NAVWEPS 01-40ALF-2

Handbook
Maintenance Instructions

NAVY MODELS

A-1H • A-1J
AIRCRAFT

SECTION III
HYDRAULIC POWER SYSTEMS

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SECTION III

HYDRAULIC MAINTENANCE

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3–1. HYDRAULIC SYSTEM.

3–2. DESCRIPTION. (See figures 3–1, 3–3, and 3–6.) The hydraulic system includes a main pressure system, an auxiliary pressure system, eight operating systems, and an aileron power boost system. A hydraulic reservoir with a capacity of 5.9 gallons is the common source of hydraulic fluid supply to the main, auxiliary, and aileron power boost pressure systems. Hydraulic system fluid supply and return lines are fabricated of 52SO aluminum alloy tubing, and the system pressure lines are fabricated of 1/4 H stainless steel tubing. This section of the manual contains information on the main and auxiliary pressure systems only. Information concerning the aileron power boost system can be found in section II. Information regarding the operation and maintenance of the operating systems can be found in the sections which pertain to the equipment which they operate. Reference to specific operating systems is as follows:

Operating System	*Section*
Landing Gear Control System	II
Main Landing Gear Brake Control System	II
Wing Flap Control System	II
Dive Brake Control System	II
Wing-Folding and -Locking Control System	II
Gun Control System	IX
Arresting Gear Control System	II
Cockpit Sliding Enclosure Control System	II
In-Flight Fueling System	IV

3–2A. The Table of Contents on page 157 preceding this section should be consulted to determine where specific information can be found within the section. The Alphabetical Index at the end of the handbook should also be consulted for determining where specific information is contained within the handbook.

3–3. TROUBLE SHOOTING. (Refer to table 3–1.) The primary concern of the trouble shooter is to determine whether trouble symptoms are caused by hydraulic failure, maladjustment, or mechanical failure. Reference to the hydraulic schematic diagram (figure 3–1) combined with simple tests in the airplane indicate, in most cases, which subsystem is responsible for the difficulty.

3–4. Possible causes of trouble in a hydraulic system are traceable to one or more of five sources: fluid supply, fluid pressure, external leaks, internal leaks, and defective units. Since the hydraulic systems contain some electrically controlled components, trouble shooting should also include the related electrical circuits.

3–5. *Fluid supply,* that is, the quantity of fluid in a system, obviously affects pressure. The reservoir must always contain sufficient fluid to fill a system without permitting the pumps to run dry or air to enter. The fluid level must reach the normal marks shown on the reservoir sight gage. Different types of hydraulic fluid must not be mixed, otherwise packings may deteriorate and cause operational failure of one or more units. Drained fluid from the system must not be re-used.

3–6. *Fluid pressure* may be responsible for most hydraulic troubles. The cause of *insufficient* pressure may be an external or an internal leak, a defective unit, or a physical obstruction. The cause of *excessive* pressure may be a defective unit or a physical obstruction. Failure to inspect and maintain lines adequately, to keep the system accumulator pressure at a minimum of 1500 psi, or to maintain the proper fluid level in the reservoir is responsible for the majority of service troubles.

3–7. *External leaks* are invariably indicated by streaks or puddles of colored fluid on or near the airplane. Leakage may be caused by a cracked line, improperly tightened fittings, or worn packing in an operational unit. In seeking to stop an external leak, the simplest remedy, that is, tightening of loose connections, should be tried first. However, care must be taken to tighten connections only to the proper torque. (See figure 1–13.)

3–8. *Internal leaks* are caused by defective units: pressure fluid slips past a worn packing or an unseated valve into a return line to the reservoir. Locating an internal leak is the most difficult type of trouble shooting, and a thorough knowledge of the system and its principles of operation is prerequisite to the isolation of the defective unit. When an internal leak is located, the unit involved should be replaced.

3–9. *Defective units* are of three types, each type subject to characteristic troubles. *Slide valves,* such as control valves, may develop external or internal leaks either because of worn packings or because of foreign matter clogging the openings or causing the slide to bind. If disassembly of the valve reveals foreign particles, they should be identified and traced to their source—a common source is flexible hose which, because of internal deterioration or improper installation, releases slivers of lining into the systems. *Spring-loaded valves,* such as relief, check, and shuttle valves, are subject to similar troubles. *Actuating cylinders* are affected by leakage which may result from worn packing or from packing damaged by scored pistons or barrels.

3–10. The following simple rules should be observed when trouble shooting the hydraulic system:

a. Make certain that there is no air in system. If necessary, operate various units to bleed system.

b. Check fluid level in reservoir before and after trouble shooting.

c. Check initial air pressure in system accumulator before trouble shooting: it must be 1500 to 1900 psi (with system gage at zero).

d. Study trouble symptoms carefully. Consider all possible causes of trouble, and then, by process of elimination, try to determine which unit is at fault.

e. When making replacements or connecting lines, follow carefully the instructions given in figure 1–13.

TABLE 3–1. HYDRAULIC SYSTEM TROUBLE SHOOTING

Trouble or Symptom	*Probable Cause*	*Correction*
1. No pressure on gage when engine running.	a. Gage inoperative.	
	(1) Gage broken.	Replace. (Open manual bypass valve until system pressure is zero.)
	(2) Air lock in gage line or dirt in restrictor.	Stop engine, place all control valves in neutral (except landing gear). Connect test stand to system. Disconnect line at gage and operate test pump. If no fluid flows from line, remove and clean restrictor.
	b. Insufficient fluid in system.	
	(1) Reservoir fluid level low.	Add fluid to level on sight gage.
	(2) External leak in system, broken line, loose connection, or leaking valve.	Repair cause of leak, then refill reservoir.
	c. Engine-driven pump sheared or air-locked. Run engine and loosen hose connection at pump. If fluid does not flow, separate disconnect fitting in reservoir line and depress valve. If fluid flows from coupling, pump has sheared. If fluid does not flow, line is air-locked.	Replace sheared pump; bleed line from reservoir to disconnect fitting.
2. Insufficient pressure when engine running.	a. Refer to trouble 1 and causes.	
	b. Pressure regulator fails to cut in and charge accumulator.	Operate wing flaps: if pressure fluctuates (between 2700 and 3000 psi), regulator is cutting in; if pressure is low, remove regulator and check adjustment.
3. Excessive system pressure.	a. Refer to trouble 1.a.	
	b. Pressure regulator fails to cut out.	Adjust or replace regulator.
	c. System relief valve fails to relieve.	Replace relief valve.
4. Fluctuating pressure.	a. Refer to trouble 1.a.	
	b. Accumulator defective.	
	(1) Low air pressure.	Check air pressure gage. Charge accumulator 1500-1900 psi air pressure.
	(2) Air leak.	Tighten valve or replace gasket.
	(3) Air in hydraulic lines.	Tighten connections, if necessary, and bleed system.
	c. Faulty regulator.	Refer to corrections 2.d. and 3.b.
5. Loss of pressure from auxiliary pump.	a. Trouble 1.b.	
	b. Leakage at pump connections.	Tighten connections; replace line or pump, if necessary.
	c. Defective pump motor.	Replace pump or wiring. (Refer to wiring diagram in section X.)
	d. Defective auxiliary pump selector valve.	Replace.
	e. Defective auxiliary relief valve.	Replace.

