Beechcraft®

TURBO-BARON®

SHOP MANUAL

56TC
A56TC

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When a revision is inserted, the revision number, the date the revision is inserted into the manual, and the initials of the person(s) inserting the revision should be recorded on this page.

RECORD OF TEMPORARY REVISIONS

REVISION NUMBER	CHAPTER/ PAGE AFFECTED	DATE INSERTED	INSERTED BY	DATE REMOVED	REASON REMOVED	REMOVED BY
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4-3	SEC 4:4-1	"	"			
15-1	SEC 15:15-2	"	"			

NOTE: Insert this Record of Temporary Revisions after the Record of Revisions page.

LIST OF EFFECTIVE PAGES

Always destroy superseded pages when you insert revised pages

B Reissue .... September, 1970
B1 Revision .... December, 1976
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Title Page	B5	Aug, 1995	2-5 thru 2-8A	B	Sep, 1970
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NOTE: A list of effective pages will be found in the front of each chapter.

B5

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 all 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.

LIST OF EFFECTIVE PAGES

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THE TURBO-BARON
SHOP MANUAL

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.

The Model 56 TC Shop Manual presents the factory recommended procedures for maintaining the Turbo-Baron in an easy to follow, easy to locate manner. Information in the Shop Manual is directed toward helping the experienced mechanic with specialized and more complex maintenance while simple and repetitive procedures are given less emphasis. When necessary, an illustration supplements the test for further clarification.

The Shop Manual is divided into sixteen sections, with each section devoted to a specific system or major component. All the pertinent information will be found in one place.

To quickly locate the information needed, an Alphabetical Index provides multiple entries for each subject. Troubleshooting guides may be found at the close of each major systems' discussion.

Serial effectivity is maintained throughout the manual to assure correct information for each airplane.

MODEL 56TC	TG-1 through TG-83
MODEL A56TC	TG-84 and after

NOTICE

WHEN A PROCEDURE APPLIES TO ONLY A CERTAIN SERIES OF THE AIRCRAFT MODEL, THE AIRCRAFT SERIAL EFFECTIVITY WILL BE DESIGNATED. PROCEDURES WITHOUT SERIAL EFFECTIVITY WILL APPLY TO ALL MODELS.

NOTE

This manual covers data on systems which are standard or standard options as of the publication of this manual, however, not all standard options may be designated as such.

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.

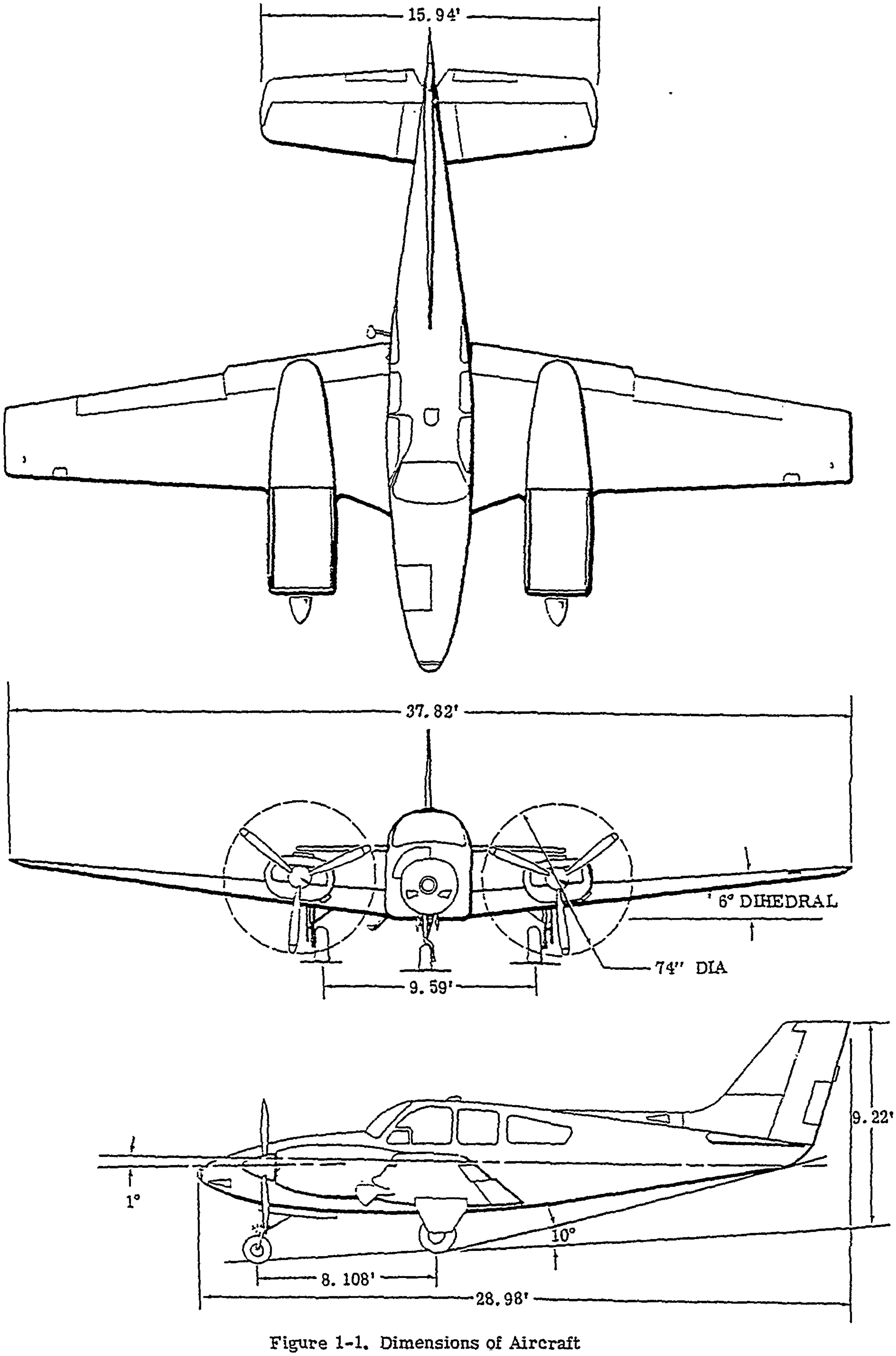


Figure 1-1. Dimensions of Aircraft

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 inspection 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.

NOTE

It shall be the responsibility of the owner/operator to ensure that the latest revision of publications referenced in this handbook are utilized during operation, servicing, and maintenance of the airplane.

GENERAL INFORMATION

POWER PLANT

Lycoming TIO-541-E1B4, rated 380 horsepower at 2900 rpm.

Spark Plugs

Champion	RHB36P	GAP: .015 to .022
A.C.	HSR87LP	GAP: .015 to .022

Firing Order

145236

NOTE

Number one cylinder is the forward cylinder on the left hand side of the engine.

Magneto Timing

20° BTC (Before top center) of number 1 cylinder.

Oil Pressure

80 pounds at 150°F at 2600 rpm.

Oil Capacity

13.0 quarts
10.5 quarts (usable) see Item 2 Consumable Materials Chart.

Propeller

Hartzell HC-F3YR-2/C7479-2R

Deice Brush Block Replacement

Goodrich, replace brushes when 15/32 inch maximum distance is measured on wire inserted through inspection hole in brush support block.

FUEL SYSTEM

Fuel Grade and Capacity

Grade: 100/130, see Item 1 Consumable Materials Chart.

Capacity:	Standard	142 Gallons (usable) TG-1 and after
	Optional	178 Gallons (usable) TG-1 through TG-68
	Optional	204 Gallons (usable) TG-69 and after

Fuel Pressure adjustment (Engine driven pump)
With the engine running at 2100 rpm, adjust the fuel pressure to 23.0 psi.

MISCELLANEOUS

Aircraft Dimensions

Overall Length	28.98 Ft
Wing Span	37.82 Ft
Tail Height	9.22 Ft
Wheel Base	8.108 Ft
Tread Width	9.59 Ft
Stabilizer Width	15.94 Ft
Propeller Diameter	74 In
Wing Dihedral	6°
Propeller Ground Clearance	1.34 Ft

Heater Spark Plug

CH-7S-06 GAP 0.312 to 0.250 inch

Brake fluid Reservoir (Fwd Baggage Compartment)
Fill to 1 1/2 inch of top.
Maintain visible fluid level on dip stick.

Brake Wear Limits

Cleveland - Minimum Abrasive surface .010 inch.
Minimum Brake disc. thickness .325 inch.

Adjustment of Suction Relief Valve

One Engine at 2200 rpm	Gage reading 4.8 to 4.9 in. Hg.
Two Engines at 2200 rpm	Gage reading 5.0 to 5.2 in. Hg.

With Autopilot

One Engine at 2200 rpm	Gage reading 8.0 in. Hg.
Two Engines at 2200 rpm	Gage reading 8.4 in. Hg.

Oxygen Cylinder

Fill slowly to 1850 ± 50 psi at 70°F. Increase 3.5 psi for each degree increase.
Decrease 3.5 psi for each degree decrease.

Stall Warning Switch

Adjust 7 to 9 mph above a complete stall.

Control Surface Travel

Flap	0° Full Up
	15° ± 1° Approach
	30° + 0° -2° Full Down

Control Surface Travel (Continued)

Aileron	20° ± 1 Up 20° ± 1 Down
Aileron Tab	10° ± 1 Up 10° ± 1 Down
Rudder	33° + 1° − 0° to Right; 25° ± 1 Left
Rudder Tab	25° ± 1 Right 25° ± 1 Left
Elevator	30° ± 1 Up 15° ± 1 Down
Elevator Tab	10° ± 1 Up 23° ± 1 Down

Motor Brush Replacement Guide

Flap	5/16 inch min. required
L. G. Retract	5/16 inch min. required
Heater Blower	3/16 inch min. required
Combustion Air Blower	3/16 inch min. required
Air Conditioner Evaporator Blower	1/8 inch min. required
Air Conditioner Condenser	1/8 inch min. required
Starter, Engine	1/4 inch min. required
Generator	1/2 inch min. required
Alternator Slip Ring	On Condition

Service

Battery (Nickel Cadmium, 24 volt 13 amp/hour)	100 hours
Propeller Accumulator	125 ± 5 psig
Main Gear Tires (6.50 x 8 - 8 ply)	80 ± 5 psig
Nose Gear Tire (5.00 x 5 - 6 ply)	47 ± 50 psig
Oil Filter	50 hours
Oil Change	75 to 100 hours/or on condition
Induction Air Filter (replace)	500 hours
Suction Relief Valve Screen	100 hours
Gyro Instrument Central Air Filter (replace)	500 hours
Main Strut Extension	3 inches
Nose Strut Extension	4.5 inches
Fuel System Screens and Strainers	100 hours or sooner if conditions warrant
Wheel Bearings (repack)	100 hours

TABLE OF TORQUES

Engine Mounting

Engine mount bracket bolts and nuts (at firewall)	350 to 390 in lbs
Engine shock mount bolts and nuts	250 to 300 in lbs
Engine mounting bracket bolts	270 in lbs

Engine Components

Engine alternator bracket bolts	500 in lbs
Engine alternator adjusting arm bolt	190 in lbs
All generator mounting bracket bolts	160-190 in lbs
Engine spark plugs	360-420 in lbs
Engine oil filter retainer bolt	30-35 ft lbs
Propeller starter gear/slip ring to crankshaft	60-70 ft lbs
Air Conditioning Compressor 5/16 drive shaft bolt	100-140 in lbs

Horizontal and Vertical Stabilizer

Front and rear spar mounting bolts (vertical stabilizer)	160-190 in lbs
Front spar mounting bolts (horizontal stabilizer)	200-225 in lbs DRY
Rear spar mounting bolts (horizontal stabilizer)	85-100 in lbs DRY
Elevator horn hinge mounting bolts	50-70 in lbs
Wing Surface Controls	
Pushrod to bell crank	30-60 in lbs
Bellcrank to structure	50-100 in lbs
Aft Fuselage Controls	
Pushrod to bell crank	30-60 in lbs
Bell crank to structure	40-60 in lbs
Rudder bell crank linkage	50-70 in lbs

Wing Mounting

Leading edge wing mounting bolt	100-140 in lbs. (dry torque)
Upper front wing mounting bolt	2480-2600 in lbs (wet torque)
Upper rear wing mounting bolt	1180-1300 in lbs (wet torque)
Lower rear wing mounting bolt	2480-2600 in lbs (wet torque)
Lower forward wing mounting bolt	2880-3000 in lbs (wet torque)

Landing Gear

Main landing gear brace bolts	290-410 in lbs
Cross arm to barrel attach bolts	25-40 in lbs
Main landing gear hinge bolts	250-800 in lbs

Fuel System

Attaching bolts for:

Filler necks	45-55 in lbs
Nacelle transmitter	45-55 in lbs
Transmitter	25 in lbs
Access plates	45-55 in lbs
Fuel cell inter-connect clamps	25 ± 5 in lbs
Rubber fuel nipple clamps	25 ± 5 in lbs
Fuel vent valve assembly	20 in lbs

When a torque wrench and adapter is used, (Figure 1-2) 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, use the following formula:

$$\frac{\text{Original wrench length x specified torque}}{\text{length of wrench + adapter}} = \text{desired reading}$$

Example:
D = Desired reading
L = Length of torque wrench
A = Adapter length
T = Torque

D = ?
L = 33 inches
A = 11 inches
T = 5,000 inch-pounds

$$\frac{33 \times 5{,}000}{33 + 11} = \frac{165000}{44} = 3750 \text{ inch-pounds}$$

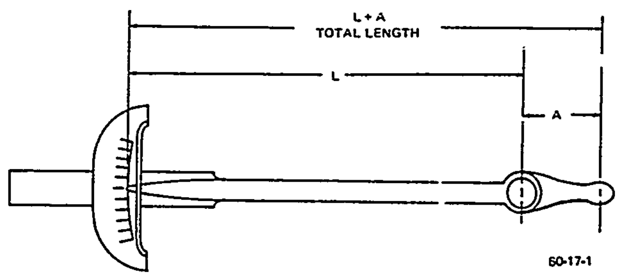


Figure 1-2. Torque Wrench and Adapter

An acceptable method of checking the torque, if a torque wrench is not available, (Figure 1-3) is to attach a spring scale to a conventional flex or "T" handle inserted in an adapter. Force should be applied in a direction perpendicular to an imaginary line extending from the center of the bolt through the spring scale attaching point.

To calculate the force in pounds (scale reading) required to obtain the specified torque, divide the torque in inch-pounds by the distance in inches between the center of the bolt and the scale attaching point. For example, if the specified torque is 5,000 inch-pounds and the distance is 25 inches a pull of 200 pounds must be applied. Unless torque values are specified as wet (lubricated), bolts to be torqued must be clean and free of all lubricants; otherwise loss of normal friction allowed for establishing the torque values may result in over torquing of the bolt.

When a torque wrench adapter is used, the length of the adapter must be added to the length of the flex or "T" handle wrench and a value calculated for that particular combination. The following is a typical example in finding a desired value.

Effective length of flex or "T" handle wrench:	12 inches
Length of adapter	3 inches
Total length	15 inches
Desired torque on bolt	2000 inch-pounds

$$\frac{2000 \text{ inch-pounds}}{15 \text{ inches}} = 133.3 \text{ pounds (scale reading)}$$

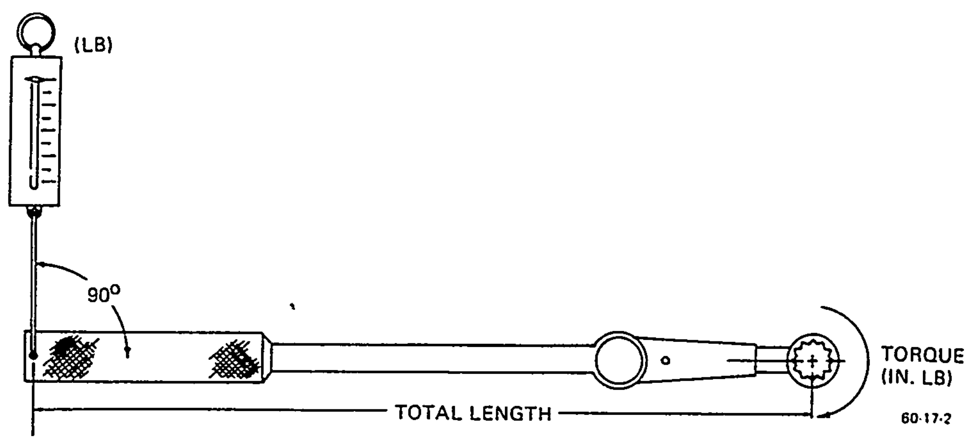


Figure 1-3. Determining Torque by Spring Scale

TORQUING FINE THREAD SERIES BOLTS LOADED IN SHEAR

NOTE

The following torque values may be used as a guide when specific torques are not called out within this shop manual.

SIZE	TORQUE LIMITS RECOMMENDED (INCH-POUNDS)		MAXIMUM ALLOWABLE TORQUE (INCH-POUNDS)	
	AN365 and AN310 Nuts Column 1	AN364 and AN320 Nuts Column 2	AN365 and AN310 Nuts Column 3	AN364 and AN320 Nuts Column 4
8-36	12-15	7-9	20	12
10-32	20-25	12-15	40	25
1/4 - 28	50-70	30-40	100	60
5/16 - 24	100-140	60-85	225	140
3/8 - 24	160-190	95-110	390	240
7/16 - 20	450-500	270-300	840	500
1/2 - 20	480-690	290-410	1100	660
9/16 - 18	800-1000	480-600	1600	960
5/8 - 18	1100-1300	660-780	2400	1400
3/4 - 16	2300-2500	1300-1500	5000	3000
7/8 - 14	2500-3000	1500-1800	7000	4200
1-14	3700-5500	2200-3300	10000	6000
1-1/8 - 12	5000-7000	3000-4200	15000	9000
1-1/4 - 12	9000-11000	5400-6600	25000	15000

NOTE: The above values apply to Class 3 threads, cadmium plated and nonlubricated.

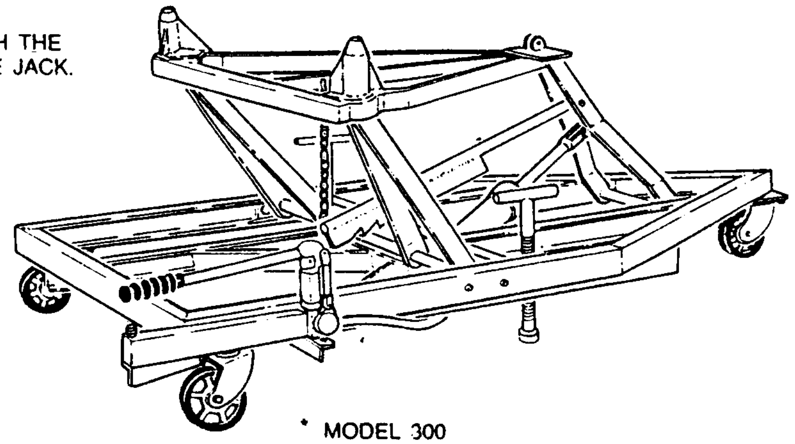
TORQUING COARSE THREAD SERIES BOLTS LOADED IN SHEAR

SIZE	TORQUE LIMITS RECOMMENDED (INCH-POUNDS)		MAXIMUM ALLOWABLE TORQUE (INCH-POUNDS)	
	AN365 and AN310 Nuts Column 1	AN364 and AN320 Nuts Column 2	AN365 and AN310 Nuts Column 3	AN364 and AN320 Nuts Column 4
8-32	12-15	7-9	20	12
10-24	20-25	12-15	35	21
1/4 - 20	40-50	25-30	75	45
5/16 - 18	80-90	48-55	160	100
3/8 - 16	160-185	95-110	275	170
7/16 - 14	235-255	140-155	475	280
1/2 - 13	400-480	240-290	880	520
9/16 - 12	500-700	300-420	1100	650
5/8 - 11	700-900	420-540	1500	900
3/4 - 10	1150-1600	700-950	2500	1500
7/8 - 9	2200-3000	1300-1800	4600	2700
1 - 8	3700-5000	2200-3000	7600	4500
1-1/8-8	5500-6500	3300-4000	12000	7200
1-1/4 - 8	6500-8000	4000-5000	16000	10000

NOTE: The above values apply to Class 3 threads, cadmium plated and nonlubricated.

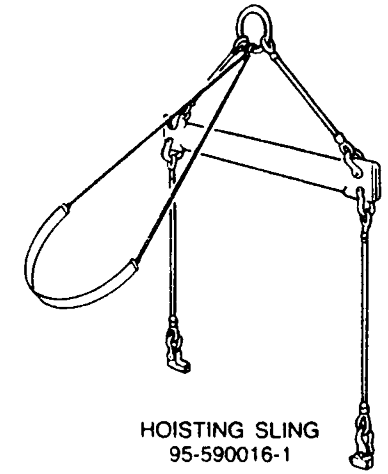
SPECIAL TOOLS

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

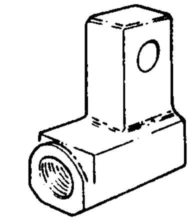


* MODEL 300
SERVICE JACK

TS1222-3	UPPER FORWARD WING BOLT WRENCH
TS1171-2	UPPER FORWARD WING NUT TORQUE WRENCH ADAPTER
TS1222-4 or TS1222-5	UPPER AFT WING BOLT WRENCH
TS1171-1 or 50-590013	UPPER AFT WING NUT TORQUE WRENCH ADAPTER
TS1222-3	LOWER FORWARD WING BOLT WRENCH
50-590014	LOWER FORWARD WING NUT TORQUE WRENCH ADAPTER
TK1817-922-4	LOWER AFT WING BOLT WRENCH
TS1171-2	LOWER AFT WING NUT TORQUE WRENCH ADAPTER

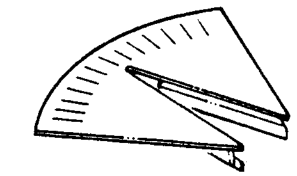


HOISTING SLING
95-590016-1

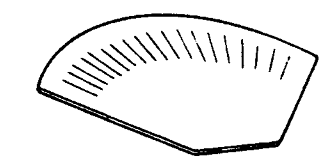


HOISTING SLING ADAPTER
95-590017

NOTE: IF AIRCRAFT IS TO BE HOISTED WITH WINGS REMOVED.
USE THE 95-590017-1 SLING ADAPTER WITH A 95-590016-23 SPACER

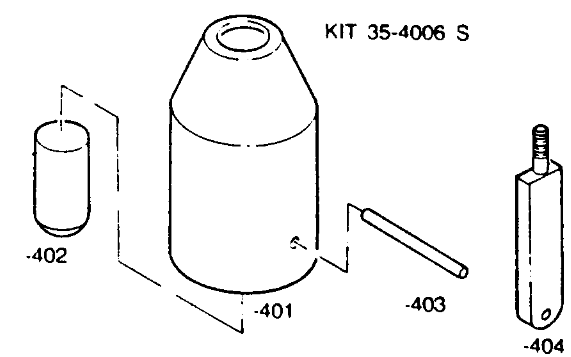


50-590090
AILERON TAB TRAVEL GAGE

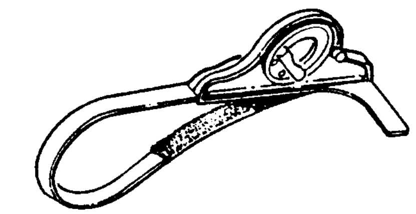


96-630000-1-810
RUDDER TAB TRAVEL GAGE

KIT 35-4006 S



ADAPTERS FOR SERVICE JACK 932-7/35-000001



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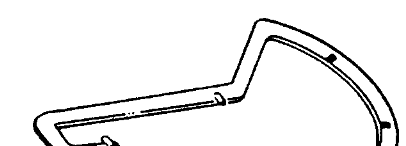
FLAP TRAVEL GAGE



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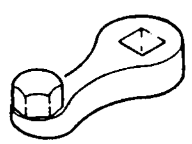
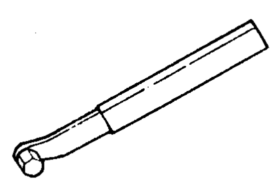
RUDDER TRAVEL GAGE



50-590013
TS1171-1
TS1171-2



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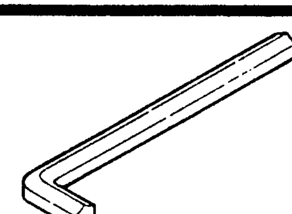
TS1222-4



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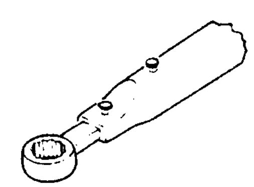

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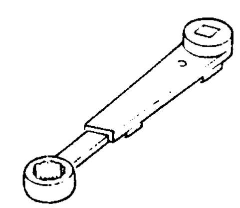
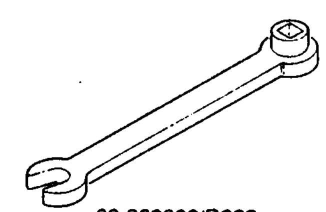


50-590014



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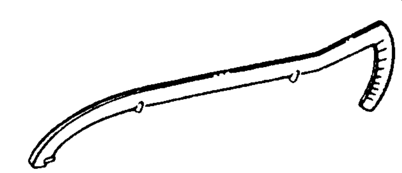
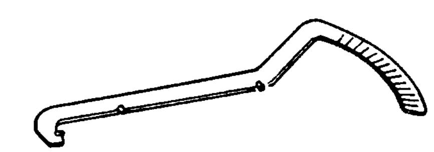
WRENCH ADAPTER



35-135025-78-810-1 L.H.
35-135025-79-810-1 R.H.
AILERON TRAVEL GAGE



95-524000-810-1 L.H. & R.H.
ELEVATOR AND ELEVATOR TAB
TRAVEL GAGE

56TC-17-3

SUPPLEMENTARY PUBLICATIONS

Following is a list of publications providing servicing, overhaul and parts information on various components of the BEECHCRAFT Turbo Baron which you may obtain to supplement the BEECHCRAFT Turbo Baron Shop Manual. In most instances, you should obtain the publications directly from the manufacturer or his distributor. Only a few, such as engine manuals and Beech supplementary publications, are available from the 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.

As publications on additional components become available, they will be added to this list of publications.

VENDOR PUBLICATIONS

ENGINE

Overhaul Manual 60294-6. Avco Lycoming Division, Williamsport, Pennsylvania.

Parts Catalog PC-120. Avco Lycoming Division, Williamsport, Pennsylvania.

FUEL INJECTION

Operation and Service Manual, Form 15-338B. Bendix Corporation, South Bend, Indiana.

PROPELLER

Overhaul Instructions 117 for Hartzell Propeller. Hartzell Propeller Inc., Piqua, Ohio.

Owner's Manual 115 for Hartzell HC-F3YR-2/C 7479-2R Propeller. Hartzell Propeller Inc., Piqua, Ohio.

Maintenance Handbook for Constant Speed Hydraulic Propeller Governor Type CSSA, Number 330014. Woodward Governor Company, Rockford, Illinois.

Installation Manual for Woodward Electronic Synchronizer, Bulletin 33059. Woodward Governor Company, Rockford, Illinois.

PROPELLER ACCUMULATOR

Hydraulic Accumulator for Propeller Unfeathering, Bulletin 33058, Woodward Governor Company, Rockford, Illinois.

MAGNETOS

Maintenance Instructions for Bendix S-1200 Series Magnetos, Form L-609. Scintilla Division, Bendix Aviation Corporation, Sidney, New York.

Service Parts List for Bendix S-1200 Series Magnetos, Form L-608. Scintilla Division, Bendix Aviation Corporation, Sidney, New York.

STARTING MOTOR

Overhaul Instructions, Form L-649A. Prestolite Company, Toledo, Ohio.

AUTOPILOT

B-5 Automatic Flight Control System Maintenance Manual 3950. Brittain Industries Torrance, California 90505.

B-5 Flight Control System Ground And Flight Check Procedures Manual 3952. Brittain Industries, Torrance, California 90505.

B-7 Flight Procedures Manual 3959. Brittain Industies, Torrance, California, 90505.

B-7 Maintenance Manual 3960. Brittain Industries, Torrance, California, 90505.

GENERATOR

Overhaul and Parts Breakdown, File 30204. Lear Siegler Inc., Cleveland, Ohio.

BATTERY

Maintenance Manual and Parts List for Nickel-Cadmium Battery, GEJ-4344-2. General Electric Company, Gainsville, Florida.

STROBE LIGHT

Installation/Maintenance Manual for Twilighter Mark IIIB High Intensity Aircraft Lighting System, Publication Number: 61-1004 and 61-1008, Hoskins Inc., Geneva, Illinois.

Instruction and Service Manual for Airguard Anti-collision Beacon, Publication Number: 50082, Bullock Magnetics Corp., Pomona, California.

ELECTRIC PROPELLER DEICER

Installation of Deicer Boots, Report 59-728. B. F. Goodrich Company, Akron, Ohio.

Installation, Inspection and Testing of Propeller Deicer System, Report 68-04-708. B. F. Goodrich Company, Akron, Ohio.

SURFACE DEICER

Maintenance Instructions Publication Number: 63-200, B. F. Goodrich Company, Akron Ohio.

HEATER VENT BLOWER

Overhaul Instructions for Vane Axial Blower # M4861H-1A, with Motor M2916V. Dynamic Air Engineering Inc., Santa Ana, California.

HEATER

Maintenance Instructions for Janitrol F83A28 Aircraft Heater, # 30C57. Janitrol Aircraft-Automotive Division, Midland-Ross Corporation, Columbus, Ohio.

Maintenance Instructions for Janitrol 11C30 Aircraft Heater Ignition Unit, # 24C54. Janitrol Aircraft-Automotive Division, Midland-Ross Corporation, Columbus, Ohio.

AIR CONDITIONER COMPRESSOR

Series 63 Compressor Manual, Form 180.30-NM. York Corporation, York, Pennsylvania.

Renewal Parts List, Form 3N-E-RP. York Corporation, York, Pennsylvania.

BRAKES

Overhaul Information for Brake Shuttle Valve, Publication # 74456.
Hoof Products Co., Chicago, Illinois.

Overhaul Information for Brake Shuttle Valve, Publication # 23595.
Paramount Machine Co., Stow, Ohio.

SUPPLEMENTARY BEECHCRAFT PUBLICATIONS

98-35062 Wheel, Brake and Tire Servicing & Maintenance Instructions, Illustrated Parts Breakdown.

98-33396 Overhaul Instructions for 60-389014 Alternator.

98-33857 Overhaul Instructions for 60-389017 and -1 Voltage Regulator.

98-35655 Operators Manual for B-5 and B-7 Autopilot.

H-14 AUTOPILOT

92-379A Operation Manual.

130333B Adaptive Maintenance Manual.

92-30103B Overhaul Instructions for BG274B2, C1, C2 Computer.

92-30105 Overhaul Instructions for CG136A1 Heading Selector.

92-30106B Overhaul Instructions for MG113A1, MG113A2, MG113A3, MG113A4 Actuator and SG28A1, SG28A3 Pressure Switch.

92-30107A1 Overhaul Instructions for PG51A1 Altitude Control.

92-30229 Overhaul Instructions for GG205A3, GG205A4 (GG205B4) Turn and Bank Indicator Gyro.

92-30411B Overhaul Instructions for GG201A1, GG202B1 Vertical Gyro.

92-30412B Overhaul Instructions for GG202A1, GG202B1 Directional Gyro.

98-32523 Overhaul Instructions for MG112A1 and MG112B1 Trim Actuator.

98-32839 Overhaul Instructions for CG417B1 and CG417B2 Flight Controller.

GROUND HANDLING

Exercise care in ground handling of the airplane to avoid unnecessary damage. The following procedures are provided to reduce the possibility of ground damage.

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 as placarded on the nose gear to prevent damage to the 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.

JACKING

A three-point jack is used to lift the aircraft off the ground. Each jack pad is identified and located on the under side of the fuselage. One jack pad is located on each lower wing-to-fuselage attachment fitting along the front spar. The 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 consists of an eye bolt that is screwed completely into the aircraft.

WARNING

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

The Model 300 service jack with an adapter kit (P/N 300-30) is designed to be used with this aircraft. Facilities that have a 932-7 35-000001 service jack can convert it for use with the adapters listed in the Special Tools.

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 by placing a floor jack under the jacking point located under each axle.

ANCHORING AND MOORING PROVISIONS

Three mooring eyes are provided; one in 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 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

The brakes are set for parking 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.

HOISTING

(Figure 2-1)

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 the upper rear wing attach bolts, (see Figure 2-1).

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 (see Figure 2-1).

d. Hoist the aircraft smoothly.

NOTE

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

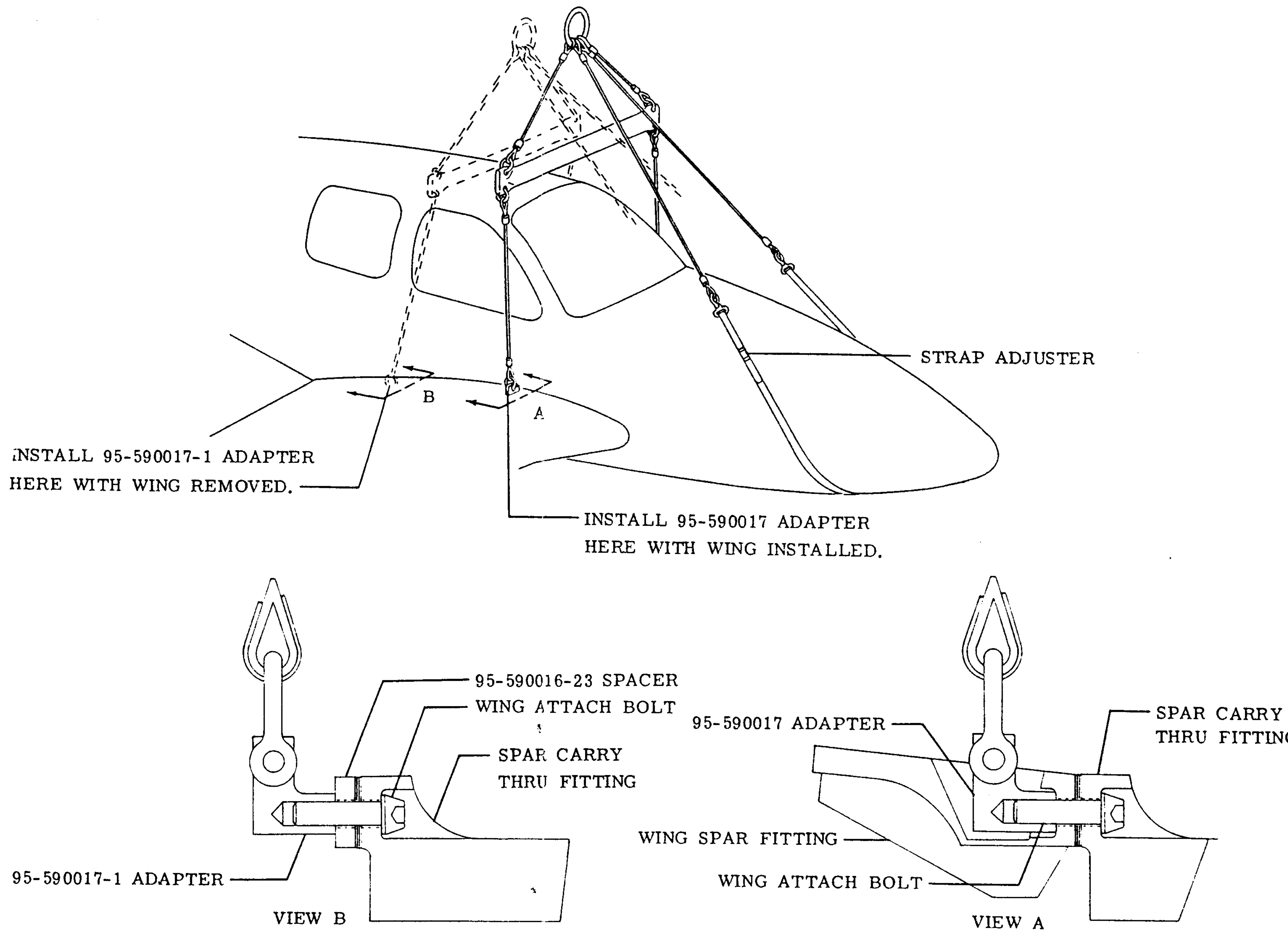


Figure 2-1. Hoisting the Aircraft

e. As an added precaution a stand may be installed under the tail of the aircraft.

LEVELING

To level the airplane longitudinally, first locate the phillips head screw labeled LEVEL POINT immediately below the left side rear window. Loosen the phillips head screw enough to attach and suspend a cord and plumb bob. Inflate or deflate the nose gear shock strut as necessary to pass the cord through the center of a second phillips head screw at the bottom edge of the fuselage. 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.

EXTERNAL POWER

An external power unit with a negative ground may be used to supply power for ground checks, starting and battery charging. A polarized external power receptacle is located on the outboard side of the left engine nacelle. The receptacle is designed for a standard AN type plug.

The aircraft is equipped with a relay and diodes that protect the aircraft electrical system against damage from an external power source with reversed polarity. Observe the following precautions when using an external power source.

a. Before connecting an external power unit, turn off the battery switch.

b. To prevent arcing, make certain no power is being supplied when the connection is made.

c. After the external power plug is connected, turn on the battery switch before turning on any other equipment. Leave the battery on during the entire external power operation.

CAUTION

The battery may be damaged if exposed to voltages higher than 30 volts.

SERVICING

Proper and periodic servicing of the airplane will prevent considerable wear and greatly lengthen the service life of parts and systems involved. For points of lubrication and the correct interval and materials, refer to the Lubrication and Servicing Charts in this section. The following information gives instruction on the servicing of major systems.

TIRES

The main wheel tires are 6.50 x 8, 8 ply tube type. The nose wheel tire is a 5.00 x 5, 6 ply tube type. Inflate the nose tire to 47 to 50 psi, and main wheel tires to 80 ± 5 psi. Maintaining proper tire inflation will help to avoid damage from landing shock and contact with sharp stones and ruts, and will minimize tread wear. When inflating tires, inspect them visually for cracks, breaks, or evidence of internal damage.

NOTE

Beech Aircraft Corporation cannot recommend the use of recapped tires. Recapped tires have a tendency to swell as a result of the increased temperature generated during take-off. Increased tire size can jeopardize proper function of the landing gear retract system, with the possibility of damage to the landing gear doors and retract mechanism.

BRAKES

The brake fluid reservoir is located in the forward baggage compartment. The reservoir should be checked regularly and filled to within 1-1/2 inches of the top and a visible fluid level maintained on the dip stick at all times by adding hydraulic fluid (Item 13, Consumable Materials Chart).

SHOCK STRUTS

The shock struts are filled with compressed air and hydraulic fluid (Item 13, Consumable Materials Chart). 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 the air pressure has been released or it may be blown off with considerable force, causing injury to personnel or property damage.

b. Remove the air valve assembly.

c. Compress the strut and fill through the air valve assembly hole with hydraulic fluid (Item 13, Consumable Materials Chart) until the fluid overflows (approximately one pint).

d. Cycle the strut (full extension to compressed) and refill. Repeat until fluid cannot be added to the strut in the compressed position.

e. Install the air valve assembly.

f. With the aircraft resting on the ground and the fuel cells full; Inflate the nose gear strut until 4-1/2 inches of the piston is exposed and inflate the main gear strut until 3 inches of piston is exposed. Rock the aircraft gently to prevent possible binding of the piston in the barrel while inflating.

NOTE

It is recommended that the nose strut inflation dimension and the tire inflation pressure be carefully adhered to. Properly inflated tires and struts reduce the possibility of ground damage occurring to the propellers. Exercise caution when taxiing over rough surfaces.

g. The shock strut piston must be clean. Remove foreign material by wiping the strut with a cloth containing hydraulic fluid.

FUEL SYSTEM

The standard fuel cell installation consists of 41 gallon fuel cell in each wing leading edge and 32 gallon fuel cell in each wing box section outboard of the nacelle. An optional 16 gallon fuel cell may be located in the aft section of the nacelle. Both standard cells located in each wing are interconnected and filled through a common opening in the upper wing surface. The opening is covered by a flush type cap. The optional nacelle tank is filled through an opening on the nacelle and is also covered by a flush type filler cap.

When filling the aircraft fuel cells, always observe the following:

a. Service the fuel cells with 100 octane Low Lead (blue) fuel, if not available, use 100/130 octane (green) or 115/145 octane (purple) fuel (Item 1, Consumable Materials Chart.)

b. Make sure the aircraft is statically grounded to the servicing unit.

c. Do not fill fuel cells near open flame or within 100 feet of any open energized electrical equipment capable of producing sparks.

CAUTION

The wing fuel cells must be filled first on aircraft equipped with optional nacelle fuel cells. Due to the location of the nacelle fuel cells and the interconnect system, the filler cap must be removed from the main fuel cells unless the fuel level in the nacelle fuel cells is six inches or more below the full mark or fuel will drain out at filler opening of the main fuel cell.

Most fuel injection system malfunctions can be attributed to contaminated fuel. Inspecting and cleaning the fuel strainers should be considered to be of the utmost importance as a regular part of preventive maintenance.

Normally the fuel strainers should be inspected and cleaned every 100 hours. However, the strainers should be inspected and cleaned at more frequent intervals depending on service conditions, fuel handling equipment and when operating in localities where there is an excessive amount of sand or dust.

Open each of the seven snap-type fuel drains daily to allow condensed moisture to drain from the system.

NOTE

If the cells are to remain unfilled for 10 days or more, apply a thin coating of light engine oil to the inside surface of the cell to prevent deterioration and cracking.

OIL SYSTEM

The engines are equipped with a wet sump, pressure type oil system. Each engine sump has a capacity of 13 quarts. The oil system may be checked through access doors in the engine cowling. A calibrated dip stick attached to the filler cap indicates the oil level. Due to the canted position of the engines, the dip sticks are calibrated for either right or left engines and are not interchangeable.

The oil should be changed every 75 to 100 hours under normal operating conditions and the oil filter changed every 50 hours. Access to the oil drain is provided by removing the plate located on the bottom of the cowling just forward of the cowl flap. The engines should be warmed to operating temperature to assure complete draining of the oil.

The oil grades listed in the Consumable Materials Chart 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; however, inlet temperatures consistently near the maximum allowable indicate a heavier oil is needed. Lycoming recommends use of the lightest weight oil that will give adequate cooling.

APPROVED OIL GRADES

AVERAGE AMBIENT AIR TEMPERATURE FOR STARTING	SINGLE VISCOSITY GRADES	MULTI-VISCOSITY GRADES	OPERATING 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 or 20W-30	170°F	225°F
Below 10°F	SAE 20	SAE 20W-30	160°F	210°F

NOTE

The turbocharged engines are to be operated with ashless dispersant oil conforming to specification MIL-L-22851 or a Lycoming approved synthetic oil.

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.

OIL FILTER

The oil filter should be replaced every 50 hours. Replace the filter as follows:

a. Cut safety wire and remove the filter housing.

b. Install new filter in the housing and secure to the engine. Torque retainer bolt to 30 to 35 foot pounds.

c. Safety retainer bolt.

INDUCTION AIR FILTER

The induction air filter should be cleaned every 50 hours and replaced every 500 hours of service. Either a dry filter element or a wet filter element maybe installed.

Wet Element:

a. Remove the filter from the aircraft and wash throughly, dirty side down, in solvent (Item 15, Consumable Materials Chart).

b. Allow to dry and apply a small amount of engine preservative oil (Item 28, Consumable Materials Chart) to the filter.

c. Allow any excess oil to drain off for approximately 2 to 4 hours before reinstalling on the aircraft.

Dry Element:

a. Remove the filter from the aircraft.

b. Clean the filter according to the instructions on the element frame and reinstall on the aircraft.

BATTERY

The following list of battery servicing precautions and checks is meant to be a general guide. For specific details and complete procedures, see Section 13 of this manual.

a. After each 100 hours of operation or every 30 days, whichever occurs first, check the electrolyte level and clean the battery and filler vent plugs.

b. Any time the battery is subjected to more than 32 volts for as long as two minutes, the battery must be completely serviced. Clean the battery, charge it, and adjust the electrolyte level.

c. Periodically check that the cell vents are clean and open. Plugged vents may cause excessive internal cell pressure and cause leaks.

d. Never remove a cell from the battery case unless a replacement is immediately available; otherwise, the remaining cells may swell, making replacement of the removed cells difficult. Loosen the vents before cell replacement to eliminate the possibility of cells swelling from internal gas pressure.

e. Check the torque of the terminal screws securing the cross links connecting the cells together. This torque should be from 48 to 60 inch-pounds (4 to 5 foot-pounds).

f. Check that no carbon deposit has built up on the cross links or between them and the battery case. If such deposits are present, clean the affected areas as indicated under "Battery Cleaning".

g. When there is any indication of oil in the battery, remove all cells from the case and check all rubber parts for deterioration. Remove the oil and replace all damaged rubber parts. Do not use a solvent, use soap and water only.

h. Do not add electrolyte just because the level in the battery is low. If electrolyte is added instead of distilled water each time the level in the battery is low, the high concentration of electrolyte may cause dissolution of the plates under high temperature conditions. This is indicated by the presence of black particles in the affected cells.

i. Keep nickel-cadmium and lead-acid batteries stored separately to prevent mutual contamination. Unless kept in closed storage containers, nickel-cadmium electrolyte (potassium hydroxide) will absorb enough carbon dioxide from the air to render it ineffective.

OXYGEN SYSTEM

To service the oxygen system, remove the protective cap from the filler valve located in the nose baggage compartment.

WARNING

Keep fires, cigarettes and sparks away when outlets are in use. Open and close all oxygen valves slowly. Make sure the oxygen shut-off valve is in the closed position. Inspect the filler connection for cleanliness before attaching it to the filler valve. Keep tools, hands and components clean, as fire or explosion may occur when pure oxygen comes in contact with organic material such as grease or oil.

Attach a hose from an oxygen recharging cart to the filler valve. To prevent overheating, fill the oxygen system slowly by adjusting the recharging rate with the pressure regulating valve on the cart. 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; similarly, 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.

SURFACE DEICER SYSTEM

Examine the filters after each 100 hours of engine operation for dirt accumulation 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. Replacement filters, P/N H9W334-231, may be obtained from Beech Aircraft Corporation. Torque filter bolt to 40 to 60 inch pounds. The filters are located in the forward right hand side of the upper nacelles.

CLEANING DEICER BOOTS

The boots should be checked for engine oil after servicing and at the end of each flight, and any oil found should 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 surfacing.

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.

CLEANING AND CARE OF AIRCRAFT FINISH

Do not apply wax or polish for a period of 90 days after delivery to allow the paint to cure. Waxes and polish seal the paint from the air and prevent curing. 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, wash the airplane with a mild soap and water. Flush loose dirt away first with clear water. Harsh, abrasive, or alkaline soap or detergents which could cause corrosion or make scratches 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. However, 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 acrylic plastic windows should never be attempted when dry. The window should first be flushed with water or a mild soap solution, then rubbed slightly 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.

PROPELLER ACCUMULATOR

The propeller accumulators are located on the lower rear section of each engine. The accumulators should be inspected every 100 hours and charged with dry air or nitrogen to 125 psi ± 5 psi.

AIR CONDITIONER

See Section 10 of this manual for servicing instructions.

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 hole in 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 empty reading is 3-1/16 inches. To add hydraulic fluid, (Item 13, Consumable Materials Chart), 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 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 pin. Spread the cotter pin to allow clearance for the measuring wire.

ROTON LOCKS

(Figure 2-2)

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

a. Use only (Item 30, Consumable Materials Chart) on the thread as shown in Figure 2-2. Too much grease or grease in the wrong place can cause improper operation.

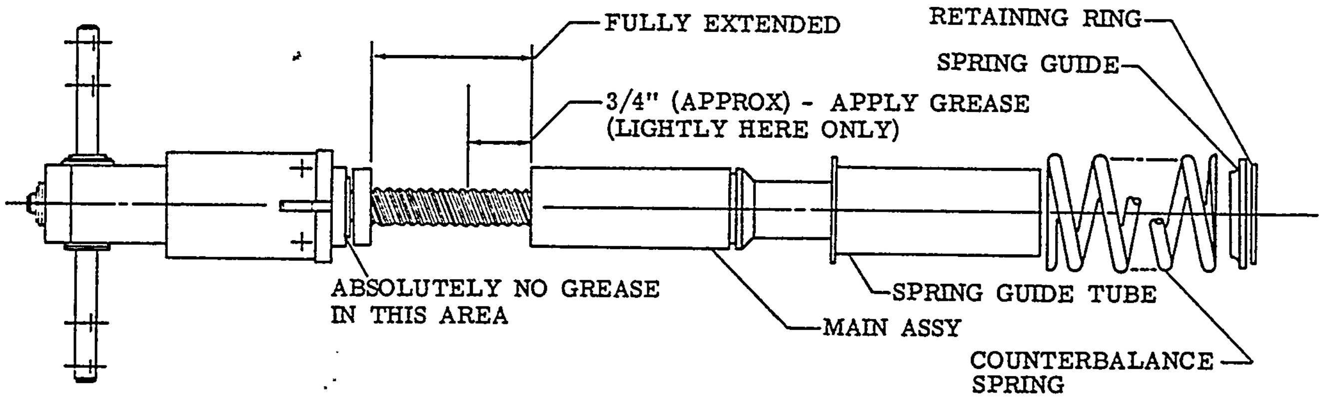


Figure 2-2. Roton Lock

b. Compress the spring guide and counter-balance spring approximately one inch.

c. Remove the retaining ring.

d. Relax pressure on the spring guide and counter-balance spring slowly until the spring is fully extended.

e. Remove the lock from the fixture and remove the spring guide, counter-balance spring, and spring guide tube.

f. Apply a small quantity of grease to the completely extended thrust screw (see Figure 2-2).

g. Reassemble the lock. For service other than lubrications return the Roton lock to the manufacturer.

PROPELLER

The propeller should be serviced at 100 hour intervals. Servicing consists of checking the air dome pressure and lubricating the blade bearings. Service as follows:

PROPELLER BLADE BEARING LUBRICATION

(Figure 2-3)

a. Remove the propeller spinner.

b. Remove the safety wire and covers from the four grease "zerks". See Figure 2-3 for location.

c. Lubricate with Item 11, Consumable Materials Chart by placing the grease gun fitting on one zerk of each blade and filling until the grease is visible from the zerk on the opposite side of the blade.

d. Clean excess grease from the propeller and reinstall the grease zerk covers and safety.

e. Reinstall the spinner.

PROPELLER AIR DOME PRESSURE

(Figure 2-3)

a. Remove the access cap from the propeller spinner to expose the filler valve.

b. Charge the dome with dry air or nitrogen to a pressure of 80 psi at 70°F. Increase the pressure an additional 2 psi for every 10 degrees of increase in temperature; similarly, for every 10 degrees of drop in temperature, reduce the pressure by 2 psi.

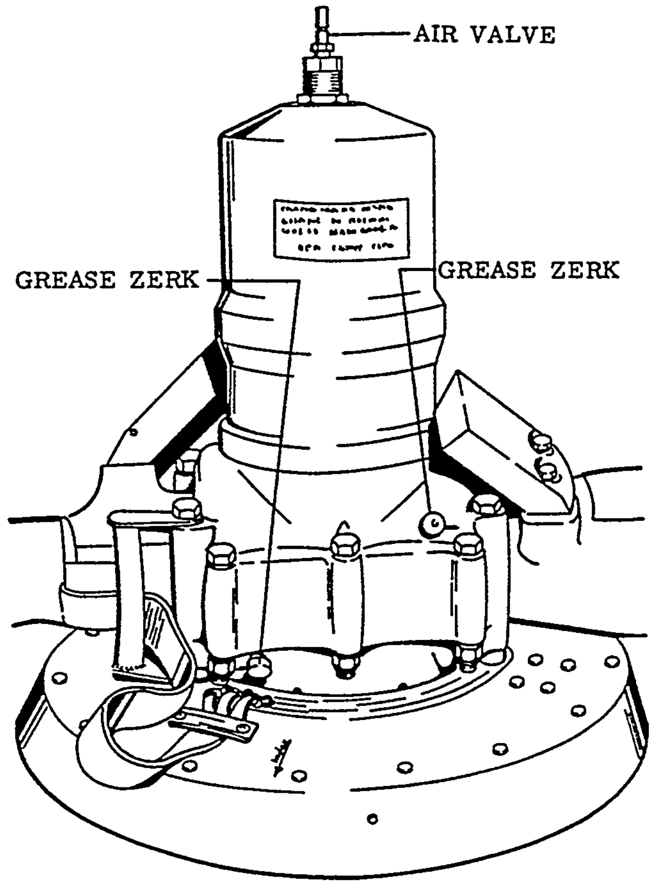


Figure 2-3. Propeller Servicing Points

INSTRUMENT WEDGE LIGHTING

(TG-84 and after)

Internal lighting of the instruments provides additional illumination across each instrument. A light tray mounted on the top side of the bezel of each instrument holds two bulbs wired in parallel. If the light bulbs are damaged or burned out, the light tray with bulbs must be replaced.

LIGHT TRAY REMOVAL

a. Remove the screws that secure the instrument panel in place and tilt the instrument panel aft to gain access to the instruments.

NOTE

Instruments located at the lower edge of the panel may be removed if necessary to gain access to the light tray at the top of the instruments.

b. Remove the two screws that attach the light tray to the instrument bezel.

LIGHT TRAY INSTALLATION

a. Install the new light tray and secure in place with the two attaching screws.

b. Install the instrument, if removed, in the instrument panel and secure in place with the attaching screws.

c. Secure the instrument panel in place.

TABLE OF THREAD LUBRICANTS

SYSTEM	MATERIAL	SPECIFICATIONS	VENDOR PRODUCTS
			Any product conforming to the referenced specification may be used.
Fuel	Anti-Seize, Graphite Petrolatum	MIL-T-5544	Armite Product, Armite Laboratories Los Angeles, Calif. Anti-seize Compound I, Esso Standard. Co.
Oil, Manifold Pressure, Anti-icer, Vacuum	Lubricating Grease (Gasoline and Oil Resistant)	MIL-G-6032	L-237, Lehigh Chemical Co., Chestertown, Maryland. Rockwell 950, Rockwell Mfg., Co., New York, N. Y. Royce 32, Royal Eng. Co., Whippany, N. J.
Brake, Deicer, Static and Pitot	Anti-Seize Compound White Lead Base	Federal Specification TT-A-580 (JAN-A-669)	Armite Product, Armite Laboratories, Los Angeles, Calif.
Oxygen	Thread Compound, Anti-Seize and Sealing, Oxygen Systems	MIL-T-5542	No. 15 Rector Well Equipment Co., Houston, Texas. Dag 217 Acheson Colloies Co., Port Huron, Michigan. Key Abso-Lute, Type B., Key Co., East St. Louis, Illinois.
Oxygen, High Pressure Side Only.	Ribbon Dope Thread Sealant.	MIL-T-27730	Permacel Tape Corp., New Brunswick, N. J.
Air Conditioner	Anti-Seize Compound	MIL-T-5544 or TT-A-580	
Turbocharger Inlet Temperature Probe	Anti-Seize Compound	MIL-A-907C	Anti-Seize Compound C5A Fel-Pro Inc., 7450 McCormick, Skokie, Illinois 60076

CONSUMABLE MATERIALS CHART

The vendor products appearing in this chart have been selected at random to help field personnel determine products conforming to the Military Specifications listed in this publication. The brand names are listed for ready reference and are not specifically recommended by Beech Aircraft Corporation. Any product which conforms to the referenced specification may be used.

ITEM	MATERIAL	SPECIFICATIONS	VENDOR PRODUCTS
1.	Fuel, Engine	100 octane Low Lead (blue, if not available, use 100/130 octane (green) or 115/130 octane (purple):	
2.	Oil, Engine	MIL-L-22851 (See Oil Grades Chart)	
3.	Corrosion Preventive Compound	MIL-C-6529	Cities Service Oil Co., 60 Wall Tower, New York 5, N. Y. Rust Foil #652-2, Franklin Oil and Gas Co., Bedford, Ohio. Kendex #7038, Kendall Refining Co., Bradford, Pa.
4.	Lubricating Oil	MIL-O-6081	Gulflite Turbojet Oil #1010, Gulf Oil Corp., Pittsburg, Pa. Aeroshell #3-1286, Shell Oil Co., 50 West 50th Street, New York, N. Y. 10020. Jet Engine Oil #1010, Texaco Inc., 135 East 42nd Street, New York, N. Y. 10017.
5.	Lubricating Oil	SAE 20	
6.	Lubricating Oil, Aircraft Reciprocating (Piston) Engine	MIL-L-6082	Conoco Aero Oil #1065, Continental Oil Co., Ponca City, Oklahoma. Phillips 66 Aviation Engine Oil, Grade 1065, Phillips Petroleum Co., Bartlesville, Oklahoma. Skelflite 100, Skelly Oil Co., El Dorado, Kansas. Avrey 10V1100, Socony Mobil Oil Co., Inc., 150 East 42nd Street, New York, N. Y. 10017. Or any approved aircraft engine oil (graded at 1100 or 1065).
7.	Lubricating Oil (Gear)	MIL-L-6086 Grade M	Trojan Gear Oil #6086 M. Cities Service Oil Co., 60 Wall Tower, New York 5, N. Y. Aeroshell Fluid 5M, Shell Oil Co., 50 W 50th Street, New York, N. Y. L-1195, Sinclair Refining Co., 600 Fifth Avenue, New York, N. Y.
8.	Lubricating Grease (General Purpose)	MIL-G-7711	Regal AFB 2, Texaco Inc., 135 East 42nd Street, New York 17, N. Y. Aeroshell Grease #6, Shell Oil Co., 50 West 50th Street, New York 20, N. Y. 22442, International Lubricants Co., New Orleans, La.
9.	Lubricating Grease (High Temperature)	MIL-G-81322	Mobil Grease 28, Mobil Oil Corp., Shoreham Bldg. Washington, D.C. 20005 Aeroshell #5, Shell Oil Co., 50 W 50th Street, New York, N. Y.
10.	Lubricating Grease (Gear)	Mobile Compound G. G.	
11.	Lubricating Grease (Aircraft and Instruments, Low and High Temperature)	MIL-G-23827	Supermil Grease #A72832, American Oil Co., 910 South Michigan Avenue, Chicago, Ill. Royco 27A, Royal Lubricants Co., River Road, Hanover, N. J.

ITEM	MATERIAL	SPECIFICATIONS	VENDOR PRODUCTS
			Shell 6249 Grease, Shell Oil Co., 50 West 50th St. New York 20, N. Y.
12.	Lubricant Molybdenum Disulfide Powder	MIL-M-7866	Molykote Z. Wilco Co., Wichita, Kansas.
			Molykote Z, Standard Oil of Kentucky.
			Molykote Z, Hafkel Seals, Glendale, California.
			Moly-Paul #4, K. S. Paul Products Ltd., Nobel Road, London, England.
13.	Hydraulic Fluid	MIL-H-5606	Brayco 756D, Bray Oil Co., 3344 Medford Street, Los Angeles 63, California.
			TL-5874, Texaco Inc., 135 East 42nd Street, New York, N. Y.
			PED 3565, Standard Oil Co. of California 225 Bush Street, San Francisco 20, Calif.
14.	Oxygen-System Leak Testing Compound	MIL-L-25567	
15.	Solvent	PD680	
16.	Lubricating Oil	SAE-10	
17.	Air Conditioner Refrigerant	Refrigerant #12	
18.	Oil, (Air Conditioner Compressor) 500 Viscosity		Suniso #5, Virginia Chemical and Smelting Co., West Norfolk, Virginia.
			Texaco Capella E., Texaco Inc., 135 East 42nd Street, New York 17, N. Y.
19.	Aviator's Breathing Oxygen	MIL-O-27210	
20.	Naphtha	TT-N-95	
21.	Methyl Ethyl Ketone	MIL-M-13999	
22.	Toluol	TT-T-548	

ITEM	MATERIAL	SPECIFICATIONS	VENDOR PRODUCTS
23.	Paint Remover		Turco #4260, Turco Products Inc., Los Angeles, California
24.	Epoxy Primer	MIL-P-23377	Ameron Industrial Coatings Div. P.O. Box 2153 Wichita, Kansas 67201
25.	Wash Primer		Ameron Industrial Coatings Div. P.O. Box 2153 Wichita, Kansas 67201
26.	Zinc Chromate Primer	MIL-P-8585	
27.	Rubber Hose	MIL-H-5593	
28.	Oil, Engine Preservative	MIL-L-21260	
29.	Graphite, Lubricating	MIL-G-6711	GP-38, National Carbon Co., New York, N.Y.
30.	Lubricating Grease	ENCO ANDOK-B	Humble Oil Co., Houston, Texas
31.	Solvent		CRC-2-26, Corrosion Reaction Consultants, Inc., Philadelphia, Pa.
32.	Penetrating Oil	Mouse Milk	Worldwide Aircraft Filters Corp., 1685 Abram Ct., San Leandro, California, 94577
33.	Adhesive	EC2216	Minnesota Mining & Mfg. Co., St. Paul, Minnesota
34.	Corrosion Preventive Compound	MIL-C-16173 Grade 2	Bray Oil Company, 1925 N. Marianna Ave. Los Angeles, California 90032
35.	Coating	Alodine 1200, 1200S or 1201	Amchem Products Inc., Spring Garden Street Ambler, Pennsylvania 19002

NOTES

1. If 100 octane Low Lead (blue) fuel is not available, 100/130 octane (green) or 115/145 octane (purple) fuel may be used as an alternate.

2. Precautions should be taken when using MIL-G-23827 and MIL-G-81322, since these greases contain chemicals harmful to painted surfaces.

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 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.

NOTE

See section 5 for instructions on periodic lubrication of up lock rollers.

ITEM	LOCATION	LUBRICANT	INTERVAL
4.	Main retract fittings (8)	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-81322	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.
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.

**See propeller lubrication in this section for propeller blade bearing lubrication instructions. Lubricate at 100 hours with MIL-G-23827 lubricating grease.

***Mix MIL-G-6711 with naphtha and apply with a brush.

† When properly filled, the oil level on a dipstick inserted through the filler hole will be approximately 1/4 inch.

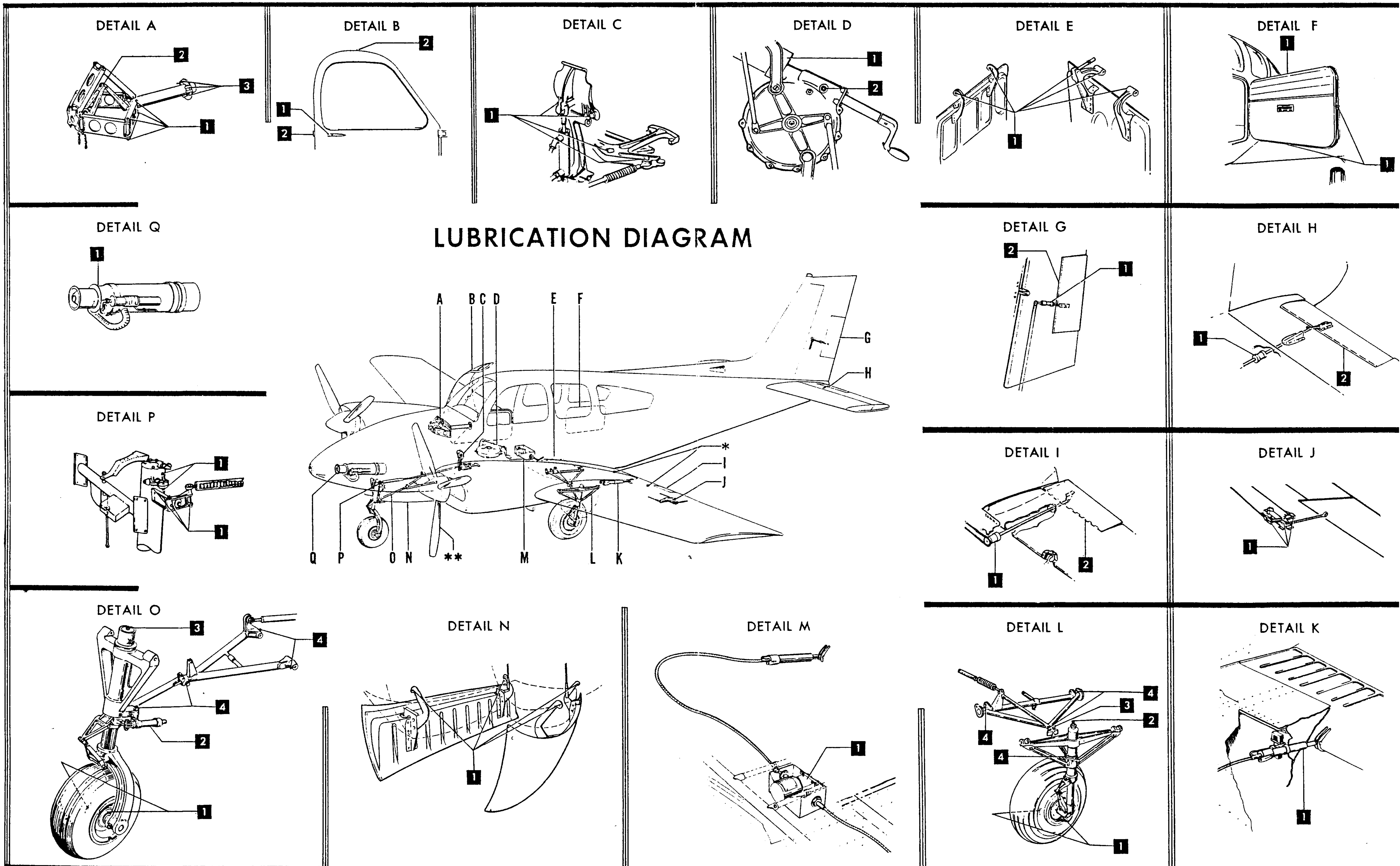


Figure 2-4. Lubrication Diagram

SERVICING CHART

ITEM	LOCATION	SERVICE WITH	INTERVAL
Check			
Engine Oil Level	Access door on upper cowling (2)	See oil grades chart	Preflight.
Battery Electrolyte	Access plate on L.H. rear nacelle (1)	See section 12 for detailed instructions.	Every 100 hrs.
Air Conditioner Compressor Oil Level	See section 10 for location and special instructions	Suniso #5 or Texaco Capella E, 500 Viscosity oil	As Req.
Air Conditioner Refrigerant	See section 10 for location and special instructions	Refrigerant # 12	As Req.
Autopilot Servo Air Filter	Aft of baggage compartment partition (1)		Every 100 hrs.
Propeller Air Dome	Access cap on propeller spinner (2)	Dry air or nitrogen	Every 100 hrs.
Propeller Accumulator	Lower rear of engine (2)	Dry air or nitrogen	Every 100 hrs.
Change			
Engine Oil	Access plate on lower nacelle (2)	See oil grades chart	Every 75 to 100 hrs.
Engine Oil Filter	R.H. side of engine (2)		Every 50 hrs.
Clean			
Deicer Filter Housing	Access plate on R.H. rear nacelle (2)	Naphtha or petroleum ether	Every 100 hrs.
Induction Air Filters	R.H. rear side of engine (2)	Clean with solvent - lubricate with MIL-L-21260	Every 50 hrs.
Servo Fuel Filter	Fuel injector (2)	Clean with solvent and blow dry with air pressure	Every 100 hrs.
Fuel Strainers	Main wheel well (2)	Clean with solvent and blow dry with air pressure	Every 100 hrs.
Heater Fuel Pump Screens	L.H. side of nose wheel well (2)	Clean with solvent and blow dry with air pressure	Every 100 hrs.
Heater Fuel Strainers	L.H. side of nose wheel well (1)	Clean with solvent and blow dry with air pressure	Every 100 hrs.
Engine Oil Screens	Lower rear of engine (2)	Clean with solvent and blow dry with air pressure	Every 50 hrs.
Suction Relief Valve Screens	Forward of instrument panel (2)	Clean with solvent and blow dry with air pressure	Every 100 hrs.
Air Pump Inlet Filter	Top rear of engine (2)	Clean with solvent and blow dry with air pressure	Every 100 hrs.
Drain			
Fuel Sump Drains	Lower wing surface (2)		Preflight.
Fuel Strainer Drains	Lower wing surface (2)		Preflight.
Fuel Tank Drains	Lower wing surface (2)		Preflight.
Heater Fuel Filter Drain	L.H. side of nose wheel well (1)		Preflight.
Static Drain	On upholstery panel below pilots sub panel (1)		Every 100 hrs.
Replace			
Central Air Filter	Forward of instrument panel (1)		Every 500 hrs.
Deicer System Air Filter	Access plate on R.H. rear of each nacelle (2)		As Req.
Autopilot Servo Air Filter	Aft of baggage compartment partition (1)		Every 1000 hrs.
Induction Air Filter	R.H. rear side of engine (2)		Every 500 hrs.
Gyro Instrument Air Filter	In nacelle aft of firewall (2)		Every 300 hrs.
Service			
Brake Fluid Reservoir	Forward baggage compartment (1)	MIL-H-5606, hydraulic fluid	As Req.
Oxygen Cylinder	Forward baggage compartment (1)	MIL-O-27210, aviator's breathing oxygen	As Req.
Main and Nose Landing Gear Struts	Top of each strut (3)	MIL-H-5606, hydraulic fluid and compressed air	Every 100 hrs.
Shimmy Dampener	Nose landing gear (1)	MIL-H-5606, hydraulic fluid	Every 100 hrs.

Numbers in parentheses indicate the number of points to be serviced.

SEALING CHART

ITEM	PRODUCT	VENDOR
1.	A-56-B Cement	B. F. Goodrich Co., Akron, Ohio.
2.	EC-870 Glue	Minnesota Mining and Manufacturing Co., St. Paul, Minnesota.
3.	Permatex Sealer No. 2	Permatex Co., Inc., Kansas City, Kansas.
4.	Presstite Sealer No. 576	Presstite Engineering Co., St. Louis, Mo.
5.	Silastic Sealer No. 140	Dow Corning, Midland, Michigan.
6.	EP711	Coast Proseal and Manufacturing Co., Los Angeles, California
7.	EC1675	Minnesota Mining and Manufacturing Co., St. Paul, Minnesota

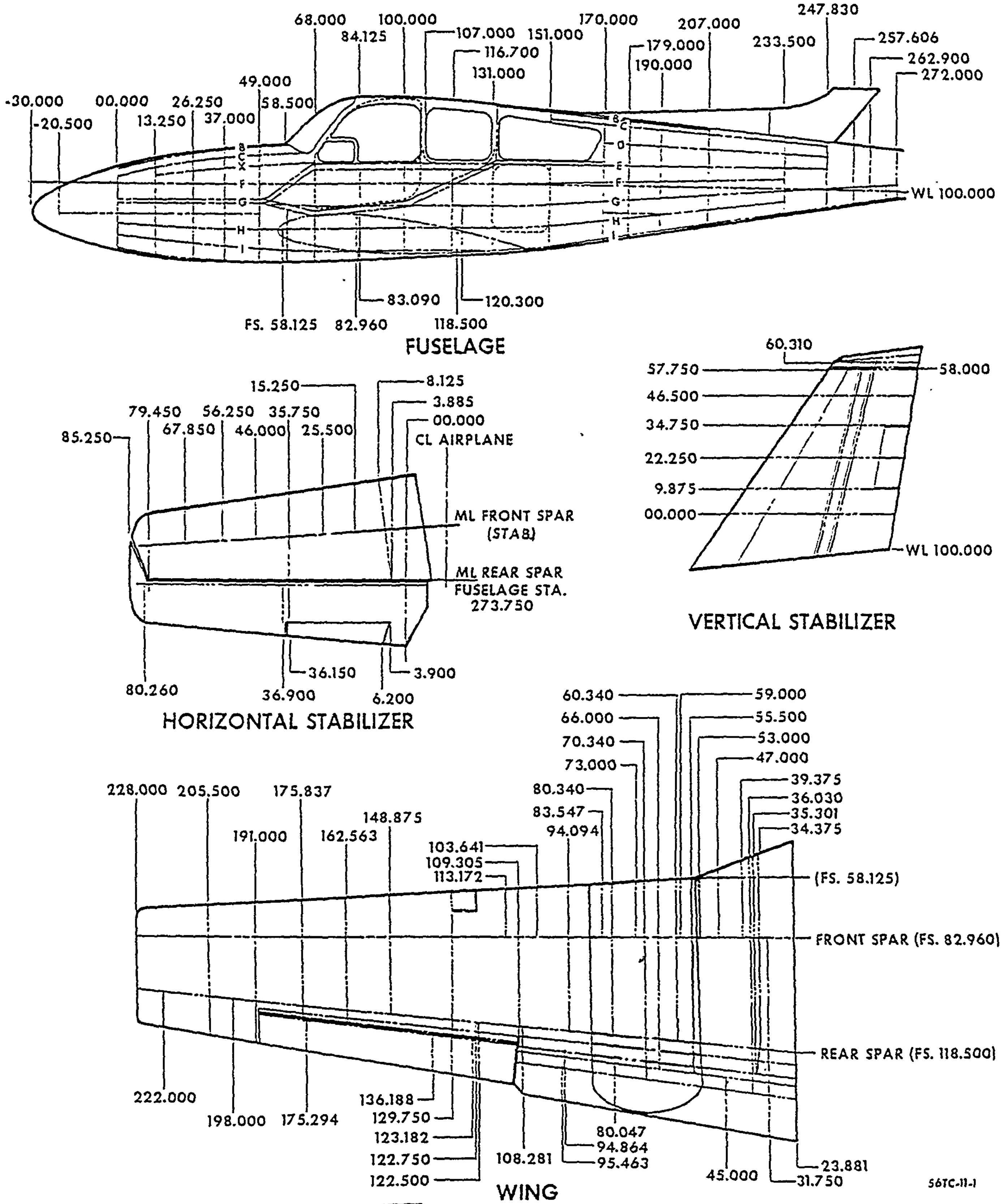


Figure 3-1. Stations Diagram

FUSELAGE AND EMPENNAGE SKIN INFORMATION

The following fuselage and empennage skin information with the tabulation of each individual skin and material description is furnished as general information for making skin repairs:

INDEX NO.	MATERIAL DESCRIPTION
1.	.025 Clad 2024-T3
2.	.032 Clad 2024-T3
3.	.020 Clad 6061-T6
4.	.020 Clad 2024-T3
5.	.020 Clad 2024-T4
6.	.016 Clad 2024-T3
7.	.090 Royalite
8.	.032 Clad 2024-T4
9.	.020 Mag. Alloy, AZ31B-H24
10.	.040 Clad 2024-T3
11.	.040 Alum. Alloy, 6061-T6
12.	.050 Alum. Alloy, 6061-T6
13.	.020 Alum. Alloy, 6061-T6
14.	No. 181 Glass Cloth, 4 or 5 ply to obtain .050 wall thickness

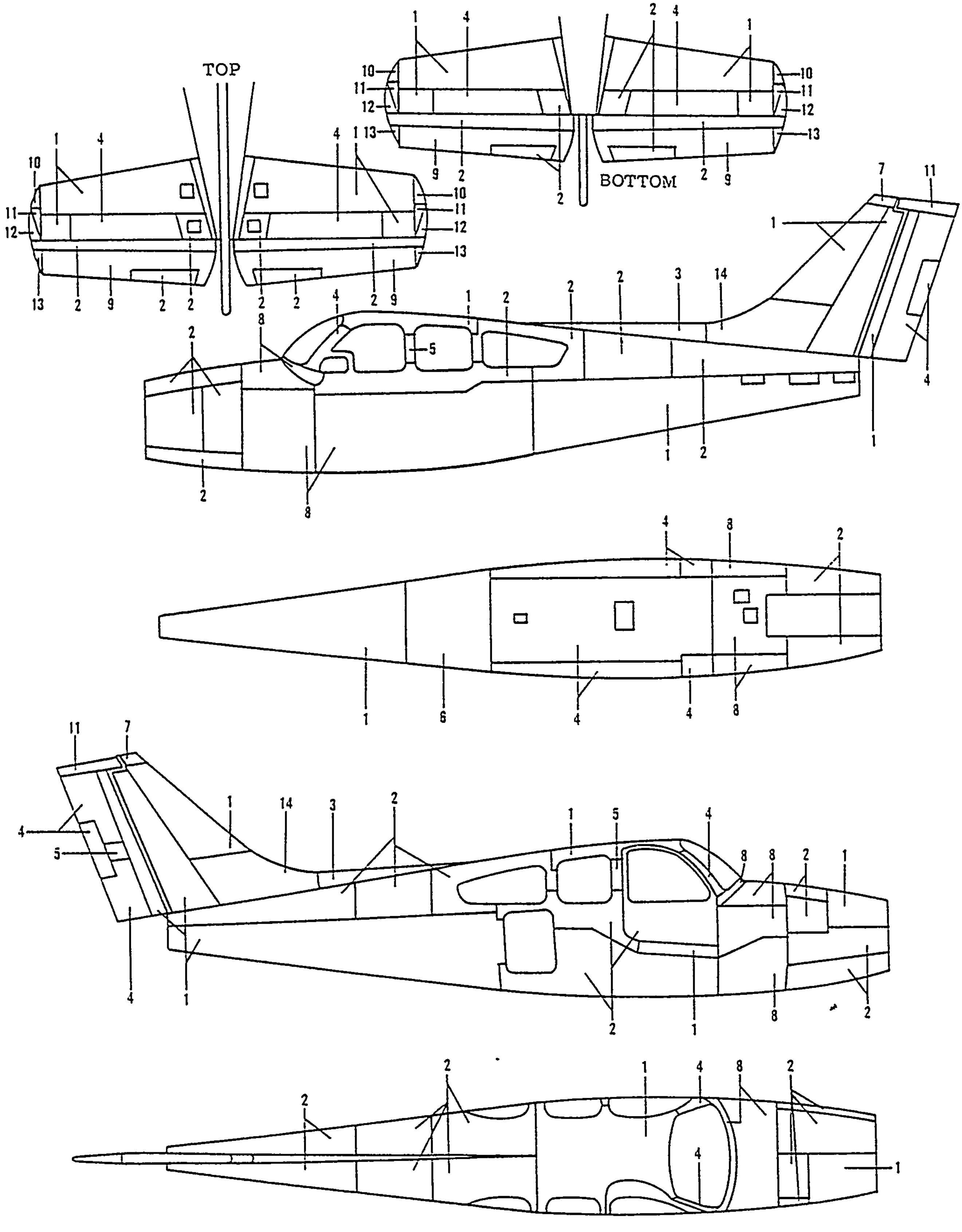


Figure 3-2. Fuselage and Empennage Skin Plating

WING SKIN INFORMATION

The following wing skin information with the tabulation of each individual skin and material description is furnished as general information for making skin repairs:

INDEX NO.	MATERIAL DESCRIPTION
1.	.025 Clad 2024-T3
2.	.032 Clad 2024-T3
3.	.020 Clad 2024-T3
4.	.020 Alum. Alloy, 2024-T42
5.	.040 Clad 2024-T3
6.	.016 Clad 6061-T6
7.	.032 Clad 2024-T4
8.	.016 Clad 2024-T3
9.	.020 Clad 6061-T6
10.	.025 Alum. Alloy, 6061-T6
11.	No. 181 Glass Cloth, 3 Ply
12.	.032 Alum. Alloy 6061-0

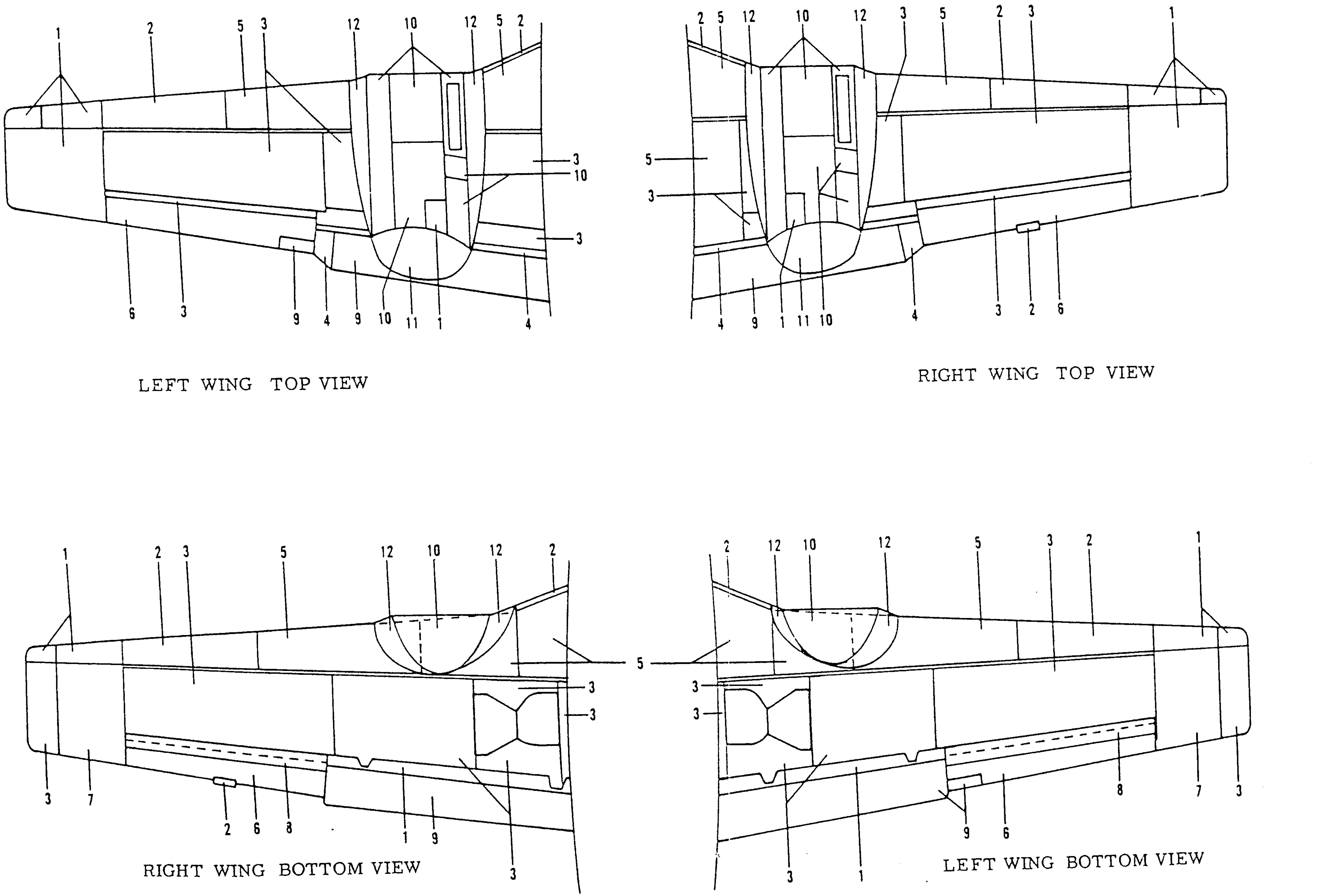


Figure 3-3. Wing Skin Plating

FUSELAGE ACCESS OPENINGS

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

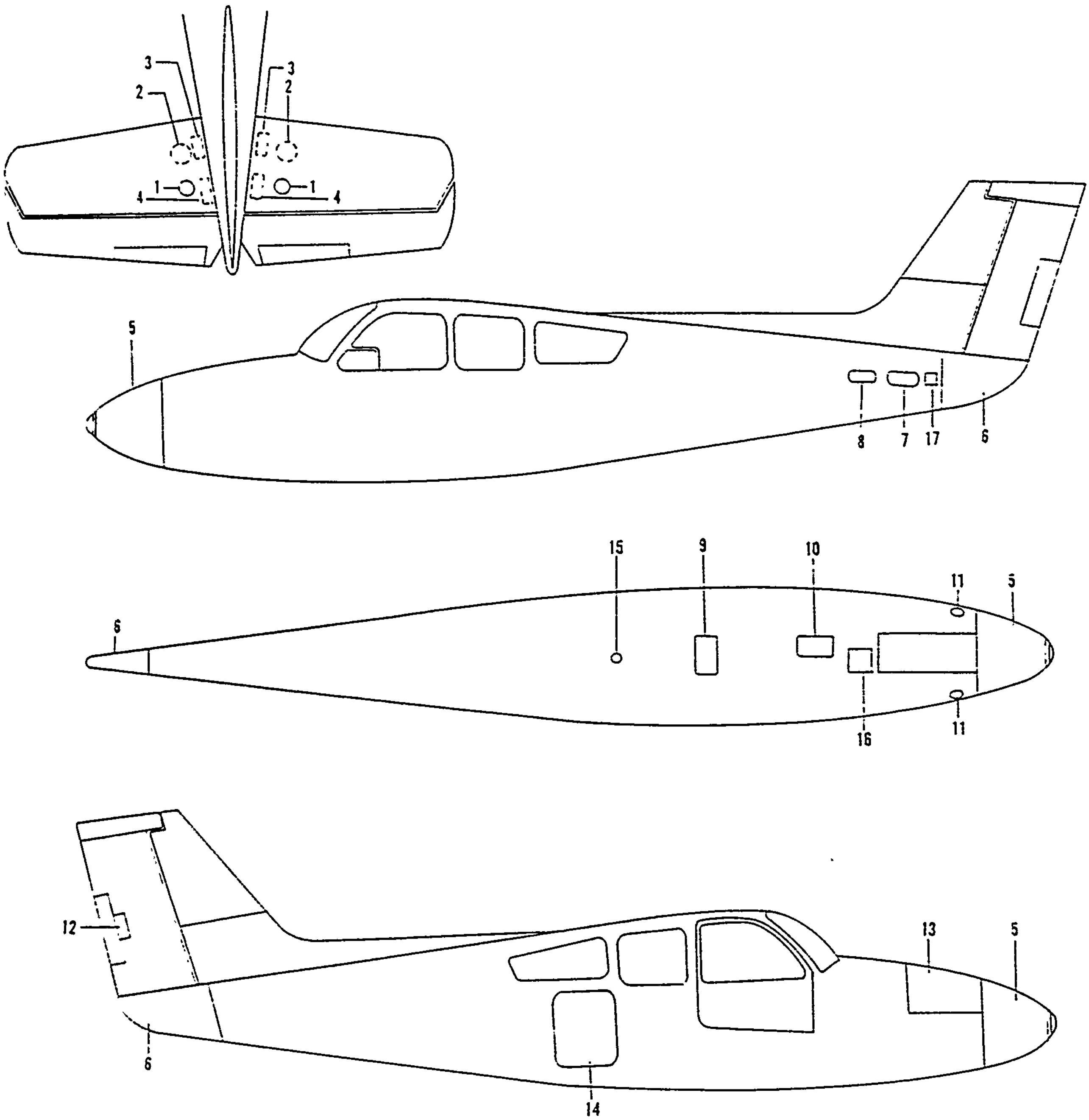


Figure 3-4. Fuselage Access Openings

WING ACCESS OPENINGS

1. Leading edge and box section fuel filler neck
2. Landing light access
3. Oil level indicator access
4. Leading edge fuel cell transmitter and fuel cell installation access
5. Reverse current diode, external power relay and L. H. control relay
6. External power receptacle
7. Auxiliary fuel cell transmitter (Installed if nacelle fuel cell is not installed.)
8. Aileron bellcrank
9. Nacelle fuel cell vent plumbing
10. Nacelle fuel cell filler neck
11. Nacelle fuel cell and vent line plumbing
12. Nacelle fuel cell plumbing, transmitter and installation access
13. Nacelle fuel cell plumbing
14. Reverse current diode
15. Leading edge fuel cell transmitter
16. Fuel pressure solenoid and deicer system filter
17. Fuel pressure solenoid, deicer system filter and cabin door seal plumbing
18. Air conditioning access
19. Battery, battery relays, voltage regulators, overvoltage relays, starter relays, paralleling rheostats, paralleling relays, alternator out relays, fuel flow inverter, radio inverter out relay, load meter shunt and fuse block
20. Wing attach bolt access
21. Cowl flap
22. Wing leading edge cap
23. Flap hinge bolt access
24. Aileron cable inspection
25. Aileron cable pulley
26. Aileron tab actuator and pulley
27. Wing tip access
28. Wing tip spar fitting
29. Pitot mast access
30. Oil drain access
31. Engine exhaust
32. Box section fuel cell installation access
33. Fuel cell siphon valve
34. Fuel boost pump

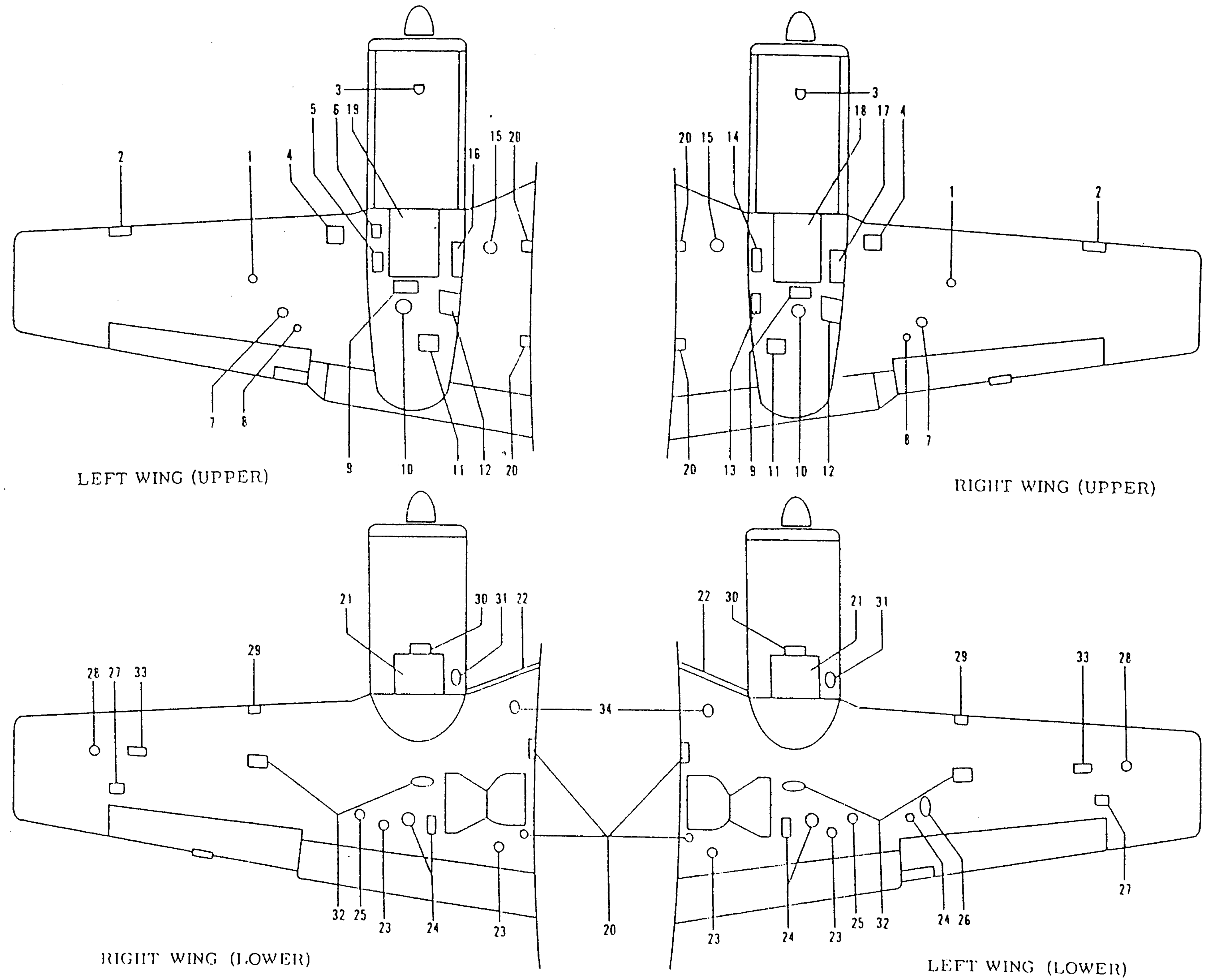


Figure 3-5. Wing Access Openings

WING

WING TIP REMOVAL

NOTE

On aircraft equipped with pneumatic surface deicers, the deicer boot must be removed from the wing tip before the wing tip can be removed. See Section 10 for deicer boot removal and installation instructions.

a. Remove the screws attaching the wing tip to the wing.

b. Disconnect the electrical leads to the navigation light and to the landing light.

WING TIP INSTALLATION

a. Attach the electrical leads to the navigation light and landing light.

b. Position the wing tip to the wing and install the attaching screws.

c. Reinstall deicer boot (If applicable).

WING REMOVAL
(Figure 3-6)

a. Drain and purge all fuel cells.

b. Remove the wing mounting bolt access plates from the top and bottom of the wing.

c. Place the aircraft on a three point jack to prevent an unbalanced condition of the airplane after the wing is removed.

d. Place a wing stand under the wing that is not being removed and place a stand under the tail. Remove the engine according to the instructions given on engine removal in Section 6.

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 turnbuckle in the wheel well and remove the roll pins from the inboard aileron cable pulley brackets. Disconnect the aileron tab cables and aileron tab stops in the left wheel well.

k. Disconnect the hydraulic brake line at the inboard connection in the wheel well.

l. Disconnect fuel lines between the wing root rib and the fuselage.

m. Disconnect the flap drive shaft at the motor and remove the clamps attaching the shaft housing to the fuselage.

n. Remove the lower aft nacelle fairing assembly.

o. Remove the inboard nacelle fairing.

p. Remove the leading edge cover of the wing located between the fuselage and nacelle.

q. Remove the clamps securing the wiring bundles to the wing inboard leading edge. Disconnect wiring bundles at terminals located on the aft side of nacelle firewall.

r. Disconnect the wiring to the electrical components located in each side of the upper nacelle.

s. Disconnect and cap the plumbing between the wing root rib and the fuselage.

WARNING

The two air conditioner lines between the right wing root rib and the fuselage are high pressure lines. Before disconnecting the two lines, loosen the fitting just enough to bleed off the pressure slowly.

t. Disconnect the flap wire bundle and safety switch wiring in the left wheel well. Disconnect the plumbing and electrical wiring (boost pump and fuel quantity transmitter) in each wheel well.

u. Remove the clamps securing engine controls to the leading edge.

v. Disconnect the pitot line between the wing root rib and the fuselage.

w. 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 bolts disengage freely. Do not screw or drive a bolt into, or out of the fittings.

x. Remove the nuts and bolts from the fittings.

y. Remove the wing by pulling it straight away from the fuselage.

NOTE

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

WING INSTALLATION

a. Using a nonmetallic brush and naphtha or methyl ethyl ketone (Item 20 or 21, Consumable Materials Chart), clean the wing attach fittings and hardware (bolts, nuts, and washers). 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. See Chart 3-1.

b. Coat the fitting bolt bores and bearing faces, bolts, washers, and nuts with MIL-C-16173 Grade II corrosion preventive compound (Item 34, Consumable Material Chart).

NOTE

Do not lubricate the leading edge attach fitting or hardware.

c. Place the slide in the fuselage fitting at the leading edge attach point (see Figure 3-6).

d. Guide the flap shaft and landing gear retract rod into their respective positions.

CAUTION

There should be no bolt binding during installation. Should binding occur, adjust the wing position until the bolt moves freely through the fittings.

e. Align the wing and fuselage fittings, install the soft aluminum washers between the upper wing attach fittings, and insert the bolts into the fittings.

CAUTION

Bolts and nuts must be oriented as shown in the applicable illustration for each location (Figure 3-6, 3-6A, 3-6B, 3-6C and 3-6D).

f. Start the nuts on the bolts. Rotate the wing trailing edge until the wing aligns with the outline drawn on the fuselage. After alignment is established, verify that the lower forward bolt is not binding in the bolt bore. If bolt binding is encountered, adjust the wing position until the bolt moves freely in the fittings.

g. Tighten the upper forward and aft nuts (Figure 3-6A and 3-6B).

CAUTION

When torquing the nuts, assure that the wrenches do not bottom out on the wing fittings. Such an occurrence could cause false torque readings and damage to the fittings. After torquing the upper forward nut, remove the holding force from the wing cradle (if used) and torque the remaining three nuts.

h. Torque the nuts in the following order: upper forward, upper aft, lower forward and lower aft (Figure 3-6A, 3-6B, 3-6C, and 3-6D). 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 shown in Figure 1-2.

CAUTION

Before the lower aft nut is torqued, a slight gap may be evident between the fittings. This gap should not exceed a width of .060 inch. No gap should exist after the nut is torqued. Torque the wing attach bolts at the nut end. Do not rotate the bolt in the bolt bore.

i. Torque the leading edge attach point to the dry torque value shown in Figure 3-6.

j. Reinstall the engine, connect engine controls.

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

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

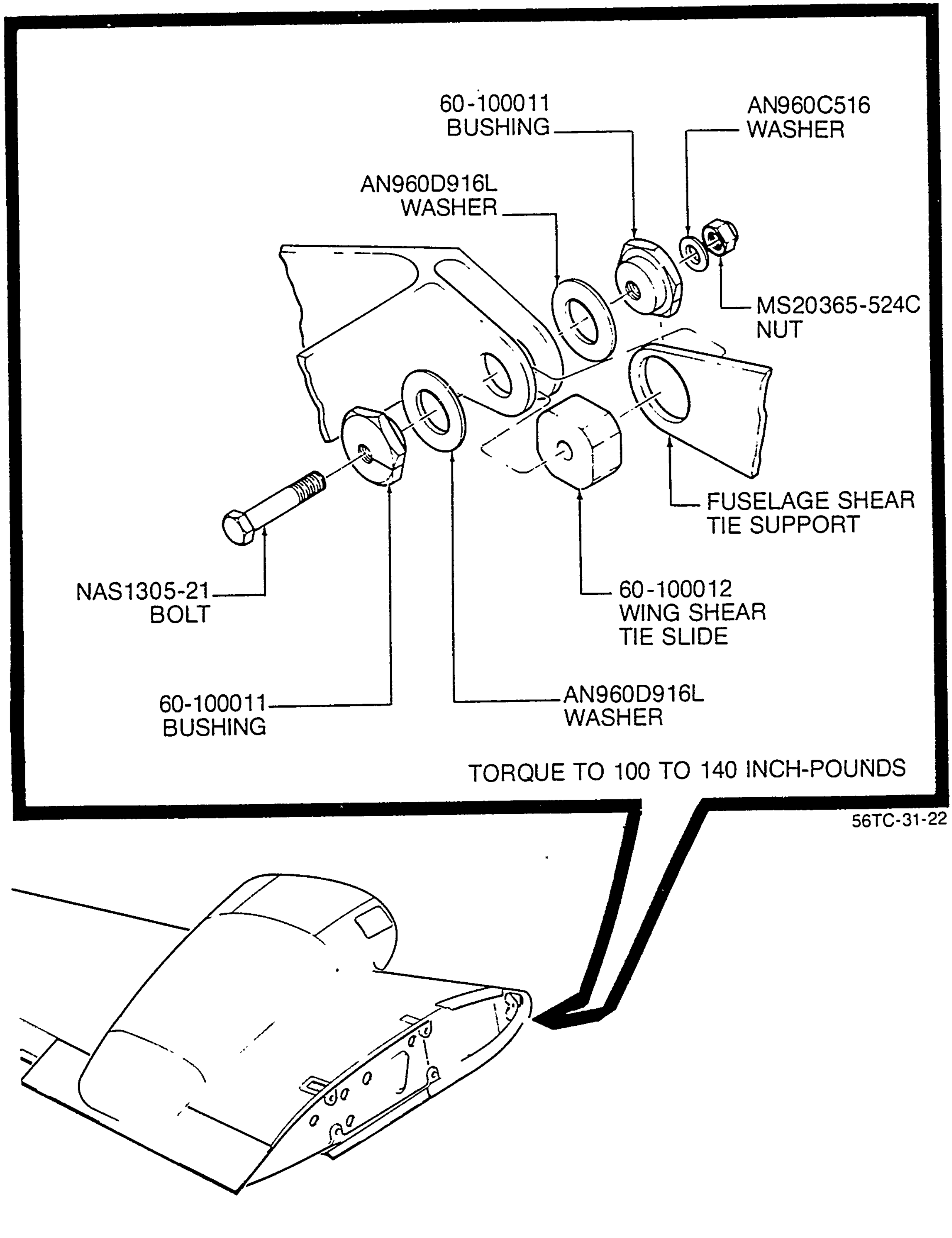
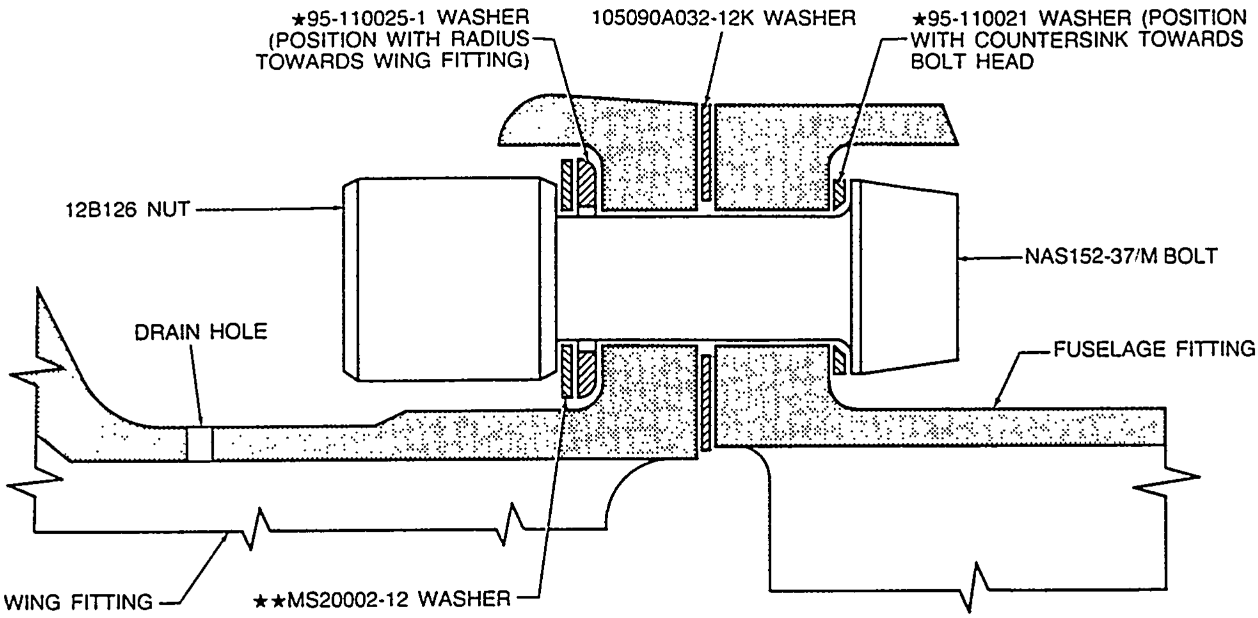


Figure 3-6. Leading Edge Attach Point Bolt Installation



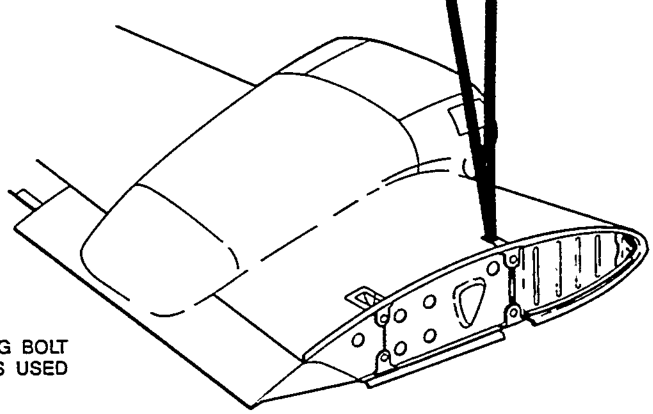
BOLT TORQUE: 2480 TO 2600 INCH-POUNDS. COAT THE COMPLETE BOLT, NUT, WASHERS, WING FITTING BOLT BORES, AND EXPOSED BOLT THREADS WITH MIL-C-16173, GRADE 2 CORROSION PREVENTIVE COMPOUND.

★CHECK WASHER FOR A SMOOTH CONTINUOUS OUTER RADIUS.

★★MS20002-12 WASHERS MAY BE USED AS REQUIRED BETWEEN THE NUT AND 95-110025-1 WASHER TO PROVIDE A PROPER BOLT GRIP ADJUSTMENT.

NOTE

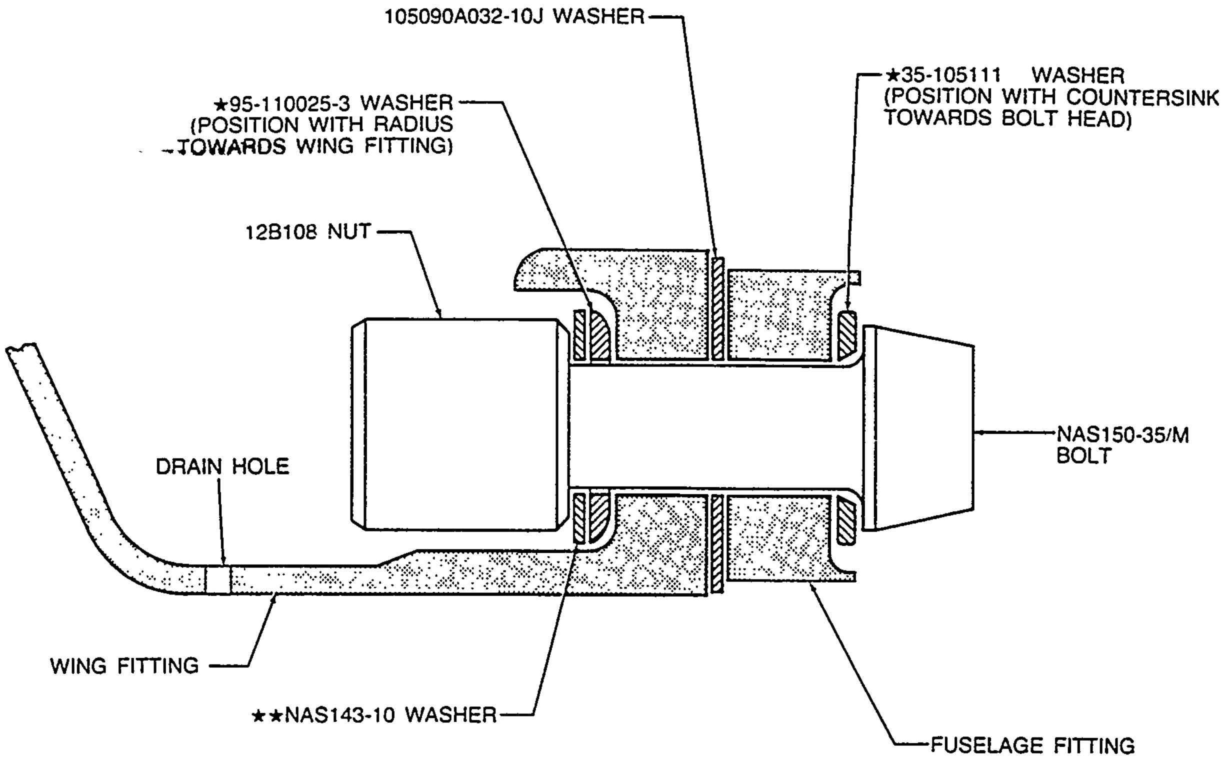
Concurrent with the scheduled torque check, inspect the upper wing attach fittings to assure that the drain holes are clear.



REFER TO CHART 3-1 FOR THE WING BOLT WRENCHES AND TORQUE ADAPTERS USED WITH THIS WING BOLT AND NUT.

56TC-31-23

Figure 3-6A. Upper Forward Wing Bolt Installation



BOLT TORQUE: 1180 TO 1300 INCH-POUNDS. COAT THE COMPLETE BOLT, NUT, WASHERS, WING FITTING BOLT BORES, AND EXPOSED BOLT THREADS WITH MIL-C-16173, GRADE 2 CORROSION PREVENTIVE COMPOUND.

★CHECK WASHER FOR A SMOOTH CONTINUOUS OUTER RADIUS.

★★NAS143-10 WASHERS MAY BE USED AS REQUIRED BETWEEN THE NUT AND 95-110025-3 WASHER TO PROVIDE A PROPER BOLT GRIP ADJUSTMENT.

NOTE

Concurrent with the scheduled torque check, inspect the upper wing attach fittings to assure that the drain holes are clear.

REFER TO CHART 3-1 FOR THE WING BOLT WRENCHES AND TORQUE ADAPTERS USED WITH THIS WING BOLT AND NUT.

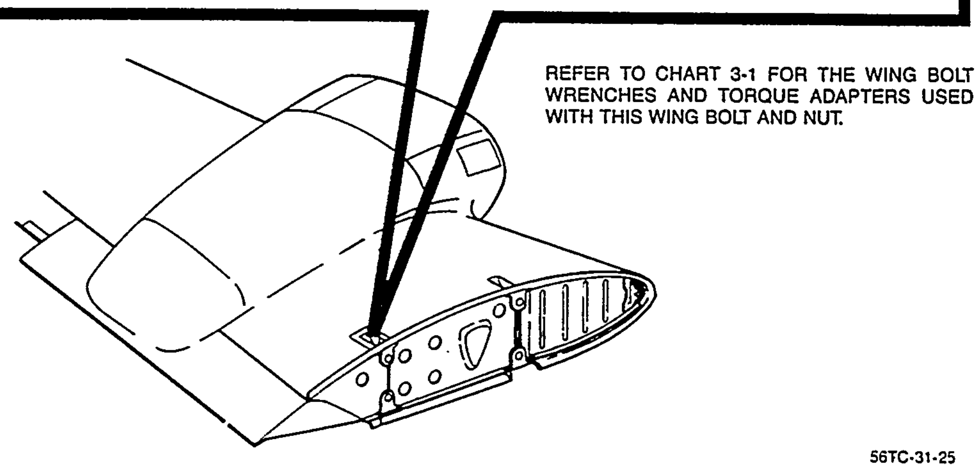


Figure 3-6B. Upper Aft Wing Bolt Installation

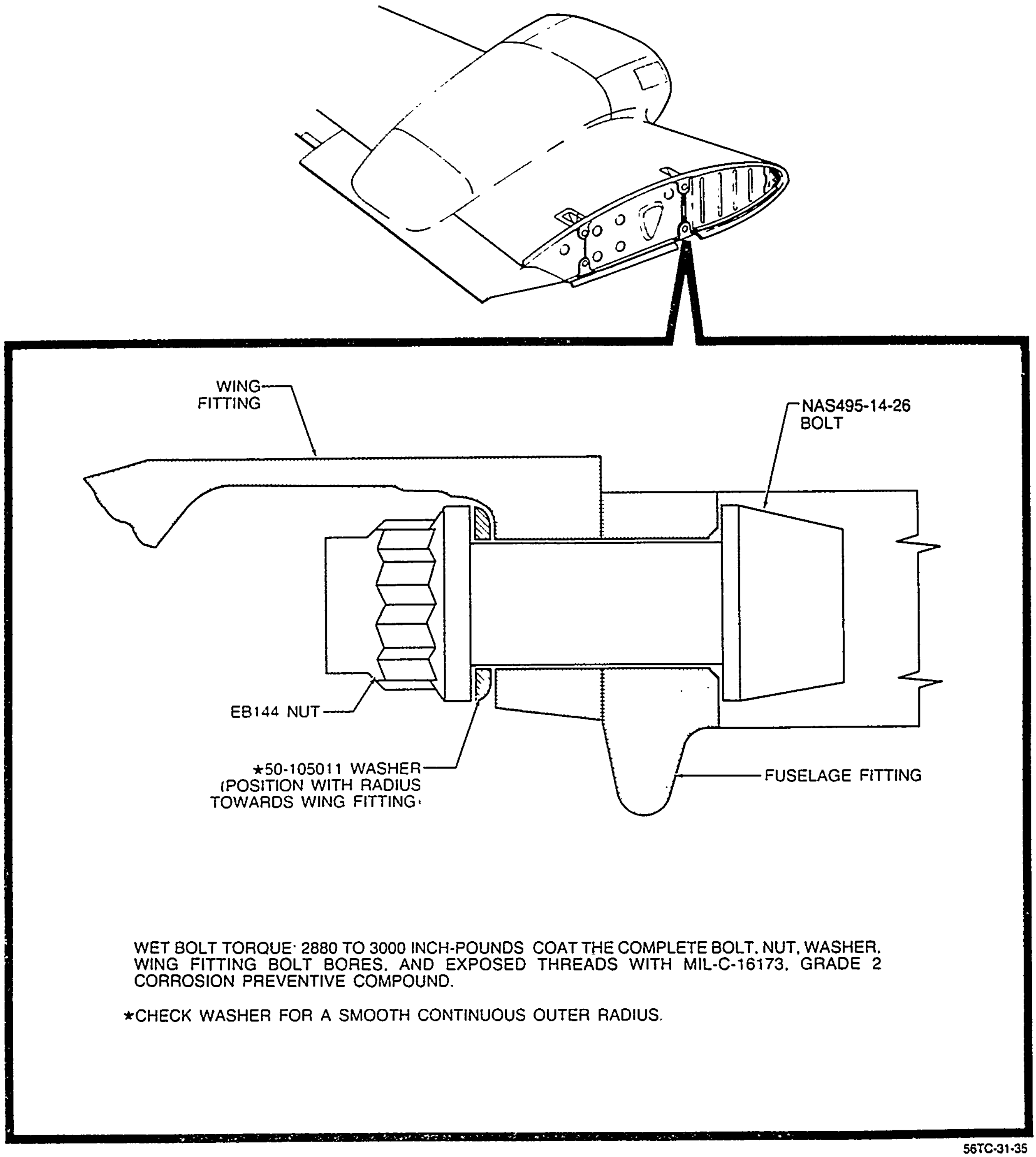
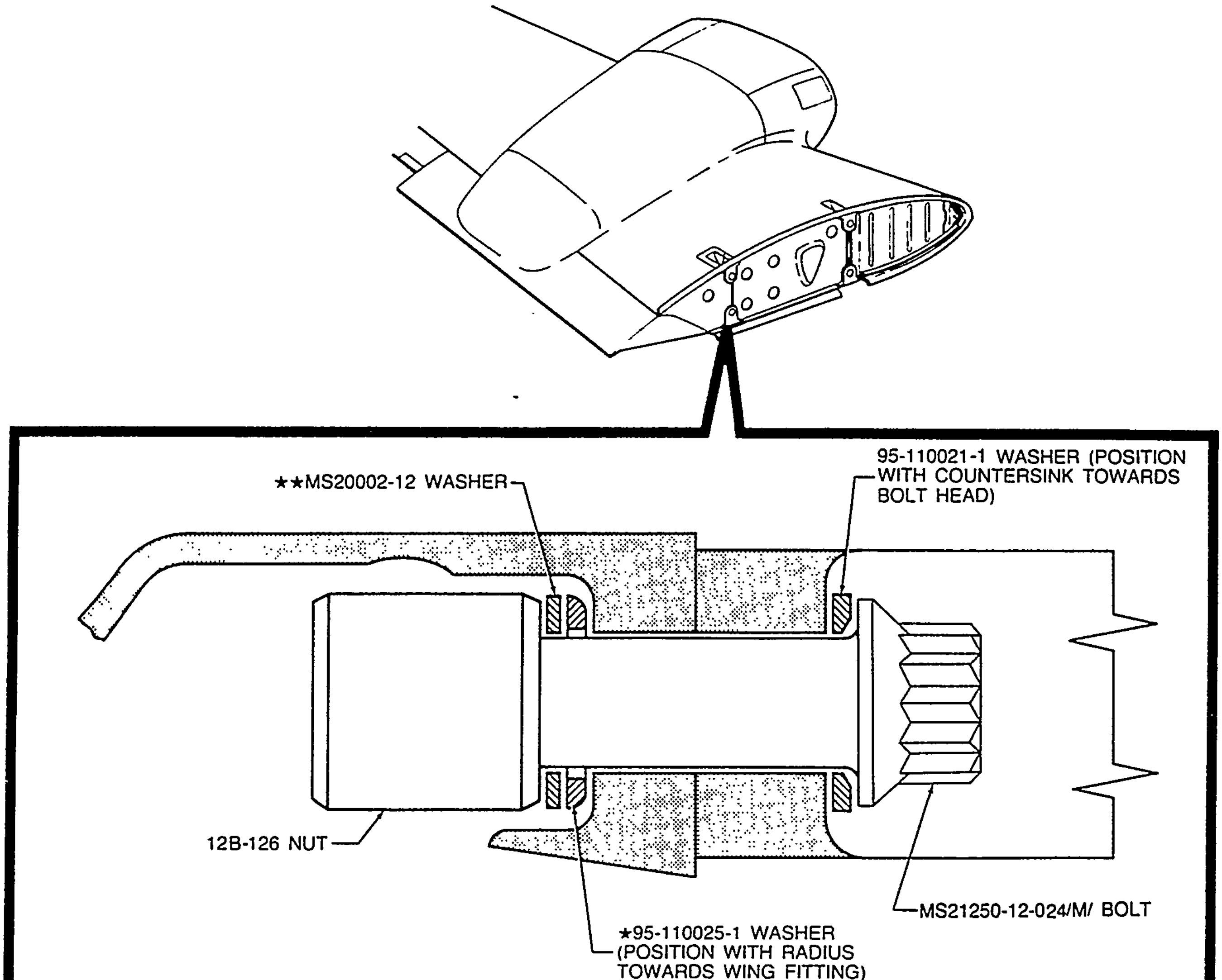


Figure 3-6C. Lower Forward Wing Bolt Installation



BOLT TORQUE: 2480 TO 2600 INCH-POUNDS. COAT THE COMPLETE BOLT. NUT. WASHERS. WING FITTING BOLT BORES. AND EXPOSED BOLT THREADS WITH MIL-C-16173. GRADE 2 CORROSION PREVENTIVE COMPOUND.

★CHECK WASHER FOR A SMOOTH CONTINUOUS OUTER RADIUS.

★★MS20002-12 WASHERS MAY BE USED AS REQUIRED BETWEEN THE NUT AND 95-110025-1 WASHER TO PROVIDE A PROPER BOLT GRIP ADJUSTMENT

56TC-31-24

Figure 3-6D. Lower Aft Wing Bolt Installation

Chart 3-1
Wing Bolt Wrenches And Torque Wrench Adapters

POSITION	BOLT PART NO.	WRENCH PART NO.	NUT PART NO.	TORQUE WRENCH ADAPTER NO.
UPPER FORWARD	NAS152-37/M/	TS1222-3	12B126	TS1171-2
UPPER AFT	NAS150-35/M/	TS1222-4 or TS1222-5	12B108	TS1171-1 or 50-590013
LOWER FORWARD	NAS495-14-26	TS1222-3	EB144	50-590014
LOWER AFT	MS21250-12 -024/M/	TK1817-922-4	12B126	TS1171-2

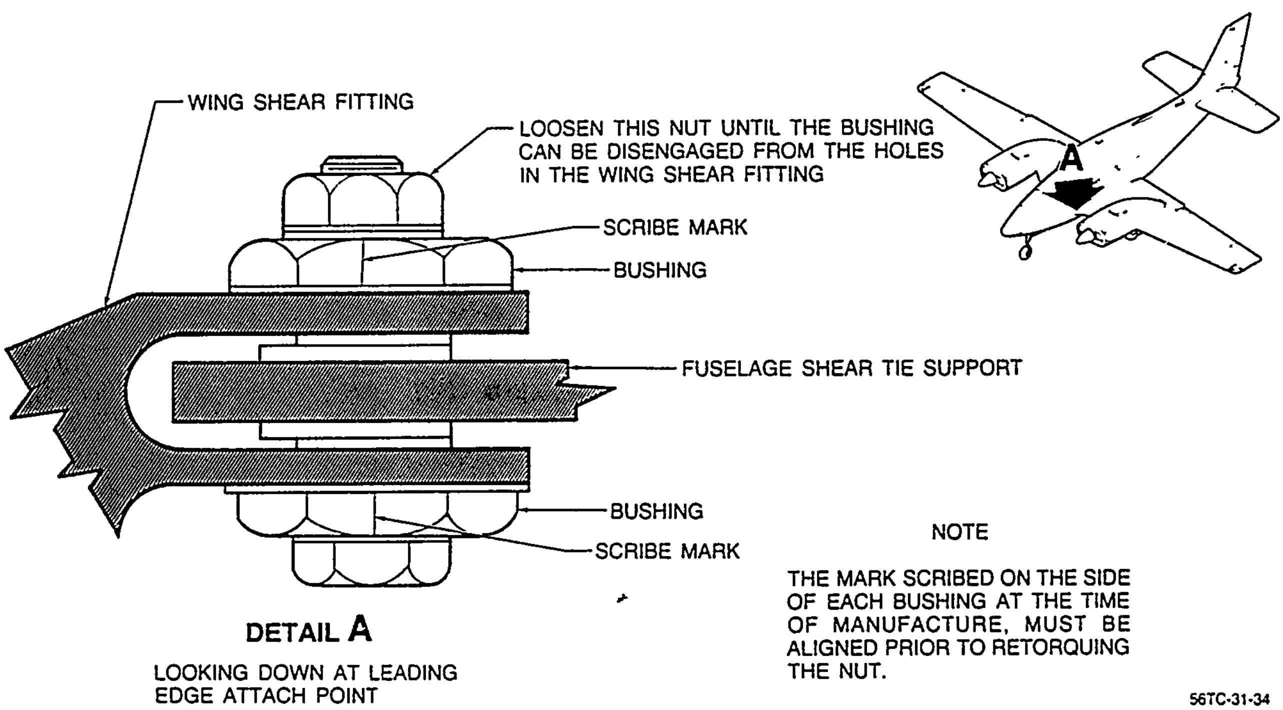


Figure 3-6E. Leading Edge Attach Point

NOTE

The air conditioning system must be purged and recharged after wing installation. See Section 10 for instructions on purging and recharging the system.

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

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

o. Reinstall the lower aft nacelle, wing leading edge cover, nacelle fillets and inboard nacelle fairing.

ADJUSTING THE WING

After the wing has been reinstalled or repaired, flight tests may show the wing to be chronically heavy or light. This condition may be corrected by rotating the wing to lower the trailing edge of the heavy wing or to raise the trailing edge of the light wing. Occasionally a combination of adjusting both wings will be required. The aluminum washers between the upper fittings must be replaced each time the position of the wing is changed. The following steps should be observed when adjusting the wings:

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

b. Place the airplane on a three point jack and raise 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.

c. Loosen the nuts on the lower wing attach bolts and remove the bolts and nuts from the upper wing attach fittings. Coat the bearing faces and bolt bores of the fittings, the bolts, washers, and nuts with MIL-C-16173 Grade II corrosion preventive compound (Item 34, Consumable Materials Chart). Install new soft aluminum washers between the upper wing attach fittings. Install the bolts, washers and nuts into the fittings.

d. Loosen the nut at the leading edge attach point until the bushings can be disengaged from the wing shear fitting (see Figure 3-6E).

e. 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.

f. Torque each nut to the wet torque value shown in the appropriate illustration (Figure 3-6A, 3-6B, 3-6C, and 3-6D). There should be no gap between the fittings after the last nut is torqued. Coat the exposed threads that protrude through the nuts with MIL-C-16173 Grade II corrosion preventive compound (Item 34, Consumable Materials Chart).

NOTE

After torquing the upper wing attach nut, remove the holding force from the wing cradle prior to torquing the remaining nuts.

g. Rotate the bushings in the leading edge attach point until they engage the shear fitting holes. The scribe mark on the side of each bushing must be aligned before the nut is torqued. Torque the nut to the dry torque value shown in Figure 3-6.

h. After removing the wing and tail stands and the jack, test fly the airplane.

i. If adjustment will not remedy a heavy wing condition, rig the flap down on the heavy wing by screwing the actuator out. Do this as a last resort, since rigging the flap down will create additional drag on the airplane.

WING BOLT, NUT, AND FITTING INSPECTION

NOTE

Read this entire section before removing any bolt for inspection. The leading edge attach point is not part of the following inspection.

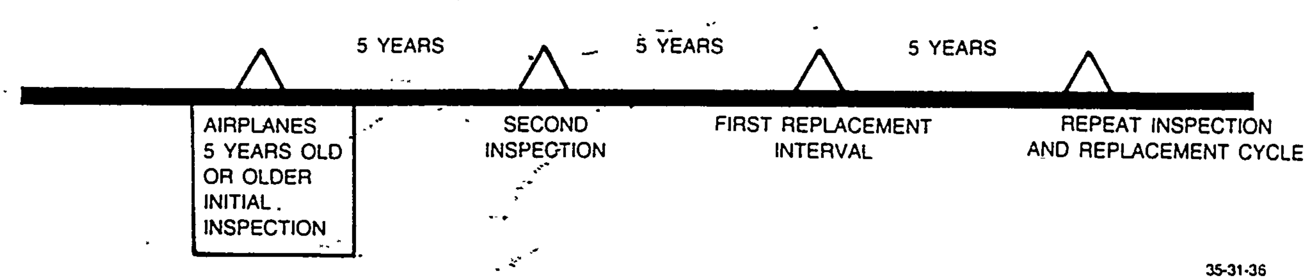
WARNING

The wing bolts and nuts installed in all 56TC Turbo Barons must be removed and inspected. If the bolts and nuts prove to be free of all damage, they may be reinstalled for an additional five year period. At the end of this time the bolts and nuts must again be removed and inspected. 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 Chart 3-2.

a. Before removing the wing bolts, 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.

NOTE

Beech Aircraft Corporation supplies wing attach hardware that has 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.



NOTE

The first wing bolt inspection must be performed at the first scheduled inspection following the issue date of revision B3.

NOTE

At each replacement interval, all wing bolts, washers, and nuts must be replaced with new hardware.

Wing Bolt And Nut Inspection And Replacement Cycle
Chart 3-2

CAUTION

There should be no wing bolt binding during removal or installation of the bolts. Do not screw or drive a bolt into or out of the fittings. If wing bolt binding is encountered, place the airplane on a three point jack and raise until the wheels are clear (see Section 2 for jacking instructions). Place a wing stand under each wing and a tail stand under the aft portion of the fuselage. Defuel the wing, loosen the remaining three bolts and rotate 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 nuts as instructed under WING INSTALLATION. 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.

WARNING

Use only the components specified in the applicable illustrations. Do not install the black P/N H20 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.

b. Starting at the lower forward 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 each bolt, nut, and washer with naphtha or methyl ethyl ketone (Item 20 or 21, Consumable Materials Chart).

CAUTION

Assure that the radiused washers shown in Figures 3-6A, 3-6B, 3-6C and 3-6D have complete radii with no sharp edges that could damage the fittings.

d. If the bolts and nuts do not exceed the life limit shown in Chart 3-2, visually inspect each component with a 10-power or stronger magnifying glass; inspect for corrosion, cracks, and mechanical damage. The cadmium plating may have areas that appear rubbed, discolored or polished. These areas are usually the result of previous 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 fitting bolt bores with naptha or methyl ethyl ketone (Item 20 or 21, Consumable Materials Chart). 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. If scoring, corrosion pitting or washer impressions are discovered, contact the Commercial Service Department of Beech Aircraft Corporation. If the fittings are satisfactory, coat the bolt bores and bearing faces of the fitting with Alodine 1200, 1200S or 1201 (Item 35, Consumable Materials Chart). Allow the coating to remain on the surface for approximately five minutes. When the time has elapsed, wash the treated area with water and blow dry (do not wipe dry). Paint the treated areas with zinc chromate primer (Item 26, Consumable Materials Chart) and allow to dry.

NOTICE

WING BOLTS ARE LUBRICATED SEE MAINTENANCE MANUAL FOR CORRECT TORQUE VALUES

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.

Figure 3-6F. Lubricated Bolt Identification Placard

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 (Item 34, Consumable Materials Chart).

h. Install the bolt, washers and nut into the fittings.

CAUTION

Ensure that the wing bolt wrenches do not bottom out on the fittings when torquing the nut. 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 3-6A, 3-6B, 3-6C or 3-6D). 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 1.

j. Coat the exposed threads that protrude through the nut with MIL-C-16173 Grade II corrosion preventive compound (Item 34, Consumable Materials Chart).

k. Check that the decal shown in Figure 3-6F is affixed to the appropriate locations on the airplane.

l. Check the drain ports in the upper wing attach fittings after each bolt installation and at each scheduled inspection to assure that they are unobstructed.

m. At the first scheduled inspection after the wing bolts have been inspected or replaced, check for proper bolt torque.

WARNING

The magnetic particle inspection described in this chapter is provided as general information on the subject and is not intended to substitute for qualified training.

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 3-3 provide for optimum detection of discontinuities perpendicular to the bolt axis.

CHART 3-3
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 requirements 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 3-4 provide for optimum detection of discontinuities parallel to the nut axis.

CHART 3-4
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 3-6G)

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 000-110011-7 LH spar and a new 000-110011-8 RH spar on the Model 56TC 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 3-6H.

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.

THIS ILLUSTRATION REPRESENTS A TYPICAL SECTION OF THE SPAR CAP TO BE INSPECTED FOR INDICATORS OF POSSIBLE CORROSION. THE INDICATORS ARE ALL SHOWN IN ONE AREA AND ARE EXAGGERATED FOR CLARITY. ANY ONE OR ANY COMBINATION OF THE INDICATORS ARE CAUSE FOR FURTHER INVESTIGATION.

