Chapter 28

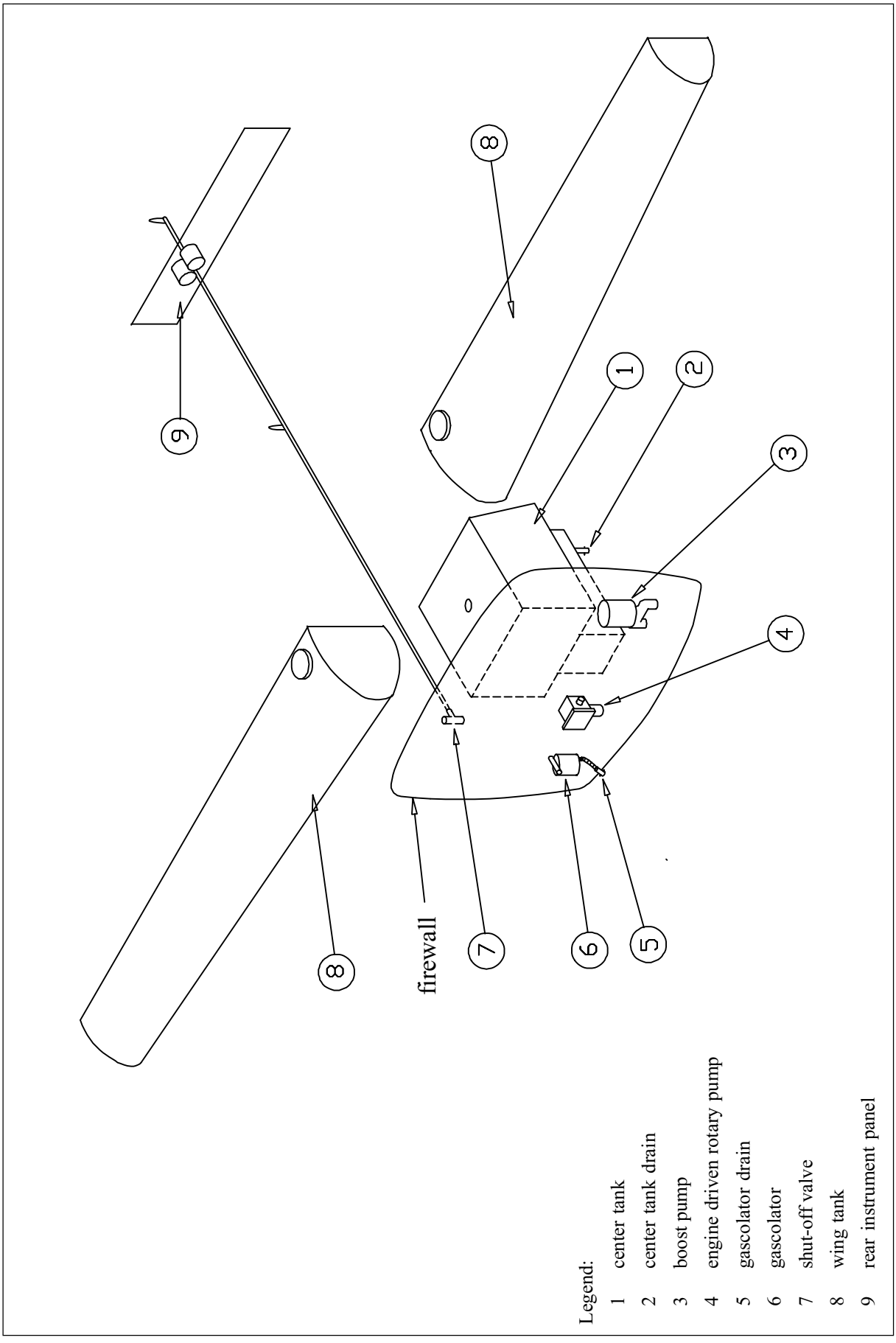
Fuel

TABLE OF CONTENTS

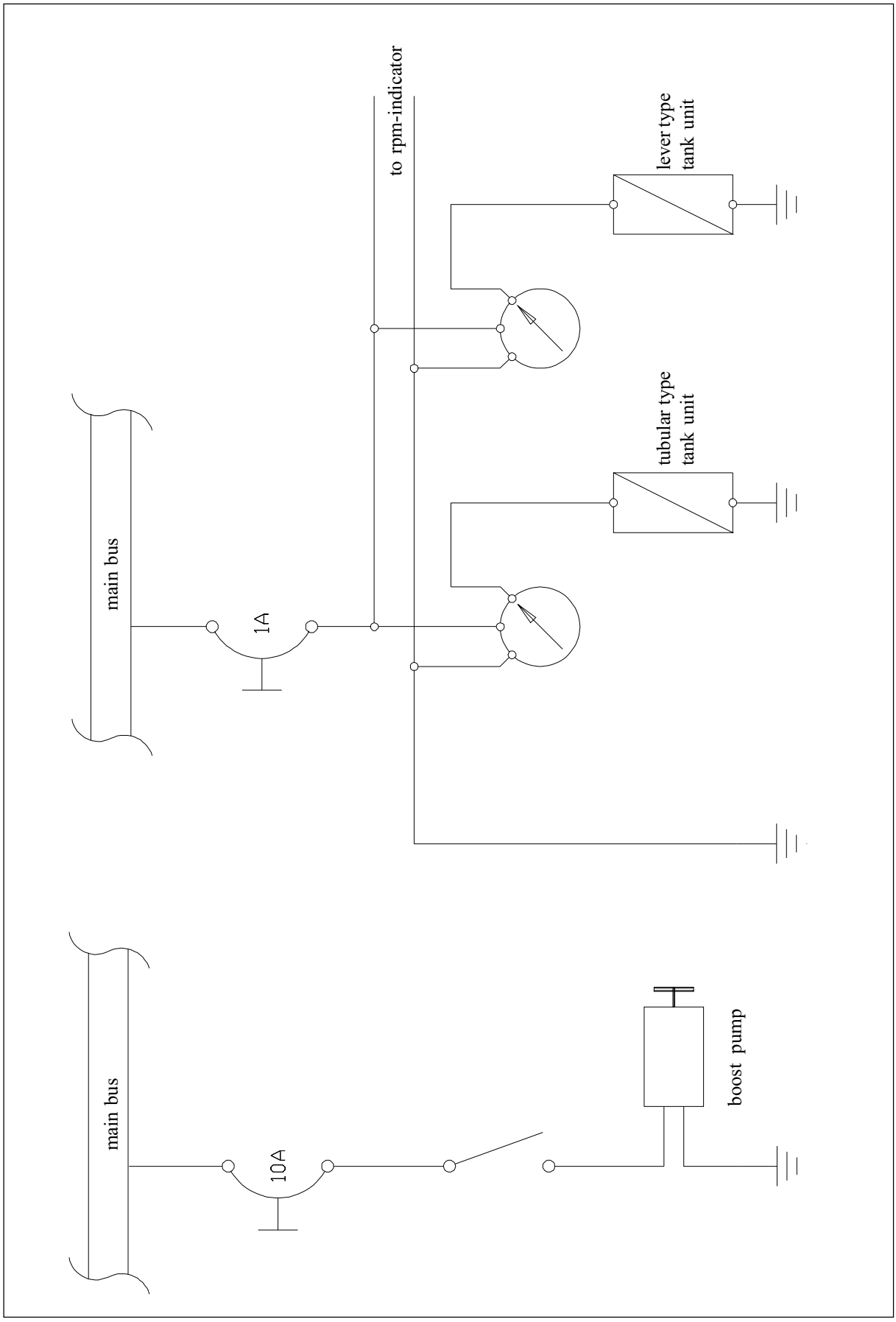
28-00-00 GENERAL

The fuel system (refer to Figure 1 Page 4) consists of one center (acro) tank (1) with a drain (2) on its bottom, two wing tanks (8), a shut-off valve (7), a gascolator (6) with drain (5), an electrically driven auxiliary pump (3) and an engine driven rotary pump (4).

On the lower rear instrument panel (9) one fuel quantity indicator for the center tank and one for the wing tanks, the switch for the boost pump and circuit breakers are installed (see Figure 14 Page 23). The electrical wiring is shown on Figure 2 Page 5.



Fuel System
Figure 1



Electrical Wiring
Figure 2

28-01-00 MAINTENANCE PRACTICES

28-01-01 Refueling/Defueling

Refer to Chapter 12 for detailed refueling/defueling procedures.

28-01-02 Reduction of Fuel Tank Vapor Hazards

General Precautions

During all ventilation or maintenance procedures involving the fuel system, observe the following general precautions.

1 Defueling should be outdoors with the aircraft at least 100 feet from hangars or other aircraft.

2 No smoking should be allowed within 100 feet of the aircraft.

3 Suitable fire fighting equipment should be available. Foam or soda type extinguishing agents are recommended.

4 Ground the aircraft to prevent static electricity from causing sparks. If a ramp ground is available it should be connected to exhaust stack. If a ramp ground is not provided, a temporary ground can be obtained by driving a metal rod into the ground and attaching a ground wire between the rod and the aircraft exhaust stack.

5 Flame and spark producing equipment should not be operated within 100 feet of the aircraft.

6 The aircraft should have its battery removed.

7 Only personnel working on the aircraft should be allowed in the immediate area, and no other maintenance should be performed while the tanks are being worked on.

8 When a fuel tank is opened for repair, air ventilation (refer to Page 7) should be started immediately to reduce vapor concentrations.

9 When draining fuel, ensure that suitable containers are available and that drained fuel is stored safely. Do not allow fuel to drip to the ground and form pools.

10 If it is necessary to ventilate a tank when the aircraft is in hangar, ensure that vapors do not accumulate to explosive or toxic levels in the hangar.

W A R N I N G

When fuel is being drained, there is little control over the release of fuel vapor. This vapor should be dissipated as quickly as possible. Compressed air or explosion-proof blowers may be used for the purpose.

