TECHNICAL MANUAL

OPERATOR, ORGANIZATIONAL, DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE MANUAL

MOBILE SEMITRAILER-MOUNTED, PETROLEUM LABORATORY (NSN 6640-00-538-2736)

HEADQUARTERS, DEPARTMENT OF THE ARMY

30 DECEMBER 1980

CHANGE

NO 2

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., 21 *July* 1987

OPERATOR, ORGANIZATIONAL, DIRECT SUPPORT
AND GENERAL SUPPORT MAINTENANCE MANUAL

MOBILE SEMITRAILER-MOUNTED
PETROLEUM LABORATORY
(NSN 6640-00-538-2736)

TM 5-6640-212-14, 30 December 1980, is changed as follows:

1 Remove and insert pages as indicated below. New or changed text material is indicated by a vertical bar in the margin. An illustration change is indicated by a miniature pointing hand.

Remove pages	Insert pages
i and iii and ii	i and ii
B-7 and B-8	B-7 and B-8

2 Retain this sheet in front of manual for reference purposes.

By Order of the Secretary of the Army:

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To be distributed in accordance with DA Form 12-25A, Operator, Unit, and Direct Support and General Support Maintenance Requirements for Laboratory, Petroleum, Mobil, Semitrailer Mounted (TM 5-6640-212-14)

CHANGE
NO. 1

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., 16 January 1984

OPERATOR, ORGANIZATIONAL, DIRECT SUPPORT
AND GENERAL SUPPORT MAINTENANCE MANUAL

MOBILE SEMITRAILER-MOUNTED
PETROLEUM LABORATORY
(NSN 6640-00-538-2736)

TM 5-6640-212-14, 30 December 1980, is changed as follows:

1. Remove and insert pages as indicated below.

	Remove pages	Insert pages
Table of Contents	iii and iv	iii and iv
Appendix B	B-1 thru B-54	B-1 thru B-54.1/B-54.2
	B-55 and B-56	B-55 and B-56
	B-61 thru B-64	B-61 thru B-64
		B-99/B-100
Appendix C	C-7 and C-8	C-7 thru C-8.2

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WARNING

The laboratory van is equipped with a 24 volt electrical system. It can be adapted to a towing vehicle with a 12 volt system by using the 12 volt cable adapter which is stored in the van tool box and is issued as a Basic Issue Item (Ref Appendix C, TM 9-2330-271-14). It is absolutely essential that the 24 volt lamps in the tail lights, brake lights and clearance lights be replaced with 12 volt bulbs before the 12 volt cable is connected to the towing vehicle.

Do not enter any of the trailer compartments from outside of the van without purging the van of explosive vapors. Step by step instructions are specified on the instruction plate adjacent to the power receptacle (fig. 1-3). Do not enter van until red light goes off.

Do not insert hands inside of centrifuge when it is in motion.
(ANALYTICAL BALANCE-SARTORIUS MODEL 2400-2463)

The radioactive isotope Polonium 210 is toxic and ingestion or inhalation of the solid material should be prevented. Do not remove the protective grid or touch the radioactive strip under the grid. If the strip is accidentally touched or handled, wash hands immediately with soap and water. The Ionizer is made by sealing Polonium between a base of silver and a layer of gold. The element is then protected by a shield and grid which prevent direct contact. Most of the radioactivity will be decayed to a non radioactive substance when the device is no longer effective as a static eliminator. The small quantity of remaining material may be a potential hazard if mishandled. Return for disposal if use is to be discontinued. DO NOT DISCARD AS SCRAP. DISPOSE AS RADIOACTIVE MATERIAL.

When filling the Reid Vapor Pressure, (RVP), Bomb Bath, exercise extreme caution in adding the required ten (10) Parts Per Million, (PPM), of copper sulfate. Do not exceed this proportion as twelve (12) PPM of copper sulfate is poisonous.

Wear safety goggles and cloth gloves while operating the Dry Ice Machine.

Do not lubricate valves and regulators on compressed gas bottles (pressurized oxygen and oil can create an explosion).

If a mercury spill occurs, do not vacuum or sweep the area. This will disperse mercury throughout the laboratory. Spills may be cleaned up by using a glass tube of about 6 cm diameter drawn out to an opening about 1 mm and connected by rubber tubing to a filter flask connected with a vacuum pump or aspirator, the flask acting as a trap. Control of mercury vapor should not be attempted with Flowers of Sulfur as this is not effective. Spills must be reported to the Environmental Science Officer providing services to the unit.

Disconnect power before removing heating element from high pressure steam boiler.

Be sure gum bath has had time to cool before working on it. Steam temperatures as high as 600 degrees F (279.9 degrees C) can be obtained in this unit.

Dry cleaning solvent, P-D-680, used to clean parts is potentially dangerous to personnel and property. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 100 degrees F to 138 degrees F (38 degrees C to 59 degrees C).

TECHNICAL MANUAL

No. 5-6640-212-14

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C
30 December 1980

OPERATOR, ORGANIZATIONAL, DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE MANUAL MOBILE SEMITRAILER-MOUNTED, PETROLEUM LABORATORY (NSN 6640-00-538-2736)

REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

You can help improve this manual. If you find any mistake or if you know of a way to improve the procedures, please let us know. Mail your letter, DA Form 2028 (Recommended Changes to Publications and Blank Forms), to: Commander, U. S. Army Troop Support Command, ATTN: AMSTR-MCTS, 4300 Goodfellow Boulevard, St. Louis, MO 63120-1798. A reply will be furnished directly to you.

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CHAPTER 1
INTRODUCTION
Section I. GENERAL

1-1. Scope. This manual contains the operations, operator organizational, and direct support and general support maintenance data for the mobile, semitrailer-mounted, petroleum laboratory (NSN 6640-00-538-2736). The instruction in this manual are limited to procedures for the use and maintenance of specific utility and laboratory equipment for the petroleum laboratory. Use and maintenance instructions for the XM822 semitrailer are given in TM 9-2330-271-14.

1-2. Maintenance Forms and Records. Equipment maintenance forms and procedures for their use are contained in TM 38-750, The Army Maintenance Management Systems (TAMMS).

1-3. Reporting Equipment *I*mprovement Recommendations (EIR). EIR's will be prepared on SF368. Maintenance Request *Instructions for* preparing EIR's are provided in TM 38-750, the Army Maintenance Management System. *EIR's* should be mailed directly to Commander, US Army Troop Support and Aviation Materiel Readiness Command, ATTN: DRSTS-ME, 4300 Goodfellow Boulevard, St. Louis, MO 63120. A reply will be furnished directly to you.

Section II. DESCRIPTION AND DATA

1-4. General. The petroleum testing laboratory is contained in the XM822 4-wheel, 10-ton semitrailer van (NSN 2330-00-122-4966) (fig. 1-1). The laboratory is used to perform tests on petroleum products in the field. Tests include qualitative and quantitative analyses of a wide range of military fuels and lubricant. The laboratory is a completely self-contained unit which requires only an external power source, a water supply and a waste water disposal facility when in operation.

a. Orientation to Laboratory and Van. Throughout this manual the terms right, left, front, and rear indicate directions from the viewpoint of the operator entering the rear door of the van (1, fig. 1-1).

b. Orientation to Laboratory *Equipment.* Throughout this manual the terms right, left, front and rear indicate directions from the viewpoint of the operator as he faces the item of equipment installed in the laboratory.

1-5. Laboratory Interior. The laboratory is composed of three compartment within the XM822 semitrailer.

a. Front Compartment*.* The front, or utility, compartment contains the air conditioner, heater unit, compressed air system, vacuum system, pressure water system, and related piping and ducting. The air conditioner (model No. 76E34-104, TM 5-4120-295-15) is rated at 60,000 BTU. The heater is made up of 12 heating elements located in the air conditioning duct. The utility compartment is completely separated from the laboratory compartment by the fume hood, gum bath area, refrigerator, and cabinets forming the front wall of the laboratory. Access to the utility compartment is through the forward curbside door.

b. Central Compartment. The central, or laboratory compartment (fig. 1-2) has three stainless steel covered counter and cabinet areas. Special laboratory equipment is installed on countertops and adjacent walls and stowed in cabinets and drawers. The laboratories are windowless.

c. Rear Compartment. The rear compartment contains the carbon dioxide ice making machine and propane, oxygen and carbon dioxide cylinders which are located along the left, (roadside) wall. Access to the rear compartment is through a door in the partition which forms the laboratory rear wall, or the door in the van rear wall. Purging ducts run the length of the van ceiling from the utility compartment to the rear compartment. This equipment is covered in greater detail in Chapters 2 and 3 of this manual.

1-6. Laboratory Exterior. The van exterior (fig. 1-1) incorporates various items for laboratory. Special vent ports are on the right (curbside) rear exterior wall and are used with the exhaust fan located in the rear compartment. Two small vents on the left (roadside) rear wall (1) relieve the propane gas tank located in the rear compartment. A water inlet, located on the left (roadside) forward exterior wall, is used to supply water to the laboratory. The power entry receptacle and the purging timer panel (fig. 1-3) are located on the left (roadside) rear wall. Roadside and curbside compartments on the van undercarriage provide

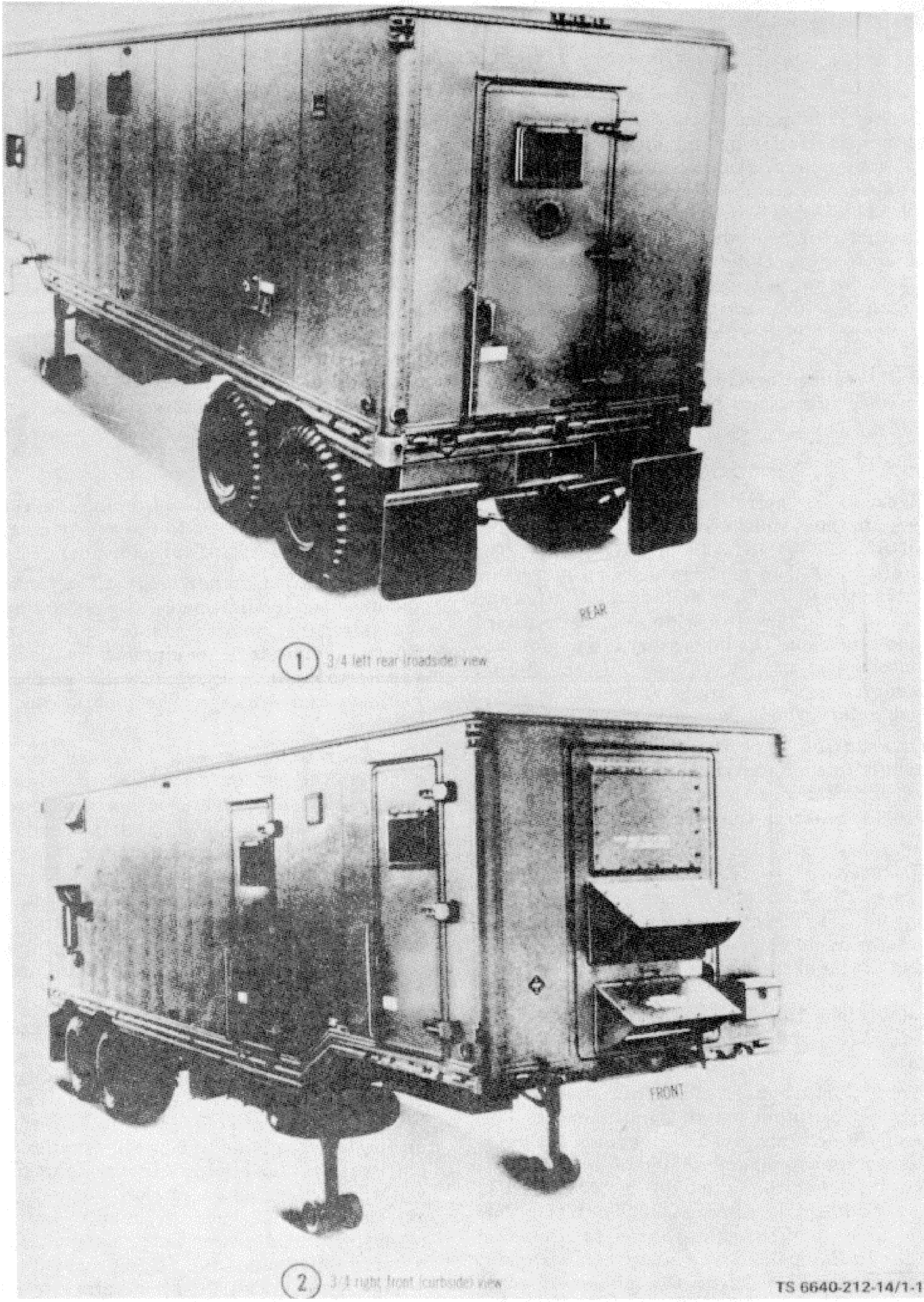
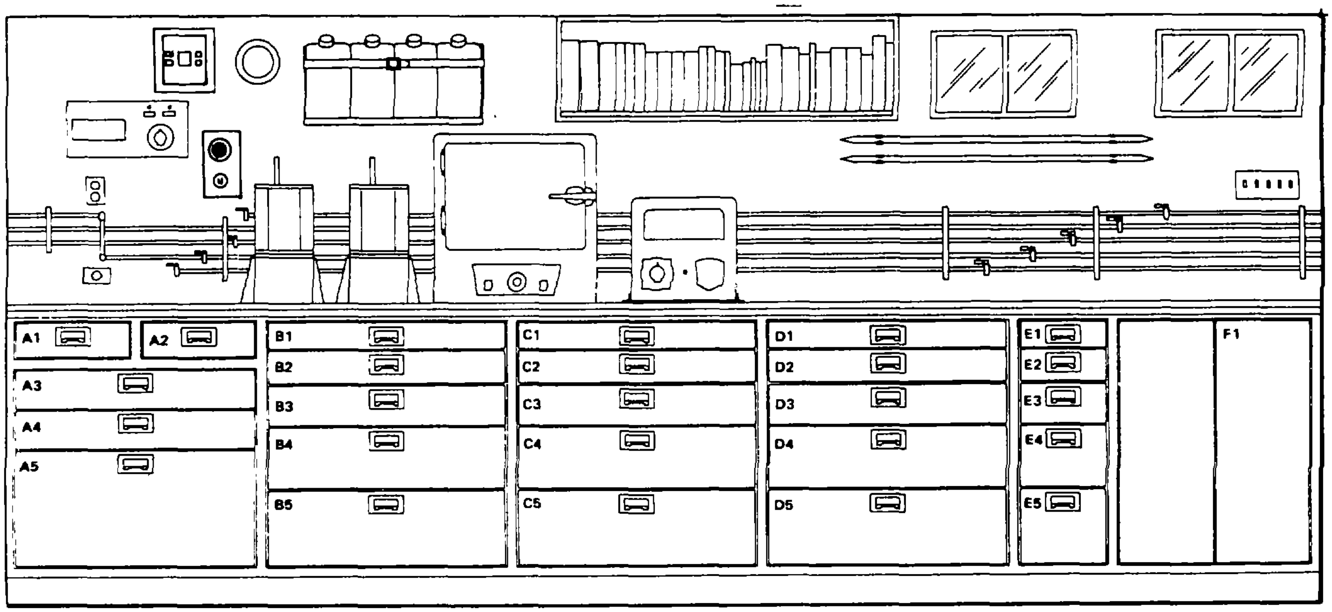
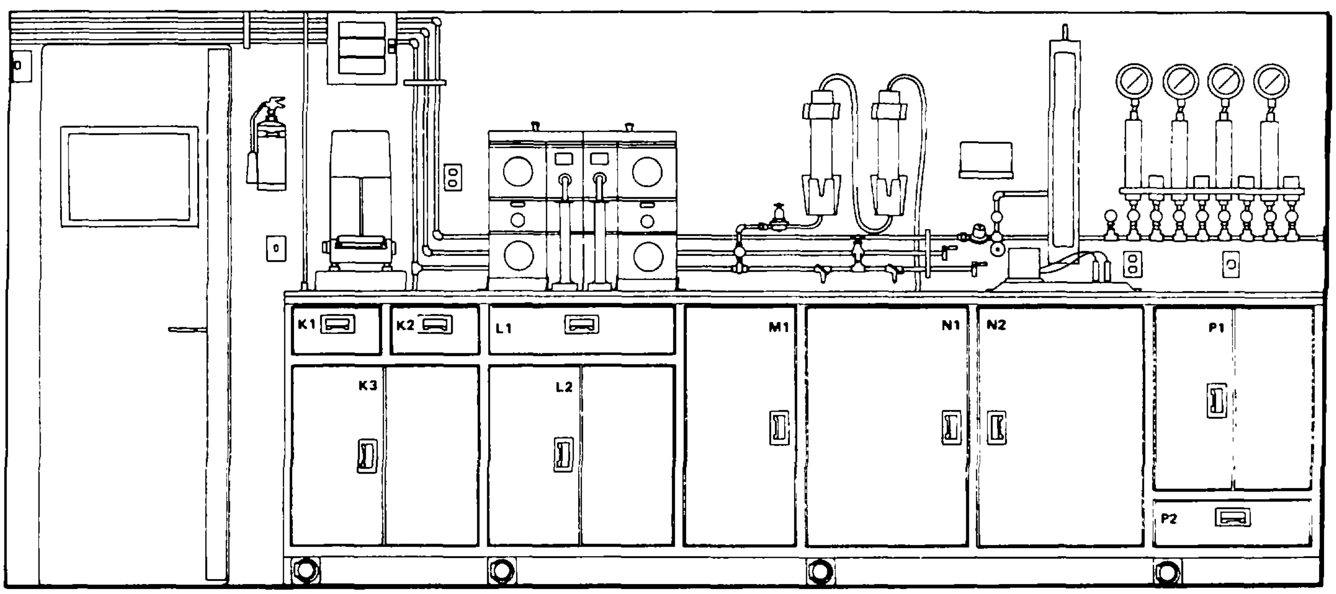


Figure 1-1. Exterior of Mobile Petroleum Laboratory Trailer



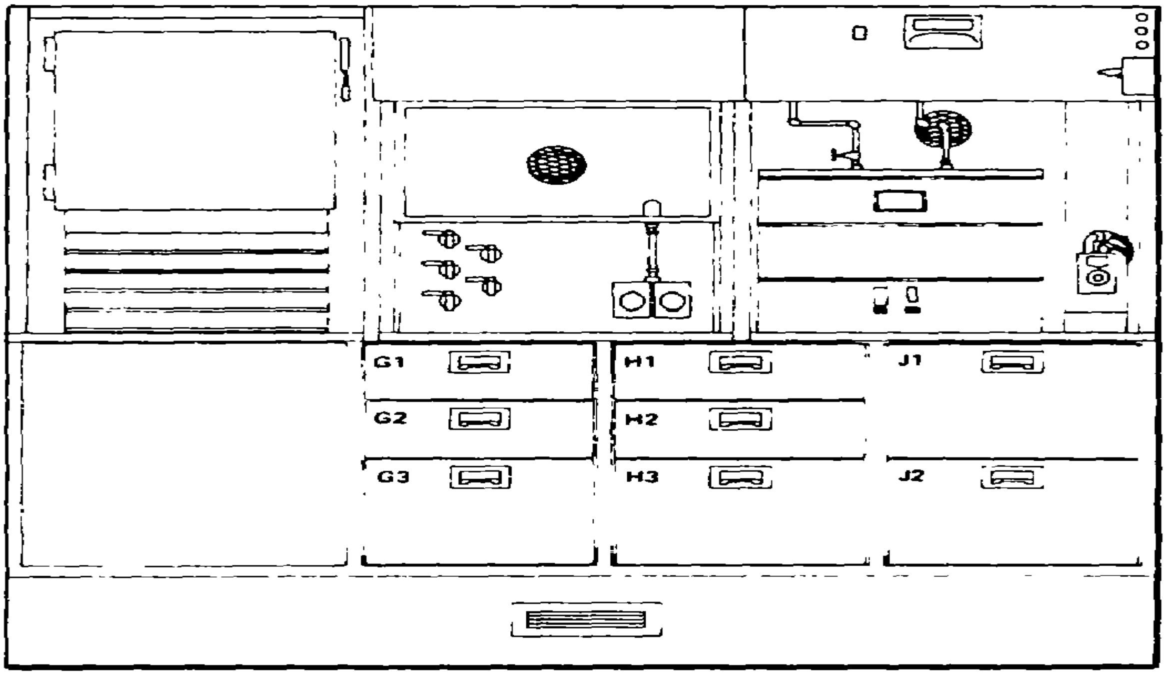
CENTRAL COMPARTMENT
(LEFT-HAND SIDE VIEW)



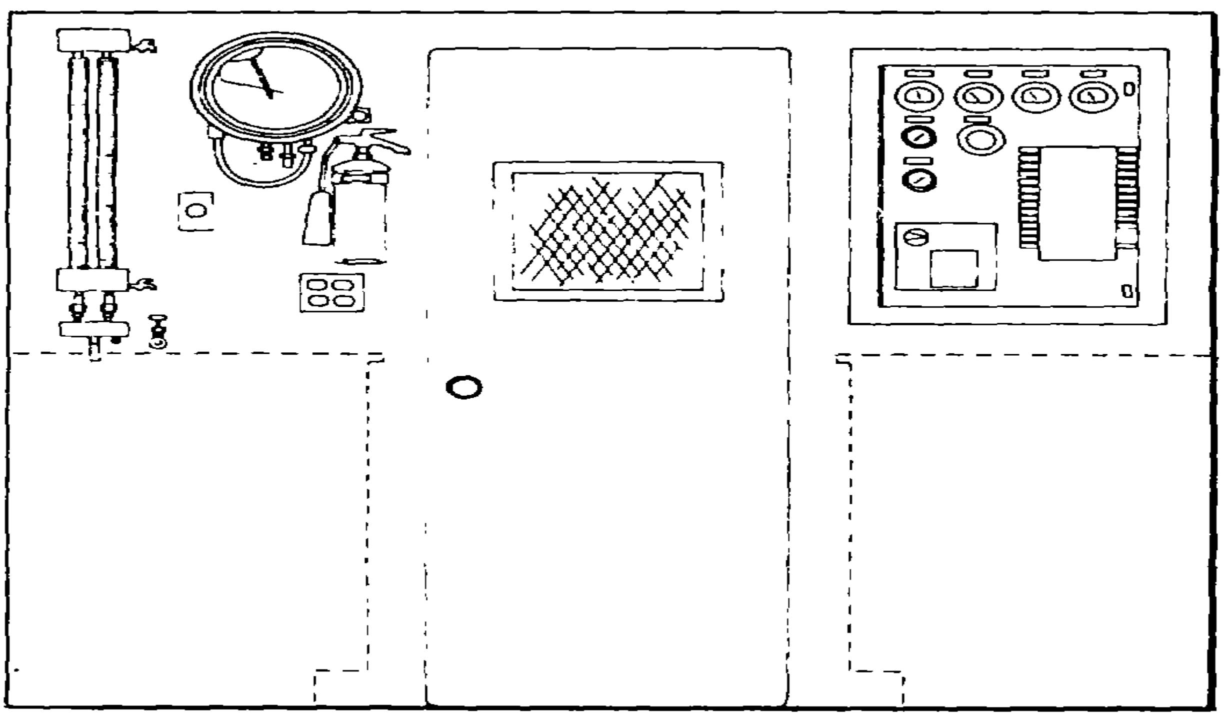
CENTRAL COMPARTMENT
(RIGHT-HAND SIDE VIEW)

TS 6640-212-14/1-2 1

Figure 1-2. Central, or Laboratory Compartment Layout (Sheet 1 of 2)



FORWARD PARTITION (FUME HOOD)



REAR PARTITION (REAR ACCESS DOOR)

TS 6640-212-14/1-2 (2)

Figure 1-2. Central, or Laboratory Compartment Layout (Sheet 2 of2) storage for spare ASTM fuel cans. The left (roadside) compartment provides space for a garden hose, tarpaulin, van grounding rod, and the power entry cable. A toolbox is also mounted on the undercarriage at the left (roadside).

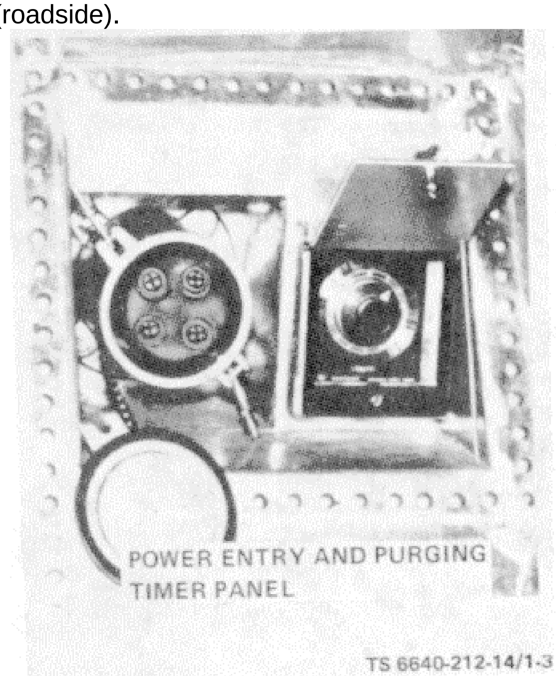


Figure 1-3. Power Entry and Purging Timer Panel

1-7. Electrical System.

a. 110/220-Volt System. The petroleum van is equipped with a 110-volt and a 220-volt electrical system. The 110-volt system (FO-1, located at back of manual) provides power for interior lighting and laboratory equipment requiring 110 volts. The 220-volt system (FO-2, located at back of manual) is used for the air conditioning, heating system, and laboratory *equipment* requiring 220 volts. A power entry receptacle and timeclock for purging the van are located on the rear, left exterior of the van.

b. 12/24-Volt System. The van has a 24-volt electrical system, but can be connected to a towing *vehicle* with a 12-volt system by using the 12-volt cable adapter (stored in toolbox) furnished as a basic issue item. Before the van is connected to the 12-volt system, the 24-volt lamps in the tail light, brakelight and *clearance* lights, must be replaced with 12-volt bulbs.

c. Master Switchboxes. Two master switchboxes are located in the rear compartment. The switchboxes control the 110-volt and 220-volt circuits. Each switchbox is provided with a circuit breaker.

d. Main Control Panel. The main control panel (fig. 1-4) is located on the left rear wall of the laboratory compartment. It contains circuit breakers for control of the laboratory equipment. Instruments and gages necessary for surveillance of systems operating conditions are also provided.

e. Light Switches. Light switches for the electrical system are shown in figure 1-5. A microswitch for the blackout lights is located in each of the three outside doorjambs. Two override switches are provided to bypass the blackout lights. Eight three-way switches are located in the van interior, four in the laboratory *compartment* and four in the rear compartment. A one-way switch is located inside the utility compartment.

f. Fume Hood and Gum Bath Controls. The fume hood and gum bath controls are also shown in figure 1-5. The switchplate for these controls is mounted on the left interior laboratory wall immediately above the countertop access to the centrifuge. There are toggle switches for the gum bath blower, the fume hood blower, and the van purging blower.

g. Receptacles. Eight dual receptacles (utility outlets) are located in the van interior, four in the laboratory compartment and two each in the rear and utility compartment. A telephone inlet jack is located toward the rear of the laboratory compartment roadside wall.

h. ***Motor Starter-Relay Boxes.*** The air compressor, vacuum pump, and water pump motors are provided with starter-relay boxes located near the equipment in the utility compartment.

i. Interior Lights. Interior lights for the laboratory are shown in figure 1-6.

(1) Fluorescent light fixtures. Six dual 80-watt, 110-watt, fluorescent lights are installed in the interior of the van, four in the laboratory compartment and two in the rear compartment.

(2) Incandescent light fixtures. Four incandescent light fixtures are installed in the utility compartment. The two rear fixtures each contain a single, white, 75-watt, 110-volt, heavy duty bulb. The two front fixtures each contain a white, 75-watt, 110- volt, heavy duty bulb and a red, 15-watt, blackout bulb.

(3) Vaportight light fixtures. Two vaportight light fixtures are installed in the van, one in the fume hood and one in the gum bath area. Each fixture is equipped with a 75-watt, 110- volt, ruggedized bulb.

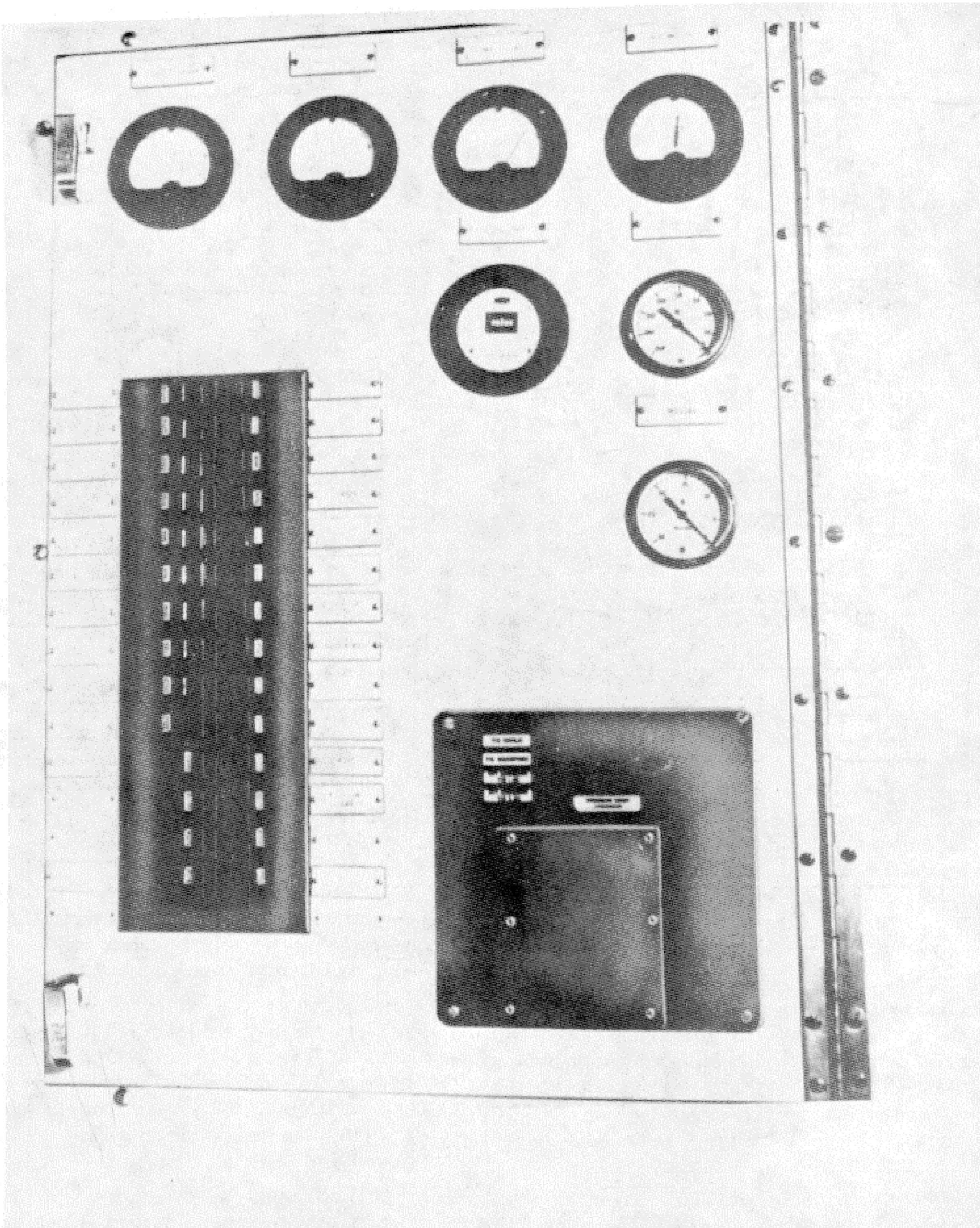


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Figure 1-4. Main Control Panel

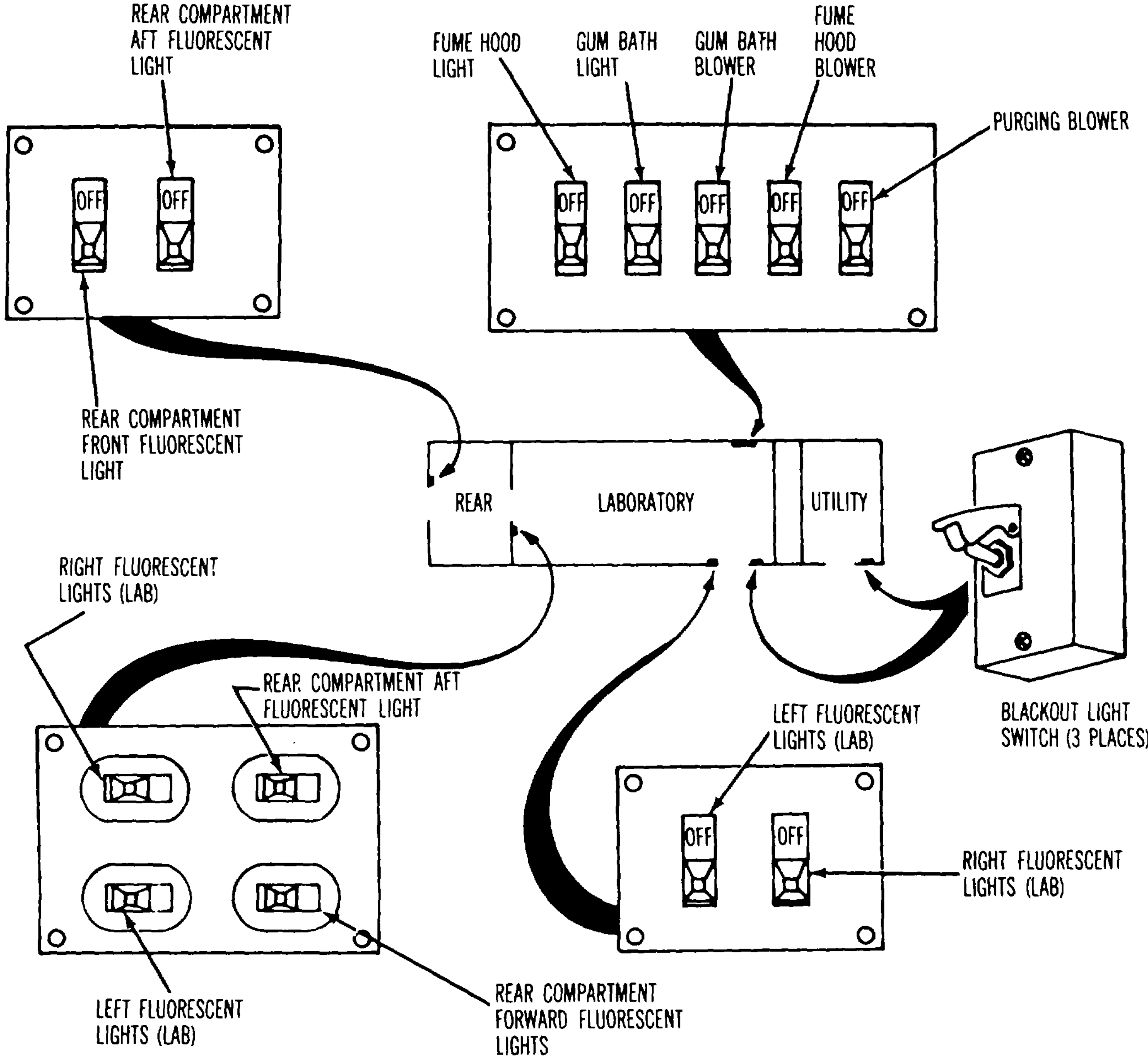


Figure 1-5. Light Switches

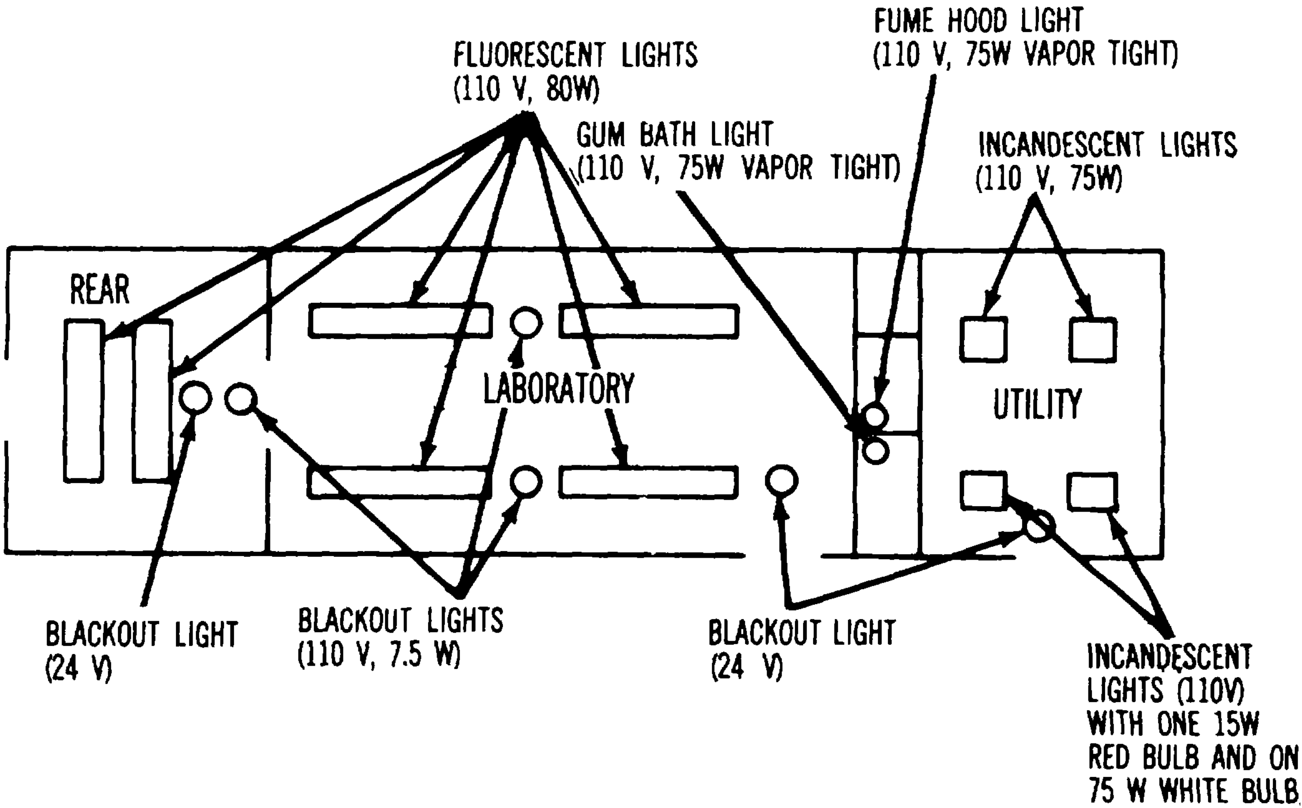


Figure 1-6. Interior Lights

(4) Blackout lights. Two 110-volt blackout dome lights are installed in the laboratory compartment and one is installed in the rear compartment. Two of the dome lights in the utility compartment contain a 110-volt, red, blackout bulb. A 24-volt blackout dome light is installed in each of the three compartments.

1-8. Piping for Utility Systems. Four utility systems provide the water, compressed air, vacuum, and propane gas required by the laboratory equipment. Piping for the utility systems is illustrated in figure 1-7. Copper tubing is used in all utility systems. All piping originates at equipment in the utility compartment, except the propane gas lines which originate in the rear compartment.

a. Water. The dual water system originates at the water pump in the utility compartments. The system consists of a water supply lines, a water return line, and a 56-gallon water tank. Water may be supplied from the water tank by the water pump, or the pump may be bypassed and an external source of water (not to exceed 70 psi) (31.8kg/sq cm) used. A gate valve allows the use of either method of water supply. The water supply line pipes water to all parts of the laboratory compartment. The line has seven outlet valves, two on the left wall, four on the right wall, and one in the fume hood. The water return line carries off water discharged from condensers and other apparatus that require constant water circulation. The return line has two inlet valves on the left wall. The water tank can be filled through a pipe fitting on top of the tank or by attaching a water source to the inlet connection on the roadside of the van. Two filters, one between the inlet and the supply lines and one between the pump and supply line, insure clean water to the system.

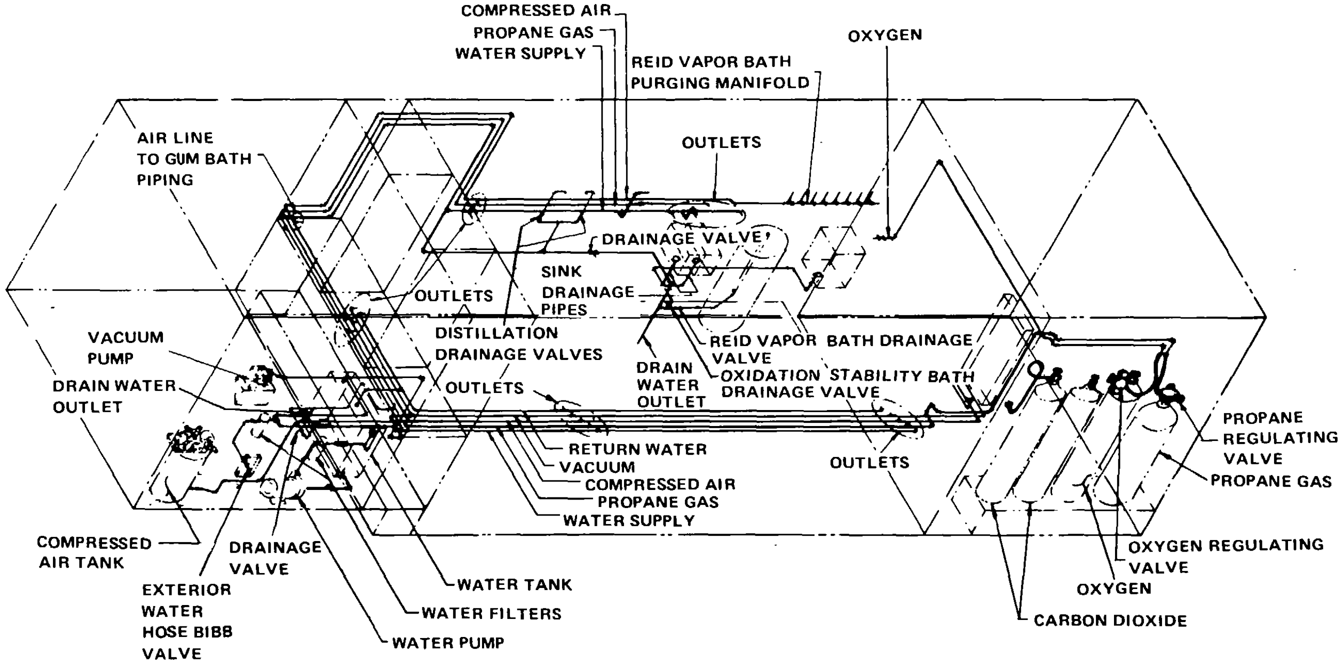


Figure 1-7. Piping for Utility Systems.

b. Compressed Air. The compressed air system originates at the air compressor in the utility compartment. The air line has four outlet valves, two on the left wall, one on the right wall, and one in the fume hood. Ten additional outlet valves are located on the right wall for the purging manifold. The compressed air line on the left side of the laboratory compartment terminates in a copper tube connected to the pressure gage in the main control panel.

c. Vacuum. The vacuum system originates at the vacuum pump in the utility compartment. The vacuum system has two inlet valves on the left wall and an inlet valve in the fume hood. The line terminates in a flexible Copper tube connected to the vacuum gage in the main control panel.

d. Propane. The propane gas system originates at the propane gas cylinder in the rear compartment. Propane is used to operate bunsen burners in the mobile laboratory. The system has two outlet valves on the left wall, two valves on the right wall, and one valve in the fume hood.

1-9. Blower (Purging). Three blowers are installed in the utility compartment. One blower purges fumes from the van, another exhausts fume from the gum bath, and another from the fume hood. All blowers are controlled individually. Switches controlling the gum bath and fume hood blowers are located on the switchplate mounted on the forward, left wall immediately behind the icemaker. The van-purging blower is also controlled by a timer located on the left (roadside) power entry panel. Van-purging instructions are located adjacent to the timer. Warning plates cautioning personnel to purge the van before entering are on all exterior doors. The circuit breaker for all blowers is located on the left wall of the rear compartment. The purging circuit breaker is always in the ON position.

1-10. Fire Extinguishers. The van is equipped with four fire extinguishers. Two are located in the laboratory compartment interior, one to the right of the curbside door and one to the left of the rear compartment access door. The rear compartment has an extinguisher mounted on the rear wall between the door and the fuel blending kit. The utility compartment has an extinguisher mounted to the left of the door.

1-11. Ladders. A 12-foot extension ladder and two three-step and one four-step boarding ladders, are stored on the undercarriage of the van.

1-12. Tabulated Data. Refer to table 1-1 for tabulated data for the petroleum semitrailer van.

Table 1-1. Tabulated Data

Semitrailer Van	Model XM822
4 Wheel, 10-Ton	(NSN 2330-00-122-4966)
Vacuum Pump	Model 1405B
Free air capacity	58 liters per minute
1/2 hp. motor	115 vac, 60 Hz.
Air Compressor	Model 1 AVSV3, w/30 gallon tank
Tank capacity	30 gallons (113.5 liters)
Water Pump	Model PE75C
Capacity	60 gallons per minute
Motor	3/4 hp., 115v, 3,450 rpm
Water tank capacity	56 gallons (212 liters)
Compressed Gas Cylinders	
CO2 gas cylinder type	No. 50 lb.-CO2
CO2 valve type	No. 50 lb.-CO2
Propane gas cylinder type	100 lb.
Propane regulator type	Pressure reducing and regulating valve
Oxygen cylinder type	No. k, 244 cu ft
Oxygen valve type	5400-OBOO
Oxygen regulator type	03X05
Air Conditioner	Model 76E34-104
Rating	60, 000 BTU
Power	208 volts, 3 phase, 60 Hz.
Operation and Maintenance Data	TM5-4120-295-15
Heating System	
First tier of six heating elements	1000 watt, 220 volt each
Second tier of six heating elements	1600 watt, 220 volt each
Analytical Balance	
Weighing capacity	
Weighing range	100 g.
Taring optical range	1 g.
Total	101 g.

Table 1-1. Tabulated Data - Continued

Taring ranges	
Manual tare range (optional)	50 g.
Mechanical taring	
(maximum with built-in weights)	100 g.
Optional range	1 g.
One optical division	10 mg.
One micrometer division	
(digital readability)	0.1 mg.
Precision (standard deviation)	± 0.05 mg.
Accuracy in optical range	± 0.05 mg.
Preventing range, direct	100 g.

CHAPTER 2
OPERATING INSTRUCTIONS

2-1. Preparation of Laboratory for Use.

a. Inspect the interior of the laboratory for broken glassware and other equipment damage, Inspect the exterior of the semitrailer for any visible damage sustained in transit. If trailer is damaged, fill in DD Form 250 (Material Inspection and Receiving Report) and process in accordance with current requirement.

b. Using the sight levels located at each end of the *semitrailer,* make certain the laboratory is leveled properly.

CAUTION

Some of the test apparatus may be adversely affected so that they are either inoperable or give incorrect readings if the laboratory is not leveled properly.

NOTE

Refer to table 2-1 for data plate information regarding warnings and cautions required to operate petroleum laboratory.

c. Supply power to the laboratory.

d. Attach a drain hose to the air conditioner condensate pipe. Operate the air conditioner and make certain that the fan is rotating in the proper direction. Refer to TM 5-4120-295-15.

e. Inspect each item of equipment and supply for *damage. Remove* all shipment retainer brackets and straps.

f. Supply water to the laboratory by manually filling the water tank or by attaching a water pipe to the inlet at the front roadside. Make certain the incoming pressure does not exceed 70 psi (31.8 kg/sq cm).

g. Connect a length of garden hose to the sink drain connection and route the hose to a drainage ditch or to a previously prepared sump.

2-2. General *Operating* Instructions.

a. Remove the stepladders from the rack. Place one three-step ladder at the rear door, the other three-step ladder at the laboratory door, and the four-step ladder at the utility compartment door.

b. Connect the electrical power cable, stored beneath the trailer, to the outside power source and to the receptacle (fig. 1-3) located on the left side of the semitrailer.

WARNING

Purging blowers operated with main power circuit breakers in OFF position. Do not enter any trailer compartment before purging van of explosive vapors.

c. Before initial entry into the van, operate the van purging blowers according to instructions on instruction plate adjacent to power entry receptacle and timer as follows:

NOTE

Purge the laboratory for a minimum of 10 minutes before entry, after a shutdown period of 2 or more hours.

(1) Open the two vent covers, identified as PURGE, DUCT ONE, on the forward sidewall of the van roadside. Open one vent cover, identified as PURGE, DUCT TWO, on the forward right (curbside) sidewall of the van.

(2) Open door of timer housing.

(3) Turn clock dial clockwise until 20 minutes is indicated on dial.

(4) Do not enter van until red light goes off. The red light indicates that the van interior has been purged of explosive vapors.

(5) If the warning light fails to illuminate, check bulb and connection to timer assembly.

d. Enter the rear compartment. Turn on the main power circuit breakers.

e. Turn on necessary lights.

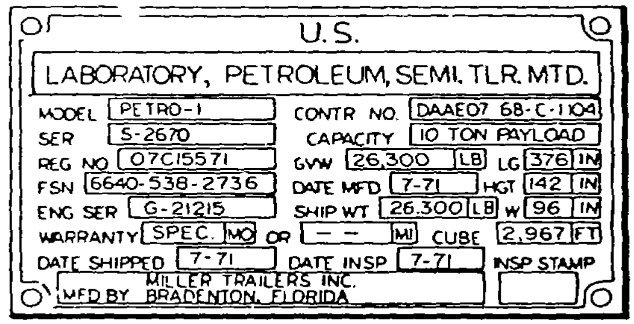
f. Check the gages on laboratory compartment control panel (fig. 1-4) for proper line voltage and current indications.

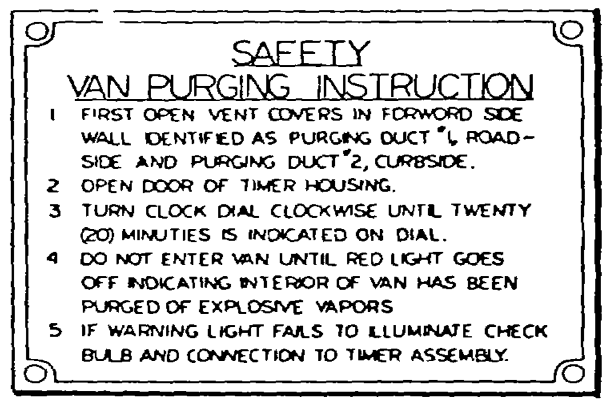
g. Operate the heater and air conditioner according to instructions in paragraphs 2-7 and 2-8.

h. Check water supply in tank located in utility compartment. Replenish if necessary.

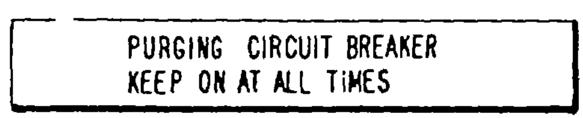
i. Turn on water pump (or connect outside water source, if available), vacuum pump, and compressor if necessary. Check compressed air and vacuum pressure gages on control panel.

Table 2-1. Data Plates

<table>
<tr><th>Qty</th><th>Description</th><th></th></tr>
<tr><td>1</td><td>PLATE, IDENTIFICATION: located aft of front door of utility compartment;</td><td>


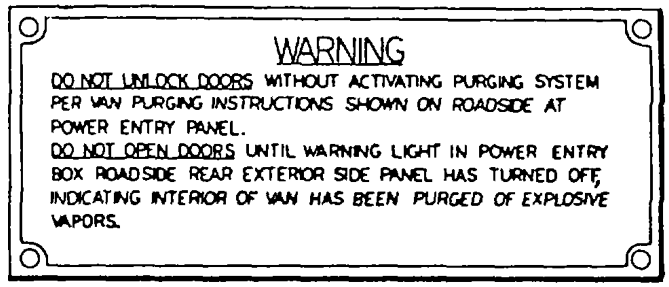
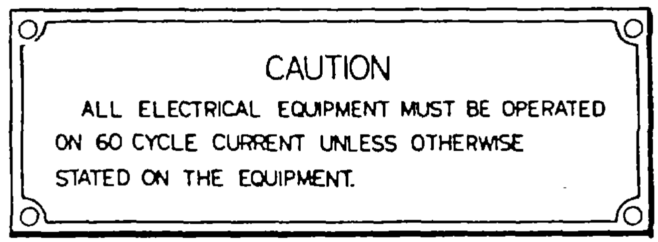
</td></tr>
<tr><td>1</td><td>PLATE, INSTRUCTION: located aft of power entry receptacle and purging timer;</td><td>


</td></tr>
<tr><td>3</td><td>PLATE, INSTRUCTION: located on front wall and on each side of semitrailer, at the drop;</td><td>


</td></tr>
<tr><td>1</td><td>PLATE, INSTRUCTION: located above purging instruction plate, aft of power entry receptacle and purging timer;</td><td>


</td></tr>
</table>

Table 2-1. Data Plates (cont.)

Qty	Description	
3	**PLATE, INSTRUCTION**: located at each of the three entrance doors;	
1	**PLATE, INSTRUCTION:** located in rear compartment at purging circuit breaker;	

2-3. Vacuum Pump.

a. Description. The vacuum pump (fig. 2-1) consists of a two-stage pump and a one-half horsepower electric motor mounted on a common base. The base is mounted on an elevated shelf on the left wall of the utility compartment adjacent to the air compressor. Power transmission from drive motor to pump is by V-belt and pulleys. The pump is connected through the van utility system piping (fig. 1-7) to the laboratory compartment outlets. The pulley-belt combination provides for a speed of 525 revolutions per minute. The pump has a 58-liter per minute free air capacity, with a vacuum of 0.1 micron (0.001 mm. Hg).

b. Controls and Instruments.

(1) Electrical Controls. Operation of the vacuum pump is controlled by the vacuum circuit breaker on the main control panel (fig. 1-4).

(2) Oil level gage. The oil level within the vacuum pump is indicated in the window on the side of the pump.

(3) Vacuum pressure gage. The vacuum in inches of mercury (HG) is indicated on the vacuum pressure gage (located on the main control panel (fig. 1-3).

c. Operation.

(1) Check to see that all vacuum pressure line valve outlets in the laboratory compartment are closed.

(2) With the intake closed to minimize splashing, turn on the power.

(3) With the pump running, check the oil for proper level. A gurgling noise, sometimes detected at high pressures, should disappear after a few seconds. If it does not, check to see if the oil level is too low or if there is a leak in the connecting lines.

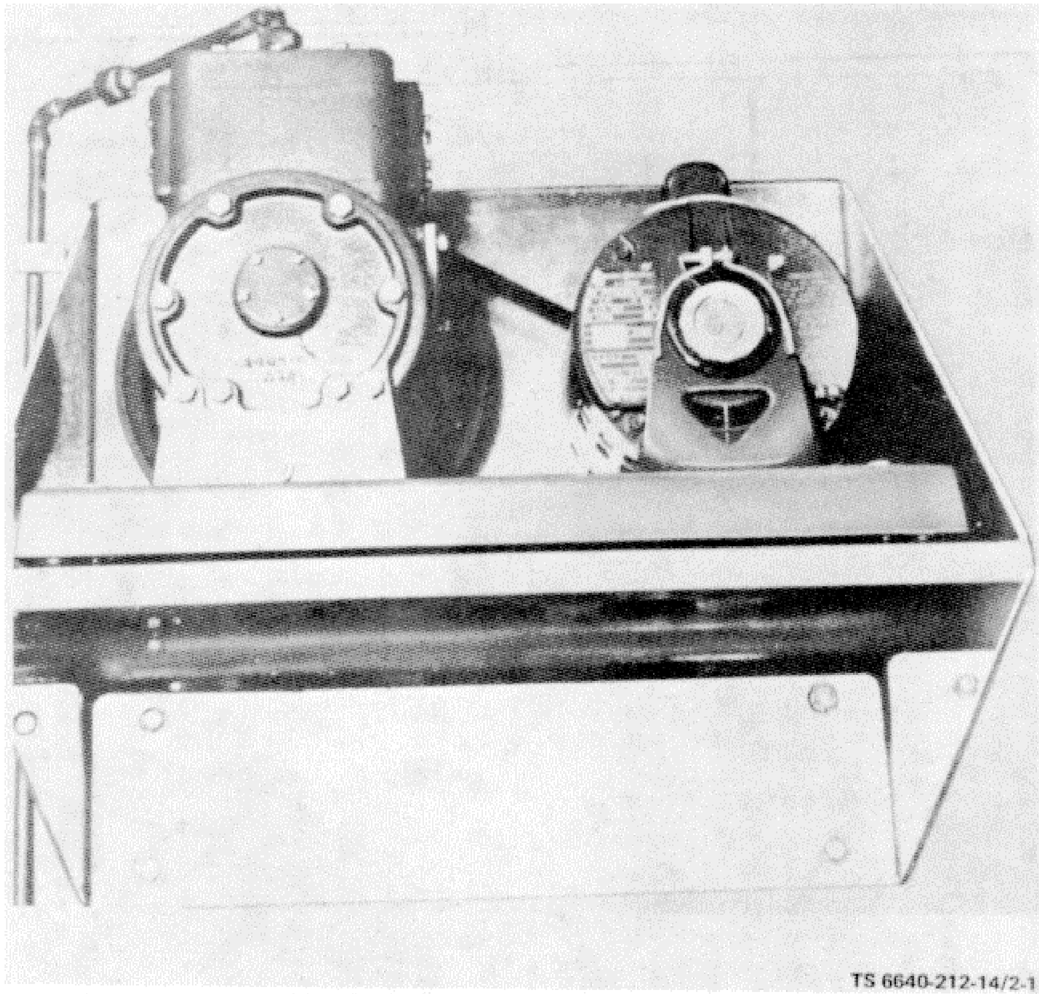


Figure 2-1. Vacuum Pump

(4) Open the intake to the vacuum system.

(5) To eliminate water and other condensed vapors from forming in the pump, open the vented exhaust valve by loosening the knurled lockring and turning the valve stem one full turn counterclockwise; then tighten lockring.

(6) To shut down the vacuum pump, close the pump intake; then place the vacuum pump circuit breaker in the OFF position. Bleed in air through the intake.

(7) If the pump is going to be out of service for a prolonged period, drain the oil and fill with new Duo-Seal oil or equivalent to prevent the possibility of corrosion.

2-4. Air Compressor

a. Description. The air compressor (fig. 2-2) is a two-cylinder, single-stage, air-cooled compressor connected by a V-Belt and pulleys to an electric motor. The motor and compressor are mounted on a common base. The base is mounted above the vertical air tank. The vertical air tank, with the required interconnect and supply piping, completes the air compressor utility system. The complete setup is located in the left front corner of the utility compartment.

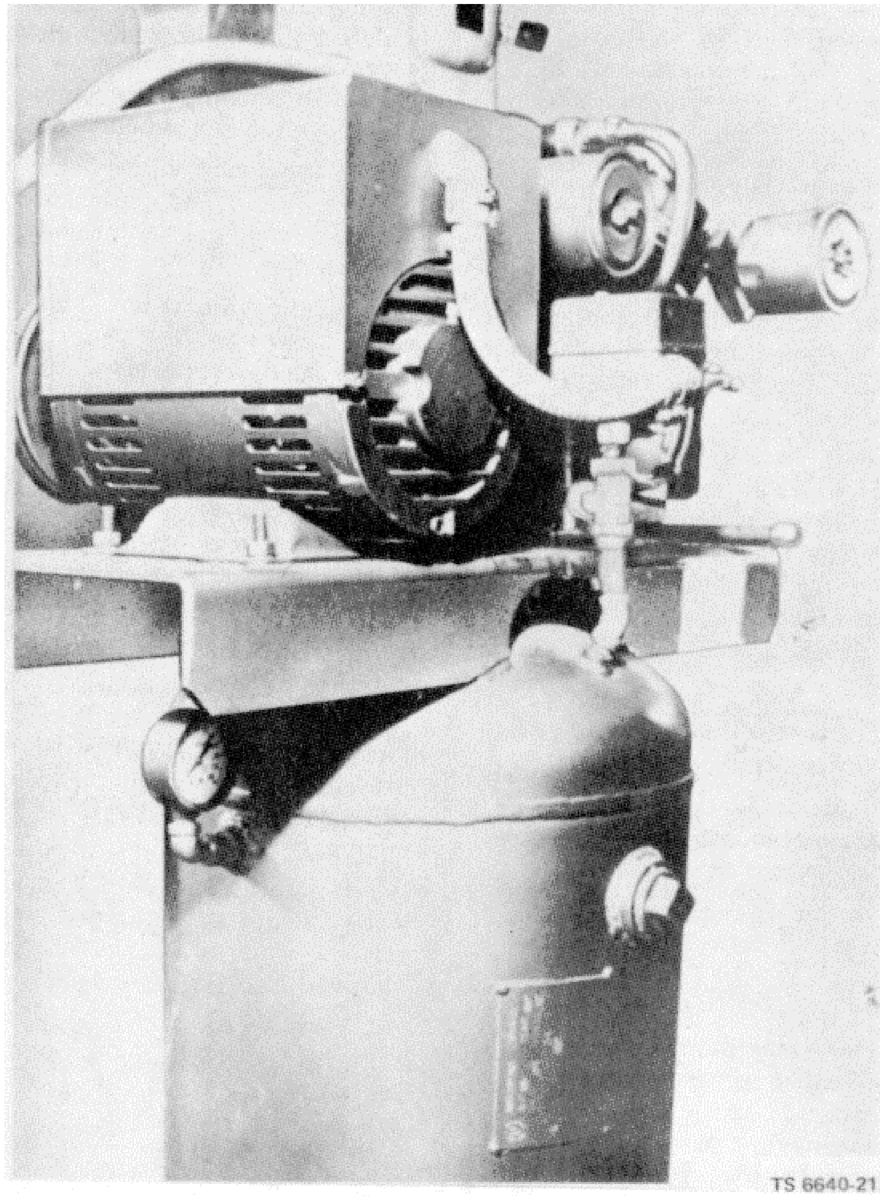


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Figure 2-2. Air Compressor

b. Controls and Instruments.

(1) Electrical controls. Operation of the air compressor is controlled by the air compressor circuit breaker switch on the main control panel (fig. 1-4). The motor starter-relay box is mounted on the utility compartment wall.

(2) Pressure switch. A pressure switch is located within the compressor to cut on and off automatically at the required pressures.

(3) Unloader pilot valve. An unloader pilot valve automatically controls the unloaders on the compression cylinders according to the predetermined setting of 80 psi (36.3 kg/sq cm) maximum and 60 psi (27.2 kg/sq cm) minimum pressure. The unloader pilot valve is connected to the tank pressure and actuates the unloaders.

(4) Safety valve. A safety valve, located on the air-receiver tank, is set to blow off if the tank reaches the maximum working pressure of 100 psi. The valve ordinarily requires no attention after being set at the time of installation.

(5) Air pressure gage. The air pressure gage, located on the air compressor, shows the air pressure maintained by the air compressor during operation.

(6) Air compressor gage. The air compressor gage, mounted on the control panel, shows the air pressure within the air supply lines of the laboratory.

***c. Operation**.* The air compressor is designed to operate through a pressure switch without damaging the air compressor or the piping and valves. However, if continuous operation should occur, the pressure switch should be checked for malfunction. Operation of the air compressor is as follows:

(1) Make sure all air supply line valves are closed.

(2) Push air compressor circuit breaker switch on control panel to ON position.

(3) When required pressure within the air receiver tank is reached, open the compressed air release valve to the air supply lines.

(4) To shut down the air compressor, place air compressor circuit breaker in the OFF position.

2-5. Water Pump.

***a. Description**.* The water pump, storage tank, and other units that make up the pressure water system fig. 2-3) are located on the floor at the rear of the utility compartment. The water pump is a centrifugal pump driven by an integral three-quarters horsepower, 115-vac, single-phase electric 2-6 motor. The pump is mounted on the floor near the water tank to which the pump inlet is connected. The pump outlet is connected through a filter to the water supply line in the laboratory compartment. At the top of the tank is a capped fill pipe and a curved vent tube. The side of the tank is equipped with a quantity sight gage. Both pump and tank are provided with drain plugs.

b. Controls and Instruments.

(1) Electrical controls. Operation of the water pump is controlled by the water pump circuit breaker on the main control panel (fig. 1-4). The motor starter-relay box is located in the utility compartment.

(2) Sight glass. The sight glass on the water tank is used to indicate the height of the water in the tank.

(3) Outlet valves. The water supply line has seven outlet valves, two on the left wall of the laboratory compartment, four on the right wall, and one in the fume hood.

(4) Tank gate valve. When closed, this valve prevents water under pressure from flowing into the tank; when open, it provides a means of filling the water tank.

(5) Inlet gate valve. This valve, when open, allows water to flow from the external source; when closed, it prevents water from being pumped out.

(6) Pressure switch. A pressure switch located in the water supply line to the sink automatically breaks the electrical circuit to the pump when the sink faucet is closed. The pump automatically starts when the faucet is opened.

(7) Check valve. A check valve prevents water under pressure from reaching the pump when the external water supply is in use.

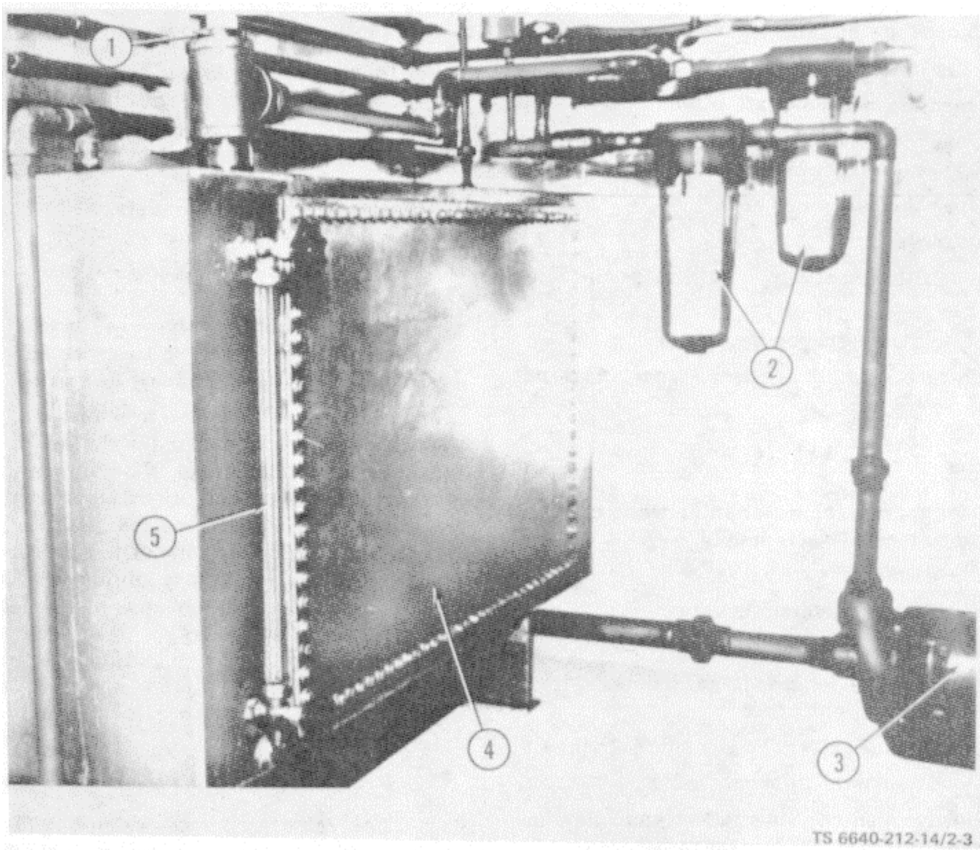
(8) Air bleed valve. An air bleed valve is located on the top of the water tank to prevent pressure buildup while pumping from the tank or filling it. An air bleed valve is located on top of the sight gage to prevent pressure buildup.

(9) Drain plug. Both the water tank and the water pump are equipped with drain plugs to remove water from the system during transit or storage.

c. Operation

(1) Open the sight gage air bleed valve and check the water level in tank. Replenish if necessary.

(2) Make certain all valves on the water supply and water return lines are closed.



Legend for figure 2-3:
1. Filler plug
2. Filters
3. Water pump
4. Tank
5. Sight gage

Figure 2-3. Water System

(3) Attach the hose from sink drain beneath trailer to the drainage ditch.

(4) Place water pump circuit breaker in the ON position.

(5) At the end of the workday, place water pump circuit breaker in the OFF position.

CAUTION

In freezing temperatures, open all valves and drain water from the system. If the heating system is not working and temperatures are below freezing, open all valves and drain all the water from the system at the end of the workday.

d. Filling Water Tank Manually.

(1) Remove the plug and air bleed valve from elbow.

(2) Open the sight gage air bleed valve.

(3) Use funnel provided and fill the reservoir through the elbow fitting.

CAUTION

Fill only with potable water.

e. Filling Water Tank Using External Water Source.

(1) Open the reservoir air bleed valve.

(2) Open the reservoir sight gage air bleed valve.

(3) Close the sink faucet.
(4) Close the inlet gate valve.
(5) Open the reservoir gate valve.
(6) Connect the external water source to inlet located on the left front exterior side of laboratory.
(7) Open the inlet gate valve.
(8) Observe the sight gage.
(9) When the reservoir is full, close the inlet gate valve.
(10) Close the reservoir gate valve.

f. Operating Water System from External Source.

CAUTION

Do not operate the water pump while using the external water source.

(1) Close the inlet gate valve.
(2) Close the reservoir gate valve.
(3) Close the sink faucet.
(4) Connect the length of garden hose from sink drain to drain field.
(5) Connect the external water source to inlet.
(6) Slowly open the inlet gate valve.
(7) Slowly open the sink faucet and allow incoming-water to force air from the system.

g. Operating Water System from Reservoir Supply.

(1) Connect the length of garden hose from sink drain to drain field.
(2) Close the sink faucet.
(3) Close the inlet gate valve.
(4) Close the reservoir gate valve.
(5) Open the air bleed valves on the water reservoir sight gage.
(6) Start the pump using water pump circuit breaker located on the main control panel.
(7) Slowly open the sink faucet and allow pumped water to force air from the system.
(8) Check pressure switch to insure that the water pump stops operating when the sink faucet is closed and starts operating when the sink faucet is open.

NOTE

To prolong the life of the water pump, make a practice of placing the water pump circuit breaker in OFF position when the water system is not in use.

2-6. Compressed Gas Cylinders.

WARNING

Do not lubricate valves and regulators on compressed gas bottles (pressurized oxygen and oil can create an explosion).

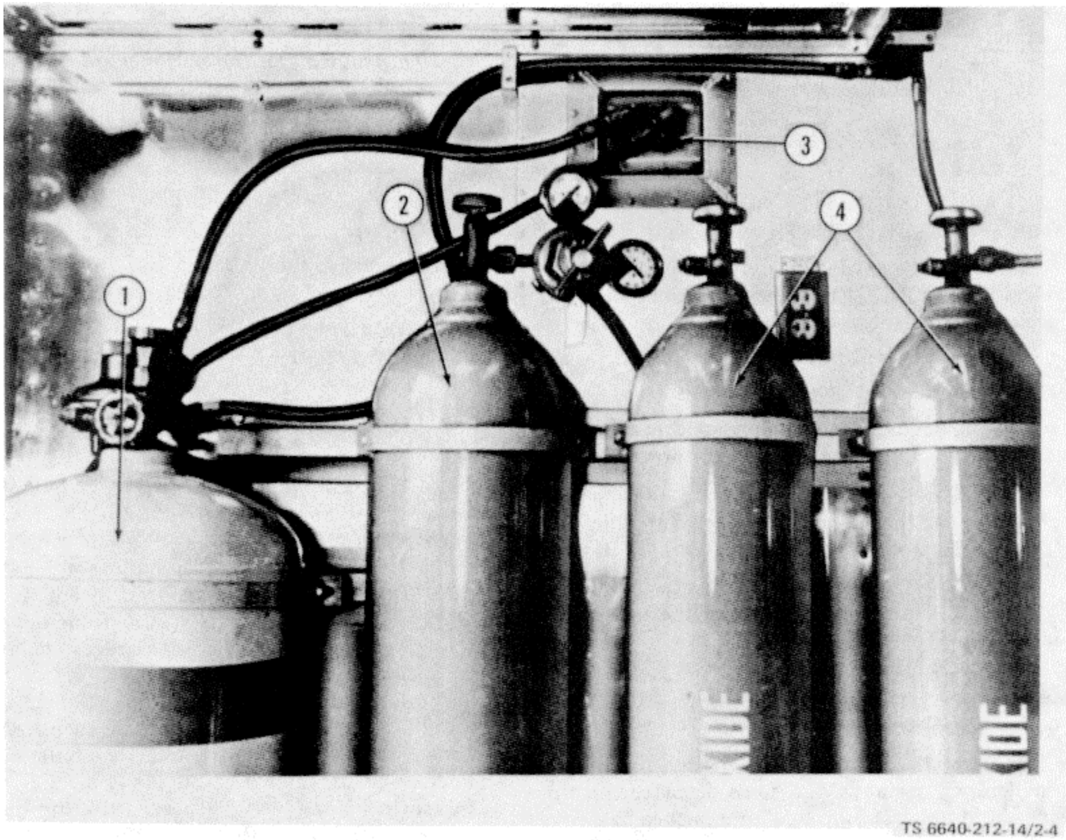
a. Description. Oxygen, propane, and carbon dioxide cylinders are located in the left rear corner of the rear compartment. The installation and storage of these cylinders is illustrated in figure 2-4. All cylinders are supported in a vertical position by a rack. The propane cylinder supplies pro-pane gas to the laboratory piping system under reduced pressure by means of a detachable pressure-regulating valve. The oxygen cylinder supplies oxygen to the oxidation stability bath. One carbon dioxide cylinder is connected to the dry-ice machine. The second carbon dioxide cylinder is a spare.

NOTE

The valves on the carbon dioxide cylinders are designed for upright operation. The valves must remain with the cylinder to be recharged or assembled to a new cylinder before recharging. Recharge cylinders are supplied with the laboratory when possible.

b. Controls and Instruments.

(1) Cylinder valve. All cylinders are equipped with a valve which controls the flow of gas from the cylinder.
(2) Pressure regulator. All cylinders in corporate pressure regulators; the inlet of the regulator is connected to the cylinder valve outlet On the propane cylinder, the outlet of the regulator is connected to the propane line leading into the laboratory area. The pressure regulator reduce, the pressure of the gas from cylinder pressure t(the desired working pressure.
(3) Gages. The gages indicate the pressure within the cylinder and the working pressure of the gas.



Legend for figure 2-4:
1. Propane gas
2. Oxygen cylinder
3. Propane gas vents
4. Carbon dioxide cylinders

Figure 2-4. Compressed Gas Installation and Storage

c. Operation (New Cylinders).

(1) Remove the valve protection cap from the cylinder.

(2) Remove the outlet connection cap from the valve outlet connection.

(3) Open the cylinder valve one-quarter turn counterclockwise and close immediately to clear the valve of particles of dust or dirt that might enter the pressure regulator.

(4) Attach the pressure regulator to the cylinder valve outlet and line.

(5) Turn the pressure regulator adjusting screw counterclockwise until the pressure regulator valve is fully open.

(6) Slowly open the cylinder valve to full open position.

(7) Turn the pressure regulator adjusting screw clockwise until the desired working pressure is reached.

(8) To shut down, close the cylinder valve. If the pressure regulator is to be removed, release all gas from the regulator and disconnect it. Replace outlet connection cap and valve protection cap.

2-7. Air Conditioner.

a. Description. The air conditioner is mounted in the utility compartment immediately behind the front door. For this reason, the front door cannot be used for access. Three vent panels in the van front door aid in the operation of the air conditioner. The two bottom vents must be opened before the cooling operation; the top vent is opened when fresh air ventilation is desired. The remote control panel is located on the main control panel in the laboratory compartment.

b. Operating Air Conditioner for Ventilation or Circulation of Air.

(1) Open all three vent panels in the van front door.

(2) Turn the control panel rotary control switch to vent position.

(3) Adjust the damper control knobs on the air conditioner to admit fresh air as desired.

(4) Shut off ventilation by turning the rotary control switch to OFF. Close the dampers and close and secure the door vent panels.

c. Operating Air Conditioner for Cooling.

(1) Open the vent panels in the van front door.

(2) Connect a hose to condensate drain to allow accumulated condensate to drain down to the ground.

(3) Set the thermostat control (located on rear of the remote control panel) to the desired temperature.

(4) Turn the rotary control switch on remote control panel to COOL.

(5) Turn the damper control knobs to desired position from MIN (100 percent return air) to MAX (100 percent fresh air).

(6) Turn the rotary control switch to OFF to stop cooling. Remove the hose from the drain, close the dampers and close and secure the vent panels.

2-8. Heating System.

a. Description. The heating system is composed of a heater assembly made of 12 heating elements located in the air conditioning duct. Six heating elements are 1000-watt, 220-volt units. The remaining six elements are 1600-watt, 220-volt units. A heater thermostat and a rotary control switch are located on the roadside interior wall forward of the main control panel. The rotary control switch has four positions; OFF, LOW, MEDIUM, and HIGH. LOW position activates the 1000 watt heating elements and illuminates the heater No. 1 indicating lamps. Setting the switch in the MEDIUM position activates the 1600-watt heating elements and illuminates the heater No. 2 indicating lamp. HIGH position activates both tiers of heating elements and illuminates both indicator lamps. A safety switch is installed in the duct above the heating elements to cut off heater power in the event the air conditioning blowers malfunction, causing an overheat condition.

b. Operating Heating System.

(1) Turn the air conditioner rotary control switch on the main control panel to VENT position.

(2) Set the heater thermostat control on the heater remote control panel to the desired temperature.

(3) Set the heater rotary control switch to the desired position (LOW, MEDIUM, or HIGH).

(4) Stop the heating system by setting the heater rotary control switch and the air conditioner rotary control switch to OFF positions.

2-9. Layout of Laboratory. All testing apparatus and equipment are stored below counters, permanently mounted on counter tops, or attached to the wall in the laboratory compartment. Numbered drawers and cabinets (fig. 1-2) are installed beneath the counters. Along the left side of the compartment are 25 drawers and one cabinet. Along the right side are four drawers and six cabinets. At the front, beneath the fume hood and gum bath, are eight drawers. The recess below the refrigerator has two shelves, one of which is suspended and the other rests on the flooring. This recess is used as a storage area for such items as tissue, spare filters, paper towels, and bulk storage in cans and is reached through cabinet Fl. Small apparatus such as pipets, thermometers, glassware, and chemicals are stored in drawers. For inventory purposes, the contents of each drawer and cabinet are ’listed. To determine storage location of apparatus or equipment, refer to fig. B-22, Appendix B.

2-10. Test References. All test references, ASTM Methods, and Federal Test Methods Standards are located in the laboratory bookcase. Refer to Appendix B, fig. B-22 for identification listing.

2-11. Laboratory Procedures. Laboratory personnel and personnel who handle petroleum products in the field are exposed to the same hazards. In addition, laboratory personnel are exposed to chemicals, and if an accident occurs, they are ex-posed to the effects of vacuums and pressures in close quarters. Efficient laboratory operations must include all safety considerations. Standing operating procedures (SOP) should be prepared for each laboratory so that emergencies may be dealt with when they occur. Laboratory practices and procedures are described in Chapter 3 of FM 10-70.

2-12. Muffle Furnace.

a. Description. The muffle furnace (fig. 2-5), designed to comply with the requirements specified in ASTM D482, D874, and D2276 (TM 10-1166), is located on the left-hand work counter (fig. 1-2). The furnace is used for heat treating, precipitate drying, ashing, igniting, and fusing. It has a continuous operating temperature range from 150 degrees F to 1800 degrees F (66 degrees C to 982 degrees C). Intermittent heating as high as 2000 degrees F (1093 degrees C) will not damage the muffle winding or refractories. The furnace consists essentially of a muffle chamber with drop door and steel tray, and a base which houses a temperature gage (pyrometer) showing both Fahrenheit and Centrigrade scales, percentage timer, pilot light, and ON-OFF toggle switch.

b. Operation.

(1) Place the toggle switch in the ON position. The pilot light is illuminated while heat is on.

(2) Set the percentage timer. The timer operates so that heat is on for a set percentage of 1 minute and off the remaining part. For example, with the timer set at 20, the heat is on 20 percent of 1 minute and off 80 percent; a setting at 60 controls temperature at approximately 1800 degrees F (982 degrees C).

(3) For quick heat-up, set the timer at 100 which provides continuous heating, but make sure to turn back the timer when pyrometer shows temperature reading at 1800 degrees F (982 degrees C) to prevent burning out of heaters, refractories, etc., caused by excessive temperatures.

Figure 2-5. Muffle Furnace.

(4) The pyrometer indicates the temperature inside the furnace and can be calibrated for difference in room temperature by means of the screw on the panel.

(5) For test procedures that use the muffle furnace, refer to ASTM Method D482, D874, and D2276 (TM 10-1166).

2-13. Oven.

a. Description. The utility oven (fig. 2-6) is located on the left-hand countertop. The oven is used for baking, drying, conditioning preheating and produces heat ranging from ambient to 200 degrees C. The cabinet type, gravity convection oven is equipped with a hydraulic, snap-action thermostat, two adjustable latticed metal shelves (fig. 2-6), hinged door with safety latch, adjustable ventilator, pilot light, ON-OFF toggle switch and a thermometer ranging from 0 degree to 2000 degrees C.

b. Operation.

(1) Insert the thermometer through the hole in the center of the exhaust vent shutter in top of the oven, and open the vent shutter. Make sure that the thermometer bulb extends as far into the heating chamber as possible to insure correct temperature reading.

(2) In loading the oven, whenever possible, use only one shelf and leave ample space between objects for proper air circulation and maximum heat transfer. Never place materials on oven floor or below lowest shelf position. Shelves should not be overloaded and should never be loaded from wall to wall.

(3) Always leave the shutter in the exhaust vent at least one-fourth open. As oven operates by gravity convection, air circulation is vertical. Air enters through opening in oven bottom, passes over the heater, and then through perforations of heater plate into the cabinet where it passes through the exhaust vent. By opening the shutter, air movement within the oven is increased, and more fresh air is introduced.

(4) Place the toggle switch in the ON position.

(5) As reference points on the temperature control knob do not correspond with temperature set-tings, temperature readings must be taken from the thermometer. To raise the temperature, turn the temperature control knob clockwise until the pilot light indicates that the heaters are on. To lower the temperature, turn the knob counterclockwise. When turning the temperature control knob clockwise, back off slightly to take up lose motion in thermostat mechanism.

(6) When oven has reached the desired temperature, turn the temperature control knob counterclockwise until the heat shuts off, as indicated by the pilot lamp being extinguished.

(7) Before final temperature adjustment is made, allow about an hour for oven heat to stabilize. If, after elapsed time, temperature is not at desired degree, turn temperature control knob to raise or lower the temperature as required until desired temperature is attained.

NOTE

When the temperature control is moved from a higher to a lower setting, the safety pilot light may flow faintly for a short time. This is inconsequential and light will disappear as soon as the new lower temperature is stabilized.

2-14. Kinematic Viscosity Baths.

a. Description. Two kinematic viscosity baths(fig. 2-7) are mounted on the left-hand counter of the laboratory compartment. The kinematic viscosity bath is designed to comply with the requirements specified in ASTM D445 (TM 10-1166). It is used to determine the kinematic viscosity of petroleum products. Each apparatus includes a constant temperature bath consisting of a plastic cylinder, stirrer and motor, and a mercury thermoregulator. The thermoregulator and thermoregulator guard are stored in drawer El (fig. B-11). Each bath accommodates three capillary type viscometer tubes. The viscometer tubes are stored in drawer C1 (fig. B-9). The paper charts are stored in drawer A5 (fig. B-7) and P2 (fig. B-21). The temperature range of the bath is 68 degrees F to 250 degrees F (20 degrees C to 121 degrees C). The heater rotary switch has five positions: OFF, LOW (125 watts), MEDIUM LOW (200 watts), MEDIUM (300 watts), and HIGH (500 watts).

b. Operation.

(1) Remove one of the circular bakelite cover and clip assemblies and fill the bath to approximately 1 1/2 inches (38.1 mm) from the top with a suitable white technical oil. Determinations above 100 degrees F (37.8 degrees C) requires the use of oil (48619) 74972. Determinations below 100 degrees F (37.8 degrees C), require the use of oil (48619) 74974. Do not use water in the bath, as this will short out the heaters.

Figure 2-6. Utility Oven (Sheet 1 of2)

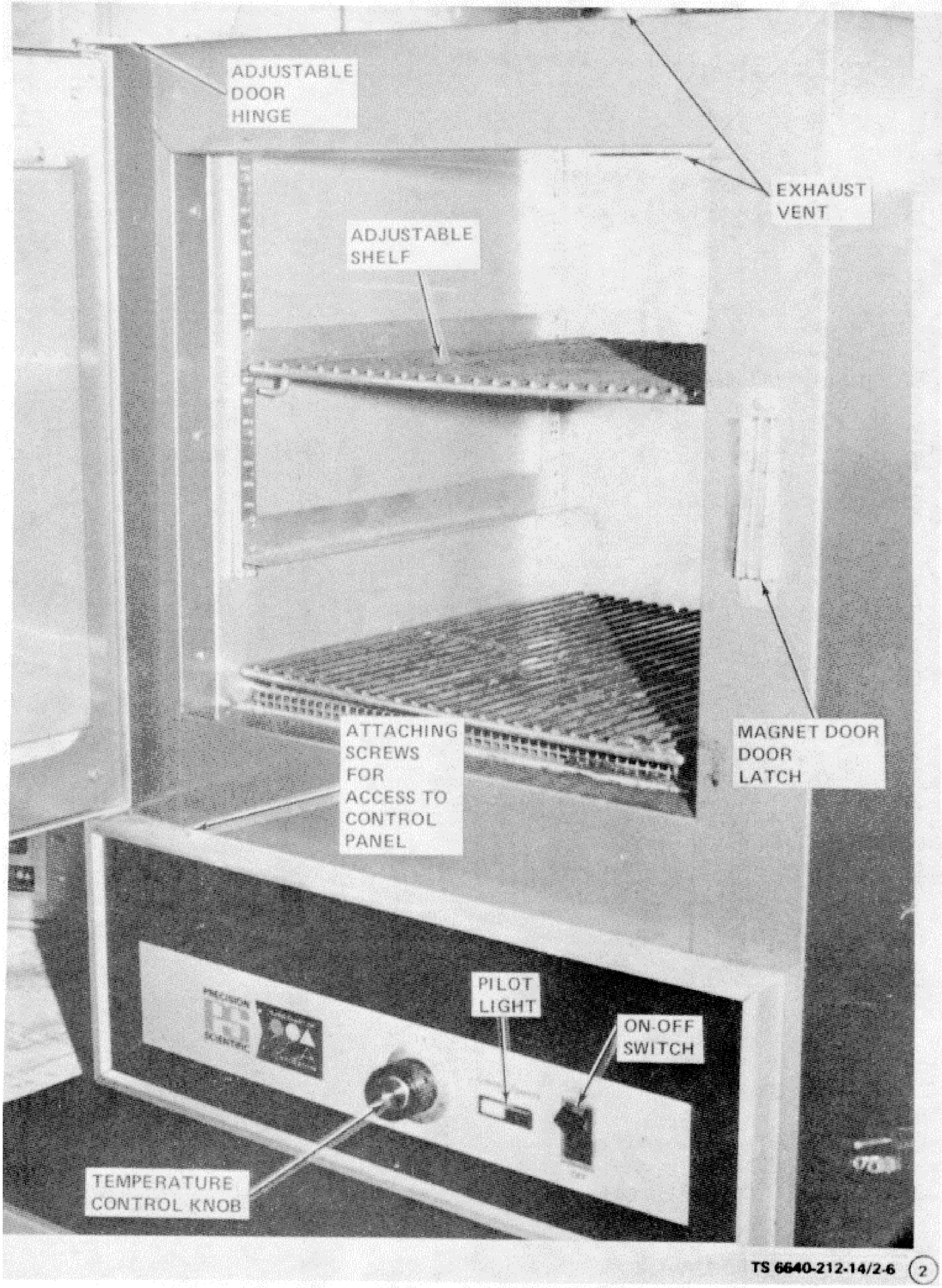


Figure 2-6. Utility Oven (Sheet 2 of 2)

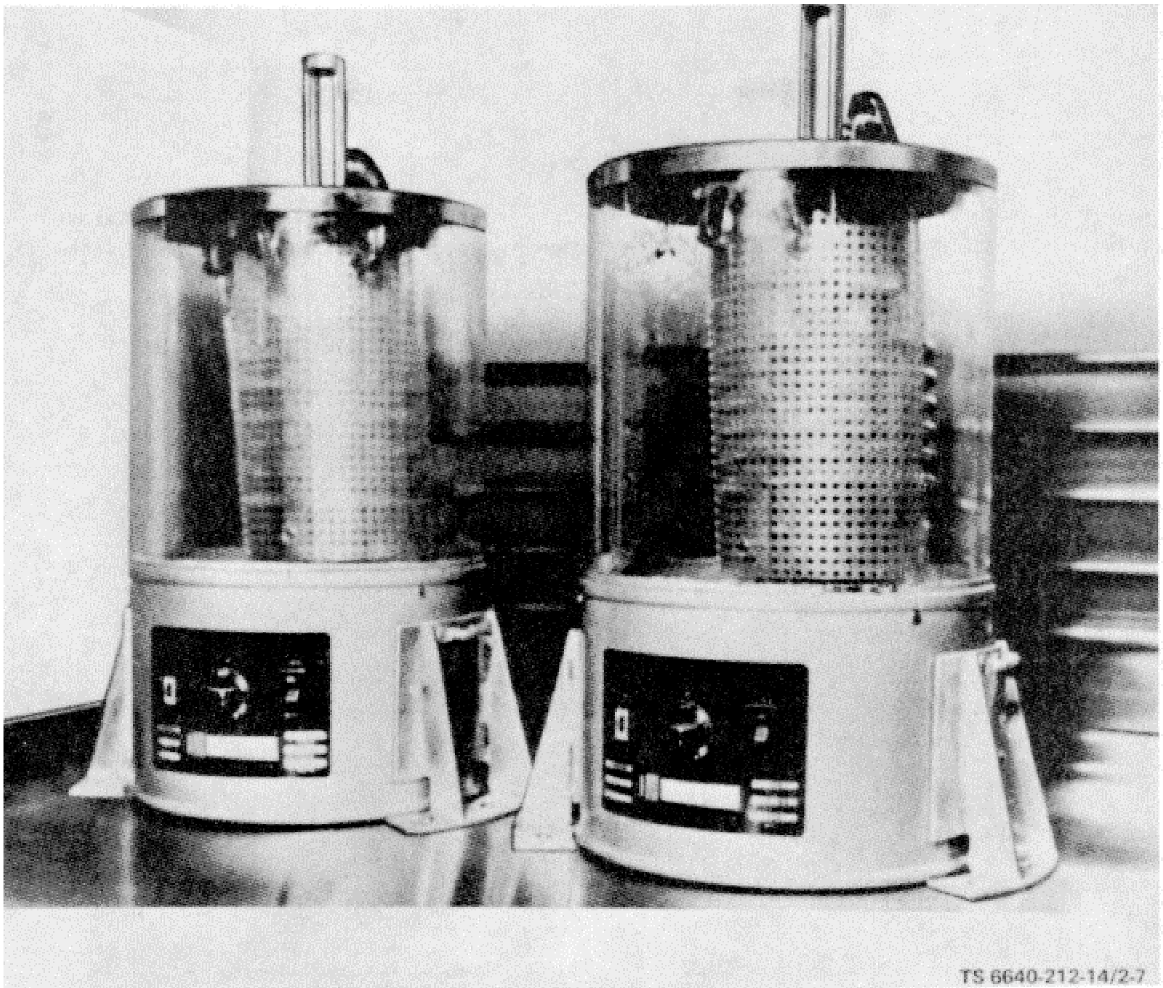


Figure 2-7. Kinematic ViscosityBaths

(2) Adjust the thermoregulator by turning the collar until the pointer reaches the desired temperature.

NOTE

The calibrations on the thermoregulator should be used for reference only, with the actual setting being made according to temperature read from a calibrated thermometer of the proper range placed in the bath.

(3) Carefully slip the thermoregulator down in to the protective guard and screw firmly in place.

(4) Place the bayonet-type connector leading from the base of the unit over the top of the controller. To engage, push down and turn clockwise.

CAUTION

Do not operate the beaters unless they are immersed in liquid.

(5) Place a suitable thermometer in the thermometer well.

(6) Place the line switch in the ON position. Place the heater switch in the HIGH position to bring bath quickly to desired temperature. When the pilot light extinguishes, the bath has reached the temperature set on the thermoregulator.

(7) Allow the apparatus to stabilize and reach temperature equilibrium.

(8) Check the controlling temperature against the temperature reading of the thermometer. Make final temperature adjustments by turning the adjustment collar on the thermoregulator.

(9) Turn the heater switch to the desired position.

(10) To shut off the apparatus, place the line switch in the OFF position.

(11) For detailed description of test procedures, consult ASTM Method D445 (TM 10-1166).

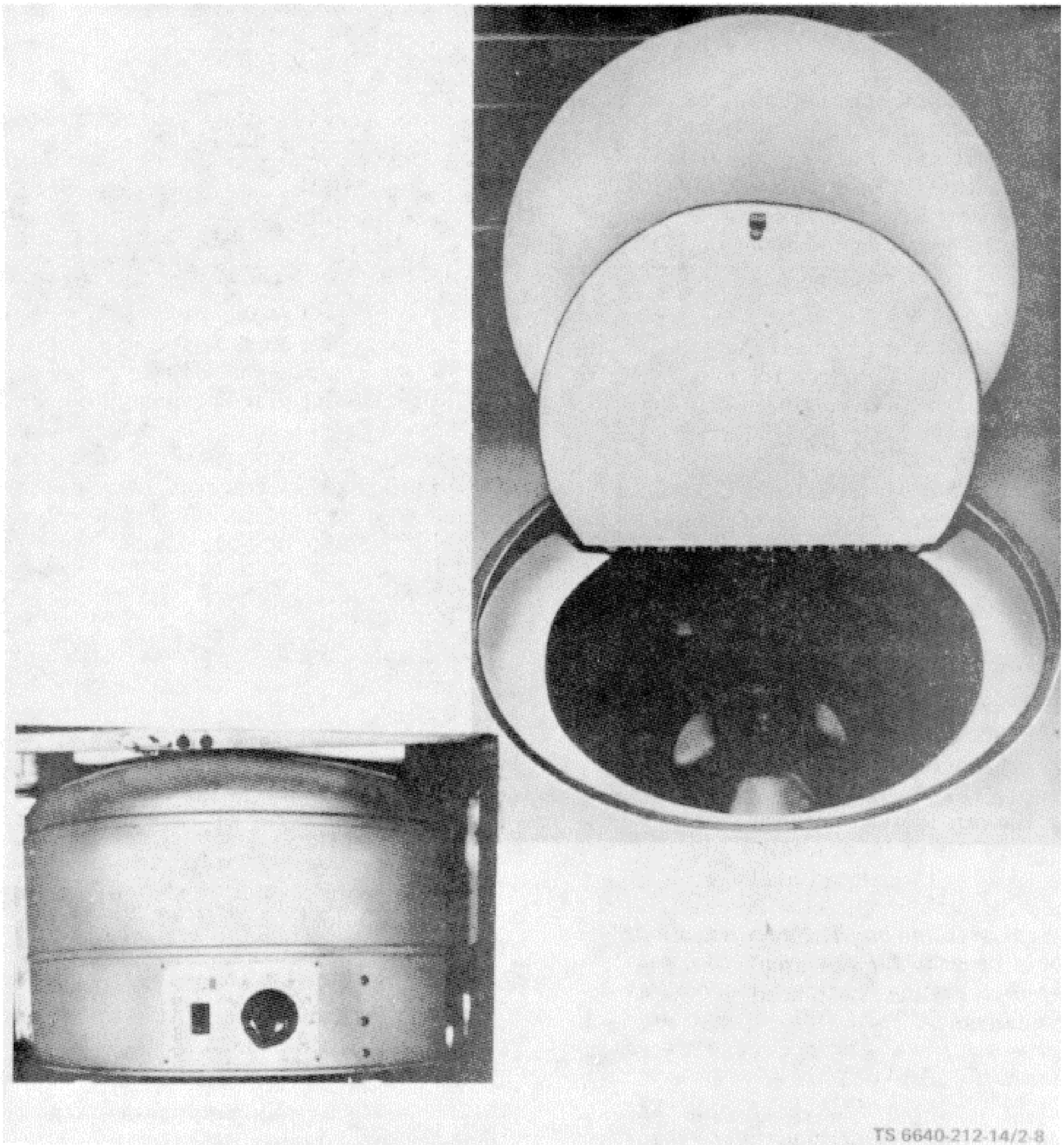


Figure 2-8. Centrifuge

c. ThermoregulatorAdjustment.

(1) Check for gas bubbles in the lower mercury chamber or in the capillary column.

(2) If bubbles are present or if the mercury in ;he capillary column is broken, heat the bulb very carefully until the bubbles are driven up into the expansion chamber. Cool slowly in a vertical position, allowing the mercury to pull back to form a solid column without bubbles.

(3) If mercury is trapped in the head of the thermoregulator behind the adjusting collar, hold the thermoregulator at a slight angle with the head up. Gently tap the head against the palm of the hand, while rotating the unit. This will dislodge the mercury and allow it to fall into the body of the thermoregulator, where it must be joined to the mercury column.

2-15. Centrifuge.

a. Description. The centerfuge (fig. 2-8), mounted in cabinet F1 (figs. 1-2 and B-12), is designed to comply with the requirements specified in ASTM Methods D91, D893, D1796, D2273, D2709, (TM 10-1166) and FTMS 791, Method 5101.6. The centrifuge is installed so that its cover can be reached through a corresponding cover in the counter top above the centrifuge at the left forward end of the laboratory. A single-phase, 120-vac, 50 to 60 HZ, 2250 rpm motor, mounted within the base, spins the head at speeds which are con-trolled by a rheostat.

b. Operation.

(1) Place samples in centrifuge so that the load is balanced. The number of tubes and their respective positions should be directly opposite one another. Tubes are stored in drawer B1 (fig. B-8). If only one sample is to be processed, another tube should be filled with a liquid of the same weight and placed in position directly across from the sample. If three samples are to be processed, they should be placed 90 degrees apart, and a fourth tube with water should be placed in position to fulfill the quadrant.

CAUTION

When inserting a centrifuge tube, be certain bottom of tube is in contact with padding. If it is not, insert additional padding of felt or sponge rubber.

(2) The range of the centrifuge is up to 2000 rpm. The calibrated reference dial allows the operator to select the setting that will give the desired speed.

(3) For tests requiring a certain speed for a certain length of time, compute the time after the sample has attained the desired speed.

(4) After loading the centrifuge, close both covers.

(5) Place the switch in the ON position and ad-just the large control knob to the desired reference point on the dial.

WARNING

Never stop centrifuge by using hands. (6) To stop the centrifuge, turn the large knob to full counterclockwise position and place switch in the OFF position.

2-16. Refrigerator Ice Maker.

a. Description. The laboratory refrigerator (fig. 2-9), built into the front partition separating the laboratory compartment from the utility compartment, is a complete plug-in type unit powered by a 1/4 horsepower hermetically sealed condensing unit. The refrigerator is specifically designed as an ice cube producing and storage unit. The unit has a freezing capacity of 16 ice cube trays with an additional storage capacity of 23 pounds.

b. Operation.

(1) Allow the unit to operate from 4 to 6 hours before loading the interior with water-filled ice cube trays.

(2) When the ice cube trays are frozen, the cubes can be stored in the stainless steel bin directly below the shelves of the freezing compartment, or this space may be used for cooling quart samples.

(3) If required, adjust the cold control for the proper operating temperatures.

c. Defrosting.

(1) Remove power from the unit.

(2) Open the door until accumulated ice has melted and drained from the cabinet.

(3) To accelerate melting, place several pans of hot water in the freezing compartment.

(4) Wipe interior completely dry.

(5) Supply power to the refrigerator and allow the unit to operate for at least 1 hour before replacing the water-filled ice cube trays.

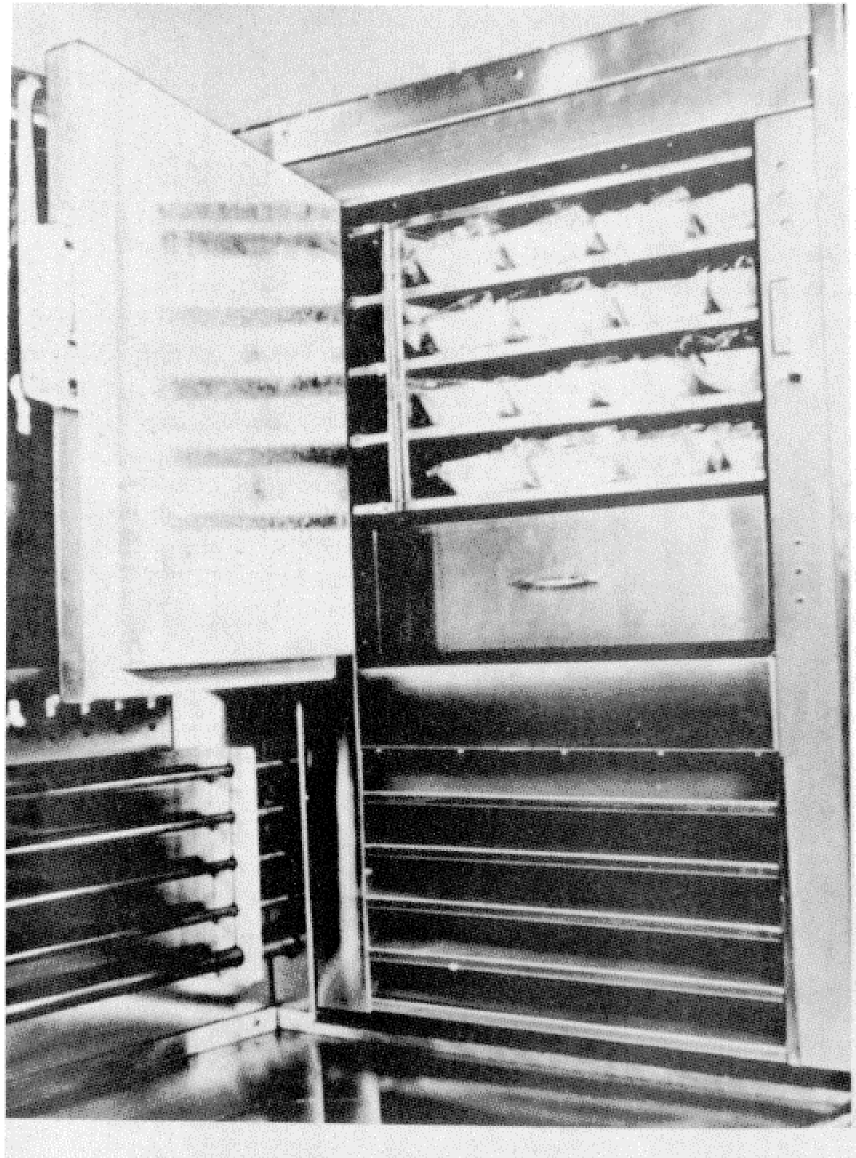


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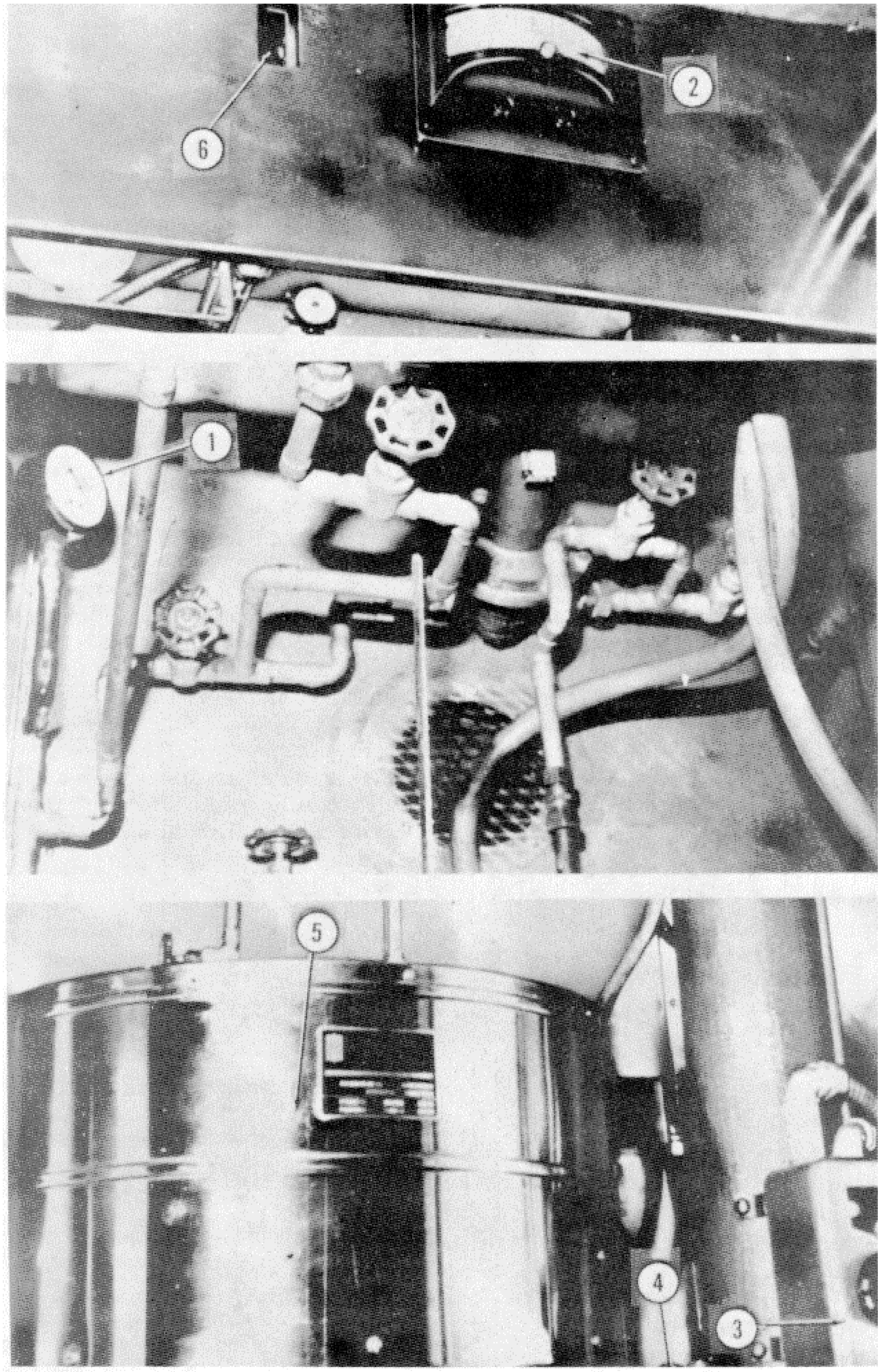
Figure 2-9. Refrigerator Ice Maker



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Legend for figure 2-10:

1. Air flow indicator
2. Pyrometer
3. Temperature control (steam)
4. High pressure steam boiler
5. Gum bath
6. High pressure purge meters

Figure 2-10. Gum Bath, Pyrometer, and High Pressure Steam Boiler

2-17. Gum Bath.

a. Description. The gum bath (fig. 2-10), designed to comply with the requirements specified in ASTM D381 (TM 10-1166), is located at the right of the front wall of the laboratory. It is used to deter-mine the existent gum in petroleum products. Included with the gum bath is an air flow indicator. A pyrometer (para 2-18), a high pressure steam boiler (para 2-19) and a low pressure steam boiler (para 2-20) are used with the gum bath and are located in the same area. The air flow indicator is calibrated in pounds and ounces, corresponding to the flow of air in liters per second. The rate of flow required is 1 liter per second plus or minus 15 per-cent. The normal reading of 1 liter per second is indicated by the black graduations on indicator, and the plus or minus 15 percent variation is indicated by red graduations. The pyrometer is an indicating and controlling device for gum bath preset temperatures. The high pressure steam boiler is a circulation heater used to raise the temperature of steam supplied to the gum bath for steam jet evaporation of turbine fuels.

b. Operation.