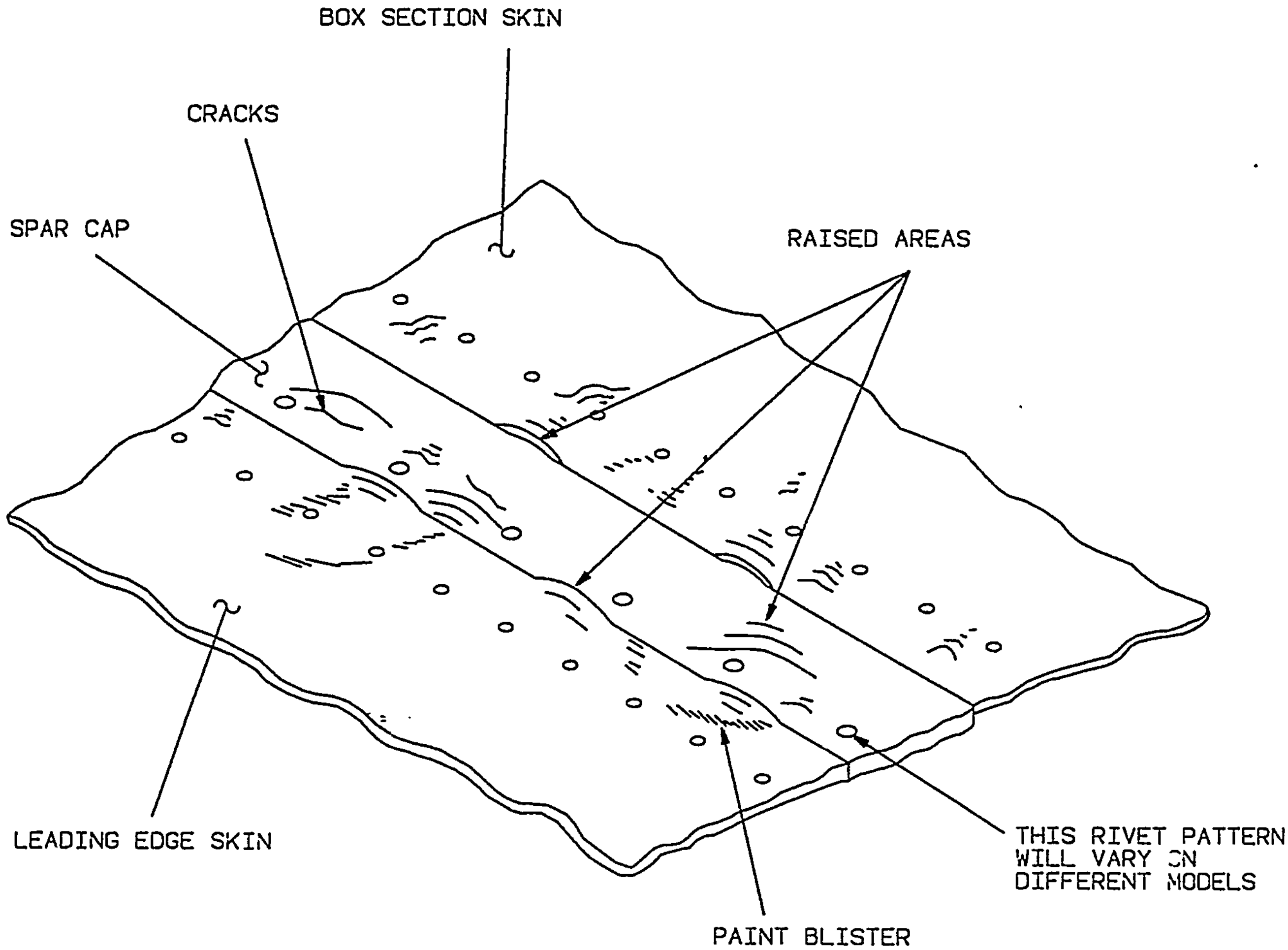


Figure 3-6G. Outboard Wing Main Spar Cap Visual Inspection

NOTICE

Uneven or raised areas on the spar caps may be detected by sliding the fingers over the surface, by moving a straightedge over the surface or by sighting down the length of the spar cap.

d. If unusual conditions are encountered that cannot be resolved locally, contact the Commercial Customer Support of Beech Aircraft Corporation for evaluation and determination of any corrective action that may be required.

WING, FORWARD SPAR CARRY-THROUGH STRUCTURE INSPECTION WITHOUT REPAIR KIT

This procedure provides inspection and repair information relating to the forward wing spar carry-through structure at the forward and aft frames.

NOTE

The areas identified in Figure 3-6I should be inspected for cracking at the intervals specified for unrepaired structure according to Chart 3-5 using the following inspection procedure:

a. Remove the pilot's and copilot's seats and the carry-through cover to obtain access to the front spar carry-through structure.

b. Thoroughly clean the forward and aft frames (webs) of the front spar carry-through structure in the areas shown in Figure 3-6I with Naphtha or equivalent cleaning agent (20, Consumable Materials Chart, Section 2).

c. Perform a visual inspection of the cleaned areas for evidence of cracks.

d. Perform a fluorescent or dye penetrant inspection per MIL-STD-6866 of the cleaned area for evidence of cracks.

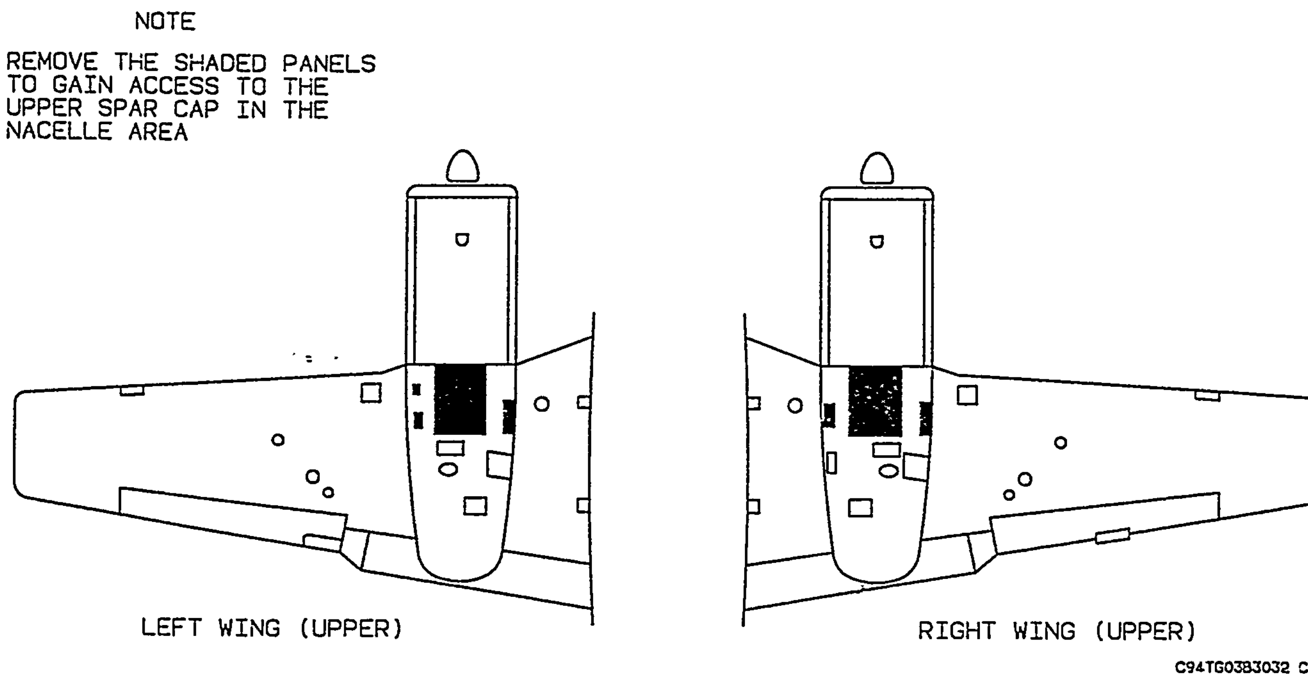


Figure 3-6H. Upper Spar Cap Access Panels

e. If cracks are discovered, determine the crack size and method of repair as outlined in the WING, FORWARD SPAR CARRY-THROUGH STRUCTURE REPAIR/INSPECTION procedure.

f. If no cracks are noted, install the carry-through cover and the pilot's and copilot's seats.

WING, FORWARD SPAR CARRY-THROUGH STRUCTURE INSPECTION WITH REPAIR KIT

NOTE

The areas identified in Figure 3-6I should be inspected for cracking at the intervals specified for repaired structure according to Chart 3-6 using the following inspection procedure.

a. Remove the pilot's and copilot's seats and the carry-through cover to obtain access to the front spar carry-through structure.

b. Thoroughly clean the forward and aft frames (webs and reinforcing doubler) of the front spar carry-through structure in the areas shown in Figure 3-6I with Naphtha or equivalent cleaning agent (20, Consumable Materials Chart, Section 2).

c. Perform a visual inspection of the cleaned areas for evidence of cracks.

d. Perform a fluorescent or dye penetrant inspection per MIL-STD-6866 of the cleaned area for evidence of cracks.

e. If cracks are discovered in the doubler or the existing web face, the crack has progressed beyond the doubler profile; contact Beech Commercial Customer Support Department for further instructions.

f. If no cracks are noted, install the carry-through cover and the pilot's and copilot's seats.

WING, FORWARD SPAR CARRY-THROUGH STRUCTURE REPAIR/ INSPECTION (Figure 3-6I)

NOTE

The extent of repair/inspection is limited to cracking in the radius of the web flange and cracks in the web face around the fasteners in the lower front spar cap.

BEND RADIUS CRACK

The following procedure should be performed to repair/inspect cracks in the bend radius:

a. A crack up to 2.25 inches in length must be stop drilled with a #30 drill bit at the crack ends, then inspected for progression at each annual inspection or every 200 hours, whichever occurs first. One stop-drilled crack per left side and one stop-drilled crack per right side of the bend radius is permissible if neither one exceeds 2.25 inches in length.

CAUTION

Caution must be used during the stop drilling operation. Do not drill into the spar cap, skin or any other structure. A thin stainless steel sheet may be used to prevent damaging adjacent structure.

b. A crack between 2.25 inches and 4.0 inches in length must be stop drilled with a #30 drill bit at the crack ends. The area must be repaired within the next 100 flight hours with the applicable kit in Chart 3-7.

c. A crack exceeding 4.0 inches in length must be repaired prior to further flight with the applicable kit in Chart 3-7.

WEB FACE CRACK

The following procedure should be performed to repair/inspect cracks in the web face around the huck-bolt fasteners:

a. A crack less than 1.0 inch in length or one crack between two fasteners does not require immediate repair, but shall be inspected for progression at each annual inspection or every 200 hours, whichever occurs first. A crack emanating from one fastener in two directions is considered to be one crack.

CAUTION

Do not stop drill, due to the possibility of damaging structure behind web face.

One crack per left side and one crack per right side of the web face is allowed if neither one exceeds 1.0 inch in length.

b. A crack more than 1.0 inch in length or a crack extending less than 0.5 inch beyond two fasteners on either end shall be repaired within the next 25 flight hours with the applicable kit listed in Chart 3-7.

c. A crack passing through two fasteners and extending beyond for more than 0.5 inch on either end shall be repaired prior to further flight with the applicable kit listed in Chart 3-7.

COMBINATION BEND RADIUS AND WEB FACE CRACKS

A combination of BEND RADIUS and WEB FACE CRACKS are acceptable without repair. However, if there are any cracks in both the forward and the aft web face, or in the bend radius on the same side of the airplane, or if any cracks more than 1.0 inch long are found, they must be repaired prior to further flight with the applicable kit listed in Chart 3-7.

a. If a fuselage skin crack is discovered around the opening for the lower forward carry-through fitting, an external skin doubler may be required. Contact Beech Commercial Customer Support Department for further instructions.

b. Repair all cracks per the appropriate kit listed in Chart 3-7 if the limitations in the BEND RADIUS CRACK and WEB FACE CRACK procedures are exceeded.

c. Reinstall the carry-through cover and the pilot's and copilot's seats.

CHART 3-5
INSPECTION PROGRAM FOR UNREPAIRED STRUCTURE

AIRCRAFT SERIAL NO.	INITIAL INSPECTION	FREQUENCY OF INSPECTION
TG-1 Thru TG-94	1,500 Hours	500 Hours

CHART 3-6
INSPECTION PROGRAM FOR REPAIRED STRUCTURE

AIRCRAFT SERIAL NO.	INITIAL INSPECTION	FREQUENCY OF INSPECTION
TG-1 Thru TG-94	1,500 Hours	1,500 Hours

CHART 3-7
FRONT SPAR CARRY-THROUGH STRUCTURE REPAIR KITS

AIRCRAFT SERIAL NO.	PART NUMBER	KIT DESCRIPTION	QUANTITY PER AIRCRAFT
Serials TG-1 Thru TG-94	58-4008-1 S	Front Spar Carry-Through Structure Reinforcement (Forward Frame)	1 Required
Serials TG-1 Thru TG-94	58-4008-3 S	Front Spar Carry-Through Structure Reinforcement (Aft Frame)	1 Required

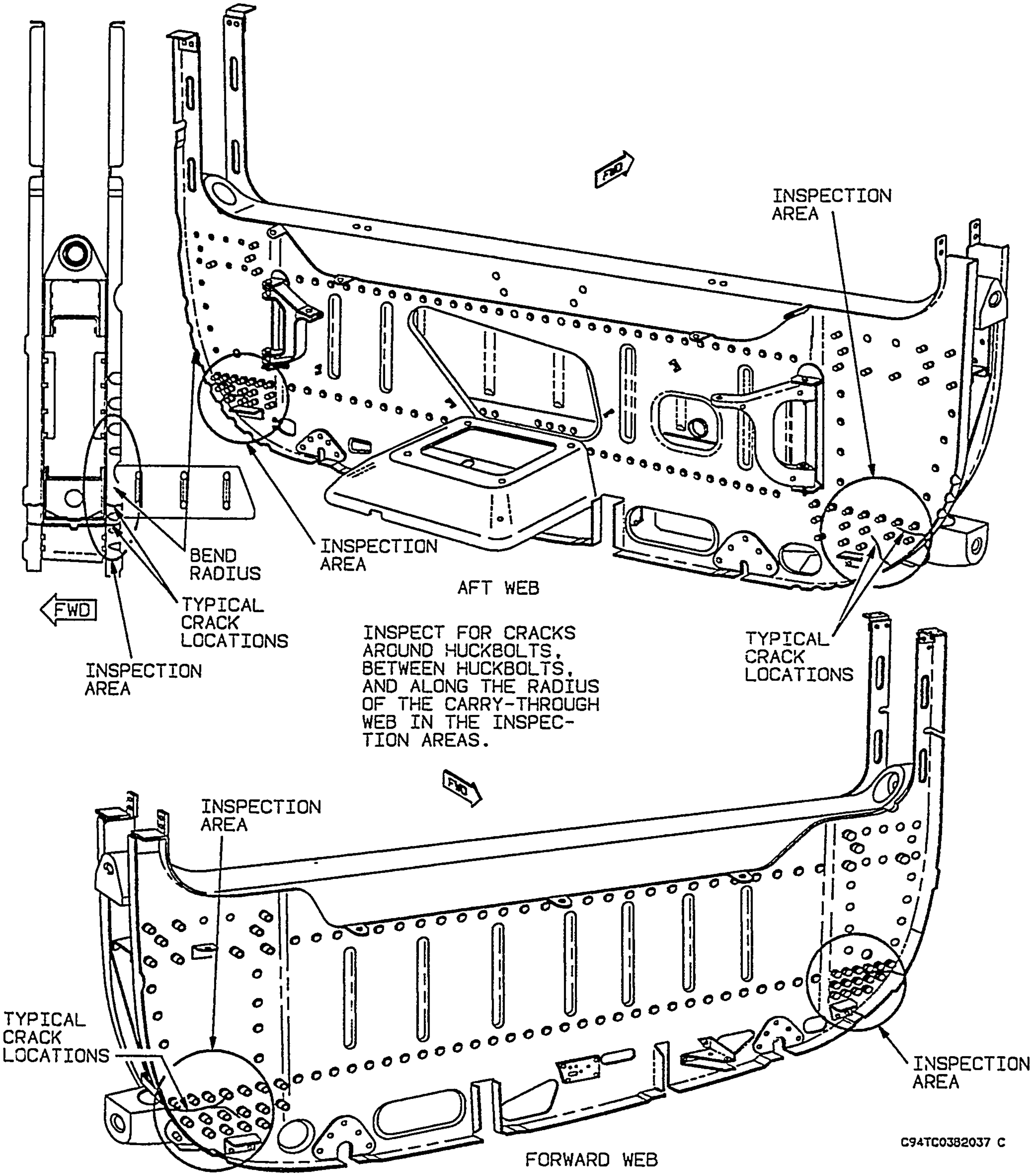


Figure 3-6I. Wing, Forward Spar Carry-Through Structure Inspection

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, making 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 forward and aft adjustment lock and slide the seat onto the mounting track. Engage the forward and aft lock, making certain the seat is securely in place.

c. Replace the seat stop on the aft end of the center track.

SEAT-BACK ADJUSTMENT

a. Adjustment of the front and center seat-backs, except for the pilot's seat, is controlled by a roton lock for selected positioning. The pilot's 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. Postion 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.

CABIN DOOR

CABIN DOOR REMOVAL AND INSTALLATION

(Figures 3-7 and 3-8)

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 phillips screws from each hinge cover (see Figure 3-7).

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 (see Figure 3-8).

g. Remove the attaching bolts from each door hinge (see Figure 3-7).

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.

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.

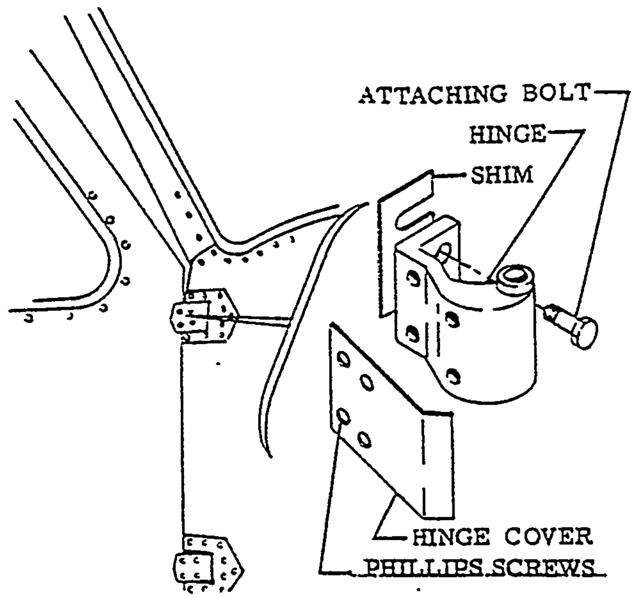


Figure 3-7. Cabin Door Hinge

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.

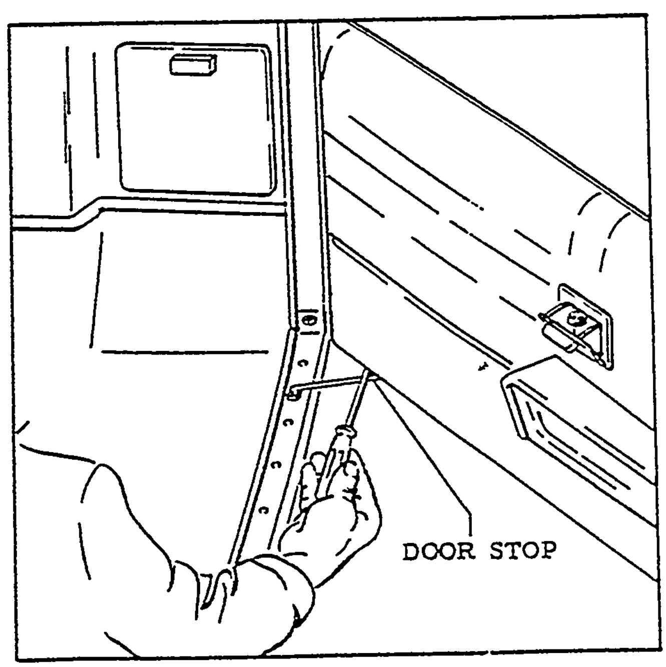


Figure 3-8. Cabin Door Stop

WINDOWS

WINDSHIELD REMOVAL

(Figure 3-9)

a. Remove the glareshield and outside air temperature gage.

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.

WINDSHIELD INSTALLATION

(Figure 3-9)

a. Clean the sealer from the canopy section where the old windshield was removed using toluol, (Item 22, Consumable Materials Chart).

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 sealer (Item 4, Sealing Chart) 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.

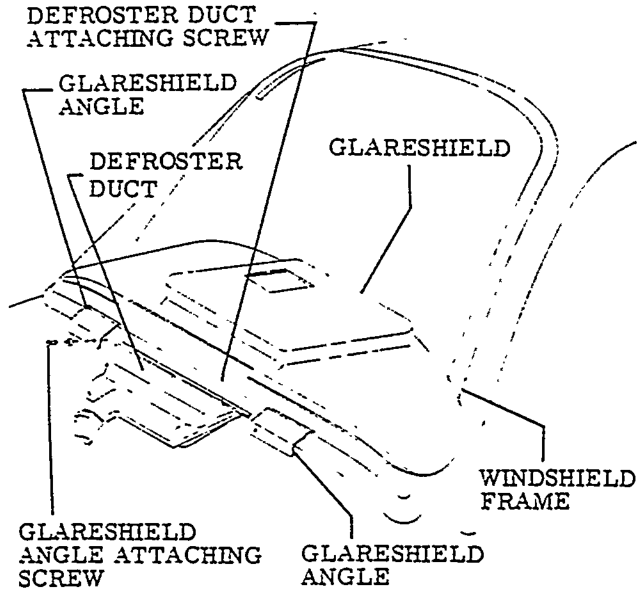


Figure 3-9. Windshield

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 glare shield 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 glare shield and outside air temperature gage.

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, (Item 22, Consumable Materials Chart).

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 sealer (Item 4, Sealing Chart) 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, (Item 22, Consumable Materials Chart).

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 sealer, (Item 4, Sealing Chart) 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 upholstery 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, (Item 22, Consumable Materials Chart).

b. Apply sealer, (Item 4, Sealing Chart) 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.

FIBERGLASS

REPAIR OF FIBERGLASS COMPONENTS

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, preferable 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, specification MIL-R-7575, which can be used in thirty minutes, in accordance with the manufacture'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 free 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 mixed 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 clean 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 air bubbles and wrinkles. 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 temperature 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 4
RECORD OF TEMPORARY REVISIONS

REVISION NUMBER	DATE INSERTED	DATE REMOVED	REASON REMOVED	PAGE NUMBER
4-1	Dec 11/92	Nov 15/93	Temporary Revision 4-2	4-18
4-2	Nov 15/93			4-18
4-3	OCT 24/97			4-1

NOTE: Insert this Record of Temporary Revisions after the Section 4 divider tab.

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Manual Affected: BEECHCRAFT Turbo-Baron Shop Manual (96-590003-5B)
Instructions: Insert this page facing page 4-1 (B1) of Section 4.
Reason: Revise text under SINGLE CONTROL COLUMN

SINGLE CONTROL COLUMN

(Figure 4-1 and 4-1A)

CONTROL COLUMN ARM REMOVAL

a. Remove the four screws that secure the retainer collar assembly to the control column housing.
b. Disconnect any electrical wiring.
c. Pull the "T" handle located on the forward side of the control arm.
d. Rotate the control column arm to the nearly vertical position and slide the control column arm off the housing.

CONTROL COLUMN ARM INSTALLATION

a. Position the control arm in a vertical position. Refer to Figure 4-1. Ensure that the slot in the lower sprocket is approximately parallel to the sides of the arm and the turnbuckles between the long and short chains are opposite each other near the access opening.
b. The ailerons MUST be in the neutral position.
c. Pull the "T" handle located on the forward side of the control arm.
d. Slide the control column arm on the control column housing.
e. Connect all electrical wiring.
f. Install the retainer collar and attach it with the four screws.
g. Check for full control column movement and for proper direction of movement.

FLIGHT CONTROLS AND SURFACES

EFFECT OF TEMPERATURE UPON CABLE TENSION

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°F 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.

SINGLE CONTROL COLUMN

(Figure 4-1 and 4-1A)

CONTROL COLUMN ARM REMOVAL AND INSTALLATION

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.

d. Installation is accomplished by reversing the above procedure.

RIGGING THE CONTROL COLUMN CHAIN
(Figure 4-1)

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 4-1 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 the chain, reinstall new safety wire.

AILERON SYSTEM

(Figure 4-2)

AILERON REMOVAL

a. Disconnect the aileron tab push rod.

b. Support the aileron and remove the two attaching screws from the top and bottom of each hinge bracket.

c. Pull the aileron straight away from the wing to avoid damage to the attaching areas.

d. Remove the screws attaching the bonding cables to the aileron.

INSTALLATION OF AILERON

a. Attach the bonding cables to the aileron.

b. Place the aileron in position on the hinge brackets. Be sure the hinge bracket is in the proper place between the aileron skin and the reinforcing structure.

c. Install the upper and lower hinge bracket screws.

d. Connect the aileron tab push rod.

RIGGING THE AILERON CONTROL SYSTEM

a. Aileron and flap surfaces must align with upper and lower surfaces of the wing within 1/16 inch.

b 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 bell crank stationary

c 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 inch is allowed between trailing edges of the aileron and wing tip. With the bell crank 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

d. Tighten securely the locknuts on all rod ends. Rig cable tension as noted on the Aileron Cable Temperature Chart. Check that the aileron bell crank contacts it's stop in the wing before the control wheel contacts the internal fixed stop in the control column (Figure 4-1A). Safety the turnbuckles.

AILERON TRIM TAB END PLAY INSPECTION

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 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 dial indicator, apply 3 lbs. load perpendicular to the tab surface toward the indicator. The

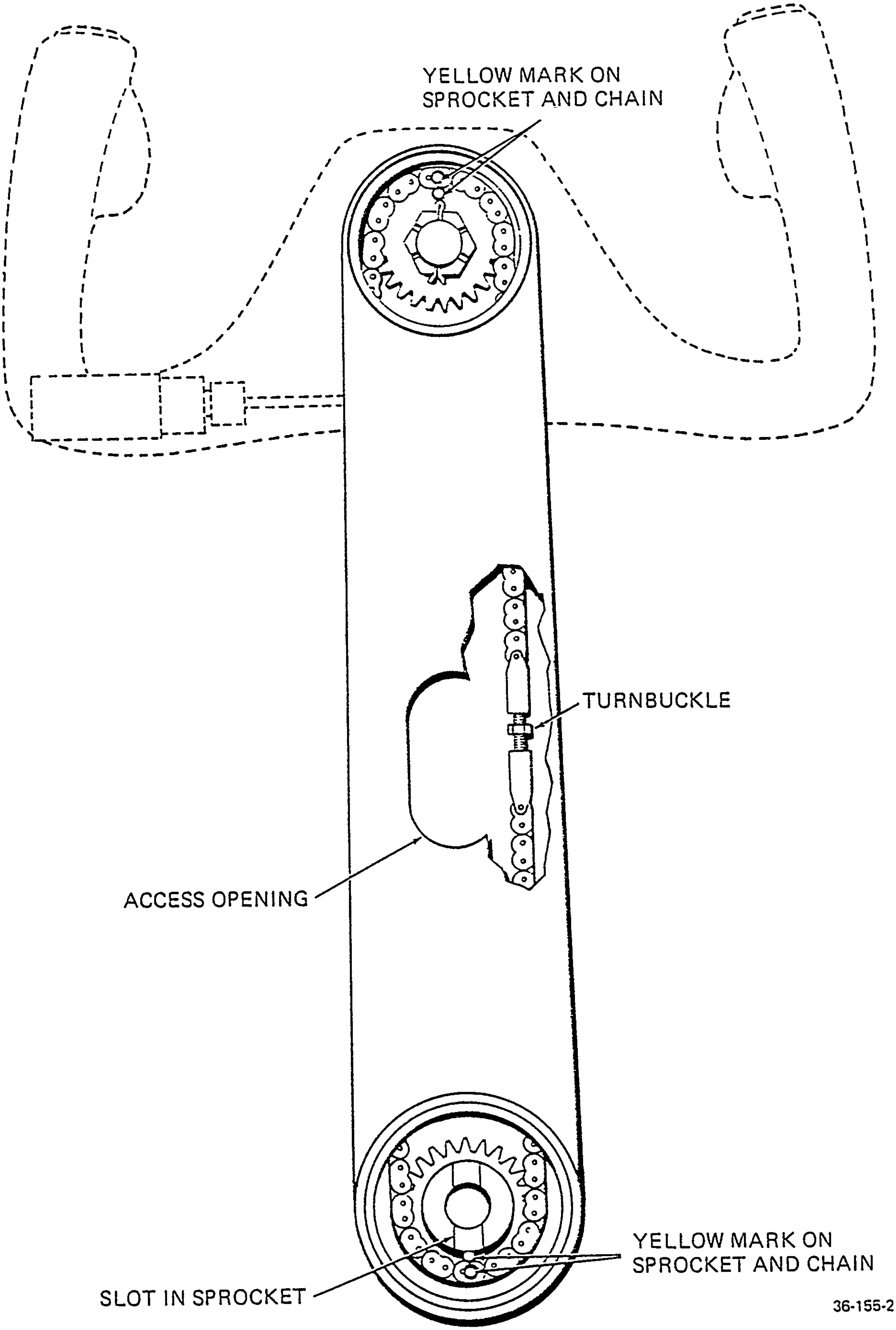
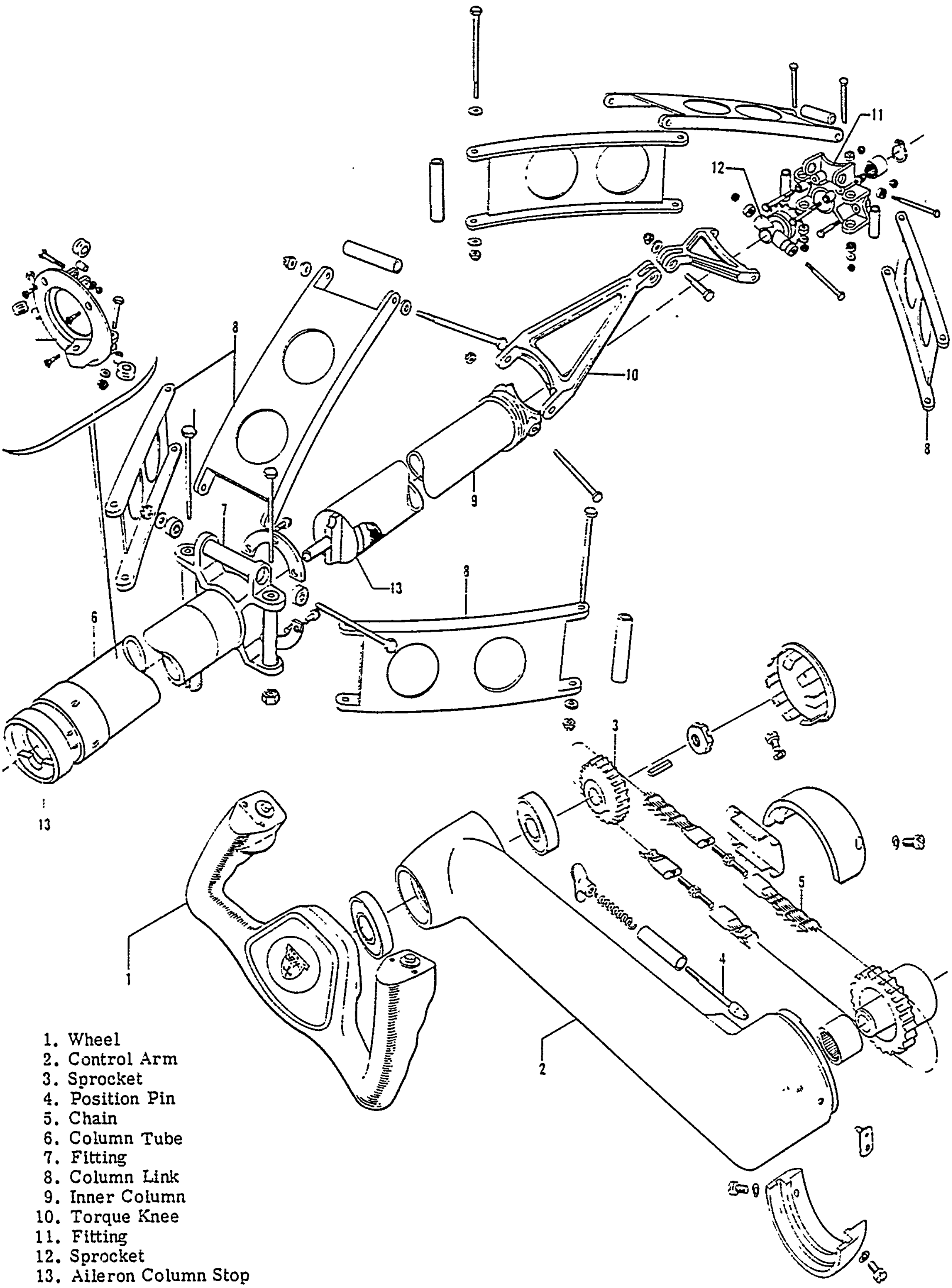


Figure 4-1. Control Column

B1



1. Wheel
2. Control Arm
3. Sprocket
4. Position Pin
5. Chain
6. Column Tube
7. Fitting
8. Column Link
9. Inner Column
10. Torque Knee
11. Fitting
12. Sprocket
13. Aileron Column Stop

Figure 4-1A. Control Column

reading on the dial indicator is the tab free play, and it should not exceed 0.165-inch.

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

AILERON TAB RIGGING

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

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. Rig cable tension and adjust travel as noted on the Aileron Cable Tension Temperature Chart.

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.

AILERON TRIM TAB ACTUATOR DISASSEMBLY
(Figure 4-3)

NOTE

If there is more than .025 inch end play measured from the screw (8) to the housing (6), the actuator is not within tolerance. If the end play cannot 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.

e. Remove the bearing (4) from the nut assembly.

Clean all parts with solvent (Item 15, Consumable Materials Chart) and inspect for cracks, corrosion and distortion. Replace bushings and any parts showing evidence of deterioration. Lubricate with (Item 11, Consumable Materials Chart) prior to assembly.

AILERON TRIM TAB ACTUATOR ASSEMBLY
(Figure 4-3)

NOTE

Lubricate all moving parts with (Item 11, Consumable Materials Chart).

a. Screw the nut (5) onto the screw (8).

b. Install bearing (4) on nut (5) and install this assembly into housing (6).

c. Install bushing (9), bearing (4), and snap ring (10).

d. Using a spanner wrench, install adjusting bushing (3).

e. Install check nut (2) on adjusting bushing (3). The nut assembly (5) must be free to rotate and provide smooth operation through its full travel.

f. Check the end play between the screw (8) and the housing (6). The end play shall not exceed .025 inch. Readjusting the adjusting bushing (3) and check nut (2) may reduce the end play. The nut assembly (5) must remain free to rotate and provide smooth operation through its full travel.

g. Install rod end (11) on the actuator screw (8).

h. Install sprocket (1) on the nut (5).

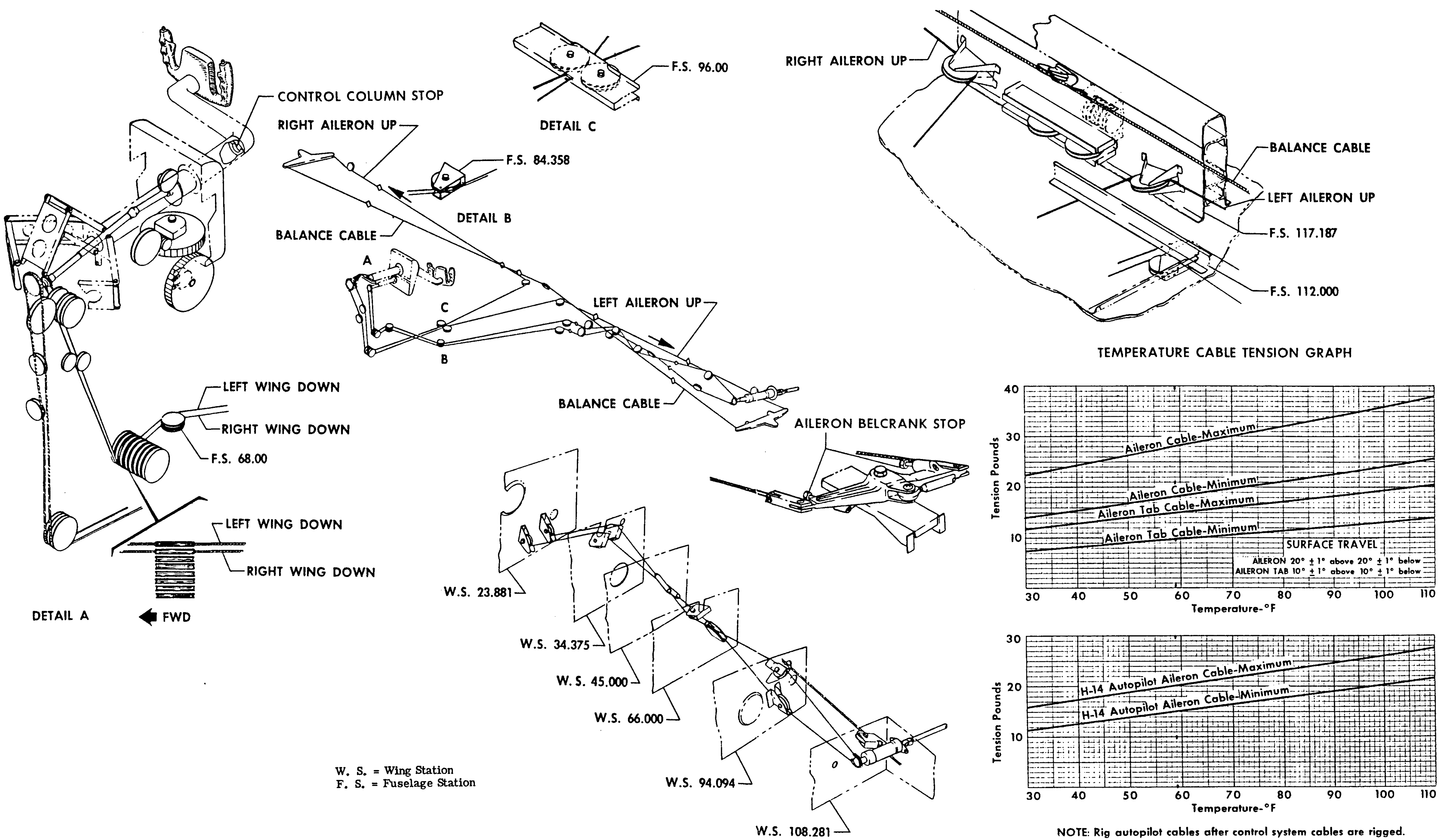


Figure 4-2. Rigging The Aileron Control System

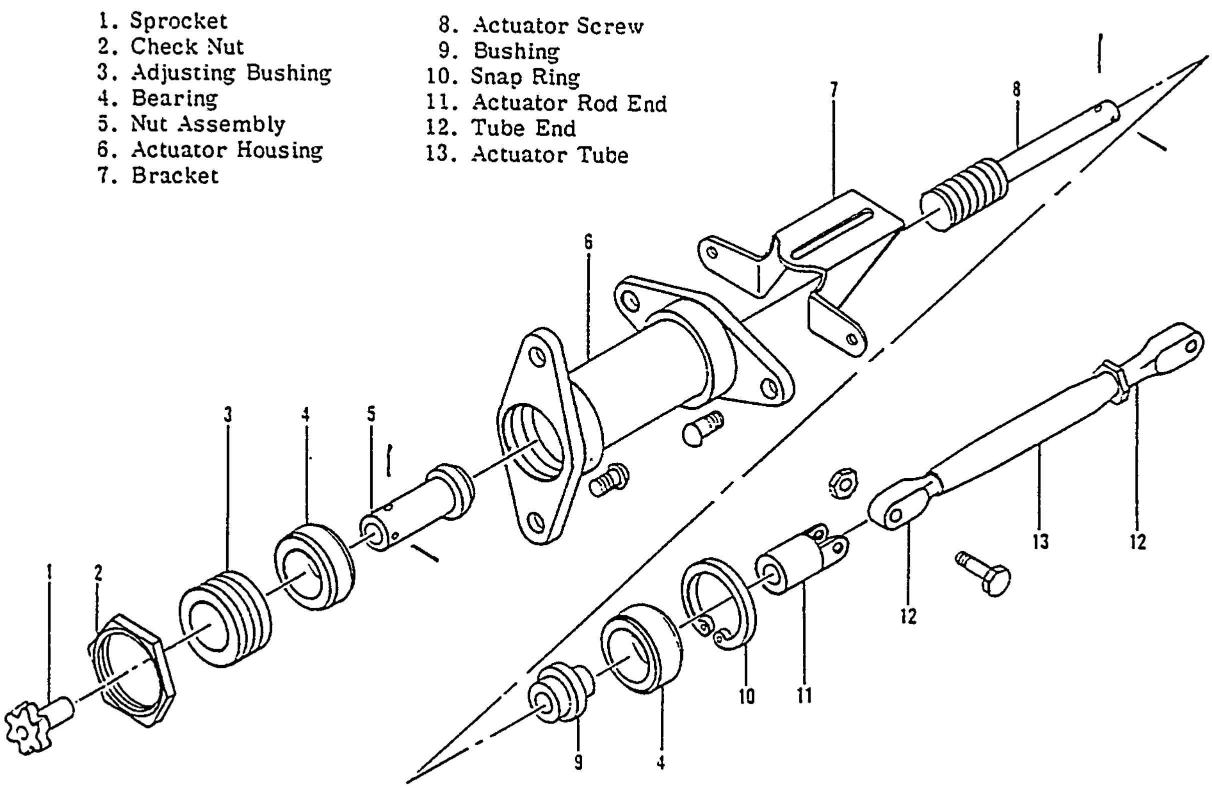


Figure 4-3. Aileron Tab Actuator

ELEVATOR SYSTEM

(Figure 4-4)

ELEVATOR REMOVAL

a. Detach the tail cone, disconnect the tail navigation light wire and remove the tail cone.

b. Remove the tail section access doors on the left hand side of the aft fuselage.

c. Disconnnect the elevator push-pull tubes from the elevator torque tube fittings.

d. Disconnect the elevator trim tab actuator rods from the elevator trim tabs.

e. Remove the hinge bolts. Disconnect the elevator bonding cables and remove the elevator.

ELEVATOR SKIN REPLACEMENT

Should an elevator become damaged to a point where skin replacement is required, it is possible to replace one or both skins; however, it should be undertaken only by an experienced sheet metal mechanic in a fully equipped sheet metal shop. Skin replacement may be accomplished by using the following procedure.

NOTE

The following special tools must be fabricated locally for use when one or both elevator skins are replaced.
a. A holding fixture designed to attach to each of the elevator hinge points that is capable of holding the spar rigid during skin removal and replacement.
b. A tool to be used for clamping the trailing edge of the elevator while the bonding material is curing. (See Figure 4-3A.) This tool should also be capable of holding the trailing edge straight.
c. A small bucking bar with a handle long enough to reach from the trailing edge down between the skins to the rivets through the spar.

a. Remove the damaged elevator from the aircraft.

CAUTION

Do not remove both skins from the elevator at the same time. If both skins are to be replaced, one skin should be removed and the replacement skin installed on the elevator before the other skin is removed.

b. Install the elevator in the holding fixture.

c. Remove the forward outboard elevator tip cover.

d. Remove the elevator tab.

NOTE

Use drill bits of the appropriate size when removing rivets to avoid oversized holes in the structure.

e. Drill out all rivets along the trailing edge of the elevator.

f. Drill out the rivets that attach the skin to the ribs and tab hinge bracket.

g. Use a thin sharp putty knife or equivalent tool to cut through the bonded area at the aft end of the skin stiffeners.

NOTE

Exercise care while cutting the bonding material to prevent damage to the honeycomb stiffeners on the undamaged skin.

h. Drill out the rivets that attach the skin to the spar and remove all attaching screws from the skin.

i. Remove the skin from the elevator.

j. If the upper skin is to be replaced, drill out the rivets in the tab actuator rod fairing and remove the fairings.

k. Remove the stiffeners from the damaged skin and secure it to the replacement skin. Trim and drill the new skin as necessary to match the old skin. (Do not drill the trailing edge rivet holes)

CAUTION

EXTREME CAUTION must be exercised throughout the assembly procedure. The replacement skin must be fit so that the trailing edge is perfectly straight from the inboard end to the outboard end. The center line of the trailing edge must be on the same center line as the hinges. (See Figure 4-3A.)

l. Paint the inside of the new skin and the attaching surfaces of the elevator structure with epoxy primer. DO NOT PRIME areas to be bonded. (Primer to be obtained locally.)

m. Remove all rivet butts, metal shavings and burrs from the elevator structure and skin.

NOTE

MS20470B rivets of the appropriate size and length are used to secure the skin to the elevator except as noted. (Rivets to be obtained locally.)

n. Install the tab actuator rod fairings (Upper skin only).

o. Position the new skin on the elevator structure and cleco in place.

p. Rivet the skin to the elevator spar and ribs working from the center out to each end. Leave the trailing edge loose.

NOTE

45-610005-114 channels are installed at the forward tab actuator rod opening on newer elevator assemblies. Use MS20470AD rivets of the appropriate size and length to secure the skin to the spar in the area of the channel. (Rivets to be procured locally.)

q. Rivet the skin to the tab hinge bracket.

r. If both skins are to be replaced, repeat the preceding procedure on the remaining skin.

s. Clean the bonding strips, and apply EP711 (Item 6, Sealing Chart) or EC1675 (Item 7, Sealing Chart) bonding cement to the bonding strips on the new skin. Apply the bonding cement just prior to riveting the trailing edge. (CURE TIME: EP711, 72 hours. EC1675, 10 hours.)

CAUTION

Do not use an excessive amount of cement as it may affect the elevator balance. Apply the cement 1/8 inch thick to only one side of the bond area.

t. Insert a new 96-610005-15 inboard trailing edge spacer, a new 96-610005-35 outboard trailing edge spacer and the fixed elevator tab between the trailing edge skins.

u. Use a clamping device (see Figure 4-3A) and clamp the bonded area of the elevator.

NOTE

The clamping device should be tightened just enough to hold the bonded area together.

v. Use a suitable clamping device to hold the trailing edge of the skins together for drilling and riveting.

w. Drill rivet holes in the trailing edge using the same spacing as was used on the old skin. Use a No. 40 drill bit.

x. Rivet the trailing edge.

y. Install all screws and attaching hardware removed during disassembly.

z. Paint the elevator.

aa. Balance the elevator by the procedure located elsewhere in this section.

bb. Reinstall the elevator on the aircraft.

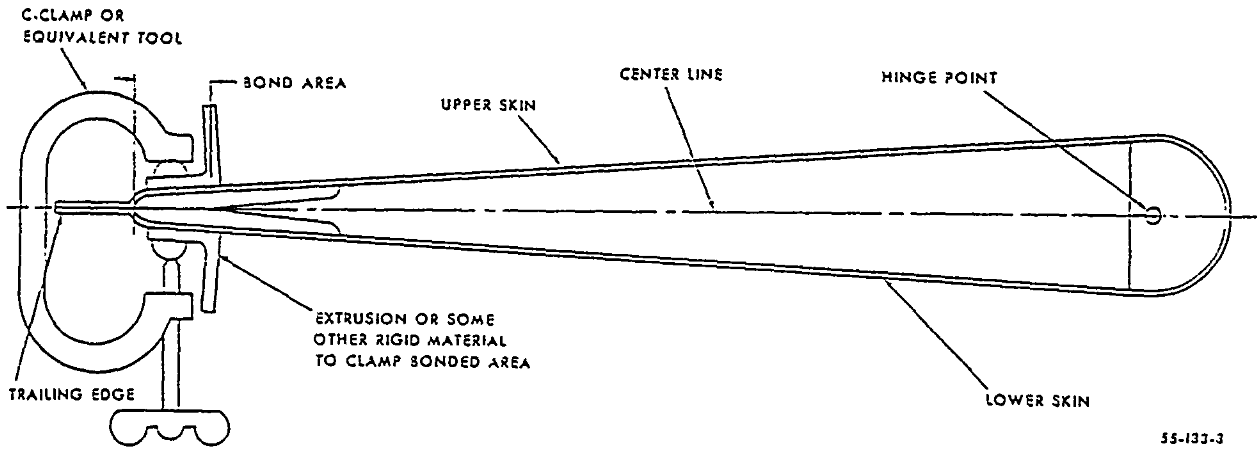


Figure 4-3A. Elevator Skin Replacement

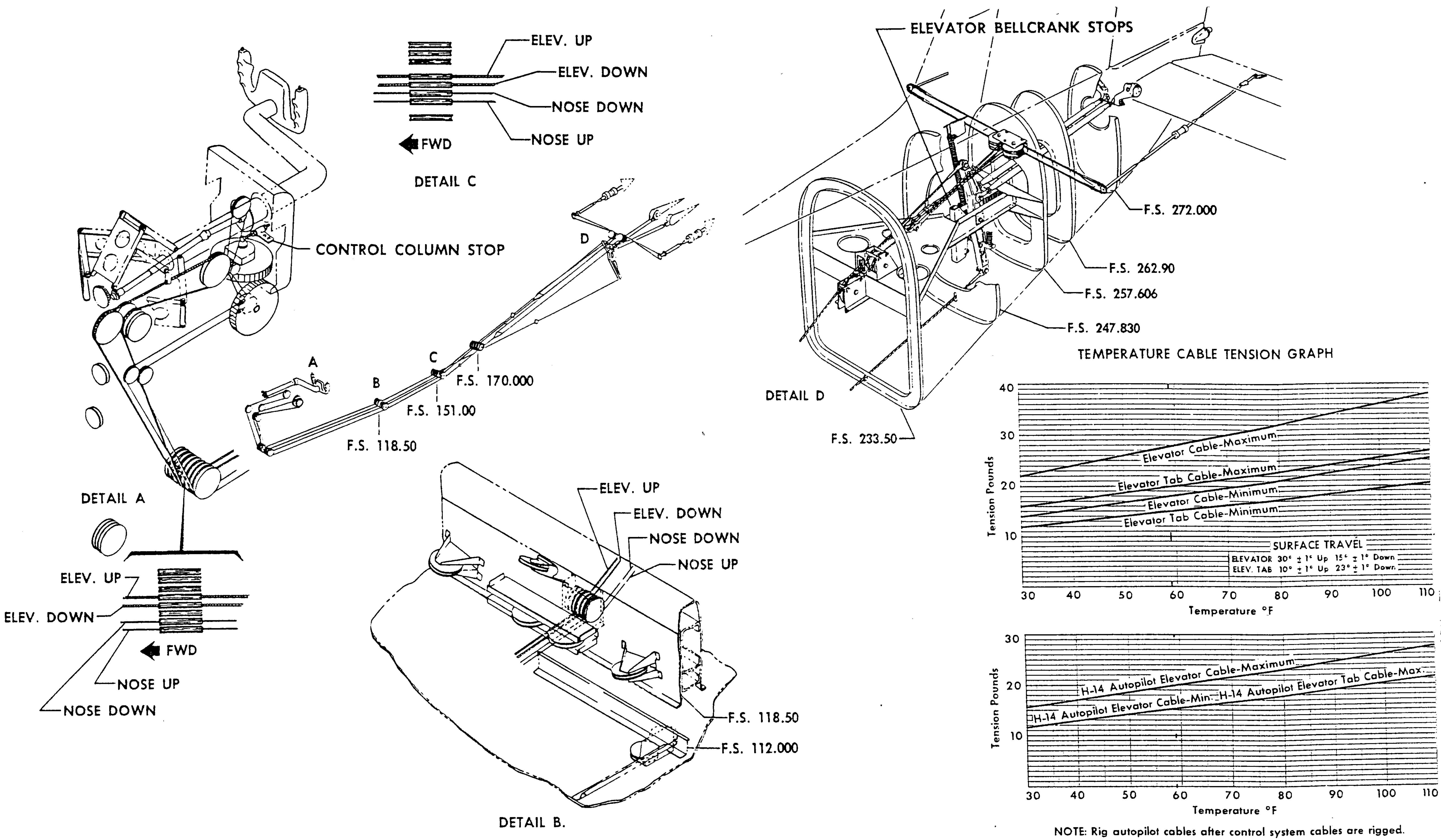


Figure 4-4. Rigging The Elevator Control System

INSTALLATION OF ELEVATOR

a. Connect the elevator bonding cables and, position the elevator on the stabilizer, install the hinge bolts and nuts. Tighten and safety.

b. Connect the elevator trim tab actuator rod to the trim tab.

c. Install the attaching nut at the inboard elevator hinge point and torque to 50-70 inch-pounds.

d. Connect the elevator push-pull tubes at the elevator torque tube fittings.

e. Connect the tail light wires and install the tail cone. Install the access doors.

RIGGING THE ELEVATOR CONTROL SYSTEM

a. Set the elevator Down stop so that the centerline of the bottom cable hook-up hole in the elevator bell crank is .80 inch from the aft bulkhead.

b. Adjust the push rods to obtain 15° ± 1° "DOWN" travel.

c. Adjust the elevator Up stop to obtain 30° ± 1° "UP" travel.

d. Rig cable tension as noted on the Elevator Cable Tension Temperature Chart, adjusting the cable so that the elevator bell crank Down stop comes into contact before the control column is in the full forward position.

NOTE

Tensiometer readings shall be taken with the elevator in the down position and the downsprings connected.

e. With the aft fuselage elevator stops set for correct travel, maintain .06 + .06 − .00 inch clearance at the Up elevator stop on the control column.

NOTE

After rigging the elevator and elevator trim tab control system, check for correct movement of the control surfaces with respect to the movement of the controls. When the elevator trim tab control wheel is moved toward the NOSE DOWN position, the elevator trim 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 actuating 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 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 (Item 21, Consumable Materials Chart) thoroughly clean the hole in the tab horn, and 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 (Item 33, Consumable Material Chart) 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 (Item 11, Consumable Materials Chart) 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 (Item 11, Consumable Materials Chart).

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 castellation 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 (Item 21, Consumable Materials Chart) 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 (Item 33, Consumable Materials Chart), 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 (Item 11, Consumable Materials Chart).

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 keytone (Item 21, Consumable Materials Chart) 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 (Item 33, Consumable Materials Chart), 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 (Item 11, Consumable Materials Chart).

ELEVATOR TAB RIGGING

a. Set elevators in neutral position.

b. Set indicator at 23 degrees down.

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

d. Set tab to 23 degrees down and connect push rod to actuator rod.

e. Locate the chain on the sprocket so that three links are left on the bottom of the sprocket and tighten the cables. Rig cable tension and adjust travel as noted on the Elevator Cable Tension Temperature Chart.

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

NOTE

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

ELEVATOR TRIM TAB ACTUATOR REMOVAL

a. Remove the access panel near the trailing edge of the horizontal stabilizer to gain access to the elevator trim tab actuator.
b. Detach the tail cone, disconnect the tail navigation light wire and remove the tail cone.
c. Remove the access panel on the left hand side of the fuselage just forward of the horizontal stabilizer.
d. Remove the access panel near the leading edge of the horizontal stabilizer to gain access to the elevator trim tab actuator sprocket.
e. Remove the elevator as outlined in Section 4 of this Shop Manual under the heading ELEVATOR REMOVAL.
f. Disconnect the elevator trim tab cables at the turnbuckles in the aft fuselage. Secure the forward elevator trim tab cables to prevent them from unwinding at the universal.

CAUTION

Do not damage the cables. Use a material such as phenolic to protect the cables.

g. Remove the chain and cable assembly from the elevator trim tab actuator sprocket.
h. Remove the hardware attaching the elevator trim tab actuator to the horizontal stabilizer. Remove the actuator from the airplane.

NOTE

If the actuator is to be reinstalled, identify with a tag to ensure proper movement of the elevator tabs upon reinstallation of the actuators.

ELEVATOR TRIM TAB ACTUATOR INSTALLATION

WARNING

To ensure proper movement of the trim tabs, make sure that the RH actuator is installed on the right hand horizontal stabilizer and that the LH actuator is installed on the left hand horizontal stabilizer.

a. Position the elevator trim tab actuator in the horizontal stabilizer and install the attaching hardware.
b. Position the chain and cable assembly on the actuator sprocket so that the ends of the chain are equidistant (within ± .20 inch) at the sprocket centerline.
c. Install the elevator as outlined in Section 4 of this Shop Manual under the heading INSTALLATION OF ELEVATOR.
d. Connect the elevator trim tab cables to the turnbuckles in the aft fuselage.
e. Remove material used to protect the cables.
f. Rig the elevator trim tab control system as outlined in Section 4 of this Shop Manual under the heading ELEVATOR TAB RIGGING.

NOTE

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

g. Install the access panel, located near the leading edge of the horizontal stabilizer.
h. Install the access panel, located near the trailing edge of the horizontal stabilizer.
i. Install the access panel on the left hand side of the fuselage, just forward of the horizontal stabilizer.
j. Connect the tail navigation light wire and install the tail cone.

ELEVATOR DOWN - SPRING LOADS

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

21 to 24 lbs. breakout (down elevator)
22 to 24 lbs. breakout at 0° elevator (neutral)
20 to 21 lbs. at 30° up elevator (.06 off stop)

ELEVATOR TRIM TAB ACTUATOR DISASSEMBLY
(Figure 4-5)
(TG-1 through TG-69)

NOTE

If there is more than .010 inch end play measured from the screw (4) to the housing, the actuator is not within tolerance. If the end play cannot be reduced to .010 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 the pin (5) and remove the actuator rod end (6) from the screw. The bearing (7) and the bushing (8) can now be removed from the screw.

d. Remove the check nut (9) and screw out the end adjusting bushing (10) with the appropriate spanner wrench.

e. Remove the bearing (3) from the nut assembly.

Clean all parts in (Item 15, Consumable Materials Chart) and inspect for cracks, corrosion and distortion. Replace bushings and any parts showing evidence of deterioration. Lubricate all parts with (Item 11, Consumable Materials Chart) prior to assembly.

ELEVATOR TRIM TAB ACTUATOR ASSEMBLY
(Figure 4-5)
(TG-1 through TG-69)

WARNING

The trim tab actuator to be installed on the left hand horizontal stabilizer MUST have threads on its actuator screw (4) that rotate clockwise when screwed into the nut assembly (2). The trim tab actuator to be installed on the right hand horizontal stabilizer MUST have threads on the actuator screw (4) that rotate counterclockwise when screwed into the nut assembly (2).

NOTE

Lubricate all moving parts with (Item 11, Consumable Materials Chart).

a. Screw the actuator screw (4) into the nut assembly (2) and install this assembly into the actuator housing.

b. Install bushing (8), bearing (7), and snap ring (1) in the actuator screw end of the housing.

c. Install bearing (3) in the nut assembly end of the housing.

d. Using a spanner wrench, install the adjusting bushing (10).

e. Install and secure check nut (9). Nut assembly (2) must be free to rotate and provide smooth operation through its full travel.

f. Check the end play between the screw (4) and housing. The end play shall not exceed .010 inch. Readjusting the adjusting bushing (10) and check nut (9) may reduce the end play. The nut assembly (2) must remain free to rotate and provide smooth operation through its full travel.

ELEVATOR TRIM TAB ACTUATOR DISASSEMBLY
(Figure 4-5)
(TG-70 and after)

NOTE

If there is more than .010 inch end play measured from the screw (4) to the housing, the actuator is not within tolerance. If the end play cannot be reduced to .010 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) and collar (11) out of the housing.

b. Remove the collar and actuator screw (4) from the nut assembly.

c. Remove the check nut (9) and screw out the end adjusting bushing (10).

Clean all parts in (Item 15, Consumable Materials Chart) and inspect for cracks, corrosion and distortion. Replace bushings and any parts showing evidence of deterioration. Lubricate all parts with (Item 11, Consumable Materials Chart) prior to assembly.

ELEVATOR TRIM TAB ACTUATOR ASSEMBLY
(Figure 4-5)
(TG-70 and after)

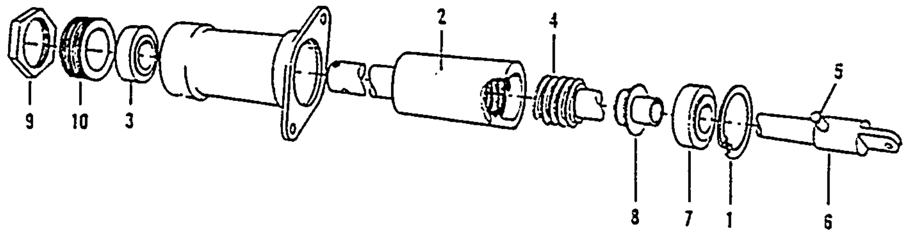
WARNING

The trim tab actuator to be installed on the left hand horizontal stabilizer MUST have threads on its actuator screw (4) that rotate clockwise when screwed into the nut assembly (2). The trim tab actuator to be installed on the right hand horizontal stabilizer MUST have threads on the actuator screw (4) that rotate counterclockwise when screwed into the nut assembly (2).

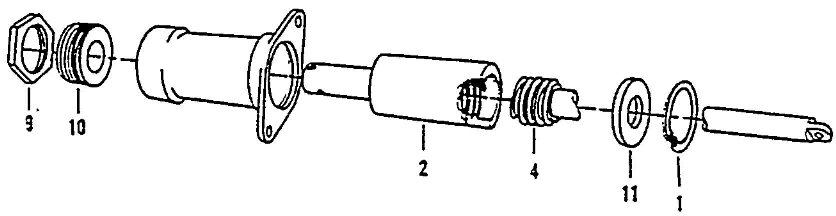
NOTE

Lubricate all moving parts with (Item 11, Consumable Materials Chart).

a. Screw the actuator screw (4) into the nut



TG-1 THROUGH TG-69



TG-70 AND AFTER

1. Snap Ring
2. Nut Assembly
3. Bearing
4. Actuator Screw
5. Pin
6. Actuator Rod End
7. Bearing
8. Bushing
9. Check Nut
10. Adjusting Bushing
11. Collar

Figure 4-5. Elevator Tab Actuator

assembly (2) and install this assembly into the actuator housing.

b. Install coller (11) and snap ring (1) in the actuator screw end of the housing.

c. Using a spanner wrench, install the adjusting bushing (10).

d. Install and secure the check nut (9).

e. Check the end play between the screw (4) and the housing. The end play shall not exceed .010 inch. Readjusting the adjusting bushing (10) and check nut (9) may reduce the end play. The nut (2) must remain free to rotate and provide smooth operation through its full travel.

ELECTRIC TAB ACTUATOR REMOVAL
(Figure 4-5A)

a. Disconnect the actuator wire harness at the disconnect splices.

b. Place a wood or sheet metal shim between the cable drum and the cable guard so the cable will not unwind.

c. Remove the fairlead mounted on the bulkhead aft of the actuator.

d. Disconnect the actuator cable at the turnbuckle first, then at the aft fitting.

e. Remove the three bolts securing the actuator to the bracket. The actuator may now be removed from the aircraft.

ELECTRIC TAB ACTUATOR INSTALLATION

Installation procedure is the reverse of the removal procedure. Tab rigging and cable tension is identical to the manually operated tab.

TAB CABLE INSTALLATION

Note the position of the cable on the cable drum in relation to the forward cable fittings. Install the new cable in the same position. This will insure adequate free cable on the drum in both directions to allow full travel of the cable stops.

MAGNETIC CLUTCH REMOVAL

a. Remove the lid from the clutch housing.
b. Loosen the set screw in the clutch rotor and armature hubs.
c. Remove the motor from the clutch housing.
d. Slide the cable drum and shaft assembly from the clutch housing.
e. Remove the clutch from the clutch housing.

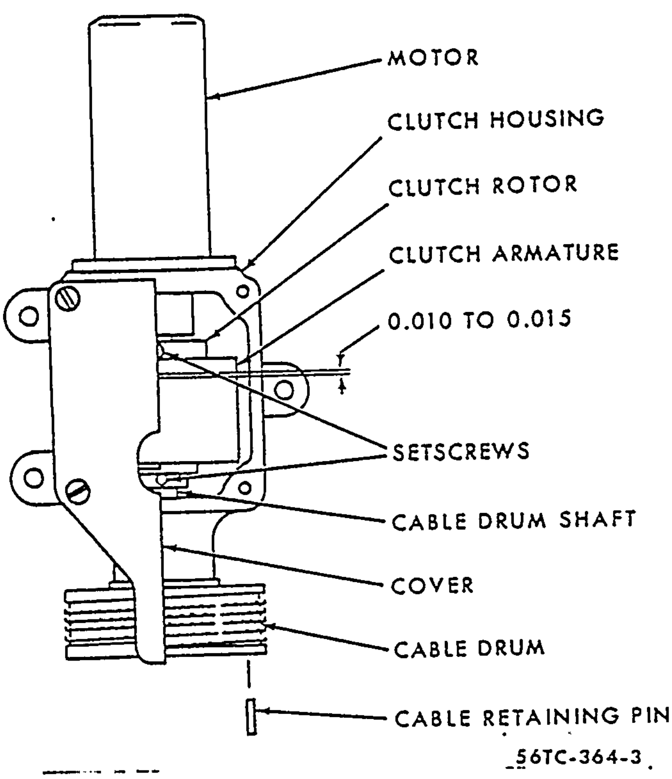


Figure 4-5A. Electric Trim Tab Actuator

MAGNETIC CLUTCH INSTALLATION

Installation procedure is the reverse of the removal procedure. No lubrication is required. Tighten the clutch armature setscrew with no visible end play in the cable drum shaft. Slide the clutch rotor on the motor shaft to obtain .010 to .015 inch clearance between the friction surfaces of the clutch before tightening the setscrew. Stake both setscrews.

MAGNETIC CLUTCH TORQUE TEST

The following check should be performed any time the magnetic clutch is replaced.

a. Using a 28 VDC power source, connect the red electrical lead of the magnetic clutch to ground and the white electrical lead to the power source. Using a torque wrench, check that the clutch holds with 30 inch-pounds of torque applied at the actuator shaft.

b. If the static torque of the clutch is less than 30 inch-pounds, burn in the clutch as follows:

1. Find a metal plate of sufficient thickness for rigidity and large enough to fit in a vise with the actuator assembly attached. Anchor the plate in a vise and drill three holes in the plate to match the actuator mounting holes. Bolt the actuator to the plate.
2. Slot the end of a tube that will fit snugly into the .437 diameter hole in the end of the shaft on which the drum is mounted.
3. Insert the tube into the shaft until the slot engages the drum retaining pin.
4. Attach the free end of the tube to a slow speed (approximately 450 RPM) half-inch drill motor.
5. Remove the access plate from the clutch housing and blow the housing and clutch clean with clean dry air.
6. Using a regulated power source set at 14 to 16 VDC, connect the red electrical lead of the clutch to ground and the white electrical lead to the power source with alligator clips.
7. Start the drill motor and unclip the lead to the power source after 15 seconds. Let the clutch cool for approximately one minute before reattaching the lead for another 15 second interval. Repeat the foregoing sequence until the clutch will hold 30 inch-pounds of torque as indicated in step "a" then blow the clutch and housing clean with clean dry air.

CAUTION

Exceeding the 15 second burn-in periods may overheat and damage the magnetic clutch.

RUDDER SYSTEM
(Figure 4-7)

RUDDER REMOVAL

a. Detach the tail cone, disconnect the tail navigation light wire and remove the tail cone.

b. Remove the tail section access doors on the left hand side of the aft fuselage.

c. Disconnect the rudder tab cables at the turnbuckles. Remove the cable retainer pins and the fairlead.

d. Remove the pivot bolt attaching the rudder torque tube actuating arm to its mounting bracket. Remove the bellcrank push-rod bolt and bonding cable.

e. Remove the rudder hinge bolts and remove the rudder.

INSTALLATION OF RUDDER

a. Align the holes in the rudder and stabilizer hinges and install the attaching bolts and the bonding cable.

o. Install the attaching bolts through the rudder torque tube and bellcrank.

c. Connect the rudder tab cables at the turnbuckles. Install the cable retainer pins and fairlead.

d. Check the travel of the tab and the rudder tab indicator to see that the tab and indicator agree.

e. Connect the tail light wires and install the tail cone. Replace the access door.

RIGGING THE RUDDER CONTROL SYSTEM

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

b. Install the off-set rig pin in the holes provided in the pilots rudder pedals, which will off-set the left rudder pedal .38 to .45 inch aft of the right rudder pedal.

c. Rig the rudder neutral with the pilots rudder pedals pinned in the off-set position.

NOTE

> Installing the rig pin in the pilots rudder pedals, will bring the copilots pedals to the same adjustment as the pilots pedals.

To facilitate rigging of the rudder pedals to these dimensions a rigging tool may be fabricated from a

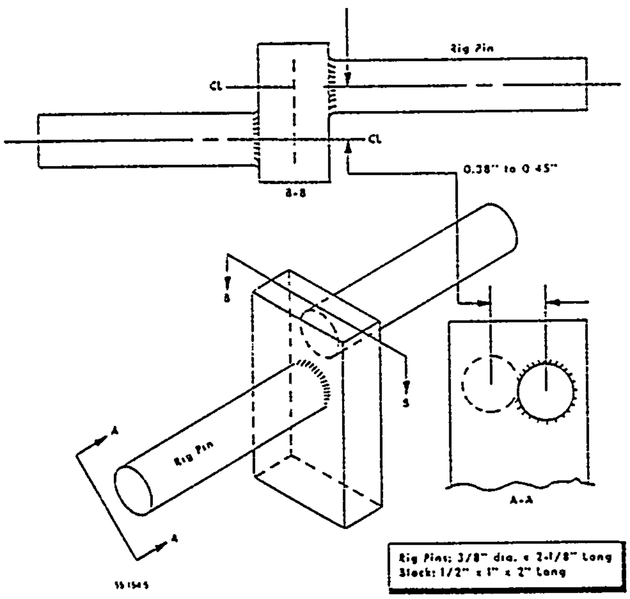


Figure 4-6. Rudder Pedal Rig Tool

steel block 1/2 x 1 x 2 inches: and two 3/8 x 2-1/8 inch long rig pins. (See figure 4-6.) The rig pins are located parallel and forward on the block, one on each side, and welded. The rig pins should be spaced as noted in the illustration.

d. Set rudder bell crank and rudder in neutral position. Adjust the rudder push rod and attach to the bell crank and rudder control arm. Set the rudder travel stops, adjust rudder travel and rig cable tension as noted on the Rudder Cable Tension Temperature Chart.

e. Check that the rudder surface movement corresponds to the movement of the rudder pedals.

RUDDER TRIM TAB END PLAY INSPECTION

a. Adjust the trim tab trailing edge to align with the 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, below 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 0.105-inch.

e. If the free play exceeds 0.105-inch, inspect all components of the tab actuation system to determine the cause. All worn parts should be replaced.

RUDDER TAB RIGGING

a. Set the indicator at 0 degrees.

b. Set the rudder in neutral position.

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, rig cable tension and adjust travel as noted on the Rudder Cable Tension Temperature Chart.

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.

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.

Lightly clamp two strips of material such as 1/4 inch plywood to the rudder trailing edge; extend them forward along the vertical stabilizer. Pull the free ends of the material in firmly against the skin contour to fair the rudder in the 0° position and mark the point on the tail cone corresponding to the bottom trailing edge corner of the rudder.

Figure 4-8 shows the point which is used to determine surface travel. All measurements given in the Table of Rudder and Rudder Tab Travel are for a straight line distance between the position of the surface at 0° and its position at maximum deflection.

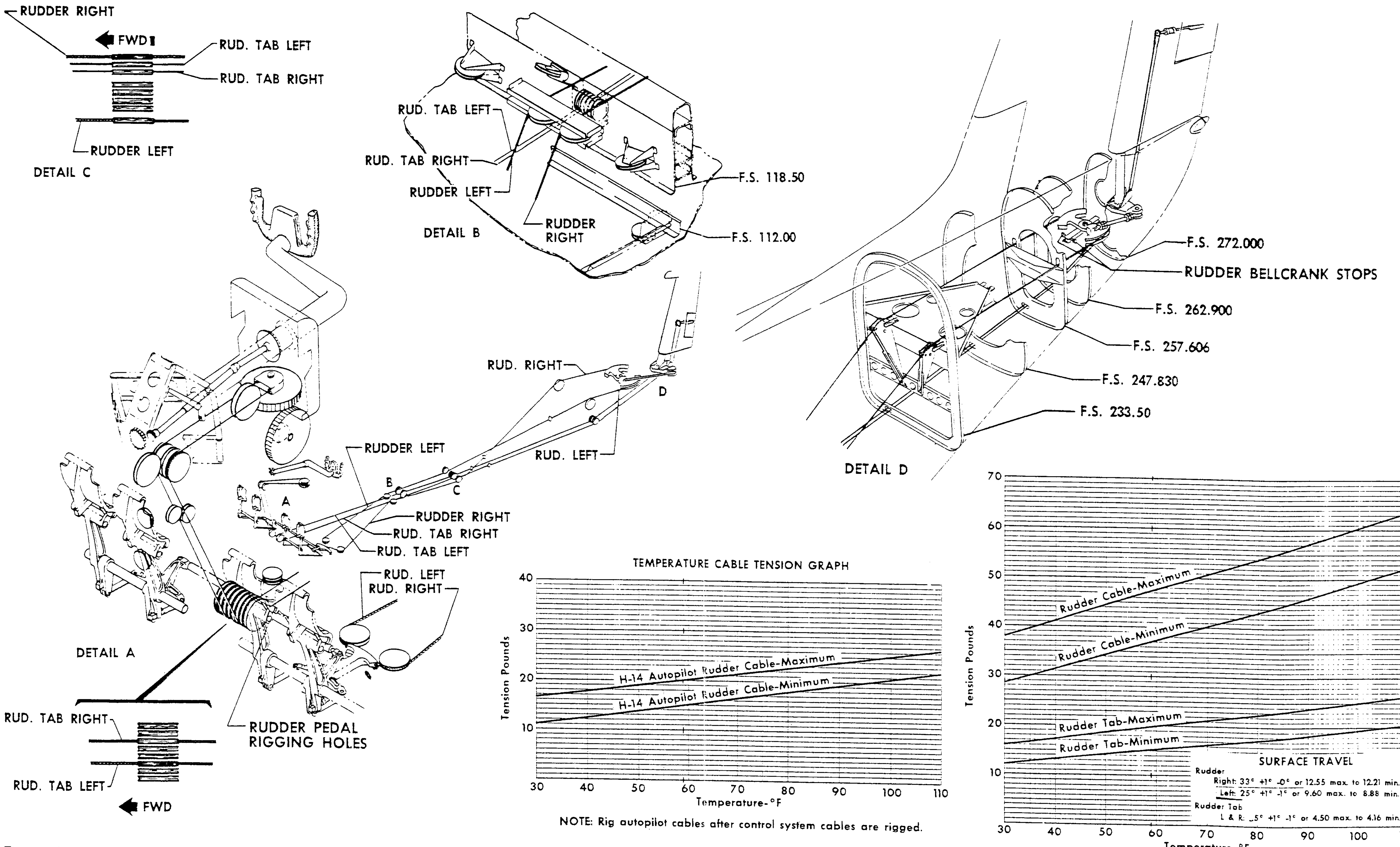


Figure 4-7. Rigging The Rudder Control System

SURFACE	DIRECTION	MAXIMUM	MINIMUM	MEASURING POINT
Rudder	R	12.55	12.21	Lower trailing edge corner
	L	9.60	8.88	Lower trailing edge corner
Rudder Tab	R & L	4.50	4.16	Lower trailing edge corner

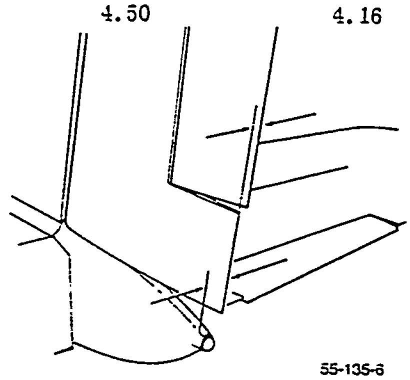


Figure 4-8. Rudder And Rudder Tab Travel In Inches

RUDDER TRIM TAB ACTUATOR DISASSEMBLY
(Figure 4-9)

a. Cut all safety wire.

b. Loosen the check nut (1) and unscrew the actuator rod end (2) from the actuator screw (3).

c. Unscrew the retaining nut (4) and remove the actuator screw (3) from the housing (5).

d. Remove the retaining screws from the sprocket housing (6), and pull the back of the housing off of the sprocket assembly shaft (7).

e. Remove the roll pins (10) and remove the sprocket assembly (7).

f. Remove the bearings (8) and bushings (9).

Clean all parts with (Item 15, Consumable Materials Chart) and inspect for cracks, corrosion, distortion, and excessive wear. Replace bushings and any other parts showing evidence of deterioration. Lubricate all parts with (Item 11, Consumable Materials Chart) prior to assembly.

RUDDER TRIM TAB ACTUATOR ASSEMBLY
(Figure 4-9)

NOTE

Lubricate screw threads with (Item 11, Consumable Materials Chart).

a. Install bearing (8) and bushings (9).

b. Install sprocket assembly (7) and roll pins (10).

c. Install the retaining screws in the sprocket housing (6).

NOTE

The sprocket end play should be reduced to 0.00 by adding laminated shims between the sprocket (7) and the sprocket assembly housing (6). The sprocket must remain free to rotate and provide smooth operation through its full travel.

d. Install actuator screw (3) in the housing (5).

NOTE

Check the end play between the screw (3) and housing (5). The end play between the screw and housing must not exceed 0.011 inch.

e. Install check nut (1) on screw (3).

f. Install actuator rod end (2) on screw (3).

NOTE

The position of rod end (2) and check nut (1) must be determined on installation on the airplane.

1. Check Nut
2. Actuator Rod End
3. Actuator Screw
4. Retaining Nut
5. Housing
6. Sprocket Assembly Housing
7. Sprocket Assembly
8. Bearing
9. Bushing
10. Roll Pin

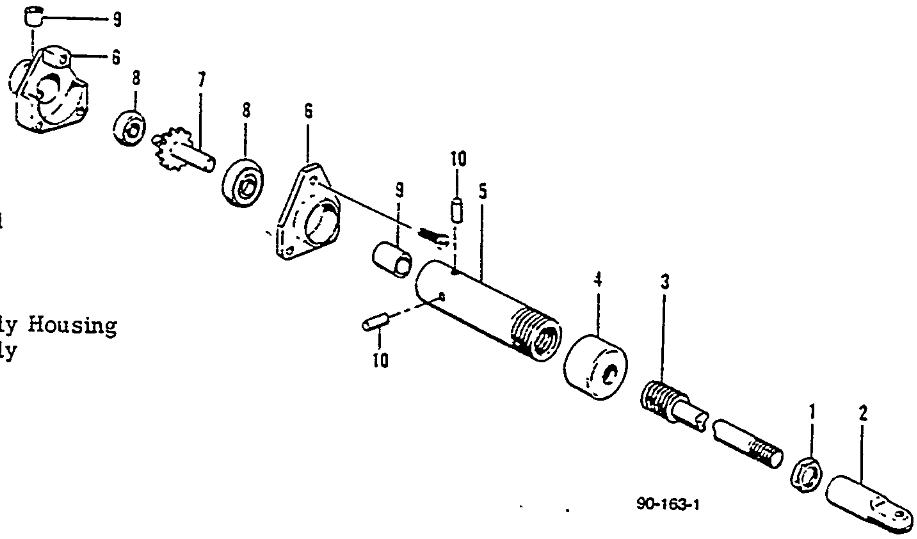
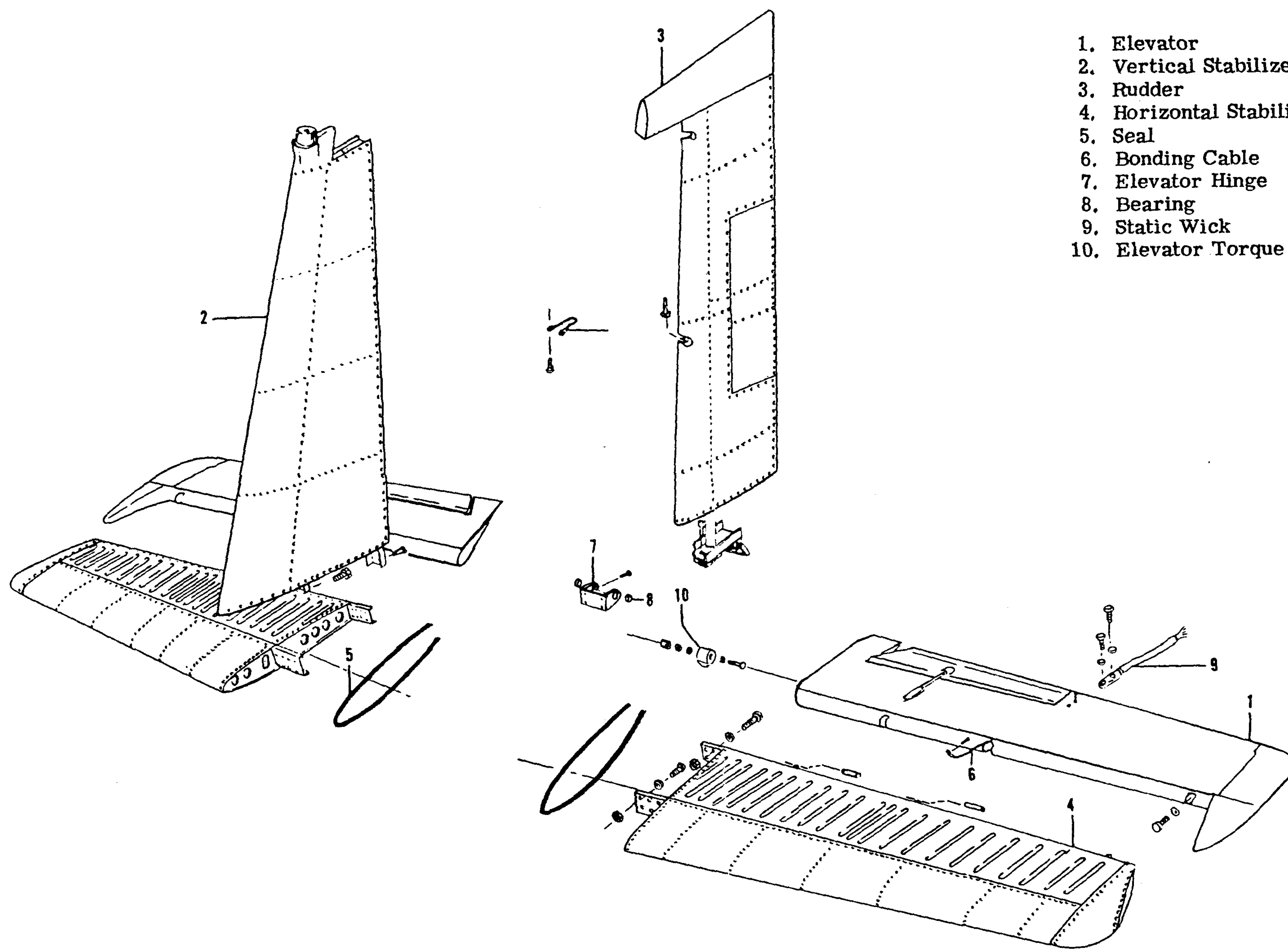


Figure 4-9. Rudder Tab Actuator



1. Elevator
2. Vertical Stabilizer
3. Rudder
4. Horizontal Stabilizer
5. Seal
6. Bonding Cable
7. Elevator Hinge
8. Bearing
9. Static Wick
10. Elevator Torque Arm

Figure 4-10. Empennage

VERTICAL STABILIZER

VERTICAL STABILIZER REMOVAL

a. Detach the tail cone, disconnect the tail navigation light wire and remove the tail cone.

b. Remove the tail section access doors on the left hand side of the aft fuselage.

c. Remove the rudder.

d. Remove the screws securing the fairings of the vertical stabilizer.

e. Disconnect the rotating beacon light wires.

f. Remove the stabilizer attaching bolts at the forward and rear spars and remove the stabilizer.

VERTICAL STABILIZER INSTALLATION

a. Position the vertical stabilizer on the fuselage and install the bolts at the forward and rear spars. Install the elevator center hinge bracket on the bottom of the rear spar. Torque the bolts to 160-190 inch pounds.

b. Connect the rotating beacon light wires and the tail navigation light wires.

c. Install the rudder, access doors and tail cone.

HORIZONTAL STABILIZER

HORIZONTAL STABILIZER REMOVAL

a. Detach the tail cone, disconnect the tail navigation light wire and remove the tail cone.

b. Remove the tail section access doors on the left hand side of the aft fuselage.

c. Remove the elevator.

d. Loosen the elevator trim tab cables at the turnbuckles just aft of the rear cabin bulkhead and disconnect them at the connection in the aft tail section. Remove the pulleys from the pulley brackets aft of the disconnect to free the cables.

e. Remove the stabilizer attaching bolts at the forward and rear spars.

f. Remove the stabilizers.

HORIZONTAL STABILIZER INSTALLATION

a. Position the stabilizers on the fuselage and install the attaching bolts in the forward and rear spars. Torque the forward spar bolts to 200-225 inch-pounds dry and torque the rear spar bolts to 85-100 inch-pounds dry.

b. Route the tab cables back through the fuselage and connect the cables at the turnbuckles.

c. Install the elevator.

d. Connect the elevator tab actuator rods.

e. Rerig the trim tabs.

f. Replace access doors.

CAUTION

If new stabilizers, P/N 96-620005-655 (LH) or 96-620005-656 (RH) are installed on the aircraft prior to serial TG-70, the aircraft weight and balance must be computed.

g. Connect tail navigational light wires and replace tail cone.

NOTE

The existing actuator, P/N 45-524565-3 (LH) or 45-524565-5 (RH), or the new actuator, P/N 96-526014-1 (LH) or 96-526014-2 (RH), may be used with the new replacement stabilizers but the new actuator, P/N 96-526014-1 (LH), 96-526014-2 (RH), can not be used with the original equipment stabilizers.

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 a .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 balancing weight.
X = The unknown weight to be added.
B = The total amount needed to give tail-heavy balance.

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
(Figure 4-11)

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.

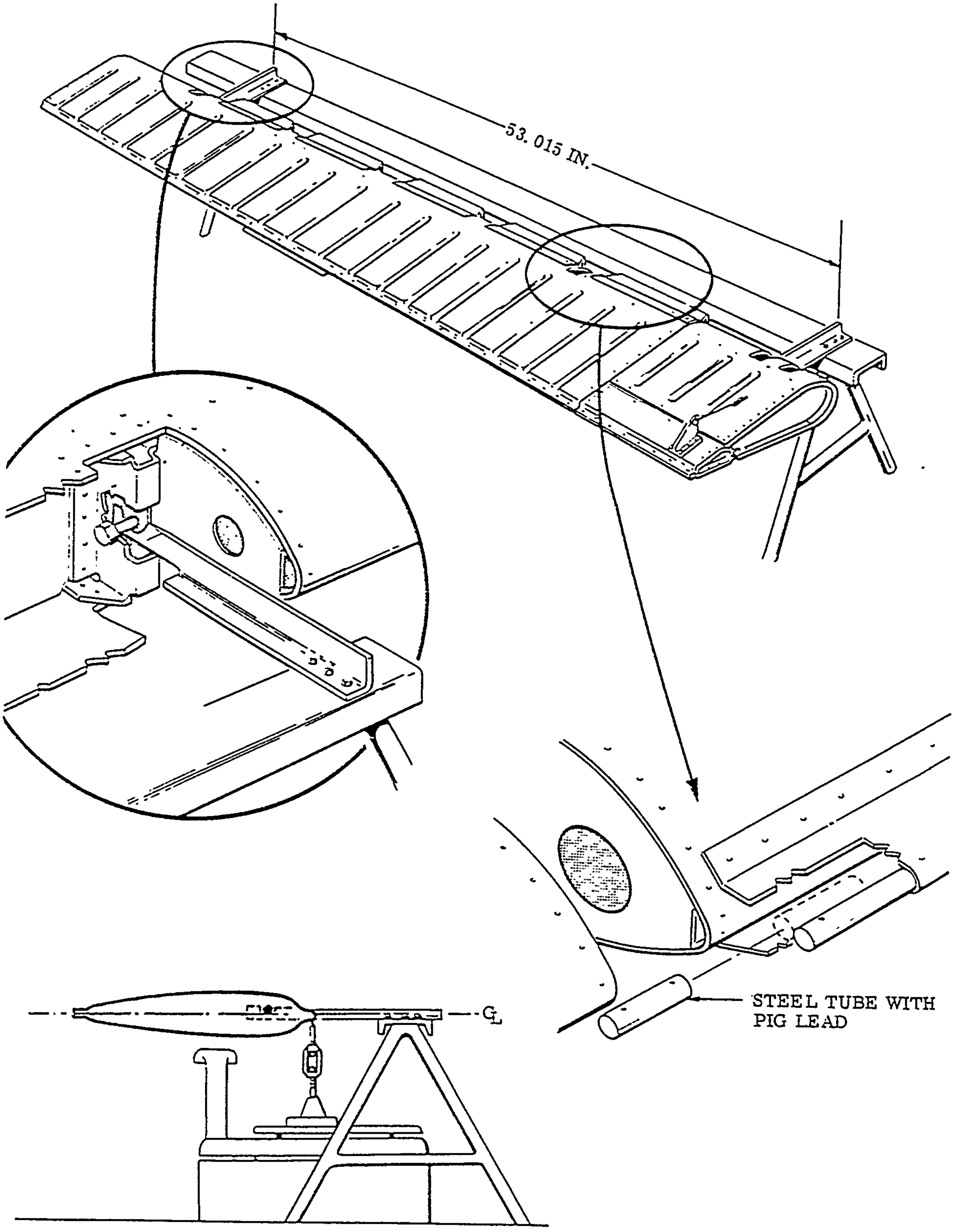


Figure 4-11. Balancing The Aileron

BALANCING THE ELEVATOR

(Figure 4-12)

The complete elevator assembly, painted and including the control arm and the tab control rod must not be tail-heavy over a maximum weight of 12.4 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.

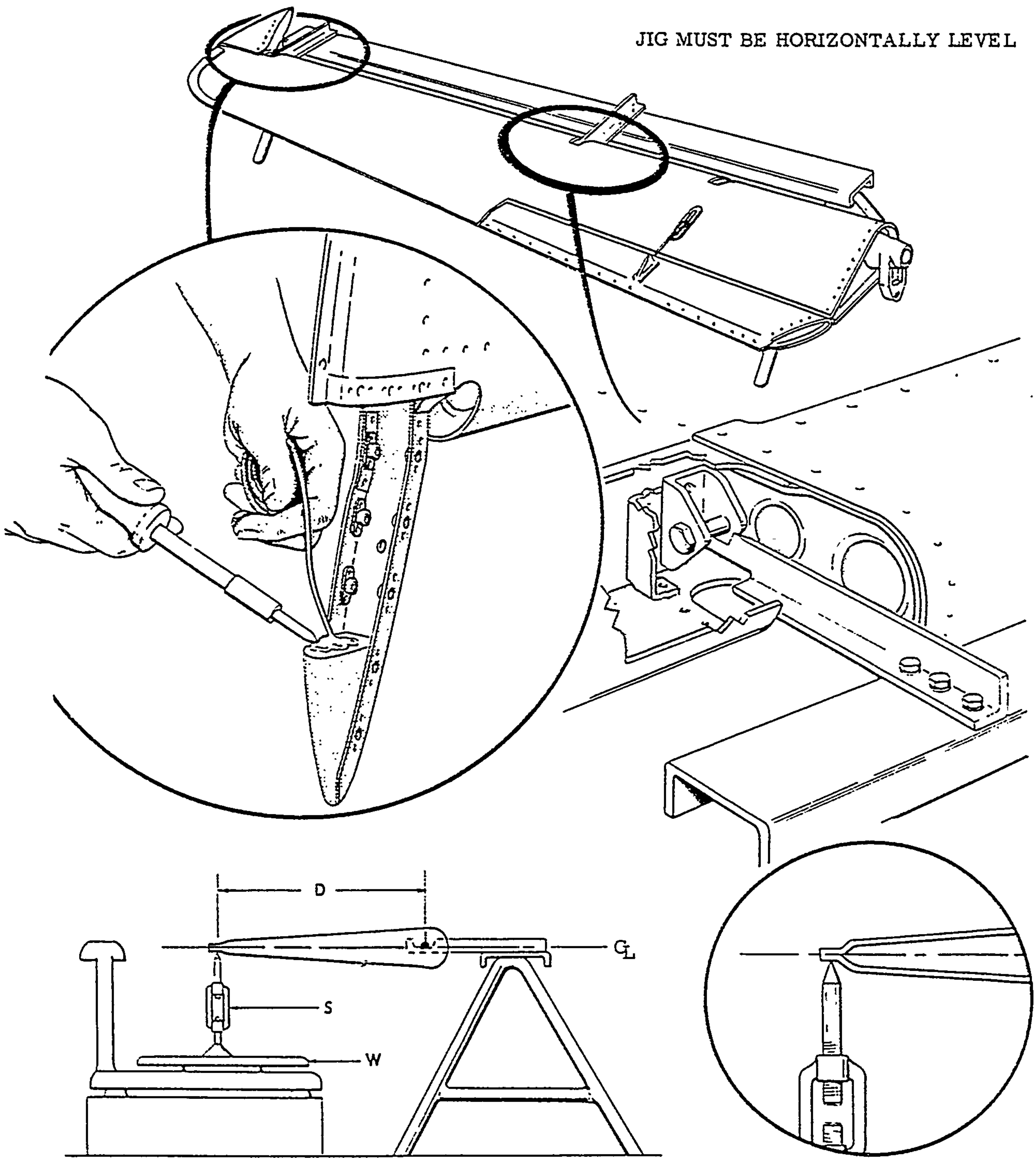


Figure 4-12. Balancing The Elevator

BALANCING THE RUDDER

(Figure 4-13)

The complete, painted rudder assembly with the torque tube actuating arm shall not be tail-heavy over a maximum of 4.5 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 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 weight 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 weight and recheck the rudder balance.

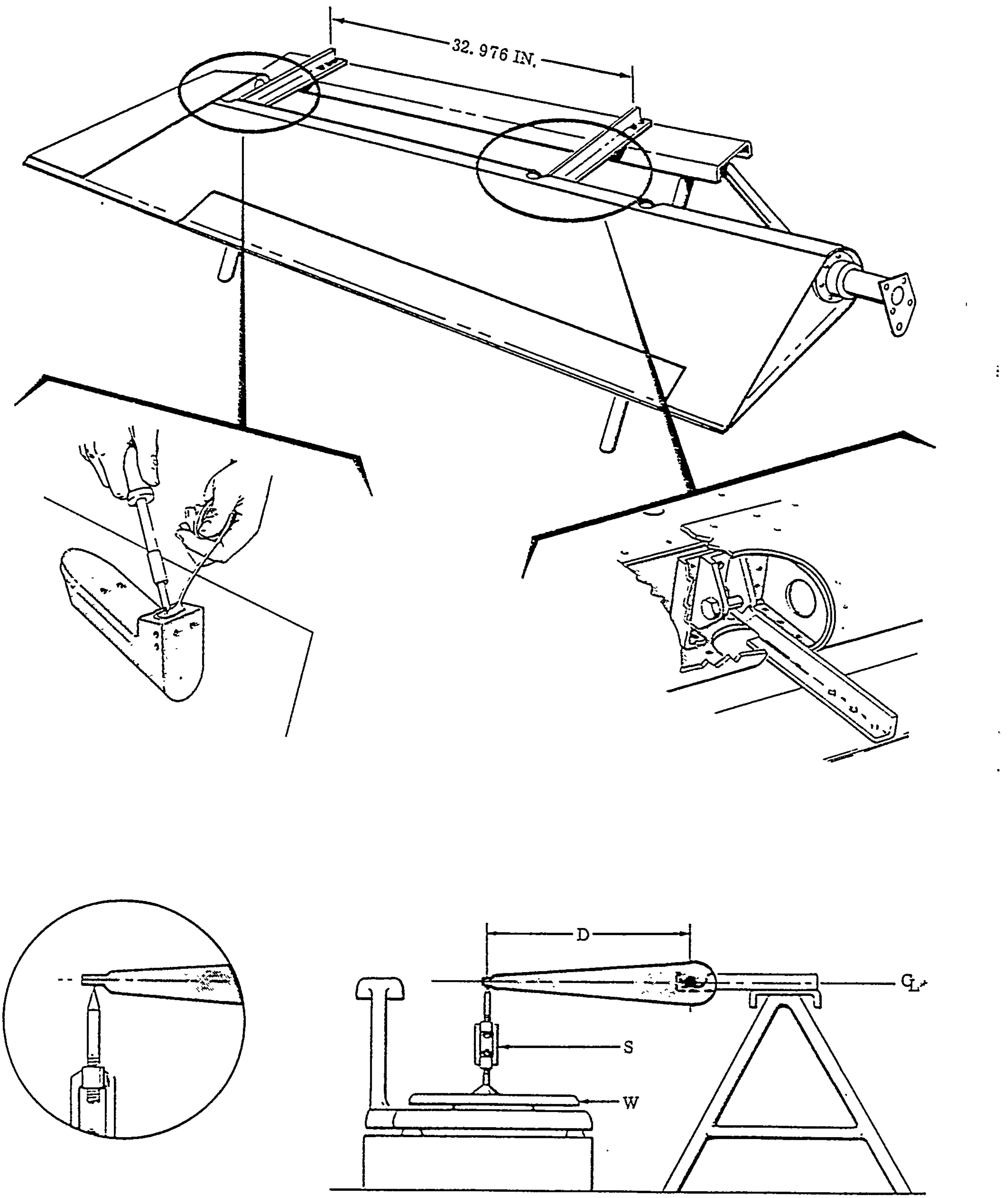


Figure 4-13. Balancing The Rudder

TEMPORARY REVISION NO. 4-2

Manual Affected: 56TC and A56TC Turbo Baron Shop Manual (96-590003-5B).

Filing Instructions: Insert adjacent to page 4-18.

Reason: Revise procedures for flap drive cable connection.

FLAP DRIVE CABLE CONNECTION

Connect the LH and RH flap drive cables to the flap drive motor as follows, using the illustration for component locations:

a. Install the outboard nut and washer as far as it will go on the threaded portion of the flap cable.

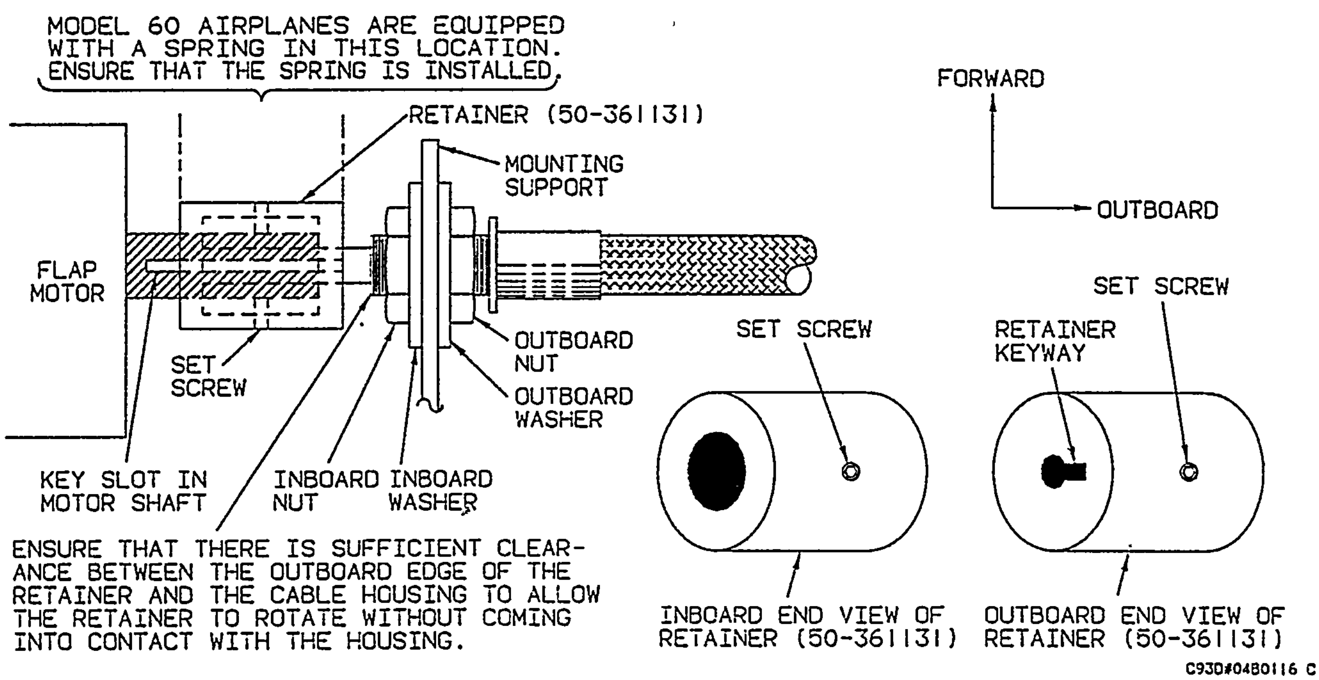
b. Insert the retainer through the mount support and onto the motor shaft as far as it will go. Align the retainer keyway with the key slot in the flap motor drive shaft and tighten one set screw temporarily.

c. While inserting the flap cable through the mount support, install the inboard washer and nut. Install the cable through the retainer and into the motor drive shaft until the keyway is just past the key slot in the retainer.

d. Loosen the set screw that was tightened in Step b. Ensure that the retainer is still installed on the motor shaft as far as it will go and rotate the retainer 90°.

e. Keep inboard pressure on the retainer and tighten both retainer set screws.

f. Secure the flap drive cable to the mounting support by tightening the nuts. Tighten the inboard nut to ensure that there is sufficient clearance between the outboard edge of the retainer and the cable housing to allow the retainer to rotate without coming into contact with the cable housing. If the threaded part of the cable housing is not long enough to install the two nuts and washers, using a die, add 5/8-24 UNEF threads until .88 inch thread length is reached. Tighten the outboard nut against the mounting support.



NOTE: Please see the
TEMPORARY
REVISION
that revises this page.

FLAPS

FLAP REMOVAL

a. Remove the bolt from the flap actuating arm.

b. Remove the bonding cable from the flap tracks.

c. Remove the bolts from the flap track brackets and remove the flap.

INSTALLATION OF FLAP

a. Hold flap in position and install the rollers and the bolts in the flap track bracket.

b. Connect the bonding cable and install the bolt in the flap actuating arm.

INSTALLATION OF FLAP TRACK ROLLERS

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.

RIGGING WING FLAP CONTROL SYSTEM

The flap limit switches are mounted on a bracket and installed on the outboard side of the inboard flap track in the left wing panel. The limit switches, one for up, two for the approach (one is a backup) position, and one for down travel, control the travel of the flaps by breaking the circuit to the flap motor at the extreme limits of selected travel. The switches are accessible by lowering the flaps.

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 approach limit switches by moving them in their slotted mountings until they actuate 15° - 1° -1° flap travel. The down limit switch is adjusted in the same manner to actuate at 30° + 0° -2° flap travel.

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".

FLAP POSITION INDICATOR ADJUSTMENT
(Figure 4-14)

An adjustable flap position indicator transmitter 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 flap travel.

b. Run the flaps down and check the pilot's compartment flap position indicator for 100% flaps. If full down flaps are not indicated, loosen the transmitter attachment bolts and adjust 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.

NOTE

After the flap is completely rigged, adjust the rubber bumper (flap down) installed on the flap and aileron dividing rib. Turn the adjusting screw in or out as required to take out play or stop vibration when the flap is in the up position. A distinct change in sound of the flap motor near the completion of the flap up travel may indicate an excessive outward adjustment of the bumper.

REMOVING AND INSTALLING THE FLAP MOTOR

a. Remove the cabin front seats.

b. Remove the access cover.

c. Detach the electrical wiring that is clamped to the RH flap shaft housing.

d. Loosen the set screws in the keeper (TG-63 and after, or prior aircraft conforming to Service Bulletin 67-40) and disconnect the keepers and flap shafts from the motor.

e. Disconnect the motor electrical wiring (except the 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.

FLAP MOTOR GEARBOX OVERHAUL
(Figure 4-15)

a. Cut and remove all safety wires.

b. Remove the two long screws from the motor brush housing to separate the motor and gearbox.

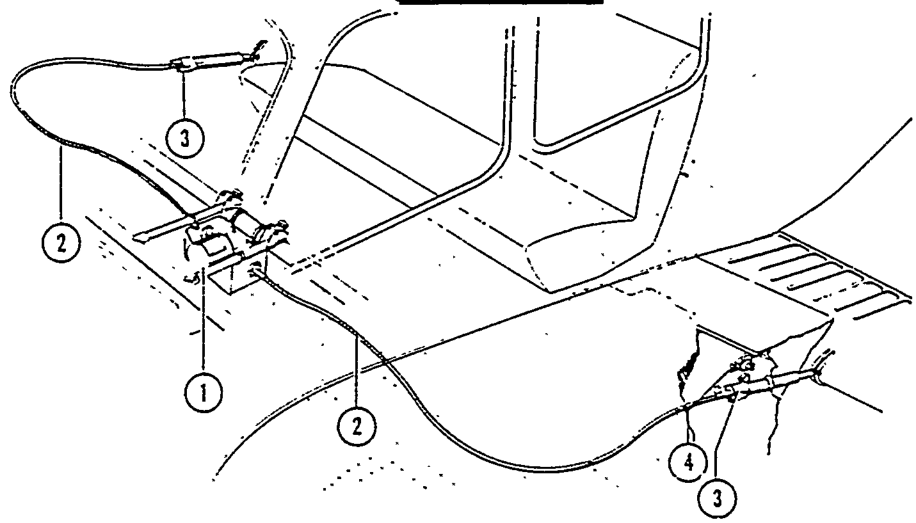
c. Remove the screws which secure the cover (8) and gasket (7) to the gear housing.

d. A small set screw (11) must be removed to allow the counter shaft (10) to be drawn out of the gearbox.

FLAP SETTINGS

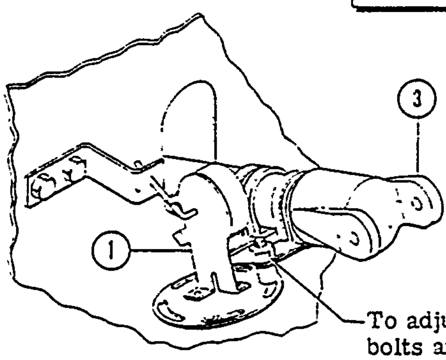
Approach - $15^\circ \pm 1$
Full Down - $30^\circ + 0^\circ - 2^\circ$

FLAP SYSTEM



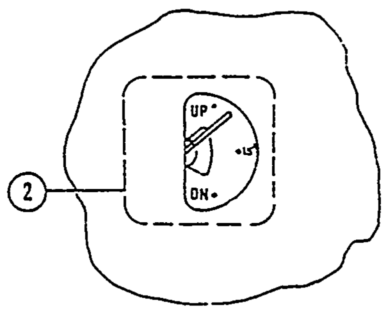
1. Flap Actuator Motor
2. Flap Shaft and Housing
3. Flap Actuator
4. Limit Switches

FLAP TRANSMITTER AND INDICATOR

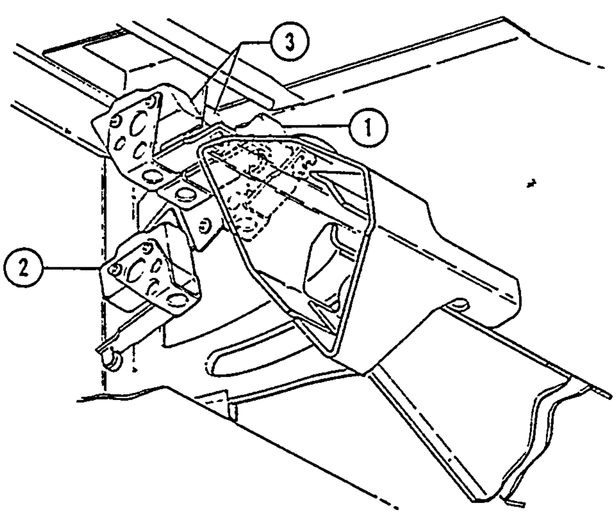


To adjust, loosen mounting bolts and move fore and aft, or rotate slightly.

1. Transmitter
2. Indicator
3. Flap Actuator

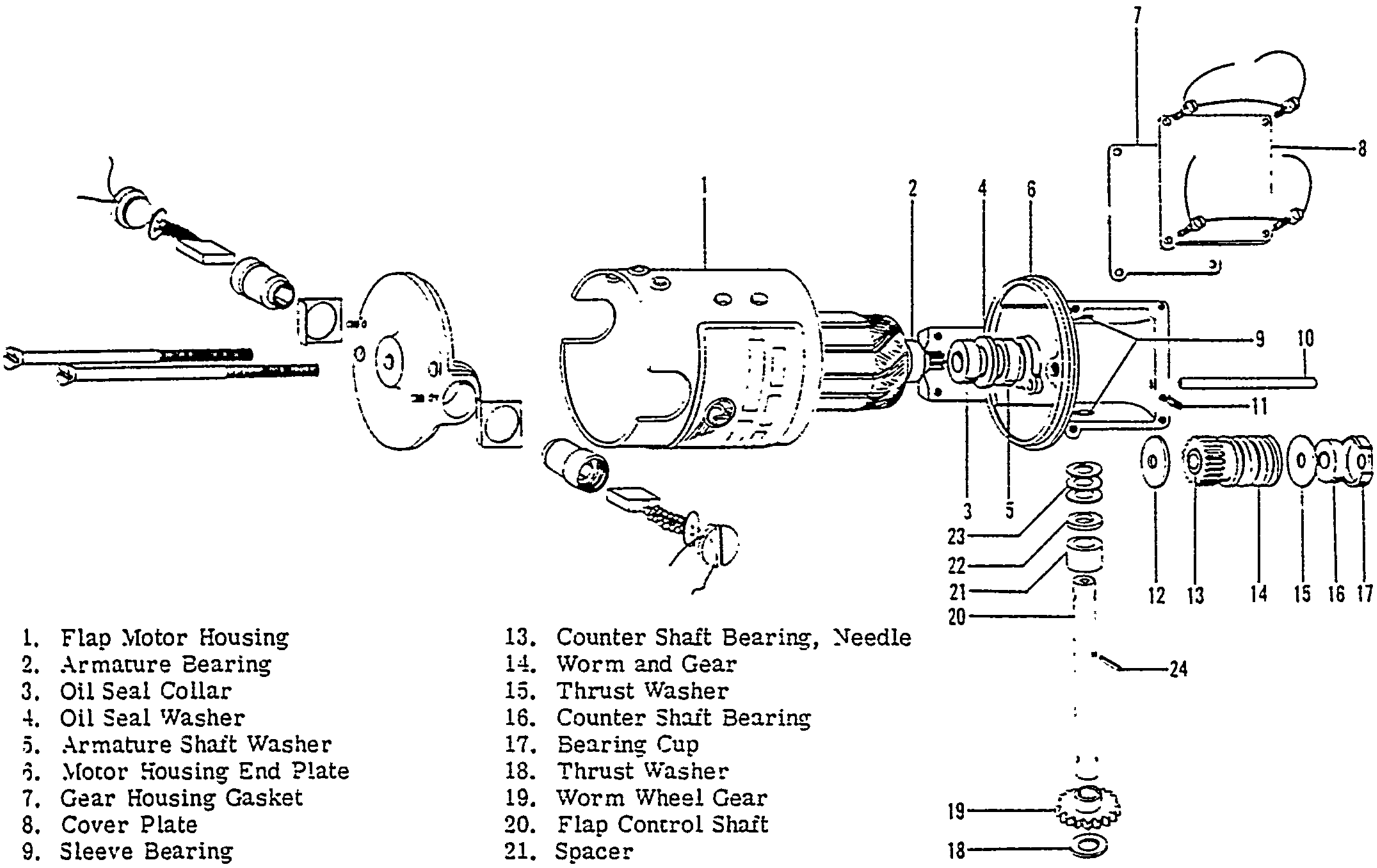


FLAP LIMIT SWITCHES



1. Down Limit Switches
2. Up Limit Switches
3. Approach Position Switches

Figure 4-14. Flap System



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 4-15. Flap Motor 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 (Item 15, Consumable Materials Chart) 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 is 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 (Item 11, Consumable Materials Chart).

Assembly is accomplished by reversing the above procedure.

FLAP ACTUATOR OVERHAUL

(Figure 4-16)

a. Remove the snap ring (1) to disconnect the flexible shaft (2) from the actuator.

b. Tap on the piston plug (3) to drive out the seal (5), spacers (4) and bearings (6).

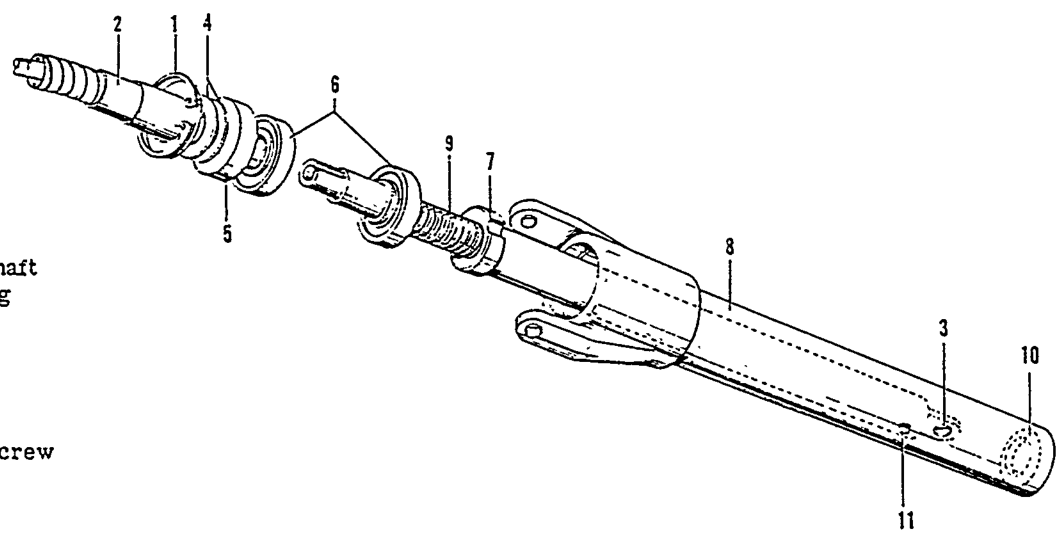
c. Slide the piston (7) out of the housing (8) and unscrew the flap actuator screw (9) from the piston.

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 (Item 15, Consumable Materials Chart) 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 (Item 11, Consumable Materials Chart). Lubricate the "O" rings with (Item 7, Consumable Materials Chart) before inserting the piston in the housing.

Pour (Item 7, Consumable Materials Chart) 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 these parts in the housing with approximately 1, 000 lbs. pressure, or use a suitable drift and mallet if a press is not available. Install the spacers, shaft and snap ring. Tap the piston plug with a rawhide mallet 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. Excess 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.



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 4-16. Flap Actuator

H-14 AUTOPILOT

(Serial TG-1 through TG-51)

The primary components of the autopilot pneumatic system are shown in Figure 4-17. Air pressure, supplied by a dry vacuum pump at the rear of the engine on the accessory housing, is admitted to the autopilot pneumatic system through a positive shut-off valve actuated by the ON-OFF switch in the flight controller. A pressure control valve (upstream from the solenoid valve) maintains a pressure of 7-8 psi in the system with the autopilot in operation. An air filter protects the servos from any impurities entering the system. This filter should be inspected for dirt on the autopilot side. If dirt is present, replace the cartridge. Servo actuators, powered by the air pressure, move the aircraft control surfaces. Servos can be overpowered without damage to the unit. The elevator trim tab actuator, also powered by air pressure, moves the aircraft trim tab to automatically maintain pitch trim.

(Serial TG-52 through TG-84)

The primary components of the H-14 Autopilot pneumatic system are shown in Figure 4-18. Air pressure, supplied by two engine driven dry air pumps located at the rear of each engine on the accessory housing, is admitted to the autopilot on-off control valves through a pressure manifold. Pressure in the manifold is regulated by variable pressure regulators, located in the nacelle of each engine. A constant pressure is maintained by the regulators for the combined operation of the autopilot and deicer systems. Control valves are installed between the pressure manifold and the autopilot servos. Aircraft with only the H-14 autopilot installation have one control valve; aircraft with both autopilot and deicer installations have two control valves. One valve will actuate when the autopilot is in operation. When the autopilot and deicer systems both are in operation, one valve automatically closes and the other valve opens to restrict the higher pressure (16-19 psig necessary for deicer operation) to 7.5 psig required for autopilot operation.

A sealed filter, located in the nacelle of each engine, protects the pressure system from impurities. This filter should be replaced every 500 hours (or less if operating in dusty and heavy smoke conditions). The servo actuators, powered by the air pressure, move the aircraft control surfaces. The servos can be overpowered without damage to the unit. The elevator trim tab actuator, also powered by air pressure, moves the aircraft trim tab to automatically maintain pitch trim.

RIGGING

NOTE

Before the autopilot control cables can be rigged, the respective aircraft control system cables must be rigged as specified in this section.

a. Aileron Control

1. Place the ailerons in the neutral position.

2. Set the aileron servo cable drum in the center of travel.

3. Rig the aileron servo cables as noted on the Aileron Cable Tension Temperature Chart.

b. Elevator Control

1. Place elevator and elevator servo in the neutral position.

2. Center the servo bellcrank on the cable (approximate center is reached when the bellcrank is in the vertical position with the servo).

3. Rig the elevator servo cables as noted on the Elevator Cable Tension.Temperature Chart.

c. Elevator Tab Control

The autopilot elevator trim tab actuator is connected directly to the aircraft elevator tab control system. Rigging of the elevator tab system may be accomplished as described in this section.

d. Rudder Control

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

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

3. Rig the rudder servo cables as noted on the Rudder Cable Tension Temperature Chart.

4. Remove the rig pin from the pilot's rudder pedals and place rudder pedals in their original position.

MAINTENANCE AND REPAIR

Maintenance, repair, troubleshooting, and testing procedures are described in the BEECHCRAFT H-14 Adaptive Autopilot Maintenance Manual. (See Supplementary Publications listing this manual.)

NOTE

When test air pressure is required, apply air pressure to the inlet side of the pressure control valve.

1. Rudder Servo
2. Aileron Servo
3. Elevator Servo
4. Computer
5. Pitch Trim Actuator
6. Air Filter
7. Flight Controller
8. Positive Shut-Off Valve
9. Overboard Vent
10. Engine Driven Vacuum Pump
11. Solenoid Valve
12. Pressure Regulator Valve
13. Vertical Gyro
14. Directional Gyro
15. Suction Relief Valve

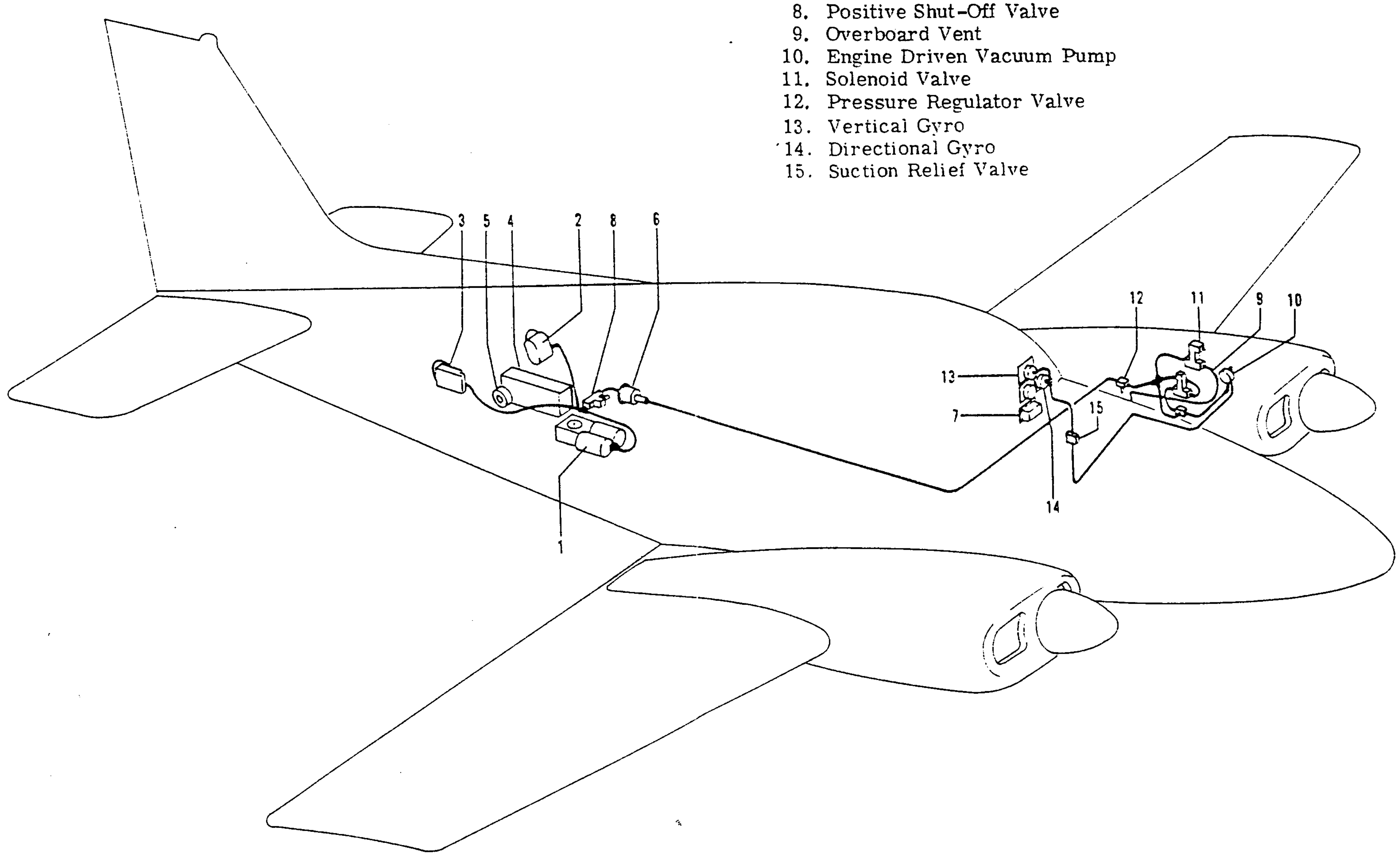


Figure 4-17. H-14 Autopilot (TG-1 through TG-51)

1. Elevator Servo
2. Pitch Trim Actuator
3. Computer
4. Aileron Servo
5. Positive Shut-off Valve
6. Pressure Manifold
7. Flight Controller
8. Instrument Panel
9. Variable Pressure Regulator
10. Filter
11. Engine-Driven Dry Air Pump
12. Filter
13. Rudder Servo
14. Adjustable Pressure Regulator

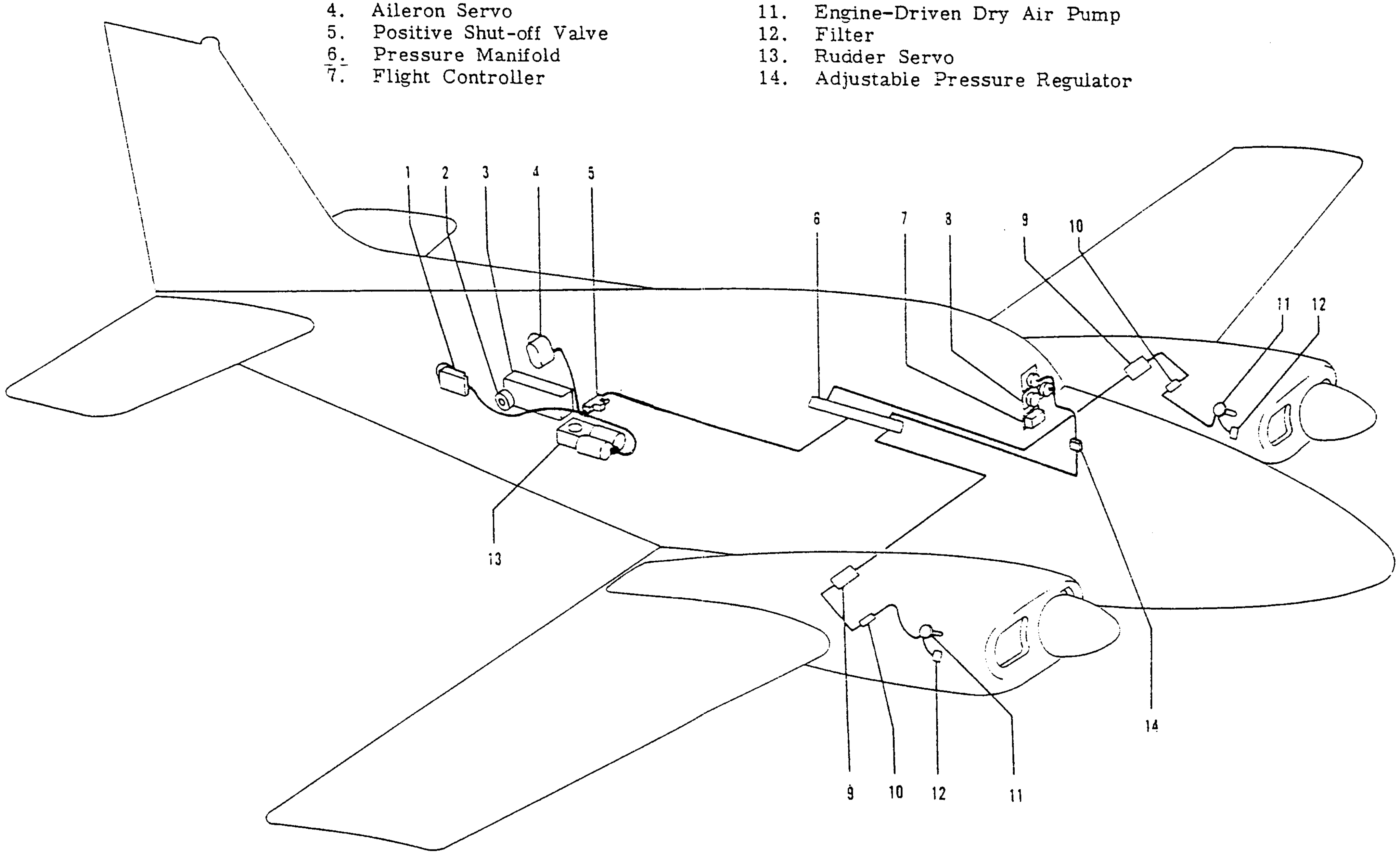
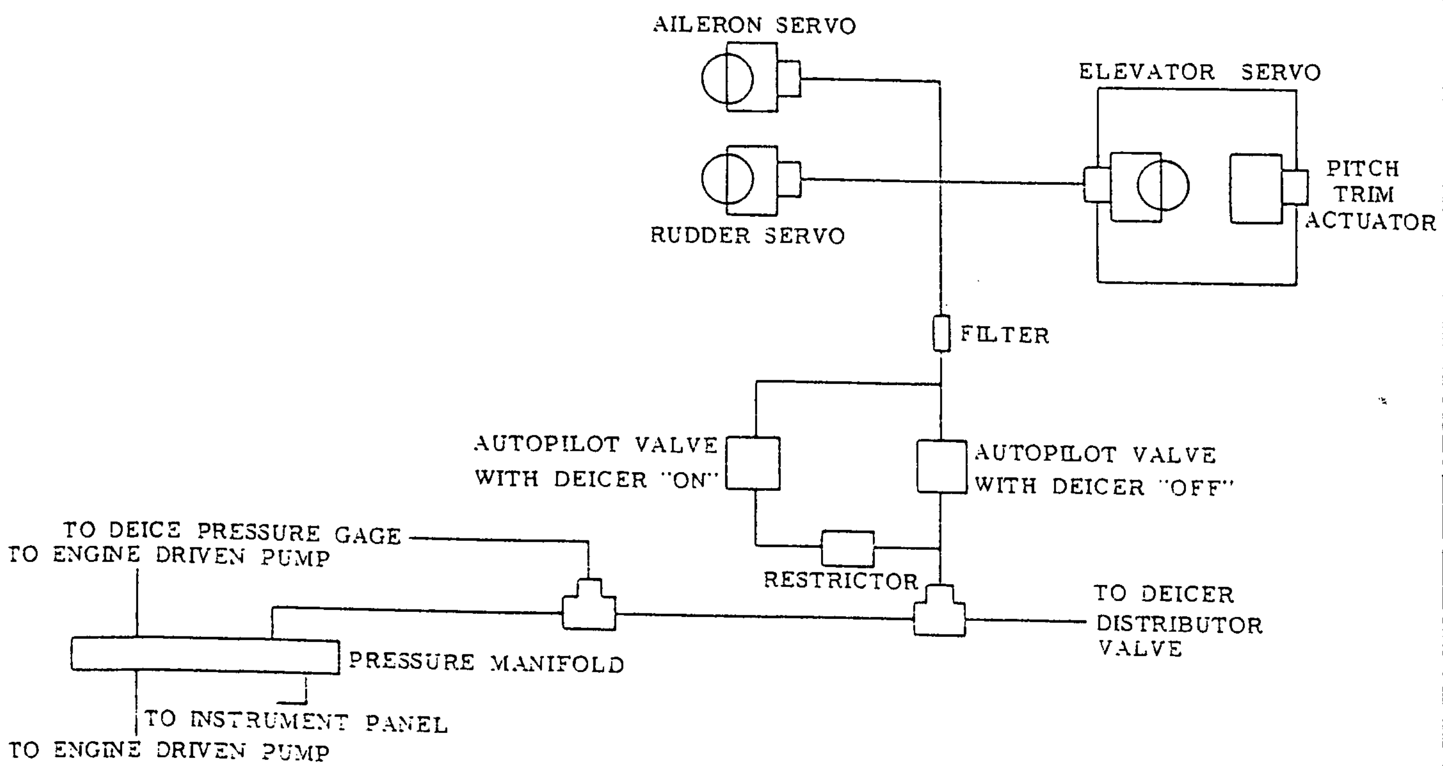
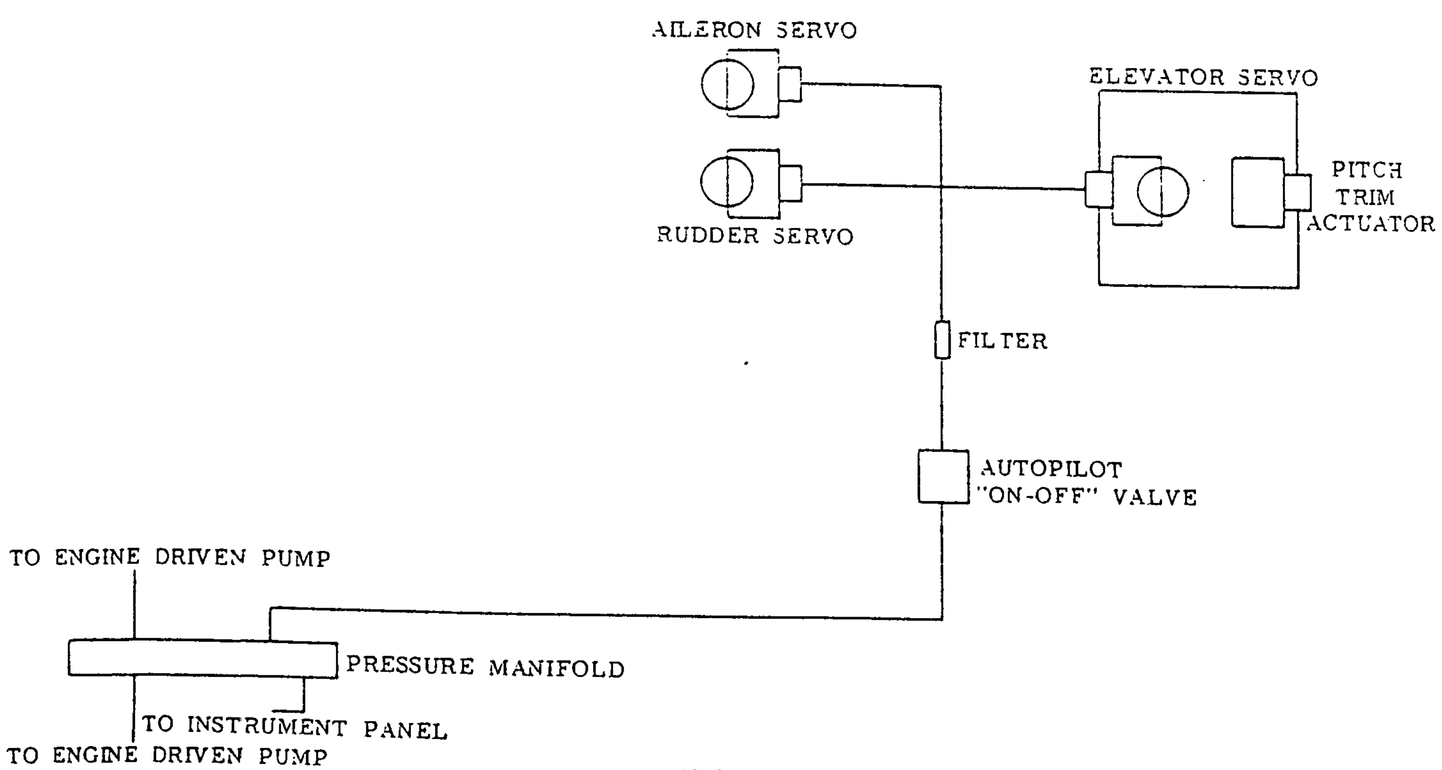


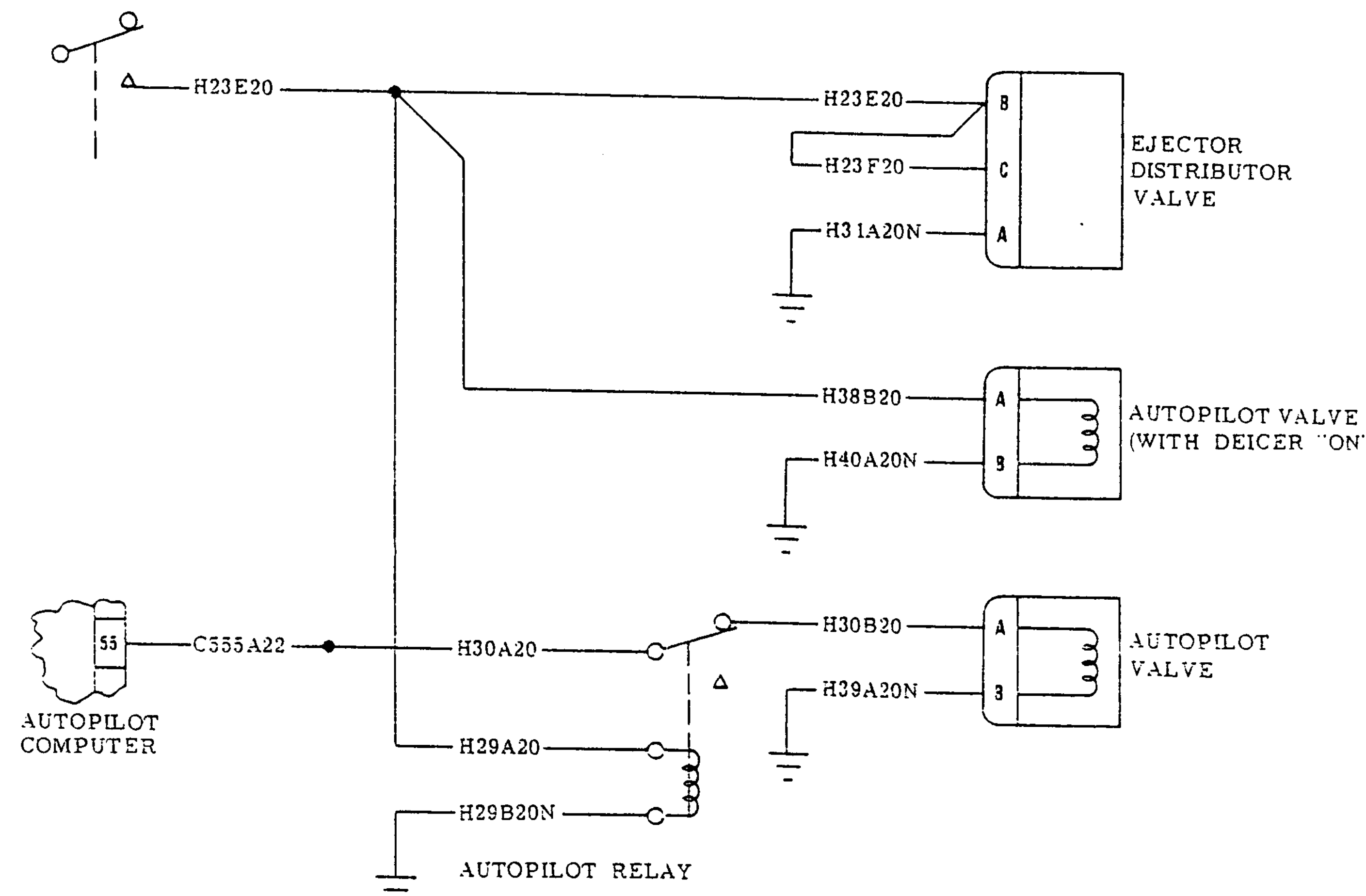
Figure 4-18. H-14 Autopilot (TG-52 through TG-84)



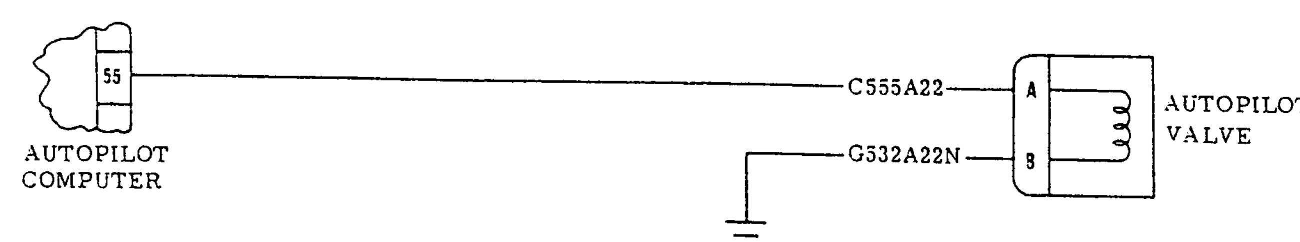
H-14 AUTOPILOT WITH DEICER (TG-52 THROUGH TG-84)



H-14 AUTOPILOT WITHOUT DEICER (TG-52 THROUGH TG-84)

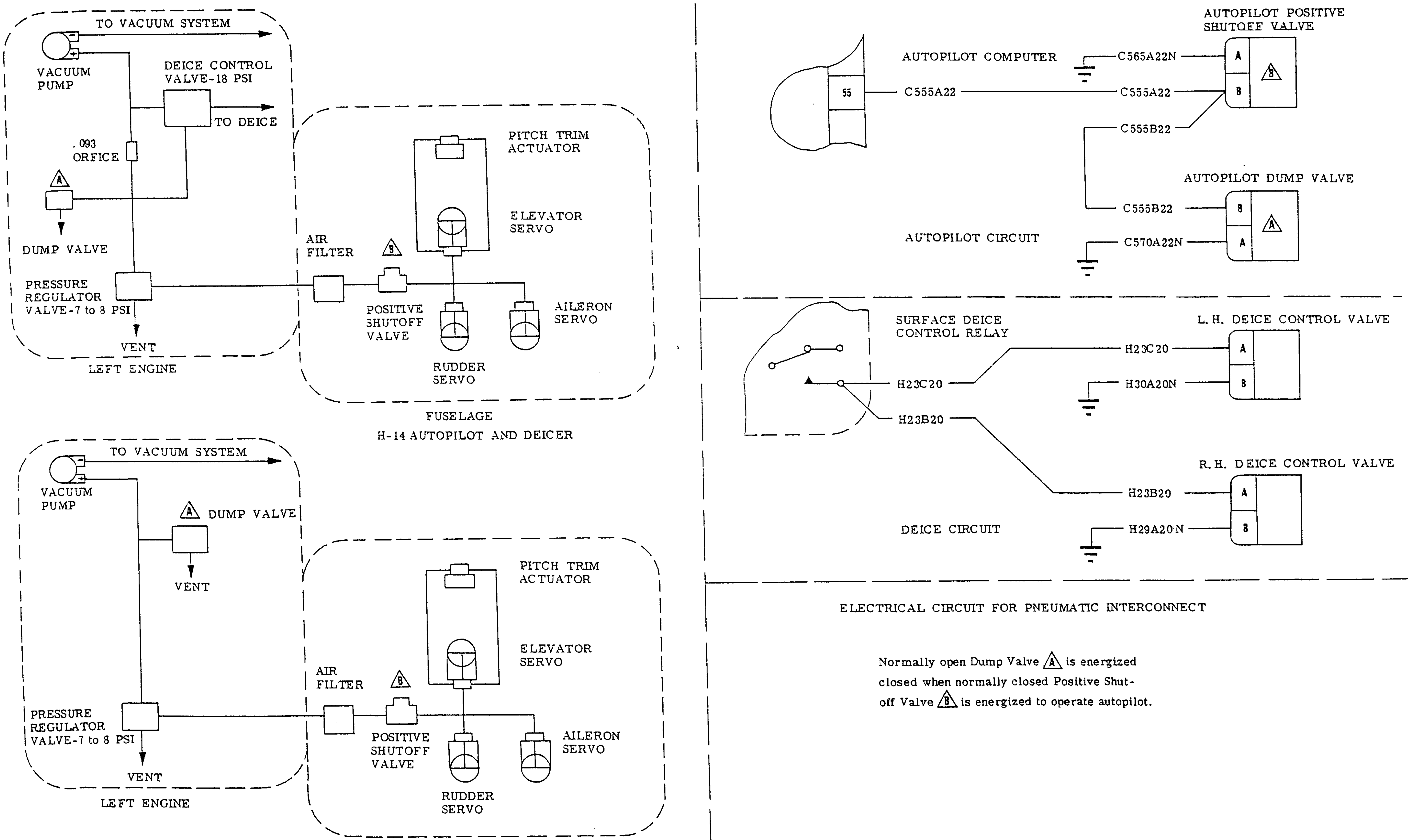


H-14 AUTOPILOT WITH DEICER (TG-52 THROUGH TG-84)



H-14 AUTOPILOT WITHOUT DEICER (TG-52 THROUGH TG-84)

Figure 4-19. Pneumatic Interconnect (TG-52 through TG-84).