Air Ventilation

1 Completely drain the fuel system per Chapter 12-10-02.

2 Remove inspection doors (refer to Chapter 28-11-03) and tank caps.

3 Use compressed air or an explosion-proof blower to blow air into the tank until tank interior is dry and free of vapor.

4 Continue ventilation whenever tank is open and being worked on.

W A R N I N G

If flammable vapors from cleaning solvents are allowed in the tank increase air circulation to dissipate them.

28-10-00 STORAGE

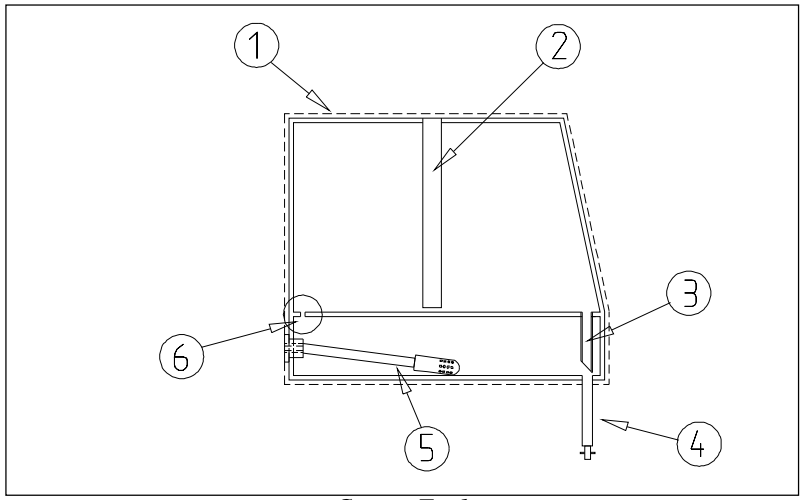
The center (acro) tank (1) (refer to Figure 4 Page 9) incorporating an inverted flight fuel supply system is mounted in the fuselage just behind the firewall. Fueling the center tank is by means of the wing tank filler caps (13) and the fuel lines connecting the tank systems. For leak detection the center tank is furnished with a GRP tank shell (see Figure 3 below). In case of leakage blue colored fuel is shining through.

The root section of each wing – in front of the main spars – forms an integral fuel tank of approximately 150 cm (59") length (8). Each wing tank has a 2" diameter filler cap (13) for gravity fueling. From Serial No. 59 sealing lips are additionally installed at the filler necks inside the wingtank. For sealing 3M Brand Fuel Resistant Coating 776 (3M, St. Paul, USA) has been applied to the inside of the wing tanks. For lightning protection reason the shell in the area of the wing tank has an outer layer of carbon fiber with incorporated aluminium thread (9). Center and wing tanks are grounded.

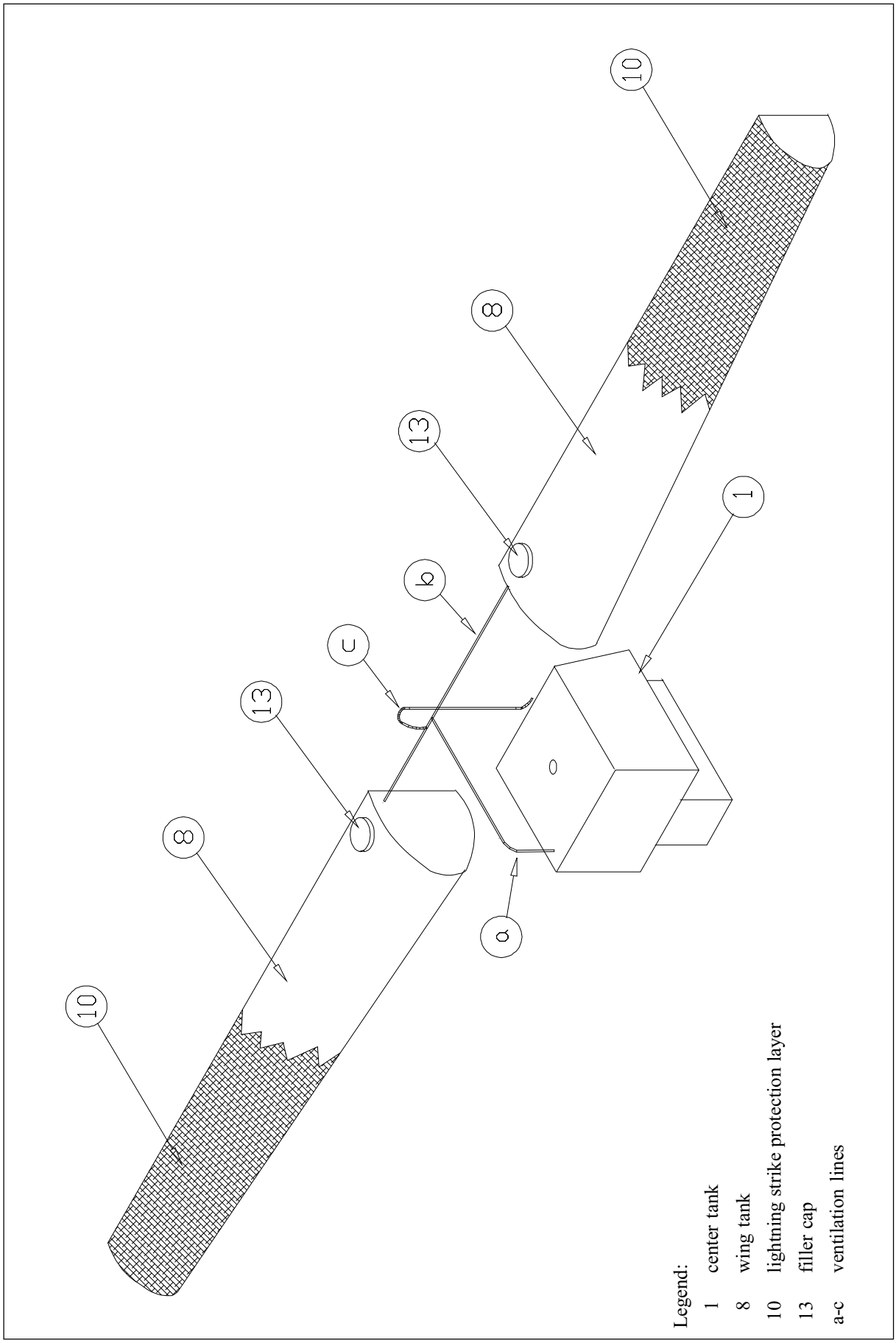
The center tank is connected with the wing tanks in a gravity feed system.

Each tank is provided with an alu ventilation tube (a,b) for adequate venting. The ventilation tubes are interconnected to a main tube (c), ending outside of the fuselage at the right side of the main landing gear spring.

1 GRP tank shell
2 Tubular type tank unit
3 Connection tube
4 Drain assembly
5 Flop tube assembly
6 Ventilation hole



Center Tank
Figure 3



Storage
Figure 4

28-11-00 MAINTENANCE PRACTICES

28-11-01 Center Tank Removal/Installation

1 Remove the top and bottom halves of the engine cowling and the tank covering sheet (refer to Chapter 51).

2 Drain the fuel system per Chapter 12-10-02.

3 Loosen the electrical facilities and the hose fixtures.

4 Loosen and remove the metal attachment belts with the rubber stripes.

5 Remove the center tank.

6 Install in reverse sequence of removal.

28-11-02 Center Tank Flop Tube Removal/Installation

1 Drain the fuel system per Chapter 12-10-02.

2 Disconnect the hose (5) and the elbow fitting (4).

3 Loosen the flop tube fitting (3) and take the flop tube assembly (2) out of the center tank (1).

W A R N I N G

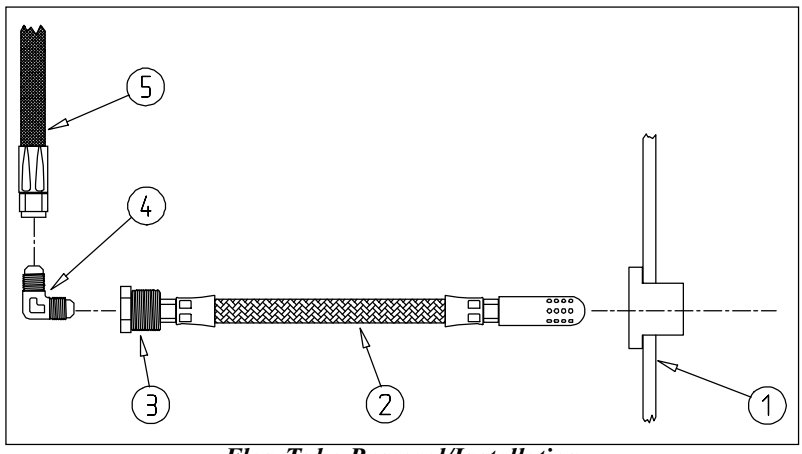
Stripping solvents can be toxic and volatile. Use only in well ventilated areas. Avoid physical contact with solvent and do not inhale vapors. Keep solvent containers covered when not in use.

4 Clean the sealing surfaces mechanically and with Acetone.

N O T E

If the flop tube assembly has to be replaced install a complete new assembly (Part Number: PC-63203A32).

5 Install in reverse sequence of removal after applying Loctite 577 to the flop tube fitting thread.



Flop Tube Removal/Installation
Figure 5

28-11-03 Wing Tank Inspection Door Removal/Installation

1 Drain the fuel system per Chapter 12-10-02.

2 Disconnect the ground bonding leads and if necessary (LH wing tank) the electrical wiring of the lever-type tank unit (3).

