

FUEL SYSTEM SERVICING

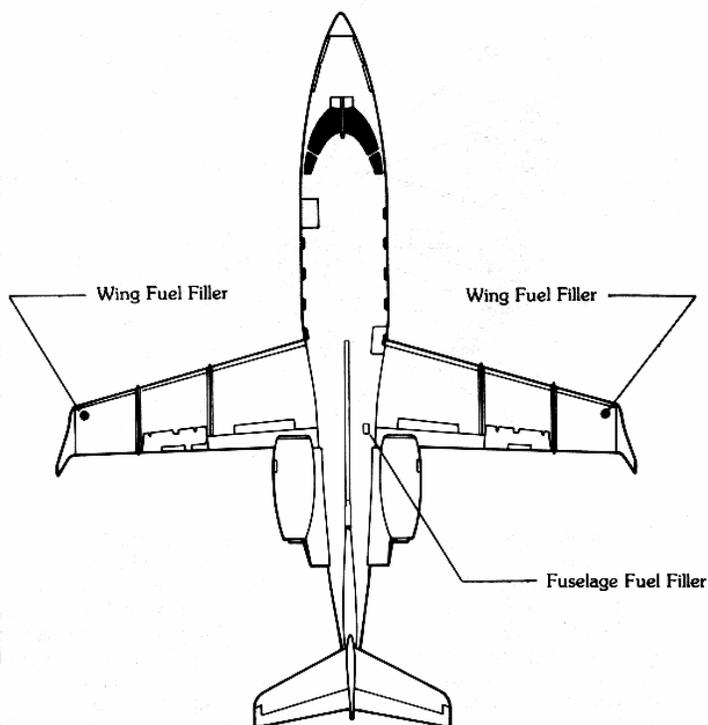
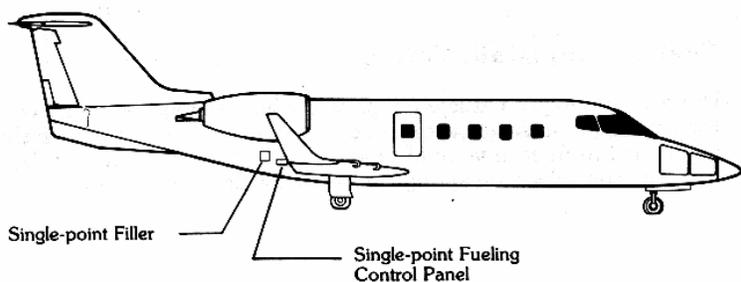
Refueling

The airplane may be fueled through a filler located in the top of each wing tank, through a filler in the top of the fuselage above the right engine, or through the single-point pressure filler (if installed) below the right engine.

Usable fuel, using the various refuel procedures, is given with the applicable procedure. Usable fuel valves may differ slightly from the chart values due to aircraft attitude at the time of refueling and other variables encountered in service.

WARNING: Ground fuel truck to apron and nose gear up-latch spacer and ground fuel nozzle to applicable ground jack prior to removing filler cap. This will help prevent possible fire and/or explosion due to static electricity or sparks.

NOTE: When refueling through the fuselage filler, reduced fuel flow rate may be required to avoid the possibility of a fuel spill or splash-back.



Fuel Tank Servicing

1. General

A. Fuel distribution should be such that during pressure fueling, the fuel level in both wings will be equal at all times.

B. The airplane is normally fueled using the pressure fueling method. However, if pressure-fueling facilities are not available, overwing fill ports in the main tanks may be used. A pressure fueling station is located on the right aft fuselage under the engine. The fueling station contains the control panel for controlling and monitoring the pressure-fueling operation.

During any fueling operation, observe and follow all standard fueling precautions and practices.

2. Replenish Fuel Tank (Pressure Method).

A. Ground airplane and fueling trucks.

WARNING: AIRPLANE AND FUEL TRUCK SHOULD BE PROPERLY GROUNDED BEFORE ANY FUELING OPERATION TO PREVENT THE POSSIBILITY OF FIRE OR EXPLOSION DUE TO DISCHARGE OF STATIC ELECTRICITY.

B. Provide electrical power if necessary.

C. Open fueling station access doors and control panel access door.

D. Connect fueling nozzle ground plugs to grounding jacks.

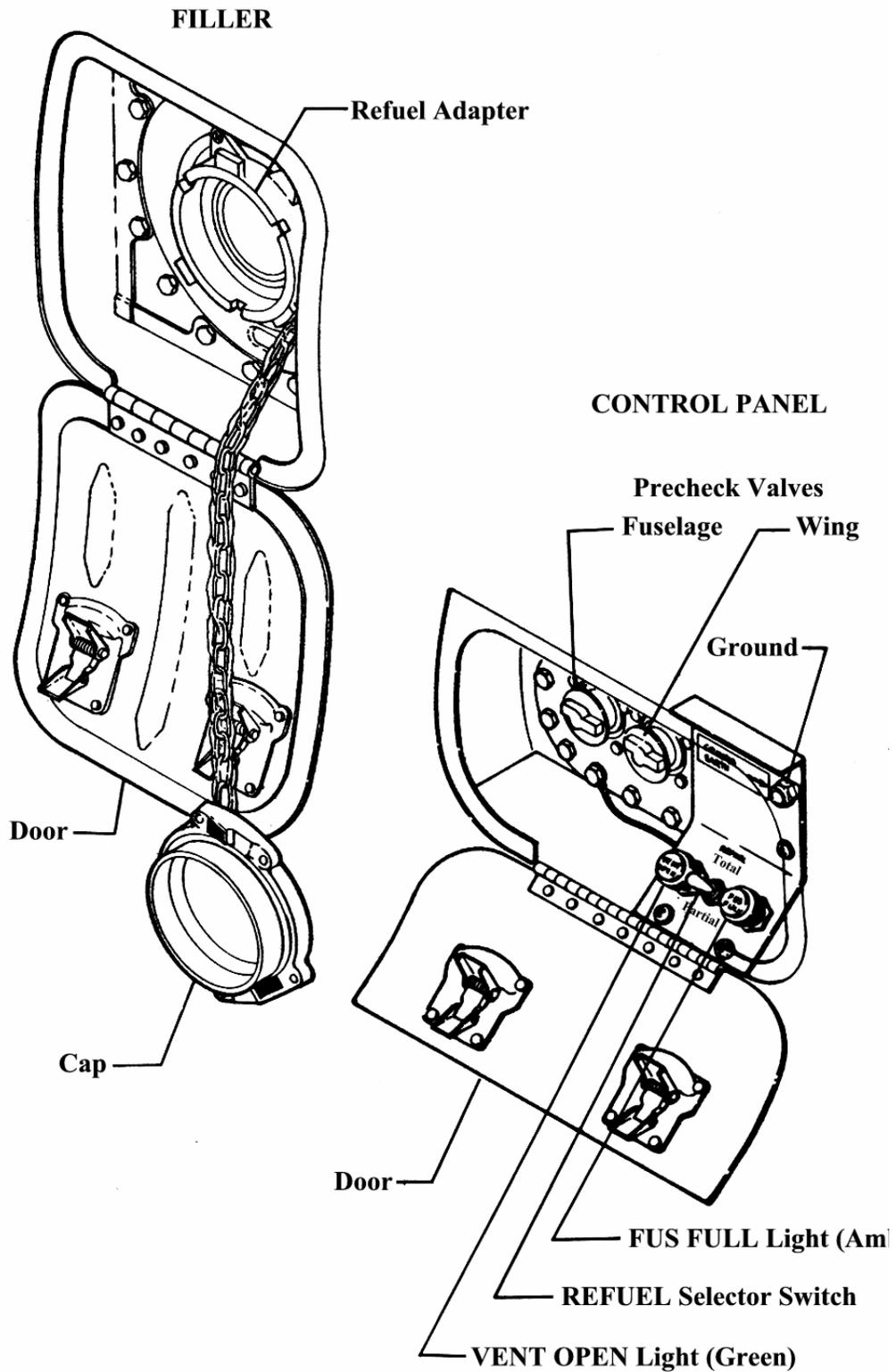
E. Remove fueling receptacle caps and connect fueling nozzles.