Normally open Dump Valve A is energized closed when normally closed Positive Shut-off Valve B is energized to operate autopilot.

Figure 4-20. Pneumatic Interconnect (TG-1 through TG-51)

BEECHCRAFT NEW-MATIC AUTOPILOT

(TG-52 and after)

The B-5 autopilot operates on an electro-pneumatic concept. Electronic circuitry is used for navigational beam detection, magnetic heading direction turns. Pneumatic servos are used for the flight control actuators. The systems are completely non-tumbling. Yaw, roll and turn detection is made by a tilted gyro (EVT turn coordinator electrical vacuum torquing combination) mounted in the instrument panel. A dampened miniature aircraft serves as the instrument indication arm. Any deviation from straight flight causes the rate gyro to move a pressure (or vacuum) valve which puts force into the aileron or rudder to return the aircraft to the correct course. Turns or beam following is made by rotating a valve sleeve by a torquing movement proportional to the voltage imposed upon it. This unit also supplies an output voltage proportional to the turning rate that is used for dip compensation and nose up signal during turns. The pitch control system does not use a gyro for reference, but uses the airspeed, rate of airspeed change and inertial signals to control the elevator through the pitch servos. A altitude hold sensing unit works in conjunction with pitch control to sustain a given altitude.

(TG-84 and after)

At this serial number, the B-7 replaces the B-5 autopilot. Both systems are similar, the main difference being the pitch trim on the B-7 is electrically operated rather than pneumatically actuated.

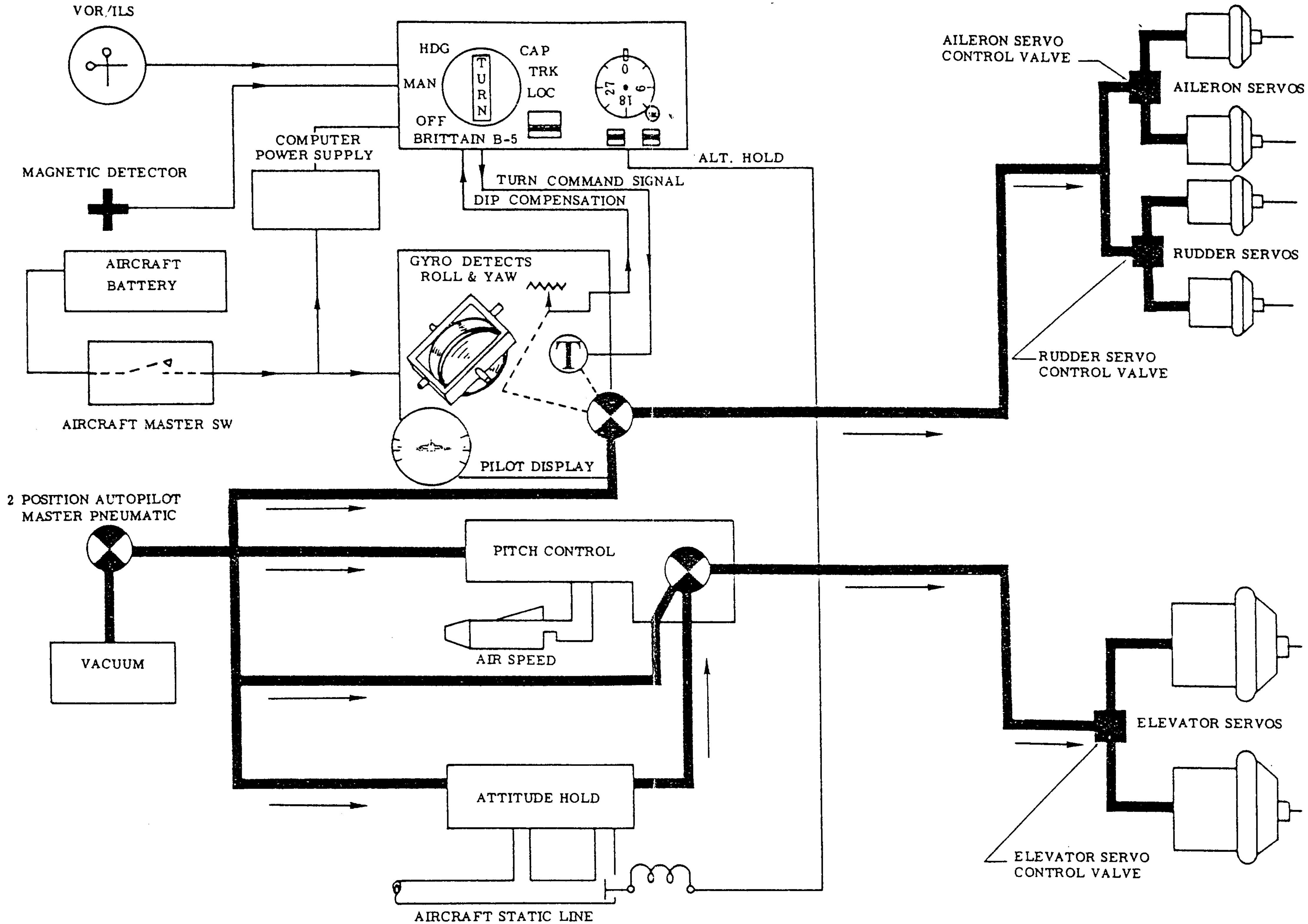


Figure 4-21. BEECHCRAFT New-Matic B-5 Autopilot System

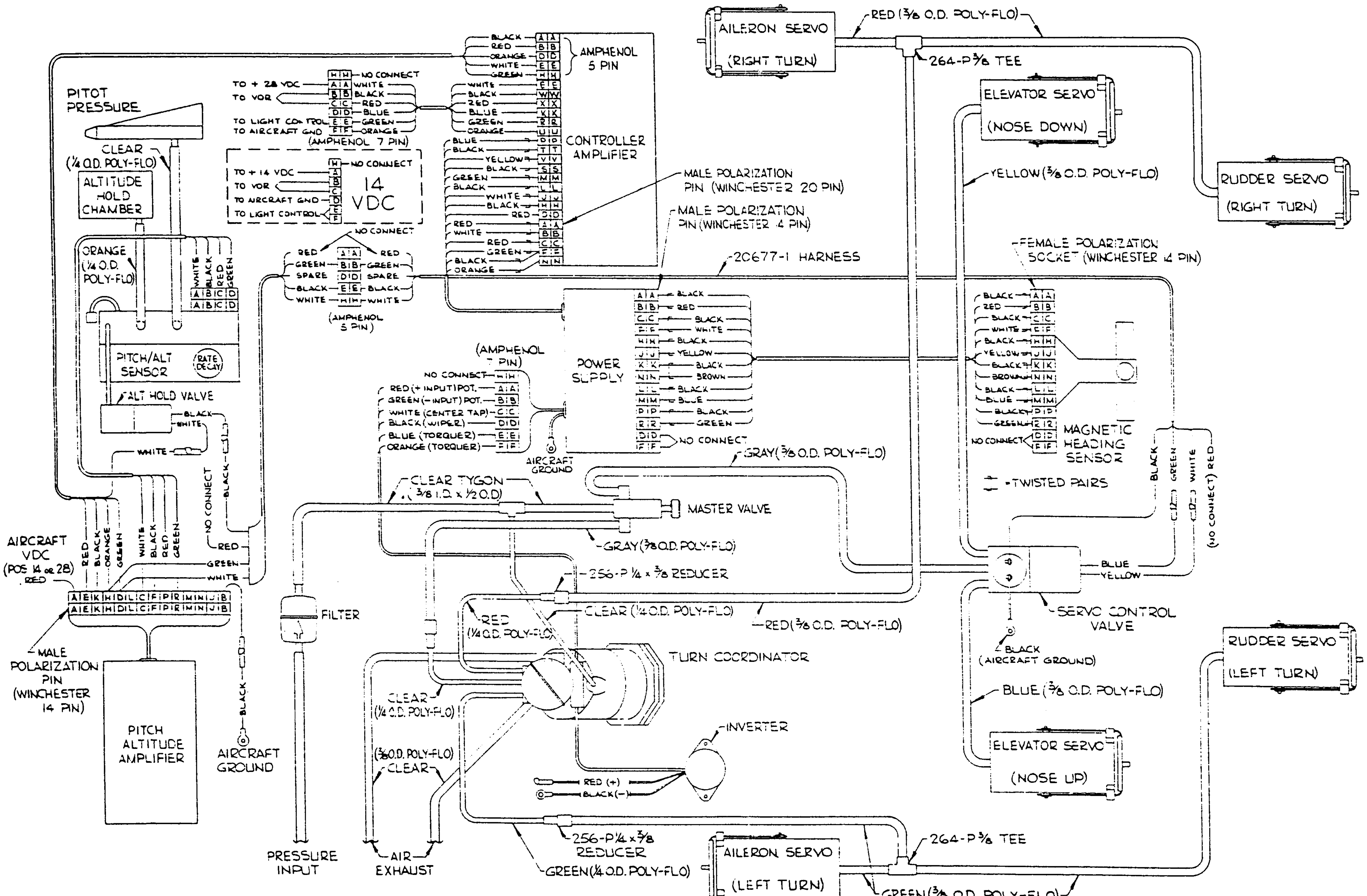


Figure 4-22. BEECHCRAFT New-Matic B-7 System Block Diagram

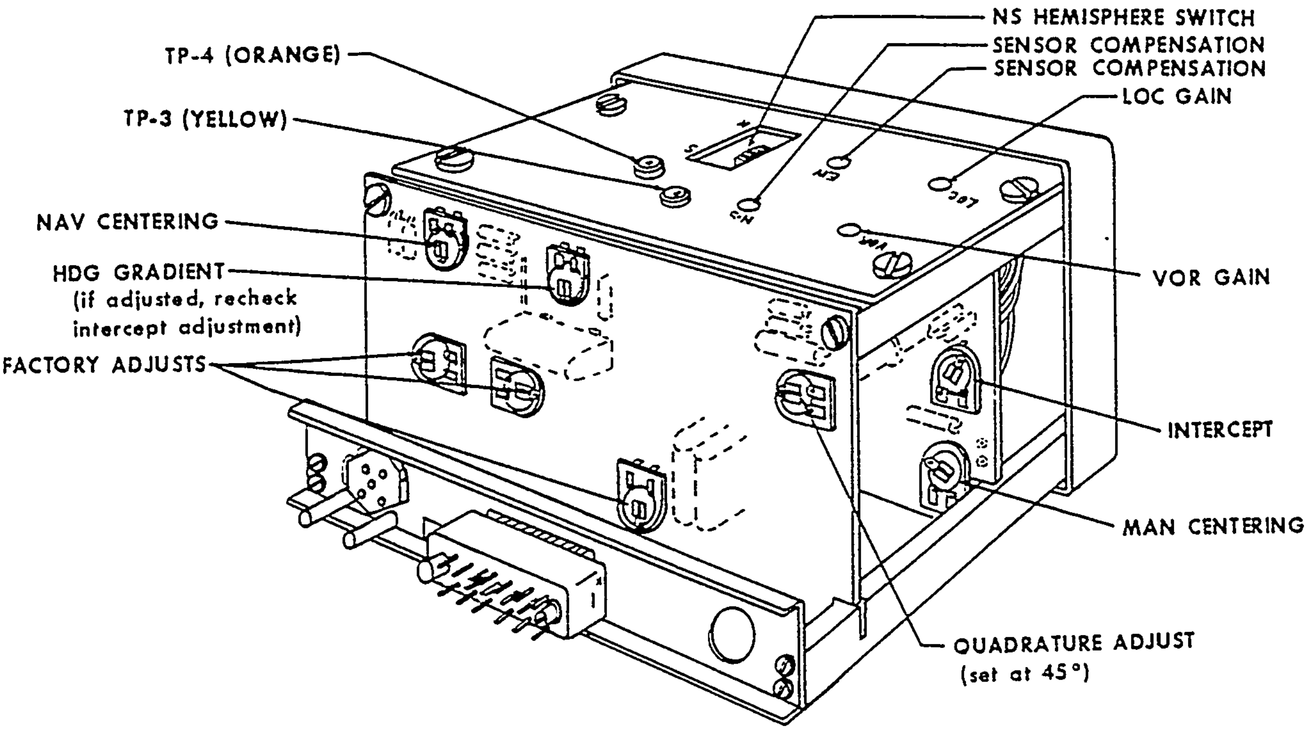


Figure 4-23. BEECHCRAFT New-Matic B-5 and B-7 Heading Lock/Navigation Coupler System Adjustment Points

AUTOPILOT TROUBLESHOOTING GUIDE

NOTE

This procedure applies specifically to the BEECHCRAFT New-Matic autopilots. Manuals noted in the Supplementary Publications list and the appropriate test sets as listed in those manuals will aid further in troubleshooting procedures.

INDICATION	PROBABLE CAUSE	REMARKS
ROLL AXIS		
1. Insufficient or excessive pressure indicated on aircraft system gage.	a. Leak in aircraft pressure system.	a. Check all lines and fittings for breaks, looseness, kinks, etc.
	b. Regulator valve improperly adjusted.	b. Adjust as outlined in Section 11.
	c. Regulator improperly adjusted.	c. Adjust as outlined in Section 11.
	d. Faulty (pressure) pump.	d. Replace pump.
	e. Ambient air filter clogged.	e. Clean or replace.
	f. Clogged system filter.	f. Check as outlined in Section 11 and replace if necessary.
2. Aircraft hunts or recovers slowly from turn in one direction.	a. Regulator valve improperly adjusted.	a. Adjust as outlined in Section 11.
	b. Loose aircraft primary cables or excessive friction in aileron and/or rudder cables, pulleys, bellcranks or loose servo cables.	b. Check security of attachment, binding, etc. and adjust as outlined in Section 4.
	c. Leak in servo or servo lines.	c. Check for leaks.
	d. Obstruction in servo lines.	d. Check for foreign matter.
	e. Faulty turn coordinator gyro.	e. Replace turn coordinator.
3. Autopilot sluggish	a. Low system pressure setting.	a. Check system filters and adjust as outlined in Section 11.
4. Aircraft turns continuously on basic stabilization (Controller "OFF")	a. Aircraft out of trim or improperly rigged.	a. Trim aircraft or check controls for proper rig as outlined in Section 4.
	b. Loose primary cables or excessive friction in cables and system. Loose servo cable.	b. Check security of attachment, binding, etc and adjust as outlined in Section 4.
	c. Defective turn coordinator gyro.	c. Replace turn coordinator gyro.
	d. Leak in servo or servo line.	d. Check for servo or line leaks.
5. Aircraft rate of turn too fast or too slow.	a. Improper regulator adjustment.	a. Adjust regulator as outlined in Section 11.
	b. Turn coordinator faulty.	b. Replace turn coordinator.

INDICATION	PROBABLE CAUSE	REMARKS
6. Continuous control wheel oscillation in smooth air.	a. Turn coordinator faulty.	a. Replace turn coordinator.
	b. Improper gyro speed or excessive pressure system.	b. Adjust system pressure as outlined in Section 11.
7. No turns or turns in one direction only, in response to turn control or on all modes of navigation coupler operation.	a. Faulty turn coordinator.	a. Replace turn coordinator.
	b. Faulty controller amplifier.	b. Replace controller amplifier.
8. Aircraft rolls in one direction only either left or right.	a. Servos improperly phased.	a. Plumb as noted on Figure 4-22.
	b. Turn coordinator not plumbed properly.	b. (Same as "a")
9. Aircraft turns in the wrong direction in "CAP" and "TRK" modes.	a. Nav input signal reversed.	a. Reverse connectors to VOR.
10. No aircraft response from navigation coupler in any mode, ground check shows electrical.	a. Faulty turn coordinator gyro.	a. Replace turn coordinator.
	b. Obstruction in pressure lines.	b. Check for foreign matter.
11. Aircraft fails to turn to and hold magnetic headings.	a. Faulty magnetic heading sensor.	a. Replace magnetic heading sensor.
	b. Faulty heading selector resolver.	b. Replace heading selector resolver.
	c. Faulty controller/amplifier.	c. Replace controller/amplifier.
12. Magnetic headings consistently high or low.	a. Heading sensor misaligned in aircraft.	a. Check for proper installation.
	b. Heading azimuth dial shifted on shaft.	b. Tighten screw and recalibrate.
	c. Improper adjustment of controller/amplifier.	c. Calibrate for the magnetic cardinal points.
13. Cardinal headings inaccurate.	a. Controller/amplifier improperly adjusted.	a. Calibrate for the magnetic cardinal points.
	b. Leak in servo system.	b. Check for leaks.
	c. Low primary pressure .	c. Adjust system as outlined in Section 11.
14. Cardinal headings accurate but intermediate headings inaccurate.	a. Faulty heading sensor.	a. Replace the heading sensor.
	b. Faulty controller/amplifier.	b. Replace controller/amplifier.
15. Insufficient or no control in "CAP" and "TRK" modes.	a. Faulty controller/amplifier.	a. Replace controller/amplifier.
	b. Faulty omni converter.	b. Replace omni converter.
	c. Insufficient signal from omni.	c. Repair or replace omni indicator.
	d. "NAV SENS" improperly adjusted.	d. Readjust.

INDICATION	PROBABLE CAUSE	REMARKS
16. Localizer approach is either sluggish or too sensitive.	a. Loc gain is set high or low.	a. Adjust localizer gain.
17. No electrical output left or right on controller/ amplifier test jacks.	a. No A+ input or improperly grounded.	a. Check A+ and ground.
	b. Defective controller/ amplifier or power supply.	b. Replace controller/ amplifier or power supply.
18. Output only one way on controller/amplifier test jacks.	a. Defective controller/ amplifier.	a. Replace controller/ amplifier.
19. No output on HDG mode on controller/amplifier test jacks.	a. Defective controller/ amplifier, or harness, or heading sensor.	a. Check controller/ amplifier; or replace heading sensor.
20. Heading output on two reciprocal headings, but not on the other two.	a. Defective sensor; or harness; or faulty controller/ amplifier.	a. Replace heading sensor, or check harness. Replace controller/amplifier.
21. "O" output when in CAP, TRK, OR APP mode, with nav signal.	a. Defective nav switching console; or no nav information; or defective controller/amplifier.	a. Check nav input leads. Replace controller/amplifier.
22. Output voltage in CAP mode decays to "O" voltage.	a. Wrong nav input signals.	a. Check wiring.
	b. Defective switching console (if installed).	b. Repair or replace console.
	c. Dirty input signal (AC volts).	c. Check indicators.
23. Voltage output in MAN, CAP, TRK, and APP mode, but none in HDG mode.	a. Polarization pins reversed on heading sensor plug.	a. Reverse pins. (See Figure 4-22.)
24. Nav indicator needle deflects left or right when controller/amplifier or radio is turned on.	a. One of the components is shorted to ground.	a. Check for shorts.
25. Low or high intercept angle.	a. Incorrect setting on controller/amplifier.	a. Adjust intercept angle.
	b. Low or high voltage output on nav indicators.	b. Check nav indicators to manufacturer's specs.
PITCH AXIS		
1. Pitch channel will not center up electrically	a. Defective pitch/altitude sensor or amplifier.	a. Check on Test Set TS-108 or replace one at a time.
2. Altitude channel will not center up electrically.	a. Defective pitch/altitude sensor or amplifier.	a. Check on Test Set TS-108 or replace one at a time.
3. Altitude hold solenoid valve will not actuate.	a. Pressure switch on servo control valve out of circuit.	a. Check for faulty switch and replace if necessary.
	b. Defective solenoid valve.	b. Replace solenoid valve.
	c. Defective altitude switch on controller/amplifier.	c. Check continuity (see Figure 4-22.)

INDICATION	PROBABLE CAUSE	REMARKS
4. Servo control valve will not center.	a. Improper pressure adjustment.	a. Adjust as outlined in Section 11.
	b. Sticky valve.	b. Replace valve.
5. Output voltage is inadequate.	a. Pitch/altitude amplifier sensor or harness shorted or improperly wired.	See Figure 4-22 run continuity check and check for shorts.
6. Pressure switch will not make contact when pressure is on.	a. Defective pressure switch or not set at proper pressure.	a. Replace pressure switch.
7. Output voltage one way only on pitch and altitude channels.	a. Servo control valve shorted to ground.	a. Replace valve.
8. System will not maintain trimmed configuration even though centered electrically.	a. Servo control valve not pneumatically centered.	a. Disconnect electrical power. Center valve pneumatically by use of differential gage to - 0.4 in Hg.
	b. Leak in servos or improperly rigged.	b. Check for leaks and rig.
	c. Leak in pitch/altitude sensor.	c. Replace sensor.
9. System will not respond to airspeed changes.	a. Primary pressure not set properly.	a. Adjust as outlined in Section 11.
	b. Pitot pressure inadequate.	b. Check pitot plumbing.
	c. Decay rate improperly adjusted.	c. Adjust as required.
10. System will not respond to up-command adjustment.	a. Defective pitch/altitude amplifier.	a. Replace pitch/altitude amplifier.
	b. No EVT potentiometer output.	b. Replace turn coordinator.
11. System will not respond to altitude gain adjustment.	a. Pitch/altitude amplifier limiter improperly set.	a. Adjust as required.
12. Aircraft has long term oscillation about pitch axis with altitude hold OFF.	a. Decay rate improperly adjusted.	a. Adjust as required.
	b. Pitch altitude gain improperly adjusted.	b. Adjust as required.
	c. Friction in elevator or servo system.	c. Check for friction and correct.
13. Aircraft has short term oscillation about pitch axis.	a. Decay rate too tight.	a. Adjust as required.
	b. Pitch gain too high.	b. Adjust as required.
	c. Primary pressure too high.	c. Readjust as outlined in Section 11.
14. Aircraft oscillates with altitude hold ON.	a. Altitude gain too high.	a. Adjust as required.
	b. Decay rate improperly adjusted.	b. Adjust as required.

INDICATION	PROBABLE CAUSE	REMARKS
15. Aircraft does not return to altitude when displaced.	a. Altitude hold solenoid inoperative.	a. Replace solenoid.
	b. Leak in altitude system.	b. Check for leaks.
	c. Altitude limiter improperly adjusted.	c. Adjust as required.
16. Aircraft descends or ascends continually when system engaged.	a. Servo control valve not phased correctly.	a. Apply positive 6.0 volts (max) to blue lead and verify nose up response.

BRAKE SYSTEM

(Figure 5-1)

The fluid reservoir, accessible through the forward baggage compartment, should be filled to within 1 1/2 inches of the top and a visible fluid level maintained on the dip stick at all times by adding hydraulic fluid (Item 13, Consumable Materials Chart).

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.

BRAKE WEAR LIMITS

The brake linings should be replaced before the metal back plate is exposed through the abrasive surface. This can be checked visually without disassembling 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.

PARKING BRAKE ADJUSTMENT

(TG-1 through TG-76)

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 setscrew and take up the slack in the actuator wire. Tighten the setscrew and lock nut down on the brake actuator wire. After the proper adjustment of the actuator wire is assured, bend the wire directly behind the parking brake valve control arm at a 90° angle to prevent a loss of adjustment. 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. Inspect the parking brake valve to determine if it is leaking and causing hydraulic fluid loss.

(TG-77 and after)

a. Place the parking brake control in the OFF (valve OPEN) position.

b. Remove the floorboards forward of the pilots seats.

c. Loosen the set screw in the cable attach fitting and adjust the cable housing through the mounting block to obtain 1 1/2 inch travel between the cable housing and the cable attach fitting. The 1 1/2 inch clearance should be made with the parking brake valve lever in the OPEN position.

d. Tighten the mounting block, insert the cable in the cable attach fitting, tighten and safety wire the set screw in the attach fitting.

e. Test the parking brake adjustment by pulling the parking brake handle out and operating the brake pedals.

f. If the brake pedals are not solid, place the parking brake control in the OFF position and recheck the rigging.

g. Inspect the parking brake valve for hydraulic fluid loss.

ADJUSTING THE LINKAGE ON BRAKE MASTER CYLINDER

The proper linkage arrangement 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 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.

BLEEDING THE BRAKE SYSTEM

Use only hydraulic fluid (Item 13, Consumable Materials Chart) 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

(Figure 5-2)

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 brake pedals is not necessary.

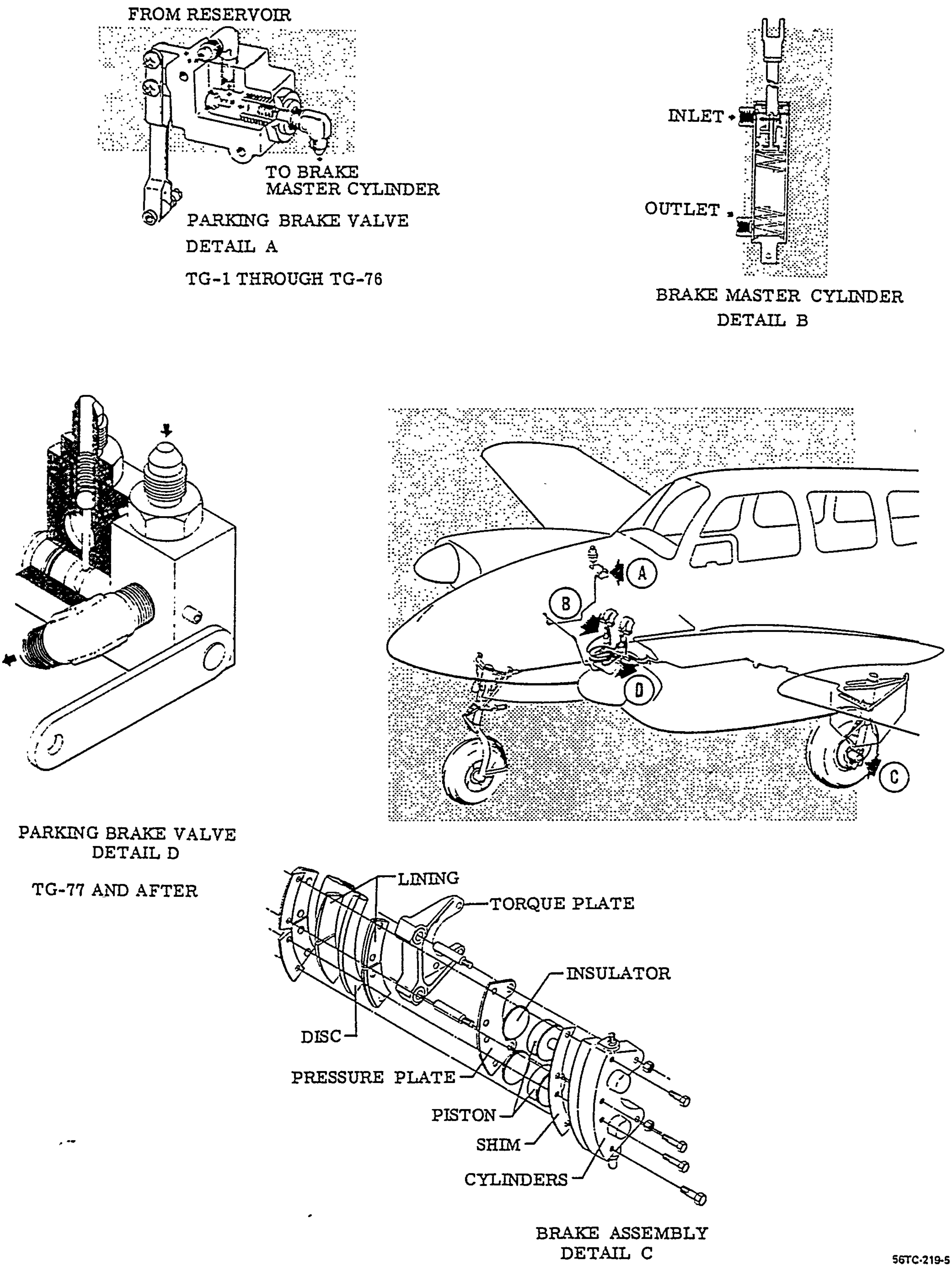


Figure 5-1. Brake System

BLEEDING DUAL BRAKE SYSTEM

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

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

REMOVING THE WHEEL AND BRAKE ASSEMBLY

a. Place the airplane on a jack.

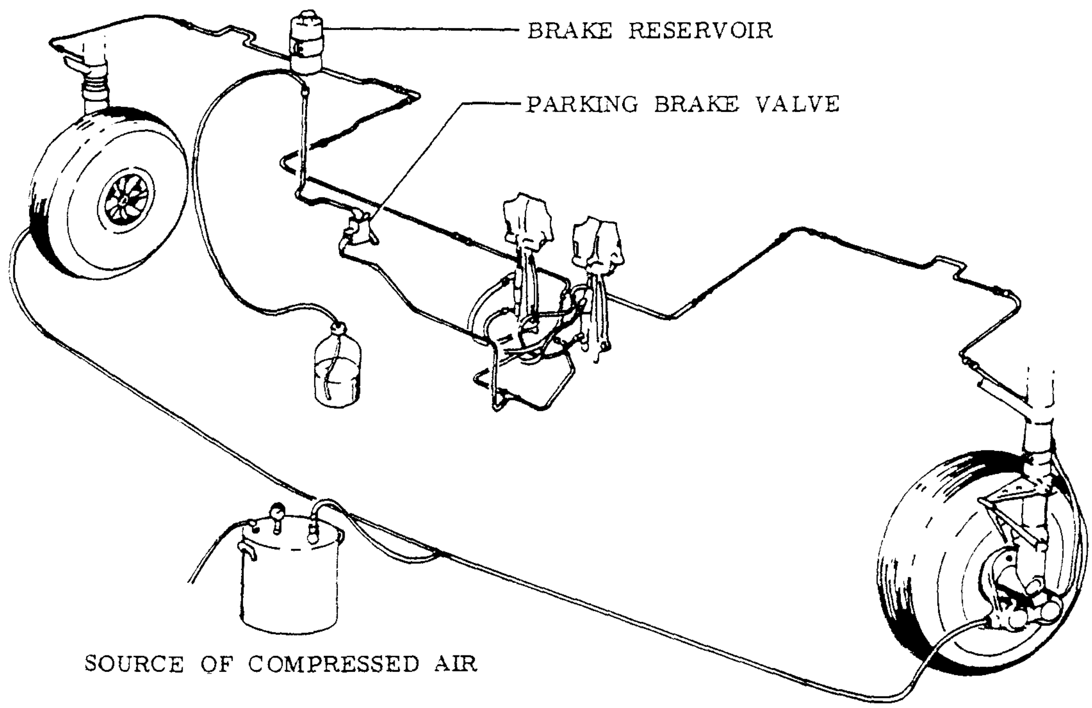


Figure 5-2. Pressure Bleeding Brake System

b. Remove the four bolts which attach the back brake plate and inner linings to the cylinders, then remove the back plate assembly.

c. Disconnect the brake hydraulic line, and remove the cylinder assembly by sliding the two guide pins out of the torque plate.

d. Remove the cotter pin, wheel retaining nut, spacers, and bearing. Slide the wheel off the axle.

e. The brake disc assembly can be removed, if desired, by removing the six bolts which join the wheel halves.

NOTE

The brake linings and cylinder assembly can be removed without removing the wheel, by utilizing steps a, b, and c.

INSTALLING THE WHEEL AND BRAKE ASSEMBLY

a. Clean and repack the wheel bearings (Item 15 and 9 in Consumable Materials Chart). Replace any damaged grease seals, and be sure grease seal retaining rings are in place before reinstalling the wheel.

b. Slide the wheel on the axle; and install the bearings, spacers, and wheel retaining nut.

c. Install the brake cylinder assembly by inserting the two guide pins into the torque plate.

NOTE

If the torque plate has been removed, it should be reinstalled so that the guide pin holes are positioned aft, and are centered above and below the horizontal centerline of the axle.

d. Install the back plate (inner lining) assembly, and tighten the four attaching bolts.

e. Connect the brake hydraulic line.

f. Torque the axle nut to 15 - 20 foot pounds while rotating the wheel to seat the bearings. Back off the nut and re-tighten with fingers to remove end play. Using a wrench, tighten the nut to the next available keying position and install a cotter pin.

g. Install a new wheel retaining nut and cotter pin.

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.

f. Reinstall the master cylinders by reversing the removal procedure.

g. Replenish and bleed the brake hydraulic system.

BRAKE MASTER CYLINDER OVERHAUL

(Figure 5-3)

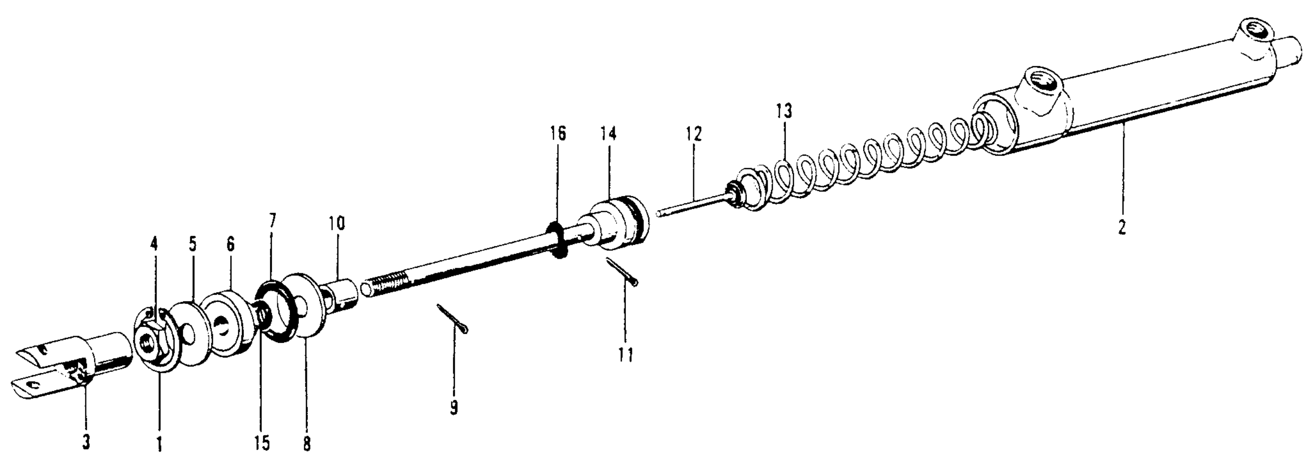
a. Remove the snap ring (1) and pull the assembled piston out of the brake cylinder (2).

b. Remove the clevis (3) from the piston (14), also the 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. The return spring (13) will fall free of the cylinder with the piston removed.

Clean all parts with solvent (Item 15, Consumable Materials Chart). Check all parts for cracks, corrosion, distortion and wear. Replace all washers and seals at reassembly. Reassemble the cylinder in reverse of the above procedure. Lubricate all parts with Hydraulic fluid (Item 13, Consumable Materials Chart) prior to assembly.



1. Snap Ring
2. Cylinder
3. Clevis
4. Check Nut
5. Washer
6. Piston Guide Bushing
7. Retainer "O" Ring
8. Rear Seat Washer
9. Cotter Pin
10. Collar
11. Cotter Pin
12. Flow Lock Piston
13. Return Spring
14. Piston
15. "O" Ring
16. Valve Spring

Figure 5-3. Brake Master Cylinder

PARKING BRAKE VALVE OVERHAUL
(TG-1 through TG-76)
(Figure 5-4)

a. Remove the valve seat (1) from the parking brake valve assembly.

b. Remove the elbow (2) from the valve seat.

c. Remove the spring (3), washer (4) and the 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 the housing and out through the valve seat bore.

e. Remove the old "O" ring from the inside of the brake housing.

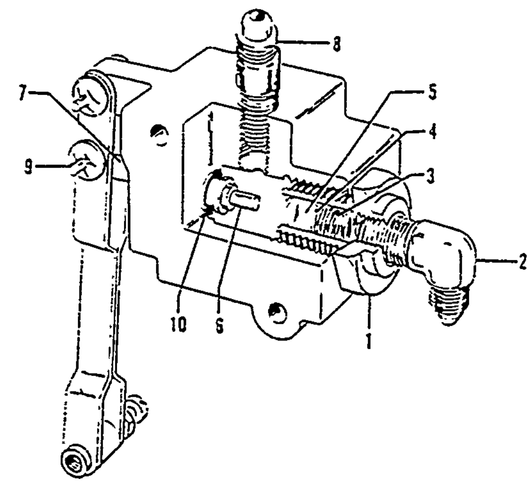
f. Clean all parts in solvent and air dry all parts.

g. Place a new "O" ring inside the brake housing.

h. Check the valve seat for wear and distortion. 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.



1. Valve Seat
2. Elbow
3. Spring
4. Washer
5. Ball
6. Plunger
7. Spacers
8. Nozzle
9. Lock Washers
10. "O" Ring

Figure 5-4. Parking Brake Valve

(TG-77 and after)
(Figure 5-4A)

a. Disconnect and remove the fitting (13). O-ring (7), spring (1), steel ball (6), O-ring (8), seal (2) and pin (3) from each of the two fittings on top of the valve body.

1. Spring
2. Seal
3. Pin
4. Cam Lever Assembly
5. Valve Body
6. Steel Ball
7. "O" Ring
8. "O" Ring
9. "O" Ring
10. Snap Ring
11. Roll Pin
12. Washer
13. Fitting

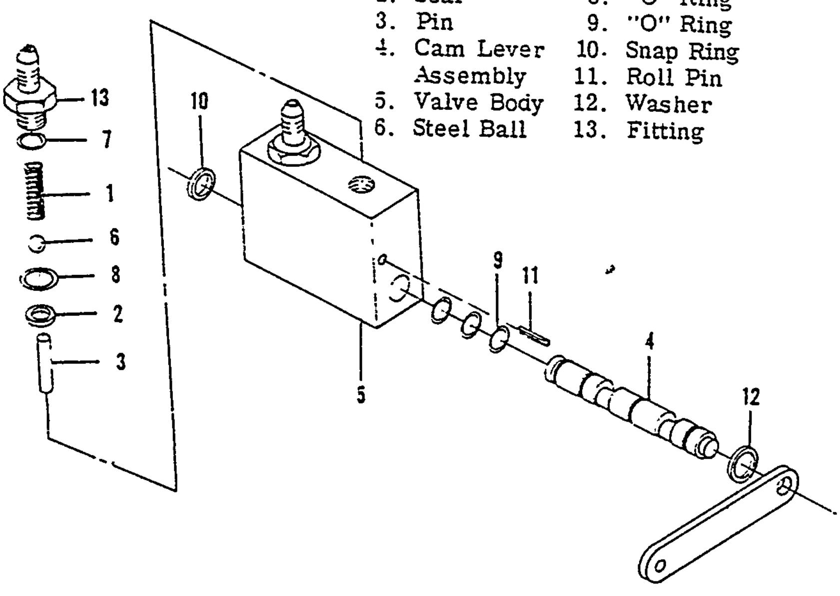


Figure 5-4A. Parking Brake Valve

b. Disconnect and remove the snap-ring (10) from the end of the cam lever assembly (4).

c. Remove the cam lever assembly (4) by grasping the lever and rotating the cam lever assembly counterclockwise while pulling outward to prevent scoring of the cam lever assembly surface.

d. Prior to assembly, inspect the cam lever assembly surface as well as all other moving parts for signs of excessive wear and replace the components if necessary.

e. Lubricate all parts with hydraulic fluid (Item 13, Consumable Materials Chart) and replace O-rings (7, 8, and 9) and seal (2) before reassembly.

f. Assembly may be accomplished by reversing the above procedure.

LANDING GEAR SYSTEM

(Figure 5-5)

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 the 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 systems 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, the microswitch adjacent to the throttle position switch must also be in the open position. This microswitch is actuated by the throttle control when the throttles are advanced sufficiently for the manifold pressure gage to register approximately 19 inches Hg. Conversely, if the throttles are retarded beyond the position corresponding to approximately 17 inches Hg of manifold pressure, the microswitch will close. If at the same time the microswitch closes 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 the microswitch and pressure switch 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 is in the ON position, the landing gears will retract when the following conditions are mutually fulfilled.

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

b. The 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 automatically extends under the following conditions:

a. The airspeed must have dropped below 120 mph.

b. The throttle setting 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 or 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 maybe accomplished:

CHECK OF SYSTEM WITH SAFETY SWITCH IN TEST POSITION

a. Place the throttle in the closed or retarded position.

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

c. 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 microswitch cannot be accurately adjusted on the ground. Before the microswitch is adjusted, it must be ascertained that the throttle warning horn switch is properly set. The microswitch may then be adjusted as follows:

a. With the airplane in flight, mark the throttle control at the control console when the manifold pressure gage registers approximately 17 inches Hg.

b. With the airplane on the ground, move the throttle until the mark on the control is aligned with the control console as accomplished in step a.

c. Adjust the microswitch until the cam clicks the switch closed with the throttle in the position indicated in the preceding step.

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 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.

a. Place the aircraft on jacks.

b. With the master switch ON, the landing gear circuit breaker ON, and the landing gear warning circuit OFF, advance the throttle to its maximum position.

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

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

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

f. Crimp the end of the tubing and roll it up until the airspeed indicator registers 90 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.

g. 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:

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

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

h. Turn the master switch ON and roll up the rubber tubing until the airspeed indicator registers 130 mph (to allow the switch to reset), then secure the tubing so that the airspeed indicator will hold that reading.

i. Retard the throttle.

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

k. 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 wheel well) as follows:

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

2. 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.

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

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 are to be made with a maximum of 28.25 volts.

a. Lengthen the main and nose gear retract rods sufficiently to eliminate the danger of the main gear V-brace damaging the skin when the gear is retracted. Disconnect the uplock cables at the brackets, leaving the springs attached. If the springs are disconnected, the uplock arm may damage the upper wing skin when the gear is retracted. Place the uplock block in the lower position.

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

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

d. Screw stop bolts in (V-brace assembly, 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 the 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 limit switches are located adjacent to the landing gear actuator assembly under the pilot's seat. To adjust the up limit switch, lower the landing gear 1/8 to 1/4 turn of the emergency handcrank 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 clearance. To decrease the clearance between the knee and the top wing skin, shorten 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 maximum clearance of .010-.020 inch between the roller and up-lock block. If this clearance is not correct, the up-lock must be adjusted. To adjust, loosen the block retaining bolts and adjust the clearance between the roller and the up-lock block. The up-lock bracket and the block are serrated and the serration must be interlocked with each other.

k. Extend gears and attach the up-lock cable to bracket.

l. Retract the gears intermittently as in step e above and observe the locking action of the up-lock bracket. If it starts to lock too soon it is an indication that the up-lock 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 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 MAIN GEAR knee joint. To increase tension, add 100951 S 063 XP 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 in the full down position and the wheel clearing the floor, adjust the NOSE GEAR tension at the aft retract rod (shorten or lengthen) to obtain deflection force of 55 pounds or higher (providing the retract spring does not stack at any point during the full travel of the nose gear) at the union of the "V" brace assembly and the drag leg assembly. The deflection force should be applied at the pivot point of this union in a plane perpendicular to the center line between these assemblies. To obtain the above requirements, additional 100951 DD 064 SM washers may be required at the forward end of the retract rod spring. With the nose wheel fully retracted, a force of 40 to 45 pounds applied at the center line of the axle downward, shall be required to pull the gear away from the up stop.

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 the 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 the main gear inboard door linkage, retract the 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. With the gear retracted, rig the inboard door linkage so that a force of 24 - 29 pounds is required to deflect the forward outboard corner of the door 1/8 inch. The doors are adjusted by disconnecting the linkage rods at the clevis fitting and screwing the rods in or out to vary their length.

CAUTION

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 the nose door linkage and rig nose door. Check closely to see that the 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 a slight tension from the actuator rods will keep the doors from vibrating.

r. With the gears down, check the adjustment of the safety switch. Refer to the landing gear safety switch in figure 5-5, while adjusting the switch.

1. Remove the safety switch actuator rod (1) from the upper torque knee, then remove the retaining nut (2) and switch arm (3) from the switch shaft.

NOTE

To prevent damage to the switch during arm removal, apply pressure similar to the manner in which a gear puller is used.

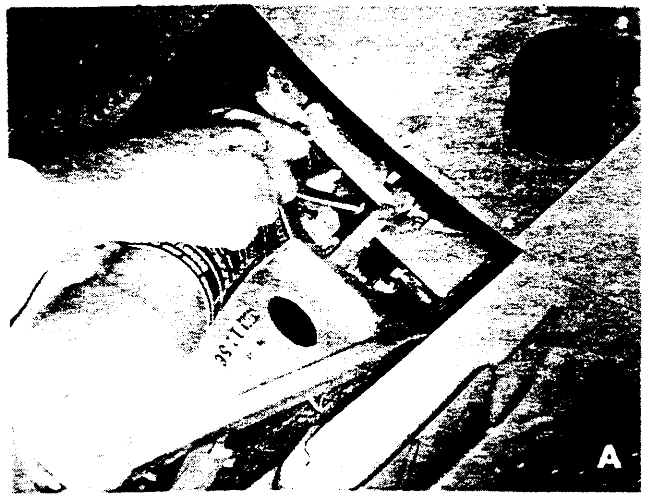
2. Deflate the LH main gear shock strut and jack the landing gear so the shock strut is compressed to .50 ± .12 inch from the fully extended position.

3. Pull the landing gear circuit breakers and use the hand crank to manually run the gear up enough to open the inboard main gear doors. DO NOT USE HAND CRANK TO FULLY RETRACT A LANDING GEAR AS THIS MAY DAMAGE THE ACTUATOR.

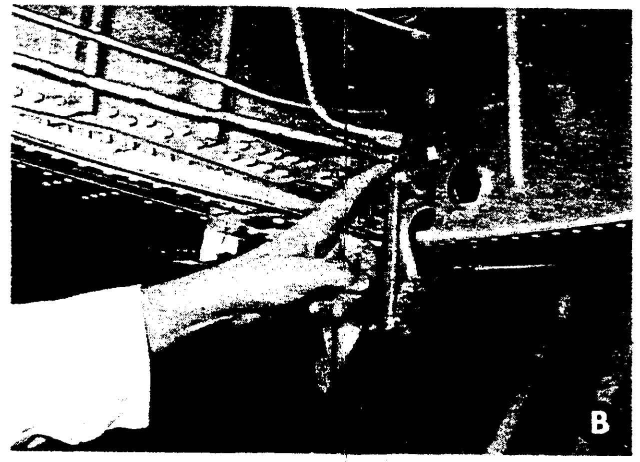
NOTE

Numbers in parentheses correspond to item numbers in figure 5-5 detail G.

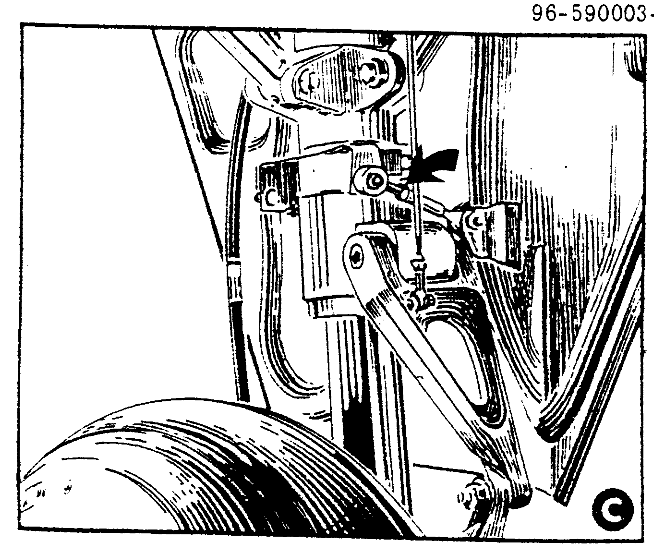
4. Connect the leads from a test light or ohmmeter to wires number 1-20 and 3-20 (about 10 inches up from the safety switch.)



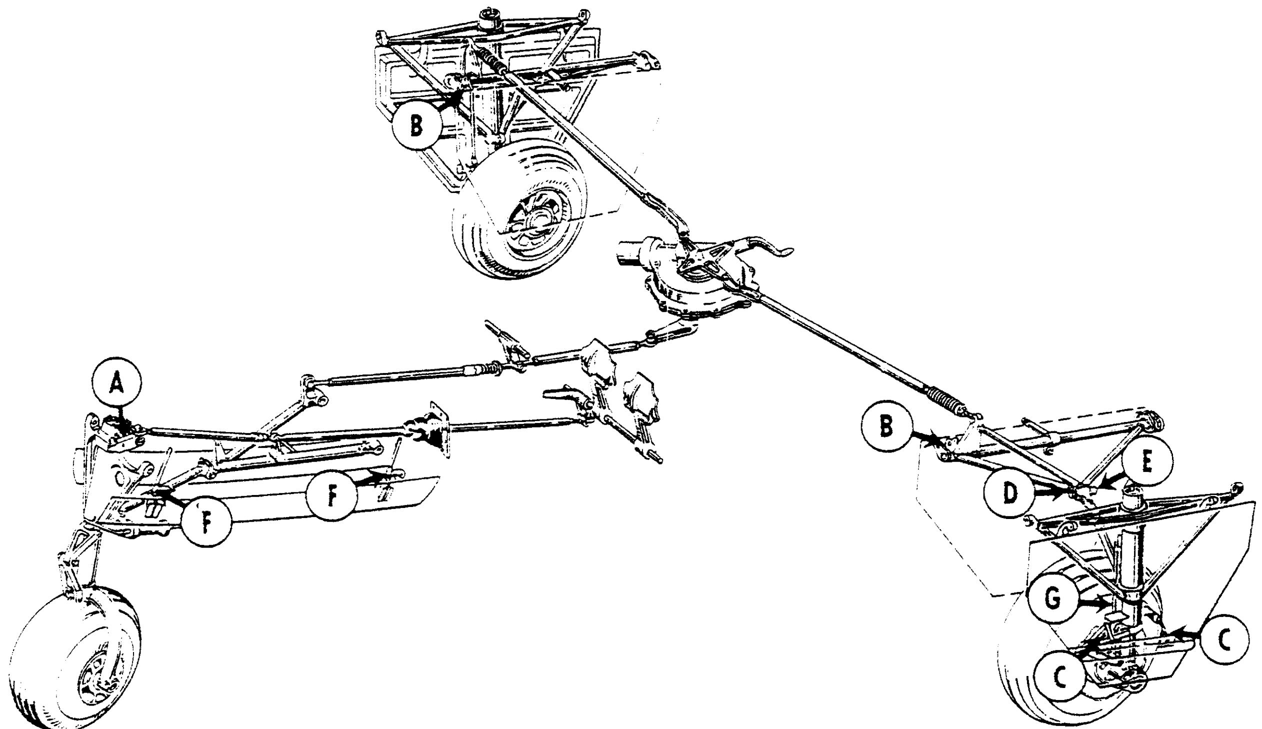
NOSE WHEEL TRAVEL STOP



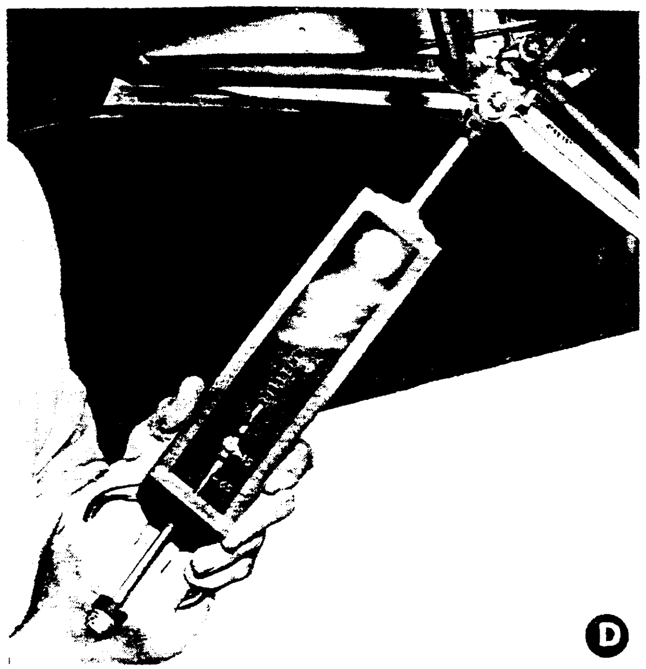
MAIN GEAR INBOARD DOOR ADJUSTMENT



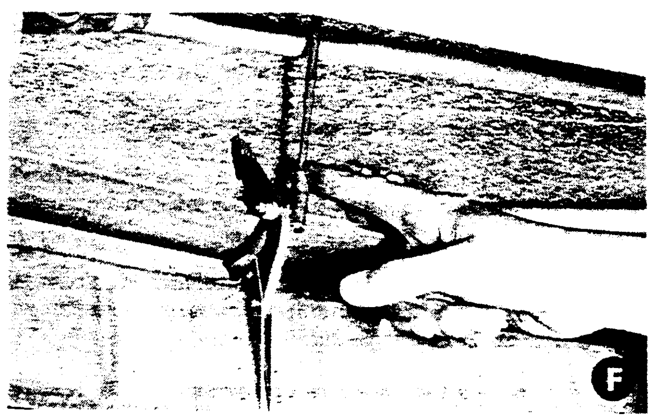
MAIN GEAR OUTBOARD DOOR ADJUSTMENT



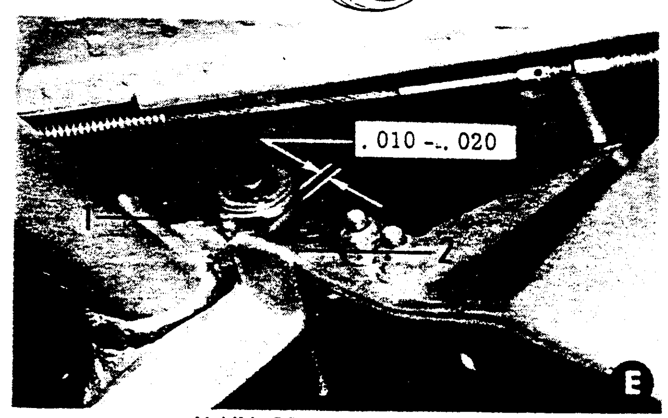
1. Actuator Rod
2. Retaining Nut
3. Switch Arm
4. Locking Screw
5. Adjusting Screw
6. Actuator Rod End



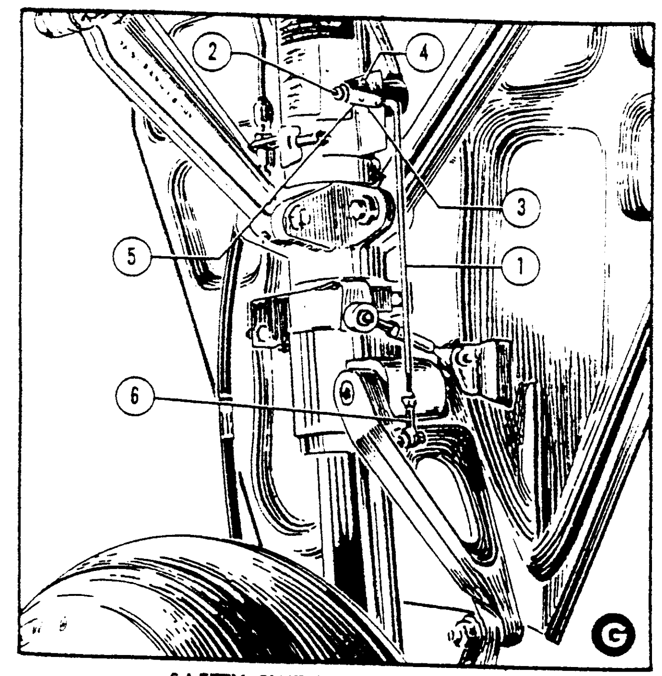
CHECKING MAIN GEAR DOWN LOCK TENSION



NOSE GEAR DOOR ADJUSTMENT



MAIN GEAR UP LOCK
1. Uplock Roller
2. Uplock Block



SAFETY SWITCH ADJUSTMENT

Figure 5-5. Landing Gear System

NOTE

Position the leads from the test light or ohmmeter so they will not interfere with the inboard gear doors when the gear is extended to the full down position.

5. With the landing gear circuit breakers still pulled, use the hand crank to manually run the landing gear to the full down position.

NOTE

The safety switch is mounted on a clamp assembly that is attached to the shock strut. Determine the clamp assembly is tight on the shock strut before adjusting the safety switch.

6. Rotate the switch shaft in a clockwise direction until continuity is indicated between wires number 1-20 and 3-20.

7. Remove the safety wire from the locking screw (4) on the switch arm (3) and back-off the locking screw (4).

8. Install the switch arm (3) on the switch shaft in a position perpendicular to the landing gear shock strut. Do not tighten the retaining nut (2) until the adjustments in step 11 are completed.

9. Adjust the actuating rod end (6) to align with the mounting hole in the upper torque knee. Install the actuating rod on the torque knee.

NOTE

The switch shaft should remain as adjusted in step "6" while accomplishing step "8" and "9".

10. Lower the shock strut to the fully extended position, then jack the landing gear so the shock strut is compressed to .87 ± .12 inch.

11. Use the adjusting screw (5) to adjust the switch shaft in a counterclockwise direction until an open circuit is indicated between wires number 1-20 and 3-20.

12. Tighten and safety wire the locking screw (4). Tighten the retaining nut (2). Do not exceed a torque of 5 inch-pounds on the retaining nut (2).

13. Lower the shock strut to the fully extended position and recheck the safety switch rigging as follows:

a. With the gear fully extended, the test light or ohmmeter should indicate continuity between wires number 1-20 and 3-20.

b. As the shock is compressed, the test light or ohmmeter should indicate an open circuit between wires number 1-20 and 3-20 when the shock strut reaches a position .87 ± .12 inch from the fully extended position. The test light or ohmmeter should continue to indicate an open circuit as the shock strut is compressed to the fully compressed position.

c. As the shock strut is extended from the fully compressed position, the test light or ohmmeter should continue to indicate an open circuit until the shock strut reaches a position .50 ± .12 inch from the fully extended position. At this point the test light or ohmmeter should indicate continuity between wires number 1-20 and 3-20 and continue to indicate continuity up to and including the fully extended position.

NOTE

The point at which the switch is actuated during compression and extension of the shock strut differs because of tolerances in the switch and it's attendant linkage on the landing gear.

14. With the landing gear circuit breakers still pulled, use the hand crank to manually run the landing gear up enough to open the inboard main gear doors. DO NOT USE HAND CRANK TO FULLY RETRACT A LANDING GEAR AS THIS MAY DAMAGE THE ACTUATOR.

15. Disconnect the leads from the test light or ohmmeter.

16. Close the inboard landing gear doors.

17. Remove the aircraft from the jacks and inflate the LH main gear shock strut as described in MAIN LANDING GEAR ASSEMBLY.

MAIN GEAR REMOVAL AND INSTALLATION

When removing the landing gear, take care to preserve the original adjustments at the rod end fittings to facilitate reassembly.

a. With the aircraft on a jack, retract the gear until the inboard landing gear door is in the fully open position.

b. Disconnect the outboard landing gear door from the landing gear strut.

c. Disconnect the inboard landing gear door actuating rod at the forward door hinge.

d. Unsnap the canvas cover and disconnect the uplock assembly from the strut.

e. Open brake cylinder bleed ports and pump all fluid from the system.

f. Disconnect the hydraulic line where the flexible hose couples to the tubing on the landing gear.

g. Disconnect the safety switch wires.

h. Remove the bolt attaching the lift leg to the strut.

i. Remove the access door in the lower surface of the wing leading edge for access to the forward hinge bolt retaining nut and remove the nut. The rear strut brace hinge bolt is accessible by lowering the flap.

j. Remove the hinge bolts securing the main gear strut assembly and lower it away from the aircraft. Be careful not to bend the skin at the wheel well edge when removing the strut.

k. Reinstall the main landing gear assembly by reversing the removal procedure. Torque the hinge bolts 250 to 800 inch pounds. Operate the gear to check for proper rigging of uplock and doors.

MAIN LANDING GEAR DISASSEMBLY

(Figure 5-6)

a. Deflate the shock strut and remove the air valve assembly (1).

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. Invert the strut and drain out the hydraulic fluid.

c. Cut the safety wire and remove the strut retainer assembly (17) using a "C" wrench.

d. Disconnect the torque knees and slide the shock strut piston (16) out of the strut housing (5).

e. Remove the orifice metering rod assembly (6) from the strut housing.

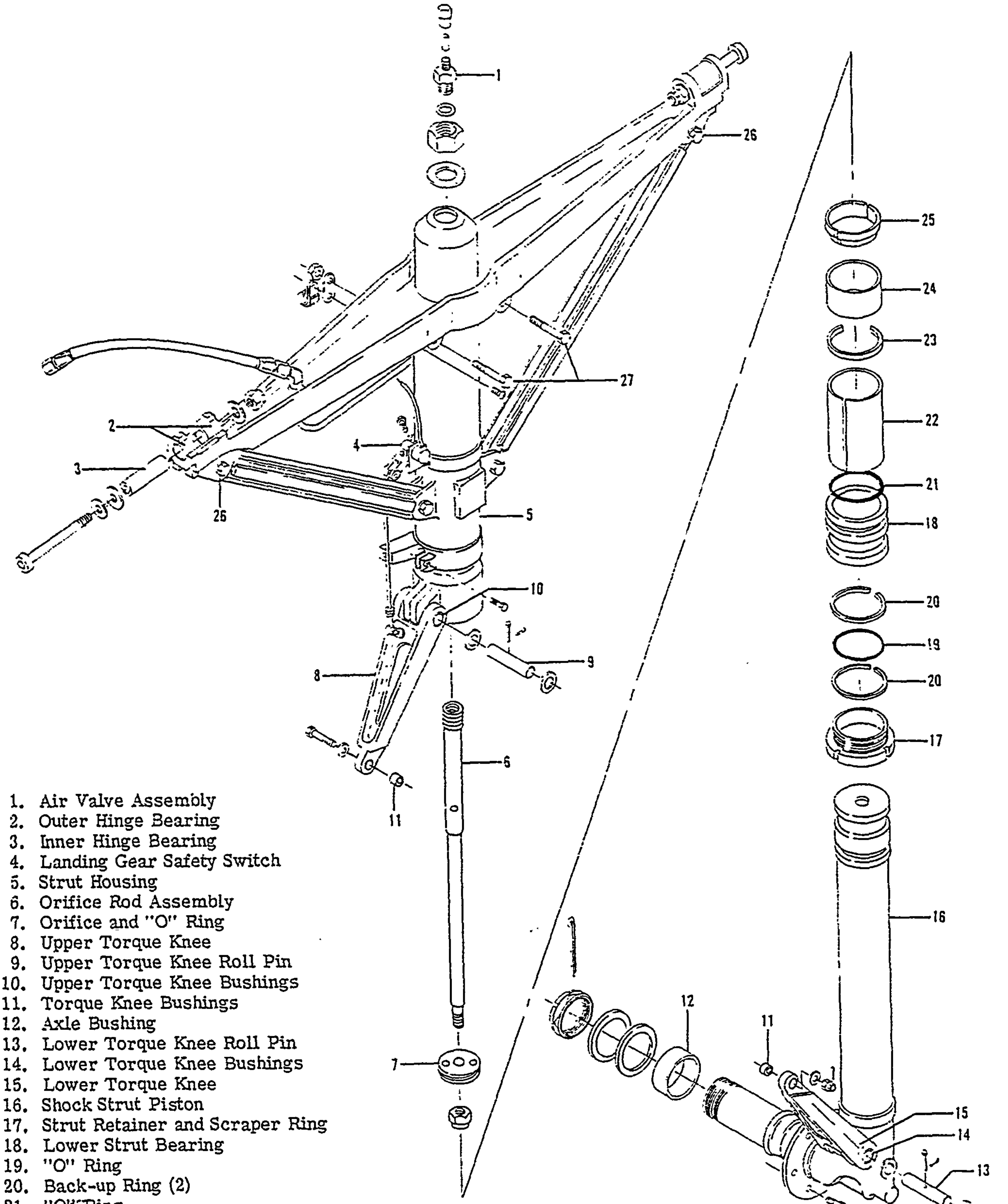
f. Remove the snap ring (23) and slide the upper bearing (24) down to free the retainer ring (25). Slide the remaining components off the strut piston.

INSPECTION AND PARTS REPLACEMENT

a. Check the complete strut assembly for cracks and corrosion. Replace worn or defective parts.

b. Replace the "O" ring seals. Clean parts with solvent (Item 15, Consumable Materials Chart) and immerse parts in clean hydraulic fluid (Item 13, Consumable Materials Chart) prior to assembly.

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.



1. Air Valve Assembly
2. Outer Hinge Bearing
3. Inner Hinge Bearing
4. Landing Gear Safety Switch
5. Strut Housing
6. Orifice Rod Assembly
7. Orifice and "O" Ring
8. Upper Torque Knee
9. Upper Torque Knee Roll Pin
10. Upper Torque Knee Bushings
11. Torque Knee Bushings
12. Axle Bushing
13. Lower Torque Knee Roll Pin
14. Lower Torque Knee Bushings
15. Lower Torque Knee
16. Shock Strut Piston
17. Strut Retainer and Scraper Ring
18. Lower Strut Bearing
19. "O" Ring
20. Back-up Ring (2)
21. "O" Ring
22. Rebound Tube
23. Snap Ring
24. Upper Strut Bearing
25. Retainer Ring
26. Bolt
27. Bolt

Figure 5-6. Main Landing Gear

MAIN GEAR TOLERANCES

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. See Figure 5-6 for Main Gear Assembly illustration.

a. Outer Hinge Bearing (2) (Maximum)	OD .7192
b. Inner Hinge Bearing (3)	ID .5000 ± .0005 OD .6235 + .0000 - .0015
c. Upper Torque Knee Roll Pin (9) (Maximum)	ID .7200
d. Torque Knee Bushings (11) (Maximum)	OD .5325
e. Lower Torque Knee Roll Pin (13) (Maximum)	ID .7200
f. Shock Strut Piston (16) (Minimum)	OD 1.999
g. Lower Strut Bearing (18) (OD Maximum) (ID Minimum)	OD 2.490 ID 2.004
h. Rebound tube (22) (Minimum)	Length 4.540
i. Upper Strut Bearing (24) (Maximum)	ID 1.968 OD 2.156

MAIN LANDING GEAR ASSEMBLY

(Figure 5-6)

a. Assemble components on the shock strut piston in the following order; strut retainer (17), lower bearing (18) with "O" rings assembled inside (19) and outside (21), rebound tube (22), snap ring (23) and the upper bearing (24).

b. Install the retainer ring halves (25) in the top groove of the shock strut piston. Slide the upper bearing (24) over the lower flange of the retainer ring (25) and secure with the snap ring (23).

c. Install the orifice metering rod assembly (6) inside the strut housing (5).

d. Slide the shock strut piston into the strut housing and screw the strut retainer assembly (17) into the strut housing. Safety the retainer assembly.

e. When installing the torque knee on aircraft serials TG-1 through TG-81, check to see if the bushings in the torque knees are tight. If the bushings seem loose, remove them from the torque knees and apply a small amount of Loctite AA to the outer surface and then install the bushings in the torque knees and assemble them on the landing gear.

f. Place the strut in a vertical position and fill through the air valve assembly hole with approximately 1 pint of hydraulic fluid (Item 13, Consumable Materials Chart) with the strut compressed. When the fluid overflows, cycle the strut (full extension to compressed) and refill. Repeat until fluid cannot be added to the strut in the compressed position.

g. Install the air valve assembly (1).

h. To leak test the assembly, inflate the strut to 410 psi and coat the air valve assembly and other surfaces with soap suds. After the leak test has been accomplished deflate the strut.

WARNING

As with all operations involving equipment under high pressure, exercise caution when performing the leak test; avoid the areas directly above and below the strut.

i. Install the wheel on the axle and tighten the nut to 15 - 20 foot pounds while rotating the wheel to seat the bearings. Back off the nut and re-tighten with fingers to remove end play. Using a wrench, tighten the nut to the next available keying position and install a cotter pin.

j. Install the landing gear in the main gear wheel well. Measure the gap between the landing gear assembly hinge points and the spar structure. If the measurement is between .016 and .031, insert a .016 thrust washer at each attach point. If the measurement is between .032 and .047, insert a .032 thrust washer at each attach point.

k. With the aircraft on the ground and the fuel cells full, inflate the strut until 3 inches of the piston is exposed.

Torque the landing gear hinge bolts at 250 - 800 inch pounds. Torque the strut connection arm bolts (26) which attach at the strut horizontal brace and at the strut housing to 290 - 410 inch pounds. Torque the bolts (27) which attach the horizontal brace to the strut housing to 25 - 40 inch pounds.

Torque the axle nut to 15 - 20 foot pounds while rotating the wheel to seat the bearings. Back off the nut and re-tighten with fingers to remove end play. Using a wrench, tighten the nut to the next available keying position and install a cotter pin.

LUBRICATION AND REPLACEMENT OF UPLOCK ROLLERS

No specific time is set for lubrication of the up-lock roller bearings other than applying Item 5, Consumable Materials Chart, every 50 hours to reactivate the grease. If during the process of wheel well cleaning, the bearings have been subjected to frequent degreasing with solvent under pressure, lubrication of the bearing may be necessary.

To lubricate (the uplock roller bearings)

a. Place the aircraft on jacks.

b. Partially retract the landing gear.

c. Remove the bolt attaching the up-lock roller and the "V" brace drag leg center hinge point.

d. Remove the up-lock roller bearing from the bolt.

e. Hold a finger over one end of the up-lock roller center bearing race and place a grease gun against the opposite side of the bearing. As grease is pumped into the inner bearing race, it will be forced through the hole in the inner race and into the bearing cavity. Completely fill the bearing with Item 11, Consumable Materials Chart.

f. Reinstall the bearing by reversing the above procedure.

NOSE GEAR REMOVAL AND INSTALLATION

When removing the nose gear, take care to preserve the original adjustments at the rod end fittings to facilitate reassembly.

a. With the aircraft on a jack, partially retract the landing gear to relieve the load on the retract rod compression spring.

b. Disconnect the steering yoke at its rod end fittings at the top of the landing gear.

c. Disconnect the drag leg at its fitting on the nose gear brace assembly.

d. Remove the hinge bolts securing the nose gear brace assembly to the fuselage structure and lower the nose gear away from the aircraft.

e. Reinstall the nose gear assembly by reversing the removal procedure.

NOSE LANDING GEAR DISASSEMBLY

(Figure 5-7)

a. Deflate the strut and remove the air valve assembly (18).

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 safety wire and bolts securing the strut retainer cap (2). Remove the cap (2) and shims (3).

c. Remove the shimmy dampener (7).

d. Slide the strut housing (19) out of gear brace (6).

e. Remove the torque knee assembly.

f. Cut safety wire and remove strut retainer (31) using a spanner wrench.

g. Slide the shock strut piston out of the strut housing.

h. Remove the orifice metering rod assembly (22) from the strut housing. The small allen-head screw at the top of the strut housing is a bonded installation and should not be removed.

i. Remove the snap ring (26), slide the upper bearing (25) down enough to remove the two halves of the retainer ring (24) and remove the remaining components assembled on the shock strut.

INSPECTION AND PARTS REPLACEMENT

a. Check all the metal parts of the strut assembly for cracks, and corrosion. Replace worn or defective parts. Clean parts with solvent (Item 15, Consumable Materials Chart); remove solvent and, to ease reassembly, apply hydraulic fluid (Item 13, Consumable Materials Chart) 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 assembly.

c. Replace scored bushings, bearings and pins.

d. Replace self locking nuts which have lost their locking ability and all cotter pins.

e. Replace any other part considered to be worn or damaged beyond serviceable limits.

NOSE GEAR TOLERANCES

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. See Figure 5-7 for Nose Gear Assembly illustration.

Chrome plated portion of absorber assembly piston (32) O.D. (minimum)	1.750 in.
Upper (25) bearing in the barrel assembly I.D. (maximum)	1.748 in.
Lower (28) bearing in the barrel assembly I.D. (maximum)	1.755 in.
Bushing (16) I.D. (maximum)	.260 in.
Bushing (16) O.D. (minimum)	.310 in.
Roll Pin (11) O.D. (minimum)	.373 in.
Roll Pin (14) O.D. (minimum)	.373 in.

1. Steering Straightner Bearing
2. Strut Retainer Cap
3. Laminated Shim
4. Spacer
5. Upper Gear Brace Bearing
6. Gear Brace
7. Shimmy Dampener
8. Lower Gear Brace Bearing
9. Spacer
10. Upper Torque Knee
11. Upper Torque Knee Roll Pin
12. Upper Torque Knee Bushings
13. Lower Torque Knee
14. Lower Torque Knee Roll Pin
15. Lower Torque Knee Bushings
16. Torque Knee Bushing
17. Fill Tube (Bonded In Strut Housing)
18. Air Valve Assembly
19. Strut Housing
20. "O" Ring
21. Lower Strut Housing Shoulder
22. Orifice Rod Assembly
23. "O" Ring (Over Metal Ring)
24. Retainer Ring
25. Upper Bearing
26. Snap Ring
27. Rebound Tube
28. Lower Bearing
29. "O" Ring
30. Backup Rings (2)
31. Lower Strut Retainer
32. Shock Strut Piston

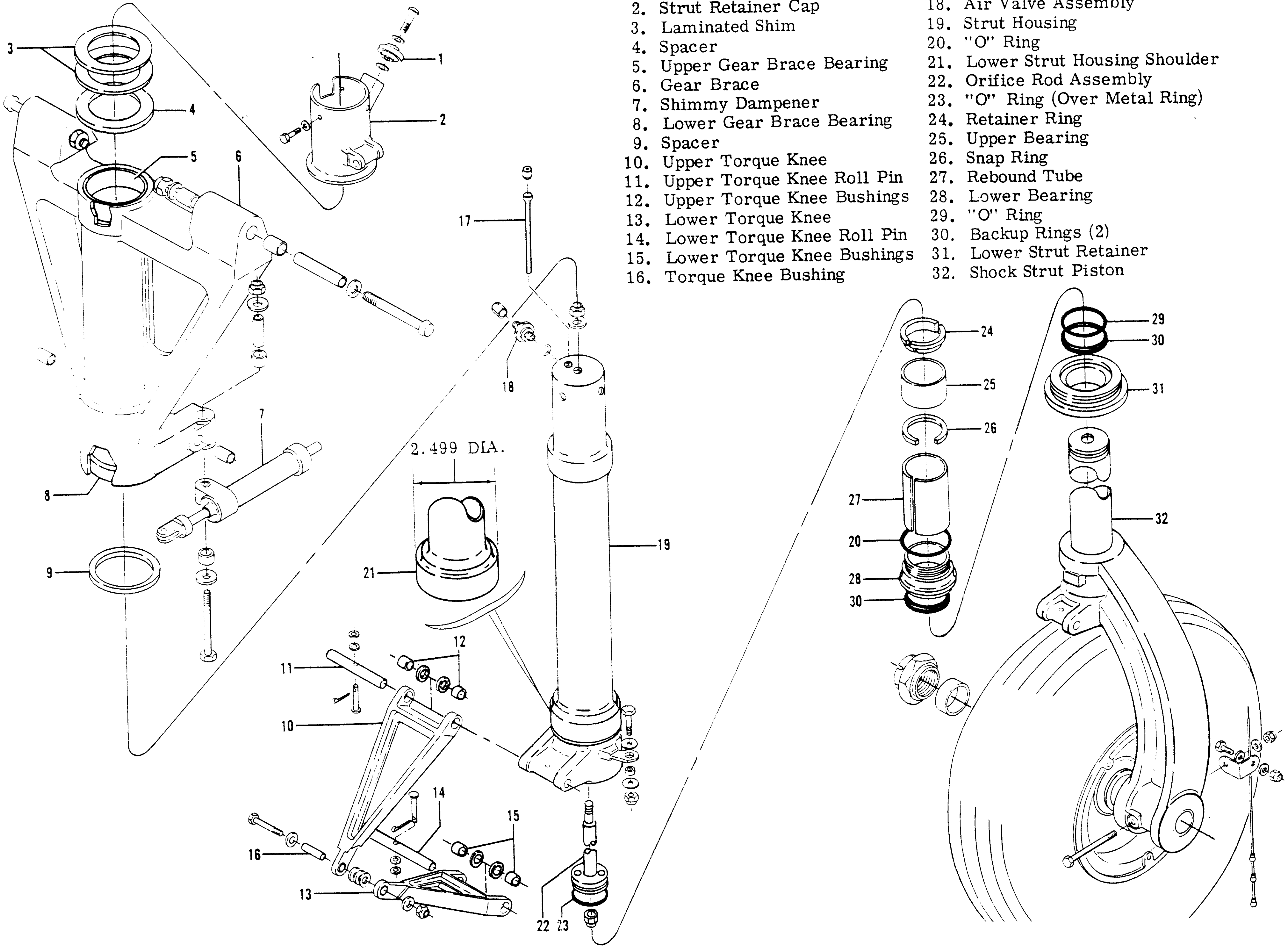


Figure 5-7. Nose Landing Gear

Bushing (12) in line and I. D. (maximum)	.3740 in.
Distance between bushing (12) faces when in knee (maximum)	2.136 in.
Bearings (5) and (8) I. D. (maximum)	2.5035 in.
Bearings (5) and (8) O. D. (minimum)	2.6880 in.
Bushings (15) in line and I.D. (maximum)	.3740 in.
Distance between bushing (15) faces when in knee (maximum)	1.580 in.
Lower strut housing shoulder (21) (minimum)	2.449 in.
Rebound tube (27) (length)	3.380 in.

NOSE LANDING GEAR ASSEMBLY

(Figure 5-7)

a. Assemble components on the shock strut piston in the following order: lower strut retainer (31), lower bearing (28) with the rings (29 and 30) assembled inside, rebound tube (27), snap ring (26) and upper bearing (25).

b. Install the retainer ring halves (24) in the top groove of the shock strut piston. Slide the upper bearing (25) over the lower flange of the retainer ring (24) and secure with the snap ring (26).

c. Install the orifice metering rod assembly (22) in the strut housing (19). Install the "O" ring (20) inside the strut housing.

d. Slide the shock strut piston into the strut housing and screw retainer assembly (31) into the strut housing. Safety retainer assembly.

e. Install the torque knees using the longer pin in the lower torque knee (14).

f. Slide the strut housing into the gear brace (6).

g. Place the gear assembly in a vertical position and slip the strut retainer cap (2) over the strut housing and measure the distance between the cap and strut housing to determine the amount of shim necessary.

h. Remove the cap (2), add the shims (3) and reinstall the cap and secure. Safety the bolts.

NOTE

Add peel-shim layer as necessary for free operation but do not allow more than .010 inch clearance between the strut retainer cap and spacer (4).

i. Install the shimmy dampener (7) using washers between the shimmy dampener attach point and the gear brace as required to align the dampener rod end with the attaching lug.

NOTE

When installing the shimmy dampener, be sure the rod end bolt is free to rotate.

j. Fill the strut with approximately 1 pint of hydraulic fluid (Item 13, Consumable Materials Chart) through the air valve assembly hole. When the fluid overflows, cycle strut (full extension to compressed) and refill. Repeat until fluid cannot be added to the strut in the compressed position.

k. Install the air valve assembly (18).

l. To leak test the assembly, inflate to 300 psi and coat the air valve, retainer cap and other surfaces with soap suds. Deflate the strut when leak test has been accomplished.

WARNING

As with all operations involving equipment under high pressure, exercise caution when performing the leak test; avoid the areas directly above and below the strut.

m. Install the wheel on the axle and torque the axle nut to 10-15 pounds while rotating the wheel to seat the bearings. Back off the nut and re-tighten with fingers to remove any end play. Using a wrench, tighten the nut to the next available keying position and install a cotter pin.

n. Install the landing gear in the nose wheel well. Place a .032 thrust washer on either side between the gear strut and the keel structure. Using a feeler gage, determine that a maximum gap of .015 exists between the thrust washer and the keel structure. If not, a maximum of two .016 washers (each side) may be added to achieve the above tolerance.

o. With the aircraft on the ground and the fuel cells full, inflate the strut until 4-1/2 inches of the piston is exposed.

NOSE GEAR SHIMMY DAMPENER OVERHAUL

(Figure 5-8)

a. Remove cotter pin (8), washer (7), snap 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.

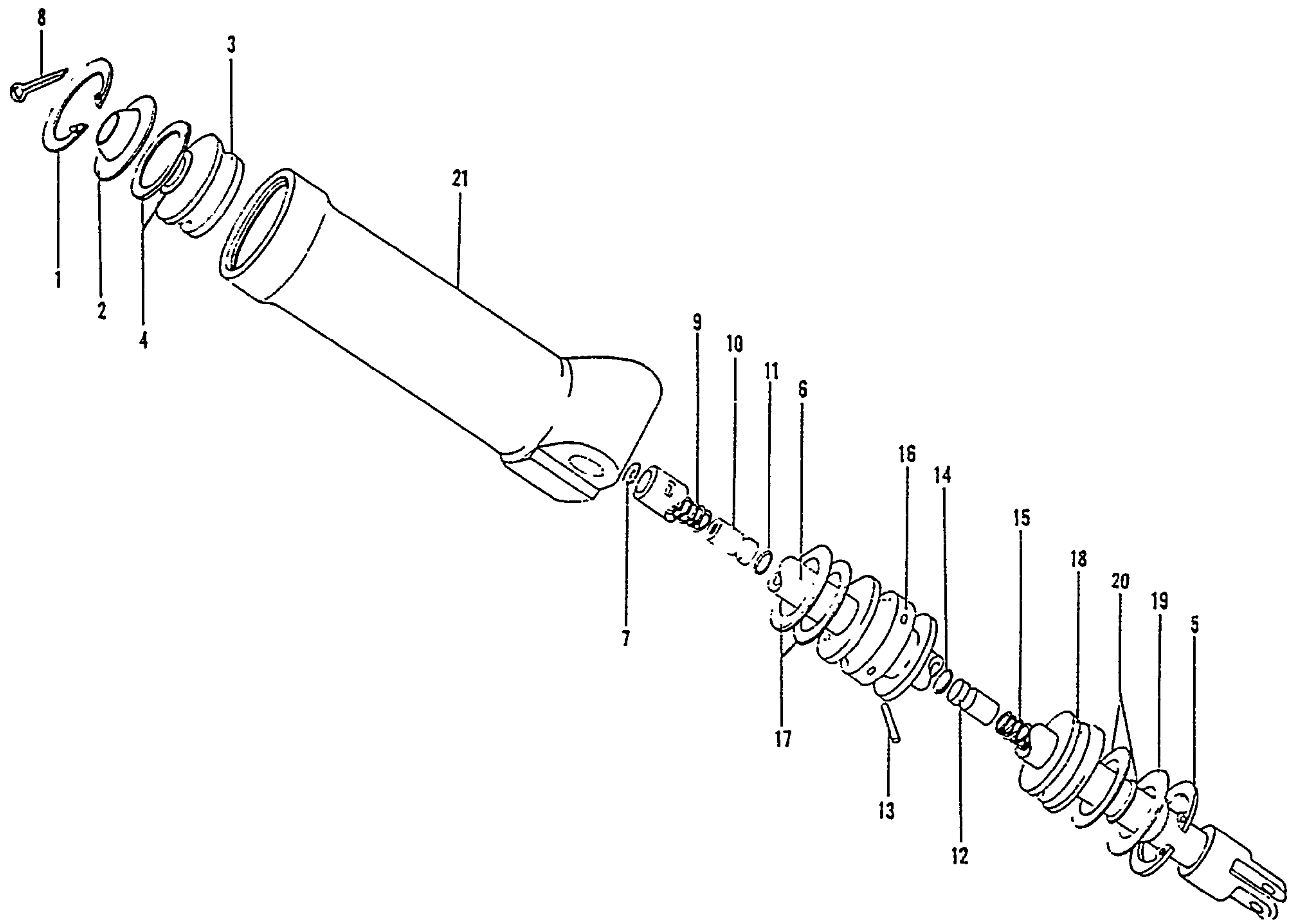
c. Remove the snap ring (5) and slide the piston rod (6) and parts out of the barrel.

d. 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



1. Snap Ring
2. Piston Scraper Ring
3. Barrel 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
21. Barrel

Figure 5-8. Shimmy Dampener

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 piston and the "O" rings (20) from the barrel end (18).

i. Remove the barrel end (18) and the scraper ring (19) from the piston rod.

CLEANING, REPAIR, AND PARTS REPLACEMENT

Repairs on the shimmy dampener should be confined to replacing worn or leaking "O" rings or replacing the complete assembly. When disassembled, clean all parts with cleaning solvent (Item 15, Consumable Materials Chart) and lubricate the parts with hydraulic fluid (Item 13, Consumable Materials Chart).

REASSEMBLY OF SHIMMY DAMPENER

(Figure 5-8)

a. Replace the "O" rings (20) on the barrel end (18). Slide the scraper ring (19) and barrel end on the piston rod (6).

b. Replace the "O" ring (14) on the forward floating piston (12) and insert the compression spring (15) and the floating piston into the piston rod (6). With a long 6-32 screw, engage the floating piston (12) and pull it toward the clevis end of the piston rod to compress the spring (15) until the dampener piston retaining pin (13) can be inserted.

c. Place the dampener piston (16) on the piston rod and insert the retaining pin. Replace the "O" rings (17) on the dampener piston.

d. Insert the piston rod assembly into the barrel (21) and place the snap ring (5) into position.

e. Place the dampener in a vise with the open end up and fill the barrel and piston with hydraulic fluid (Item 13, Consumable Materials Chart). Work the piston rod up and down until bubbles stop appearing in the fluid, then refill the barrel and the piston rod.

f. Replace the "O" rings in the other barrel end (3), and "O" ring (11) on the floating piston (10) and insert the barrel end and the scraper ring (2) into the barrel (21) and secure them with the snap ring (1).

g. Engage the forward floating piston (12) with the 6-32 long screw and pull forward. At the same time, insert the aft floating piston (10) and compression spring (9) and push down. The piston will follow the fluid down and prevent the entry of air into the rod assembly. Secure the spring and piston with the washer (7) and the cotter pin (8). To check the fluid level in the shimmy dampener, spread the portion of the cotter pin within the piston rod and insert a wire through the hole in the washer at the aft end of the piston rod until the wire touches the bottom of the hole in the floating piston. If the wire enters the piston rod over 2-3/8 inches, remove the floating piston and add more fluid to the piston rod.

REMOVING AND INSTALLING THE LANDING GEAR ACTUATOR ASSEMBLY

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 actuating 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.

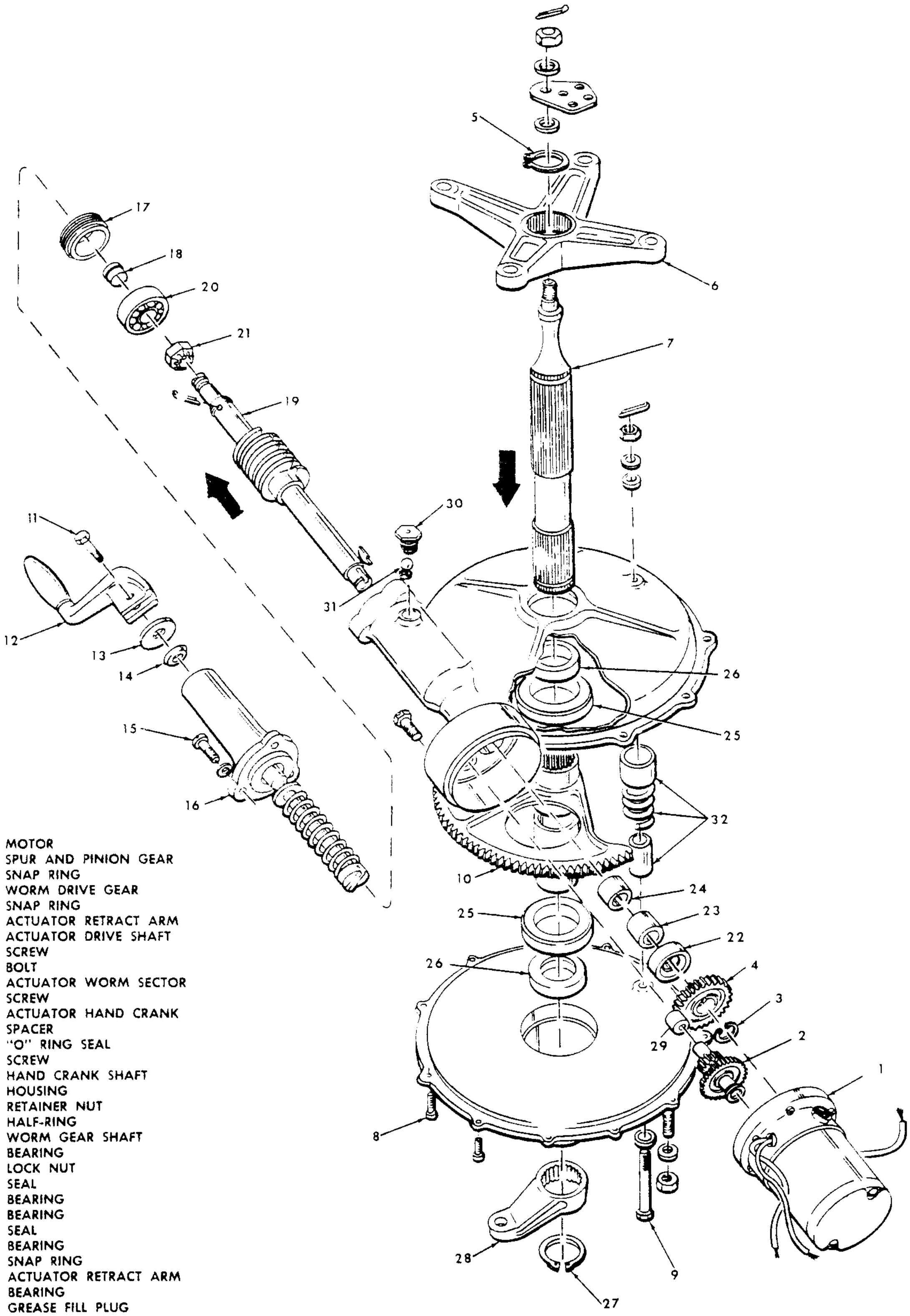
LANDING GEAR ACTUATOR OVERHAUL

(Figure 5-9)

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.



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 5-9. Landing Gear Actuator Assembly

d. Remove the screws (8) from around the housing, also the bolt (9). Separate the housing and remove the sector gear (10) and gear stop assembly (32).

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. Tap out the shaft (19) in the direction of the arrow. Remove the cotter pin and back off the lock nut (21). Slide the bearing (20) down the shaft until the two sections of the half ring (18) may be removed. The bearing can now be removed from the shaft. Drive the seal (22) out of the actuator housing.

h. Remove the bearings (23 and 24) from the actuator 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 (Item 15, Consumable Materials Chart) removing the grease and oil. Check all bearings for cracks and wear. Check 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 Perfect Seal Sealing Compound (Item 5, Sealing Chart). Reassemble the actuator in the reverse of the above procedure. Remove the filler plug (30) from the actuator housing and fill the housing with 1/2 pint of gear grease (Item 10, Consumable Materials Chart). Before attaching the motor, pack the motor gear housing with approximately one ounce of grease (Item 8, Consumable Materials Chart) 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 and the main actuator retract arm on each end of the actuator drive shaft.

REMOVING AND INSTALLING THE LANDING GEAR MOTOR

a. Remove the right front seat.

b. Remove the access plate over the motor.

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 DYNAMIC BRAKE RELAY

a. Remove the right front seat.

b. Remove the access covers 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 and check rigging.

NOSE WHEEL STEERING MECHANISM

(Figure 5-10)

The nose wheel should be parallel to the fore and the aft center line of the airplane with the rudder pedals in the neutral position. Take the nose gear steering actuator loose at the aft 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 in either direction.

If adjustment is required the following procedure is recommended:

a. Loosen the lock nuts 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 clear the stops with the nose wheel in this position.

c. Place tape around the aft end of the shimmy

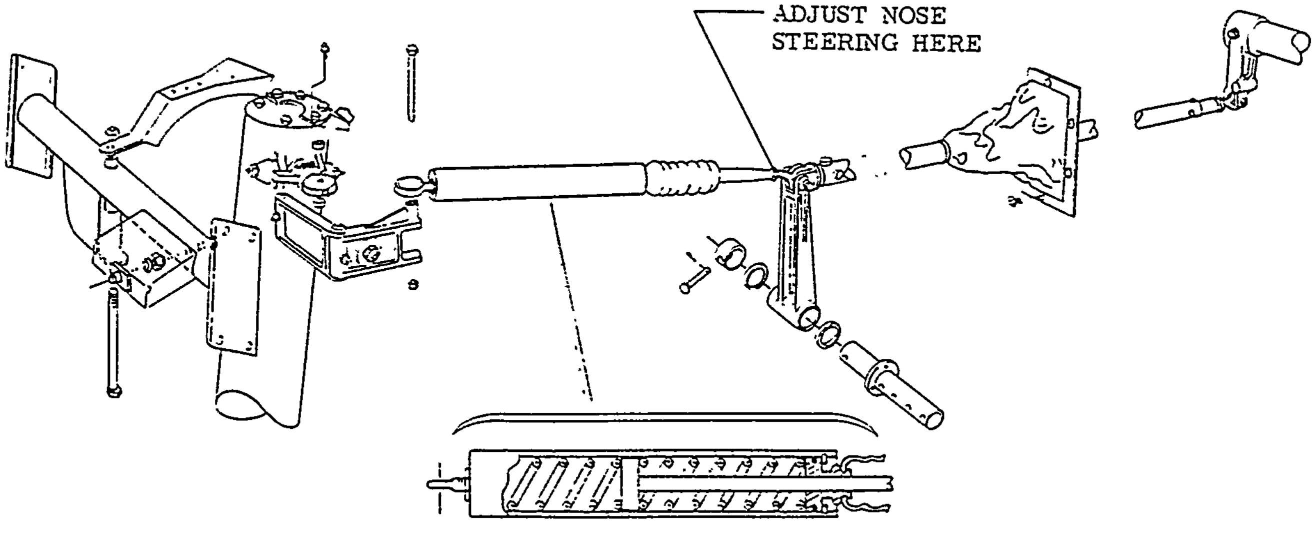


Figure 5-10. Nose Gear Steering

dampener piston rod 1/32 inch from the scraper ring.

d. Turn the lock nuts on the adjustment bolts so the nose wheel is turned and the tape on the piston rod just contacts the scraper ring. Tighten the lock nuts securely.

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

WHEEL AND TIRE MAINTENANCE

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.

In service, tire carcasses grow slightly due to shock loads in landing. Normally, this growth is balanced by tread wear so there is no increase in tire diameter.

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.

TROUBLESHOOTING

LANDING GEAR ELECTRICAL SYSTEM

INDICATION	PROBABLE CAUSE	REMARKS
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.
	b. Up limit switch remaining open.	b. Replace limit 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 limit switch.
4. Landing gear actuator is hitting internal stops.	a. Limit switch out of adjustment.	a. Readjust limit switch.
	b. Dynamic brake switch defective.	b. Replace switch.
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.
	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.

BRAKE SYSTEM

INDICATION	PROBABLE CAUSE	REMARKS
1. Solid pedal and no brakes.	a. Brake lining worn beyond allowable limit.	a. Replace lining.
2. Spongy brake.	a. Air in system.	a. Bleed brake system.
3. Unable to hold pressure.	a. Leak in brake system.	a. Visually check entire system for evidence of leaks.
		b. Check master cylinder seals, replace if scored.
4. Parking brake will not hold.	a. Air in system.	a. Bleed brake system.
	b. Defective parking brake valve.	b. Replace the valve.
5. Brakes grab.	a. Stones or foreign matter locking brake disc.	a. Clean brake disc and lining.
	b. Warped or bent disc.	b. Replace disc.

POWER PLANT

GROUND RUNNING AND WARM-UP

Because the turbocharged engines depend on forward air speed for cooling, caution should be used to prevent overheating on the ground. The following precautions should be followed when performing power checks or engine run up:

a. Head the aircraft directly into the wind.

b. Operate the engines on the ground with the propeller blade set at the minimum angle (unfeathered position).

c. Maintain the cylinder head temperature between 150°C and 246°C. Never allow the cylinder head temperature to exceed 246°C.

d. The Exhaust Gas Temperature (EGT) gage monitored at the turbocharger turbine inlet must not exceed 1650°F.

e. Extended periods of idling at low rpm may result in fouled spark plugs.

f. The mixture control should remain in the "FULL RICH" position unless leaning is required during checkout.

g. Warm up the engine at 1000 to 1500 rpm.

NOTE

The oil should reach 25 psi within 30 seconds: normal oil pressure should be approximately 90 psi at maximum rpm and 25 psi idling.

COWLING REMOVAL

a. Check magneto switches for "OFF" position.

b. Remove the two screws in each end of the two nose cowling fairing channels located just aft of the propeller spinner and remove the fairing channels.

c. Open both cowl doors and remove the four screws on each side of the nose bug. This will separate the forward end of the upper cowl from the lower cowl.

CAUTION

Support the lower front cowl with blocks before removing the remaining screws in the cowl.

d. Disconnect the cowl flap actuator rod end from the cowl flap. Then remove the screws from the aft end of the lower cowl and remove the cowl.

e. Remove the screws across the aft end of the upper cowl and remove the cowl.

f. To reinstall, reverse the removal procedure.

COWL FLAP AND ACTUATOR REMOVAL

a. With the cowl flap open, disconnect the cowl flap actuator rod end from the cowl flap clip.

b. Remove the bolts from the cowl flap hinges and remove the cowl flap.

c. Remove the AMP terminals from the cowl flap actuator leads.

d. Remove the bolt holding the cowl flap actuator to the firewall actuator support and remove the actuator.

e. Reinstallation is accomplished in the reverse of the above procedure.

RIGGING THE COWL FLAP ACTUATOR

a. Set the actuator to 9.50 ± .03 inches retracted and 12.87 ± .03 inches extended.

b. Install the actuator on the firewall actuator support and attach the rod end to the cowl flap clip.

c. Adjust the actuator so that the cowl flap sides will extend into the cowl by .25 inches minimum when open. If the cowl flap does not meet the minimum required extension into the cowl, adjust the actuator to obtain this position. A minimum of .06 inch clearance is required between the actuator lug and the actuator support, and between the actuator rod end lug and the cowl flap clip through the entire range of movement.

NOTE

The life of the actuator may be reduced considerably if the heat shield is not installed.

ENGINE REMOVAL AND INSTALLATION

CAUTION

The engine induction air is supplied thru a fiberglass duct located in the right hand aft section of the engine compartment. Care should be taken when removing or installing the engine that no dirt or foreign objects be allowed to enter the induction system. Be careful not to damage the fiberglass ductwork attached to the firewall.

a. Check the magneto switches for "OFF" position.

CAUTION

To be safe, treat all magnetos as hot whenever the ground lead is disconnected. To ground this magneto, disconnect the magneto switch lead wire at the capacitor and ground the capacitor pole. If this is impractical, remove the ignition harness distributor cap, or disconnect the spark plug leads.

b. Remove the upper and lower cowl. (See cowling removal procedure, this section.)

c. Remove the propeller. (See propeller removal procedure, Section 7.)

d. Disconnect all plumbing at firewall. Be sure to cap all open lines and fittings.

CAUTION

Place fuel selector valve handle in the "ON" position to relieve approximately 60 psi of pressure on fuel line from firewall to the fuel pump.

e. Disconnect all electrical wiring at firewall. Be sure to identify each wire for fast and easy reinstallation.

f. Place a wing stand under the opposite wing and a support under the tail.

g. Position the engine hoist and attach to the three lifting eyes on the engine.

h. Remove the slack from the hoisting cable and remove the bolts that attach the engine mounts to the firewall.

i. Remove the engine.

j. To reinstall, reverse the removal procedure. When reinstalling the engine, torque the engine mount bolts 350 to 390 inch pounds.

IDLE SPEED AND MIXTURE ADJUSTMENT
(Figure 6-1)

a. Raise the right hand cowl on the engine requiring adjustment.

b. Start the engine and run at 1000 to 1500 rpm until the oil and cylinder head temperature gages read normal.

c. Proceed to check magnetos. (See Magneto Drop-off Check.) Maximum "drop-off" should not exceed 125 rpm. If the "drop-off" is within limitations, proceed with idle adjustment.

d. Slowly retard the throttle lever to idle position. The engine tachometer should indicate 700 rpm (normal idle setting). To adjust, turn the idle speed adjusting screw at the throttle lever stop until the desired rpm is reached.

e. When the idle setting has been stabilized, move the cockpit mixture control lever with a smooth steady pull, into the "IDLE CUT-OFF" position. Observe the change in rpm during the leaning out process. Increased rpm indicates the idle mixture is set on the rich side of best power setting. An immediate decrease in rpm indicates idle mixture is set on the lean side of best power setting. The best mixture setting is obtained when the rich setting provides satisfactory acceleration under all conditions and yet is lean enough to prevent spark plug fouling and rough operation.

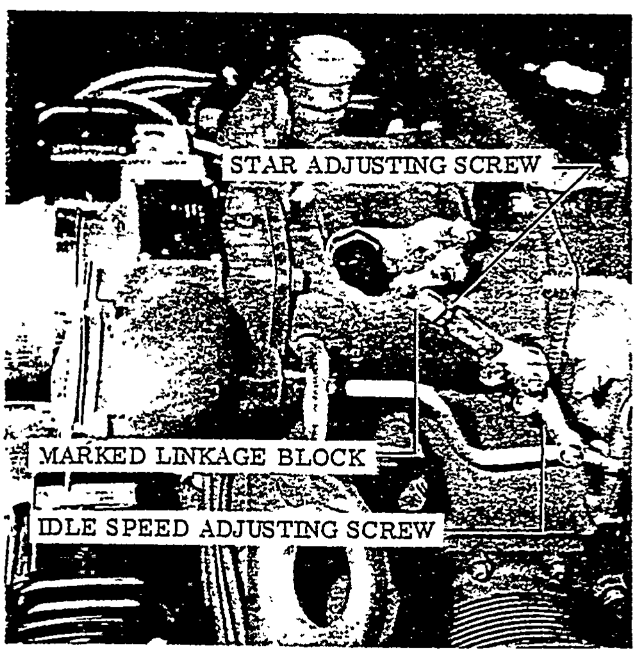


Figure 6-1. Idle and Mixture Adjustment

f. Adjustment of the mixture is obtained by turning the "STAR" adjustment screw, one or two notches, in the direction required, as noted on the linkage blocks with an "L", for lean, and an arrow for direction of rotation.

g. After each idle mixture adjustment change, clear the engine by running it up to 2000 rpm before making a mixture check. For major adjustments refer to Bendix Manual Form 15-338B.

h. If the idle setting does not remain stable, check the idle linkage; any looseness in this linkage will cause erratic idling. In all cases, allowance should be made for the effect of weather conditions upon idling adjustment.

OIL PRESSURE ADJUSTMENT
(Figure 6-2)

The oil pressure adjustment screw is located approximately 3 inches directly below the oil filter housing. To adjust, turn the adjusting screw clockwise to in-

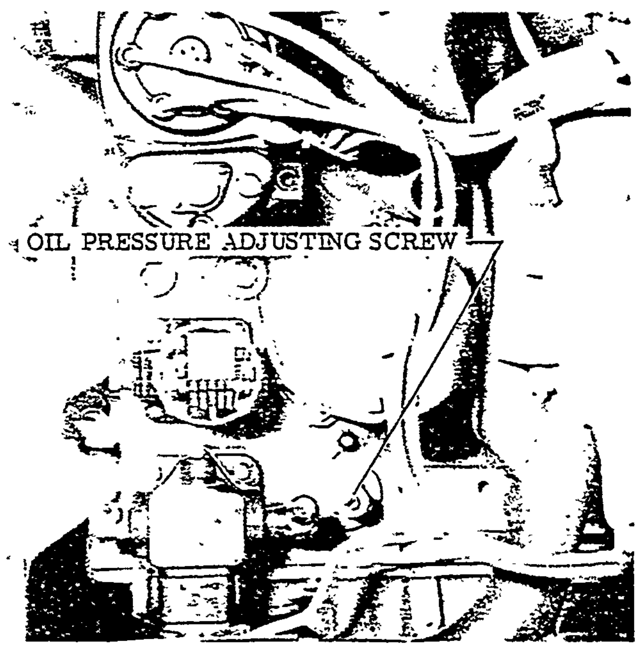


Figure 6-2. Oil Pressure Adjustment

crease or counterclockwise to decrease oil pressure. Run the engine at 2600 rpm with oil temperature at 150°F, set the oil pressure at 80 psi.

ENGINE AIR INDUCTION SYSTEM

Engine induction air is available from two sources, primary and alternate air. The primary air source is supplied thru an intake duct, located on the engine RH cowl door. The primary air passes thru an air filter, and then into the turbocharger.

NOTE

The air filter, located in the air box assembly has a service life of 500 hours with periodic cleaning.

When the primary source of air is obstructed, the turbocharger forms a suction that opens the "Alternate Air Source" door and permits the required volume of air flow for normal engine performance. The alternate air door is located on the firewall behind the induction air box assembly.

THROTTLE LANDING GEAR WARNING HORN SWITCH ADJUSTMENT

a. In flight, place the propeller lever in low pitch. Slowly pull both throttle levers back until 12 to 14 in. Hg. is indicated. Mark this position on the quadrant.

b. Land the airplane and shut the engine down.

c. Position the throttle levers on the mark previously made. Raise or lower the micro-switches until the cams "click" the switches closed.

NOTE

The landing gear warning horn micro-switches are located on a bracket, at the lower end of the throttle linkage, in the console.

d. Fly the airplane to check adjustment.

MAGNETOS

MAGNETO DROP-OFF CHECK

The drop-off check is accomplished by switching the magneto switch from "BOTH" to either the "RIGHT" or "LEFT" position and noting any loss or variance in rpm.

a. Thoroughly warm up the aircraft and set the propeller control in low pitch. Place the mixture control in "FULL RICH".

b. Set the throttle to produce 1900 rpm.

c. Note the amount of rpm drop-off as the magneto switch is turned from "BOTH" to "LEFT and then to RIGHT" position.

CAUTION

Operation on one magneto should not exceed 5 seconds to avoid fouling the spark plugs.

d. Normal magneto drop-off is approximately 100 rpm on either magneto and should be within 50 rpm of each other. If the magneto drop-off persistently exceeds 125 rpm, an inspection to determine the cause should be accomplished. Common causes are incorrect grade of fuel, fouled or incorrectly gapped spark plugs, incorrectly timed magnetos, incorrect air/fuel ratio.

MAGNETO BREAKER POINT ADJUSTMENT

Each engine is equipped with two Bendix S-1200 series magnetos. The left magneto incorporates a retard breaker point assembly which provides a fixed retard and long duration spark for easier starting. The right magneto has only the conventional breaker points which are grounded out when the engine is being started.

Every 100 hours check the breaker points for condition, clearance and timing. Breaker point clearances for the magnetos are .016 ± .006 for the retard points and .016 ± .003 for the conventional points. 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.

MAGNETO TIMING

a. Remove a spark plug from No. 1 cylinder and turn the crankshaft in the direction of normal rotation until the compression stroke is reached.

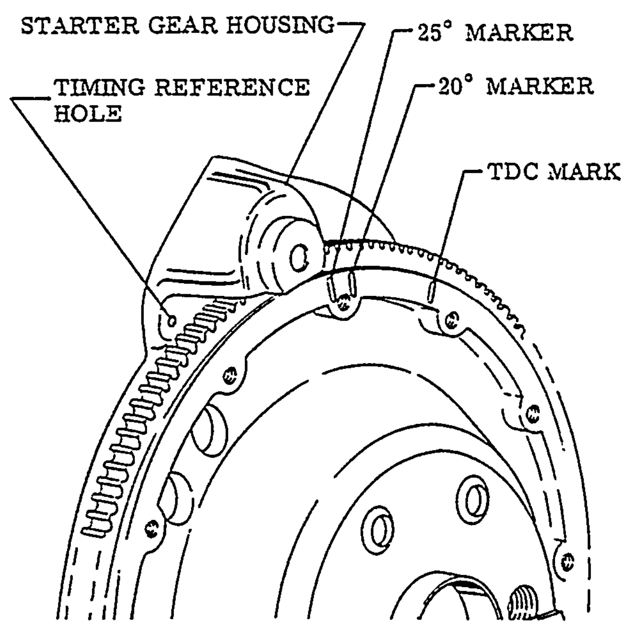


Figure 6-2A. Magneto Timing Reference Points

b. Continue turning the crankshaft until the 20° BTC advance timing mark, on the forward face of the starter ring gear, is in alignment with the small hole located on the face of the starter housing (see illustratoin Figure 6-2A).

c. Remove the inspection plug on the left magneto and turn the drive coupling in the direction of normal rotation until the first marked tooth is aligned in the center of the inspection hole. Without allowing the gear to turn from this position, assemble the gasket and magneto to the engine.

d. Using an electric timing light, fasten the ground wire to any unpainted portion of the engine and one of the positive wires to a suitable terminal connected to the ground terminal of the magneto. Then turn the crankshaft several degrees from the advance timing mark in direction opposite to that of normal rotation.

e. With the timing light on, turn the crankshaft slowly in the direction of normal rotation until the mark on the starter ring gear aligns with the hole in the starter housing. If the timing is correct the timing light should go OUT.

NOTE

When a battery powered timing light is used, the light will go ON when the marks align.

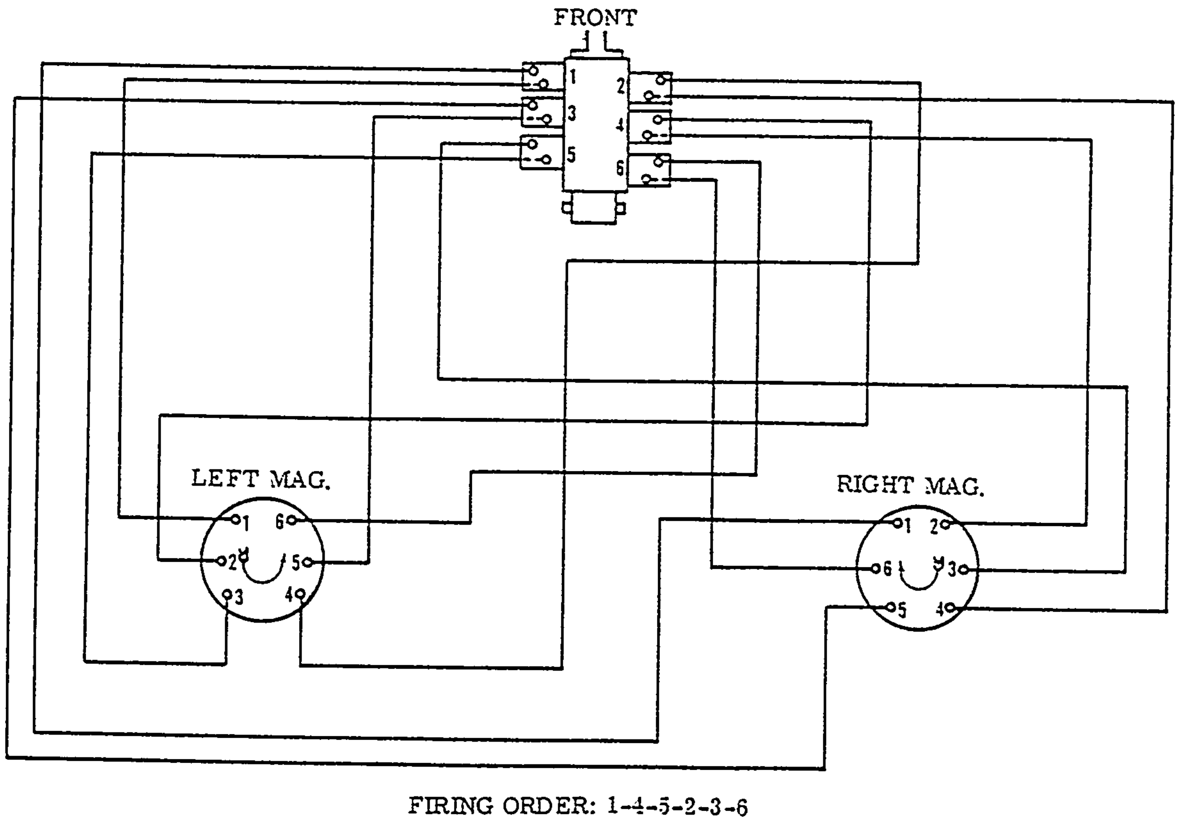


Figure 6-3. Magneto Wire Routing

TURBOCHARGER SYSTEM

(Figure 6-4).

The turbocharger is mounted as an accessory to the engine and increases the power output and efficiency of the engine by supplying compressed air to the intake manifold. In operation, engine exhaust gas passing over the turbine wheel causes the turbocharger compressor, which is mounted on the same shaft, to rotate. Ambient, filtered air is drawn in from the engine cowl intake to the compressor, where it is compressed and delivered to the engine. The turbocharger reacts to engine exhaust variation to meet engine demands. As the engine power increases, the flow of exhaust also increases, resulting in a proportionate increase in the speed of the rotating assembly and turbocharger output.

CONTROL SYSTEM

The turbocharger control system is automatic and functions continuously as engine power, speed and altitude are varied. The variable pressure controller, wastegate, wastegate actuator and engine oil are the principal components of the control system. The pressure controller senses compressor outlet pressure and regulates the oil pressure controlling the wastegate actuator position. The wastegate actuator is a hydraulic cylinder with spring tension holding the wastegate butterfly valve open. When oil pressure increases in the actuator, the spring tension is overcome and the butterfly valve closes, routing all exhaust gas through the turbocharger turbine. The variable pressure controller regulates the oil pressure in the actuator by means of an aneroid bellows which is sensitive to pressure changes at the induction manifold. The metering valve which is connected to the bellows within the controller, is held closed by spring tension and vacuum. As the induction manifold pressure increases, the force on the aneroid bellows causes the metering valve to open. The controller is regulated by a cam which is connected to the throttle valve. Thru this linkage, the pressure setting of the controller is varied proportionally to the amount of power the pilot selects with the throttle. The control system prevents the engine from exceeding 41.5 Hg. manifold pressure; however, rapid movement of the throttle with low oil temperature or operation at low rpm, high manifold pressures may result in an overboost condition. An overboost condition may cause turbocharger surge, detonation or detuning of the engine counterweight system; any of which may cause serious engine damage.

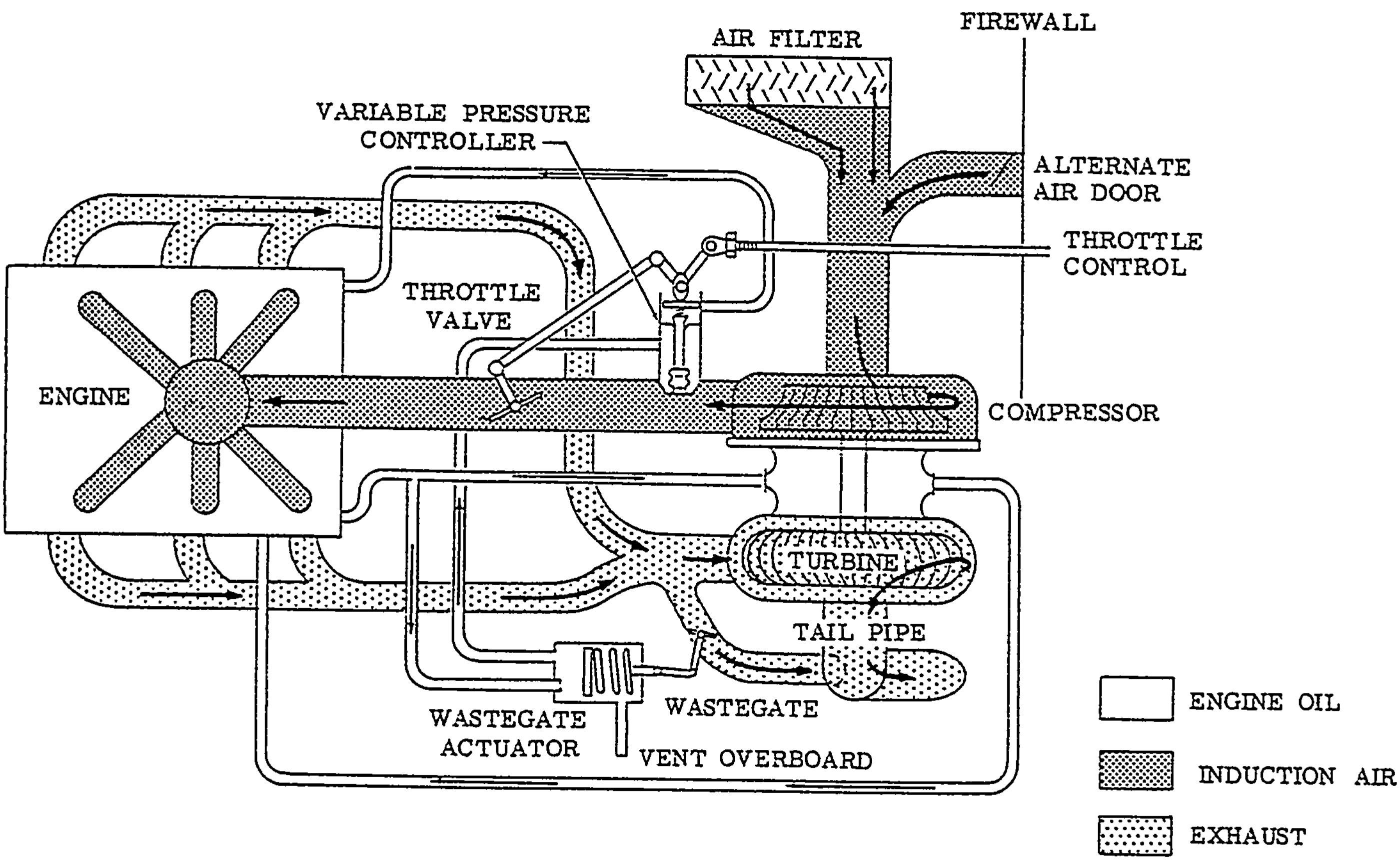


Figure 6-4. Turbocharger Schematic

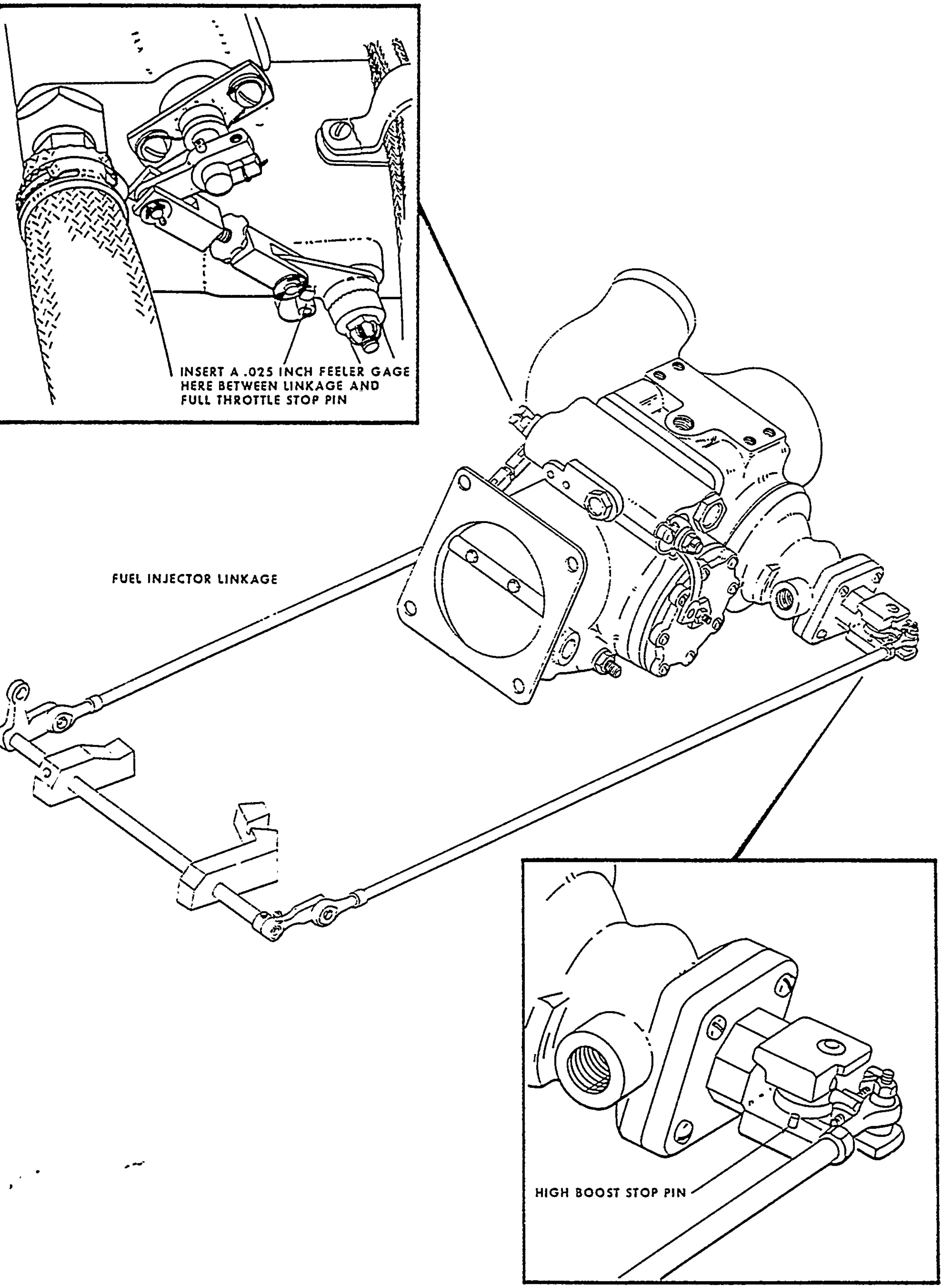


Figure 6-4A. Adjusting Throttle and Pressure Controller Linkage

INSTALLATION AND INITIAL RUN-IN OF TURBOCHARGER

Immediately prior to mounting the unit, prime the turbocharger lubrication system by inverting the turbocharger and filling the center housing with new, clean oil through the oil drain. Rotate the assembly by hand to coat the bearings and the thrust washer with oil.

