Cessna®

150, 172, 175, 180,
182, AND 185 SERIES

100 - SERIES

SERVICE MANUAL

1962 AND PRIOR

THIS SUPERSEDES ALL PREVIOUS SINGLE ENGINE SERVICE MANUALS

1 FEBRUARY 1962

D138-13 - RAND - 500 - 4-72

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MODEL 175 (Cont)

RUDDER TRAVEL	
Right	*16°
Left	*16°
ELEVATOR TRAVEL	
Up	28°
Down	26°
ELEVATOR TRIM TAB TRAVEL	
Up	28°
Down	13°
PRINCIPAL DIMENSIONS	
Wing Span (prior to 1962)	36'
Wing Span (1962 & on)	36'2"
Tail Span	10'8"
Length (prior to 1960)	25'
Length (1960 & on)	26'6"
Height (prior to 1960)	**8'6"
Height (1960 & on)	**8'
Track Width	7'2"
BATTERY LOCATION	
Aft of baggage compartment	
SERIAL NUMBERS	
1958	55001 thru 55703
1959	55704 thru 56238
1960 (175A)	56239 thru 56777
1961 (175B)	17556778 thru 17557002
1962 (175C)	17557003 & on

*Rudder travel on swept tails measured paralled to water line. When measuring perpendicular to hinge line, equivalent is 17°44'.

**If rotating beacon is installed on vertical fin, add approximately 3" to height.

MODEL 180

DESIGN GROSS WEIGHT	
Prior to 1957	2550 lb
1957 & on	2650 lb
TOTAL FUEL CAPACITY (prior to 1957)	60 gal
TOTAL FUEL CAPACITY (1957 & on)	65 gal
OIL CAPACITY	12 qt
ENGINE MODEL (Continental)	
Prior to 1955	O-470-A
1955	O-470-J
1956 thru 1959	O-470-K
1960 & 1961	O-470-L
1962 & on	O-470-R
HP RATING	
O-470-A and -J	225
O-470-K, -L, and -R	230
RATED RPM	
O-470-A, -K, -L, and R	2600
O-470-J	2550
MAIN WHEELS	6:00 x 6
Pressure	28 psi
TAILWHEEL	8:00 S.C.
Pressure	35 psi
AILERON TRAVEL	
Up	20°
Down	15°
FLAP TRAVEL	39°
RUDDER TRAVEL	
Right	24°
Left	24°
ELEVATOR TRAVEL	
Up	*25°
Down	*23°
STABILIZER TRAVEL (prior to 1960)	
Up	1°50'
Down	8°20'
STABILIZER TRAVEL (1960 & on)	
Up	0°45'
Down	8°45'
PRINCIPAL DIMENSIONS	
Wing Span (prior to 1962)	36'
Wing Span (1962 & on)	36'2"
Tail Span	10'10"
Length	25'6"
Fin Height	**7'6"
Track Width	7'8"
BATTERY LOCATION	
Aft of baggage compartment	
SERIAL NUMBERS	
1953	30000 thru 30639
1954	30640 thru 31260
1955	31261 thru 32150
1956	32151 thru 32661
1957 (180A)	32662 thru 32999 & 50001 thru 50105
1958 (180A)	50106 thru 50355
1959 (180B)	50356 thru 50661
1960 (180C)	50662 thru 50911
1961 (180D)	18050912 thru 18051063
1962 (180E)	18051064 & on

*With stabilizer full down.

**If rotating beacon is installed on vertical fin, add approximately 3" to height.

and neutralizing and cleaning off any spilled electrolyte or corrosion. Use bicarbonate of soda (baking soda) and water to neutralize electrolyte or corrosion. Follow with a thorough flushing with water. Brighten cables and terminals with a wire brush, then coat with petroleum jelly before connecting. The battery box also should be checked and cleaned if any corrosion is noticed. Distilled water, not acid or "rejuvenators" should be used to maintain electrolyte level. Check the battery every 25 hours (or at least every 30 days), oftener in hot weather.

2-17. TIRES should be maintained at the air pressures specified below in psi. When checking tire pressure, examine tires for wear, cuts and bruises.

MODEL	150	172	175	180	182	185
MAIN TIRES	30	23	23	28	*28	**35
NOSE (OR TAIL) TIRES	30	***26	***26	35	***29	45

*32, 1962 and on.
**35, for 6:00 x 6 tires; 25, for 8:00 x 6 tires.
***These pressures are used for tube-type tires and magnesium nose wheels only. The pressures for tubeless tires and aluminum nose wheels are: 172 and 175, 35 psi; 182, 45 psi. The older, magnesium wheels used on these models can be easily identified by the presence of six webs which are evenly spaced between the rim and center hub. The newer, aluminum wheels do not have these webs. The higher pressures help prevent damage to wheel flanges.

NOTE

Since low tire pressure may result in leakage around tubeless tire beads, the recommended tire pressures should be maintained. Especially in cold weather, remember that any drop in temperature of the air inside a tire causes a corresponding drop in pressure.

2-18. NOSE GEAR STRUTS require periodic checking to ensure that the strut is filled with hydraulic fluid and is inflated to the correct air pressure. The servicing procedure is stated on the strut placard, or the following procedure may be used.
a. Remove valve cap and release all air.
b. Remove valve housing assembly.
c. Compress strut completely (that is, with the stops in contact with the outer barrel hub).
d. Fill strut level to valve hole with MIL-H-5606 hydraulic fluid.
e. Lift nose of aircraft and extend strut.
f. Replace valve housing assembly and inflate the strut with nose wheel off the ground. Inflate to 35 psi (20 psi on the Model 150 and 50 psi on the Model 182, 1962 and on).

NOTE

Keep the nose gear shock strut, especially the exposed portion of the strut piston, wiped off with a clean dry cloth to remove dust and grit which may cut the seals in the strut barrel. Do not wipe the strut with hydraulic fluid, since this tends to collect even more dust and grit.

2-19. NOSE GEAR SHIMMY DAMPENERS should be serviced at least every 100 hours. The dampener must be filled completely with fluid, free of entrapped air, to serve its purpose. Two types of dampeners were used, one of which must be removed to check fluid level and refill. If the dampener has a filler plug, refill as follows:
a. Remove the filler plug.
b. Using the tow bar, turn the nose gear in the direction that places the dampener piston at the end opposite the filler plug.
c. Fill with MIL-H-5606 hydraulic fluid.
d. Install and safety the filler plug.
If the dampener does not have a filler plug, refill as follows:
a. Remove the dampener from the airplane.
b. Pull the fitting end of the dampener shaft to its travel limit.
c. Fill through the opposite end with MIL-H-5606 hydraulic fluid, while holding the dampener vertical.
d. Push the shaft upward slowly to seal off the filler hole, and reinstall the dampener on the airplane. Be sure to keep the shaft protruding through the filler hole until the dampener is installed.
An alternate method of filling either type shimmy dampener is to submerge it in clean hydraulic fluid and work the dampener shaft back and forth (filler plug removed) to expel air and fill completely with fluid.

NOTE

Keep the shimmy dampener, especially the exposed portions of the dampener shaft wiped off with a clean dry cloth to remove dust and grit which may cut the seals in the dampener barrel. Do not wipe the shaft with hydraulic fluid, since this tends to collect even more dust and grit.

2-20. HYDRAULIC BRAKE SYSTEMS should be checked for fluid at least every 100 hours. Add MIL-H-5606 hydraulic fluid at the brake master cylinders as required. Brakes should be bled of entrapped air whenever there is a spongy response to the brake pedals.

2-21. OXYGEN CYLINDER. Some aircraft are equipped with an optional oxygen system. The oxygen cylinder should be refilled when oxygen system pressure is below 300 psi. When fully charged, the cylinder contains 48 cubic feet of oxygen at 1800 psi at 70°F. To refill the oxygen cylinder:
a. Unfasten baggage compartment rear wall or access plate to gain access to the oxygen cylinder.
b. Turn off oxygen cylinder valve by turning it full clockwise.
c. Disconnect oxygen line from cylinder.
d. Loosen clamps securing cylinder and remove cylinder.
e. Refill cylinder with aviators' breathing oxygen (Fed. Spec. BB-O-925, or equivalent).
f. Reverse the above steps to install the cylinder.

27. Bendix-Scintilla Magnetos.
    a. Breaker compartment for dirt and grease.
    b. Breaker points for security, pits, burns, and carbon deposits.
    c. Cam followers for correct lubrication.
    d. Ventilator screens for cleanliness and security.
    e. Magnetos for correct internal timing, timing to engine, and security of attachment.
28. Slick (formerly Case) Magnetos.
    a. Magnetos for correct timing to engine and security of attachment.

NOTE

As long as Slick magneto timing is correct, the magnetos need be checked internally only at 500-hour intervals. Check the following items whenever a magneto is disassembled.

    b. Breaker points for security, pits, burns, and carbon deposits.
    c. Cam oiler pad for correct lubrication.
    d. Ventilator screens for cleanliness and security.
    e. Carbon brush for excessive wear. The brush should protrude a minimum of 1/32" from the shaft.
    f. Each end of the distributor gear shaft for correct lubrication.
    g. The magnetos for correct internal timing during reassembly, timing to the engine, and security of attachment.
29. Carburetor for security, cracks, corrosion, fuel leaks, cleanliness of inlet screen and proper safetying.
30. Fuel/air control unit for security, cracks, corrosion, fuel leaks, cleanliness of inlet screen, proper safetying, and security of cooling shrouds.
31. Engine-driven fuel pump for security, cracks, leaks, proper safetying, and security of cooling shrouds.
32. Fuel manifold valve (fuel injection distributor) for security, proper safetying, and leaks.
33. Fuel injection lines for security, kinks, cracks, dents, leaks, and chafing.
34. Fuel injection nozzles for cleanliness and security.
35. Engine cowling for cleanliness, proper fit, security, cracks, dents, cuts, tears, loose or broken hinges, defective latches or fasteners, and deteriorated paint.
36. Cowl flaps for cleanliness, proper fit, security, cracks, dents, cuts, tears, loose or broken hinges, and deteriorated paint; control for security, proper rigging, and binding.

PROPELLER.

1. Fixed-pitch propeller for track, nicks, cracks, corrosion, bends, dents, security, and proper safetying.
2. Constant-speed propellers for nicks, cracks, corrosion, bends, dents, loose nuts and bolts, oil leaks, freedom of blade movement, excessive looseness of blades, security, and proper safetying.
3. Hartzell constant-speed propeller for correct lubrication.
4. Propeller governor for security, safetying, cracks, oil leaks; control for correct rigging, security, binding, and proper safetying.
5. Spinner and spinner bulkhead for cracks, dents, alignment, security, and condition of paint.

FUEL SYSTEM.

1. Fuel strainer for internal cleanliness, security, leaks, and safetying; drain valve and control for proper rigging, operation, leaks, and security.
2. Electric fuel pumps for cleanliness of filter screens, security, leaks, proper operation, and tight electrical connections.
3. Fuel tank sump drains for water and sediment, leaks, security, and safetying; quick-drain valves for proper operation.
4. Underside of wings for evidence of fuel leaks; rubber fuel cells for loose fasteners attaching upper surface to wing; fuel tank filler cap placards for legibility; caps for leaks and security.

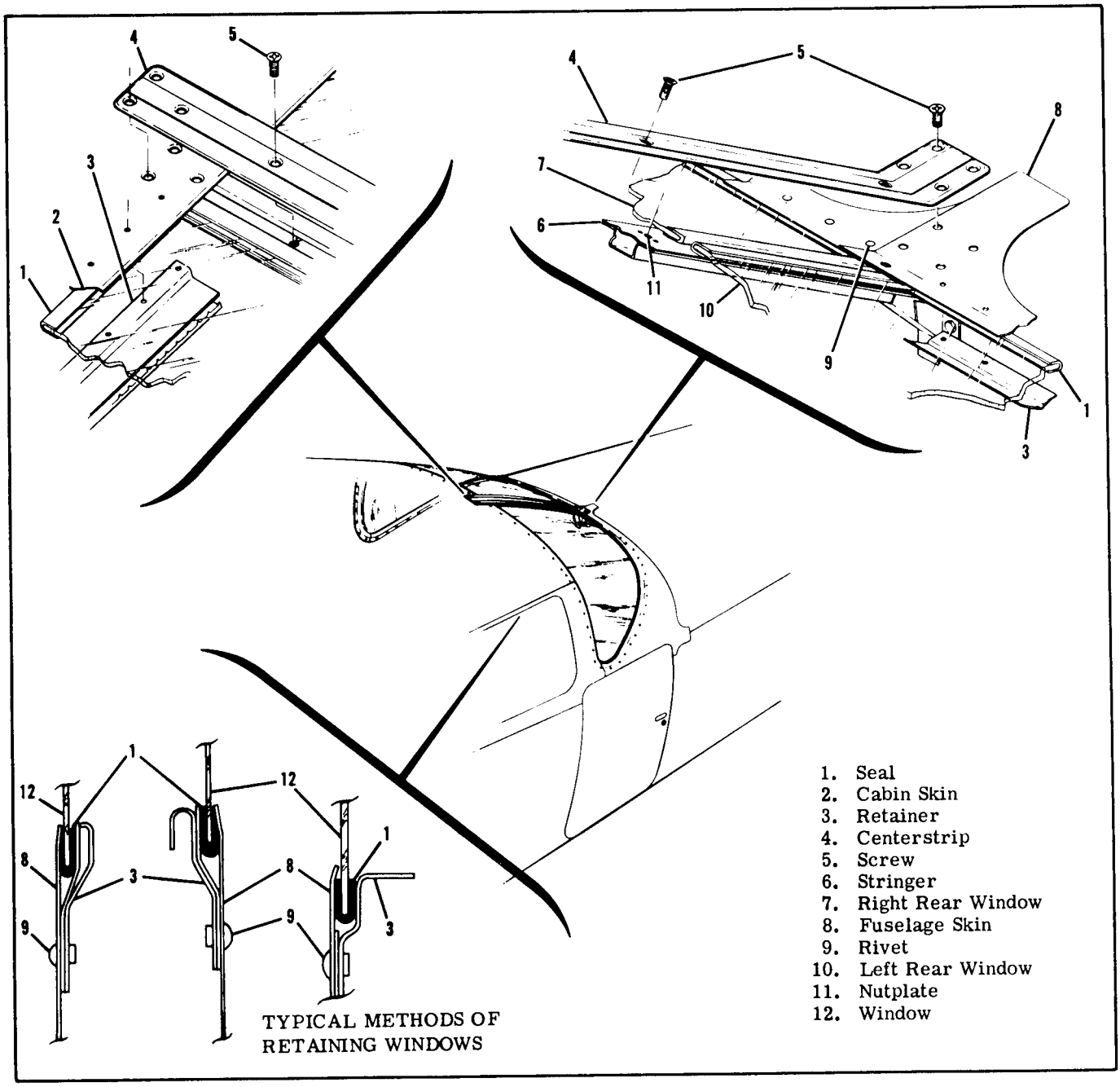


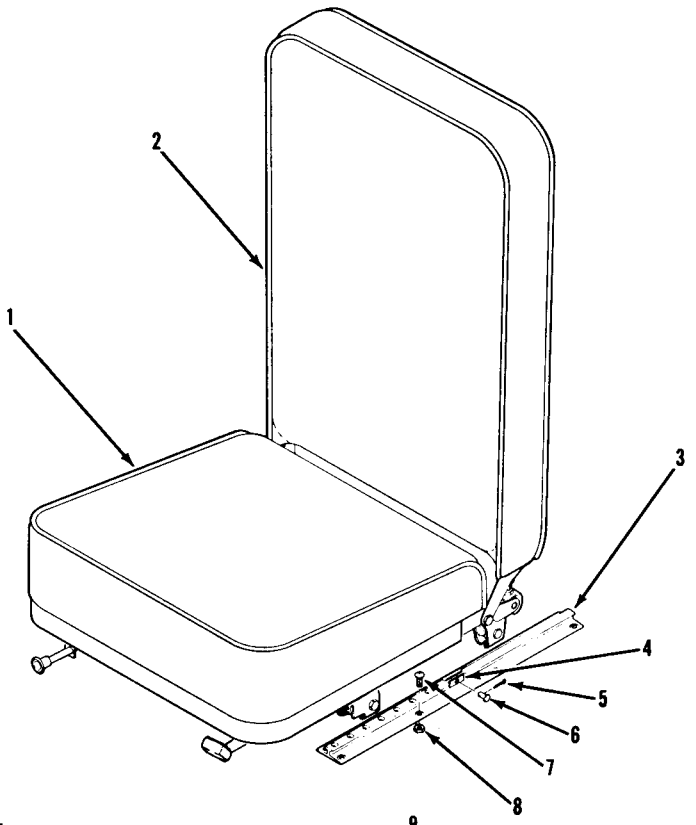
Figure 3-4. Fixed Cabin Windows

Some models have removable hinge pins securing the door hinges to facilitate door removal. The door latch and door handles may be replaced, using figures 3-5 and 3-6 as a guide. When fitting a new door, some trimming of the door skin at the edges may be necessary to achieve a good fit

3-14. CABIN DOOR WEATHER STRIP is cemented around all edges of the door. New weatherstrip may be applied after mating surfaces of weatherstrip and door are clean, dry and free from oil or grease. Apply a thin, even coat of adhesive to each surface and allow to dry until tacky before pressing strip in place. Minnesota Mining Co. No. EC-880 cement is recommended.

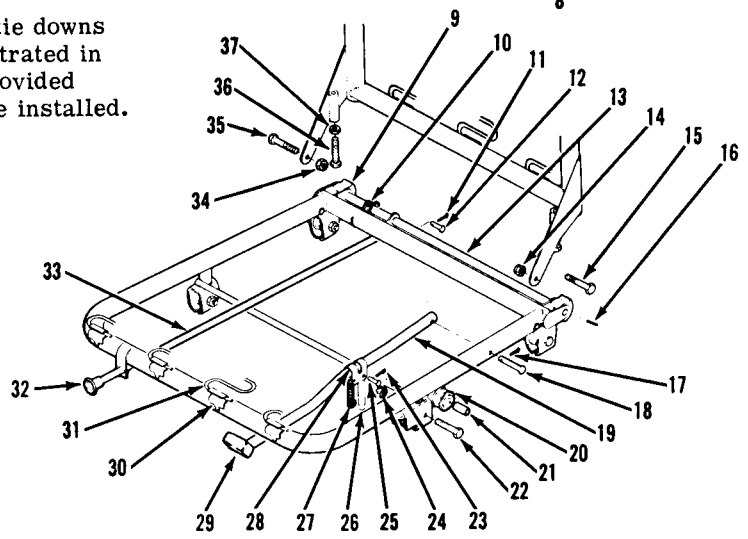
3-15. ADJUSTMENT OF CABIN DOOR is provided by adjusting the latch strike plate mounted in the rear door post. The plate should be adjusted to fair in the door skin with the cabin outer skin. To adjust the plate, loosen the attachment screws, reposition the strike plate, and then tighten screws.

3-16. CABIN DOOR LATCHES are held in place by screws accessible with the door upholstery panel removed. Latches are actuated by a flush-mounted outside door handle and a conventional inside door handle. The left cabin door is equipped with a key-operated lock and the right cabin door either is equipped with a thumb latch or can be locked by inside handle rotation. On later Model 150 airplanes, the inside door handles



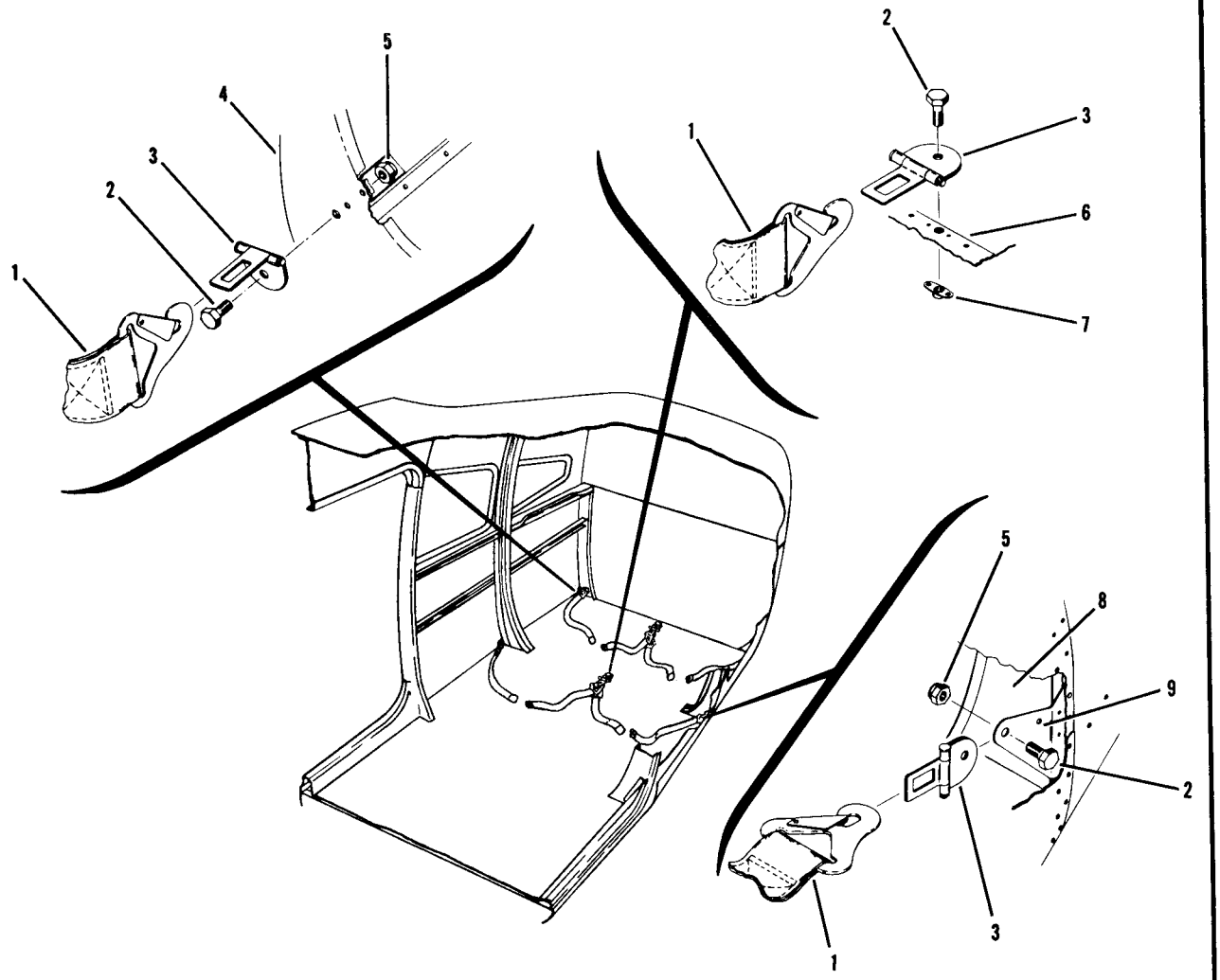
NOTE

The baggage and cargo tie downs for the Model 150, illustrated in figure 3-19, must be provided when reclining seats are installed.