3 Remove the inspection door bolts.

4 Remove the inspection door flange (1).

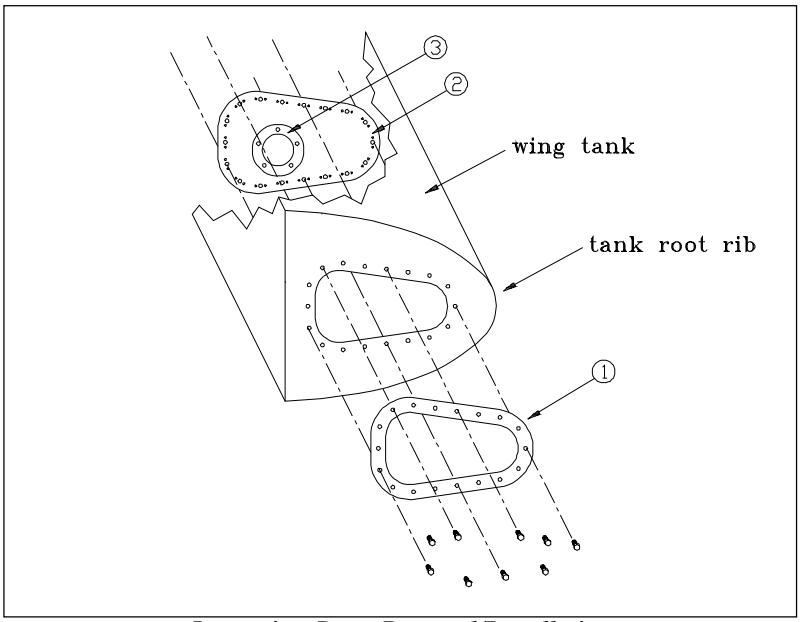
5 Push the inspection door (2) into the tank, then turn and remove.

W A R N I N G

Stripping solvents can be toxic and volatile. Use only in well ventilated areas. Avoid physical contact with solvent and do not inhale vapors. Keep solvent containers covered when not in use.

6 Clean the sealing surfaces mechanically and with Acetone.

7 Install in reverse sequence of removal after applying 3M Brand Fuel Resistant Coating 776 (3M, St. Paul, USA) to the sealing surfaces (inspection door and tank root rib).



Inspection Door Removal/Installation
Figure 6

28-11-04 Wing Tank Outlets Removal/Installation

1 Remove the inspection door (1) (refer to Figure 7) per Chapter 28-11-03.

2 Remove the union nuts (2) and the elbow tubes (3).

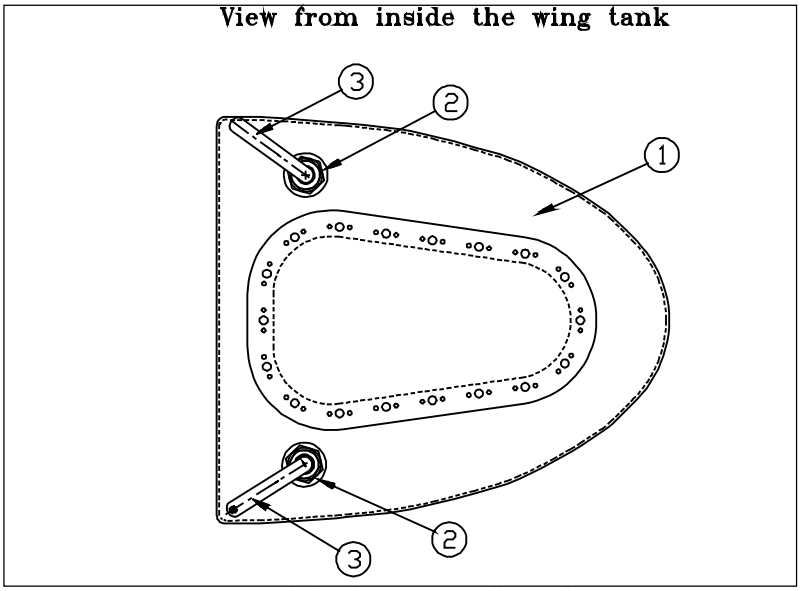
3 Remove AN 924 nut and washers and remove AN 832 fitting.

W A R N I N G

Stripping solvents can be toxic and volatile. Use only in well ventilated areas. Avoid physical contact with solvent and do not inhale vapors. Keep solvent containers covered when not in use.

4 Clean sealing surfaces mechanically and with Acetone.

5 Install in reverse sequence of removal after applying 3M Brand Fuel Resistant Coating 776 (3M, St. Paul, USA) to the sealing surfaces (fitting to tank root rib). Ensure that the outlet end positions are in the upper- resp. undermost edge of the wing tank (see Figure 7 below).



Wing Tank Outlets Removal/Installation
Figure 7

28-11-05 Filler Neck Removal/Installation

1 Completely drain the fuel system per Chapter 12.

2 Remove wing tank inspection door per Chapter 28-11-03.

3 Unscrew filler neck lock ring (4, Figure 8) with sealing lip (5) using a tool as shown in Figure 8.

4 Remove filler neck (3) with filler cap (1) and O-ring (2).

W A R N I N G

Stripping solvents can be toxic and volatile. Use only in well ventilated areas. Avoid physical contact with solvent and do not inhale vapors. Keep solvent containers covered when not in use.

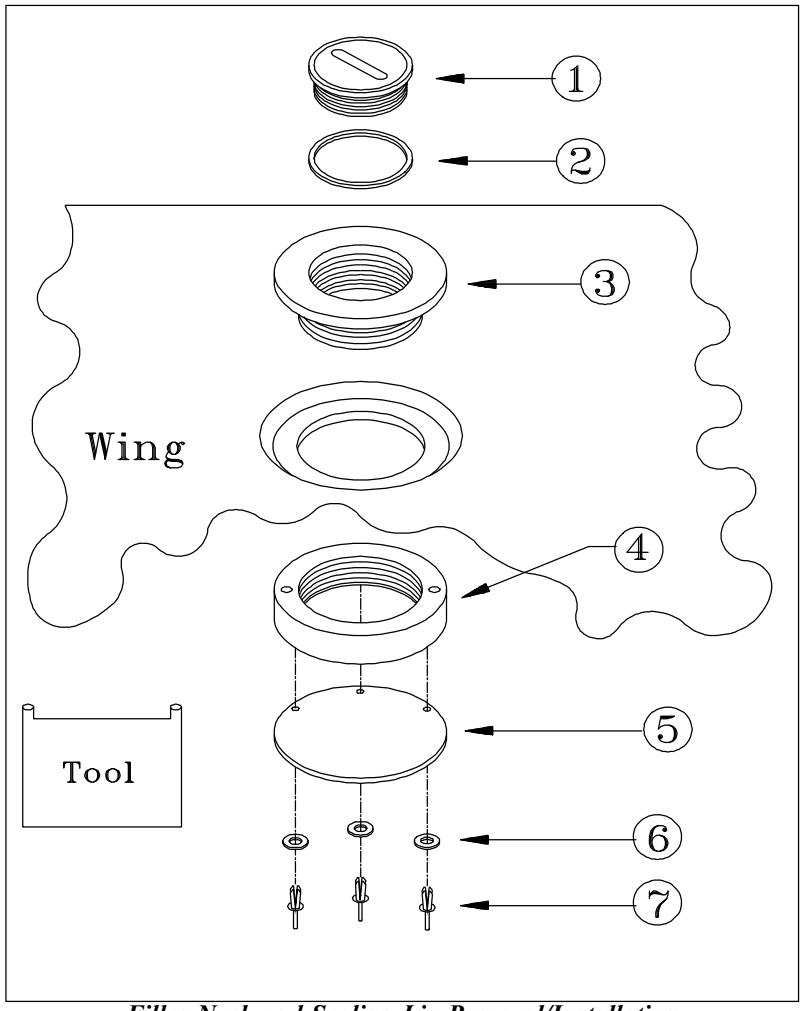
5 Clean all sealing surfaces with Acetone.

6 Install in reverse sequence of removal after applying 3M Brand Fuel Resistant Coating 776 (3M, St. Paul, USA) to the sealing surfaces (wing/filler neck).

28-11-06 Filler Neck Sealing Lip Replacement

1 Carefully drill out the body-bound rivets (7, Figure 8).

2 Install the new sealing lip driving in new washers (6) and body-bound rivets.



Filler Neck and Sealing Lip Removal/Installation
Figure 8

28-11-07 Ventilation Line Replacement

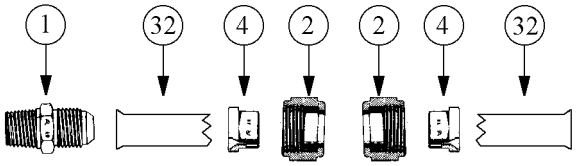
Refer to Figure 9 Page 14. Small letters (a-c) refer to the marks of Figure 4.

General information concerning fittings you find in Chapter 20-10-08.

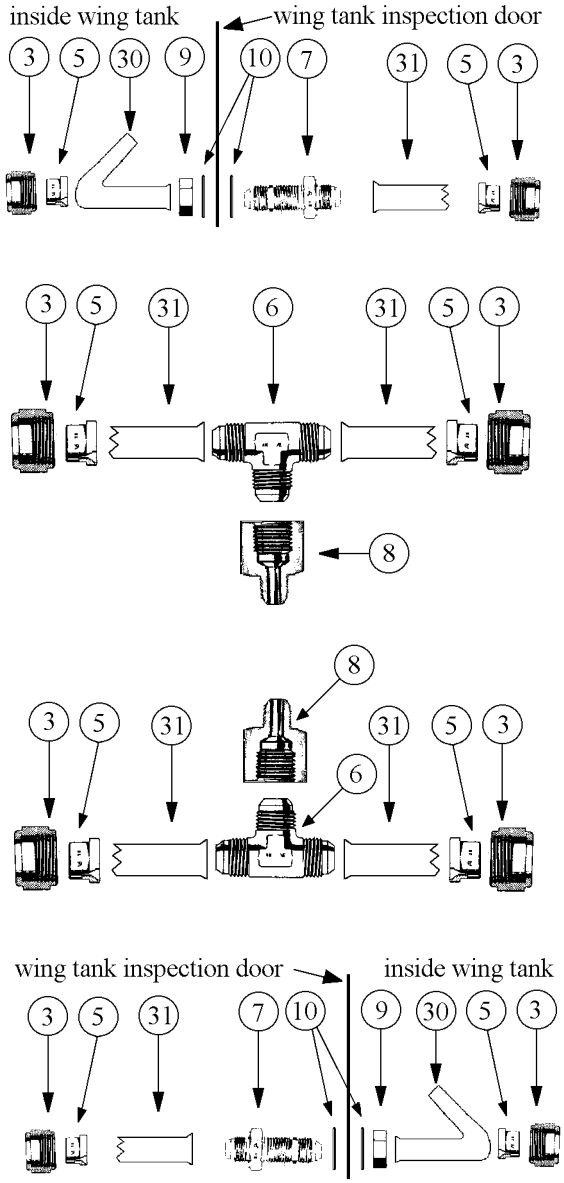
N O T E

Use only, tubes and fittings as required in the following.

