Beechcraft

TRAVEL AIR

95 (TD-2 thru TD-302)

B95 (TD-303 thru TD-452)

B95A (TD-453 thru TD-533)

D95A (TD-534 thru TD-707)

E95 (TD-708 thru TD-721)

SHOP MANUAL

95-590001-1C
Reissued: September 15, 1967

95-590001-1C4
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Listed below are the pages required for this publication, with effectivity current through the revision and or reissue code shown on the lower right corner of this page, and on the title page. Each page is followed by an entry that denotes whether the page is still as originally issued or is a part of some later revision or reissue.

LIST OF EFFECTIVE PAGES

Always destroy superseded pages when you insert revised pages.

C Reissue	September 15, 1967
C1 Revision	November 30, 1976
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C3 Revision	August 10, 1978
C4 Revision	June 24, 1983

EFFECTIVE PAGES

Title Page	C4	June 24, 1983	4-7 and 4-8	C4	June 24, 1983
A Page	C4	June 24, 1983	4-9 and 4-10	C	September 15, 1967
i thru iv	C3	August 10, 1978	4-10A	C3	August 10, 1978
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3-1	C	September 15, 1967	6-1 thru 6-11	C	September 15, 1967
3-2 and 3-2A	C*4	May, 1970	6-12	AMEND III	March, 1969
3-3 thru 3-4	C	September 15, 1967	6-13 thru 6-38	C	September 15, 1967
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3-6A and 3-6B	C1	November 30, 1976	6-48	AMEND III	March, 1969
3-7	C2	November 4, 1977	6-49 thru 6-60	C	September 15, 1967
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3-9	C1	November 30, 1976	8-1	C3	August 10, 1978
3-10 thru 3-15	C	September 15, 1967	8-2	C3	August 10, 1978
3-16 and 3-17	C/6	October, 1971	8-3	C	September 15, 1967
3-18 thru 3-74	C	September 15, 1967	8-4	C3	August 10, 1978
4-1	C	September 15, 1967	8-5	C4	June 24, 1983
4-2 thru 4-6G	C4	June 24, 1983			

98-34400B

C4

Basic publications are assigned a part number which appears on the title page with the date of the issue. Subsequent revisions are identified by the addition of a revision code after the part number. A1 after a part number denotes the first revision to the basic publication, A2 the second, etc. Occasionally, it is necessary to completely reissue and reprint a publication for the purpose of obsoleting a previous issue and outstanding revisions thereto. As these replacement reissues are made, the code will also change to the next successive letter of the alphabet at each issue. For example, B for the first reissue, C for the second reissue, etc.

When ordering a manual, give the basic number, and the reissue code when applicable, if a complete up-to-date publication is desired. Should only revision pages be required, give the basic number and revision code for the particular set of revision pages you desire.

ALPHABETICAL INDEX

95 SHOP MANUAL

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THE TRAVEL AIR SHOP MANUAL

The BEECHCRAFT Travel Air Shop Manual contains information which will assist the experienced mechanic in his day-to-day work in the shop. Simple and repetitive maintenance and removal procedures are omitted. Highlights and specialized procedures are organized in a manner which is clear and easy to find. Descriptive text and theory are omitted except where necessary to provide essential information. Illustrations, diagrams and tables are used to present complex information in a concise and easy to understand form.

As new information becomes available, revisions will be issued whenever needed to keep information current and to add further information which will assist the mechanic.

NOTICE

Beech Aircraft Corporation expressly reserves the right to supersede, cancel and/or declare obsolete any part, part number, kit or publication that may be referenced in this manual without prior notice.

CORRESPONDENCE

If a question should arise concerning the care of your airplane, it is important to include the airplane serial number in any correspondence. The serial number appears on the designation placard. On early serial airplanes the model designation placard is attached to the bottom of the fuselage immediately forward of the tie down lug. On later serial airplanes, the placard is attached to the lower right hand side of the fuselage adjacent to the flap.

WARNING

Use only genuine BEECHCRAFT or BEECHCRAFT approved parts obtained from BEECHCRAFT approved sources, in connection with the maintenance and repair of Beech airplanes.

Genuine BEECHCRAFT parts are produced and inspected under rigorous procedures to insure airworthiness and suitability for use in Beech airplane applications. Parts purchased from sources other than BEECHCRAFT, even though outwardly identical in appearance, may not have had the required tests and inspections performed, may be different in fabrication techniques and materials, and may be dangerous when installed in an airplane.

Salvaged airplane parts, reworked parts obtained from non-BEECHCRAFT approved sources, or parts, components, or structural assemblies, the service history of which is unknown or cannot be authenticated, may have been subjected to unacceptable stresses or temperatures or have other hidden damage, not discernible through routine visual or usual nondestructive testing techniques. This may render the part, component or structural assembly, even though originally manufactured by BEECHCRAFT, unsuitable and unsafe for airplane use.

BEECHCRAFT expressly disclaims any responsibility for malfunctions, failures, damage or injury caused by use of non-BEECHCRAFT approved parts.

SUPPLEMENTARY PUBLICATIONS

Following is a list of publications providing servicing, overhaul and parts information on various components of the BEECHCRAFT Travel Air which you may obtain to supplement the Shop Manual. In most instances, you should obtain the publication directly from the manufacturer or his distributor. Only a few, such as engine manuals and Beech supplementary publications, are available from Parts and Service Operations, Beech Aircraft Corporation. Those which are available are listed in the current Publications Price List. Since a wide variety of radio equipment is available and because radio manufacturers normally supply parts and servicing manuals with each set, radio publications have not been included in the list.

VENDOR PUBLICATIONS

ENGINE

Operator's Manual, Lycoming 0-360-A1A, No. 60297-4. Williamsport, Pa.

Operator's Manual, Lycoming IO-360-A1A and IO-360-B1B, No. 60299-16. Williamsport, Pa.

Overhaul Manual, Lycoming 0-360 and IO-360, No. 60298-3. Williamsport, Pa.

Parts Catalog, Model 0-360 and IO-360 Series Engines, No. PC 106. Williamsport, Pa.

CARBURETOR

Construction, Operation and Adjustment, Marvel-Schebler Products Div., Borg-Warner, Decatur, Illinois.

Overhaul Instructions for Models MA-4-5 and MA-4-5AA, Marvel-Schebler Products Div., Decatur, Illinois.

FUEL INJECTION SYSTEM

Operation, Service and Maintenance Instructions for Type 530, No. PD3530, Simmonds Precision Products Inc., Tarrytown, New York.

Bendix RSA-5 Fuel Injection System Operation and Service Manual, 15-338B, Bendix Corporation, South Bend, Indiana.

FUEL PUMP

Installation and Service Instructions for the Bendix Fuel Pump, EM 236 Bendix Aviation Corporation, Elmira, New York.

Dukes 4140 Series Electric Fuel Auxiliary Pump Maintenance and Overhaul, 4140, Dukes Astronautics Co., South Gate, California.

MAGNETO

User Operating Instructions, Bendix Aircraft Magnetos, Form L-239-2. Scintilla Div., Bendix Aviation Corp., Sidney, New York.

Service Instructions, Bendix Aircraft Magnetos, Form L-205-5. Scintilla Div., Bendix Aviation Corp., Sidney, New York.

Service Parts List, Bendix Aircraft Magnetos, Form L-227-4. Scintilla Div., Bendix Aviation Corp., Sidney, New York.

Installation, Maintenance and Operation Instructions, Bendix S-200 Series Magnetos, Form L-526-2. Scintilla Div., Bendix Aviation Corp., Sidney, New York.

Service Parts List, Bendix S-200 Series Magnetos, Form L-528-2. Scintilla Div., Bendix Aviation Corp., Sidney, New York.

PROPELLER

Operation and Overhaul Instructions, Hartzell HC-92ZK-2. Hartzell Propeller, Inc., Piqua, Ohio.

PROPELLER GOVERNOR

Maintenance Handbook for Constant Speed Hydraulic Propeller Governor Type CSSA, No. 33001A. Woodward Governor Company, Rockford, Illinois.

PROPELLER UNFEATHERING ACCUMULATOR

Overhaul Manual for AA-14000 and AA- and AS-14300 Series Hydraulic Accumulators, Service Data 910148, Vickers, Inc., Detroit, Michigan.

Parts Catalog for AA-14000 and AA- and AS-14300 Series Hydraulic Accumulators, Service Data 910149, Vickers, Inc., Detroit, Michigan.

Hydraulic Accumulators, Service Data 910149, Vickers, Inc., Detroit, Michigan.

ENGINE OIL COOLER

Overhaul Instructions, Service Bulletin HES-62-77F. Harrison Radiator Div., General Motors Corp., Buffalo, New York.

COWL FLAP ACTUATOR

Overhaul and Parts Breakdown, Motor-Driven Actuator, No. 4154-00, Dukes Astronautics Co., South Gate, California.

VACUUM PUMP

Service Manual (operation, service and overhaul instructions, including parts catalog), Pesco Products Div., Borg-Warner Corp., Bedford, Ohio.

Overhaul Manual, G-450 Series, Weston Instruments Inc., Wichita, Kansas.

Overhaul and Maintenance Instructions with Illustrated Parts Breakdown, No. T.M. 66-1, Aro Corporation, Bryar, Ohio.

GENERATOR

DR 324S Test Specifications, Delco-Remy Div., General Motors Corp., Anderson, Indiana.

Group 93G Parts List. Delco-Remy Div., General Motors Corp., Anderson, Indiana.

Tests and Maintenance of Delcotron Generators, No. 1G-262, Delco-Remy Div., General Motors Corp., Anderson, Indiana.

STARTER MOTOR

Delco-Remy Cranking Motors Service Bulletin, No. IM-125, Delco-Remy Div., General Motors Corp., Anderson, Indiana.

VOLTAGE REGULATOR

DR 324S Test Specifications, Delco-Remy., General Motors Corp., Anderson, Indiana.

Group 6K Parts List. Delco-Remy Div., General Motors Corp., Anderson, Indiana.

Test and Adjustments of Transistor Regulators, No. 1R-273, Delco-Remy Div., General Motors Corp., Anderson, Indiana.

Regulator Service Bulletin (used with generators) No. 1R-116A, Delco-Remy Div., General Motors Corp., Anderson, Indiana.

HEATER

Maintenance Instructions for Janitrol C83A28 and D83A28 Aircraft Heaters, No. 30C57 and No. 23C36. Janitrol Aircraft-Automotive Division, Midland-Ross Corporation, Fort Worth, Texas.

Parts List for Janitrol D83A28 Aircraft Heater, No. D83A-X3. Janitrol Aircraft-Automotive Division, Midland-Ross Corporation, Fort Worth, Texas.

Maintenance Instructions for Janitrol 11C30 Aircraft Heater Ignition Unit, No. 24C54. Janitrol Aircraft-Automotive Division, Midland-Ross Corporation, Fort Worth, Texas.

HEATER BLOWER

Overhaul Instructions, Vaneaxial Fan, Part No. M4861H-1A with Motor M 2916V. Dynamic Air Engineering, Inc., Santa Ana, California.

WHEELS, BRAKES, AND TIRES

Maintenance Instructions for Wheels, Brakes, and Tires Used on the BEECHCRAFT Model 95 Travel Air, P/N AP-116. Goodyear Tire and Rubber Company, Los Angeles, California.

Maintenance Instructions for Goodyear 6.50-8 Brake Assembly 9532475 Used on BEECH Models 35, 95, and 55, P/N AP-125. Goodyear Tire and Rubber Company, Los Angeles, California.

LIGHTWEIGHT DEICER

Installation Manual for Lightweight Reservoir Type Pneumatic Deicing System for BEECH 95 Aircraft, Report No. 58-138. B. F. Goodrich Company, Akron, Ohio.

Maintenance and Repair of Lightweight Reservoir Assembly, Report No. 61-137. B. F. Goodrich Company, Akron, Ohio.

AUTOPILOT

Tactair T3 Autopilot Installation Instructions, No. A2461, Tactair Inc., Bridgeport, Pennsylvania.

SUPPLEMENTARY BEECHCRAFT PUBLICATIONS

92-30582 Servicing and Maintenance Instructions with Parts Breakdown for 95-300001-1, -67 and -73 Main Wheel Assemblies, 95-300001-5 LH

-6 RH Brake Assemblies, and 95-32669 and 95-32926 Nose Wheel Assemblies.

98-33281 Servicing and Maintenance Instructions for Goodyear Multi-Disc Brake Assembly.

130409 Maintenance Instructions for the Beechcraft New-matic Autopilot.

GENERAL INFORMATION

Some of the most important information about the Travel Air . . . lubrication, cleaning, shop handling . . . will be found in this section. Particular attention should be paid to these items, since they are among the items which the customer sees and consequently can influence directly his decision to come back again, or to go elsewhere.

The section includes a three-view drawing giving the major dimensions of the Travel Air; a table of hangar clearance dimensions; and an access opening illustration.

A full-page illustration shows the special tools, with their part numbers, which will make maintenance of the Travel Air simpler.

HANGAR CLEARANCES, AIRPLANE ON GROUND

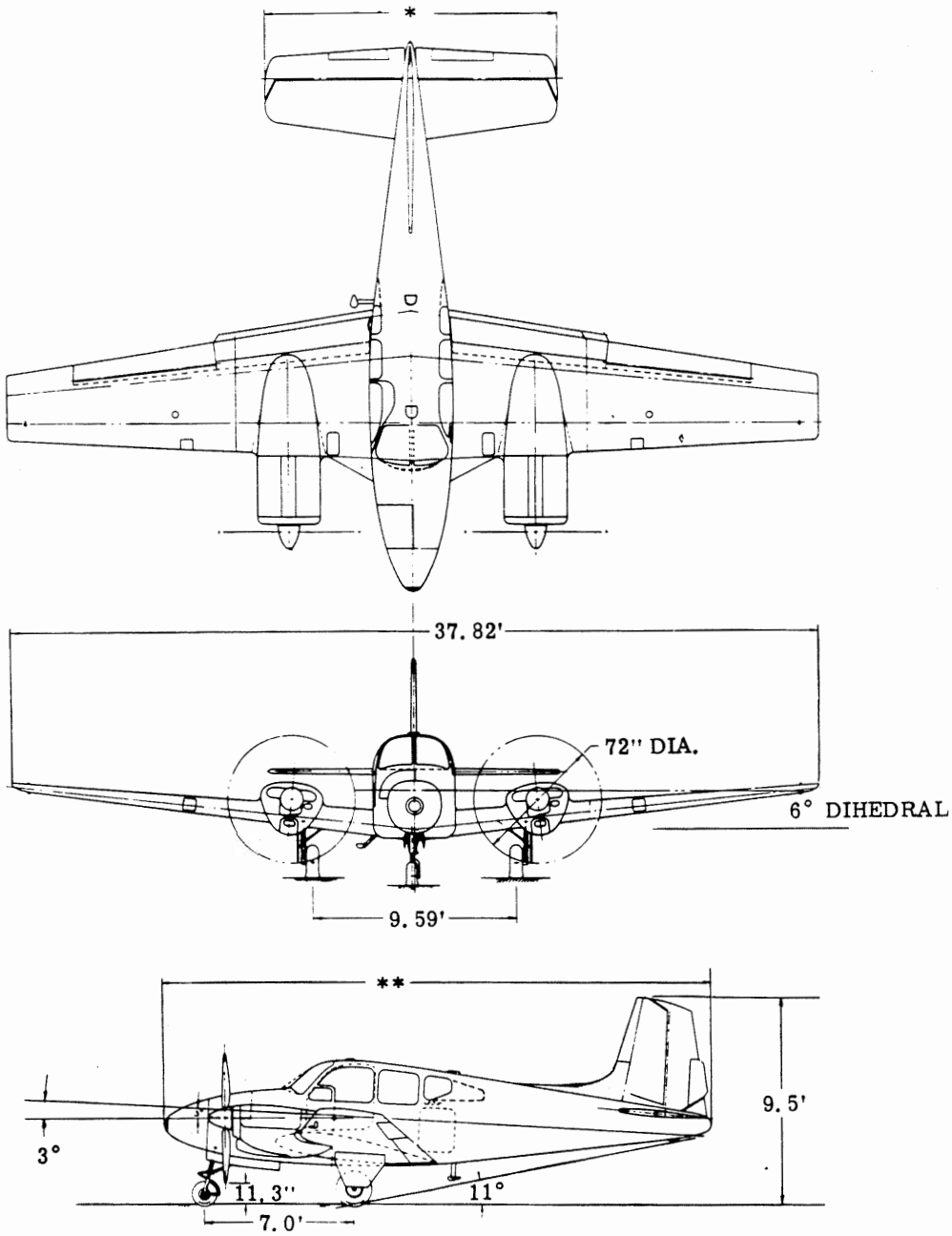
With normal tire and strut inflation:

VHF antenna to ground	10' 1 1/2"
Wing tip to ground	4' 8"
Wing tie down fittings to ground	3' 0"
Tail bumper to ground	2' 11"

HANGAR CLEARANCES, AIRPLANE ON JACKS

Shock struts extended, wheels clear - level flight attitude:

VHF antenna to ground	11' 8 1/2"
Wing tip to ground	5' 0"
Wing tie down fittings to ground	3' 9"
Tail bumper to ground	4' 6"

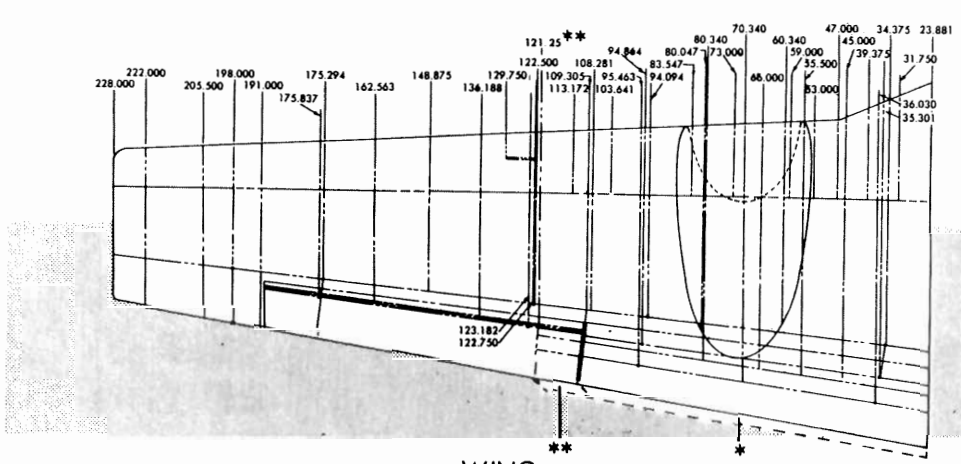


* 12. 18' Airplanes prior to Serial TD-303
13. 77' Airplanes Serial TD-303 and after

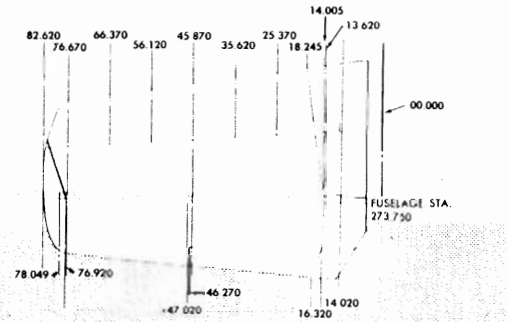
** 25. 36' Airplanes prior to Serial TD-534
25. 94' Airplanes Serial TD-534 and after

Airplanes TD-638 and after have a One-Piece Windshield

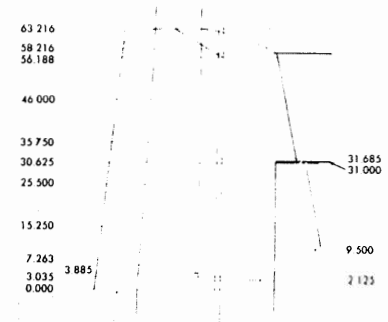
Figure 2-1. Dimensions of Aircraft



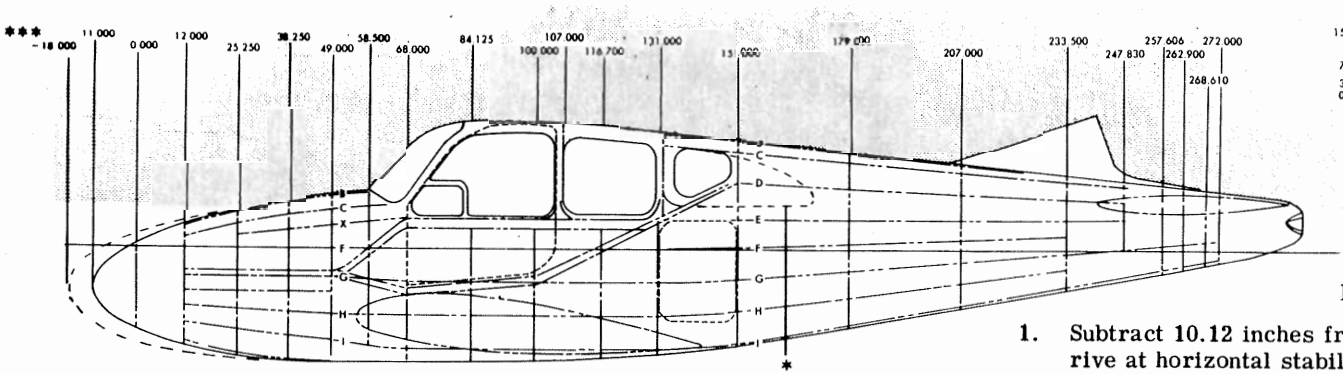
WING



HORIZONTAL STABILIZER
(See Note 1)



VERTICAL STABILIZER
(See note 2)



FUSELAGE

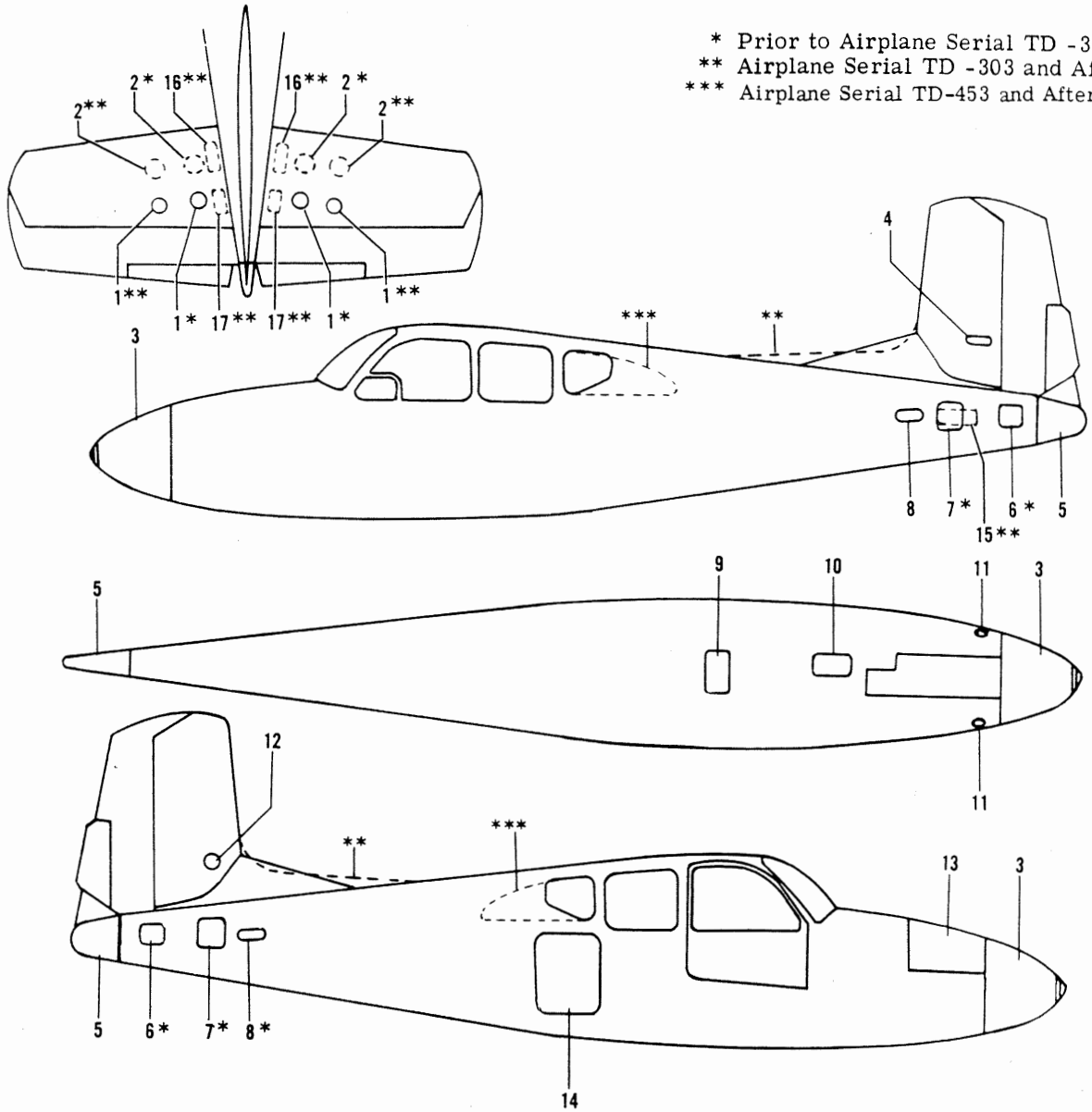
* Airplane Serials TD-303 and after
** Airplane Serials TD-453 and after
*** Airplane Serials TD-534 and after

Note:

1. Subtract 10.12 inches from given stations to arrive at horizontal stabilizer stations for airplanes prior to serial TD-303.

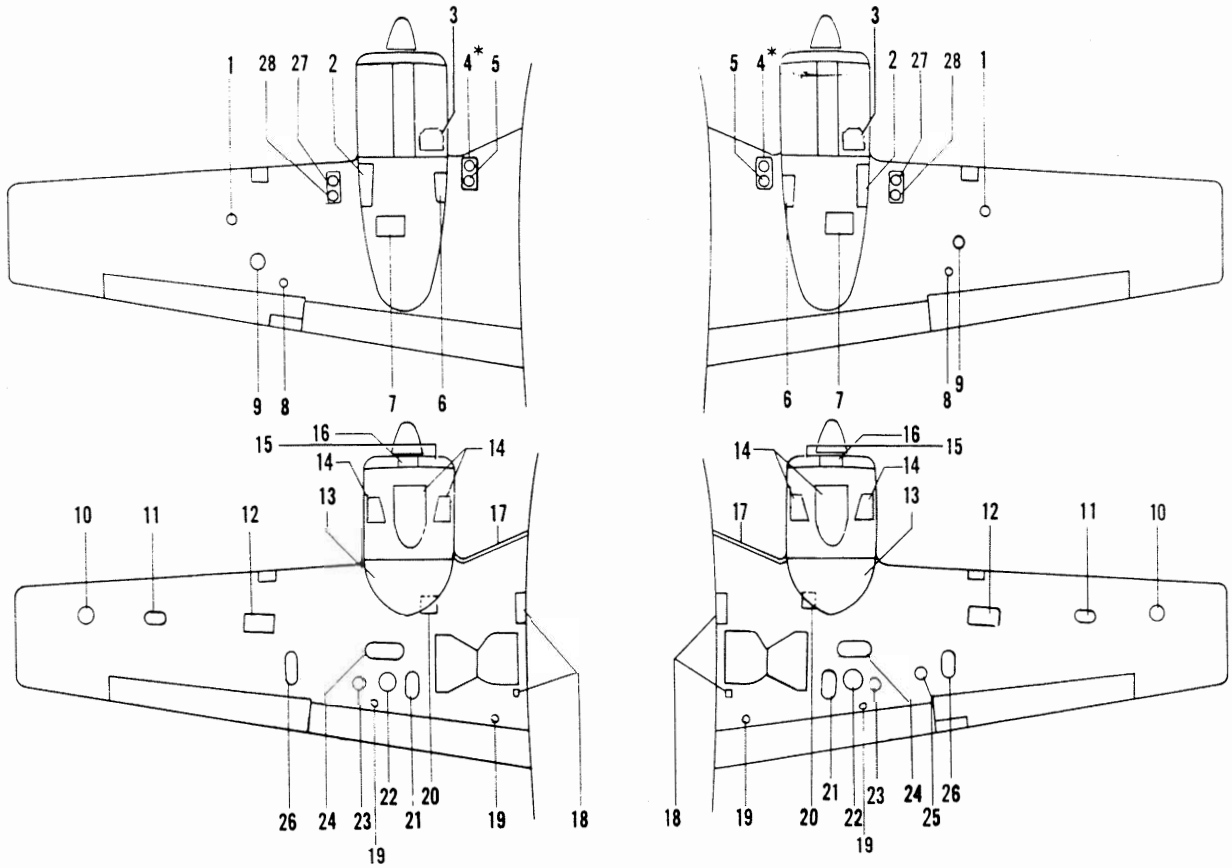
2. The station locations of the vertical stabilizer on aircraft serial TD-303 and after, are the same as those for aircraft prior to TD-303 (shown), although the physical design differs slightly.

Figure 2-2. Stations Diagram



1. Elevator trim tab actuator
2. Elevator trim tab actuator sprocket
3. Heater ignition, iris valve and blower assy.
4. Tab actuator, vertical stabilizer
5. Tail cone
6. Rudder bellcrank and elevator down spring
7. Elevator bellcrank and turnbuckles
8. Cable inspection
9. Landing gear actuator
10. Control cable pulleys and nose gear retract idler arm
11. Hinge bolts for nose wheel strut
12. Rudder tab actuator sprocket
13. Nose baggage door
14. Aft baggage compartment
15. Elevator bellcrank, elevator down spring, and turnbuckles
16. Elevator tab cables
17. Horizontal stabilizer mounting bolts

Figure 2-3. Fuselage Access Openings



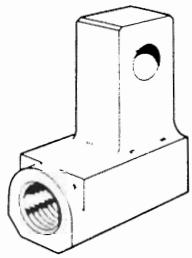
* 25 Gallon Main Fuel Cell is Optional Installation On Airplane Serial TD-453 and After

1. Auxiliary fuel cell filler neck
2. Propeller accumulator, voltage regulator and circuit limiter
3. Oil lever indicator access
4. Main fuel cell filler neck (25-main fuel cell installation optional TD-453 and after)
5. Main fuel cell transmitter
6. Nacelle inspection plate and access to engine plumbing
7. Auxiliary fuel cell transmitter
8. Aileron bell crank
9. Auxiliary fuel cell transmitter
10. Wing tip spar fitting
11. Auxiliary tank siphon valve
12. Auxiliary tank access
13. Firewall terminal bus (starter relay L.H. only)
14. Engine access
15. Removable cowl nose cap (TD-126 and after)
16. Carburetor air filter
17. Removal wing leading edge cap
18. Wing mounting bolts
19. Flap access
20. Landing gear bolt
21. Aileron cable inspection
22. Aileron cable inspection
23. Aileron cable pully
24. Auxiliary tank access
25. Aileron tab actuator and pully
26. Aileron cable inspection
27. Main fuel cell filler neck (39 or 40-gallon main fuel cell)
28. Main fuel cell transmitter (39 or 40-gallon main fuel cell)

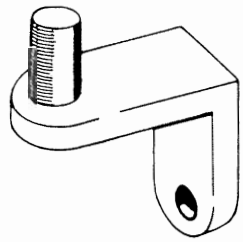
Figure 2-4. Wing Access Openings

SPECIAL TOOLS

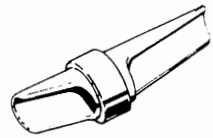
HOISTING SLING
95-590016



HOISTING SLING ADAPTER
95-590017



SERVICE JACK ADAPTER
TK 1518



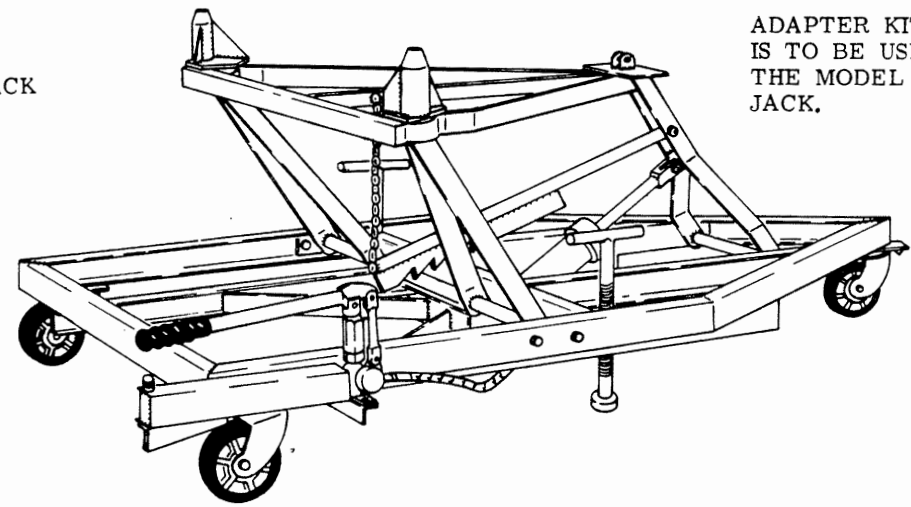
MAIN WHEEL
JACK ADAPTER
35-590006

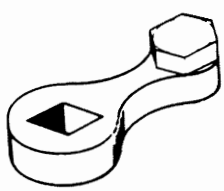
AIR FRAME

50-590013	UPPER REAR WING BOLT NUT TORQUE WRENCH ADAPTER
TS 1171-2	UPPER FRONT AND LOWER REAR WING BOLT NUT TORQUE WRENCH ADAPTER
50-590014	FORWARD WING NUT TORQUE WRENCH ADAPTER
TS 1222-1	UPPER FRONT AND LOWER REAR WING BOLT NUT WRENCH
TS 1222-2	UPPER REAR WING BOLT NUT WRENCH
TS 1222-3	UPPER AND LOWER FRONT AND LOWER REAR WING BOLT WRENCH
TS 1222-4	UPPER REAR WING BOLT WRENCH
TC922-2 95910001	PROPELLER TORQUE WRENCH

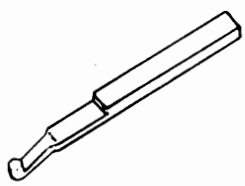
MODEL 300
SERVICE JACK

ADAPTER KIT 300-30
IS TO BE USED WITH
THE MODEL 300 SERVICE
JACK.

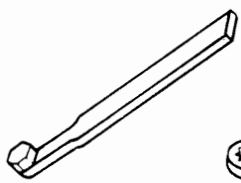




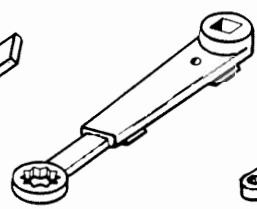
50-590013
TS 1171-2



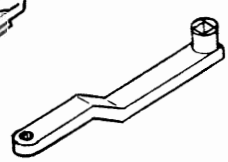
TS 1222-3
TS 1222-4



TS 1222-1
TS 1222-2



50-590014



TC922-2 95910001

WING

Figure 2-6. Special Tools

GROUND HANDLING

JACKING

Two three-point service jacks are available for jacking the aircraft, the Model 300 service jack and the Model 35 service jack (TC932 35-000001 equipped with a 95-801 adapter kit for use of the Model 95). Jack pads are identified and located on the underside of the fuselage. One jack pad is located on each lower wing-to-fuselage attachment fitting along the front spar. A rear jack pad is located under a protective cap in the middle of the fuselage at the rear fuselage carry thru spar. The rear jack fitting screws completely into the aircraft jack pad.

WARNING

Be sure the rear jack point safety pin is in place to prevent the aircraft from nosing over.

When one engine or one wing is to be removed, a stand should be placed under the opposite wing and the tail to counteract the resulting unbalanced condition of the aircraft. Individual main wheels may be jacked using the special main wheel jack adapter. (See special tools).

TOWING

Attach the hand towbar to the tow lug on the nose gear lower torque knee.

CAUTION

When towing with a tug, observe turn limits of the nose gear.

CAUTION

Do not push on propeller or control surfaces. Do not place your weight on the horizontal stabilizers to raise the nose wheel off the ground.

ANCHORING AND MOORING PROVISIONS

Three mooring eyes are provided; one on each wing and one in the tail bumper. To moor the airplane, chock the wheels fore and aft, install the control lock and tie down the aircraft with a nylon line or a chain of sufficient strength at each mooring eye. Avoid overtightening the rear line, which pulls up the nose so that wind will create higher lift on the wings. If bad weather is anticipated, it is advisable to nose the airplane into the wind.

PARKING BRAKE

NOTE

Use of the parking brake is not recommended when wheel chocks and/or tie down facilities are available.

The parking brakes are set by pulling out the parking brake control and depressing the pilot's brake pedals to pressurize the system. Do not attempt to lock the parking brake by applying force to the parking brake handle; it controls a valve only, and cannot apply pressure to the brake master cylinders.

CAUTION

Do not set the parking control when the brakes are hot from severe use or during low temperatures when an accumulation of moisture may cause the brakes to freeze. Do not leave the parking brake set for prolonged periods.

HOISTING

The aircraft may be hoisted for maintenance or parts replacement as follows:

a. Install one 95-590017 hoisting sling adapter on each forward wing attach bolt.

NOTE

When hoisting the aircraft with the wings removed, replace the 95-590017 sling adapters with 95-590017-1 sling adapters and add a 95-590016-23 spacer between each sling adapter and the spar carry thru fitting. Install with upper rear wing attach bolts.

b. Attach the sling assembly, (P/N 95-590016-1), to the sling adapters.

c. Install the sling strap around the nose, forward of the nose landing gear.

d. Hoist the aircraft smoothly.

NOTE

Adjust the sling strap to keep the aircraft in a level or slightly nose-down attitude.

LEVELING

To level the airplane longitudinally, attach a cord and plumb bob to the Phillips-head screw just above the rear baggage compartment door. Inflate or deflate the nose gear shock strut as necessary to pass the cord through the center of a second Phillips-head screw directly below. Suspending the plumb bob in a can of light engine oil will assist in stabilizing it.

Lateral leveling is done by putting a bubble level on the rear baggage compartment floorboard and deflating the tire or strut on the high side of the airplane to center the bubble.

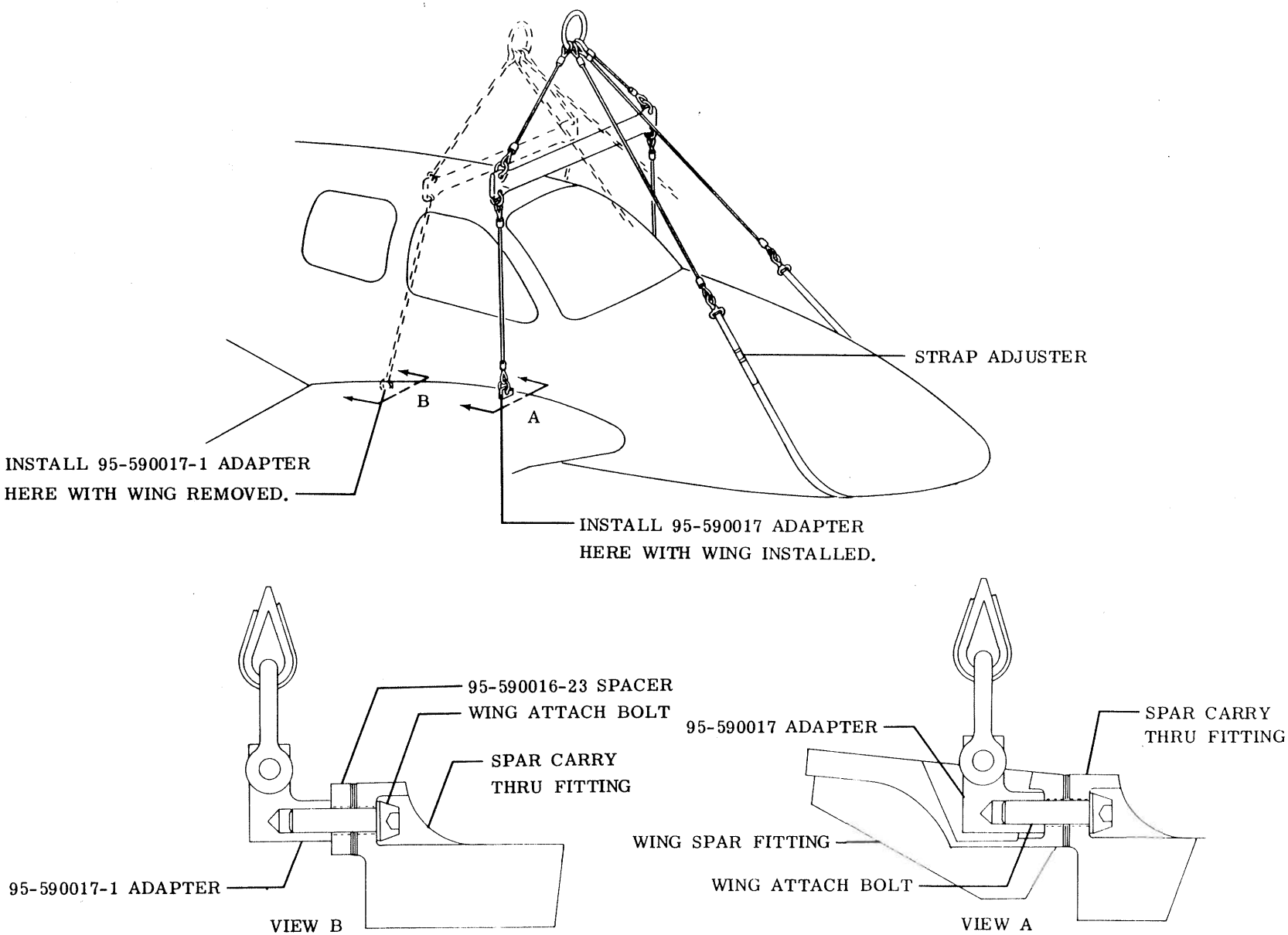


Figure 2-7. Hoisting The Aircraft.

EXTERNAL POWER (OPTIONAL EQUIPMENT)

Before connecting an auxiliary power unit, turn off the Battery and Generator/Alternator switches and any other electrically operated equipment. If the auxiliary power unit does not have a standard AN type plug, check the polarity of the unit and connect the positive lead to the battery positive post and the negative lead to the battery negative post. The aircraft, having a negative ground system, requires a negative ground auxiliary power unit.

After the aircraft has been started and the auxiliary power unit disconnected, the electrical system switches may be turned on and normal procedure resumed.

Recharging a battery without removing it from the aircraft may be accomplished by connecting a known negative ground auxiliary power unit to the aircraft's external power receptacle and turning on the battery master switch. In case of an extremely weak battery, removing and precharging may be necessary since the battery may not have sufficient capacity to close the battery solenoid. It is essential that you make certain the power unit is negative ground, otherwise, a battery fire may result.

NOTE

On aircraft TD-668 and after, a protection feature is incorporated into the external power circuit to protect against a ground power unit with reversed polarity.

MAGNETOS

Ordinarily, the magnetos will require only occasional adjustment, lubrication and breaker point replacement.

CAUTION

The internal, automatic grounding devices used on the original S series magnetos have proved unreliable in service and current production magnetos do not have this feature. To be safe, treat all S series magnetos as hot whenever the ground lead is disconnected. To ground the magneto, connect a wire to the switch lead at the filter capacitor and ground the wire to the engine case. If grounding is impractical, remove the cable outlet plate on the rear of the magneto or disconnect all the spark plug leads.

SERVICING THE OIL SYSTEM

The Travel Air is provided with a wet sump pressure-type oil system. Each engine sump capacity is 8 quarts with an absolute minimum capacity of 2 quarts required for safe engine operation. To service the oil system, open the right hand section of the cowling and remove the filler cap. On aircraft TD-174 and after, access doors are provided in the cowling to service the oil system. A calibrated dip stick attached to the filler cap indicates the oil level. The oil should be changed every 50 hours under normal operating conditions. When operating under adverse weather conditions or continuous high power settings, the oil should be changed more frequently.

NOTE

The special preservative oil in the engines of the Travel Air when the airplane is delivered from the factory should be changed for normal oil after 25 hours of engine operation.

The oil may be drained by removing the pipe plug from the bottom inboard side of the oil sump, the low spot of the system. The engines should be warmed up to operating temperature to assure complete draining of the oil. Moisture that may have condensed and settled in the oil sump should be drained by occasionally removing the oil drain plug and allowing a small amount of oil to escape; this is particularly important in winter, when the moisture will collect more rapidly and may freeze.

The oil suction and pressure screens should be cleaned at each periodic oil change. To clean the suction screen, remove the hex head plug at the rear of the oil sump and pull out the screen. To clean the pressure screen, remove four bolts that secure the screen housing to engine accessory section. Pull housing back and remove screen. Wash the screens in Stoddard Solvent, Federal Specification P-D-680.

The oil grades listed below are general recommendations only, and will vary with individual circumstances. The determining factor for choosing the correct grade of oil is the oil inlet temperature observed during flight. Inlet temperatures consistently near the maximum allowable indicates a heavier oil is needed. All oil used should conform to Lycoming Specification 301E.

Either straight mineral type oil or multi-grade additive type oil may be used. Additive type oil is not recommended for use in excessively dirty engines with high total operating time. However, when it is known that the engine is free from excessive sludge contamination, additive type oils can be used providing the following precautions are observed.

a. Drain the engine of all mineral oil.

b. Fill the crankcase with the desired grade of aviation additive oil.

c. Change the oil after five hours operation and check all oil screens for evidence of plugging. If the screens show any signs of plugging, change the oil and check the screens every ten hours until there is no more evidence of plugging.

d. Resume normal oil change periods.

During cold weather, the oil sumps should be checked at pre-flight inspection to be sure that they are not blocked with ice. Also, since there may be more cylinder blow-by during cold weather starting, with an attendant increase in oil sludge, the oil pressure screens should be checked more frequently for sludge accumulations. If necessary to prevent excessive sludge formation, change the oil more frequently.

An all-climate synthetic aircraft engine lubricant, Anderol 456H or Anderol 471, is approved by Lycoming. Owners desiring detailed information concerning the use of these oils should consult Lycoming Service Letter No. L147A. The provisions specified in this service letter must be followed when using this oil.

RECOMMENDED OIL FOR MODEL 95 ENGINES

Average Ambient Air Temperature	Straight Mineral Type Oil	Multi-grade Additive type oil	Oil Inlet Temperature	
			Desired	Maximum
Above 60°F	SAE 50	SAE 40 or SAE 50	180°F	245°F
30° to 90°F	SAE 40	SAE 40	180°F	245°F
0° to 70°F	SAE 30	SAE 40	170°F	225°F
Below 10°F	SAE 20	SAE 40	160°F	210°F

SERVICING THE FUEL SYSTEM

Service the fuel cells with 91/96 octane or the next higher grade fuel. Aircraft prior to Serial TD-453 have a 25-gallon main fuel cell in each leading edge and a 17-gallon auxiliary fuel cell outboard of each nacelle installed as standard equipment. Two 39-gallon leading edge fuel cells are standard on airplanes Serial TD-453 thru TD-533, with 40-gallon leading edge cells standard on Serials TD-533 and after. The 25-gallon main cells with 31-gallon auxiliary cells are optional equipment on all airplanes Serial TD-2 and after. Each cell is filled separately.

Open each of the eight snap-type fuel drains daily to allow contaminated fuel to drain from the system. The four sump drains extend through the bottom of the wing skins; the two selector valve drains are located at the system low spot to drain the interconnecting lines and extend through the bottom of the fuselage center section skin. The fuel strainers are provided with drains that extend through the lower inboard cowling skins. Fuel strainers and drains prior to TD-174 except TD-127 are located on the firewall, and on aircraft TD-127 and TD-174 and after they are located in the wheel wells.

CAUTION

Never leave the fuel cells completely empty or the cell inner liners may dry out and crack, permitting fuel to seep through the walls of the cell after refueling.

Inspecting and cleaning the fuel strainers should be considered of the utmost importance as a regular part of preventive maintenance. The frequency of inspecting and cleaning the fuel filters will depend upon service conditions and fuel handling cleanliness. However, when operating in localities where there is an excessive amount of sand or dirt, the strainers should be inspected at more frequent intervals. The following inspection and cleaning schedule is recommended for the fuel system components:

COMPONENT	INTERVAL
Fuel Strainer	100 hours
Carburetor fuel inlet screen (TD-2 thru TD-452 except TD-127 and TD-444)	100 hours
Throttle body finger strainer (TD-127, TD-444, TD-453 thru TD-533 except TD-506)	50 hours
Fuel Regulator finger strainer (TD-506, TD-534 and after)	50 hours

NOTE

The finger strainer in the fuel injection system of all aircraft Serials TD-127, TD-444, TD-453 and after should be cleaned the first 10, 25, 50, 75 and 100 hours, then commence the normal cleaning interval. Remove the "O" ring and soak the finger strainer of TD-506, TD-534 and after in acetone for 10-15 minutes and blow dry.

To prevent leaks from occurring at tubing connections, apply MIL-T-5544 thread compound sparingly on the male fitting threads. Do not lubricate the female fitting or the mating surfaces of the tubing and fitting. Clean off all old compound before reinstalling fittings and tubing.

SHOCK STRUTS

The shock struts are filled with compressed air and MIL-H-5606 hydraulic fluid. The same procedure is used for servicing both the main and nose gear shock struts. To service a strut proceed as follows:

a. Remove the air valve cap and depress the valve core to release the air pressure.

WARNING

Do not unscrew the air valve assembly until all air pressure has been released or it may be blown off with considerable force, causing injury to personnel or property damage.

b. With the weight of the aircraft on the gear, loosen the filler plug slowly to assure that all air has escaped, then remove the filler plug.

c. With the shock strut fully deflated, jack the strut barrel 1/4 inch off the fully compressed position, block it there and fill to the level of the filler plug hole with MIL-H-5606 hydraulic fluid.

d. Jack the main strut an additional 2 inches, then replace the filler plug, depress the valve core and lower the jack, releasing the excess oil and air. On the nose strut, merely remove the block and allow the excess oil to drain away, then install the filler plug.

e. Rock the airplane gently to prevent possible binding of the piston in the barrel, inflate the main gear strut until 2 inches of the piston is exposed. Inflate the nose gear until 2 inches of the strut is exposed on aircraft prior to Serial TD-303. On airplane Serial TD-303 and after, inflate the nose gear strut until 3-1/2 inches of the strut is exposed. (All measurements are made with the aircraft resting on the gear.)

f. The shock strut pistons must be clean. Remove foreign material by wiping the strut with a cloth containing hydraulic oil.

SHIMMY DAMPENER

To check the fluid level in the shimmy dampener, insert a wire of approximately 1/16 inch diameter through the hole in the disc at the end of the piston rod until it touches the bottom of the floating piston. Mark the wire, remove and measure the depth of insertion. Inserting the wire in the hole of the floating piston, rather than letting it rest against the face of the piston, will give a more accurate check.

NOTE

To determine if the wire is inserted in the hole of the floating piston, insert the wire several times, noting each insertion depth. When the wire is correctly inserted the length will be approximately 1/4 inch greater.

When the shimmy dampener is full, the insertion depth is 2-3/16 inches. The depth reading is 3-1/16 inches. To add MIL-H-5606 hydraulic fluid, remove the shimmy dampener and proceed as follows:

a. Remove the cotter key, washer, and spring from the piston rod.

b. Remove the internal snap ring, scraper ring and the end seal from the aft end of the barrel. (Opposite clevis end.)

c. Insert a 6/32 threaded rod into the floating piston and remove the piston, using extreme care when moving the "O" ring seal of the floating piston past the drilled holes in the piston rod.

d. Push the piston rod to the clevis end and fill the barrel with MIL-H-5606 hydraulic fluid.

e. Slowly actuate the piston rod, allowing the fluid to flow into the clevis end chamber, then return the piston to the clevis end of the barrel.

f. Refill the displaced fluid and replace the end seal, scraper ring and internal snap ring.

g. Fill the piston rod with fluid.

h. Reinstall the floating piston, spring, washer and cotter key. Spread the cotter pin to allow clearance for the measuring wire.

SERVICING THE BRAKES

The Goodyear single-disc, single or dual cylinder type and ring disc type hydraulic brakes require no adjustment, as the pistons move outward to compensate for lining wear. Discs should be checked for small nicks or sharp edges which could damage the brake linings. Worn, dished or distorted brake discs should be replaced. The fluid reservoir, accessible through the forward baggage compartment, should be checked regularly and a visible fluid level maintained on the dip stick at all times by adding MIL-H-5606 hydraulic fluid.

In service, the brake discs will lose their green (prime) color and become bright, then will assume a light straw color as the result of heat. These changes in color are normal and need not be a cause for concern. A glazed appearance of the brake linings also is normal; the glaze actually improves the effectiveness of the brakes.

SERVICING TIRES

Aircraft prior to TD-533 use either 4-ply or 6-ply, 6.50 x 8 tires on the main landing gear wheels. Aircraft TD-534 and after use 6-ply, 7.00 x 6 tires. On all aircraft, the nose wheel tire is either a 4-ply or 6-ply, 5.00 x 5 tire. The tubeless side-inflated nose wheel tire on airplane serial TD-127, TD-300 thru TD-601, except TD-303, and the tubeless main wheel tires on airplanes TD-300 thru TD-603 require the installation of a different wheel assembly before they can be mounted on prior aircraft. Maintaining proper tire inflation will minimize tread wear and aid in preventing tire breakage when running over sharp stones and ruts. When inflating tires, visually inspect them for cracks or breaks.

TIRE INFLATION PRESSURE

Serial Effectivity	Nose Wheel	Main Wheel
TD-1 thru TD-299 and TD-303, except TD-127	36	36
TD-127, TD-300 thru TD-533 except TD-303	55	45
TD-534 thru TD-600	55	38
TD-601 and after	50	38

Beech Aircraft Corporation cannot recommend the use of recapped tires on the Model 95. The tires may pass the retraction test when first installed; however, recapped tires have a tendency to swell after use and may cause malfunction of the retract system or damage the landing gear doors.

Oil and other hydrocarbons spilled on tires not only weaken the rubber, but may cause it to swell. Avoid spilling oil, fuel or solvents on the tires and clean off any accidental spillage as soon as possible.

SERVICING THE OXYGEN SYSTEM

WARNING

Always keep tools, equipment and hands clean when servicing the oxygen system. Oils or other hydrocarbons can burst into flame when exposed to high concentrations of oxygen.

The oxygen system on the Model 95 may have either the 38, 49 or 65 cubic foot cylinder installed, depending on the aircraft model. The cylinders may be located behind the nose cone or in the nose baggage compartment.

To fill the oxygen cylinder, close the shutoff valve in the oxygen console by the pilot's seat, and connect the supply cylinder to the filler valve on the right side of the nose baggage compartment forward bulkhead.

To prevent overheating, fill the oxygen system slowly by adjusting the rate of flow. The oxygen cylinder should be filled to a pressure of 1850 ± 50 psi at a temperature of 70°F. This pressure may be increased an additional 3.5 psi for each degree of increase in temperature; or, for each degree of drop in temperature, reduce the pressure by 3.5 psi. When the oxygen system is properly charged, disconnect the filler hose from the filler valve and replace the protective cap.

CAUTION

Do not attempt to fill the cylinder while the console shut-off valve is open because the high pressure developed in the line between the cylinder and regulator during filling can damage the pilot's oxygen pressure gage. When opening the console shut-off valve to check the pressure or to operate the system, first crack the valve to allow the pressure on the gage to stabilize, then turn the valve fully open.

Use only anti-seize compounds and leak-testing soaps recommended for use in a breathing oxygen system. Keep all fire and sparks away while oxygen is in use. Do not smoke during this time.

SERVICING THE LIGHT WEIGHT "RESERVOIR" DEICER SYSTEM

a. Pull the air supply valve control out so that the valve is fully open.

b. Remove the yellow cap on the reservoir filler valve.

c. Attach the filler hose to the valve and turn the hex nut on the valve assembly counterclockwise 1/4 turn.

WARNING

1. Connect the filler hose to the filler valve before releasing the filler valve locking device.
2. Never service the system with oxygen or corrosive gases.

d. Charge the reservoir to a pressure of 2800 ± 200 psi with dry compressed air or nitrogen.

e. Tighten the hex nut, remove the filler hose, replace the safety cap and close the air supply valve.

SERVICING THE PROPELLER UNFEATHERING ACCUMULATORS

To ensure proper operation, the accumulator should be checked periodically for correct pressure. When checking the air pressure, the propeller control should be in the low pitch position so that all oil can be exhausted from the accumulators. The pressure in the propeller accumulators should be maintained at 135 ± 5 psi. The accumulators are located in the top outboard side of each nacelle and are serviced through an access door in the top side of the nacelles.

SERVICING THE ANTI-ICING SYSTEM

The anti-icing tank is located in the nose baggage compartment and on airplanes prior to Serial TD-453 has a capacity of 1.5 U.S. gallons. On airplanes serial TD-453 and after, the tank has a capacity of 3 U.S. gallons and is located in the lower section of the nose baggage compartment. The tank is accessible through an access door under the left hand floor boards of the nose compartment. Service the system by filling the tank with anti-icing fluid (isopropyl alcohol). Check the fluid level and refill before each cold weather flight. The anti-icing tank should be drained and flushed twice a year.

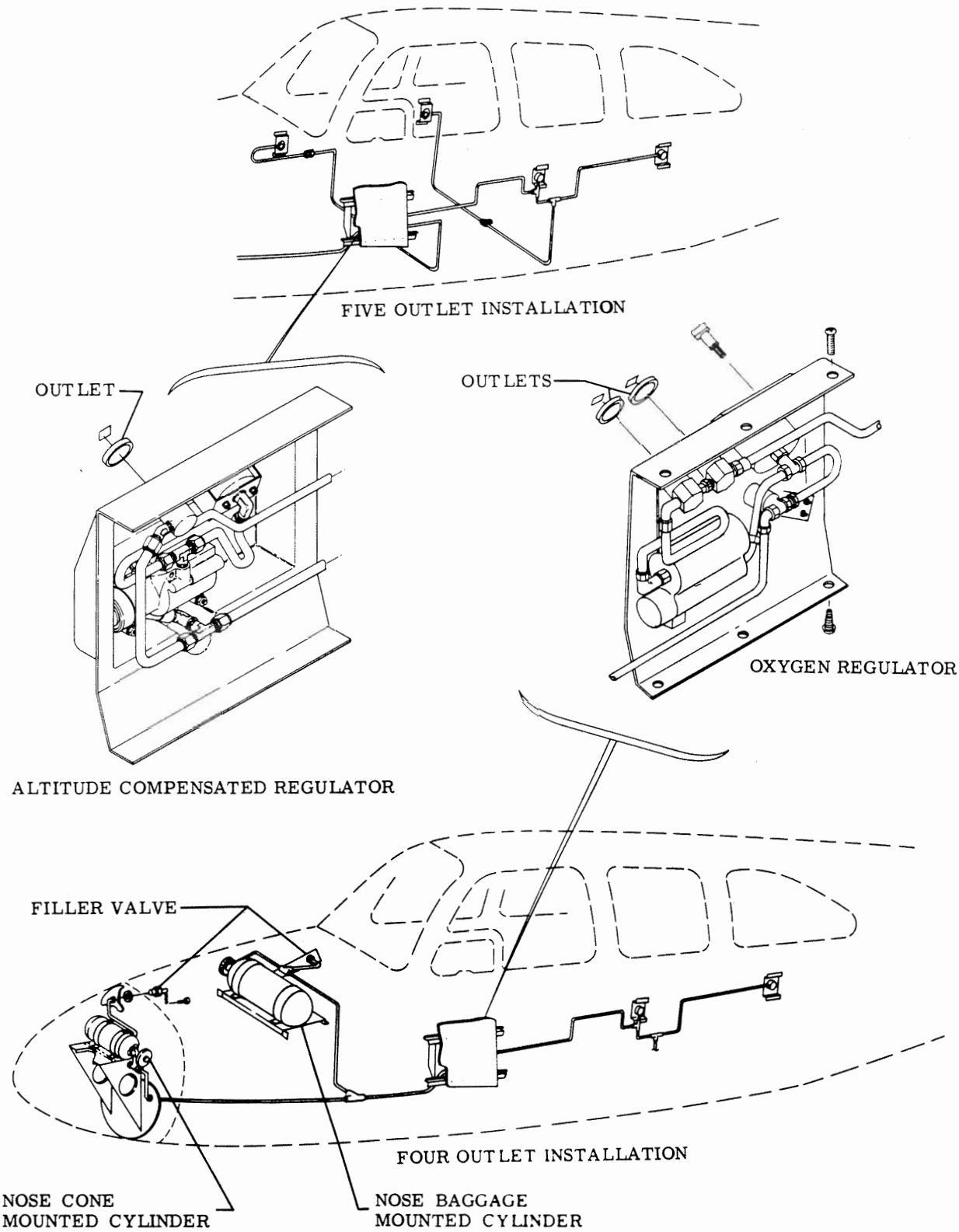


Figure 2-8. Oxygen System

HEATER FUEL PUMP

After every 100 hours of airplane operation, remove the heater fuel pump strainer by turning the base of the pump counterclockwise. Wash the strainer in clean unleaded gasoline and dry with compressed air.

HEATER FUEL FILTER

A fuel filter is installed in the nose wheel well next to the heater fuel pump and filters foreign matter from the fuel. The strainer is equipped with a snap-type drain and should be drained daily during cold weather to remove accumulated moisture which, if allowed to freeze, could cause heater malfunction.

ROTON LOCKS

Usually Roton locks will need no service. If there is a grinding and binding in the lock as the seat reclines or return action becomes jerky, a little grease properly applied as follows should improve the operation.

a. Use only Enco ANDOK-B (a product of Humble Oil Co.) on the thread as shown in the illustration. Too much grease, or grease in the wrong place can cause improper operation.

b. Compress the spring guide and counterbalance spring approximately one inch.

c. Remove the retaining spring.

d. Relax pressure on the spring guide and counterbalance spring slowly until the spring is fully extended.

e. Remove the lock from the fixture and remove the spring guide, counterbalance spring and spring guide tube.

f. Apply a small smount of grease to the completely extended thrust screw.

g. Reassemble the lock. For service other than lubrication, return the lock to the manufacturer.

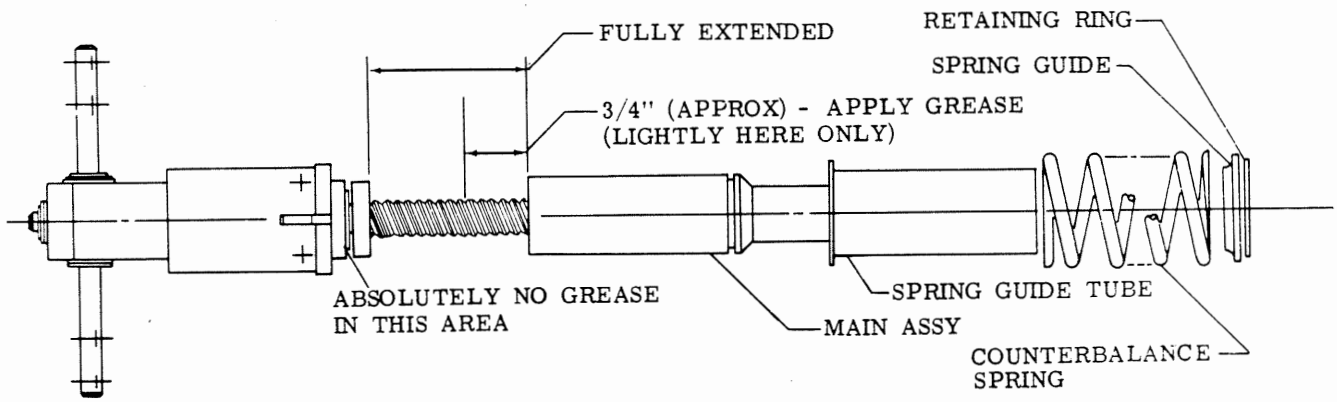


Figure 2-9. Servicing Roton Locks

AIRCRAFT FINISHES

Paint Removal From Magnesium Surfaces

a. Plug or mask all openings and adjoining surfaces to prevent paint remover from entering the aircraft.

b. Apply paint remover (Torco #4260) to the exterior surface, using a brush or non-atomizing gun.

CAUTION

Prolonged exposure to high concentrations of vapor may cause irritations to eyes and lungs. Avoid contact with the skin or eyes. The paint stripping should be done with adequate ventilation.

c. Allow the paint remover to work for 20 to 30 minutes. Then agitate the paint remover with a bristle brush to break up and loosen the paint film.

NOTE

Use of a wire brush may scratch the magnesium surface.

d. Wash parts thoroughly with water under high pressure. Small traces of old paint may be removed with lacquer thinner.

e. Remove all plugs and masking and carefully remove any remaining residue.

NOTE

Coat any scratches or abrasions with BEECHCRAFT Dow #1 Solution to prevent corrosion.

Preparation of Magnesium Surface for Paint

a. Sand lightly and coat any scratches or abrasions with BEECHCRAFT Dow #1 Solution to prevent corrosion.

b. To ensure cleanliness, wash thoroughly with solvent.

c. Make sure the surfaces are thoroughly dry, prime and apply the finish coat.

NOTE

Improper use of abrasives on skins will damage the magnesium.

Application of Exterior Paint to Magnesium Surfaces

a. Remove hand prints and shop soils with solvents.

b. Prime exterior surface with one coat of epoxy primer.

c. Allow to air-dry for a minimum of four hours before applying top finish coats.

Preparation of Aluminum Surface for Paint

a. Mask windows with a double thickness of paper. Cover all openings where paint may enter the airplane.

b. Sand scratches and rough areas to improve smoothness.

c. Clean surface of aircraft with laquer thinner or methyl ethyl ketone to remove shop primer, exposed sealer and other shop soils.

d. Lightly roughen all scratches with a nylon pad to insure a satisfactory paint base.

e. Reclean the roughened surface with solvents to ensure aircraft is clean.

Application of Exterior Paint to Aluminum Surfaces

a. Prime surfaces with wash primer.

b. Apply one coat of wash primer. Keep air pressure at a minimum to prevent overspray.

NOTE

Primer drying time is a function of temperature and humidity. It should dry at least 15 minutes before recoating the surface.

c. Prime with a wet coat of zinc chromate primer thinned by one part primer and two parts toluol.

d. Apply the top finish coats.

Exterior Paint Touch-up (Enamels)

a. Mask around the skin containing the damaged area.

b. Remove any loose edges of the paint by using a high tack adhesive tape around the edge of the damaged area.

c. Using a coarse sandpaper, fair the edge of the damaged area with the metal.

d. When the edge of the paint begins to "feather" into a smooth joint, use a fine grade of sandpaper to eliminate the scratches left by the coarse paper. Take care to avoid removing any more metal than is absolutely necessary.

e. Wash the sanded area with a solvent. Change the wash cloths used for this purpose frequently so that all the sanding dust will be removed.

f. After the area to be painted has been cleaned with solvent until all trace of discoloration is gone, apply a thin coat of pretreatment primer to the damaged area.

g. Spray two or three coats of zinc chromate primer for a heavier than normal build-up.

h. After the primer has dried, sand the area being repaired with a medium fine sandpaper. Sand the edge of the repair area until the indention where the junction of the paint and metal meet is no longer visible. If necessary, additional primer may be applied.

i. Spray on two thin topcoats of finish paint.

Exterior and Interior Finishes

The following list is included to be used as a reference should it become necessary to touch up or match an interior or exterior paint. Each paint is listed according to specific type and whether an exterior or interior paint.

Short cut masking jobs are possible when you use pre-cut paint patterns and numbers. Stripe patterns and numeral patterns are available from Mid-America Markings, Inc., 517 South Saint Francis, Wichita, Kansas, 67202. Current listings include 4, 12, and 20 inch call letters and numbers. Time can be saved when using these patterns and a much neater final paint job can be expected.

ENAMEL

(Exterior Colors)

Pacific Blue	118684-1
Morning Glory Blue	118684-3
Blueberry Blue	118684-5
Surf Green	118684-7
Shamrock Green	118684-9
Turquoise	118684-11
San Mateo Wheat	118684-13
Lemon Yellow	118684-15
Saturn Gold	118684-17
Castle Tan	118684-19
Beaver Brown	118684-21
Flamingo	118684-23
Huntsman Red	118684-25
Toreador Red	118684-27
Chianti Red	118684-29
Matterhorn White	118684-31

Black	118684-33
Jubilee Gold (stripe only)	118684-221
Sable Brown	118684-223
Sunshine Yellow	118684-231
Capri Blue	118684-265
Omaha Orange	118684-273

LACQUER

(Interior Colors)

Autumn Smoke	118684-155
Desert Beige	118684-181
Driftwood	118684-183
Banff Blue	118684-241

VINYL

(Interior Colors)

Driftwood	118684-245
Autumn Smoke	118684-255

ENAMEL

(Interior Colors)

Insignia Red	94-509
Black	94-515

EXTERIOR AND INTERIOR PRIMERS

Interior (Aluminum)	MIL-P-8585
Interior (Magnesium)	Enmar EX-1479
Exterior (Aluminum)	Enmar EX-2016G or MIL-P-8585
Exterior (Magnesium)	Enmar Epoxy Primer

CLEANING AND WAXING THE AIRCRAFT FINISH

Because wax seals the paint from the outside air, a new paint job should not be waxed for a period of 90 days to allow the paint to cure. For uncured painted surfaces, wash only with cold or lukewarm (never hot) water and a mild nondetergent soap. Any rubbing of the painted surface should be done gently and held to a minimum to avoid cracking the paint film.

After the paint cures, a thorough waxing will protect painted and unpainted metal surfaces from a variety of highly corrosive elements. Flush loose dirt away first with clear water, then wash the airplane with a mild soap and water. Harsh, abrasive or alkaline soaps or detergents should never be used. Use soft cleaning cloths or chamois to prevent scratches when cleaning and polishing. Any good grade automobile wax may be used to preserve painted surfaces. To remove stubborn oil and grease, use a soft cloth dampened with naphtha. After cleaning with naphtha, the surface should be rewaxed and polished.

CLEANING PLASTIC WINDOWS

A commercial cleaning compound made specifically for acrylic plastic windows may be used. When using a commercial cleaner follow the instructions on the container.

If a commercial cleaner is not available, the following instructions should be followed.

Cleaning of the windows should never be attempted when dry. The window should first be flushed with water or a mild soap solution, then rubbed lightly with a grit-free soft cloth, chamois or sponge. Stubborn grease or oil deposits are readily removed with aliphatic naphtha or hexane. Rinse with clear water.

CAUTION

Do not use thinner or aromatic abrasive cleaners to clean the windows; they will damage the surface of the plastic. Aliphatic naphtha and similar solvents are highly inflammable and extreme care must be taken when using them.

CLEANING DEICER BOOTS

The boots should be checked for engine oil after servicing and at the end of each flight, and any oil found must be removed. This can be accomplished by the use of a neutral soap and water solution. Care should be exercised to avoid scrubbing the surface of the boot as this will tend to remove the special conductive surface.

NOTE

Since the deicer boots are made of soft, flexible stock, care must be exercised against dragging gasoline hoses over them or resting ladders or platforms against the surface of the boots.

BULB REPLACEMENT GUIDE

LOCATION		BULB NUMBER
Alternator Out Light		2390-17
Cabin Dome Light		303
Compass Light		327
Console Light		1819
Cowl Flap Position Light		313
Flap Position Light	(TD-1 thru TD-667) (TD-668 thru TD-707)	313 327
Fuel Pump Console Light		1819
Glareshield Instrument Lights	(TD-1 thru TD-707) (TD-708 and after)	1864 1820
Ice Light		MS 25318-1
Ignition Panel Light		327
Instrument Lights		327
Landing Gear Position Lights		327
Landing Lights		4553, 4596
L. G. Visual Indicator Light		356, 327
Map Light		303
Nose Baggage Light		307
O. A. T. Light		327
Overhead Instrument Light		303
Post Lights		327
Reading Lights		WEMAC 1870
Rotating Beacon		A-7079B-24
Tab Position Indicator Light	(TD-1 thru TD-707) (TD-708 and after)	1819R 1819
Tail Light		1203
Taxi Light (Nose Cone)	(TD-1 thru TD-533) (TD-534 thru TD-614) (TD-615 and after)	4570 4596 4626
Taxi Light (Landing Gear Strut)		4522
Wing Navigation Lights		1524

SYSTEMS MAINTENANCE

Since it is intended for use as a day-to-day reference, this section has been arranged to provide as far as possible "at-a-glance" information on the location, adjustments and rigging of the components in the various systems.

Each system is pictured in an illustration showing the location of the various components in the airplane and their interconnecting cables, wiring or tubing. Detail illustrations on the basic drawing, either photographs or line drawings, show the exact locations of the components and their adjustment or other maintenance procedures; wherever practical, cable tensions, pressures, measurements, clearances and the like are tabulated directly on the illustration or shown on the details.

Detailed explanations of procedures have been limited to those instances, such as rigging the landing gear, where the proper sequence of actions is important and its illustration is impractical. Procedures for major disassembly and overhaul of various units are contained in other sections of the Shop Manual; this section has been confined deliberately to day-to-day maintenance information.

SINGLE CONTROL COLUMN
(Figure 3-1)

CONTROL COLUMN ARM REMOVAL

a. Remove the two screws that secure the retainer collar assembly to the control column housing.
b. Disconnect any electrical wiring.
c. Rotate control column arm over to a near vertical position and slide the control column off of the housing.

RIGGING THE CONTROL COLUMN CHAIN

a. With the control wheel in the neutral position, the yellow marks on the sprockets must align with the yellow marks on the chain.
b. The slot in the sprocket as shown in Figure 3-1 must be in alignment with the yellow marks.
c. To tighten the chain, remove the safety wire from the turnbuckles and adjust as necessary. Check for freedom of movement.
d. After proper adjustment of chain, reinstall new safety wire.

CONTROL COLUMN ARM INSTALLATION

a. Slide the control column on the control column housing.
b. Install the chrome collar and attach with the two screws.
c. Attach all electrical wires.

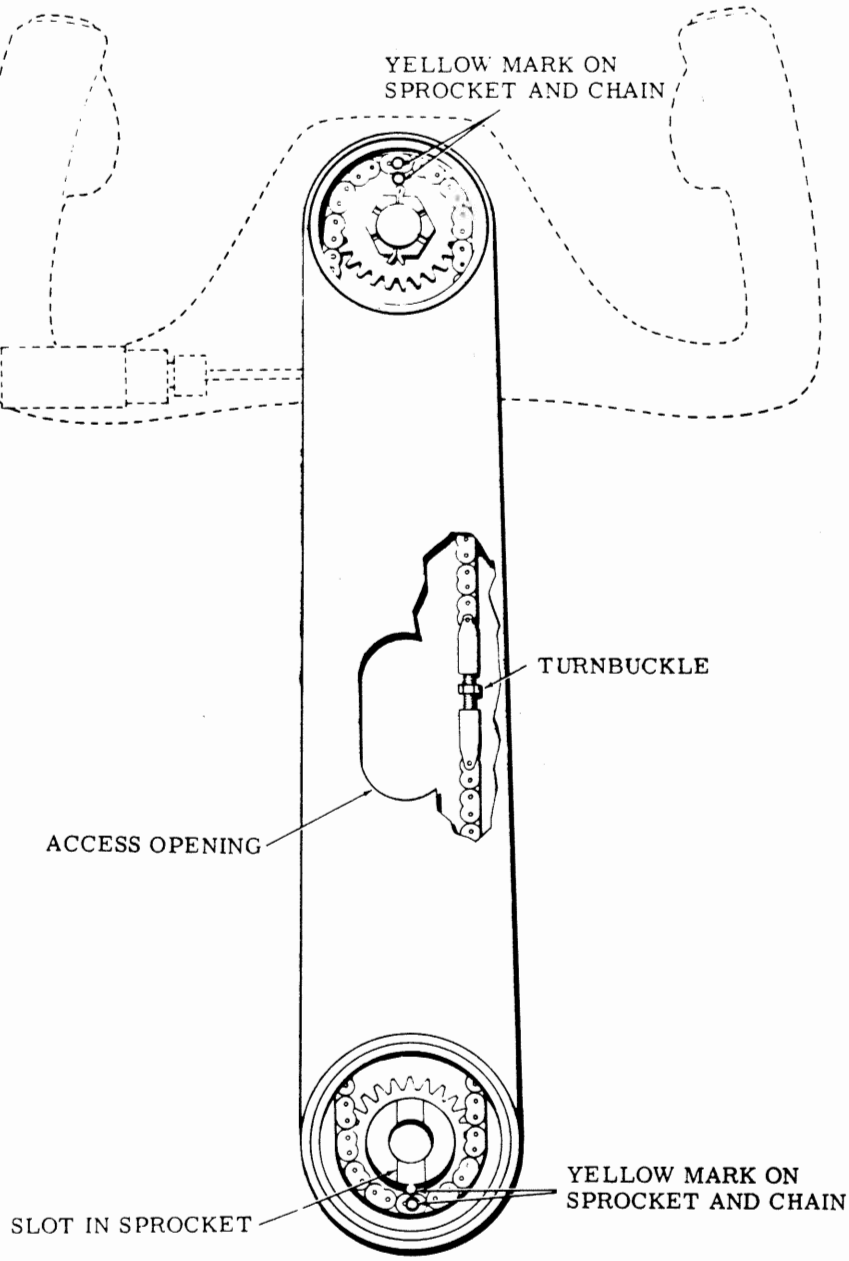


Figure 3-1. Control Column

RIGGING THE FLIGHT CONTROLS

Graphs specifying the correct maximum and minimum cable tension permissable for the various controls appear on the individual rigging control system illustrations. The graphs provide rigging limits at temperatures varying from 30° to 110° F. The horizontal scale on the graphs designates the temperature in degrees Fahrenheit at which the control cables may be rigged, and the vertical scale designates the correct tension in pounds for each temperature reading.

MEASURING RUDDER TRAVEL IN INCHES

Measuring rudder travel when no travel gage is available may be accomplished by measuring the deflection in inches rather than degrees. Given below are the distances that points on the rudder and rudder tab should travel from 0° to the extreme in each direction. Definite physical characteristics of the surface, such as the lower trailing edge corner, must be established before measuring rudder or rudder tab travel. The 0° position will be the lower trailing edge of the rudder aligned with the tail cone dorsal fin. All measurements given in the Table of Rudder and Rudder Tab Travel are for straight line distance between the 0° position and the position at maximum deflection.

RIGGING THE RUDDER CONTROL SYSTEM

a. Release the rudder pedal adjusting levers and place all pedals in the aft position.

b. Install rig pin in the holes provided in the pilot's rudder pedals.

c. Adjust the copilot's pedals to the neutral position by lengthening or shortening the push-pull tube between the bellcranks.

d. Place the rudder in the neutral position and secure it there.

e. Rig the cables to the tension shown on the cable tension graph.

f. Check the surface travel to insure it agrees with that shown on figure 3-2.

g. Make sure that rudder movement corresponds to the movement of the rudder pedals.

RUDDER TAB RIGGING

a. Set the indicator at 0 degrees.

b. Set the rudder in neutral position.

Model 95

Rudder				Lower trailing edge of tab corresponding to rudder fairing with tab in neutral, to top trailing edge corner of fairing.
TD-1 thru TD-302	R & L	11.75	11.02	
TD-303 and After	R	13.23	12.50	
	L	11.75	11.02	
Rudder Tab	R & L	3.78	3.49	Lower trailing edge of tab corresponding to rudder fairing with rudder in neutral, to top trailing edge corner of fairing.

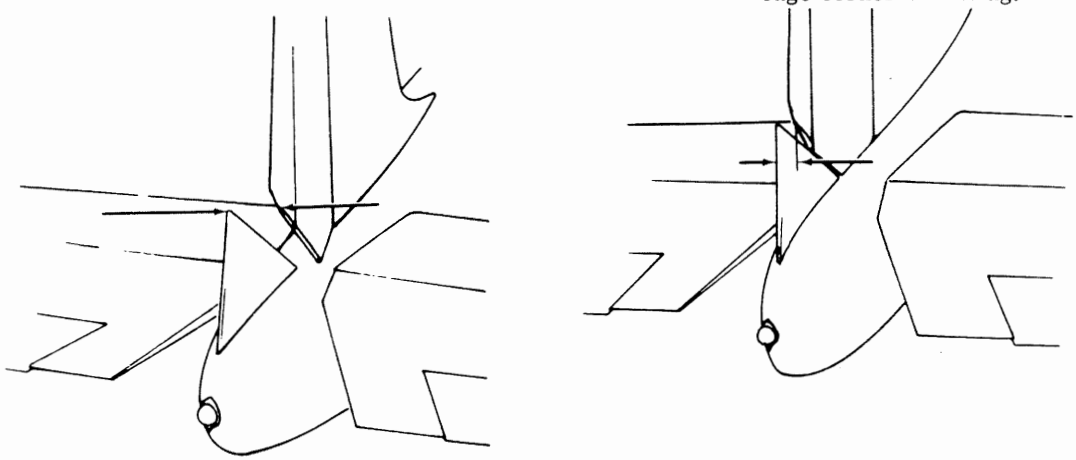


Figure 3-1A. Measuring Rudder Travel

c. Adjust the tab actuator so that the tab actuator rod extends a little less than half way.

d. Set the tab to neutral position by adjusting the push rod and connect the rod to the actuator rod.

e. Center the chain on the sprocket and tighten the cable. Refer to figure 3-2 and the cable tension graph for tension and travel.

f. Adjust tab stops, check travel and safety turnbuckles.

NOTE

After rigging the rudder tab system, check the tab control and the surface for correct movement. When the tab control is moved to the left, the tab should move to the right.

RUDDER TRIM TAB END PLAY INSPECTION

a. Adjust the rudder trim tab trailing edge to align with the rudder control surface trailing edge (0° position).

NOTE

The rudder must be in the neutral position for this inspection.

b. Carefully attach a dial indicator to the surface of the rudder, above the trim tab in line with the control surface trailing edge.

c. Zero the indicator while applying 3 lbs. load perpendicular to the tab surface away from the dial indicator at the tab trailing edge, aft of the trim tab horn.

d. Without moving the indicator, apply 3 lbs. load perpendicular to the tab surface toward the indicator. The reading on the dial indicator is the tab free play, and it should not exceed 0.044-inch.

e. If the free play exceeds 0.044-inch, inspect all components of the tab actuation system to determine the cause. All worn parts should be replaced.

RIGGING THE ELEVATOR CONTROL SYSTEM

a. Set the elevator bellcrank in the neutral (vertical) position and install a rig pin. On airplane Serials TD-352 thru TD-379, TD-411 and after, the bottom screw securing the elevator bellcrank down spring brackets must be removed before the rig pin can be installed through the bellcrank. Replace this screw after rigging is completed.

NOTE

The rig pin holes in the elevator bellcrank and elevator bellcrank bracket assembly may be used to set the bellcrank in the neutral position for rigging operations except on airplane Serials TD-303 thru TD-351, and TD-380 thru TD-410. On these aircraft the elevator bellcrank may be placed in the neutral position by locating the bellcrank forward of the elevator down stop as indicated in figure 3-3.

b. Adjust the push rods to bring the elevator in the neutral position.

c. Set the control column approximately 4 inches aft of its forward stop on aircraft prior to Serial TD-534, and secure it with a parallel clamp or padded "C" clamp. Insert a rig pin in the control lock pin hole on Serial TD-534 and after.

d. Rig the cables to the tension shown on the cable tension graph.

e. Remove the rig pin.

f. Adjust elevator travel at the elevator stops on the bellcrank in the fuselage tail section, accessible through inspection openings on the fuselage under the horizontal stabilizer. Refer to figure 3-3 for elevator travel.

g. Watch the elevator movement to make sure that it correctly corresponds to movement of the control column.

ELEVATOR TAB RIGGING

a. Set elevators in neutral position.

b. Set indicator at 20 degrees down.

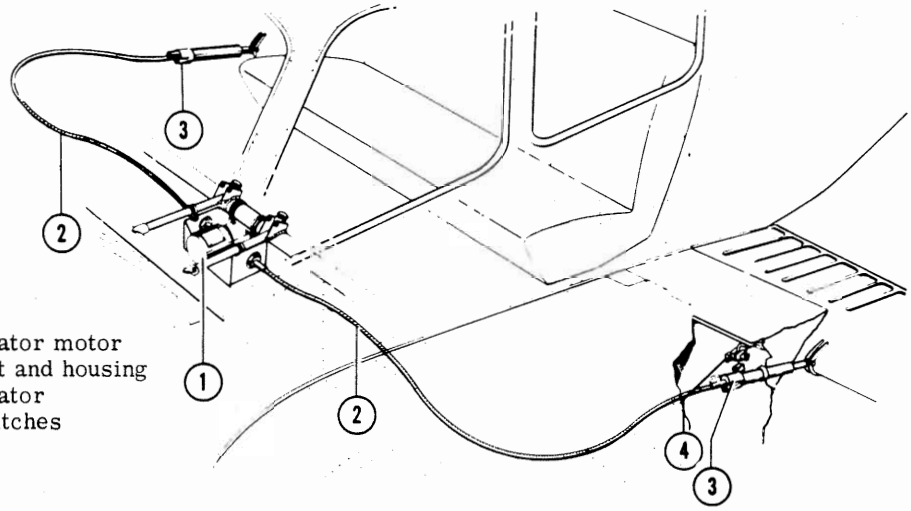
c. Adjust tab actuator so that tab actuator rod extends 2/3 of its total travel.

d. Set tab to 20 degrees down and connect push rod to actuator rod.

e. Put chain on the sprocket so that three links are left on the bottom of the sprocket and tighten cables. Refer to figure 3-3 and the cable tension graph for tension and travel.

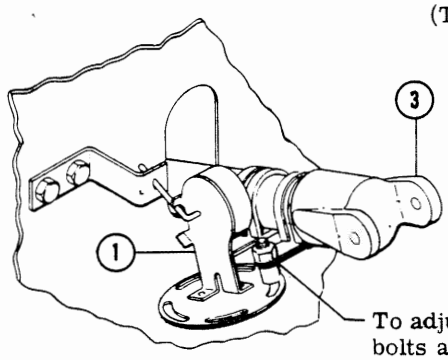
f. Adjust tab cable stops, check travel and safety turnbuckles.

FLAP SYSTEM

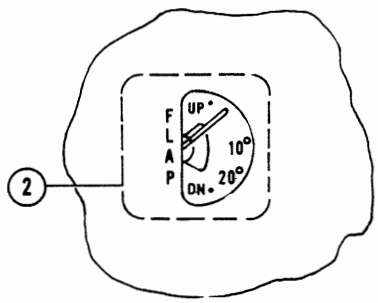


1. Flap actuator motor
2. Flap shaft and housing
3. Flap actuator
4. Limit switches

FLAP TRANSMITTER AND INDICATOR
(TD-668 and After)

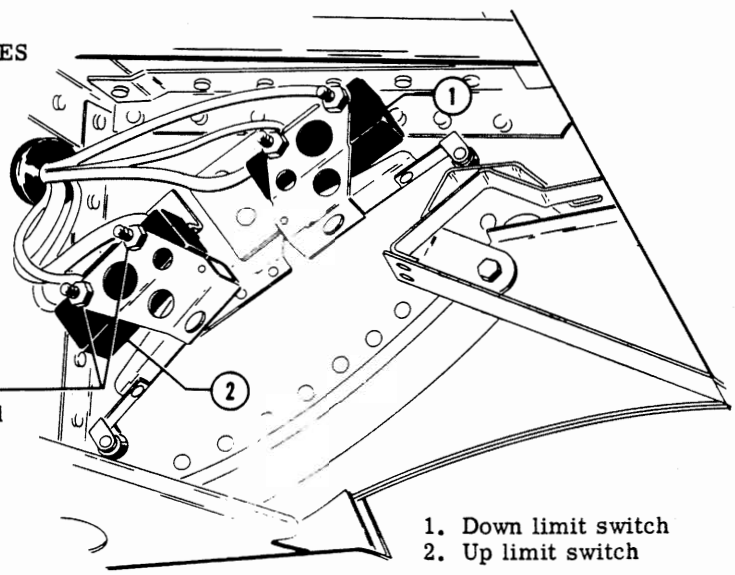


1. Transmitter
2. Indicator
3. Flap actuator



To adjust, loosen mounting bolts and move fore and aft, or rotate slightly.

LIMIT SWITCHES



To adjust, loosen mounting screw nuts, slide switch forward or aft on bracket.

1. Down limit switch
2. Up limit switch

Figure 3-4. Flap System

NOTE

After rigging the elevator and the elevator tab control system, check for correct movement of the control surfaces with respect to the movement of the controls. When the elevator tab control is moved toward the "NOSE DOWN" position the tab should move up.

ELEVATOR TRIM TAB END PLAY INSPECTION

a. Adjust the elevator trim tab trailing edge to align with the elevator control surface trailing edge. (0° position).

NOTE

The elevator must be in the neutral position for this inspection.

b. Carefully attach a dial indicator to the surface of the elevator, outboard of the trim tab in line with the control surface trailing edge.

c. Zero the indicator while applying 3 lbs. load perpendicular to the tab surface away from the dial indicator at the trailing edge aft of the trim tab horn.

d. Without moving the dial indicator, apply 3 lbs. load perpendicular to the tab surface toward the indicator. The reading on the dial indicator is the tab free play, and it should not exceed 0.084-inch.

e. If the free play exceeds 0.084-inch, inspect all components of the tab actuation system to determine the cause. All worn parts should be replaced with new parts.

f. If the elevator tab push rod attach holes in the tab horns are found to be worn, the trim tabs may be removed and the tab horn repaired as indicated in ELEVATOR TRIM TAB HORN REPAIR in lieu of replacing the complete tab assemblies.

NOTE

Elevators must be removed from the airplane and be checked for static balance after accomplishing the repair procedures described in ELEVATOR TRIM TAB HORN REPAIR.

ELEVATOR TRIM TAB HORN REPAIR.

For Tab Horns With Brazed In Bushings.

a. Carefully grind or spot face the brazed in bushing flush with the sides of the tab horn.

b. Drill and ream the existing hole to .4995/.5010-inch inside diameter.

c. Using a clean rag dampened with methyl ethyl keytone, thoroughly clean the hole in the tab horn, the area around the hole and a new P/N 96-610026-1 bushing.

d. Scuff sand the contact surfaces of the bushing and the tab horn and clean the area thoroughly again as specified in step "c".

e. Wipe off the parts again with a clean rag before the solvent evaporates.

f. Apply a thin coat of adhesive, EC2216 (P N of Minnesota Mining & Mfg. Co., St. Paul, Minnesota) or equivalent, to the contact surfaces of both the bushing and the tab horn.

g. Join the horn and bushing and clamp together (use care not to squeeze out all of the adhesive) until the adhesive has cured completely (approximately 24 hours).

h. Lubricate the new 104-524056-3 grip bushing with MIL-G-23827 grease and install the grip bushing in the tab horn bushing.

i. Reinstall the trim tab and lubricate all pivotal points with MIL-G-23827 grease.

NOTE

If the rod end on the push rod assembly is worn, the push rod assembly should be replaced. When connecting the tab push rod assembly to the tab horn, tighten the castellated nut against the rod end and turn the nut to the next castallation to install the cotter key. The grip bushing within the yoke of the rod end should not rotate.

For Tab Horns Of .125-Inch Thick Flat Steel Sheet And No Bushings.

a. Drill and ream the existing hole in the tab horn to .3745/ .3760-inch inside diameter.

b. Using a clean rag dampened with methyl ethyl keytone or equivalent, clean the hole in the tab horn, the area around the hole and a P/N 96-610026-3 bushing.

c. Scuff sand the contact surfaces of the bushing and the tab horn and clean the area thoroughly again as specified in step "b".

d. Wipe off the parts again with a clean rag before the solvent evaporates.

e. Apply a thin coat of adhesive (EC2216, P N of Minnesota Mining & Mfg. Co., St. Paul, Minnesota) to the contact surfaces of both the bushing and the tab horn.

f. Join the tab horn and bushing and clamp together (use care not to squeeze out all of the adhesive) until the adhesive has cured completely (approximately 24 hours).

g. Reinstall the trim tab with a new P/N 96-526021-1 rod assembly and a new NAS464P4-8/M/ bolt at the tab horn end.

NOTE

When connecting the tab push rod to the tab horn, the rod end must be free to move without binding against the bushing in the tab horn. (Turning the nut on the bolt to contact the rod end plus one castellation should accomplish this.)

h. Lubricate all pivotal points with grease conforming to MIL-G-23827 specifications.

For Tab Horns Of .091-Inch Thick Aluminum With A Pressed In Steel Bushing

a. Remove the existing bushing from the tab horn and ream the hole in the tab to .3276/ .3291-inch inside diameter.

b. Using a clean rag dampened with methyl ethyl ketone or equivalent, clean the hole in the tab horn, the area around the hole and a P/N 96-610026-5 bushing.

c. Scuff sand the contact surfaces of the bushing and the tab horn and clean the area thoroughly again as specified in step "b".

d. Wipe off the parts again with a clean rag before the solvent evaporates.

e. Apply a thin coat of adhesive (EC2216, P/N of Minnesota Mining & Mfg. Co., St. Paul, Minnesota or equivalent) to the contact surfaces of both the bushing and the tab horn.

f. Join the tab horn and the bushing and clamp together (use care not to squeeze out all of the adhesive) until the adhesive has cured completely (24 hrs.).

g. Remove the existing rod end from the tab push rod assembly at the tab horn end and replace it with a P/N 96-610026-7 rod end.

h. Reinstall the trim tab and install a new P/N AN173C6/M/ bolt at the tab horn end of the push rod.

NOTE

When connecting the tab push rod to the tab horn, the rod end must be free to move without binding against the tab horn or the bushing in the tab horn. (Turning the nut on the bolt to contact the rod end plus one castellation should accomplish this.)

i. Lubricate all pivotal points with grease conforming to MIL-G-23827 specifications.

ELEVATOR DOWN SPRING LOADS

With down spring connected, the loads in the elevator system are to be as follows (measured with hand force on control wheel):

Airplanes Prior to Serial TD-303	Airplane Serial TD-303 and after
13 to 15 lbs. at 0° Elevator	19 to 21 lbs. at Neutral
18 lbs. at 10° UP Elevator	22 to 24 lbs. Break-out at DOWN Elevator
23 to 25 lbs. at 25° UP Elevator	
Tolerance ± 1 lb.	

The elevator system must be freed up sufficiently to allow free return of the elevator from full UP to full DOWN position.

ELEVATOR DOWN SPRING INSTALLATION

a. Hook spring over roller on elevator bellcrank.

b. On airplanes not incorporating down spring adjustment straps, hook other end of spring over bolt

e. If the free play exceeds 0.165-inch, inspect all components of the tab actuation system to determine the cause. All worn parts should be replaced, with new parts.

AILERON TAB RIGGING (Effective airplanes prior to Serial TD-453)

a. Place cockpit aileron trim tab control in neutral position.

b. Place aileron in neutral position and connect trim tab to tab actuator.

c. By turning sprocket on actuator, adjust trim tab to both extremes of travel; measure both settings and return tab to the mid-point of the two extremes of travel. This will place the actuator in the neutral positon.

d. If the trim tab is not in the neutral position upon completion of step c, adjust push rod to place tab in neutral position.

e. Center the chain on the sprocket and tighten the cable. Refer to figure 3-5 for tension and travel.

f. Check trim tab travel, adjust cable stops and safety turnbuckles.

NOTE

After rigging the aileron and aileron tab control system, check for correct movement of the control surfaces with respect to the movement of the controls.

Since the aileron tab is a servo tab, every time the aileron moves down the tab should move up. Also when the tab control is moved toward "RIGHT WING UP" the tab should move down.

AILERON TRIMMER (TD-453 and after)

Effective with airplane Serial TD-453, and after, all Travel Air airplanes have the aileron trim tab removed and are equipped with an aileron control trimmer which functions by applying tension to the aileron control cables. The trimmer does not change the rigging of the system, but should be removed before checking cable tension. To remove, unscrew the two body halves by holding the clutch body housing (outer half) and turning the clutch body nut (inner half) counterclockwise. Separate the two body halves by pulling out on the clutch body housing. When installing, carefully insert the shaft through the felt seal into the hub bearing, being careful not to shear the felt seal. Screw the two halves of the unit together by holding the clutch body by turning the clutch body nut. Care should be taken to see that the tangs of the drive shaft engage properly with the sprocket as the nut is being tightened by hand. Also note that the position indicator on the face of the unit is right side up as the shaft engages with the sprocket. Hand tightening the two halves should be sufficient.

BALANCING CONTROL SURFACES

Control surfaces ordinarily need not be rebalanced unless they are repainted, repaired or have parts replaced. When repainting, hang the control surfaces by the trailing edge so excess paint will drain toward the leading edge.

Mark the chord line of each control surface and, with the surface supported by the jig and spindle, adjust the spindle until the bubble of a bubble protractor or level held on the marked chord line is centered.

The surfaces must balance within the limits given for each; deviations must be corrected by adding or removing weight. If the aileron, for example, were tail-heavy by .72 inch-pounds, you would add the required amount of nose heaviness (0.2 inch-pounds) to give the total amount of tail-heavy balance that must be compensated for.

Use this formula to determine the amount of weight to add:

$Y(X) = B$

Y = Distance in inches from hinge center line to center line of the balance weight.

X = The unknown weight to be added.

Using 3 inches as an example of the distance Y, we have:

$3X = 0.92$ inch-pounds

$X = 0.306$ pounds of weight to be added.

BALANCING THE AILERON

The painted aileron assembly must be nose-heavy by 0.2 to 1.5 inch-pounds.

Use this equation to figure the overbalance.

Static Nose Heaviness = $D(W-S)$

D = Distance in inches from hinge center line to point where spindle supports the aileron.

S = Weight of spindle (in pounds) used to support leading edge of aileron.

W = Scale reading of platform scale in pounds.