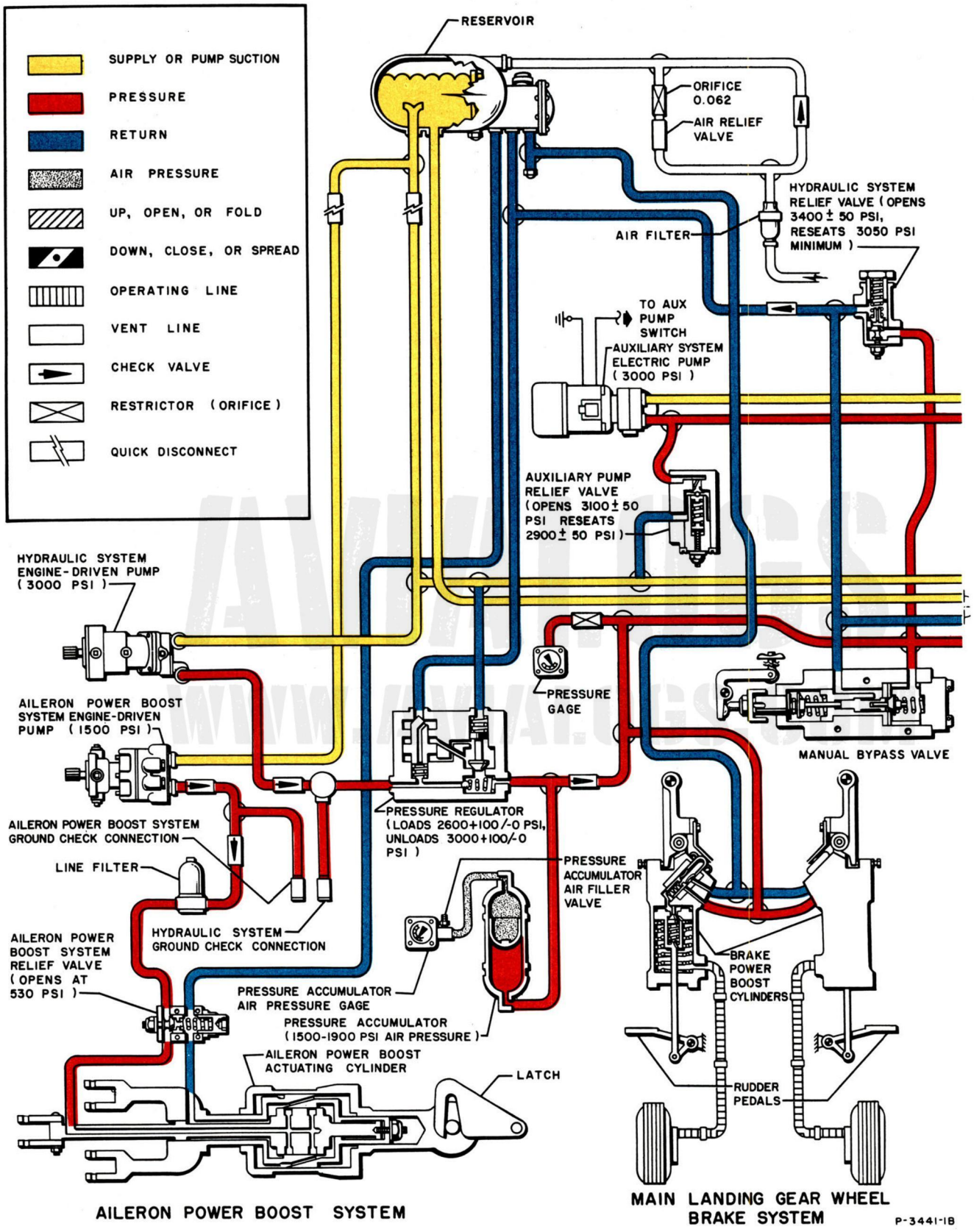


Figure 3–1. Hydraulic System—Schematic (Sheet 1)

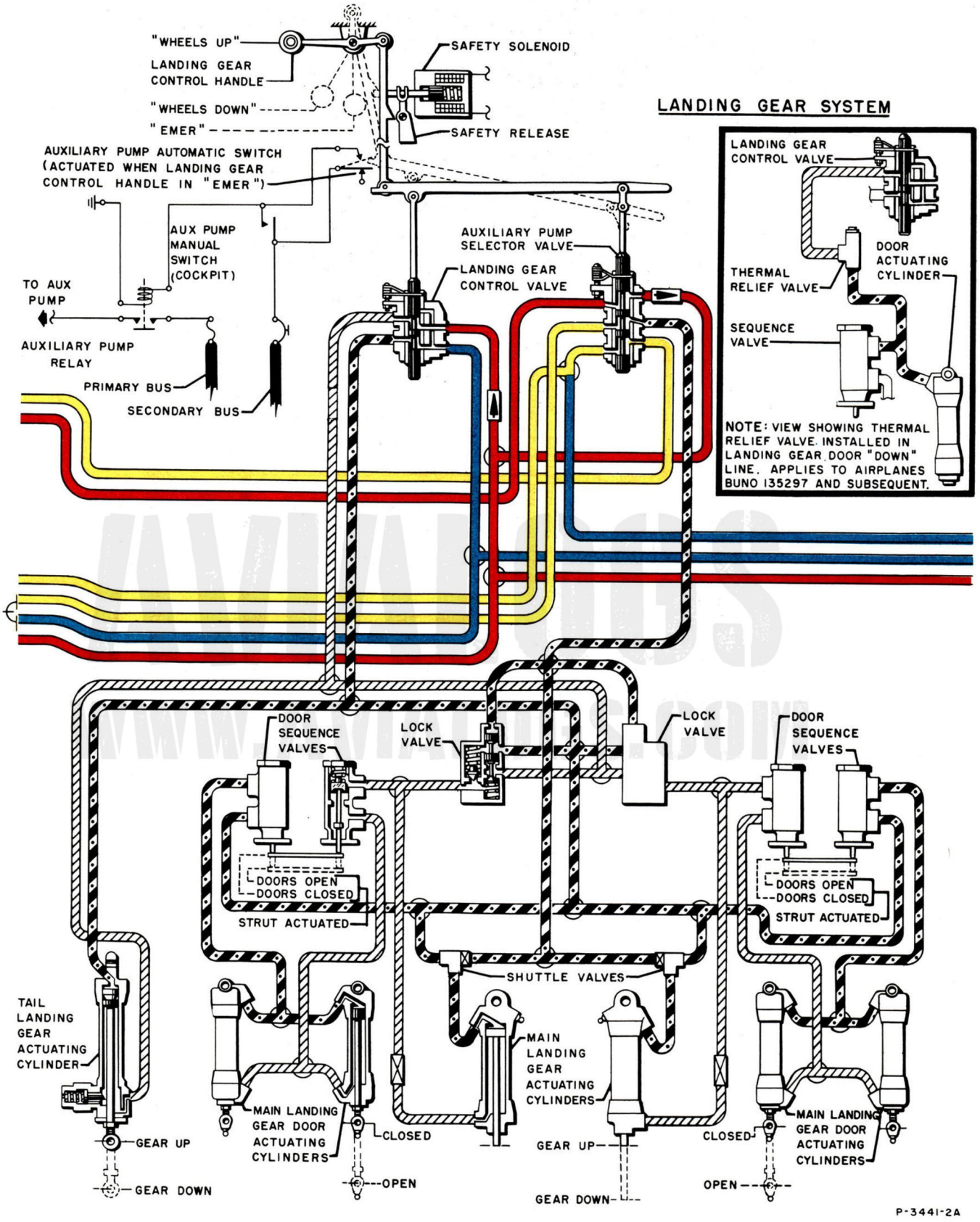


Figure 3–1. Hydraulic System—Schematic (Sheet 2)

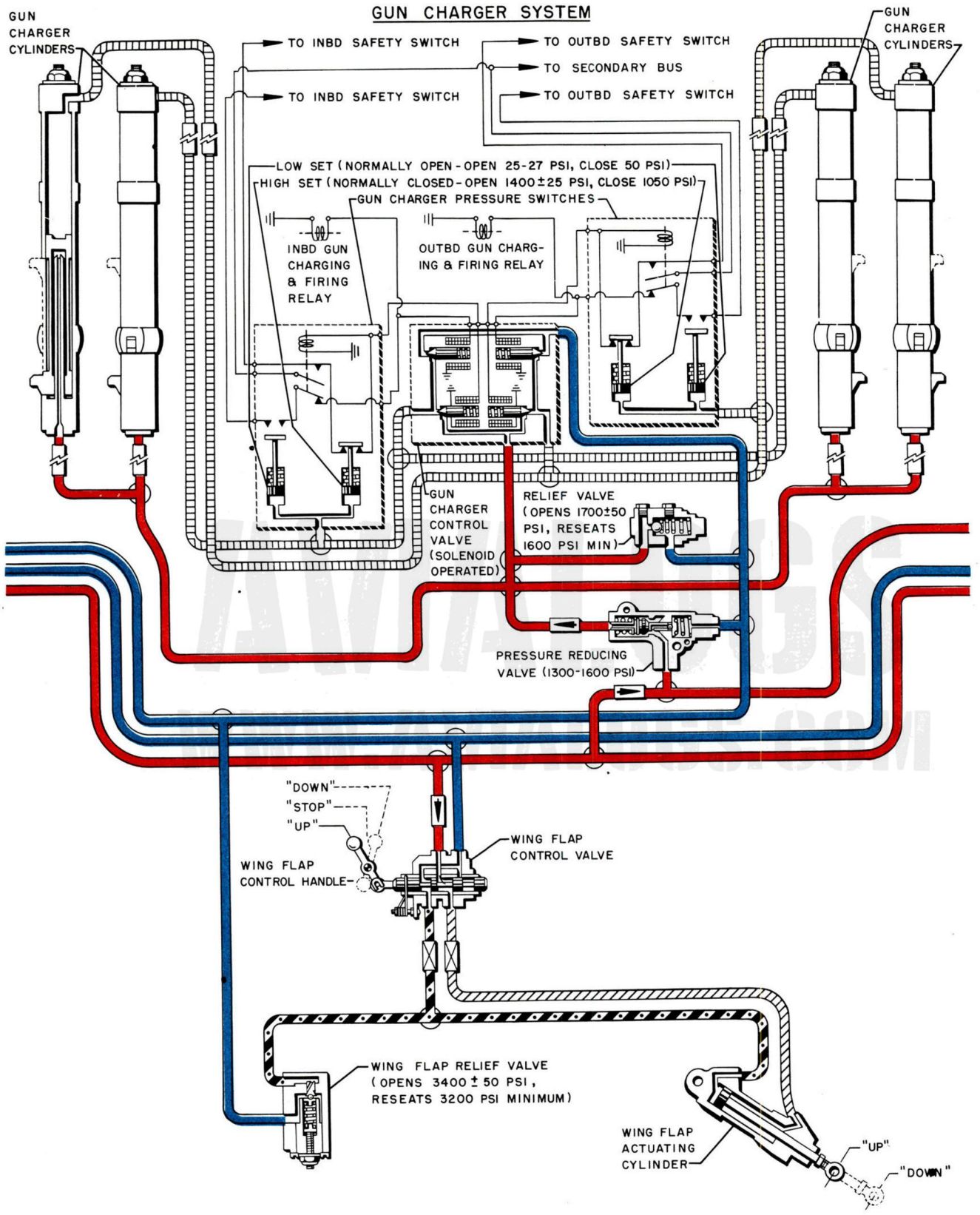


Figure 3–1. Hydraulic System—Schematic (Sheet 3)