(1) Apply power to the gum bath.

(2) Adjust air supply until the flow is indicated on the black graduations of the flowmeter.

(3) Turn on the INT switch on the gum bath that controls the pyrometer and the AUX switch that controls the high pressure steam boiler.

(4) Before operating gum bath drain any steam or water that may be in the piping system as follows:

(a) Close the pressure regulator by-pass valve (fig. 2-11, sheet 4) and the regulated high pressure steam open-close valve.

(b) Open the drain valve (fig. 2-11, sheet 2) which allows water and steam in lines to be flushed to bottom of semitrailer (fig. 2-11, sheet 3).

(c) When water and steam stop coming out, close drain valve and open regulated high pressure steam open-close valve and proceed with test.

(d) When gum bath testing is complete for the day close all circuit breakers to gum bath, high pressure boiler, and to low pressure boiler, then drain all water from the high and low pressure boilers by opening the drain valve (fig. 2-11, sheet 2).

NOTE

Draining of water from the low and high pressure boilers will reduce the possibility of minerals and other deposits from building onto critical parts in the boilers and water feeders which can cause a malfunction over a period of time if not flushed. Also in temperatures below the freezing mark and without heat supplied to laboratory the boilers and pipes containing water can burst.

(5) Proceed with the test in accordance with the procedures of ASTM Method D381 (TM 10-1166).

2-18. Pyrometer.

a. Description. The pyrometer (fig. 2-10), designed to comply with the requirements specified in ASTM D381 (TM10-1166), is mounted above the gum bath area. It is used with the gum bath. The pyrometer is an indicating and controlling device of gum bath preset temperatures. The INT switch on the gum bath turns the pyrometer on or off, as required, to maintain the preset temperature. The upper green pointer on the pyrometer indicates the operating temperature. The lower red pointer indicates the temperature to be maintained. A red light is on when the gum bath is heating. When desired temperature is attained, the red light goes off and the green light comes on.

b. Operation.

(1) Set the red pointer to the desired temperature, using the knob located below the scale.

(2) Turn the INT switch on the gum bath to the ON position.

(3) The pyrometer will keep the heat on (red light is on) until the preset heat is attained. At that time, the pyrometer will turn the heat off (red light will go off, green light will come on). 2-19. High Pressure Steam Boiler.

a. Description. The high pressure steam boiler (fig. 2-10), designed to comply with the requirements specified in ASTM D381, (TM 10-1166), is located in the gum bath area. It is a circulation heater used to raise the temperature of steam received from the low pressure steam unit located in the front compartment just behind the gum bath. The high pressure steam boiler is equipped with a thermostatic control which can be set to desired temperatures up to 550 degrees F (288 degrees C). The AUX switch on the gum bath turns the high pressure steam boiler on or off.

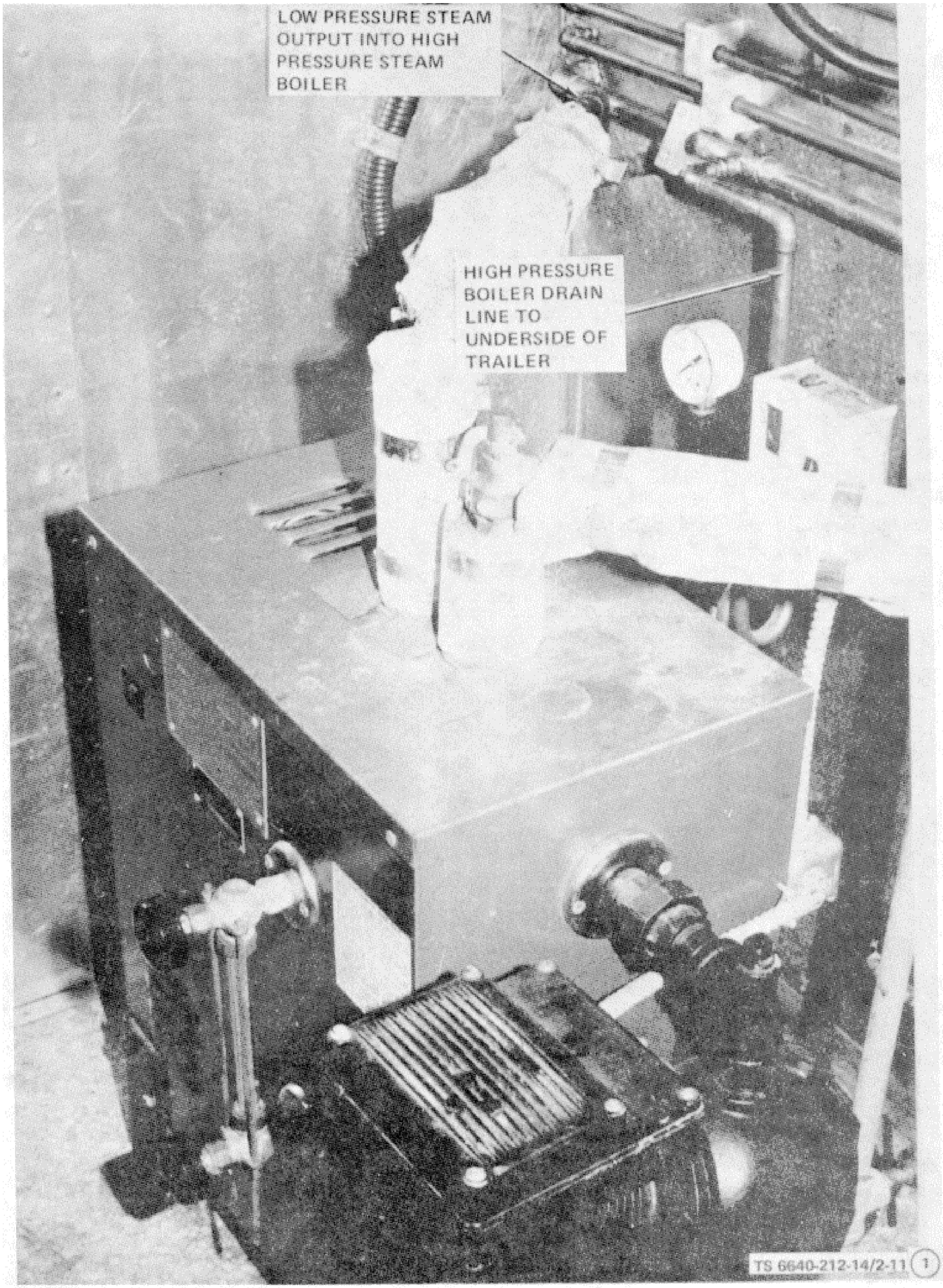

Figure 2-11. Gum Bath, Low and High Pressure Steam Setup (Sheet 1 of 5)

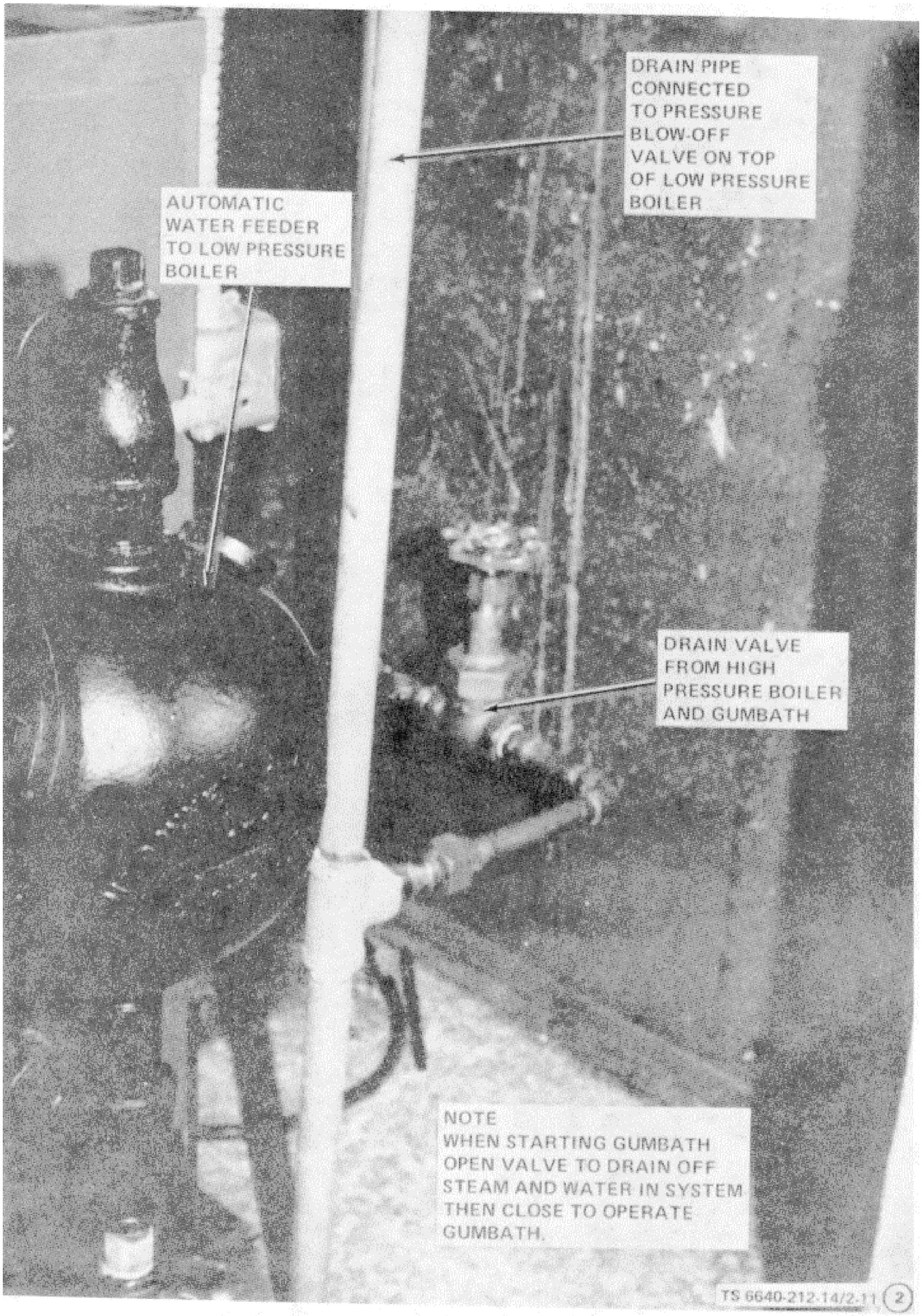

Figure 2-11. Gum Bath Low and High Pressure Steam Setup (Sheet 2 of 5)

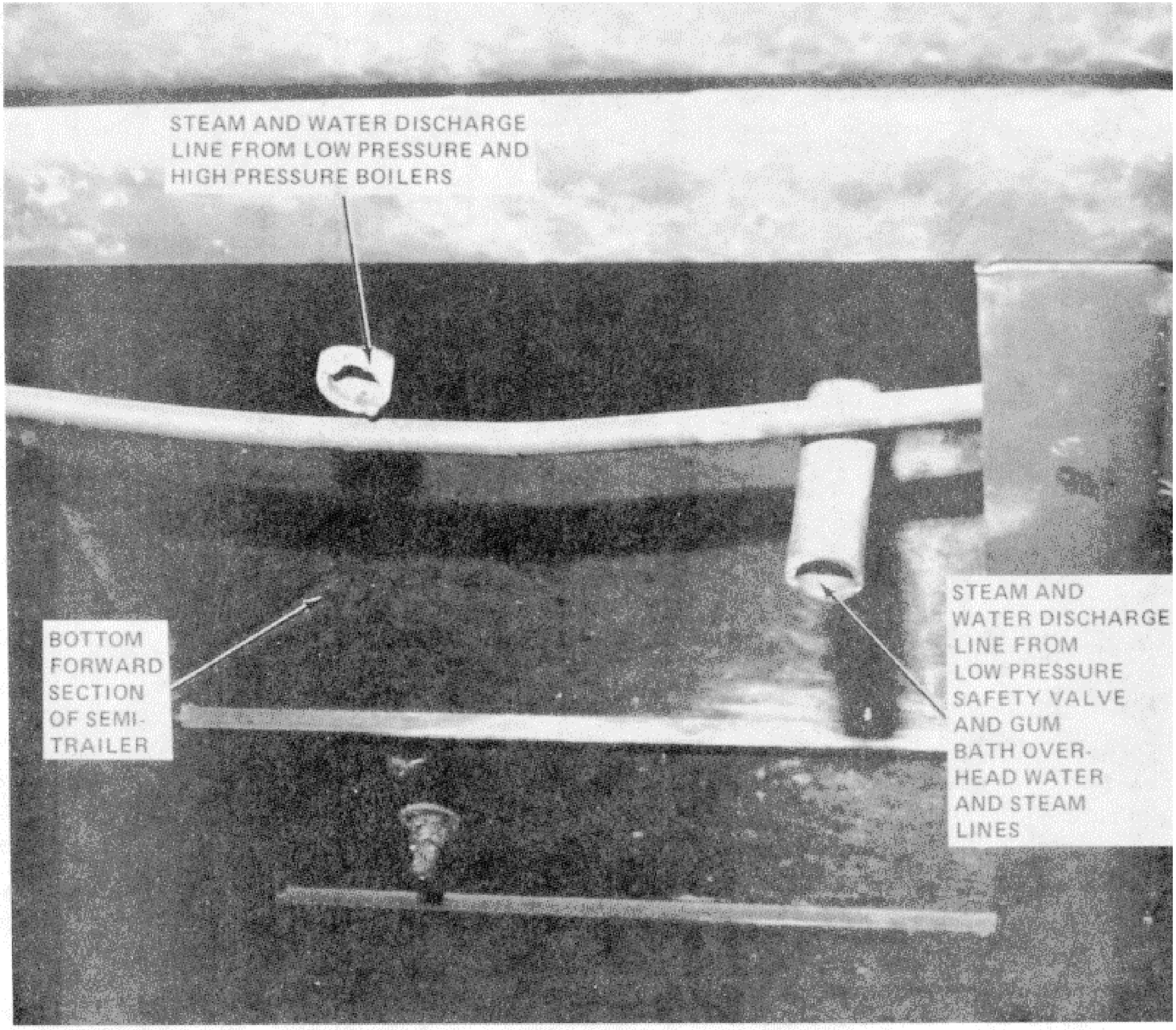

Figure 2-11. Gum Bath, Low and High Pressure Steam Setup (Sheet 3 of 5)

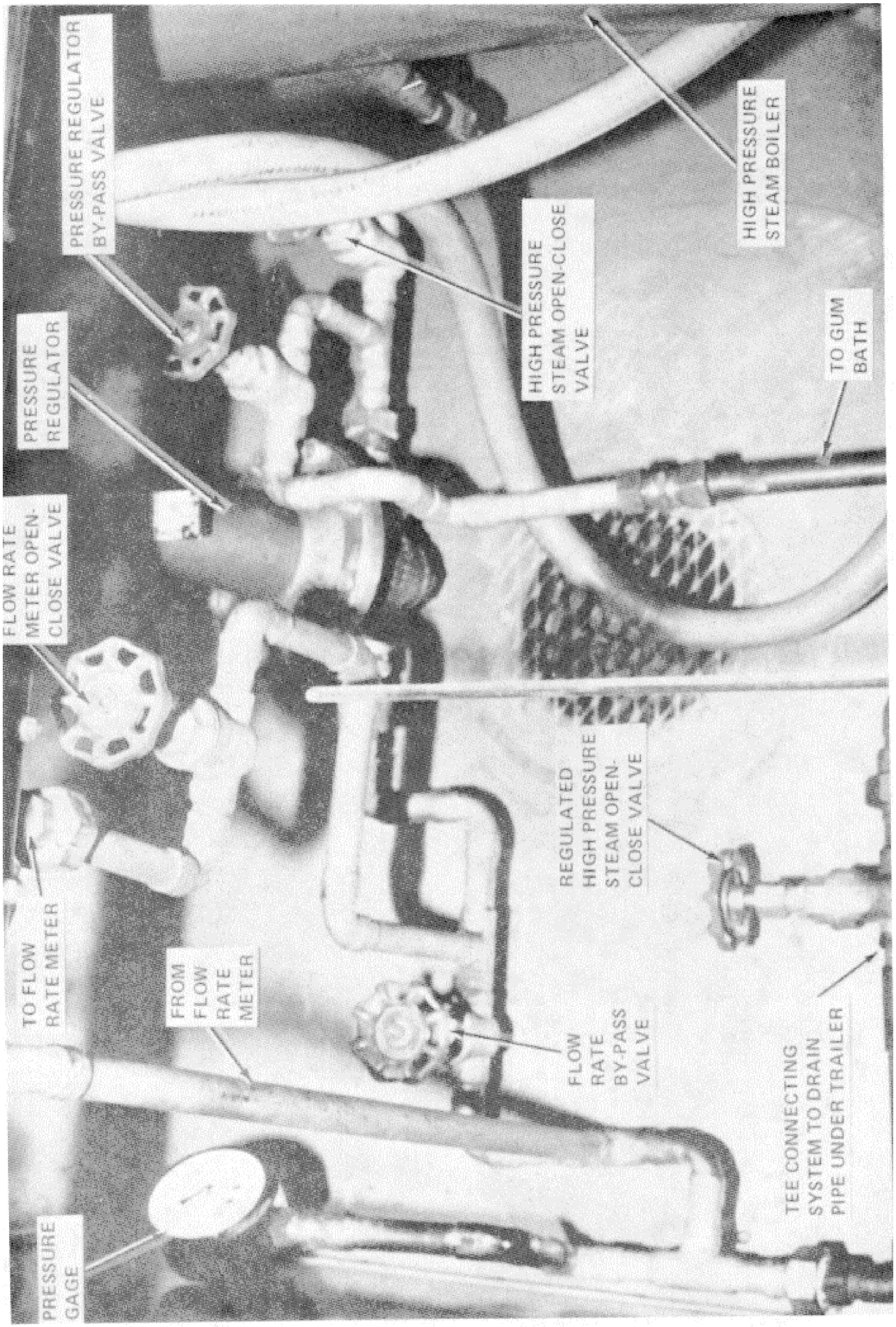

Figure 2-11. Gum Bath, Low and High Pressure Steam Setup (Sheet 4 of 5)

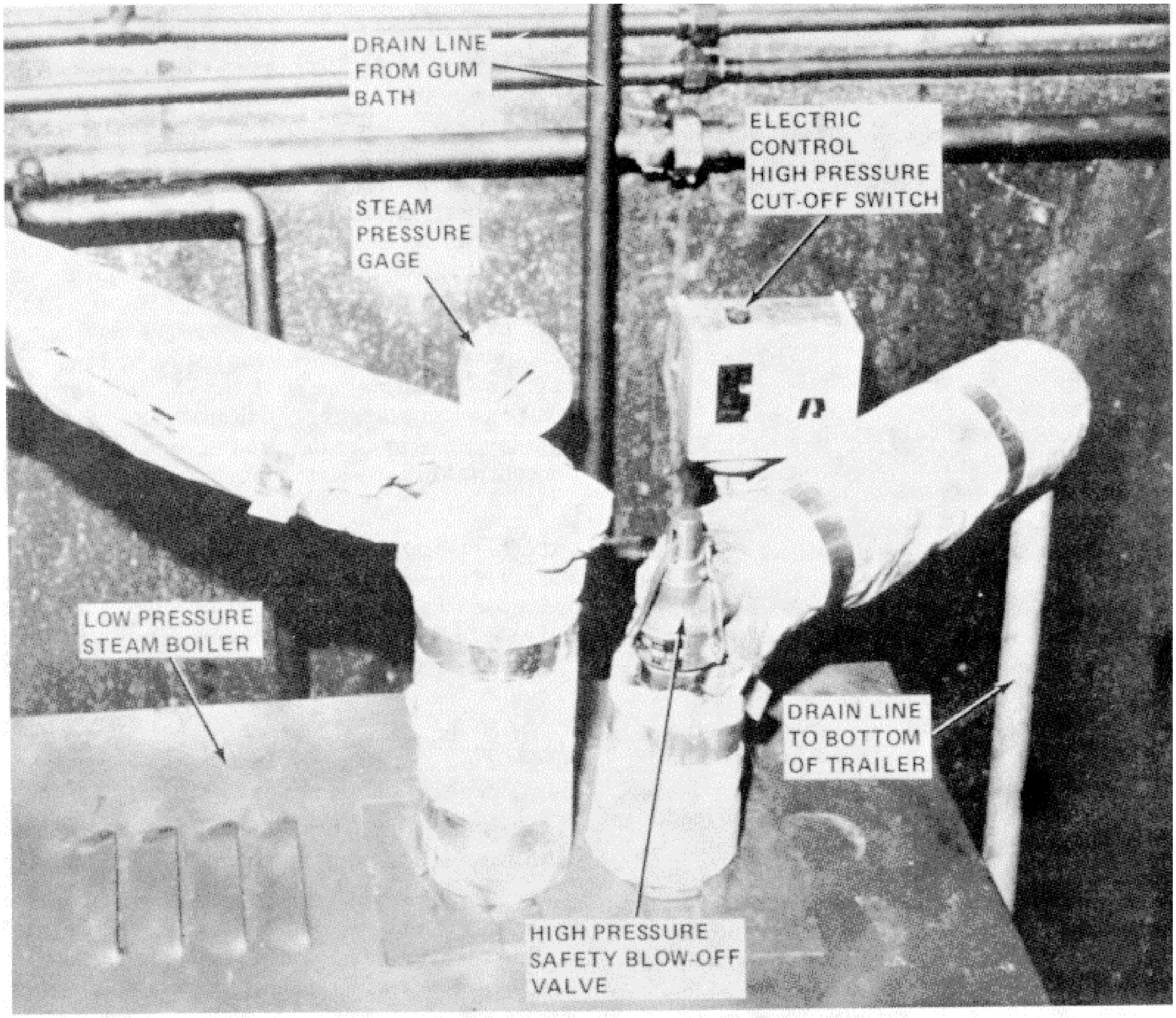

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Figure 2-11. Gum Bath, Low and High Pressure Steam Setup (Sheet 5 of 5)

b. Operation.

(1) Set thermostatic control to desired temperature.

CAUTION

Do not allow high pressure steam boiler to operate when steam flow is interrupted.

(2) Turn AUX switch on the gum bath to the ON position.

NOTE

Do not exceed service-pressure temperature rating.

(3) To shut down the high pressure steam boiler, set the AUX switch on the gum bath to the OFF position.

2-20. Low Pressure Steam Boiler. Description. The low pressure steam boiler (fig. 2-12) is located in the front compartment of the semitrailer, on the left side as you enter the compartment. The low pressure steam boiler is used to preheat water from the water tank to the high pressure steam boiler which is used with the gum bath. The low pressure steam boiler has its own circulator pump (fig. 2-13) which can be used to draw water from the water tank, or external water supply; if tank or external water supply is under pressure, circulator pump need not be turned on. The boiler is equipped with an automatic water fill system (fig. 2-14), and glass sight glass. The automatic water feeder system (fig. 2-15) will automatically fill boiler to proper level and shut off the water when an internal float valve closes when proper water level is reached. The low pressure boiler also contains a pressure gage, pressure cut-off switch and a pressure release valve to protect the boiler from damage if boiler pressure is too high, or water level is too low. Circuit breakers for the pressure steam boiler, high pressure steam boiler and gum bath must be turned on for use. After tests are completed, open drain valve (fig. 2-11) on low pressure boiler and drain off water from boiler then close valve. Turn off circuit breakers.

CAUTION

If trailer is to be stored in an area where the temperature will be below freezing and no heat supplied, be sure to drain all water from system to prevent damage to boiler.

2-21. Automatic Combustible Gas Alarm and Air Purging System. Description.

a. The automatic combustible gas alarm is a calibrated instrument designed to continuously monitor for combustible gas air mixtures. It alerts personnel of combustible mixtures that could cause explosions and fires, and it automatically activates an air purging system.

b. The alarm system consists of a main control unit (cabinet assembly) (fig. 2-16) and a remote detector assembly (fig. 2-17). The main control unit is wall mounted in a protected nonhazardous area and connects electrically to the detector assembly. The alarm can operate using 115/230 vac, 50/60 Hz, or 12 vac, with 15 watts of power. The alarm is calibrated for propane and has a setting of 20 to 40 percent of the lower explosive limit (lel) of gasoline. The remote detector voltag voltage is 5.5 vdc. An indicating meter shows the concentration level of a sample being monitored, and adjustable dual-level alarm circuits are triggered whenever a concentration exceeds the preset level (lel).

c. The cabinet assembly houses the electronics and control circuits necessary for instrument operation. Incoming power and detector leads enter the cabinet through 3/4 inch conduit fittings. The controls, fittings, and connections are discussed below.

(1) Green Pilot Light. When the instrument power is on and the detector circuit is energized, the green pilot light comes on.

(2) Blue Fail Light. When there is equipment failure or malfunction, the blue fail light comes on.

(3) Amber Warn Light. The amber warn light comes on when a combustible gas condition exceeding the low alarm setting exists at the remote detector, or when the alarm test switch ((e) below) has been actuated.

(4) Red Alarm Light. The red alarm light comes on when a combustible gas condition exceeding the high alarm setting exists at the remote detector, or when the alarm test switch has been actuated.

(5) Alarm Test Switch. The alarm test switch is a momentary contact pushbutton switch incorporated with the warn light. When it is depressed electrically, there is a simulation of an alarm level of gas concentration at the remote detector. This switch provides a functional check of the analyzer and remote alarm circuit.

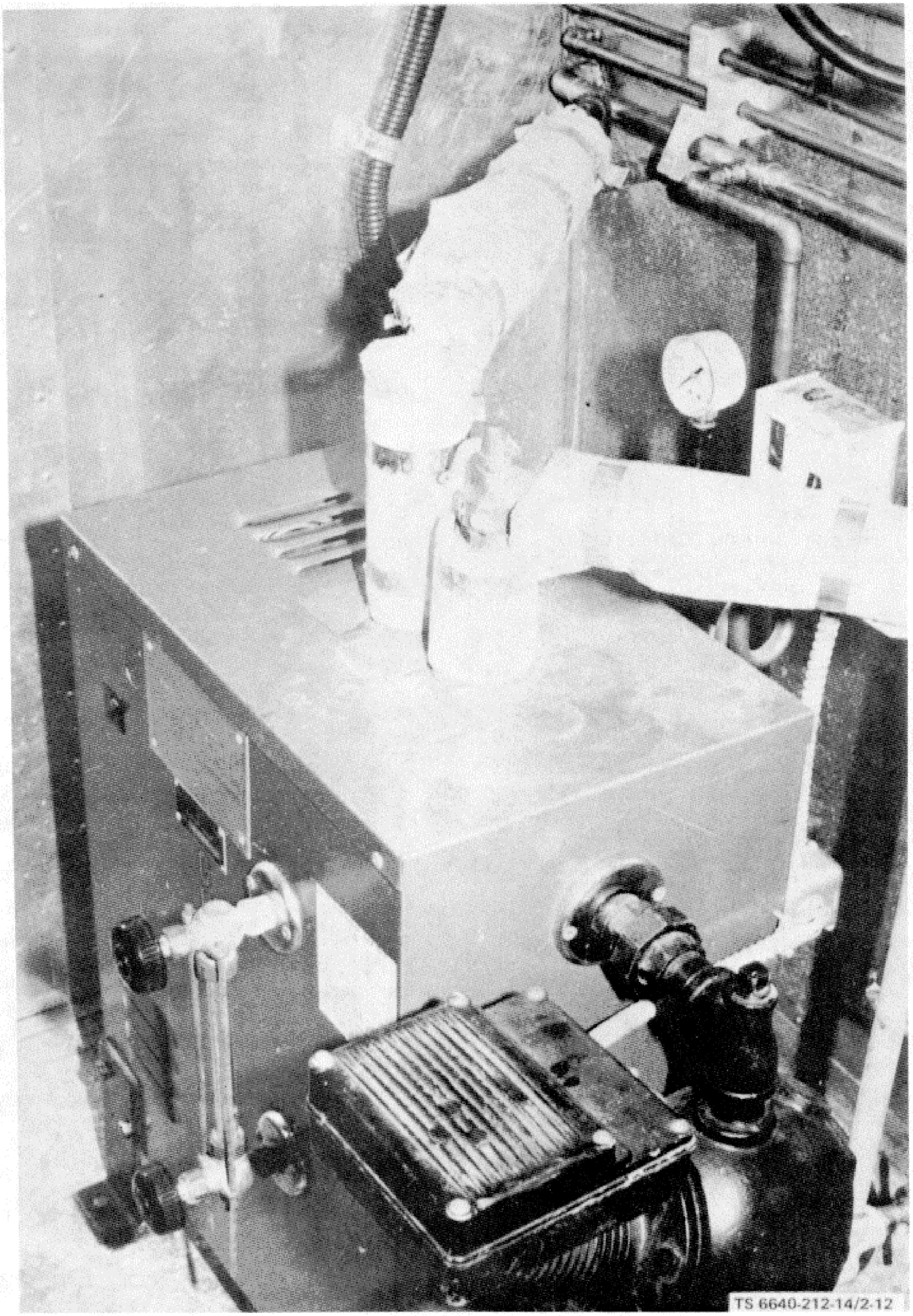

Figure 2-12. Low Pressure Boiler

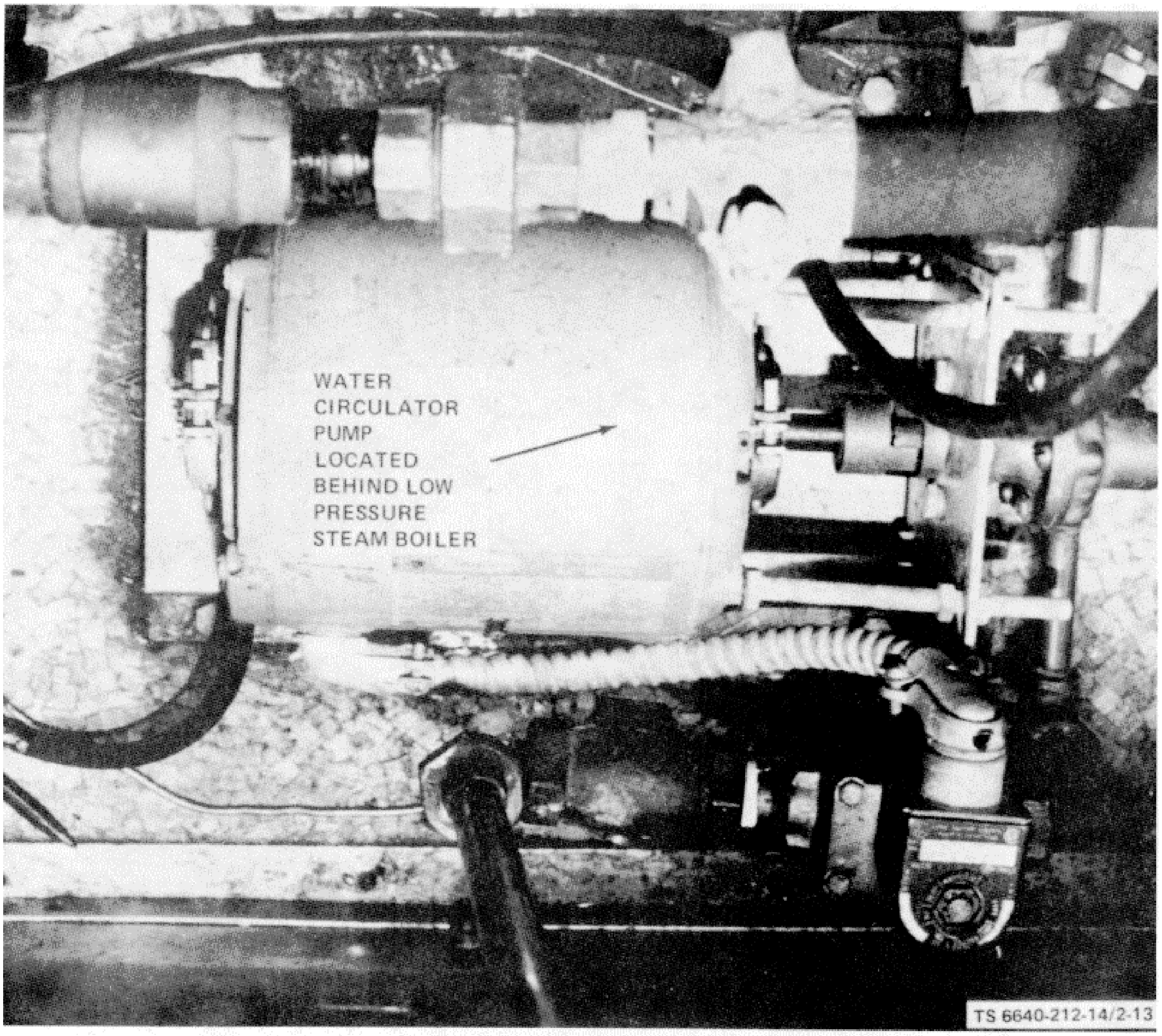

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Figure 2-13. Water Circulator Pump for Low Pressure Boiler

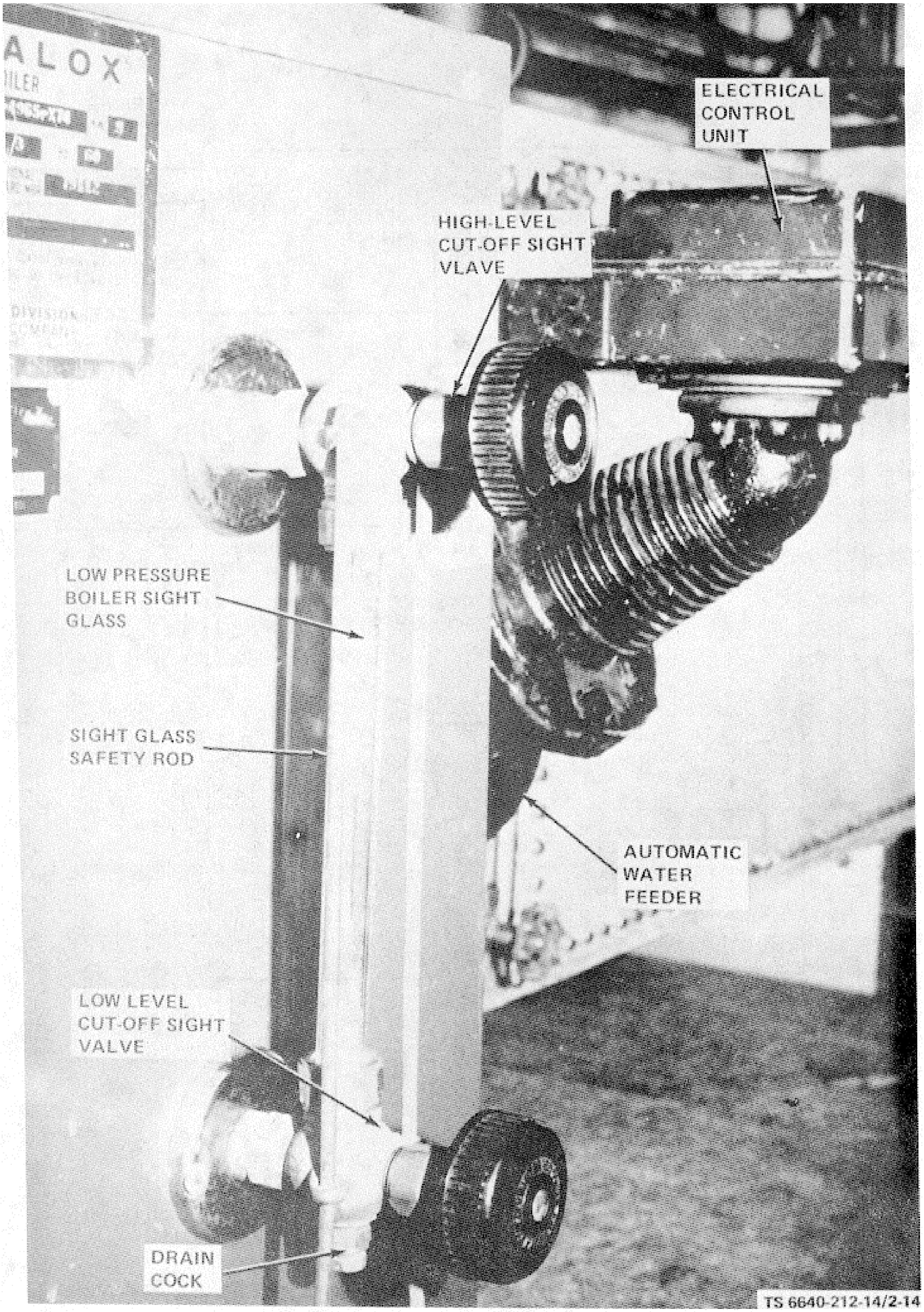


Figure 2-14. Low Pressure Boiler Sight Glass mind Electric Control Unit

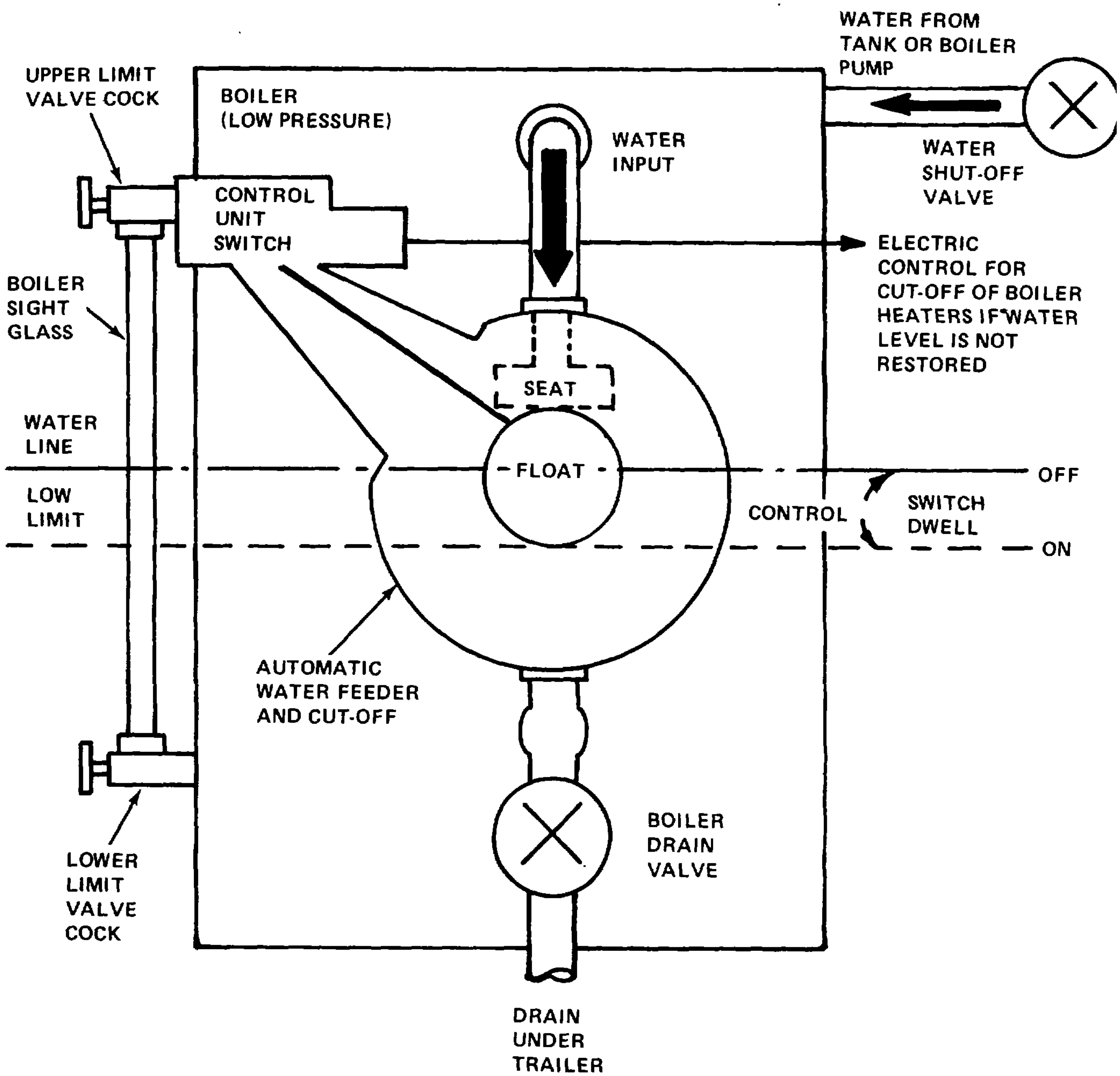


Figure 2-15. Simplified Diagram, Automatic Water Feeder System

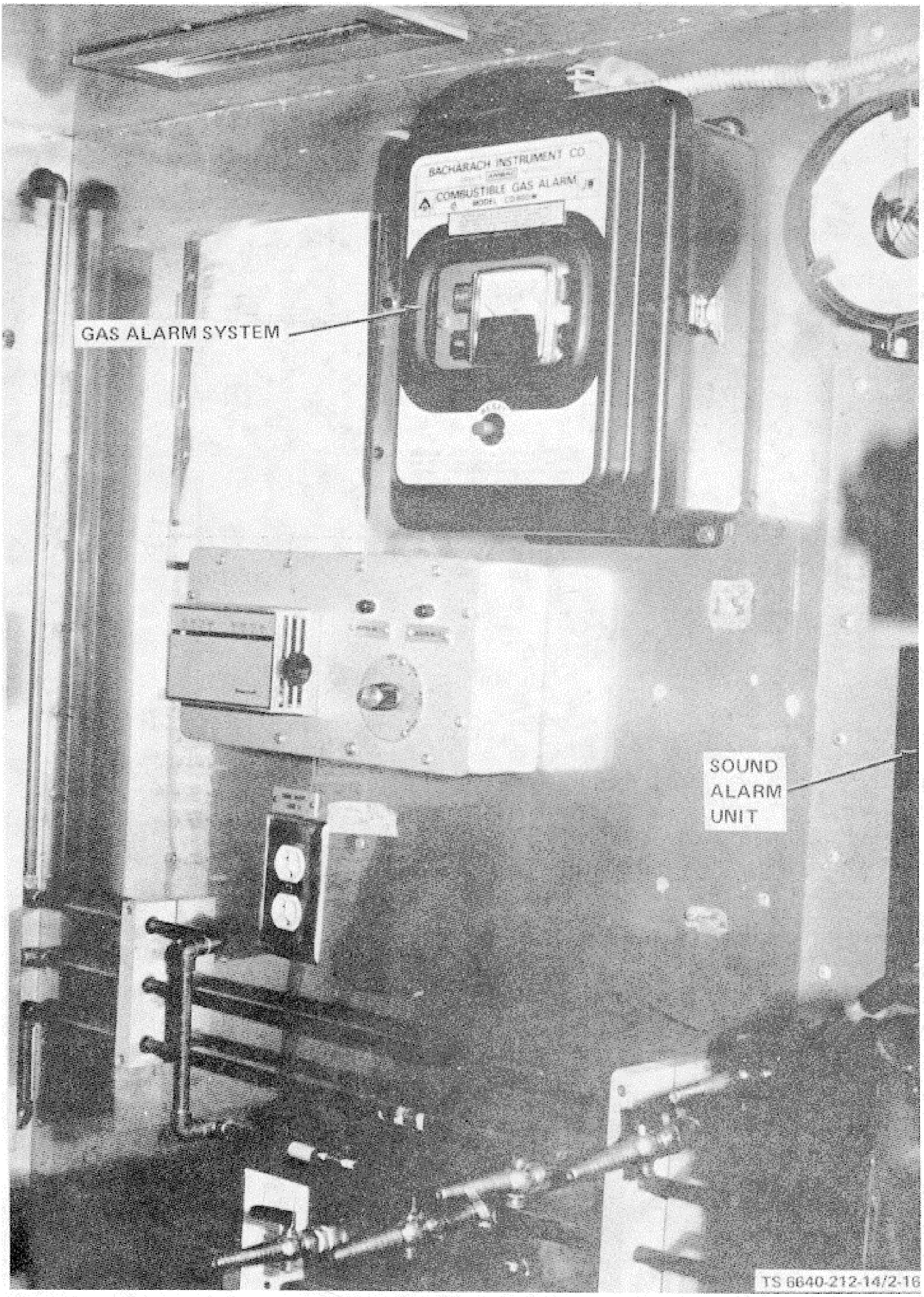


Figure 2-16. Gas Alarm System Location

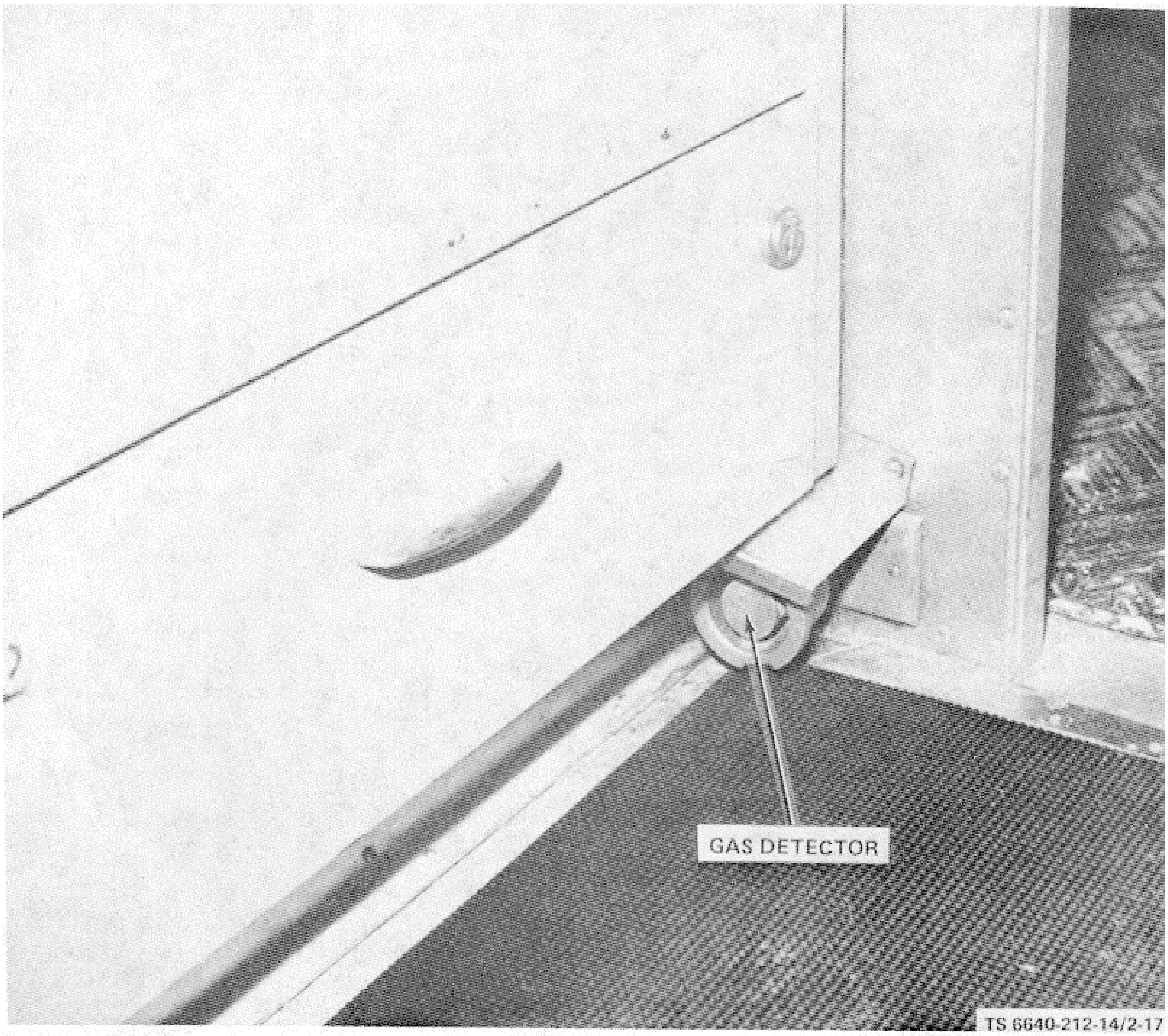


Figure 2-17. Typical Gas Detector Installation

(6) Alarm Reset Switch. The alarm reset switch is a momentary contact pushbutton switch located on the cabinet door. Depressing the switch deactivates the holding circuits of the alarm and warning relays if a safe gas condition has been restored at the remote detector. If a safe condition does not exist, the unit cannot be reset.

(7 Indicator Meter. The indicator meter shows the concentration of combustible gas at the detection point.

(8) Terminals. Terminals are accessible when the front panel is open and the printed circuit card is removed. Terminals are provided for incoming power, remote detector leads, alarm and failure devices, and for external warning devices and recorder, if desired.

d. The alarm system detector consists of the body, detector element, and shield assembly. The body houses the detector element and holds the shield in place. The element is a replaceable gas sensing unit that plugs directly into the body when the shield is removed. The shield assembly consists of a shield and a flashback screen, which prevents ignition of combustible gases. The detector, which is explosion proof, is located in an area where flammable gas or vapor may be released. In the semitrailer, one is located on the floor of the front compartment where the vacuum pump and exhaust units are, and another on the floor under the oxidation stability bath by the rear partition in the laboratory compartment (fig. 2-17).

2-22. Placing the Alarm System in Operation.

a. Initial Startup Procedures.

(1) Turn on the power (the pilot light should come on). A 45-second delay disables the alarm circuits to permit instrument warmup. Allow the system to stabilize for 5 minutes.

(2) Make sure that the remote detector is in a combustible gas-free area. The area surrounding the detector can be checked by using a portable combustible gas indicator.

(3) Zero the indicating meter; use a small screwdriver to turn the zero adjuster on the printed circuit board. Turning the adjuster clockwise increases the reading.

(4) Depress the warn/test button, and verify an up-scale meter reading. The warn and alarm lights should come on. A 2-second delay on the alarm indication is provided.

b. Initial Startup Adjustments.

(1) Measure and adjust the detector voltage at the remote detector head, and adjust the volt control in the corresponding module.

(2) Measure the detector voltage at the cabinet as follows:

(a) With instrument power on, connect the high-resistance, direct-current voltmeter leads to the detector voltage test points on the printed circuit board (terminals B). Observe the polarity.

(b) Record the voltmeter reading. The reading recorded is the detector voltage without resistance due to detector lead length. This procedure provides a convenient means of checking the detector voltage at any time without disassembling the remote detector.

(3) Expose the detector to a sample of combustible gas. See that the meter reads up-scale and that the alarms come on at the desired levels.

(4) If the warn and alarm set points need to be adjusted, proceed as follows:

(a) Make sure that the detector is in a combustible gas-free environment.

(b) Remove the warn and alarm relays (first and last relays) from the printed circuit board.

(c) Turn the warn and alarm adjusters fully counterclockwise. Both the warn and alarm lights should come on.

(d) Turn the zero adjuster on the control module printed circuit board until the meter reads approximately 2 percent below the desired warn setting.

(e) Turn the warn adjuster slowly clockwise until the warn light goes off.

(f) Turn the zero adjuster slowly clockwise and see that the warn light comes on at the desired level. (There is a 2-second delay on warn and alarm indication).

(g) Repeat the above three steps for the alarm set point.

(5) The instrument may now be placed in operation.

c. Inspections.

(1) Daily.

(a) Inspect the instrument and pilot lights to see that they show normal operation.

(b) Check the meter readings and investigate any abnormal deviations from zero.

(2) Weekly. Check meter readings, and adjust zeros if necessary while detectors are in a combustible gas-free environment.

(3) Periodic. Check response of the instrument periodically by exposing the detector to a sample of combustible gas of known concentration.

d. Services.

(1) Replace pilot, alarms, and fail lights when necessary.

(2) Calibrate the instrument, when necessary, as follows:

(a) Expose the detector to a known concentration of combustible gas in the air.

(b) Correct meter reading by adjusting the gain adjuster on the printed circuit board using a known concentration of gas or the test and calibration kit, which can be obtained commercially.

(3) Replace the detector element (e. *(2)* below) whenever it is no longer possible to make the zero adjustments within the span of the zero adjuster on the corresponding control module. Check detector voltage between the detector voltage test points on the printed circuit board each time the element is replaced.

e. Detector Voltage Measurement and Element Replacement

(1) Voltage measurement. Two people are required to perform the initial detector voltage settings and measurements, one person at the control unit (fig. 2-16) and one person at the remote detector (A, fig. 2-18). Refer to figure 2-18 and proceed as follows:

(a) Turn instrument power off.

(b) Loosen the setscrew holding the shield assembly to the body, and unscrew the shield assembly from the body.

(c) Remove the detector element.

(d) Insert the test socket adapter (23-4027) into the body (fig. 2-19), and insert the detector element into the test socket adapter.

(e) Using a direct current voltmeter (0-10 volt range), clip the voltmeter leads to terminals A (+) and R (-).

(f) Turn the instrument power on and adjust the detector voltage, using the voltage adjuster on the printed circuit board. The detector voltage must be 5.5 vdc. Clockwise rotation increases voltage.

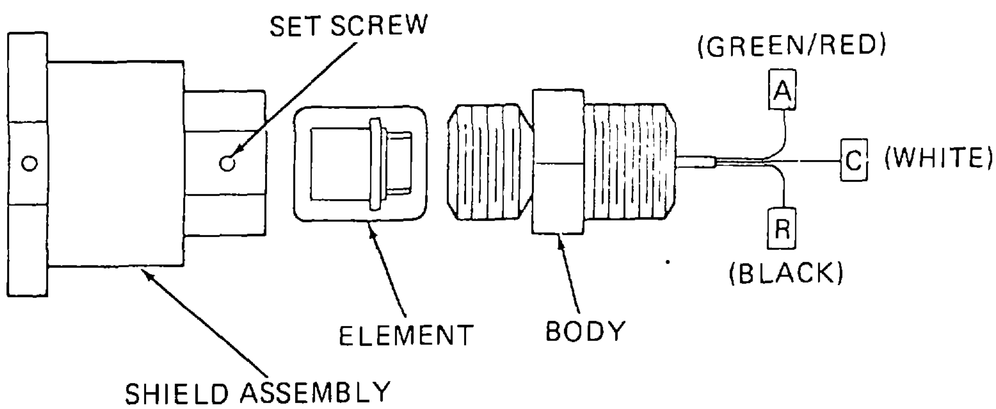
(g) Turn the instrument power off and remove the test socket adapter.

(h) Insert detector element into the body and reassemble the detector. Tighten all parts securely, and turn the power on.

(2) Element replacement. To replace the detector element, follow procedures in *(1)*, *(a)*, *(b)*, *(c)* and *(h)* above.

f. Fail Indications. A fail relay and fail light are provided to monitor equipment operations. If equipment failure occurs, the blue fail light comes on; external failure terminals, switch and alarm circuits are disabled to prevent false alarms. Fail indications may be caused by:

(1) A short or open circuit in the detector circuit.



A. DETECTOR DISASSEMBLED

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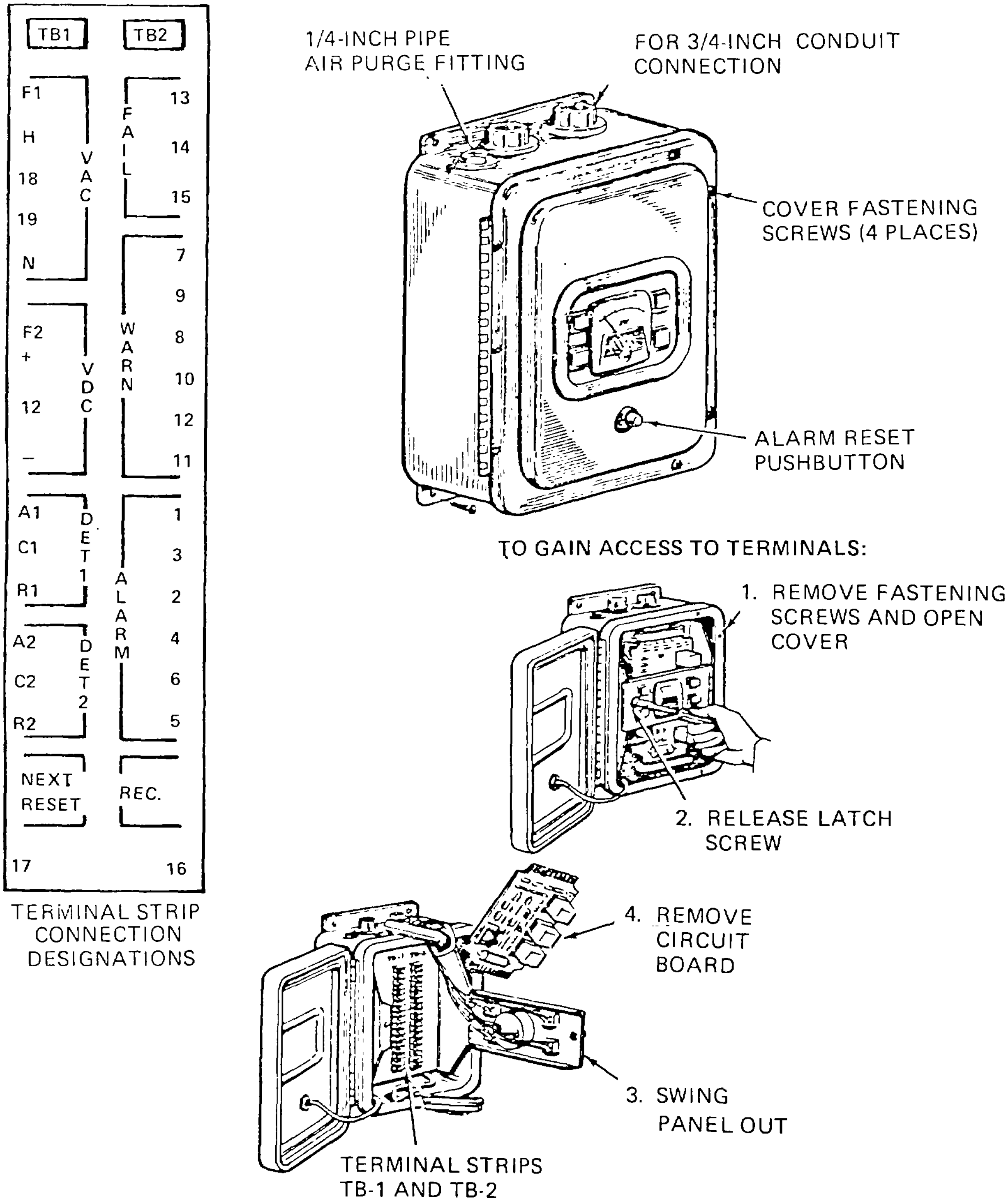
Figure 2-18. Alarm System Detector and Control Unit Disassembled (Sheet 1 of 2)



B. PRINTED CIRCUIT BOARD REMOVAL

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Figure 2-18. Alarm System Detector and Control Unit Disassembled (Sheet 2 of 2)

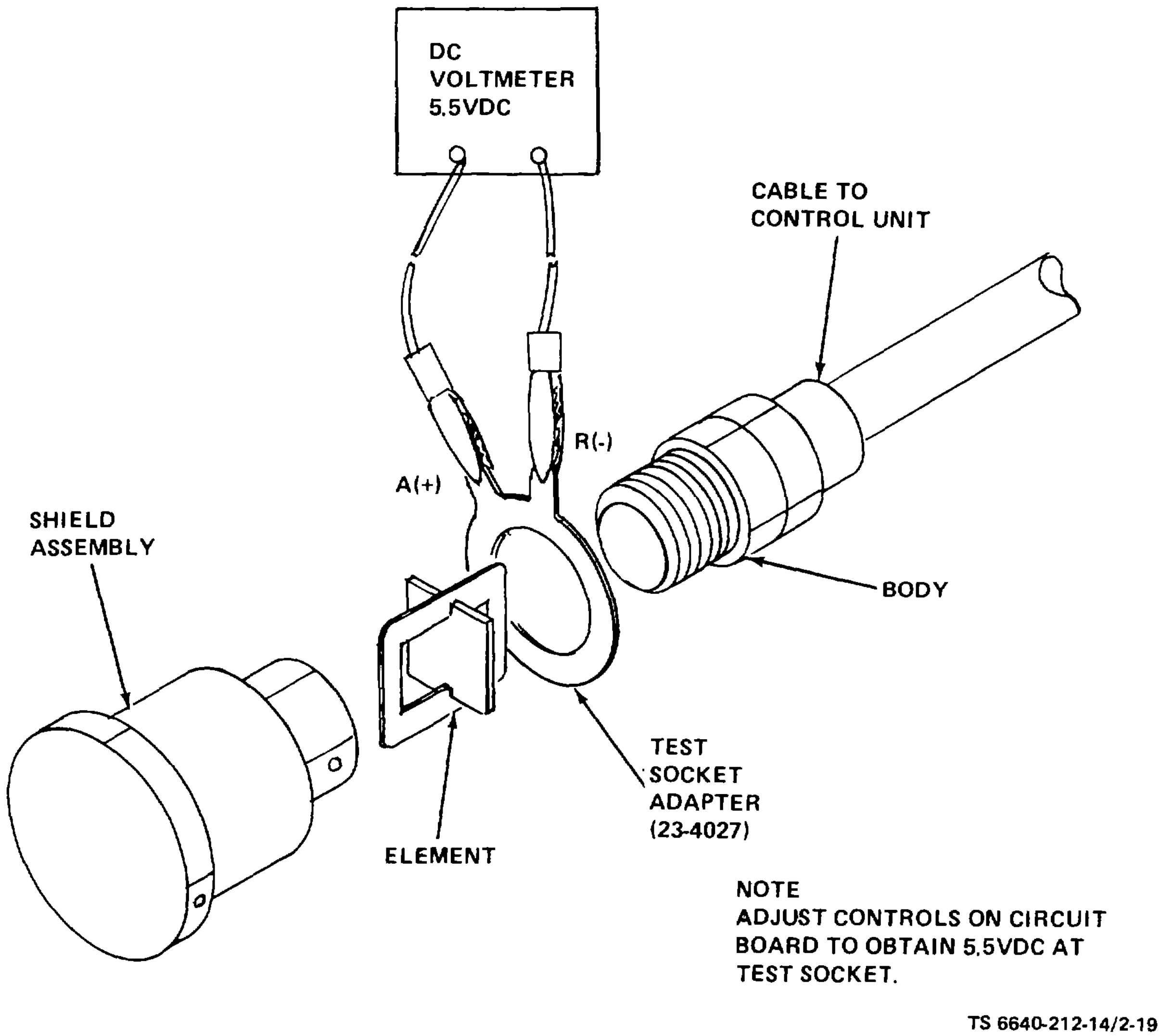


Figure 2-19. Test Setup, Element 5.5 VDC Check

(2) Detector voltage being set abnormally low.*(3)*

(3) Excessive negative meter drift.

g. Power Supply. The power supply is designed to maintain a constant voltage to the detector circuits despite variations in the input voltage. If the voltage at test points B on the printed circuit board is incorrect and cannot be brought to the correct value by adjusting the voltage adjuster, proceed as follows:

(1) Make sure that the module is fully inserted into its socket.

(2) Check fuse (or circuit breaker). Light will be off on all modules if fuse is burned out (or circuit breaker has tripped).

(3) Check the detector, and replace if necessary.

(4) If voltage is still incorrect after element replacement, replace the printed circuit board (B, fig. 2-18).

b. Troubleshooting Refer to table 2-2 for troubleshooting procedures.

2-23. Analytical Balance.

a. Description*.* The analytical balance (fig. 2-20), designed to meet the requirements specified in ASTM Method D2276 (TM 10-1166), is located on the right-hand counter adjacent to the entrance door, above drawers K1 and K2 (fig. 1-2). It has an automatic preweighing and single-knob taring system. It incorporates full 1000-milligram optical range with digital readout. The numbers to be read on the optical scale appear in a clear window while all neighboring values are visible, but subdued, through a green filter.

Table 2-2. Gas Analyzer Troubleshooting

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

1. NOT POSSIBLE TO MAKE ZERO ADJUSTMENT WITHIN SPAN OF ZERO ADJUSTER IN ABSENCE OF COMBUSTIBLE GAS.
   Step 1. Check by substitution of another detector unit.
   a. If zero adjustment is within range of zero adjuster replace old detector unit.
   b. Check detector voltage between the detector voltage test (on P.C. board).
   c. Insure module is fully inserted into its socket.
   Step 2. Voltage still incorrect after element replacement.
   Replace P.C. board.
2. NO POWER TO GAS ANALYZER (ALL LIGHTS OFF).
   Check fuse on circuit breaker.
   a. Replace fuse or reset circuit breaker.
   b. Check other equipment for availability of power, if no power check source and correct.
3. FAIL LIGHT IS ON.
   If equipment failure occurs, the fail light will come on, external failure terminal will switch, and alarm circuits will disable to prevent false alarms.
   a. Check if detector voltage set abnormally low. Adjust as necessary.
   b. Check for excessive negative meter drift. Adjust as necessary.
   c. Check for a short or open circuit in the detector circuit. Repair or replace as necessary.
4. METER CANNOT BE SET TO ZERO WITH TWO DETECTORS ON LINE.
   Check if one detector is installed and the other detector removed from the control module, and a set of 15-ohm resistors set across the DET 2A-C-R terminals. If detector or resistors are missing proper zero setting cannot be done.

   If zero cannot be set, there is a mismatch between the two sensors; replace the older sensor with a new one, and adjust potentiometer R24 for a zero adjustment.

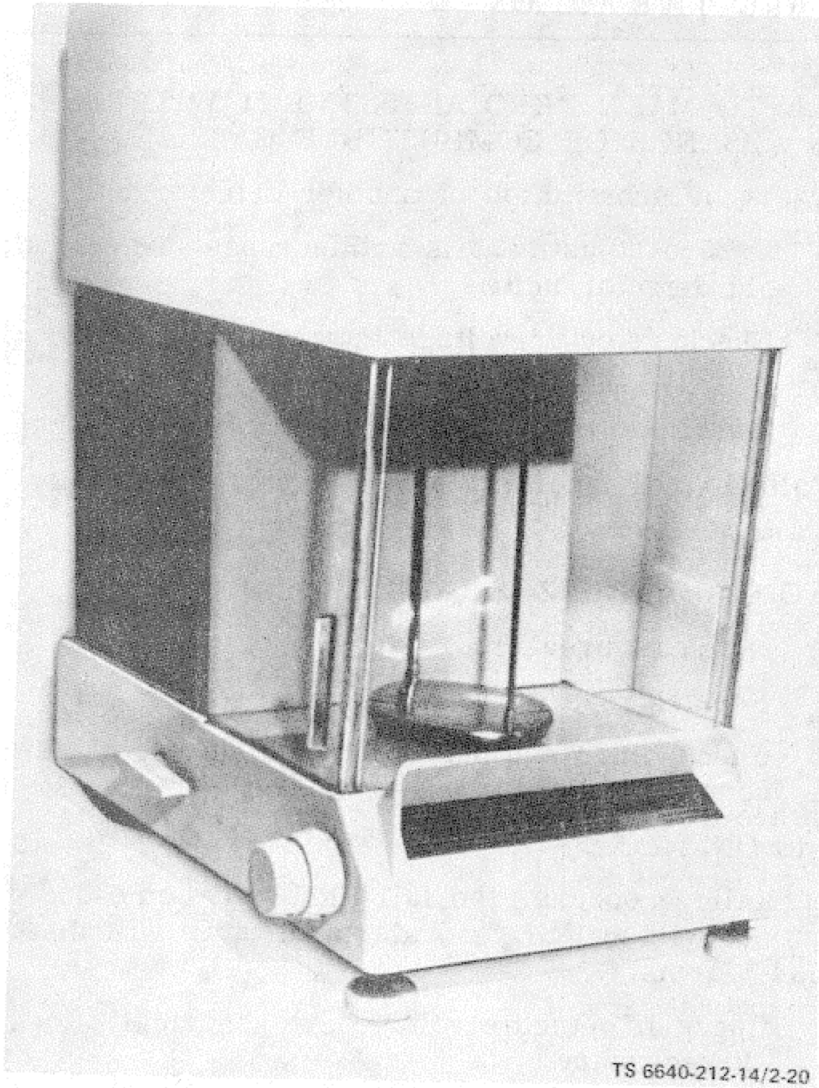


Figure 2-20. Analytical Balance

(1) *C*ontrols. Two knobs (left side front) dial in the weights from 1 to 99 grams. The release lever is turned down and the weight is read to the last decimal place by superimposing a hairline on the optical scale with the micrometer control knob (right side front). The weight application knobs and readout are arranged in a straight line, in their logical sequence form left to right.

(2) Single field of view. The pan, optical scale, and controls are in a single field of view.

(3) Weighing chamber. Sliding glass doors on either side provide access to the weighing chamber. A pan brake which acts on the bridle above the chamber provides damping of pan swing.

(4) Ionizer. The analytical balance is operated with an ionizer positioned near the weighing pan to dissipate static charges. The ionizer operates on the following nuclear principles: Alpha radiation is emitted from the polonium elements and is harmless externally. Alpha rays travel through the air very rapidly, but have no power to penetrate the skin. As the rays travel through the air, they produce dense ionization. It is this ionized air that dissipates static charges.

WARNING

ANALYTICAL BALANCESARTORIUS MODEL 2400-2463. The radioactive Isotope Polonium 210 is toxic and ingestion or inhalation of the solid material should be prevented. Do not remove the protective grid or touch the radioactive strip under the grid. If the strip is accidentally touched or handled, wash hands immediately with soap and water. The Ionizer is made by sealing Polonium between a base of silver and a layer of gold. The element is then protected by a shield and grid which prevent direct contact. Most of the radioactivity will be decayed to a nonradioactive substance when the device is no longer effective as a static eliminator. The small quantity of remaining material may be a potential hazard if mishandled. Return for disposal if use is to be discontinued. DO NOT DISCARD AS SCRAP. DISPOSE AS RADIOACTIVE MATERIAL.

b. Operation (fig. 2-21).

(1) To weigh a sample of unknown weight, use the weight knob to return the macro weight counter to zero and use the micrometer drum knob to zero the micrometer line on optical scale.

(2) Move arrestment lever to the PREWEIGHT (up) position (fig. 2-22). If the optical scale does not indicate zero, refer to paragraph 1 for calibration and maintenance instructions.

(3) After the scale is zeroed, arrest the balance by depressing the arrestment lever to the ARREST position (fig. 2-22). Check zero in the full release position.

(4) Place the arrestment lever in the down position. Adjust the optical scale to zero by using the zero adjust knob.

(5) Place a sample on the pan and lift the arrestment lever to PREWEIGH position. The coarse weight will be indicated on the optical scale.
Set the weight control knobs to show the same weight on macro weight counter.

(6) Depress the arrestment lever to ARREST position and, after a brief pause (about 3 seconds), move the arrestment lever to FULL RELEASE position (fig. 2-22). When the optical scale comes to a stop, use the micrometer drum knob to move the scale pointer (micrometer line) over the next lower optical division of the moving scale. The readout can then follow from left to right: first the macro values from the macro weight counters, then the first two decimal places on the optical scale, and the final two digits from the micro (digital) scale.

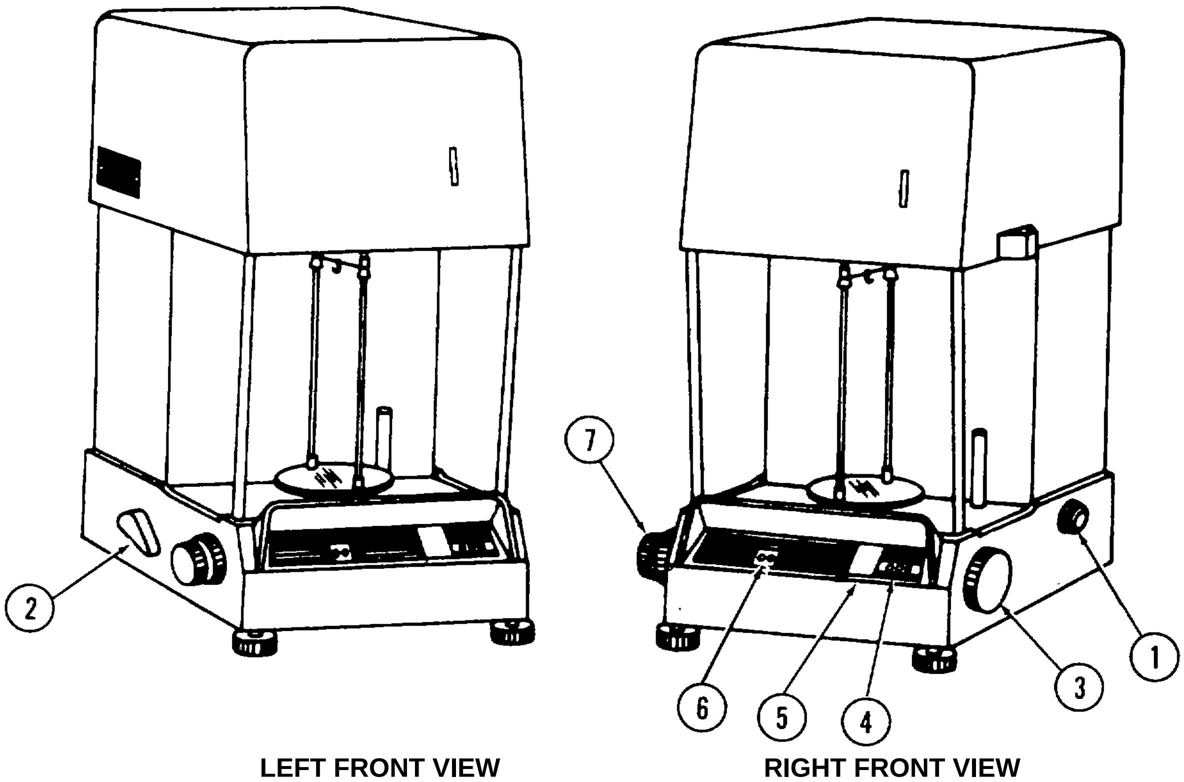
(7) Return fine adjustment to zero at the completion of each weighing.

(8) The taring capabilities of the balance can be used on containers weighing less than 1 gram.
Zero the balance; then place the container on the pan. The reading on the optical scale is the tare weight of the container.

(9) After taring, if it is desired to fill the container with a specific volume, adjust the zero control knob to reflect zero on the optical scale and proceed as follows:

(a) Remove the container from the analytical balance and place it on the double beam balance.
(Tongs should be used).

(b) Tare the container on the double beam balance and proceed to fill it.



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Legend for figure 2-21:
1. Zero adjust knob
2. Arrestment lever
3. Micrometer drum knob
4. Digital readout.
5. Optical scale
6. Macro weight counter
7. Weight knob

Figure 2-21. Analytical Balance Details

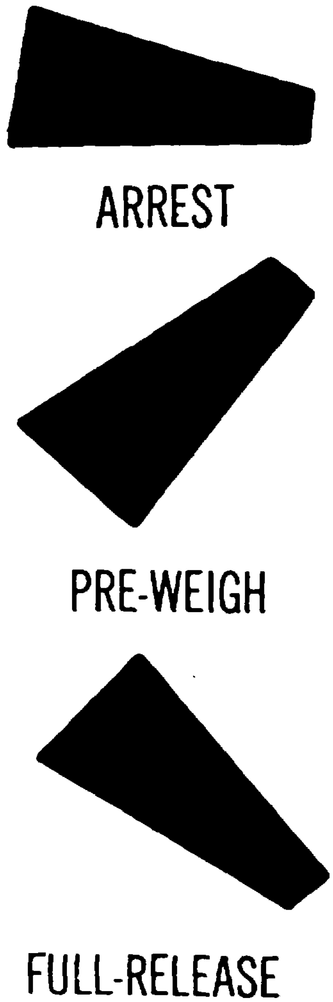


Figure 2-22. Arrestment Lever Positions

(c) After obtaining a volume of 0.1 gram, remove the container from the double beam balance and place it on the pan of the analytical balance. (Tongs should be used).

(d) Adjust the volume by use of filter paper or a glass rod.

(10) To tare containers over 1 gram, weigh the container as noted above for any unknown weight.
After taring, if it is desired to fill the container with a specific volume, adjust the zero control knob to reflect zero on the optical scale, leaving the macro scale untouched. Proceed as in *(9) (a)* through *(c)* above, and, by use of filter paper or a glass rod, adjust to the specific volume desired by accounting for the macro weight figure only.

NOTE

If a tared weighing boat is used, remove the tare ring and zero with the empty boat on the pan.

(11) To weigh to a preset weight, adjust the weight control knobs and, if necessary, the micrometer drum knob to the desired value. Preweigh, following steps *(9) (a)* through *(c)*, move the arresting lever to the full release position, and adjust the volume by use of filter paper or a glass rod until the value is reached.

(12) The weighing results can be corrected for conditions requiring absolute weighings. The switching weights are made on noncorrosive nonmagnetic steel having a density of 7.88 grams per milliliter. For a medium air density of 0.0012 grams per milliliter, they are adjusted to match brass weights of density 8.4 grams per milliliter.
Differential weighing of the same material do not require correction. In case of absolute weighings, the result of the following formula has to be added to the weighing result.
COKn (1.10-5 (PL/PG) + (PL/PP) grams where
n = reading of the balance in grams
PL = the density of the air in grams per milliliter
PG = the density of the switching weights in grams/milliliter
PP =the density of the weighing material in grams/milliliter

2-24. Distillation Test Apparatus.

a. Description. Two distillation units (fig. 2-23) are located above drawer L1 (fig. 1-2). Each unit is designed to comply with the requirements specified in ASTM Method D86 (TM 10-1166) in the distillation of petroleum products. The righthand unit incorporates a 500-watt immersion heater for gas oils. Each unit consists of a shield assembly and a condenser assembly. The shield and condenser exteriors are constructed of stainless steel; the condenser interior of copper insulated with a 1-inch thickness of fiberglass. The ice-refrigerated condenser is equipped with a drain and overflow outlet, and distilled oil outlet. The shield incloses a 750-watt heater with autotransformer, two porcelain refractory blocks, observation window, an elevating device to allow proper alinement of distillation flask to condenser tube, a temperature control assembly, and an ONOFF toggle switch. Wood blocks are stored in drawer K1 (fig. B-16) for supporting cooling jar and graduate. Asbestos boards and covers are stored in drawer K1.

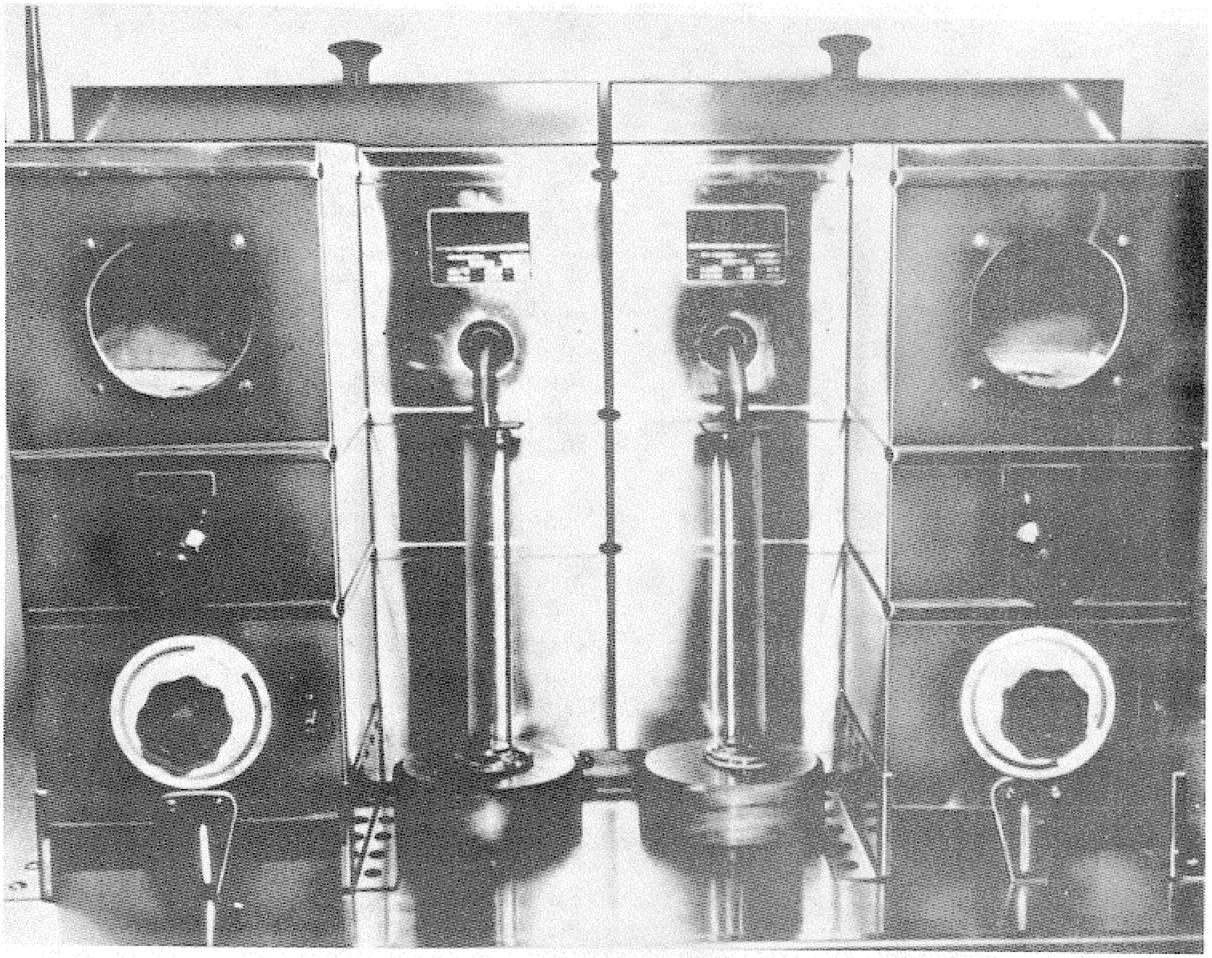


Figure 2-23. Distillation Test Apparatus

b. Operation.

(1) Push the toggle switch to ON position.

(2) Turn the temperature control knob clockwise to increase temperature; counterclockwise to decrease temperature.

(3) To operate the elevating control, push in and turn the knob clockwise to raise the platform; counterclockwise to lower the platform. Total vertical adjustment is three-fourths of an inch.

(4) Consult ASTM Method D86 (TM 10-1166) for detailed test procedures.

2-25. Reid Vapor Pressure Bomb Bath.

a. Description. The Reid vapor pressure (RVP) bomb bath (fig. 2-24), designed to comply with the requirements specified in ASTM Method D323 (TM 10-1166) is flush mounted in the right-hand countertop and it extends into cabinet N2 (fig. 1-2). The apparatus consists of items required for the immersion of four RVP bombs in a constant temperature bath. The four RVP bombs and gages are stored in a rack to the right and above the bath. Included are heating unit and sensitive controls for automatic maintenance of required temperature. Components include a stainless steel bath, set into the counter. Over the top are mounted a 1/30 horsepower motor, a thermometer, a 500-watt low lag immersion heater controlled by a micro set thermoregulator (stored in drawer El, fig. B-11ll), and brackets for suspending the bombs. The theromoregulator is adjustable; the maximum current carrying capacity is 15 milliampere. A standpipe stoppered drain is threaded into the bottom of the bath. In the housing below the bath working chamber are mounted a relay, pilot light, and ON-OFF toggle switch.

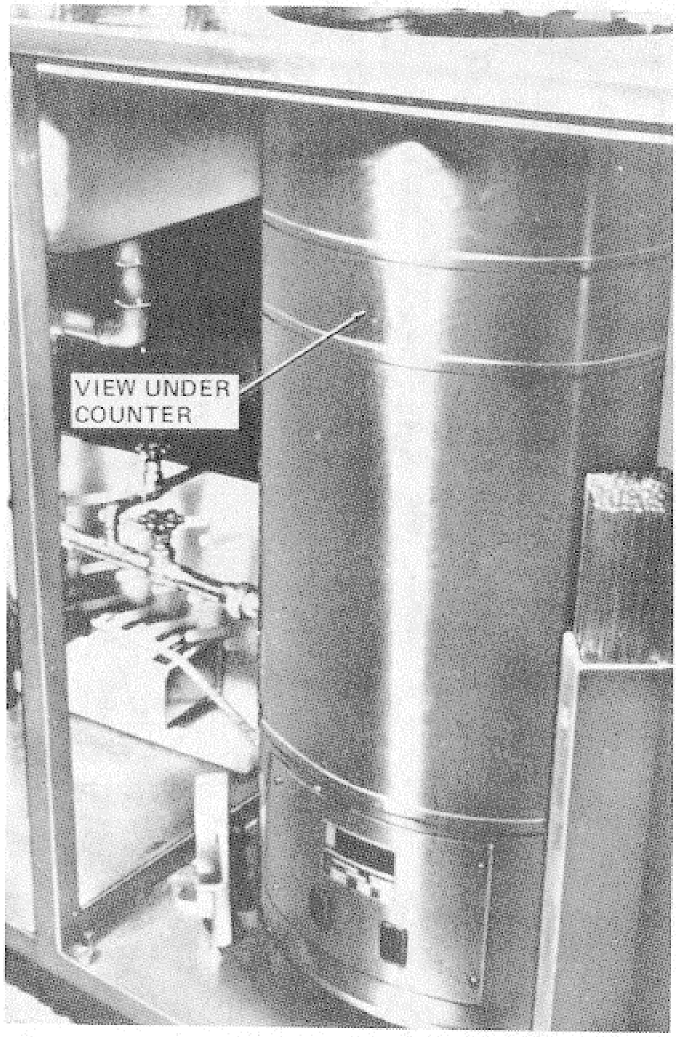


Figure 2-24. Reid Vapor Pressure Bomb Bath (Sheet 1 of 2)

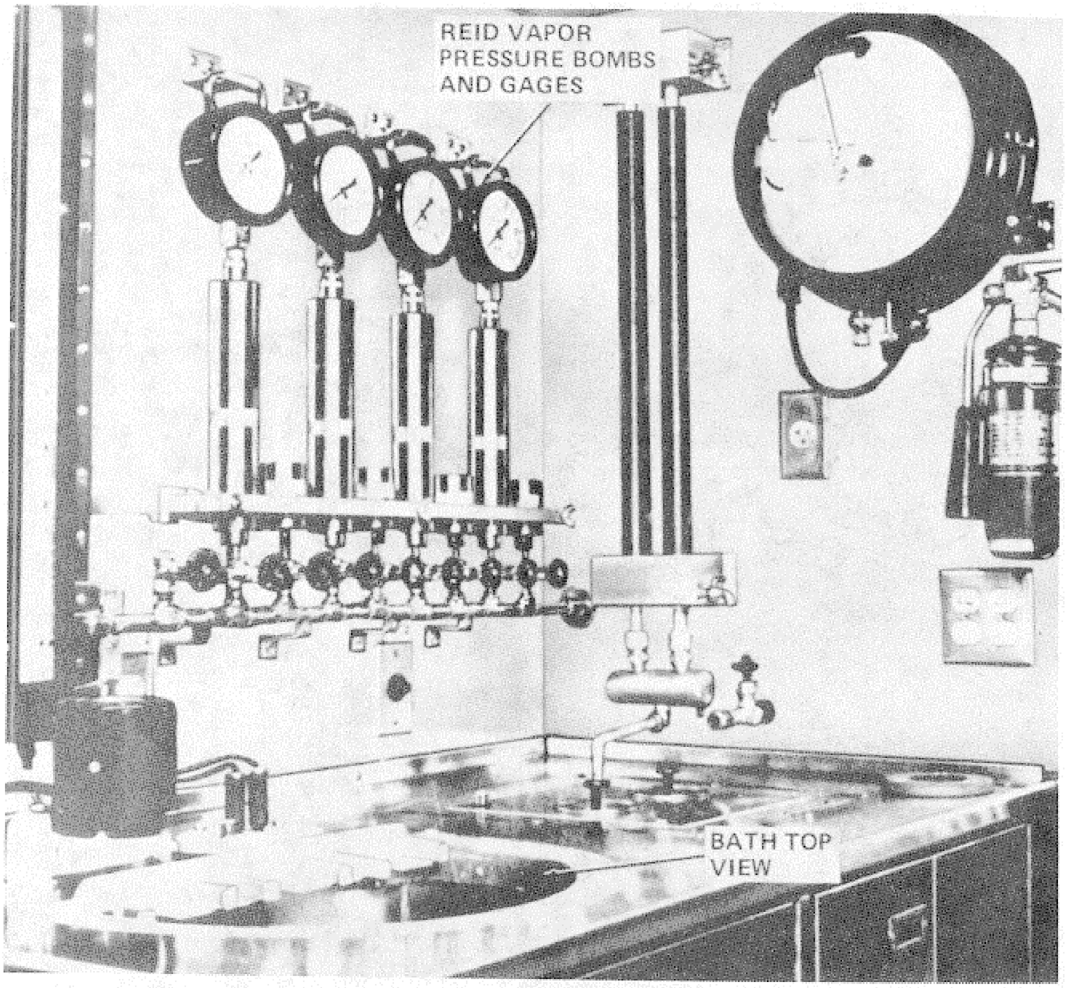


Figure 2-24. Reid Vapor Pressure Bomb Bath (Sheet 2 of 2)

b. Operation.

WARNING

Exercise extreme care not to exceed this proportion, as 12 parts per million (0.012 ml/liter) of copper sulfate is poisonous.

(1) Fill the bath to level of the overflow standpipe with water to which has been added 10 parts per million (0.01 ml/liter) of copper sulfate to cut down the growth of algae.

(2) Check and calibrate the thermoregulator (para 3-18d).

(3) Install the thermoregulator in the bath.

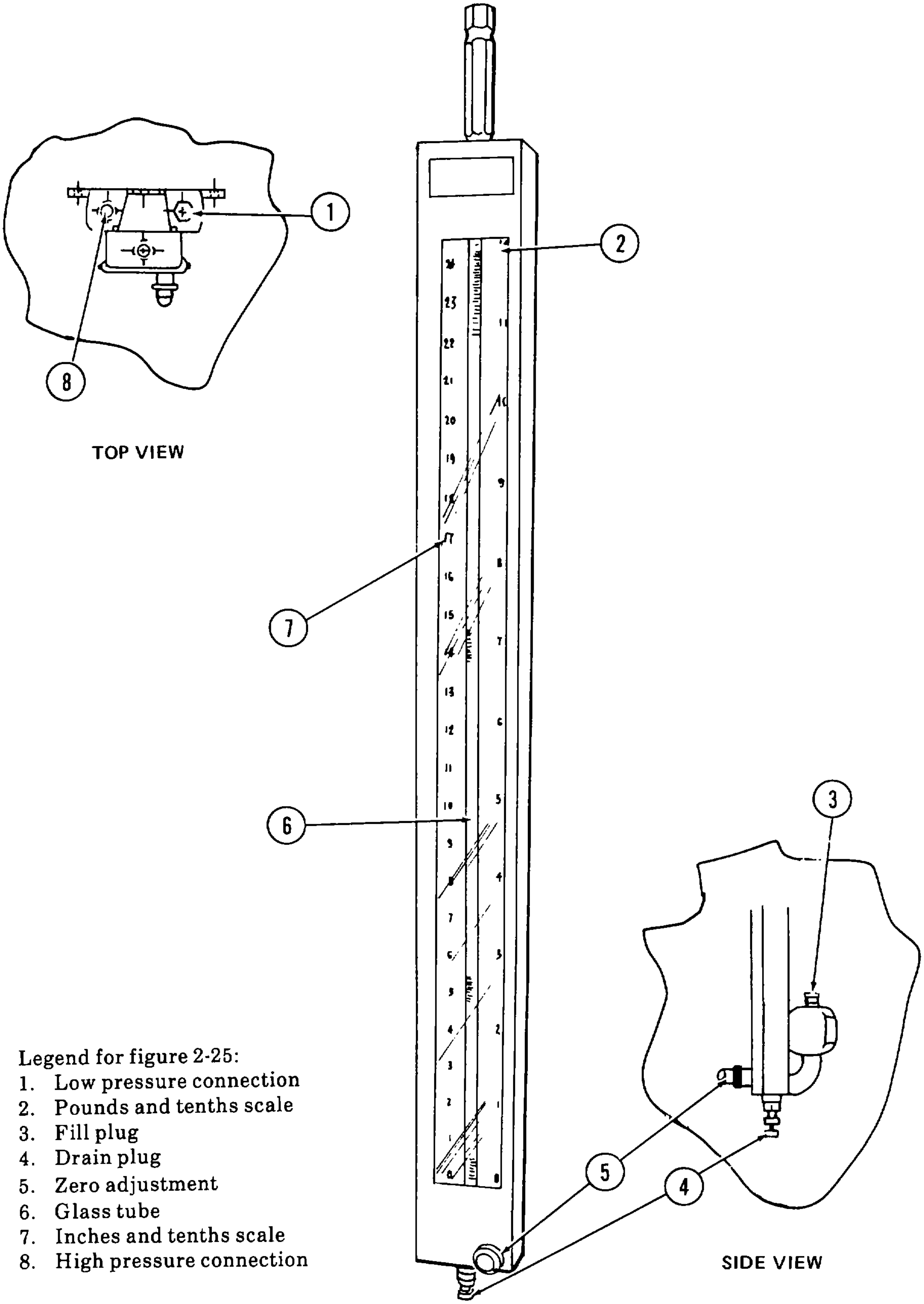
(4) Apply power to the unit. This will energize the heater and stirrer motor circuit. Turn on the stirrer motor.

CAUTION

Never turn on the toggle switch unless bath is filled with water. Heaters will burn out if they are not immersed.

(5) Pilot light will light while the heater is on. When the temperature attains 100 degrees F (38 degrees C), the thermoregulator will shut down the heater and the light will extinguish.

(6) To drain the bath, unscrew the standpipe by turning the handle (rod through pipe) counterclockwise. Lift out the pipe and the water will drain out.



Legend for figure 2-25:
1. Low pressure connection
2. Pounds and tenths scale
3. Fill plug
4. Drain plug
5. Zero adjustment
6. Glass tube
7. Inches and tenths scale
8. High pressure connection

Figure 2-25. Manometer

2-26. Manometer.

a. Description. The manometer (fig. 2-25) is mounted on the laboratory right sidewall, above the Reid vapor pressure bomb bath. The manometer is the primary basic standard of pressure measurement. It is used in the laboratory to calibrate the Reid vapor pressure gages. It consists of a glass column supported within a frame and connected at the bottom by a U-shaped tube to the manometer fluid reservoir. It has a duplex-type scale calibrated in inches and tenths on the left side of the tube, pounds and tenths using mercury on the right side. It is also equipped with high pressure (HP) connection, low pressure (LP) connection, fill plug, drain plug, vent plug, and a zero scale adjustment kno*b.*

b. Operation.

(1) To measure pressure higher than atmospheric, connect the line to the high pressure (HP) connection on fluid reservoir.

CAUTION

Air pressure to the manometer must not exceed 15 psi (6.8 kg/sq cm) (30 inches mercury).

(2) To measure vacuum, connect the line to the low pressure (LP) connection at top of indicating column.

(3) To measure a differential pressure, connect the line with higher pressure to the high pressure (HP) connection, and the line with lower pressure to the low pressure (LP) connection.

(4) To fill the mercury reservoir:

(a) Remove the fill plug on the well.

(b) Vent the instrument on the low pressure side. Assure zero adjustment at midscale.

WARNING

If a mercury spill occurs, do not vacuum or sweep the are*a.* This will disperse mercury throughout the laboratory. Spills may be cleaned up by using a glass tube of about 6 cm diameter drawn out to an opening of about 1 mm and connected by rubber tubing to a filter flask connected with a vacuum pump or aspirator, the flask acting as a trap. Control of mercury vapor should not be attempted with Flowers of Sulfur as this is not effective. Spills must be reported to the Environmental Science Officer providing services to the unit.

(c) Using a glass funnel, slowly pour the mercury in the well until the indicating level is at approximately the zero graduation on the scale.

(d) Replace the plug tightly.

(e) Adjust the scale for the correct zero position in relation to the mercury meniscus.

(5) For consistent results in reading the manometer, always observe the mercury meniscus the same way. Always read the meniscus at eye level.

2-27. Oxidation Stability Bath.

a. Description. The oxidation stability bath (fig. 2-26) is designed to comply with the requirements specified in ASTM Method D525 and D873 (TM 10-1166). It is flush mounted on the right-hand countertop, above cabinet P1 (fig. 1-2). The oxidation stability bath is used to determine oxidation stability of gasoline in storage. The apparatus consists of an electrically heated oxidation stability bath with a two-bomb capacity and three-heat switch. It is provided with a wall-mounted atmospheric condenser, two stainless steel bombs (stored in drawer A4, fig. B-7), provided with composition gaskets, needle valve, and a heat and chemical resistant glass liner (stored in drawer C1, fig. B-9) a wall-mounted two-pen type pressure recording gage with electric clock mechanism, and a range of from zero to 200 pounds (90.8 kg/sq cm) in 2-pound divisions (.9 kg/sq cm) recording charts, and ink set; two 5 foot (1 5 m) lengths of flexible metal tubing with a coupler at each end for connection between bomb and recorder; and a table socket to accommodate bomb when tightening bomb cap.

b. Operation.

(1) Fill the bath to required height with water.

(2) Insert the bombs in the bath.

(3) Insert the chart in the pressure recording gage (para 2-28*b. (1)*).

(4) Apply power to the apparatus.

(5) Proceed with the test according to ASTM Method D525 and D873 (TM 10-1166).

2-28. Pressure Recording Gage.

a. Description. The pressure recording gage (fig. 2-27) is designed to comply with the requirements specified in ASTM Methods D525 and D873 (TM 10-1166). It is mounted on the rear partition adjacent to the oxidation stability bath. The pressure recording gage is a two-pen, disk chart, electrically powered (or spring powered according to model in-

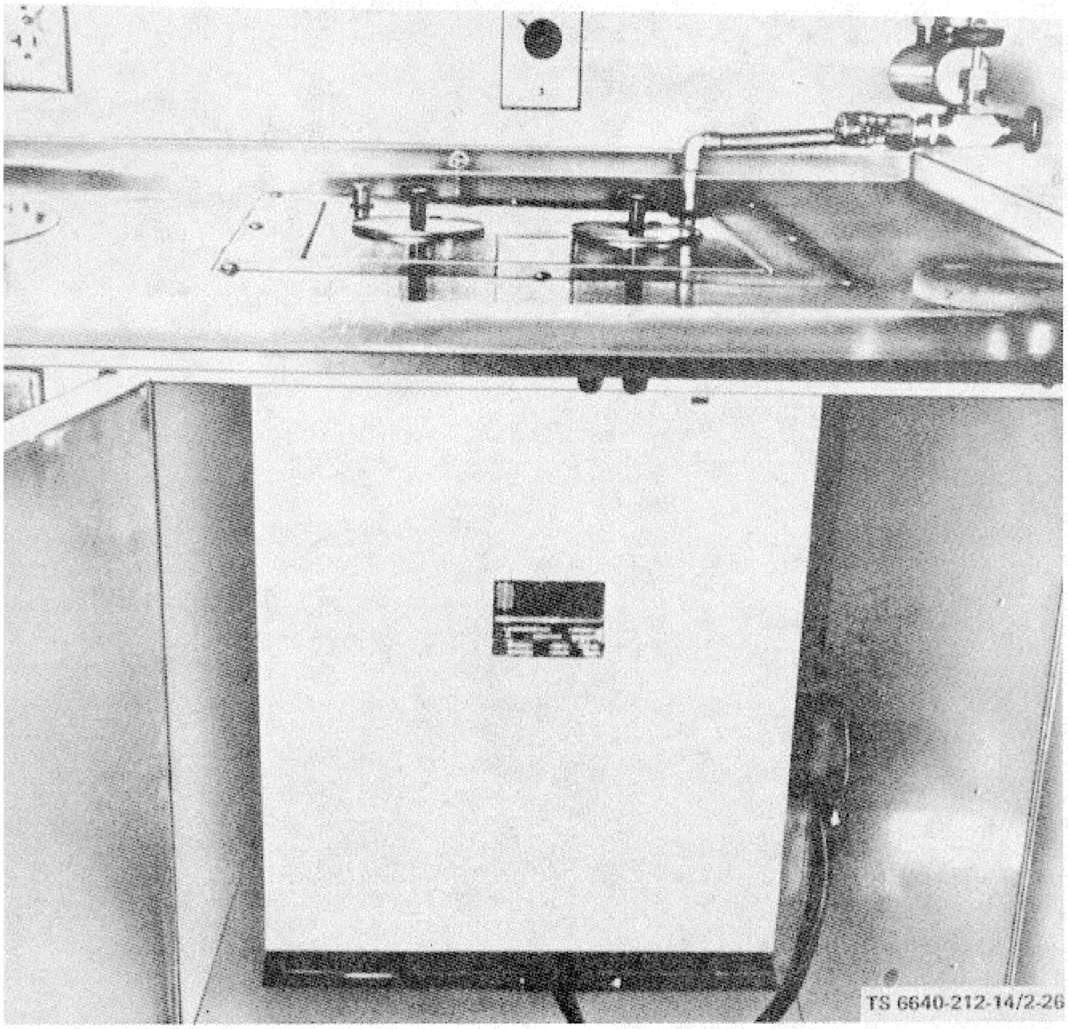


Figure 2-26. Oxidation Stability Bath

stalled) device used to provide a continuous record of test results obtained form the bombs used in the oxidation stability bath. The range is from zero to 200 poungs (90.8 kg/sq cm) pressure per square inch, with an accuracy rating of 0.5 percent of full scale. One complete revolution around the circular chart is equivalent to 24 hours.

b. Operation.

(1) Changing Chart.

(a) Open the gage door (fig. 2-27) and raise the pen lifter.

(b) Pull outward on the chart hub; it will collapse into itself, leaving the chart free to be removed.

(c) Insert a new chart. Push in on the chart hub to engage the chart.

(d) Rotate the chart hub until the proper time arc is indicated by the time set pointer.

NOTE

The time set pointer and the pen point register on the same time arc.

(e) Close and latch the gage door; the pen lifter is automatically lowered to place the pens on the chart.

(2) Inking pens.

(a) Put a small drop of ink in the pen, at the tip, and wet the tip with ink.

(b) Touch the pen to the chart; if light pressure does not start the flow of ink, draw a moistened finger or piece of paper across the tip.

(c) After starting, add no more ink than is considered necessary for the test.

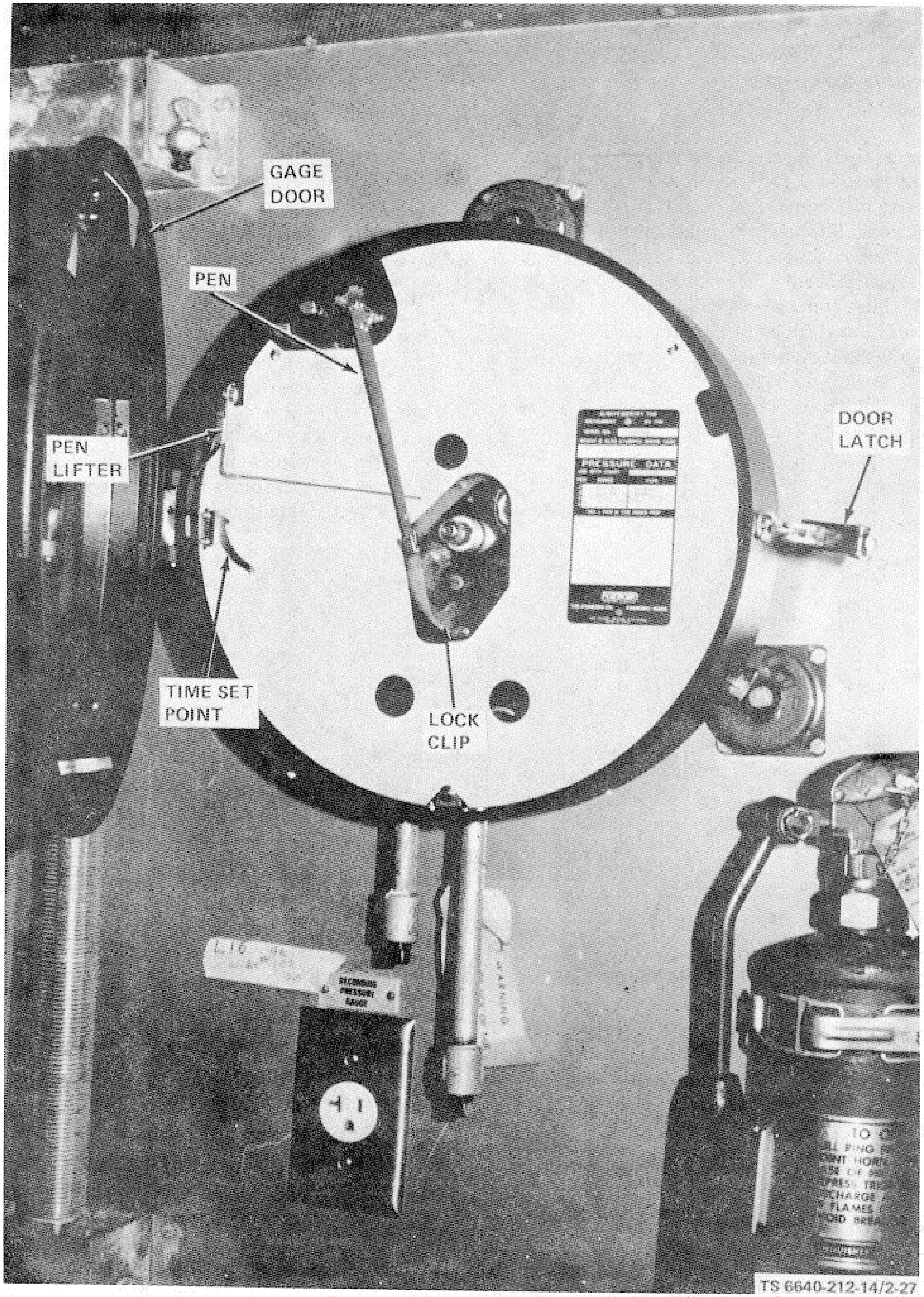


Figure 2-27. Pressure Recording Gage

NOTE

The ink level should be kept as low as possible for cleanest lines and shortest drying time.