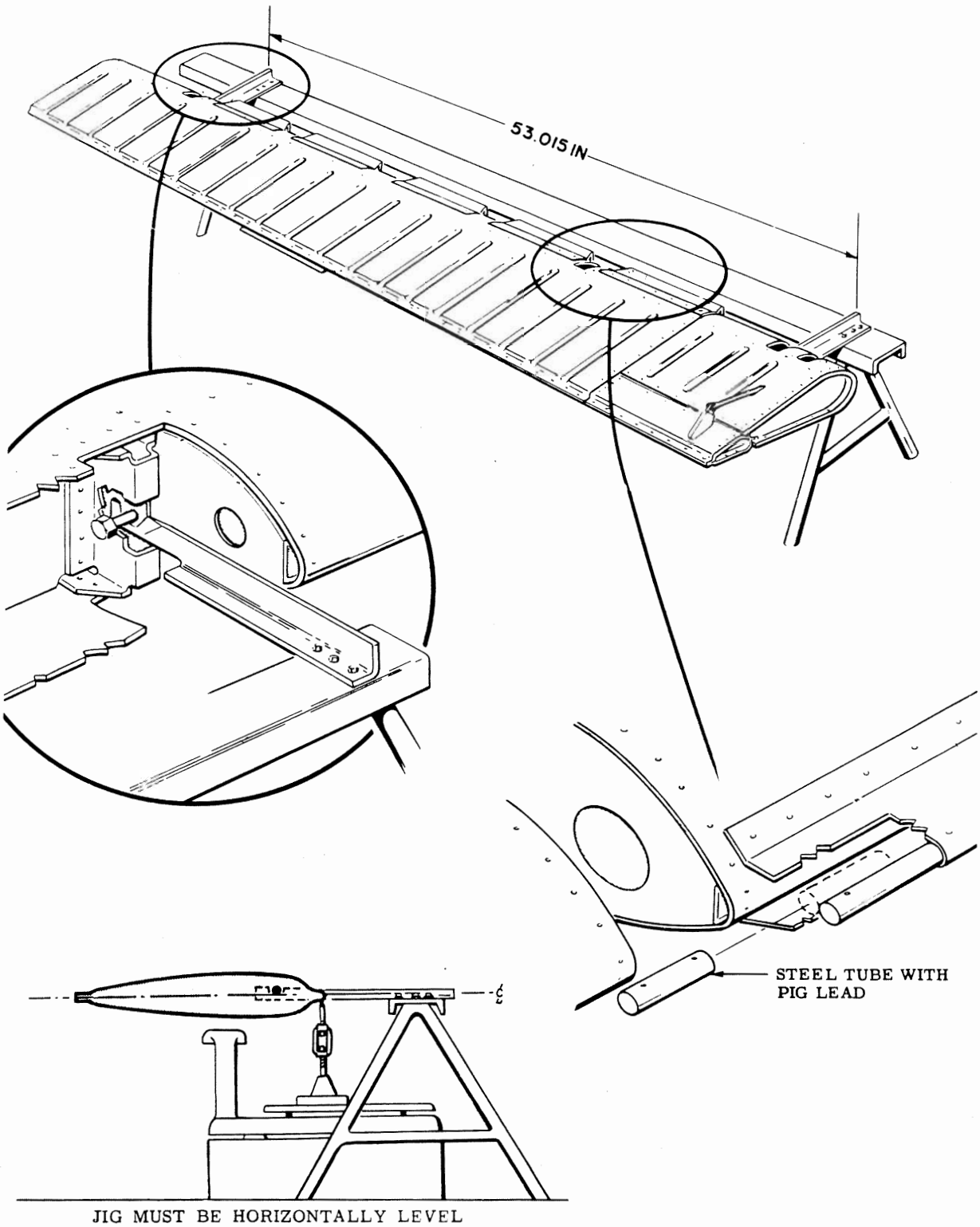


Figure 3-6. Balancing the Aileron

BALANCING THE ELEVATOR

The maximum allowable underbalance for all completed painted elevator assemblies, including the control arm and the tab control rod, must be from 15.6 to 20.2 inch-pounds on aircraft prior to Serial TD-303, and must not exceed 22.6 inch-pounds on airplane Serial TD-303 and after. On aircraft equipped with optional utility baggage door, the static underbalance must not exceed 17.5 inch-pounds.

Use this formula to figure the tail heaviness:

Static Tail Heaviness = D(W-S).

D = Distance in inches from hinge center line to point where spindle supports elevator.

W = Scale reading of platform scale in pounds.

S = Weight of spindle (in pounds) used to support trailing edge of elevator.

Remove the elevator horn cover and add or remove solder to bring the elevator balance within required limits. Coat the weight with a corrosion preventative material such as zinc chromate primer to insulate the dissimilar metals. Replace the elevator horn cover and recheck the balance.

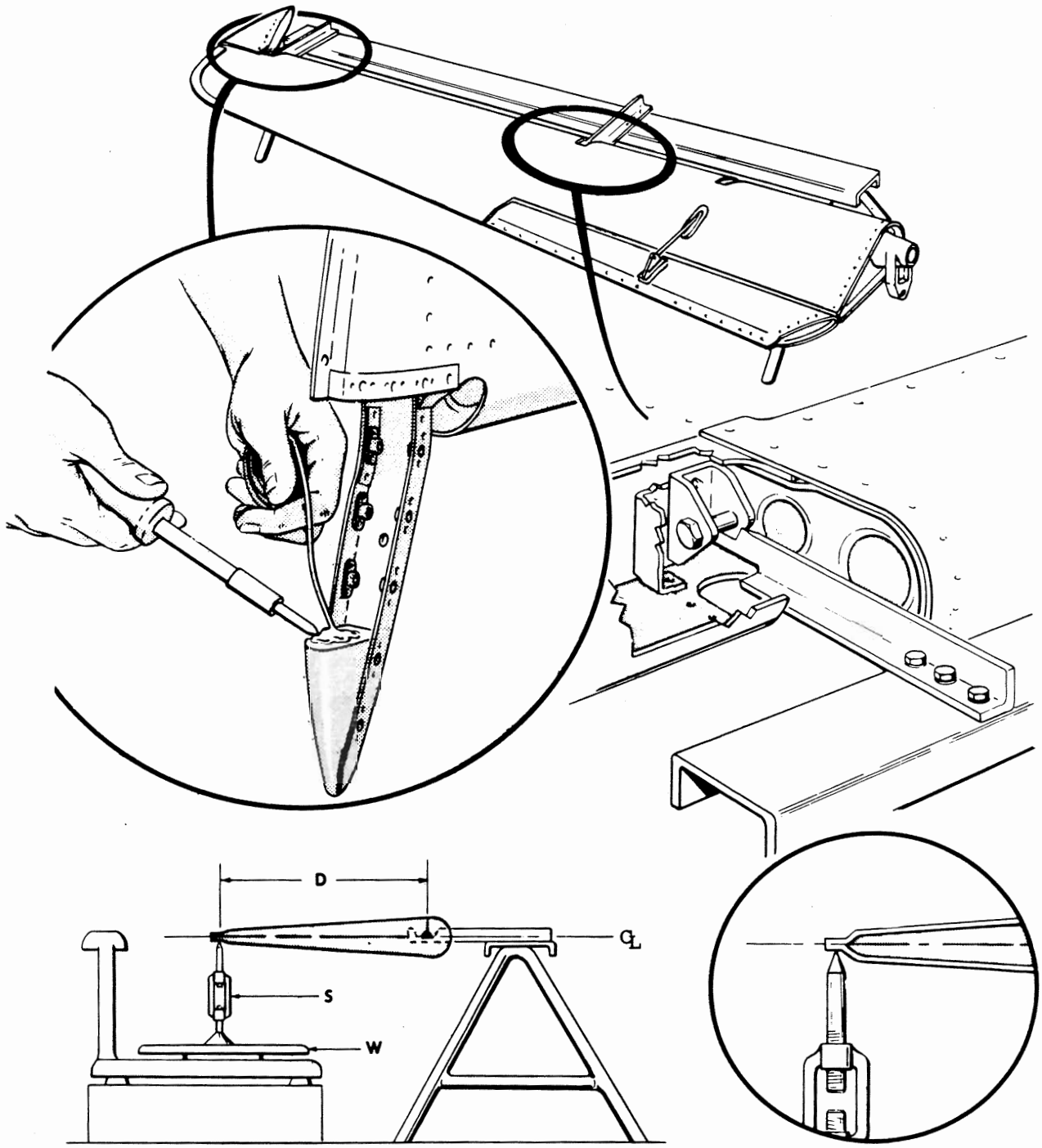


Figure 3-7. Balancing the Elevator

BALANCING THE RUDDER

The maximum allowable underbalance for all completed painted rudder assemblies, including the control arm and the rudder tab actuator, must be from 18.1 to 22.5 inch-pounds on aircraft prior to Serial TD-303, and must not exceed 19.4 inch-pounds on airplane Serial TD-303 and after.

Use this formula to figure the tail heaviness:

Static Tail Heaviness = D(W-S)

D = Distance from hinge center line to point where the spindle supports the rudder.

W = Scale reading of platform scale in pounds.

S = Weight of spindle (in pounds) used to support trailing edge of rudder.

Remove the rudder horn cover and add or remove solder to bring the rudder balance within required limits. Coat the weight with a corrosion preventative material such as zinc chromate primer to insulate the dissimilar metals. Replace the rudder horn cover and recheck the rudder balance.

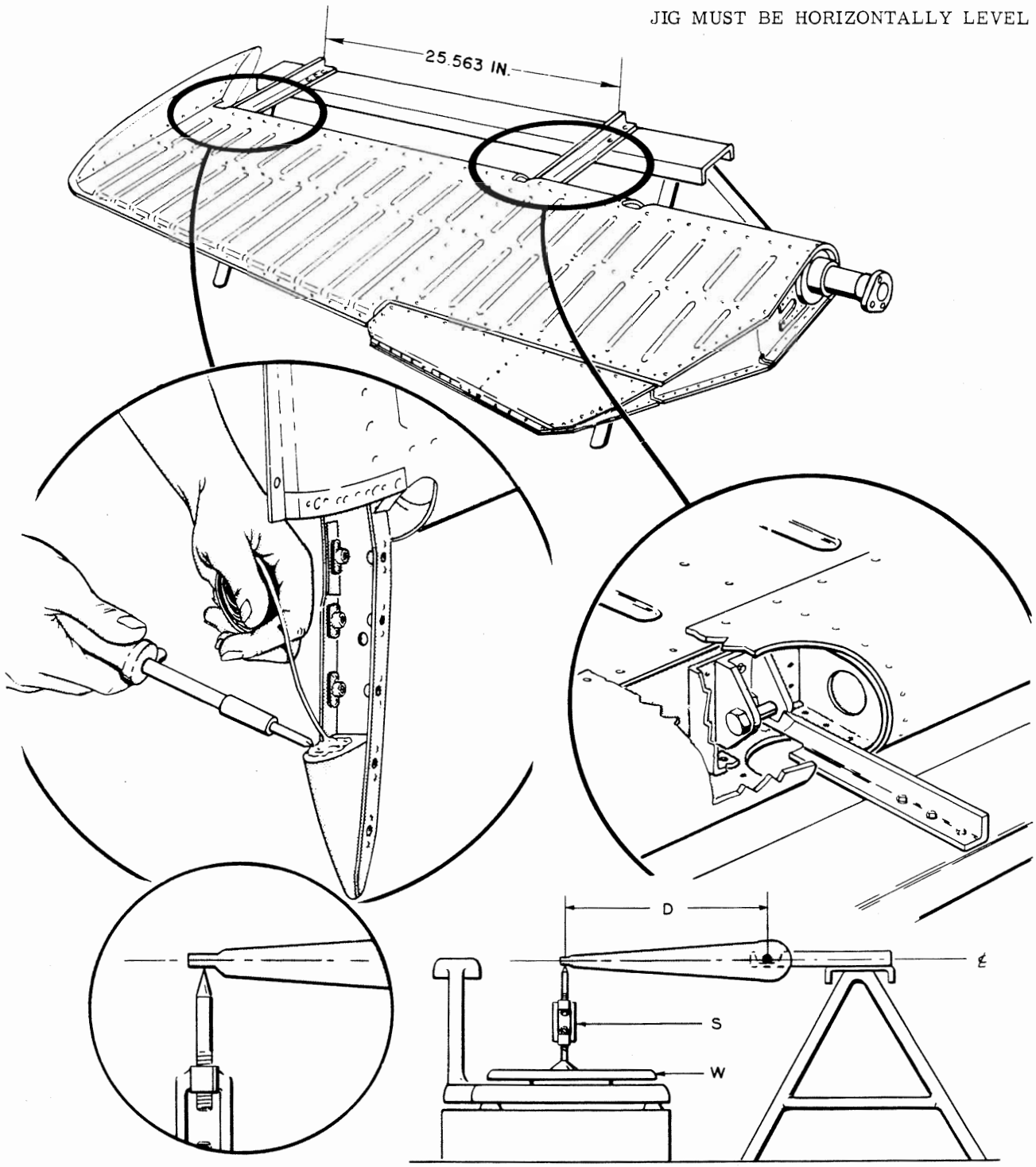


Figure 3-8. Balancing the Rudder

RIGGING THE LANDING GEAR

Whenever the landing gear mechanism or doors are removed or disconnected, retract the gear and check the rigging. The following procedure for rigging the landing gear was written on the assumption that the entire landing gear is out of rig.

NOTE

Over-tightening the nut on the bolt that connects the retract rod to the shock strut can bind the strut or distort the drilled shank of the bolt. Torque the nut only to 25 to 75 inch-pounds.

All landing gear operations, tests and adjustments on aircraft TD-2 thru TD-59 are to be made with a maximum of 25 volts. On TD-60 and after, a new brush installed in the landing gear motor allows full 28-1/4 volts to be used. Installation of a new motor or the replacement brushes (35175-A) will allow the use of 28-1/4 volts on aircraft prior to TD-60.

a. Lengthen the main and nose gear retract rods sufficiently to eliminate the danger of the V-brace on the main gear damaging the skin when the gear is retracted and excessive tensions of the nose gear retract rods. Damage to vital parts may result if abnormal loads are applied to the retract system. By lengthening the retract rod, such danger is removed. Disconnect uplock cables at the brackets, leaving the springs attached. If the springs are disconnected, upon the retraction of the gear the uplock arm may damage the top wing skin. Place the uplock block in the lower position.

b. Disconnect nose wheel door linkage at attaching point on the door and remove links by unscrewing at the upper ball joint.

c. Remove bolts attaching the main gear outboard door links to main strut. Remove inboard door actuator rod by unscrewing from inboard rod ends and removing bolt in door bracket.

d. Screw stop bolts into the V-brace assembly of the main gear until approximately four or five threads are showing.

CAUTION

When running the gear electrically before the switches are reset or for the first time after resetting the switches, run it with extreme caution to make sure the switches open the electrical circuits before the sector gear hits the internal stops in the gear box. The sector gear should not be touching the stop when the motor stops coasting. Serious damage may result if the internal stops are hit by the sector gear.

e. Run the gear about 2/3 up, then stop and inch the gear the remaining distance to the limit switch by intermittent operation of the circuit breaker. Check hand crank for 1/8 to 1/4 turn between retracted position and the internal stop. If this clearance is not obtained adjust the landing gear up limit switch. The up limit switch is located adjacent to the landing gear actuator assembly under the pilot and copilot seats. To adjust the up limit switch, lower the landing gear 1/8 to 1/4 turn of the emergency hand crank and adjust the switch by turning the screw in the actuator so that it just breaks the circuit.

f. Extend gear and check hand crank. There should be 1/8 to 1/4 turn between the extended position and the internal stop. The down limit switch adjustment is accomplished by bending the switch actuator arm tab so that it just breaks the circuit.

g. Extend and retract the gear two or three times to assure that the switches are correctly set. Check the hand crank each time to insure proper adjustment.

h. Adjust the main retract rod (either right or left) to maintain 1/16 inch minimum clearance between the joint (knee) of the V-brace and lift leg and the top wing skin with the landing gear fully retracted. The main gear should retract only far enough to clear the inboard door in addition to maintaining the minimum of 1/16 inch clearnace. To decrease the clearance between the knee and the top wing skin, shorten the retract rod; to increase clearance, lengthen the retract rod.

i. When the proper setting is obtained, leave the gears in the retracted position and screw the stop bolt down against the main strut. To assure a firm seating, insert a .003 feeler gage under the bolt head and adjust the bolt until a firm, steady effort is required to pull the feeler gage out. With the feeler gage removed, screw the bolt down an additional 3/4 turn. Tighten locknut securely.

j. Check the uplock roller for free movement and a clearance of .010 - .020 inch between the roller and the uplock block. If this clearance is not correct, the uplock must be adjusted. To adjust, loosen the block retaining bolts and adjust the clearance between the roller and the uplock block. The uplock bracket and the block are serrated and the serrations must be interlocked with each other.

k. Extend gears and attach the uplock cable to bracket.

l. Retract the gears intermittently as in step e. above and observe the locking action of the uplock bracket. If it starts to lock too soon it is an indication that the uplock cable is too tight. The cable should be adjusted for a tension of 52-1/2 + 10 -0 pounds. The tension is adjusted at the outboard end of the cable. If sufficient adjustment is not obtainable at the cable eye, additional adjustment may also be made at No. 3 wing rib by moving the cable housing inboard or outboard.

m. Extend the gear and check the force required to deflect the knee joint. With the gears in down position, it should take 45 to 65 pounds of force to deflect the knee joint. To increase tension, add

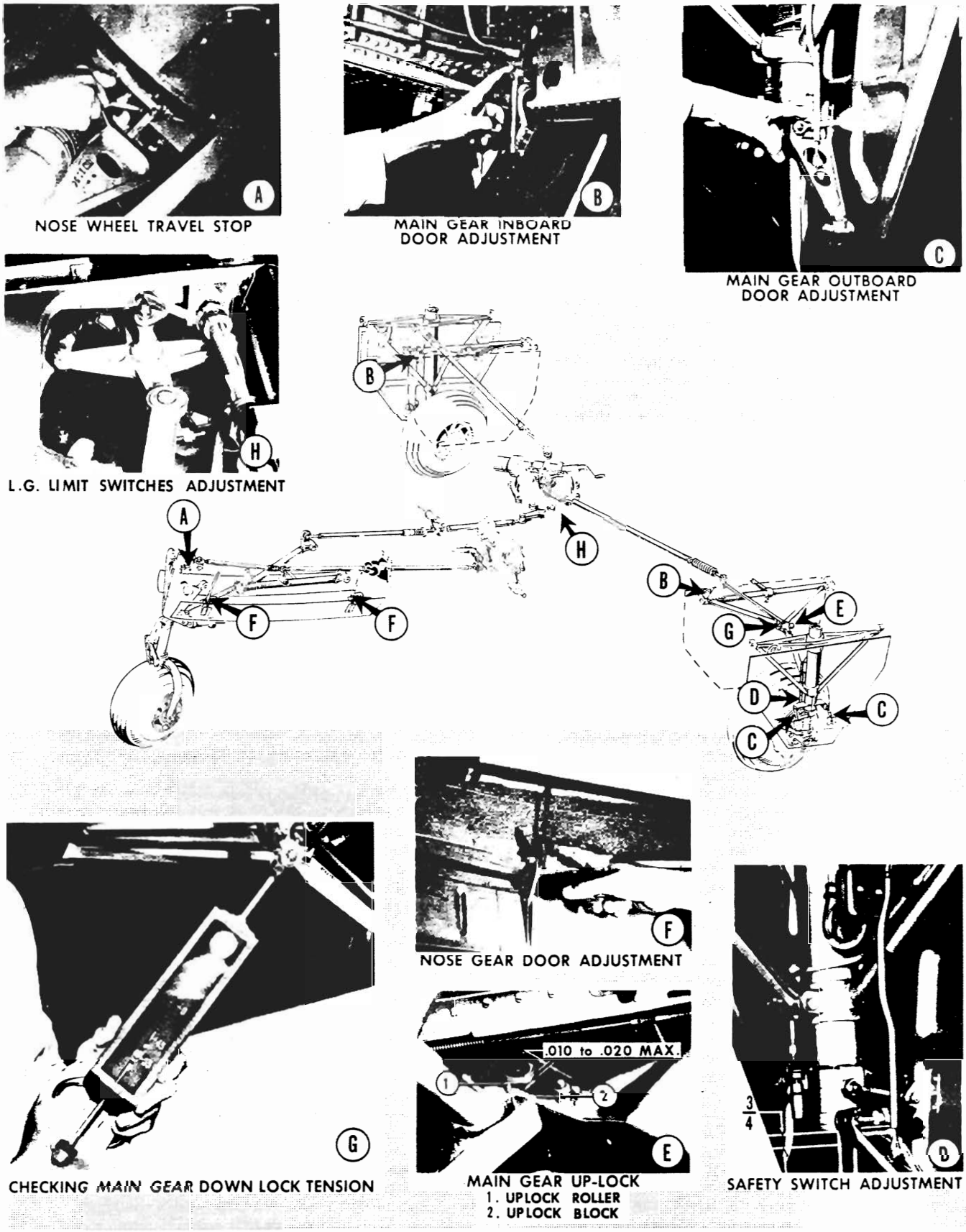


Figure 3-9. Landing Gear System

100951S063XP washers between the spring and rod end. A maximum of five washers may be added. If more tension is needed, replace the spring.

NOTE

If unable to obtain adequate spring tension, check for worn bushings in the retract linkage. Wear in the bushings has the effect of lengthening the entire linkage, causing the rod end spring to compress and stack, leaving nothing for spring adjustments. New bushings will shorten the linkage, again permitting adjustment of the spring.

n. With the gears extended adjust the nose wheel so that 45 to 65 pounds is required to cause any deflection at the knee joint. With nose wheel fully retracted, a force of 18 to 25 pounds applied at the center line of the axle downward, shall be required to pull the gear away from the up stop. To adjust the nose gear tension the aft retract rod is extended or shortened. In the event correct tensions can not be obtained, 100951DD064SM washers may be added at the forward end of the spring in the retract rod in the nose wheel well (maximum of three washers).

o. Unscrew main gear outboard door attaching link to assure the door is not damaged when retracted. Connect outboard door linkage and retract gear slowly, checking to see that clearance is maintained between the door and gear. After checking to see that the door is not too tight, run gear down and adjust linkage as required. Continue this procedure until a snug, firm fit is obtained when the door is completely closed.

p. Connect main gear inboard door linkage, retract gear slowly and check for clearance between door linkage and root rib. Run gear to 3/4 down position and adjust to maintain 1/4 inch minimum clearance between gear and inboard door with the slack removed from the door linkage. Continue this procedure until door will close tightly in both up and down position. Adjust doors by varying the length of the push-pull linkage rods. Disconnect the rods at the clevis fitting to make this adjustment.

NOTE

Install the main landing gear door push rod attaching bolt in the door linkage bracket with the head to the rear. If installed wrong, the bolt may catch on the fuselage skin and root rib of the wing, causing damage to the landing gear retract mechanism or preventing the gear from retracting.

q. Connect nose door linkage and rig nose door. Check closely to see that right hand aft hinge clears the tire. Adjust the nose gear doors by varying the length of the push-pull linkage rods in the nose wheel well. With the gear retracted, the doors should have a slight tension on them from the actuator rods to keep the doors from vibrating.

r. Check the landing gear safety switch for proper adjustment. Measure 3/4 inch down on the piston from the bottom of the left shock strut cylinder and mark the piston with a piece of tape. Raise the left wheel with a small jack, compressing the shock strut, until the tape is even with the lower edge of the cylinder. Adjust the switch actuating arm at the clevis so the switch is actuated as the tape touches the end of the cylinder.

s. Run gear up and check landing gear position indicator. To adjust the position indicator, remove the indicator cover and bend the actuating wire to move the flag or bend the tab on the clamp to increase or decrease the flag travel. Set the covering in place, retract the gear and check the indicator position with the gear retracted.

t. Recheck limit switch adjustment and remove aircraft from jacks.

LANDING GEAR SAFETY SYSTEM (OPTIONAL)

The optional landing gear safety system functions through the action of a solenoid in the landing gear position switch in conjunction with a three-position safety system switch, a relay and diode mounted on the front spar, two pressure switches mounted on the inboard side of the left main landing gear wheel well, and a microswitch located adjacent to each existing throttle position warning switch.

Each pressure switch is connected into the pitot and static system. The pressure switch in the gear-up circuit is actuated by the pressure differential that exists between the pitot and static air system and will close with increasing pressure at approximately 70 mph. The pressure switch in the gear-down circuit will close with decreasing pressure at 120 mph.

When the landing gear position switch is in the UP position and an airspeed of 70 mph has been attained, the pressure switch in the gear-up circuit closes and actuates a relay mounted on the front spar, thus completing the circuit and retracting the landing gear. A diode locks the relay in the closed position until the retraction cycle is completed. For the preceding to occur however one microswitch adjacent to the throttle position warning switch must also be in the open position. This microswitch is actuated by the throttle control when the throttle is advanced sufficiently for the manifold pressure gage to register approximately 19 inches Hg. Conversely, if both throttles are retarded beyond the position corresponding to approximately 17 inches Hg of manifold pressure, the microswitches will close. If at the same time the microswitches close the airspeed has dropped below 120 mph, the resultant pressure differential between the pitot and static systems will actuate the pressure switch in the gear-down circuit. With both microswitches and pressure switches closed, the current flow through the solenoid will cause the landing gear position switch to drop into the DOWN position, thus completing the gear-down circuit.

If the landing gear position switch is placed in the UP position while the landing gear safety system switch is in the ON position, the landing gears will retract only when the following conditions are mutually fulfilled:

1. The airplane must have attained an airspeed of at least 70 mph.

2. One throttle setting must have been advanced sufficiently to have produced a manifold pressure of approximately 19 inches Hg.

By the same token, the landing gear will automatically extend under the following conditions:

1. The airspeed must have dropped below 120 mph.

2. Both throttles must have been retarded enough for manifold pressure to have dropped below approximately 17 inches Hg.

The safety system switch is a three position switch, with normally ON and OFF positions. The switch also contains a momentary or test position for checking that the system is functioning properly. When released from the test position, the switch returns to the ON position.

SYSTEM MAINTENANCE AND ADJUSTMENT

No maintenance is required for the landing gear safety system, other than replacing defective units or checking the electrical wiring for condition, security of attachment, and tightness of electrical connections. The switches are preset and adjustment will not normally be required; however, should the system fail to function properly, the following checks and adjustments may be accomplished.

CHECK OF SYSTEM WITH SAFETY SWITCH IN TEST POSITION

1. Place the throttles in the closed or retarded position.

2. Place the battery master switch ON. The landing gear circuit breaker may be either IN or OUT.

3. Place the landing gear safety system switch in the momentary full up (TEST) position. Noise or movement of the solenoid in the landing gear position switch indicates that the automatic landing gear extension part of the system is functioning properly. The ON-OFF switch returns normally to the ON position unless the pilot intentionally places the switch in the OFF position.

MICROSWITCH ADJUSTMENT

The landing gear safety system microswitches are set to operate at 3 to 5 inches Hg above the throttle warning horn switch (see this section for proper setting of the warning horn switch). This is accomplished by a step in the cam which operates the throttle warning horn switch.

PRESSURE SWITCH ADJUSTMENT

The pressure switches are preset and will not normally require adjustment. Because of the built-in tolerance of these switches, they should not be tampered with unless radically out of adjustment, that is unless the switch in question fails to actuate at an airspeed within 2 mph above or below the setting recommended for it. Even then the system plumbing and electrical wiring should be checked to ascertain that the source of trouble is not something other than improper adjustment of the pressure switches.

1. Place the aircraft on jacks.

2. With the master switch ON, the landing gear circuit breaker ON, and the landing gear warning circuit breaker OFF, advance the throttles to maximum position.

3. Place the landing gear safety position switch in the ON position.

4. Place the landing gear position switch in the UP position.

5. Clamp a section of soft rubber tubing over the pitot head inlet, making certain the connection is airtight.

6. Crimp the end of the tubing and roll it up until the airspeed indicator registers 70 mph. The landing gear will start retracting immediately if the pressure switch is properly adjusted.

CAUTION

To avoid rupturing the diaphragm of the airspeed indicator, the rubber tubing must be rolled SLOWLY.

7. If the landing gear failed to retract in the preceding step, turn the master switch OFF and adjust the pressure switch (outboard switch of the two installed in the left main wheel well) as follows:

a. Secure the rolled up tubing so that it will hold the airspeed indicator reading at 70 mph.

b. Connect a continuity tester across the contacts of the pressure switch, then turn the adjustment screw until the switch closes at the 70 mph reading on the airspeed indicator.

8. Turn the master switch ON and roll up the rubber tubing until the airspeed indicator registers 130 mph, then secure the tubing so that the airspeed indicator will hold that reading.

9. Retard the throttles.

10. Slowly bleed off pressure until the airspeed indicator registers 120 mph. The landing gear will extend immediately if the pressure switch is properly adjusted.

11. Should the landing gear fail to extend, turn the master switch OFF and adjust the pressure switch (inboard switch of the two installed in the left main gear wheel well) as follows:

a. Secure the rolled up tubing so that it will hold airspeed indicator reading at 120 mph.

b. Connect a continuity tester across the contacts of the pressure switch, then turn the adjustment screw until the switch closes at the 120 mph reading on the airspeed indicator.

12. Turn the master switch ON and check the landing gear safety system through the complete cycle of operation.

NOSE WHEEL STEERING MECHANISM

The nose wheel should be parallel to the fore and aft center line of the airplane with the rudder pedals in the neutral position. Take the nose gear steering actuator arm loose at the back end and screw the end fitting either in or out to make the adjustment.

NOSE WHEEL TRAVEL STOP ADJUSTMENT

The travel stop must be adjusted so the nose wheel travel is stopped when the shimmy dampener is 1/32 to 1/4 inch from its maximum travel.

If adjustment is required the following procedure is recommended:

a. Loosen the locknuts on the adjustment bolts so they clear the stops on the nose wheel straightener.

b. Turn the nose wheel to the extreme left turn position. The adjustment bolts must be clear of the stops with the nose wheel in this position.

c. Place tape around the aft end of the shimmy dampener position rod 1/32 inch from the dust shield.

d. Turn the locknuts on the adjustment bolts so the nose wheel is turned and the tape on the piston rod just contacts the dust shield. Tighten the locknuts securely.

e. Turn the nose wheel to the extreme right, place the tape on the forward end of the piston rod and repeat steps b, c, and d.

INSPECTION AND MAINTENANCE OF NOSE GEAR RETRACT ROD ENDS

Inspect the three rod ends, two on the aft retract rod and one on the forward retract rod, for evidence of stretching due to high tension loads.

a. Place the airplane on jacks.

b. Partially retract the landing gear with the hand crank to remove the load from the retract mechanism. Approximately five turns of the hand crank will be sufficient.

c. Disconnect the rod end on the forward retract rod from the brace assembly, inspect the rod end and rotate the bearing to insure that it is free to move inside the rod end.

d. Grasp the front end of the aft retract rod with the thumb and index finger and apply a rotational force to the rod. The retract rod should be free to move. However, if it cannot be rotated freely, remove it from the airplane, thoroughly inspect each rod end and rotate the bearings making sure they are free to move inside the rod end. Replace rod ends if the bearings drag.

e. Reinstall retract mechanism.

WHEEL, TIRE AND TUBE MAINTENANCE

Before disassembling either the main wheel or the nose wheel completely deflate the tire, thus avoiding the possibility of bodily injury. Then break the tire beads away from the wheel flanges and remove the self locking nuts and washers from the wheel bolts. Separate the wheel halves and remove the tire.

Smooth wheel abrasions, nicks and burrs with a fine file and retouch with zinc chromate primer and aluminum lacquer to prevent corrosion. Replace any damaged wheel parts. Replace tire casings showing breaks, blisters, or excessive wear. Replace tubes as necessary.

When assembling the main wheel, torque the bolts to 140 inch pounds. The nose wheel bolts are torqued at 83 inch pounds. Torque the axle nut to 15 - 20 inch pounds while rotating the wheel to seat the bearings. Back off the nut and re-tighten with the fingers to remove end play. Using a wrench, tighten the nut to the next available cotter key position.

Beech Aircraft Corporation cannot recommend the use of recapped tires. The tires may pass the retraction test when first installed; however, recapped tires have a tendency to swell after use and may cause malfunction of the retract system or damage the landing gear doors.

BLEEDING THE BRAKE SYSTEM

Use only MIL-H-5606 hydraulic fluid in the brake lines and insure that no dirt or foreign matter is allowed to get in the brake system. Dirt can get under seals and cause leaks or clog the compensating valve and cause the brakes to lock.

Use either gravity flow or pressure bleeding to bleed

brakes. Using either method, the parking brake lever and toe brake pedals must both be fully released to open the compensating port in the brake master cylinders.

GRAVITY BLEEDING

The reservoir must be kept full during bleeding. The brake pedals should be operated slowly and smoothly to eliminate trapped air in the master cylinders. When no more air bubbles appear in the fluid drained from the bleeder plug, close the bleeder valve.

PRESSURE BLEEDING

Connect the hoses from a pressure pot to the bleeder fitting on the brake and bleed the system from the wheel cylinder up. Disconnect the fluid supply line at the reservoir, attach a hose to it and put the other end of the hose in a large, clean container. Using not more than 30 pounds pressure, bleed the system until all air bubbles are gone from the draining fluid. Pumping the brakes is not necessary.

BLEEDING DUAL BRAKE SYSTEM

In airplanes having the optional dual brake system, the copilot's brake system is bled by closing the valve on the pressure pot and pumping the copilot's brake pedal to change the shuttle valve position. This causes hydraulic fluid to be routed through the copilot's system and this system should be bled as was the pilot's system.

After the pilot's and copilot's brakes have been bled, close the bleeder valve and repeat for the other wheel.

PARKING BRAKE ADJUSTMENT

Put the parking brake control in the off position and check the parking brake valve to make sure it is in the off position. Loosen the locknut and screw and take up slack in the actuator wire. Tighten the screw and locknut down on the brake actuator wire. Pull the brake control to the on position and pump the brakes to see if the pedals are solid, if the brake pedals are not solid put the brakes in the off position and recheck the rigging.

ADJUSTING THE LINKAGE ON BRAKE MASTER CYLINDER

The proper linkage arrangment will adjust the brake pedals to a straight up-right position. This is considered the best adjustment since it will prevent the pedals from hitting the firewall in their extreme

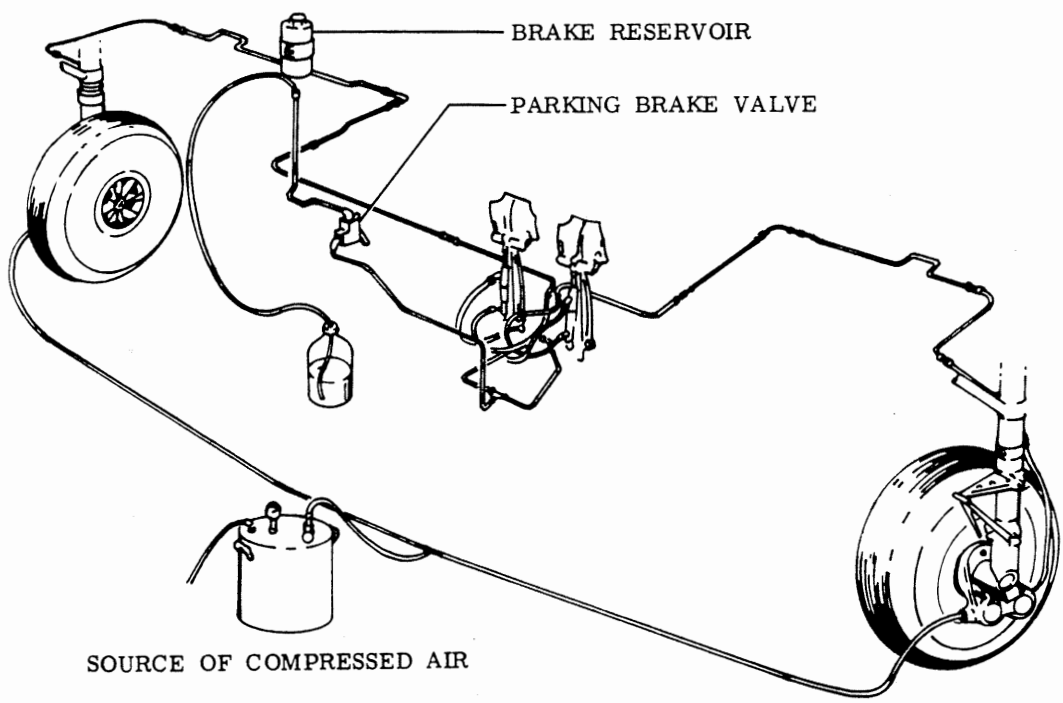
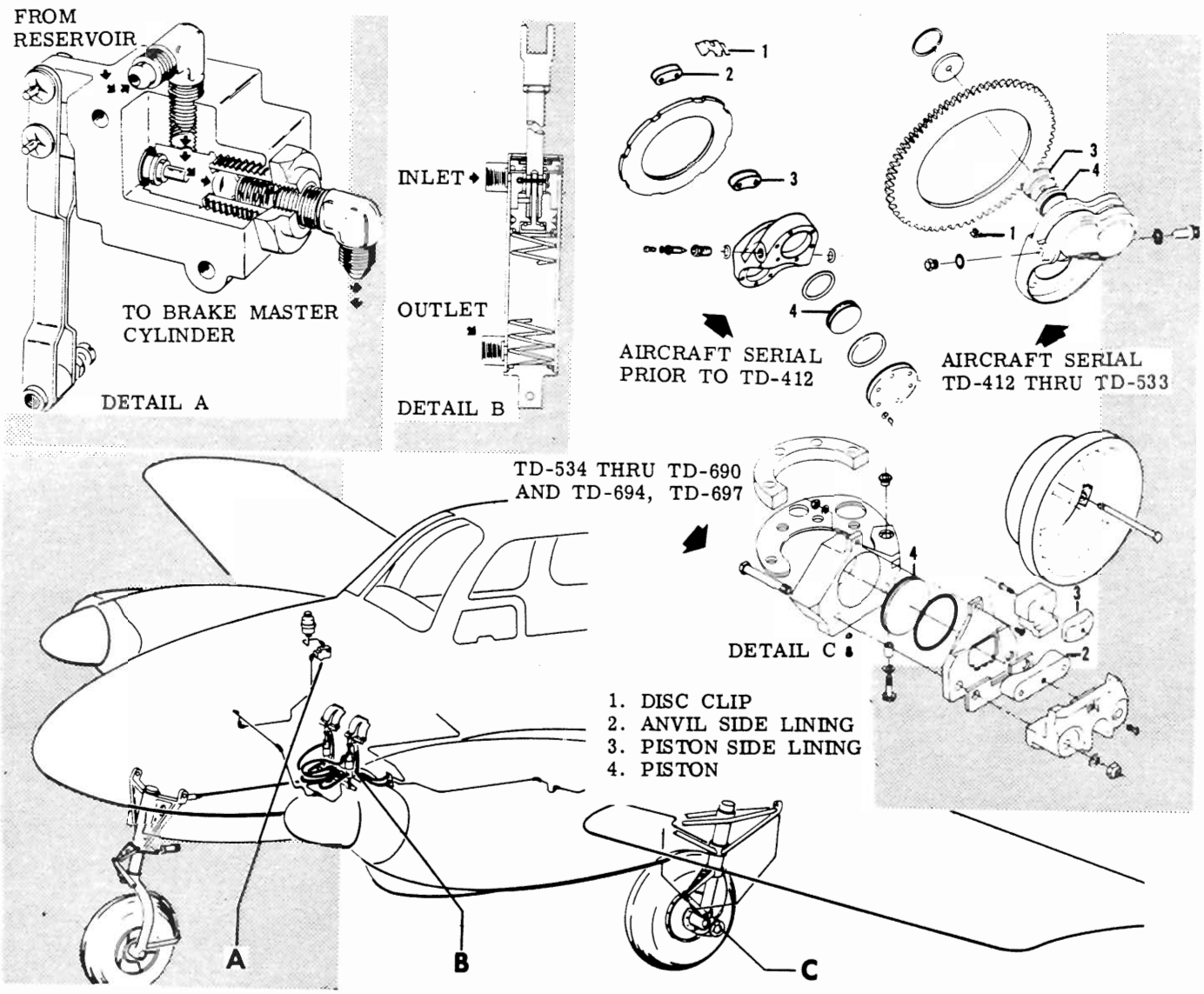


Figure 3-10. Bleeding The Brake System



TD-708 AND AFTER

TD-691 THRU TD-707 (EXCEPT TD-694, TD-697)

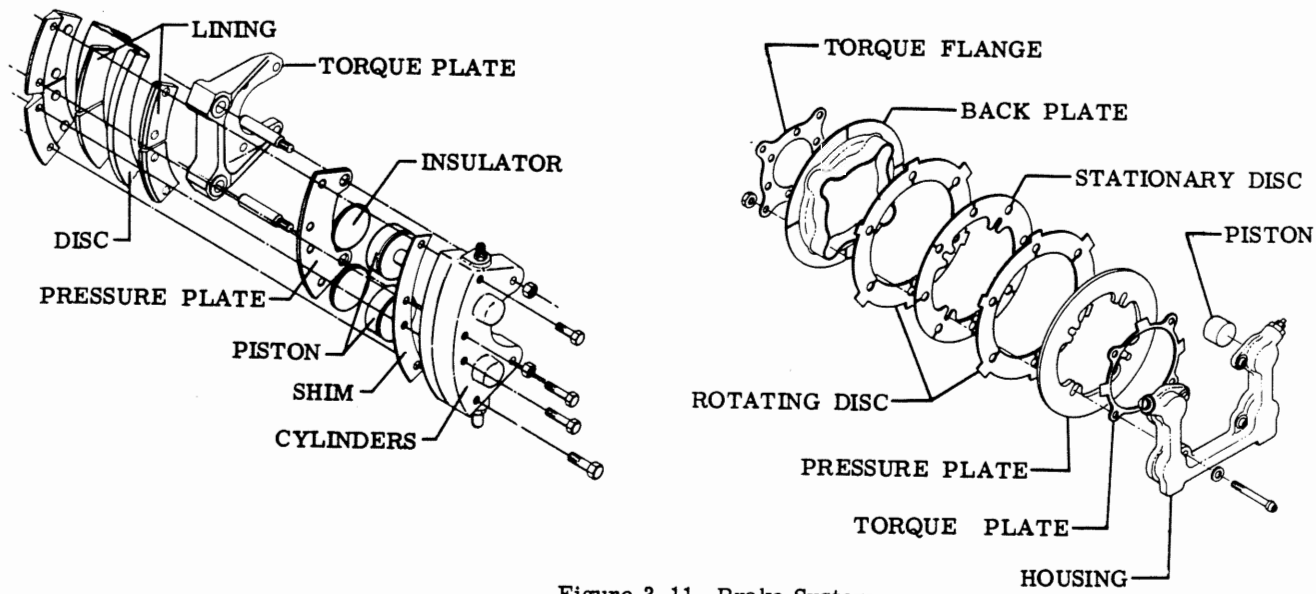


Figure 3-11. Brake System

On page 3-22 following the last line of the last paragraph under the heading "BRAKE WEAR LIMITS" add the following:

CLEVELAND BRAKE LINING REMOVAL

On all aircraft which have the CLEVELAND brake assembly, the lining, after extended use has a tendency to stick to the retaining plate. The locating pins for the lining section are peened into the retaining plate. (See figure 1.) It is not necessary to drill out these locating pins to remove the brake lining. To remove the lining apply a screwdriver or a similar prying tool between the retaining plate and the lining, the lining should then pop off. Replace the lining by fitting a new lining section over the locating pins in the retainer plate.

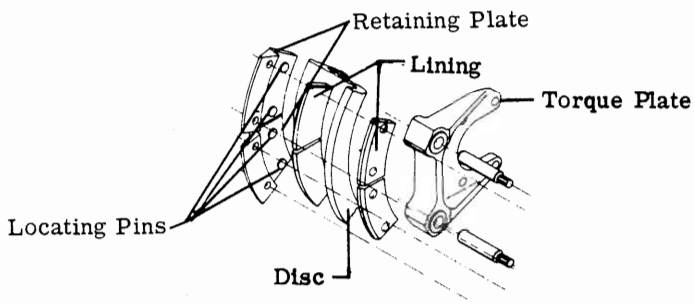


Figure 1.

forward position. Linkage adjustment is obtained by removing the clevis from the rudder pedal and turning the clevis on or off the piston rod as required. After both pistons are adjusted to the same length, tighten the jam nuts.

BRAKE WEAR LIMITS

On aircraft prior to Serial TD-412, the brake lining wear is indicated by the position of the steel brake disc on the steel drive keys. Replace the linings when the distance from the brake housing to the disc reaches 1/4 inch with brakes applied, and replace the steel brake disc when the thickness is .170 inch measured at the thinnest section. On airplanes TD-412 thru TD-533, replace linings when the distance from the outside edge of the brake housing to the outer edge of the disc reaches .250 inch with the brakes applied, and replace the steel brake disc when the thickness (.250 new) is .225 inch measured at the thinnest section or are dished or distorted. The brake disc and wheel half must be replaced when the distance between the disc teeth and wheel teeth reaches .040 inch.

NOTE

When replacing the brake linings, inspect the anvil lining that have the retaining rings installed for wear or damage.

On aircraft serials TD-534 thru TD-690 and TD-694 and TD-697, a clearance of 1/32 inch or less between the brake housing and the torque flange indicates the need for lining replacement. Anvil lining worn to 5/32 inch thick measured from the rubbing surface to the back at the lining center, should be replaced. Piston lining worn until it is 15/16 inch thick, when measured from the rubbing surface to the bottom of the metal support at the center, should be replaced.

On aircraft TD-691 thru TD-707 (except TD-694 and TD-697) multi-disc brakes are installed. Brake wear is determined by measuring the distance from the flat surface of the brake housing near the piston to the back of the pressure plate. The brake should be inspected when the distance is .350 inch or more. Replace the rotating discs when their thickness is .104 inch or less. Replace the stationary disc when worn to a thickness of .085 inch or less. Replace the piston if the diameter is worn to .990 inch or less. Replace the pressure plate if worn to .170 inch or less. On aircraft TD-708 and after, the brake linings should be replaced before the metal back plate is exposed through the abrasive surface. This can be checked visually without disassembly of the brake. The minimum allowable thickness for the abrasive surface is .010 inch. The brake disc should be replaced when its thickness measures .325 inch.

ASSIST STEP ADJUSTMENT (RETRACTABLE)

The assist step, when it is extended should be rigged to allow the two slide tube bumpers to clear the fuselage structure 1/16 to 1/8 inch, at station 151. The step adjustment is made in two places, on the nose wheel brace and if needed at station 151. The adjustment in the nose wheel well is made where the cable assembly is attached to the nose brace. This adjustment is made by removing the washers on the aft side of the brace and adding them to the forward side.

This adjustment will raise the step. The adjustment at station 151 should be made only if proper adjustment can not be made at the nose wheel brace. This adjustment is made by either lengthening or shortening the amount of cable housing that extends beyond the housing retaining nut. Lengthening the amount of housing extending beyond the retaining nut will raise the step.

ADJUSTMENT OF CABIN ENTRANCE DOOR

Several adjustments are available to assure proper closing and sealing of the door. If the door does not close tightly or permits air leaks when completely closed, loosen the four retaining screws and move the latch tongue guide outboard to create additional tension on the latch tongue.

Air leaks around the upper portion of the door may be caused by improper adjustment of the upper door latch. This may be corrected by removing the small upholstery panel above the door window and adjusting the length of the upper latch control cable. Shorten the cable sufficiently, by screwing it into the latch terminal, to properly seal the door.

If the door does not open freely, the main door latch may not be retracting enough. This can be corrected by removing the upholstery panel below the door window and shortening the length of the connecting tube assembly.

THE HEATER CONTROL SYSTEM

The heater control system is a simple one, consisting of two thermostats the duct thermostat and the heater overheat thermostat. The thermostat in the heater duct controls the duct temperature according to its setting, which is varied by the push-pull control (CABIN HEAT) in the subpanel. When the push-pull control is all the way out the heater will automatically shut off when the duct temperature reaches 180 degrees Fahrenheit. The further the control is pushed in the lower the temperature at which the heater will shut off. Controlling the temperature in the duct also controls cabin temperature. A blower control switch is installed on the left main panel on aircraft TD-638 and after.

The overheat thermostat is set to shut off the heater at 300 degrees Fahrenheit in case the duct thermostat malfunctions. As in other combustion heater installations, it is a normally-open thermoswitch which closes if an overheat condition develops. When closed, it shorts the heater power supply to ground, blowing a fuse and shutting down the heater. The

fuse can not be replaced in flight.

RIGGING THE HEATER CONTROLS

The cabin air control on the far left hand side of the subpanel controls the iris valve and the heater safety switch. Place the iris valve actuator as far to the right (facing forward) as possible. With the "CABIN AIR" control pushed in, attach the control wire to the iris valve actuator arm. The safety switch is positioned on the underside of the heater shelf in adjustable slots. Pull the "CABIN AIR" control to the half-on position and set the micro safety switch arm against the guide on the control cable in the actuated position, secure the micro switch in this position.

When disconnecting the iris valve control for adjustment purposes, position the control in either the full-open or full-closed position, so that it may be reinstalled without disturbing the adjustment of the safety switch.

The heater ductstat control located at the far right of the left hand subpanel controls the heater thermostat. With the "CABIN HEAT" control pushed in and the lug on the ductstat pushed to the far right (facing forward), push the control wire thru the lug and tighten the screw. Make sure the guide lug on the ductstat switch is in the straight upright position before securing the control wire on aircraft prior to Serial TD-453, and in the straight downward position on airplane Serial TD-453 and after.

OVERHEAT THERMOSTAT

The overheat thermostat is controlled by an adjusting screw on the bottom of the thermostat. A letter "H" with an arrow through it on the head of the switch indicates the direction the sleeve be turned to increase the temperature setting. One turn will change the temperature setting approximately 125 degrees Fahrenheit.

The overheat thermostat is set at the factory to operate at 300 degrees Fahrenheit and ordinarily will not need to be adjusted.

WARNING

Never set the thermostat for temperatures above 300 degrees Fahrenheit. The heater is not designed for higher temperatures and fire may result.

CLEANING HEATER SPARK PLUG

a. Remove the nose cone, to gain access to heater. Disconnect the high tension lead from the spark plug.

b. Remove the spark plug using a deep socket.

c. Before cleaning, examine the spark plug for evidence of cracked or broken porcelain, arcing or carbon tracks. If cracks are found in the porcelain, the plug should be discarded without further examination. Arcing or carbon tracks may be caused by shorting of the plug or by dirt on the spring connector. In either case the fault should be corrected before installing the plug in service or using a new plug.

d. Wipe out the inside of the heater with a clean cloth dampened with solvent, to remove any grease or carbon deposits.

e. Clean the spark plug by sand blasting.

NOTE

Cover the spark plug hole with a stopper or cap to prevent dirt or sand from lodging there during the cleaning.

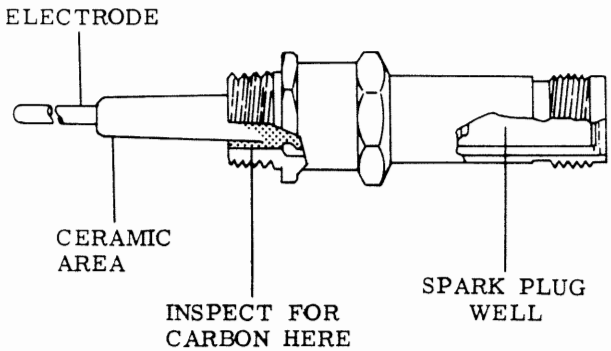


Figure 3-12. Aircraft Heater Spark Plug

HEATER SPARK PLUG GAP

Heater spark plug gap should be set from 0.312 to 0.250 inches. The gap is determined by measuring the distance between the spark plug electrode and the ground electrode. The gap may be adjusted by adding or removing shims under the electrodes until the desired distance is obtained.

REMOVING AND INSTALLING THE CABIN HEATER IGNITION UNIT

To remove the heater ignition unit, disconnect the wiring at the electrical plug, disconnect the ignition lead, remove the ignition unit attaching screws and remove the unit. Reinstall the ignition unit by reversing the removal procedure.

HEATER IGNITOR POINTS

Two sets of heater ignition points are installed in the vibrator of the heater ignition unit. The primary set of ignitor points has a service life of 1000 hours, (heater operation). At this time, on Aircraft TD-534 thru TD-707, the alternate set of points should be

b. Severe overheating will result in general weakening of the metal that results in soft and spongy spots. These are usually found directly opposite the cross-over passages. They can be detected by tapping lightly with a ball peen hammer. This will give a slightly soft or spongy response in contrast to a solid feel when tapping on live metal. These soft spots will usually have a dull gray appearance indicating considerable surface oxidation. The presence of soft spots is reason for rejecting the combustion chamber and radiator assembly.

CAUTION

If any soft spots are located in the combustion chamber and radiator assembly, there is a malfunction in the heater system and a new heater should not be installed until the trouble has been corrected.

HEATER OVERHAUL

The heater should be pressure tested every 500 hours of heater operation or 1000 hours of aircraft operation and overhauled every 1500 hours of heater operation or 3000 hours of aircraft operation.

HEATER PRESSURE TEST

The following information is intended to serve as a guide for testing Janitrol heaters without removal from the aircraft. This test will determine whether leakage through the combustion chamber is within the allowable limits or if the heater should be overhauled.

To conduct this test, seal the fuel inlet, the combustion air inlet and the exhaust opening. Connect an air line to the heater drain connection. This air line should have two shutoff valves in series to assure positive air shutoff and a 20 inch mercury manometer (or an accurate pressure gage) located between the shutoff valves and the heater. Slowly apply air pressure till the gage has a reading of 7 psi or 14.25 inches of mercury, then lock in the air pressure by closing both shutoff valves. The maximum allowable pressure drop of 2.5 psi or 5.1 inches of mercury represents normal leakage at fittings and gaskets. If the pressure drop is in excess, the heater should be overhauled.

CLEANING THE STATIC AIR SYSTEM

Blow low pressure air through the lines from the disconnected line at the air-speed indicator to the static ports. Cover each static port separately when blowing to insure that each line is clear. Instrument error or possible damage could result if even one port is clogged with dirt or foreign matter.

CAUTION

Never blow air through the line toward the instrument panel; to do so will seriously damage the instruments. When blowing back through the line from the instrument panel, make sure that no air is blown into the instruments.

NOTE

Wax or polish applied to the static air buttons can cause wrong instrument readings. The static air buttons should be cleaned periodically with a cleansing solution to insure that no film exists on the static air buttons.

Drain the static air line by opening the access door in the rear baggage compartment and removing the section of rubber hose. Disconnect the line at the airspeed indicator and blow this line clear.

On aircraft serials TD-638 and after, the system is drained at the emergency static air source located on the left wall of the cockpit, below the instrument panel. The system is drained by turning the knob to the emergency static air position. Return the knob to the normal position after the line is competely drained. Frequent draining of the static air line is recommended when the humidity is high or when heavy moisture (dew, rain or wash down) is encountered.

TESTING THE PITOT SYSTEM FOR LEAKS

A functional test of the pitot system can be made by using an observer in the cabin to watch the airspeed indicator while air pressure is built up artificially by using a section of soft rubber tubing as follows:

a. Clamp the rubber tubing over the pitot head inlet, making certain that the connection is airtight.

b. Crimp the end of the tubing and slowly roll it up until the airspeed indicator registers approximately 100 miles per hour.

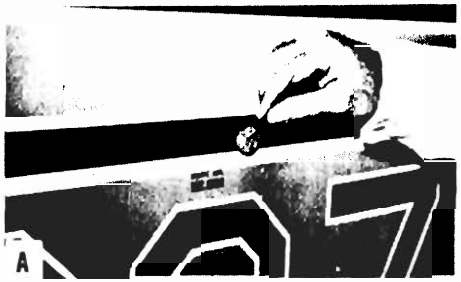
CAUTION

To avoid rupturing the diaphragm of the airspeed indicator, roll up the rubber tubing slowly and do not build up excessive pressure in the line.

c. Secure the rolled up tubing so that it will hold the airspeed indicator reading.

d. If there is no decline in the reading after several minutes, there is no leak in the pitot system.

e. If a decline in the reading of the airspeed indicator is observed, check the pitot system plumbing for leaky hoses and loose connections.



STATIC BUTTON

STATIC LINE DRAIN

EMERGENCY STATIC AIR SOURCE AND DRAIN

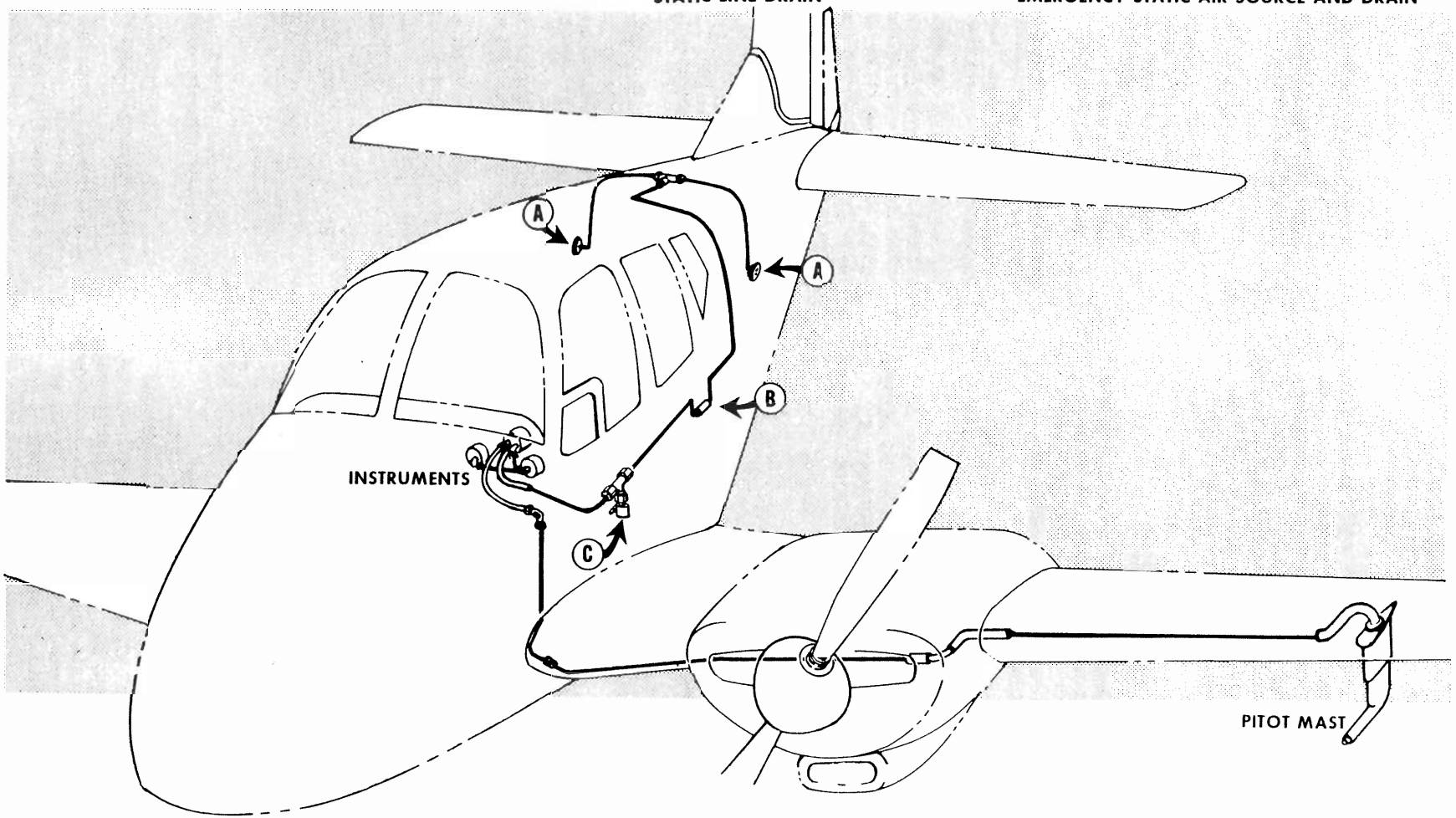


Figure 3-15. Pitot and Static System

CAUTION

Release the air pressure slowly by unrolling the rubber tubing; a sudden release of the air pressure may damage the airspeed indicator.

INSPECTING THE PITOT SYSTEM HOSE

After the pitot system is checked for leaks, inspect the hose sections for signs of deterioration. Remove the pitot mast to inspect the hose attaching to it and tip the instrument panel to inspect the hose section attaching to the airspeed indicator. Hoses with outer surfaces checked or cracked, particularly at the bends or connecting points, or which have become hard, should be replaced. Replace the defective hose with hose that corresponds to Military Specification MIL-H-5593. When a new hose is installed, recheck the pitot system for leaks using the procedure described previously.

INSPECTING THE STATIC AIR SYSTEM

The static air system should be inspected at the same time as the pitot system is inspected, as follows:

Check the rubber hoses connecting the static air line to the instrument plumbing and the rubber hose which forms the static air line drain (prior to TD-638) accessible through the inspection opening in the left side of the baggage compartment. Hoses with outer surfaces checked or cracked, particularly at the bends or connecting points, or which have become hard, should be replaced. Replace defective hose with hose meeting the specifications described above in the pitot system.

Remove one end of the hose which forms the static air line drain and permit the system to drain. Frequent draining of the static air line is recommended when humidity is high or when heavy dews are experienced. Also, the line should be drained each time the airplane is flown through heavy rain or washed down.

ADJUSTING THE VACUUM SYSTEM (Prior to TD-534)

To adjust the vacuum system; on aircraft prior to TD-534.

a. Start only one engine and set the throttle to obtain 2200 RPM.

b. Position the vacuum selector valve to the operating engine and check the vacuum gage reading for 5 inches of mercury. If the gage does not indicate 5 inches:

1. Tape the air intake screen on the bottom of the central suction relief valve.

2. With the right engine running at 2200 RPM, adjust the suction relief valve in the right nacelle to obtain a gage reading of 5 inches of mercury. Loosen the locknut and turn the adjusting screw clockwise to increase suction or counterclockwise to decrease suction.

NOTE

If a reading of 5 inches of mercury has been obtained on one instrument and the other does not agree, check the lines of the one not agreeing for foreign matter.

c. Stop the engine and repeat steps a. and b. with the opposite engine running.

d. After both suction relief valves have been individually adjusted to obtain 5 inches of mercury, remove the tape from the central relief valve.

e. Start both engines and set throttles to obtain 2200 RPM. Then adjust the central suction relief valve just forward of the instrument panel to obtain a gage reading of 5 inches of mercury.

ADJUSTING THE VACUUM SYSTEM (TD-534 thru TD-707)

To adjust the vacuum system on aircraft serials TD-534 Thru TD-707.

a. Start only one engine and set the throttle to obtain 2200 rpm.

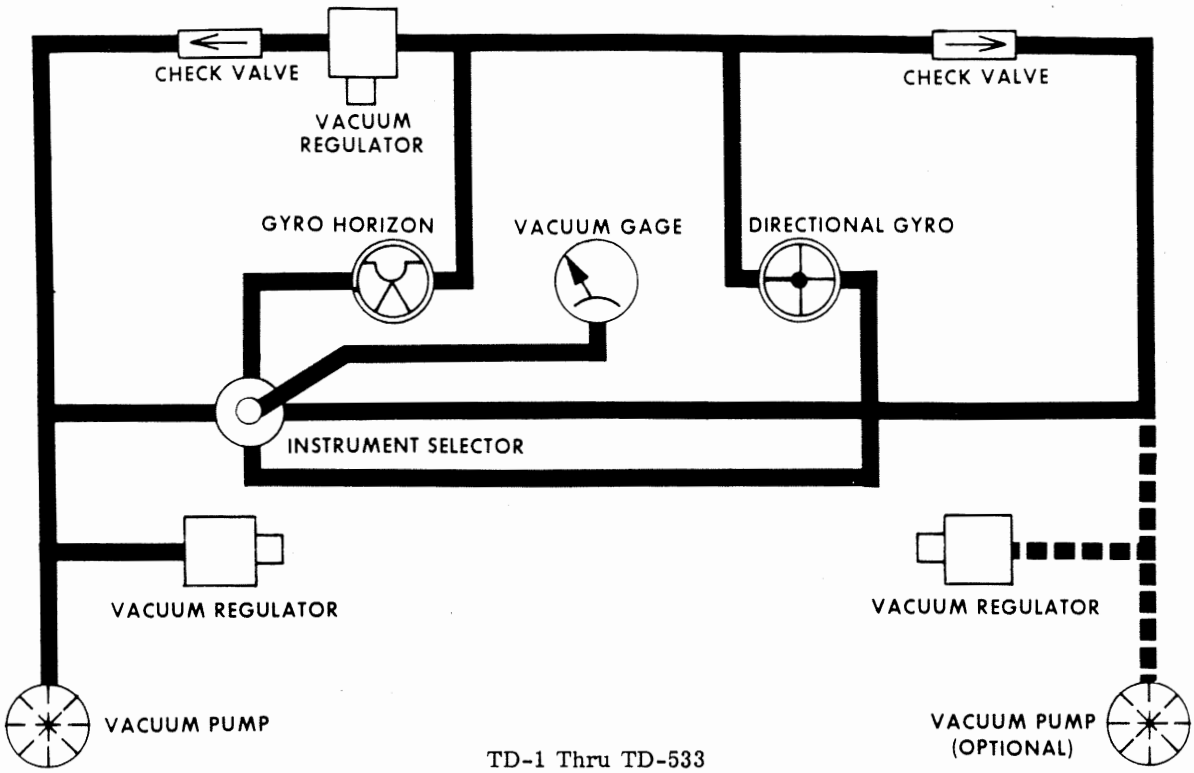
b. Adjust the appropriate vacuum regulator behind the instrument panel to obtain a gage reading of 4.8 to 4.9 inches of mercury. Shut down the engine.

c. Repeat steps a. and b. with the opposite engine running.

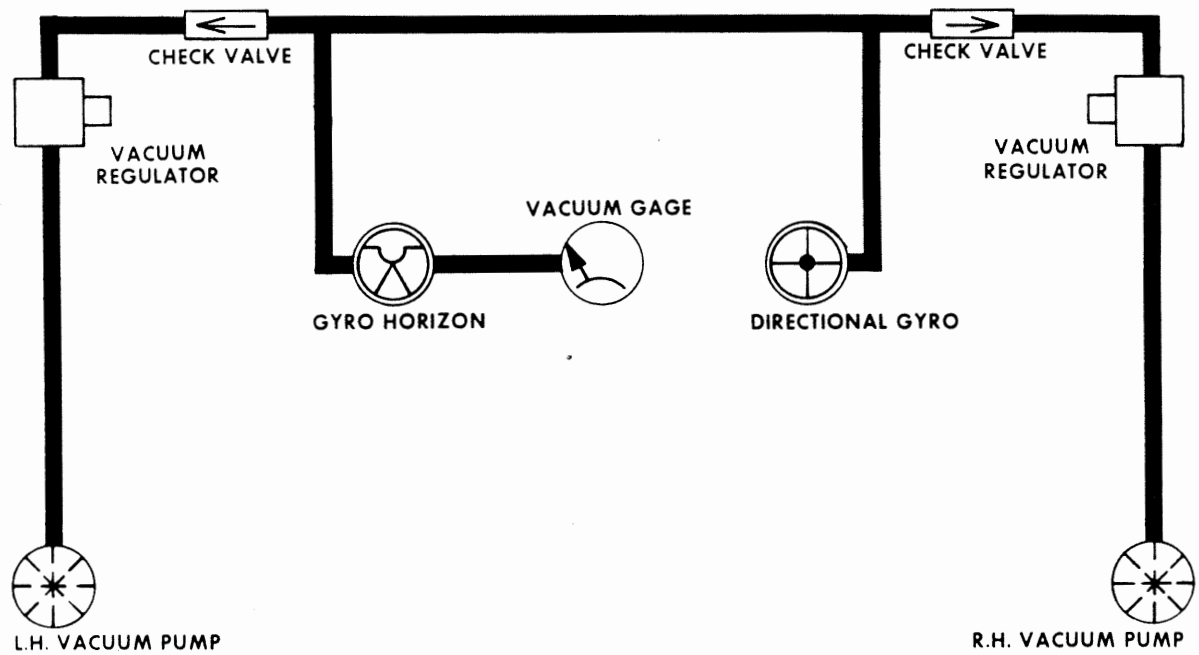
d. After both vacuum regulators have been individually adjusted, start both engines and set the throttles to obtain 2200 rpm. The gage reading should then read between 5.0 and 5.2 inches of mercury. If the reading is over 5.25, or goes over 5.25 during maximum power operation, reduce both regulators slightly to reduce the total to within limits.

PRESSURE SYSTEM (TD-708 and after)

The pressure system on aircraft serials TD-708 and after provides air for deicer and instrument operation. Air pressure is derived from two engine-driven dry air pumps. Air pressure from the pumps is regulated by a pressure relief valve located in each nacelle. The air is then filtered and directed to a manifold, which distributes the air to the instrument panel and deice system (if installed). System pressure is indicated by a gage on the instrument panel.



TD-1 Thru TD-533



(TD-534 Thru TD-670)

Figure 3-16. Vacuum System

Insert opposite Page 3-31. Amendment II

This information supersedes the pneumatic pressure system adjustment described on Page 3-30, 3-31 and 3-32.

PNEUMATIC PRESSURE SYSTEM
(TD-708 and after)

The pressure system provides filtered air for pressure-operated instruments, deice boots, and autopilot (if installed). The components that require adjustment in this system are the pressure regulator relief valves and the gyro instrument adjustable orifice.

NOTE

The foam rubber filter on the intake side of the pressure pump, located forward of the rear engine baffle, should be removed and cleaned every 100 hours of operation (or sooner if conditions warrant). The sealed filter on the side of the pressure pump, located in the center of each nacelle, under the upper nacelle access door, should be replaced every 500 hours of operation (or sooner if operating in dusty conditions).

BASIC PRESSURE SYSTEM (Instruments only)

The basic pressure system may be adjusted by the following procedure:

a. Locate the pressure regulator relief valve on the RH side of each nacelle, aft of the firewall.
b. Tee in a test gage (0-10 psi) on the "out" side of the regulator relief valve.
c. Loosen the check nut and rotate the adjusting screw clockwise to increase the pressure and counterclockwise to decrease the pressure to obtain a reading of 6.0 psi with the engine operating at 2200 rpm.
d. Tighten the check nut and remove the test gage.
e. Repeat the above procedure on the opposite side of the aircraft.
f. Locate the gyro instrument adjustable orifice on the LH side of the aircraft, forward of the instrument panel, near the top of the upholstery panel. (See Figure 1.)
g. Loosen the check nut and rotate the orifice body counterclockwise to increase the pressure and clockwise to decrease the pressure to obtain a reading of 2.5 + .5 - 0 inches of Hg. on the gyro pressure indicator with the engine operating between 600 and 650 rpm.
h. Tighten the check nut and recheck the gyro pressure indicator to read in the green arc with the engines operating at 2200 rpm.

BASIC PRESSURE SYSTEM PLUS B5P AUTOPILOT INSTALLATION

This pressure system may be adjusted by the following procedure:

a. Locate the regulator relief valves in the RH side of each nacelle, aft of the firewall.
b. Tee in a test gage (0-10 psi) on the "out" side of the regulator.
c. Loosen the check nut and turn the adjusting screw clockwise to increase the pressure and counterclockwise to decrease the pressure to give a reading of 4.5 + .5 - 0 psig with the engine operating at 2200 rpm and the autopilot ON.
d. Tighten the check nut.
e. Repeat the above procedure on the opposite side of the aircraft.
f. Locate the gyro instrument adjustable orifice (see Figure 1) on the LH side of the aircraft, forward of the instrument panel, near the top of the upholstery panel.
g. Loosen the check nut and rotate the orifice body counterclockwise to increase the pressure and clockwise to decrease the pressure to obtain a reading of 2.5 + .5 - 0 inches of Hg. on the gyro pressure indicator with the engine operating between 600 and 650 rpm.
h. Tighten the check nut and recheck the gyro pressure indicator to read in the green arc with the engine operating at 2200 rpm.

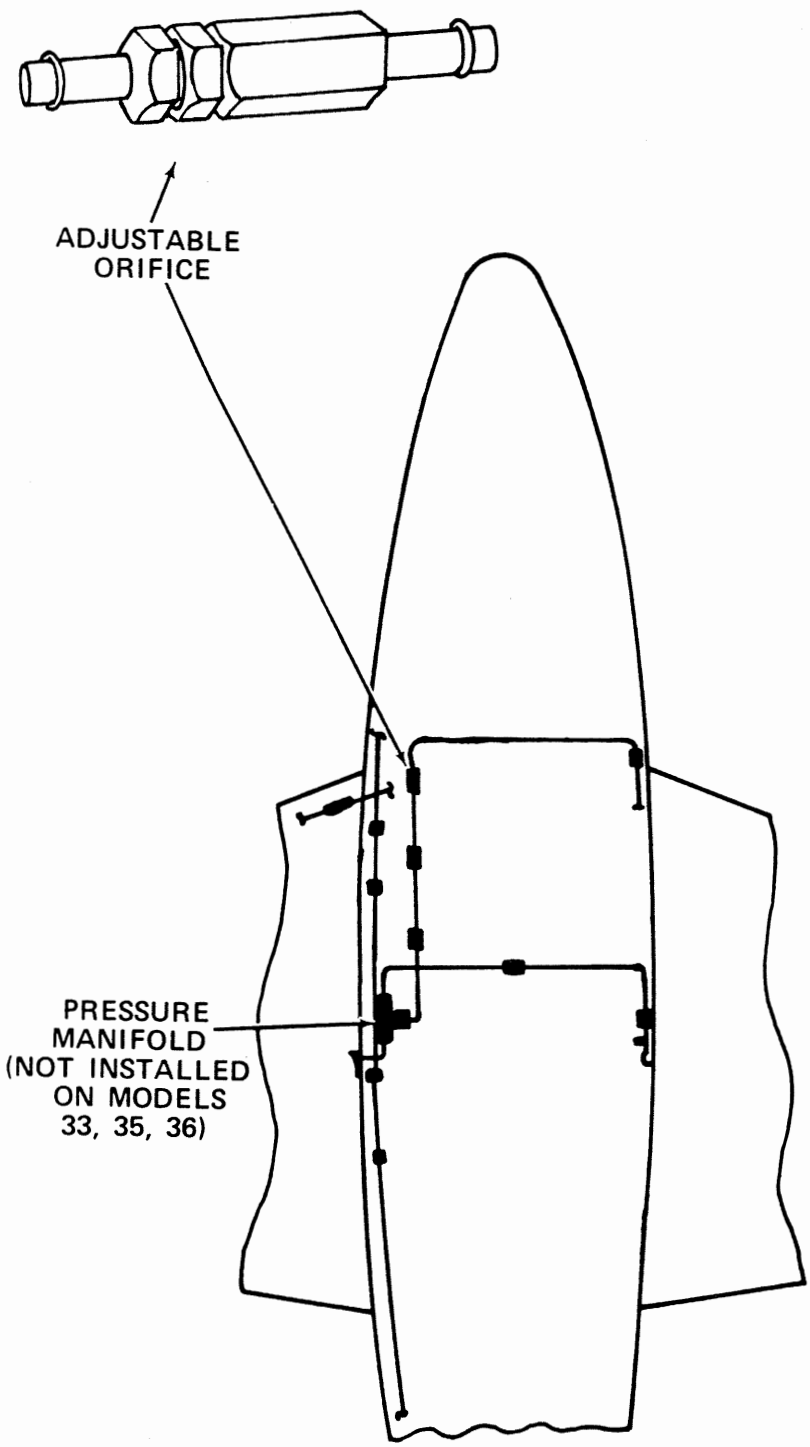

ADJUSTABLE
ORIFICE
PRESSURE
MANIFOLD
(NOT INSTALLED
ON MODELS
33, 35, 36)

Figure 1

BASIC PRESSURE SYSTEM PLUS DEICER INSTALLATION

This pressure system may be adjusted by the following procedure:

a. Locate the two-stage pressure regulator in the RH side of each nacelle, aft of the firewall.
b. Loosen the check nut on the low pressure section of the regulator (section with the solenoid attached), and rotate the adjusting screw clockwise to increase the pressure and counterclockwise to decrease the pressure to obtain a reading of 7.5 ± .5 psi on the pneumatic pressure gage with the engine operating at 2200 rpm and the deicer OFF.
c. Tighten the check nut on the low pressure section of the regulator.
d. Loosen the check nut on the high pressure section of the regulator (section without the solenoid) and rotate the adjusting screw clockwise to increase the pressure and counterclockwise to decrease the pressure to obtain a pressure between 16 to 19 psi on the pneumatic pressure gage with the engine operating at 2200 rpm and the deicer ON.
e. Tighten the check nut on the high pressure side of the regulator.
f. Repeat the above procedure on the opposite side of the aircraft.
g. Locate the gyro instrument adjustable orifice (see Figure 1) on the LH side of the aircraft, forward of the instrument panel, near the top of the upholstery panel.
h. Loosen the check nut and rotate the orifice body counterclockwise to increase the pressure and clockwise to decrease the pressure to obtain a reading of 2.5 + .5 - 0 inches of Hg. on the gyro pressure indicator with the engine operating between 600 and 650 rpm.
i. Tighten the check nut and recheck the gyro pressure indicator to read in the green arc with the engine operating at 2200 rpm.

BASIC PRESSURE SYSTEM PLUS DEICER AND B5P AUTOPILOT INSTALLATION

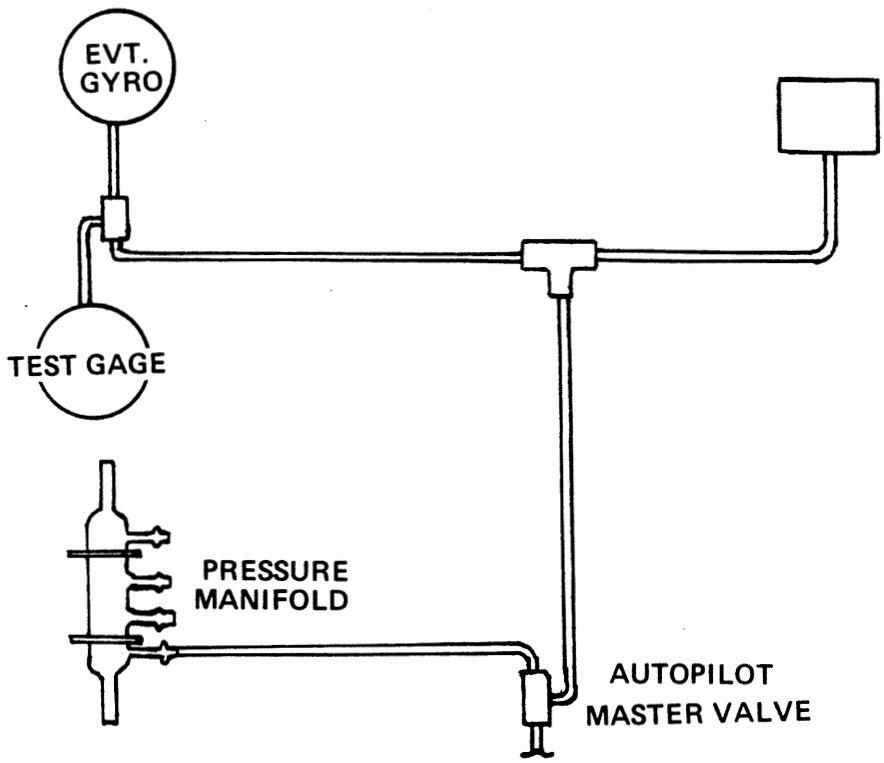
This system may be adjusted by the following procedure:

a. Locate the two-stage pressure regulator in the RH side of each nacelle aft of the firewall.
b. Loosen the check nut on the low pressure section of the regulator (section with the solenoid attached), and rotate the adjusting screw clockwise to obtain a reading of 7.5 ± .5 psi on the pneumatic pressure gage with the engine operating at 2200 rpm and the deicer OFF.
c. Tighten the check nut on the low pressure section of the regulator.
d. Loosen the check nut on the high pressure section of the regulator (section without the solenoid) and rotate the adjusting screw clockwise to increase the pressure and counterclockwise to decrease the pressure to obtain a pressure between 16 to 19 psi on the pneumatic pressure gage with the engine operating at 2200 rpm and the deicer ON.
e. Tighten the check nut on the high pressure side of the regulator.
f. Repeat the above procedure on the opposite side of the aircraft.
g. Locate the gyro instrument adjustable orifice (see Figure 1) on the LH side of the aircraft, forward of the instrument panel, near the top of the upholstery panel.
h. Loosen the check nut and rotate the orifice body counterclockwise to increase the pressure and clockwise to decrease the pressure to obtain a reading of 2.5 + .5 - 0 inches of Hg. on the gyro pressure indicator with the engines operating between 600 and 650 rpm.
i. Tighten the check nut and recheck the gyro pressure indicator to read in the green arc with the engines operating at 2200 rpm.
j. Locate the B5P regulator in the nose baggage compartment.
k. Tee a test gage (0-10 psi) into the pressure line entering the EVT gyro (Turn Coordinator of the B5P installation). (See the B5P Autopilot Schematic Figure 2).
l. Loosen the check nut and adjust the regulator by turning the adjusting screw clockwise to increase pressure and counterclockwise to decrease pressure to give a reading of 4.5 + .5 - 0 with the LH engine operating at 2200 rpm autopilot ON.
m. Tighten the check nut and remove the test gage.

TURN AND SLIP ADJUSTABLE ORIFICE

A turn and slip adjustable orifice is installed for each pressure-driven turn and slip indicator. The orifice is located on the turn and slip indicator forward of the instrument panel. The orifice may be adjusted as follows:

a. Remove the glareshield and/or radio panel to provide access to the back side of the turn and slip indicator.
b. Remove the plug on the upper side of the orifice and install a test gage (0-5 inches Hg.).
c. Loosen the check nut and adjust the turn and slip orifice to 2.2 inches of Hg. with the engines operating at 2200 rpm. Rotate the adjusting screw counterclockwise to increase the pressure and clockwise to decrease the pressure.
d. Tighten the check nut, remove the test gage and reinstall the plug in the orifice.
e. Reinstall the glareshield and/or radio panel.



B-5P Autopilot Schematic

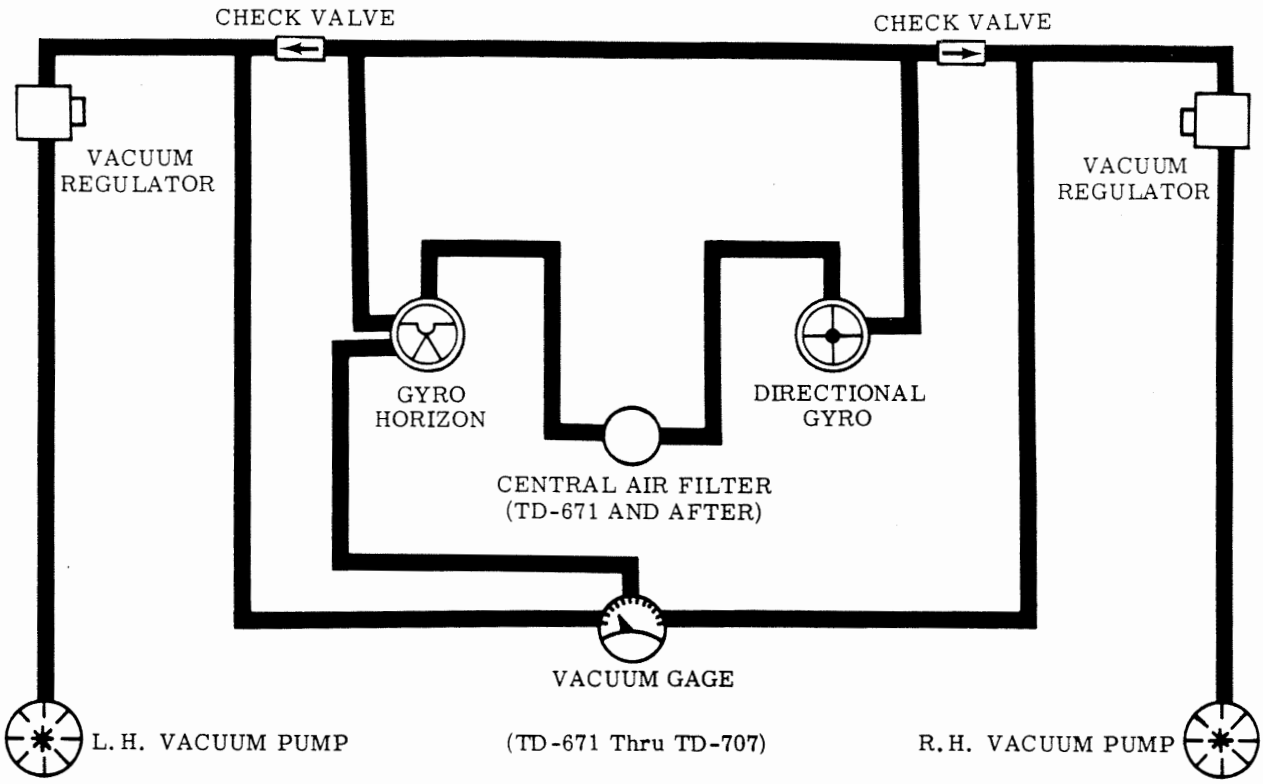


Figure 3-17. Vacuum System and Central Air Filter

ADJUSTING THE PRESSURE SYSTEM (TD-708 and after)

a. Start only one engine and set the throttle to obtain 2200 rpm.

b. Adjust the pressure regulator in the appropriate nacelle to obtain a gage reading of 3.5 to 4.5 pressure. Shut down engine.

c. Repeat steps a and b with the opposite engine.

d. After both regulators have been individually adjusted, start both engines and set the throttles at 2200 rpm. The pressure gage should read between 3.5 to 4.5.

CLEANING THE SUCTION RELIEF VALVE SCREEN

How often the screens are cleaned depends on the conditions under which the airplane is flown. Should the valves need adjusting, especially to lower the vacuum, the screen should be cleaned and the setting rechecked before readjusting. The screen should be washed in Stoddard solvent, or a similar cleaner, then blown dry with high pressure air.

REPLACING GYRO INSTRUMENT AIR FILTERS

The replacement of the air filter in the gyro instruments may be accomplished without removing the instrument from the airplane. The frequency of cleaning or replacing the air filters will depend upon service conditions; however, they should be checked approximately every 100 hours of operation. It should be borne in mind when operating in localities where there is an excessive amount of sand or dust in the air, that the filter should be inspected, and if necessary, replaced at more frequent intervals. Under extremely dusty conditions, it may be necessary to inspect the filter daily. A clogged filter reduces air flow and slows up the rotor, causing a loss of gyroscopic inertia and improper gyro indication.

To replace the filter assembly on the instrument, remove the air filter body-cover by taking out the four fillister-head machine screws. Lift out the snap ring which holds the filter in place, remove the filter, and replace it with a new one. Replace the air filter body-cover and gasket, securing them with screws. If the air filter body-cover is not used, the filter may be removed by lifting the snap ring past the four protective lugs.

Aircraft serials TD-671 thru TD-707 have a central air filter installed behind the instrument panel. The filter (two filters are used with dual instruments), should be replaced every 500 hours or less if operating in heavy smoke or dust conditions. Aircraft TD-708 and after have an air filter located in each nacelle. This filter should be replaced every 500 hours as noted above. An additional air filter is

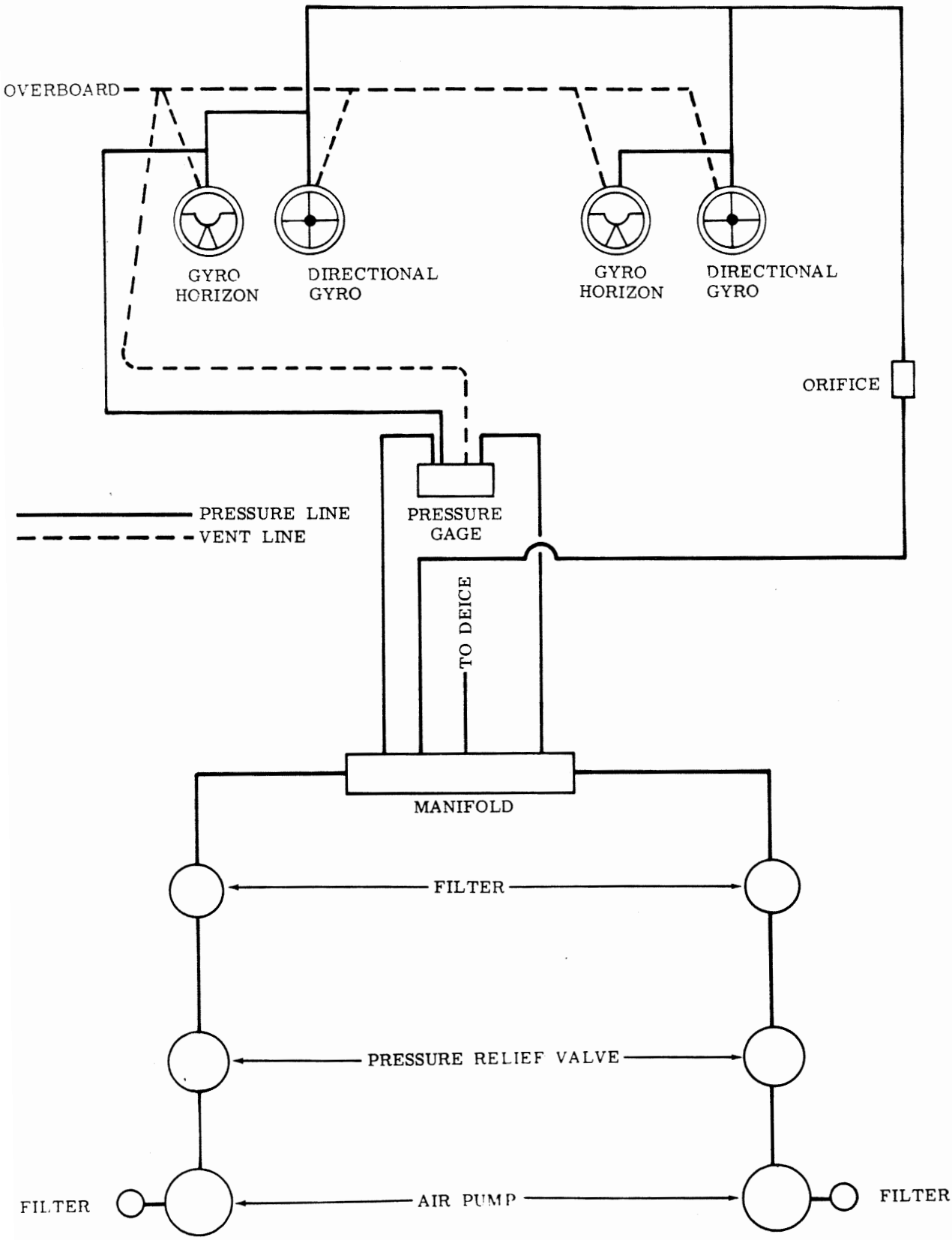


Figure 3-18. Pressure System (TD-708 And After)

installed on the firewall to provide the intake side of the dry air pump with dry, ambient air. At approximately 100 hours, the filter should be removed, cleaned with solvent and blown dry with air pressure.

STALL WARNING SYSTEM ADJUSTMENTS

The stall warning switch is carefully adjusted when the airplane is test flown at the factory. Should it require readjusting, proceed as follows: Locate the switch installation on the under surface of the left wing and loosen the two Phillips-head screws, one on either side of the vane. If the stall warning has been coming on too early, pull the vane back and down. If the stall warning has been coming on too late, push the vane up and forward. Moving the vane with the Phillips-head screws loosened moves the entire unit up or down inside the wing causing the switch to be closed earlier or later. Retighten the screws after making each adjustment. NEVER TRY TO ADJUST THE SWITCH BY BENDING THE VANE.

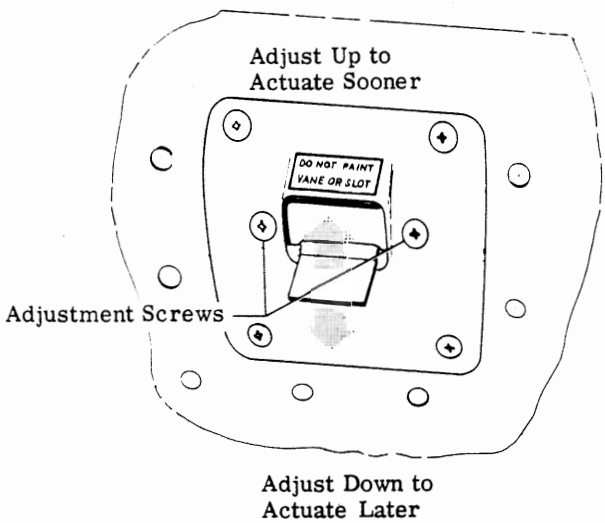


Figure 3-19. Stall Warning Adjustment

As a rule of thumb, moving the vane 1/4 inch will change the time the stall warning actuates by about 5 mph of indicated airspeed. The only way to test the accuracy of the setting is to fly the airplane into a stall, noting the speed at which the warning horn and light come on and the speed at which the full stall occurs. The stall should be made with the flaps and gear up and power off. Prior to stalling decelerate no faster than one mph per second. It may be necessary to make several alternate adjustments and test flights before the desired setting can be reached. The stall warning should actuate, ideally, at 7 to 9 mph ahead of the complete stall, although from 5 to 10 mph ahead of the complete stall will meet FAA requirements. The switch setting should be checked and adjusted as necessary whenever a wing or wing leading edge is replaced or extensively repaired, or if a new switch is installed. The switch should require no adjustment in normal service.

MAGNETO TIMING

Remove the top spark plug from the No. 1 cylinder. Place the thumb of one hand over the spark plug hole and rotate the crankshaft in direction of normal rotation until the compression stroke is reached. The compression stroke is indicated by a positive pressure inside the cylinder tending to lift the thumb off the spark plug hole. In this position both valves of No. 1 cylinder are closed.

Rotate the crankshaft opposite to its normal direction of rotation until it is approximately 35° before top center of the compression stroke of No. 1 cylinder.

Having determined that the engine is beginning the compression stroke on No. 1 cylinder, continue to rotate the crankshaft in its normal direction of rotation until the 25° advance timing mark on the front (propeller) face of the starter ring gear is in exact alignment with the small hole located at the two o'clock position on the front face of the starter housing.

NOTE

With the engine cowling removed, the crankshaft can be aligned in the correct firing position for No. 1 cylinder by means of the advance timing marks on the rear face of the starter ring gear. This is done by attaching an ignition timing pointer to the ring gear with the pointer accurately lined up with the timing mark on the rear face of the gear. The crankshaft is then rotated in its normal direction of rotation until the pointer is in alignment with the crankcase parting line.

With the magneto gear assembled on the right magneto, remove the inspection plug in the magneto cover and turn the magneto gear until the chamfered tooth on the distributor gear inside the magneto aligns with the white pointer as seen through the opening.

Without allowing the gear to turn from this position, assemble the magneto with gasket on the engine. Secure magneto in place with washers and nuts; tighten nuts only finger tight.

Fasten ground wire of electric timing light to any unpainted metallic portion of the engine, and one of the positive wires of the timing light to a suitable terminal connected to the ground terminal connection of the right magneto. Then turn the engine crankshaft several degrees from the 25° BTC in direction opposite to that of normal rotation.

Turn on the switch of the timing light. The light should be lit. Turn the crankshaft very slowly in direction of normal rotation until the mark on the

starter ring gear aligns with the hole in the starter housing, at which point the light should dim (or go out, on battery-powered timing lights). If not, turn the magneto in its mounting flange slots and repeat the procedure until the light dims at 25° before top dead center. Tighten the two mounting nuts and replace magneto inspection plug.

NOTE

On airplane Serial TD-127, TD-444, TD-453 and after, repeat the above procedure for timing the right magneto to time the left magneto. On airplanes prior to Serial TD-453, except TD-127 and TD-444, proceed to time the left magneto using the following procedure.

Install magneto impulse coupling adapter with gasket on left magneto mounting pad of the accessory housing.

NOTE

The impulse coupling magneto can be used only on the left side of the engine, when viewed from the rear, or accessory housing, end.

Remove inspection plug and turn magneto drive coupling until the white beveled tooth on the magneto gear aligns with the pointer.

NOTE

In order to turn the shaft on the impulse coupling magneto, depress the pawl on the impulse coupling with the finger.

Place magneto gasket over mounting studs and secure left magneto in place with washers and nuts; tighten nuts only finger tight.

Connect the other positive wire of the timing light to a suitable terminal connected to the ground terminal connection of the left magneto and time the magneto in the same manner as described for the right magneto.

NOTE

The crankshaft should not be rotated more than 35° in direction opposite normal rotation, as the pawl on the impulse coupling will engage with the stop pin and late timing will be indicated through the impulse coupling mechanism. If this should happen, rotate engine in normal direction until sharp click is heard, which will indicate that impulse coupling has passed through firing position; then turn crankshaft in direction opposite normal rotation to approximately 35° before top center and proceed with timing check.

After both magnetos have been timed, leave the timing light wires connected and recheck magneto timing as previously described to make sure that both magnetos are set to fire together. If timing is correct, both timing lights will dim simultaneously when the advance timing marks on the front of the engine are in exact alignment. If the breaker points open too early, loosen the mounting nuts and rotate the magneto clockwise. If the breaker points open too late, rotate the magneto counterclockwise.

After magnetos have been properly timed, clean the breaker points to remove any trace of oil or dirt. Replace the breaker cover, the lock and the retaining screws together with the lockwire.

The breaker point clearance for the S-200 magneto is .018 ± .006. If the points are burned or worn excessively, do not try to redress the contact surfaces. Install a complete new breaker assembly if the points are found to be in an unsatisfactory condition. Wipe the breaker compartment free of any oil or dirt with a clean cloth. The point clearance and condition should be checked every 100 hours.

Any time the magneto harness cable outlet plate is removed, check the height of all distributor block contact springs using a flush pin gage. This dimension is determined by measuring from the top of the block outlet tower down to the top of the spring (see illustration). The measurement should not exceed

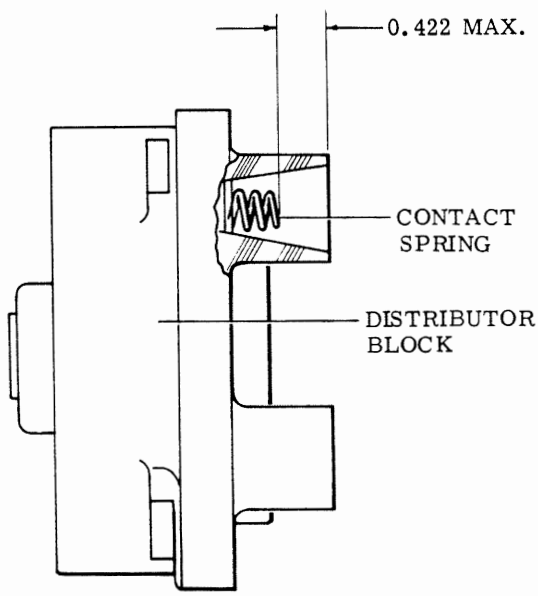


Figure 3-20. Magneto Spring Height

.422 inch. If the measurement is in excess, the spring should be replaced. Be certain the bottom coils of the spring are not forced down into the recess of the distributor block.

PARALLELING RELAY (Generator)

When accessory loads make it necessary to use two

generators in the electrical charging system of twin engine aircraft and when they charge into a single battery, a paralleling generator regulator system is necessary for proper operation of the charging system. An external two unit paralleling relay also provides for separate operation of either generator, should the other become inoperative. There is no adjustment to the paralleling relay, their operation is adjusted by the shunt paralleling coil located on the voltage regulator unit.

ADJUSTING THE VOLTAGE REGULATOR (Generator)

Before any adjustment of the voltage regulator can be made, it must be at operating temperature. To adjust the voltage regulator a fixed resistance is substituted for the external charging circuit by disconnecting the battery lead at the regulator and connecting the resistance between the regulator "Bat" terminal and ground. A test voltmeter is connected in parallel with the 7 ohm resistance. The resistance must be able to carry 6 or 7 amperes current without any change of resistance due to temperature changes. With the generator operating at 3300 rpm (1730 engine rpm) with cover in place, note voltage reading on voltmeter.

The voltmeter must read 27 to 28.5 volts. If this reading is not obtained the regulator must be reset. To adjust voltage setting remove cover and turn adjusting screw clockwise to increase voltage and counterclockwise to decrease voltage setting.

