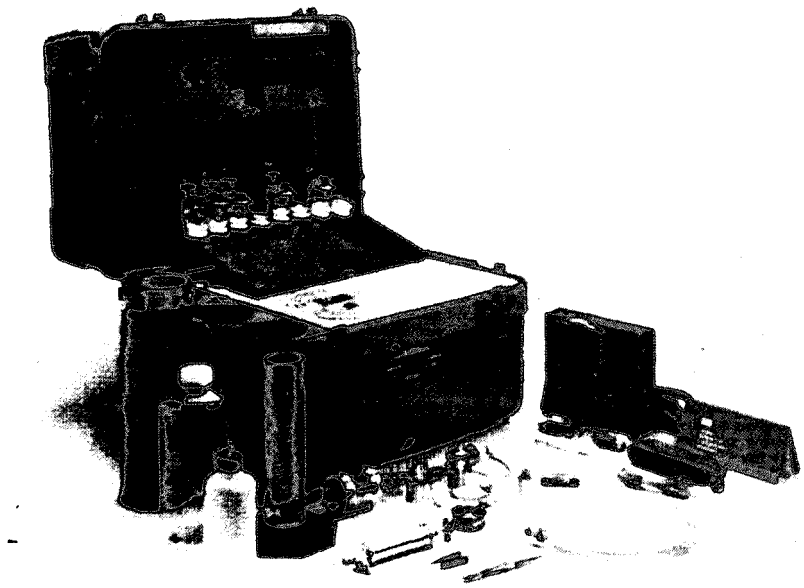
TECHNICAL MANUAL

OPERATOR'S MANUAL

AVIATION FUEL CONTAMINANT TEST KIT NSN 6630-01-008-5524



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CHANGE

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OPERATOR'S MANUAL

AVIATION FUEL CONTAMINANT
TEST KIT
NSN 6630-01-008-5524

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Table of Contents, (con't.)

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Chapter 1.0 General Information

1.1 Description

The Millipore *Aviation Fuel Contaminant Test Kit* is a one-person, portable kit consisting of components and testing equipment capable of determining the particulate contaminant level, API Gravity and temperature, and free water content in aviation fuel samples.

1.2 Scope

This manual details and illustrates the following:

a. contents of the Aviation Fuel Contaminant Test Kit
b. operating procedures
c. cleaning and maintenance

1.3 Documentation

The following documents were in effect at time of invitation for bids.

Specifications:
- Mil-M-7298C (TM) Manuals, Technical, Commercial Equipment
- Mil-M-38784B (TM)
- Mil-M-63036 (TM) (Supplements)

Standards:
- ASTM - Dl298 - 85 $\varepsilon 1$ - Standard Test Method for Density, Relative Density (Specific Gravity) or API Gravity of Crude Petroleum and Liquid Petroleum products by Hydrometer method.
- ASTM - D2276 - 88 $\varepsilon 1$ - Standard Test Method for Particulate Contamination in Aviation Fuel.
- ASTM D 3240 - 86a - Standard Method of Test for Undissolved Water in Aviation Turbine Fuels.
- ASTM D 3830 - 79 $\varepsilon 2$ - Standard and Practice for Filter Membrane Color Ratings of Aviation Turbine Fuels.
- Aviation Turbine Fuel Contamination Standards Booklet (XX6403785) included in the Aviation Fuel Contaminant Test Kit.

1.4 Equipment Specifications

Length: 54.6 centimeters (21.5 inches)
Width: 13.5 centimeters (5.3 inches)
Height: 41.9 centimeters (16.5 inches)
Weight: not to exceed 20.4 kilograms (45 pounds)

1.5 Kit Components (equipment and expendables)

The numbered components in the following equipment list included in the Aviation Fuel Contaminant Test Kit correspond to lettered items in Figure 1.1, Loading Plan.

Equipment List

Find No.	Qty	Description	NSN	CAGE/PN
1	1	Case, Carry, Testing Kit contains: Computer, Oil Gravity, API (Aviation Fuel), Instruction Placard, Insert, Secure Foam Materials with Cavities	6630-01-232-0531	(08071) XX6403702
2	2	Bulb, Replacement, Ultraviolet		(32218) GTP-2380
3	1	Syringe, Vacuum, with Two-Way Valve	6640-00-086-6326	(08071) XX6200035
4*	1	Hydrometer, 29-41 Gravity Range	6630-00-265-7758	P16902
5*	2	Hydrometer, 39-51 Gravity Range	6630-00-265-7759	P16901
6*	2	Hydrometer, 49-61 Gravity Range	6630-00-265-7764	P16900
7*	1	Hydrometer, 59-71 Gravity Range	6630-00-265-7765	P16899
8*	1	Hydrometer, 69-81 Gravity Range	6630-00-815-2267	P16898
9	1	Holder, Hydrometer, Gatling, for Seven Hydrometers		(08071) XX6403725
10	1	Bottle, Narrow Mouth, PVC 850, Graduated 1,000 Milliliter Capacity, with Screw Cap	6630-01-232-9537	(08071) XX6403706
11	1	Monitor, Stainless Steel	6630-01-232-9542	(08071) XH0000006
12	1	Bottle, Low Density Polyethelene with Tipped Cap and Tube (Used with Tipped Cap; Stored with Flat Cap), 250 Milliliter Capacity Flat Storage Cap, Screw Closure		(08071) XX6403726 (05198) 2401-0250 (05198) 2165-0240
13	1	Valve, Quick-Release Female with Plug and Chain	6630-00-009-1423	(08071) XX6403735
14	1	Tweezers, for removing monitor pads	6636-01-232-9536	P16894

Equipment List (con't)

Find No.	Qty	Description	NSN	CAGF./PN
15	1	Forceps, Filter	6640-00-426-0300	(08071) XX6200006
16	1	Wrench, Crescent, Adjustable, 8 inch		(08071) 008606P
17**	1	Detector Unit, Free Water, Aqua-Glo Series III, with Instrument Pack GTP-768, and Cable GTP-2402 with Ultra Violet Bulb, Power Cord	6640-01-235-7877	P16893
18	1	Sampler Valve Hose Assembly with Three-Way Valve	6630-00-999-0753	(08071) XX6403708
19**	1	Jewelers Screwdriver, Calibrating Standard, stored in F/N 34		(32218) GTP-765
20	1	Remote Grounded Sampling Hose Assembly	6630-00-999-0754	(08071) XX6403705
21	1	Battery Pack, External for Aqua-Glo Detector Unit	6140-01-232-9546	P16891
22	1	Connector Wire, for External Battery	6630-01-232-9547	P16904
23	2	Free-water Pads, 50/Box	6640-00-235-3820	P16890
24	1	Matched-Weight Monitors, 48/Box	6630-00-764-5761	(08071) MAWP037PM
25	1	Contamination Monitors, 48/Box	6630-00-445-3662	(08071) MAWPO37PO
26	1	Standards, Fuel, Color	6640-00-326-7684	XX6504733
27	1	Teflon Tape, Anti-Seize, 1/2 inch x 260 inch, for sealing threads	80300-889-3535	(08071) TP0001326
28	1	Cylinder, Hydrometer Test, 250 Milliliters		(08071) XX6403709
29	1	Nipple, Hex 1/4 NPTM, 2 inches long	4730-01-232-9608	(08071) XX6700125
30***	1	Plug, Sampler, Thread with O-Ring		(08071) XX6403720
31	1	Valve, Quick-Release Male, with Cap and Chain	6630-01-232-9534	(08071) XX6403716
32	1	Adapter, Reducing 1/4 NPTF x 1/8 NTIM		(08071) XX6403715
33	1	Anodized Aluminum Case, Storage		(08071) XX6403704

Equipment List (con't.)

Find No.	Qty	Description	NSN	CAGE/PN
34	1	Case, plastic, for Item 19 and Calibration Pad		(08071) XX6403719
35****	1	Tube, Plastic, Replacement, with Male Luer Adapter	4720-01-229-7045	(08071) XX6403780
36	1	Wire, Grounding, with Clamps		(08071) 15043
37	1	O-rings, Cold Temp, for F/N 13 Stored in F/N 34, 3/Pkg		(08071) XX6403717 (02697) 2-110, L677-70

Notes:
*1. Hydrometers are part of F/N 9.
**2. Calibration pad and jeweler's screwdriver supplied with detector unit, stored in F/N 34.
***3. F/N 30 is part of F/N 20 but vendor may furnish it as separate part.
****4. F/N 35 is furnished as part of F/N 18. This call-out is for one spare

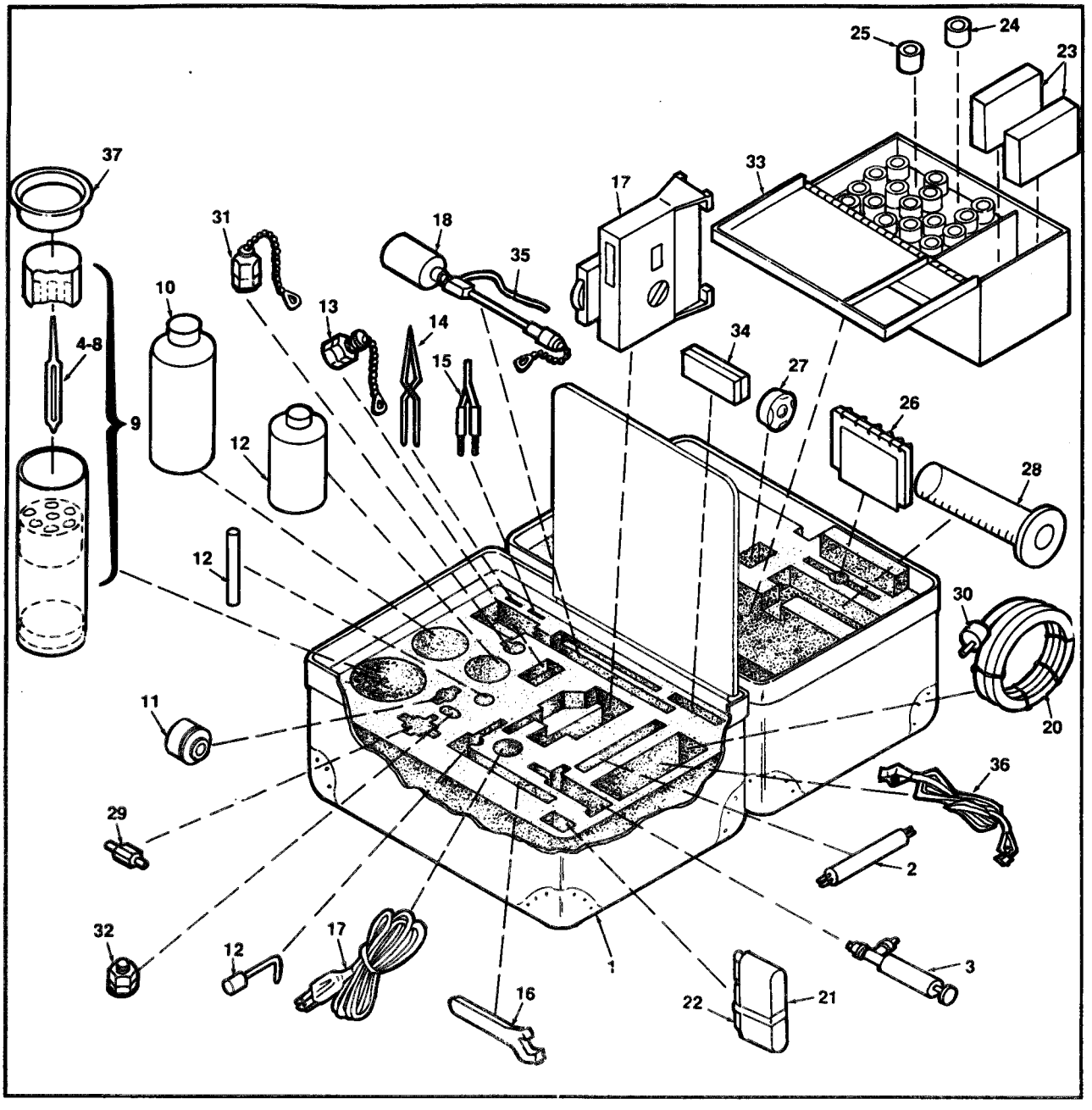

Figure 1.1 Loading Plan

1.6 Operating Climatic Conditions

The test kit shall perform as specified in any ambient temperature from +35°C to -20.5°C (+95°F to -69°F) with the following exception. The exception being that the free water detector shall be tested in the temperature range from +35°C to +.5°C (+120°F to +33°F).

1.7 Storage Climatic Conditions

The test kit shall not be damaged by storage in any ambient temperature from -140.5°C to -7.8°C (-285°F to -18°F).

1.8 Transportability

The kit is capable of withstanding vibrational stress and shock encountered when transported by all modes of transportation. When transporting via aircraft, the pressure valve (Figure 1.2) located on the front of the case must be in the **open** position during flight to avoid the potential explosion of the case. When not in flight, the pressure valve should be in **closed** position to prevent dust, etc., from entering the valve. The open position is to the left; the closed is to the right.

WARNING

Be sure to open the pressure valve (see Figure 1.2) on the outside of the kit just prior to airflight. A closed valve may cause the kit to explode. In addition, be sure all receptacles (such as PVC bottles) contained within the kit are free and dry of any chemical solvents which could explode or ignite during airflight.

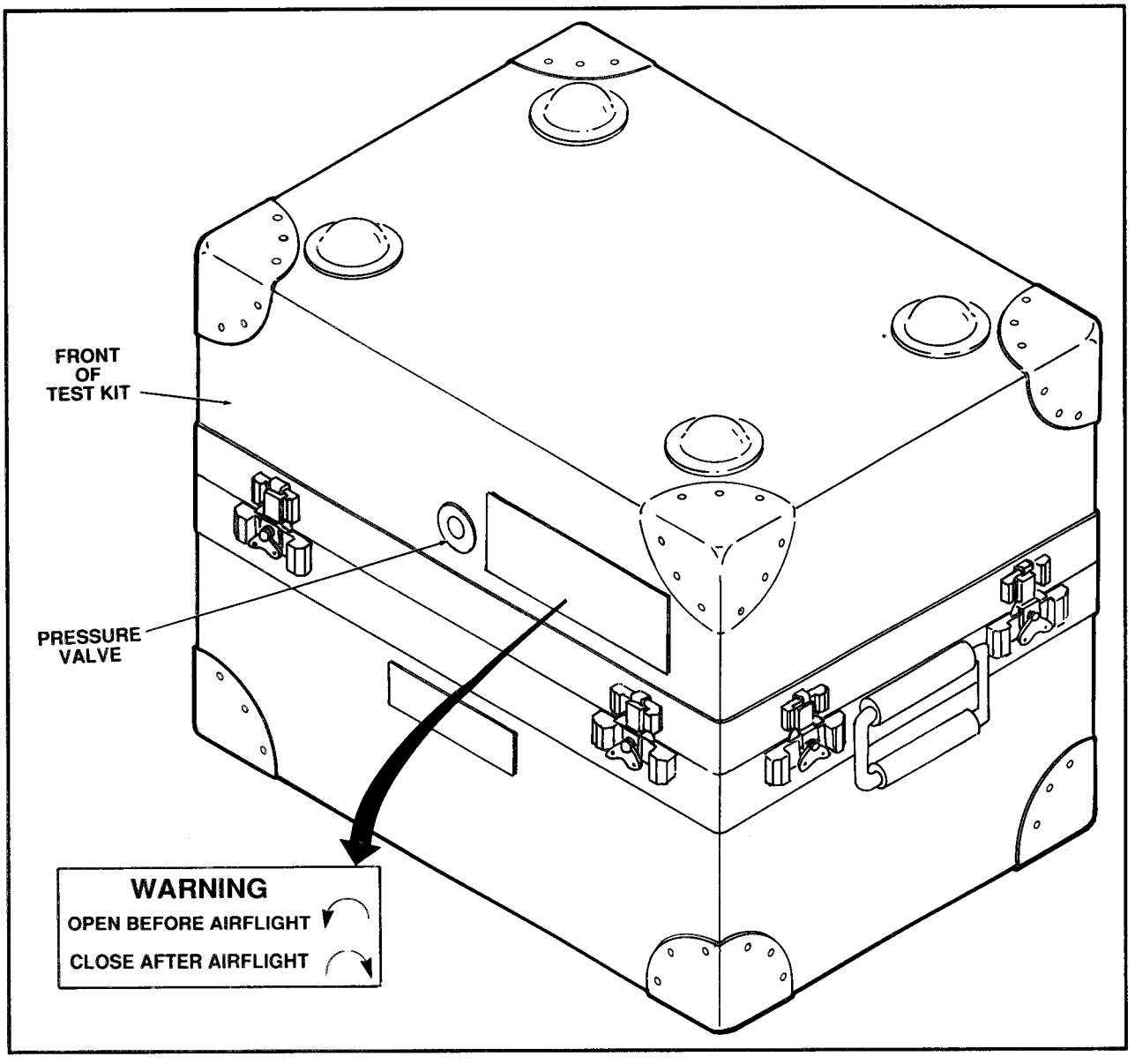

Figure 1.2 Pressure Valve in Closed Position

Chapter 2.0 Operating Instructions

2.1 Introduction

This chapter contains information on collecting and testing aviation fuel for solid contaminants using the *Particulate Contaminants Test* (as outlined in Section 2.3), for specific gravity using the *API Gravity Test* (as outlined in Section 2.4), and for free water content using the *Undissolved Water Test* (as outlined in Section 2.5).