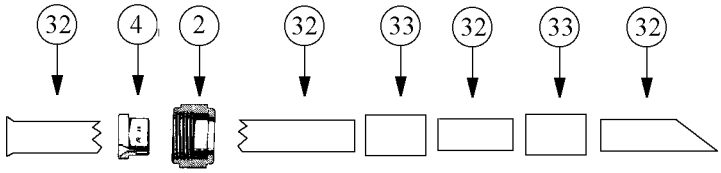
Center tank ventilation assembly (a)



Wing tank to wing tank connection (b)



Connection tubing assembly (c)



Fittings and washers

1 AN816-4D
PN: PC-00159

2 AN818-4D
PN: PC-00161

3 AN818-6D
PN: PC-00160

4 AN819-4D
PN: PC-00860

5 AN819-6D
PN: PC-00162

6 AN824-6D
PN: PC-00168

7 AN832-6D
PN: PC-00170

8 AN894-6-4D
PN: PC-00154

9 AN924-6D
PN: PC-00177

10 AN960-C916
PN: PC-01852

Tubes

30 strainer tube
PN: PC-63202.2

31 alu tube 5052-0, Ø3/8 inch
PN: PC-00122

32 alu tube 5052-0, Ø1/4 inch
PN: PC-00123

33 vinyl tubing
PN: PC-01607

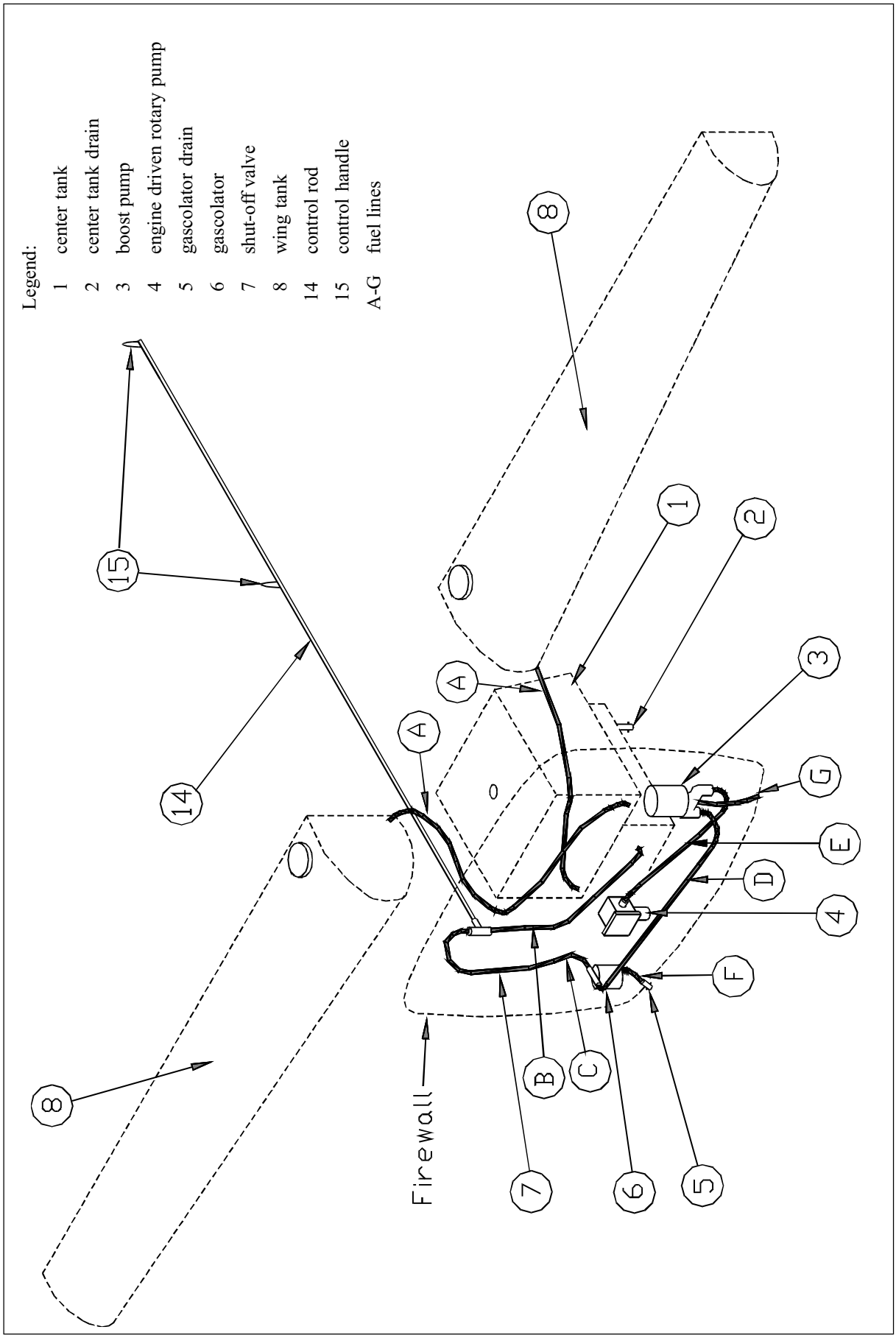
Ventilation Lines
Figure 9

28-20-00 DISTRIBUTION

(Refer to Figure 10) Flexible hoses (A-F) connect the particular components of the fuel system. From Ser. No. 66 the drain line "G" has been added. To prevent filling the wing tanks during aerobatic flight the fuel hoses (A) connecting the wing tanks (8) and the center tank (1) are installed crosswise.

In addition to the engine driven fuel pump (4), an electrically driven boost pump (3) having sufficient capacity to feed the engine at take-off power is fitted as a safety device against failure of the engine driven pump. The boost pump switch is located on the instrument panel in the rear cockpit (see Figure 15). A shut-off valve (7) is located behind the firewall on a separate support. A control rod (14) connects the shut-off valve to the front and rear control handles (15). From Serial No. 59 the shut-off valve has been replaced by an 3-port selector valve of which the bottom port has been closed by means of an AN913-6D fitting. The other ports are marked by the letters "E" (for: "to Engine") and "T" (for: "to center Tank"). At the same time the control rod design has been modified to ensure proper installation of control rods and handles. However the removal/installation procedures are the same in both cases.

A gascolator (6) with drain (5) is installed between the fuel shut-off valve and the auxiliary fuel pump at the fire wall (engine side). A second drain (2) is located at the lowest point of the fuel system, the bottom of the center tank.



Distribution
Figure 10

28-21-00 MAINTENANCE PRACTICES

28-21-01 Shut-Off Valve and Control Rod Removal/Installation

(Refer to Figure 11 Sheet 1 resp. Sheet 2 from Serial No. 59)

1 Drain the fuel system per Chapter 12-10-02.

2 Disconnect the fuel lines on the shut-off valve.

3 Loosen the control rod attachment bolt (1).

4 Loosen the shut-off valve attachment bolts (2).

5 Remove the shut-off valve (3).

6 Loosen the torque rod attachment bolts (4).

7 Disassemble the torque rods (5).

8 Install in reverse sequence of removal. Ensure that all control handles (6, 7) are installed in the same direction like shown in Figure 11 Sheet 1 (up to Serial No. 58). Use LOCTITE when installing the attachment bolts of the new type shut-off valve.

28-21-02 Shut-Off Valve Lubrication (Up to S. No 58)

(Refer to Figure 11)