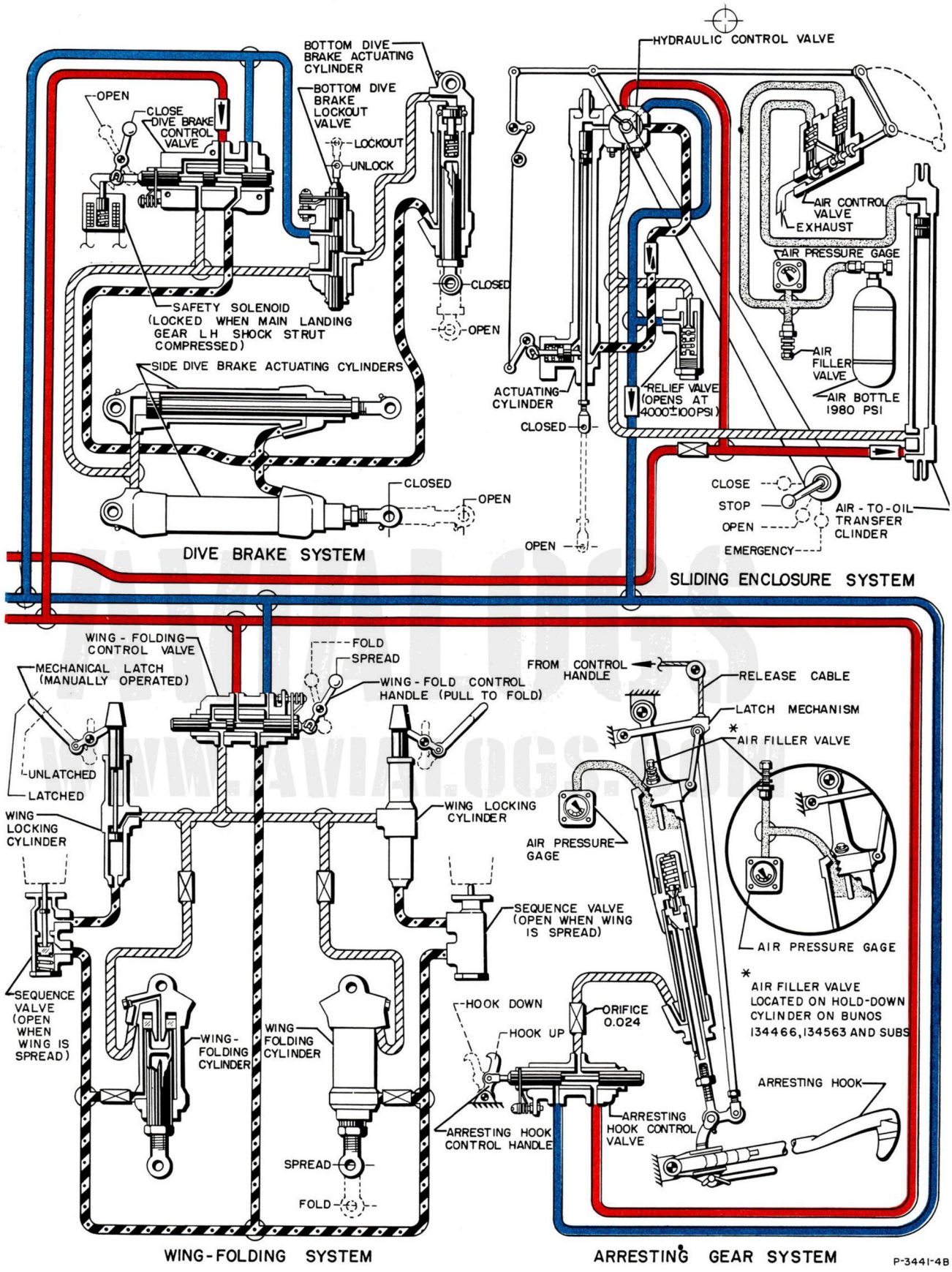


Figure 3–1. Hydraulic System—Schematic (Sheet 4)

3-11. Deleted.

3-12. BLEEDING HYDRAULIC SYSTEM. Disconnecting hydraulic lines or replacing hydraulic equipment introduces air into the hydraulic system. Bleeding the hydraulic system should, therefore, be considered post-requisite to servicing which involves disconnection. Bleeding can be accomplished by operating hydraulically controlled units several times. After bleeding, the hydraulic system reservoir should be checked and fluid added as necessary.

NOTE

A functional check of the hydraulic system should be made whenever any system component has been installed, replaced, disconnected, or partially disassembled by cycling of the equipment at least five times to insure that the system is functioning properly. Refer to the applicable section of the handbook concerning the operational system being checked for additional information.

3-13. MAIN PRESSURE SYSTEM.

3-14. DESCRIPTION. (See figures 3-1, 3-3, 3-4, and 3-5.) The main pressure system provides a nominal 3000 psi pressure source for normal operation of the hydraulic operating systems during engine operation. An external hydraulic pressure disconnect fitting installed in the pressure line of the main pressure system is provided for connecting external power to the main pressure system during hydraulic ground check. Hydraulic fluid is supplied to an engine-driven main pressure system pump by the hydraulic system reservoir. The main pressure system includes the following principal components:

Hydraulic system reservoir

Main pressure system pump

Main pressure system regulator

Main pressure system accumulator

Main pressure system pressure gage

Main pressure system relief valve

Main pressure system manual by-pass valve.

3-15. The hydraulic reservoir supplies hydraulic fluid to the engine-driven pump and the action of the pump forces the fluid into the main system pressure lines. System pressure lines direct the pressurized hydraulic fluid to the operating system control valves. The regulator installed in the main system pressure line regulates pressure in the line at 2600 to 3100 psi. The pressure accumulator acts as a cushion in the system to aid in stabilizing system pressure during actuation of an operating system. The pressure accumulator also prevents the pressure regulator from cycling at excessively high rates during the periods when no hydraulic operating system is being actuated. The system relief valve is provided to prevent system pressure from reaching dangerously high values and is set to relieve at 3400 psi pressure. The manual by-pass valve provides an alternative, but manually controlled method of relieving excessive pressure in the system. The hydraulic pressure gage provides visual indication of system pressure. Hydraulic check valves are installed in the system to insure free flow of fluid in one direction only.

3-16. HYDRAULIC SYSTEM RESERVOIR.

3-17. DESCRIPTION. (See figure 3-4.) The hydraulic system reservoir is mounted on the left-hand side of the airplane directly below the horizontal firewall. The reservoir is secured in place by a support shroud attached to brackets on the horizontal firewall. The capacity of the reservoir is approximately 5.9 US. gallons (4.83 Imperial gallons; 21.96 liters). A sight gage and filling instruction plate are located on the outboard end of the reservoir, adjacent to the reservoir filler plug. A stand-pipe assembly, welded to the bottom of the reservoir, provides a port for the supply lines to the main pressure system engine-driven pump and the aileron power boost system pump, two ports for supply lines through the auxiliary selector valve to the auxiliary pump (one line connected with the pump to supply auxiliary pressure to the main pressure system, the other connected with the pump to provide reserve pressure for lowering the landing gear), and a port for draining the reservoir.

 (Figure 3-2 and pages 164 thru 167 Deleted.)