Coat the threads of the attaching bolts or studs with high temperature thread lubricant. Connect the ducts and make sure all connections are air tight.

Flush oil through the oil supply line to assure the line is clean and unobstructed. Connect the oil supply line at the engine. To be sure that oil is being supplied to the turbocharger, hold the compressor impeller by hand and start the engine.

WARNING

Do not attempt to stop impeller after unit is rotating.

As soon as oil appears at the end of the oil inlet line, attach the line to the turbocharger and allow the rotating assembly to spin.

Operate the engine at a load and listen for sounds of metallic contact from the turbocharger. If any such noise is apparent, shut down immediately and correct the cause.

LUBRICATION OF TURBOCHARGER SHAFTS

Rust deposits may form in the area of the turbocharger turbine shaft piston ring seal as a result of water vapor accumulation if the aircraft is subjected to short intervals of engine operation.

This condition occurs only when the unit is new and combustion deposits have not formed a protective barrier on the seal surfaces. Units which are binding after long time service are coked internally and must be removed for cleaning or replacement.

These deposits while they do restrict, or even stop shaft rotation, are not harmful to subsequent turbocharger operation once they are removed sufficiently to give free shaft movement.

When this condition is noted, remove the exhaust discharge stack and apply Mouse Milk Penetrating Oil (Item 32, Consumable Materials Chart) liberally to the area behind the wheel around the turbine shaft seal. After a few minutes attempt to turn the shaft. A light top on the shaft end with a soft mallet will often assist in freeing the shaft. Once the shaft is free the engine may be started and a power check made to confirm turbocharger output either on the ground or in flight.

RIGGING THE THROTTLE AND TURBOCHARGER PRESSURE CONTROLLER LINKAGE
(Figure 6-4A)

a. With the injector connecting rod installed, determine that the throttle lever moves freely from idle to full open throttle.

b. Adjust the pressure controller rod so that, with the pressure controller cam arm against the full boost stop (full forward position), the throttle lever is approximately .020 - .030 inch from the full throttle position.

VARIABLE PRESSURE CONTROLLER ADJUSTMENT
(Figure 6-5)

The variable pressure controller is mounted directly to the turbocharger discharge ducting between the oil filler neck and the engine throttle valve. Adjustment of the controller is made as follows:

a. Head the aircraft into the wind. Set the brakes and chock the wheels.

b. Warm up the engine until the oil temperature reaches a minimum of 185°F.

c. Set the propeller control lever in the high rpm position. Slowly and smoothly apply the throttle until 41 in. Hg. manifold pressure or the full throttle position is reached.

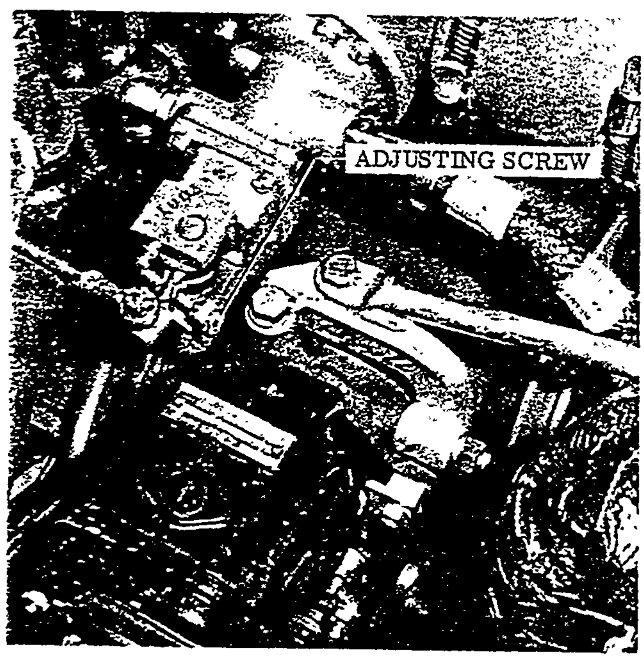


Figure 6-5. Variable Pressure Controller

CAUTION

Do not exceed 41.5 in. Hg. manifold pressure.

d. If at the full throttle position the manifold pressure has not reached 41 in. Hg:

1. Slowly and smoothly shut down the engine.
2. Loosen the lock nut on the adjusting screw.
3. Turn the adjusting screw counter clockwise to increase the manifold pressure. (One full turn equals approximately 1 in. Hg. manifold pressure.)
4. Retighten the locknut on the adjusting screw.

e. If the manifold pressure reaches 41 in. Hg. before obtaining full throttle:

1. Slowly and smoothly shut down the engine.
2. Loosen the locknut on the adjusting screw.
3. Turn the adjusting screw clockwise to decrease the manifold pressure. (One full turn equals approximately 1 in. Hg. manifold pressure.)
4. Retighten the locknut on the adjusting screw.

CAUTION

Do not exceed 41.5 in. Hg. manifold pressure.

f. Repeat steps b through e until the manifold pressure at full throttle is 41 in. Hg.

ADJUSTMENT OF TURBOCHARGER WASTE GATE VALVE
(Figure 6-6)

The linkage connecting the butterfly valve to the actuator is adjustable. It is adjusted at the time of valve installation so that the piston in the actuator cylinder bottoms simultaneously with, or just before, the butterfly valve seats in its bore. Misadjustment of the linkage may cause the butterfly valve to seat before the actuator piston bottoms and will result in damage to the linkage as the hydraulic closing forces are high at engine idle or during cold engine operation. The linkage adjustment is used to establish critical altitude which is the altitude at which the waste gate buttefly just fully closes. The adjustment must be made with full hydraulic or air pressure applied to the inlet port of the waste gate actuator. The full open butterfly stop adjustment, located on the center of the actuator cover, may be adjusted to stop the butterfly at the position required for safe engine operation. In the event the butterfly valve fails to close or fully open, adjustment of the valve is made as follows:

a. Disconnect both the inlet and outlet oil lines at the waste gate actuator. Plug the actuator outlet port and connect an air pressure supply line to the inlet port. This line must have a pressure gage installed to maintain 50-60 psig into the waste gate actuator.

b. Loosen the lock-nut on the adjusting turnbuckle and remove the pin, washers, and cotter key.

c. Apply 50 to 60 psig to the waste gate actuator and adjust the closed position of the waste gate butterfly valve by rotating the turnbuckle counterclockwise to fully close the waste gate butterfly. After the butterfly has made contact with the bore, back off the turnbuckle clockwise until the hole and slot align.

NOTE

Maintain a clearance of .005 to .025 between butterfly edge and bore.

d. Reinstall the pin, washer and cotter pin. Tighten the locknut against the turnbuckle with 80 to 100 in-lbs. torque.

e. With zero air pressure in the waste gate actuator, adjust the full open stop position of the butterfly valve with the adjusting screw located on the end of the actuator.

NOTE

Maintain a minimum clearance of .80 to .90 between the edge of the butterfly and bore.

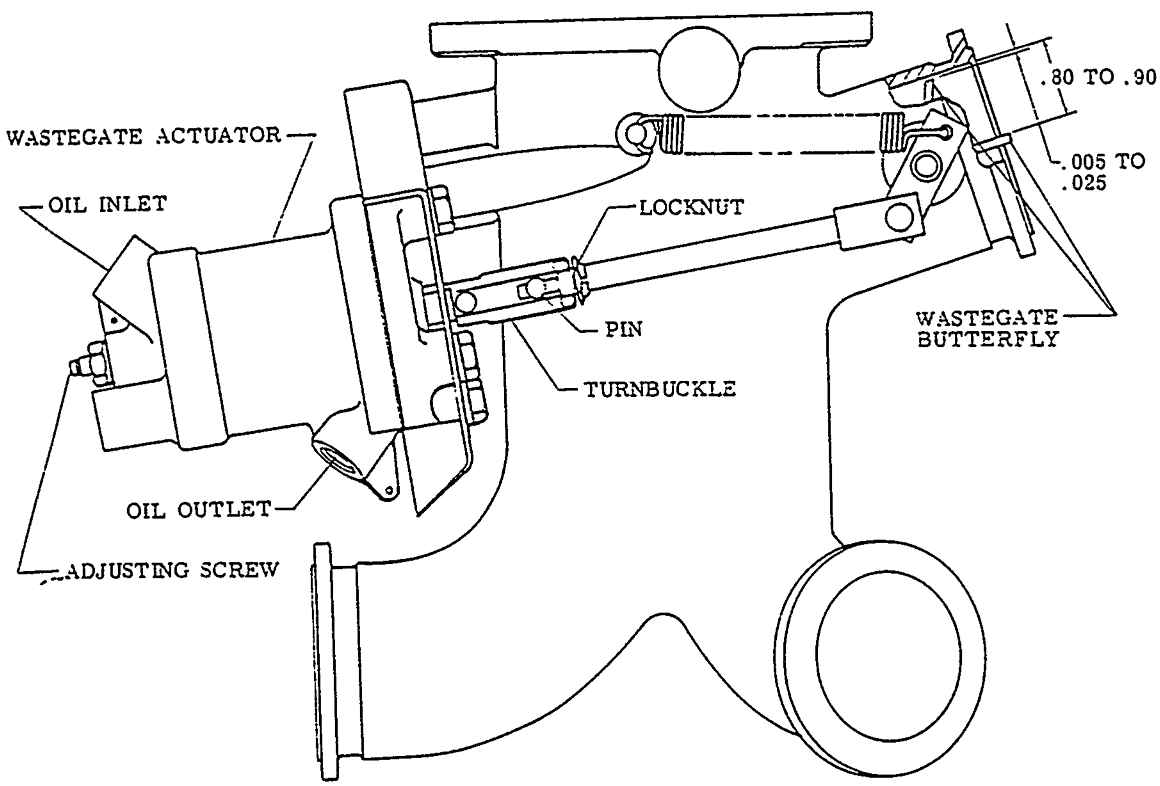


Figure 6-6. Wastegate Adjustment

LUBRICATION OF TURBOCHARGER WASTE GATE BUTTERFLY

The turbocharger wastegate butterfly valve should regularly be inspected, for free operation. If the butterfly valve does not move freely, it should be lubricated and cleaned of any accumulated carbon deposits. Remove the wastegate exhaust stack for access to the valve mechanism, and disconnect the valve linkage, so that the valve can be freely moved back-and-forth.

CAUTION

Be very careful not to alter the adjustment of the linkage.

Squirt Mouse Milk Penetrating Oil (Item 32, Consumable Material Chart) on the valve shaft and work it in until the valve moves freely by hand. Knock carbon deposits out by tapping the valve casing lightly during lubrication. (If this procedure is ineffective, the entire valve should be removed, set upright on a bench, and the carbon knocked out by tapping the casing). Reinstall the wastegate exhaust stack and connect the valve linkage.

APPROVED OVERHAUL FACILITIES

The following facilities are presently approved for providing complete service for the exhaust turbocharger and controls manufactured by AiResearch Industrial Division, Garrett Corporation, Los Angeles, California and used on Avco Lycoming aircraft engines. The services of these organizations include parts replacement and rebalancing the rotating assembly. As new faciities are approved they will be added to this list.

Hagelin Aircraft Motors Company
933 Airway
Glendale 1, California 91201

Sacramento Sky Ranch, Inc.
Sacramento Municipal Airport
P.O. Box 8550
Sacramento, California 95822

Industrie Aeronautiche E Meccaniche
Rinaldo Piaggio S.p.A.
Finale Ligure, Italy

Standard Aero Engine Ltd.
International Airport
Winnipeg, Manitoba,
Canada

Aerotransportes Wollkupf
Libertad 1388
Buenos Aires, Argentina

Shimadzu Siesakusho, Ltd.
Kyoto, Japan

Hartzog-Schneck Aviation, Inc.
Greater Rockford Airport
Rockford, Illinois 61109

M.A.N. Turbo, GMBH
Dachauen Strasse 665
8 - Munchen - Allach
West Germany

Garrett Manufacturing Ltd.
International Airport
Rexdale, Ontario, Canada

Hawker de Haviland Australia Pty. Ltd.
Birnie Ave., Lidcombe
Box 78, Lidcombe, P.O.
Sydney, Australia

Motortec Industria e Comercio, S.A.
Av. Franklin Roosevelt 137
Rio de Janeiro, Brazil

Alvis Limited
Coventry, England

TIT INDICATOR CALIBRATION

(Figure 6-7)

CAUTION

Damage to the turbocharger turbine blades, excessive turbine coking, and excessive oil consumption may be caused by turbine inlet temperatures above 1650°F.

To prevent a turbine inlet over-temperature condition, due to an inaccurate TIT indicator reading, the TIT system should be checked and the indicator calibrated every 100 hours.

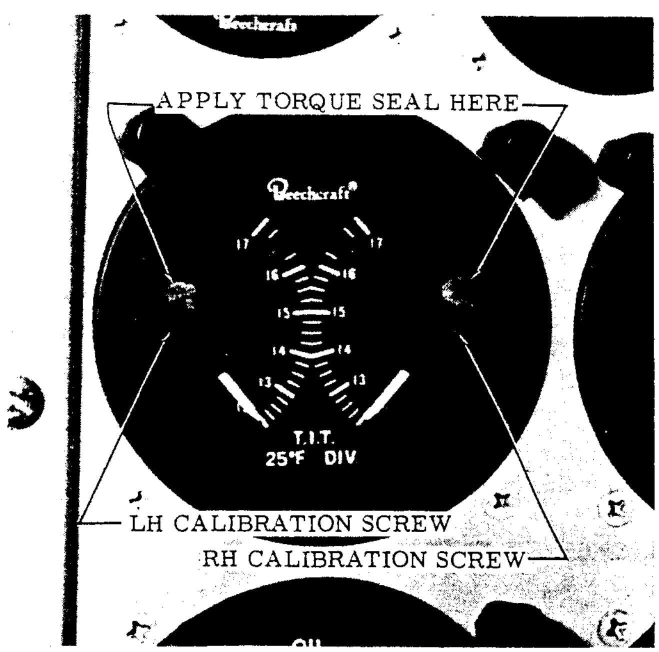


Figure 6-7. TIT Indicator Calibration

The following procedure may be used to check and calibrate the TIT indicator.

a. Remove the TIT probe from the turbocharger intake manifold on the RH engine. (Do not disconnect the wires from the probe.)

b. Using the AlCal test equipment, heat the probe to 1650°F (900°C).

c. If the TIT indicator reads 1650°F, the indicator is properly calibrated, If the reading is not 1650°F, the calibration screw on the face of the instrument should be adjusted to obtain this reading.

d. If the seal was broken on the calibration screw, reseal by applying a small amount of Torque Seal as shown in Figure 6-7.

e. Reinstall the probe in the turbocharger intake manifold. Lubicate the threads on the probe with anti-seize compound (MIL-A-907C , Table of Thread Lubricants).

f. Repeat the above procedure on the LH engine.

ALCAL CALIBRATION UNIT

The AlCal Calibration unit, available locally through the BEECHCRAFT Dealer Organization, provides a simple and accurate method for checking and, if necessary, recalibrating aircraft piston engine EGT systems. If the red line temperature is exceeded by the TIT indicators, the calibration unit will quickly determine if the fault lies with the indication system or the engine. The following method will accomplish the TIT calibration test:

a. Light the AlCal unit and support it from the engine cowling.

b. Place the TIT thermocouple into the comparator port of the AlCal unit until it is touching the reference thermocouple.

c. Raise the heat from the AlCal unit until the temperature of 1650°F is indicated on the unit's reference meter.

d. Because both thermocouples are measuring the same temperature, the aircraft-installed TIT indicator should indicate the same red line temperature. If the indicator corresponding to the engine being tested does not register 1650°F., refer to the adjustment procedure outlined under "TIT Indicator Calibration".

e. Replace the TIT thermocouple in the turbocharger intake. Lubricate the threads of the TIT thermocouple with anti-seize compound (MIL-A-970C, Table of Thread Lubricants.)

TURBOCHARGER CRITICAL ALTITUDE TEST

The following procedure provides a means of checking turbocharger performance. Refer to the Turbocharger Performance Graph. This graph indicates the minimum acceptable critical altitude the aircraft can achieve while maintaining 41.0 inch Hg. manifold pressure. To check the turbocharger performance against the graph it will be necessary to flight test the aircraft. Place the aircraft in a climb configuration and note the altitude at which the manifold pressure begins to drop off; then observe the outside air temperature gage. Locate these points on the axes of the graph and project lines from these points toward the center of graph. The point at which the lines intersect is the aircraft's critical pressure altitude. This point is located below the minimum acceptable pressure altitude line on the graph, a thorough check of the turbocharging system, including variable controller, induction system leaks and wastegate adjustment, should be accomplished.

CRITICAL PRESSURE ALTITUDE VS OAT

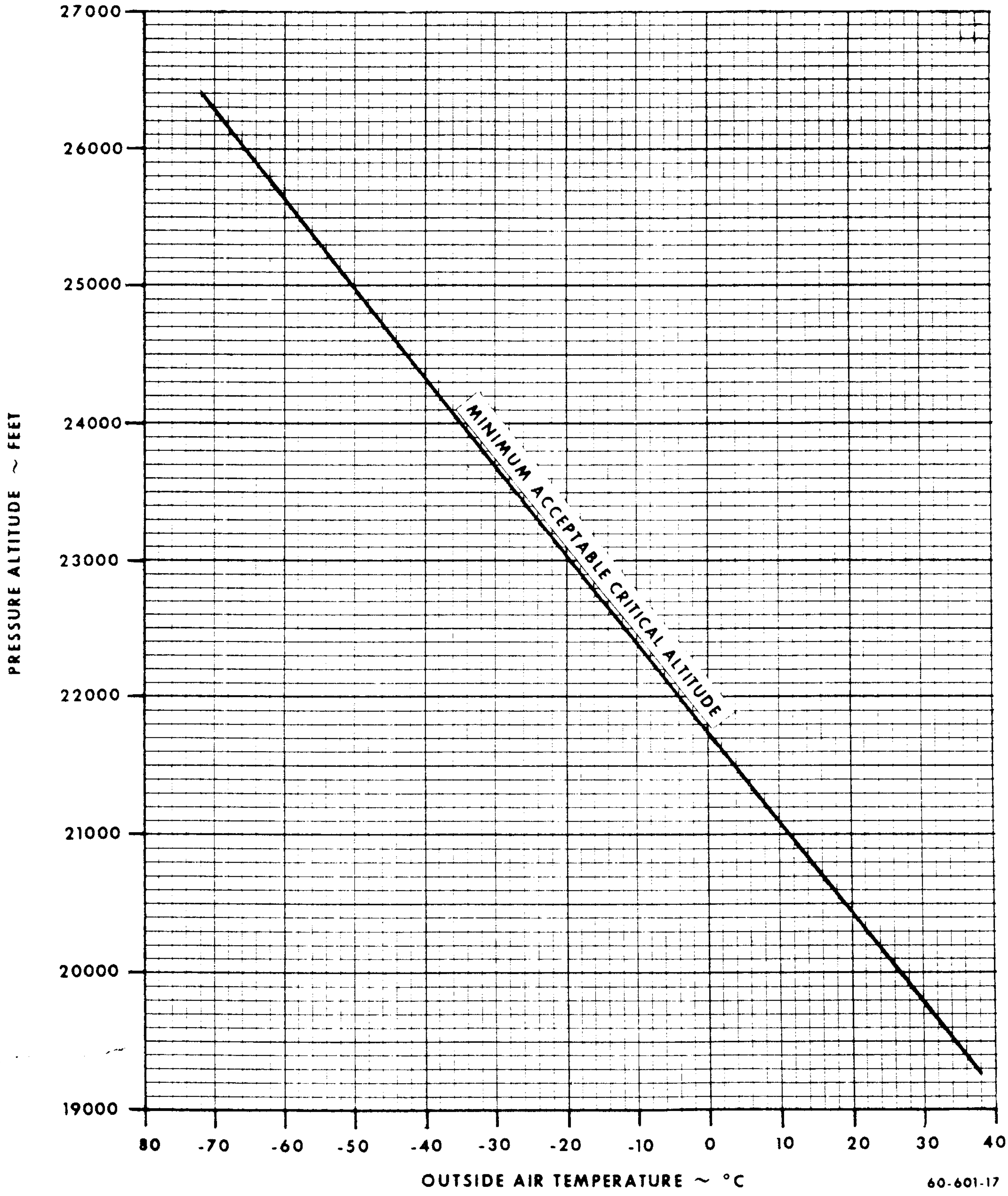


Figure 6-8. Turbocharger Performance Graph

TROUBLESHOOTING
ENGINE

INDICATION	PROBABLE CAUSE	REMARKS
1. Failure of Engine to Start.	a. Lack of fuel.	a. Check fuel system for leaks. Fill fuel cell. Clean dirty lines, strainers or fuel valves.
	b. Overpriming.	b. Unload engine by standard clearing procedure.
	c. Incorrect throttle setting.	c. Open throttle to 1/4 of its range.
	d. Defective spark plugs.	d. Clean and adjust or replace spark plugs.
	e. Defective ignition wire.	e. Check with tester and replace any defective wires.
	f. Improper operation of magneto.	f. Clean points. Check timing.
	g. Internal failure.	g. Check oil screens for metal particles. If found, complete overhaul of engine is indicated.
2. Failure of Engine to Idle Properly.	a. Incorrect idle mixture.	a. Adjust mixture control.
	b. Incorrect idle speed.	b. Adjust idle speed.
	c. Leak in induction system.	c. Tighten all connections, replace any defective parts.
	d. Uneven cylinder compression.	d. Check condition of piston rings and valve seats.
	e. Faulty ignition system.	e. Check ignition system.
3. Low Power and Uneven Running.	a. Mixture too rich; indicated by sluggish engine, red exhaust flame. Extreme cases indicated by black smoke at exhaust.	a. Readjustment of fuel injector is indicated.
	b. Mixture too lean; indicated by overheating and back-firing.	b. Check fuel lines for restrictions. Readjust mixture.
	c. Leak in induction system.	c. Tighten all connections, replace any defective parts.
	d. Defective spark plugs.	d. Clean and gap or replace spark plugs.
	e. Improper fuel.	e. Fill cell with fuel of recommended grade.
	f. Magneto breaker points not working properly.	f. Clean points, check timing.
	g. Defective ignition wire.	g. Check wires with tester, replace any defective wires.
	h. Defective spark plug terminal connectors.	h. Check and replace connectors if necessary.

ENGINE (CONT'D)

INDICATION	PROBABLE CAUSE	REMARKS
4. Failure of Engine to Develop Full Power.	a. Leak in the induction system.	a. Tighten all connections replace any defective parts.
	b. Throttle lever out of adjustment.	b. Check travel of throttle linkage.
	c. Improper fuel flow.	c. Check strainers and flow at fuel injector.
	d. Restriction in air scoop.	d. Examine air scoop and remove any obstructions.
	e. Improper fuel.	e. Drain and refill cell with fuel of recommended grade.
	f. Faulty ignition.	f. Check ignition system.
5. Rough Engine.	a. Cracked engine mount.	a. Replace or repair mount.
	b. Defective mounting bushing.	b. Replace bushing.
	c. Uneven compression.	c. Check compression.
6. Low Oil Pressure.	a. Insufficient oil.	a. Fill sump with oil.
	b. Air lock or dirt in relief valve.	b. Remove and clean oil pressure relief valve.
	c. Dirty oil strainers.	c. Remove and clean oil strainers.
	d. High oil temperatures.	d. See "High Oil Temperatures".
	e. Defective pressure gage.	e. Replace gage.
	f. Stoppage in oil pump intake passage.	f. Check line for obstruction.
7. High Oil Temperature.	a. Insufficient oil supply.	a. Fill sump with oil of recommended grade.
	b. Low grade of oil.	b. Drain and fill sump with oil conforming to specifications.
	c. Clogged oil lines or strainers.	c. Clean oil lines and strainers.
	d. Excessive blow-by.	d. Usually caused by worn or stuck rings.
	e. Failed or failing bearings.	e. Examine oil strainers for metal particles. If found, overhaul of engines is indicated.
	f. Defective temperature gage.	f. Replace gage.
8. Excessive Oil Consumption.	a. Low grade of oil.	a. Fill sump with oil conforming to specifications.
	b. Failing or failed bearings.	b. Check sump for metal particles.
	c. Worn piston rings.	c. Install new rings.
	d. Incorrect installation of piston rings.	d. Install new rings.

INDICATION	PROBABLE CAUSE	REMARKS
	e. Failure of rings to seat (nitrided barrels)	e. Use mineral base oil. Climb to cruise altitude at full power and operate at 75% cruise power setting until consumption stabilizes.

TURBOCHARGER

INDICATION	PROBABLE CAUSE	REMARKS
1. Excessive Noise or Vibration.	a. Improper bearing lubrication.	a. Supply required oil pressure. Clean or replace oil line. If trouble continues remove and send to the nearest approve overhaul station for repair.
	b. Leak in engine intake or exhaust manifold.	b. Tighten loose connections, or replace manifold gaskets as necessary.
2. Engine Will Not Deliver Rated Power.	a. Clogged manifold system.	a. Clean all ducting.
	b. Foreign material lodged in compressor impeller or turbine.	b. Replace or send to the nearest approved overhaul station for repair.
	c. Excessive dirt buildup in compressor.	c. Service engine induction air filter and check for leakage.
	d. Leak in engine intake or exhaust manifold.	d. Tighten loose connections, or replace manifold gaskets as necessary.
	e. Rotating assembly bearing seizure.	e. Remove and send to the nearest approved overhaul station for repair.
	f. Restriction in return lines from actuator to waste gate controller.	f. Remove and clean lines.
	g. Waste gate controller out of adjustment.	g. Have waste gate controller adjusted.
	h. Oil pressure too low.	h. Tighten fittings, replace lines or hoses. Increase oil pressure.
	i. Inlet orifice to actuator clogged.	i. Remove inlet line at actuator and clean orifice.
	j. Waste gate controller malfunction.	j. Replace unit.
	k. Waste gate butterfly not closing.	k. Low pressure, butterfly shaft binding.
	l. Impeller binding, frozen or fouling housing.	1. Check the bearings.
	m. Piston seal in actuator leaking.	m. Replace actuator or disassemble and replace packing.
3. Critical Altitude Lower Than Specified.	a. Controller not getting enough oil pressure to close by-pass valve.	a. Check pump outlet pressure, oil filters and lines for leaks or obstructions.

TURBOCHARGER (CONT'D)

INDICATION	PROBABLE CAUSE	REMARKS
	b. Chips under metering valve in controller holding it open.	b. Replace controller.
	c. Metering jet in actuator plugged.	c. Remove actuator and clean jet.
	d. Actuator piston seal leaking excessively.	d. Clean cylinder and replace piston seal.
	e. Waste gate valve sticking.	e. Clean and free action.
4. Engine Surges or Smokes.	a. Air in oil lines or actuator.	a. Bleed system.
	b. Controller metering valve stem seal leaking oil into manifold.	b. Replace controller.
	c. Actuator to by-pass valve linkage binding.	c. Correct cause of binding.
	d. Clogged breather.	d. Check breather for restriction to air flow.

NOTE

Smoke would be normal if engine has idled for a prolonged period.

INDICATION	PROBABLE CAUSE	REMARKS
5. High Deck Pressure (Compressor Dis-Charge Pressure)	a. Controller metering valve not opening.	a. Replace controller.
	b. Exhaust by-pass valve sticking closed.	b. Shut-off valve in return line inoperative.
	c. Controller return line restricted.	c. Clean or replace line.
	d. Oil pressure too high.	d. Reduce oil pressure.
	e. Waste gate actuator piston locked in closed position.	e. Disassemble actuator, check condition of piston and packing.
	f. Waste gate controller malfunction.	f. Replace controller.

PROPELLER REMOVAL AND INSTALLATION

a. Remove the retaining screws and the nose cowling fairing channels from the base of the propeller hub.

b. Remove the safety wire and remove the nuts around the propeller hub base, with the special propeller torque wrench adapter #60-960000/D922.

NOTE

When propeller deicer equipment is installed, it is necessary to disconnect the terminal wires on the starter ring gear.

c. Pull the propeller carefully from the mounting studs.

CAUTION

Do not damage threads on attachment studs and be careful not to damage spinner.

d. To install the propeller, reverse the disassembly procedure. (Torque propeller mounting nuts 90-100 ft. lbs.)

PROPELLER GOVERNOR REMOVAL AND INSTALLATION (Figure 7-1)

a. Remove the nuts around the base of the governor.

b. Loosen and remove the oil line from the outboard end of the governor.

c. Remove bolt, washer, nut, and cotter key, and remove adjusting rod end from the governor.

NOTE

To insure proper adjustment, do not turn the adjusting rod end when reinstalling. Replace the gasket between the governor and engine.

d. To install the governor, reverse the disassembly procedure. (Torque governor mounting nuts to 150 in. lbs.)

ADJUSTING THE PROPELLER GOVERNOR (Figure 7-1)

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

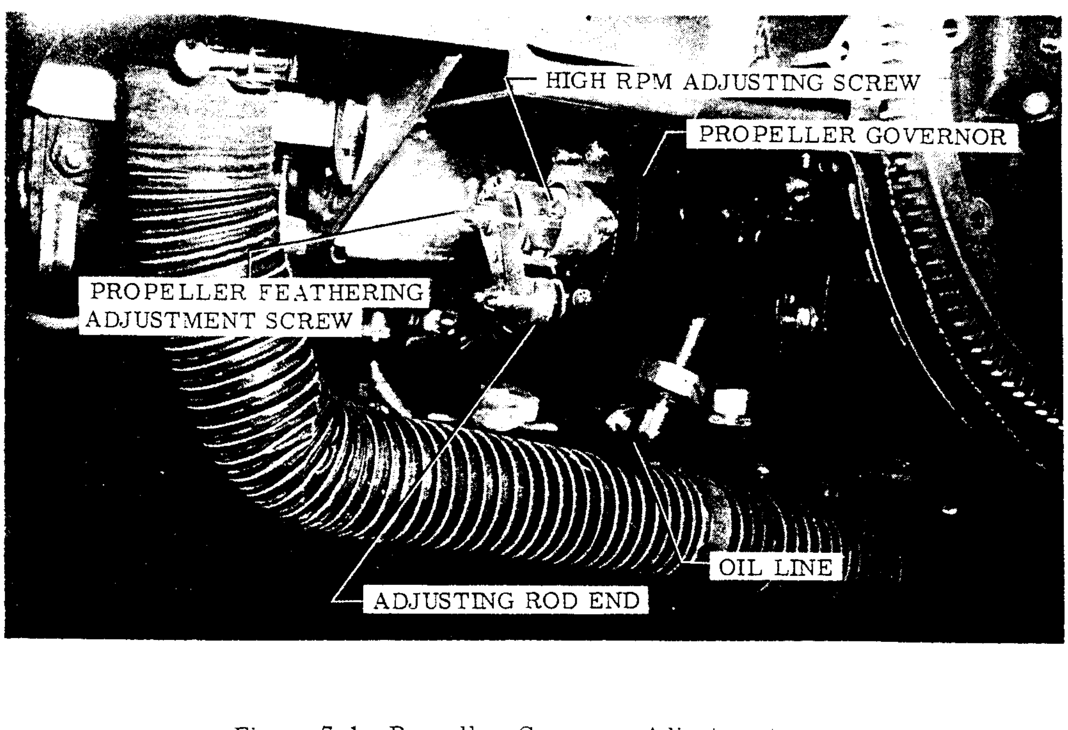


Figure 7-1. Propeller Governor Adjustments

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 25-30 revolutions.

FEATHERING ADJUSTMENT

To adjust 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 low rpm. The point at which propeller feathering starts should be at 2100 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. (See Figure 7-1.)

LOW RPM ADJUSTMENT
(Figure 7-2)

The low rpm adjustment is made while the aircraft is on the ground. To make this 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 2200 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 the setting shorten the rod.

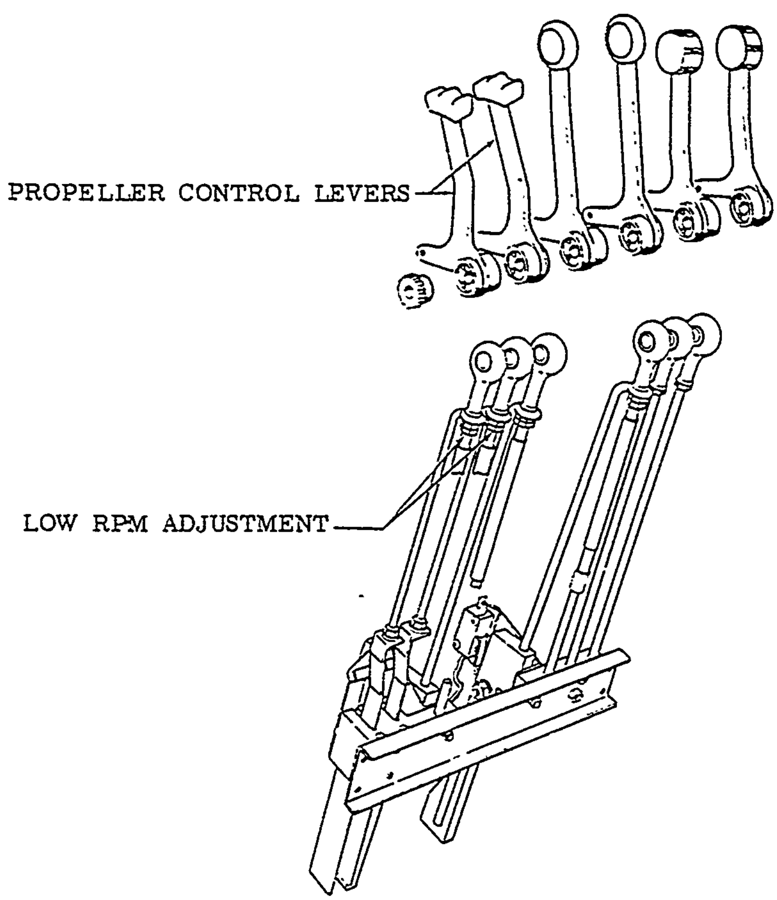


Figure 7-2. Propeller Low RPM Adjustment

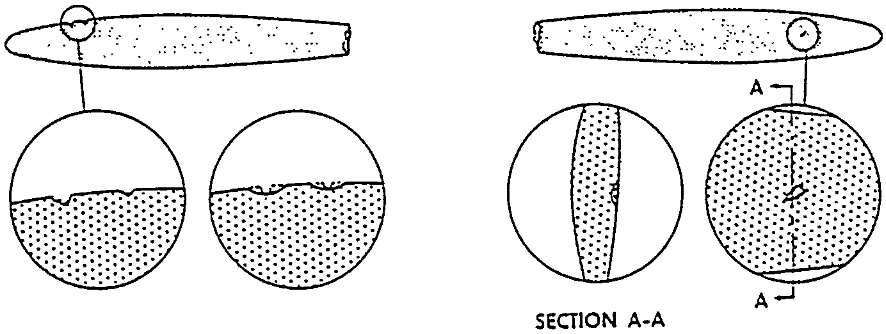


Figure 7-3. Minor Propeller Blade Repair

PROPELLER ADJUSTMENT

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

MINOR PROPELLER BLADE REPAIR
(Figure 7-3)

Minor nicks, dents, and gouges may be dressed out by approved line personnel. Blend any nicks or gouges into the leading edge with smooth curves, and generous radii as shown in figure 7-3. Reanodize reworked area by the chromic acid process only.

PROPELLER ACCUMULATOR REMOVAL
(Figure 7-4)

a. Check the propeller control lever for unfeathering (low pitch) position, to release accumulator pressure.

CAUTION

This system has approximately 300 PSI of pressure with the propeller in full-feather position.

b. Remove the oil line from the end of the accumulator

c. Remove the four clamps that hold the accumulator mounting brackets to the engine mount and remove the accumulator.

d. To install the accumulator, reverse the disassembly procedure.

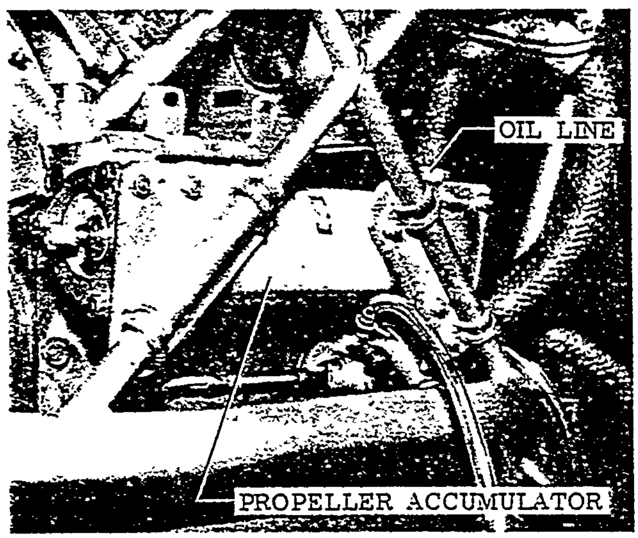


Figure 7-4. Unfeathering Accumulator Removal

FUEL SYSTEM

(Figure 8-1 and 8-1A)

The standard fuel system, on aircraft, serials TG-1 and after, consists of an inboard leading edge fuel cell, and a box section fuel cell, utilizing the box section filler cap for fueling both cells. The standard system has a total of 71 gallons per wing or a total of 142 gallons of usable fuel. An interconnect tube between the inboard leading edge cell and the box section cell incorporates a flapper valve (at the leading edge cell) to prevent fuel surging from the leading edge cell back into the box section cell while the aircraft is in a nose high attitude.

The optional fuel system for aircraft, serials TG-1 through TG-68 has an additional fuel cell installed in the nacelle which increases the total fuel capacity to 89 gallons per wing. Total system capacity is 178 gallons of usable fuel. This system is filled through two fuel cell filler caps, one is located in the box section fuel cell outboard of the nacelle, and the other on top of the nacelle fuel cell.

CAUTION

> The nacelle fuel cell is located higher than the box section and leading edge fuel cells and care should be used when checking the level of the fuel system. DO NOT remove the wing cell filler cap if fuel is indicated on the nacelle filler cap dip stick, or if fuel is less than six inches below the filler opening.

The fuel system on aircraft, serials TG-69 and after, consists of nacelle, box, inboard and outboard leading edge fuel cells. This increases the total fuel capacity to 102 gallons per wing. Total system capacity is 204 gallons of usable fuel. All tanks in this system are filled from a single point filler cap located in the outboard leading edge fuel cell. All the fuel cells are interconnected in order to make all of the usable fuel in each wing available to its engine when the fuel selector valve is turned "on".

The fuel system is actually two independent systems connected by a crossfeed. Each fuel cell (except the box section cell and outboard leading edge cell is equipped with a float-type transmitter unit. These units transmit their collective fuel quantity for each wing to the gage for that wing. The fuel quantity gage is measured in gallons per wing.

A submerged boost pump is located in each inboard leading edge tank. The boost pumps are controlled by separate ON - OFF toggle switches located on the pilot's subpanel. If a boost pump should fail, a pressure switch (located in the fuel line) will cause the respective BOOST PUMP FAIL sign on the annunciator panel to illuminate.

The fuel system is drained by 6 snap-type drains under the wings. A drain is located in each leading edge cell, box section cell and in the fuel strainer. An additional fuel strainer drain for the heater fuel line is located in the nose wheel well.

AIRCRAFT DEFUELING

To insure that all fuel is removed from the system, the fuel should be drained through the boost pumps. To expedite the defueling operation, the boost pumps may be used to pump the fuel out of the system. The following steps must be accomplished before emergizing the pumps:

a. Apply external power to the aircraft electrical system.

b. Place the fuel selector valve in the "ON" position and the mixture lever in "IDLE CUT-OFF".

c. Remove the filler caps to vent the system.

d. Disconnect the fuel line at the firewall and attach a drain hose. Provide a suitable container for the fuel.

e. Energize the boost pumps.

f. When fuel is no longer pumped from the aircraft, open the sump drains to complete the defueling operation.

ADJUSTING THE FUEL PRESSURE (ENGINE-DRIVEN FUEL PUMP)

a. The fuel pump is located at the rear, on the lower right side of the engine.

b. Install a fuel pressure gage (0-30 psi range) and a "T" fitting on the pressure side of the pump.

c. Break the safety wire and loosen the lock nut on the adjusting screw.

d. Disconnect and plug the air reference line from the engine pump.

NOTE

> Allow the air reference line fitting on the fuel pump to remain open while adjusting the pressure on the pump.

e. Operate the engine at 2100 rpm and set the engine pump to 23 psi with the boost pump off.

f. Reinstall the air reference line to the pump.

g. Tighten the lock nut and safety wire.

ENGINE-DRIVEN FUEL PUMP REMOVAL AND INSTALLATION

a. Access to the engine-driven fuel pump is gained through the right cowl door on each nacelle.

b. The fuel pump is located at the rear, on the lower right side of the engine.

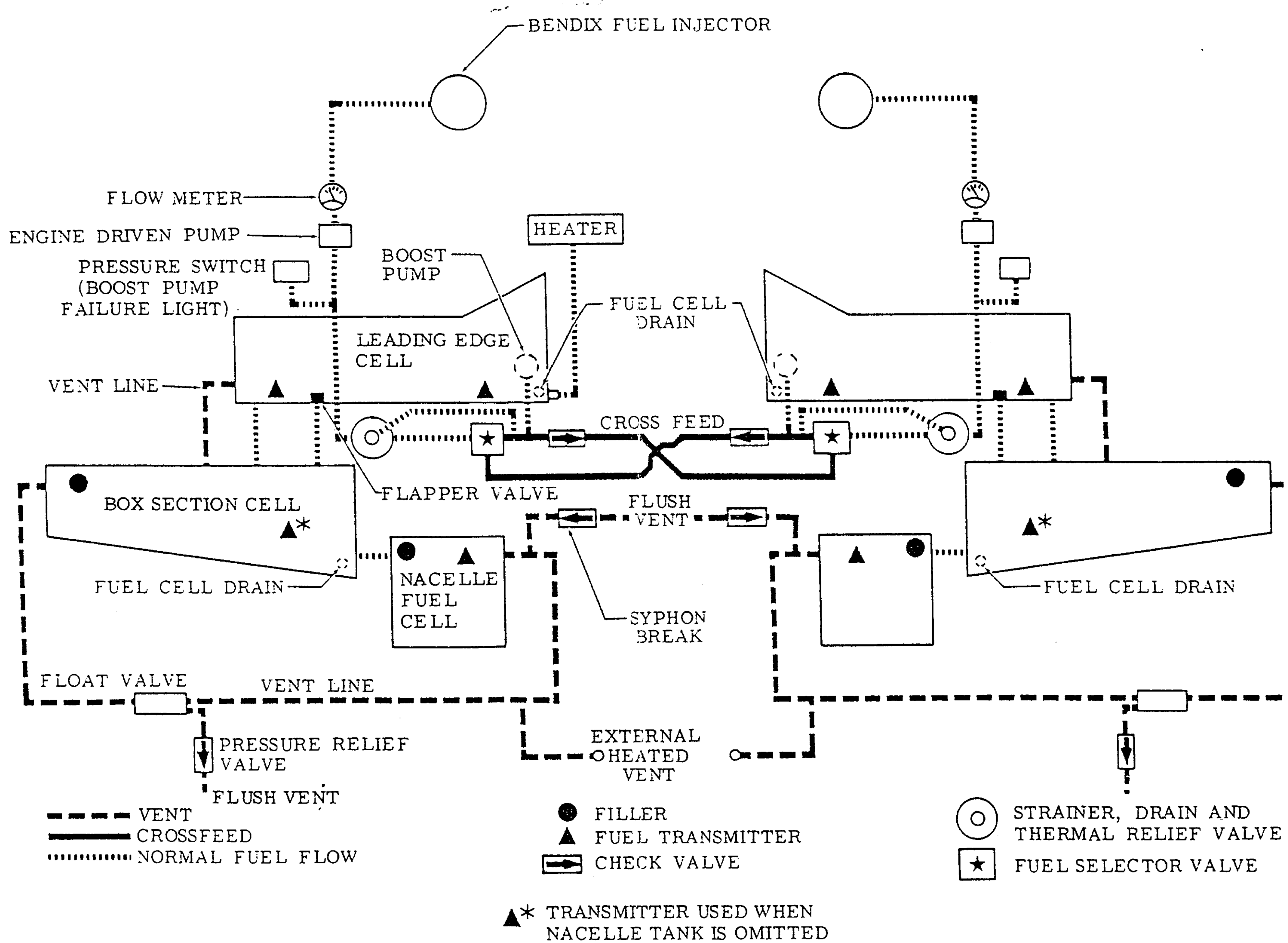


Figure 8-1. Fuel System Schematic (TG-1 through TG-68)

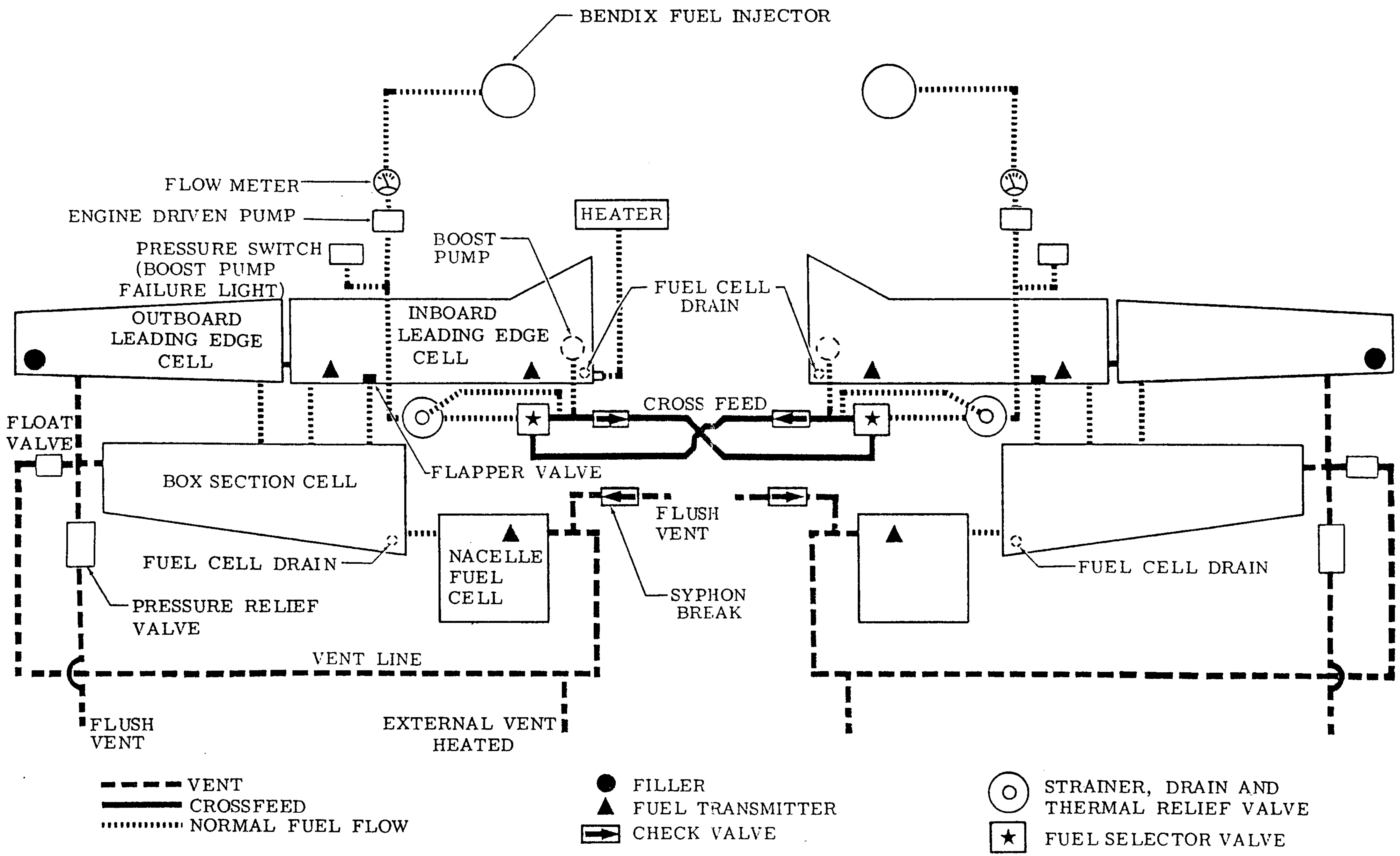


Fig. 8-1A. Fuel System Schematic (TG-69 and after)

c. Disconnect the fuel plumbing and drain plumbing from the pump. Remove the fuel pump heat shield (TG-63 and after). (See Service Instructions No. 0007-283 for prior aircraft).

d. Remove the pump retaining nuts and remove the pump.

e. To install the pump, reverse the preceding steps.

REMOVING AND INSTALLING FUEL BOOST PUMP (ELECTRIC)

a. Drain and purge the fuel system for the appropriate wing.

b. Make sure the electrical power to the boost pump is off.

c. Remove the boost pump access cover on the underside of the wing.

d. Disconnect the electrical leads to the pump.

e. Cut the safety wire from around the retaining bolts and remove the bolts.

f. Pull the pump down far enough to gain access to the pump outlet line.

g. Disconnect the outlet line and remove the pump.

h. Install the pump by the reverse of the above procedure. Torque the pump mounting bolts to 20-30 inch-pounds and safety wire.

TESTING THE FUEL QUANTITY TRANSMITTER

a. To check the resistance of the transmitter, place an ohmeter between the transmitter cover and the terminal stud.

b. Refer to the chart below to determine the desired resistance readings.

FUEL QUANTITY GAGE RESISTANCE READINGS

	TG-1 through TG-68	TG-69 through TG-83	TG-84 and after
Nacelle Fuel Cell	0.0 ±2 ohms full, 40 ±3 ohms empty	0-0.5 ohms full, 30 ±2 ohms empty	0-0.5 ohms full, 90 ±2 ohms empty
Leading Edge (Inbd)	0.0 ±2 ohms full, 120 ±3 ohms empty	0-0.5 ohms full, 30 ±2 ohms empty	0-0.5 ohms full, 90 ±2 ohms empty
Leading Edge (Outbd)	0.0 ±2 ohms full, 120 ±3 ohms empty	0-0.5 ohms full, 30 ±2 ohms empty	0.0.5 ohms full, 90 ±2 ohms empty
Box Section	0.0 ±2 ohms full, 120 ±3 ohms empty		

ADJUSTMENT OF THE FUEL QUANTITY TRANSMITTER

a. If the resistance reaches the desired reading before the transmitter float reaches the full position, bend the float arm up slightly.

b. If the resistance reaches the desired reading before the transmitter float reaches the empty position, bend the float arm down slightly.

c. After completing the above operation, check the transmitter in the full and empty conditions.

REMOVING AND INSTALLING THE FUEL SELECTOR VALVES

a. Drain the fuel system.

b. Place the aircraft on jacks and partially retract the gear until the inboard main gear door is fully extended.

c. Remove the selector control cable. (See Control Cable Removal.)

d. Remove the fuel selector valve plumbing.

e. Remove the bolts securing the selector valve to the mounting bracket.

f. Assembly is accomplished by the reversal of the above procedure. Lubricate the fuel line threads with anti-seize compound (See Table of Thread Lubricants) before installation.

Refer to the rigging procedure for the control cable installation.

FUEL SELECTOR VALVE CONTROL CABLE RIGGING.

(Figure 8-3)

To aid in the rigging procedure, a locally manufactured "rigging tool" (see Figure 8-2) may be constructed for turning the selector gear. Tubing of 1/4 or 3/8 inch diameter is used for the handle and 1/8 inch steel pins are used for the protrusions which contact the selector gear.

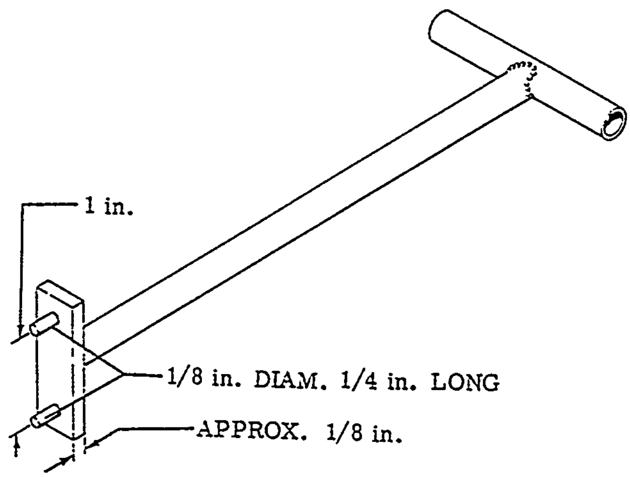


Figure 8-2. Rigging Tool

a. Remove the cover plate (not shown), stop screw (1) and overtravel tube (2) from the fuel selector valve gearbox (3) located in the wheel well.

b. Using the rigging tool, set the selector gear (4) in the "CROSSFEED" position. The arrow on the selector gear should be positioned at 12 o'clock.

c. Set the selector handle pointer on the fuel selector panel, 180° from the "ON" position and hold firmly in this position.

d. Insert the control cable (5) through the overtravel port and rotate the cable (LH thread) to engage two threads in the selector valve gear.

e. Rotate the selector gear 6-3/4 revolutions to feed the control cable through its housing up to the fuel selector panel gearbox in the cockpit.

f. Screw the cable in (LH thread) until the cable end is 4.3 inches minimum to 4.5 inches maximum from the face of the overtravel port. It will be necessary to have someone hold the selector handle pointer in position until the control cable is engaged with the gears in the fuel selector panel.

g. Move the fuel selector handle pointer to the "CROSSFEED" position. The arrow on the selector gear should now be at the 12 o'clock position. The cable end should measure 2.7 inches minimum to 3.3 inches maximum from the overtravel port.

h. Install the stop screw and install and safety the overtravel tube. Place the selector handle in all positions to insure proper selection and operation.

i. Install and safety the cover plate. No lubricant is used on the fuel selector valve.

FUEL SELECTOR VALVE CONTROL CABLE REMOVAL

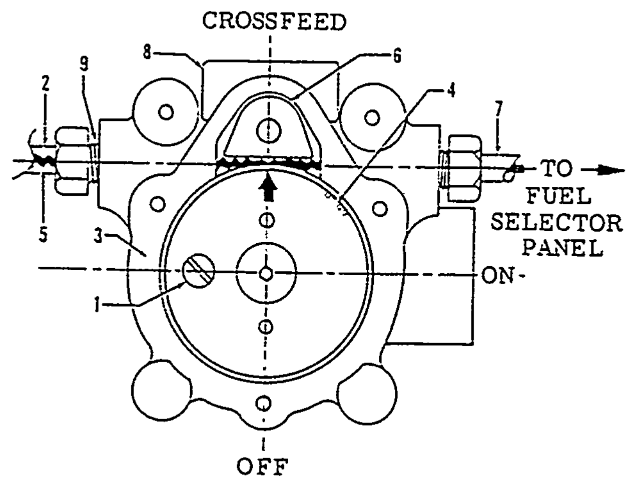
(Figure 8-3)

a. Remove the cover plate (not shown), stop screw (1) and overtravel tube (2) from the valve gearbox (3) located in the wheel well.

b. The cable may be removed through the overtravel port by rotating the selector gear.

INSTALLATION OF FUEL FLARED FITTINGS

When installing flared fittings and hoses, make sure the threads are lubricated properly (see Figure 8-4) 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.



FUEL SELECTOR VALVE
(L. H. Shown, Cover Plate Removed)

1. Stop Screw
2. Overtravel Tube
3. Selector Valve Gearbox
4. Selector Gear
5. Control Cable
6. Slider
7. Cable Housing
8. Cross Feed Port
9. Over Travel Port

Figure 8-3. Fuel Selector Valve

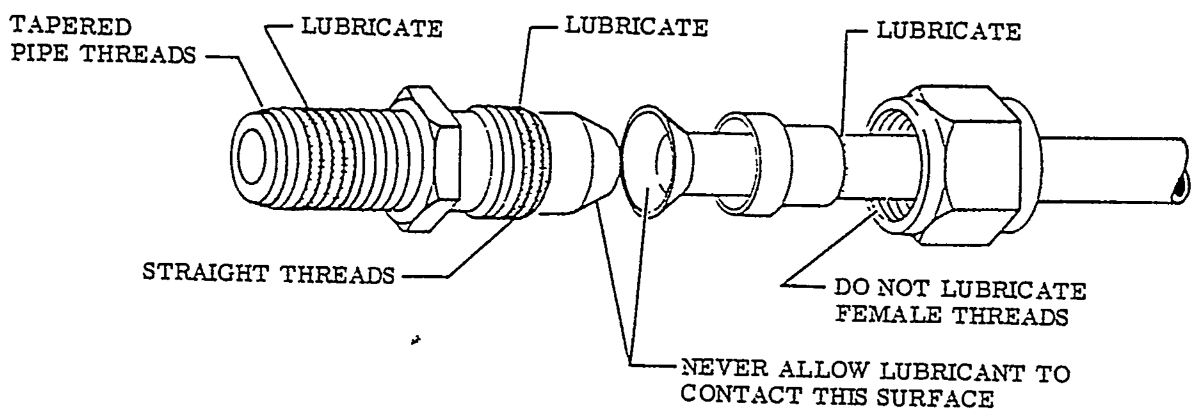
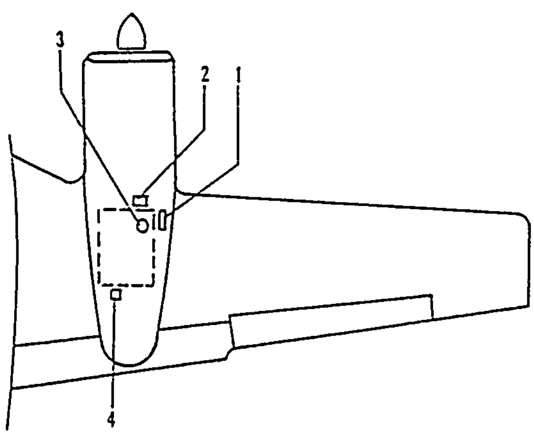


Figure 8-4. Lubrication of Flare Fittings

FLARE FITTING TORQUE CHART

TUBING OD INCHES	TORQUE - INCH POUND					
	ALUMINUM - ALLOY TUBING FLARE AND 10061 OR AND 10078		STEEL TUBING FLARE AND 10061		HOSE END FITTING AND HOSE ASSEMBLIES	
	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	---	---	---	---	---	---

NACELLE FUEL CELL REMOVAL AND INSTALLATION



1. Nacelle Fuel Cell Access and Transmitter
2. Forward Access Plate
3. Nacelle Filler Neck (TG-1 through TG-68)
4. Nacelle Vent Line Access Plate

Figure 8-5. Nacelle Fuel Cell Access Openings

a. Drain and purge the fuel cell.

b. Remove the fuel cell access plate (1), the forward access plate (2) and the vent line access plate (4).

c. Remove the screws securing the filler neck (3) to the nacelle skin (if installed).

d. Remove clamp from 3 inch interconnect tube in bottom of cell and the vent nipple clamp & interconnect line in wheel well.

e. Remove the fuel transmitter and the fuel cell plate (1).

f. Unsnap the fuel cell and remove it from the nacelle cavity through the access hole (1).

NOTE

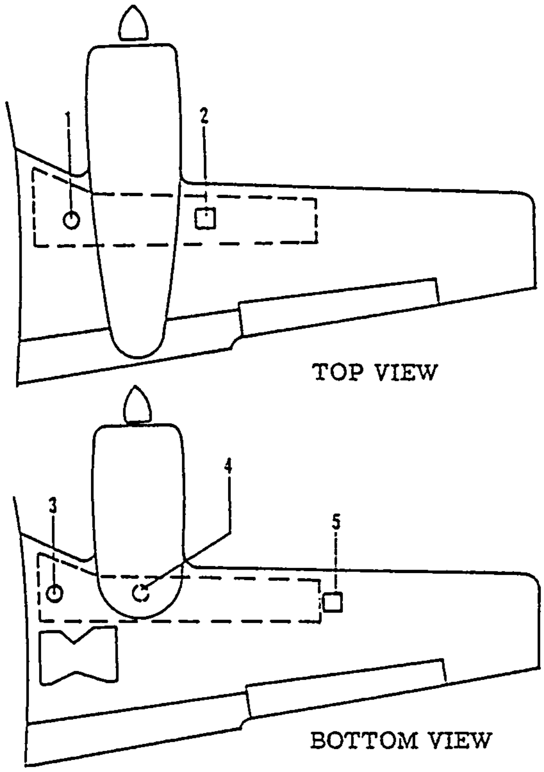
Tape edge of access hole to protect cell from damage during removal.

g. Installation is accomplished by reversing the above procedure. Use Permatex No. 2 (Item 3, Sealing Chart) between the skin and the adapter flange when installing the filler neck. Torque the bolts securing the filler neck to 45 to 55 inch pounds and safety wire. Torque the bolts securing the transmitter to 45 to 55 inch pounds and safety wire. Torque interconnect clamp to 25 ± 5 inch pounds. Torque the rubber fuel cell nipples to 25 ± 5 inch lbs.

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 or deterioration.

LEADING EDGE FUEL CELL REMOVAL AND INSTALLATION



1. Access Plate and Transmitter
2. Fuel Cell Access and Transmitter
3. Fuel Boost Pump
4. Fuel Cell Access Plate (under the removable aft nacelle section)
5. Outboard Fuel Cell Access

Figure 8-6. Leading Edge Fuel Cell Access Openings

a. Drain and purge the fuel cell.

b. Remove the fuel cell access plate (2) and transmitter.

c. Remove inboard access cover and transmitter (1).

d. Remove the access cover and the fuel boost pump (3) under the wing.

e. Remove the lower aft nacelle section and the fuel cell access plate (4). Remove the cotter pin securing the flapper valve assembly to the internal inboard interconnect. Remove the interconnect clamp.

f. Remove the outboard internal interconnect clamp through the fuel access hole (2).

g. Remove the outboard fuel cell access plate (5).

h. Disconnect all fuel and vent plumbing.

i. Unsnap the fuel cell and remove it through the fuel access hole (2).

NOTE

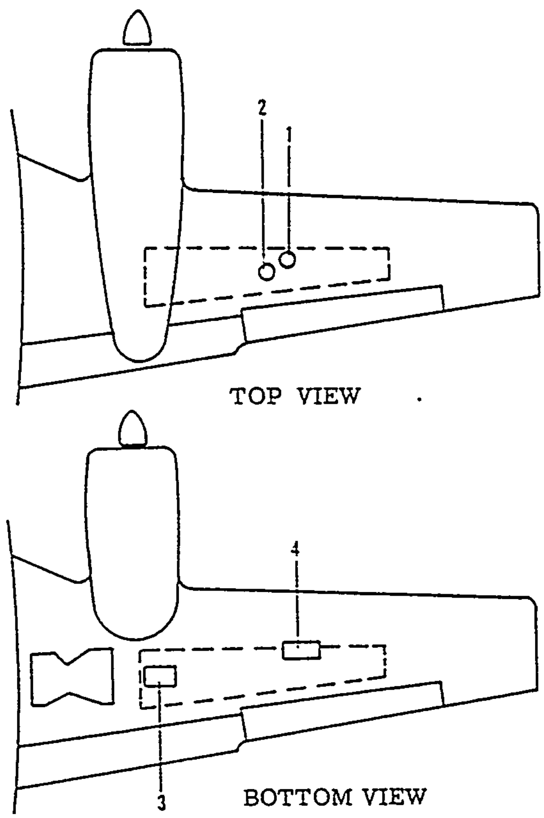
Tape edge of liner and access hole to prevent damage to cell.

j. Installation is accomplished by reversing the above procedure. Torque the transmitters to 25 inch pounds and safety wire. Torque the fuel boost pump to 20 to 30 inch pounds and safety wire. Torque the fuel cell outlet plate screws and bolts to 20 to 30 inch pounds and safety wire the bolts. Torque the fuel cell plates (2 and 4) to 45 to 55 inch pounds and safety wire. Torque interconnect clamps to 25 ± 5 inch pounds, the rubber fuel fitting nipples to 25 ± 5 inch pounds.

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 or deterioration.

BOX SECTION FUEL CELL REMOVAL AND INSTALLATION



1. Fuel Filler Neck (if installed)
2. Access Plate and Transmitter (If Installed)
3. Box Section Cell Inboard Access
4. Box Section Cell Outboard Access

Figure 8-7. Box Section Fuel Cell Access Openings

a. Drain and purge the fuel cell.

b. Remove the screws securing the filler neck (1) to the wing skin.

c. Remove the access plate (2) and the transmitter (if installed).

d. Remove the inboard (3) and outboard (4) access plates on the underside of the wing.

e. Remove the fuel cell plates and remove the internal fuel cell interconnect clamps.

f. Disconnect the drain and vent plumbing.

g. Unsnap the fuel cell and remove it from the wing cavity through the outboard access hole (4).

NOTE

Tape the edge of the access hole to protect fuel cell during removal and installation.

h. Installation is accomplished by reversing the above procedure. Use Permatex No. 2 (Item 3, Sealing Chart) between skin and the adapter flange when installing the filler neck. Torque the filler neck bolts to 45 to 55 inch pounds and safety wire. Torque the transmitter (if installed) to 25 inch pounds and safety wire. Torque the access plates (3 and 4) to 45 to 55 inch pounds. Torque the fuel cell interconnect clamps to 25 ± 5 inch pounds. Torque the rubber fuel cell nipples to 25 ± 5 inch pounds.

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 or deterioration.

OUTBOARD LEADING EDGE FUEL CELL REMOVAL AND INSTALLATION (TG-69 and after)

a. Drain and purge the fuel cell.

b. Remove the screws securing the filler neck (3) to the wing skin.

c. Remove the access plates (2) and the fuel and vent plumbing access plate (1) on the underside of the wing.

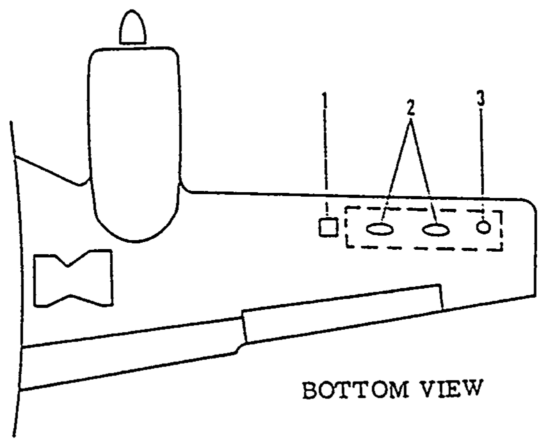
d. Disconnect the fuel and vent plumbing.

e. Remove the fuel cell plates and remove the internal fuel cell interconnect clamps.

f. Unsnap the fuel cell and remove it from the wing cavity through one of the access openings (2).

NOTE

Tape the edge of the access hole to protect the fuel cell during removal and installation.



1. Fuel Plumbing Access
2. Fuel Cell Access
3. Fuel Filler Neck

Figure 8-8. Outboard Leading Edge Fuel Cell Access Openings

g. Installation is accomplished by reversing the above procedure. Use permatex No. 2 (Item 3, Sealing Chart) between the skin and the adapter flange when installing the filler neck. Torque the filler neck bolts to 45 to 55 inch pounds and safety wire. Torque the transmitter to 25 inch pounds and safety wire. Torque the access plates to 45 to 55 inch pounds. Torque the fuel cell interconnect clamps to 25 ± 5 inch pounds and the rubber fuel nipples to 25 ± 5 inch pounds.

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 or deterioration.

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.

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

1. Attach test plates to all fitting openings except one.

2. Pour ammonia on the absorbent cloth in the ratio of 3 cc per cubic foot of cell capacity. Place the saturated cloth inside the cell and install the remaining test plate.

3. Make up a phenolphthalein solution as follows: add 40 grams phenolphthalein crystals to 1/2 gallon of ethyl alcohol, mix, then add 1/2 gallon of water.

4. Inflate the cell with air to a pressure of 1/4 psi maximum.

5. Soak a large white cloth in the phenolphthalein solution, then wring it out thoroughly and spread it smoothly on the outer surface of the cell. Press the cloth down to insure detection of minute leaks.

6. Check the cloth for red spots which will indicate a leak. Mark any leaks found and move the cloth to a new location. Repeat this procedure until the entire exterior surface of the cell has been covered. If red spots appear on the cloth, they may be removed by resoaking the cloth in the solution.

7. The solution and test cloth are satisfactory only as long as they remain clean. Indicator solution that is not in immediate use should be stored in a closed container to prevent evaporation and deterioration.

After the test, remove all plates and test equipment. Allow the cell to air out.

NOTE

In conducting the tests outlined above, the cell need not be confined by a cage or jig, providing the 1/4 psi pressure is not exceeded.

FUEL CELL REPAIR

REPAIR OF RUBBER FUEL CELLS (GOODYEAR)

The following items for field repairable injuries (inside or outside) are permissable. Damaged cells, not covered by these items, should be returned to the Goodyear Tire and Rubber Company, Rockmart, Georgia, for repair.

1. Punctures

2. Slits - to maximum 3 inch length

3. Abraided holes

4. Loose hangers and glove snaps (hot repair only)

Repair the fuel cell as follows:

a. Thoroughly clean the damaged area, (at least one square foot surrounding the injury) with Methyl-Ethyl-Ketone solvent. Three washings are recommended to assure cleanliness.

b. Cut a patch from repair material furnished in repair Kit, No. 2F1-2-31853, large enough to extend beyond damaged area by 2 inches in all directions. The patch should be thinned toward the edges.

c. Place the dull or gum stock side of the patch next to the cell. Wash the patch thoroughly in Methyl-Ethyl-Ketone.

NOTE

No patch is required for loose hanger or glove snap repair, but heat must be used for curing.

d. Mix the cement in the following proportions and sequence. Use one quart can containing 272 grams of 2342C, heat if necessary to liquify. To this add one can of 2233C (185cc) and stir until smooth (a minimum of 5 minutes is required).

e. Apply two evenly brushed coats of cement to the cell and patch surface. Allow 30 minutes drying time between the second coat and the application of patch (do not use cement after it has been mixed more than two hours).

f. Center repair patch over repair area and roll down firmly using the 1 inch stitcher. Start rolling from center of patch to the outside edge. This will remove any trapped air. Hanger or glove snap repairs use the same cementing and drying time as regular repair but will require heat for curing.

g. Place cellophane over repair and on inside of cell under repair. It is very important that the cellophane on the inside of the cell be placed under the repair area, thus preventing the two inside surfaces of the cell from being cemented together. Over the outside cellophane place the 1/4 inch cloth backed foam rubber, cloth side up. Over the foam rubber place a 1/4 x 6 x 6 aluminum plate and place a "C" clamp (8 inch min. clamp) over the metal plate and underneath the work bench top. With patch and plate centered over repair area, tighten the "C" clamp until cement is forced out under edges of the repair (let cure for 72 hours).

NOTE

Air cured repairs are to be made at room temperature of approximately 75° F. Add 25% to the cure time for each 10° drop in temperature.

If heat is to be used for curing, insert heat from No. 2F1-3-25721 cure iron (contained in Kit No. 2F1-2-31234) between "C" clamp until cement is forced from edges of the patch. Cure for 2 hours at 240° F. Allow iron to cool for 15 to 20 minutes before removing. Remove iron, metal plate, foam rubber and cellophane. Dampen cellophane with water, using a sponge, and remove by peeling off. Loose edges of patch up to 1/4 inch maximum may be trimmed off and buffed smooth. Protect area of tank around buffed area with masking tape. Loose edges exceeding 1/4 inch may be re-cemented using the same cure procedure as previously used.

Storage and Handling: Prior to storage, clean the cell with warm water and soap. Dry and wrap in as small a package as possible and place in a cardboard box. Store in a cool dry room away from any electric motor that might be in operation.

Materials and Equipment needed for repair:

a. Air Cure: (Kit 2F1-2-31853)

QUANTITY	NOMENCLATURE	GOODYEAR PART NO.
2 Qts.	Cement	2342C
2 1/2 Pts.	Mixture	2333C
2 Bottles	Mixture	2315C
2 (1 Pts.)	Methyl-Ethyl-Ketone	
1 Sheet 12" x 12"	Patch	BTC 39
1 Sheet 12" x 24"	Cellophane	
1 Sheet 1/4 x 12" x 12"	Foam Rubber, Cloth Back	

b. Heat Cure: (Kit No. 2F1-2-31234). Kit consists of all the above items listed in the air cure repair kit, plus the following items:

QUANTITY	NOMENCLATURE	GOODYEAR PART NO.
1	1" Paint Brush	
1	1" Stitcher	
1	Cure Iron (240° F)	2F1-3-25721
2	1/4" x 6" x 6" Aluminum Plate	

THE HEATER CONTROL SYSTEM

(Figure 10-1)

(TG-1 through TG-62)

The heating system consists of a 55,000 BTU combustion air heater, (located in the fuselage nose section) a six position mode switch, vent air blower, combustion air blower, two heater fuel pumps, four cabin outlet ducts, a defroster duct, an automatic temperature control and three sensing elements. The six position mode switch controls the heater and air conditioner systems.

The CABIN AIR control is attached to the iris valve, located at the heater inlet, and controls the heater and air conditioner air valve switch. When the control is pulled out (closing the iris valve) the air valve switch will shut down the heater. If the CABIN AIR control is pushed in (opening the iris valve) the switch will shut off the air conditioner.

When placed in AUTO HEAT or AUTO COOL, the heating and air conditioning are automatically controlled through the temperature controller, located on the forward cockpit bulkhead. The temperature controller regulates the comfort level by "balancing" the readings transmitted by sensors located in the heater inlet, cabin overhead air panel and heater outlet duct. The heater is cycled by a 180°F thermal switch in the heater outlet duct. When the mode switch is placed in the BLOWER position, the vent air blower on the heater intake is activated. The blower will operate if the landing gear is in the extended position only; if the gear is retracted, the blower will shut off. When the aircraft is in flight, the heater relies on ram air and an additional combustion air blower, which operates continually, to supply air at high altitudes.

The CABIN TEMPERATURE control is located next to the CABIN AIR control on the left side of the subpanel. When the mode switch is in the AUTO COOL or AUTO HEAT position, the CABIN TEMPERATURE control may be used to increase the temperature (turn to the right) or decrease the temperature (turn to the left). The CABIN TEMPERATURE control will not work in any other mode.

An 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.

NOTE

Single or dual heater fuel pump operation is controlled by the landing gear limit switch. While on the ground, or with the landing gears extended, heater operation is supplied by one heater fuel pump. During flight, or with landing gears retracted, heater operation is supplied by both heater fuel pumps.

(TG-63 and after)

A three position heater control switch replaces the automatic heat control switch on aircraft (TG-63 and after) that are not equipped with air conditioning. The ventilation blower, which operates through the landing gear down limit switch, provides ventilation air only when the aircraft is on the ground and the BLOWER position is selected. When the HEAT position is selected, the heater operational limits are controlled by the heater ductstat. As heat increases to 200° ±5°, the ductstat shuts off the heater fuel solenoid and fuel pumps; when the temperature has dropped below 60° ± 2 °, the ductstat activates the fuel pumps and fuel solenoid and the heater ignites.

RIGGING THE HEATER CONTROLS

The CABIN AIR control, on the far left side of the subpanel, controls the iris valve at the heater inlet and the heater-airconditioner air valve 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 air valve switch is positioned on the underside of the radio shelf and may be adjusted by moving the switch back or forth in its mounting slot. Pull the CABIN AIR control until it reaches the midpoint of its travel and adjust the air valve switch to actuate at this point.

The pilot and copilot air vent doors above the rudder pedals are controlled by individual push-pull knobs located below the left and right subpanels. The doors are adjusted at the attachment of the cable and vent door on the forward cabin bulkhead.

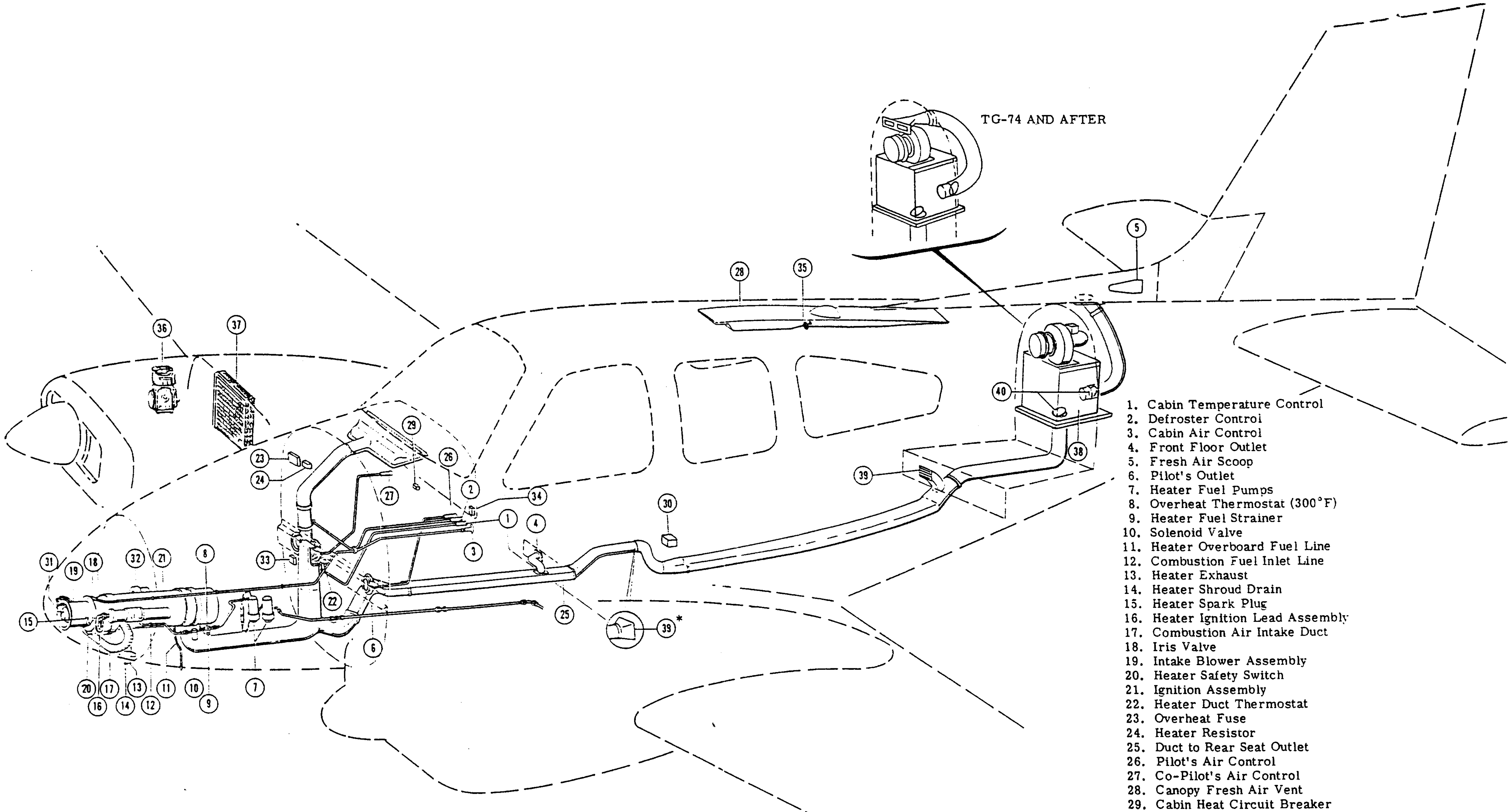
HEATER ELECTRICAL SYSTEM

OVERHEAT THERMOSTAT

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 temperature above 300 degrees Fahrenheit. The heater is not designed for higher temperature and fire may result.



1. Cabin Temperature Control
2. Defroster Control
3. Cabin Air Control
4. Front Floor Outlet
5. Fresh Air Scoop
6. Pilot's Outlet
7. Heater Fuel Pumps
8. Overheat Thermostat (300°F)
9. Heater Fuel Strainer
10. Solenoid Valve
11. Heater Overboard Fuel Line
12. Combustion Fuel Inlet Line
13. Heater Exhaust
14. Heater Shroud Drain
15. Heater Spark Plug
16. Heater Ignition Lead Assembly
17. Combustion Air Intake Duct
18. Iris Valve
19. Intake Blower Assembly
20. Heater Safety Switch
21. Ignition Assembly
22. Heater Duct Thermostat
23. Overheat Fuse
24. Heater Resistor
25. Duct to Rear Seat Outlet
26. Pilot's Air Control
27. Co-Pilot's Air Control
28. Canopy Fresh Air Vent
29. Cabin Heat Circuit Breaker
30. Cabin Temperature Sensor
31. Outside Air Temperature Sensor
32. Combustion Air Blower
33. Temperature Controller
34. Six-Position Mode Switch
35. Overhead Fresh Air Control
36. Compressor
37. Condenser
38. Evaporator
39. Rear Floor Outlet
40. Butterfly Valves

* Location Without Optional Air Conditioning

Figure 10-1. Heating, Ventilation and Optional Air Conditioning.

To determine the temperature at which the points close, place the thermostat and a thermometer into a pail of oil. Heat the oil slowly until the points close.

If it is necessary the overheat thermostat may be adjusted 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 screw should be turned to increase the temperature setting. One turn will change the temperature setting approximately 125 degrees Fahrenheit.

CLEANING HEATER SPARK PLUG

a. Remove the nose cone, heater vent blower and iris valve assembly. 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, (Item 15, Consumable Material Chart) 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.

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.

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 the alternate set of points should be put in use. When the alternate set of points has been used for 1000 hours, replace the vibrator. Failure to switch to the alternate set of points at 1000 hours may make the alternate set of points inoperative.

The duplicate set of points are placed into service by adding an 18 gage jumper wire between terminals "A" and "B" of the heater ignition unit (see wiring diagram) on aircraft serials TG-1 through TG-51. On aircraft, serials TG-52 and after, this is accomplished by a switch on the LH subpanel.

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.

REPLACING IGNITION VIBRATOR

a. Remove the safety wire and the vibrator retaining ring (1).

b. Remove the vibrator (2) and radio noise shield (3).

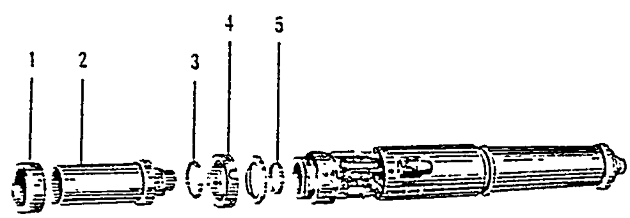
NOTE

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).



1. Retaining Ring
2. Vibrator
3. Radio Noise Shield
4. Support Collar
5. O-ring Packing

Figure 10-2. Ignition Unit Assembly

REMOVING AND INSTALLING THE CABIN HEATER

a. Remove the nose cone (disconnect the nose taxi light wiring on airplanes incorporating the optional taxi light).

b. Disconnect the iris valve control and blower wiring. Remove the clamp that secures the blower to the supporting bracket.

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 ignitor.

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 the 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°.

m. Make certain the clamps securing the inlet and outlet plenums are properly positioned to prevent damage to the plenums.

n. Use Item 4. Sealing Chart as required to obtain a good seal between the iris valve and the fiberglass plenum.

REMOVING AND INSTALLING THE HEATER VENT AIR BLOWER

a. Remove the nose cone (disconnecting the nose taxi light wiring on airplanes incorporating the optional taxi light).

b. Disconnect the electrical wiring at the blower.

c. Disconnect the iris valve control at the iris valve.

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 installing the blower, apply Item 4, Sealing Chart as needed to obtain a good seal between the iris valve and the fiberglass plenum.

REMOVING AND INSTALLING THE COMBUSTION AIR BLOWER

The combustion air blower is located under the nose baggage compartment floor along the right keel directly aft of the forward bulkhead. The blower intake and exhaust ducts extend through the forward bulkhead. To remove the blower assembly, use the following procedure:

a. Remove the nose cone (disconnect the nose taxi light wiring on airplanes incorporating the optional taxi light).

b. Disconnect the electrical wiring at the blower.

c. Remove the screws securing the blower mounting bracket to the keel.

d. Remove the wire screen over the end of the blower intake duct.

e. Remove the screws securing the blower intake duct to the bulkhead.

f. Remove the clamps and pull the flexible combustion air hose from the blower exhaust duct.

g. Remove the screws securing the blower exhaust duct to the bulkhead.

h. Turning the blower assembly slightly to gain clearance for the intake duct, lift the blower assembly out through the baggage compartment. Installation is accomplished by the reversal of the above procedure.

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. The heater should be subjected to this pressure test after each 500 hours of heater operation or 1000 hours of airplane operation.

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 exceeds this limitation, remove the heater and repair the leak. If the pressure drop is still excessive, the heater should be overhauled. The heater is normally overhauled every 1500 hours of heater operation or 3000 hours of airplane operation.

HEATER FUEL SYSTEM

HEATER FUEL PUMPS

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

(See Bendix Electric Fuel Pump Installation and Service Instructions, Form EM-236 and Supplement No. 1 for detailed coverage of the heater fuel pump).

HEATER FUEL PUMP REMOVAL AND INSTALLATION

Two electric fuel pumps, connected in series for high pressure, are located on the left side of the nose wheel well. To remove the pumps, the following must be accomplished:

a. Drain all fuel from the left wing cells.

b. Disconnect the electrical plugs from the pump condensers.

c. Disconnect the inlet and outlet lines to the pump.

d. Remove the nuts securing the pump mounting base to the aircraft.

The installation of the fuel pumps is accomplished by reversing the above procedure.

HEATER FUEL FILTER

A fuel filter is installed in the nose wheel well next to the heater fuel pumps 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.

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 iris valve assembly.

d. Remove the blower attaching clamp and disconnect the iris valve control.

e. Unfasten the clamp securing fiberglass plenum to the heater and lift plenum and blower assembly forward.

f. Disconnect the ignition lead at 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.

AIR CONDITIONING SYSTEM (OPTIONAL)
(Figure 10-3)

The air conditioning system is a recirculating air cooling system containing a 14,000 BTU Freon refrigerative type cooler. The unit is controlled by an automatic temperature control and three sensing elements.

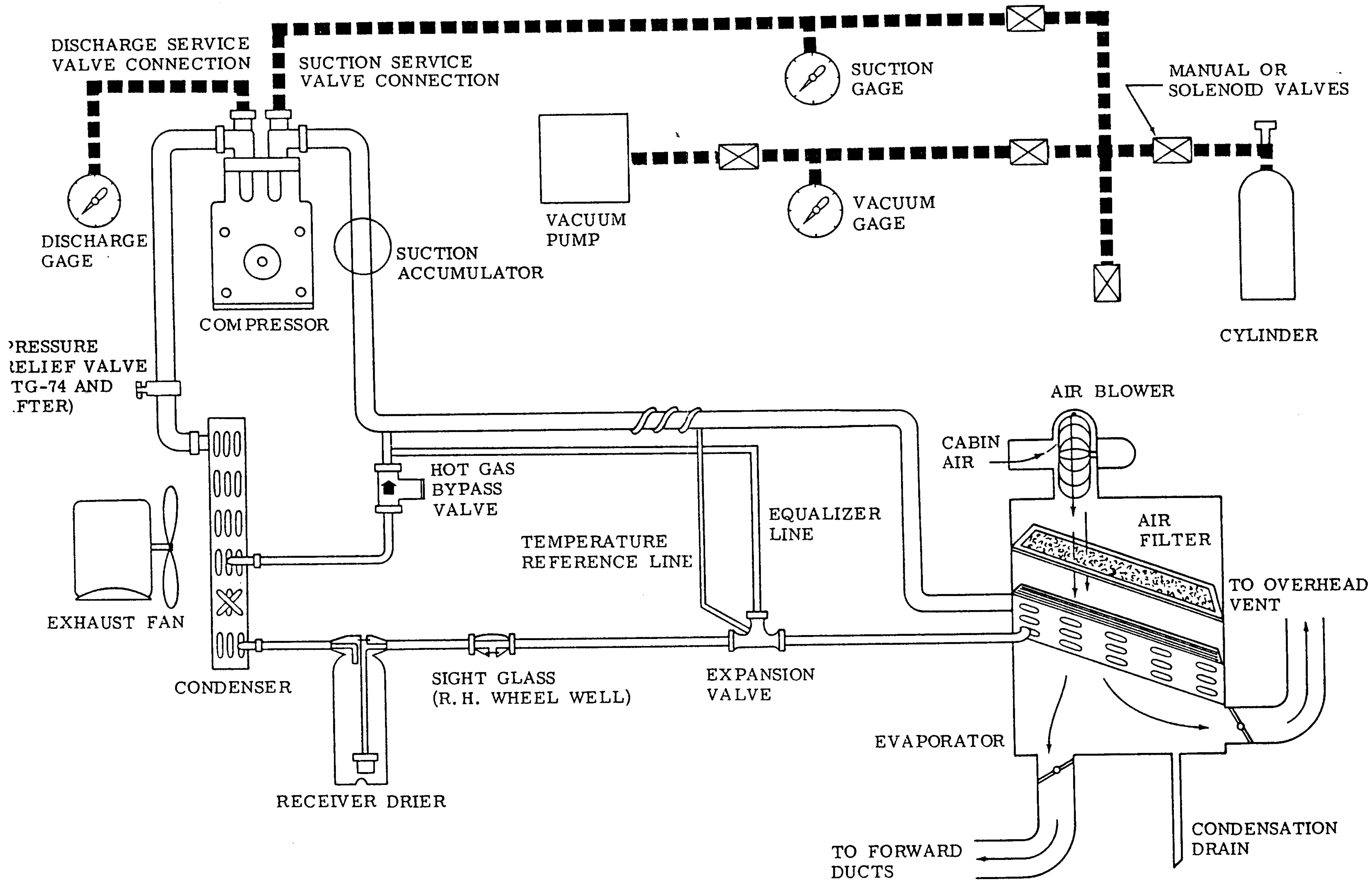


Figure 10-3. Air Conditioner and Service Schematic

A six position mode switch controls the heater and air conditioner systems; however, each system operates independently of the other. When placed in AUTO position, the temperature is automatically controlled through the temperature controller located on the forward cockpit bulkhead above the copilot pedals. It also regulates the cabin temperature variations monitored at the sensing units. The sensing units are located in the cabin overhead fresh air vent, at the heater inlet and the heater outlet duct.

A fresh air inlet shut off door is located in the dorsal fin airscoop. A push-pull control located in the overhead fresh air panel controls the airscoop door. This door should be kept closed to prevent heater and air conditioned air loss.

The air scoop and ramp assembly located in the upper RH nacelle controls the air circulation through the condenser compartment and is completely automatic. The air scoop and ramp assembly has three positions: "closed" (when the air conditioning is not in use), "flight" (air scoop extended about 2 inches above the nacelle), and "ground" (air scoop fully extended). When the air conditioning is turned on, a switch incorporated in the landing gear selects air scoop position: gear down, the air scoop will open to the "ground" position; gear off the ground, the air scoop will open or lower to the "flight" position. The condenser fan operates any time the air conditioning mode is selected.

FREON REFRIGERATIVE AIR COOLING SYSTEM

The air conditioning system is similar to many home and automotive units and consists of six major components. (See Air Conditioner Schematic.) The belt-driven compressor, which is coupled by a magnetic clutch, compresses the Freon to a high pressure, high temperature gas. At aircraft TG-74 and after, a pressure relief valve is installed in the line to prevent excessive pressure buildup in the system. The gas passes through the condenser where cooling air removes heat from the gas, condensing it to a liquid state. The liquid is then stored in the receiver-dryer where any moisture or foreign material is removed from the system. The Freon flows to the expansion valve where it is metered into the evaporator at a rate which allows all the liquid to return to a gas. The heat required for evaporation is absorbed from the cabin air passing over the evaporator coils. After passing through the evaporator, the Freon returns to the compressor at a reduced pressure. For partial cooling, a hot gas bypass valve allows a portion of the gas to bleed off from the condenser, cycling back through the compressor.

SERVICING THE AIR CONDITIONER

Servicing the air conditioner system consists of checking and maintaining the correct refrigerant level, compressor oil level, belt tension and belt condition.

SPECIAL SERVICING PRECAUTIONS

When working on a Freon refrigerative air cooling system, observe the following special servicing precautions:

a. Remember, this is a high pressure system. When disconnecting a Freon line, loosen the fittings just enough to bleed off pressure slowly, then disconnect the fitting.

b. Whenever a Freon line is disconnected, purge the entire system with a vacuum pump operating at the 125 micron level.

c. Use only refrigerant 12 in this system; other refrigerants, particulary those containing methyl chloride, will cause rapid deterioration of the aluminum compressor components.

d. When servicing the system with R-12, avoid smoking or working near an open flame. R-12 passing over an open flame will produce a highly toxic Phosgene gas.

CHARGING THE FREON SYSTEM

The system should be recharged when:

a. The Freon level is insufficient or the Freon observed through the sight glass (see Figure 10-4) in the right hand wheel well contains bubbles or appears milky.

b. Leaks are detected after inspection with a halide gas torch.

c. Air has entered the system.

d. Freon carrying components have been replaced.

The Freon system should be serviced by a qualified air conditioner service man. The Air Conditioner Schematic shows a typical service unit hook-up.

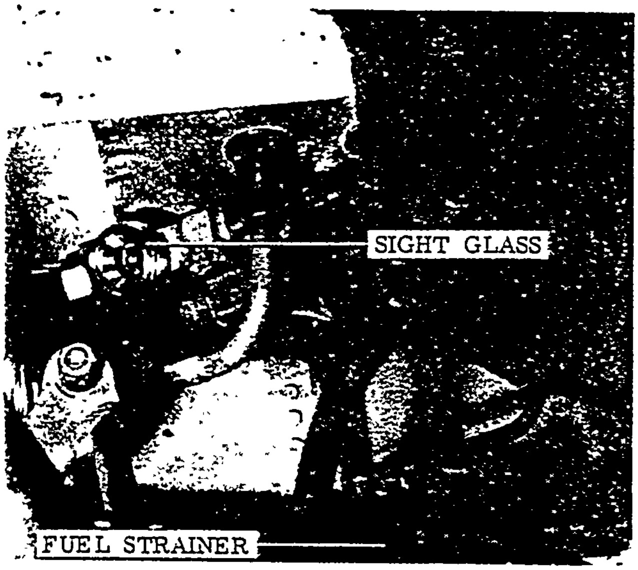


Figure 10-4. R.H. Wheel Well Looking Forward

NOTE

The Freon system contains a total charge of 5 pounds 4 ounces of Refrigerant 12.

Hook the service unit to the connections on the compressor. The abbreviation DISCH or the letter "D" on the compressor cylinder head designates the discharge service valve. The word SUCTION or the letter "S" on the compressor cylinder head designates the suction service valve.

Charge the system until the flow stops. The Freon should be added in a vapor form to prevent liquid "slugging", which may cause damage to the compressor. After the system has been fully charged and run approximately 15 minutes, the compressor oil level should be checked as outlined below.

CHECKING COMPRESSOR OIL LEVEL
(Figure 10-5)

The compressor oil level should be checked by a qualified air conditioner service man at the following times:

a. After the air conditioner has operated for the first time.

b. At the beginning of each season's operation.

c. When oil is emitted from the compressor during servicing operation.

d. After Freon system is recharged.

The compressor is charged with 5/8 pint of 500 viscosity, Suniso Number 5 or Texaco Capella E oil. Only these or equivalent oils should be used when adding oil.

e. To check the compressor oil level, use the following procedure:

1. Operate the air conditioner for approximately 15 minutes.

2. Attach service gages to compressor service valve ports.

3. With air conditioner operating, slowly close the suction service valve until the suction pressure gage reads 0 or slightly below.

4. Stop the air conditioner and quickly close the suction service valve when the suction gage reads a little above 0.

5. Close the discharge service valve.

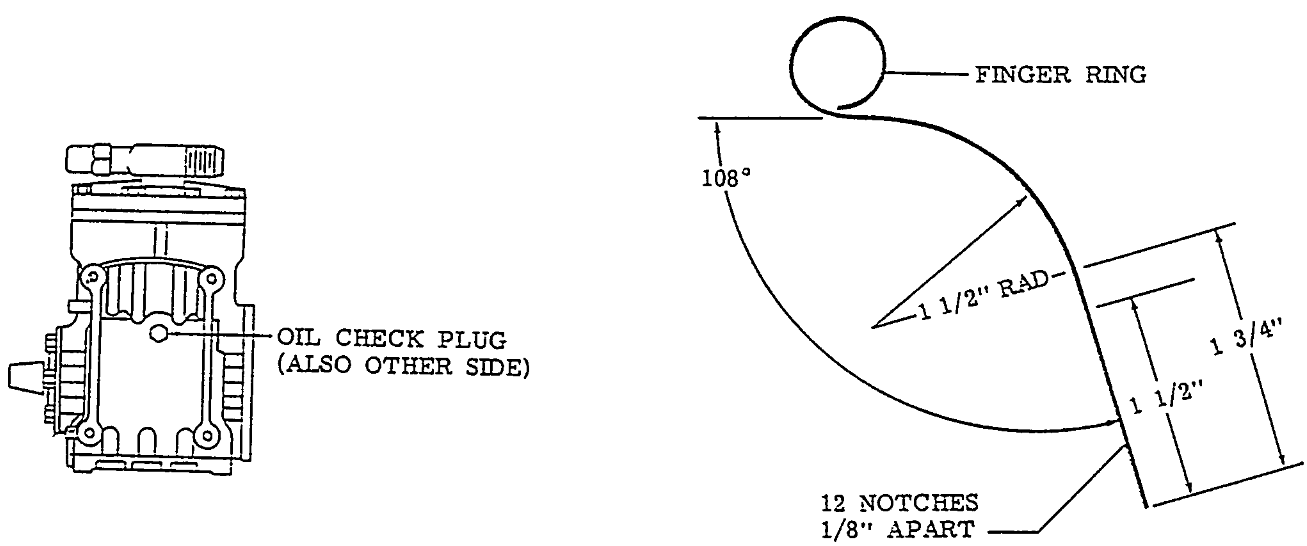


Figure 10-5. Compressor Oil Check Plug And Dipstick

OIL LEVEL					
MINIMUM		NORMAL		INITIAL CHARGE	
Dip Stick Depth	Oil Quantity	Dip Stick Depth	Oil Quantity	Dip Stick Depth	Oil Quantity
7/8"	6 oz.	1"	8 oz.	1-1/8"	10 oz.

6. With both service valves closed, the suction pressure will slowly rise to about 5 pounds gage pressure.

7. The remaining pressure is relieved by unscrewing the oil check plug 5 full turns and bleeding off the pressure until the gage reads 0.

8. Remove the oil plug and "O" ring and determine the oil level on the dip stick by the oil level chart. To place the crank throw in the best position for dip stick insertion, point the keyway on the compressor shaft up toward the cylinder head.

A locally manufactured dip stick (see Figure 10-5) may be fabricated from 1/8" diameter rod; a non ferrous material, which is not subject to corrosion, is preferred. Notches cut 1/8" apart will aid in visually detecting oil depth.

COMPRESSOR BELT TENSION ADJUSTMENT

After 36 to 48 hours operating time, a new belt will stretch to it's normal operating length. The belt tension should be checked at this time and adjusted (by moving the compressor up or down in it's slotted mounts) so the belt can be twisted, with some effort, 1/4 to 1/2 turn at a point midway on the longest span.

RIGGING THE AIR SCOOP AND RAMP ASSEMBLY

(Figure 10-6)

The air scoop and ramp assembly is rigged by adjusting the two push rods located on each side of the assembly. With the air scoop in the "closed" position, adjust the air ramp until it's trailing edge is flush with the upper nacelle skin.

Two limit switches control the air scoop actuator travel for the "flight" (or intermediate) position. The "extend" switch that limits upward travel is located on the right side of the air scoop. The "retract" switch that limits the downward travel is located on the left side of the air scoop. Because the area of operation is overlapped by the two limit switches, the switch that governs air scoop travel in a specific (up or down) direction must actuate first. To adjust the switches, raise the air scoop 1.9 inch above the top of the nacelle. Move the switches in their slotted mounts until they actuate (a distinct click will be heard) in the following order: the "extend" switch actuates first when the air scoop moves up from the "closed" position; the "retract" switch actuates first when the air scoop moves down from the "ground" position.

CONDENSER AND EXHAUST BLOWER REMOVAL AND INSTALLATION

The condenser compartment is located aft of the right nacelle firewall.

a. Remove the screws securing the skin covering the condenser compartment. Position the air scoop and ramp vertically to remove the skin.

b. Remove the pins attaching the push rod clevises to the air ramp. Remove the pins at the air ramp hinge points and lift the air ramp out.

c. Disconnect the electrical wiring at the terminals on the exhaust blower. Remove the screws securing the blower to its' mounting bracket and then lift out the blower.

d. Remove the screws securing the blower mount bracket and the two baffles to the condenser compartment. Lift out the mounting bracket and baffles.

e. Disconnect the fittings on the condenser and cap.

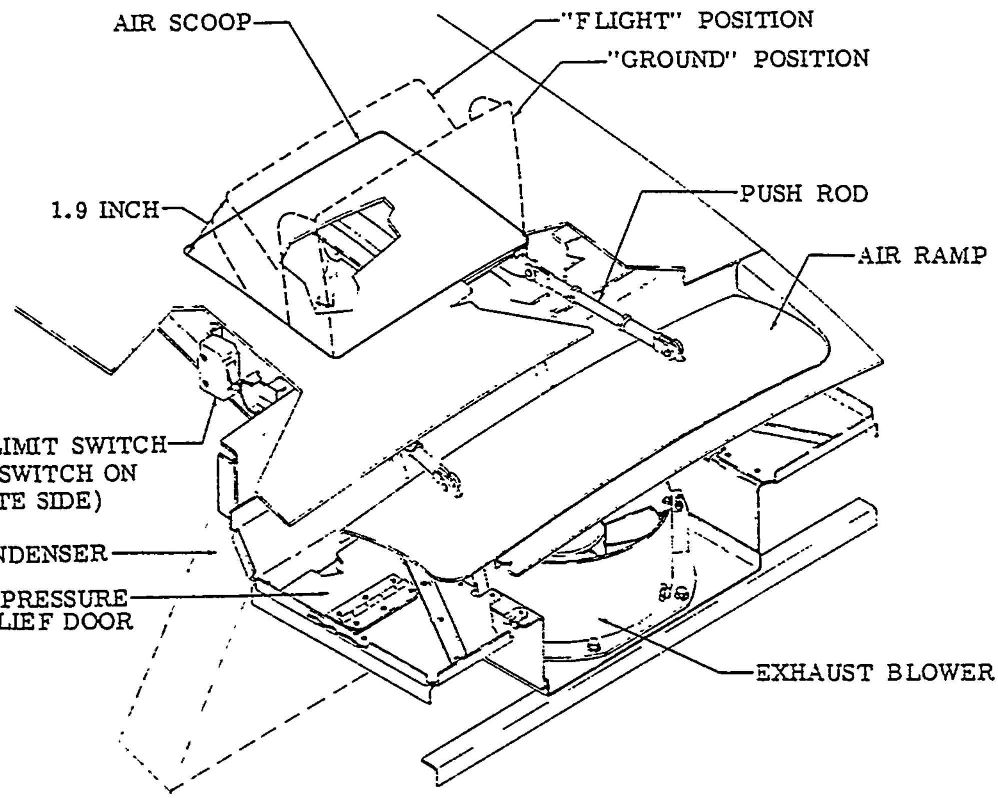


Figure 10-6. Air Scoop And Ramp Assembly

WARNING

The lines connected to the condenser are under high pressure. Refer to the Special Servicing Precautions, in this section, before disconnecting any fitting in the freon system.

f. Remove the screws securing the condenser to its mounting flange and lift the condenser out of the compartment. Installation is accomplished by the reversal of the above procedure.

EVAPORATOR AIR FILTER REPLACEMENT

The evaporator air filter should normally be replaced annually. Actual replacement time may be required more often due to extremely dusty operating conditions.

a. Remove the aft cabin bulkhead to gain access to the evaporator.

b. Remove the screws securing the top of the evaporator case.

c. Disconnect the electrical wiring at the blower and lift the blower assembly and top off the evaporator.

d. Remove the old filter.

e. When installing the new filter, be sure the reinforced backing of the filter is placed against the evaporator coil.

COMPRESSOR REMOVAL AND INSTALLATION

a. Remove the RH engine cowling to gain access to the air conditioner compressor.

b. Disconnect electrical leads to the magnetic clutch.

c. Disconnect Freon lines at compressor service valves.

WARNING

The lines connected to the compressor are under high pressure. Refer to Special Servicing Precautions in this section before disconnecting any fitting in the Freon system.

d. Loosen the compressor mounting bolts.

e. Slide the compressor up in it's slotted mounting to relieve tension on the drive belt. Roll belt off the compressor pulley.

f. Remove mounting bolts and remove compressor.

g. Installation is accomplished by reversal of the above procedure. See compressor belt tension adjustment.

COMPRESSOR BELT REMOVAL AND INSTALLATION

a. Remove the RH engine cowling to gain access to the compressor belt.

b. Loosen compressor attaching bolts and slide the compressor upward in its slotted mount to relieve tension on the belt. Slip the belt off the compressor pulley.

c. Remove the bolts attaching the compressor/turbocharger mount support to the engine.

d. Remove the belt from the engine crankshaft pulley and slip it out between the compressor/turbocharger mount and the engine.

e. Installation is accomplished by reversal of the above procedure. After adjusting tension on a new belt, be sure the belt has ample clearance on all sides. See Compressor Belt Tension Adjustment.

TROUBLESHOOTING

HEATER SYSTEM

INDICATION	PROBABLE CAUSE	REMARKS
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. Switch to reserve vibrator contacts. If this corrects trouble, replace vibrator at first opportunity.
	c. Faulty ignition unit coil.	c. Remove lead from spark plug and hold so spark may jump to structure. If no spark, repair or 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 continuity meter across ductstat leads and operate control. As the control is pulled out, ductstat switch should close, completing the circuit.
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.
	d. Both pumps operating with gear extended.	d. Check limit switch.
	e. Iris valve opening too small.	e. Check limit switch to operate at 1/2 opening.
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.
	d. Restriction in air ducts.	d. Check air valve and ducts for obstruction.

HEATER SYSTEM (CONT'D)

INDICATION	PROBABLE CAUSE	REMARKS
	e. Spray nozzle partially clogged.	e. Clean spray nozzle.
	f. One pump operating with gear retracted.	f. Close L.G. limit switch and check both pumps for operation.

AIR CONDITIONER

INDICATION	PROBABLE CAUSE	REMARKS
1. Insufficient cooling.	a. Blower not functioning.	a. Repair.
	b. Obstructed or disconnected air duct.	b. Remove obstruction or repair.
	c. Compressor clutch or belt slipping.	c. Repair or adjust.
	d. Evaporator filter clogged.	d. Replace.
	e. Freon level low.	e. Leak-test and recharge.
	f. Hot gas by-pass valve defective.	f. Replace.
2. No cooling.	a. Blown fuse, loose connection.	a. Check connections, fuse, continuity.
	b. Blower not functioning.	b. Repair.
	c. Leak in system.	c. Leak-test and recharge.
	d. Compressor reed valves inoperative.	d. Repair or replace.
	e. Expansion valve stuck open.	e. Replace.
3. Air conditioner will not operate in AUTO mode but will function in the MAN COOL mode.	a. Misadjustment of heater control box.	a. Replace.
	b. Malfunction of control box.	b. Replace.
	c. Malfunction of temperature sensing elements.	c. Replace.
4. Air conditioner runs constantly in either AUTO or MAN COOL.	a. Malfunction of temperature sensing elements.	a. Replace.
5. Excessive vibration of unit.	a. Overcharge.	a. Correct Freon charge.
	b. Air in system.	b. Purge and recharge system.
	c. Mount or compressor bolts loose.	c. Tighten.
	d. Drive pulley loose.	d. Tighten.
6. Noisy unit.	a. Compressor oil level low.	a. Add oil.
	b. Defective belt.	b. Replace.
	c. Low refrigerant level.	c. Add R-12.

AIR CONDITIONER (CONT'D)

INDICATION	PROBABLE CAUSE	REMARKS
	d. Excessive moisture in system.	d. Replace receiver-dryer and recharge.
	e. Fan hitting shroud.	e. Align and tighten shroud.
	f. Defective compressor.	f. Replace.
7. Hissing in evaporator case.	a. Low charge.	a. Add R-12.
8. Chatter or knock in evaporator case.	a. Defective expansion valve.	a. Replace.
9. Belt Slipping.	a. Loose.	a. Adjust.
	b. Overcharge.	b. Correct Freon level.
	c. Air in system.	c. Evacuate and recharge.
10. Excessive belt wear.	a. Pulleys not in line.	a. Align pulleys.
	b. Belt too tight.	b. Adjust or replace.
	c. Pulley groove wrong size.	c. Replace.
	d. Belt width wrong.	d. Replace.
11. Broken belt.	a. Check all causes above.	a. Replace.

OXYGEN SYSTEM

(Figure 11-1)

The oxygen system consists of an altitude compensated oxygen regulator, six outlets, a nose mounted cylinder and recharging valve. The system may be fitted with a 65 or 114 cubic foot cylinder. The altitude compensated regulator limits system operation to above 8,000 feet where its sensing element meets each increase in altitude with increased oxygen flow. When the system is not in use, shut off the control valve on the console to prevent oxygen loss.

To recharge the oxygen system, remove the protective cap from the filler valve located in the nose forward baggage compartment.

WARNING

> Keep fires, cigarettes and sparks away when outlets are in use. Open and close all oxygen valves slowly. Make sure the oxygen shut-off valve is in the closed position. Inspect the filler connection for cleanliness before attaching it to the filler valve. Keep tools, hands and components clean, as fire or explosion may occur when pure oxygen comes in contact with organic material such as grease or oil.

Attach a hose from an oxygen recharging cart to the filler valve. To prevent overheating, fill the oxygen system slowly by adjusting the recharging rate with the pressure regulating valve on the cart. 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; similarly, 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. If at any time, in the process of servicing and purging the system or replacing the oxygen cylinder, it becomes necessary to disconnect a fitting, the threads should be treated with MIL-T-5542 anti-seize compound prior to being connected back into the system.

OXYGEN SYSTEM LEAK TEST

A soap solution, per MIL-L-25567A-1 or TEC 915 Leak Detector (a product of TEC Chemical Co., Monterey Park, Calif.) may be used to locate system leaks if the system does not meet the following test procedure.

NOTE

> Only aviator's breathing oxygen per MIL-O-27210 shall be used in testing the system.

Low pressure system test (regulator outlet)

a. With the oxygen supply cylinder and control valve on the console turned off, plug a pressure test gage into a mask outlet.

b. Plug a low pressure oxygen supply into a second mask outlet.

c. Pressurize the system to 50 - 55 psi and shut off or remove the supply line.

d. Allow two minutes for pressure to stabilize in the system. Pressure loss in the next 15 minutes shall not exceed 5 psi.

High pressure system test (supply cylinder to regulator)

a. With the supply cylinder turned on and the low pressure system turned off at the regulator, the system pressure gage should be read 1500 to 1900 psi.

b. Turn off the supply cylinder and observe the pressure loss on the system gage; the system loss should not exceed 400 psi in 5 minutes.

OXYGEN SYSTEM PURGING

The oxygen system may be rid of obnoxious and offensive odors by purging. Also, the system should be purged any time the system pressure falls below 50 psi or the lines are left open for a period of time. The purging operation consists of nothing more than connecting a recharging cart filler hose to the applicable oxygen filler valve and allowing oxygen to flow through the system and escape at the outlets carrying away the bad odors. The following steps outline the procedure for purging the oxygen system.

a. Connect a line from a recharging cart to the applicable oxygen filler valve.

b. Slowly open the oxygen supply.

c. Slowly open the high pressure line valve on the oxygen control console.

d. Plug in an oxygen mask at each outlet in the cabin and cockpit.

e. Open all doors and windows.

f. Set the cart pressure regulator to deliver 50 psi to the system.

g. Allow system to purge for one hour and check for the presence of odor. If the odor is still present continue purging for one additional hour. If the odor is still present after the second hour of purging replace the supply cylinder.

OXYGEN CYLINDER REPLACEMENT

The oxygen cylinder is mounted on a shelf in the nose

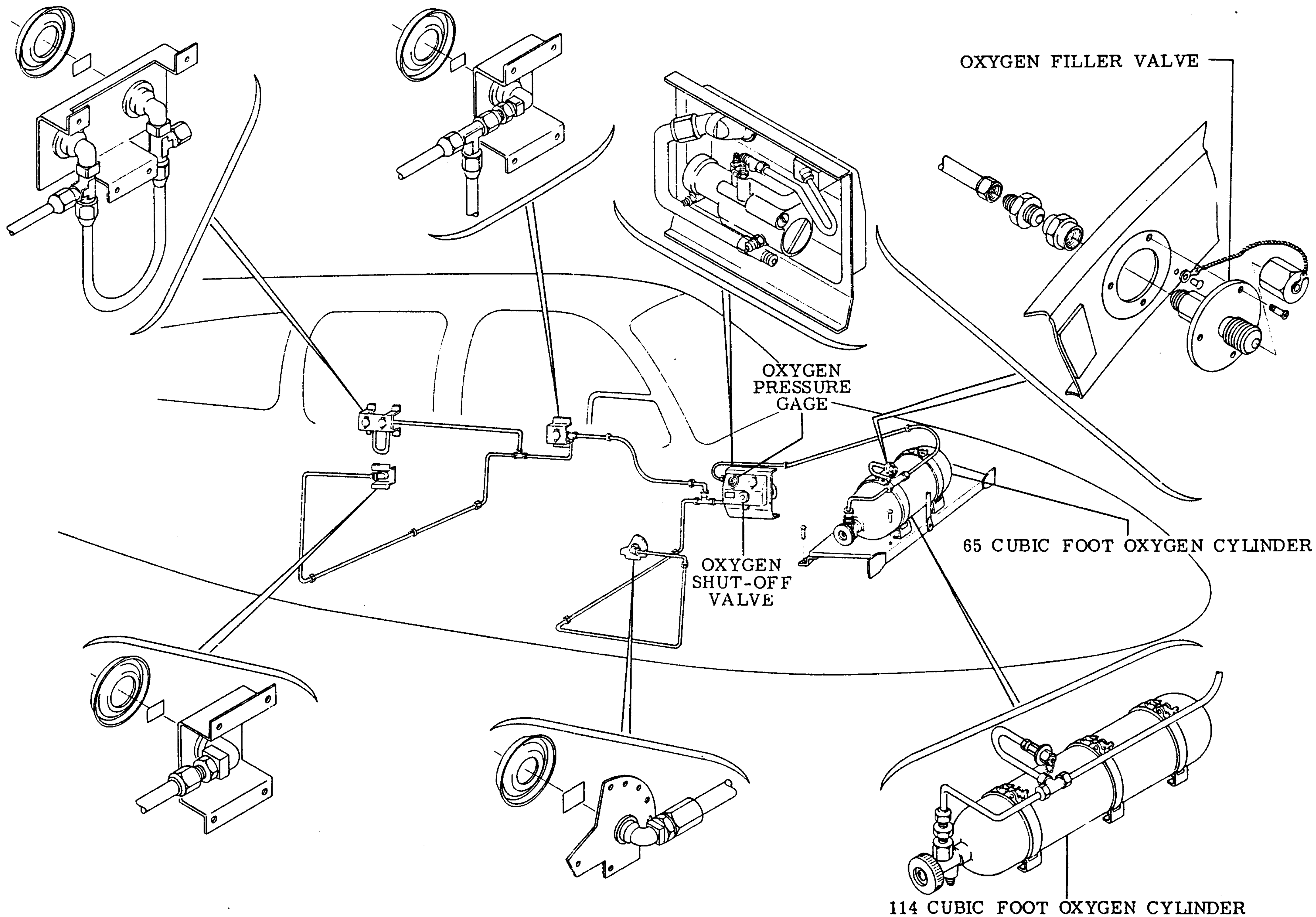


Figure 11-1. Oxygen System

baggage compartment. The cylinder may be removed as follows:

WARNING

Keep fire, cigarettes and sparks away from the vicinity of the oxygen cylinder. Hands, clothing and tools should be clean. Oil and grease will ignite upon contact with pure oxygen under pressure.

a. Slowly close the oxygen supply cylinder valve.

b. Disconnect the line from the supply cylinder.

c. Cap the open line immediately with a clean metal fitting.

d. Remove the screws securing the shelf support tube located in the center of the shelf in front of the cylinder.

e. Loosen the bracket clamp wing nuts.

f. Raise the cylinder clamps and remove the cylinder from the brackets.

g. Place the new cylinder in the brackets and close the cylinder clamps.

h. Tighten the bracket clamp wing nuts.

i. Install the shelf support tube.

j. Carefully inspect the fittings on both the cylinder and the line for cleanliness and the presence of foreign matter, which may contaminate the oxygen until it is unfit for breathing.

k. Connect the line fitting to the cylinder fitting.

l. Slowly open the supply cylinder valve.

m. Test the connections for leaks with Item 14, Consumable Materials Chart.

SURFACE DEICER SYSTEM

(Figures 11-2 and 11-2A)

DESCRIPTION (TG-1 through TG-51)

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 dry 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 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 16 to 19 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.

An air filter is connected to the pressure outlet of each control valve to remove foreign particles 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.

DESCRIPTION (TG-52 and after)

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 dry pressure pumps which provide air pressure (16-19 psig) for deicer boot inflation and evacuation; an electric timer; a distributor valve and control switch.

In operation, the engine-driven pumps supply air to a pressure manifold in the pilots compartment and in turn to the distributor valve. When the distributor valve is actuated to inflate the boots, a time delay relay is energized. 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 intergrated 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 5 to 8 seconds before resuming a vacuum 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 the system pressure.

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:

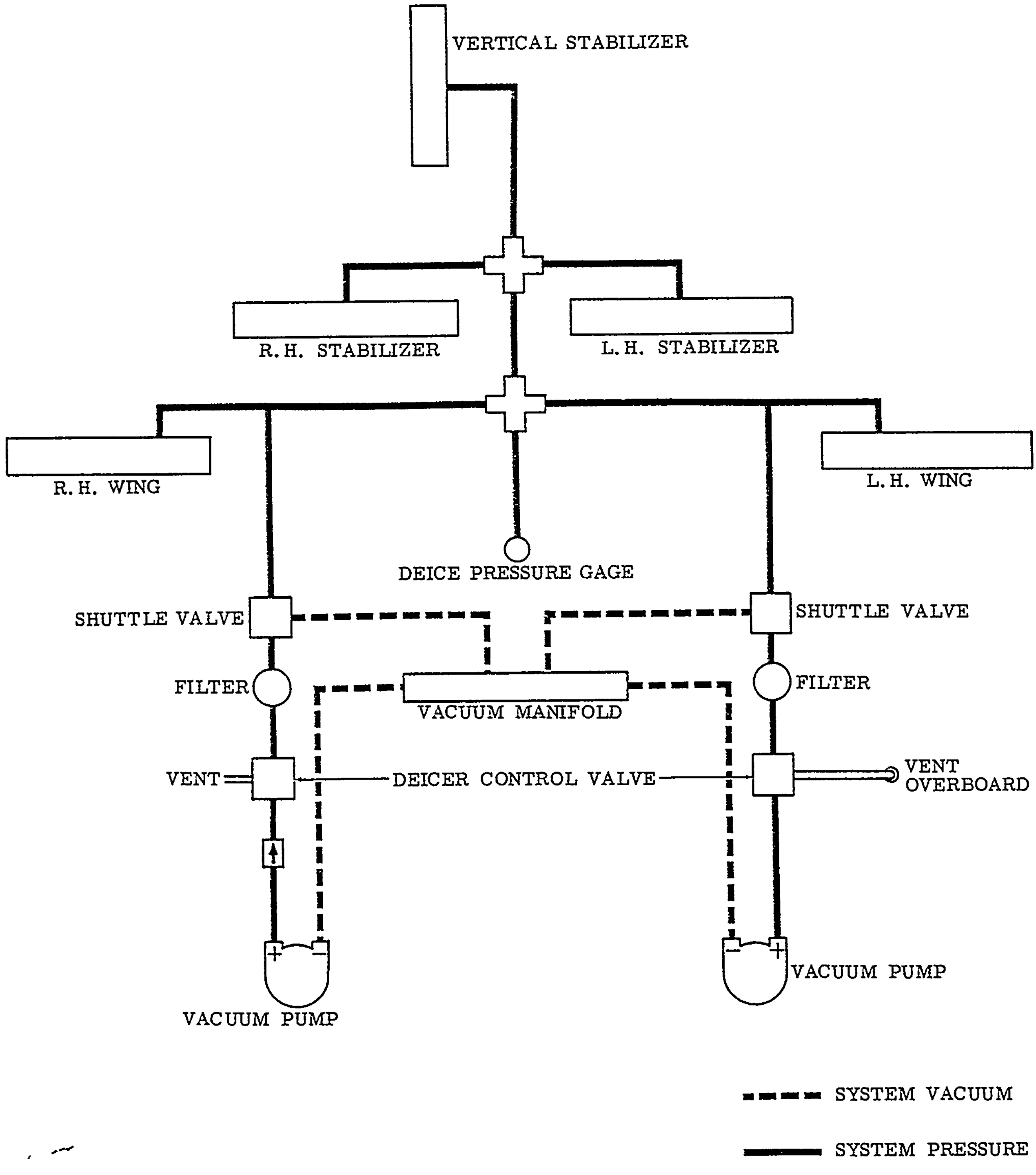


Figure 11-2. Surface Deicer System, Vacuum (TG-1 through TG-51)

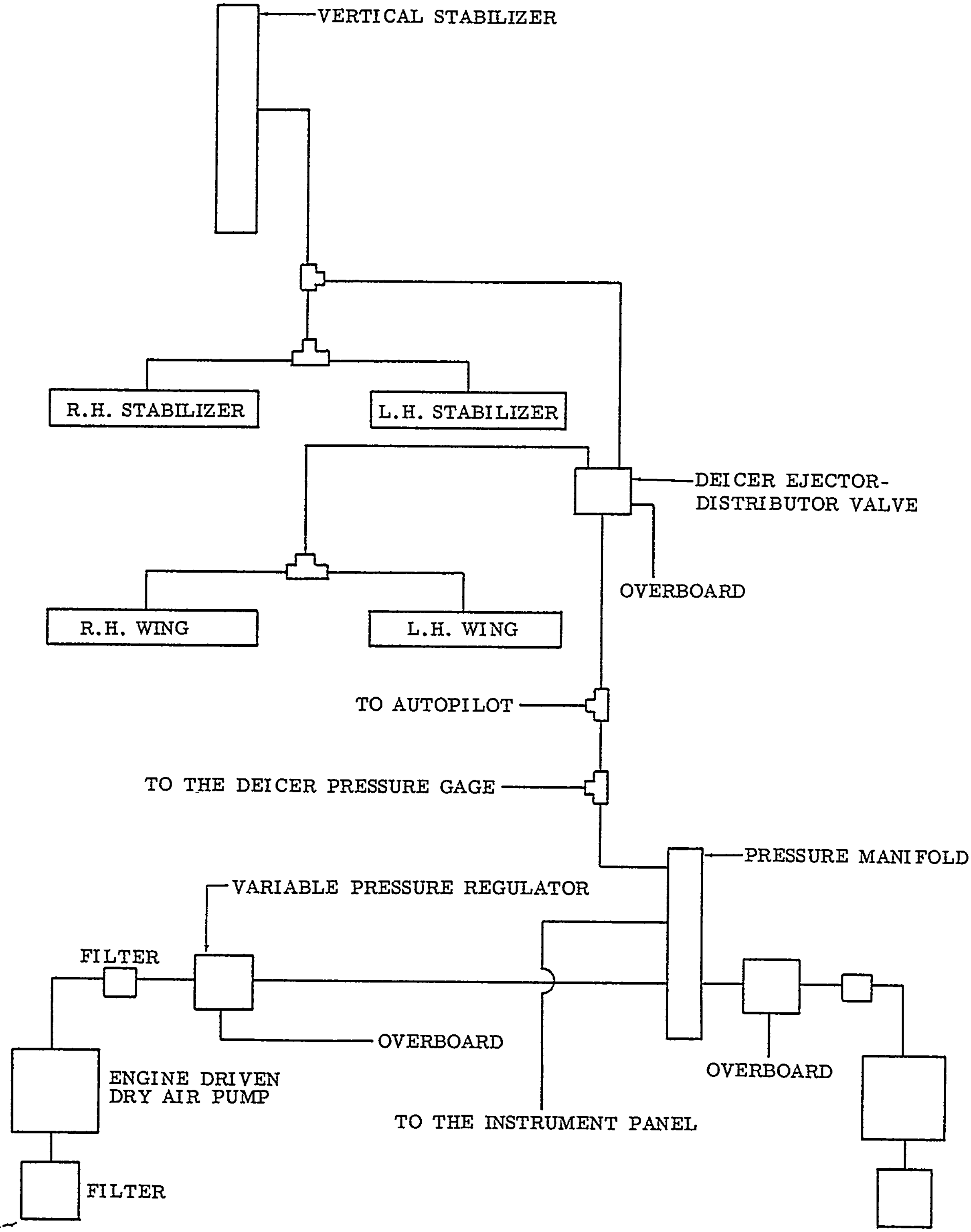


Figure 11-2A. Surface Deicer System, Pressure (TG-52 and after)

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. 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.

OPERATION CHECK

a. With both engines operating at cruise rpm (2750), 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, the system pressure gage should register approximately 16 to 19 psi.

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.

COMPONENT MAINTENANCE AND REPLACEMENT

Air Filters (TG-1 through TG-51)

Examine the filter after each 100 hours of engine operation for dirt 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. If necessary, replacement filters may be obtained. Torque filter bolt to 40 to 60 in. lbs.

Control Valves (TG-1 through TG-51)

After approximately 100 hours of engine operation, the valve poppet and internal lining of the control valve may become coated with a film substance 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:

a. Remove the solenoid electrical connector.

b. 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.

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

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

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 sent to Beech Aircraft Corporation for repair or replacement.

Component Replacement

No component maintenance other than that described in this shop manual is recommended. Repair or replacement of parts should be made only through Beech Aircraft Corporation.

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 principle factors involved when resurfacing seems advisable are:

a. If the surfacing material has abraded off.

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.

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 trigger type 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, centralally 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, by 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
(Figure 11-3)

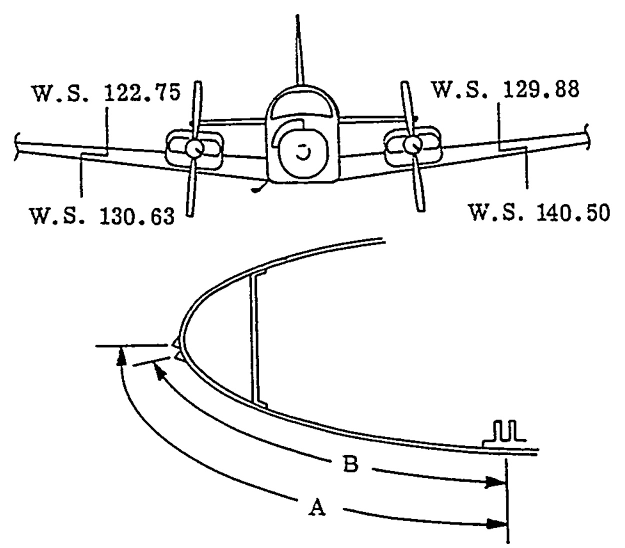
a. The stall strips are 10.62 inches long for the right wing and 7.88 inches long for the left. The right stall strip is installed with its inboard end at Wing Station 122.75 and the left stall strip is installed with its inboard end at Wing Station 129.88.

b. Clean boot surface thoroughly, removing all old glue. Mask off the area where new strip is to be installed and wipe with methyl ethyl keytone.

c. 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).

d. 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.

e. When dry, coat the area with A-56-B cement (Item 1, Sealing Chart) to replace the conductivity of the boot.



Right Wing	Left Wing
Dimension "A" is 14.50 at Wing Station 122.75 and 14.00 at Wing Station 130.63.	Dimension "B" is 14.19 at Wing Station 129.88 and 13.50 at Wing Station 140.50.

Figure 11-3. Stall Strip Installation

TROUBLESHOOTING

AUTOMATIC SURFACE DEICER (VACUUM, TG-1 through TG-51)

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

INDICATION	PROBABLE CAUSE	REMARKS
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, partially blocked, 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.
	d. Deicer boot puncture.	d. Repair as prescribed in this section or replace.
3. Deicer boots deflate too slowly.	a. Defect in aircraft vacuum system.	a. See Vacuum System, this manual.
	b. Clogged air filters.	b. See Component Maintenance and Replacement, Air Filters.
	c. Piping lines kinked or partially blocked.	c. Inspect and blow out lines.
	d. Overboard line from control valve partially blocked.	d. Inspect and blow out lines.

TROUBLESHOOTING

AUTOMATIC SURFACE DEICER (PRESSURE, TG-52 and after)

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.
	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 $17.5 \pm 5\%$ 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.

ELECTRIC PROPELLER DEICING SYSTEM, GOODRICH

(Figure 11-4)

The electric propeller deicer system includes an electrically heated boot for each propeller blade, brush assemblies, slip rings, an ammeter, and an on-off circuit breaker switch. When the switch is turned on, the ammeter registers the amount of current (14 to 18 amps) passing through the system. If the current rises beyond the switch limit, an integral circuit breaker will cut off the power to the timer. The current flows from the timer in the RH wing center section to the brush assembly mounted on front of the engine case and is conducted by the brush assembly to the slip rings installed on the starter ring gear. The slip rings distribute current to the deicer boots on the propeller blades. Heat from the boots reduces the grip of the ice, which is then removed by the centrifugal effect of propeller rotation and the blast of the air stream. Power to the two heating elements on each blade is cycled by the timer to the outboard and inboard heating elements in the following sequence: RH outboard, RH inboard, LH outboard, LH inboard. Since each of these phases is 30 seconds in duration, the timer makes a complete cycle every two minutes. Whenever the timer switches to the next phase of operation, the ammeter will register a momentary deflection.