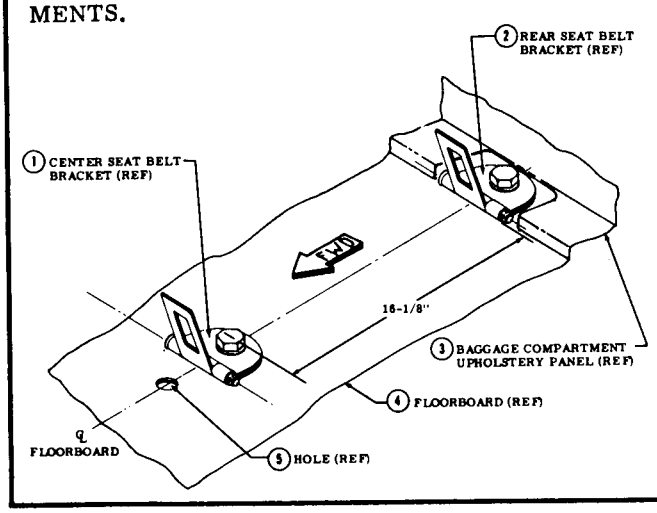


1. Seat Bottom
2. Seat Back
3. Seat Rail
4. Seat Stop
5. Cotter Pin
6. Clevis Pin
7. Screw
8. Nut
9. Cam
10. Spring
11. Cotter Pin
12. Clevis Pin
13. Shaft
14. Nut
15. Bolt
16. Rollpin
17. Cotter Pin
18. Clevis Pin
19. Seat Adjustment Tube
20. Roller
21. Bushing
22. Bolt
23. Cotter Pin
24. Nut
25. Clevis Pin
26. Seat Adjustment Pin
27. Spring
28. Seat Adjustment Clevis
29. Seat Adjustment Knob
30. Clip
31. Seat Spring
32. Seat Reclining Knob
33. Seat Reclining Tube
34. Nut
35. Bolt
36. Bolt
37. Nut

Figure 3-11. Model 150 Optional Reclining Seats



BE SURE CENTER SEAT BELT BRACKET IS IN LOCATION SHOWN. THE FLOOR-BOARD IS REINFORCED AT THE AFT HOLE FOR STRUCTURAL REQUIREMENTS OF THE SEAT BELT AND CARGO TIE-DOWN ATTACH-MENTS.

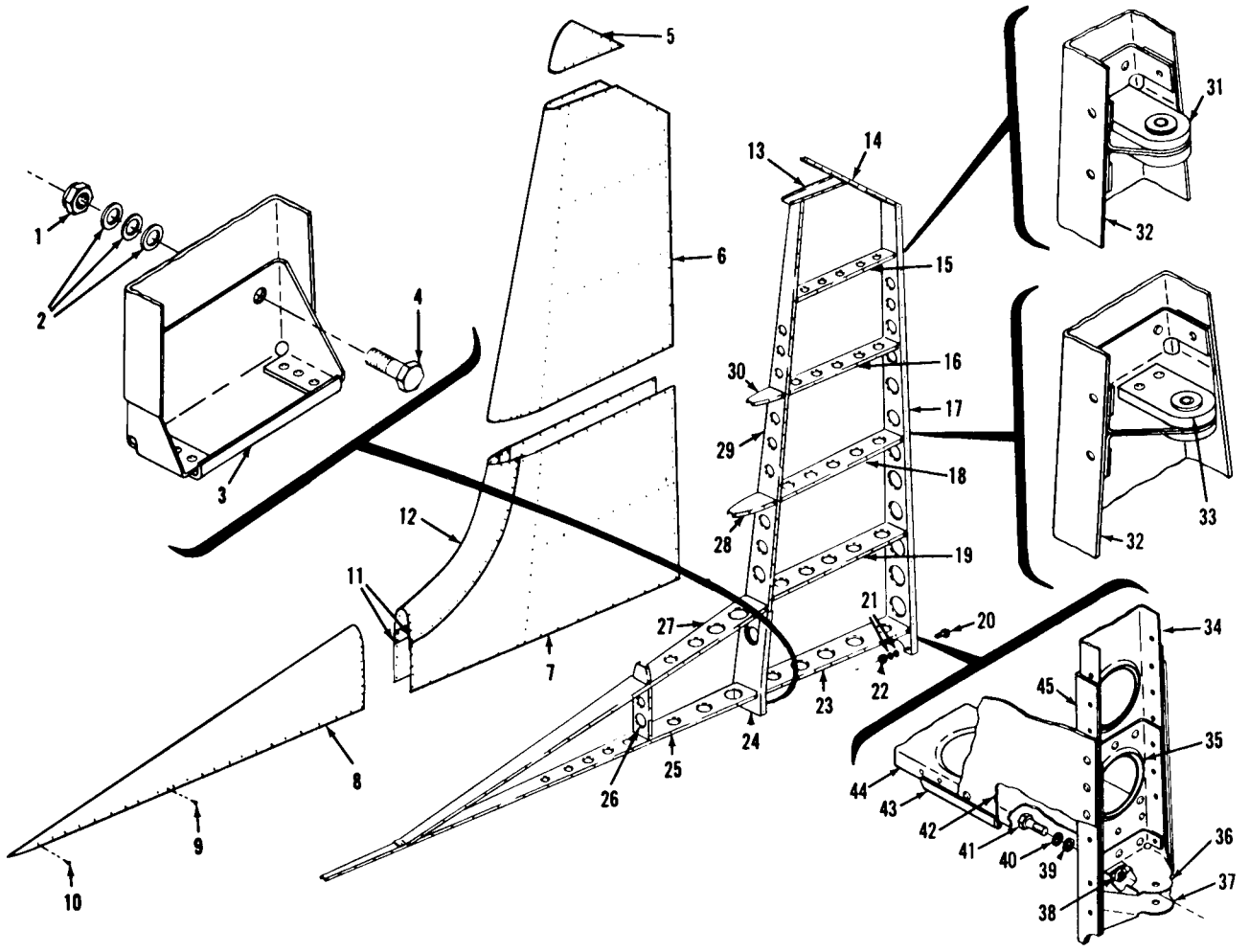


NOTE

Model 185 stowable-seat safety belts can be removed quickly by unsnapping them from their brackets. These same brackets then serve as cargo tie-down brackets.

1. Safety Belt
2. Bolt
3. Bracket
4. Bulkhead (Station 108)
5. Nut
6. Floorboard
7. Nutplate
8. Bulkhead (Station 90)
9. Anchor Plate

Figure 3-18. Safety Belt and Cargo Tie-Down Provisions (Utility Model 185)



1. Nut
2. Washer
3. Stabilizer Stop
4. Bolt
5. Tip Assembly
6. Fin Upper Skin
7. Fin Lower Skin
8. Dorsal Skin
9. Screw
10. Screw
11. Splice Plate
12. Leading Edge Skin
13. Rib
14. Fin Tip Rib
15. Fin Rib
16. Fin Rib
17. Fin Rear Spar
18. Fin Rib
19. Fin Rib
20. Bolt
21. Washer
22. Nut
23. Fin Rib
24. Channel
25. Dorsal Lower Rib
26. Dorsal Rib
27. Dorsal Upper Rib
28. Fin Leading Edge Rib
29. Fin Front Spar
30. Fin Leading Edge Rib
31. Hinge Assembly
32. Fin Rear Spar
33. Center Hinge Assembly
34. Fin Rear Spar Reinforcement
35. Plate
36. Hinge Upper Bracket
37. Hinge Lower Bracket
38. Nutplate
39. Washer
40. Washer
41. Bolt
42. Fin Lower Skin
43. Moulding
44. Dorsal Lower Rib

Figure 4-6. Fin - 180 (All) and 182 (Prior to 1960)

TIRES WEAR EXCESSIVELY. (Cont).		
Incorrect shimming at inboard end of spring.	If no defects are found, correct by adding shims or washers.	Install washers or shims as required. Refer to paragraph 5-6.
Bent axles.	Check visually.	Replace axles.
Dragging brakes.	Jack wheel and spin to check for friction.	See paragraph 5-62.
Wheel bearings too tight.	Jack wheel and check for bearing drag.	Adjust properly.
Loose torque links.	Check for excessive clearances.	Add washers or replace as necessary.
Loose or defective nose wheel bearings.	Raise nose, check wheel bearings.	Tighten wheel bearings properly; replace, if defective.
Nose wheel out of balance.	Check wheel balance.	Correct in accordance with paragraph 5-40.
HYDRAULIC FLUID LEAKAGE FROM NOSE STRUT.		
Defective strut seals.	Check for evidence of fluid leakage.	Replace defective seals.
NOSE STRUT WILL NOT HOLD AIR PRESSURE.		
Defective air filler valve, or valve not tight.	Check for air leakage at valve.	Check gasket and tighten loose valve. Replace, if defective.
Defective strut seals.	Check for evidence of fluid leakage.	Replace defective seals.

NOTE

A Goodyear kit for repairing tubeless tires without removing them from wheels (Simplug Repair Kit No. 241-6251) is available locally from Goodyear Dealers.

5-4. MAIN GEAR.

5-5. REMOVAL.

NOTE

Three different methods are used to attach the main landing gear spring to the fuselage outboard structure. Wide U-bolts are used on some models, shims and wedges on others, and steel channels on others. The spring is attached to the fuselage inboard structure with a bolt which passes through a hole in the end of the spring.

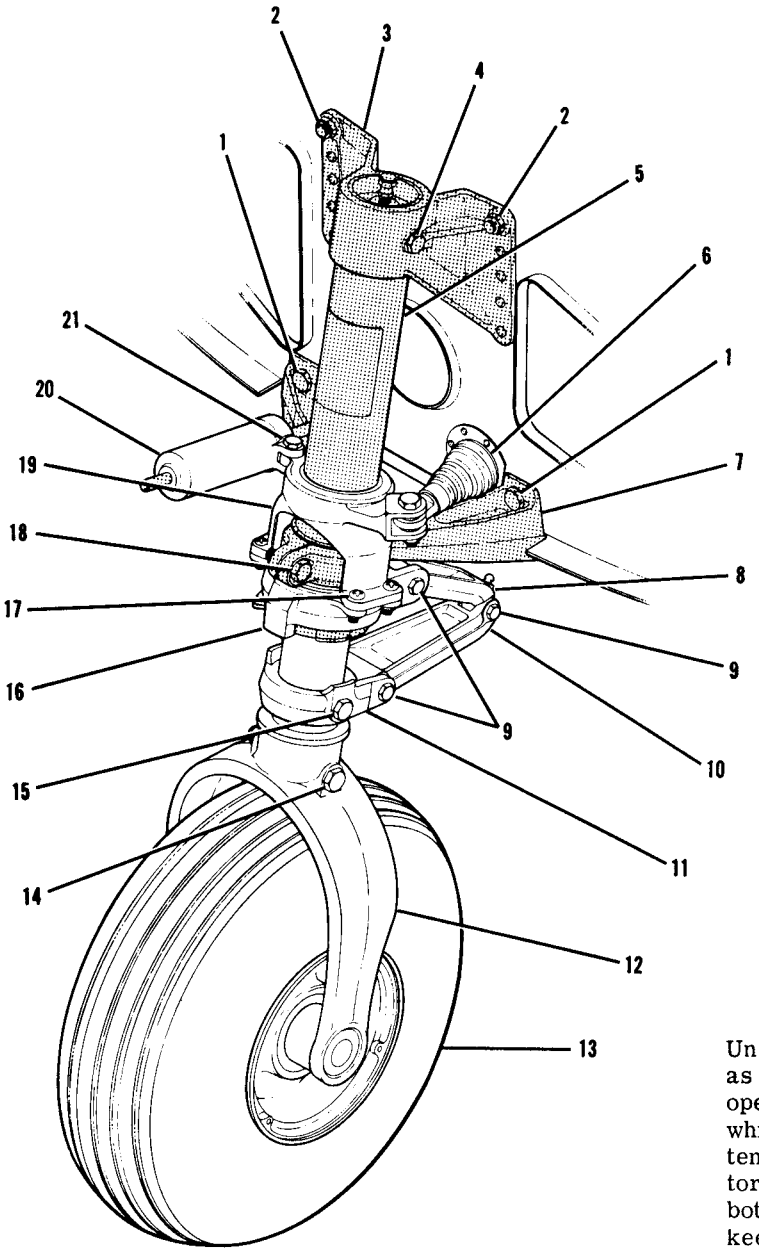
a. Remove floorboard access covers over spring, remove screws and slide external fairing and seal down around spring, drain hydraulic brake fluid and hoist airplane.

b. On those models where the brake line is attached to a bulkhead fitting through the fuselage skin, disconnect the brake line at this fitting. On those models where the brake line connection is inside the fuselage beneath the floor, disconnect the brake line from the spring and the wheel brake cylinder. Remove the gear, leaving the brake line protruding from the fuselage.

c. On aircraft with U-bolts, remove the nuts and washers from the U-bolts and tap them free of the attaching structure. On aircraft with shims and wedges, remove the attaching bolts and pry the shims and wedges out of the fuselage. On aircraft with a channel, remove the attaching bolts, washers, and nuts and remove the channel.

d. Remove the bolt, washer, and nut attaching the inboard end of the spring and pull the entire gear out of the fuselage. Note shims and washers placed under the inboard end of the spring and mark them to be sure they are replaced correctly at reinstallation of the landing gear.

SHOP NOTES:

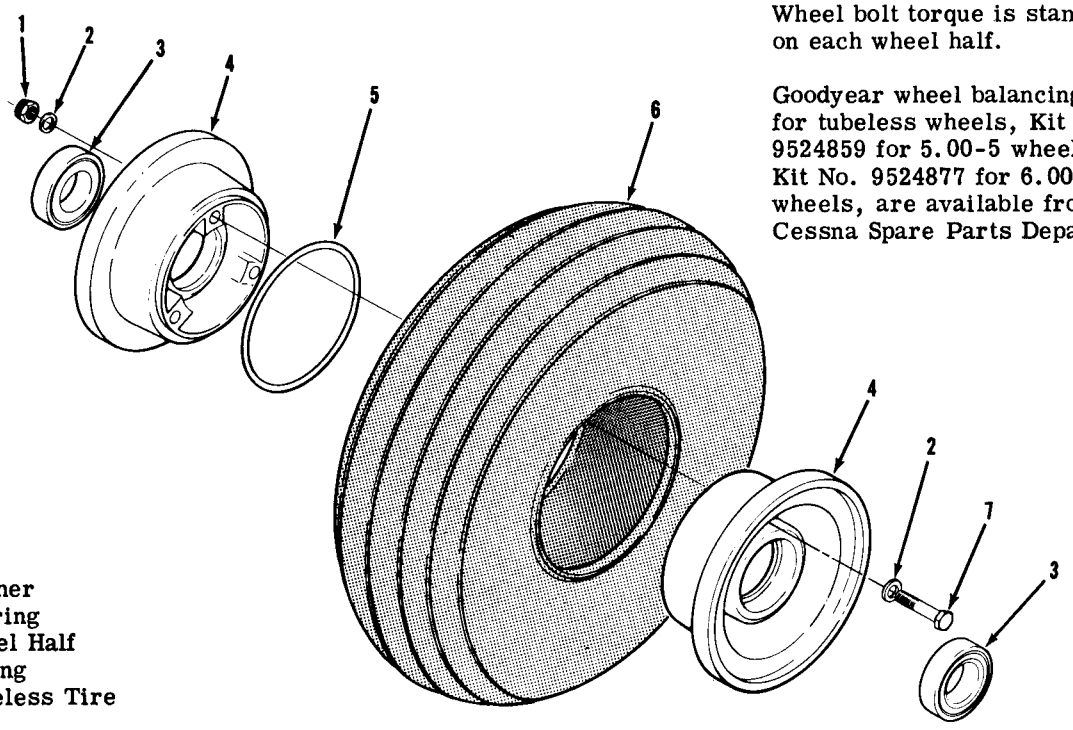


NOTE

Unshaded parts of the nose gear turn as the nose gear steering system is operated on the ground, but do not turn while airborne. As the lower strut extends, a centering block on the upper torque link contacts a flat spot on the bottom end of the upper strut, thus keeping the lower strut and wheel from turning.

1. Bolt
2. Nut
3. Upper Forging
4. Bolt
5. Upper Strut
6. Steering Bungee
7. Lower Forging
8. Upper Torque Link
9. Bolt
10. Lower Torque Link
11. Torque Link Fitting
12. Nose Gear Fork
13. Wheel and Tire
14. Bolt
15. Bolt
16. Steering Collar
17. Screw
18. Bolt
19. Steering Torque Arm
20. Shimmy Dampener
21. Bolt

Figure 5-13A. Nose Gear (Model 182, 1962 & on)



Note

Wheel bolt torque is stamped on each wheel half.

Goodyear wheel balancing kits for tubeless wheels, Kit No. 9524859 for 5.00-5 wheels and Kit No. 9524877 for 6.00-6 wheels, are available from the Cessna Spare Parts Department.

1. Nut
2. Washer
3. Bearing
4. Wheel Half
5. O-ring
6. Tubeless Tire
7. Bolt

Figure 5-18. Goodyear Nose Wheel (Tubeless Tire)

WARNING

Injury can result from attempting to separate wheel halves with tire inflated. Avoid damaging wheel flanges when breaking tire beads loose.

b. Remove thru-bolts and separate wheel halves.
c. Remove tire and tube. With tubeless tires, remove O-ring placed between wheel halves to seal them against leakage.
d. Remove bearing retaining rings, grease seals, and bearing cones. Various types have been used according to the model and date of manufacture.

NOTE

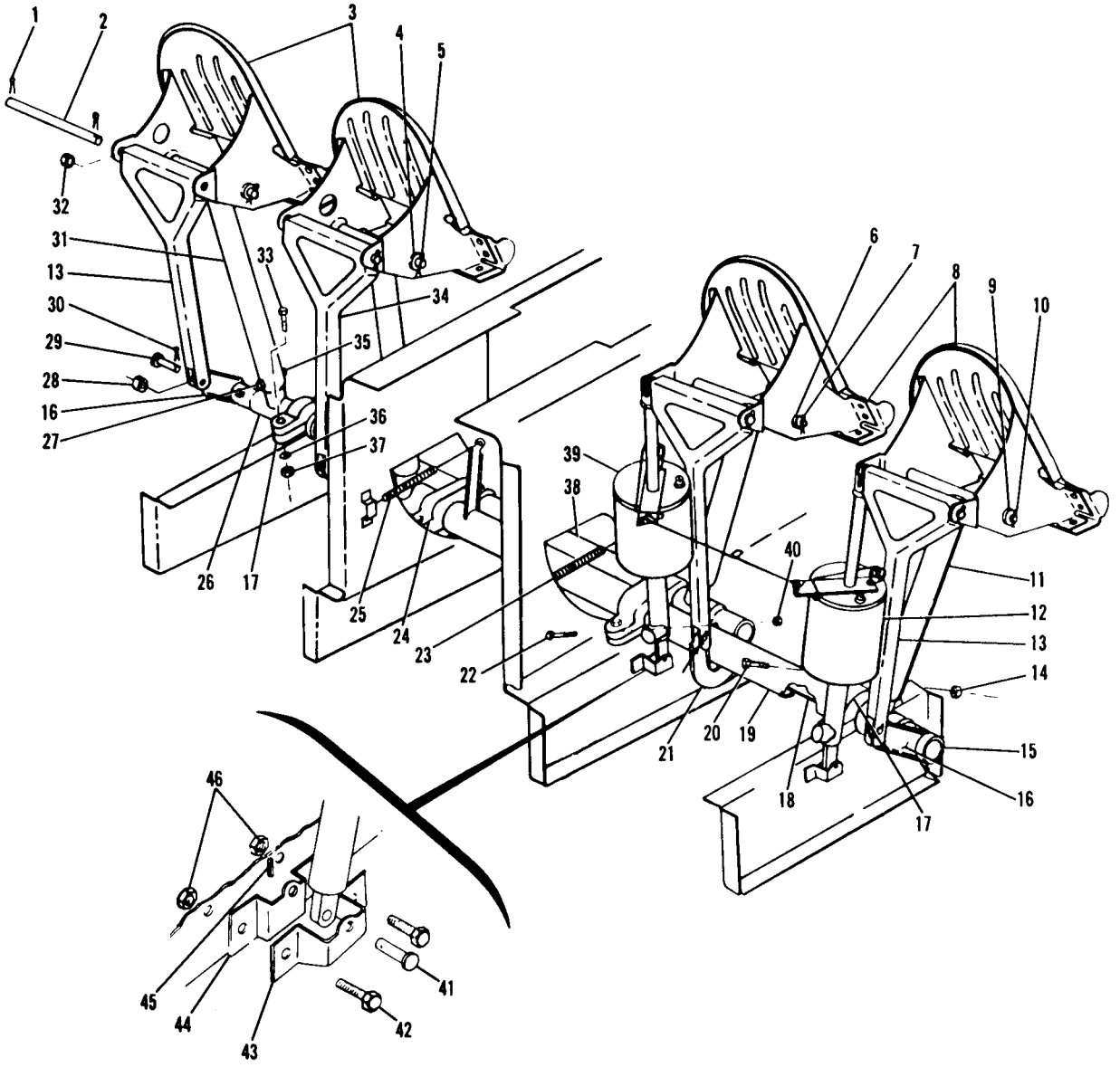
The bearing cups are a press fit in the wheel halves and should not be removed unless replacement is necessary. To remove, heat the wheel half in boiling water for 15 minutes. Using an arbor press, if available, press out the bearing cup and press in the new one while the wheel is still hot.

5-38. INSPECTION AND REPAIR. Instructions given in paragraph 5-14 for the main wheels may be used as a guide for inspection and repair of the nose wheels.

5-39. ASSEMBLY.
a. On tube-type tires, insert tube in tire, aligning yellow stripe on tube with red dot on tire. Place tire on wheel half and position valve stem through valve hole. Insert thru-bolts, position other wheel half, and secure with nuts and washers. Take care to avoid pinching tube between wheel halves. Torque to value marked on wheel.
b. On tubeless tires, insert thru-bolts through one wheel half and place tire in position. Inspect the O-ring groove on both wheel halves to assure a smooth, clean surface. Dirt or chips under the O-ring will cause an air leak. Wipe the O-ring with clean bearing grease and center in the O-ring groove. Place the other wheel half in position. Apply a light force to bring the wheel halves together; if the wheel halves do not bottom solidly together, the O-ring is not placed properly. Maintaining the light force, assemble a washer and nut on one thru-bolt and tighten snugly. Assemble the remaining nuts and washers on the thru-bolts and torque to the value marked on the wheel.