F. Position the Refuel Selector Switch to either "TOTAL" or "PARTIAL" depending on the fuel order received by the flight crew.

G. Make sure the VENT OPEN LIGHT is on (green) before proceeding to fuel.

H. After the fuel is flowing, close the precheck valves (wing / fuselage). Fuel flow should stop within 10 seconds. If the fuel flow stops, turn the precheck switches back to normal and continue fueling. If the fuel flow does not stop, cease fueling and report it to the flight crew.

NOTE: All fueling nozzle pressures should be adjusted equally to 50 psi.



NOTE: Tanks to be completely filled will shut off automatically when full. When operation is complete, stop fueling source.

I. Disconnect fueling nozzles, then disconnect nozzle grounding plugs.

K. Install fueling receptacle caps.

L. Close fueling station access doors.

M. Check that all fueling valve switches are in CLOSED position, then close fueling control panel door.

N. Disconnect fueling truck grounding cables.

O. Remove electrical power if no longer required.

Switch Fueling

Switch fueling is the practice of mixing fuels with a flash point of less than 100°F (38°C) with fuels having a flash point of more than 100°F (38°C). Mixing kerosene base, JP-5, Jet-A, Jet-A-1 or AVTUR fuels with wide cut petroleum distillates, JP-4, Jet-B, or AVTAG is considered switch fueling.

WARNING: Switch fueling changes the fuel/air mixture flammability characteristics. When switch fueling must be accomplished, fueling rates must be reduced to one-half the normal truck delivery rate in addition to observing the normal ground procedures.

NOTE: For additional information on the possible hazards of switch fueling, refer to FAA Order 8110.34, Advisory Circular AC 150/5230-3, and Advisory Circular AC 00-34A.

Fuel Anti-Ice Additive

CAUTION: On aircraft not equipped with fuel heaters, lack of anti-icing additive may cause fuel filter icing and subsequent engine flameout.

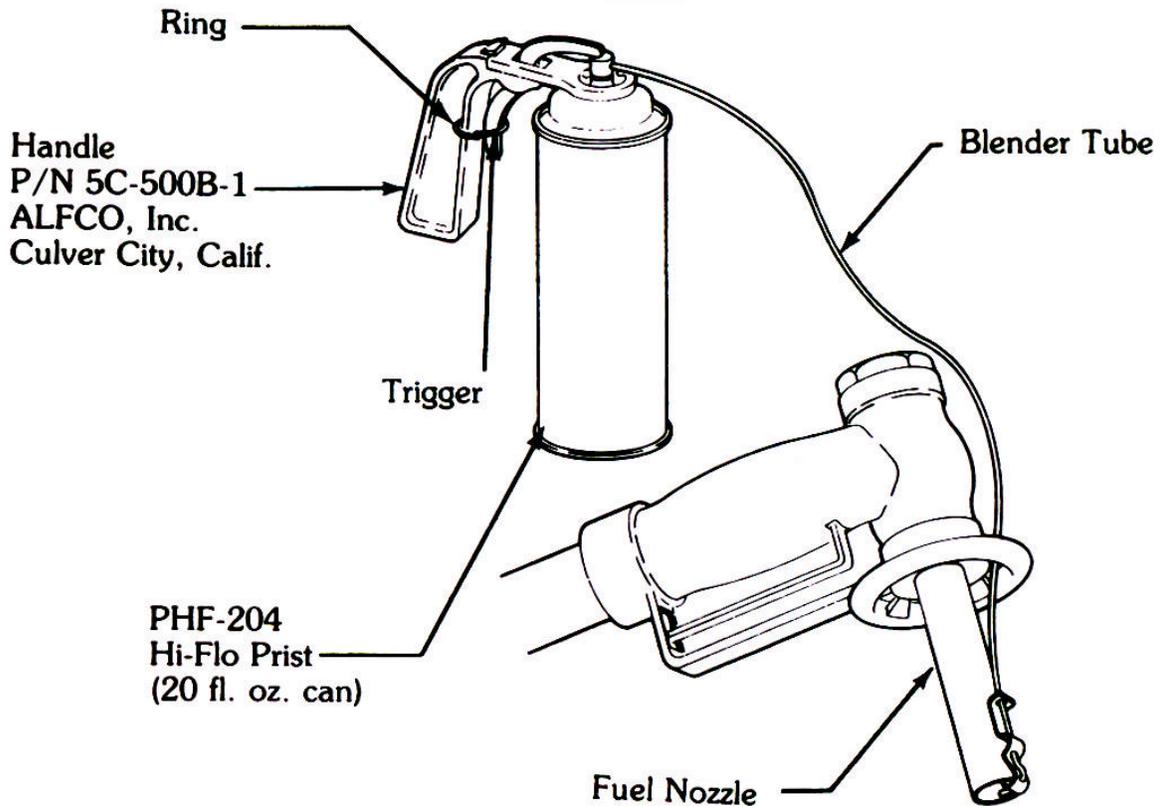
NOTE: On aircraft equipped with fuel heaters, for microbial protection, it is recommended that anti-icing additive be used, in the concentration specified, at least once a week for aircraft in regular use and whenever a fueled aircraft will be out of service for a week or more.