1 Drain the fuel system per Chapter 12-10-02.

2 Disconnect the control rod following the steps 3, 6 and 7 of Chapter 28-21-01.

3 Disconnect the control handle (6).

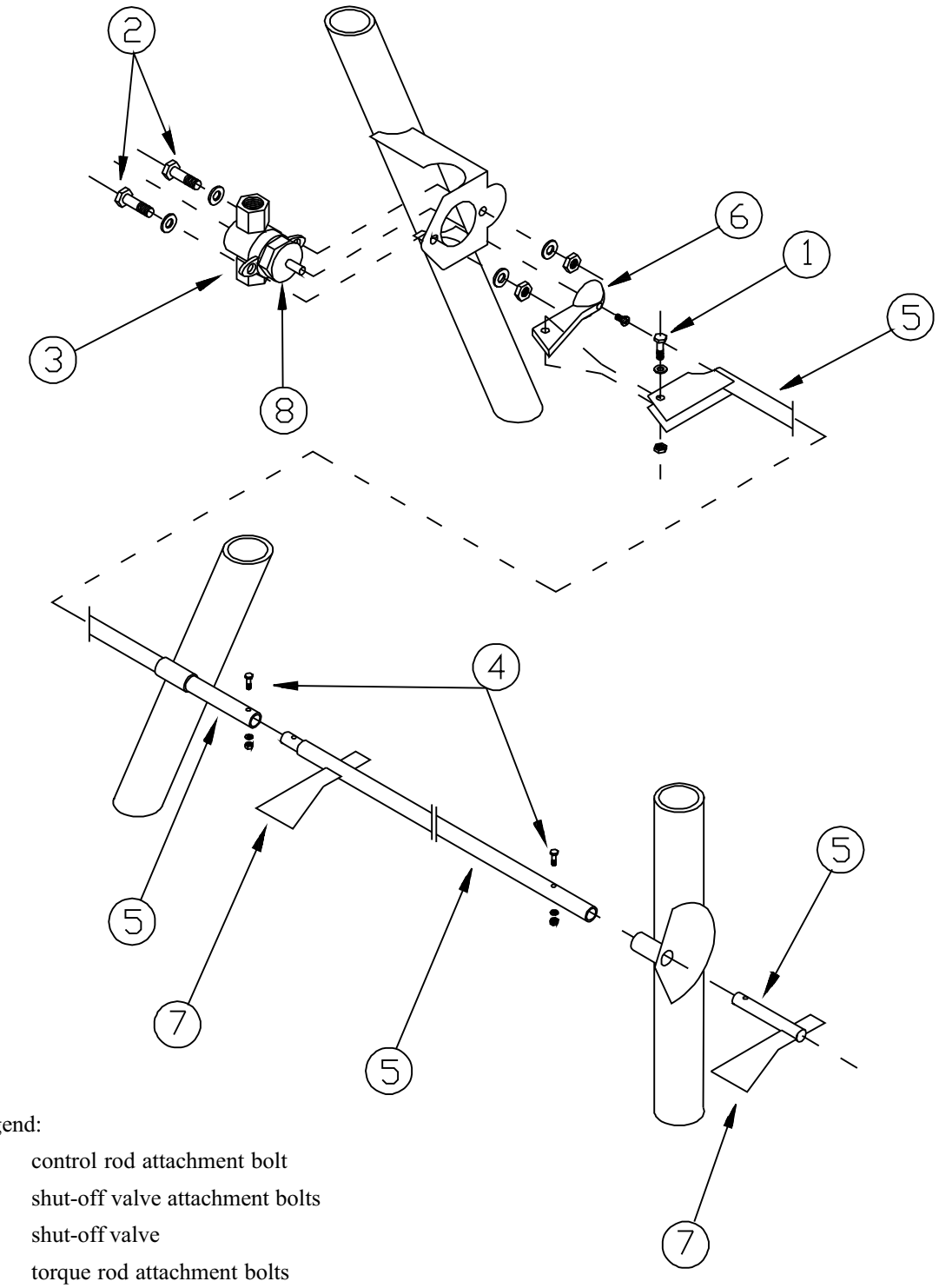
4 Loosen and remove the castle nut (8).

5 Lubricate with FUELUBE (FLEET SUPPLIES, INC., Cleveland, USA).

6 Screw up the castle nut.

7 Reinstall the control handle (6).

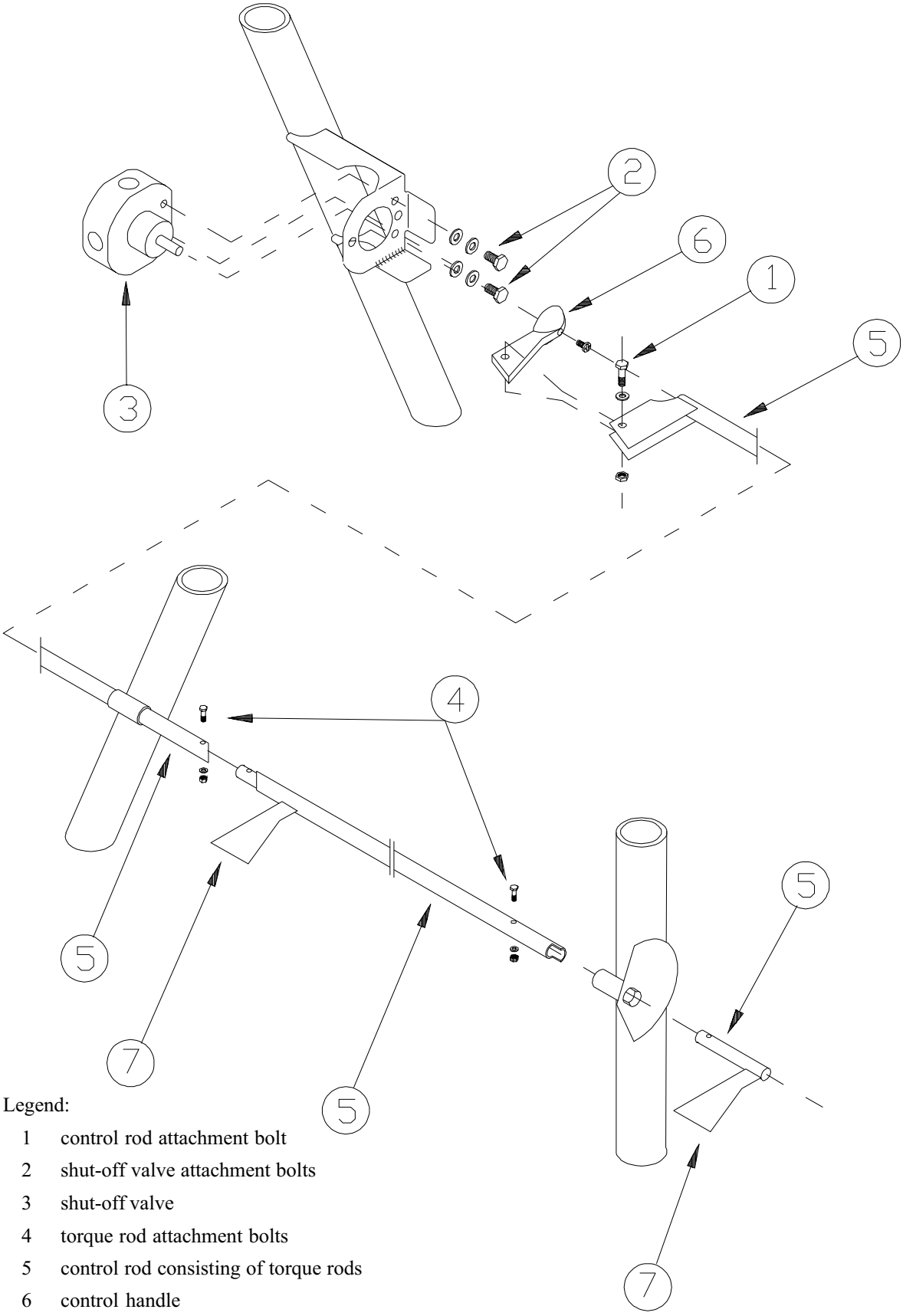
8 Reinstall the control rod.



Legend:

1 control rod attachment bolt
2 shut-off valve attachment bolts
3 shut-off valve
4 torque rod attachment bolts
5 control rod consisting of torque rods
6 control handle
7 control rod handle
8 castle nut

Shut-Off Valve and Control Rod Removal/Installation
Figure 11, Sheet 1



Legend:

1 control rod attachment bolt
2 shut-off valve attachment bolts
3 shut-off valve
4 torque rod attachment bolts
5 control rod consisting of torque rods
6 control handle
7 control rod handle

Shut-Off Valve and Control Rod Removal/Installation
Figure 11, Sheet 2

28-21-03 Gascolator Removal/Installation

1 Drain the fuel system per Chapter 12-10-02.

2 Disconnect the fuel lines on the gascolator.

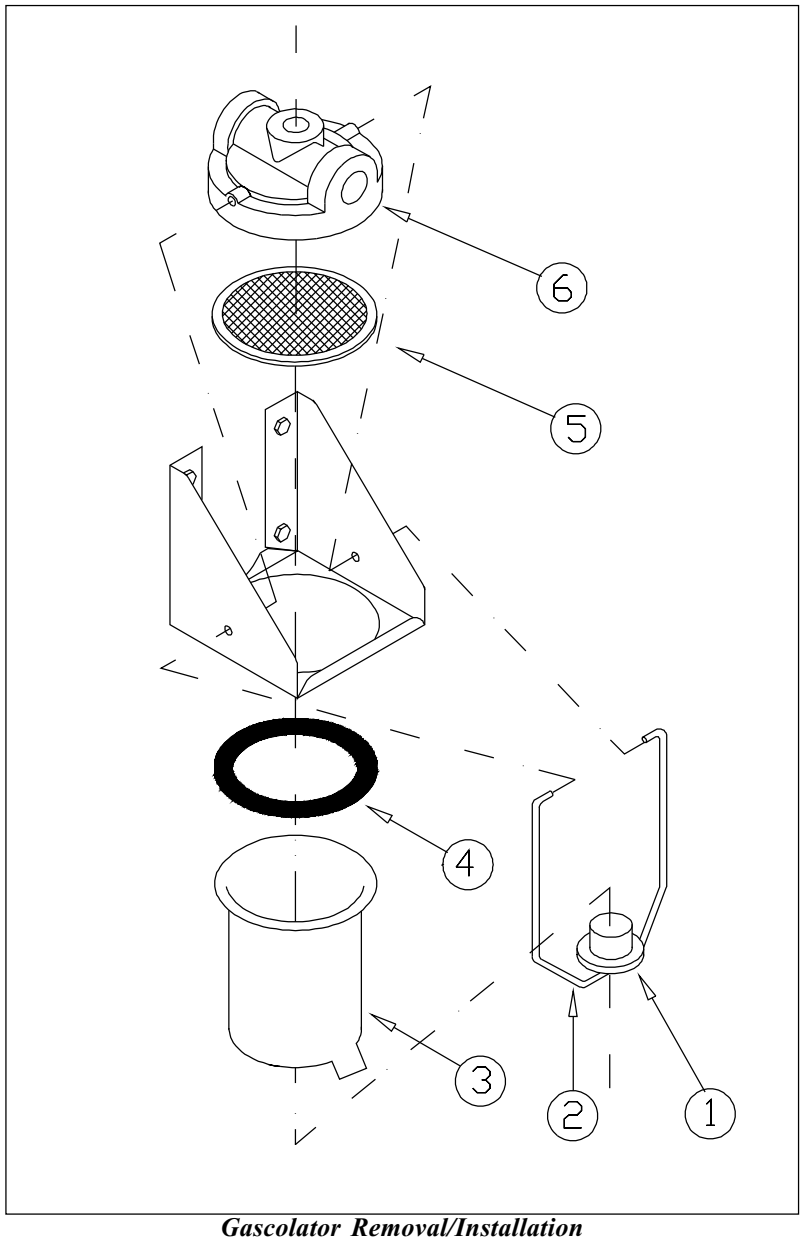
3 Loosen the knurled nut (1).