CAUTION

If adjusting screw is turned down (clockwise) beyond the normal adjustment range, the spring support may fail to return when pressure is relieved. In such case, turn screw counterclockwise until sufficient clearance develops between screw head and spring support, then bend spring support upward carefully with small pliers until contact is made with screw head. Final setting of the unit should be approached by increasing spring tension, never by reducing it. If setting is too high, adjust unit below required value, and then raise to exact setting by increasing spring tension.

After each adjustment and before taking voltage reading, replace the regulator cover, reduce generator speed until relay points open and then bring the generator back to speed again.

VOLTAGE ADJUSTMENT FOR DELCOTRON AND OECO TRANSISTORIZED REGULATORS

a. A Regulator Select switch allows either voltage regulator to operate both alternators. Run the engines approximately 15 to 20 minutes at a 50% load (25 amperes each alternator) to allow the regulator temperature to stabilize.

b. Connect a precision voltmeter to the circuit breaker bus.

c. Check the bus voltage, if it is not 28.5 ± .25 volts, an adjustment should be made.

d. Operate the LH engine at cruise rpm with the LH alternator "ON", and the electrical load reduced to a minimum.

e. On the Delcotron regulator, remove the hex plug from the cover and turn the inner slot head screw clockwise to increase and counterclockwise to decrease the voltage. Each graduation marked on the cover corresponds to a 0.3 volt change. Remove the plastic plug labeled "REG" from the cover on the Oeco regulator and adjust by turning the potentiometer clockwise to increase voltage and counterclockwise to decrease the voltage.

f. Make any adjustments in small increments and allow 2 or 3 minutes for the system to stabilize between adjustments.

g. The opposite regulator may be checked and adjusted in the same manner.

h. For final check and adjustment both engines should be operated at cruise rpm with both alternators on and each carrying approximately 50% load.

GENERATOR BRUSH WEAR LIMIT

Generator brushes should be replaced before their maximum wear limits are reached. The minimum permissible brush length is one half its original length.

ALTERNATOR

Delcotron alternators are installed as optional equipment on the Model 95, serials TD-578 and after. The following procedures should be used when servicing the "Delcotron".

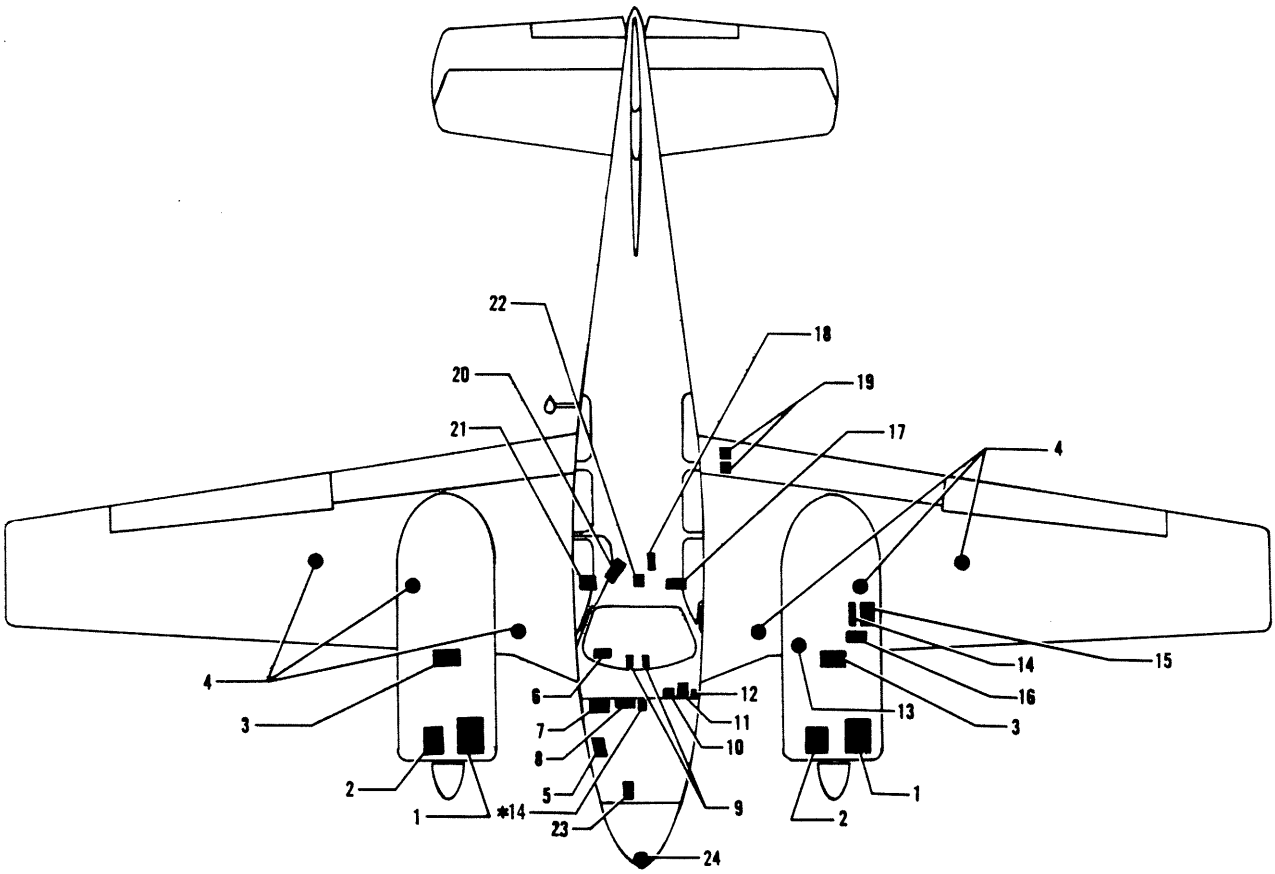
The Delcotron Alternator and regulator are designed for use on only one polarity system, therefore, the following precautions must be observed when working on the charging circuit. Failure to observe these precautions will result in serious damage to the electrical equipment.

a. When installing a battery, always make absolutely sure the ground polarity of the battery and the ground polarity of the "Delcotron" are the same.

b. When connecting a booster battery, make certain to connect the negative battery terminals together and the positive battery terminals together.

c. When connecting a charger to the battery, connect the charger positive lead to the battery positive terminal and the charger negative lead to the battery negative terminal.

d. Never operate the "Delcotron" on open circuit.



1. Starter
2. Generator
3. Cowl flap motor
4. Fuel tank transmitters
5. Battery master relay
6. Flap motor circuit breaker and switches
7. Paralleling relay
8. R. H. relay starter
9. Landing gear warning switch
10. Landing gear warning horn
11. Stall warning horn
12. Flasher
13. L. H. relay starter
14. Voltage regulator *Later serial effectivity.
15. External power receptacle
16. Generator circuit limiter
17. Nav light flasher (omit when rotating beacon used)
18. Landing gear limit switches
19. Flap limit switch
20. Landing gear motor
21. Dynamic brake relay
22. Wing flap control
23. Batteries
24. Nose landing light

Figure 3-21. Electric Equipment Location

Make absolutely certain all connections in the circuit are secure.

e. Do not short across or ground any of the terminals on the "Delcotron" or regulator, except as shown on wiring diagram.

f. Do not attempt to polarize the "Delcotron".

For additional overhual, testing, brush replacement and lubrication, refer to Delco-Remy Service Bulletins 1G-262 and 1R-273.

BELT TENSION

Adjust the generator or alternator drive belt so that there is 1/4 to 3/8 inch deflection at the center of the belt between the two pulleys.

SERVICING STARTER BRUSHES

Starter brushes should be replaced before their maximum wear limits are reached. The minimum permissible brush length is 3/8 inch. When replacing a worn brush, the new brush should be properly seated. Wrap a strip of 00 sandpaper (rough side out) around the starter commutator and allow the brushes to ride against the sandpaper. Rotate the starter until the brushes match the contour of the commutator. Starter brush should be replaced if the spring tension is less than 24 ounces.

THROTTLE WARNING HORN SWITCH ADJUSTMENT

a. Remove the instrument cowl pad, set the parking brake, chock the wheels and start the engines.

b. Advance the throttles until the manifold pressure gage registers 12 inches Hg. with the propellers in low pitch.

c. Stop the engines by moving the mixture control to Idle Cut-off. Leave the throttles in the same position established in step b.

d. Adjust each switch on the throttle controls until the cam clicks the switch closed.

e. Flight test the airplane to determine that the warning system functions properly.

COWL FLAP ADJUSTMENT

Electrically operated cowl flaps are the standard installation on all airplanes prior to serial TD-453 and are optional installation on all airplanes after that serial. Manually controlled cowl flaps are standard equipment on airplanes serial TD-453 and after. The following describes the methods for adjusting each of the various types of actuators used to operate the cowl flaps:

a. To adjust electrical actuators that have the cable-type stop, close the actuator to the full retract position, and place the cowl flap in the closed position by locating the actuator shaft attaching bracket on the cowl flap so that a clearance of .50 ± .03 inch exists between the aft inboard corner of the flap and the nacelle, then open the cowl flap and adjust it to the proper open position (2.50 ± .25 inch between the flap and nacelle) by screwing the eye bolt on the end of the stop cable until the proper clearance is obtained.

b. To adjust electrical actuators that do not have the cable-type stop, place the cowl flaps in the closed position. If the gap between the inboard corner of the flap and the nacelle is less than .50 ± .03 inch, install 100951S032XD and 100951S063XD spacers on the actuator arm until the proper distance is obtained: if the gap is more than .50 ± .03 inch, grind the 10293358ZT1680 spacer on the actuator arm until the distance between the flap and nacelle is within the tolerance.

c. To adjust the mechanical linkage, disconnect the linkage rod end from the bellcrank, and pull the control full out. Adjust the linkage rod ends to obtain .50 ± .03 inch clearance, then reconnect the linkage rod to the bellcrank.

ELECTRICAL UTILIZATION LOAD CHART

MAXIMUM CONTINUOUS LOAD

EQUIPMENT	NO. OF UNITS	AMPERES PER UNIT
Battery master relay	1	.60
Paralleling relay	1	.22
*Flap indicator light	2	.17
*Cowl flap indicator light	2	.17
*Landing gear position indicator light	2	.17
Landing gear visual indicator light	1	.17
Trim tab position indicator light	2	.04
Heater blower	1	14.00
Heater igniter	1	1.20
Heater fuel pump	1 or 2	.40
Heater fuel solenoid valve	1	.30
Fuel quantity indicator	2	.38
Oil temperature indicator	1	.15
Cylinder head temperature indicator	2	.10

Navigation lights flasher	1	.10
Wing tip lights	4	.75
Tail light	1	.65
Cabin dome light	3	.30
Map light	1	.30
Overhead instrument light	2	.30
Compass light	1	.20
Edgelit placard light	7	.04
Fuel selector and rheostat panels light	1	.04
Fuel selector panel post light	2	.04
Heated L. H. pitot	1	3.08
**Heated R. H. pitot	1	3.30
**Heated stall warning	1	1.60
**Heated fuel vents	2	2.30
**Upper rotating beacon	1	3.75
**Lower rotating beacon	1	3.75
**Instrument post light	35	.04
**Engine hour meter	1	.05
**Anti-ice pump	1	.40
**Anti-ice indicator	1	.10
**Anti-ice indicator post light	1	.04

*Only one indicator light will be operating at any given time.

**Optional equipment

INTERMITTANT LOAD

EQUIPMENT	NO. OF UNITS	AMPERES PER UNIT
Starter	2	100.00
Starter Relay	2	.22
Ignition vibrator (TD-453 and after)	1	2.50
Landing gear motor	1	10.00
Landing gear dynamic brake relay	1	.40
Landing gear warning horn	1	.60
Landing gear warning horn flasher	1	.30
Wing flap motor	1	13.00
Cowl flap motor	2	1.00
Stall warning horn	1	1.50
Stall warning indicator light	1	.04
Fuel boost pump (TD-1 thru TD-452)	2	.40
Fuel boost pump (TD-453 TD-516 except TD-501)	2	2.10
Fuel boost pump (TD-501, TD-517 and after)	2	2.00
Cigarette lighter	1	7.50
Wing landing light	2	8.90
Nose gear landing light	1	8.90
Nose taxi light	1	5.36

TACHOMETER CABLE MAINTENANCE

Although the tachometer mechanism does not require periodic lubrication, if it does not operate properly the cable should be inspected, lubricated or, if necessary, replaced. The cable is lubricated by the manufacturer with a special high-low temperature grease which is intended to last the lifetime of the cable under normal operating conditions. However, in extremely hot or dusty climates relubrication of the cable may be necessary every two years of service.

To remove a cable disconnect the casing nut from the tachometer and remove the cable by pulling it out of the casing. If the cable is broken, the lower section of the cable can be pulled out after disconnecting the casing nut at the drive end.

Check the removed cable for worn spots and kinks which indicate a lack of lubrication or sharp bends in the casing. If the cable is kinked the casing must be examined for breaks or distortion due to sharp bends. Replace kinked cables and broken or distorted casings. A casing radius of not less than five inches must be maintained at bends.

When installing a new cable spread a thin layer of special high-low temperature grease, AC Spark Plug Type ST-640, over the lower two-thirds of the cable. Reinstalling the cable will spread the lubricant over its entire length. DO NOT OVER GREASE.

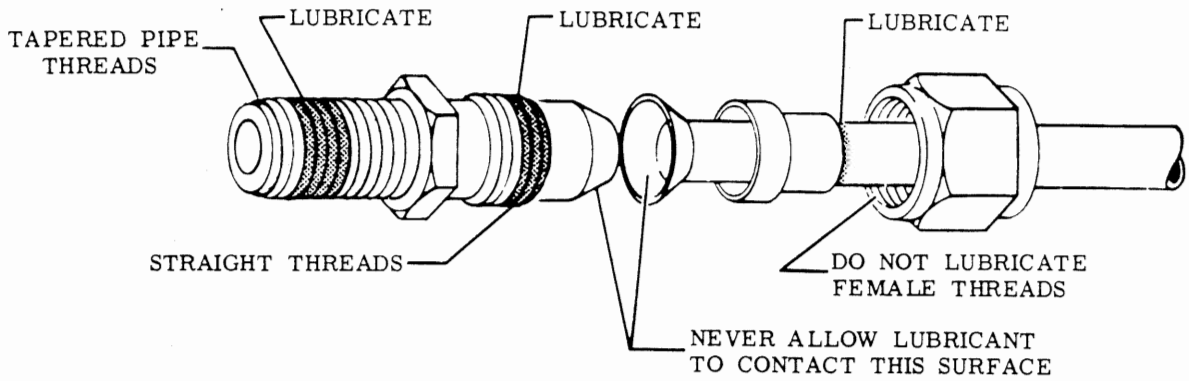


Figure 3-22. Lubrication of Flared Fittings

INSTALLATION OF FUEL FLARED FITTINGS

When installing flared fittings and hoses, make sure the threads are lubricated properly with anti-seize compound (in accordance with the TABLE OF THREAD LUBRICANTS). When previously installed fittings are removed, they should be wiped clean and relubricated before they are reinstalled. Torque all fittings in accordance with the FLARE FITTING AND HOSE FITTING TORQUE CHART.

FLARE FITTING AND HOSE FITTING TORQUE CHART

	WRENCH TORQUE FOR TIGHTENING AN818 NUT (POUND INCH)				HOSE END FITTING AND HOSE ASSEMBLIES (POUND INCH)	
TUBING OD INCHES	ALUMINUM-ALLOY TUBING FLARE AND 10061 or AND 10078		STEEL TUBING FLARE AND 10061			
	MINIMUM	MAXIMUM	MINIMUM	MAXIMUM	MINIMUM	MAXIMUM
1/8	---	---	---	---	---	---
3/16	---	---	90	100	70	100
1/4	40	65	135	150	70	120
5/16	60	80	180	200	85	180
3/8	75	125	270	300	100	250
1/2	150	250	450	500	210	420
5/8	200	350	650	700	300	480
3/4	300	500	900	1000	500	850
1	500	700	1200	1400	700	1150
1-1/4	600	900	---	---	---	---
1-1/2	600	900	---	---	---	---
1-3/4	---	---	---	---	---	---
2	---	---	---	---	---	---

ADJUSTING FUEL QUANTITY GAGES

On aircraft prior to TD-143 and on aircraft TD-403 and after, the adjustment is made by removing the liquidometer access covers from the tanks and bending the float wire up or down slightly to obtain the proper reading in both the full and empty tank conditions.

NOTE

Do not raise the outboard transmitter float when tank is empty in either the 31 gallon auxiliary tanks or the 39 gallon main tanks; except when power is off.

On aircraft TD-143 thru TD-402, potentiometers located in the firewall above the rudder pedals are adjusted to give the proper gage reading. Each gage should be adjusted with a full tank; adjusting the gage to the full position will correct the reading in the other needle position. When adjusting the gages 28 volts should be applied to the system. Loosen the locknuts on the potentiometer adjusting screw and adjust the screw so that the gage needle moves to the full position. The adjustment screw is located on the lower end of the potentiometer.

CARBURETOR ADJUSTMENT (Effective airplanes prior to Serial TD-453, Except TD-127 and TD-444)

Except for idling adjustment, all other functions of the carburetor are adjusted at the factory. In adjusting the idle mixture and speed allow the engine to warm up and set the throttle stop screw so that the engine idles at approximately 550 rpm. Turn the idle adjusting screw toward the rich position till the engine rolls from richness then turn the screw toward the lean position till the engine runs irregularly from leanness, this gives an idea of the idle adjustment range and extreme engine operating conditions. Starting from the lean position, turn the screw toward the rich setting just far enough to prevent the rich roll and uneven running from richness. This adjustment will in most cases give a slower idle speed than a slightly leaner adjustment, with the same throttle stop screw setting, but will give smoother idle operation.

To check the idle adjustment, run up engine to clear spark plugs and then slowly move throttle back to closed position. Slowly move mixture control into full lean position and observe the tachometer for a rise in rpm. If the adjustment is correct there will be a pickup in rpm, but it should not exceed 15 rpm.

CARBURETOR SERVICING (Effective airplanes prior to Serial TD-453 Except TD-127 and TD-444)

The carburetor should be drained and the fuel inlet screen cleaned at least every 100 hours. The fuel inlet strainer assembly, located on the upper right hand side of the carburetor, should be removed and the screen cleaned with an air blast. If there is any evidence of corrosion when the drain plug is removed, the carburetor should be removed for overhaul.

FUEL INJECTION SYSTEM ADJUSTMENT (Effective airplanes TD-127, TD-444, TD-453 thru TD-533 Except TD-506)

Two adjustments can be made on the fuel injection system throttle body--idle speed and air bleed adjustments. The adjustable linkage between the throttle butterfly shaft and the mixture control is preset and should not be altered.

Idle rpm is adjusted by a stop screw adjacent to the throttle control arm. Turning the screw clockwise increases idle rpm. Normal idle speed is 500 to 650 rpm.

To correct for rough idle, move the mixture control toward Idle Cut-off. If a momentary gain in idle rpm, followed by a drop in rpm, is noted, the mixture is too rich. An immediate drop in rpm indicates the mixture is too lean. Adjust the air bleed adjustment screw clockwise to enrich or counterclockwise to lean the mixture until satisfactory idle is obtained.

FUEL INJECTION SYSTEM ADJUSTMENT (Effective airplanes TD-506, TD-534 and after)

Adjust the throttle control arm stop screw to obtain an idle speed of approximately 650 rpm.

Check the idle mixture by moving the cockpit mixture control lever with a smooth, steady pull toward Idle Cut-off and observe the tachometer for any change. Return the mixture control to Full Rich before the rpm drops to a point where the engine cuts out. An increase of more than 25 rpm during "leaning out" indicates the idle mixture is too rich. An immediate decrease in rpm (if not preceeded by a momentary increase in rpm) indicates the mixture is too lean.

The Idle mixture adjustment is a thumbscrew in the linkage between the throttle control arm and the idle valve lever. Lengthening the linkage leans the idle mixture and shortening the linkage enriches the mixture. Each time the adjustment is changed, clear the engine by running it up to approximately 2000 rpm and repeat the mixture check. Adjust the engine idle speed as required after the mixture is set.

If the idle mixture setting does not remain stable, check the idle linkage for looseness or wear. Any looseness in the linkage can cause rough idling.

ADJUSTING FOR OIL PRESSURE FLUCTUATIONS

The function of the oil pressure relief valve is to maintain engine oil pressure within specified limits by withdrawing a portion of the oil from the circulating system and returning the oil to the sump should the pressure become excessive.

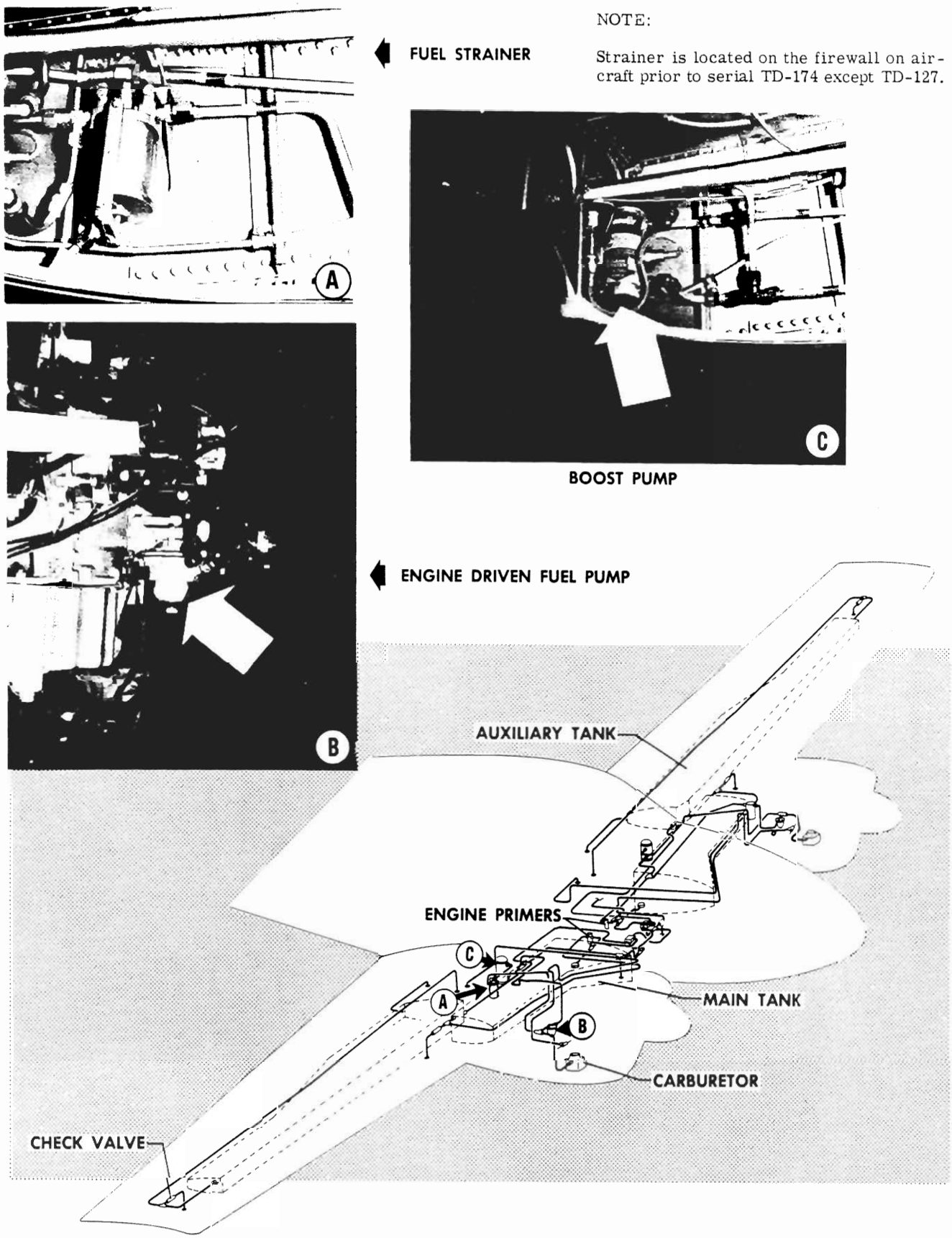


Figure 3-23. Fuel System
Airplanes Prior to TD-453 except TD-127 and TD-444

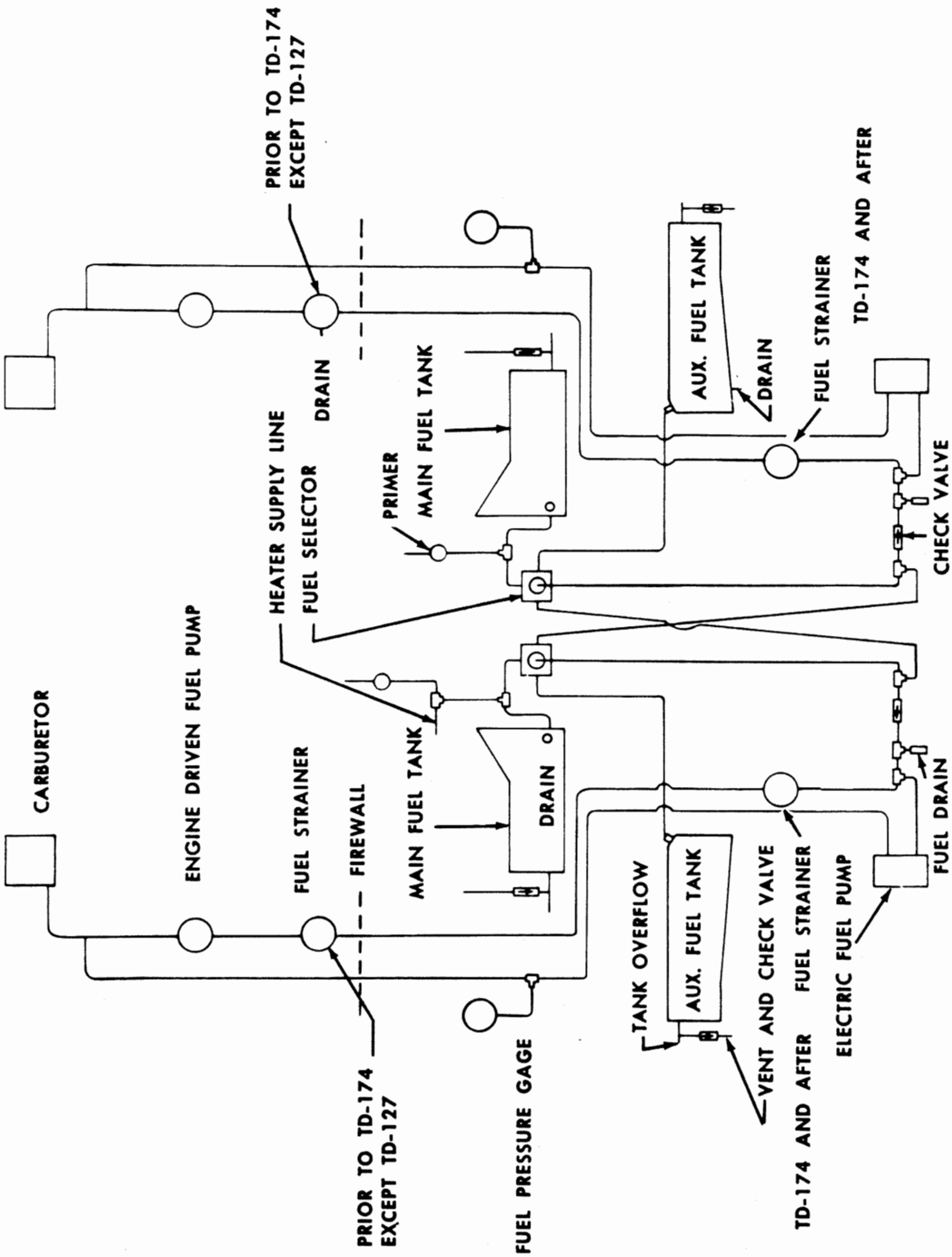


Figure 3-24. Fuel System Schematic
Airplanes Prior to TD-453, Except TD-127 and TD-444

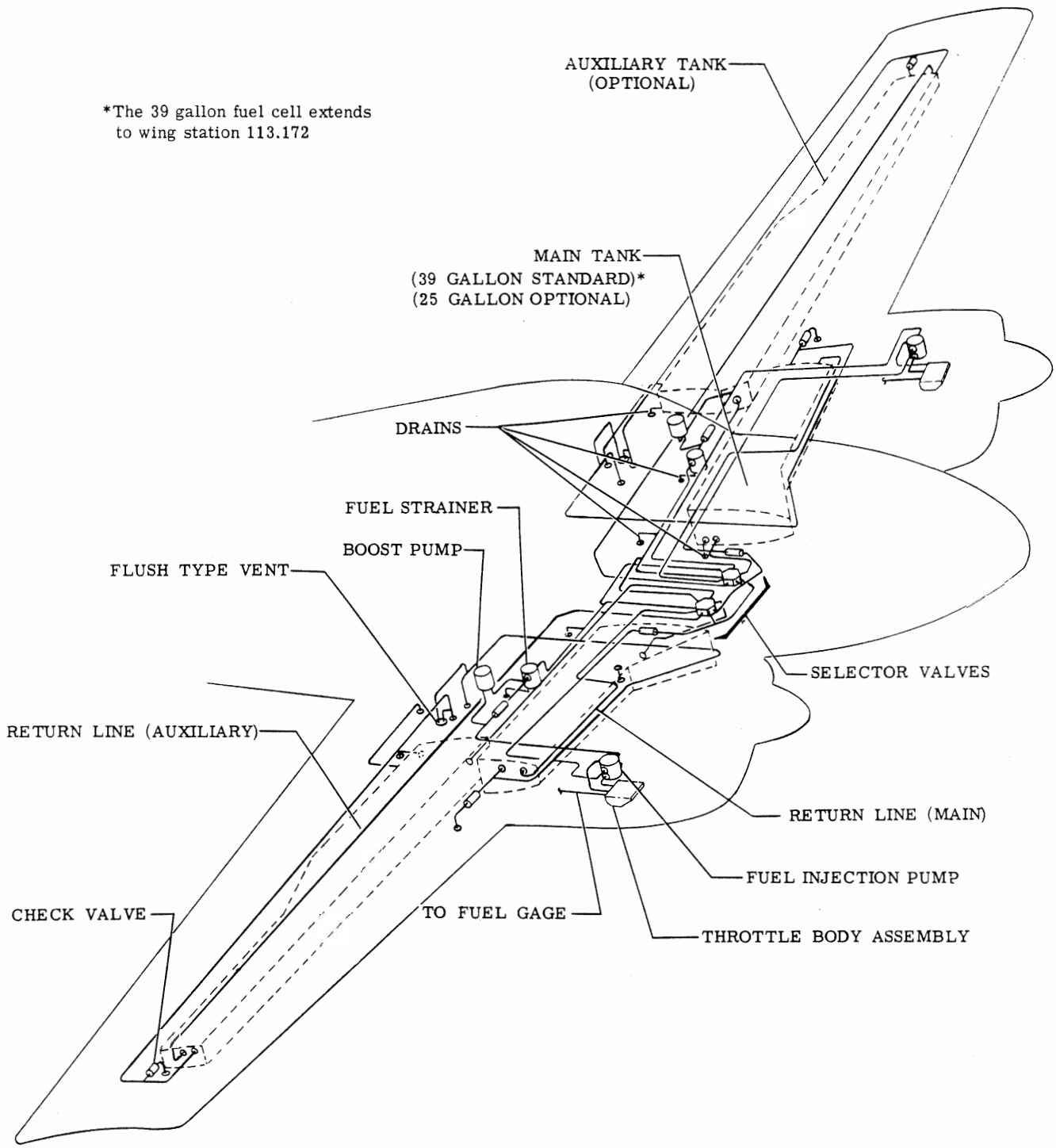


Figure 3-25. Fuel System
TD-127, TD-444, TD-453 thru TD-533

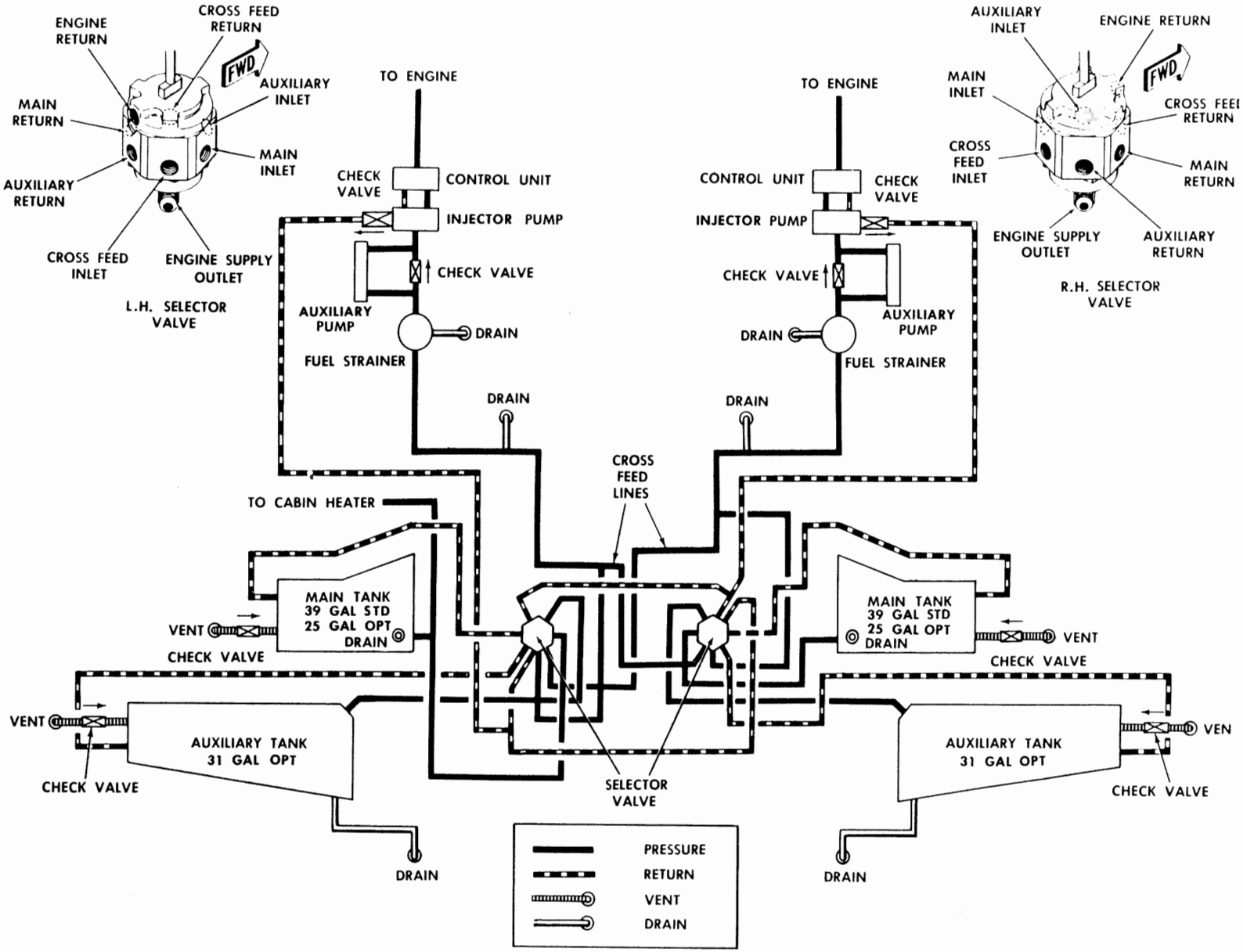


Figure 3-26. Fuel System Schematic
TD-127, TD-444, TD-453 thru TD-533

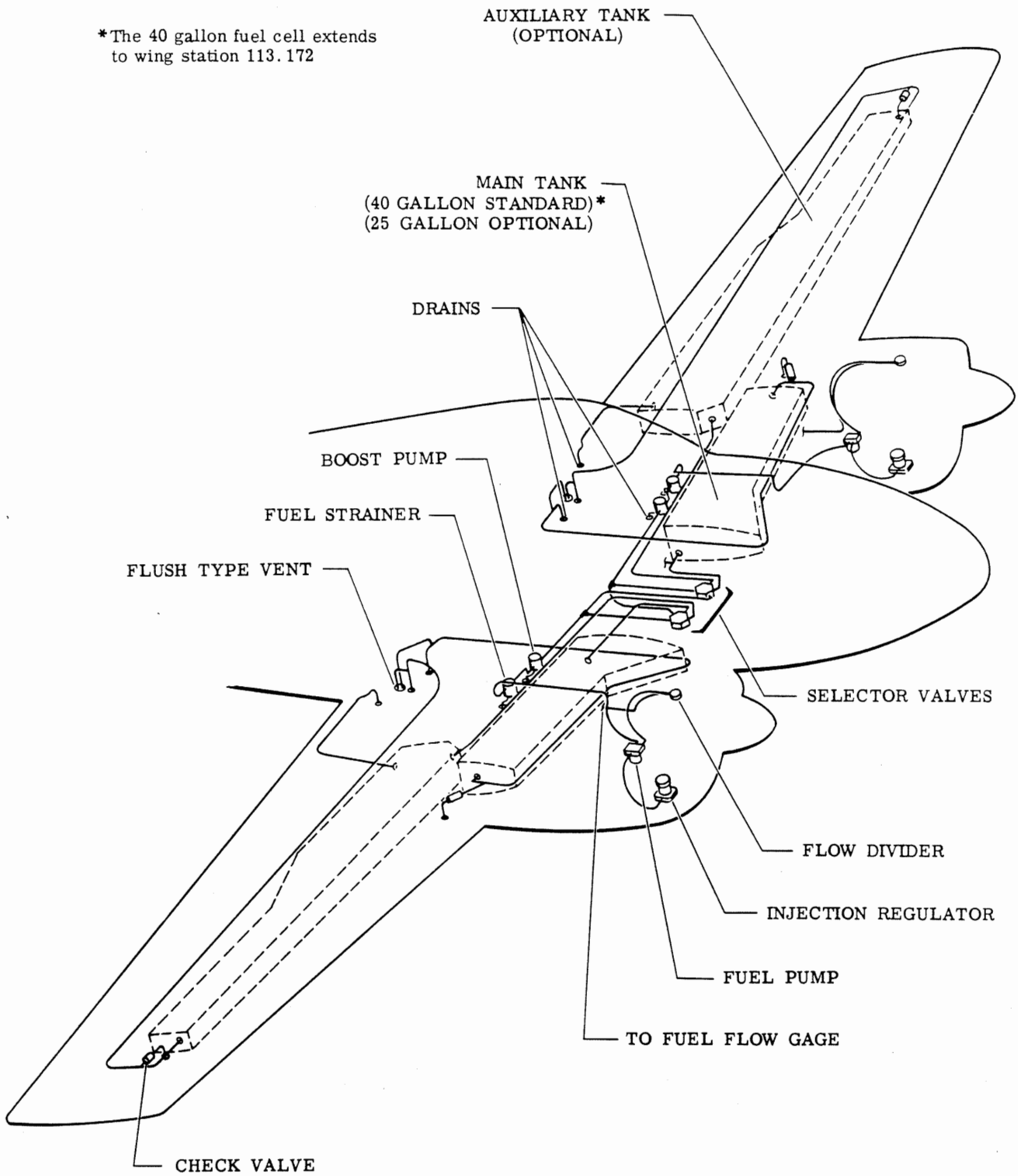


Figure 3-27. Fuel System
TD-506, TD-534 and After

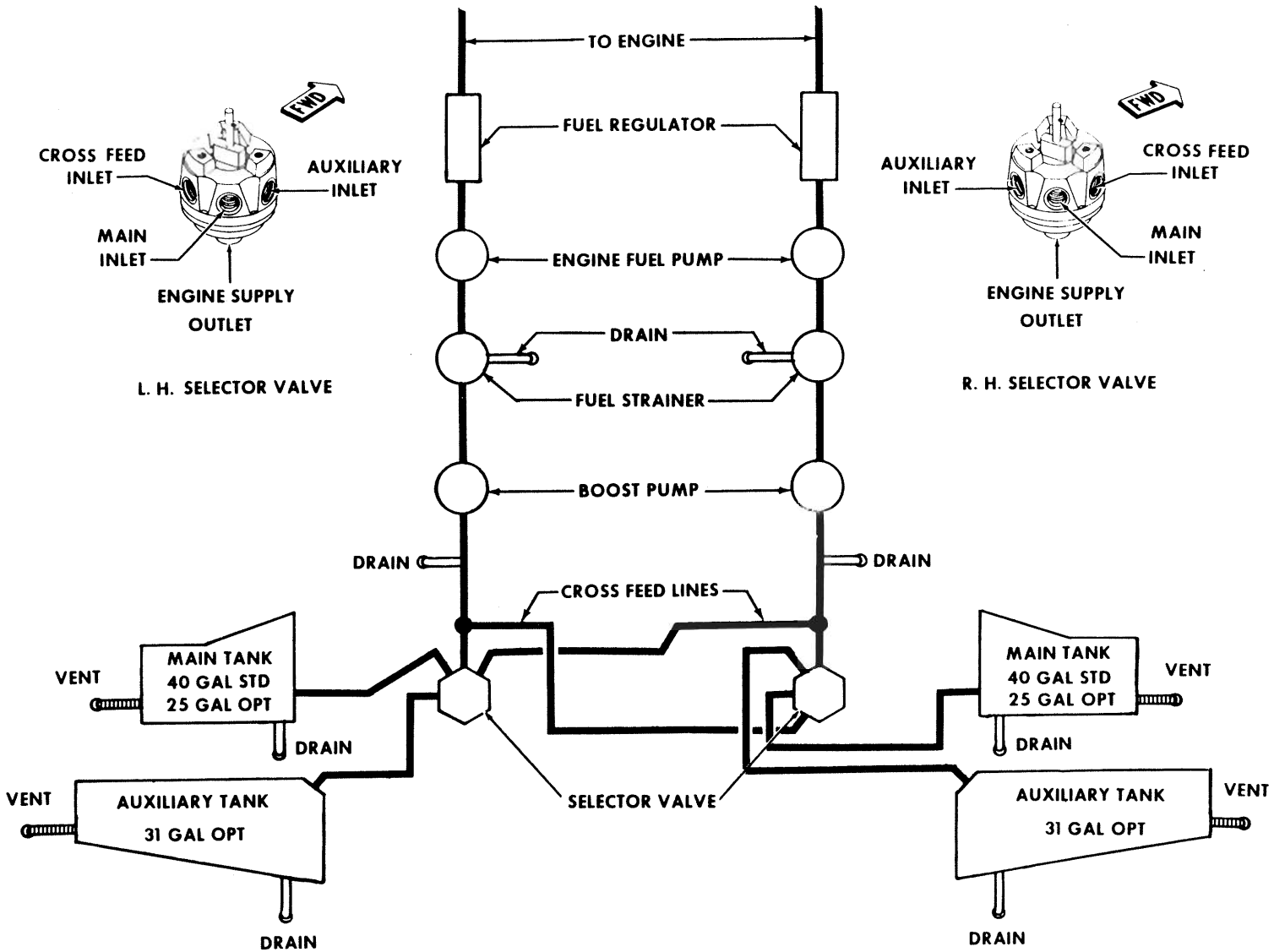


Figure 3-28. Fuel System Schematic
TD-506, TD-534 and After

This valve is not adjustable; however particles of metal or other foreign matter lodged between the ball and seat will result in a drop in oil pressure. It is advisable to disassemble, inspect, and clean the relief valve if excessive pressure fluctuations are noted.

ADJUSTING THE PROPELLER GOVERNOR

The propeller governor can be adjusted for a high and low rpm setting and a feathering adjustment. The high rpm adjustment must be checked while the aircraft is in flight. Observe the take-off rpm to see if it exceeds the redline figure. If excessive rpm is observed, land the plane and adjust the high rpm screw inward to reduce the rpm to the redline figure. The high rpm adjustment screw is located at the rear of the governor just forward of the speed adjusting control lever. One complete revolution of the screw reduces the propeller rpm by approximately 30 revolutions.

The low rpm adjustment is made while the aircraft is on the ground. To make the adjustment, pull the propeller lever back against the detent and observe the rpm setting. If the rpm varies from the specified low rpm setting of 2000 rpm, the low rpm setting must be adjusted. The low rpm adjustment is made on the detent rod which is located behind the instrument panel on the governor control linkage. To increase the setting, lengthen the rod; to decrease setting shorten the rod.

In adjusting the feathering action, pull the control back through the detent and observe the point at which the rpm setting begins to fall off sharply, then bring the propeller back to high rpm. The point at which propeller feathering starts should be at 1800 rpm. If adjustment is required turn the square-head screw on the end of the governor control shaft inward or outward to correct the setting. One half revolution of the screw inward will lower the feathering rpm approximately 100 revolutions.

PROPELLER AND GOVERNOR ADJUSTMENT

For high and low pitch adjustments, service, overhaul and maintenance procedures refer to the manufacturers applicable FAA Approved Propeller Manuals.

RIGGING THE ENGINE CONTROLS

Rig the propeller governor, mixture and throttle controls to travel from stop to stop at the engine end with approximately 3/32 inch spring-back at the pedestal end.

TEST AND ADJUSTMENT FOR COMPONENTS OF LIGHT WEIGHT "RESERVOIR" DEICER SYSTEM

a. Control Cables.

1. The air supply valve control cable should be attached to the reservoir air supply valve so that the valve operating lever closes completely without the cable stopping short against the cable mounting in the cabin.

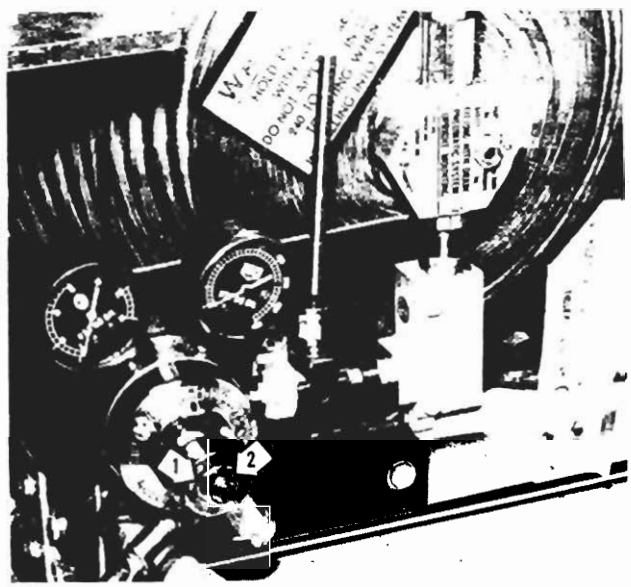
2. The cycling control cable should be attached to the cycling valve so that the control arm can operate to the extreme limits of the cycling valve. The cable handle in the "IN" position should have a 1/4 inch cushion from the cable mounting in the cabin to insure the cycling valve is in the fully closed position.

b. Air Pressure Regulator (See Figure 3-29).

Regulator gages will not register unless the air supply valve is open. With the air supply valve in the open position observe the gages, if the gages do not correspond to the following table, reset the regulator to agree to this table.

INLET PRESSURE (PSI)	REGULATED PRESSURE (PSI)
3000	17.0
2500	18.0
2000	19.0
1500	20.25
1000	21.5
750	22.75
500	24.0
250	25.5

The pressure regulator may be adjusted by loosening the locknut on the pressure regulator and turning the screw clockwise to increase pressure and counterclockwise to decrease pressure.



1. Lock Nut
2. Pressure Adjusting Screw

Figure 3-29. Air Pressure Regulator

c. Cycling Valve (See Figure 3-32).

1. Cycling Valve Control Arm Adjustment.

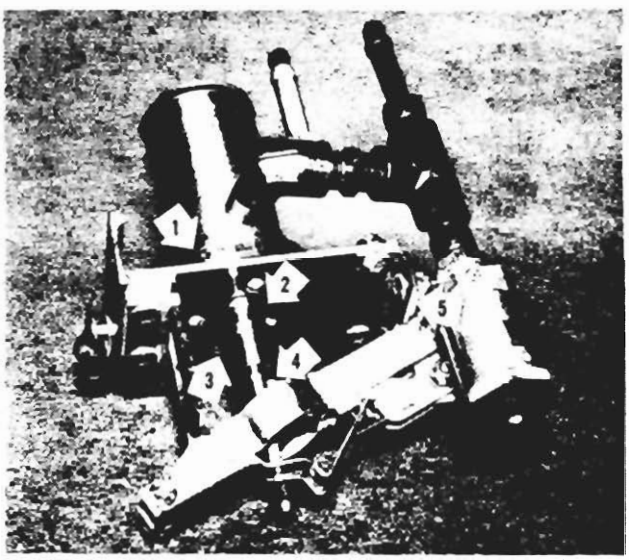
(a) Adjustment for all possible variations in the control arm assembly is accomplished by the addition or removal of laminated shims between the upright supporting the control arm and the angle attaching the upright to the valve mechanism base.

(b) With the valve shaft actuated and locked in the detent, the control arm is properly adjusted only when the "dog" which operates the valve shaft will:

(1) Engage 1/64 to 1/32 of an inch on the shaft, and then:

(2) Slide past the shaft without driving the shaft beyond and out of the detent.

(c) The adjustment of the mechanism is accomplished by loosening the fasteners between the previously described upright and angle, then adding or removing laminated shim stock.



1. 'Pop-Off' Pressure Adjusting Ring
2. Detent
3. Cotter Pin
4. 'Dog'
5. Shim Location

Figure 3-32. Cycling Valve

If the "dog" engages too far on the shaft or drives the shaft past the detent, add shims until the mechanism is properly adjusted. If the "dog" does not cause the valve shaft to engage in the detent, remove shims until the valve shaft engages in the detent satisfactorily.

(d) The valve operating mechanism and valve should be functionally tested with pressure from the reservoir package.

2. Cycling Valve Adjustment.

(a) The valve is properly adjusted when the low pressure gage on the regulator reads 15 to 17 psi at the time the valve shaft automatically returns to its normal position completing the deicing cycle. This is known as the "pop-off" pressure. The low pressure gage on the regulator will show a higher value after the valve completes the deicing cycle. This higher value is the set pressure of the regulator.

(b) The valve is adjusted by rotating a ring on the valve located directly below the top plate on the working end of the valve. The cam action of the interior of this ring increases or decreases the "pop-off" pressure as the ring rotates.

(c) To adjust the "pop-off" pressure of the valve:

(1) Remove the cotter pin locking the adjusting ring to the valve body.

(2) Cycle the valve and observe the "pop-off" pressure on the low pressure gage of the regulator.

(3) Rotate the adjusting ring, recycle the valve and again observe the "pop-off" pressure.

(4) From the "pop-off" pressures, determine the direction to rotate the adjusting ring to increase or decrease the "pop-off" pressure.

(5) Set the adjusting ring on the valve so that the "pop-off" pressure is from 15-17 psi.

(6) Relock the adjusting ring to the valve body with the cotter pin.

LIGHTWEIGHT AUTOMATIC (PUMP-DRIVEN) SURFACE DEICER SYSTEM.

The following description applies to deicer systems utilizing Goodrich control valves, but is applicable also to systems incorporating Tavco control valve assemblies with the exception of control valve operation and air filtering provisions, which will be discussed separately.

The principle components of the deicer system are: lightweight rubber and fabric pneumatic deicer boots cement-bonded to the wing and empennage leading edges; the two engine-driven vacuum pumps which provide air pressure for deicer boot inflation and vacuum for deicer boot deflation; an electric timer forward of the instrument panel which actuates a solenoid operated combination overboard - pressure relief control valve in each engine nacelle; pressure sensitive shuttle valves to control the flow of air to and from the boots; a three-position switch to control the operation of the timer (and hence the deicer system); and the necessary plumbing and wiring components.

Normally, the engine-driven vacuum pumps apply vacuum to the deicer boots at all times, except when the boots are being inflated. When the deicer system control switch is placed in either the MANUAL or AUTOMATIC position, the timer energizes the

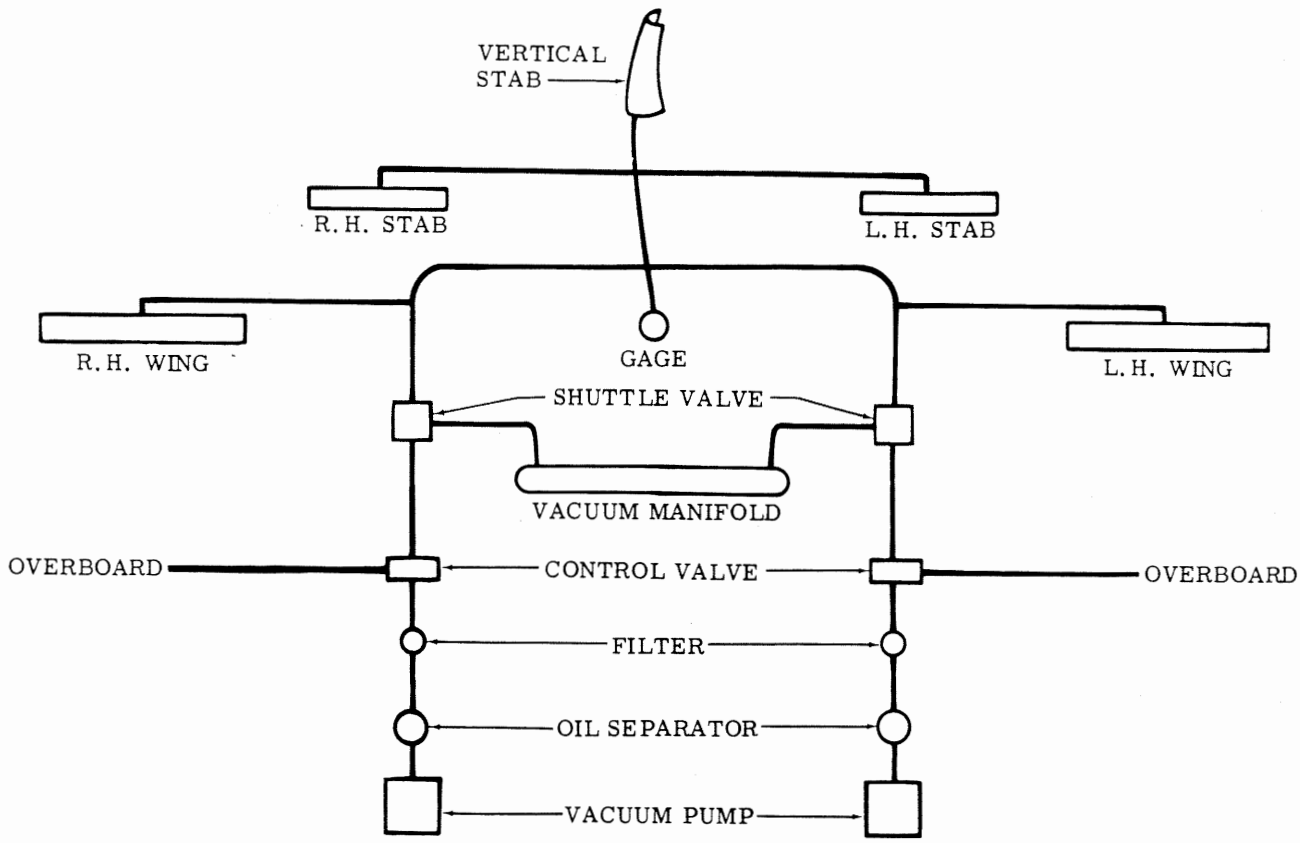


Figure 3-33. Lightweight Automatic (Pump Driven) Surface Deicer System With Goodrich Valves

combination overboard - pressure relief valves; the energized control valves port pressurized air to the pressure sensitive shuttle valves which, in turn, shut off the vacuum normally applied to the boots and allow pressurized air to inflate the boots. A deicer system pressure of 15 to 18 psig is maintained by the pressure relief function of the control valves. When the control valves are de-energized by the timer, the shuttle valves port the boot inflating air overboard through the control valves; system vacuum is then reapplied to the boots.

Through the electric timer the solenoid operated control valves cause all of the boots to be inflated simultaneously; therefore, the system is described as a "single-inflation" type. Since the control valves operate simultaneously and are positive in positioning from "dump" to "deicer pressure," the system will operate with one engine-driven vacuum pump inoperative, which permits operation of the deicer system on one engine.

Both MANUAL and AUTOMATIC positions of the deicer switch are momentary. Momentary engagement of the AUTOMATIC position will automatically inflate the deicer boots for five to eight seconds before they resume the vacuum hold-down condition. The MANUAL position will inflate the boots only while the switch is held in engagement; when the switch is released, the boots will return to the vacuum hold-down condition.

The oil separator in each engine accessory section recovers oil in the pump output air; the oil is then returned to the engine sump. An air filter is connected to the pressure outlet of each control valve to remove foreign particles and any remaining oil from the deicer boot inflating air. The deicer system also contains a gage in the cockpit to register system pressure and a standard reset type circuit breaker to protect the deicer system electrical circuit.

SYSTEMS INCORPORATING TAVCO CONTROL VALVE ASSEMBLIES

When the deicer system three-position switch is actuated, a solenoid operated pilot valve builds up pressure against the pressure-vent shuttle spool, causing the boots to be pressurized. When the pressure reaches approximately one psig, a ball poppet closes off the vacuum port and the pressure continues to increase until regulated boot pressure is reached. The pressure relief valve is an integral part of the control valve assembly.

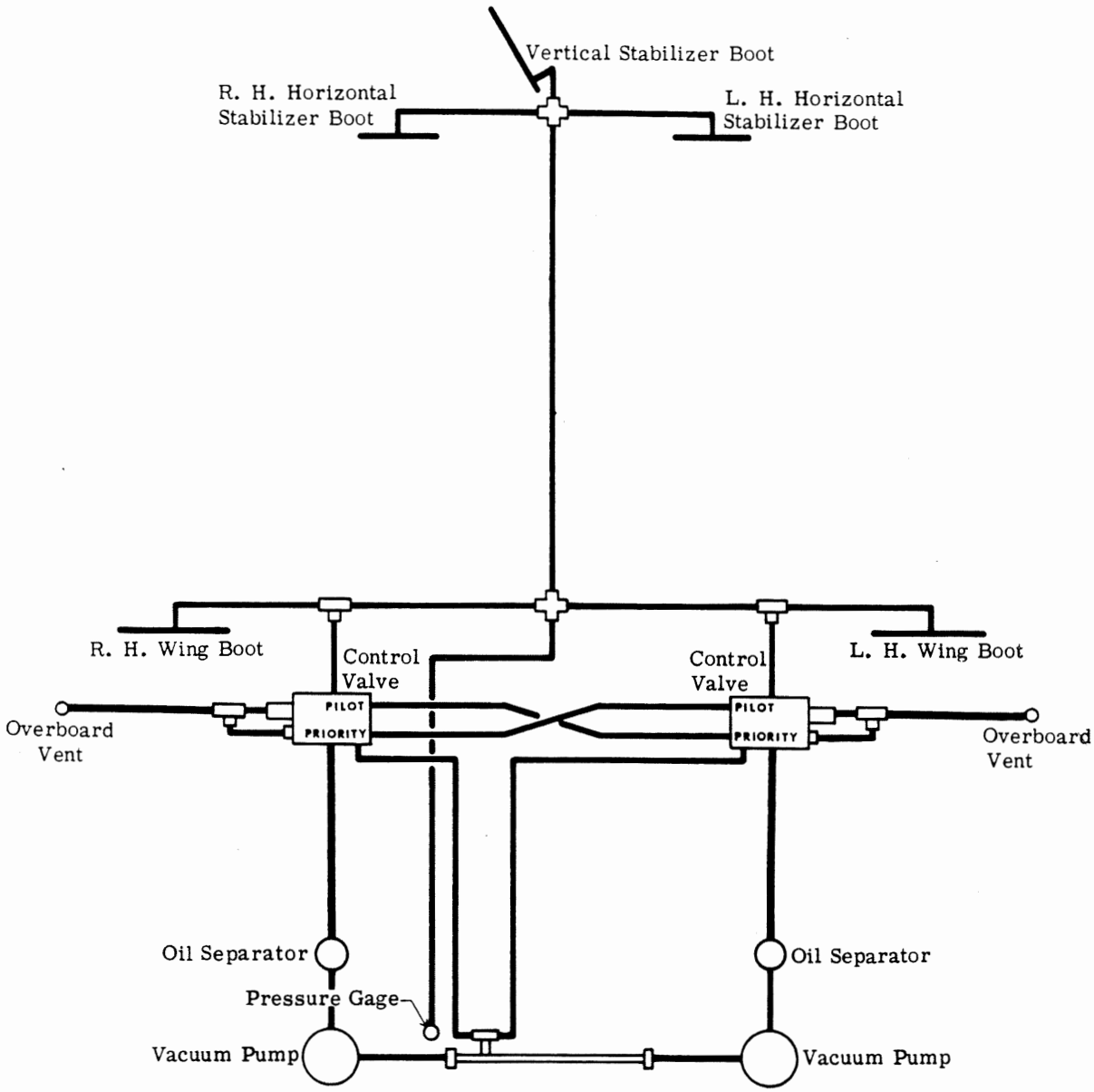


Figure 3-34. Lightweight Automatic (Pump Driven) Surface Deicer System With Tavco Valves

After the solenoid is de-energized, the shuttle returns to the "dump" position. When the remaining boot pressure lowers to 1 to 1.5 psig, the ball poppet opens to the vacuum port, permitting the boots to evacuate.

Two small lines, pilot pressure and priority pressure, plumbed between the valve assemblies in the nacelles, allow operation of the system on one engine by using pressure from the valve for the operative engine to operate the shuttle in the opposite valve.

Each control valve assembly incorporates a filter to remove oil and any foreign particles from the system.

OPERATION CHECK

a. With both engines operating at cruise rpm, momentarily place the deicer switch in the AUTOMATIC position; the deicer boots should inflate for five to eight seconds, then deflate and reach a vacuum hold-down condition. During inflation, check to see that system pressure is within the green arc on the deicer system pressure gage.

b. Place the deicer switch in the MANUAL position and hold for a few seconds; the deicer boots should inflate and remain inflated while the switch is retained in the MANUAL position. Check for correct system pressure.

c. Release the deicer switch, permitting it to return to the OFF position; the deicer boots should deflate and reach a vacuum hold-down condition.

d. Repeat Steps a through c with each engine operating individually at cruise rpm.

SYSTEM CHECKOUT

Control Valves

a. Check control valve operation as follows:

1. Turn on the battery master switch.

2. Momentarily place the deicer system switch in the AUTOMATIC position.

3. The control valve solenoid should be actuated immediately for seven seconds as evidenced by an audible "click" at the beginning and at the end of the cycle. The "click" can also be detected by placing the hand on the solenoid.

b. If a control valve does not function, proceed as follows:

1. Unplug the electrical connector at the solenoid.

2. Attach a test light or other suitable test equipment to the connector and place the deicer switch in the AUTOMATIC position.

3. If the test equipment does not indicate a complete circuit, check the circuit from the timer, to the solenoid connector, to ground.

4. Replace defective timer component (holding relay or time-delay), if necessary.

5. Use an ohmmeter to check the solenoid for an open circuit. If the solenoid circuit is open, replace the control valve.

c. On Goodrich control valves only, if the solenoid circuit is satisfactory perform the following check:

1. Remove the solenoid safety wire and unscrew the solenoid.

CAUTION

Do not lose the steel hex actuator pin or the valve poppet.

2. Reattach the connector to the solenoid, insert the hex actuator pin into the solenoid, and actuate the deicer switch. If the pin is not ejected from the solenoid, replace the control valve.

Air Leakage Test

a. Cap the overboard port of the control valve in either the left or right nacelle.

b. Connect a source of clean air to the inlet port of the capped control valve. A minimum inlet pressure of 18 to 20 psig is required for the test.

c. Install a pressure gage in the air line to observe system pressures.

d. Apply 18 psig pressure to the system and with a hand operated valve, trap the pressure in the deicer system.

e. Observe the system for leakage; the leakage rate should not exceed a pressure drop of 4.0 psig per minute.

f. Remove the test equipment, lubricate all threads, and replace all system components.

Vacuum Relief Valve Adjustment

For proper operation of the deicer system the aircraft vacuum relief valves must be adjusted to provide adequate vacuum. See Vacuum System, this manual if adjustment is required.

COMPONENT MAINTENANCE AND REPLACEMENT

Air Filters

a. Goodrich Control Valve Installation.

Examine the filter discs after each 100 hours of

engine operation and clean if oil has accumulated in the filter housing. For a cleaning agent use a commercial hydrocarbon type solvent such as naphtha, petroleum ether, or gasoline; kerosene type distillates should be avoided.

b. Tavco Control Valve Installation.

After each 100 hours of engine operation, remove the filter cover on each control valve assembly to dispose of residual oil in the filter.

Control Valves

a. Goodrich Control Valve.

After approximately 100 hours of engine operation, the valve poppet and internal lining of the control valve may become coated with a film of dried oil, causing the valve poppet to stick. To determine if the valve poppet is sticking, perform the checks outlined in System Checkout, Control Valves. If the solenoid ejects the hex actuator pin (Step c, 2) proceed as follows:

1. Remove the solenoid electrical connector.

2. Remove the valve poppet.

NOTE

It may be necessary to apply slim nose pliers to the pin projection in order to pull the poppet from the valve.

3. Thoroughly clean the control valve bore and poppet with a commercial hydrocarbon type solvent.

4. Reassemble the valve and reinstall and safety the solenoid.

b. Tavco Control Valve Assembly.

Sticking of the valve poppet may be caused by a film of dried oil on the poppet and the interior of the valve. The valve may be cleaned as follows:

1. Disconnect the valve assembly and remove it from the aircraft.

2. Force a commercial hydrocarbon type solvent into the inlet port of the valve assembly while operating the solenoid several times.

WARNING

Observe the normal safety precautions required for this type of operation.

3. Reinstall the valve assembly.

Timer

The timer consists of a holding relay and a time-delay device. Defective components may be replaced as required.

Shuttle Valves

No field maintenance is recommended or authorized. Defective valves should be returned to manufacturer for overhaul or replaced. Since the Tavco shuttle valve is an integral part of the complete control valve assembly, the entire unit must be submitted for inspection.

Component Replacement

No component maintenance other than that described in this shop manual is recommended.

SURFACE DEICER SYSTEM (PRESSURE)

The surface deicer system consists of lightweight pneumatic deicer boots cement-bonded to the wing and empennage leading edges, two engine-driven dry air pumps which provide pressure for boot inflation and evacuation, and a distributor valve located in the aft fuselage section which shuttles air flow to and from the deicer boots.

In operation, the engine-driven pumps supply air to a manifold assembly in the pilots compartment and directs it to the distributor valve. When the distributor valve is actuated to inflate the boots, a time delay relay is energized at the same time. After 5 to 8 seconds, the relay returns the distributor valve to the original or "evacuate" position. In the "evacuate" position, the air flow is routed through an integrated venturi which creates a vacuum in the deicer supply lines to hold down the boots.

Either an AUTOMATIC or MANUAL position may be selected by the Deicer Control Switch located on the instrument panel. The AUTOMATIC position provides one complete cycle of five to eight seconds before resuming a hold-down condition. The MANUAL position will inflate the boots only while the switch is engaged; when the switch is released, the boots will return to the vacuum hold-down position. A Deicer Pressure Gage on the instrument panel indicates system operation.

RESURFACING DEICER BOOTS

Static electric charges, if allowed to accumulate, would eventually discharge through the boot to the metal skin beneath, causing static interference with radio equipment and possibly puncturing the rubber. Also, such static charges are a temporary fire hazard after each flight. To dissipate static electric charges, a thin coating of conductive cement is applied over the neoprene of the boot. From time to time it may be necessary to restore the conductivity to efficiently dissipate such charges. The principal factors involved when resurfacing seems advisable are:

a. If the surfacing material has abraded off.

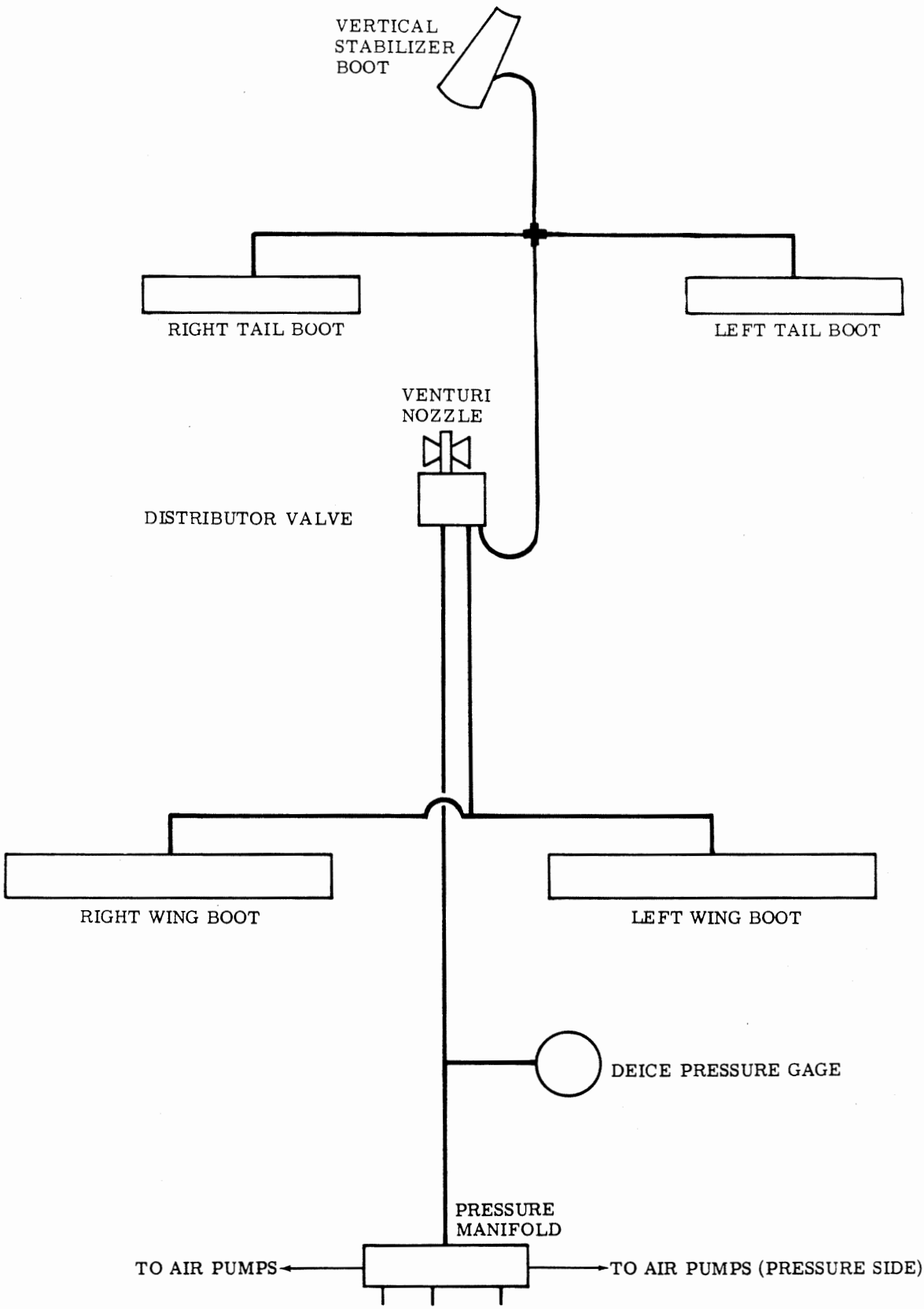


Figure 3-35. Surface Deicer (Pressure), TD-708 And After

b. If the surfacing has developed cracks.

c. If the conductivity is low.

The following procedures should be followed when resurfacing deicer boots:

a. Clean the deicer boot thoroughly with toluol or uncontaminated unleaded aviation gasoline.

b. Roughen the entire surface of the boot with fine sandpaper.

c. Clean the surface again with a clean lint-free cloth moistened with toluol or uncontaminated unleaded aviation gasoline.

d. Apply masking tape beyond the upper and lower trailing edges, leaving a 1/4-inch gap of bare metal.

e. Brush one coat of Goodrich A-56-B cement on the boot and allow it to dry at least one hour. Then apply a second coat and allow it to dry at least four hours before operating the deicers. The airplane may be flown as soon as the cement is dry.

NOTE

If A-56-B cement has aged three months or more, it may be necessary to dilute it with toluol to obtain the proper brushing consistency. Mix thoroughly, approximately five parts cement to one part toluol.

The deicer boots are installed as a permanent installation and should not be removed except when vulcanized repair at the factory is required.

DEICER BOOT REPAIRS

Minor scuffed areas on the boots normally require only restoration of the conductive surface in the immediate area. However, if the entire surface ply has been removed, exposing the brown natural rubber underneath, or if the boot is cut, torn or ruptured, it is necessary to patch the damage. B.F. Goodrich Repair Kit No. 74-451-C contains cold patches suitable for repairing damaged areas. A cold patch on a deicer boot, however, is a temporary or emergency method of repair; at the first opportunity, the boot should be removed and returned to the factory for a vulcanized repair. Cold patch repairs can be made by the following method:

a. Clean around the damage with a clean lint-free cloth moistened with toluol or uncontaminated unleaded aviation gasoline.

b. Select a patch which will extend at least 1/2-inch beyond the damaged area in all directions.

c. Buff the area around the damage with steel wool or fine sandpaper to remove the conductive coating and thoroughly roughen the exposed surface.

NOTE

A locally manufactured buffing shield will assure a neater job. The shield can be fabricated from any thin sheet material such as acetate, steel, etc., and can be long strips taped to the boot around the perimeter of the damaged area. Remove the buffing shield after the area has been buffed.

d. Wipe the buffed area with a clean lint-free cloth moistened with toluol or uncontaminated unleaded aviation gasoline to remove all loose particles.

e. Brush one even coat of No. 4 cement (supplied in the repair kit on the boot corresponding to the patch. Remove the backing from the patch and apply one coat of cement to that surface of the patch.

f. Allow the cement to set until tacky.

g. Position the patch over the boot and make contact with one edge or the center of the patch. Work down the remainder of the patch carefully to avoid trapping air pockets. Roll the patch thoroughly, starting from the center and working to the edges.

h. Allow the patch to set for 10 to 15 minutes, then wipe the patch and surrounding area with a clean lint-free cloth moistened with toluol or uncontaminated unleaded aviation gasoline.

i. Satisfactory adhesion of the patch will be reached in about four hours; however, the boot may be inflated to check the repair after a minimum of 25 minutes.

j. Apply one light coat of A-56-B cement to the patched area, extending beyond the buffed area, to restore the conductive surface. Allow the cement to dry thoroughly (at least one hour) and apply a second light coat. The airplane may be flown as soon as the cement is dry; however, do not operate the deicers until the cement has dried for at least four hours.

DEICER BOOT REMOVAL AND INSTALLATION

Removal

To loosen or remove an installed deicer boot, use toluol to soften the "adhesion" line where the boot is joined to the metal surface. The solvent should be applied sparingly with a brush or triggertype oil can with a spout. Slowly peel the boot back, allowing the solvent time to undercut the boot. Exercise care not to injure the boot during removal.

Preparation of Metal Surfaces

Solvent Cleaning: The metal surface should be completely clean to prevent adhesion failure. Using a grease-free cloth dampened in Methyl-Ethyl-Ketone, go over the area to be covered by the boot. Change the cloths frequently, to avoid contaminating a previously cleaned area. Do not contaminate the clean

supply of MEK, by dipping a used cloth into it. Repeat the process. Now, using a clean, damp cloth and a clean dry cloth, go over the area again; use the dry cloth (following the damp cloth) to wipe the surface dry, rather than letting it air dry.

Chemical Cleaning: Follow the solvent cleaning, with a grease-free cloth wetted with an acid cleaner such as Turco Metal-glo #3 (a product of Turco Products. Inc., Los Angles, California). Vigorously scrub surface.

CAUTION

Although the acid cleaner is a mild acid solution, protective rubber gloves should be worn and contact with the skin should be avoided.

After the acid cleaner has had one minute's contact, wipe dry with a clean cloth. Allow a minimum of one hour dry-time before applying cement. At the end of the dry-time, wipe the surface with a clean cloth and inspect the cloth for dirt. If dirt is present, reclean with MEK; if not, cover the clean surface with paper until the cementing operations are begun.

Preparation of the Rubber Surface

If the deicer boot has a smooth back finish, roughen it slightly with sandpaper before beginning the cleaning operation. Wet a clean cloth with toluol and carefully clean the rough back surface of the boot. Change cloths frequently to avoid contamination of the cleaned areas. Clean the boot a minimum of two times, if the area still seems dirty, reclean the surface in the same manner.

Application of Adhesive: The drying of the cement is a function of time and temperature, and the table below should be used as a shop guide when applying the cement:

Temperature - °F	Minutes of Dry Time
Above 80	30
60-80	45
Below 60	60

Do not apply cement under dusty conditions or in high humidity (80% relative humidity or above). Prior to cementing, mask off the boot area on the metal surfaces, allowing 1/2" to 3/4" margin.

Spray Coat Method:

If the adhesive is applied by spray, the first coat on the back surface of the boot and on the metal surface should dry a minimum of 30 minutes. The second cross coat on each surface should be allowed to dry a minimum of 30 minutes, preferably one hour.

Brush Coat Method:

Apply an even brush coat of EC 1403 adhesive (a product of Minnesota Mining and Manufacturing Co., St. Paul, Minnesota) to the back surface of the boot and the metal surface of the aircraft. Allow a minimum of 30 minutes to dry. Apply a second coat to each surface in a smooth, even layer. Brushing in one area too long, tends to soften the first coat and "rolling" and "balling up" will result. Allow the coating to thoroughly dry a minimum of 30 minutes, preferably one hour before installation. Excess drying time (not to exceed 7 days) is not critical as long as the surfaces are not contaminated.

Installation of the Boot

Using a chalk line, snap a line centrally located on the leading edge of the surface. Snap a line, centrally located cordwise, on the cemented side of the boot.

Securely attach hoses to the deicer connection, being careful to handle the boot section without getting finger marks on the adhesive. Using a lint-free cloth, heavily moisten (not dripping) with toluol, reactivate the surface of the leading edge and boot about 3 inches on either side of the chalk line. Position the boot chalk line directly on the leading edge chalk line and hand roll the boot surface onto the leading edge. Moving along the center line of the leading edge, continue reactivating the adhesive in strips 6 inches wide by 24 inches long. Avoid excessive rubbing of the adhesive surface as some of the adhesive may be removed. Hand roll the joined surfaces to insure complete contact of the adhesive and elimination of air pockets. If the boot does not follow the chalk line on the leading edge, pull it up immediately with a quick motion and reposition properly. Now complete the installation by activating the adhesive surfaces and rolling on the top and lower half of the boot in sequence. Finally roll the entire boot (applying pressure) moving in a direction parallel with the inflatable tubes. Use a narrow stitch roller between tubes to eliminate air entrapment. If an air pocket or blister is noted immediately after boot installation, the air may be removed by inserting a hypodermic needle into the blister and allowing the air to escape. The surfaces may then be pressed down, permitting the surfaces to adhere.

NOTE

When removing entrapped air from the boot by use of a needle, be extremely careful not to puncture one of the inflatable tubes.

Sealing Edges

Fair in all around cut edges and trailing edges of the boot with EC 801 sealer (a product of Minnesota Mining and Manufacturing Company) and cover all exposed adhesive. Never try to remove excess adhesive closer than 1/4 inch from the boot edge. After all adhesives and sealing compounds have dried and cured, remove masking tape and clean adjacent areas with solvent.

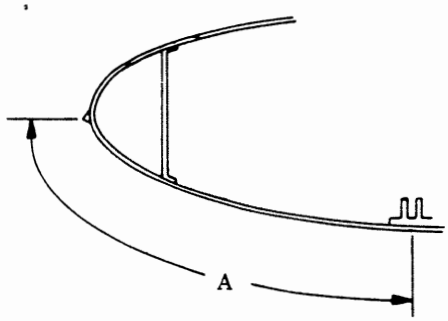
STALL STRIP INSTALLATION

a. Clean boot surface thoroughly, removing all old glue. Mask off the area where new strip is to be in-

stalled and wipe with Methyl Ethyl Ketone.

b. Bostic 1008, a two part cement, is used to join the stall strip to the deicer boot. Mix the Bostic 1008 in the following manner: 30 parts (by weight) of the base material (in the "A" package) with 1 part (by weight) of the accelerator (in the "B" package).

c. Apply a coat to both the stall strip and the area to which it will be bonded. Allow to dry 10 to 15 minutes, then install the strip as described in the illustration. The cement will set in about 6 hours.



Left Wing Only

Prior to TD-706	TD-706 and after
Dimension "A" is 14.75 at Wing Station 111.38 and 14.25 at Wing Station 120.38	Dimension "A" is 14.38 at Wing Station 123.25 and 14 03 at Wing Station 132.25

Figure 3-36. Stall Strip Installation

d. When dry, coat the area with A-56-B cement to replace the conductivity of the boot

PROPELLER ANTI-ICING SYSTEM MAINTENANCE

The flow of anti-icing fluid (isopropyl alcohol) to the propellers is controlled by two orifices contained in a tee fitting located aft of the anti-icing pump in the fluid pressure supply line. The size of the holes in these orifices are quite small (.0130/.0225 inch diameter) and are easily plugged. The system should be checked periodically to insure the proper fluid flow is maintained (2.25 to 2.75 quarts per hour per propeller).

Clogged or restricted orifices may be held to a minimum by:

a. Regularly cleaning the screen located in the bottom of the anti-icing pump.

b. Servicing the tank only with clean isopropyl alcohol.

INSTALLING THE PROPELLER ANTI-ICER BOOT

Locate the anti-icer boot in the following manner:

a. Sight along the center line of the blade leading edge and make a temporary mark on the hub directly above this center line. The mark should be used as a guide in locating the boot.

b. Place the boot along the leading edge of the blade as follows: at the inboard end of the boot, locate the centerline of the boot 1/8 to 1/4 inch forward of the propeller blade leading edge centerline, and at the outboard end of the boot locate the centerline of the boot on the propeller blade leading edge centerline. The boot should be 1/2" from the propeller hub at its inboard end.

Preparing the blade for bonding

a. Mask around the area covered by the boot, leaving a 1/4 inch border on all sides except for the outer end where the border is increased by the amount of stretch.

b. Remove the paint or other organic coating within the masked area with a suitable paint stripper. In many instances, stripping may be accomplished with lacquer thinner and Methyl-Ethyl-Ketone and immediately follow with a clean dry cloth before solvent evaporates.

Preparing the boot for bonding

a. Mask the perimeter on the ribbed side with 1/2" inch tape to prevent excessive curling of the feathered edges after the cement is applied.

b. Sand the smooth sides thoroughly with No. 280 paper abrasive and clean with naphtha. The boot is now ready to install on the blade.

Installing the boot on the propeller blade

a. Warm the cleaned blade to 70° F (minimum) with heat lamps or equivalent heaters and maintain this minimum temperature throughout the installation. This heating operation is unnecessary during warm seasons. A maximum temperature of 150° F shall not be exceeded.

b. Brush a thin uniform coat of EC776 cement (3-M company) over the entire cleaned blade area. Allow one hour to air dry.

c. Brush a thin coat of Bostik 1007P cement primer (B.B. Chemical Company) over the entire cleaned blade area and let dry for up to three hours. This time may be shortened to 30 minutes by accelerated aging under heat lamps or chromalox heaters at 150° F. Check the primer for hardness by scratching with the thumb nail. If any degree of tackiness is indicated, additional cure is needed before applying the bonding cement.

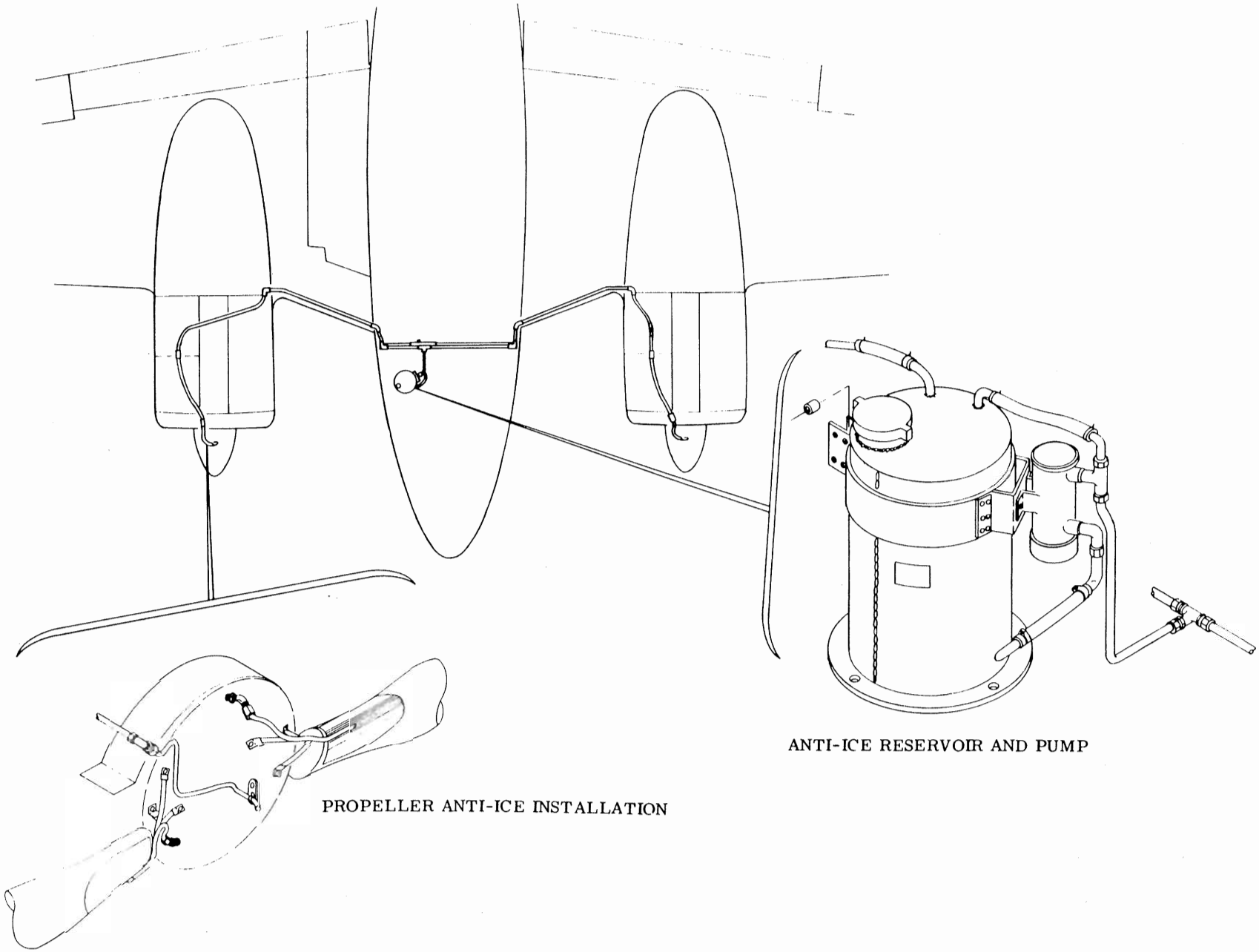


Figure 3-30. Propeller Anti-Icer (TD-1 Thru TD-452)

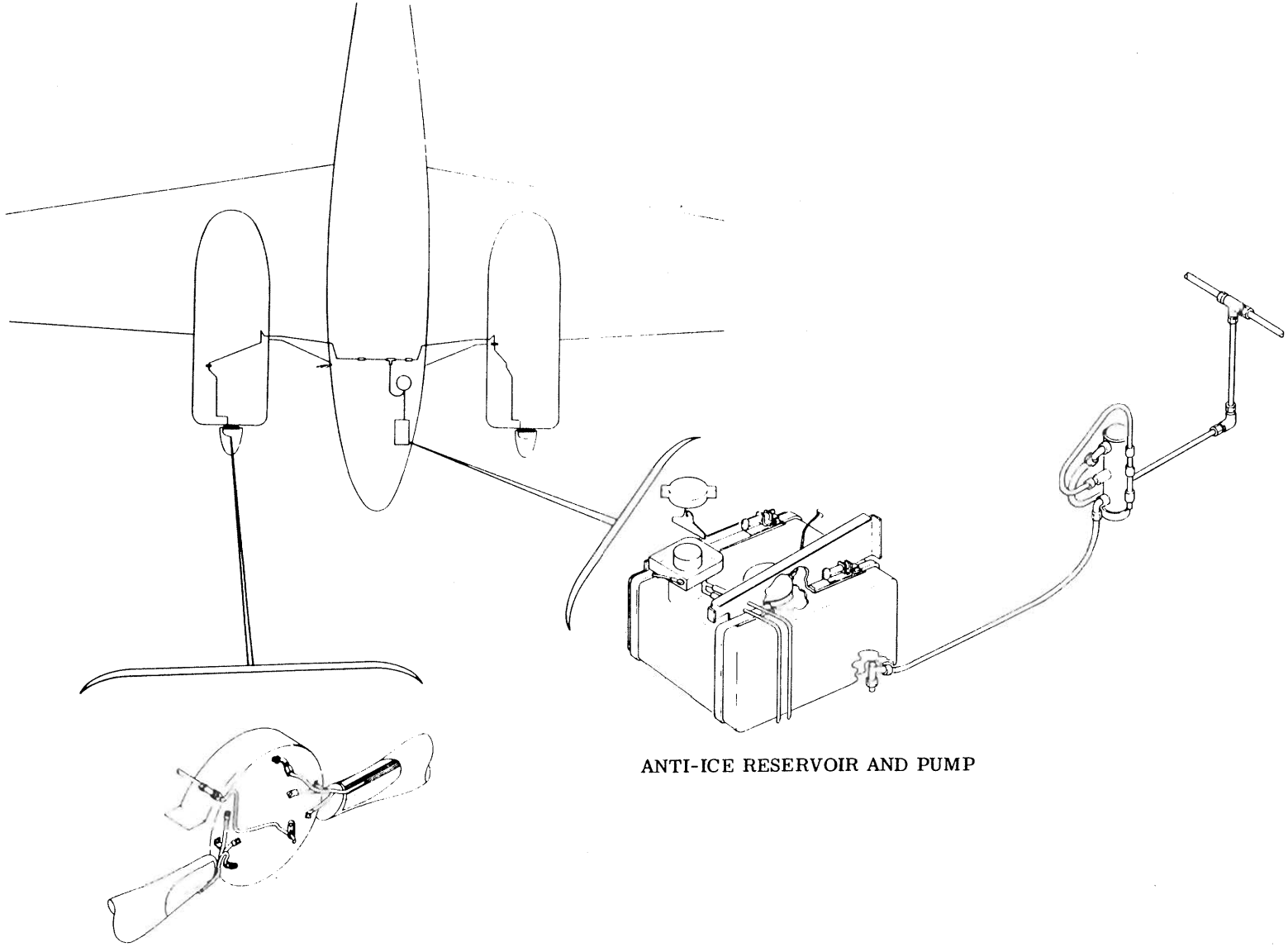


Figure 3-31. Propeller Anti-Icer (TD-453 and After)

d. Brush a heavy coat of Bostik 1008 (one part accelerator B is mixed, by weight, to 40 parts of cement A) on the primed blade and a similar coat on the sanded side of the boot. Allow to stand 45 minutes and repeat the brush coat operation on both surfaces.

e. Allow the second cement coat to dry about 30 minutes before placing the boot into position. Do this by aligning the feed end center with the propeller hub mark and working outward. It is necessary to stretch the boot lengthwise over the blade in the area between the root end and the flat cross section in order to prevent wrinkling of the boot at the edges. The outward section of the boot will lay into position without stretching and should fall within 1/4 inch of the glue line. Roll the boot firmly by working outward from the full length of the center line in order to prevent excessive local stretching and the trapping of air under the boot.

f. Remove the masking carefully so that the 1/4 inch glue line around the boot remains undisturbed.

g. Remove any trapped air with the aid of a hypodermic needle and roller.

h. Allow the installation to cure 48 hours undisturbed before placing into service.

TROUBLESHOOTING

HEATER SYSTEM

TROUBLE	PROBABLE CAUSE	CORRECTION
1. Blower runs but heater will not start.	a. Blown fuse.	a. Check ductstat operation; check combustion chamber and ducts for obstructions.
	b. Faulty ignition unit vibrator.	b. Replace vibrator.
	c. Faulty ignition unit coil.	c. Remove lead from spark plug and hold so spark may jump to structure. If no spark, replace ignition unit.
	d. Faulty spark plug.	d. If test in (c) produces spark, remove and clean or replace spark plug.
	e. Fuel solenoid valve not energized.	e. Check electrical connections. Disconnect fuel line and check for fuel flow. Replace defective valve.
	f. Fuel filter clogged.	f. Clean filter.
	g. Spray nozzle clogged.	g. Clean spray nozzle.
	h. Insufficient combustion air.	h. Remove obstructions or repair leaks.
2. Heater will not shut off automatically.	a. Defective ductstat.	a. Connect voltmeter across ductstat leads and operate control. As the ductstat is pulled out, voltage should decrease. If not, replace ductstat.
3. Heater backfires intermittently.	a. Loose connection in control circuit or loose ignition lead to spark plug.	a. Check electrical connections.
	b. Mixture too rich.	b. Make checks in item 4 below.
4. Fuel mixture too rich; exhaust smudges fuselage.	a. Restriction in combustion air duct.	a. Check iris valve. Check ducts for obstructions.
	b. Restriction in exhaust duct.	b. Check exhaust outlet.
	c. Loose core in fuel nozzle.	c. Clean nozzle. Make sure core is seated tightly in shell.
5. Heater produces inadequate heat.	a. Thermostat not properly adjusted.	a. Adjust thermostat.
	b. Fuel filter partially clogged.	b. Clean filter.
	c. Restriction in fuel lines.	c. Clean line or otherwise remove restriction.

TROUBLE	PROBABLE CAUSE	CORRECTION
	d. Restriction in air ducts.	d. Check air valve and ducts for obstruction.
	e. Spray nozzle partially clogged.	e. Clean spray nozzle.

ELECTRICAL TROUBLESHOOTING

In general, electrical troubles will fall in three classes: internal failures in the units themselves, faults in the wiring, or failures in the power source. With a few exceptions, such as those components which are relay-controlled, ordinary continuity checks with a test lamp or meter should isolate these faults and the corrections then will be obvious. The trouble-shooting tables given here deal with the more complex electrical systems and contain specific suggestions for isolating and correcting troubles. Certain operations, such as flashing a generator field, should be done only by qualified mechanics - preferably at a Beechcraft Certified Service Station.

ALTERNATOR

TROUBLE	SYSTEM EFFECT	PROBABLE CAUSE
1. Output Transistor Shorted	a. High system voltage b. Battery overcharge c. Lights burning out	a. F terminal of generator has been grounded. b. Poor ground in system or poor connection at generator or regulator. c. Regulator too hot. d. Ground in wiring between F terminals of generator and regulator. e. Defective transistor. f. Shorted field in generator.
2. Output Transistor open emitter	a. No Charge	a. Severe ground at F terminal of generator. b. Severe ground in wiring between F terminals of generator and regulator. c. Generator field completely shorted.
3. Driver Transistor Shorted	a. No Charge	a. Reverse battery polarity. b. High positive transient from an external source. c. Defective transistor.
4. Driver Transistor Open	a. High System voltage	a. Defective transistor.
5. Zener Diode Shorted	a. No Charge	a. Reverse battery polarity. b. High system voltage. c. Defective zener.
6. Zener Diode Open	a. High System voltage	a. Defective zener.

TROUBLE	SYSTEM EFFECT	PROBABLE CAUSE
7. Field Discharge Diode Open	a. Shorted output transistor and high system voltage	a. Reverse battery polarity. b. Defective diode.
8. Back Bias Diode Open	a. No Charge	a. Severe ground at F terminal of generator. b. Severe ground in wiring between F terminals of generator and regulator. c. Generator field completely shorted. d. Defective diode.
9. Back Bias Diode Shorted	a. Poor switching which would cause shorted output transistor	a. F terminal of generator has been grounded. b. Poor ground in system or poor connection at generator or regulator. c. Regulator too hot. d. Ground in wiring between F terminals of generator and regulator. e. Defective transistor. f. Shorted field in generator. g. Defective diode.
10. Transient Suppression Diode Open	a. Output transistor may short from transients depends on application	a. Reverse battery polarity. b. High positive transient from external source.
11. Filter Capacitor Open	a. Poor switching may or may not fail output transistor	a. Defective connection. b. Defective capacitor.
12. Feedback Capacitor Shorted	a. High system voltage	a. Defective capacitor.
13. Feedback Capacitor Open	a. Poor switching which could cause shorted output transistor	a. Poor connection. b. Defective capacitor.
14. Open resistor in negative side of voltage divider. Open negative side of potentiometer.	a. High system voltage	a. Defective resistor or potentiometer.

TROUBLE	SYSTEM EFFECT	PROBABLE CAUSE
15. Open resistor in positive side of voltage divider. Open positive side of potentiometer.	a. No Charge	a. Defective resistor or potentiometer.
16. Open collector load resistor	a. No Charge	a. Defective resistor.
17. Open driver emitter - base	a. Poor switching which will short output transistor. High system voltage.	a. Defective resistor.

BATTERY

TROUBLE	PROBABLE CAUSE	CORRECTION
1. No power indicated with battery master switch on.	a. Batteries discharged or defective.	a. Test with hydrometer and voltmeter.
	b. Open circuit between battery relay and master switch.	b. Check continuity.
	c. Master switch defective.	c. Check switch for operation. Replace if necessary.
	d. Defective battery relay.	d. Check relay for operation. Replace if necessary.
2. Power on with master switch off.	a. Master switch defective.	a. Check switch for operation. Replace if necessary.
	b. Battery relay contacts stuck.	b. Replace relay.

STARTER

TROUBLE	PROBABLE CAUSE	CORRECTION
1. Both starters inoperative.	a. Circuit breaker tripped in starter switch circuit.	a. Reset.
	b. Starter relay inoperative.	b. Check continuity of starter system.
	c. Low batteries.	c. Test batteries. If low, replace or start with external power.
	d. Loose connections or open circuit between battery relay and left starter relay.	d. Check connections and continuity.
2. One starter inoperative.	a. Starter relay inoperative.	a. Check relay terminal connections and continuity of solenoid energizing circuit. If energizing circuit is closed and relay does not operate, replace relay.
	b. Poor ground at starter.	b. Test continuity from armature lead to ground. Repair if necessary.

TROUBLE	PROBABLE CAUSE	CORRECTION
	c. Open circuit.	c. Check continuity to starter.
	d. Defective starting motor.	d. Check brushes, springs, condition of commutator; replace if necessary.

GENERATORS

TROUBLE	PROBABLE CAUSE	CORRECTION
1. No ammeter indication.	a. Engine speed too low.	a. Increase speed.
	b. Loose connection.	b. Check connections throughout system.
	c. Open field circuit in generator; defective armature.	c. Test resistance of field. Check field circuit connections. Replace generator if defective.
	d. Brushes not contacting commutator.	d. Clean brushes and holders with a clean, lint-free, dry cloth. Replace weak springs.
	e. Brushes worn out.	e. Replace brushes if worn to a length of 1/2 inch or less.
	f. Dirty commutator.	f. With generator running, clean commutator with No. 0000 sandpaper. Use air jet to remove grit.
	g. Defective voltage regulator.	g. Replace regulator.
	h. Defective ammeter.	h. Replace ammeter.
2. No generator output.	a. Circuit breaker tripped.	a. Reset.
	b. Open circuit.	b. Check continuity of circuit.
	c. Loss of residual magnetism.	c. Flash generator field.
	d. Defective generator control switch or current relay.	d. Test switches. Replace if defective.
3. Low generator output.	a. Generators not paralleled.	a. Readjust minimum-load voltage, then readjust paralleling coil in voltage regulator.
4. Ammeter reads off scale in wrong direction.	a. Defective reverse-current relay.	a. Replace relay.