The wide range of temperatures to which jet fuels are exposed in flight result in substantial changes in the water solubility of the fuel. Some jet fuels have an anti-ice additive blended at the refinery and no additional fuel preparation is required prior to aircraft servicing. However, the majority of fuels do not contain anti-ice additive and additive conforming to MIL-I-27686 or MIL-I-85470 must be blended with these fuels during aircraft refueling. (Refer to FAA Approved Airplane Flight Manual.) The additive functions as a freeze-point-depressant and as a biocide. Its partitioning characteristics make it especially effective in nullifying the icing effects of small quantities of water in jet fuels. The second important characteristic of this jet fuel additive is its action as a biocidal agent which retards fungal and bacterial growth in fuel systems and fuel tanks.

Biocide Additive

Biobor JF is approved for use as a biocide additive when premixed with fuel in the fuel supply facility. Over-the-wing blending of Biobor JF and fuel is not approved. Concentrations of Biobor JF up to, but not exceeding, 270 ppm can be used.

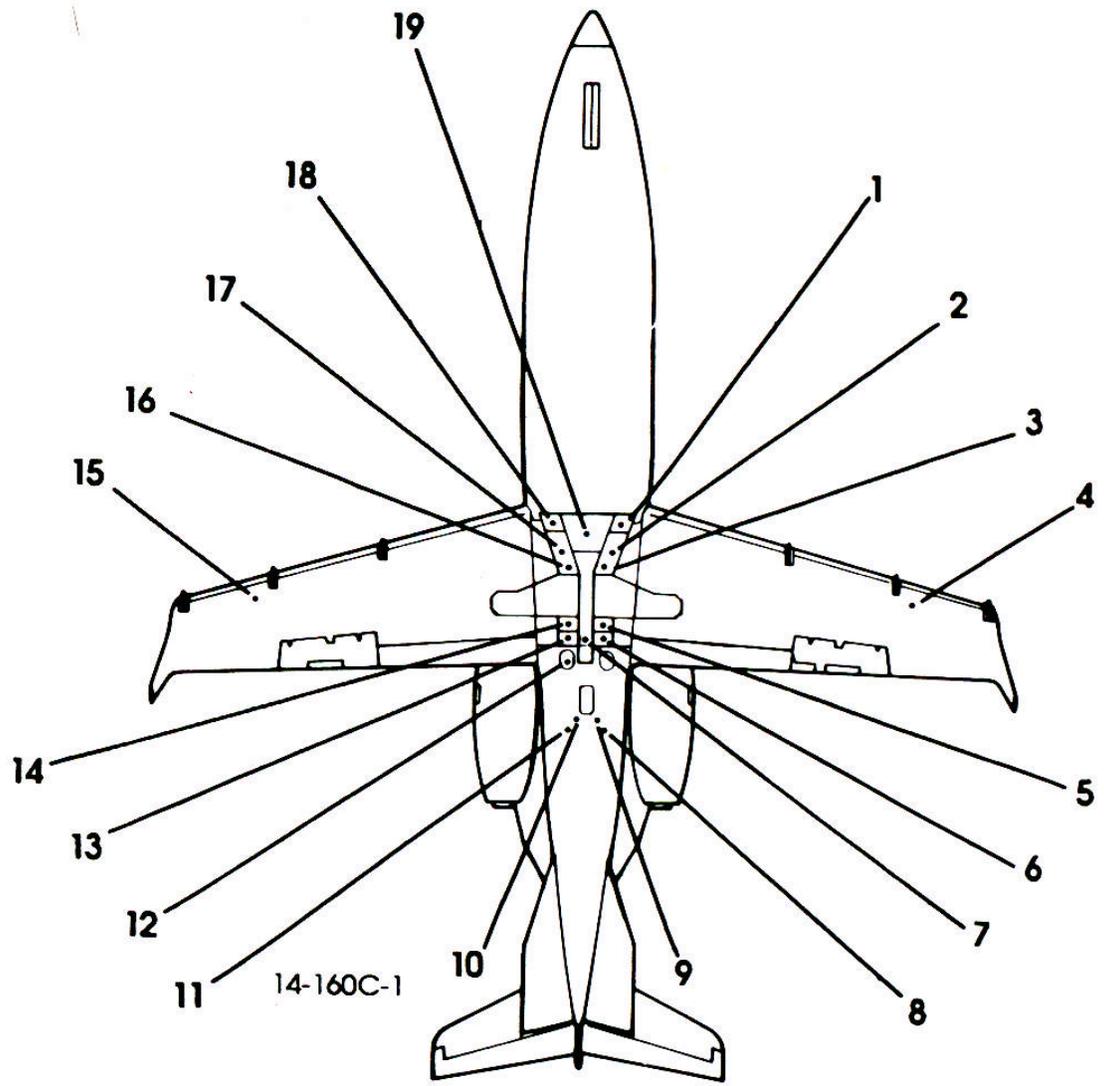
CAUTION: Drain all sumps prior to refueling. Excessive water concentrations combined with excessive Biobor JF concentrations can result in the formation of solid crystalline precipitates in the fuel system.



Fuel System Drain Valves

Drain valves, located at low points throughout the fuel system, are used for draining condensation or sediment. A small amount of fuel should be drained from each valve after servicing and prior to the first flight of the day. The valves are spring-loaded to the closed position.

1. Left Wing Scavenge Pump
2. Left Wing Sump
3. Left Engine Fuel
4. Left Wing Vent (Sump)
5. Left Wing Expansion Line
6. Left Wing Transfer Line
7. Fuel Vent (Fuselage)
8. Left Fuel Computer
9. Left Fuel Filter
10. Right Fuel Filter
11. Right Fuel Computer
12. Fuselage Tank Sump
13. Right Wing Transfer Line
14. Right Wing Expansion Line
15. Right Wing Vent (Sump)
16. Right Engine Fuel
17. Right Wing Sump
18. Right Wing Scavenge Pump
19. Fuel Crossover



OIL SYSTEM SERVICING

Service the engine lubrication system only with the oils listed in the APPROVED OILS list. (Refer to Addendum 11 - OIL SERVICING in the FAA Approved Airplane Flight Manual) Do not mix oils. The oils should be filtered through a 10-micron filter prior to use.