2-29. Extraction Heater. The extraction heater is stowed in cabinet F1 (figs. 1-2 and B-12). It is a thermostatically controlled hot plate with four sets of extraction clamps supported on four vertical rods attached to the back of the unit. The clamps and rods are stored in drawer E2 (fig. B-12). A repeatable heat control and a percentage timer provide accurate and reproducible temperatures over the entire working surface within a range of 150 degrees F to 800 degrees F (66 degrees C to 427 ,degrees C). The extraction heater may be used as a Utility hot plate by removing the extraction clamp rods.

2-30. Refractometer.

a. **Description.**

(1) The refractometer (fig. 2-28) is designed to comply with the requirements specified in ASTM Method D1218 (TM10-1167) and FTMS 791, Method 5340. It is stowed in cabinet K3 (figs. 1-2 and B-16). The refractometer is used to determine the refraction index of percent of total dissolved solids. The instrument consists of a refracting prism system, a scale, a compensation system consisting of Amici prisms which permit the use of white light, and a telescope with crosshairs which permit the borderline of total reflection to be observed and set precisely. The refracting prism is fixed and horizontal and the observing eyepiece is directly above the measuring prism. A pivotal mirror is used to move the total reflection dividing line. The index scale is attached to the pivotal mirror. The single eyepiece is used to observe both the total reflection field and the scale

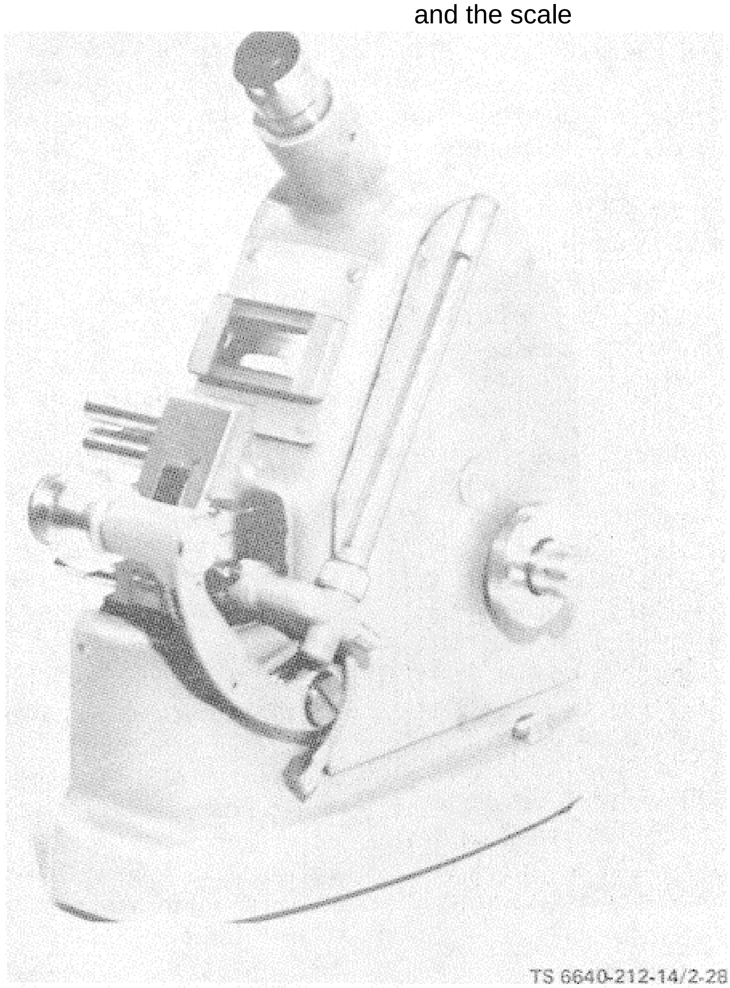


Figure 2-28. Refractometer

(2) Liquids are measured by introducing a thin film between the upper and lower refracting prisms. Solids are measured by affixing them to the surface of the lower prism by means of a suitable contact liquid which must be higher in index than the sample to be measured.

(3) The miniature-type field lamp is operated from an internally mounted transformer and is controlled by the line switch. The internal scale lamp is operated by a momentary contact switch on the side of the instrument. Normally the field lamp is on while the internal scale lamp is off. Depressing the momentary contact switch lever reverses this condition.

(4) The upper prism is the illuminating prism, and the lower prism is the measuring prism. When the prisms are closed, a liquid sample may be introduced by pipet or dropped through the channel between the prism boxes. The prism housings are hollow and provide for the flow of liquid to hold the prism at a constant temperature.

(5) A small hinged shield on the lower prism housing blocks off the front face of the refractometer prism to prevent the entrance of stray light. When reflected light is required to enter the front face of the refraction prism, the shield is rotated out and down toward the base of the instrument. The polished surface of the shield may be used as a reflector to provide optimum illumination.

(6) The index and total solids are photographed on a transparent glass plate which is attached to the sector arm inside the housing. The scales are read through the eyepiece by depressing the momentary contact switch. Focus the eyepiece for best results.

(7) A mirror is used to direct the total reflection line from the refracting prism into the viewing system. It is mounted on a pivoted ball bearing sector. Its position, calibrated in index or percent solids, is indicated on the scales attached to the sector, which is moved by turning the concentric handwheels on the side of the instrument. The larger of the two wheels is a fast friction disk drive traversing the entire index range in two and a quarter turns. The smaller wheel is a slow planetary ball bearing drive requiring 11 turns to traverse the range. Any slight backlash which may exist will not affect the accuracy of the setting.

(8) The compensator unit and both prisms move together in the same direction. The scale dial serves to rotate them. When correct compensation has been secured, the borderline will be achromatic at the center of the field with a faint red dispersion showing at one extremity and a faint blue dispersion showing at the other extremity Set the system so that the short achromatic' section of the borderline is centered on the crosshairs.

NOTE

A snap-on plastic cover is provided to cover the compensator scale dial. Use the cover to prevent the samples from running inside the instrument.

(9) The thermometer is attached in an upright position by means of two knurled collars. The thermometer may be adjusted to any reading position by loosening the collars, adjusting the thermometer to the desired position, and then tightening the collars.

b. Operation.

(1) Place the sample in position on the instrument and set the scale at the approximate value expected. To see the scale, depress the momentary contact switch on the side of the instrument.

(2) Release the contact switch and bring the borderline, which will probably be strong colored, near the crosshair. Compensate the color by adjusting the position of the dial. The borderline should be faintly blue on one side and faintly red on the other side.

(3) Observe the crosshairs, sharply focusing the eyepiece if necessary, and bring the dividing line upon their intersection by means of the coarse or fine hand controls.

(4) Read the index by depressing the momentary contact switch, estimating the fourth place.

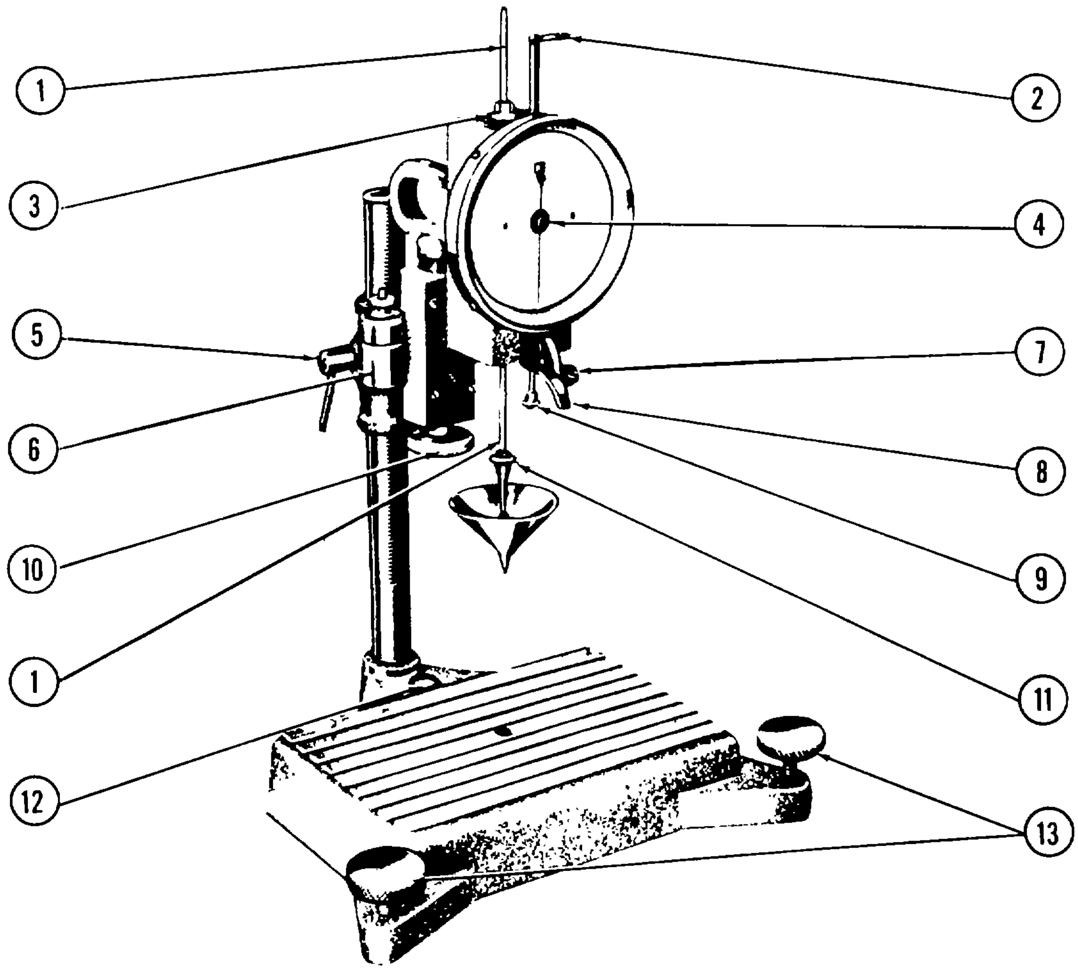
(5) If working with liquids, record both index and prism temperature at the time of reading.
Follow the test procedures of ASTM Methods D1218 (TM 10-1167) and FTMS 791, Method 5340.

NOTE

The refractometer should be kept in the case when not in use to prevent the accumulation of dust and grit.

2-31. Penetrometer.

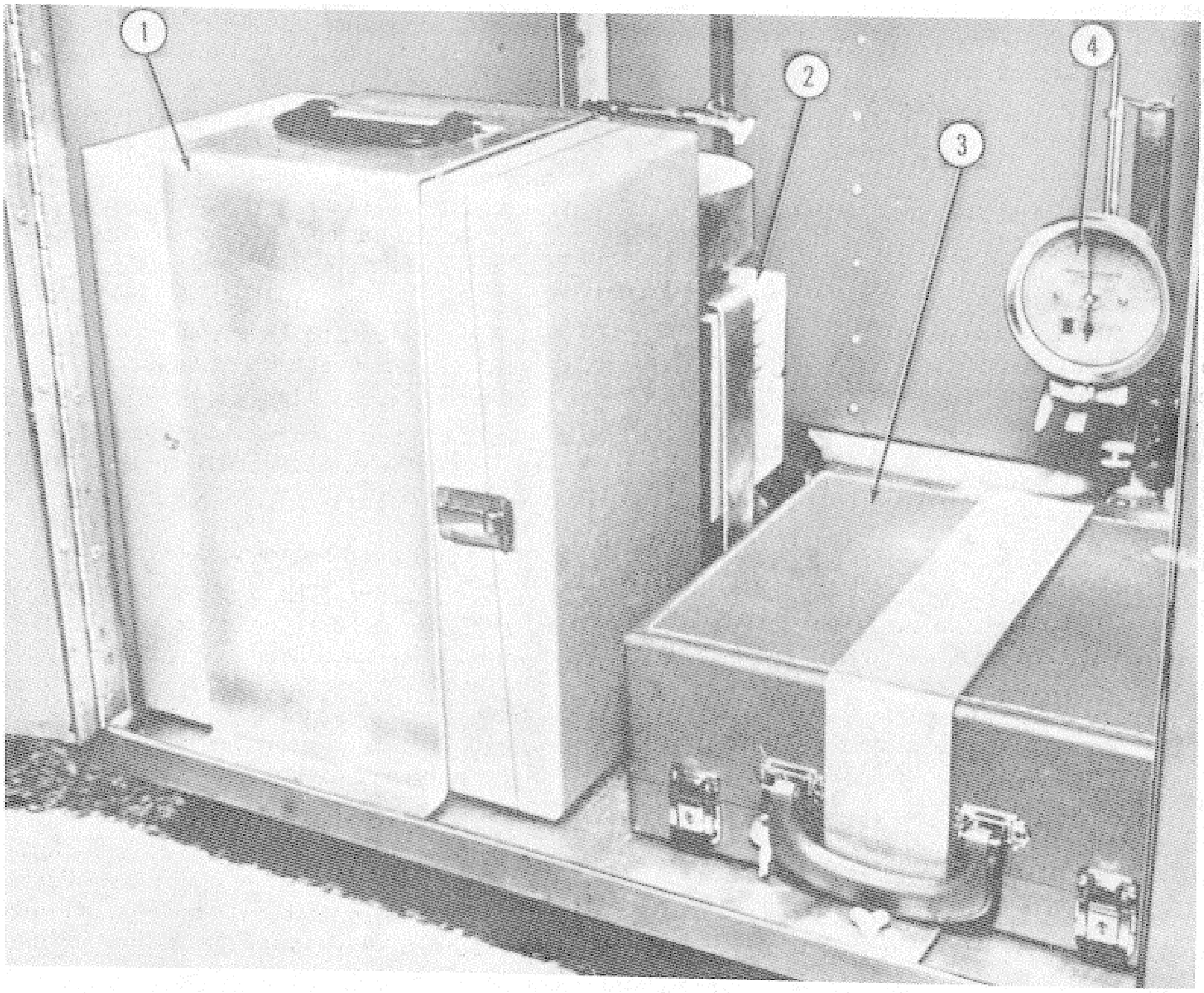
a. Description. The penetrometer (fig. 2-29) is designed to comply with the requirements specified in ASTM Method 217 (TM 10-1166). It is stored in cabinet K3 (figs. 1-2, 2-30 and B-16). The penetrometer is used to measure penetration of grease with a penetration cone. The penetration includes a dial for measuring depth of penetration up to 38 millimeters on a single sweep of the dial needle. The unit is provided with stainless steel plunger bearings, preliminary setting and fine pitch micrometer adjustments, clutch, ASTM 2.5 gram needle, and a 50 gram weight.



TS 6640-212-14/2-29

Legend for figure 2-29:
1. Test rod
2. Depth gage rod
3. Upper shoulder bearing
4. Dial pointer
5. Lockscrew
6. Weights
7. Clutch trigger
8. Finer grip
9. Zero adjusting screw
10. Micrometer adjusting screw
11. Chuck
12. Spirit level
13. Leveling screws

Figure 2-29. Penetrometer



TS 6640-212-14/2-30

Legend for figure 2-30:
1. Refractometer
2. Cleveland open cup flash point tester
3. Calculator
4. Penetrometer

Figure 2-30. Cabinet Kit

b. **Operation.**

(1) Level the instrument carefully by means of the leveling screws in the base, sighting the spirit level.

(2) Insert the cone (stored in drawer Al, fig. B-7) into the chuck and tighten securely.

(3) Set the dial pointer to zero. Grasp the test rod, release the clutch trigger, and raise the test rod as high as possible. If dial reading is not exactly zero, adjust the reading to zero by means of the zero adjusting screw. Should this adjustment fail to bring dial pointer to zero, set the zero adjusting screw to approximately midposition and draw the depth gage rod to its Uppermost or stop position. Remove the dial rim and glass and loosen the knurled thumb nut. Reset the dial pointer to zero and tighten the thumb nut.

(4) Add weights to the test rod as required. In adding weights to make up the required test load, note that the weight of the test rod itself is 47.5 grams. When the specified load for grease penetrations with a grease cone, for example, is 150 grams, no weights need be added, as the combined weight of the cone (102.5 grams) and the test rod (47.5 grams) makes up the required load as specified by ASTM.

(5) Place the prepared sample to be tested in position on the penetrometer table.

(6) Adjust the height of the penetrometer to bring the point of the penetrating instrument (cone) exactly into contact with surface of the sample as follows: *(a)* Place a weak light to one side of the cone and follow the shadow formed by the penetrating instrument on the surface of the sample until no light appears from the point.

(b) In adjusting the height of the penetrometer, release the lockscrew and make a coarse adjustment by means of the coarse adjusting screw directly opposite the lockscrew. Tighten the lockscrew securely.

(c) Make final contact adjustment by means of the micrometer adjusting screw.

(7) Release the test rod, allowing the penetrating instrument (cone) to descend into the sample. To release the test rod, depress the clutch trigger and hold in its released position during the specified time required for the test, using a stopwatch. At end of this time, release the clutch trigger quickly, allowing the test rod to be locked instantly into position.

(8) Observe the dial reading. To read the depth of penetration, push down the depth gage rod gently as far as it will go. The dial reading indicates depth of penetration in tenths of millimeters. For example, if the dial needle rests at the fourth mark past the 270 point, penetration depth is 27.4 millimeters. On depths greater than 38 millimeters, the dial needle makes more than one complete revolution to a maximum depth of 39 millimeters on a single reading.

(9) Return the dial needle to zero. If the original zero setting has been accurate, the dial needle will return exactly to zero, and subsequent readings will check against standard gage blocks.

(10)Consult ASTM Methods D217 (TM 10-1166) for detailed descriptions of test procedures using penetrometer.

2-32. Adding and Subtracting Machine

a Description. The adding and subtracting machine (3, fig. 2-30) is designed to comply with the requirements specified in ASTM Method D2270 (TM 10-1166). It is stowed in cabinet K3 (figs. 1-2 and B-16). The calculator is an eight-bank, hand operated machine used for adding, subtracting, multiplying, and dividing.

b. Operating Controls and Parts.

(1) Upper dials. The upper dials are located in the upper part of the movable carriage. These dials show the quotient (answer) of a division problem in red figures; they show the multiplier in black figures.

(2) Lower dials. These 16 dials are located in the lower part of the carriage. These dials show the answers.

(3) Carriage shift kno*b.* This knob is located at the right end of the carriage. It is used for shifting several places at a time. Lift up on the knob and slide the carriage to the desired position.

(4) Clear-out crank. This is the smaller crank located at the right end of the carriage. Turn clockwise to clear the upper dials; turn counterclockwise to clear the lower dials.

(5) Operating crank. This is the larger crank located on the right side of the machine. It is used in all operations and is turned either clockwise or counterclockwise, depending on the type of problem.

(6) Repeat and nonrepeat keys. These keys are located on the right front face of the machine. The repeat key is marked R. When the repeat key is depressed, any figures set on the keyboard remain down until cleared by the operator. The nonrepeat key is located above the repeat key. When the nonrepeat key is depressed, the keyboard clears after each turn of the operating crank.

NOTE

The repeat key must be depressed when the machine is used for multiplication and division.

(7) Keyboard clear key. This key is marked O and is located at the lower right corner on the face of the machine. Depressing the key clears the entire keyboard. At the bottom of each row of keys there is a zero clear key. Depressing any of these keys clears the keys in that column.

(8) Carriage shift lever. This lever is located at the left front of the machine. By half a turn of this lever, the carriage may be shifted to the right or left as desired. When the carriage is shifted, the operating crank must be in the upright position.

c. Clearing Machine. The operator should always remember to clear the entire machine before starting any new work. To clear the keyboard, depress the keyboard clear key. For upper dials clearance, make a complete forward turn of the clear-out crank; for lower dials clearance, make a complete backward turn of the clear-out crank.

NOTE

The operating crank must be in upright, or neutral, position when clearing.

***d. Adding and Subtracting Whole Numbers*.** Addition and subtraction can be done with the carriage in any position, but it is suggested that the carriage be placed in position 1, that is, as far to the left as possible. The most rapid and efficient way to add and subtract is with the nonrepeat key depressed so that the numbers automatically clear from the keyboard.

(1) Adding with nonrepeat key. To add 12, 23, and 34, depress the nonrepeat key. Clear the machine.

Set on keyboard 12	Make one forward turn of operating crank.
Set on keyboard 23	Make one forward turn of operating crank.
Set on keyboard 34	Make one forward turn of operating crank.
In lower dials 69	Total.

(2) Subtracting with nonrepeat key. To subtract 15 from 45 depress the nonrepeat key. Clear the machine.

Set on keyboard 45	Make one forward turn of operating crank.
Set on keyboard 15	Make one backward turn of operating crank.
In lower dials 30	Answer.

(3) Adding and subtracting with repeat key.) Addition and subtraction can be done exactly as above with the repeat key depressed. When this is done, the number added or subtracted remains on the keyboard after the turn of the operating crank. This saves time when adding and subtracting numbers which have one or more digits the same, For example, to add 3 to 47 depress the repeat key, clear the machine, and process as follows:

Set on keyboard 47	Make a forward turn of operating crank.
Change keyboard to 43	Make a forward turn of operating crank.
Change keyboard to 40	Make a backward turn of operating crank.
In lower dials 50	Answer.

***e. Multiplying Whole Numbers**.* Multiplication is done by setting one figure usually the larger, on the keyboard and writing the other figure in the upper dials with the operating crank. The repeat key must be depressed when the machine is used for multiplication. For example, to multiply 12 by 12.

(1) Depress the repeat key, Clear the machine.

(2) With the carriage in position 1, set 12 on the extreme right of the keyboard. Turn the operating crank forward 2 turns. If too large a number is turned into one of the upper dials, it can easily be corrected. Simply position the carriage so the carriage position arrow points to the dial showing the incorrect number and turn the operating crank backward until the correct number appears. If the incorrect number is too small, turn the crank forward until it is correct.

(3) With the carriage shift lever, shift the carriage one place to the right. Turn the operating crank forward one turn.

(4) The result should be:

Upper dials	12
Keyboard	12
Lower dials	144
	Answer

If the correct numbers show in the upper dials and keyboard, the answer cannot be incorrect.

***f. Multiplying Whole Numbers With Constant Multiplier*.** The above explanation of correcting the upper dials naturally leads to the problem of having to multiply the same number by several dif ferent numbers. In the previous example, 12 was multiplied by 12. Suppose it was necessary to multiply 12 by 31, and 12 by 15. After completing the first multiplication, the machine reads as follows: upper dials, 12; keyboard, 12; lower dials, 144. To multiply 12 by 31 and by 15.

(1) Clear nothing on the machine because clearing is not required. Leave the 12 on the keyboard.

(2) Change the upper dials to the next multiplier, 31 in this example. Change the I in the upper dials to 3 with two forward turns of the operating crank. Shift carriage one place to the right. Change 2 in the upper dials to 1 with one backward turn of operating crank.

(3) The result should be:

Upper dials	31
Lower dials	372
	Answer

In a similar manner, change the upper dials to 15 and the result should be:

Upper dials	15
Keyboard 12 Lower dials	180
	Answer

(4) It can be seen from the above that multiplication can be done in either direction. As long as the figures on the keyboard and in the upper dials are correct, the result in the lower dials will be correct.

g. Dividing Whole Numbers. As multiplication is a process of repeated additions, accomplished by forward turns of the operating crank, so division is a process of continued subtractions, accomplished by backward turns of the operating crank. The repeat key must be depressed when doing division. For example, to divide 1728 by 12:

(1) Depress the repeat key. Clear the machine.

(2) With the carriage in position 1, set the dividend, 1728, on the extreme right of the keyboard.

Make one forward turn of the operating crank. Depress the keyboard clear key and turn clear-out crank clockwise. (This clears the keyboard and clears the 1 out of the upper dials).

(3) Set the divisor, 12, on the right of keyboard and move the carriage two spaces to the right so that the divisor, 12, is in direct alinement with 17, the first two figures of the dividend in the lower dials.

.

NOTE

In division problems, the left-hand figure of the divisor on the keyboard must always be either directly under the left-hand figure of the dividend in the lower dials, or beyond it to the left.

(4) Turn the operating crank backward until the bell rings. Turn the crank forward one turn. (The red 1 in the upper dials is the first digit of the answer). Shift the carriage one place to the left. Turn the crank backward until the bell rings. Turn the crank forward one turn (bell also rings on the one forward turn to warn you not to go any farther).

(5) Continue this operation of shifting the carriage one place to the left, turning the crank back until the bell rings and turning the crank forward one turn.

(6) The results should be:

Lower dials	0 (remainder)
Upper dials	144 (answer)

(7) If the crank is turned backward rapidly and goes a turn or two past the bell, simply turn the crank forward until the bell rings, and stop. Listening for these bells makes it possible to perform the division without watching the machine.

h. Using Decimals. On all calculating machines, fractions are expressed as decimals. For example, 1/4 = .25, 5/8 = .625, et*c.* The arrangement of the dials and the keyboard makes it particularly adaptable to handling calculations involving decimal numbers. All decimals can be set for a complete group of problems before starting the work, and all the calculations can be completed without any resetting of the decimals. The work is done entirely around preset, fixed decimals. The one simple rule for setting decimals is as follows: Keyboard decimal + upper dial decimal = lower dial decimal.

(1) Keyboard decimal markers. The keyboard decimal is marked by turning one of the small knurled wheels below the keyboard to the right so that the yellow decimal marker appears between the proper keyboard columns.

(2) *D*ial decimals. The upper and lower dials decimals are marked by the gray pointers which can be easily positioned to point off the decimal exactly as with paper and pencil. To set a decimal at two in the dials, simply set the marker to the left of the two on the slide

i. Adding and Subtracting Decimals. To preset the decimals for a group of problems involving addition and subtraction, examine the numbers in all the problems and determine which has the largest number of decimal places. Set the keyboard decimal marker to accommodate this number of decimal places. Set the lower dial decimal at the same number. The upper dial decimal is a zero (0). For example, to add 12.25 to 3.333 or to subtract 75.242 from 160.0:

(1) Set upper dial decimal setting to 0 and keyboard and lower dial to 3 because three is the greatest number of decimal places that appears in these figures.

(2) Set the numbers on the keyboard exactly as they are written. The figures that appear to the left of the decimal point should be set to the left of the keyboard decimal marker, and those that appear to the right of the decimal should be set to the right of the keyboard decimal marker.

(3) Follow the instructions for addition and subtraction given in d *(1)* and *(2)* above, and the result will always be correct.

j. Multiplying Decimals. To multiply, set the larger number on the keyboard and, with the operating crank, turn the other number into the upper dials. When this is done, the answer appears in the lower dials. Therefore, when multiplying decimal numbers, set the keyboard decimal marker to accommodate the largest number in the problem and the upper dials decimal marker to accommodate the other number. Then, following the rule for decimals (h above), add the number of decimal places on the keyboard to the number of decimal places in the upper dials and set the lower dials decimal marker at this number of decimal places. This is exactly how you point off the decimal when multiplying by pencil and paper; add the number of decimal places in the two numbers and point off this many places in the result. All decimal markers should be set before beginning any of the work. For example, to multiply 20.125 by .425:

(1) Set the larger number (20.125) on the keyboard. It has three decimal places so the keyboard decimal marker should be set at three. Set the other number (.425) in the upper dial, setting the upper dials decimal at three. Add the two (3 + 3 = 6) and set the lower dials decimal at six. Set the decimal markers accordingly and do the above example following the step by step instructions below.

(2) With the repeat key depressed, set 20.125 on the keyboard (20 to the left of the keyboard decimal marker and .125 to the right).

(3) With the carriage in position 1, turn the operating crank five turns forward. Shift the carriage one place to the right. Make two forward turns. Shift the carriage to the right. Make four forward turns.

(4) The result (answer) on the lower dials should be 8.553125. Not that the .425 appears in the upper dial to the right of the decimal marker and the lower dials decimal marker correctly points off the answer.

(5) Always set the decimal for a whole group of problems to avoid changing the decimal markers for every problem. To do this for a group of multiplication problems, simply find the largest number of decimal places appearing in the numbers to be set on the keyboard. Set the keyboard decimal marker for this number. Find the largest number of decimal places to be entered in the upper dials. Set the upper dial decimal for this number. Set the lower dials decimal at the sum of these two. Enter all figures around these preset decimals and the results will be all correct. The following example illustrates this:

24.75 x .35 = 8,6625
32.5 x .24 = 7.8
110.333 x 1.4 = 154.4662

The largest number of decimal places in the numbers which go on the keyboard is three; in the numbers which go in the upper dials, two. Therefore, the decimal setting should be:

Upper dials	2
Keyboard 3 Lower dials	5

k. Dividing Decimals. In division, as explained in the instructions for simple division, both numbers (divided and divisor), are set on the keyboard. Therefore, when working with decimal numbers, examine all numbers to find the largest number of decimal places appearing in the whole group of problems at hand. Set the keyboard decimal at this number. To set the upper dials decimal always decide how many decimal places are required in the answer and set the decimal marker to one more place than this (to permit rounding off). Again, for the lower dials decimal, add the keyboard and upper dials decimal and set the lower dials decimal at this number.

(1) For example, to divide 22.868 by 6.7, set the keyboard decimal at three. Three decimal places are required in the answer, so set the upper dials decimal at four (3 + 1= 4). Then the lower dials decimal is seven (3 + 4 = 7).

(2) With the repeat key depressed, set 22.868 on the keyboard. Shift the carriage so the lower dial decimal at seven is in direct alinement with the keyboard decimal at three. Turn the operating crank forward one turn. Make one forward turn of the clear-out crank to clear 1 from the upper dials.
Depress the keyboard clear key.

(3) Set 6.7 on the keyboard. Shift the carriage one place to the right. (To aline the left-hand digit in the lower dials with the left-hand digit on the keyboard).

(4) Turn the operating crank backward until the bell rings. Make one forward turn. Shift the carriage one place to the left.

(5) Continue as in step *(4)* above until the carriage reaches the first position. The answer is 3.4131, rounded off to 3.423.

NOTE

Be sure to line up the lower dials decimal with the keyboard decimal before setting the first number in the lower dials.

2-33. Flash Point Testers. The mobile laboratory is equipped with apparatus for performing three standard flash point tests on petroleum products.

a. Cheveland Flash Point Tester.

(1) The Cleveland flash point tester is stowed in cabinet K3 (figs. 2-30 and 2-31). It is designed to comply with the requirements specified in ASTM Method D92 (TM 10-1166 and TM 10-1167). The apparatus is an open-cup type flash point tester and is electrically heated by a 750-watt heater with an integral rheostat and dial control. It is used to determine the flash and fire points of petroleum products, except fuel oils, which have an open cup flash above 175 degrees F (79 degrees C). The heat range is from 20 degrees F to 760 degrees F (-6.67 degrees C to 404 degrees C). Included with the apparatus is a permanently mounted test flame burner, pivot post thermometer holder, and refractory top which includes a heat-resistant board, cast iron plate, test flame bead, and open flash cup. The asbestos clamp is located in cabinet L2 (fig. B-17); the thermometer (ASTM 11F) is located in the thermometer rack on the door of cabinet N1 (fig. B-19); the flash point cup is stored in drawer A1 (fig. B-7).

(2) Refer to ASTM Method D92 (TM 10-1166 and TM 10-1167) for detailed test instructions.

b. Pensky Martens Flash Point Tester.

(1) The Pensky Martens flash point tester designed to comply with the requirements specified in ASTM Method D93 (TM 10-1166), is located in cabinet M1 (figs. 2-32 and B-18). It is an electrically heated closed-type unit, with two thermometers, one with a range of 20 degrees F to 230 degrees F (-6.1 degrees C to 110 degrees C), and the other with a range of 200 degrees F to 700 degrees F (93 degrees C to 371 degrees C). The apparatus is used to determine the flash point of fuel oils. The flash point cup is stored in drawer J2 (figs. 1-2 and B-15). The stirrer is located in drawer B5 (fig. B-8) and the flexible shaft and support rod are stored in drawer D2 (fig. B-10).

(2) Consult ASTM Method D93 (TM 10-1166) for detailed test instructions.

***c.* Tag Flash Point Tester.**

(1) The tag flash point tester, designed to comply with the requirements specified in ASTM Method D56 (TM 10-1166), is located in drawer J2 (figs. 1-2 and 2-31). It is a closed type, electrically operated unit and is used to determine the flash point of mobile liquids except fuel oils, flashing below 175 degrees F (67 degrees C). It consists of a water bath and cover mounted on the base, overflow drain, brass test cup (stored in drawer A4, fig. B-7) and standard flashing mechanism mounted on the cover. Two 20 degrees to 230 degrees F (6.6 to 110 degrees C), thermometers are used with the equipment.

(2) The control can be set to have the heater on for any part of a minute. At FULL ON, the heater is on for a full minute.

NOTE

To increase the setting, turn the knob counterclockwise.

(3) Refer to ASTM Method D56 (TM 10-1166) for detailed test procedures.

2-34. Foam Test Apparatus.

a. Description. The foam test apparatus, designed to comply with the requirements specified in ASTM Method D892 (TM 10-1166), is located in cabinet M1 (figs. 2-32 and B-18). It is an electrically heated device designed to determine the foaming characteristics of crankcase oils at specified temperatures. The constant temperature bath consists of a 12by 18-inch glass jar supported on a base. Temperature of the bath is automatically

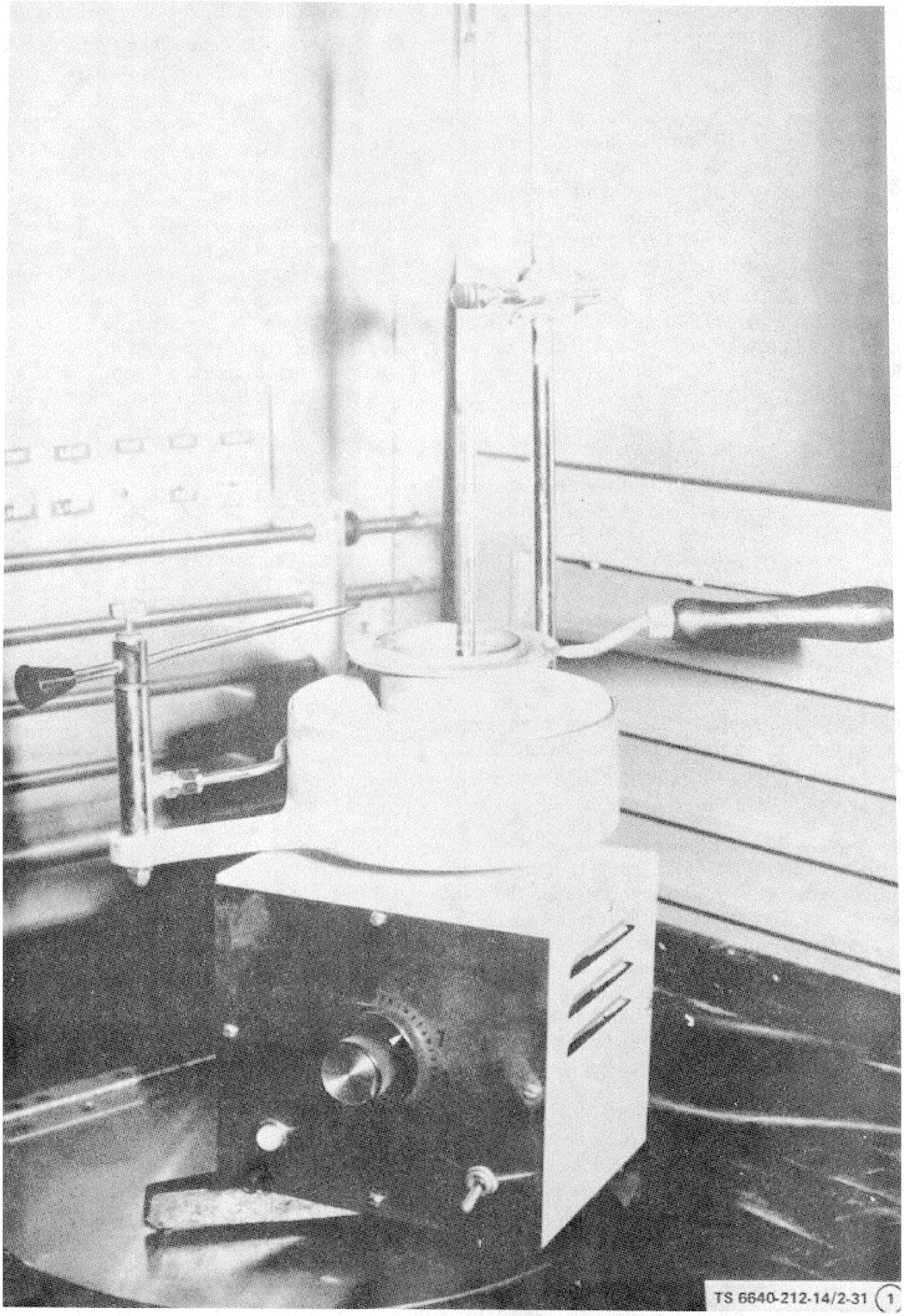


Figure 2-31. Flash Point Tester (Sheet 1 of 2)

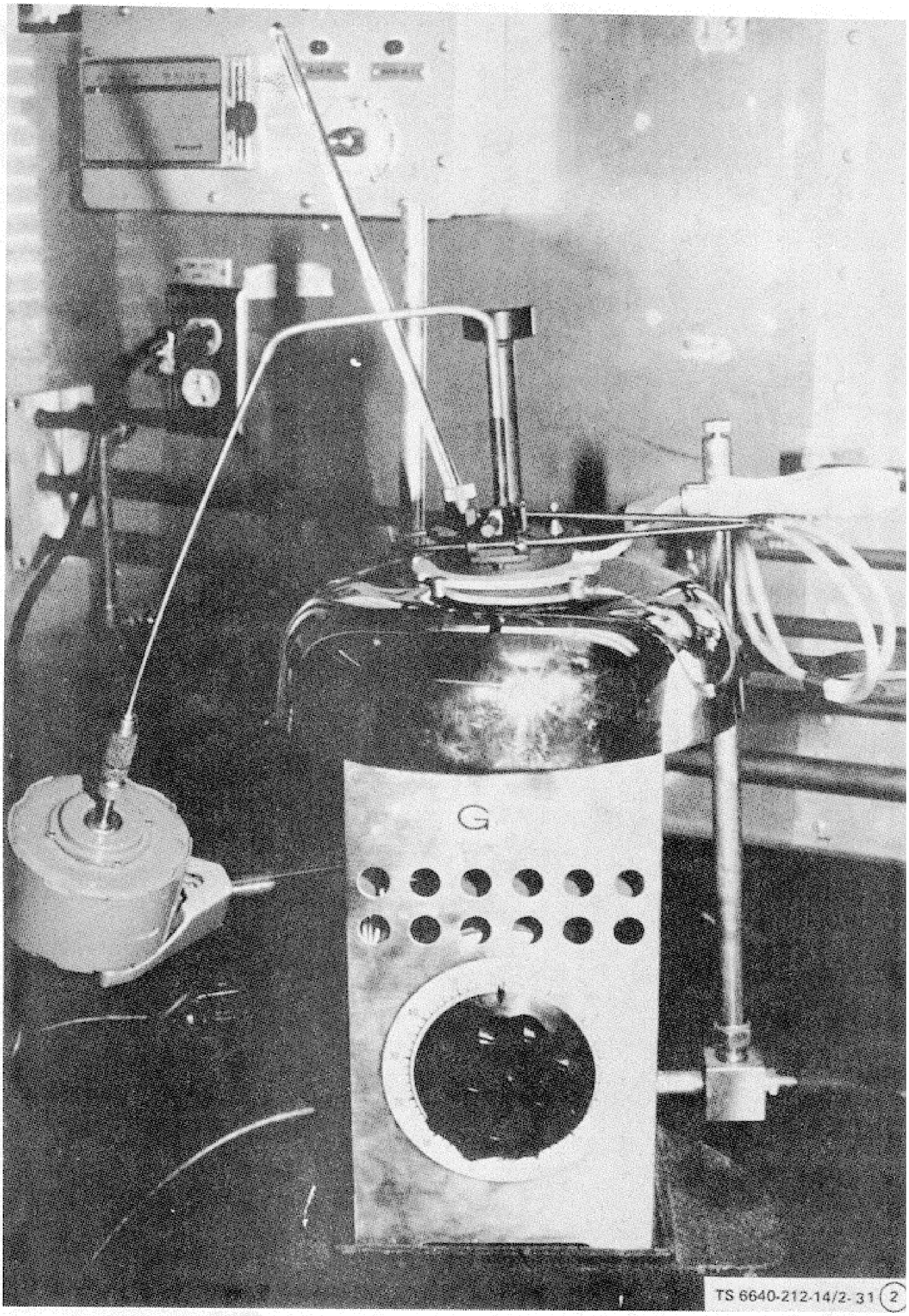
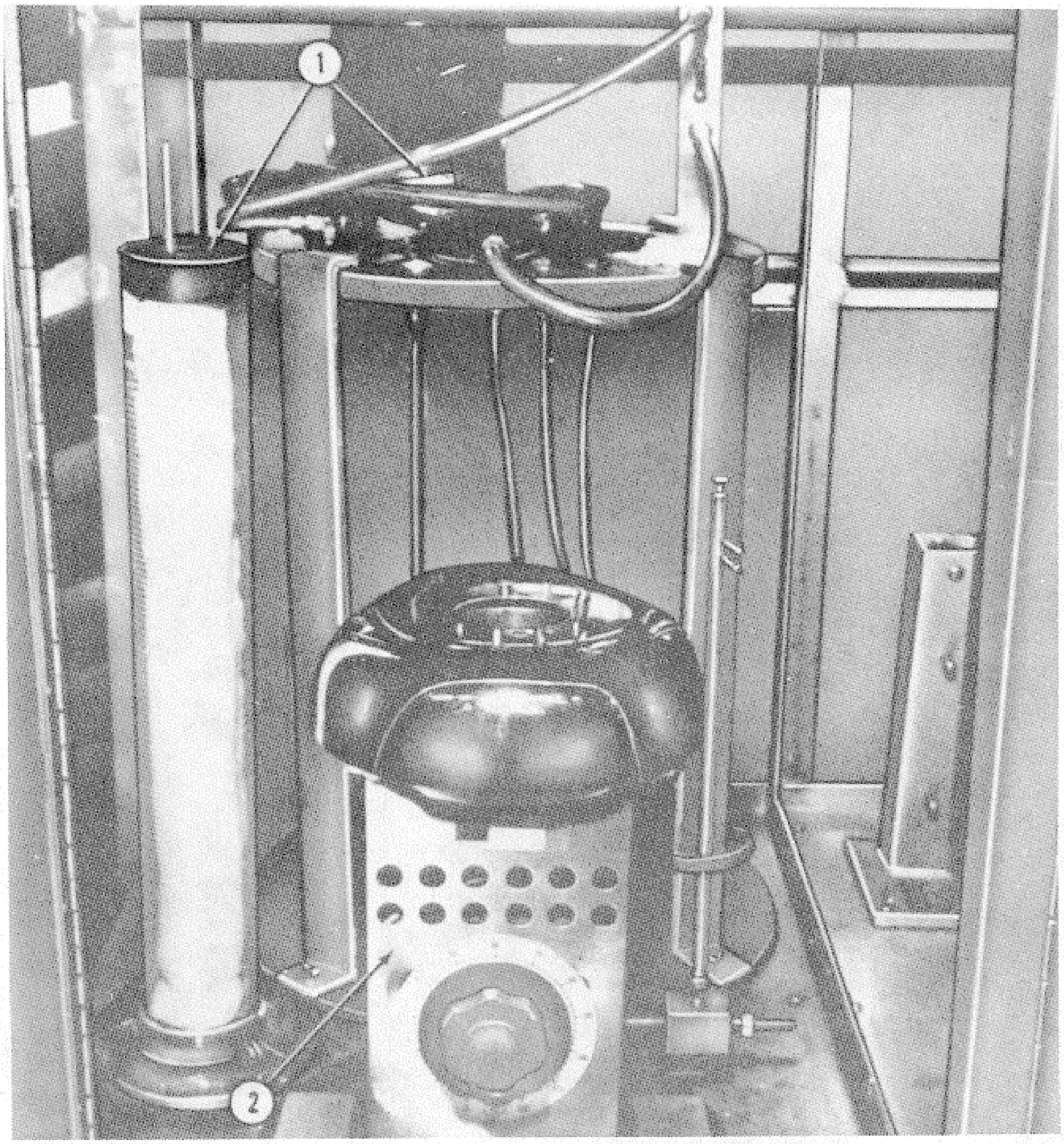


Figure 2-31. Flash Point Teeters (Sheet 2 of2)



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Legend for figure 2-32:
1. Foam test apparatus
2. Flash point tester 57-905

Figure 2-32. Cabinet M1

maintained to plus or minus 1 degree F (-17 degrees C) within the range of 75 degrees F to 200 degrees F (24 degrees C to 93 degrees C). A motorized stirrer provides efficient circulation. The center of the cover has a fitted 1000-milliliter graduated cylinder of specified dimensions. A rubber stopped supports the diffusion stone assembly (stored in drawer C2, figs. 1-2 and B-9) which is connected to a calibrated flowmeter with a needle valve for maintaining an air flow rate of 94 milliliter plus or minus 5 milliliter per minute. Thermoregulator used with the apparatus is stored in drawer C5 (fig. B-9).

b. Operation.

(1) Set the bath on the counter.

(2) Fill the bath to the required level with water or light oil.

(3) Set the thermo regulator as required and apply power to the apparatus.

(4) Place both the line switch and the auxiliary heat switch in the ON position.

(5) In a low-temperature test, place the auxiliary heat in the OFF position when the test temperature is reached.

(6) In a high temperature test, leave the auxiliary heat switch in the ON position after the test temperature is reached.

(7) Refer to ASTM Method D892 (TM 10-1166) for detailed testing procedures.

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Figure 2-33. Dry Ice Machine

2-35. Dry Ice Machine.

a. Description*.* The dry ice machine (fig. 2-33) is designed to comply with the requirements specified in ASTM Method D2386 (TM 10-1166). It is mounted on a platform in the rear compartment immediately forward of the carbon dioxide cylinders. The dry ice machine is capable of producing fifteen to twenty 12-ounce cakes of dry ice from a standard 50-pound cylinder of compressed carbon dioxide. The machine is connected to the gas cylinder by copper tubing. Dry ice cakes are made only as required and are used primarily for cooling cloud and pour point test baths and wherever required for application of low temperatures. The machine is equipped with a hinged cover and safety valves, and is provided with strainer, copper tubing, and fitting for attachment to the carbon dioxide cylinders.

b. Operations*.*

WARNING

Wear safety goggles and cloth gloves while operating dry ice machine.

NOTE

Do not invert carbon dioxide cylinders.

(1) Both carbon dioxide cylinders are equipped with an internal pipe extending from the valve to the bottom of the tank to facilitate removal of the liquid carbon dioxide to the dry ice machine. Connect one end of tubing to the cylinder and the other to the valve on the side of the dry ice machine. Make certain fiber washers are properly positions.

NOTE

When recharging cylinders, make certain that internal pipe and valve connected to the pipe remain with the charged cylinder.

(2) Close the cover of the ice machine, engaging the handle securely. Close gas control valve on side of machine. Open the cylinder valve.

(3) Open the gas control valve slightly until gas can be heard entering the machine and hold open for about 30 seconds or until safety valve on top of machine discharges or the cover is raised by the safety valve on the cover hinge, indicating that cavity is filled with dry ice. It is normal for excess gas to escape on the sides and bottom of the machine while the dry-ice cake is being formed.

(4) Close gas control valve and remove dry-ice cakes.

2-36. Utility Bath.

a. Description. The utility bath, designed to meet the requirements specified in ASTM Methods D91 and D1796 (TM 10-1166) is stored in drawer B5 (figs. 1-2 and B-8). It is a constant temperature, thermostatically controlled general utility bath. The hydraulic thermostat is sensitive to within plus or minus 0.1 degrees C. The unit can control the bath liquid at temperatures up to a maximum of 100 degrees C plus or minus 0.3 degrees C. Thorough mixing of the heated solution is obtained by means of a perforated diffuser shelf.

b. Operation.

(1) Place the unit on the countertop and plug the service cord into a 120-volt convenience outlet.

(2) Fill the bath with water to the desired level.

(3) Insert the thermometer in the space provided at the top of the bath.

(4) Set the temperature control knob for the desired temperature. Observe the immersed thermometer and refine the control setting until the exact temperature is indicated

(5) Refer to ASTM Methods D91 and D1796 (TM 10-1166) for detailed test instructions.

2-37. Copper Strip Corrosion Bath.

a. Description*.* The copper strip corrosion bath, designed to comply with the requirements specified in ASTM D130 (TM 10-1166), is stored in drawer B5 (figs, 1-2 and B-8). The apparatus consists of a constant temperature bath having a temperature range from room temperature to 110 degrees F plus or minus 0.6 degrees F, openings for four test bombs, four rubber stoppers, a thermometer well, copper Soxhlet condensers, thermostat, and drain plug. It is also provided with two test bombs and an ASTM 12F thermometer having a range of minus 5 degrees F to plus 215 degrees F (minus 11.6 degrees C to 101.5 degrees C). The test bombs, copper strips, and copper strip corrosion standards are stored in drawer D3 (fig. B-10). The overall dimensions of the apparatus are 7 inches wide by 12 1/2 inches deep by 24 inches high (178 mm wide by 432 mm deep by 609 mm high). The apparatus requires a minimum of 750 watts.

b. Operation.

(1) Fill the bath with water through the bomb hole. To heat the constant temperature bath to operating temperature, connect the power cord and turn the line switch to the ON position. Adjust the bath to the desired temperature by turning the graduated dial on the thermostat.

(2) When the bath has reached desired temperature, remove the rubber stoppers. Insert bombs through the openings into the rack; then replace the rubber stoppers.

(3) Connect a cooling water line to one of the small tubes on the Soxhlet condenser. Connect a drain line to the other. This will condense the steam coming from the bath and return the condensate to the bath. If water supply is insufficient to operate the condenser, vent steam directly into the atmosphere.

(4) Refer to ASTM Method D130 (TM 10-1166) for detailed test instructions.

2-38. Cloud and Pour Point Test Bath.

a. Description. The cloud and pour point test bath, stored in drawer B5 (figs. 1-2 and B08), is designed to comply with the requirements specified in ASTM Method D97 (TM 10-1166). The assembly of four jackets may be raised or lowered on the rod support to vary depth of jackets in the cooling medium (dry ice and acetone; dry ice and alcohol), according to the standard test procedure. The bath is equipped with a drain plug near the bottom, and a cover provided with openings to admit passage of test jars and thermometers. Both bath and cover are fitted with handles. The test apparatus includes four ASTM high-range thermometers and drilled cork stoppers. The thermometers are stored in the thermometer receptacle on the door of cabinet NI (fig. B-19). The drilled cork is stored in tray L2 (fig. B-17).

b. Operation. Complete details for performing tests are described in ASTM Method D97 (TM 10-1166 and TM 10-1167).

2-39. Aniline Point Apparatus.

a. Description. The aniline point apparatus, designed to comply with the requirements specified in ASTM Methods D611, (TM 10-1166 and TM 10-1167) and D1012 (TM 10-1166), is stored in drawer B3 (figs. 1-2 and B-8). The apparatus is used to determine the aniline point of petroleum products. It consists of a cover with U-tube, belt driven stirrers for bath liquid and sample, and cooling coil, a glass bath jar, a 115-volt 50-to 60-Hz stirrer motor, electric heater, two thermometers, stand and support rod, and clamp for stirrer motor.

b. Operation. Refer to ASTM Method D611 (TM 10-1166) and TM 10-1167) and D1012 (TM 10-1166) procedures for complete instructions for performing test.

2-40. Grease Dropping Point Apparatus.

a. Description. The grease dropping point apparatus is designed to comply with the requirements specified in ASTM Method D566 (TM 101166). The apparatus is used to determine the dropping point of lubricating grease. It consists of chromium-plated brass cup (drawer A1, Fig. B-7), test tube with indentions (drawer B2, fig. B-8) to support the cup inside the tube, a 400-milliliter beaker (drawer B4, fig. B-8), a 110-volt, 500-watt capacity rheostat heater and electrobestos top (drawer A5, fig. B-7), support rod (drawer E2, fig. B-11), 115-volt stirrer motor with stirrer (drawer B5, fig. B-8) two corks (drawer Al', fig. B-7), a chromium plated rod (drawer A1, fig. B-7) for forming grease film in the cup, a support bracket (drawer A1, fig. B-7), and two ASTM thermometers stored in the thermometer receptacle on the door of cabinet N1 (fig. B-19).

***b. Operation**.* Refer to ASTM Method D566 (TM 10-1166) procedure for complete directions for determining the dropping point of grease.

2-41. Freezing Point Apparatus.

a. Description. The freezing point apparatus, designed to comply with requirements specified in ASTM Method D2386 (TM 10-1166), is stored in drawer B3 (figs. 1-2 and B08). The apparatus is used to determine the freezing point of aviation gasoline and turbine fuels. It consists of' two Dewar flasks, one inside the other. The external flask is completely evacuated; the internal flask is fitted with a stopcock to regulate heat transfer. The freezing medium is solid carbon dioxide. The inner flask is fitted with drilled cork, which holds stirrer, and thermometer. Included are brass cover and support bracket. The stirring loop is stored in drawer B3 (fig. B-8).

b. Operation.

(1) Fill the outer flask to proper level with any convenient liquid cooled with solid carbon dioxide and add the carbon dioxide. Acetone and alcohol may be used. *(21* Refer to ASTM Method D2386 (TM 10-1166) for detailed test procedures.

2-42. Grease Working Machine.

a. Description. The grease working machine, designed to comply with the requirements specified in ASTM Method D217 (TM 10-1166), is stored in cabinet N1 (figs. 1-2 and B-19). The machine is used to measure the consistency of lubricating greases by penetration of standard cone. It is hand operated.

b. Operation. Refer to ASTM Method D217 (TM 10-1166) for detailed test procedures.

2-43. Water Detector Kit, Automotive/Aviation Fuel **(Aqua-Glo Series II).**

a. Description. The portable, self-contained water detector kit (NSN 6640-00-244-9478) (fig. 1-2 and B-9) is used to detect the presence of undissolved water in automotive and aviation fuel in accordance with ASTM Method D3240. It is battery powered and detects the presence of water within 1.5 parts per million (ppm). The fluorescence of a sample-soaked pad is automatically compared by a double photoelectric cell circuit with a permanent fluorescing standard. An ultraviolet light source is adjusted until a responding microameter reads zero, which means that the sample and standard pads are glowing with equal intensity. The ultraviolet light source level crosses a scale and produces the test result readings.

b. Flushing the Detector Pad Holder.

(1) Connect the detector pad holder assembly to the quick-disconnect coupler at the test point.

(2) Flush at least 1 gallon (3.785 liters) of sample through the assembly. Open and close the valve several times while flushing is taking place.

(3) Close the toggle valve and remove the entire assembly by disconnecting it at the quick disconnect coupler.

c. Exposing the Sample Pad.

(1) Open the detector pad holder and remove a 25 mm detector pad from its sealed envelope using tweezers.

(2) Press the pad into the recess of the outlet half of the sample holder housing with yellow side exposed.

(3) Reassemble the detector pad holder by screwing both halves together firmly by hand.

(4) Reconnect the assembly at the quick-disconnect coupler. Open the toggle valve and allow 500 ml of test fluid to. pass through the detector pad.

NOTE

A 500 ml test is necessary for accurate results in the range of 1 to 10 ppm of water. A 100 ml test is suitable for determination of water content up to 13 to 60 ppm.

(5) Close the toggle valve and remove the entire assembly by actuating the quick-disconnect coupler.

d. Reading Test Results.

CAUTION

A pad must never be dried in air because it will pick up moisture from the air. A desiccator must be used if the pads are to be dried. Fuel clamp means; a detector pad that has been pressed between paper towels as described in step (2) below.

(1) Open the detector pad holder and remove the detector pad with tweezers. The point of the tweezers can be inserted under the pad through the notch in the rin of the recess.

(2) Press the detector pad between dry paper towels to remove excess fluid. Press firmly (about 5 lb.) three or four times with heel of the hand, moving the pad with tweezers to a dry spot each time.

(3) Place the fuel-damp test pad under the flap on the bottom of the unit with yellow side facing inward.

(4) Mount the meter assembly on the side of the unit by sliding it into the tracks provided. Turn on the Aqua-Glo lamp by following the directions on the battery cover.

NOTE

Never leave the light on except while a reading is being taken; the battery will provide only 1 hour of light, and it takes 14 to 16 hours to recharge the battery.

(5) Adjust the lever on the back of the unit until the meter reads zero when the switch button on the meter is depressed.

(6) Interpreting test results. The scale reads in parts per million where the lever crosses it if the test sample is 500 ml. The scale multiplying factor is 5 if a 100-ml test as sample is used. The scale is calibrated for a fuel-damp test pad. Divide the scale reading by 1.2 if the test pad is read when it is not fuel-damp and if the water content is in the range of 1 to 8 ppm. A factor of 1.3 should be used if the water content is more than 8 ppm when the pad is dry.

(7) Storing exposed pads. Exposed pads can be stored for long periods if kept in desiccant-dried containers. They change appreciably in open containers or envelopes.

NOTE

The vast majority of readings that are taken on aviation fuels do not indicate the presence of any free water. If the technician wishes to reassure himself that the detectorpad is effective and the instrument is functioning, he can moisten his finger, touch it to the pad and view the pad in the instrument.

(8) Scale conversion chart. The water detector unit can be used to take undissolved or free water context readings regardless of the quality of fuel that has passed through the detector pad. Figure 2-34 gives the conversion from scale readings to water content for different sample volumes from 100 to 500 ml. The figure can be used to obtain scale multiplying factors for any sample volume, even if that volume is not an exact 100 ml increment. The unit can also be used to read water content when detector pads are of a different size than the ones that are supplied with the unit. The standard detector pad is 25 mm in diameter, but other pads are made that have a diameter of 37 and 47 mm. Be sure to use only 25 mm pads.

CAUTION

The Aqua-Glo calibration may not be accurate if additives are present. For example, certain additives used in heating oils will prevent water that is not dissolved in the fuel from reacting with he sodium fluorescein.

(9) Condition: 25 mm test pads. Example: A scale reading of 6 is recorded on a fuel damp, 25 mm test pad. The sample volume was 100 ml. Read up from the scale reading of 6 to 100 ml curve. Then read on the left-hand scale 30 ppm water content. Refer to TM 5-6630-216-12 and to FM 10-70 for complete instructions covering the water Detector Kit, Automotive Aviation Fuel.

2-44. Flowmeter Kit.

a. Description. The Manostat flowmeter kit, housed in a carrying case, is stored in drawer D3 (figs. 1-2 and B-10). The unit is designed to accurately measure flow rate and permit calculation of the calibration curve without conducting experimental calibration. Calibration charts are supplied for air and water. Correction charts are included for rate observation of gases and liquids other than air or water. The flowmeter kit consists of four flowmeters and housing with removable stand for countertop use or for panel or support mounting. No tools are required for changing tubes. Integral needle valves can be utilized at either inlet or outlet end. The Teflon stop provides easy replacement of floats. Stainless steel and sapphire floats are provided for the three lower ranges. For the two upper ranges, stainless steel black Pyrex floats are supplied. These can be used individually or combined. The triflat tubes are circular in cross section at the bottom and triangular at the top. In between, the tube has a cross section which progressively changes from a circle to an equilateral triangle whose sides are tangent to the circle. The balls which act as floats slide snugly in the tube at all positions from top to bottom.

b. Operation.

(1) Set up the unit and transmit fluid to the unit.

(2) As more fluid passes through the tube, balls will rise and increase annular area between ball and tube.

(3) Balls will come to equilibrium at a point where the weight of the ball is equal to the force required to flow the liquid through the annular area.

(4) Obtain a generalized correlation of the flow of any liquid against the readings on the meter by plotting a flow coefficient against a viscous influence number for different positions on the tube corresponding to its readings. The only information required to obtain a calibration for a given fluid is the density and viscosity of the fluid under the conditions of flow. When both floats are in the flowmeter, read either one, referring to its proper column in the calibration chart.

2-45. Fuel Sampling Kit.

a. Description. The fuel sampling kit, contained in a carrying case, is stored in drawer D5 (figs. 1-2 and B-10). It is designed to comply with the *re*quirements specified in ASTM Method D2275 (TM 10-1166). The unit is used for field sampling of liquids from pressurized systems by means of millipore fuel monitors. The contaminant retained on the test filter held in the monitor is retained for subsequent analysis. The sampling kit contains a stainless steel holder (sampler assembly) for the monitors, and the tubing, connectors, and accessories required to perform the sampling operation and prepare the monitor for subsequent analysis. The monitors are disposable plastic filter holders made of fuel resistant Tenite and preloaded with 37-millimeter filters.

b. Operation. Follow detailed instructions imprinted on the plastic card mounted inside the kit case. Refer to ASTM Method D2276 (TM 10-1166) for detailed test procedures.

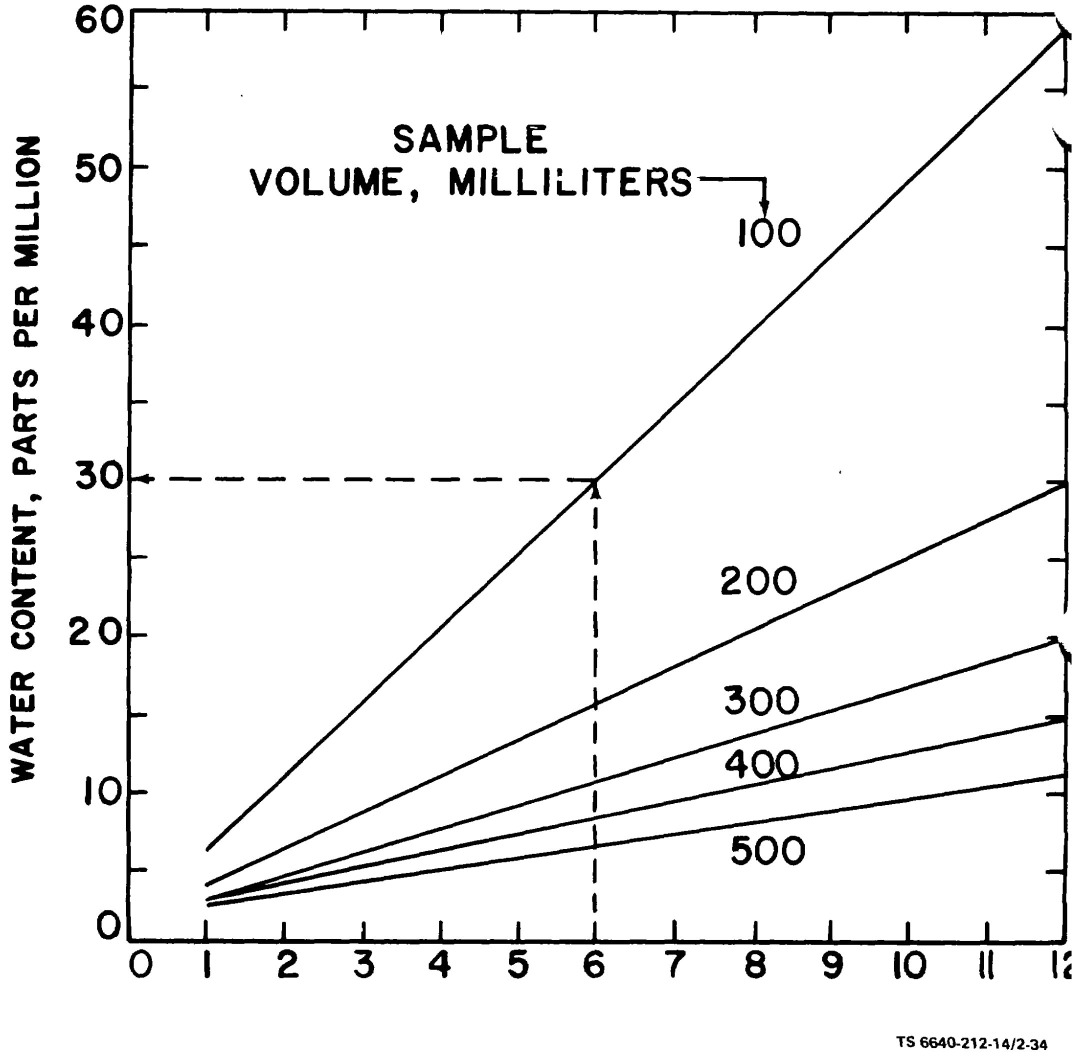

Figure 2-34. Detector Scale Conversion Chart

2-46. Color Comparator.

a. Description. The color comparator, designed to comply with the requirements of ASTM Method D2392 (TM 10-1166), is stored in drawer D5 (figs. 1-2 and B-10). It is used to determine the acceptability of color of dyed aviation gasoline by comparing the hue and color intensity of the dyed sample to glass permanent color standards. The device includes a split field color comparator that provides for simultaneous viewing of the dyed gasoline sample and the glass color standard disks, glass fluid tubes of 200-mm viewing depth, and fluid-type plungers made of polished optical glass. The reference fluid used in the color comparator may be either distilled water or a sample (without dye or lead alkyl fluid additives) of the gasoline to be tested.

b. Operation. Refer to ASTM Method D2392 (TM 10-1166) for detailed test procedures.

2-47. Double Beam Balance.

a. Description. The double beam balance is located in drawer C5 (figs. 1-2 and B-10). It is used to measure chemicals to be used in the various testing procedures. The upper beam is graduated from zero to 10 grams in 0.1 gram divisions. The lower beam is graduated from zero to 200 grams in 10 grams divisions. The capacity of the balance is 200 grams and may be increased through the use of weights. A set of weights in a case, from 1 to 1000 grams, is stored in drawer D3 (fig. B-9).

b. Operation.

(1) Set each poise at the zero mark.

(2) If balance scale is not balanced at zero, make the necessary corrections with the two knurled nuts on front of the beam; then lock the nuts against each other to prevent any movements.

NOTE

Always check zero balance before each use.

(3) Place the specimen to be weighed on the left platform of the balance.

(4) Move the lower poise to the right until the first notch is reached which causes the right platform to drop. Move poise back one notch. This should cause the right platform to rise again.

(5) Move the upper poise to the right until the scale is brought into balance, with pointer in center of the dial or swinging an equal distance to left and right.

(6) Read the weight directly from the beam by adding the amount indicated on upper and lower beams.

(7) When weighing above the beam capacity, place the additional weights on the right platform until the total of these weights comes to within the beam capacity range of the weight of the specimen. The final balance is done by *means* of *the poises.* The weight of the specimen is represented by the total of the weights on the right platform plus the weight indicated on the beams.

2-48. Aneroid Barometer.

a. Description. The aneroid barometer (fig. 2-35), designed to comply with the requirements specified in ASTM Method D86 (TM 10-1166), is wall mounted on the left side of the *laboratory* above the kinematic viscosity bath. It is a temperature compensated instrument and is graduated in both English and metric systems, from 26 to 31 inches (166 cm to 78.7 cm) of mercury. Pressure graduation is 0.10 inch (0.25 cm) of mercury. It can be used for altitudes from sea level to 3500 feet (1057.5 m).

b. Operation.

(1) The basic unit used in the aneroid barometer is a round thin metal box fitted inside a clamp in the form of a C-spring. The metal box, or bellows, is sealed after practically all of the air has been removed. At this point the bellows would collapse due to the air pressure pushing against it from the outside. The C-spring keeps the bellows from collapsing since it holds the sides of the metal box apart and in balance. Changes in air *pressure* disturb this point of balance in respect to the atmosphere and each slight movement is transmitted to the barometer pointer which is positioned over a dial graduated in one-tenth of an inch of mercury.

(2) Figures on dial 26 through 31, represent inches of mercury, the standard means of expressing atmospheric pressure. Read the indicating hand closet to the dial which responds readily to any change in atmospheric pressure. Use the set hand to note any change in pressure. Position the set hand directly over the indicating hand. A few hours after setting, note any change in pressure. A rise in pressure is indicated by movement of the indicating hand to the right. A fall in pressure is indicated by movement of the indicating hand to the left.

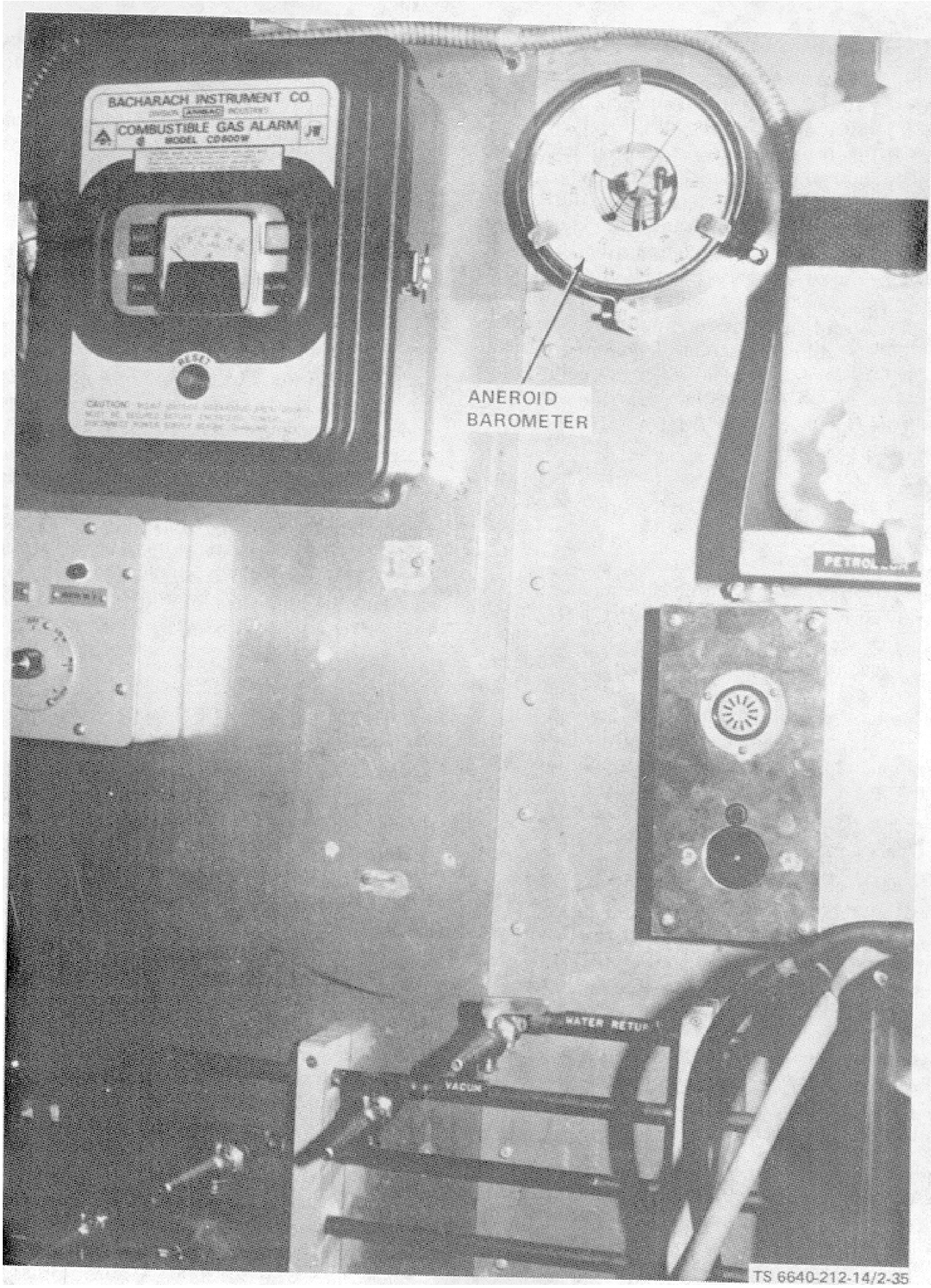

Figure 2-35. Aneroid Barometer Locations

2-49. Water Demineralizer Unit.

a. Description. The water demineralizer unit is wall mounted on the right side wall of the laboratory, above the sink (fig. 1-2). It consists of two Barnstead water demineralizer cartridges mounted in wall brackets. The cartridge color coded red contains a mixed resin bed used to remove inorganics from water. The cartridge color coded black contains a resin bed used to remove organics from water.

b. Operation.

(1) Using 3/8 inch (9.5 mm) (inside diameter) plastic or rubber tubing, connect the inlet hose nipple (bottom of organic removal cartridge) to the demineralizer water supply. Connect the outlet hose nipple (top of organic removal cartridge) to the inlet hose nipple (bottom) of mixed resin cartridge. Connect the outlet hose nipple (top of mixed resin cartridge) to a suitable demineralizer water container.

(2) The basic limiting factor on flow rate is pressure (25-pounds per square inch gage design). The normal optimum flow rate is 10 gallons per hour. The direction of flow of the water through the cartridge must be from the bottom up.

CAUTION

Do not shut off or restrict the flow of the outlet tubing.

(3) Water or other solutions purified by ion exchange resins are not necessarily free from odor, color, or taste which may make it unsuitable for some purposes. In some instances color, taste, or odor may be introduced to the finished product by trace quantities of either free amines or low molecular weight polymers which are present in the fresh, untreated resin. Generally, the amine odor will lessen or disappear after passage of a few gallons of water through the cartridge.

2-50. Desiccating Cabinet.

a. Description. The desiccating cabinet is designed to comply with the requirement specified in ASTM Method D2276 (TM 10-1166). It is wall mounted above the analytical balance, on the right front side of the laboratory. It is constructed of stainless steel with glass side panels. The molded rubber door gasket fits snugly to provide an airtight fit.

b. Cabinet Data.

(1) Molded rubber gasket for door.

(2) Shelf runners to hold shelves or tray (set of two).

(3) Tray, stainless steel 8 by 9 by 5/8 inch (203 mm by 228.5 mm by 15.9 mm) inch.

(4) Shelf, asbestos with twelve 7/8-inch diameter holes.

(5) Manual relief valve, disk only.

(6) Double action bar lock.

NOTE

This desiccating cabinet is not intended for the purpose of maintaining a negative or positive pressure.

c. Operation.

(1) To close the door, it may be necessary to force the door tightly against the jamb before turning the handle. Be sure the square rods enter the top and bottom keepers before tightening the lock.

NOTE

Do not turn the handle any more than is necessary to seal the door. Balance of movement should be reserved for future adjustment.

(2) Before opening the door, normalize the pressure in the cabinet by opening the manual relief valve located in the upper righthand corner.

(3) Place a thermometer in the cabinet with the heated samples. Note temperature rise. Do not open the door until the temperature returns to ambient.

2-51. Fume Hood. A fume hood (fig. 2-36) is built into the front wall of the laboratory, to the left of the gum bath. The purging blower and the light are activated by switches located on the left side wall near the ice maker. The fume hood incorporates two vaporproof electrical receptacles. The *glass* window moves vertically for access to the interior. Five stopcocks in the unit provide capability for the use of water supply, water return, air, propane, and vacuum. The fume hood is used to protect the operator from toxic, corrosive, poisonous, explosive, radioactive, odoriferous, and other harmful and dangerous materials, It provides an area in which solids can be crystallized by controlled evaporation, and in which heat and steam can be removed from hot objectives.

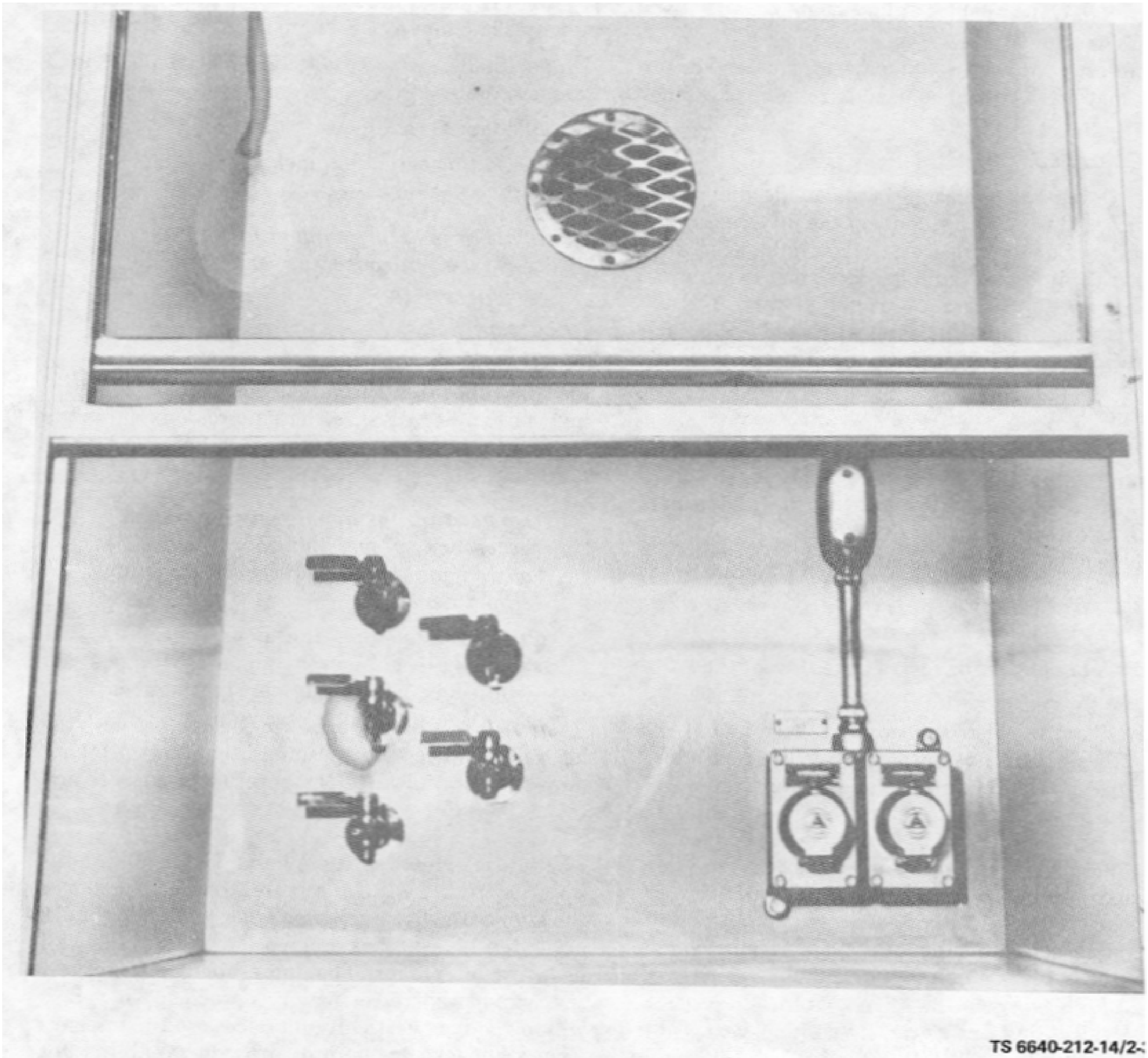

Figure 2-36. Fume Hood

CHAPTER 3

OPERATOR/CREW MAINTENANCE INSTRUCTIONS

3-1. General. This section contains instructions on the duties which must be performed by Operator/Crew Maintenance. Refer to table 3-1 for preventive maintenance checks and services (PMCS).

3-2. Utility Oven.

a. Inspection. Check the on-off switch and pilot light for proper function and replace if necessary.

b. Cleaning. Use a clean cloth and a mild soap and water solution to clean the interior and exterior when the oven has cooled.

c. Troubleshooting. The operator should be guided by the following chart (table 3-2) in diagnosing and correcting operating difficulties.

3-3. Kinematic Viscosity Bath.

a. Inspection.

(1) Inspect motor regularly for signs of deterioration and wear.

(2) Examine Pyrex jar for cracks or chips and replace if necessary.

(3) Check for proper function of line switch and 5 position switch.

(4) Inspect the unit for excessive accumulation of dust and leaking or spilled oil.

b. Cleaning.

(1) Clean the exterior of the bath, using a clean damp cloth.

(2) When required, clean the bath interior after completely draining oil, using suitable solvent to remove remaining oil. Wash the bath with a mild soap and water solution and rinse thoroughly with clean water. Air dry or use a clean, lint-free cloth.

c. Lubrication. Oil the stirrer motor every 1000 hours of operation, using light lubricating oil (PL-S).

3-4. Centrifuge.

a. Inspection.

(1) Inspect test tube holder. Tighten nut if necessary to insure the holder is securely in place.

(2) Check the two centrifuge covers for snug closure.

b. Cleaning.

(1) Use a clean cloth to clean the interior and exterior of centrifuge.

(2) Use a suitable solvent and mild soap and water solution for cleaning the centrifuge tubes. Rinse tubes with clear water, and air dry.

3-5. Vacuum Pump.

a. Lubrication.

(1) Motor. Lubricate monthly with engine crankcase lubricating oil.

(2) Vacuum Pump. Remove the top plate and fill with vacuum oil supplied with the pump until it is slightly above oil level (approximately 3 quarts) as indicated in window on the side of the pump. In operation, the oil should be even with or slightly above the oil level as indicated in the window. If sufficient oil is used, a good seal around the vanes may not be maintained. If too much oil is used, oil may back through the pump trap into the vacuum line. The oil supplied with the pump is specially prepared for high vacuum work. For maximum pumping speeds at low pressure, no other oil should be used. After the oil is changed, the pump must run for some time on a closed system before lowest pressure is obtained. Refer to PMCS chart, table 3-1 for detail checks.

b. Troubleshooting. The operator should be guided by the following chart (table 3-3) in diagnosing and correcting difficulties.

3-6. Air Compressor.

a. Lubrication.

(1) Motor. Lubricate monthly with lubricating oil (PL-S). A few drops of oil in each oil fitting once a month is generally sufficient for average services.

(2) Air Compressor. Fill the crankcase with engine crankcase lubricating oil (OEA for cold weather, OE30 for hot weather operation.) Remove oil filling plug and check oil level weekly. If the oil level is not up to the tapped opening, add sufficient oil to raise the level to this opening. Never remove the oil filling plug while the compressor is operating. Clean the compressor monthly. To clean, drain oil, disconnect tubing to the unloader

Table 3-1. Preventive Maintenance Checks and Services (PMCS)

NOTE: Within designated interval, these checks are to be performed in the order listed.

B - Before　　A - After　　M - Monthly
D - During　　M - Monthly　　C - Combat Operability Check

ITEM NO.	INTERVAL B	D	A	W	ITEM TO BE INSPECTED	PROCEDURE	Equipment is NOT READY/ AVAILABLE if:
1	•				Vacuum Pump	Check to see that the vacuum pump motor is lubricated and the vacuum pump is properly filled with oil.	
	•					Check the condition of drive belt, make sure belt is not too tight or too loose, check belt pulleys.	
	•					Check all connections for tightness.	
	•					Check oil level after pump has been running for at least 15 minutes. Oil level should be maintained between oil level marks when in operation.	
	•					Check for overheating.	
	•					Check vacuum pressure gage on control panel to see that it is operative.	
	•					Check air compressor gage on control panel to see that it is operative.	
	•					Check compressor air pipes for indications of leaks.	

Table 3-1. Preventive Maintenance Checks and Services (PMCS) - Continued

NOTE: Within designated interval, these checks are to be performed in the order listed.

B - Before A - After M - Monthly
D - During M - Monthly C - Combat Operability Check

ITEM NO.	INTERVAL B	D	A	W	ITEM TO BE INSPECTED	PROCEDURE	Equipment is NOT READY/ AVAILABLE if:
			•		Vacuum Pump	Open draincock daily at bottom of tank receiver tank and drain out accumulated water resulting from condensation. Leave the draincock open only as long as a solid stream of water runs, then close tightly.	
				•		Clean the air intake filters weekly.	
			•			Periodically, the V-belt should be adjusted so that a firm down-ward pressure at the middle of the span will cause a defection of one-half to three-fourths inch.	
2	•				Air	Check for loose mounting bolts. Compressor	
	•					Check crankcase oil level.	
	•					Check intake filters for ob-structions.	
		•				Listen for rattles, knocks, squeaks, or hums that may indicate trouble in air com-pressor or motor.	
		•				Observe motor for indication of overheating and smoke.	

Table 3-1. Preventive Maintenance Checks and Services (PMCS) - Continued

NOTE: Within designated interval, these checks are to be performed in the order listed.

B - Before
D - During
A - After
M - Monthly
M - Monthly
C - Combat Operability Check

ITEM NO.	INTERVAL B	D	A	W	M	ITEM TO BE INSPECTED	PROCEDURE	Equipment is NOT READY/ AVAILABLE if:
			•			Air Compressor	Observe drive belts for slippage or binding caused by excessive looseness or tightness of belt. Proper drivebelt deflection should be 3/4 inches under moderate thumb pressure.	
				•			Monthly or more often if required, remove valve caps on the cylinder heads and thoroughly clean inlet and discharge valves and their seats.	
3	•					Water Pump	Check piping for leaks or looseness. Make sure outlet valves are closed.	
	•						Make sure tank contains sufficient water.	
		•					Inspect pump and motor for unusual noises or heat that could indicate malfunction.	
		•					Make sure pump does not leak at shaft seal.	
		•					Check water piping in utility and laboratory compartments for signs of leakage.	
		•					Make sure all outlet valves deliver full flow when open and do not leak when closed.	

Table 3-1. Preventive Maintenance Checks and Services (PMCS) - Continued

NOTE: Within designated interval, these checks are to be performed in the order listed.

B - Before A - After M - Monthly
D - During M - Monthly C - Combat Operability Check

ITEM NO.	INTERVAL B	D	A	W	ITEM TO BE INSPECTED	PROCEDURE	Equipment is NOT READY/ AVAILABLE if:
			•		Water Pump	Remove fill cap from water tank and fill tank with water. Take care to prevent impurities from entering tank.	
4					Compressed	WARNING Gas Cylinders Do not lubricate the cylinder valve or the pressure regulator.	
	•					Check to make sure that the cylinder is undamaged, that connection threads are clean and undamaged, and that all connections are tight.	
		•				Check to make certain that proper cylinder and specified working pressures are being maintained.	
		•				Check for leaking valves, connections and lines.	
			•			Check all leaks in oxygen lines and repair or replace defective components as required.	
			•			If the pressure regulator is defective, replace pressure regulator; if cylinder or cylinder valve is defective, replace the entire cylinder.	

Table 3-1. Preventive Maintenance Checks and Services (PMCS) - Continued

NOTE: Within designated interval, these checks are to be performed in the order listed,

B - Before A - After M - Monthly
D - During M - Monthly C - Combat Operability Check

ITEM NO.	INTERVAL B	D	A	W	M	ITEM TO BE INSPECTED	PROCEDURE	Equipment is NOT READY/ AVAILABLE if:
				•		Compressed Gas Cylinders	If cylinder is nearly empty, disconnect pressure regulator, unfasten cylinder clamp, remove cylinder from compartment, open the cylinder valve until positive that cylinder is entirely empty, close the valve, replace the outlet connection cap, replace the valve protection cap, and turn in the cylinder to the issuing agency.	
5					•	Reid Vapor Pressure Bomb Bath	Oil the stirrer motor monthly using a good grade of light machine oil (PL-5).	
6	•					Pentrometer	Lubricate the stem, adjusting and locking screws, the depth gage and needle valves, and the clutch mechanism as often as required, using light lubricating oil (PL-5).	
7	•					Flash Point Testers	Oil the stirrer motors with a light oil every 1, 000 hours estimated of use. Oil the moving parts of Pensky Martens tester top as often as needed using light lubricating oil (PL-5).	

Table 3-1. Preventive Maintenance Checks and Services (PMCS) - Continued

NOTE: Within designated interval, these checks are to be performed in the order listed.

B - Before A - After M - Monthly
D - During M - Monthly C - Combat Operability Check

ITEM NO.	INTERVAL B	D	A	W	ITEM TO BE INSPECTED	PROCEDURE	Equipment is NOT READY/ AVAILABLE if:
			•		Flash Point Testers	Clean flash cups. Never use gasoline or naphtha for cleaning, use kerosene or Stoddard solvent (SD-1) as cleaning agents.	
8				•	Foam Test Apparatus	Oil the motor bearings weekly with a few drops of light oil (P L-5).	
9	•				Gas Analyzer	Inspect and note pilot lights show normal operation. Note meter readings and check any abnormal deviations from zero. Note meter readings and adjust zeros if necessary while detectors are in a combustible gas-free environment. Refer to paragraph 2-21 if replacement of detector element is required.	

Table 3-2. Utility Oven Troubleshooting

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

1. HEAT LOSS.

Step 1. heck for faulty door gasket.

If defective replace gasket.

Step 2. Check if door strike improperly positioned.

Adjust door strike for tighter closure.

2. TEMPERATURE VARIES.

Step 1. Check if vent is closed.

Open vent to maximum.

Step 2. Check if oven is improperly loaded.

Test oven empty.

Step 3. Check if oven is not stabilized.

Allow 1 to 2 hours for stabilization.

Step 4. Check for faulty electrical connections.

Check all electrical lines and connections.

Step 5. Check for partial failure of components.

Replace faulty switch, thermostat, heaters, or wiring as required.

Table 3-2. Utility Oven Troubleshooting - Continued

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

3. NO HEAT.

Step 1. Check for no power.

a. Check line voltage and connections.

b. Check heaters and thermostat.

4. LOSS OF HEAT CONTROL.

Step 1 Check if thermostat contacts are sticking.

Replace thermostat,

Step 2. Check if heater is shorted.
Correct short or replace heater.

Table 3-3. Vacuum Pump Troubleshooting

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

INSUFFICIENT VACUUM PRESSURE.

Step 1. Check for low oil level.

Fill pump to prescribed oil level.

Step 2. Check for leakage in line.

Locate leak and repair line.

Step 3. Check if motor is functioning properly.

a. Check wiring for shorts or loose connections.

b. Check drive belt for tightness. Correct condition.

valve in the end cover, and remove the end cover. Pull the oil pump out of its bearing and release the strainer by removing a snapring. Clean out sediment or sludge if found in the crankcase, as these interfere with oil pump operation. Clean other parts in the crankcase, such as the relief ball check in the crankshaft counterweight, the ports in the valve cap and the opening in the counterweight. Refer to table 3-1 PMCS chart for detail checks.

b. Troubleshooting. The operator should be guided by the following chart (table 3-4) in diagnosing and correcting operating difficulties.

3-7. Water Pump.

a. Lubrication. The water pump requires no lubrication. Refer to PMCS chart, table 3-1 for detail checks.

b. Troubleshooting. The operator should be guided by the following chart (table 3-5) in diagnosing and correcting operating difficulties.

3-8. Compressed Gas Cylinders.

a. Lubrication.

WARNING

Do not lubricate the cylinder valve or the pressure regulator.

b. Checks and Services. Refer to PMCS chart, table 3-1 for details.

c. Troubleshooting. No repairs to a defective cylinder or valve should be attempted by laboratory personnel. In event of leaking or blocked oxygen line, repair or replace the line. Replace entire cylinder if the cylinder or cylinder valve is defective. Replace the pressure regulator if defective.

3-9. Blowers (Purging). No lubrication is required. Check mounting bolts and duct connections for tightness.

3-10. Vaportight Light Fixtures.

a. Cleaning. Clean the globe and fixture with a damp, lint-free cloth.

b. Removal and Replacement of Lamp.

(1) Unscrew and remove the opal globe.

(2) Unscrew and remove the heavy duty lamp.

(3) Screw the new ruggedized lamp into socket.

(4) Screw the globe in place.

3-11. Refrigerator Ice Maker.

a. Inspection.

(1) Inspect the refrigerator door gasket for signs of wear and a tight fit with door closed. *(2)* Inform organizational maintenance of frequent excess of frost.

b. Cleaning.

(1) Exterior. Wipe regularly with a damp, lint-free cloth. Occasionally use a quality cleaner to restore the original luster of the finish. To eliminate fingerprints, apply a commercial glass cleaner or a thin film of automobile wax wiped on with a soft cloth.

CAUTION

Never use an abrasive or an alkaline solution.

(2) Interior. It is important that the *interior* of the cabinet be cleaned periodically beginning with the initial installation. Spillage and poorly wrapped packages will tend to cause objectionable odors. When this condition occurs, clean the entire interior with a solution of baking soda and warm water. Wipe thoroughly dry after cleaning.

(3) Condenser. The condenser is located directly behind the louvered section at the front of the cabinet. Use a brush with stiff bristles to remove any stubborn foreign matter that may cling to the condenser; then clean thoroughly with a vacuum cleaner.

c. Lubrication. No lubrication is required.

d. Inspection and Troubleshooting.

(1) Electrical trouble check.

(a) When checking for electrical trouble, always be sure there is a live electrical circuit to the cabinet and that the temperature selector dial is in the OFF position.

(b) When the sealed unit will not start and the cabinet temperature is warm, the trouble may be in the relay, in the thermostat, in the wiring, or in the compressor motor itself.

(c) If the compressor will not run, make a test lamp check across the relay terminals. The test lamp should light to show a live circuit if the thermostat is in the normal operating position and not in the OFF position. If this check does not show a live circuit, the thermostat and wiring should be checked for an open circuit. Pay particular attention to all terminal connections.

Table 3-4. Air Compressor Troubleshooting

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

1. AIR COMPRESSOR MOTOR FAILS TO START, OR STOPS AT IMPROPER TIME.

Step 1. Check for defective wiring or connections.

Check wiring and connections and correct.

Step 2. Check for current overload which opens circuit breaker.

Locate and correct cause of overload.

Step 3. Check for defective motor.

If motor is defective, replace.

2. AIR COMPRESSOR MOTOR DRIVE BELT BINDING.

Check drive belt, which may be too tight.

Loosen motor mounting bolts, position motor proper distance from compressor.

3. MOTOR RUNS BUT FAILS TO DRIVE COMPRESSOR.

Step 1. Check for broken drive belt.

Replace belt.

Step 2. Check for loose drive belt.

Loosen motor mounting bolts, position motor in proper position.

Step 3. If motor or compressor pulley is loose on shaft, tighten pulley.

Table 3-4. Air Compressor Troubleshooting - Continued

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

4. AIR COMPRESSOR FAILS TO COMPRESS AIR.

Step 1. Check for lack of oil pressure.

a. Check crankcase oil level.

b. Clean strainer in base of pump.

c. Clean or replace ball check in plunger or pneumatic cushion port plug.

Step 2. Check for dirty ball check or seat.

Clean ball check or ball check seat.

5. SAFETY VALVE IN AIR STORAGE TANK LEAKS.

Dirt around seat of valve.

Clean valve seat.

Table 3-5. Water Pump Troubleshooting

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

1. PUMP FAILS TO START, OR IT STOPS DURING OPERATION.

Step 1. Check for defective wiring.

Check wiring and correct.

Step 2. Current overload causes circuit breaker or overload cutout switch in starter relay box to open.

Close circuit breaker and reset overload switch in relay box.

Step 3. Check for defective motor.

If defective, replace motor.

Step 4. Check for broken or clogged impeller.

Clean volute and inspect impeller. Replace, if defective.

2. PUMP FAILS TO DELIVER WATER AT PROPER PRESSURE.

Step 1. Check for insufficient water.

Fill water tank.

Step 2. Check if motor speed too low.

Check electrical system and correct defect.

Step 3. Check for leak at shaft seal.

Disassemble pump and replace seal.

Table 3-5. Water Pump Troubleshooting - Continued

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

2. PUMP FAILS TO DELIVER WATER AT PROPER PRESSURE. **-** Continued

Step 4. Check for clogged water inlet.

Drain pump and tank. Disassemble and clean suction pipe.

Step 5. Check for worn impeller.

If worn, replace.

3. PUMP VIBRATES OR RUNS NOISILY.

Step 1. Check for foreign matter in volute.

Disassemble and clean.

Step 2. Check for insecure mounting.

Tighten pump motor mounting bolts.

Step 3. Check for bent shaft, warped impeller, worn bearings.

Remove and inspect volute. Replace defective parts.

4. MOTOR OVERHEATS.

Step 1. Mechanical defect in pump or motor.

Check motor for easy rotation and straight shaft, and correct condition as required.

Step 2. Check for incorrect voltage.

Check electrical system and correct applicable defect.

e. Refrigerator Maintenance.

(1) Door seal adjustment.

(a) Each hinge is provided with slotted mounting holes in the wing that is fastened to the door.

(b) If it becomes necessary to remove the complete door assembly, remove the screws that secure the hinge to the cabinet exterior; the door gasket pressure will not be disturbed.

(2) Thermostat.

(a) The thermostat is mounted on the right side of top interior, and is secured by two screws.

(b) To adjust the thermostat for a warmer or colder setting, an indicator knob is provided. Turn the knob clockwise for a warmer temperature.

(c) Changing the thermostat indicator setting to a warmer or colder position changes the cutout temperature only. The thermostat indicator should not be changed more than once each 24 hours, and then by only one or two numbers. Usually, 24 hours are required for the temperature to stabilize.

(d) A thermostat check can be made by using a piece of wire as a temporary bridge across the two thermostat terminals. If the compressor starts and runs with the bridge, the thermostat is at fault and should be changed.

(e) If the test lamp check shows power supply at the relay terminals, check the compressor by means of a manual test set.

f. Troubleshooting. The operator should be guided by the following chart (table 3-6) in diagnosing and correcting operating difficulties.

3-12. Pyrometer.

a. Inspection.

(1) Inspect the thermocouple regularly for signs of deterioration. Replace as required.

(2) Inspect the protection tube for leaks.

b. Cleaning. Keep the instrument free from accumulation of oil or moisture.

c. Lubricating. Do not grease or lubricate any part of the unit.

3-13. Muffle Furnace.

a. Inspection.

(1) Inspect the thermocouple and muffle unit regularly for signs of deterioration.

(2) Check the on-off switch and pilot light and replace if necessary.

b. Cleaning. Clean the steel tray and the chamber interior, using a clean cloth and mild soap and water solution.

c. Removal and Replacement Procedures. Procedures for removing and replacing the muffle unit, thermocouple, on-off switch and pilot light are as follows:

(1) Removal of burned-out muffle and thermocouple.

(a) Remove three screws (7, fig. 3-1) from sides of the case and remove the backplate (6).

(b) Remove loose insulation blocks.

(c) Lay the furnace on its face. Remove the thermocouple (5) from the instrument, marking each wire. Withdraw the thermocouple from the hole. Remove the metal air vent from the hole.

(d) Remove the nuts and the wires from the muffle terminals.

(e) Remove the terminal plate.

(f) Remove the insulating blocks at the back of the muffle carefully, laying out both layers so that they may be installed in the same order that they were removed. Grasp lead wires. Gently work the muffle unit out. Remove the insulating sleeves from the muffle lead wire.

(2) Replacement of muffle and thermocouple.

(a) Replace the insulating sleeves over the wire. Insert the muffle with the hole for the thermocouple toward the top of the furnace (fig. 3-2). Replace the insulating blocks over the rear of the muffle.

(b) Replace the terminal plate, drawing lead wires through holes.

(c) Attach leads to the terminals.

(d) Attach the thermocouple to the instrument in the base, making sure that each wire goes to the terminal from which it has been removed. Replace metal air vent with spring in hole. Stand the furnace up. Open the hole from inside of the muffle and insert the thermocouple (5, fig. 3-1).

(e) Replace the loose insulation blocks.

(f) Replace the backplate (6) and tighten three screws (7).

(3) On-Off switch and timer.

(a) Turn muffle furnace on its side and tag all wires going to switch and timer (fig. 3-3).

(b) Remove setscrew from switch knob (fig. 3-1) and remove knob, remove attaching nut securing switch and timer assembly to lower oven chassis.

Table 3-6. Refrigerator-Ice Maker Troubleshooting

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

1. UNIT WILL NOT RUN.

Step 1. Check for blown fuse.

Replace fuse and check for cause of blown fuse.

Step 2. Check for defective thermostat.

Check, if defective, replace.

Step 3. Check for defective relay.

Check, if defective, replace.

2. COMPRESSOR CYCLES INTERMITTENTLY.

Step 1. Check for low voltage.

Check line voltage, eliminate cause of circuit overload.

Step 2. Check for dirty condenser.

Clean condenser.

Step 3. Check for defective relay, overload protector.

Check with wattmeter, if defective replace.

Step 4. Check for loose electrical connection.

Check wiring and make necessary repair.

Table 3-6. Refrigerator-Ice Maker Troubleshooting - Continued

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

3. UNIT RUNS BUT DOES NOT COOL OR FREEZE TO PROPER TEMPERATURE

Step 1. Check for leak in refrigerant system.

Check and make repair.

Step 2. Check for defective control.

Check and make repair.

Step 3. Check for dirty condenser.

Clean condenser.

Step 4. Unit too close to wall or to a heat emitting appliance.

Move out from wall, or to a cooler spot.

4. REFRIGERATOR EVAPORATOR OR COILS WITH EXCESSIVE FROST BUILDUP.

Step 1. Check for faulty control.

Check, if defective, replace.

Step 2. Check if control too far from coil.

Check, if defective, replace.

Step 3. Check if controls set too high.

Set to lower number.

Step 4. Check for dirty condenser.

Clean condenser.

Table 3-6. Refrigerator-Ice Maker Troubleshooting - Continued

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MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

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5. COMPRESSOR RUNS CONTINUOUSLY.

Step 1. Check for excessive heat in room or too close to heat generating equipment.

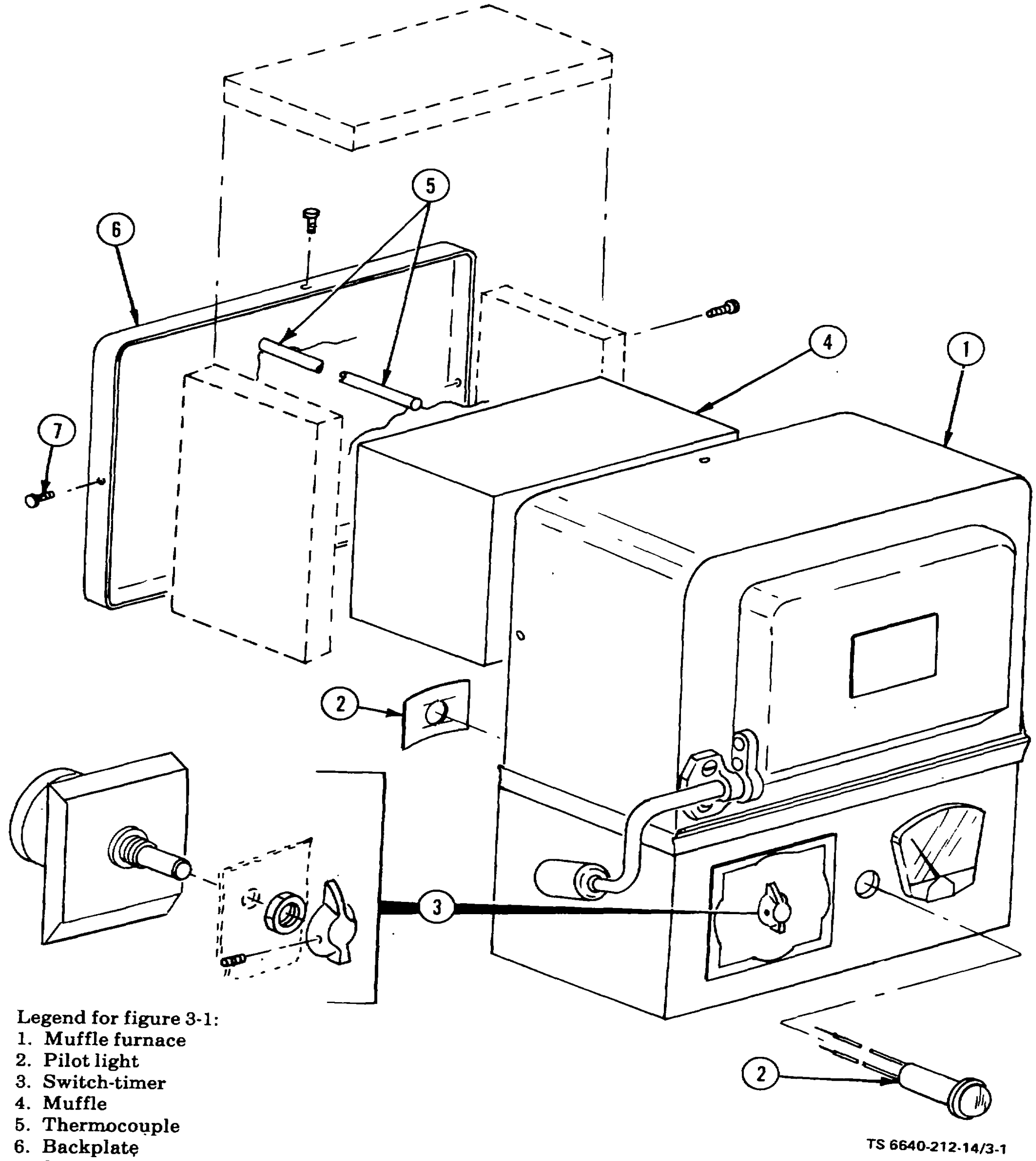
Relocate to cooler location.

Step 2. Check for faulty control.

Check, if defective, replace.

Step 3. Check for improper ventilation.

Allow more air space or install cooling fan.