WING FLAP ELECTRICAL SYSTEM

TROUBLE	PROBABLE CAUSE	CORRECTION
1. Flap motor fails to shut off when flaps are retracted.	a. Up limit switch out of adjustment.	a. Readjust switch.
	b. Defective up limit switch.	b. Replace switch.
2. Flap motor fails to shut off when flaps are extended.	a. Down limit switch out of adjustment.	a. Readjust switch.
	b. Defective down limit switch.	b. Replace switch.

TROUBLE	PROBABLE CAUSE	CORRECTION
3. Flaps fail to extend.	a. Circuit breaker tripped.	a. Reset.
	b. Loose connection.	b. Check continuity of extension circuit.
	c. Down limit switch open.	c. Check limit switch. With flaps retracted, down limit switch should be closed. Replace if necessary.
4. Flaps fail to retract.	a. Circuit breaker tripped.	a. Reset.
	b. Loose connection.	b. Check continuity of retraction circuit.
	c. Up limit switch open.	c. Check limit switch. With flaps extended, down limit switch should be closed. Replace if necessary.
5. Flap rollers bottom in flap tracks.	a. Limit switch out of adjustment.	a. Readjust switch.

LANDING GEAR SYSTEM

TROUBLE	PROBABLE CAUSE	CORRECTION
1. Landing gear motor fails to shut off when gear is retracted.	a. Up limit switch out of adjustment.	a. Readjust switch.
	b. Defective switch.	b. Replace switch.
2. Landing gear fails to retract.	a. Safety switch not closing.	a. Readjust switch.
	b. Up limit switch remaining open.	b. Replace switch.
3. Landing gear motor fails to shut off when gear is extended.	a. Down limit switch does not open.	a. Readjust limit switch.
	b. Defective down limit switch.	b. Replace switch.
4. Landing gear actuator is hitting internal stops.	a. Limit switch out of adjustment.	a. Readjust limit switch.
	b. Dynamic brake relay defective.	b. Replace relay.
5. Warning horn inoperative or malfunctioning.	a. Open or grounded circuit.	a. Check continuity.
	b. Throttle switches inoperative.	b. Check and adjust as necessary.
6. Landing gear fails to extend.	a. Tripped circuit breaker.	a. Reset circuit breaker.
	b. Down limit switches open.	b. Check down limit switch. With the gear retracted the down limit switch should be closed.

TROUBLE	PROBABLE CAUSE	CORRECTION
	c. Open circuit.	c. Run a continuity check on the down limit switch.
7. Landing gear will not retract or extend.	a. Bad electrical connections.	a. Run a continuity check from circuit breaker to switch. Inspect the dynamic brake relay.
	b. Landing gear motor not grounded.	b. Check motor ground.
	c. Defective control circuit.	c. Check items 1 through 3.

ENGINE

TROUBLE	PROBABLE CAUSE	CORRECTION
1. Engine fails or is hard to start.	a. Lack of fuel.	a. Check fuel system for leaks. Fill fuel tank. Clean dirty lines, strainers or fuel cocks.
	b. Underpriming.	b. Prime with 2 or 3 strokes of primer.
	c. Overpriming.	c. Open throttle and "unload" engine by turning in counter-clockwise direction. (Magneto switches off on 95 and B95).
	d. Incorrect throttle setting.	d. Open throttle to one-tenth of its range.
	e. Defective spark plugs.	e. Clean and adjust or replace spark plug or plugs.
	f. Defective ignition wire.	f. Check with electric tester and replace any defective wires.
	g. Defective battery.	g. Replace with charged battery.
	h. Improper operation of magneto breaker points.	h. Clean points. Check timing of magnetos.
	i. Water in carburetor or fuel injector.	i. Drain carburetor or fuel injector and fuel lines.
	j. Internal failure.	j. Check oil sump strainer for metal particles. If metal particles are found, a complete overhaul of the engine may be indicated
2. Failure of the engine to idle properly.	a. Incorrect idle adjustment.	a. Adjust throttle stop to obtain correct idle.
	b. Idle mixture.	b. Adjust mixture.
	c. Leak in the induction system.	c. Tighten all connections in the induction system. Replace any parts that are defective.
	d. Low cylinder compression.	d. Check condition of piston rings and valve seats.
	e. Faulty ignition system.	e. Check entire ignition system.

TROUBLE	PROBABLE CAUSE	CORRECTION
3. Low power and uneven running.	a. Mixture too rich: indicated by sluggish engine operation, red exhaust flame at night. In extreme cases indicated by black smoke from exhaust.	a. Check primer shut-off valve for leakage. Readjustment of carburetor or fuel injector may be required.
	b. Mixture too lean; indicated by overheating or back-firing.	b. Check fuel lines for dirt or other restrictions. Check fuel supply. Readjust carburetor or fuel injector if necessary.
	c. Leaks in induction system.	c. Tighten all connections. Replace defective parts.
	d. Defective spark plugs.	d. Clean or replace spark plugs.
	e. Improper fuel.	e. Use only fuel of the recommended octane grade.
	f. Magneto breaker points not working properly.	f. Clean points. Check timing of magnetos.
	g. Defective ignition wire.	g. Check wire with electric tester.
	h. Improper ignition timing.	h. Check magnetos for timing and synchronization.
	i. Defective spark plug terminal connectors.	i. Replace connectors on spark plug wire.
	j. Incorrect valve clearance.	j. Adjust valve clearance.
4. Failure of engine to develop full power.	a. Throttle lever out of adjustment.	a. Adjust throttle lever.
	b. Leak in the induction system.	b. Tighten all connections and replace defective parts.
	c. Restriction in carburetor air scoop.	c. Inspect air scoop and remove restrictions.
	d. Improper fuel.	d. Use only fuel of the recommended octane grade.
	e. Faulty ignition.	e. Tighten all connections. Check system with tester. Check ignition timing.
5. Rough engine.	a. Cracked engine mount.	a. Replace or repair mount.
	b. Unbalanced propeller.	b. Check propeller for proper balance.
	c. Defective engine mount bushings.	c. Install new engine mount bushings.
6. Low oil pressure.	a. Insufficient oil.	a. Check oil supply.
	b. Air lock or dirt in relief valve.	b. Remove and clean oil pressure relief valve.
	c. Leak in suction line or pressure line.	c. Check gasket between accessory housing and crankcase.

TROUBLE	PROBABLE CAUSE	CORRECTION
	d. Dirty oil strainers.	d. Remove and clean oil strainers.
	e. Defective pressure gage.	e. Replace oil pressure gage.
	f. Stoppage in oil pump intake passage.	f. Check line for obstruction. Clean suction strainer.
7. High oil temperature.	a. Insufficient air cooling.	a. Check air inlet and outlet for deformation or obstructions.
	b. Insufficient oil supply.	b. Fill oil sump to proper level.
	c. Low grade of oil.	c. Use only oil which conforms to engine specifications.
	d. Clogged oil lines or strainers.	d. Remove and clean oil strainers.
	e. Excessive blow-by.	e. Worn or stuck rings. Complete overhaul required.
	f. Defective bearing.	f. Inspect sump for metal particles. If metal particles are present overhaul of engine is required.
	g. Defective temperature gage.	g. Replace gage.
8. Excessive oil consumption.	a. Low grade of oil.	a. Use only oil which conforms to engine specifications.
	b. Defective bearing.	b. Inspect sump for metal particles. If metal particles are present overhaul of engine is required.
	c. Worn piston rings.	c. Install new rings.
	d. Incorrect installation of piston rings.	d. Install new rings.

MAGNETOS

TROUBLE	PROBABLE CAUSE	CORRECTION
1. Hard Starting	a. Low voltage at vibrator input.	a. Measure voltage between vibrator terminal marked "in" and the ground terminal while operating starter. Must be at least 13 volts.
	b. Inoperative or defective vibrator.	b. If voltage is adequate, listen for buzzing of vibrator during starting. If no buzzing is heard, either the vibrator is defective or the circuit from the "output" terminal on the vibrator to the retard (dual breaker) magneto is open. Check both "Switch" and "Retard" circuits. Also check for good electrical ground.

TROUBLE	PROBABLE CAUSE	CORRECTION
	c. Retard breaker or impulse coupling not operating. Engine may kick back during cranking due to advance timing of ignition.	c. Points may not be closing due to wrong adjustment, or may not be electrically connected in the circuit due to a poor connection. Inspect points to see if they close. Check for proper contact at the terminals of magneto and at the vibrator. Check wiring.
	d. Vibrator-magneto combination not "functioning" electrically.	d. Turn engine in proper direction of rotation until retard points just open on No. 1 cylinder position. Remove input connection from starter to prevent engine turning and while holding No. 1 plug lead 5/16 inch from ground energize vibrator by turning switch to start. Plug lead should throw a 5/16 inch spark. If spark is weak or missing try new vibrator. If this does not correct trouble remove magneto and check for improper internal timing or improperly meshed distributor gears.
	e. Magneto improperly timed to engine.	e. Check magneto-to-engine timing.
	f. Advance breaker out of adjustment (internal timing off).	f. Check magneto internal timing.
	g. Retard points opening too late or impulse coupling timed wrong.	g. Check timing of retard points or impulse coupling.
2. Engine Roughness.	a. Defective spark plugs.	a. Try new spark plugs.
	b. Defective spark plug leads.	b. Check plug leads for continuity and breakdown.
	c. Defective breaker points.	c. Check magneto breaker for burning or dirt. (Main & Retard)

SIMMONDS FUEL INJECTION

TROUBLE	PROBABLE CAUSE	CORRECTION
1. Rough engine operation, cold cylinder or high fuel pressure.	a. Clogged nozzle(s) or lines.	a. Remove nozzles and clean in solvent. Blow compressed air through the nozzle in direction opposite fuel flow with 100 psi air pressure.
	b. Incorrect fuel/air mixture.	b. Make sure mixture control is set properly. Check throttle body and fuel pump assembly. If proper adjustment of mixture control does not give correct fuel flow remove and replace fuel pump and throttle body.

TROUBLE	PROBABLE CAUSE	CORRECTION
	c. Clogged by-pass restrictor in fuel pump.	c. Replace fuel pump and throttle body.
2. Engine Idles Rough.	a. Clogged nozzle(s).	a. Use same remedy as (1-a) above.
	b. Idle adjustments set incorrectly.	b. Adjust air bleed screw.
3. Engine does not fire (pressure indication on pressure gage).	a. Clogged nozzles.	a. Check for fuel flow from nozzles. Follow procedures in (1-a).
	b. Flooded engine (excessive use of boost pump).	b. Clear engine, re-start engine.
4. Engine does not fire (no pressure on pressure gage).	a. Incorrect setting of fuel controls.	a. Check fuel controls for proper setting.
	b. No fuel.	b. Check fuel level.
	c. Defective fuel pump.	c. Replace fuel pump and throttle body.
5. Poor acceleration.	a. Idle adjustment set too lean.	a. Adjust air bleed screw.
	b. Defective fuel pump assembly, throttle body assembly and/ or linkage.	b. Inspect components. Replace both fuel pump and throttle body if either is defective. Replace linkage if defective.
6. Low fuel pressure or fuel starvation.	a. Clogged fuel strainer (either finger strainer in the throttle body or fuel strainer in the wheel wells).	a. Remove and clean strainer with pressurized air. Inspect strainer for deterioration prior to reinstalling.
7. Fluctuations of fuel pressure gage needle.	a. Dirty fuel filter screen.	a. Remove the hex nut on the side of the throttle body. Remove and clean filter screen.
8. Fuel leakage at filter hex nut.	a. Crushed "O" ring caused by over-tightening of hex.	a. Replace "O" ring. Tighten hex nut, not to exceed a torque of 45 to 55 inch-pounds.

BENDIX FUEL INJECTION

TROUBLE	PROBABLE CAUSE	CORRECTION
1. Rough engine operation.	a. Clogged nozzle.	a. Remove and clean nozzles in solvent. Blow compressed air through nozzle in direction opposite fuel flow with 100 psi air pressure.
2. Engine idles rough.	a. Clogged nozzle.	a. Clean nozzles as described in (1-a).
	b. Incorrect idle adjustment.	b. Adjust idle mixture linkage.
3. Low fuel flow or fuel starvation.	a. Clogged fuel strainer (either wheel well fuel strainer or finger strainer in regulator).	a. Remove and clean fuel strainer. Backflush finger strainer.

TROUBLE	PROBABLE CAUSE	CORRECTION
	b. Clogged metering jet.	b. Disassemble mixture control and clean jet.
	c. Clogged flow divider.	c. Disassemble and clean flow divider.
4. Poor acceleration.	a. Idle mixture too lean.	a. Readjust idle mixture.

LIGHT WEIGHT RESERVOIR DEICER

TROUBLE	PROBABLE CAUSE	CORRECTION
1. Deicers do not inflate, or inflate slowly.	a. Control cables not connected or not fastened to the valves tightly.	a. Inspect cable connections to the valves for tightness and proper adjustment.
	b. Mechanical interference of cables or mechanism.	b. Correct interference problem.
	c. Reservoir empty.	c. Charge reservoir.
	d. Shut-off valve not open.	d. Check shut-off valve control cable for proper adjustment.
	e. Regulator set for too low a pressure.	e. Reset regulator.
	f. Cycling valve not operating or not completely engaged.	f. Check cycling control cable for proper adjustment.
	g. Plumbing blocked or not connected.	g. Blow out lines and inspect connections.
2. Deicers do not deflate, or deflate slowly.	a. Cycling valve not operating properly.	a. Check cycling control cable for proper adjustment and possible mechanical interference.
	b. Plumbing blocked or not connected.	b. Blow out lines and inspect connections.
	c. Check valve malfunctions at cycling valve assembly.	c. Observe check valve. Unplug outlet, repair or replace check valve if defective.
	d. Right engine not running, vacuum supply to aid deflation and hold down is not available.	d. Start right engine or correct vacuum system malfunction.
3. Deicers remain inflated, reservoir drains on first cycle, or automatic return of cycling valve does not function.	a. Improper tubing connection.	a. Check tubing connections to cycling valve.
4. Regulator safety valve popping under 30 psi.	a. Regulator safety valve improperly set.	a. Reset valve.
5. Shut-off valve does not effect complete shut-off.	a. Shut-off valve actuating pin does not drop free to let the shaft inside the valve seat completely.	a. Check actuating pin, replace if defective.

TROUBLE	PROBABLE CAUSE	CORRECTION
6. Cycling valve automatic return functions before deicers are fully inflated or inflation cycle is longer than 5 to 9 seconds.	a. Cycling valve out of adjustment.	a. Adjust the cycling valve "pop-off" pressure.

ENGINE-DRIVEN DEICER

(TAVCO OR GOODRICH VALVES)

The following troubleshooting procedures are based on the assumption that the aircraft engine-driven vacuum pumps and the aircraft electrical system are operational.

TROUBLE	PROBABLE CAUSE	CORRECTION
1. Deicer boots do not inflate (either or both engines operating at minimum cruise rpm for a period of eight seconds).	a. Open circuit breaker.	a. Push deicer circuit breaker to reset.
	b. Loose electrical connection or broken wire.	b. Tighten or repair as required.
	c. Timer not functioning.	c. See Component Maintenance and Replacement, Timer.
	d. Control valves not functioning.	d. See system Checkout, Control Valves.
	e. Control valve poppet sticking.	e. See Component Maintenance and Replacement, Control Valves.
	f. Piping lines kinked, blocked, or not connected.	f. Inspect lines and connections; blow out lines.
	g. Leak in system.	g. See System Checkout, Air Leakage Test.
2. Deicer boots inflate too slowly (either or both engines operating at minimum cruise rpm for a period of eight seconds).	a. Piping lines kinked, parblocked, or not connected securely.	a. Inspect lines and connections; blow out lines.
	b. Leak in system.	b. See System Checkout Air Leakage Test.
	c. Shuttle Valve not functioning.	c. Check fitting in shuttle valve deicer port for proper installation (Goodrich control valves only).
	d. Deicer boot puncture.	d. Repair as prescribed in Part III of this amendment or replace.
3. Deicer boots do not deflate.	a. Pilot pressure and priority pressure lines improperly installed (Tavco control valve assemblies only).	a. Install each line between pilot port of one valve assembly and priority port of opposite valve assembly.
4. Deicer boots deflate too slowly.	a. Defect in aircraft vacuum system.	a. See Vacuum System, this manual.
	b. Clogged air filters (Goodrich control valves only).	b. See Component Maintenance and Replacement, Air Filters.
	c. Piping lines kinked or partially blocked.	c. Inspect and blow out lines.

TROUBLE	PROBABLE CAUSE	CORRECTION
	d. Overboard line from control valve partially blocked.	d. Inspect and blow out line.
	e. Pilot pressure and priority pressure lines improperly installed (Tavco control valve assemblies only).	e. Install each line between pilot port of one valve assembly and priority port of opposite valve assembly.

AUTOMATIC SURFACE DEICER (PRESSURE)

The following troubleshooting procedures are based on the assumption that the aircraft engine-driven dry air pumps are operational.

TROUBLE	PROBABLE CAUSE	CORRECTION
1. Deicer boots do not inflate (either or both engines operating at minimum cruise RPM for a period of eight seconds).	a. Open circuit breaker.	a. Push deicer circuit breaker to reset.
	b. Loose electrical connection or broken wire.	b. Tighten or repair as required.
	c. Time delay relay not functioning.	c. See component maintenance and replacement, time delay relay.
	d. Deicer boot puncture.	d. Repair as prescribed in this section or replace.
	e. Distributor valves not functioning.	e. See Items 4 and 5 (Troubleshooting Chart).
	f. Piping lines kinked, blocked, or not connected.	f. Inspect lines and connections; blow out lines.
	g. Leak in system.	g. See system checkout, locate and repair.
2. Deicer boots inflate too slowly (either or both engines operating at minimum cruise RPM for a period of eight seconds).	a. Piping lines kinked, partially blocked, or not connected securely.	a. Inspect lines and connections; blow out lines.
	b. Leak in system.	b. See system checkout, locate and repair.
	c. Deicer boot puncture.	c. Repair as prescribed in this section or replace.
	d. Distributor valve not functioning.	d. See item 4 and 5 (Troubleshooting Chart).
3. Deicer boots deflate too slowly.	a. Clogged instrument air filters.	a. See Component maintenance and replacement, air filters.
	b. Piping lines kinked or partially blocked.	b. Inspect and blow out lines.
	c. Overboard line from distributor valve partially blocked.	c. Inspect and blow out lines.
	d. Distributor valve not operating properly.	d. Overhaul or replace.

TROUBLE	PROBABLE CAUSE	CORRECTION
	e. Electrical circuit malfunctioning.	e. See system wiring diagram.
	NOTE	
	The following items might aid in ascertaining whether or not the distributor valve is functioning properly.	
4. One or more boots do not inflate -- with pressure gage at normal reading and timer cycling.	a. Defective wiring in external circuit or other units.	a. Refer to system wiring diagram and make complete check. Disconnect plug at distributor valve. Voltage should cycle at approximately 28 volts.
	b. Faulty solenoids in distributor valve.	b. Measure resistance of solenoids. Reading should be 17.5 ± 5% ohms through the receptacle pins. Replace if readings do not check.
	c. Mechanical failure in distributor valve.	c. Disconnect lines at the outlet ports of the distributor valve and check valve operation with a gage. If trouble is not found in the distributor valve, inspect boots and lines for leaks or blockage.
5. One or more boots inflate but do not deflate readily-with pressure gage at normal reading and timer cycling.	a. Exhaust port of distributor valve not vented to low pressure area.	a. Reroute exhaust line to low pressure area.
	b. Vacuum ejector on distributor valve plugged or partially blocked.	b. Overhaul or replace distributor valve.
	c. Defective boots.	c. Repair as prescribed in this section or replace.
	d. Obstruction of lines.	d. Disconnect line from exhaust port of distributor valve and see if line is clear to low pressure area.
	e. Mechanical failure in distributor valve.	e. With line disconnected see if exhaust port is discharging; if not, replace distributor valve.

MAJOR DISASSEMBLY

This section stresses special points on removing and installing major assemblies of the Travel Air.

Step-by-step procedures are given only where it is considered necessary because the process is complex -- such as the removing and installing of the wing and the installing of the wing panel leading edge.

A table of torques on major assemblies is included in this section.

REMOVING AND INSTALLING THE ENGINE

a. Remove the upper cowl.
b. Disconnect the air filter and cowl flap actuator.
c. Remove the propeller.
d. Remove the lower cowl and fillets.
e. Disconnect all plumbing and exhaust stacks at the firewall.
f. Disconnect engine controls.
g. Disconnect electrical wiring at firewall, and at accessories where necessary.
h. Place a wing stand under the opposite wing and a stand under the tail.
i. Position the engine hoist and attach the hoisting hook to the engine lifting ring. Remove the slack from the cable.
j. Remove the bolts securing the engine mount to the nacelle firewall.
k. Remove the engine.
l. Reverse preceding steps for installation.

CAUTION

To be safe, treat all S series magnetos as hot whenever the ground lead is disconnected. To ground the magneto, connect a wire to the switch lead at the filter capacitor and ground the wire to the engine case. If grounding is impractical, remove the cable outlet plate on the rear of the magnetos or disconnect all the spark plug leads.

When reinstalling the engine, torque the engine mount bracket bolts 305 to 325 inch-pounds on the bolt head. Torque on the nut should be 265 to 290 inch-pounds prior to Serial TD-534 except TD-506, and 245 to 265 inch-pounds on Serials TD-506, TD-534 and after. Add no more than three 105090-032-6K washers between the lower engine mounts and firewall as spacers for alignment of the propeller assembly and the engine cowl opening.

If the engine is disconnected at the engine shock mounts, rather than at the firewall, on reinstallation torque these engine mount bolts 475 plus or minus 25 inch-pounds. Be careful to align the holes in the rubber mount bushings with the pin which protrudes equidistant on both sides of the steel bushing.

Because the cowling is an integral part of the cooling system, the engine will overheat if operated with the cowling removed for more than short test periods.

WING

REMOVING THE WING

a. Drain both fuel cells.
b. Remove the wing mounting bolt access plates from the top and bottom of the wing.
c. Place the airplane on a three point jack and raise until the wheels are clear. See Section 2 for jacking instructions.
d. Place a suitable cradle under the wing being removed and a wing stand under the opposite wing. A tail stand will also be required to assure stability.
e. Open the brake cylinder bleed ports and pump all fluid from the system.
f. Retract the landing gear until the inboard landing gear doors are fully open.
g. Disconnect the inboard door actuating rod from the control horn.
h. Disconnect the landing gear uplock cable at the inboard door idler arm in the cabin.
i. Disconnect the landing gear actuator rod from the V-brace in the wheel well.
j. Disconnect the aileron cables at the turnbuckles in the wheel well and remove roll pins from inboard aileron cable pulley brackets. Disconnect aileron tab cables and aileron tab stops in left wheel well (if installed).
k. Disconnect the hydraulic brake line at the inboard connection in the wheel well.
l. Disconnect fuel lines between wing root rib and the fuselage.
m. Disconnect the flap drive shaft at the motor and remove the clamps attaching the shaft to the fuselage.
n. Remove the lower aft nacelle fairing assembly.
o. Remove the leading edge cover of the wing located between the fuselage and nacelle.
p. Remove the clamps securing the wiring bundles to the wing inboard leading edge. Disconnect wiring bundles at terminals located on aft side of nacelle firewall.
q. Disconnect wiring to the electrical components located in each side of the upper nacelle.
r. Disconnect the plumbing between the wing root rib and the fuselage.
s. Disconnect flap wire bundle and safety switch wiring in left wheel well. Disconnect plumbing and electrical wiring (booster pump and fuel quantity transmitter) in each wheel well.
t. Remove the clamps securing engine controls to leading edge.
u. Disconnect the pitot line between the wing root rib and the fuselage (left wing only).
v. Outline the position of the wing on the fuselage as a guide to reinstallation.

CAUTION

There should be no bolt binding during removal. Should binding occur, adjust the wing position until the bolt disengages freely.

w. Remove the wing attach bolts from the fittings.
x. Remove the wing by pulling it straight away from the fuselage.

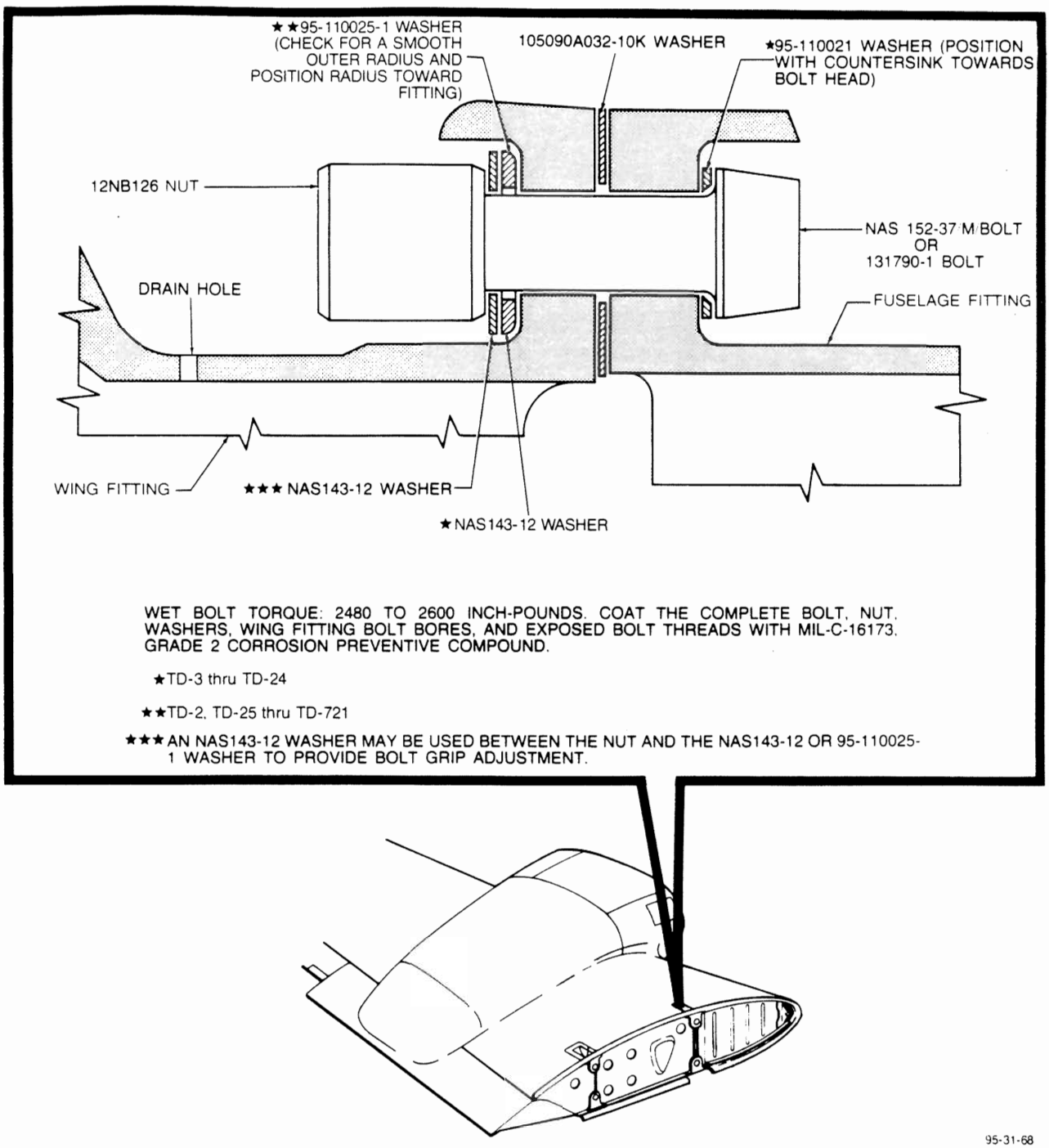


Figure 4-1. Upper Forward Wing Bolt Installation

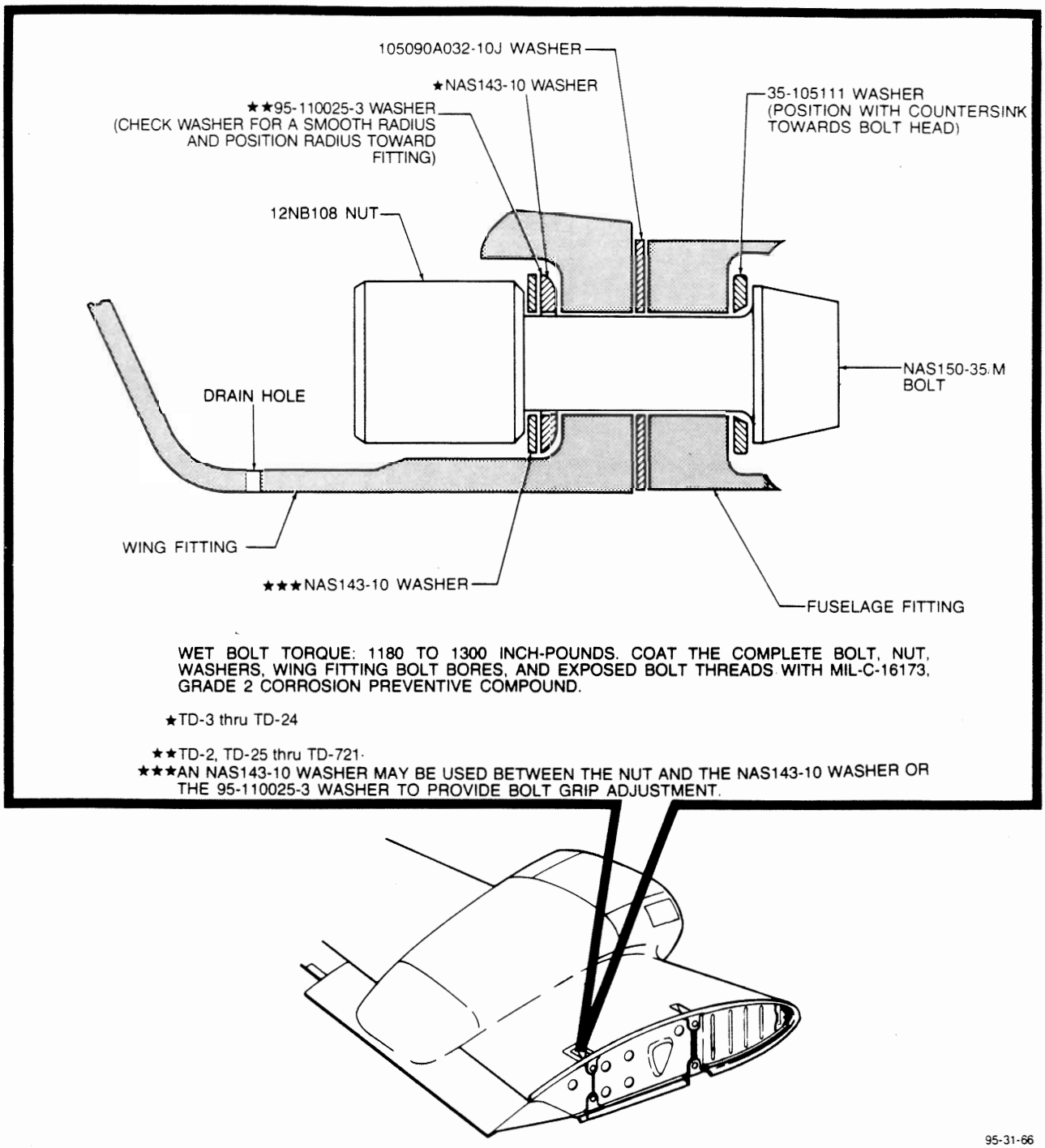


Figure 4-1A. Upper Aft Wing Bolt Installation

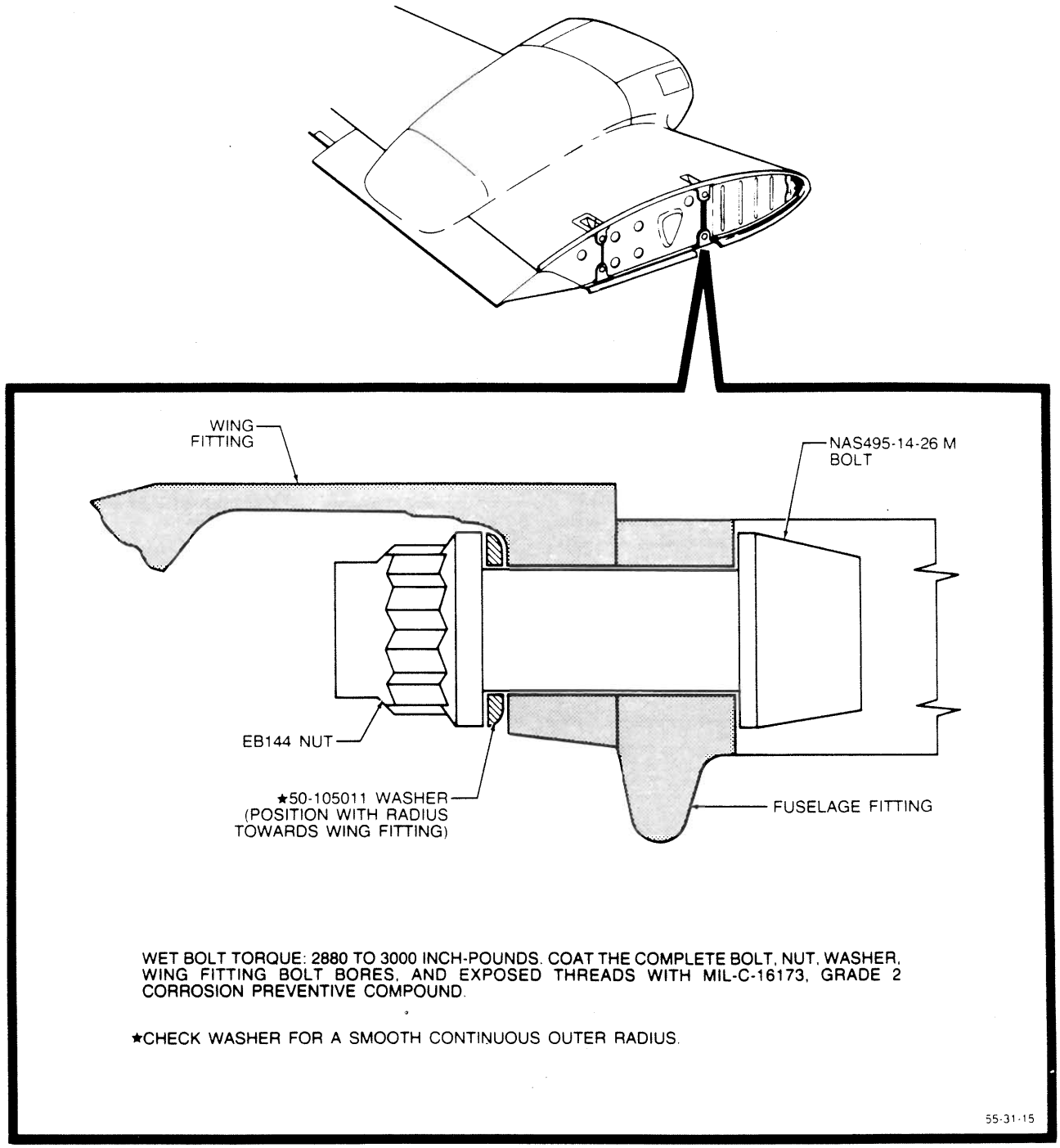


Figure 4-1B. Lower Forward Wing Bolt Installation

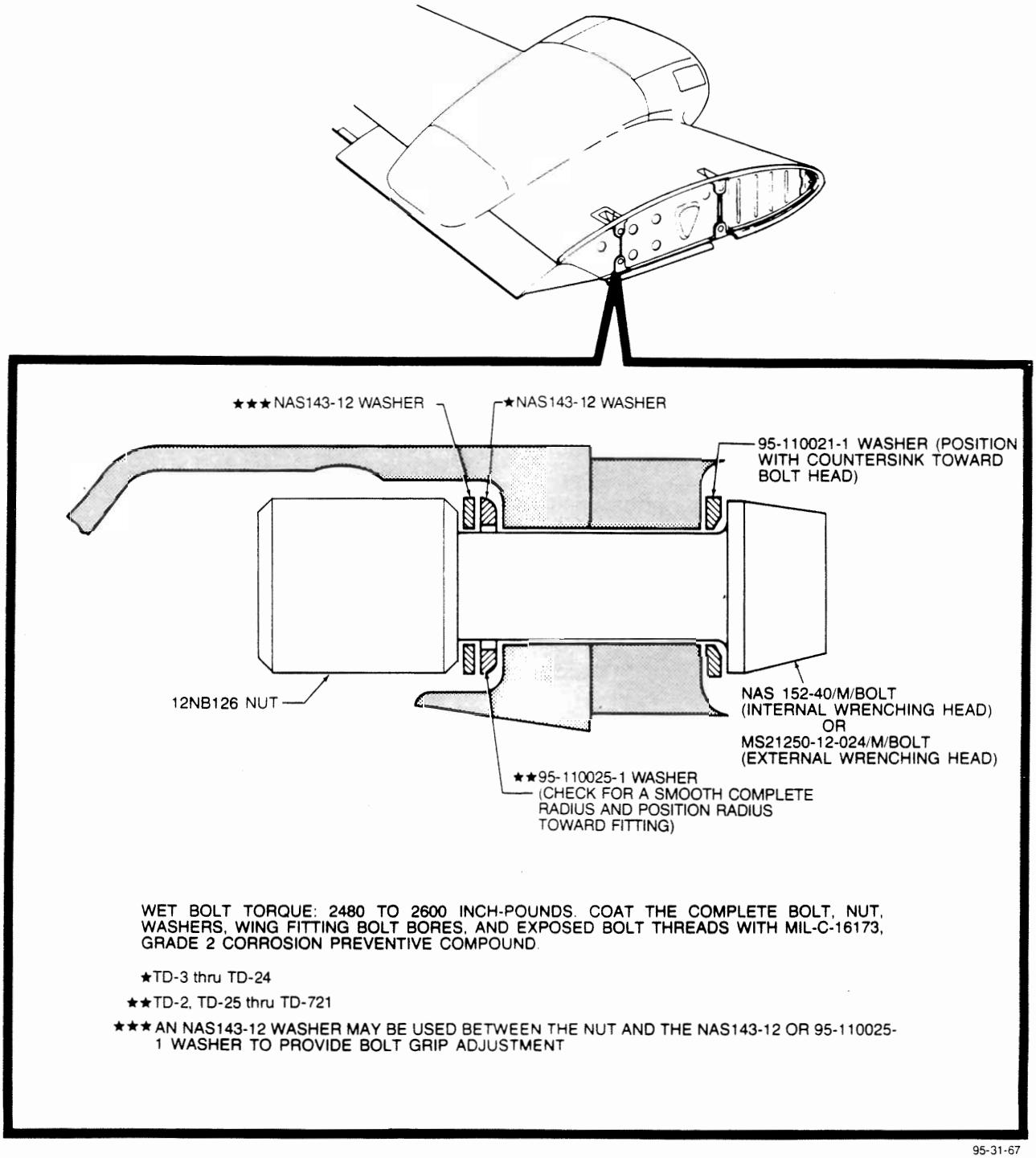


Figure 4-1C. Lower Aft Wing Bolt Installation

NOTE

Discard the soft aluminum washers installed between the upper wing attach fittings. Install new washers when the wing is reinstalled.

INSTALLING THE WING

a. Using a nonmetallic brush and naphtha or methyl ethyl ketone (1 or 2, Chart 2), clean the wing attach fittings and hardware (bolts, washers, and nuts). Inspect the wing attach fittings and hardware as instructed under WING BOLT, NUT, AND FITTING INSPECTION.

WARNING

Wing bolts that have reached their life limit (10 years after the initial inspection), must not be reused.

b. Coat the fitting bolt bores and bearing faces, bolts, washers, and nuts with MIL-C-16173 Grade II corrosion preventive compound (5, Chart 2).

CAUTION

Each bolt must be inserted by hand without binding. If a bolt cannot be easily inserted, reposition the wing until the bolt moves freely in the fittings. Do not screw or drive the bolt into the fittings.

c. Guide the flap shaft and retract rod into their respective positions and secure them. Align the wing and fuselage fittings and insert the wing bolts into the attach fittings.

CAUTION

Bolts, washers, and nuts must be oriented as shown in the applicable figure for each location (Figure 4-1, 4-1A, 4-1B, and 4-1C).

d. Start the nuts on the upper forward and aft bolts. Rotate the wing trailing edge until alignment with the outline drawn on the fuselage is realized. After rotation is established, verify that the lower forward bolt is not binding in the bolt bore. If bold binding is encountered, adjust the wing until the bolt moves freely.

e. Tighten the upper forward and aft nuts.

CAUTION

Before the nut at the lower aft wing attach point is torqued, a slight gap may be noted between the fittings. This gap must not exceed a width of .060 inch. When the nut is torqued to the wet torque value shown in Figure 4-1C, no gap should exist between the fittings.

f. Torque the nuts in the following order: Upper forward, upper aft, lower forward, and lower aft. When a torque wrench adapter is used, the length of the adapter must be added to the length of the torque wrench and the proper torque value computed as detailed in Section 4. Coat the bolt threads that protrude through the nut with MIL-C-16173 Grade II corrosion preventive compound (5, Chart 2).

CAUTION

When torquing the wing bolts assure that the wing bolt wrenches do not bottom out on the wing attach fittings. Such an occurrence could cause false torque readings and damage the fittings. After torquing the upper forward wing attach bolt, remove the holding force from the wing cradle prior to torquing the remaining 3 bolts.

g. Reinstall the engine and connect engine controls.

h. Connect all electrical wiring to the engine, nacelle terminal, and the electrical components located in each side of the upper nacelle.

i. Connect the plumbing between the wing root rib and the fuselage.

j. Connect the flap wire bundle and plumbing in the aft wheel well.

k. Replace all clamps securing wiring bundle and engine controls to the leading edge.

l. Reinstall the lower aft nacelle, wing leading edge cover and nacelle fillets.

INSTALLING THE WING PANEL LEADING EDGE

a. Support the aft section of the wing panel and align the leading edge hinges.

b. Insert a new hinge wire into the attaching hinge, as far as it will go by hand.

c. Drive the hinge wire using a telescoping guide tube and rivet gun. As the wire is driven in, remove sections of the telescoping guide.

NOTE

The guide is made up of the following tubes: 3/16 x 0.049 steel tubing, 60 inches, 32 inches, 17 inches, 9 inches, 5 inches and 2-1/2 inches long; 1/4 x 0.028 steel tubing 60 inches, 32 inches, 17 inches, 9 inches, 5 inches and 2-1/2 inches..

d. Install the machine screws that attach the root

nose rib to the front spar.

e. Install screws attaching the nose skin to the front spar.

f. Install screws that attach the nose rib at station 66.000 to the front spar.

g. Install the three screws attaching the forward section of the outboard rib to the spar.

h. Connect the navigation light wire and install the wing tip.

i. Install the screws that attach the wing tip to the wing.

j. Connect the electrical wiring to the landing light.

k. Cement the rubber fillet to the root of the wing, using Minnesota Mining and Manufacturing Company EC 750 cement or other fuel-resistant rubber cement.

l. Install the fuel cell.

m. Install the access doors.

n. At the first scheduled inspection after wing installation, check for correct wing bolt torque. Check the drain holes in the upper wing attach fittings to assure that they are unobstructed.

ADJUSTING THE WING

After reinstallation of a wing, or repairs to it, flight tests may show one wing is chronically heavy. If so, alter the angle of attack of either or both wings to correct the difference, using the following procedure:

a. Raise the trailing edge of the light wing to decrease its lift or lower the trailing edge of the heavy wing (if both wings are full up) to increase its lift as follows:

1. Using a grease pencil, outline the position of the wing on the fuselage.

2. Place the airplane on a 3-point jack and raise until the wheels are clear. See Section 2 for jacking instructions. Place a suitable cradle under the wing being adjusted and a wing stand under the opposite wing. A tail stand will also be required to assure stability.

3. Loosen the nuts on the lower wing attach bolts and remove the bolts and nuts from the upper wing attach fittings. Install new soft aluminum washers between the upper wing attach fittings and replace the bolts and nuts. Raise or lower the trailing edge as required and retorque the wing attach nuts in the following order: upper forward, upper aft, lower forward and lower aft. There should be no gap between the fittings after the last nut is torqued. Torque each nut to the value shown in the appropriate illustration (Figure 4-1, 4-1A, 4-1B, and 4-1C). Coat the exposed threads that protrude through the nuts with MIL-C-16173 Grade II corrosion preventive compound (5, Chart 2).

NOTE

After torquing the upper forward wing attach nut, remove the holding force from the wing cradle then torque the remaining 3 nuts.

4. Remove the wing and tail stands, remove the airplane from the jack and test flight the airplane.

b. If the preceding steps do not correct the wing heavy condition, rig the flap down on the heavy wing by screwing the actuator out. Do this only as a last resort, since it will create a drag on the airplane.

c. At the first scheduled inspection after the wing has been adjusted, check for correct wing bolt torque. Check the drain holes in the upper wing attach fittings to assure that they are not obstructed.

WING, BOLT, NUT, AND FITTING INSPECTION

Read the entire section before removing any wing bolts.

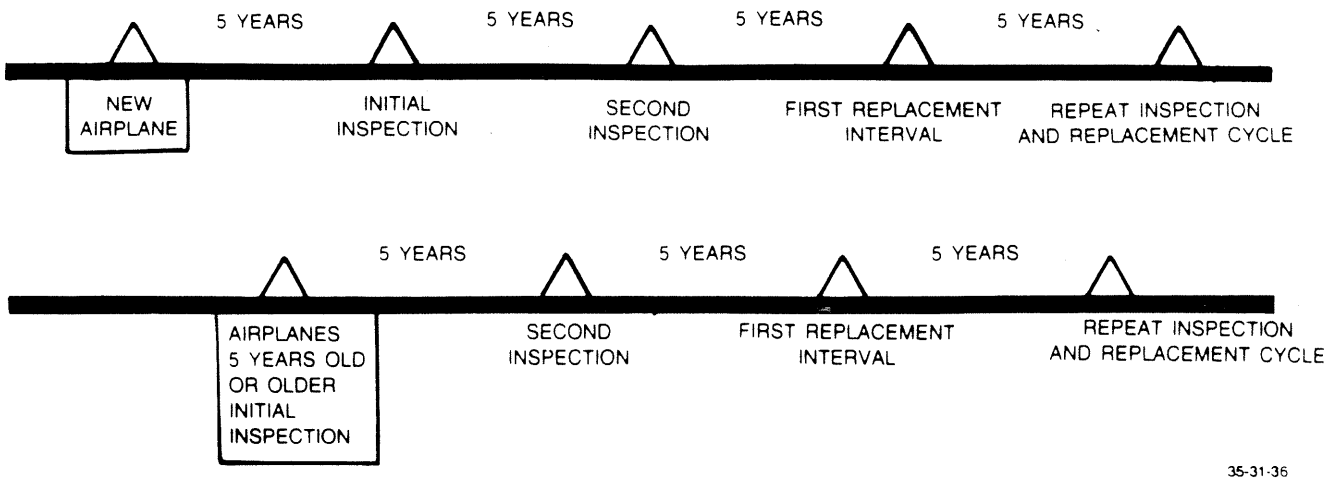
WARNING

The wing bolts and nuts installed in all Model 95 twin Bonanza 5-years old or older must be removed and inspected. If the bolts and nut prove to be free of all damage, they may be reinstalled for an additional 5 year period. At the end of this period the bolts and nuts must be inspected again. Ten years after the initial inspection all wing bolts and nuts must be replaced with new hardware. Render unserviceable all components removed in compliance with this warning. See Chart 1 for the inspection replacement cycle of the wing attach bolts.

a. Before removing any wing attach bolt, draw an outline of the wing position on the fuselage with a grease pencil. If wing bolt binding is encountered and the wing must be shifted, the outline will be helpful in returning the wing to its original position.

CAUTION

There should be no wing bolt binding during removal or installation. Do not screw or drive a bolt in or out of the fittings. If wing bolt binding is encountered, place the airplane on a three point jack and raise the airplane until the wheels are clear (see Section 2 for jacking instructions). Place a suitable cradle under each wing and a tail stand under the aft portion of the fuselage. Defuel the wing, loosen the remaining 3 bolts and reposition the wing until the binding bolt moves freely through the fittings. Replace the soft aluminum washers between the upper wing attach fittings and retorque the bolts as instructed under INSTALLING THE WING. If bolt binding is not encountered and the wing has not shifted, replacement of the soft aluminum washers between the upper wing attach fittings is not required.



NOTE

The first inspection for airplanes five years old or older must be performed at the first scheduled inspection following the issue date of revision C4.

NOTE

At each replacement interval, all wing attach hardware (bolts, washers, and nuts) must be replaced.

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Wing Bolt And Nut Inspection And Replacement Cycle
Chart 1

NOTE

Beech Aircraft Corporation supplies wing attach hardware (bolts and nuts) that have been given an additional magnetic particle inspection since manufacture. These components may be identified by the green dye on the head of the bolt and on some portion of the nut.

WARNING

Use only the components specified in the applicable illustrations. DO NOT INSTALL THE BLACK P/N H-20 NUTS, these nuts have been dry film lubricated with molybdenum disulfide. When MIL-C-16173 Grade II corrosion preventive compound is added to these nuts, the additional lubrication may cause improper preload in the bolt when it is torqued to the wet torque values specified in Figures 4-1, 4-1A, 4-1B, and 4-1C.

b. Starting at the lower wing attach point on each side, remove, inspect, and retorque one bolt at a time until the complete set of eight bolts and nuts have been inspected.

c. Using a nonmetallic brush, thoroughly clean the bolt, washers, and nut with naphtha or methyl ethyl ketone (1 or 2, Chart 2).

CAUTION

Assure that the 95-110025-1 (shown in Figure 4-1 and 4-1C), the 95-110025-3 (shown in Figure 4-1A), and the 50-105011 (shown in Figure 4-1B) washers have a full complete radius with no sharp edges that could mark the fittings. Replace any washers that have an incomplete radius or sharp edges.

d. If the bolts and nuts do not exceed the life limit shown in Chart 1, visually inspect each bolt and nut with a 10-power or stronger magnifying glass; inspect for corrosion, cracks and mechanical damage. The cadmium plating may display areas that appear rubbed, discolored or polished. These areas are usually the result of prevailing installation procedures and are of no significance. A bolt should not be rejected because of cadmium plating deterioration; however, any component that is cracked, corroded or has mechanical damage must be replaced.

e. Using the magnetic particle inspection process described in this chapter, check each bolt for circumferential crack indications and each nut for longitudinal crack indications. If the bolt and nut prove to be free of all damage (corrosion, cracks, and mechanical damage), they may be reused after demagnetization and cleaning.

f. Clean the spar fitting bolt bores with naphtha or methyl ketone (1 or 2, Chart 2). Do not strip the epoxy paint from this area. Inspect the surface condition of each fitting; focus special attention on the washer seat and bolt bore area. If scoring, corrosion pitting, or washer impressions are

discovered in this area, contact the Commercial Service Department of Beech Aircraft Corporation. If the fitting is satisfactory, coat the bolt bore and bearing faces of the fitting with Alodine 1200, 1200S or 1201 (3, Chart 1). Allow the coating to remain on the surface for approximately five minutes. When the five minutes have elapsed, wash the coated areas with water and blow dry (do not wipe dry). Paint the treated areas with zinc chromate primer (4, Chart 1).

g. Coat the bearing faces and bolt bores of the fittings, the complete bolt, washers, and nut with MIL-C-16173 Grade II corrosion preventive compound (5, Chart 2).

h. Install the bolt, washer or washers and nut into the wing fittings.

CAUTION

Ensure that the wing bolt wrenches do not bottom out on the wing fittings. This could result in damage to the wing fittings and erroneous torque readings.

i. Torque the nut to the wet torque value shown in the appropriate illustration (Figure 4-1, 4-1A, 4-1B, or 4-1C). When a torque wrench adapter is used, the length of the adapter must be added to the length of the torque wrench and the proper torque value computed as detailed in Section 4 (TABLE OF TORQUES).

j. Coat the exposed threads that protrude through the nut with MIL-C-16173 Grade II corrosion preventive compound (5, Chart 2).

k. Check that the decal shown in figure 4-1D is affixed to the appropriate locations on the airplane.

l. At the first scheduled inspection after the bolts have been loosened and retorqued, or after initial installation, check the wing bolts for proper torque.

m. Check the drain ports in the upper wing attach fittings to ensure that they are unobstructed and free to drain.

NOTICE

WING BOLTS ARE LUBRICATED SEE MAINTENANCE MANUAL FOR CORRECT TORQUE VALUES

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WHEN THE CORROSION PREVENTIVE COMPOUND HAS BEEN APPLIED TO THE WING BOLTS, AFFIX THE ABOVE DECAL TO THE FOLLOWING LOCATIONS:

1. On the side of the fuselage immediately above the RH forward and aft wing bolt covers.
2. On the wing immediately forward of the LH forward and aft wing bolt covers.
3. On the wing immediately forward of the lower forward wing bolt covers on both sides.
4. On the wing immediately aft of the lower aft wing bolt covers on both sides.

Lubricated Bolt Identification Placard Location Figure 4-1D

CHART 2

CONSUMABLE MATERIALS

MATERIAL	*SPECIFICATION*	*PRODUCT*	*VENDOR*
1. NAPHTHA	TT-N-95		
2. METHYL ETHYL KETONE	TT-M-261		
3. COATING		ALODINE 1200, 1200S or 1201	Amchem Products Inc., Spring Garden Street, Ambler, Pennsylvania 19002
4. PRIMER, ZINC CHROMATE	MIL-P-8585		
5. CORROSION PREVENTIVE COMPOUND	MIL-C-16173 Grade 2	Braycote 137	Bray Oil Co., 1925 Marianna St., Los Angeles, California 90032
		Petrotech 1-4	Penreco P.O. Box 671 Butler, Pennsylvania 16001

CHART 3

WING BOLT WRENCHES AND TORQUE ADAPTERS

POSITION	*BOLT PART NO.*	*WRENCH PART NO.*	*NUT PART NO.*	*NUT TORQUE ADAPTER*
LOWER FORWARD	NAS495-14-26/M/	TS1222-3	EB144	50-590014
UPPER FORWARD	NAS152-37/M/ or 131790-1	TS1222-3 (5/8 inch hex) TS1222-4 (9/16 inch hex)	12NB126	TS1171-2
UPPER AFT	NAS150-35/M/	TS1222-4	12NB108	TS1171-1 or 50-590013
LOWER AFT	NAS152-40/M/ (Internal wrenching bolt) or MS21250-12-024/M/ (External wrenching bolt)	TS1222-3 (for internal wrenching bolt) TK1817-922-4 (for external wrenching bolt)	12NB126	TS1171-2 or TS1176-2

MAGNETIC-PARTICLE INSPECTION

Magnetic-Particle Inspection is a method for locating surface and subsurface discontinuities in ferromagnetic materials (i.e. materials capable of being magnetized); consequently, nonferromagnetic materials (such as aluminum alloys, magnesium alloys, copper alloys, lead, titanium alloys, nickle base alloys and many stainless steel alloys) cannot be inspected by this method. Magnetic-Particle Inspection is based upon the principle that any discontinuities lying in a direction generally transverse to the direction of the magnetic field of the part magnetized for the test will cause a leakage field to be formed at and above the surface of the part. The presence of the leakage field denoting the discontinuity is detected by the use of finely divided ferromagnetic particles over the surface of the part. Some of the particles are magnetically gathered and held by the leakage field to form an outline indicating the location, size, shape and extent of the discontinuity. In general, magnetic particle inspection utilizes a variety of types of equipment for magnetization as well as several methods for application of ferromagnetic particles to the test part. Additionally, the ferromagnetic particles are available in a selection of colors (including fluorescent) and particle shapes. Magnetic particle inspections required by this manual can best be accomplished utilizing the "wet continuous method" on the standard wet horizontal type equipment with either visible or fluorescent magnetic particles suspended in a petroleum base vehicle (normally kerosene). Since magnetic particle indications are best obtained when the discontinuity lies in a direction transverse to the magnetic field, the following procedures are recommended for optimum detection of discontinuities in both bolts and nuts.

WARNING

Improper operation of the magnetic particle inspection because of faulty equipment or untrained personnel can jeopardize the airworthiness of the parts being inspected. Minute electrical arc burns caused by improper operation of the test equipment can result in eventual failure of the part.

Bolts: Inspection of a bolt is accomplished by longitudinal magnetization in a multiturn low-fill factor coil (i.e. the inner diameter of the coil greatly exceeds the bolt diameter). For proper magnetization the bolt is positioned close to the coil inside wall with the bolt length perpendicular to the winding direction. The magnetic particle suspension is flowed on the bolt and the appropriate current is applied to achieve adequate field strength. Using the described procedure, laboratory testing has indicated that the ampere turn values listed in Chart 4 provide for optimum detection of discontinuities perpendicular to the bolt axis.

CHART 4
MAGNETIC-PARTICLE INSPECTION
(STEEL BOLTS)

BOLT DIAMETER	*TOTAL BOLT LENGTH INCLUDING HEAD TO NEAREST 1/4 INCH*	*AMPERE TURNS**
5/8 INCH	2 1/2 INCH	7900
5/8 INCH	2 3/4 INCH	7100
5/8 INCH	3 INCH	6600
3/4 INCH	3 INCH	7900
3/4 INCH	3 1/4 INCH	7400
3/4 INCH	3 1/2 INCH	6700
3/4 INCH	3 3/4 INCH	6300
7/8 INCH	3 1/2 INCH	7900
7/8 INCH	3 3/4 INCH	7400
7/8 INCH	4 INCH	6900
7/8 INCH	5 INCH	5500
1 INCH	5 INCH	6300

*Amperage requirement is the ampere turns value divided by the number of turns on the coil. For example: A 1-inch diameter x 5-inch long bolt tested on a 5-turn coil would require 6300 ÷ 5, or 1260 amps.

Nuts: Inspection of a nut is accomplished by circular magnetization on a central conductor (usually a copper rod) the approximate size of the nut inside diameter. For proper magnetization, the central conductor bar is inserted through the nut and the bar is positioned between the heads of the wet horizontal equipment. The magnetic particle suspension is flowed on the nut and the appropriate current is applied through the central conductor to achieve adequate field strength. Using the described procedure, laboratory testing has indicated that the amperage values listed in Chart 5 provide for optimum detection of discontinuities parallel to the nut axis.

CHART 5
MAGNETIC-PARTICLE INSPECTION
(STEEL NUTS)

NUT SIZE	*CENTRAL CONDUCTOR SIZE*	*AMPERAGE*
5/8 INCH	1/2 INCH	500 AMPS
3/4 INCH	5/8 INCH	600 AMPS
7/8 INCH	3/4 INCH	700 AMPS
1 INCH	7/8 INCH	800 AMPS

After magnetic particle inspection, the parts must be carefully demagnetized and cleaned of the ferromagnetic particles. Examine parts for any possible evidence of electric arc burn that may have occurred during the inspection.

OUTBOARD WING MAIN SPAR CAP VISUAL INSPECTION (Figure 4-1E)

The outboard wing main spar cap must be inspected annually for corrosion.

WARNING

All areas of the wing main spar cap, from the wing attach fittings to the outboard end of the spar cap, must be inspected.

BEECHCRAFT KIT NO. 58-4002-1S contains the parts and instructions necessary to install a new 000-110011-3 LH spar and a new 000-110011-4 RH spar on the Model 95 series wing panels. The kit does not contain the spars which must be ordered separately.

NOTE

Special emphasis should be placed on airplanes that have been operated or stored for extended periods (5 years or longer) in geographical locations where atmospheric conditions are highly conducive to corrosion.

Inspection of the upper and lower spar caps should be accomplished in the following manner:

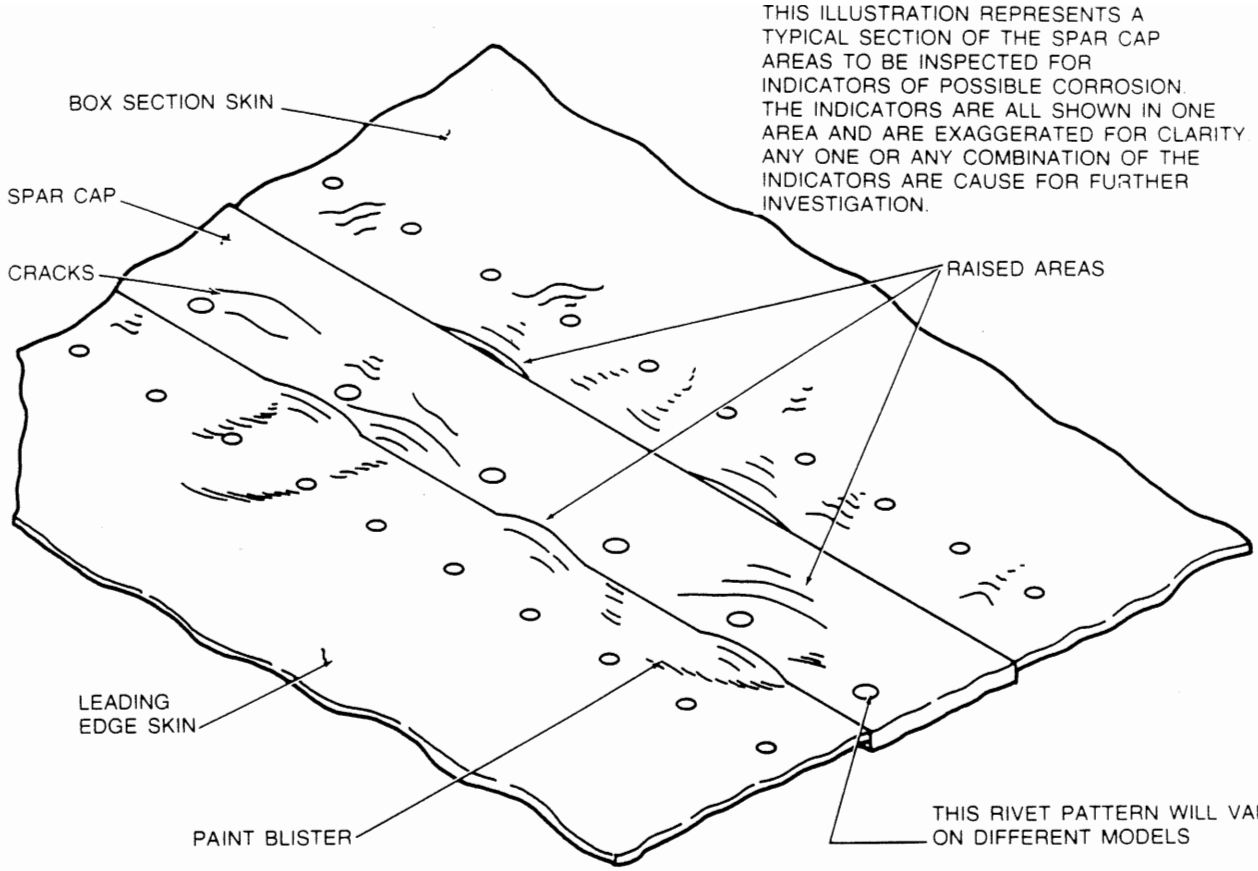
a. Examine the forward and aft sides of the spar cap where it meets the skin. If a whitish, salt like, nonmetallic substance is noted in these areas, a thorough inspection must be performed to determine if corrosion is present. Wax or paint trapped between the edge of the skin and the exposed section of the spar cap should not be misinterpreted as corrosion.

NOTE

To gain access to the upper spar cap in the nacelle area, remove the shaded panels shown in Figure 4-1F.

b. Wash all exposed areas of the upper and lower spar caps.

c. Visually inspect all exposed areas of the upper and lower spar caps for irregularities, such as paint blisters, raised or uneven areas, and cracks. The exposed areas of the spar cap are extruded flat and irregularities could be an indication of corrosion. Thoroughly investigate all irregularities to determine if any damage has occurred.



Visual Spar Cap Inspection
Figure 4-1E

C99 35 23

NOTE

Uneven or raised areas on the spar caps may be detected by sliding the fingers over the surface, by moving a straight edge over the surface or by sighting down the length of the spar cap surface.

If unusual conditions are encountered that cannot be resolved locally, contact the Commercial Service Department of Beech Aircraft Corporation for evaluation and determination of corrective action that may be required.

FLAP REMOVAL

a. Remove the bolt from the flap actuating arm.
b. Remove the bonding cables from the flap tracks.
c. Remove the bolts from the flap track bracket and remove the flap.

FLAP INSTALLATION

a. Hold the flap in position and install the flap rollers and the bolts in the flap track bracket.

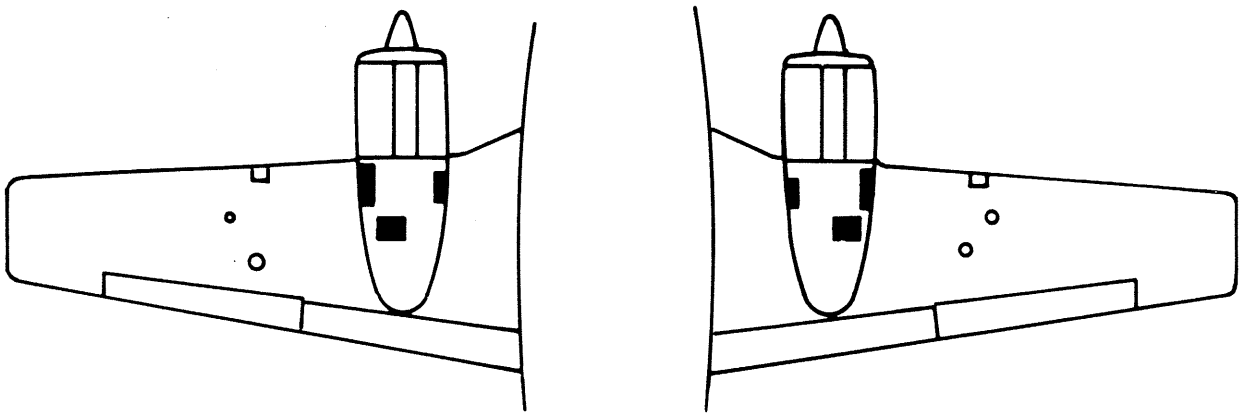
NOTE

Install the flap track rollers (four rollers per flap and two rollers per track) in the flap track brackets with the flanges facing each other. Use only the wide flanged rollers in the aft locations.

b. Connect the bonding cable and install the bolt in the flap actuating arm.

REMOVING AND INSTALLING THE FLAP MOTOR

a. Remove the cabin front seats.
b. Remove the access cover.



Upper Spar Access Panels
Figure 4-1F

c. Detach the electrical wiring from the right hand flap shaft.

d. Disconnect the flap shafts from the door.

e. Disconnect the motor electrical wiring (except ground wire) at the quick disconnects.

f. Remove the four flap motor attaching bolts and the ground wire secured to one of the bolts and remove the flap motor.

g. Reinstall the flap motor by reversing the above removal procedure.

REMOVING AND INSTALLING THE LANDING GEAR

Removal of the landing gear is a comparatively simple operation, if care is taken to preserve the original adjustments by not disturbing the rod end fittings, etc. When removing or installing the gear, observe the following precautions:

Be careful not to bend the skin at the wheel well edge when removing the main strut assemblies.

When reinstalling the landing gear, lubricate all fittings with grease, Specification MIL-G-7711. Torque the nuts on the main gear hinge bolts 250 to 800 inch-pounds. There is no specified torque for the nose gear attaching bolts. Operate the gear to check for proper rigging of the uplock and doors. If no change in the actuating linkage has been made, no rigging adjustment should be necessary. Consult Section III for rigging instructions.

TABLE OF TORQUES

ENGINE MOUNTING	
Engine mount bracket bolts (at firewall)	265 to 290 inch-pounds (on nut) (Prior to TD-534 except TD-506) 245 to 265 inch-pounds (on nut) (TD-506, TD-534 and after) 305 to 325 inch-pounds (on bolt head)
Engine shock mount bolts	475 plus or minus 25 inch-pounds
WING MOUNTING	
Upper front wing mounting bolt	2480-2600 inch-pounds (wet torque)
Upper rear wing mounting bolt	1180-1300 inch-pounds (wet toruqe)
Lower rear wing mounting bolt	2480-2600 inch-pounds (wet torque)
Lower forward wing mounting bolt	2880-3000 inch-pounds (wet torque)
VERTICAL STABILIZER	
Front and rear spar mounting bolts	50-70 inch-pounds
HORIZONTAL STABILIZER	
The mounting bolts in the front and rear spar and the bolt that attaches the elevator horn hinge to the rear spar bracket.	50-70 inch-pounds
PROPELLER	650-675 inch-pounds
LANDING GEAR	
Main gear brace support arms	200-250 inch-pounds
Main gear hinge bolts	250-800 inch-pounds
Main wheel halves	
Goodyear	140 inch-pounds
Cleveland	150 inch-pounds
Nose wheel halves	
Goodyear	83 inch-pounds
Cleveland	90 inch-pounds
Brake attach bolts	50 inch-pounds

When torque wrench adapters are used, compensation must be made for the extra leverage gained; new indicator readings must be calculated before the wrench is used. To figure the desired lower readings which will

actually give the torques specified in the table above, use the following formula:

$$\frac{\text{Original wrench length x specified torque}}{\text{length of wrench + adapter}} = \text{desired reading}$$

REMOVING THE PROPELLER

a. Remove the spinner dome retaining screws and remove the spinner dome.

b. Feather the propeller. Use the blade arms on each blade to decrease pitch, then using two screw drivers, hold the high pitch stop pins down so that the blades can be feathered.

c. Remove both high pitch stop assemblies by removing the attaching screws.

d. Remove the six flange mounting screws.

e. Remove the propeller, "O" ring, and mounting shim from the engine.

INSTALLING THE PROPELLER

a. Make certain the propeller and engine flanges are clean.

b. Install the B-1322 plastic shim on the engine shaft.

CAUTION

The B-1322 shim must be installed, or the propeller retaining bolts may fail due to relative movement of the two flanges.

c. Install the "O" ring on the engine shaft.

d. Position the propeller on the engine. Install the propeller mounting bolts and torque the bolts to 650 plus 25, minus 0 inch-pounds. Safety wire the bolts.

e. Install the two high pitch stop assemblies.

f. Check the propeller installation for security.

g. Install the spinner dome.

REMOVING THE CARBURETOR (Prior to Serial TD-453, except TD-127 and TD-444)

a. Remove the induction air afterbody.

b. Disconnect the carburetor air box from the air intake duct and the carburetor heater duct.

c. Disconnect the carburetor heat control and the carburetor air temperature bulb from the carburetor air box.

d. Remove the access door on the bottom of the carburetor air box; remove the four attaching bolts and remove the carburetor air box.

e. Disconnect the carburetor fuel inlet line and the throttle and mixture

controls.

f. Remove the four carburetor attaching nuts and remove the carburetor.

INSTALLING THE CARBURETOR (Prior to Serial TD-453, except TD-127 and TD-444)

The carburetor may be reinstalled by reversing the above removal procedure and noting the following points:

a. If a new caburetor is to be installed the throttle arm attaching screw must be safetied.

b. If a carburetor inlet fitting is to be installed, the carburetor fitting should not be permitted to turn, as it may shear the carburetor fitting lock plate.

c. Use only AN74-3A bolts to secure the carburetor air box to the carburetor to avoid damaging the carburetor bowl.

d. When reinstalling the carburetor air box access door, check for good seal between the box and the door. Apply additional No. 576 Presstite Sealer (product of Presstite Engineering Company, St. Louis, Missouri) if necessary. Wipe off excessive sealer on the outside of the carburetor air box, and make certain that no sealer enters the air box.

REMOVING AND INSTALLING THE FUEL PUMP

a. Aircraft prior to Serial TD-453, except TD-127 and TD-444, and aircraft TD-506, TD-534 and after.

To remove the fuel pump disconnect all fuel pump plumbing and remove the bolts and pump. Replace the fuel pump gasket when reinstalling the fuel pump and make certain that the pump actuator arm is in line with fuel pump plunger in the engine accessory case.

Aircraft serials TD-618 and after use straight thread ports rather than pipe threads. The vent port and the drain line were removed from the fuel pump on the TD-556 and after.

b. Aircraft Serial TD-127, TD-444, and TD-453 thru TD-533 except TD-506.

1. Disconnect the control linkage to the injector pump where the injector pump actuator arm connects to the rod end.

2. Disconnect all fuel plumbing.

3. Disconnect the flexible air hose.

4. Remove the screws securing the covers to the injector pump.

5. Remove the lower covers.

NOTE

The engine governor's support brace is located directly aft of the injector pump on the R. H. engine and must be repositioned to allow the removal of the lower injector pump covers. This may be accomplished by removing the bolts securing the governor to the engine housing and sliding the governor aft approximately 4 inches.

NOTE

The fuel pump and throttle body on airplane Serials TD-127, TD-444 and TD-453 thru TD-533 except TD-506, are a matched pair and should be replaced in pairs. The serial numbers of the pump and throttle body are corresponding numbers to prevent accidental mismatching of components.

6. Remove the nuts securing injector pump and remove pump.

7. Installation may be accomplished by reversing the preceding steps.

REMOVING AND INSTALLING THE FUEL SELECTOR VALVES

a. Turn both fuel selector valves to "OFF".

b. Unsnap the floor mat and remove the screws securing the fuel selector valve cover.

c. Cut the soundproofing material at the aft corner on each side of the fuel selector valve cover and remove the cover. The fuel selector valve shafts are removable with the cover.

d. Disconnect the fuel selector valve plumbing.

e. Remove the fuel selector valve attaching screws and remove the fuel selector valves.

f. Remove the access plate in the fuel selector valve cover before installing the fuel selector valves. Make certain that the selector valve shafts are properly engaged with the valves.

REMOVING AND INSTALLING THE MAIN FUEL CELLS

CAUTION

The parts of the aerobatic reservior type fuel cells, baffled, and non-baffled fuel cells are not interchangable. When installing a new fuel cell, use only those items pertaining to that particular cell being installed. Extreme care should be used when installing the finger fuel strainer to prevent damage to the fuel cell. The long finger fuel strainer (approximately 9 inches) is used only in the aerobatic reservoir type fuel cell as provided in kit No. 35-9012. All other inboard main fuel cells that use a finger fuel strainer, use the short type finger fuel strainer (approximately 4 inches long). Refer to the applicable BEECHCRAFT Parts Catalog for the particular installation. The reference to "aerobatic" in this "CAUTION" refers only to the type of reservoir fuel cells and does NOT express or imply that the airplanes involved are to be flown in an aerobatic configuration. The Travel Air airplanes are NOT certified for aerobatic flight, refer to the applicable Owner's Manual for certified flight operations.

a. Drain and purge the fuel cell.

b. Remove the access door at the fuel cell filler neck and transmitter. Remove the transmitter and the access door splash pan.

c. Remove the inboard cover plate and transmitter on airplanes having 39 gallon main tanks.

d. Remove the jack pad cover plate and remove the fuel strainer.

e. Remove the fuel cell drain plug.

f. Remove the lower aft nacelle and remove the fuel cell access door on the underside of the wing.

g. Disconnect the fuel cell plumbing at the access hole on the underside of the wing.

h. Unsnap the fuel cell and remove it from the wing cavity.

i. Reinstall the fuel cell by reversing the above removal procedure.

NOTE

If the fuel cell is to be stored for a period of 10 days or longer, coat the inside of the cell with light engine oil to prevent cracking and deterioration.

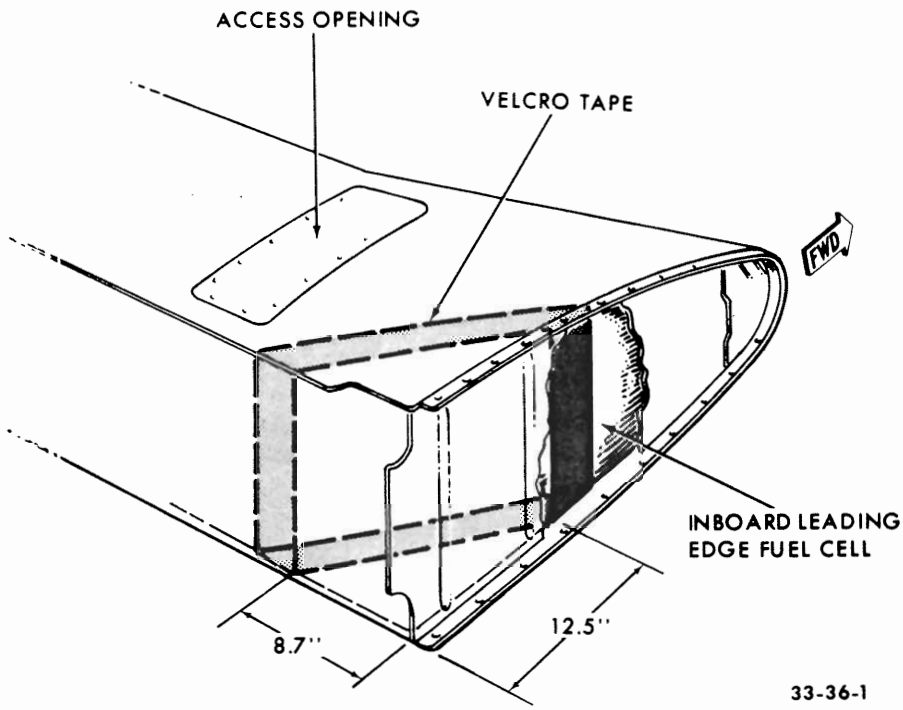


Figure 4-1G. Installation of Velcro Tape

REMOVING AND INSTALLING THE AUXILIARY FUEL CELLS

a. Drain and purge the fuel cell.

b. Detach the fuel cell from the wing at the filler neck and remove the inboard and outboard fuel cell transmitters. The inboard transmitter is accessible through the inspection door in the upper nacelle skin.

c. Remove the three fuel cell access doors on the underside of the wing and remove the inner fuel cell liner door at the inboard access door.

d. Disconnect the plumbing at the inboard and outboard ends of the fuel cell.

e. Remove the drain plug from the inboard aft corner of the fuel cell.

f. Unsnap the fuel cell and remove it from the wing cavity.

g. Reinstall the fuel cell by reversing the above removal procedure.

NOTE

If the fuel cell is to be stored for a period of 10 days or longer, coat the inside of the cell with light engine oil to prevent cracking and deterioration.

INSTALLATION OF VELCRO TAPE WITH REPLACEMENT FUEL CELLS
(Effective airplanes TD-1 thru TD-721)

Aircraft that have had or will have existing fuel cells replaced with spare fuel cells P/N 35-380135-1, 35-380135-2, 35-380135-3, and 35-380135-4 should install kit 35-9009 S in the fuel cell liner top, bottom, root rib and spar as described below and in Service Instruction 0365-281. Serials TD-722 and after were delivered from the factory with the equivalent of kit 35-9009 S installed.

a. Remove the fuel cell as described in REMOVING AND INSTALLING THE MAIN FUEL CELLS.

NOTE

Aircraft that have had any of the above fuel cells previously installed do not require complete removal of the fuel cell. Access covers and inboard fittings should be removed and the inboard end of the fuel cell pulled back far enough to allow installation of the velcro tape.

b. Lightly sand the surface that the velcro tape will be bonded to as shown in Figure 4-1G and clean the sanded surface with naphtha.

c. Activate the velcro by dipping into methyl ethyl ketone and press the velcro tape in place as shown in Figure 4-1G.

d. Position the fuel cell in place and press the velcro pile and hook together pressing outboard in the area of the velcro tape.

e. Inspect the flapper valve for free movement under it's own weight. If the flapper valve binds, work up and down by hand until it works freely.

NOTE

Before closing the zipper inspect the fuel cell for any foreign material.

f. Close the zipper and refer to REMOVING AND INSTALLING THE MAIN FUEL CELLS for further instructions on installing the fuel cell.

NOTE

Installation of Kit 35-9009 S is required on a first time basis only for each fuel cell. Repeat installations of the kit are unnecessary when new cells are installed.

CAUTION

The parts of the aerobatic reservoir type fuel cells (baffled and non-baffled) are not interchangable. When installing a new fuel cell, use only those items pertaining to that particular cell. Extreme care should be used when installing the finger fuel strainer to prevent damage to the fuel cell. The long finger fuel strainer (approximately 9 inches) is used only in the aerobatic reservoir type fuel cell as provided in kit No. 35-9012. All other inboard main fuel cells that use a finger fuel strainer, use the short type finger fuel strainer (approximately 4 inches long). Refer to the applicable BEECHCRAFT Parts Catalog for the particular installation. The reference to "aerobatic" in this "Caution" refers only to the type of reservoir fuel cells and does NOT express or imply that the airplanes involved are to be flown in an aerobatic configuration. The Travel Air airplanes are NOT certified for aerobatic flight, refer to the applicable Pilot's Operating Manual for certified flight operations.

REMOVING AND INSTALLING THE LANDING GEAR MOTOR

a. Remove the right front seat.

b. Remove the access plate over the motor and disconnect the heater duct from the outlet.

c. Disconnect the electrical wiring at the landing gear dynamic brake relay.

d. Remove the three landing gear motor attaching bolts and remove the landing gear motor.

e. Reinstall the landing gear motor by reversing the above removal procedure and safety the three attaching bolts.

REMOVING AND INSTALLING THE LANDING GEAR ACTUATOR

a. Remove the cabin front seats.

b. Remove the access covers on top and directly behind the front carry through structure.

c. Disconnect the main landing gear retract rods at the actuator.

d. Remove the flap motor attaching bolts and disconnect the landing gear door actuator rods at the actuator.

e. Remove the four screws securing the landing gear limit switch assembly on the left hand side of the actuator and move the switch assembly aside to permit removal of the actuator.

f. Disconnect the landing gear motor electrical wiring.

g. Remove the landing gear actuator access door on the bottom of the fuselage, and remove the nose gear actuator retract arm and linkage from the actuator.

h. Remove the four actuator attaching nuts and remove the actuator.

i. Installation is the reverse of removal. When reinstalling the nose gear actuator retract arm on the actuator, make certain that the index mark on the arm coincides with the index mark on the actuator shaft.

j. Make certain that the landing gear limit switch actuators are installed when the retract rods are connected to the actuator.

k. Reinstall cotter pins and safety wire.

l. After completing the landing gear actuator installation, check the landing gear for proper rigging (Section III).

REMOVING AND INSTALLING THE LANDING GEAR DYNAMIC BRAKE RELAY

a. Remove the right front seat.

b. Remove the access cover on top and directly behind the front carry through structure.

c. Disconnect the electrical wiring at the dynamic brake relay.

d. Remove the two dynamic brake relay attaching screws and remove the dynamic brake relay.

e. Reinstall the dynamic brake relay by reversing the above removal procedure. Check the rigging.

REMOVING THE WHEEL AND BRAKE ASSEMBLY

a. Place airplane on a jack.

b. Remove the hub cap, cotter pin, wheel retaining nut and wheel and bearings. On aircraft prior to TD-534 except TD-506, support the brake disc to prevent it from dropping and striking the axle when the wheel is removed.

c. Disconnect the brake hydraulic line, remove the brake assembly attaching bolts and remove the brake assembly.

INSTALLING THE WHEEL AND BRAKE ASSEMBLY

a. On aircraft prior to TD-534 except TD-506, place the brake housing on the axle and position the housing on axle attaching hole from the perpendicular so that the wheel cylinder slants down and aft from the strut center line. The cylinder is aft and level with the axle on aircraft TD-506, TD-534 thru TD-691 and TD-694, TD-697.

Aircraft equipped with the multi-disc brake have the cylinders mounted centrally around the wheel. The Cleveland brake installed on aircraft serials TD-708 and after, is positioned so that the cylinder slants down and aft of the strut centerline.

b. Install the brake housing attaching bolts and connect the brake hydraulic line to the brake assembly

c. Clean and repack the wheel bearings.

d. Position the brake disc on aircraft prior to TD-534 except TD-506. Install the wheel assembly and bearings.

e. Tighten the wheel retaining nut, then back off until the wheel rotates freely.

f. Install the wheel retaining nut cotter pin. The head of the pin must be flush with the nut or the pin will contact the hub cap.

g. Install the hubcap and, on aircraft prior to TD-534 except TD-506, the five brake disc clips.

h. Bleed the brake system.

REMOVING AND INSTALLING THE BRAKE MASTER CYLINDERS

a. Close parking brake valve by pulling parking brake handle.

b. Unsnap the floor mat and remove the floor board section below the brake pedals.

c. Disconnect the two brake hydraulic lines at each master cylinder and mark the lines to assure correct reinstallation.

d. Remove the master cylinder attaching bolts and nuts and remove the master cylinders.

e. If new master cylinders are to be installed, note the positions of the master cylinder 45-degree elbow fittings (if installed).

f. Reinstall the master cylinders by reversing the removal procedure.

g. Bleed brake hydraulic system and fill reservoir.

REMOVING AND INSTALLING THE CABIN HEATER

a. Remove the nose cone, disconnect the taxi light wiring on airplanes incorporating the optional taxi light and remove the nose cone.

b. Disconnect the iris valve control and the blower wiring. Remove the clamp securing the blower to the bracket. (Heater blower is an optional installation on airplane Serial TD-453 and after.)

c. Remove the bolts that attach the iris valve to the fiberglass plenum and lift the blower and iris valve from the plenum.

d. Disconnect the heater ignition lead from the spark plug and the heater igniter.

e. Disconnect the combustion air flexible tubing from the combustion air inlet at the heater.

f. Remove the fiberglass plenum from the heater by removing the clamp and asbestos strip.

g. Disconnect the fuel inlet line from the solenoid in the nose wheel well and the drain line at the heater fuel inlet.

h. Disconnect the heater shroud drain line in the nose wheel well.

i. Remove the clamp securing the plenum to the rear of the heater.

j. Remove the two clamps securing the heater in the wheel well.

k. Remove the heater attaching bolts that secure the heater supporting ring to No. 1 bulkhead and remove the heater from the nose section.

l. Installation is the reverse of the removal procedure. When installing the heater, position the support ring and gasket so that the heater exhaust extends to the left of perpendicular approximately 8° on aircraft prior to TD-534 and straight down on TD-534 and after.

m. Make certain the clamps securing the inlet and outlet plenums are properly positioned to prevent damage to the plenums.

n. Use Presstite No. 576, (product of Presstite Engineering Company, St. Louis, Missouri) as required when reinstalling the blower and iris

valve.

REMOVING AND INSTALLING THE CABIN HEATER BLOWER
(Optional Installation in Airplane Serial TD-453 and after)

a. Remove the nose cone, disconnect the taxi light wiring on airplanes incorporating the taxi light and remove the nose cone.

b. Disconnect the electrical wiring at the blower.

c. Disconnect the iris valve control at the blower.

d. Remove the blower attaching clamp.

e. Remove the bolts that attach the iris valve to the fiberglass plenum and remove the blower and iris valve.

f. Installation is the reverse of removal. When reinstalling the blower check for a good seal between the blower, the inlet air plenum and the iris valve. Apply additional No. 576 Presstite Sealer (product of Presstite Engineering Company, St. Louis, Missouri) if necessary.

REMOVING AND INSTALLING THE CABIN HEATER FUEL DISCHARGE NOZZLE

a. Remove the nose cone.

b. Disconnect the combustion air flexible tubing from the combustion air inlet at the heater.

c. Disconnect the heater ignition lead at the ignition unit and remove the clamp securing the lead to the iris valve assembly.

d. Remove the blower attaching clamp, disconnect the iris valve control.

e. Remove the clamp securing the fiberglass plenum to the heater and lift plenum and blower assembly forward.

f. Disconnect the ignition lead at the spark plug and remove the plenum and blower assembly.

g. Remove the fuel inlet cover and disconnect the combustion fuel inlet line.

h. Remove the screws securing the fuel inlet shroud assembly and remove the shroud assembly and the 90-degree fuel inlet elbow.

i. Disconnect the aerating line at the heater forward end.

j. Remove the fuel discharge nozzle body from the heater and remove the discharge nozzle using a 5/8-inch socket wrench.

k. Flush the heater fuel system before reinstalling the fuel discharge nozzle.

l. Reinstallation procedure is the reverse of the removal procedure. When securing the inlet plenum to the heater, make certain that the clamp cleats are positioned between the plenum and the heater or the cleats may damage the plenum.

REMOVING AND INSTALLING THE CABIN DOOR TELEFLEX CABLE

The following procedure may be employed when it is necessary to replace the cabin door latching mechanism teleflex cable:

a. Remove the door from the airplane.

b. Remove the door upholstery panels.

c. Remove the bolt securing the teleflex cable to the upper door latch and remove the upper door latch assembly.

d. Remove the bolt securing the lower end of the cable to the lower latch actuating arm and remove the screws that hold the teleflex cable in place.

NOTE

Attach a length of safety wire to the lower end of the cable before removing it from the door, and leave the wire in the cable track as a means of positioning the new cable.

e. Grasp the upper end of the cable with vise-grip pliers and pull it out through the upper latch opening. Remove the safety wire from the cable.

NOTE

Braze or silver solder two AN340-832 nuts to two new AN742-4 clamps.

f. Prior to installing the upper clevis, place one of the newly prepared clamps between the shoulders on the lower end of the cable housing and attach the safety wire remaining in the door to the upper end of the cable.

g. Pull the cable into position by gripping it with vise-grip pliers below the shoulders at the lower end. Pull on the safety wire attached to the upper end while tapping on the vise-grip pliers to drive the cable through the door channel.

h. Align the lower clamp with the hole in the door facing and secure it with a machine screw, then install the upper clamp in place on the cable and secure it in the same manner.

i. Install the upper clevis and attach the cable to the upper and lower latch connections.

j. Adjust cable tension by varying the cable length at either latch connection. See Section III for rigging instructions.

CABIN DOOR REMOVAL AND INSTALLATION

a. Remove the inboard door handle, the ash tray assembly and the arm rest.

NOTE

The attaching screws for the ash tray assembly are located behind the ash tray insert and the attaching screws for the arm rest are located behind the two car plugs on the inboard side of the arm rest.

b. Remove the attaching screws from the center upholstery panel. Lift the panel up and out.

c. Remove the attaching screws and release the snaps on the lower upholstery panel.

d. Remove the lower upholstery panel.

e. Remove the AN470AD4 rivets from each hinge cover.

f. With the door open, insert a screw driver between the door stop and the bottom of the door. Slowly close the door while applying a downward pressure on the door stop until the stop is released from the door.

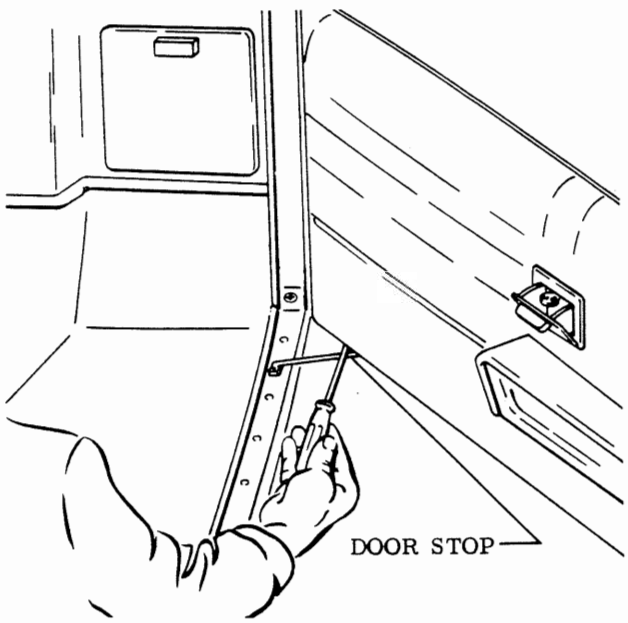


Figure 4-2. Cabin Door Stop

g. Remove the attaching bolts from each door hinge.

NOTE

Shims have been installed between the hinges and the door to obtain a proper fit. The shims should be retained and the same number of shims installed under each hinge when the door is reinstalled.

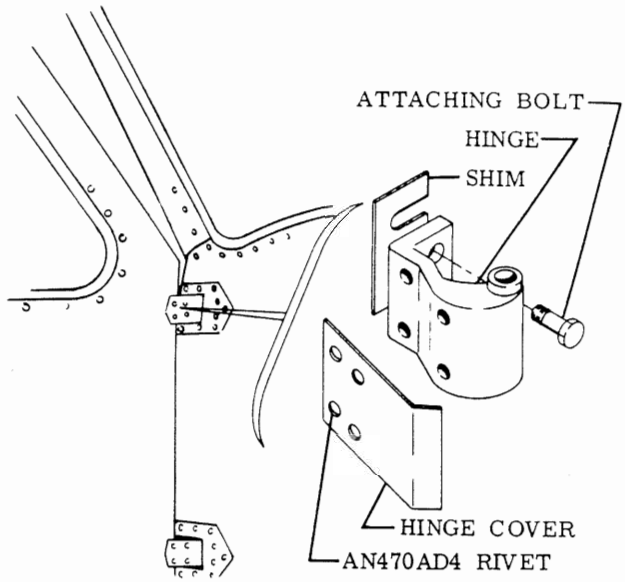


Figure 4-3. Cabin Door Hinge

h. Installation is accomplished in the reverse of the removal procedure.

CABIN DOOR ADJUSTMENT

Several adjustments are available to assure proper closing and sealing of the door. If the door does not close tightly or permits air leaks when completely closed, loosen the four retaining screws and move the latch tongue guide outboard to create additional tension on the latch tongue. Air leaks around the upper portion of the door may be caused by improper adjustment of the upper door latch. This may be corrected by removing the small upholstery panel above the door window and adjusting the length of the upper latch control cable. Shorten the cable sufficiently, by screwing it into the latch terminal, to properly seal the door. If the door does not open freely, the main door latch may not be retracting enough. This can be corrected by removing the upholstery panel below the door window and shortening the length of the connecting tube assembly.

WINDOWS

WINDSHIELD REMOVAL (ONE AND TWO PIECE) (Figure 4-4)

a. Remove the glareshield and outside air temperature gage (if installed).

b. Remove the attaching screws from the defroster duct and move the duct to clear the lower row of rivets on the windshield.

c. Remove the screws and spacers from the glare shield angles.

d. Remove the trim strips from around the inside of the windshield.

e. To facilitate reinstallation, mark the location of the trim strip clips.

f. Remove the rivets from around the windshield.

g. Remove the windshield.

NOTE

Due to the windshield being sealed, considerable effort may be required to break the windshield loose from the canopy section.

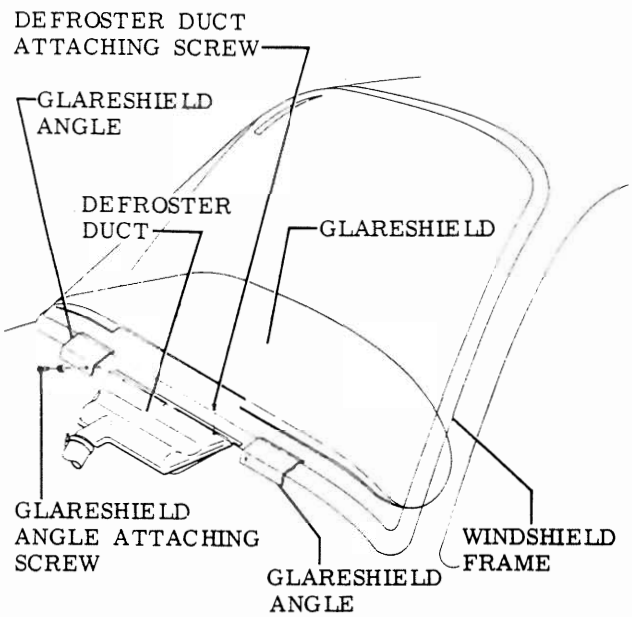


Figure 4-4. Windshield (Typical)

WINDSHIELD INSTALLATION

a. Clean the sealer from the canopy section where the old windshield was removed using toluol.

b. Trim the tooling tabs from the windshield, place the windshield in position and mark the areas where material must be removed from the windshield to obtain a proper fit.

c. Remove the windshield and trim off excess material as determined in step "b".

d. Place the windshield in position and cleco in place using the pilot holes provided.

e. Back drill the windshield frame using the existing holes in the canopy section as a guide.

f. Remove the windshield, burr all holes and apply Presstite #576 sealer to the windshield frame where it makes contact with the canopy section.

g. Place the windshield in position and cleco in place.

h. Using AN470AD4 rivets, secure the windshield to the canopy section.

NOTE

When riveting the windshield in place, install the trim strip clips in the same locations as marked in step "e" of the windshield removal procedure.

i. Secure the glareshield angles in place with attaching screws, nuts and spacers.

j. Position the defroster duct and secure in place with the attaching screws.

k. Install the trim strips.

l. Install the glareshield and outside air temperature gage (if removed).

m. Clean and paint as necessary.

STORM WINDOW REMOVAL AND INSTALLATION

a. Remove the attaching bolt from the storm window sleeve assembly.

b. Remove the hinge pin.

c. Installation is accomplished by reversing the above procedure.

FORWARD L. H. WINDOW REMOVAL

a. Remove the storm window.

b. Remove the upholstery panels as required to gain access to the window frame.

c. Remove the trim strip from around the inside of the window.

d. Remove the screws and nuts attaching the storm window strike to the window frame.

e. To facilitate reinstallation, mark the location of the trim strip clips.

f. Remove the rivets from around the window.

g. Remove the window.

FORWARD L. H. WINDOW INSTALLATION

a. Clean the sealer from the canopy section where the old window was removed using toluol.

b. Place the window in position and mark the areas where material must be removed to obtain a proper fit.

c. Remove the window and trim off the excess material as determined in step "b".

d. Place the window in position and cleco in place using the pilot holes provided.

e. Back drill the window frame using the existing holes in the canopy section as a guide.

f. Remove the window, burr all holes and apply Presstite #576 sealer to an area approximately 1/2 inch wide on the canopy section where the old sealer was removed.

g. Place the window in position and cleco in place.

h. Using AN470AD4 rivets, secure the window to the canopy section.

NOTE

When riveting the window in place, install the trim strip clips in the same locations as marked in step "e" of the window removal procedure.

i. Install the trim strips.

j. Attach the storm window strike to the window frame.

k. Install the storm window.

l. Clean and paint as necessary.

m. Reinstall the upholstery panels.

CABIN DOOR WINDOW REMOVAL

a. Remove the inboard door handle, ash tray and arm rest.

b. Remove the center upholstery panel.

c. Remove the trim strip around the inside of the window.

d. To facilitate reinstallation, mark the location of the trim strip clips.

e. Remove the rivets around the window.

f. Remove the window.

CABIN DOOR WINDOW INSTALLATION

a. Clean the sealer from the door where the old window was removed using toluol.

b. Place the window in position and mark the areas where material must be removed to obtain a proper fit.

c. Remove the window and trim off excess material as determined in step "b".

d. Place the window in position and cleco in place using the two pilot holes on the aft side of the window frame.