NOTE: Check the oil level immediately after engine shutdown. While the engine is inoperative, oil seeps from the tank into the gearbox. A false indication of low oil supply may be obtained if the level is checked after the engine has remained inoperative for a length of time.

Approved Oils

Type 2 oils conforming to Garrett Specification EMS 53110, are approved. (Refer to Addendum II - OIL SERVICING in the FAA Approved Airplane Flight Manual for a list of approved oils).

Oil Level Check

The engine oil servicing doors are located on the forward and outboard side of each engine nacelle and are opened by releasing the lever locks.

Oil level is checked on the right engine by viewing through the sight glass on the engine oil tank. The sight glass is placarded to indicate FULL, 1 QT LOW, and 3 QTS LOW.

Oil level is checked on the left engine with an oil dipstick incorporated into the oil filler cap. The oil filler cap is removed by pushing down and rotating counterclockwise.

Adding Oil

Adding oil to the right engine is accomplished by pouring oil directly into the tank. The oil tank cap is removed by pushing down and rotating counterclockwise. Add oil until sight glass indicates FULL.

Adding oil to the left engine is accomplished by pouring oil into the oil filler tube (dipstick tube). The filler tube cap is removed by pushing down and rotating counterclockwise. Add oil until dipstick indicates full.

External Power Receptacle

A standard AN power receptacle is located on the RH side of aft fuselage just aft of the engine. The receptacle, connected to the battery bus, provides provisions for connecting a 28-volt DC external power unit.

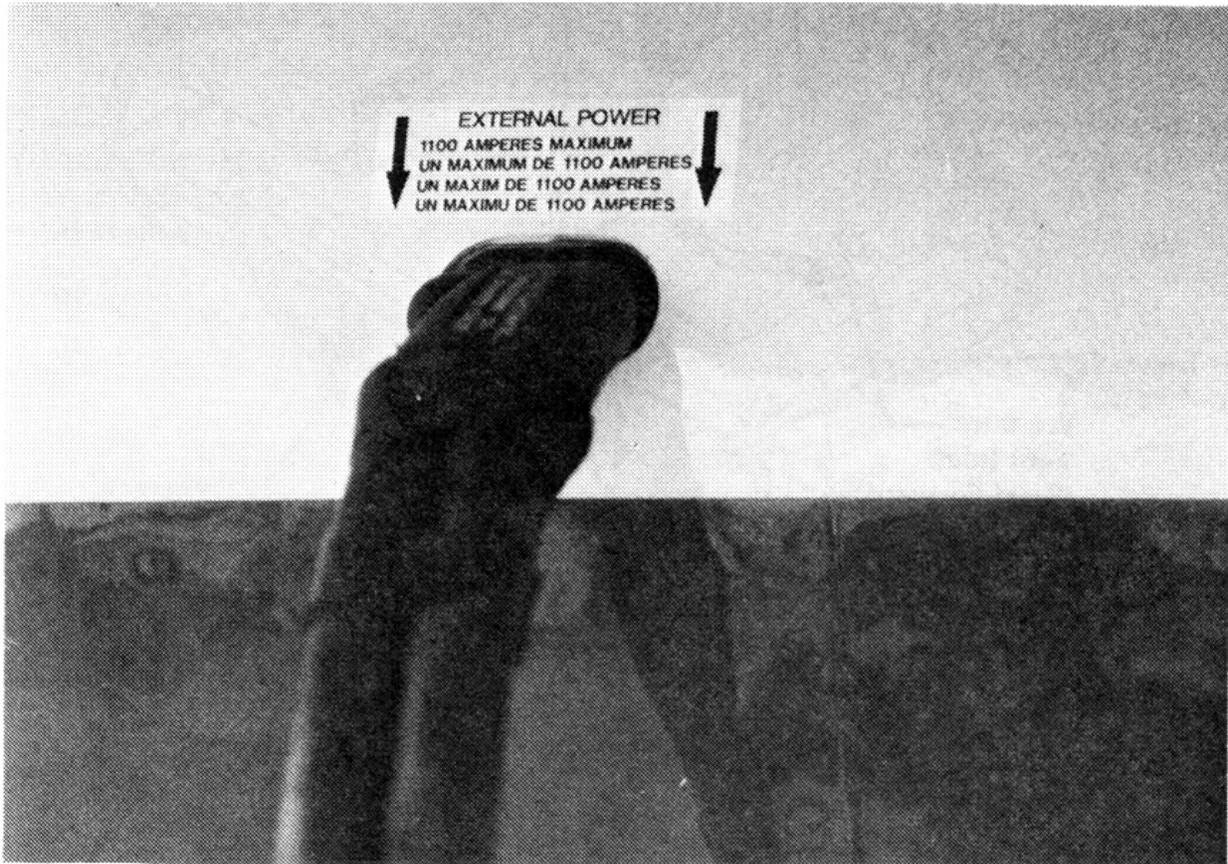
CAUTION: Limit external power output to a maximum of 1100 amps when connected to this aircraft.

Batteries

Battery power is supplied by two nickel-cadmium or lead acid batteries located in the tailcone equipment section. The batteries are of sufficient capacity to accommodate the normal electrical requirements of the airplane including starting. Normally, the batteries should not be removed in transient maintenance; however if this should be required, adhere to the following:

WARNING: Disconnect both battery quick-disconnects (QD) even though only one battery is being removed. If only one QD is disconnected, battery voltage will feed back from the connected battery and arcing will occur if the disconnected QD is inadvertently shorted to the aircraft structure.

CAUTION: Do not allow any item used on or with lead-acid batteries to come into contact with nickel-cadmium batteries. Even acid fumes can damage a nickel-cadmium battery.