2.1.1 Applicable Documents

Standards:

• ASTM D 1298-85 $^{\varepsilon 1}$ - Standard Test Method for Density, Relative Density (Specific Gravity) or API Gravity of Crude Petroleum and Liquid Petroleum products by Hydrometer method.

Ž ASTM D 2276-88 $^{\varepsilon 1}$ - Standard Test, Method for Particulate Contamination in Aviation Fuel.

• ASTM D 3240-86a - Standard Method of Test for Undissolved Water in Aviation Turbine Fuels.

Ž ASTM D 3830-79 $^{\varepsilon 2}$ - Standard and Practice for Filter Membrane Color Ratings or Aviation Turbine Fuels.

• Aviation Turbine Fuel Contamination Standards Booklet (XX6403785) included in the Aviation Fuel Contaminant Test Kit.

2.2 Aviation Fuel Sample

The aviation fuel sample is the sample required for colormetric and gravimetric Particulate Contaminant Test Procedure--ASTM D 2276- 88$^{\varepsilon 1}$, the API Gravity Test Procedure--ASTM D 1298-85$^{\varepsilon 1}$, and the Undissolved Water Test Procedure--ASTM D 3240-86a.

WARNING
If fuel is under pressure, obtain pressure reading. Be sure that the pressure does not exceed 100 psi to avoid excessive pressure and damage to fuel lines. Determine appropriate safety and health regulations prior to sampling. Also see ASTM D 2276 - 83$^{\varepsilon 1}$ for specific precautionary statements.

Using the site-established method of collection, collect a one-gallon (3.8 liter) sample of aviation fuel for each of three tests. Contain the sample in an approved safety receptacle which holds at least 5 gallons (19 liters). **Wear gloves and protective eyewear.** For consistency, the collection method should be the same for all three tests.

2.3 Operating Instructions for Particulate Contaminants Test

Particulate matter in aviation fuel must be minimized to avoid filter plugging and other operational problems. The Particulate Contaminants Test allows you to measure and monitor the amount of particulate matter present in the aviation fuel sample. (Testing methodology is in accordance with ASTM D 2276-88$^{\varepsilon 1}$.)

This section contains information on the required equipment and expendable needed to perform the test, the two methods of particulate contaminant analysis, and the test operating procedures.

2.3.1 Required Equipment and Expendable (See Figure 1.1, page 1-5, Aviation Fuel Contaminant Test Kit Loading Plan)

Equipment List

Find No	Description	NSN(CAGE)P/N
3	Syringe, Vacuum, with Two-Way Valve	6640-00-086-6326
13	Valve, Quick-Release Female with Plug and Chain	6630-00-009-1423
14	Tweezers, for removing monitor pads	6636-01-232-9536
16	Wrench, Crescent, Adjustable, 8 inch	(08071)008606P
18	Sampler Valve Hose Assembly, with Three-Way Valve	6630-00-999-0753
20	Remote Grounded Sampling Hose Assembly	6630-00-999-0754
26	Standards, Fuel, Color	6640-00-326-7684
36	Wire, Grounding, with Clamps	(08071)15043

Expendables List

Find No	Description	NSN(CAGE)P/N
24	Matched-Weight Monitors, 48/Box	6630-00-764-5761
25	Contamination Monitors, 48/Box	6630-00-445-3662
27	Teflon Tape, Anti-Seize, 1/2 inch x 260 inch, for sealing threads	8030-00-889-3535
	5-Gallon Receptacle, for fuel collection and drainage	as site specified
	Protective Wrapping, for shipping monitor to laboratory	as site specified

2.3.1.1 Methods for Particulate Contaminants Testing

Measuring the amount of particulate contaminants present in the aviation fuel sample can be accomplished using one or both, of two test methods: the Color Comparator Method and/or the Gravimetric Method.

The Color Comparator Method can be performed at the test location with visual analysis; this method is a quick way to check fuel and is recommended for an initial check of the sample's particulate contaminant level. If color comparator test results are marginal or unacceptable, perform a gravimetric test. The Gravimetric Method involves measurement of contaminants through off-site laboratory analysis and is a more exact method.

The Color Comparator Method and Gravimetric Method tests are accomplished in nine procedural steps (as outlined below and on the test kit placard): the first eight steps are the same for both methods. The ninth step or the *analysis* step varies according to the test method: when using the Color Comparator Method, analysis of the sample is made using the *Aviation Turbine Fuel Contamination Standards* booklet included in the test kit (see booklet for more detail). When testing the sample gravimetrically (using the Gravimetric Metiod), you must ship the sample to the nearest approved laboratory for analysis.

All parts and tools referred to in the following steps can be identified in Figure 1.1, page 1-5, or on the test kit placard (see Loading Plan).

2.3.2 Installing the Quick-Release Valve

Using the eight-inch adjustable wrench, attach the quick-release valve to the designated point on the system (this will vary with the type of equipment you are using, however, attach the valve in a horizontal position on the system or at the top of the system to allow for proper flushing). See Figure 2.1.

CAUTION
Make sure that the pressure in system does not exceed 100 psi.

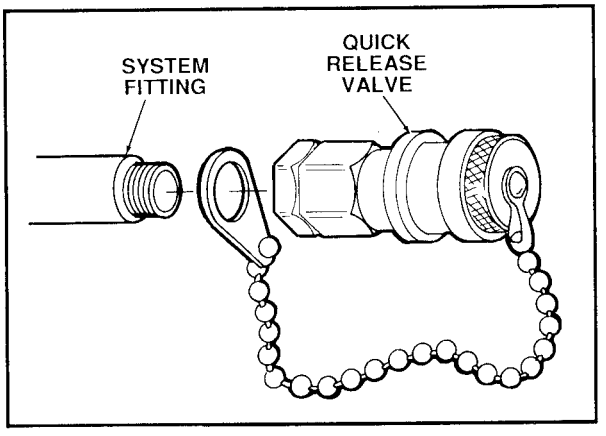

Figure 2.1 Installing the Quick-Release Valve

NOTE: Keep the valve plug in its fitting when valve is not in use (Figure 2.2).

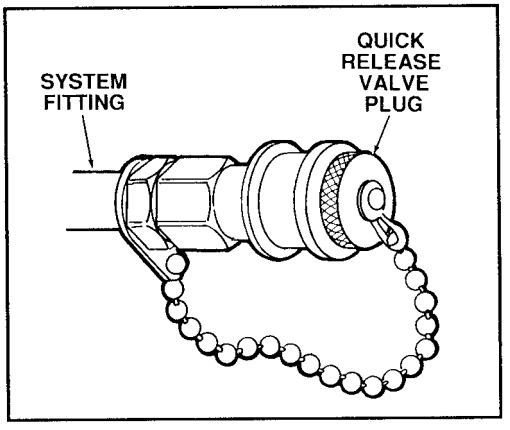

Figure 2.2 Valve Plug in Fitting

2.3.3 Inserting the Monitor within Sampler Valve Hose Assembly

a. With the quick-release valve in place, you are ready to select a monitor. Use **contamination** monitors (blue and red protective plugs) for color comparator testing and **matched-weight** monitors (yellow and red protective plugs) for gravimetric testing. Remove the plugs from the monitor: remove the bottom (red) plug from the monitor first, followed by the top (blue or yellow) plug (Figure 2.3). Keep plugs in a safe place for replacement on monitors when test is completed.

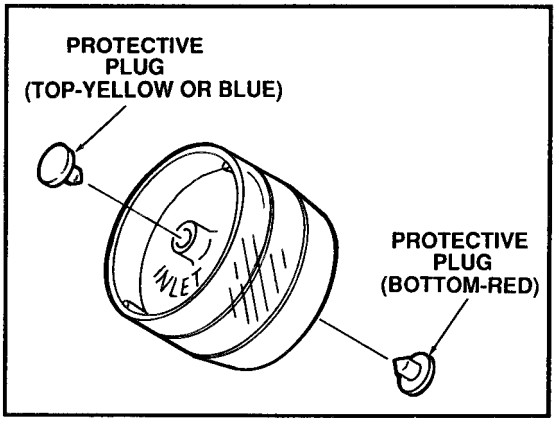

Figure 2.3 Removing Protective Plugs from Monitor

b. Unscrew the sampler cover from the sampler base and insert the monitor spoke-side dew-n into the base (Figure 2.4).

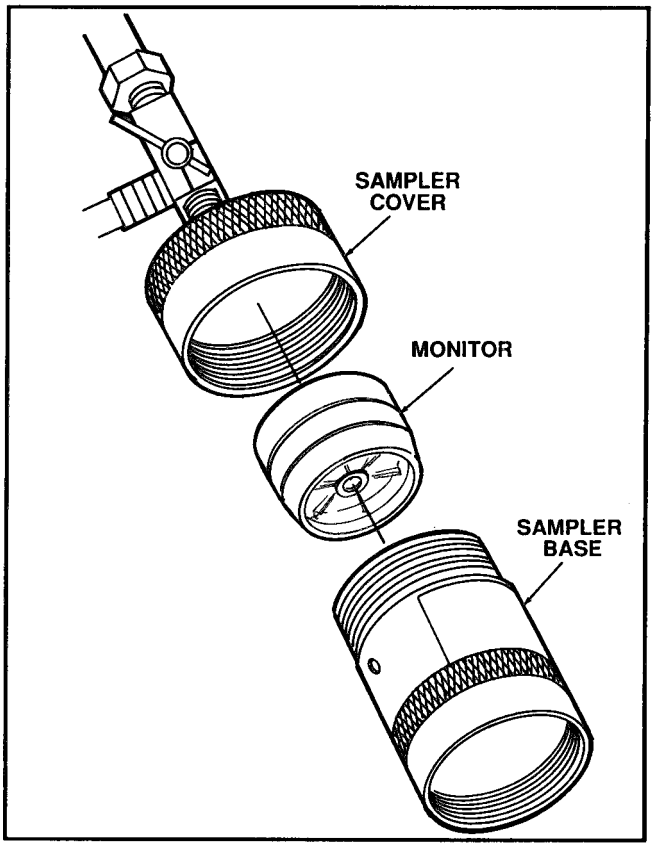

Figure 2.4 Inserting the Monitor into Sampler Base

2.3.4 Assembling the Sampler Valve Hose Assembly

a. Insert the sampler base (with monitor in place) into the sampler cover and screw the two pieces together to a snug hand-tightness.

CAUTION
Do not over-tighten or damage to the monitor or membrane may occur.

b. Connect the bypass hose from the three-way valve to either bypass port located on the sides of the base (Figure 2.5). Press the hose down firmly into the port for a tight fit.

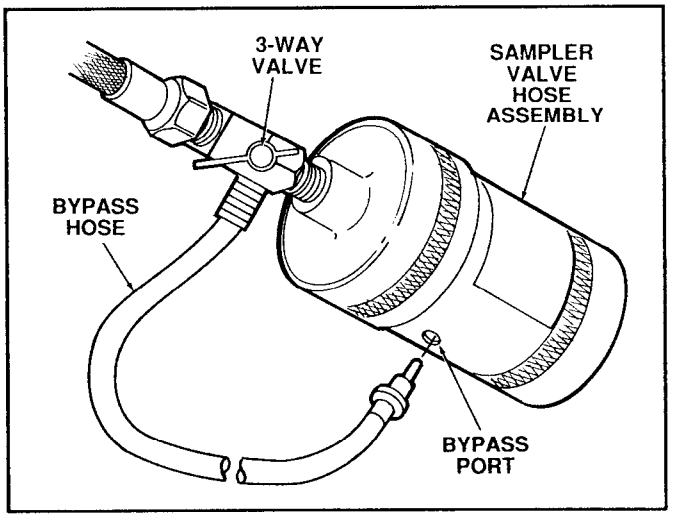

Figure 2.5 Inserting the Bypass Hose into Sampler Base

2.3.5 Attaching the Remote Sampling Assembly to the Sampler Valve Hose Assembly

a. Screw the remote sampling assembly onto the sampler base.

b. Force the nylon plug into the open port on the side of the sampler base tightly plugging the port hole to prevent leakage (Figure 2.6).