Legend for figure 3-1:
1. Muffle furnace
2. Pilot light
3. Switch-timer
4. Muffle
5. Thermocouple
6. Backplate
7. Screw

Figure 3-1. Muffle Furnace, Exploded View

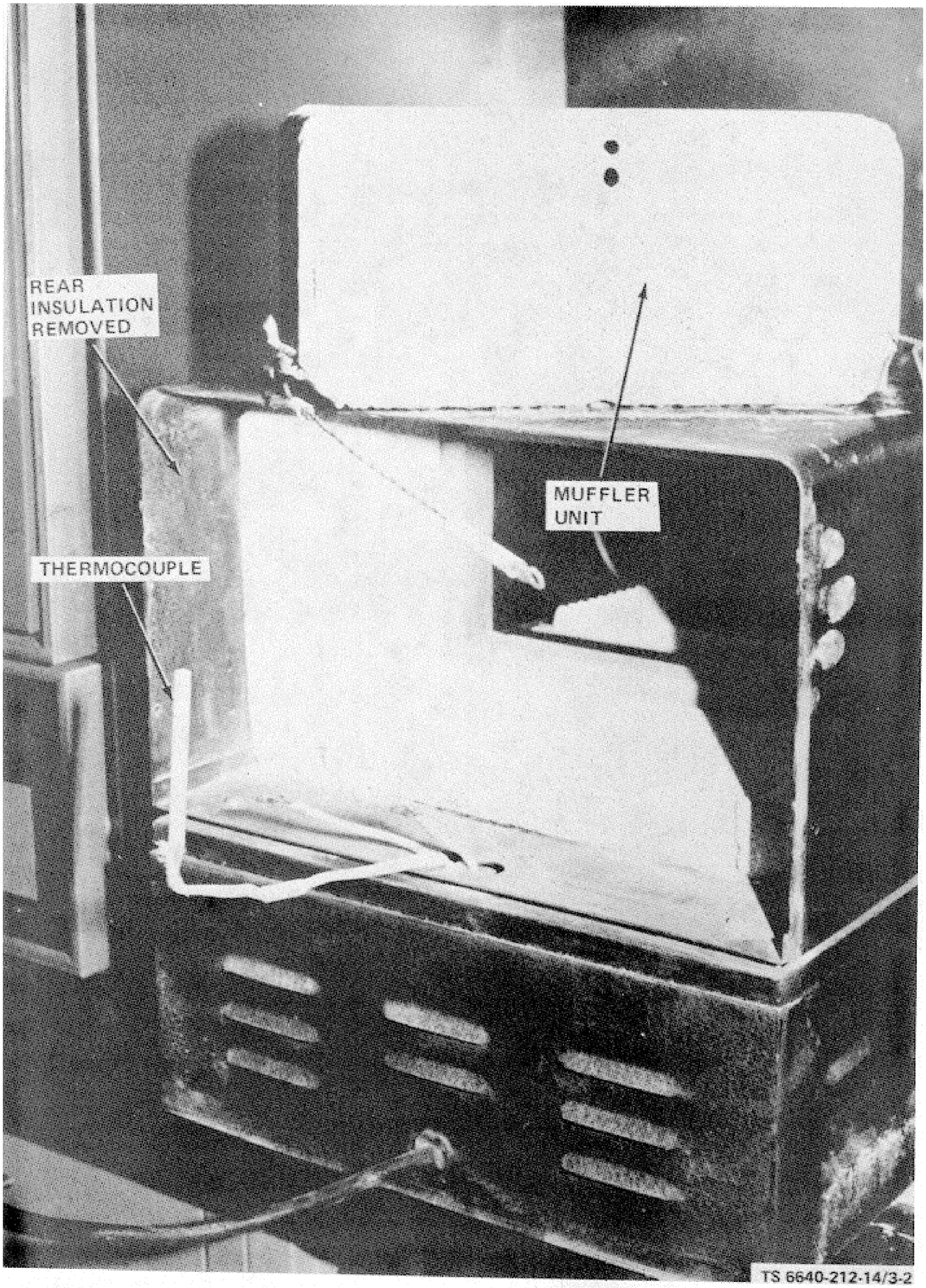


Figure 3-2. Muffle Furnace With Backover Removed Along with Insulation ad Muffle Unit

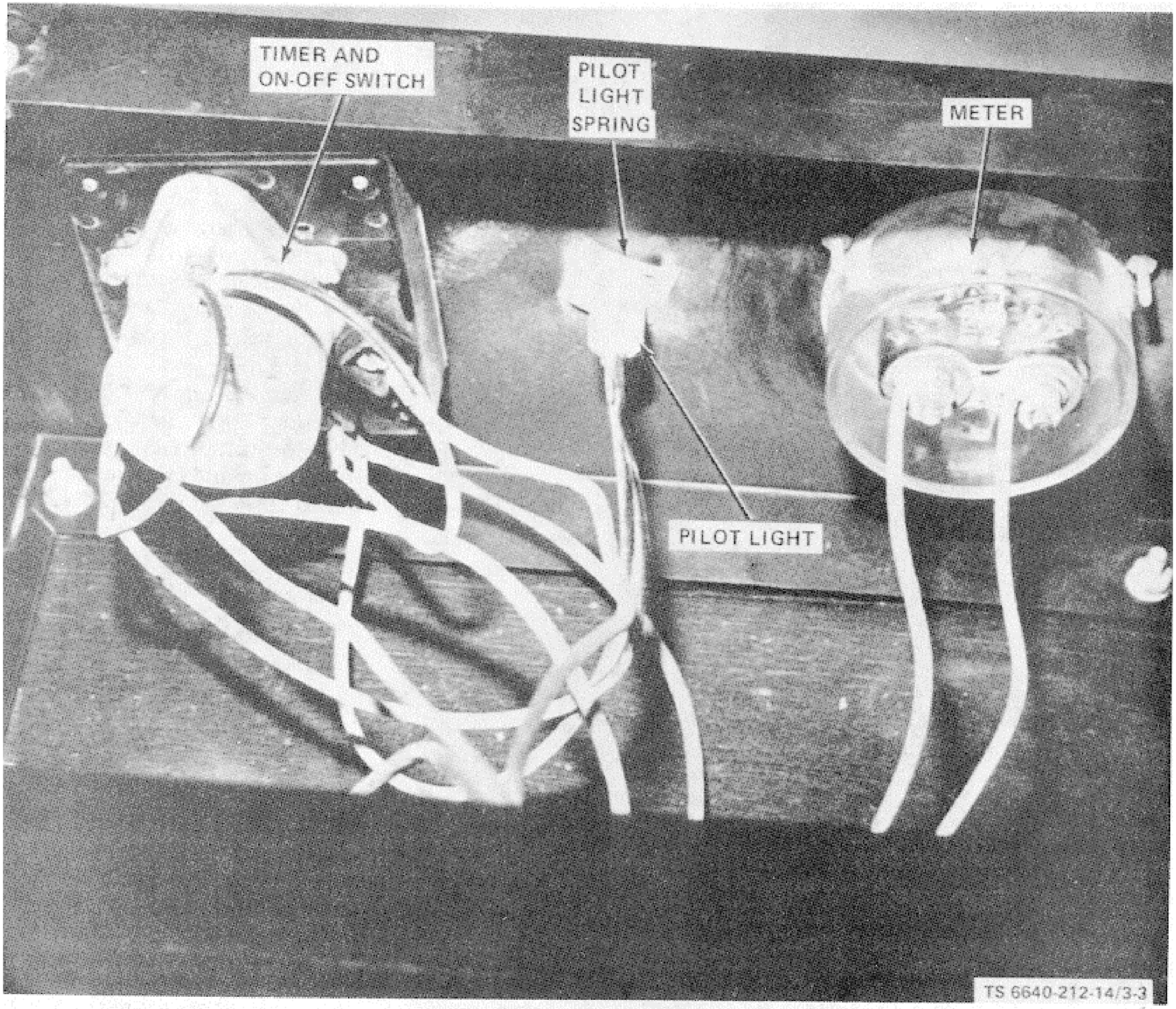


Figure 3-3. Muffle Furnace Lower Chassis Parts Location

(4) Pilot light.

(a) Turn muffle furnace on its side, tag and remove wires going to pilot light.

(b) Remove spring nut attaching light to lower chassis and remove pilot light (2, fig. 3-1 and 3-3).

3-14. High Pressure Steam Boiler.

a. Inspection.

(1) Inspect the terminal end of the heater to be sure it is protected from drippings, condensation, spray, or direct spillover of material.

WARNING

Disconnect power before removing heating

(2) Remove the heating element and scale periodically and inspect for signs of deterioration.

b. Cleaning. Clean the exterior of the boiler with a clean cloth and mild soap and water solution.

3-15. Gum Bath.

a. Inspection*.* Check to see if the gooseneck tubes are installed. Visually inspect condition of switches on lower side of gum bath for smooth action, any breakage or foreign matter. Check stainless steel housing and top ring for foreign matter. Inspect thermocouple leads going to pyrometer for breaks or defective insulation. Check for breaks or defective insulating on power cord. Check thermostat tubing from high pressure boiler control to gum bath for breaks or kinks.

b. Cleaning*.* Clean the exterior of the boiler with a clean cloth and mild soap and water solution.

3-16. Analytical Balance. Figures 2-21, 3-4 and 3-5 give various views of the analytical balance. The cleaning and calibrating procedures explained below refer to these figures.

a. Inspection*.* Inspect the glass doors and glass weighing chamber for cracks and chips.

b. Cleaning.

(1) From time to time clean the weights of the balance with a camel's hair brush or chamois leather. To remove the weights, arrest the beam and take off the hood. Move all knobs to the maximum setting so that scales show 99.9999. Remove the weighing pan from the weighing compartment. Lift the weight carriage and swing the weight carriage bridle forward to detach it from the bearing (stirrup) plate. Unscrew two large knurled head screws in the ceiling on the weighing compartment and remove the partition. Unscrew knurled knobs (4 and 5, fig. 3). Separate the upper part of the weight carriage from the lower while holding the lower to prevent it from falling into the weighing compartment. Take out the lower part and switch the weight decade slowly from 9 to 8 to 7, etc., to zero. While doing this, remove the corresponding weights which will be lying freely in their respective hooks. Clean the weights thoroughly. Do not leave fingerprints on the surface. Handle weights with forceps only. After cleaning, reassemble the balance check zero, calibrate, and adjust sensitivity, if necessary.

(2) To clean the weighing compartment interior, arrest the balance, remove the weighing pan and wipe the interior clean, using a water-damp chamois. Wring the chamois dry and wipe again, removing all traces of water. Remove dust particles, using a camel's hair brush. Clean and replace the weighing pan. Sliding glass doors may be removed for cleaning. Wipe the exterior of the balance clean, using the waterdamp chamois. Do not attempt to clean the balance mechanism other than the weights and knives unless the balance malfunctions.

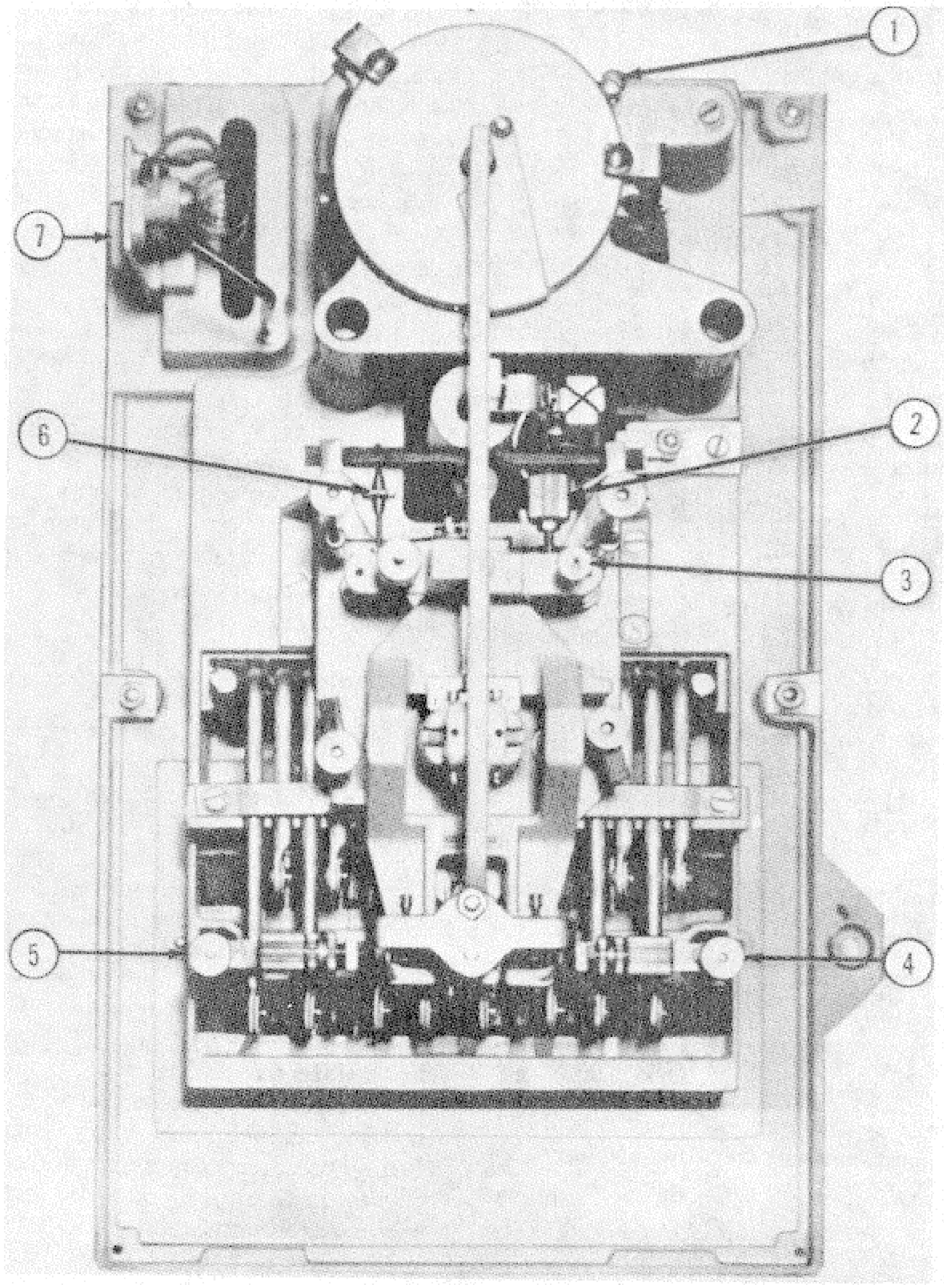
CAUTION

DO NOT ATTEMP TO REPAIR THE BALANCE. Only a skilled service repairman with factory facilities available should attempt repairs. Adjustment and calibration can be accomplished by the laboratory technician.

c. Calibrating.

(1) Check zero the balance (fig. 2-21) by rotating weight control knobs until the macro scale shows zero; then rotating the micrometer drum knob until the optical scale is zeroed, or until the micrometer line is as nearly on zero as the mechanical lash in the knob control will allow; and finally, rotating the zero control knob until zero shows on the micro scale. If exact zeroing of the micro scale cannot be achieved, zeropoint adjust the balance as noted in (4) below. If the range of the zero control knob does not permit zeropoint adjustment, readjust range as noted in (5) below. If macro scale cannot be zeropoint adjusted, the range of the weight control knobs must be adjusted as described in (6) below.

(2) Scale illumination can be increased by adjusting bulb contact to provide maximum bulb brightness. If additional illumination is desired, remove the hood and loosen the knurled head screw (7, fig. 3-4) which holds the cover on the



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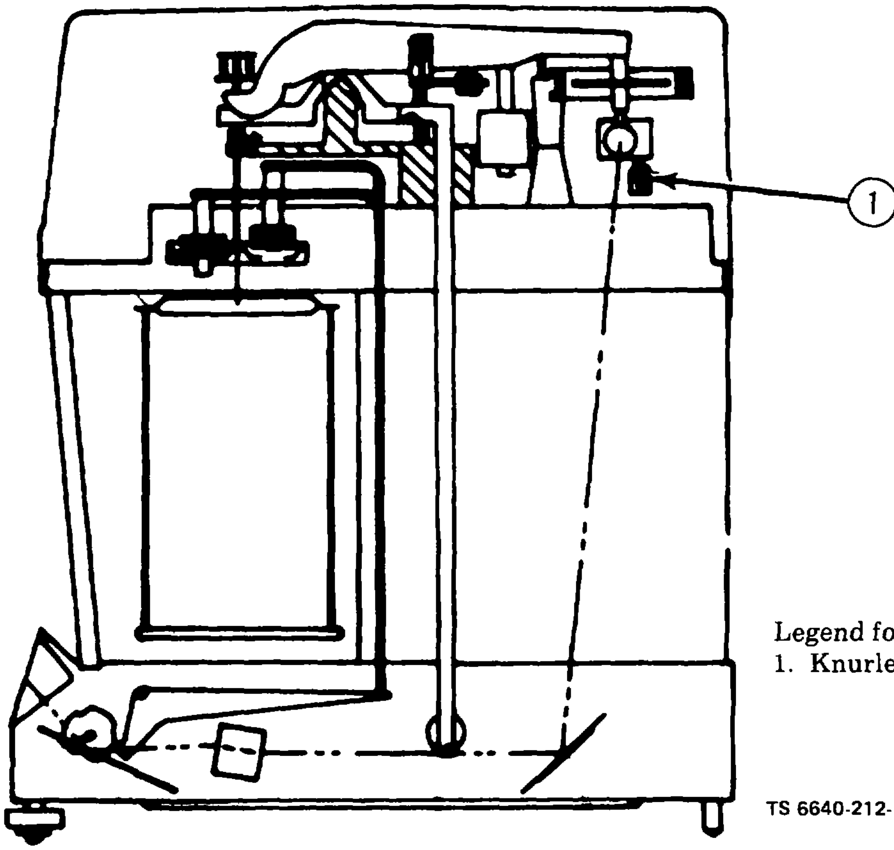
Legend for figure 3-4:
1. Screw
2. Knurled screw
3. Knurled nut
4. Knurled knob
5. Knurled knob
6. Knurled knob
7. Knurled screw

Figure 3-4. Top View of Analytical Balance



Legend for figure 3-5:
1. Knurled knob

Figure 3-5. Analytical Balance, Side View

recessed lamp housing in the left rear of the balance. Slide the cover from side to side and up and down until the desired illumination is obtain-ed. Tighten the knurled head screw firmly while holding the cover in position. A replacement bulb is available and is stored in the lower spare mount.

(3) Scale focusing is controlled by the long knurled knob (1, fig. 3-5) at the rear of the scale. Carefully adjust the knob until the desired focus is achieved on the optical scale.

(4) Zeropoint adjustment is accomplished by first rotating the weight control knobs and micrometer drum knob until the macro weight scale and optical scale are returned to zero. Move the arrestment lever into PRE-WEIGH position (fig. 2-22) and adjust the micro scale to zero by turning screw (1, fig. 3).

(5) Range adjustment of the zero control knob has the effect of recentering the knob. Set the knob in the center of its adjusting range without regard to micro scale reading. Arrest the beam by moving the arrestment lever to horizontal position (fig. 2-22). Remove the balance hood and adjust the knurled knob (6, fig. 3-4) until optical and micro scales are zeroed. If the scale deviation is so great that this method cannot be used to zero the knob midrange, it is necessary to zero the macro system as described in (6) below.

(6) To perform macro zero adjustments, check zero calibration as described in (1) above; then arrest the beam and remove the hood. Loosen the locking screw or knurled screw as required to zero the macro scale. Retighten the locking screw, release the beam, and check zero again. Repeat the correction if the deviation exceeds one scale division. As soon as the deviation is reduced to one scale division, replace the hood and use the zero control knob to adjust to zero.

(7) Check sensitivity by rotating the weight control knobs until 01 appears on the macro scale while the beam is arrested. Place a 1-gram weight on the pan, release the beam, and check zero on the optical scales as described in (1) above. Rotate the weight control knobs to show zero on the macro scale. Let the optical scale swing in and read the result. If the full deflection of 0100 is not obtained, adjust the sensitivity by turning the knurled nut (3, fig. 3-4) to adjust the scale accordingly. Turn weight control knob so that 01 appears on the macro scale and set zero point as described in (4) above. Recheck the sensitivity. If required, readjust the sensitivity, set the zeropoint, and recheck. Continue the sequence until the balance is correctly adjusted.

3-17. Distillation Test Apparatus.

a. Inspection*.* Visually inspect condition of switches, autotransformer, and pilot light for malfunctions or breakage. Inspect power cord for defective insulation. Inspect viewing glass for breakage, and overall unit for cleanliness.

b. Cleaning*.* Use a clean cloth and a mild soap and water solution to clean the interior and exterior of the distillation apparatus.

3-18. Reid Vapor Pressure Bomb Bath.

a. Inspection**.** Inspect the thermoregulator closely for presence of gas bubbles in the mercury column. If bubbles or separation of mercury in column exist, heat the bulb gently until bubbles are driven up into the expansion chamber. Cool slowly to form a solid column without bubbles or separation.

b. Cleaning. Wipe all components with a clean, damp cloth.

c. Lubricating. Oil the stirrer motor approximately every 4 months, using a good grade of light machine oil (PL-S).

d. Calibrating Thermoregulator*.* Immerse thermoregulator in the bath. Bring the bath temperature up to 96 degrees F to 98 degrees F (35.6 degrees C to 36.7 degrees C), rotate the microset magnetic coupler until the indicator light on the control box is extinguished. Rotate the magnetic coupler until the indicator light is on. Continue making minor adjustments until the bath temperature is maintained at the desired temperature, 100 degrees F + or- .2 degrees F (37.8 degrees C + or- 1.12 degrees C). e. Troubleshooting. The operator should be guided by the following chart (table 3-7) in diagnosing and correcting operating difficulties.

3-19. Manometer.

a. Inspection. Inspect scale for cracks or leaks and replace if defective.

b. Cleaning. The normal maintenance necessary with the manometer is an occasional cleaning of the glass tube, where deposits of oxidized mercury have collected on the interior surface. Drain the mercury and remove the top and bottom plugs on the tube. A suitable brush with either naphths or acetone moved rapidly up and down in the tube will clean the tube efficiently.

NOTE

Refill the manometer reservoir with clean mercury. See paragraph 2-26 b (4) for instructions on filling reservoir.

c. Troubleshooting. The operator should be guided by the following chart (table 3-8) in diagnosing and correcting operating difficulties.

3-20. Pressure Recording Gage.

a. Inspection. Inspect to see that ink is not overfilled and pen point is clear to write.

b. Cleaning*.* Remove the pen from the pen arm. Swab the pen with a pipe cleaner and fresh ink or water. Do not use a knife on the pen point. Replace the pen point.

c. Calibrating*.* The pressure recording gage should be calibrated by pneumatic means only. The simplest way of testing pneumatically is by using the manometer, provided in the mobile laboratory, in a test configuration similar to that shown in figure 3-6. For operation of the manometer, see paragraph 2-26 b.

3-21. Refractometer.

a. Inspection. Visually inspect conditions of switches, controls and lines for malfunctions or breakage. Inspect power cord for defective insulation. Inspect refractometer for drippings, or direct spillover of material.

b. Cleaning.

(1) Clean all exterior surfaces thoroughly at the close of each day's work.

(2) Clean prisms immediately after use.

3-22. Dry Ice Machine.

a. Inspection. Inspect the copper tubing connection for corrosion or leaks.

b. Cleaning. Use a clean, damp cloth for cleaning interior and exterior of machine.

c. Adjusting. Safety valves are factory set and should not be adjusted.

3-23. Utility Bath.

a. Inspection. Inspect the bath for leaks. Should leaks develop beneath the bath, tighten either the compression fittings at heater terminals or at thermostat plug in the center of the underside.

b. Cleaning*.* Clean exterior with a damp cloth and wipe dry. Wipe first with clean, dry lens, tissue, and then wipe with a tissue or cotton dampened with water, alcohol, or other solvent

Table 3-7. Reid Vapor Pressure Bomb Bath Troubleshooting

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

1. LOSS OF TEMPERATURE CONTROL OF BATH WATER.

Step 1. Check if stirrer motor is malfunctioning.

a. Check electrical connections to stirrer motor.

b. Check stirrer rod (may be bent) and propeller (may be missing). Insure proper water circulation.
Correct applicable defect.

Step 2. Check heater element for malfunction.

Check electrical connections and insure proper power supply to elements. Using an electrical circuit tester, insure proper function of elements. Correct applicable defect.

Step 3. Check thermoregulator for malfunction.

a. Check thermoregulator. Reset and calibrate as required.

b. Check location of thermoregulator. Restore to proper location as required.

c. Check condition of thermoregulator. Replace if cracked or broken.

d. Reset if bubbles are noted in mercury columns.

Step 4. Check for improper water level.

Add water as required up to overflow tube level.

Table 3-7. Reid Vapor Pressure Bomb Bath Troubleshooting - Continued

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

2. BATH DRAIN HAS BEEN OPENED BUT WATER DOES NOT RUN OUT.

Check for plugged drain or bent tube under trailer.

Check drain and tube. Make applicable correction.

Table 3-8. Manometer Troubleshooting

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

1. NO PRESSURE READING.

Step 1. Pressure is not being applied to either or both sides of the instrument.

Check for plugged or leaking pressure lines.
Make applicable correction.

Step 2. Atmospheric pressure connection not vented to atmosphere.

Check atmospheric pressure connection and insure proper venting.

Step 3. Check for foreign particles in internal passages of the meter blocking the flow.

Remove mercury from meter and check internal passages for foreign particles.

2. HIGH OR LOW PRESSURE READINGS.

Step 1. Check for leaks or obstructions.

Check lines for leaks or obstructions.
Make applicable corrections.

Step 2. Tubing and/or mercury may contain foreign matter.

Disassemble and clean instrument. Replace mercury.

Step 3. Check for improper zero setting.

Check zero setting. Make proper adjustment.

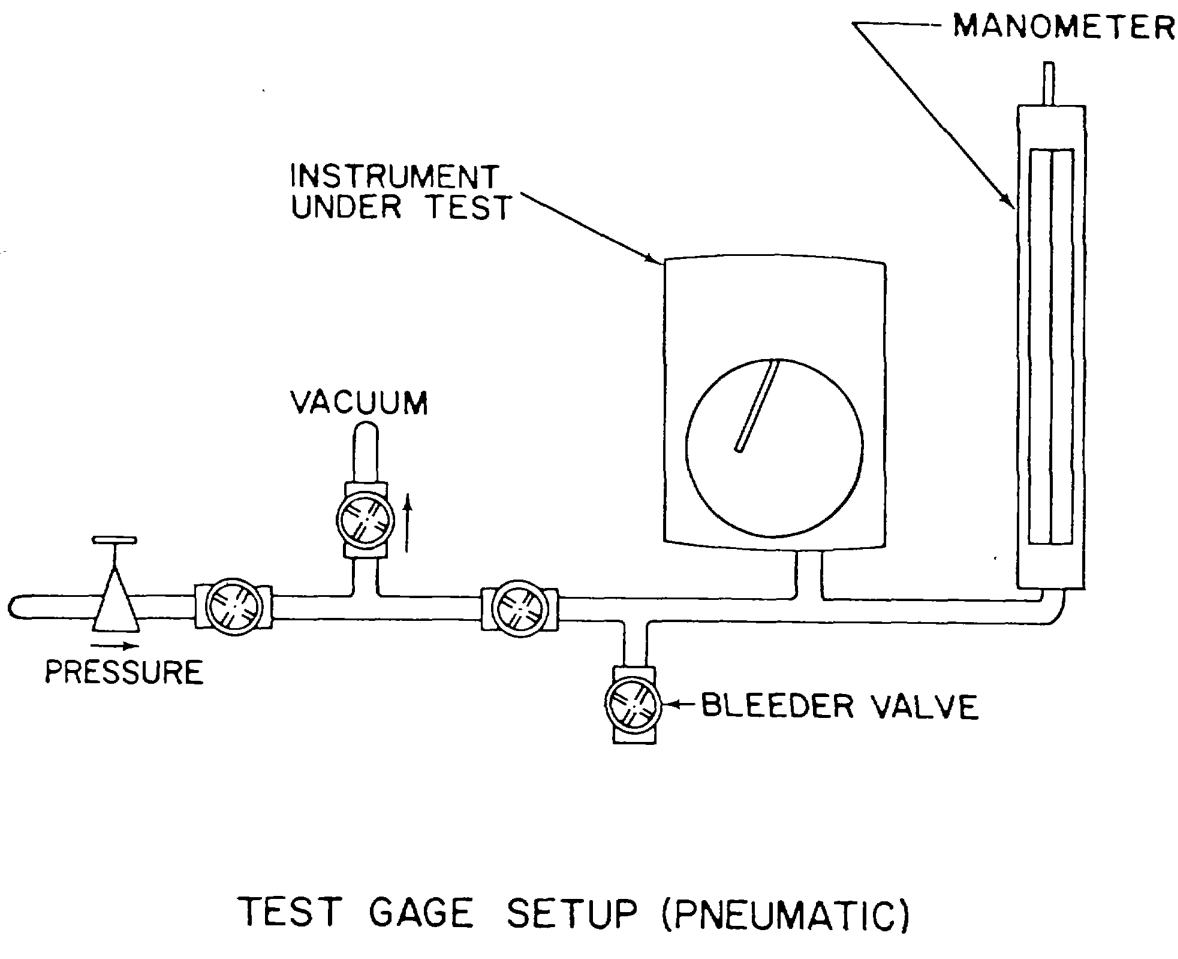


Figure 3-6. Test Gage Set (Pneumatic)

Dry, if necessary, with clean lens tissue or thoroughly washed linen.

NOTE

Avoid the use of linen or tissue which has been lying about on the worktable where it can pick up dust and grit.

(3) Use camel's hair brush to clean the internal mirror and scale.

b. Replacing Lamps.

(1) Field Lamp. Unscrew the toric-shaped housing from the swinging arm. Remove and replace the lamp, and secure the housing.

(2) Scale Lamp. Swing open the trap door on the bottom of the instrument by rotating the slotted lever. Remove and replace the lamp, and close the trap door.

3-24. Penetrometer.

a. Inspection*.* Check the dial and test rod for accuracy. Replace a defective or otherwise unserviceable penetrometer.

b. Cleaning. Remove test product with solvent. Air-dry or wipe dry with a clean, lint-free cloth. Use mild soap and water if necessary and dry thoroughly to prevent rust.

c. Lubricating. Lubricate stem, adjusting and locking screws, depth gage and needle gears, and clutch mechanism as often as required, using light lubricating oil (PL-S).

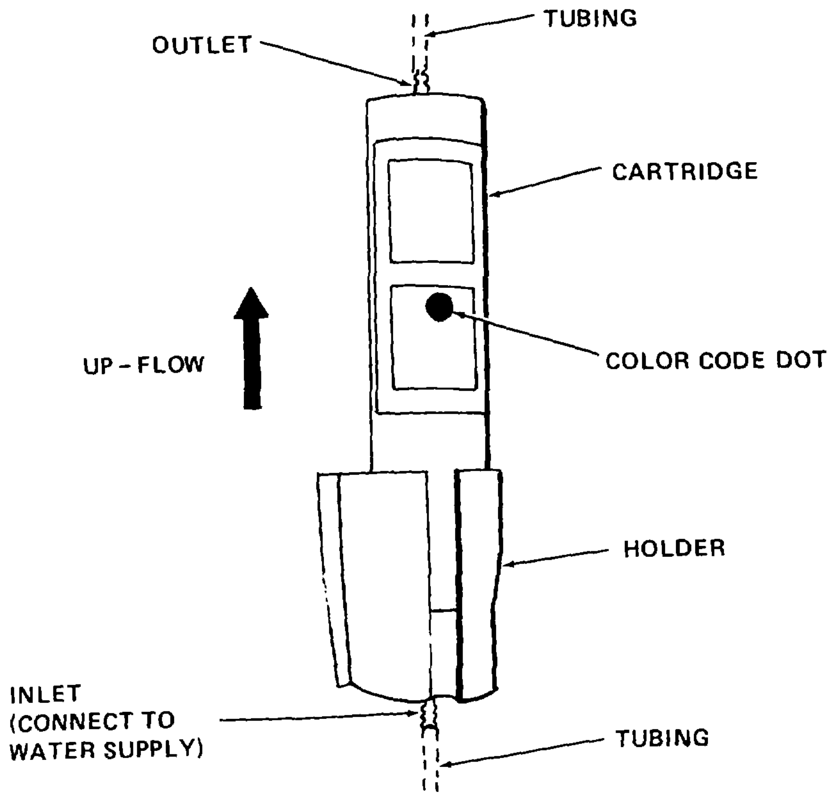


Figure 3-7. Cartridge, Typical Installation

3-25. Flash Point Testers.

a. Inspection. Periodically test stirrer motors for proper function. Replace defective motors.

b. Lubricating. Oil the stirrer motors with a light oil every 1000 hours of use. Oil moving parts of Pensky Martens tester top as often as needed, using light lubricating oil (PL-S).

c. Cleaning. Never use gasoline or naphtha for cleaning flash cups. Use kerosene or stoddard solvent (SD-1) as cleaning agents.

3-26. Foam Test Apparatus.

a. Inspection.

(1) Periodically check motor for proper functioning.

(2) Inspect the glass jar for chips or cracks.

Replace a defective apparatus.

b. Cleaning. Wipe the exterior with a clean cloth dampened with a mild soap and water solution. Wipe dry with a clean cloth.

c. Lubrication. Oil the motor bearings weekly with a few drops of light oil (PL-S).

3-27. Water Demineralization Unit.

a. Removal.

(1) Shut regulator valve to close off water supply to water cartridges (fig. 3-8).

(2) Remove tubing located on the top and bottom of each cartridge.

(3) Remove cartridges.

NOTE

Replace cartridges with same type and location. Cartridges should be replaced when bottom layer turns from purple to yellow.

b. Installation.

(1) Install new cartridges with the outlet facing up (fig. 3-7).

(2) Connect tubing as shown in figure 3-8.

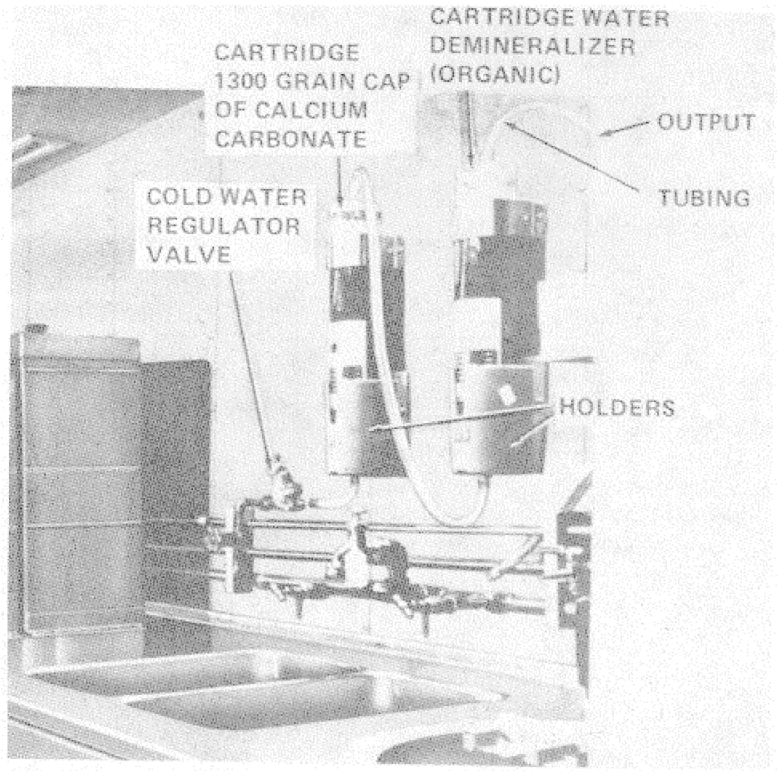


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Figure 3-8. Cartridges, Detail Installation

(3) Turn on regulator valve.

NOTE

Water regulator valve must be adjusted to approximately 10 gph flow to get maximum life out of cartridges. However higher flow rates up to 30 gph can be used, but with reduced water purity.

NOTE

Cartridges should be kept away from heat and the seals should not be removed until ready for use. The exchange capacity will be greatly reduced if the resins are allowed to dry completely. Resins shrink due to moisture loss and the cartridge may not appear full. The resins will expand when wet and will fill the cartridge.

3-28. Armored High Pressure Purge Meter.

Description. The armored high pressure purge meter (6, fig. 2-10) is used in the high- pressure steam boiler lines which feed steam to the gum bath. The high pressure purge meter is a flow rate measuring instrument especially designed for use at elevated pressures and temperatures. The flow rate is measured by the movement of a tapered plug within a fixed orifice. A magnet is imbedded in the plug within the extension tube. On the out-side of this tube is a lightweight sleeve type follower which moves in response to the plug position. It is held in permanent bond to the plug position by the flex-force of the magnet imbedded in the plug extension.

CHAPTER 4
ORGANIZATIONAL MAINTENANCE INSTRUCTIONS

4-1. Water Filters.

a. There are two types of filters connected to the water tanks located in the front compartment of the semitrailer petroleum laboratory. One is a dirt and rust filter and the other a taste and odor filter (2, fig. 2-3).

CAUTION

Do not overtighten pipe fitting, or use wicking or sealer. Teflon tape is recommended. Do not use torch near plastic. Do not use wrench to tighten sump to head. This unit is designed to seal by hand tightening.

b. Cartridge Replacement. Original cartridge may have shorter than normal life due to disturbing pipes on installation. Replace cartridge when there is a decided drop in water flow at faucet or tap. To replace cartridge proceed as follows:

(1) *C*lose circuit breaker to water pump.

(2) Drop water level in water tank and depress pressure relief button on top of filter head to relieve pressure on filter.

(3) Unscrew sump (fig. 4-1) from head of filter and remove used cartridge, taking care not to lose metal seal plate located at bottom of cartridge.

(4) Empty water and replace seal plate with projection upward.

(5) Lubricate gasket (fig. 4-2) in head with vasoline.

(6) Place new cartridge on seal plate and screw sump firmly onto head of filter but do not force. Sump must not be tight against flange of head. Do not use wrench to tighten sump.

(7) Fill water tank and turn on circuit breaker for water pump then depress pressure relief button until air is purged from filter. Release button and check water flow at sink located in laboratory.

4-2. Water Tank Sight Glass Removal and Replacement.

a. Removal. Close both valves on top and below the sight glass (5, fig. 2-3). Using a suitable wrench loosen nuts securing sight glass to upper and lower valves. Carefully lift sight glass tubing up until bottom of sight glass clears the bottom of the lower valve seat, and remove sight glass. Refer to figure 4-3 and disassemble sight glass assembly.

b. Replacement. Make sure replacement glass is of same diameter and length as original glass. Place the two valve nuts on first with threads facing out to ends of glass tube, install seal washers on both ends as shown in figure 4-3. Install glass into upper valve seat as far as necessary for glass tube to clear bottom valve seat, then carefully insert glass tube into bottom seat, adjust bottom seal washer, place teflon tape around treads of valve. To obtain best seal, hand tighten bottom nut and repeat above procedure for top seat, then tighten both nuts until unit is free from any water leaks. Do not overtighten, sight glass can break from stress due to overtightening. Open both valves to allow sight glass to fill. When full, check for water leaks. If leak is noted, carefully tighten nut to stop leak. Turn on circuit breaker to water pump and check for leaks when system is under pressure.

4-3. Gas Analyzer.

a. Calibration.

(1) Calibration consists of setting ZERO and GAIN adjustments on the control module so that 0 to 100% Lower Explosive Limits (LEL) gas-air mixtures at the detector drive the control module meter indicator between 0 to 100% readings. Because each specific combustible gas releases energy upon oxidation at a different rate than another, different gases require different calibrations. After calibration has been completed, control module WARN and ALARM potentiometers may be adjusted to switch warning and alarm relays in response to designated per cent LEL gas-air mixture levels at the detector. Then a RANGE potentiometer is set to drive the meter indicator full-scale when the TEST pushbutton is depressed, and a RECORD potentiometer may be adjusted to operate a recorder at desired voltage levels. Calibration procedures are required for three different alarm system applications:

(a) Individual detectors.

(b) Detectors paired with one control unit.

(c) One or two detectors per control unit sampling volatile hydrocarbons with flash points below 70 degrees F.

(d) Select and follow the procedure appropriate to the existing system.

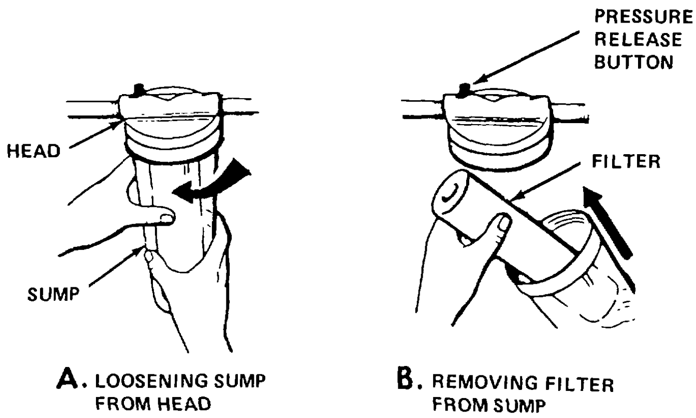

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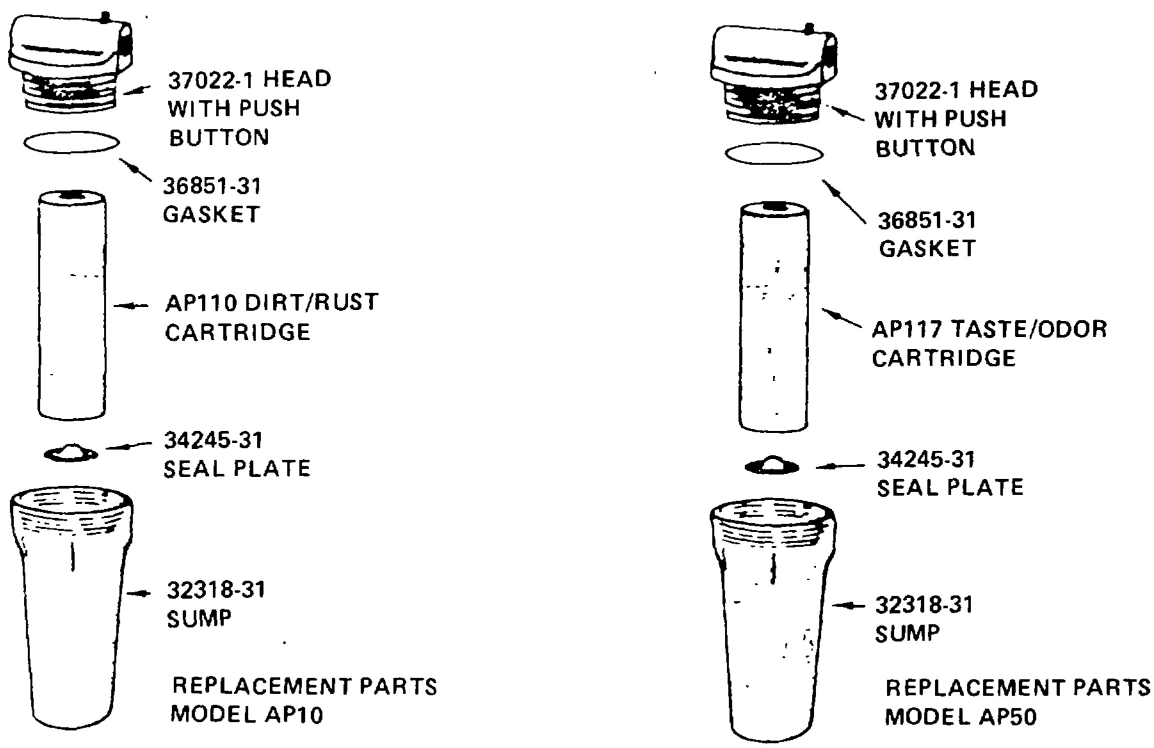
Figure 4-1. Filter Removing Procedures



AQUA-PURE TASTE/ODOR CARTRIDGE (AP117) SHOULD BE PLACED ON SEAL PLATE IN SUMP WITH SIDE HOLES TO THE TOP OF THE FILTER.

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Figure 4-2. Water Filter, Exploded View

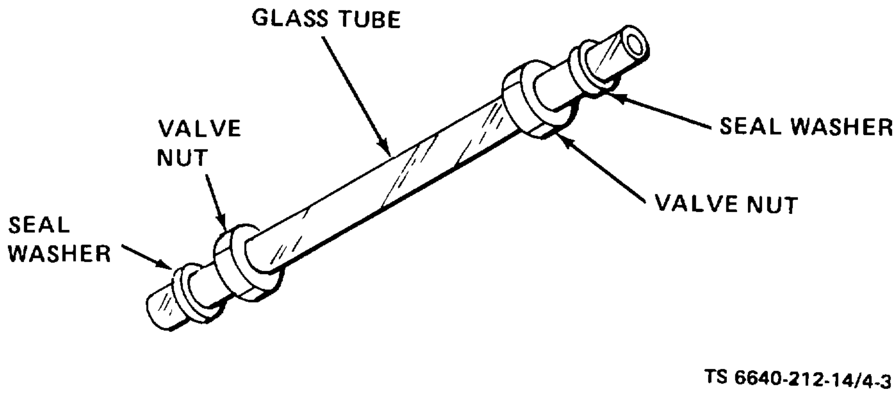


Figure 4-3. Water Tank Glass Sight Gage

NOTE

New installations and operating installations with new detectors should be rezeroed with no combustible gas detectors after 24 hours of operation and again after 1 week of operation.

(2) Calibrating a System With One Detector Per Control Unit. Two people and the following special tools are required to calibrate the gas alarm system:

(a) Portable Combustible Gas Indicator.

(b) Gas Calibration Kit (0023-7260) Sample Cup 0023-4098 for detectors 0023-4012.

(c) Gas Calibration Cylinder: Either 0023-4003 100% nitrogen or 0023-4004 Zero-gas/dry-air if combustible-gas-free air does not exist at the detector.

(d) Gas Calibration Cylinder: Containing sample gas equivalent to that expected at detector location.

(3) Perform sampling and adjustment procedures for calibration as follows:

NOTE

System will not operate properly unless the remote detector voltage is first set. Voltage setting should be checked and readjusted, if necessary, each time a detector element is replaced. (Refer to paragraph 2-22 for specific instructions on voltage measurements.)

(a) If necessary, turn meter mechanical screw adjustment to set indicator needle to zero on meter scale.

(b) Turn power on at control unit and operate detector for at least five minutes before calibrating.

(c) Using a portable combustible gas indicator, test air at detector. If air is free of combustible gases, go on to step (4) (a). If air is not free of combustible gases, or if portable test instrument is not available, apply Zero Gas/Dry Air or 100% Nitrogen Gas to the detector as follows:

1. Using Gas Calibration Kit 0023-7260, appropriate sample cup and gas calibration cylinder (0023-4003 100% Nitrogen or 0023-4004 Zero Gas/Air), attach regulator assembly, kit to gas cylinder. Close regulator valve and attach hose and sample cup to regulator (fig. 4-4).

2. Open regulator valve to fill cup with sample gas and displace air.

(4) Calibrating a System With One Detector Per Control Unit or Individual Detector of Two-Channel Control Unit.

(a) Turn adjustment screw of ZERO potentiometer on control unit printed circuit board (CD800/830;R24;CD802/832: Channel 2 R9, labeled 21; R13, labeled 22) as necessary to set meter indicating needle at zero reading on meter scale.

(b) Using Gas Calibration Kit as directed in step (c) 1 thru 3 above, but with gas cylinder containing gas of known concentration, expose detec-

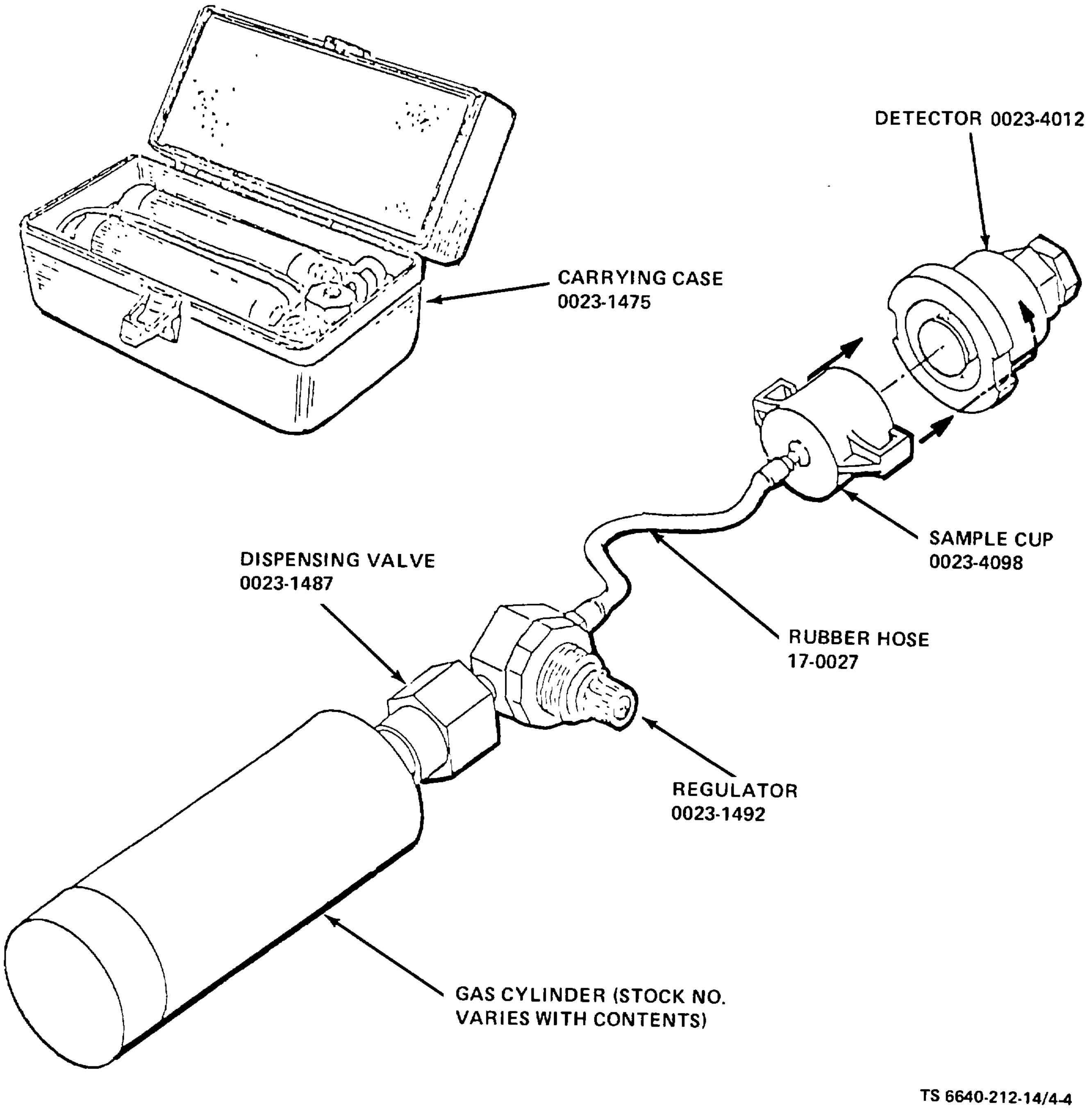


Figure 4-4. Use of Test Kit Dispensing Valve and Regulator Assembly, Gas Cylinder, and Sample Cup at Diffusion Detectors for System Calibration Test

tor to sample gas until meter reading stabilizes. If desired, standard propane gas cylinders (1 percent gas by volume in air, Part No. 0023-4009, 46 per-cent LEL) may be used to calibrate gas detection systems for correct response to gases other than propane as follows:

1. On conversion chart (fig. 4-5) horizontal scale for "% LEL GAS", find point representing 46 percent (the correct percent LEL reading if a standard propane by volume in air is used).

2. Follow up 46 percent line vertically to diagonal line representing gas for which calibration is wanted.

3. From point found on diagonal line, follow horizontally to left and read percent LEL meter reading on vertical "% LEL METER READING" scale. For example: Following up from the 46 percent point of the horizontal scale to the diagonal line representing ethylene oxide, and then following from the point on the diagonal to the vertial scale at left indicates a percent LEL meter reading of approximately 58 percent for ethylene oxide. For gases that are not represented on the chart, figure 4-5, the multiplying (K) factors in table 4-1 may be used to calibrate with propane for gases other than propane. Or the multiplying factors may be used as a preferred alternate method to use of the chart. For example, to use pro-pane gas to calibrate for ethylene oxide, multiply the propane standard (1 percent by volume) sample percent LEL value of 46 percent by the ethylene oxide multiplying (K) factor of 1.265 as shown in the table, and get 58.190 percent as calculated per-cent LEL meter reading.

(c) While continuing exposure of detector to sample gas, adjust GAIN potentiometer R10 on control module printed circuit board so that meter reading matches percent LEL concentration of sample gas or percent equivalent for another gas.

Table 4-1. Multiplying (K) Factors for Conversion of Propane Gas Percent LEL to Percent LEL Readings for Other Gases

Acetone	1.33	Hydrogen	0.71
Acetylene	1.36	Hydrogen Sulfide	8.42
Acrylonitrile	0.99	Isopropyl Alcohol	1.48
Butadiene	1.52	Methyl Alcohol	1.46
Butane	1.04	Methyl Acrylate	1.47
Butyl Acetate	2.35	Methyl Chloride	0.72
Carbon Disulfide	8.88	Methyl Ethyl Ketone	
Carbon Monoxide	0.78	(MEK)	1.74
Cyclohexane	1.51	O-Xylene	2.86
Ethane	0.78	Pentane	1.67
Ethyl Acetate	1.62	Propylene	1.22
Ethyl Alcohol	1.11	Propylene Oxide	1.24
Ethylene	0.91	Styrene Monomer	4.00
Ethyl Ether	1.31	Tetrahydrofuran	1.33
Ethyl Oxide	1.51	Toluena	1.69
Heptane	1.90	Trichloroethylene	1.00
Hexane	1.70	Vinyl Acetate	2.54
Vinyl Chloride	1.18		

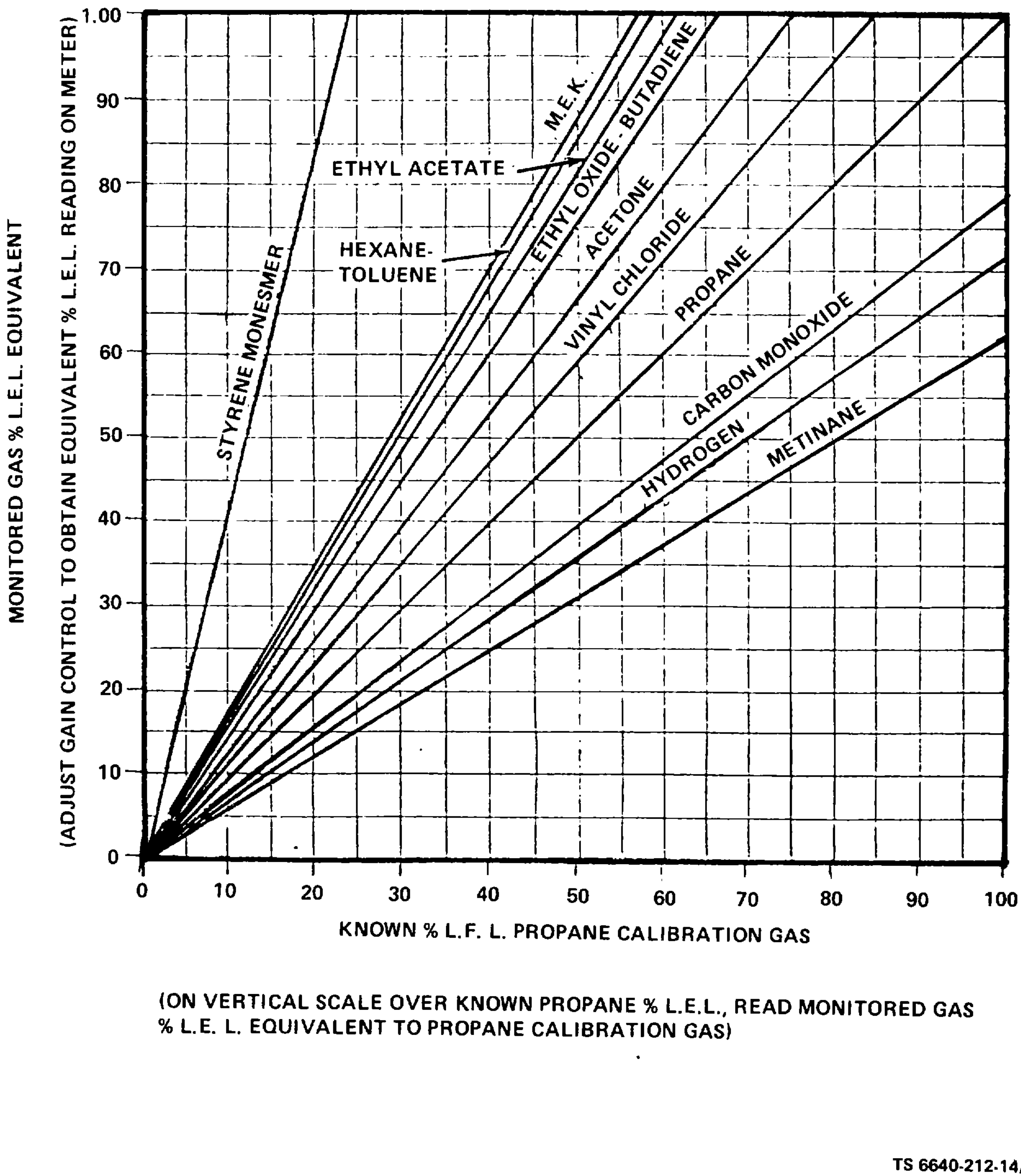


Figure 4-5. Calibration Percent LEL Equivalents for Gases Other Than Propane, with Propane Used a Calibrating Gas

(d) Close regulator valve on cylinder and remove sample cup from detector. (Meter reading should return to zero). Disassemble sampling kit components and replace in kit. Store sample gas cylinder in cool area when not in use.

(e) After 24 hours of operation, confirm that meter reading indicates zero in absence of combustible gas. If necessary, readjust reading to zero (as in step (4) (a). Repeat readjustment, if necessary, after one week.

(6) Calibrating a System With Two Detectors Per Control Unit. The following special tools are required to calibrate a paired detector system.

(a) Portable Combustible Gas Indicator; 2 Gas Calibration Kits (0023-7260) (1 if fresh air is assured at both detectors).

(b) Two Sample Cups (fig. 4-4).

(c) Two Gas Calibration Cylinders: Either 100% Nitrogen (0023-4003) or Zero-Gas/Dry-air (0023-4004) if combustible-gas-free air does not exist at both detectors (one or none required if one or both detectors are in fresh air.)

(d) Gas Calibration Cylinder containing sample gas similar to that expected at detector locations.

(e) 0-10 Volt Range DC Voltmeter With + or - 2% Accuracy in 5-6 Volt Range.

(f) Test Socket Adapter 0023-4027 ig) Circuit Card Extender 0023-4023 (except for CD800P models with built-in extension feature).

(6) Calibrate a paired-detector alarm system for zero meter indication in gas free air as follows:

(a) Read supply voltage at both detectors (using test socket adapter and voltmeter).

(b) If supply voltages are not within + or - 0.15 VDC at both detectors, correct faulty circuit conditions (poor connections, leakage, open or short circuits, unbalanced resistances in supply lines due to wrong choice of wire gauges for length of run). Remove test socket adapter(s) and reinstall sensor elements in detectors socket(s). (c) Using portable combustible gas indicator, test surrounding air at both detectors. If combustible gases are present at one or both detectors, use gas calibration kit(s), sample cup(s), and 100% Nitrogen or Zero- Gas/Dry-Air cylinder to supply combustible-gas-free air. (See instructions Al paragraph 4-3 a (1) and fig. 4-4).

NOTE

Both detectors must be sampling zero combustible gas before adjusting indicating meter to zero.

(d) For access to control unit screw adjustments in many rack and cabinet installations, remove circuit board, plug circuit card extender 0023-4023 into connector strip at rear, and plug circuit board into card extender. Use of the card ex-tender during circuit adjustment prevents remote alarms from operating.

(e) Turn screw adjustment of ZERO potentiometer R24 on control module printed circuit board to set meter indicator to zero on meter scale. (t) If meter indicator cannot be set to zero, disconnect detector 2 at the control module and in-stall a set of 15-ohm resistors across DET 2 A-C-R terminals. If meter indicator cannot be adjusted to zero with one operating detector, probably the response characteristics of the paired sensor elements are too dissimilar while both are operating. (One element may have been long in use and the other new.)

(g) If necessary, replace old sensor element, reconnect detector 2 to control module, and adjust ZERO potentiometer R24 to set meter indicator to zero on meter scale.

(7) After meter indicator has been set to zero, calibrate paired detectors to coordinate meter indicator percent LEL deflection range with detector response to gas as follows:

(a) Apply sample gas of known concentration from gas calibration cylinder to one detector. Second detector must be simultaneously sampling zero combustible gas (fig. 4-6).

(b) Turn adjustment screw of GAIN potentiometer R10 on control module circuit board until meter reading matches percent LEL concentration of gas specified on sample gas cylinder label.

(c) Remove sample gas from first detector. Confirm that meter returns to zero in response to fresh air. Expose second detector to sample gas. Compare meter reading with first reading taken. Do not readjust GAIN control R10. If readings differ more than + or - 10% of the LEL reading, replace sensor element in detector with lowest reading and repeat ZERO and GAIN adjustment procedures, following steps (a) and (b) above.

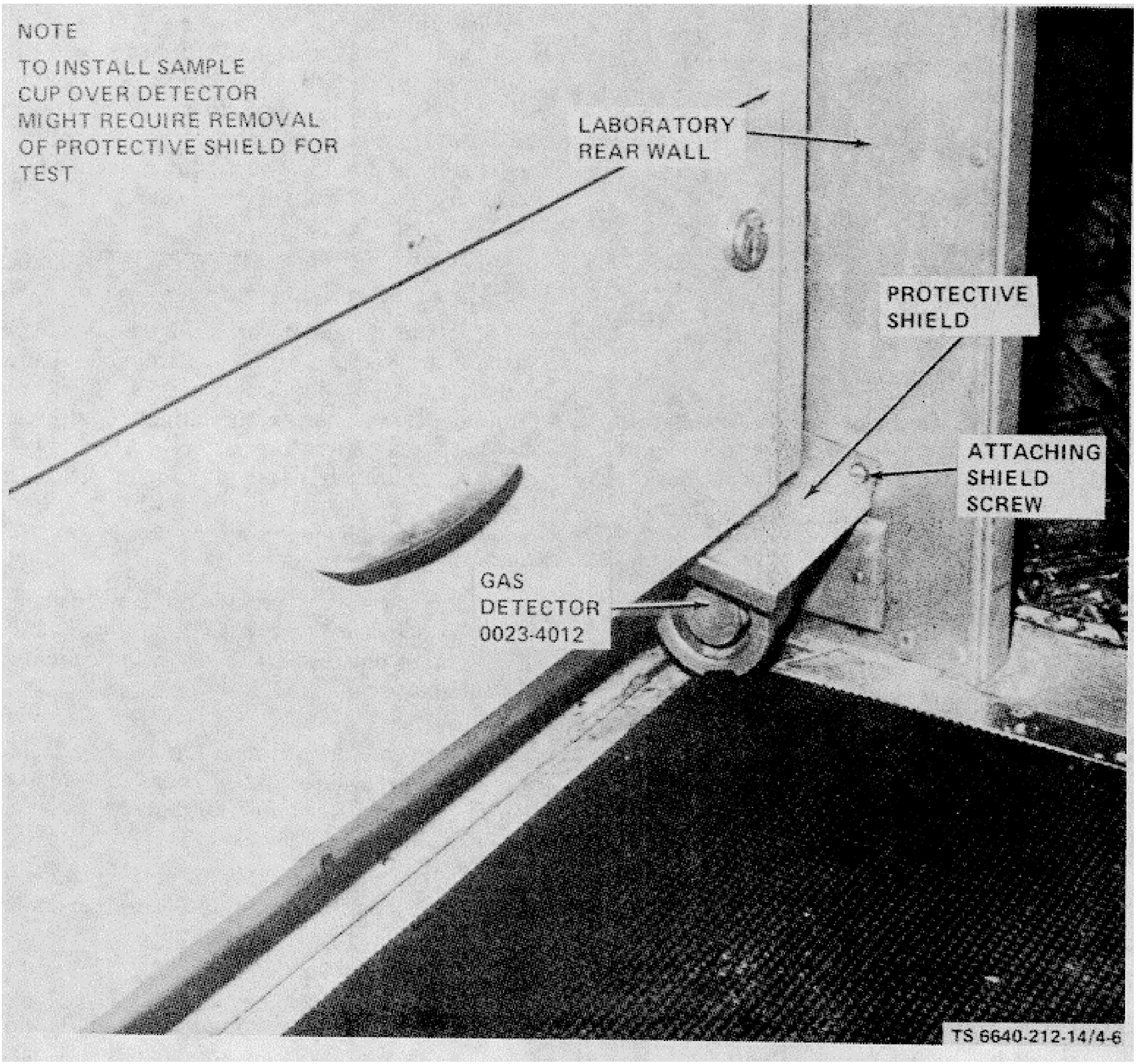


Figure 4-6. Installation of Gas Detector in Laboratory

(d) Record meter responses to each detector to aid in evaluating future performances of the detectors.

(8) Calibrating a System for Volatile Hydrocarbons With Flash Points Below 70 Degrees F. The following materials are required to calibrate a detector/module system for response to volatile liquid vapors:

Graduated pipette, 01- ml (icc).
One-gallon jug with cap
Piece of aluminum foil
Thermometer Sample of volatile liquid

(a) Calibrate detector/module system for response to volatile liquid vapors as follows. Before exposing detector to sample mixture, con-firm that meter reads zero with detector sampling fresh air. Adjust ZERO control R24 of CD800/830 Systems, or Channel 1 Z1 (R9) and Channel 2 Z2 (R13) of CD802/832 Systems, if necessary.

1. Using pipette, drop 0.2 cc of liquid from which vapors are to be detected in a one-gallon jug. Place aluminum foil on jug to aid in mixing vapor in air.

2. Cap jug and agitate until liquid has completely evaporated and vapor has diffused.

NOTE

Toluene, hexane, and xylene may take up to half an hour to evaporate and diffuse.

3. Remove cap and place mouth of jug over detector. Invert jug if position of detector permits, since vapors of all flammable liquids are heavier that air.

4. Note reading on module indicating meter after 45 seconds. Reading should approximate percent LEL value for same liquid at temperature of 70 degrees F listed in table 4-2. (Heat or cool vaporizing jug to thermometer reading 70 degrees for testing.)

5. Adjust GAIN potentiometer R10 on control module circuit board to move meter indicator to read on scale at approximate table 4-2 value.

NOTE

The percent LEL reading for compounds other than those listed in table 4-2 may be calculated by using the following formula:
Reading = Specific Gravity x 11,200 Divided by Molecular Weight x LEL.
Example: n-Pentane molecular weight = 72.15
Specific Gravity - 0.634
Reading: 0.634 x 11,200 Divided by 72.15x 1.5 = 66% LEL.

b. Adjustments. With percent LEL meter response properly adjusted for the specific detector element type and kind of combustible gas monitored, adjust warning, alarm, test, and recording circuits to operate at the desired voltage levels in accordance with the following procedures.

(1) Warning Circuit Adjustment. Adjust warning circuit to operate at the voltage level representing a specified percent LEL gas-air mixture as follows:

Table 4-2. Percent LEL Reading With 0.2 cc Vaporized Volatile Liquid in One Gallon of Air

Material	Percent LEL at 70 Degrees F
Acetone	58
Allyl Alcohol	66
Ethyl Alcohol	59
Methyl Alcohol	41
Ethyl Ether	57
Methyl Ethyl Ketone	69
Methyl Isobutyl Ketone	63
n- Heptane	70
n-Hexane	78
n-Pentane	66
Toluene	88
Xylene	91

NOTE

If FAIL light comes on during adjustment operations, wait 45 seconds after FAIL light goes out so that time delay circuit will not interfere with continuing adjustments.

(a) To impress a warning level triggering signal on the warning circuit, turn ZERO potentiometer adjustment screw (R24 for CD800/830, R9, labeled Z1, for Channel 1 or R13, labeled Z2, for Channel 2 of CD802/832 systems) slowly clockwise until warning relay K1 energizes and WARN light goes on (circuit card extender circuitry prevents operation of external warning devices). A two-second time delay occurs before light goes on and relay operates after trigger signal begins.

(b) If WARN light goes on at meter percent LEL reading lower or higher than desired, turn screw adjustment of ZERO potentiometer to obtain a meter reading 2 to 3 percent below the desired point.

(c) Press RESET button to deenergize warning relay.

(d) Turn screw adjustment of WARN potentiometer (R26 for CD800/830 Systems: R48, labeled w, for CD802/832 Systems) fully counterclockwise until warning relay K1 energizes and WARN light comes on (after two-second delay past trigger point).

(e) Push and hold down RESET button and turn WARN potentiometer slowly clockwise until WARN light goes off (time-delay circuit does not operate as light goes out and relay deenergizes).

(f) Turn screw adjustment of ZERO potentiometer R24 until WARN light goes on, signifying an energized warning relay. Note percent LEL indication at this point.

(g) Repeat steps (b) through (e) for fine adjustment of warning relay trigger point.

(h) Using ZERO control, rezero indicating meter after confirming that detector is sampling gas-free air.

(2) Alarm Circuit Adjustment. Adjust alarm circuit to operate at the voltage level representing a specified percent LEL gas-air mixture as follows:

NOTE

If FAIL light comes on during adjustment operations, wait 46 seconds after FAIL light goes out so that time delay circuit will not interfere with continuing adjustments.

(a) To impress an alarm-level triggering signal on the alarm circuit, turn ZERO potentiometer adjustment screw slowly clockwise until alarm relay K2 energizes and ALARM light goes on (circuit card extender circuitry prevents operation of external alarm devices). A two-second time delay occurs before light goes on and relay operates after trigger signal begins.

(b) If ALARM light goes on at a meter per-cent LEL reading lower or higher than desired, turn screw adjustment of ZERO potentiometer to' obtain a meter reading 2 or 3 percent below the desired point.

(c) Press RESET button to deenergize alarm relay.

(d)Turn screw adjustment of ALARM potentiometer (R29 for CD800/830 Systems; R41 labeled "A" for CD802/832 Systems) fully counterclockwise until alarm relay energizes and ALARM light comes on (after two-second delay past trigger point).

(e) Push and hold down RESET button and turn ALARM potentiometer adjustment screw slowly clockwise until ALARM light goes off (time delay circuit does not operate as light goes out and relay deenergizes).

(f) Turn screw adjustment of ZERO potentiometer until ALARM light goes on, signifying an energized alarm relay. Note percent LEL meter reading at this point.

(g) Repeat steps (b) through (e) for fine adjustment or alarm relay trigger point.

(h) Return screw adjuster of ZERO potentiometer to setting that re-zeros indicating meter pointer after confirming that detector is sampling gas-free air.

(3) Test Adjustment. The TEST pushbutton, when depressed, closes a circuit to ground through one lead to differential amplifier U3, thus impressing a voltage equivalent to that which would appear on the lead if the detector were sensing a gas-air mixture of 100 percent LEL. Adjust test circuit to obtain a full-scale meter reading (100 percent LEL) as follows:

(a) Press TEST pushbutton and observe deflection of meter pointer.

(b) If reading is less than full scale, or if pointer rapidly swings to a mechanical stop, turn screw adjuster of RANGE potentiometer R22 on control module printed circuit board (CD800X: located on narrow flange below opening at left in-side circular window) to obtain a full-scale meter reading with TEST pushbutton depressed.

(c) Observe WARN and ALARM lights.
Both should go on as TEST pushbutton is depressed, and warning and alarm relays should energize. If not, set WARN and ALARM adjustments in accordance with paragraphs b. (1) and (2).

(4) Recorder Output Adjustment. At full-scale meter reading, the recorder circuit can be adjusted to provide an output of from 25 to 100 millivolts dc, with accurate correspondence of voltage output to LEL meter reading throughout the entire meter range. Adjust recorder output level as follows:

(a) With external recorder (minimum input impedance 100 ohms) connected to recorder terminals of control module (REC + and -), press and hold down TEST pushbutton.

(b) Observe recorder response at full-scale control module LEL meter reading.

(c) Turn screw adjuster of REC potentiometer (R17 for CD800/830; R36 for CD802/832 Systems) on printed circuit board to set recorder deflection at 100 percent point on recorder graph.

(d) Release TEST pushbutton. Confirm that indicating meter and recorder return to zero.

4-4. Dry Ice Machine.

WARNING

Wear safety goggles and cloth gloves while operating the dry ice machine.

a. Do not make any changes to the adjustment of the valve in the center of the cover or to the safety valve on the cover hinge. These valves are set at the factory to give the greatest efficiency and safety.

NOTE

During the operation of the machine there will be an escape of gas at the side and bottom of the machine. This is normal and should not be taken as a sign that the machine is not operating properly.

b. Repair is limited to the replacement of rubber gaskets, latch and hinge pins, safety valve body, springs and ball. However, do not attempt repair an compressing the seal washer, orifice tube, body out or the two hex nuts. These parts are set at the factory at time of manufacture. If repair is required in this area entire machine must be returned to manufacturer for adjustment.

4-5. Vacuum Pump. Removal.

a. Remove power from circuit breaker to vacuum pump.

b. Using suitable wrench, open union on vacuum line (fig. 4-8).

c. Remove attaching nuts, washers and bolts securing vacuum pump to wall shelf.

d. Remove vacuum pump.

NOTE

Do not turn unit on its side, or upside down when removing from shelf or oil filled pump will discharge oil.

4-6. Cabinets. The cabinet drawer slides, located on each side of the drawers, (fig. 4-9), contain screws which are set in slotted holes, so that the drawer can be aligned with the cabinet. After heavy use and vibration the drawers might become out of line with the cabinet. If this occurs, empty contents of drawer. Note which side of drawer is sitting low or high, and approximately by now much. Remove attaching screws, nuts, and lockwashers securing drawer to slides, remove drawer by picking up the front of drawer and lifting out. If right side of drawer is low by 1/4-inch, and left side is in alignment with cabinet, loosen right side slide assembly and lift slide until desired position is obtained; then secure by tightening attaching screw. Check again with drawer installed with one screw on each side, if further adjustment is required remove drawer and repeat above procedure. When proper alignment is complete, install all screws, washers and nuts which secure drawer to slides.

4-7. Electric Heater. Disassembly.

a. Turn unit on its side (fig. 4-10) and remove four screws securing bottom cover to housing. Remove bottom cover.

b. Remove heating board and insulator from housing and detach wires going to auto-transformer.

c. Loosen setscrew on knob attached to auto-transformer and remove knob.

d. Remove and tag wires from auto- transformer, remove green ground wire and nut and bolt from housing.

e. Remove nut securing auto-transformer to housing, and remove auto-transformer.

f. Check heater board for broken heater elements. Use multimeter to check continuity across heater elements.

g. Check auto-transformer for continuity using multimeter, replace parts as necessary.

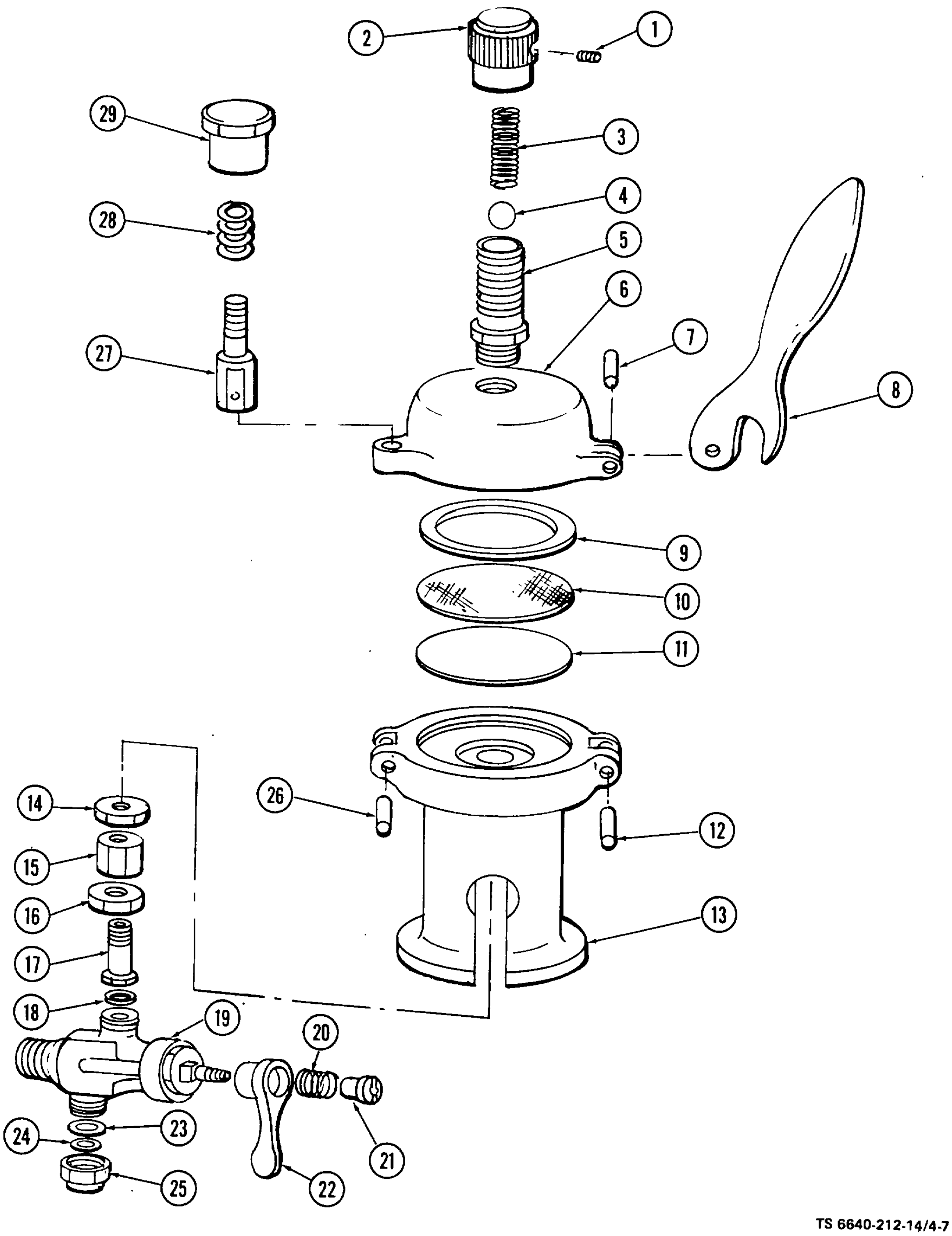


Figure 4-7. Dry Ice Machine, Exploded View

Legend for figure 4-7:

1. Setscrew
2. Safety valve cap
3. Spring
4. Ball
5. Safety valve body
6. Chamber
7. Latch hinge pin
8. Latch handle
9. Seal gasket
10. Screen
11. Filter disk
12. Latch pin
13. Housing
14. Hex nut
15. Body nut
16. Hex nut
17. Orifice tube
18. Seal washer
19. Valve
20. Spring
21. Retaining nut
22. Handle
23. Gasket
24. Safety disc
25. Cap
26. Hinge pin
27. Hinge
28. Spring
29. Safety valve cap

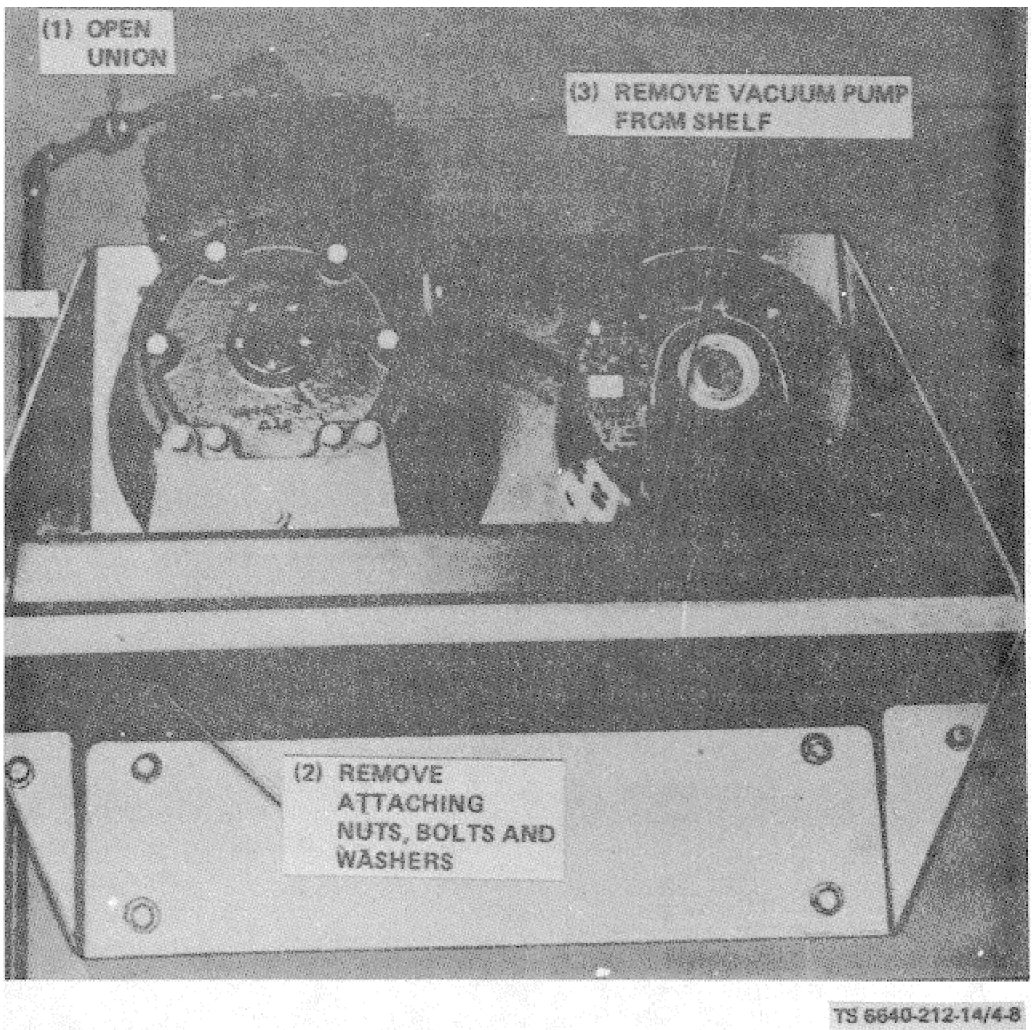


Figure 4-8. Vacuum Pump, Removal

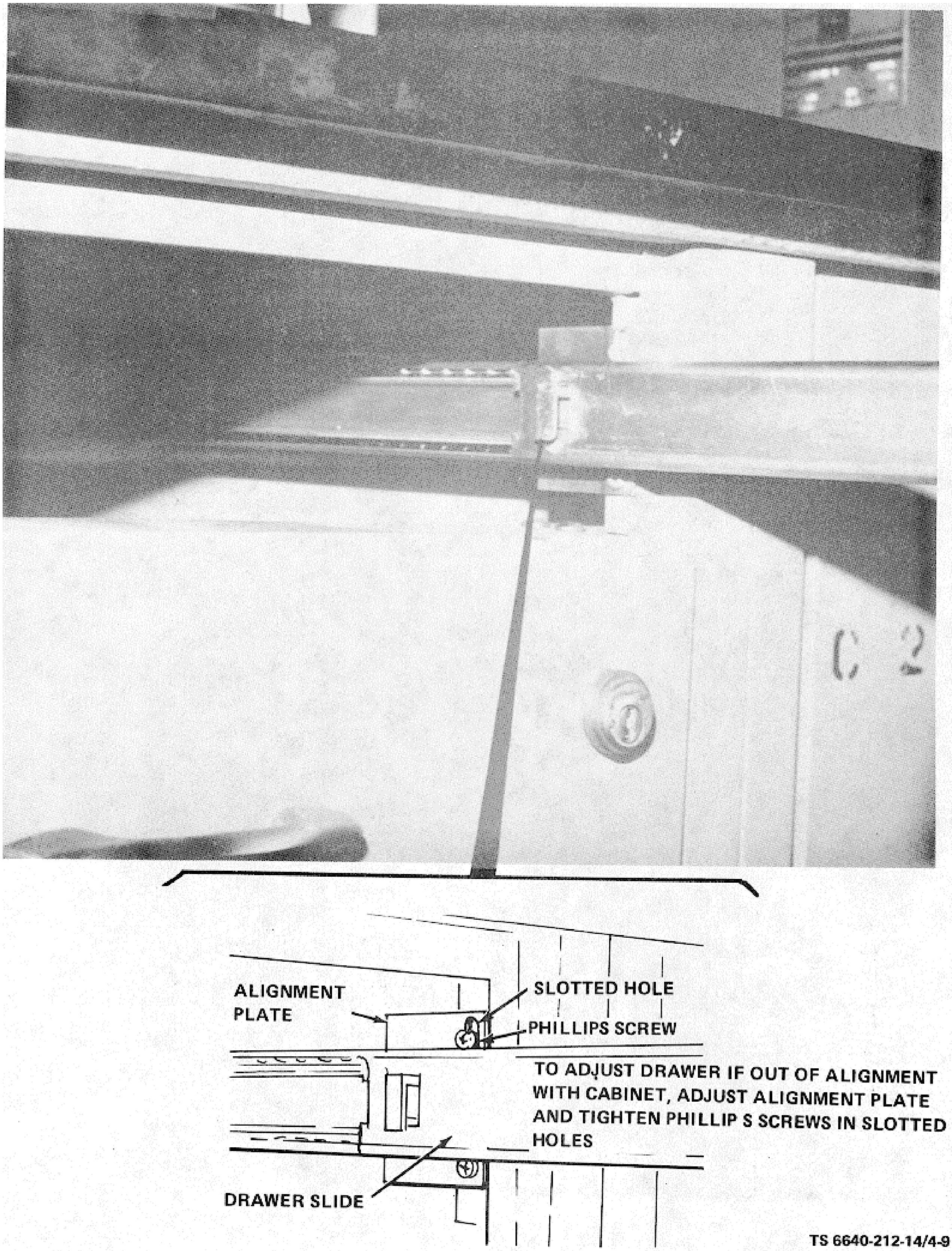


Figure 4-9. Drawer Slide Adjustment

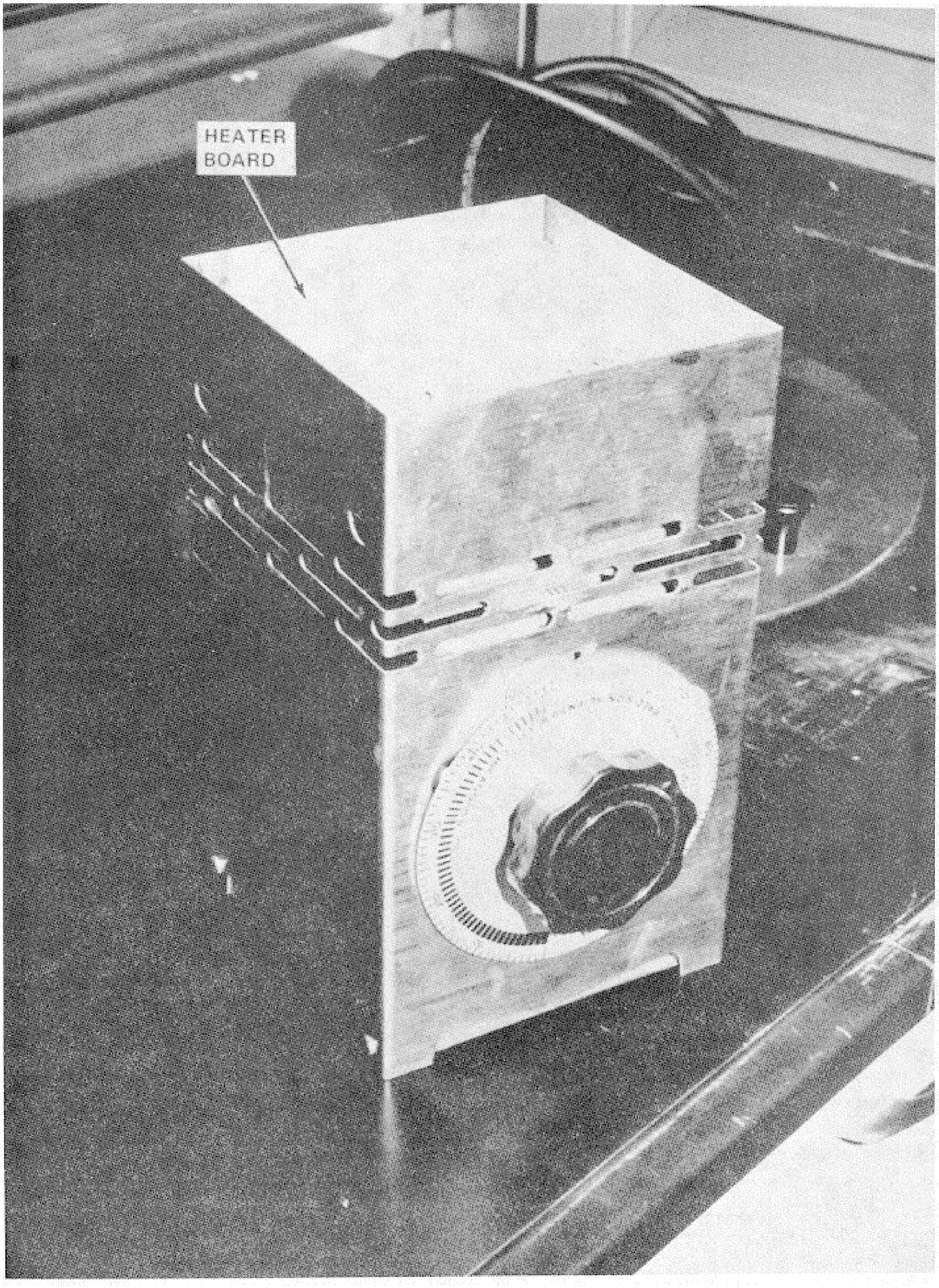


Figure 4-10. Electric Heater, Parts Locations (Sheet 1of 2)

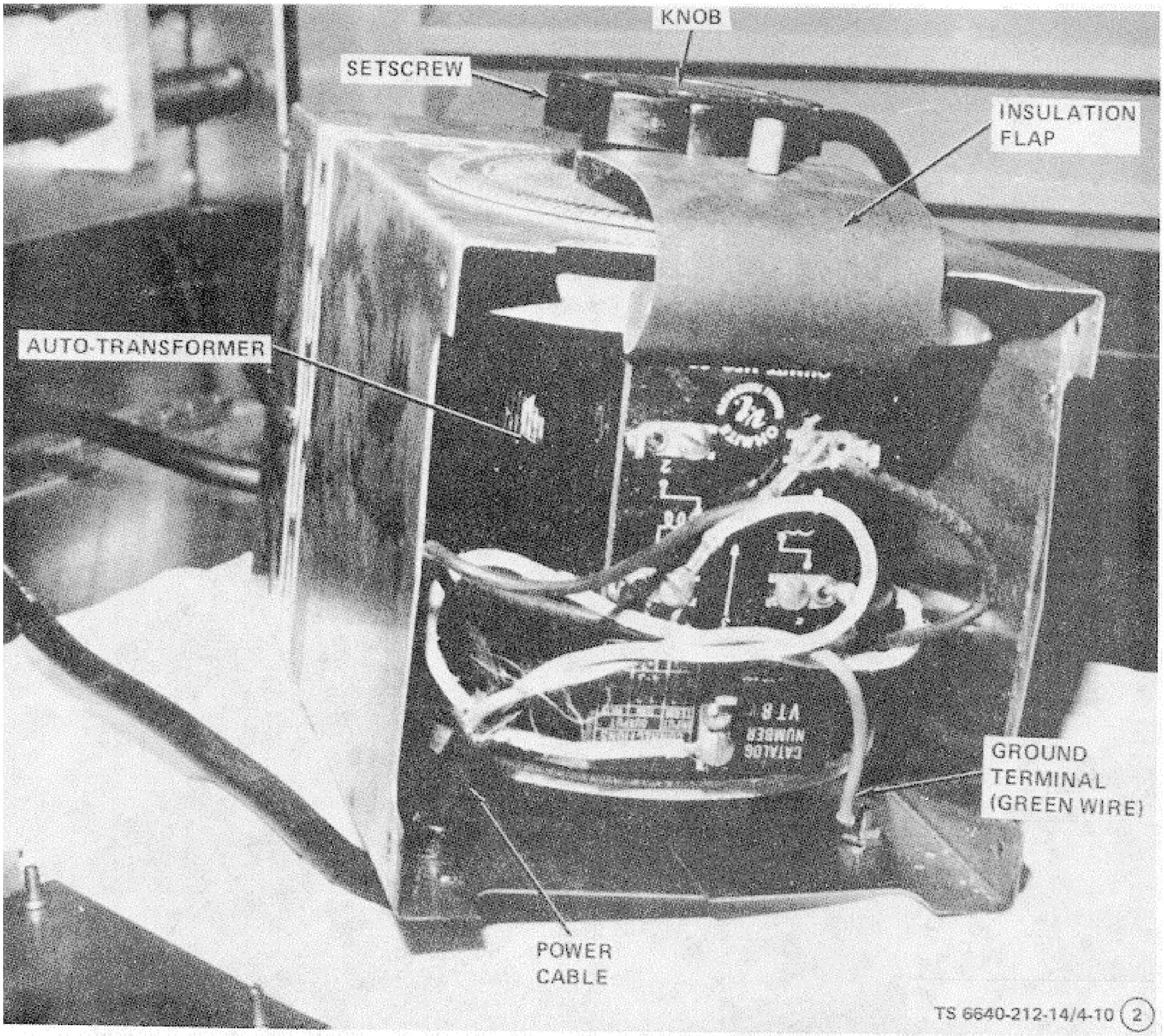


Figure 4-10. Electric Heater, Parts Locations (Sheet 2 of 2)

4-8. Cabinet Hinges. Apply a few drops of oil into hinge pin of each of the chrome plated hinges on the cabinet doors approximately every six months. Wipe off any excess oil from the chrome plated surface of the hinges. The light oil surface which re-mains on the chrome surface will slow down rusting of hinges.

4-9. Cabinet Locks. Cabinet locks can be replaced as follows:

a. Remove Philips screw (1, fig, 4-11) which secures locking tab (2) onto lock assembly (6).

b. Note direction of indexing washer (3) on lock assembly (6), before removing.

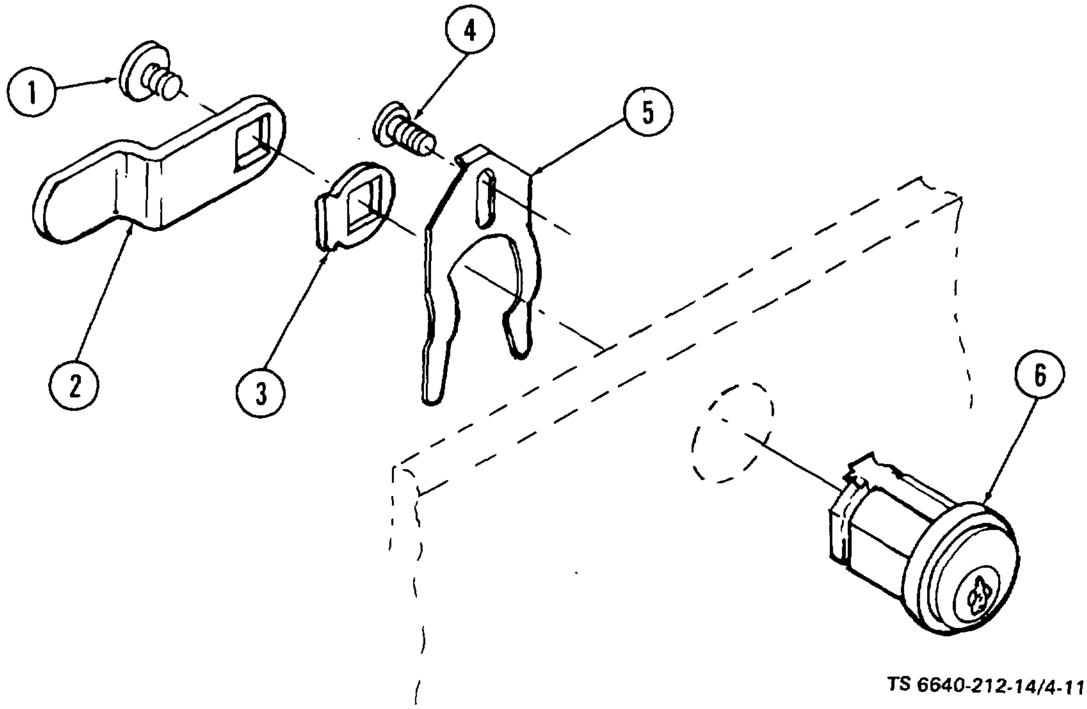
NOTE

If fiat side of indexing washer (3) is turned around 180 degrees, lock assembly ill work in opposite direction when key is turned.

c. Remove small Philips screw (4) located in retaining spring (5).

d. Remove retaining spring (5) from lock assembly by pressing or tapping out with a suitable screwdriver. It might become necessary to rotate retaining spring approximately 45 degrees to gain clearance for the removal of retaining spring.

e. Remove lock assembly (6) from hole in cabinet of drawer.



Legend for figure 4-11:
1. Screw
2. Locking tab
3. Indexing washer
4. Screw
5. Retaining spring
6. Lock assembly

Figure 4-11. Disassembly of Cabinet Lock Assembly

c. Remove screws securing socket shell (6) into socket (5), and remove screws securing socket onto fixture body (4).

d. Remove wires from socket (5).

e. Remove attaching screw securing fixture body mounting bracket (3) onto mounting plate (1).

f. Pull fixture body mounting bracket (3) away from mounting plate (1) until free of wiring.

g. Remove gasket (2).

h. If necessary mounting plate (1) can be removed from wall by removing attaching screws.

4-10. Vapor tight Light Fixture. Removal.

a. Remove globe (9, fig. 4-12) from fixture body (4) by unscrewing globe and remove gasket (8).

b. Remove lamp (7) from socket (5).

WARNING

Be sure power has been removed from fixture before attempting removal of socket or wiring.

4-11. Centrifuge Machine. Removal.

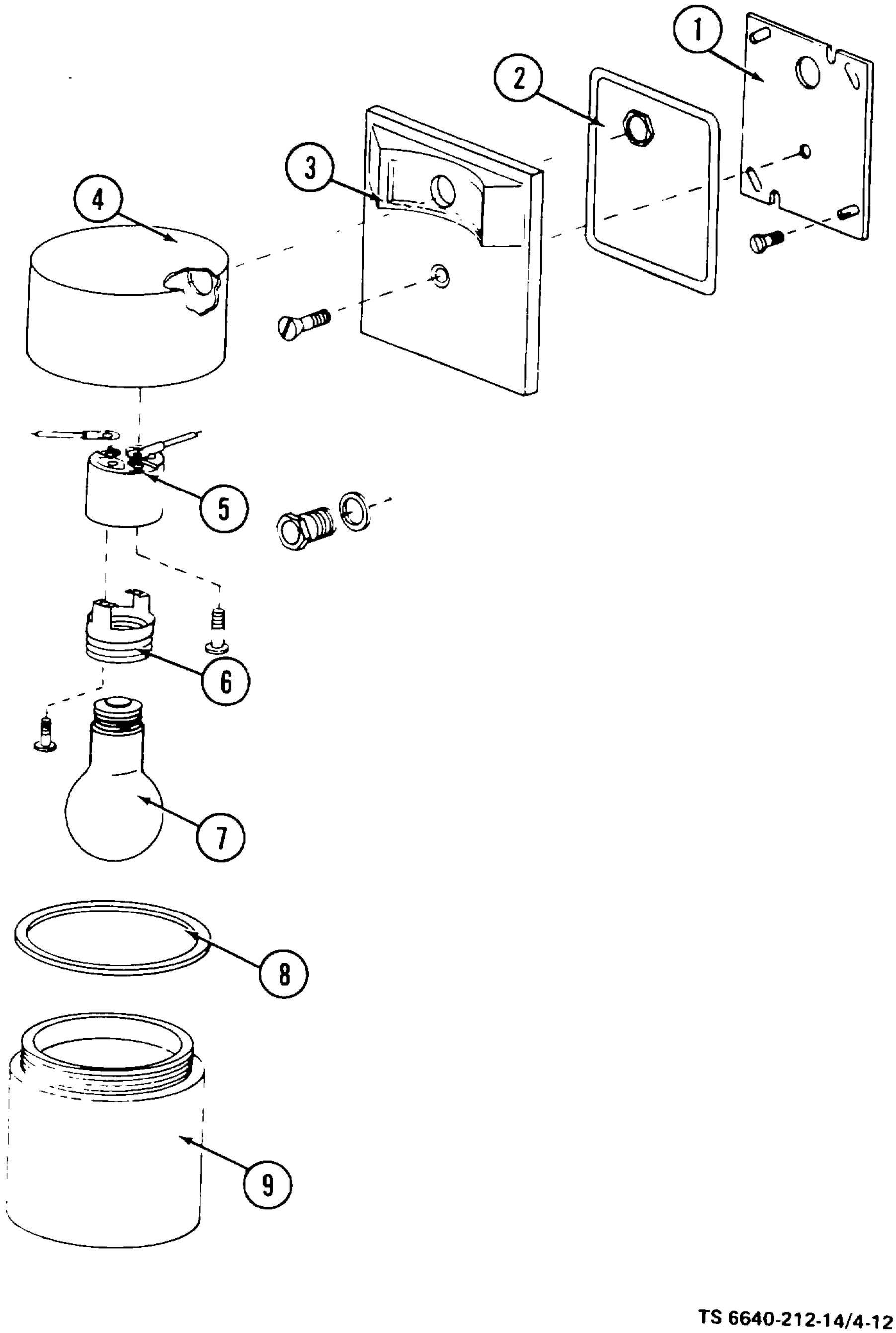
a. Disconnect power from centrifuge machine.

b. Remove attaching screws, nuts, and washers securing rubber shock mounts (fig. 4-13) to shelving.

c. Remove centrifuge.

NOTE

Be sure top lids are closed before trying to remove centrifuge.



Legend for figure 4-12:
1. Mounting plate
2. Gasket
3. Fixture body, mounting bracket
4. Fixture body, socket enclosure
5. Socket
6. Shell, socket
7. Lamp
8. Gasket
9. Globe

Figure 4-12. Vapor tight Light Fixture, Exploded View

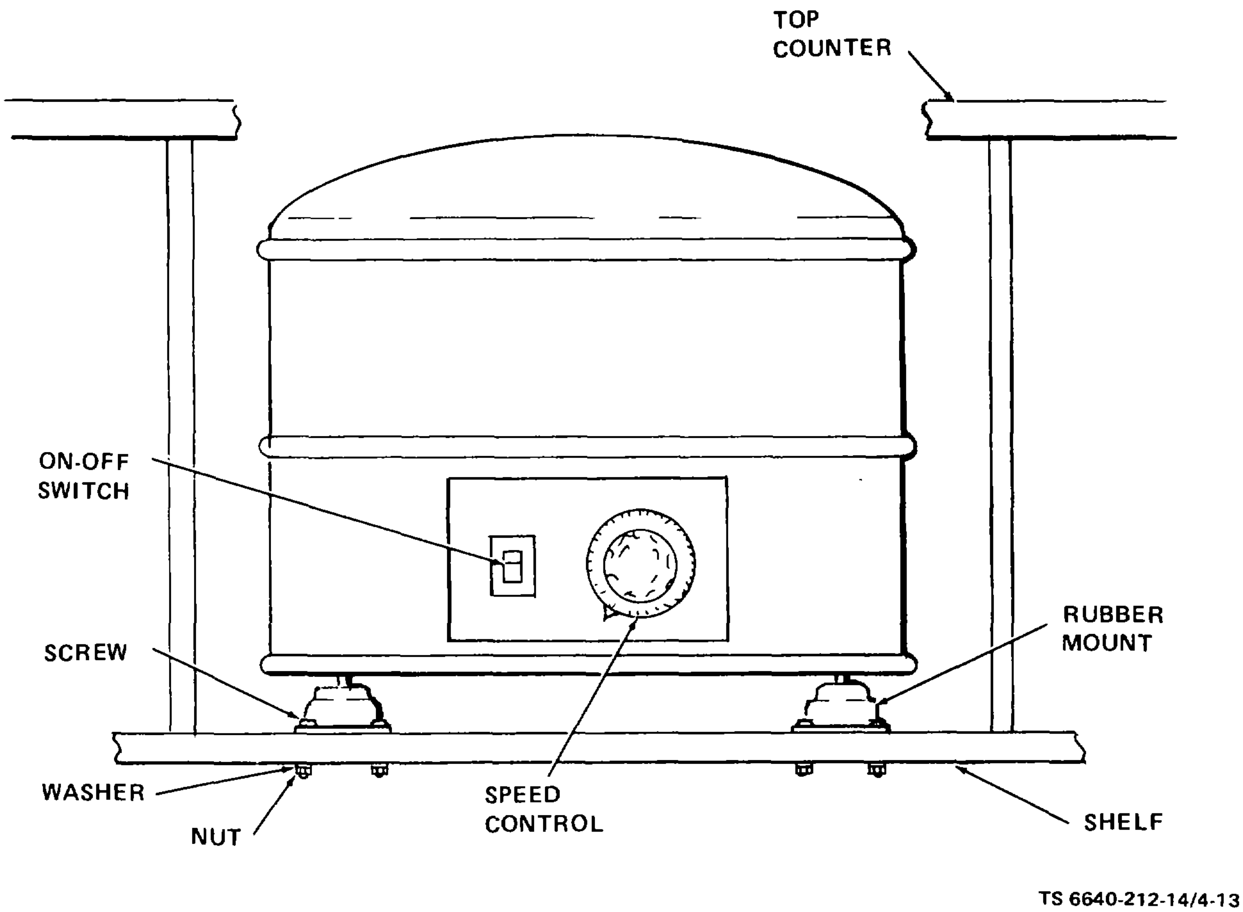


Figure 4-13. Centrifuge Machine, Removal Data

CHAPTER 5
DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE INSTRUCTIONS

5-1. Water Pump.

a. Removal and Disassembly. Close circuit breaker to water pump. Tag and remove wires from motor. Close all valves to the suction and pressure sides of the pump. Then proceed as follows:

(1) Open pipe plug at bottom of pump, and drain pump.

(2) Loosen both unions at pump housing, and remove pump and motor as an assembly.

(3) Remove the four casing to bracket screws and the mounting-foot screws. This permits the removal as an assembly the motor, bracket, foot, and impeller.

(4) Disassemble the impeller (5) from the motor shaft holding the motor shaft with a screwdriver engaging the slot which is covered by a cap at the opposite end of the motor. Turn impeller free from the shaft's 7/16 in. right-hand thread.

b. Cleaning. Cleaning all parts in the pump is essential before reassembling the pump. Be sure that no grit remains between the surfaces of the mechanical shaft seal.

c. Troubleshooting. Refer to table 5-1 for troubleshooting procedures for the water pump.

d. Assembly. Be sure all connections are made air and water tight, and assemble in the reverse order of disassembly.