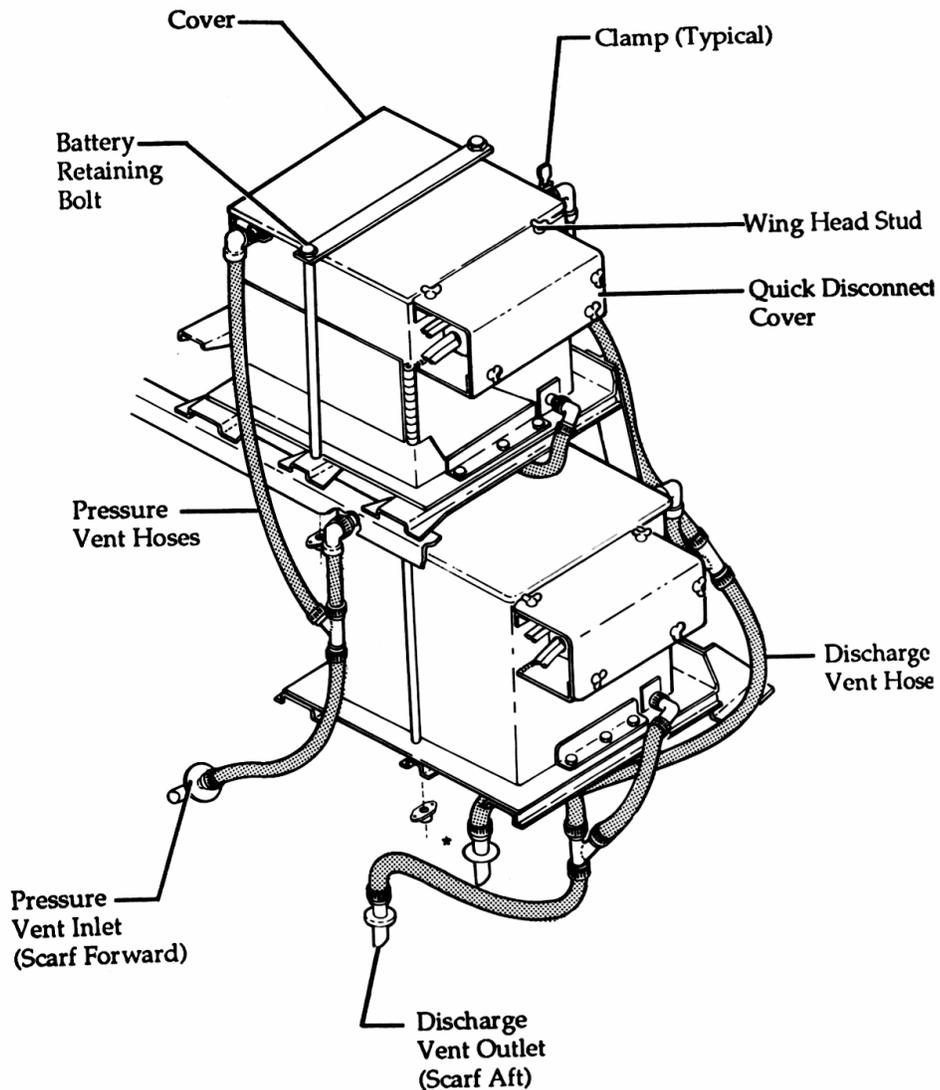


BATTERY

Battery Charging With Batteries Installed

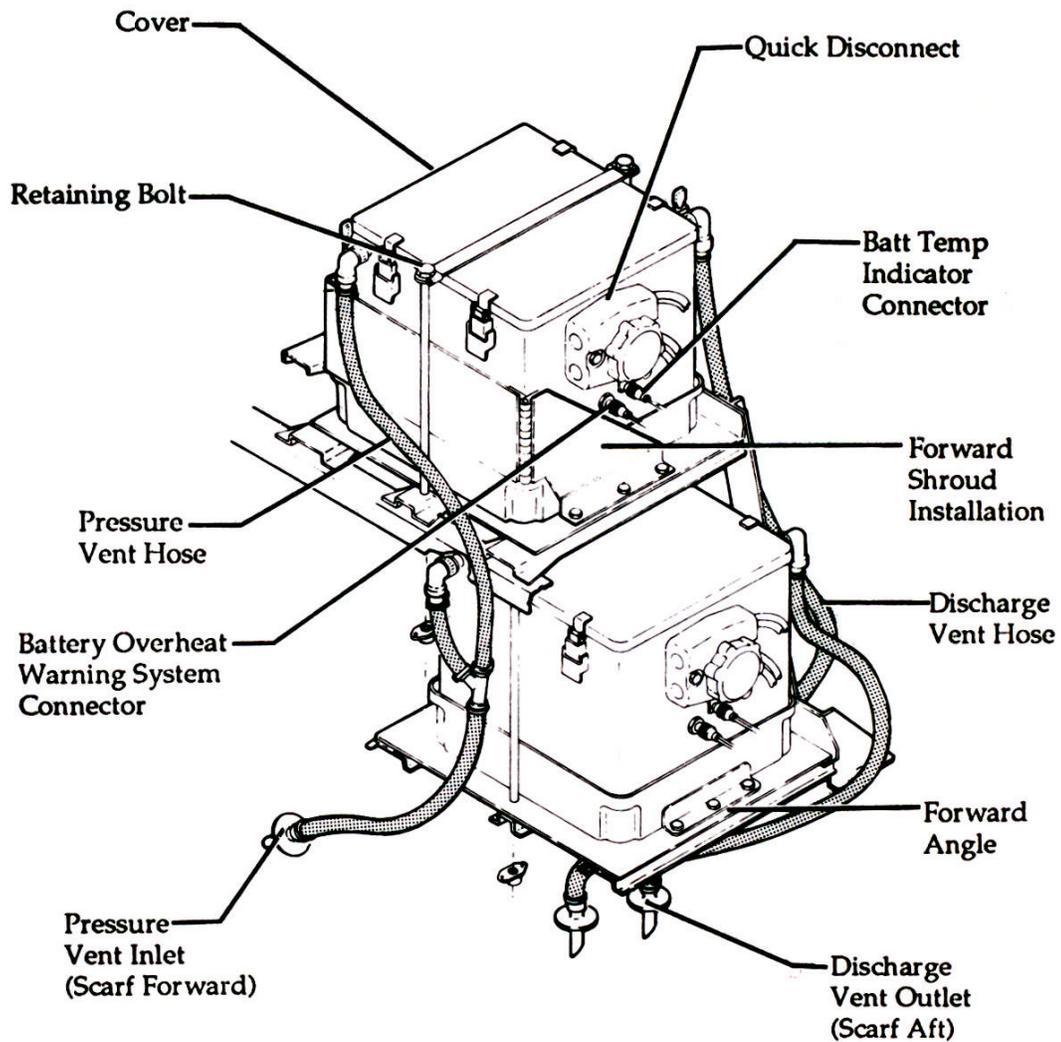
Learjet Inc. does not recommend that batteries be charged while in the aircraft. However, if charging batteries in the aircraft becomes absolutely necessary, they may be charged using external power as follows:

1. Plug in and turn on power source.
2. Regulate output from power source to 28 volts and 1100 amps.
3. Assure both battery switches are ON. If batteries were discharged, **do not** attempt engine start until batteries have charged at least 15 minutes.