NOTE

To eliminate the possibility of the door being warped; the door must be closed and latched when drilling the attaching holes and securing the window in place.

e. Back drill the window frame using the existing holes in the door as a guide.

f. Remove the window, burr all holes and apply Presstite #576 sealer to an area approximately 1/2 inch wide on the door where the old sealer was removed.

g. Place the window in position and cleco in place.

h. Using AN470AD4 rivets, secure the window to the door.

NOTE

When riveting the window in place, install the trim strip clips in the same locations as marked in step "d" of the window removal procedure.

i. Install the trim strip.

j. Clean and paint as necessary.

k. Reinstall the center upholslery panel.

l. Reinstall the inboard door handle, ash tray and arm rest.

CENTER WINDOW REMOVAL AND INSTALLATION

a. Remove the emergency release pin.

b. Remove the hinge pin.

c. Installation is accomplished by reversing the above procedure.

NOTE

Some hand forming may be required to obtain a proper fit.

AFT WINDOW REMOVAL

a. Remove the upholstery panel along bottom of the window.

b. Remove the royalite molding around the window.

c. Remove the top, bottom and forward retaining angles by removing the attaching screws.

d. Remove the window.

AFT WINDOW INSTALLATION

a. Clean the sealer from the canopy section where the old window was removed using toluol.

b. Apply Presstite #576 sealer to an area approximately 1/2 inch wide on the canopy section where the old sealer was removed.

c. Position the window and secure in place with the retainers and retainer attaching screws.

d. Reinstall the royalite molding and the upholstery panel.

SEATS

FRONT SEAT REMOVAL

a. Remove the seat stop at the aft end of the outboard track.

b. Release the fore and aft adjustment lock.

c. Move the seat aft until it clears the mounting tracks.

FRONT SEAT INSTALLATION

a. Place the seat in position and align the seat guides with the mounting track.

b. Release the fore and aft adjustment lock and slide the seat onto the mounting track. Engage the fore and aft lock and make certain the seat is securely in place.

c. Replace the seat stop on the aft end of the outboard track.

CENTER SEAT REMOVAL

a. Release the fore and aft adjustment lock and move the seat forward against the stop.

b. Remove the seat stop from the aft end of the center track.

c. Release the fore and aft adjustment lock and move the seat aft until it clears the mounting tracks.

CENTER SEAT INSTALLATION

a. Place the seat in position and align the seat guides with the mounting track.

b. Release the fore and aft adjustment lock and slide the seat onto the mounting track. Engage the fore and aft lock and make certain the seat is securely in place.

c. Replace the seat stop on the aft end of the center track.

SEAT BACK ADJUSTMENT

Adjustment of the front and center seat backs except for the pilots seat, is controlled by a roton lock for selected positioning. The pilots seat back adjustment is controlled by a mechanical, three position, stop. A lever, located on the inboard side of each seat, operates the seat back stops.

FIFTH AND SIXTH SEAT REMOVAL

a. Raise the seat bottom up to release the tension on the seat back support rod.

b. Remove the seat back support rod from the mounting brackets and fold the seat back forward.

c. Remove the attaching bolts and seat.

FIFTH AND SIXTH SEAT INSTALLATION

a. Position the seat and secure in place with the attaching bolts.

b. Raise the seat bottom and insert the seat back support rod into the mounting brackets.

FIFTH AND SIXTH SEAT STOWAGE

The fifth and/or sixth seat may be folded up to provide additional baggage space. This is accomplished as follows:

a. Raise the seat back up to a horizontal position.

b. Fold the seat bottom up to a vertical position.

c. Fold the seat back down in front of the seat bottom and snap in place.

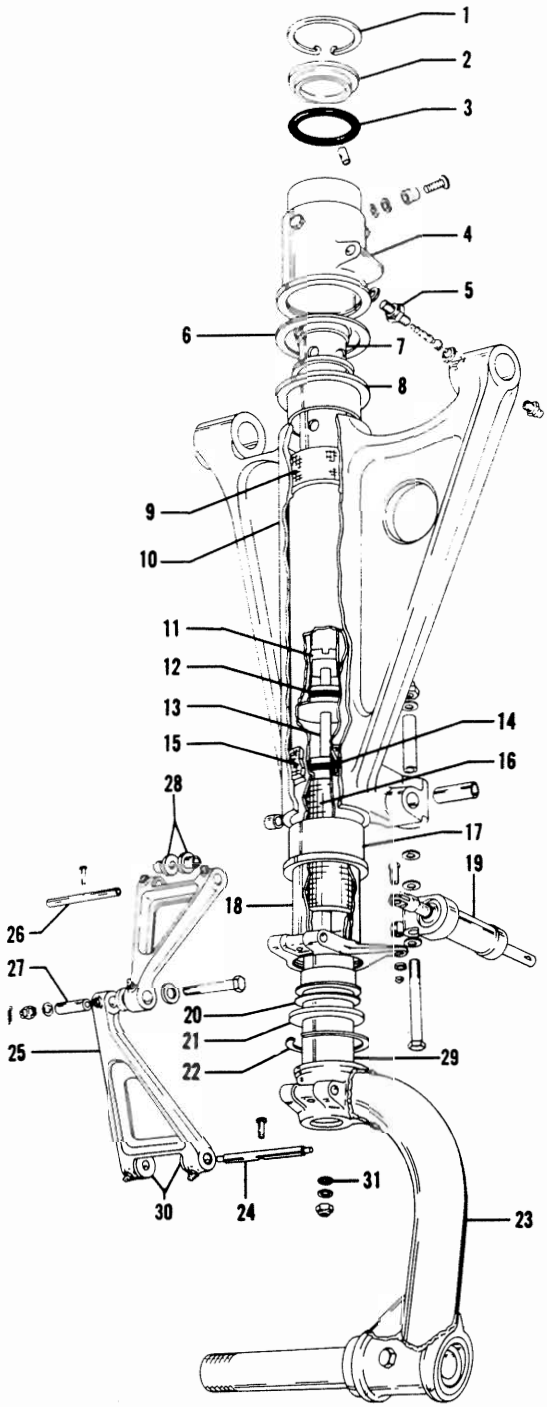
d. Fold the seat legs down against the seat bottom.

MAJOR MAINTENANCE AND OVERHAUL

This section contains maintenance and overhaul information on major components of the aircraft. Assembly and disassembly procedures, wear tolerances, and other criteria for replacing parts are given.

The procedures are given on a parts-replacement basis only. Repair procedures such as welding, brazing, building up with weld material and machining to size, etc. cannot be given a blanket endorsement, since each such case must be evaluated individually. This section is intended, rather, as a guide to normal overhaul, its goal being the restoration of the parts to full serviceability.

As the necessity arises, or the information becomes available, overhaul instructions for additional major assemblies will be added to this section.



1. Snap ring
2. Barrel end plug
3. "O" ring
4. Collar
5. Air valve assembly
6. Shim
7. Rebound control assembly
8. Bearing
9. Felt pad
10. Nose gear brace assembly
11. Rebound control assembly pin head
12. "O" ring and Teflon packing rings.
13. Rebound control assembly pin
14. "O" ring
15. Felt pad
16. Felt lubricating liner
17. Bearing
18. Barrel
19. Shimmy dampener
20. Scraper ring
21. Adapter ring
22. Snap ring
23. Fork assembly
24. Lower torque knee pin
25. Torque knees
26. Upper torque knee pin
27. Torque knee bushing
28. Upper torque knee bushings
29. Piston
30. Lower torque knee bushings
31. "O" ring

Figure 5-1. Nose Landing Gear Shock Strut Assembly
(Airplane Serials TD-1 thru TD-402)

DISASSEMBLY OF NOSE GEAR SHOCK STRUT
(Airplanes prior to Serial TD-403)

a. Remove the air valve cap and depress the valve core to release the air inside the strut.

WARNING

Do not unscrew the air valve assembly until all air pressure has been released or it may be blown off with considerable force and cause injury or damage.

b. Remove the snap ring (with gear assembly in upright position) and remove the plug and "O" ring by lifting the piston thus exerting internal pressure on the plug.

c. Invert the strut and drain the fluid.

d. Disconnect the torque knees at the joint and remove the shimmy dampener.

e. Remove the air valve assembly.

f. Loosen the rebound control assembly retaining nut with a socket wrench, inserting a long screwdriver through the top of the barrel assembly to hold the slotted head of the rebound control assembly pin.

g. Pull the rebound control assembly out of the top of the barrel assembly.

h. Slide the piston and fork assembly out of the bottom of the barrel assembly.

i. Remove the bolts that secure the collar to the barrel and slide the collar and shim (if one is installed), off the barrel. Keep the shim with the collar to avoid misplacing it.

j. Pull the barrel assembly out of the nose gear brace assembly.

k. Remove the snap ring, adapter ring and scraper ring from the barrel.

l. Pull the felt lubricating liner from the barrel assembly.

m. Remove the "O" ring from the groove in the center brazed bearing of the barrel with a piece of wire bent as shown in Figure 5-2.

n. Remove the two small felt pads, one in the top groove and one in the bottom groove inside the nose gear brace assembly.

NOTE

These two small felt pads were installed on the early model 95 airplanes only. They were omitted on later production models when they were found to be unnecessary. They may be discarded upon disassembly.

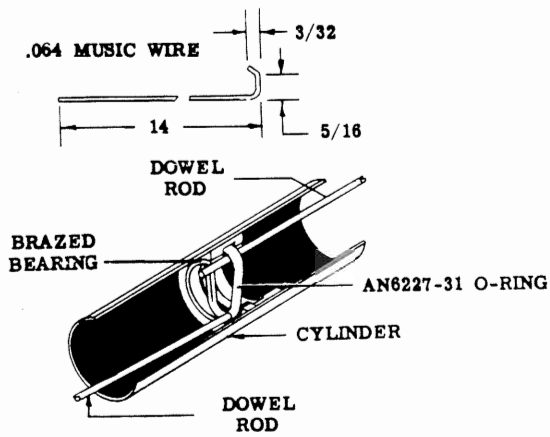


Figure 5-2. Shock Strut "O" Ring Installation

INSPECTION AND PARTS REPLACEMENT

a. Check all the metal parts of the strut assembly for cracks, weld breaks and corrosion. Replace worn or defective parts. Clean parts with solvent, Specification PD-680; remove solvent and, to ease reassembly, apply specification MIL-H-5606 hydraulic fluid to all friction surfaces.

b. If fluid leaks are observed on top of the air valve assembly, check the small "O" ring of the valve assembly; then look for defects in the valve.

WARNING

Do not unscrew the air valve assembly until all air pressure has been released or it may be blown off with considerable force and cause injury or damage.

c. If the leak seems to be coming from under the barrel end plug, remove it and check the condition of the large "O" ring.

d. Peel shim layers as necessary for free operation but do not allow more than .012 inch clearance between the strut collar and the nose gear brace.

e. Replace scored bushings, bearings and pins, and all gaskets, packings, pads and scrapers.

f. Replace self locking nuts which have lost their locking ability and all cotter pins.

g. Replace any other part considered to be worn or damaged beyond serviceable limits.

NOSE SHOCK STRUT WEAR TOLERANCES
(Airplane prior to Serial TD-403)

Listed below are manufacturing tolerances which will aid in determining the extent of wear. Exactly how much deviation from these tolerances can be allowed must be determined by the performance of the strut.

Chrome plated portion of absorber assembly piston (29) O. D. (minimum)	1.7485 in.
Upper and lower brazed bearings in the barrel assembly I. D. (maximum)	1.752 in.
Bushing (27) I. D. (maximum)	0.2505 in.
Bushing (27) O. D. (minimum)	0.310 in.
Pin (26) O. D. (minimum)	0.3725 in.
Pin (24) large O. D. (minimum)	0.3725 in.
Bushings (28) in line and I. D. (maximum)	0.3755 in.
Distance between bushing (28) faces when in knee (maximum)	1.505 in.
Bearings (8 and 17) I. D. (maximum)	2.252 in.
Bearings (8 and 17) O. D. (minimum)	2.378 in.
Bushings (30) in line and I. D. (maximum)	.3755 in.
Distance between bushing (30) faces when in knee	1.505 in.
Barrel (18) O. D. (minimum)	2.219 in.

ASSEMBLY OF THE NOSE GEAR STRUT
(Airplanes prior to TD-403)

a. Install the lower half of the torque knee on the piston and fork assembly.

b. Slip the snap ring, adapter ring and scraper ring over the top of the piston and work down the piston.

c. Install the upper half of the torque knee on the barrel assembly.

d. Slide the barrel assembly up inside the brace assembly.

e. Slip the collar over the barrel and measure the amount of shim necessary. Remove the collar, insert the shim and reinstall the collar and secure. Safety wire the two bolts.

NOTE

Peel shim layers as necessary for free operation but do not allow more than .012 inch clearance between the strut collar and the nose gear brace assembly bearing.

f. Install the nose gear roller on the collar by inserting the bolt through the roller, adding the two washers on the side of the roller nearest the collar, inserting the bolt through the mounting hole in the barrel, and securing with the barrel nut.

g. Install the "O" ring in the groove in the center brazed bearing inside the barrel assembly. Use two small dowel rods to work it into position. Hold the "O" ring with one rod while working it into the groove with the other. See Figure 5-2.

h. Soak the felt lubricating liner pad in SAE No. 10 oil and insert it into the bottom of the barrel assembly, fitting it between the center brazed bearing and the bottom end fitting.

i. Install the piston and fork assembly in the bottom of the barrel assembly. Slide the scraper ring, adapter and snap ring up into the bottom of the barrel assembly. Connect the shimmy dampener.

NOTE

When installing the shimmy dampener be sure the rod end bolt is free to rotate.

j. Fit the two MS28782-23 plastic back-up rings with the AN6227-23 "O" ring between them in the groove at the bottom of the rebound control assembly. Dip the rebound control assembly head in MIL-H-5606 fluid to ease installation.

k. Insert the rebound control assembly into the top of the barrel assembly. Guide the threaded end of the rebound control assembly pin through the hole in the bottom of the piston assembly.

l. Slip the small AN6227-5 "O" ring over the threaded end of the pin. Install the AN960-416 washer and the retaining nut. Hold the slotted head of the rebound control assembly pin with a long screwdriver while tightening the retaining nut.

m. Connect the torque knee halves.

n. Attach the clip to which the nose wheel mud scraper attaches by inserting the bolt through the axle and installing the bracket, washer and retaining nut.

o. Fill the dry strut with 475 cc or 16 fluid ounces of MIL-H-5606 hydraulic fluid and install the "O" ring, shim (if one was originally installed), plug and snap ring. Tap the snap ring until it fits snugly under the ledge of the collar and fitting. The snap ring should be installed with the beveled edge down. If a fluid measuring device is not available use the following refill procedure.

1. With the strut extended at least 1/4-inch fill the strut with MIL-H-5606 hydraulic fluid and fully actuate the strut slowly several times to remove all air from below the orifice; then refill with the strut at least 1/4-inch from the fully compressed position.

2. Install the "O" ring, plug and snap ring.

3. Extend the strut at least two inches then compress it completely allowing the excess air and fluid to escape through the air valve body port.

NOTE

If the strut has been properly refilled a little fluid will escape through the air valve body port. If no fluid escapes, remove the snap ring and plug and repeat steps 1, 2 and 3 of paragraph o.

p. Install the valve body and valve core.

q. Inflate the strut to approximately 80 psi and smear the top and sides of the collar with soap suds to test for air leaks.

r. When the airplane is again on the ground with the weight of the craft on the strut, check the strut inflation. There should be 2 inches of piston exposed, with the airplane empty except for fuel.

DISASSEMBLY OF NOSE GEAR SHOCK STRUT
(Airplanes Serial TD-403 and after)

a. Deflate strut and remove the air valve assembly.

WARNING

Do not unscrew the air valve assembly until all air pressure has been released or it may be blown off with considerable force and cause injury or damage.

b. Remove the snap ring retaining the orifice tube assembly.

c. Retract piston to push the orifice tube out of the top of the barrel. Remove the orifice tube.

d. Invert the strut and drain out the hydraulic fluid.

e. Disconnect the torque knees by removing the bolt and bushing. Slide the piston and fork assembly out of the barrel. Remove the collar.

CAUTION

Be sure that the air pressure is released prior to disconnecting the torque knee. The torque knees provide the extension stop for the lower shock absorber cylinder assembly and when disconnected, the piston is free to slide out of the upper barrel assembly.

f. Remove the lower snap ring, adapter, and scraper. Remove the "O" ring from the center bearing and remove the felt lubricating pad from inside the barrel.

g. Remove the shimmy dampener and pull the barrel out of the nose gear brace assembly.

NOSE SHOCK STRUT WEAR TOLERANCES
(Airplane Serial TD-403 and after)

Listed below are manufacturing tolerances which will aid in determining the extent of wear. Exactly how much deviation from these tolerances which can be allowed must be determined by the performance of the strut.

Chrome plated portion of absorber assembly piston (20) O. D. (minimum)	1. 7485 in.
Upper and lower brazed bearings in the barrel assembly I. D. (maximum)	1. 752 in.
Bushing (15) I. D. (maximum)	0. 2505 in.
Bushing (15) O. D. (minimum)	0. 310 in.
Pin (10) O. D. (minimum)	0. 3725 in.
Pin (22) large O. D. (minimum)	0. 3725 in.
Bushings (9) in line and I. D. (maximum)	0. 3755 in.
Distance between bushing (9) faces when in knee (maximum)	1. 505 in.
Bearings (25 and 26) I. D. (maximum)	2. 252 in.
Bearings (25 and 26) O. D. (minimum)	2. 378 in.
Bushings (27) in line and I. D. (maximum)	. 3755 in.
Distance between bushing (27) faces when in knee (maximum)	1. 505 in.
Barrel (13) O. D. (minimum)	2. 247 in.

ASSEMBLY OF NOSE GEAR SHOCK STRUT
(Airplane Serial TD-403 and after)

a. Install the "O" ring in the center bearing as shown in Figure 5-2, using two dowel rods to work it into position. Soak the lubricating felt pad in oil (SAE No. 10) before installation.

b. Install the torque knees using the longer pin in the lower torque knee.

c. Slide the barrel assembly into the nose wheel brace.

d. Slip the collar over the barrel and measure the amount of shim necessary. Remove the collar, insert the shim and reinstall the collar and secure. Safety the bolts.

NOTE

Peel shim layers as necessary for free operation but do not allow more than . 012 inch clearance between the strut collar and the nose gear brace assembly bearing.

e. Install the shimmy dampener using washers between the shimmy dampener and the brace as required to align the dampener rod end and lug.

NOTE

When installing the shimmy dampener be sure the rod end bolt is free to rotate.

f. Slide the snap ring, adapter and scraper over the top of the piston. Slide the piston into the barrel. Work the scraper, adapter and snap ring into the lower end of the barrel and connect the torque knees.

g. Fill the strut with 475 cc of MIL-H-5606 hydraulic fluid. If no measuring device is available collapse the strut and fill it to the opening for the air valve assembly.

h. Install the piston ring and "O" ring on the orifice

1. RETAINER RING
2. "O" RING
3. COLLAR
4. AIR VALVE ASSEMBLY
5. SHIM
6. ORIFICE TUBE
7. "O" RING
8. FELT PAD
9. UPPER TORQUE KNEE BUSHING
10. UPPER TORQUE KNEE PIN
11. PISTON RING
12. SHIMMY DAMPENER
13. BARREL
14. UPPER TORQUE KNEE
15. TORQUE KNEE BUSHING
16. BEARING
17. SCRAPER ADAPTER
18. SCRAPER
19. SNAP RING
20. PISTON
21. LOWER TORQUE KNEE
22. LOWER TORQUE KNEE PIN
23. PLUG
24. FORK ASSEMBLY
25. UPPER SHOCK ABSORBER BRACE BEARING
26. LOWER SHOCK ABSORBER BRACE BEARING
27. LOWER TORQUE KNEE BUSHING
28. "O" RING
29. NOSE GEAR BRACE ASSEMBLY

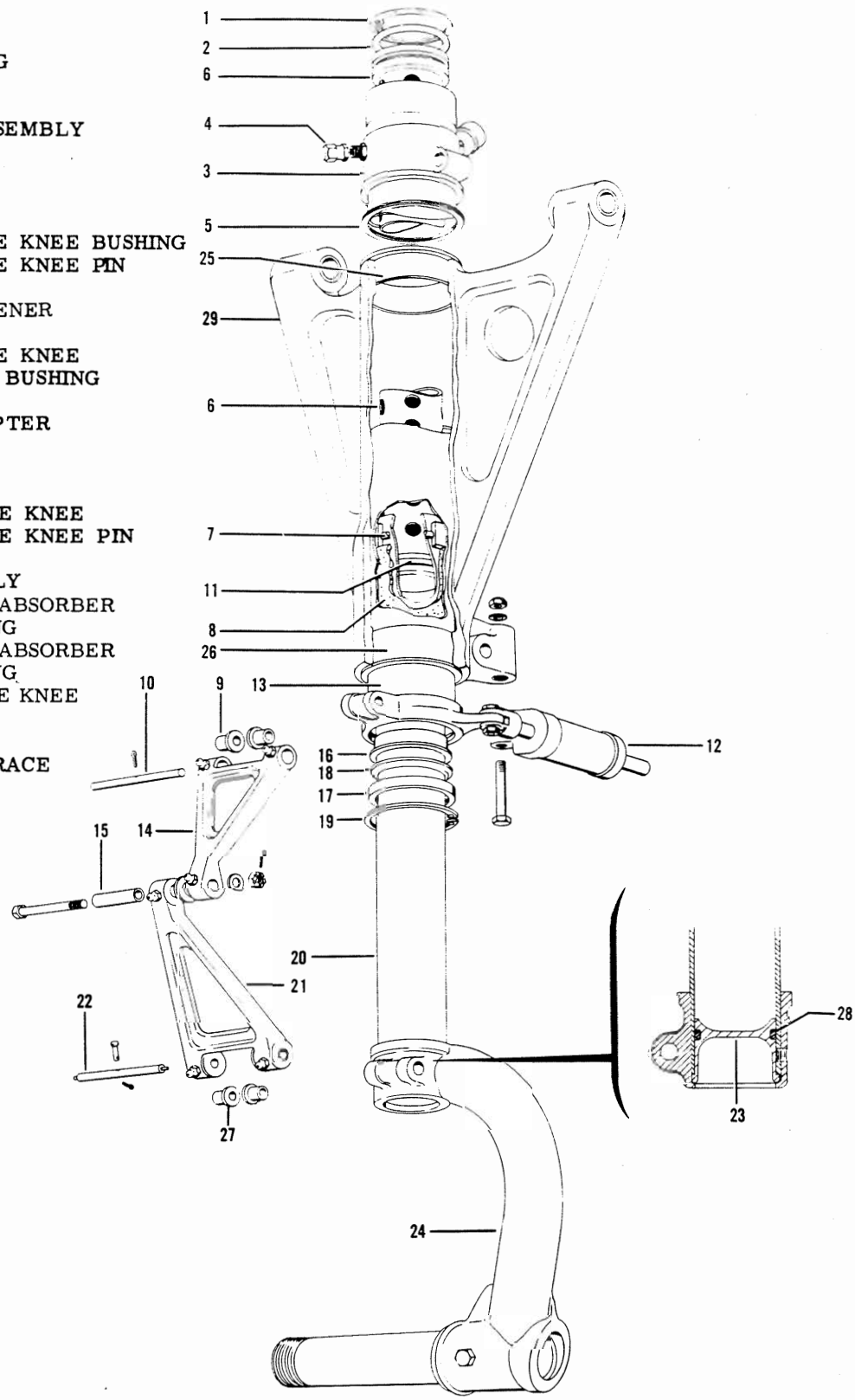


Figure 5-3. Nose Landing Gear Shock Strut Assembly
(Airplane Serial TD-403 and after)

tube, partially extend the strut and insert the orifice tube into the barrel.

i. Install the orifice tube retaining snap ring with the beveled side down.

j. Raise and lower the strut several times to remove air and excess fluid.

k. Install the air valve assembly.

l. Inflate the strut to approximately 100 psi. Coat the cap and air valve with soap suds and check for air leaks.

DISASSEMBLY OF MAIN GEAR SHOCK STRUT
(Airplanes prior to Serial TD-252)

a. Remove the air valve cap and depress the valve core to release the air inside the strut.

WARNING

Do not unscrew the air valve assembly until all air pressure has been released or it may be blown off with considerable force and cause injury or damage.

b. Remove the air valve assembly.

c. Remove the snap ring, lock, plug and "O" ring.

d. Invert and drain the strut.

e. Detach the torque knees by removing the attaching hardware.

f. Disengage the rebound control assembly from the piston assembly by holding the pin assembly head of the rebound control assembly with a long screwdriver inserted through the top of the barrel assembly and removing the retaining nut.

g. Pull the rebound control assembly out through the top of the barrel.

h. Slide the piston out the bottom of the barrel.

i. Remove the snap ring, adapter ring and scraper from the bottom of the barrel.

j. Remove the felt lubricating pad from the lower part of the barrel.

k. Remove the "O" ring from the groove in the center brazed bearing inside the cylinder with a piece of wire bent as shown in Figure 5-2.

l. Remove the "O" ring and plastic back-up rings from the rebound control assembly.

INSPECTION AND PARTS REPLACEMENT

a. Check the complete strut assembly for cracks, weld breaks and corrosion. Replace worn or defective parts.

b. Replace "O" ring seals. Clean parts with solvent, Federal Specification PD-680, and immerse parts in clean hydraulic fluid, Specification MIL-H-5606, prior to reassembly.

c. If fluid leaks have been observed on top of the cap assembly, check the small "O" ring of the valve; then look for defects in the valve.

d. If the leak seems to be coming from the junction of the air valve assembly and the barrel assembly walls, check the large "O" ring gasket under the barrel end plug.

e. If fluid is observed leaking out the bottom of the piston, the small "O" ring near the lower end of the rebound control assembly rod may be defective or the seating of the rod may not be firm. Inspect the inside bottom of the piston to see that the grooved seating for the rod is clean and smooth.

f. After pressing new bushings (15, 21) in knees, line ream to 0.5000 inches plus or minus 0.0005 inches.

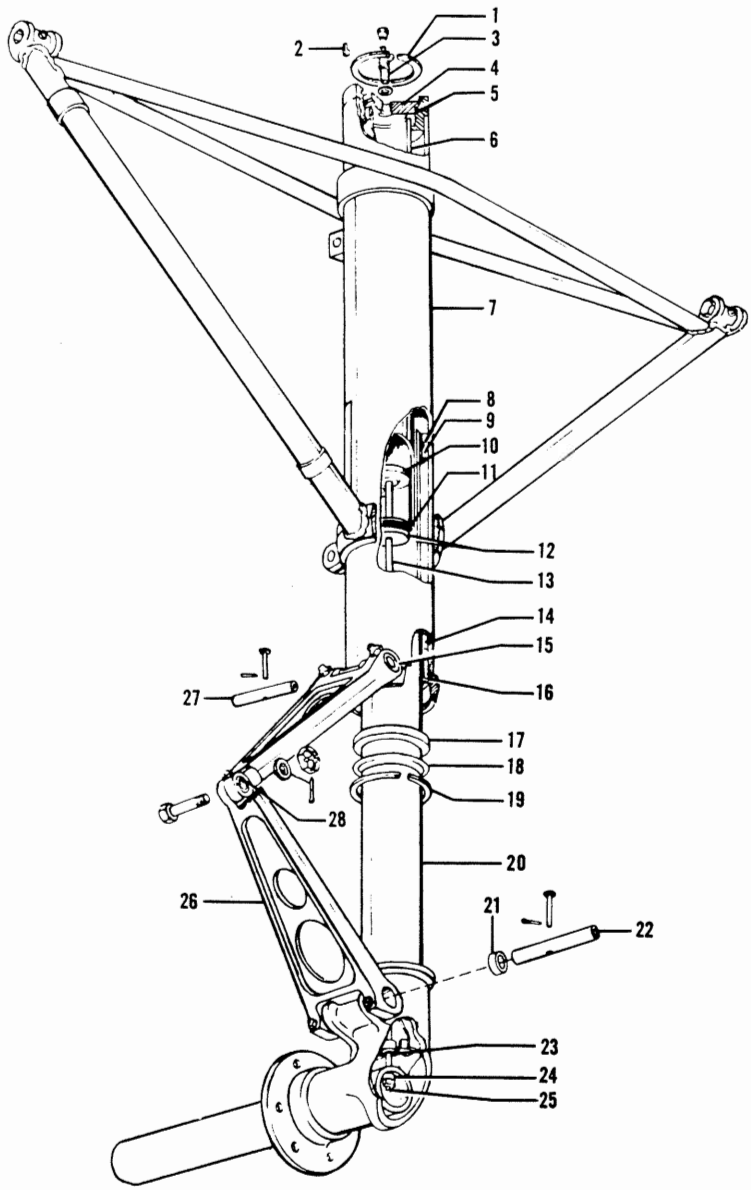
MAIN SHOCK STRUT WEAR TOLERANCES
(Airplanes prior to Serial TD-252)

The following are manufacturing tolerances which will aid in determining the extent of wear. The exact allowable deviation from these tolerances must be determined by the performance of the strut.

Pins (27 and 22) O.D. (minimum)	0.4985 in.
Bushings (15 and 21) bore (maximum)	0.5005 in.
Chrome plated portion of absorber assembly piston (20) O.D. (minimum)	1.862 in.
Upper (9) and lower (16) bearings I.D. (maximum)	1.866 in.
Bushing (28) O.D. (minimum)	.433 in.
Bushing (28) I.D. (maximum)	.315 in.

Experience in the field indicates the points of greatest wear on both the main and nose gear struts are the upper and lower bearings in the barrel and the piston. The forces exerted on the bearings and the piston during take-off and landing tend to result in an out-of-round condition. The out-of-round condition of the piston combined with the wear of the upper bearing in the barrel will eventually result in leakage of hydraulic fluid through the upper bearing and "O" ring. The fluid will seep down through the felt lubricating liner and out the lower bearing.

When replacement of the scraper ring (17) and all "O" rings and Teflon packing rings in the strut assembly fails to stop leaks, an out-of-round condition of the bearings and piston is probable. In such instances the strut assembly should be returned to the factory for complete reconditioning. Field replacement of the lower bearing in the barrel is possible; however, the concentricity tolerance between the upper and lower bearings is critical and factory reconditioning of the barrel usually will be more satisfactory.



1. Snap ring
2. Lock
3. Air valve assembly
4. Plug
5. "O" ring
6. Rebound control assembly tube
7. Shock absorber barrel assembly
8. "O" ring
9. Brazed bearing
10. Rebound control assembly pin head
11. "O" ring and Teflon packing rings
12. Rebound control tube head
13. Rebound control assembly pin
14. Felt lubricating liner
15. Upper torque knee bushings
16. Bearing
17. Scraper ring
18. Adapter ring
19. Snap ring
20. Piston
21. Lower torque knee bushings
22. Lower torque knee pin
23. Packing "O" ring
24. 35-815081 washer
25. Pin retaining nut
26. Torque knees
27. Upper torque knee pin
28. Torque knee bushing

Figure 5-4. Main Landing Gear Shock Strut Assembly
(Aircraft prior to Serial TD-252)

ASSEMBLY OF THE MAIN LANDING GEAR SHOCK STRUT (Airplanes prior to Serial TD-252)

a. Install the upper torque knee assembly and attaching hardware on the barrel assembly. The zerk lubrication fittings should be on the upper side.

b. Install the lower torque knee assembly and attaching hardware on the piston assembly. Zerk lubrication fittings should face down.

c. Tap the number 16 cork about 1-1/4 inches into the axle end of the piston assembly.

d. Slide snap ring, adapter and the scraper on the piston assembly in that order. The horizontal flat surface of the ring must be down.

e. Install "O" ring in the groove in the center brazed bearing of the barrel assembly. Use two small dowel rods to work the seal in position. Hold the "O" ring with one rod while working it into the groove with the other. See Figure 5-2.

f. Soak the felt pad in SAE No. 10 oil, roll and insert in the barrel assembly, fitting it between the center brazed bearing and the lower end fitting.

g. Insert the piston into the barrel assembly.

h. Slide the scraper, adapter and snap ring up the piston assembly and into the lower end of the barrel assembly.

i. Fit the two MS28782-24 plastic back-up rings with the AN6227-24 "O" ring between them in the groove at the bottom of the rebound control assembly. Dip the rebound control assembly head in MIL-H-5606 fluid to ease installation.

j. Slip the AN6227-6 "O" ring over the threaded end of the rebound control assembly pin and fit it snugly against the welded flange.

k. Insert the rebound control assembly into the top of the barrel assembly until the threaded end of the rebound control assembly pin comes through the hole in the bottom of the piston assembly. The "O" ring mentioned in step j. should fit into the spot-faced depression around the hole in the bottom of the piston assembly to prevent fluid leaks.

l. Secure the rebound control assembly to the piston assembly as follows: Install the thick contoured washer on the threaded end of the rebound control assembly pin, fitting it to the curved surface of the bottom of the piston. Next install the flat washer and secure with the nut. Tighten the nut by holding the slotted head of the rebound control assembly pin with a long screwdriver inserted through the top of the barrel assembly.

m. Connect the two halves of the torque knee as follows: Install the bushing in the upper torque knee half. Join the two halves with the bolt and nut, putting a washer next to the head of the bolt and one next to the nut. Secure with a cotter pin. Be careful not to tighten the nut so much that it binds the torque knee.

n. Work the piston up and down a few times to make sure it operates freely and does not bind.

o. Fill the dry strut with 759 cc or 25.7 fluid ounces of MIL-H-5606 hydraulic fluid and install the AN6230-2 "O" ring, plug, lock pin and snap ring. Tap the snap ring until it fits snugly under the ledge of the collar and fitting. The snap ring should be installed with the beveled edge down. If a fluid measuring device is not available use the following refill procedure.

1. With the strut extended at least 1/4-inch fill the strut with MIL-H-5606 hydraulic fluid and fully actuate the strut slowly several times to remove all air from below the orifice; then refill with the strut at least 1/4-inch from the fully compressed position.

2. Install the "O" ring seal around the inner ledge of the top of the barrel assembly. Install the barrel end plug and lock pin over the "O" ring and install the snap ring with its beveled edge facing down. Tap it back into the groove under the top edge of the barrel assembly.

3. Install the AN902-5 "O" ring over the threads of the air valve assembly. Screw the air valve assembly (minus the valve core) into the barrel end plug.

4. Extend the strut at least two inches, then compress it completely allowing the excess air and fluid to escape through the air valve body.

NOTE

If the strut has been properly refilled a little fluid will escape through the air valve body. If no fluid escapes, slowly actuate the strut several times, remove the snap ring and plug and repeat steps 1, 2, 3 and 4.

p. Install the air valve core.

q. Inflate the strut to approximately 80 psi and smear soap suds over the air valve assembly and top of the barrel assembly to test for leaks.

r. When the airplane is again on the ground with the weight of the craft on the gear, check the strut inflation. There should be two inches of piston exposed with the airplane empty except for fuel.

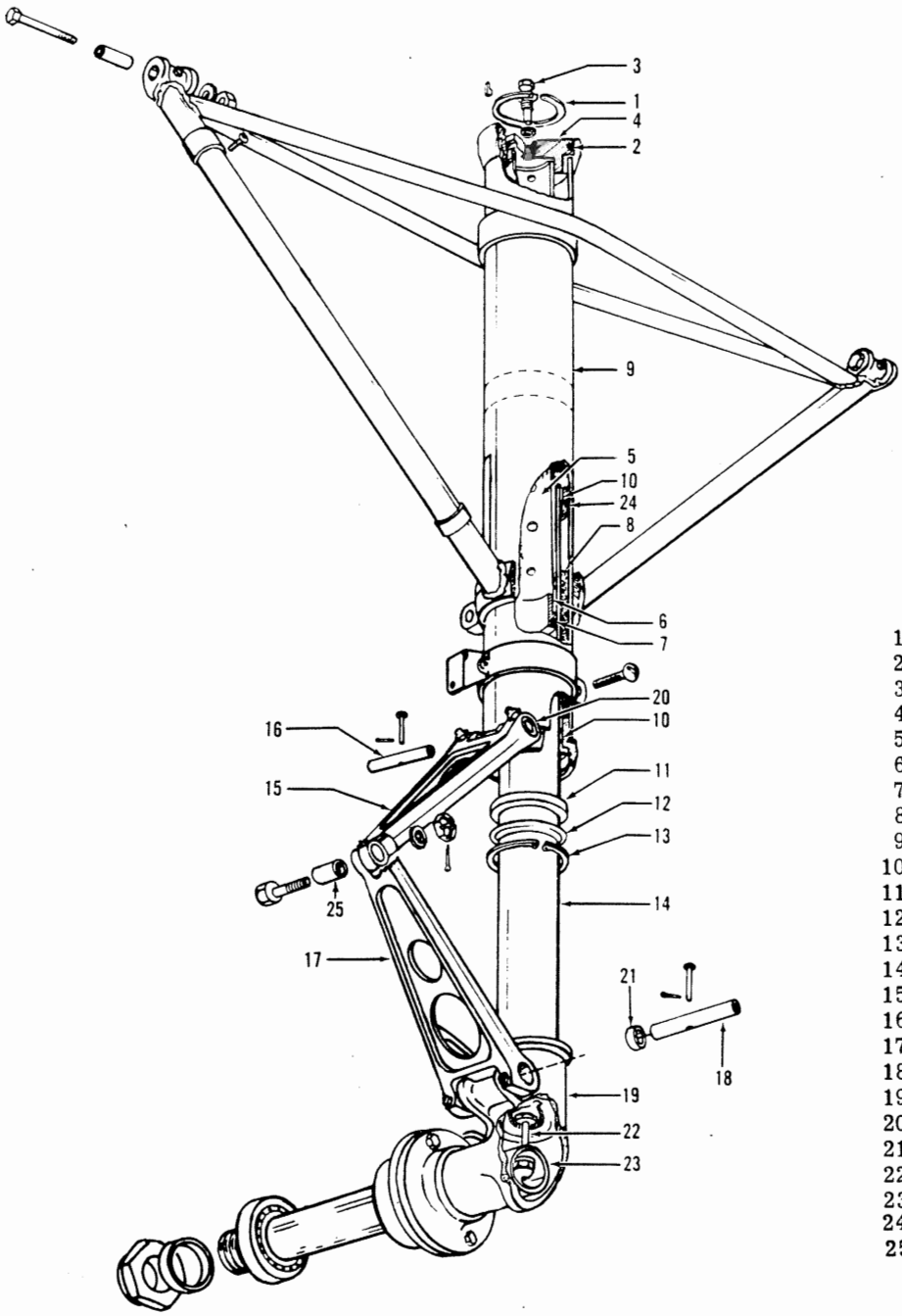
DISASSEMBLY OF MAIN GEAR SHOCK STRUT (Airplane Serial TD-252 and after)

a. Deflate strut completely and remove the air valve assembly.

WARNING

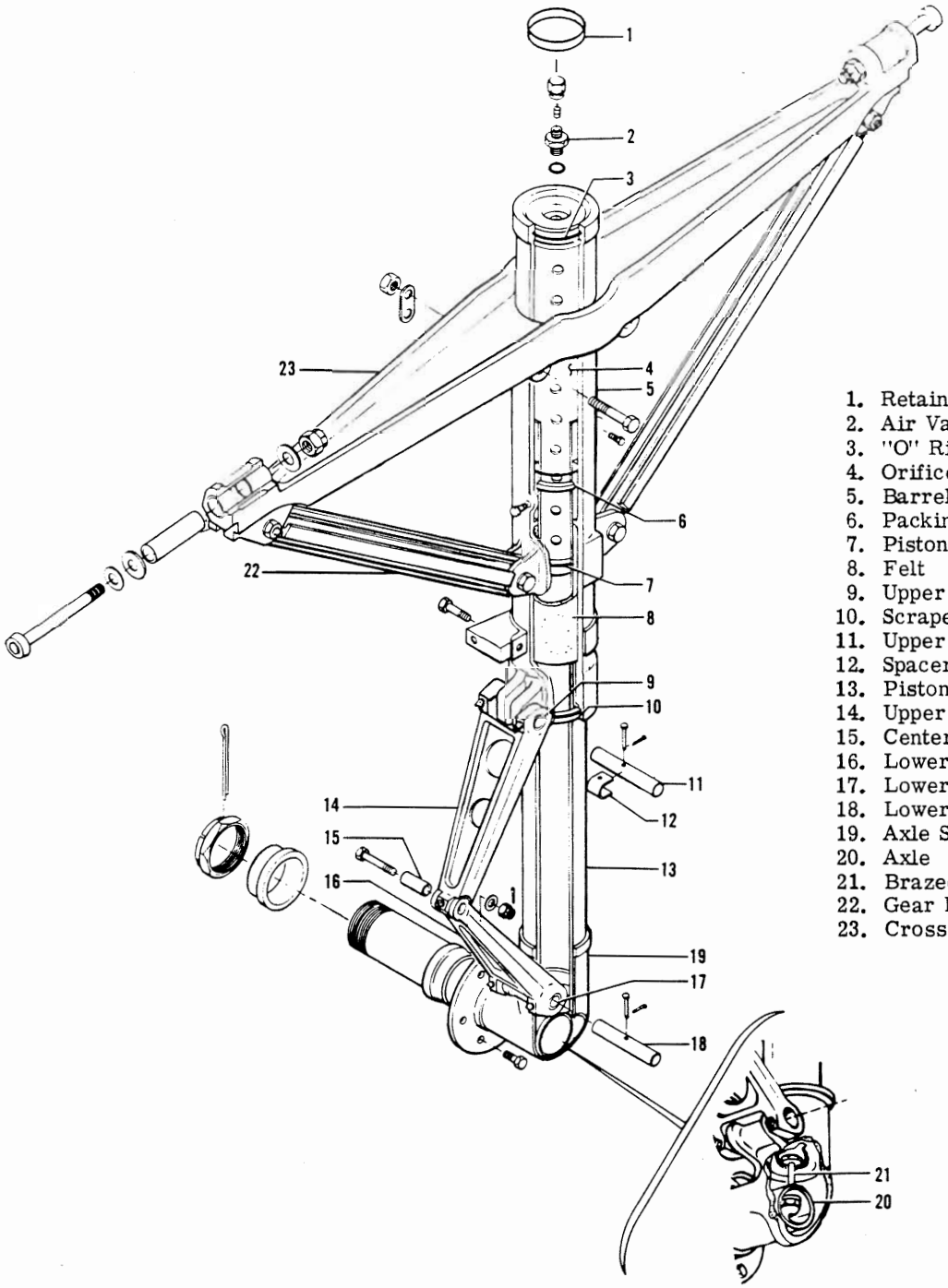
Do not unscrew the air valve assembly until all air pressure has been released or it may be blown out with considerable force and cause injury or damage.

b. Remove the retainer ring and pull the orifice tube assembly out of the barrel.



1. Snap Ring
2. "O" Ring
3. Air Valve Assembly
4. Cap
5. Orifice Tube
6. Orifice Head
7. Piston Ring
8. Felt Pad
9. Barrel
10. Brazed Bearing
11. Scraper Ring
12. Adapter Ring
13. Snap Ring
14. Piston
15. Upper Torque Knee
16. Upper Torque Knee Pin
17. Lower Torque Knee
18. Lower Torque Knee Pin
19. Axle Socket
20. Upper Torque Knee Bushing
21. Lower Torque Knee Bushing
22. Brazed Retaining Bolt
23. Axle
24. "O" Ring
25. Center Torque Knee Bushing

Figure 5-5. Main Landing Gear Shock Strut Assembly
(Airplane Serial TD-252 thru TD-523)



1. Retainer Ring
2. Air Valve Assembly
3. "O" Ring
4. Orifice Tube
5. Barrel
6. Packing
7. Piston Ring
8. Felt
9. Upper Torque Knee Bushing
10. Scraper Ring
11. Upper Torque Knee Pin
12. Spacer
13. Piston
14. Upper Torque Knee
15. Center Torque Knee Bushing
16. Lower Torque Knee
17. Lower Torque Knee Bushing
18. Lower Torque Knee Pin
19. Axle Socket
20. Axle
21. Brazed Retaining Bolt
22. Gear Brace
23. Cross Arm

Figure 5-6. Main Landing Gear Shock Strut Assembly
(Airplane Serial TD-524 and after)

c. Invert the strut and drain the hydraulic fluid out of the strut.

d. Disconnect the torque knees and slide the piston out of the barrel.

CAUTION

Be sure that air pressure is released prior to disconnecting the torque knees. The torque knees provide the extension stop for the lower shock absorber assembly and when disconnected, the piston is free to slide out of the upper barrel assembly.

e. Remove the snap ring and adapter (on TD-252 thru TD-524 only) and scraper. Remove the felt pad and "O" ring from the barrel.

MAIN SHOCK STRUT WEAR TOLERANCES
(Airplane Serial TD-252 and after)

The following are manufacturing tolerances which will aid in determining the extent of wear. The exact allowable deviation from these tolerances must be determined by the performance of the strut.

Pins (16 and 18) O. D. (minimum)	0. 4985 in.
Bushings (20 and 21) bore (maximum)	0. 5005 in.
Chrome plated portion of absorber assembly piston (14) O. D. (minimum)	1. 862 in.
Upper and lower bearings (10) I. D. (maximum)	1. 866 in.
Bushing (25) O. D. (minimum)	. 433 in.
Bushing (25) I. D. (maximum)	. 315 in.

When replacement of the scraper ring (11) and all "O" rings in the strut assembly fails to stop leaks, an out-of-round condition of the bearings and piston is probably the cause. In such instances the strut assembly should be returned to the factory for complete reconditioning. Field replacement of the lower bearing in the barrel is possible; however, the concentricity tolerance between the upper and lower bearings is critical and factory reconditioning of the barrel usually will be more satisfactory.

ASSEMBLY OF MAIN LANDING GEAR SHOCK STRUT
(Airplane Serial TD-252 and after)

a. Install the "O" ring in the center brazed bearing. See Figure 5-2.

b. Install the lower and upper torque knees but do not connect them.

c. Soak the felt pad in SAE No. 10 oil, and install it below the center brazed bearing.

d. Slip the snap ring and the adapter (on TD-252 thru TD-524) and scraper over the piston.

e. Slide the piston into the barrel. Work the scraper, and on Serials TD-252 thru TD-523, the adapter and snap ring into the lower end of the barrel, and connect the torque knees.

f. Pour approximately 27 fluid ounces (800 cc) of MIL-H-5606 hydraulic fluid into the strut. If no measuring device is available collapse the strut and fill it with hydraulic fluid.

g. Install the upper and lower "O" rings on the orifice tube, partially extend the strut and insert the orifice tube into the piston.

h. Install the orifice tube retaining ring. Prior to TD-524, the beveled side of the retaining ring goes down.

i. Install the air valve assembly.

j. Raise and lower the strut several times to remove air and excess fluid.

k. Inflate the strut to approximately 100 psi air pressure. Coat the top of the strut and air valve assembly with soap suds and check for air leaks.

OVERHAUL OF THE LANDING GEAR ACTUATOR
(Figure 5-7)

NOTE

On aircraft serials TD-546 thru TD-554 and TD-574, TD-577, the helical sector gear (10) and the actuator drive shaft (7) are combined as one unit.

a. Remove the motor (1) from the actuator and remove the gear (2) from the face of the motor.

b. Remove the snap ring (3) from the end of the shaft (19) and remove the gear (4) from the shaft.

c. Remove the snap ring (5) from the end of the actuator drive shaft (7) and remove the actuator retract arm (6) from the shaft. Push the shaft out of the assembly in the direction of the arrow.

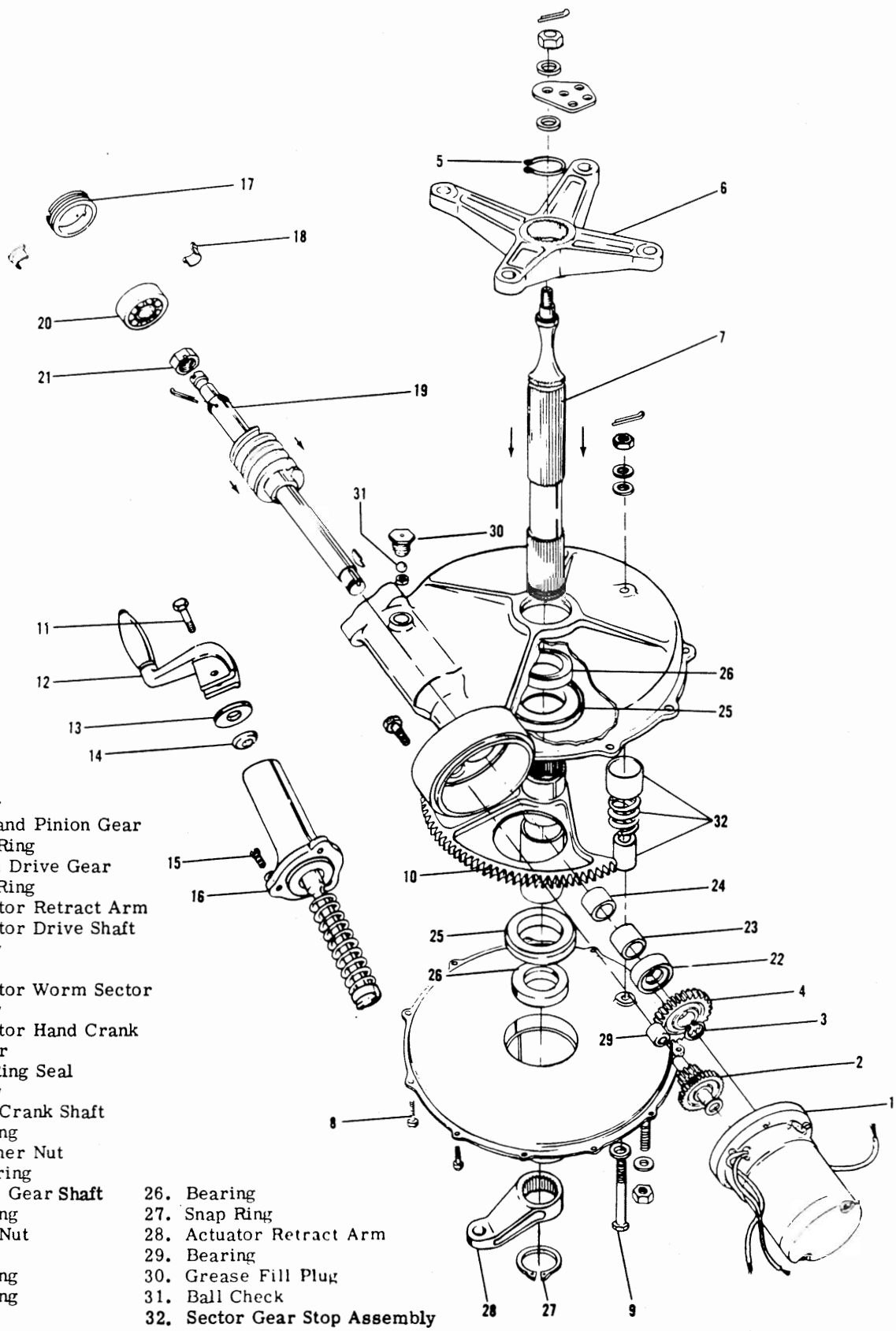
d. Remove the screws (8), and the bolt (9) from the housing. Separate the housing and remove the sector gear (10).

e. Remove the screw (11) from the actuator hand crank (12) and remove the spacer (13) and "O" ring (14) from the shaft.

f. Remove the screws (15) from the hand crank housing (16) and remove the hand crank housing from the actuator housing.

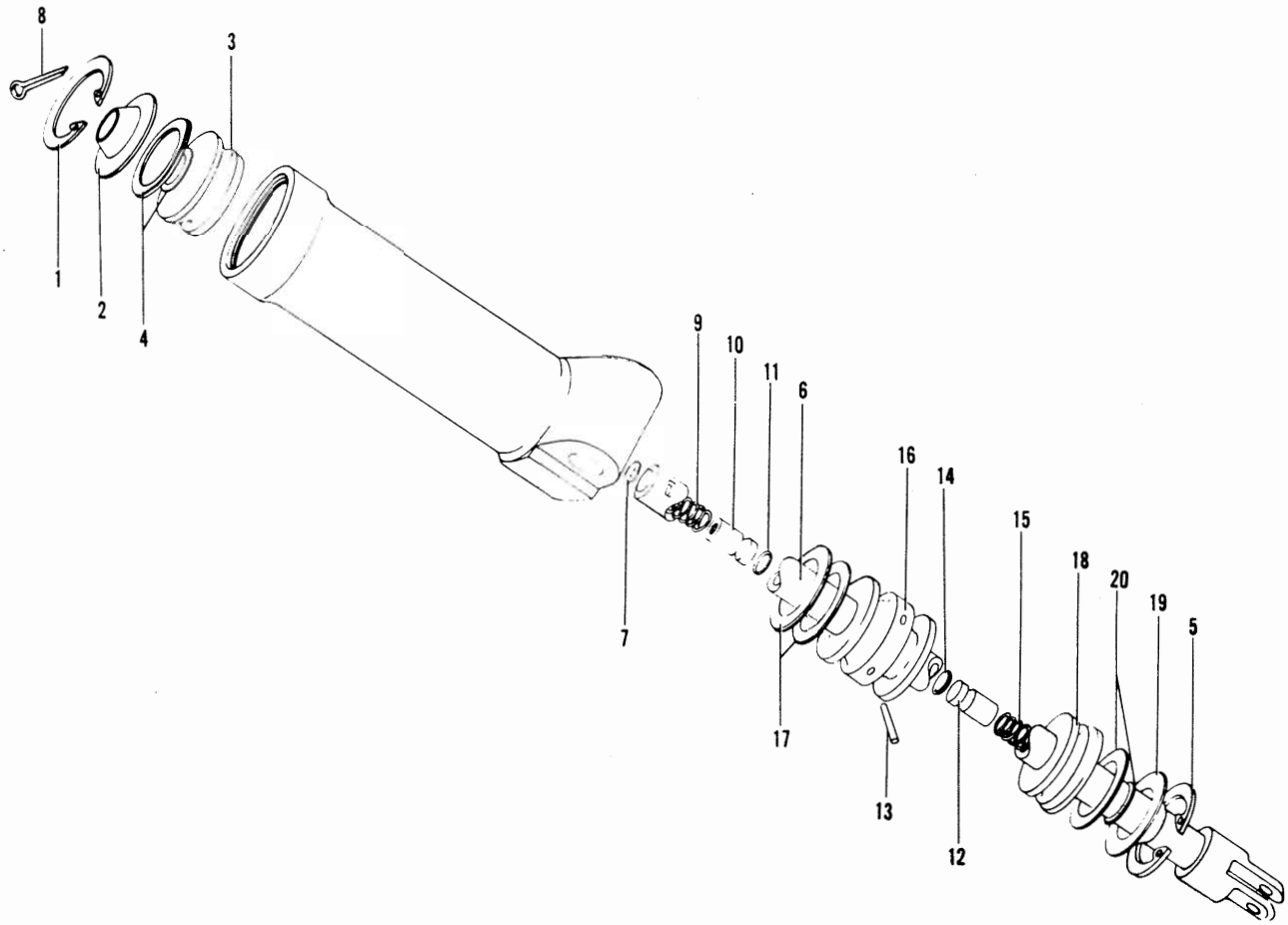
g. With a lug spanner wrench remove the retainer nut (17) from the actuator housing. Remove the cotter pin and back off the lock nut (21) and remove the two sections of the half-ring (18) from the shaft. Tap out the shaft (19) in the direction of the arrow, the bearing (20) is now free and the seal (22) will come out with the shaft.

h. Remove the bearings (23 and 24) from the actuator



1. Motor
2. Spur and Pinion Gear
3. Snap Ring
4. Worm Drive Gear
5. Snap Ring
6. Actuator Retract Arm
7. Actuator Drive Shaft
8. Screw
9. Bolt
10. Actuator Worm Sector
11. Screw
12. Actuator Hand Crank
13. Spacer
14. "O" Ring Seal
15. Screw
16. Hand Crank Shaft Housing
17. Retainer Nut
18. Half-ring
19. Worm Gear Shaft
20. Bearing
21. Lock Nut
22. Seal
23. Bearing
24. Bearing
25. Seal
26. Bearing
27. Snap Ring
28. Actuator Retract Arm
29. Bearing
30. Grease Fill Plug
31. Ball Check
32. Sector Gear Stop Assembly

Figure 5-7. Landing Gear Actuator



1. Internal Retainer Ring
2. Piston Scraper Ring
3. Shimmy Dampener End
4. "O" Ring
5. Snap Ring
6. Piston Rod
7. Washer
8. Cotter Pin
9. Compression Spring
10. Floating Piston
11. "O" Ring
12. Floating Piston
13. Piston Retaining Pin
14. "O" Ring
15. Compression Spring
16. Piston
17. "O" Ring
18. Barrel End
19. Scraper Ring
20. "O" Ring

Figure 5-8. Shimmy Dampener

housing.

i. Remove the seal (25) and the bearing (26) from the top and bottom housing halves.

j. Remove the snap ring (27) from the shaft (7) and slide the nose gear actuator retract arm (28) off the shaft.

k. Remove the bearing (29) from the housing.

Clean all parts in solvent to remove the grease and oil. Check all bearings and the teeth of the sector gear for cracks and wear. Replace parts as necessary. Replace all seals at reassembly. Seal the upper and lower housing joints using Silastic #140 or RTY 108. Reassemble the actuator in the reverse of the above procedure. Remove the filler plug from the actuator housing and fill the housing with 1/2 pint of Mobil Compound GG. Before attaching the motor, pack the motor gear housing with approximately one ounce of MIL-G-7711 general purpose lubricating grease. Fill within +.00 -.10 inch of the housing center line.

NOTE

At assembly when installing the actuator drive shaft through the sector gear make sure the scribe marks on each piece match. The same applies when installing the nose gear actuator retract arm on each end of the actuator drive shaft.

NOSE GEAR SHIMMY DAMPENER OVERHAUL (Figure 5-8)

a. Remove cotter pin (8), washer (7), internal retainer

ring (1), and the scraper ring (2). Force the barrel end (3) out of the barrel by working the piston back and forth. Remove the "O" rings (4) from the barrel end.

b. Remove all remaining hydraulic fluid from the shimmy dampener.

c. Remove the forward snap ring (5) and slide the piston rod (6) and parts out of the barrel.

d. Hold the washer (7) down and remove the cotter pin (8); remove the washer and compression spring (9).

e. Remove the aft floating piston (10) with a 6-32 screw and remove the "O" ring (11).

f. Insert a long 6-32 screw into the hole at the clevis end of the piston and engage the floating piston (12). Maintain tension on the floating piston while driving out the piston retaining pin (13).

g. Release the floating piston slowly and push it out the open end of the piston rod and remove the "O" ring (14).

h. Remove the remaining compression spring (15) from the rod and slide the piston (16) off the piston rod. Remove the "O" rings (17) from the piston.

i. Remove the barrel end (18), "O" rings (20), and the scraper ring (19) from the piston rod.

Clean all parts with Federal Specification PD-680 solvent and inspect for cracks, corrosion and distortion. Replace all "O" rings with those approved for use with mineral base hydraulic fluid. Lubricate all parts with MIL-H-5606 hydraulic fluid prior to assembly.

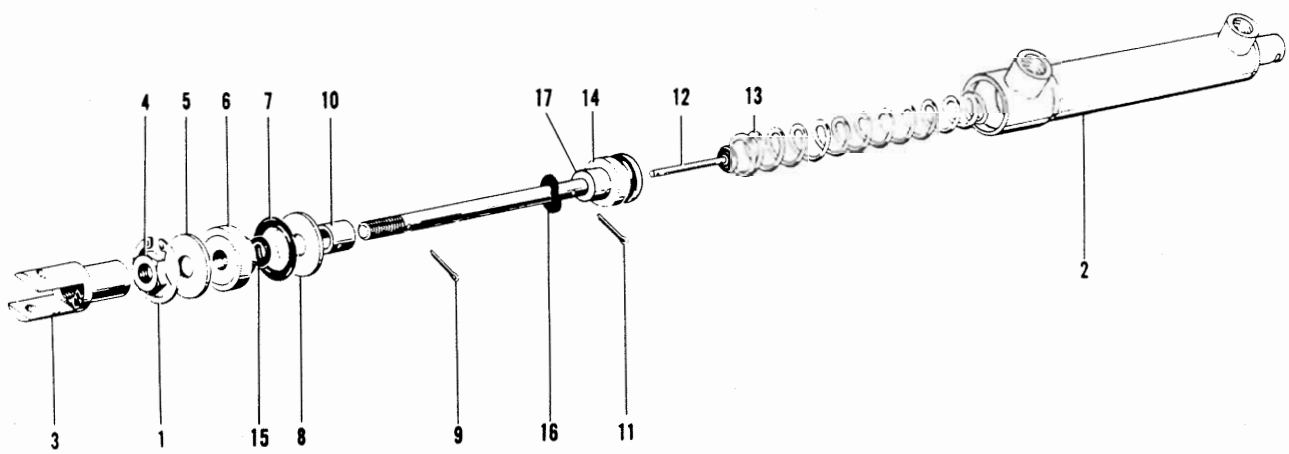
REASSEMBLY OF SHIMMY DAMPENER

a. Slide the scraper ring, barrel end and piston on the piston rod. Engage the floating piston with a threaded rod and pull it toward the clevis end of the piston rod so the piston retaining pin can be installed.

b. Slide the piston rod and assembled parts into the barrel and install the aft snap ring.

c. Place the dampener in a vise with the open end up and fill the barrel and piston rod with MIL-H-5606 hydraulic fluid. Work the piston up and down until bubbles stop appearing in the fluid in the piston rod. Refill the barrel with hydraulic fluid and install the remaining barrel end. Make sure the barrel is full enough so there is no air pocket under the barrel end. If the barrel is overfilled, the excess fluid will be forced into the piston rod as the barrel end is slid into position.

d. Fill the piston rod with hydraulic fluid. Engage the lower floating piston with a threaded rod. Pull down on the threaded rod and at the same time push down on the upper piston so it will follow the column of fluid down in the piston rod and prevent the entry of air. A tool which will aid in compressing the spring and installing the cotter pin can be made out of a piece of tubing small enough to fit inside the piston rod and at least six inches long. Cut a 1/4 inch slot, large enough to accommodate the cotter pin, in one end of the tubing. Place a stiff wire through the washer and spring down into the piston to act as a guide while the spring is being compressed. Compress the spring with the slotted end of the tubing, remove the guide wire, and install the cotter pin. Spread the portion of the cotter pin within the piston rod and insert a wire until it bottoms in the floating piston. If the wire enters the piston rod over 2-



1. Snap Ring
2. Cylinder
3. Clevis
4. Check Nut
5. Washer
6. Piston Guide Bushing
7. Retainer "O" Ring
8. Rear Sest Washer
9. Cotter Pin
10. Collar
11. Cotter Pin
12. Flow Lock Piston
13. Return Spring
14. Piston
15. "O" Ring
16. Spring Washer
17. Valve Stop

Figure 5-9. Brake Master Cylinder

3, 8 inches, remove the floating piston and add more fluid to the piston rod.

OVERHAUL OF BRAKE MASTER CYLINDER
(Figure 5-9)

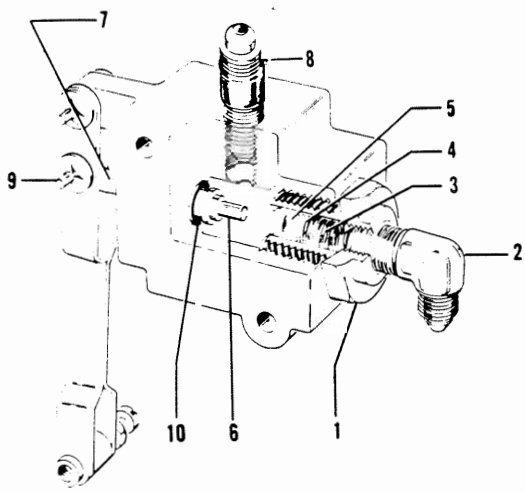
a. Remove the snap ring (1) and pull the assembled piston out of the brake cylinder (2).

b. Remove the clevis (3) from the piston (14), also the thin check nut (4), this will free the washer (5), piston guide bushing (6), retainer "O" ring (7) and the rear seat washer (8) from the piston (14).

c. Remove the cotter pin (9) from the collar (10) and pull the collar from the piston.

d. Remove the cotter pin (11) from the plunger end of the piston and allow the flow lock piston (12) to come free. Remove the valve stop (17) and spring washer (16). The return spring (13) will fall free of the cylinder with the piston removed.

Clean all parts with PD-680 solvent. Check all parts for cracks, corrosion, distortion and wear. Replace all washers and seals at reassembly. Reassemble in reverse of the above stated procedure. Lubricate all parts with MIL-H-5606 hydraulic fluid prior to assembly.



1. Valve Seat
2. Elbow
3. Spring
4. Washer
5. Ball
6. Plunger
7. Spacers
8. Nozzle
9. Lock Washer
10. "O" Ring

Figure 5-10. Parking Brake Valve

PARKING BRAKE VALVE OVERHAUL
(Figure 5-10)

a. Remove the valve seat (1) from the parking brake assembly.

b. Remove the elbow (2) from the valve seat.

c. Remove the spring (3), washer (4) and ball (5) from the valve seat.

d. Remove the lock washer (9) from the pin through the brake valve handle, remove the spacers (7) on the arm and push the plunger (6) through housing and out through the valve seat bore.

e. Remove the old "O" ring (10) from the inside of the brake housing.

f. Clean all parts in solvent and air dry all parts.

g. Place a new "O" ring (10) inside the brake housing.

h. Check the valve seat for wear and distortion around the ball seat. If necessary replace the valve seat.

i. Reassemble the valve in reverse of the above procedure.

Check the parking brake valve for leaks by placing 1500 lbs. pressure in the valve through the elbow (2). Remove the pressure and place it in the nozzle (8). The valve should open with application of 2 lbs. pressure or less. If this is not the case, the valve is not serviceable.

FLAP MOTOR GEARBOX OVERHAUL
(Figure 5-11)

a. Cut and remove all safety wires.

b. Remove the two long screws from the motor brush housing to separate the motor and gearbox.

c. Remove the screws which secure the cover (8) and gasket (7) to the gear housing.

d. A small set screw (11) must be removed to allow the counter shaft (10) to be drawn out of the gearbox.

e. Take out the worm and gear (14), washers (12, 15), bearing (16) and bearing cup (17).

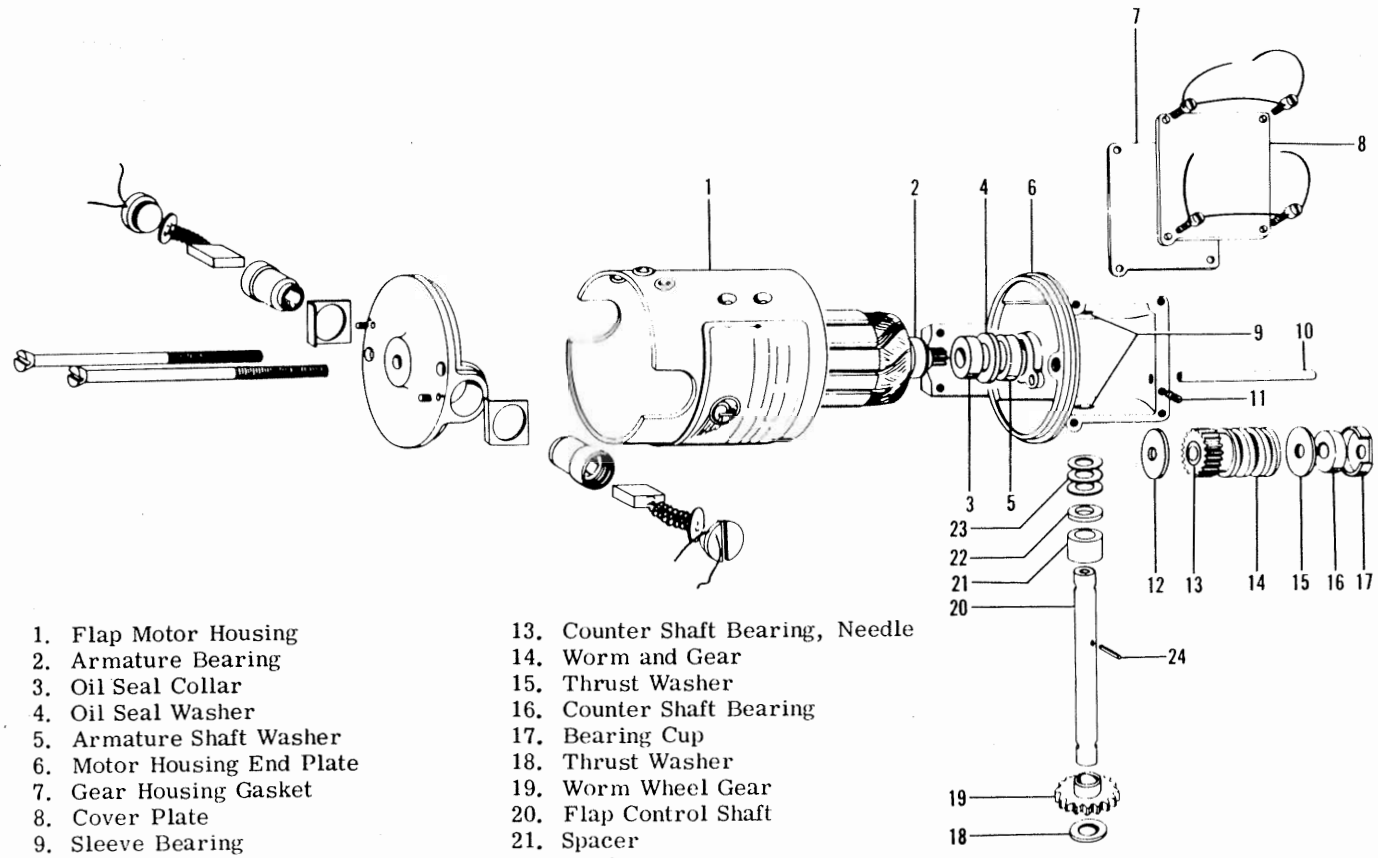
f. Remove the retaining pin (24) from the control shaft (20) and slip the spacer (21) and washer (22) down enough to remove the shaft.

Clean all parts in solvent PD-680 and inspect for worn, cracked or corroded components. Pay particular attention to the worm and worm wheel gear (19) and the bearings (9) in the side of the gearbox. Inspect the brushes of the flap motor for wear. The original length of the brushes are 1/2 inch; if the length is less than 5/16 inch they should be replaced. Refer to Aircraft Parts Catalog for replacement brushes. Fill the gearbox with lubricating grease MIL-G-23827.

Assembly is accomplished by reversing the above procedure.

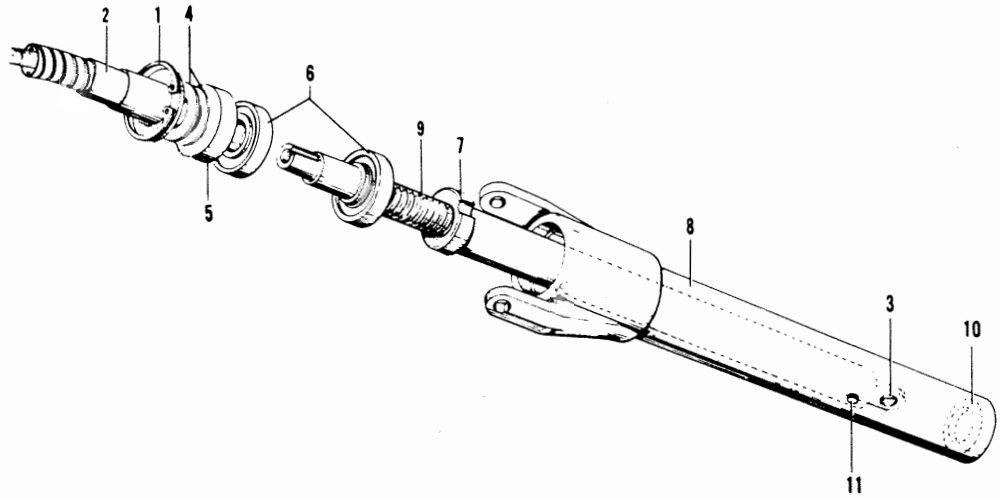
FLAP ACTUATOR OVERHAUL (Figure 5-12)

a. Remove the snap ring (1) to disconnect the flexible



1. Flap Motor Housing
2. Armature Bearing
3. Oil Seal Collar
4. Oil Seal Washer
5. Armature Shaft Washer
6. Motor Housing End Plate
7. Gear Housing Gasket
8. Cover Plate
9. Sleeve Bearing
10. Counter Shaft
11. Set Screw
12. Washer
13. Counter Shaft Bearing, Needle
14. Worm and Gear
15. Thrust Washer
16. Counter Shaft Bearing
17. Bearing Cup
18. Thrust Washer
19. Worm Wheel Gear
20. Flap Control Shaft
21. Spacer
22. Washer
23. Shim Washer
24. Retaining Pin

Figure 5-11. Flap Motor Gearbox



1. Snap Ring
2. Flexible Shaft
3. Piston Plug
4. Spacers
5. Seal
6. Bearing
7. Piston
8. Housing
9. Actuator Screw
10. "O" Ring
11. Pin

Figure 5-12. Flap Actuator

shaft (2) from the actuator.

b. Tap on the piston plug (3) to drive out the seal (5), spacers (4), and bearings (6).

c. Slide the piston (7) out of the housing (8) and unscrew the flap actuator screw (9) from the piston.

d. Remove the "O" ring (10) from the housing.

e. Drill out the pin (11) and take the plug out of the piston.

Clean all parts with Federal Specification PD680 solvent and inspect for cracks, corrosion, distortion and excessive wear. Replace the O-ring and seals. Coat the plug and pin with zinc chromate before assembly. Peen the pin and file it flush with the piston. Pack the bearings with MIL-G-23827 grease. Lubricate the O-rings with MIL-L-6086, Grade M gear lube before inserting the piston in the housing.

Pour MIL-L-6086, Grade M gear lube into the piston until it is about two inches from being full. Slide a bearing on the screw. Start the screw in the piston and slide the piston into the housing. Install the remaining bearing and seal. Seat parts in the housing with 1000 lbs. pressure. Install the spacers, shaft, and snap ring. Apply 1000 lbs. reverse pressure to seat the parts against the snap ring. End play between the piston and housing should be between .010-inch and .031-inch. Run the actuator in and out several times to assure proper operation in its full travel. Excessive lubricant will be forced out of the vent hole the first time the actuator is run all the way up. Install the actuator with the vent hole up.

RUDDER TRIM TAB ACTUATOR DISASSEMBLY
(Figure 5-13)

NOTE

If there is more than 0.005 inch end play measured from the screw (4) to the housing, the actuator is not within tolerance. If the end play can not be reduced to 0.005 or less with the adjusting bushing the nut or screw or both may need replaced.

a. Remove the snap ring (1) from the actuator housing and pull the nut assembly (2) out of the housing.

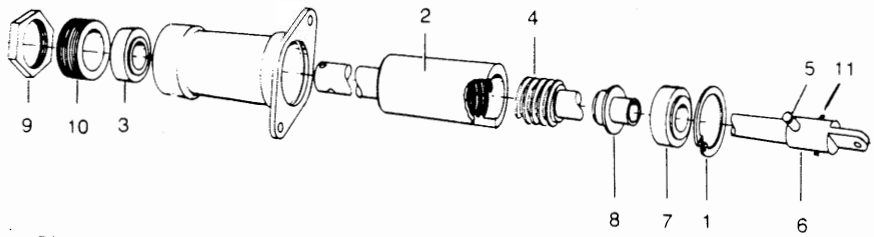
b. Remove the actuator screw (4) from the nut assembly.

c. Drill out rivet (5), [on later models remove shoulder pin (5)] rivet (11) and remove actuator rod end (6) from the screw (4). The bearing (7) and bushing can now be removed from the screw (4).

d. Remove the check nut (9) and screw out the end plug adjusting bushing (10) with the appropriate spanner wrench.

e. Remove the bearing (3) from the nut assembly.

Clean all parts with Federal Specification PD680 solvent and inspect for cracks, corrosion and distortion. Replace all "O" rings and bushings. Lubricate all parts with MIL-G-23827 prior to assembly.



1. Snap Ring
2. Nut Assembly
3. Bearing
4. Actuator Screw
5. Shoulder Pin or Rivet and Spacer
6. Actuator Rod End
7. Bearing
8. Bushing
9. Check Nut
10. Adjusting Bushing
11. Rivet

Figure 5-13. Rudder or Elevator Trim Tab Actuator

RUDDER TRIM TAB ACTUATOR ASSEMBLY
(Figure 5-13)

NOTE

Lubricate all moving parts with MIL-G-23827.

a. Screw actuator screw (4) into nut (2).

b. Install bearing (3) on nut (2).

c. Install bushing (8) and bearing (7) on screw (4), and install this assembly into the housing.

d. Install snap ring (1) into the housing.

e. Install adjusting bushing (10) and check nut (9).

f. Check the end play between the actuator screw (4) and the actuator housing. The end play must not exceed 0.005 inch. The nut (2) must be free to rotate and provide smooth operation through its full travel.

NOTE

Readjusting adjusting bushing (10) and check nut (9) may reduce the endplay. The nut must remain free to rotate and provide smooth operation through its full travel.

g. Install rod end (6) on screw (4) with spacer and rivet (5) [later actuators use a shoulder pin, nut and washer] and rivet (11).

ELEVATOR TRIM TAB ACTUATOR DISASSEMBLY AND ASSEMBLY
(Figure 5-13)

Except for a slight difference in outward appearance the elevator trim tab actuator is the same as the rudder trim tab actuator. To disassemble and assemble the elevator trim tab actuator refer to RUDDER TRIM TAB ACTUATOR DISASSEMBLY and RUDDER TRIM TAB ACTUATOR ASSEMBLY.

AILERON TRIM TAB ACTUATOR DISASSEMBLY
(Figure 5-14)

NOTE

If there is more than .025 inch end play measured from the screw (8) to the housing (6), the acutator is not within tolerance. If the end play can not be reduced to .025 or less with the adjusting bushing the nut or screw or both may need replaced.

a. Remove the snap ring (10) from the actuator housing and pull the nut assembly (5) out of the housing.

b. Remove the actuator screw (8) from the nut assembly.

c. Remove the actuator rod end (11) from the screw. The bearing (4) and the bushing (9) can now be removed from the screw.

d. Remove the check nut (2) and screw out the adjusting bushing (3) with a spanner wrench.

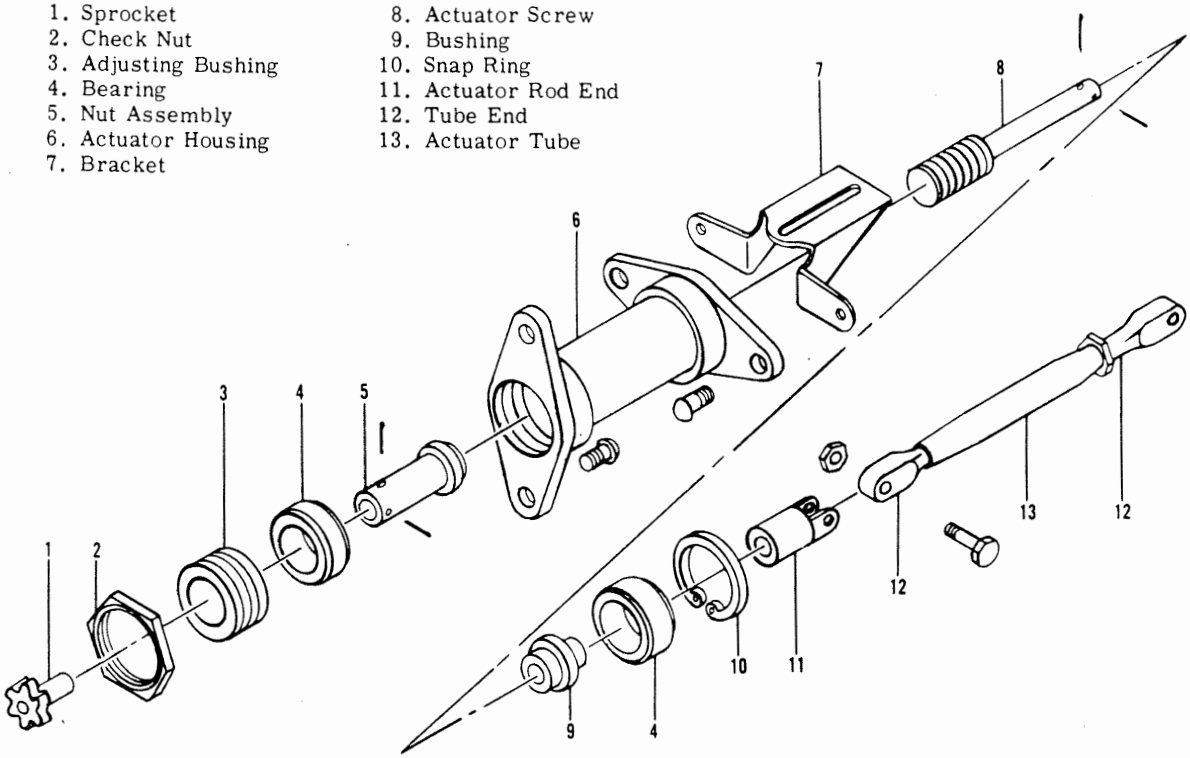


Figure 5-14. Aileron Tab Actuator

e. Remove the bearing (4) from the nut assembly.

Clean all parts with solvent and inspect for cracks, corrosion and distortion. Replace bushings and any parts showing evidence of deterioration. Lubricate with grease MIL-G-23827 prior to assembly.

AILERON TRIM TAB ACTUATOR ASSEMBLY (Figure 5-14)

NOTE

Lubricate all moving parts with MIL-G-23827.

a. Install bearing (4) on the nut assembly (5).

b. Install bushing (9) and bearing (4) on the actuator screw (8).

c. Install the actuator screw (8) in the nut assembly (5).

d. Position the actuator screw (8) and the nut assembly (5) in the actuator housing (6) and secure with snap ring (10).

e. Using a spanner wrench, screw the adjusting bushing (3) into the actuator housing (6) until the end play between the nut assembly (5) and housing (6) is removed. After tightening the adjusting bushing (3), the nut assembly (5) must be free to rotate and the complete assembly must be sufficiently free of binding to provide smooth operation throughout its full travel. Secure with the check nut (2).

f. Check the end play between screw (8) and housing (6). The end play must not exceed 0.025 inch.

g. Install the actuator rod end (11) on the actuator screw (8).

NOTE

Readjusting adjusting bushing (3) and check nut (2) may reduce the end play. The nut must remain free to rotate and provide smooth operation through its full travel.

TESTING FOR FUEL CELL LEAKS

Although the chemical test is more sensitive, either of the following test procedures may be used to detect leaks in the bladder cells.

a. Soap Suds Test

1. Attach test plates to all fittings.

2. Inflate the cell with air to a pressure of 1/4 psi maximum.

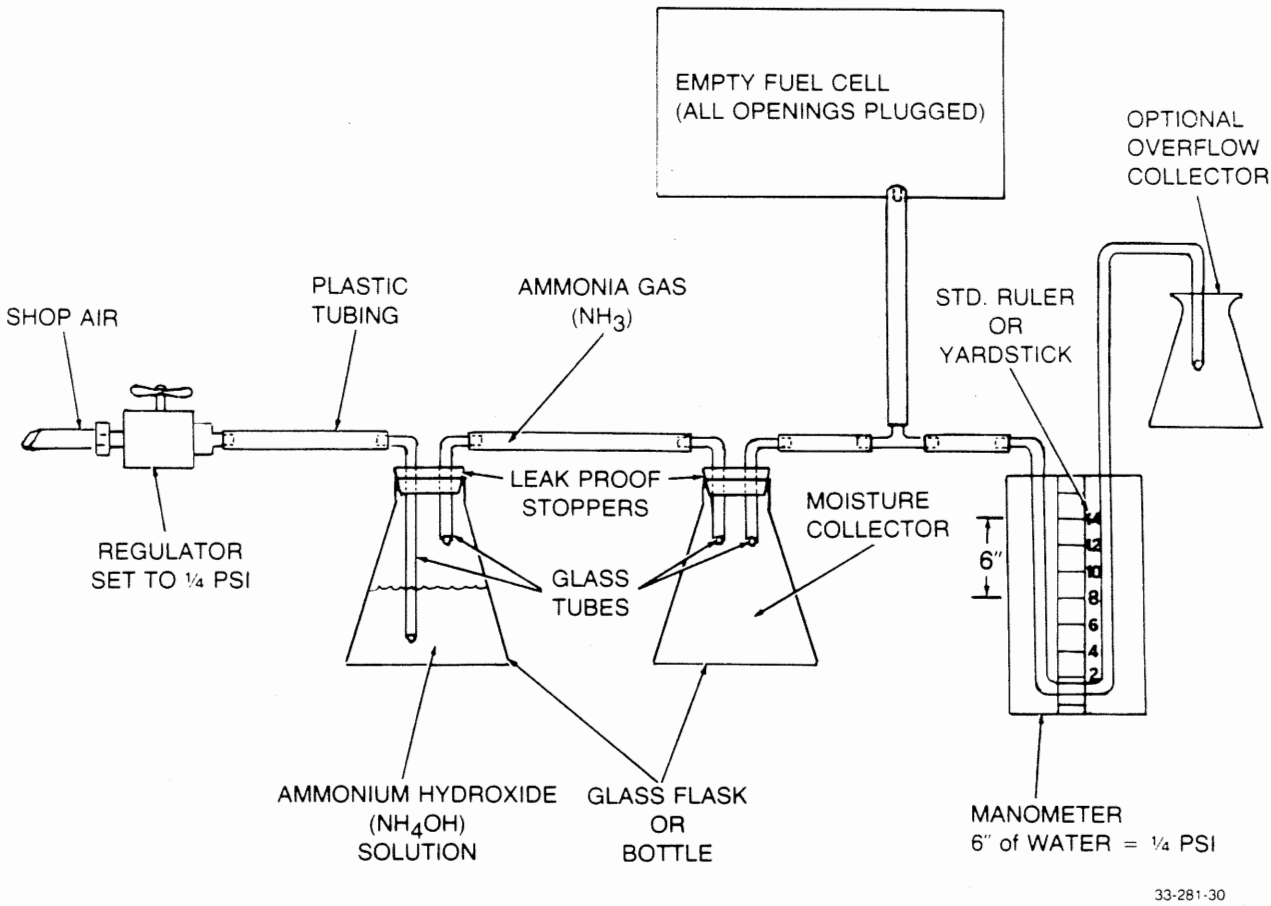


Figure 5-15. Setup For Leak Test

3. Apply a soap and water solution to all repaired areas and any areas suspected of leakage. Bubbles will appear at any point where leakage occurs.

4. After test, remove all plates and wipe soap residue from the exterior of the cell.

b. Chemical Test

Rubber bladder type fuel cells may be bench tested for leakage by sealing off all openings and inflating the empty cell to 1/4 psi with a mixture of shop air and ammonia gas, then checking for visible indications of leakage on a cloth saturated with phenolphthalein solution. To set up and conduct the leakage test, proceed as follows:

1. The following equipment is required and should be hooked up as indicated in the schematic in Figure 5-15:

a. Closure plates for the fuel cell openings. Such plates may be fabricated of aluminum sheet cut to a size sufficient to cover the cell openings. Drill holes in the closure plate to match the hole pattern around the opening in the fuel cell.

b. Rubber stoppers to plug the fitting openings in the fuel cell. One of the stoppers should have a hole for insertion of the plastic tubing used to connect the fuel cell into the test setup.

c. A manometer for measuring 6 inches of water differential. The manometer can be fabricated from glass or clear plastic tubing, frame and scale similar to the illustration shown.

d. A regulator that can be set to provide 1/4 psi (6 inches of water) from a supply of shop air.

e. Two flasks (or bottles) approximately one liter (or quart) in capacity. A third container may be hooked into the test setup to provide an optional overflow collector if desired. The two containers should be provided with rubber stoppers that have holes for the insertion of 1/4-inch tubes (glass or metal) as shown in the schematic in Figure 5-15.

f. Plastic tubing of a size to provide a leak-free fit over the tubes and of a length sufficient to interconnect

the test components as shown in Figure 5-15.

g. Make up a solution of phenolphthalein as follows: Add 1/3 ounce phenolphthalein crystals to 1/2 gallon ethyl alcohol, mix, then add 1/2 gallon water.

h. Make up an ammonia solution by adding 100 cc (3 fluid ounces) of concentrated ammonium hydroxide (NH_4OH) per gallon of water.

2. Place the fuel cell and test equipment on a clean work bench.

CAUTION

Make sure the work area is clean of metal shavings or other debris that could damage the fuel cell.

3. Install the closure plates over the fuel cell openings and torque the retaining screws as specified in the installation section of the shop manual for the openings, then insert the rubber stoppers into the open fittings.

4. The flask (or bottle) containing the ammonium hydroxide solution should be 1/3 to 1/2 full as shown in the illustration.

5. Connect a shop air supply to the regulator and interconnect the regulator, beakers, fuel cell, and manometer as indicated in Figure 5-15.

6. Inflate the fuel cell to 1/4 psi with a mixture of shop air and ammonium gas. A 6-inch difference in the two water levels of the manometer will indicate that the fuel cell is inflated to 1/4 psi. It is not necessary to restrain the cell other than to keep it from rolling off the bench. The filling of the cell will be rather slow at the 1/4 psi, but should not be rushed as overpressure of the cell could result.

7. Saturate a large, clean cloth with phenolphthalein. (Immerse it in a container and squeeze out excess liquid.)

CAUTION

Wear rubber gloves to protect against skin irritation when handling the cloth. As a further protection against possible penetration of the phenolphthalein solution through the gloves, wash your hands thoroughly after finishing the test.

8. Lay the cloth over the various portions of the fuel cell until the entire exterior of the cell has been covered. With each application of the cloth, watch for the formation of a reddish pink stain on the cloth to indicate the presence of a leak. Encircle the area on the fuel cell beneath such stains with a chalk mark to pinpoint the locations of leaks.

NOTE

Continued use of the testing cloth will require repeated saturations with phenolphthalein since rapid evaporation of the alcohol from the cloth progressively reduces the sensitivity of the test unless the solution in the cloth is frequently renewed.

REPAIR OF UNIROYAL RUBBER FUEL CELLS, OUTSIDE

a. Cut a rounded patch of Uniroyal 5200 outside repair material large enough to cover the damage at least 2 inches from the cut in any direction. The patch should be thinned toward the edges.

b. Buff the base of the patch and the damaged area to be covered by the patch lightly and thoroughly. Wash off the buffing dust with methyl ethyl ketone.

c. Coat the base of the patch and the damaged area with EC-678 cement and allow it to dry for 10 to 15 minutes. Next apply a second coat of EC-678 cement to the base of the patch and the damaged area and allow it to dry 10 to 15 minutes.

d. Reactivate these two surfaces by moistening them with a piece of cheesecloth dampened in methyl ethyl ketone. Place the patch on the damaged area when the surfaces are tacky making contact first at the center of the patch. Then roll the patch outward from the center by hand. Next apply pressure to the repair with a 1/4 inch roller beginning at the center and working to the outside edge in order to prevent air or solvent pockets between the patch and the cell.

e. Cover the patch with a sheet of polyethylene and lay a 50 pound shot bag over the repair. After six hours remove the weight and polyethylene sheet.

f. Seal coat the edge of the patch 1/2 inch on each side of edge with EC-678 and allow it to dry thoroughly for at least six hours.

REPAIR OF UNIROYAL RUBBER FUEL CELLS, INSIDE

a. Allow 6 hours to elapse after completion of the outside patch before beginning repair of the inside of the cell.

b. Repair procedure for inside of cell is the same as the outside except Uniroyal 5200/5187 inside patching material is used. Wipe a light coat of light engine oil on the patched area, to prevent it from sticking to other areas of the cell, on installation.

Large holes and cracks require that the damaged area be cut and trimmed just beyond the area of noticeable damage. If the parts are painted remove paint and sand area at least two inches beyond the edge of the cutout. Then prepare three patches of laminated glass cloth, Specification MIL-F-9084, preferably No. 181 fabric. One patch should be the size of the sanded area, the second patch should be smaller so that approximately one-half inch of the first patch will be exposed. Cut the third patch to approximately one-half inch smaller than the second patch. Prepare a sufficient amount of resin, MIL-R-7575 which can be used in thirty minutes, in accordance with the manufacturer's instructions. Never use catalytic resin which has been exposed to air more than thirty minutes. If the repair is large, prepare small amounts of resin as required. Make sure that your hands are clear of oil, grease and dirt.

NOTE

There are several different resins available which will cure when exposed to air and at room temperature. Two are suggested; American Cyanimide, Laminac 4116, blended 100 parts resin to 1/2 to 1 part of DDM peroxide; or Gliddens 1001 resin blended 100 parts resin to 1/2 part cobalt with 1/2 to 1 part DDM peroxide. Both resins conform to specifications MIL-R-7575 and MIL-P-8013.

WARNING

In preparing resin never mix DDM peroxide and cobalt together, as this will result in a spontaneous fire. Always add one catalytic agent to the resin and mix thoroughly before adding the other agent.

Apply an even coat of resin to the sanded area. Impregnate all three laminated glass cloth patches by laying the patches on clear paper and working the resin through the fabric with a 2 inch brush. Place the large patch over the cutout area, working out all air bubbles and wrinkles. If the cutout is large enough to cause the patch to sag, place a suitable support coated with automobile wax or waxed paper behind the repair area to prevent the resin from adhering to the support. Apply the second patch over the first patch working out all wrinkles and air bubbles. Apply the third patch over the second patch in the same manner. After all three patches have been applied, brush the area with an even coat of resin. Let the patches cure for a period of 24 hours at temperatures of 23°C (75°F) to 66°C (150°F). With fine sandpaper, smooth the patch area for desired finish. Repaint the finished area with matching paint.

SECTION VI

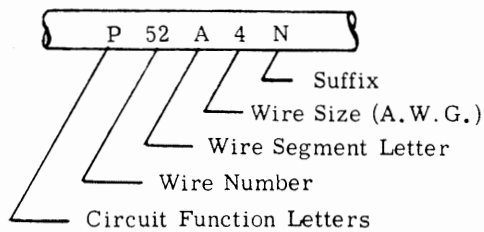
ELECTRICAL WIRING DIAGRAMS

The individual circuit diagrams shown on the following pages identify each wire with a code assigned according to its usage in the aircraft. The individual circuit components are indexed and listed in the nomenclature accompanying each diagram. Wire bundles and harnesses are not indicated. The arrangement of the components in the diagram was chosen for clarity without the attempt to indicate the actual location in the aircraft.

Optional equipment and changes have been noted by placing them in emphasized manner such as dotted lines and heavily outlined sections. Notes have been added for clarity when specific requirements need to be met.

The wire codes used, closely follow the military numbering system. Briefly, a wire code consists of a function letter, wire segment letter, and wire size (American Wire Gage). Frequently a suffix indicating ground (N), phase (A, B, etc.) or thermocouple material (alumel, chromel etc.) is added.

Electrical symbols used in diagrams appear on pages 6-3 and 6-4.



A list of circuit function designation follows

A Armaments
B Photographic
C Control surfaces; autopilot
D Instruments other than flight or engine instrument, ammeter, landing gear position, free air temperature, cabin pressure, etc.
E Engine instrument; fuel flow, fuel quantity, tachometer, synchroscope, etc.
F Flight instrument
G Landing gear; actuator, retraction, warning, down lock, etc.
H Heating
J Ignition
K Engine control; starter, prop pitch, prop synchronizer, etc.
L Lighting
M Miscellaneous electric; windshield wiper, etc.
P DC power
Q Fuel and oil; fuel valves, fuel pump motors, throttle control, oil pumps, etc.
R Radio; RC-radio command, RM-marker beacon, etc.
S Radar; SA-altimeter, 3S-search, etc.
T Special electronics, TK-telemetry, TR-receivers, etc.
U Miscellaneous electronics (other than RS or T)
V DC power for AC systems
W Warning and emergency
X AC power
Y Armaments special systems

WIRING DIAGRAM INDEX

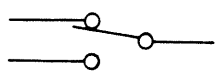
ELECTRICAL SYMBOLS

SWITCHES & RELAYS

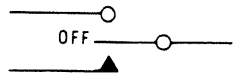
○ Positive Contact

▲ Momentary Contact

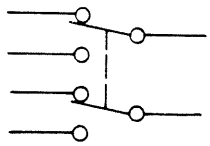
These contacts may be found in various combinations on most of the following type switches and relays.