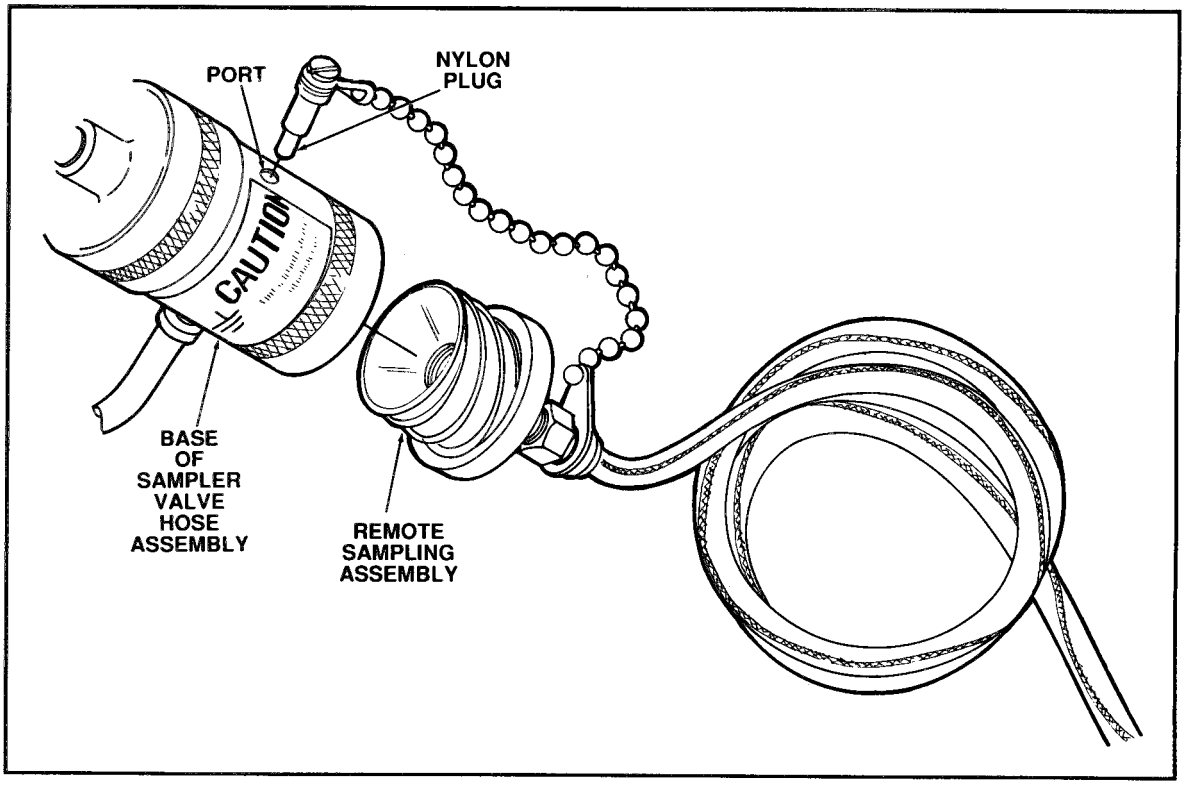

Figure 2.6 Attaching the Remote Sampling Assembly

2.3.6 Connecting the Sampler Valve Hose Assembly to the Quick-Release Valve

a. The three-way valve must be in the OFF position *before* attaching the sampler to the remote assembly the valve is closed or off when the valve arm is positioned approximately forty-five degrees from the base of the valve (Figure 2.7).

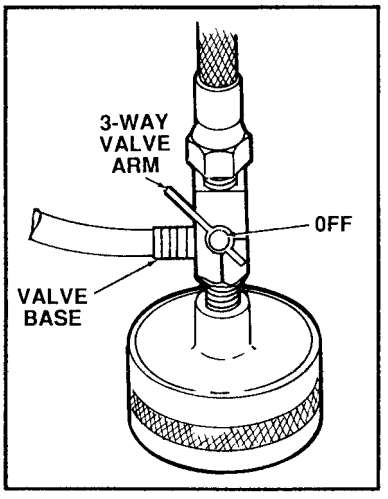

Figure 2.7 Three-Way Valve
- OFF Position

b. Remove the protective cap and plug from the quick-release valve, inlet hose nipple, and sample valve (Figure 2.8).

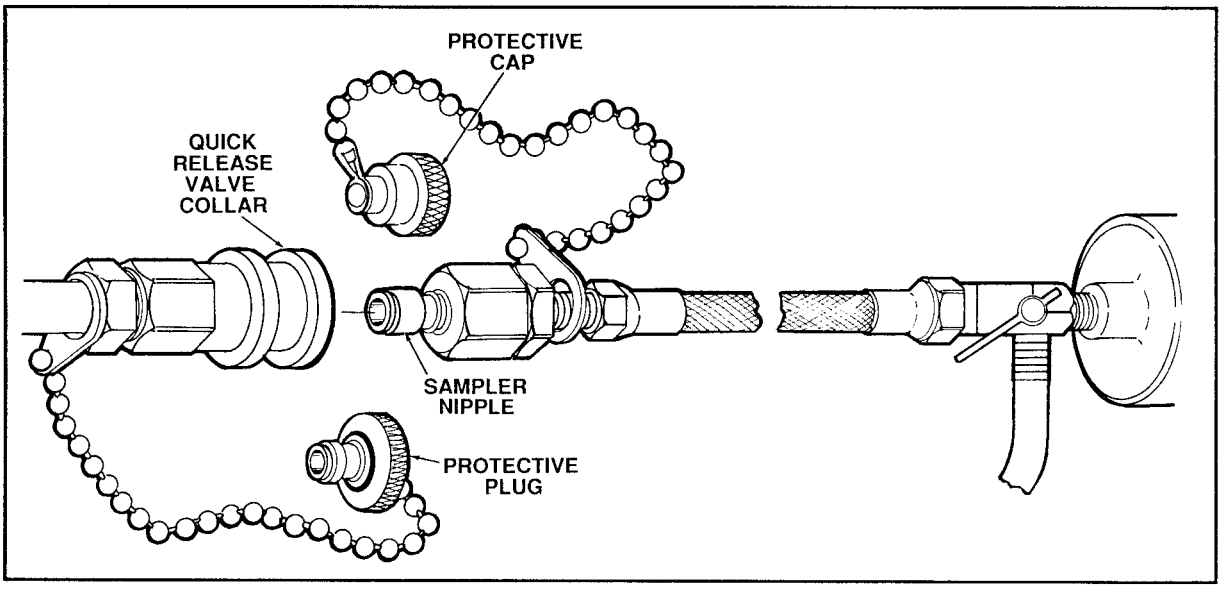

Figure 2.8 Removing Sampler Protective Cap from Quick-Release Valve Plug

c. Insert the sampler hose nipple into the quick-release valve collar (Figure 2.9): retract the valve collar and insert the nipple firmly into the valve. Release the collar when the nipple is seated.

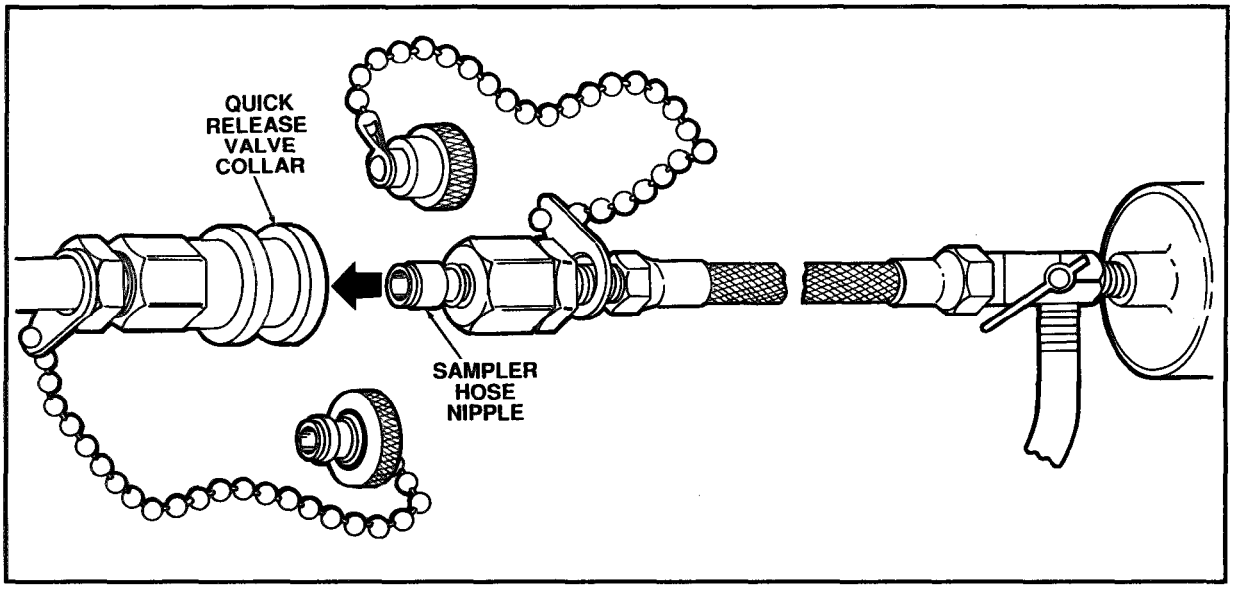

Figure 2.9 Inserting Sampler Hose Nipple into Sample Valve Collar

WARNING
The Sampler Valve Hose Assembly must be properly grounded to avoid possible fire or explosion from static electrical charges. An electrical continuity test of the ground hook-up should be performed prior to test to assure conductance of electrical charges from system to ground.

d. Attach ground wire: place one end of the ground wire on the assembly and the other end on grounded metal (such as to an automobile bumper). See Figure 2.10 for example of assembly placement.

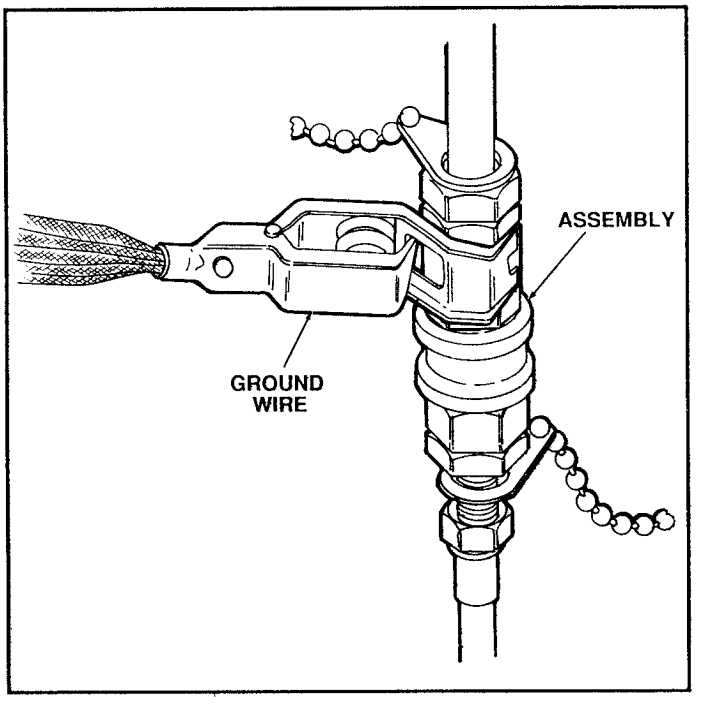

Figure 2.10 Attachment of Ground Wire to Assembly

2.3.7 Flushing the Inlet Hose

a. Turn the three-way valve to the **FLUSH** position: the valve arm is horizontal to the base of the valve (Figure 2.11).

b. Pass at least two volumes, about twice the containment of the assembly system, 3 or more liters (3.2 quarts), into the 5-gallon receptacle. This should remove contaminants from the inlet valve, hose, and three-way valve.

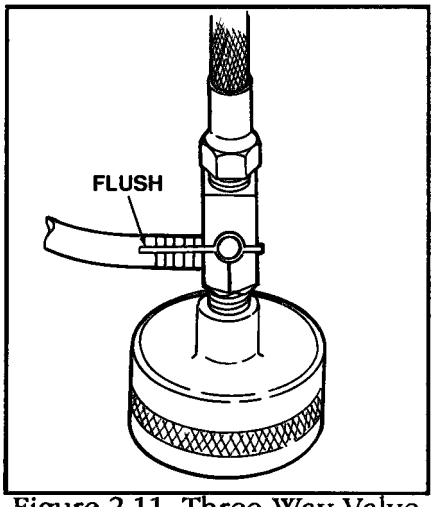

Figure 2.11 Three-Way Valve - FLUSH Position

2.3.8 Taking a Sample

a. Hold the sampler in an upright (vertical) position, turn the three-way valve to the **TEST** position: when the valve arm is positioned at a right angle to the base of the valve (vertical) (Figure 2.12).

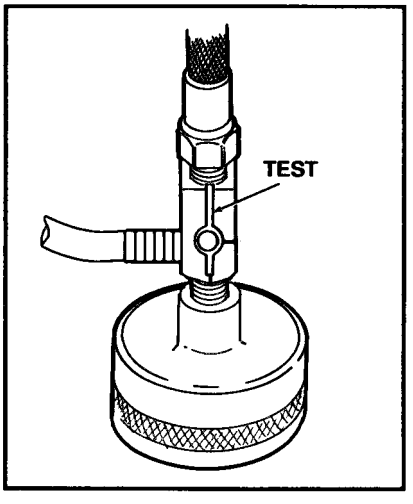

Figure 2.12 Three-Way Valve - TEST Position

b. Allow no more than 1 liter (1.0 quart) to flow through the monitor. Record the sample volume for reporting.

c. When collection is completed, turn the three-way valve to the **OFF** position before turning off the system pump.

CAUTION
Some pumping systems (e.g. aircraft refuelers) develop a vacuum when closed which can cause backflow and rupture the monitor filter, rendering the test ineffective.

d. Retract the quick-release valve collar and remove the sampler nipple from the valve. Replace the protective cap and plug (Figure 2.13).

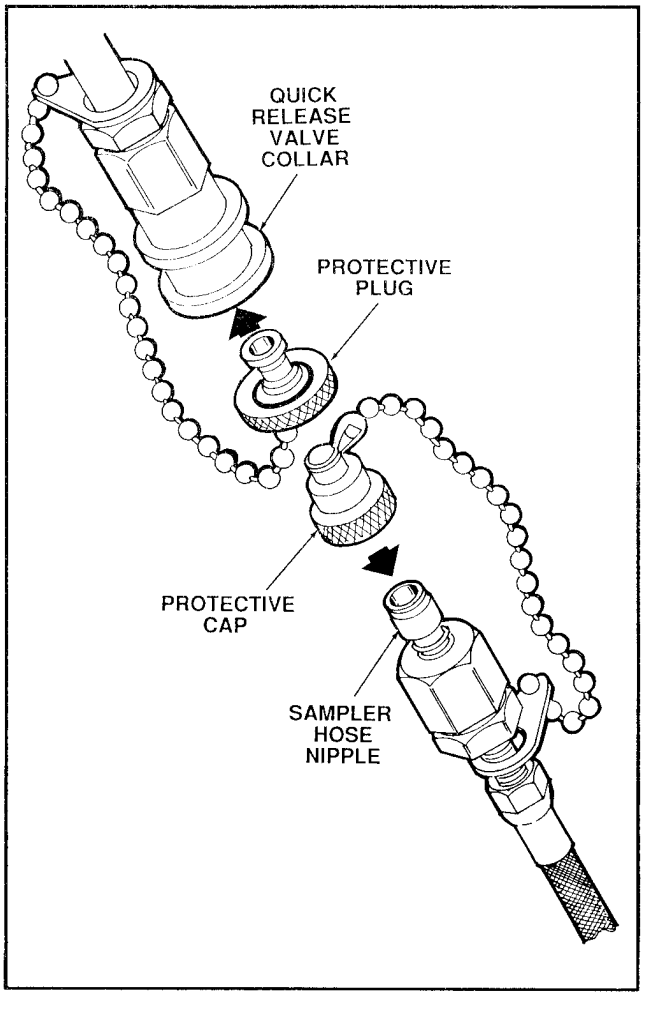

Figure 2.13 Replacing the Protective Cap and Plug

e. Disconnect the bypass hose from the side of the sampler and unscrew the sampler base. Hold the sampler in an upright position and remove the monitor.