Aircraft With Lead-Acid Batteries

* Certain aircraft have discharge hose outlets for each battery.



Aircraft With Nickel-Cadmium Batteries

Battery Removal

WARNING: Remove the quick-disconnects from both batteries even though only one battery is to be removed. Battery voltage will feed back from connected battery and arcing will occur if the quick-disconnect is inadvertently shorted to aircraft structure.

1. Open tailcone equipment access door.
2. Remove quick-disconnect covers by rotating wing head studs (lead-acid batteries only).
3. Disconnect both battery electrical quick-disconnects.
4. Disconnect battery overheat warning system plug located directly below the battery electrical quick-disconnect (nickelcadmium batteries only).
5. Disconnect battery temperature indicator plug (nickel-cadmium batteries only).
6. Loosen clamps and remove vent hoses.
7. Remove battery retaining bolts. The battery lid bar is slotted to allow retaining bolt removal.

8. In upper battery position remove forward shroud installation bolts and shroud will hinge to aid in battery removal.
9. In lower battery position remove forward angle bolts and angle to aid in battery removal.
10. Remove battery from aircraft. Remove battery box with leadacid battery.
11. Clean battery area as required.

Install batteries

1. Inspect batteries to assure no damage has occurred during shipment. If new batteries are being put into service, refer to Chapter 12 of the Maintenance Manual for servicing procedures.
2. Check all electrical connections for tightness (nickel-cadmium batteries).

CAUTION: Poor electrical contact could result in damage to the battery.

3. In upper battery location, position the battery to permit the shroud installation bolts.
4. In lower battery location, position the battery to permit the installation of the forward angle.
5. Install bolt securing the battery to battery shelf. The battery lid clamp is slotted to aid in bolt installation. A keeper is utilized to maintain bolt location in battery lid clamp.
6. Connect battery pressure vent hoses and battery discharge vent hoses. Secure hoses with clamps.
7. Connect battery overheat warning plug and battery temperature indicator plug (nickel-cadmium batteries only).
8. Connect battery electrical quick-disconnects and safety wire per double-twist method.
9. Install quick-disconnect covers (lead-acid batteries only).
10. Close tailcone access door.

SERVICING TIRES

The aircraft tires on both dual main gear and the nose gear are tubeless. They should be serviced with dry air or nitrogen to the following pressures:

Service Nose Gear Tire

1. Remove valve cap and check tire pressure with a gage capable of 125 psi (862 kPa).
2. Inflate tire to 105 L5) psi (724 [\pm 34] kPa) (104 to 114 psi [717.0 to 786.0 kPa] loaded) with dry air nitrogen. Assure that valve core is not leaking and replace cap.

NOTE: The nose gear tire is not considered loaded unless the pilot and copilot are actually seated in the cockpit.

Service Main Gear Tires

1. Remove valve cap and check tire pressure with a gage capable of 200 psi (1379 kPa).
2. On aircraft not certified for 21,500 lb takeoff gross weight, inflate main gear tires to 180 L5) psi (1241 [\pm 34]kPa) unloaded, 187 L5) psi (1289 [\pm 34]kPa) loaded.
3. On aircraft certified for 21,500 lb takeoff gross weight, inflate main gear tires to 193 (+5) psi (1331 [\pm 34] kPa) unloaded, 201 L5) psi (1386 [\pm 34] kPa) loaded.

WINDSHIELD ANTI-ICE SYSTEM

Servicing Windshield Anti-Ice System

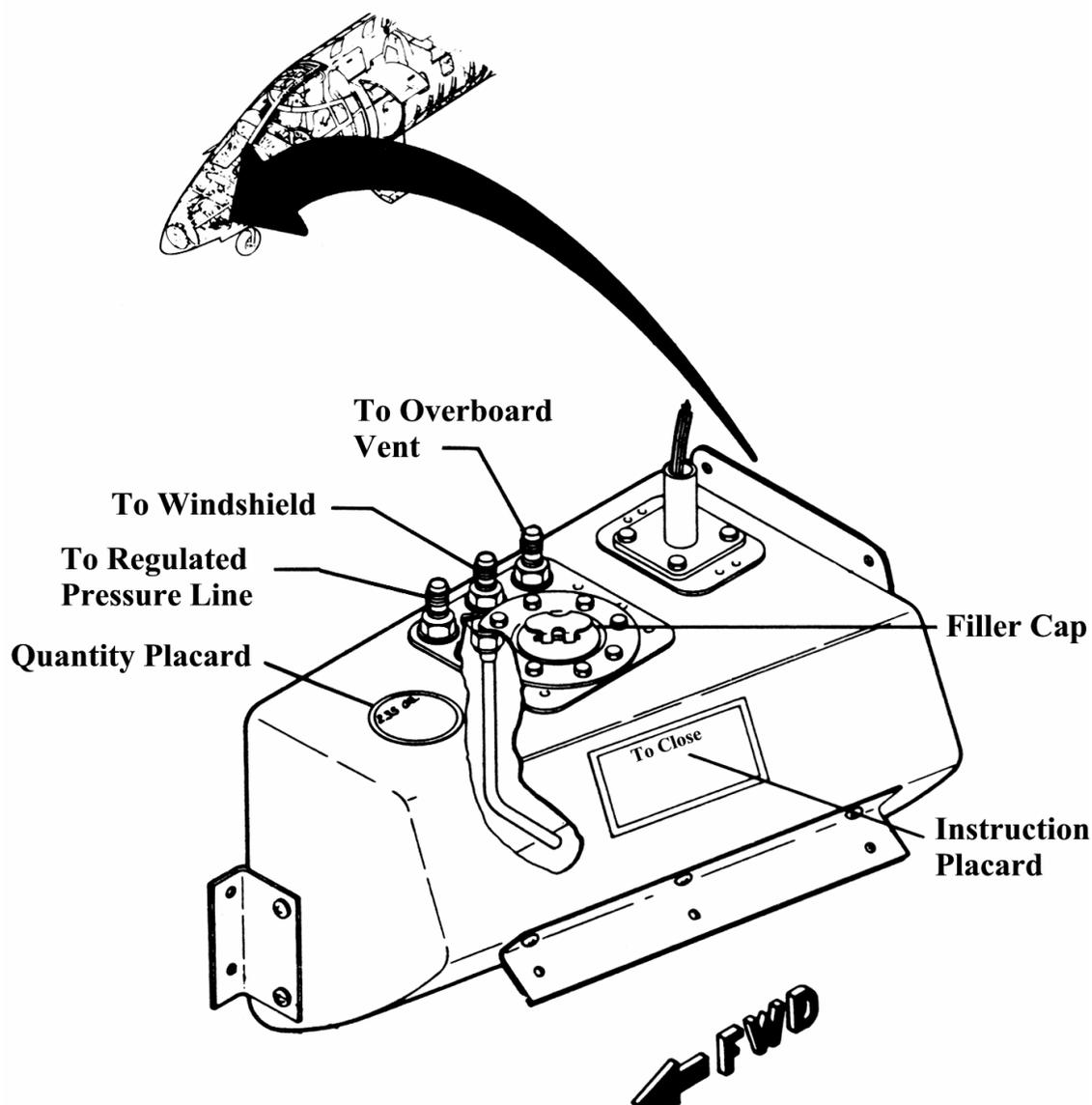
Alcohol for windshield anti-icing is stored in a 2.35 gallon (8.89 liter) supply tank located in the LH forward avionics compartment.