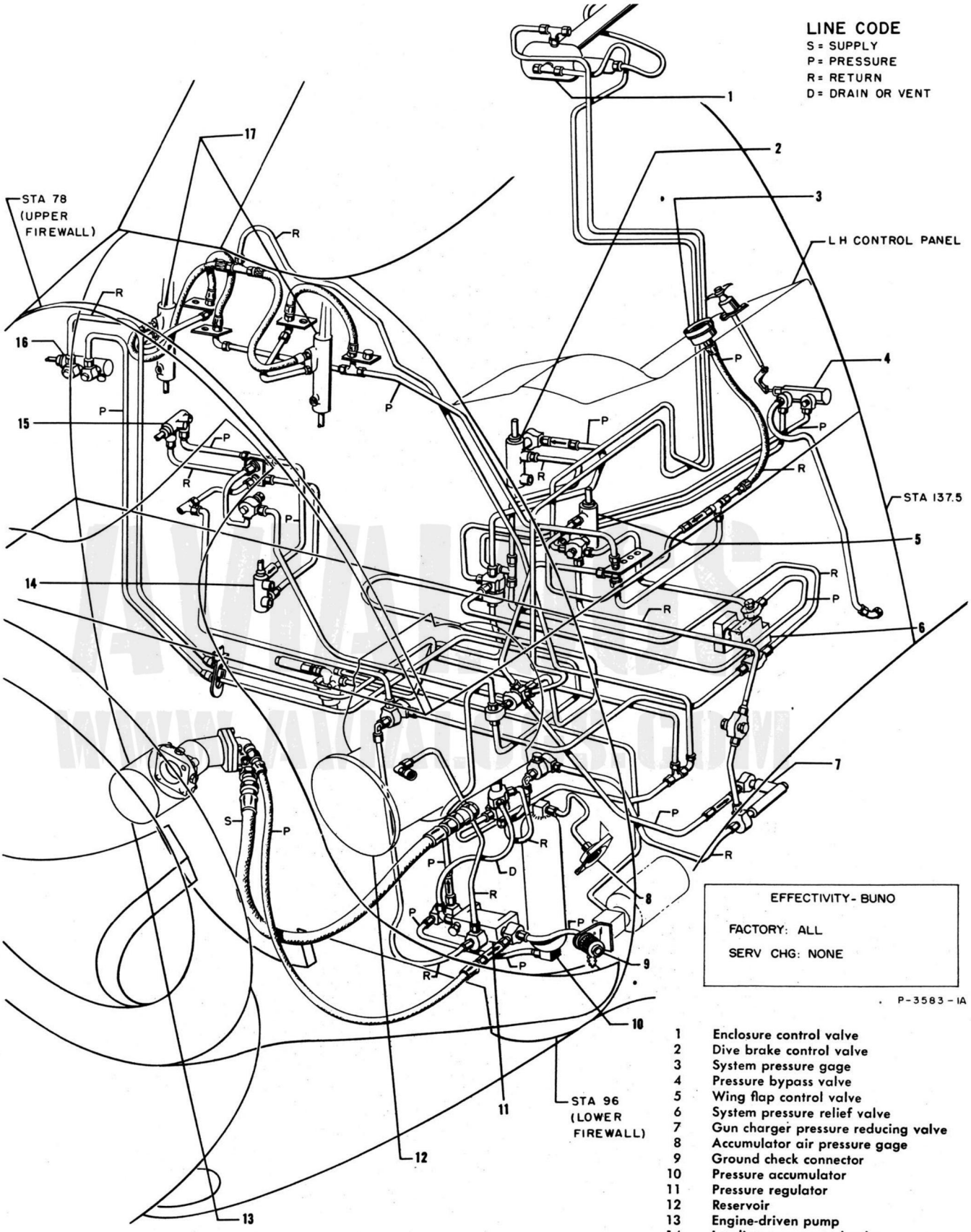


Figure 3–3. Main Pressure System—Perspective

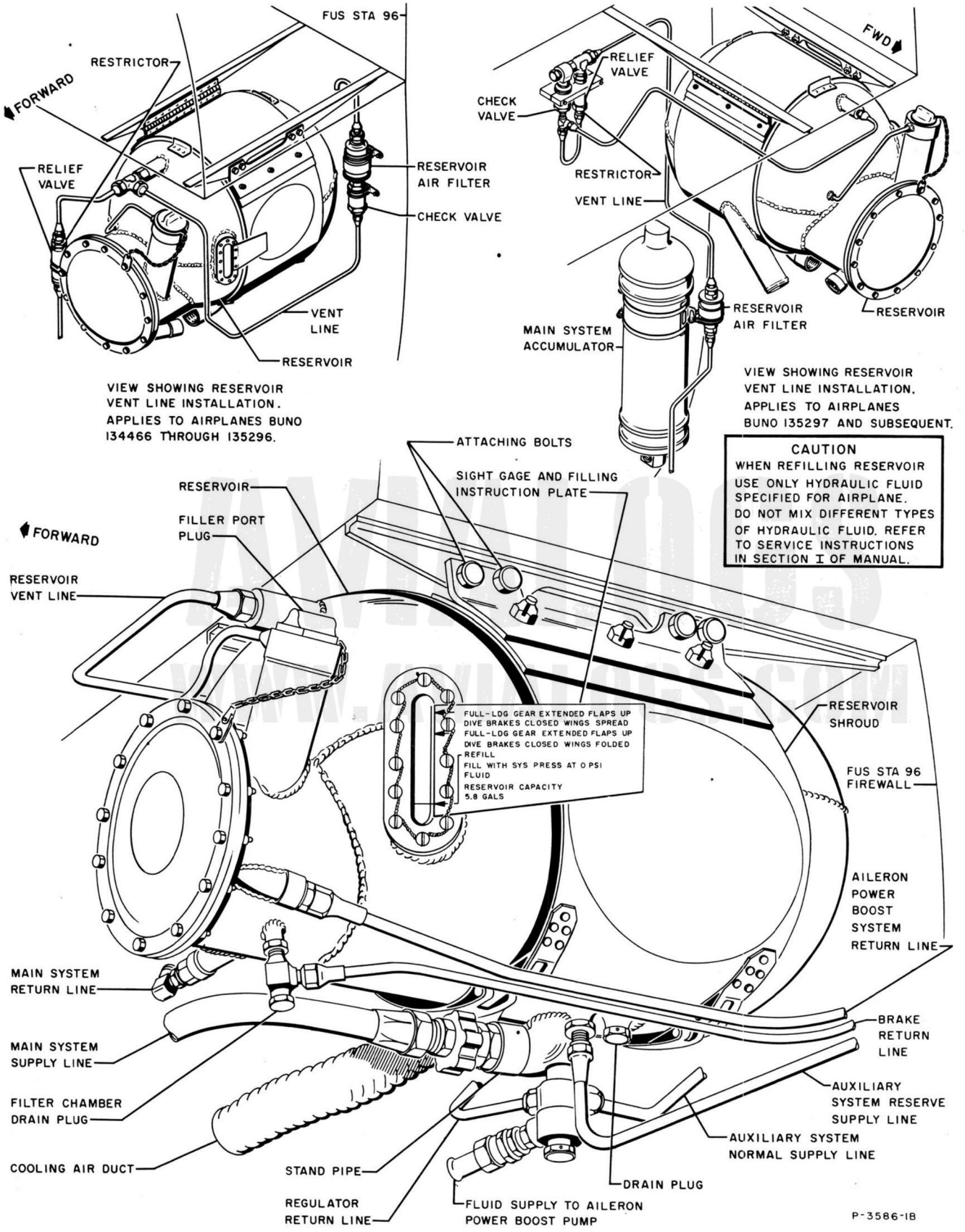


Figure 3–4. Hydraulic Reservoir and Vent System Installation

3-18. An integral filter chamber in the forward end of the reservoir contains a replaceable micronic filter. A drain port is installed in the bottom of the filter chamber.

3-19. An air line connected to the reservoir is provided to pressurize the reservoir, or to relieve excess air pressure in the reservoir. The air line is connected to an intake line with a check valve for drawing air into the reservoir, and to an exhaust line with a relief valve and a restrictor for expelling excess air pressure from the reservoir. The intake line and the exhaust line are connected to an air filter.

3-20. A cooling duct of molded synthetic rubber extends from the forward duct of the oil cooler to the shroud support of the hydraulic reservoir. The duct directs cooling air around the reservoir to keep fluid temperature below 71°C (160°F).

CAUTION

Make certain what type hydraulic fluid is currently in use in airplane before filling reservoir. Fill reservoir only with type fluid currently in use in airplane. Do not mix different types of hydraulic fluid.

NOTE

Use MIL-H-5606, red hydraulic fluid on all airplanes.

3-21. REMOVAL. (See figure 3-4.)

a. Relieve hydraulic system pressure. Make certain that pressure is fully relieved by pulling up on manual bypass valve handle until pressure gage indicates zero.

b. Remove lower left-hand accessory cowling.

c. Remove two drain plugs on reservoir, and fully drain reservoir.

d. Disconnect and cap hydraulic lines at reservoir or at disconnect fittings.

e. Disconnect and cap air line at reservoir.

f. Remove bolts attaching reservoir support shroud to outboard support bracket. Lower shroud and remove reservoir.

3-22. INSTALLATION. (See figure 3-4.)

a. Place reservoir in position and install bolts which attach support shroud to outboard support bracket.

b. Uncap and connect hydraulic lines at reservoir or at disconnect fittings.

c. Uncap and connect air line at reservoir.

CAUTION

Fill reservoir only with type hydraulic fluid currently in use in airplane. Do not mix different types of hydraulic fluid.

d. Make certain that drain plugs are installed at bottom of reservoir and fill reservoir with hydraulic fluid.

3-23. HYDRAULIC RESERVOIR FILTER.

3-24. DESCRIPTION. The hydraulic reservoir filter is a micronic filter, and is located in the reservoir filter chamber. The filter is provided to filter all fluid entering the reservoir, either from the main pressure system return line, the aileron power boost system return line, or the reservoir filler line. If the filter element becomes clogged, a flapper valve in the reservoir filter chamber opens and permits fluid to bypass the filter. The filter element can be replaced without removing the reservoir from the airplane. The following steps outline the procedure for filter replacement:

a. Relieve hydraulic system pressure. Make certain that pressure is fully relieved by pulling up on manual bypass valve handle until pressure gage indicates zero.

b. Remove filter chamber drain plug and drain fluid from chamber.

c. Remove bolts attaching filter chamber cap to reservoir.

d. Remove gasket, flapper valve and filter element.

e. Install new filter element and new gasket and reinstall flapper valve.

f. Install filter chamber cap and attaching bolts.

g. Install and lockwire filter chamber drain plug.

h. Add fluid to reservoir before restoring hydraulic system pressure.

3-25. HYDRAULIC RESERVOIR AIR FILTER.