CAUTION

Do not run pump unless it is filled with water to keep the seal lubricated.

5-2. Pyrometer.

a. Window Removal.

(1) Remove four captive cover screws (fig. 5-2) from cover assembly.

(2) Loosen setscrew and remove setting knob.

(3) Remove front cover carefully from instrument.

(4) Remove window retainer spring from front cover.

(5) Remove glass window from front cover.

b. Photocell Removal.

(1) Loosen four captive cover screws on instrument front panel and pull meter forward and out of housing.

(2) Remove any dust that might have accumulated, pry up plug button on top of meter.

(3) Turn setting knob clockwise until red pointer is at top of scale. Setting arm carrying photocell and light source is then visible through hole to side of setting.

(4) To remove photocell, pull up without turning.

c. Light Source Removal.

(1) Loosen four corner screws on instrument front panel and pull meter forward and out of housing.

(2) Remove any dust that might have accumulated, pry up plug button on top of meter.

(3) Turn setting knob clockwise until red pointer is at top of scale. Setting arm carrying light source and photocell is then visible through hole to side of setting.

(4) To remove light source, press down on light source and turn counterclockwise.

d. Photocell Installation*.* Replace new cell with window facing light source, replace plug button and replace meter in housing. After installation, correlating the instrument must be done, refer to subparagraph g.

e. Light Source Installation*.* Install with open side of reflector facing photocell.

NOTE

When either photocell or light source is replaced correlating of instrument is usually required.

f. Window Installation. Install window in reverse order of removal.

g. Correlating the Instrument*.*

(1) This should be done if green indicating and red index pointers do not coincide at point where control action is installed.

Table 5-1. Water Pump Troubleshooting

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

1. MOTOR WILL NOT START OR RUN.

Step 1. Check circuit breaker.
Reset if open.

Step 2. Using test lamp, check for power at motor terminals.
If power is available at terminals proceed to Step 3, if not, trace wiring for short, or open condition.

Step 3. Check for defective motor capacitor.
If defective replace motor.

Step 4. Check for stuck impeller or seal.
Turn motor shaft with screwdriver engaging slot end of shaft. If motor is stuck, disassemble and correct cause.

2. MOTOR OVERHEATS.

Step 1. Check for low voltage.
Bring voltage level up to requirement.

Step 2. Mechanical defect in motor or pump.
Turn motor shaft with screwdriver engaging slot end of shaft. If motor is stuck or binding is indicated, disassemble and correct cause.

Step 3. Check for poor ventilation.
Vacuum clean motor air passages, ventilate surrounding area.

Table 5-1. Water Pump Troubleshooting- - Continued

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

3. MOTOR RUNS-NO WATER-LOW CAPACITY-LOW PRESSURE.

Step 1. Check if pump is primed.
Prime pump.

Step 2. Check for low motor speed.
Check for low voltage or defective motor.

Step 3. Check for air leak in shaft seal.
If shaft seal leaks, replace seal.

Step 4. Check for air leaks in piping.
Repair or replace any defective piping.

Step 5. Check for plugged impeller in pump.
Disassemble and clean or replace impeller.

4. PUMP VIBRATES OR IS NOISY.

Step 1. Check for air leak in suction pipe.
Check for location of leak, repair or replace pipe.

Step 2. Check for clogged impeller.
Disassemble pump, repair or replace impeller.

Step 3. Check motor for bent shaft.
If motor shaft is bent, replace motor.

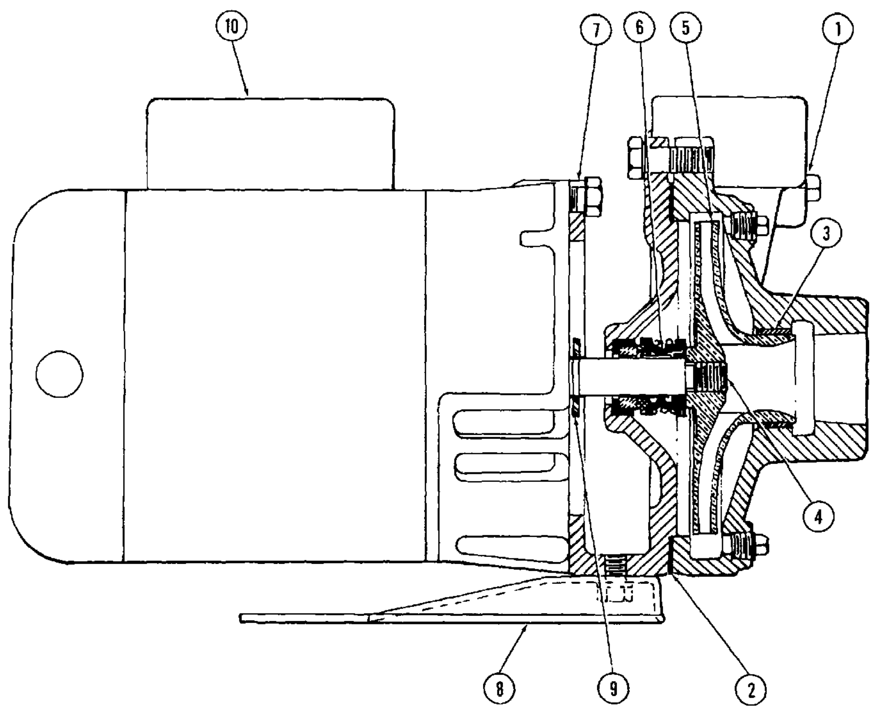
Table 5-1. Water Pump Troubleshooting- - Continued

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

4. PUMP VIBRATES OR IS NOISY. - Continued

Step 4. Check motor for bearing wear.

Disassemble motor from pump and check bearing play, if excessive, replace bearings or motor.



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Legend for figure 5-1:

1. Casing
2. Gasket
3. Ring
4. Screw, Lock
5. Impeller
6. Seal, shaft
7. Bracket
8. Foot
9. Deflector
10. Motor

Figure 5-1. Water Pimp, Exploded View

NOTE

Not making this adjustment will not affect the operation of the instrument since the indicating pointer always indicates true temperature and set pointer may be set up or down scale to compensate for the difference.

(2) To bring the two pointers in line it is necessary to move the red pointer either to the right or left.

(3) Note how many scale divisions the pointer must be moved, and in which direction. It may then be moved by either one of two methods.

(4) Method 1, for newer instruments.

(a) Remove black plastic screw from the underside of the front directly under the scale (fig. (5-2). By moving the red pointer near to the hole it can be pushed either right or left with the aid of a suitable size rod pushed through the hole.

CAUTION

Do not move red pointer far enough to touch scale or pointer will bind.

(b) Hold setting knob so it does not turn while making adjustment. After making adjustment move the red pointer to the indicating pointer to see if control action takes place where they coincide when instrument is powered. If they do not, repeat above procedure.

(5) Method 2, for older instruments.

(a) Loosen the four corner screws on the instrument and pull meter forward and out of the housing. After blowing off all dust, pry up the plug button in the top of the meter. Turn the setting knob clockwise until the red pointer is at the top of the scale. The setting arm carrying the photocell and light source is then visible.

(b) Insert a small screwdriver into slot and turn clockwise or counterclockwise to adjust red pointer the required distance. Replace plug button and replace meter in housing.

(c) Move red pointer to indicating pointer, with instrument provided, to see if control action takes place where pointers coincide. If no action takes place repeat the above procedures. When adjustment has been completed tighten four corner screws.

h. Troubleshooting. Refer to table 5-2 for troubleshooting procedures.

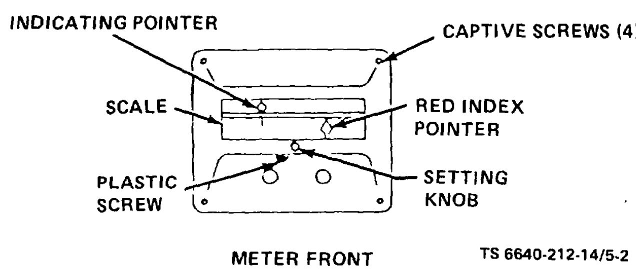

Figure 5-2. Method No. 1, Correlating Instrument

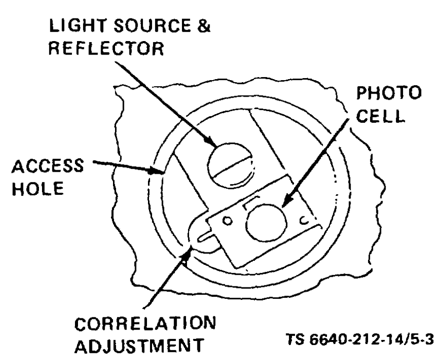

Figure 5-3. View Through Access Hole

Table 5-2. Pyrometer Troubleshooting

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

1. NEITHER PILOT LIGHT BURNS.

Check power supply, circuit breakers supplying power to the unit.

a. Reset circuit breaker if open.
b. Check pilot light bulbs, replace as necessary.

2. GREEN PILOT LIGHT ON AT ALL TIMES.

Step 1. Check for low line voltage.
If line voltage is low, adjust to proper level.

Step 2. Check to see if meter is plugged into chassis all the way.

Make visual check, if not plugged all the way into chassis, make necessary adjustments.

Step 3. Check if light source bulb is burned out.
If bulb is burned out, replace.

Step 4. Check if photocell is defective.
Replace photocell.

3. RED PILOT LIGHT ON AT ALL TIMES.

Step 1. Check for high line voltage.
Bring low voltage to proper level.

Step 2. Check if flag on indicating pointer is free to pass between light and photocell.
If flag is not free to pass, make necessary adjustments.

Table 5-2. Pyrometer Troubleshooting - Continued

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

3. RED PILOT LIGHT ON AT ALL TIMES. - Continued

Step 3. Check photocell.
If defective replace with new one.

4. INSTRUMENT PILOT LIGHTS OPERATE NORMALLY, BUT FURNACE OVERHEATS, OR WILL NOT HEAT.

Step 1. Check wiring and connections from HCL terminals on terminal panel to external contactor or other load.
Make necessary repairs.

Step 2. Check operation of external contactors, solenoids, or motor valves.
Make necessary repair or replacement.

Step 3. Check instrument relay contacts.
Clean dirty contacts, or replace relay.

5. INSTRUMENT NOT READING CORRECT TEMPERATURE.

Step 1. Check thermocouple and lead wire connections.
Make necessary repair or replacement.

Step 2. Check ambient temperature setting.
Make required adjustments.

Step 3. Check thermocouple for deterioration and lead wire for correct polarity.
Make necessary repair or replacement.

5-3. Utility Oven.

a. Thermostat Removal.

(1) Remove screws and saddle clamps which hold sensing bulb of thermostat in place on bottom of working chamber.

(2) Carefully lift sensing bulb to a perpendicular position with diffuser panel.

(3) Pull off reference dial.

(4) Lay oven cabinet on its side.

(5) Remove screws securing thermostat to rear of oven control panel and disconnect electrical connections to thermostat.

(6) Withdraw thermostat capillary out through bottom of working chamber.

CAUTION

Do not crimp or sharply bend capillary tubing.

b. Heater Bank.

(1) Remove screws and saddle clamps which hold sensing bulb of thermostat in place on diffuser panel on bottom of working chamber.

(2) Carefully erect sensing bulb to a perpendicular position with diffuser panel.

(3) Lay cabinet on its back and withdraw capillary from inside working chamber out through bottom of working chamber.

CAUTION

Do not crimp or sharply bend capillary tubing.

(4) Stand oven in an upright position and lift out diffuser panel. Disconnect electrical connections from three buss bars of heater bank.

(5) Remove four screws securing heater to bottom of oven and lift out heater assembly.

c. Pilot Light and Switch.

(1) Lay oven on its side, compress spring clips at each side of switch and push out through front of oven (fig. 5-4).

(2) Disconnect wires from defective part.

d. Installation. Install components removed in reverse order of removal. Refer to figure 5-5 for wiring data.

5-4. High Pressure Purge Meter.

a. Removal and Installation. Meter must be mounted in vertical position (6, fig. 2-10) with inlet of meter facing vertically downward and outlet of meter facing in a horizontal direction. The reading extension can be rotated in any direction by loosening cap nut at top and turning reading extension manually.

b. Maintenance. Meter need not be removed from line for cleaning. The meter body is of a single piece construction and is coupled to reading extension by means of a screwed adapter with an O-ring seal. By removing reading extension, the metering plug, compression spring, and orifice can be removed and the indicator housing can be disassembled. Refer to the exploded view, figure 5-6. Care should be exercised in handling plug and orifice since damage could result in malfunction or complete failure of meter.

c. Checking and Adjustment.

(1) Orifice should be seated properly during assembly.

(2) Magnetic follower and extension should be free from foreign matter to permit maximum freedom of motion.

(3) Indicating scale can be adjusted by means of an assembly screw on the mounting brackets.

5-5. Kinematic Viscosity Baths.

a. Removal.

(1) Remove one of the circular bakelite cover and cup assemblies and drain bath of all its white technical oil.

CAUTION

Be sure power is removed from bath. If operated without oil, heaters will burn out, or if used with water in the bath, heaters will short out.

(2) Remove bayonet-type connector leading from base of unit over top of controller. To remove turn counterclockwise and pull up.

(3) Unscrew protective guard and carefully slip thermoregulator up and out of protective guard.

(4) Remove thermoregulator from base and control unit and carefully lift out the outer plastic enclosure as well as inner glass enclosure.

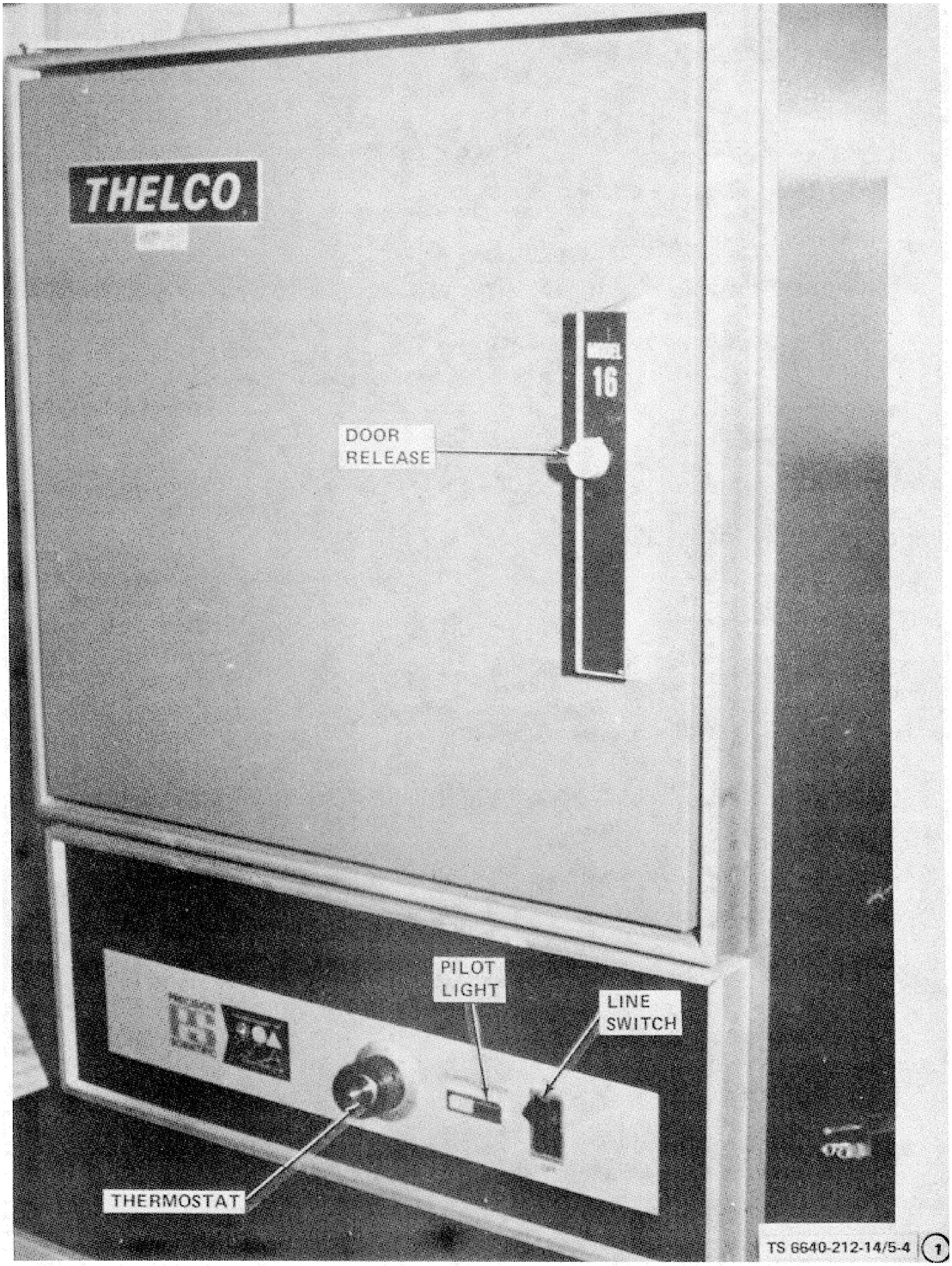

Figure 5-4. Utility Oven, Parts Location (Sheet 1 of 3)

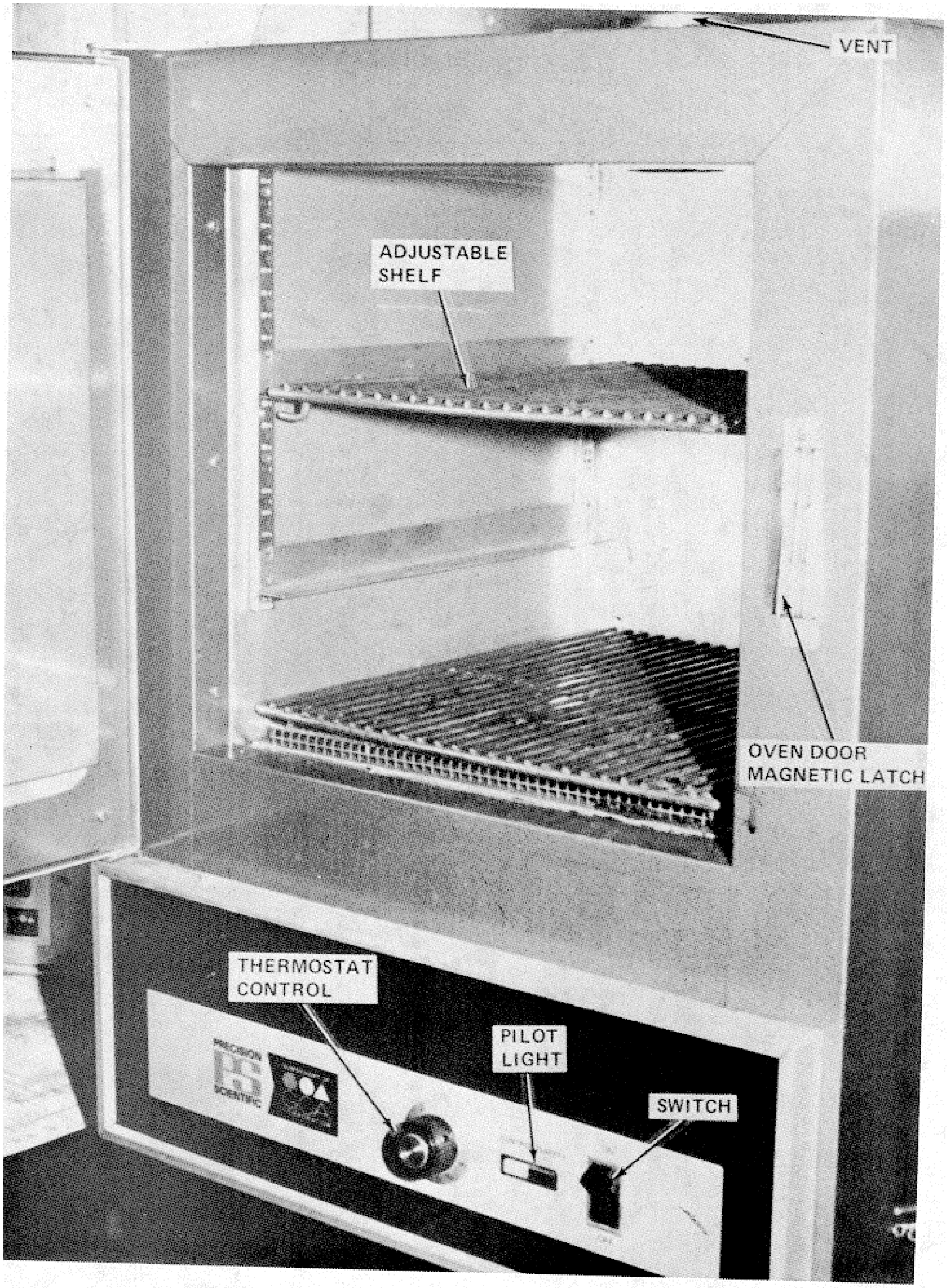

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Figure 5-4. Utility Oven, Parts Location (Sheet 2 of 3)

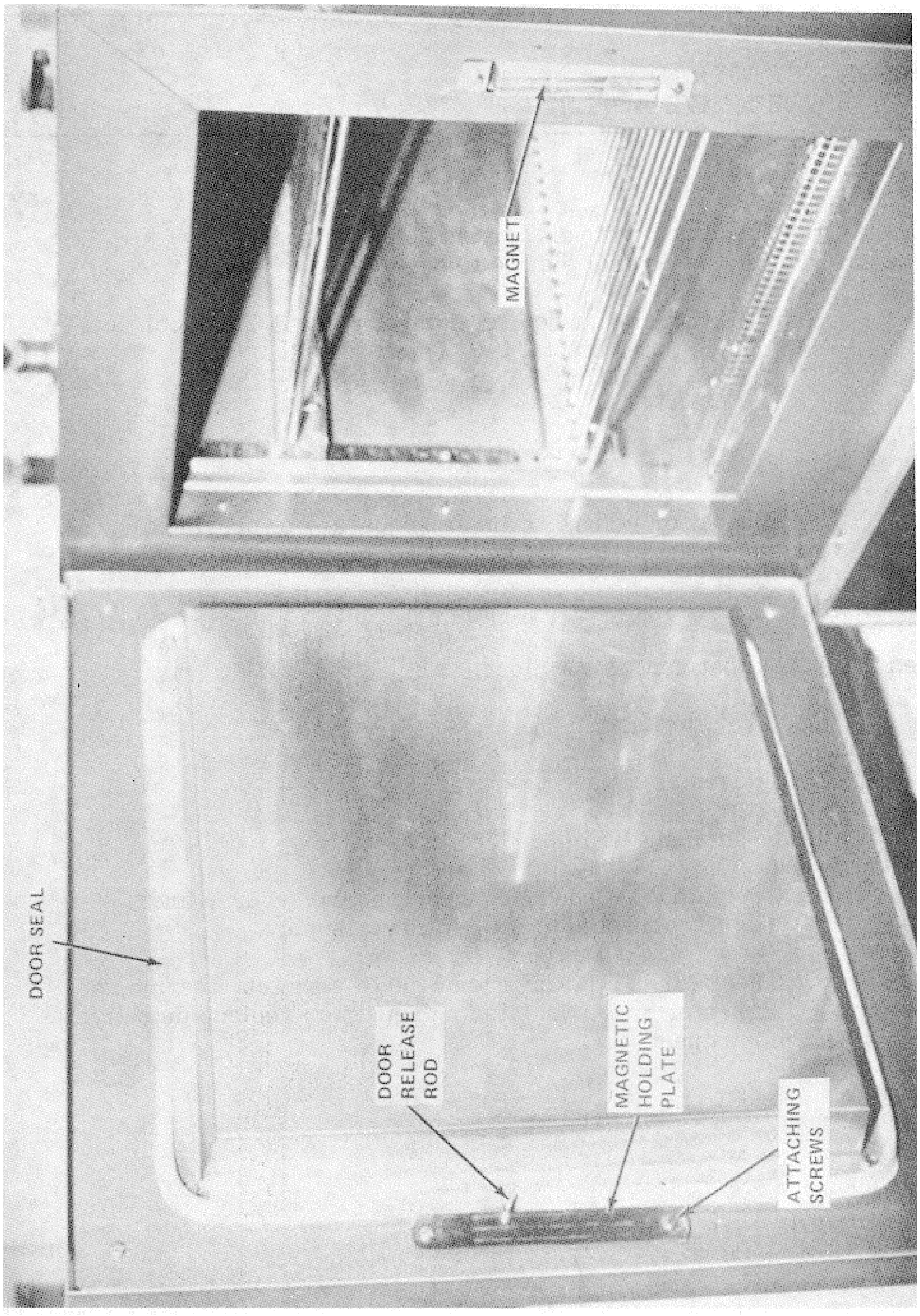

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Figure 5-4. Utility Oven, Parts Location (Sheet 3 of 3)

Table 5-3. Utility Oven Troubleshooting

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

1. LOSS OF HEAT CONTROL.

Check if temperature continues to rise above normal temperature for the control dial setting.

Check if thermostat contacts are sticking. Clean contacts or replace thermostat.

2. HEAT LOSS.

Check door strike.

Readjust door release rods as necessary to provide a good door seal. See figure 5-4.

3. TEMPERATURE VARIES.

Step 1. Check that vent is not closed.
Open vent to maximum.

Step 2. Check oven empty.

a. Oven might be improperly loaded.

b. Check that all power connections are secure, and unit is connected to proper power supply.

c. Check for partial failure of the line switch, thermostat, or heater bank. Isolate and repair or replace defective component.

Table 5-3. Utility Oven Troubleshooting - Continued

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

4. NO HEAT.

Place oven on if the oven does not heat.

a. Check the line voltage, the line switch and all electrical connections. Repair or replace defective components.

b. Check the heater bank for continuity. Be sure power cord is removed from outlet before doing the test. If heater is good, thermostat is not functioning and requires replacement. See figure 5-5.

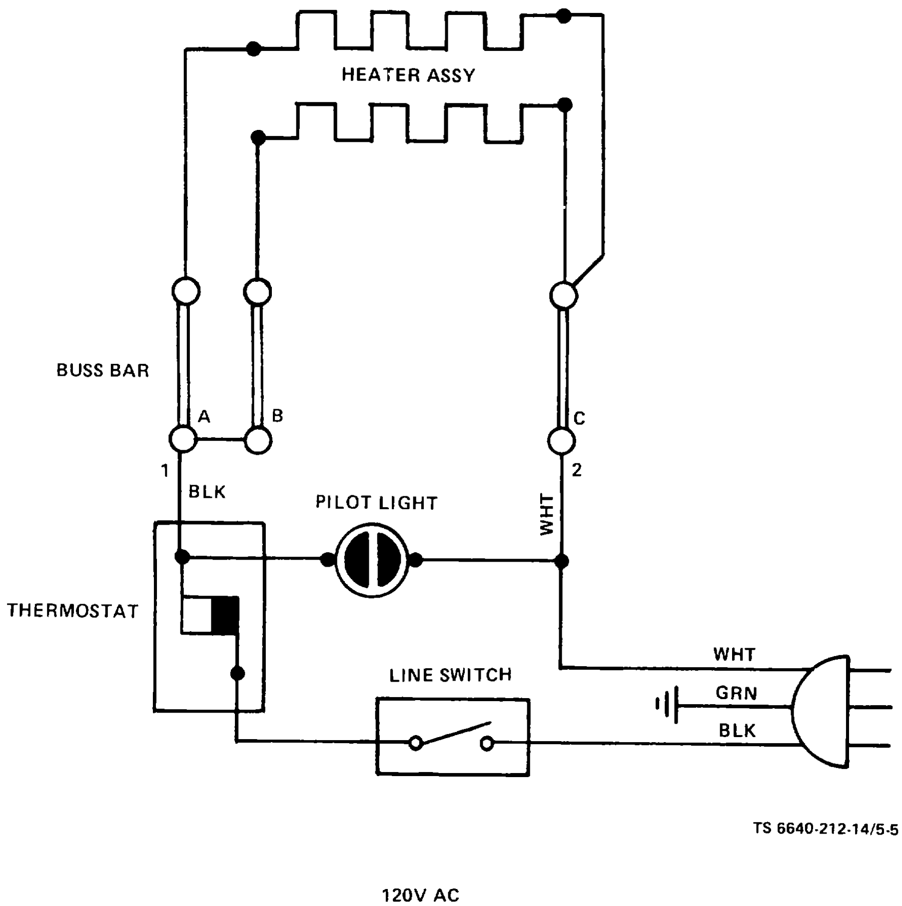
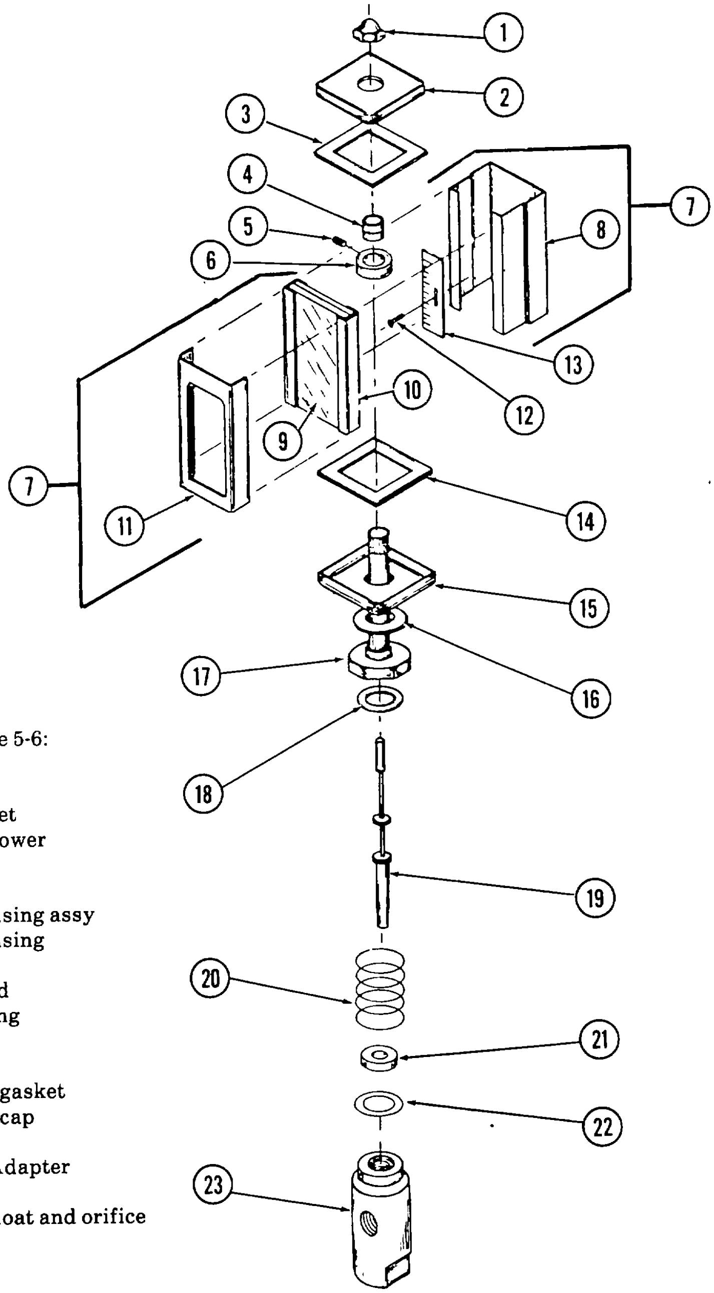


Figure 5-5. Utility Oven, Schematic Diagram



Legend for figure 5-6:
1. Cap nut
2. Top end cap
3. Top end gasket
4. Magnetic follower
5. Setscrew
6. Collar
7. Indicator housing assy
8. Indicator housing
9. Glass
10. Safety shield
11. Front housing
12. Screw
13. Scale
14. Bottom end gasket
15. Bottom end cap
16. Washer
17. Extension Adapter
18. O-ring
19. Extension float and orifice
20. Spring
21. Orifice
22. O-ring
23. Body

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Figure 5-6. High Pressure Purge Meter, Exploded View

(5) Remove contents and foam cushion material from drawer under kinematic viscosity bath (fig. 5-7), and remove attaching screws, washers, and nuts securing drawer to cabinet slides, then lift front of drawer up and out of slides located on both sides of drawer.

(6) Remove attaching bolts, lockwashers, and nuts, located under countertop, under kinematic viscosity bath (fig. 5-8), securing holddown brackets to countertop.

b. Line Switch Removal

(1) To remove line switch, remove power cord from outlet.

(2) Lay kinematic viscosity bath on its side, compress spring clips at each side of switch and push out from inside of bath. Refer to figure 5-9 for wiring data.

(3) Disconnect wires from switch.

c. Pilot Light Removal.

(1) Lay bath on its side, compress spring clips at each side of pilot light and push out from inside bath.

(2) Disconnect wires from pilot light.

d. Heat Switch Removal

(1) Loosen setscrew in knob and remove knob.

(2) Remove nut securing switch to bath housing and push switch into housing.

(3) Remove and tag wiring for ease of assembly. Refer to figure 5-9 for additional wiring data.

e. Pyrex Jar Removal

(1) Remove heaters from cover, if installed.

(2) Remove top cover, and attaching screws holding protective plastic shield

(4) Remove inner pyrex jar.

f. Regulator Removal

(1) Remove bayonet-type cap connector from the top of thermoregulator.

(2) Unscrew thermoregulator and carefully lift unit up and out of protective guard.

g. Motor Removal

(1) Place bath on its side.

(2) Tag and remove wires at motor.

(3) Remove attaching hardware securing motor base and remove motor.

h. Assembly. Assembly is accomplished in the reverse order of disassembly with the following precautions.

(1) After installing thermoregulator rotate adjusting magnet counterclockwise to lower temperature and clockwise to raise temperature. The thermoregulator is graduated in degrees Fahrenheit, indicated by a pointer which is raised or lowered by turning adjusting collar.

CAUTION

Do not operate heaters unless immersed in liquid.

(2) Check controlling temperature against temperature reading of thermometer and make final temperature adjustment by turning adjustment collar.

5-6. Air Compressor.

a. Automatic Drain Valve Servicing. Figure 5-10 shows a cross-sectional view of the automatic drain valve.

(1) After approximately six months service, remove and disassemble the valve.

(2) Clean all parts thoroughly and inspect for damage. Replace damaged or defective parts.

(3) Apply a light coat of silicone grease (MIL-L-4343A or equivalent) to the valve body, and 0-rings.

(4) Reassemble the valve, being careful not to damage O-rings.

(5) Refer to figure 5-10 and install valve.

b. Automatic Drain Valve Installation. Install automatic drain valve, manual drain valve, and fit-tings in the air receiver (fig. 5-11).

NOTE

The nipple, connecting the tee to the receiver, must be installed well above the inside of the receiver bottom. This prevents receiver sediment from entering the drain valve.

Connect the tubing from the automatic drain valve to the air compressor unloader tubing.

c. Unloader Pilot Valve Adjustment. To vary operating pressure proceed as follows.

CAUTION

Do not adjust this valve beyond range indicated.

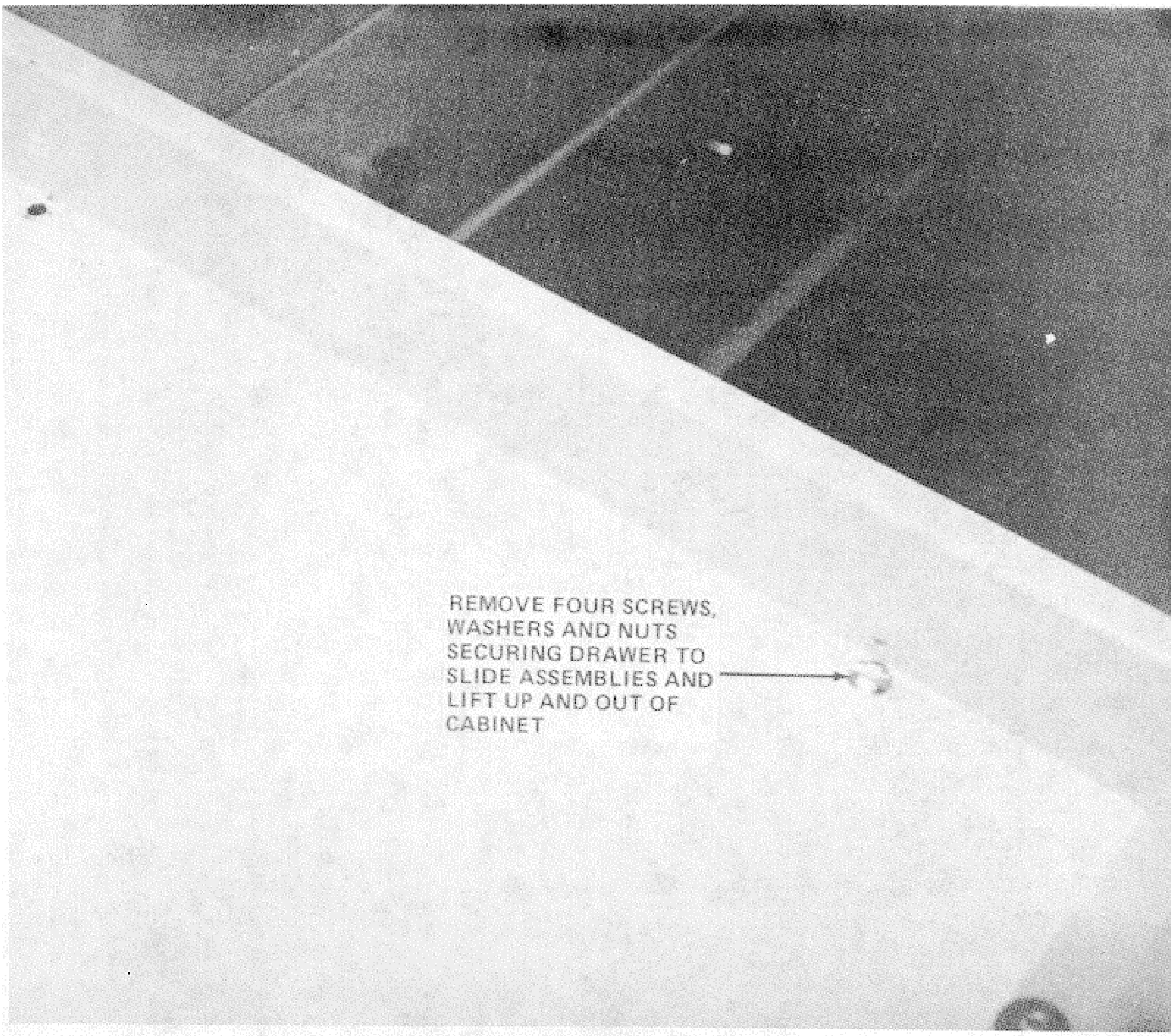

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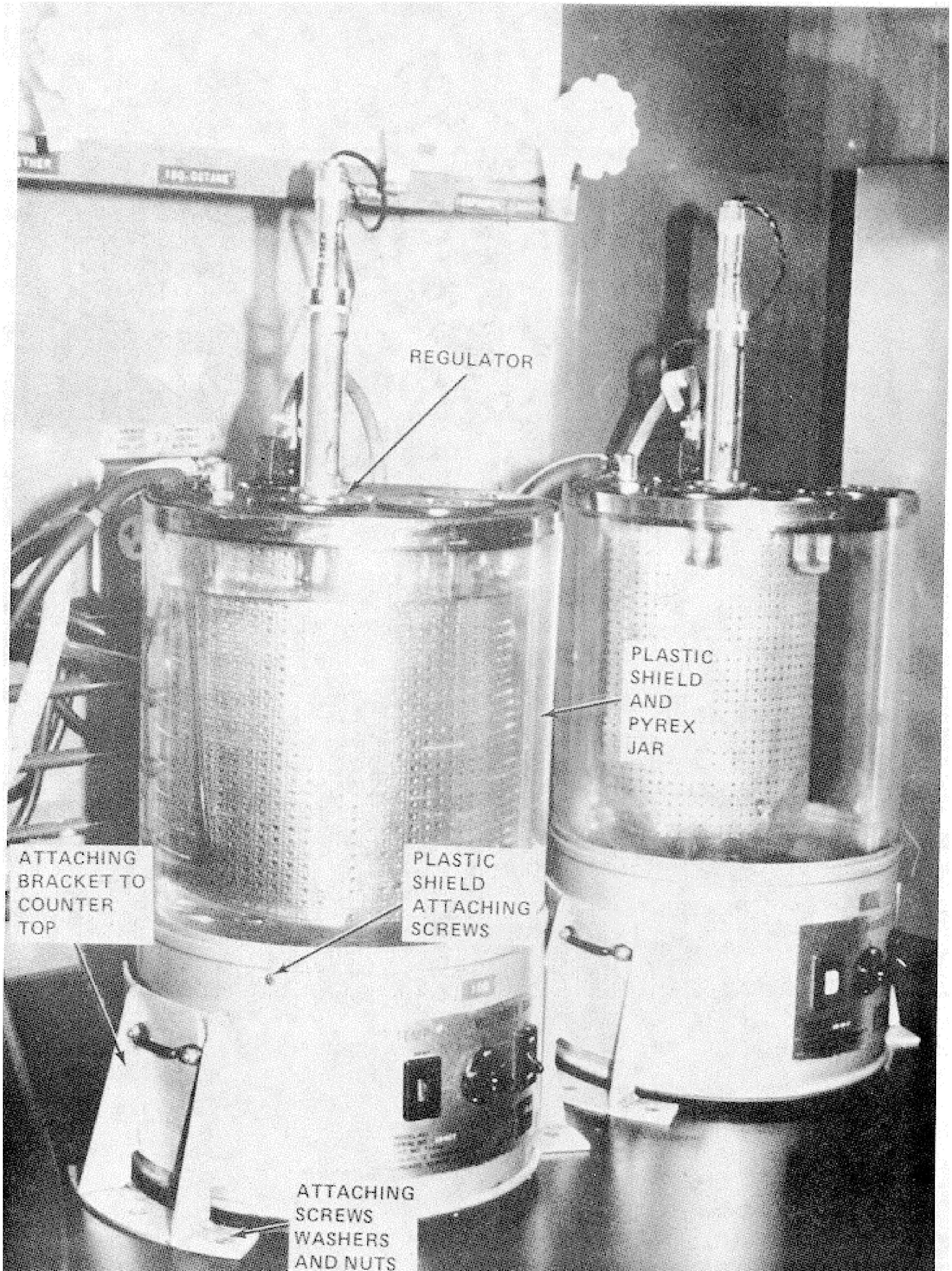
Figure 5-7. Removing Drawer Under Viscosity Bath



TS 6640-212-14/5-8 ①

Figure 5-8. Viscosity Bath, Parts Location (Sheet 1 of 3)

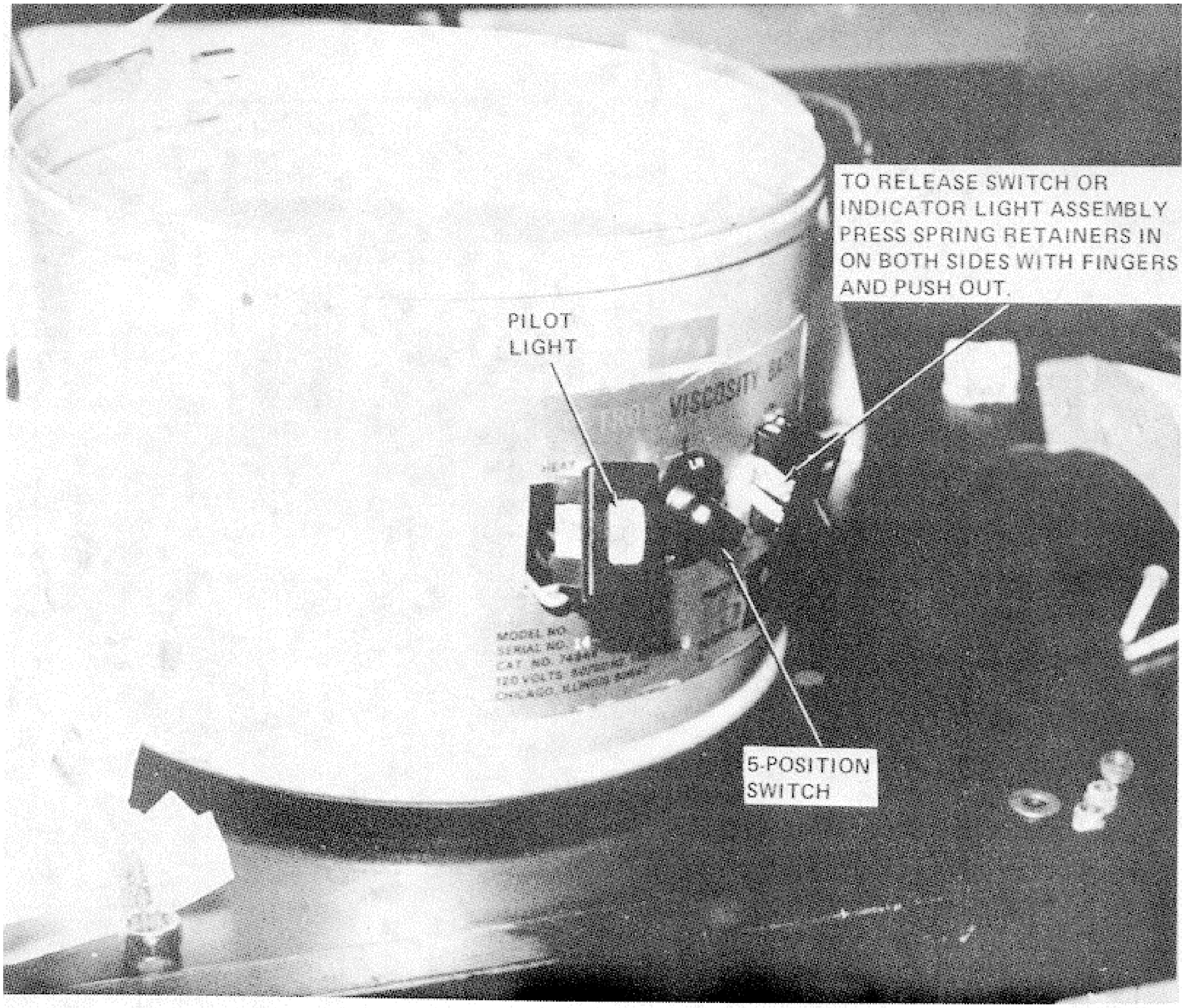


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Figure 5-8. Viscosity Bath, Parts Location (Sheet 2 of 3)

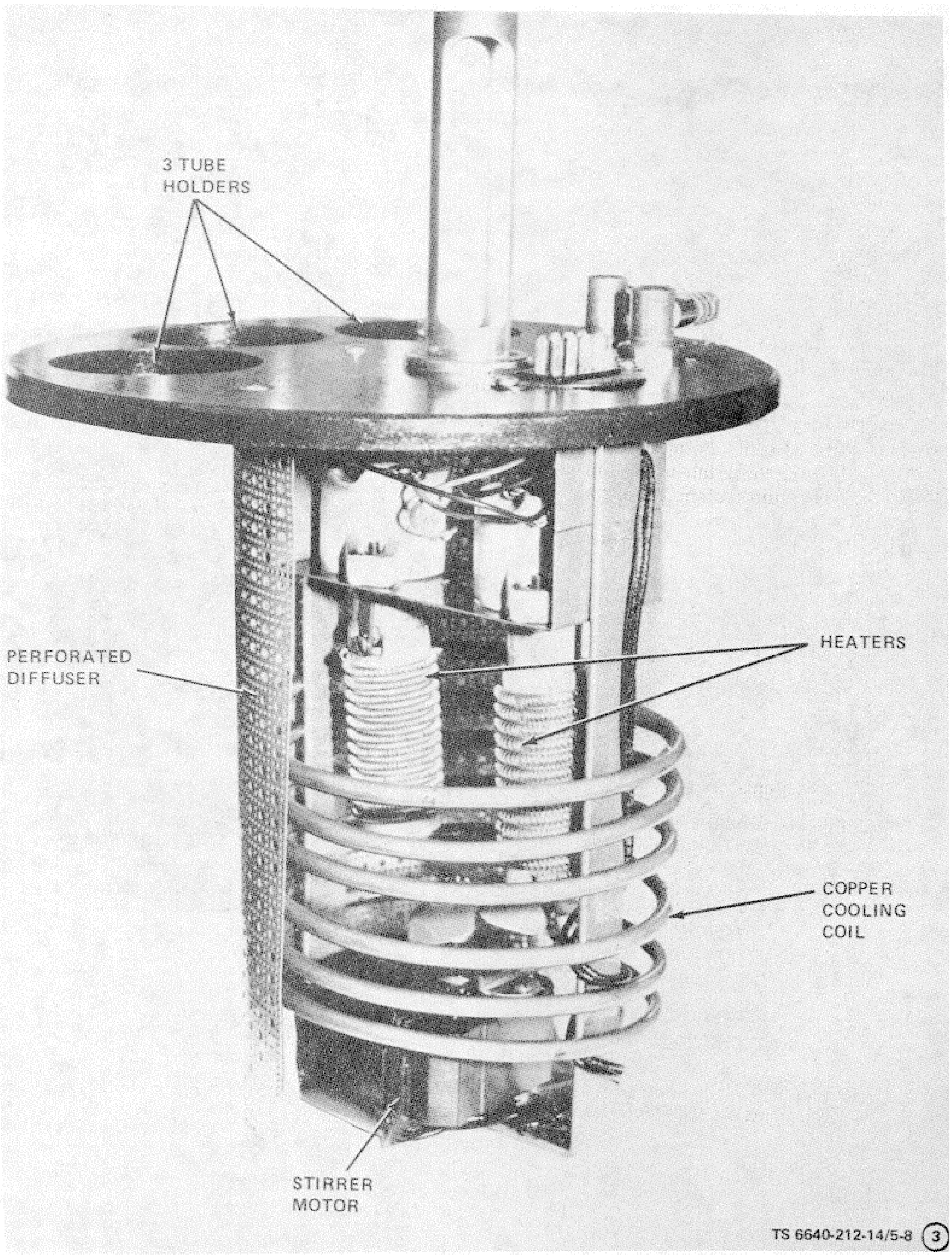
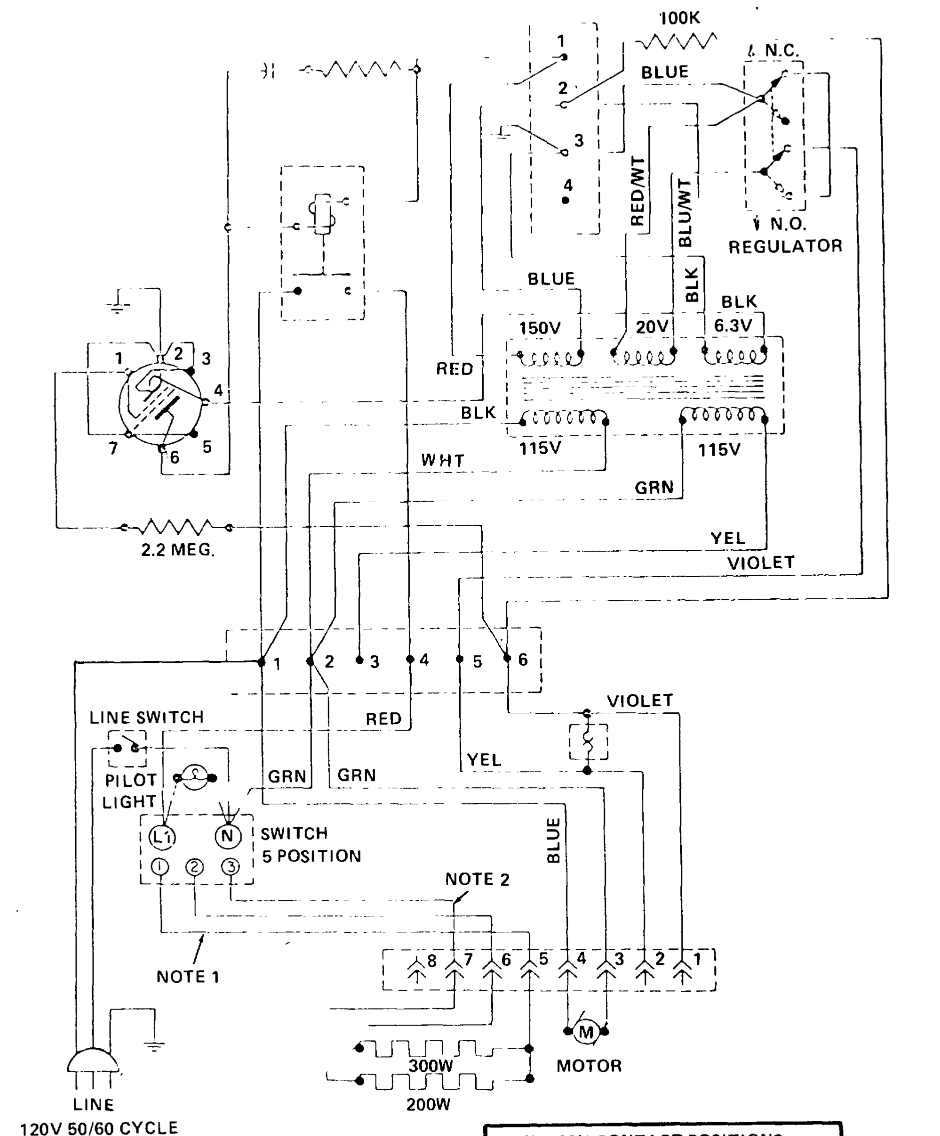


Figure 5-8. Viscosity Bath, Parts Location (Sheet 3 of 3)



NOTE:
1. 2 WIRES (1 RED, 1 BROWN).
2. 2 WIRES (1 BLACK, 1 WHITE).

SWITCH CONTACT POSITIONS			
HIGH (500W)	MED (300W)	LOW-MED (200W)	LOW (120W)
L1-1 N-2 N-3	L1-1 N-2	L1-1 N-3	L1-2 N-3

TS 6640-212-14/5-9

Figure 5-9. Kinematic Viscosity Bath, Schematic Diagram

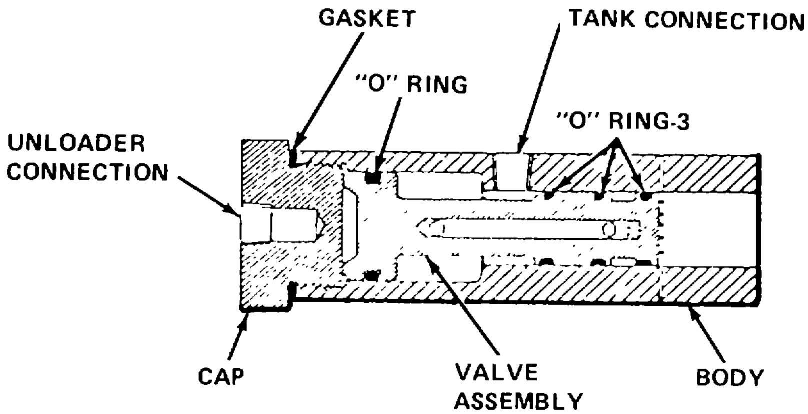


Figure 5-10. Automatic Drain Valve, Cross Sectional View

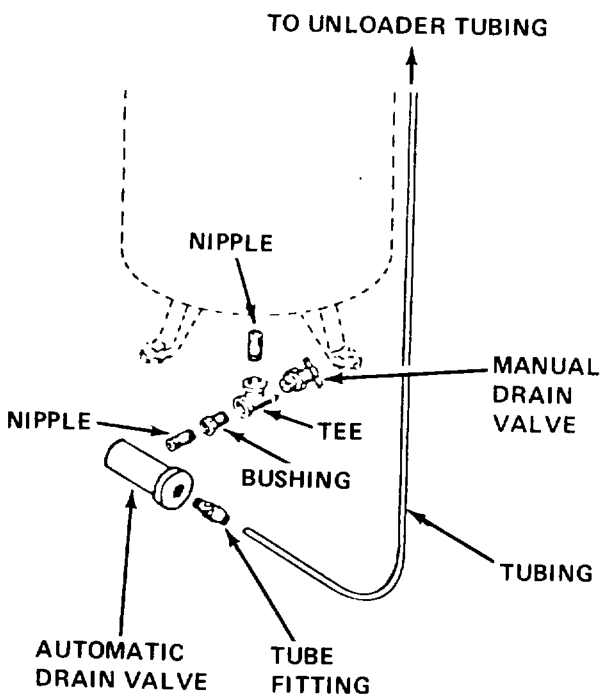


Figure 5-11. Automatic Drain Valve, Installation

CAUTION

Do not tamper with or change exhaust port setting.

(1)Tension of the spring (fig. 5-12) governs unload pressure within indicated range.

(2)To increase unload pressure setting (within indicated range) tighten knurled nut after unlocking. When desired pressure is attained, relock. Spring must be kept parallel to valve body.

(3)To decrease unload pressure setting (within indicated range), loosen knurled nut after unlocking, set and relock. Spring must be kept parallel to valve body.

(4)Position of the spring on notched main lever governs the differential between load and unload pressure.

(5)To increase differential between load and unload, move the spring closer to the valve body.

(6) To decrease differential between load and unload move the spring away from the valve body. Spring must be kept parallel to valve body.

d. Discharge Valve. The discharge valve should be removed, cleaned, and inspected after approximately six months of operation. Figure 5-13 shows an exploded and cross-sectional view.

(1) Removal.

(a) Remove discharge valve cap (19, fig. 5-16) and gasket (20).

(b) Remove discharge valve plug (21) and lift out discharge valve (fig. 5-13) and gasket (29, fig. 5-16).

(2) Disassembly. Refer to figure 5-13 and disassemble the discharge valve.

(3) Cleaning and Inspection.

(a) Clean all parts thoroughly.

(b) Inspect for damage or wear.

(c) Replace damaged or worn parts.

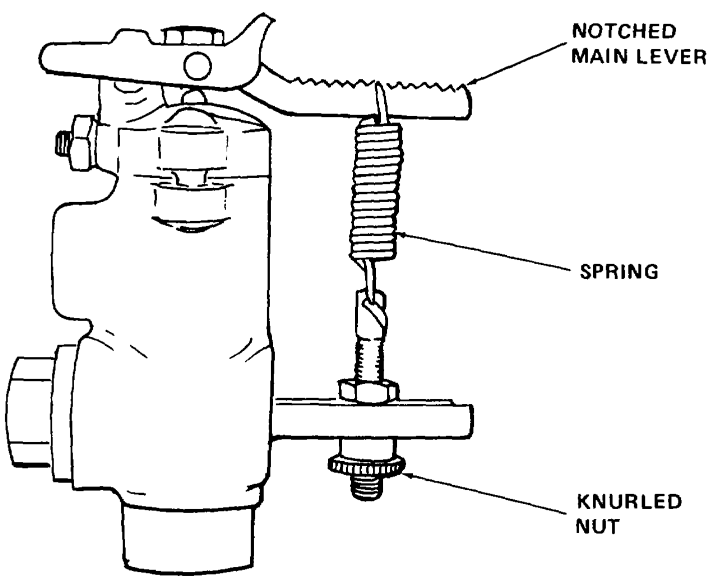


Figure 5-12. Unloader Pilot Valve

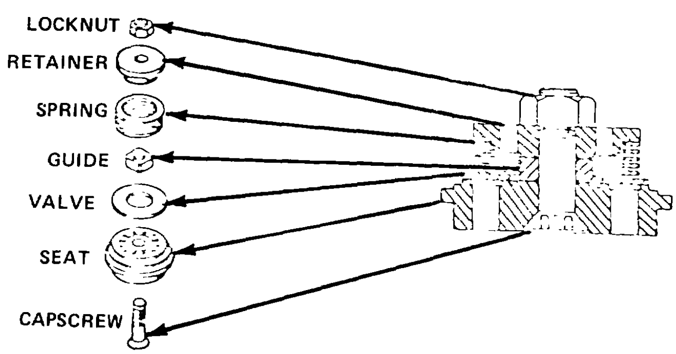


Figure 5-13. Discharge Valve, Cross Sectional and Exploded View

(4) Reassembly. Refer to figure 5-13 and reassemble the discharge valve. Torque nut as specified in table 5-4.

(5) Installation.

(a) Place the discharge valve gasket and discharge valve in the cylinder head.

(b) Install discharge valve plug. Torque as specified in table 5-4.

(c) Install the cap gasket and discharge valve cap.

e. Suspection Valve Unloader

(1) Removal.

(a) Disconnect the unloader tubing from the suction valve cap (fig. 5-14) and remove the cap and O-ring.

(b) Remove the unloader assembly from the cylinder head and lift out the suction valve and gasket.

(2) Disassembly.

(a) Refer to figure 5-14 and disassemble the unloader.

(b) Refer to figure 5-15 and disassemble the suction valve

(3) Cleaning and Inspection.

(a) Clean all parts thoroughly.

(b) Inspect for damage and wear.

(c) Replace damaged or worn parts.

(4) Reassembly.

(a) Refer to figure 5-15 and reassemble suction valve. Torque nut as specified in table 5-4.

(b) Refer to figure 5-14 and reassemble the unloader.

NOTE

Before installing the unloader apply a light coat of silicone grease (MIL-L-4343A or equivalent) to the outside of the plunger and to the inside of the hold down sleeve and seals.

(5) Installation.

(a) Install the gasket (18, fig. 5-16) and suction valve in the cylinder head.

(b) Place the unloader over the suction valve · and tighten as specified in table 5-4.

(c) Install the suction valve cap and attach the unloader tubing.

f. Cylinder Head. Remove cylinder head only if loss of compressor pressure has been isolated to a defective cylinder, or severe knocking points to internal problems within the cylinder.

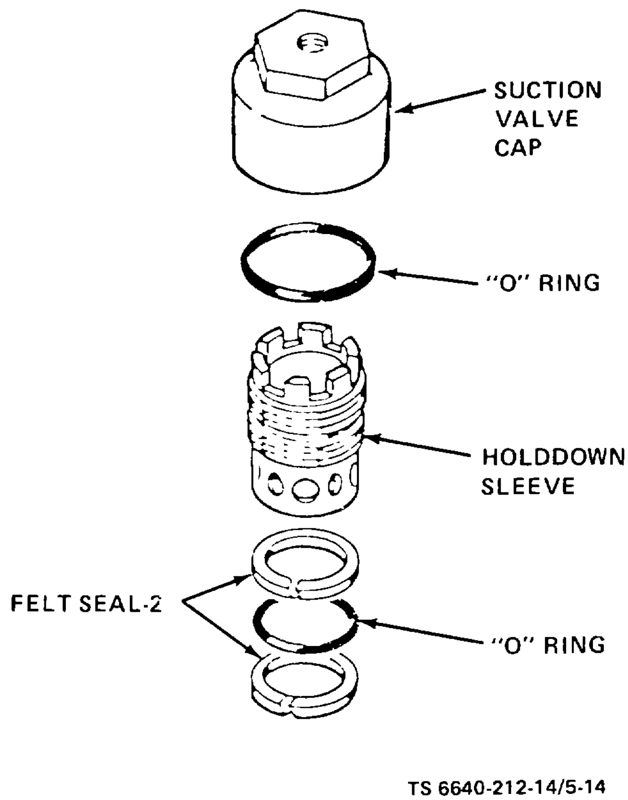


Figure 5-14. Suction Valve Unloader

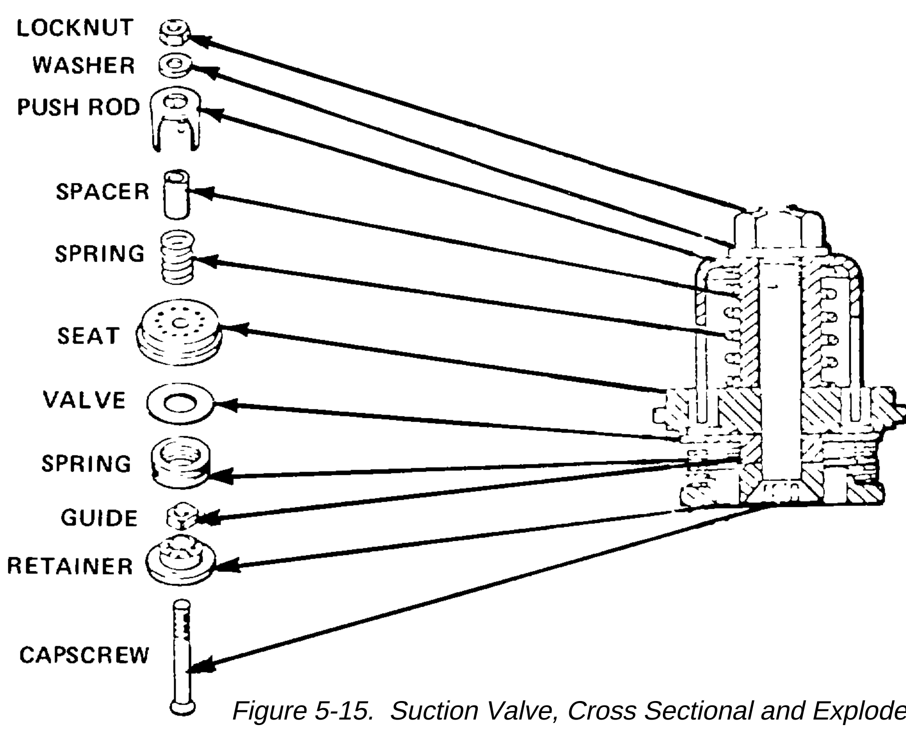
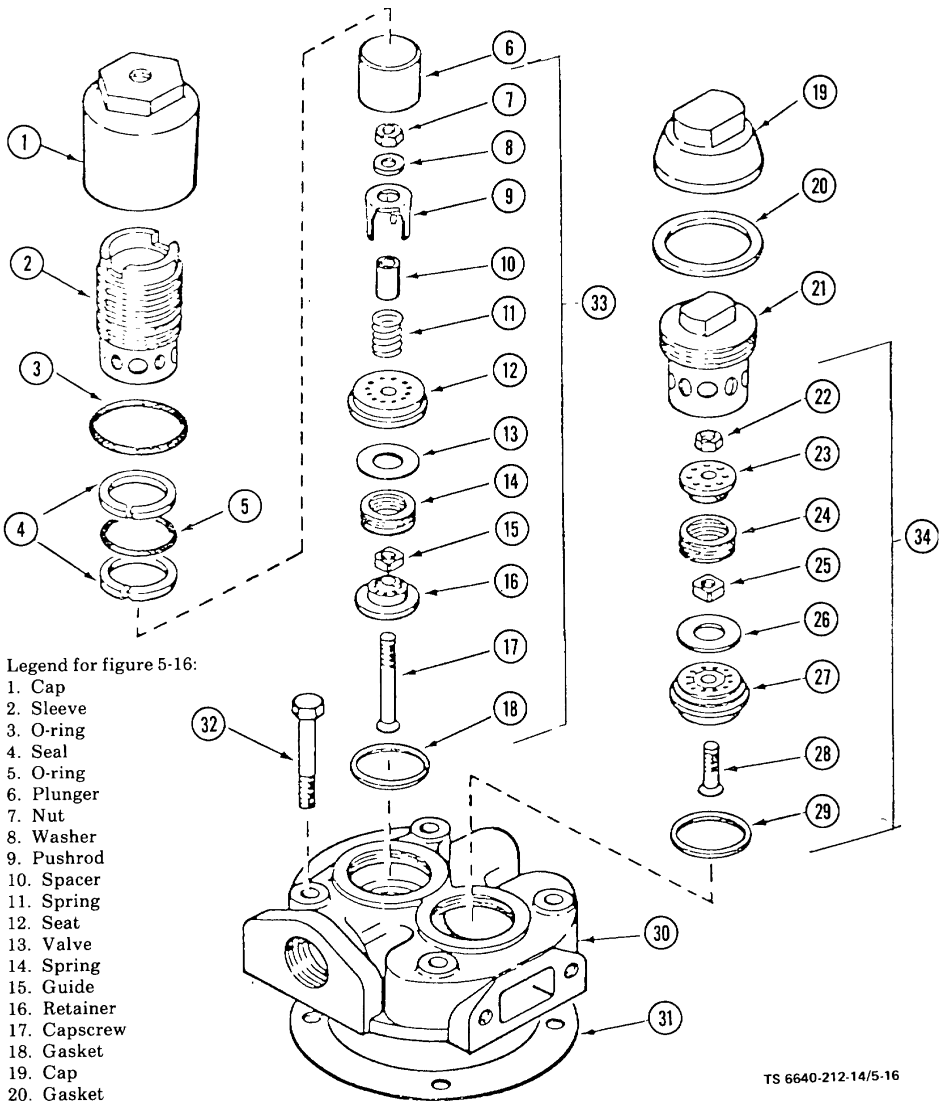


Figure 5-15. Suction Valve, Cross Sectional and Exploded View

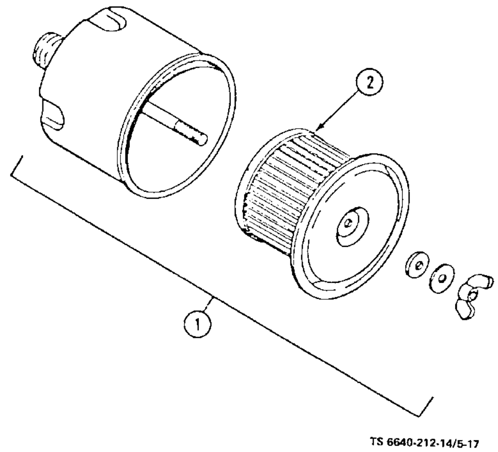
Table 5-4. Clearance, Tolerance and Torque Data

CLEARANCE, TOLERANCE	INCHES (cm)
Piston Clearances:	
L. P. at Skirt	0.0025/0.0045 (0.0064/0.0114 cm)
Piston Ring Gap:	
L. P. Compression	0.010/0.020 (0.025/0.050 cm)
L. P. Oil	0.010/0.020 (0.025/0.050 cm)
Piston Ring Groove Clearance:	
L. P. Compression Ring	0.0020/0.0035 (0.0051/0.0089 cm)
L. P. Oil Control Ring	0.0015/0.0030 (0.0038/0.0076 cm)
Top of Piston To Top Of Cylinder Clearance	- 0.004+0.019 (-0.010+0.048 cm)
Connecting Rod Bearing Running Clearance	0.0025/0.0044 (0.0064/0.0112 cm)
Crankshaft End Play	0.003/0.005 (0.0076/0.013 cm)
TORQUE DATA	(metric)
VALVE NUT:	
L. P.	110 in-lbs. (1.3 kg/m)
Connecting Rod Bolts	120 in-lbs. (1.4 kg/m)
Valve Plug or Unloader: L. P.	100 ft-lbs. (13.8 kg/m)
Flywheel Retainer Bolts	47 ft-lbs. (6.5 kg/m)
Cylinder Bolts	47 ft-lbs. (6.5 kg/m)
Cylinder Head Bolts	29.7 ft-lbs. (4.1 kg/m)
Oil Pump Cover Bolts	8.8 ft-lbs. (1.2 kg/m)



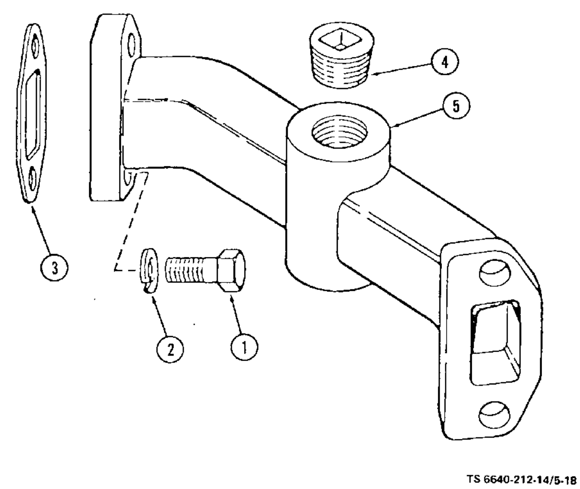
Legend for figure 5-16:
1. Cap
2. Sleeve
3. O-ring
4. Seal
5. O-ring
6. Plunger
7. Nut
8. Washer
9. Pushrod
10. Spacer
11. Spring
12. Seat
13. Valve
14. Spring
15. Guide
16. Retainer
17. Capscrew
18. Gasket
19. Cap
20. Gasket
21. Plug
22. Nut
23. Retainer
24. Spring
25. Guide
26. Valve
27. Seat
28. Capscrew
29. Gasket
30. Cylinder head
31. Gasket
32. Capscrew
33. Valve assy suction
34. Valve assy discharge

Figure 5-16. Cylinder Head, Exploded View



Legend for figure 5-17:
1. Air filter assy
2. Element

Figure 5-17. Air Filter, Exploded View



Legend for figure 5-18:
1. Capscrew
2. Lockwasher
3. Gasket
4. Plug
5. Manifold

Figure 5-18. Manifold

(1) Removal. Remove both air filters (1, fig. 5-17) from the cylinder heads.

(2) Remove all lines and fittings going into valves located on top of each cylinder head.

(3) Remove manifold (5, fig. 5-18) by removing capscrews (1), lockwashers (2) and lift out gaskets (3).

(4) Remove both suction valve and discharge valve (para d and e) and remove gask5-16) from each cylinder head.

(5) Remove capscrews (32) securing each cylinder head onto cylinder (2, fig. 5-19) and lightly tap each cylinder head to unseat them, and remove.

g. Cylinder Removal. Remove capscrews (1, fig. 5-19) and firmly pull cylinders from piston and rings, and remove gasket (3).

h. Flywheel.

(1) Removal. Remove belts from flywheel and motor, and remove motors by removing attaching hardware. Tag wires for ease of assembly.

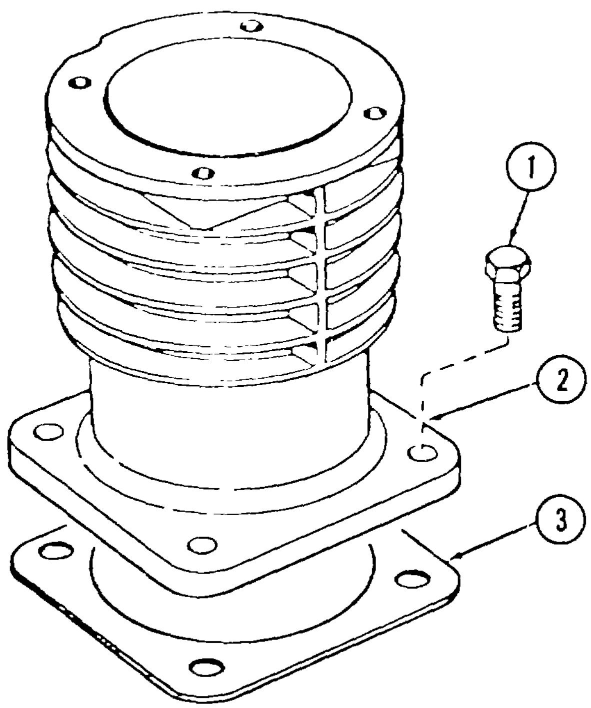
(2) Remove capscrew (1, fig. 5-20) and remove lockwasher (2), flat washer (3) and key (5).

(3) Pull flywheel (4) free from crankshaft.

i. Crankshaft and Piston.

(1) Removal. Drain all oil from crankcase (4, fig. 5-24) by removing drain plug (1). Crankcase holds approximately 7/8 qt of oil.

(2) Remove all piping, fittings and controls connected to crankcase.



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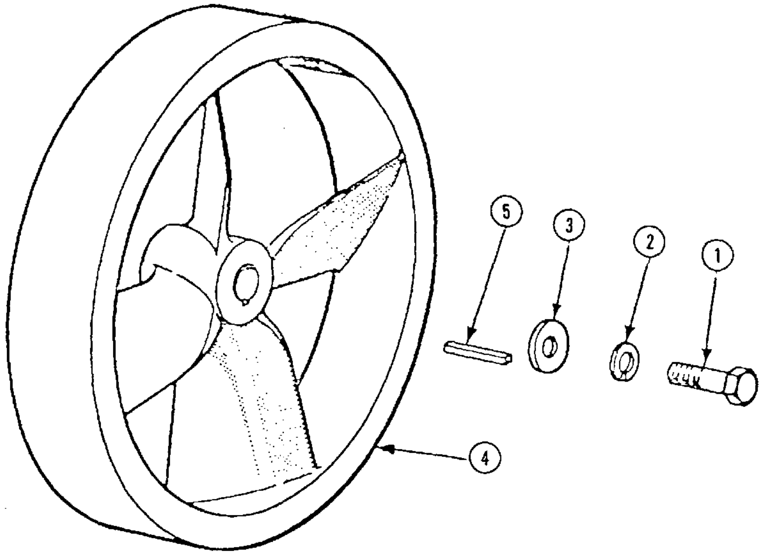
Legend for figure 5-19:
1. Capscrew
2. Cylinder
3. Gasker

Figure 5-19. Cylinder



Legend for figure 5-20:
1. Capscrew
2. Lockwasher
3. Washer
4. Flywheel
5. Key

Figure 5-20. Flywheel

(3) Remove oil pump cover (17, fig. 5-21) by removing attaching screws (1) and lockwashers (2).

(4) Remove oil pump cover O-ring (1, fig. 5-22).

(5) Remove rotor (2), vane (3) and spring (4) from rotor.

(6) Remove insert (5) from rear retainer (7).

(7) Remove rear retainer (7), shims (9, 10 and 11).

(8) Remove bearing cup (8) and front oil seal (3, fig. 5-24) from crankcase.

(9) Rotate crankshaft until connecting rod bolts (9, fig. 5-23) are accessible then remove bolts (9), locknuts (7) and washers (8); remove connecting rod bearing caps (12) and bearing inserts (11).

CAUTION

Mark the connecting rod from which the caps were removed, and assemble caps on the same rod. Do not intermix the connecting rods and caps.

10) Remove pistons and connecting rods as an assembly.

(11) Carefully remove bearing cones (2, fig. 5-25) from crankshaft (1), remove crankshaft.

j. Piston and Connecting Rod Disassembly.

(1) Using a piston ring removal pliers carefully lift off rings (4 and 5) and expander spacer (6, fig. 5-23).

NOTE

Mark connecting rod and piston to assure correct relationship at assembly.

(2) Remove piston pin retainer (1, fig. 5-23), rest piston on wooden block and tap out piston pin (2).

NOTE

Do not remove the connecting rod bushings, if inspection reveals a defect, they must be replaced as an assembly.

k. Oil Pump Cover Disassembly.

(1) Remove screws (4, fig. 5-21), lockwashers (5) and lift off valve cover (6) from body (14).

(2) Remove cover seal (7) from valve cover.

(3) Remove spring (8), check valve (9), pin (10) and pin seal (11) from body.

(4) Remove screws (12) and lockwashers (13) which attach body (14) onto oil pump cover (17).

(5) Remove body (14) and disassemble piston (15) and bellofram (16).

(6) The pipe plug (3) does not require removal unless a defect is noted.

l. Cleaning and Inspection.

WARNING

Drycleaning solvent, P-D-680, used to clean parts is potentially dangerous to personnel and property. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 100 degrees F to 138 degrees F (38 degrees C to 59 degrees C).

(1) Clean all metal parts in P-D-680 cleaning solvent and dry thoroughly.

(2) Inspect the crankshaft for cracks, scores, and distortion. If defects are noted replace crankshaft with a new crankshaft assembly.

NOTE

A crankshaft assembly comes complete with two matched bearing cones.

(3) Inspect the crankshaft bearing cones for rough, pitted, or scored rollers. Replace a defective bearing.

(4) Inspect the crankcase for cracks, breaks or other defects. Replace the crankcase if defective.

(5) Measure the ring grooves in the piston for wear. Replace piston if tolerance is greater than noted in table 5-4.

m. Reassembly and Installation. Crankshaft and Piston.

(1) Refer to figures 5-21 thru 5-25 and reassemble and install the pistons, piston rings, expander spacer, connecting rods and crankshaft into crankcase taking the following precautions.

(2) When installing piston rings expand them carefully and sufficiently to allow the ring to slide freely over the piston to the position required. Starting with bottom piston rail ring (5, fig. 5-23) install piston rings and expanded spacer in their proper grooves. Stagger ring gaps so that they are not lined up.

(3) Check piston ring gap as noted in table 5-4.

(4) Lubricate each piston and connecting rod assembly with a light coat of engine oil before in-stalling into crankcase.

(5) Torque connecting rod bolts as indicated in table 5-4.

(6) Lubricate bearing cones (2, fig. 5-25) and in-stall onto crankshaft and into crankcase, then in-stall two bearing cups into the front and rear of crankcase. Check end play as indicated in table 5-4.

(7) Apply a light coat of engine oil to inside wall of cylinder, install new cylinder gasket and cylinder over piston, secure with capscrews (1, fig. 5-19) and torque to 47 foot-pounds (6.5 kg/m).

(8) Install new front oil seal (3, fig. 5-24) into crankcase.

(9) Install new oil relief valve nylon ball (15, fig. 5-22), spring (14), retainer (13) and roll pin (12) if removed for inspection, or found defective.

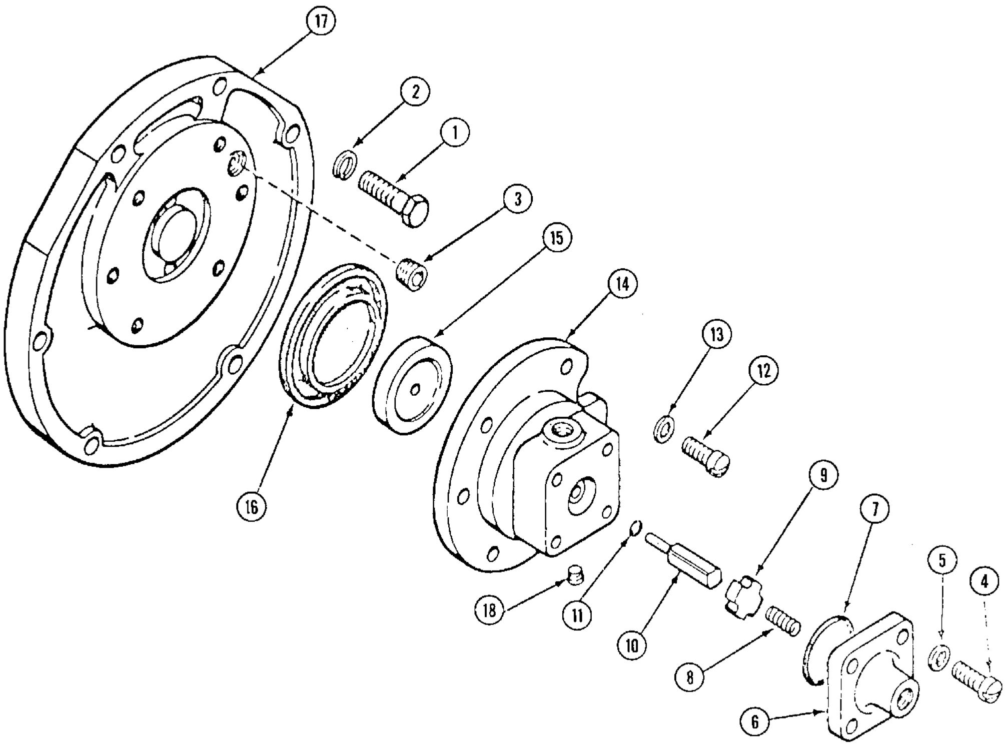
(10) Install shims (9, 10, and 11) and rear retainer (7) onto crankcase.

(11) Install new pump cover O-ring into grooves on rear retainer.

(12) Install roll pin (6) and insert (5) into rear retainer.

(13) Install springs (4), vanes (3) into rotor (2), and carefully into rear retainer.

(14) Assemble oil pump cover (17, fig. 5-21) on-to rear retainer and secure with screws (1) and lockwashers (2).

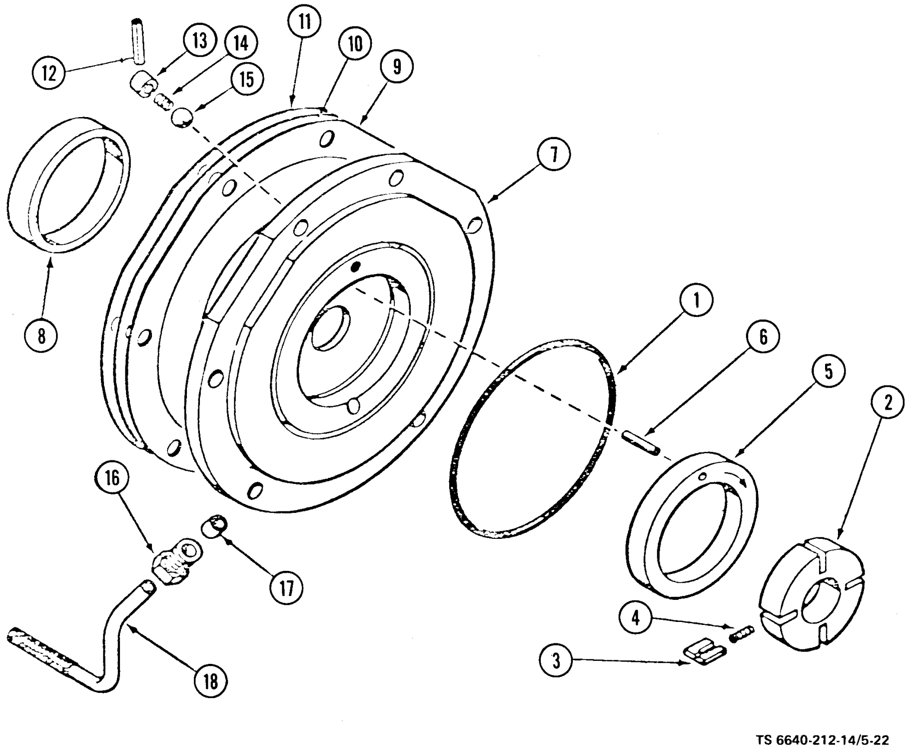


TS 6640-212-14/5-21

Legend for Figure 5-21:

1. Screw	10. Pin
2. Lockwasher	11. Seal
3. Plug	12. Screw
4. Screw	13. Lockwasher
5. Lockwasher	14. Body
6. Cover	15. Piston
7. Seal	16. Bellofram
8. Spring	17. Cover
9. Check Valve	18. Plug

Figure 5-21. Oil Pump Cover, Exploded View

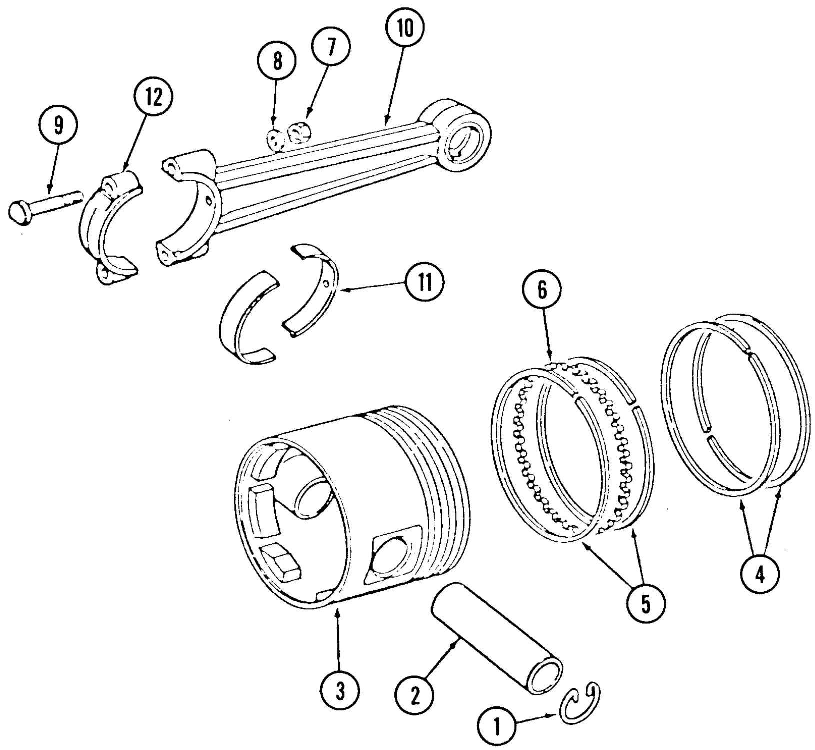


TS 6640-212-14/5-22

Legend for figure 5-22:

1. 0-ring	10. Shim 0.0075 in.
2. Rotor	11. Shim 0.020 in.
3. Vane	12. Roll pin
4. Spring	13. Retainer
5. Insert	14. Spring
6. Roll pin	15. Nylon ball
7. Retainer	16. Fitting
8. Cup	17. Sleeve
9. Shim 0.005 in.	18. Tube

Figure 5-22. Rear Retainer and Oil Pump, Exploded View

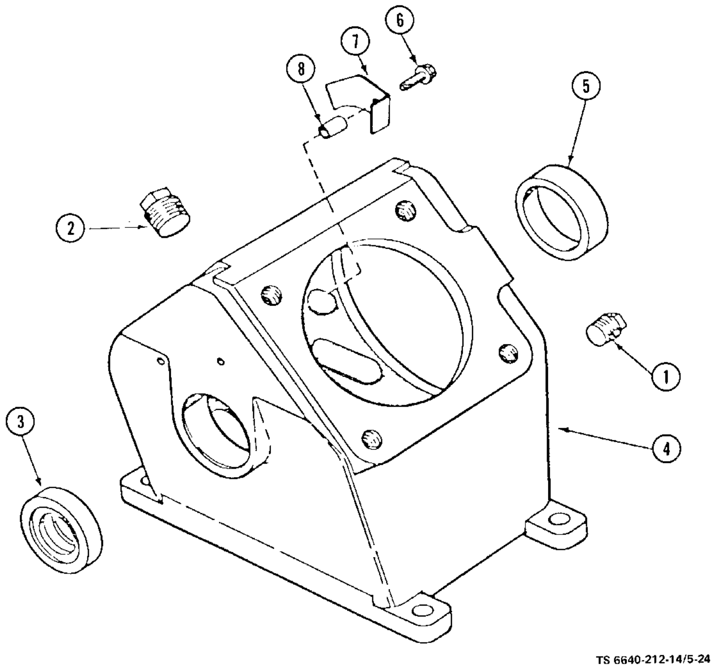


TS 6640-212-14/5-23

Legend for figure 5-23:

1. Retainer	7. Locknut
2. Pin	8. Washer
3. Piston	9. Bolt
4. Ring, compression	10. Connecting rod
5. Ring, rail	11. Bearing
6. Spacer	12. Cap

Figure 5-23. Pistons and Connecting Rods, Exploded View

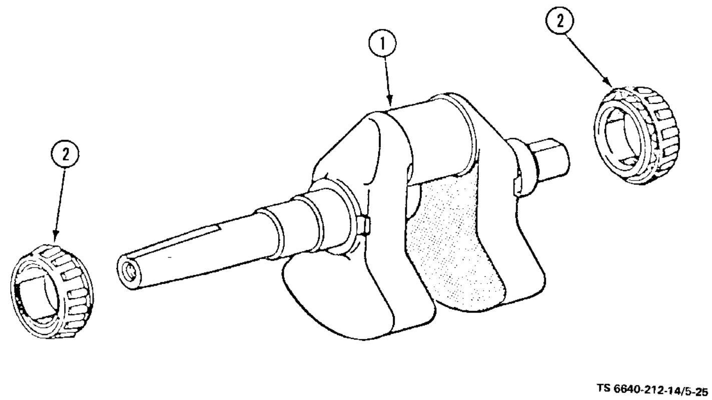


TS 6640-212-14/5-24

Legend for figure 5-24:

1. Plug	5. Bearing cup
2. Plug	6. Screw
3. Oil seal	7. Baffle
4. Crankcase	8. Spacer

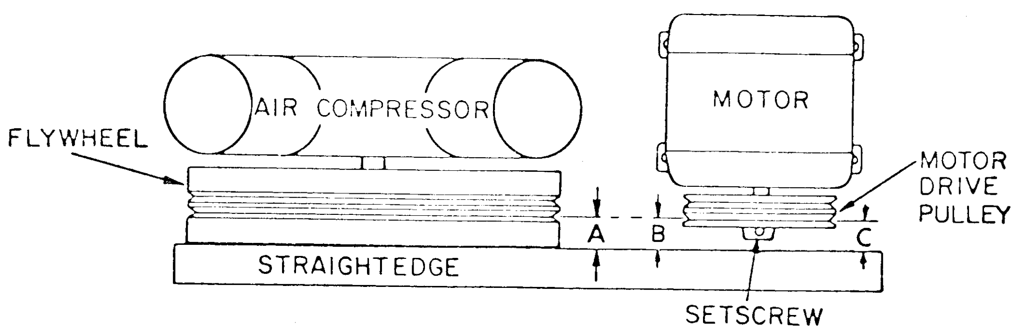
Figure 5-24. Crankcase



TS 6640-212-14/5-25

Legend for figure 5-25:
1. Crankshaft
2. Bearing Cone

Figure 5-25. Crankshaft



TS 6640-212-14/5-26

Figure 5-26. Pulley Alignment

(15) Install pipe plug (3), if removed.

(16) Assemble bellofram (16), piston (15), and body (14) onto pump cover, secure with screws (12) and lockwashers (13).

(17) Install a new pin seal (11) onto pin (10) and insert into body.

(18) Place new cover seal (7) into groove in valve cover (16) and insert spring into cover.

(19) Place check valve (9) over pin (10) and carefully install cover and spring over it, secure with screws (4) and lockwashers (5).

(20) Attach oil intake tube, sleeve and fitting to oil pump.

(21) Attach cylinder heads to cylinders and secure with capscrews (32). Torque capscrews as listed in table 5-4.

(22) Attach manifold (5, fig. 5-18) to cylinder heads and install new gaskets (3), attach with capscrews (1) and lockwashers (2). Install pipe plug (4) into manifold (5), if removed.

(23) Attach compressor to base with attaching hardware. Check the pulley and flywheel alignment by placing a straightedge against the compressor flywheel as shown in figure 5-26. Measure the distance from the straightedge and the center of the drive belt grooves at point A, B, and C. The distance should be the same at all points. To correct misalignment:

(a) Loosen the setscrew in the motor drive pulley.

(b) Move pulley toward or away from the motor as necessary.

(c) Tighten the setscrew.

(24) Install matched set of drive belts onto flywheel and motor pulley. Adjust drive belt tension so that there is one inch play on belt midspan with a 10 pound load applied. Tighten motor mounting hardware.

(25) Fill compressor crankcase with oil (approximately 7/8 qt.).

(26) Install discharge and suction valves into cylinder head and attach lines and fitting. Torque valves as noted in table 5-4.

(27) Attach air filter to compressor.

5-7. Gum Bath.

a. Removal.

(1) Remove electric power to gum bath by opening circuit breaker to gum bath.

WARNING

Be sure gum bath has had time to cool before performing any maintenance. Steam temperature as high as 600 degrees F (279.9 degrees C) can be obtained in this unit.

(2) Remove power to high and low pressure steam boilers.

(3) Open drain valve (fig. 5-27) to clear overhead pipes of any steam or water.

(4) Remove all five gooseneck tubes located on top of gum bath.

(5) Open union and compression fitting above gum bath (fig. 5-29).

(6) Carefully remove thermoregulator lines going to high pressure boiler control unit and to pyrometer.

CAUTION

Be sure not to kink or make a sharp bend on these lines, kinks or sharp bends will destroy them for future use.

(7) Remove contents and drawer under gum bath, (fig. 5-28) then remove attaching bolts, washers and nuts securing gum bath to countertop.

NOTE

If the gum bath is to be removed from the countertop two people will be required to handle it due to its weight, approximately 160 lbs (71 kg).

(8) Remove any water that might be in gum bath, then turn both on its side to gain access to switches, relay or heaters. Be sure to tag all wires before removal. Refer to figure 5-30, schematic diagram as an aid to troubleshooting.

b. Installation. Installation is basically the reverse of removal. 5-8. Vacuum Pump.

a. Cleaning Filter. The vacuum pump is equipped with an air filter screen. It is located below the pump intake port and acts as a trap for solids, which can cause damage to the pump. Unless the screen has been damaged, the filter may be removed and cleaned as follows.

(1) Turn off power to the pump.

(2) Remove the intake cover.

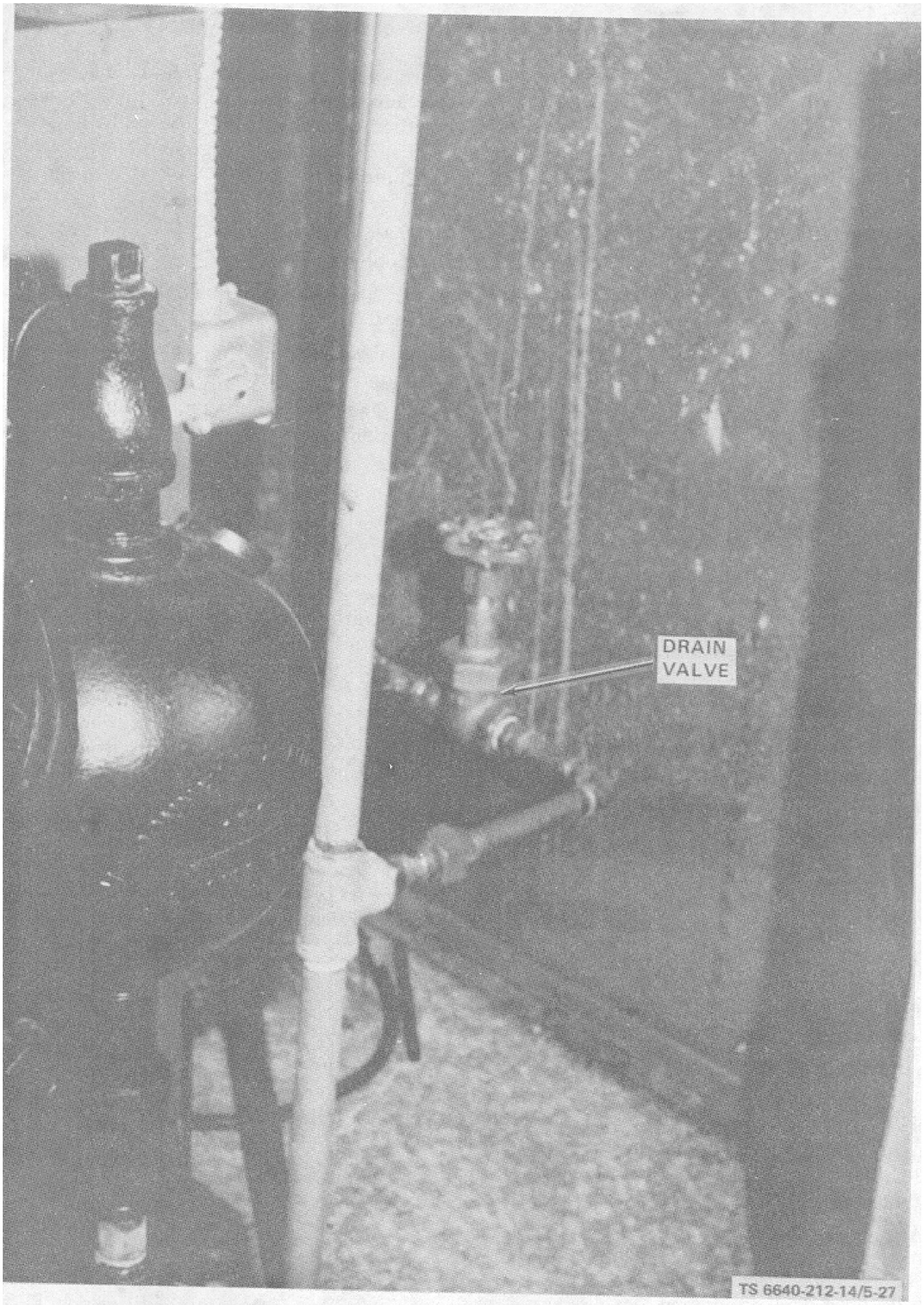
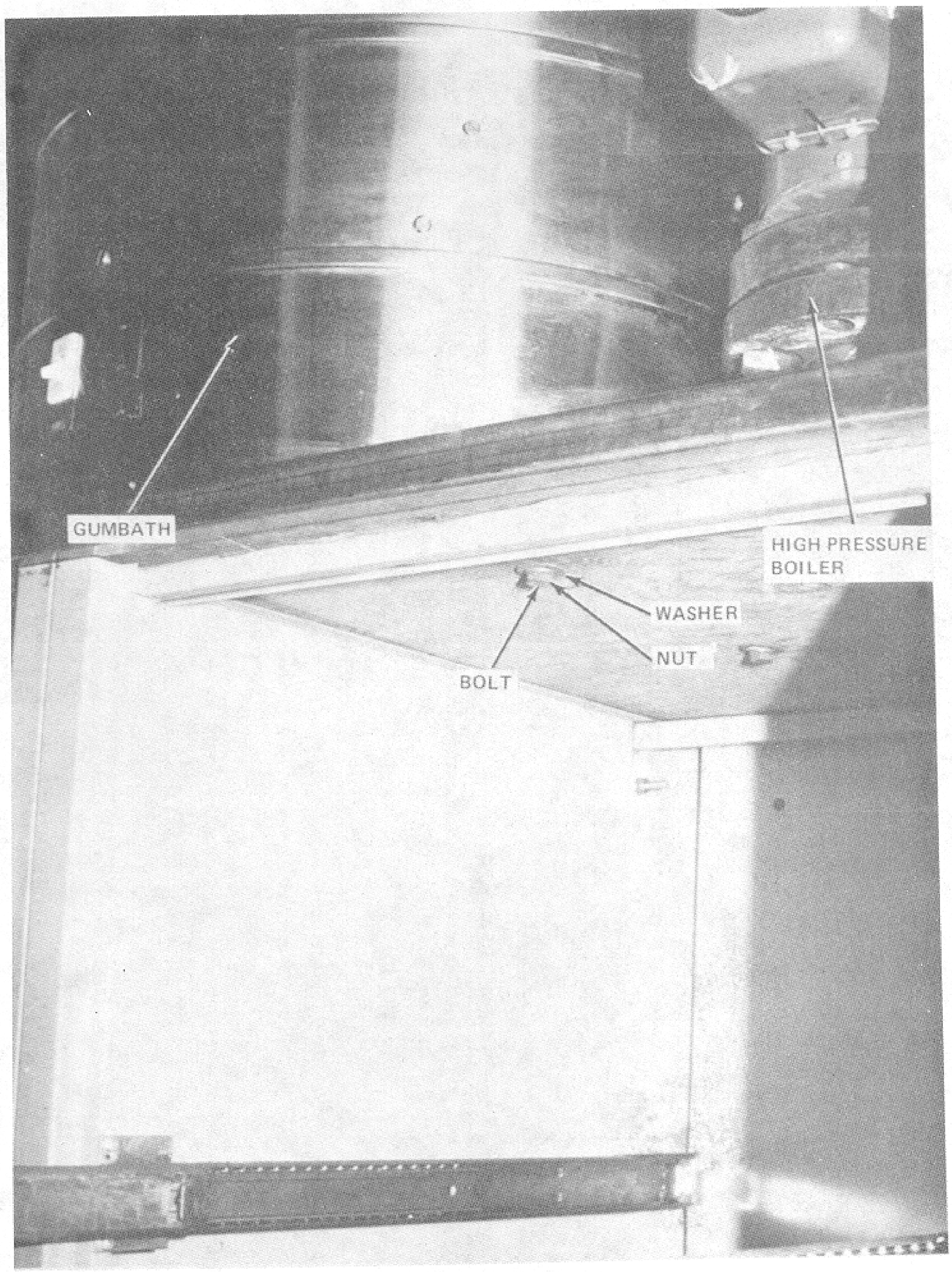


Figure 5-27. Drain Valve for Gum Bath Overload Piping



TS 6640-212-14/5-28

Figure 5-28. Gum Bath Removal Procedure

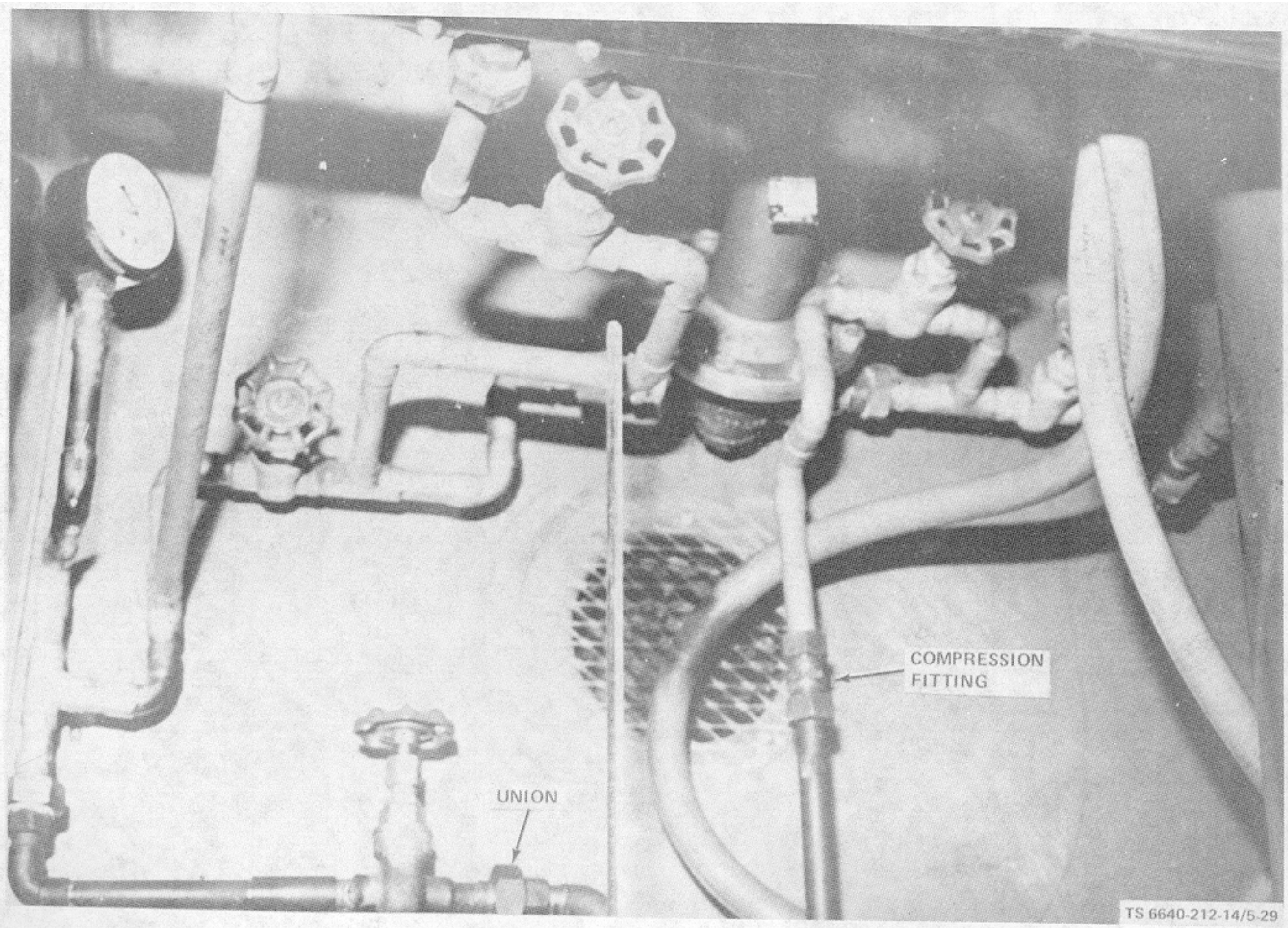


Figure 5-29. Gum Bath Removal, Overhead Piping

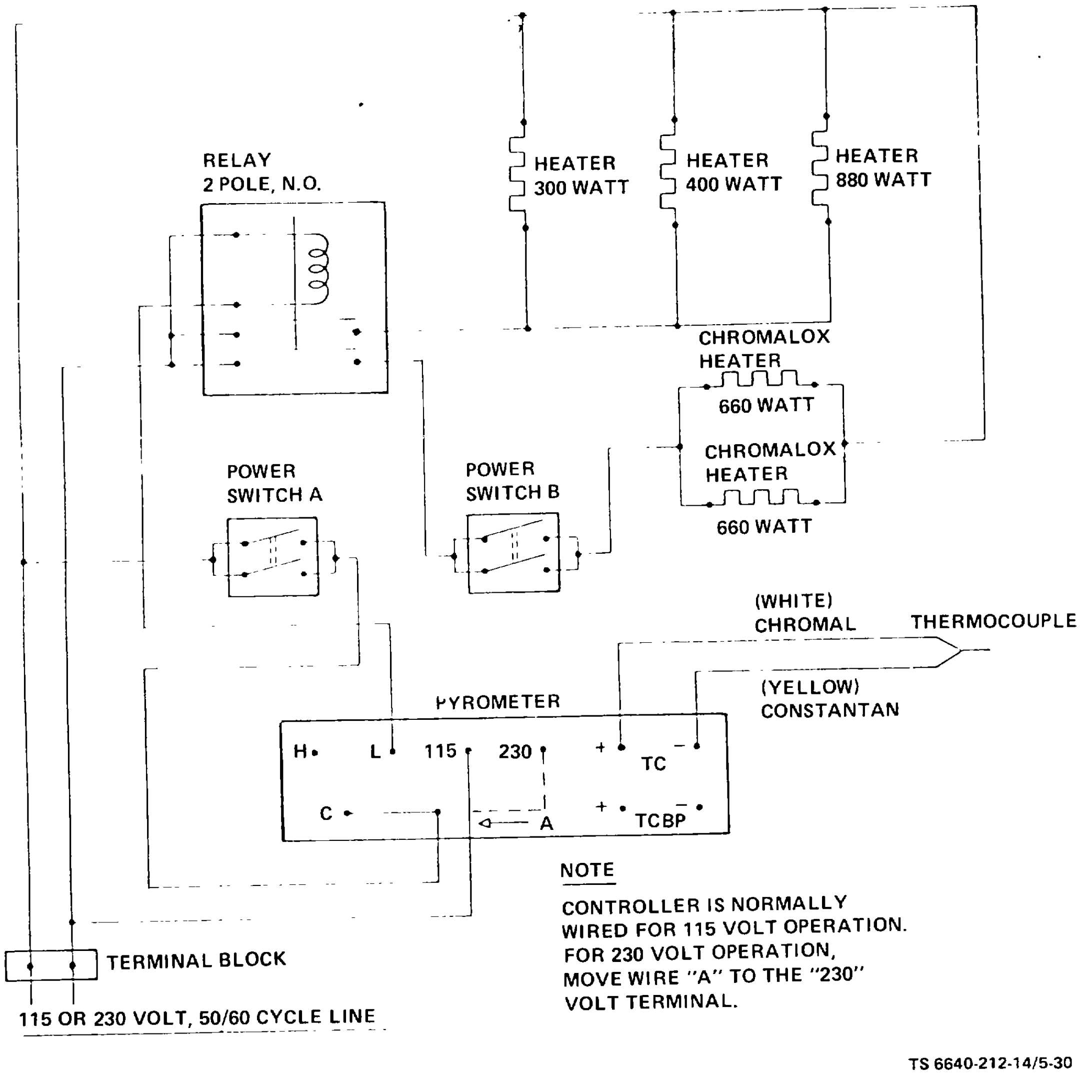


Figure 5-30. Gum Bath, Schematic Diagram

(3) Lift out air filter.