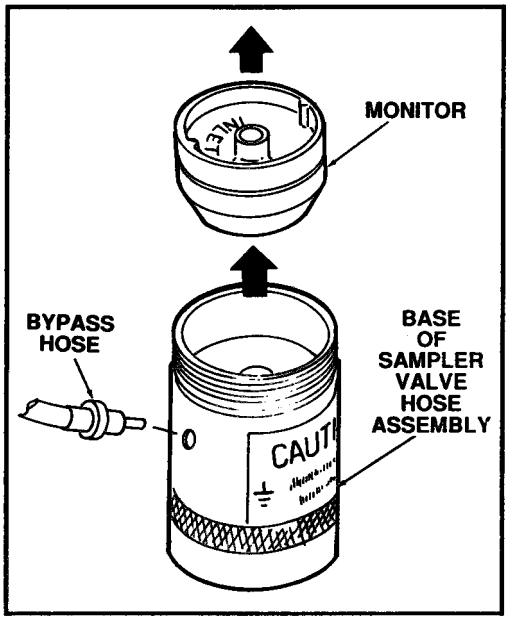

Figure 2.14 Removing the Monitor from Sampler

2.3.9 Pumping the Monitor Dry

a. Securely fit the bottom or *spoke-side* of the monitor onto the syringe valve (Figure 2.15) and pump the syringe arm point the syringe away from you and pump the arm, holding the extended arm for 5 seconds before releasing each time. Pump the arm two or three times, or until the filter inside the monitor appears dry of fuel.

CAUTION
Drain the excess fuel into a proper drain or receptacle.

b. Remove the monitor from the syringe.

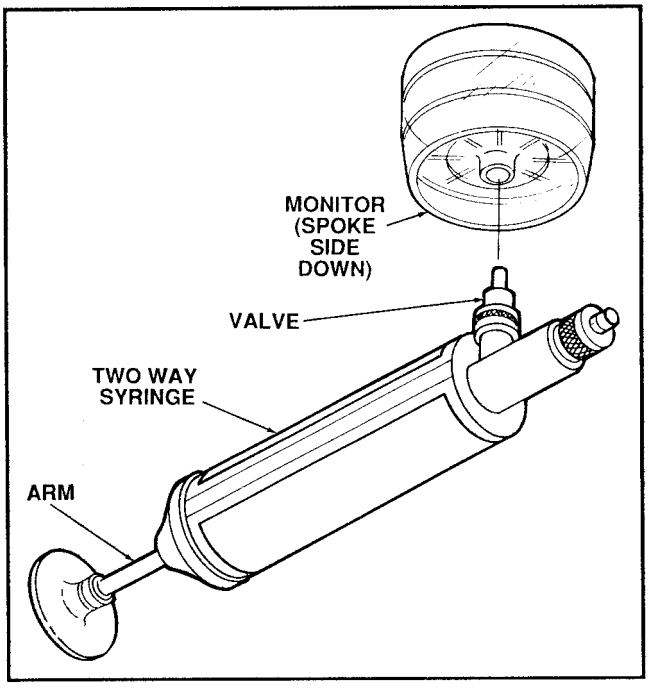

Figure 2.15 Fitting the Monitor into the
Two-Way Syringe Valve

2.3.10 Preparing the Monitor for Assessment of Particulate Contamination

If you are testing the fuel using the Color Comparator Method, refer to the *Aviation Turbine Fuel Contamination Standards* contained in the kit.

Using the back of the tweezers, carefully pry off the top of the monitor. Follow steps 2 through 6 of the *Operating Instructions* outlined in the booklet to assess the filter's visible solid particle contamination--matching the gradation of color and determining if the gross particles are acceptable or unacceptable. If the results are marginal or unacceptable, re-test the fuel using the Gravimetric Method.

If you are testing the fuel using the Gravimetric Method, replace the monitor's protective plugs (top and bottom), label the monitor, wrap it well in bubble paper or whatever protective covering you prefer, and ship to a designated laboratory for analysis.

2.4 Operating Instructions for API Gravity Tests

Testing for specific or API gravity and relative density is necessary to control the quality and volume levels of the fuel. The measurement of fuel temperature is also required to minimize volume correction errors. The testing methodology outlined in this section is in accordance with ASTM Standard D 1298 - 85 ε1.

This section contains information on the required equipment and expendable needed to perform the tests and the test operating procedures.

2.4.1 Required Equipment and Expendable (See Figure 1.1, page 1-5 Aviation Fuel Contaminant Test Kit Loading Plan)

Equipment List

Find No:	Description	NSN/(CAGE)P/N
10	Bottle, Narrow Mouth, PVC 850, Graduated 1,000 Milliliter Capacity, with Screw Cap	6630-01-232-9537
13	Valve, Quick-Release, Female with Plug and Chain	6630-00-009-1423
16	Wrench, Crescent, Adjustable, 8 inch	(08071) 008606P
18	Sampler Valve Hose Assembly, with Three-Way Valve	6630-00-999-0753
	Cylinder, Hydrometer Test, 250 Milliliters	(08071) XX6403709
28	Wire, Grounding with Clamps	(08071) 15043
36		

Expendables List

Find No:	Description	NSN/(CAGE)P/N
27	Teflon Tape, Anti-Seize, 1/2 inch x 260 inch, for sealing threads	8030-00-889-3535
	5-gallon Receptacle, for fuel collection and drainage	as site specified
	Paper Towels, for blotting	as site specified

2.4.1.1 Method for API Gravity Testing

Collect approximately two volumes--100 milliliters (3.4 ounces) of fuel sample. Balance the sample to a prescribed temperature (for example, 15°C or 47°F) and transfer the sample to a cylinder prepared at approximately the same temperature.

Select an appropriate hydrometer and lower it into the cylinder. Allow the hydrometer to settle. After temperature equilibrium is attained (approximately 5 minutes), take a temperature reading from the hydrometer scale and record it according to site procedure.

All parts and tools referred to in the following steps can be identified in Figure 1.1, page 1-5, or on the test kit placard (see Loading Plan).

2.4.2 Installing the Quick-Release Valve

Follow the procedure for installing the quick-release valve as described in Section 2.3.2. Refer to Figure 2.1.

CAUTION
Make sure that the pressure in system does not exceed 100 psi.

2.4.3 Assembling the Sampler Valve Hose Assembly

Follow the procedure for assembling the sampler valve hose assembly as described in Section 2.3.4. Refer to Figure 2.5.

CAUTION
Do not over-tighten or damage to the monitor or membrane might occur.

2.4.4 Attaching the PVC Sample Bottle to the Remote Sampling Assembly

Screw the PVC sample bottle mouth onto the remote sampling assembly (Figure 2.16).

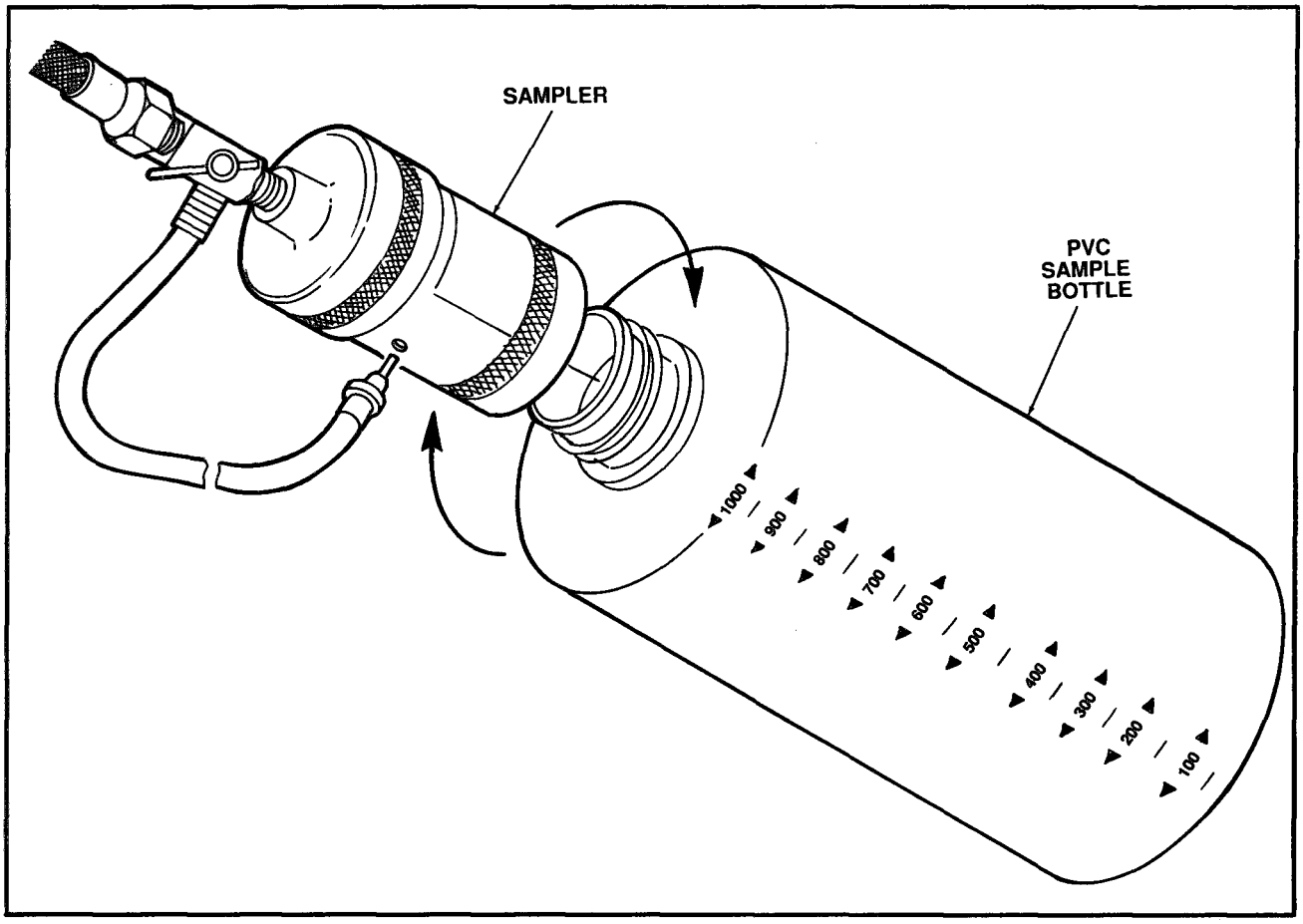

Figure 2.16 Attaching the Remote Sampling Assembly

2.4.5 Connecting the Sampler Valve Hose Assembly to the Quick-Release Valve

a. Follow the procedure for connecting the sampler valve hose assembly to the quick-release valve as described in Section 2.3.6. Refer to Figures 2.7, 2.8, and 2.9.

WARNING
The Sampler Valve Hose Assembly must be properly grounded to avoid possible fire or explosion from static electrical charges. An electrical continuity test of the ground hook-up should be performed prior to test to assure conductance of electrical charges from system to ground.

b. Attach ground wire: place one end of the ground wire on the assembly and the other end on grounded metal (such as to an automobile bumper). See Figure 2.10 for example of assembly placement.

2.4.6 Flushing the Inlet Hose

If one or all test procedures are performed at the same time (within the same hour), re-flushing the lines is not required. However, if the system has not been flushed, do not use the PVC bottle to contain the sample, but rather follow the procedure for flushing the inlet hose as described in Section 2.3.7. Refer to Figure 2.11. Allow sufficient quantity of fuel to flow through the bypass tubing to flush entrained contaminants from the inlet valve, hose, and three-way valve. Discard approximately two times the required test volume or approximately 200 milliliters (7.0 ounces).

2.4.7 Taking a Sample

a. Hold the sampler upright and turn the three-way valve to the **TEST** position (Figure 2.12).

b. Collect enough fuel to fill the PVC sample bottle - no more than 1 liter (1.0 quart).

c. When collection is completed, turn the three-way valve to the **OFF** position (Figure 2.7) before turning off the system pump.

d. Retract the quick-release valve collar; remove the sampler nipple from the valve and replace the protective cap and plug (Figure 2.13).

e. Carefully remove the PVC sample bottle from the sampler.

2.4.8 Determining the API Gravity and Temperature

a. Fill the clear plastic cylinder half-full with fuel--pour **the fuel at an angle to minimize air entrapment** (Figure 2.17).

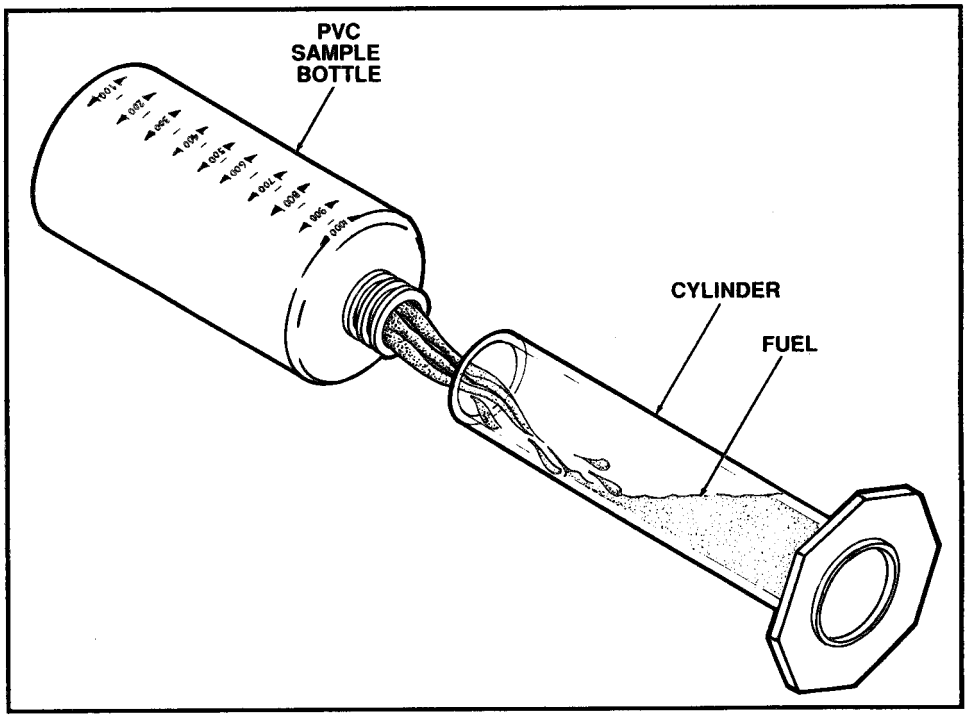

Figure 2.17 Filling the Plastic Cylinder

b. Select a hydrometer which allows the scale to fall **within** the fuel cap (Figure 2.18). Place the hydrometer into the cylinder giving it a slight twist as you release it into the fuel.