3-26. DESCRIPTION. (See figures 3-4 and 3-5.) In A-1H airplanes BuNo. 134466 through 135296 a hydraulic reservoir air filter is installed adjacent to the hydraulic reservoir. In A-1H airplanes BuNo. 135297 and subsequent, the air filter is attached to a bracket on the hydraulic system pressure accumulator. The air filter connects into the reservoir vent line and is provided to filter air drawn into the reservoir. The filter element should be replaced when dirty, as outlined in the following steps:

a. Disconnect air lines from filter.

b. Remove filter.

c. Unscrew halves of filter case and remove filter element.

d. Install new filter element, screw halves of case together and safety with lockwire.

e. Reinstall filter with end marked RES upward.

f. Connect air lines at filter.

3–27. HYDRAULIC RESERVOIR AIR RELIEF VALVE AND RESTRICTOR.

3–28. DESCRIPTION. (See figure 3–4.) The hydraulic reservoir air relief valve is installed in the reservoir air exhaust line, and is provided to relieve reservoir internal pressure in excess of 14 psi. The valve closes when reservoir internal pressure is reduced to approximately 10 psi. The restrictor is installed in the reservoir air exhaust line between the reservoir and the reservoir air relief valve. The restrictor is provided to prevent loss of hydraulic fluid during airplane acrobatics when the air relief valve is open.

3–29. HYDRAULIC RESERVOIR AIR CHECK VALVE.

3–30. DESCRIPTION. (See figure 3–4.) The hydraulic reservoir air check valve is installed in the reservoir air intake line and is provided to prevent air in the reservoir from returning to outside atmosphere through the air intake line.

3–31. MAIN PRESSURE SYSTEM PUMP.

3–32. DESCRIPTION. (See figure 3–3.) The main pressure system engine-driven pump is a cylinder-and-piston-type, constant delivery pump, installed on the engine accessory drive section. The ratio of pump speed to engine speed is 1.4:1. The direction of pump rotation is as indicated by the rotation arrow on the pump housing.

Note

No attempt should be made to disassemble or repair the pump. If damaged, the pump should be removed and replaced by a new or overhauled pump.

3–33. REMOVAL.

a. Through left-hand lower accessory cowling, disconnect and cap main pressure system pump lines.

b. Remove pump mounting nuts.

c. Remove pump by pulling pump straight out of mounting pad.

3–34. INSTALLATION.

a. Remove pump plug from pump body and fill body with hydraulic fluid. Replace plug.

b. Remove preservative coating from pump spline.

c. Lubricate both ends of spline with graphited grease (Specification MIL-G-7187).

d. Install pump on engine mounting pad. Tighten mounting nuts to 220 ± 10 inch-pounds torque.

e. Uncap and connect main pressure system lines.

3–35. MAIN PRESSURE SYSTEM REGULATOR.

3–36. DESCRIPTION. (See figure 3–5.) The main pressure system pressure regulator is located on the forward face of fuselage station 96 firewall on the left-hand side of the airplane next to the pressure system accumulator. It is provided to maintain pressure in the hydraulic system by cutting-in (loading) when pressure falls below 2600 + 100 —0 psi and continuing to operate until pressure reaches 3000 + 100 —0 psi, at which the regulator cuts-out (unloads).

3–37. REMOVAL.

a. Relieve main pressure system pressure. Make certain that pressure is fully relieved by pulling up on manual bypass valve handle until pressure gage indicates zero.

b. Remove left-hand lower accessory cowling.

c. Disconnect and cap hydraulic fluid lines from pressure regulator.

d. Remove screws attaching regulator to bracket.

3–38. INSTALLATION.

a. Remove left-hand lower accessory cowling.

b. Position pressure regulator on bracket and install attaching screws.

c. Loosen screw attaching bracket to channel.

d. Connect main pressure system lines to pressure regulator.

e. Tighten screw attaching bracket to channel.

f. Install left-hand lower accessory cowling.

3–39. MAIN PRESSURE SYSTEM ACCUMULATOR.

3–40. DESCRIPTION. (See figure 3–5.) The main pressure system pressure accumulator is mounted on brackets on the forward face of fuselage station 96 firewall on the left-hand side of the airplane. The pressure accumulator is a 190-cubic-inch cylinder in which a free-floating piston is assembled. A port in the bottom of the cylinder is connected with the pressure line from the manifold on which the pressure regulator is mounted. An air pressure gage and an air filler valve are mounted outboard of the accumulator and are connected to the accumulator at a port in the top of the accumulator. Air should be added to the filler valve as necessary to maintain 1500 to 1900 psi air pressure in the accumulator when the main pressure system pressure is zero, in which condition the free-floating piston is bottomed in the cylinder. As system pressure is increased above the 1500–1900 psi air pressure range, the free-floating piston is forced upward, further compressing the air in the cylinder to the pressure in the main pressure system. Actuation of an operating system relieves pressure in the main pressure system and the compressed air in the accumulator then forces a supply of high-pressure fluid out of the accumulator and into the main pressure system, tending to stabilize system pressure.

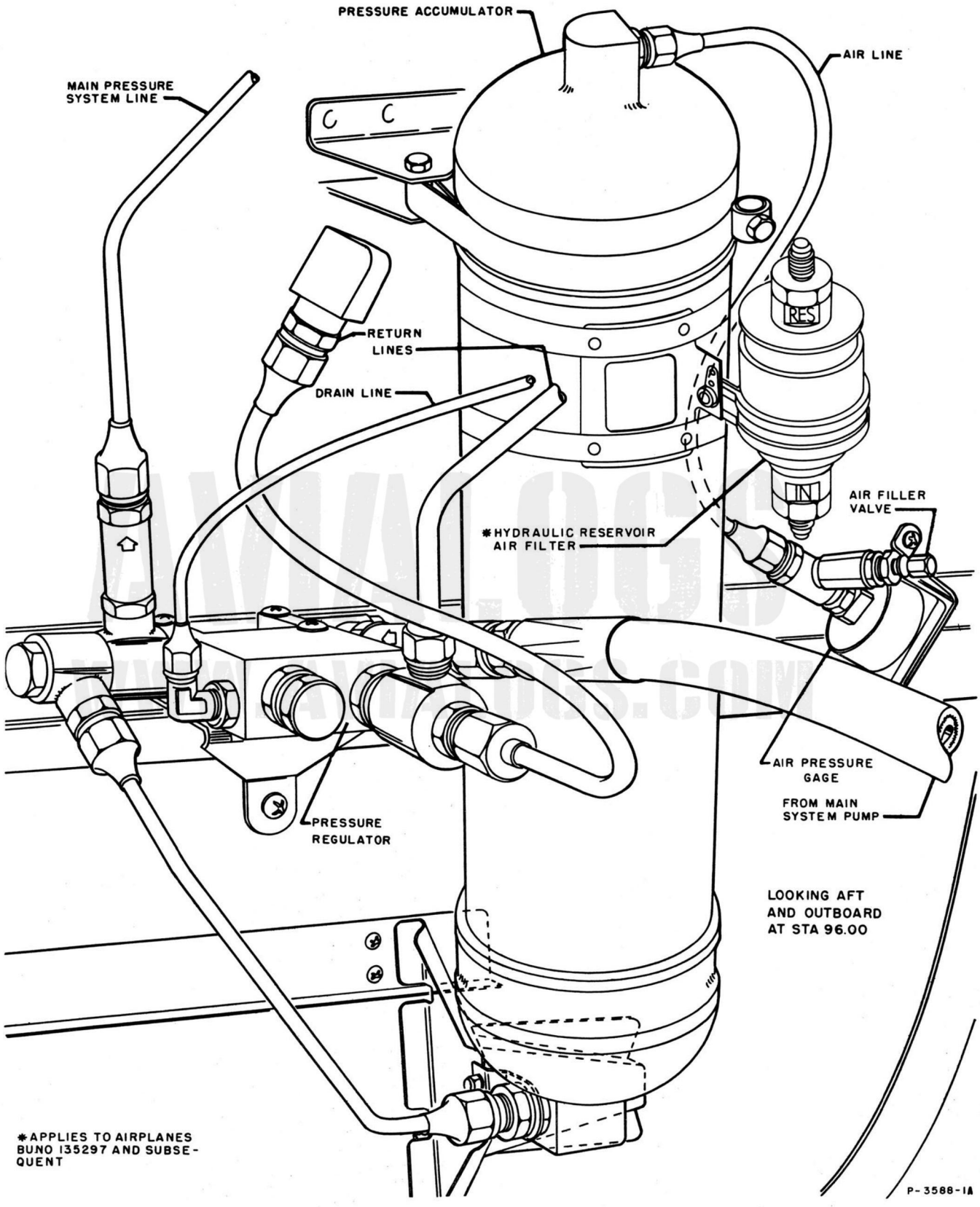


Figure 3–5. Main Pressure System Accumulator and Regulator Installation

3–41. REMOVAL. (See figure 3–5.)

a. Relieve main system pressure. Make certain that pressure is fully relieved by pulling up on manual bypass valve handle until pressure gage indicates zero.

b. Remove left-hand lower accessory cowling.

c. Disconnect and cap pressure line at bottom of accumulator.

d. Loosen air valve approximately one-fourth turn and permit air to discharge slowly and completely.

e. Disconnect and cap air line at top of cylinder.

f. On airplanes BuNo. 135297 and subsequent, detach hydraulic reservoir air filter from support bracket on accumulator.

g. Remove bracket nut from union at bottom port of accumulator.

h. Remove clamp near top of accumulator and remove accumulator.