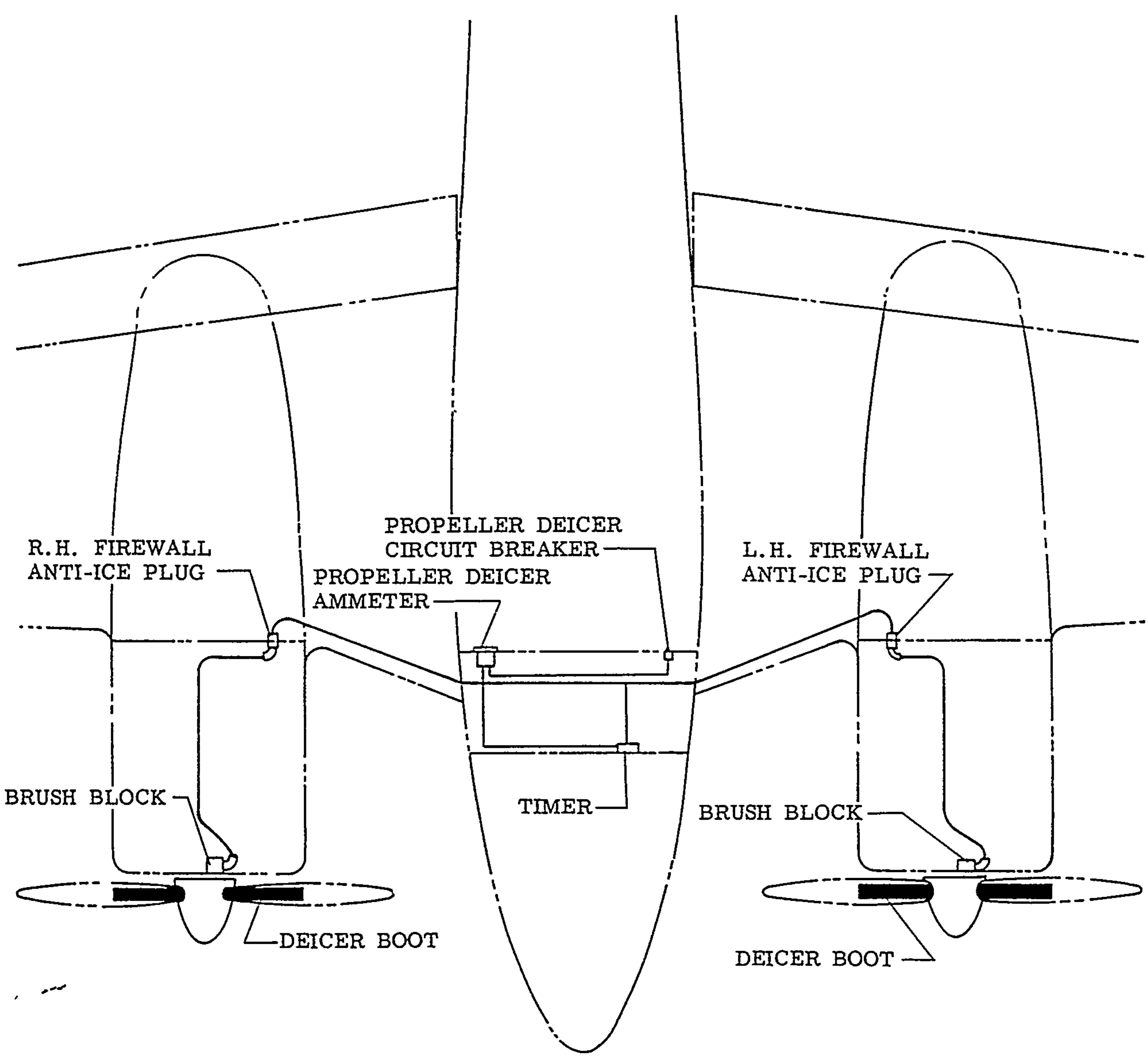


Figure 11-4. Propeller Deice System

DEICER BRUSH REPLACEMENT

The propeller deicer brushes should be replaced when a minimum of 1/4 inch of brush material remains. It is good practice, however, to replace the brushes when 3/8 inch of the brush material still remains. Brush length may be determined by inserting a piece of safety wire into the holes at the back of the brush block assembly (Figure 11-5). When 1-7/16 inch dimension is measured, there is approximately 1/4 inch of brush material left. Replace the brushes as follows:

NOTE

The brush block and mounting bracket should be removed intact so the brush block's exact location with respect to the mounting bracket can be marked. This will facilitate alignment of the brush block during reinstallation.

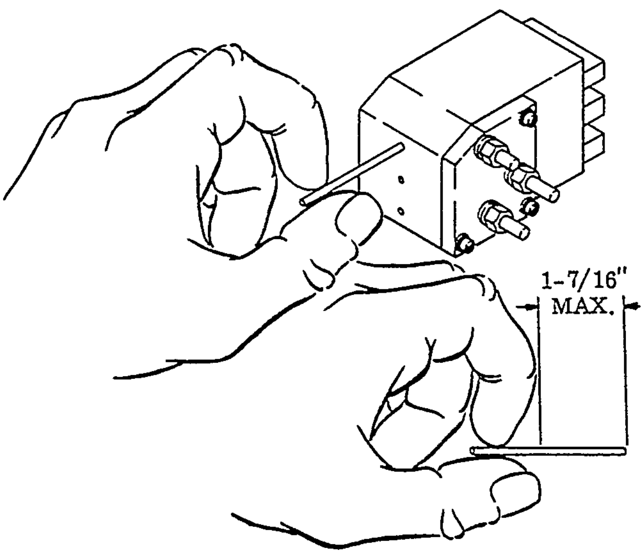


Figure 11-5. Determining Deicer Brush Wear

a. Loosen both ends of the brush block mounting bracket and remove the complete assembly.

b. Tag the lead wires attached to the terminals on the brush block and disconnect them.

c. Clean the brush block and mounting bracket. Paint the side of the brush block and the edge of the mounting bracket as shown in Figure 11-5A with black paint.

d. Remove the brush block from the mounting bracket.

e. Disassemble the brush block (Figure 11-6) by removing the screws attaching the terminal plate to the brush block, then separate the brush block by pulling the guide black approximately 1/4 inch toward the terminals to disengage the guide pins.

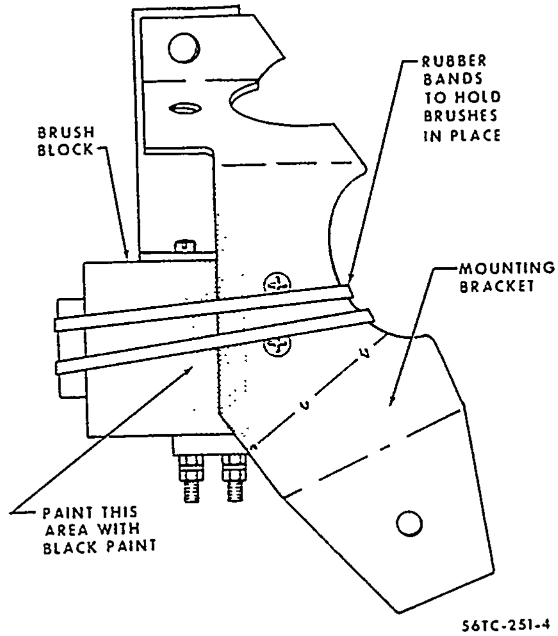


Figure 11-5A. Marking Location of Brush Block

f. Remove the terminal plate, brushes and springs from the brush block.

g. Mask off and paint a white stripe .170 to .180 inch wide on the brush block and brush guide. Locate as shown in figure 11-6A. The white stripes should be in line with the outer brush and will be used to align the brushes with the slip ring during reinstallation.

h. Remove the terminal plate, brushes and springs from the brush block.

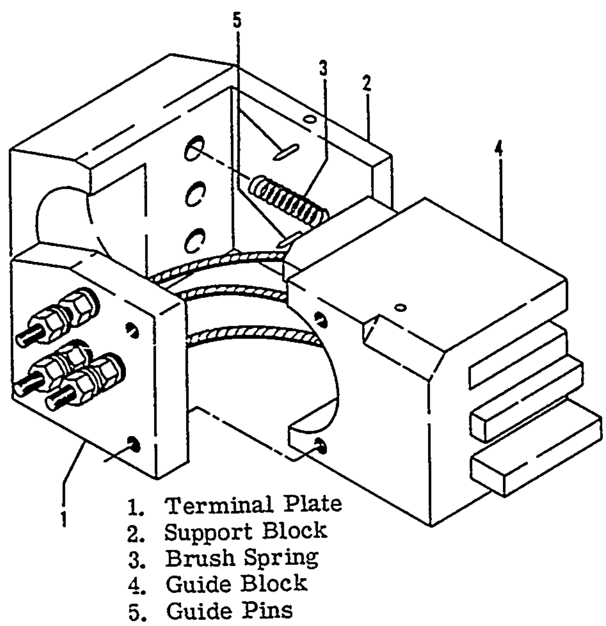


Figure 11-6. Deicer Brush Block Assembly

i. Disconnect the wires from the brushes being replaced, noting which terminal they correspond to.

j. Solder the wires from the new brushes to the appropriate terminals holding the "wicking" to 1/8 inch maximum.

k. Install each brush in its correct groove in the guide block. Insert new springs into the guide block behind the brushes. Taking care not to apply a side load on the brushes or damage or pinch the brush leads, bring the support block into position. Install the opposite end of the springs into their corresponding holes in the support block. Press the two blocks together until the guide pins in the support block slip into the holes in the guide block. Install the screws which hold the terminal plate to both blocks.

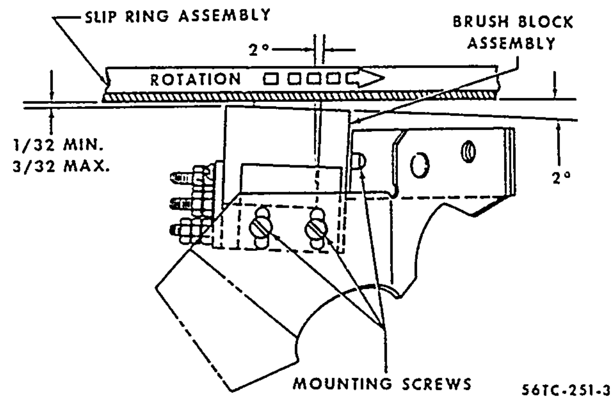


Figure 11-7. Deicer Brush Block Installation

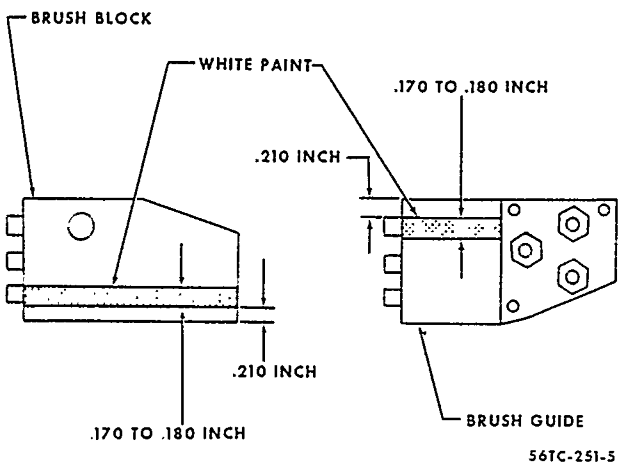


Figure 11-6A. Deicer Brush Alignment Stripes

NOTE

When replacing brushes or brush retainer assemblies, always install new brush springs.

l. Check the amount of brush protrusion from the block. If the brushes protrude less than 9/16 inch, the brush leads should be untwisted to give more length. If this distance is more than 5/8 inch, the lead should be twisted to shorten the effective length until the brushes protrude from 9/16 to 5/8 inch. The brushes should then be checked for free sliding action.

m. Reinstall the brush block assembly on the mounting bracket, using the black paint (see step "c") as a guide for correct alignment.

n. Carefully push the brushes back into the brush block and secure them in place with a rubber band. (See Figure 11-5A).

o. Using care not to bend or distort the mounting brackets, install the brush block and bracket assembly as originally removed from the engine in step "a". Cut the rubber band and rotate the propeller to remove the broken pieces of rubber band.

NOTE

The white stripes on the top and bottom of the brush block should align with the outer slip ring, If the white stripes do not align with the outer slip ring it may be necessary to add or remove, all or part of the laminated skin. Removing shim material will move the brush block out. Each laminate in the shim is approximately .003 inch.

p. Check for proper clearance between the slip rings and the brush block (see Figure 11-7). The clearance should be 1/16 ± 1/32 inch with an angle of approximately two degrees from perpendicular, as measured toward the direction of slip ring rotation. If not correct, loosen the brush block mounting screws and move in the elongated holes to correct the brush block position.

q. To preclude arcing caused by the rough surfaces of the new brushes, the engine should be operated for at least five hours before the deicer system is turned on. This does not apply to ground checks of the system performed while the engine is not running.

SLIP RING MACHINING

Slip rings which have roughened or damaged surfaces, but which are structurally sound, can be machined and restored to serviceability. Remove the slip ring assembly from the aircraft and mount it in a lathe. Position it concentrically in the lathe, with not over 0.002 inch wobble or run-out over 360 degree rotation. Take light cuts for a smooth finish and cut no deeper than required to remove surface damage. The contact surfaces of the three slip rings must be parallel within 0.005 inch, and flat within 0.005 inch overall. Deviation from flat is not to exceed 0.002 inch over a 4 inch arc. If necessary, undercut the insulation between the slip rings to a depth of 0.020 to 0.030 inches below the contact surface of the slip rings. In this operation, width of the slip ring MUST NOT be reduced more than 0.005 inch. Contact surfaces of the slip rings must have a finish of 29-35 micro inches. Deburr the slip ring edges and reinstall in the aircraft and align.

NOTE

If, in machining, the solder or braze connection on the underside of the slip ring is exposed, replacement of the slip ring assembly will be necessary.

DEICER TIMER CHECK

Experience in the field has indicated that often the timer is considered defective when the source of the trouble lies elsewhere. For this reason, the following test should be performed before the timer is removed as defective:

a. With the wiring harness disconnected at the timer and the deicer switch in the ON position, check the voltage from pin B of the harness plug to ground. If no voltage is present, the timer is NOT at fault; however, if system voltage is present at pin B, check the circuit from harness plug pin G to ground with an ohmmeter. If no circuit is indicated, the fault is in the ground lead rather than the timer. If ground connection is open, the timer step switch will not change position.

b. After the ground and power circuits have been checked, connect a jumper wire between pin B of the timer receptacle and terminal B of the connector plug and from pin G of the timer receptacle to ground. With the deicing system switch ON, check the voltage to ground from pin B of the timer. The voltmeter should indicate approximately 25 volts when the aircraft battery supply is being used. Next, check the DC voltage to ground from pins C, D. E, and F, the points at which the system voltage is impressed in sequence to cycle power to the propeller deicers. Each of the plugs should read 24 volts in the following sequence.

Timing Sequence	Time ON	Areas of Prop Deicers Heated
Pin C	30 sec.	Right engine prop, Outbd. halves
Pin D	30 sec.	Right engine prop, Inbd. halves
Pin E	30 sec.	Left engine prop, Outbd. halves
Pin F	30 sec.	Left engine prop, Inbd. halves

NOTE

The timer does not reposition itself to start at pin C when the system is turned off, but will begin its cycling at the same position in which it was when last turned off. Cycling will then proceed in the order of C, D, E, and F as before.

After a voltage reading of 24 volts DC is obtained, hold the voltmeter probe on the pin until the voltage drops to zero before moving the probe on to the next pin in the sequence noted above. After the correctness of the cycling sequence has been established, turn the deicing system switch OFF at the beginning of one of the "on-time" periods and record the letter of the pin at which the voltage supply is present to facilitate performance of the following test.

HEAT TEST

Before this test can be performed, the jumper wire installed for the timer test must be removed so that the connector plug can be replaced in the timer receptacle. Two men are required to perform this test, one in the cockpit to monitor the ammeter while the other checks the deicer boots. The man in the cockpit turns the deicer system circuit breaker switch ON while the man outside feels the deicer boots to see if they are heating properly. The man in the cabin observes the ammeter for the proper readings (14 to 18 amperes) throughout the timing sequence. The ammeter needle should deflect every 30 seconds in response to the switching action of the timer. Each time this occurs, the man in the cockpit must notify the man inspecting the propeller deicer boots so that the latter can change the position of his hands to check the proper heating sequence of the propeller deicer areas. If any irregularities are detected, a continuity check should be performed on the wiring from the timer to the brush block holders and the propeller deicer terminal connections.

CONTINUITY TEST

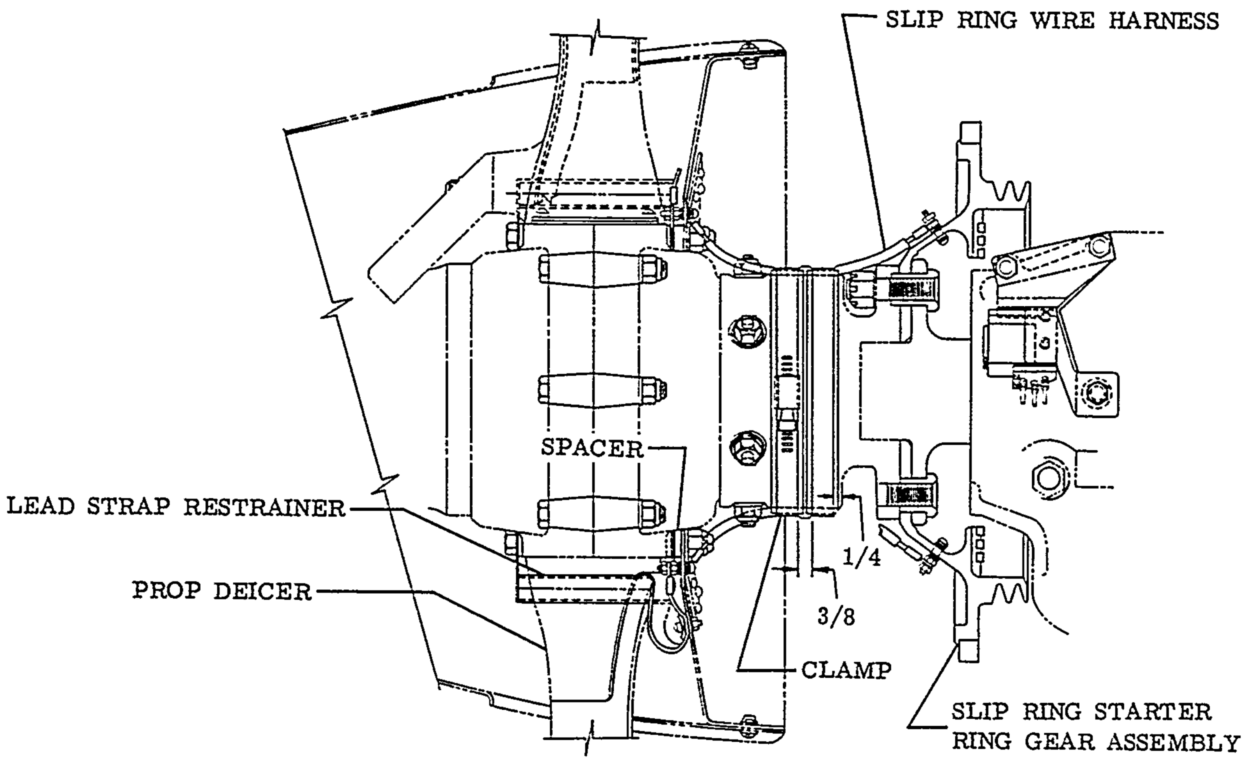
After removing the plug from the timer, use an ohmmeter to check continuity from:

a. Pin C of the plug to the outboard terminal of one prop boot on the right engine.

b. Pin D of the plug to the inboard terminal of one prop boot on the right engine.

c. Pin E of the plug to the outboard terminal of one prop boot on the left engine.

d. Pin F of the plug to the inboard terminal of one prop boot on the left engine.



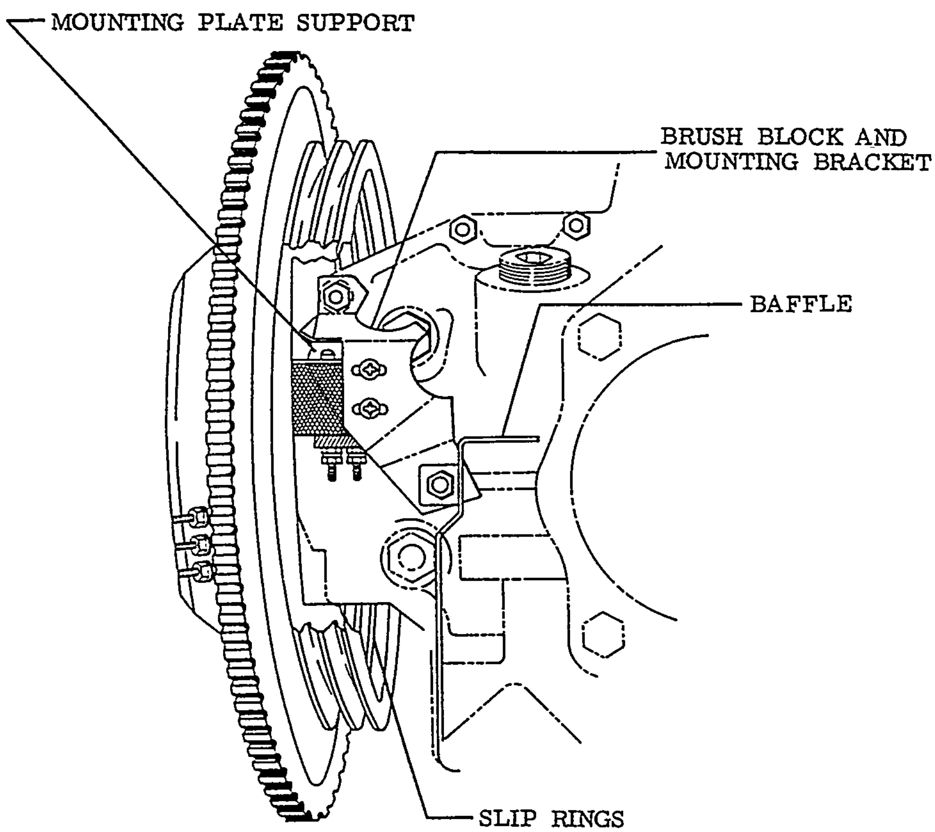


Figure 11-8. Propeller Deice Installation

e. Pin G of the plug to ground.

f. Ground terminal of one prop boot on the right engine to ground.

g. Ground terminal of one prop boot on the left engine to ground.

DEICER RESISTANCE CHECK

To check for incorrect resistance or the presence of a short or open circuit at the brush-to-slip ring contact, disconnect the harness at the timer and check the resistance from each deicer circuit lead (pins C, D, E, and F of the harness plug) to ground with a low range ohmmeter. If the resultant readings are not 1.55 to 1.78 ohms, disconnect the deicer lead straps to measure heater resistance individually. Individual boot resistance should measure between 4.58 and 5.26 ohms. If the readings in the first check are not within the accepted limits but those in the second check are, the trouble is probably in the brush-to-slip ring area. If the readings in the second check are also off, the deicer concerned is damaged and must be replaced.

BRUSH BLOCK RESISTANCE CHECK

To check for an open circuit, a short, or high resistance in the brush block, measure the resistance from the face of the brush to its terminal studs or receptacle pin with a low range ohmmeter. If this resistance measure over 0.013 ohm, locate and repair the cause of excessive resistance. If the resistance is infinite locate and correct the open circuit or else replace the brush. Check the resistance between the three terminal studs or receptacle pins. This resistance should not be less than 0.5 meg-ohm.

NOTE

The above adjustments may affect the clearance between the brush block and slip rings/ consequently, after slip ring alignment, a check should be made to ascertain that a distance of from 1/32 to 3/32 inch is maintained between the brush block and slip ring surface (see Figure 11-7).

PROPELLER DEICER BOOT REMOVAL

a. Remove the propeller spinner.

b. Disconnect the deicer boot leads from the spinner bulkhead.

CAUTION

Unless the boot being removed is to be scrapped, cushion the jaws of any pulling tool to prevent damaging the boot surface.

c. Remove the clip securing the lead strap to the spinner bulkhead and the clamp securing it to the propeller hub.

d. Using methyl ethyl ketone or toluol to soften the adhesion line between the boot and the blade, loosen one corner of the boot sufficiently to grasp it with vice grip pliers or a similar tool.

e. Apply a slow, steady pull on the boot to pull it off the propeller surface while continuing to use the solvent to soften the adhesive.

f. Remove the remaining adhesive from the boot and propeller blade with toluol or methyl ethyl ketone.

PROPELLER DEICER BOOT INSTALLATION

a. Position the deicer boot on the propeller blade so that its center line at the inboard end is adjacent to the split in the propeller blade clamp and 2±1/16 inch outboard of the clamp, and the center line at the outboard end falls on the blade leading edge. Be sure the lead strap is in the proper position to be clamped to the blade retaining clamp.

b. Mask off an area approximately 1/2 inch from the end and each side of the boot. (See Figure 11-9.)

c. Remove the deicer boot and strip any paint in the masked area from the retaining clamp outboard. Clean the area thoroughly with methyl ethyl ketone or toluol. For final cleaning, wipe the solvent off quickly with a clean, dry, lint-free cloth to avoid leaving a film.

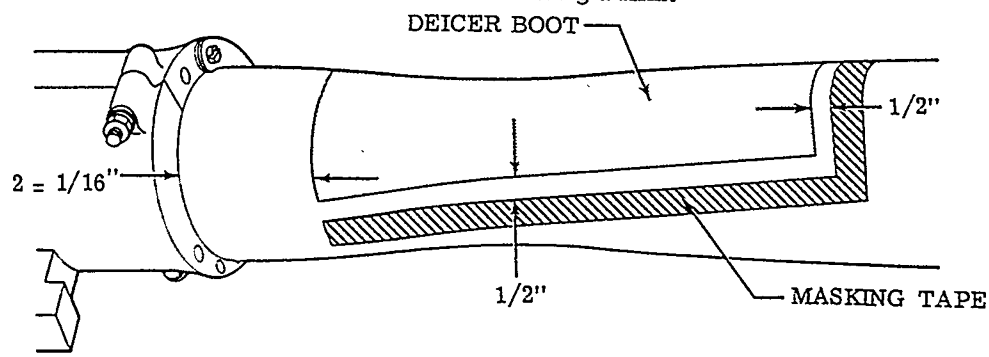


Figure 11-9. Deicer Boot Installation

CAUTION

The metal and rubber parts must be thoroughly clean to assure maximum adhesion.

d. Moisten a clean cloth with methyl ethyl ketone or toluol and clean the unglazed surface of the deicer boot, changing the cloth frequently to avoid contamination of the clean area.

NOTE

To prevent the edges of the deicer boots from curling while applying the cement, place masking tape around the glazed side of the boot. Remove the masking tape before installing the boot.

e. Apply one even brush coat of EC-1300L (Minnesota Mining and Manufacturing Co.) cement to the propeller blade. Allow the cement to dry for at least one hour at 40°F or above when the relative humidity is less than 75%, or two hours if the humdity is between 75% and 90%. Do not apply the cement if the relative humidity is higher than 90%.

f. After allowing sufficient drying time, apply a second brush coat of cement to the propeller and one coat of cement to the unglazed surface of the deicer boot. It is not necessary to cement more than 1/2 inch of the deicer lead strap. Allow the cement to dry.

g. Position the deicer boot on the propeller, starting 2 ± 1/16 inch from the blade retaining clamp, making sure the lead strap is in position to clamp to the blade retaining clamp. Moisten the cement lightly with methyl ethyl ketone or toluol and tack the boot center line to the blade leading edge. If the center line of the boot deviates from the blade leading edge, pull up with a quick motion and replace properly. Roll firmly along the center line with a rubber roller. (See Figure 11-10.)

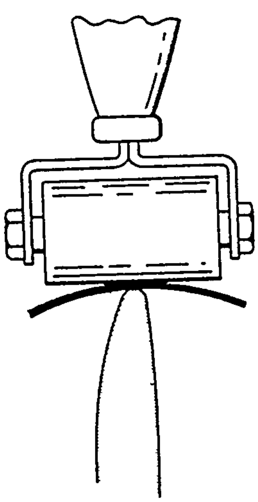


Figure 11-10. Center Rolling

CAUTION

Never use a metal or wooden roller for this purpose, for they would damage the heating elements in the deicer boot.

h. Gradually tilting the roller, work the boot carefully over each side of the blade contour. Avoid trapping air pockets under the boot. (See Figure 11-11.)

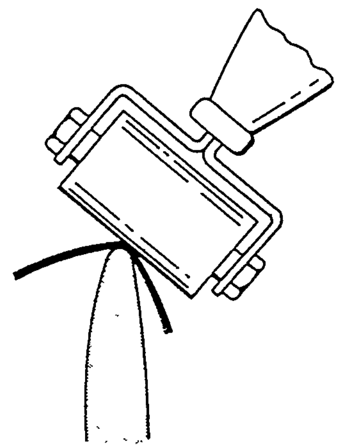


Figure 11-11. Side Rolling

i. Roll outwardly from the center line to the edges of the boot. (See Figure 11-12.) If excess material at the edges tends to form puckers, work them out smoothly and carefully.

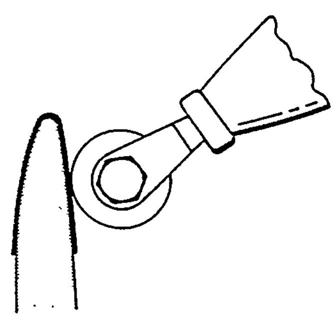


Figure 11-12. Edge Rolling

j. Roll the tapered edges of the boot with a narrow steel stitcher roller.

k. Clean the blade with a clean cloth moistened with toluol or methyl ethyl ketone. Be careful not to let solvent run into the edge of the boot.

l. Apply one even brush coat of either EC-801 or EC-750 sealer behind the lead strap where the boot and the blade meet.

NOTE

The EC-750 sealer is a one part sealer and requires no mixing. The EC-801 sealer is a two part sealer and must be thoroughly mixed. Mix 12 parts EC-1031 to 100 parts EC-801.

m. Apply one even brush coat of either EC-801 or EC-750 sealer around the edges of the boot, allowing 1/16 to 1/8 inch overlap on the boot but extended to the masking tape. Remove the masking tape immediately after applying the sealer to obtain a neat border.

n. Allow sufficient time for the EC-801 or EC-750 to dry (from 24 to 72 hours, depending on conditions).

o. Apply satin finish black urethane paint to an area around the boot so that it covers all of the sealer and overlaps the edge of the boot and the blade by a minimum of 1/8 inch.

NOTE

To prevent propeller blade bearing grease from causing the boot to peel back or deteriorate, the urethane paint should be applied in a uniform coat so that grease cannot get to the boot cement or sealer.

p. Allow the urethane paint to dry as specified by the manufacturer.

q. Install the clamp securing the lead strap to the propeller blade retaining clamps.

r. Connect the lead terminals and install the clip on the spinner bulkhead. There must be no slack between the terminal and the clip to assure enough slack between the clip and the clamp on the blade to allow propeller feathering.

PROPELLER DEICER BOOT REPAIR

CAUTION

Running the engine with the spinner removed may damage wiring to deicer boots.

Minor damage to the deicer boots may be repaired with the rubber patch material provided in the manufacturer's (B. F. Goodrich Company, Akron, Ohio) Field Repair Kit No. 77-802. The following information describes the proper procedure for repair to the propeller deicer boots.

a. Clean the rubber area being patched with methyl ethyl ketone or toluol to remove all grease and dirt.

b. Wipe the surface dry with a clean lint-free cloth to remove the solvent film.

c. Cut a patch big enough to overlap the damaged area 1/4 inch on all sides. Since this patch will be exposed to the airstream, the edges should be cut clean (without fringes) and beveled.

NOTE

If any of the heating element wires are exposed (but not broken) in the damaged area, cut a second patch big enough to extend 1/4 inch beyond all sides of the first patch.

d. Apply one even brush coat of EC-1300L cement to the area of the boot to be patched. Allow the cement to dry for at least one hour at 40°F or above when the relative humidity is less than 75%, or two hours if the humidity is between 75% and 90%. Do not apply the cement if the relative humidity is higher than 90%.

e. Apply masking tape to the open side of the patch to prevent the patch from curling as the cement dries.

f. Remove the protective paper from the side of the patch to be cemented.

g. Apply an even brush coat of EC-1300L cement to the patch and allow sufficient time for the cement to dry. Apply a second coat of cement to the patch and allow to dry.

h. Moisten surfaces of the patch and deicer boot with a cloth slightly dampended with methyl ethyl ketone or toluol.

i. Stick either the center or one edge of the patch lightly in place on the boot, then work the remainder of the patch down carefully to avoid trapping air between the surfaces of the patch and boot.

j. Roll the patch down securely with a rubber roller.

CAUTION

Never use a metal or wooden roller for this purpose, for they would damge the heating element in the deicer boot.

k. After allowing 1-hour's drying time, rub the edges and center of the patch to see that it is holding before releasing the airplane for flight.

NOTE

If the patch covers a heating element that was previously exposed, the second patch should be installed at this time as indicated in the preceding steps.

l. Wrinkled or loose patches must be reattached. Loosen the bond for an additional 1/4 inch beyond the wrinkled or loose area with methyl ethyl ketone, then reattach the loose portion of the patch with EC-1300L cement as noted in the preceeding steps.

NOTE

If the material is stretched and will not cement flat, replace the boot.

TROUBLESHOOTING PROPELLER ELECTRIC DEICER SYSTEM

The ammeter of the deicer system can be used to indicate the general nature of most electrical problems. Consequently, it is recommended that troubleshooting be preceded by the ammeter test outlined in step a of the 50-hour inspection in Section 16 and the heat test described in this section to determine which circuits are involved. A reading of two-thirds the normal amount of current is an indication that one of the circuits is open between the slip ring and deicer heater. If the ammeter registers excess current, the power lead is shorted to ground. It may be possible that the excess current has welded the timer contacts in one phase. Under these circumstances, the timer will either feed current to the welded contacts continuously or will not cycle. If the former is true, the heat test will show two phases heating simultaneously throughout three of the four phases. Unless the grounded power lead is located and corrected, any new timer that is installed may suffer the same internal damage during the first use of the system. In the following troubleshooting chart, the "indication" entries should be read to locate that which matches conditions of the particular system being checked. The numbered "probable cause" and "remarks" then indicate the proper sequence of checks. It should be noted, however, that such numbers are assigned with respect to the approximate usefulness of the check rather than to the most likely sequence of occurrence.

TROUBLESHOOTING

PROPELLER ELECTRICAL DEICER SYSTEM

INDICATION	PROBABLE CAUSE	REMARKS
1. Ammeter shows zero current. (All 4 phases of the 2 minute cycle.)	a. Switch circuit breaker tripped.	a. Locate and correct short before resetting circuit breaker by turning switch OFF, then ON.
	b. Switch faulty.	b. If no voltage at switch output with voltage at switch input, replace the switch. If voltage is OK at switch output, go to step d.
	c. No power from aircraft.	c. If no voltage into switch, locate and correct open circuit.
	d. Ammeter faulty. (If some or all deicers heat with ammeter at zero, replace the ammeter.)	d. Test for voltage up to and out of ammeter. If low or zero output but proper input, replace ammeter. If no voltage to ammeter, locate and fix open between switch and ammeter.
	e. Open circuit between ammeter and timer.	e. Disconnect harness at timer and check voltage pin B (of harness) to ground. If none, locate and correct open circuit.
2. Ammeter shows normal current part of cycle, zero current rest of cycle.	a. Open in wiring between timer and firewall connector.	a. Refer to the paragraph on heat test to find deicers not heating and test for voltage on that pin of firewall connector. If zero over 2 minutes, locate and fix open in wiring from timer to firewall.
	b. Open between firewall and deicer lead straps.	b. If voltage OK to firewall plug, try voltage at junction of deicer lead and slip ring lead. If no voltage, find and correct open in wiring to brush block, open within brush block, or no contact brush to slip ring.
	c. No ground circuit, one engine.	c. If voltage at deicer leads, locate and fix open from deicer to ground.
3. Ammeter shows normal current part of cycle, low current rest of cycle.	a. Inner and outer deicers heating same phase.	a. Locate and repair incorrect connections.
	b. Open in deicer or slip ring assembly.	b. Disconnect deicer straps to check heater resistance. If resistance is within specified limits, locate and fix open in slip ring leads. If not, replace deicer with open circuit.
	c. High resistance in circuit with low current.	c. If not in contact of brush to slip ring (including ground brush), trace wiring to deicer and to timer to fix partially broken wire, loose or corroded connection.
4. Ammeter shows low current over entire cycle.	a. Aircraft voltage low.	a. Check voltage into switch.
	b. Ammeter faulty.	b. Refer to step 1-d.
	c. High resistance up to timer.	c. Check for partially broken wire, loose or corroded connection in wiring from aircraft supply to timer input.

INDICATION	PROBABLE CAUSE	REMARKS
5. Ammeter shows excess current over entire cycle.	a. Ammeter faulty.	a. Refer to step 1-d.
	b. Ground between ammeter and timer.	b. Disconnect harness at timer and, with ohmeter, check from pin B (of harness) to ground. If ground is indicated, locate and correct.
6. Ammeter shows normal current part of cycle, excess current rest of cycle.	a. Ground between timer and brush block.	a. Disconnect leads at brush block and check from power leads to ground with ohmeter. If ground is indicated, locate and correct.
	b. Ground between brush block and deicers. (Excluding ground brush circuit.)	b. If no short exists at brush-slip ring contact, check for ground from slip ring lead to bare prop while flexing slip ring and deicer leads. If a ground is indicated, locate and correct.
	c. Short between two adjacent circuits.	c. Check for shorts or low resistance between circuits, if any, locate and correct.
	d. Timer faulty.	d. Test timer as indicated in paragraph on timer check.
7. Ammeter does not "flick" each 30 seconds.	a. Timer ground open.	a. Disconnect harness at timer and check with ohmeter from pin G (of harness) to ground. If no circuit, refer to wiring diagram to fix open circuit.
	b. Timer contacts are welded (caused by short circuit in system).	b. Test timer as in paragraph on timer check. If timer does not cycle with voltage at pin B, replace timer but be sure short causing original failure has been located and corrected.
8. Ammeter flicks between 30 second phase periods (confirm by ground test as in step j of 100 hour inspection).	a. Loose connection between aircraft power supply and timer input.	a. If trouble occurs over entire cycle, trace wiring from power source to timer input to locate and tighten loose connection.
	b. Loose or poor connection timer to deicers.	b. If trouble occurs in part of cycle, find which deicers are affected and check for rough or dirty slip rings causing brush to "skip". If not this, trace circuits to locate and fix loose or poor connection. (If all deicers on one prop are affected, check the ground circuit.)
	c. Timer cycles erratically.	c. Test timer as indicated in paragraph on timer check.
9. Radio noise or interference with deicers on.	a. Brushes "arcing".	a. Check brush alignment as in step i of 100 hour inspection. Look for rough or dirty slip rings. If this is the cause, clean, machine or replace slip ring assembly. Check for slip ring alignment.

PROPELLER ELECTRICAL DEICER SYSTEM (CONT'D)

INDICATION	PROBABLE CAUSE	REMARKS
	b. Loose connection.	b. Refer to step 8 above.
	c. Switch faulty.	c. Try jumper wire across switch. If radio noise disappears, replace the switch.
	d. Wiring located within less than 8 inches of radio equipment wiring.	d. Replace at least 8 inches from input wiring to radio equipment.
10. Cycling sequence not correct.	a. Crossed connections.	a. Check system wiring against circuit diagram for improper connections.
11. Rapid brush wear or frequent breakage.	a. Brush block out of alignment.	a. Check brush alignment as in step g of 100 hour inspection.
	b. Slip ring wobbles.	b. Check slip ring alignment with dial indicator.

PITOT AND STATIC SYSTEM

(Figure 11-13)

The pitot and static pressure system provides a source of impact (ram) and static air for instrument operation. The impact air entering the pitot mast is routed through the leading edge of the left wing to the airspeed indicator. A heating element is installed in the pitot mast to prevent it from becoming clogged by icing conditions. An optional pitot system may be installed on the right wing if the aircraft is equipped with dual instruments. The static air is taken from two static air ports, located on either side of the rear fuselage, and routed along the left side of the fuselage to the rate-of-climb, altimeter, and airspeed indicator. Should the normal static source become restricted, an emergency static air source control (located on the upholstery panel forward of the pilot's seat) will provide an alternate source of air. When this air source is used, airspeed and altimeter readings will be slightly higher.

NOTE

On aircraft TG-84 and after, the pitot mast is located on the left side of the nose. The dual instrument installation is optional and incorporates a second pitot mast on the right side of the nose.

CLEANING THE STATIC AIR SYSTEM

Blow LOW pressure air through the lines from the disconnected line at the airspeed 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 cleaning solvent to insure that no film exists on the static air buttons.

The static air system may be drained by opening the emergency static air source valve located on the left hand upholstery panel forward of the pilot's seat. Frequent draining of the static air line is recommended when humidity is high, heavy rains are frequent or the aircraft is washed down.

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 air tight.

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.

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. Check all polyethlene tubing for hardness or brittleness. Remove the pitot mast to inspect the hose section attached to the airspeed indicator. Rubber hoses with outer surfaces checked or cracked, particularly at the bends or connecting points, or have become hard, should be replaced. Replace defective hose with rubber hose complying to Item 27, Consumable Materials Chart. When a new hose is installed, recheck the pitot system for leaks using the above procedure.

INSPECTING THE STATIC AIR SYSTEM

The static system should be checked for leaks in accordance with the instructions set forth in Federal Aviation Regulation 91.170.

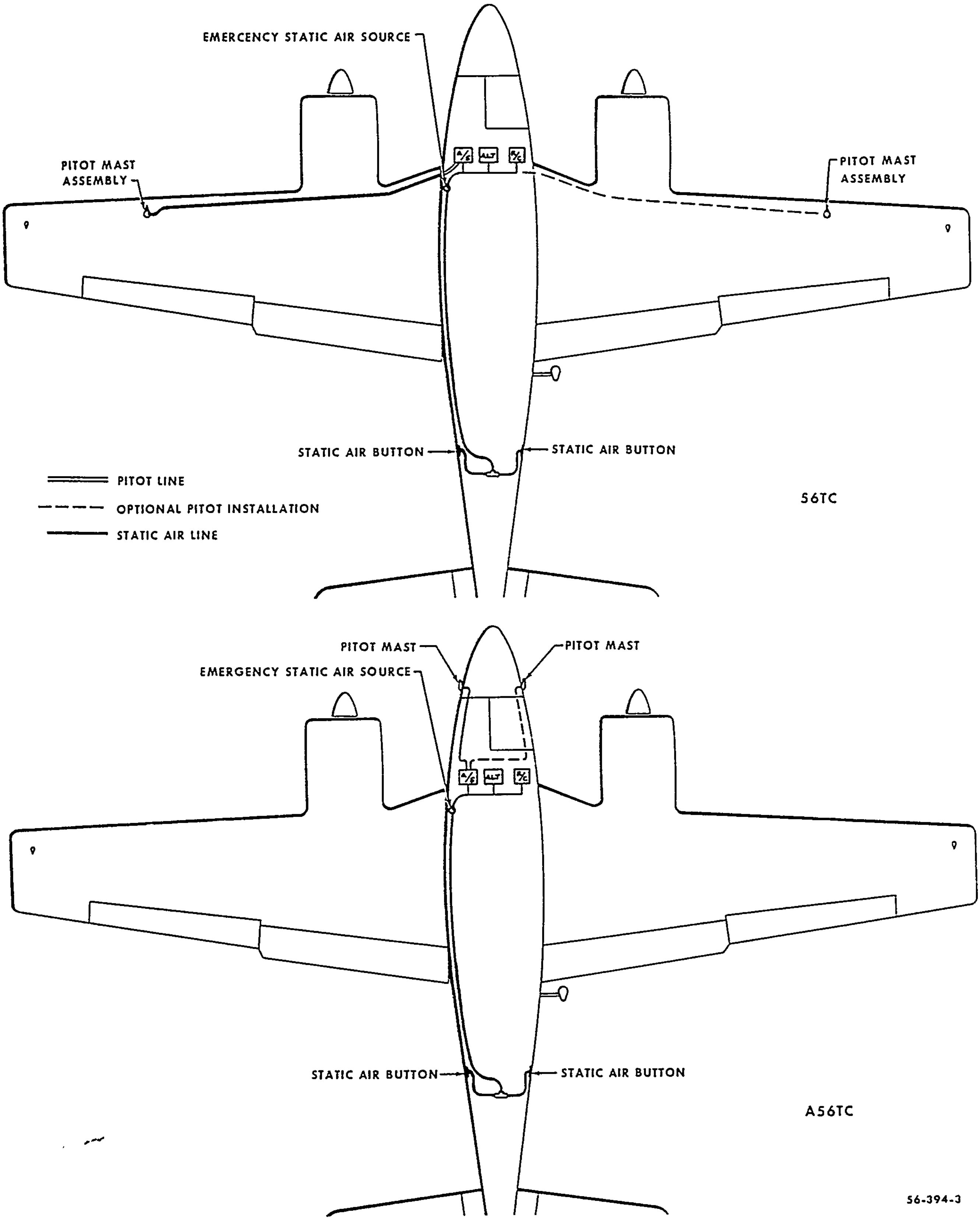


Figure 11-13. Pitot and Static System

STALL WARNING SYSTEM ADJUSTMENT
(Figure 11-14)

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.

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 air speed. 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 comes 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.

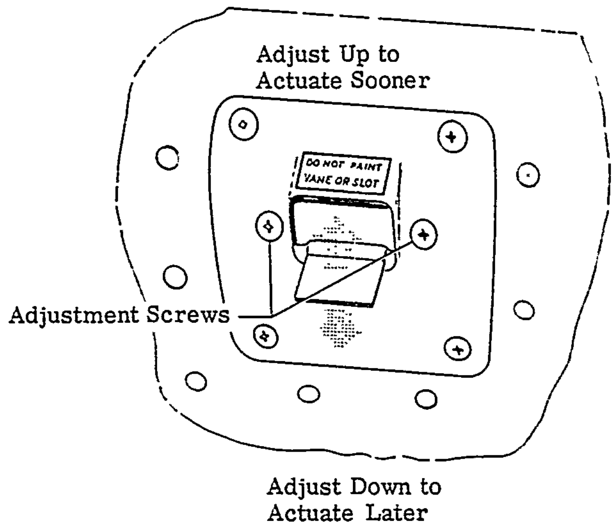


Figure 11-14. Stall Vane Adjustment

TROUBLESHOOTING

PITOT AND STATIC PRESSURE SYSTEM

INDICATION	PROBABLE CAUSE	REMARKS
1. Heating element inoperative.	a. Defective switch.	
	b. Grounded or open circuit. Check for continuity.	
	c. Defective heating element in pitot head.	
2. Circuit breaker keeps tripping.	a. Grounded wire.	
3. Instruments inoperative or erratic in operation.	a. Lines clogged. Drain lines at Emergency Static Drain. Disconnect lines at instruments and blow out with low pressure air.	
	b. Line leaks. Check lines for looseness at all connection points.	

STALL WARNING SYSTEM

INDICATION	PROBABLE CAUSE	REMARKS
1. Warning system inoperative.	a. Warning circuit breaker tripped. If circuit breaker persists in tripping, check for grounded circuit.	
	b. Open circuit. Check for continuity.	
	c. Defective switch.	
	d. Defective horn.	
2. Horn continues to blow.	a. Defective warning horn switch.	

VACUUM SYSTEM (TG-1 through TG-51)
(Figure 11-15)

The vacuum system provides air for deicer, autopilot and instrument operation. The vacuum is derived by engine-driven pumps and is controlled by suction relief valves which limit the air entering the vacuum lines to the instruments. A central air filter (2 installed for dual instruments) is incorporated in the lines to protect the instruments from dust and other foreign particles. This filter(s) is mounted on a bracket behind the instrument panel and contains a sealed unit which should be replaced every 500 hours (or less during operation in dusty or heavy smoke conditions). The only other servicing required is the suction relief valves located on each side of the forward cockpit bulkhead, behind the instrument panel. Since the suction relief valves bleed outside air into the vacuum system, it is essential to the operation of the vacuum-driven instruments that the suction relief valve screens should be kept clean. The polyethylene element in the screen should be removed, cleaned in solvent and dried with compressed air. The screens should be cleaned every 100 hours or more frequently as required. If it appears that the valves need adjustment, especially to lower the vacuum, the screens should be cleaned and the setting checked before readjusting the valve.

SUCTION RELIEF VALVE ADJUSTMENT

a. Check that the suction relief valve screens are not clogged, causing the suction gage reading to be higher than normal.

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

NOTE

Because the exhaust-driven turbocharger produces considerable heat, prolonged ground operation at high engine RPM may cause heating in the accessory compartment. If the compartment and it's components become excessively hot, shut down the engine and allow to cool.

c. Adjust the appropriate vacuum relief valve to obtain a gage reading of 4.8 to 4.9 in Hg. Shut down engine.

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

e. After both relief valves have been individually adjusted, start both engines and set throttles to obtain 2200 RPM. The gage should then read between 5.0 and 5.2 in Hg.

NOTE

A vacuum source indicator located in the vacuum gage will indicate failure of either vacuum pump.

ADJUSTMENT OF SUCTION RELIEF VALVES WITH AUTOPILOT

The procedure is the same as above except the following values should be used: each individual relief valve should be set at 8.0 in Hg. With both engines running the gage reading should be 8.4 in Hg.

REMOVAL AND INSTALLATION OF THE VACUUM PUMP

The dry air vacuum pump is located towards the rear, on the lower left-hand side of the engine. Should replacement become necessary, the pump may be removed by the following method:

a. Disconnect the fittings at the outlet and inlet ports of the pump. The vacuum lines should be capped to prevent entrance of foreign material.

b. Remove the bolts securing the pump to the engine and slip the pump off the spline drive.

NOTE

A nylon shear plate is incorporated into the pump drive mechanism which may be replaced should the pump seize during operation.

To install the vacuum pump, reverse the disassembly procedure. Do not use thread lubricant or pipe compound when connecting the lines to the inlet and outlet ports. Such compounds may cause damage to the vacuum system or the instruments.

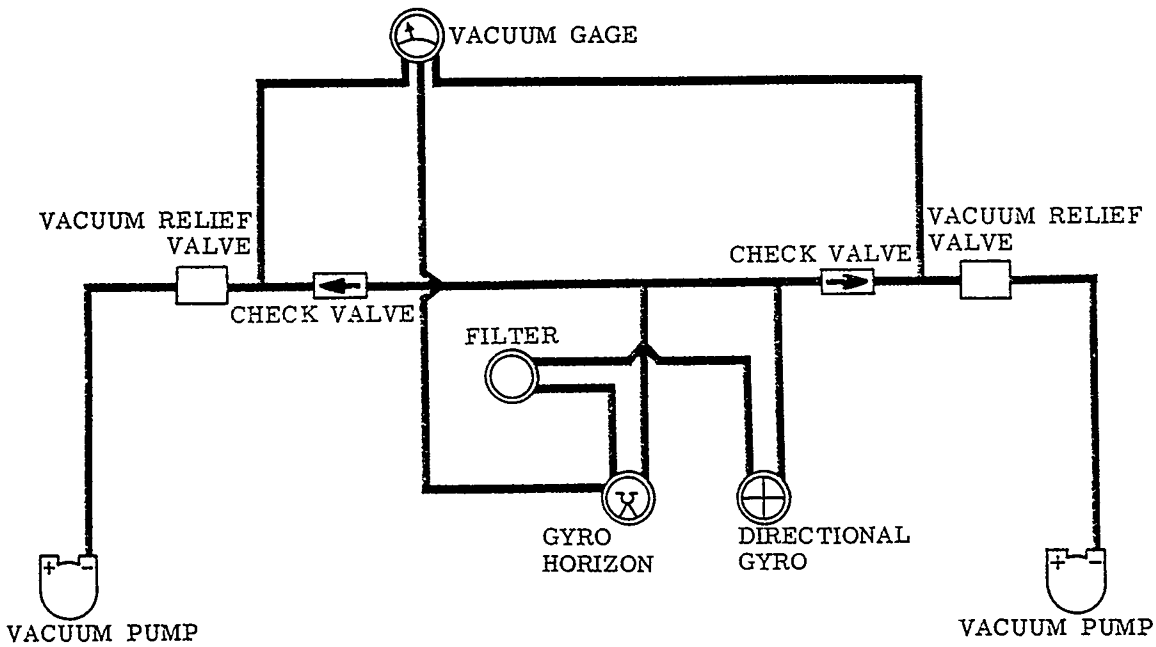


Figure 11-15. Vacuum System (TG-1 through TG-51)

PRESSURE SYSTEM (TG-52 and after)

The pressure system on the Model 56TC, serials TG-52 and after, provides filtered air for deicer, autopilot and gyro instrument operation. Air pressure is supplied bv two engine-driven dry air pumps. Pressure is controlled by a pressure regulator located in each nacelle. From the pressure regulator, air then flows to the pressure manifold, located below the floorboards, aft of the front spar and to the left of the aircraft centerline. Air from the manifold is distributed to the instruments and the deicer and autopilot systems (if installed). Pressure from the pressure manifold to the instruments is controlled by a gyro instrument adjustable-orifice, located on the LH side of the aircraft, forward of the instrument panel, under the upper upholstery panel.

NOTE

Aircraft with four (or more) air driven gyros and an air-operated autopilot installed should be equipped with high capacity air pumps to safely operate these components in the event of single-engine operation. A pump of the same capacity must be used as a replacement.

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 pressure side of the pressure pump, located in each nacelle aft of the firewall, should be replaced every 300 hours of operation (or less if operating in dusty conditions).

PRESSURE SYSTEM INSPECTION AND ADJUSTMENT

BASIC PRESSURE SYSTEM (INSTRUMENTS ONLY) (Figure 11-16)

To determine that the pressure system is adjusted properly, inspect the system as follows:

NOTE

Test gage connections are provided by a tee fitting in the air supply on the "out" side of the pressure regulator in each nacelle.

a. Install a test gage (0-10 psi) at the "out" side of both pressure regulators, located on the RH side of each nacelle aft of the firewall.

b. Operate each engine individually at 2300 rpm and check the readings on the test gages. The pressure on each test gage should be 5.0 ± .5 psi. The difference between the pressures recorded on the test gages should not exceed .5 psi.

c. With both engines running at 2300 rpm, the pressure reading on the gyro pressure indicator should be 5.0 +.1 -.2 inch Hg.

ADJUSTMENT

If the basic pressure system does not meet the requirements of the preceding inspection, adjust the system as follows:

a. Remove both inline filters from the system and check for obstruction by comparing the resistance to flow with a new filter. Use a low, dry air pressure source (maximum 10 psi) to accomplish this test. If the resistance to air flow in a filter removed from the aircraft exceeds that of a new filter by more than one psi, replace with a new filter.

b. Install a test gage (0-10 psi) at the "out" side of each pressure regulator.

c. Operate one engine at 2300 rpm and adjust the regulator for that side to obtain a reading of 5.0 psi on the test gage.

d. Repeat the above step on the opposite engine and pressure regulator.

NOTE

Rotating the adjusting screw on top of the pressure regulator clockwise increases pressure and counterclockwise decreases pressure.

e. Locate the gyro pressure regulator on the LH side of the aircraft, forward of the instrument panel and adjust as follows:

1. Loosen the check nut and rotate the adjusting screw clockwise to increase pressure or counterclockwise to decrease pressure to obtain a reading of 5.0 + .1 - .2 inch Hg on the gyro pressure indicator with both engines running at 2300 rpm.

2. Tighten the check nut and recheck the gyro pressure indicator to read in the green arc with both engines running at 500 rpm.

f. After adjusting the gyro pressure regulator, the pressure on the test gages in the nacelles should be rechecked with each engine running at 2300 rpm. If the pressure readings are not 5.0 ± .5 psi, the regulators should be readjusted to this value. The difference between the pressure readings of each test gage should not exceed .5 psi.

NOTE

If the requirements of this adjustment procedure cannot be obtained, the complete system, including the check valves and the gaskets in the manifold, should be checked for leaks and/or restrictions, the discrepancy repaired and the system readjusted.

Remove the test gages from the aircraft.

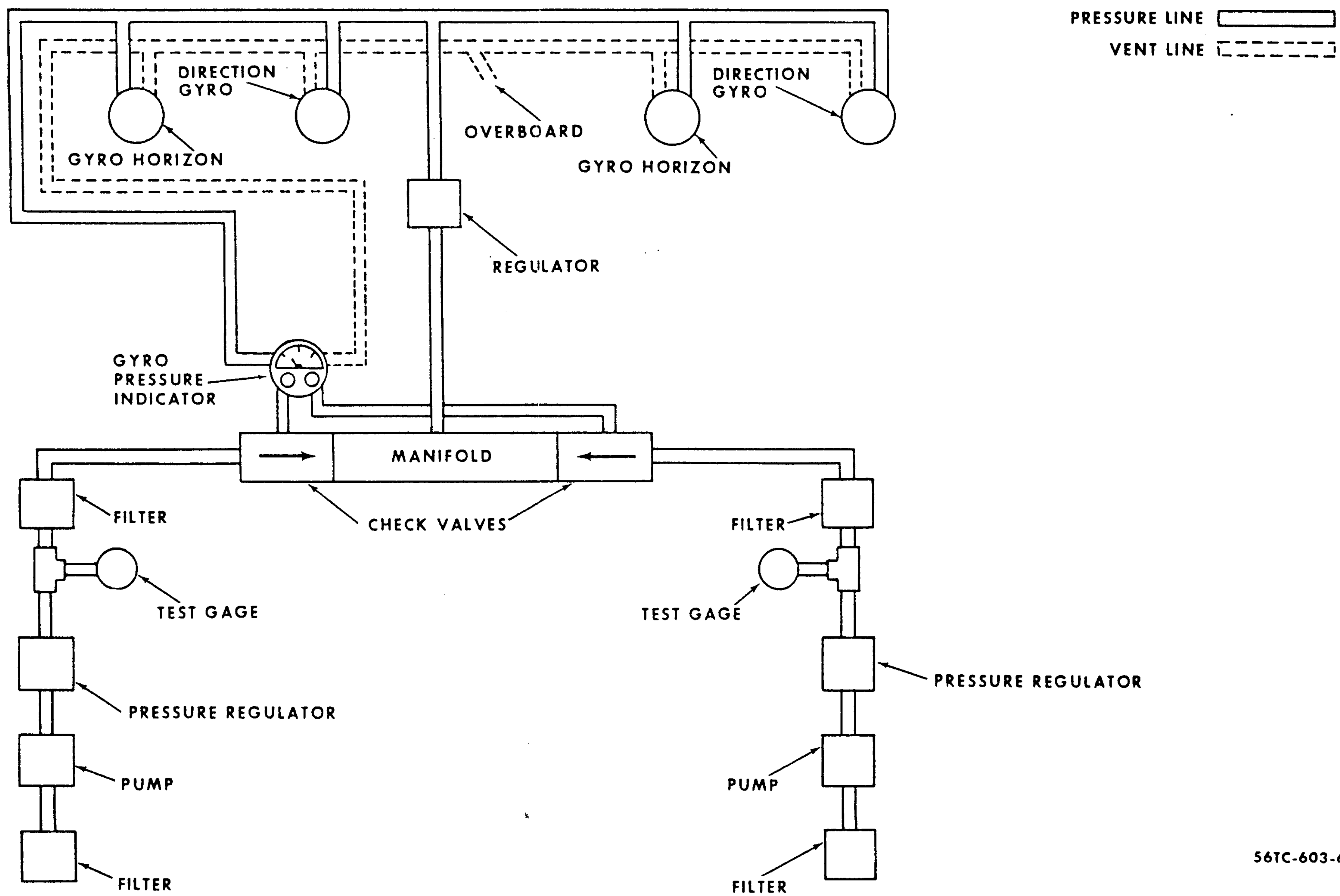


Figure 11-16. Basic Pressure System

BASIC PRESSURE SYSTEM PLUS DEICER INSTALLATION
(Figure 11-17)

INSPECTION

a. Install a test gage (0-20 psi) at the tee connections provided at the "out" side of each two-stage pressure regulator located on the RH side of each nacelle, aft of the firewall.

b. Run each engine individually at 2300 rpm and check for the following readings.

1. 7.5 ± .5 psi on the deicer pressure gage and a maximum of 9.0 psi on the test gage in the nacelle with the deicer OFF.

2. 16 to 19 psi on the deicer pressure gage and a maximum of 20 psi on the test gage in the nacelle with the deicer ON.

c. With both engines running at 2300 rpm, the pressure on the gyro pressure indicator should be 5.0 + .1 - .2 psi.

d. With both engines running at 2300 rpm, the difference between the pressure on the test gages in the nacelles should not exceed .5 psi.

If the pressure system does not meet the requirements of the preceding inspection procedure, the system should be adjusted as follows:

ADJUSTMENT

a. Remove both inline filters from the system and check for obstruction by comparing the resistance to flow with a new filter. Use a dry, low pressure air source (maximum of 10 psi) to accomplish this test. If the resistance to air flow in the filter removed from the aircraft exceeds that of a new filter by more than one psi, the filter should be replaced.

b. Install a test gage (0-20 psi) at the test fittings on the "out" side of each two-stage pressure regulator.

c. Run one engine at 2300 rpm and adjust the two-stage pressure regulator, for that engine, as follows:

1. Adjust the low-pressure section of the pressure regulator (section with solenoid) to obtain a reading of 7.5 ± .5 psi on the deicer pressure gage with the deicer system OFF. A pressure of 9.0 psi on the test gage in the nacelle should be sufficient to obtain the reading of 7.5 ± .5 psi on the deicer pressure gage.

2. Adjust the high-pressure section of the pressure regulator (section without solenoid) to obtain a reading of 16 to 19 psi on the deicer pressure gage with the deicer system ON. A pressure of 17 to 20 psi on the test gage in the nacelle should be sufficient to obtain the reading of 16 to 19 psi on the deicer pressure gage.

d. Repeat step "c" on the opposite side of the aircraft.

NOTE

Rotating the adjusting screws on the pressure regulator clockwise increases pressure and counterclockwise decreases pressure.

e. Locate the gyro pressure regulator on the LH side of the aircraft, forward of the instrument panel and adjust as follows:

1. Loosen the check nut and rotate the adjusting screw clockwise to increase pressure or counterclockwise to decrease pressure to obtain a reading of 5.0 + .1 - .2 in Hg on the gyro pressure indicator with both engines operating at 2300 rpm.

2. Tighten the check nut and recheck the gyro pressure indicator to read in the green arc with both engines operating at 1500 rpm.

f. After adjusting the gyro pressure regulator, the pressure on the test gages in the nacelles should be rechecked with each engine operating individually at 2300 rpm. If the pressure on the test gage has been affected by the adjustment of the orifice (regulator), the regulators in the nacelles should be readjusted as specified in steps "c" and "d".

g. With both engines operating at 2300 rpm, the difference between the pressures on the test gages at the pressure regulators in the nacelles should not exceed .5 psi.

NOTE

If the required pressures of the above adjustment procedure cannot be obtained, a complete check of the system (including the check valves and the gasket in the manifold) should be made for leaks or restrictions, the discrepancy repaired and the system readjusted.

h. Remove the test gages from the aircraft.

BASIC PRESSURE SYSTEM PLUS AUTOPILOT
(Figure 11-18)

INSPECTION

a. Install a test gage (0-10 psi) at the tee fitting provided in the "out" line of the pressure regulators located on the RH side of each nacelle, aft of the firewall.

b. Install a test gage (0-10 psi) in the turn coordinator supply line.

c. Operate each engine individually at 2300 rpm and check the readings on the test gages with the autopilot turned ON. The pressure on the test gage in the turn coordinator supply line should read 5.0

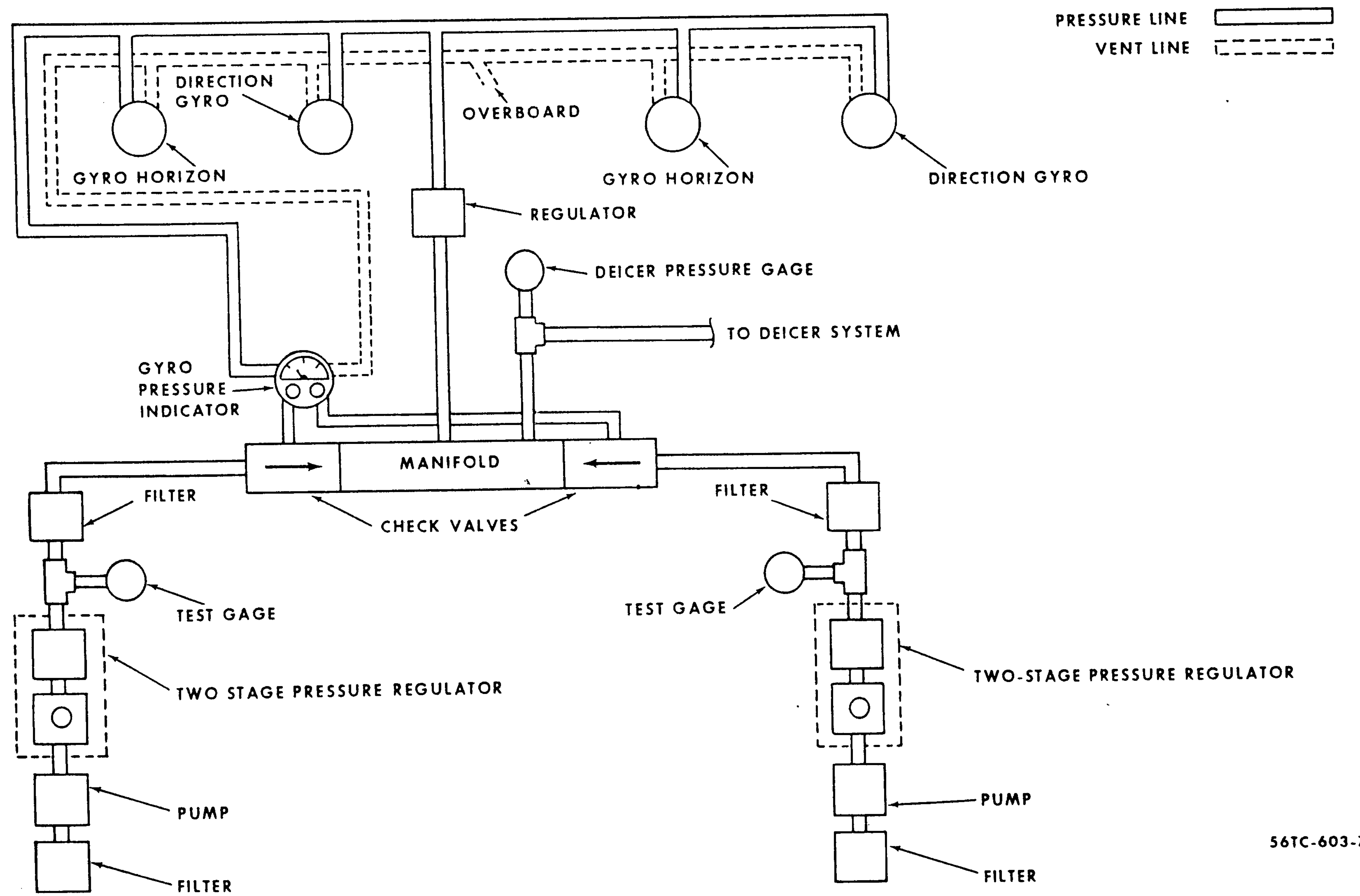


Figure 11-17. Basic Pressure System and Deicer

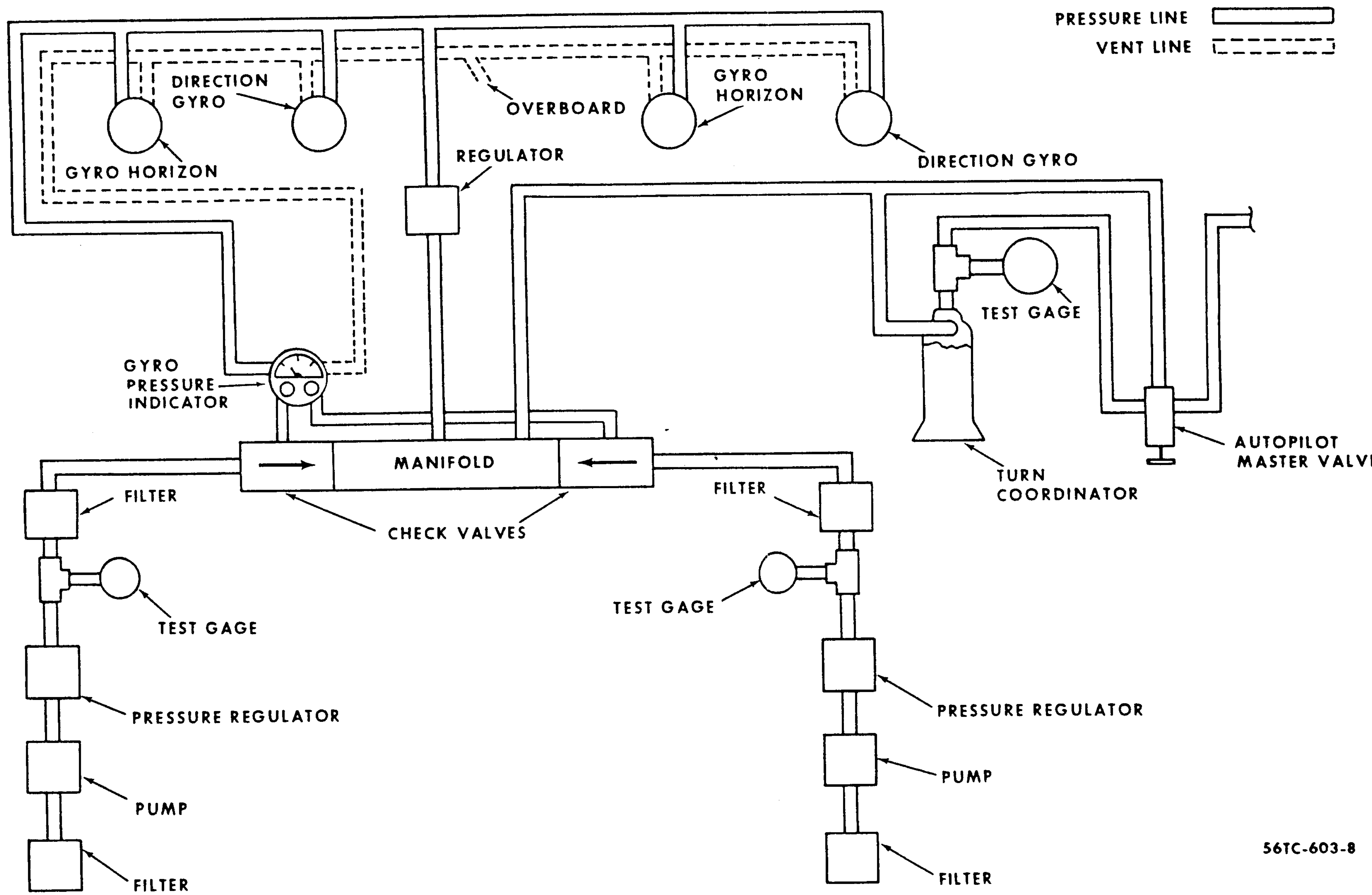


Figure 11-18. Basic Pressure System and New-Matic Autopilot

+ .0 - .5 psi with a reading on the nacelle test gage of 6.5 psi (maximum of 7 psi).

d. With both engines running at 2300 rpm, the pressure on the gyro pressure indicator should be 5.0 + .1 - .2 in Hg.

e. With both engines running at 2300 rpm, the difference between the pressure on the test gages in the nacelles should not exceed .5 psi.

ADJUSTMENT

If the pressure system does not meet the requirements of the preceding inspection procedure, the system should be adjusted as follows:

a. Remove both inline filters from the system and check for obstruction by comparing the resistance to flow with a new filter. Use a dry, low pressure air source (maximum of 10 psi) to accomplish this test. If the resistance to air flow in the filter removed from the aircraft exceeds that of a new filter by more than one psi, the filter should be replaced.

b. Install a test gage (0-10 psi) on the tee connection at the "out" side of each pressure regulator.

c. Install a test gage (0-10 psi) in the turn coordinator supply line.

d. Run one engine at 2300 rpm and adjust the pressure regulator for that engine to obtain a reading of 5.0 + .0 - .5 psi on the test gage in the turn coordinator supply line with the autopilot ON. Normally a pressure of 6.5 psi on the test gage at the pressure regulator is sufficient to obtain the 5.0 + .0 - .5 psi reading at the turn coordinator. Under no circumstances should the reading at the pressure regulator exceed 7.0 psi.

e. Repeat step "d" on the opposite side of the aircraft.

NOTE

Rotating the adjusting screw on the pressure regulator clockwise increases pressure and counterclockwise rotation decreases pressure.

f. Locate the gyro pressure regulator on the LH side of the aircraft, forward of the instrument panel and adjust as follows:

1. Loosen the check nut and rotate the adjusting screw clockwise to increase pressure or counterclockwise to decrease pressure to obtain a reading of 5.0 + .1 - .2 in Hg on the gyro pressure indicator with both engines operating at 2300 rpm.

2. Tighten the check nut and recheck the gyro pressure indicator to read in the green arc with both engines running at 1500 rpm.

g. After adjusting the gyro pressure regulator, the pressure on the test gage in the turn coordinator supply line should be rechecked with each engine running individually at 2300 rpm. If the pressure on the test gage has been affected by the adjustment of the orifice (regulator), the regulators in the nacelles should be readjusted as specified in steps "d" and "e".

h. With both engines operating at 2300 rpm, the difference between the pressures on the test gages at the pressure regulators in the nacelles should not exceed .5 psi.

NOTE

If the requirements of this adjustment procedure cannot be obtained, the complete system, including the check valves and the gaskets in the manifold, should be checked for leaks and/or restrictions, the discrepancy repaired and the system readjusted.

i. Remove the test gages from the aircraft.

BASIC PRESSURE SYSTEM PLUS DEICER AND AUTOPILOT
(Figure 11-19)

INSPECTION

a. Install a test gage (0-20 psi) at the tee connection provided at the "out" side of each two-stage pressure regulator located on the RH side of each nacelle, aft of the firewall.

b. Install a test gage (0-10 psi) in the turn coordinator supply line.

c. Operate each engine individually at 2300 rpm and check for the following readings:

1. 7.5 ± .5 psi on the deicer pressure gage, maximum of 9.0 psi on the test gage in the nacelle and 5.0 psi on the test gage in the turn coordinator supply line with the autopilot ON and the deicer OFF.

2. 16 to 19 psi on the deicer pressure gage, maximum of 20 psi on the test gage in the nacelle and 5.0 + .0 - .5 on the test gage in the turn coordinator supply line with the autopilot and deicer ON.

d. With both engines operating at 2300 rpm, the pressure on the gyro pressure indicator should be 5.0 + .1 - .2 in Hg.

e. With both engines operating at 2300 rpm, the difference between the pressures on the test gages in the nacelles should not exceed .5 psi.

If the pressure system does not meet the requirements of the preceding inspection procedure, the system should be adjusted as follows:

ADJUSTMENT

a. Remove both inline filters from the system and

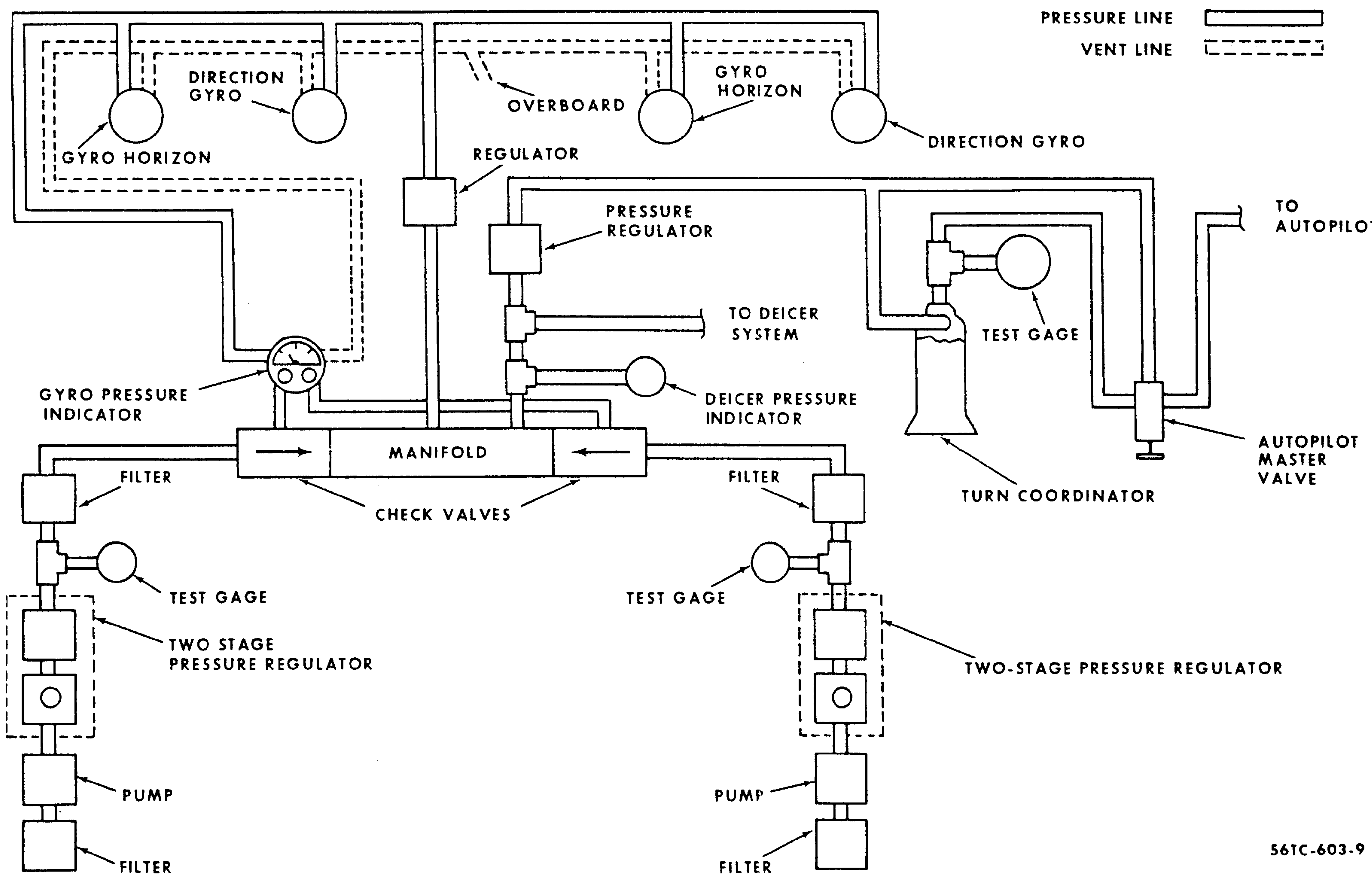


Figure 11-19. Basic Pressure System, New-Matic Autopilot and Deicer

check for obstruction by comparing the resistance to flow with a new filter. Use a dry, low pressure air source (maximum of 10 psi) to accomplish this test. If the resistance to air flow in the filter removed from the aircraft exceeds that of a new filter by more than one psi, the filter should be replaced.

b. Install a test gage (0-20 psi) at the tee connections provided at the "out" side of each two-stage pressure regulator.

c. Install a test gage (0-10 psi) in the turn coordinator supply line.

d. Operate one engine at 2300 rpm and adjust the low-pressure section of the two-stage pressure regulator (section with solenoid) to obtain a reading of 7.5 ± .5 psi on the deicer pressure gage with the deicer OFF. A pressure of 9.0 psi on the test gage in the nacelle should be sufficient to obtain a 7.5 ± .5 psi reading on the deicer pressure gage.

e. Repeat step "d" on the opposite side of the aircraft.

NOTE

Rotating the adjusting screw on the pressure regulator clockwise increases pressure and counterclockwise rotation decreases pressure.

f. Operate both engines at 2300 rpm and adjust the pressure regulator to obtain a reading of 5.0 + .0 - .5 psi on the test gage in the turn coordinator supply line with the autopilot ON and the deicer OFF. The pressure regulator is located in the nose baggage compartment or under the pilot's seat aft of the main spar.

g. Operate one engine at 2300 rpm and adjust the high-pressure section of the two-stage pressure regulator (section without solenoid) to obtain a reading of 16 to 19 psi on the deicer pressure gage with the deicer system ON. A pressure of 17 to 20 psi on the test gage in the nacelle should be sufficient to obtain the 16 to 19 psi reading on the deicer pressure gage.

h. Repeat step "g" on the opposite side of the aircraft.

i. Locate the gyro pressure regulator on the LH side of the aircraft, forward of the instrument panel and adjust as follows:

1. Loosen the check nut and rotate the adjusting screw clockwise to increase pressure or counterclockwise to decrease pressure to obtain a reading of 5.0 + .1 - .2 in Hg on the gyro pressure indicator with both engines operating at 2300 rpm.

2. Tighten the check nut and recheck the gyro pressure indicator to read in the green arc with both engines operating at 1500 rpm.

j. After adjusting the gyro pressure regulator, the pressure on the test gage in the turn coordinator supply line, should be rechecked with each engine operating individually at 2300 rpm. If the pressure on the test gage has been affected by the adjustment of the orifice (regulator), the regulators in the nacelles should be readjusted as specified in steps "d" through "h".

k. With both engines operating at 2300 rpm, the difference between the pressures on the test gages at the pressure regulators in the nacelles should not exceed .5 psi.

NOTE

If the requirements of this adjustment procedure cannot be obtained, the complete system, including the check valves and the gaskets in the manifold, should be checked for leaks and/or restrictions, the discrepancy repaired and the system readjusted.

l. Remove the test gages from the aircraft.

BASIC PRESSURE SYSTEM PLUS H-14 AUTOPILOT INSTALLATION
(Figure 11-20)

INSPECTION

a. Install a test gage (0-15 psi) at the tee fitting provided on the "out" side of both pressure regulators, located on the RH side of each nacelle, aft of the firewall.

b. Install a test gage (0-10 psi) in the autopilot supply line, at the "out" side of the pressure manifold. The pressure manifold is located under the upholstery side panel, aft of the pilot's seat.

c. Run each engine individually at 2300 rpm and check the readings on the test gages with the autopilot ON. The pressure on the test gage at the manifold should read 7.5 ± .5 psi with a reading on the test gage in the nacelle of 8.5 psi (maximum of 9.0 psi).

d. With both engines running at 2300 rpm, the pressure on the gyro pressure indicator should be 5.0 + .1 - .2 in Hg.

e. With both engines running at 2300 rpm, the difference between the pressures on the test gages in the nacelles should not exceed .5 psi.

If the pressure system does not meet the requirements of the preceding inspection procedure, the system should be adjusted as follows:

ADJUSTMENT

a. Remove both inline filters from the system and check for obstruction by comparing the resistance to flow with a new filter. Use a dry, low pressure air source (maximum of 10 psi) to accomplish this test.

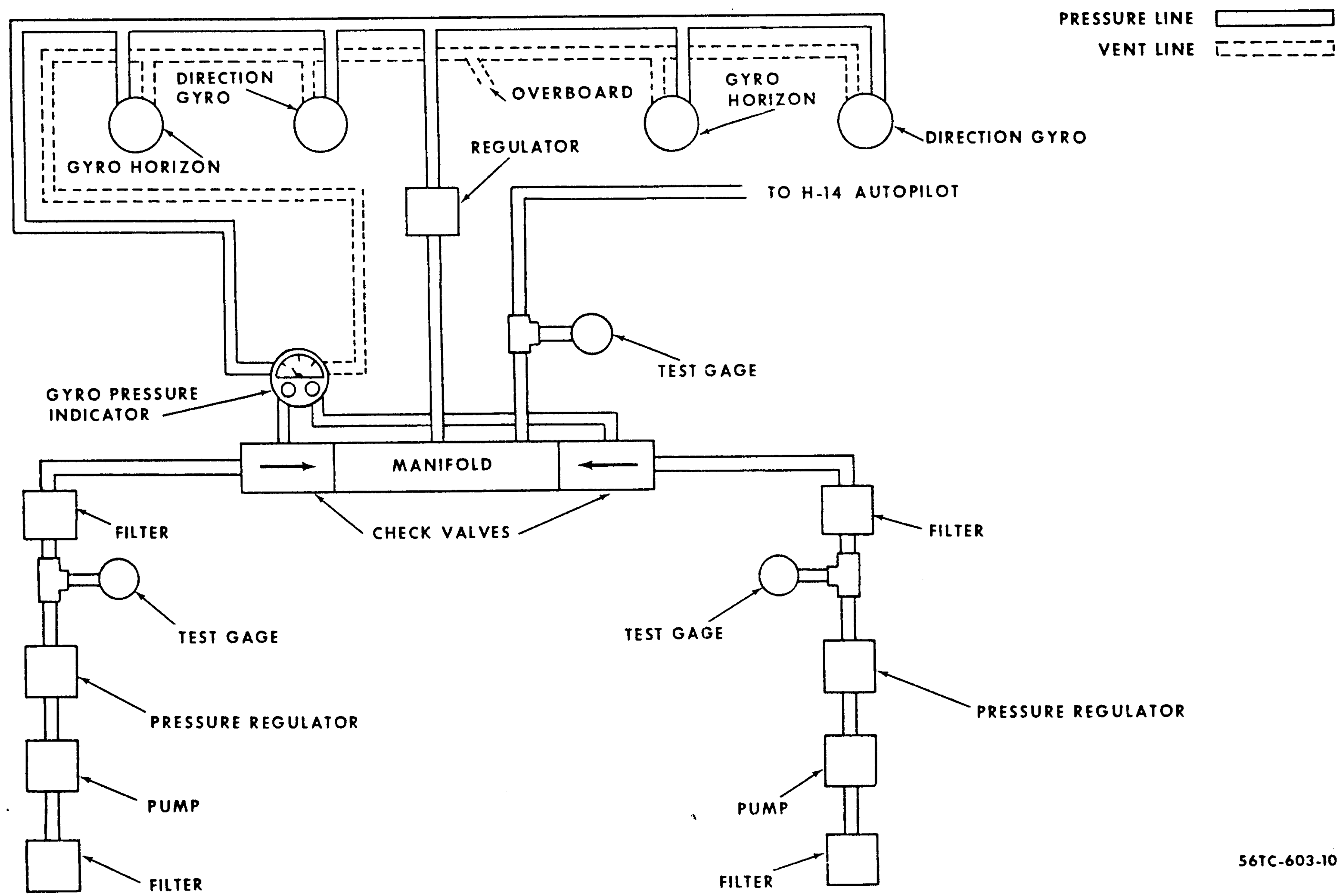


Figure 11-20. Basic Pressure System and H-14 Autopilot

If the resistance to air flow in the filter removed from the aircraft exceeds that of a new filter by more than one psi, the filter should be replaced.

b. Install a test gage (0-15 psi) at the tee connection provided at the "out" side of each pressure regulator.

c. Install a test gage (0-10 psi) in the autopilot supply line, at the "out" side of the pressure manifold.

d. Run one engine at 2300 rpm and adjust the pressure regulator, for that engine, to obtain a reading of 7.5 ± .5 psi on the test gage in the autopilot supply line with the autopilot ON. Normally a pressure of 8.5 on the test gage at the pressure regulator is sufficient to obtain the 7.5 ± .5 reading in the autopilot supply line. Under no circumstance should the reading at the pressure regulator exceed 9.0 psi.

e. Repeat step "d" on the opposite side of the aircraft.

NOTE

Rotating the adjusting screw on the pressure regulator clockwise increases pressure and counterclockwise rotation decreases pressure.

f. Locate the gyro pressure regulator on the LH side of the aircraft, forward of the instrument panel and adjust as follows:

1. Loosen the check nut and rotate the adjusting screw clockwise to increase pressure or counterclockwise to decrease pressure to obtain a reading of 5.0 + .1 - .2 in Hg on the gyro pressure indicator with both engines operating at 2300 rpm.

2. Tighten the check nut and recheck the gyro pressure indicator to read in the green arc with both engines operating at 1500 rpm.

g. After adjusting the gyro pressure regulator, the pressure on the test gage in the autopilot supply line should be rechecked with each engine running individually at 2300 rpm. If the pressure on the test gage has been affected by the adjustment of the orifice (regulator), the regulators in the nacelles should be readjusted as specified in steps "d" and "e".

h. With both engines operating at 2300 rpm, the difference between the pressures on the test gages in the nacelles should not exceed .5 psi.

NOTE

If the requirements of this adjustment procedure cannot be obtained, the complete system, including the check valves and the gaskets in the manifold, should be checked for leaks and/or restrictions, the discrepancy repaired and the system readjusted.

i. Remove the test gages from the aircraft.

BASIC PRESSURE SYSTEM PLUS DEICER AND H-14 AUTOPILOT
(Figure 11-21)

INSPECTION

a. Install a test gage (0-20 psi) at the tee connection provided at the "out" side of each two-stage pressure regulator located on the RH side of each nacelle, aft of the firewall.

b. Operate each engine individually at 2300 rpm and check for the following readings:

1. 7.5 ± .5 psi on the deicer pressure gage with a reading of 8.5 psi (maximum of 9.0 psi) on the test gage in the nacelle with the autopilot ON and the deicer OFF.

2. 16 to 19 psi on the deicer pressure gage with a reading of 17 to 20 psi (maximum of 20 psi) on the test gage in the nacelle with the deicer and autopilot ON.

c. With both engines operating at 2300 rpm, the pressure on the gyro pressure indicator should be 5.0 + .1 - .2 in Hg.

d. With both engines operating at 2300 rpm, the difference between the pressures on the test gages in the nacelles should not exceed .5 psi.

If the pressure system does not meet the requirements of the preceding inspection procedure, the system should be adjusted as follows:

ADJUSTMENT

a. Remove both inline filters from the system and check for obstruction by comparing the resistance to flow with a new filter. Use a dry, low pressure air source (maximum of 10 psi) to accomplish this test. If the resistance to air flow in the filter removed from the aircraft exceeds that of a new filter by more than one psi, the filter should be replaced.

b. Install a test gage (0-20 psi) at the tee fitting provided at the "out" side of each two-stage pressure regulator.

c. Operate one engine at 2300 rpm and adjust the two-stage pressure regulator, for that engine, as follows:

1. Adjust the low-pressure section of the pressure regulator (section with solenoid) to obtain a reading of 7.5 ± .5 psi on the deicer pressure gage with the deicer system OFF and the autopilot ON. A pressure of 9.0 psi on the test gage in the nacelle should be sufficient to obtain the reading of 7.5 ± .5 psi on the deicer pressure gage.

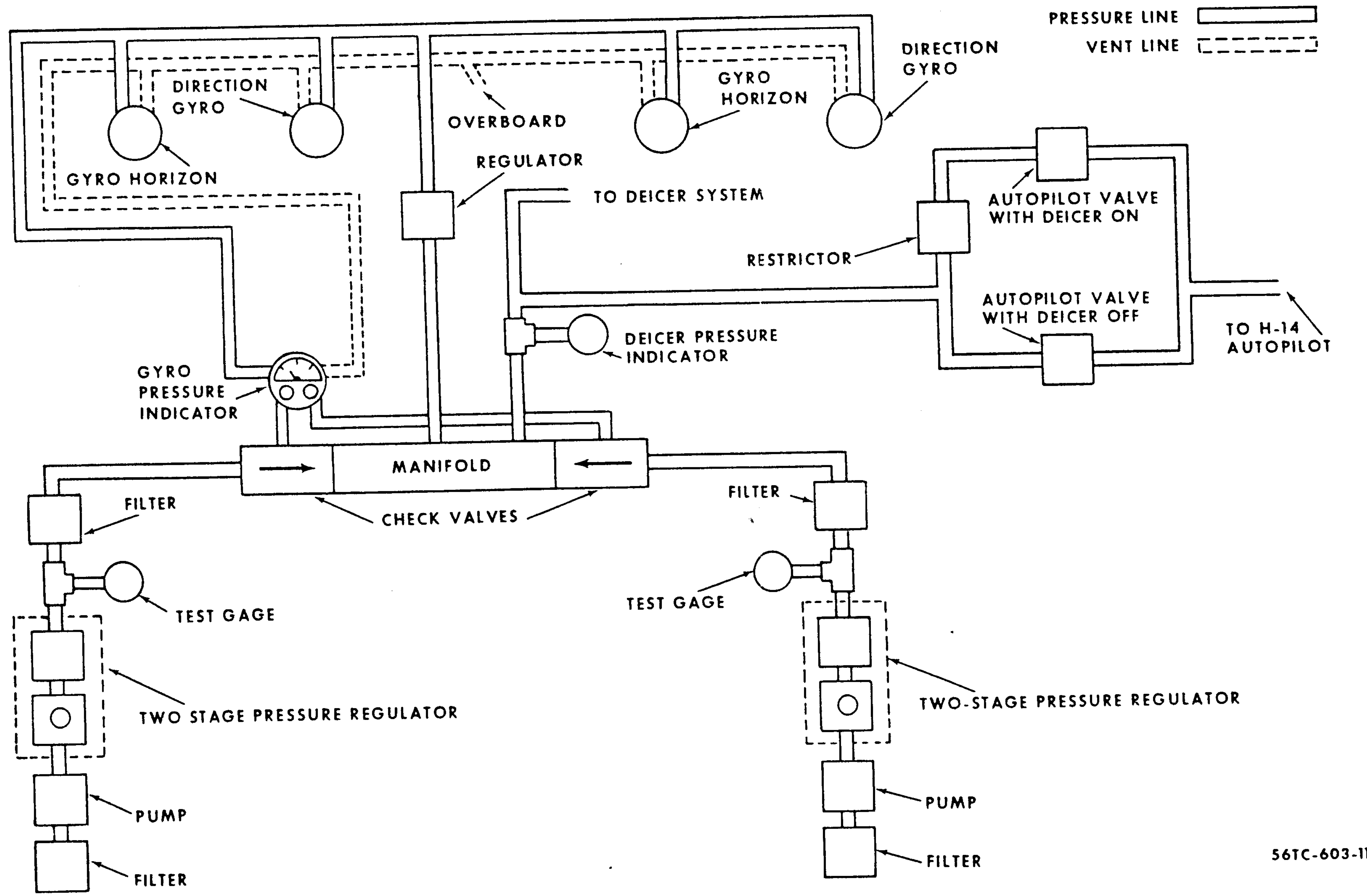


Figure 11-21. Basic Pressure System, Deicer and H-14 Autopilot

2. Adjust the high-pressure section of the pressure regulator (section without solenoid) to obtain a reading of 16 to 19 psi on the deicer pressure gage with the deicer system and autopilot ON. A pressure of 17 to 20 psi on the test gage in the nacelle should be sufficient to obtain the reading of 16 to 19 psi on the deicer pressure gage.

d. Repeat step "c" on the opposite side of the aircraft.

NOTE

Rotating the adjusting screws on the pressure regulator clockwise increases pressure and counterclockwise rotation decreases pressure.

e. Locate the gyro pressure regulator on the LH side of the aircraft, forward of the instrument panel and adjust as follows:

1. Loosen the check nut and rotate the adjusting screw clockwise to increase pressure or counterclockwise to decrease pressure to obtain a reading of 5.0 + .1 - .2 in Hg on the gyro pressure indicator with both engines operating at 2300 rpm.

2. Tighten the check nut and recheck the gyro pressure indicator to read in the green arc with both engines operating at 1500 rpm.

f. After adjusting the gyro pressure regulator, the pressure on the test gage in nacelle should be rechecked with engine running individually at 2300 rpm. If the pressure on the test gages has been affected by the adjustment of the orifice (regulator), the regulators in the nacelles should be readjusted as specified in steps "c" and "d".

g. With both engines operating at 2300 rpm, the difference between the pressures on the test gages at the pressure regulators in the nacelles should not exceed .5 psi.

NOTE

If the requirements of this adjustment procedure cannot be obtained, the complete system, including the check valves and the gaskets in the manifold, should be checked for leaks and/or restrictions, the discrepancy repaired and the system readjusted.

h. Remove the gages from the aircraft.

TURN AND SLIP ADJUSTABLE ORIFICE

A turn and slip adjustable orifice is installed for each pressure-driven turn and slip indicator. The regulator 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 Hg on a test gage. Both engines should be running at 2000 rpm while the adjustment is being made. Rotate the adjusting screw counterclockwise to increase pressure and clockwise to decrease 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.

AIRCRAFT FINISH CARE

Enamel paint is the primary finish used on the exterior of the aircraft. Epoxy and Urethane paints are available as optional finishes. This section will cover primarily the care and preserving of the exterior finish. Special procedures such as, removal and application as well as touch up repair are listed to aid in preserving and maintaining the exterior finish of the aircraft. Each type of paint available for the Turbo-Baron with paint names and numbers, is listed to aid in reordering matching colors. Areas of the aircraft requiring other paints and special procedures such as, battery box and lid, magnesium surfaces etc, are also listed.

PAINTING ALUMINUM

PREPARATION OF AIRPLANE ALUMINUM EXTERIOR FOR PAINT

a. Mask windows with a double thickness of paper. Cover all openings where paint might enter airplane.
b. Sand scratches and rough areas to improve smoothness.
c. Clean surface of airplane with solvent, (lacquer 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 insure removal of all hand prints, dirt, and etc.

APPLICATION OF EXTERIOR PAINT ON ALUMINUM SKINS

a. Prime surfaces with zinc chromate primer (Item 26, Consumable Materials Chart). Mix only enough primer for use within an 8 hour period. Primer mixed longer than 8 hours must be discarded.
b. Apply one coat of wash primer (Item 25, Consumable Materials Chart). Keep air pressure at a minimum to prevent overspray.

NOTE

> Temperature and humidity will effect drying time of the primer. It should dry at least 15 minutes before recoating the surface (test surface with light fingernail pressure).

c. Proceed to prime with a wet coat of zinc chromate primer, (Item 26, Consumable Materials Chart) thinned one part primer and two parts toluol. A heavy hiding coat of this primer is not desired and will impair performance.
d. The exterior surfaces are now ready for color coat.

EXTERIOR PAINT TOUCH-UP REPAIR

a. Mask around the skin containing the damaged area.
b. Remove any loose edges of 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 sand scratches left by the coarse paper so that the finish will be perfectly smooth. Take care to avoid removing any more metal than is absolutely necessary.
e. Wash the sanded area with a solvent, such as naphtha, (Item 20, Consumable Materials Chart), or toluol, (Item 22, Consumable Materials Chart). Change the wash cloths used for this purpose frequently so that all the sanding dust will be picked up.
f. After the area to be touched up has been cleaned with solvent until all trace of discoloration is gone, apply a coat of pretreatment primer to the damaged area.
g. Spray two or three coats of zinc chromate primer, (Item 26, Consumable Materials Chart), 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 metal and the old paint meet is gone. If it is necessary, apply additional primer until the junction of the paint and metal is no longer visible.
i. Spray on two thin topcoats of finish paint.

The following is a list of the Enamel paints available for the BEECHCRAFT TURBO-BARON.

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
Champagne Gold	118684-39
Jubilee Gold	118684-221
Sable Brown	118684-223
Sunshine Yellow	118684-231
Capri Blue	118684-265
Omaha Orange	118684-273
Kingston Gray	118684-299
Peacock Turquoise	118684-333
Terrace Blue	118684-335
Sahara Tan	118684-337
Prairie Beige	118634-339
Antique Gold	118684-341
Klondike Yellow	118684-343
Beechwood	118684-345
Embassy Red	118684-347
Marlin Blue	118684-349

ENAMEL (Continued)
(Exterior Colors)

Bahama Blue	118684-351
Pavonne Blue	118684-353
Matador Red	118684-355
Sunburst Yellow	118684-357
Jade Mist Green	118684-359
Astro Blue	118684-361

EPOXY PAINT (OPTIONAL)

Besides forming a tougher film than enamel or lacquer, epoxy has a very lustrous sparkle. However, the painted surface oxidizes a little faster than enamel or lacquer, and must be polished more frequently to retain the sheen. Oxidation is accelerated by exposure to the sun, hence in hot weather oxidation will occur faster than in cold weather. A good coat of wax will protect the aircraft surface from the sun's rays and keep the surface from oxidizing as fast. Any good automotive polish or wax can be used.

PAINT REPAIR PROCEDURES

NOTE

At temperatures below 70°F, the paint cure time required for any of the paints used in this procedure will extend beyond the time normally required. Under no circumstances should the paint be applied at temperatures below 60°F, since the paint will not cure.

The aircraft maybe finished with pretreatment (wash) primer, Epoxy primer, and a topcoat of Epoxy enamel. The following procedures include cleaning, paint stripping, prepaint preparation, priming, Epoxy painting, and an alternate method for small repairs that does not involve paint stripping. Careful observance of these procedures should result in a smooth, high lustre finish with firm adhesion for maximum life.

PAINT STRIPPING AND CLEANING

Epoxy paints and primer are difficult to strip because of their resistance to chemicals and solvents, therefore, a paint stripper made specifically for Epoxy paints should be used.

If an Epoxy stripper is not available, use a good enamel stripper. Removing the finish with such a substitute will require several applications and working the stripper with a stiff brush or wooden scraper.

a. Mask around the edge of the skin or skins containing the damaged area. Use a double thickness of heavy paper to prevent accidental splashes of paint stripper from penetrating the masking.

b. Apply Epoxy stripper as indicated by the manufacturer's directions. Try to stay approximately 1/8 inch away from the masking tape. This will necessitate a little more clean up upon finishing, but will prevent any damage to the finish on the next skin. The stripper will not attack aluminum during the stripping process and can be neutralized by rinsing the affected area with water.

CAUTION

Epoxy stripper usually contain acids that will irritate or burn the skin. Wear rubber gloves and eye protection when using the stripper.

c. Rinse the area with water and dry.
d. Wash the stripped area carefully with a solvent such as acetone, methyl ethyl ketone, or lacquer thinner. This will prevent tiny particles of loose paint from adhering to the stripped area.
e. Using a nylon scratch pad or aluminum wool dipped in clean water, clean the surface with a cleanser such as Bon Ami, Ajax, Comet Cleaner, etc. A good scouring will leave the surface completely clean.
f. Rinse thoroughly with clean water and dry the affected area carefully. If the stripped area includes several joints or skin laps, let the aircraft sit until all moisture has dried. This may be accelerated by blowing the skin laps with compressed air. Wet masking should be replaced.

PRETREATMENT (WASH) PRIMER

An acid etching primer that conforms to specification MIL-C-8514 should be applied to improve adhesion of the finishing coats. EX2016G base and EX2016 catalyst (products of Enmar Paint Company, Wichita, Kansas) are used in equal parts as a pretreatment wash primer at the factory.

a. Mix the primer in accordance with the manufacturers instructions.
b. Apply a thin wet coat of primer. It should dry for at least an hour, but not over 6 hours before applying Epoxy primer.

EPOXY PRIMER

a. Mix 54-23985 Epoxy primer (product of Enmar Paint Company, Wichita, Kansas) in accordance with the manufacturers instructions.

NOTE

For the best results these directions must be followed carefully, since some manufacturers require that the primers be allowed to set for 1/2 hour after the catalyst and base have been mixed while others allow immediate use after mixing.

b. Apply a thin coat of Epoxy primer with a spray gun using 35 to 40 psi of air pressure. A dappled appearance indicates that the coat is too thin.

c. If the initial coat is allowed to cure for more than 24 hours before topcoating, sand the primer slightly to roughen the surface to assure adhesion. Wipe off the surface with a cloth dampened with a solvent (such as lacquer thinner), then apply the topcoat.

APPLYING EPOXY TOPCOAT

a. Mix the paint and catalyst as directed by the manufacturer.

b. Apply the topcoat with a spray gun at 35 to 45 psi of air pressure. Two coats are normally required to fully conceal the primer and buildup the topcoat film to a thickness necessary for adequate service life and beauty. The Epoxy finish will normally cure to approximately 85% of its full hardness in 24 hours at temperatures of 80°F or higher.

EPOXY TOUCH-UP PAINT REPAIR

a. Mask around the skin containing the damaged area.

b. Remove any loose edges of 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 fair into a smooth joint, use a fine grade of sandpaper to eliminate the sand scratches left by the coarse paper so that the finish will be perfectly smooth. Take care to avoid removing any more metal than is absolutely necessary.

e. Wash the sanded area with a solvent, such as lacquer thinner or methyl ethyl ketone. Change the wash cloths used for this purpose frequently so that all of the sanding dirt will be picked up.

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

NOTE

If a metal conversion coating such as iridite or alodine is used, the wash primer coating can be dispensed with. If the metal has not been treated with a metal conversion coating but no wash primer is available, carefully clean the surface to be touched up and apply Epoxy primer to the bare metal. This will produce a satisfactory undercoat for the repair area.

g. Spray two or three coats of Epoxy for a heavier than normal buildup of primer.

h. After the Epoxy primer has cured for 24 hours, sand the area being repaired with a medium fine sandpaper. Sand the edge of the repair area until the indentation where the metal and the old paint meet is gone. If necessary, apply additional Epoxy primer until the conjunction of old paint with metal is no longer visible.

i. Spray on two topcoats.

EPOXY TOPCOAT

The following optional Epoxy paints are used as topcoats at the factory:

BLUE	
Blueberry Blue	118684-185
Capri Blue	118684-267
Morning Glory Blue	118684-189
Pacific Blue	118684-187
Turquoise	118684-197
GREEN	
Shamrock Green	118684-195
Surf Green	118684-193
RED	
Chianti Red	118684-215
Huntsman Red	118684-211
Toreador Red	118684-213
YELLOW	
Champagne Gold	118684-269
Jubilee Gold	118684-185
Lemon Yellow	118684-201
San Mateo Wheat	118684-179
Saturn Gold	118684-203
Sunshine Yellow	118684-233
WHITE	
Matterhorn White	118684-217
ORANGE	
Omaha Orange	118684-281
BROWN	
Beaver Brown	118684-207
Castle Tan	118684-205
Sable Brown	118684-227
GRAY	
Kingston Gray	118684-301
BLACK	
Black	118684-219

NOTE

Any order for the Epoxy paints listed above MUST include No. 5400 catalyst.

URETHANE PAINT (OPTIONAL)

The need for an extremely hard finish for protection against sandblast during takeoff and landings led to the development of urethane coatings for aircraft. Urethane paint dries into a high gloss and retains color much better than standard finishes. It is unaffected by the chemicals in hydraulic fluids, deicers, and fuels and requires far less care and maintenance than other finishes.

URETHANE PAINT REPAIR PROCEDURES

NOTE

The time normally required for urethane paint to cure must be extended at temperatures below 70°F. The paint will not cure at temperatures below 60°F.

The surface on the aircraft may be finished with pretreatment (wash) primer, urethane primer, and a top coat of urethane enamel. The following procedures include cleaning, paint stripping, prepaint preparation, priming, applying a urethane topcoat, and an alternate method for small repairs not requiring paint stripping. Careful observance of these procedures should result in a smooth, hard, glossy finish with firm adhesion for maximum life.

NOTE

Precut stripe and number patterns are available through Mid-America Marking, Inc., 1720 S. 151W, Wichita, Kansas 67052.

PAINT STRIPPING AND CLEANING URETHANE PAINT

Because of their resistance to chemicals and solvents, urethane paints and primers require a special paint stripper. If a urethane stripper is not available, a good enamel stripper may be used. Removing the finish with such a substitute will require several applications while working the stripper in with a stiff brush or wooden scraper.

a. Mask around the edge of the skin or skins containing the damaged area. Use a double thickness of heavy paper to prevent accidental splashes of paint stripper from penetrating the masking.

b. Apply urethane stripper as indicated by the manufacturer's directions. Try to stay approximately 1/8 inch away from the masking tape. This will necessitate a little more cleanup upon finishing, but will prevent damage to the finish on the next skin. The stripper will not attack aluminum during the stripping process and can be neutralized afterwards by rinsing the affected area with water.

CAUTION

Urethane strippers usually contain acids that irritate or burn the skin. Wear rubber gloves and eye protection when using the stripper.

c. Rinse the area with water and dry.

d. Wash the stripped area carefully with a solvent such as acetone, methyl ethyl ketone, or lacquer thinner. This will prevent tiny particles of loose paint from adhering to the stripped area.

e. Using a nylon scratch pad or aluminum wool dipped in clean water, clean the surface with a cleanser such as Bon Ami, Ajax, Comet cleaner, etc. A good scouring will leave the surface completely clean.

f. Thoroughly rinse with clean water and carefully dry the affected area. If the stripped area includes several joints or skin laps, let the aircraft sit until all moisture has dried. This may be accelerated by blowing the skin laps and seams with compressed air. Wet masking should be replaced.

PRETREATMENT (WASH PRIMER FOR URETHANE PAINT)

An acid etching primer that conforms to Specification MIL-C-8514 should be applied to improve adhesion of the finishing coats. EX2016G base and T6070 catalyst (products of Enmar Paint Company, Wichita, Kansas) are used in equal parts as a pretreatment wash primer at the factory.

a. Mix the primer in accordance with the manufacturers instructions.

b. Apply a thin wet coat of primer. It should be permitted to dry for at least one hour, but not over six hours, before the next coat of urethane primer is applied.

URETHANE PRIMER

a. Mix the urethane catalyst and base in accordance with the manufacturers instructions when preparing the primer.

NOTE

For the best results these directions must be followed carefully, for some manufacturers require that the primer be allowed to set for 1/2 hour after the catalyst and base have been mixed while others recommend immediate use after mixing.

b. Apply a coat of urethane primer with a spray gun using 35 to 40 psi of air pressure. A dappled appearance only indicates that the coat is thin.

c. If the initial coat is allowed to cure for more than 24 hours before the topcoat is applied, sand the primer slightly to roughen the surface and assure adhesion. Wipe off the surface with a cloth dampened with a solvent (such as lacquer thinner), then apply the topcoat.

APPLYING OPTIONAL URETHANE TOPCOATS

a. Mix the paint and catalyst as directed by the manufacturer.

b. Apply the topcoat with a spray gun at 35 to 45 psi of air pressure. Two coats are required to fully conceal the primer and build up the topcoat film necessary for adequate service life and beauty. The urethane finish will normally cure to approximately 85% of its full hardness in 24 hours at temperatures of 80°F or higher.

URETHANE TOUCH-UP REPAIR

a. Mask around the skin containing the damaged area.
b. Remove all loose edges of 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 fair 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, such as lacquer thinner or methyl ethyl ketone. Change the wash cloths used for this purpose often so that all the sanding dirt will be picked up.
f. After the area to be touched up has been cleaned with solvent until all traces of discoloration are gone, apply a thin coat of pretreatment primer to the damaged area.

NOTE

If a metal conversion coating such as iridite or alodine is used, the wash primer coating can be dispensed with. If the metal has not been treated with a metal conversion coating but no wash primer is available, carefully clean the surface to be touched up and apply urethane primer to the bare metal. This should produce a satisfactory undercoat for the repair area.

g. After the urethane primer has cured for 24 hours, sand the area under repair with medium fine sandpaper. Sand the edge of the repair area until the indentation where the metal and old paint meet is gone. If necessary, apply additional urethane primer until the juncture of old paint with metal is no longer visible.
h. Spray on two topcoats.

URETHANE TOPCOATS

The following colors are available at the factory for optional urethane topcoats:

BLACK	
Black	118684-319
BLUE	
Blueberry Blue	118684-305
Capri Blue	118684-322
Morning Glory Blue	118684-304
Pacific Blue	118684-303
Turquoise	118684-308
BROWN	
Beaver Brown	118684-313
Castle Tan	118684-312
Sable Brown	118684-320
GREEN	
Shamrock Green	118684-307
Surf Green	118684-306
GRAY	
Kingston Gray	118684-325
ORANGE	
Omaha Orange	118684-324
RED	
Chianti Red	118684-317
Flamingo	118684-314
Huntsman Red	118684-315
Toreador Red	118684-316
WHITE	
Matterhorn White	118684-318
YELLOW	
Champagne Gold	118684-323
Jubilee Gold	118684-302
Lemon Yellow	118684-310
San Mateo Wheat	118684-309
Saturn Gold	118684-311
Sunshine Yellow	118684-321

PAINTING MAGNESIUM

PAINT REMOVAL FROM MAGNESIUM SURFACES

a. Mask around the edge of the damaged area with a double thickness of heavy paper to prevent accidental splashes of paint stripper from penetrating the masking.
b. Apply Turco No. 4260 (product of Turco Products Inc., Los Angeles, California) to the skin under repair with a brush or non-atomizing gun.

CAUTION

Stripping should be accomplished in a well ventilated area since prolonged exposure to high concentrates of Turco No. 4260 vapor may irritate the eyes and lungs.

c. Allow the paint stripper to work for 20 to 30 minutes, then work the remaining paint loose with a bristle brush.

CAUTION

Never use a wire brush for it will damage the magnesium surface.

d. Remove the masking paper and wash the affected area thoroughly with water under high pressure. Remove all remnants of paint with lacquer thinner.
e. Sand the repaired area lightly, then apply BEECH-

CRAFT Dow Number 1 solution to prevent corrosion. The surface must be dried completely after Dow treatment.

NOTE

If surface is not completely void of moisture before finish coat is applied the finish will blister and flake off.

PAINTING MAGNESIUM SURFACES

a. Prepare the surface to be repainted as indicated under PAINT REMOVAL FROM MAGNESIUM SURFACES. Clean the affected area thoroughly with lacquer thinner or an equivalent solvent.

b. Prime the affected area and apply the topcoat as indicated under the applicable (for urethane or epoxy) paint procedure in this Section.

NOTE

Do not apply wash primer to magnesium surfaces. Allow a minimum of four hours drying time between application of the primer and topcoat.

CLEANING AND WAXING THE AIRCRAFT FINISH

Because the 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 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.

NOTE

Frequently inspect the underside of the wing and flaps in the area covered by the engine turbocharger exhaust stream for fuel lead deposits. If such deposits are discovered, they should be removed immediately with a water and mild detergent solution and the surface rewaxed.

INTERIOR COLORS

The following is a listing of the interior colors available for the BEECHCRAFT Turbo-Baron.

INTERIOR LACQUER

Driftwood	118684-183
Desert Beige	118684-181
Autumn Smoke	118684-155
Banff Blue	118684-241
Alpine Blue	246-57655
Seminole Beige	246-55762
Anchor Gray	246-57298
Lakewood Green	246-55911
Nairobi Pearl	27H-19251

INTERIOR VINYL

Driftwood	118684-245

INTERIOR ENAMEL

Black	94-515
Driftwood	82A-23294

SPECIAL PROCEDURES

The following special procedures should be followed for best results when applying paint to the following areas:

BATTERY BOX AND LID

Apply a minimum of three coats of vinyl paint to the interior of the battery box and lid in the following manner.

a. One coat of EX2016G wash primer.

b. One coat of intermediate vinyl paint.

c. One coat of finish vinyl paint.

NOTE

To insure complete coverage, each coat must be of a different color and must completely hide the preceding coat. The final coat shall be gray in color.

NOSE RADOME

No filler shall be used on the forward 13 inches of the nose cone. Spray with only one coat of primer and a maximum of two topcoats of non-metallic pigmented paint.

RUBBER SEALS

Apply one coat of a thoroughly dissolved solution of one part Oakite No. 6 and two parts water to all rubber surfaces that are to come in contact with either metal or other rubber surfaces. Apply a thin coat of Dow Corning No. 7 after completing the painting.

PROPELLER BLADES

[illegible] t the backs of the propeller blades with quick drying enamel per MIL-E-5556, color No. 37038 per Federal Standard 595.

LANDING LIGHT

Paint the landing light wells, excluding the ribs at the inboard ends, with quick drying enamel per MIL-E-5556, color No. 37038 per Federal Standard 595.

PAINT FREE AREAS

The following areas shall be kept free from paint.

a. Engine controls

b. Flight control cables and chains.

c. Control pedestals.

d. Exhaust manifolds and exhaust stacks.

e. Firewalls and wrought aluminum surfaces forward of the firewall, with the following exception:

1. Aluminum parts attached directly to the firewall shall be primed and painted in detail.

f. Aluminum flexible conduit.

g. All tubing except unplated steel, which shall receive two coats of primer on the exterior, and except as noted for the interior of the engine compartment, and interiors where the color scheme must be maintained.

h. Interior of all fluid lines.

i. Chromium plated portions of the landing gear piston tubes.

j. Rubber and rubber like surfaces.

k. Electrical wiring, unless otherwise noted as a specific requirement.

l. Glide path antenna (if installed).

m. Pitot mast and static button.

n. Cabin door sill and upper latch.

The following items are painted with Insignia Red, Enmar 94-509 Baking Enamel on all BEECHCRAFT TURBO-BARON AIRCRAFT.

a. Fuel selector handle.

b. Landing gear emergency operation handle.

c. Control lock assembly except the portion of the pin which extends into the control column.

d. Lock assembly, rudder pedal safety and chain.

The following items are painted with Instrument Black, ANA Color No. 514.

a. Console cover.

b. Elevator tab drum shield.

c. Upper and lower center console.

d. Engine control levers.

e. Nose gear indicator bezel.

f. Instrument faces and bezels.

g. Radio

h. Bendix ignition switch handles.

i. Instrument panel cutout covers.

Apply Aluminum Lacquer to all sound deadener material above the baggage compartment floor in the forward baggage compartment.

LOWER WING AND FLAP SKINS
(TG-1 through TG-81)

If inspection of the lower wing and flap area aft of the exhaust stacks disclose corrosion from fuel lead deposits, remove with a mild soap and water solution. Use a stainless steel wire brush to remove deeper, more resistive corrosion. If corrosion is so deep that 15% or more of the skin thickness is removed, the surface should be replaced. If skin thickness has been reduced by less than 15% (after the corrosion has been removed), the area should be treated with a 50% solution of nitric acid in water and then given a protective coating as described below.

CAUTION

Be careful to keep the 50% nitric acid solution off control cables. After the nitric acid treatment, rinse with water.

The protective coating should be placed on all accessible interior aluminum wing parts on the lower side of the wing, between wing stations 66.00 and 108.281 and aft of the second stringer aft of the front wing spar.

a. Mix Alodine 1200 or 1200S (a product of Amechem Products, Inc., Ambler, Pennsylvania) with water in a ratio of 3 to 4 ounces per gallon of water.

b. Place in a plastic container and allow to dissolve at least one hour.

c. Add 10 milliliters of nitric acid per gallon of solution.

d. Prepare the surface by wiping with Stoddard Solvent or methyl ethyl ketone, then scrubbing with a nylon abrasive pad to remove oxide films. Rinse with water and repeat the above procedure until water will not bead on the surface.

e. After cleaning, immediately treat the surface, using a cheesecloth pad, cellulose sponge, or nylon brush to apply the solution, with light pressure and continuous, even motion. On curved or inclined surfaces, begin application at the lower edge of the work to minimize streaking Keep the surface wet with the solution for 1 to 3 minutes so that a continuous film is obtained, with neither a grayish appearance nor a dark, powdery, non-adherent coating. Generally, a light coating, rather than a heavier coating is preferable for a paint base, especially for epoxy primers. Streaks from brushing, or rundown or excess solution are allowable, as are slight chromic acid stains.

f. Remove excess solution with cold running water or a cheesecloth pad wetted with clean water. Never use a high pressure hose rinse, since the freshly formed chemical film will be removed or damaged. All treated parts should be kept clean before priming and painting, which should follow the chemical film application as soon as practical.

ELECTRICAL SYSTEM

Direct current for the electrical system is supplied by a 24 volt, 13 ampere hour battery and two 28 volt, 60 ampere alternators or two optional 125 ampere generators, connected in parallel.

COMPONENT REPLACEMENT

Federal Aviation Agency Manual AC 43.13-1 should be used as a guide to aid in establishing a standard of workmanship for inspection, replacement and repair of electrical components.

NICKEL-CADMIUM BATTERY

BATTERY ELECTROLYTE LEVEL ADJUSTMENT

Although the electrolyte level in the nickel-cadmium battery varies with the state of charge, it should at all times be visible above the bottom of the baffle when the battery is fully charged. When the state of charge of the battery is low, the plates absorb some of the electrolyte, then release it as the battery is recharged. The electrolyte level on any battery must be adjusted after a full charge and a two to four hour rest on open circuit. Check the electrolyte level of the battery (fully charged) in the following manner after each 100 hours of service or every 30 days, whichever occurs first:

WARNING

Never use acid or tools contaminated with acid during this adjustment, for both bodily injury and equipment damage may result. If possible, use equipment reserved for nickel-cadmium batteries. If lead-acid battery equipment must be used, remove all possible acid contamination with a sodium bicarbonate solution and rinse. Even minute traces of acid can damage a nickel-cadmium battery.

a. Remove the upper access door of the electrical equipment compartment aft of the L.H. nacelle firewall.

b. Remove the two nuts securing the battery hold-down bar in place and remove the bar and lid.

c. Remove the filler cap vent plug on each cell. One cell at a time - do not drip electrolyte on aircraft.

d. Insert a transparent tube perpendicularily into the filler well until the open end rests lightly on the cell baffle, then place the index finger over the top open end and withdraw the tube.

CAUTION

Do not push down, for the light material of the baffle will give enough to result in a false indication of the electrolyte level. Do not spill electrolyte on wing, wiring or structure.

e. The electrolyte level of a fully charged battery should be between 1/8 and 1/4 inch above the bottom of the baffle. If the level of liquid in the tube exceeds 1/4 inch, remove the excess with a syringe or squeeze bottle. If the level of the electrolyte is less than 1/8 inch above the bottom of the baffle, add DISTILLED WATER with a syringe or squeeze bottle.

CAUTION

Tap water contains minerals, chlorines, softening agents, and other foreign materials which will contaminate a storage battery and shorten its life.

CAUTION

The battery may be damaged if the proper procedure is not followed when adding water to the cells.

f. Clean as instructed in this section and reinstall the filler cap vent plugs, check the battery terminal links for tightness. Discolored links or melted nylon around cell terminals indicate loose link connections.

CAUTION

To prevent damage from freezing after addition of distilled water during cold weather, recharge the battery.

g. Reinstall the hold-down bar and battery access door.

CAUTION

If water or electrolyte is spilled into the battery container, the resultant electrolyte corrosion may cause battery failure.

WARNING

The potassium hydroxide used as an electrolyte for nickel-cadmium batteries is highly caustic and will burn skin or clothing. Spilled electrolyte should be neutralized with vinegar or a mild boric acid solution. If neither of these is available, wash the contaminated area thoroughly with water. Immediate medical attention is necessary if the electrolyte comes into contact with the eyes.

WARNING

Potassium hydroxide is an alkali. Never use equipment that is contaminated with acid, for bodily injury, equipment damage and damage to the battery may result. If possible use equipment reserved for nickel-cadmium batteries. If acid contaminated equipment must be used, remove all possible acid contamination with a sodium bicarbonate solution and rinse. Even minute traces of acid can damage a nickel-cadmium battery.

BATTERY CLEANING

For peak performance, nickel-cadmium batteries must be kept clean and dry. If foreign materials are present in sufficient quantities, the resultant deposits may form conductive paths that permit a rapid self discharge of the cells of the battery. To prevent the collection of such deposits the battery should be cleaned after each 100 hours of service or every 30 days, whichever occurs first.

CAUTION

Excessive spewage may result if cell vents are not kept clean and open.

a. Remove the battery and wipe off the battery case and cover with a clean cloth, then remove the cover.

CAUTION

Damage to the battery case liner or cover gasket may result if solvents are used to clean the battery. Do not wash the battery with water except when disassembled so it can be air dried.

b. Clean the top of the cells, the filler cap vent plugs, and the battery terminal links with a soft bristle brush or compressed air. Never use a wire brush for this purpose as short circuiting or other damage may result. Do not use solvents to clean the battery, they may damage the battery case insulation.

c. Wipe off the top of the cell cases, the filler cap vent plugs, and battery terminal links with a clean cloth.

d. Remove the filler cap vent plugs from the battery. Avoid contact with any portion of the vent plug that has electrolyte on it.

e. Wash the filler cap vent plugs under running water while removing all deposits from the plug with a nylon brush or its equivalent. Make sure that the vents are unobstructed.

f. Dry the filler cap vent plug with a clean cloth or compressed air, then reinstall the plugs on the battery.

g. If the inside of the battery container is damp or wet, discharge the battery to approximately 4.0 V, remove links and cells, using a mild solution of boric acid or vinegar to neutralize the affected area. Wash the battery case, insulation, links and cells clean with water and dry thoroughly with a clean, dry cloth or with compressed air.

h. Reassemble battery per Figure 13-1. Make sure cells are connected correctly, positive of one cell to negative of next. Recharge, adjust electrolyte and return battery to use.

EQUALIZING BATTERY CELLS

To equalize the cell voltages, proceed as follows:

NOTE

If the battery capacity is to be checked, that procedure will serve to equalize the cell voltages. The following procedure is then not required.

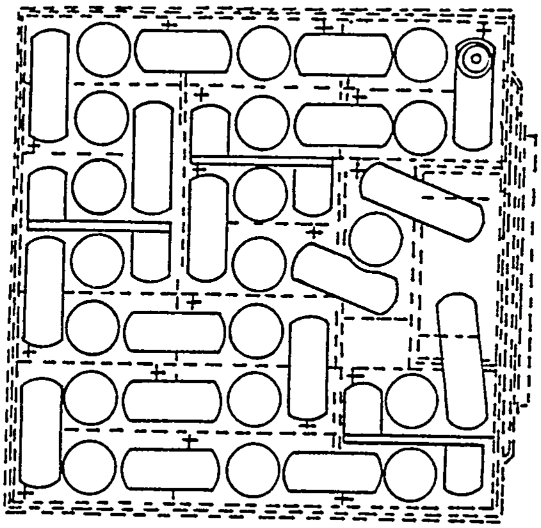


Figure 13-1. Cell Link Arrangement.

a. Loosen (but do not remove) the cell vents, then discharge the battery at the rate of 2.2 amperes until the battery voltage reaches 19 volts.

b. Continue discharging at 1.1 amperes for at least 12 hours.

c. Remove the load and recharge the battery.

d. Check and adjust the electrolyte level.

PERIODIC BATTERY CAPACITY CHECK

It is recommended that the condition of the battery be determined annually if temperatures are 100°F or below, or more frequently if temperatures, are above 100°F. When the battery condition is checked, it also serves to equalize the cell voltages.

a. Discharge the battery at 2.2 amperes until the battery voltage drops to 19 volts.

b. Continue discharging for at least 12 hours with a resistive load that gives an initial rate of 1.1 amperes.

c. Completely recharge the battery as soon as it cools to room temperature.

d. After adjusting the electrolyte level as necessary, let the battery stand idle for from four to eight hours.

e. Discharge the battery at a rate of 11 amperes until the battery voltage drops to 19 volts. If less than one hour is required to do this, the battery may have defective cells that need replacement. If the battery fails this test, let it stand idle from four to eight hours, then recharge and discharge the battery again. Any cell that falls below one volt before the end of the one-hour discharge period is defective and should be replaced.

NOTE

Tighten the terminal screws holding the cell cross links in place to a torque of from 48 to 60 inch-pounds, (4 to 5 foot-pounds).

f. Recharge the battery and it is ready for service.

BATTERY CHARGING

Never charge a nickel-cadmium battery in the proximity of lead-acid batteries, for there may be enough fumes or acid spillage to contaminate the nickel-cadmium battery. When the same battery charging equipment is used to charge both types of batteries, the equipment should be thoroughly cleaned with a sodium bicarbonate solution before using it on nickel-cadmium batteries. The battery must be in an upright position during charging.

CAUTION

Complete servicing of the battery is required if subjected to more than 32 volts for 2 minutes.

CONSTANT CURRENT CHARGING

When charging is necessary, the following constant current method is recommended.

a. When a new or completely discharged battery is being charged, the single cell voltage will be 1.4 volts at the beginning of the charge and from 1.50 to 1.65 volts at the end depending on the charge current.

NOTE

If the state of charge of the battery is unknown, completely discharge it before commencing with this procedure.

CAUTION

To prevent damage to the battery, allow batteries that have been discharged at temperatures of 140°F and above to return to ambient temperature before recharging. A four to six hour period of rest should be sufficient for the battery to return to the ambient temperature.

Charge the battery at 2.5 amperes for a period of 7 hours. Monitor all cell voltages during this time to assure that they are rising evenly. Approximately 3 hours before the battery is fully charged, the cell voltages will rise sharply as indicated in Figure 13-2, which is typical cell voltage variation curve during constant current charging.

b. The charging rate for a partially discharged battery is the same as that for a new battery, but the charge time can be shortened. By checking the single cell voltages, the charge time required can be determined by using Figure 13-2. Otherwise, use the procedure described above.

CONSTANT-POTENTIAL CHARGING

In the field it may be necessary to charge the battery by the constant-potential method. When this method is employed, a current-limiting charger is not required. Charge the battery with a voltage regulated at 28.25 ± .25 volts for a period of two to four hours.

BATTERY CELL REPLACEMENT

a. Remove the upper access door to the electrical equipment compartment aft of the L.H. nacelle firewall.

b. Remove the two nuts from the battery hold-down bar and remove the bar and lid.

c. Remove the battery from its compartment and clean in accordance with the cleaning procedure outlined in this section.

WARNING

To avoid personal injury or battery damage, do not remove cell or terminal lugs from a charged battery. If the battery has not been discharged through normal use, discharge it as indicated in step "k".

d. Remove the two terminal connections from the battery, but be sure to save the attaching hardware.

e. Loosen all the vent plugs with the vent-plug wrench.

f. Remove the cell connections from the cell to be replaced.

g. Withdraw the cell from the battery case only when a replacement cell is immediately available.

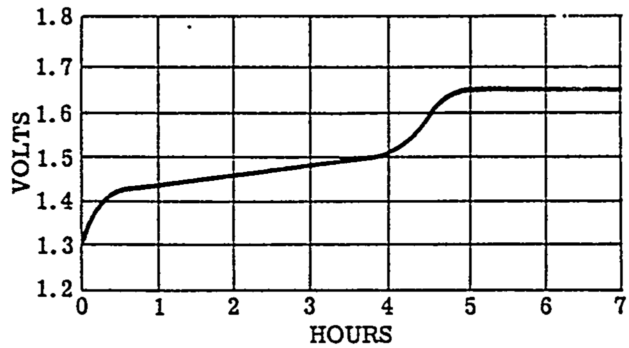


Figure 13-2. Cell Voltage Variation Curve.

h. Insert the new cell with the polarity symbols in the right direction for connecting plus to minus. If the cell is difficult to insert, apply a light coat of petroleum jelly or silicone grease to the sides of the cell case.

i. Reassemble the attaching hardware finger tight. Arrange the cell links as illustrated in Figure 13-1.