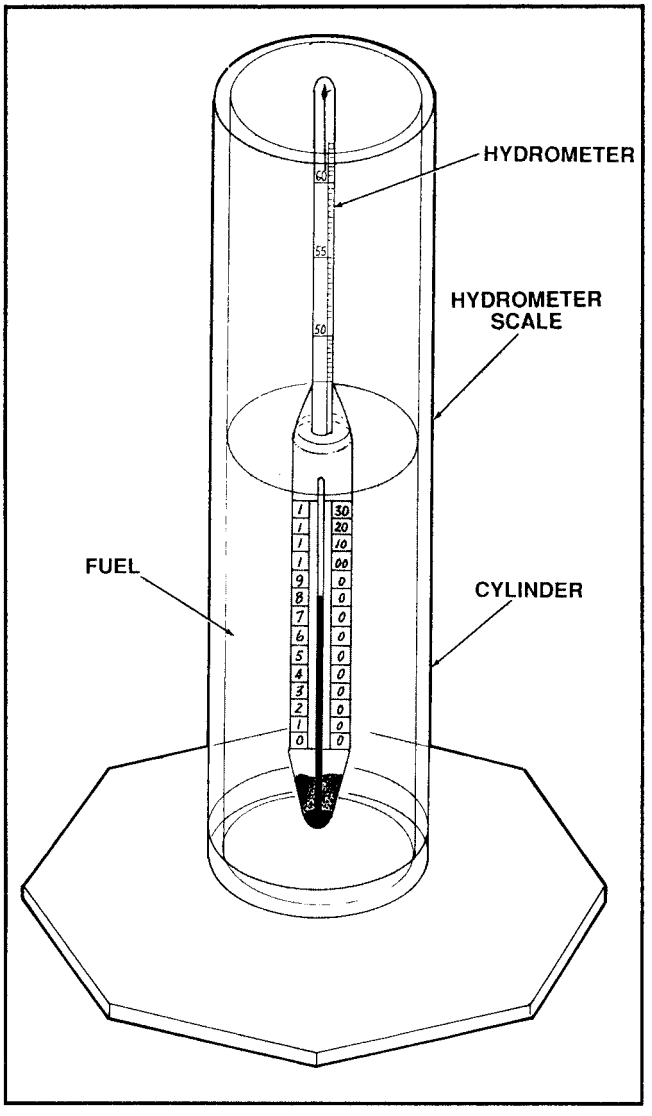

Figure 2.18 Hydrometer Scale within Fuel Cap

c. Let the hydrometer settle. Allow approximately 5 minutes for the temperature of the hydrometer to equilibrate with the temperature of the fuel sample.

d. With the hydrometer in the cylinder, read the degrees API to the nearest 0.1 at the miniscus cut point (Figure 2.19). Remove the hydrometer from the cylinder and take a temperature reading. Record the readings.

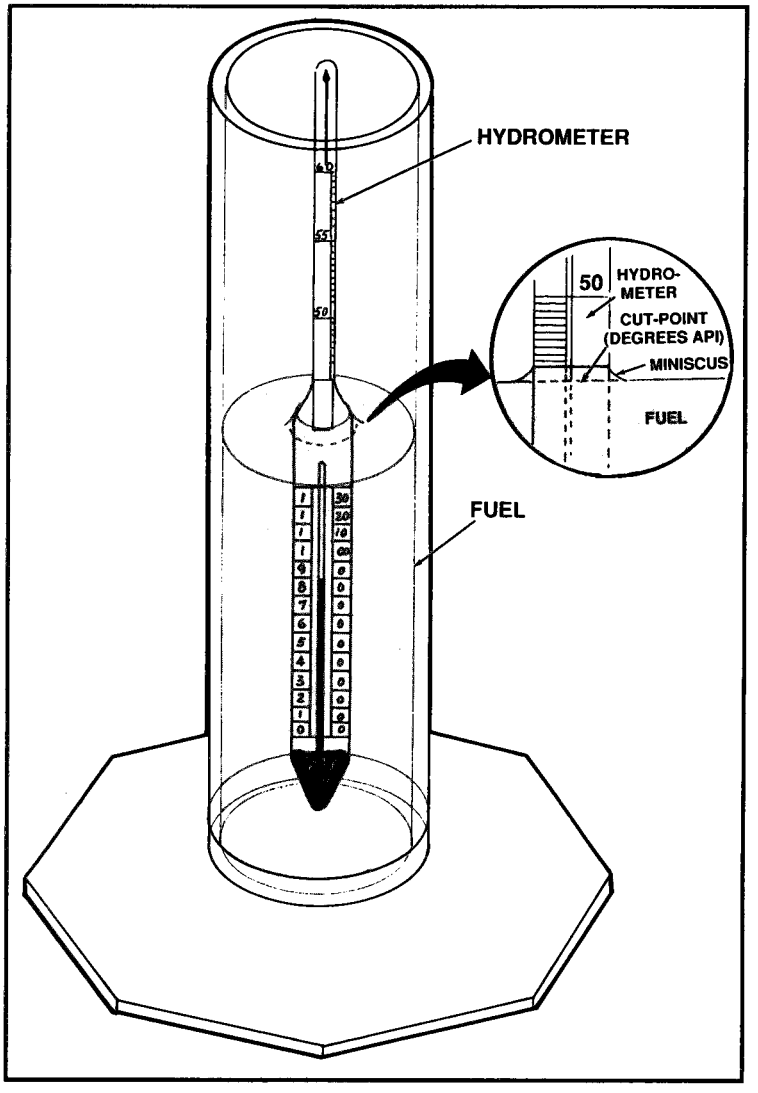

Figure 2.19 Miniscus Cut Point

2.4.9 Finding the Corrected API Gravity, Temperature, and Relative Density

a. Using the gravity calculator attached to the test kit placard, determine the corrected API: select the appropriate type of fuel being tested and turn the computer slide to match the recorded API gravity with the recorded temperature.

b. Read and record the corrected gravity, temperature, and relative density indicated at the 60° mark on the computer scale (Figure 2.20). Refer to the example shown on the gravity calculator as well.

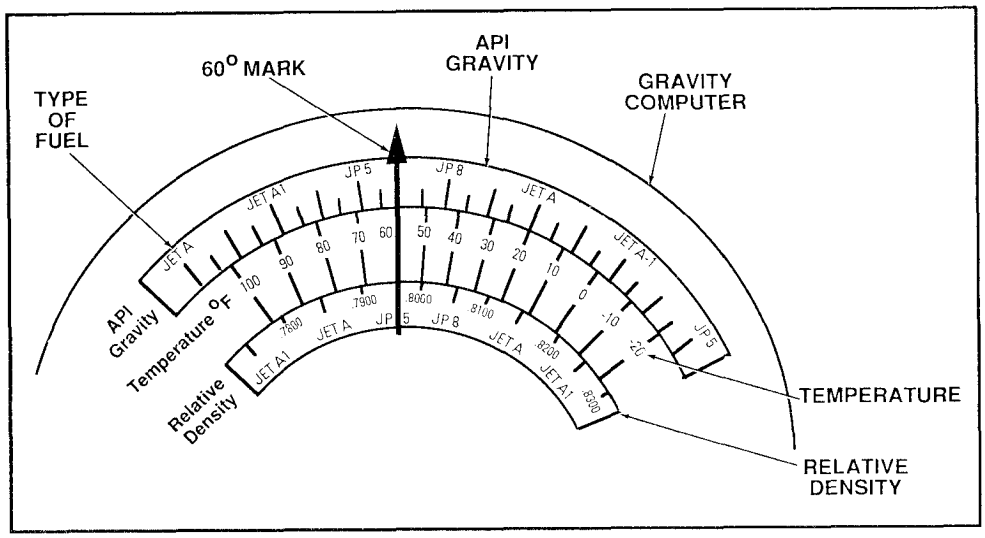

Figure 2.20 Reading Corrected API Gravity, Temperature, and Relative Density

c. Compare the readings to the established site standards and record the test results. Determine if the fuel sample satisfies specified site standards.

d. Dispose of excess fuel safely and according to site regulations.

2.5 Operating Instructions for Undissolved Water Test

Testing for undissolved (free) water is necessary to control the growth of Microorganisms and the subsequent corrosion caused by such microorganisms in aircraft tanks. In addition, undissolved water testing is essential to prevent filters from icing in the fuel system. The testing methodology outlined in this section determines the quantity of water in parts per million (ppm) present in a 500 milliliter (17.0 ounce) fuel sample and is in accordance with ASTM Standard D 3240 - 86a.

This section contains information on the test operating procedures and the required equipment and expendable needed to perform the tests.

2.5.1 Required Equipment and Expendable (See Figure 1.1, page 1-5, Aviation Fuel Contaminant Test Kit Loading Plan)

Equipment List

Find No	Description	NSN/(CAGE)P/N
10	Bottle, Narrow Mouth, PVC 850, Graduated 1,000 Milliliter Capacity, with Screw Cap	6630-01-232-9537
11	Monitor, Stainless Steel	6630-01-232-9542
13	Valve, Quick-Release Female with Plug and Chain	6630-00-009-1423
14	Tweezers, for removing monitor pads	6636-01-232-9536
16	Wrench, Crescent, Adjustable, 8 inch	(08071) 008606P
17	Detector Unit, Free Water, Aqua-Glo Series III, with Instrument Pack GTP-768, and Cable GTP-2402 with Ultra -Violet Bulb, Power Cord	6640-01-235-7877
18	Sampler Valve Hose Assembly, with Three-Way Valve	6630-00-999-0753
19	Jeweler's Screwdriver, Calibrating Standard, stored in F/N 34	(32218) GTP-765
20	Remote Grounded Sampling Hose Assembly	6630-00-999-0754
36	Wire, Grounding, with Clamps	(08071) 15043

Expendables List

Find No	Description	NSN/(CAGE)P/N
23	Free-Water Pads, 50/Box	6640-00-235-3820
27	Teflon Tape, Anti-Seize, 1/2 inch x 260 inch, for sealing threads	8030-00-889-3535
	Paper Towels, for blotting	as site specified

2.5.1.1 Method for Undissolved Water Testing

Undissolved water in the fuel sample will react with the free-water pad dye for detection and measurement with the Aqua-Glo® Water Detector.

Collect a 500 milliliter (17.0 ounce) sample of fuel. Pass the fuel sample through the sampler with the free-water test pad contained within the stainless steel monitor. Remove the free-water test pad from the monitor and blot dry between paper towels. Insert the free-water test pad into the Aqua-Glo Water Dectector and read and record ppm of water.

All parts and tools referred to in the following steps can be identified in Figure 1.1, page 1-5, or on the test kit placard (see Loading Plan).

2.5.1.2 Calibrating the Aqua-Glo Water Detector

To ensure accurate undissolved water detection, calibrate the Aqua-Glo Water Detector **before each daily use and after every hour of use**

a. Turn on the water detector, setting the indicator switch to the appropriate power source: set to either AC (power cord), internal, or external battery (Figure 2.21).

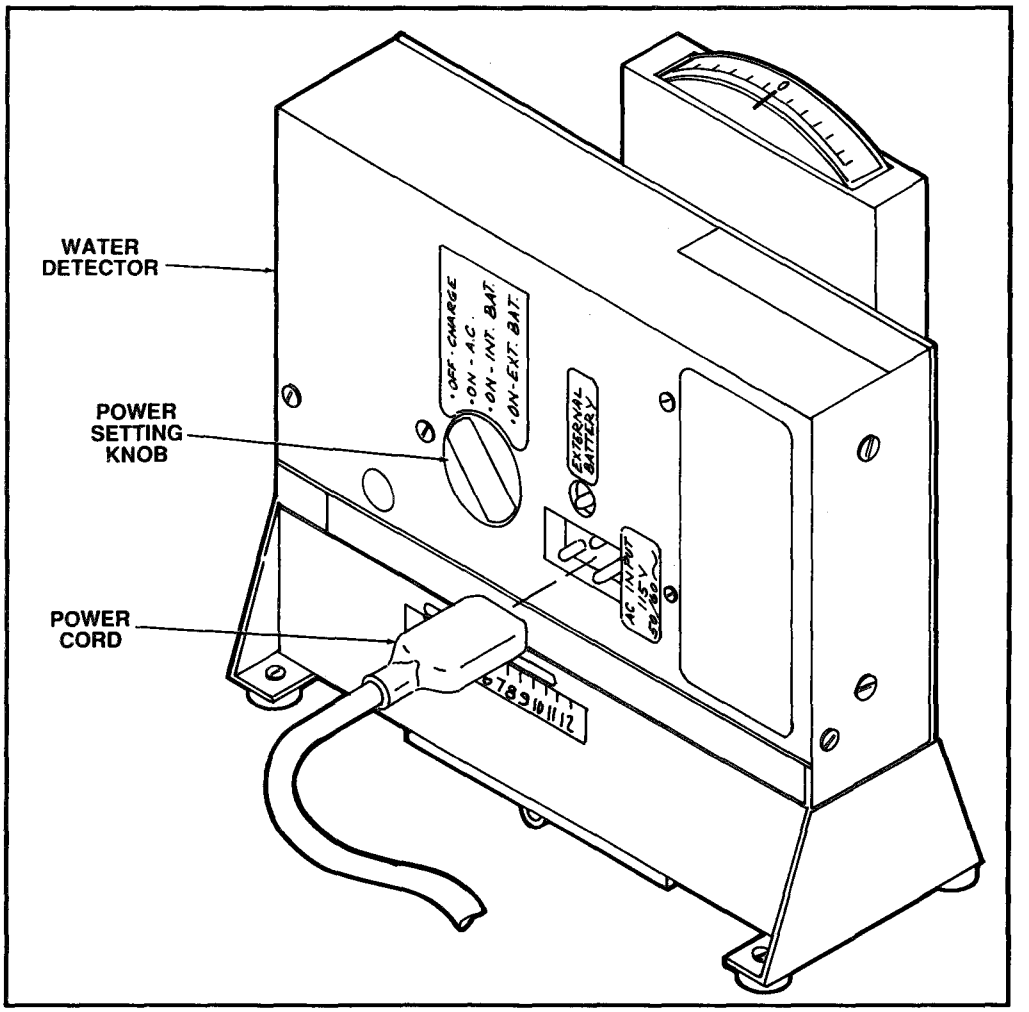

Figure 2.21 AC/Internal/External Power Setting

b. Remove the calibration pad stored in Kit Find No. 34. The pad is covered with a clear plastic shielding and has a coding standard written on one side. Note the "Set" code in the center of the pad: this is the calibration setting you will use for calibrating. The sample pad shown in Figure 2.22 has a calibration set code of 5.3.

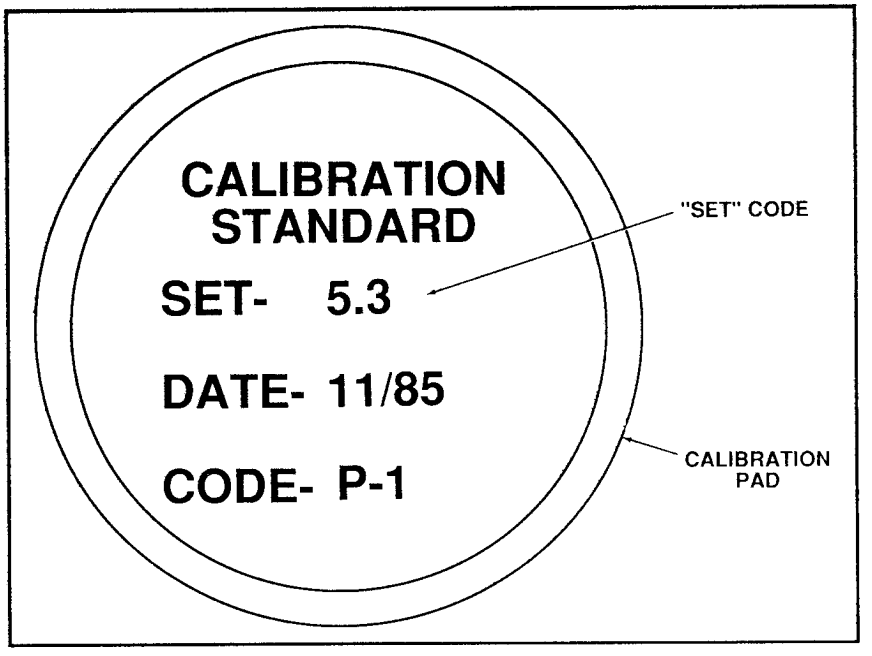

Figure 2.22 Calibration Pad and Calibration Set Code

c. Insert the Calibration Pad in test area window located on the bottom of the water detector: lift the cover's curved metal tab and place the pad (text facing you) in the depressed circular area or "window" located in the center of the test area (Figure 2.23). Close the test area cover and stand the water detector upright.