3–42. INSTALLATION. (See figure 3–5.)

a. Position accumulator on brackets with air port upward.

b. Attach union in bottom port to support bracket.

c. Install and tighten clamp in position near top of accumulator.

d. Uncap and connect air line to port at top of accumulator.

e. On airplanes BuNo. 135297 and subsequent, attach hydraulic reservoir air filter to support bracket on accumulator.

f. Charge accumulator with 1500–1900 psi air pressure.

g. Uncap and connect pressure line to port at bottom of accumulator.

h. Install left-hand lower accessory cowling.

3–43. MAIN PRESSURE SYSTEM ACCUMULATOR AIR FILLER VALVE AND PRESSURE GAGE.

3–44. DESCRIPTION. (See figure 3–5.) The pressure accumulator air filler valve and pressure gage are mounted on a bracket outboard of the accumulator, and are connected to the accumulator air line, which, in turn, is connected to the port at the top of the accumulator. Air should be added at the air filler valve as necessary to maintain 1500–1900 psi air pressure in the accumulator when main pressure system pressure is zero. The pressure gage is provided to indicate the amount of pressure in the accumulator.

3–45. MAIN PRESSURE SYSTEM PRESSURE GAGE.

3–46. DESCRIPTION. The main pressure system pressure gage is mounted on the cockpit left-hand control panel. The gage registers pressure in the main pressure system.

CAUTION

Do not use main pressure system pressure gage for adjustment of any relief valves on airplane; gage has tolerance of ± 125 psi pressure.

3–47. A restrictor is installed in the line to the main pressure system pressure gage. The restrictor is provided to prevent high pressure surges in the main pressure system from registering on the pressure gage, and thus it protects the pressure gage from being damaged. The restrictor has a bore of 0.0995 inch which is plugged with a pin of 0.095 inch diameter.

3–48. MAIN PRESSURE SYSTEM RELIEF VALVE.

3–49. DESCRIPTION. (See figure 3–3.) The main pressure system relief valve is mounted on the web of the pilot's seat support structure, just below the cockpit floor and just aft of fuselage station 110. The valve is incorporated in the system to prevent fluid pressure from rising to a dangerous point if the pressure regulator fails or if thermal expansion of the fluid occurs due to sudden temperature changes. The valve contains a pressure port which is normally closed by a spring-loaded poppet, and a return port which is connected with the return line to the reservoir. The valve is set to relieve at 3400 psi pressure and reseat at 3100 psi pressure.

3–50. REMOVAL.

a. Relieve main pressure system pressure. Make certain that pressure is fully relieved by pulling up on manual bypass valve handle until system pressure gage indicates zero.

b. Disconnect and cap lines at valve.

c. Remove valve mounting bolts and remove valve.

3–51. INSTALLATION.

a. Position valve to support so that valve adjustment bolt is upward and install valve attaching bolts.

b. Uncap and connect lines at valve.

c. Restore main pressure system pressure.

3–52. MAIN PRESSURE SYSTEM MANUAL BYPASS VALVE.

3–53. DESCRIPTION. (See figure 3–6.) The main pressure system manual bypass valve is a manually controlled, normally closed relief valve, connected with the system pressure line between the pressure regulator and the operating control valves to provide an emergency means of relieving system pressure. It is installed below the left-hand control panel. The valve control handle is mounted on the panel and actuates the valve through rod-and-cam linkage. Pulling the handle up rotates the cam to open the valve.

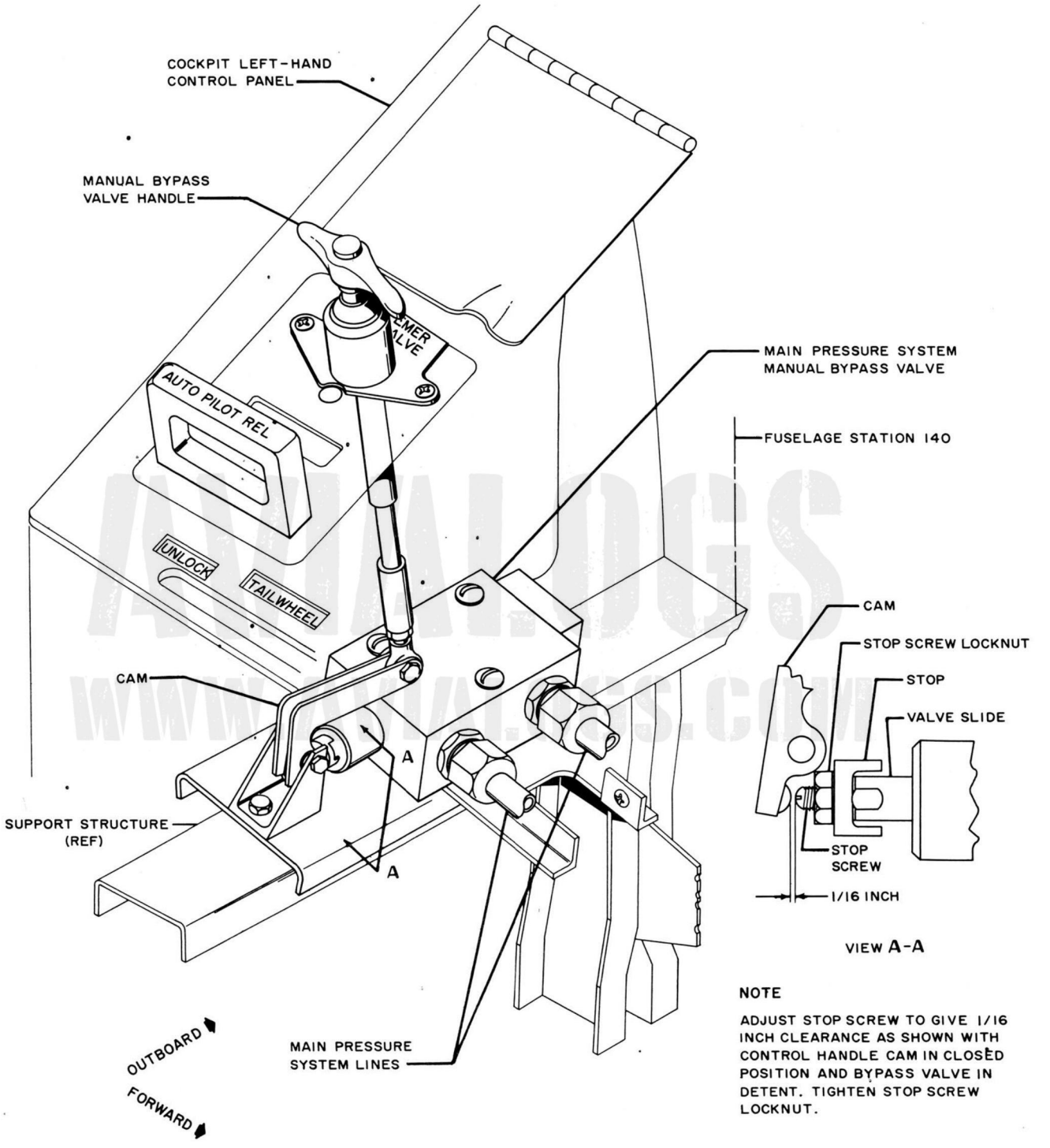


Figure 3–6. Main Pressure System Manual Bypass Valve Installation

3–54. REMOVAL.

a. Relieve system pressure.

b. Remove side access panel from left-hand control panel.

c. Disconnect and cap lines at valve.

d. Remove valve attaching screws and remove valve.

3–55. INSTALLATION.

a. Place valve on bracket so that ports are forward; bolt in place.

b. Connect hydraulic lines to valve: pressure line to inboard port, return line to outboard port.

c. With control handle in closed (down) position, adjust rod and/or stop on valve plunger to provide 1/16-inch clearance between plunger and lower lip of cam.

3–56. AUXILIARY PRESSURE SYSTEM.

3–57. DESCRIPTION. (See figure 3–7.) The auxiliary pressure system provides an alternate means of furnishing hydraulic pressure to the operating systems through the auxiliary pressure system selector valve and main pressure system lines in the event of main pressure system pump failure. The auxiliary pressure system includes the following principal components:

Name	*Para Ref*
Hydraulic system reservoir	3–16
Auxiliary pressure system pump	3–59
Auxiliary pressure system pump control circuit	3–63
Auxiliary pressure system selector valve	3–66
Auxiliary pressure system relief valve	3–70

3–58. The auxiliary pressure system pump is driven by an electric motor. The auxiliary pressure system selector valve is actuated by the landing gear control linkage. When the landing gear control handle is in WHEELS UP or WHEELS DOWN and the auxiliary pump motor is energized, hydraulic fluid is supplied to the auxiliary pump from the hydraulic reservoir through the auxiliary system selector valve and normal supply line. The auxiliary pump hydraulic pressure is then directed to the operating systems through the auxiliary system pressure line, selector valve and main pressure system lines. When the landing gear control handle is placed in EMER the auxiliary pump motor is energized and hydraulic fluid is supplied to the pump from the reserve section of the hydraulic reservoir through the auxiliary system selector valve and reserve supply line. The auxiliary pump hydraulic pressure is then directed to the landing gear down line to lower the landing gear. Auxiliary pump hydraulic pressure is not available to other operating systems when the landing gear control handle is positioned for emergency lowering of the main landing gear. The auxiliary pressure system relief valve is installed in the pressure line between the auxiliary pump and auxiliary selector valve and is set to relieve at 3100 ± 50 psi pressure.