CAUTION

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

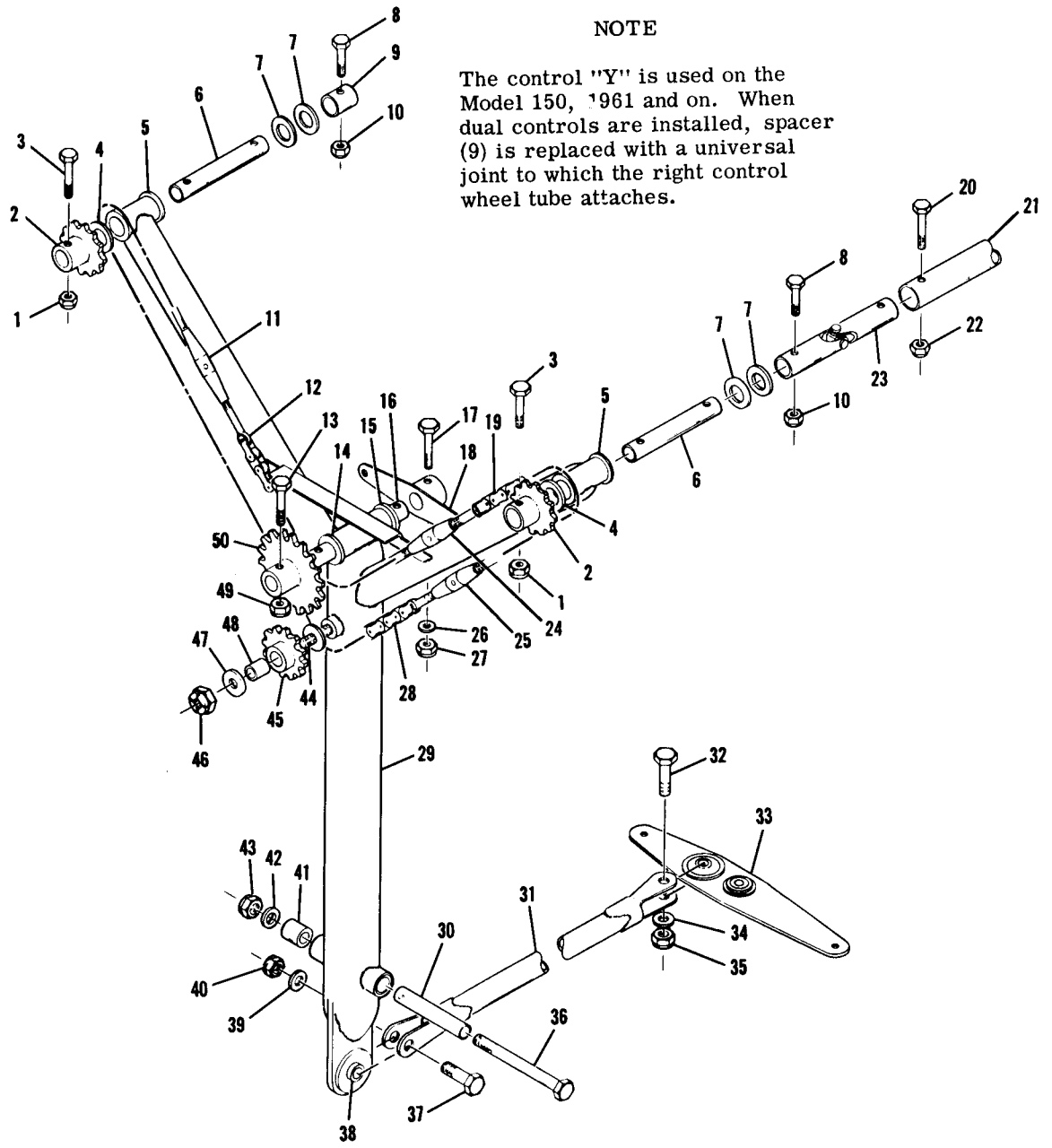


1. Cotter Pin
2. Shaft
3. Copilot's Pedals
4. Shaft
5. Cotter Pin
6. Shaft
7. Cotter Pin
8. Pilot's Pedals
9. Shaft
10. Cotter Pin
11. Rudder Bar Arm
12. Brake Cylinder Assembly
13. Dual Brake Link
14. Nut
15. Dual Brake Hub
16. Bellcrank Assembly
17. Outboard Bearing Assembly
18. Dual Brake Tube
19. Weld Assembly
20. Bolt
21. Brake Linkage Bellcrank Assembly
22. Bolt
23. Spring
24. Bearing Assembly
25. Spring
26. Bearing
27. Bolt
28. Spacer
29. Pin
30. Cotter Pin
31. Rudder Bar Arm
32. Spacer
33. Bolt
34. Dual Brake Line
35. Nut
36. Washer
37. Nut
38. Weld Assembly
39. Cylinder Assembly
40. Nut
41. Pin
42. Bolt
43. Brake Bracket
44. Brake Bracket
45. Cotter Pin
46. Nut

Figure 5-22. Typical Brake Pedals

NOTE

The control "Y" is used on the Model 150, 1961 and on. When dual controls are installed, spacer (9) is replaced with a universal joint to which the right control wheel tube attaches.



1. Nut
2. Sprocket
3. Bolt
4. Washer
5. Bearing
6. Shaft
7. Washer
8. Nut
9. Spacer
10. Nut
11. Barrel
12. Chain Assembly
13. Nut
14. Bearing
15. Bearing
16. Shaft
17. Nut
18. Arm
19. Chain Assembly
20. Nut
21. Control Wheel Tube
22. Nut
23. Universal Joint
24. Barrel
25. Barrel
26. Washer
27. Nut
28. Chain Assembly
29. Control "Y"
30. Bushing
31. Control Link
32. Bolt
33. Bellcrank
34. Washer
35. Nut
36. Bolt
37. Bolt
38. Control Link
39. Washer
40. Nut
41. Bearing
42. Washer
43. Nut
44. Bolt
45. Sprocket
46. Nut
47. Washer
48. Bushing
49. Nut
50. Sprocket

Figure 6-2. Control "Y"

References for Figure 7-2.

1. Nut
2. Spacer
3. Bushing
4. Pulley
5. Bushing
6. Bolt
7. Pulley Guard
8. Nut
9. Cotter Pin
10. Pulley
11. Washer
12. Cotter Pin
13. Bolt
14. Cotter Pin
15. Bushing
16. Pulley
17. Washer
18. Nut
19. Bolt
20. Cotter Pin
21. Cable
22. Nut
23. Cable
24. Turnbuckle Barrel
25. Cable
26. Cable
27. Cable
28. Bolt
29. Cable
30. Bolt
31. Bushing
32. Pulley
33. Cam
34. Spacer
35. Bolt
36. Cable
37. Flap Lever Cam
38. Washer
39. Bushing
40. Spacer
41. Nut
42. Spacer
43. Bushing
44. Ratchet
45. Spacer
46. Button
47. Bolt
48. Latch Rod
49. Placard
50. Latch Assembly
51. Lever Assembly
52. Spacer
53. Spacer
54. Bushing
55. Pulley
56. Cotter Pin
57. Cable

7-6. OPERATIONAL CHECKOUT OF FLAP SYSTEM.

a. Operate flaps through full range of travel, observing for uneven or jumpy motion, binding and lost motion in system.

b. Raise flaps and check to see that they are completely up. Mount an inclinometer on one flap and set to 0°.

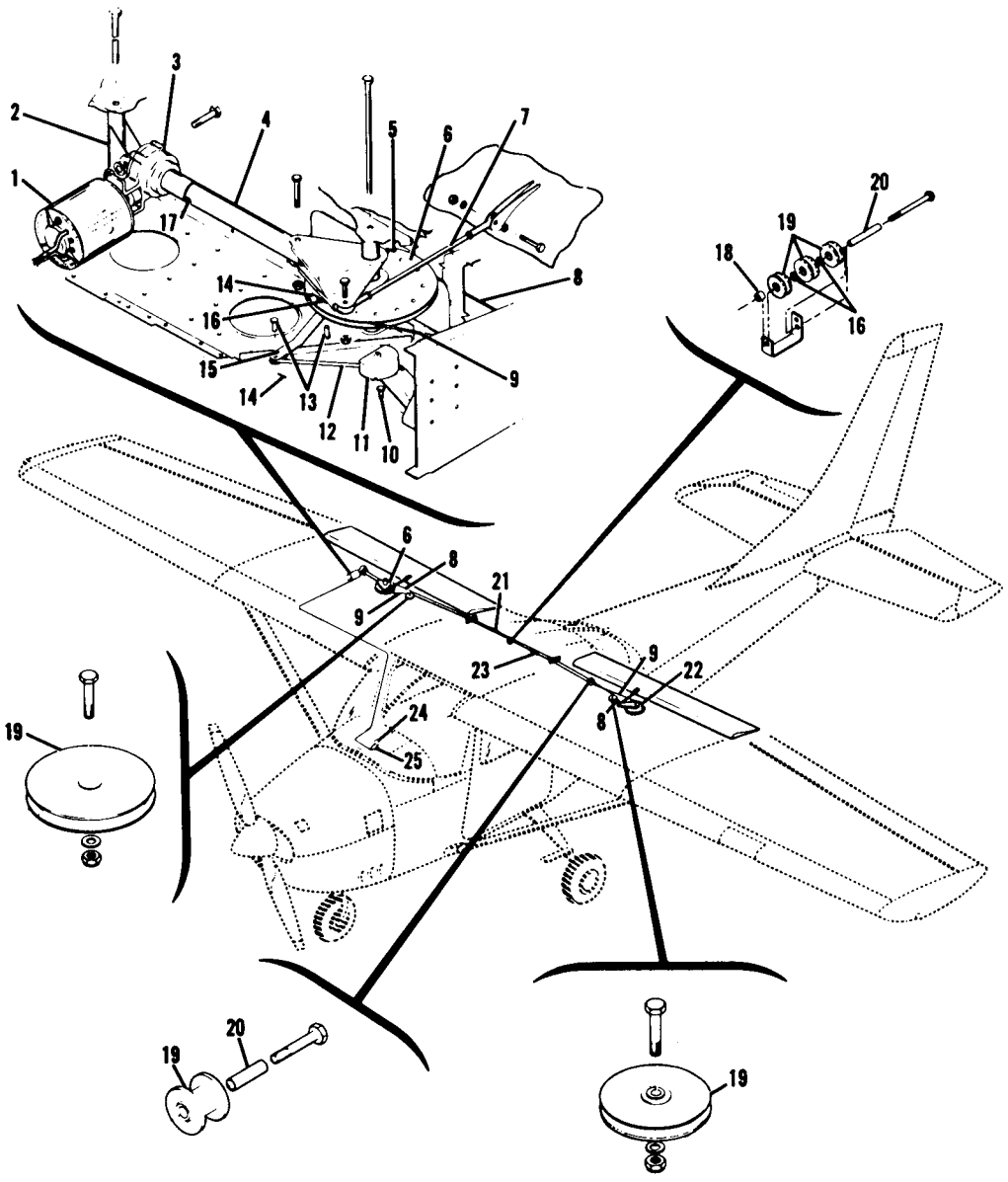
c. Raise flap lever to extreme flap down position and check for proper flap angle with inclinometer.

d. Open flap bellcrank access opening and attempt to rock bellcrank to disclose internal bearing play.

e. Examine rollers and tracks for defective parts.

7-7. TROUBLE SHOOTING THE FLAP SYSTEM.

PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
BOTH FLAPS FAIL TO LOWER WHEN LEVER IS RAISED.		
Broken or detached forward direct cable.	Open tunnel access cover aft of lever and check direct cable.	Attach or replace cable.
ONE FLAP FAILS TO LOWER.		
Broken or detached direct cable to malfunctioning flap.	Open bellcrank access cover and feel for cable tension.	Attach or replace cable.
BOTH FLAPS FAIL TO RETRACT WHEN FLAP LEVER IS LOWERED.		
Broken or detached forward return cable.	Open tunnel access forward of lever and check forward return cable.	Attach or replace cable.
BINDING IN SYSTEM AS FLAPS ARE RAISED OR LOWERED.		
Cables not riding on pulleys.	Open access covers and observe pulleys.	Route cables correctly over pulleys.
Flap lever binding.	Check lever bearings and ratchet.	Replace defective parts.
Binding in flap bellcrank.	Check bellcrank in motion.	Replace defective bellcrank.
	Remove bellcrank and check needle bearings.	Replace or lubricate bearings.



NOTE

This system is typical for the flap system used on the Model 182 (1962 and on).

1. Motor
2. Hinge Assembly
3. Transmission
4. Tube Assembly
5. Bolt
6. Drive Pulley Assembly
7. Push - Pull Rod
8. Direct Cable
9. Retract Cable
10. Bolt
11. Flap Position Transmitter
12. Wire Rod
13. Pin
14. Cotter Pin
15. Flap Transmitter Arm
16. Washer
17. Set Screw
18. Spacer
19. Pulley
20. Bushing
21. Turnbuckle
22. Drive Pulley Assembly
23. Turnbuckle
24. Flap Position Indicator
25. Flap Switch

Figure 7A-1 Flap Control System

SECTION 9

ELEVATOR TRIM TAB CONTROL SYSTEMS

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9-1. ELEVATOR TRIM TAB CONTROL SYSTEM.

NOTE

The Models 150, 172, 175 and 182 (1962 and on) incorporate an elevator trim tab control system. On the 180, 182 (prior to 1962), and 185, stabilizer attitude is adjustable providing the longitudinal trim afforded by the elevator trim system in the other models.

9-2. A trim wheel, roller-chain and cable linkage and a screwjack actuator comprise the control system which affords flight adjustment of the elevator tab located on the right elevator. Adjustment of the trim wheel relieves control wheel pressure for any predetermined flight attitude. A position indicator in the tab wheel mechanism indicates nose attitude of the aircraft. Forward rotation of the wheel trims the nose down, and aft movement of the wheel trims the nose up.

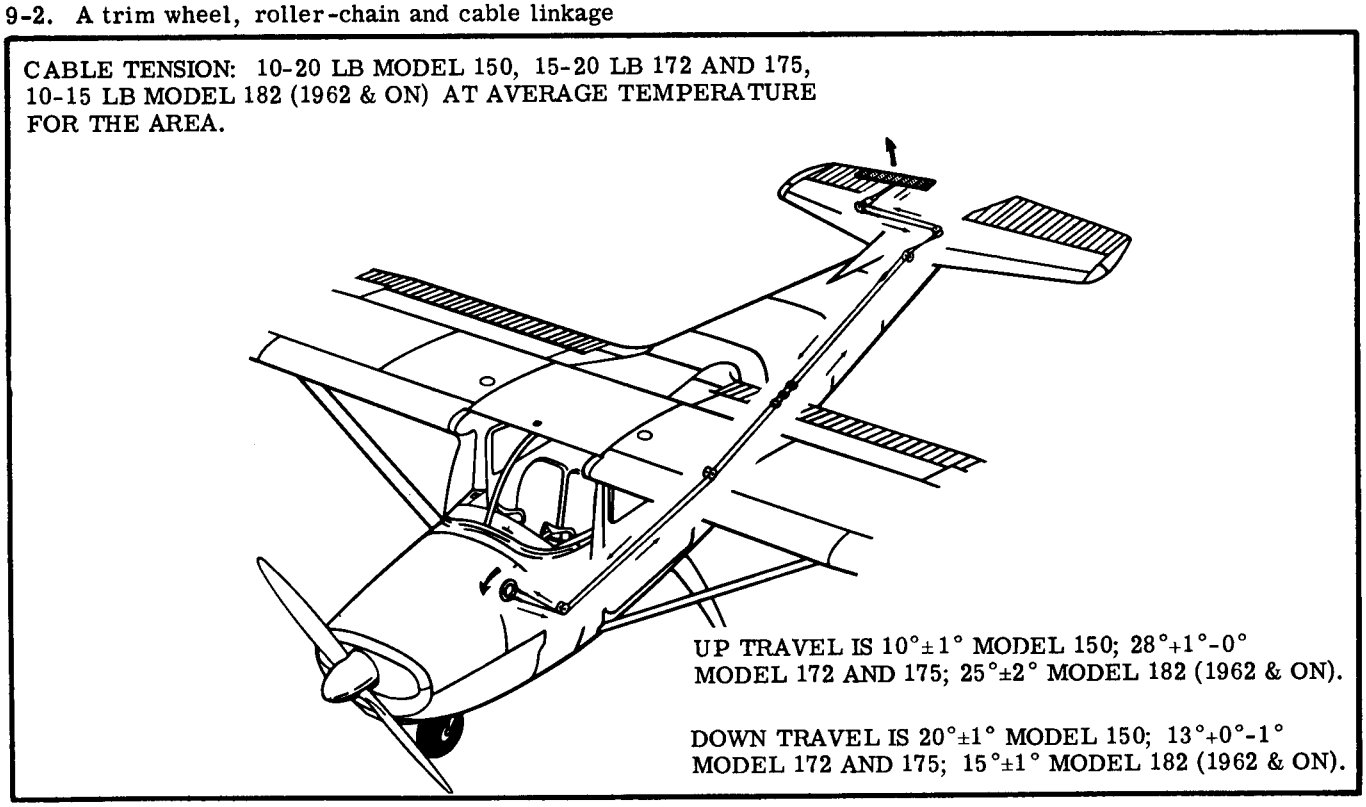
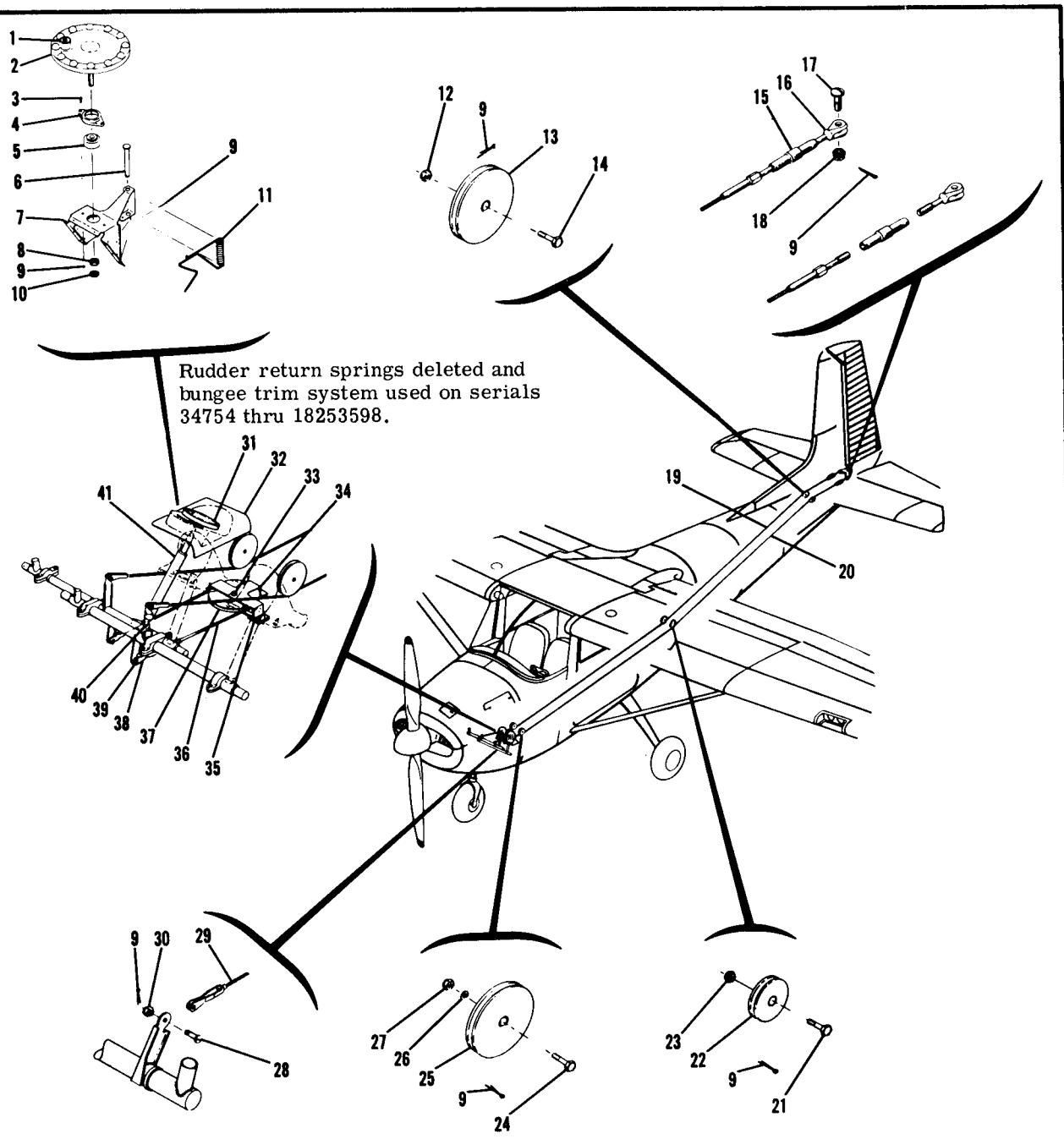
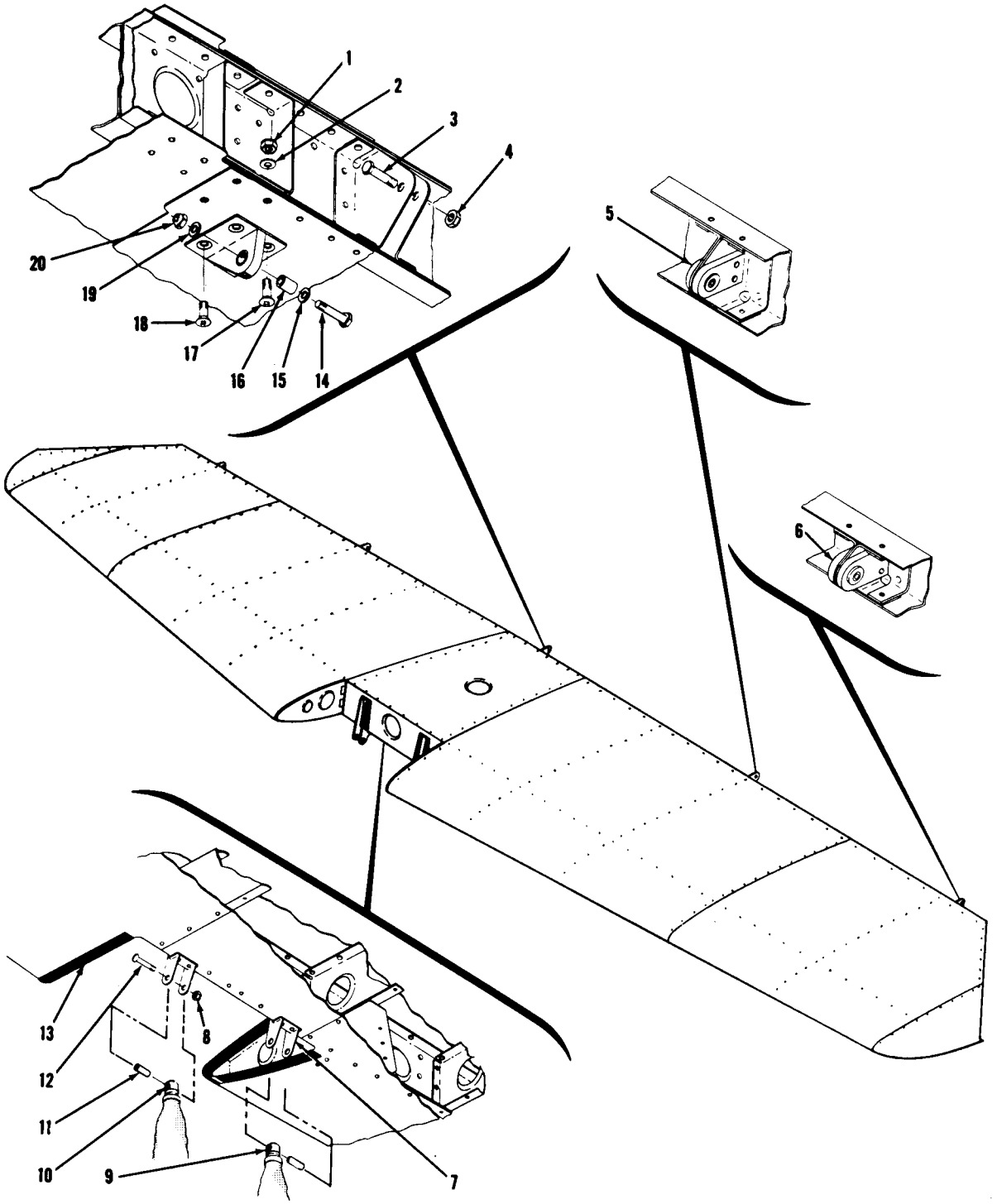