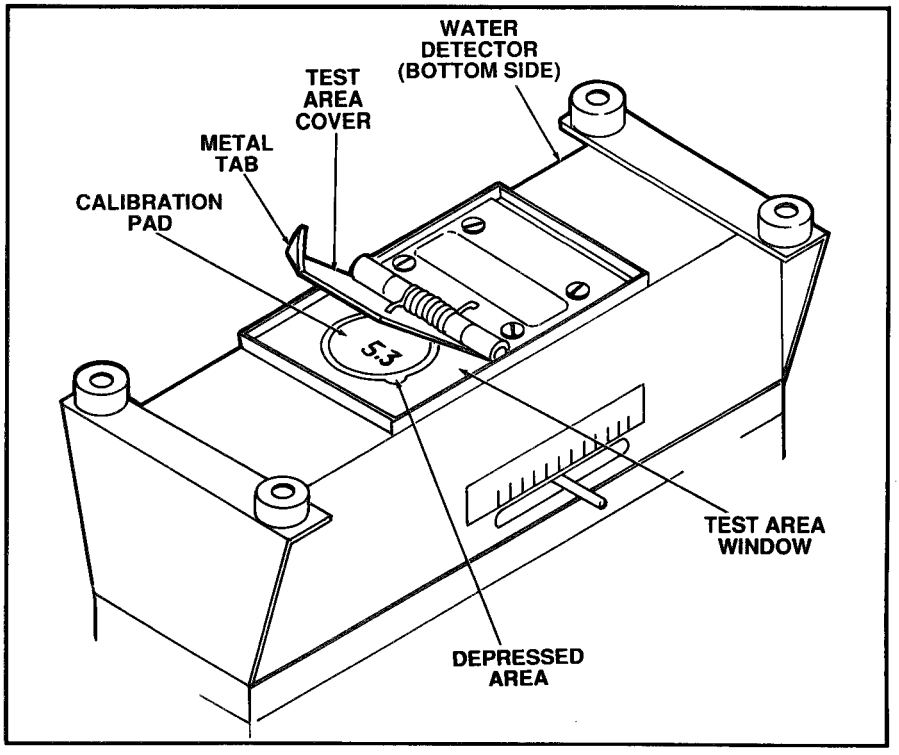

Figure 2.23 Placement of Calibration Pad in Test Area Window

d. Position the light-modulator lever, located on the side of the water detector, (move the lever left or right), until the lever is directly above the number on the scale which corresponds to the set number shown on the calibration pad (i.e., 5.3). See Figure 2.24.

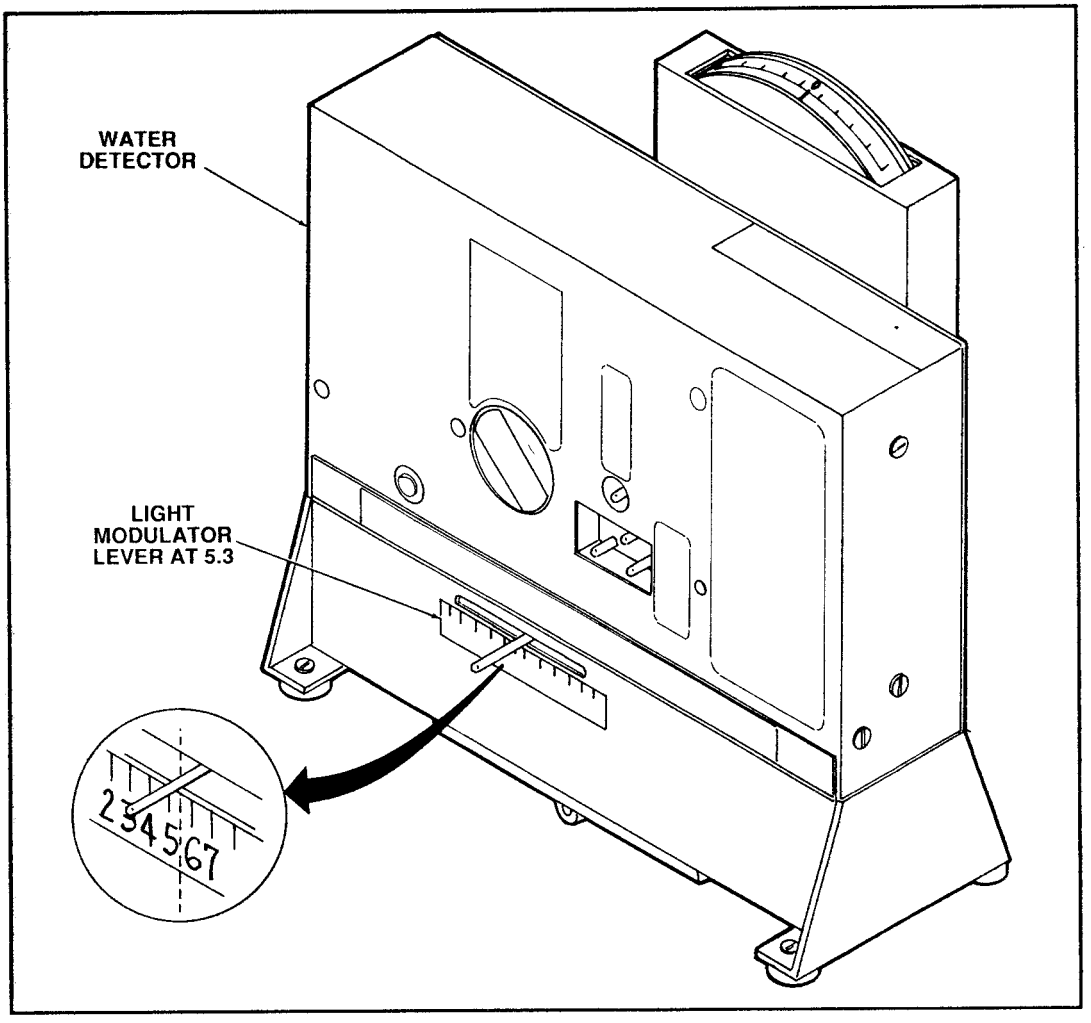

Figure 2.24 Set the Light-Modulator Lever

e. Depress the switch button on the instrument pack and read the calibration meter: if the meter reads “0”, the water detector calibration procedure is complete (Figure 2.25). If the meter reads any increment other than “0”, you must adjust the internal calibration screw until the water detector is “zeroed-out” (i.e., the meter lever shaft reads “0”). See **f., g.,** and **h.** below for instructions. Also refer to the calibration card stored with Kit Find No. 34.

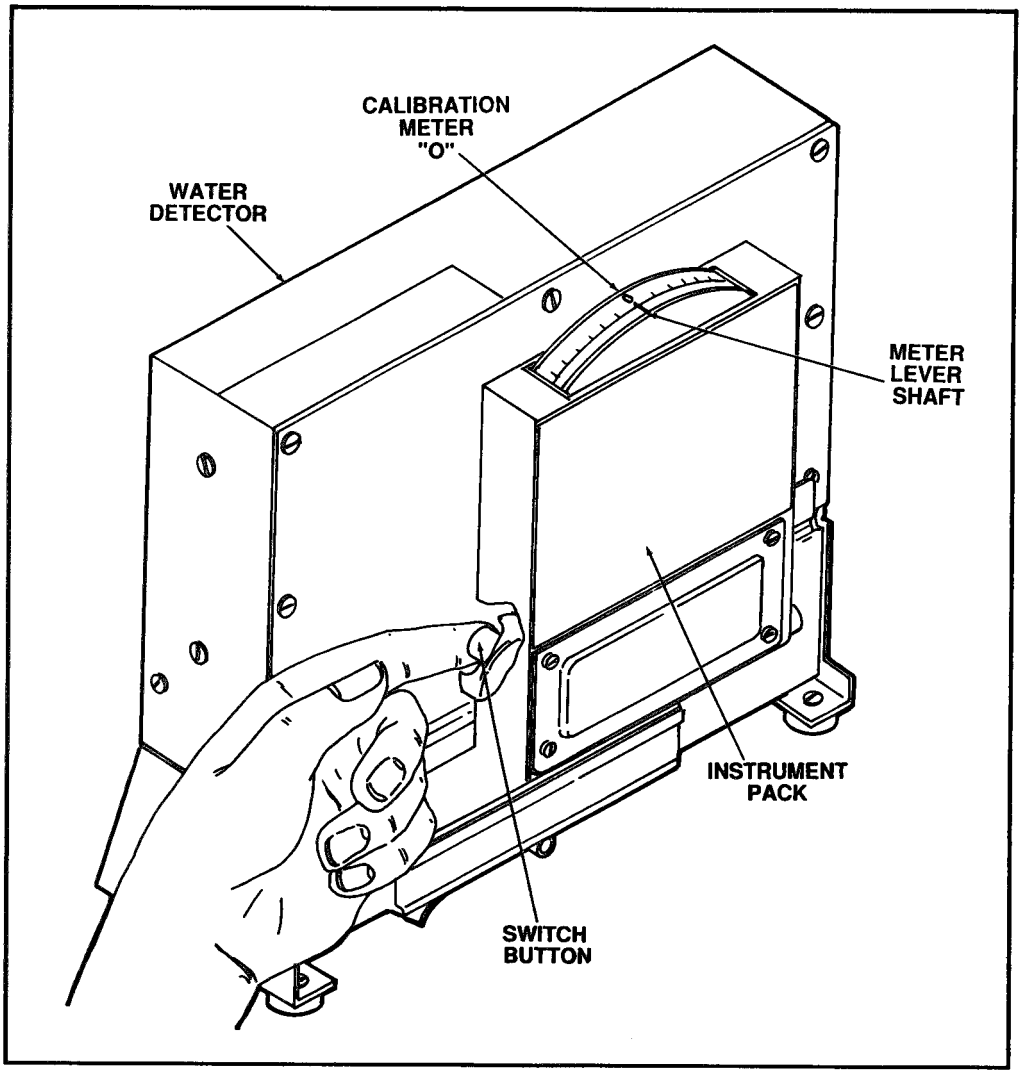

Figure 2.25 Calibration Meter Lever Shaft Reading “0”

f. Using the jeweler’s screwdriver, remove the outer screw on the side of the calibration meter housing (Figure 2.26). This provides access to the internal adjustment screw which allows adjustment to the meter lever.

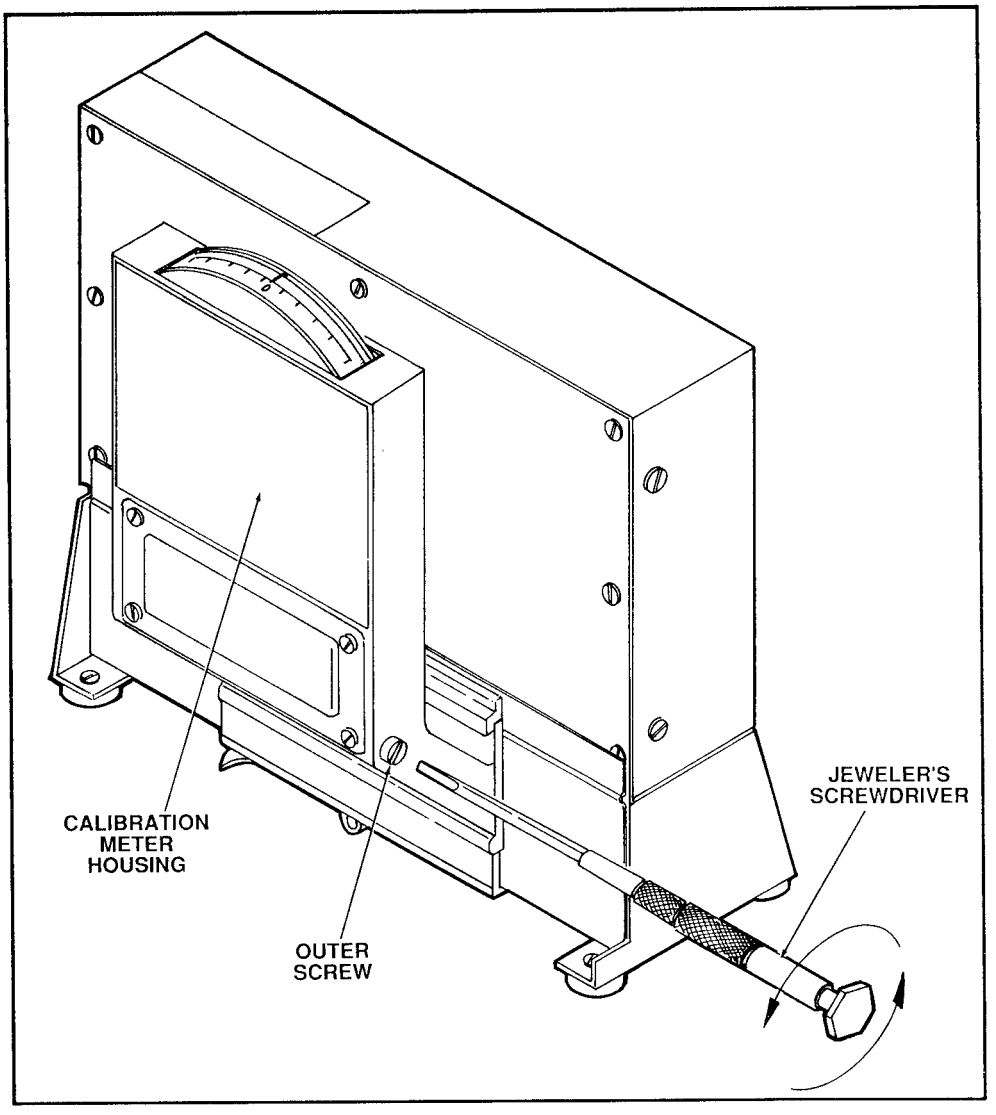

Figure 2.26 Removing the Outer Screw from Calibration Meter Housing

g. Insert the tip of the jeweler's screwdriver into the housing and turn the internal adjustment screw (in either a right or left direction). Depress the switch button on the instrument pack as you turn the screw until the meter lever reads "0". See Figure 2.27.