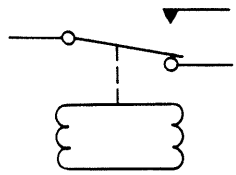
2 - Position



3 - Position

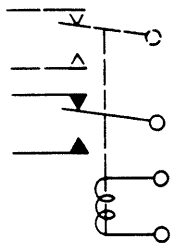


2 - Pole

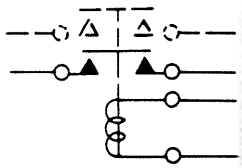


Pressure Switch

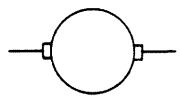
MOTORS



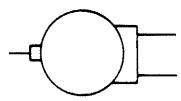
Low Current



High Current



2 - Wire



3 - Wire

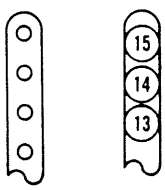
CIRCUIT BREAKERS

Push-Pull

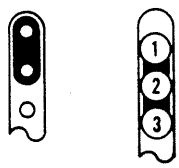
Toggle

Push to Reset

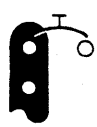
TERMINAL BOARDS & BUS BARS



Terminal Board



Terminal Board with Bus Bar



Open Bus Bar

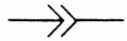
ELECTRICAL SYMBOLS (Cont'd)

WIRES, CONNECTORS, CABLES

Wire Crossing
(Not Connected)

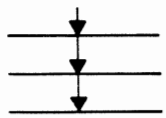
Permanent Splice

Wire Connection

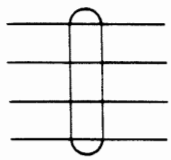


Quick Disconnect

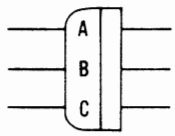
Shielded Wire



Twisted Wiring



Multiple Conductor
Cables



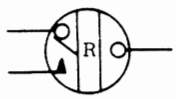
Plug and Receptacle

GROUND CONNECTORS

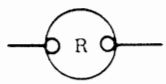
Ground Connection

Case Ground
Connection

LIGHTS



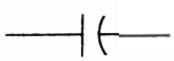
Press to Test Light



Light

MISCELLANEOUS

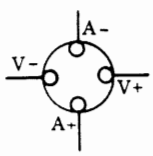
Battery



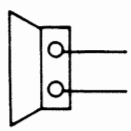
Capacitor

Heating Element

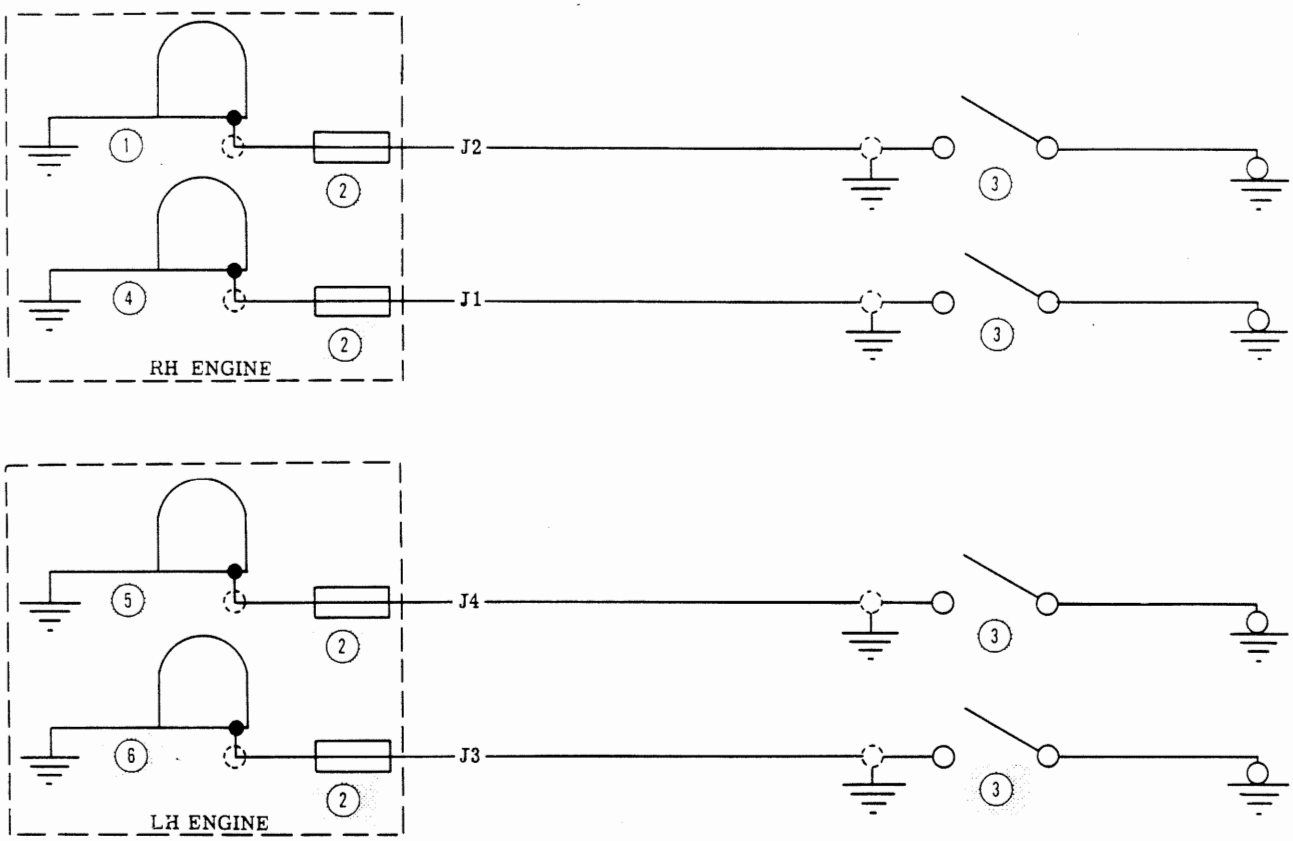
Thermocouple



Electrical Instrument

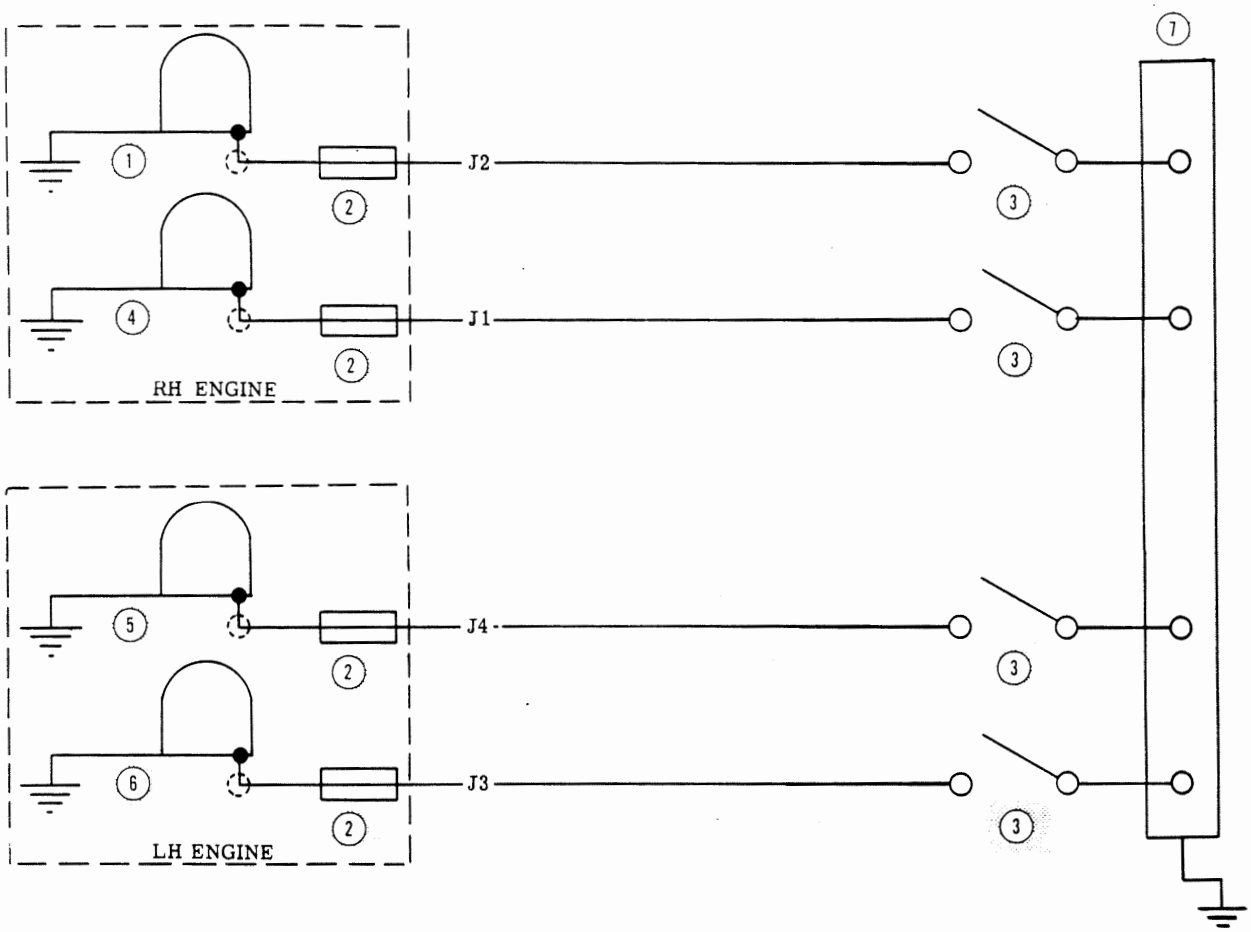


Speaker or
Warning Horn



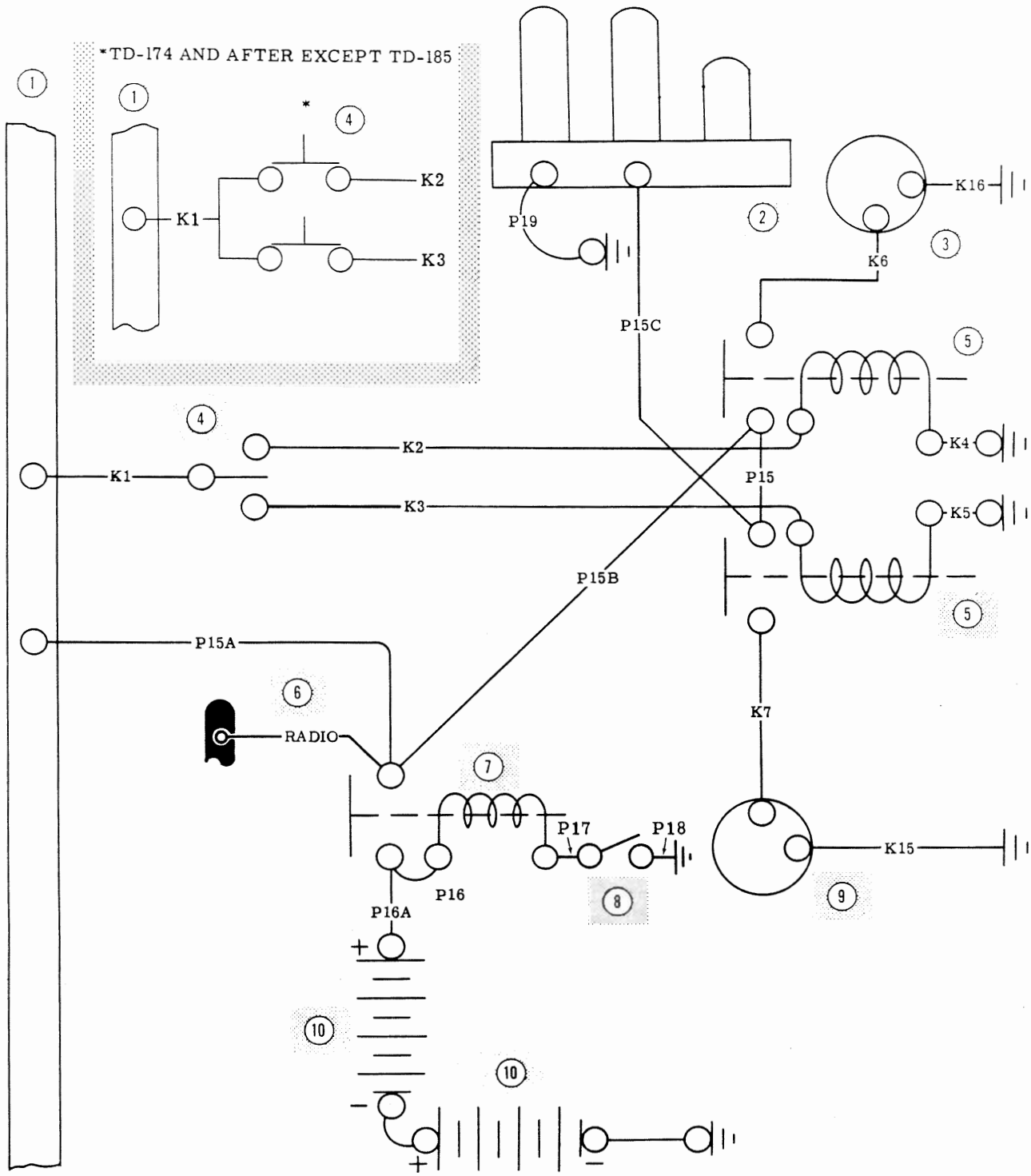
1. Right Magneto
2. Filter Units
3. On-Off Switches
4. Left Magneto
5. Right Magneto
6. Left Magneto

IGNITION CIRCUIT
TD-1 thru TD-173, and TD-185 except TD-127



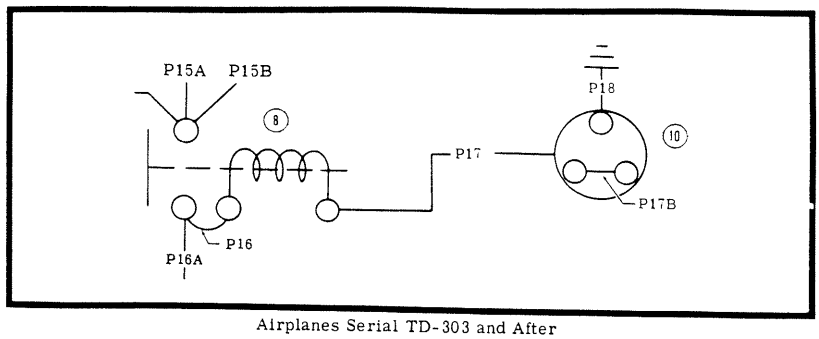
1. Right Magneto
2. Filter Units
3. Off-On Switches
4. Left Magneto
5. Right Magneto
6. Left Magneto
7. Bus Bar

IGNITION CIRCUIT
TD-174 thru TD-452, Except TD-185 and TD-444

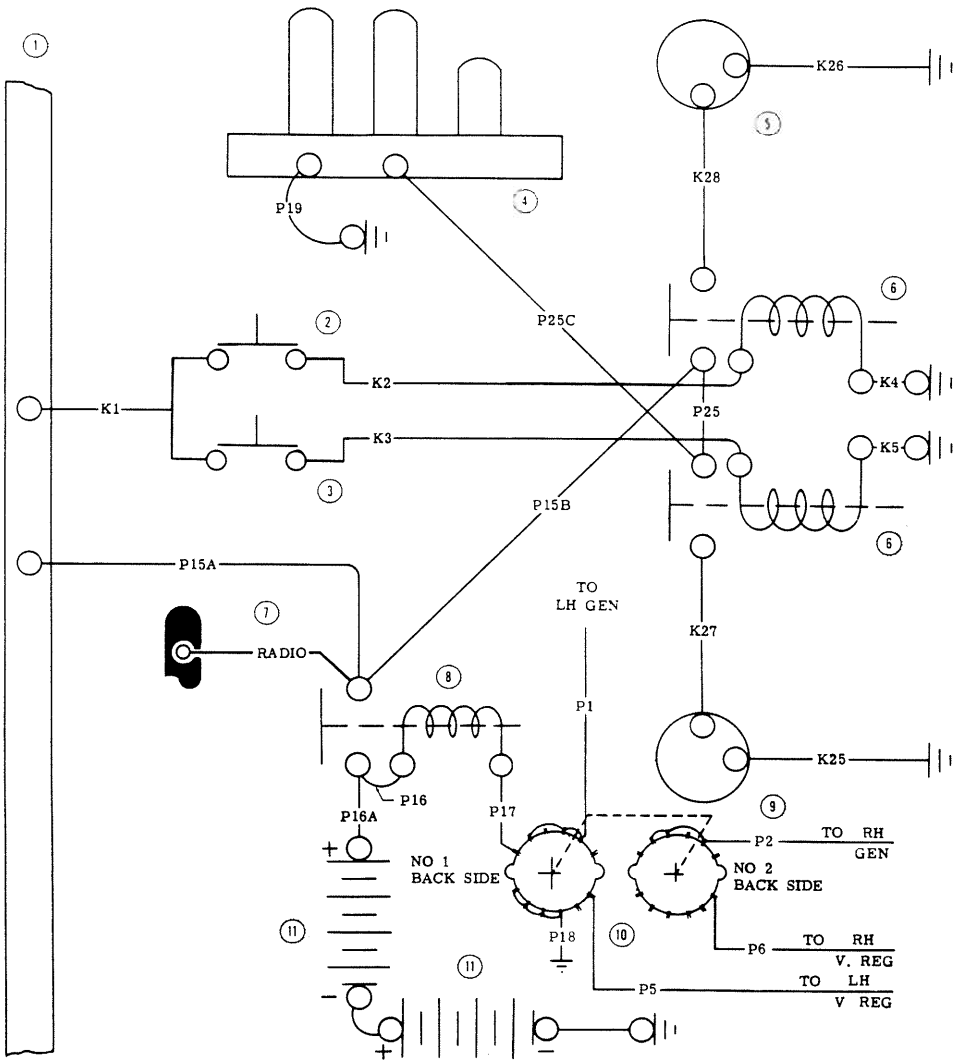


1. Main Bus Bar
2. External Power Receptacle (Optional)
3. Starter (RH Engine)
4. Starter Switch
5. Starter Relays
6. Radio Bus Bar
7. Battery Master Relay
8. Battery Master Switch
9. Starter (LH Engine)
10. Batteries

BATTERY AND STARTER CIRCUIT
TD-1 thru TD-185 except TD-127

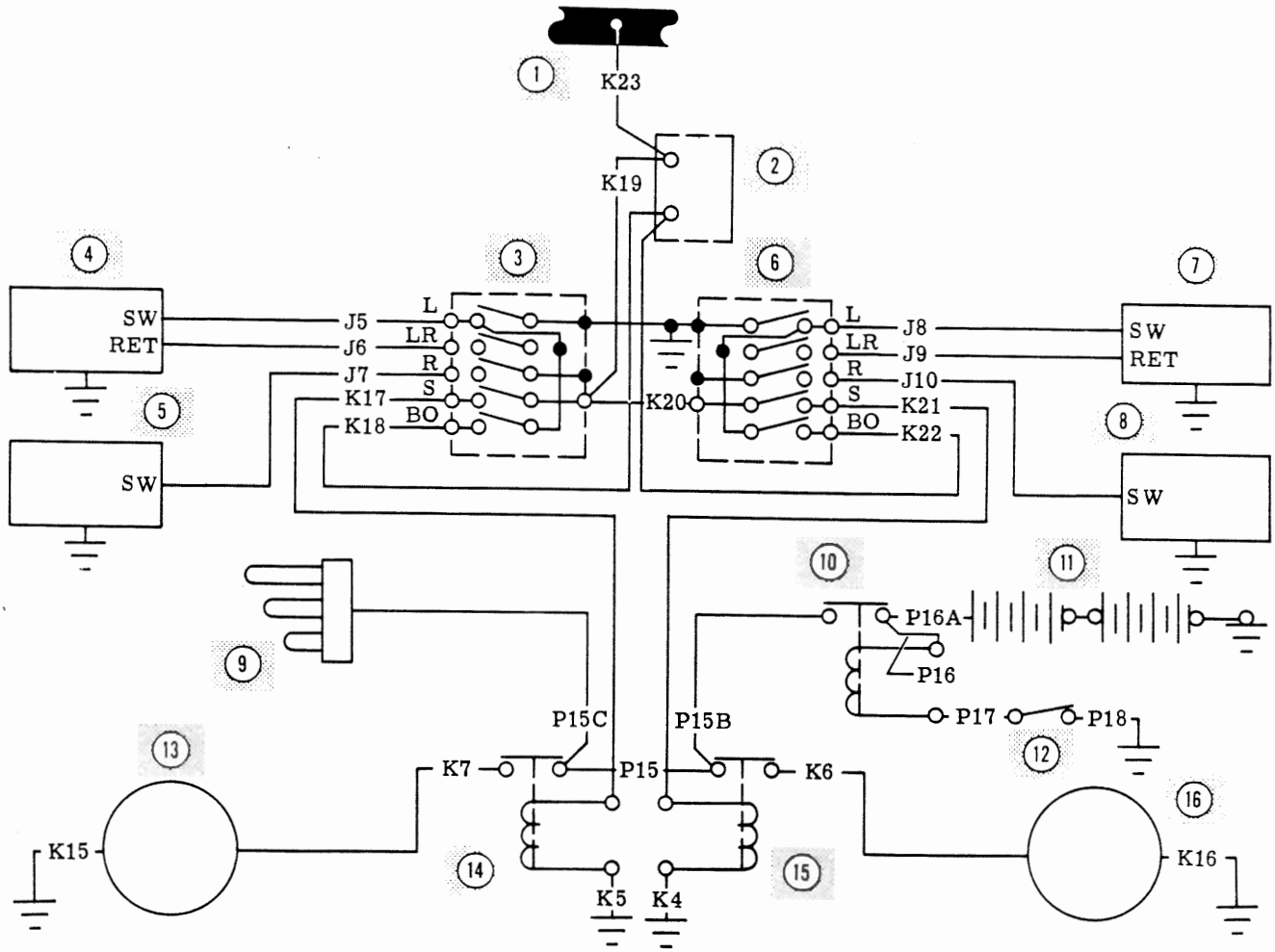


Airplanes Serial TD-303 and After



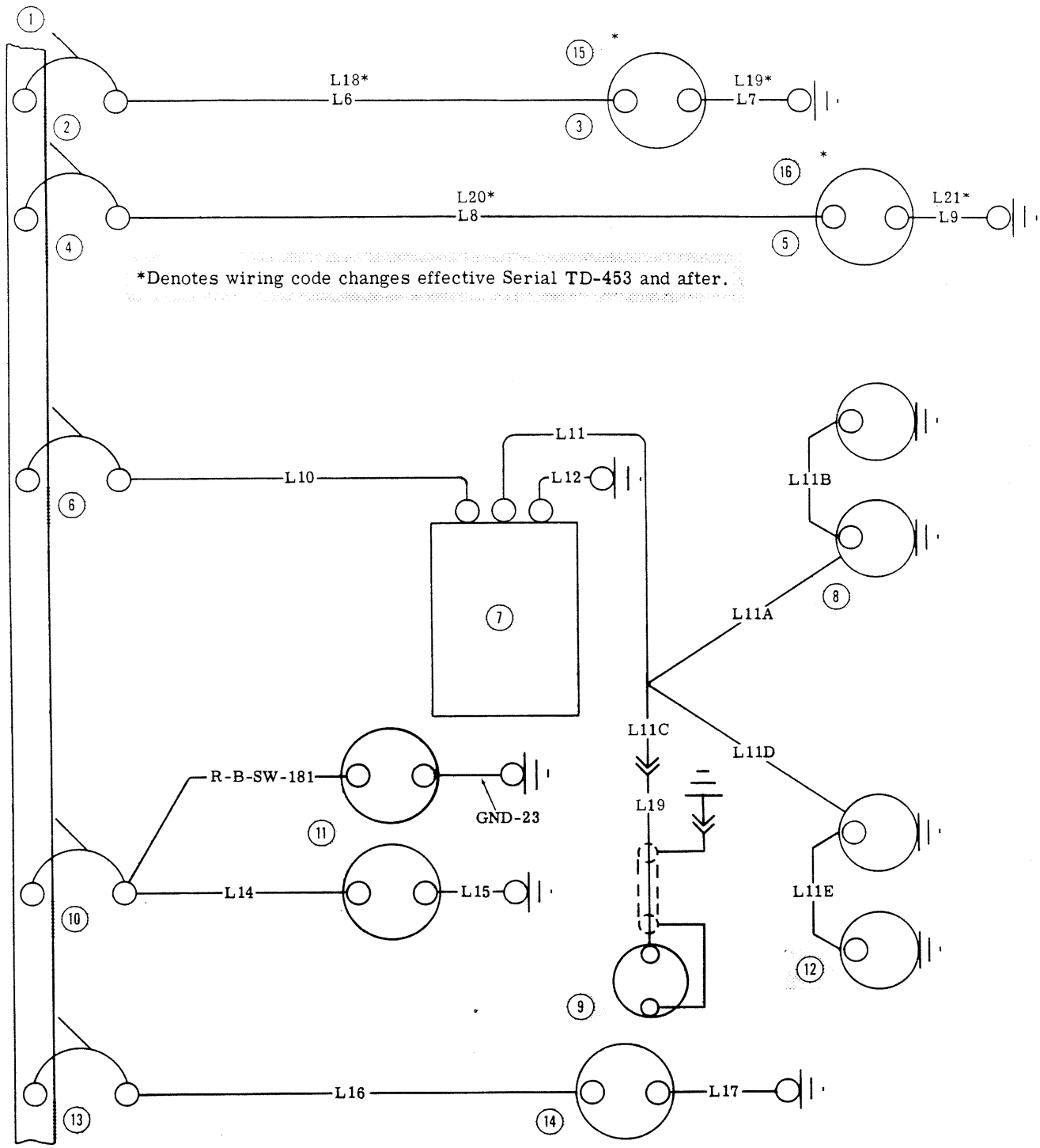
1. Main Bus Bar
2. Starter Switch (RH Engine)
3. Starter Switch (LH Engine)
4. External Power Receptacle (Optional)
5. Starter (RH Engine)
6. Starter Relays
7. Radio Bus Bar
8. Battery Master Relay
9. Starter (LH Engine)
10. Key Switch Assembly
11. Batteries

BATTERY AND STARTER CIRCUIT
TD-186 thru TD-452 except TD-444



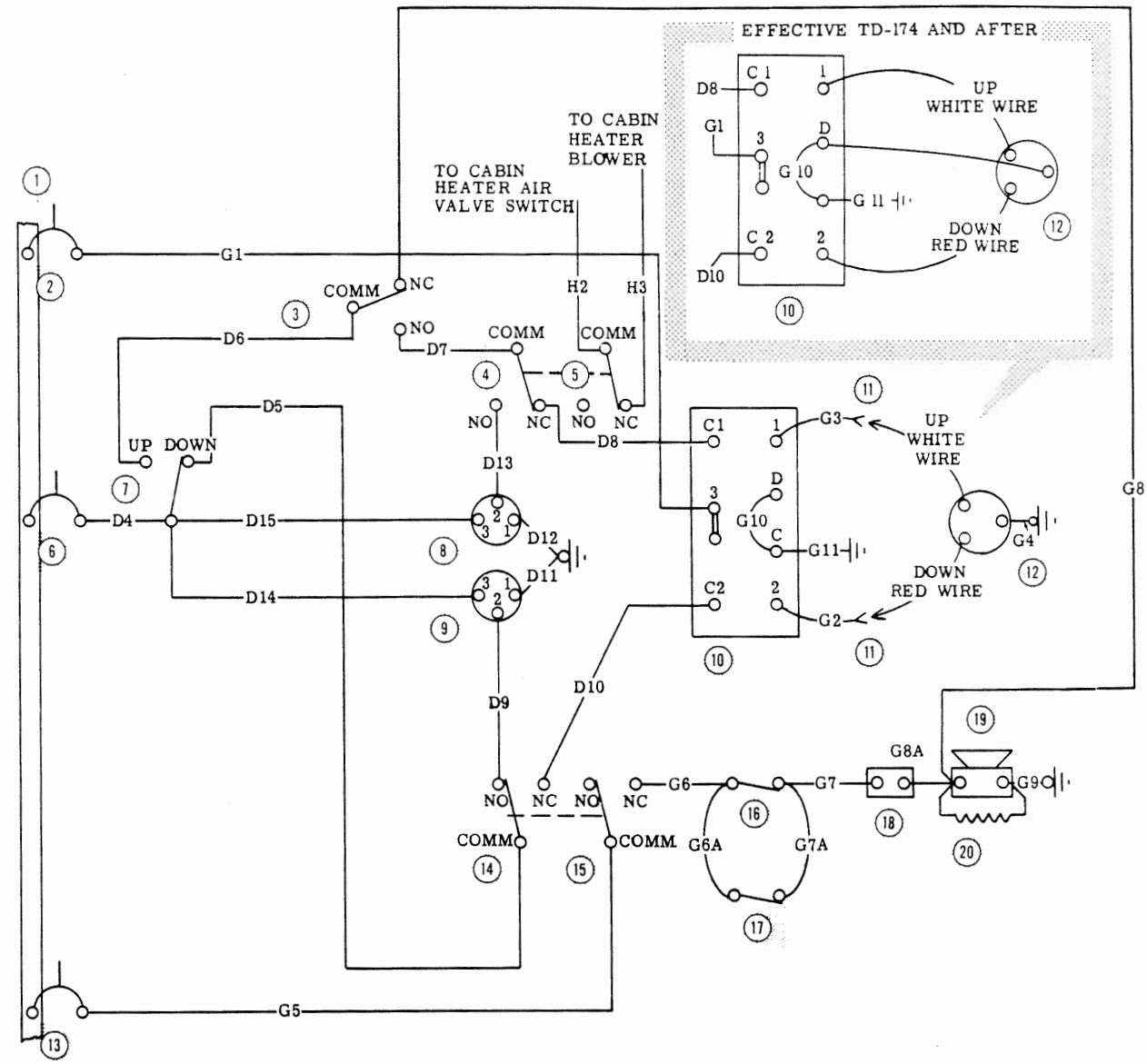
1. Bus Bar
2. Starter Vibrator
3. L. H. Starter - Magneto Switch
4. Left Engine L. H. Magneto
5. Left Engine R. H. Magneto
6. R. H. Starter - Magneto Switch
7. Right Engine L. H. Magneto
8. Right Engine R. H. Magneto
9. External Power Receptacle
10. Battery Master Relay
11. Batteries
12. Battery Master Switch
13. L. H. Starter
14. L. H. Starter Relay
15. R. H. Starter Relay
16. R. H. Starter

IGNITION, BATTERY & STARTER CIRCUITS
TD-127, TD-444, TD-453 thru TD-533



1. Main Bus Bar
2. Circuit Breaker (Switch Type, 15 Amp)
3. Landing Light (RH)
4. Circuit Breaker (Switch Type, 15 Amp)
5. Landing Light (LH)
6. Circuit Breaker (Switch Type, 5 Amp)
7. Flasher
8. Navigation Lights (RH)
9. Tail Light
10. Circuit Breaker (Switch Type, 5 Amp)
11. Rotating Beacon Light
12. Navigation Lights (LH)
13. Circuit Breaker (Switch Type, 5 Amp)
14. Taxi Light (Optional)
15. Landing Light (Nose)
16. Taxi Light (Gear)

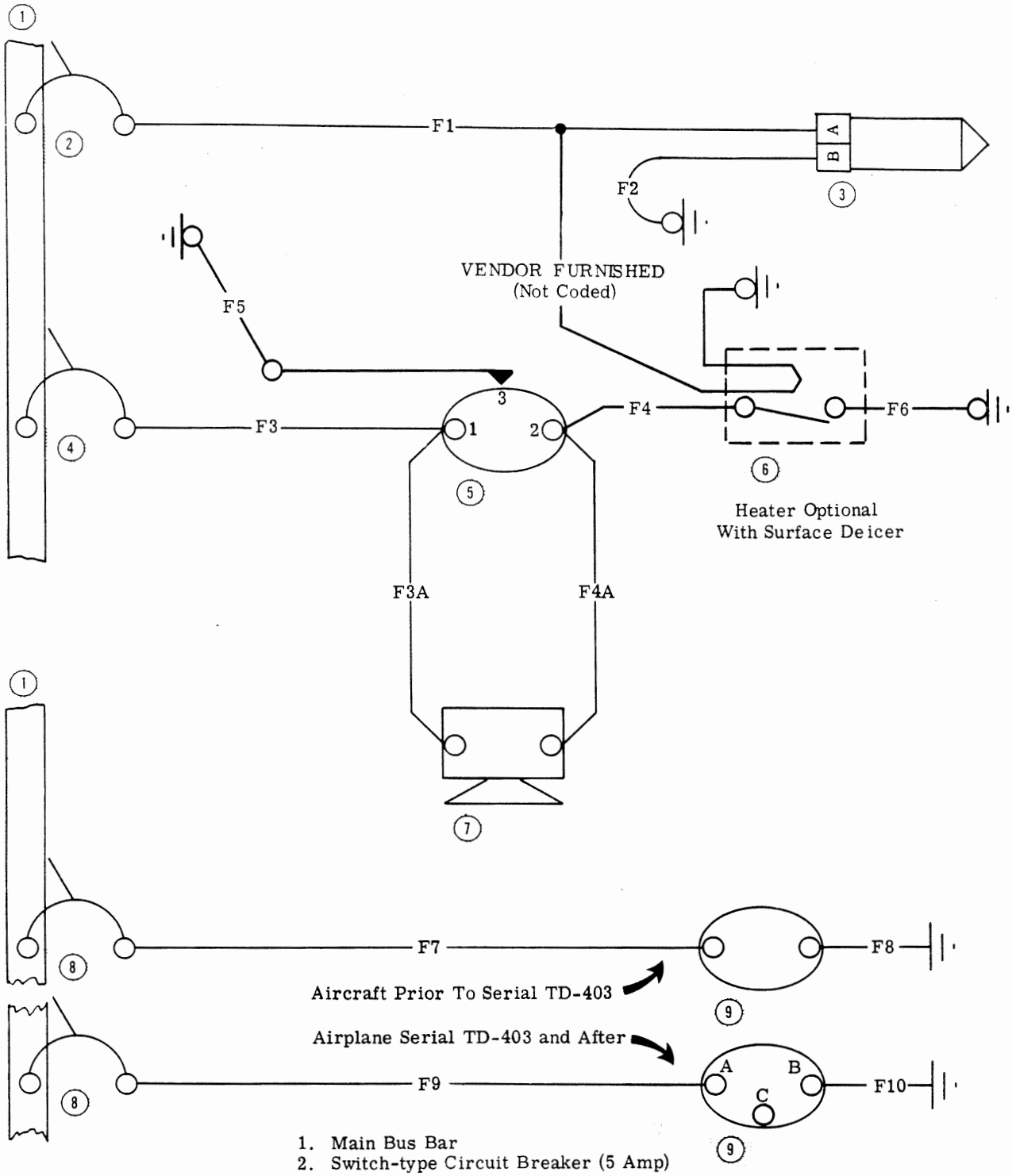
EXTERIOR LIGHTING CIRCUIT
TD-1 thru TD-533



1. Main Bus Bar
2. Circuit Breaker (30 amp)
3. Safety Switch
4. Up Limit and Up Indicator Switch
5. Heater Blower Switch
6. Circuit Breaker (5 amp)
7. Landing Gear Position Switch
8. Up and Locked Indicator
9. Down and Locked Indicator
10. Dynamic Braking Relay
11. Connectors
12. Landing Gear Motor
13. Circuit Breaker (5 amp)
14. Down Limit and Down Indicator Switch
15. Warning Horn Switch
16. Throttle Warning Horn Switch (RH Engine)
17. Throttle Warning Horn Switch (LH Engine)
18. Flasher
19. Warning Horn
20. Resistor

LANDING GEAR AND WARNING HORN CIRCUIT
TD-1 thru TD-533

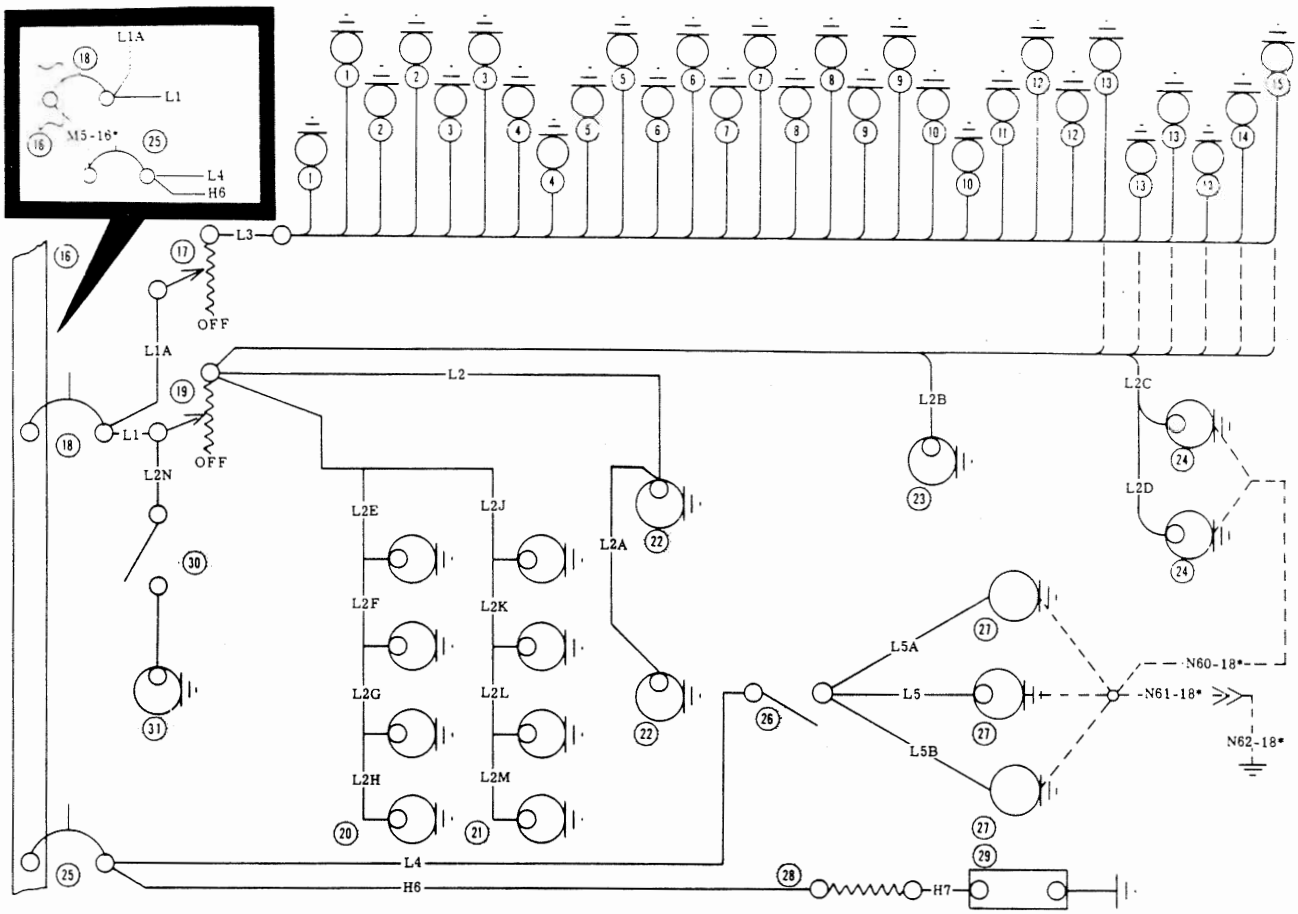
This page supersedes page 6-12. Remove and replace page 6-12 with this page.



1. Main Bus Bar
2. Switch-type Circuit Breaker (5 Amp)
3. Pitot Heating Element
4. Circuit Breaker (5 Amp)
5. Stall Warning Light
6. Stall Warning Detector Switch And Heater
7. Stall Warning Horn
8. Circuit Breaker (5 Amp)
9. Turn And Bank Indicator

TURN AND BANK, STALL WARNING, AND PITOT HEAT CIRCUIT
TD-1 thru TD-533

Issued: March, 1969

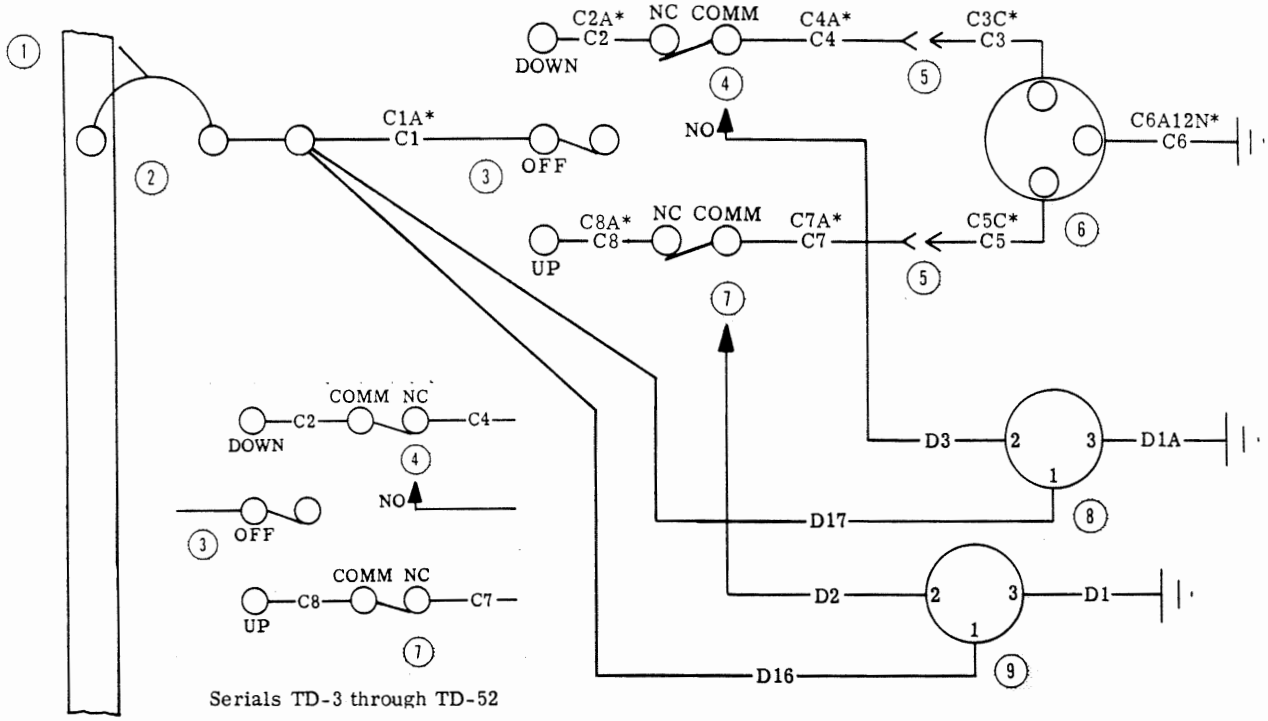


*Denotes wiring changes on airplanes TD-453 thru TD-533. On airplanes prior to TD-453, Items 24 and 27 are individually grounded.

1. Air Speed Indicator Lights
2. Altimeter Lights
3. Turn and Bank Indicator Lights
4. Rate of Climb Indicator Lights
5. Manifold Pressure Gage Lights
6. Tachometer Lights (RH Engine)
7. Tachometer Lights (LH Engine)
8. Gyro Horizon Lights
9. Directional Gyro Lights
10. Clock Lights
11. Suction Gage Light
12. Radio Lights
13. Engine Gage Cluster Lights
14. Compass Light
15. Fuel Selector Placard Light
16. Main Bus Bar
17. Light Control Rheostat
18. Circuit Breaker (5 Amp)
19. Light Control Rheostat
20. Ignition Panel Lights
21. Circuit Breaker and Switch Panel Lights (RH)
22. Tab Position Indicator Lights
23. Landing Gear Visual Indicator Light
24. Instrument Light
25. Circuit Breaker (10 Amp prior to TD-453) (3 Amp TD-453 thru TD-533)
26. On-Off Switch
27. Cabin Lights
28. Resistor (2 Ohm, 50 Watt)
29. Cigarette Lighter
30. On-Off Switch
31. Map Light

INSTRUMENT LIGHTS AND CIGARETTE LIGHTER CIRCUIT
TD-1 thru TD-533

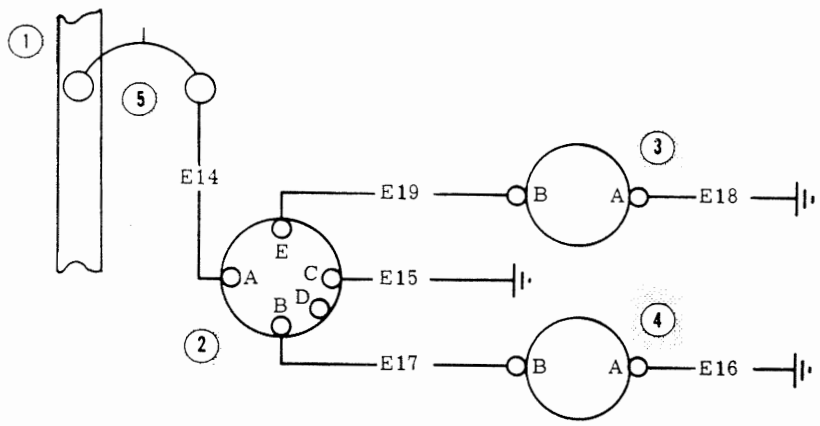
*Denotes wiring code changes effective Serial TD-303, TD-328 and after.



Serials TD-3 through TD-52

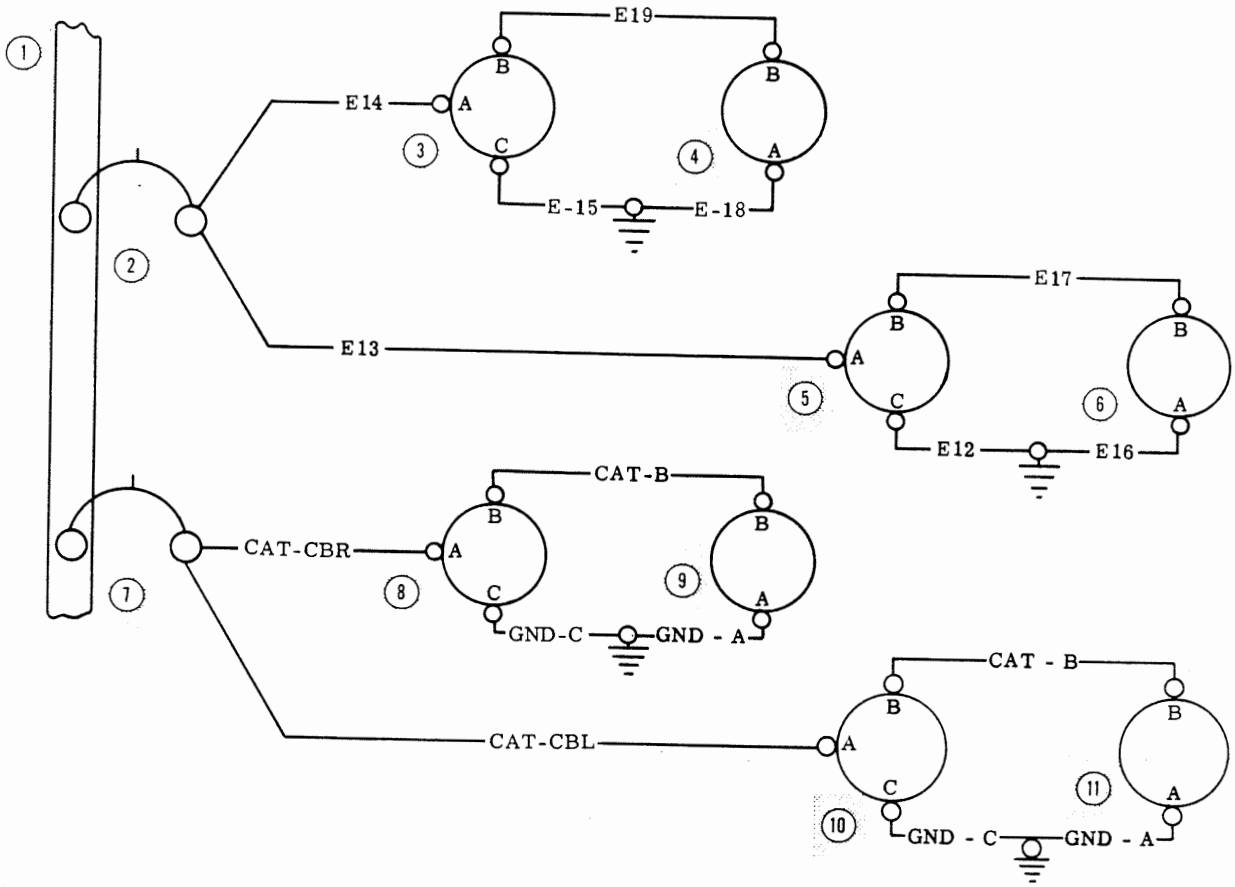
1. Main bus bar
2. Circuit breaker (5 Amp prior to TD-303) and (15 Amp, TD-303 and after)
3. Flap position switch
4. Down limit switch
5. Connectors
6. Flap motor
7. Up limit switch
8. Flaps down indicator
9. Flaps up indicator

FLAP CONTROL AND POSITION INDICATOR CIRCUIT
TD-1 thru TD-533



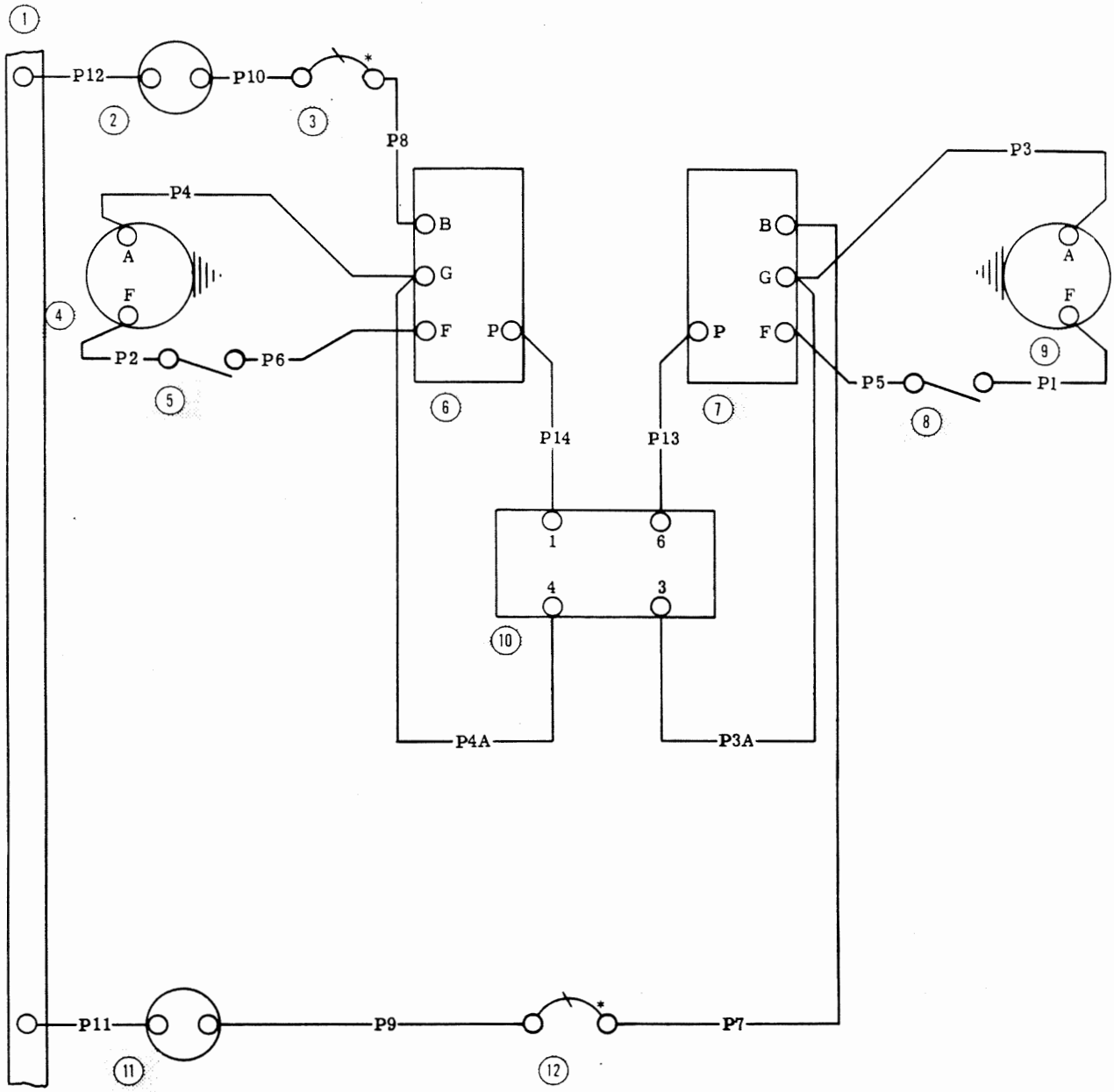
1. Main bus bar
2. Engine gage unit
3. Right engine oil temperature bulb
4. Left engine oil temperature bulb
5. Circuit breaker (5 Amp)

OIL TEMPERATURE CIRCUIT
TD-127, TD-444, TD-453 thru TD-533



1. Main bus bar
2. Circuit breaker (5 amp)
3. Right engine oil temperature gage
4. Right engine oil temperature bulb
5. Left engine oil temperature gage
6. Left engine oil temperature bulb
7. Circuit breaker
8. Right engine carburetor air temperature gage
9. Right engine carburetor air temperature bulb
10. Left engine carburetor air temperature gage
11. Left engine carburetor air temperature bulb

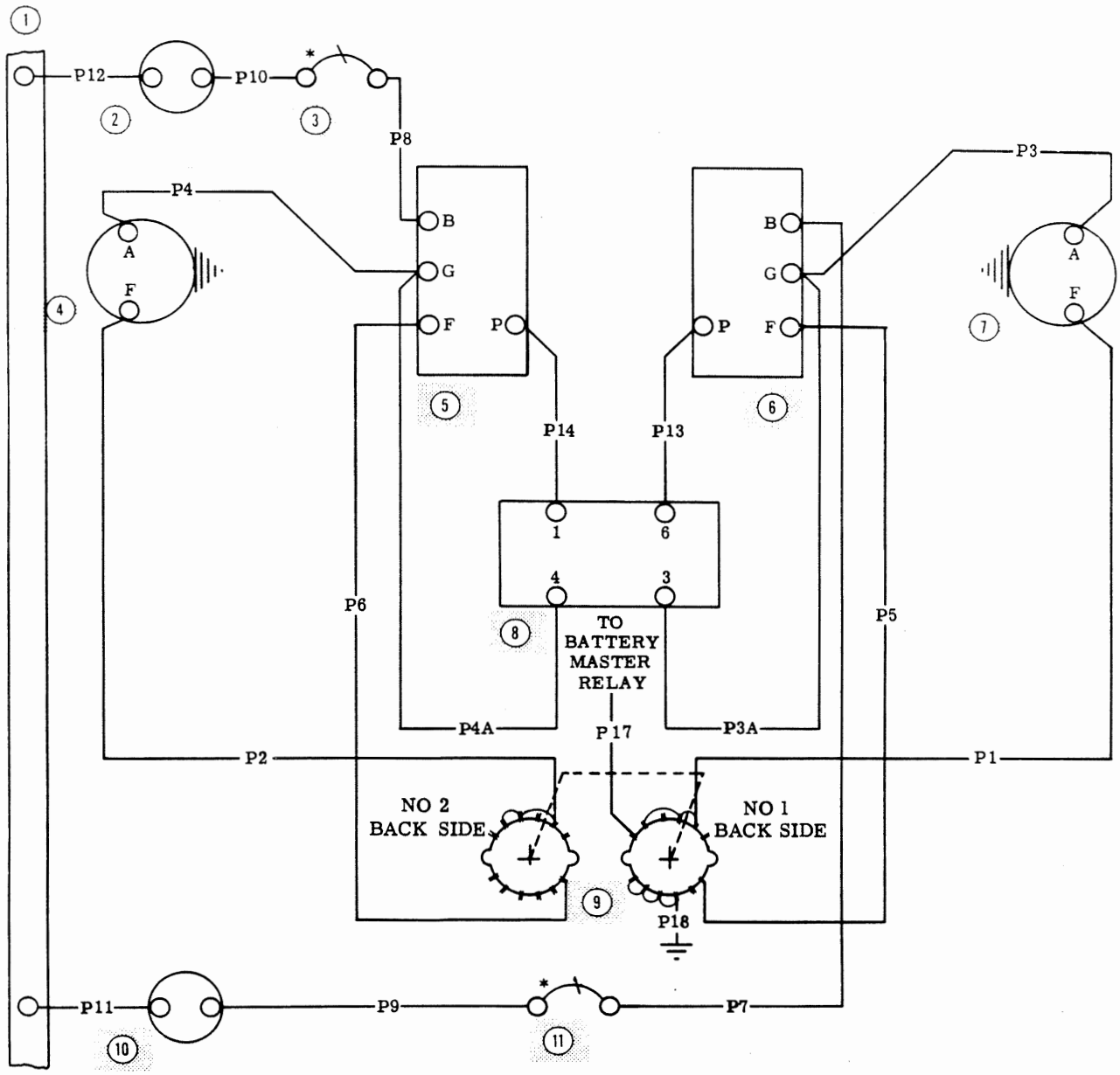
OIL TEMPERATURE AND CARBURETOR AIR TEMPERATURE CIRCUIT
TD-1 thru TD-452, except TD-127 and TD-444



*50 Amp Circuit Breakers for Optional 40 Amp Generators

1. Main Bus Bar
2. Ammeter, RH Generator
3. Circuit Breaker (30 Amp)
4. RH Generator
5. On-Off Switch
6. RH Voltage Regulator
7. LH Voltage Regulator
8. On-Off Switch
9. LH Generator
10. Paralleling Relay
11. Ammeter, LH Generator
12. Circuit Breaker (30 Amp)

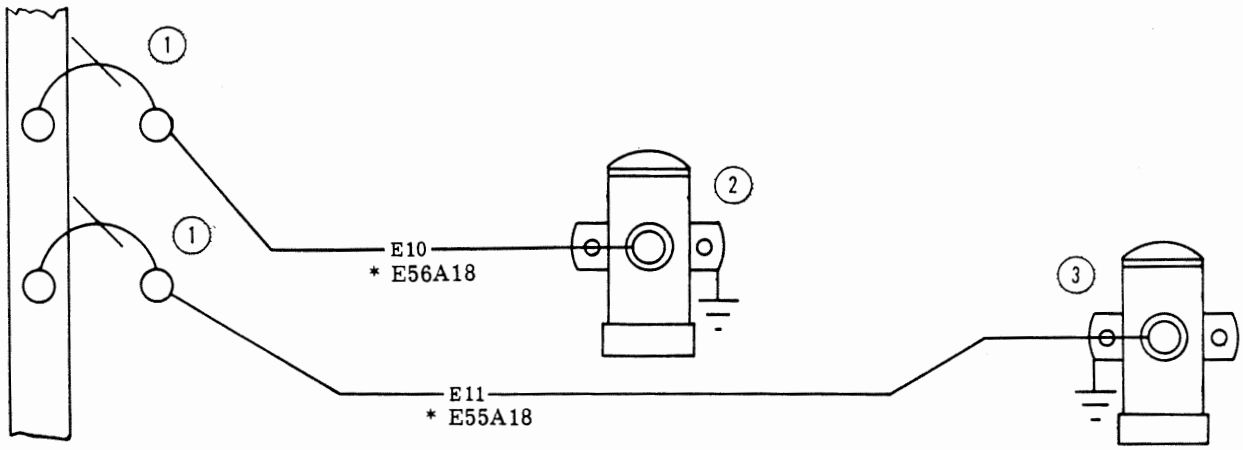
GENERATOR CIRCUIT
TD-1 thru TD-173
TD-185, TD-303 thru TD-533



* 50 Amp Circuit Breakers For Optional 40 Amp Generators

1. Main Bus Bar
2. Ammeter, RH Generator
3. Circuit Breaker (30 Amp)
4. RH Generator
5. RH Voltage Regulator
6. LH Voltage Regulator
7. LH Generator
8. Paralleling Relay
9. Key Switch Assembly
10. Ammeter, LH Generator
11. Circuit Breaker (30 Amp)

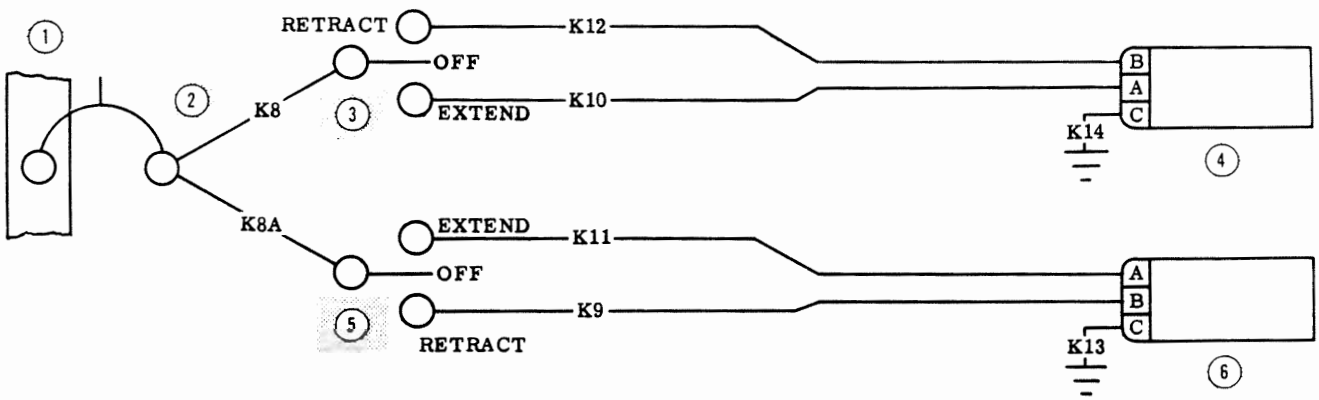
GENERATOR CIRCUIT
TD-174 thru TD-302, except TD-185



*EFFECTIVE TD-501, TD-517 THRU TD-533

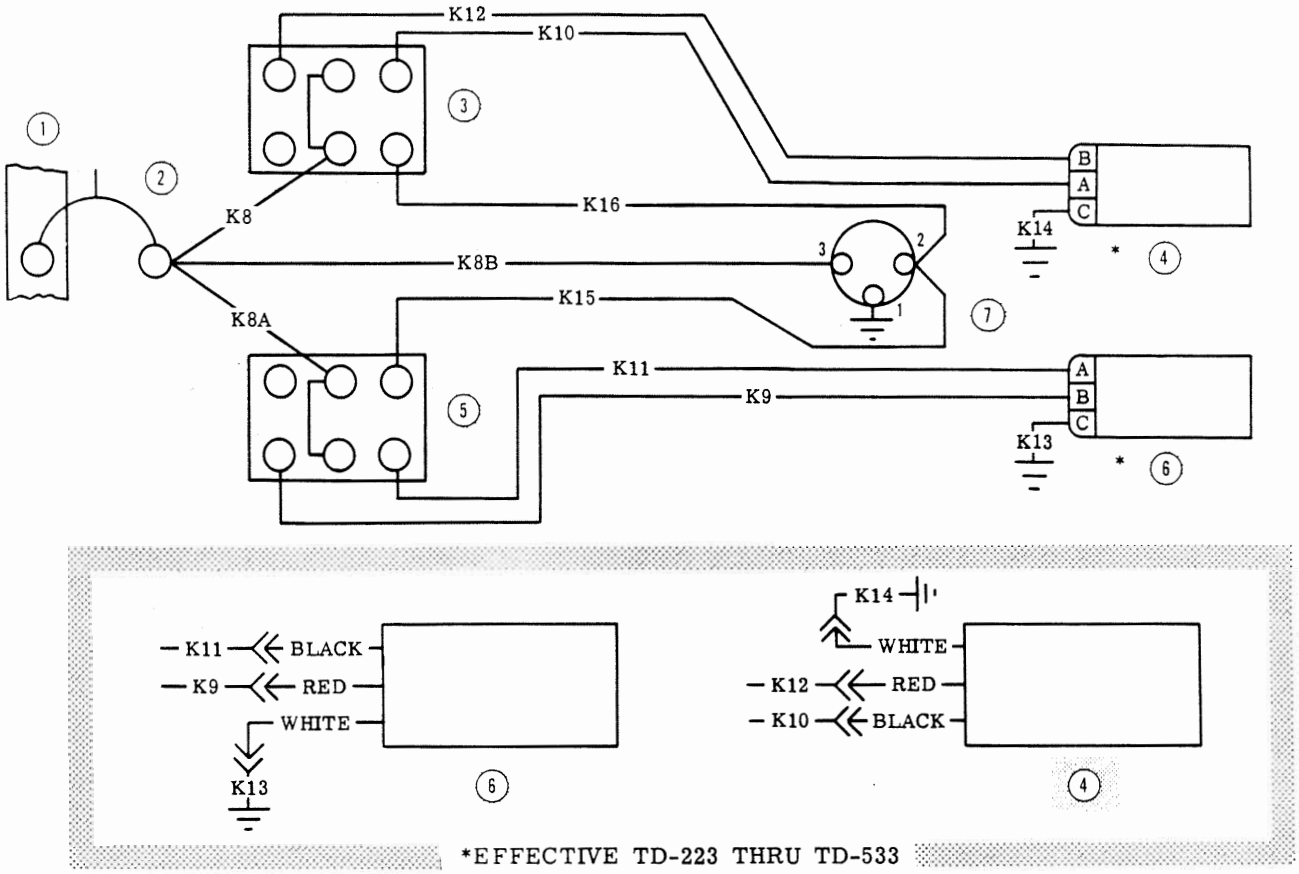
1. Circuit Breaker (5 Amp)
2. Right Hand Fuel Boost Pump
3. Left Hand Fuel Boost Pump

FUEL BOOST PUMP CIRCUIT
TD-1 thru TD-533



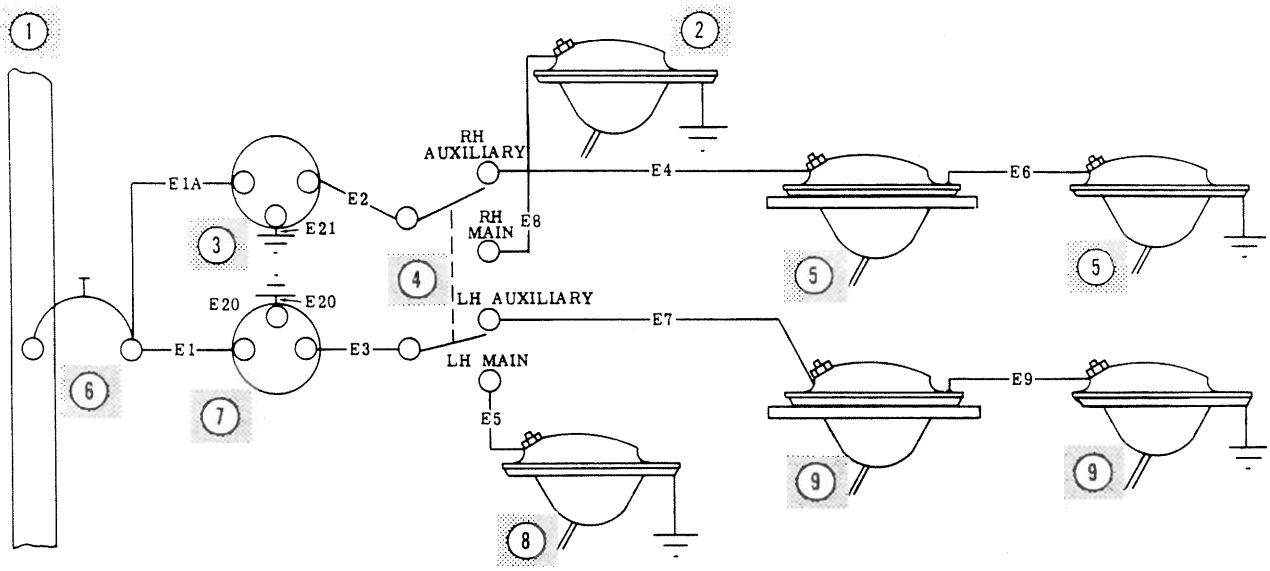
1. Main Bus Bar
2. Circuit Breaker (5 Amp)
3. Right Hand Cowl Flap Switch
4. Right Hand Cowl Flap Motor
5. Left Hand Cowl Flap Switch
6. Left Hand Cowl Flap Motor

COWL FLAPS CIRCUIT
TD-1 thru TD-173 and TD-185



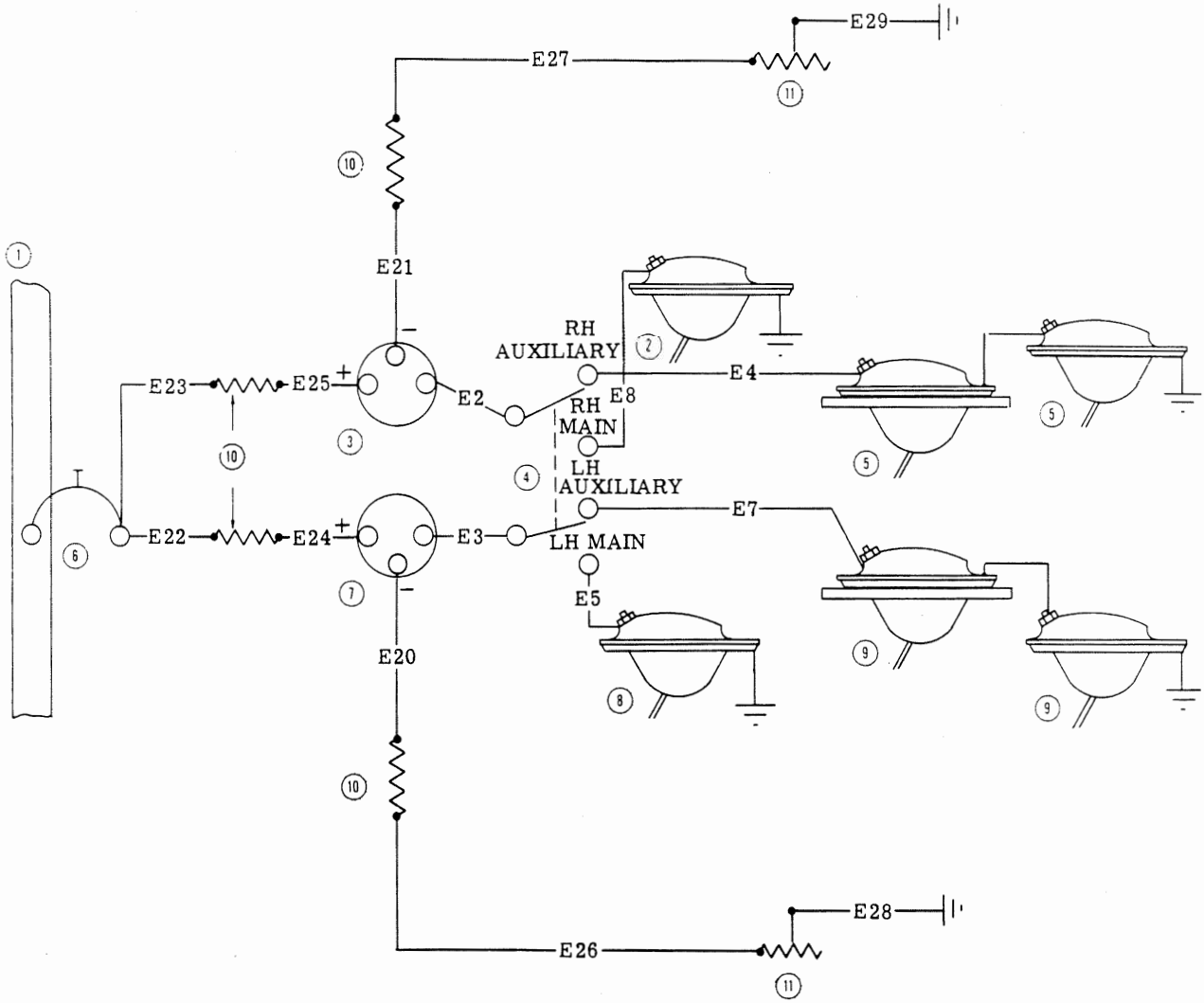
1. Main Bus Bar
2. Circuit Breaker (5 Amp)
3. Right Hand Cowl Flap Switch
4. Right Hand Cowl Flap Motor
5. Left Hand Cowl Flap Switch
6. Left Hand Cowl Flap Motor
7. Cowl Flap Position Indicator Lights

COWL FLAPS CIRCUIT
TD-174 thru TD-533 except TD-185



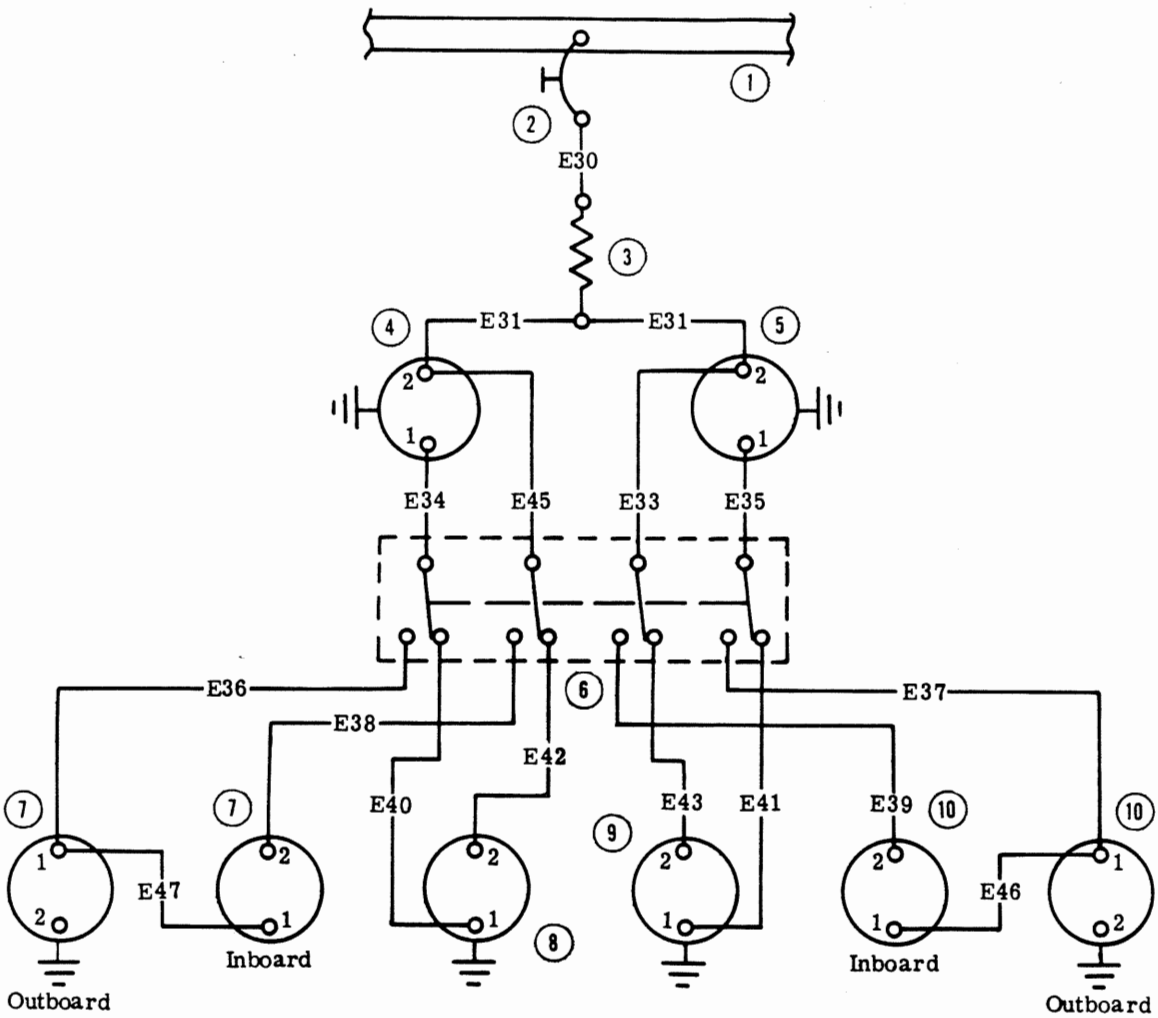
1. Main Bus Bar
2. Right Main Fuel Tank Transmitter
3. Fuel Quantity Indicator (RH Tanks)
4. Fuel Selector Switch
5. Right Auxiliary Fuel Tank Transmitter
6. Circuit Breaker (5 Amp)
7. Fuel Quantity Indicator (LH Tanks)
8. Left Main Fuel Tank Transmitter
9. Left Auxiliary Fuel Tank Transmitter

FUEL QUANTITY INDICATOR CIRCUIT
TD-1 thru TD-142



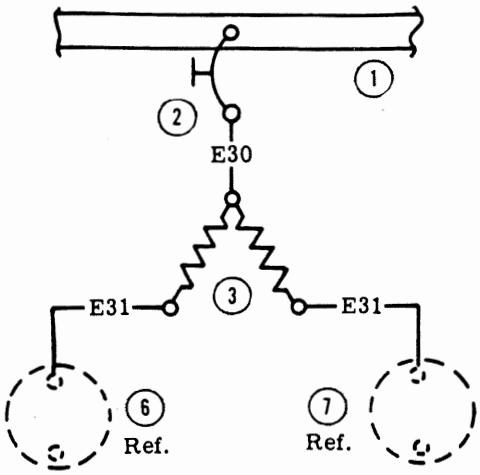
1. Main Bus Bar
2. Right Main Fuel Tank Transmitter
3. Fuel Quantity Indicator (RH Tanks)
4. Fuel Selector Switch
5. Right Auxiliary Fuel Tank Transmitters
6. Circuit Breaker (5 Amp)
7. Fuel Quantity Indicator (LH Tanks)
8. Left Main Fuel Tank Transmitter
9. Left Auxiliary Fuel Tank Transmitters
10. 800 Ohm Resistors
11. Potentiometer

FUEL QUANTITY INDICATOR CIRCUIT
TD-143 thru TD-402

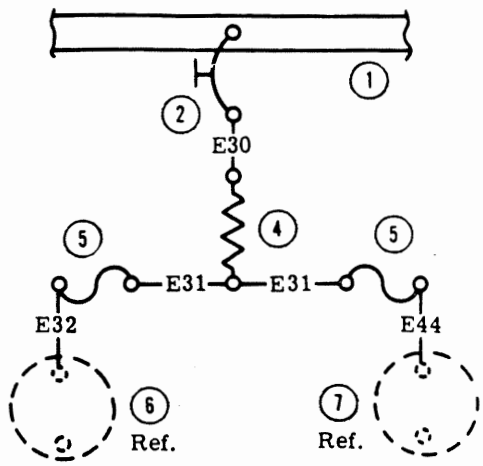


1. Main Bus Bar
2. Circuit Breaker (5 Amp)
3. Resistor (25 ohm 10 watt)
4. Fuel Gage (LH)
5. Fuel Gage (RH)
6. Fuel Selector Switch
7. Auxiliary Tank Transmitters (LH)
8. Main Tank Transmitter (LH)
9. Main Tank Transmitter (RH)
10. Auxiliary Tank Transmitters (RH)

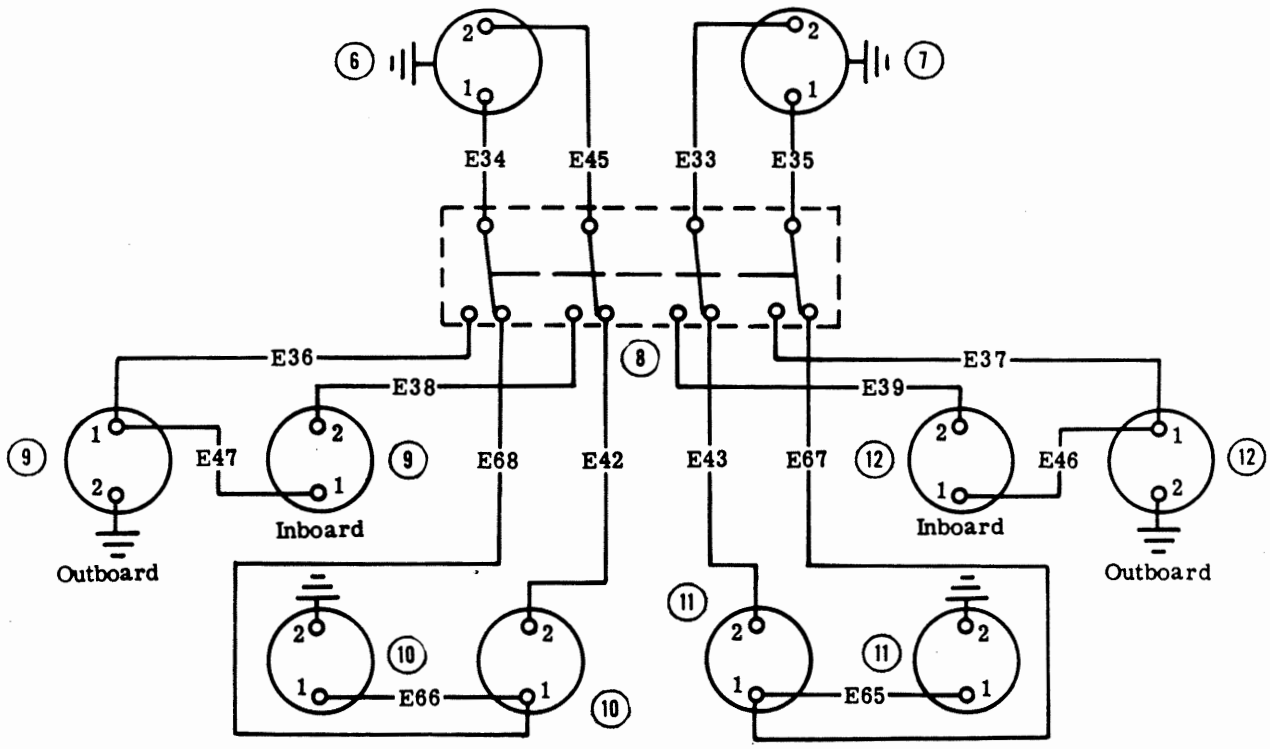
FUEL QUANTITY INDICATOR CIRCUIT
TD-403 thru TD-452



TD-460 thru TD-471
and TD-475 thru TD-524

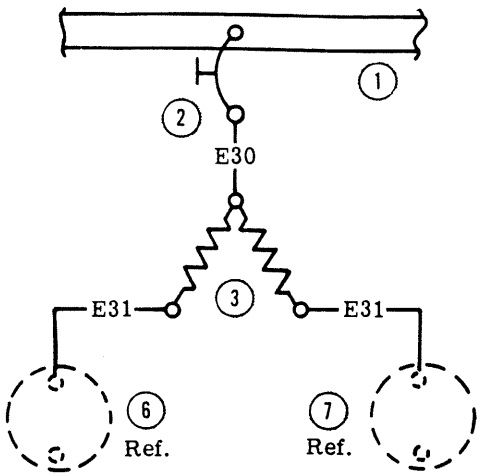


TD-453 thru TD-459
and TD-472 thru TD-474

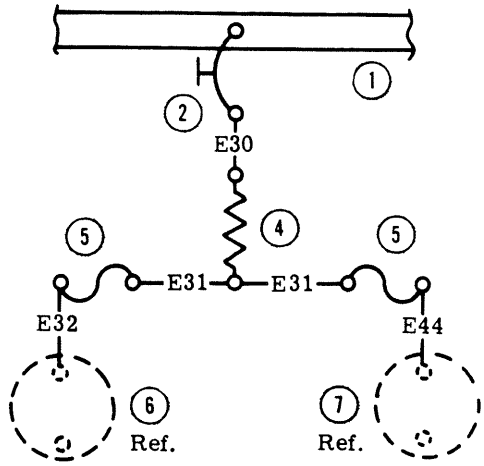


1. Main Bus Bar
2. Circuit Breaker (5 Amp)
3. Resistor (50 ohm 25 watt)
4. Resistor (25 ohm 10 watt)
5. Fuse (1/2 Amp)
6. Fuel Gage (LH)
7. Fuel Gage (RH)
8. Fuel Selector Switch
9. Tank Transmitters (LH)
10. Main Tank Transmitters (RH)
11. Main Tank Transmitters (RH)
12. Auxiliary Tank Transmitters (RH)

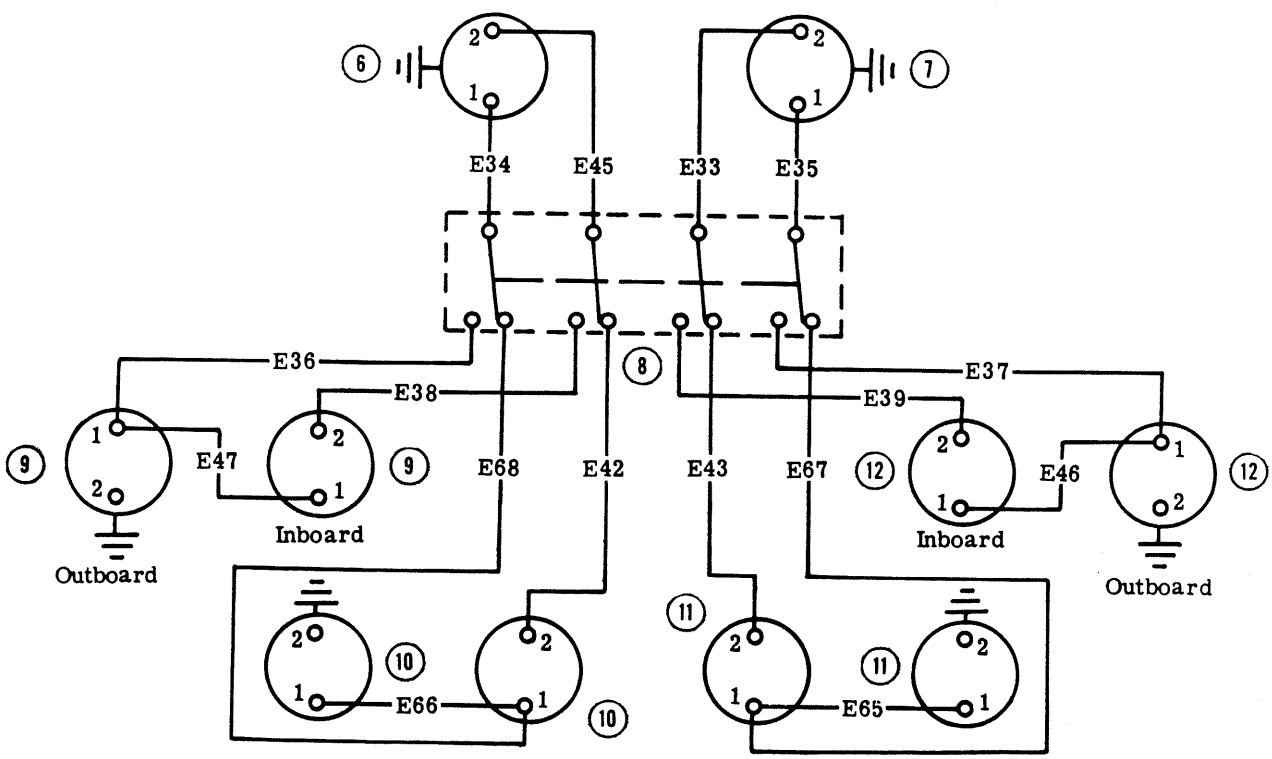
FUEL QUANTITY INDICATOR CIRCUIT, STANDARD 39 GALLON MAIN CELLS
TD-453 thru TD-524



TD-460 thru TD-471
and TD-475 thru TD-524

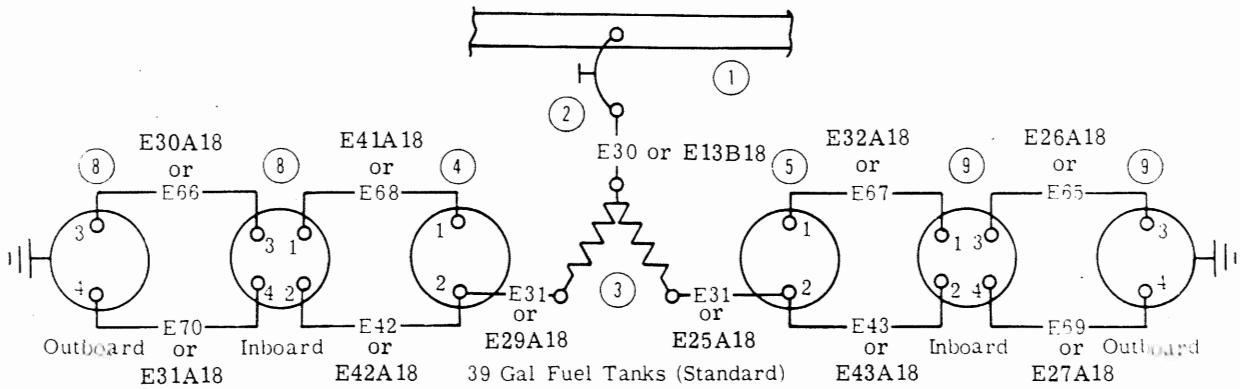


TD-453 thru TD-459
and TD-472 thru TD-474

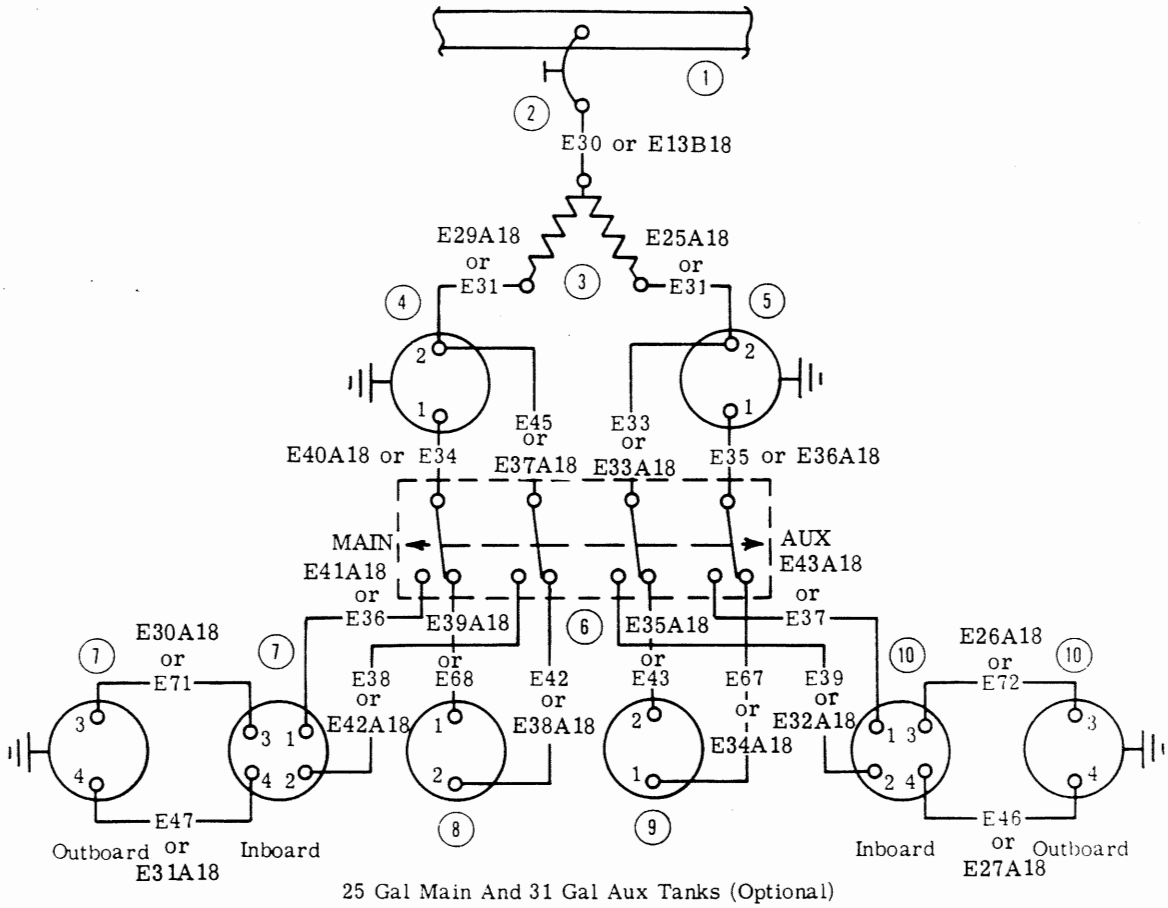


1. Main Bus Bar
2. Circuit Breaker (5 Amp)
3. Resistor (50 ohm 25 watt)
4. Resistor (25 ohm 10 watt)
5. Fuse (1/2 Amp)
6. Fuel Gage (LH)
7. Fuel Gage (RH)
8. Fuel Selector Switch
9. Tank Transmitters (LH)
10. Main Tank Transmitters (RH)
11. Main Tank Transmitters (RH)
12. Auxiliary Tank Transmitters (RH)

FUEL QUANTITY INDICATOR CIRCUIT, OPTIONAL 25 GALLON MAIN CELLS
TD-453 thru TD-524



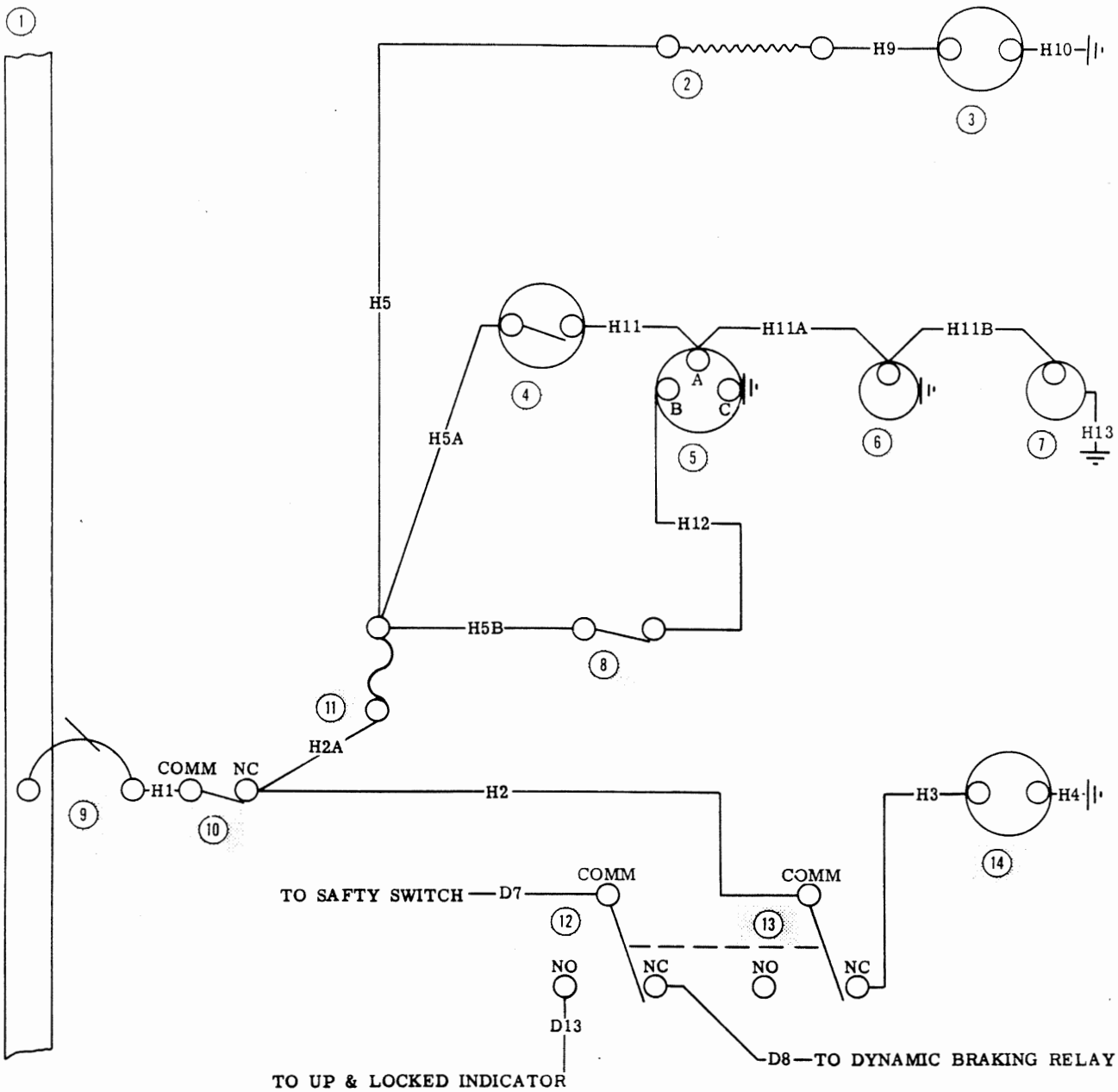
39 Gal Fuel Tanks (Standard)



25 Gal Main And 31 Gal Aux Tanks (Optional)

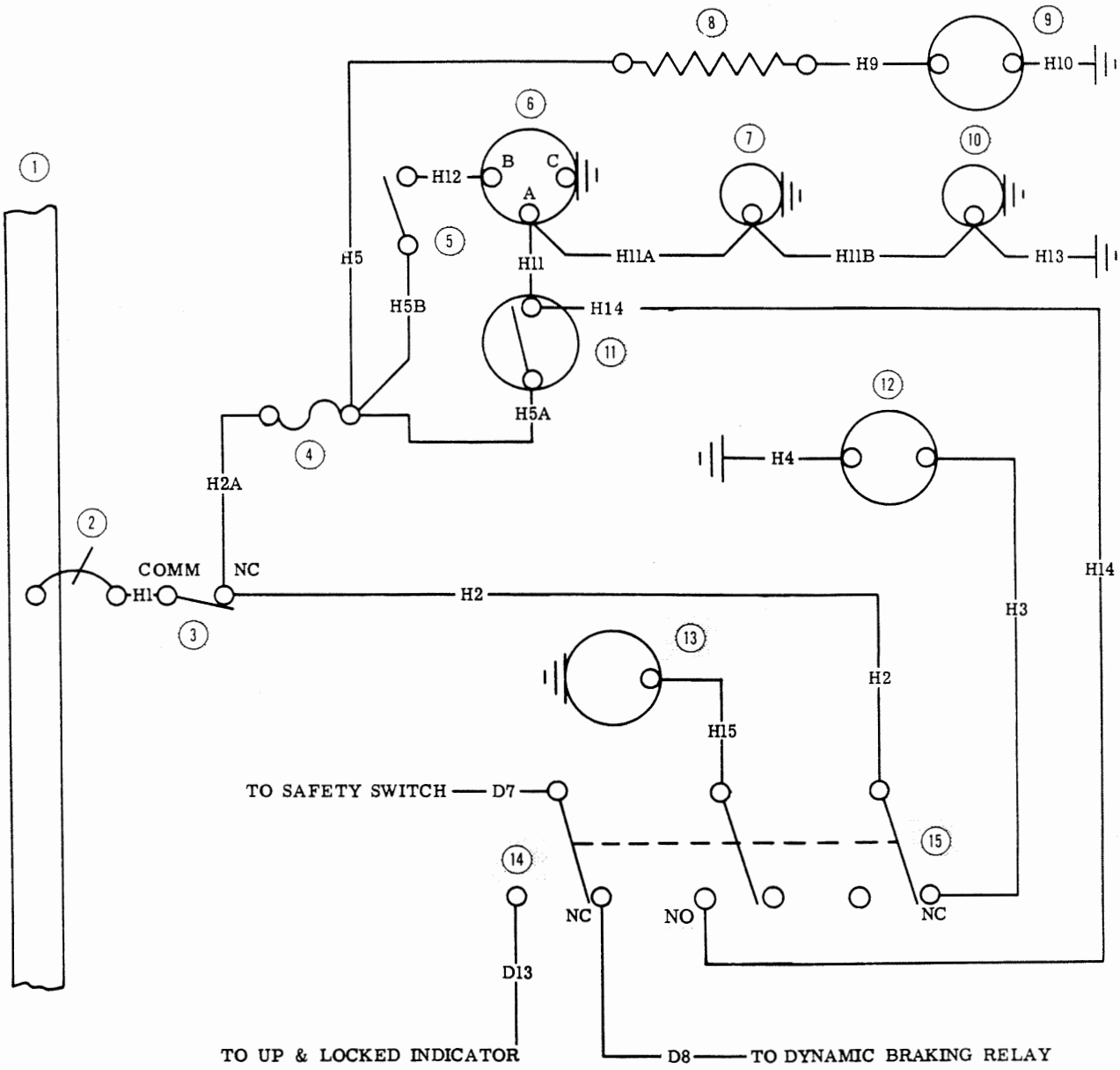
1. Main Bus Bar
2. Circuit Breaker (5 Amp)
3. Resistor (50 ohm 25 watt)
4. Fuel Gage (LH)
5. Fuel Gage (RH)
6. Fuel Selector Switch
7. Auxiliary Tank Transmitters (LH)
8. Main Tank Transmitters (LH)
9. Main Tank Transmitters (RH)
10. Auxiliary Tank Transmitters (RH)

FUEL QUANTITY INDICATOR CIRCUIT
TD-525 thru TD-533



1. Main Bus Bar
2. Resistor (3 Ohm 10 Watt)
3. 300°F High Temperature Control
4. Heater Ductstat
5. Heater Ignitor
6. Heater Fuel Pump
7. Solenoid Valve
8. Changeover Switch
9. Switch-Type Circuit Breaker (20 Amp)
10. Air Valve Switch
11. Fuse
12. Landing Gear Up Limit and Up Indicator Switch
13. Heater Blower Switch
14. Heater Blower

CABIN HEATER CIRCUIT
TD-1 thru TD-202 except TD-127

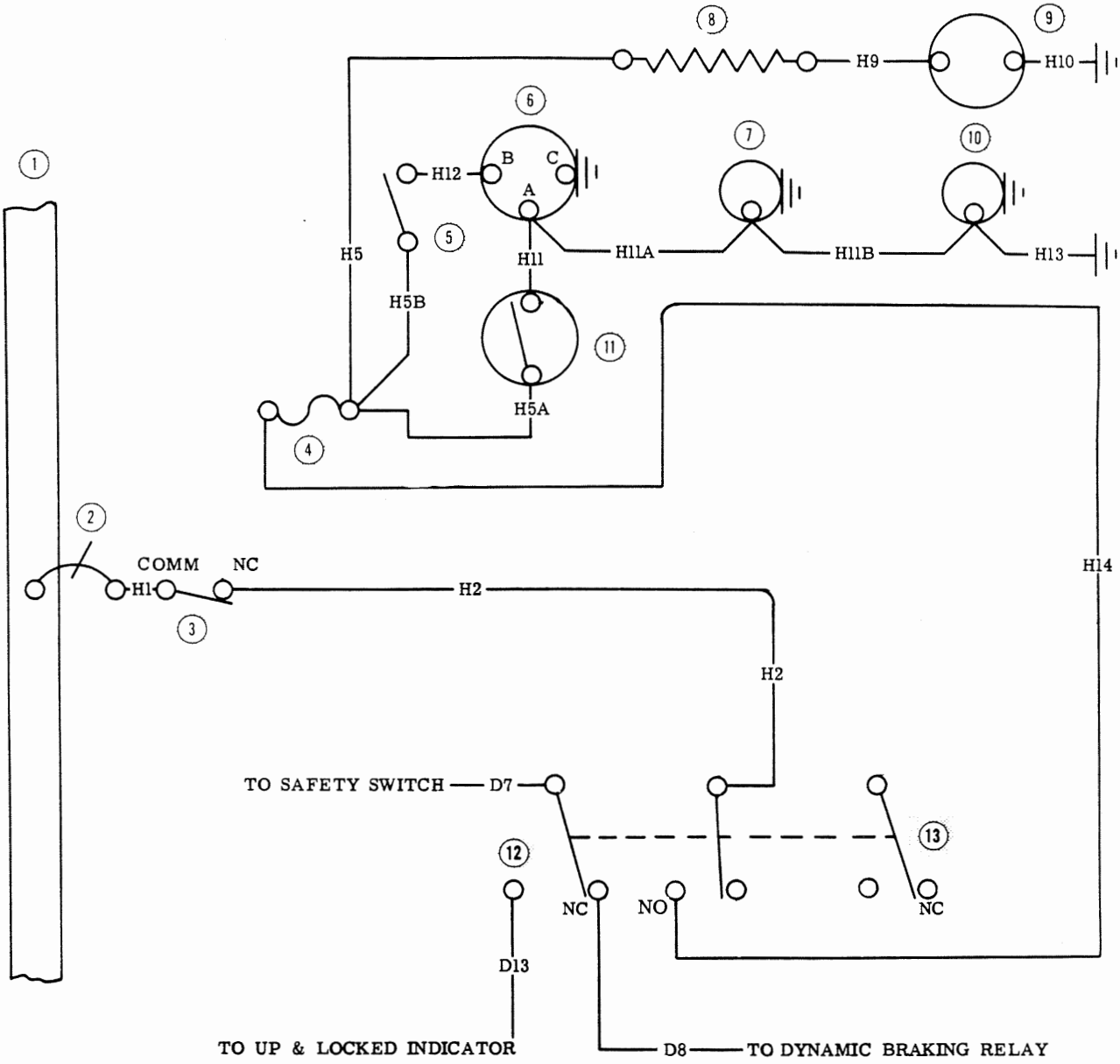


NOTE

This System is the Standard Installation on aircraft TD-127 and TD-203 thru TD-452, and is the Optional Installation on Airplanes Serial TD-453 thru TD-533.