Figure 9-1. Elevator Trim Tab System Schematic



1. Knob
2. Trim Wheel
3. Screw
4. Bearing Retainer
5. Bearing
6. Pin
7. Bracket
8. Nut
9. Cotter Pin
10. Jamb Nut
11. Pointer
12. Nut
13. Pulley
14. Bolt
15. Turnbuckle Barrel
16. Turnbuckle Fork
17. Clevis Bolt
18. Nut
19. Right Cable
20. Left Cable
21. Bolt
22. Pulley
23. Nut
24. Bolt
25. Pulley
26. Washer
27. Nut
28. Clevis Bolt
29. Cable
30. Nut
31. Trim Wheel
32. Decorative Cover
33. Bolt
34. Pulley
35. Pulley Bracket
36. Carry-thru Cable
37. Pulley
38. Turnbuckle Fork
39. Clevis Bolt
40. Bolt, Nut
41. Bungee Assembly

Figure 10-4. Model 182 Rudder Control System (Prior to Serial 18253599)



1. Nut
2. Washer
3. Bolt
4. Nut
5. Inboard Hinge
6. Outboard Hinge
7. Lower Attaching Bracket
8. Nut
9. Stabilizer Actuator RH
10. Stabilizer Actuator LH
11. Eccentric Bushing
12. Bolt
13. Rubber Moulding
14. Bolt
15. Washer
16. Bushing
17. Screw
18. Stabilizer Hinge Assembly
19. Washer
20. Nut

Figure 11-2. Stabilizer

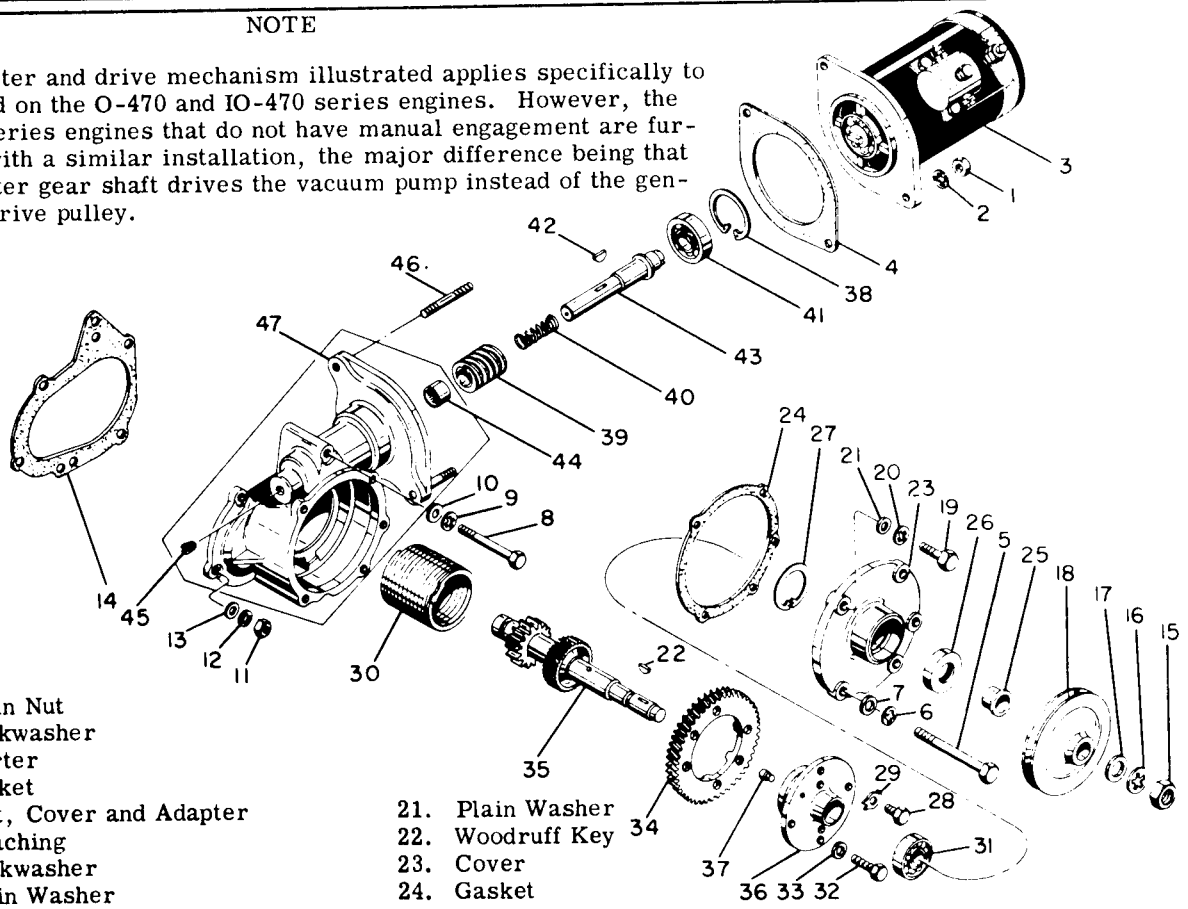
12-4. TROUBLE SHOOTING.

PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
ENGINE FAILS TO START.		
Improper use of starting procedure.		Review starting procedure.
Restriction in fuel lines.	Disconnect fuel lines from carburetor. If fuel does not flow from disconnected line, loosen line at other connections until restriction is located.	Remove and clean or replace lines as necessary.
Defective magneto switch or grounded magneto leads.	Check continuity of switch and magneto leads.	Repair/replace switch or leads.
Spark plugs fouled by moisture or deposits.	Remove several spark plugs and check visually.	Remove and clean all spark plugs. Replace if defective.
Defective carburetor.	If engine will start on primer but stops when mixture is placed in full rich position and priming is discontinued, the carburetor is defective.	Repair or replace carburetor.
Failure of magneto impulse couplings, if used.	With ignition switch off, rotate propeller slowly by hand and listen for loud clicks as impulse couplings operate.	Repair or replace magnetos.
Failure of starting vibrator, if used.	Turn starter circuit switch "OFF" (1961 only). Turn master switch "ON." Turn ignition switch to "START." Do NOT push in on 1962 and on. Buzzing sound denotes vibrator is operating.	Replace starting vibrator.
Excessive induction air leaks.	Check visually.	Correct the cause of leaks.
Water in fuel system.	Open fuel strainer drain valve and check for water.	Drain fuel tank sumps, fuel lines, fuel strainer and carburetor.
ENGINE STARTS BUT DIES.		
Water in fuel system and/or carburetor.	Open fuel strainer drain valve and check for presence of water in fuel.	Drain fuel tank sumps, fuel lines, fuel strainer, and carburetor bowl.
Moisture on spark plug electrodes.	Remove several spark plugs and check condition of electrodes.	Remove and clean all spark plugs.
Defective carburetor.	If engine will start on primer but stops when mixture is placed in full rich position and priming is discontinued, the carburetor is defective.	Repair or replace carburetor.
Excessive induction system air leaks.	Check visually.	Determine cause of leaks and correct.
Obstructed air intake.	Check visually.	Remove obstructions; service air filter if necessary.

STARTER DRAGS (Cont).		
Defective starter.	Check starter brushes, brush spring tension, thrown solder on brush cover.	Repair or replace starter.
Dirty, worn commutator.	Clean, check visually.	Turn down commutator.
STARTER EXCESSIVELY NOISY.		
Worn starter pinion.	Remove and examine pinion.	Replace starter drive.
Worn or broken teeth on crankshaft gears.	Remove starter and turn over engine by hand to examine crankshaft gear.	Replace crankshaft gear.

NOTE

The starter and drive mechanism illustrated applies specifically to that used on the O-470 and IO-470 series engines. However, the O-300 series engines that do not have manual engagement are furnished with a similar installation, the major difference being that the starter gear shaft drives the vacuum pump instead of the generator drive pulley.



1. Plain Nut
2. Lockwasher
3. Starter
4. Gasket
5. Bolt, Cover and Adapter Attaching
6. Lockwasher
7. Plain Washer
8. Bolt, Adapter Attaching
9. Lockwasher
10. Plain Washer
11. Plain Nut
12. Lockwasher
13. Plain Washer
14. Gasket
15. Plain Nut
16. Lockwasher
17. Plain Washer
18. Generator Drive Sheave (Pulley)
19. Bolt, Cover
20. Lockwasher
21. Plain Washer
22. Woodruff Key
23. Cover
24. Gasket
25. Sleeve
26. Oil Seal
27. Retaining Ring
28. Bolt, Spring Retaining
29. Tab Washer
30. Clutch Spring
31. Bearing
32. Bolt
33. Lockwasher
34. Starter Worm Wheel
35. Starter Gear Shaft
36. Starter Clutch Drum
37. Stepped Dowel
38. Retaining Ring
39. Starter Worm Gear
40. Spring
41. Bearing
42. Woodruff Key
43. Worm Drive Shaft
44. Bearing
45. Plug
46. Stud
47. Adapter

Figure 12-2. Starter and Starter Drive

12-48. BENDIX-SCINTILLA MAGNETOS.

12-49. Bendix-Scintilla magnetos used on Cessna aircraft are all of the same basic type. Beginning in 1961, the familiar impulse couplings were replaced by a starting vibrator starting system on the Models 180, 182 and 185. Bendix-Scintilla magnetos contain a conventional two-pole rotating magnet (rotor) mounted in ball bearings. Engine-driven at one end, the rotor shaft operates breaker points at the other end. A gear on the rotor shaft drives a distributor gear which transfers high-tension current from the coil to the proper outlet in the distributor block. A breaker compartment is located at the end of the magneto. On all except the magnetos used with the starting vibrator system, a condenser is provided in the breaker compartment. A coaxial capacitor which serves as the condenser as well as a radio noise suppressor is provided on magnetos used with the starting vibrator system.

The starting vibrator system employs a combination ignition and starter switch, and a starting vibrator. The left magneto contains an extra set of contact points so positioned that the magneto cam operates them at a retarded position to obtain the proper timing for starting. A starter circuit switch is provided (on 1961 models only) to make the starter circuit inoperative for hand-cranking (see paragraph 12-16). When the ignition switch is turned to "START," the right magneto is inoperative and the starting vibrator is energized. On 1961 models only, the starter solenoid is also energized. A push-to-start ignition switch (1962 and on) energizes the starter solenoid only when the key is pushed in, eliminating the need for a starter circuit switch. While the starter is cranking the engine, high-tension current is supplied to the spark plugs in the following manner:

a. The vibrator rapidly interrupts the direct current supplied to it by the battery, and this interrupted current flows to both sets of contact points in the left magneto.

b. The interrupted current flows to ground through both sets of points until the main set opens, then it flows to ground through the retard set of points only.

c. When the retard set opens, the interrupted current flows through the magneto primary coil to ground, thus inducing secondary current with a series of high-voltage peaks (a "shower of sparks") which are distributed to the spark plugs at the correct time by the magneto regular distribution system. The condenser operates in parallel with both sets of points.

12-50. REMOVAL. When removal of the complete magneto is desired, remove the high-tension outlet plate, disconnect the primary lead, and remove the nuts securing the magneto to the engine. On magnetos used with a starting vibrator, also disconnect the lead to the retard connection. Condenser or breaker assemblies can be replaced by removing the breaker cover; however, for ease of replacement and internal timing, it is recommended that the magneto be removed. Never remove the screws fastening the two halves of the magneto together - to do so would disengage the distributor gears, causing loss of internal timing and necessitating complete removal and retiming. Note approximate angle at which the magneto is mounted on the engine.

12-51. INTERNAL TIMING OF S-20 SERIES MAGNETOS.

NOTE

The information given here is for adjusting contact points to break at the proper position. It is assumed that the magneto has not been disassembled, and that the distributor gear, rotor gear, and cam have been installed for correct meshing of gears and correct direction of rotation. Magneto overhaul, including separating the two major sections of the magneto, is not covered in this manual. Refer to applicable Bendix publications for disassembly and overhaul.

a. Fabricate a timing template as follows:

1. Cut a paper template from figure 12-9.

2. Cement paper template to a thin piece of metal for use as a support plate, then trim the plate to the shape of the paper template.

3. Drill the two mounting holes with a No. 18 drill.

b. Fabricate a timing pointer as shown in figure 12-9A.

c. Remove magneto from engine, remove breaker compartment cover, and remove timing inspection plug from top of magneto.

d. Attach timing template to breaker compartment as shown in figure 12-9B, using 8-32 screws 1/4 inch long.

e. Turn rotating magnet in its direction of rotation until the painted chamfered tooth on distributor gear is approximately in center of inspection window, then turn rotating magnet back until it locates in its magnetic neutral position.

NOTE

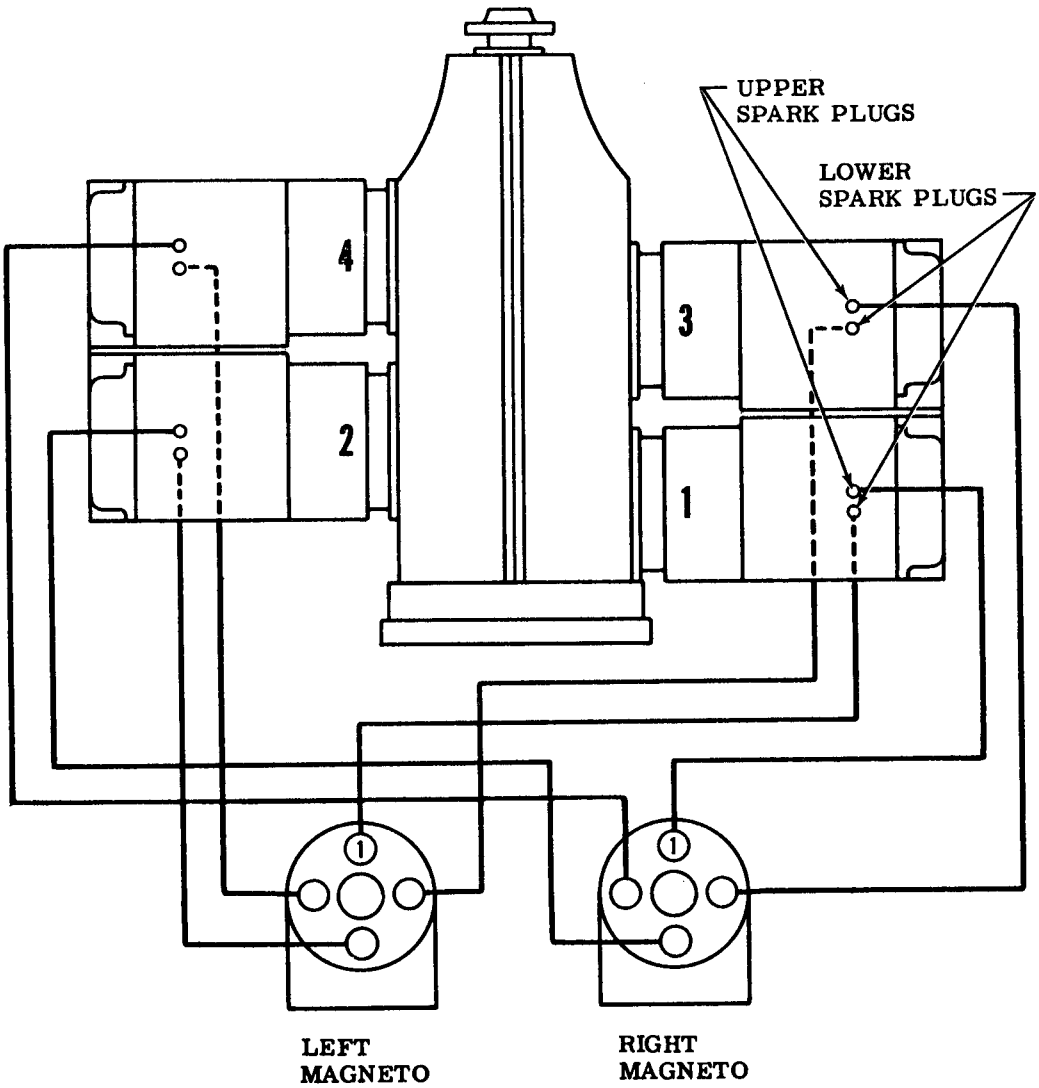
Impulse coupling pawls must be depressed to turn rotating magnet in its normal direction of rotation.

f. Remove cam screw, lockwasher, and washer, and use cam screw to install timing pointer so it indexes with 0° mark on template, while rotating magnet is still in its magnetic neutral position.

g. Turn rotating magnet in proper direction of rotation until pointer indexes with 10° mark ("E" gap). Using 11-851 timing light or equivalent, adjust the breaker contacts to open at this point.

CAUTION

The special breaker grounding spring used on early magnetos short-circuits the primary at all times when the ground terminal is not installed. To prevent this from interfering with the action of the timing light, an insulating strip of heavy paper should be placed between the breaker grounding spring and



FIRING ORDER 1-3 2-4

Figure 12-13. Model 150 Ignition Schematic

SECTION 12A

MODEL 185 POWERPLANT

(SEE SECTION 12 FOR POWERPLANTS OF OTHER MODELS)

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12A-1. DESCRIPTION.

12A-2. An air cooled, wet-sump, six cylinder opposed Continental IO-470-F engine, equipped with fuel injection, is used to power the Model 185. For engine specifications refer to paragraph 12A-3.

NOTE

For repair and overhaul of the engine, accessories, and propeller, refer to appropriate publications issued by the manufacturers of these items.

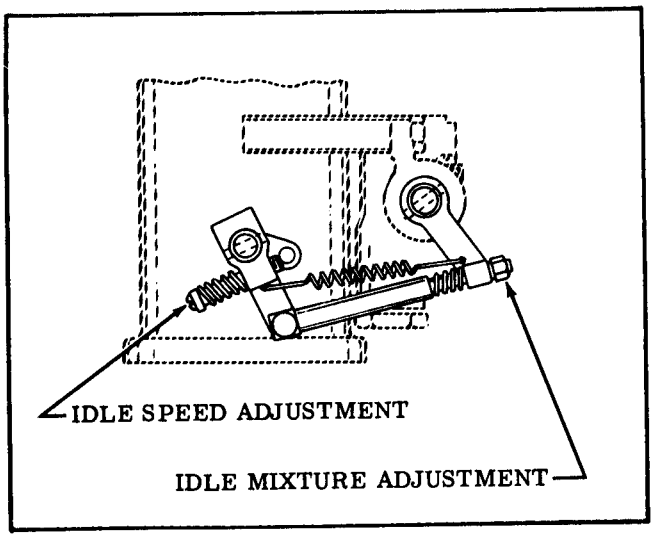

Figure 12A-2. Idle Adjustments

12A-27. CLEANING FUEL MANIFOLD VALVE ASSEMBLY.

a. Disconnect all lines and remove the fuel manifold valve assembly.

b. Hold the top cover down against internal spring until all four attaching screws have been removed, then gently lift off the cover. Use care not to damage the spring-loaded diaphragm below it.

c. Remove the upper spring and lift the diaphragm assembly straight up.

NOTE

If the valve attached to the diaphragm is stuck in the bore of the body, grasp the center nut and rotate and lift at the same time to work gently out of the body.

d. Remove the lower ball and spring.

CAUTION

The filter screen is a tight fit and may be damaged if removal is attempted. It should be removed only if a new screen is to be installed.

e. Using clean gasoline, flush out the chamber below the screen.

f. Flush above the screen and inside the center bore making sure that outlet passages are open. Use only a gentle stream of compressed air to remove dust and dirt and to dry.

g. Clean the diaphragm and valve, top cover, and ball and springs in the same manner.

h. Replace lower spring and ball (ball on TOP of spring).

i. Carefully replace diaphragm and valve, making sure ball and spring feed into hollow end of valve. Check that valve works freely.

j. Place upper spring in position.

k. Align mounting holes in body, diaphragm, and top cover, locating the small vent hole in the cover to the rear. Hold the cover down against the spring while installing and tightening all four attaching screws. Safety the screws.

l. Install the fuel manifold valve assembly on the engine and reconnect all lines.

12A-28. INSTALLATION OF FUEL MANIFOLD.

a. Secure the fuel manifold to the crankcase with two crankcase bolts.

b. Connect the two fuel hoses and the six fuel injection lines.

12A-29. FUEL DISCHARGE NOZZLES. From the fuel manifold, individual fuel lines carry the metered fuel to the fuel discharge nozzles, one for each cylinder. These nozzles are installed in the cylinder heads outside each intake valve. An air bleed arrangement is incorporated in each nozzle. This aids in vaporization of fuel and, by breaking the high vacuum at idle, maintains the fuel lines solidly filled and ready for instant acceleration of the engine. Nozzles are stamped with a letter on the hex of the nozzle body. Each engine has matched (same letter) nozzles. Replacement nozzles must match, but a matched set of another letter may be used.

12A-30. REMOVAL OF FUEL DISCHARGE NOZZLES.

NOTE

Plug or cap all disconnected lines and fittings.

a. Disconnect the fuel injection lines at the fuel discharge nozzles. Remove the nozzles with a 1/2 inch deep socket.

12A-31. CLEANING OF FUEL DISCHARGE NOZZLES. To clean nozzles, immerse in clean solvent. Use compressed air to dry. Do not remove shield to clean air screens in nozzle. Do not use a wire or other object to clean orifices.

12A-32. INSTALLATION OF FUEL DISCHARGE NOZZLES.

a. Install the fuel discharge nozzles in the cylinders using a 1/2 inch deep socket.

b. Connect the fuel injection lines at the fuel discharge nozzles.

c. Check installation for crimped lines, loose fittings, etc.

12A-33. FUEL INJECTION PUMP. The fuel pump is a positive-diaplacement, rotating vane type. It has a splined shaft for connection to the accessory drive section of the engine. Fuel enters the pump at the swirl well of the vapor separator. Here, vapor is separated by a swirling motion so that only liquid fuel is fed to the pump. The vapor is drawn from the top center of the swirl well by a small pressure jet of fuel and is fed into the vapor return line and returned to the fuel tank. Since the pump is engine driven, changes in engine speed affect total pump flow proportionally. The pump supplies more fuel than is required by the engine, therefore a relief valve is provided. A check valve is also provided to permit auxiliary pump pressure to bypass the engine-driven pump for starting, or in the event of engine-driven fuel pump failure in flight.