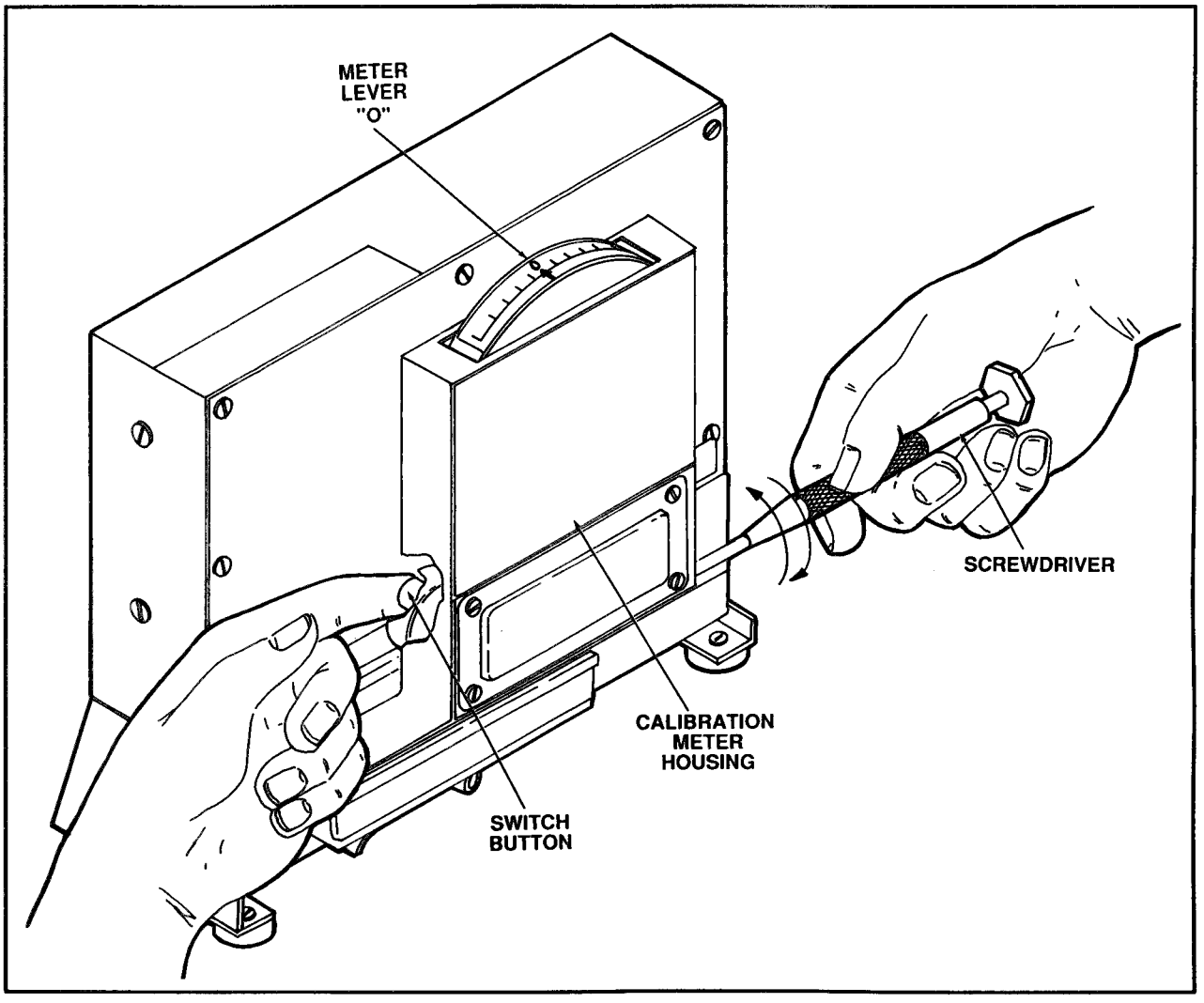

Figure 2.27 Zeroing-Out the Meter Lever

h. Replace the outer screw and the calibration of the water detector is completed. You are ready to begin the undissolved water test procedure. First collect a sample and prepare the stainless steel monitor.

NOTE: Normal sample volume is 500 milliliters (17.0 ounces) of fuel, however, if the reading is off--higher than normal--sample volumes maybe reduced to as low as 100 milliliters (3.4 ounces), multiplying the reading number by 5 to obtain the parts per million.

You may opt to perform this test prior to performing the API Gravity tests since this fuel sample can be re-used and a smaller, less exacting amount of fuel is required for the API Gravity tests.

2.5.1.3 Installing the Quick-Release Valve

Follow the procedure for installing the quick-release valve as described in Section 2.3.2. Refer to Figure 2.1.

CAUTION
Make sure that the pressure in the system does not exceed 100 psi. Damage to the system fuel lines or components might result.

2.5.2 Preparing the Stainless Steel Monitor

a. Pry open the top of the stainless steel monitor using the back end of the tweezers (Figure 2.28).

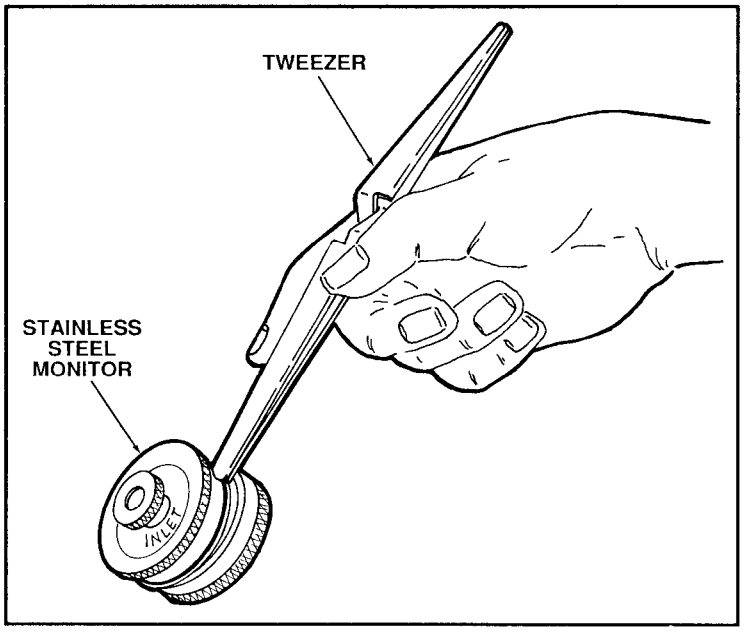

Figure 2.28 Removing Stainless Steel Monitor Top

b. Carefully remove the free-water test pad from its sealing package using clean, dry tweezers. **Take care not to touch the pad: oil from your fingers may contaminate the dye.**

CAUTION
Do not remove the test pad from its sealed package until you are ready to place it into the monitor. DO not allow any discrete water droplets to come into contact with the pad. DO not expose the pad to humidity or the atmosphere. Contact with these elements may effect the accuracy of the test results.

c. The pad has an orange, fluffy-textured top and a white backing. Insert the pad orange-side up towards the inlet of the monitor (the orange side should be facing upstream of the fuel flow). See Figure 2.29.

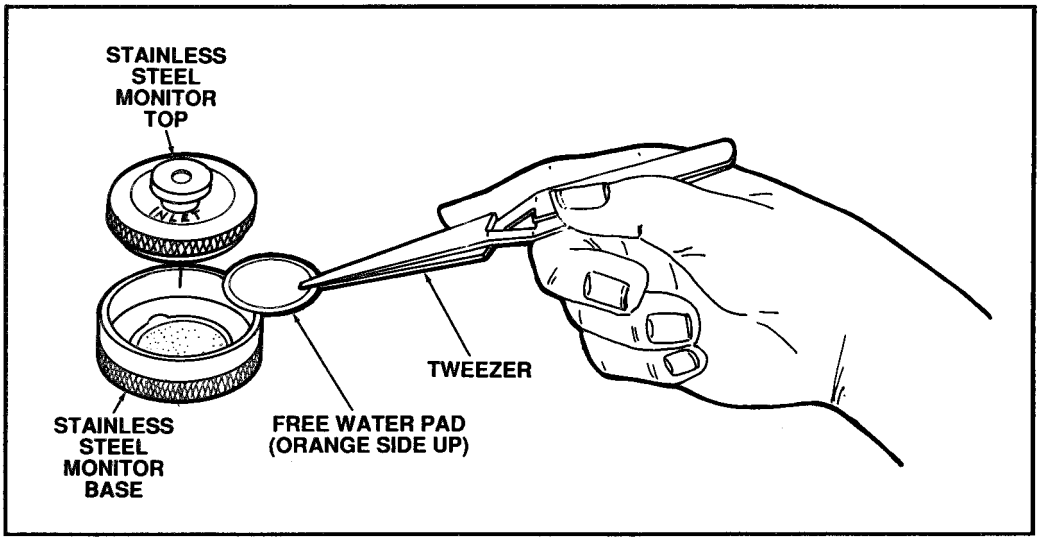

Figure 2.29 Inserting the Free Water Test Pad in the Monitor

d. Reassemble (snap the top on) the monitor.

2.5.3 Inserting the Stainless Steel Monitor into Sampler Assembly

a. Unscrew the sampler cover and insert the stainless steel monitor containing the free-water test pad (inlet side facing upstream). Screw the sampler case into the sampler cover (to a snug hand-tightness). See Figure 2.30.

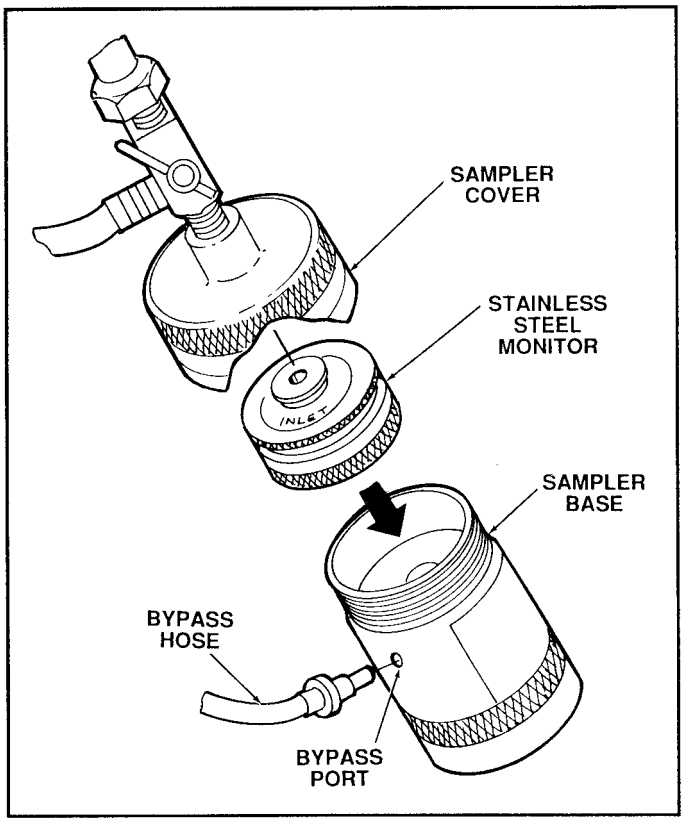

Figure 2.30 Inserting the Monitor into Sampler Base

b. Connect the bypass hose from the three-way valve to either bypass port located on the sides of the base (Figure 2.6). Press the hose down firmly into the port for a tight fit.

2.5.4 Attaching the Remote Sampling Cap and Bypass Hose

a. Thread the remote sampling cap and bypass hose into the base of the sampler.

b. Force the nylon plug into the port located on the side of the sampler base (Figure 2.31).

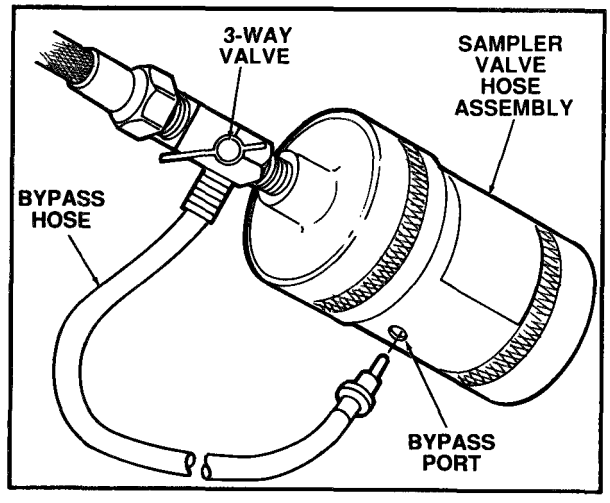

Figure 2.31 Attaching the Remote Sampling Cap and Bypass Hose

2.5.5 Connect Sampler to Quick-Release Valve

a. Remove the protective cap and plug from the quick-release valve, inlet hose nipple, and sample valve (Figure 2.8).

b. The three-way valve must be in the OFF position *before* attaching the sampler to the remote assembly the valve is closed or off when the valve arm is positioned approximately 45 degrees from the base of the valve (Figure 2.32).

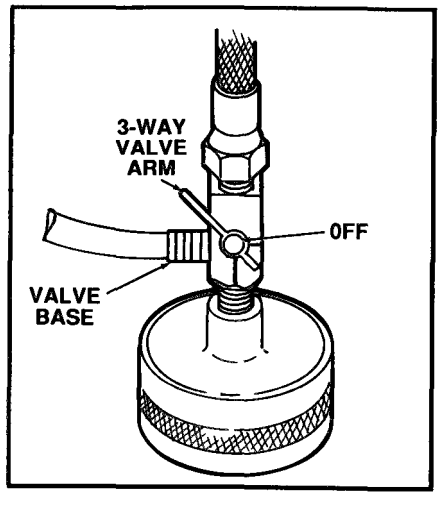

Figure 2.32 Three-Way Valve - OFF Position

c. Insert the sampler hose nipple into the quick-release valve collar (Figure 2.33): retract the valve collar and insert the nipple firmly into the valve. Release the collar when the nipple is seated.

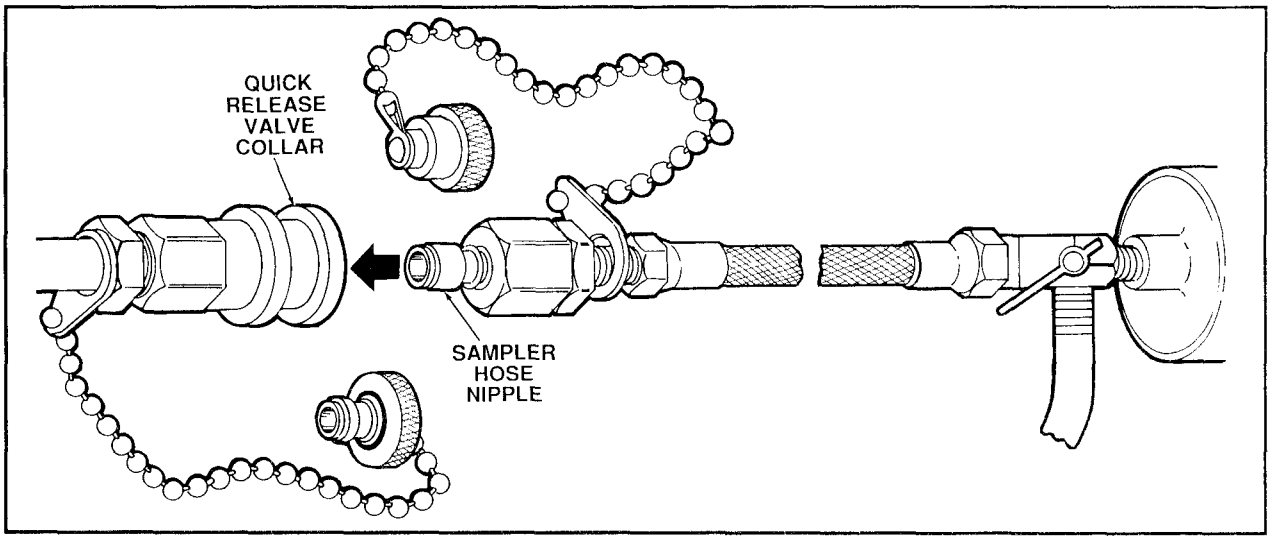

Figure 2.33 Inserting Sampler Hose Nipple into Sample Valve Collar

WARNING
The Sampler Valve Hose Assembly must be properly grounded to avoid possible fire or explosion from static electrical charges. An electrical continuity test of the ground hook-up should be performed prior to test to assure conductance of electrical charges from system to ground.

d. Attach ground wire: place one end of the ground wire on the assembly and the other end on grounded metal (such as to an automobile bumper). See Figure 2.10 for example of assembly placement.