3–59. AUXILIARY PRESSURE SYSTEM PUMP.

3–60. DESCRIPTION. (See figure 3–8.) The auxiliary system pump is mounted in the lower left-hand side of the forward equipment compartment at approximately fuselage station 120. The pump is operated by an integral electric motor energized by the airplane d-c electrical system. The pump supplies pressure to the main pressure system through the auxiliary selector valve.

3–61. REMOVAL. (See figure 3–8.)

a. Disconnect pump motor electrical wiring.

b. Disconnect and cap auxiliary pressure system lines at pump.

c. Remove bolts attaching pump to pump support and remove pump.

3–62. INSTALLATION. (See figure 3–8.)

a. Position pump to pump support so that pump motor is aft and install attaching bolts.

b. Uncap and connect auxiliary pressure system lines at pump.

c. Connect pump motor electrical wiring.

3–63. AUXILIARY PRESSURE SYSTEM PUMP CONTROL CIRCUIT.

3–64. DESCRIPTION. The auxiliary pressure system pump control circuit comprises, in addition to the pump motor, the following:

Name	*Location*
Circuit breaker, 5-amp	Cockpit—circuit breaker panel
Manual control switch, designated EMER HYDRAULIC PUMP	Cockpit—left-hand control panel
Automatic control switch	Forward equipment compartment—firewall, LH
Pump relay	Forward equipment compartment—terminal panel 17
Current limiter, 80-amp	Forward equipment compartment—terminal panel 17

3–65. The circuit breaker is connected with the secondary bus to provide power to both switches. When either switch is closed, the coil of the relay is energized and the primary bus is thereby connected to the pump circuit. When actuated by the manual control switch, auxiliary pump output is directed through the auxiliary selector valve to the main pressure system pressure lines, and can be utilized either for ground operation or to replace pressure normally provided in flight by the main pressure system engine-driven pump. The automatic control switch is actuated by the landing gear control handle linkage when the handle is placed in "EMER"; at the same time, the linkage shifts the auxiliary selector valve slide so that auxiliary pump output is drawn from the reservoir reserve line and routed through the selector valve to the landing gear *down* lines. The 80 amperes current limiter is provided in the auxiliary pressure sys-

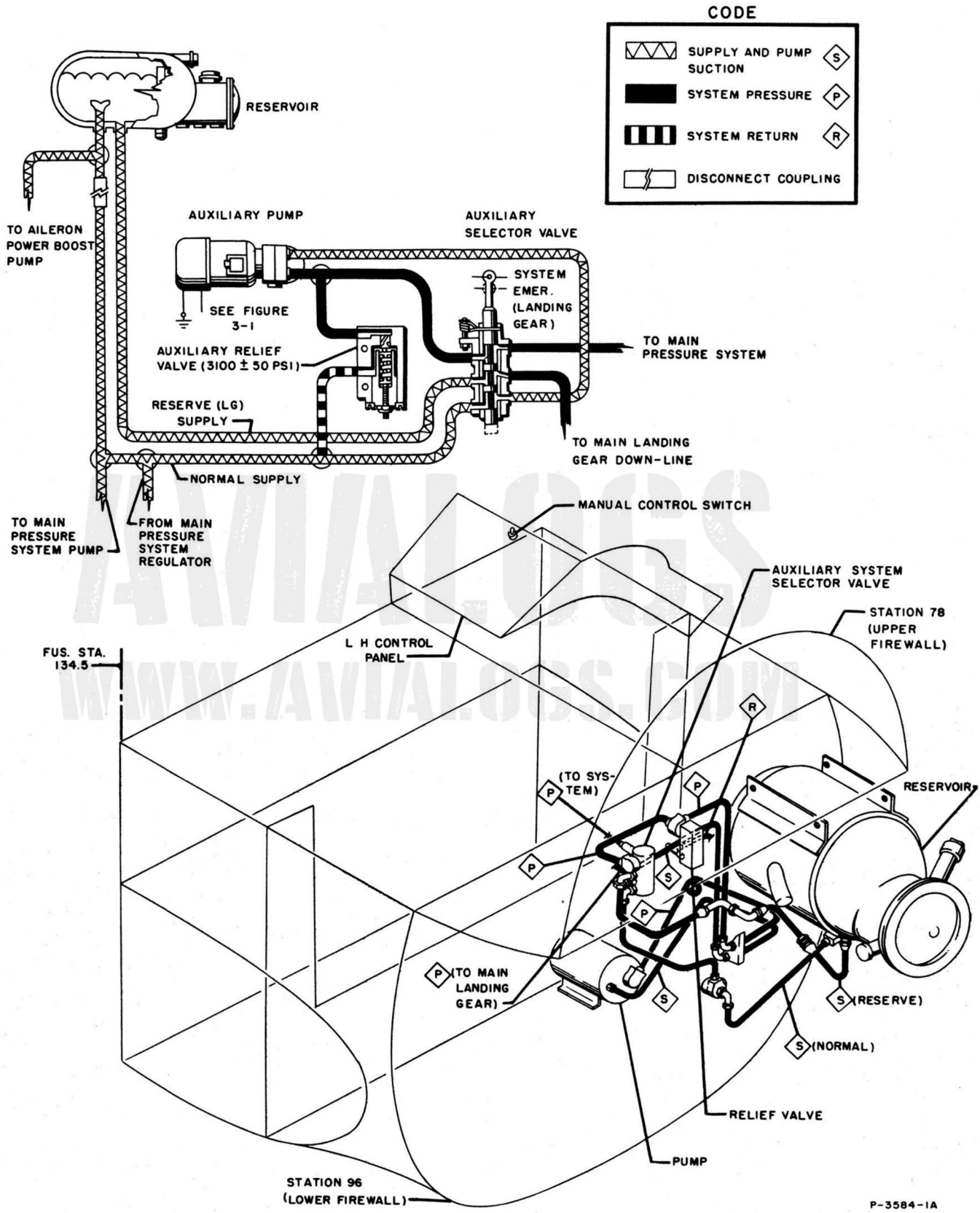
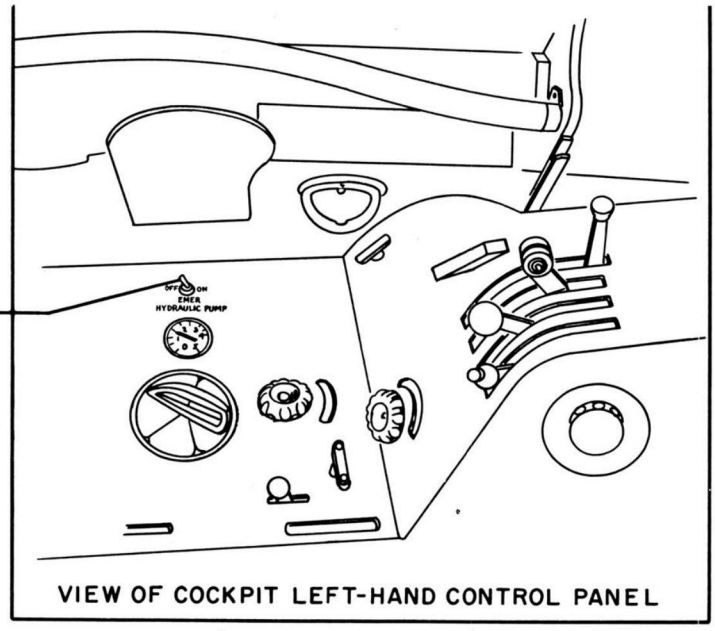