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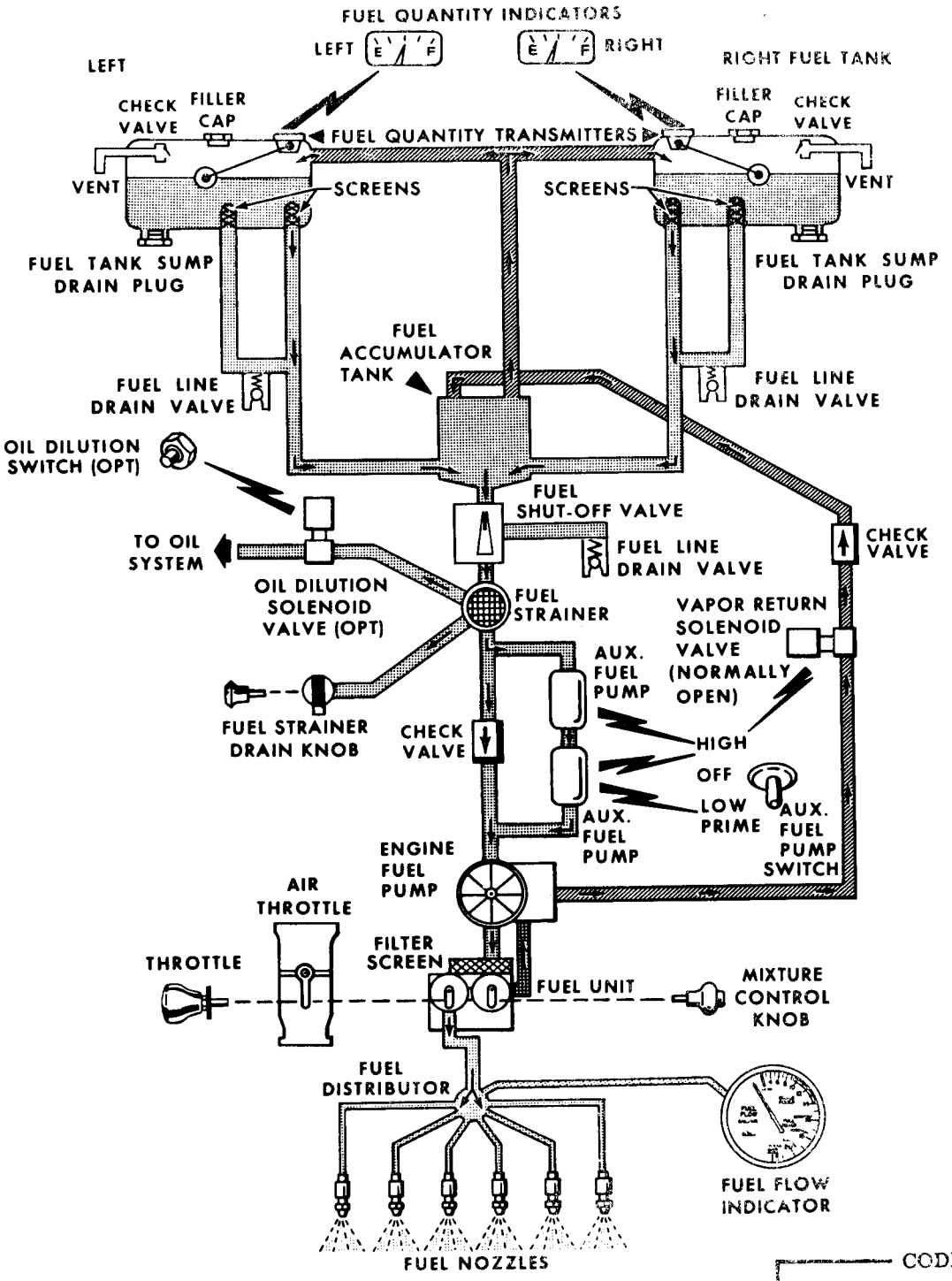

NOTE

Fuel tank sump drain plugs may be replaced with optional quick-drain valves. Prior to 1962, drain plugs were used on fuel lines instead of quick-drain valves.

Figure 13-1B. Fuel Schematic - Model 185

13-7. FUEL TANK REPLACEMENT - 150, 172 AND 175.

NOTE

These airplanes are equipped with rigid, welded aluminum fuel tanks located in the inboard wing area. Since the installation is similar, the following general procedure may be followed for all subject airplanes.

a. Remove fuel sump drain plug and drain fuel.
b. Remove fuel tank cover by removing attaching screws.
c. Remove wing root fairings.
d. Disconnect all fuel and vent lines from fuel tank. Remove fittings as necessary for clearance when removing tank.
e. Loosen upholstery around direct-reading fuel gages and remove; disconnect electrical leads from fuel tanks with electrical fuel gage transmitters.
f. Disconnect straps securing fuel tank and remove the tank. Use care not to damage protruding fittings and hose connections when removing the tank.
g. Install tank by reversing above procedure.

NOTE

Latest recommendation for lubrication and sealing fuel system fittings is MIL-T-5544 graphite-petrolatum (or equivalent). Apply to male threads only, omitting the first two threads.

13-8. REPLACEMENT OF DIRECT-READING FUEL QUANTITY GAGE.

a. Drain fuel from tank.
b. Remove four screws and washers attaching gage to tank and pull gage from tank.
c. Install gage with a new gasket, using four screws and washers.

CAUTION

When replacing the quantity gage, take care to avoid bending the float arm. If the float arm is bent, the gage indication will be incorrect.

13-9. REPLACEMENT OF FUEL GAGE TRANSMITTERS.

NOTE

The resistor-type fuel gage transmitters are used in all aircraft which do not employ the direct-reading gages.

a. Drain fuel from tank or cell.
b. On 150, 172 and 175 series, remove skin plate over fuel tank to gain access to fuel gage transmitter. On the 180, 182 and 185, remove wing root fairings.
c. Disconnect electrical lead to unit.
d. On 150, 172 and 175, remove screws attaching transmitter to top of tank. On 180, 182 and 185 models, remove screws through unit and root rib.
e. Replace unit by reversing steps listed above. On rubberized fuel cells, no gasket paste should be used.
f. Fill tank; check for leaks and correct gage reading.

13-10. CHECKING FUEL VENT. Field experience has demonstrated that fuel vents can become plugged, with possible fuel starvation of the engine or collapse of fuel cells. Although the vent system varies in the different models, the following check is practical for aircraft covered by this manual.

a. Remove right hand fuel tank filler cap.
b. Force air through vent line (lower left wing). Providing system is free from obstructions, air will be emitted from the right tank.
c. Make certain vent is properly positioned behind the wing strut as shown in figure 13-6.

NOTE

Earlier airplanes which incorporate vent systems with vent openings on top of the wing, and the Model 185 which has a vent for each tank, will require forcing air through the vent and out the filler opening of each tank separately.

Any system found to be plugged should be corrected prior to returning the airplane to service.

References for Figure 13-5

1. Line
2. Grommet
3. Nut
4. Washer
5. O-ring
6. Union
7. Door
8. Hinge
9. Door Plate
10. Latch
11. Cotter Pin
12. Screw
13. Weld Assembly
14. Fuel Cap
15. Filler Neck
16. Gasket
17. Clamp
18. Adapter
19. Sump Drain Plug
20. Gasket
21. Nut
22. Protector
23. Finger Strainer
24. Outer Ring
25. Gasket
26. Fuel Transmitter
27. Inner Ring
28. Outer Ring
29. Gasket
30. Adapter
31. Fuel Gage
32. Fuel Cell
33. Inner Ring
34. Outer Ring
35. Hose
36. Valve
37. Adapter
38. Hinge Pin
39. Chain
40. O-ring

SECTION 14

PROPELLERS

(SEE SECTION 14A FOR HARTZELL PROPELLERS—MODEL 182, 1962 AND ON)

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NOTE

Civil Air Regulations define major and minor repairs and alterations and who may accomplish them, and they furnish information on limits, tolerances, and workmanship. This section may be used as a guide, but the Civil Air Regulations and the propeller manufacturer's instructions must be observed.

14-1. PROPELLERS.

14-2. All-metal, fixed pitch propellers are used on the Models 150, 172 and 175 (prior to 1962). Models 180, 182, 185 and 175 (1962 and on) are equipped with all-metal, constant-speed, governor-regulated propellers.

14-3. REPAIR of metal propellers first involves evaluating the damage and determining whether the repair will be a major or minor one and, in accordance with Civil Aeronautics Manual 18 (CAM 18), who is permitted to accomplish the repair.

a. General Repair Considerations:

Under no circumstances are the raised edges of defects to be corrected by peening. No welding, soldering or compounds of any nature are to be used to fill or correct defects. All repair is to be in accordance with standard approved and accepted practice.

More than one defect on blade is not cause for considering blade not airworthy if repair is within indicated limits. A reasonable number of repairs per blade is permissible if their location with respect to each other is not such as to form a continuous line that may materially weaken blade. Any transverse crack shall be cause for considering blade not airworthy.

Repair necessitating the removal of an appreciable amount of metal shall be reason to check horizontal and vertical balance.

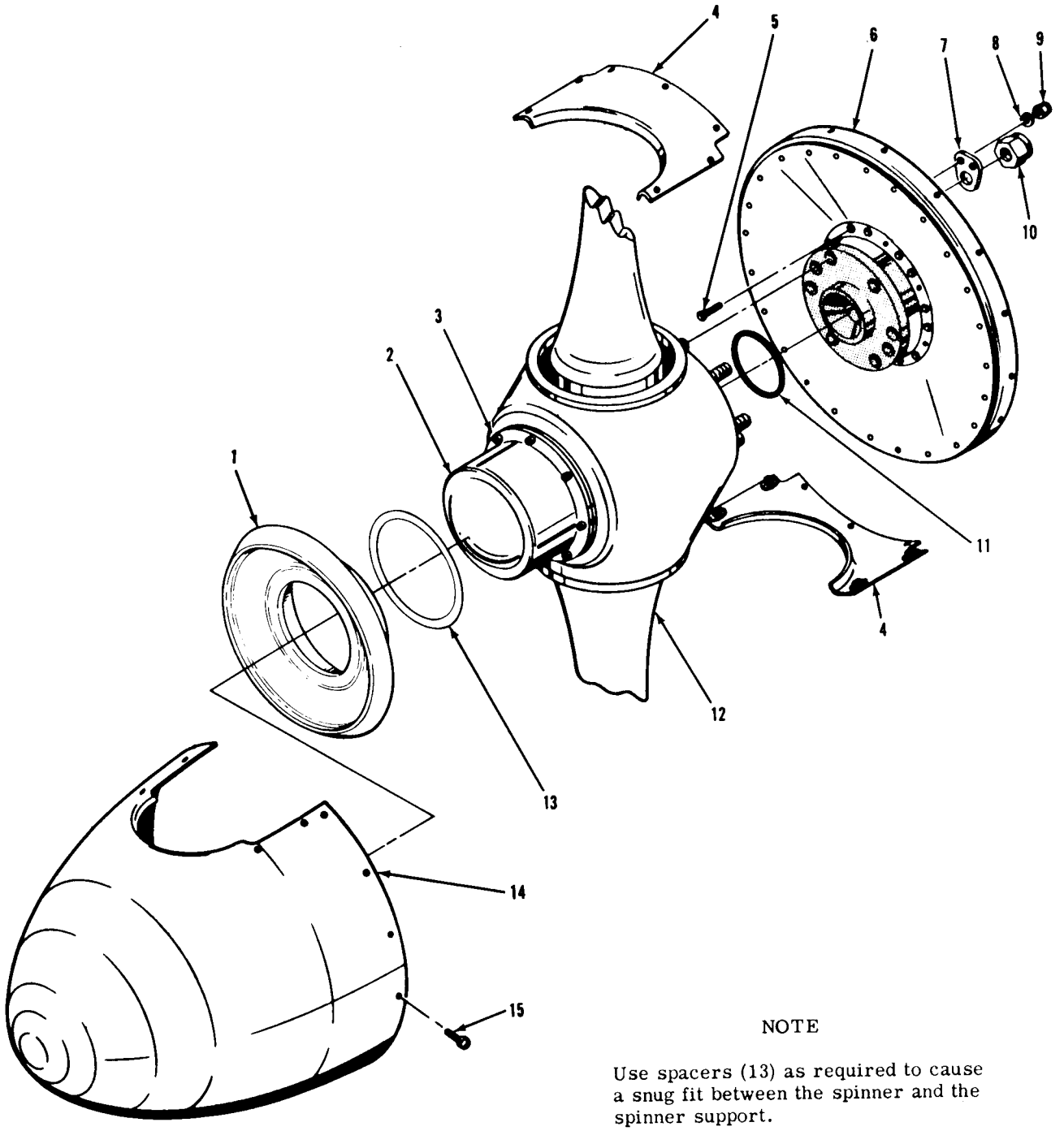
The repair of defects is permissible providing the treatment does not materially weaken the blade, reduce its weight, or impair its performance.

b. Defects on Thrust Face or Camber Side:

Repair by removal of metal to form shallow, large radius, round bottomed depressions. Periodic inspection during repair should be made to avoid removal of excessive amounts of metal. All raised edges should be carefully smoothed out to reduce the area of the defect and the amount of metal to be removed. Repair with suitable fine cut files and coarse grain emery cloth and smooth all edges and surfaces with fine grain emery cloth. Any blade repair on these surfaces which necessitates a depression that exceeds the manufacturer's tolerances or those listed in CAM 18 shall be cause for considering blade not airworthy.

c. Defects on Leading and Trailing Edge:

Repair defects as outlined in "b" above with suitable half round file and emery cloth. Carefully smooth all edges of repaired defect. Any

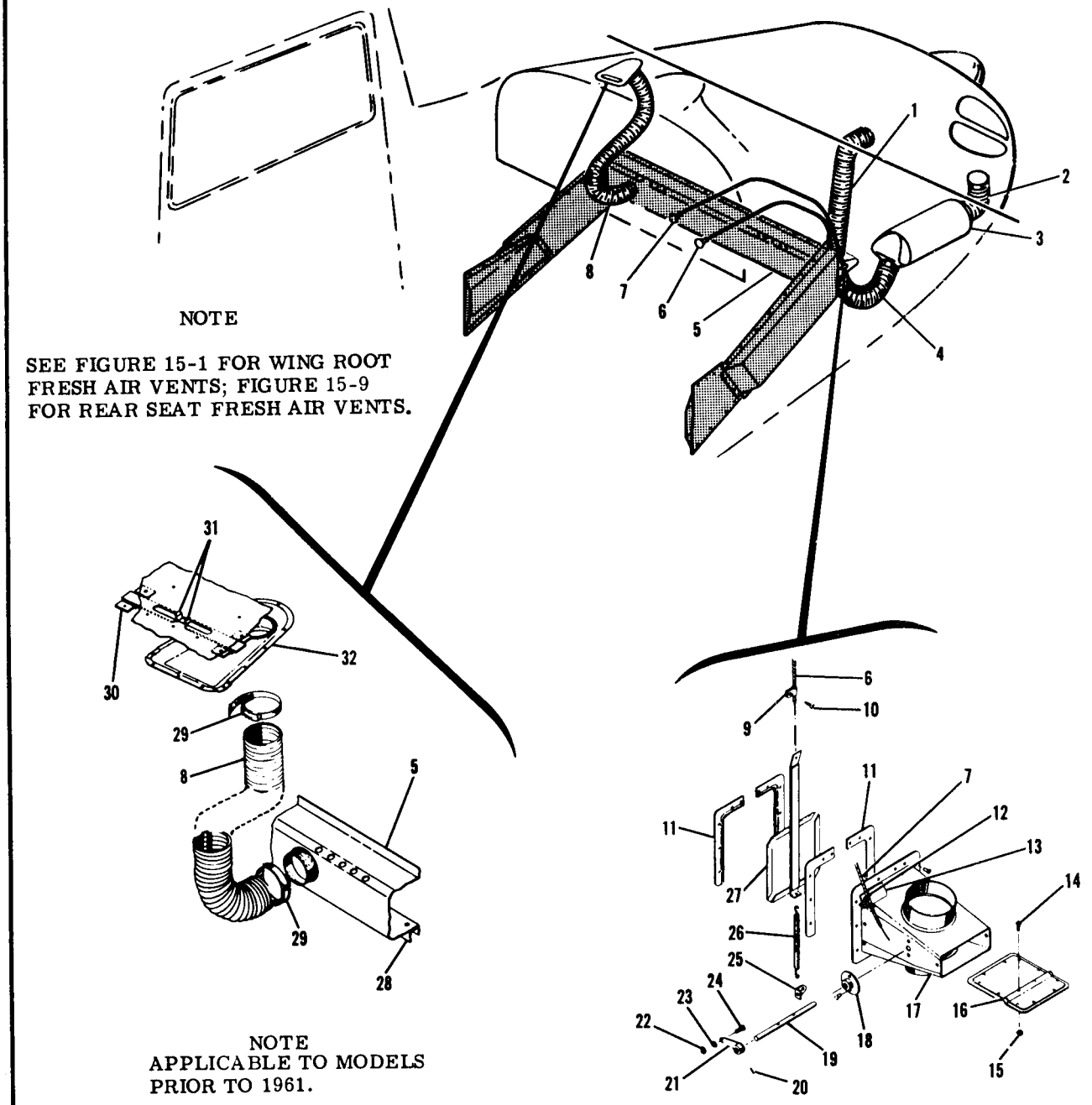


NOTE

Use spacers (13) as required to cause a snug fit between the spinner and the spinner support.

1. Spinner Support
2. Cylinder
3. Screw
4. Fillet
5. Screw
6. Spinner Bulkhead
7. Lug
8. Washer
9. Nut
10. Nut
11. O-Ring
12. Propeller
13. Spacer
14. Propeller Spinner
15. Screw

Figure 14-5. Typical McCauley Propeller Installation



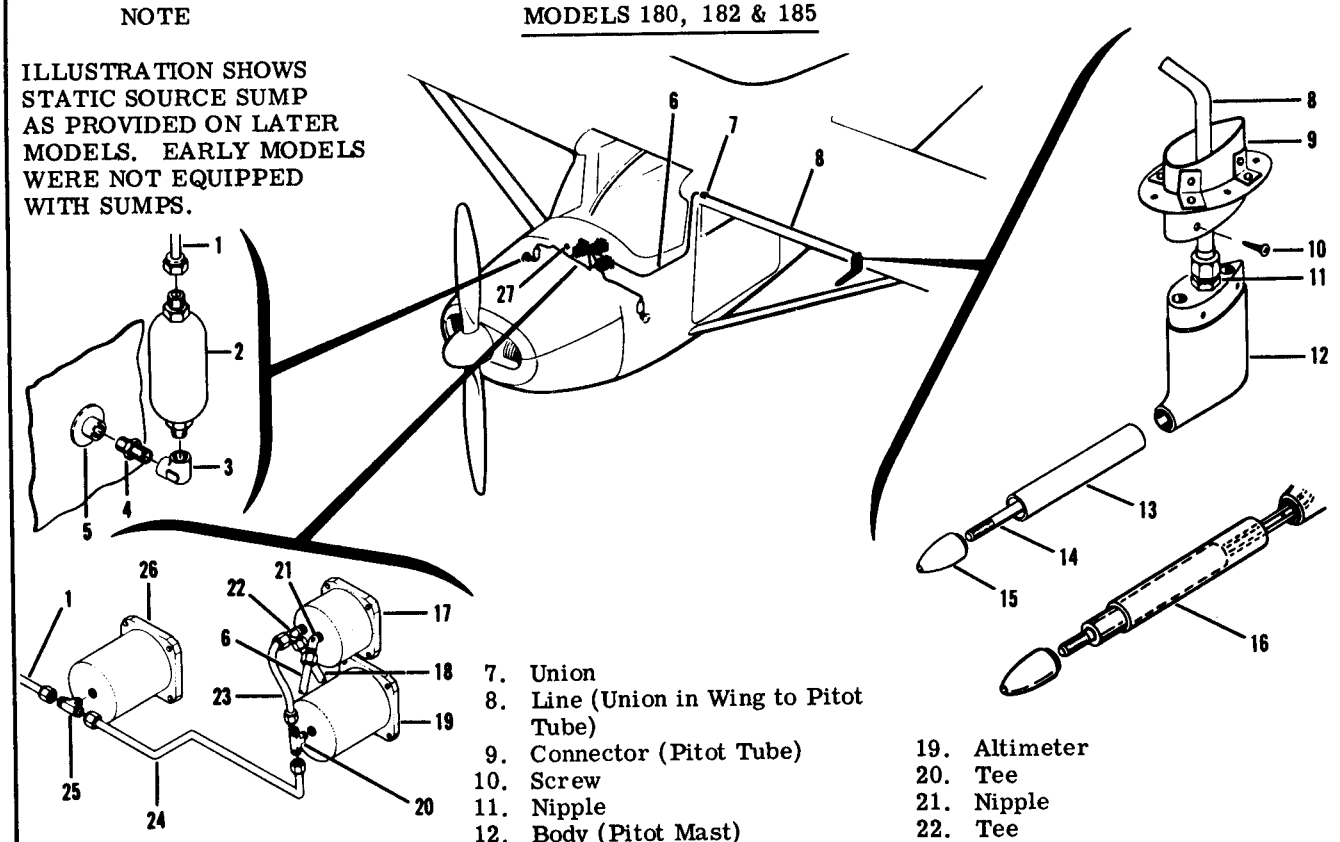
1. Hose (Valve to Baffle)
2. Hose (Inlet to Baffle)
3. Shroud Inlet
4. Hose (Valve to Shroud)
5. Duct
6. Air Control
7. Heat Control
8. Hose (Duct to Defroster)
9. Clamp
10. Screw
11. Spacer
12. Clip
13. Angle
14. Screw
15. Nut
16. Plate
17. Valve
18. Bushing
19. Shaft
20. Roll Pin
21. Arm
22. Nut
23. Washer
24. Clamp
25. Bracket
26. Spring
27. Valve
28. Angle
29. Clamp
30. Guide
31. Valve
32. Duct

Figure 15-2. Model 172 Cabin Heating and Ventilating System, Prior to 1961

NOTE

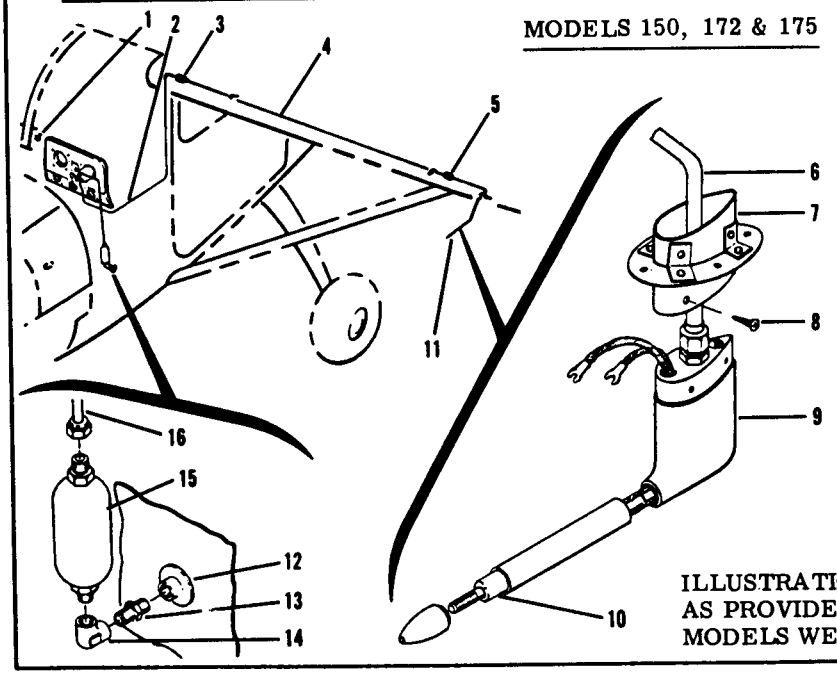
ILLUSTRATION SHOWS STATIC SOURCE SUMP AS PROVIDED ON LATER MODELS. EARLY MODELS WERE NOT EQUIPPED WITH SUMPS.

