIPTION	
11	S-1637-2	HOUSING-PLUG	
10	S-1672-1	STALL DETECTOR	
9	S-1641-9	HOUSING-SOCKET	
8	S-1640-9	HOUSING-PIN	
7	VM920M-3	LIGHT ASSY	
6	S-1360-5L	CIRCUIT BREAKER	
5	S-1641-6	HOUSING-SOCKET	
4	S-1640-6	HOUSING-PLUG	
3	S-1637-1	HOUSING-CAP	
2	S-1856-1	SWITCH	
1	1270733-1	WARNING UNIT ASSY	

EQUIPMENT TABLE

WIRE CODE NO	GA	MATERIAL	LG	TERMINALS			SERIALS
BLU GC26	20	-20-6		S-1636-1	S-1493-1		
BLK FC7	20	-20-0		S-1367-1-6	S-1367-1-8		
BLK GC27	20	-20-0		S-1637-1-8	S-1493-1		
TAN FC6	18	-18-10	145	S-1635-1	S-1367-1-6		
FC5	20			S-1636-1	S-1636-1		
GC25	20			S-1637-1-6	S-1636-1		
GC24	20			S-1636-1	S-1635-1		
GC23	20			S-1636-1	SOLDER		
GC22	20			SOLDER	S-1367-1-10		
GC21	20			S-1636-1	SOLDER		

WIRE TABLE

CONTRACT NO:

	NAME	DATE
DESIGN	V R SIPES	11-15-74
GROUP	J R Smith	11-18-74
DRAWN	G. WHITSON	11-11-74
CHECK	J. YOUEL	11-12-74
STRESS		
PROJ	HMC/PLH	11-21-74
APPD		
OTHER		

Cessna AIRCRAFT CO.

COMMERCIAL AIRCRAFT DIV.
5800 E. PAWNEE
WICHITA, KANSAS

TITLE

WIRING DIAGRAM — DUAL WARNING SYSTEM

SIZE	CODE IDENT. NO.	DWG NO
C	71379	1270709

SCALE: NONE | 210 | PAGE: 15.5

(SR 7913)(21061040)

CES-1000 IS APPLICABLE
VENDOR CODES PER S-1400
CES-XXXX=CESSNA SPEC. NO.
S-XXX OR CMXXXX=CESSNA STD. NO.

SUPERSEDES:

SUPERSEDED BY:

FORM NO. 80-2188