CAUTION

Many of these parts are specifically designed to produce an adequate electrical connection, so NEVER use homemade hardware for this purpose.

j. Tighten the link screws to a torque of 48 to 60 inch-pounds (4 to 5 foot-pounds).

k. Discharge the battery at a rate of 2.2 amperes until the voltage reaches approximately 4.0 volts. Some cells may reverse during the discharge period, reversal will not damage cells. Short the cells individually until each cell is completely at zero.

l. Recharge the battery as indicated in this section under the heading of "BATTERY CHARGING".

m. Allow the battery to stand from two to four hours, then adjust the liquid level as outlined in this section under the heading of "BATTERY ELECTROLYTE LEVEL ADJUSTMENT".

CAUTION

If the battery is to be recharged by the constant potential method, all cells, including new ones, must be individually shorted a minimum of 8 hours before charging. This is also a good procedure to use with constant current charging, as it tends to start all the cells out at the same state of charge.

ALTERNATOR SYSTEM

The standard electrical system includes two 60 ampere alternators. Alternator output is controlled by either of two transistorized voltage regulators and two overvoltage relays. A "REGULATOR SELECT" switch, located on the pilot's subpanel, allows either voltage regulator to operate both alternators.

The alternators are not self-excited and require an outside source for the electrical energy to "flash" the alternator field. To meet such emergencies as a completely discharged battery, an emergency excitation circuit is incorporated into the system. The circuit consists of a small, rechargeable battery and its charging circuit which will "flash" the alternator field when the "ALT RE EXC" switch on the left side panel is pressed momentarily.

Should an alternator fail, a relay which senses alternator output will cause the appropriate "ALT OUT" light on the annunciator panel to illuminate.

VOLTAGE REGULATOR ADJUSTMENTS (With Alternators)

Voltage Adjustment

Both alternators are controlled by a single transistorized voltage regulator, therefore, paralleling of the alternators is not necessary. The voltage regulators are located in the electrical equipment compartment in the LH nacelle and requires very little adjustment. When making an adjustment to the voltage regulator, use the following method:

a. Bring the voltage regulator to be adjusted and the alternators up to operating temperature by operating both engines at 1200 rpm with approximately 50% load (30 amperes each alternator) for a minimum of 20 minutes.

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

c. Check the bus voltage. If it is not 28.25 ± .25 volts, adjustment should be made.

d. Operate the RH engine at cruise rpm (2750 rpm) with the RH alternator "ON", and the electrical load reduced to a minimum.

e. Remove the plastic plug labeled "REG" from the cover of the regulator and adjust the regulator by turning the potentiometer clockwise to increase voltage and counterclockwise to decrease the voltage. Make any adjustments in small increments and allow 2 or 3 minutes operation for the system to stabilize between adjustments.

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

g. For final check and adjustment both engines should be operated at cruise rpm (2750 rpm) with both alternators on and each carrying approximately 50% load (30 amperes).

ADJUSTING OVERVOLTAGE RELAY (On The Aircraft)

If it is necessary to adjust the overvoltage relay and it is not feasible to make the adjustments on the bench, it may be made on the aircraft. To make this adjustment the alternator is used as a power source, and the voltage regulator must be put out of adjustment and the entire system subjected to abnormal voltages. Prior to making the adjustment, turn off all unnecessary electrical and avionics equipment and open all circuit breakers not necessary for the test.

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

b. Operate the RH engine at cruise rpm (2750 rpm).

c. Monitor the voltmeter to determine the voltage at which the overvoltage relay trips and removes the alternator from the line. Slowly adjust the voltage regulator to increase the bus voltage. The overvoltage relay must trip at 32 ± 1 volt.

CAUTION

If the battery voltage exceeds 32 volts for 2 minutes. The battery must be serviced as noted in the battery service instructions.

d. If the overvoltage relay trips at below voltage requirements or fails to trip before the bus reaches 33.0 volts as measured on a precision voltmeter, the overvoltage relay must be adjusted. Remove the plastic plug marked O.V. and turn the adjustable potentiometer clockwise to increase voltage and counterclockwise to decrease the trip voltage.

e. Recheck the adjustment

NOTE

The overvoltage relay may be reset by turning the alternator "OFF".

f. Readjust the voltage regulator to 28.25 ± .25 volts. This adjustment should be checked with both engines running at cruise rpm (2750 rpm) and both alternators on and stabilized as noted in the voltage regulator adjustment procedure.

g. Replace the plastic plugs over the adjustable potentiometers.

OVERVOLTAGE ADJUSTMENT (Off The Aircraft)

The overvoltage relay is preset at the factory to trip at 32 ± 1 volt. The relay should be adjusted only if there is reason to suspect a maladjustment (such as frequent overvoltage tripping after determining that the voltage regulator is properly adjusted). The overvoltage relay can be adjusted on the bench to prevent subjecting the aircraft circuit to excessive high voltage.

a. Unplug the connector from the voltage regulator/ overvoltage relay unit in the electrical components compartment in the LH nacelle.

b. Remove the mounting screws from the base of the unit and remove it from the aircraft.

The equipment needed for making this adjustment consists of a precision voltmeter, a variable power supply, and a test harness. The test harness may be constructed from an MS3106-18-13 connector (or equivalent) with pins A, F, H, and J jumpered and connected to the positive side of the variable power supply; pin C connected to the negative side of the variable power supply; and a 30 volt indicating light connected between pins G and C.
Proceed as follows:

a. Plug the test harness into the voltage regulator/ overvoltage relay unit.

b. Connect the voltmeter, indicator light, and the variable voltage power supply.

c. Slowly increase the power supply voltage and monitor the voltage and indicating light. The indicator light should go out at 32 ± 1 volts. Do not exceed 33 volts.

d. Reconnect the wiring to the alternator.

e. If the overvoltage relay does not trip at the prescribed voltage, remove the plastic cap marked O.V. and make the necessary adjustment until the prescribed voltage is obtained.

f. Reinstall the unit on the aircraft.

ALTERNATOR REMOVAL

a. Disconnect the wiring from the alternator.

CAUTION

The output terminal of the alternator is connected directly to the battery. Make sure the master switch is "OFF" before removing the wires at the alternator or serious damage to the wiring harness and alternator may result from accidental grounding of the output stud.

b. Loosen the bolt at the upper mounting bracket until the alternator can be rotated to a position where the drive belt can be removed.

c. Remove the bolts anchoring the unit to the upper and lower mounting brackets, then remove the alternator from the aircraft.

ALTERNATOR INSTALLATION

CAUTION

Never close the master switch until all wiring harness connections have been made and properly tightened or serious damage to the wiring harness and alternator may result from accidental grounding.

a. Secure the alternator to the upper and lower mounting brackets with the attaching bolts, making certain the upper mounting bolt is loose enough for the alternator to rotate freely in the bracket slot.

b. Slide the unit in the slot of the upper mounting bracket until the drive belt can be mounted on the alternator pulley.

c. Position the alternator in the mounting brackets at the point where the belt tension will be 100 ± 5 pounds, then tighten the adjustment bolt until the alternator is anchored securely in place. Torque the adjustment bolt to 250 to 270 inch pounds. Torque the lower bracket bolt to 500 inch pounds.

CAUTION

When adjusting the drive belt tension, always place pressure against the rear of the front housing, never against the stator (steel center) section of the alternator.

ALTERNATOR OVERHAUL

Refer to Beech Publication 98-33396 for complete overhaul and maintenance procedures.

GENERATOR SYSTEM

The optional electrical system includes two 125 ampere generators. The generators are isolated from the aircraft bus by reverse current diodes and generator control relays and regulated individually by a carbon-pile type regulator. The circuit of each generator contains an overvoltage relay to protect the aircraft systems from excessive high voltages. Paralleling relays are used to connect the equalization circuits of the voltage regulators and to sense generator output to the annunciators in the pilot's compartment.

OVERVOLTAGE RELAYS

No attempt should be made to adjust the overvoltage relays. They are preset at the factory to trip at a voltage of 32 ± 1 volt for aircraft prior to TG-84 and 33 + .00 - .25 volts on aircraft TG-84 and after. When the relay is determined defective, it should be replaced with a new or exchange relay.

OVERVOLTAGE RELAY CHECK

The overvoltage relays should be functionally checked for proper operation at 500 hour intervals or whenever an overvoltage relay, voltage regulator or generator is replaced. This test may best be accomplished in the aircraft.

A variable resistance introduced in series with the voltage regulator input will allow the generator system to be driven into an overvoltage condition without disturbing the voltage regulator adjustment. The electrical components involved in this check are located in the electrical equipment compartment, immediately aft of the L.H. nacelle firewall. Test each overvoltage relay separately as outlined in the following procedure.

a. Attach a set of 16 gage test leads to a 2 ampere circuit breaker (or fuse) and a 150 ohm rheostat with a minimum rating of 50 watts.

b. Remove the jumper bus between the terminals of the R.H. voltage regulator which may be marked "C" and "B" or "G+" and "L+".

NOTE

Refer to the Generator Wiring Diagram (Figure 14-5) in this manual for the applicable wiring code.

Attach the test lead from the wiper contact of the 150 ohm rheostat to the "B" or "L+" terminal of the R.H. voltage regulator.

c. Attach the test lead from the 2 ampere circuit breaker (or fuse) to the "C" or "G+" terminal of the R.H. voltage regulator. Do not remove the existing wire from the "C" or "G+" terminal.

d. Monitor the overvoltage relay trip voltage with a precision voltmeter that is known to be accurate within one percent over a range of 0 to 50 volts. Connect the positive lead of the voltmeter to one of the circuit breaker buses behind the subpanel. Connect the negative lead of the voltmeter to the aircraft structure.

e. Adjust the 150 ohm rheostat to its minimum resistance setting.

CAUTION

To prevent excessive overvoltage, check the resistance with an ohmeter to ensure the rheostat is set for minimum resistance prior to initiating this test. Do not operate the system above 29 volts for more than two minutes during the test. If the battery is subjected to voltages in excess of 32 volts for more than two minutes, the battery must be removed from the aircraft and completely serviced.

f. Start the engines and advance the throttles as required to obtain desired voltage output.

g. Turn off all switches and circuit breakers except the battery master switch and the alternator or generator protection circuit breakers.

CAUTION

Should the test equipment be improperly installed, the aircraft electrical equipment may be damaged unless all switches and circuit breakers except those noted above are turned off.

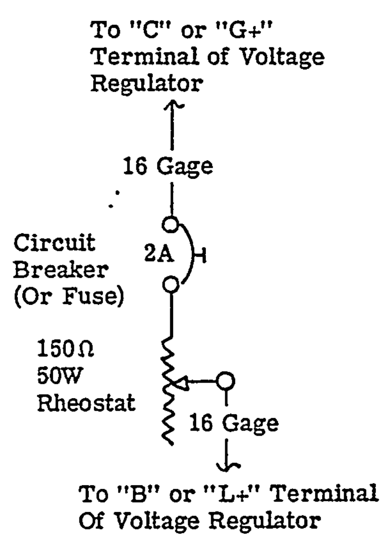


Figure 13-2A. Overvoltage Test Circuit

h. After the aircraft's loadmeters stabilize at a point below 10 percent of full scale, observe the precision voltmeter while slowly increasing the resistance setting of the 150 ohm rheostat. A sharp drop in voltage will indicate the operation of the overvoltage relay. This should occur when the precision voltmeter registers a reading of 32 to 34 volts. The ALTERNATOR/GENERATOR OUT light on the annunciator panel should illuminate at the same time the overvoltage relay trips. If the overvoltage relay does not operate within the prescribed limits, it should be replaced with a new one, then rechecked for proper operation as in steps "f" through "h".

VOLTAGE REGULATOR ADJUSTMENT AND GENERATOR PARALLELING

It is desirable that both generators share the electrical load equally. To obtain this condition, the voltage regulators and the paralleling rheostats must be properly adjusted. The adjustment procedure is outlined below.

Preliminary Adjustment of Paralleling Rheostats

a. Open the electrical components compartment access cover on top of the LH nacelle aft of the engine cowling.

b. Connect the negative lead of a voltmeter to terminal "D" on the LH voltage regulator base and the positive lead to the aircraft structure. (Terminal "D" carries a voltage that is negative with respect to aircraft structure).

c. Operate the LH engine with the generator charging and carrying a moderate to heavy electrical load.

CAUTION

Monitor the bus voltage as soon as the generators are turned on. Voltages in excess of 32 volts for two minutes will damage the battery.

d. Monitor the voltmeter and turn the LH paralleling rheostat first clockwise then counterclockwise to determine which direction of rheostat rotation results in an increasing negative voltage at terminal "D".

e. Turn the LH paralleling rheostat to a maximum negative voltage then decrease the voltage by turning the rheostat back 1/8 turn.

f. Repeat steps c, d, and e for the RH system.

STABILIZATION OF GENERATOR SYSTEM

The generators and regulators must be stabilized for temperature changes before any final adjustments are attempted. Operate both engines at approximately 1000 rpm with both generators "ON" and a heavy electrical load turned on. Use the lights, blowers, radio equipment, etc. to obtain a 20% electrical load for each generator. Allow a minimum of 20 minutes to stabilize the system.

CAUTION

Do not operate the landing lights, rotating beacon, or pitot heat for extended periods during ground operation. Excessive heat build-up may cause damage to these components.

VOLTAGE ADJUSTMENT (Minimum Load)

The voltage regulators are adjusted to produce a voltage of 28.25 ± 0.25 volts measured at the circuit breaker bus with a minimum electrical load on the system as follows:

a. Connect the positive lead of a portable precision voltmeter to the circuit breaker bus. The meter must be capable of measuring 28.25 volts with an accuracy of 1%. Connect the negative lead of the voltmeter to a good ground, such as a seat track.

b. Operate both engines at 1800 to 2000 rpm with both generators "ON", and the electrical load reduced to a minimum.

c. Turn the RH generator off. Determine the bus voltage as maintained by the L.H. generator.

d. Turn R.H. generator "ON" and L.H. generator "OFF". Determine the bus voltage as maintained by the R.H. generator.

e. Turn the L.H. generator "ON", and idle the engines.

NOTE

Maintain temperature stabilization by operating the generators individually for only short periods.

f. Make the necessary voltage adjustments by turning the voltage adjusting potentiometer on the voltage regulator clockwise to increase the voltage and counterclockwise to decrease the voltage. Make the adjustments in small increments only. Allow ample time for the voltage to stabilize before making further adjustments.

g. Repeat steps b. through f. until the minimum load voltage is satisfactory.

CAUTION

Never adjust the core or carbon pile adjusting screws (slotted heads in the ends of the regulators). The regulating characteristics of the regulator will be altered as well as the voltage setting.

CURRENT ADJUSTMENT (Maximum Load)

The paralleling rheostats are adjusted to produce equal outputs from the generators at heavy loads.

a. Check the accuracy of the loadmeters on the instrument panel by alternately switching from one generator to the other while a normal load is turned on. If equal readings are obtained as each generator supplies the current individually, the loadmeters are satisfactory. If excessive deviation in loadmeter readings exist the loadmeters should be replaced.

b. Operate both engines at 1800 to 2000 rpm with both generators "ON". Turn on all feasible electrical loads using lights, blowers, radio equipment, etc.

CAUTION

Do not operate the landing lights, rotating beacon, or pitot heat for extended periods during ground operation. Excessive heat concentrations will result in damage to these components. The landing lights draw heavy currents and may be used for very short periods of time to check the paralleling adjustments.

c. Read the loadmeters. Each generator should take its share of the load within 10% of the loadmeter full scale reading.

d. Adjust the paralleling rheostats until the load is equally shared by increasing the output from the low generator and decreasing the output from the high generator.

NOTE

To maintain sensitivity keep both rheostats as near the maximum voltage end of the rheostat as possible. There is a possibility of excessive sensitivity resulting in a "hunting" condition. Should such a condition be encountered, sensitivity may be reduced by turning both paralleling rheostats away from the high voltage end.

e. Check both minimum current voltage and maximum current paralleling at cruise engine rpm (2750 rpm).

FINAL PARALLELING CHECKS

a. Secure the access cover in place using sufficient fasteners to hold the cover securely in place during engine operation.

b. Stabilize the regulator and generator temperatures as outlined in Stabilization of Generator System.

c. Check minimum load voltage and maximum current paralleling at cruise engine rpm (2750 rpm).

d. Remove the cover and make any necessary adjustments. Replace the access cover and repeat the checks.

e. After determining that the adjustments are satisfactory, secure the access cover in place using all fasteners.

GENERATOR REMOVAL

a. Remove the lower engine cowling.

b. Remove the generator wiring.

c. Remove the generator cooling air duct.

d. Remove the bolt from the adjusting bracket and loosen the attaching mounting bracket bolts until the generator can be rotated to permit removal of the drive belts from the generator.

e. Remove the attaching bolts and remove the generator from the aircraft.

GENERATOR INSTALLATION

a. Secure the generator to the mounting brackets with the attaching bolts. Leave the bolts loose enough to allow the generator to rotate sufficiently to install the drive belts.

NOTE

To equalize belt service life, the belts must be replaced in pairs.

b. Install the bolt and washer in the adjusting bracket.

c. Position the generator in the mounting brackets so that the belt tension is 100 ± 5 pounds, then tighten the adjustment bolt until the generator is anchored securely in place. Torque the adjustment bolt to 250 to 270 inch pounds.

d. Safety as necessary.

e. Attach the generator cooling air duct.

f. Attach the electrical wiring and tighten securely.

GENERATOR BRUSH REPLACEMENT

During periodic maintenance inspections, the generator brushes should be inspected for cracks, chipped edges, loose or frayed wire. A lateral groove in the edge of the brush is an indication of the minimum wear length (approximately 1/2 inch). The brush should be replaced if it has been worn to the indicator or if it is obvious that the brush will reach the minimum length before the next inspection time.

New brushes must be properly seated on the commutator surface before the generator is subjected to heavy loads to prevent arcing which will cause burning and pitting of the commutator. New brushes should be sanded and run-in to properly seat them on the commutator surface. Refer to the applicable Vendor Publication for replacement and run-in procedures.

GENERATOR OVERHAUL

Refer to the applicable Vendor Publication for complete Overhaul and Maintenance procedures.

STARTER SYSTEM

STARTER REMOVAL

a. Open engine cowling.

b. Disconnect and tape starter lead.

c. Remove starter mounting nuts.

d. Lift starter up and aft to remove.

STARTER INSTALLATION

a. Place starter into position and install mounting nuts and cap screws. Tighten securely.

b. Connect starter lead.

c. Fasten engine cowling.

STARTER OVERHAUL

Refer to the applicable Vendor Publication for Starter Overhaul procedures.

STARTER MAINTENANCE

Starter circuit checks

a. The starter circuit wiring should be inspected at regular intervals to determine that all connections are clean and tight and that the insulation is sound.

b. The starter circuit should be checked to determine if there is excessive resistance in the circuit. This test is made with a low reading voltmeter while cranking the engine.

1. The voltage loss from the battery positive terminal to the starter terminal should not exceed 0.3 volts.
2. The voltage loss from the battery ground terminal to the starter frame should not exceed 0.1 volt.

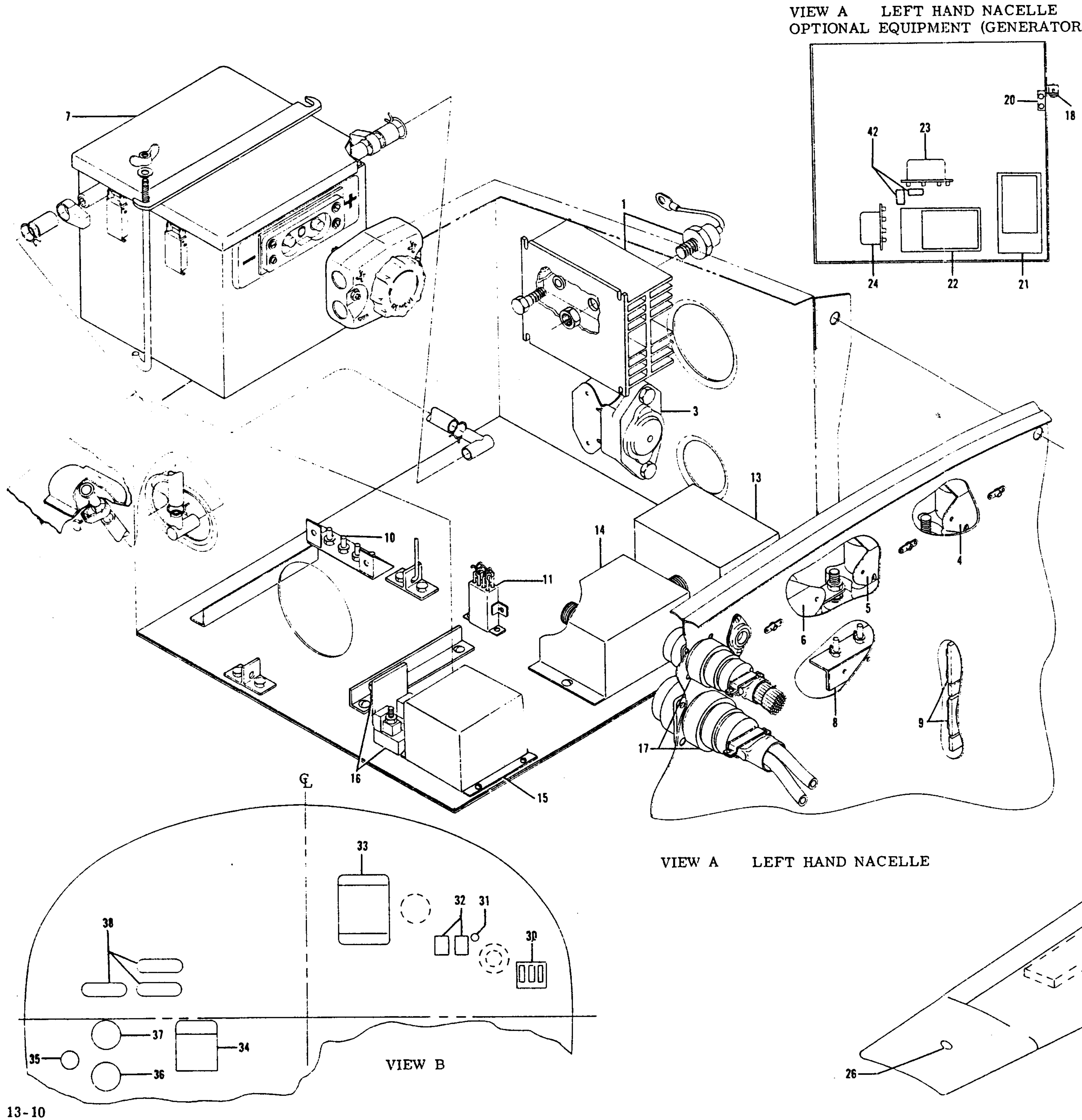
If there are greater voltage losses than indicated above, additional checks should be made to locate the high resistance connections.

Starter Lubrication

No lubrication is required on the starting motor except at the time of overhaul. At this time the entire shaft under the Bendix Drive should be lubricated, the grooves in the armature shaft at the drive end should be filled, and the gear box should be packed using Lithium Soap Base grease #1925 Molytex "O" or an equivalent lubricant.

Starter Brushes

The starter brushes should slide freely in their holders and make full contact on the commutator. The brushes should be replaced when they have worn to one half their original length (approximately 1/4 inch). Proper brush spring tension with new brushes installed is 32 to 40 ounces. This tension is measured with a scale hooked under the brush spring near the brush and the reading taken just as the spring leaves the brush.



1. L.H. Heat Sink and Reverse Current Diode
2. R.H. Heat Sink and Reverse Current Diode
3. External Power Relay
4. L.H. Starter Relay
5. R.H. Starter Relay
6. Battery Master Relay
7. Battery
8. Battery Relay Diodes
9. Regulator Fuses
10. Regulator Isolation Diodes
11. L.H. Alternator Out Relay
12. R.H. Alternator Out Relay
13. #1 Voltage Regulator/Overvoltage Relay
14. #2 Voltage Regulator/Overvoltage Relay
15. Inverter, Fuel Flow Indicator
16. L.H. Shunt and Loadmeter Fuse
17. R.H. Shunt and Loadmeter Fuse
18. L.H. Generator Control Relay and Fuse
19. R.H. Generator Control Relay and Fuse
20. Paralleling Rheostats
21. L.H. Voltage Regulator
22. R.H. Voltage Regulator
23. L.H. Overvoltage Relay
24. R.H. Overvoltage Relay
25. Stall Warning Switch
26. Navigation Lamp
27. Fuel Cell Transmitter
28. Flap Limit Switches
29. Flap Position Transmitter
30. Heater Fuses
31. Heater Resistor
32. Heater/Air Conditioner Relays
33. Navigation Light Flasher
34. Starting Vibrator
35. Warning Horn Flasher
36. Landing Gear Warning Horn
37. Stall Warning Horn
38. Limiters
39. Landing Gear Motor
40. Ventilation Blower Relay
41. External Power Receptacle
42. Paralleling Relays

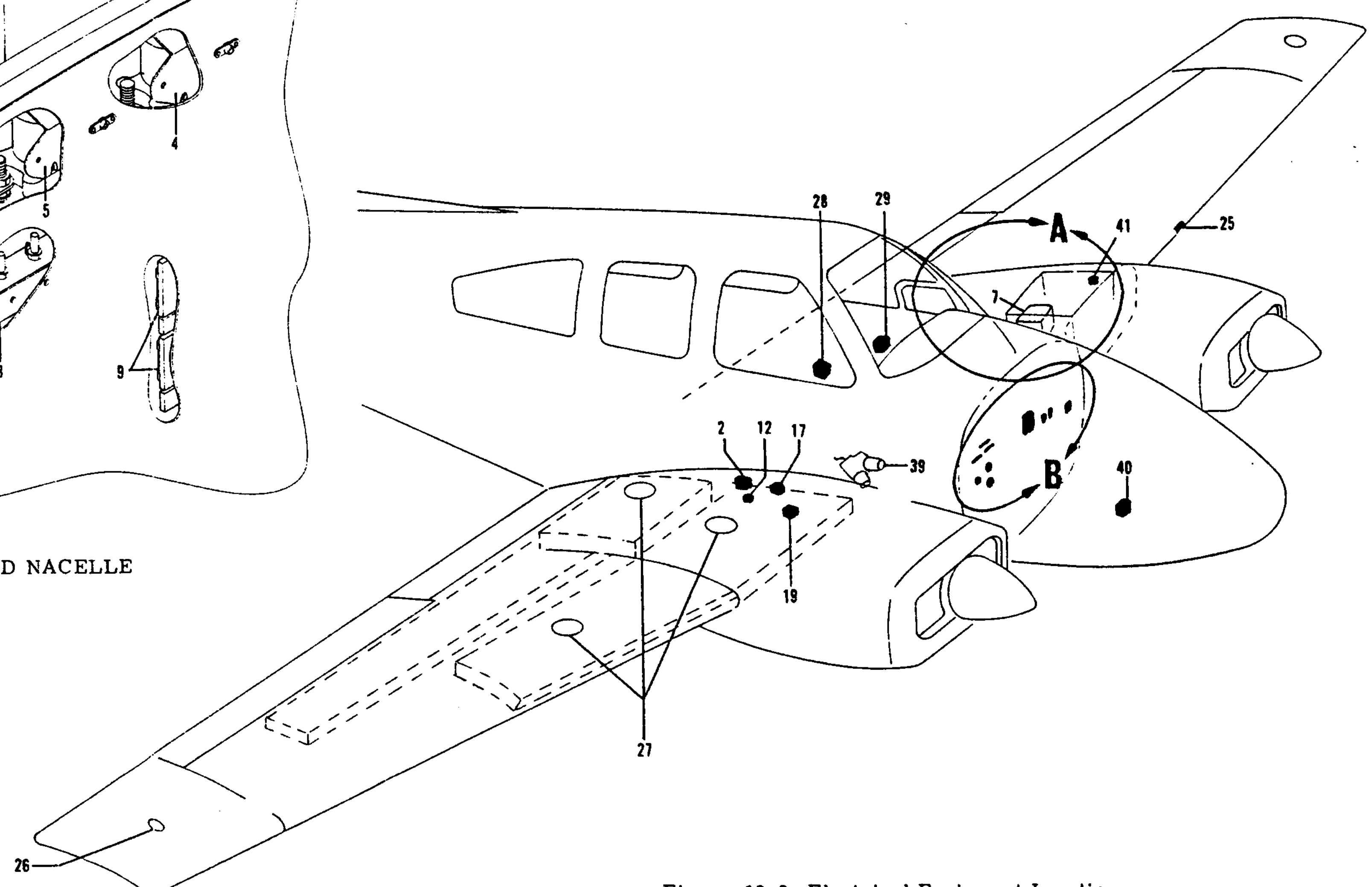


Figure 13-3. Electrical Equipment Location.

LIGHT BULB REPLACEMENT GUIDE

LOCATION	BULB PART NUMBER
Instrument Post Lights	327
Rheostat Light	327
Placard Lights	327
Fuel Selector Placard Light	327
Wing Navigation Lights	1524
Nose Cone Light (Taxi)	4626
Tail Light	1203
Landing Light	4596
Cabin Dome Light	303
Overhead Instrument Lights	303
Map Light	1495
Reading Light	1495
Tab Position Indicator Light	1819R
L.G. Visual Indicator Light Assembly	95-324006-75
Compass Light	327
Instrument Lights	327
Rotating Beacon	A-7079B-24
Taxi Light (Landing Gear)	4626
Landing Gear Position Light	327
Ice Light	A-7796A-24
Alternator Warning Light	2390A17
Generator Warning Light	2390A12
Fuel Boost Warning Light	2390A20
Glareshield Instrument Lights	1829
Nose Baggage Light	303
Cowl Flap Position Indicator Light	313
Light Tray Assembly	58-380022-11

STROBE LIGHT SYSTEM
(TG-84 and after)

HOSKINS UNIT

Pulsating strobe lights mounted adjacent to the wing tip and tail lights greatly increase the visibility of the aircraft during night flight. A circuit breaker switch on the instrument panel actuates the strobe light system. The strobe lights are powered by a master power supply assembly which is located in the nose baggage compartment. This assembly consists of three power supply modules (one for each strobe light) and a timing circuit mounted in the negatively grounded subchassis. A transistorized circuit in the power supply unit steps up the voltage of the aircraft electrical system to the level (450 volts) required to operate the strobe light. The stepped-up voltage is stored in a condenser until released to the strobe light by the timer. The current from the power supply assembly is conducted to the flash tube of the strobe light by a specially shielded power cable. A charge of high voltage electricity is momentarily released to a coil in the flashtube assembly. The coil further steps up the charge to a point where it ionizes the xenon gas in the flashtube. The high voltage stored in the condenser then surges through the gas to produce the brilliant burst of energy that characterizes the strobe light.

POWER CABLE CHECKS

a. Check that the individual conductors of the power cable are soldered to the connector pins as follows: Red wire to the "A" pin, white wire (or striped wire of red and white) to the "B" pin, and black wire (or striped wire of red and black) to the "C" pin.

CAUTION

Failure to hook up the conductors and pins in this manner will result in extensive damage to both the light units and the power supply modules.

b. Using a 500 volt megger, check that the power cable resistance between the connector pins and between all the pins and ground (the cannon plug) is 15 megohms or greater.

c. Check the condition of the potting for the power supply cable at the terminals, connectors, and clamp cavities. The potting compound used to protect the system against moisture is RTV No. 102 silicon rubber.

d. Make sure the cable clamps are not tight enough to cause a short in the cable.

SYSTEM CHECK-OUT

The following check is recommended when the flash tube of a strobe light unit fails to fire:

a. Check that the flash tube is not broken and that the connectors are tight.

b. Disconnect the power cable from the inoperative light at the power supply module.

NOTE

To avoid the chance of shock through contact with the cable at the light fixture or with connector pins "A" and "B" at the power supply module, short out these pins to pin "C" (ground) to dissipate any residual charge left in the condenser after the system has been turned off.

Disconnect the power cable from one of the functioning lights and plug it into the power supply unit of the inoperative light. If the flash tube of the good light then fails to fire, the power supply unit has either failed or has tripped a circuit breaker.

CAUTION

Never place the power supply unit of the functioning light circuit into the circuit of the inoperative light, for a short in the defective circuit would then damage the functioning power supply unit.

A short in the power cable will normally trip the circuit breaker in the power supply unit. The most likely reasons for malfunctions of this unit are shorts in either the power cable or the lamp assembly, shorts caused by contact of the transistor case with a foreign object during operation of the unit, moisture in the connectors, and the buildup of excessive heat within the unit due to inadequate ventilation.

POWER SUPPLY UNIT REMOVAL AND INSTALLATION

Remove the two aft seats and the aft panel partition of the cabin to gain access to the power supply unit. This unit consists of three power supply modules (one for each light) and a timer mounted in the subchassis. The entire unit may be removed by disconnecting the wiring from the power supply and removing the screws anchoring the subchassis to the support structure. To reinstall the unit, merely reverse the foregoing procedures.

TROUBLESHOOTING STROBE LIGHT POWER SUPPLY

A. MODULE TROUBLESHOOTING

CAUTION

Do not operate the unit without a light attached. Use extreme caution working around the opened unit. Capacitors will remain charged to 600 volts for approximately 15 minutes after power is removed. Do not exceed 5 minutes continuous operation without light flashing.

1. Connect a light assembly to the Cannon Connector S-2.

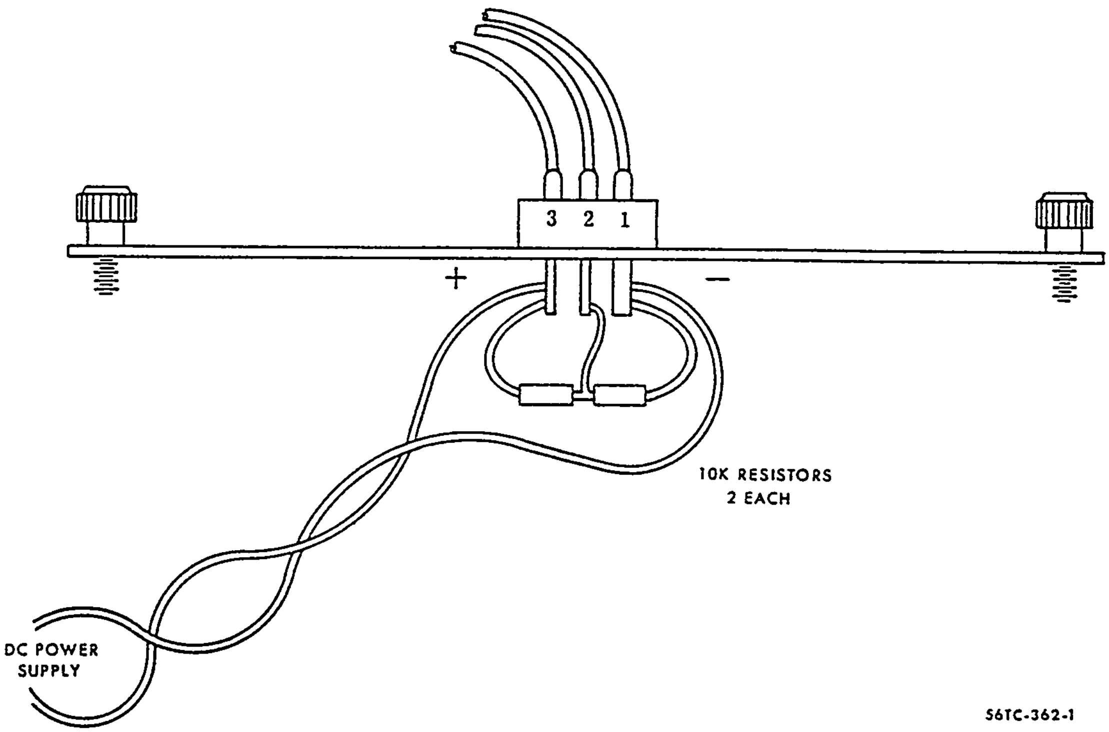


Figure 13-4. Test Set-up For Troubleshooting

2. Apply appropriate DC voltage to pin 1 (-) and pin 3 (+) of the Jones connector P-1 located on the bottom of the module. Referring to Figure 13-4, wire two 10K resistors across pins 1 and 3, tying the junction to pin 3. The light should flash when pin 2 (the center pin) is intermittently shorted to either pin 1 or pin 3. If this test proves OK, the module is good and may be returned to service. If not, proceed to step two (case disassembly).

B. CASE DISASSEMBLY

1. Place the case on its top, remove the four bottom screws, and lift away the bottom.

2. Reverse the case, remove the four top screws, and lift away top assembly.

3. Remove the circuit breaker retainer ring from the front

4. Remove the four screws from the MS connector and pull the connector from the case.

5. Move the connector wires to one side and slide the case halves apart.

The assembly may be laid out for troubleshooting. Carefully separate all exposed components before operating the unit. Refer to Figure 13-4 for bench hook-up instructions for troubleshooting.

C. POWER PACK TROUBLESHOOTING

1. Connect a voltmeter (1000 volt range) to pins A (+) and C (-) of S-2. This can be done at the red and black wires at the board connection. Apply input power. The meter should read 500 to 700 volts DC. If this reading is present, the power pack is good and the next three steps may be ignored. If no reading exists, proceed to step 2.

2. Unsolder the three pigtails and remove the power pack assembly. With the unit removed apply voltage to the green or yellow lead (+) and the black (-) lead. Measure the output between the black (1) and the red (+) wires. The no-load voltage should be approximately 900 volts. If there is no reading, replace or repair the power pack assembly.

3. The power pack assembly consists of a simple, single transistor, DC to DC converter. The diodes, resistors, and transistor can be checked with an ohmmeter. If the large silicone transistor is defective, replace only with a Hoskins P/N 61-1015. This is an RCA No. 40363, selected for gain.

Substitutes will usually not be satisfactory. If unit does not oscillate, check for shorted diodes SC-3 or SC-4.

4. If the power pack operated unloaded, but not when connected, the output capacitors C-1 and C-2 are shorted or a short circuit exists on the timer board. Check or replace C-1 and C-2. (Use only Hoskins P/N 61-1000-401 special duty capacitors.) If the short persists, carefully check the printed

board and terminals for loose solder, etc.

5. Once the power pack is operating, check out the timer and trigger circuits by operating the unit as described previously. If the light does not flash, proceed to the trigger circuit troubleshooting procedure.

D. TRIGGER CIRCUIT TROUBLESHOOTING

1. Measure SCR anode voltage at the junction of R-2 (100K) and C-5 (.22 uf 400V). This point is also the anode of SC-1 (the mounting terminal) and should measure 250 to 300 volts DC with respect to ground (T-2), dropping to zero when a trigger pulse is applied. If this voltage is 0, replace SC-1 and R-2 and repeat the measurement.

NOTE

When SC-1 fails it will often cause R-2 to open.

2. If the above measurement is correct, but no switching is observed, measure the control gate of SC-1 (junction of C-4 and R-5) with an oscilloscope. This should appear as a pulse of approximately 2 volts peak. Other components may be checked and replaced.

E. SUBCHASSIS/TIMER TROUBLESHOOTING

1. The metal subchassis is the power distribution center. The following steps can be performed to determine proper operation: With the modules removed, apply power to the input wire and measure each pin of the three Jones plugs.

Pin 1 (the pin turned lengthwise) = Gnd.
Pin 2 (center) alternating + 10V (approximately and 0
Pin 3 14 or 28 volts input voltage

If all measurements except pin 2 are correct, replace the timer board.

2. The timer may be observed for proper operation with a dual trace oscilloscope. Each output should be a square wave (opposite in phase) of approximately 10 volts peak-to-peak, alternating at a rate of 50 times per minute.

3. If one or both outputs of the timer are not correct, troubleshoot the timer as follows:

a. Observe that the unijunction is operating by placing an oscilloscope lead at the junction of C-2 and C-3. If the unijunction does not operate, check for approximately 12 volts across CR-1. Repair the unijunction circuit by replacing TR-1 or related components. Usually, a defective IC will not prevent the unijunction from operating. The correct oscilloscope indication should be a pulse height of 1 to 2 volts at a rate of 100 pulses/minute.

b. When the unijunction is operating, the IC flip flop can be checked by placing the oscilloscope at the IC end of R-9 and R-10. If no signal exists, try unsoldering R-10 and lifting it intermittently. A shorted driver or predriver will occasionally load down the circuit.

NOTE

The IC flip flop is extremely reliable and rugged. Carefully check out the drivers (TR-4 and TR-5) and predrivers (TR-2 and TR-3) before suspecting the IC itself.

c. If the driver transistors are suspected, unsolder the base of TR-4 and TR-5 (the junction of TR-4 and R-11 or TR-5 and R-12) and measure the voltage swing at the point removed. This should be several volts. The drivers or predrivers should be replaced as needed.

BULLOCK UNIT
(TG-80 and after)

The system consists of a solid state power supply unit, a circuit breaker switch on the instrument panel, a shielded power cable and a single, ventral-mounted xenon gas light. System operation is based on the capacitance discharge principle. A DC converter steps up the aircraft battery voltage to approximately 400 volts to charge the capacitor. The trigger circuit consists of a unijunction oscillator and a silicon controlled rectifier which applies a pulse of negative voltage to the trigger transformer in the lamp. The trigger transformer produces an ionization voltage of approximately 4000 volts to ignite the xenon gas in the lamp. As the lamp ignites, the energy stored in the capacitor is discharged through the lamp to produce a peak light intensity of over a million candle power. When the capacitor voltage drops below 50 volts, the lamp will go out and the capacitor begins recharging for the next cycle. System operational cycle will repeat, until the strobe light is turned off, at a flash rate of 45 flashes per minute.

TROUBLE ANALYSIS

Whenever trouble occurs, check all primary power lines, external circuit elements, fuses and wiring for a malfunction before troubleshooting the strobe light system. System electrical failure may be traced to any of three general areas: power unit, lamp assembly or wiring. A quick method of isolating the trouble source is to remove the lens of the xenon lamp and test the lamp. Inspect the lamp to see if it is broken or loose in its socket. If the lamp is intact, use a DC voltmeter to check for approximately 350 volts at the top of the lamp with the system turned on. The rate that the voltage peaks should be between 40 and 55 times per minute. If no voltage is present, the fault is probably located in the power unit.

TROUBLESHOOTING POWER UNIT

Disassemble the power unit by removing the screws securing the end plates to the power unit. Remove the end plate which has the power plug and slide the bottom heat sink forward until it can be separated. The large capacitor may be attached to the rear end plate by thermal epoxy for efficient heat transfer and care should be taken to avoid breaking this bond. The upper heat sink (with transistors mounted on it) can be slid forward, exposing the component board and capacitor bracket. Remove the nuts securing the board to the metal bracket and the component board will be completely accessible.

CONVERTER TROUBLESHOOTING

a. If the fuse keeps blowing, check transistor 2N3055 for a possible short. It will be necessary to remove the emitter wire, and unsolder the base wire before an ohmmeter check can be made. Many times only one transistor will fail. Failure of Capacitor C1 will also cause the fuse to blow.

b. If the converter won't start when voltage is first applied, a small current "kick" is noted and then no current is drawn; look for a poor solder joint in the starting circuit, R2 2.7K and R1 82 ohms. The converter may be started by applying about 2 volts to the junction of R1 and R2.

c. Low or no output voltage, but converter operates otherwise. Using an ohmmeter, look for a shorted diode in the bridge circuit. In extreme cases, the transformer could have a shorted winding. As a check, disconnect a lead from the transformer secondary, if the current remains the same, the transformer should be replaced.

d. Low output voltage can be the result of a faulty capacitor C2. Check by removing the positive lead from the capacitor.

e. Low voltage coupled with very slow voltage buildup can be traced to a faulty transistor 2N3055. An ohmmeter check will indicate which transistor has failed. Select replacement transistors having a collector to emitter resistance of 100 ohms minimum.

TRIGGER CIRCUIT TROUBLESHOOTING

a. Using a high impedance voltmeter, check for 180 volts DC at the junction of R8, R9 and C5. If there is no voltage, check C5 and SCR T1 145A2.

b. If there is voltage at the junction, it should periodically drop to around 30 volts as the SCR triggers. If the SCR does not trigger, measure the voltage across R7 (100 ohms). This voltage will be below .5 volts. If the voltage is indicated, place an oscilloscope across R7 and look for a positive going pulse of around 4 volts at the repetition rate of 40 to 55 times per minute. If the pulse is recorded on the scope, then the SCR is not triggering and should be replaced.

c. When no voltage is observed across R7, check for battery voltage at R5 and R6. If voltage is present, then the trouble is in the unijunction.

d. If normal voltage is observed across R7, check the capacitor C4 for shorts and leakage.

e. If unijunction Q3 is to be replaced, it may be necessary to readjust the flash rate. This can be done by changing R5 or by changing the value of C4. In many cases, the value is recorded on the component board, and it is only necessary to order the exact value from the manufacturer (see the Vendor Publication List).

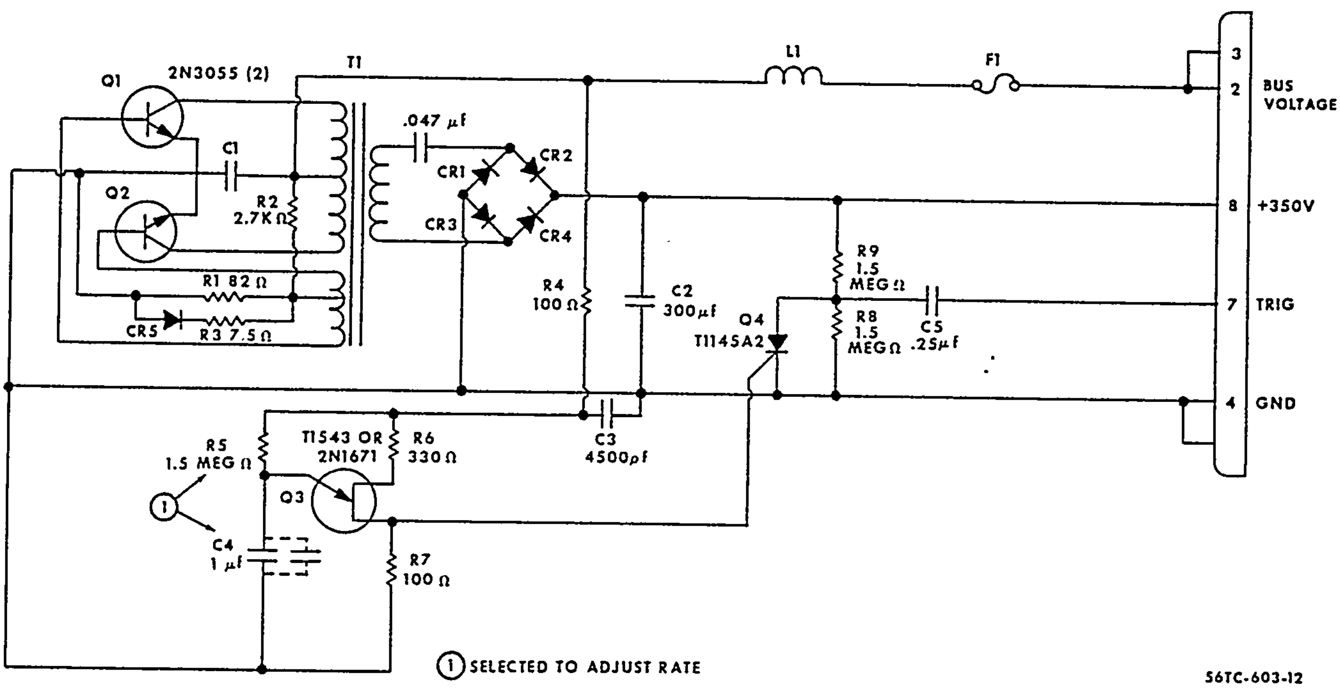


Figure 13-5. Bullock Power Supply Schematic (Internal)

ELECTRICAL UTILIZATION LOAD CHART

	Number Per Aircraft	Load Per Unit In Amps.	Load Per Aircraft In Amps.
CONTINUOUS LOAD (STANDARD EQUIPMENT)			
Battery Relay	1	0.60	0.60
Fuel Quantity System	2	0.06	0.12
Fuel Flow System	1	0.94	0.94
Flap Position Indicator	1	0.06	0.06
Alternator Control System			
* Alternator Regulator	2	0.07	0.07
Alternator Out Relay	2	0.09	0.18
Alternator Out Annunciator	2	0.08	0.16
Field Exciter Printed Circuit Board	1	0.03	0.03
Heater System			
** Vent Blower	1	14.0	14.0
Vent Blower Relay	1	0.10	0.10
Combustion Blower	1	2.90	2.90
Fuel Pump	2	0.40	0.80
Solenoid (heater fuel)	1	0.39	0.39
Manual or Auto Select Relay	1	0.09	0.09
Cabin Temperature Control Box	1	0.18	0.18
Ignitor	1	1.90	1.90
Lighting			
Edge Lights (Circuit breaker and switch panel)	7	0.04	0.28
Compass	1	0.04	0.04
Dome	1	0.30	0.30
Fuel Selector	2	0.04	0.08
* Landing Gear Position	2	0.04	0.04
Landing Gear Visual Indicator	1	0.17	0.17
Navigation (Wing)	4	0.75	3.00

* ONLY ONE IS USED AT A TIME
** MAXIMUM STALL LOAD

	Number Per Aircraft	Load Per Unit In Amps.	Load Per Aircraft In Amps.
CONTINUOUS LOAD (STANDARD EQUIPMENT CONT'D)			
Lighting (Continued)			
Navigation (Tail)	1	0.65	0.65
Flasher (Navigation)	1	0.10	0.10
Overhead Instrument	2	0.30	0.60
Reading	2	0.30	0.60
Rheostat	1	0.04	0.04
Tab Indicator	2	0.18	0.36
Cylinder Head Temperature Indicator	2	0.49	0.98
Oil Temperature Indicator	2	0.31	0.62
Turn and Bank Indicator	1	0.15	0.15
Pitot Heater (L.H.)	1	3.30	3.30
Stall Warning Switch Heater	1	1.60	1.60
CONTINUOUS LOAD (OPTIONAL EQUIPMENT)			
Air Conditioner			
Heater and Air Conditioner Control Relays	2	0.09	0.18
Condenser and Evaporator Blower Relay	1	0.50	0.50
Evaporator Blower	1	17.50	17.50
Condenser Blower	1	15.00	15.00
Nacelle Scoop Relay	1	0.09	0.09
Magnetic Clutch	1	0.20	0.20
Suction Throttling Solenoid	1	0.75	0.75
Hot Gas By-Pass	1	0.75	0.75
Autopilot (H-14)	1	3.1	3.1
Propeller Deicer	1	12.0	12.0
Pitot Heat (R.H.)	1	3.30	3.30
Generator Control System			
Overvoltage Relay	2	0.03	0.06
Generator-Out Annunciator	2	0.08	0.16
Generator Control Relay	2	0.60	1.20

	Number Per Aircraft	Load Per Unit In Amps.	Load Per Aircraft In Amps.
CONTINUOUS LOAD (OPTIONAL EQUIPMENT CONT'D)			
Lighting			
Oxygen Indicator	1	0.04	0.04
Control Wheel Map	1	0.30	0.30
Clock Light	1	0.04	0.04
Instrument Post	41	0.04	1.64
Wing Ice Light	1	2.14	2.14
Rotating Beacon	2	3.75	7.50
Engine Hour Meter	1	0.05	0.05
Flight Hour Meter	1	0.05	0.05
INTERMITTENT LOAD (STANDARD EQUIPMENT)			
Lights			
Landing	2	8.90	17.80
Taxi	1	6.00	6.00
Fuel Boost-Out Annunciator	2	0.08	0.16
Stall Warning Horn	1	1.50	1.50
* Fuel Boost Pump	2	14.0	14.0
* Cowl Flap Actuator	2	1.2	1.2
Cigarette Lighter	1	7.5	7.5
* Starter Relay	2	0.6	0.6
Starting Vibrator	1	2.00	2.00
* Starter	1	**275.00	275.00
Flap Motor	1	13.0	13.0
L.G. Warning Horn	1	1.5	1.5
L.G. Horn Flasher	1	0.40	0.40
L.G. Dynamic Brake Relay	1	0.40	0.40
L.G. Motor	1	20.00	20.00

* ONLY ONE USED AT A TIME
** MAXIMUM STALL LOAD

	Number Per Aircraft	Load Per Unit In Amps.	Load Per Aircraft In Amps.
INTERMITTENT LOAD (OPTIONAL EQUIPMENT)			
Surface Deice Relay	1	0.09	0.09
Surface Deice Time Delay Relay	1	0.17	0.17
Surface Deice Valve	2	1.50	3.00
Magic Hand Switch	1	2.50	2.50
Nacelle Scoop Actuator	1	1.20	1.20

TROUBLESHOOTING

ALTERNATOR SYSTEM

INDICATION	PROBABLE CAUSE	REMARKS
1. Failure to charge.	a. Loose drive belt.	a. Adjust belt, Check for cracked or frayed belt. Replace if necessary.
	b. Open field circuit breaker.	b. Reset breaker, check for short circuit if breaker opens during operation.
	c. Open fuse in field circuit.	c. Replace fuse and check for short circuits.
	d. Open current limiter in output line.	d. Check for short circuits (alternator output will not normally be sufficient to burn out the current limiter).
	e. Voltage regulator failure (neither alternator operative).	e. Switch to alternate regulator to determine if the regulator will control alternators.
	f. Worn or broken brushes, shorted field or open field.	f. Check resistance between field terminal and alternator frame, it should be approximately 12 ohms. If resistance varies greatly from 12 ohms, repair alternator per Alternator Service Manual.
	g. Shorted or open diodes.	g. Check resistance with ohmmeter from BAT terminal to alternator frame. Note reading and reverse the ohmmeter leads. One reading should be low and one high. If both are low or high, repair alternator per the Alternator Service Manual.
2. Noisy Alternator.	a. Loose, worn or frayed drive belt.	a. Replace.
	b. Loose, bent or improperly installed pulley assembly.	b. Straighten or replace.
	c. Defective bearings. Shorted rectifier (magnetic whine). Loose housing.	c. Replace or repair per the Alternator Service Manual.
	d. Loose mounting bolts.	d. Tighten.
3. Loadmeter or light flicker.	a. Loose connections.	a. Tighten.
	b. Defective brushes.	b. Replace at 2000 hours or as necessary.

BATTERY

INDICATION	PROBABLE CAUSE	REMARKS
1. No power indicated with battery master switch key "ON".	a. Battery discharged or defective.	a. Test.
	b. Open circuit between battery and master switch.	b. Check continuity.
	c. Master switch defective.	c. Check switch for operation. Replace if necessary.

BATTERY (CONT'D)

INDICATION	PROBABLE CAUSE	REMARKS
	d. Defective relay.	d. Check relay for operation. Replace if necessary.
2. Power on with master switch in "OFF" position.	a. Master switch defective.	a. Check switch for operation. Replace if necessary.
	b. Relay contacts stuck.	b. Replace relay.
3. Apparent loss of capacity.	a. Cells unbalanced.	a. Equalize cell voltages.
4. Complete failure to operate.	a. Loose or broken lead.	a. Secure lead.
	b. Loose or disengaged terminals in battery.	b. Secure terminals.
	c. Battery not charged.	c. Charge battery.
5. Excessive spewage (crystalline deposits on outside of battery).	a. Excessive charge rate.	a. Clean the battery and charge as required, then adjust the electrolyte level.
	b. Excessive ambient temperature during charge.	b. Clean the battery and charge as required, then adjust the electrolyte level.
	c. Electrolyte level too high.	c. Clean the battery and charge as required, then adjust the electrolyte level.
6. Cell cases distorted.	a. Excessive charge rate.	a. Replace distorted cells.
7. Unequal voltages among cells.	a. Cells unbalanced.	a. Equalize cell voltages.
8. Foreign matter within cells.	a. Impure or acid-contaminated water.	a. Such cells will not normally respond to charging. They will show up as unbalanced cells and must be replaced.
	b. Electrolyte concentration too high.	b. Same as above.
9. Frequent addition of water.	a. Unbalanced cells.	a. Equalize cell voltages.
10. Burn marks on connectors.	a. Loose connectors.	a. Secure connectors.
11. Overheating of intercell connectors.	a. Loose or dirty intercell connectors.	a. Disassemble, clean, reassemble and properly torque intercell connectors.

STARTER SYSTEM

INDICATION	PROBABLE CAUSE	REMARKS
1. Both starters inoperative.	a. Circuit breaker tripped in starter-switch circuit.	a. Check for short circuit; reset.
	b. Battery relay inoperative.	b. Check continuity of battery system.
	c. Low battery.	c. Test battery. If low, replace or start with external power.

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

GENERATOR SYSTEM

INDICATION	PROBABLE CAUSE	REMARKS
1. Zero or low charge indicated.	a. Engine speed too low.	a. Increase speed.
	b. Loose connection.	b. Check connections throughout system.
	c. Open or shorted 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 filtered air jet to remove grit.
	g. Defective voltage regulator.	g. Replace regulator.
	h. Defective loadmeter.	h. Replace loadmeter.
2. No generator output.	a. Current limiter blown.	a. Check for short circuit; replace.
	b. Open circuit.	b. Check continuity of circuit.
	c. Defective generator control switches, generator control relay, or reverse current diode.	c. Test switches relay, or diode. Replace if defective.
	d. Generator not turning.	d. Check generator drive belts. Replace if necessary.
3. Low generator output.	a. Generators not paralleled.	a. Readjust minimum-load voltage. Then readjust paralleling rheostats.

GENERATOR SYSTEM (CONT'D)

INDICATION	PROBABLE CAUSE	REMARKS
4. Loadmeter reads off scale in wrong direction.	a. Generator field magnetized in wrong direction.	a. Flash field. (Do not flash field when generator is running.)
5. Loadmeter does not read.	a. Loose connection on "SW" terminal or reverse current relay.	a. Tighten.
	b. Loose connection or ground in aircraft wiring.	b. Check entire system.
	c. Open fuse in loadmeter circuit.	c. Check for short circuit; replace.

LIGHTS

INDICATION	PROBABLE CAUSE	REMARKS
1. Lights inoperative.	a. Circuit breaker tripped.	a. Check for short circuit. Reset circuit breaker.
	b. Loose connection.	b. Check and tighten electrical connections.
	c. Battery defective.	c. Replace battery or use external power.
2. One bulb does not light.	a. Bulb burned out.	a. Replace bulb.
	b. Fixture not grounded.	b. Check for good bonding between fixture and structure. Tighten mounting screws.
	c. Loose connection.	c. Check all connections in circuit.
	d. Defective fixture or switch.	d. Replace fixture or switch.

LANDING LIGHTS

INDICATION	PROBABLE CAUSE	REMARKS
1. Lamp fails to light.	a. Circuit breaker tripped.	a. Check for short circuit. Reset circuit breaker.
	b. Lamp burned out.	b. Replace lamp.
	c. Loose connection or defective wire.	c. Tighten connections and check circuit continuity. Replace or repair wire if necessary.
	d. Landing-light switch defective.	d. Check continuity through switch. Replace if necessary.

STALL WARNING CIRCUIT

INDICATION	PROBABLE CAUSE	REMARKS
1. Warning horn inoperative.	a. Horn circuit breaker tripped.	a. Check for short circuit; reset.
	b. Open circuit.	b. Check continuity: (1) Circuit breaker to indicator. (2) Indicator to switch. (3) Switch to ground.
	c. Defective switch.	c. Check switch operation.
	d. Defective indicator.	d. Check horn operation.

STALL WARNING CIRCUIT (CONT'D)

INDICATION	PROBABLE CAUSE	REMARKS
2. Horn stays on.	a. Grounded circuit between horn and switch.	a. Test for ground.
	b. Defective switch.	b. Check switch operation.

ELECTRICAL WIRING DIAGRAMS

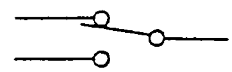
To aid in the location and tracing of wires in the circuit diagrams on the following pages, each wire is identified by the number it bears in the aircraft. Individual items are indexed and identified. Terminals, wire numbers and items are shown in a manner which will make the operation of each component easily understandable. Symbols used in the diagrams appear on pages 14-2 and 14-3. In most instances, components which appear in the diagrams and in the pages of symbols are itemized. Circuits are shown in a condition consistent with the position of the control switches and as noted on the diagrams. The arrangement of the components in the diagrams has been chosen for clarity rather than to show physical location in the aircraft. The inter-relationship of the various circuits, in most instances, has been ignored.

SWITCHES & RELAYS

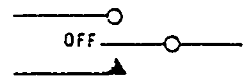
○ Positive Contact

▲ Momentary Contact

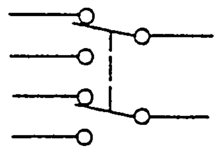
These contacts may be found in various combinations on most of the following type switches and relays.



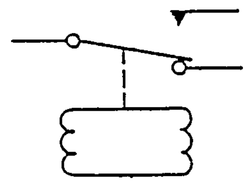
2 - Position



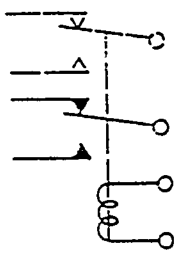
3 - Position



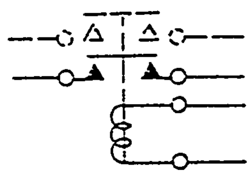
2 - Pole



Pressure Switch

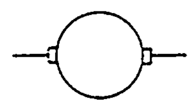


Low Current

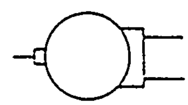


High Current

MOTORS

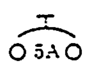


2 - Wire

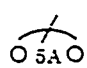


3 - Wire

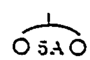
CIRCUIT BREAKERS



Push-Pull

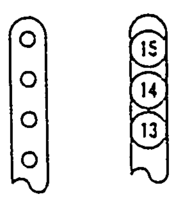


Toggle

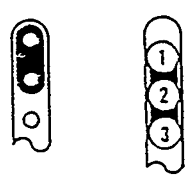


Push to Reset

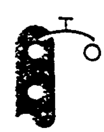
TERMINAL BOARDS & BUS BARS



Terminal Board



Terminal Board
with Bus Bar



Open Bus Bar

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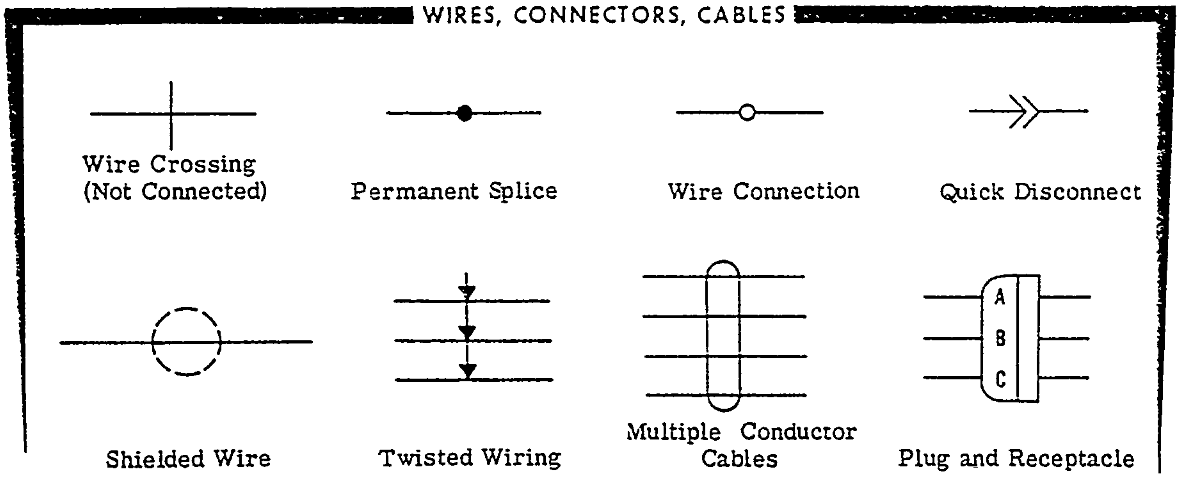
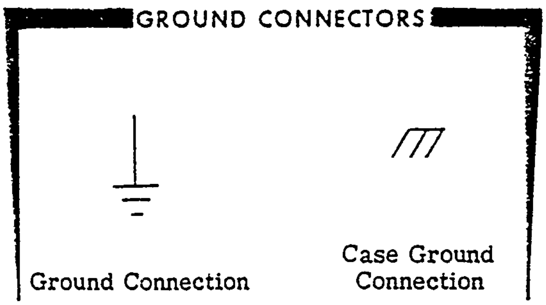
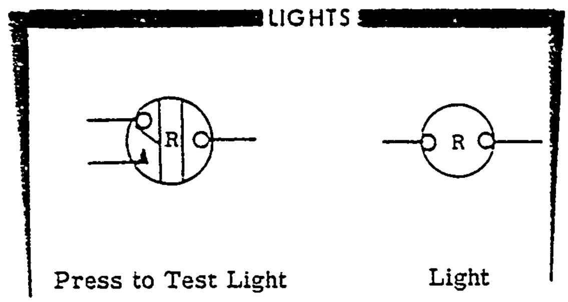
WIRES, CONNECTORS, CABLES



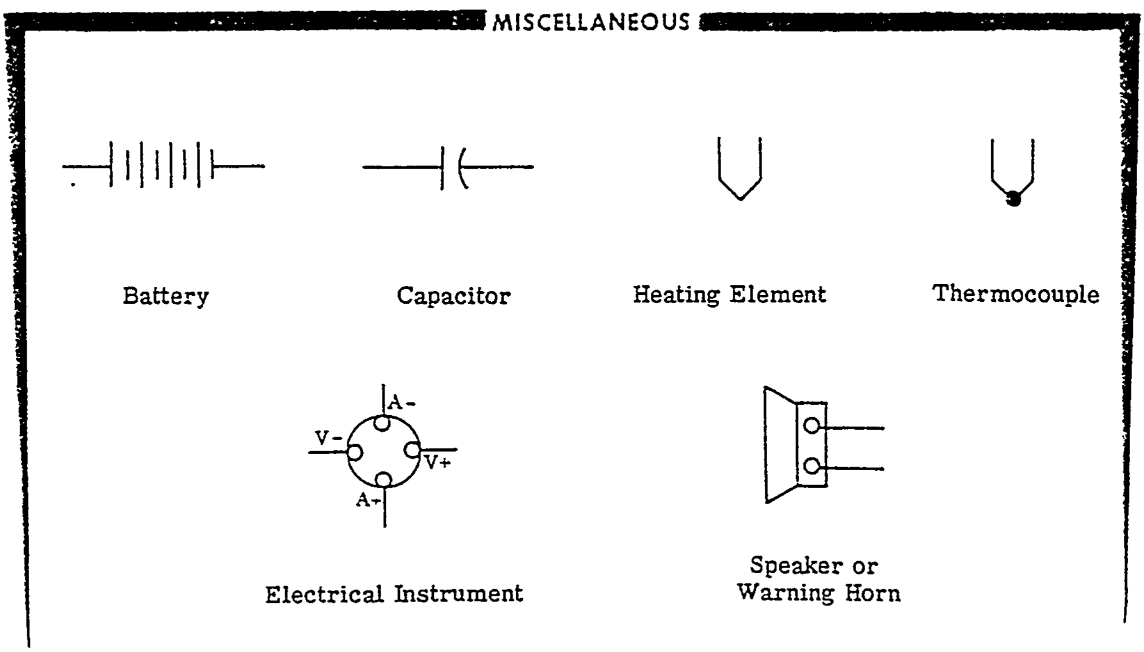
GROUND CONNECTORS



LIGHTS



MISCELLANEOUS



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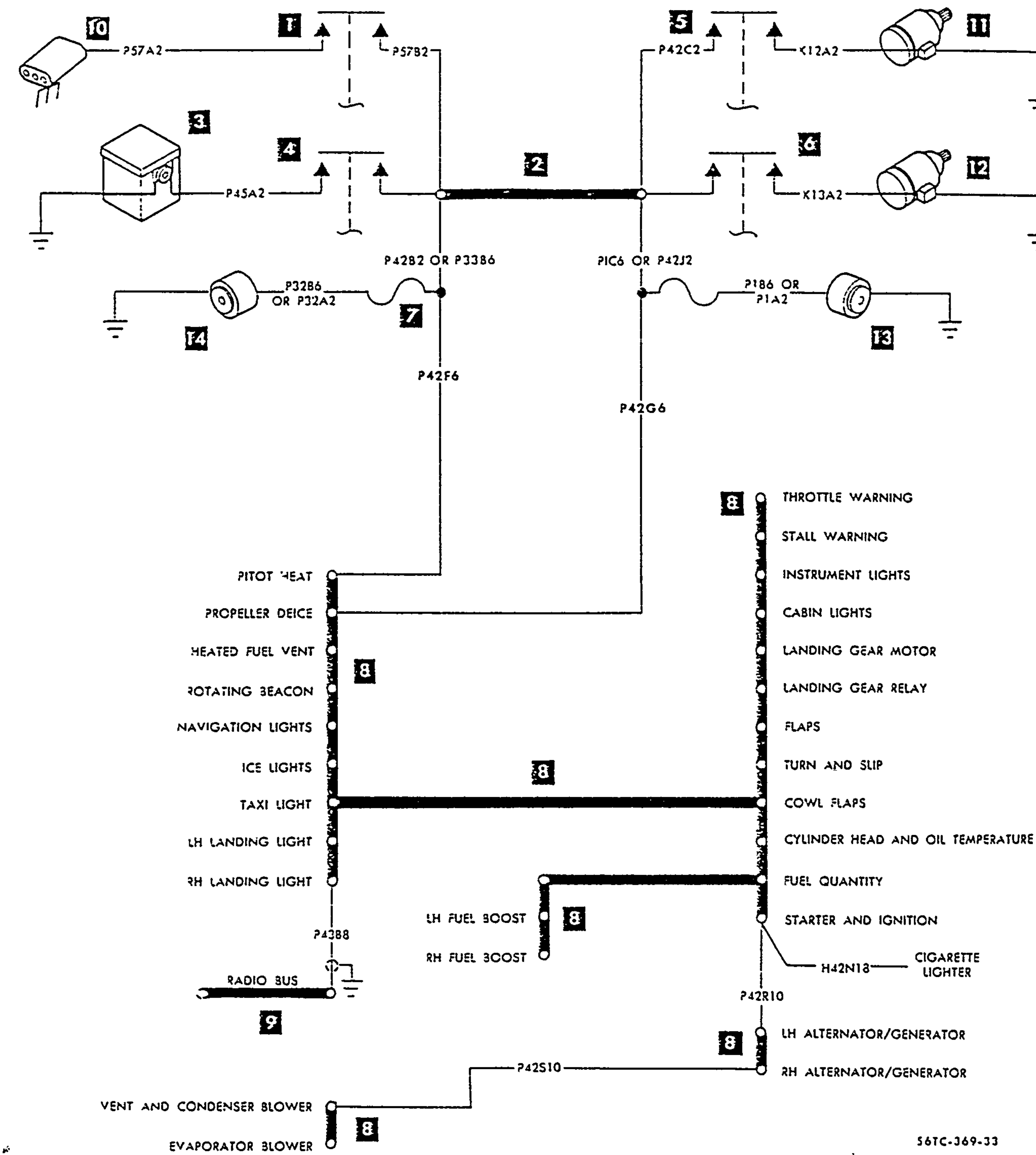
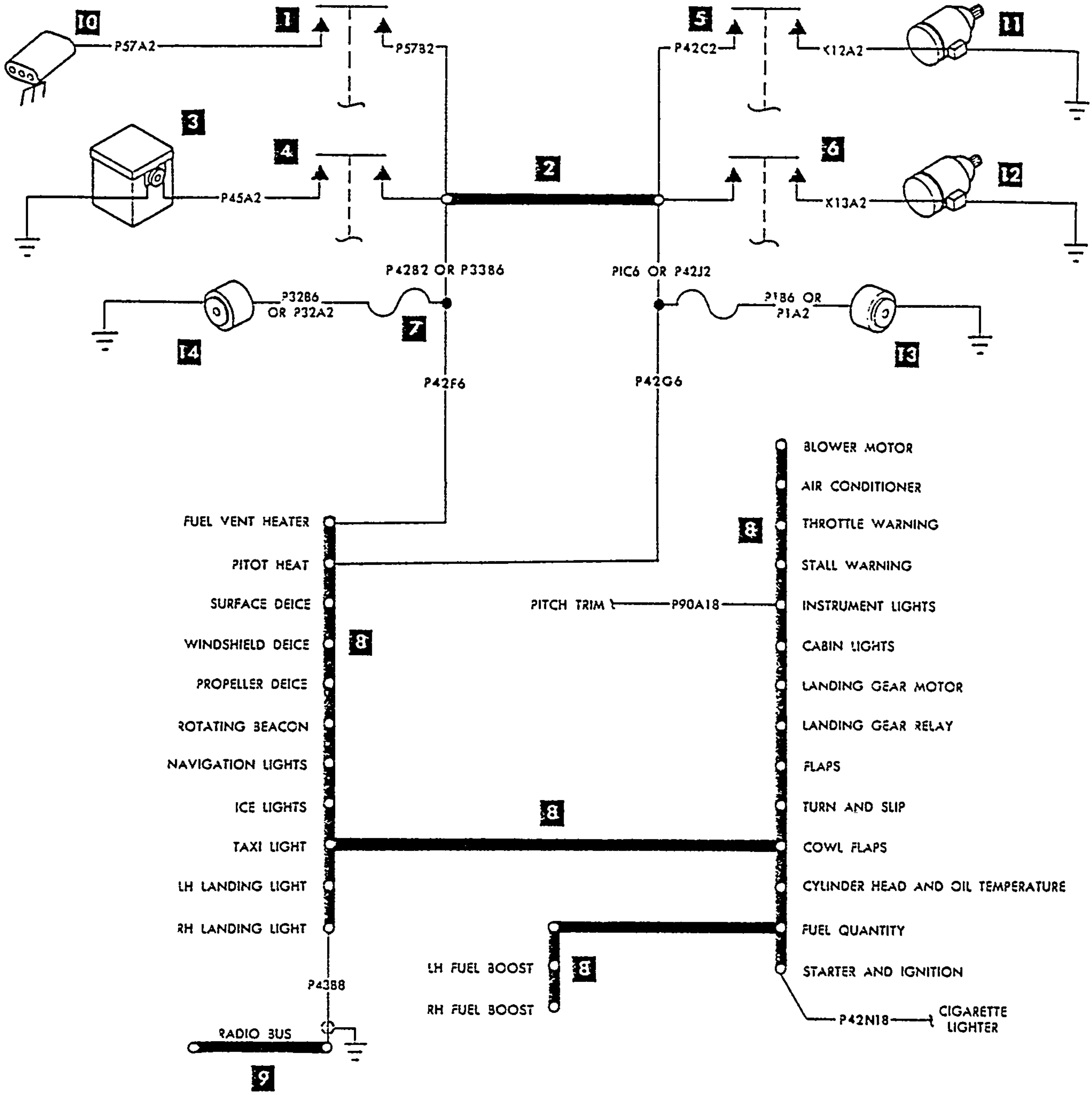


1. External Power Relay
2. Battery Bus
3. Battery
4. Battery Relay
5. LH Starter Relay
6. RH Starter Relay
7. Limiter
8. Bus
9. Radio Bus
10. External Power Plug
11. LH Starter
12. RH Starter
13. RH Alternator/Generator
14. LH Alternator/Generator

Figure 14-1. Power Distribution (TG-1 thru TG-52)



1. External Power Relay
2. Battery Bus
3. Battery
4. Battery Relay
5. LH Starter Relay
6. RH Starter Relay
7. Limiter
8. Bus
9. Radio Bus
10. External Power Plug
11. LH Starter
12. RH Starter
13. RH Alternator/Generator
14. LH Alternator/Generator

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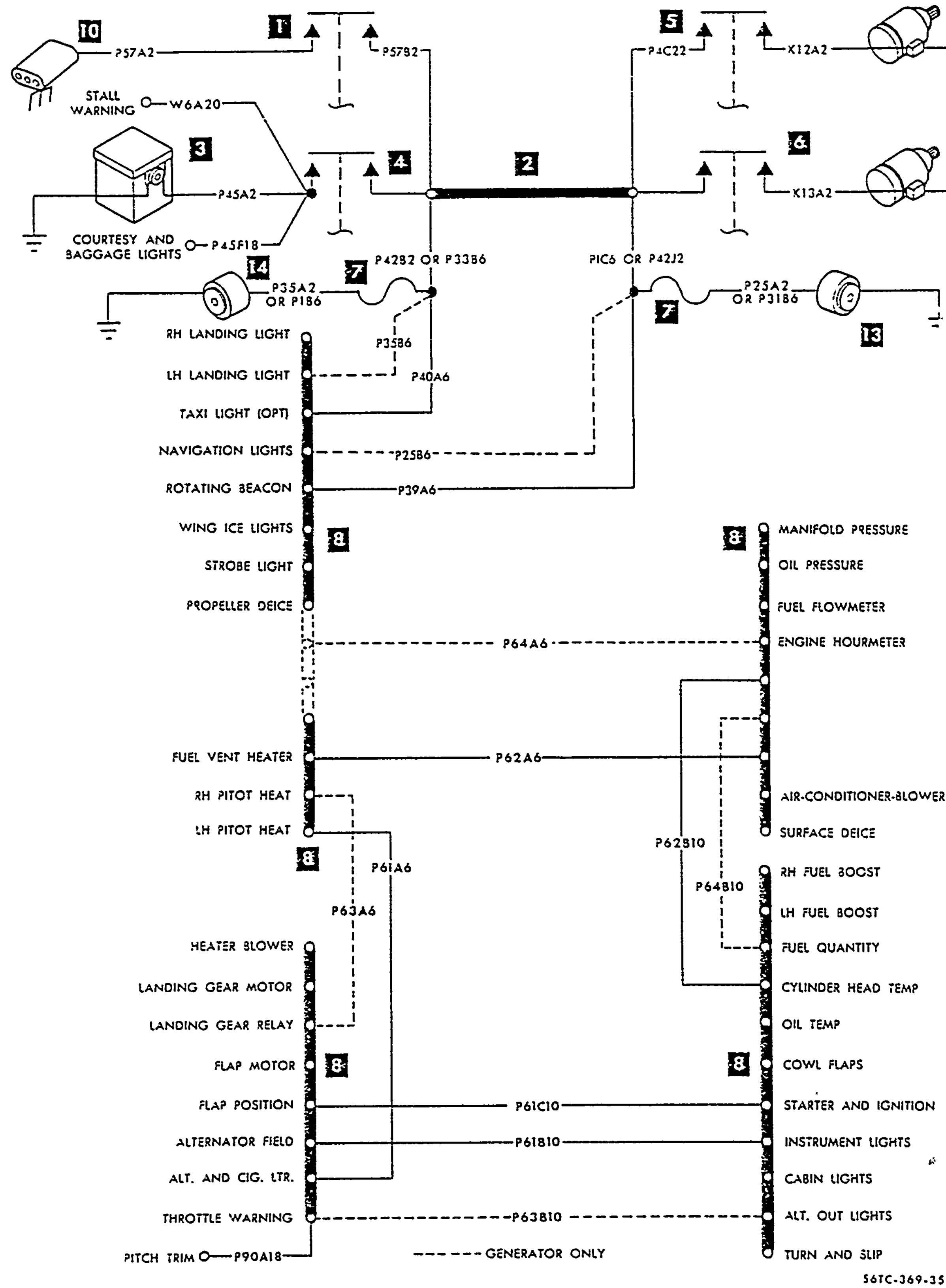
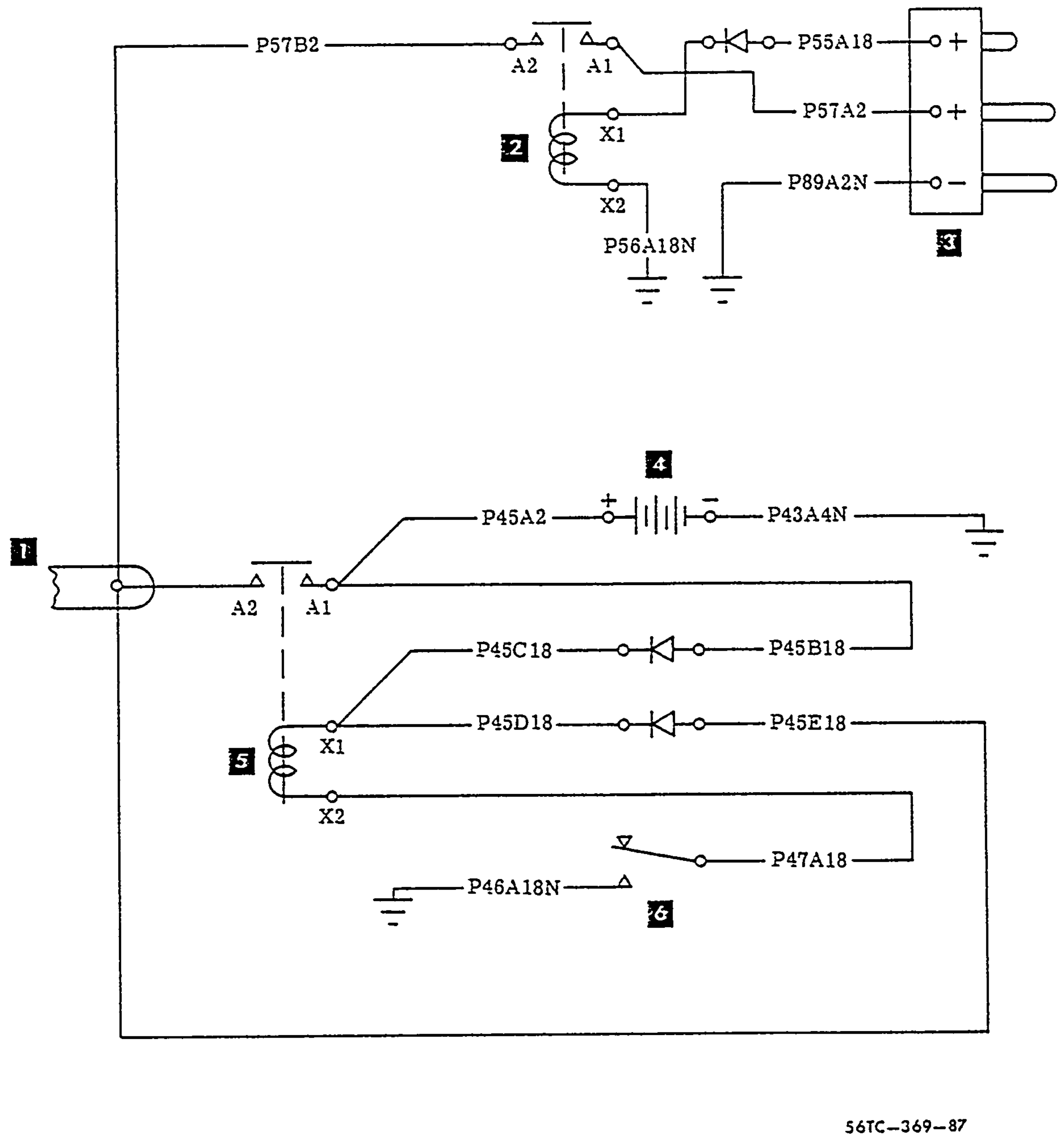
Figure 14-1. Power Distribution (TG-53 thru TG-83)



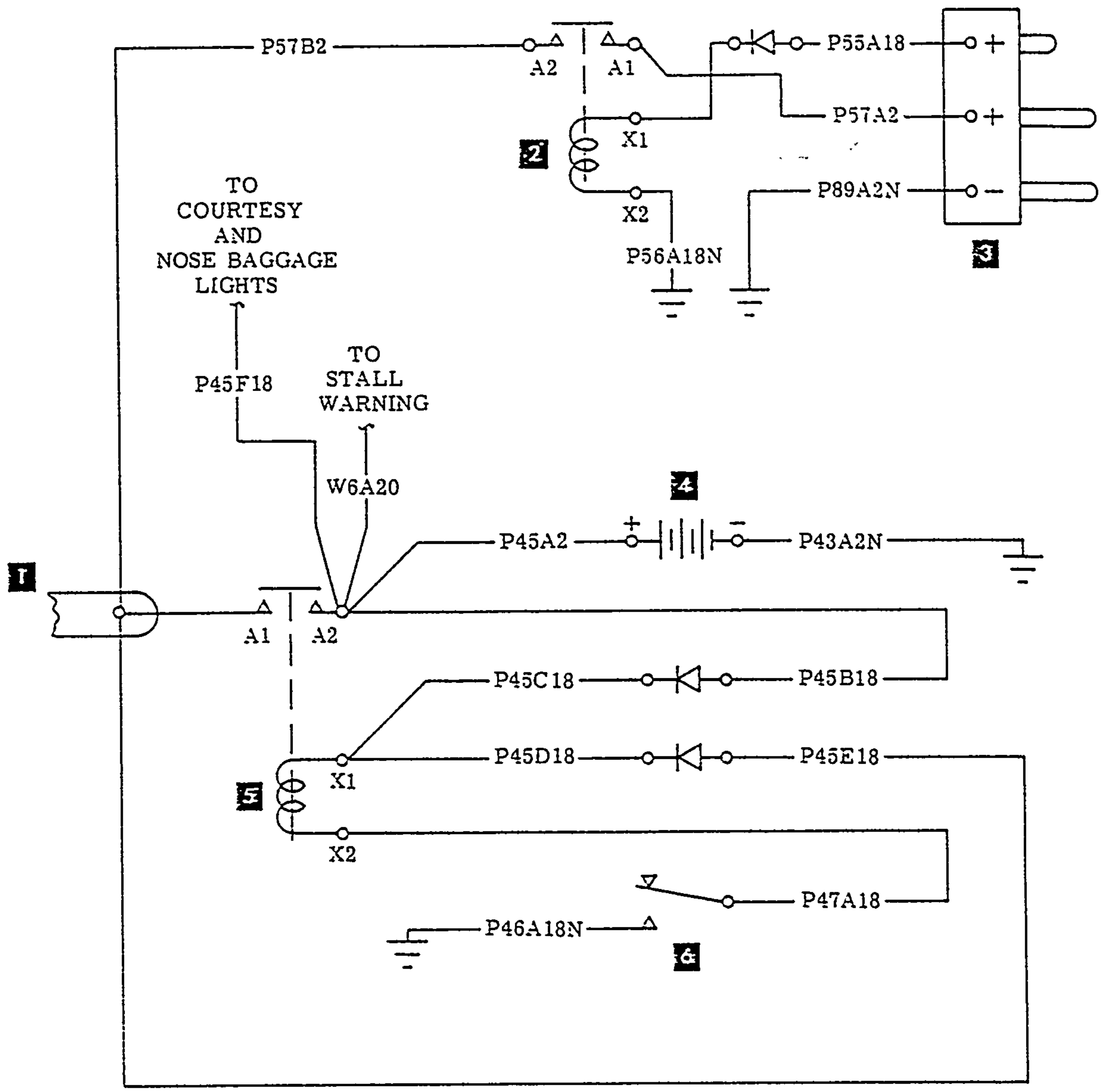
1. External Power Relay
2. Battery Bus
3. Battery
4. Battery Relay
5. LH Starter Relay
6. RH Starter Relay
7. Limiter
8. Bus
9. External Power Plug
10. LH Starter
11. RH Starter
12. RH Alternator/Generator
13. LH Alternator/Generator

Figure 14-1. Power Distribution (TG-84 and after)



1. Bus
2. External Power Safety Relay
3. External Power Receptacle
4. Battery
5. Battery Relay
6. Battery Switch

Figure 14-2. Battery and External Power (TG-1 thru TG-83)



1. Bus
2. External Power Safety Relay
3. External Power Receptacle
4. Battery
5. Battery Relay
6. Battery Switch

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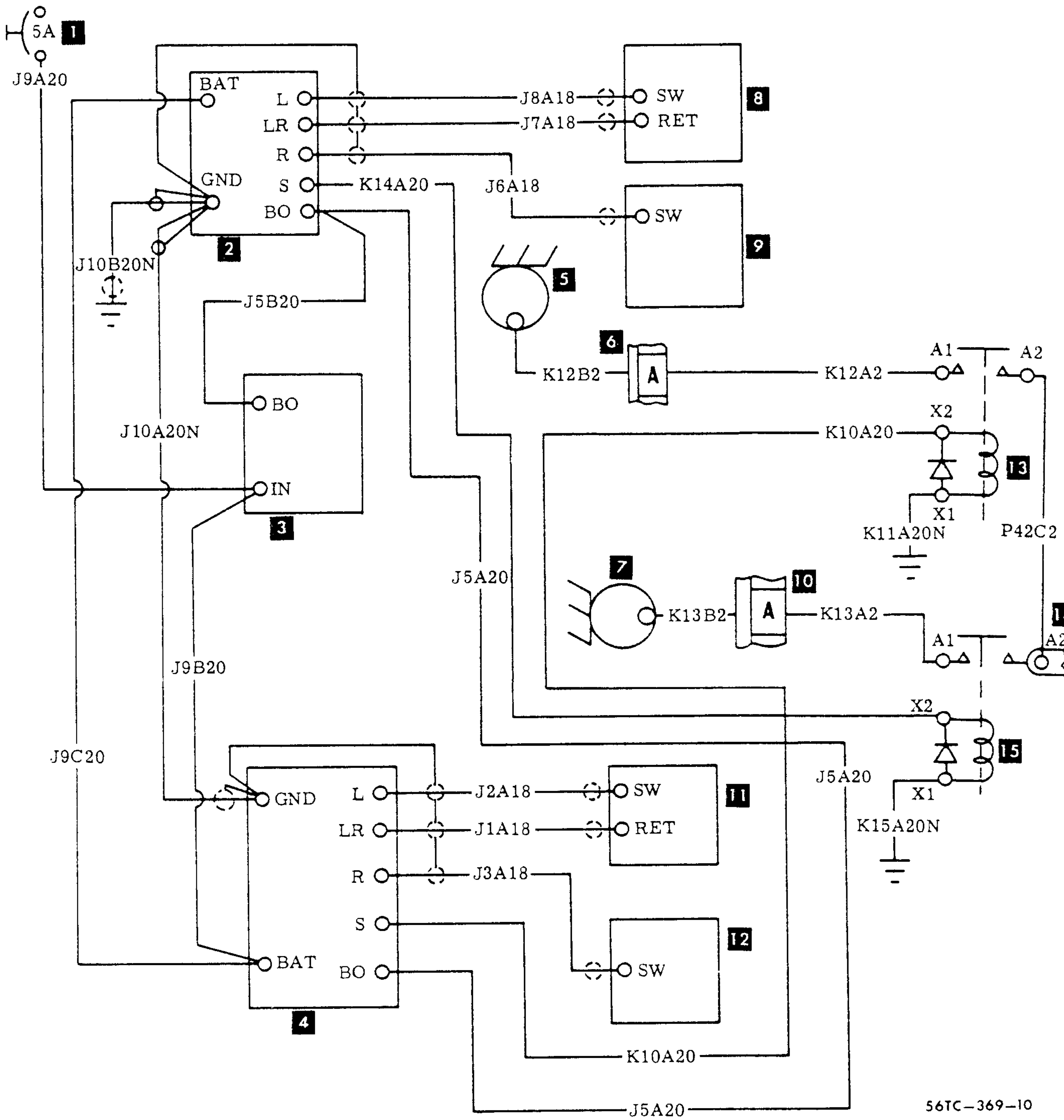
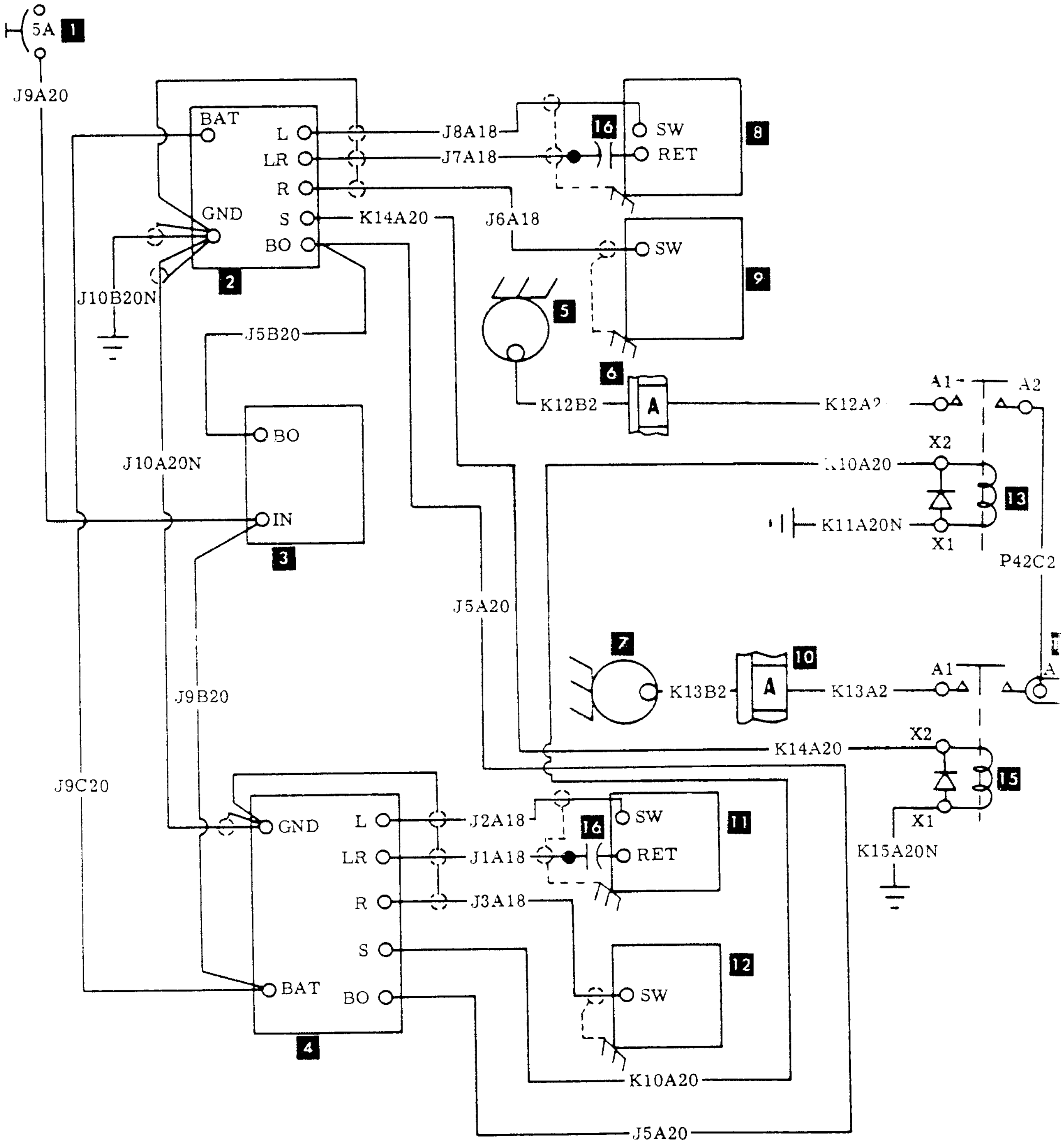
Figure 14-2. Battery and External Power (TG-84 and after)



1. Circuit Breaker
2. R.H. Engine Ignition Switch
3. Starting Vibrator
4. L.H. Engine Ignition Switch
5. L.H. Starter
6. L.H. Generator And Starter Firewall Connector
7. R.H. Starter
8. L.H. Mag - R.H. Engine
9. R.H. Mag - R.H. Engine
10. R.H. Generator Firewall Connector
11. L.H. Mag - L.H. Engine
12. R.H. Mag - L.H. Engine
13. L.H. Starter Relay
14. Battery Bus
15. R.H. Starter Relay

Figure 14-3. Starter and Ignition; (TG-1, TG-3 thru TG-6, TG-8 thru TG-10, TG-12 and TG-14)



1. Circuit Breaker
2. R.H. Engine Ignition Switch
3. Starting Vibrator
4. L.H. Engine Ignition Switch
5. L.H. Starter
6. L.H. Generator And Starter Firewall Connector
7. R.H. Starter
8. L.H. Mag - R.H. Engine
9. R.H. Mag-R.H. Engine
10. R.H. Generator Fire Wall Connector
11. L.H. Mag-L.H. Engine
12. R.H. Mag-L.H. Engine
13. L.H. Starter Relay
14. Battery Bus
15. R.H. Starter Relay
16. Filter Capacitor

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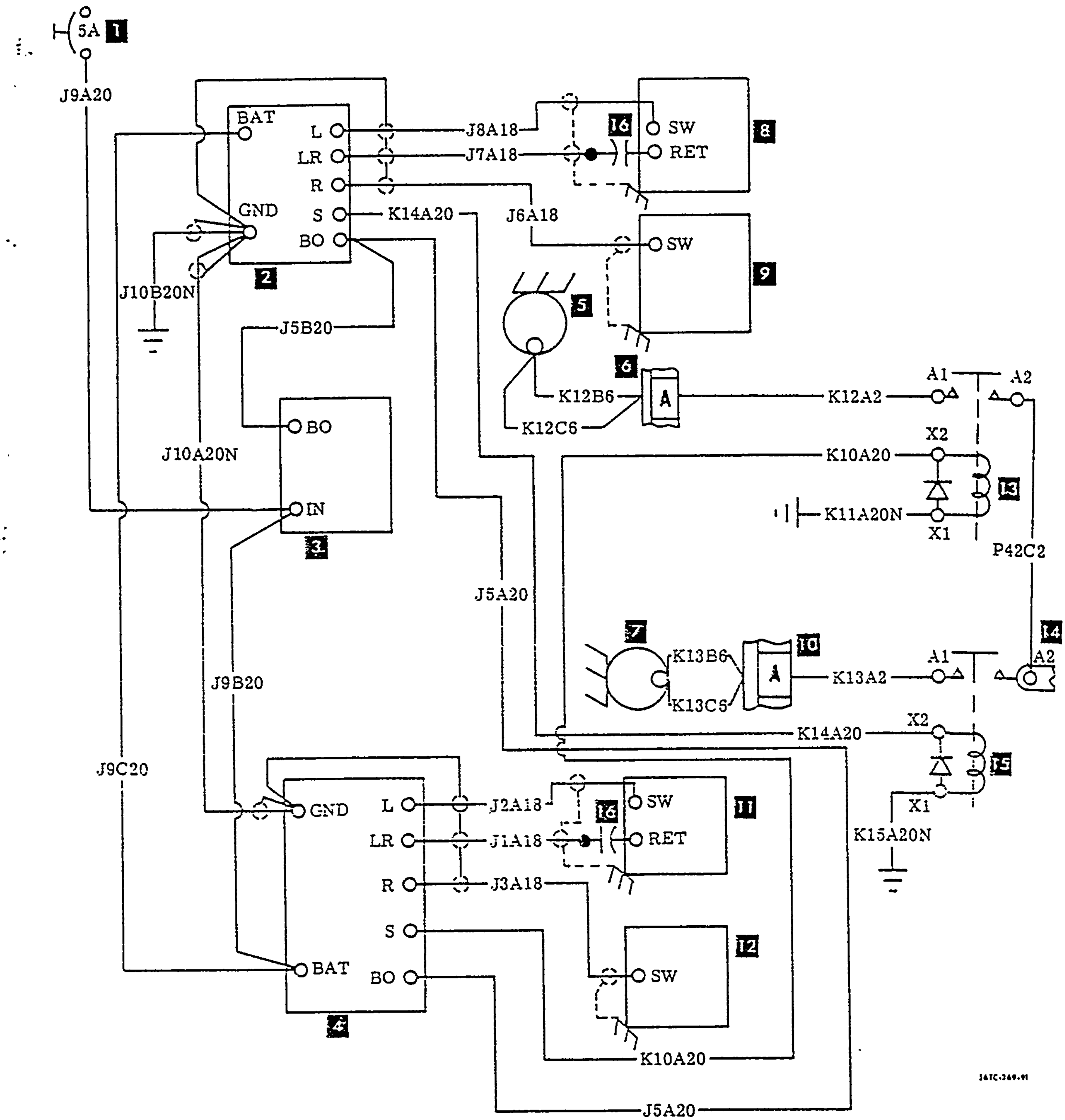
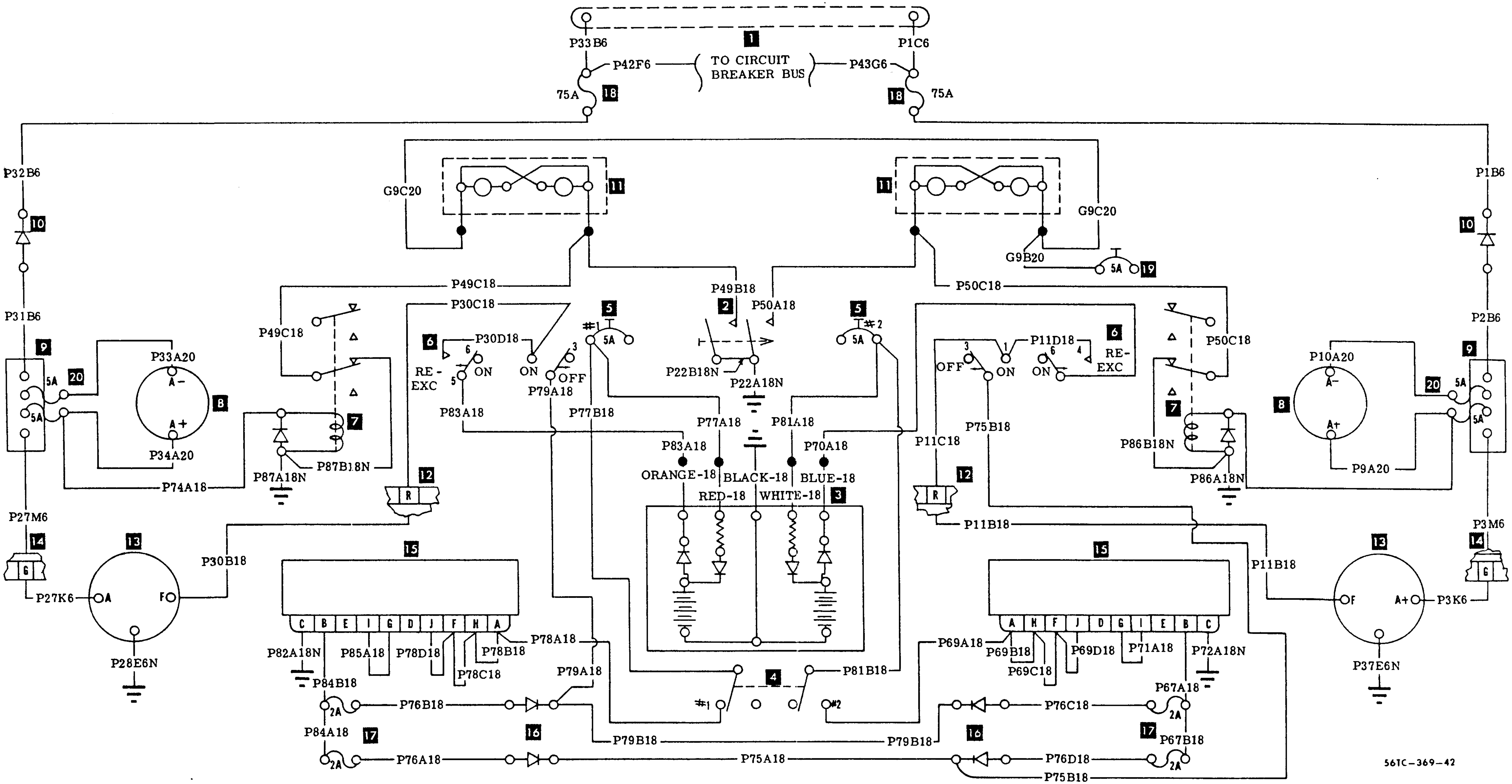
Figure 14-3. Starter and Ignition (TG-2, TG-7, TG-11, TG-13, TG-15 thru TG-83)



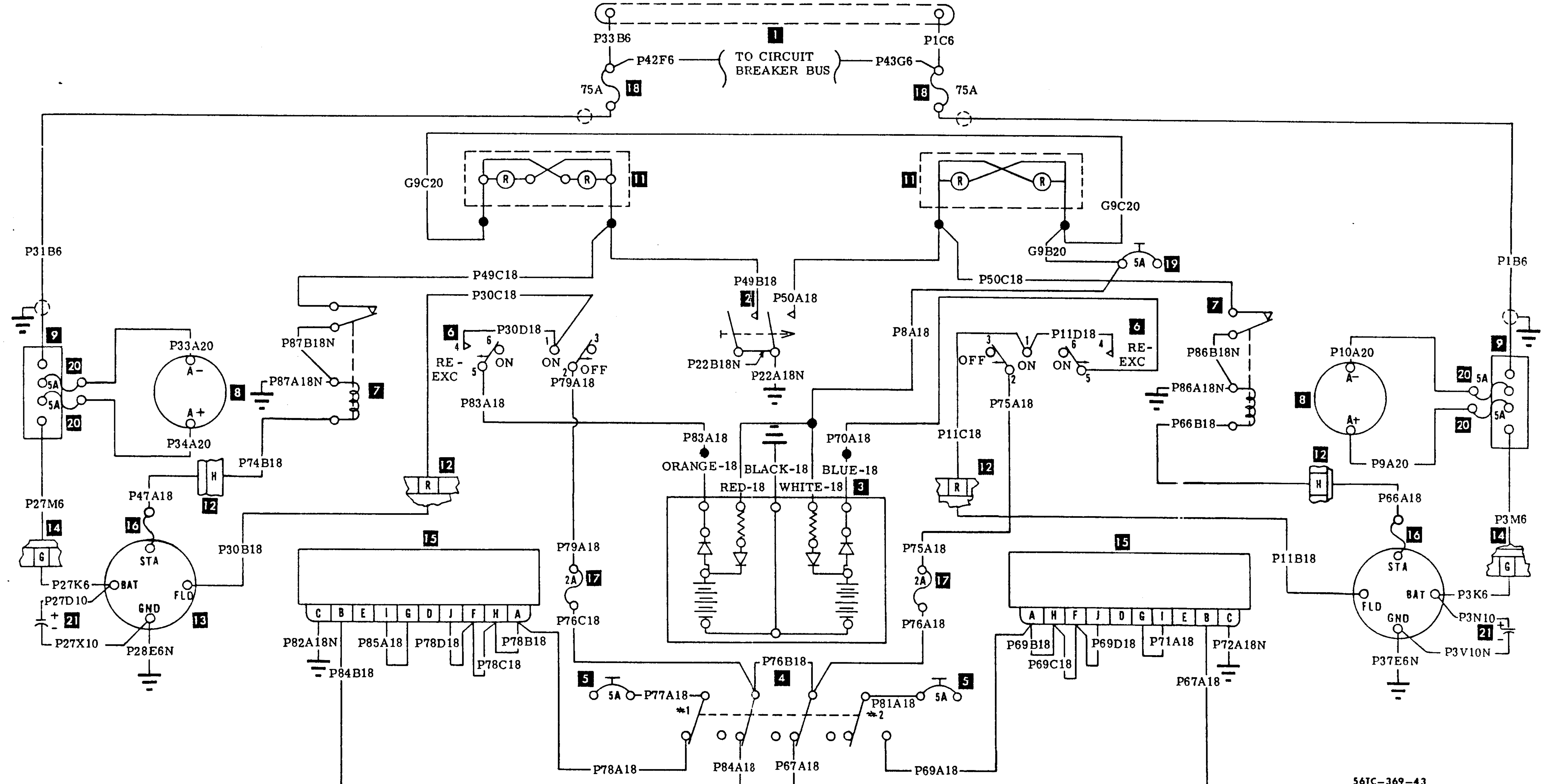
1. Circuit Breaker
2. R.H. Engine Ignition Switch
3. Starting Vibrator
4. L.H. Engine Ignition Switch
5. L.H. Starter
6. L.H. Generator And Starter Firewall Connector
7. R.H. Starter
8. L.H. Mag - R.H. Engine
9. R.H. Mag-R.H. Engine
10. R.H. Generator Fire Wall Connector
11. L.H. Mag-L.H. Engine
12. R.H. Mag-L.H. Engine
13. L.H. Starter Relay
14. Battery Bus
15. L.H. Starter Relay
16. Filter Capacitor

Figure 14-3. Starter and Ignition (TG-84 and after)



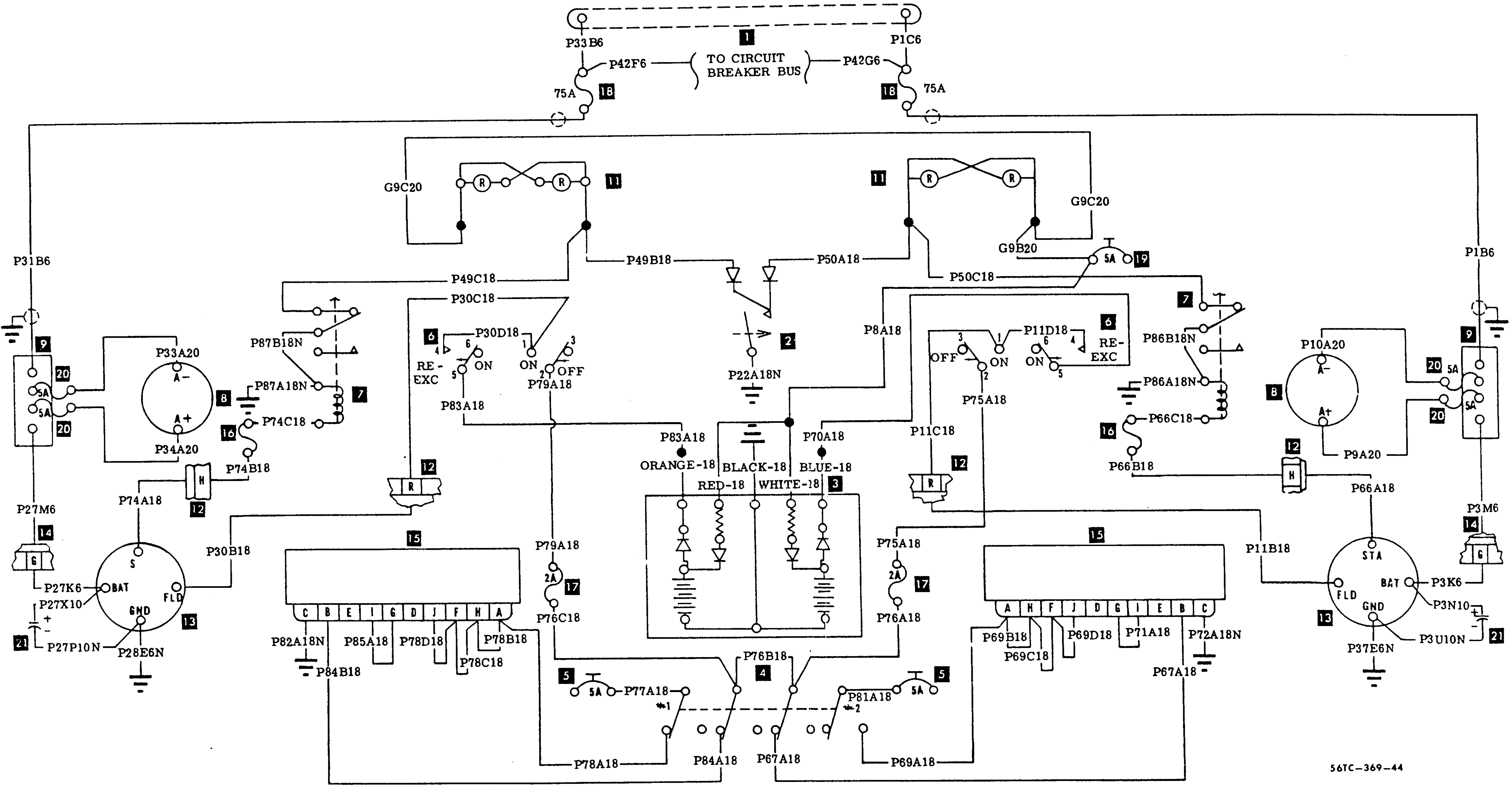
1. Battery Bus
2. Annunciator Test Switch
3. Emergency Excitation Supply
4. Regulator Select Switch
5. Circuit Breaker (Alternator Field)
6. Alternator Switch
7. Relay (Annunciator)
8. Loadmeter
9. Shunt (75 amp 50 mv)
10. Reverse Current Diode
11. Annunciator (Alternator Out)
12. Firewall Connector (Accessories)
13. Alternator
14. Firewall Connector (Generator & Starter)
15. Voltage Regulator - Overvoltage Relay
16. Diodes (Regulator Isolator)
17. Fuses (Regulator)
18. Current Limiter (Alternator)
19. Circuit Breaker (Throttle Warning)
20. Loadmeter Fuse

Figure 14-4. Alternator (TG-1 thru TG-9, except TG-7)



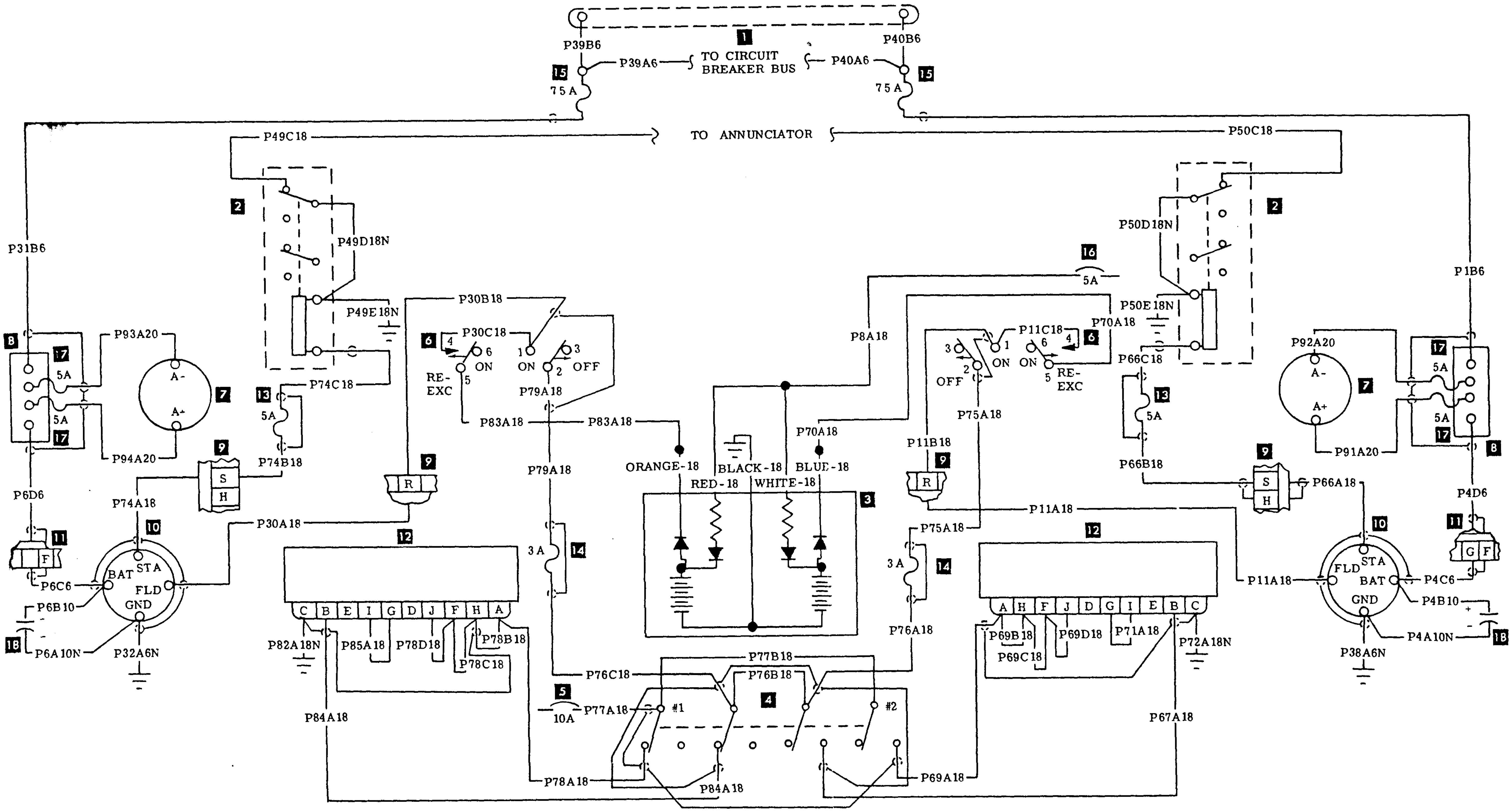
1. Battery Bus
2. Annunciator Test Switch
3. Emergency Excitation Supply
4. Regulator Select Switch
5. Circuit Breaker (Alternator Field)
6. Alternator Switch
7. Relay (Annunciator)
8. Loadmeter
9. Shunt (75 amp 50 mv)
10. Not Used
11. Annunciator (Alternator Out)
12. Firewall Connector (Accessories)
13. Alternator
14. Firewall Connector (Generator and Starter)
15. Voltage Regulator - Overvoltage Relay
16. Fuse (Alternator Stator)
17. Fuse (Alternator Field)
18. Current Limiter (Alternator)
19. Circuit Breaker (Throttle Warning)
20. Fuse (Loadmeter)
21. Filter Capacitor

Figure 14-4. Alternator (TG-7, TG-10 thru TG-51)



1. Battery Bus
2. Annunciator Test Switch
3. Emergency Excitation Supply
4. Regulator Select Switch
5. Circuit Breaker (Alternator Field)
6. Alternator Switch
7. Relay (Annunciator)
8. Loadmeter
9. Shunt (75 amp 50 mv)
10. Not Used
11. Annunciator (Alternator Out)
12. Firewall Connector (Accessories)
13. Alternator
14. Firewall Connector (Generator and Starter)
15. Voltage Regulator - Overvoltage Relay
16. Fuse (Alternator Stator)
17. Fuse (Alternator Field)
18. Current Limiter (Alternator)
19. Circuit Breaker (Throttle Warning)
20. Fuse (Loadmeter)
21. Filter Capacitor

Figure 14-4. Alternator (TG-52 thru TG-83); Aircraft complying with S.I. 0001-350)



1. Battery Bus
2. Alternator Out Relay.
3. Emergency Excitation Supply
4. Regulator Select Switch
5. Circuit Breaker (Alternator Field)
6. Alternator Switch
7. Loadmeter
8. Shunt (75 amp 50 mv)
9. Firewall Connector (Accessories)
10. Alternator
11. Firewall Connector (Generator and Starter)
12. Voltage Regulator - Overvoltage Relay
13. Fuse (Alternator Stator)
14. Fuse (Alternator Field)
15. Current Limiter (Alternator)
16. Circuit Breaker (Alternator Re-excite and Cigarette Lighter)
17. Fuse (Loadmeter)
18. Filter Capacitor

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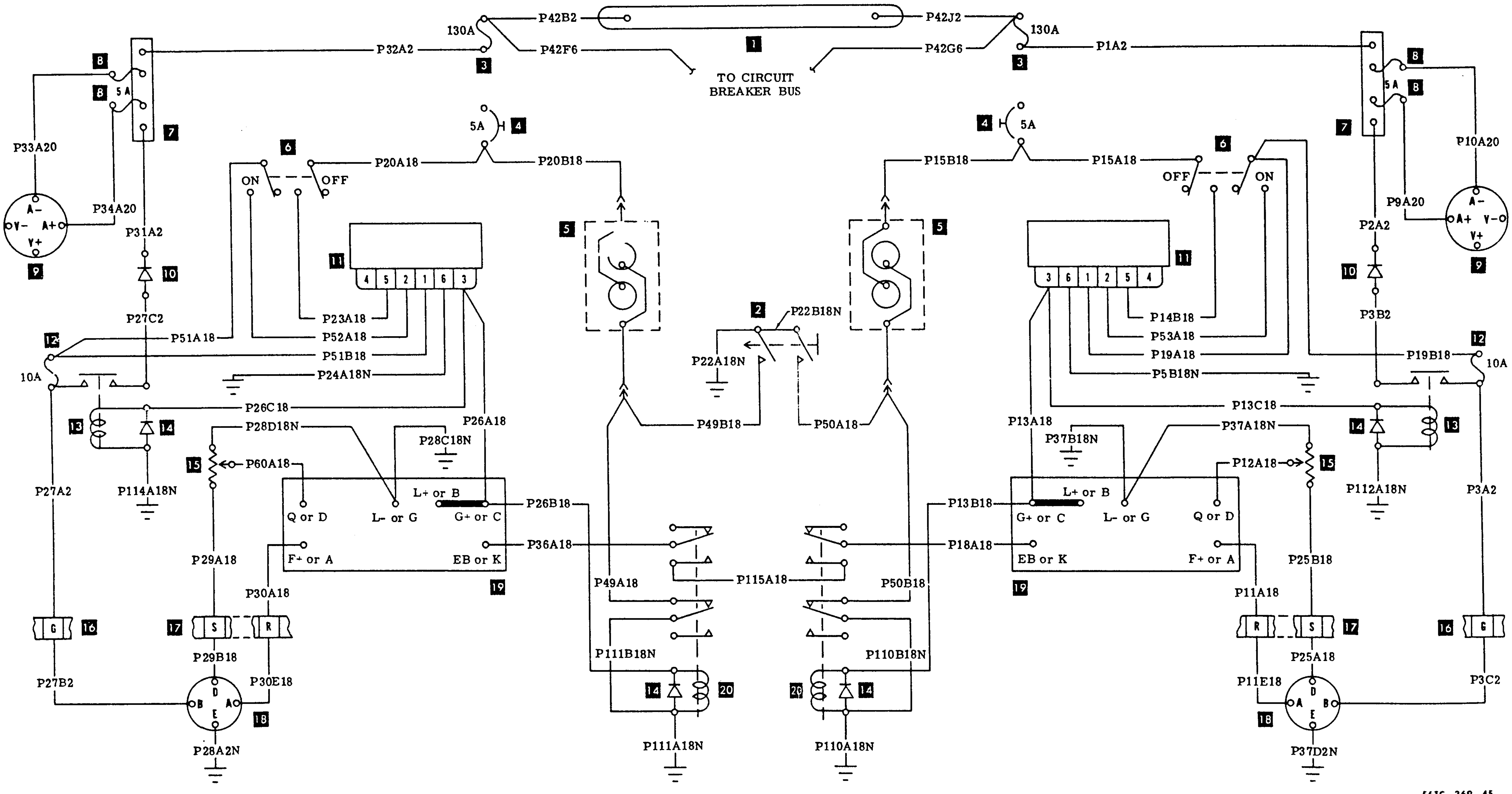
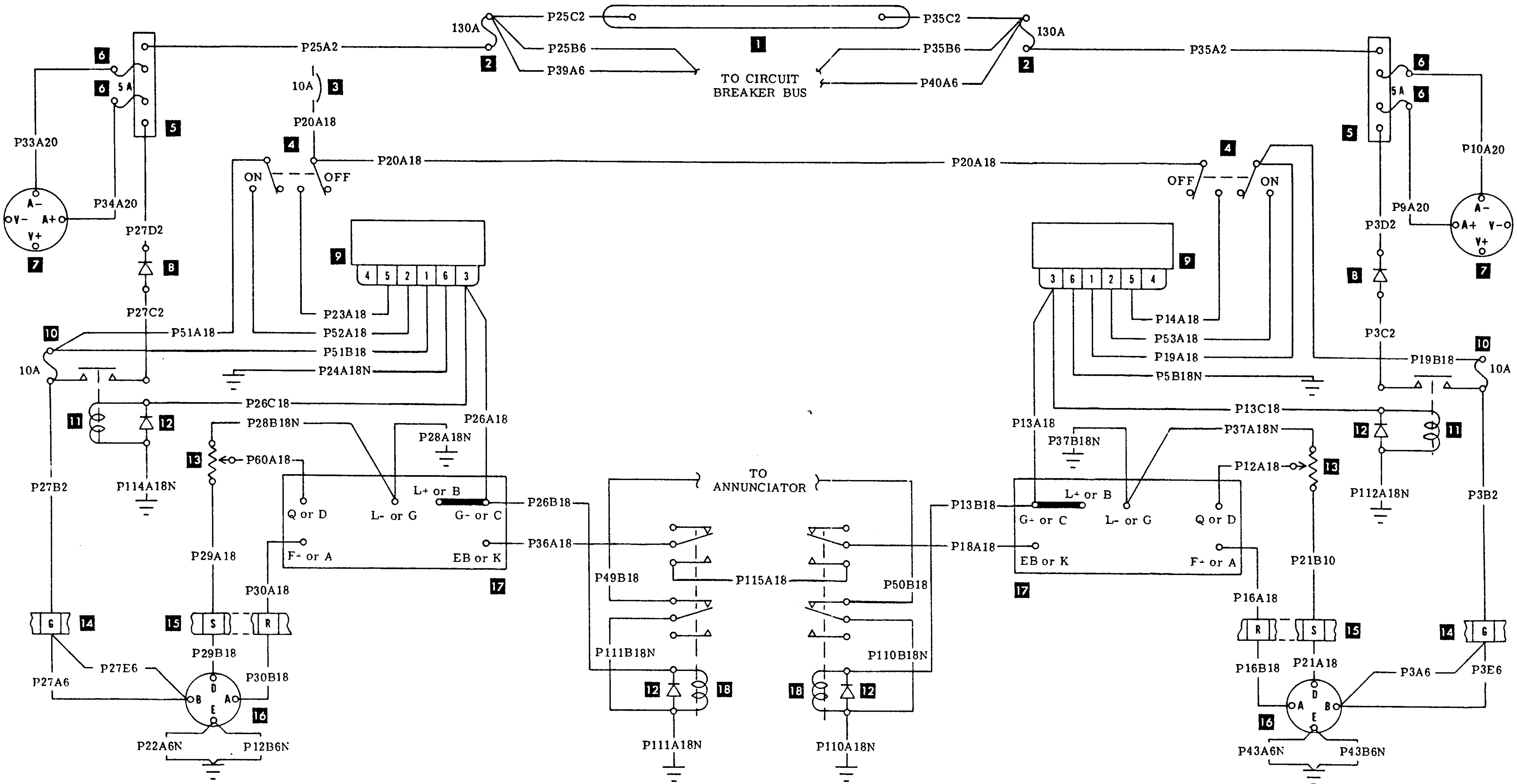
Figure 14-4. Alternator (TG-84 and after)



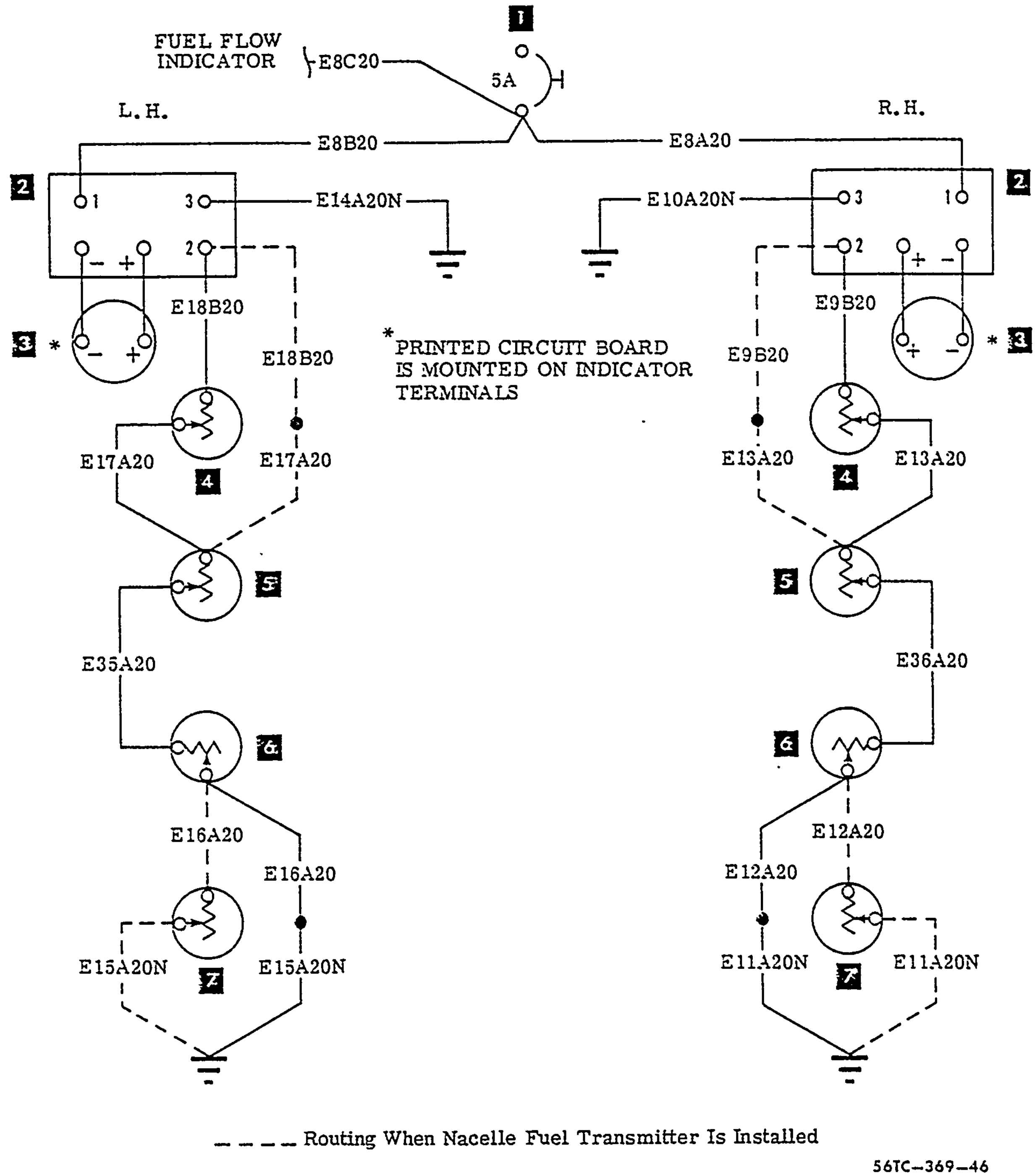
1. Battery Bus
2. Annunciator Test Switch
3. Current Limiter (Generator)
4. Circuit Breaker (Overvoltage Relay)
5. Annunciator (Generator Out)
6. Control Switch
7. Shunt (125A 50 mv)
8. Fuse (Loadmeter)
9. Loadmeter
10. Reverse Current Diode
11. Overvoltage Relay
12. Fuse (Generator Control)
13. Control Relay
14. Diode
15. Paralleling Rheostat
16. Firewall Connector (Generator-Starter)
17. Firewall Connector (Accessories)
18. Generator
19. Regulator
20. Paralleling Relay