MODELS 180, 182 & 185



1. Line (Right Sump to Tee)
2. Right Static Source Sump
3. Elbow
4. Nipple
5. Right Static Port
6. Line (Airspeed Indicator to Union in Wing)
7. Union
8. Line (Union in Wing to Pitot Tube)
9. Connector (Pitot Tube)
10. Screw
11. Nipple
12. Body (Pitot Mast)
13. Tube (Pitot Mast)
14. Stem (Pitot Mast)
15. Nose Fitting (Pitot Mast)
16. Heater Assembly (Pitot Mast)
17. Airspeed Indicator
18. Line (Tee to Left Static Source Sump)
19. Altimeter
20. Tee
21. Nipple
22. Tee
23. Line (Airspeed Indicator Tee to Altimeter Tee)
24. Line (Altimeter Tee to Vertical Speed Indicator Tee)
25. Tee
26. Vertical Speed Indicator
27. Switch (Pitot Heater)

MODELS 150, 172 & 175



1. Switch (Pitot Heater)
2. Line (Airspeed Indicator to Union in Wing)
3. Union
4. Line (Pitot Tube to Wing Root)
5. Union
6. Line (Union to Heated Pitot Tube)
7. Connector (Pitot Tube)
8. Screw
9. Pitot Tube Mast Assy (Heated)
10. Heater Element (Pitot Mast)
11. Pitot Tube (Unheated)
12. Static Port
13. Nipple
14. Elbow
15. Static Source Sump
16. Line (Static Source to Airspeed Indicator)

NOTE

ILLUSTRATION SHOWS STATIC SOURCE SUMP AS PROVIDED ON LATER MODELS. EARLY MODELS WERE NOT EQUIPPED WITH SUMPS.

Figure 16-2. Pitot-Static Systems

PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
DIAL SPINS IN ONE DIRECTION CONTINUOUSLY.		
Operating limits have been exceeded.		Cage and reset when airplane is level.
Defective mechanism.	Substitute known-good gyro and check indication.	Replace instrument.

16-20B. TROUBLE SHOOTING -- VACUUM PUMP.

PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
EXCESSIVE OIL IN DISCHARGE.		
Excessive flow to pump.	Check pump vent plugs.	Clean vent plugs.
Clogged oil separator.	Check separator for obstructions.	Clean separator.
Damaged engine drive seal.		Replace gasket.
HIGH SUCTION.		
Suction relief valve screen clogged.	Check screen for obstructions.	Clean or replace screen.
LOW SUCTION.		
Relief valve leaking.		Replace relief valve.
Vacuum pump failure.	Substitute known-good pump and check pump suction.	Replace vacuum pump.
LOW PRESSURE.		
Safety valve leaking.		Replace safety valve.
Vacuum pump failure.	Substitute known-good pump and check pump pressure.	Replace vacuum pump.

16-35. TROUBLE SHOOTING -- CARBURETOR AIR TEMPERATURE GAGE (ELECTRIC).

PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
GAGE POINTER STAYS OFF LOW END OF SCALE.		
Blown fuse/circuit breaker out.	Check fuse/circuit breaker.	Replace fuse/reset circuit breaker.
Master switch "OFF" or switch defective.	Check switch "ON."	Replace defective switch.
Broken or grounded leads between gage and sensing unit.	Check circuit wiring.	Repair or replace defective wiring.
Defective gage or sensing unit.	Substitute known-good gage or sensing unit.	Replace gage or sensing unit.
GAGE POINTER GOES OFF HIGH END OF SCALE.		
Broken or grounded lead.	Check circuit wiring.	Repair or replace defective wiring.
Defective gage or sensing unit.	Substitute known-good gage or sensing unit.	Replace gage or sensing unit.
GAGE OPERATES INTERMITTENTLY.		
Defective master switch, broken or grounded lead.	Check circuit wiring.	Replace switch, repair or replace defective wiring.
Defective gage or sensing unit.	Substitute known-good gage or sensing unit.	Replace gage or sensing unit.
EXCESSIVE POINTER OSCILLATION.		
Loose or broken lead.	Check circuit wiring.	Repair or replace defective wiring.
Defective gage or sensing unit.	Substitute known-good gage or sensing unit.	Replace gage or sensing unit.
Excessive panel vibration.	Check panel shock mounts.	Replace defective shock mounts.
OBVIOUSLY INCORRECT TEMPERATURE READING.		
Defective gage or sensing unit.	Substitute known-good gage or sensing unit.	Replace gage or sensing unit.
POINTER FAILS TO GO OFF SCALE WITH CURRENT OFF.		
Defective master switch.		Replace switch.
Defective gage.	Substitute known-good gage.	Replace gage.

17-10. TROUBLE SHOOTING THE BATTERY SYSTEM - Cont.

PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
BATTERY SUPPLIES POWER TO BUS BUT WILL NOT CRANK ENGINE		
Low battery.	Check specific gravity.	Charge battery.
Faulty battery cables.	Inspect for corrosion and poor connection.	Clean and reconnect.
Battery cell shorting under load.	Test battery with a load tester.	Replace battery.
Defective starter contactor or solenoid.	On aircraft with starter switch check operation of switch and solenoid.	Repair wiring. Replace switch. Replace solenoid.
BATTERY USES EXCESSIVE AMOUNT OF WATER.		
Charging rate too high.	Test voltage regulator or try a new unit.	Adjust or replace regulator.
	NOTE Voltage regulators are adjustable, however adjustment should not be attempted unless proper equipment is available. Refer to Delco-Remy service bulletins for instructions.	

17-11. REMOVAL AND REPLACEMENT OF BATTERY. (See figures 17-1 thru 17-4.)

a. Remove the battery box cover and open cover.

b. Disconnect the ground cable from the negative battery terminal.

CAUTION

Always remove the ground cable first and replace it last to prevent accidental short circuits.

c. Disconnect the cable from the positive terminal of the battery.

d. Lift the battery out of the battery box.

e. To replace the battery, reverse this procedure.

17-12. CLEANING THE BATTERY. For maximum efficiency, the battery and connections should be kept clean at all times.

a. Remove the battery in accordance with the preceding paragraph.

b. Tighten battery cell filler caps to prevent the cleaning solution from entering the cells.

c. Wipe battery cable ends, battery terminal and the entire surface of the battery with a clean cloth moistened with a solution of bicarbonate of soda (baking soda) and water.

d. Rinse with clear water, wipe off excess water and allow batteries to dry.

e. Brighten up cable ends and battery terminals with emery cloth or a wire brush.

f. Coat the battery terminals and the cable ends with petroleum jelly.

g. Install the batteries according to the preceding paragraph.

17-13. ADDING ELECTROLYTE OR WATER TO THE BATTERY. A battery being charged and discharged with use will decompose the water from the electrolyte by electrolysis. When the water is decomposed hydrogen and oxygen gases are formed which escape into the atmosphere through the battery vent system. The acid in the solution chemically combines with the plates of the battery during discharge or is suspended in the electrolyte solution during charge. Unless the electrolyte has been spilled from a battery, acid should not be added to the solution. The water, however will decompose into gases and should be replaced regularly. Add distilled water as necessary to maintain the electrolyte level with the horizontal baffle plate or the split ring on the filler neck inside the battery. When "dry charged" batteries are put into service fill as directed with electrolyte. When the electrolyte level falls below normal with use, add only distilled water to maintain the proper level. The battery electrolyte contains approximately 25% sulphuric acid by volume. Any change in this volume will hamper the proper operation of the battery.

CAUTION

Do not add any type of "battery rejuvenator" to the electrolyte. When acid has been spilled from a battery, the acid balance may be adjusted by following instructions published by the Association of American Battery Manufacturers.

17-14. TESTING THE BATTERY. The specific gravity, of the battery may be measured with a hydrometer to determine the state of battery charge. If the hydrometer reading is low, slow-charge the battery and re-

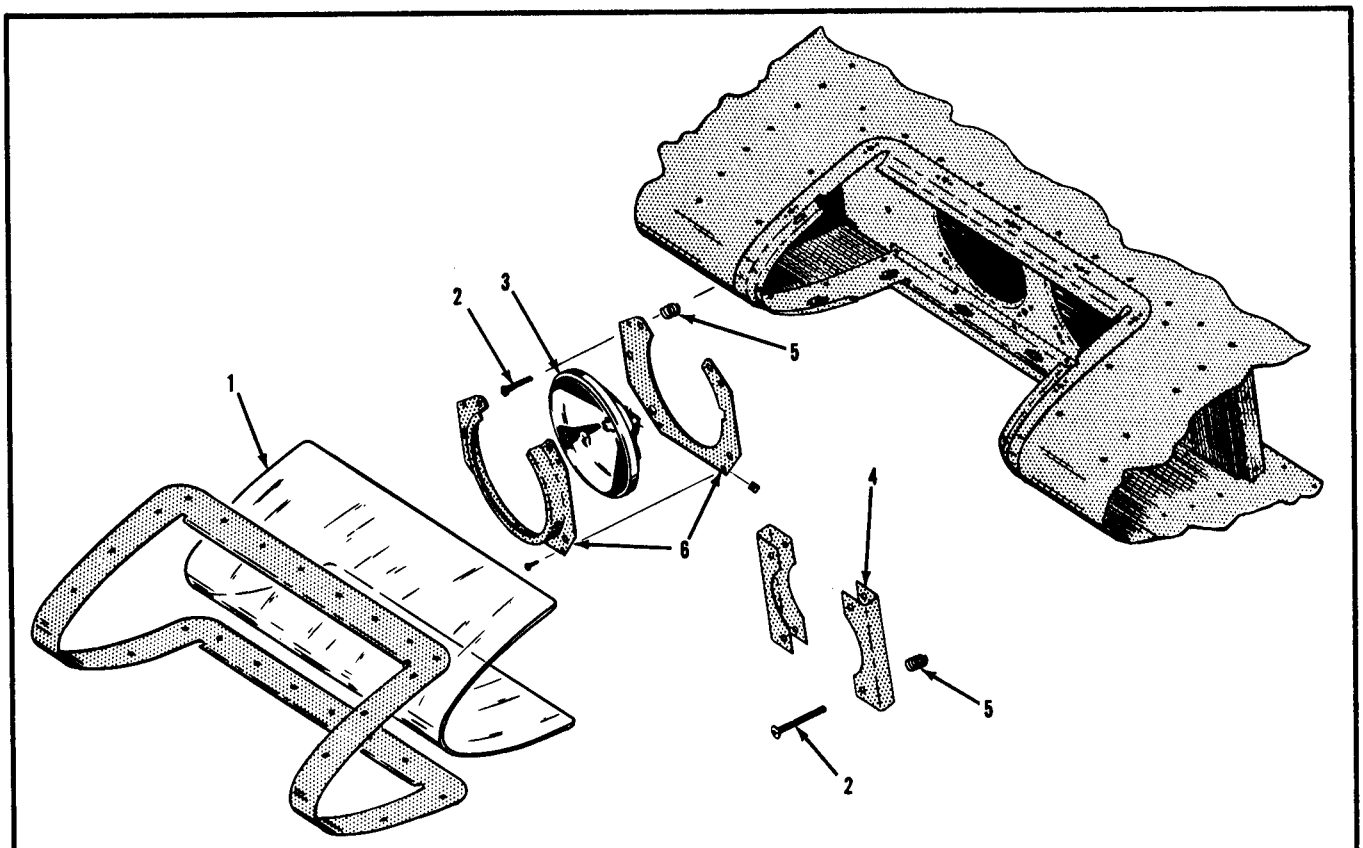
a. Remove the three screws holding the beacon to the fiberglas mounting.
b. Withdraw the beacon from the mounting and remove the screw attaching the ground wire to the fin structure.
c. Disconnect the other electrical lead and remove beacon.
d. To replace the beacon, reverse this procedure. Mount the beacon with the light baffle forward.

17-46. REMOVAL AND REPLACEMENT OF DOME AND INSTRUMENT LIGHTS. Figure 17-11 shows in detail all components of the dome and instrument lights installation. Use this figure as a guide for removal and replacement.

17-47. ADJUSTMENT OF OVERHEAD LIGHT CONSOLE FOR LATE MODEL 182'S. The overhead light console on late 182 models may be adjusted to allow the light to illuminate the instrument panel without striking the windshield and causing glare. Adjust the angle of light by turning the rear outboard screws (see figure 17-11), until the light beams are properly directed.

17-48. REMOVAL AND REPLACEMENT OF COURTESY LIGHTS. Figure 17-12 shows in detail all components of the courtesy lights installation. Use this figure as a guide for removal and replacement.

SHOP NOTES:



1. Window
2. Screw
3. Landing Light
4. Support Channel
5. Spring
6. Bracket

Figure 17-7. Landing and Taxi Lights Installation

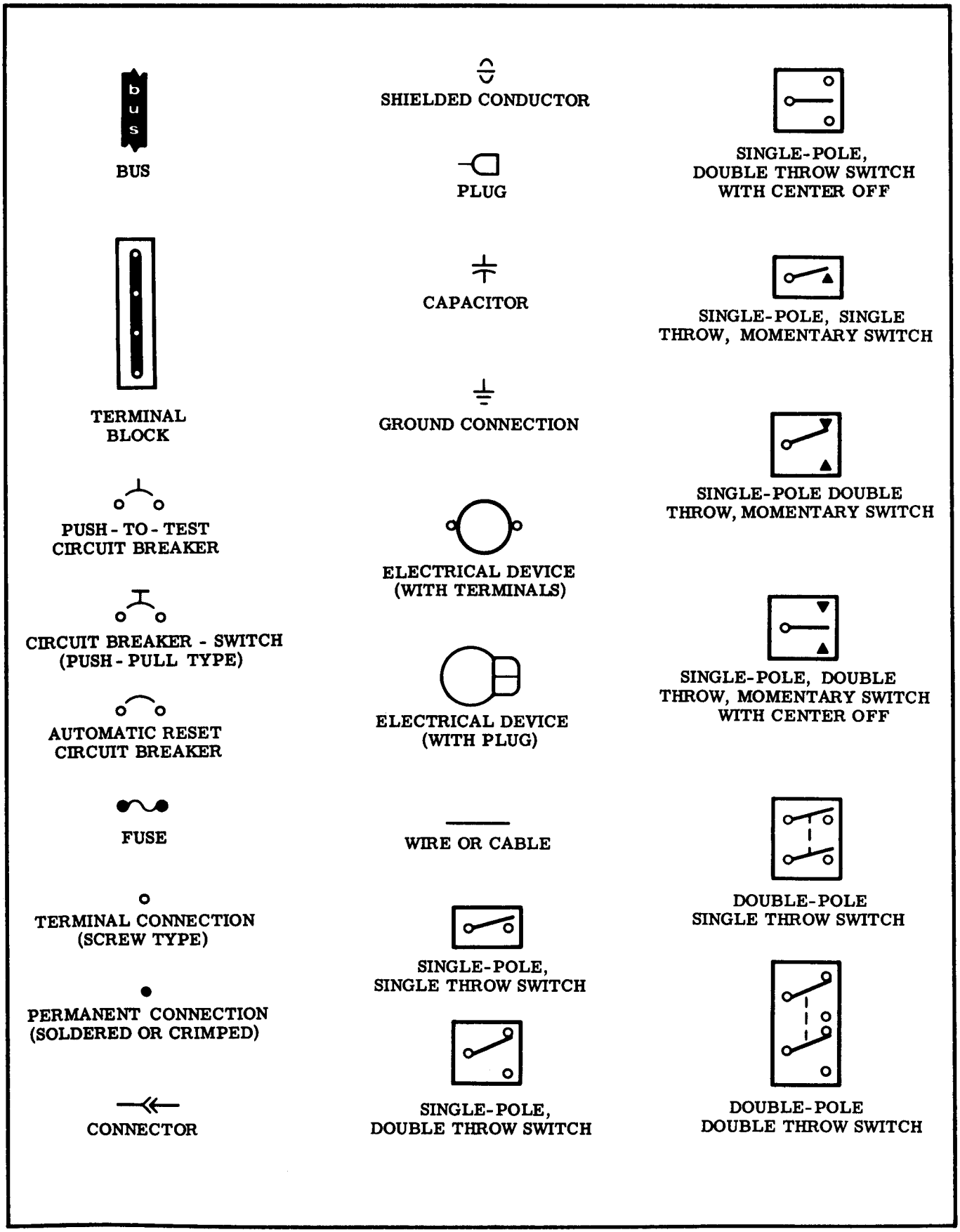


Figure 17-15. Symbols Chart (Sheet 1 of 4)

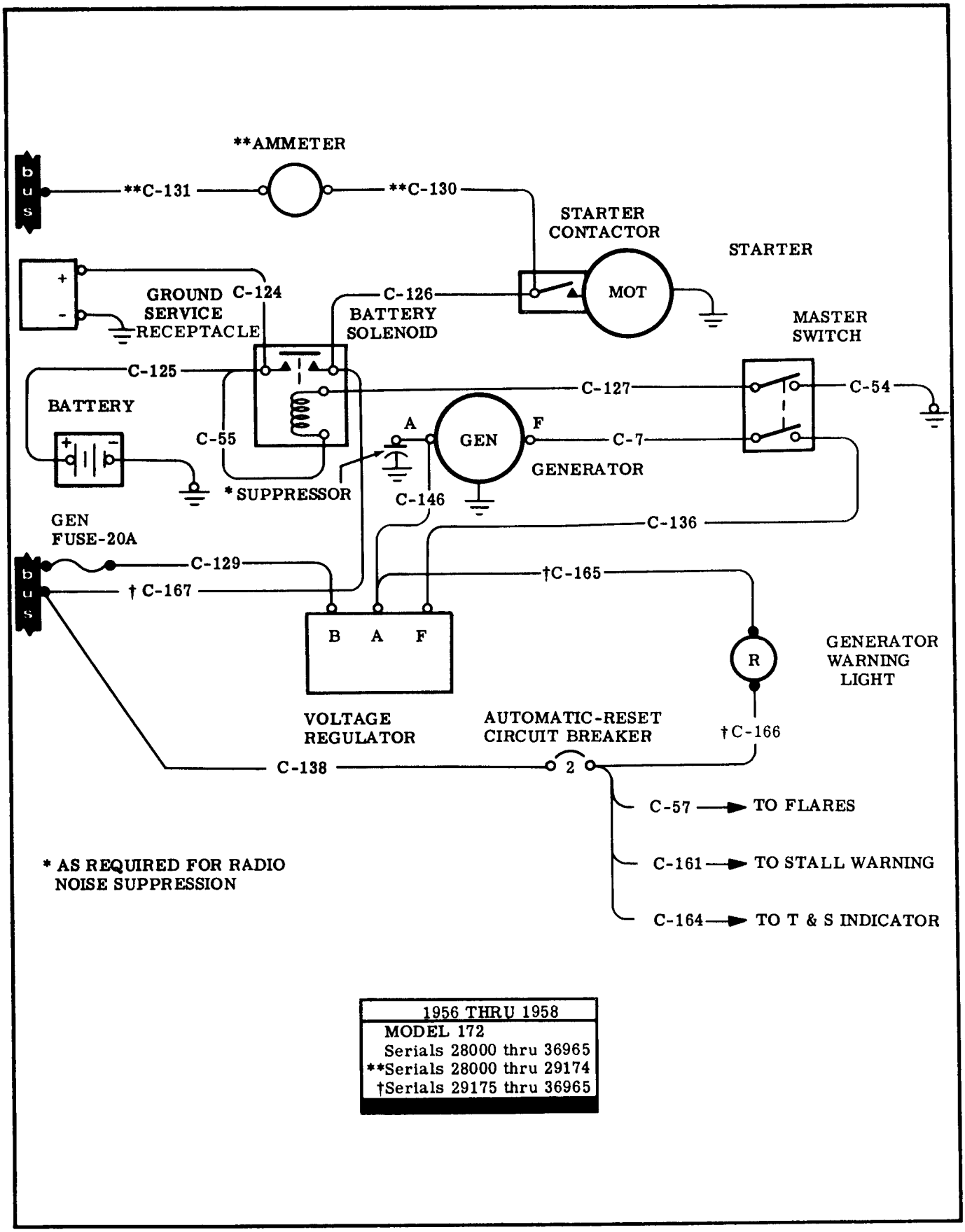


Figure 17-22. Bat., Gnd. Serv. Recpt., Gen., Start., Vol. Reg. and Clock - Model 172 (Sheet 1 of 3)