(4) Tap filter on clean surface to remove solid particles. If further cleaning is required, rinse filter thoroughly in clean acetone followed by a rinse in clean alcohol and then a rinse in distilled water. Dry in stream of hot, dry air.

b. Installing Filter.

(1) Install cleaned or new filter in intake area.

(2) Use a new intake cover gasket and coat both sides with varnish.

(3) When varnish is tacky, mount gasket in position on pump casting.

(4) Replace intake cover and tighten screws evenly.

(5) Fill pump with new Duo-Seal oil. Check level after running pump for a few minutes.

c. Vacuum Pump Motor.

(1) Removal.

(a) Loosen motor attaching hardware on base of pump.

(b) Remove electrical power to pump, then remove and tag wiring to motor.

(c) Remove belt between pump and motor.

(2) Motor Testing. Use standard shop practices to test motor. Refer to the following data for motor facts:

Motor Data:
Horsepower- 1/2 HP
RPM - 1725
Motor Pulley - 3 inch diameter
Motor Pulley - 1/2 inch bore
Power Requirement - 115 Vac, 60 Hz

d. V-Belt Removal and Replacement.

(1 Loosen motor mounting bolts and slide motor toward pump, remove V-belt.

(2) To replace V-belt place belt on motor pulley and pump pulley and slide motor away from pump and tighten motor mounting bolts.

(3) Check belt tension at the middle of the belt span with a firm downward pressure, deflection of 1/2 to 3/4 inch is correct.

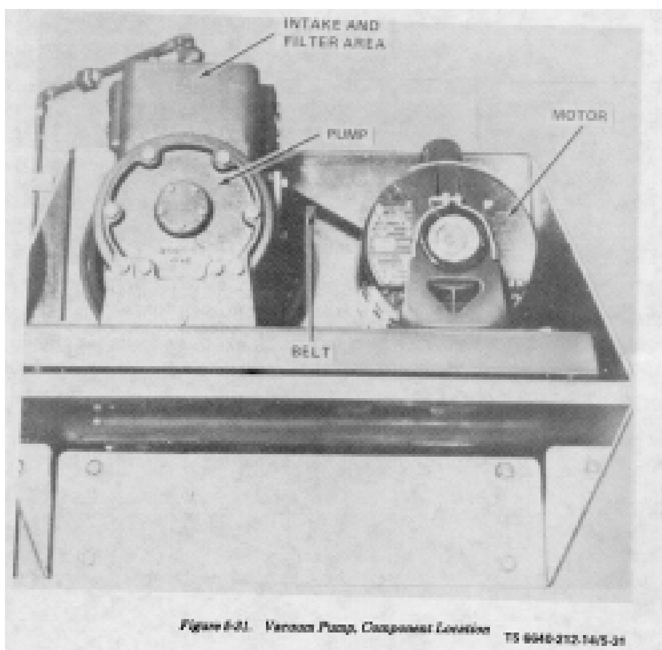


Figure 5-31. Vacuum Pump, Component Location TS 6640-212-14/5-31

NOTE

If the belt is too tight, it will cause excessive wear on the pump. If it is too loose, it will slip, reducing the pump efficiency and cause excessive belt wear.

5-9. Distillation Test Apparatus.

a. Repair of the distillation test apparatus is limited to switch, auto transformer, heater elements and glass replacement.

(1) To gain access to components located in the bottom inside area of the apparatus, the unit must be empty of any water, and power disconnected.

(2) Remove drawers that are directly under apparatus and counter top (fig. 5-32).

(3) Turn apparatus on its side with bottom facing forward, and proceed with the following steps for removal of items as follows:

(a) Power Switch. Press spring clips on sides of switch and push out. Tag wires as to location then remove from switch.

(b) Auto Transformer. Remove knob attached to auto transformer shaft by loosening setscrew in know and removing. Remove attaching nut on transformer shaft. Push shaft and auto transformer into center of unit until shaft is clear of housing. Remove and tag wiring from auto transformer for ease of assembly.

(c) Observation Window. Remove four attaching screws, washers and nuts, then remove window ring and glass (fig. 5-32).

(d) Heater Board. Carefully lift board out of apparatus and turn it on its side, remove heavy leads which are secured to under side of heater board with nuts.

b. Assembly. Assembly is basically the reverse of disassembly. Refer to schematic diagram (fig. 5-33) for any wiring data required.

5-10. Hot Plate.

a. Disassembly.

(1) Turn hot plate over and remove inspection cover and bottom shell by removing attaching screws (fig. 5-34). With hot plate power cord removed from outlet check line cord, and heater elements for continuity using multimeter supplied with laboratory.

(2) Repair or replace any defective parts found during disassembly.

CAUTION

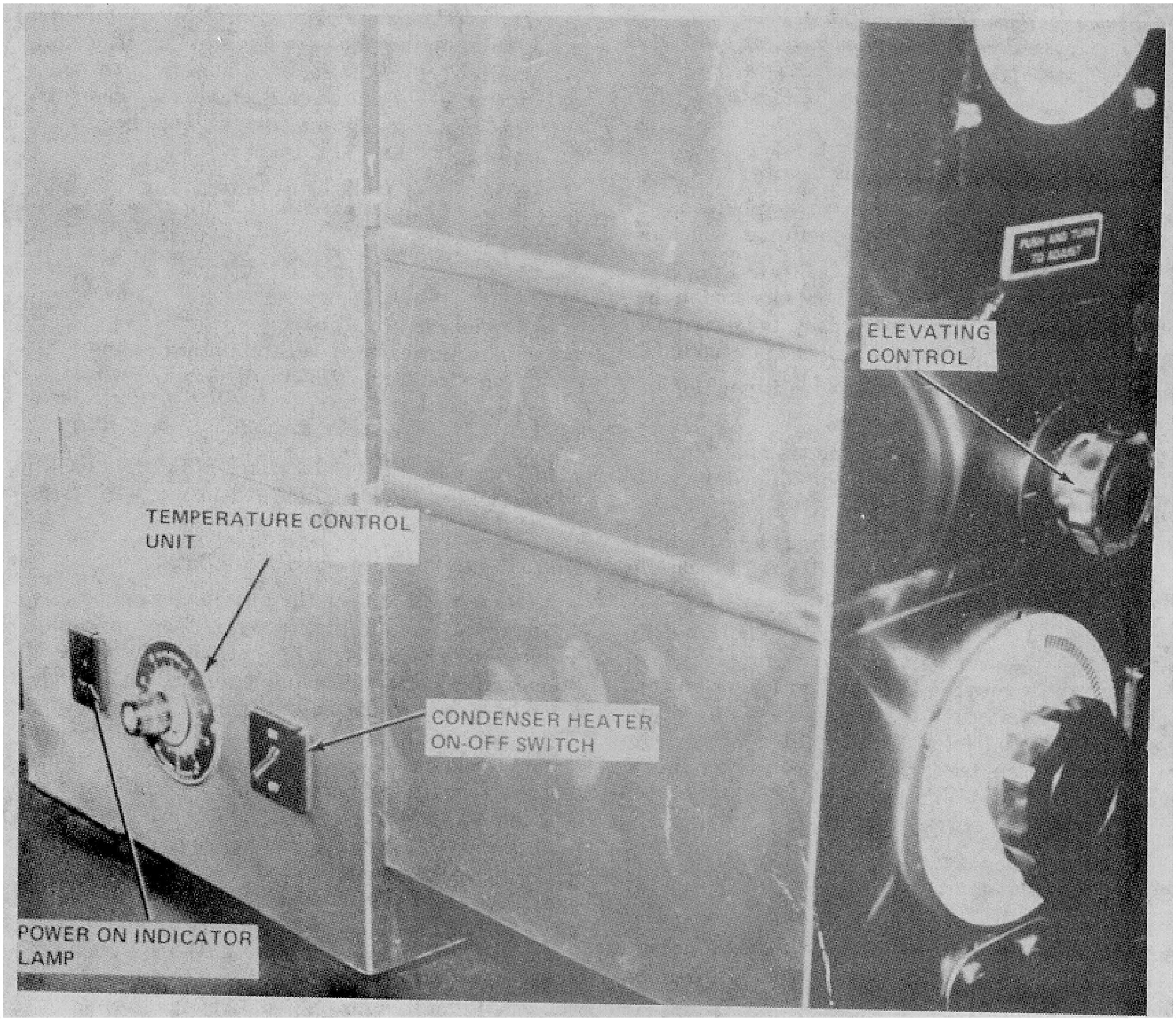
Do not replace high temperature wire used in power cord with standard extension wire. Intense heat will short out wiring.

b. Assembly of the hot plate is the reverse of disassembly, refer to figure 5-35 for wiring information on the hot plate.

5-11. Reid Vapor Pressure Bomb Bath.

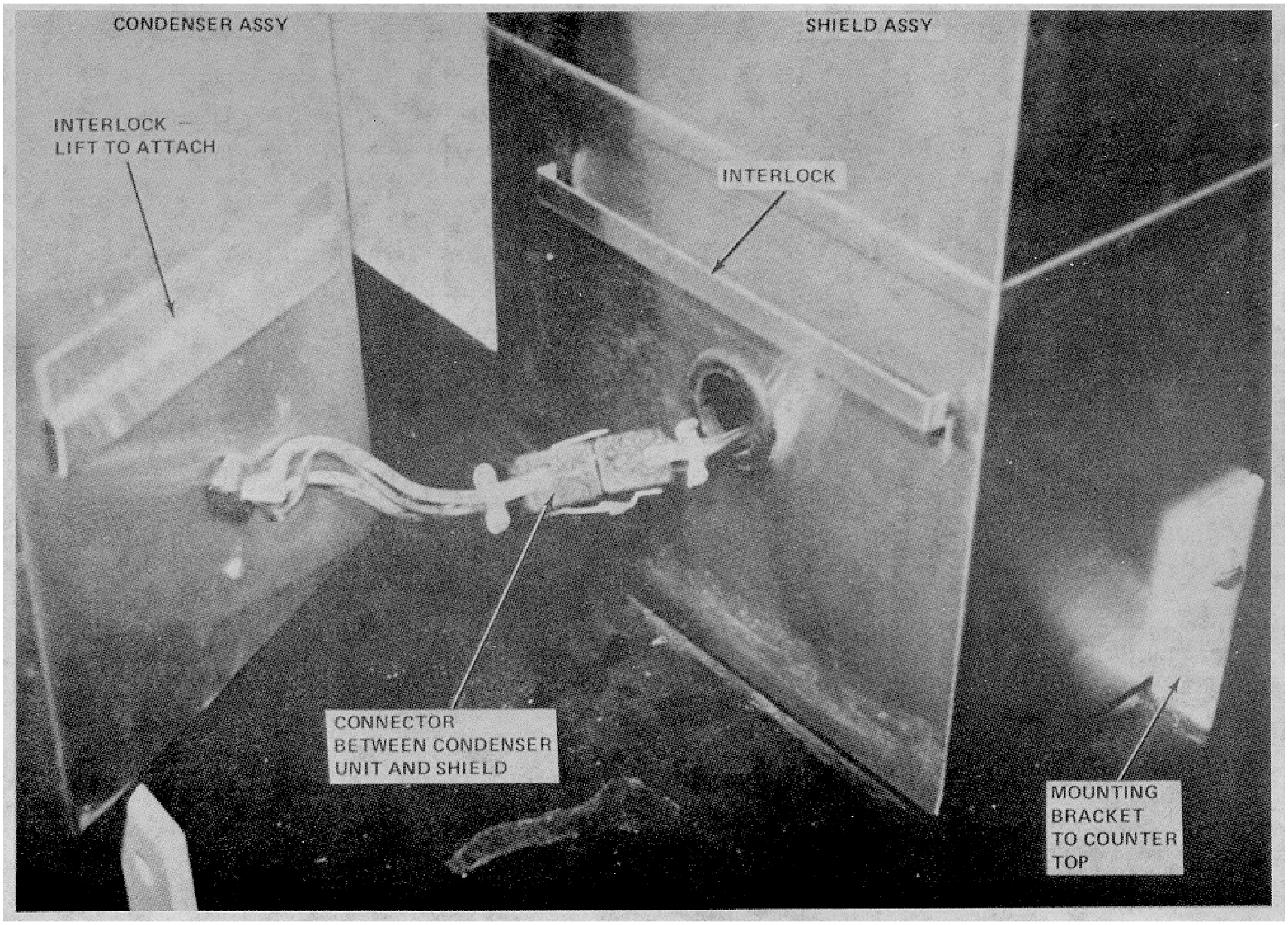
a. Repair. To replace the heater, disconnect the power cord and drain the bath. Remove clamp holding the heater to the bottom of the bath. Remove the terminal canopy and cap and wire from both legs of the heater. Remove the mounting block and heater from the bath. Pull the heater from the mounting block. Using the old heater as a pattern form the new heater and install by reversing the above procedure. If the bath is equipped with a removable control panel, remove the front panel screws and pull out the control chassis to gain access to the electrical system. On older units not equipped with removable control panel it will be necessary to completely drain the bath and turn the entire bath on its side to service the electric system. Refer to figure 5-36 for wiring information.

b. Troubleshooting. Refer to table 5-5 for troubleshooting procedures on the Reid vapor pressure bomb bath.



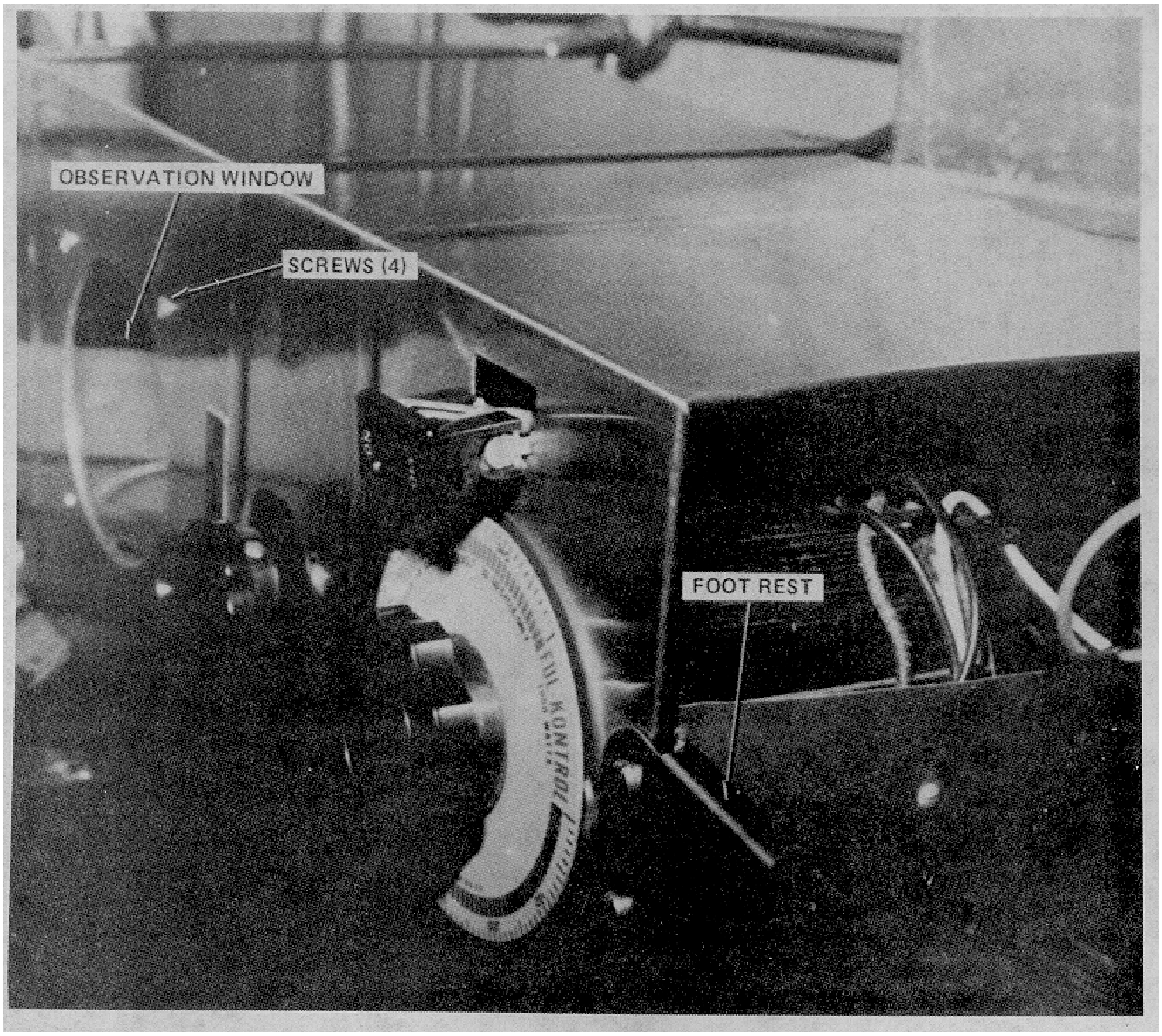
TS 6640-212-14/5-32 ①

Figure 5-32. Distillation Test Apparatus, Disassembly (Sheet 1 of 6)



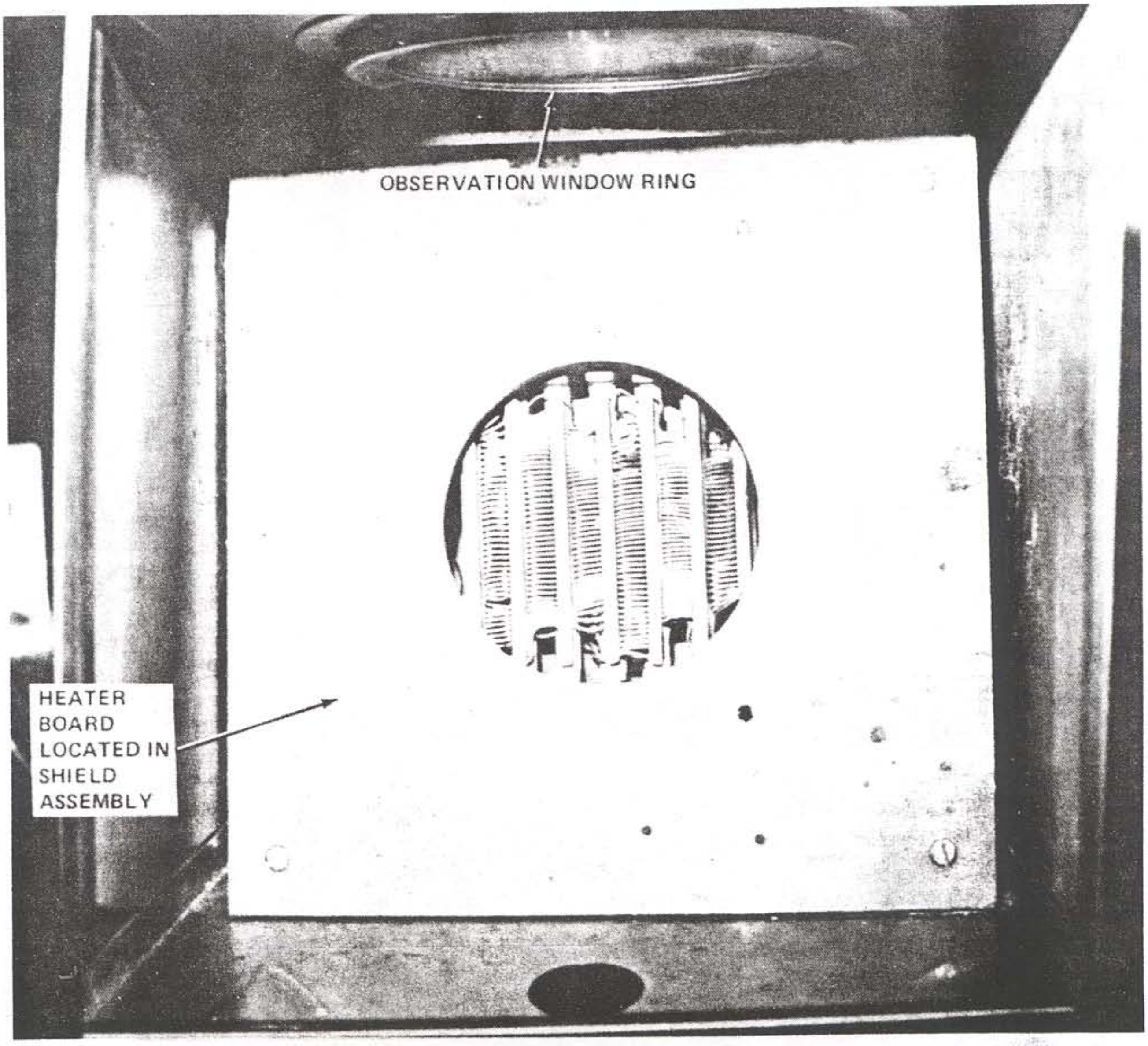
TS 6640-212-14/5-32 ②

Figure 5-32. Distillation Test Apparatus, Disassembly (Sheet 1 of 6)



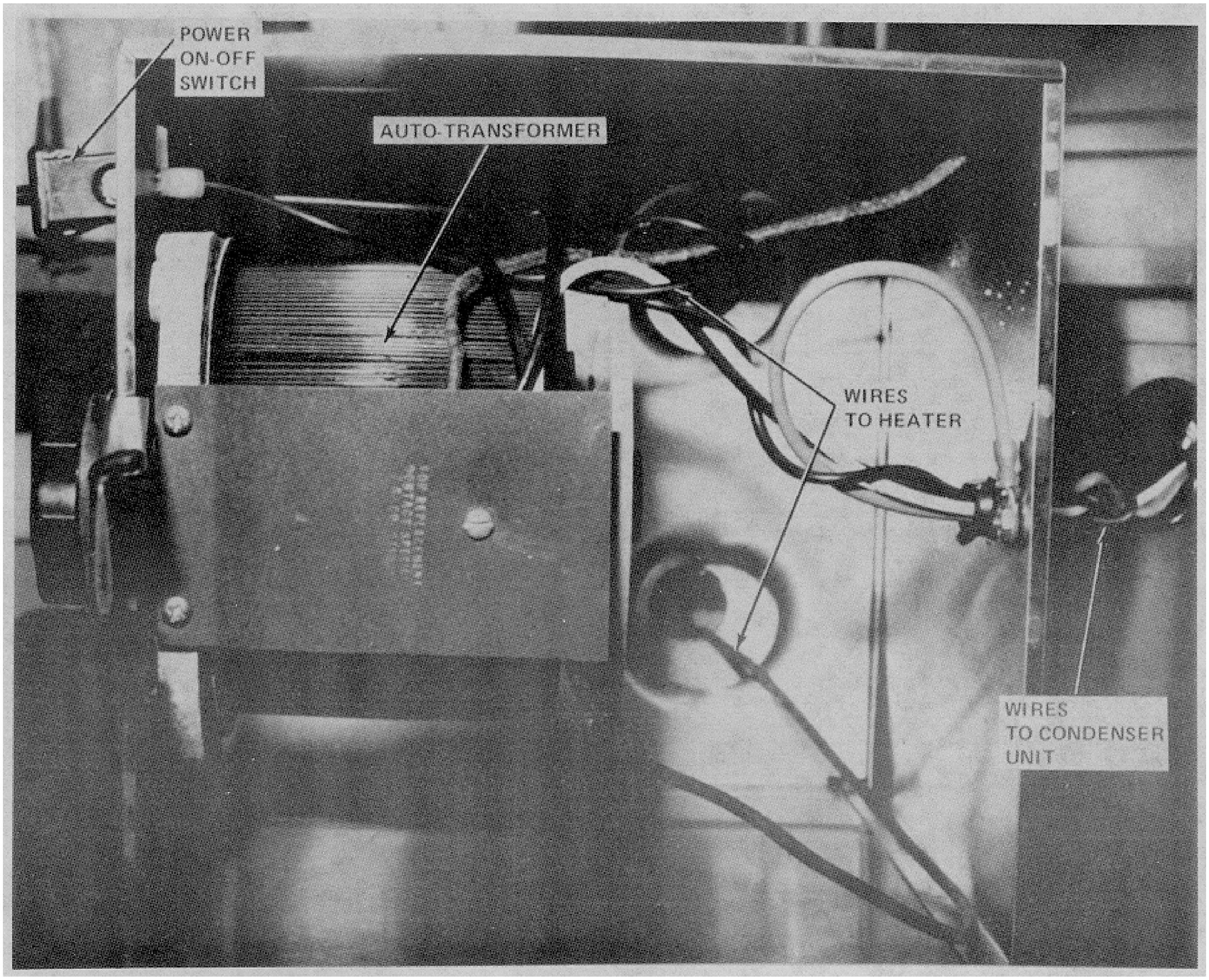
TS 6640-212-14/5-32 ③

Figure 5-32. Distillation Test Apparatus Disassembly(Sheet 3 of 6)



TS 6640-212-14/5-32 (4)

Figure 5-32. Distillation Test Apparatus, Disassembly (Sheet 4 of 6)



TS 6640-212-14/5-32 ⑤

Figure 5-32. Distillation Test Apparatus Disassembly (Sheet 5 of 6)

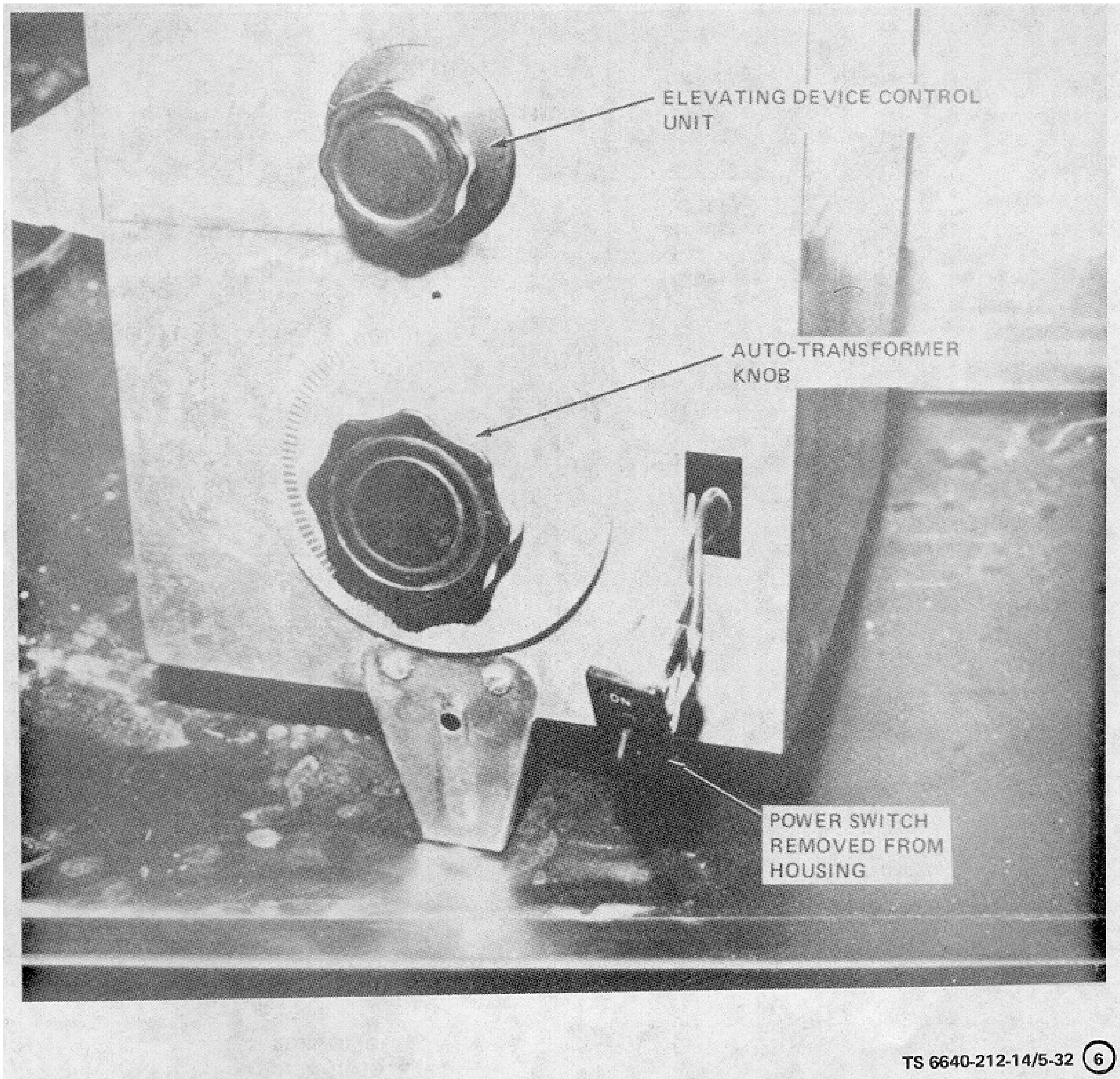
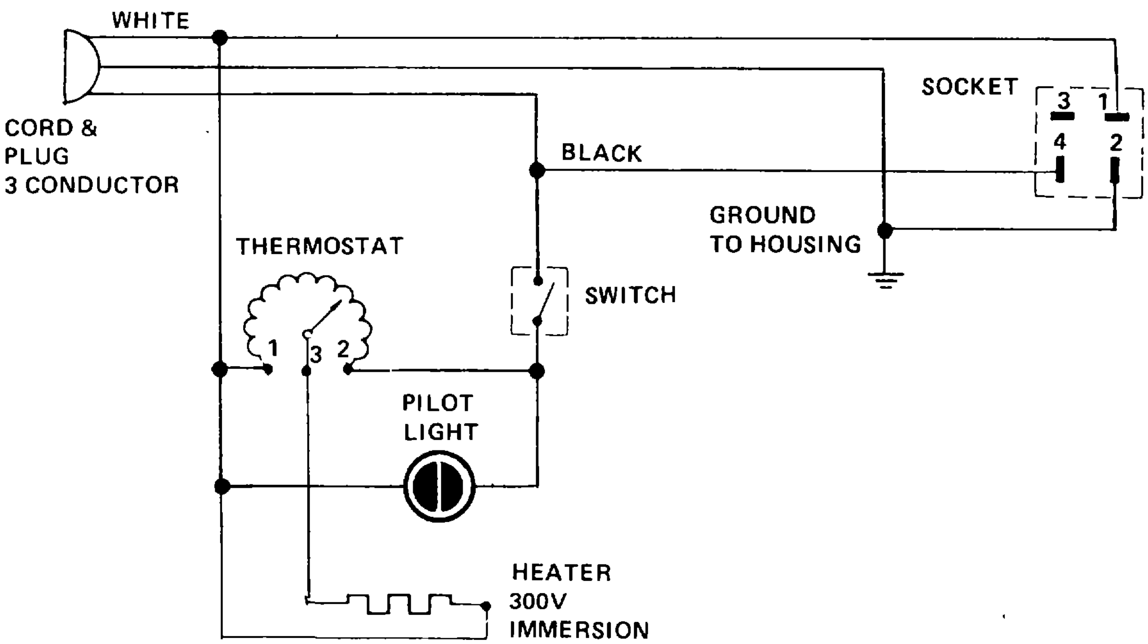
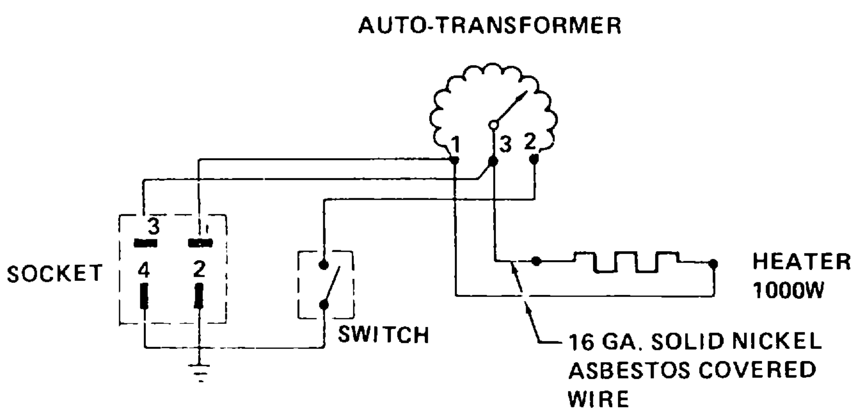


Figure 5-32. Distillation Test Apparatus, Disassembly (Sheet 6 of 6)



CONDENSER SCHEMATIC DIAGRAM



SHIELD SCHEMATIC DIAGRAM

SHIELD SCHEMATIC DIAGRAM

TS 6640-212-14/5-33

Figure 5-33. Distillation Test Apparatus, Schematic Diagram

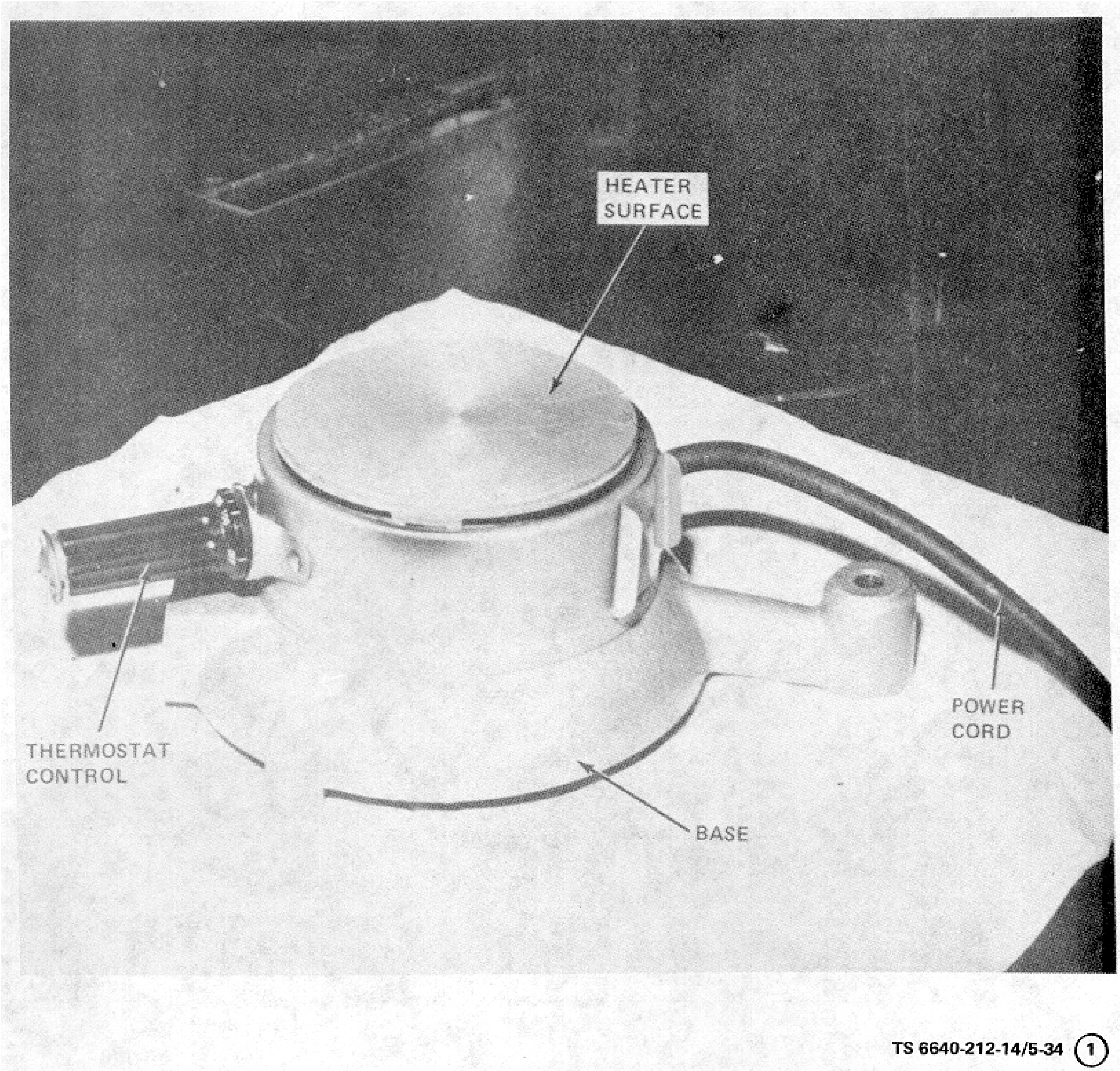


Figure 5-34. Hot Plate Disassembly (Sheet 1 of 2)

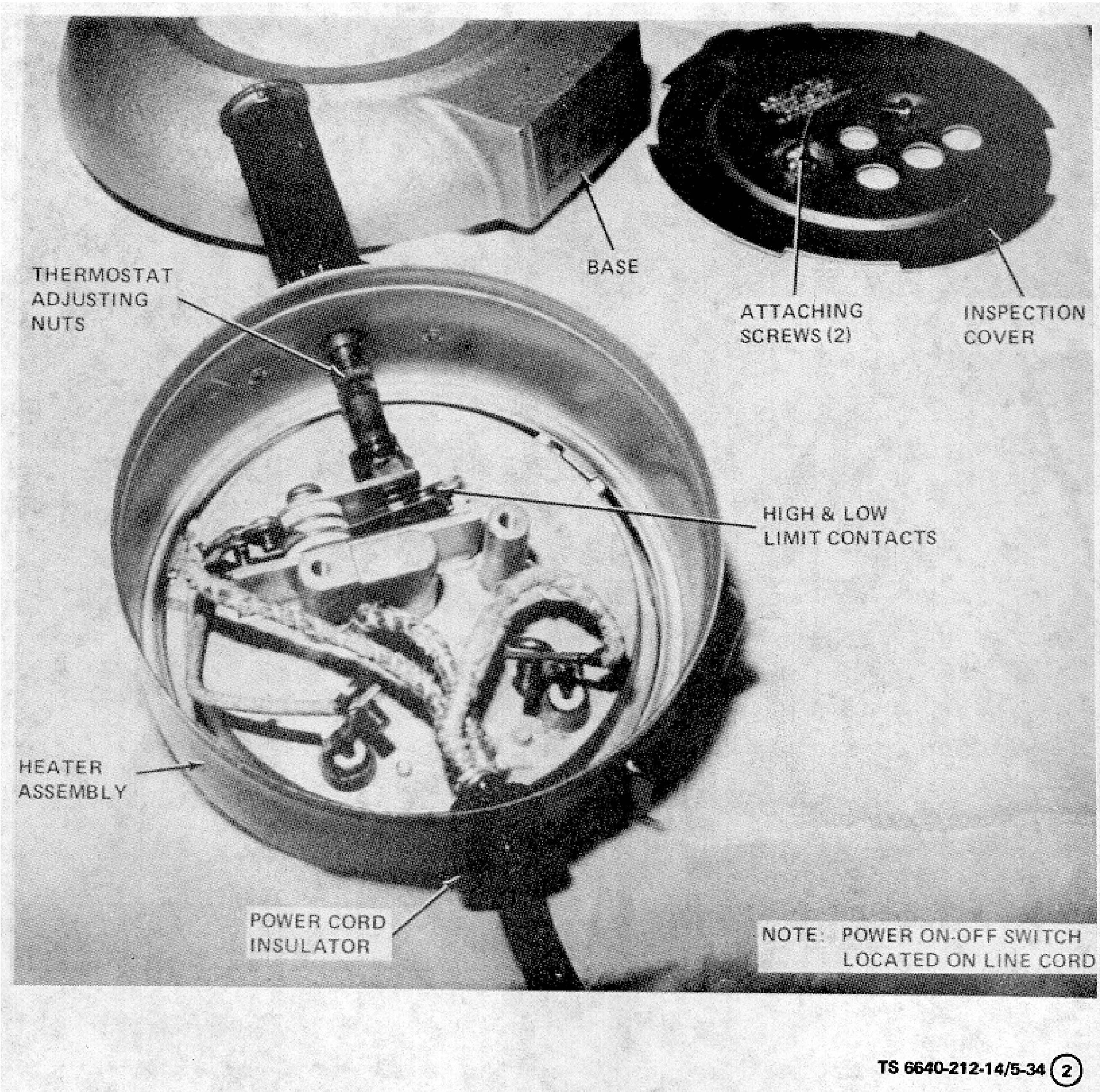


Figure 5-34. Hot Plate Disassembly (Sheet 2 of 2)

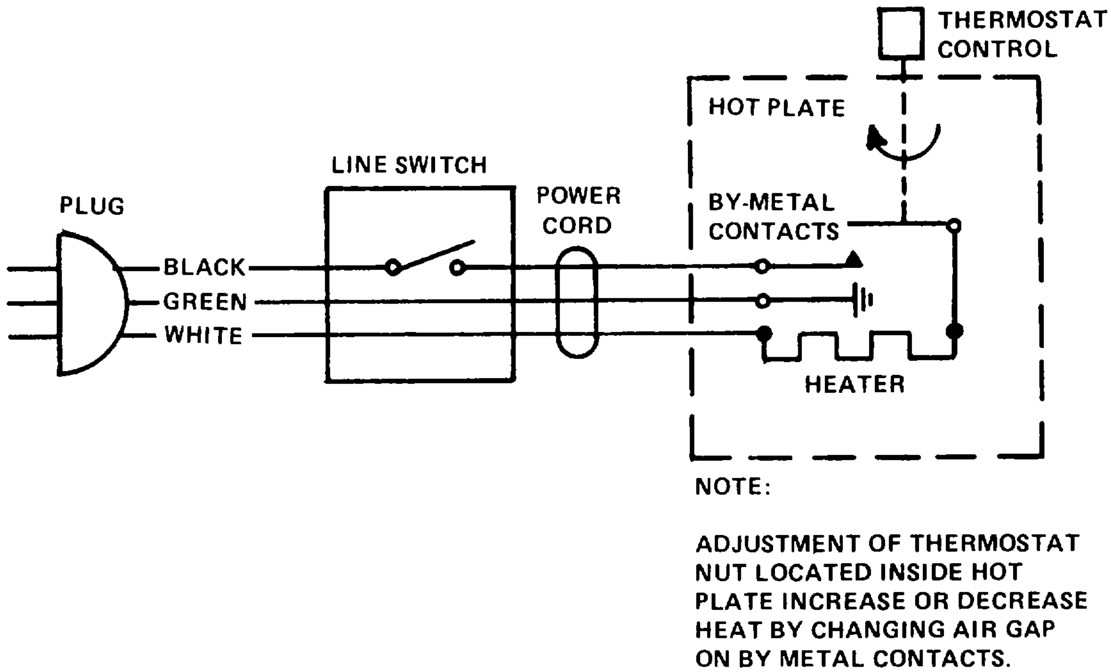


Figure 5-35. Hot Plate, Schematic Diagram

Table 5-5. Troubleshooting Chart for Reid Vapor Pressure Bomb Bath

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

1. NOT HEATING, MOTOR NOT OPERATING.

a. Be sure plug is in outlet tightly and line switch is on.

b. Check line voltage at line terminals. If zero volt reading is obtained, failure of cord, plug or switch is apparent. Check and repair or replace as necessary.

c. If the line voltage is measured, the cord, plug and switch are working, check voltage at the load terminals. If no voltage, check the thermoregulator to be sure no break exists in the mercury columns. If this is not the to check all terminals and other connections for tightness.

d. If trouble is not resolved, check voltage across transformer, across relay coils and resistors.

e. If problem is still unsolved check for possible burned out motor and heater at the same time.

2. NOT HEATING, STIRRER OPERATES.

a. Check thermoregular and electronic relay to be sure no break exists in the mercury columns, check all terminals and other connections for tightness. If these check out, inspect heater terminals. If no continuity, heater is burned out. Check for low line voltage.

3. HEATING, BUT NO TEMPERATURE CONTROL.

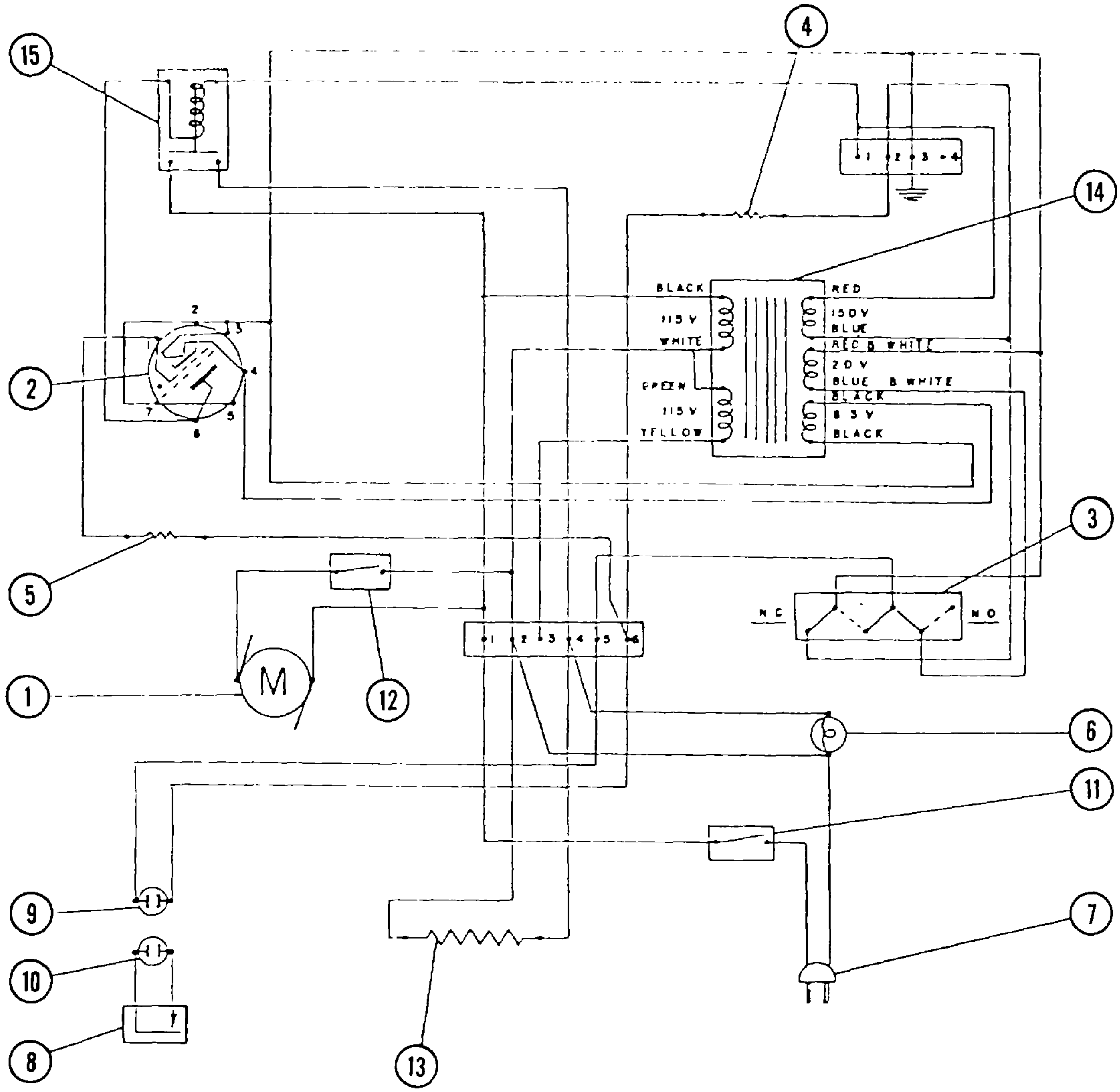
a. Check if thermoregulator or relay has failed. Also check for bad contacts at thermoregulator plug or broken wire lead between thermoregulator and chassis.

Table 5-5. Troubleshooting Chart for Reid Vapor Pressure Bomb Bath - Continued

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

4. HEATING, BUT NOT STIRRING.

Be sure stirrer switch is on. Check stirrer cord, switch and motor for voltage drop.



Legend for figure 5-36:

1. Stirrer motor
2. Electronic tube 2D21
3. Switch
4. Resistor, 100K ohms, 1/2 watt
5. Resistor, 1 Meg, 1/2 watt
6. Pilot light, 120v
7. Plug
8. Thermoregulator
9. Receptacle thermoregulator
10. Plug, male
11. Switch, line
12. Switch, motor
13. Heater, 120v, 500 watts
14. Transformer, power
15. Relay, mercury, 120v

Figure 5-36. Reid Vapor Pressure Bomb Bath, Schematic Diagram

APPENDIX A
REFERENCES

A-1. Army Regulations (AR).

310-25	Dictionary of United States Army Terms.
310-50	Authorized Abbreviations and Brevity Codes.
420-90	Fire Prevention and Protection.

A-2. Field Manuals (FM).

21-5	Military Training Management.
21-6	Techniques of Military Instruction.
21-30	Military Symbols.
10-70	Inspecting and Testing Petroleum Products.

A-3. Technical Manuals (TM).

3-250	Storage, Shipment, Handling, and Disposal of Chemical Agents and Hazardous Chemicals.
5-687	Repairs and Utilities; Fire Protection Equipment and Appliances; Inspections, Operations, and Preventive Maintenance.
5-4120-295-15	Operator's, Organizational, DS, GS, and Depot Maintenance Manual: Air Conditioner.
5-6630-216-12	Testing Kit, Petroleum, Fuel Contamination, Portable.
9-207	Operation and Maintenance of Ordnance Material in Cold Weather.
9-2330-271-14	Operator's, Organizational, Direct and General Support Maintenance Manual (Including Repair Parts and Special Tool Lists) for Semi-Trailer, Van, Electronic.
10-110	Petroleum Handling Equipment and Operations.
10-1165	Significance of ASTM Tests for Petroleum Products.
10-1166	Book of ASTM Standards--Part 17: Petroleum Products--Fuels; Solvents; Engine Tests; Burner Fuel Oils; Lubricating Oils; Cutting Oils; Lubricating Greases; Hydraulic Fluids.
10-1167	ASTM Standards, Part 18: Petroleum Products--Measurement and Sampling Liquefied Petroleum Gases, Light Hydrocarbons, Plant Spray Oils, Aerospace Materials, Sulforates, Crude Petroleum Wax, and Graphite.
38-230-1	Preservation, Packaging, and Packing of Military Supplies and Equipment (Volume 1).

A-4. Technical Bulletins (TB).

9-5200-201-50	Calibration Procedure for Weights (mass) (General).
9-6625-1250-50	Calibration Procedure for Volt-Ohm Millimeter, Triplett Model 310 and Multimeter, Weston Model 980, Mark II.
9-6630-201-50	Calibration Procedure for Hydrometer Kit (7907391).
9-6680-286-50	Calibration Procedure For: Tachometer, Mechanical, Hand Held, Centrifugal (6680-171-4584).
9-6685-319-50	Calibration Procedure For: Dial Indicating Pressure Gages (General).
9-6685-314-50	Calibration Procedure for Self-Indicating Thermometers (Celsius and Fahrenheit).
9-6685-324-50	Calibration Procedure for Thermocouple Indicators (General).
750-236	Calibration Requirements for the Maintenance of Army Materiel.
750-240	Maintenance and Repair Procedures for S-141G, S144/G, 2-250/G, and S-318/G Type Shelters.

A-5. Supply Catalog (SC).

6640-97-CL-E02	Sets, Kits, and Outfits Components List: Laboratory, Petroleum, Semitrailer Mounted.

A-6. **Supply Bulletin (SB).**

708-42Federal Supply Code for Manufacturers--United States and Canada--Code to Name (Cataloging Handbook H4-2).

A-7. DA Pamphlets (DA Pam).

108-1	Index of Army Motion Pictures and Related Audio Visual Aids.
310-series	Military Publications Indexes (as applicable).

A-8. Handbook.

MIL-HDBK-200E	Quality Surveillance Handbook for Fuels and Lubricants.

A-9. Miscellaneous Publications.

USAF, AFAPL-TR-70-63	Evaluation of the Aqua-Glo Series II Free Water Detector.
Pamphlet 10A	National Fire Protection Association (NFPA) 60 Batterymarch Street, Boston, Massachusetts 02110.

APPENDIX B
COMPONENTS OF END ITEM

B-1. Scope. This appendix lists components of end item and basic issue items for the petroleum laboratory to help inventory items required for safe and efficient operation.

B-2. General. Components of End Item List is divided into the following sections.

a. Section II, Components of the End Item. These items, when assembled, comprise the Petroleum Laboratory and must accompany it whenever it is transferred or turned in. Illustrations will help you identify these items.

b. Section III, Basic** Issue **Items. A list of items which accompany the petroleum laboratory and are required by the operator/crew for installation, operation, or maintenance.

B-3. Explanation of Columns.

a. Illustration. This column is divided as follows:

*(1)*Figure Number. Indicates the figure number of the illustration on which the item is shown (if applicable).

(2) Item Number. The number used to identify item called out in the illustration.

b. National Stock Number (NSN). Indicates the National Stock Number assigned to the item and which will be used for requisition.

c. Part Number *(P/N).* Indicates the primary number used by the manufacturer, which controls the design and characteristics of the item by means of its engineering drawings, specifications, standards, and inspection requirements to identify an item or range of items.

d. Description*.* Indicates the Federal item name and, if required, a minimum description to identify the item.

e. Location*.* The physical location of each item listed is given in this column. The lists are designed to inventory all items in one area of the major item before moving on to an adjacent area.

f. Usable on Code*.* Usable on Codes are not applicable.

g. Quantity Required (Qty Reqd). This column lists the quantity of each item required for a complete major team.

h. Quantity*.* This column is left blank for use during inventory. Under the Rcv'd column, list the quantity actually received on major item. The Date columns are for use when you inventory the major item at a later date such as for shipment to another site.

i. Those Federal manufacturers codes and part numbers suffixed with (*) are not issued with the laboratory, but are listed for Reference Purposes Only**.**

Section II. COMPONENTS OF END ITEM

(1) ILLUSTRATION (a) FIGURE NO	(b) ITEM NO	(2) NATIONAL STOCK NO.	(3) PART NO. & FSCM	(4) DESCRIPTION	(5) LOCATION	(6) USABLE CODE	(7) ON REQD	(8) QUANTITY QTY RCVD	DATE	DATE	DATE
B-1	1	886640-00-986-5033	(96906) MS36217-3	Cabinet, Desiccating (u/o ASTM 2276-730)	Right Front Section of Lab	None	1				
B-i	2	6670-00-494-8152	(53088) 2400-2463	Balance, Analytical w/case cu/o ASTM 2276-73	Right Front Section of Lab	None	1				
			(53088) 72-60-090-B (*)	Bulb, Light, 6 Volt, 5 Watt		None	6				
			(53088) 69-05-150-2 (*)	Bulb, Signal, Series. None1 2400							
B-1	3		(53088) 69-00-070-3 (4)	Door, Glass,	Right	None	1				
B-1	6		(53088) 69-00-060-6 (*)	Door, Glass,	Left	None	1				
B-1	**4**		(53088) 69-05-070-1 (*)	Plate, Glass Weighing Chamber		None	1				
			(53088) 69-01-100-1 (*)	Knob, Control, Micrometer		None	1				
			(53088) 89-01-190-0 (*)	Knob, Control Zero		None	1				
B-15		6670-00-494-8153	(80740)78-902	Support, Vibration Damping, Analytical Balance	Right Front Section of Lab	None	1				
		6670-00-456-9853	(80740) 78-903	Rod, Support, Vibration Damping	Right Front Section of Lab	None	1				
		6670-00-489-8110	(53088) 726002	Ring, Tare, Analytical Balance	Right Front Section of Lab	None	1				
		6670-00-436-9860	(53088) 726005	Scoop, Balance, Laboratory	Right Front Section of Lab	None	1				
B-1	7	4210-00-555-8837	NPN	Extinguisher, Fire 2.75 lb	See Basic Issue Items List		4				
		4210-00-708-0031	NPN (*)	Charged Cylinder (Replacement)		None	4				
B-1	8	88630-00-251-2118	(48619) 74731	Distillation Test Apparatus, Left Hand (cu/o ASTM D'86)	Right Front Section of Lab	None	1				
			(48819) 225095 (*)	Auto-Transformer VT8N, 120 v, 60 Hz		None	1				

Section II. COMPONENTS OF END ITEM - Continued

(1) ILLUSTRATION (a) FIGURE NO	(1) ILLUSTRATION (b) ITEM NO	(2) NATIONAL STOCK NO.	(3) PART NO. & FSCM	(4) DESCRIPTION	(5) LOCATION	(6) USABLE CODE	(7) ON REQD	(8) QUANTITY QTY RCVD	DATE	DATE	DATE
			(48619) 225087 (*)	Brush, Auto-Transformer		None	1				
			(48619) 523549 (*)	Heater, Lo-cap, 120 v, 100 w		None	1				
B-1	9	6630-00-359-9772	(48619) 74730	Distillation Test Apparatus, Right Hand (u/o ASTM D86)	Right Front Section of Lab	None	1				
			(48619) 225095 (*)	Auto-Transformer, VTBN, 120 v, 60 Hz		None	1				
			(48619) 225087 (*)	Brush, Auto-Transformer		None	1				
			(48619) 223459 (*)	Heater, Lo-cap, 120v 1,000 w		None	1				
B-1	10	4820-00-957-5641	(22527) 15-529	Valve, Regulating, Demineralizer Water Pressure	Right Front Section of Lab	None	1				
B-1	11	6100-729-486	(05852) 0802	cartridge, Water Demineralizer, 1,300 Grain Cap of Calcium Carbonate	Right Front Section of Lab	None	1				
B-1	12	461000-222-8261	(06852) D8904	Cartridge, Water Demineralizer (Organ ic)	Right Front Section of Lab	None	1				
B-1	13	4610-06022-1882	(21519} 30-867-10	Bracket, Cartridge Water Demineralizer	Right Front Section of Lab	None	1				

Section II. COMPONENTS OF END ITEM - Continued

(1) ILLUSTRATION		(2) NATIONAL STOCK NO.	(3) PART NO. & FSCM	(4) DESCRIPTION	(5) LOCATION	(6) USABLE CODE	(7) ON REQD	(8) QUANTITY			
(a) FIGURE NO	(b) ITEM NO							QTY RCVD	DATE	DATE	DATE
B-2	1	4820-00-957-5639	(22527) 1-088	Regulator, Air Pressure, Diaphragm Type	Right Wall of Lab	None	1				
B-2	2	68885-00-842-4565	(39739) 301EA15WM	Manometer, 24 in., Wall Mounted, w/sc 4606 Duplex Scale (Hg/psl)	Right Wall of Lab	None	1				
B-2	3	4820-00-111-1142	(39739) 942K50	Valve, Check Manometer	On Top of Man-ometer	None	1				
B-2	4	66885-00-194-1699	(22527) 13-419-30A	Gauge, Reid Vapor Pressure Test (0-5 psi) (u/o ASTM D-323-72)	On Right Wall of Lab	None	2				
B-2	5	6685-00-194-1683	(22527) 13-419-30B	Gauge, Reid Vapor Pressure Test (0-15 psi) (u/o ASTM D-323-72)	On Right Wall of Lab	None	2				
B-2	6	6630-00-399-2964	(22627) 138-418-	Bomb, Reid Vapor Pressure Test	On Right Wall of Lab	None	4				

Section II. COMPONENTS OF END ITEM - Continued

(1) ILLUSTRATION (a) FIGURE NO	(b) ITEM NO	(2) NATIONAL STOCK NO.	(3) PART NO. & FSCM	(4) DESCRIPTION	(5) LOCATION	(6) USABLE CODE	(7) ON REQD	(8) QUANTITY QTY RCVD	DATE	DATE	DATE
B-3	1	6640-00-359-9814	(48619) 31000TF	Furnace, Muffle, 100 to 200 DEGF, 120 v, ac, 1500 w (u/o ASTM D-482-74 and ASTM D-2276-73)	On Left Side Counter Top	None	1				
B-3	2		(48619) J409A (*)	Pilot Light, 120 v		None	1				
B-3	3		(488619) J22705A (*)	Switch, Off/On		None	1				
			(48619) J480 (*)	Muffle Unit, 120 v		None	1				
			(48619)J481 (*)	Thermocouple		None	1				
B-3	4	6840-00-359-9880	(48619) 31477	Oven, Gravity Convection 110-120v 60 Hz, 650 w	On Left Side of Counter Top	None	1				
B-3	5		(48619) 240150 (*)	Switch, Line		None	1				
B-3	6		(48619) 234035 (*)	Pilot Light		None	1				
			(48819) 239091 (*)	Thermostat		None	1				

Section II. COMPONENTS OF END ITEM - Continued

(1) ILLUSTRATION		(2) NATIONAL STOCK NO.	(3) PART NO. & FSCM	(4) DESCRIPTION	(5) LOCATION	(6) USABLE CODE	(7) ON REQD	(8) QUANTITY			
(a) FIGURE NO	(b) ITEM NO							QTY RCVD	DATE	DATE	DATE
B-4	1	6630-00-404-2763	(48619) 13-619-100	Bath, Kinematic Viscosity (v/o ASTM D-445-74)	Left Front Section of Lab	None	2				
			(48619) 223259 (*)	Motor, 120 v, 60 Hz		None	1				
B-4	9		(48619) 234026 (*)	Pilot Light, 120/240 v		None	1				
B-4	7		(48619) 240119 (*)	Switch, Line, 120 v		None	1				
B-4	8		(48619) 240151 (*)	Switch, 5-Position, 120 v		None	1				
B-4			(48619) 62541 (*)	Regulator		None	1				
B-4	10		(48619) 287014 (*)	Jar, Pyrex		None	1				
B-4	2	6685-00-255-9507	(22527) 2-405	Barometer, Aneroid (u/o ASTM D-86)	On Left Front Wall	None	1				
B-4	3	8125-00-174-0852	(81349) MIIB-26701	Bottle, Polyethylene Round, 1 Gal., w/cap	On Left Front Wall	None	4				
B-4	4	6640-00-404-2748	(48619) 69402	Foot, Laboratory Frame	On Left Front Wall	None	2				
B-4	5	4110-01-093-5600	(90339) F4CSS-TS	Icemaking Machine	On Front Section of Wall	None	1				
			(90339) SCIM-16 (*)	Compressor		None	1				
			(90339) C052-82-83 (*)	Drier, Sporlan		None	1				
			(90339) (*)	Small Drier, Kenmore		None	1				
			(90339) VC85 (*)	Motor, Blower, Coil		None	1				
B-4	6	6695-00-496-9624	(21519)68-875	Thief, Oil, 40 in. lg. (u/o ASTM D-270)		None	2				

Section II INTEGRAL COMPONENTS OF END ITEM

(1) ILLUSTRATION (A) FIGURE NO.	(B) ITEM NO.	(2) NATIONAL STOCK NUMBER	(3) PART NO. & FSCM	(4) DESCRIPTION	(5) LOCATION	(6) USABLE ON CODE	(7) QTY REQD	(8) QUANTITY REV'D	DATE	DATE	DATE
B-5	1	6630-00-895-1259	(48619) 74801	Gum Bath, Bronze Block 5 Unit (u/o ASTM D-381)	Right of Fume Hood	None	1				
			(48619) 240119 (*)	Switch, Power, 120 v	None	1					
			(48619) 248133 (*)	Relay, 2 Pole, 120 v 60 Hz	None	1					
			(48619) 513560 (*)	Heater, Strip, 120 v 600 w	None	1					
			(48619) 247049 (*)	Heater, Ring, 120 v 300 w	None	1					
			(48619) 247051 (*)	Heater, Ring, 120 v 400 w	None	1					
			(48619) 247053 (*)	Heater, Ring, 120 v	None 880 w	1					
B-5	2	6680-00-456-9611	(48619) 74803	Regulator, Air/Steam For Use With Gum Bath (u/o ASTM D-381)	Inside Gum Bath Piping	None	1				
B-5	3	88680-00-063-4116	(91556) 3602	Meter, Flow Rate, (u/o ASTM D-381)	Above Gum Bath Piping	None	1				
B-5	4	6685-00-401-1423	(48619) 74802	Pyrometer, Indicating, 0 to 600 Deg. (u/o ASTM D-381)	Above Gum Bath	None	1				
			(48619) JA-0001 (A)	Indicator Assembly		None	1				
			(48619) 25-0008 (A)	Cell, Photo		None	1				
			(48619) 34-0002 (*)	Window, Glass		None	1				
B-5	5		(65586) CES-12-208-3 PN	Boiler, Steam, High Pressure (u/o ASTM D-323-72)	Right of Gum Bath	None	1				
			(65566) TM-215-120 v-1500 w (*)	Element, 120 v, 1500 w		None	1				
			(65586) AR5514 (*)	Thermostat, 120 v		None	1				
			(65586) 2-10048 (*)	Gasket		None	1				

Section II INTEGRAL COMPONENTS OF END ITEM-Continued

(1) ILLUSTRATION (A) FIGURE NO.	(B) ITEM NO.	(2) NATIONAL STOCK NUMBER	(3) PART NO. & FSCM	(4) DESCRIPTION	(5) LOCATION	(6) USABLE ON CODE	(7) QTY REQD	(8) QUANTITY REV'D	DATE	DATE	DATE
B-6	1	68830-00-985-7278	NPN	Propane 100 LB, Fed. Spec. BB-G-110A Type w/o Cylinder	Rear Com-partment	None	1				
B-6	1	8120-00-175-8569	NPN	Cylinder, Propane 100 LB Capacity	Rear Com-partment	None	1				
B-6	2		(06023) 2403C-9	Regulator, Fluid	Rear Pressure Com-partment	None	1				
B-6	3	6830-00-292-0129	NPN	Oxygen, Technical, w/Cylinder, NSN 8120-00-151-9758	Rear Com-partment	None	CY				
B-6	4	6685-00-641-3519	(03866) R64 (0305) Linde Type	Regulator, Fluid Pressure	Rear Com-partment	None	1				
B-6	5	8830-00-292-0142	NPN	Carbon Dioxide, Technical, w/Cylinder, B120-00-285-4723	Rear Com-partment	None	CY				
B-6	6	6640-00-585-1801	(73369) Model No. 2	Icemaking Machine 12 oz. Carbon Dioxide Disc	Rear Com-partment	None	1				
B-6	7	6545-00-922-1200	NPN	First Aid Kit, Mil. Spec. C-36033A, Size 1, c/o:	Rear Com-partment	None	1				
		6545-00-912-9920	NPN	Chest, Medical		None	1				
		6505-00-106-0875	NPN	Ammonia, Ampoules 1/3 cc, Fed. Spec. U-A 5003		None	1				
		6505-00-200-8183	NPN	Beuzalkonium Chloride Tincture, 2 cc, Mil. Spec. B 37451, Size 1		None	4				
		6510-00-200-3075	NPN	Compress, Gauze, Fed. Spec., DDD-C-570A, Size 2		None	1				
		6510-00-200-3080	NPN	Compress, Gauze, Fed. Spec., DDD-C-570A, Size 4		None	1				
		6510-00-200-3190	NPN	Sandage, Gauze, Fed. Spec., DD-B-61E		None	1				
		6510-00-201-1755	NPN	Bandage, Muslin Fed. Spec., DDD-B-85, Class 2		None	1				
		6510-00-597-7468	NPN	Bandage, Adhesive, Fed. Spec., DD-B-35		None	1				
		6530-00-663-1556	NPN	Pin, Safety, Fed. Spec., FF-P-00417A		None	1				
		6546-00-853-6309	NPN	Kit, Eye Dressing Aid, Mil. Spec., F-36043B		None	1				
		6545-00-459-7500	NPN	Forceps, Scissors, Tourniquet Set		None	1				

Section II INTEGRAL COMPONENTS OF END ITEM-Continued

(1) ILLUSTRATION (A) FIGURE NO.	(B) ITEM NO.	(2) NATIONAL STOCK NUMBER	(3) PART NO. & FSCM	(4) DESCRIPTION	(5) LOCATION	(6) USABLE ON CODE	(7) QTY REQD	(8) QUANTITY REV'D	DATE	DATE	DATE
		NNSN	NPN	Instruction Card, Artificial Respiration		None	1				
		NNSN	NPN	Instruction Sheet, First Aid		None	1				

Section II INTEGRAL COMPONENTS OF END ITEM-Continued

(1) ILLUSTRATION (A) FIGURE NO.	(B) ITEM NO.	(2) NATIONAL STOCK NUMBER	(3) PART NO. & FSCM	(4) DESCRIPTION	(5) LOCATION	(6) USABLE ON CODE	(7) QTY REQD	(8) QUANTITY REV'D	DATE	DATE	DATE
B-7	1	6685-00-401-1422	(48619) 66966 Mdl 82	Regulator, Water Level (u/w Utility Bath for ASTM D-94)	Drawer A1		None	1			
B-7	2	6640-00-403-9349 79348	(48619)	Cup Grease Dropping (u/o ASTM D566-76)	Drawer A1		None	1			
B-7	3			Bracket, Support, (Part of Dropping Point Apparatus, NSN 6635-00-359-9827)	Drawer B1		None1				
B-7	4	6640-00-835-0898	(64484) S-730456D	Ring, Laboratory Apparatus Support 4.5 in. ID.	Drawer A1		None	3			
B-7	5	8640-00-290-1699	(64484) 8-7304F	Ring, Laboratory Apparatus Support 6 1/8 in. ID.	Drawer Al		None	3			
B-7	6	6640-00-403-1000	(96906) MS36259-2	Beads, Glass, Laboratory, Fed. Spec., DD-G-541B, Type 1, Class A, 5 mm	Drawer A1		None	Box			
B-7	7	6640-00-835-0896	(64484) 8-73045B	Ring, Laboratory Apparatus Support, 2 1/2 in. ID.	Drawer A1		None	3			
B-7	8	6640-00-440-1325	(96906) MS35944-3 3 1/2 in. ID.	Ring, Laboratory Apparatus Support,	Drawer A1		None	3			
B-7	9	6630-00-359-9757	(48619) 74604	Cup Flash and Fire Point, Cleveland Open Cup (u/o ASTM D-92-72)	Drawer A1		None	1			
B-7	10	6640-00-359-2218	(48619) 73526	Cone, Penetrometer (u/o ASTM D-217-668)	Drawer A1		None	1			
B-7	11	6640-00-359-9995	(48619) 76018	Swab Cleaning (u/o STM D-86)	Drawer A1		None	1			
B-7	12	6640-00-444-9000	(22527)	Triangle, Wire 15-260B	Drawer A1		None	1			
B-7	13	6640-00-410-4446	(48619) 73457	Stopper, Split Cork (u/o ASTM D-566-76)	Drawer A1		None	6			
B-7	14	6640-00-436-9921	(21519) G18009	Rod, Dropping Point Apparatus (u/o ASTM D-566-76)	Drawer A1		None	1			
B-7	15	7510-00-221-0790	NPN	Ink, Blue, 2 oz. Bottle	Drawer A2		None	2			
B-7	16	6240-00-155-8675	(79500) PR6	Lamp, Incandescent, 2.47 v, 0.3 Amp, Fed. Spec., W-L-MC (u/o ASTM D-270)	Drawer A2		None	2			
B-7	16	6240-00-797-3750	(96906) 11	Lamp, Incandescent, 3.7 v, 0.3 Amp, Fed. W-L-MC (u/o ASTM D-270)	Drawer A2		None	2			
B-7	17	7510-00-579-8550	NPN	Eraser, Rubber, Fed. Spec 22-E-661F, Type A2 1, Grade A, Style A, (u/o ASTM D-130-75)	Drawer		None	12			

Section II INTEGRAL COMPONENTS OF END ITEM-Continued

(1) ILLUSTRATION (A) FIGURE NO.	(B) ITEM NO.	(2) NATIONAL STOCK NUMBER	(3) PART NO. & FSCM	(4) DESCRIPTION	(5) LOCATION	(6) USABLE ON CODE	(7) QTY REQD	(8) QUANTITY REV'D	DATE	DATE	DATE
B-7	18	5110-00-223-6371	NPN	Shears, Straight, 8 in. lg., Fed. Spec. GGG-S-278A, Type 1, Class 1, Style B	Drawer A2		None	1			
B-7	19	5120-00-540-7155	NPN	Punch, Eyelet, 11/16 in. Throat Depth, Fed. Spec., GGG-D-846A Type II	Drawer A2		None	1			
B-7	20	7510-00-272-9662	NPN	Staples	Drawer A2		None	BX			
B-7	21	7520-00-935-7136	NPN	Pen, Ball Point	Drawer A2		None	DZ			
B-7	22	7520-00-281-5895	NPN	Stapler	Drawer A2		None	1			
B-7	23	7510-00-281-5234	NPN	Pencil, No. 2	Drawer A2		None	DZ			
B-7	24	7510-00-174-3205	(64484) 13-380D	Pencil, Wax, Black, Fed. Spec., SS-P-196 Black	Drawer A2		None	DZ			
B-7	25	7510-00-161-6215	NPN	Ruler, 12 in. Wood	Drawer A2		None	1			
B-7	26	7520-00-240-2411	(22527) 11-865	Dispenser, Tape Fed. Spec., GG-D-45 BB, Type V, Class V	Drawer A2		None	1			
B-7	27	7520-00-162-6178	NPN	Sharpener, Pencil	Drawer A2		None	1			
B-7	28	NNSN	NPN	Tags, Petroleum Sample (DA Form1804)	Drawer A2		None	98			
B-7	29	7490-00-813-0152	NPN	Embossing Machine, Identification Tape Fed. Spec., 00-E-491 E, Type 11I, Class A, Style 2	Drawer A2		None	1			
B-7	30	6640-00-290-6717	(22527) 14-670B	Stand, Laboratory, Apparatus Support, Fed. Spec., NNN-S-00750A, Type I, Grade A, Size 2	Drawer A3		None	2			
B-7	31	6640-00-359-9982	(64484) S-67386	Strainer, 100 mesh	Drawer		None	1			
B-7	32	6640-00-440-1300	(96906) MS36020-1	Stand, Laboratory Apparatus Support, Fed. Spec., NNN-S-00750A, Type I, Grade B, Size 2 (u/o ASTM D-94)	Drawer		None	2			
B-7	33	6640036O89-9982	(6444) S-67386)	Strainer, 100 Mesh	Drawer		None	1			
B-7	34	6640-00-392-8643	(06006) MS36021-1	Support Arm, Funnel	Drawer A3		None	2			
B-7	35	5210-00-221-1886	NPN	Tape, Measuring, Tank Gauging, 50 Ft. w/bob, Mil. Spec.T-16644	Drawer A4		None	1			
B-7	36	6630-00-359-9758	(22527) 13-510-10	Cup, Flash Point, Tag Closed (u/o ASTM D-56)	Drawer A4		None	1			

Section II INTEGRAL COMPONENTS OF END ITEM-Continued

(1) ILLUSTRATION (A) FIGURE NO.	(B) ITEM NO.	(2) NATIONAL STOCK NUMBER	(3) PART NO. & FSCM	(4) DESCRIPTION	(5) LOCATION	(6) USABLE ON CODE	(7) QTY REQD	(8) QUANTITY REV'D	DATE	DATE	DATE
B-7	37	6640-00-846-3602 14-209	(22527)	Bomb, Sampler (Bacon) (u/o ASTM D-270)	Drawer A4		None	1			
B-7	38	401000-1714512	NPN	Chain, Sash, Fed. Spec. RR-C -271B (Part of Testing Kit, NSN 6630-00-151-5310:	Drawer A4		None	1			
B-7	39	5340-00-847-4608	NPN	Eyebolt, Swivel,(Part of , Testing Kit, NSN 6630-00-151-5310)	Drawer		None	1			
B-7	40	5365-00-649-7029	NPN	Ring, Retaining, Spiral, Mil-R-27426A Type I, Class I (Part of Testing Kit, NSN 6630-00-151-5310	Drawer A4		None	3			
B-7	41	5999--263-1051	(64484) S-31115C	Clip, Electrical, Battery Type, (Part of Testing Kit, NSN 6630-00-151-5310)	Drawer A4	None		10			
B-7	42	6695-00-359-9944 13-417	(22527)	Sampler, Oil (Part of Testing Kit, NSN 6630-00-151-5310)	Drawer A4		None	1			
B-7	43	6630-00-359-9759 13-507	(22527)	Cup, Flash Point, Pensky Martens, Closed (u/o ASTM D-93-73)	Drawer A4		None	1			
B-7	44	4520-00-401-3903		Heater, Faucet, Electric	Drawer A4		None	1			
B-7	45	6625-00-691-6605 310	(60741)	Model Multimeter, Range-0 to 1200 v, w/2 Test Leads	Drawer A4		None	1			
B-7	45	NNSN	(22527) 9-522-15	Case Multimeter	Drawer A4		None	1			
B-7	46	5905-00-448-5328 236052	(48619)	Rheostat (Tetraethyl Lead Apparatus), (u/o ASTM 526-70)	Drawer A4		None	2			
B-7	47	6640-00-360-0067 74741	(48619)	Wrench, For Gum Stability Bomb (80740) A4 68-430 (u/o ASTM D-525-74)	Drawer		None	1			
B-7	48	6145-00-192-1698	NPN	Wire, Resistance, No. 28 Awg, Fed. Spec., A4 QQ-R-175A, Composi-tion E, 1/4 lb. Spool	Drawer		None	1			
B-7	49	6145-00-299-5186 QQW343	(81348)	Wire, Solid Conductor Uninsulated, 16 Awg. Fed. Spec., QQ-W-343D, Type S., 1 LB Spool	Drawer A4		None	1			
B-7	50	6640-00-404-2760	(48619) 61729-HP3	Hotplate, Laboratory, w/Support Rod	Drawer A4		None	1			
			(48619)508991	Handle, Hotplate (*)			None	1			
			(48619)520482	Heater, 120v, 450w (*)			None	1			
			(48619)239022	Thermostat (*)			None	1			

Section II INTEGRAL COMPONENTS OF END ITEM-Continued

(1) ILLUSTRATION (A) FIGURE NO.	(B) ITEM NO.	(2) NATIONAL STOCK NUMBER	(3) PART NO. & FSCM	(4) DESCRIPTION	(5) LOCATION	(6) USABLE ON CODE	(7) QTY REQD	(8) QUANTITY REV'D	DATE	DATE	DATE
B-7	51	640-00-522-1892 BFI	(07818)	Positioner, Ionizing Unit	Drawer A4		None	1			
B-7	52	630-00-359-9655 74740	(48619)	Bomb, Oxidation Stability (u/o ASTM D-525-7 and D-873-74)	Drawer A4		None	1			
B-7	53	6810-00-051-5872	NPN	Ligroin, 1 Gal. Bottle, Fed. Spec., 0-C-265A, (u/o ASTM D-2276-73)	Drawer A5		None	1			
B-7	54	6810-00-815-6105	(64484) BK-9490	Xylene, ACS, 1 Gal. Per Bottle, (u/o ASTM D-56 and D-95-70)	Drawer A5		None	1			
B-7	55	6810-00-543-7415	(22527)	A-407 Alcohol, Denatured, 1 Gal. Bottle, Fed. Spec. O-E-760B Grade HI, (u/o ASTM D-94 and F-5415)	Drawer A5		None	1			
B-7	56	6810-00-227-0410	NPN	2-Propanol, ACS, (CH3) 2 CHOH, 1 Gal. A5 Bottle, Fed. Spec., O-C-265A	Drawer		None	1			
B-7	57	5350-00-184-6255	(22527)C-190	Carboruidum Powder, 150 Grit, 1 LB Can, Mil. Spec., A-21380B, Type 111, Mod. Grade, (u/o ASTM D-130-75)	Drawer A5		None	1			
B-7	58	6850-00-281-1985	NPN	Solvent, Dry-cleaning 1 Gal. Bottle, Fed. Spec., P-D-680, Type I, (u/o ASTM D-892-74)	Drawer A5		None	1			
B-7	59	6635-00-359-9827	(48619) 73455	Dropping Point Apparatus, (u/o ASTM D-566 -76)	Drawer		None	1			
B-7	60	NNSN	(48619) 61820	Refractory Top, 500 or 800 MI Rd Bottom Flasks (u/with Dropping Point Apparatus)	Drawer A5		None	3			
B-7	61	6640-00-980-5002	(48619) 61600	Heater, Electric	Drawer A5		None	2			
		(48619) 225086 (*)		Transformer, Electric Heater (VT8)			None	1			
		(48619) 225087	Brush Contact				None	1			
B-7	62	6810-00-146-7520	NPN	Acid, Sulfuric, ACS, H2SO4, Fed. Spec., D-C-265A, (u/o ASTM D-1094-72) (SPTPER 9 LB Bottle)	Drawer A5		None	2			
B-7	63	6640-00-428-4490	(80740) 69-883	Chart, Kinematic Viscosity, Per Pad, (u/o ASTM D-341-74)	Drawer A5		None	1			

Section II INTEGRAL COMPONENTS OF END ITEM-Continued

(1) ILLUSTRATION (A) FIGURE NO.	(B) ITEM NO.	(2) NATIONAL STOCK NUMBER	(3) PART NO. & FSCM	(4) DESCRIPTION	(5) LOCATION	(6) USABLE ON CODE	(7) QTY REQD	(8) QUANTITY REV'D	DATE	DATE	DATE
B-7	64	6810-00-281-2002	NPN	Toluene, Technical, Fed. Spec. TT-T-548D A5 (u/o ASTM D-1796-68) 1 Gal. Bottle	Drawer		None	1			
B-7	65	6810-00-222-9675	(22527) P-188	Potassium Dichromate, ACS, Crystal Form, 1 lb. Bottle, Fed. Spec., O-C-265A	Drawer A5		None	1			

Section II INTEGRAL COMPONENTS OF END ITEM-Continued

(1) ILLUSTRATION (A) FIGURE NO.	(B) ITEM NO.	(2) NATIONAL STOCK NUMBER	(3) PART NO. & FSCM	(4) DESCRIPTION	(5) LOCATION	(6) USABLE ON CODE	(7) QTY REQD	(8) QUANTITY REV'D	DATE	DATE	DATE
B-8	1	6640-00-438-6881 3582	(14674)	Trap, Distilling Crainkcase Dilution (u/o ASTM D-322-67)	Drawer B1		None	1			
B-8	2	6640-00-403-9341	(75278) 38004	Pump, Filter, Laboratory	Drawer B1		None	1			
B-8	3	6640-00-445-6625	(96906) MS36165-1	Tube, Centrifuge, Fed. Spec., NNN-T-780B, Type I, (u/o ASTM D-91-61 and D-1796-68)	Drawer B1		None	4			
B-8	4	6635-00-025-9152 6900	(14674)	Jar, Cold Test (u/'o ASTM D-97-66)	Drawer B1		None	4			
B-8	5	6640-00-445-5000	(96906) MS36181-2	Tube, Drying Fed. Spec., NNN-T-792A, Type I, Size 2	Drawer B1		None	2			
B-8	6	6640-00-081-6553	(22527) 7-722B	Condenser, Reflux, Extract (u/o ASTM D-95-70)	Drawer B1		None	2			
B-8	7	Deleted									
B-8	8	6640-00-410-4462	(14674) 3611-25	Receiver, Distilling (u/o ASTM D-95-70)	Drawer B1		None	1			
B-8	9	6640-00-925-S649	(14674) 3611-10	Receiver, Distilling (u/o ..STM D-95-70)	Drawer B1		None	1			
B-8	10	6640-00-061-8966	(22527) 14-955G	Test Tube, Fed. Spec DD-G-541B, Type I, Class A	Drawer B2		None	5			
B-8	11	6640-00-061-8967	(22527) 14-955K	Test Tube, Fed. Spec DD-G-541B, Type I, Class A	Drawer B2		None	5			
B-8	12	6640-00-290-6551	(96906) MS36089-4	Crucible, Filtering, 50 Ml, Cap., (u/o ASTM D-873-74)	Drawer B2		None	2			
B-8	13	6640-00-298-7258	(22527) 14-960D	Test Tube, Fed. Spec. NNN-T-189A, Type 1, Style II	Drawer B2		None	6			
B-8	14	6640-00-899-8976	22527) 08-227-1B	Crucible, Filtering, 30 19Ml, Cap	Drawer B2		None	2			
B-8	15	6640-00-404-0657	(22527) 8-226-10B	Crucible, Filtering, 5 Micron, Fine Porosity	Drawer 132		None	3			
B-8	16	6640-00-290-6791	(96906) MS35966-5	Crucible, Ignition, Fed. Spec. NNN-C-00680A, Type I, Size 5	Drawer B2		None	4			
B-8	17	6640-00-550-6287	(145666) 250 Size 3	Crucible, Ignition, Fed. Spec., NNN-C-0068A, Type I, Size 6 (u/o ASTM D-189)	Drawer B2		None	2			

Section II INTEGRAL COMPONENTS OF END ITEM-Continued

(1) ILLUSTRATION (A) FIGURE NO.	(B) ITEM NO.	(2) NATIONAL STOCK NUMBER	(3) PART NO. & FSCM	(4) DESCRIPTION	(5) LOCATION	(6) USABLE ON CODE	(7) QTY REQD	(8) QUANTITY REV'D	DATE	DATE	DATE
B-8	19	6640-00-419-3050	(22527) 8-236-1C	Crucible, Filtering, Fine Porosity, 30 Ml, MIL. Spec., C-3659A	Drawer B2		None	3			
B-8	20	6640-00-404-8001	(22527) 2-992B	Bottle, Dropper, 60 Ml, Fed. Spec., NNN-B-00194, Type II, Class II, Grade B, Size 2, (u/o ASTM D-2276-73)	Drawer B2		None	4			
B-8	21	6640-00-359-9753 08285	(22527)	Holder, Filtering Crucible, Water	Drawer B2		None	6			
B-8	22	8640-00-410-1915	22527) 88B	Holder, Crucible, Bordsillcate Glass	Drawer B2		None	2			
B-8	23	6640-00-290-6570	(14674) 3042-10	Cylinder, Graduated, 10 Ml, Capacity, 0.1 Ml Graduated Interval, Fed. Spec. NNN-C-9 40B, Style I, Size 2 Type I	Drawer B2		None	2			
B-8	24	6640-00-404-2757	(22527) 13-420-45	Test Tube, Flat, for Copper Strip Test,(u/o ASTM D-130-75)	Drawer		None	1			
B-8	25	6640-00-290-6923	(22527) 10-326A	Funnel, Common, Bordsllicate Glass 50 mm	Drawer B2		None	3			
B-8	26	6640-00-912-8656	(80740) 28-476-5	Cylinder, Graduated, 5 Ml, Cap., 0.1 Ml Interval Graduated	Drawer B2		None	4			
B-8	27	6640-00-360-0046 73461	(48619)	Test Tube, Melting Point Determination (u/o ASTM D-586-76)	Drawer	B2	None	2			
B-8	28	6640-00-502-3550 1340-30	(14674)	Bottle, Dropper, Pyrex, 30 Ml Cap, Fed. Spec., NNN-B-001194, Type II, Class I, Grade A, Size I, (u/o ASTM D-22786-73)	Drawer		None	2			
B-8	29	6630-00-471-5301	(48619) 73478	Aniline Point Apparatus, (u/o ASTM D-611-64)	Drawer B3		None	2			
B-8	30	8640-00-899-6901	(22527) 08-549-5D	Cylinder, Graduated, 50 Ml Cap., 1.0 Mil Graduated	Drawer B3		None	3			
B-8	31	6640-00-883-8516	(22527) 08-652E	Cylinder, Graduated, 100 Ml Cap., (u/o ASTM D-86)	Drawer B3		None	4			
B-8	32	6640-00-420-6000	(96906) MS35947-6	Cylinder, Graduated, 100 MI Cap., Fed. Spec., NNN-C-940B, Style II, Size 6	Drawer B3		None	3			
B-8	33	6640-00-899-8993	22527) 10-358M	Funnel, Filtering, Buchner Type, 150 MI B3 Cap., 60 mm Dia.	Drawer		None	2			
B-8	34	81265-26-8241	(14674) 1420-2L106	Bottle, Stopper, Pyrex Etched Label "Acetic B3 Acid"	Drawer		None	1			

Section II INTEGRAL COMPONENTS OF END ITEM-Continued

(1) ILLUSTRATION		(2)	(3)	(4)	(5)	(6)	(7)	(8) QUANTITY			
(A) FIGURE NO.	(B) ITEM NO.	NATIONAL STOCK NUMBER	PART NO. & FSCM	DESCRIPTION	LOCATION	USABLE ON CODE	QTY REQD	REV'D	DATE	DATE	DATE
B-8	34	8125-00-263-8245	(14674) 1420-2L290	Bottle, Stopper, Pyrex, Etched Label "Hydrochloric Acid"	Drawer B3		None	1			
B-8	34	6640-00-159-4441	(80740) 6-730-L335	Bottle, Stopper, Reagent, Etched Label "Methyl Orange"	Drawer B3		None	1			
B-8	34	8125-00-263-8262	(14674) 1420-2L346	Bottle, Stopper, Reagent, Etched Label "Nitric Acid Cond"	Drawer B3		None	1			
B-8	34	8126-01-119-3933	(14674) 6-730-L480	Bottle, Stopper, Reagent Etched Label "Potassium Dichromate"	Drawer B3		None	1			
B-8	34	8125-00-263-8254	(14674) 1420-2L465	Bottle, Stopper, Reagent, Etched label "Sulfuric Acid Oil"	Drawer B3		None	1			
B-8	35	6640-00-290-6817	(14674) 1040-100	Beaker; Glass, 100 M' Cap. Fed. Spec., NNN-B-175B, Type III, (u/o ASTM D-38)	Drawer B3		None	10			
B-8	36	6640-08900-881	(81348) NNN-B176 NNN-B-175B,	Beaker; Glass, 100 MI Cap., Fed. Spec., Type I	Drawer B3		None	4			
B-8	37	6640-00-403-1500	(96906) MS35992-4	Beaker; Glass, 50 MI Cap., Fed. Spec., NNN-B-175B, Type I	Drawer B3		None	3			
B-8	38	6640H0-377-9383	(65662) 62932-022	Freezing Point Apparatus, (u/o ASTM D-2386)	Drawer B3		None	1			
B-8	38	6640-00-436-9939	(00116) 8350-02	Tube, Freezing Point Apparatus, (u/w 80 740) 67-990	Drawer B3		None	1			
B-8	39	6640-00-494-3959	(96906) MS36943-4	Cylinder, Graduated, 25 Ml Cap., 0.2 mm Graduated Interval, Fed. Spec., NNN-C-9048, Style I, Size 4; (u/o ASTM D-56)	Drawer B3		None	2			
B-8	40	6640-00-459-5936	(80740) 67-990-09	Gland and Stirrer (u/o ASTM D-2386)	Drawer B3		None	1			
B-8	41	6640-00-942-4397	(14674) 1000-IL	Beaker, Glass, 1000 MI Cap., Fed. Spec. NNN-B-175B, Type I, Mod, 1000 MI Cap.	Drawer B4		None	2			
B-8	42	6640-00-359-9870 6920	(14674)	Jar, Cylindrical, Glass, (u/o ASTM D-86)	Drawer	B4	None	1			
B-8	43	6640-00-899-2784	(14674) 11000-2L	Beaker, Glass, 2000 Ml Cap., Fed. Spec., NNN-B-175B, Type I, 2000 MI, (u/o ASTM D-322 -67)	Drawer B4		None	1			

Section II INTEGRAL COMPONENTS OF END ITEM-Continued

(1) ILLUSTRATION (A) FIGURE NO.	 (B) ITEM NO.	(2) NATIONAL STOCK NUMBER	(3) PART NO. & FSCM	(4) DESCRIPTION	(5) LOCATION	(6) USABLE ON CODE	(7) QTY REQD	(8) QUANTITY REV'D	 DATE	 DATE	 DATE
B-8	44	6640-00-558-0651	(96906) MS36055-11	Flask, Boiling, 1000 Ml Cap., No. 24/40 Std Stopper, Fed. Spec., NNN-F-2400, Type I, Class 2, Style III, Size 4, (u/o ASTM D-95-70 and F-322-67)	Drawer		None	2			
B-8	45	6640-00-551-9224	(22527)	10-106 Flask, Erlenmeyer, (Boron-Free) Glass, 300 Ml Cap., (u/o ASTM D-94)	Drawer B4		None	2			
B-8	46	6640-00-942-4393	(14674) 1000-250	Beaker, Glass, 250 Ml Cap., Fed. Spec., NNN-B-175B, Type I	Drawer B4		None	3			
B-8	47	66404)-942-4394 14000	(75278)	Beaker, Glass, 400 MI Cap., Fed. Spec., B4 NNN-B-175B, Type I	Drawer		None	4			
B-8	48	6640-00-526-8491	(14674) 1060-500	Beaker, Glass, 500 Ml Cap.	Drawer B4		None	2			
B-8	49	6640-00-942-4395	(14674) 1000-600	Beaker, Glass, 600 MI Cap. Fed. Spec., NNN-B-175B, Type I, Size 600	Drawer B4		None	3			
B-8	50	6640-00-425-8000	(96906) MS36068-6	Flask, Volumetric, Glass, 500 Ml, Fed. Spec., NNN-F-289C Type I, Class A, Grade 2, Size 500	Drawer B4		None	2			
B-8	51	6640-00-425-9000	(96906) 068-7	Flask, Volumetric, Glass, 1000 Ml Cap., Fed. Spec., NNN-F- 289C, Type I, Class A, Grade 2, Size 1000	Drawer B4		None	2			
B-8	52	NNSN 78029	(48619)	Boards, Distillation (u/o Distillation Units NSN 6640-00-359-9772 and NSN 6640-00-257-2118)	Drawer B5		None	2			
B-8	53	88630-00-403-0420	(48619) 66643	Bath, Utility, Constant Temperature (u/o ASTM D-94)	Drawer B5		None	1			
			(48619) 234129 (*)	Pilot Light, Utility Bath			None	1			
			(48619) 239099 ('*)	Thermostat, Utility Bath			None	1			
			(48619) 240275 (*)	Switch, Utility Bath			None	1			
B-8	54	6630-00-359-9730 K460	(93282)	Test Bath, Cloud and Pour Point, (u/o ASTM D-97 -66)	Drawer B5		None	1			
			(80740) 68-785-12 (*)	Corks, One-Hole			None	4			
			(80740) 68-785-05 (*)	Discs, Cork			None	4			

Section II INTEGRAL COMPONENTS OF END ITEM-Continued

(1) ILLUSTRATION (A) FIGURE NO.	(B) ITEM NO.	(2) NATIONAL STOCK NUMBER	(3) PART NO. & FSCM	(4) DESCRIPTION	(5) LOCATION	(6) USABLE ON CODE	(7) QTY REQD	(8) QUANTITY REV'D	DATE	DATE	DATE
			(80740) 68-785-06 (*)	Rings			None	4			
			(80740) 68-788 (*)	Jar, Test			None	4			
			(80740) (')	80-100 Thermometer			None	4			
B-8	55	NNSN	NPN	Stirrer: Part of Dropping Point Apparatus, NSN 6640-00-359-9827	Drawer B5		None	1			
B-8	56	6640-00-403-9348	(80740)67-948	Shaft, Stirrer, (u/o ASTM D-93-73)	Drawer B5		None	1			
B-8	57	6640404-2756	NPN	Condenser, (Part of Corrosion, NSN 6640-00-522-1886), (Fig. B-8, Item 61)	Drawer B6		None	1			
B-8	58	6640-00-531-5022	(48619) 75765	Stirrer, Slo-Speed, (u/o ASTM D-93-73)	Drawer B5		None	2			
B-8	59	6640-00-404-27	(22527) 13-420-40	Holder, Polishing, 4 Unit, (u/o ASTM D-130-75)	Drawer		None	1			
B-8	60	NNSN	NPN	Shaft and Propeller, (Part of Dropping Point Apparatus, NSN 6640-00-359-9827 (Fig. B-7, Item 59)	Drawer B6		None	1			
B-8	61	6640-00-522-1886 76037	(48619)	Bath Corrosion Test (u/o ASTM D-130-75)	Drawer B5		None	1			
			(48619) 232064 (')	Gasket, O-Ring, Test Bomb			None	25			
			(22527)	Test Tube, Flat 13-420-45 (*)			None	1			
			(48619) 239079	Thermostat			None	1			

Section II INTEGRAL COMPONENTS OF END ITEM-Continued

(1) ILLUSTRATION (A) FIGURE NO.	(B) ITEM NO.	(2) NATIONAL STOCK NUMBER	(3) PART NO. & FSCM	(4) DESCRIPTION	(5) LOCATION	(6) USABLE ON CODE	(7) QTY REQD	(8) QUANTITY REV'D	DATE	DATE	DATE
B-9	1	6630-00-359-9892	(22527) 13-617K	Viscometer, Cannon-fenske Transparent Type, Calibrated, Size 500 (u/o ASTM D-445 -74)	Drawer C1		None	1			
B-9	2	6630-00-359-9893	(22527) 13-617L	Viscometer, Cannon-fenske Transparent Type, Calibrated, Size 600 (u/o ASTM D-445-74)	Drawer		None	1			
B-9	3	6630-00-450-5699	(22527) 13-615-5L	Viscometer, Cannon-fenske Opaque Type Reverse Flow, Calibrated, Size 600, (u/o ASTM D-445-74)	Drawer C1		None	2			
B-9	4	6630-00-450-3479	(22527) 13-615-5K	Viscometer, Canon-fenske Opaque Type, Reverse Flow, Calibrated, Size 500 (u/o ASTM D-445-74)	Drawer C1		None	2			
B-9	5	6630-00-359-9891	(22527) 13-615-5H	Viscometer, Cannon-fenske Opaque Type Reverse Flow, Calibrated, Size 400, (u/o ASTM D-445-74)	Drawer C1		None	2			
B-9	6	6630-00-359-9890	(22527) 13-615-5F	Viscometer, Cannon-fenske Opaque Type Reverse Flow Calibrated, Size 300, (u/o ASTM D-445-74)	Drawer C1		None	2			
B-9	7	6630-0-359-9889	(22527) 13-615-5E	Viscometer, Canon-fenske Opaque Type Reverse Flow Calibrated, Size 200, (u/o ASTM D-445-74)	Drawer C1		None	2			
B-9	8	6630-00-359-9888	(22527) 13-615-5C	Viscometer, Cannon-fenske Opaque Type Reverse Flow Calibrated, Size 100, (u/o ASTM D-445-74)	Drawer C1		None	2			
B-9	9	6630-00-359-9886	(22527) 13-617A	Viscometer, Cannon-fenske Transparent Type, Reverse Flow Calibrated, Size 25, (u/o ASTM D-44-5-74'	Drawer C1		None	1			
B-9	10	6630-00-397-9293	(22527) 13-617B	Viscometer, Cannon-fenske Transparent Type, Reverse Flow, Calibrated, Size 50, (u/o ASTM D-445-74)	Drawer C1		None	2			
B-9	11	6630-00-359-9903	(22527) 13-617C	Viscometer, Cannon-fenske, Transparent Type. Calibrated, Size 100. (u/o ASTM D-445-74)	Drawer C1		None	2			

Section II INTEGRAL COMPONENTS OF END ITEM-Continued

(1) ILLUSTRATION (A) FIGURE NO.	(B) ITEM NO.	(2) NATIONAL STOCK NUMBER	(3) PART NO. & FSCM	(4) DESCRIPTION	(5) LOCATION	(6) USABLE ON CODE	(7) QTY REQD	(8) QUANTITY REV'D	DATE	DATE	DATE
B-9	12	6630-00-359-9904	(22527) 13-617E	Viscometer, Cannon-fensky Transparent Type, Calibrated, Size 200, (u/o ASTM D-445-74)	Drawer C1		None	2			
B-9	13	6630-00-359-9905	(22527) 13-617F	Viscometer, Cannon-fenske Transparent Type, Calibrated, Size 300, (u/o ASTM D-445-74)	Drawer C1		None	2			
B-9	14	6630-00-397-9309	(22527) 13-617H	Viscometer, Cannon-fenske Transparent Type, Calibrated, Size 400, (u/o ASTM D-445 -74)	Drawer C1		None	2			
B-9	15	6630-00-397-9311	(22527) 13-617J	Viscometer, Cannon-fenske, Transparent Type, Calibrated, Size 450, (u/o ASTM D-445-74)	Drawer C1		None	1			
B-9	16	6640-00-359-9985	(80740} 68-826-06	Support, Sediment Apparatus, (u/o ASTM D-473)	Drawer C2		None	1			
B-9	17	6640-00-360-0011	(22527) 09-61B	Thimble, Extraction, (u/o ASTM D-473)	Drawer C2		None	2			
B-9	18	6640-00-494-3726	(96906) MS36074-1	Bulb, Pressure or Suction, 6 in., (u/o ASTM D-611-64)	Drawer C2		None	2			
B-9	19	6640-00-522-1890	(07818) 2U500	Ionizer, Air, (u/o ASTM D-2276-73)	Drawer C2		None	2			
B-9	20	6640-00-090-4469	(68692) 36308	Cup, Glass, Sediment Apparatus, (u/o ASTM D-473)	Drawer C2		None	2			
B-9	21	5210-00-619-7036	NPN	Level and Plumb, 9 in., lg, Fed. Spec., GGG-L-211C, Type II, Class I, Style A	Drawer C2		None	1			
B-9	22	6630-00-337-6890	(80740)68-442	Liner, Bomb, With Cover, (u/o ASTM D-873 -74)	Drawer C2		None	4			
B-9	23	NNSN	(80740) 93-4700	Tube, Suction for Syringe, 12 in. Lg. (u/o ASTM D-322-67)	Drawer C2		None	1			
B-9	24	6685-00-975-0041	(48619) 73503	Thermometer, Self Indicating, B, Metallic, 0 to 220 Deg., (u/o ASTM D-217-68)	Drawer C2		None	1			
B-9	25	6615-00-068-5022	(80740) 2307-100	Syringe, Luer, 100 cc Cap., (u/o ASTM D-322 -67)	Drawer C2		None	1			
B-9	26	6640-00-440-7000	(96906) MS35988-2	Stopcock, Straight; 2 mm Bore, (u/o ASTM)	Drawer C2		None	2			