Figure 14-5. Generators (TG-1 thru TG-83)



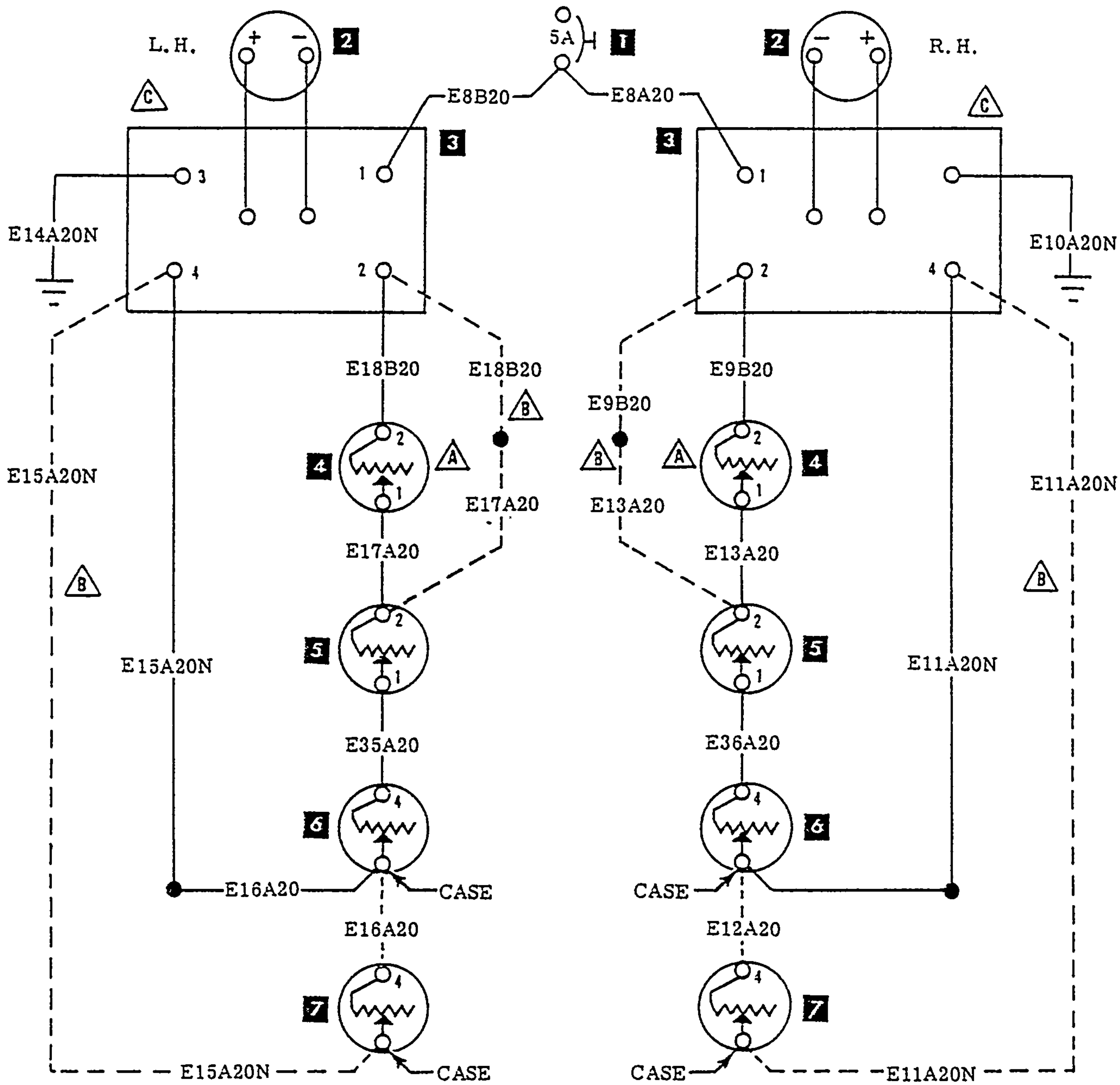
1. Battery Bus
2. Current Limiter (Generator)
3. Circuit Breaker
4. Control Switch
5. Shunt(125A 50mv)
6. Fuse (Loadmeter)
7. Loadmeter
8. Reverse Current Diode
9. Overvoltage Relay
10. Fuse (Generator Control)
11. Control Relay
12. Diode
13. Paralleling Rheostat
14. Firewall Connector (Generator-Starter)
15. Firewall Connector (Accessories)
16. Generator
17. Regulator
18. Paralleling Relay

Figure 14-5. Generators (TG-84 and after)



1. Fuel Quantity Circuit Breaker
2. Printed Circuit Board
3. Fuel Quantity Indicator
4. Wing Tank Outboard Transmitter
5. Leading Edge Fuel Cell Inboard Transmitter
6. Leading Edge Fuel Cell Outboard Transmitter
7. Nacelle Fuel Transmitter (Optional)

Figure 14-6. Fuel Quantity Indicator (TG-1 thru TG-68)



(A) WHEN OPTIONAL NACELLE FUEL CELL IS INSTALLED, THE BOX SECTION TRANSMITTER IS OMITTED

(B) WIRE ROUTING WHEN OPTIONAL NACELLE FUEL CELL IS INSTALLED

(C) PRINTED CIRCUIT BOARD IS MOUNTED ON INDICATOR WITH NO WIRES BETWEEN

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1. Circuit Breaker
2. Fuel Quantity Indicator
3. Printed Circuit Board
4. Box Section Fuel Cell Transmitter
5. Leading Edge Fuel Cell Inboard Transmitter
6. Leading Edge Fuel Cell Outboard Transmitter
7. Nacelle Fuel Cell Transmitter (Optional)

Figure 14-6. Fuel Quantity Indicator (TG-69 thru TG-83)

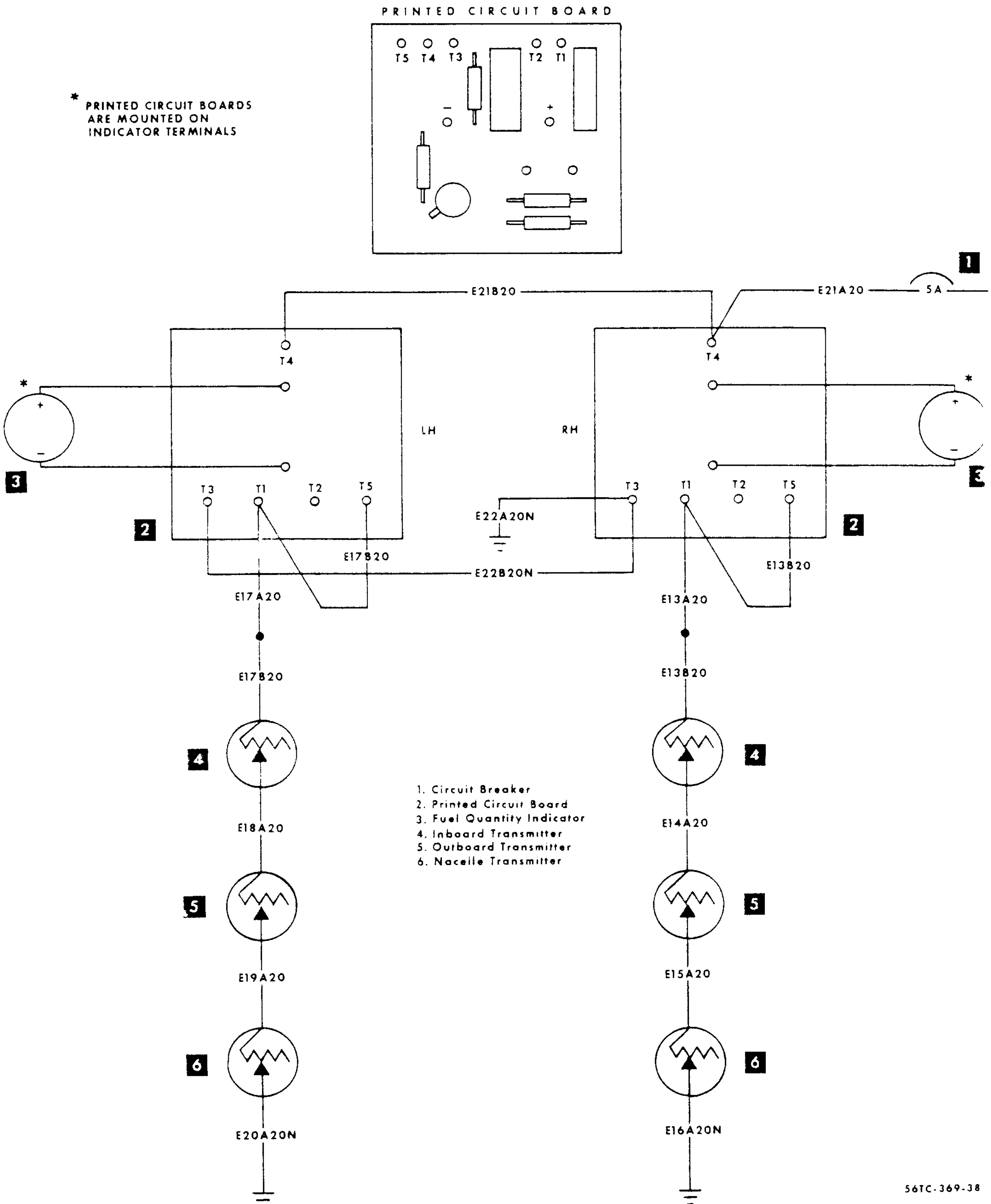
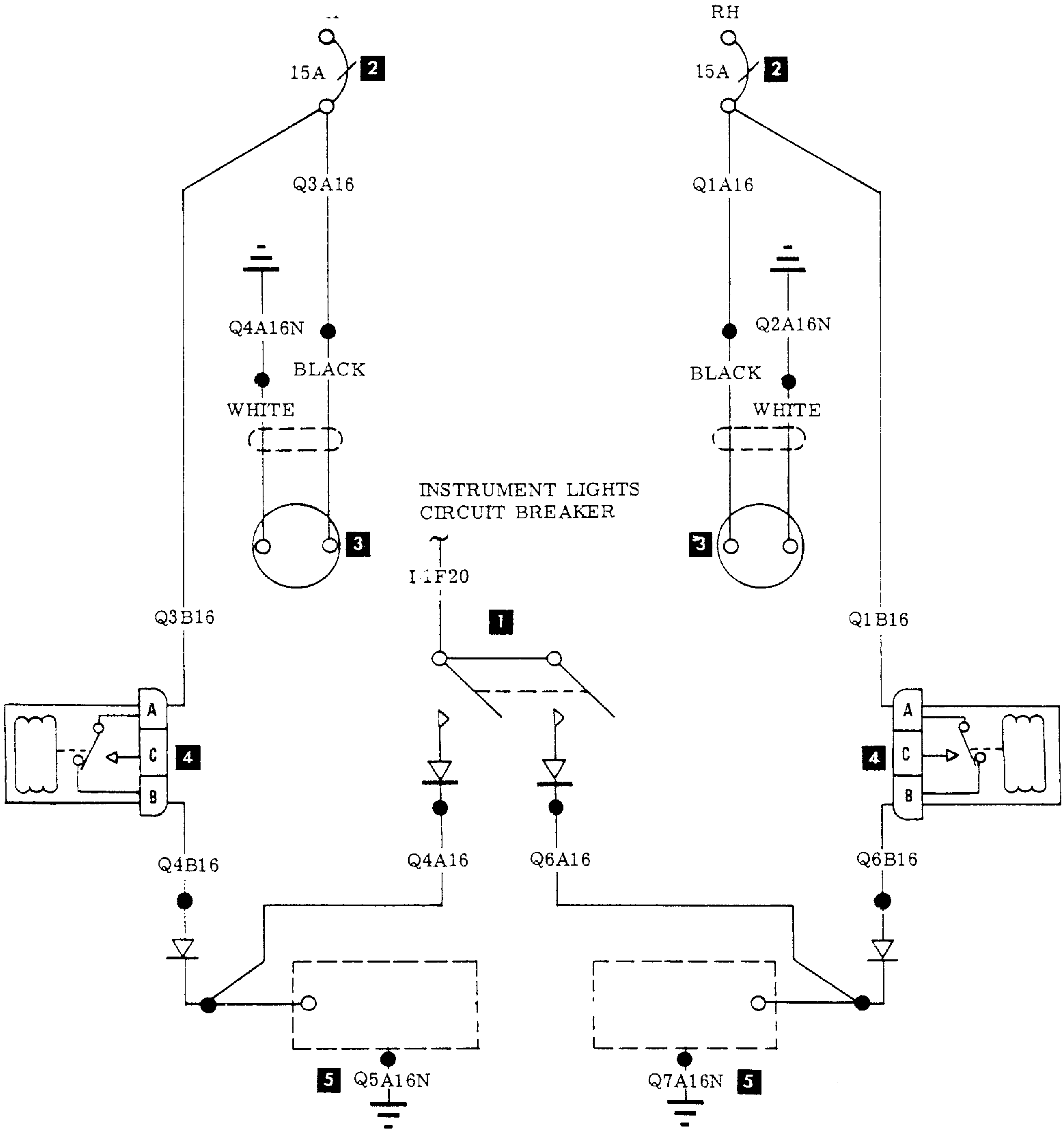
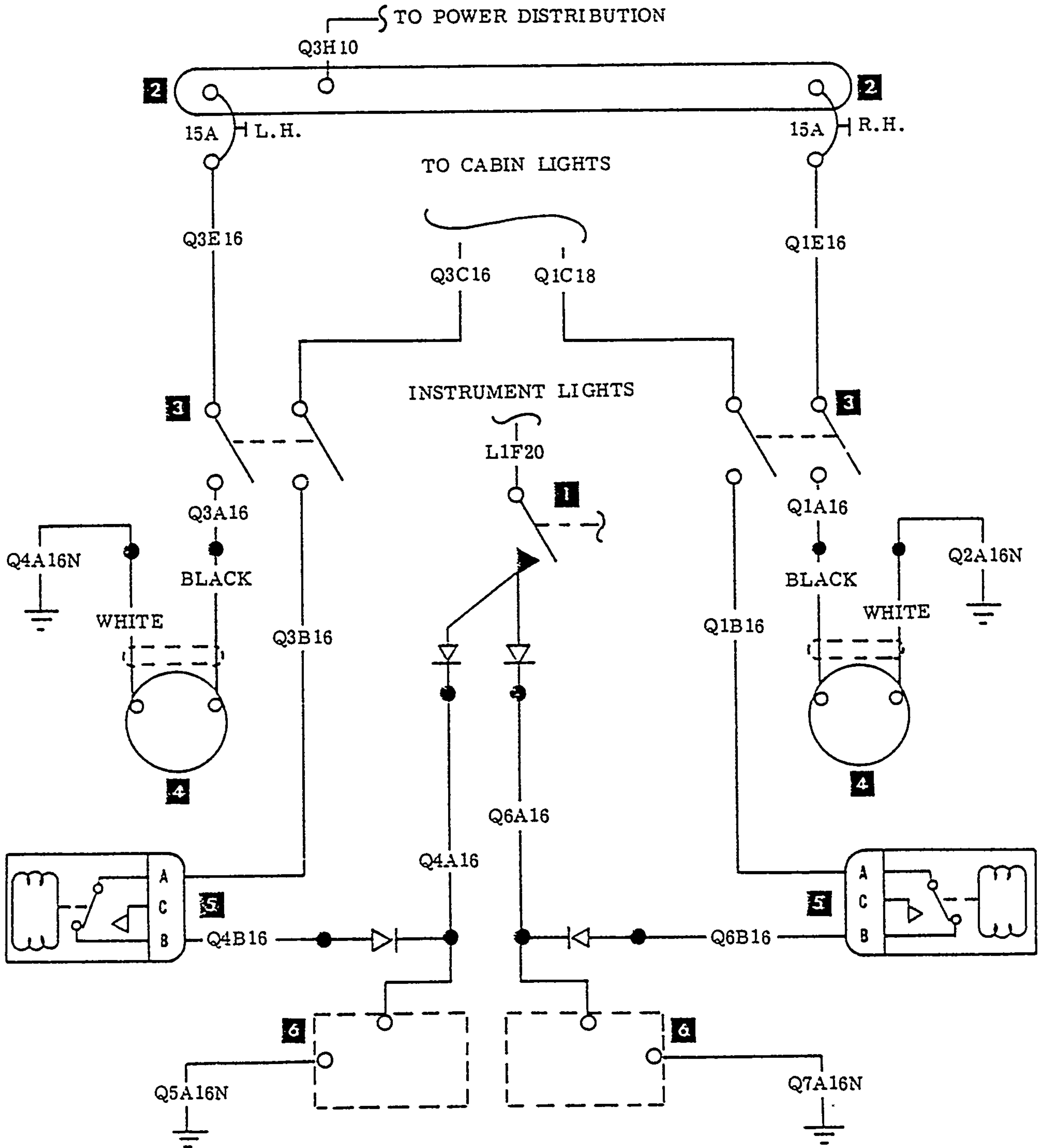


Figure 14-6. Fuel Quantity Indicator (TG-84 and after)



1. Annunciator Test Switch
2. Circuit Breaker
3. Fuel Boost Pump
4. Pressure Switch
5. Fuel Boost Annunciator

Figure 14-7. Fuel Boost Pumps (TG-1, TG-3 thru TG-15, TG-18 thru TG-20, TG-22, TG-23, TG-25 thru TG-27, TG-29, TG-30, TG-36 and TG-37)



1. Annunciator Test Switch
2. Boost Pump Circuit Breaker
3. Boost Pump Switch
4. Fuel Boost Pump
5. Pressure Switch
6. Fuel Boost Fail Annunciator

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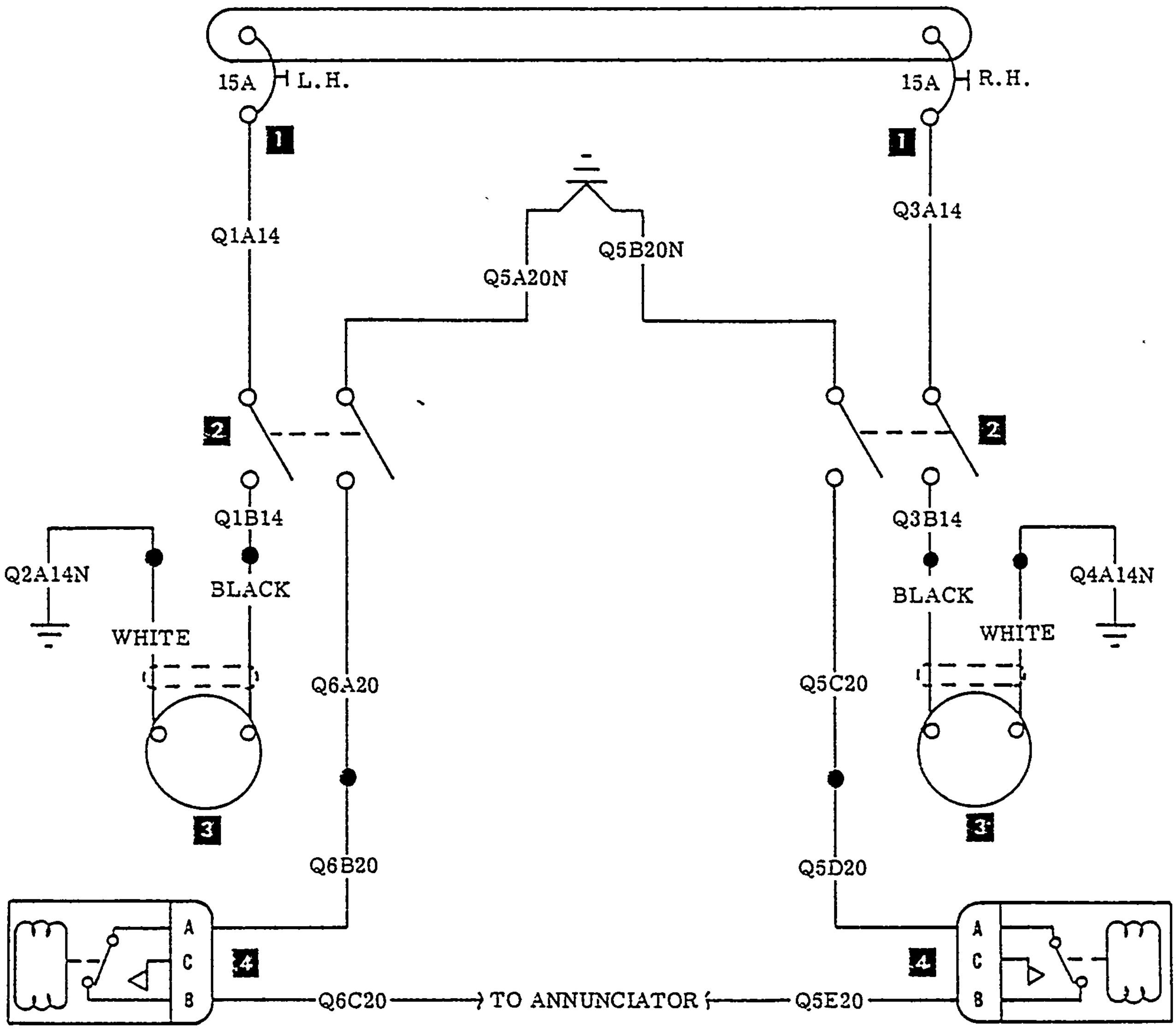
Figure 14-7. Fuel Boost Pumps; (TG-2, TG-16, TG-17, TG-21, TG-24; TG-28, TG-31 thru TG-35, TG-38 and after; Aircraft complying with S.B. 67-36)



1. Boost Pump Circuit Breaker
2. Boost Pump Switch
3. Fuel Boost Pump
4. Pressure Switch

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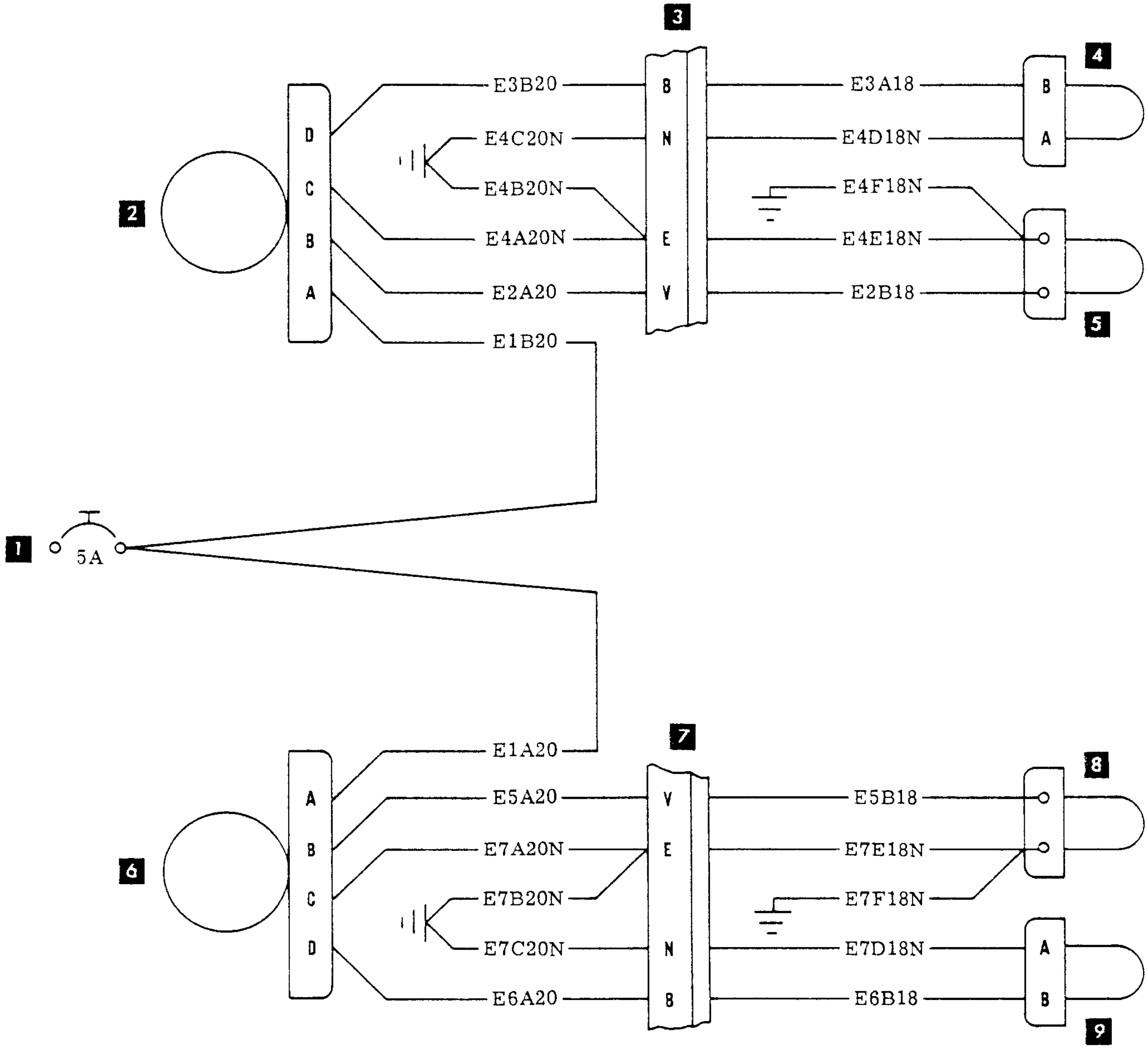
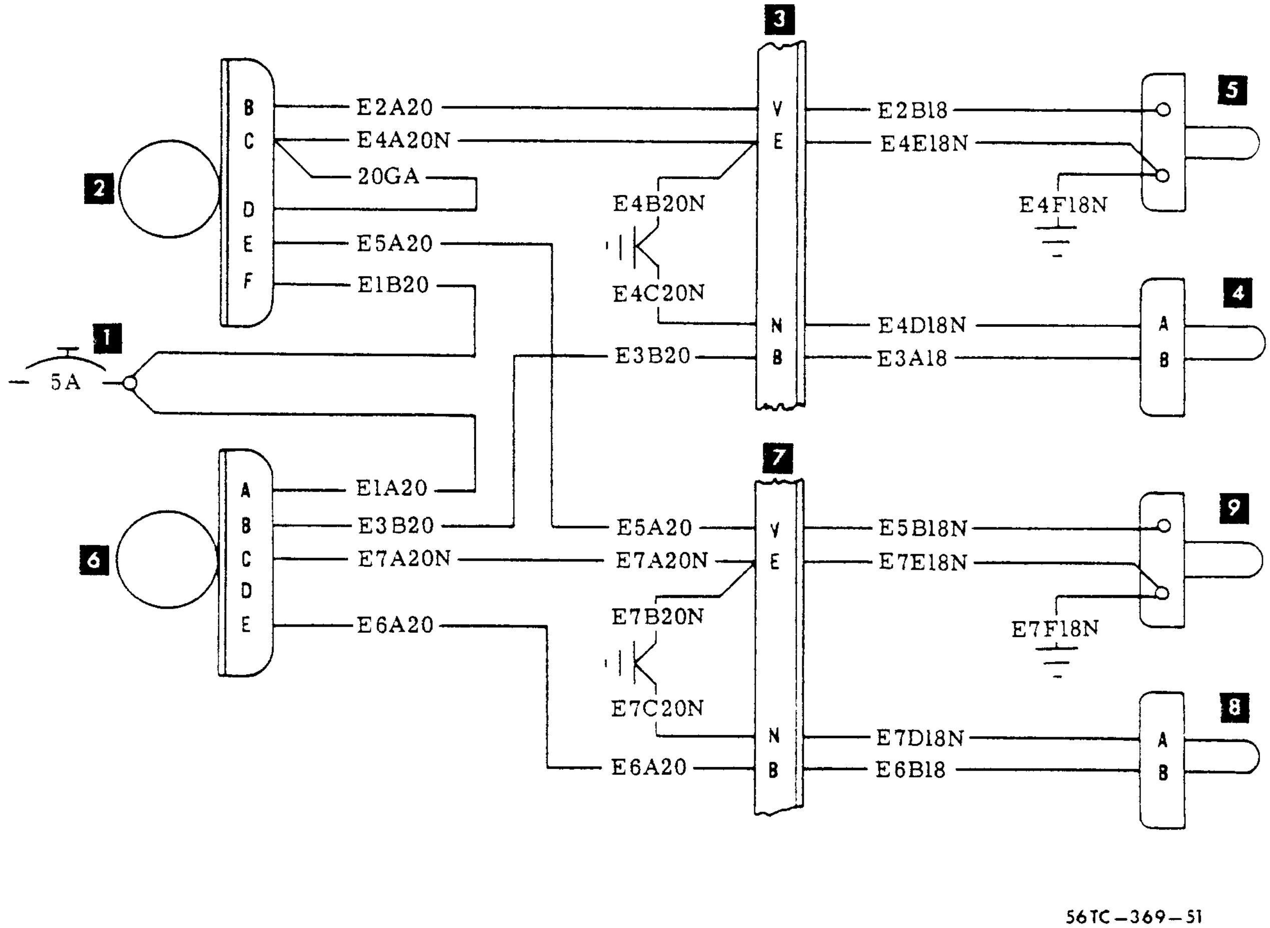
Figure 14-7. Fuel Boost Pump (TG-84 and after)



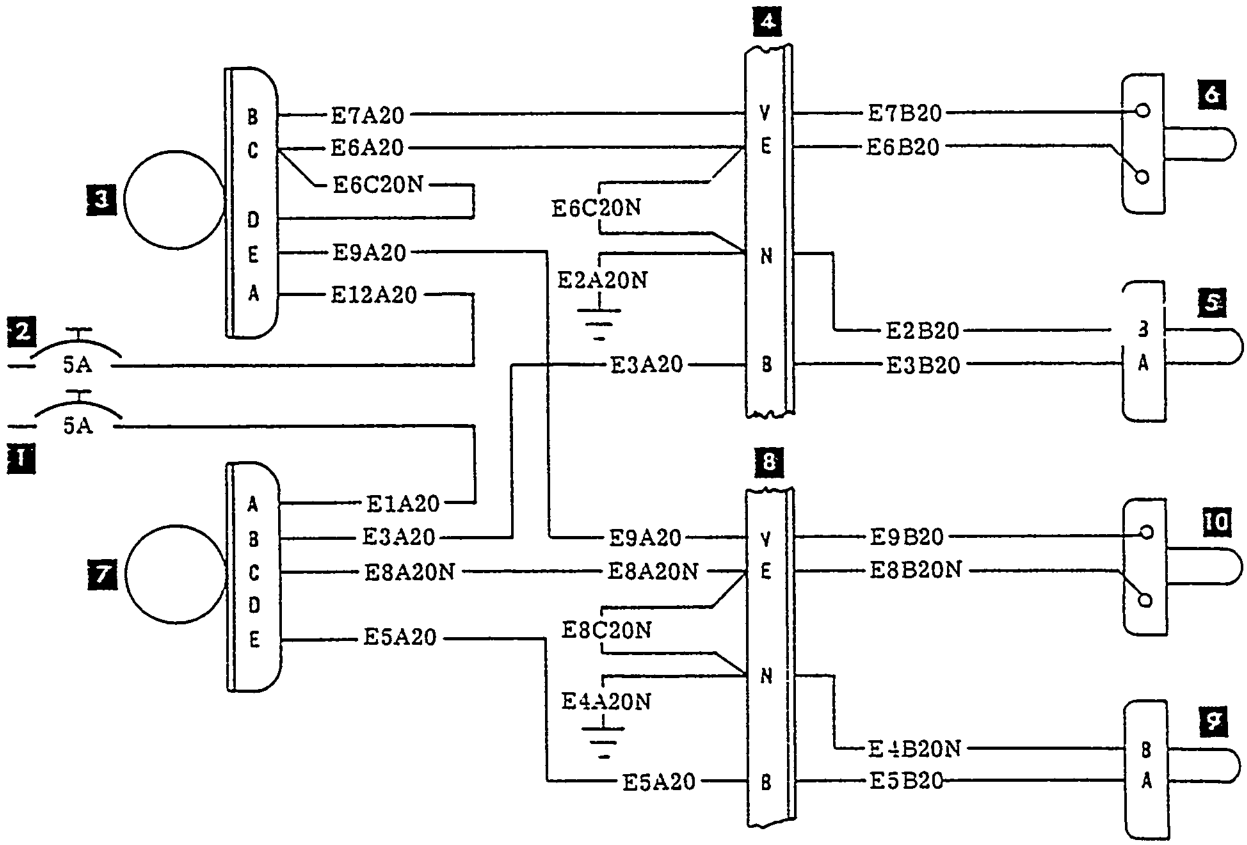
1. Circuit Breaker
2. L. H. Cylinder Head and Oil Temperature Indicator
3. Firewall Connector (Accessories)
4. Oil Temperature Bulb
5. Cylinder Head Temperature Bulb
6. R. H. Cylinder Head and Oil Temperature Indicator
7. Firewall Connector (Accessories)
8. Cylinder Head Temperature Bulb
9. Oil Temperature Bulb

Figure 14-8. Cylinder Head and Oil Temperature Indicator (TG-1 thru TG-61, except TG-4, TG-25, TG-34 TG-52,TG-53 and TG-56)



1. Circuit Breaker
2. Cylinder Head Temperature Indicator
3. L.H. Firewall
4. L.H. Oil Temperature Bulb
5. L.H. Cylinder Head Temperature Bulb
6. Oil Temperature Indicator
7. R.H. Firewall Connector (Accessories)
8. R.H. Oil Temperature Bulb
9. R.H. Cylinder Head Temperature Bulb

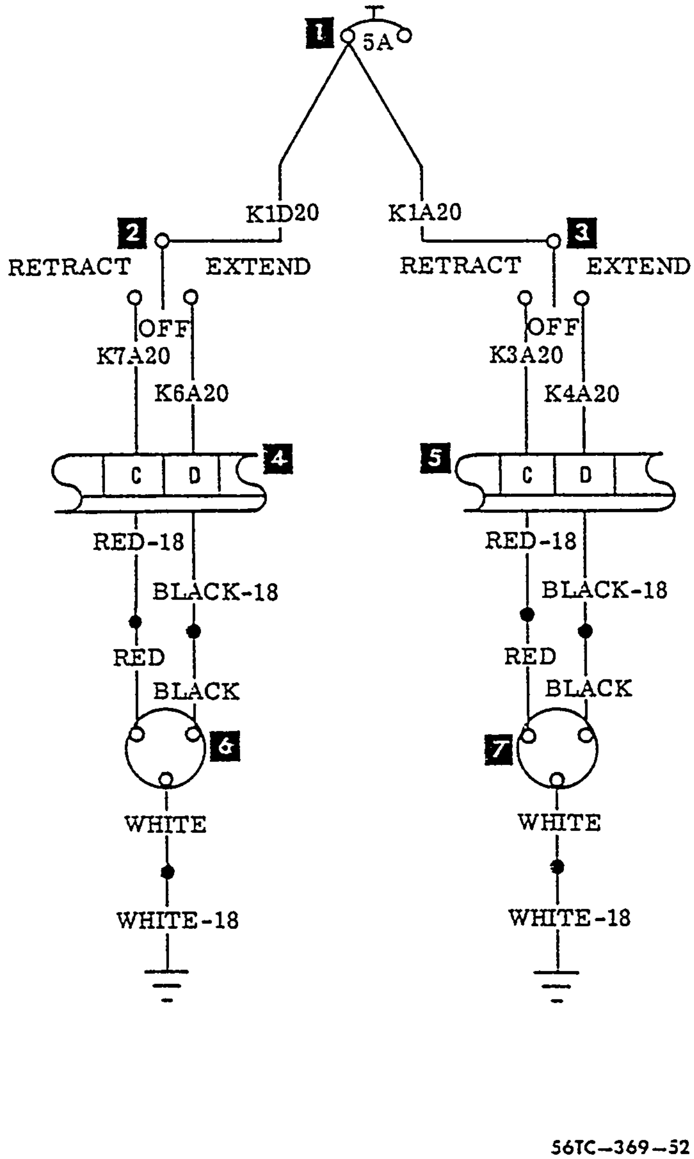
Figure 14-8. Cylinder Head and Oil Temperature Indicator (TG-4, TG-25, TG-34, TG-52, TG-53, TG-56, TG-63 thru TG-83; Aircraft complying with S.I. 0029-390)



1. Oil Temperature Circuit Breaker
2. Cylinder Head Temperature Circuit Breaker
3. Cylinder Head Temperature Indicator
4. L.H. Firewall
5. L.H. Oil Temperature Bulb
6. L.H. Cylinder Head Temperature Bulb
7. Oil Temperature Indicator
8. R.H. Firewall Connector (Accessories)
9. R.H. Oil Temperature Bulb
10. R.H. Cylinder Head Temperature Bulb

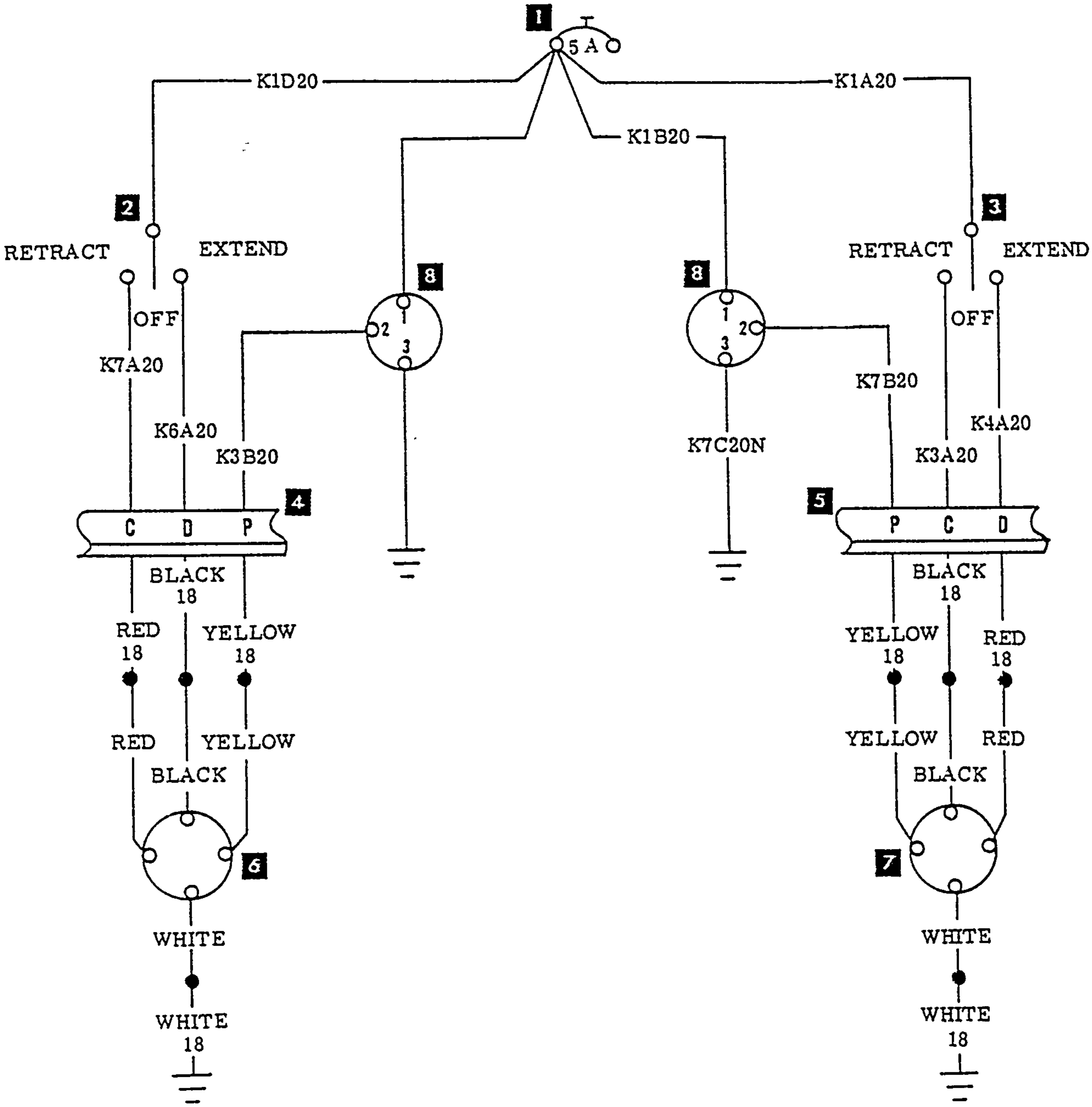
56TC-369.13

Figure 14-8. Cylinder Head and Oil Temperature Indicator (TG-84 and after)



1. Circuit Breaker
2. L.H. Cowl Flap Control Switch
3. R.H. Cowl Flap Control Switch
4. L.H. Firewall Connector (Engine Accessories)
5. R.H. Firewall Connector (Engine Accessories)
6. L.H. Cowl Flap Motor
7. R.H. Cowl Flap Motor

Figure 14-9. Cowl Flap Acautaors (TG-1 thru TG-51)



1. Circuit Breaker
2. L. H. Cowl Flap Control Switch
3. R. H. Cowl Flap Control Switch
4. L. H. Firewall Connector (Engine Accessories)
5. R. H. Firewall Connector (Engine Accessories)
6. L. H. Cowl Flap Motor
7. R. H. Cowl Flap Motor
8. Cowl Flap Open Indicator

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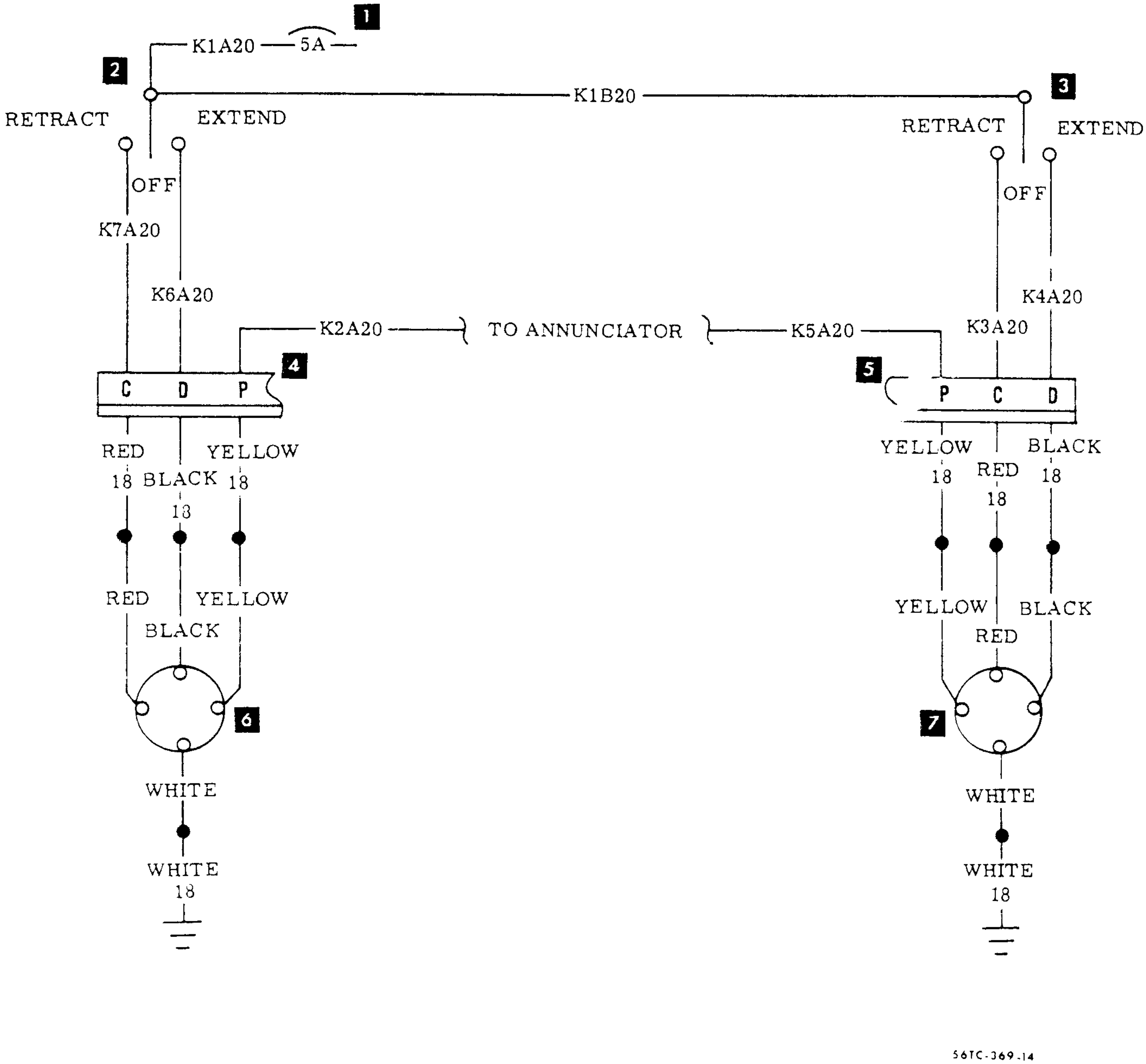
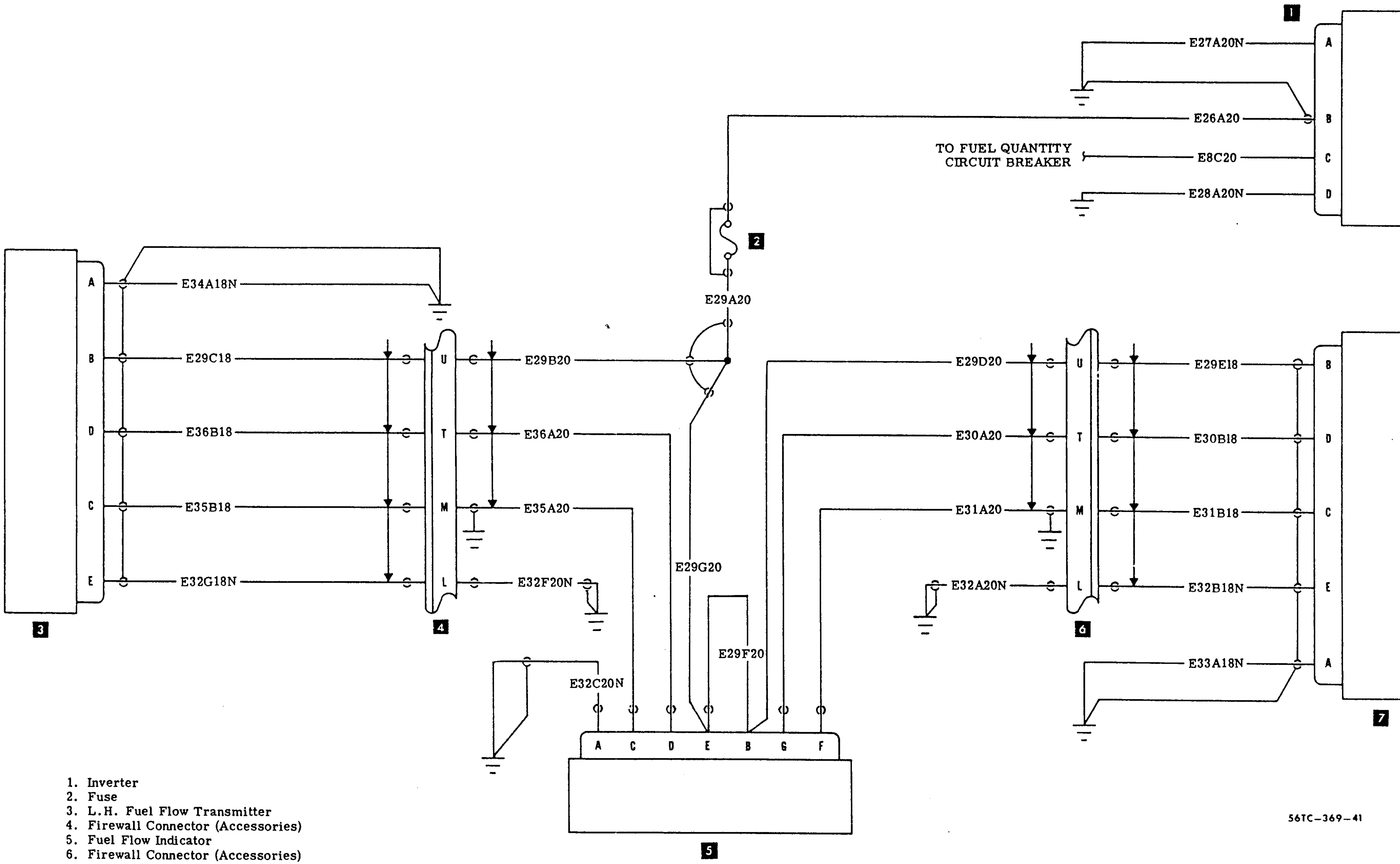
Figure 14-9. Cowl Flap Actuators (TG-52 thru TG-83)



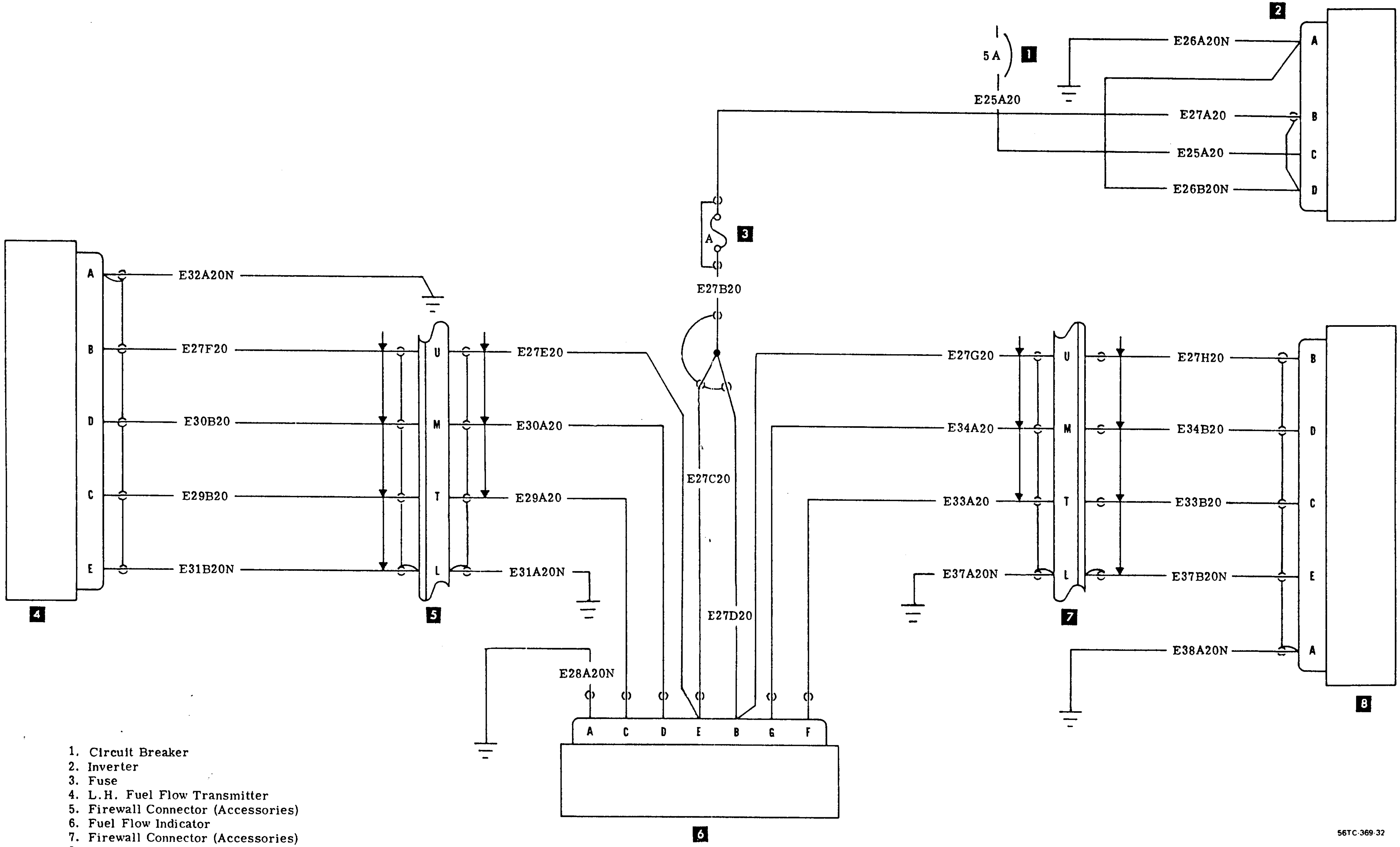
1. Circuit Breaker
2. L. H. Cowl Flap Control Switch
3. R. H. Cowl Flap Control Switch
4. L. H. Firewall Connector (Engine Accessories)
5. R. H. Firewall Connector (Engine Accessories)
6. L. H. Cowl Flap Motor
7. R. H. Cowl Flap Motor

Figure 14-9. Cowl Flap Actuators (TG-84 and after)



1. Inverter
2. Fuse
3. L.H. Fuel Flow Transmitter
4. Firewall Connector (Accessories)
5. Fuel Flow Indicator
6. Firewall Connector (Accessories)
7. R.H. Fuel Flow Transmitter

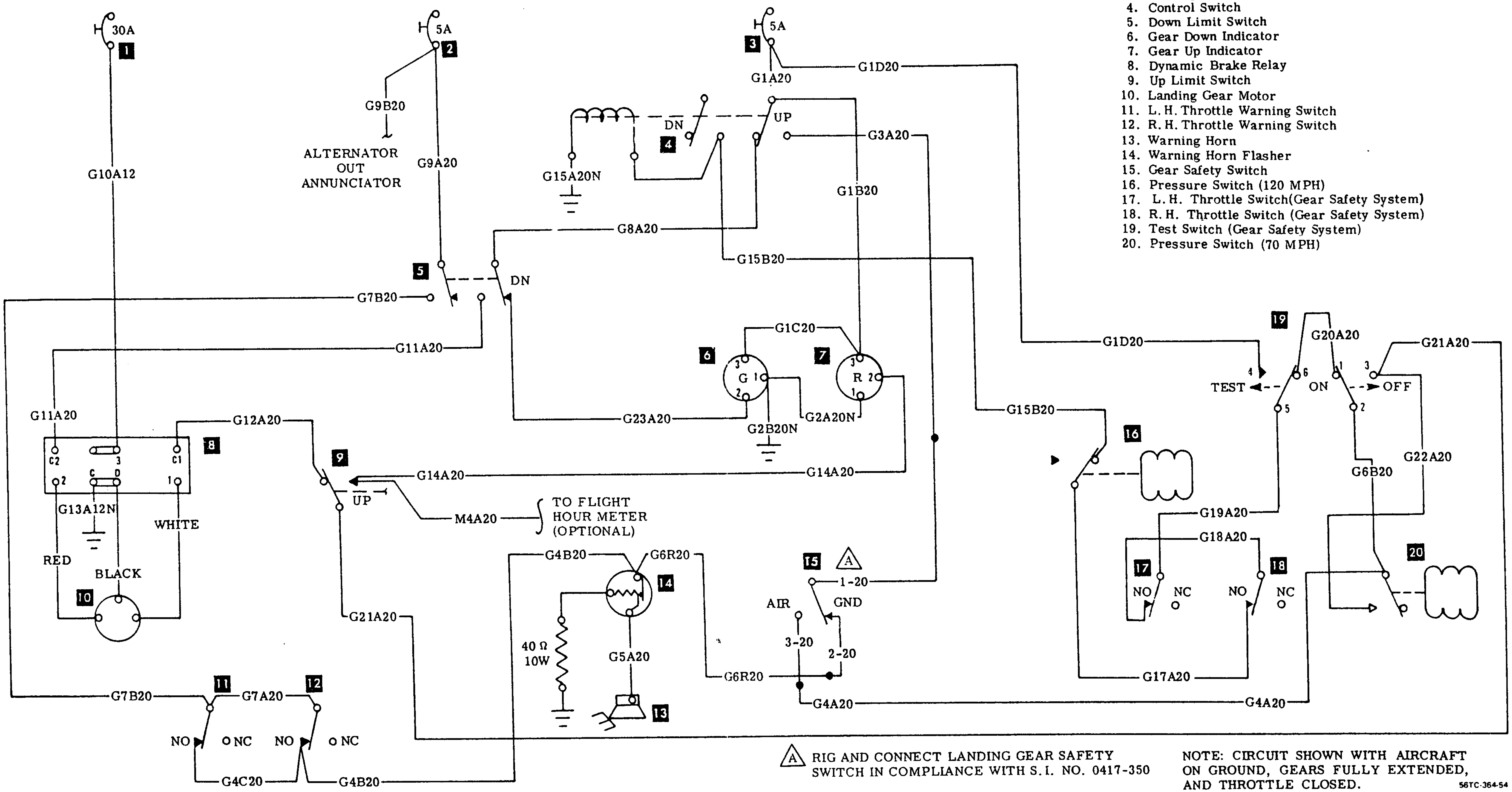
Figure 14-10. Fuel Flow Indicator (TG-1 thru TG-83)



1. Circuit Breaker
2. Inverter
3. Fuse
4. L.H. Fuel Flow Transmitter
5. Firewall Connector (Accessories)
6. Fuel Flow Indicator
7. Firewall Connector (Accessories)
8. R.H. Fuel Flow Transmitter

Figure 14-10. Fuel Flow Indicator (TG-84 and after)

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. Landing Gear Motor
11. L. H. Throttle Warning Switch
12. R. H. Throttle Warning Switch
13. Warning Horn
14. Warning Horn Flasher
15. Gear Safety Switch
16. Pressure Switch (120 MPH)
17. L. H. Throttle Switch (Gear Safety System)
18. R. H. Throttle Switch (Gear Safety System)
19. Test Switch (Gear Safety System)
20. Pressure Switch (70 MPH)



A RIG AND CONNECT LANDING GEAR SAFETY SWITCH IN COMPLIANCE WITH S.I. NO. 0417-350

NOTE: CIRCUIT SHOWN WITH AIRCRAFT ON GROUND, GEARS FULLY EXTENDED, AND THROTTLE CLOSED.

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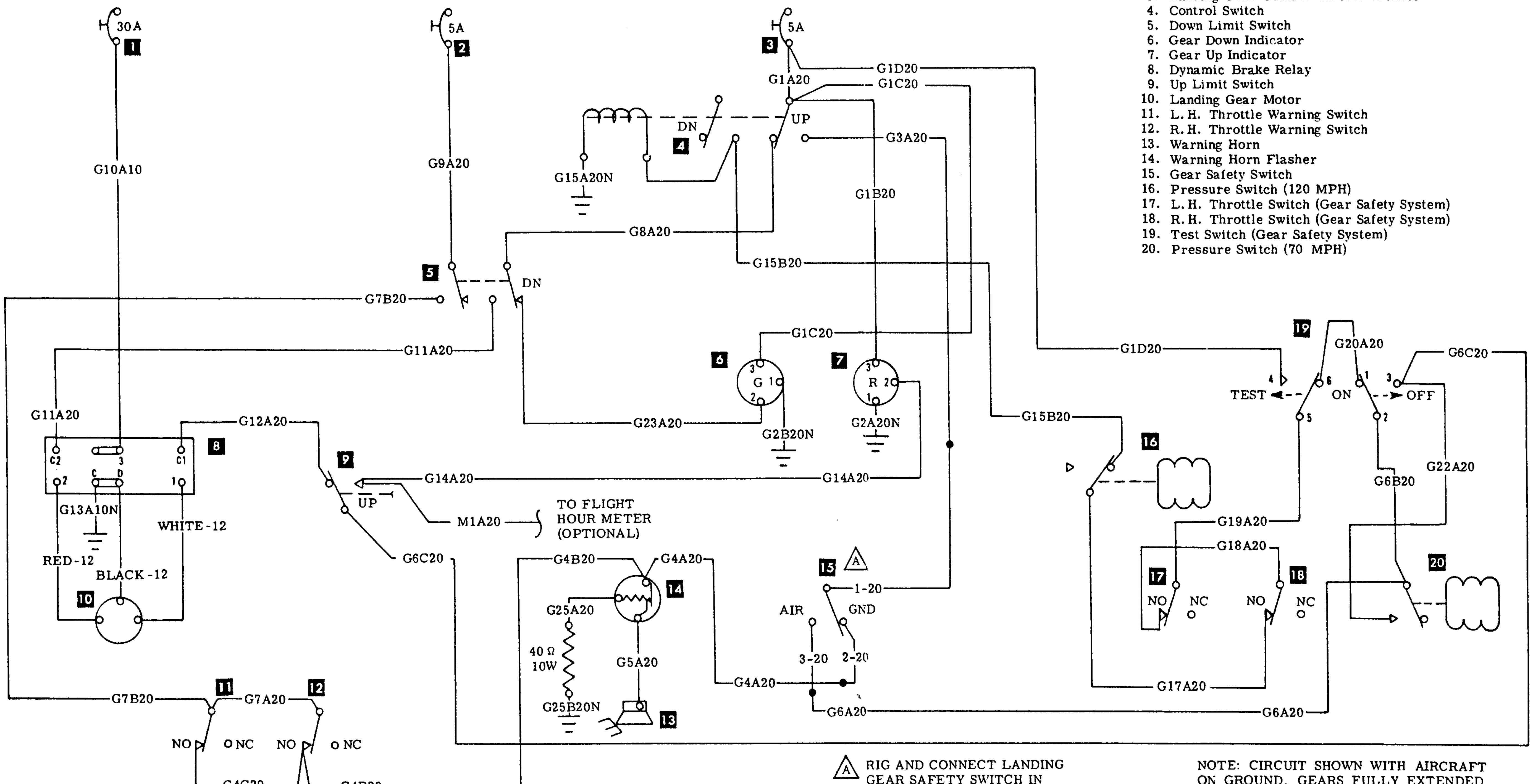
Figure 14-11. Landing Gear (With Safety System) (TG-1 thru TG-83)

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. Landing Gear Motor
11. L.H. Throttle Warning Switch
12. R.H. Throttle Warning Switch
13. Warning Horn
14. Warning Horn Flasher
15. Gear Safety Switch
16. Pressure Switch (120 MPH)
17. L.H. Throttle Switch (Gear Safety System)
18. R.H. Throttle Switch (Gear Safety System)
19. Test Switch (Gear Safety System)
20. Pressure Switch (70 MPH)

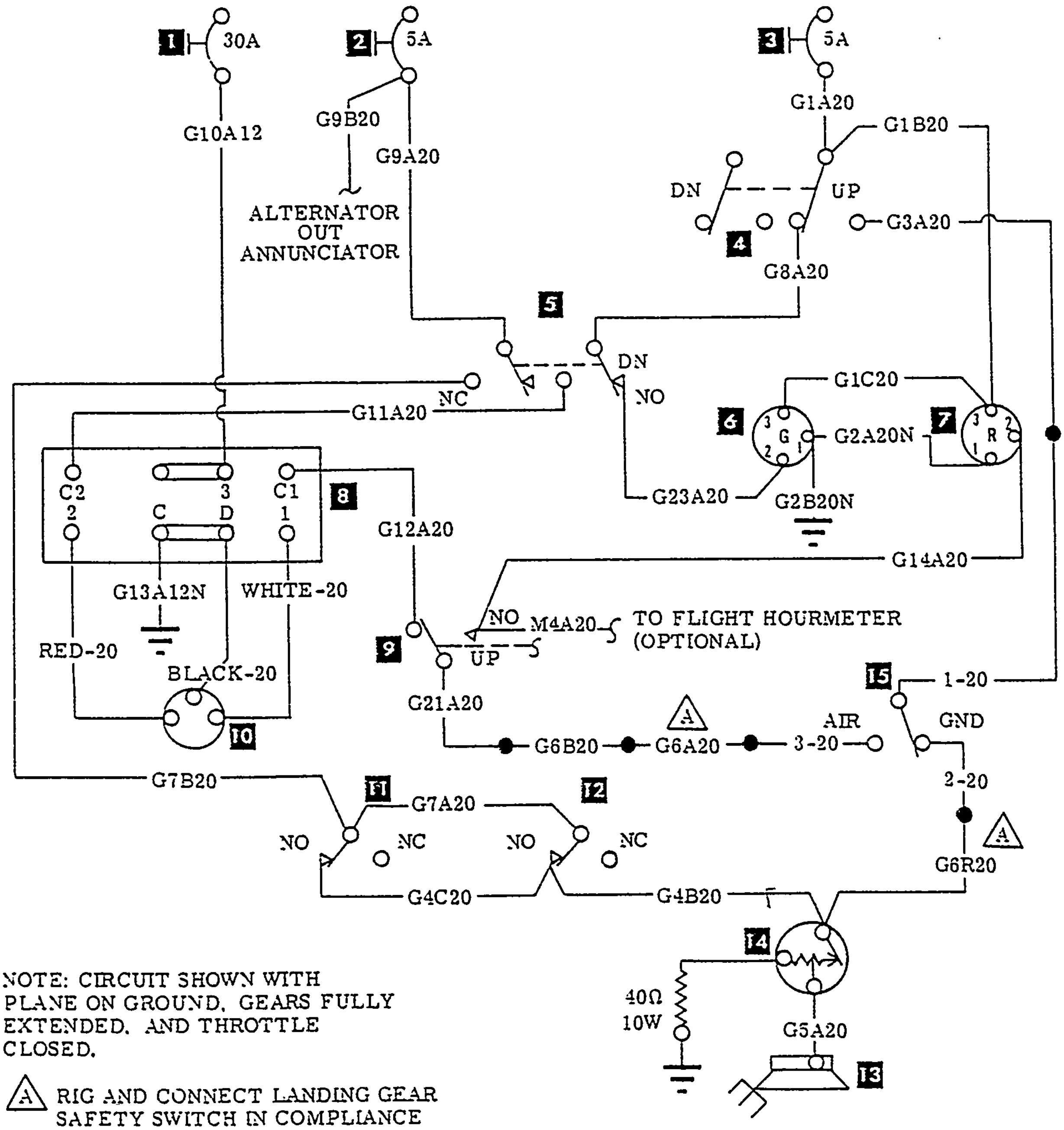


Ⓐ RIG AND CONNECT LANDING GEAR SAFETY SWITCH IN COMPLIANCE WITH S.I.O 0417-350

NOTE: CIRCUIT SHOWN WITH AIRCRAFT ON GROUND, GEARS FULLY EXTENDED, AND THROTTLE CLOSED.

56TC-369-28

Figure 14-11. Landing Gear (With Safety System) (TG-84 and after)



NOTE: CIRCUIT SHOWN WITH PLANE ON GROUND, GEARS FULLY EXTENDED, AND THROTTLE CLOSED.

A RIG AND CONNECT LANDING GEAR SAFETY SWITCH IN COMPLIANCE WITH S. I. 0417-350

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. Landing Gear Motor
11. L. H. Throttle Warning Switch
12. R. H. Throttle Warning Switch
13. Warning Horn
14. Warning Horn Flasher
15. Gear Safety Switch

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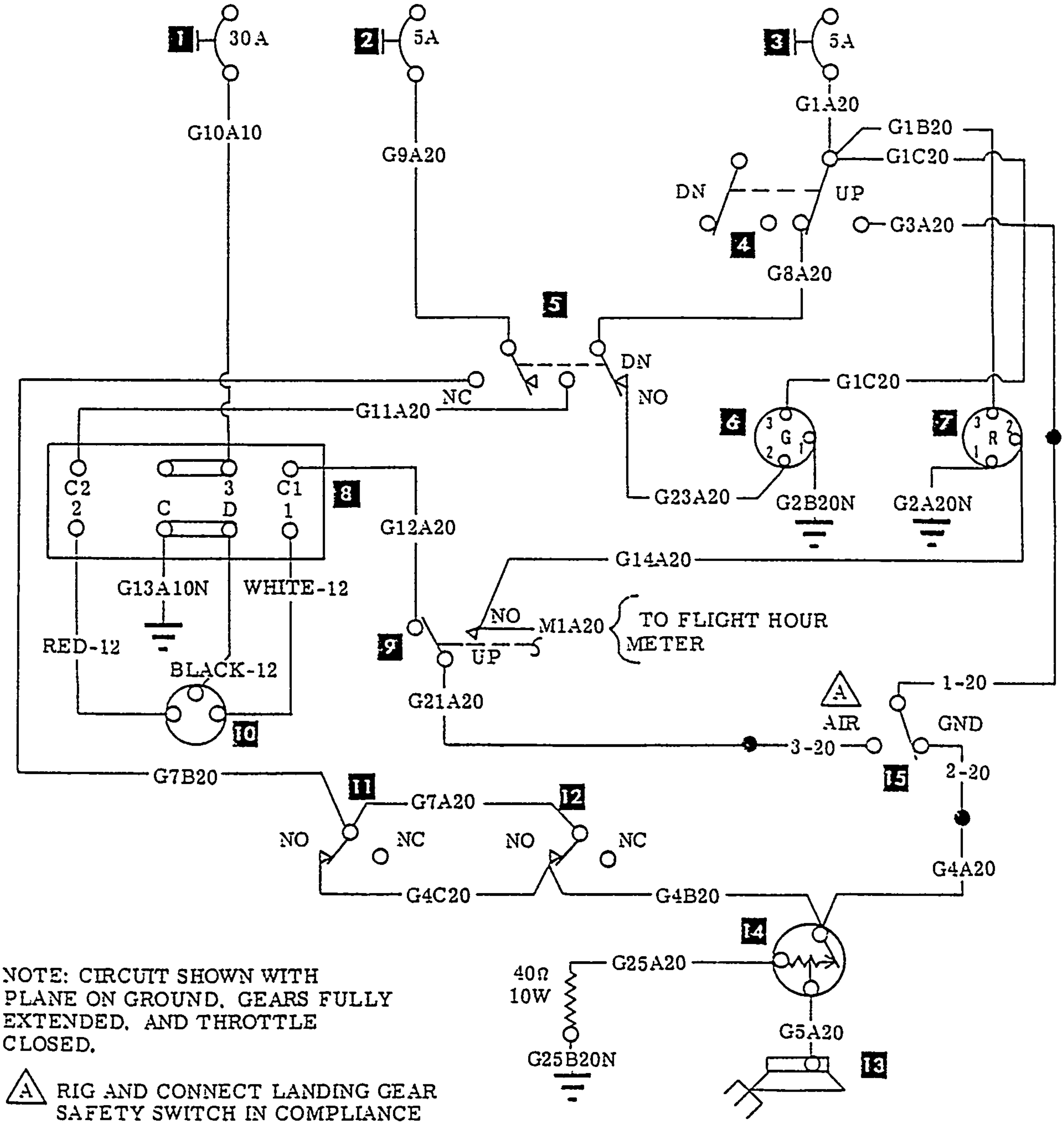
Figure 14-12. Landing Gear (Without Safety System) (TG-1 thru TG-83)



NOTE: CIRCUIT SHOWN WITH PLANE ON GROUND, GEARS FULLY EXTENDED, AND THROTTLE CLOSED.

A RIG AND CONNECT LANDING GEAR SAFETY SWITCH IN COMPLIANCE WITH S.I. 0417-350

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 Light
7. Gear Up Light
8. Dynamic Brake Relay
9. Up Limit Switch
10. Landing Gear Motor
11. L.H. Throttle Warning Switch
12. R.H. Throttle Warning Switch
13. Warning Horn
14. Warning Horn Flasher
15. Gear Safety Switch

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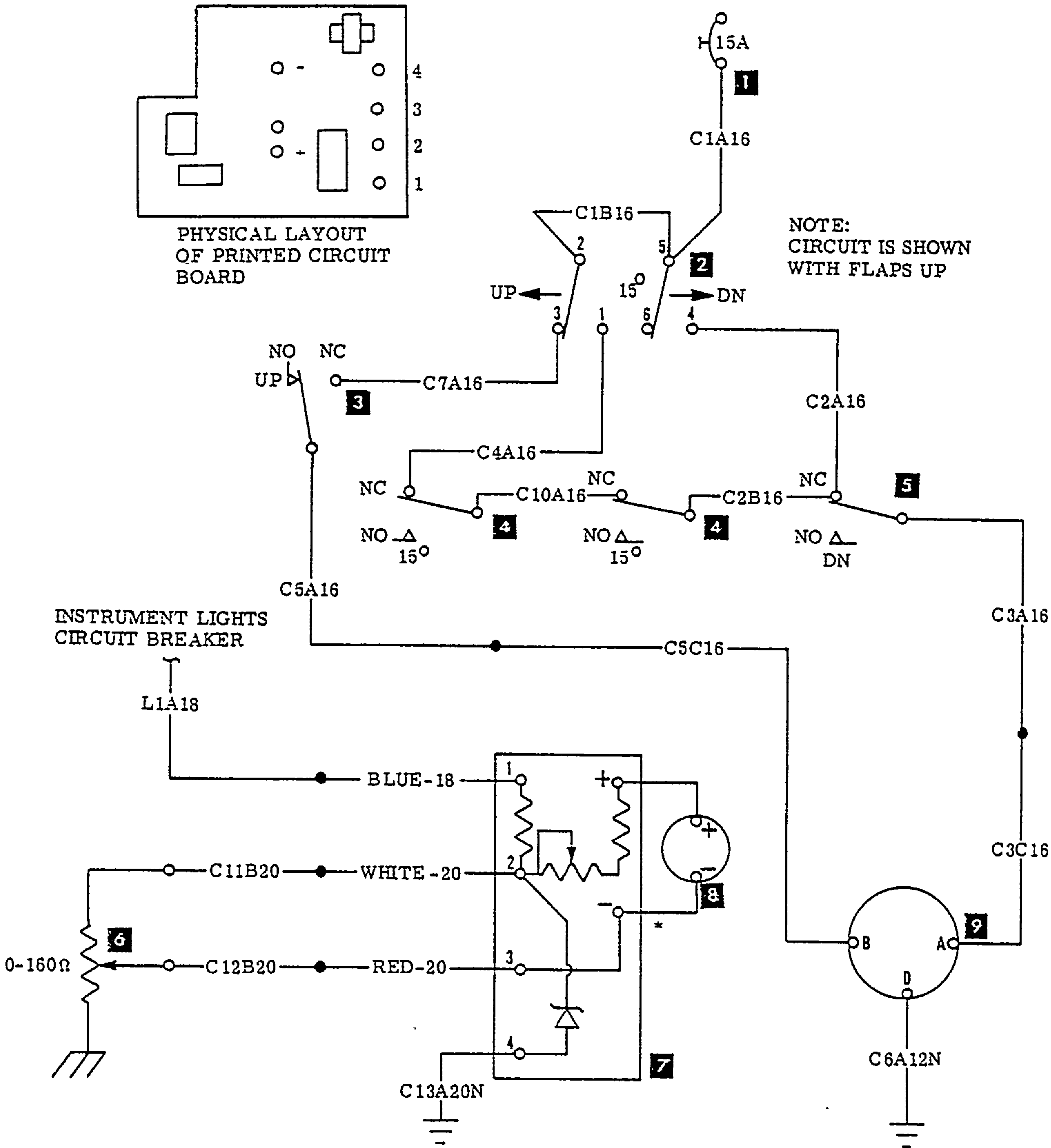
Figure 14-12. Landing Gear (Without Safety System) (TG-84 and after)



* PRINTED CIRCUIT BOARD
MOUNTED ON INDICATOR
TERMINALS

1. Circuit Breaker (Flap)
2. Flap Control Switch
3. Up Limit Switch
4. 15° Limit Switch
5. Down Limit Switch
6. Flap Position Transmitter
7. Printed Circuit Board
8. Flap Position Indicator
9. Flap Motor

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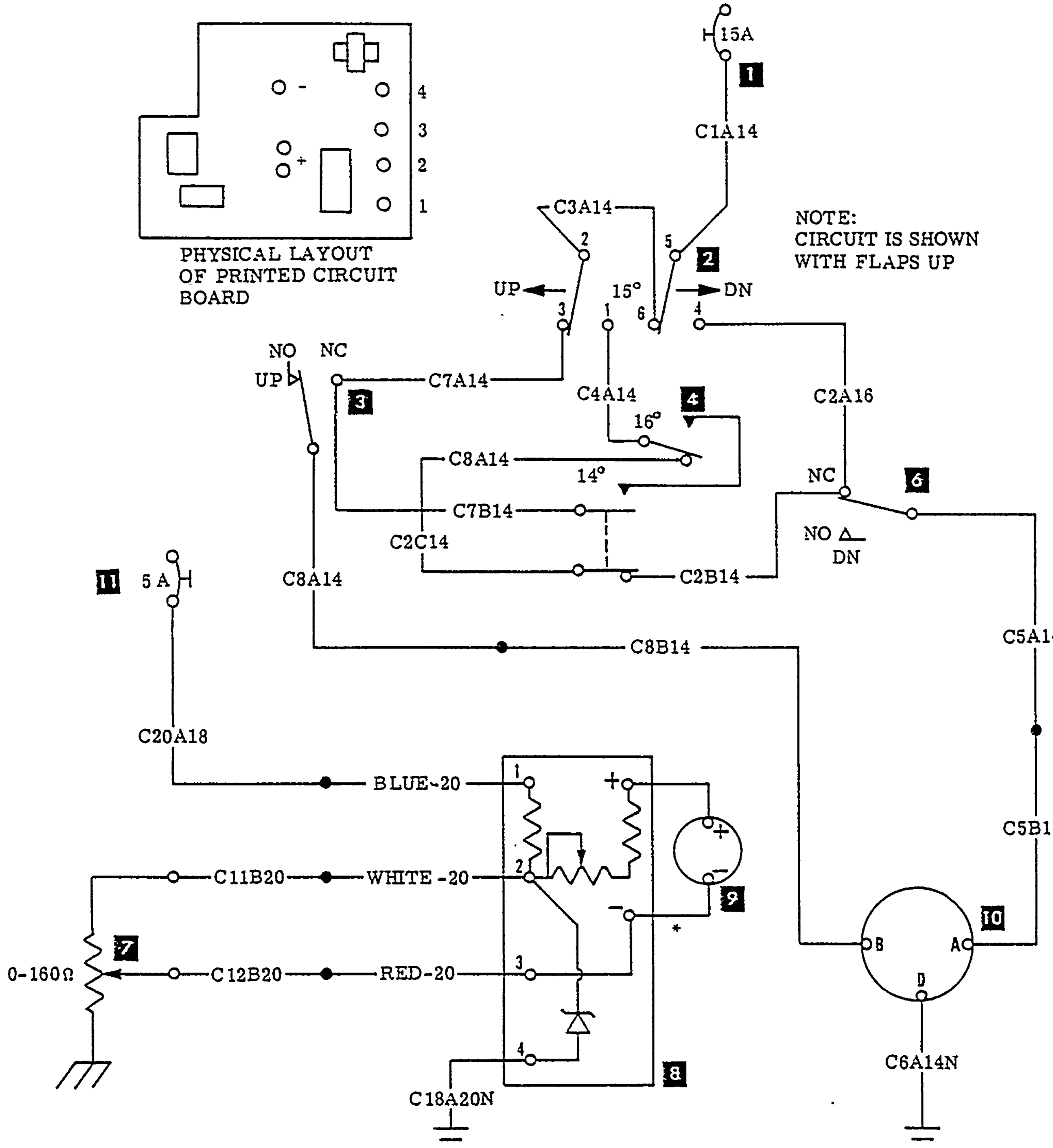
Figure 14-13. Wing Flaps (TG-1 thru TG-83)



* PRINTED CIRCUIT BOARD MOUNTED ON INDICATOR TERMINALS

1. Circuit Breaker (Flap)
2. Flap Control Switch
3. Up Limit Switch
4. 16° Limit Switch
5. 14° Limit Switch
6. Down Limit Switch
7. Flap Position Transmitter
8. Printed Circuit Board
9. Flap Position Indicator
10. Flap Motor
11. Circuit Breaker (Indicator)

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Figure 14-13. Wing Flaps (TG-84 and after)

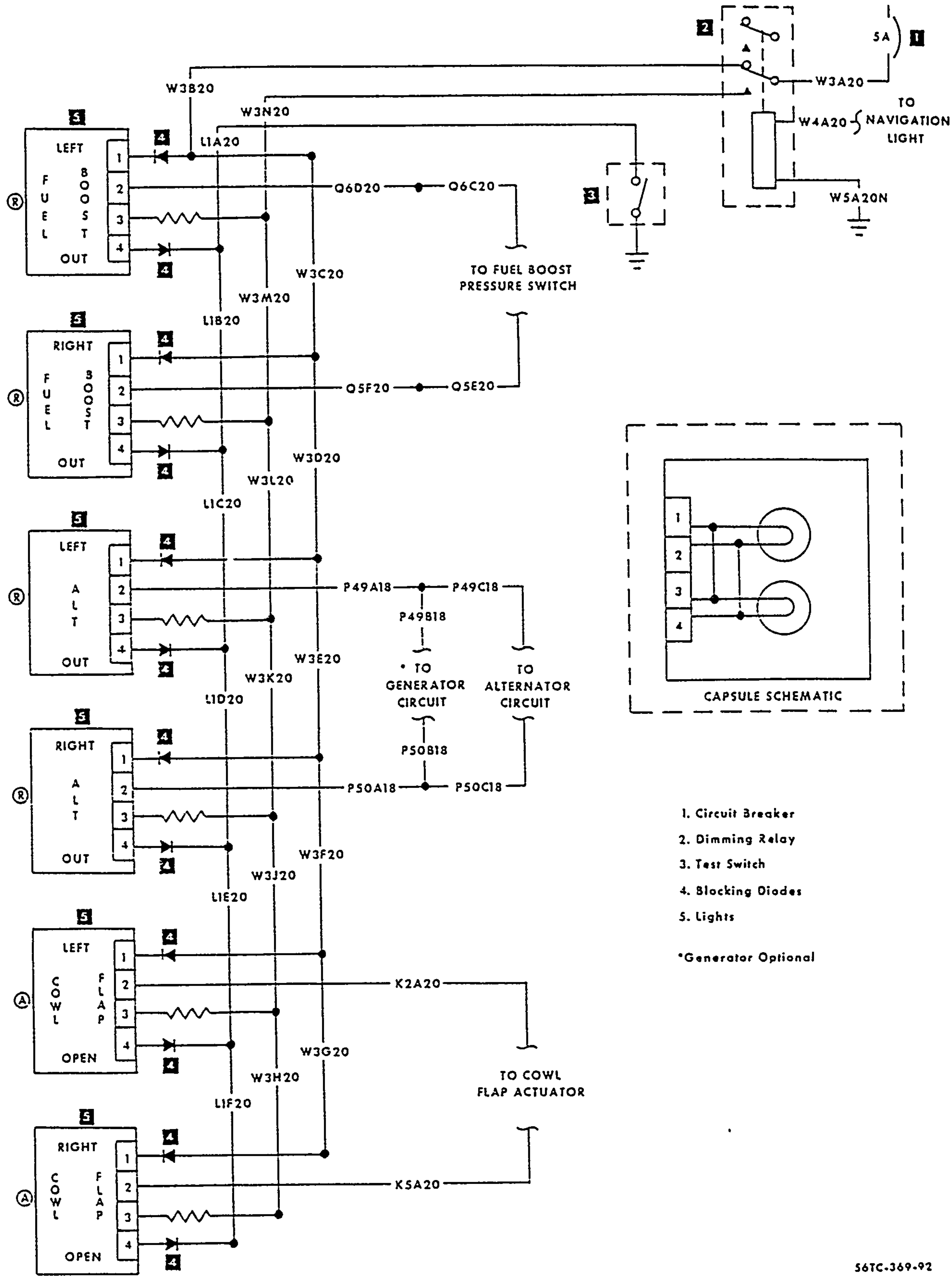
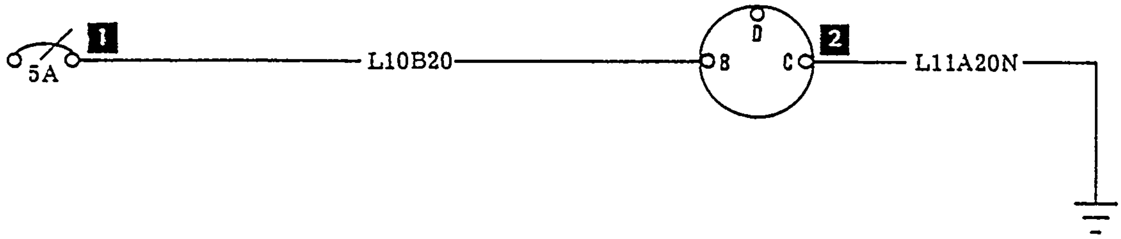


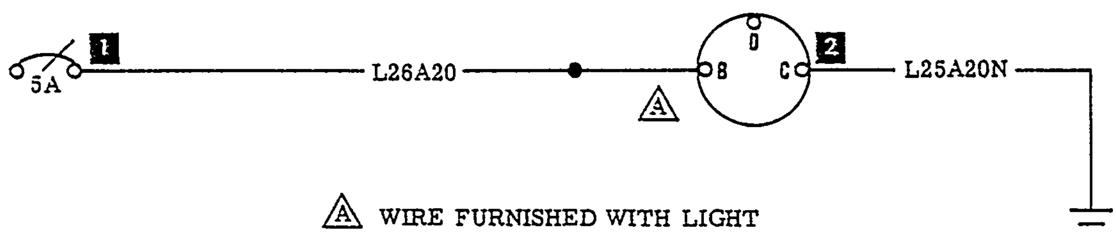
Figure 14-14. Annunciator (TG-84 and after)



1. Circuit Breaker
2. L.H. Wing Ice Light

56TC-369-55

Figure 14-15. Wing Ice Light (TG-1 thru TG-83)

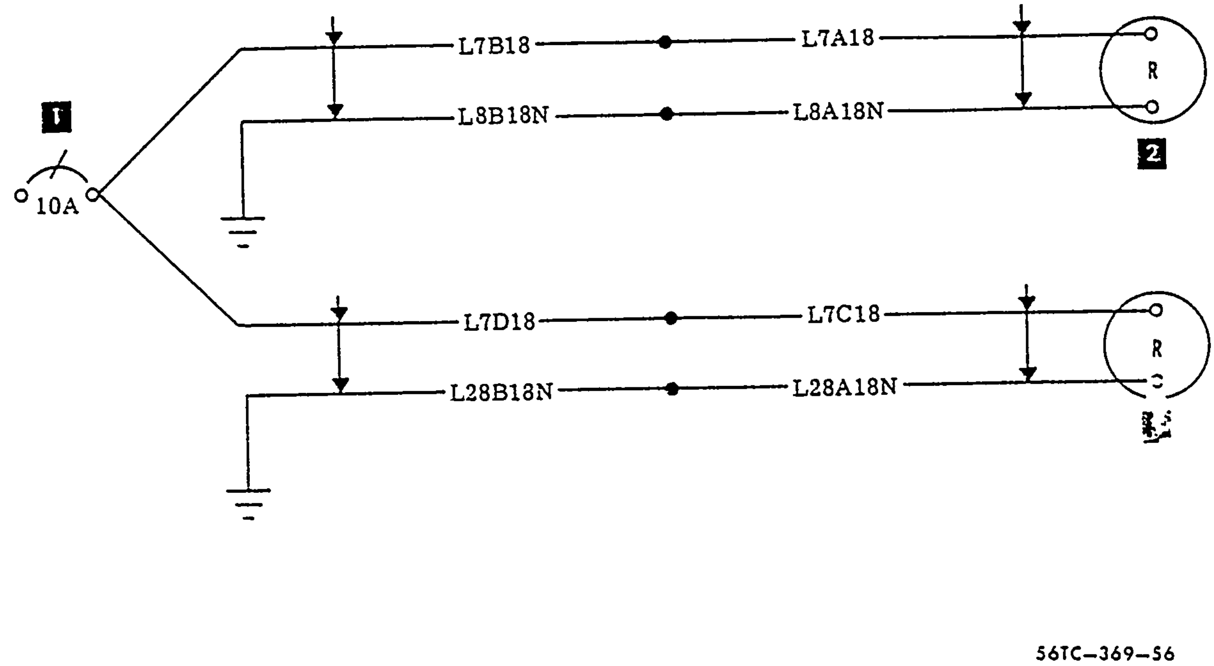


A WIRE FURNISHED WITH LIGHT

1. Circuit Breaker
2. L.H. Wing Ice Light

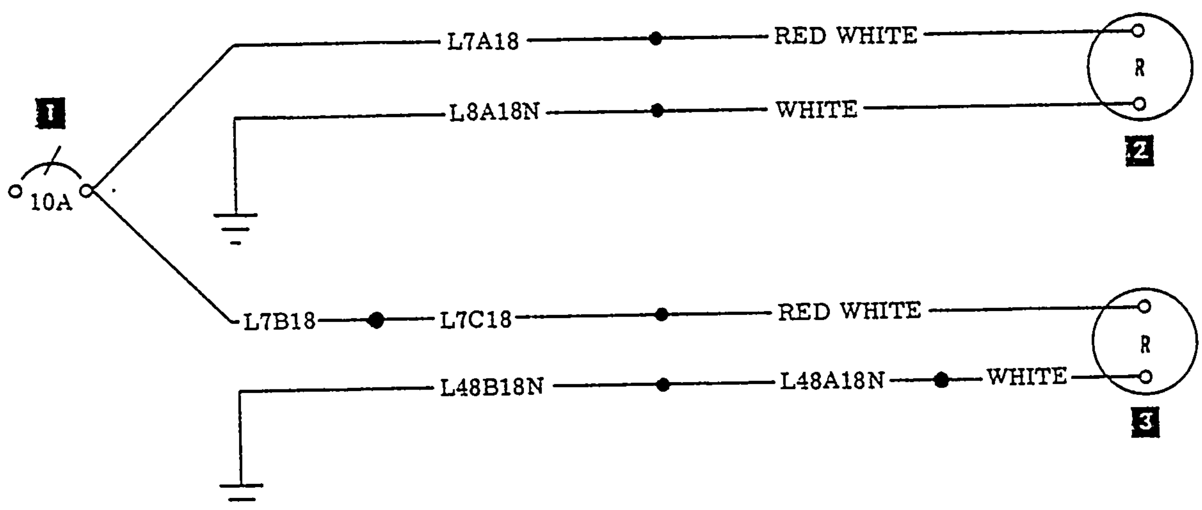
56TC-369-90

Figure 14-15. Wing Ice Light (TG-84 and after)



1. Circuit Breaker
2. Upper Rotating Beacon
3. Lower Rotating Beacon

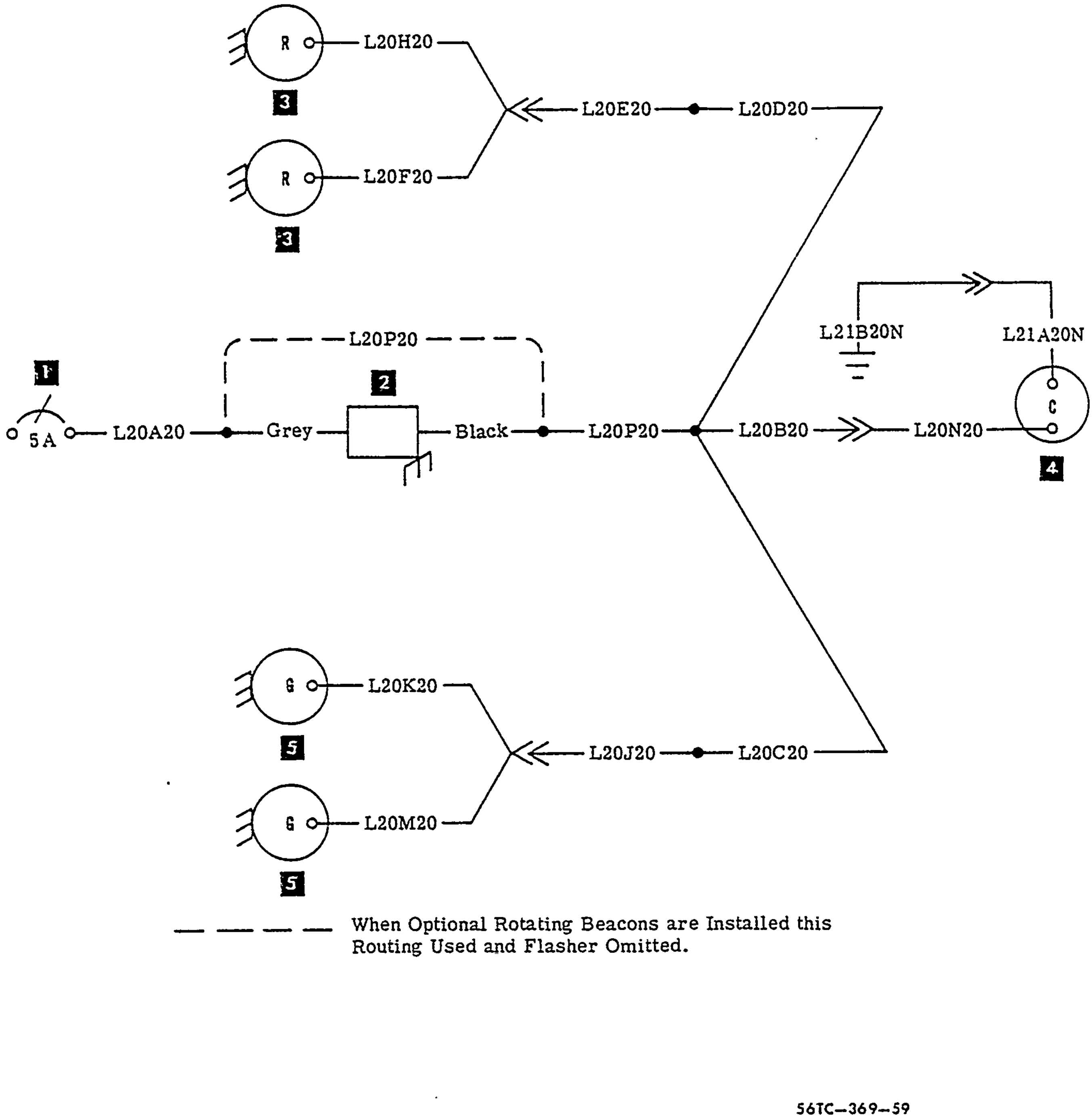
Figure 14-16. Rotating Beacon (TG-1 thru TG-83)



1. Circuit Breaker
2. Upper Rotating Beacon
3. Lower Rotating Beacon

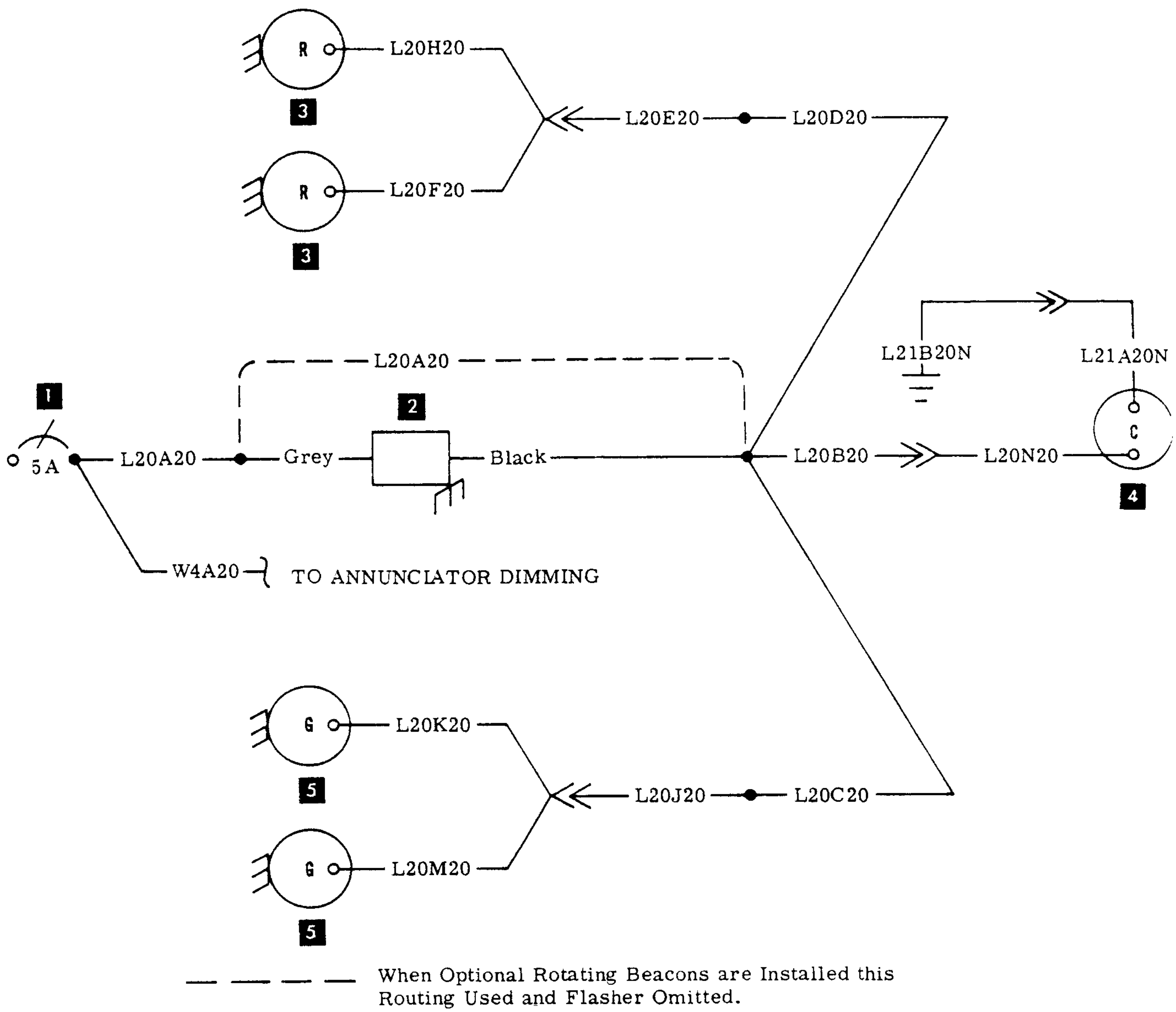
56TC-369-17

Figure 14-16. Rotating Beacon (TG-84 and after)



1. Circuit Breaker
2. Navigational Lamp Flasher
3. L.H. Wing Navigational Lights
4. Tail Navigation Lights
5. R.H. Wing Navigational Lights

Figure 14-17. Navigation Lights (TG-1 thru TG-83)



1. Circuit Breaker
2. Navigational Lamp Flasher
3. L.H. Wing Navigational Lights
4. Tail Navigation Lights
5. R.H. Wing Navigational Lights

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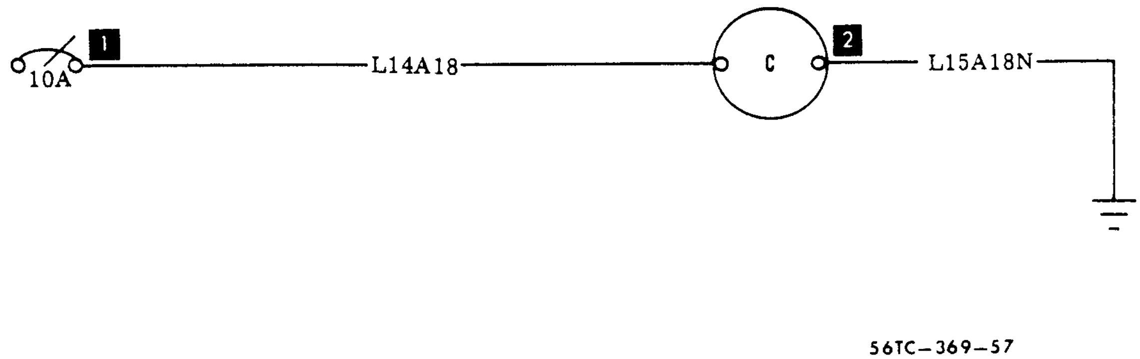
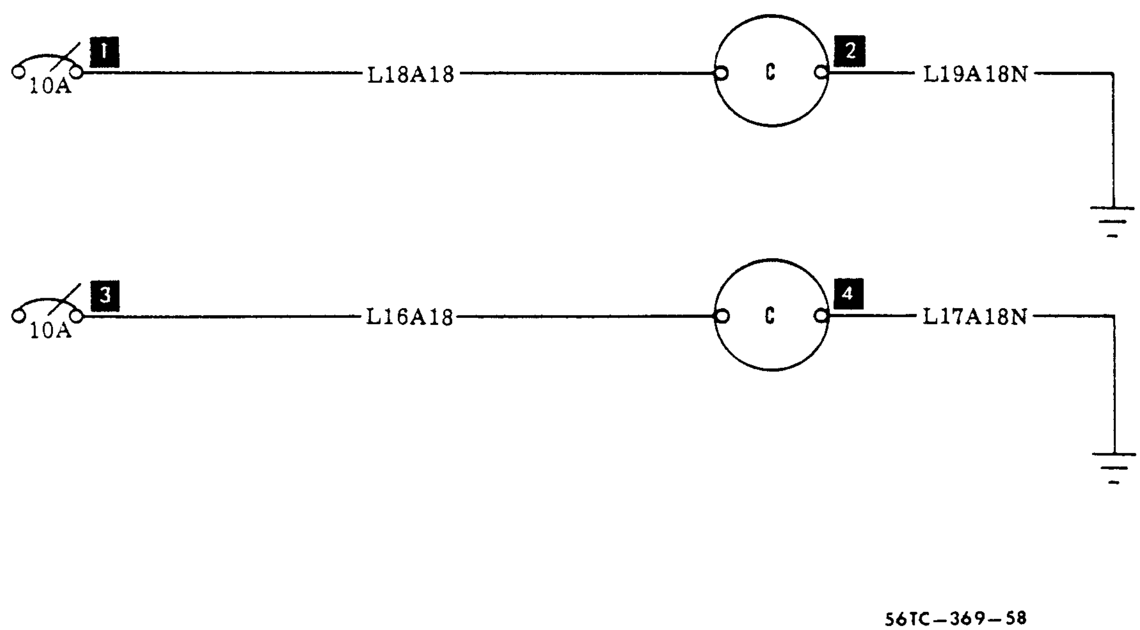
Figure 14-17. Navigation Lights (TG-84 and after)



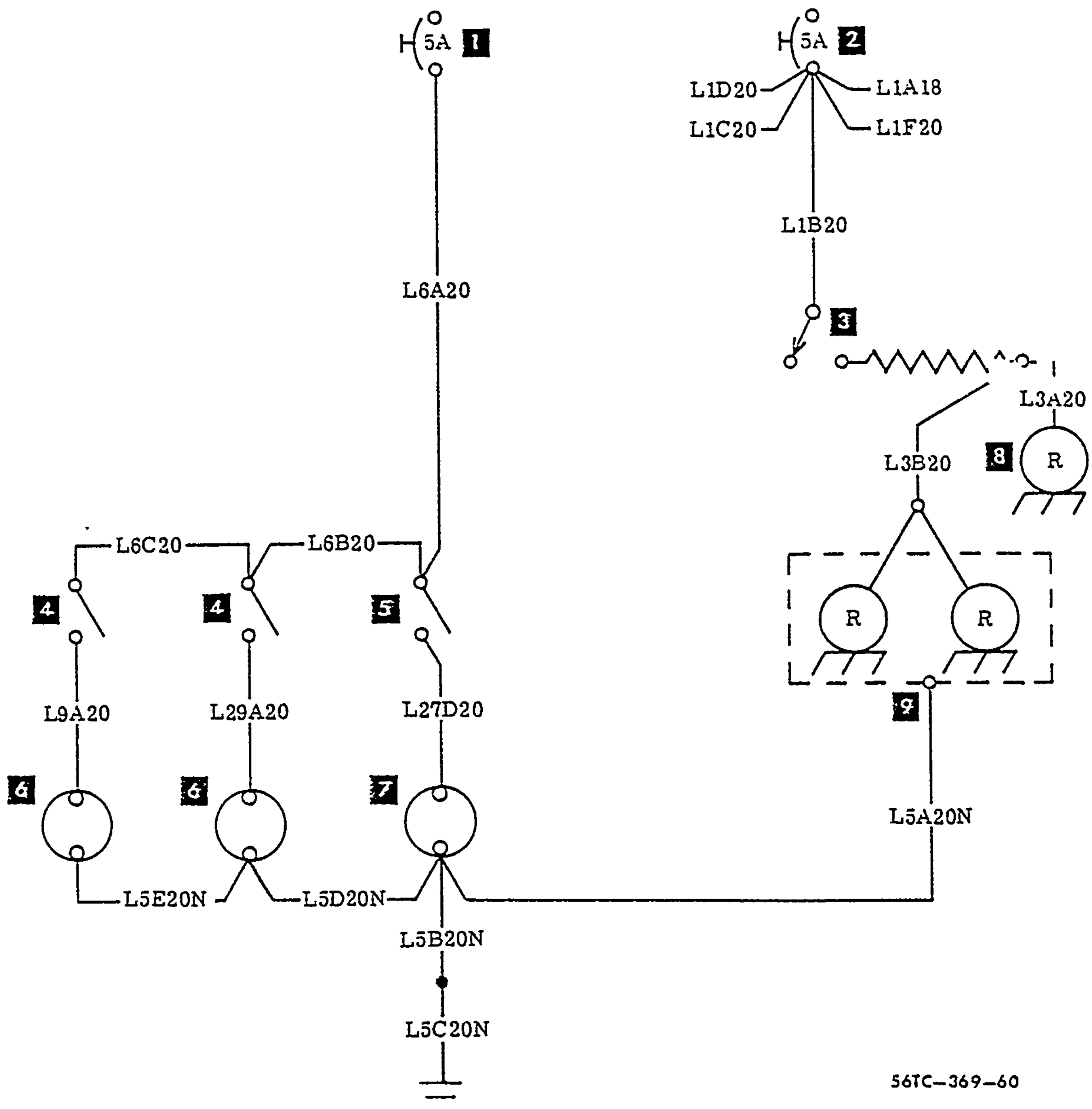
1. Circuit Breaker
2. Taxi Light

Figure 14-18. Taxi Light



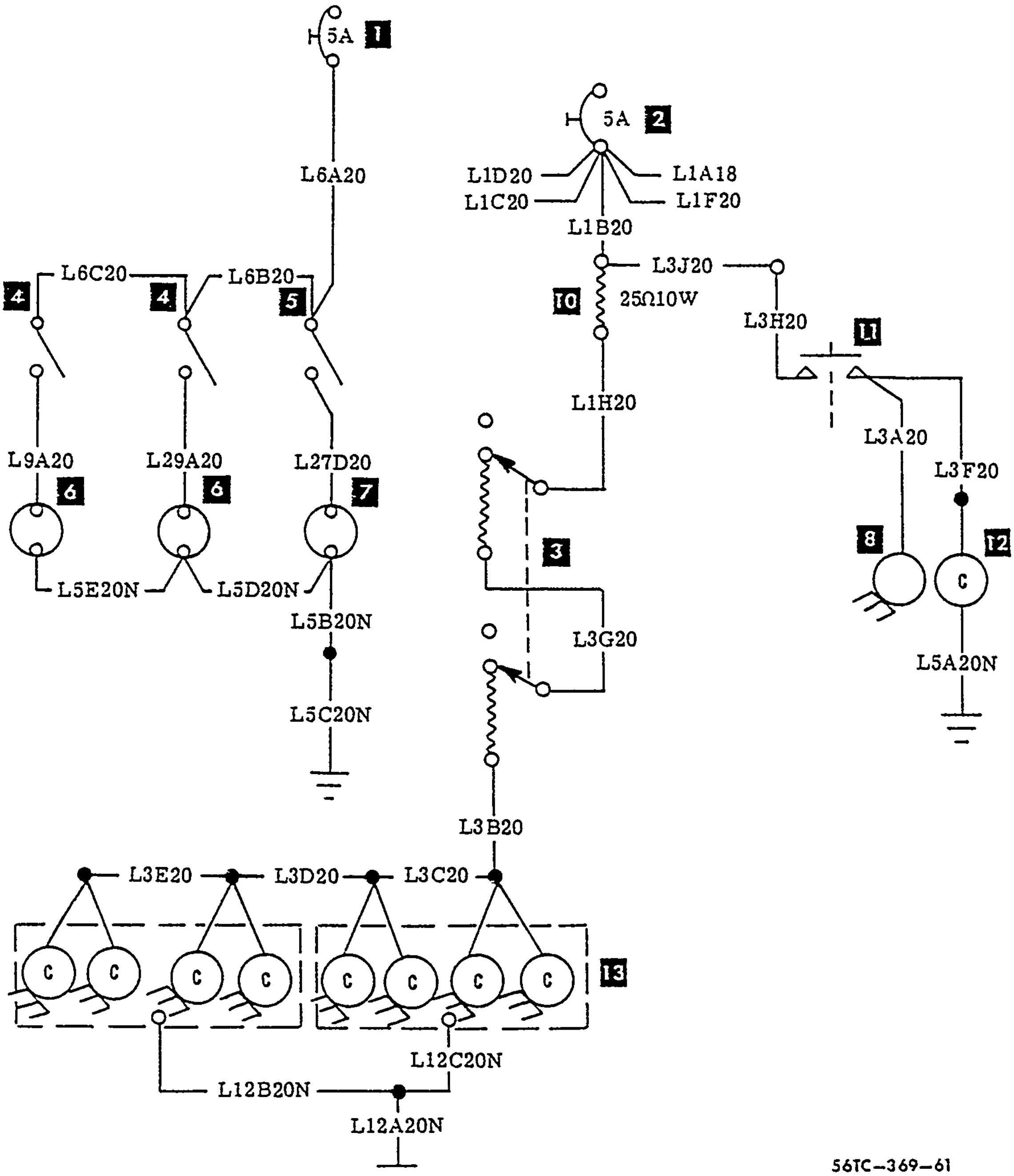
1. Circuit Breaker
2. L.H. Landing Light
3. Circuit Breaker
4. R.H. Landing Light

Figure 14-19. Landing Lights



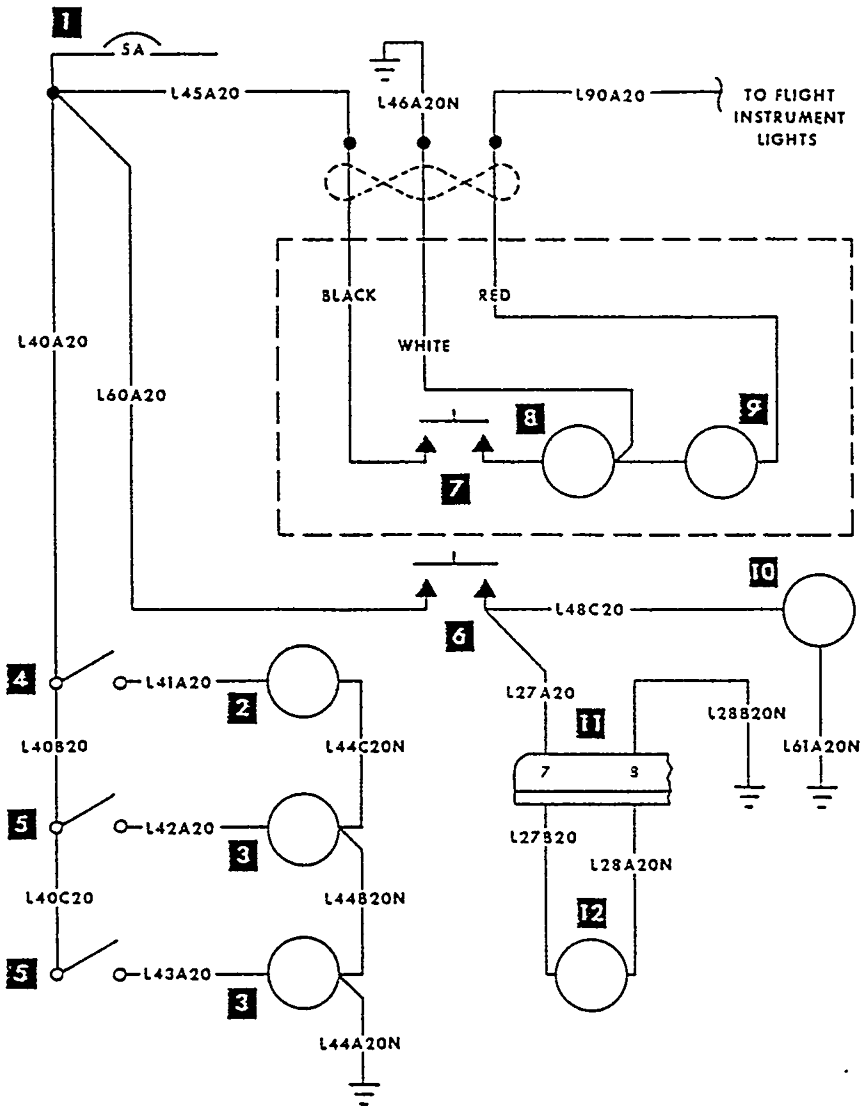
1. Cabin Lights Circuit Breaker
2. Instrument Panel Light Circuit Breaker
3. Rheostat
4. Reading Light Switch
5. Dome Light Switch
6. Reading Light
7. Dome Light
8. Compass Light
9. Overhead Instrument Lights

Figure 14-20. Dome and Reading Lights (TG-1 thru TG-51)



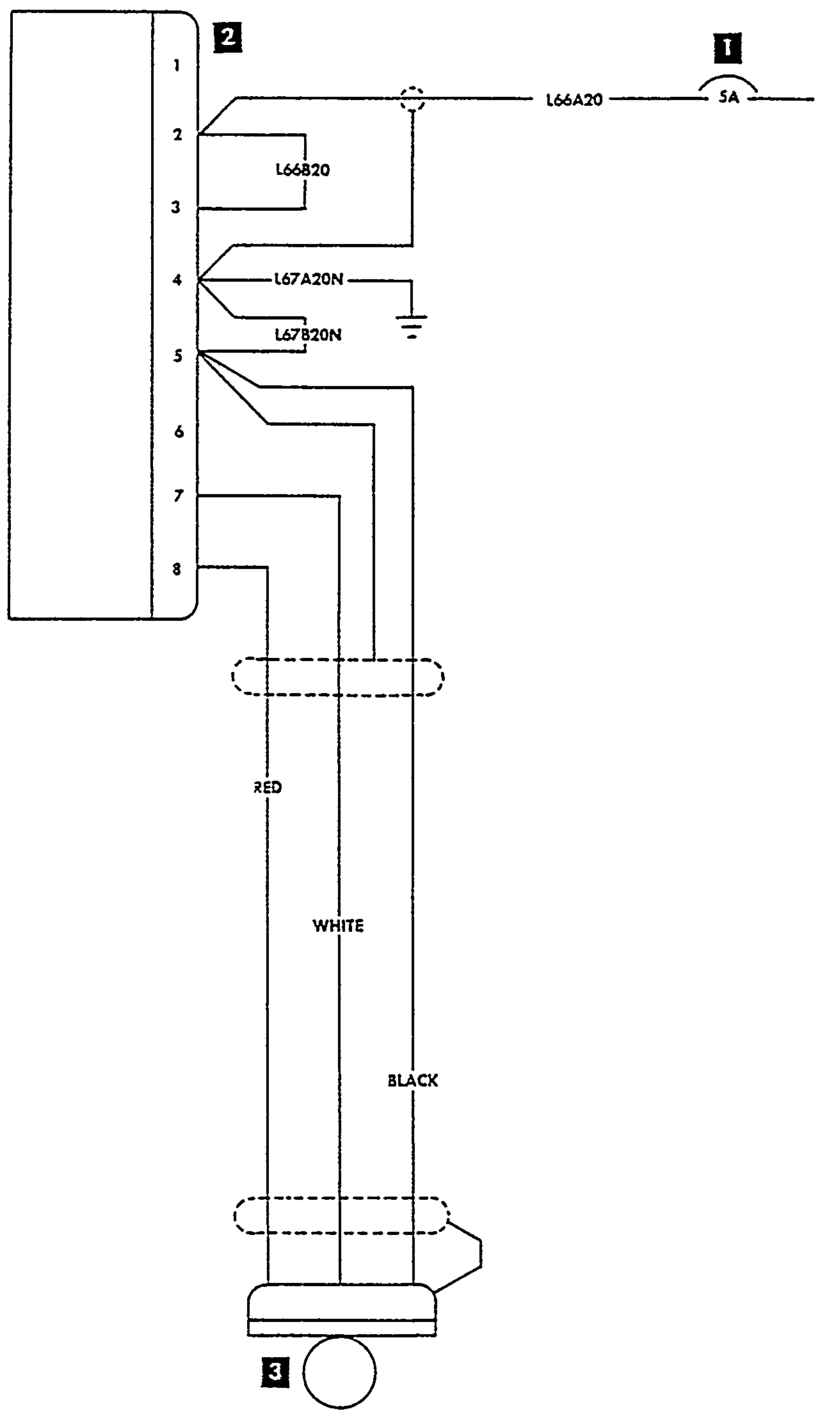
1. Cabin Lights Circuit Breaker
2. Instrument Panel Light Circuit Breaker
3. Rheostat
4. Reading Light Switch
5. Dome Light Switch
6. Reading Light
7. Dome Light
8. Compass Light
9. Not Used
10. Resistor
11. Switch
12. O. A. T. Light
13. Glareshield Lights

Figure 14-20. Dome and Reading Lights (TG-52 thru TG-83)



1. Cabin Lights Circuit Breaker
2. Dome Light
3. Reading Light
4. Dome Light Switch
5. Reading Light Switch
6. Compass and OAT Light Switch
7. Map Light Switch
8. Map Light
9. Wheel Clock Light
10. OAT Light
11. Glareshield Connector
12. Compass Light

Figure 14-21. Cabin and Map Lights (TG-84 and after)



1. Circuit Breaker
2. Power Unit and Connector
3. Strobe Light

Figure 14-22. Bullock Strobe Light

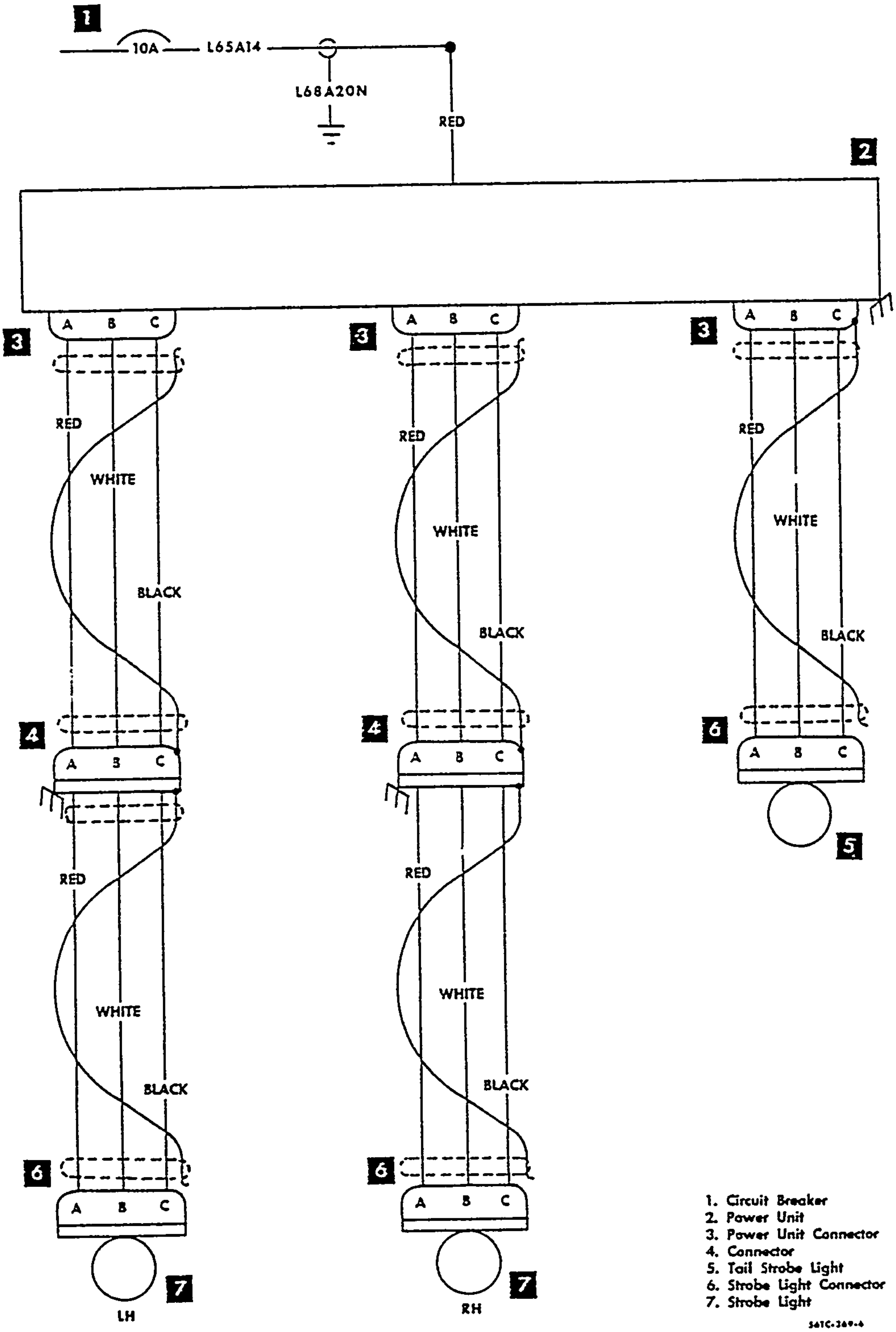


Figure 14-23. Hoskins Strobe Light

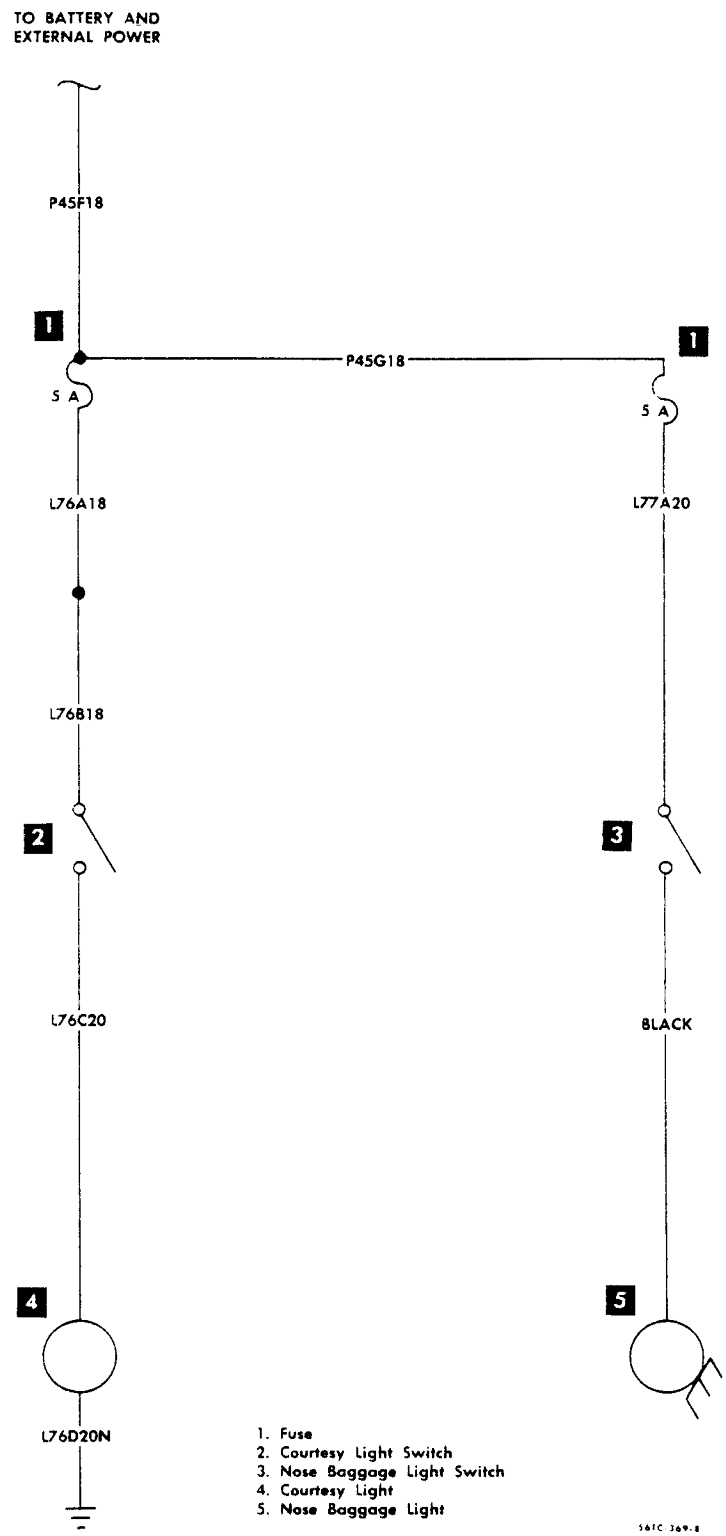
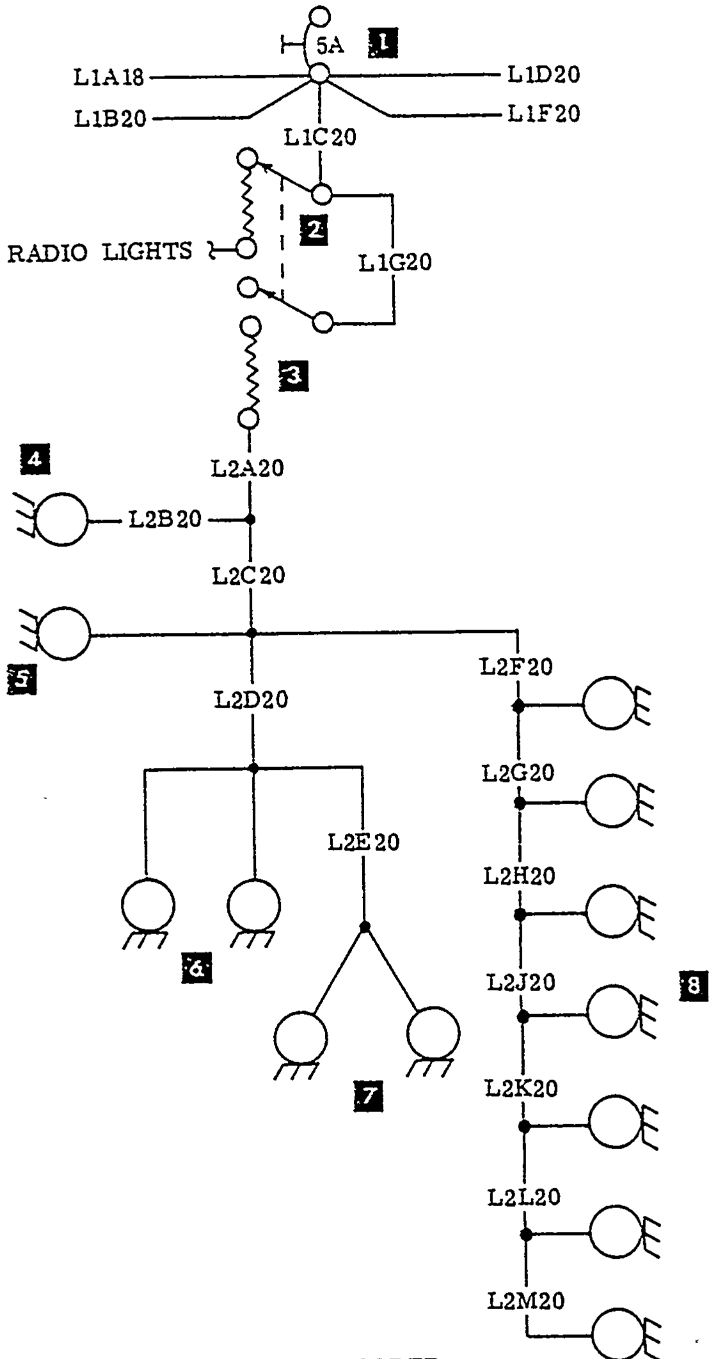


Figure 14-24. Courtesy and Nose Baggage Lights (TG-84 and after)