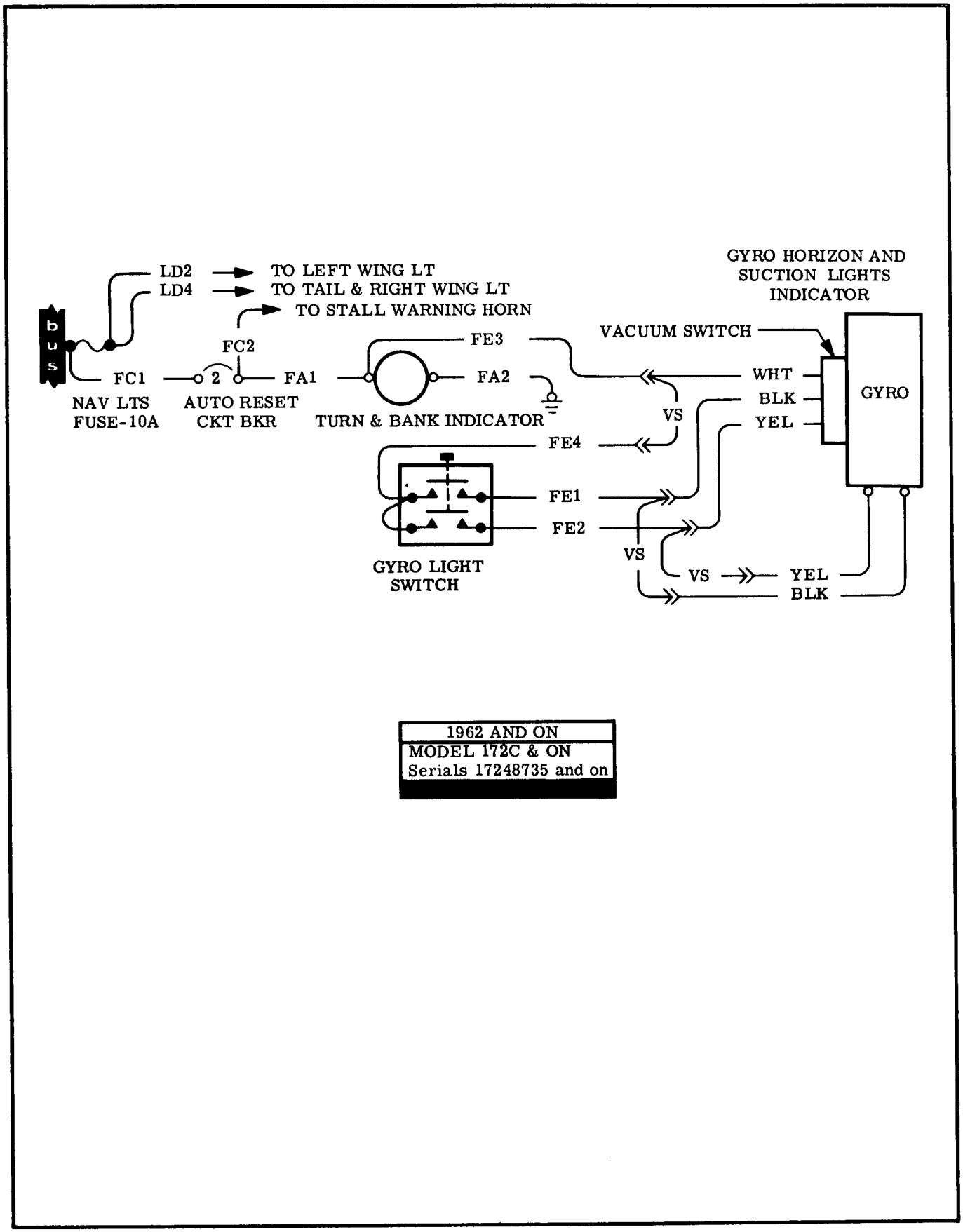


Figure 17-30. Gyro Horizon Indicator Circuits - Model 172

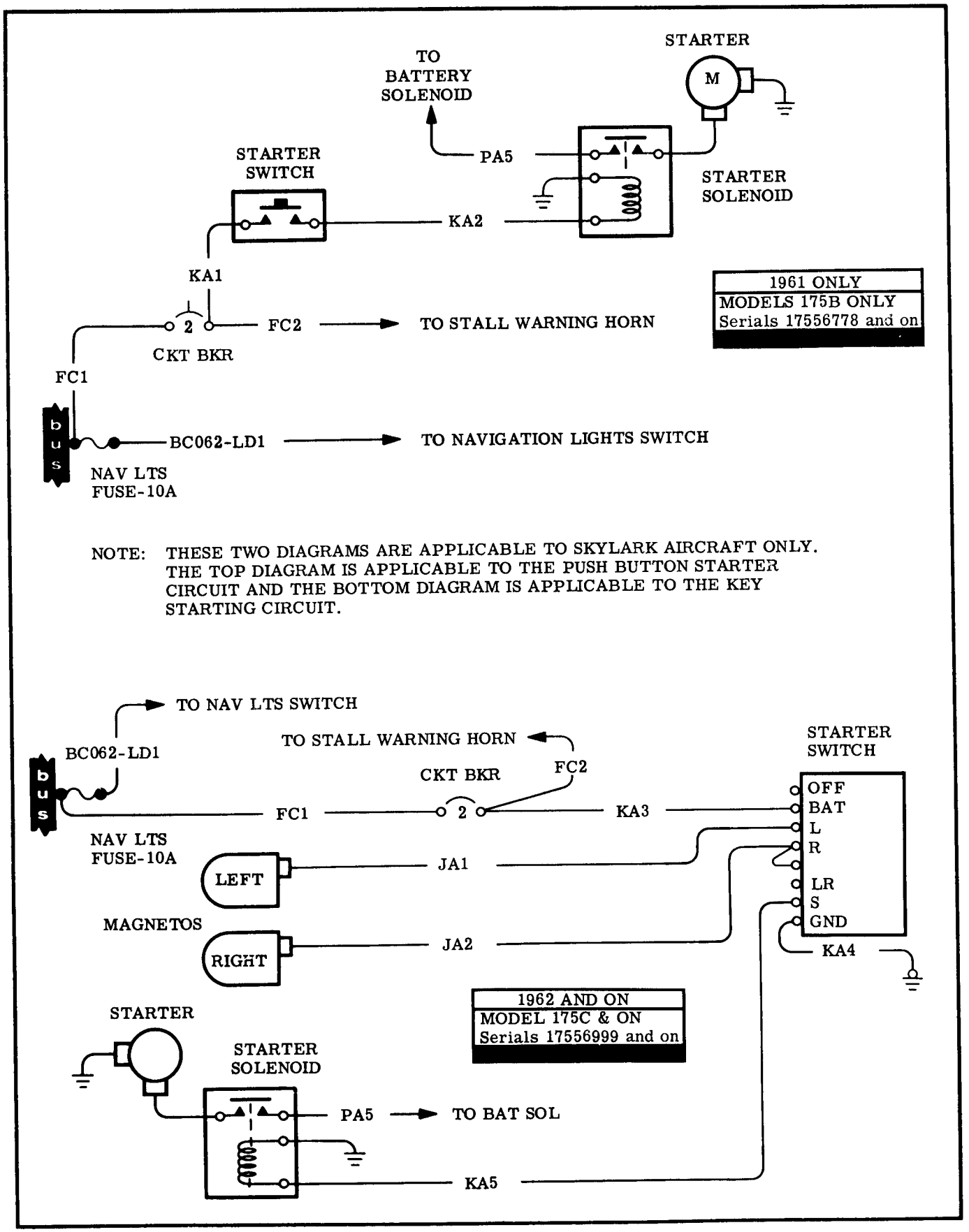


Figure 17-37. Push-Button and Key Starting Circuits - Model 175

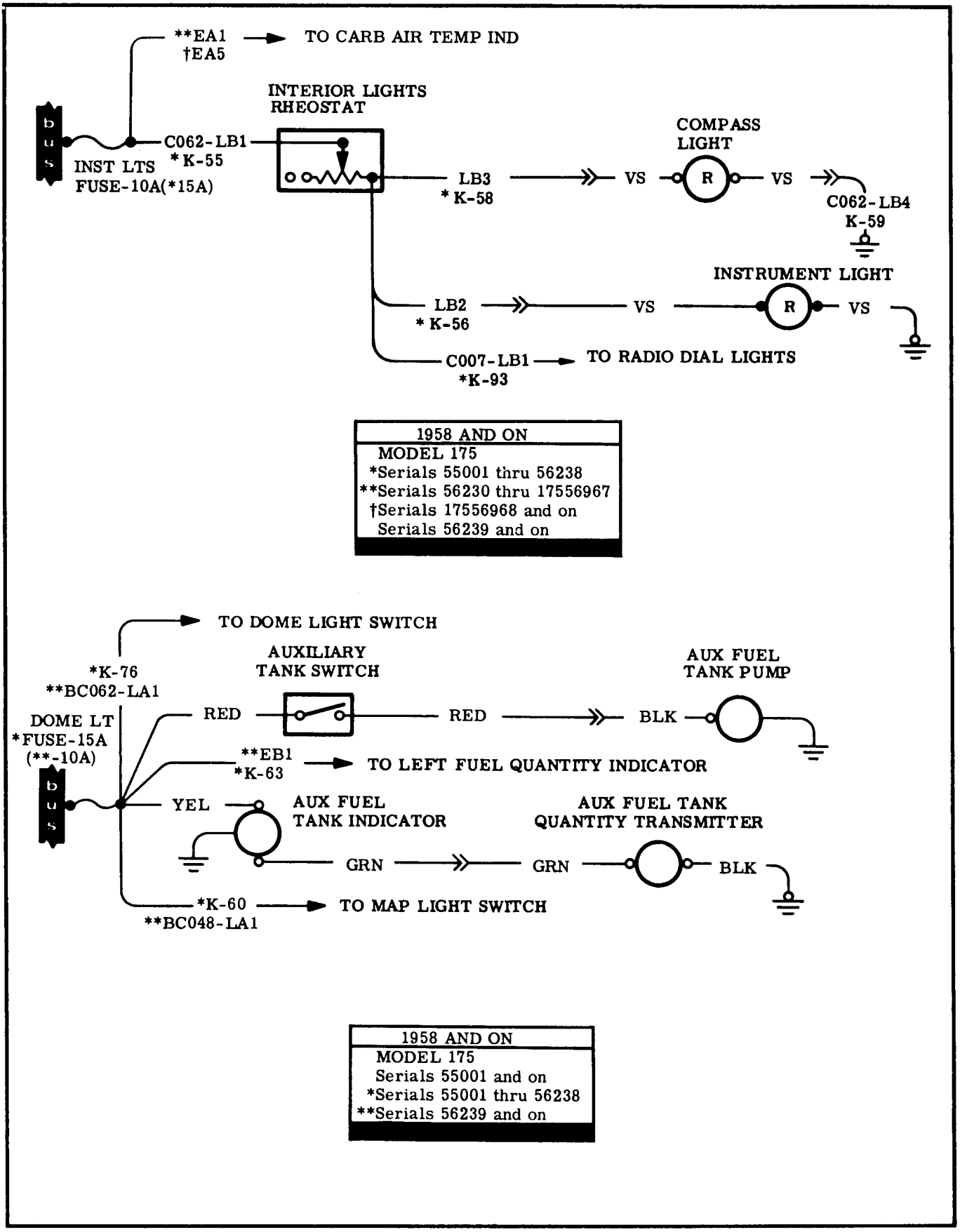
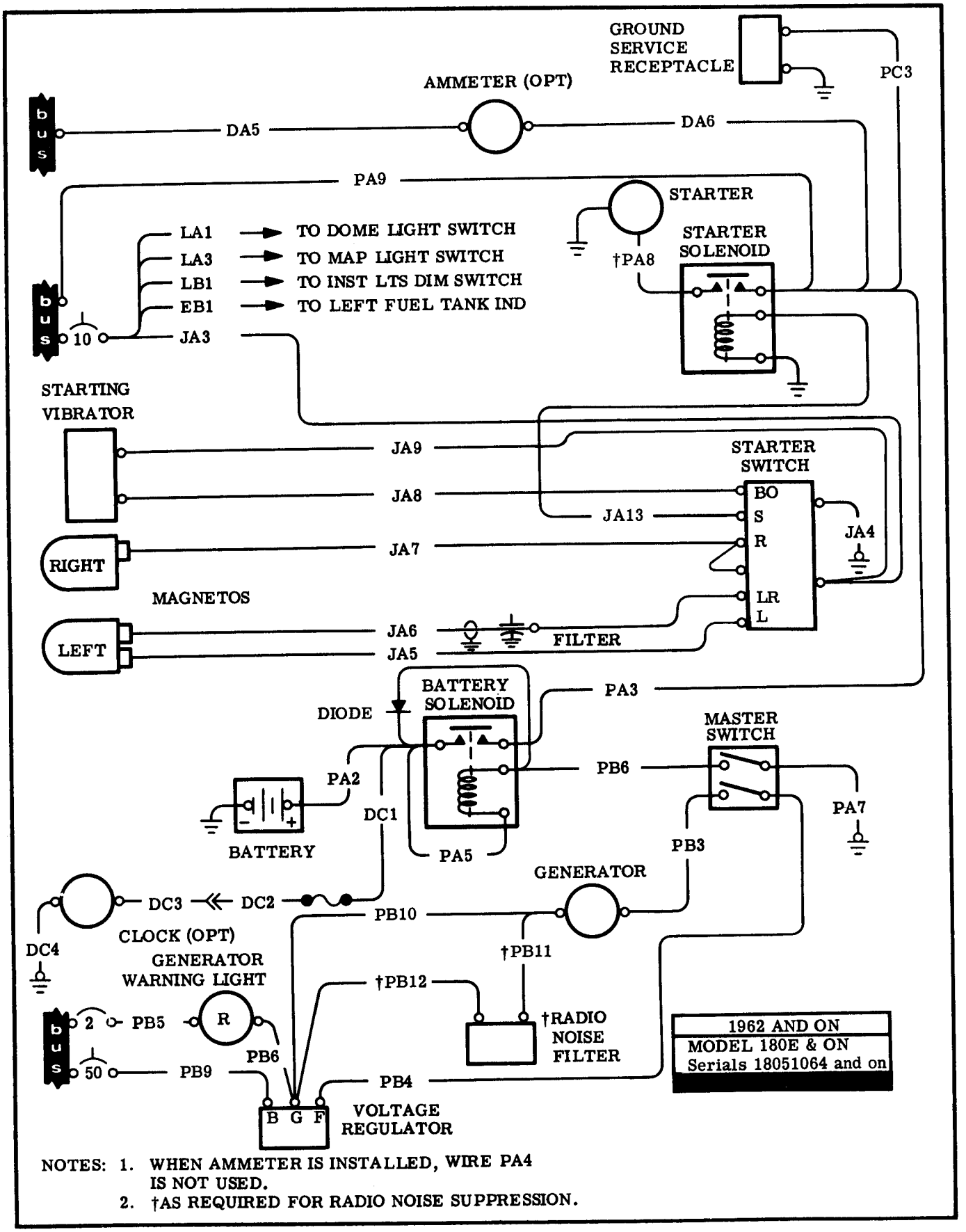


Figure 17-45. Compass Light, Instrument Light and Auxiliary Fuel Tank Circuits - Model 175



NOTES: 1. WHEN AMMETER IS INSTALLED, WIRE PA4 IS NOT USED.
2. †AS REQUIRED FOR RADIO NOISE SUPPRESSION.

Figure 17-50. Bat., Gnd. Ser. Recpt., Gen., Str., Vol. Reg., Mag. and Clock Ckts. - Model 180 (Sheet 6 of 6)

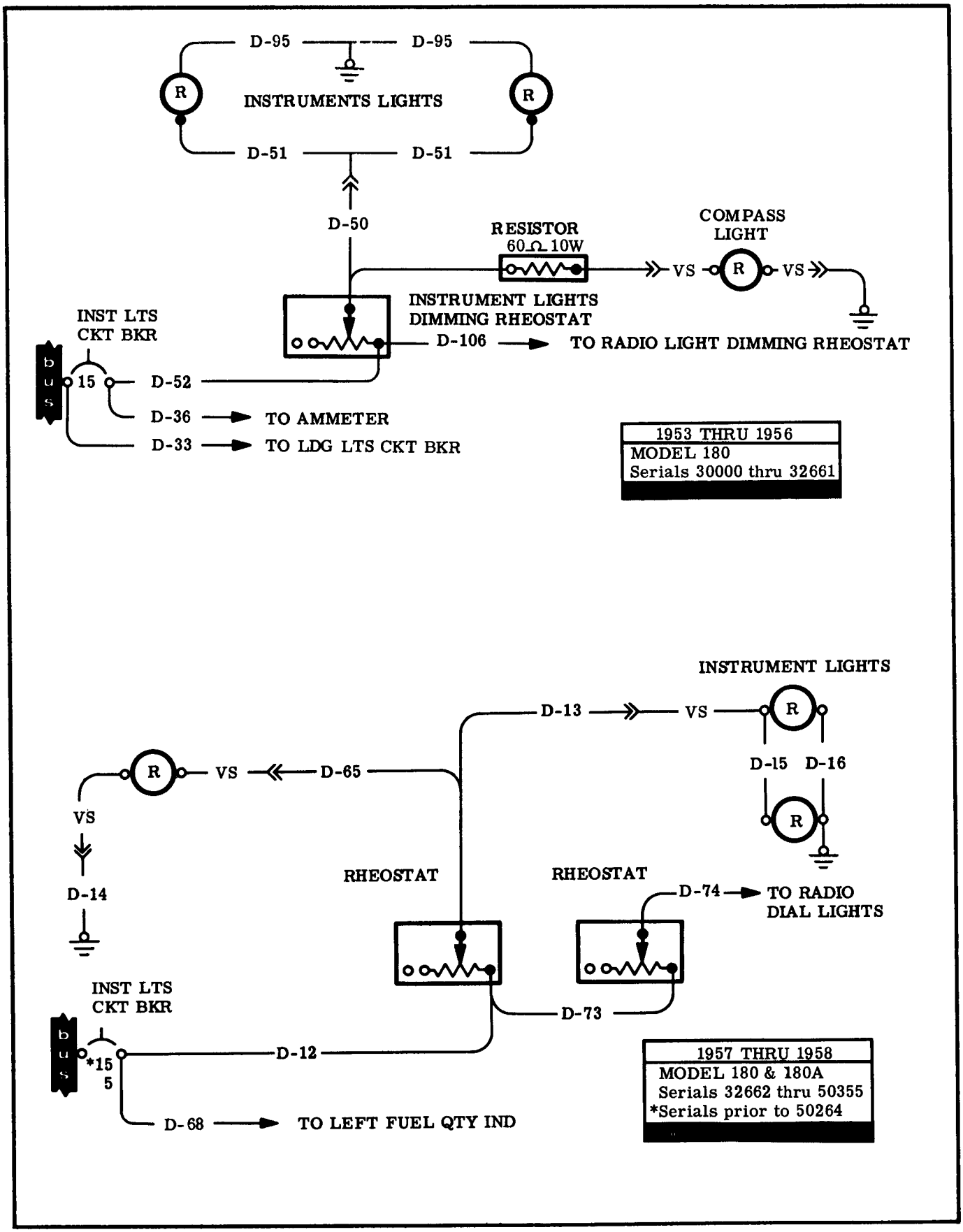


Figure 17-59. Instruments and Compass Lights Circuits - Model 180 (Sheet 1 of 2)

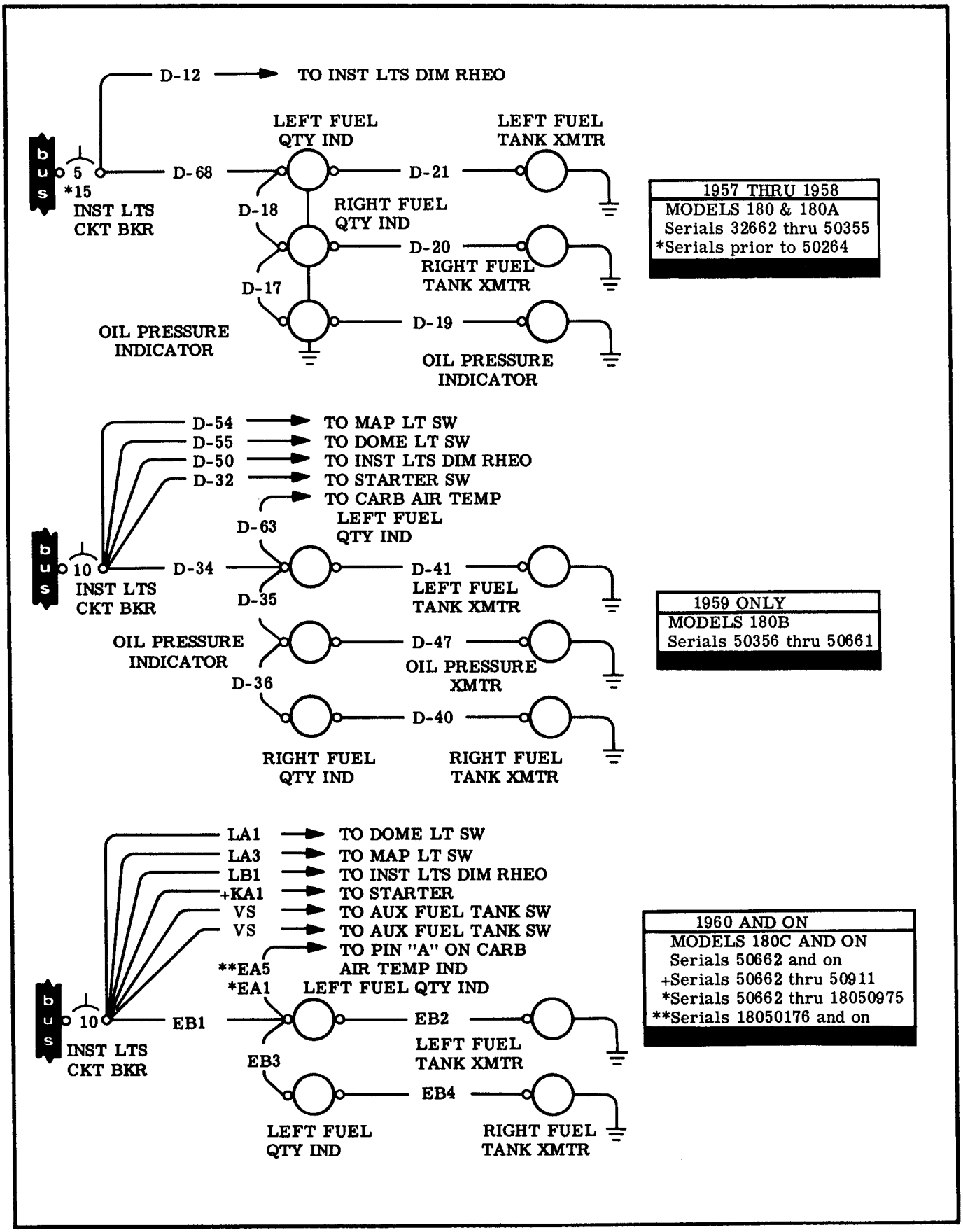
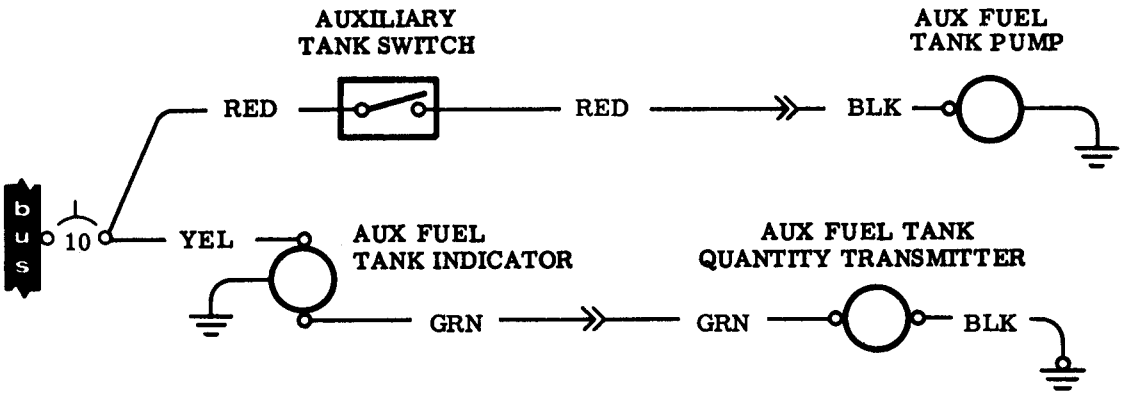
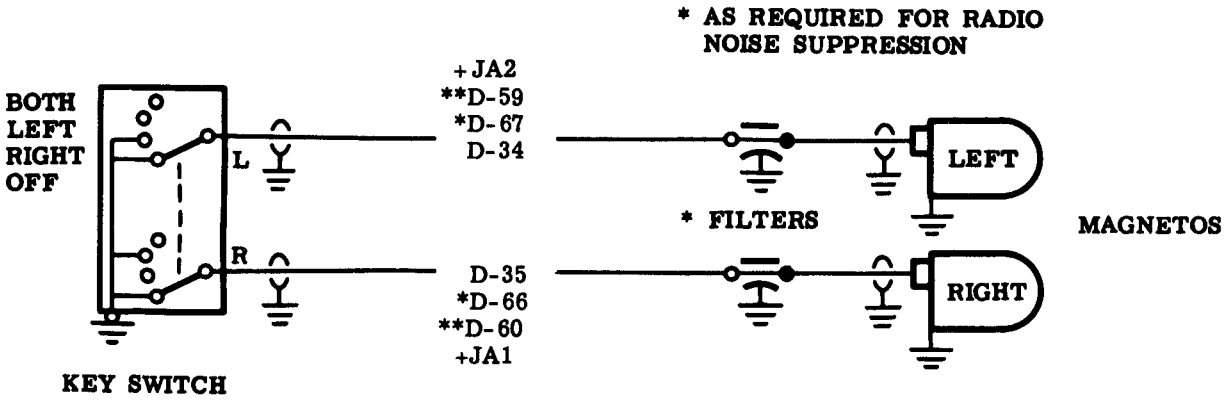


Figure 17-64. Fuel and Oil Pressure Indicator Circuits - Model 180



NOTE: ALL WIRES ARE VENDOR FURNISHED. THE AUXILIARY FUEL TANK SWITCH AND INDICATOR WIRES CONNECT TO THE NAVIGATION LIGHT CIRCUIT BREAKER ON SERIAL 51557 AND ON. ON SERIALS THRU 51556, WIRES CONNECT TO INSTRUMENTS LIGHT CIRCUIT BREAKER.