4 Remove the mounting bracket (2).

5 Remove the fuel reservoir (3) and the sealing ring (4).

6 Remove the strainer (5) and the gascolator cover (6).

7 Install in reverse sequence of removal.



Gascolator Removal/Installation
Figure 12

28-21-04 Electrical Boost Pump Removal/Installation

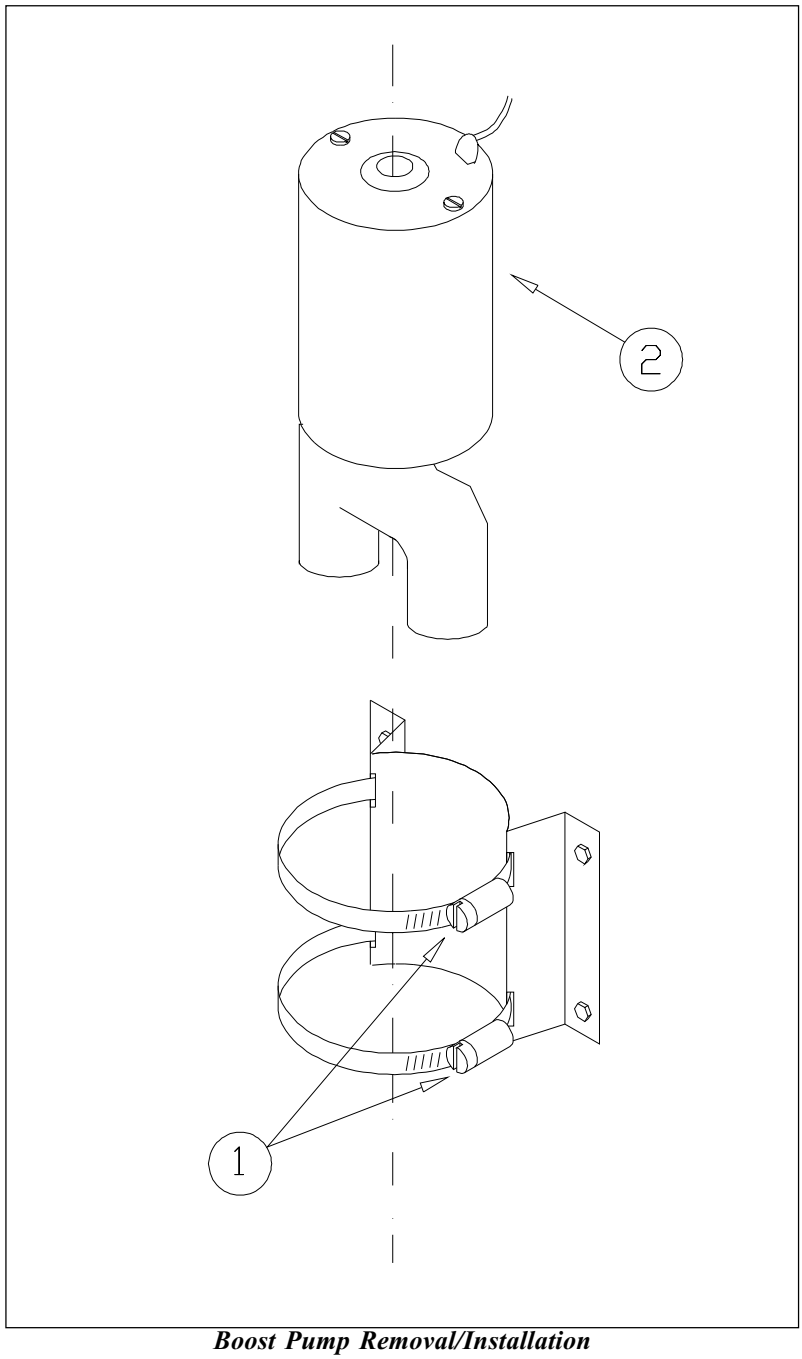
1 Drain the fuel system per Chapter 12-10-02.

2 Disconnect the plug and the fuel lines on the boost pump.

3 Loosen the clamping device screws (1).

4 Remove the boost pump (2).

5 Install in reverse sequence of removal.



Boost Pump Removal/Installation
Figure 13

28-21-05 Fuel Line Replacement

Refer to Figure 14. The letters (A-G and 2) refer to the markings of Figure 10.

General information concerning hoses and fittings you find in Chapter 20-10-07/08.

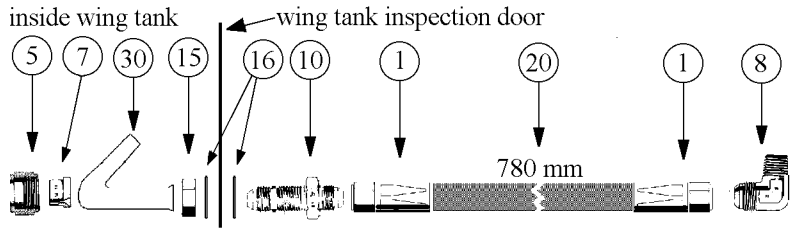
I M P O R T A N T

If replacement of fuel lines passing the firewall is necessary, renew the sealing of the rubber grommet grooves and gaps at the engine side of the firewall. Use PRC-812 (Products Research & Chemical Corporation, USA) firewall sealant. Cover the fuel lines of the engine department with AEROQUIP AE102 fire sleeves as per Chapter 20-10-07.

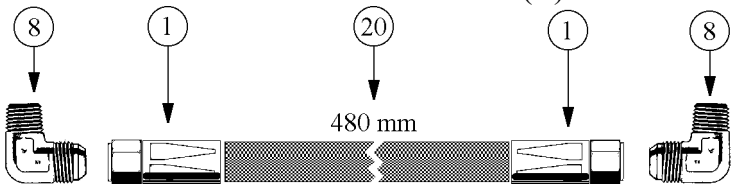
N O T E

Use only hoses, tubes and fittings as required in the following.

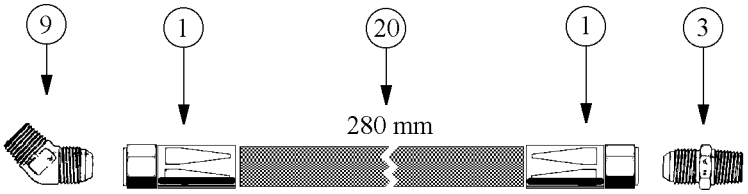
Wing tank to center tank connection (A)



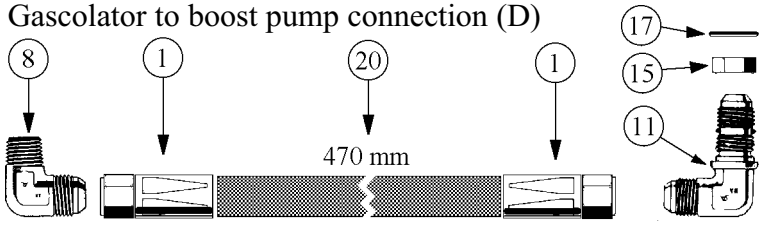
Center tank to shut off valve connection (B)



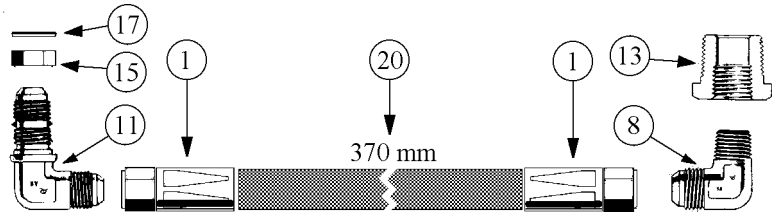
Shut-off valve to gascolator connection (C)



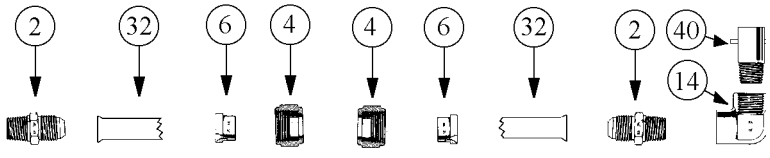
Gascolator to boost pump connection (D)



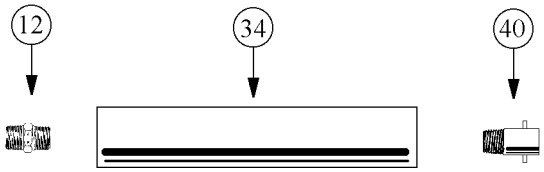
Boost pump to engine driven fuel pump connection (E)



Gascolator drain assembly (F)



Center tank drain assembly (2)



Fittings and washers

1 AN491-6D
PN: PC-00150
2 AN816-4D
PN: PC-00159
3 AN816-6D
PN: PC-00158
4 AN818-4D
PN: PC-00161
5 AN818-6D
PN: PC-00160
6 AN819-4D
PN: PC-00860
7 AN819-6D
PN: PC-00162
8 AN822-6D
PN: PC-00164
9 AN823-6D
PN: PC-00166
10 AN832-6D
PN: PC-00170
11 AN833-6D
PN: PC-00172
12 AN911-1D
PN: PC-00988
13 AN912-9D
PN: PC-00176
14 AN916-1D
PN: PC-00180
15 AN924-6D
PN: PC-00177
16 AN960-C916
PN: PC-01852
17 O-ring MS29512-06
PN: PC-01270