Section II INTEGRAL COMPONENTS OF END ITEM-Continued

(1) ILLUSTRATION (A) FIGURE NO.	(B) ITEM NO.	(2) NATIONAL STOCK NUMBER	(3) PART NO. & FSCM	(4) DESCRIPTION	(5) LOCATION	(6) USABLE ON CODE	(7) QTY REQD	(8) QUANTITY REV'D	DATE	DATE	DATE
B-9	27	6640-00-852-3452	(22627) 14-665B	Stopcock, Straight, 4 mm Bore	Drawer		None	2			
B-9	28	6685-00-411-5489	(48619) 31024	Thermometer, Self Indicating, B, Metallic, 0 to 200 Deg.	Drawer		None	1			
B-9	29	6640-00-310-8550	(80740) 67-973-01	Stone, Foam Test Apparatus, (u/o ASTM D-892 -74)	Drawer		None	2			
B-9	30	6685-00-239-4937	(80740) 80-886-02	Thermometer, Cup and Case (Part of Testing Kit NSN 6630-00-151-5310)	Drawer		None	1			
B-9	31	4520-00-401-3904	(80740) 42-706-02	Element, Infrared Heater-, 375 Watts	Drawer C2		None	2			
B-9	32	6640-00-404-2759	(22527) 13-6881-10	Pipette Safety Control (u/o ASTM D-611-64)	Drawer C2		None	1			
B-9	33	6640-00-926-1313	(22527) 10-437B	Funnel, Separatory, 125 Ml, (u/o ASTM D-2276-73)	Drawer C3		None	3			
B-9	34	6640-00-427-1000	(22527) 10-437C	Funnel, Separatory, 250 Ml, (u/o ASTM D-974-64 and D-2276-73)	Drawer C3		None	2			
B-9	35	4440-00-192-7595	(80740) 31-634	Drying Apparatus, Air Gas, (Indicating Drierete is Blue and when Exhausted, turns Pink) (u/o ASTM D-8-92-74)	Drawer C3		None	2			
B-9	36	6640-00-244-4341	(21519) G6860	Cylinder, Hydrometer	Drawer C3		None	2			
B-9	37	6640-00-290-6543	(22527) 08-549-G	Cylinder, Graduated, Glass, Fed. Spec., NNN-C-940B, Style I, Size 8, Type 1, (u/o ASTM D-2276-73)	Drawer C3		None	2			
B-9	38	6640-00-290-6936	(22527) 10-094B	Flask, Iodine, with Stopper, 250 Ml	Drawer		None	2			
B-9	39	6640-00-424-4000	(98906) MS36062-5	Flask, Erlenmeyer, Glass, 250 Ml, Fed. Spec., NNN-F-240C, Type IV, Class I, Style I, Size 5, (u/o ASTM D-974-64)	Drawer C3		None	3			
B-9	40	6640-00-290-6872	(22527) 10-090B	Flask, Erlenmeyer, Glass, Graduated 50 to 200 Ml, (u/o FTMS F-5415)	Drawer C3		None	2			
B-9	41	6640-00-425-6000	(96906) MS30684	Flask, Volumetric, Glass, 100 Ml, Fed. Spec., NNN-F-289C, Type I, Class A, Grade 1 or 2, Size 100 Ml	Drawer C3		None	2			
B-9	42	6640-00-432-8500	(96906) MS36058-3	Flask, Distilling, Glass, 125 Ml, Fed. Spec., NNN-F-240C, Type III, Class I, Style I, Size 3" 2u/o ASTM D-86}	Drawer C3		None	2			

Section II INTEGRAL COMPONENTS OF END ITEM-Continued

(1) ILLUSTRATION (A) FIGURE NO.	(B) ITEM NO.	(2) NATIONAL STOCK NUMBER	(3) PART NO. & FSCM	(4) DESCRIPTION	(5) LOCATION	(6) USABLE ON CODE	(7) QTY REQD	(8) QUANTITY REV'D	DATE	DATE	DATE
B-9	43	6640-00-424-2000	(96906) MS36062-3	Flask, Erlenmeyer, Glass 50 Ml, Fed. Spec., NNN-F-240C, Type III, Class I, Style I, Size 3	Drawer C3		None	3			
B-9	44	6640-00-404-2750	(00115)NICH ROME E1039-99	Tetraethyl Lead Apparatus	Drawer C4		None	2			
B-9	45	6640-00-935-4270	(22527) 10-090C	Flask, Erlenmeyer, Glass, Graduated, 500 Ml	Drawer C4		None	3			
B-9	46	6640-00-935-4270	(96906) MS36062-7	Flask, Erlenmeyer, Glass, Ungraduated, 500 Ml, Fed. Spec., NNN-F-240C, Type IV, Class I, Style I, Size 6	Drawer C4		None	3			
B-9	47	6640-00-424-8000	(96906) MS36066-4	Flask, Filtering, Glass, 500 Ml, Fed. Spec., NNN-F-240C, Type V, Size 4	Drawer C4		None	2			
B-9	48	6640-00-424-6000	(96906) MS36062-9	Flask, Erlenmeyer, Glass, 1000 Ml, Fed. Spec., NNN-F-240C, Type IV, Class I, Style I, Size 7	Drawer C4		None	2			
B-9	49	6640-00-522-1888	(22527) 10-181F	Flask, Filtering, 1000 Ml, Glass, Fed. Spec., NNN-F-240C, Type V, Size 5, (u/o ASTM D-2276-73)	Drawer C3		None	2			
B-9	50	4540-00-401-3905	(22527) 11-604-50	Heater, Infrared, 115 v, 60 Hz, w/Corc	Drawer C5		None	1			
B-9	51	6645-00-235-4685	(22527) 6-657	Timer, Electrical	Drawer C5	None	1				
B-9	52	6640-00-244-9478	(52218) GTP-523 MM-Series II	Kit, Detector, Water Aviation and Automo- tive Fuel	Drawer C5		None	1			
B-9	53	NNSN	NPN	Thermoregulator Used with Bath, Foani C5 Test Apparatus NSN 6640-00-359- 9678	Drawer		None	1			
B-9	54	6670-00-436-9857	(22527) 2-052-5D	Balance, Double Beam (u/o Weights)	Drawer C5		None	1			
B-9	55	6640-00-482-7235	(53078) S-40990	Stirrer-hot Plate, Magnetic, (u/o ASTM D-322-67)	Drawer C5		None	1			
B-9	56	6630-00-038-7007	(80740) 72003W587Z94 KIT	72002 Meter, PH; Chem-mat	Drawer C5		None	1			

Section II INTEGRAL COMPONENTS OF END ITEM-Continued

(1) ILLUSTRATION (A) FIGURE NO.	(B) ITEM NO.	(2) NATIONAL STOCK NUMBER	(3) PART NO. & FSCM	(4) DESCRIPTION	(5) LOCATION	(6) USABLE ON CODE	(7) QTY REQD	(8) QUANTITY REV'D	DATE	DATE	DATE
B-10	1	664o0-00438-0000	(96906) /1S35985-9	Pipet, Volumetric, Glass 25 M1, Fed. Spec., NNN-P-396C, Type I, Class A, Grade 2	Drawer D1		None	4			
B-10	2	6640-00.438-0250	(96906) MS35985-10	Pipet, Volumetric, 50 Ml, Fed. Spec., NNN-P-395C, Type I, Class A, Grade 2	Drawer D1		None	2			
B-10	3	6640-00-437-9000	(96906) M1S35985-6	Pipet, Volunmetrlc, Glass, 10 Ali, Fed. Spec., NNN-P-395C, Type I, Class A. Grade 2	Drawer D1		None	3			
B-10	4	6640-00-558-0580	(96906) . MhS35985-5	Pipet, Volumetric, Glass, 5 MlI, Fed. Spec., NNN-P-395C, Type 1, Class A, Grade 2, (u/o ASTM D-611-64 and D-1012)	Drawer D1		None	4			
B-10	5	6640-00-558-0575	(96906) MS35985-2	Pipet, Volumetric, Glass, 2 Ml, Fed. Spec. NNN-P-395C, Type I, Class A, (u/o ASTM D-611-64 and D-1012)	Drawer D1		None	3			
B-10	6	6640-00-410-0000	(96906) MS35971-3	Burette, Straight, Calibrated, Graduated at 0.1 Ml, 50 Mil Cap. Fed. Spec., NNN-B-789, Type I, Style 1, Class A, Grade 2, Size 6 (u/o ASTM D-94 and D-974-64)	Drawer D1		None	3			
B-10	7	6640-00-409-9000	(96906) NMS35971-2	Burette, Straight, Calibrated, Graduated at 0.1 Ml, 25 MiI Cap. Fed. Spec., NNN-B-789, Type I, Class A, Style I, Grade 2, Size 5, (u/o ASTMI D-94)	Drawer D1		None	3			
B-10	8	6640-00-409-8500	(96906) NhS35971-1	Burette, Straight, Calibrated, Graduated at 0.05 Ml, 10 I1l Cap Fed. Spec., NN-B-789, Type 1, Class A, Grade 2, Size 4, (u/o ASTM D-94 and D-974 -64)	Drawer D1		None	2			
B-10	9	6640-00-252-5205	(96906) 1MS36097-27	Paper, Filter, 12.5 Cm Dia., Fed. Spec. NNN-P-1475A, Type II Class 8, (100 per box)	Drawer D2		None	1			
B-10	10	6640-00-985-2096	(08071) Ramp-025-00	Disc, Filtering, Micro Porous, 25 mm Dia. (u/o ASTMI D-2276-78)	Drawer D2		None	2			
B-10	11	6640-00-176-5088	(08071) M00O-037-PO	Holder, Filtering Disc (u/o ASTM D-2276-73)	Drawer D2		None	3			

Section II INTEGRAL COMPONENTS OF END ITEM-Continued

(1) ILLUSTRATION (A) FIGURE NO.	(B) ITEM NO.	(2) NATIONAL STOCK NUMBER	(3) PART NO. & FSCM	(4) DESCRIPTION	(5) LOCATION	(6) USABLE ON CODE	(7) QTY REQD	(8) QUANTITY REV'D	DATE	DATE	DATE
B-10	12	NNSN	NPN	Clamp, Hose, with Allen Wrench, (Part of Kit, Fuel Sampling NSN 6665-00-496-9623'	Drawer		None	2			
B-10	13	6640-00-488-5221 S-6363	(53629)	Rod, Stirring, 10 in. Lg.	Drawer D2		None	2			
B-10	14	NNSN	NPN	Regulator, Foam, Test (Part of Bath, Foam Test Apparatus, NSN 6640-00-359-9628'	Drawer D2		None	1			
B-10	15	NNSN	(80740) 77-881-01	Shaft, Stirrer, Flexible	Drawer D2		None	1			
B-10	16	4720-00-640-0329	(08071) XX71-000-04	Tubing, Gum Rubber 3/8 in. ID, 4 It, Ig., Fed. Spec., ZZ-T-831 C, Type 5 Class 2, (u/o ASTM D-2276-73)	Drawer D2		None	2			
B-10	17	6640-00-404-2758	(08071) XX10-047-09	Pipet, 10 Ml, Grad-uated, (u/o ASTM D-2276-73)	Drawer D2		None	1			
B-10	18	9150-00-965-2408	(22527)	Stopcock Lubricant 14-635-5D	Drawer D2		None	1			
B-10	19	NNSN	NPN	Stirrer, (Part of Kit Fuel, Sampling, NSN 6665-00-496-9623)	Drawer D2		None	2			
B-10	20	NNSN	NPN	Tubing, Plastic, (Part of Kit, Fuel Sampling, NSN 6665-00-496-9623)	Drawer		None	1			
B-10	21	6640-00-055-0071	(22527) 14-196	Stretcher, Rubber Tubing	Drawer		None	1			
B-10	22	6670-00-263-0249	(22527) 2-354	Forceps, Analytical Balance Weights	Drawer D2		None	1			
B-10	23	7530-00-526-9792	(22527) 11-850E	Label, Gummed, Fed. Spec., UU-L-49D, Type I, Class A, Style 2, (90 per Box)	Drawer D2		None	3			
B-10	24	6640-00-290-0146	(96906) MS36253-2	Litmus Paper, ACS, 5 cm Ig., Blue, 100 per Vial	Drawer D2		None	4			
B-10	25	6640-00-290-0147	(96906) MS36253-1	Litmus Paper, ACS, 5 cm Ig, Red, 100 per Vial	Drawer D2		None	4			
B-10	26	NOT USED									
B-10	27	NNSN	(08071) XX20-47-11	Test Tube, 15 Ml, (Part of Fuel Sampling Kit, NSN 6665-00-496-9623)	Drawer D2		None	1			
B-10	28	6640-00-426-0315	(81348) NNNF001643	Forceps, Flat Bladed (u/o ASTM D-2276-73)	Drawer D2		None	1			
B-10	29	6850-00-270-5526	(22527) 13-634-10	Paste, Gasoline Indicating, (Part of Petroleum Testing Kit, NSN 6630-00-151-5310)	Drawer D2		None	1			

Section II INTEGRAL COMPONENTS OF END ITEM-Continued

(1) ILLUSTRATION (A) FIGURE NO.	(B) ITEM NO.	(2) NATIONAL STOCK NUMBER	(3) PART NO. & FSCM	(4) DESCRIPTION	(5) LOCATION	(6) USABLE ON CODE	(7) QTY REQD	(8) QUANTITY REV'D	DATE	DATE	DATE
B-10	30	6630-00-442-9005	(22527) A-988	Test Paper, Hydrion, Fed. Spec., O-P-94A Long Range, A and B Class A	Drawer D2		None	1			
B-10	31	6850-00-090-1361	(22527) 13-634-5	Paste, Water indicating, (Part of Petroleum Testing Kit, NSN 6630-00-151-5310)	Drawer D2		None	1			
B-10	32	8030-00-889-3535	(81349) MIL-T-27730	Tape, Antiseizing MIL. Spec., T-2793 OA, Size II	Drawer D2		None	2			
B-10	33	6640-00-985-2099	(08071) HAWP-026-	Disc, Filtering, 25 mm Dia., (u/o ASTM D-2276-73) 100 Each	Drawer D2		None	1			
B-10	34	9150-00-965-2408	(71984) High Vacuum Grease	Stopcock Lubricant Silicone, 2 oz. Jar	Drawer D2		None	1			
B-10	35	7530-00-663-3949	(22527) 11-876-10A	Label, Opaque, Red, Fed. Spec., L-L-0040, 33 Ft. Roll	Drawer D2		None	2			
B-10	36	6640-00-291-8724	(96906) MS36097-27	Paper, Filter, Qualitative 100 Each, Fed. Spec., NNN-P-1475A,Type 2, Class 7	Drawer	D2	None	2			
B-10	37	6640-00-436-9920	(08071) AAWP-037-00	Paper, Filter, 37 mm, 100 Each, (u/o ASTM D-2276-73)	Drawer D2		None	1			
B-10	38	NNSN	NPN	Plugs, Protective, Fuel Monitor, (Part of Kit, Fuel Sampling NSN 6665-00-496-9623)	Drawer D2		None	24			
B-10	39	6640-00-252-5198	(22527) 09-826D	Paper, Filter, Qual-tatlve, 100 Each, Mil. Spec., P-0036551,Type I, Class 1, Grade 1, Style I	Drawer D2		None	1			
B-10	40	6640-00-866-1427	(96906) MS36097-14	Paper, Filter, Quali-tative, 100 Each, Fed. Spec., NNN-P-1475A, Type I, Class L, Grade I, Style I	Drawer D2		None	1			
B-10	41	6640-004)-083-5308	IIAWP-047-00	(08071) (u/o ASTM D-2276-73)	Paper, Filter, 47 mm, D2		Drawer		None	2	
B-10	42	6640-00-967-0501	(08071) AAWP-047-00	Disc, Filtering, Micro Porous, 47 mm, (u/o ASTM D-2276-73)	Drawer D2		None	1			
B-10	43	6640-00-252-5202	(22527) 09846E	Paper, Filter, Qualitative, Whatman No 40, 12.5 cm Dia.,(u/o ASTM D-482-74)	Drawer D2		None	1			
B-10	44	5685-00-194-1707 T-3790	(53629)	Thermometer Set, M36 to P761DEGF	Drawer D3		None	1			
B-10	45	5640-00-323-8689	(96906) MS36252-1	Corrosion Test Strip Copper, (u/o ASTM D-130-75)	Drawer D3		None	24			

Section II INTEGRAL COMPONENTS OF END ITEM-Continued

(1) ILLUSTRATION (A) FIGURE NO.	(B) ITEM NO.	(2) NATIONAL STOCK NUMBER	(3) PART NO. & FSCM	(4) DESCRIPTION	(5) LOCATION	(6) USABLE ON CODE	(7) QTY REQD	(8) QUANTITY REV'D	DATE	DATE	DATE
B-10	46	6645-00-126-0286	(81349) MIL-S-14823	Stopwatch, 30 min to 1/5 second, Mil. Spec S-14823	Drawer D3		None	4			
B-10	47	6680-00-762-4057	(22527) 11-164-50	Flowmeter, Precision	Drawer D3		None	1			
B-10	48	6640-00-074-3339	(81346) 12-401300-00	Corrosion Reference Standards for ASTM D-130-75, (13 Each Test Strips)	Drawer D3		None	1			
B-10	49	6640-00-436-9926	(21519) 82-460-02	Kit, Glass Tubing Repair, 5 mm to 12 mm O.D.	Drawer D3		None	1			
B-10	50	6640-00-084-5080	(22527) 11-998	Paper, Bibulous (Drying) (50 Sheets per Book)	Drawer D3		None	1			
B-10	51	6640-00-290-2241	(22527) 03-995B	Wing Top, for Gas Burner	Drawer D3		None	1			
B-10	52	6670-00-351-2356	(22527) 2-214A	Weight Set, Balance, Class S, (8 Each, Unit Weights and 8 Each Fractional Weights)	Drawer D3		None	1			
B-10	53	6630-00-522-1893	(22527) 13-420-20	Bomb, Test, Copper Strip, (u/o ASTM D-130-75)	Drawer D3		None	2			
B-10	54	6640-00-442-5100	(22627) 14-810-37	Rack, Test Tube, Cres, 14 Tube	Drawer		None	1			
B-10	55	5210-00293-3606	(81348) GGG-T-106	Tape, Measuring, 72 In. Lg., Fed. Spec., GGG-T-106D, Type V, Class B, Style 2	Drawer D3		None	1			
B-10	56	6670-00-803-9680	(81348) AAAW200	Weight Set, Balance I to 1000 g (13 Each per Set)	Drawer D3		None	1			
B-10	57	6640-00-410-1917	(05668) 6070-30	Stopcock, Plastic, Tapered Ends, 3/8 in. to 1/4 in.	Drawer D3		None	6			
B-10	58		(14674) 3582	Receiver, Distilling, Outer 24/40 Joint Top, Inner 24/40 Joint Side Arm (u/o ASTM D-322-67)	Drawer D3		None	2			
B-10	69	Deleted									
B-10	60	6640-00-244-4341	(14674) 2962-260	Cylinder, Ungraduated Glass, w/Spout, (u/o ASTM D-287)	Drawer D4		None	1			
B-10	61	6640-00-899-6375	(14674) 3767-10	Flask, Dewier, Evacuated, Glass 1900 mm Cap., (u/o ASTM D-322-67)	Drawer D4		None	1			
B-10	62	6640-00-494-3923	(14674) 8980-24	Tube, Connecting 3 Way, 75 Deg., (u/o ASTM D-322-67)	Drawer D4		None	2			
B-10	63	6640-00-857-6877	(14674) 4300-500	Flask, Boiling, Glass Long Neck, Joint Size 24/40, (u/o ASTM D-95-70)	Drawer D4		None	2			

Section II INTEGRAL COMPONENTS OF END ITEM-Continued

(1) ILLUSTRATION (A) FIGURE NO.	(B) ITEM NO.	(2) NATIONAL STOCK NUMBER	(3) PART NO. & FSCM	(4) DESCRIPTION	(5) LOCATION	(6) USABLE ON CODE	(7) QTY REQD	(8) QUANTITY REV'D	DATE	DATE	DATE
B-10	64	6640-00-852-3013	(14674) 8840-24	Adapter, Glass, Curved, 20/40 Joint (u/o ASTM D-322-67)	Drawer D4		None	2			
B-10	65	6640-00-069-2747	(22527) 03-403-10	Bottle, Washing, Guth Universal, 500 Ml Cap.	Drawer D4		None	2			
B-10	66	6640-00-494-3922	(14674) 8945-24	Tube Connecting, Glass, 105 Deg, 24/40 Joint w/Suction Tube, (u/o ASTM D-322-67)	Drawer D4		None	2			
B-10	67	6640-00-477-3274	(14674) 8160-100	Tube, Centrifuge, Glass, 100 mm Cap., (u/o ASTM D-322-67, D-1796-68, D-2273)	Drawer D4		None	2			
B-10	68	6640-00-899-8980	(53629) 9320-300	Tower, Drying, Calc-cium Chloride, Glass 300 mm H, (u/o ASTM D-892-74)	Drawer D4		None	1			
B-10	69	NNSN	NPN	Tube, Delivery, Bent (Part of Washing Bottle, NSN 6640-00-069-2747)	Drawer D4		None	1			
B-10	70	6665-00-496-9623	(08071)	Kit Fuel Sampling XX64-037-30	Drawer		None	1			
B-10	71	6630-00-713-2097	(90767) 611A	Tester, Aqua, with Magnifying Prism, (w/o Color Standards) (u/o ASTM)	Drawer D5		None1				
B-10	72	6640-00-893-3096	(08071) XX20-047-20	Hydrosol, Stainless, 47 mm, (u/o ASTM D-2276-73)	Drawer D5		None	1			
B-10	73	6680-00-526-6889	(22527) 5-097	Tachometer, Hand	Drawer D5		None	1			
B-10	74	6680-00-496-9612 5-097-5	(22527)	Shaft, Extension, 30 mm, (For Hand Tachometer, NSN 6680-00-526-6389)	Drawer D5		None	1			
B-10	75	6630-00-789-0486	(90767) 611-95	Color Disc, Blue, Green, Purple and Brown Gasoline Colorants, (u/o ASTM D-2392)	Drawer D5		None	1			
B-10	75	6630-00-789-0487	(90767) 611-96	Color Disc, Red Gas-oline Colorants (u/o ASTM D-2392)	Drawer D5		None	1			
B-10	76	6630-00-789-0488	(90767) 611-97	Color Disc, Red Gas-oline Colorant, (For Army Spec., Mil-G-3 056), (u/o ASTM D-23 92)	Drawer D5		None	1			
B-10	76	6640-00-235-3820	(32218) GTP 25	Pad, Water Detector (25 Per Box) (Used with Testing Kit, 6640-00-244-9478)	Drawer D5		None	2			
B-10	77	6640-00-551-4082	(22527) 3-902P	Burner, Gas (For LP Gas)	Drawer D5		None	1			

Section II INTEGRAL COMPONENTS OF END ITEM-Continued

(1) ILLUSTRATION (A) FIGURE NO.	(B) ITEM NO.	(2) NATIONAL STOCK NUMBER	(3) PART NO. & FSCM	(4) DESCRIPTION	(5) LOCATION	(6) USABLE ON CODE	(7) QTY REQD	(8) QUANTITY REV'D	DATE	DATE	DATE
B-10	78	7510-00-821-0285	(22527) 13-940-724	Ink, Recording, Instr. Red, (u/o ASTM D-525-74 and D-873 -74)	Drawer D5		None	1			
B-10	79	7510-00-267-9249	(22527) 13-940-725	Ink, Recording Instr. Blue (u/o ASTM D-525-74 and D-873-74)	Drawer D5		None	1			
B-10	80	6640-00-688-7882	(08071) XX66-025-00	Dispenser, Filtering Solvent, 25 mm, (u/o ASTM D-2276-73)	Drawer D5		None	2			

Section II INTEGRAL COMPONENTS OF END ITEM-Continued

(1) ILLUSTRATION (A) FIGURE NO.	(B) ITEM NO.	(2) NATIONAL STOCK NUMBER	(3) PART NO. & FSCM	(4) DESCRIPTION	(5) LOCATION	(6) USABLE ON CODE	(7) QTY REQD	(8) QUANTITY REV'D	DATE	DATE	DATE
B-11	1	3685-00-179-2534 81-608-01	(20056) Micro-Set	Thermoregulator,	Drawer E1		None	Y			
B-11	2	3685-00-179-2533 62543	(48619)	Guard, Thermoregulat- or	Drawer E1		None	1			
B-11	3	NNSN	(48619) 522235	Thermoregulator, (Part of Bath, R.V.P., El NSN 6630-00-359-9629)	Drawer		None	2			
B-11	4	NNSN	NPN	Thermoregulator (Part of Bath, Kine- matic Viscosity, NSN 6630-00-404-2753)	Drawer E1		None	1			
B-11	5	6640-00-403-9338	(48619) 69419	Frame Assembly, Laboratory Apparatus, Fed. Spec., NN-F-600 Set 1	Drawer E2		None	1			
B-11	5	6640-00-410-1912	(48619) 69416	Rod, Laboratory Frame, 1/2 x 48 Lg., Aluminum	Drawer E2		None	2			
B-11	5	6640-00-410-1911	(48619) 69403	Connector, Laboratory Frame, End-to-End Type, 1/2 in. Rods	Drawer E2		None	2			
B-11	6	NNSN	(29227) 100X	Cup, Suction (1/2 in. Hole)	Drawer E2		None	2			
B-11	7	6810-00-282-2910	(64484) SC-108	Asbestos-Sodium Hydroxide Mixture 1 LB Bottle (u/o ASTM D-974 -64)	Drawer E3		None	1			
B-11	8	6810-00-234-8362	(22527) B46	Barium Hydroxide Octahydrate, ACS Ba (OH) 28H 0 1 LB Bottle, u/io ASTM D-974-64)	Drawer E3		None	1			
B-11	9	6810-00-234-8377	(22527) 5-421	Sodium Sulfate Anhydrous, ACS, NA S04, Granular, 1 LB Bottle, (u/o ASTM D-86 and D-611-64)	Drawer E3		None	1			
B-11	10	6810-00-264-6592	(22527) S-421	Sodium Chloride, ACS NAC1, Crystal, 1 LB E3 Bottle, (u/o ASTM D-526-70)	Drawer		None	1			
B-11	11	6810-00-233-0118	(22527) S-343	Sodium Nitrate, ACS NANO3, Crystal, 1 kg E3 Bottle, (u/o ASTM D-2700-70)	Drawer		None	1			
B-11	11	6810-00-233-0118	(22527) S343	Sodium Nitrate, ACS NANO3, Crystal, I kg E3 Bottle, (u/o ASTM D-2699-70 and D-2700- 70)	Drawer		None	1			
B-11	12	6810-00-262-8582	(22527) S-235	Sodium Dichronlate Crystal, NA2Ct207- 2li20, 1 LB, Bottle	Drawer		None	1			

Section II INTEGRAL COMPONENTS OF END ITEM-Continued

(1) ILLUSTRATION (A) FIGURE NO.	(B) ITEM NO.	(2) NATIONAL STOCK NUMBER	(3) PART NO. & FSCM	(4) DESCRIPTION	(5) LOCATION	(6) USABLE ON CODE	(7) QTY REQD	(8) QUANTITY REV'D	DATE	DATE	DATE
B-11	13	6810-00-241-1143	(22527) S-233	Sodium Bicarbonate, ACS, Powder, NAHCO 3, 1 LB Bottle	Drawer E3		None	1			
B-11	14	6810-00-234-8380	(22527) S-445	Sodium Thlosulfate, ACS, Crystal, NAS2-035H20, 1 LB Bottle, (u/o ASTM D-526-70)	Drawer E3		None	1			
B-11	15	6810-00-223-7612	(22527) P-79	Phenolphthalein, ACS C6H4COOC (C6H4-4-011) 1/4 LB Bottle, (u/o ASTM D-94 and D-974 -64)	Drawer E3		None	1			
B-11	16	6640-00-861-6215	(22527) 14-862	Test Papers, Lead Acetate, 100 Strips per Vial, (u/o ASTM D-526-70)	Drawer E3		None	12			
B-11	17	6640-00-269-8345	(96906) MS36015-3	Grid, Wire Gauze, 6 6 in. x 6 in., Nickel-chrome	Drawer E4		None	2			
B-11	18	6640-00-427-3960	(96906) MS36016-2	Grid, Wire Gauze 6 in. x 6 in., Carbon Steel	Drawer E4		None	4			
B-11	19	6640-00-840-1390	(22527) 15-590A	Grid, Wire Gauze 4 in. x 4 in., Steel	Drawer E4		None	4			
B-11	20	6640-00-269-8342	(96906) MS36015-1	Grid, Wire Gauze 4 in. x 4 in. Nickel-Chrome	Drawer E4		None	4			
B-11	21	6630-00-359-9706	(48619) 735-71	Carbon Residue Apparatus (u/o ASTM D-189-76)	Drawer E4		None	1			
B-11	22	NNSN	(94481) S-6	Oil, Calibration Standard Series 75-100 1 pt, (u/o ASTM D-445 -74)	Drawer E4		None	1			
B-11	23	NNSN	(94481) S600	Oil, Calibration Standard Series 600 1 pt, (u/o ASTM D-445-74)	Drawer E4		None	1			
B-11	24	NNSN	(94481) S60	Oil, Calibration Standard Series 200 -300, 1 pt, (u/o ASTM D-445-74)	Drawer E4		None	1			
B-11	25	6810-00-890-2052	(22527) C-577	Sodium Dichromate Solution, 6 Each 1 Fl. oz. Bottles per Carton, (u/o ASTM D-1094-72)	Drawer E4		None	1			
B-11	26	6640-00-966-3644	(22527) 14-797A	Basket, Test Tube, 128 mm Dia.	Drawer E4		None	1			
B-11	27	6640-00-936-2065	(64484) S-24155	Crucible, Skidmore, 70 Ml Cap., (u/o ASTM D-189-76)	Drawer E4		None	1			
B-11	28	6640-00-290-6913	(22527) 10-381-ID	Funnel, Common, Glass	Drawer E5		None	1			
B-11	29	6640-00-522-1889	(22527) 10-181-5E	Flask, Filtering, 4000 Ml Cap	Drawer E5		None	1			
B-11	30	NNSN	(02993) 27067	Tubulature, Plastic	Drawer		None	1			
B-11	31	NNSN	(02993) 27066	Grommet, Neoprene	Drawer		None	6			

Section II INTEGRAL COMPONENTS OF END ITEM-Continued

(1) ILLUSTRATION (A) FIGURE NO.	(B) ITEM NO.	(2) NATIONAL STOCK NUMBER	(3) PART NO. & FSCM	(4) DESCRIPTION	(5) LOCATION	(6) USABLE ON CODE	(7) QTY REQD	(8) QUANTITY REV'D	DATE	DATE	DATE
B-12	1	6230-00-269-3034	NPN	Flashlight, 2 Cell Explosion Proof, Mil. Spec. F-3747C Type T, Style I, (u/o ASTM D-270)	Cabinet Fl and F2						
B-12	2	6840-00-062-4336	(48619) 67310	centrifuge, Laboratory 120 v, 50/60 Hz, 250 w 2250 RPM, (u/o ASTM D-91-6, D-893, D-17 96-68, D-2273 and FTMS E-5101. 5), Consisting of-	Cabinet Fl and F2		None	1			
			(48619) 67357	Shield, 15 nil. Rd Bottom Tube			None	28			
			(48619) 67358	Shield, 50 ml. Taper Bottom Tube			None	8			
	6640-	6640-00-360-1062	(48619) 67359	Shield, 100 ml., Cone Shaped Tube			None	4			
			(48619) 67360	Shield, 100 ml., Pear Shaped Tube			None	4			
				Trunnion Carriers,							
			(48619) 67312	2 Place, 50 ml. Tube			None	4			
			(48619) 67311	7 Place, 15 ml. Tune			None	4			
				Trunnion Rings							
B-12	3	6640-00-690-3269	(48619) 67313	100 mi. Cone Shaped Tube			None	4			
			(48619) 67314	100 ml. Pear Shaped Tube			None	4			
		6640-00-179-2558 07-785	(22627)	Corks, XXXX Quality, Length, Asst Sizes 100 Each Per Bags	Cabinets Fl and F2		None	1			
		NNSN	(22527) 07-835AA	Ring, Cork, Insula-tion 12 Each Per Bag, (u/o ASTM D-97-66)	Cabinets Fl and F2		None	1			
B-12	4	NNSN	(15472)	AP10 Filter, Water, Aquapure	Cabinets Fl and F2		None	2			
		NNSN	(15472)	AP10 Cartridge, Water Filter	Cabinets Fl and F2		None	8			

Section II INTEGRAL COMPONENTS OF END ITEM-Continued

(1) ILLUSTRATION (A) FIGURE NO.	(B) ITEM NO.	(2) NATIONAL STOCK NUMBER	(3) PART NO. & FSCM	(4) DESCRIPTION	(5) LOCATION	(6) USABLE ON CODE	(7) QTY REQD	(8) QUANTITY REV'D	DATE	DATE	DATE
B-12	5	8110-00-879-7182	(81348) PPP-C-96	Can, Screw Cap, 1 Gal. Fed. Spec., PPP-C-96D, Type V, Class 4	Cabinets F1 and F2		None	3			
B-12	6	8110-00-222-3061	(22527) 4-677C	Can, Screw Cap, 1/2 Gal., Fed. Spec., PPP-C-96D, Type V, Class 4	Cabinets F1 and F2		None	2			
B-12	7	7920-00-965-1709	(22527) 6-666A	Towel, Paper, 15 in. W. (72 Each Per Box)	Cabinets F1 and F2		None	2			
B-12	8	4720-00-244-7790	(81348) Type 5 Class 2	Tubing, Rubber, 3/16 In. is., 50 ft. Roll	Cabinets Fl and F2		None	1			
B-12	9	7240-00-248-9620	(22527) 4-664B	Can, Safety, 2 1/2 Gal. Fed. Spec., RR-S-30 Style 11, Grade C	Cabinets F1 and F2		None	1			
B-12	10	9150-00-499-7819	(48619) 74972	Oil, VL scosimeter Bath (1 Gal. Can)	Cabinet Fl and F2		None	6			
B-12	11	8125-00-400-7958	(22527) 11-815-llB	Bottle, Polyethylene With Cap, 1 Gal.	Cabinets F1l and F2		None	6			
B-12	14	6640-00-403-9347	(48619) 65554	Heater, Extraction, 150 to 800 Deg.	Cabinet Fl and F2		None	1			
			(48619) 525276 (*)	Heater, 120 v, 800 w			None	1			
			(48619) 234042 (*)	Pilot Light, NE-SI			None	1			
			(48619) 248003 (*)	Relay, 115 v, 60 Hz.			None	1			

Section II INTEGRAL COMPONENTS OF END ITEM-Continued

(1) ILLUSTRATION (A) FIGURE NO.	(B) ITEM NO.	(2) NATIONAL STOCK NUMBER	(3) PART NO. & FSCM	(4) DESCRIPTION	(5) LOCATION	(6) USABLE ON CODE	(7) QTY REQD	(8) QUANTITY REV'D	DATE	DATE	DATE
B-13	1	6640-00-404-0658	(22527) 02-883-1CC	Bottle, Screw Cap, Amber Glass, 16 oz., (w/o No. 28 Cap)	Drawer G1		None	2			
B-13	2	6640-00-404-0661	(64484) S-8275H	Bottle, Screw Cap, Glass, 32 oz., (w/Cap) 31	Drawer		None	3			
B-13	3	6640-00-404-0659	(64484) S-8245E	Bottle, Screw Cap, Amber Glass, 32 oz., (w/o No. 33 Cap)	Drawer G1		None	2			
B-13	4	6640-00-404-0660	(64484) S-8275G	Bottle, Screw Cap, Glass, 16 oz., (w/Cap) :1	Drawer		None	2			
B-13	5	6810-00-281-9825 05468B	(22527)	Charcoal, Activated, 4 lb. Can, MIL-C-137 .2 24, MIL-C-1020tA, (u/O ASTM D-974-64)	Drawer		None	1			
B-13	6	5350-00-161-9033	(22527) P-363	Pumice, Powder, Fed. Spec., SS-P-82B, 32 Grade FFF, 5 lb. Can	Drawer		None	1			
B-13	7	6810-00-264-6593	(22527) S-263	Sodium Carbonate, Anhydrous, Powder, 1 lb. Bottle, NA2CO3 Fed. Spec. C-265A	Drawer G2		None	1			
B-13	8	6810-00-227-1259	(22527) M-216	Methyl Orange ACS, (Indicator) 1/4 lb. Bottle, 4-NaSO2C6H4 N:NC6H4-4N (CH3)2 Fed. Spec. -O-C-265A (u/o ASTM D-974-64 and FTMS F-5101.6)	Drawer G2		None	1			
B-13	9	6810-00-236-5359	(22527) L-62	Lead Nitrate, ACS 1 lb. Per Bottle, Pb-(NO3)2, (u/o ASTM D-526-70)	Drawer G2		None	1			
B-13	10	6810-00-237-2908	(22527) S-425	Sodium Sulfide, Non-Hydrate, NA2S-9H20, Fed. Spec.-O-C-265A, 1 lb. Bottle, (u/o ASTM D-526-70)	Drawer G2		None	1			
B-13	11	6810-00-275-8134	(22527) P-245	Potassium Hydrogen Phthalate Primary Standard, ACS, HOCOC6H4COOK, Fed. Spec. O-C265A	Drawer G2		None	1			

Section II INTEGRAL COMPONENTS OF END ITEM-Continued

(1) ILLUSTRATION (A) FIGURE NO.	(B) ITEM NO.	(2) NATIONAL STOCK NUMBER	(3) PART NO. & FSCM	(4) DESCRIPTION	(5) LOCATION	(6) USABLE ON CODE	(7) QTY REQD	(8) QUANTITY REV'D	DATE	DATE	DATE
B-13	12	6810-00-281-7477	(22527) M-141	Mercury, Metal, Instrument Grade, ACS, Fed. Spec. O-C-265A, 6 lb. Bottle	Drawer G2		None	1			
B-13	13	6810-00-070-7677	(22527) 924	P-Naptholbenzein, 25 gm. Bottle, 4HOC1oH6C:CIOH6-4:-O(C6H5) (u/o ASTM D-974-64)	Drawer G2		None	1			
B-13	14	6810-00-243-4433	(22627) P-256	Potassium Iodide, Free Flowing, Granular, ACS, KI, 1 lb. Bottle, (u/o ASTM D-526-70)	Drawer G2		None	1			
B-13	15	6810-00-271-1405	(22527) L-33	Lead Acetate, Normal ACS, 1 lb. Bottle, PB(C2H302)-3H20, (u/o ASTM D-526-70)	Drawer G2		None	1			
B-13	16	6810-00-233-0126	(22527) S-181	Silver Nitrate, Crystal, ACS, AgNO3 1/4 lb. Bottle, (u/o ASTM D-94)	Drawer G2		None	1			
B-13	17	6810-00-247-0600	(22527) M-156	Mercury Iodide, Red, ACS, HgL2, 1/4 lb. Bottle	Drawer GI		None	1			
B-13	18	6810-00-241-1157	(22527) Z-52	Zinc-Oxide, Powder, ACS, ZnO, 1 lb. Bottle	Drawer G2		None	1			
B-13	19	6810-00-234-2013	(22527) N-105	P-Nitrophenol, Flake 100 gm. Bottle, (u/o ASTM D-526-70)	Drawer G2		None	1			
B-13	20	6810-00-281-9827	(22527) P-248	Potassium Hydroxide, Pellets, KOH, 1 lb. Bottle, (u/o ASTM D-94 and D-974-64)	Drawer G2		None	1			
B-13	21	6810-00-281-7450	'22527) M-141	Mercury, Metal, Instrument Grade, ACS Fed. Spec. O-C-265A 6 lb. Bottle	Drawer G2		None	1			

Section II INTEGRAL COMPONENTS OF END ITEM-Continued

(1) ILLUSTRATION (A) FIGURE NO.	(B) ITEM NO.	(2) NATIONAL STOCK NUMBER	(3) PART NO. & FSCM	(4) DESCRIPTION	(5) LOCATION	(6) USABLE ON CODE	(7) QTY REQD	(8) QUANTITY REV'D	DATE	DATE	DATE
B-13	22	6810-00-237-2935	(64484) SC16063	Calcium Chloride, Anhydrous, CaC12 5 lb. Bottle, Fed. Spec. O-C-105D, Type 2, Grade B, (u/o ASTM D-93-73)	Drawer G2		None	1			
B-13	23	6810-00-753-4780	(22527) A-19	Acetone, Spectranalyz-ed ACS, CH3COCH3 I qt. Bottle	Drawer G3		None	6			
B-13	24	6810-00-281-5265	(64484) SC10987	Benzene, ACS, Liquid, 1 qt. Bottle	Drawer G3		None	4			
B-13	25	6810-00-222-2636	(22527) G-33	Glycerin, ACS, Liquid 1 pt. Bottle, CH2OHCHOHCH2OH, FTMS F-5340)	Drawer G3		None	1			
B-13	26	6810-00-264-6609	(22527) C-574	Chloroform, Spectranalyzed, ACS, CHC13 1 qt. Bottle, (u/o ASTM D-526-70)	Drawer G3		None	1			
B-13	27	6810-00-264-8997	(22527) E-182	Ethylene Glycol, Mono-Methyl Ether, C3H802, 1 pt. Bottle (u/o FTMS F-5340)	Drawer G3		None	1			
B-13	28	6810-00-222-2637	(22527) C-187	Carbon Tetrachloride ACS, CC14, 1 pt. Bottle, (u/o ASTM D-526-70)	Drawer G3		None	1			
B-13	29	6810-00-270-8211	(22527) D-30	N-Butyl Phthalate 8. 7 lb. Bottle, C6H4-1,2 (COO(C H2)3C H3)2	Drawer G3		None	1			
B-13	30	6810-00-753-4783	(22527) A-412	(Methanol, ACS, CH3-OH 1 pt. Bottle, (u/o ASTM D-94 and D-2386)	Drawer G3		None	1			
B-13	31	6810-00-222-2635	(22527) A-740	Aniline, C6H5NH2 1 pt. Bottle, (u/o ASTM D-611-64)	Drawer G3		None	1			
B-13	32	6505-00-753-4773	(22527) M-220	Methyl Salicylate, C8H803, pt. Bottle	Drawer G3		None	1			

Section II..COMPONENTS OF END ITEM - Continued

(1) ILLUSTRATION (a) FIGURE NO	(1) ILLUSTRATION (b) ITEM NO	(2) NATIONAL STOCK NUMBER	(3) PART NO. & FSCM	(4) DESCRIPTION	(5) LOCATION	(6) USABLE ON CODE	(7) QTY REQD	(8) QUANTITY RCVD	DATE	DATE	DATE
B-14	1	6640-00-062-5949	(22527) 10-094C	Flask, Iodine, Glass 500 ml	Drawer H1	None	1				
B-14	2	6640-00-405-1000	(22527)2-940C	Bottle, Stopper, Glass 250 ml	Drawer Hi	None	3				
B-14	3	6640-00-405-1500	(22527) 02-940D	Bottle Stopper, Glass, 500 ml	Drawer HI	None	3				
B-14	4	6640-00-405-3000	(22527) 2-940E	Bottle Stopper, 1000 mli.	Drawer	None	1				
B-14	5	6640-00-926-1315	(22527) 10-437-5D	Funnel, Separatory, 500 ml (u/o ASTM D-2276-73)	Drawer H1	None	1				
B-14	6	6640-00-456-1036	(22527) 14-1699C	Tubing, PVC, 1/4 in I.D., (u/o ASTM D-2276-73)	Drawer H2	None	1				
B-14	7	4720-00-429-6874	(22527) 14-1782CC	Tubing, Rubber, 1/4 In I.D., 12 ft. lg	Drawer H2	None	3				
B-14	8	4720-00-410-9506	(22527) 14-169-1S3/8	Tubing, Plastic, Plastic, 3/8 in I.D., 25 FTL lg. (u/o 0-2276-73)	Drawer H2	None	1				
B-14	9	4720-00-729-6406	(22527) 14-171A	Tubing, Neoprene, 3/16 In. Bore, 50 ft lb.	Drawer H2	None	1				
B-14	10	4720-00-927-5538	(22527) 14-175B	Tubing, Rubber, Black Pressure and Vacuum, 3/16 In. I.D. 12 ft. lg.	Drawer H2	None	1				
B-14	11	4720-00-411-5450	(22527) 14-169J	Tubing, Medical Grade PVC, 1/2 in I.D., 50 ft. lg. (u/o ASTM D-2276-73)	Drawer H2	None	1				
B-14	12	4720-00-410-9505	(22527) 14-1699F	Tubing, Medical Grade PVC, 3/8 in. I.D., 50 ft. lg. (u/o ASTM D-2276-73)	Drawer H2	None	1				
B-14	13	4720-00-411-5451	(64484) S-73650KG	Tubing, Plastic, Tygon, 1/2 In. I.D. 50 ft. lg., (u/o ASTM D-2276-73)	Drawer H2	None	1				
B-14	14	4720-00-273-1032	(22527) 14-171B	Tubing, Neoprene, 1/4 in. I.D., 50 ft. lg	Drawer H2	None	1				

Section II..COMPONENTS OF END ITEM - Continued

(1) ILLUSTRATION (a) FIGURE NO	(b) ITEM NO	(2) NATIONAL STOCK NUMBER	(3) PART NO. & FSCM	(4) DESCRIPTION	(5) LOCATION	(6) USABLE ON CODE	(7) QTY REQD	(8) QUANTITY RCVD	DATE	DATE	DATE
B-14	15	6810-00-174-5188	(22527) C-614	Calcium Chloride, ACS CaC12, 5 lb Bottle	Drawer H2	None	1				
B-14	168	810-00-275-8126	(22527) S-516	Starch, Soluble, ACS 1 lb. Bottle, (u/o ASTM D-528-70)	Drawer H3	None	1				
B-14	17	6810-00-137-5000	(22527) P-285	Potassium Phosphate, KH2PO4, 1 lb. Bottle, (u/o ASTM D-1094-72)	Drawer H3	None	1				
B-14	18	8810-00-270-3255	(81348) 0C265	Potassium Phosphate Dibaslc, K2HPO4, 1/4 lb. Bottle, (u/o ASTM D-1094-72)	Drawer H3	None	1				
B-14	19	6810-00-240-2119	(22527) S-272	Sodium Chromate, ACS Na2CrO4, 1 lb. Bottle (u/o ASTM D-2699-70 and D-2700-70)	Drawer H3	None	1				
B-14	20	6640-00-202-1701	(35051) 70844H-81	Asbestos, Long Fiber (Amphibole) 1/4 lb Can (u/o ASTM D-526-70)	Drawer H3	None	1				
B-14	21	6810-00-174-8585	(22527) S-318	Sodium Hydroxide, NaOH, 1 lb. Bottle	Drawer H3	None	1				
B-14	22	68810-00-753-4784	(22527) A-869	Ammonlum Hydroxide, ACS, NH4OH, 1 pt Bottle, (u/o ASTM D-526-70)	Drawer H3	None	1				
B-14	23	6810-00-222-2634	(22527) A-38	Acetic Acid, ACS, CH3COOH, I pt Bottle (u/o ASTM D-526-70)	Drawer H3	None	1				
B-14	24	6810-00-237-2954	(22527) A-200	Nitric Acid, ACS, HN03, I pt Bottle (u/o ASTM D-526-70)	Drawer H3	None	4				
B-14	25	6810-00-753-4786	(22527) A-144	Hydrochloric Acid, ACS, HC1, 1 pt Bottle, (u/o ASTM D-974-64)	Drawer H3	None	4				
B-14	26	6850-281-1837	(81348) OD210A Type 1CL 1	Desiccant, Anhydrous Calcium Sulfate, 5 lb. Can, (u/o ASTM D-892-74)	Drawer H3	None	1				
B-14	27	6810-00-241-1150	(22527) P-212	Potassium Chlorate, ACS, $KC10_3$, 1 lb Bottle, (u/o ASTM D-526-70)	Drawer H3	None	1				

Section II..COMPONENTS OF END ITEM - Continued

(1) ILLUSTRATION (a) FIGURE NO	(b) ITEM NO	(2) NATIONAL STOCK NUMBER	(3) PART NO. & FSCM	(4) DESCRIPTION	(5) LOCATION	(6) USABLE ON CODE	(7) QTY REQD	(8) QUANTITY RCVD	DATE	DATE	DATE
B-14	15	6810-00-174-5188	(22527) C-614	Calcium Chloride,	Drawer	None	1				
B-15	1	6640-00-436-9941	(22527) 13-361A	Tray, Haif-Size, Stainless Steel, 9 7/8 X 8 1/2 X 2 1/4	Drawer J1	None	1				
B-15	2	4240-00-269-7912	(22527) 11-401 -01	Goggles, Safety, Impact and Chemical Splash	Drawer J1	None	1				
B-15	3	4240-00-964-5615	(22527) 11-409 -1	Visor, Face Shield	Drawer J1	None	1				
B-15	4	6840-00-410-1919	(80740) 90276	Support Rack, Pipet	Drawer J1	None	1				
B-15	5	6640-00-403-9343	(22527) 5-719 -9A	Jar, Chromatography, 3.8 Liters	Drawer J1	None	1				
B-15	6	6685-00-411-5488	(64484) S-39746	Gauge, Vacuum, Mercury Manometer	Drawer J1	None	1				
B-15	7	668000-151-695310	(19099) SC6630 -97-CL-EO6	Kit, Petroleum Testing, Mil Spec Mil -T-51028A, (u/o ASTM D-270, D-287, D-1085, D-1086-64, D-1250-56, and D-1298)	Drawer J1	None	1				
B-15	8	6640-00-522-1897	(80740) 48-299	Computer, Oil Gravity A.P.1., (Part of Kit Petroleum Testing, NSN 6630-00-151 -5310)	Drawer J1	None	1				
B-15	9	6810-00-277-12T1	(64484) SC-136 80	Naptha, Precipitation 1 Gal Can, (u/o ASTM D-91-61)	Drawer J2	None	1				
B-15	10	6810-00277-1271	(64484) SC-135 55	Methyl Ethyl Ketone, 1 Gal Can, (u/o ASTM D-94)	Drawer J2	None	1				
B-15	11	6810-00-865-2055	(22527) E-177	Ethylene Glycol, 1 Gal Can, HOCH,CH,OH (u/o ASTM D-5t(D -361)	Drawer J2	None	1				
B-15	12	6630-00-244-9415	(22627) 13-509-1	Tester, Flash Point Closed Cup, Electric (u/o ASTM D-56)	Drawer J2	None	1				
B-15	13	6810-00-964-3497	(22527) C-140	Calcium Sulfate, ACS C2SO042H2O0, 1 lb Bottle, (u/o ASTM D-611-64)	Drawer J2	None	1				
B-15	14	9150-01-045-0446	(22527) 0-119	Paraffin Oil, White, 1 qt. Bottle	Drawer	None	1				
B-15	15	8810-00-982-5125	(22527) C-334	Chromium Oxide, Powder, CR203 1 lb Bottle	Drawer J2	None	1				
B-15	16	6810-00-234-7209	(22527) A-637	Ammonium Acetate, ACS, OH3COONH4, 1 lb Bottle, (u/o ASTM D-526-70)	Drawer J2	None	1				

Section II..COMPONENTS OF END ITEM - Continued

(1) ILLUSTRATION (a) FIGURE NO	(b) ITEM NO	(2) NATIONAL STOCK NUMBER	(3) PART NO. & FSCM	(4) DESCRIPTION	(5) LOCATION	(6) USABLE ON CODE	(7) QTY REQD	(8) QUANTITY RCVD	DATE	DATE	DATE
B-14	15	6810-00-174-5188	(22527) C-614	Calcium Chloride,	Drawer	None	1				
B-15	17	7930-00-266-7137	NPN	Polish, Metal, 1 pt Can, Fed Spec., P-P 556D, Type II, Class 1	Drawer	None J2					
B-15	18	NNSN	(22527) 13-507	Cup, Flash Point, Part of Tester, Flashpoint, Pensky-Marten, NSN 6630-00-530-0987	Drawer J2	None	1				
B-15	19	6850-00-803-6420	NPN	Carbon Removing Compound, 1 gal MIL SPEC., MIL-C-25107B (u/o ASTM D-2699-70 and D-2700-70)	Drawer J2	None	1				

Section II..COMPONENTS OF END ITEM - Continued

(1) ILLUSTRATION (a) FIGURE NO	(b) ITEM NO	(2) NATIONAL STOCK NUMBER	(3) PART NO. & FSCM	(4) DESCRIPTION	(5) LOCATION	(6) USABLE ON CODE	(7) QTY REQD	(8) QUANTITY RCVD	DATE	DATE	DATE
B-16	1	6640-00-410-4463	(22527) 14-105A	Scraper (Policeman) Rubber	Drawer K1	None	6				
B-16	2	6640-00-522-1894	(22527) 13-580	Heater, Electric, Viscosilmeter, (u/o ASTM D-445-74)	Drawer K1	None	1				
B-16	3	NNSN	(22527) 11-455	Board, Asbestos (Part of Distillation Test Apparatus NSN 6630-00-359-9772 and 6630-00-251-2118)	Drawer K1	None	4				
B-16	4	6640-00-410-1913	(80740) 90-006 -04	Cover, Graduated, (u/o ASTM D-86)	Drawer K1	None	4				
B-16	5	NNSN	(48619) 76028	Block, Wood, Round, (Part of Distillation Test Apparatus, Petroleum, NSN 6630-00-359-9772 and 6630 00-251-2118)	Drawer K1	None	2				
B-16	6	NNSN	(22627) 11-375A	Rod, Stirring, Glass	Drawer K1	None	2				
B-16	7	NNSN	(22527) 11-375C	Rod, Stirring, Glass	Drawer K1	None	4				
B-16	8	NNSN	(22527) 11-375C	Rod, Stirring, Glass	Drawer	None	8				
B-16	9	NNSN	(22527) 11-375D	Rod, Stirring, Glass	Drawer K1	None	2				
B-16	10	6640-00-194-9728	(22527) 02-883-2E	Cap, Screw, Plastic, No. 33	Drawer K2	None	48				
B-16	11	8125-00-251-7529	(22527) 02-883-2B	Cap, Screw, Plastic, No. 28	Drawer K2	None	48				
B-16	12	6640-00-232-5991	(22527) 07-781H	Stopper, Bottle, Cork No. 5, 100 Each Per Bag	Drawer K2	None	1				
B-16	13	6640-00-232-6014	(22527) 07-781J	Stopper, Bottle, Cork No. 6, 100 Each Per Bag	Drawer K2	None	1				
B-16	14	8640-00-232-6005	(22527) 14-130N	Stopper, Bottle, Solid Rubber, No. 9	Drawer K2	None	12				
B-16	15	6640-00-232-6004	(22627) 14-130R	Stopper, Bottle, Solid Rubber, No. 11	Drawer K2	None	5				

Section II..COMPONENTS OF END ITEM - Continued

(1) ILLUSTRATION (a) FIGURE NO	(b) ITEM NO	(2) NATIONAL STOCK NUMBER	(3) PART NO. & FSCM	(4) DESCRIPTION	(5) LOCATION	(6) USABLE ON CODE	(7) QTY REQD	(8) QUANTITY RCVD	DATE	DATE	DATE
B-16	16	6640-00-232-8007	(22527) 14-130L	Stopper, Bottle, Solid Rubber, No. 7	Drawer K2	None	12				
B-16	17	6640-00-232-6012	(22527) 14-130D	Stopper, Bottle, Solid Rubber, No. 2	Drawer K2	None	5				
B-16	18	6640-00-232-6011	(22527) 14-130E	Stopper, Bottle, Solid Rubber, No. 3	Drawer K2	None	12				
B-16	19	6640-00-232-6010	(22627) 14-130F	Stopper, Bottle, Solid Rubber, No. 4	Drawer K2	None	12				
B-16	20	66840-00-935-1105	(22627) 14-130J	Stopper, Bottle, Solid Rubber, No. 6	Drawer K2	None	12				
B-16	21	6640-00-232-8009	(22527) 14-1300	Stopper, Bottle, Solid Rubber, No. 5	Drawer K2	None	12				
B-16	22	6640-00-232-8006	(22527) 14-130M	Stopper, Bottle, Solid Rubber, No. 8	Drawer K2	None	12				
B-16	23	6640-00-103-1845	(22527) 14-130T	Stopper, Bottle, Solid Rubber, No. 12	Drawer K2	None	5				
B-16	24	6640-00-116-2823	(22627) 07-791E	Stopper, Bottle, Cork No. 4, 100 Each Per Bag	Drawer K2	None	1				
B-16	25	6640-00-232-5992	(22527) 07-781G	Stopper, Bottle, Cork No. 7, 100 Each Per Bag	Drawer K2	None	1				
B-16	26	6650-00-263-3552	(06175) 33-4558-01	Refractometer, ABBE Type, (u/o ASTM D-1218 and FTMS F-53 40)	Drawer K3	None	1				
B-16	27	6630-00-359-9787	(22527) 13-528	Tester, Flash Point, Electrically Heated (u/o ASTM D-92-72)	Drawer K3	None	1				
		NNSN	(22527) 10564 (*)	Switch		None	1				
		NNSN	(22527) 10673 (*)	Heater, 115 v		None	1				
		NNSN	(22527) 10551 (*)	Powerstat, 115 v		None	1				
B-16	28	6635-00-359-2232	(48619) 73510	Penetrometer, Universal, (u/o ASTM D-217-68)	Cabinet K3	None	1				
B-16	29	7420-00-579-9381	(41330) LN-160-X	Adding and Subtract Machine, 8 Digit (u/o ASTM D-2270-64)	Cabinet K3	None	1				

Section II..COMPONENTS OF END ITEM - Continued

(1) ILLUSTRATION (a) FIGURE NO	(1) ILLUSTRATION (b) ITEM NO	(2) NATIONAL STOCK NUMBER	(3) PART NO. & FSCM	(4) DESCRIPTION	(5) LOCATION	(6) USABLE ON CODE	(7) QTY REQD	(8) QUANTITY RCVD	DATE	DATE	DATE
B-17	1	86640-00-359-9642	(48619) 61834	Shield, Heat, (u/o ASTM D-86)	Drawer L1	None	2				
B-17	2	6640-00-314-2097	(22527) 3-409-10E	Bottle, Wash, 500 ml, Polyethylene	Drawer L1	None	4				
B-17	3	6840-00-422-2200	(22527) 08-747E	Dish, Culture, Petri	Drawer L1	None	12				
B-17	4	6640-00-290-8808	(22627) 9986-65	Watch Glass, 65 mm	Drawer L1	None	3				
B-17	5	86640-00-290-6789	(14674) 9985-90	Watch Glass, 90 mm	Drawer L1	None	8				
B-17	6	6640-00-282-5708	(22527) 02-609B	Watch Glass, 90 mm	Drawer L1	None	3				
B-17	7	664 06717	(22527) 02409C	Watch Glass, 100 mm	Drawer L1	None	3				
B-17	8	5110-00-223-7782	NPN	Knife, Craftsman	Drawer L1	None	1				
B-17	9	6640-00-171-5198	(22527) 14-365D	Spatula, Laboratory	Drawer L1	None	2				
B-17	10	6640-00-975-0453	(22527) 14-371A	Spatula, Laboratory	Drawer L1	None	2				
B-17	11	6640-00-439-7365	(96906) MS3620 8-4	Spatula, Laboratory	Drawer L1	None	1				
B-17	12	6640-00-439-7375	(96906) MS3620 8-4	Spatula, Laboratory	Drawer L1	None	1				
B-17	13	6640-00-848-8209	(96906) MS3600 0-5	Watch Glass, 150 mm	Drawer L1	None	8				
B-17	14	6640-00-359-9643	(488619) 61836 ASTM D-86)	Shield, Heat, (u/o	Drawer LI	None	2				
B-17	15	68640-00-359-9645	(48619) 61824 ASTM D-86)	Shield, Heat, (u/o	Drawer L1	None	1				
B-17	18	6640-00-404-2762	(80740) 68-785-12	Cork, Drilled, Cloud and Pour Point Apparatus, (12 Each Per Pkg.)	Drawer L2	None	1				

Section II..COMPONENTS OF END ITEM - Continued

(1) ILLUSTRATION (a) FIGURE NO	(b) ITEM NO	(2) NATIONAL STOCK NUMBER	(3) PART NO. & FSCM	(4) DESCRIPTION	(5) LOCATION	(6) USABLE ON CODE	(7) QTY REQD	(8) QUANTITY RCVD	DATE	DATE	DATE
B-17	17	6640-00-404-2761	(21619) G-17482E	Disc, Cork, Cloud & Pour Point Apparatus (u/o ASTM D-97-66)	Drawer L2	None	12				
B-17	18	5330-00-143-8334	(80740) 69-056	Gasket, R.V.P Bomb Liquid Chamber, (25 Each Per Pkg.) (u/o ASTM D,323-72)	Drawer L2	None	1				
B-17	19	5330-00-350-9438	(80740) 68-450-01	Gasket, Teflon, for Gum Stability Bomb (u/o ASTM D-525-74 and D-873-74)	Drawer L2	None	5				
B-17	20	5330-00-350-9346	(48619) 232064	Gasket, D-ring, for Copper Strip Corrosion Bomb, (u/o ASTM D-130-75)	Drawer L2	None	5				
B-17	21	5330-00-402-2209	(80740) 68-450	Gasket, Composition, Used on Gum Stability (u/o ASTM D-525-74 and D-873-74)	Cabinet L2	None	20				
B-17	22	4730-00-908-3193	(96906) MS3584 2-12	Clamp, Hose, 2 in I.D.	Cabinet L2	None	12				
B-17	23	6640-00-410-1917	(06568) C-6074-00	Stopcock, Nalgene, No. 40	Cabinet L2	None	8				
B-17	24	7920-00-023-1056	(22527) 3-608	Brush, Centrifuge Tube	Cabinet L2	None	1				
B-17	25	8020-00-260-1302	NPN	Brush, Varnish, 2 in	Cabinet	None	1				
B-17	26	6640-00-918-7719	(22527) 10-331	Support, Funnel, Rubber	Cabinet L2	None	12				
B-17	27	7920-00-205-0565	(22627) 03-661	Brush, Dust, Camel Hair, 5/8 In. dia	Cabinet L2	None	1				
B-17	28	7920-00-297-1510	(22527) 03-6572-5	Brush, Test Tube, 11 in. lg.	Cabinet	None	2				
B-17	29	7920-00-917-5843	(22527) 3-621A	Brush, Test Tube 1 3/4 In. dia	Cabinet L2	None	2				
B-17	30	7920-00-917-5844	(22527) 3-621B	Brush, Test Tube, 2 3/8 in. dia	Cabinet L2	None	1				

Section II..COMPONENTS OF END ITEM - Continued

(1) ILLUSTRATION (a) FIGURE NO	(b) ITEM NO	(2) NATIONAL STOCK NUMBER	(3) PART NO. & FSCM	(4) DESCRIPTION	(5) LOCATION	(6) USABLE ON CODE	(7) QTY REQD	(8) QUANTITY RCVD	DATE	DATE	DATE
B-17	31	7920-00-282-7784	(22627) 03-578	Brush, Test Tube, 3/4 in. dia	Cabinet L2	None	4				
B-17	32	7920-00-409-4000	(22527) 3-571	Brush, Test Tube, 2 in. dia	Cabinet L2	None	1				
B-17	33	7920-00-178-8315	(22527) 3-680	Brush, Table Dusting, 13 in. Lg	Cabinet L2	None	1				
B-17	34	5110-00-224-8840	(07429) 37560	Cleaner, Valve Stem Guide, (u/o ASTM D-2700-70)	Cabinet L2	None	1				
B-17	35	7920-00-240-6359	(22627) 03-625	Brush, Tapered, Pipet 17 in. lg	Cabinet L2	None	2				
B-17	36	7920-00-494-3688	(22527) 03-570A	Brush, Flask, 9 1/2 in. lg	Cabinet L2	None	1				
B-17	37	7920-00-402-2379	(22527) 3-622	Brush, Nessler Tube 19 in. lg	Cabinet L2	None	1				
B-17	38	7920-00-753-5260	(22627) 03-590	Brush, Test Tube, 1 3/8 in. dia	Cabinet L2	None	1				
B-17	39	7920-00-889-3381	(22527) 03-573	Brush, Test Tube, 1 1/4 in. dia	Cabinet L2	None	2				
B-17	40	5330-00-169-0557	(48619) 232068	Gasket, Gauge Coupling, 25 Each in Pkg (u/o ASTM D-323-72)	Cabinet L2	None	1				
B-17	41	5999-00-263-1051	(22527) 2-513-10	Clip, Electrical, Alligator Style, No. 1	Cabinet L2	None	10				
B-17	42	NNSN	(80740) 69-075-02	Gasket, for 1/4 Size R.V.P. Bomb	Cabinet L2	None	48				
B-17	43	6640-00-403-9344	(22627) 08-239B	Adapter, Crucible, Rubber	Cabinet L2	None	12				
B-17	44	NNSN	(48819) 67542	Clamp, Extraction Heater Rod	Cabinet L2	None	8				
B-17	45	5340-00-252-5317	(64484) S-40221G	Clamp, Manostat Joint (u/o ASTM D-322-67)	Cabinet L2	None	8				

Section II..COMPONENTS OF END ITEM - Continued

(1) ILLUSTRATION (a) FIGURE NO	(1) ILLUSTRATION (b) ITEM NO	(2) NATIONAL STOCK NUMBER	(3) PART NO. & FSCM	(4) DESCRIPTION	(5) LOCATION	(6) USABLE ON CODE	(7) QTY REQD	(8) QUANTITY RCVD	DATE	DATE	DATE
B-17	46	6640-00-024-2279	(96906) MS3600 3-1	Clamp, Tubing	Cabinet L2	None	6				
B-17	47	6640-00-948-6393	(96906) MS3600 1-3	Clamp Laboratory, Support Rod	Cabinet L2	None	3				
B-17	48	3030-00-478-8368	(48619) 603480	Belt, Drive, Stripper Assembly (u/o ASTM D-93-73)	Cabinet L2	None	5				
B-17	49	6640-00-551-9364	(64484) S-19228	Clamp, Utility, 8 in lg	Cabinet L2	None	2				
B-17	50	6640-00-962-9820	(22527) 05766	Clamp, Utility	Cabinet L2	None	7				
B-17	51	6640-00-526-7989	(22527) 05-742	Clamp, Utility, 3 Prong	Cabinet L2	None	2				
B-17	52	NNSN	(22527) 5-767	Clamp, Utility, Asbestos Covered Jaws	Cabinet L2	None	1				
B-17	53	6640-00-264-5024	(96906) MS3601 2-4	Clamp, Utility, 2 Prong, 9 in. lg	Cabinet L2	None	4				
B-17	54	4820-00-401-9177	(64484) S-76905	Stopcock, Nickle Plated, 3/8 in. L2	Cabinet	None	4				
B-17	55	6640-00-063-5240	(22527) 14-105A	Scraper, Rubber, w/o Glass Rod	Cabinet L2	None	12				
B-17	56	8125-00-281-4107	(22527) 21-381	Stopper, Bottle, Solid Rubber	Cabinet L2	None	12				
B-17	57	5120-00-965-0603	NPN	Flint Tip, Friction Igniter, Fed Spec GG-1-271C	Cabinet L2	None	1				
B-17	58	6640-00-410-4464	(653629) T-9430	Connector, Y Shape Brass	Cabinet L2	None	6				
B-17	59	5120-00-965-0326	(64484)	Igniter, Friction S-13095	Cabinet L2	None	2				
B-17	60	6640-00-131-4566	(80740) 27-084	Borer Set, Cork	Cabinet L2	None	1				
B-17	61	6640-00-410-4465	(22627) 15-319C	Connector, Elastic Tubing, 1/4 in. I.D (u/o ASTM D-322-67)	Cabinet L2	None	6				

Section II..COMPONENTS OF END ITEM - Continued

(1) ILLUSTRATION (a) FIGURE NO	(b) ITEM NO	(2) NATIONAL STOCK NUMBER	(3) PART NO. & FSCM	(4) DESCRIPTION	(5) LOCATION	(6) USABLE ON CODE	(7) QTY REQD	(8) QUANTITY RCVD	DATE	DATE	DATE
B-17	62	5110-00-658-8101	(22527) 11-345	Wheel, Cutting, Glass Tubing (for 11-340 Cutter)	Cabinet L2	None	6				
B-17	63	59635-0081-8025	(22527) 9-525-10	Adapter, Grounding	Cabinet L2	None	3				
B-17	64	NNSN	(80740) 5-779-51	Spout, Pouring, Poly-ethylene, for Gallon Jug	Cabinet L2	None	1				
B-17	65	5110-00-489-8135	(22527) 11-340	Cutter, Tubing, Griffin Type	Cabinet L2	None	1				
B-17	66	6640-00-418-1000	(96906) MS3600 9-1	Clamp, Test Tube, 1 1/2 in. Opening	Cabinet L2	None	2				
B-17	67	6640-00-063-3420	(22527) 15-200	Tongs, Crucible, 9 in	Cabinet L2	None	1				
B-17	68	6640-00-360-0013	(22527) 02-620	Tongs, Beaker, With Asbestos Mittens (u/o ASTM D-525-74 and D-873-74)	Cabinet L2	None	1				
B-17	69	6640-00-494-3731	(64484) S-23145	Extractor, Cork, Self Pulling	Cabinet L2	None	1				
B-17	70	6640-00-494-3779	(22527) 15-208	Tongs, Crucible, 18 in	Cabinet L2	None	1				
B-17	71	6640-00-444-8000	(96906) MS3602 3-1	Tongs, Crucible, 9 in. lg	Cabinet L2	None	1				
B-17	72	5110-00-263-0248	(22627) 07-865	Sharpener, Cork, Borer	Cabinet L2	None	1				
B-17	73	6640-00-986-2721	(22527) 11-284	Gauge, Cork and Rubber Stopper	Cabinet L2	None	2				
B-17	74	NNSN	(22527) 9-586	Condenser, With Copper Cover and Wire (Part of Extraction Apparatus NSN 6640-00-450-5700)	Cabinet L2	None	1				
B-17	75	6640-00-688-7881	(08071) XX64-0 37-12	Bottle, Polyethylene 1 Gal., (u/o ASTM D-2276-73)	Cabinet L2	None	2				

Section II..COMPONENTS OF END ITEM - Continued

(1) ILLUSTRATION (a) FIGURE NO	(b) ITEM NO	(2) NATIONAL STOCK NUMBER	(3) PART NO. & FSCM	(4) DESCRIPTION	(5) LOCATION	(6) USABLE ON CODE	(7) QTY REQD	(8) QUANTITY RCVD	DATE	DATE	DATE
B-17	76	6640-00-410-4461	(22527) 02-924B	Bottle, Polypropolyene 1 Gal (Takes Cap (80740) 38-450)	Cabinet L2	None	1				
B-17	77	7430-00-254-4319	(83735) Letter 22	Typewriter, Portable 11 in. Carriage	Cabinet M1	None	1				

Section II..COMPONENTS OF END ITEM - Continued

(1) ILLUSTRATION (a) FIGURE NO	(b) ITEM NO	(2) NATIONAL STOCK NUMBER	(3) PART NO. & FSCM	(4) DESCRIPTION	(5) LOCATION	(6) USABLE ON CODE	(7) QTY REQD	(8) QUANTITY RCVD	DATE	DATE	DATE
B-18	1	6640-00-359-9628	(35061) D-3372	Bath, Foam Test (u/o ASTM D-892-74	Cabinet M1	None	1				
B-18	2	NNSN	(80740) 91-021-03	Jar, Glass, 12x18 in	Cabinet M1	None	1				
B-18	3	6640-00-404-6739	(80740) 67-973-02	Cylinder, Graduated 1000 ml	Cabinet M1	None	1				
		NNSN	(80740) 91-021-07 (*)	Element, Heater		None	1				
		NNSN	(80740) 91-021-09 (*)	Stirrer, Motorized		None	1				
		NNSN	(80740) 91-021-33 (*)	Pilot Light		None	1				
B-18	4	88630-00-530-0987	(22527) 13-497-6	Tester, Flash Point Pensky-Martens, Closed Cup (u/o ASTM D-93-73)	Cabinet M1	None	1				
			(80740) 95-162-3 (*)	Powerstat		None	1				
			(80740) 95-162-4 (')	Heater		None	1				
			(80740) 77-881-01 (*)	Shaft, Flexible		None	1				
			(22527) 13-49-5	Stirrer, Motorized		None	1				

Section II..COMPONENTS OF END ITEM - Continued

(1) ILLUSTRATION (a) FIGURE NO	(b) ITEM NO	(2) NATIONAL STOCK NUMBER	(3) PART NO. & FSCM	(4) DESCRIPTION	(5) LOCATION	(6) USABLE ON CODE	(7) QTY REQD	(8) QUANTITY RCVD	DATE	DATE	DATE
B-19	1	6635-00-359-9831	(48619)73531	Grease Working Machine, Hand Operated, (u/o ASTM D-217-68)	Cabinet N1	None	1				
B-19	2	8135-00-541-2453	NPN	Aluminum Foil, 12 in W.,75 ft. lg., MIL Spec., A-148; Type Grade A	Cabinet N1	None	1				
B-19	3	8135-00-043-5331	NPN	Plastic Film (Handi-wrap) 12 in. W., 100 ft kg., (u/o ASTM D-2276)	Cabinet N1	None	1				
B-19	4	7930-00-558-1111	(81348) P-D-1526	Detergent, General Purpose, 5 lb can	Cabinet N1	None	1				
B-19	5	6640-00-441-5486	(22527) 14-781-14	Rack, Test Tube, Plastic, 34 Pins	Cabinet N1	None	1				
B-19	6	7920-00-409-2000	(22527) 3-614	Brush, Burrete, 36 in. Lg.	Cabinet N1	None	1				
B-19	7	6640-00-558-0292	(22527) 11-3r0B	Glass Tubing, Round, 12 mm, O.D	Cabinet N2	None	6				
B-19	7	6640-00-558-0307	(96906) MS36079-1	Glass Tubing, Round, 4 mm, O.D	Cabinet N2	None	6				
B-19	7	6640-00-445-7750	(96906) MS36079-2	Glass Tubing, Round, 6 mm, O.D	Cabinet N2	None	6				
B-19	7	6640-00-245-7129	(96906) MS36079-3	Glass Tubing, Round, 8 mm, O.D.	Cabinet N2	None	6				
B-19	7	6840-00-445-7775	(96906) MS36079-4	Glass Tubing, Hound, 10 mm, O.D.	Cabinet N2	None	6				
B-19	8	6630-00-359-9629	(48619) 74893	Bath, Reid Vapor Pressure, 3 Bomb Capacity	Cabinet N2	None	1				
B-19	9	NNSN	(48619) 240119 (*)	Switch, Line		None	1				
		NNSN	(48619) 522235 (*)	Thermoregulator		None	1				
		NNSN	(48619) 248162 (*)	Relay, Mercury, 120 v		None	1				
B-19	10	NNSN	(48619) 234026 (*)	Pilot Light, 120 v		None	1				
B-19	11	6640-00-438-2150	(22527) 07-880	Press, Cork	Cabinet N2	None	1				

Section II..COMPONENTS OF END ITEM - Continued

(1) ILLUSTRATION (a) FIGURE NO	(b) ITEM NO	(2) NATIONAL STOCK NUMBER	(3) PART NO. & FSCM	(4) DESCRIPTION	(5) LOCATION	(6) USABLE ON CODE	(7) QTY REQD	(8) QUANTITY RCVD	DATE	DATE	DATE
B-20	1F	6685-00-411-5495	(22527) 15-167A	Thermometer, Fahrenheit, 0 to 302 Deg.	Cabinet N1	None	2				
B-20	2F	6685-00-247-3744	(22527) 15-167B	Thermometer, Fahrenheit, +20 to +580 Deg., ASTM	Cabinet N1	None	2				
B-20	3F	6685-00-411-5493	(22527) 16-167C	Thermometer, Fahrenheit, +20 to +760 Deg., ASTM No. 3F, (u/o ASTM D-381)	Cabinet N1	None	3				
B-20	5F	6685-00-247-3737	(02308) 80-100-05	Thermometer, Fahrenheit, -36 to +120 Deg., ASTM No. 5F, (u/o ASTM D-97-66)	Cabinet N1	None	4				
B-20	10F	6685-00-245-9521	(02308) 80-100-06	Thermometer, Fahrenheit, -112 to +70 Deg., ASTM No. 6F, (u/o ASTM D-97-66)	Cabinet N1	None	4				
B-20	10F	6685-00-242-2184	(22527) 13-505	Thermometer, Fahrenheit, +200 to +700 Deg., ASTM No. 10F, (u/o ASTM D-93-73)	Cabinet N1	None	2				
B-20	11F	6685-00-242-2223	(22627) 13-535	Thermometer, Fahrenheit, +20 to +760 Deg., ASTM No. 11F, (u/o ASTM D-92-72)	Cabinet N1	None	3				
B-20	7F	6685-00-242-2187	(22527) 13-480	Thermometer, Fahrenheit, +30 to +580 Deg., ASTM No. 7F, (u/o ASTM D-86)	Cabinet N1	None	5				
B-20	8F	6685-00-915-5601	(22627) 13486	Thermometer, Fahrenheit, +30 to +760 Deg., ASTM No. 8F, (u/o ASTM D-86)	Cabinet N1	None	5				
B-20	9F	6685-00-242-2183	(22527) 13-500	Thermometer, Fahrenheit, +20 to +230 Deg., ASTM No. 9F, (u/o ASTM D-93-73)	Cabinet N1	None	4				
B-20	12F	6685-00-242-2224	(22627) 11-604	Thermometer, Fahrenheit, -5 to +215 Deg., ASTM No. 12F, (u/o ASTM D-130-75)	Cabinet N1	None	4				
B-20	18F	6685-00-242-2203	(22527) 13-575H	Thermometer, Fahrenheit, +94 to +108 Deg., ASTM No. 18F, (u/o ASTM D-323-72)	Cabinet N1	None	3				

Section II..COMPONENTS OF END ITEM - Continued

(1) ILLUSTRATION (a) FIGURE NO	(b) ITEM NO	(2) NATIONAL STOCK NUMBER	(3) PART NO. & FSCM	(4) DESCRIPTION	(5) LOCATION	(6) USABLE ON CODE	(7) QTY REQD	(8) QUANTITY RCVD	DATE	DATE	DATE
B-20	22F	6685-00-242-2205	(22527) 13-675M	Thermometer, Fahrenheit, +204 to +218 Deg., ASTM No. 22F, (u/o ASTM D-525-74, D-873-74 & D-942)	Cabinet N1	None	2				
B-20	28F	6685-00-247-3765	(22627) 13-618D	Thermometer, Fahrenheit, +97.5 to 102 5 Deg., ASTM No. 28F, (u/o ASTM D-445-74)	Cabinet N1	None	2				
B-20	29F	6685-00-247-3764	(64484) S-80800E	Thermometer, Fahrenheit, +127.5 to +132.5 Deg., ASTM No. 29F, (u/o ASTM D-445-74)	Cabinet N1	None	2				
B-20	30F	6685-00-247-3763	(22627) 13-18J	Thermometer, Fahrenheit, +207.5 to +212.5 Deg., ASTM No. 30F, (u/o ASTM D-445-74)	Cabinet N1	None	2				
B-20	33F	6685-00-247-3757	(22627) 13-394-35A	Thermometer, Fahrenheit, -36.5 to +107.5 Deg., ASTM No. 33F, (u/o ASTM D-611-64)	Cabinet N1	None	1				
B-20	34F	6685-00-411-5496	(22627) 13-394-35B	Thermometer, Fahrenheit, +77 to +221 Deg., ASTM No. 34F, (u/o ASTM D-611-64 & D-1012)	Cabinet N1	None	3				
B-20	35F	6685-00-411-5492	(22527) 13-394-35C	Thermometer, Fahrenheit, +194 to +338 Deg., ASTM No. 35F, (u/o ASTM D-611-64 & D-1012)	Cabinet N1	None	2				
B-20	57F	6685-00-245-9519	(22527) 13-510-105	Thermometer, Fahrenheit, -4 to +122 Deg., ASTM No. 57F, (u/o ASTM D-56)	Cabinet N1	None	2				
B-20	58F	6685-00-245-7696	(22527) 1-173-14A	Thermometer, Fahrenheit, -30 to +120 Deg., ASTM No. 58F, (u/o ASTM D-323-72)	Cabinet N1	None	3				
B-20	59F	6685-00-247-3739	(22527) 15-173-14B	Thermometer, Fahrenheit, 0 to +180 Deg., ASTM No. 59F, (u/o ASTM D-323-72)	Cabinet N1	None	2				

Section II..COMPONENTS OF END ITEM - Continued

(1) ILLUSTRATION (a) FIGURE NO	(b) ITEM NO	(2) NATIONAL STOCK NUMBER	(3) PART NO. & FSCM	(4) DESCRIPTION	(5) LOCATION	(6) USABLE ON CODE	(7) QTY REQD	(8) QUANTITY RCVD	DATE	DATE	DATE
B-20	114C	6685-00-411-5494	(80740) 80-001-14	Thermometer, Centigrade, -80 to +20 Deg., ASTM No. 114C, (u/o ASTM D-2386)	Cabinet N1	None	2				
B-20	SPL	6685-00-411-5487	122527) 156002B	Thermometer, Centigrade, -10 to 110 Deg., (u/o ASTM D-322-67)	Cabinet N1	None	2				
B-20	9-21	66300-265-7610	(64484) S42346A	HYDROMETER: thermometer,Fahren-heit, API gravity; 9-21 deg; thermometer range 20-130 deg F (u/o ASTM D-287-67)	w/ Cabinet N1		2				
B-20	19-32	6630-00-265-7611	(64484) S-42345B	HYDROMETER: w/ thermometer,API gravity; 19-32 deg; ther-mometer range 20-130 deg F (u/o ASTM D-287-67)	Cabinet N1		2				
B-20	29-41	6630-00-285-7758	(64484) S-42345C	HYDROMETER: w/ thermometer,API gravity; 29-41 deg; ther-mometer range 20-130 deg F (u/o ASTM D-287-67)	Cabinet N1		3				
B-20	39-51	6630-00-266-7759	(64484) S-42345D	HYDROMETER: w/ thermometer,API gravity; 39-61 deg; ther-mometer range 20-130 deg F (u/o ASTM D-287-67)	Cabinet N1		3				
B-20	49-61	6630-00-265-7764	(64484) S42346E	HYDROMETER: w/ thermometer,API gravity; 49-61 deg; ther-mometer range 20-130 deg F (u/o ASTM D-287-67	Cabinet N1		3				
B-20	59-71	6630-00-265-7765	(64484) S-42345F	HYDROMETER: w/ thermometer,API gravity; 59-71 deg; ther-mometer range 20-130 deg F (u/o ASTM D-287-67)	Cabinet N1		8				
B-20	69-81	6630-00-816-2267	(64484) S-42345G	HYDROMETER: w/ thermometer,API gravity; 69-81 deg; ther-mometer range 20-130 deg F (u/o ASTM D-287-67)	Cabinet N1		2				

Section II..COMPONENTS OF END ITEM - Continued

(1) ILLUSTRATION (a) FIGURE NO	(b) ITEM NO	(2) NATIONAL STOCK NUMBER	(3) PART NO. & FSCM	(4) DESCRIPTION	(5) LOCATION	(6) USABLE ON CODE	(7) QTY REQD	(8) QUANTITY RCVD	DATE	DATE	DATE
B-20	79-91	6630-00-404-2754	(63629) H-8100-79-91	HYDROMETER: w/ thermometer,API gravity; 79-91 deg; thermometer range 20-130 deg F (u/o ASTM D-28767)	Cabinet N1		2 1				
B-20	89-101	6630-00-404-2755	(64484) S-42345J	HYDROMETER: w/ thermometer,API gravity; 89-101 deg; thermometer range 20-130 deg F (u/o ASTM D-287-67)	Cabinet N1		2				

Section II..COMPONENTS OF END ITEM - Continued

(1) ILLUSTRATION (a) FIGURE NO	(b) ITEM NO	(2) NATIONAL STOCK NUMBER	(3) PART NO. & FSCM	(4) DESCRIPTION	(5) LOCATION	(6) USABLE ON CODE	(7) QTY REQD	(8) QUANTITY RCVD	DATE	DATE	DATE
B-21	1	664000-290-6693	(48619) 75042	Bomb Bath, 2 Unit, 115 v, (U/rO ASTMI D-525-74 &8 873-74)	Cabinet Pi	None	1				
		NNSN	(48619) 247175 (*)	Heater, 120 v, 2000 w		None	1				
		NNSN	(48619) 240718 (*)	Switch, 120 v		None	1				
B-21	2	6640-00-403-9345	(48619)74740	Socket, Bomb, (u/o ASTM D-525-74 & 873-74)	Cabinet P1	None	1				
B-21	3	8305-00-267-3015	(22627) 06-665-18	Cloth, Cleaning, 70 YD Per Bolt	Drawer P2	None	1				
B-21	4	8415-00-266-8679	(22627) 11-394-20A	Gloves, Rubber, Size 9	Drawer P2	None	1				
B-21	4	8415-00-266-8675	(22627) 11-394-30B	Gloves, Rubber, Size 11	Drawer P2	None	1				
B-21	5	6640-00-267-1783	(22627) 03-642B	Cleaner, Tubing, 5 mm Dia., 16 ft Ig	Drawer P2	None	5				
B-21	6	5350-00-240-2920	(22627) 15-600	Steelwool Pads, 16 Per Box Grade 000	Drawer P2	None	1				
B-21	7	6510-00-201-4000	(22527)	Cotton, Absorbent 07-891	Drawer P2	None	1				
B-21	8	6640-00-248-4492	(64484) S-674568	Chart, Kinematic Viscosity, -30 to 450 Deg. F., ASTM Chart E. (u/o ASTM Test D-341) 25 Shts.	Drawer P2	None	1				
B-21	9	8105-00-281-3924	NPN	Bag, Mailing, 100 Per Bundle	Drawer P2	None	1				
B-21	10	7920-00-240-2559	(22527)	Sponge, Cellulose 14-417	Drawer P2	None	6				
8-21	11	6640-00-494-3846	(64484) S-10065C	Cleaner, Tubing, 8 mm Dia. , 50 ft Ig	Drawer P2	None	1				
B-21	12	6640-0264-5014	(22627) 11-388	Glass Wool, 1 lb	Drawer P2	None	1				
B-21	13	8330-00-965-1722	(22527) 5-680A	Chamois, Sheep Skin	Drawer P2	None	4				
B-21	14	8415-00-082-6108	(81349)	Apron, Rubber MILA-41829	Drawer P2	None	1				

Section II. COMPONENTS OF END ITEM - Continued

(1) ILLUSTRATION (a) FIGURE NO	(b) ITEM NO	(2) NATIONAL STOCK NUMBER	(3) PART NO. & FSCM	(4) DESCRIPTION	(5) LOCATION	(6) USABLE ON CODE	(7) QTY REQD	(8) QUANTITY RCVD	DATE	DATE	DATE
B-21	15	4720-00-360-0047	(80740) 68-459-01	Bronze Tubing, Helical, 5 ft Ig., (u/o ASTM D-525-74 & 873-74)	Drawer P2	None	2				
B-21	16	NNSN	NPN	Hose Connection, Oxidation Stability Bath, Oxygen Supply	Drawer P2	None	1				
B-21	17	8415-00-261-7015	(22627) 11-92-15	Gloves, Asbestos, Universal Size	Drawer P2	None	1				
B-21	18	6640-00-267-1784	(22527) 03-42A	Cleaner, Tubing, 3 mm Dia., 50 ft lg	Drawer P2	None	1				
B-21	19	6640-00-248-4491	(64484) S-87459	Chart, Kinematic Viscosity, - 30 to +450 Deg. F., ASTM Chart D, (u/o ASTM D-341) 2 Shts.	Drawer P2	None	1				
B-21	19	6640-00-404-2749	(80740) 69-889	Chart, Viscosity Temperature Index	Drawer P2	None	1				

Section II..COMPONENTS OF END ITEM - Continued

(1) ILLUSTRATION (a) FIGURE NO	(b) ITEM NO	(2) NATIONAL STOCK NUMBER	(3) PART NO. & FSCM	(4) DESCRIPTION	(5) LOCATION	(6) USABLE ON CODE	(7) QTY REQD	(8) QUANTITY RCVD	DATE	DATE	DATE
B-22	1	NNSN	NPN	Military/Federal Specifications, Volume I	Lab Book-case	None	1				
B-22	2	NNSN	NPN	Military/Federal Specifications, Volume II	Lab Book-case	None	1				
B-22	3	NNSN	NPN	Military/Federal Specifications, Volume III	Lab Book-case	None	1				
B-22	4	NNSN	NPN	Methods of Testing, Federal Test Method Standard No. 791B	Lab Book-case	None	1				
B-22	5	NNSN	NPN	Index of Speciflcations and Standards Part I	Lab Book-case	None	1				
B-22	6	NNSN	NPN	Index of Specifications and Standards Part II	Lab Book-case	None	1				
B-22	7	NNSN	NPN	Reference List of Specifications and Standards	Lab Book-case	None	1				
B-22	8	NNSN	NPN	TM10-1101, Petroleum Handling Equipment and Operations	Lab Book-case	None	1				
B-22	9	NNSN	NPN	TM5-4120-295-25P, Air Conditioner Manual	See Basic Issue Items List	None	1				
B-22	10	NNSN	NPN	TM5-4120-295-15, Air Conditioner Manual	See Basic Issue Items List	None	1				
B-22	11	NNSN	NPN	TM9-2330-271-14, Operator's Manual, Semi-trailer Van 10 Ton	See Basic Issue Items List	None	1				
B-22	12	NNSN	NPN	FM10-70, Inspecting and Testing Petroleum Products	Lab Book-case	None	1				

Section II..COMPONENTS OF END ITEM - Continued

(1) ILLUSTRATION (a) FIGURE NO	(b) ITEM NO	(2) NATIONAL STOCK NUMBER	(3) PART NO. & FSCM	(4) DESCRIPTION	(5) LOCATION	(6) USABLE ON CODE	(7) QTY REQD	(8) QUANTITY RCVD	DATE	DATE	DATE
B-22	13	NNSN	NPN	TM10-1166, 1972 ASTM Standards, Part 17	Lab Book-case	None	1				
B-22	14	NNSN	NPN	TM10-1163, ASTM Manual for Rating Motor, Diesel and Aviation Fuels	Lab Book-case	None	1				
B-22	15	NNSN	NPN	TM10-1165, Significance of ASTM Tests for Petroleum Products	Lab Book-case	None	1				
B-22	16	7610-00-904-7166	NPN	ASTM Standards Index	Lab Book-case	None	1				
B-22	17	NNSN	NPN	Technical Methods of Analysis, McGraw Hill	Lab Book-case	None	1				
B-22	18	NNSN	NPN	Chemical Technology of Petroleum and Its Products, McGraw Hill	Lab Book-case	None	1				
B-22	19	NNSN	NPN	TM5-6640-212-14 Manual Trailer Mounted Laboratory	See Basic Issue Items List	None	1				
B-22	20	NNSN	NPN	TM10-1167, ASTM Standards, Part 18	Lab Book-case	None	1				
B-22	21	NNSN	NPN	Tables, Petroleum Measuring	Lab Book-case	None	1				
B-22	22	NNSN	NPN	Catalog, Precision Scientific	Lab Book-case	None	1				
B-22	23	NNSN	NPN	Catalog, Price List Precision Scientific	Lab Book-case	None	1				
B-22	24	NNSN	NPN	Charts, Foxboro Humltex	Lab Book-case	None	1				

Section II..COMPONENTS OF END ITEM - Continued

(1) ILLUSTRATION (a) FIGURE NO	(b) ITEM NO	(2) NATIONAL STOCK NUMBER	(3) PART NO. & FSCM	(4) DESCRIPTION	(5) LOCATION	(6) USABLE ON CODE	(7) QTY REQD	(8) QUANTITY RCVD	DATE	DATE	DATE
B-22	25	NNSN	NPN	Catalog 1972, Chemical Reagents, Sargent-Welsh Scientific	Lab Book-case	None	1				
B-22	26	NNSN	NPN	Catalog, Greiner Scientific Corp case	Lab Book-case	None	1				
B-22	27	NNSN	NPN	Catalog, Greiner Scientific Corp	Lab Book-case	None	1				
B-22	28	7610-00-274-7060	NPN	Catalog, Fisher Scientific Co	Lab Book-case	None	1				
B-22	29	NNSN	NPN	Catalog, Millipore Filters and Associated Apparatus	Lab Book-case	None	1				
B-22	30	NNSN	NPN	Binder, Loose Leaf							
B-22	31	NNSN	NPN	Report, DA Form 2077 Petroleum Products Laboratory Analysis	Lab Book-case Report	None	1				
B-22	32	7610-00-233-9597	NPN	Handbook, Chemistry and Physics	Lab Book-case	None	1				
B-22	33	NNSN	NPN	Book, ASTM Viscosity Index (u/o ASTM D-445-74)	Lab Book-case	None	1				
B-22	34	7610-00-250-6633	NPN	Handbook, Chemical Engineers	Lab Book-case	None	1				
B-22	35	NNSN	NPN	Paper, White, Bond	Lab Book-case	None	1				
B-22	36	NNSN	NPN	Folder, Manila (Overpack List-1-18)	Lab Book-case	None	1				
B-22	37	NNSN	NPN	Paper, Carbon	Lab Book-case	None	1				

Section II..COMPONENTS OF END ITEM - Continued

(1) ILLUSTRATION (a) FIGURE NO	(b) ITEM NO	(2) NATIONAL STOCK NUMBER	(3) PART NO. & FSCM	(4) DESCRIPTION	(5) LOCATION	(6) USABLE ON CODE	(7) QTY REQD	(8) QUANTITY RCVD	DATE	DATE	DATE
B-22	38	NNSN	NPN	Log, Record Book	Lab Book-case	None	1				
B-22	39	NNSN	NPN	Binder, Loose Leaf	Lab Book-case	None	1				
B-22	40	NNSN	NPN	Binder, Loose Leaf, SC6640-97-CL-EO2	Lab Book-case	None	1				

Section II..COMPONENTS OF END ITEM - Continued

(1) ILLUSTRATION (a) FIGURE NO	(b) ITEM NO	(2) NATIONAL STOCK NUMBER	(3) PART NO. & FSCM	(4) DESCRIPTION	(5) LOCATION	(6) USABLE ON CODE	(7) QTY REQD	(8) QUANTITY RCVD	DATE	DATE	DATE
B-23	1	5180-00-541-1644	(30327) 121F	Kit, Flaring and Cutting 45 Deg	Drawer R1	None	1				
B-23	2	3439-00-618-6623	(22527) 231-12	Gun; Soldering, 115 v	Drawer R1	None	1				
B-23	3	4930-00-287-8474	NPN	Oiler, Hand, 5 oz	Drawer R1	None	1				
B-23	4	5130-00-889-8996	(07429) 6001D	Drill, Electric, 1/4 in cap	Drawer R1	None	1				

Section II..COMPONENTS OF END ITEM - Continued

(1) ILLUSTRATION (a) FIGURE NO	(1) ILLUSTRATION (b) ITEM NO	(2) NATIONAL STOCK NUMBER	(3) PART NO. & FSCM	(4) DESCRIPTION	(5) LOCATION	(6) USABLE ON CODE	(7) QTY REQD	(8) QUANTITY RCVD	DATE	DATE	DATE
B-24	1	6230-00-162-1227	NPN	Light, Extension W/50 ft. Cable	Drawer S1	None	1				
B-24	2	6160-00487-3037	81348) J-C-1270	Cable Ay, Electrical 15 ft. lg	Drawer S1	None	1				

Section II..COMPONENTS OF END ITEM - Continued

(1) ILLUSTRATION (a) FIGURE NO	(b) ITEM NO	(2) NATIONAL STOCK NUMBER	(3) PART NO. & FSCM	(4) DESCRIPTION	(5) LOCATION	(6) USABLE ON CODE	(7) QTY REQD	(8) QUANTITY RCVD	DATE	DATE	DATE
B-25	1	NNSN	(97403) 13219E 1993	Duct, Exhaust, Gum Bath	Utility Compart- ment	None	1				
B-25	2	NNSN	(30190) 430	Blower W/7 1/2 HP Electric Motor	Utility Compart- ment	None	2				
B-25	3	NNSN	(97403) 13219E 1994	Duct, Exhaust Fume Hood	Utility Compart- ment	None	1				
B-25	4	NNSN	(97403) 13219E 1604	Bracket, Blower Mounting	Utility Compart- ment	None	2				

Section II..COMPONENTS OF END ITEM - Continued

(1) ILLUSTRATION (a) FIGURE NO	(b) ITEM NO	(2) NATIONAL STOCK NUMBER	(3) PART NO. & FSCM	(4) DESCRIPTION	(5) LOCATION	(6) USABLE ON CODE	(7) QTY REQD	(8) QUANTITY RCVD	DATE	DATE	DATE
B-26	1	4930-00-819-2732	(22627) 1406B-01	Vacuum Pump, Rotary (v/o ASTM D-322-67)	Utility Compart-ment	None	1				
B-26	2	NNSN	(79250) 1405A	Belt, Vacuum Pump	Utility Compart-ment	None	1				
		9150-00-084-4138	(64484) 1407K (*)	Lubricating Oil, Vacuum Pump 1 qt.		None	1				
			(79250) 41-130 (*)	Gasket, Oil Case, Vacuum Pump		None	1				
B-26	3	NNSN	(79250) 1405	Motor, Electric, 1/2 HP, 115 v, 60 Hz, Vacuum Pump	Utility Compart-ment	None	1				
B-26	4	4320-00-150-6201	(90785) PE-75C	Pump Water, 3/4 HP	Utility Compart-ment	None	1				
			(90785)2611903 (*)	O-Ring Casing		None	1				
			(90785)1181377 (*)	Mechanical Seal		None	1				
B-26	5	NNSN	(97403)	Tank, Water 13219E1651	Utility Compart-ment	None	1				
B-26	6	NNSN	(65035) H41-407	Belt, Compressor Unit	Utility Compart-ment	None	2				
			(65035) H43-623 (*)	Element Air Filter Air Compressor		None	2				
B-26	7	4310-00-249-4199	(35301)	Compressor, Assembly 2178V37	Utility Compart-ment	None	1				

Section II..COMPONENTS OF END ITEM - Continued

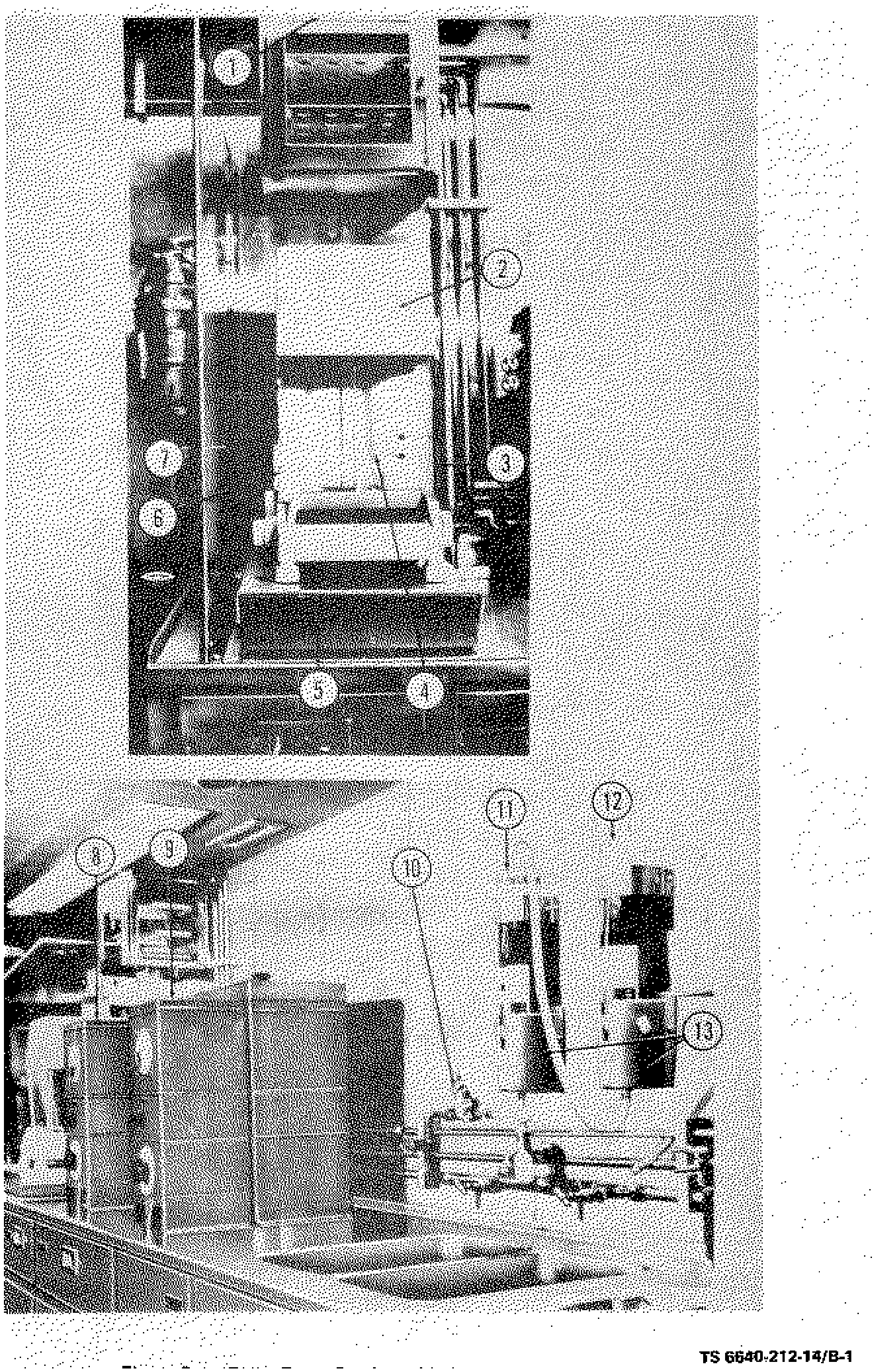
(1) ILLUSTRATION		(2) NATIONAL STOCK NUMBER	(3) PART NO. & FSCM	(4) DESCRIPTION	(5) LOCATION	(6) USABLE ON CODE	(7) QTY REQD	(8) QUANTITY			
(a) FIGURE NO	(b) ITEM NO							RCVD	DATE	DATE	DATE
B-27	1	6810-00-470-4631	(46935) N-Heptane	N-Heptane, 5 Gal Drumn (v/o ASTM D-2699-70 and D-2700-70)	Storage Compart-ment Under Trailer	None	2				
B-27	2	4720-00-302-3912	NPN	Hose Assembly, 3/4 W. ID, 50 ft. lg	Storage Compart-ment Under Trailer	None	3				
B-27	3	6810-00-290-0048	NPN	Toluene 5 Gal. (v/o ASTM D-2699-70 and D-2700-70)	Storage Compart-ment Under Trailer	None	1				

Section II..COMPONENTS OF END ITEM - Continued

(1) ILLUSTRATION (a) FIGURE NO	(b) ITEM NO	(2) NATIONAL STOCK NUMBER	(3) PART NO. & FSCM	(4) DESCRIPTION	(5) LOCATION	(6) USABLE ON CODE	(7) QTY REQD	(8) QUANTITY RCVD	DATE	DATE	DATE
B-28		NNSN	(97403) 13219E2126	Light, Dome 110 v, Explosion Proof, c/o:	Fume Hood and	Gum Bath None	2				
B-28	1	NNSN	(97403) 13219E-2126-10	Plate, Mounting		None	1				
B-28	2	NNSN	(97403) 13219E-2126-9	Gasket, Mounting Plate		None	1				
B-28	3	NNSN	(97403) 13219E-2126-7	Fixture, Mounting Bracket		None	1				
B-28	4	NNSN	(97403)	Fixture, Socket 13219E-2126-5	Enclosure	None	1				
B-28	5	NNSN	(97403) 13219E-2126-4	Socket		None	1				
B-28	6	NNSN	(97403) 13219E-2126-3	Shell, Socket		None	1				
B-28	7	NNSN	(97403) 13219E-2126-16	Lamp	None	1					
B-28	8	NNSN	(97403) 13219E-2126-2	Gasket, Globe	None	1					
B-28	9	VNSN	(97403) 13219E-2126-1	Globe, Opal	None	1					
		NNSN	(97403) 13219E-2023	Plate, Identification, (Behind	Utility Compartment Door)						

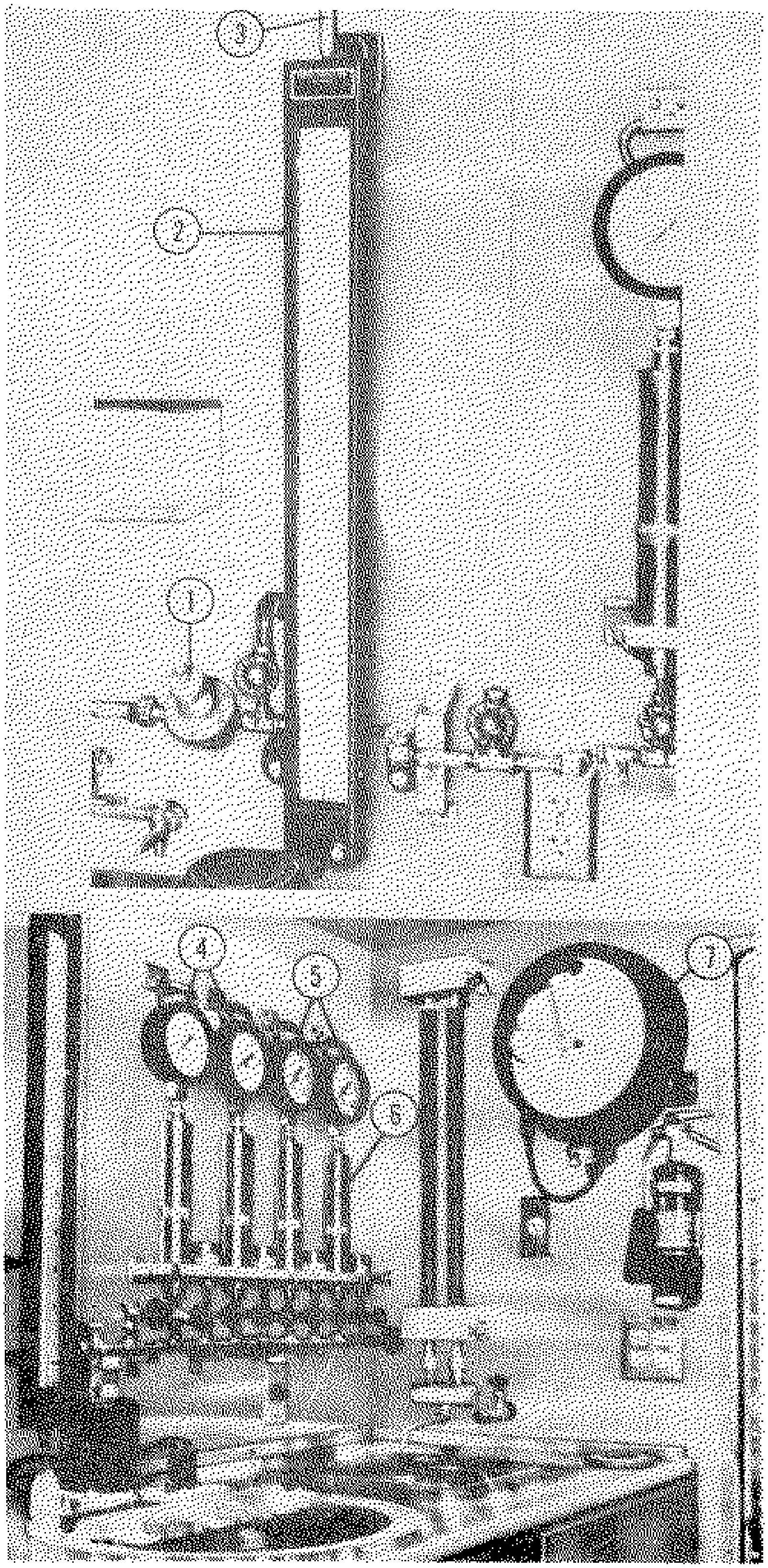
Section II..COMPONENTS OF END ITEM - Continued