Figure 3–7. Auxiliary Pressure System Installation



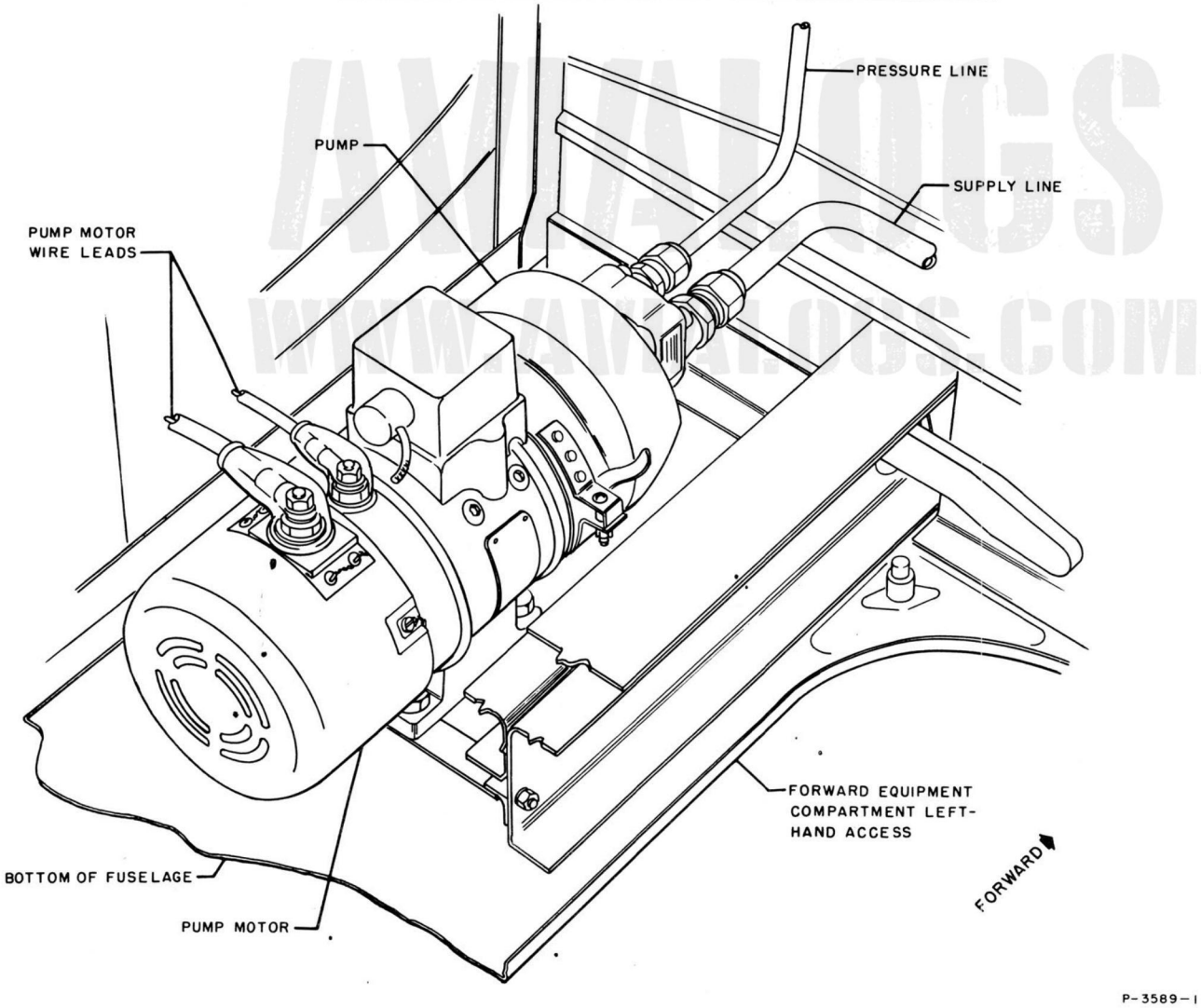


Figure 3—8. Auxiliary Pressure System Pump Installation

tem pump circuit to protect the wiring between the source of power and the pump motor in the event of a "short" in the pump motor. The circuit limiter operating limit is 80 amperes; however, the limiter will pass current loads exceeding 80 amperes for a period of short duration to prevent "blowing" during the starting cycle of the pump motor.

CAUTION

When replacing auxiliary pressure system pump current limiter use only Burndy Engineering Co. part number FLLB-G4. Never use a fuse.

3–66. AUXILIARY PRESSURE SYSTEM SELECTOR VALVE.

3–67. DESCRIPTION. (See figure 3–9.) The auxiliary pressure system selector valve is mounted on the after face of fuselage station 96 firewall, just to the left of the center line of the airplane and just below the cockpit floor. The normal (extended) position of the valve slide maintains an open line between the hydraulic system reservoir and the auxiliary pump; when the auxiliary pump motor is energized by the control switch in the cockpit, pressure is routed from the auxiliary pump back through the selector valve to the main pressure system. The alternate (retracted) position of the valve slide opens a second line between the hydraulic system reservoir, the auxiliary pump, and the landing gear down lines; it is effected by the landing gear control handle linkage when the handle is in EMER. After placing the main landing gear control handle in EMER, the auxiliary selector valve must be reset to the normal (slide extended) position at the valve. The valve is properly reset for normal auxiliary system operation when the selector valve slide is extended and is engaged with the extended position detent.

WARNING

Do not reset auxiliary selector valve to normal position by actuation of landing gear control handle and linkage. Actuation of landing gear control handle and linkage to extend selector valve slide for normal auxiliary system operation will raise landing gear, causing damage to airplane and possible injury to personnel.

3–68. REMOVAL. (See figure 3–9.)

a. In forward equipment compartment, disconnect and cap lines at selector valve. Plug valve ports.

b. Disconnect valve link from valve actuating lever.

c. Remove valve attaching screws and remove valve.

3–69. INSTALLATION. (See figure 3–9.)

a. Position valve to firewall and install valve attaching screws.

b. Make certain that valve slide is extended, then connect valve link to valve actuating lever.

c. Unplug valve ports. Uncap and connect lines to valve.

3–70. AUXILIARY PRESSURE SYSTEM RELIEF VALVE.

3–71. DESCRIPTION. (See figure 3–7.) The auxiliary pressure system relief valve is installed in the pressure line between the auxiliary pump and the auxiliary selector valve, and is mounted adjacent to the wing flap hydraulic system relief valve in the left-hand side of the forward equipment compartment at fuselage station 108, approximately 5 inches below the cockpit floor. The valve is set to open at 3100 ± 50 psi pressure, and to reseat at 2900 ± 50 psi pressure.

3–72. SYSTEM CHECK VALVES.

3–73. DESCRIPTION. (See figure 3–1.) Check valves are installed throughout the three pressure systems to insure free flow of hydraulic fluid in one direction only. An arrow marked on the outside of each check valve indicates the direction of flow through the valve.

3–74. AILERON POWER BOOST SYSTEM. (Refer to section II for information concerning the aileron power boost system.)

3–75. IN-FLIGHT FUELING SYSTEM HYDRAULIC COMPONENTS. For information concerning hydraulic components of the in-flight fueling system, refer to the in-flight fueling system paragraphs in section IV.

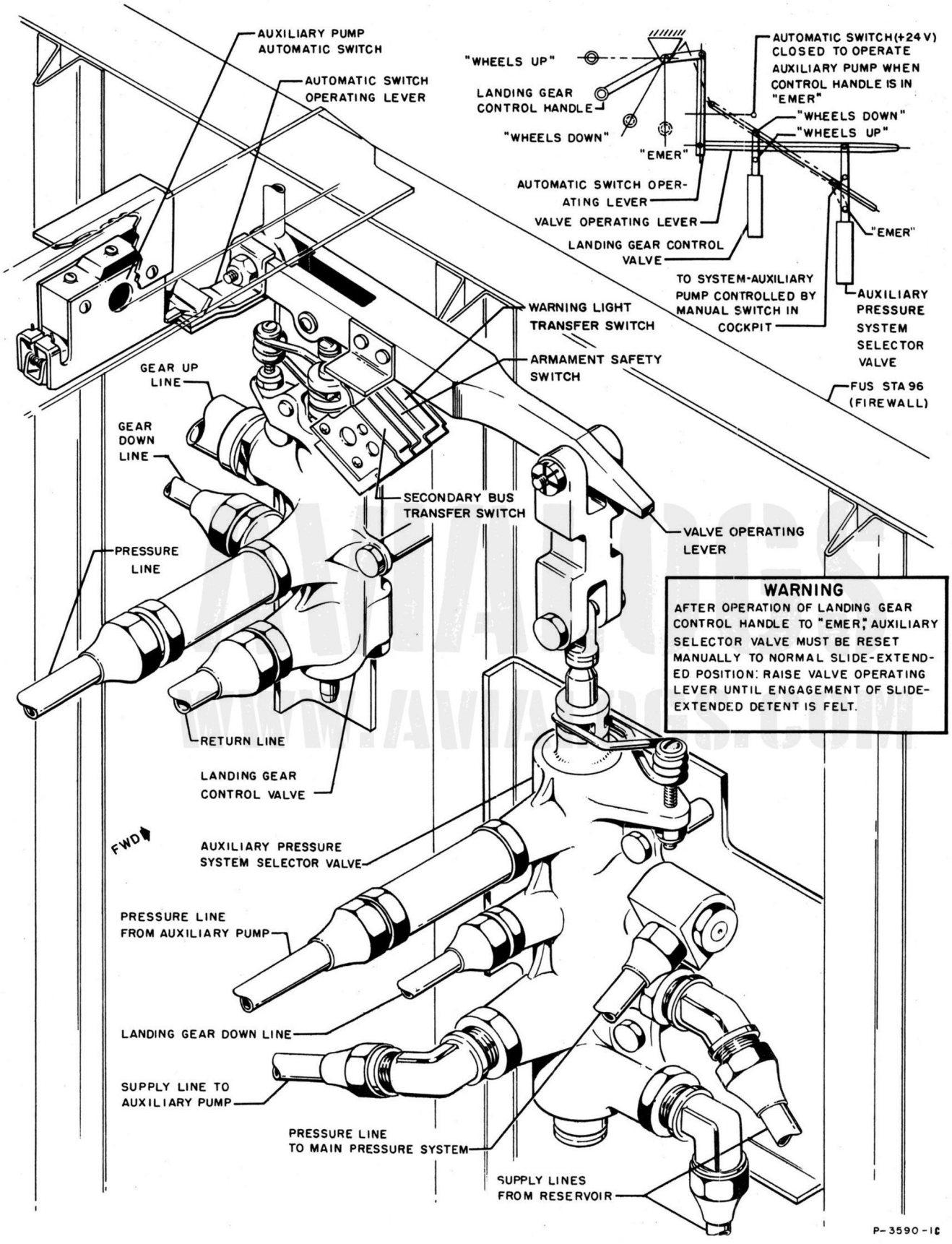


Figure 3–9. Auxiliary Pressure System Selector Valve Installation