The tank is to be refilled with methyl alcohol, (Fed. Spec.) O-M-232, Grade A after each use.

NOTE: Remove filler cap per instruction placard.

Refill Alcohol Tank

1. Open the LH forward avionics compartment access door.
2. Remove filler cap and fill tank with methyl alcohol, (Fed. Spec.) O-M-232, Grade A.
3. Install filler cap.
4. Close the LH forward avionics nose compartment access door.



SERVICING OXYGEN SYSTEM

WARNING: Prior to servicing the oxygen system, personnel should familiarize themselves with and strictly adhere to maintenance precautions and procedures.

On aircraft equipped with nose-mounted oxygen cylinder, the oxygen storage cylinder is located below the floor of the nose baggage compartment between frames 4 and 5.

On aircraft equipped with vertical fin-mounted oxygen cylinder, the oxygen storage cylinder is located on vertical stabilizer spar # 1 between W.L. 75.0 and W.L. 95.0.

If the oxygen storage cylinder has been thermally discharged, remove the cylinder with shutoff valve and regulator assembly attached. Send the unit to an oxygen recharging station to be functionally tested and to have the burst disc and washer replaced. The green discharge indicator must be replaced prior to recharging the cylinder.

The regulator does not normally need to be closed. However, when servicing or performing maintenance on the oxygen system, verify that the regulator is open prior to returning the aircraft to service.

Use only dry breathing oxygen. Federal Specification MIL-O-27210, Type I from a green colored cylinder.

Oxygen Maintenance Precautions and Procedures

Maintenance on the oxygen system or any other system requiring removal of an oxygen system component requires strict adherence to the following procedures and precautions.

WARNING:

- **Assure all electrical power is disconnected from aircraft and that the aircraft is properly grounded.**
- **Oils, grease, and solvent may burn or explode spontaneously when contacted by oxygen under pressure.**
- **Be sure hands and clothing are free of grease and oil.**
- **When depleting the oxygen bottle pressure, either remove the bottle from the aircraft or connect a line to the oxygen bottle regulator outlet port and direct the released oxygen to an open area away from the aircraft. If bottle is removed, cap or plug all lines to prevent system contamination. If line is to be used to drain bottle, clean line by degreasing with MIL-T-81533, 1,1,1 Trichlorethane, and dry with dry nitrogen MIL-N-6011, Grade A, Type 1 prior to use.**
- **Do not permit smoking or open flame in or near aircraft while maintenance is being performed on the oxygen system.**

1. Deplete oxygen system pressure.

2. Use extreme caution to assure every part of system is kept thoroughly clean and free of water, oil, grease, and solvent contamination.
3. Cap all openings immediately upon removal of any component. DO NOT use tape or caps which will introduce moisture.
4. Use extreme caution to avoid bending tubing or damaging flares on tubing that is not being removed.
5. If an opening becomes uncapped or unplugged, remove and clean affected component by degreasing with MIL-T-81533, 1,1, Trichlorethane, then dry with dry nitrogen (MIL-N-6011), Grade A, Type 1.
6. All tools used for removal and installation of oxygen system components must be free of dirt, grease, and oil.
7. Maintenance personnel must assure that their hands are free of dirt or grease prior to removal and installation of oxygen system components.
8. When connecting straight threaded fittings, align tubing and pressure flare end firmly against fitting end. Tighten 1/2 to 1 turn and apply MIL-T-5542 thread compound sparingly to remaining exposed threads.
9. When connecting tapered threaded fittings, place polytetrafluorethylene anti-seize tape (MIL-L-27730) so that a minimum of 1 1/2 threads remain uncovered at starting end of fitting. Stretch tape during wrapping of fitting and apply 1-1/2 turns of tape to fitting.
10. Under no circumstances should any adjustment or repair of oxygen equipment be attempted. Any damaged or defective oxygen system component must be replaced.

Charge Oxygen Storage Cylinder

1. *Aircraft equipped with oxygen cylinder in nose*, open nose baggage compartment access door and remove nose baggage compartment floor.

Aircraft equipped with oxygen cylinder in vertical fin, open oxygen service access door on LH side of dorsal assembly.

2. Remove fill cap and attach oxygen supply to fill valve.

WARNING: Rapid charging of oxygen system will create a dangerous overheat condition in oxygen storage cylinder.

NOTE: Slight leakage may be detected when the fill cap is removed.

3. Open supply tank valve and slowly charge oxygen system to pressure specified, in table below.

NOTE: Aircraft 55-137 & Subsequent with dual oxygen system, ensure shutoff valve and pressure regulator of nose oxygen storage cylinder is in the ON position before filling the vertical fin oxygen storage cylinder. If nose oxygen storage cylinder is not in the ON position, all

supply oxygen being delivered to the vertical fin oxygen storage cylinder will be vented into aircraft's nose.

4. Close supply line valve and disconnect supply line.
5. Install fill valve cap on fill valve. Tighten cap, using care when torquing to prevent stripping of threads.
6. Using CG Leak Detector Fluid, leak test fill valve cap.
7. Verify that shutoff valve and regulator assembly is open.
8. *Aircraft equipped with oxygen cylinder in nose*, install nose baggage compartment floor and close nose baggage compartment access door.