THRU 1961
MODELS THRU 182D
Serials thru 18253598



NOTE: FOR 1961 AND ON MAGNETO CIRCUITS, SEE FIGURE 17-68.

1956 THRU 1960
MODELS 182 THRU 182C
Serials 33000 thru 33842
*Serials 33843 thru 51556
**Serials 51557 thru 52358
+Serials 52359 thru 53007

Figure 17-69. Auxiliary Fuel Tank and Magneto Circuits - Model 182

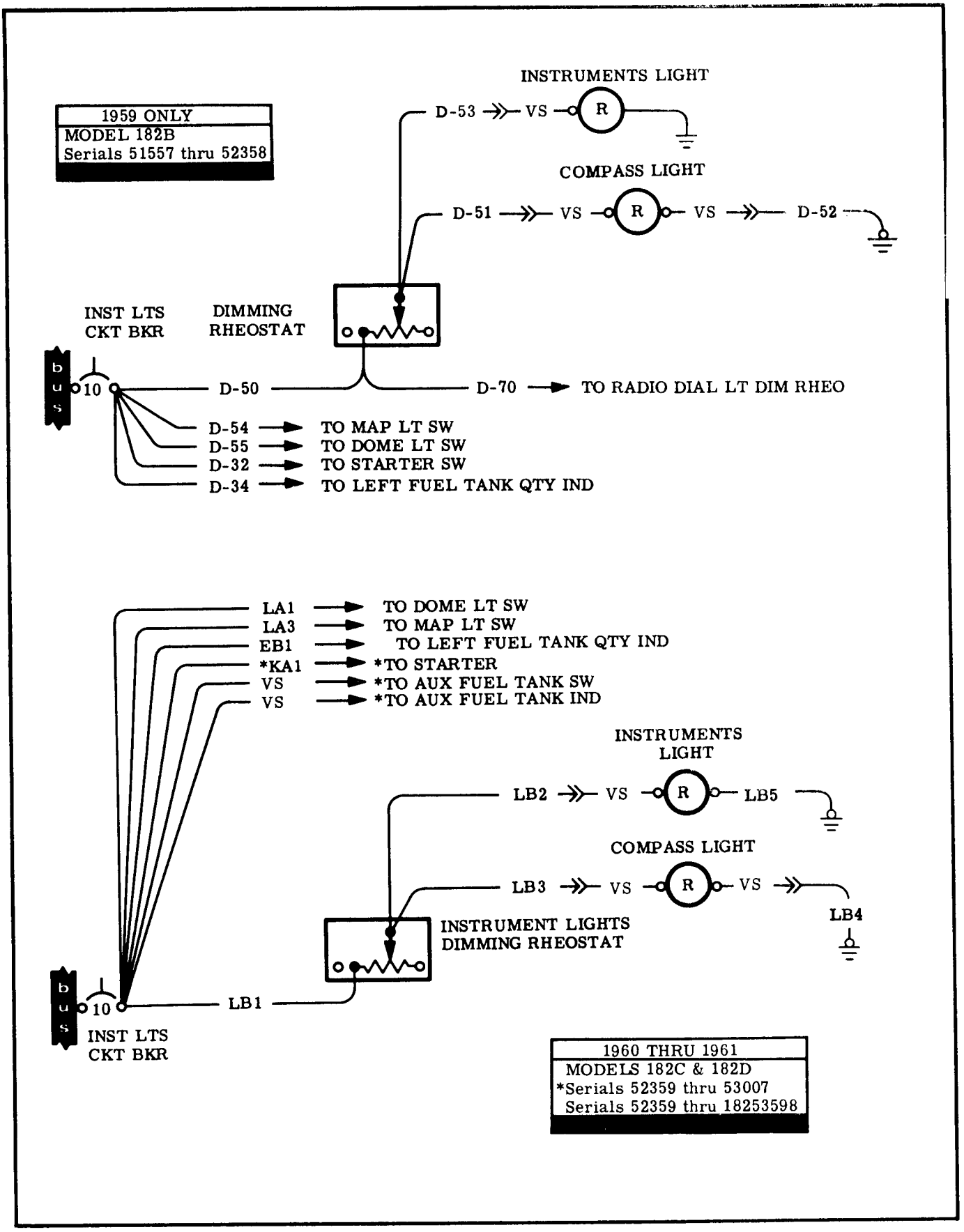


Figure 17-77. Compass and Instrument Lights Circuits - Model 182 (Sheet 2 of 3)

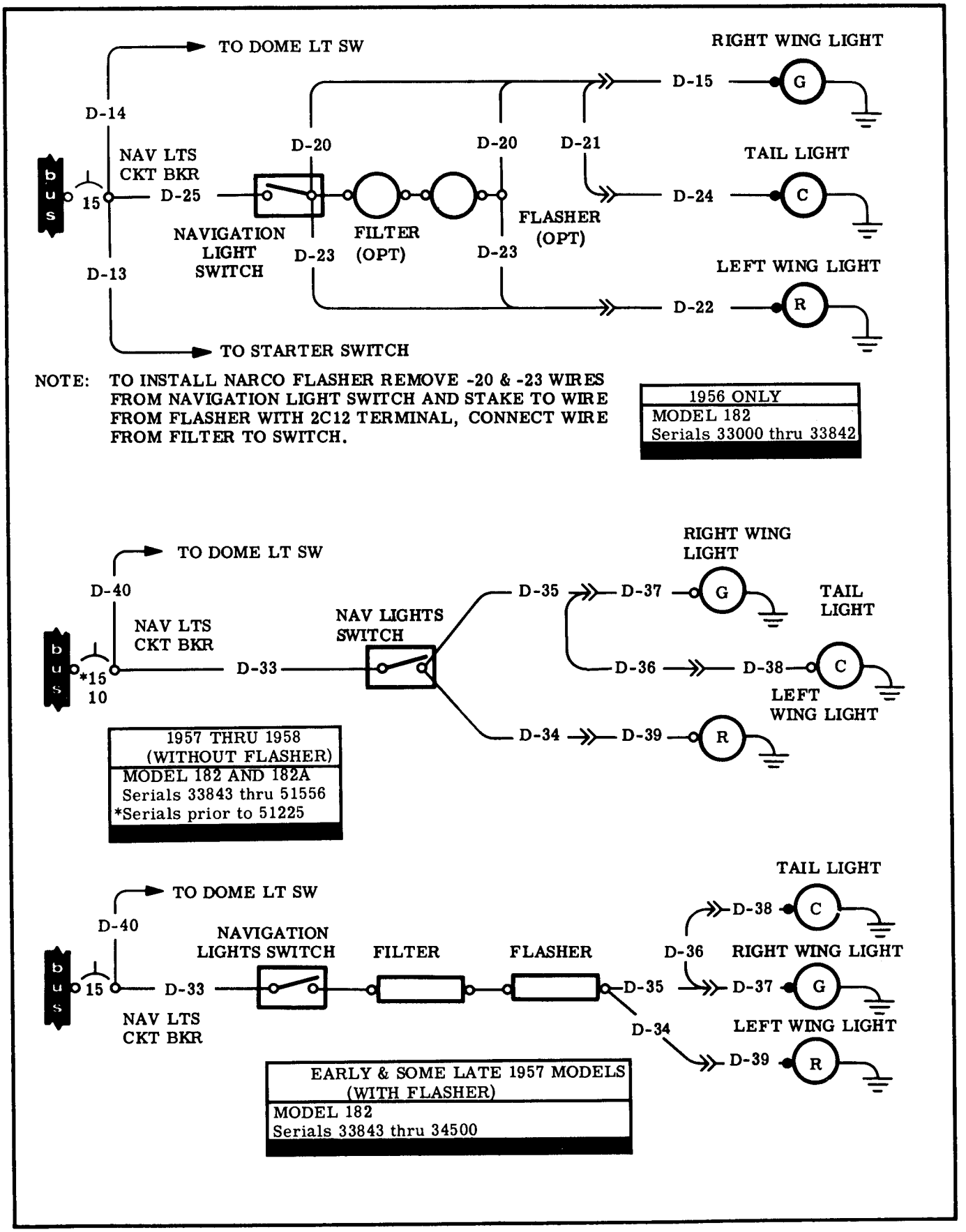


Figure 17-82. Navigation Lights Circuits - Model 182 (Sheet 1 of 4)

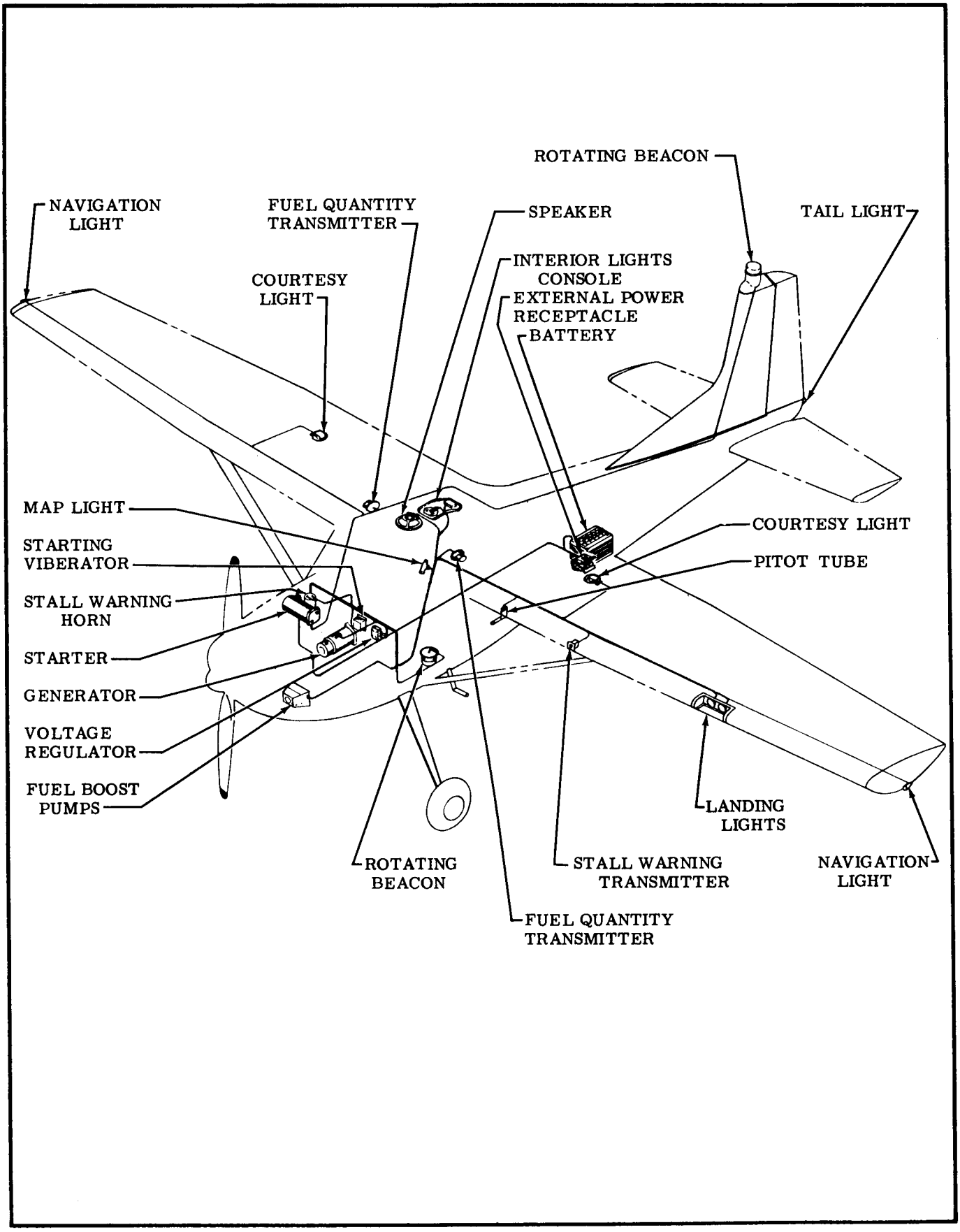


Figure 17-87. Electrical Equipment Installation - Model 185

SECTION 19

STRUCTURAL REPAIR

TABLE OF CONTENTS

19-1. REPAIR CRITERIA.

19-2. Although this section outlines repair permissible on structure of the various aircraft, the decision of whether to repair or replace a major unit of structure will be influenced by such factors as time and labor available, and by a comparison of labor costs with the price of replacement assemblies. Past experience indicates that replacement, in many cases, is less costly than major repair. Certainly, when the aircraft must be restored to its airworthy condition in a limited length of time, replacement is preferable.

19-3. Restoration of a damaged aircraft to its original design strength, shape and alignment involves careful evaluation of the damage, followed by exacting workmanship in performing the repairs. This section suggests the extent of repair practicable on Cessna single-engine aircraft and supplements C.A.M. 18. Consult the factory when in doubt about a repair not specifically mentioned here.

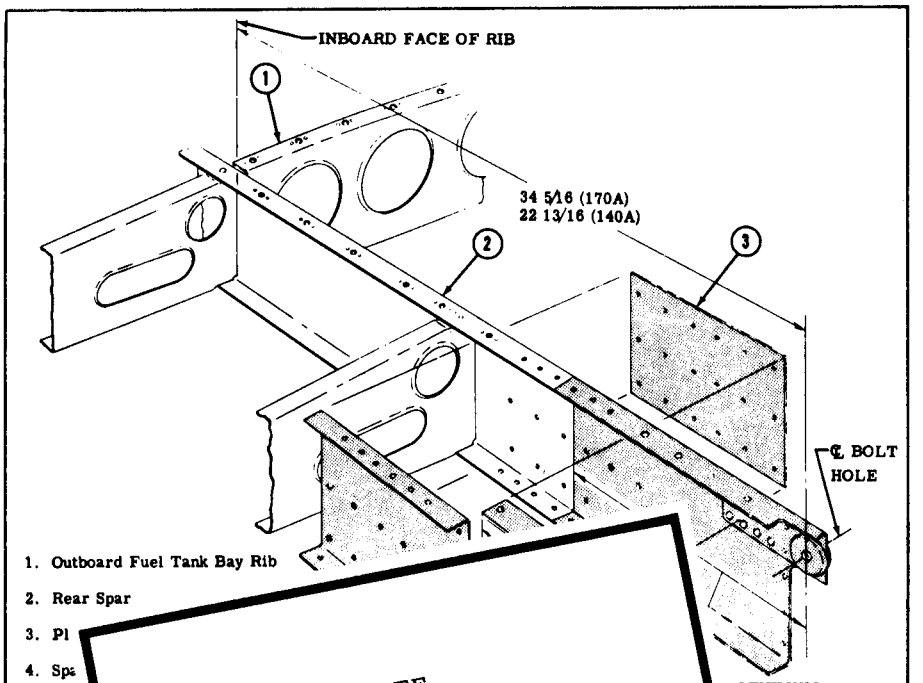
19-4. EQUIPMENT AND TOOLS.

19-5. Equipment and tools for repair of structure may be fabricated locally for all but major repair jobs. For major repair of wings and fuselage, special jigs, available from the factory, are recommended. These jigs are precision equipment designed to ensure accurate alignment of these airframe components.

19-6. CONTROL BALANCING requires the use of a fixture to determine the static balance moment of the control surface assembly. Plans for, and the use of such a fixture are shown in figure 19-2.

19-7. SUPPORT STANDS shown in figure 19-1 are used to hold a fuselage or wing when it is removed. The stands may be manufactured locally of any suitable wood.

19-8. FUSELAGE REPAIR JIG. The fuselage jig which may be obtained from the factory is a



1. Outboard Fuel Tank Bay Rib
2. Rear Spar
3. Pl
4. Spa
5. Jogg
6. Chan

NOTE

This information is now contained in Service Kits, which are available from the Cessna Spare Parts Department. These Kits supply parts and instructions for repairing the inboard end of rear wing spars.

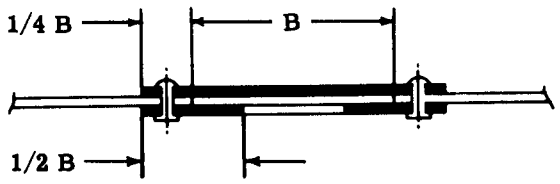
ED.

1. This re removal is optional.
2. Remove
3. Remove opening. This will prov.
4. Cut off dai " and a maximum of 25 5/16'
5. Attach chan
6. Cut the spar between outboard fuel ta
7. Slide the spar ...mp in place with "C" clamps and check dimensi
8. Rivet spar segi ...n shown.
9. Trim and install the joggled angle (5) so that the outboard end of the angle butts against the inboard end of of the channel.
10. Rivet skins in place as necessary. Replace tank and tank cover.

NOTE

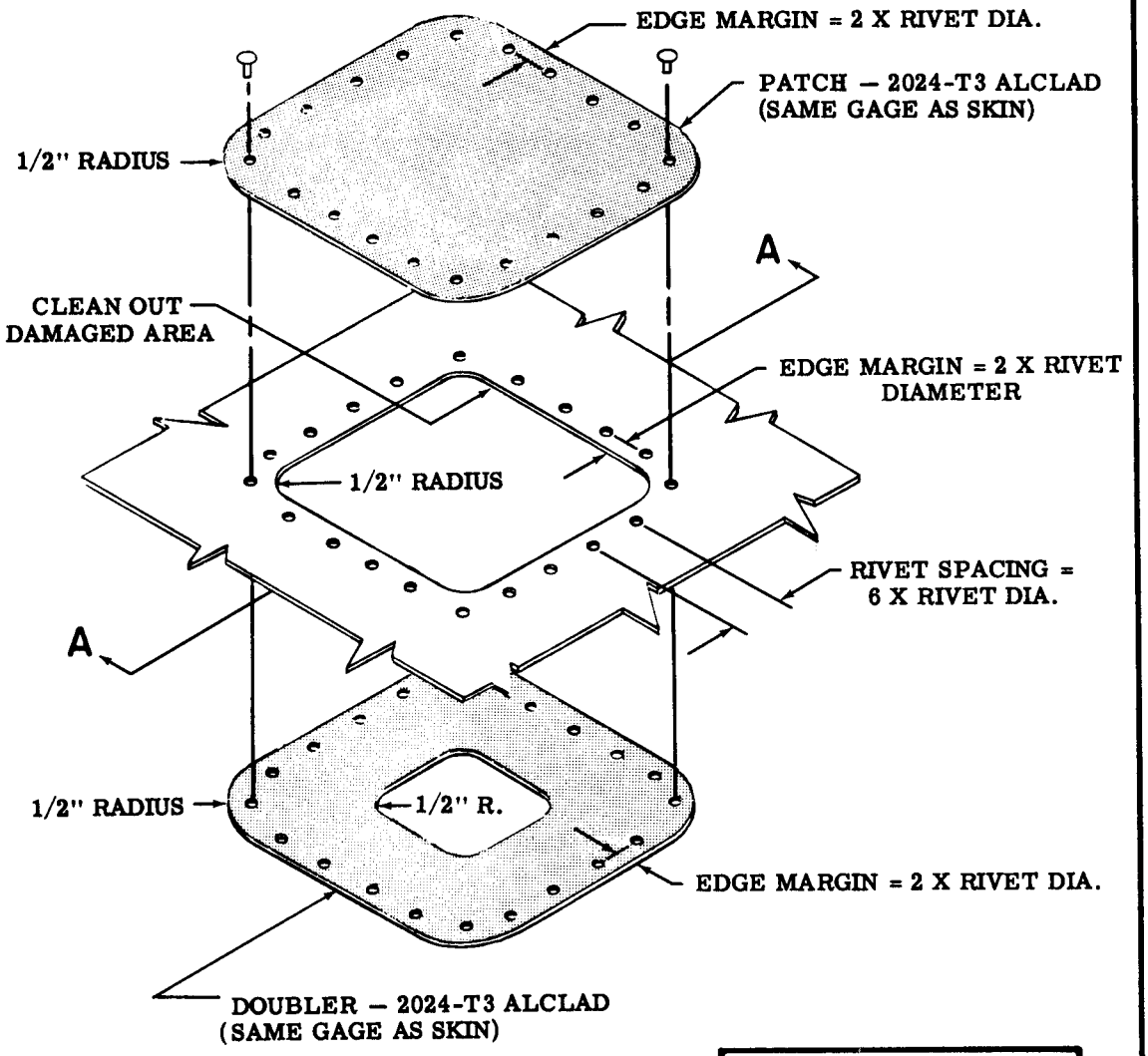
In case of any slight damage in area 4, plate #3, channel #6 and angle #5 may be used as reinforcements without the replacement of section 4.

Figure 19-6. Wing Spar Repair - Sheet 1



SECTION THRU ASSEMBLED PATCH

A–A



ORIGINAL PARTS

REPAIR PARTS

REPAIR PARTS IN CROSS SECTION

RIVET TABLE	
SKIN GAGE	RIVET DIA.
.020	1/8
.025	1/8
.032	1/8
.040	1/8
.051	5/32

Figure 19-10. Clear-of-Structure Skin Repair

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