2.5.6 Flushing the Inlet Hose

Follow the procedure outlined in Section 2.3.7 for flushing the inlet hose. **If either or all of the test procedures are performed at the same time (within the same hour), re-flushing of the lines is not required.**

2.5.7 Taking a Sample

a. Hold the sampler in an upright (vertical) position, turn the three-way valve to the **TEST** position: when the valve arm is positioned at a right angle to the base of the valve (vertical) (Figure 2.34).

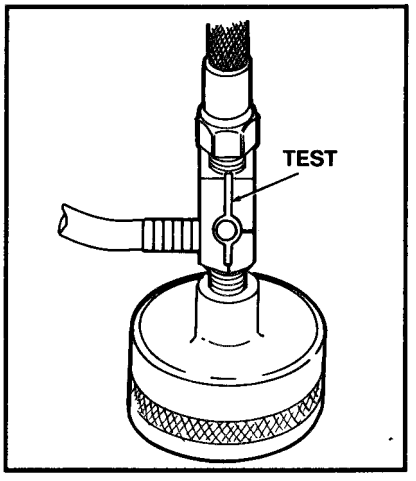

Figure 2.34 Three-Way Valve
- TEST Position

b. Allow 500 milliliters (17.0 ounces) or less of fuel to pass through the assembly and free-water test pad. Record sample volume for reporting.

c. When collection is completed, turn the three-way valve to the **OFF** position *before* turning off the system pump.

CAUTION
Some pumping systems (e.g. aircraft refuelers) develop a vacuum when closed which can cause backflow and rupture the monitor filter, rendering the test ineffective.

d. Retract the quick-release valve collar and remove the sampler nipple from the valve. Replace the protective cap and plug. See Figure 2.13.

e. Disconnect the bypass hose from the side of the sampler and unscrew the sampler base. Hold the sampler in an upright position and remove the stainless steel monitor (Figure 2.35).

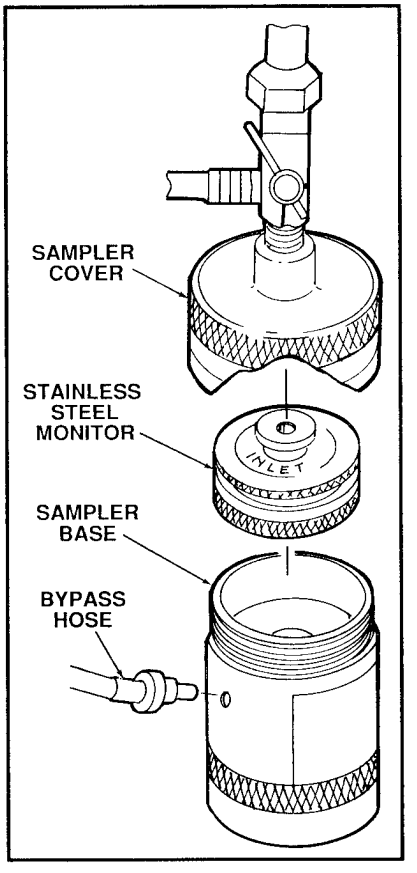

Figure 2.35 Removing Monitor from Sampler

2.5.8 Removing the Free-Water Test Pad for Undissolved Water Testing

NOTE: To maximize the accuracy of the reading, the free water test pad should be read within 3 minutes of initiating the sampling.

a. Disassemble the stainless steel monitor (pry off the top with the back end of the tweezers) and using the tweezer tips, gently remove the free-water pad.

b. Place the pad between two dry, clean paper towels. Using the heel of your hand, press the layers firmly (with approximately 5 pounds of pressure) three or four times to blot excess fluids.

NOTE: A pad that is not properly blotted will result in a low reading because the excess fuel will absorb part of the ultraviolet light and decrease flourescence.

c. Test for undissolved water level: open the test area cover located on the bottom side of the water detector. Place the free-water pad (orange-side down) in the test area window (see Figure 2.36.) Close the cover and turn the water detector upright.

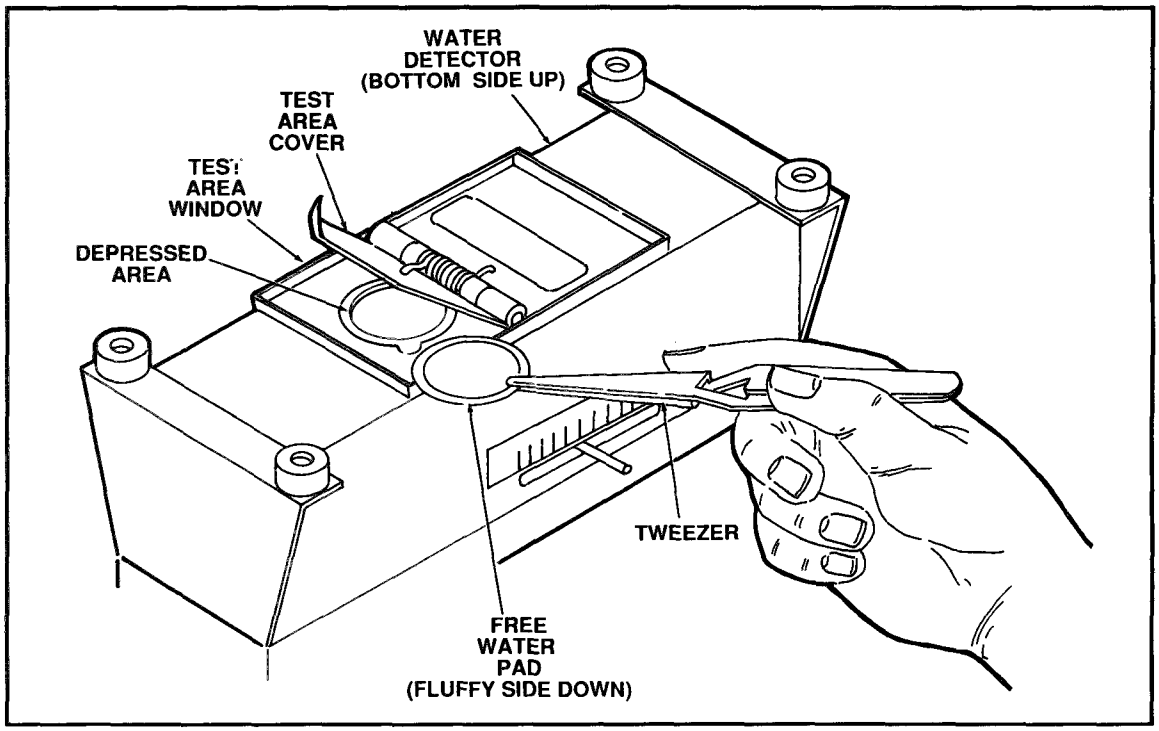

Figure 2.36 Placement of Free-Water Pad in Test Area Window

d. Turn the power setting knob to the appropriate power source (i.e., AC, external or internal battery). See Figure 2.21.

e. Depress the switch button on the instrument pack and adjust the light-modulator lever until the meter reads **"0".**

f. Read the undissolved water level where the lever crosses the scale (Figure 2.37).

NOTE: Free water, ppm = (meter reading, ppm) (500)/(sample volume, mL)

g. Record the reading to the nearest whole number as ppm by volume of undissolved water in fuel.

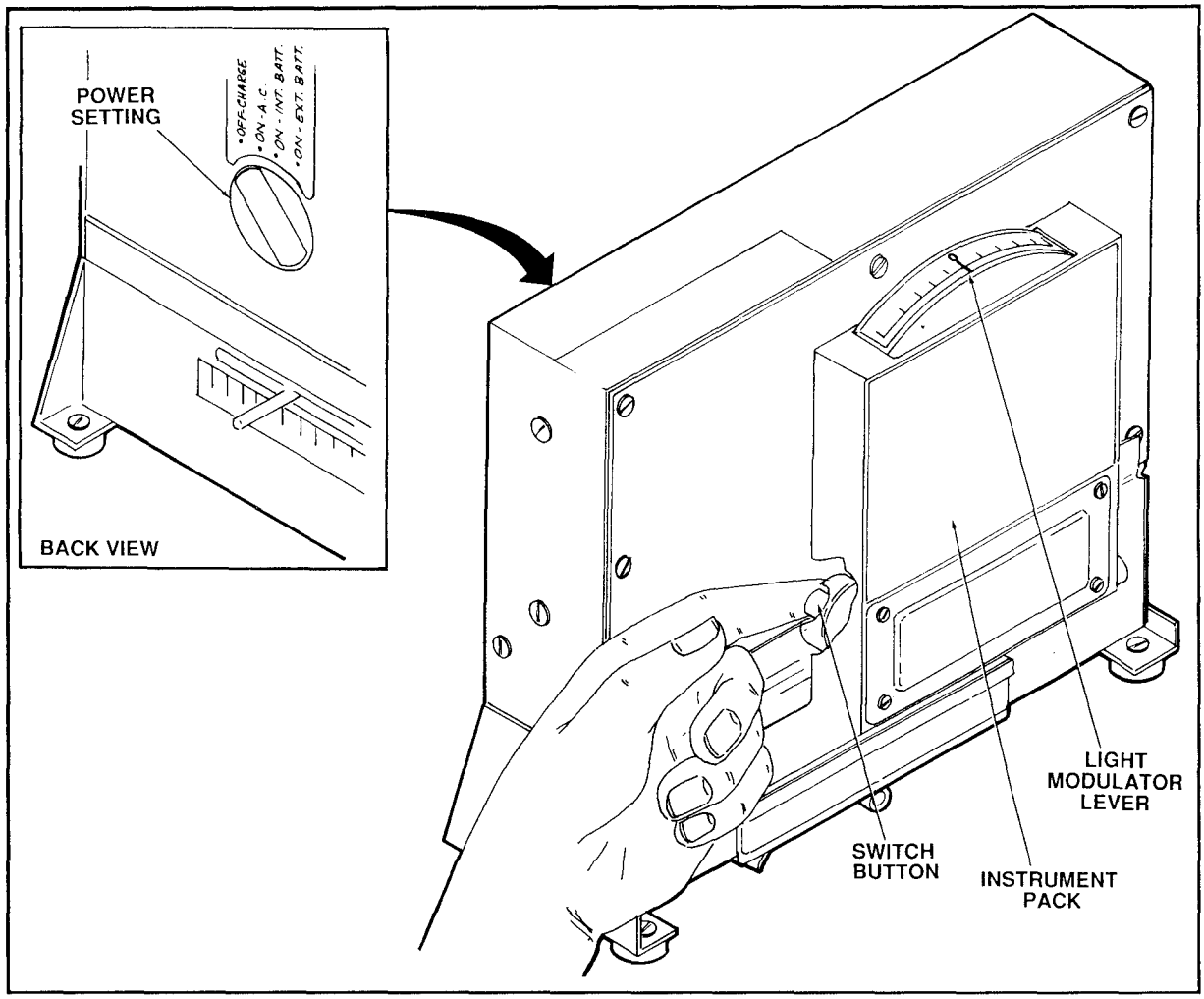

Figure 2.37 Reading the Undissolved Water Level

Chapter 3. Cleaning and Maintenance

3.1 Introduction

With proper care and maintenance, the materials used to construct the *Aviation Fuel Contaminant Test Kit* are designed for trouble-free performance throughout a long product lifetime. The following basic procedures for cleaning and care, if rigidly observed, can eliminate problems resulting from improper care. For specific replacement parts, refer to the equipment list on pages 1-2 through 1-4 and the corresponding Loading Plan (Figure 1.1) on page 1-5.

3.2 Kit Maintenance

Perform the following five steps according to a maintenance schedule developed for specific site requirements.

3.2.1 Completely disassemble all fuel line parts and components (including tubing and connectors) that come in contact with fuel.

When unscrewing or replacing threaded fittings, take particular care not to damage the metal threads which may weaken the line and cause leakage, As a general rule, threaded fittings located *upstream* of the filters can be left in place, except when dealing with liquids that deposit heavy residues. You may supplement fuel line seals with Teflon tape which should be periodically removed and replaced.

3.2.2 Remove all O-rings and gaskets from their seats, If necessary, use flat-blade unserrated forceps to pry O-rings out of their grooves.

3.2.3 Inspect all O-rings and gaskets for embedded dirt and remove any dirt with a gentle scraping. If grit particles are deeply embedded, replace the O-ring or gasket rather than excavate the grit and risk damaging a seal.

3.2.4 Carefully examine O-rings and gaskets for cracks and deep or large abrasions: discard and replace the part if the integrity of the part is compromised. For a list of replacement parts, see the equipment list on pages 1-2 through 1-4 and Figure 1.1, Page 1-5, Loading Plan.

3.3 Kit Cleaning

Perform the following five steps according to site specified standards after each testing session:

WARNING
Be sure all parts/components are clean and dry of fuel before airflight: an explosion or ignition might result from residual solvents.

3.3.1 Flush all parts/components with hot, flowing tap water to remove loose dirt particles. Wash each piece separately with a hot water and non-abrasive soap solution. Rub or gently scrub the various surfaces as described in the following steps until any dirt or dirt film is thoroughly cleaned from the piece.

3.3.2 Vigorously scrub smooth metal surfaces **(DO NOT scrub filter support screens)** with a sponge or soft bristle brush. Be systematic to ensure cleaning of entire surface area.

3.3.3 On threaded parts, use a stiff bristle brush to remove matter sticking to the bottoms of the threads.

3.3.4 O-ring grooves are best cleaned by using a cotton-tip swab, rubbing systematically along the entire length of the groove.

3.3.5 wash all O-rings and gaskets in the same soapy solution being careful not to scratch their surfaces. If adherent material strongly resists removal, replace the part rather than damaging the piece from scrubbing too hard.

CAUTION
As a general rule, do not use special solvents to remove stains or stubborn soil. If proper cleaning is performed routinely (after each use) stains and soil will be minimized. Remember that the harmful effects of overzealous cleaning techniques can far outweigh the effect of the stain on the function of the part or component.

3.3.6 After cleaning, thoroughly rinse all components in hot, flowing water then rinse again with cold water. It is always good practice -- and essential in critical applications -- to prefilter the final rinse water for removal of any entrained dirt. In hard-water areas, distilled or de-ionized water might be needed for the final rinse to remove any deposits.

3.3.7 After the final rinse, re-inspect O-rings and gaskets for cracks or other damage. Replace them if damaged.

3.4 Drying and Storage

Dry all components completely before storing with a clean, soft absorbent cloth and if available, a blast of compressed air. If compressed air is used it must be entirely free of oil droplets and dirt particles. When thoroughly dried, re-assemble the equipment and store it in its appropriate slot in the kit's foam insert. (see Figure 1.1, Loading Plan, page 1-5.)

3.5 Hydrometer Maintenance and Cleaning

The hydrometers come in direct contact with fuel and should be properly cleaned and wiped dry before storing and re-use. Follow these three steps after each use:

3.5.1 Wipe excess fuel off the glass hydrometer(s) with clean, soft absorbent cloth.

3.5.2. Wipe the glass hydrometer(s) with a second cloth that has been dampened with the specified cleaning solvent for the type of fuel tested and allow solvent to air dry (excess may be wiped with a dry cloth).

3.5.3 when completely dry, place the hydrometer(s) inside the protective container.

By Order of the Secretary of the Army:

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Chief of Staff

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☆U.S. GOVERNMENT PRINTING OFFICE: 1990 - 754-029/20112

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