Hoses*

20 AEROQUIP 303-6
PN: PC-00403

Tubes

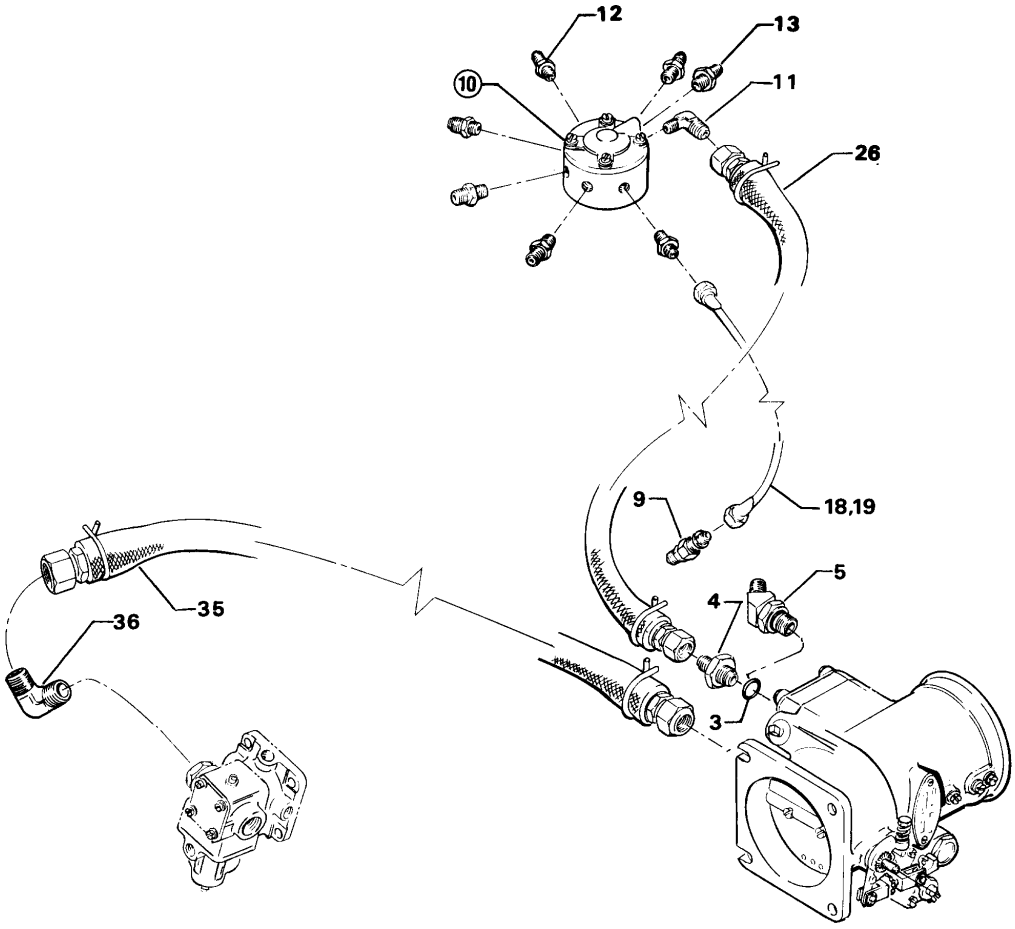
30 strainer tube
PN: PC-63202.2
31 alu tube 5052-0, Ø3/8 inch
PN: PC-00122
32 alu tube 5052-0, Ø1/4 inch
PN: PC-00123
34 stand pipe
PN: PC-63203.6

Valves

40 drain valve
PN: PC-01211

**) Refer to Chapter 20-10-07*

Fuel Lines Airframe Department
Figure 14, Sheet 1

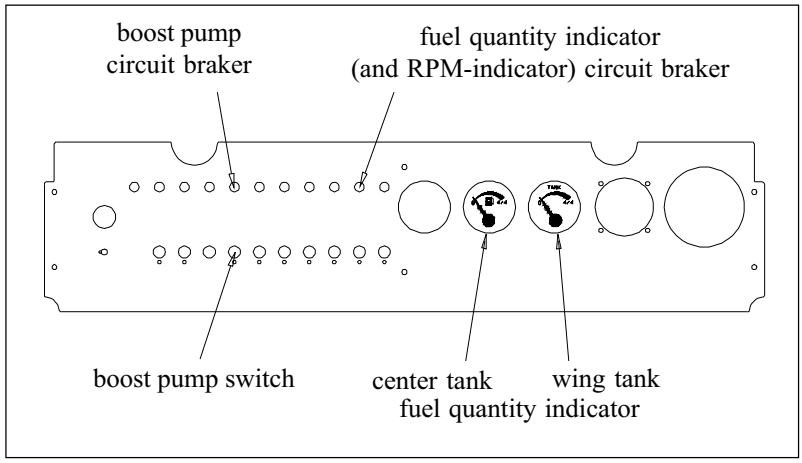


3	LW-MS29512-6	SEAL, Oil, 5/64 dia. sect. x 15/32 I.D.
4	LW-AN919-6	REDUCER, Flared tube, 1/4 tubing
5	LW-76304	ELBOW, Adjustable, 45°
9	LW-18265	NOZZLE, Injector
10	LW-77418	MANIFOLD ASSY., Fuel
11	LW-MS20822-4	ELBOW, 1/4 tube & 1/8 NPT, 90°
12	LW-STD-148	NIPPLE, Union, 1/8 NPT
13	LW-12604	NIPPLE, 1/8 tube to 1/8 NPT
18	LW-12098-0-200	TUBE ASSY., Fuel manifold to nozzle cyls. 1, 2, 5, 6
19	LW-12098-0-170	TUBE ASSY., Fuel manifold to nozzle cyls. 3, 4
26	LW-12798-4S242	HOSE ASSY., Fuel injector to fuel manifold
35	LW-12799-6S322	HOSE, Fuel pump to injector
36	LW-MS20822-6-8	ELBOW, 3/8 flared tube & 1/2 NPT (90°), fuel pump outlet

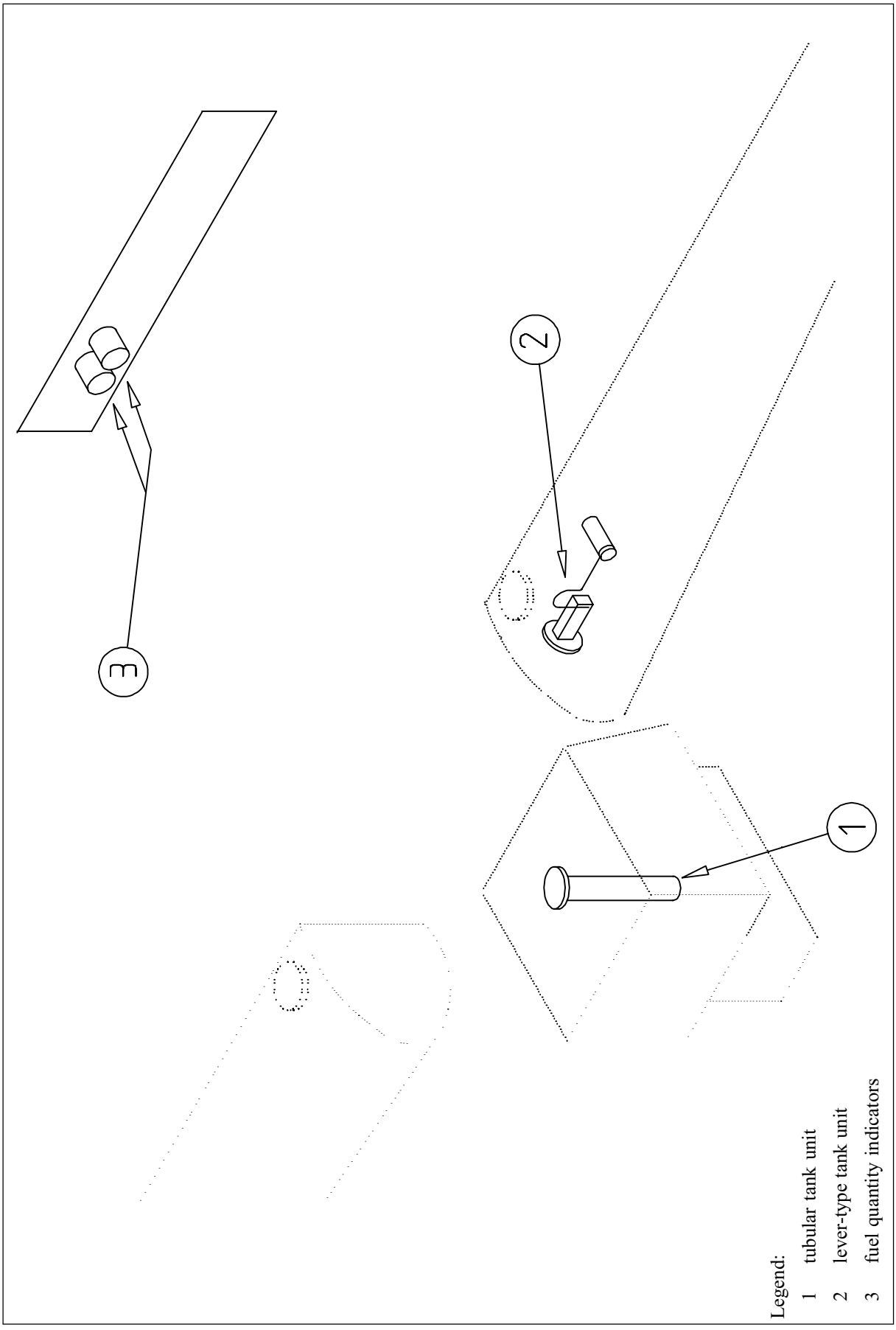
Fuel Lines Engine Department
Figure 14, Sheet 2

28-40-00 INDICATING

(Refer to Figure 16) For fuel contents indicating the center tank is equipped with a tubular tank unit (1) and the left wing tank with a lever-type tank unit (2). They transmit the fuel level to the respective fuel quantity indicators at the lower rear instrument panel (3). In contrast to the fuel quantity indicator of the center tank the one in the wing tank is not adjustable. If the indication is inexact the float wire of the tank unit has to be adjusted (refer to Chapter 28-41-05).