NOTE:
WIRING FURNISHED BY VENDOR IS NOT CODED

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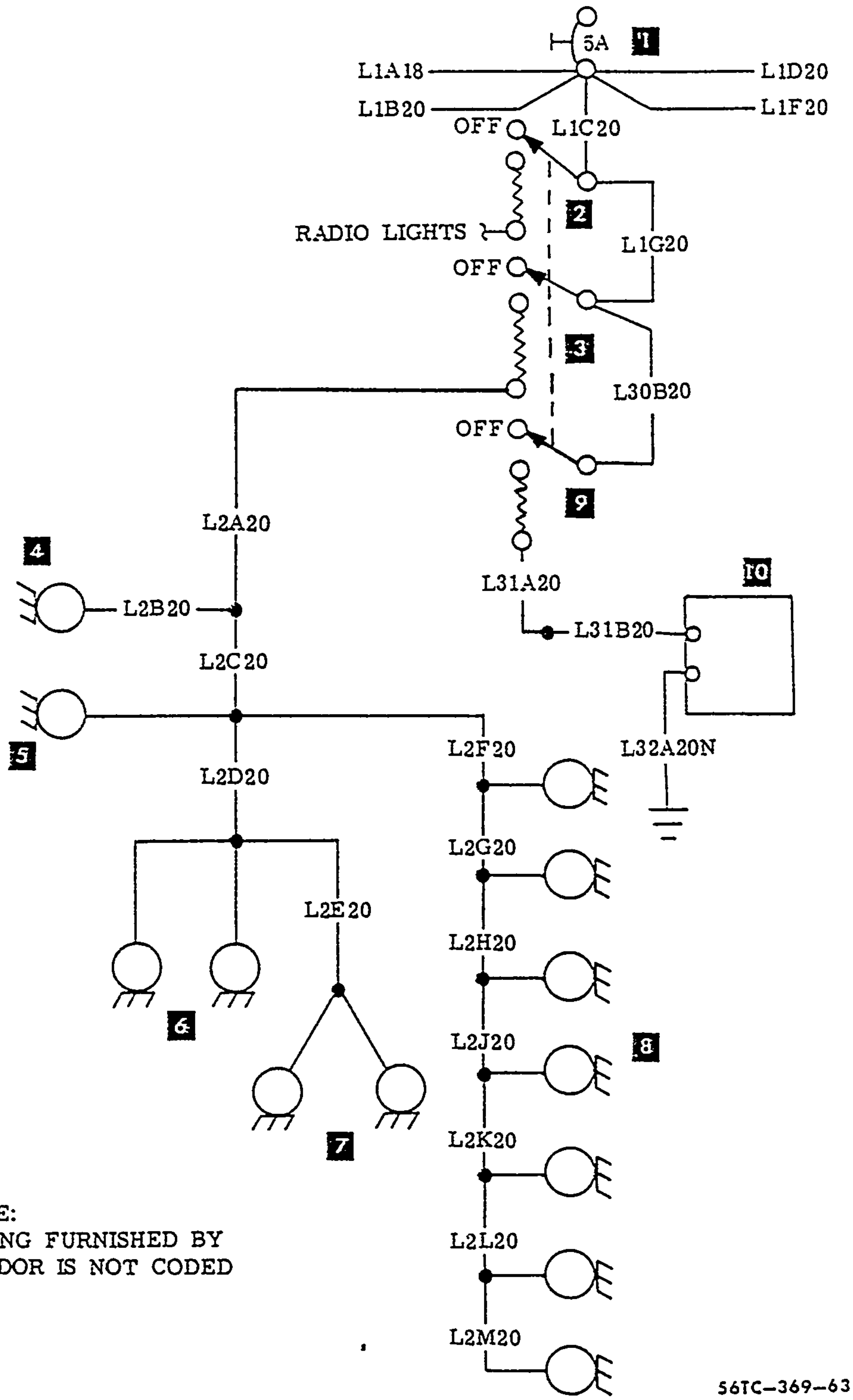
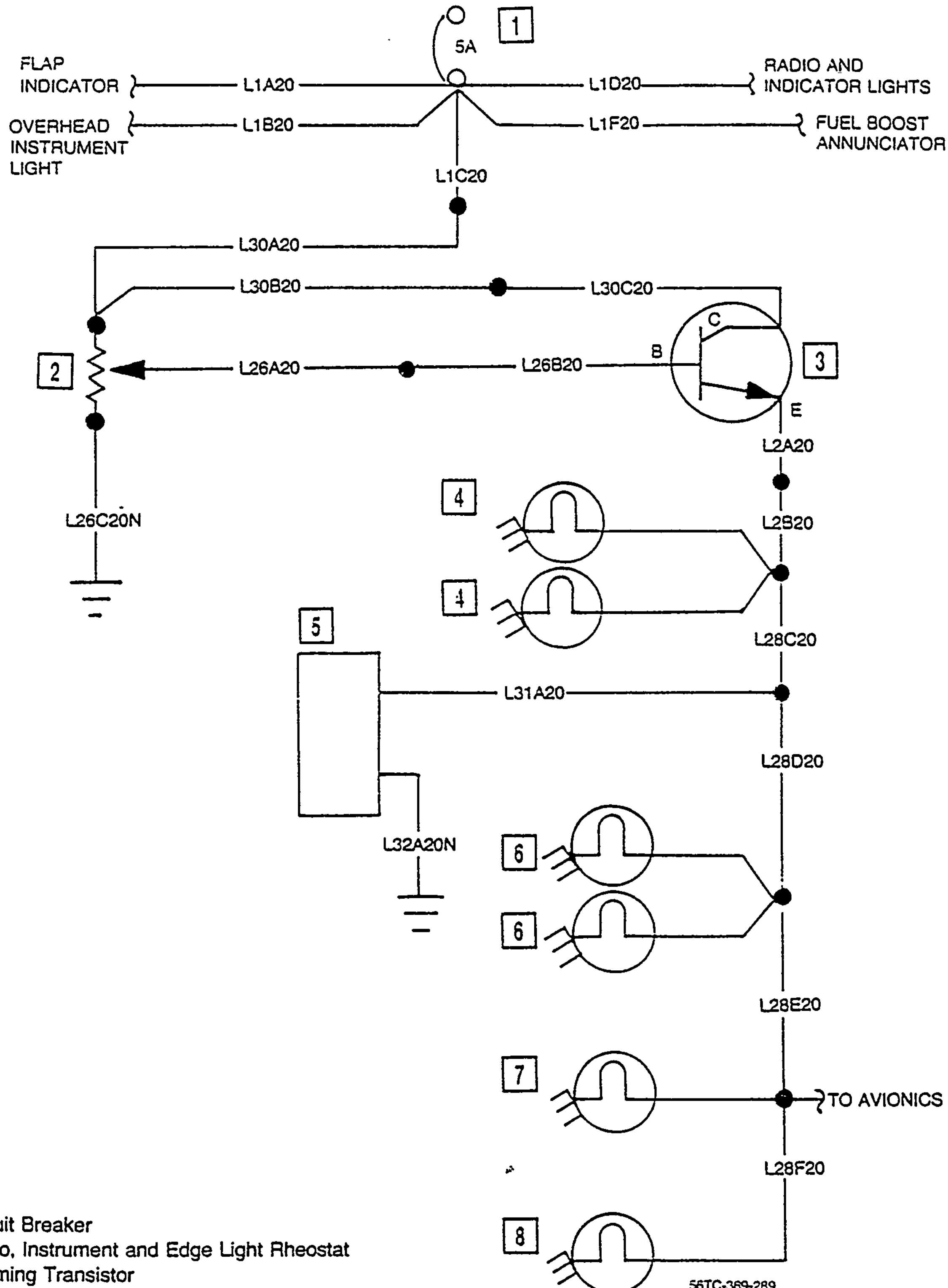
1. Circuit Breaker
2. Radio Light Rheostat
3. Instrument And Edge Lights Rheostat
4. Landing Gear Visual Indicator Light
5. Rheostat Light
6. Tab Indicator Light
7. Fuel Selector
8. Circuit Breaker And Switch Panel Lights

Figure 14-25. Control Panel and Indicator Lights (TG-1 thru TG-51)



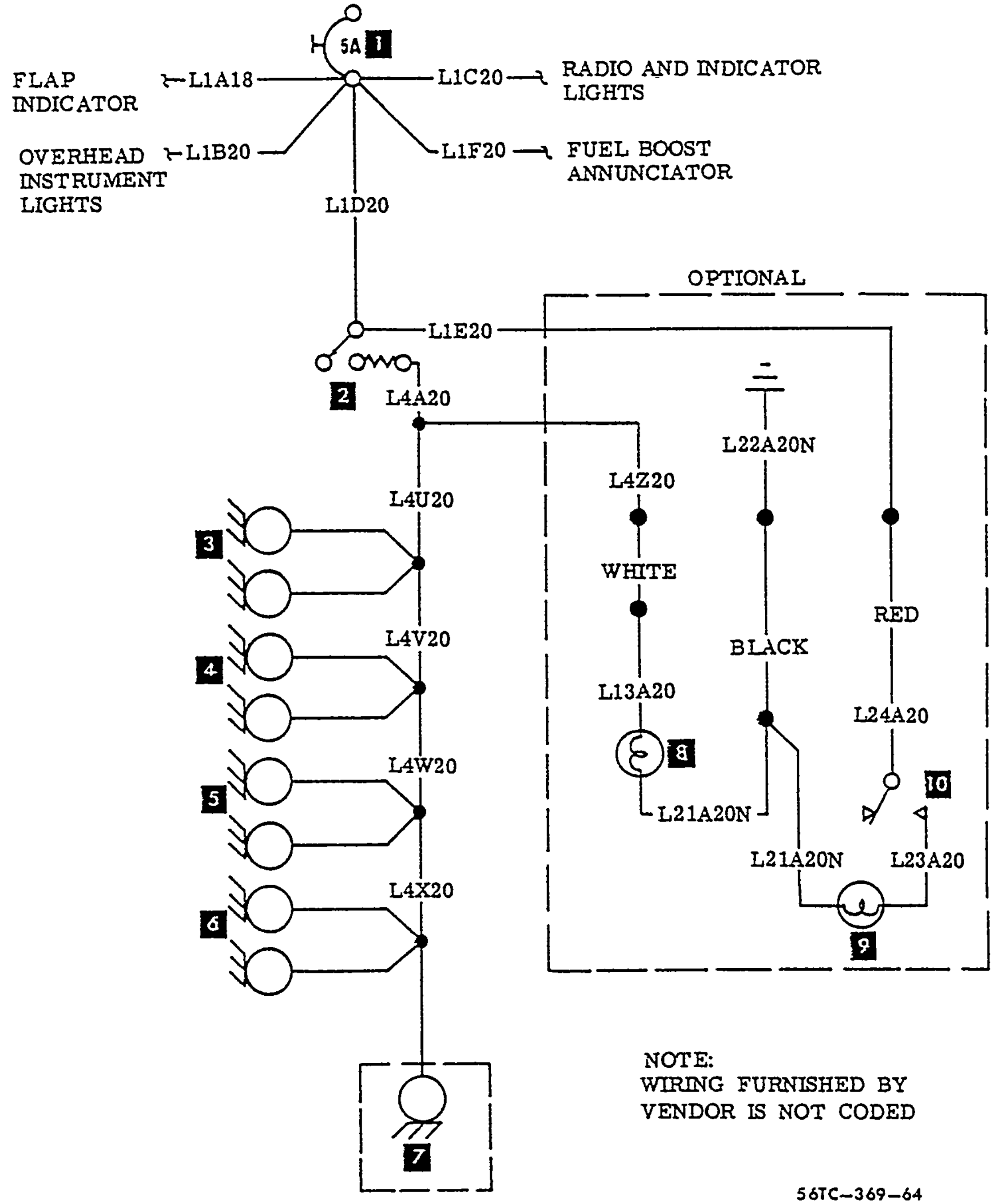
1. Circuit Breaker
2. Radio Light Rheostat
3. Instrument And Edge Lights Rheostat
4. Landing Gear Visual Indicator Light
5. Rheostat Light
6. Tab Indicator Light
7. Fuel Selector
8. Circuit Breaker And Switch Panel Lights
9. Switch Panel Light Rheostat
10. Switch Panel Light Assembly

Figure 14-25. Control Panel Indicator Lights (TG-52 thru TG-76)



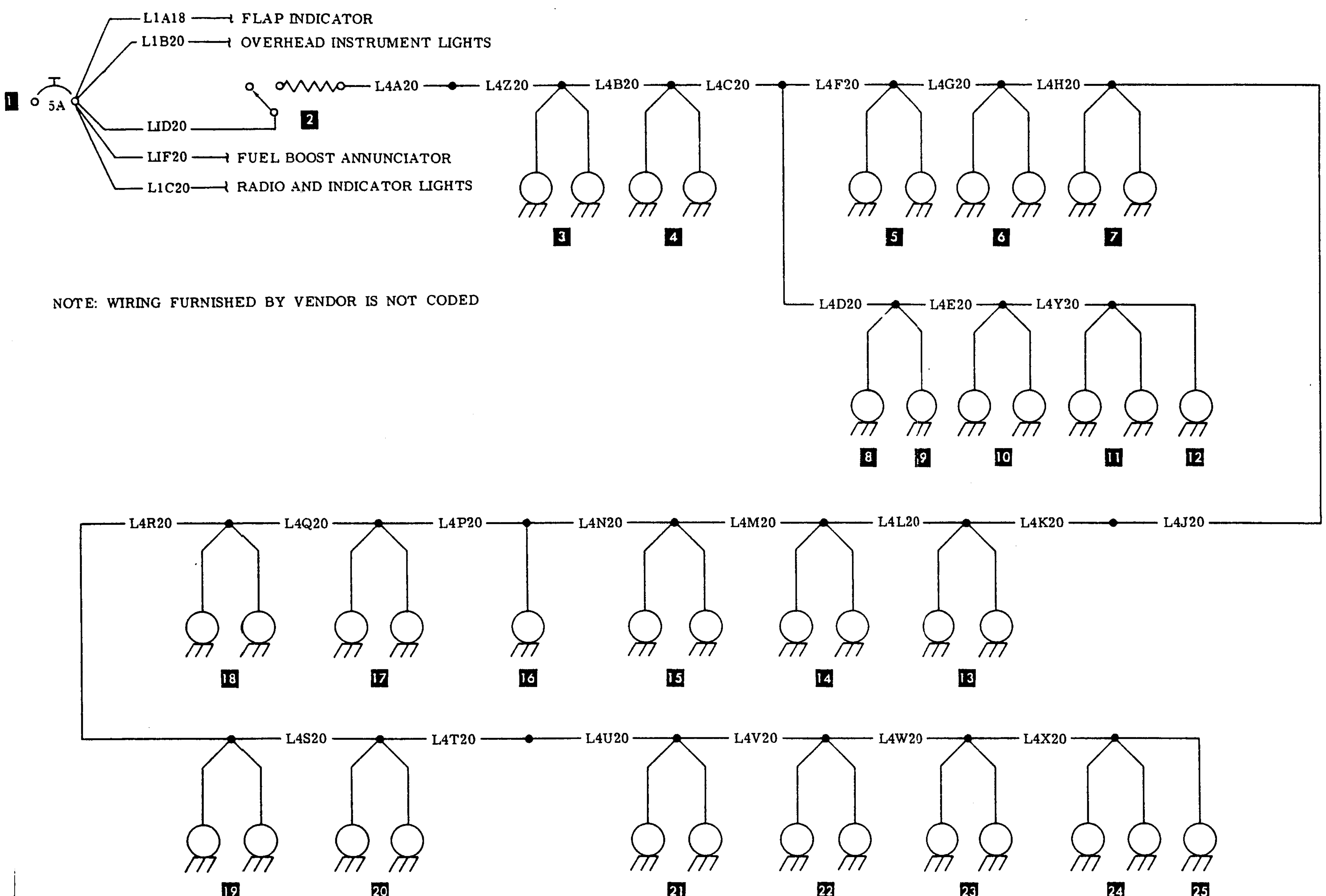
1. Circuit Breaker
2. Radio, Instrument and Edge Light Rheostat
3. Dimming Transistor
4. Fuel Select Lights
5. Switch Panel Light Assembly
6. Tab Indicator Lights
7. Rheostat Light
8. Landing Gear Visual Indicator

Figure 14-25. Control Panel Indicator Lights (TG-77 thru TG-83)



1. Circuit Breaker
2. Rheostat
3. Omni #2 Lights
4. Omni #1 Lights
5. R.H. Engine Lights
6. L.H. Engine Lights
7. Oxygen Indicator Lights
8. Clock Light
9. Maplight
10. Map Light Switch

Figure 14-26. Instrument Panel Lights (TG-1 thru TG-83)



1. Instrument & Edge Panel Lights Circuit Breaker
2. Instrument Lights Rheostat
3. Fuel Quantity Lights
4. Ammeter Lights
5. Fuel Pressure Lights
6. Manifold Pressure Lights
7. Tachometer Lights
8. Suction Light
9. Prop Anti-Ice Light
10. Mixture Lights
11. Altimeter or Airspeed Lights
12. Engine Hour Meter or Flight Hour Meter Light
13. Altimeter Lights
14. Gyro Horizon Lights
15. Airspeed Lights
16. Clock Light
17. ADF Lights
18. Turn and Bank Lights
19. Direction Gyro Lights
20. Rate of Climb Lights
21. Omm #2 Lights
22. Omm # 1 Lights
23. R.H. Engine Lights
24. L.H. Engine Lights
25. Oxygen Indicator Light

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Figure 14-26. Instrument Panel Lights (Optional) (TG-1 thru TG-83)

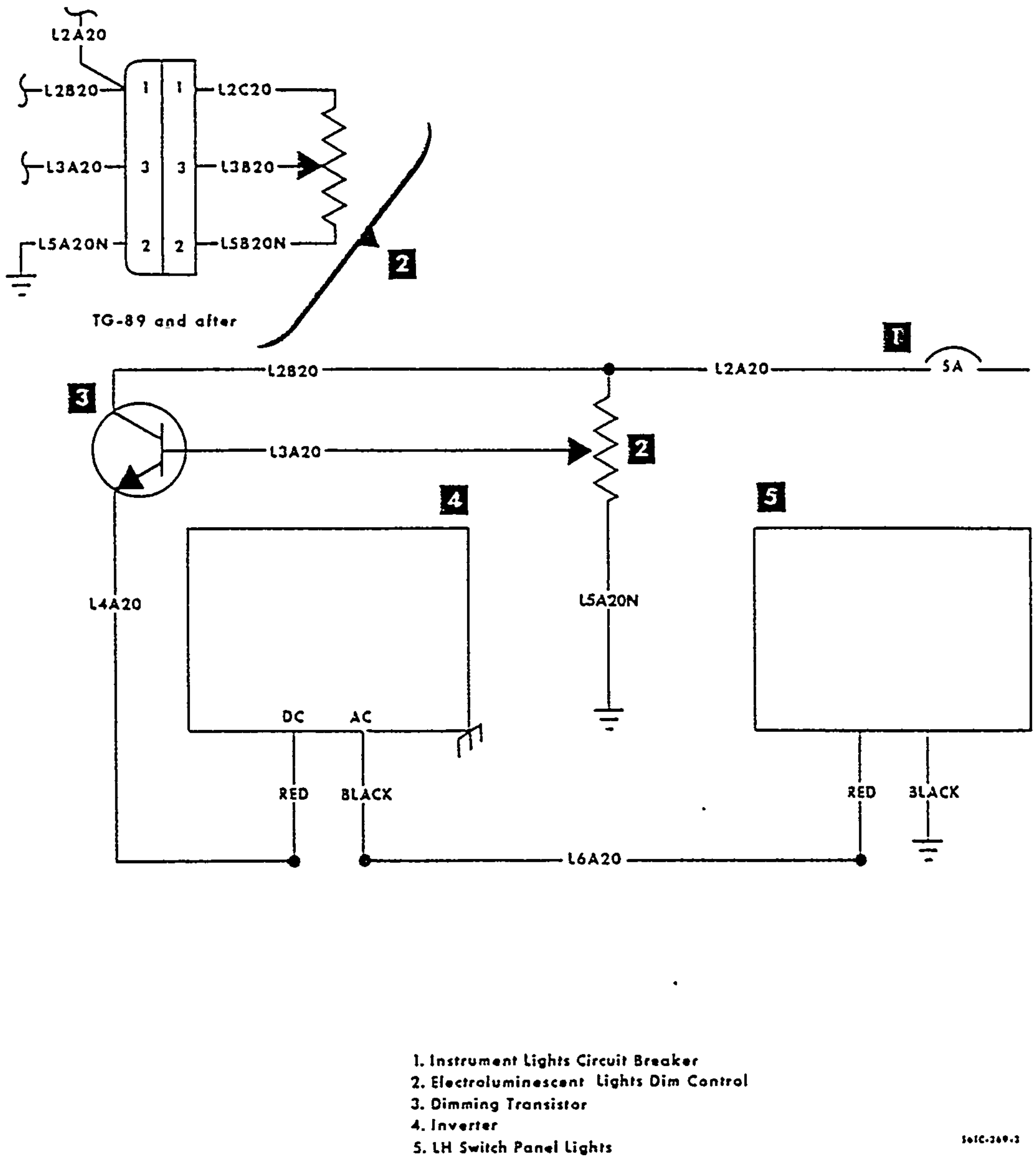
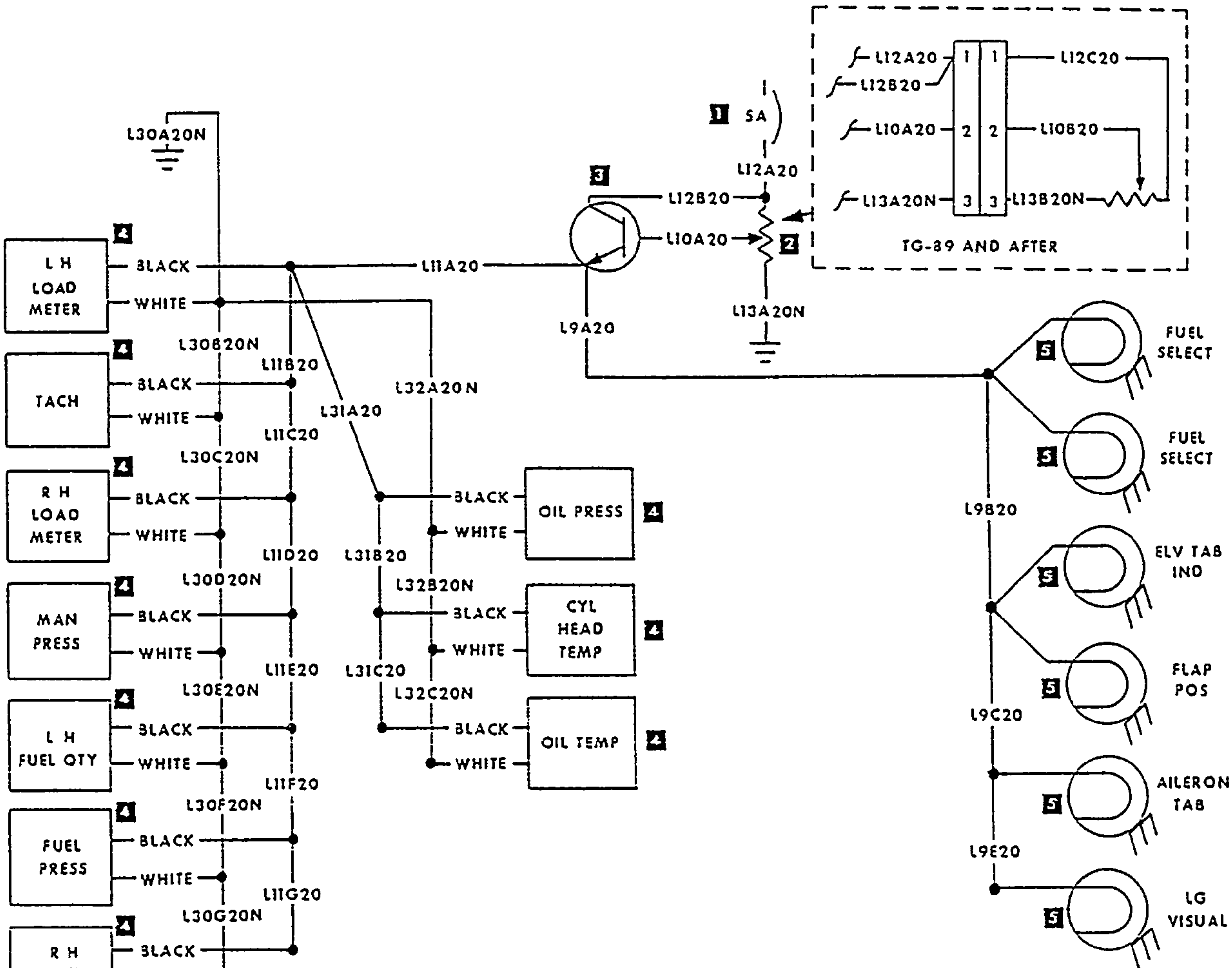


Figure 14-27. Electroluminescent Panel Lights (TG-84 and after)



1. Instrument Lights Circuit Breaker
2. Dimming Rheostat
3. Dimming Transistor
*4. Engine Instrument Wedge Lights
5. Lights

*Wedge Lights-Optional

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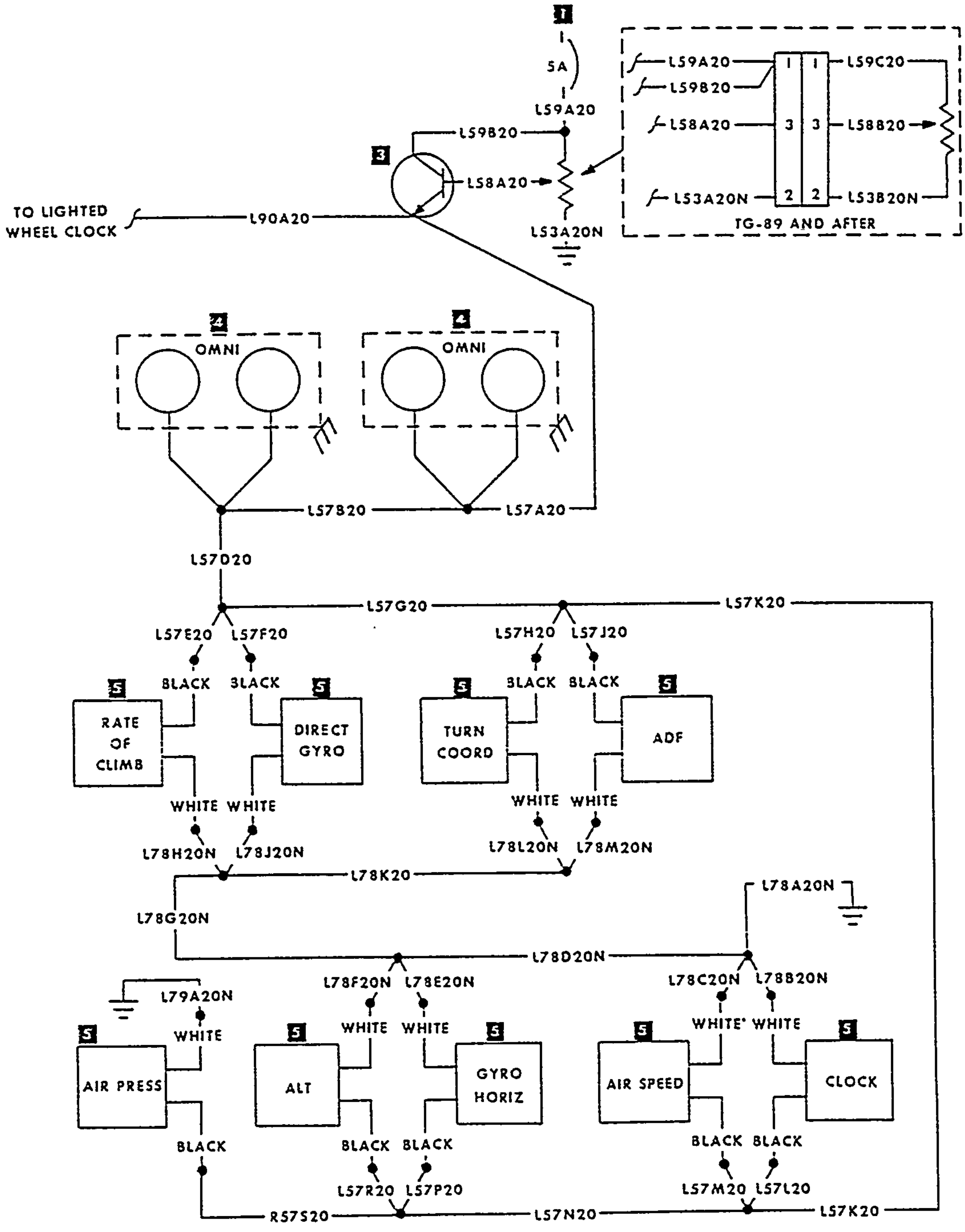
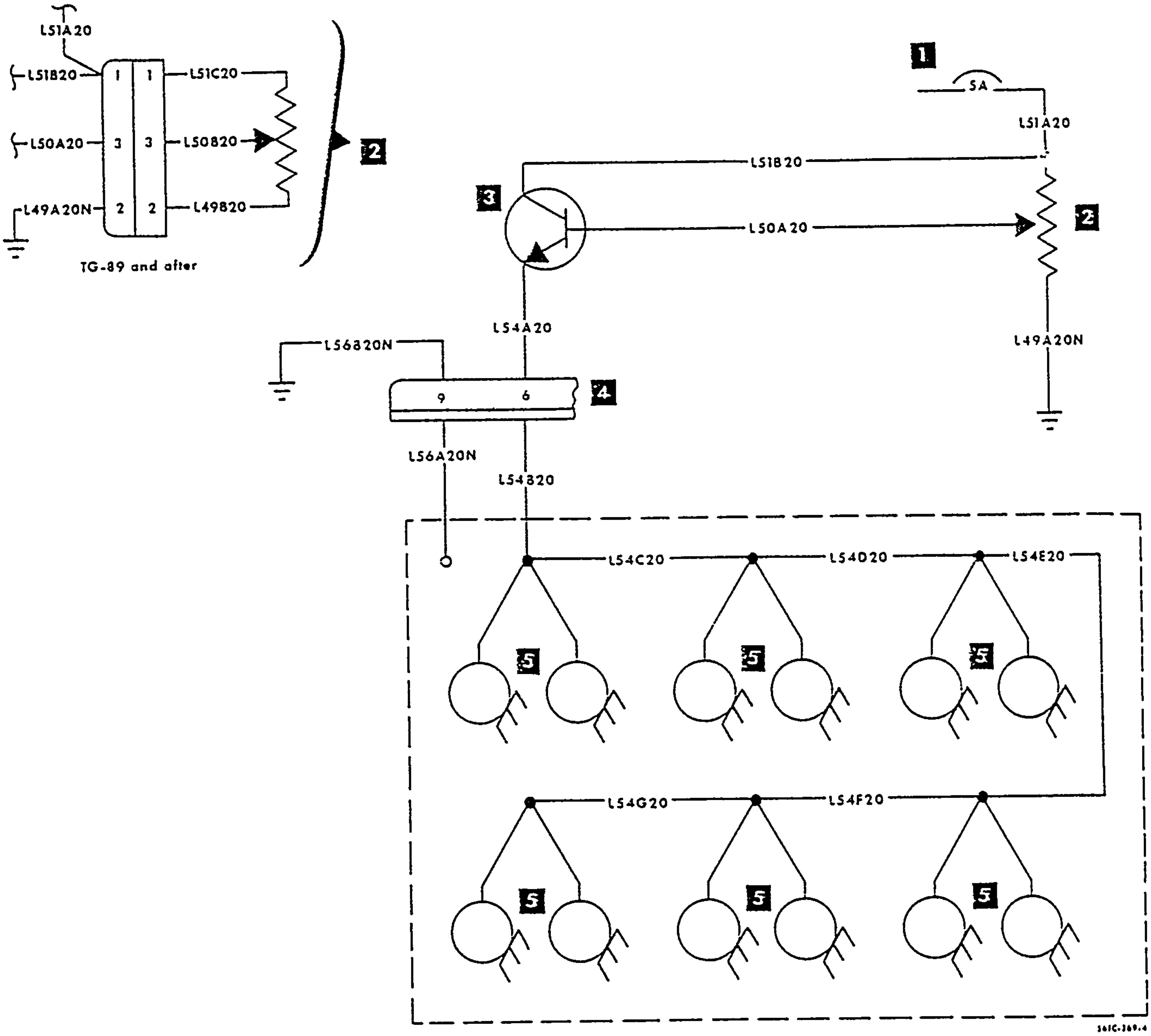
Figure 14-28. Engine Instrument Wedge Lights
TG-84 and after



1. Instrument Lights Circuit Breaker
2. Dimming Rheostat
3. Dimming Transistor
4. Omni Lights
*5. Instrument Wedge Lights

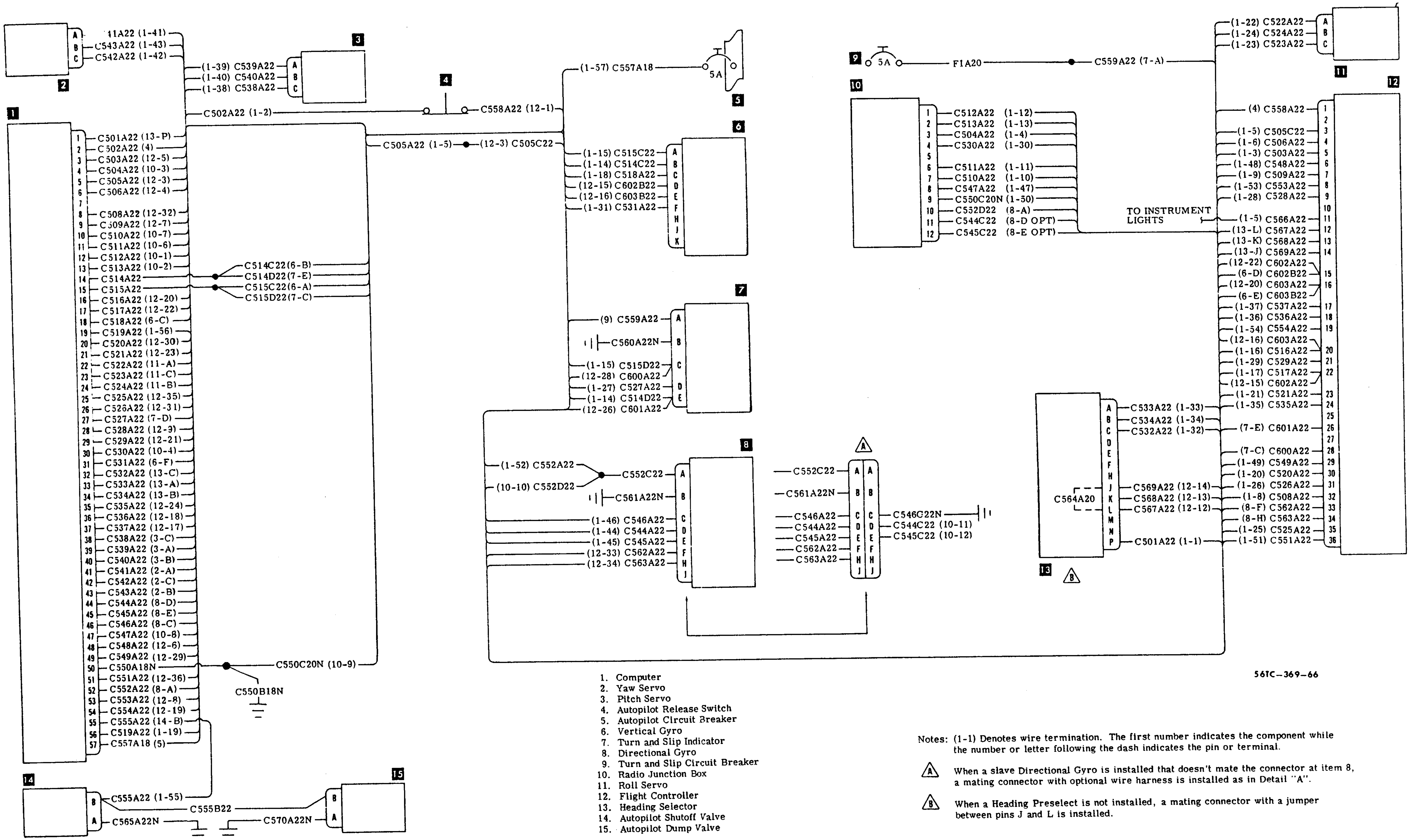
*Wedge Lights-Optional

Figure 14-29. Flight Instrument Lights (TG-84 and after)



1. Instrument Lights Circuit Breaker
2. Dim Control
3. Dim Transistor
4. Glareshield Connector
5. Instrument Flood Lights

Figure 14-30. Instrument Flood Lights (TG-84 and after)



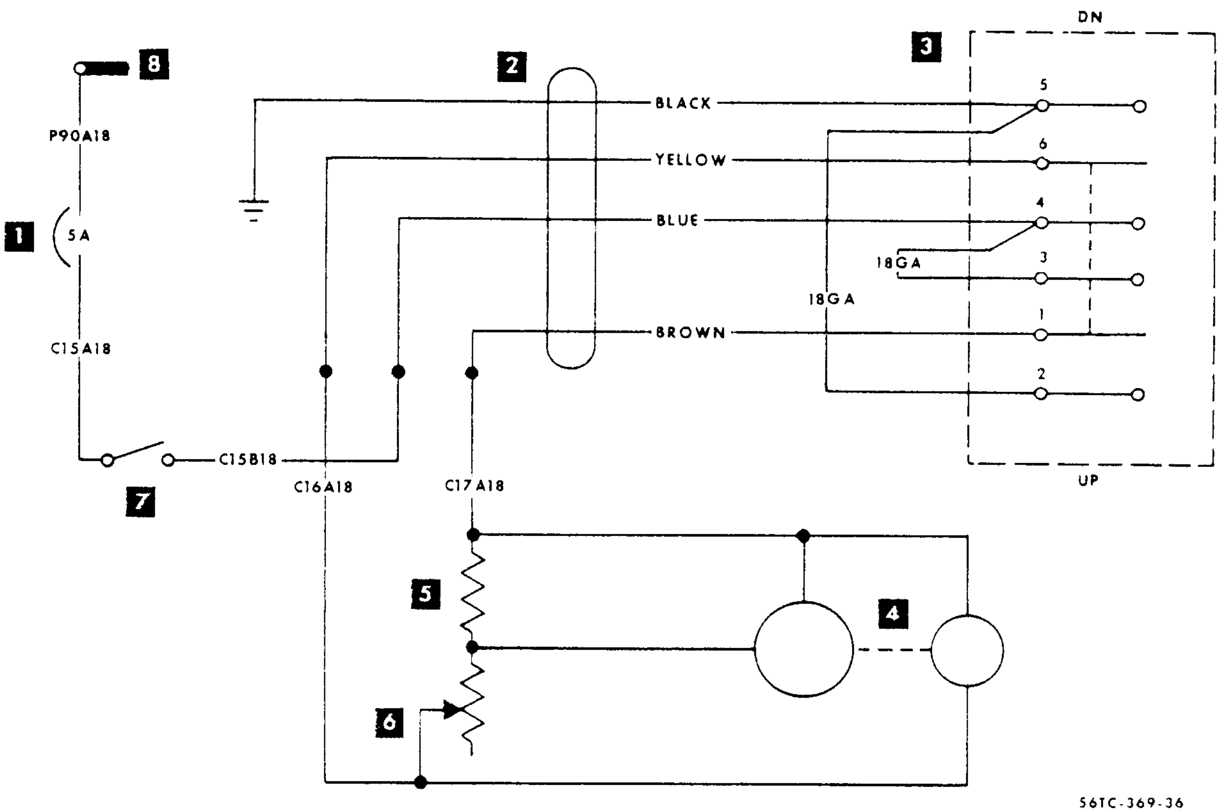
1. Computer
2. Yaw Servo
3. Pitch Servo
4. Autopilot Release Switch
5. Autopilot Circuit Breaker
6. Vertical Gyro
7. Turn and Slip Indicator
8. Directional Gyro
9. Turn and Slip Circuit Breaker
10. Radio Junction Box
11. Roll Servo
12. Flight Controller
13. Heading Selector
14. Autopilot Shutoff Valve
15. Autopilot Dump Valve

Notes: (1-1) Denotes wire termination. The first number indicates the component while the number or letter following the dash indicates the pin or terminal.

(A) When a slave Directional Gyro is installed that doesn't mate the connector at item 8, a mating connector with optional wire harness is installed as in Detail "A".

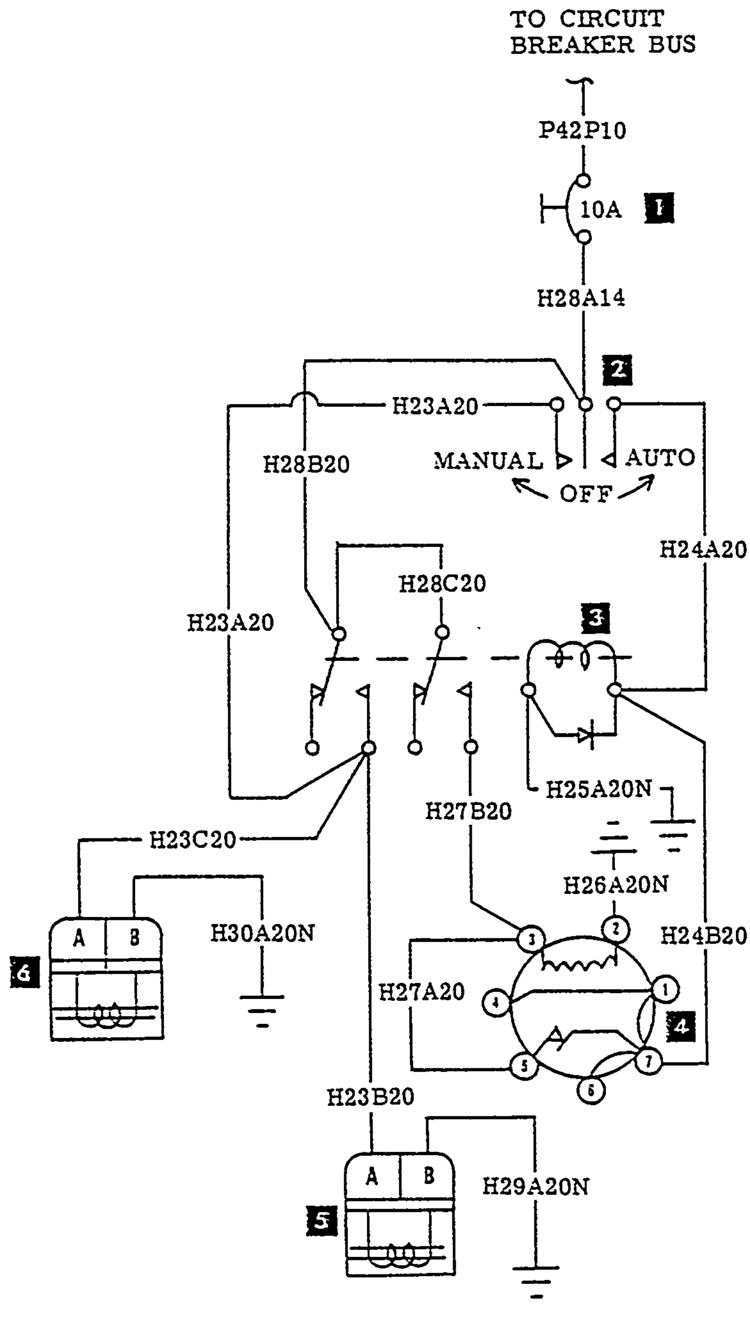
(B) When a Heading Preselect is not installed, a mating connector with a jumper between pins J and L is installed.

Figure 14-31. H-14 Autopilot



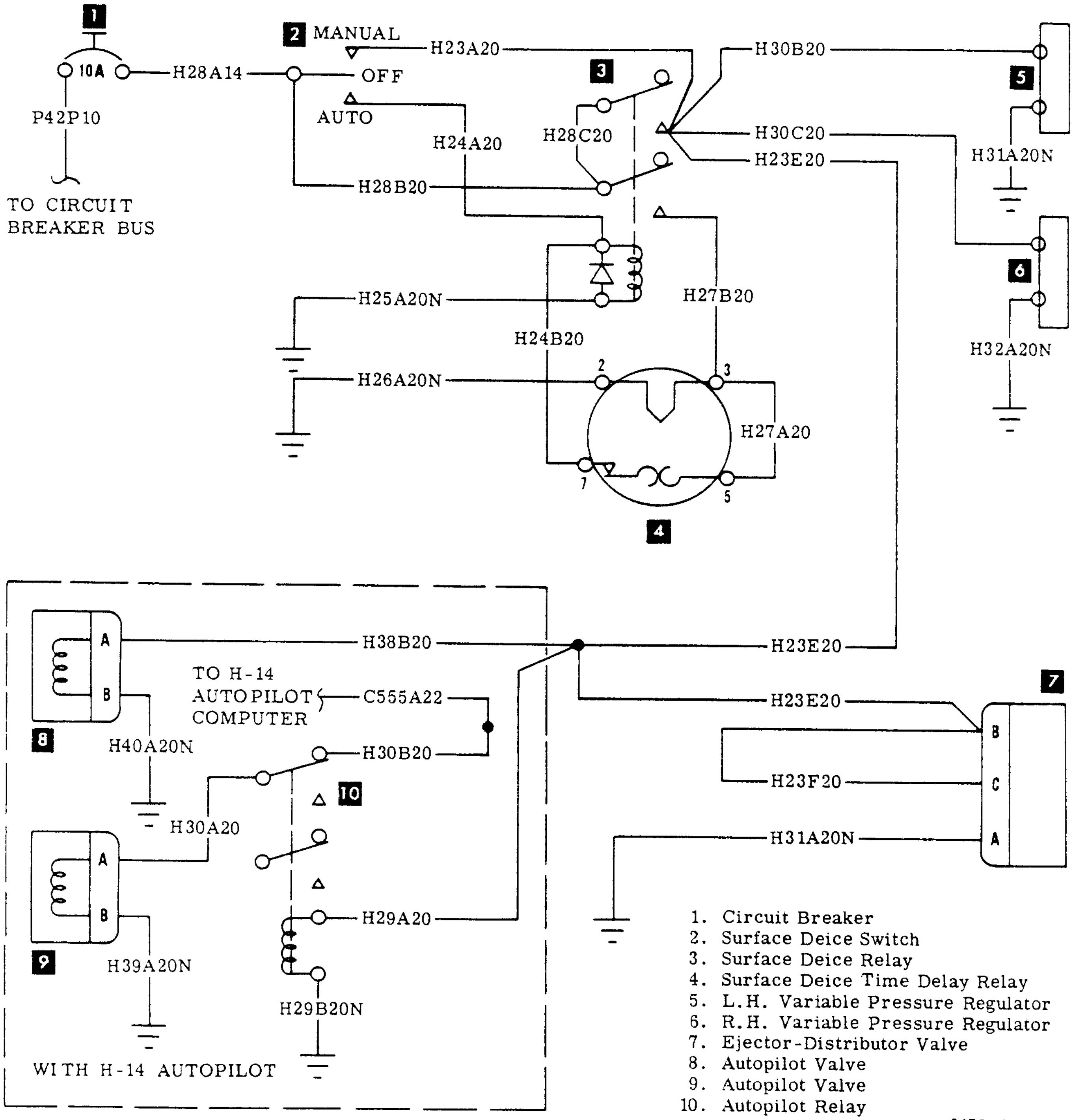
1. Pitch Trim Circuit Breaker
2. Control Column Coiled Cord
3. Trim Control Switch
4. Trim Actuator
5. Constant Speed Resistor (7.5Ω 10W)
6. Speed Control Resistor (50Ω 25W) (ADJ.)
7. Trim ON/OFF Switch
8. Bus

Figure 14-32. Pitch Trim (TG-84 and after)



1. Circuit Breaker
2. Surface Deice Switch
3. Surface Deice Relay
4. Surface Deice Time Delay Relay
5. R. H. Deice Valve
6. L. H. Deice Valve

Figure 14-33. Surface Deice (TG-1 thru TG-51



1. Circuit Breaker
2. Surface Deice Switch
3. Surface Deice Relay
4. Surface Deice Time Delay Relay
5. L.H. Variable Pressure Regulator
6. R.H. Variable Pressure Regulator
7. Ejector-Distributor Valve
8. Autopilot Valve
9. Autopilot Valve
10. Autopilot Relay

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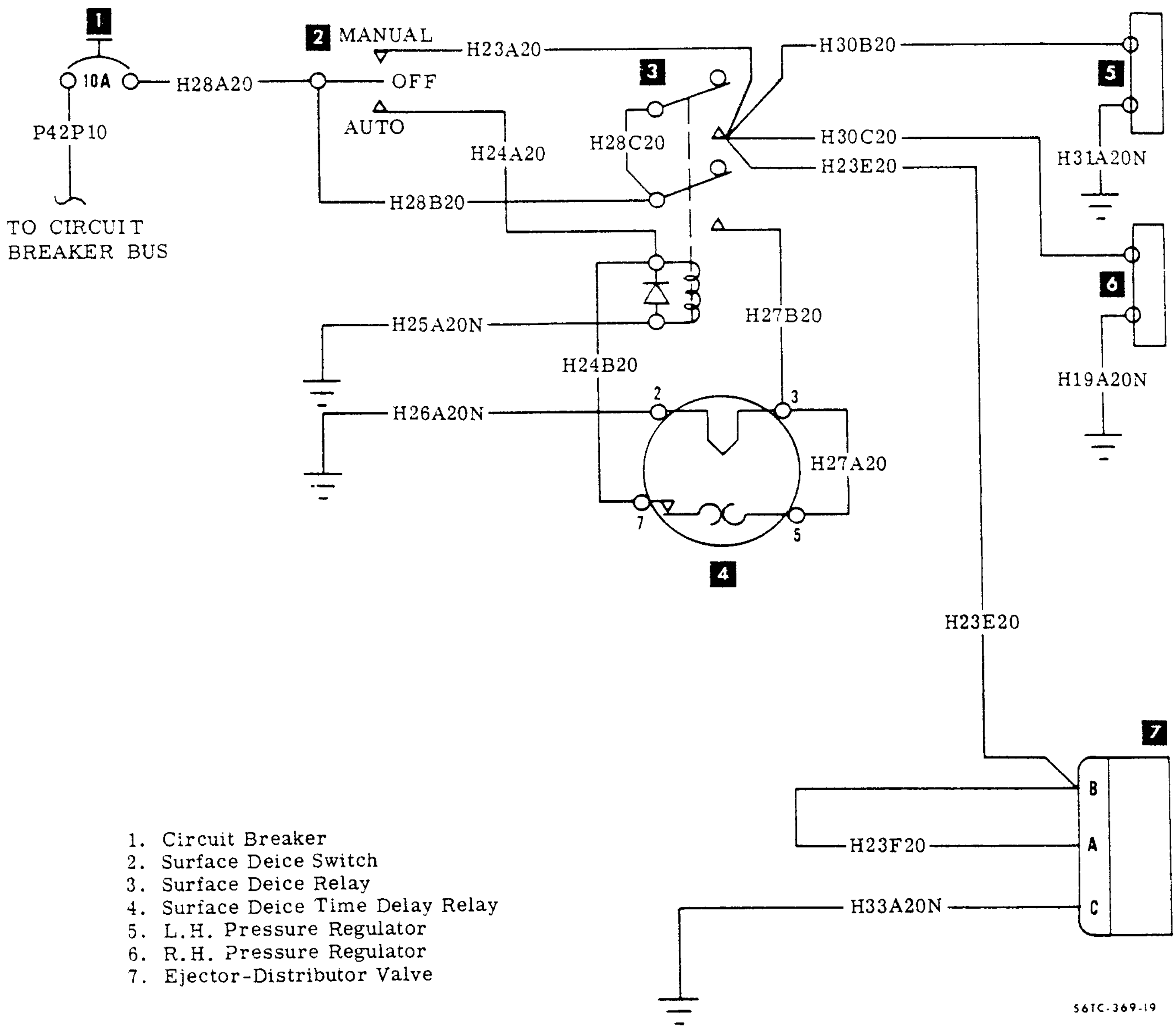
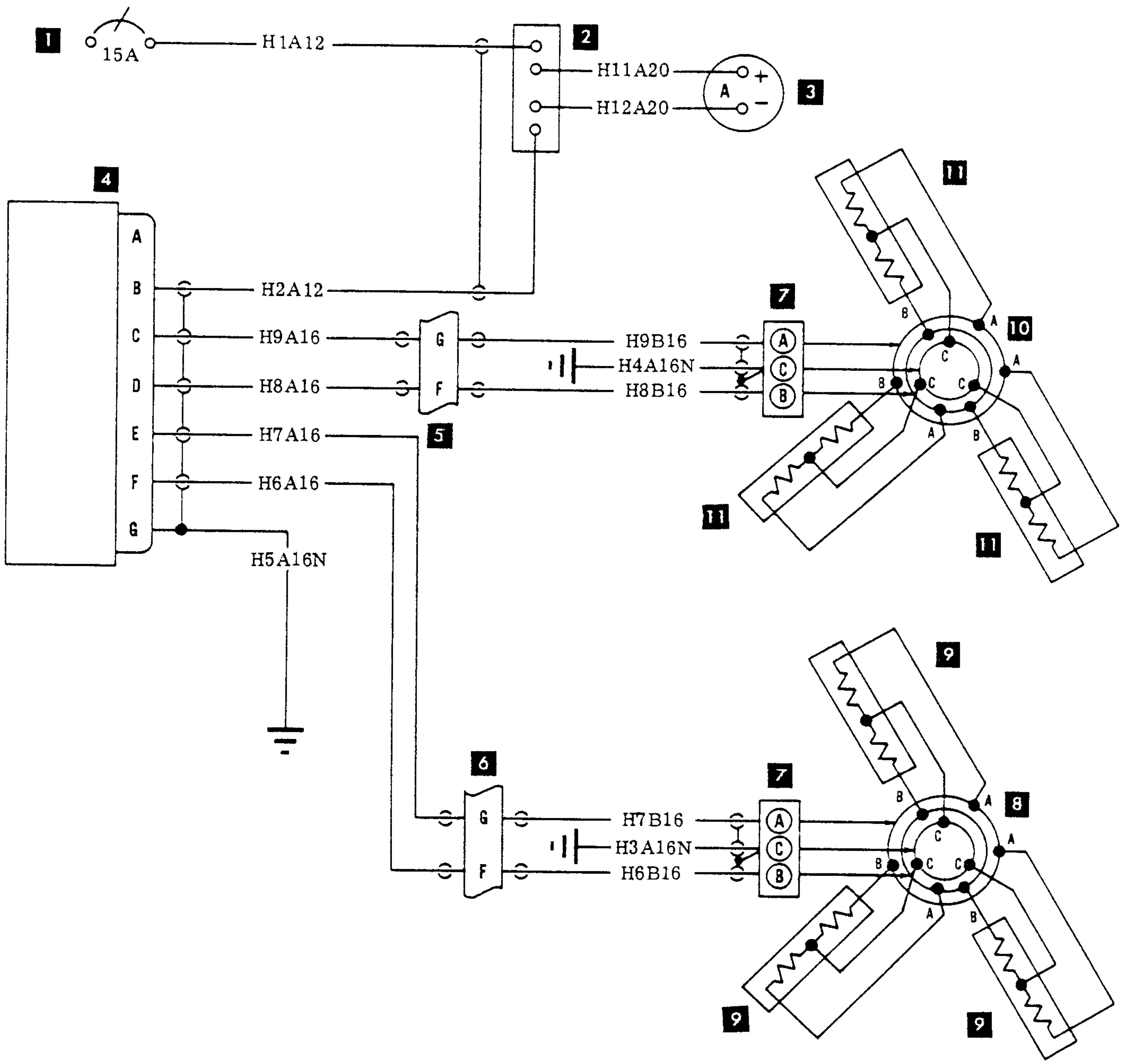
Figure 14-33. Surface Deice (TG-52 thru TG-83)



1. Circuit Breaker
2. Surface Deice Switch
3. Surface Deice Relay
4. Surface Deice Time Delay Relay
5. L.H. Pressure Regulator
6. R.H. Pressure Regulator
7. Ejector-Distributor Valve

Figure 14-33. Surface Deice (TG-84 and after)



1. Circuit Breaker
2. Shunt
3. Ammeter
4. Timer
5. R. H. Firewall Connector (Engine Accessories)
6. L. H. Firewall Connector (Engine Accessories)
7. Brush Block
8. L. H. Slip Ring
9. L. H. Propeller Deice Boot
10. R. H. Slip Ring
11. R. H. Propeller Deice Boot

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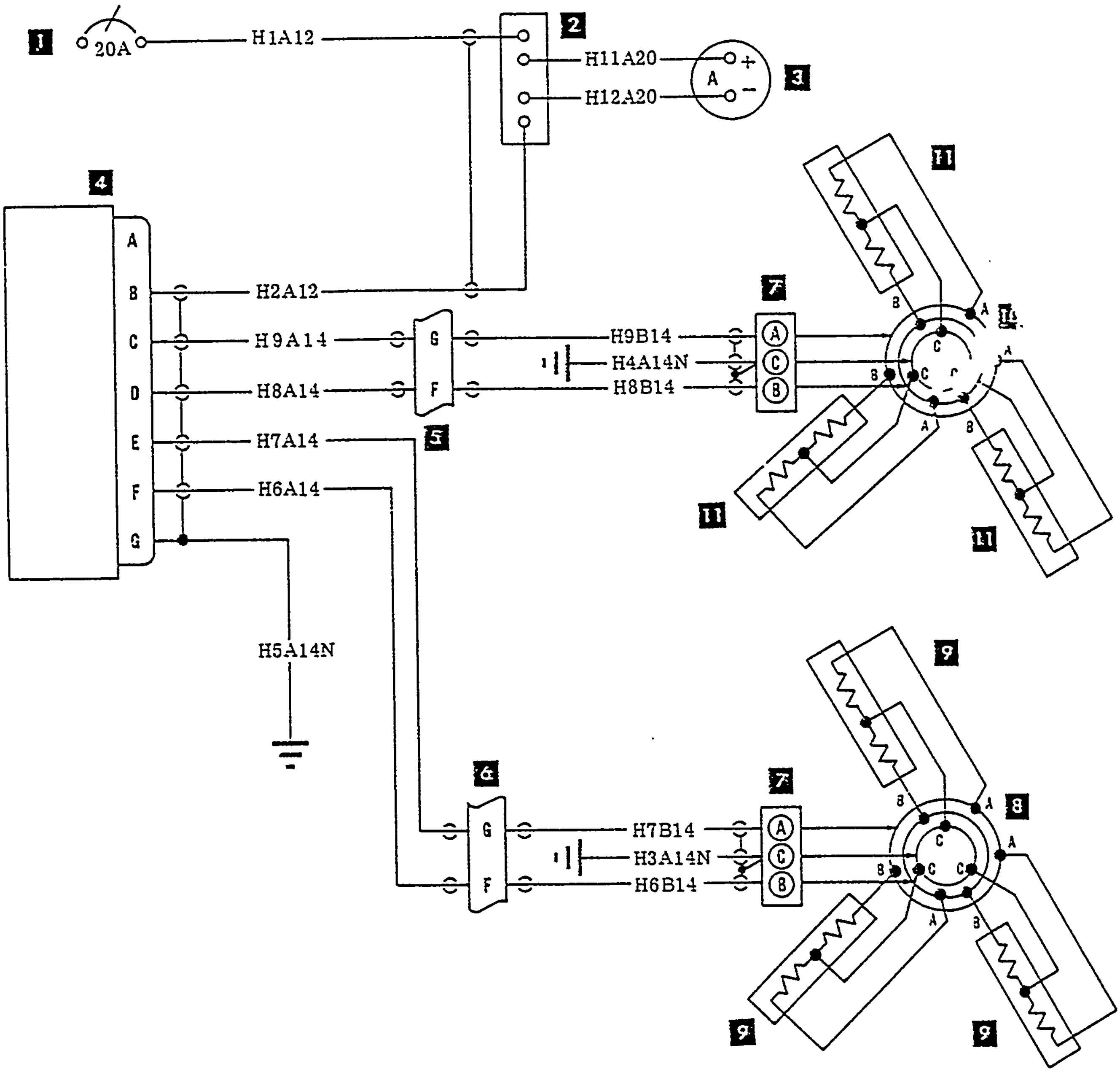
Figure 14-34. Propeller Deice (TG-1 thru TG-83)



1. Circuit Breaker
2. Shunt
3. Ammeter
4. Timer
5. R. H. Firewall Connector (Engine Accessories)
6. L. H. Firewall Connector (Engine Accessories)
7. Brush Block
8. L. H. Slip Ring
9. L. H. Propeller Deice Boot
10. R. H. Slip Ring
11. R. H. Propeller Deice Boot

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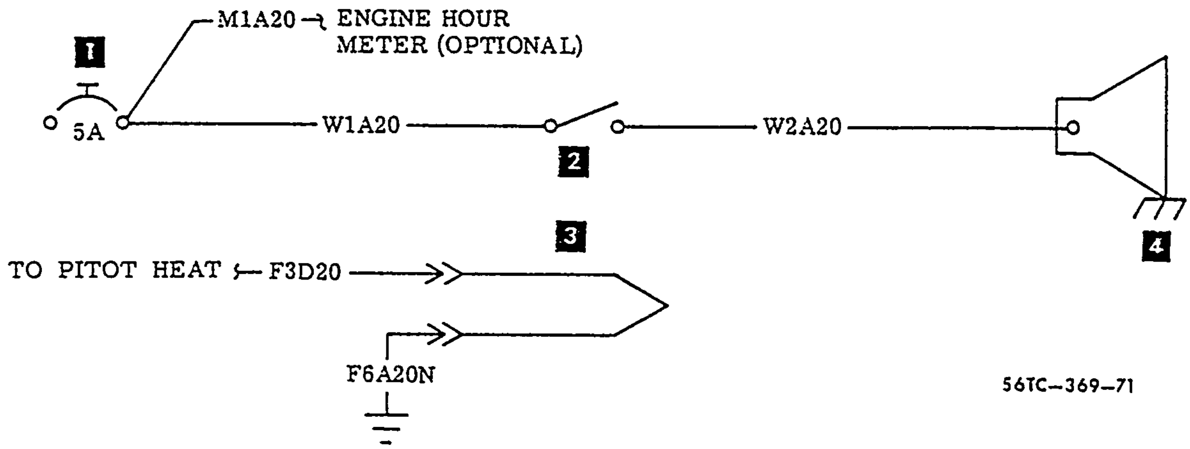
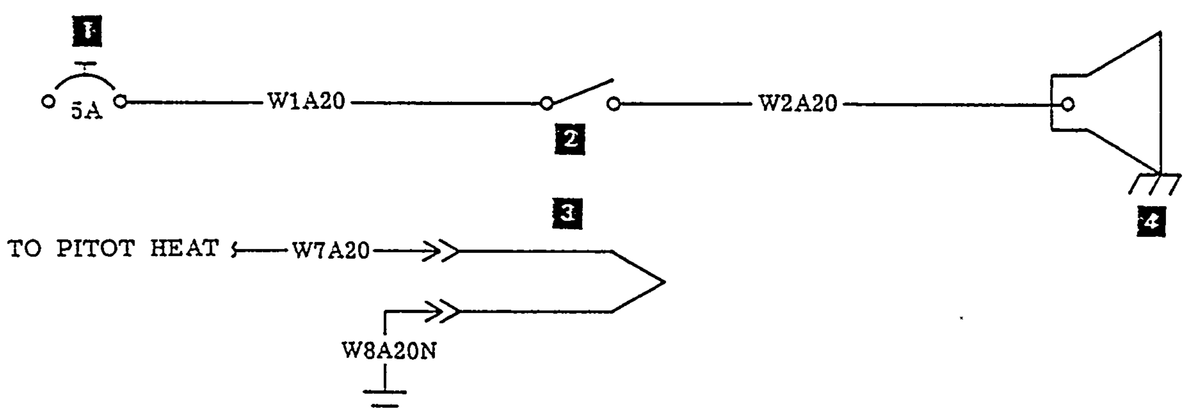
Figure 14-34. Propeller Deice (TG-84 and after)



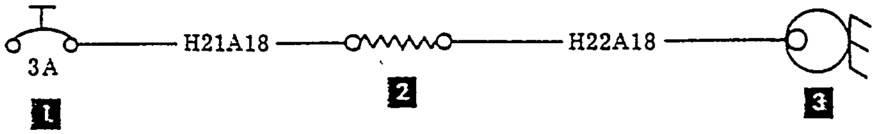
1. Circuit Breaker
2. Wing Detector Switch
3. Switch Heater
4. Stall Warning Horn

Figure 14-35. Stall Warning Horn (TG-1 thru TG-83)



1. Circuit Breaker
2. Wing Detector Switch
3. Switch Heater
4. Stall Warning Horn

Figure 14-35. Stall Warning Horn (TG-84 and after)



1. Circuit Breaker
2. Resistor (2 Ω 50W)
3. Cigarette Lighter

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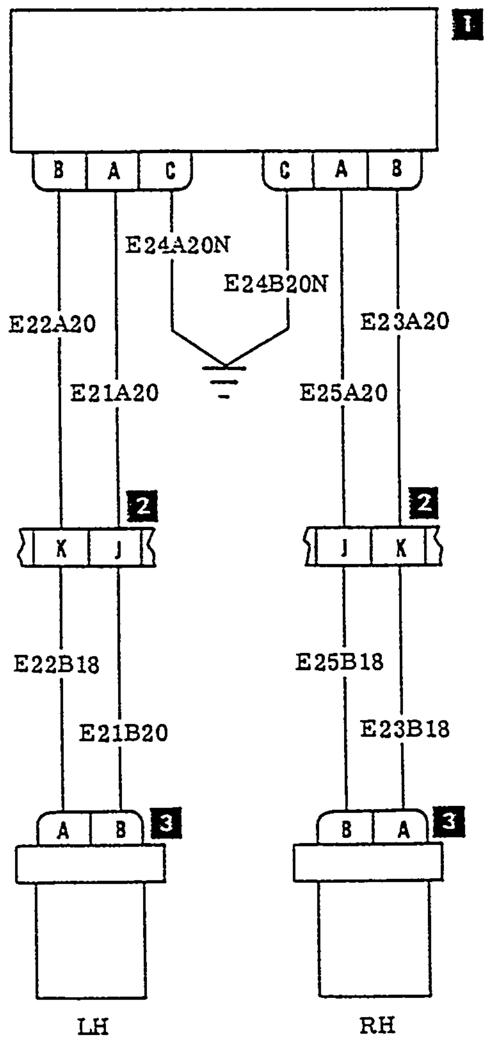
Figure 14-36. Cigarette Lighter



1. Tachometer
2. Firewall Connector (Engine Accessories)
3. Tachometer Generator

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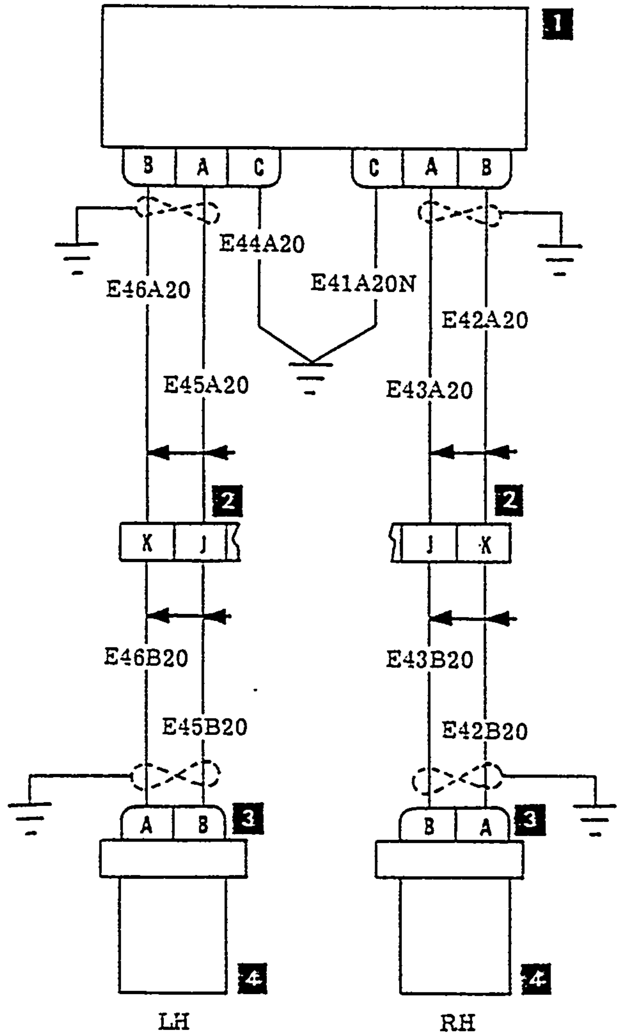
Figure 14-37. Tachometer (TG-1 thru TG-83)



1. Tachometer
2. Firewall Connector (Engine Accessories)
3. Tachometer Generator Connector
4. Tachometer Probe

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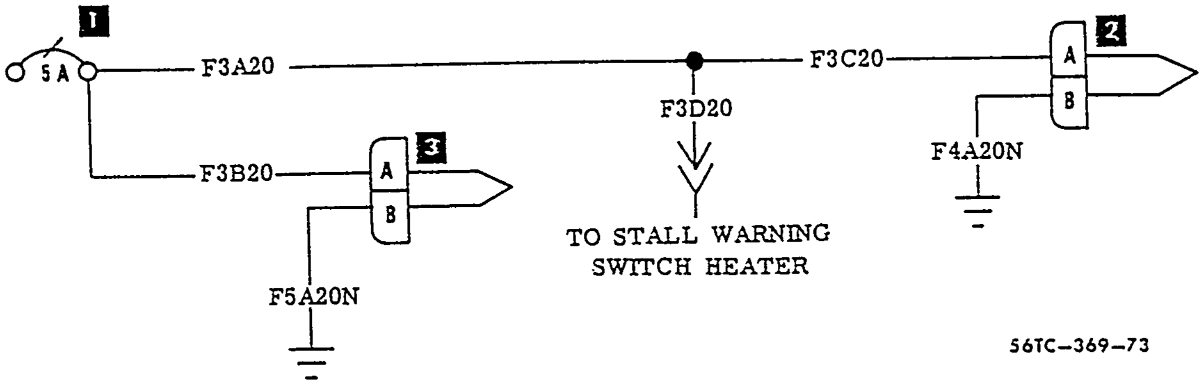
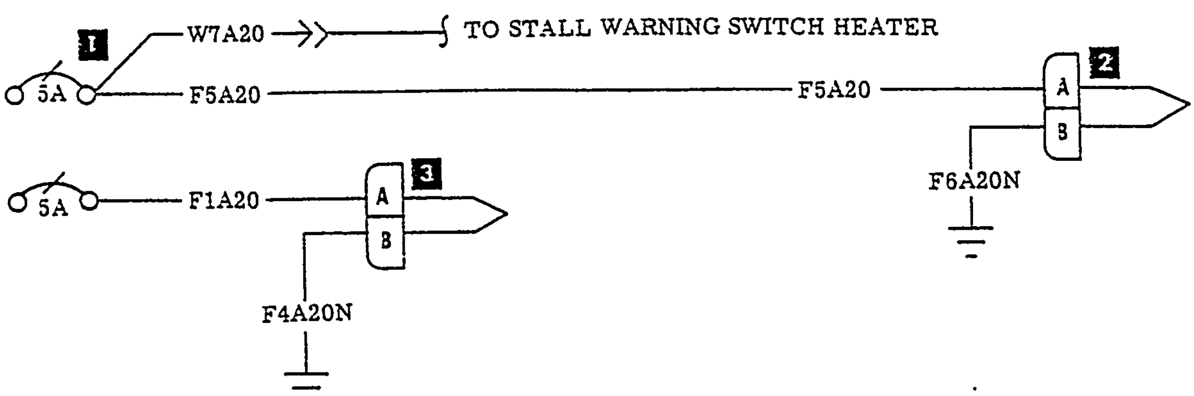
Figure 14-37. Tachometer (TG-84 and after)



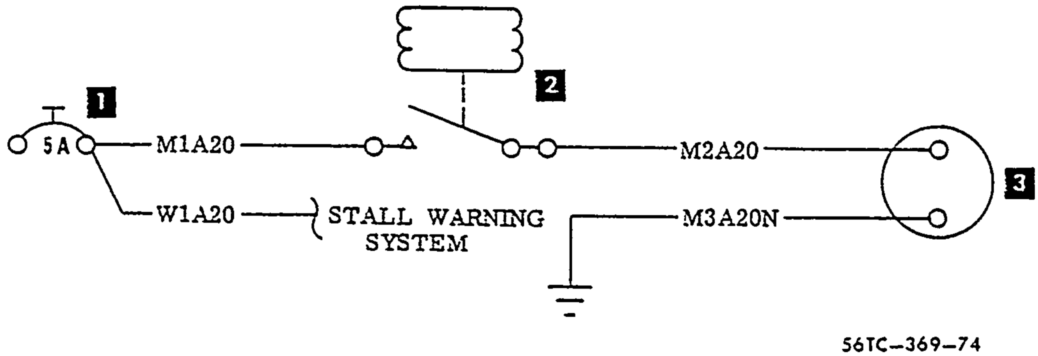
1. Circuit Breaker
2. L. H. Pitot Heater
3. R. H. Pitot Heater (Optional)

Figure 14-38. Pitot Heat (TG-1 thru TG-83)



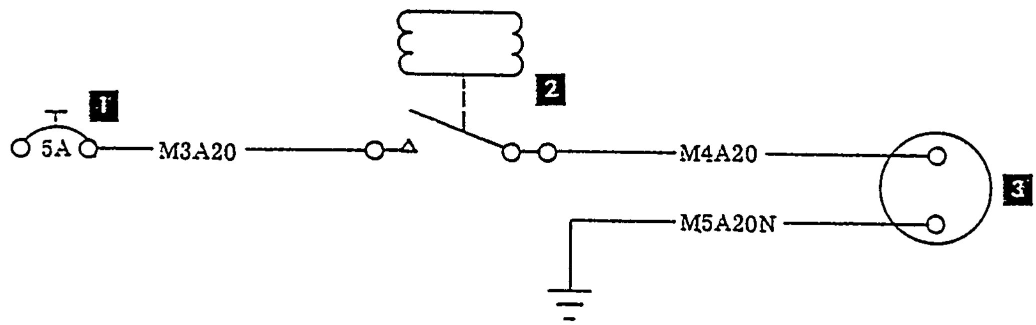
1. Circuit Breaker
2. L. H. Pitot Heater
3. R. H. Pitot Heater

Figure 14-38. Pitot Heat (TG-84 and after)



1. Circuit Breaker (Stall Warning)
2. Oil Pressure Switch
3. Engine Hour Meter

Figure 14-39. Engine Hour Meter (TG-1 thru TG-83)



1. Circuit Breaker (Stall Warning)
2. Oil Pressure Switch
3. Engine Hour Meter

Figure 14-39. Engine Hour Meter (TG-84 and after)

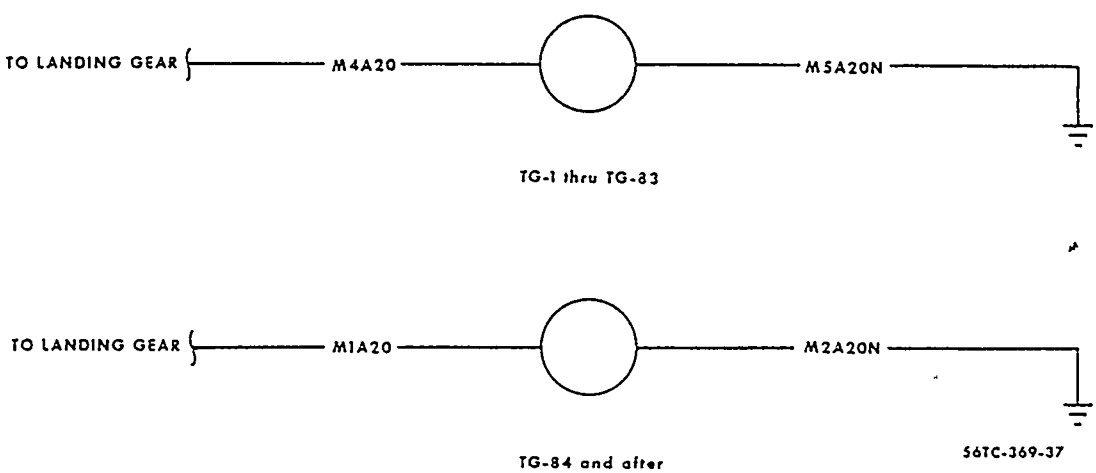
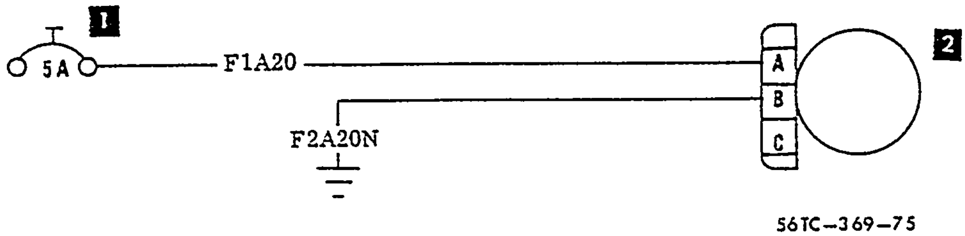
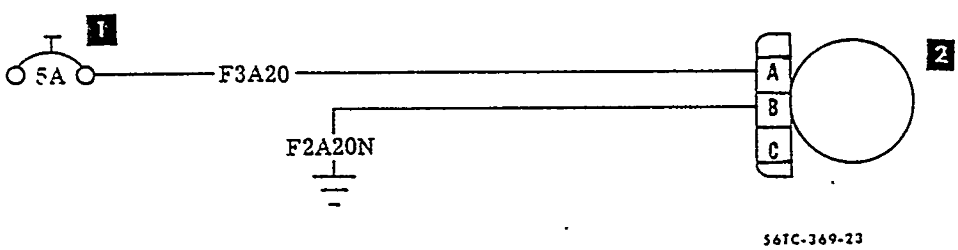


Figure 14-40. Flight Hour Meter (TG-84 and after)



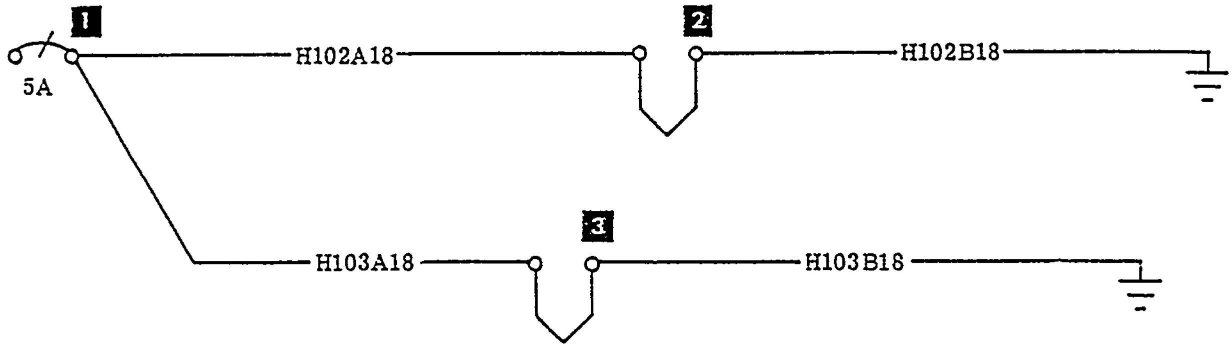
1. Circuit Breaker
2. Turn and Slip Indicator

Figure 14-41. Turn and Slip Indicator (TG-1 thru TG-83)



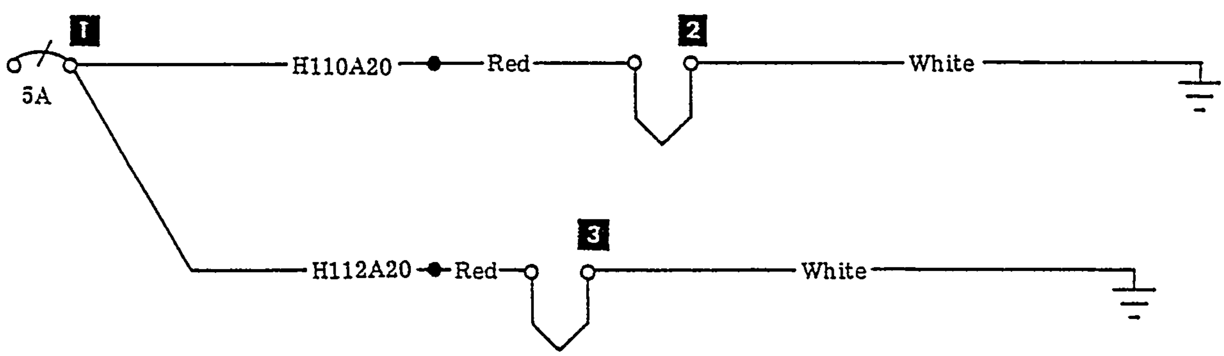
1. Circuit Breaker
2. Turn and Slip Indicator

Figure 14-41. Turn and Slip Indicator (TG-84 and after)



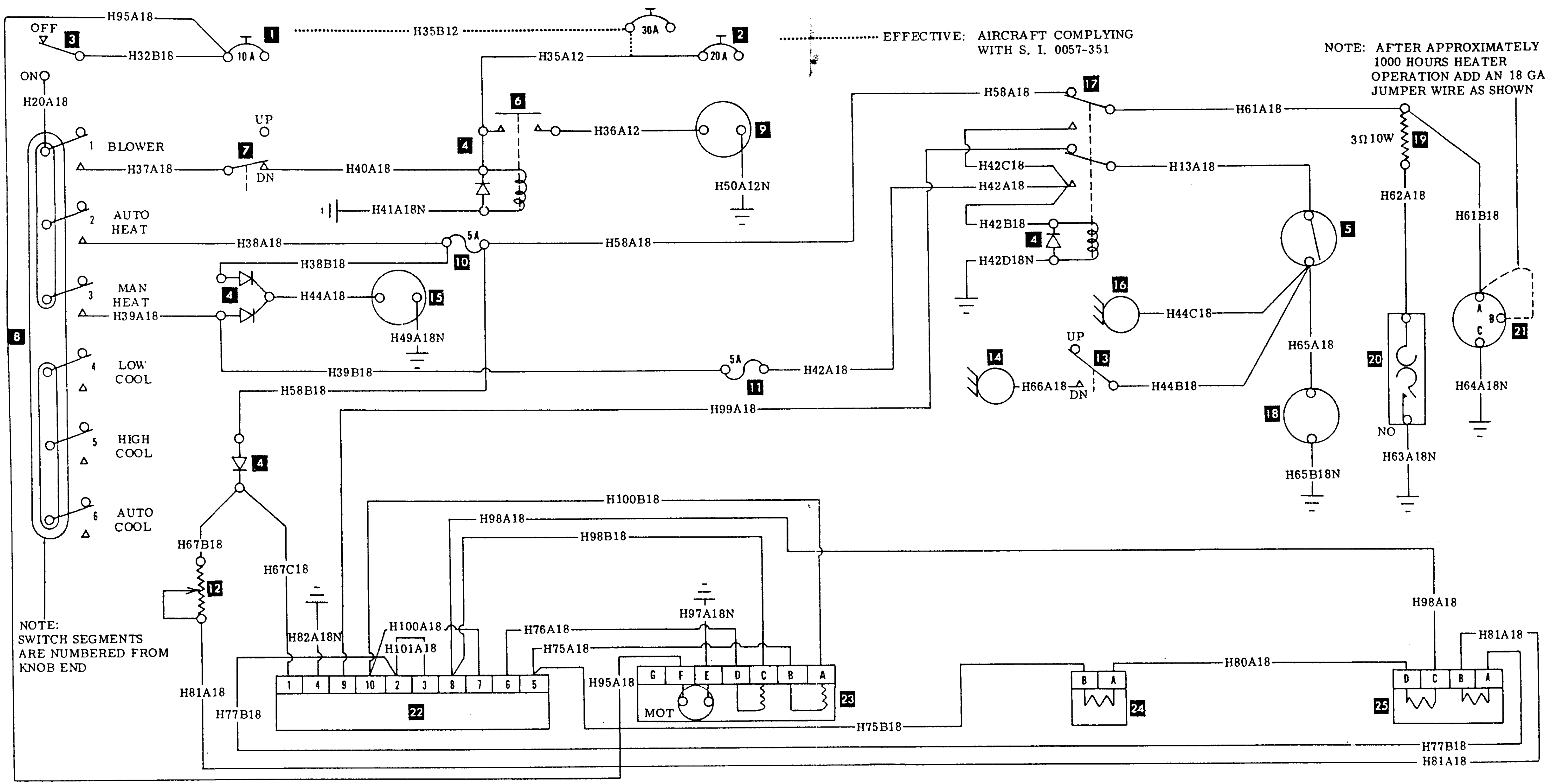
1. Circuit Breaker Switch
2. L. H. Fuel Vent Heater
3. R. H. Fuel Vent Heater

Figure 14-42. Heated Fuel Vent (TG-1 thru TG-83)



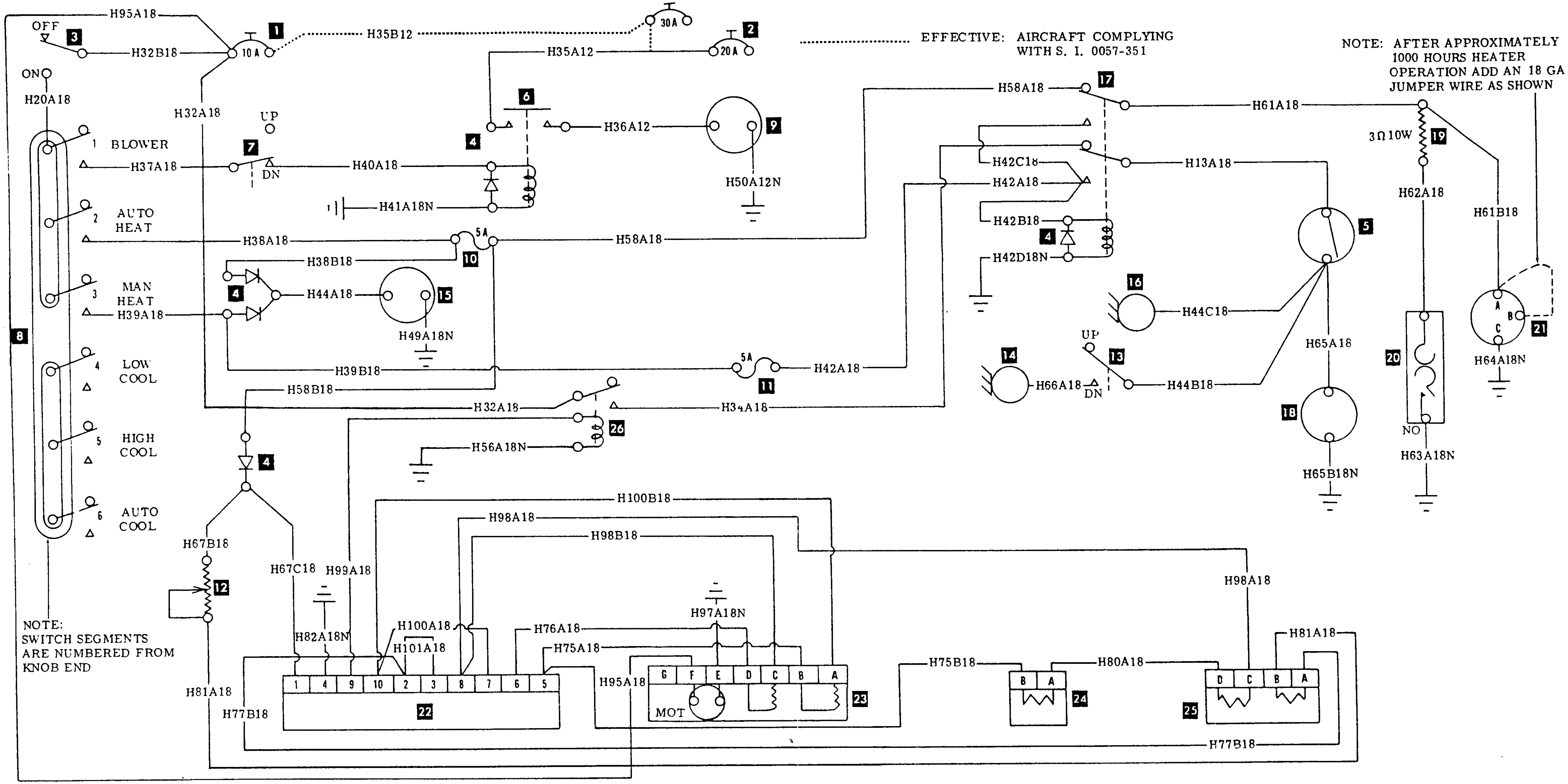
1. Circuit Breaker Switch
2. L. H. Fuel Vent Heater
3. R. H. Fuel Vent Heater

Figure 14-42. Heated Fuel Vent (TG-84 and after)



1. Cabin Temperature Control Circuit Breaker
2. Ventilation Blower Circuit Breaker
3. Air Valve Switch
4. Diode
5. Ductstat Heat Control
6. Ventilation Blower Relay
7. Landing Gear Down Limit Switch
8. Cabin Temperature Control Mode Select Switch
9. Ventilation Blower
10. Fuse (Automatic Heat)
11. Fuse (Manual Heat)
12. Temperature Control Rheostat
13. Landing Gear Up Limit Switch
14. Heater Fuel Pump
15. Combustion Blower
16. Heater Fuel Pump
17. Heater Mode Select Relay (Manual or Automatic)
18. Heater Solenoid Valve
19. Heater Resistor
20. Overtemperature Safety Switch
21. Heater Ignitor
22. Cabin Temperature Control Box
23. Cabin Air Temperature Sensor
24. Outside Air Temperature Sensor
25. Heater Discharge Temperature Sensor

Figure 14-43. Cabin Temperature Control (TG-1 thru TG-15, TG-19, TG-26, TG-27, TG-29 and TG-30)



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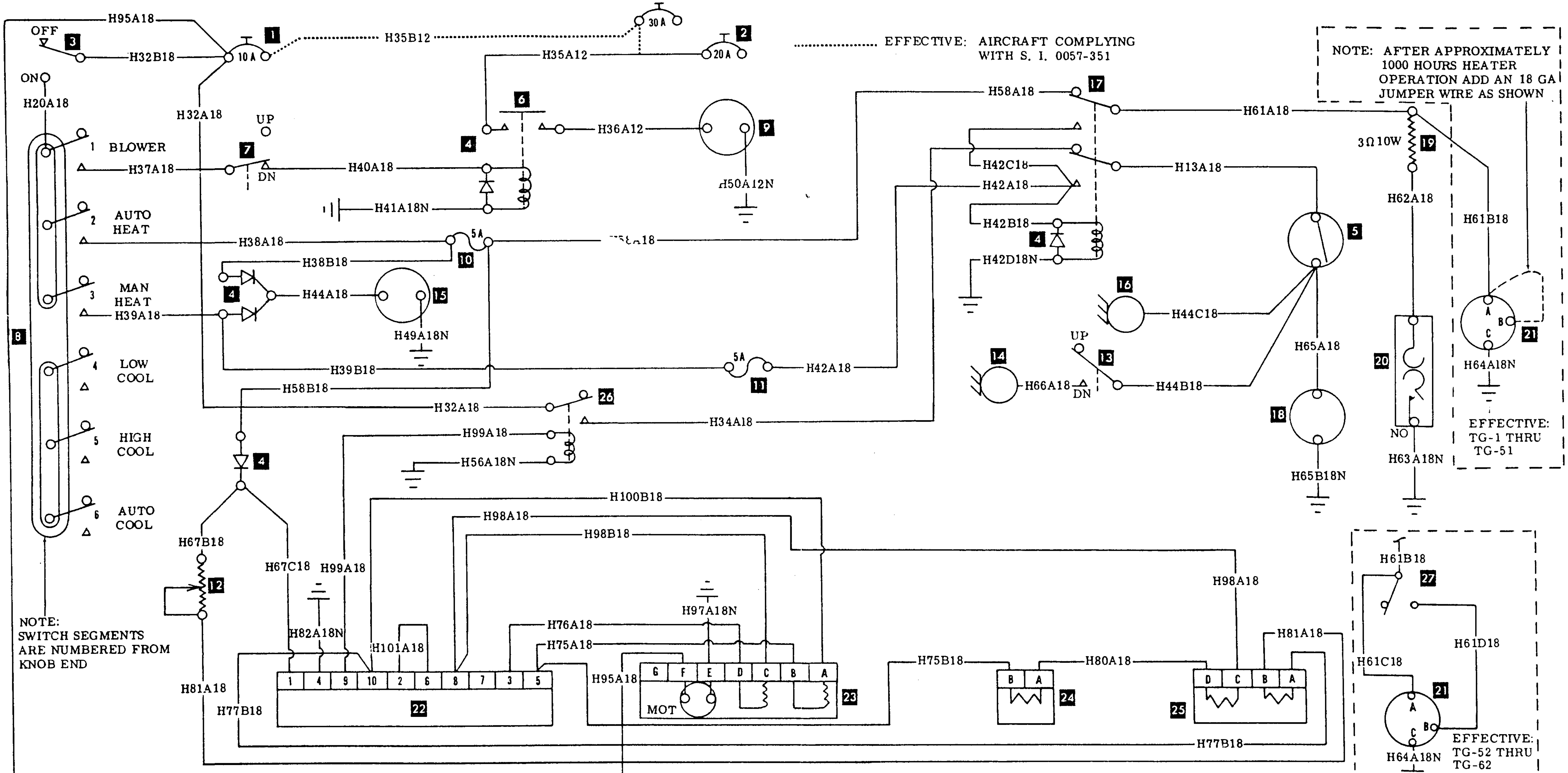
1. Cabin Temperature Control Circuit Breaker
2. Ventilation Blower Circuit Breaker
3. Air Valve Switch
4. Diode
5. Ductstat Heat Control
6. Ventilation Blower Relay
7. Landing Gear Down Limit Switch
8. Cabin Temperature Control Mode Select Switch
9. Ventilation Blower
10. Fuse (Automatic Heat)
11. Fuse (Manual Heat)
12. Temperature Control Rheostat
13. Landing Gear Up Limit Switch
14. Heater Fuel Pump
15. Combustion Blower
16. Heater Fuel Pump
17. Heater Mode Select Relay (Manual or Automatic)
18. Heater Solenoid Valve
19. Heater Resistor
20. Overtemperature Safety Switch
21. Heater Ignitor
22. Cabin Temperature Control Box
23. Cabin Air Temperature Sensor
24. Outside Air Temperature Sensor
25. Heater Discharge Temperature Sensor
26. Heater Control Relay

Figure 14-43. Cabin Temperature Control (TG-20, TG-22, TG-23, TG-25, TG-36, TG-37, TG-39 and TG-43)



1. Cabin Temperature Control Circuit Breaker
2. Ventilation Blower Circuit Breaker
3. Air Valve Switch
4. Diode
5. Ductstat Heat Control
6. Ventilation Blower Relay
7. Landing Gear Down Limit Switch
8. Cabin Temperature Control Mode Select Switch
9. Ventilation Blower
10. Fuse (Automatic Heat)
11. Fuse (Manual Heat)
12. Temperature Control Rheostat
13. Landing Gear Up Limit Switch
14. Heater Fuel Pump
15. Combustion Blower
16. Heater Fuel Pump
17. Heater Mode Select Relay (Manual or Automatic)
18. Heater Solenoid Valve
19. Heater Resistor
20. Overtemperature Safety Switch
21. Heater Ignitor
22. Cabin Temperature Control Box
23. Cabin Air Temperature Sensor
24. Outside Air Temperature Sensor
25. Heater Discharge Temperature Sensor
26. Heater Control Relay
27. Heater Ignitor Switch

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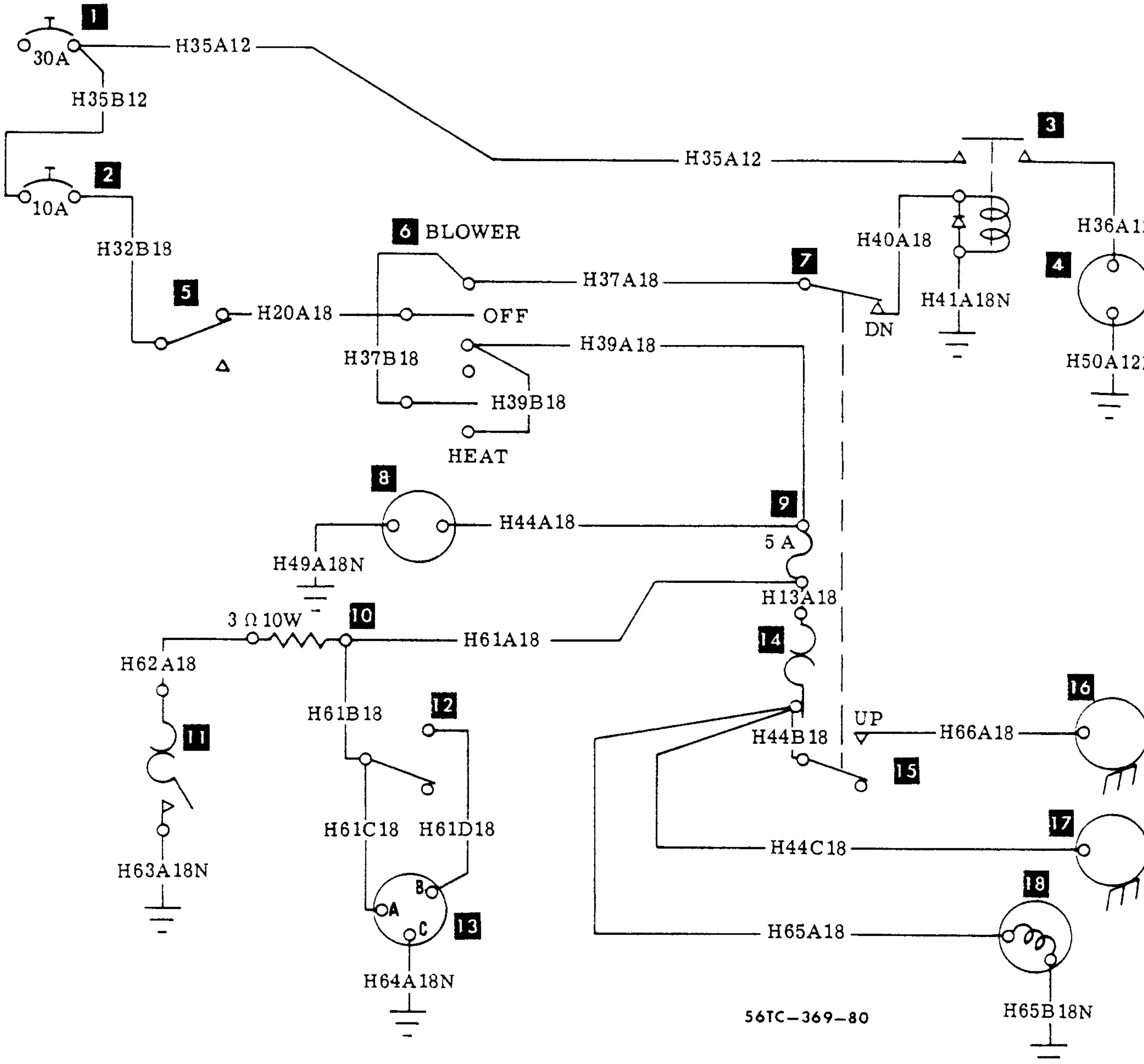
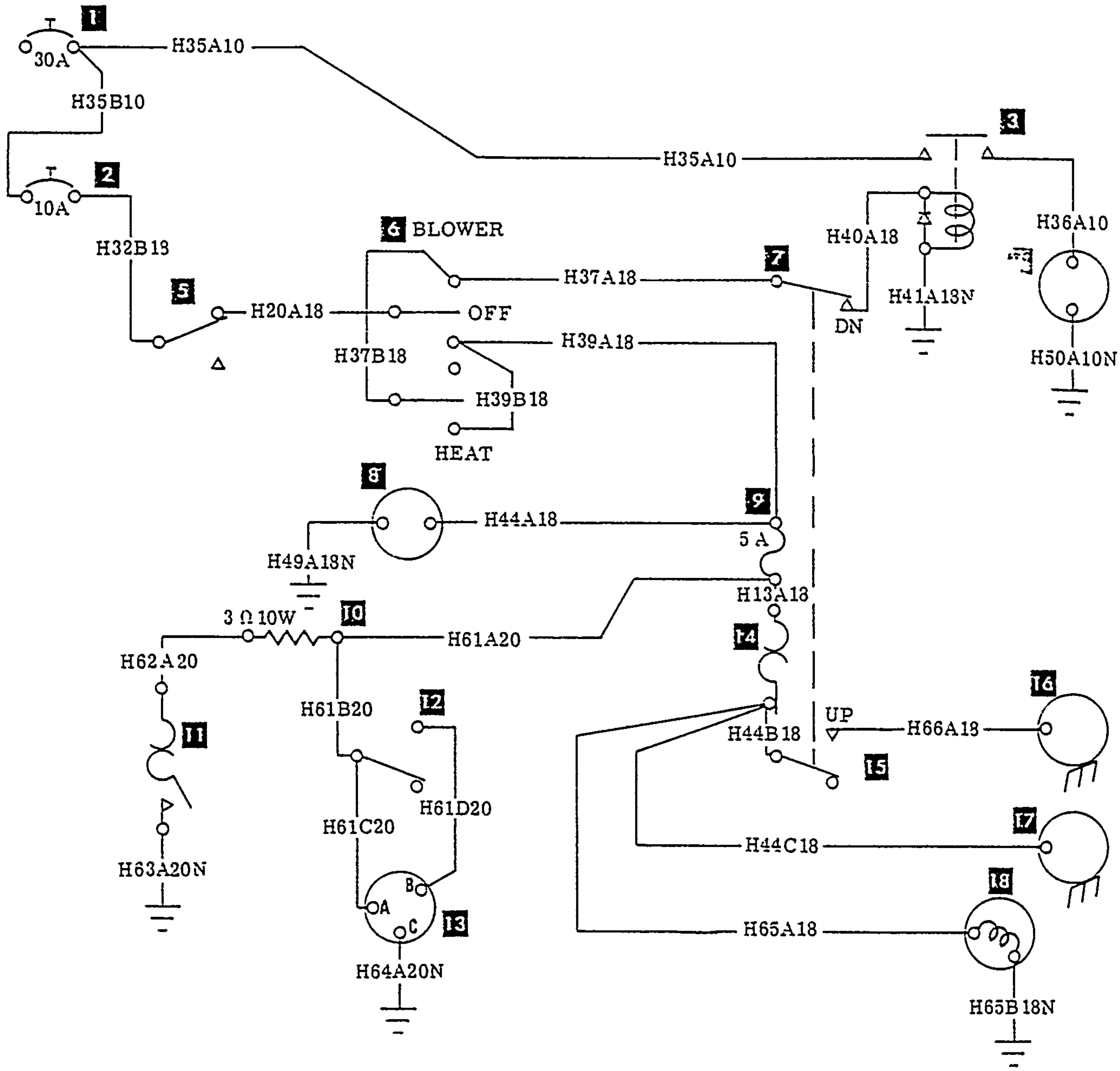
Figure 14-43. Cabin Temperature Control
TG-16, TG-17, TG-18, TG-21, TG-24, TG-28, TG-31 thru TG-35, TG-38, TG-40, TG-41, TG-42, TG-44 thru TG-62, and Aircraft Complying with S.I. 0033-411)



1. Ventilation Blower Circuit Breaker
2. Heater Control Circuit Breaker
3. Ventilation Blower Relay
4. Ventilation Blower
5. Air Valve Switch
6. Heater Switch
7. Landing Gear Down Limit Switch
8. Combustion Blower
9. Heater Fuse
10. Resistor
11. Overtemperature Safety Switch
12. Heater Ignitor Switch
13. Heater Ignitor
14. Ductstat Heat Control
15. Landing Gear Up Limit Switch
16. Heater Fuel Pump
17. Heater Fuel Pump
18. Heater Fuel Solenoid

Figure 14-43. Cabin Temperature Control (TG-63 thru TG-83)



1. Ventilation Blower Circuit Breaker	10. Resistor
2. Heater Control Circuit Breaker	11. Overtemperature Safety Switch
3. Ventilation Blower Relay	12. Heater Ignitor Switch
4. Ventilation Blower	13. Heater Ignitor
5. Air Valve Switch	14. Ductstat Heat Control
6. Heater Switch	15. Landing Gear Up Limit Switch
7. Landing Gear Down Limit Switch	16. Heater Fuel Pump
8. Combustion Blower	17. Heater Fuel Pump
9. Heater Fuse	18. Heater Fuel Solenoid

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Figure 14-43. Cabin Temperature Control (TG-84 and after)

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1. Cabin Temperature Control Circuit Breaker
2. Ventilation and Condenser Blower Circuit Breaker
3. Evaporator Blower Circuit Breaker
4. Air Valve Switch
5. Cabin Temperature Control Mode Select Switch
6. Landing Gear Down Limit Switch
7. Ventilation Blower Relay
8. Ventilation Blower
9. Evaporator Blower
10. Condenser Blower
11. Diode
12. Evaporator and Condenser Blower Relay
13. Nacelle Scoop Relay
14. Nacelle Scoop Retract Limit Switch
15. Nacelle Scoop Extend Limit Switch
16. Fuse (Automatic Heat Control)
17. Fuse (Manual Heat Control)
18. Heater Mode Select Relay (Manual or Automatic)
19. Heater Resistor
20. Overtemperature Safety Switch
21. Heater Ignitor
22. Heater Solenoid Valve
23. Heater Fuel Pump
24. Combustion Blower
25. Heater Fuel Pump
26. Ductstat Heat Control
27. Temperature Control Rheostat
28. Heater Air Conditioner Select Relay
29. Heater and Air Conditioner Cycle Relay
30. Hot Gas By Pass Solenoid Valve
31. Cabin Temperature Control Box
32. Cabin Air Temperature Sensor
33. Outside Air Temperature Sensor
34. Heater Discharge Temperature Sensor
35. Landing Gear Up Limit Switch
36. Nacelle Scoop Actuator
37. R.H. Firewall Connector (Accessories)
38. Magnetic Clutch
39. Landing Gear Safety Switch
40. Nacelle Scoop Actuator Relay
41. Evaporator Thermoswitch
42. Fuse (Air Conditioner Over Pressure)
43. Air Conditioner Over Pressure Resistor
44. Air Conditioner Over Pressure Switch
45. Heater Ignitor Point Selector Switch

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Figure 14-44. Cabin Temperature Control (Air Conditioner) (TG-74 thru TG-83)

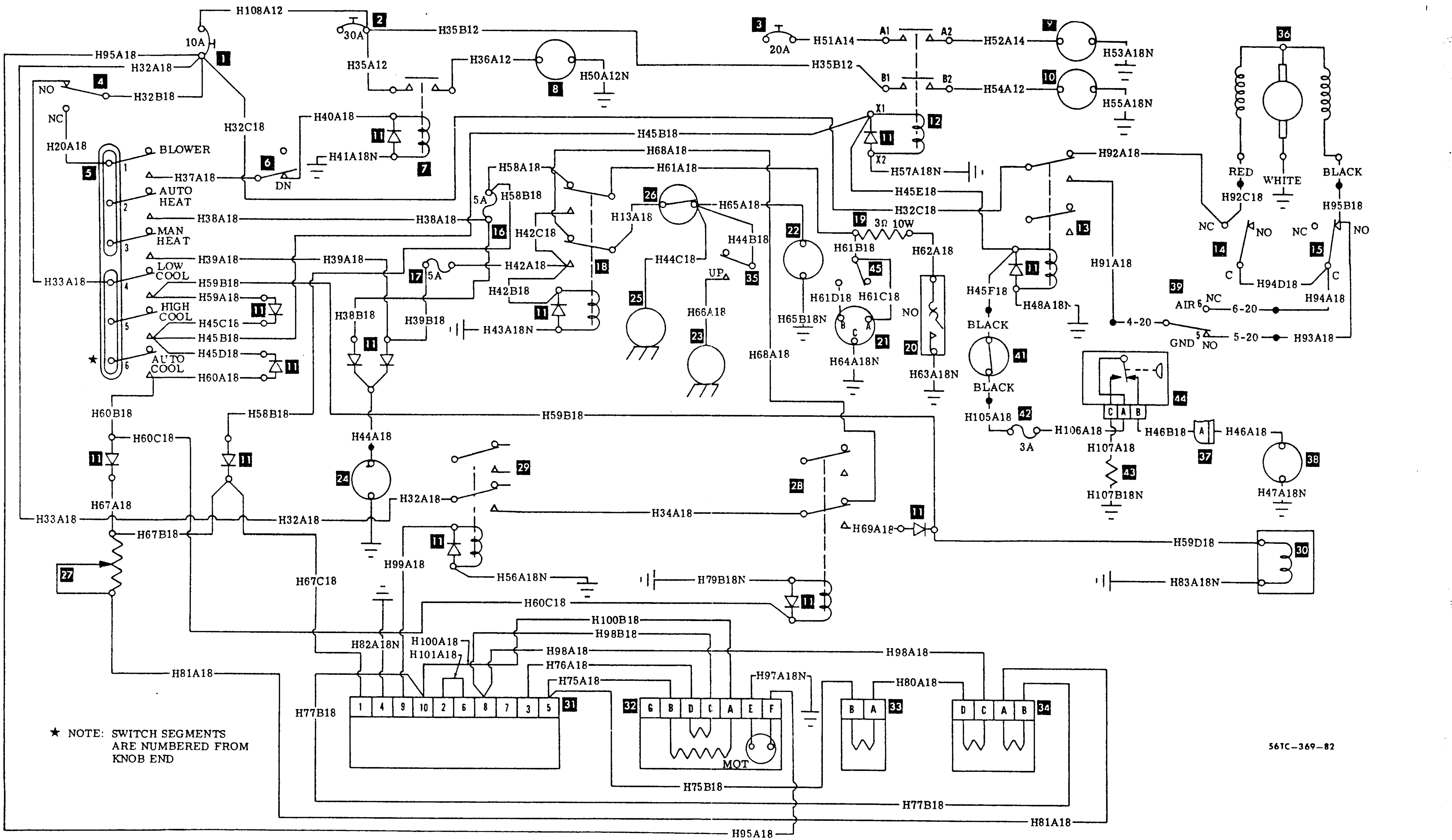

Figure 14-44. Cabin Temperature Control (Air Conditioner) (TG-74 thru TG-83)

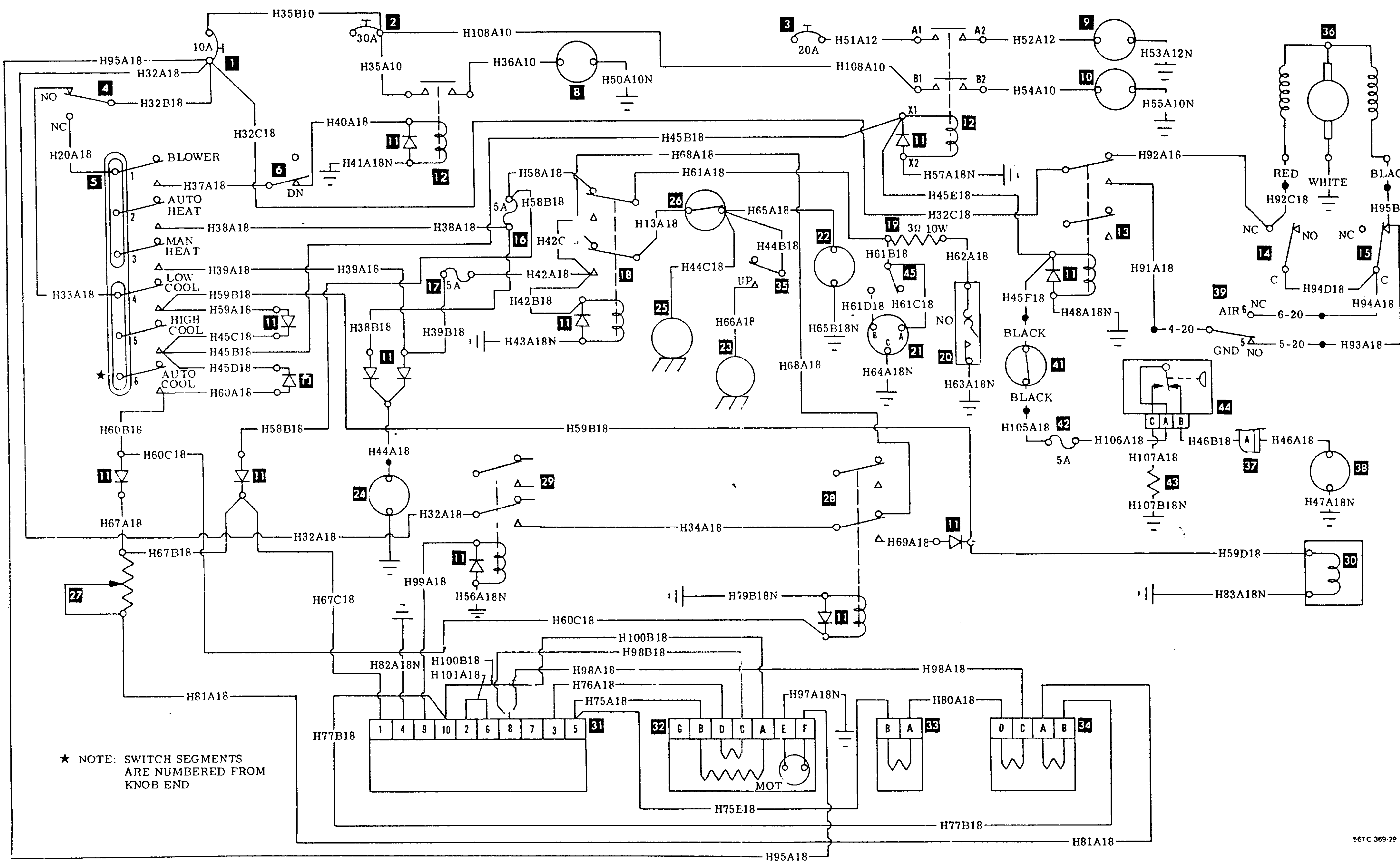

Figure 14-44. Cabin Temperature Control (Air Conditioner) (TG-84 and after)

1. Cabin Temperature Control Circuit Breaker
2. Ventilation and Condenser Blower Circuit Breaker
3. Evaporator Blower Circuit Breaker
4. Air Valve Switch
5. Cabin Temperature Control Mode Select Switch
6. Landing Gear Down Limit Switch
7. Ventilation Blower Relay
8. Ventilation Blower
9. Evaporator Blower
10. Condenser Blower
11. Diode
12. Evaporator and Condenser Blower Relay
13. Nacelle Scoop Relay
14. Nacelle Scoop Retract Limit Switch
15. Nacelle Scoop Extend Limit Switch
16. Fuse (Automatic Heat Control)
17. Fuse (Manual Heat Control)
18. Heater Mode Select Relay (Manual or Automatic)
19. Heater Resistor
20. Overtemperature Safety Switch
21. Heater Ignitor
22. Heater Solenoid Valve
23. Heater Fuel Pump
24. Combustion Blower
25. Heater Fuel Pump
26. Ductstat Heat Control
27. Temperature Control Rheostat
28. Heater Air Conditioner Select Relay
29. Heater and Air Conditioner Cycle Relay
30. Hot Gas By Pass Solenoid Valve
31. Cabin Temperature Control Box
32. Cabin Air Temperature Sensor
33. Outside Air Temperature Sensor
34. Heater Discharge Temperature Sensor
35. Landing Gear Up Limit Switch
36. Nacelle Scoop Actuator
37. R. H. Firewall Connector (Accessories)
38. Magnetic Clutch
39. Landing Gear Safety Switch
40. Nacelle Scoop Actuator Relay
41. Evaporator Thermoswitch
42. Fuse (Air Conditioner Over Pressure)
43. Air Conditioner Over Pressure Resistor
44. Air Conditioner Over Pressure Switch
45. Heater Ignitor Point Selector Switch

Figure 14-44. Cabin Temperature Control (Air Conditioner) (TG-84 and after)

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 shop manual 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.

Manual Affected: BEECHCRAFT Turbo-Baron Shop Manual (96-590003-5B)

Instructions: Insert this page facing page 15-2 (B2) of Section 15.

Reason: Revise text under OVERHAUL AND REPLACEMENT SCHEDULE

OVERHAUL AND REPLACEMENT SCHEDULE

ITEM	OVERHAUL OR REPLACE
LANDING GEAR	
Main Gear	On condition (Leaking or collapsed struts that cannot be corrected by seal replacement will constitute the "On condition" requirement. Any pitting, corrosion, cracking, distortion or visible wear noted during the seal replacement will also constitute the requirement for an overhaul.)
Nose Gear	On condition (Leaking or collapsed struts that cannot be corrected by seal replacement will constitute the "On condition" requirement. Any pitting, corrosion, cracking, distortion or visible wear noted during the seal replacement will also constitute the requirement for an overhaul.)
Actuator Assembly	Gray and green colored actuators every 2,000 hours. White colored actuators every 4,000 hours.

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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	Every 500 hours or on condition
Shimmy dampener	Every 2000 hours or 3 years
Wheels and tires	On condition
Brake assembly	On condition
Brake lining	On condition
Master cylinder	On condition
Shuttle valve assembly	On condition
Parking brake valve	On condition
All hose	On condition
POWER PLANT	
Engine	Every 1200 hours, maximum 1600 hours per Lycoming Service Bulletin No. 1009W
Engine controls	On condition
Engine vibration isolator mounts	On condition
Exhaust system	On condition
Starter	Inspect at engine overhaul and overhaul or replace on condition
Generator or Alternator	On condition
Oil cooler	On condition (replace when contaminated)
Propeller	Every 1000 hours, not to exceed 2 years or maximum of 1500 hours or 4 years per Hartzell Service Letter No. 61D
Propeller controls	On condition
Propeller governor	At engine overhaul but not to exceed 1600 hours
Vacuum pumps	1000 hours
Turbocharger assembly	Overhaul or replace every 800 hours.

NOTE: Please see the ***TEMPORARY REVISION*** *that revises this page.*

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
Nacelle fuel quantity transmitter	On condition
Wing fuel quantity transmitter	On condition
Fuel cell drain valve	On condition
Fuel system check valves	On condition
Fuel selector valve	Inspect every 500 hours Overhaul every 1000 hours
Fuel pump, engine-driven	Every 1600 hours
Fuel boost pump	Overhaul 800 hours
Hose carrying flammable liquids	When condition warrants, at engine overhaul or 5 years from date of delivery, whichever occurs first
All other hoses	On condition
Float valve	On condition
INSTRUMENTS	
Turn and bank 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
Airspeed indicator	On condition
Rate-of-climb	On condition
Fuel pressure gage	On condition
Fuel flow gage	On condition
Tachometer	On condition

ITEM	OVERHAUL OR REPLACE
INSTRUMENTS (CONT'D)	
Flap position indicator	On condition
Free air temperature indicator	On condition
All hose	On condition
Central air filter (TG-1 through TG-51)	500 hours
Gyro instrument air filter (TG-52 and after)	300 hours
Air pump inlet filter (TG-52 and after)	On condition
ELECTRICAL SYSTEM	
Landing Gear Selector Switch	Replace - 1200 hours
Landing gear dynamic brake relay	On condition
Battery master relay	On condition
Paralleling relay	On condition
All other relays	On condition
Voltage regulators	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 SYSTEMS	
H-14 Autopilot servo air filter	Replace every 1000 hours
Cabin heater	Pressure test every 500 hours of heater operation or every 1000 hours of airplane operation and overhaul every 3000 hours
Heater ignition vibrator	Switch points every 1000 hours of heater operation and replace every 2000 hours of heater operation
Heater igniter and plug	On condition
Heater fuel pump	On condition
Heater fuel shutoff valve	On condition

ITEM	OVERHAUL OR REPLACE
UTILITY SYSTEMS (CONT'D)	
Combustion blower	On condition
Combustion blower brushes	500 hours
Vent blower	On condition
Vent blower brushes	500 hours
Condenser blower	On condition
Condenser blower brushes	500 hours
Evaporator blower	On condition
Evaporator blower brushes	500 hours
Oxygen regulator	Every 2000 hours or 48 months
Oxygen cylinder	Hydrostatically test every 3 years, replace every 12 years or 4,380 refills (ICC Regulation)
MISCELLANEOUS	
Wing bolts	Replace 10 years after the initial inspection or when condition warrants (See Section 3 for inspection criterion)

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 the 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.

Inspection forms are available under Part Number 118662E or subsequent revision.

Correct servicing and inspection will prolong the life of the aircraft. Careful, regular inspections will not only assure that servicing has been done correctly, but will disclose minor troubles so they can be corrected before they become malfunctions. The 50 and 100 hour inspections in this section have been provided to aid in inspecting and servicing the Turbo-Baron.

CAUTION

After the first twenty-five hours of engine operating time, a new, remanufactured or newly overhauled engine should be given the 50 hour inspection including draining and renewing lubricating oil, and removal of the turbocharger oil strainer.

50 HOUR INSPECTION

POWER PLANT

a. Check spark plug elbows and shielding nuts for security.

b. Check cylinders for evidence of burned paint.

c. Check intake and exhaust systems for leaks and security.

d. Check baffles for security, holes, cracks, bending, and close fit around cylinders.

e. Check controls for sufficient travel, freedom of movement, security and adequate lubrication.

f. Inspect and service the engine induction air filter.

g. Drain and clean fuel inlet strainer.

h. Remove and clean fuel injector fuel strainer.

NOTE

Steps "g" and "h" are most essential to insure proper operation of the fuel injection system. Failure to comply may cause irrepairable damage to the system.

i. Remove and clean suction and pressure oil strainers.

j. Remove and replace element in full flow oil filter.

k. Inspect mounting and connections of turbocharger for security, lubricant leakage, or air leakage.

l. Operate the engine under a load, and listen for unusual turbocharger noise. If a shrill whine (over and above normal turbine whine) is heard, shut the engine down immediately. This may indicate turbocharger bearing failure. Other unusual noises may result from improper clearance between the turbine wheel and turbine housing. If such noises are heard, the turbocharger must be removed from the engine and sent to the nearest Approved Overhaul Station for repair.

m. Check the turbocharger for unusual vibrations while operating the engine under a load. If excessive vibration is evident, remove the turbocharger and send it to the nearest Approved Overhaul Station for repair.

n. Check oil lines for leaks, particularly at the connections, for security of attachment, wear due to rubbing or vibration, dents and cracks.

o. Check pulley belts for good condition and tension.

AIRFRAME

a. Check fairings, panels and doors for security and damage.

b. Check wings, fuselage and control surfaces for damage.

c. Check windshield for cleanliness.

d. Check battery terminals and vent hoses for security and obstructions.

e. Check airframe skin for damage.

f. Trim tabs faired with control surfaces with flight and trim tab controls in neutral.

g. Check all doors and inspection openings for security.

h. Check static air buttons for obstructions.

i. Check pitot tube for obstructions.

j. Check heat and air vent for obstructions.

LANDING GEAR

a. Check shock struts and tires for cleanliness and proper inflation.

b. Check landing gear safety switch for security and damage.

c. Check wheel well plumbing, doors, and electrical wiring for security and damage.

d. Check uplock roller bearing for sufficient lubrication.

CABIN

a. Flight control surfaces (including trim tabs). Freedom and correct response to the movement of the controls.

b. Readings of fuel quantity gages correspond to known contents of the tanks.

c. Fuel selector valves and fuel booster pumps operate correctly by assuring that no pressure is indicated with pumps ON and valves OFF; and that proper pressure is indicated when valves are operated with pumps ON.

d. Cockpit lights, navigation lights, landing lights, instrument lights all work properly.

e. Engine controls operate freely and are in good condition.

f. Directional gyro's caging mechanism works properly.

g. Pitot heater operates (note temperature rise of pitot head).

h. Check static rpm with propeller in high rpm, mixture in "FULL RICH" position.

i. Check propeller governor to operate at predetermined rpm settings.

j. All seat belts are properly secured and the buckles work correctly.

k. Check magnetos for normal drop-off.

l. Check idle speed adjustment.

m. Check mixture adjustment for best power setting.

ELECTRIC PROPELLER DEICER

a. Lock the brakes and operate the engines at near take-off power. Turn the deicer system ON and observe the ammeter for at least 2 minutes. If the ammeter needle does not rest within the shaded band, except for a flicker at 30 second intervals when the step switch of the timer cycles, refer to the troubleshooting chart for the probable sources of trouble.

b. With the engine shut-off, turn the deicer switch ON and feel the deicer boots on the propellers for proper heat sequence. The presence of local hot spots indicates service damage to the deicer heating elements, which should be repaired before more serious damage develops.

c. Remove the spinner dome and open all access doors pertaining to the wiring and components of the deicer system. Turn the deicer switch ON and station an assistant in the cockpit to observe the system ammeter. Flex all accessible wiring, particularly the lead straps, leads from the slip ring and the firewall electrical connectors and their wiring. Any movement of the ammeter, other than the cycling flicker that occurs at 30 second intervals, indicates a short or open circuit that must be located and corrected.

d. To extend the life of the lead strap between the hub clamp and clip, reposition the bend in the strap at a point at least 1/2 inch from the existing location of the bend.

e. Check for damaged springs and worn or damaged brushes.

100 HOUR INSPECTION

In addition to the 50 Hour Inspection, a more intesive check should be made at this time; add the following items:

OPERATIONAL INSPECTION

a. Engine Controls operate freely.

b. Correct boost pump fuel pressure setting.

c. Correct oil pressure and temperature setting.

d. Correct fuel pressure reading.

e. All lights work properly.

f. Fuel quantity gages read correctly.

g. Fuel tank selectors work properly.

h. Heat and ventilating system operating correctly.

i. Vacuum system functions properly.

j. Generator or alternator has sufficient output with all systems "ON".

k. Propeller governor operates correctly.

l. Magneto "drop-off" within limitations.

m. Correct rpm setting on "IDLE" control.

n. Cylinder head temperature reads normal.

o. "IDLE CUT-OFF" and "MIXTURE" operating smoothly and correctly.

p. 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.

q. Check starter brushes and electrical connections.

r. Wing flaps and cowl flaps operate correctly.

s. Pitot heat functions properly.

t. Stall warning has correct setting.

u. Gyros operate correctly.

v. Power check on all electrical equipment.

w. Check the Emergency Locator Transmitter for proper operation.

NOTE

Tune radio to 121.5 MHz on VHF or 243 MHz on UHF, then turn ELT switch to ON and monitor for one signal. Turn ELT switch OFF, then place in ARM position.

x. Emergency Exit Hatch - Inspect the emergency exit hatch seal and latching mechanism for conditon, security of attachment, and proper operation.

y. At the airplane's first 100 hours and every 200 hours thereafter, place the airplane on jacks and cycle the landing gear while checking to ascertain that the position light switches operate in conjunction with the landing gear position. Check condition and operation of complete landing gear system.

POWER PLANT

a. Inspect all electrical wiring for general condition and proper anchorage.

b. Check cylinders for cracked or broken fins.

c. Check air entrances and exits for deformation.

d. Remove breaker cover and check for excessive oil in the breaker compartment, if found wipe dry with clean cloth.

e. Check magnetos for synchronization, and magneto points for condition, clearance and timing.

f. Check generator or alternator and air compressor drive belts for proper tension.

g. Check accessories for leaks, security and signs of damage.

h. Remove and clean oil pressure screens.

i. Clean fuel injection control valve screen.

j. Clean engine induction air filter.

k. Remove and clean spark plugs.

l. Vacuum regulator functioning properly.

m. Check engine baffles for security and proper fit.

n. Exhaust and induction system functioning properly.

o. Check electrical wiring and equipment for security and damage from rubbing or chafing.

p. Check engine controls for freedom of movement.

q. Check engine mounts for condition.

r. Check propellers for damage.*

s. Check for correct air pressure in propeller accumulator.

t. Check for correct air pressure in propeller dome.

u. Inspect all air ducting and connections for leaks. Make inspection with engine shut down, and with engine running. Check at manifold connections to turbine inlet and at engine exhaust manifold gasket.

CAUTION

Do not operate the turbocharger if leaks exist in the ducting, or if air cleaner is not filtering efficiently. Dust leaking into the turbocharger can damage the turbocharger and engine.

v. Check all flexible air ducts for delamination (refer to Service Instruction No. 0166-258).

w. Remove the air inlet duct and check for dirt or dust buildup. Remove all such foreign matter, determine and correct the cause. Uneven deposits on the impeller can effect the balance and cause premature bearing failure.

x. If unusual turbocharger noises are present, such as rubbing or binding, remove the turbocharger and send it to the nearest Approved Overhaul Station for repair.

y. Inspect mounting and connections of turbocharger for security, lubricant leakage and air leakage.

z. Check engine crankcase breather for restrictions to air flow.

* Check the tip of the blade and shank of the balde for evidence of lightning strikes, check the area of entering or leaving the blade for hardness. The inside and outside shank area should be checked for evidence of arcing. In all cases of

lightning strikes the thrust bearings should be replaced, soft blades rejected, and all steel parts demagnetised.

AIRFRAME

a. Check all skin areas and structure for missing rivets, cracks, dents, and paint damage.

b. Check all cables and pulleys for freedom of movement.

c. Check condition and operation of all moveable control surfaces.

d. Check that the drain holes in the left and right upper wing fittings are open.

e. Check that static ports are free from obstructions.

f. See Section 3 for wing bolt inspection criterion and frequency.

g. Perform aileron tab, rudder tab, and elevator tab free play inspections.

h. Check fuel tanks and vents (Refer to Service Instruction No. 0632-280 Rev I or subsequent).

CABIN

a. Check the landing gear gearbox for operation.

b. Check flap motor and drives for security and function.

c. Check the fuel selector valves for proper function.

d. Check brake system for leaks, pedal adjustment, and plumbing wear.

e. Check control column for looseness and proper travel.

f. Check instrument plumbing and wiring for leaks, condition, and security.

g. Check windows for visibility, cracks, and distortion.

h. Check all seat belts for proper function.

i. Check TIT indictator for proper calibration.

j. Check the emergency exit door for security and proper operation.

k. See Section 3 for Wing Forward Spar Carry-Through Structure inspection criterion and frequency.

LANDING GEAR

a. Correct function of retract system.

b. Check brake lining for wear.

c. Check shock strut fluid level and inflation.

d. Check retract rod ends for security.

e. Check shimmy dampener.

f. Check safety switches for adjustment and function.

g. Check emergency extension for proper function.

h. Check up and down lock cable tension.

i. Check landing gear doors for proper operation, clearance and condition.

j. Check visual indicator for correct indication.

GENERAL

a. Aircraft clean and serviced.

b. Aircraft lubricated.

ELECTRIC PROPELLER DEICER

a. Check for radio noise or radio compass interference by operating the engine at near take-off power with the radio gear turned on. If, under these conditions, noise or interference occurs when the deicer switch is ON and disappears when the switch is OFF, refer to the troubleshooting chart for the probable source of trouble.

b. Check all clamps, clips, mountings, electrical connections, and connectors for tightness and electrical soundness. Check also for loose, broken, or missing safety wire.

c. Closely check the deicer boots for wrinkled, loose, or torn areas, particularly around the outboard end and at the point where the strap passes under the hub clamp. Look for abrasion or cuts along the leading edge of the flat or thrust face. If the heater wires are exposed in damaged areas or if the rubber is found to be tacky, swollen, or deteriorated (as from contact with oil or solvent fluids), replace the damaged deicer boot.

d. Check that the hub clamps are tight. Inspect for cracks or other damage. Check to see that the cushioning material is not missing or damaged in the area under the hub clamp or on the edge of the spinner dome. Manually operate the propeller from "full pitch" to "feathering" while checking that the deicer lead straps do not come under tension.

e. Check the slip rings for gouges, roughened surface, cracks, burned or discolored areas, and for deposits of oil, grease, or dirt. Clean greasy or contaminated slip rings with solvent (Item 31, Consumable Materials Chart). After such a cleaning, a run-in time of 5 hours of engine operation must be allowed before the deicer system is turned on.

f. Examine the brush mounting brackets and housings for cracks, deformation, or other indications of damage. Check for tight connections and that the leads are not chafed or binding.

g. Check to see that each brush rides fully on its slip ring over 360 degrees of rotation. If the brush is not properly aligned, raise or lower the brush block to the proper position. If the brushes ride BOTH high and low with respect to the slip rings in 360 degrees of rotation, the slip ring assembly is eccentrically mounted and the starter ring gear must be replaced.

h. Check for proper spacing between the brush block and slip rings as indicated in Figure 11-7. If this distance is not within the specified limits, loosen the mounting screws and reposition them in the elongated holes until the block is properly positioned. If necessary, shims can be added between the thrust bearing plate and mounting bracket until the brush block is properly located.

i. Estimate the contact angle of the brush block in relation to the slip rings. If this angle is not approximately 2 degrees, loosen the mounting bolts and reposition the brush block until the proper angle exists between the brush block and slip rings. It should be noted that the spacing established in step h must also be maintained after the proper contact angle is established.

j. With the deicer system operating and a man in the cockpit observing the ammeter, visually inspect and physically flex the wiring from the brush blocks to each component of the deicer system and to the aircraft power supply. Jumps of the ammeter needle other than the momentary flicker that occurs when the timer switches at 30-second intervals, indicate loose or broken wiring in the area under examination at the moment. In such instances, continue to flex the wiring in the area that first indicated trouble while checking the continuity through the individual wires of the affected harness until the source of trouble is located. Use the wiring diagram to trace the circuitry of the deicer system.