Aircraft equipped with oxygen cylinder in vertical fin, close oxygen service access door on LH side of dorsal assembly.

AMBIENT TEMP °F	CHARGING PRESSURE PSIG	AMBIENT TEMP °F	CHARGING PRESSURE PSIG
0	1600	70	1925
10	1650	80	1950
20	1675	90	2000
30	1725	100	2050
40	1775	110	2100
50	1825	120	2150
60	1875	130	2200

This figure provides approximate pressure to which aircraft oxygen bottles may be charged to have 1800 psig after cooling.

$^{\circ}\text{F} = 9/5^{\circ}\text{C} + 32$ 1 psi = 6.89 kPa

Deplete Oxygen Storage Cylinder Pressure

1. Gain access to oxygen storage cylinder.

WARNING: Use a clean hose that is compatible with oxygen and of sufficient length to discharge oxygen away from any source of combustible material.

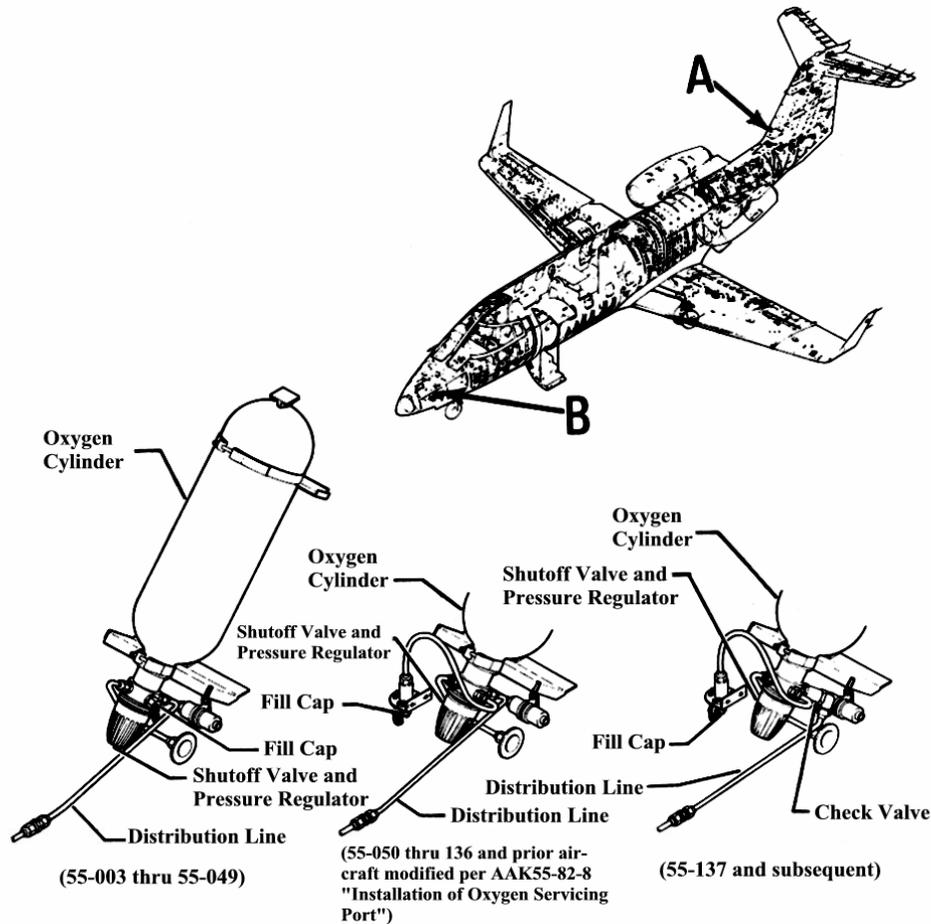
On aircraft 55-137 & subsequent with dual oxygen system, the vertical fin oxygen storage cylinder shutoff valve and pressure regulator must be set to off before the nose oxygen storage cylinder shutoff valve and pressure regulator is set to off. This will prevent vertical fin storage cylinder oxygen pressure from venting into the aircraft's nose thru the nose storage cylinder shutoff valve and pressure regulator.

2. Either remove cylinder from aircraft or connect a clean hose to oxygen storage cylinder regulator outlet port.

NOTE: Oxygen pressure in system lines will bleed to ambient through shutoff valve and regulator assembly when closed.

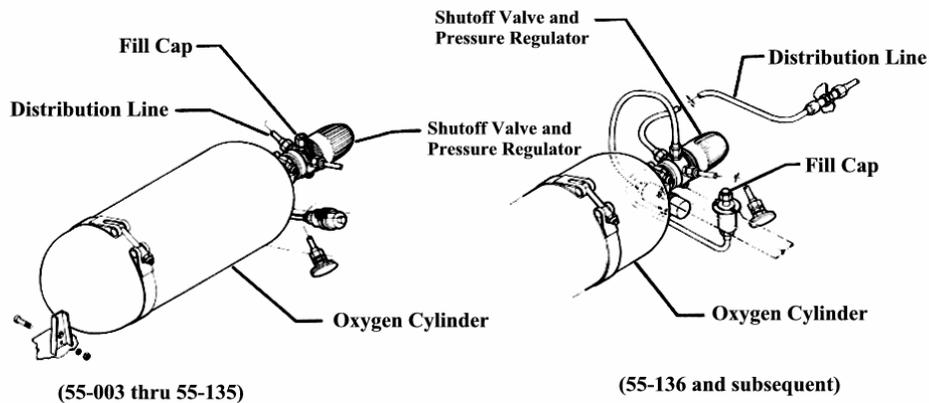
On aircraft 55-137 & subsequent with single vertical fin oxygen supply, a check valve is located between the shutoff valve and distribution line; therefore, the distribution lines will not bleed down when the vertical fin oxygen storage cylinder shutoff valve is turned off. To bleed oxygen from distribution lines, connect pilot's oxygen mask to oxygen outlet and depress the PRESS TO TEST button/knob on the bottom of mask pressure regulator until oxygen pressure is depleted.

3. Slowly release oxygen pressure, directing it into an open area away from aircraft.



Aircraft With Vertical Fin Mounted Oxygen Storage Cylinder

Detail A



Aircraft With Nose Fin Mounted Oxygen Storage Cylinder

Detail B