Lower Rear Instrument Panel
Figure 15

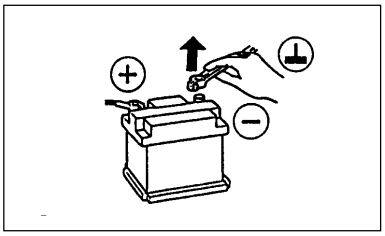


Indicating
Figure 16

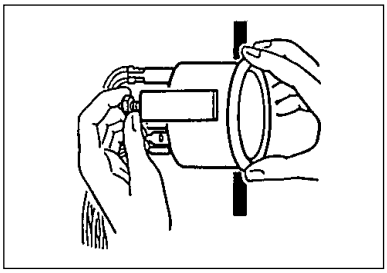
28-41-00 MAINTENANCE PRACTICES

28-41-01 Fuel Quantity Indicator Removal/Installation

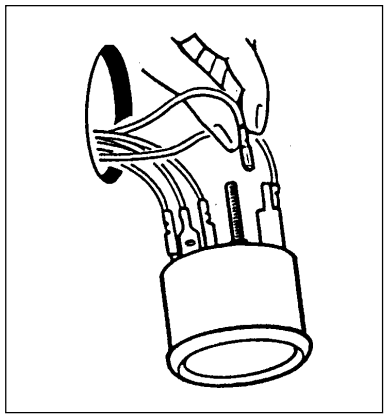
1 Disconnect battery.



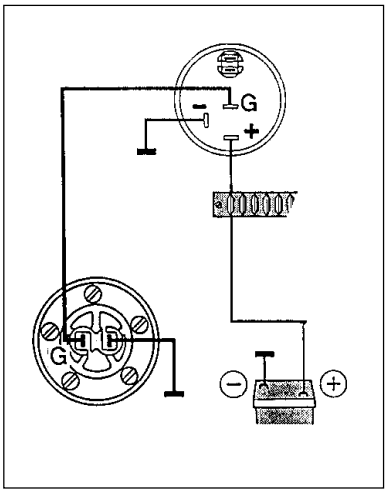
2 Loosen the nuts, remove the mounting bracket and remove the fuel quantity indicator.



3 Disconnect the wiring (the lamp is not used).



4 Install in reverse sequence of removal observing the wiring diagram.

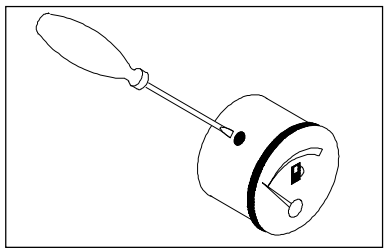


28-41-02 Fuel Quantity Indicator Calibration (Center Tank)

1 Drain the fuel system (refer to Chapter 12-10-02).

2 Remove the fuel quantity indicator following step 2 of Chapter 28-41-01.

3 Bring indicator to „0"-position by turning the adjustment screw.



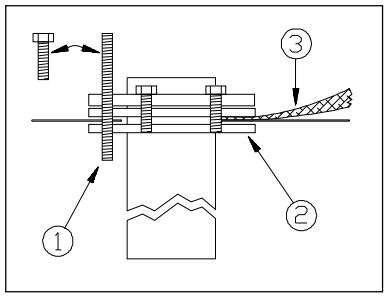
4 Reinstall the fuel quantity indicator.

28-41-03 Tubular Tank Unit (Center Tank) Removal/Installation

1 Drain the fuel system per Chapter 12-10-02.

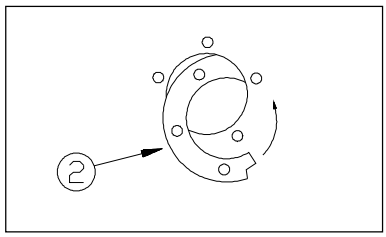
2 Loosen one bolt and replace by a M5 threaded rod (1) for securing the slotted retainer ring (2).

3 Remove the other bolts and the ground bonding lead (3).



4 Lift tubular tank unit and sealing ring over the threaded rod.

5 Remove the threaded rod and turn out the slotted retainer ring (2).



W A R N I N G

Stripping solvents can be toxic and volatile. Use only in well ventilated areas. Avoid physical contact with solvent and do not inhale vapors. Keep solvent containers covered when not in use.

6 Clean sealing surfaces mechanically and with Acetone.

7 Install in reverse sequence of removal after applying 3M Brand Fuel Resistant Coating 776 (3M, St. Paul, USA) for sealing to both sides of the sealing ring.

28-41-04 Lever-type Tank Unit (Wing Tank) Removal/Installation

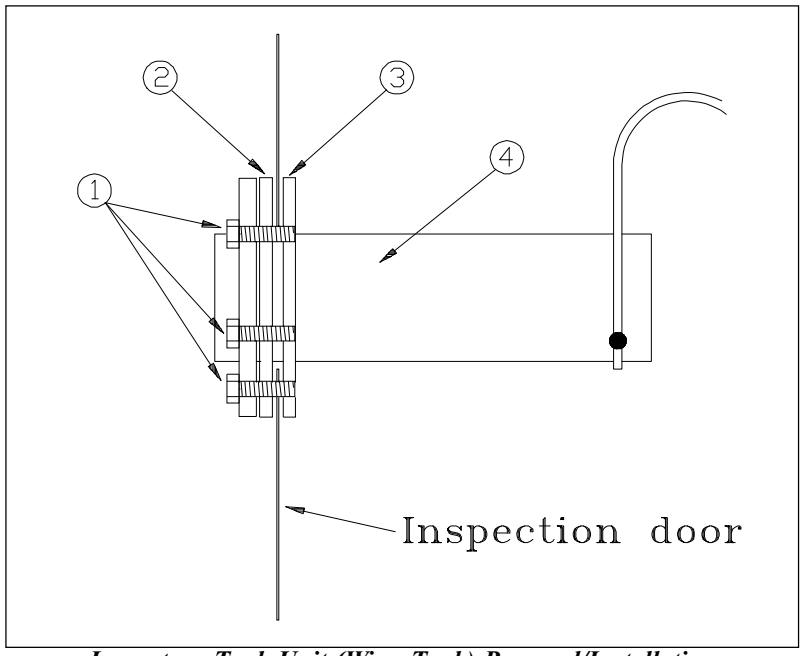
(refer to Figure 17 below)

1 Disconnect the electrical wiring.

2 Remove LH inspection door (refer to Chapter 28-11-03)

3 Remove tank unit bolts (1).

4 Remove the retainer ring (3) the tank unit (4) and the sealing ring (2).



Lever-type Tank Unit (Wing Tank) Removal/Installation
Figure 17

W A R N I N G

Stripping solvents can be toxic and volatile. Use only in well ventilated areas. Avoid physical contact with solvent and do not inhale vapors. Keep solvent containers covered when not in use.

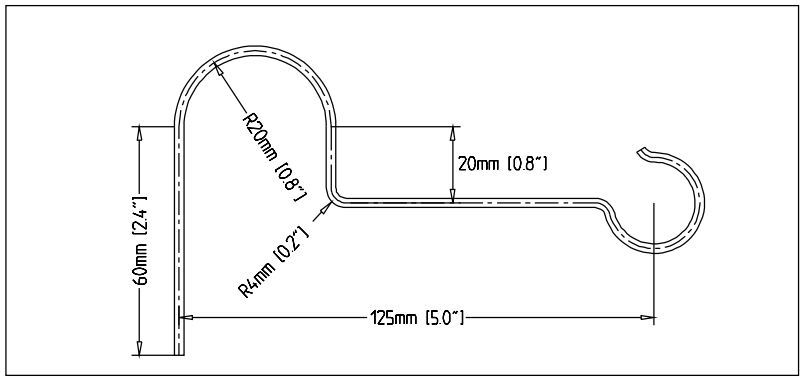
5 Clean sealing surfaces mechanically and with Acetone.

6 Install in reverse sequence of removal after applying 3M Brand Fuel Resistant Coating 776 (3M, St. Paul, USA) for sealing to both sides of the sealing ring and the grooves inside the tank..

28-41-05 Float Wire Adjustment

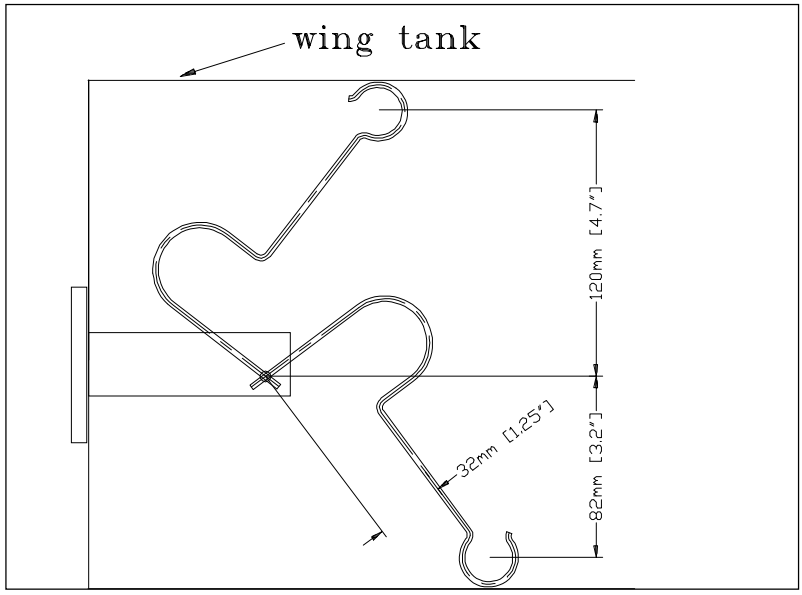
1 Remove the lever-type tank unit per Chapter 28-41-04.

2 Remove the float wire and bend it in form like shown in the following Figure 18:



Float Wire Adjustment
Figure 18

3 Reinstall the float wire observing the distances shown in Figure 19, pay attention to a proper alignment and tighten well the attachment bolt.



Float Wire Installation
Figure 19

4 Reinstall the lever-type tank unit per Chapter 28-41-04.