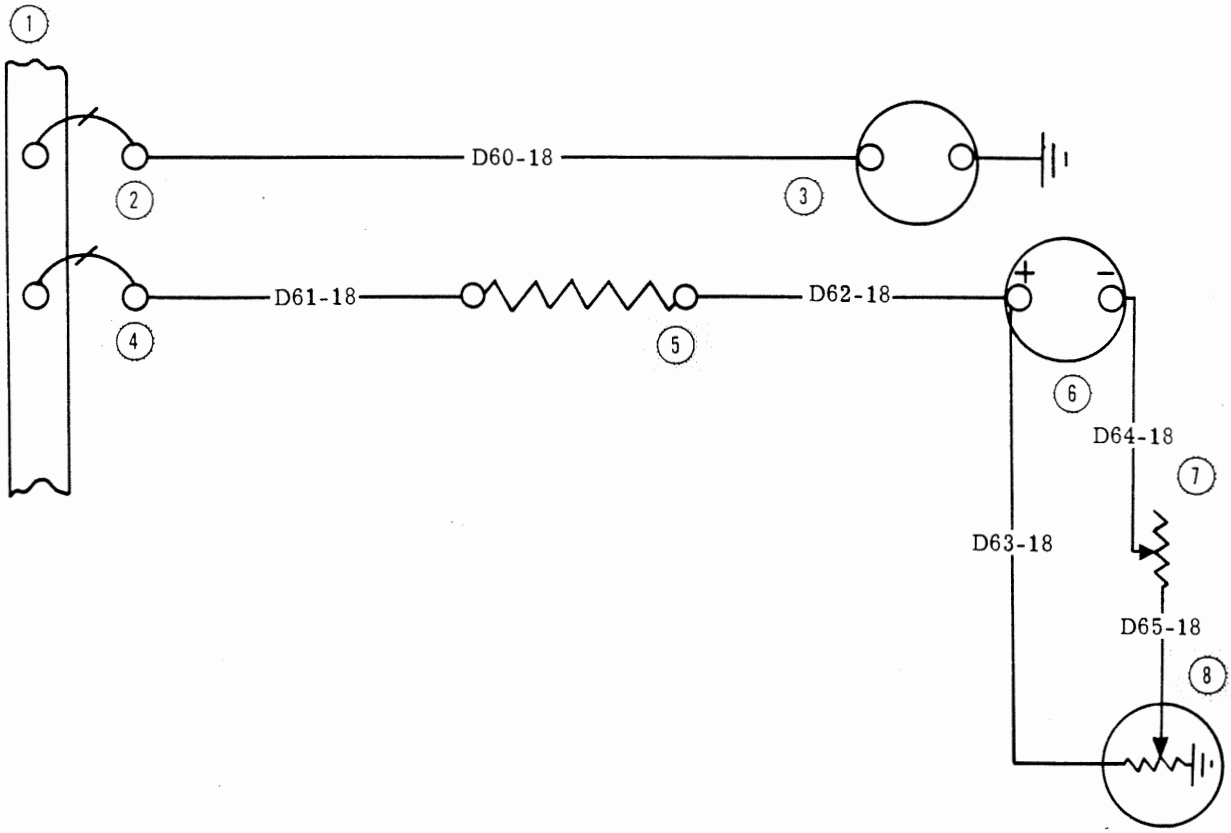
1. Main Bus Bar
2. Switch-type Circuit Breaker (20 Amp)
3. Air Valve Switch
4. Fuse
5. Changeover Switch
6. Heater Ignitor
7. Heater Fuel Pump
8. Resistor (3 Ohm 10 Watt)
9. 300° F High Temperature Control
10. Solenoid Valve
11. Heater Ductstat
12. Heater Blower
13. Heater Fuel Pump
14. Landing Gear Up Limit and Up Indicator Switch
15. Heater Blower Switch

CABIN HEATER CIRCUIT
Standard TD-127 and TD-203 thru TD-452
Optional TD-453 thru TD-533



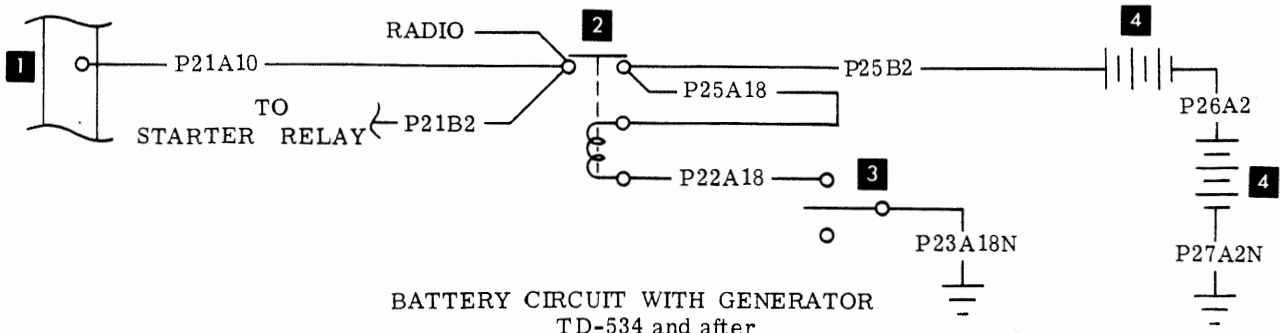
1. Main Bus Bar
2. Switch-type Circuit Breaker (20 Amp)
3. Air Valve Switch
4. Fuse
5. Changeover Switch
6. Heater Ignitor
7. Heater Fuel Pump
8. Resistor (3 Ohm 10 Watt)
9. 300° F High Temperature Control
10. Solenoid Valve
11. Heater Ductstat
12. Landing Gear Up Limit and Up Indicator Switch
13. Heater Switch

CABIN HEATER CIRCUIT
Standard TD-453 thru TD-533

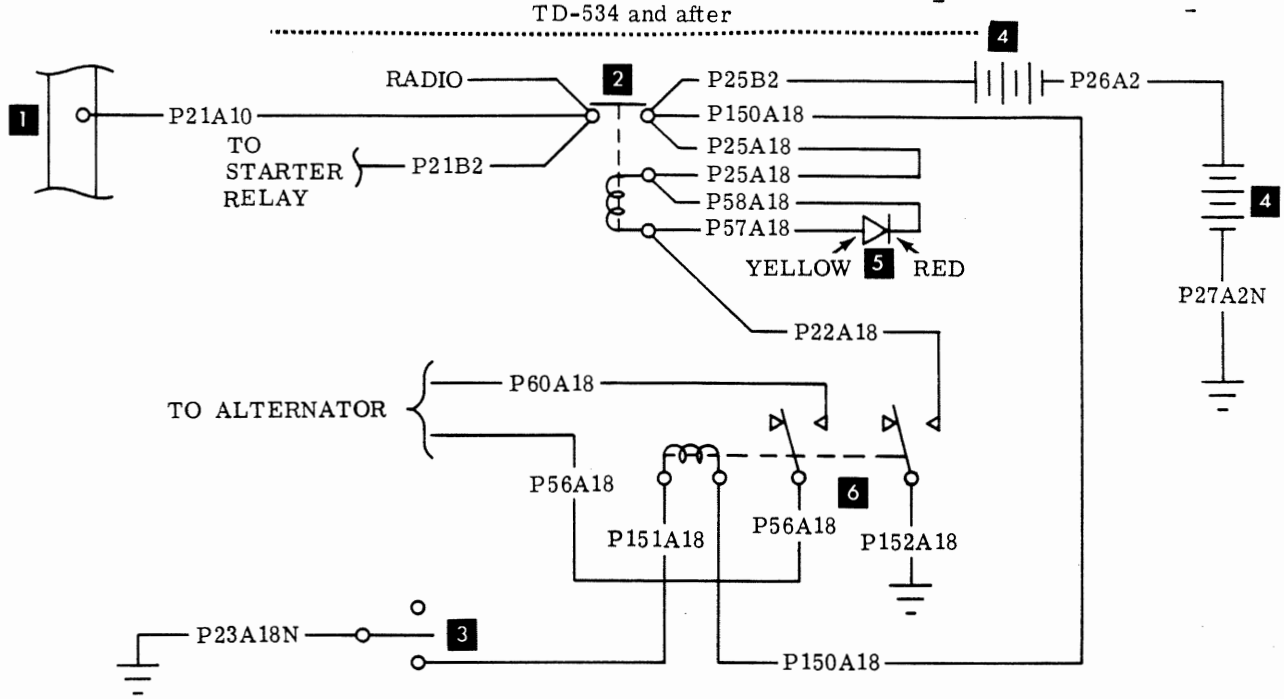


1. Bus Bar
2. Circuit Breaker (5 Amp)
3. Anti-icer Pump
4. Circuit Breaker (5 Amp)
5. Resistor (75 ohm - 10 watt)
6. Quantity Gage
7. Potentiometer
8. Transmitter

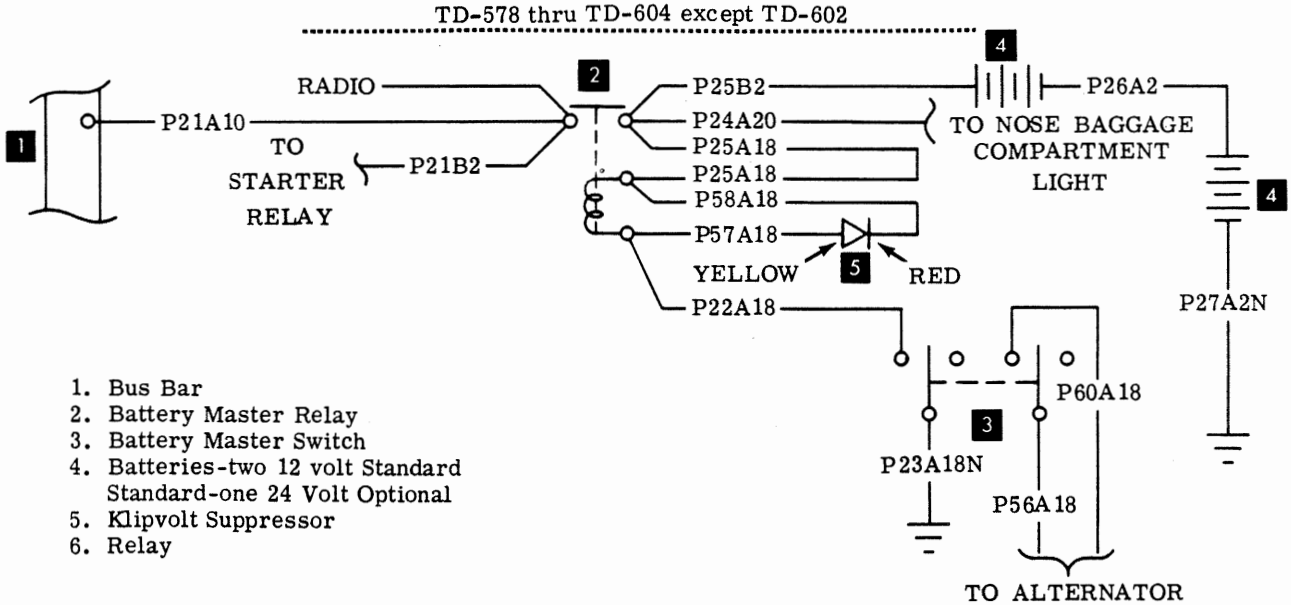
Propeller Anti-icer Circuit
TD-453 thru TD-533



BATTERY CIRCUIT WITH GENERATOR
TD-534 and after

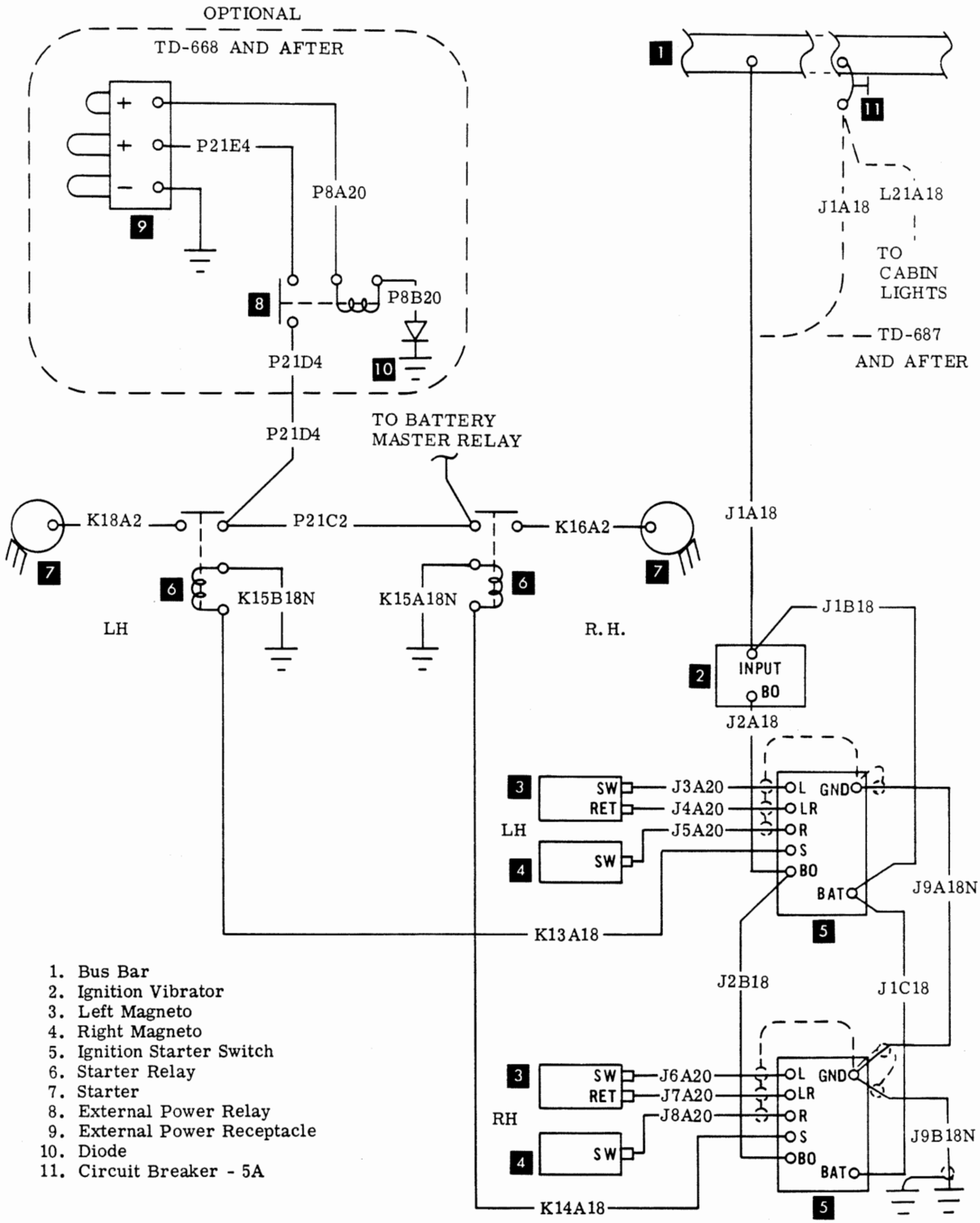


BATTERY CIRCUIT WITH OPTIONAL ALTERNATOR
TD-578 thru TD-604 except TD-602



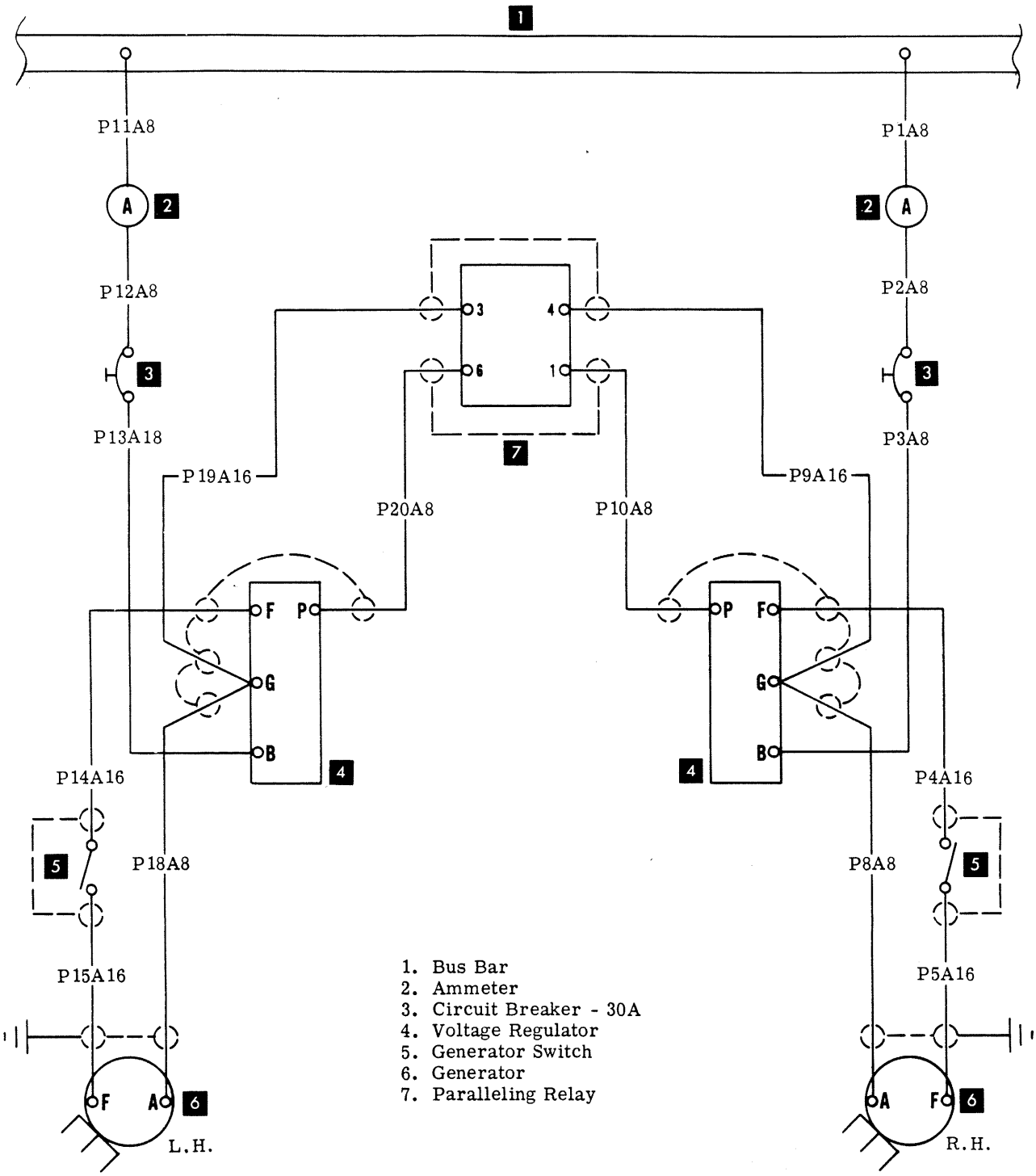
1. Bus Bar
2. Battery Master Relay
3. Battery Master Switch
4. Batteries-two 12 volt Standard
   Standard-one 24 Volt Optional
5. Klipvolt Suppressor
6. Relay

BATTERY CIRCUIT WITH OPTIONAL ALTERNATOR
TD-605 and after



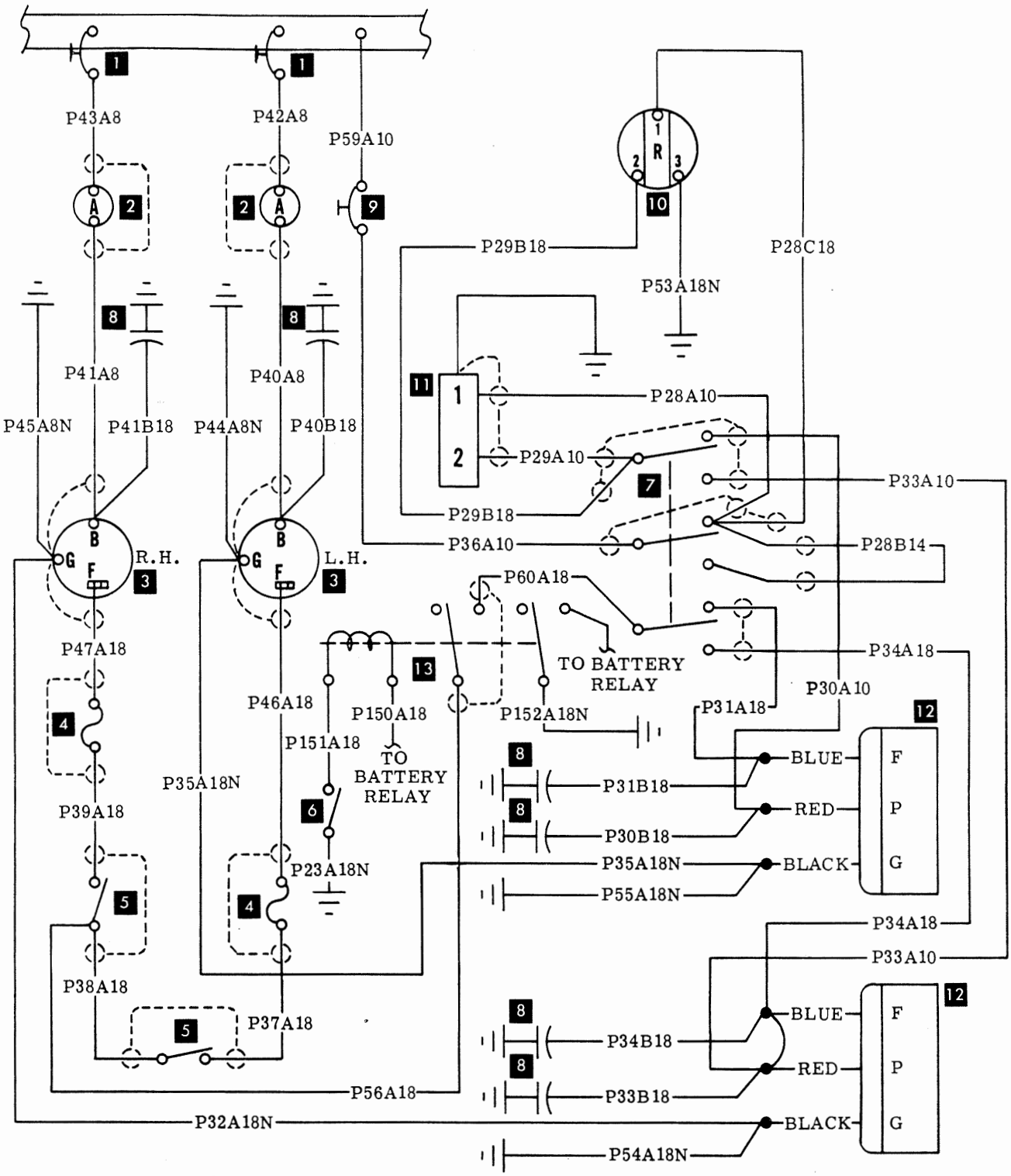
1. Bus Bar
2. Ignition Vibrator
3. Left Magneto
4. Right Magneto
5. Ignition Starter Switch
6. Starter Relay
7. Starter
8. External Power Relay
9. External Power Receptacle
10. Diode
11. Circuit Breaker - 5A

IGNITION AND STARTER CIRCUIT
TD-534 and after



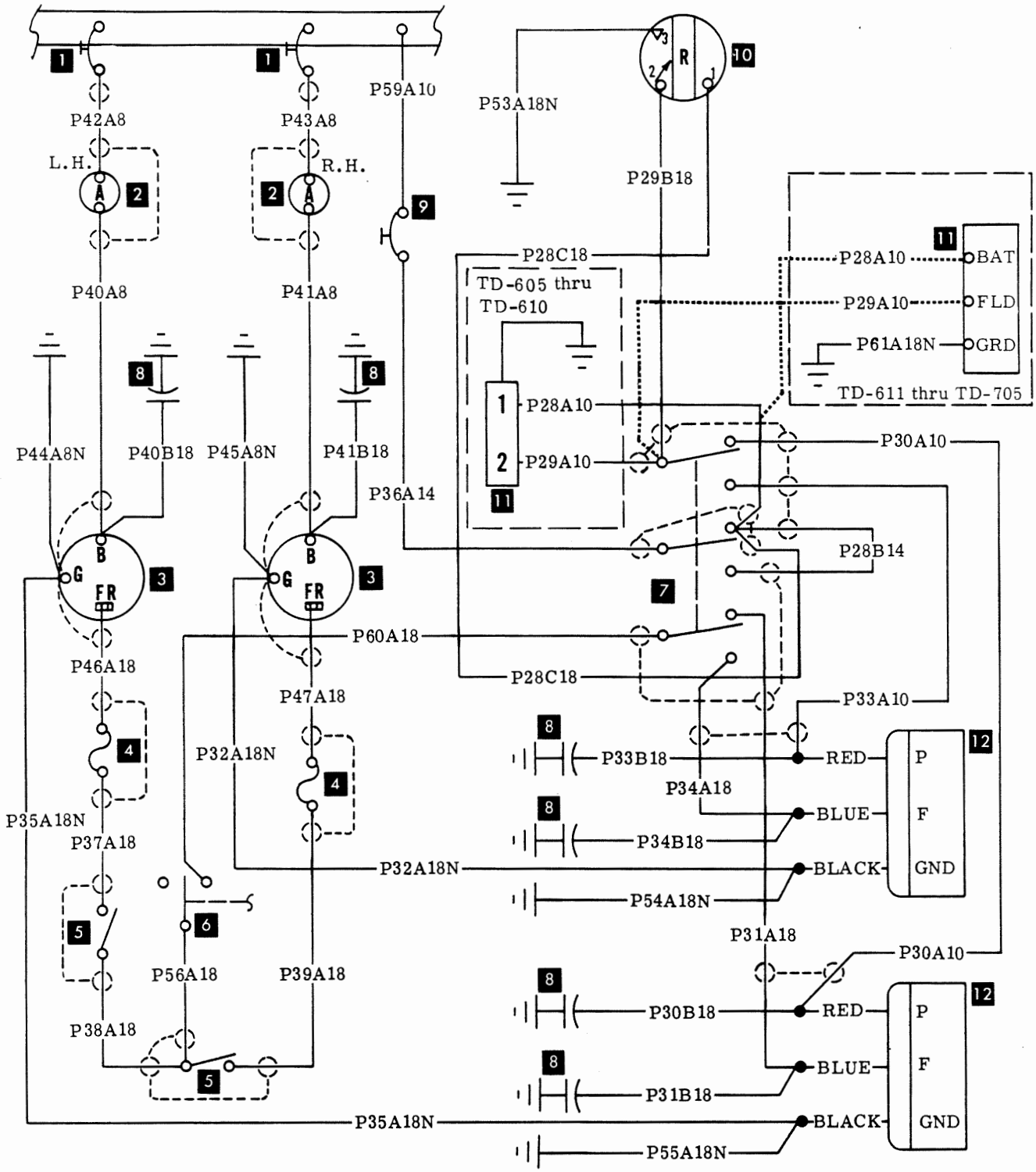
1. Bus Bar
2. Ammeter
3. Circuit Breaker - 30A
4. Voltage Regulator
5. Generator Switch
6. Generator
7. Paralleling Relay

GENERATOR CIRCUIT
TD-534 and after



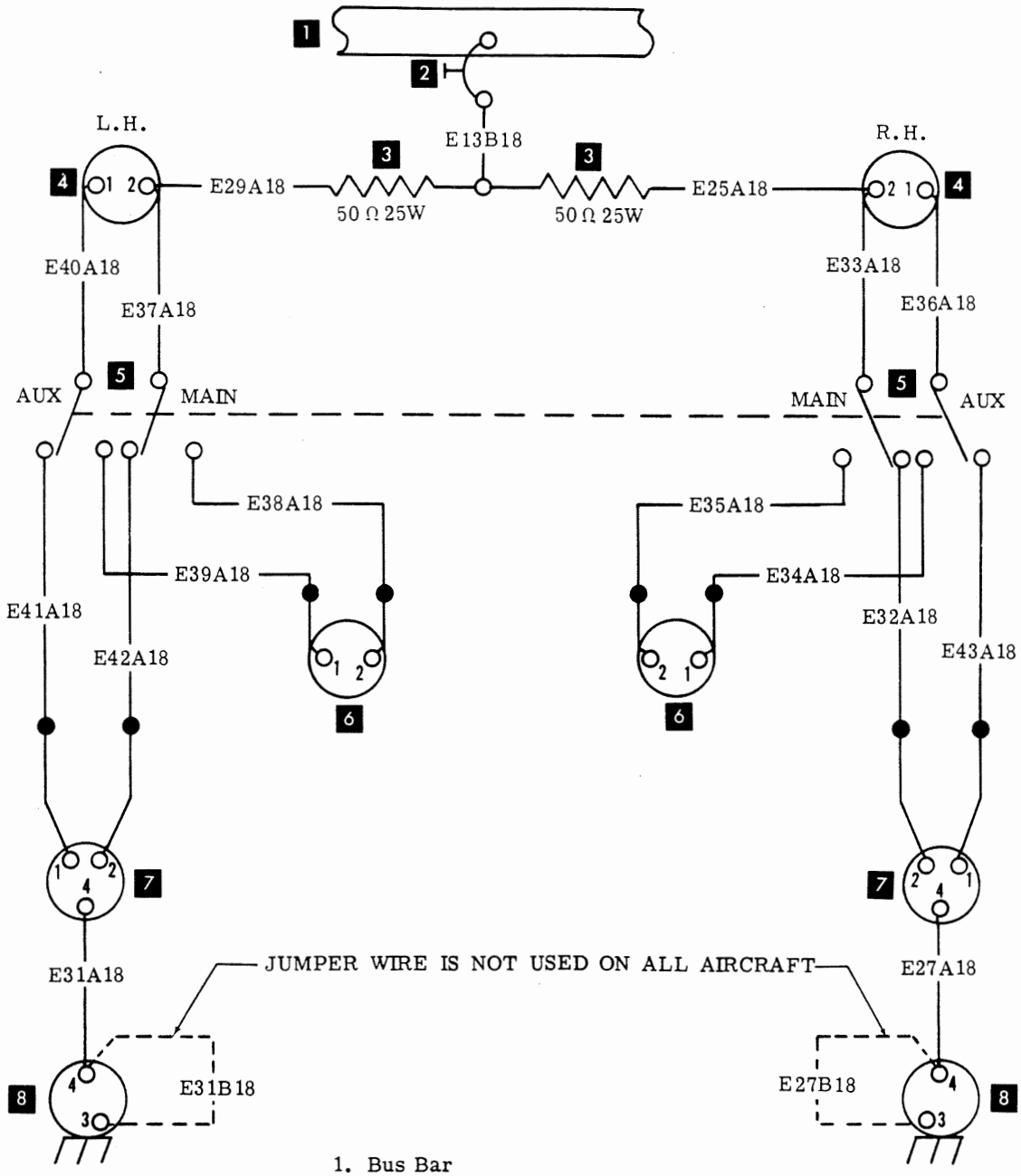
1. Circuit Breaker - 50A
2. Ammeter
3. Alternator
4. Fuse - 2A
5. Switch
6. Battery Master Switch
7. Regulator Selector Switch
8. Condensor
9. Circuit Breaker - 10A
10. Overvoltage Warning Light
11. Overvoltage Relay
12. Voltage Regulator
13. Relay

ALTERNATOR CIRCUIT OPTIONAL
TD-578 thru TD-604 except TD-602



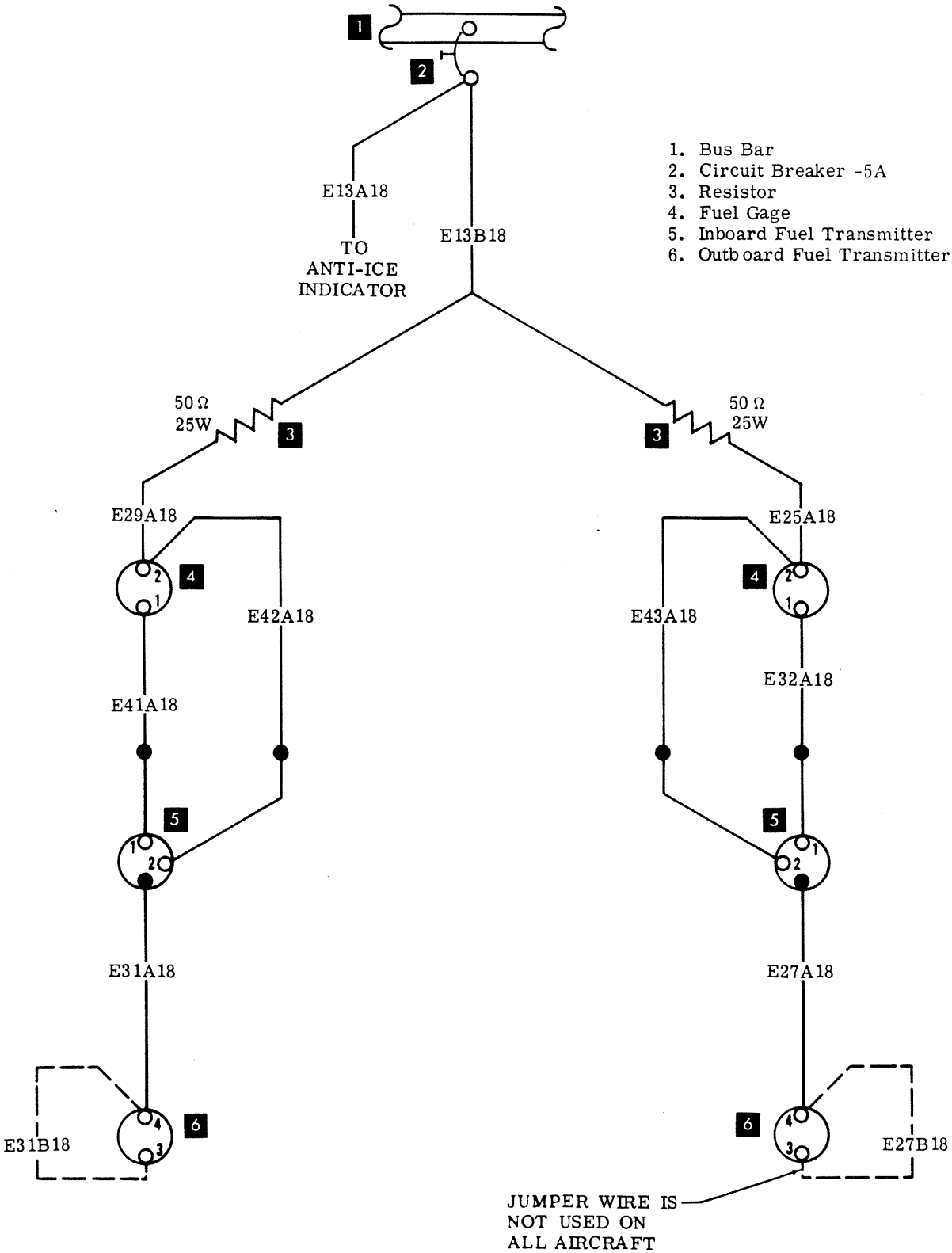
1. Circuit Breaker 50A
2. Ammeter
3. Alternator
4. Fuse 2A
5. Alternator Switch
6. Battery Master Switch
7. Regulator Selector Switch
8. Condensor
9. Circuit Breaker 10A
10. Overvoltage Warning Light
11. Overvoltage Relay
12. Voltage Regulator

ALTERNATOR CIRCUIT OPTIONAL
TD-605 thru TD-705

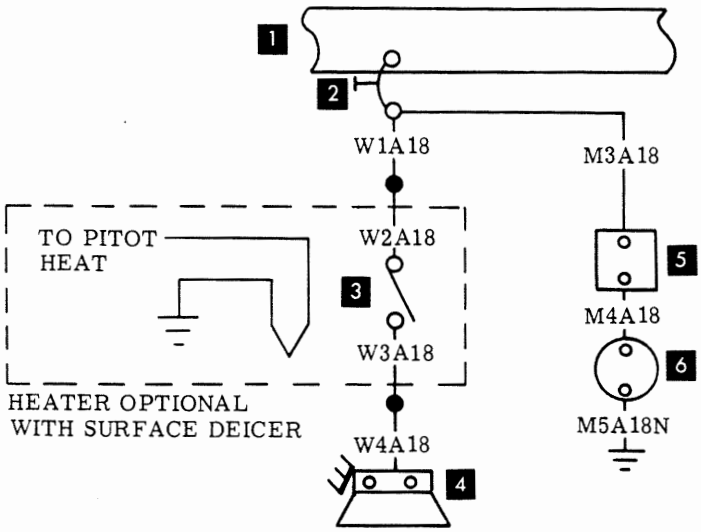


1. Bus Bar
2. Circuit Breaker - 5A
3. Resistor
4. Fuel Gage
5. Fuel Gage Transfer Switch
6. Main Tank - 25 gallon
7. Aux. Inboard Transmitter
8. Aux. Outboard Transmitter.

FUEL QUANTITY INDICATOR CIRCUIT(OPTIONAL)
TD-534 and after

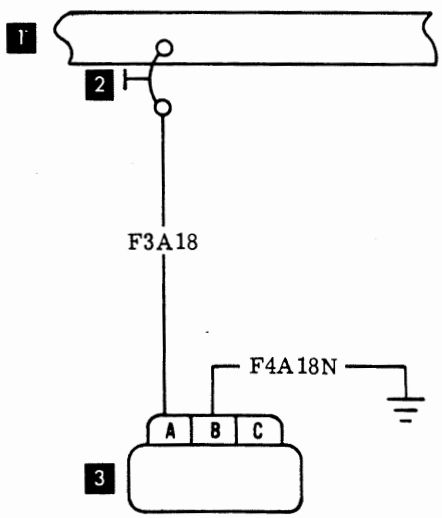


FUEL QUANTITY INDICATOR CIRCUIT (STANDARD)
TD-534 and after



1. Bus Bar
2. Circuit Breaker - 5A
3. Stall Warning Detector Switch and Heater
4. Stall Warning Horn
5. Pressure Switch
6. Engine Hour Meter

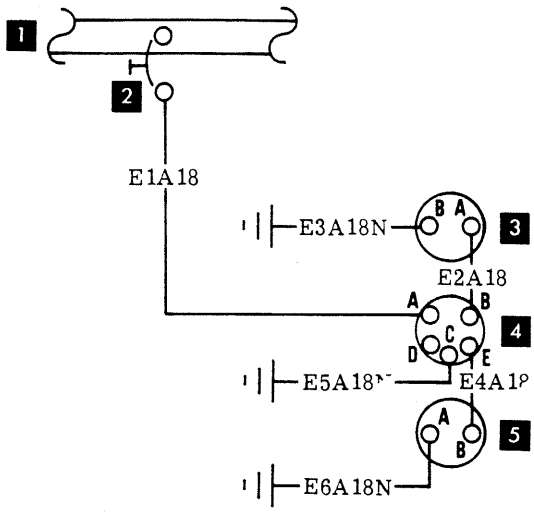
STALL WARNING AND ENGINE HOUR METER CIRCUIT OPTIONAL
TD-534 and after



1. Bus Bar
2. Circuit Breaker - 5A
3. Indicator

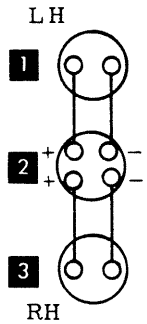
TURN AND SLIP
TD-534 and after

1. Bus Bar
2. Circuit Breaker - 5A
3. L.H. Oil Thermocouple Bulb
4. Oil Temperature Gage
5. R.H. Oil Thermocouple Bulb



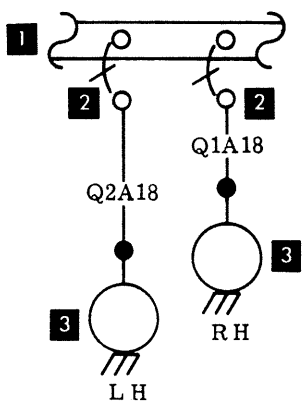
OIL TEMPERATURE CIRCUIT
TD-534 and after

1. L.H. Cylinder Head Thermocouple Bulb
2. Cylinder Head Temperature Gage
3. R.H. Cylinder Head Thermocouple Bulb

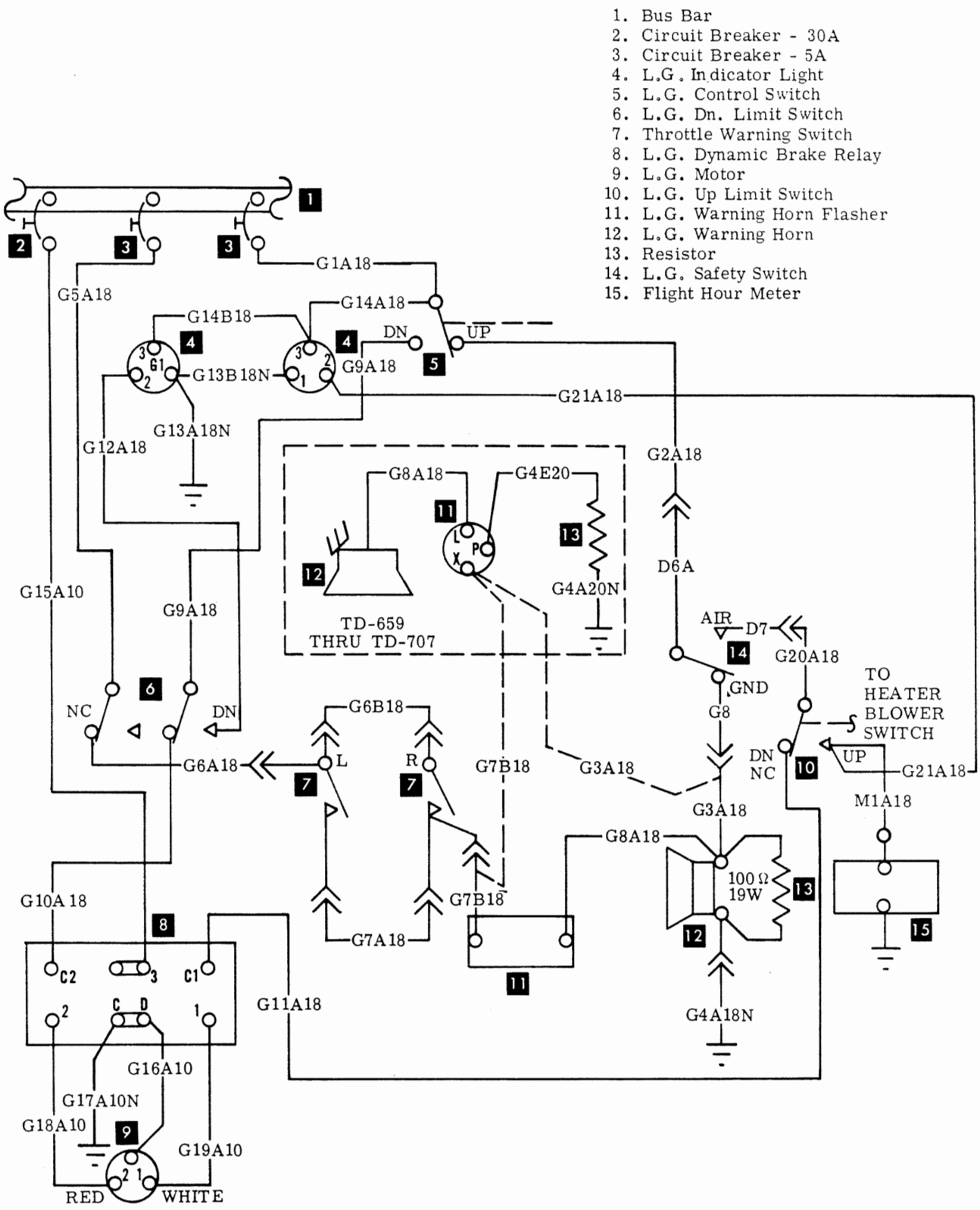


CYLINDER HEAD TEMPERATURE CIRCUIT
TD-534 and after

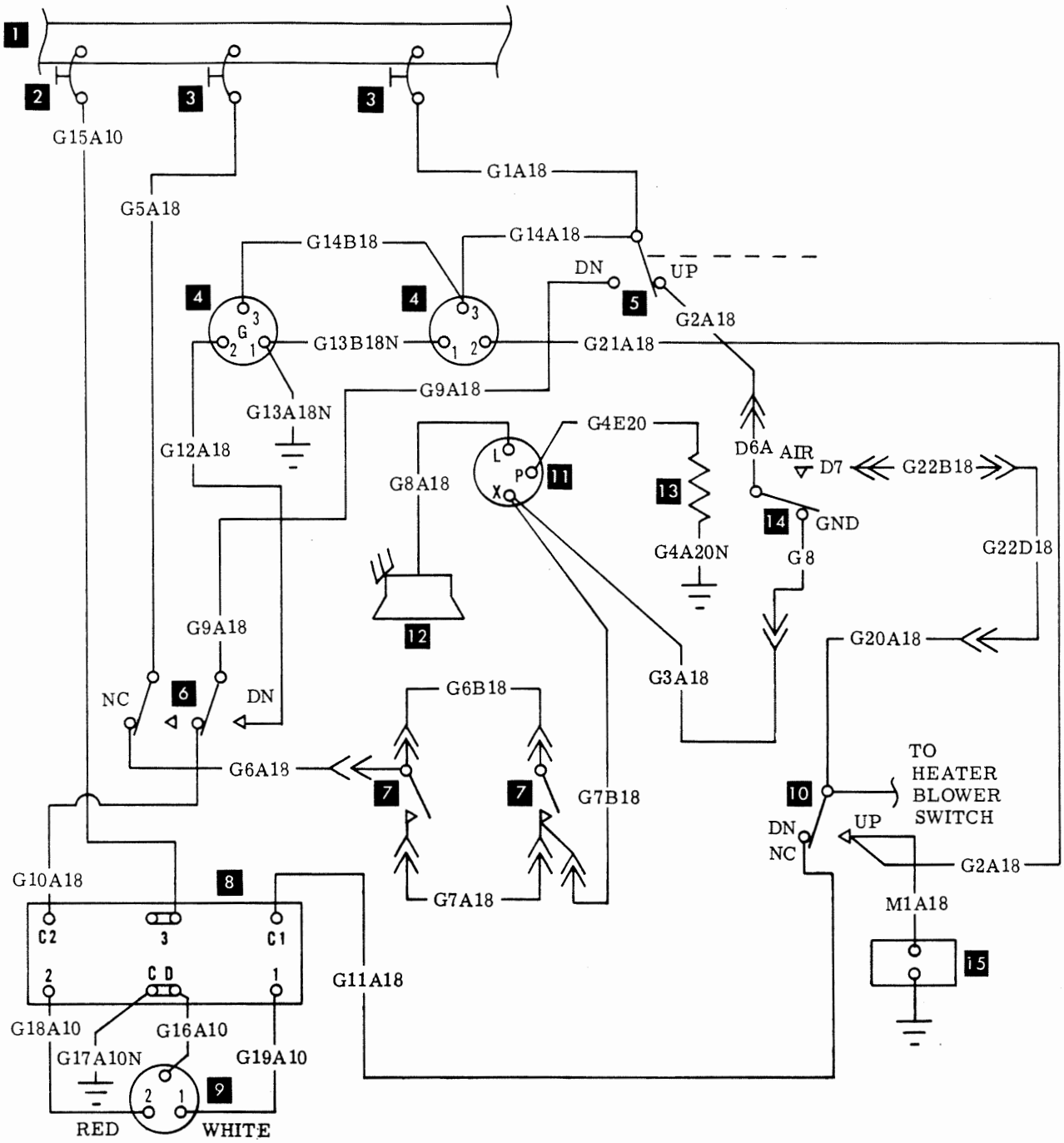
1. Bus Bar
2. Circuit Breaker - 5A
3. Fuel Boost Pumps



FUEL BOOST PUMPS
TD- 534 and after

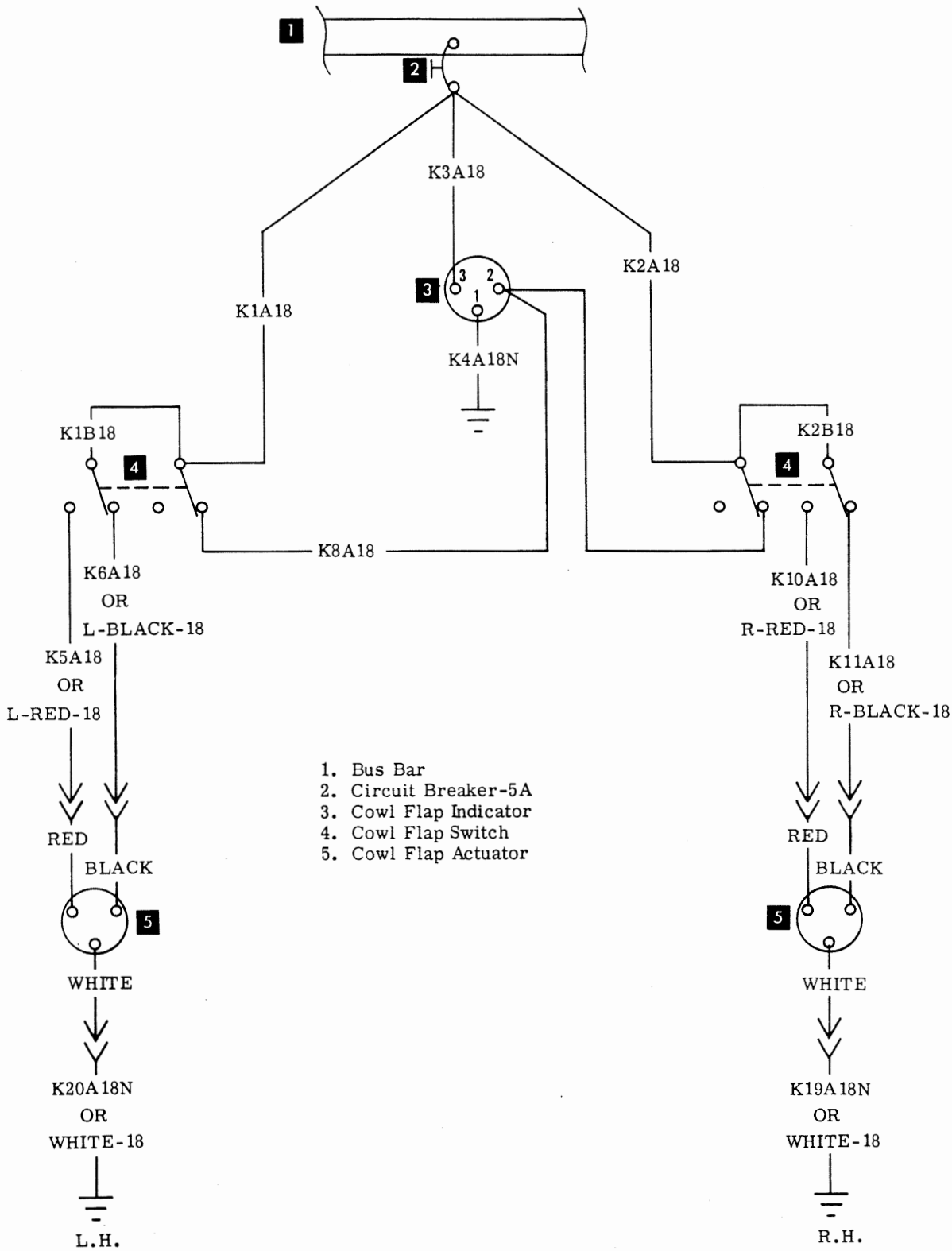


LANDING GEAR AND THROTTLE WARNING CIRCUIT
TD-534 thru TD-707



1. Bus Bar
2. Circuit Breaker - 30A
3. Circuit Breaker - 5A
4. L.G. Indicator Light
5. L.G. Control Switch
6. L.G. Dn. Limit Switch
7. Throttle Warning Switch
8. L.G. Dynamic Brake Relay
9. L.G. Motor
10. L.G. Up Limit Switch
11. L.G. Warning Horn Flasher
12. L.G. Warning Horn
13. Resistor
14. L.G. Safety Switch
15. Flight Hour Meter

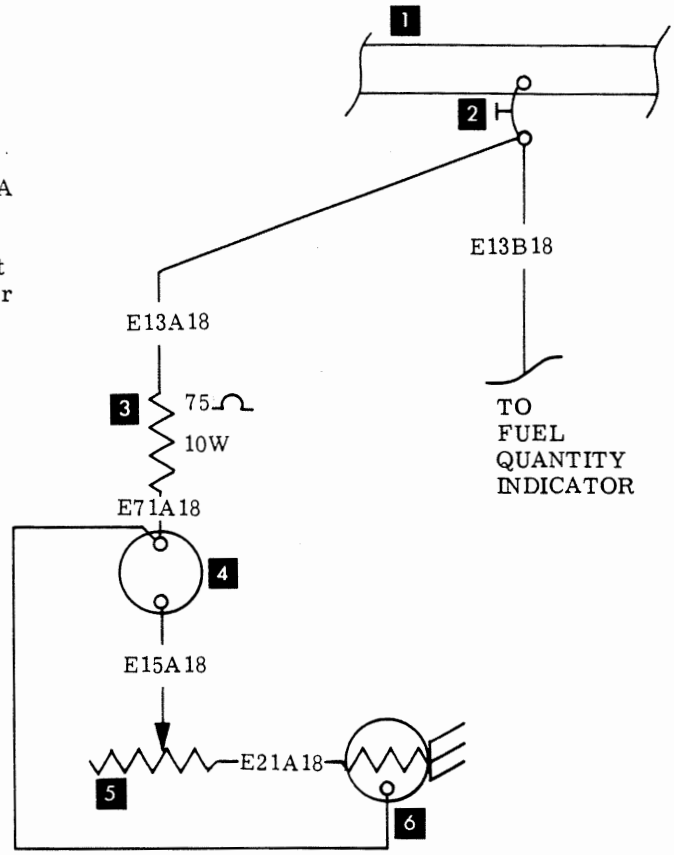
LANDING GEAR AND THROTTLE WARNING CIRCUIT
TD-708 and after



1. Bus Bar
2. Circuit Breaker-5A
3. Cowl Flap Indicator
4. Cowl Flap Switch
5. Cowl Flap Actuator

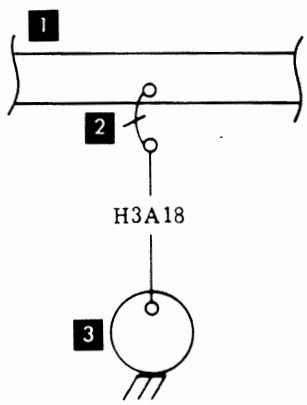
COWL FLAP CIRCUIT
TD-534 and after

1. Bus Bar
2. Circuit Breaker - 5A
3. Resistor
4. Anti-ice Indicator
5. Calibrating Rheostat
6. Anti-ice Transmitter

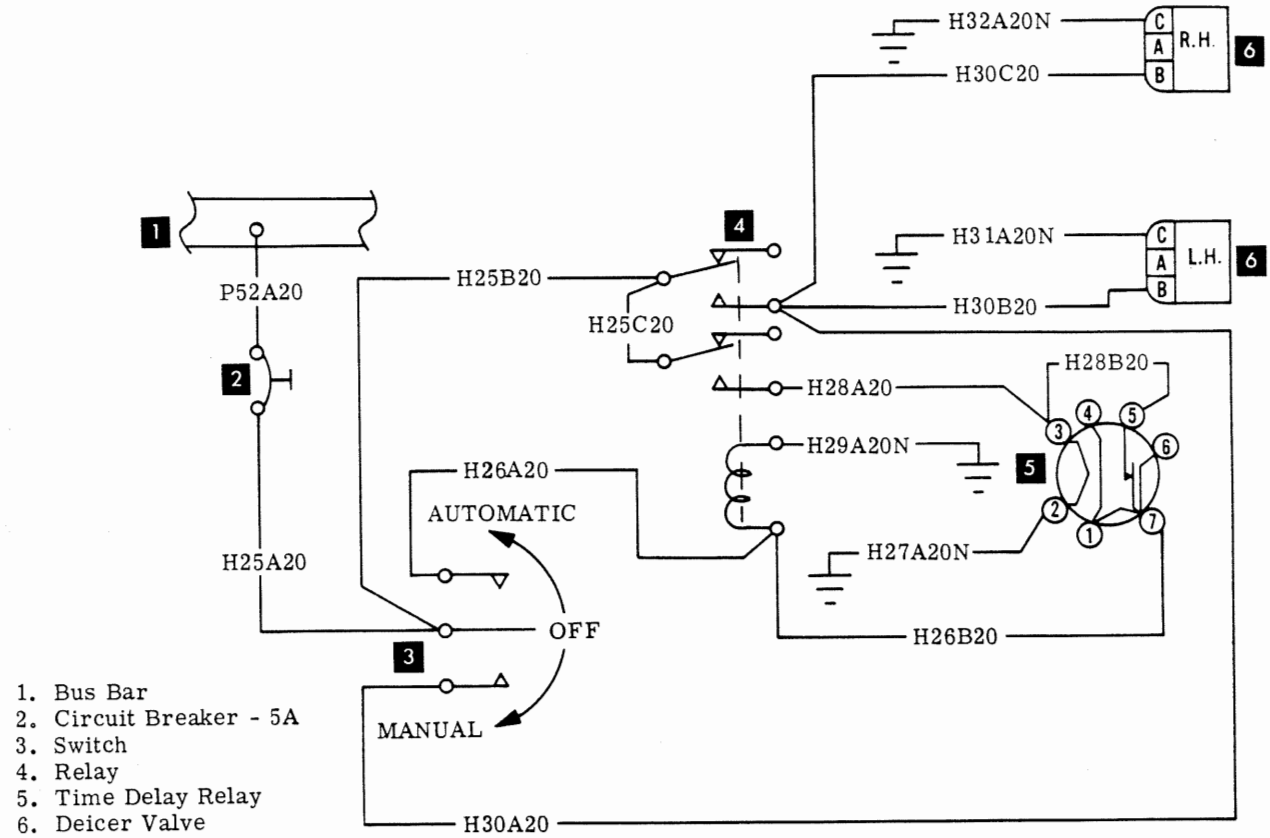


ANTI-ICER CIRCUIT
TD-534 and after

1. Bus Bar
2. Circuit Breaker -5A
3. Propeller Anti-ice Pump

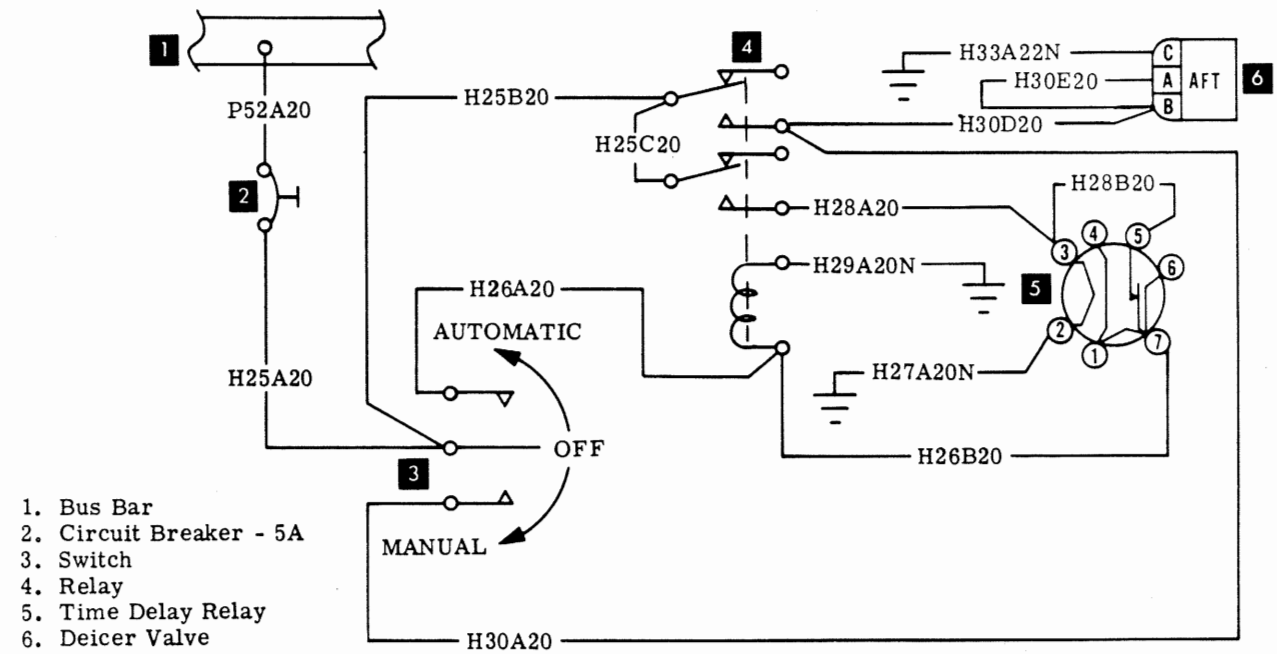


PROP ANTI-ICE PUMP CIRCUIT (OPTIONAL)
TD-534 and after



1. Bus Bar
2. Circuit Breaker - 5A
3. Switch
4. Relay
5. Time Delay Relay
6. Deicer Valve

DEICER CIRCUIT (OPTIONAL)
TD-534 thru TD-707

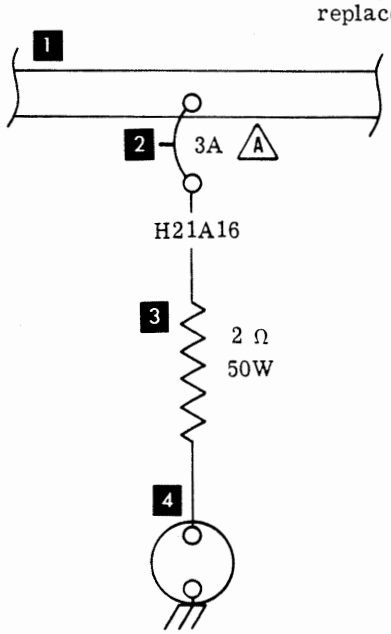


1. Bus Bar
2. Circuit Breaker - 5A
3. Switch
4. Relay
5. Time Delay Relay
6. Deicer Valve

DEICER CIRCUIT (OPTIONAL)
TD-708 and after

AMENDMENT III

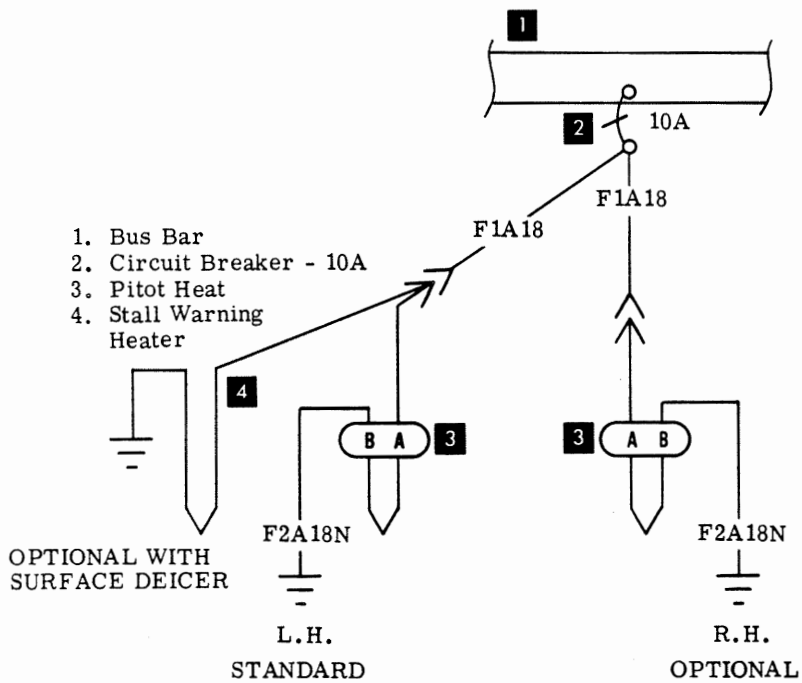
This page supersedes page 6-48. Remove and replace page 6-48 with this page.



A 5A
TD-714 AND AFTER

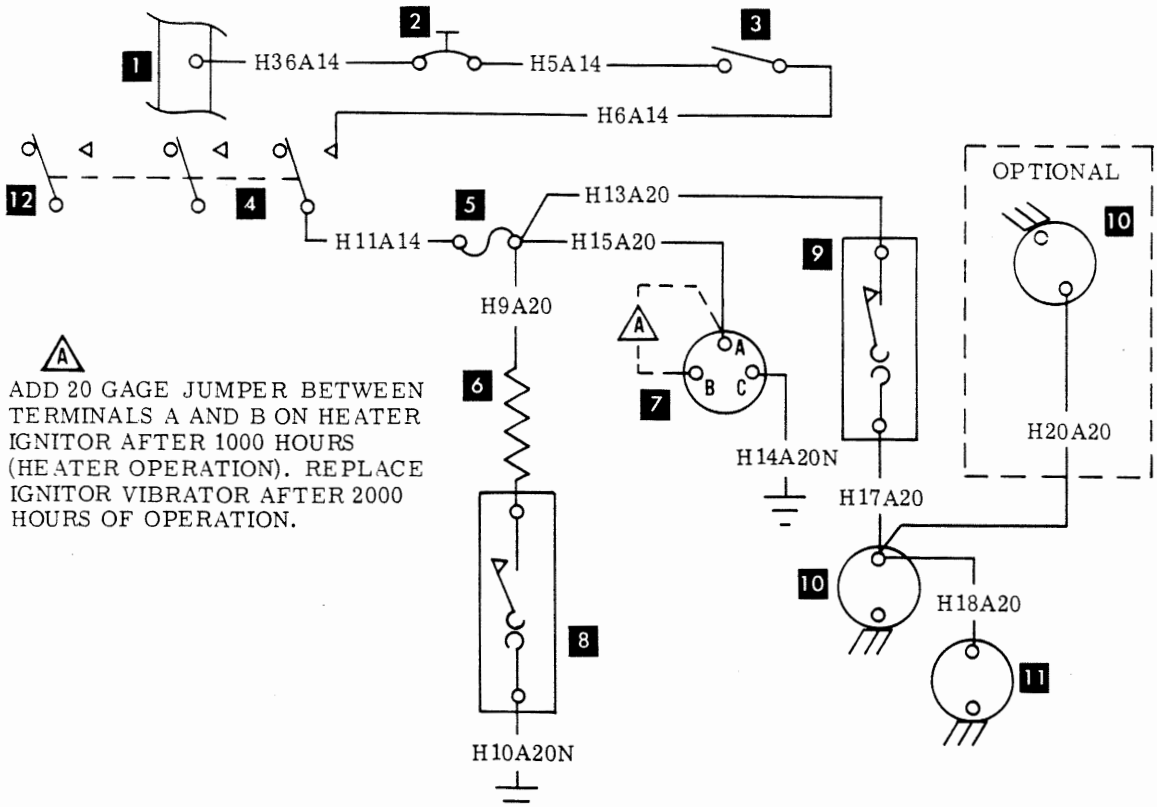
1. Bus Bar
2. Circuit Breaker
3. Resistor
4. Cigarette Lighter

CIGARETTE LIGHTER CIRCUIT
TD-534 and after



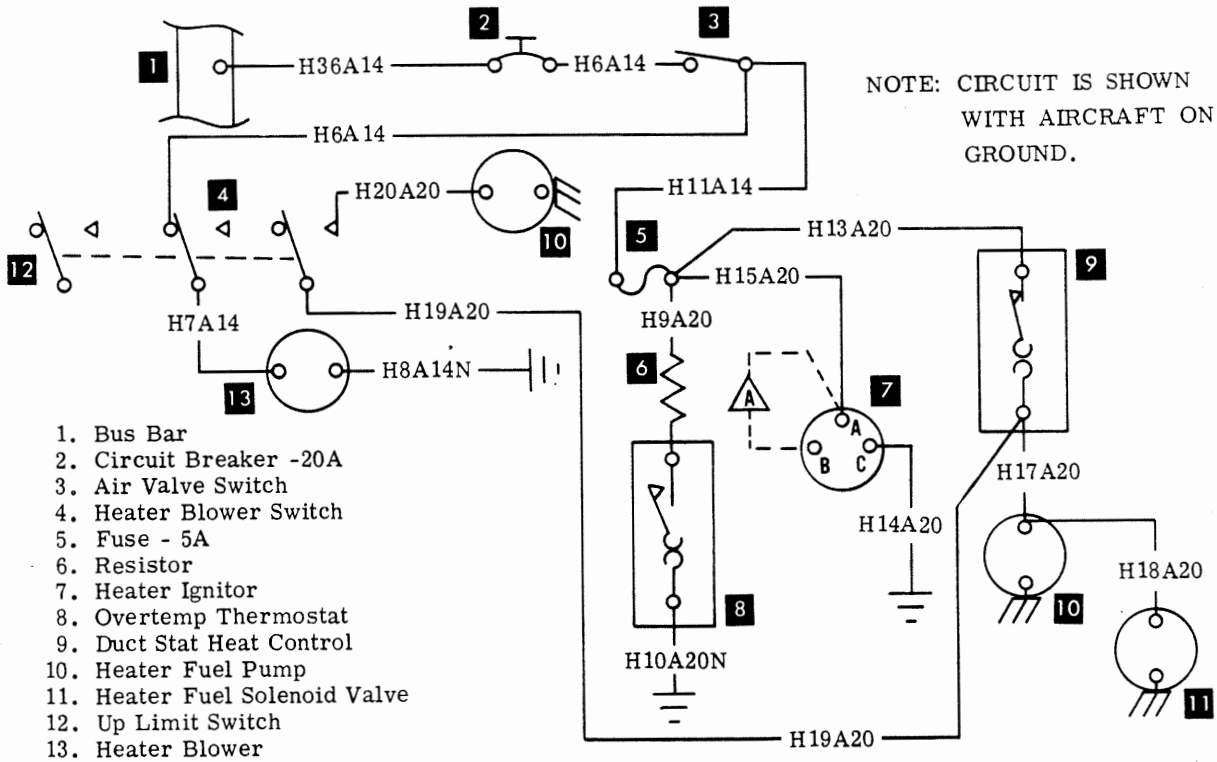
PITOT HEAT AND STALL WARNING HEATER CIRCUIT
TD-534 and after

Issued: March, 1969



ADD 20 GAGE JUMPER BETWEEN TERMINALS A AND B ON HEATER IGNITOR AFTER 1000 HOURS (HEATER OPERATION). REPLACE IGNITOR VIBRATOR AFTER 2000 HOURS OF OPERATION.

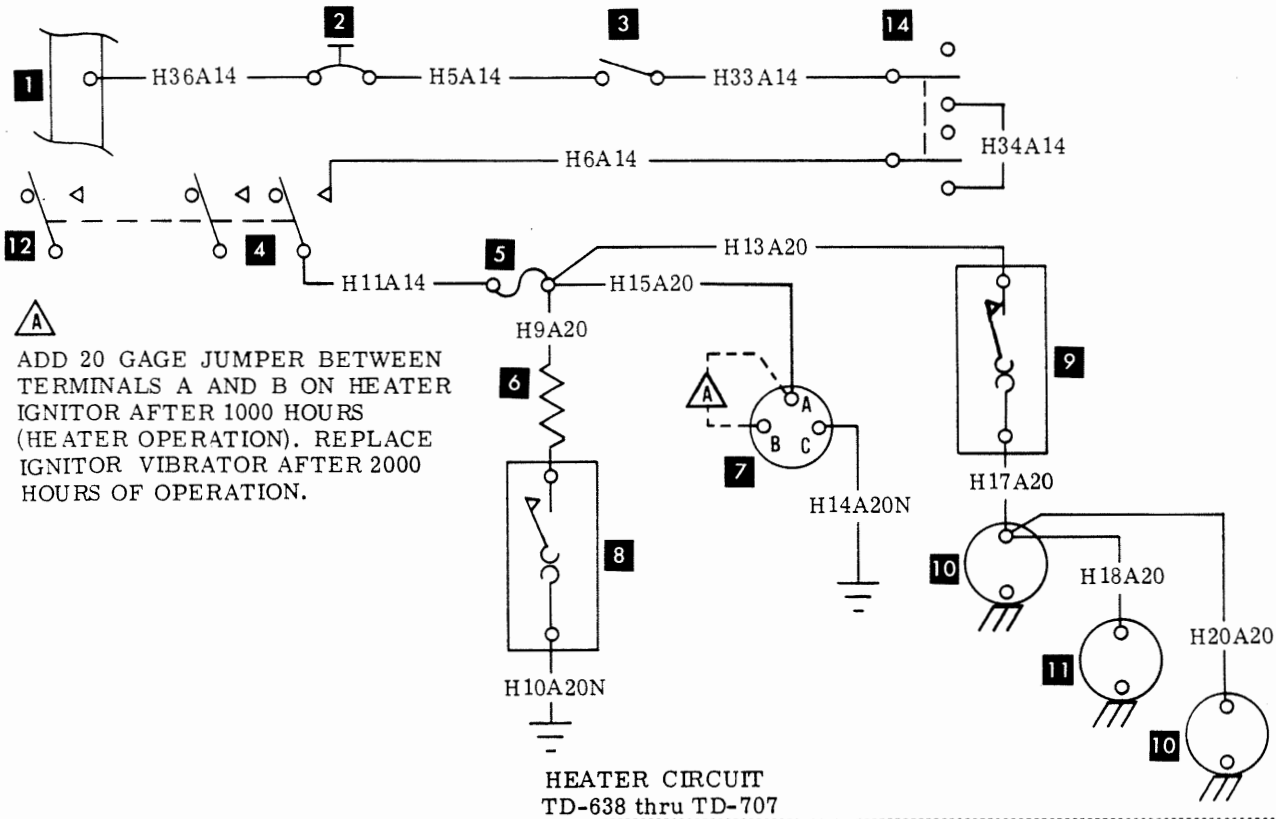
HEATER CIRCUIT
TD-534 thru TD-637



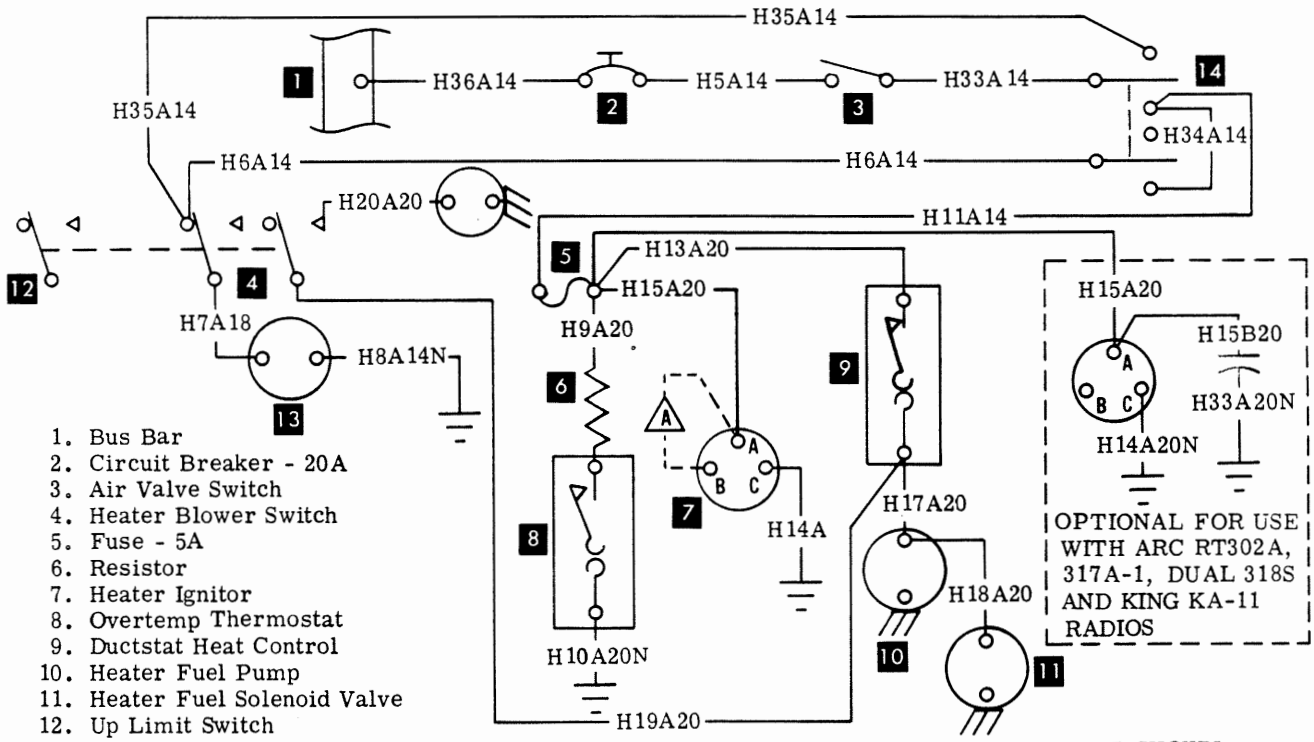
NOTE: CIRCUIT IS SHOWN WITH AIRCRAFT ON GROUND.

1. Bus Bar
2. Circuit Breaker -20A
3. Air Valve Switch
4. Heater Blower Switch
5. Fuse - 5A
6. Resistor
7. Heater Ignitor
8. Overtemp Thermostat
9. Duct Stat Heat Control
10. Heater Fuel Pump
11. Heater Fuel Solenoid Valve
12. Up Limit Switch
13. Heater Blower

HEATER CIRCUIT WITH OPTIONAL BLOWER
TD-534 thru TD-637



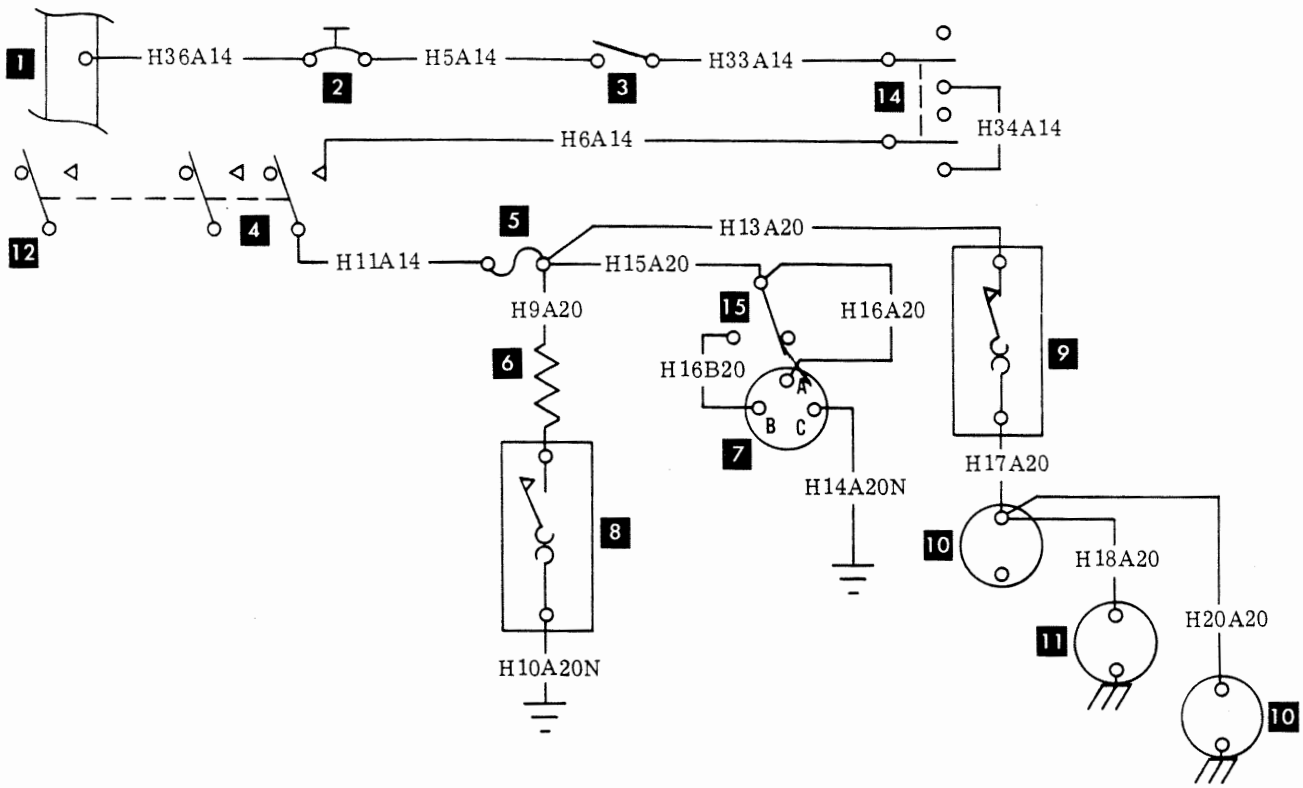
HEATER CIRCUIT
TD-638 thru TD-707



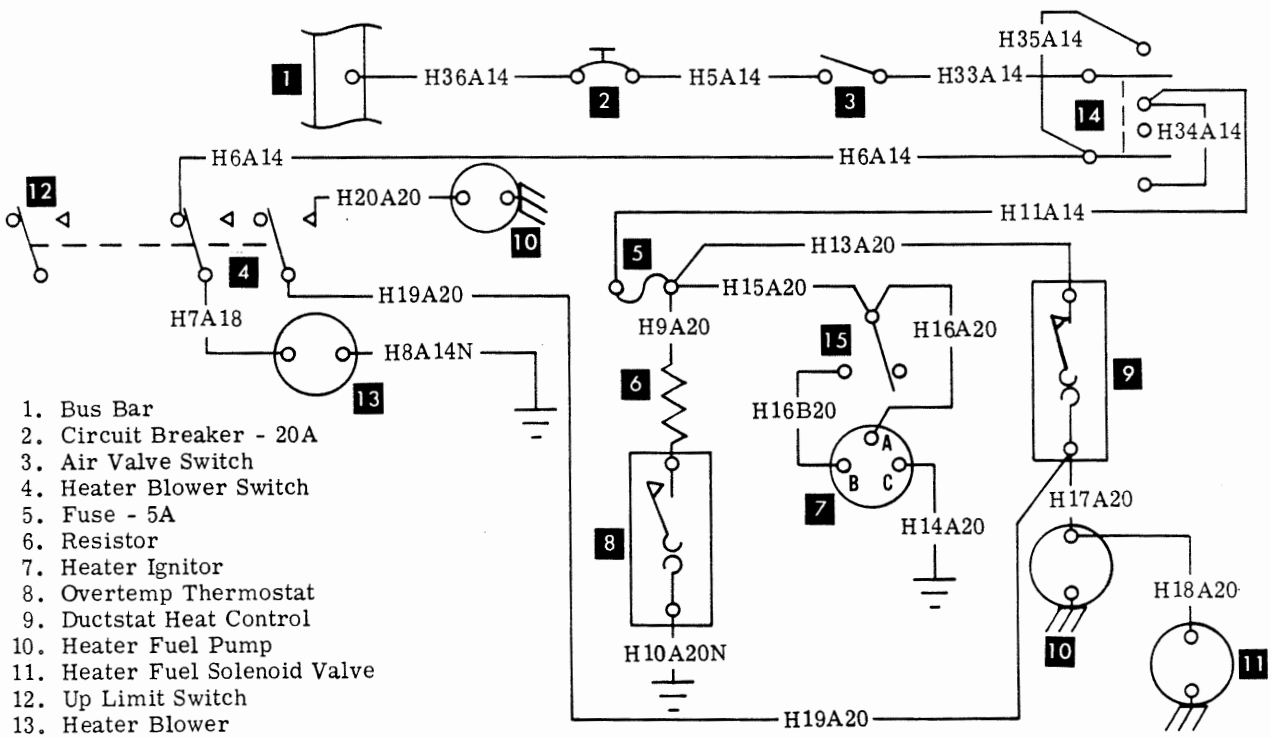
1. Bus Bar
2. Circuit Breaker - 20A
3. Air Valve Switch
4. Heater Blower Switch
5. Fuse - 5A
6. Resistor
7. Heater Ignitor
8. Overtemp Thermostat
9. Ductstat Heat Control
10. Heater Fuel Pump
11. Heater Fuel Solenoid Valve
12. Up Limit Switch
13. Heater Blower
14. Heater Blower Select Switch

NOTE: CIRCUIT IS SHOWN WITH AIRCRAFT ON GROUND.

HEATER CIRCUIT WITH OPTIONAL BLOWER
TD-638 thru TD-707



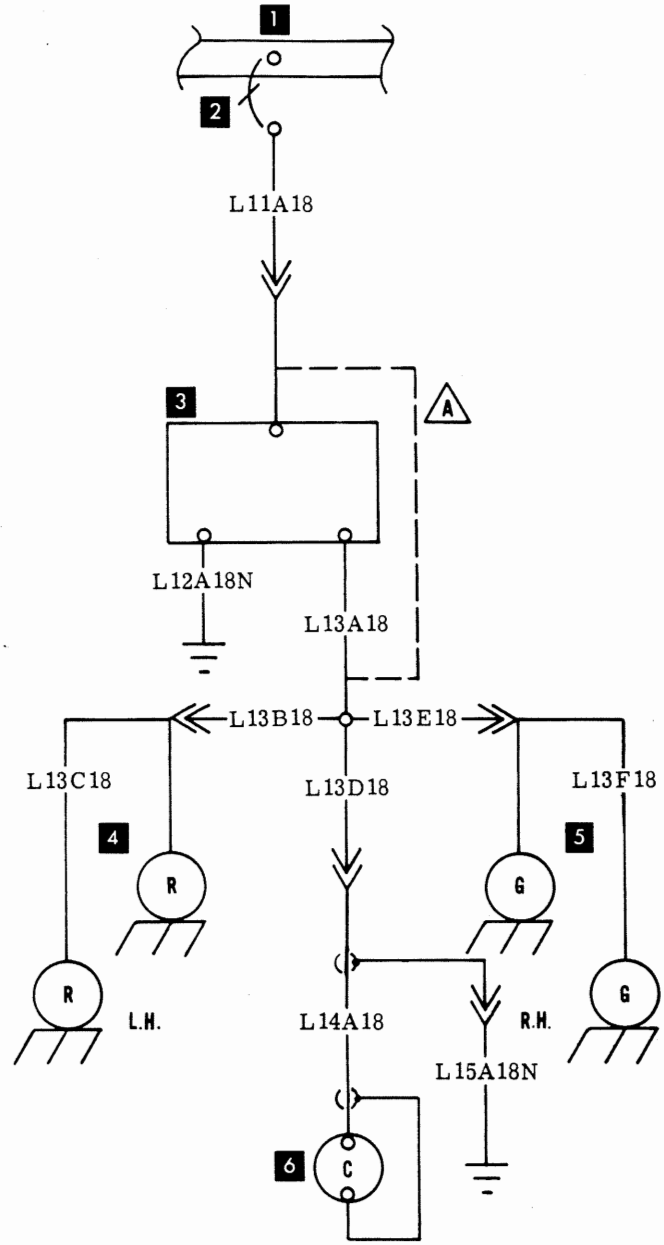
HEATER CIRCUIT
TD-708 and after



1. Bus Bar
2. Circuit Breaker - 20A
3. Air Valve Switch
4. Heater Blower Switch
5. Fuse - 5A
6. Resistor
7. Heater Ignitor
8. Overtemp Thermostat
9. Ductstat Heat Control
10. Heater Fuel Pump
11. Heater Fuel Solenoid Valve
12. Up Limit Switch
13. Heater Blower
14. Heater Blower Select Switch
15. Heater Ignitor Switch

NOTE: CIRCUIT IS SHOWN WITH AIRCRAFT ON GROUND.

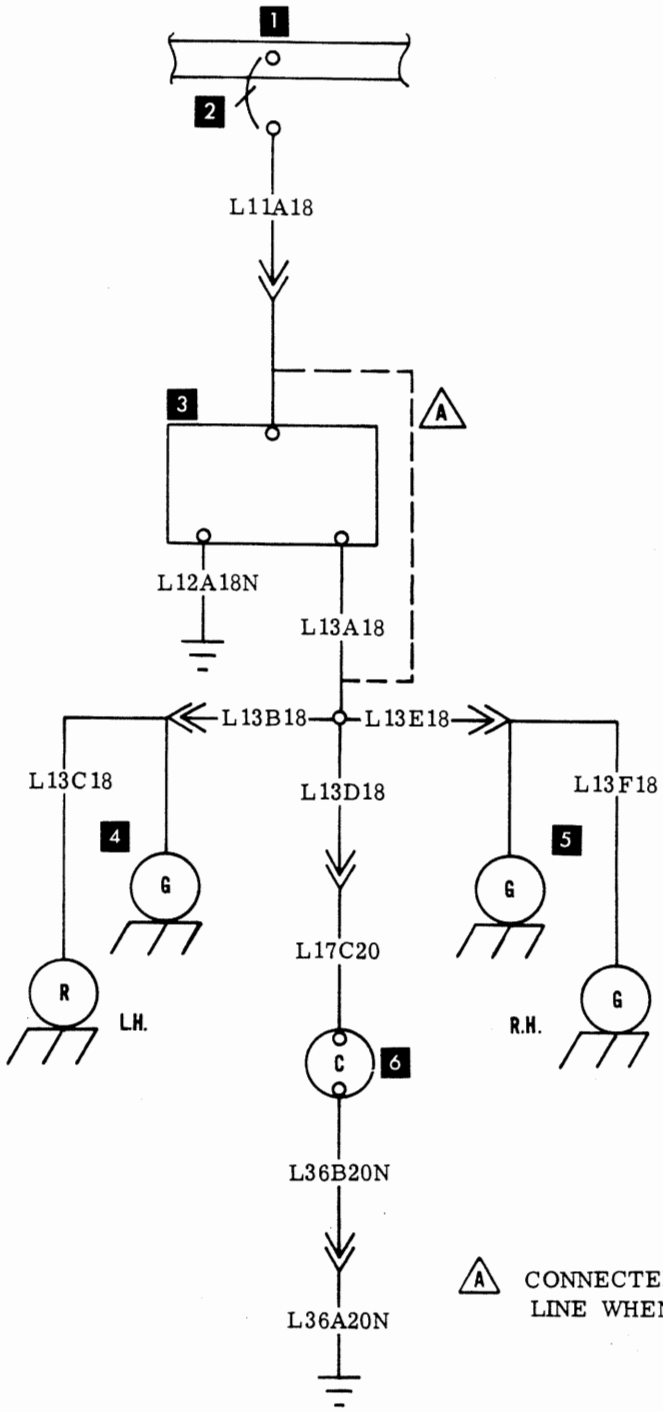
HEATER CIRCUIT WITH OPTIONAL BLOWER
TD-708 and after



A CONNECTED AS SHOWN BY DOTTED LINE WHEN FLASHER IS NOT USED

1. Bus Bar
2. Circuit Breaker - 5A
3. Navigation Lights Flasher (Optional)
4. Left Wing Tip Lights
5. Right Wing Tip Lights
6. Tail Light

NAVIGATION LIGHTS CIRCUIT
TD-534 thru TD-707

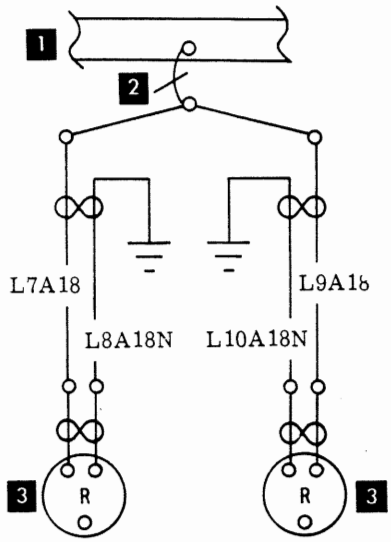


A CONNECTED AS SHOWN BY DOTTED LINE WHEN FLASHER IS NOT USED

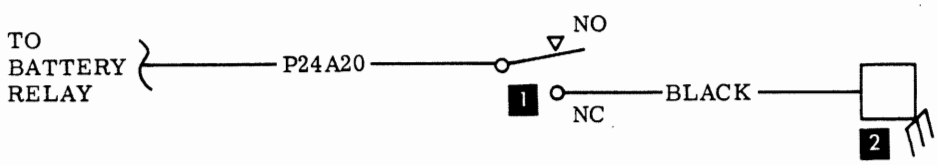
1. Bus Bar
2. Circuit Breaker - 5A
3. Navigation Lights Flasher
4. Left Wing Tip Lights
5. Right Wing Tip Lights
6. Tail Light

NAVIGATION LIGHTS CIRCUIT
TD-708 and after

1. Bus Bar
2. Circuit Breaker - 10A
3. Rotating Beacon

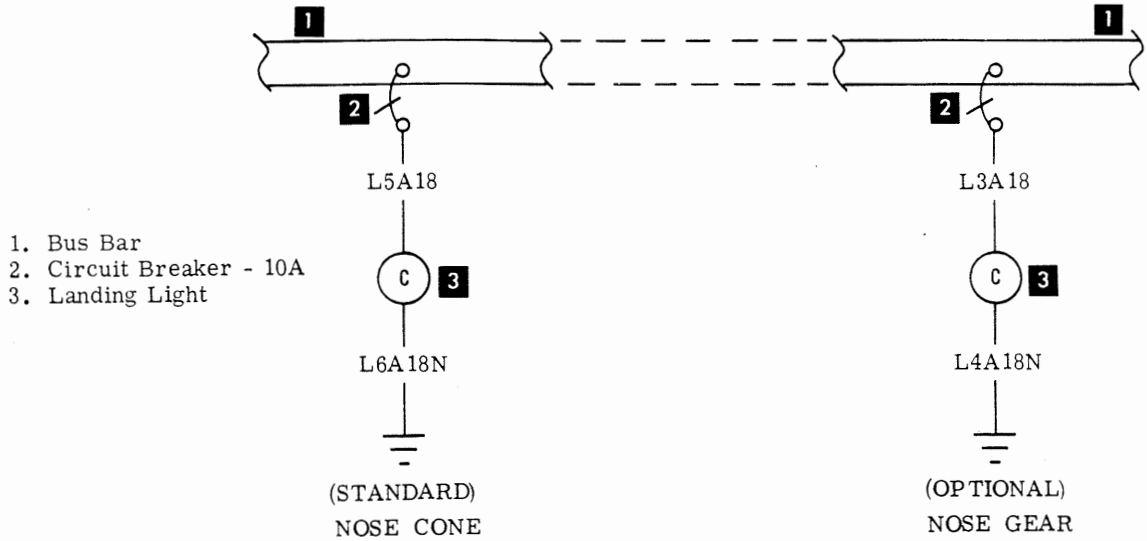


ROTATING BEACON CIRCUIT
TD-534 and after



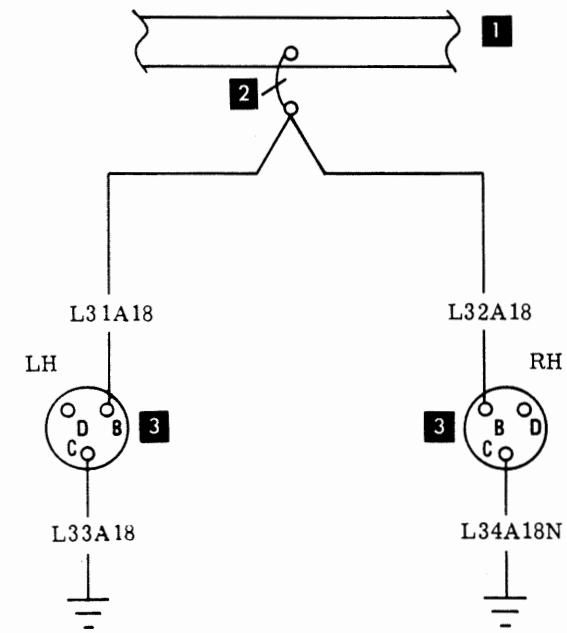
1. Switch
2. Light

NOSE BAGGAGE COMPARTMENT LIGHT CIRCUIT
TD-708 and after



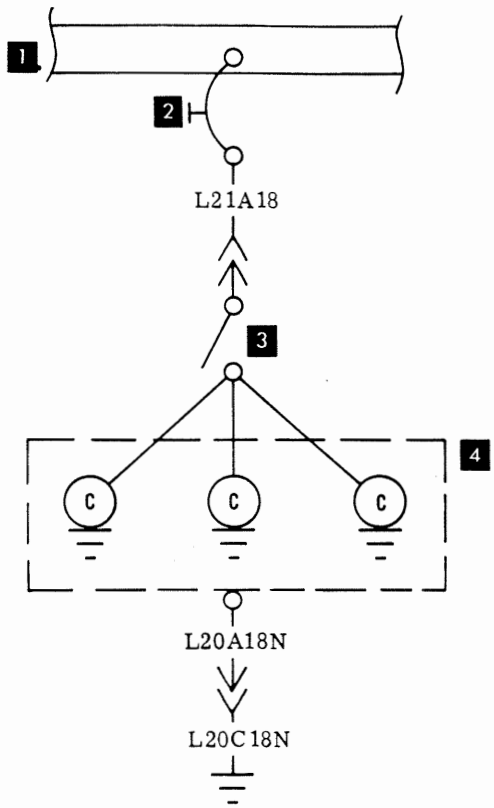
1. Bus Bar
2. Circuit Breaker - 10A
3. Landing Light

LANDING LIGHTS CIRCUIT
TD-534 and after

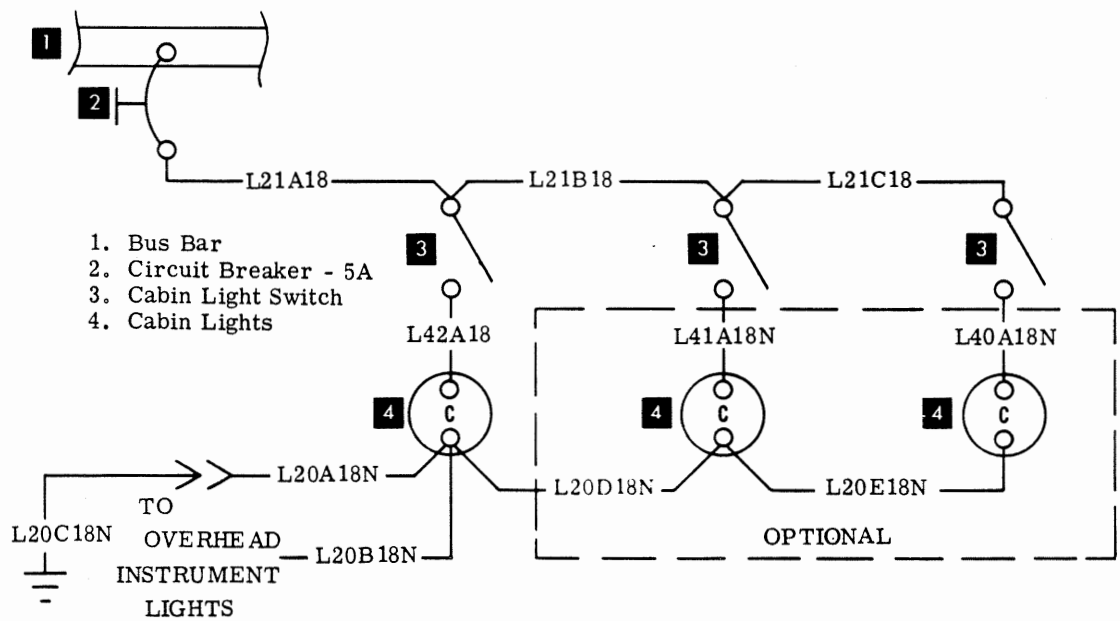


1. Bus Bar
2. Circuit Breaker - 5A
3. Wing Ice Light

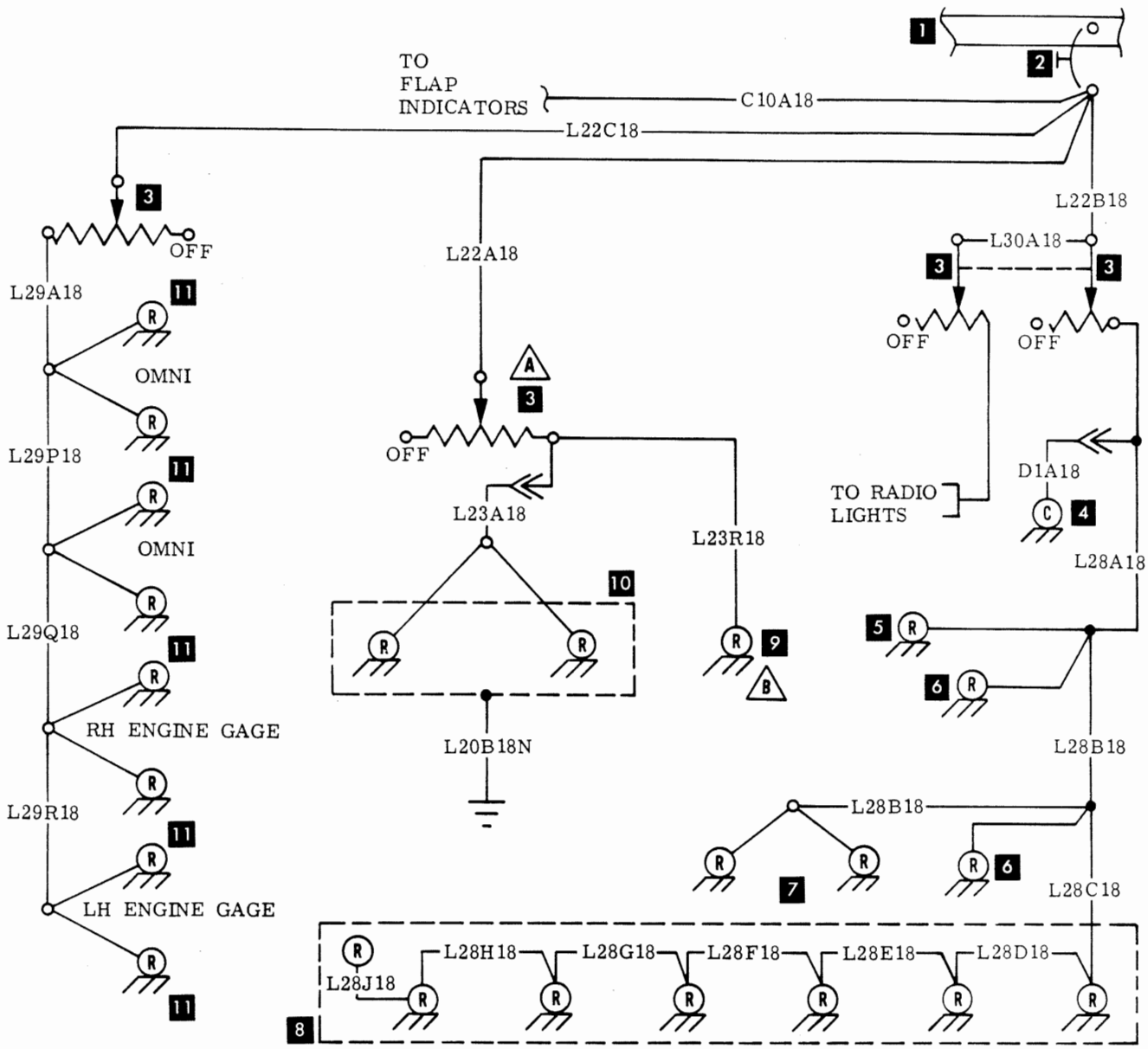
WING ICE LIGHTS CIRCUIT (OPTIONAL)
TD-534 and after



CABIN LIGHTS CIRCUIT
TD-534 thru TD-637



CABIN LIGHTS CIRCUIT (OVERHEAD AND VENT)
TD-638 and after

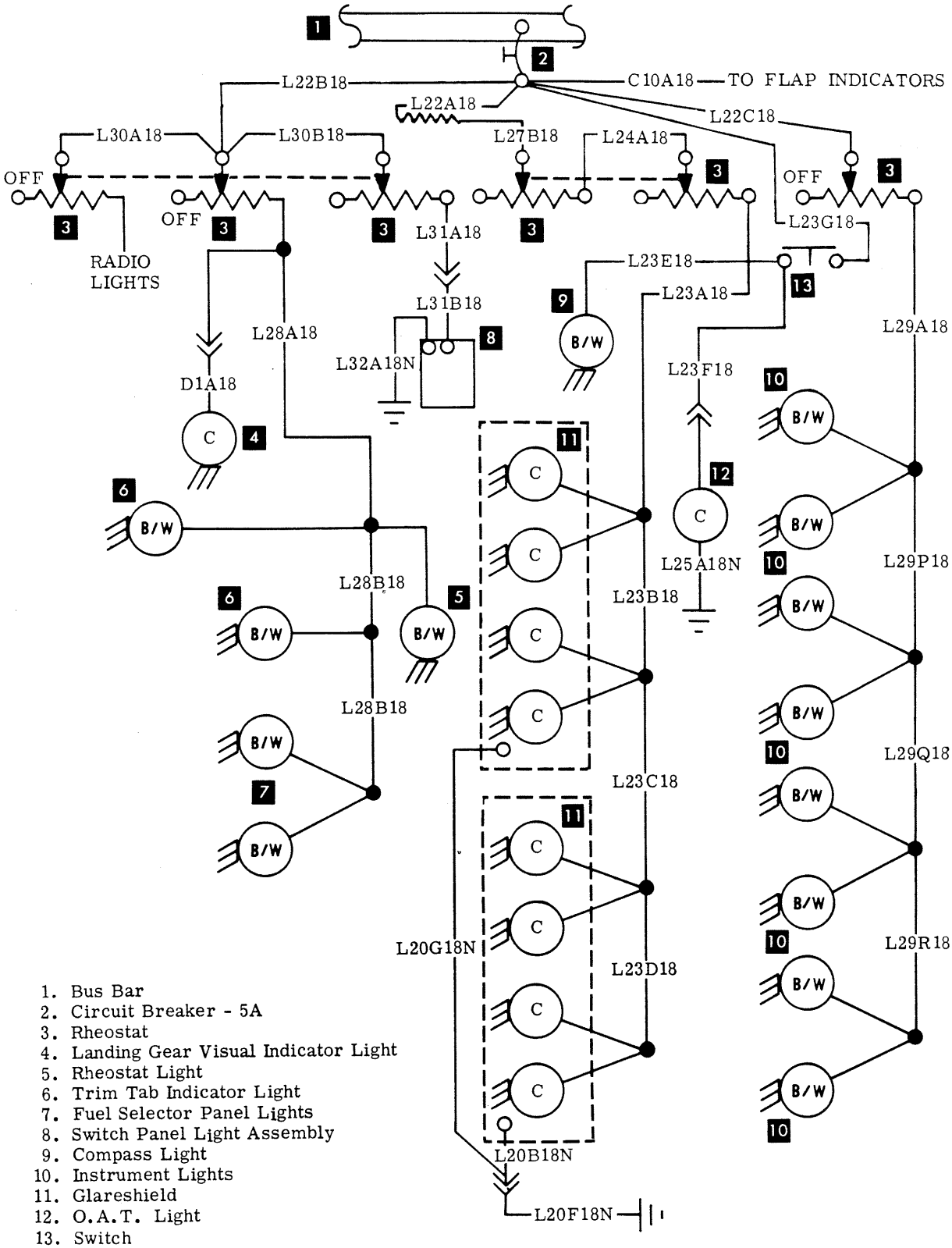


1. Bus Bar
2. Circuit Breaker - 5A
3. Rheostat
4. Landing Gear Visual Indicator Light
5. Rheostat Light
6. Trim Tab Indicator Light
7. Fuel Selector Panel Lights
8. Circuit Breaker And Switch Panel Lights
9. Compass Light
10. Overhead Lights
11. Instrument Lights

(A) WIRE L22A18 IS CONNECTED TO CABIN LIGHTS CIRCUIT BREAKER WHEN OPTIONAL LIGHTS ARE INSTALLED.

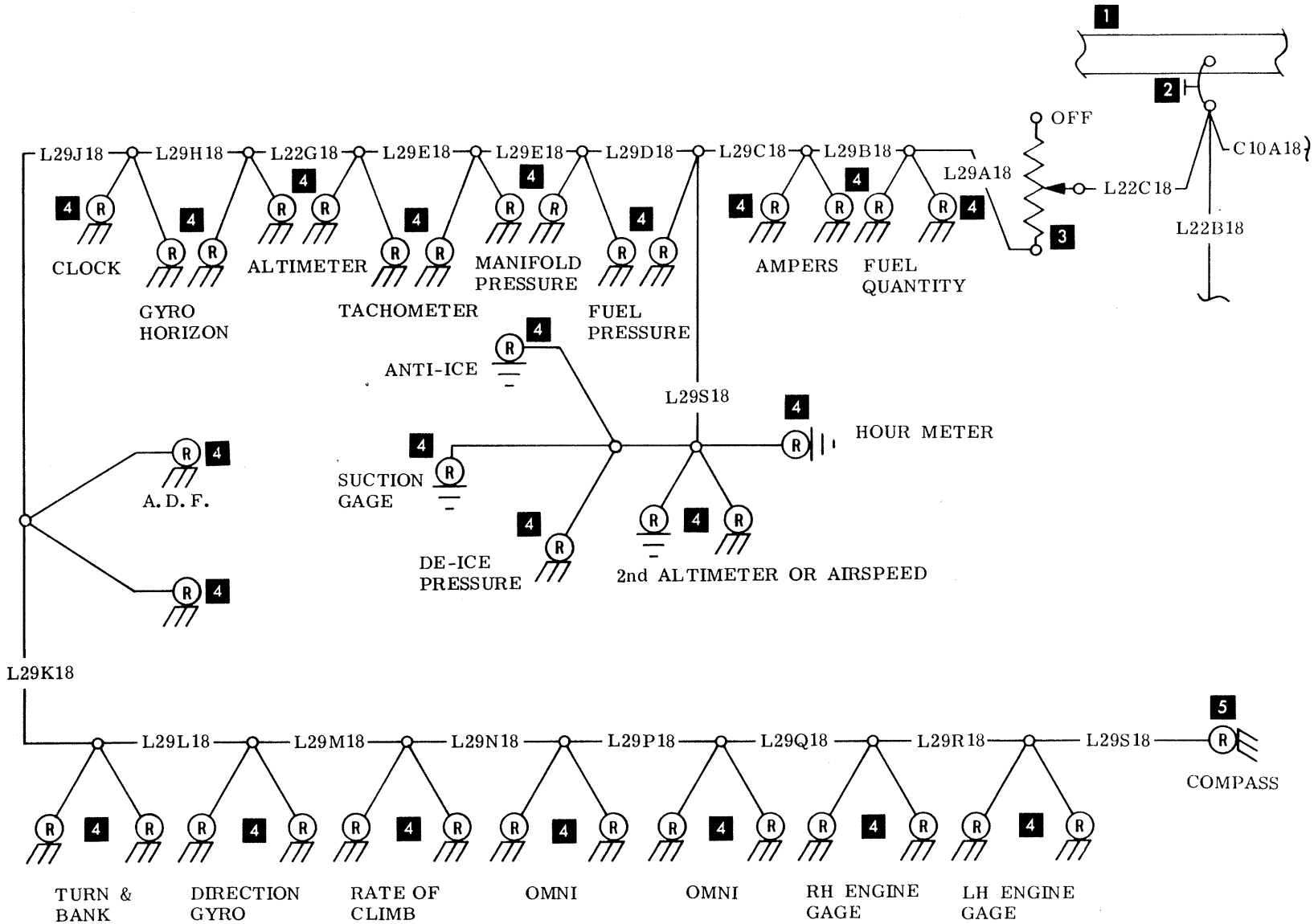
(B) CONNECT WITH POST LIGHTS ON OPTIONAL INSTALLATION

INSTRUMENT LIGHTS
TD-534 thru TD-707



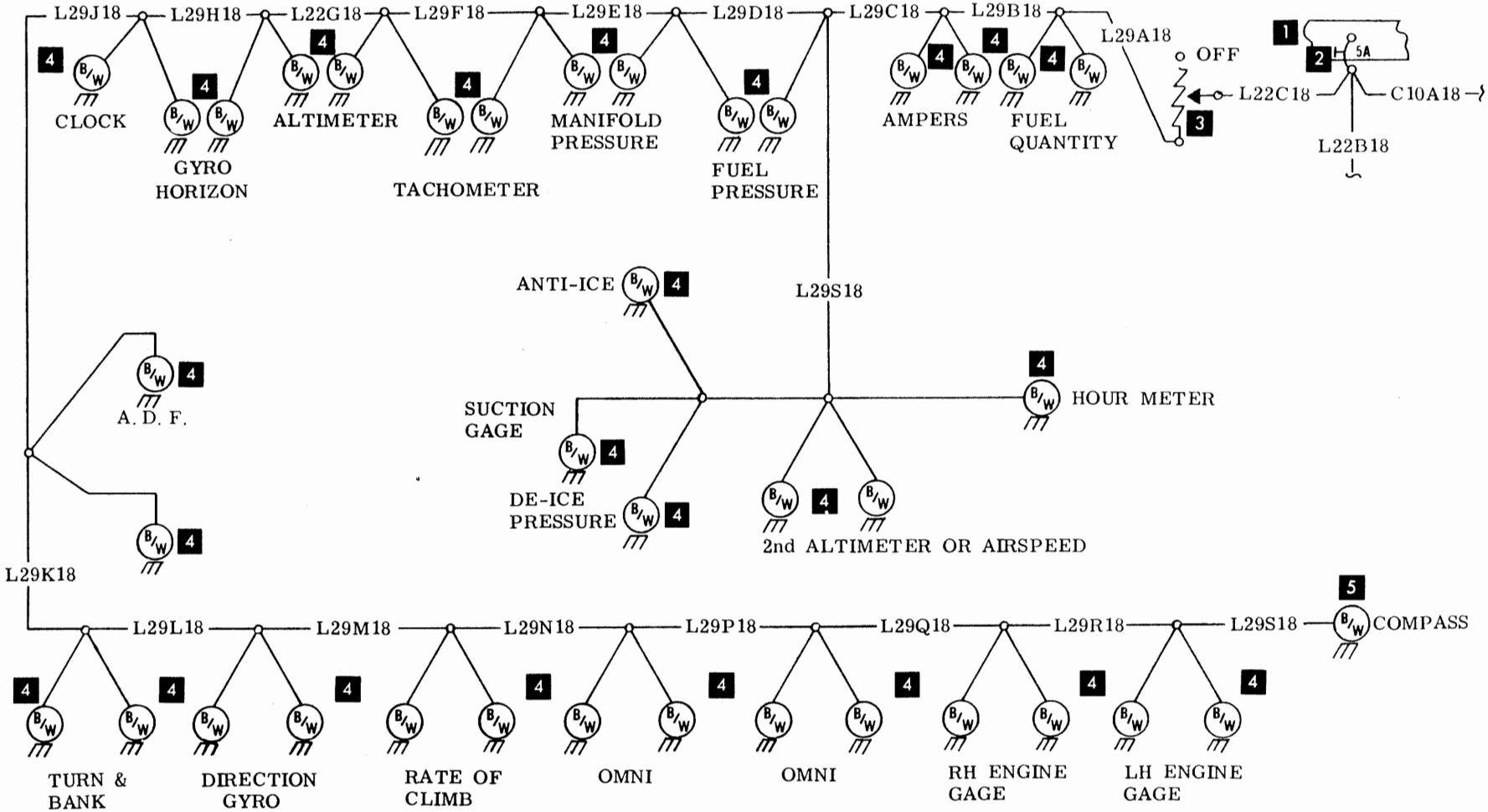
1. Bus Bar
2. Circuit Breaker - 5A
3. Rheostat
4. Landing Gear Visual Indicator Light
5. Rheostat Light
6. Trim Tab Indicator Light
7. Fuel Selector Panel Lights
8. Switch Panel Light Assembly
9. Compass Light
10. Instrument Lights
11. Glareshield
12. O.A.T. Light
13. Switch

INSTRUMENT LIGHTS CIRCUIT
TD-708 and after



1. Bus Bar
2. Circuit Breaker - 5A
3. Rheostat
4. Instrument Lights
5. Compass Light

OPTIONAL INSTRUMENT LIGHTS CIRCUIT
TD-534 thru TD-707



1. Bus Bar
2. Circuit Breaker - 5A
3. Rheostat
4. Instrument Lights
5. Compass Light

OPTIONAL INSTRUMENT LIGHTS
TD-708 and after

PERIODIC INSPECTION GUIDE

100-HOUR INSPECTION GUIDE

NOTE

This inspection procedure meets the intent of FAR 91.217 (b) (4).

The owner or operator is primarily responsible for maintaining the airplane in an airworthy condition, including compliance with all applicable Airworthiness Directives as specified in Part 39 of the Federal Aviation Regulations. It is further the responsibility of the owner or operator to ensure that the airplane is inspected in conformity with the requirements of Parts 43 and 91 of the Federal Aviation Regulations. Beech Aircraft Corporation has prepared this inspection guide to assist the owner or operator in meeting the foregoing responsibilities. This inspection guide is not intended to be all-inclusive, for no such guide can replace the good judgment of a certified airframe and powerplant mechanic in the performance of his duties. As the one primarily responsible for the airworthiness of the airplane, the owner or operator should select only qualified personnel to maintain the airplane.

The time periods for the inspections noted in this schedule are based on normal usage under average environmental conditions. Airplanes operated in extremely humid tropics, or in exceptionally cold, damp climates, etc., may need more frequent inspections for wear, corrosion, lubrication, and/or lack of maintenance. Under these adverse conditions, perform periodic inspections in compliance with this guide at more frequent intervals until the operator can set his own inspection periods based on the contingencies of field experience. A 100-hour inspection MUST be accomplished within each 12-month period for compliance with the Federal Aviation Regulations. To the extent that the airplane is operated in excess of 100 hours per year, Beech Aircraft Corporation strongly recommends that the airplane be inspected at 100-hour intervals rather than annually. The 100-hour interval between performance of the procedures specified herein should NEVER be exceeded by more than 10 hours, and then only if the additional time is required to reach a place where the inspection can be satisfactorily accomplished.

While this guide may be used as an outline, detailed information of the many systems and components in the airplane will be found in the various sections of this shop manual and the pertinent vendor publications. It is also recommended that reference be made to the applicable maintenance handbooks, service instructions, service letters, service bulletins, installations instructions, and vendor's specifications for torque values, clearances, settings, tolerances, and other requirements. It should further be verified that all interior and exterior placards are legible and in place during the inspection. In the final analysis, it is the responsibility of the owner or operator to ensure that the airframe and powerplant mechanic inspecting the airplane has access to the previously noted documents as well as to this inspection guide.

NOTE

In addition to the inspections prescribed by this schedule, the altimeter system and all ATC transponders MUST be tested and inspected at 24-month intervals in compliance with the requirements specified in FAR Parts 91.170 and 91.177 under Title 14 of the Code of Federal Regulations.

Additional 100-hour inspection guides may be obtained under Part Number 95-590026B or subsequent.

MODEL 95 100-HOUR INSPECTION

OPERATION INSPECTION

1. Engine controls
2. Boost pump fuel pressure
3. Oil Pressure and temperature
4. Fuel pressure
5. All lights
6. Fuel quantity gages
7. Fuel tank selectors
8. Heat and ventilating system
9. Vacuum system
10. Generator/Alternator output
11. Propeller governor
12. Magnetos
13. Idle RPM and mixture
14. Cylinder head temperature
15. Feather propellers
16. Idle cut-off
17. Ignition Switch - Rotate the ignition switch through the OFF position to the extreme limit of its travel, if the engine stops firing the switch is normal. If the engine continues to run with the switch held in the past OFF position refer to Bendix Service Bulletin No. 583 dated February, 1976
18. Starters
19. Flaps
20. Pitot heat
21. Stall warning
22. Power check
23. Induction heat
24. Gyros

POWER PLANT

1. Service oil screens
2. Drain carburetor bowls (when installed)
3. Clean fuel strainers
4. Induction air filters
5. Vacuum regulator
6. Magnetos
7. Spark plugs
8. Engine cylinders and baffles
9. Exhaust and induction systems (Refer to Service Instructions No. 0166-258)
10. Induction air valves
11. Electrical wiring and equipment
12. Plumbing
13. Engine controls
14. Engine accessories
15. Engine mounts
16. Cowl flaps and actuators
17. Propellers
18. Starter gears
19. Cowling
20. Generator/Alternators
21. Ignition harness
22. Drain valves
23. Fuel injection nozzles (when installed)

REAR FUSELAGE AND EMPENNAGE

1. Skin
2. Structure
3. Cables and pulleys
4. Assist step and assist step bungee (when installed)
5. Drain static line
6. Empennage structure
7. Empennage surfaces
8. Rudder operation
9. Elevator operation
10. Trim tabs operation
11. Static ports
12. Rudder & elevator trim tab end play inspection

CABIN SECTION

1. Skin
2. Structure
3. Cables and pulleys
4. Landing gear gearbox
5. Flap motor and drives
6. Fuel selector valves
7. Brake system
8. Rudder pedal
9. Control column
10. Instrument plumbing and wiring
11. Instrument filters
12. Engine controls
13. Windows and cabin door
14. Seat belts and seats
15. Electrical wiring and equipment
16. Emergency exit hatch - Inspect the emergency exit hatch seal and latching mechanism for condition, security of attachment, and proper operation.

NOSE SECTION

1. Skin
2. Structure
3. Heater fuel system
4. Heater ducting and wiring
5. Heater iris valve
6. Brake reservoir
7. Battery and battery drain
8. Electrical wiring and equipment

WINGS

1. Skin
2. Structure (Refer to Service Instructions No. 0514-035)
3. Access doors
4. Cables
5. Ailerons
6. Navigation lights
7. Landing lights
8. Fuel tanks and vents (Refer to Service Instruction No. 0632-280 Rev I or subsequent)
9. Liquidometers
10. Plumbing
11. Electrical wiring and equipment

WINGS (Cont'd)

12. Leading edge wiring and plumbing
13. Flaps and actuators
14. **Wing bolts
15. Aileron and trim tab controls (when installed)
16. Boost pumps
17. Fuel strainers
18. Aileron trim tab end play inspection

NACELLES

1. Skin
2. Structure
3. Electrical wiring and equipment
4. Propeller accumulators
5. Plumbing
6. Engine controls

MAIN GEAR AND BRAKES

1. Brake lining and discs
2. Wheels and tires
3. Landing gear strut
4. Gear doors and linkage
5. Retract mechanism

NOSE GEAR

1. Wheel and tire
2. Landing gear strut
3. Retract rod ends

NOSE GEAR (Cont'd)

4. Doors and linkage
5. Shimmy dampener
6. Retract mechanism

***MAIN GEAR RETRACTION**

1. Doors
2. Position lights
3. Warning horn
4. Uplock cable tension
5. Uplock rollers
6. Safety switch
7. Emergency extension
8. Downlock tension
9. Strut fluid level
10. General operation

***NOSE GEAR RETRACTION**

1. Doors
2. Visual indicator
3. Nose gear up tension
4. Assist step (when installed)
5. Downlock tension
6. Strut fluid level

GENERAL

1. Aircraft cleaned and serviced
2. Aircraft lubricated

* First 100 hours and every 200 hours thereafter, place the airplane jacks and cycle the landing gear while checking to ascertain that the position lights switches operate in conjunction with the landing gear position. Check condition and operation of complete landing gear system.

** Check the wing bolts for proper torque at the first 100 hour inspection or at the first 100 hour inspection after a wing has been installed. Refer to the Shop Manual for torque values and procedures.

OVERHAUL OR REPLACEMENT SCHEDULE

The first overhaul or replacement should be performed not later than the required period. The condition of the item at the end of the first period can be used as a criterion for determining subsequent periods applicable to the individual airplane or fleet operation, providing the operator has an approved monitoring system.

The time periods for inspection noted in this handbook are based on average usage and average environmental conditions.

SPECIAL CONDITIONS CAUTIONARY NOTICE

Airplanes operated for Air Taxi or other than normal operation and airplanes operated in humid tropics or cold and damp climates, etc., may need more frequent inspections for wear, corrosion and/or lack of lubrication. In these areas periodic inspections should be performed until the operator can set his own inspection periods based on experience.

NOTE

The required periods do not constitute a guarantee that the item will reach the period without malfunction, as the aforementioned factors cannot be controlled by the manufacturer.

NOTE

"On Condition" items are to be overhauled or replaced when inspection or performance of these items reveal a potentially unsafe or unserviceable condition.

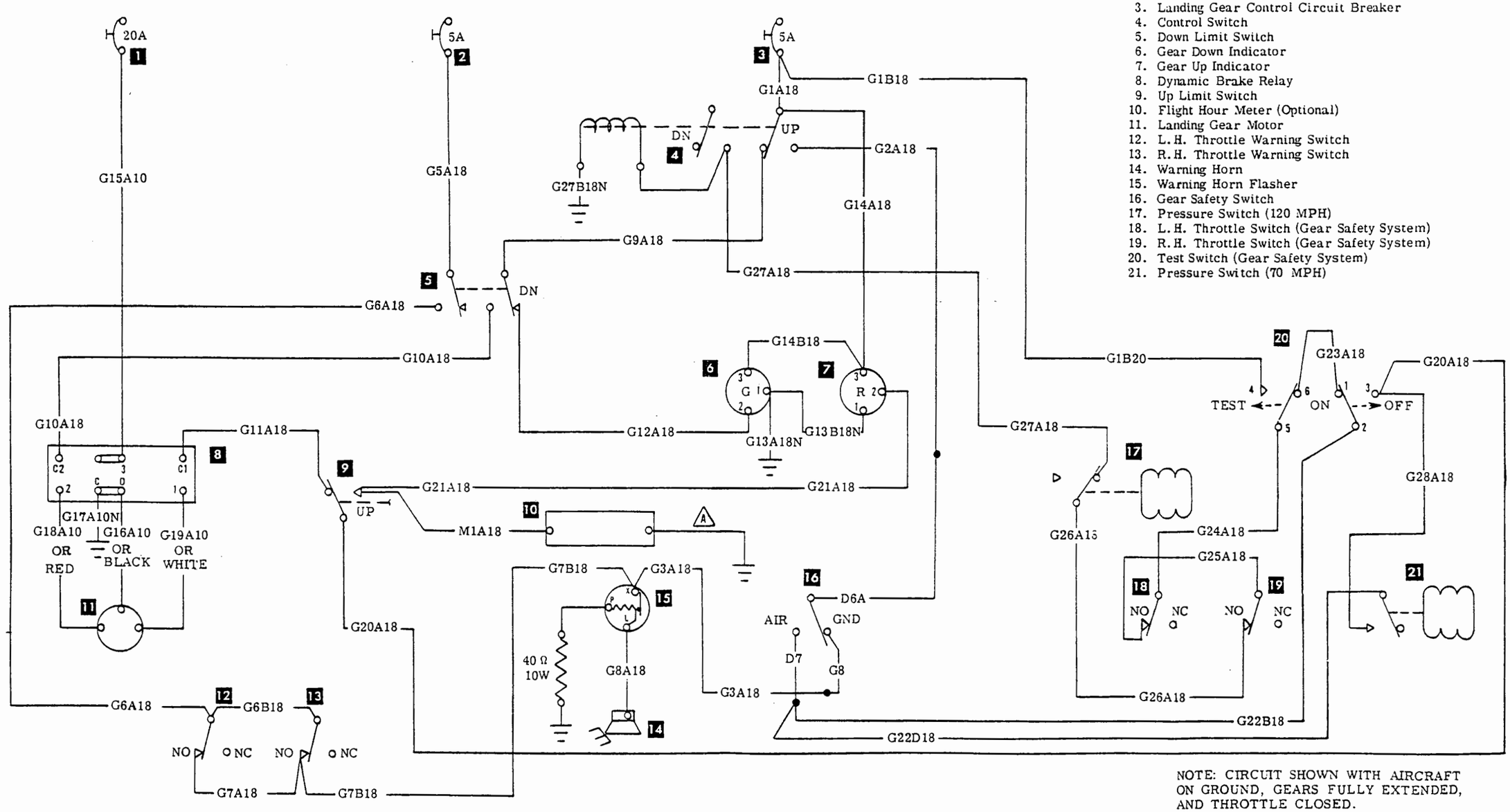
OVERHAUL AND REPLACEMENT SCHEDULE

ITEM	OVERHAUL OR REPLACE
LANDING GEAR	
Main gear	Every 2000 hours
Nose gear	Every 2000 hours
Actuator assembly	Every 2000 hours
Retract motor	Every 2000 hours
Retract motor brushes	On condition
Shimmy dampener	On condition
Wheels and tires	On condition
Brake assembly	On condition
Master cylinder	On condition
Shuttle valve assembly	On condition
Parking brake valve	On condition
All hose	On condition
POWER PLANT	
Engine	*2000 - O-360 Engine *1400 - IO-360 Engine
Engine controls	On condition
Exhaust system	On condition
Starter	Inspect at engine overhaul and overhaul or replace on condition
Generator or alternator	On condition
Oil cooler	Engine overhaul
Propeller	1200 hours
Propeller governor	1200 hours or at engine change due to internal engine failure.
Vacuum or pressure pumps	1200 hours
	*See Lycoming Service Instructions 1009T or later revisions as applicable

ITEM	OVERHAUL OR REPLACE
FLAPS AND FLIGHT CONTROLS	
Flight controls	On condition
Aileron tab actuator	On condition
Elevator tab actuator	On condition
Rudder tab actuator	On condition
Flap motor and drives	Every 2000 hours
Flap motor brushes	On condition
Flap gear box	Every 2000 hours
Flap actuators	Every 2000 hours
Flap flexible shaft	Every 2000 hours
FUEL SYSTEM	
Fuel cells	On condition
Fuel quantity transmitter	On condition
Fuel drain valve	On condition
Fuel system check valves	On condition
Fuel selector valve	Inspect every 600 hours Overhaul every 1200 hours
Fuel boost pump	Overhaul 1200 hours
All hose	On condition
INSTRUMENTS	
Turn and slip indicator	On condition
Altimeter	Every 24 months per FAA Directive
Directional gyro	On condition
Gyro horizon	On condition
Suction gage	On condition
Engine gage units	On Condition
Manifold pressure	On condition

ITEM	OVERHAUL OR REPLACE
INSTRUMENTS (CONT'D)	
Airspeed	On condition
Rate-of-climb	On condition
Fuel pressure	On condition
Fuel flow	On condition
Tachometer	On condition
Flap position indicator	On condition
All hose	On condition
Instrument filter (central)	500 hours
ELECTRICAL SYSTEM	
Landing Gear Selector Switch (TD-534 and after)	1200 hours - Replace
Landing gear dynamic brake relay	On condition
Battery master relay	On condition
Paralleling relay	On condition
All other relays	On condition
Voltage regulator	On condition
Heater vibrator points	Every 2000 hours of heater operation
Starter	Inspect at engine overhaul and overhaul or replace on condition
Starter relay	On condition
Generator or alternator	On condition
UTILITY SYSTEM	
Cabin heater	Overhaul every 500 hours of heater operation.
Heater igniter and plug	On condition
Heater fuel pump	On condition
Heater fuel shutoff valve	On condition
Deicer regulator	On condition

ITEM	OVERHAUL OR REPLACE
	UTILITY SYSTEMS (CONT'D)
Deicer cycling valve	On condition
Deicer reservoir	On condition
Vacuum regulator	On condition
Propeller anti-ice pump	On condition
Oxygen regulator	Every 2000 hours or 48 months
Oxygen cylinder	Hydrostatically test every 5 years; no replacement duration (ICC Regulation)
Oxygen cylinder (lightweight)	Hydrostatically test every 3 years, replace every 24 years or 4,380 refills (ICC Regulation)
All hose	On condition
	MISCELLANEOUS
Wing Bolts	Replace 10 Years After Initial Inspection or On Condition. See Section 4.

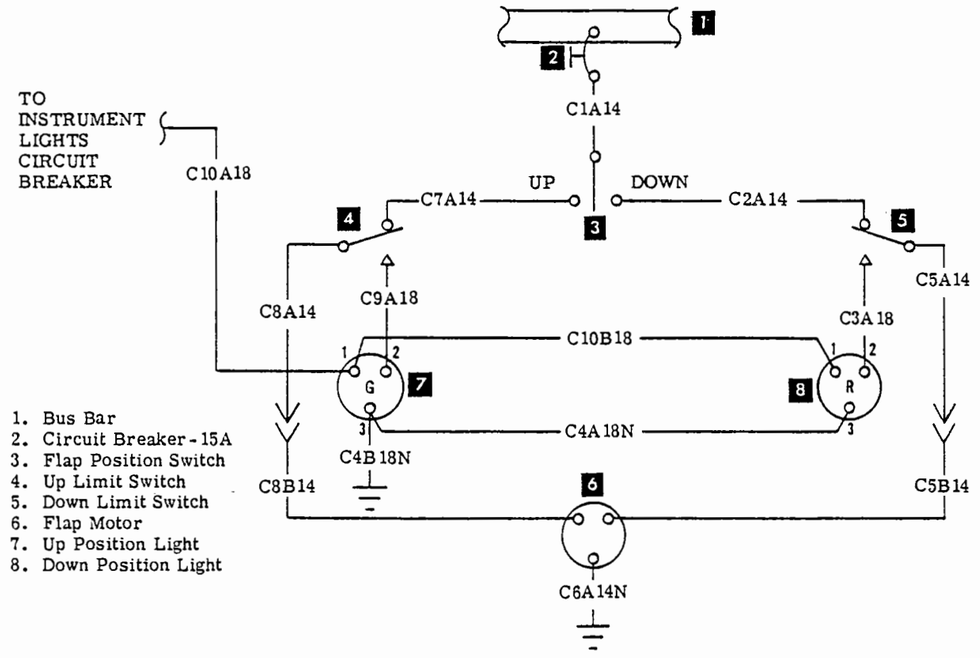


1. Landing Gear Motor Circuit Breaker
2. Throttle Warning Circuit Breaker
3. Landing Gear Control Circuit Breaker
4. Control Switch
5. Down Limit Switch
6. Gear Down Indicator
7. Gear Up Indicator
8. Dynamic Brake Relay
9. Up Limit Switch
10. Flight Hour Meter (Optional)
11. Landing Gear Motor
12. L.H. Throttle Warning Switch
13. R.H. Throttle Warning Switch
14. Warning Horn
15. Warning Horn Flasher
16. Gear Safety Switch
17. Pressure Switch (120 MPH)
18. L.H. Throttle Switch (Gear Safety System)
19. R.H. Throttle Switch (Gear Safety System)
20. Test Switch (Gear Safety System)
21. Pressure Switch (70 MPH)

NOTE: CIRCUIT SHOWN WITH AIRCRAFT ON GROUND, GEARS FULLY EXTENDED, AND THROTTLE CLOSED.

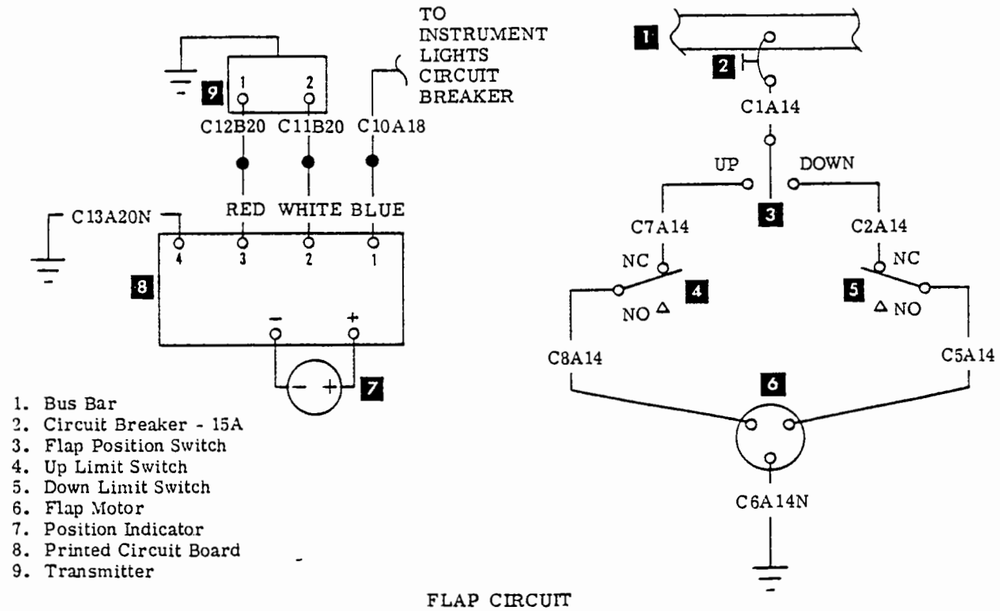
Ⓐ WIRE FURNISHED WITH LIGHT

LANDING GEAR AND THROTTLE WARNING CIRCUIT
(WITH SAFETY SYSTEM) OPTIONAL
TD-680 and after



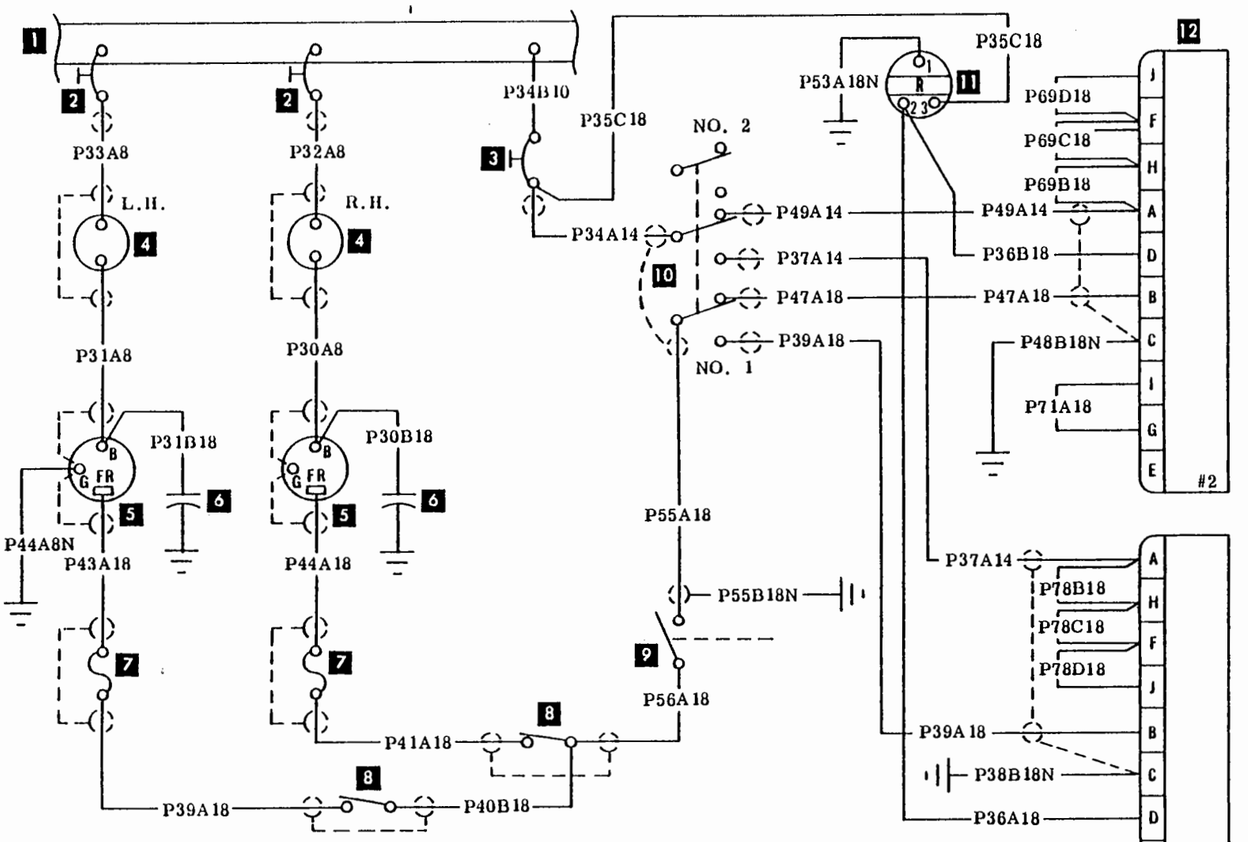
1. Bus Bar
2. Circuit Breaker - 15A
3. Flap Position Switch
4. Up Limit Switch
5. Down Limit Switch
6. Flap Motor
7. Up Position Light
8. Down Position Light

FLAP CIRCUIT



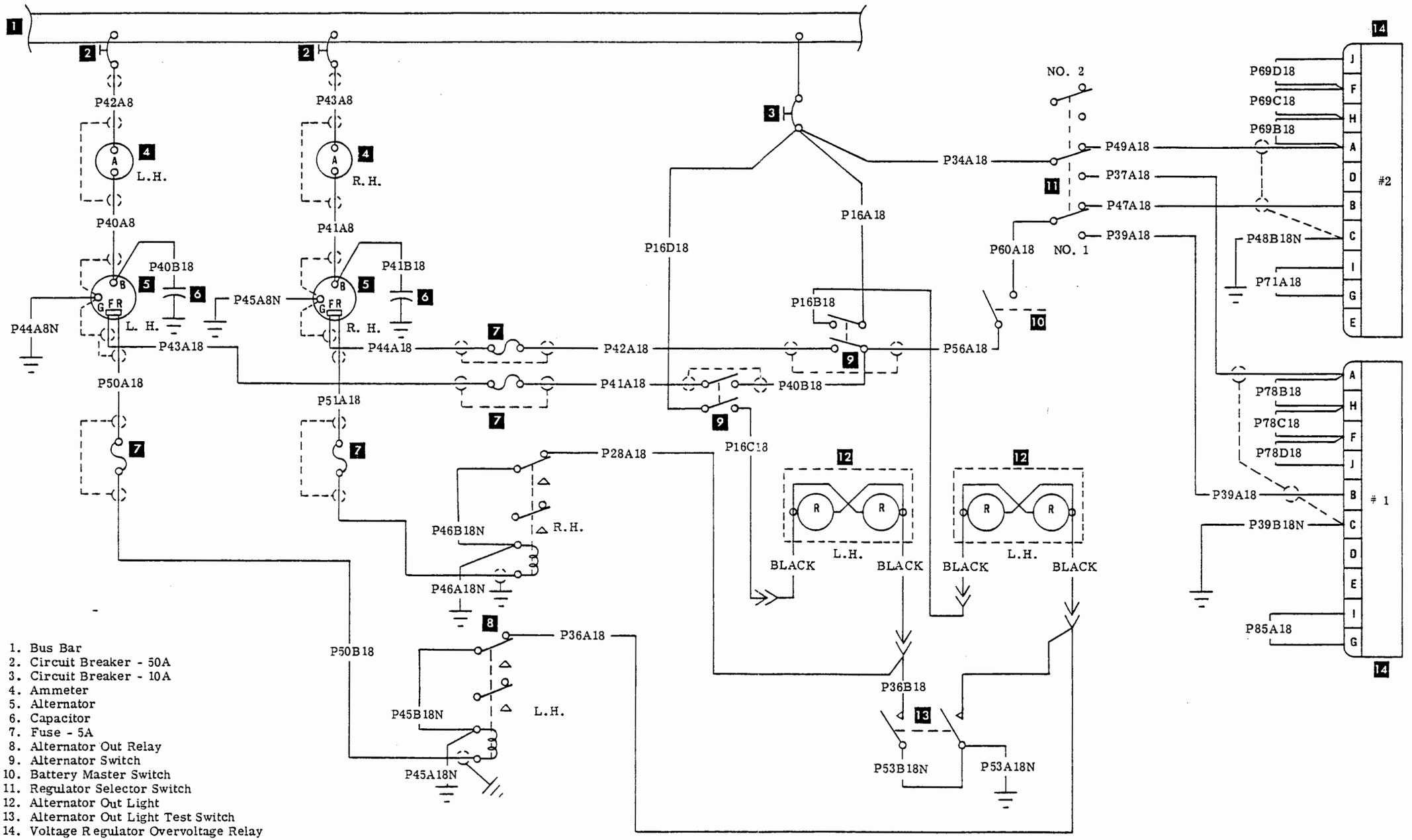
1. Bus Bar
2. Circuit Breaker - 15A
3. Flap Position Switch
4. Up Limit Switch
5. Down Limit Switch
6. Flap Motor
7. Position Indicator
8. Printed Circuit Board
9. Transmitter

FLAP CIRCUIT
TD-668 and after



1. Bus Bar
2. Circuit Breaker - 50A
3. Circuit Breaker - 10A
4. Ammeter
5. Alternator
6. Capacitor
7. Fuse
8. Alternator Switch
9. Master Battery Switch
10. Regulator Select Switch
11. Overvoltage Warning Light
12. Voltage Regulator Overvoltage Relay

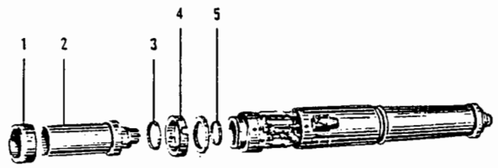
ALTERNATOR CIRCUIT OPTIONAL
TD-706 thru TD-707



1. Bus Bar
2. Circuit Breaker - 50A
3. Circuit Breaker - 10A
4. Ammeter
5. Alternator
6. Capacitor
7. Fuse - 5A
8. Alternator Out Relay
9. Alternator Switch
10. Battery Master Switch
11. Regulator Selector Switch
12. Alternator Out Light
13. Alternator Out Light Test Switch
14. Voltage Regulator Overvoltage Relay

ALTERNATOR CIRCUIT OPTIONAL
TD-708 and after

put in use by adding a 20 gage jumper wire between terminals "A" and "B" on the heater ignition unit (see wiring diagram). On Aircraft prior to TD-534, and beginning with TD-708 and after, the change-over to the alternate set of points is accomplished by a point selector switch located below the left instrument panel. When the alternate set of points has been used for 1000 hours of heater operation, replace the vibrator. Failure to switch to the alternate set of points at 1000 hours may make the alternate set of points inoperative.



1. Retaining Ring
2. Vibrator
3. Radio Noise Shield
4. Support Collar
5. O-ring Packing

Figure 3-13. Ignition Unit Assembly

REPLACING IGNITION VIBRATOR

a. Remove the safety wire and the vibrator retaining ring (1).

b. Remove the vibrator (2) and radio noise shield (3).

NOTE

Be careful that "O" ring packing (5) does not drop out of place while replacing the vibrator.

c. Install new vibrator (2) with radio noise shield (3).

d. Install the vibrator retaining ring (1).

e. Safety wire the retaining ring to one of the screws in the vibrator support collar (4).

HEATER SOLENOID VALVE

Check the valve operation by connecting a 24-volt DC power source with an ammeter with a 0-1 ampere range in the line. Turn the power on and off several times. The valve should draw 0.26 amperes current and click when the valve opens.

To check for valve leakage, apply 35 psi air pressure to the inlet end of the valve and submerge the outlet end in water (check direction of flow arrow on valve). If the valve leaks more than 20 bubbles per minute, clean the valve and recheck.

To clean the valve, wipe all parts with a soft cloth saturated with solvent, making sure that no solvent gets into the electrical parts. Inspect the plunger cap, seal and spring. Replace these parts if worn or damaged. Blow out the valve body with compressed air before reassembling.

CLEANING THE HEATER

a. Cleaning the Combustion Chamber and Radiator Assembly. Either of the two following methods may be used to clean the combustion chamber:

1. Soak the combustion chamber and radiator assembly in an Oakite M-3 stripper solution for 10 hours. The solution is made by mixing one pound of Oakite (Oakite Products, Inc., 22 Thames Street, New York 6, New York) with each gallon of water used. The solution should be maintained at a temperature between 190 to 210 degrees Fahrenheit during the soaking period. Flush the heater thoroughly with water after it is removed from the Oakite solution.

2. Use a stainless steel brush or sandblast to remove any accumulation of carbon or other foreign material from the inside of the combustion chamber. Clean thoroughly with compressed air.

b. Cleaning the Spray Nozzle.

1. Disassemble the spray nozzle by unscrewing the fuel strainer and two piece core from the nozzle body.

2. Clean the parts in Stoddard solvent.

3. If soaking fails to thoroughly clean the parts, scrub them with a soft, non-metallic brush.

4. The grooves in the core and orfice in the body, may be cleaned with a soft pointed piece of wood.

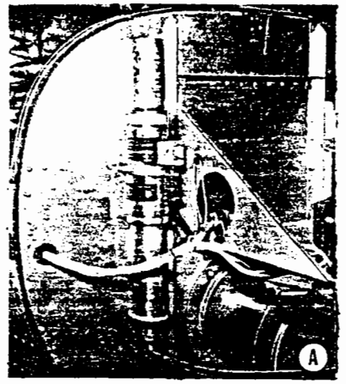
NOTE

Do not use a metal tool for cleaning the parts as it will alter the flow characteristics of the nozzle.

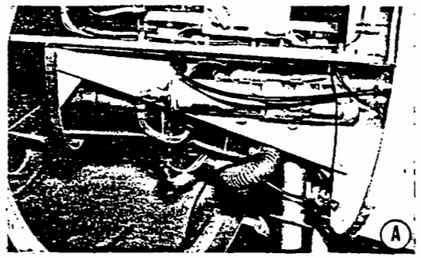
5. When reassembling the spray nozzle, tighten the core with a screwdriver and the strainer with the fingers.

COMBUSTION CHAMBER AND RADIATOR INSPECTION

a. Slight scaling and discoloration of the combustion chamber and radiator assembly is a normal condition on heaters that have been in use. The scale will be mottled and a blue powder can be rubbed off of the scaled areas. This does not constitute ground for rejecting the heater since considerable life can still be expected if there are no soft spots in the metal where it has been subjected to severe overheating.

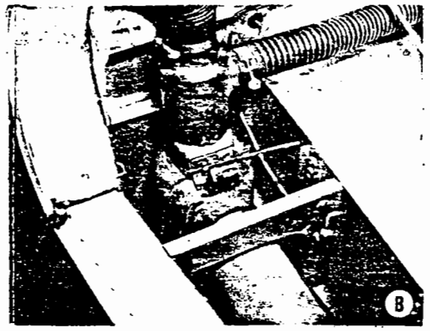


(Airplane Serials TD-1 thru TD-452)



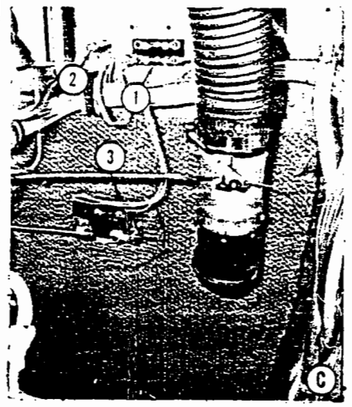
(Airplane Serials TD-453 and after)

IGNITOR



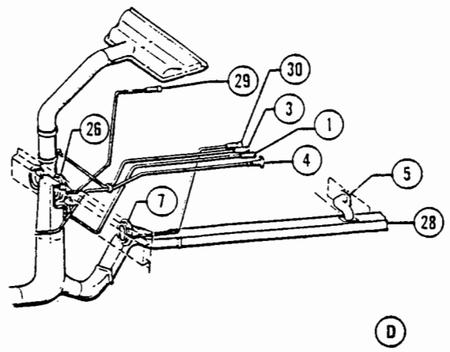
HEATER THERMOSTAT

(Airplanes prior to Serial TD-453)



1. **FUSES**
2. **RESISTOR**
3. **HEATER THERMOSTAT**

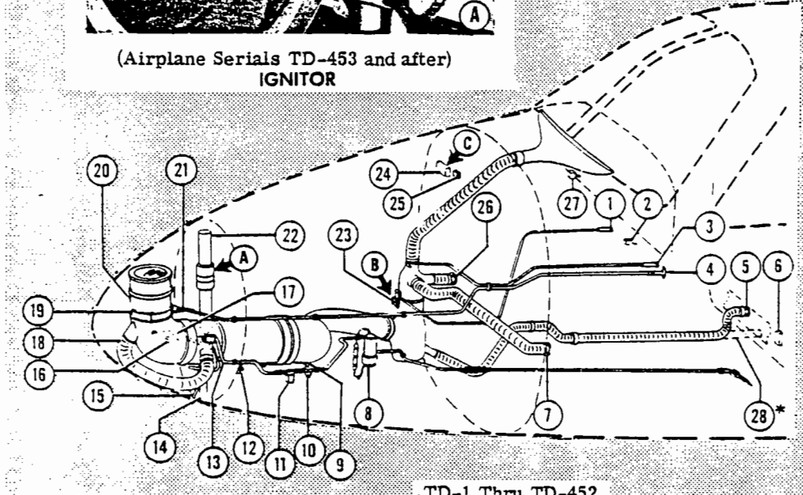
(Airplane Serials TD-453 and after)



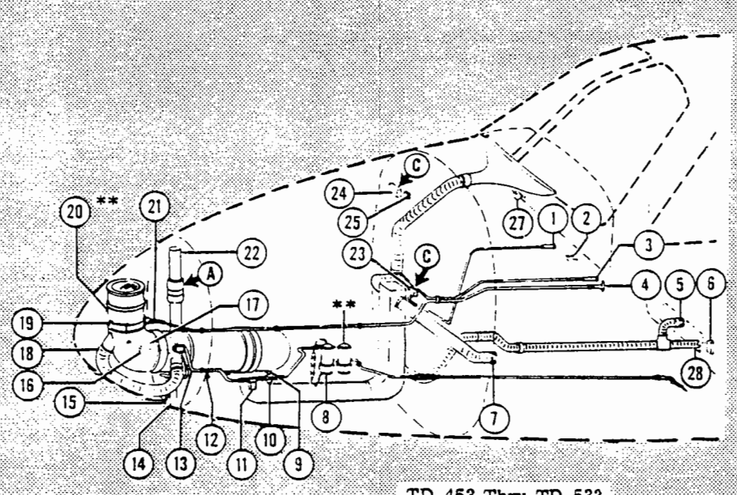
DEFROST AND HEAT DUCTS

Airplane Serials TD-638 and after

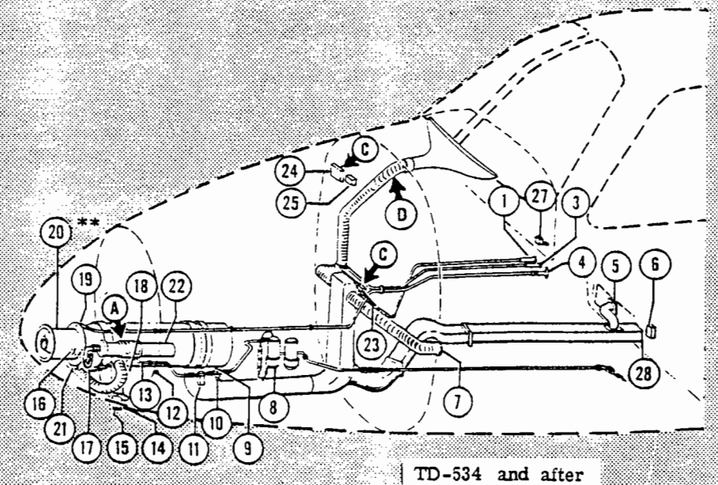
1. Temperature Control
2. Alternate Points-Switch
3. Defroster Control
4. Iris Valve Control
5. Rear Seat Outlet
6. Heater and/or Blower Switch
7. Pilots Outlet
8. Heater Fuel Pump
9. Overheat Thermostat (300°F)
10. Heater Fuel Strainer
11. Solenoid Valve
12. Heater Overboard Fuel Line
13. Combustion Fuel Inlet Line
14. Heater Exhaust
15. Heater Shroud Drain
16. Heater Spark Plug
17. Heater Ignition Lead Assy.
18. Combustion Air Intake Duct
19. Iris Valve
20. Intake Blower Assembly
21. Heater Safety Switch
22. Ignition Assembly
23. Heater Duct Thermostat
24. Overheat Fuse
25. Heater Resistor
26. Copilots Outlet
27. Cabin Heat Circuit Breaker
28. Rear Seat Outlet
29. Copilots Outlet Control
30. Pilots Outlet Control



TD-1 Thru TD-452



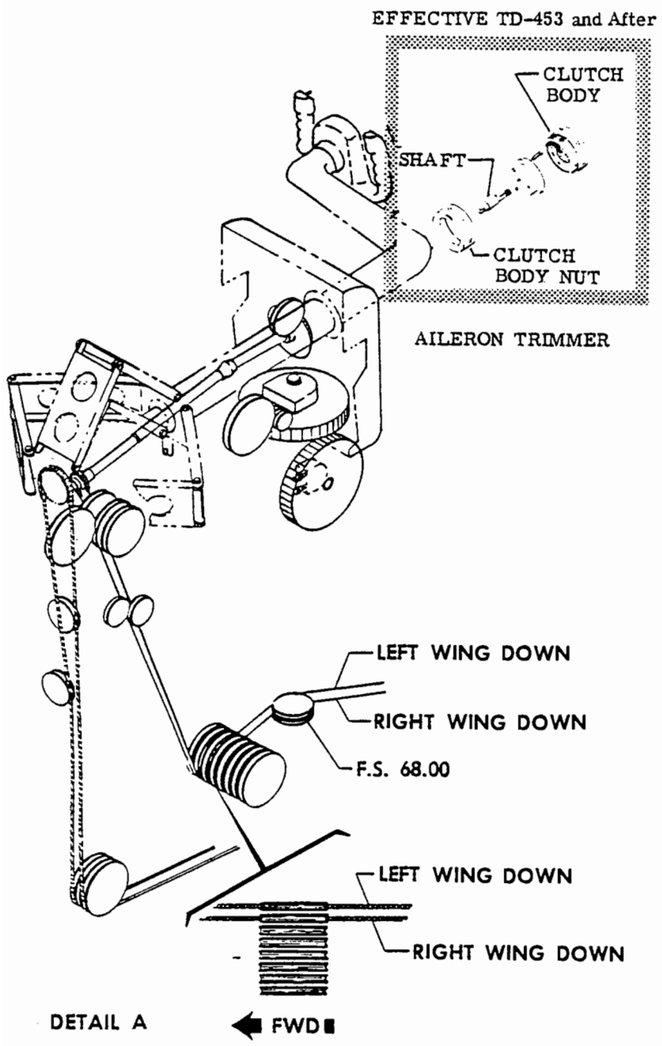
TD-453 Thru TD-533

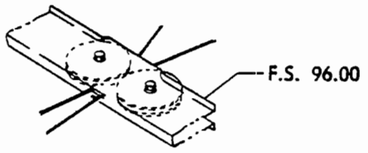


TD-534 and after

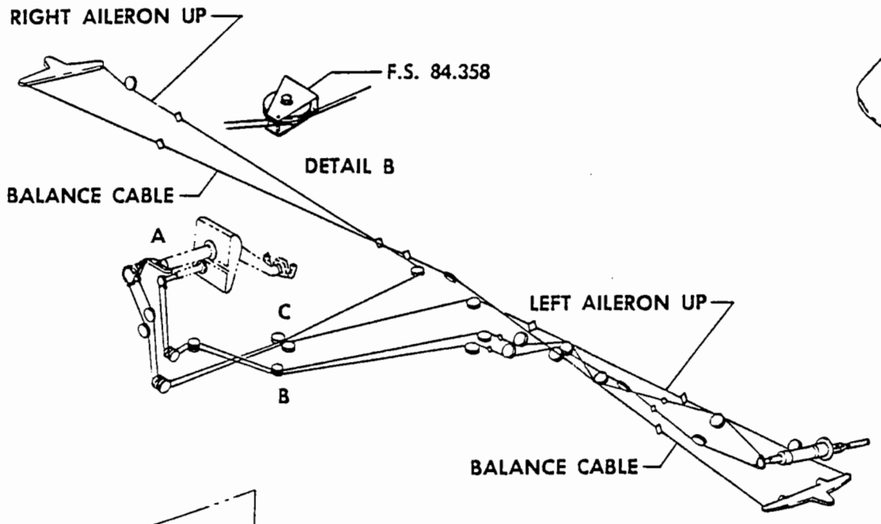
*Airplane Serials TD-303 and after
**Optional Installation Airplanes Serials TD-453 and after

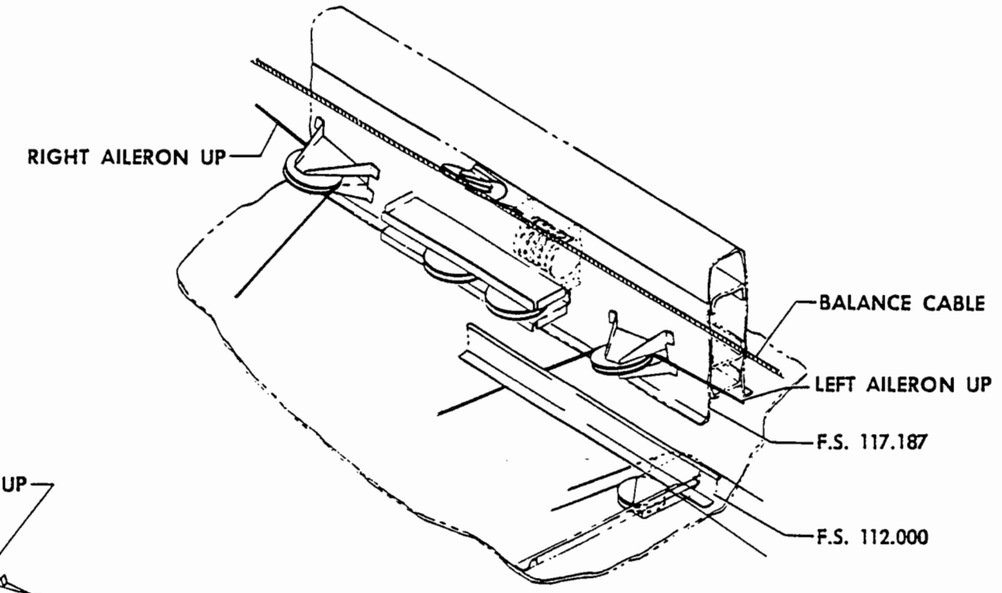
Figure 3-14. Heat and Vent System

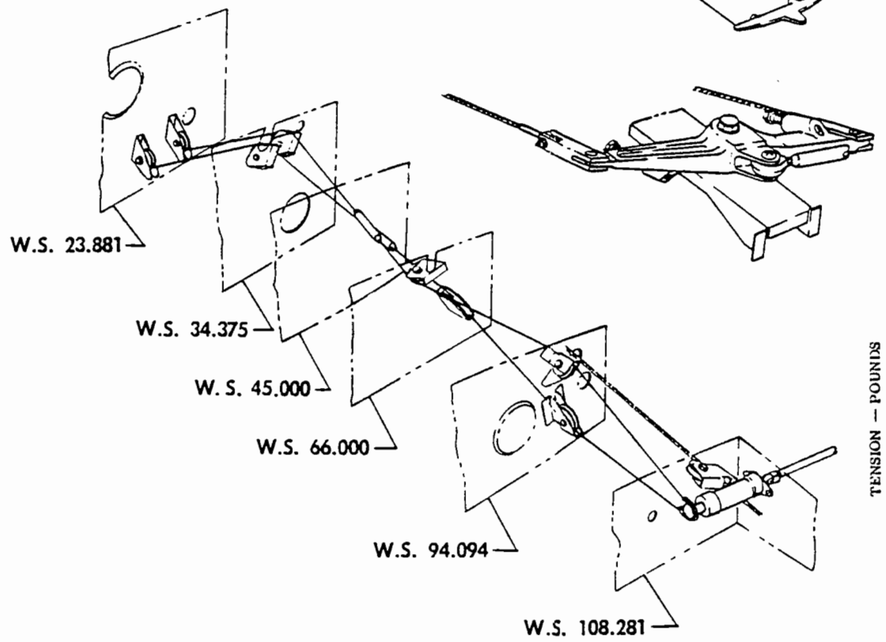




DETAIL C







NOTE: RIG AUTOPILOT SERVO CABLES AFTER RIGGING BASIC CABLES.

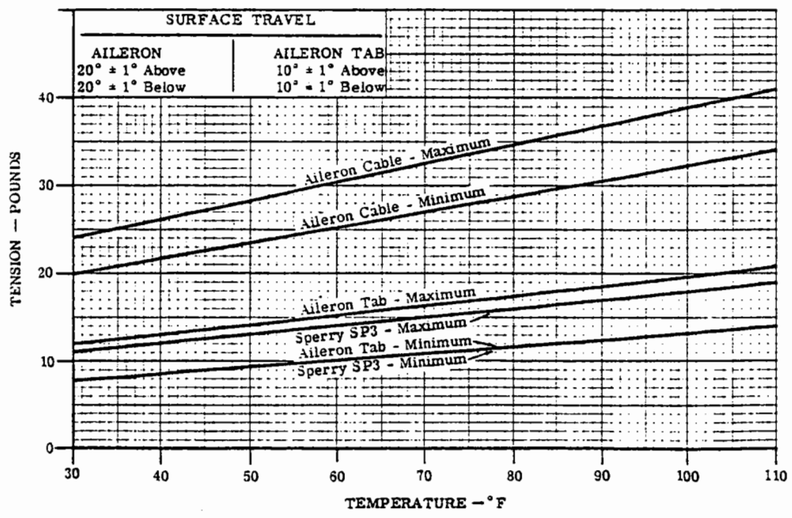


Figure 3-5. Rigging the Aileron Control System

in attaching bracket on overhead structure. On airplanes equipped with spring adjustment straps, attach spring to adjusting strap and secure strap to attaching bracket.

c. Employing a hand force gage on the control wheel, check for the correct force (refer to the elevator down spring loads given above).

d. Omit, readjust, or install adjusting straps, as necessary, to obtain the above readings.

RIGGING WING FLAP CONTROL SYSTEM

The flap travel is adjusted by moving the limit switches. The left flap is rigged first and then the right flap is synchronized with it. Rig as follows:

a. Adjust the up limit switch so the flap will stop approximately 3/32 inch from the forward portion of the slot on the inboard flap track.

b. Adjust the down limit switch to obtain the correct flap travel: 33° + 0° − 2° for aircraft prior to TD-303, 28° + 0° − 1° for aircraft TD-303 thru TD-452, and 28° + 0° − 2° for aircraft TD-453 and after.

c. Remove the bolt attaching the right actuator to the right flap.

d. Turn the jackscrew on the right actuator in or out to align the right flap with the left.

e. Install the bolt connecting the actuator to the flap.

CAUTION

If flaps are removed for any reason the flap actuator switch should be in the "Neutral" position or the Main power switch "OFF".

f. With flap rigged and in the DOWN position, adjust the rubber bumper (if installed) to remove play or vibration of the flap. A distinct change of sound in the flap motor near the completion of the flap UP travel may indicate an excessive outward adjustment of the bumper.

FLAP POSITION INDICATOR AND ADJUSTMENT

On Model D95A Travel Air's, TD-668 and after, a flap position gage is installed in the instrument panel and replaces the flap position indicator lights. The transmitter for the position indicator is installed on the flap actuator in the left wing just forward of the rear spar.

a. Adjust the flap travel limit switches to provide the correct up and down travel of the flaps. (See above.)

b. Run the flaps to the full down position. If the flap position indicator does not read 100% flaps, loosen the transmitter attachment bolts and adjust the transmitter fore and aft or rotate slightly until the reading is correct, then tighten the transmitter attaching bolts.

c. Run the flaps up and check the indicator for up flaps reading.

RIGGING THE AILERON CONTROL SYSTEM

Aileron and flap surfaces must align with upper and lower surfaces of the wing within 1/16 inch.

Aileron and connecting linkage may have a maximum of 1/16 inch lost motion. Check for lost motion at the midpoint of the aileron trailing edge with the bellcrank stationary.

NOTE

On aircraft Serials TD-453 and after, remove the aileron trimmer before rigging the cables.

The aileron is in neutral when its trailing edge aligns with the trailing edge of the wing tip and its inboard end is parallel with the outboard end of the flap. A horizontal misalignment of plus or minus 3/16 inches is allowed between trailing edges of the aileron and wing tip. With the bellcrank parallel to the wing rib, set the aileron in neutral by adjusting the length of the push-pull tube. Loosen the locknuts on both ends and turn the tube to shorten or lengthen.

Tighten securely the locknuts on all rod ends. Rig cables as shown in the diagram. Safety the turnbuckles.

AILERON TRIM TAB END PLAY INSPECTION (EFFECTIVE AIRPLANES PRIOR TO SERIAL TD-453)

a. Adjust the aileron trim tab trailing edge to align with the aileron control surface trailing edge (0° position).

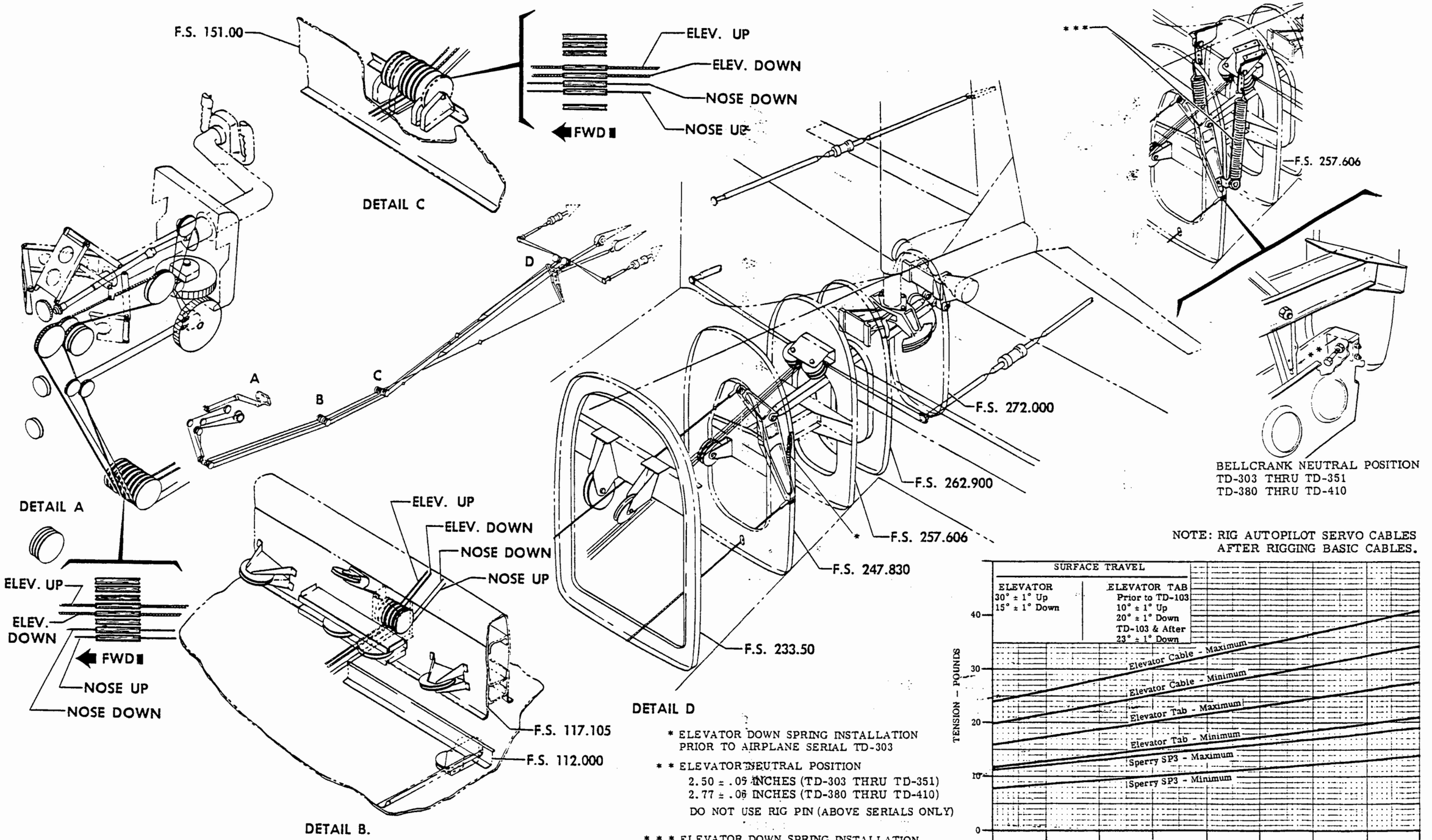
NOTE

Due to servo tab action, ailerons must be in the neutral position for this inspection.

b. Carefully attach a dial indicator to the surface of the aileron, outboard of the tim tab in line with the control surface trailing edge.

c. Zero the indicator while applying 3 lbs. load perpendicular to the tab surface away from the dial indicator at the tab trailing edge aft of the trim tab horn.

d. Without moving the dial indicator, apply 3 lbs. load perpendicular to the tab surface toward the indicator. The reading on the dial indicator is the tab free play, and it should not exceed 0.165-inch.



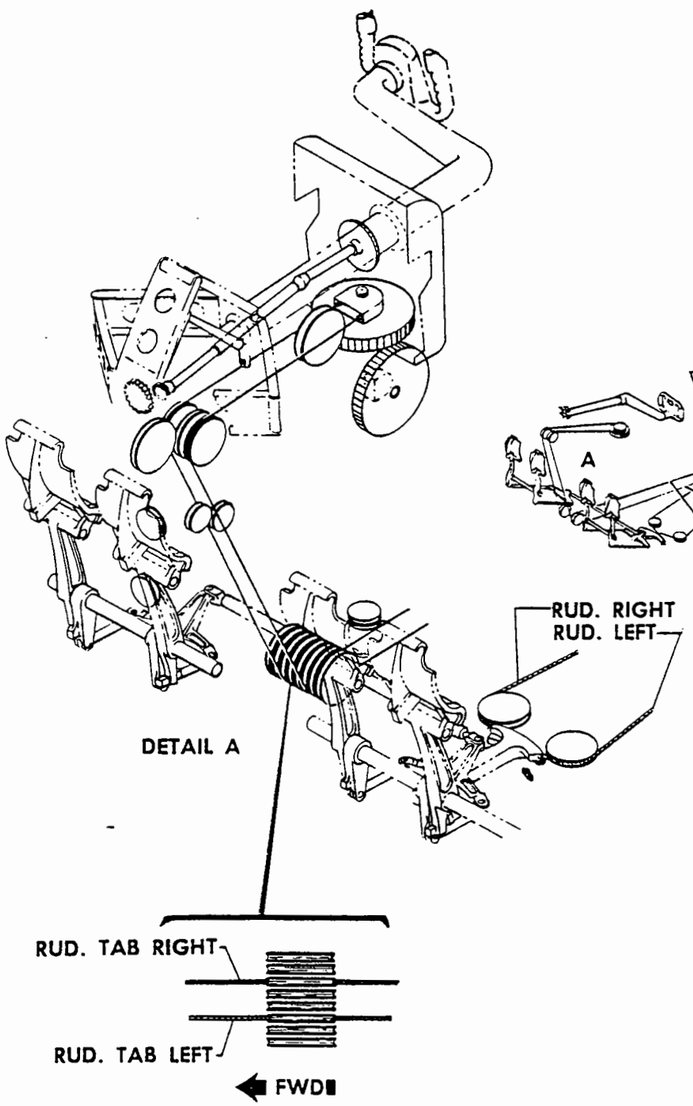
* ELEVATOR DOWN SPRING INSTALLATION PRIOR TO AIRPLANE SERIAL TD-303

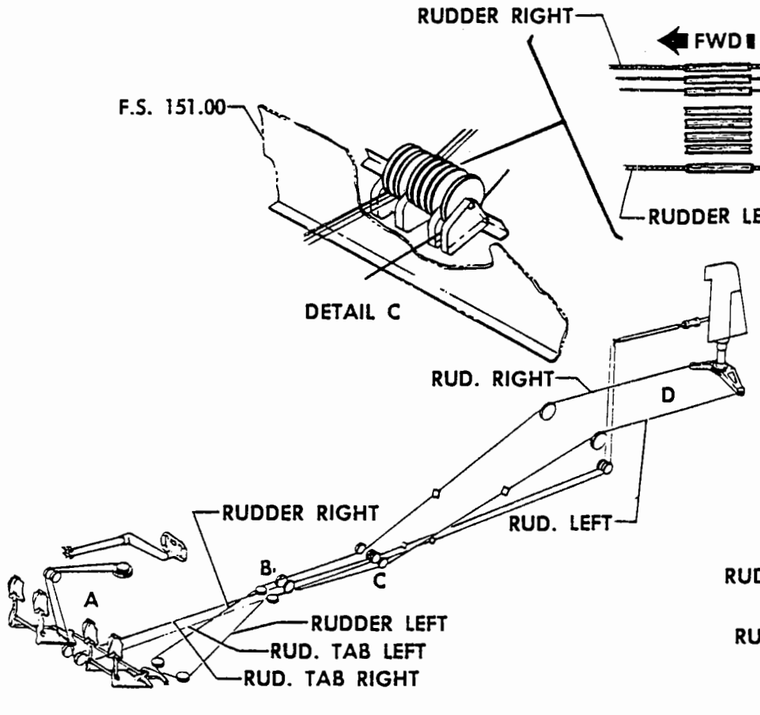
* * ELEVATOR NEUTRAL POSITION
2.50 ± .05 INCHES (TD-303 THRU TD-351)
2.77 ± .05 INCHES (TD-380 THRU TD-410)
DO NOT USE RIG PIN (ABOVE SERIALS ONLY)

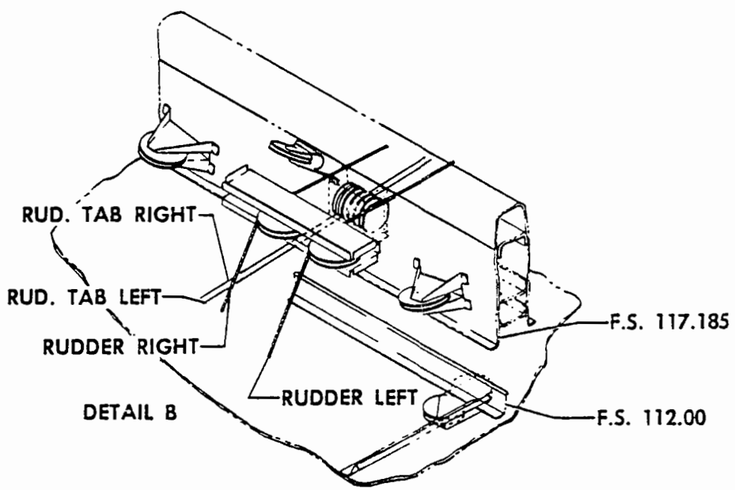
* * * ELEVATOR DOWN SPRING INSTALLATION (TD-303 AND AFTER)

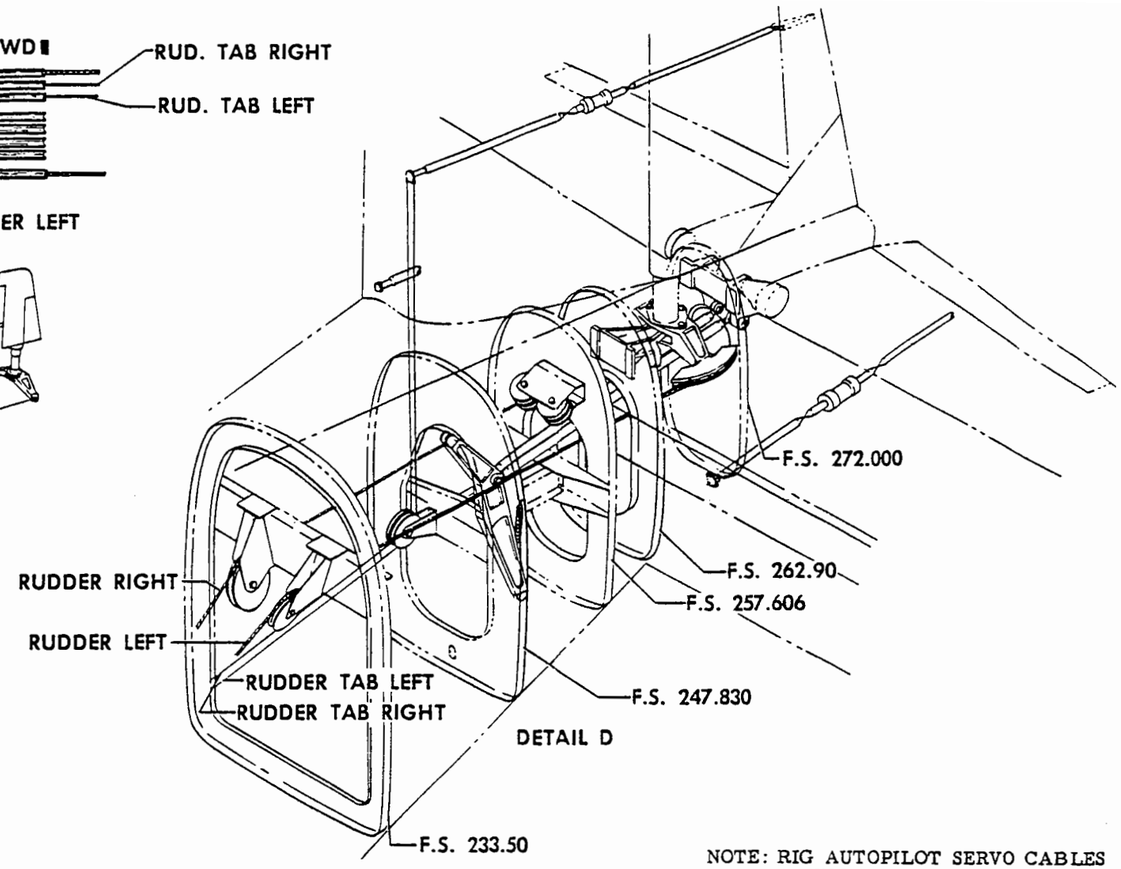
NOTE: RIG AUTOPILOT SERVO CABLES AFTER RIGGING BASIC CABLES.

Figure 3-3. Rigging the Elevator Control System









NOTE: RIG AUTOPILOT SERVO CABLES AFTER RIGGING BASIC CABLES.

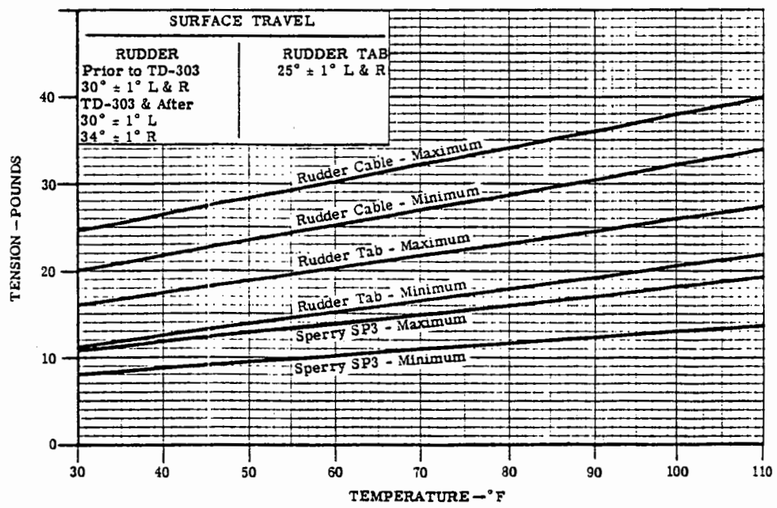
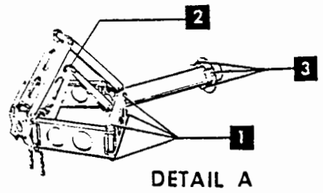
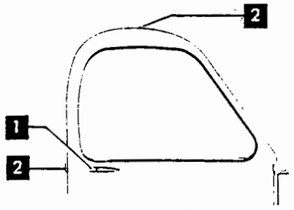


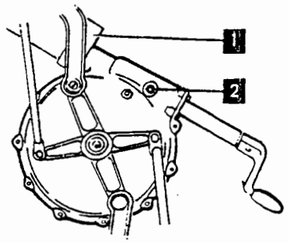
Figure 3-2. Rigging the Rudder Control System



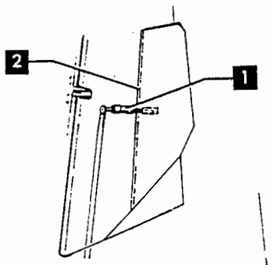
DETAIL A



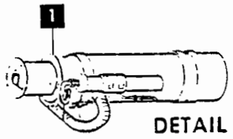
DETAIL B



DETAIL D

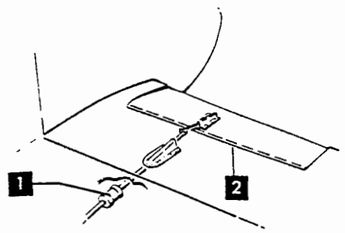


DETAIL G

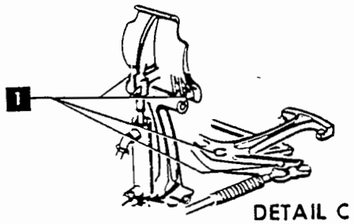


Effective TD-534 and after

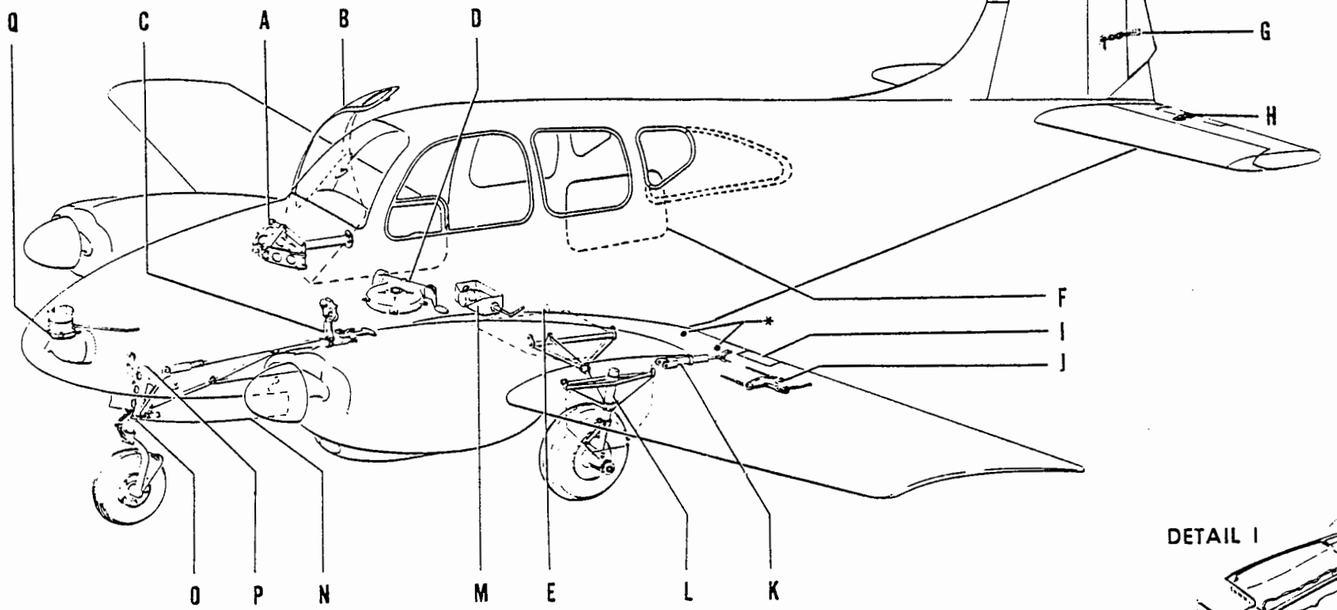
DETAIL Q

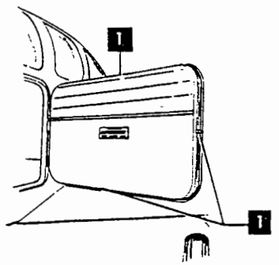


DETAIL H

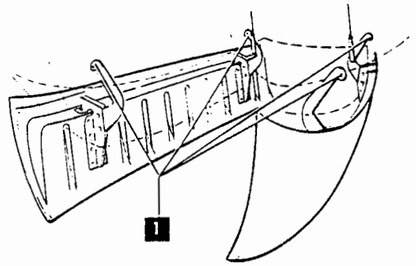


DETAIL C

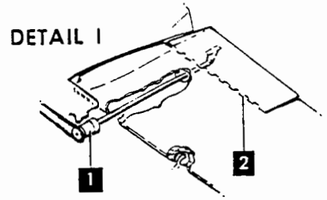




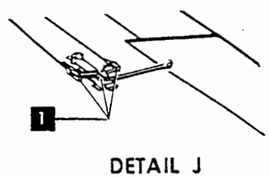
DETAIL F



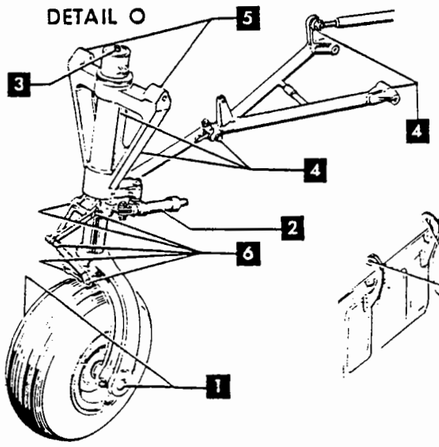
DETAIL N



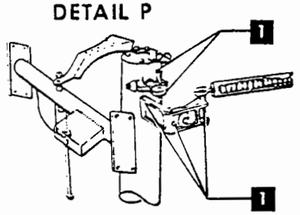
DETAIL I



DETAIL J



DETAIL O



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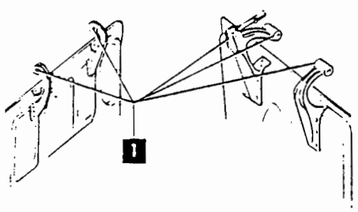

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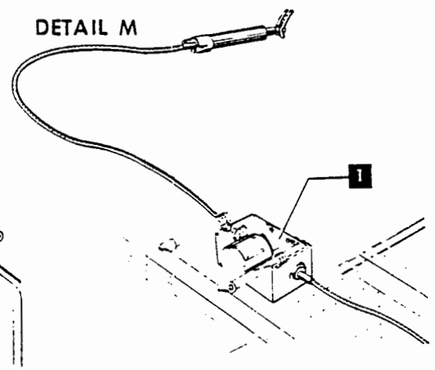
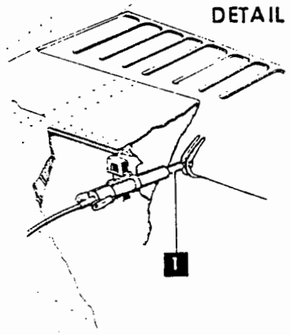
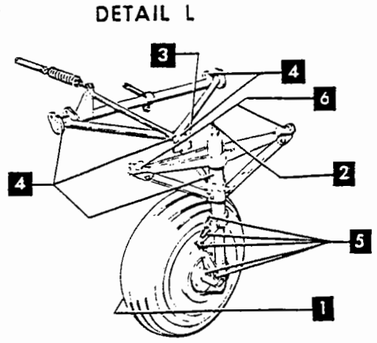


DETAIL M



DETAIL K



DETAIL L

Figure 2-5. Lubrication Diagram

LUBRICATION CHART

ITEM	LOCATION	LUBRICANT	INTERVAL
DETAIL A			
1.	Control column linkage (18)	SAE-20	100 hrs.
2.	Control column head (6)	SAE-20	100 hrs.
3.	Control column aileron link (3)	SAE-20	100 hrs.
DETAIL B			
1.	Door handle (1)	SAE-20	100 hrs.
2.	Door latch (2)	SAE-20	100 hrs.
DETAIL C			
1.	Rudder pedals (8)	SAE-20	100 hrs.
DETAIL D			
1.	Landing gear motor gear box (1)	MIL-G-7711	300 hrs.
2.	Landing gear actuator gear box (1)	Mobile Compound GG	300 hrs.
DETAIL E			
1.	Main gear door hinges (10)	SAE-20	100 hrs.
DETAIL F			
1.	Optional utility baggage door latch mechanism (3)	SAE-20	100 hrs.
DETAIL G			
1.	Rudder trim tab actuator (1)	MIL-G-23827	AR
2.	**Rudder trim tab hinge (1)	MIL-G-6711	100 hrs.
DETAIL H			
1.	Elevator trim tab actuator (1)	MIL-G-23827	AR
2.	**Elevator trim tab hinge (1)	MIL-G-6711	100 hrs.
DETAIL I			
1.	Aileron trim tab actuator (1)	MIL-G-23827	AR
2.	**Aileron trim tab hinge (1)	MIL-G-6711	100 hrs.
DETAIL J			
1.	Aileron bell cranks (6)	SAE-20	100 hrs.
DETAIL K			
1.	Flap actuator (2)	MIL-L-6086 Grade M	300 hrs.
DETAIL L			
1.	Main wheel bearings (4)	MIL-G-3545	100 hrs.
2.	Main shock struts (2)	MIL-H-5606	100 hrs.
3.	Up lock rollers (2)	SAE-20	50 hrs.
4.	Main retract fittings (8)	MIL-G-7711	100 hrs.
5.	Torque knee (12)	MIL-G-7711	100 hrs.
6.	Hinge points (2) prior to TD-352	MIL-G-7711	100 hrs.
DETAIL M			
1.	Flap motor gear box (1)	MIL-G-23827	300 hrs.
DETAIL N			
1.	Nose wheel door hinges (4)	SAE-20	100 hrs.
DETAIL O			
1.	Nose wheel bearings (2)	MIL-G-3545	100 hrs.
2.	Shimmy dampener (1)	MIL-H-5606	100 hrs.
3.	Nose shock strut (1)	MIL-H-5606	100 hrs.
4.	Nose retract fittings (4)	MIL-G-7711	100 hrs.
5.	Hinge points (2) Prior to TD-402	MIL-G-7711	100 hrs.
6.	Torque knees (6)	MIL-G-7711	100 hrs.
DETAIL P			
1.	Nose steering mechanism (5)	MIL-G-7711	100 hrs.
DETAIL Q			
1.	Heater iris valve (1)	MIL-M-7866	AR

NOTES

Precaution should be taken when using MIL-G-23827 and MIL-G-7711, since these greases contain chemicals harmful to painted surfaces.

*Flap track rollers (pre-lubed sealed bearings). Pressure lubricate at 1000 hours inspection using MIL-G-23827 lubricating grease.

**Mix MIL-G-6711 with naphtha and apply with a brush.

Number within parentheses denotes number of servicing points.