(1) ILLUSTRATION (a) FIGURE NO	(b) ITEM NO	(2) NATIONAL STOCK NUMBER	(3) PART NO. & FSCM	(4) DESCRIPTION	(5) LOCATION	(6) USABLE ON CODE	(7) QTY REQD	(8) QUANTITY RCVD	DATE	DATE	DATE
B-1	7	4210-00-555-8837	NPN	Extinguisher, Fire	4 Places 2.75 lb.	None	4 in Lab				
		4210-00-708-0031	NPN	(*) Charged Cylinder -(Replacement)		None	4				
		NNSN	NPN	TM5-6640-212-14, Operator, Organizational, Direct and General Support Maintenance Manual Laboratory, Trailer Mounted Petroleum, NSN 6640-00-538-2736	Lab Book-case	None	4				
		NNSN	NPN	TM9-2330-271-14, Operator, Organizational, Direct and General Support Maintenance Manual, Semi-Trailer Van Electronic, 10 Ton, 4 Wheel, Model-XM822, NSN 2330-00-122-4966	Lab Book-case	None	1				
		NNSN	NPN	TM5-4120-295-25P, Repair Parts Manual For Air Conditioner, NSN 4120-00-963-4477	Lab Book-case	None					
		NNSN	NPN	TM5-4120-295-15, Operator, Organizational, Direct and Depot Maintenance Manual, Air Conditioner, NSI4 4210-00-963-4477	Lab Book-case	None	1				
				NOTE: The Basic Issue Items For The 10 Ton Van Are Listed In Section I, Appendix C, TM9-2330-271-14							



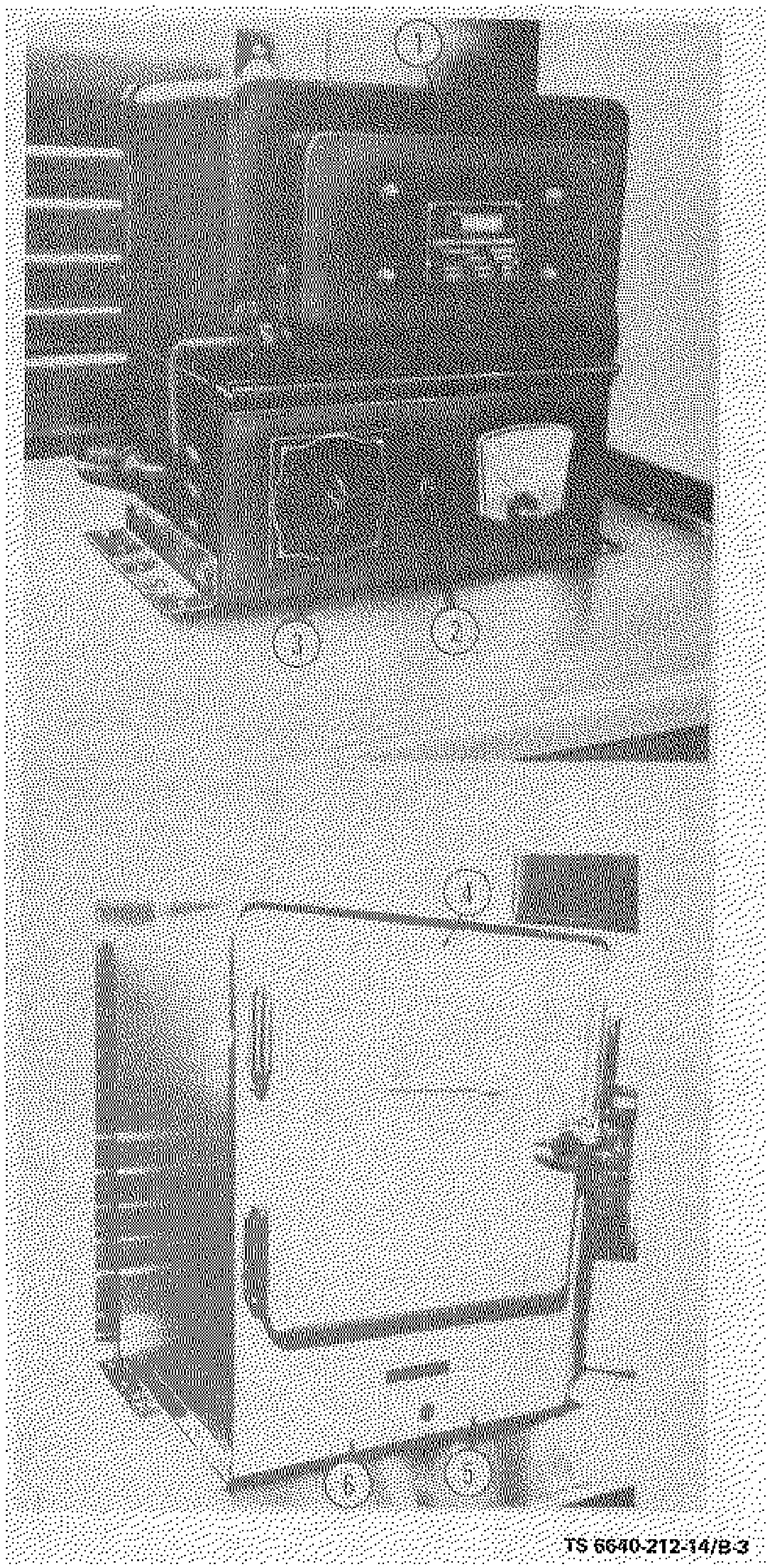
TS 6640-212-14/B-1

Figure B-1. Right Front Section of Laboratory



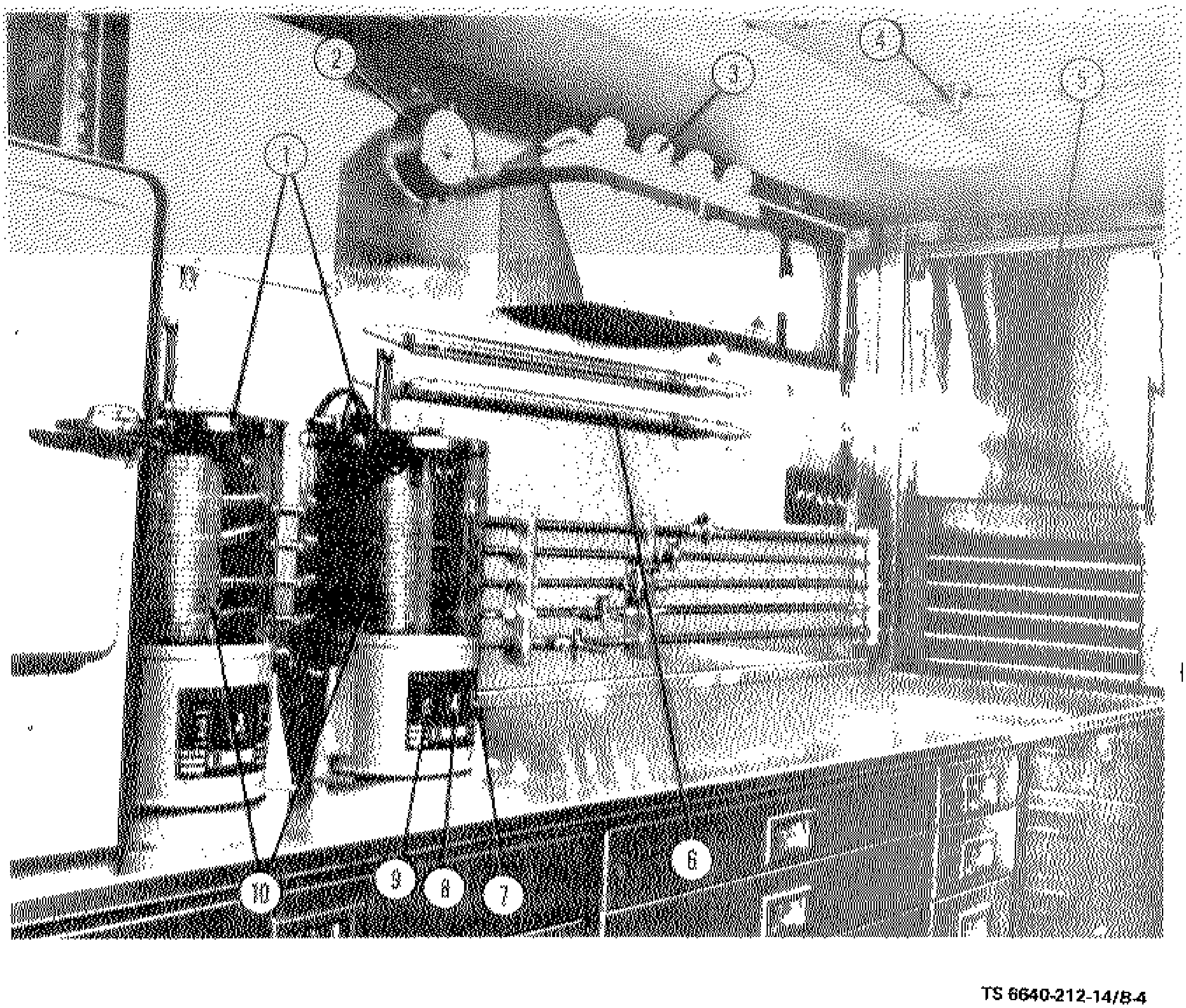
TS 6640-212-14/B-2

Figure B-2. Right Rear Section of Laboratory



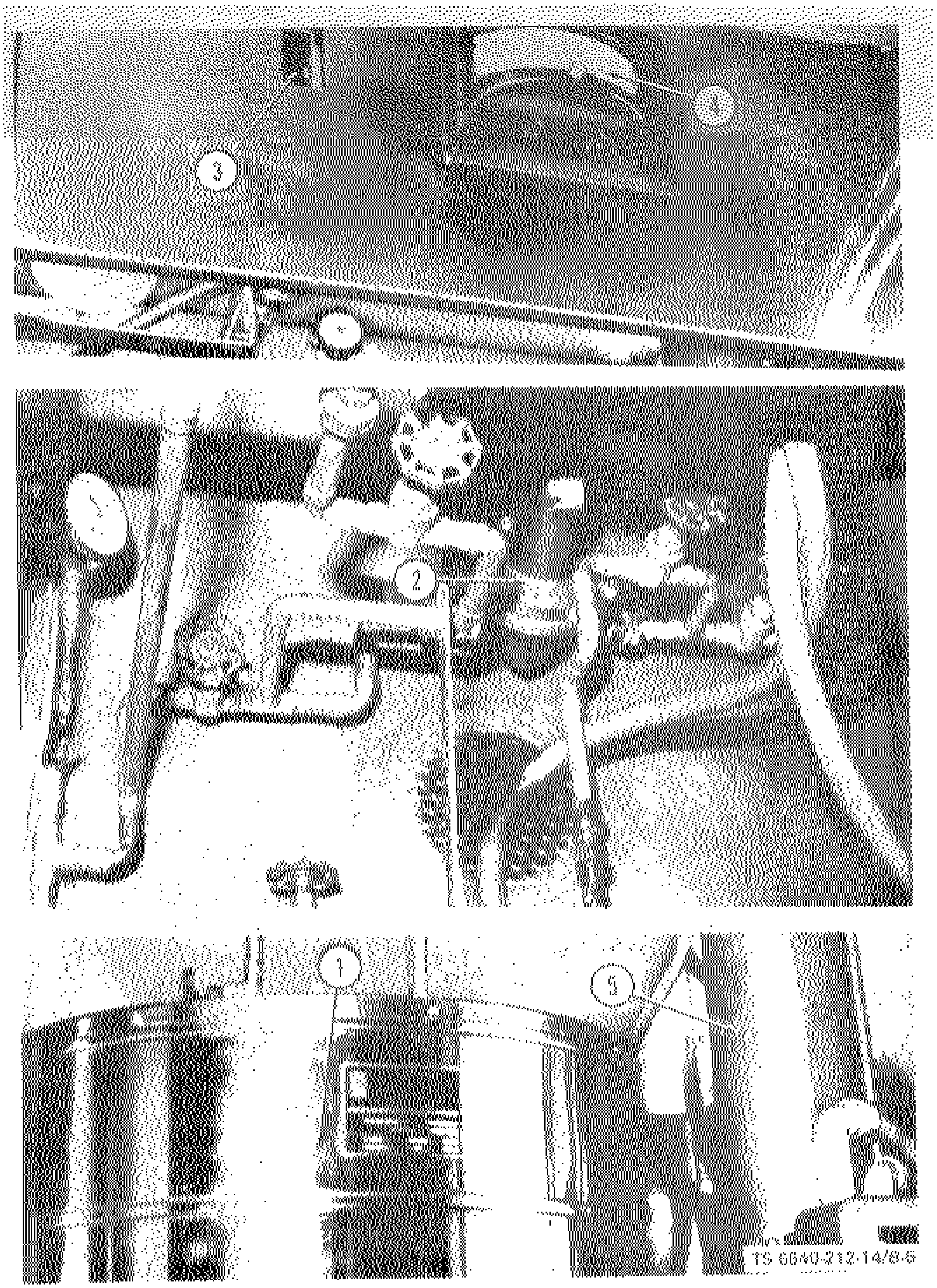
TS 6640-212-14B-3

Figure B-3. Muffle Furnace and Laboratory Oven



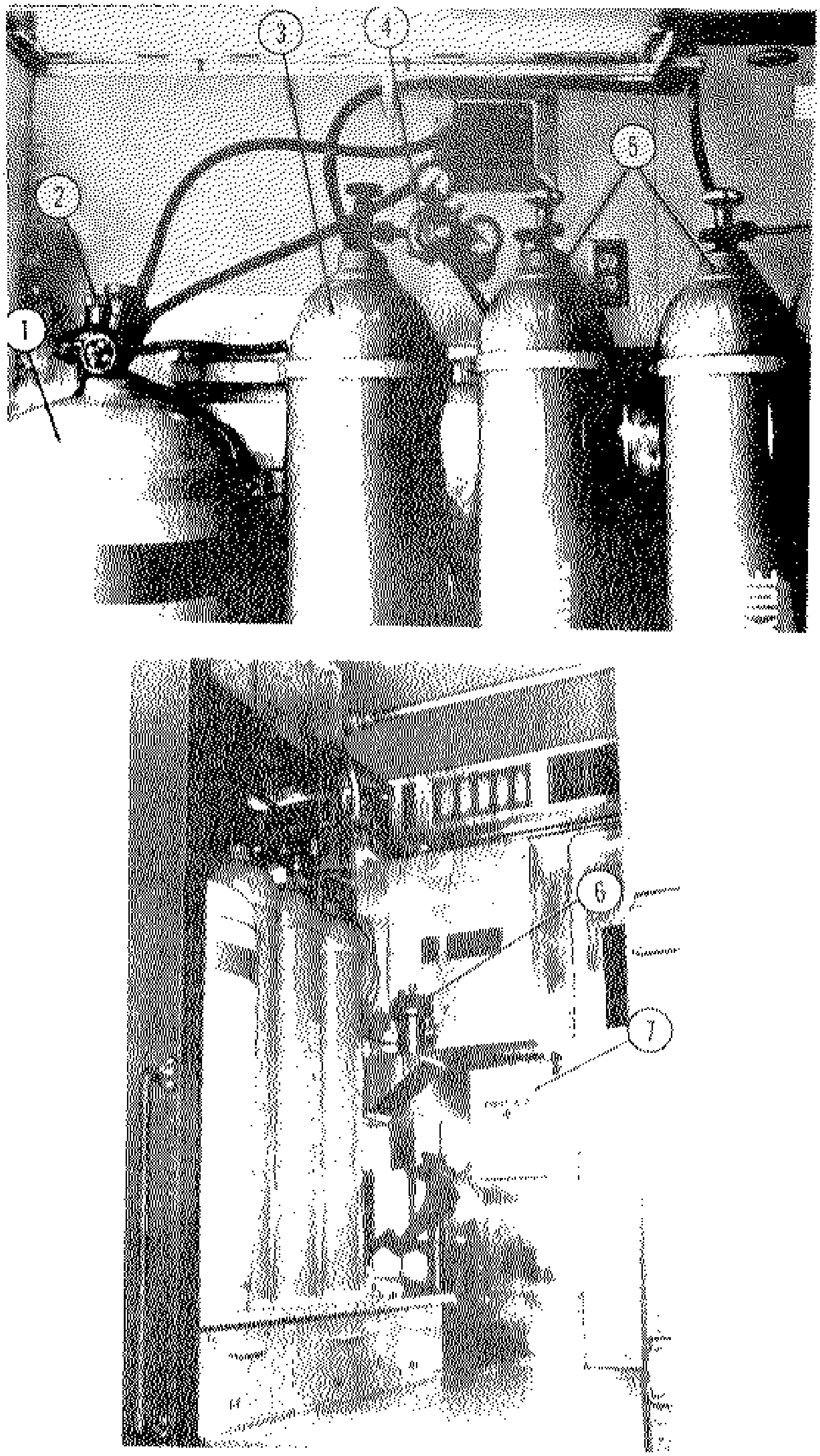
TS 6640-212-14/8B4

Figure B-4. Left Front Section of Laboratory



TS 6640 212 14/8-5

Figure B-5. Gum Bath



TS 6640-212-14/B-6

TS 6640-212.14/B-

Figure B-6. Rear Compartment of Laboratory

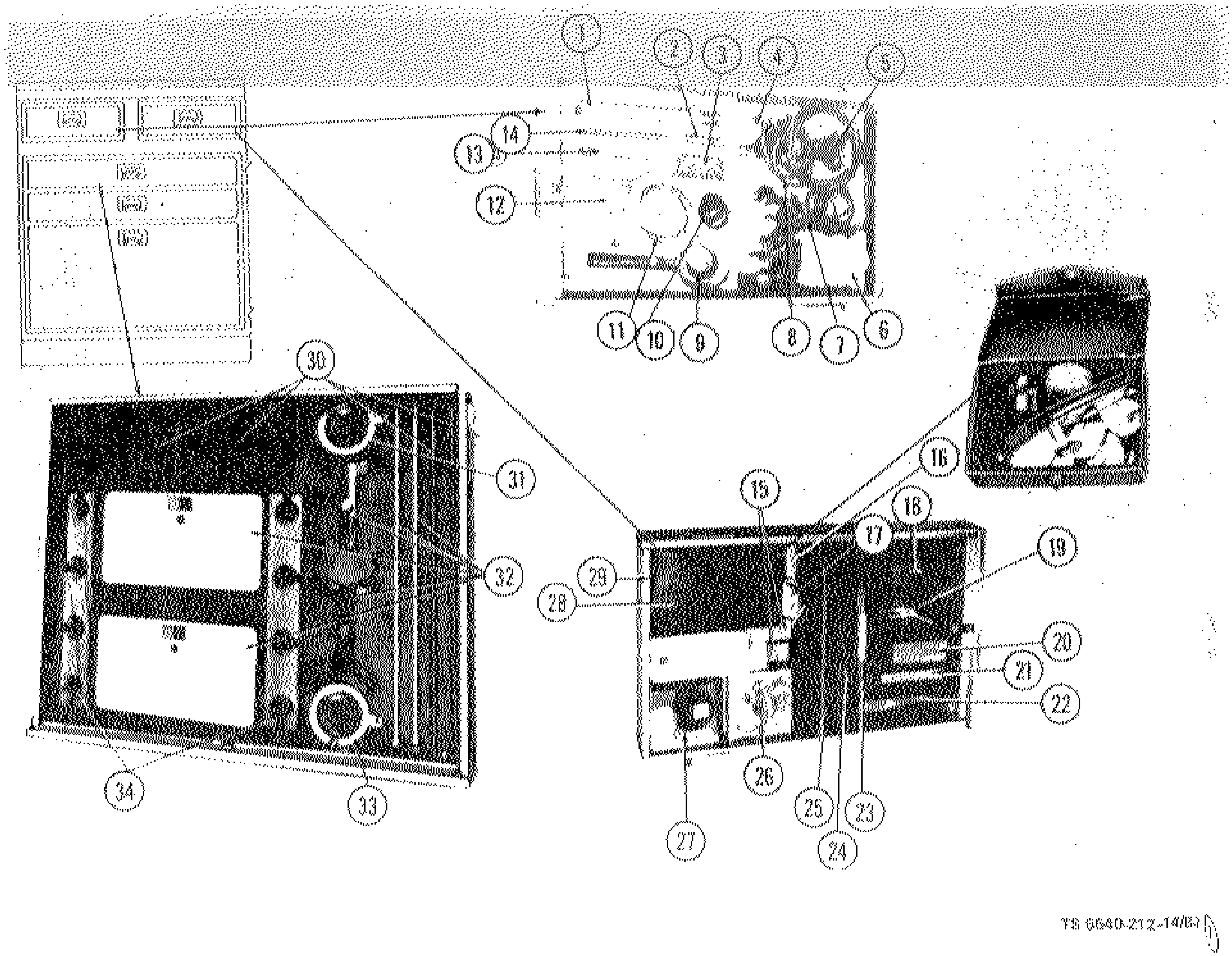


Figure B-7. Drawers A1 Through A5 (Sheet 1 of 2)

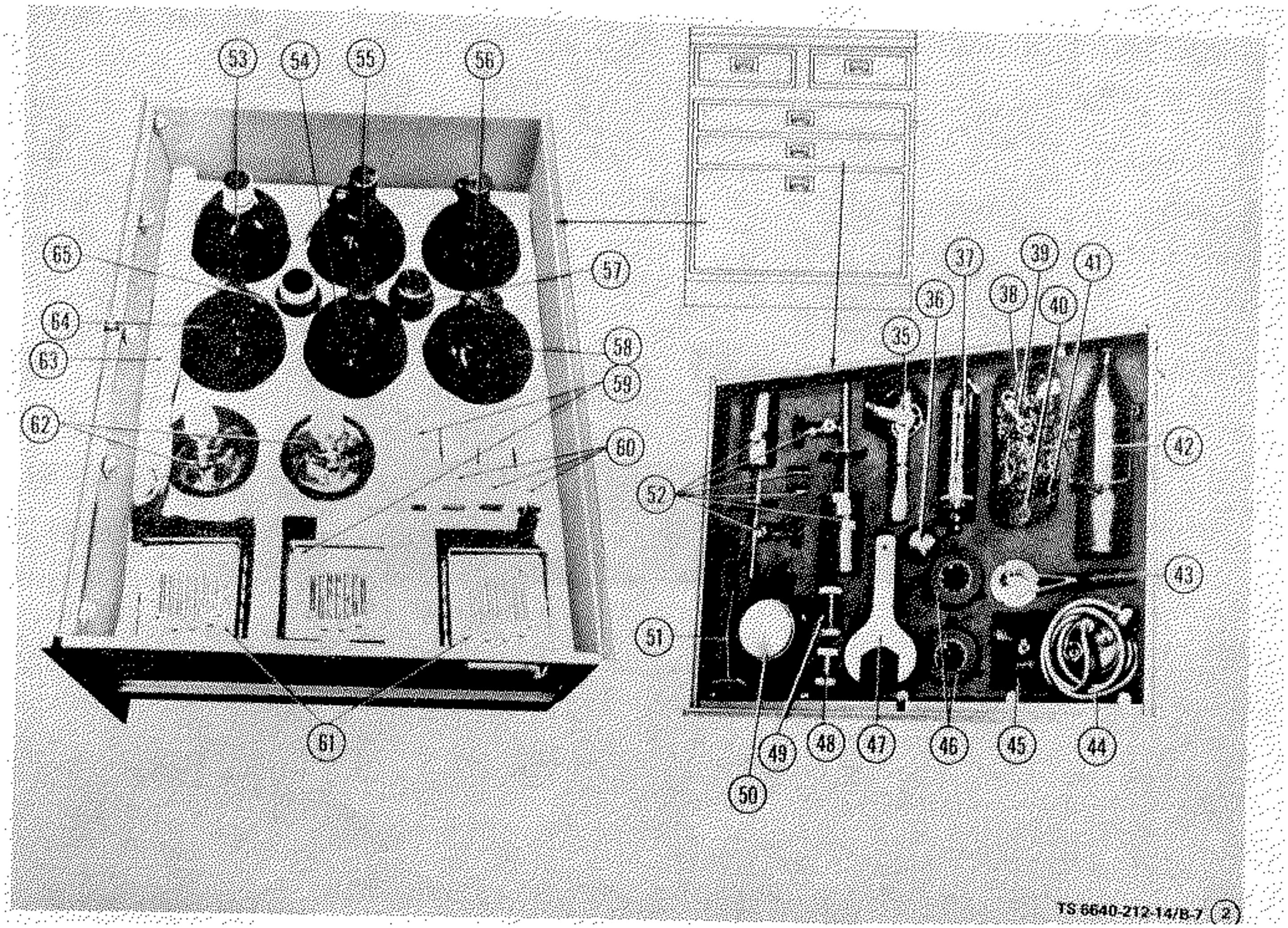


Figure B-7. Drawers A1 Through A5 (Sheet 2 of 2)

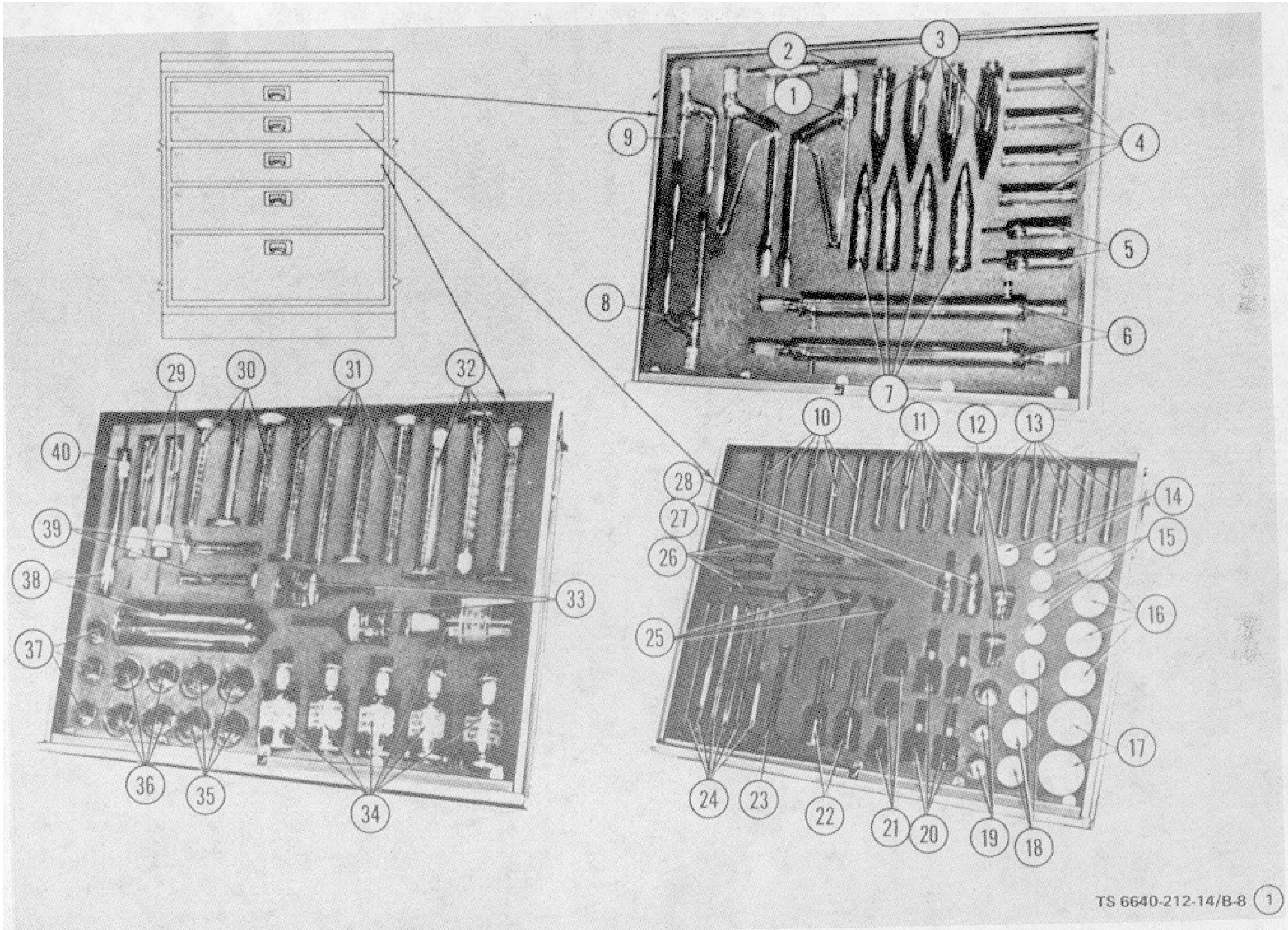


Figure B-8. Drawers B1 Through B5 (Sheet 1 of 2)

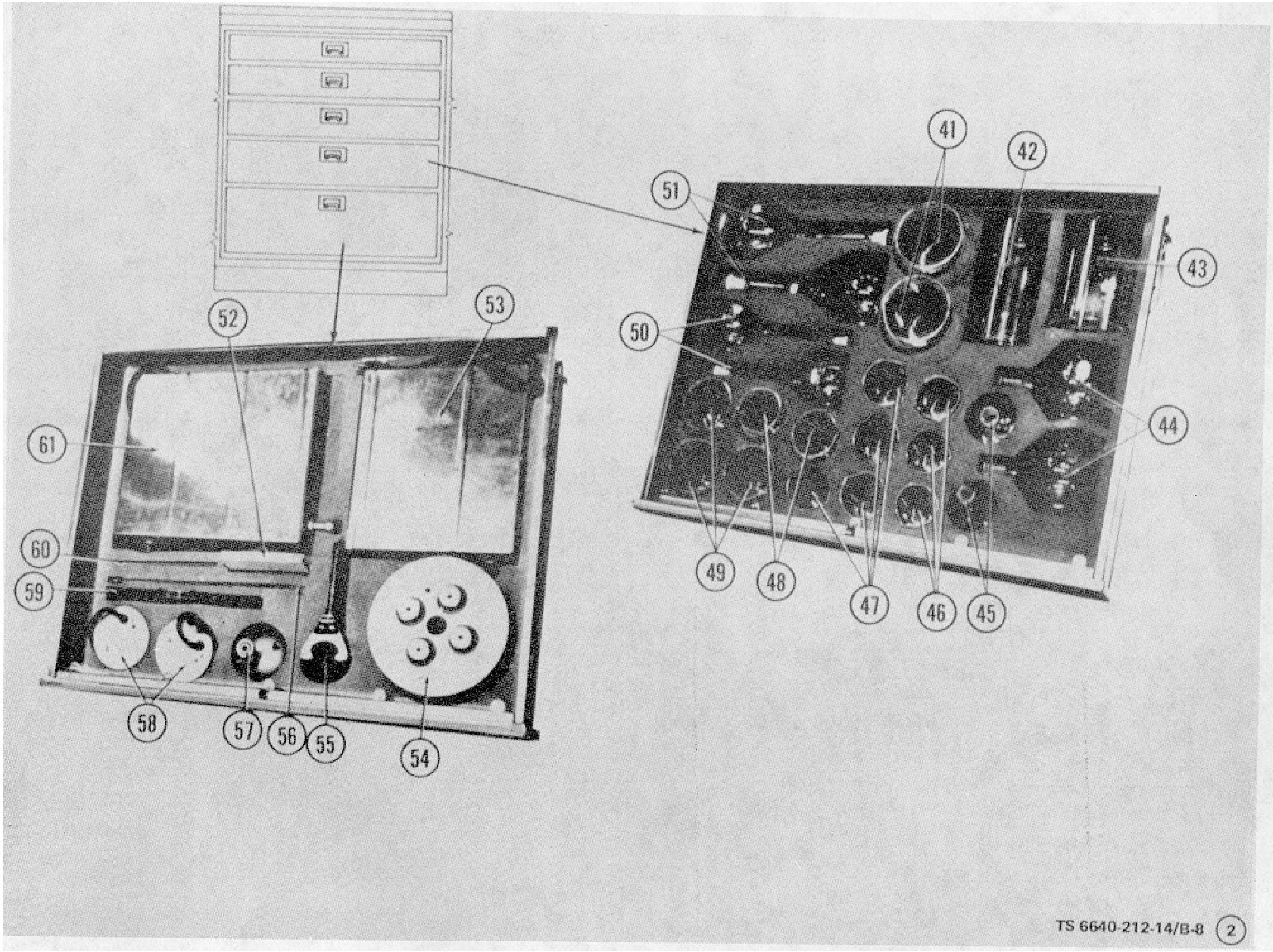


Figure B-8. Drawers B1 Through B5 (Sheet 2 of 2)

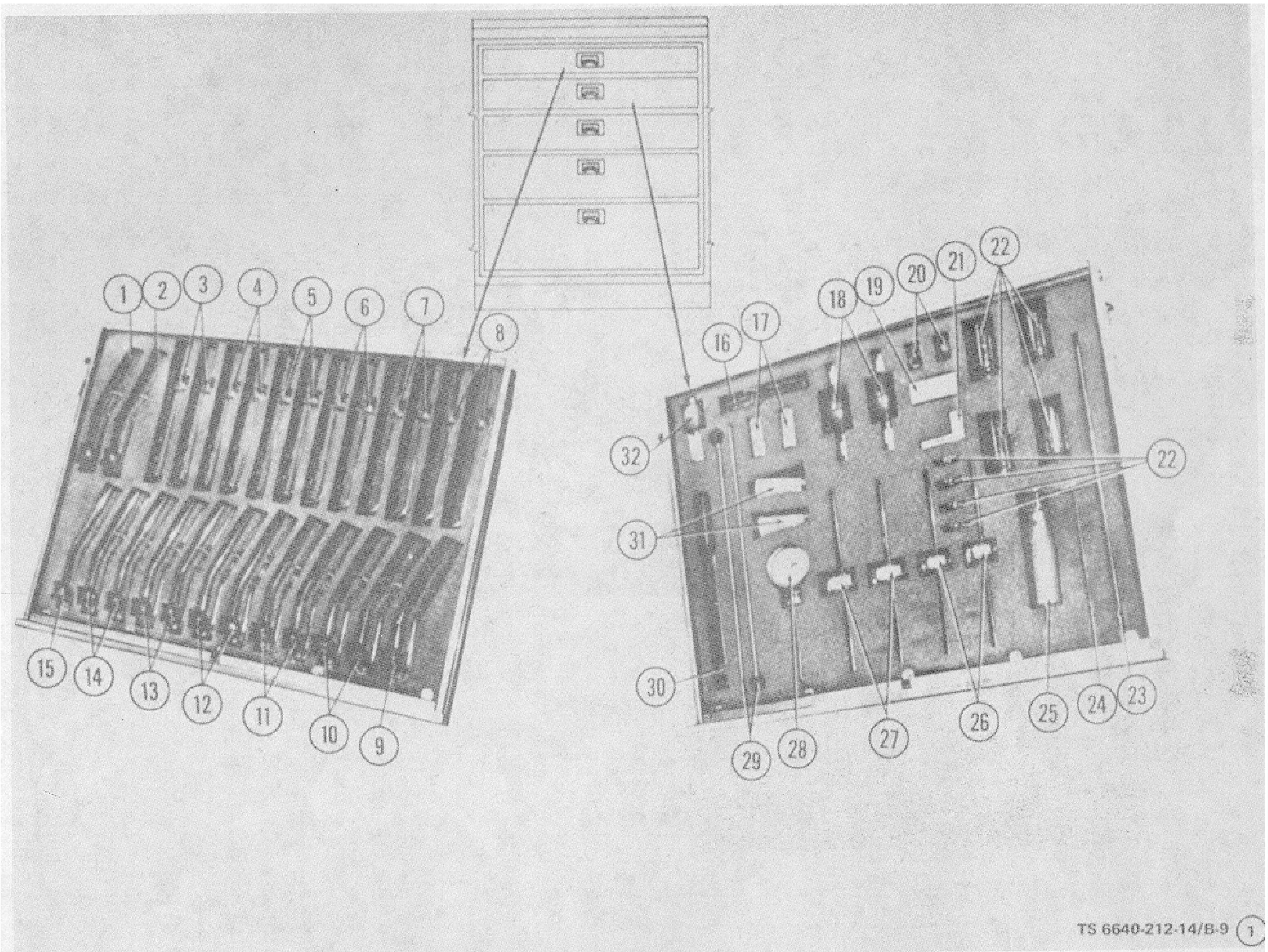


Figure B-9. Drawers C1 Through C5 (Sheet 1 of 2)

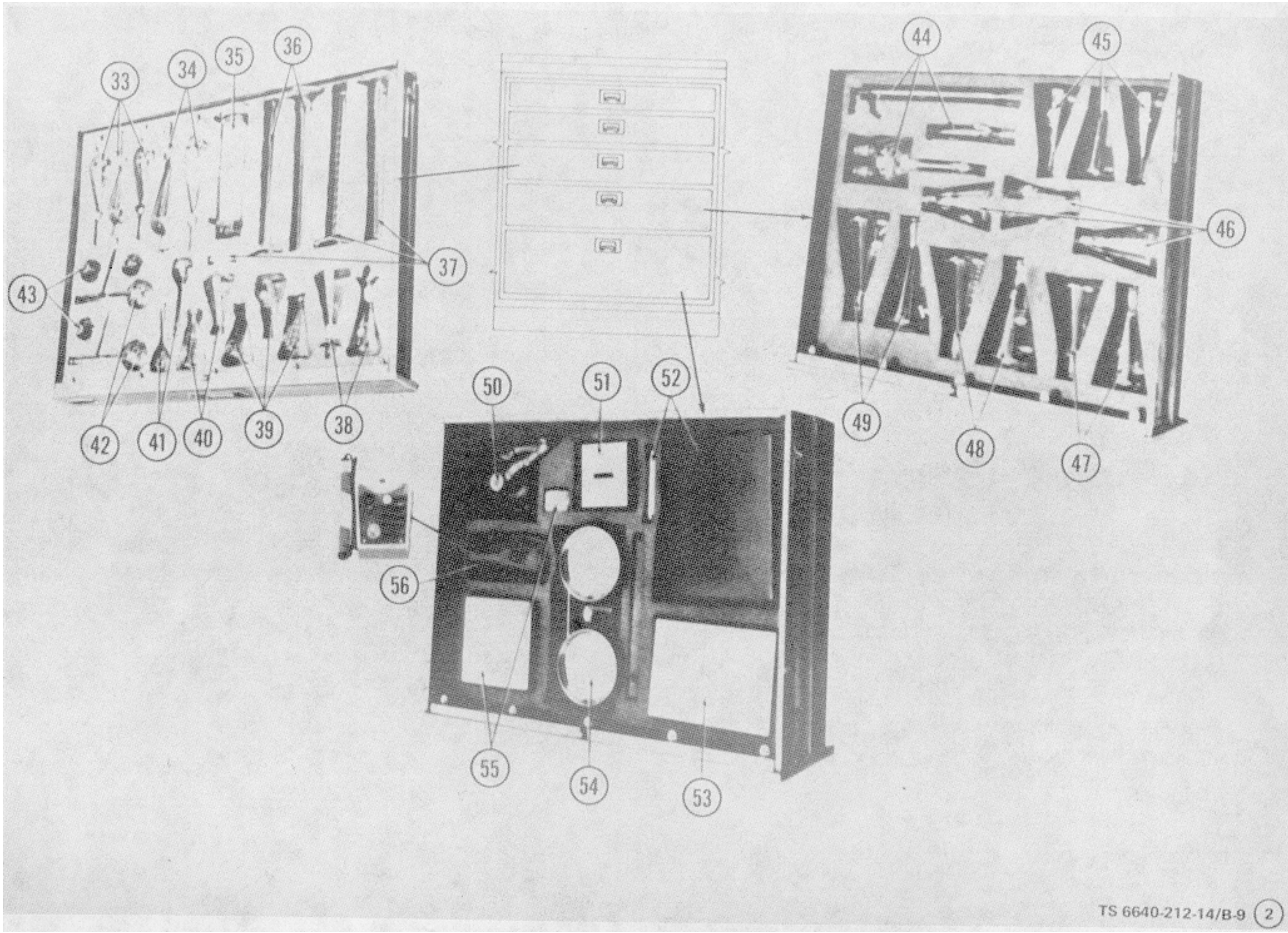


Figure B-9. Drawers C1 Through C5 (Sheet 2 of 2)

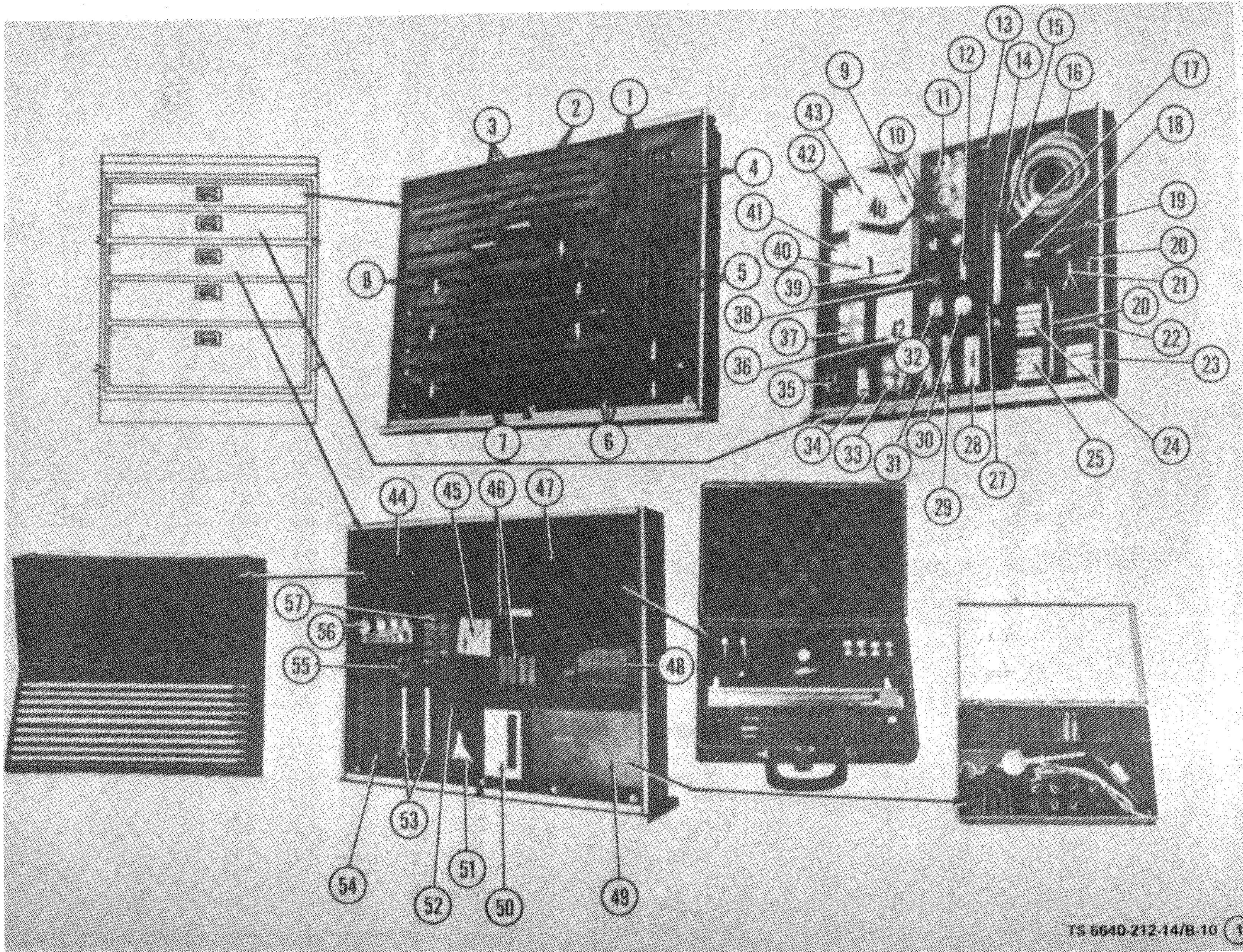
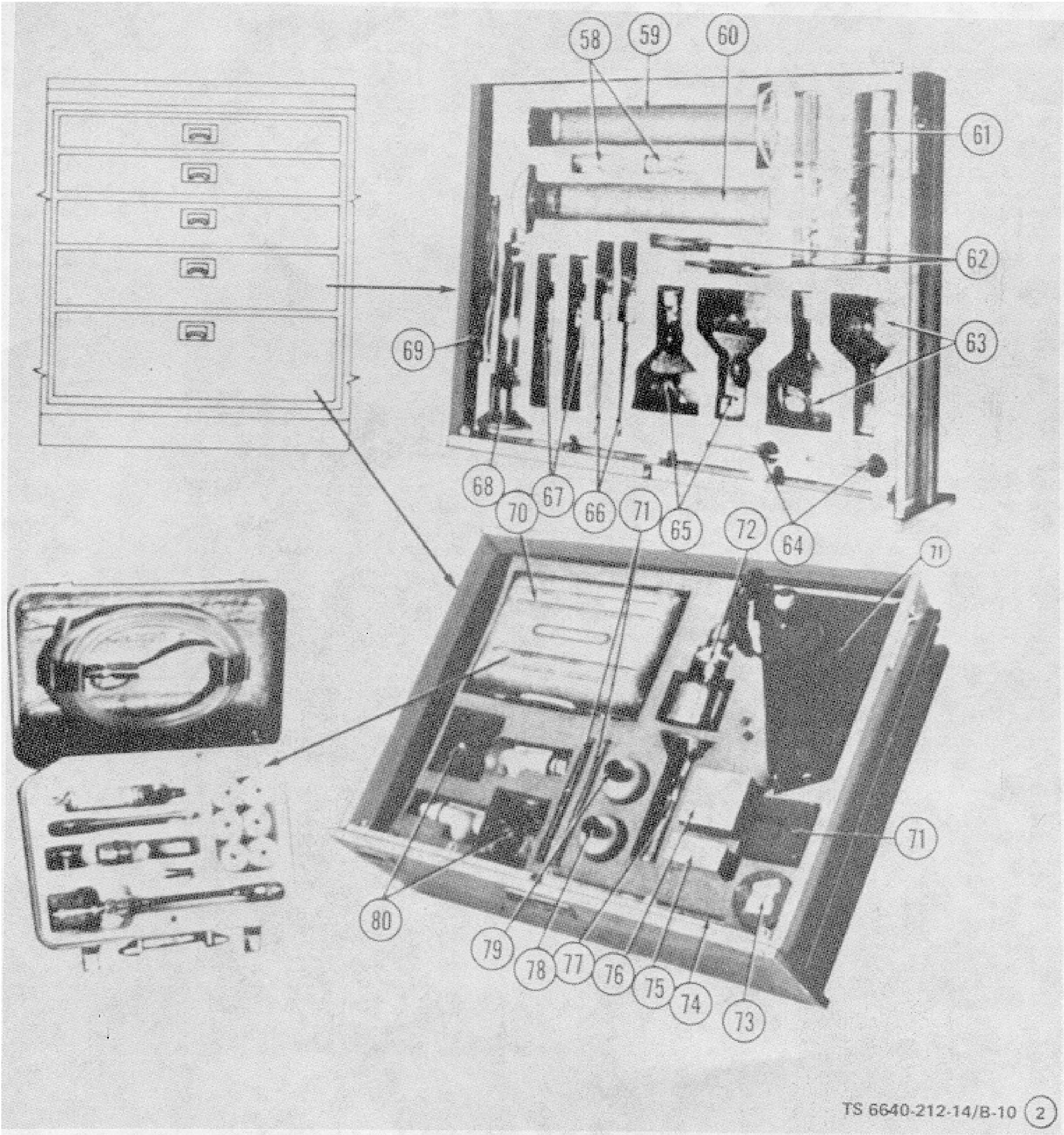


Figure B-10. Drawers D1 Through D5 (Sheet 1 of 2)



TS 16O2-14/.-10 ②

Figure B-10. Drawers D1 Through D5 (Sheet 2 of 2)

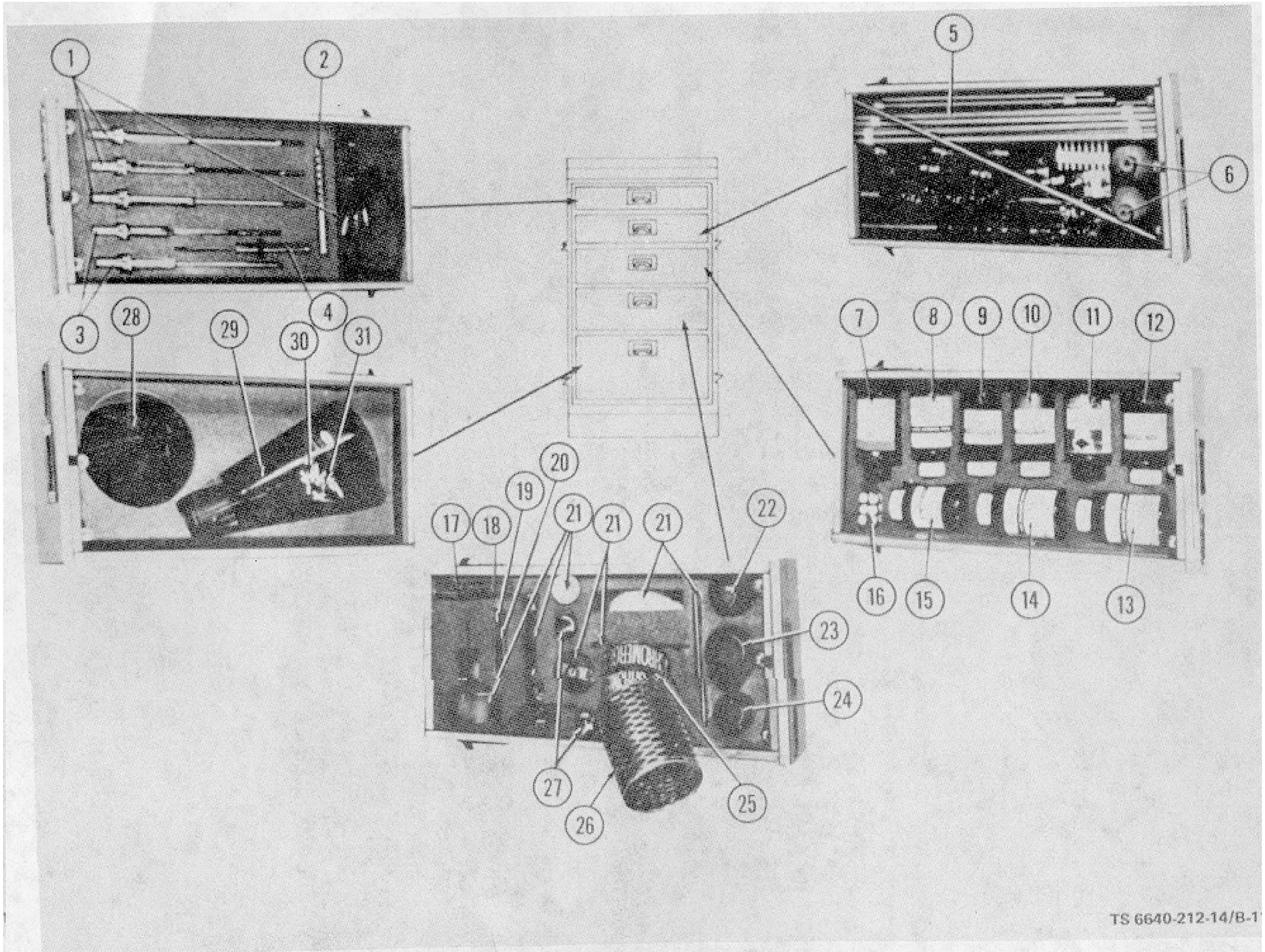


Figure B-11. Drawers E1 Through E5

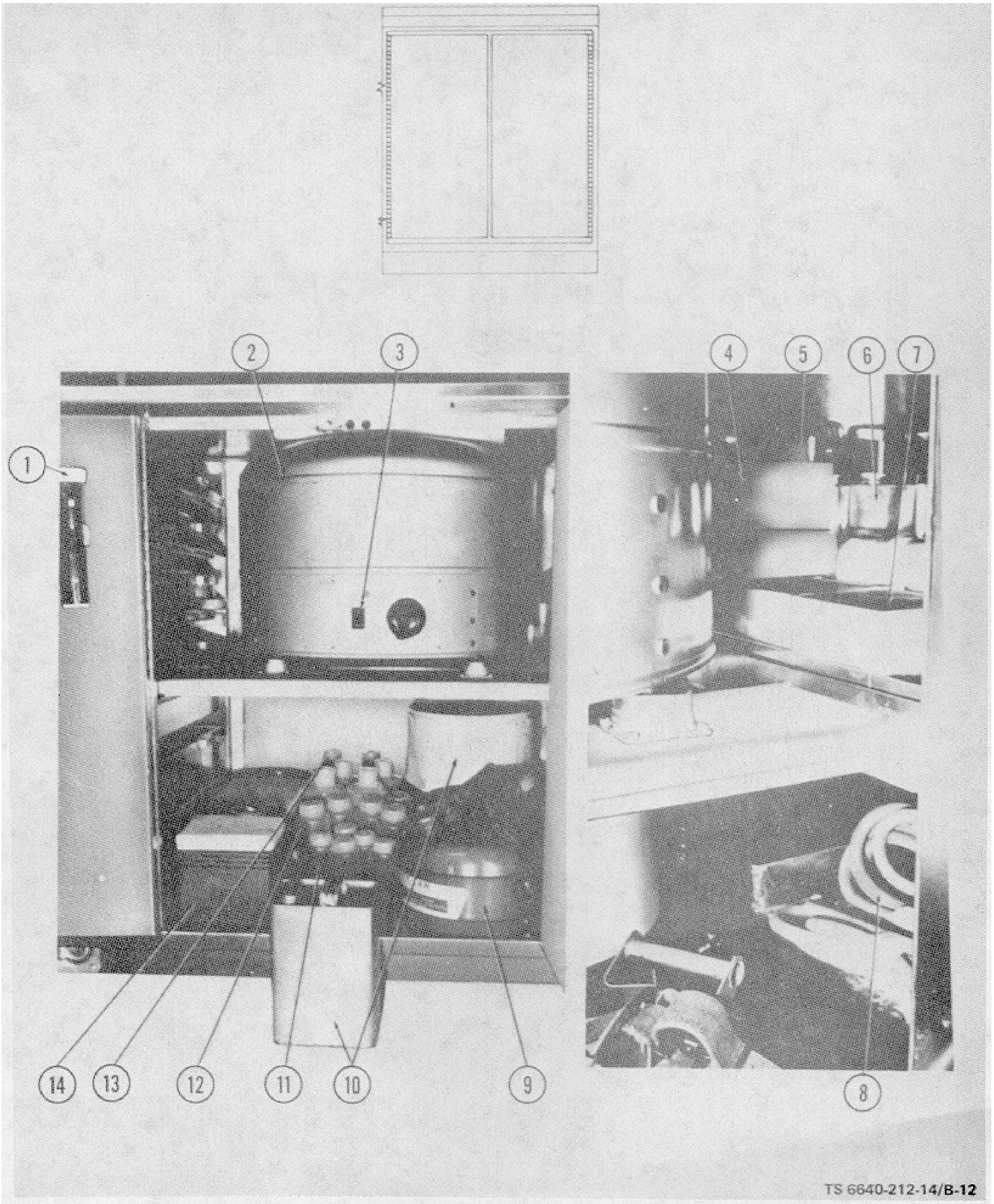
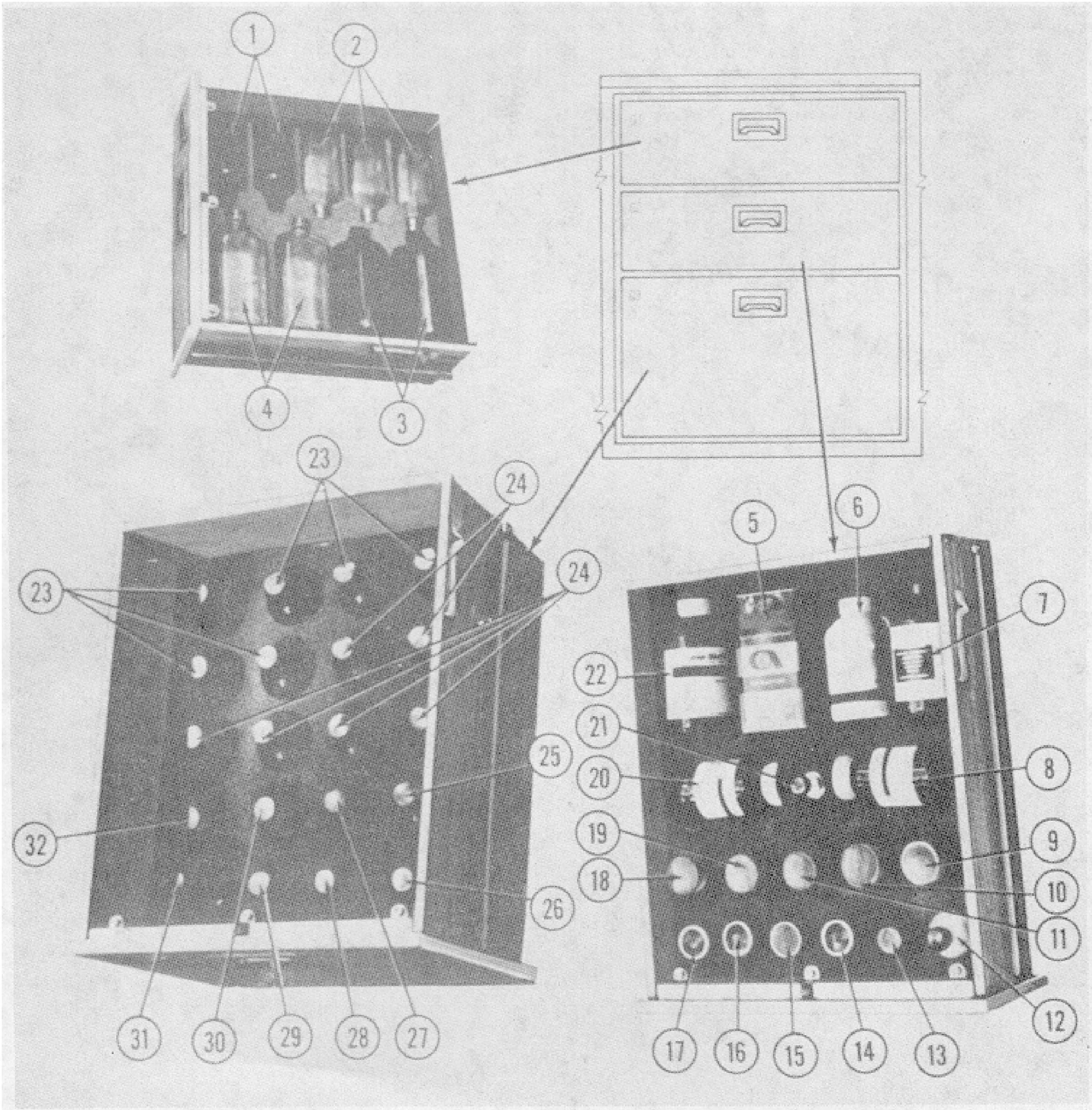
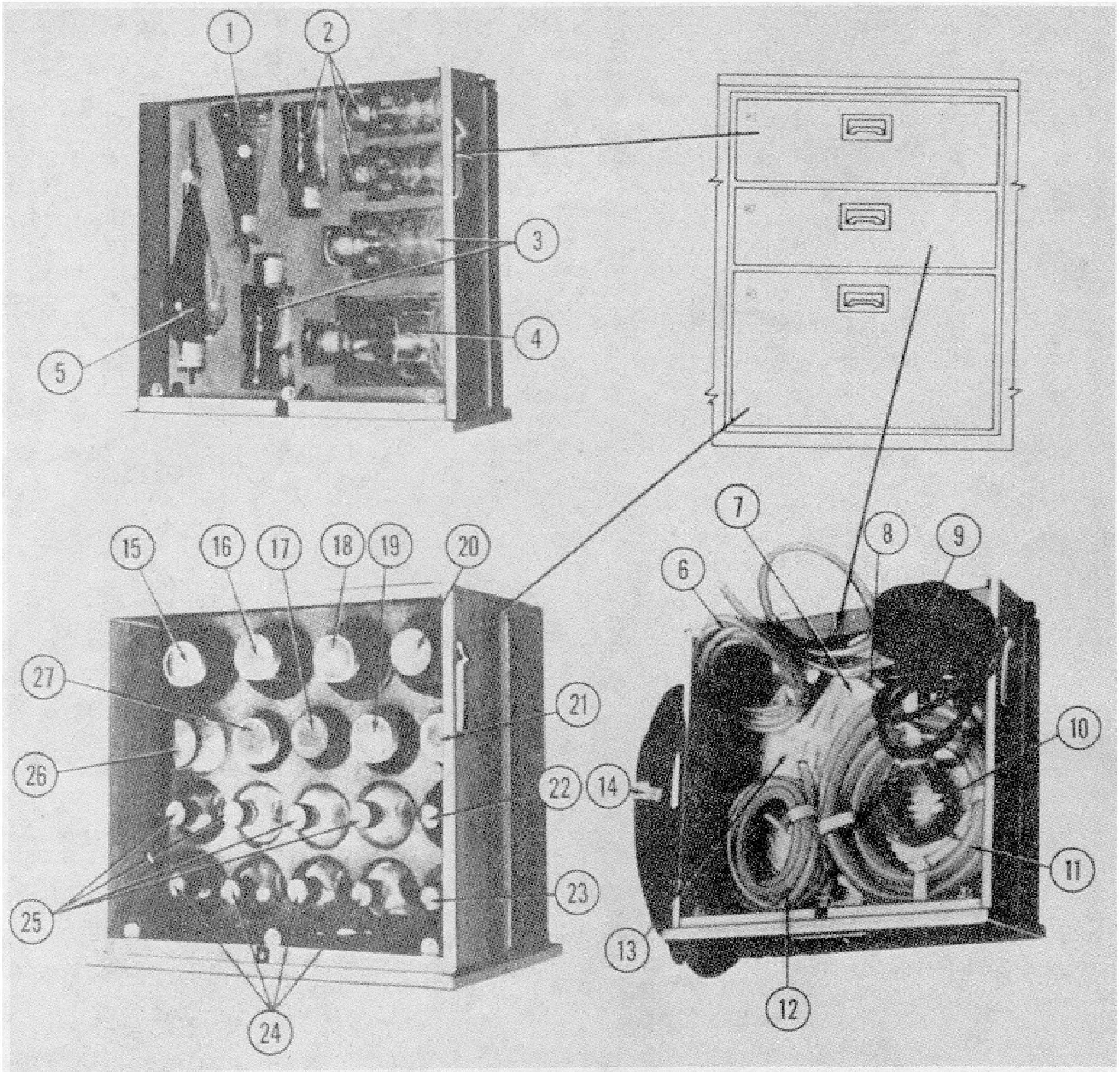


Figure B-12. Drawers F1 and F2



TS 6640-212-14/B-13

Figure B-13. Drawers G1 Through G3



TS 6640-212-14/8-14

Figure B-14. Drawers H1 Through H3

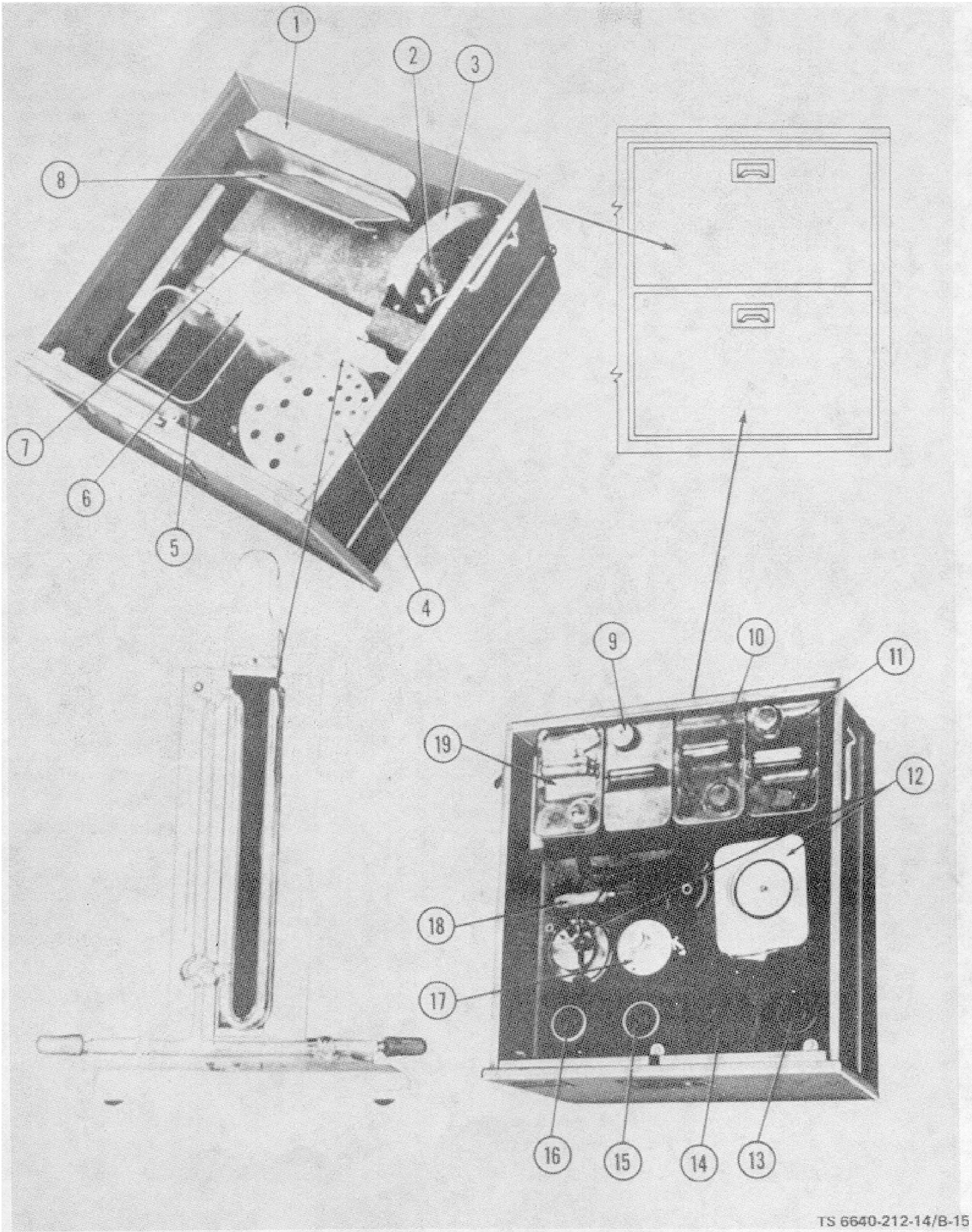


Figure B-15. Drawers J1 and J2

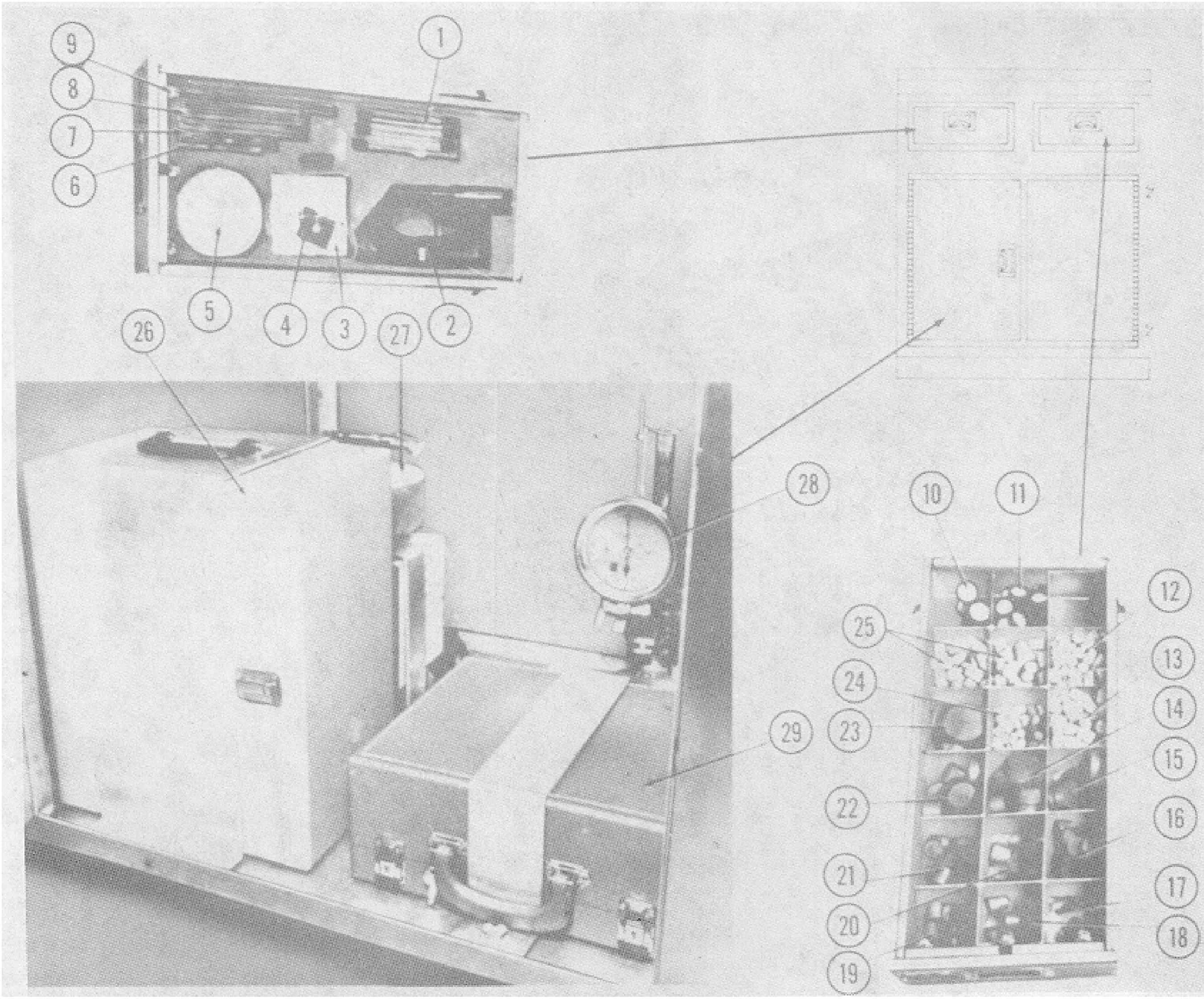


Figure B-16. Drawers K1,K2 and Cabinet K3

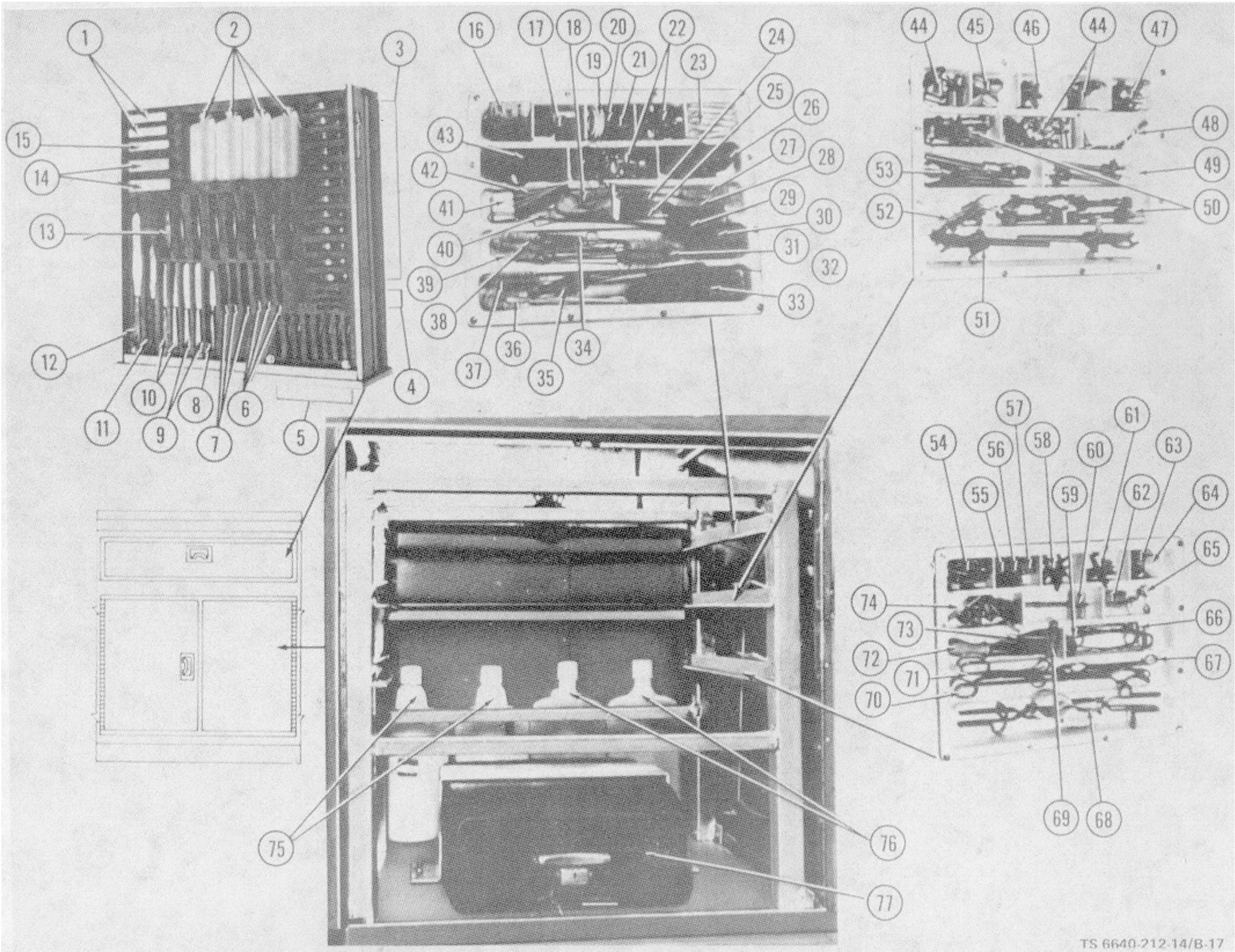


Figure B-17. Drawer L1 and Cabinet L2

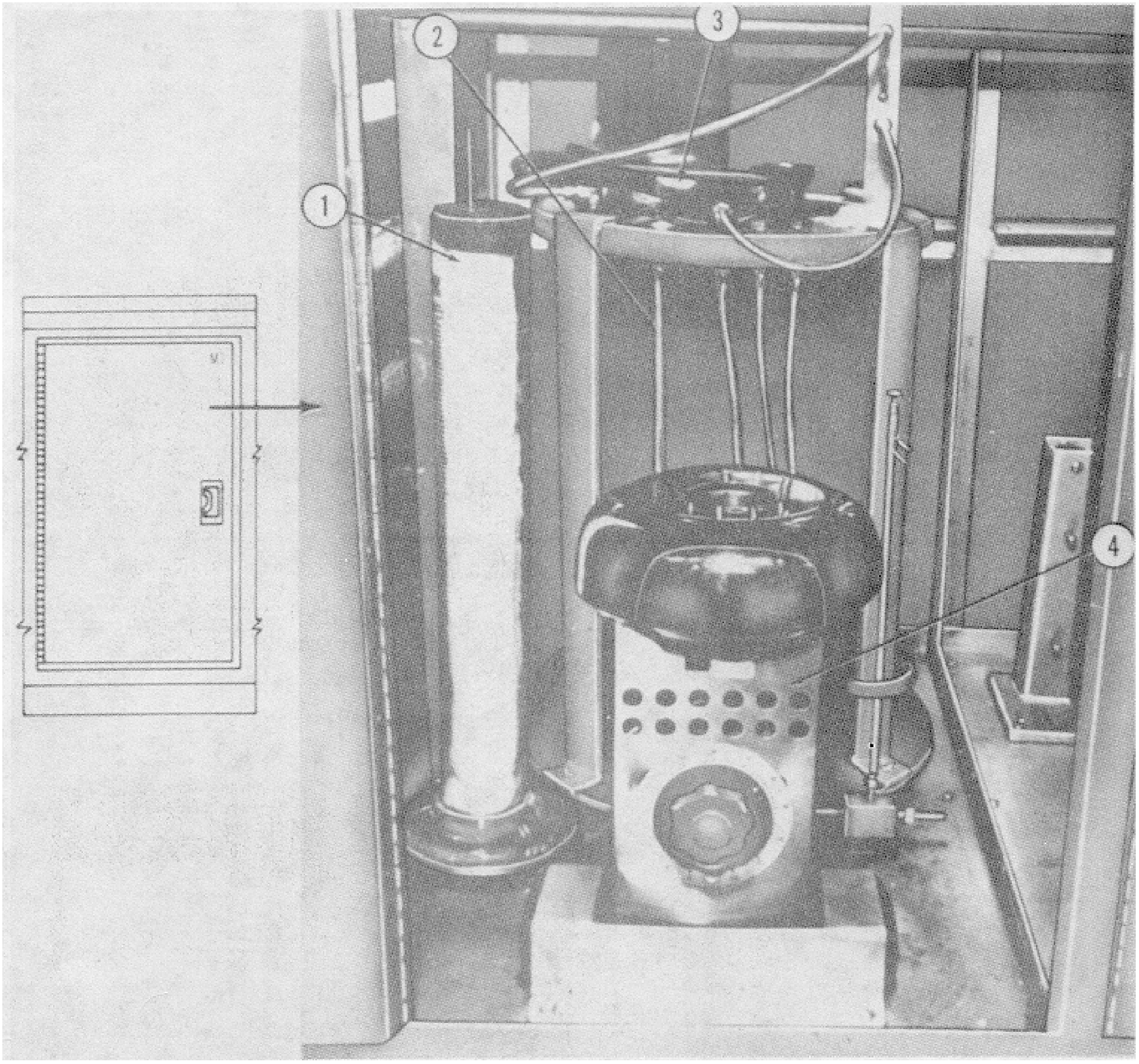


Figure B-18. Cabinet M1

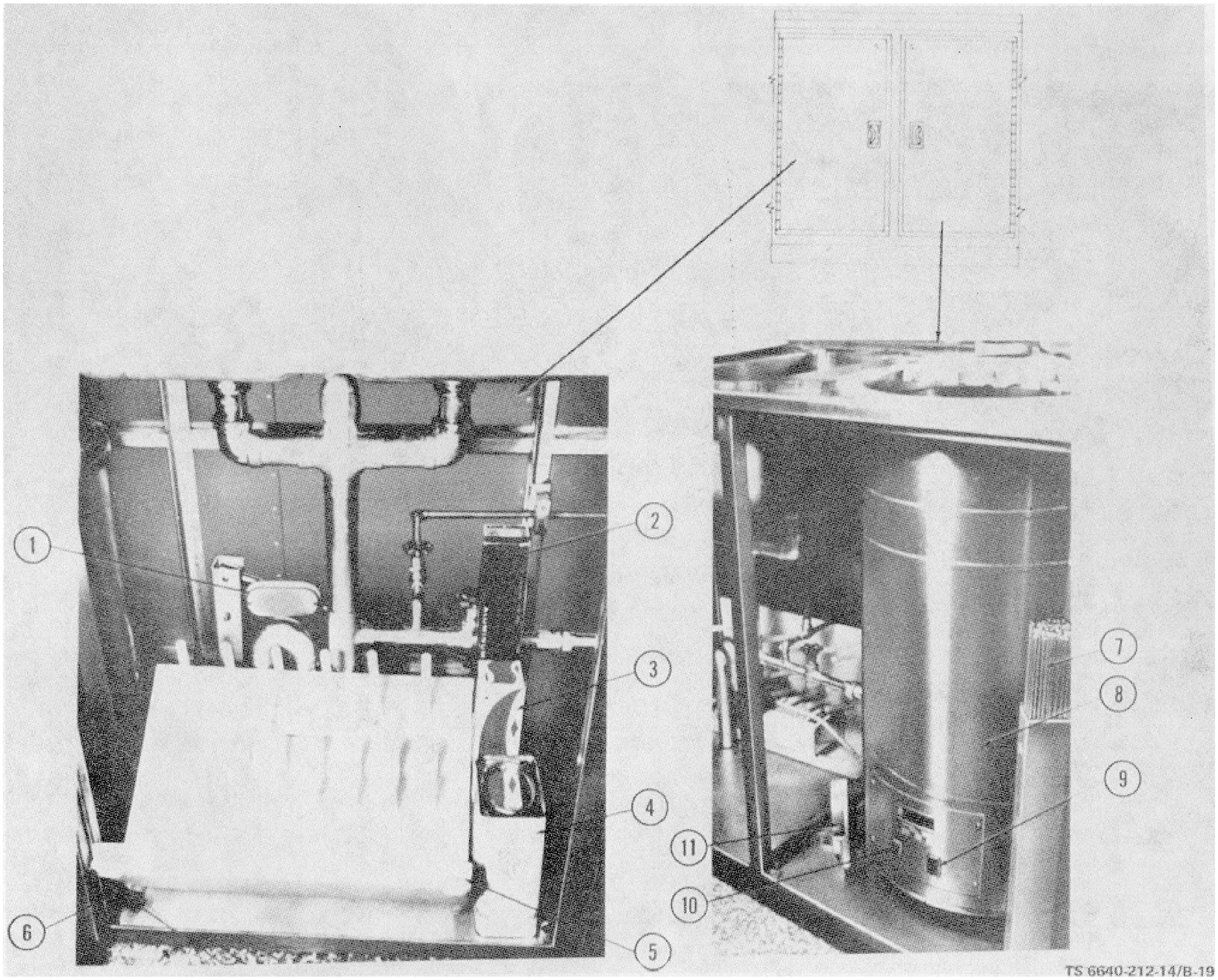


Figure B-19. Cabinets N1 and N2

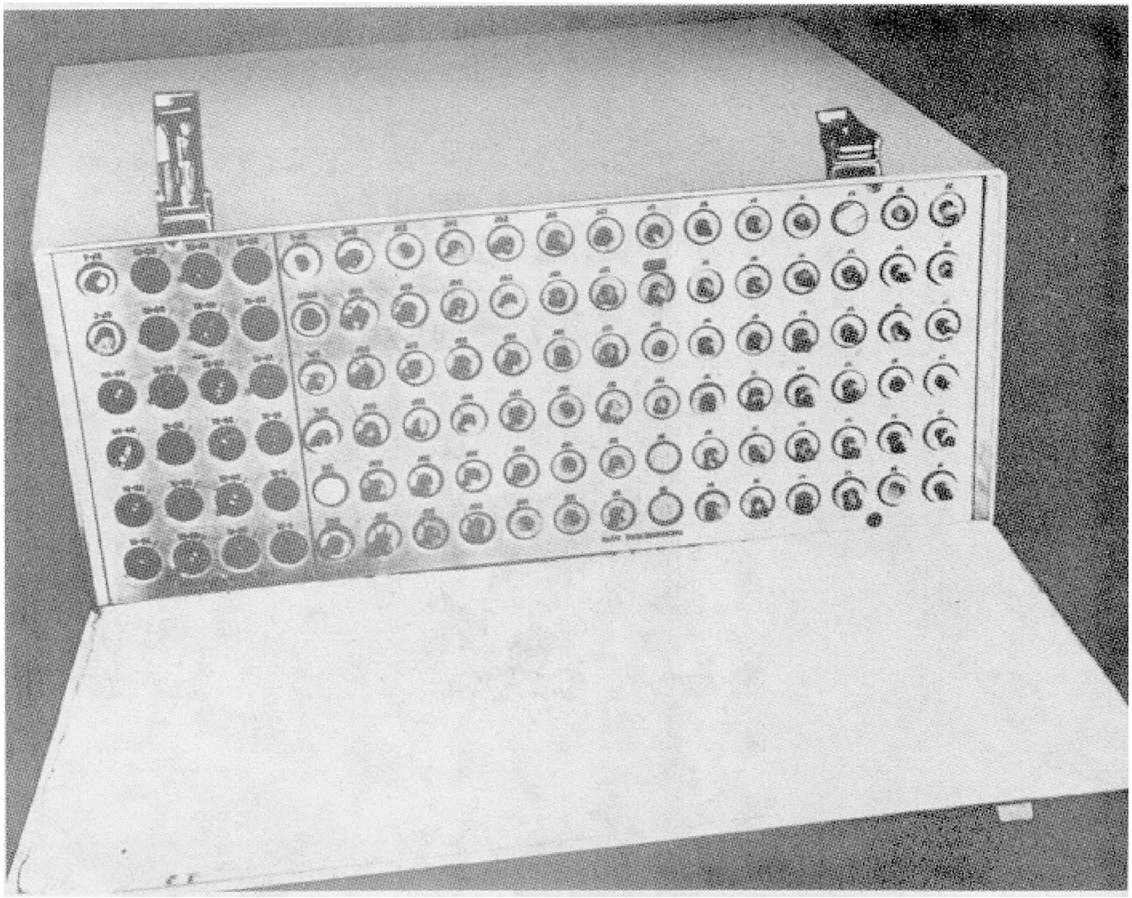


Figure B-20. Thermometer and Hydrometers

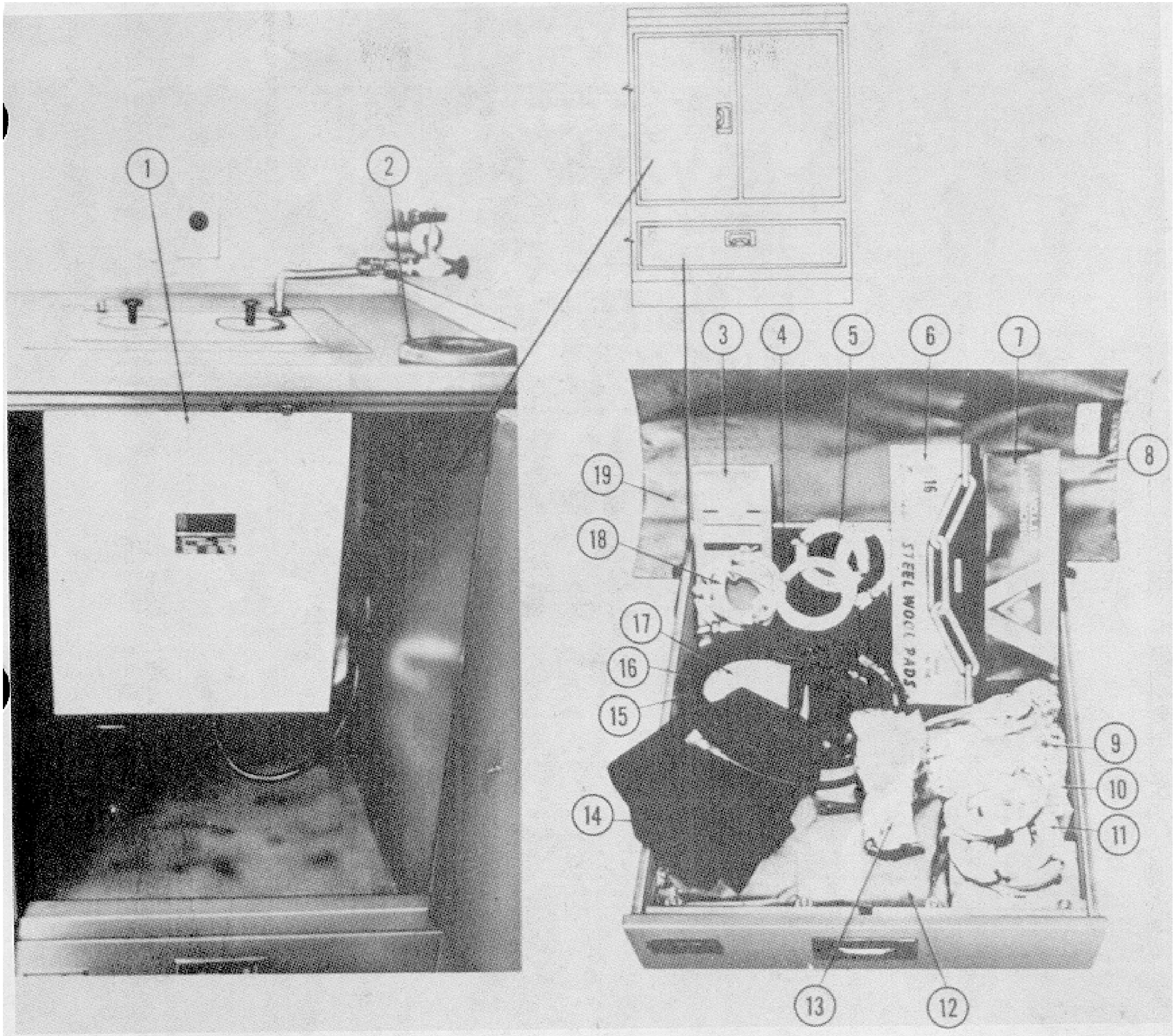


Figure B-21. Cabinets P1 and Drawer P2

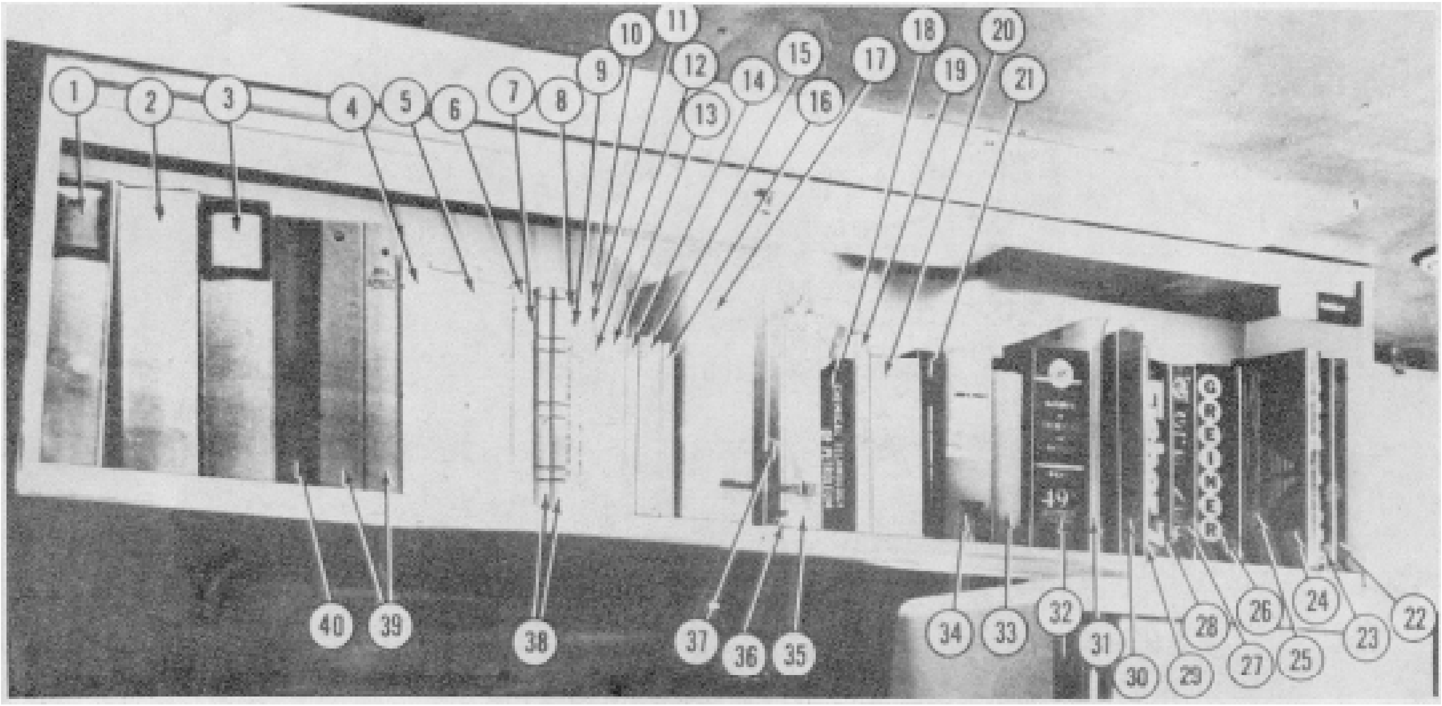


Figure B-22. Laboratory Bookcase

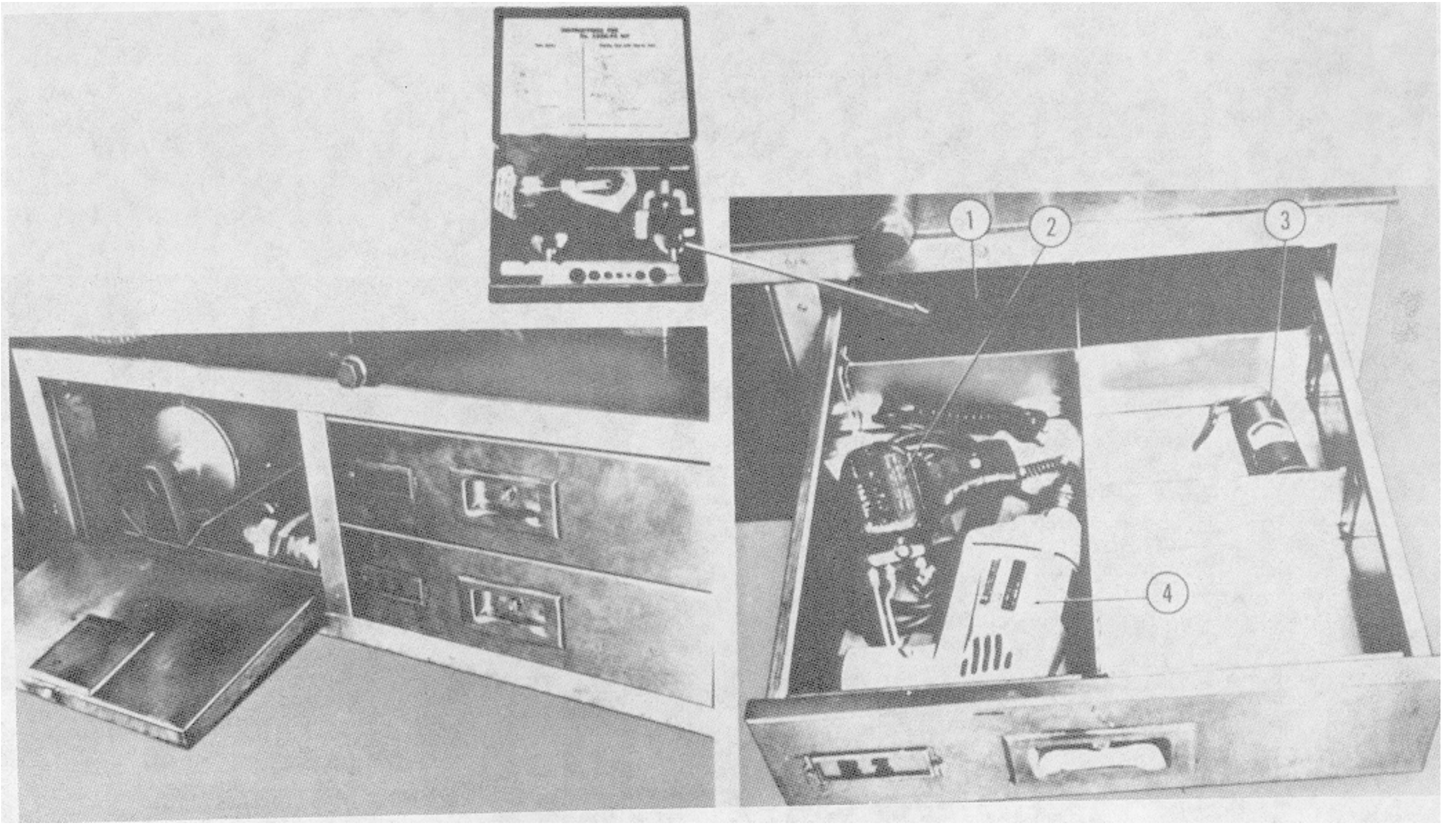


Figure B-23. Drawers R1 and R2

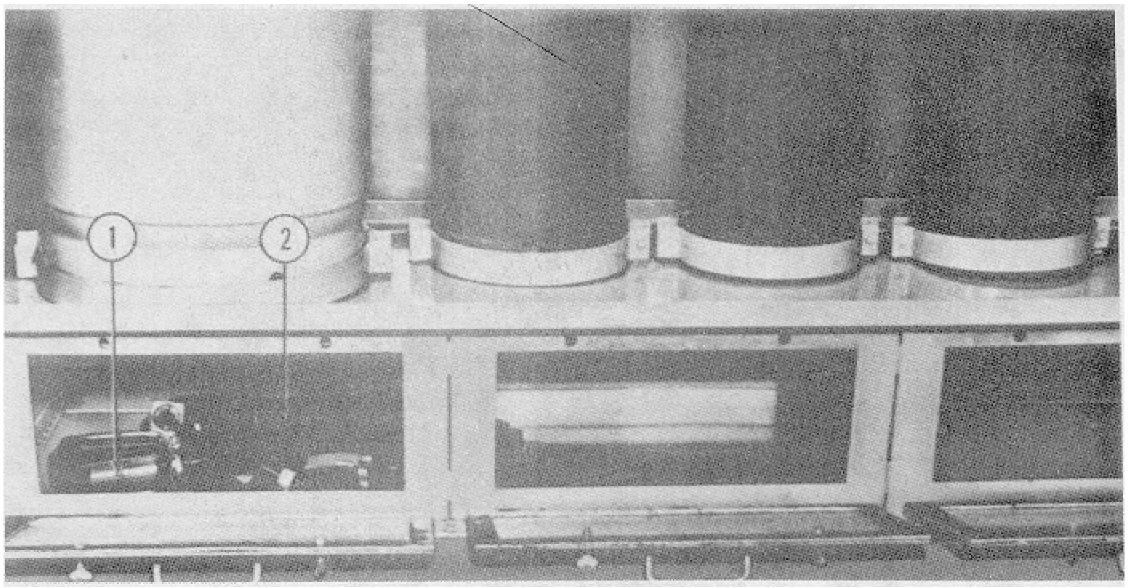
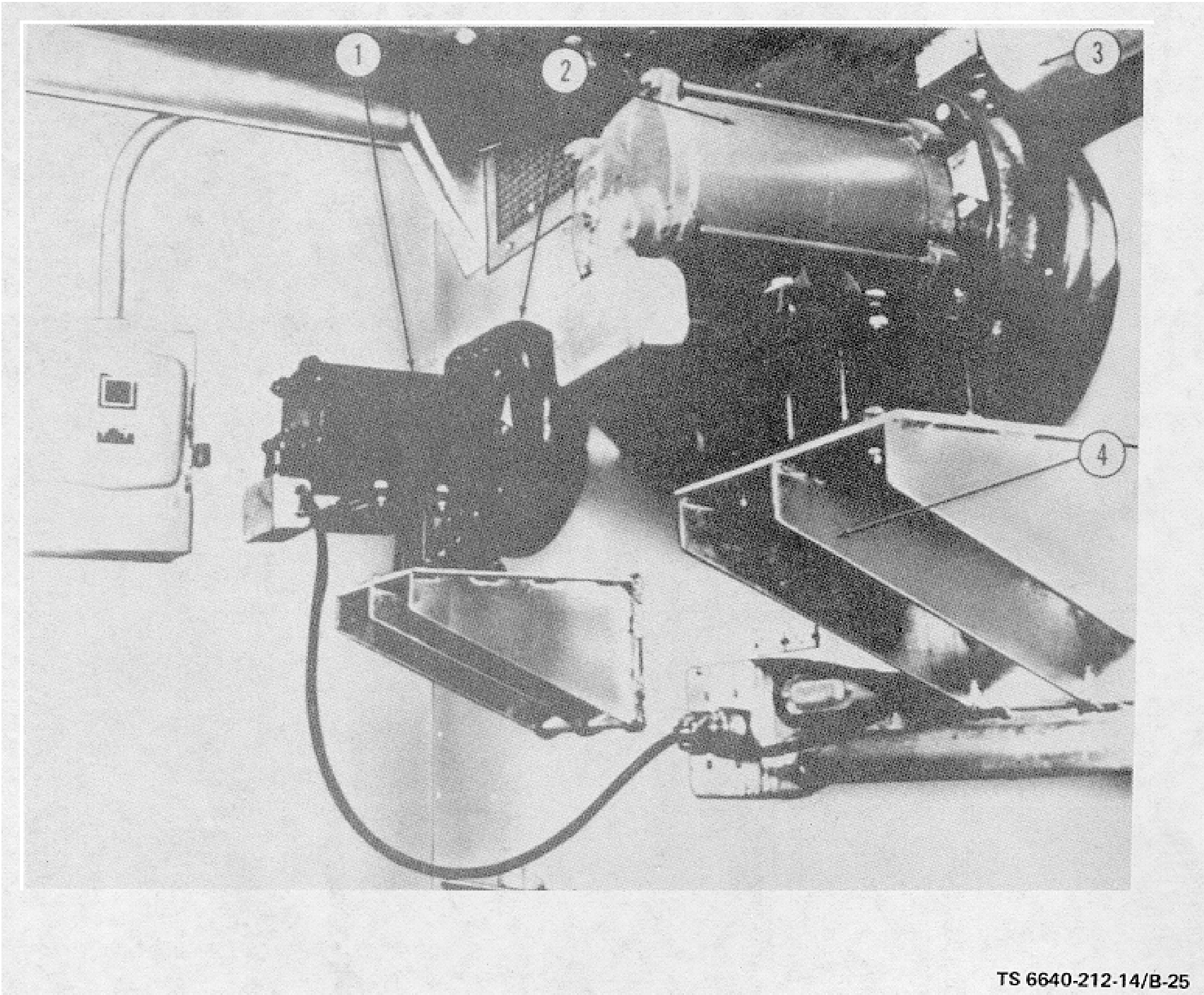
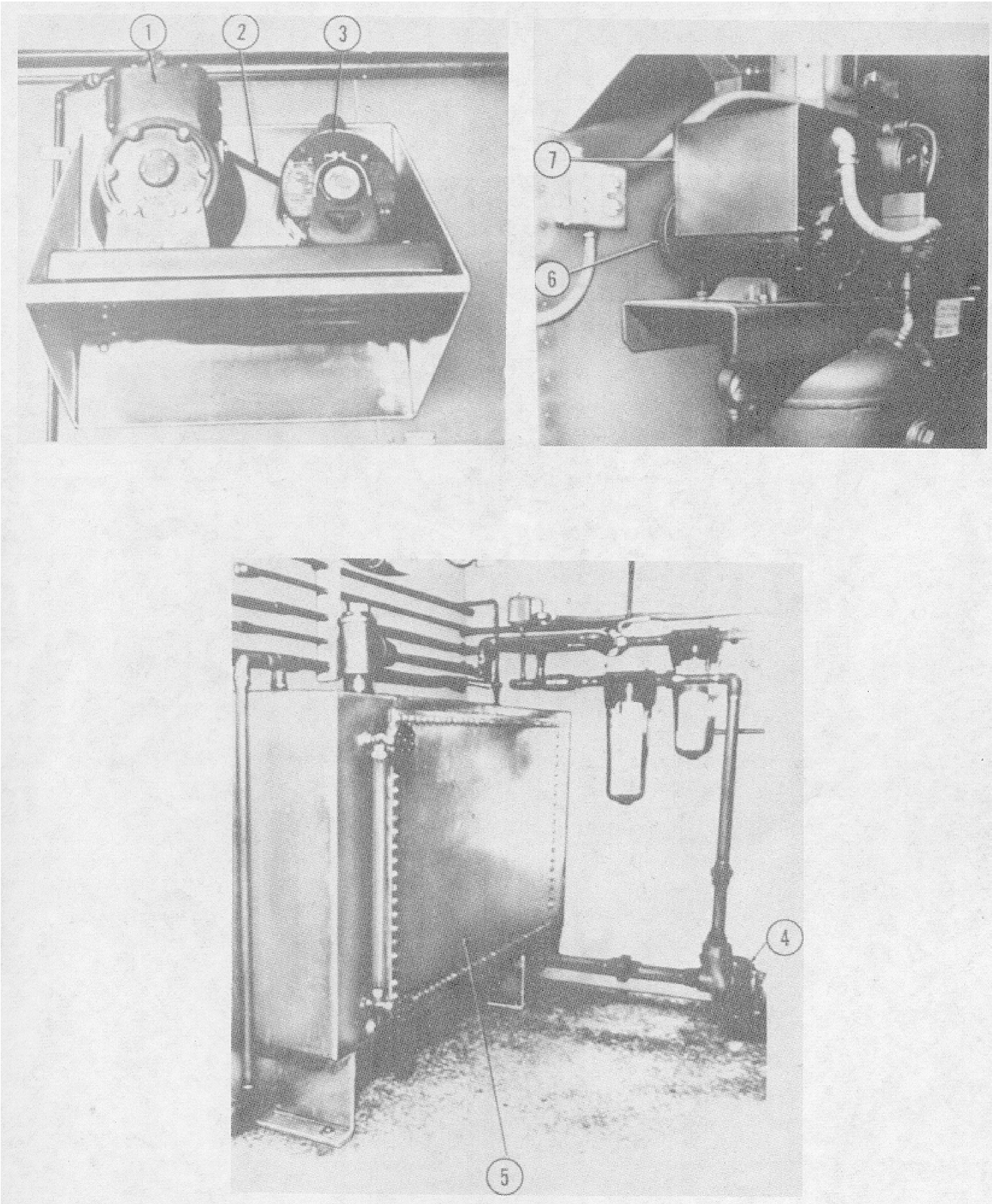


Figure B-24. Drawers S1, S2 and S3



TS 6640-212-14/B-25

Figure B-25. Purging Blowers



TS 6640-212-14/B-26

TS 6640-212-14/B-26

Figure B-26. Utility Compartment

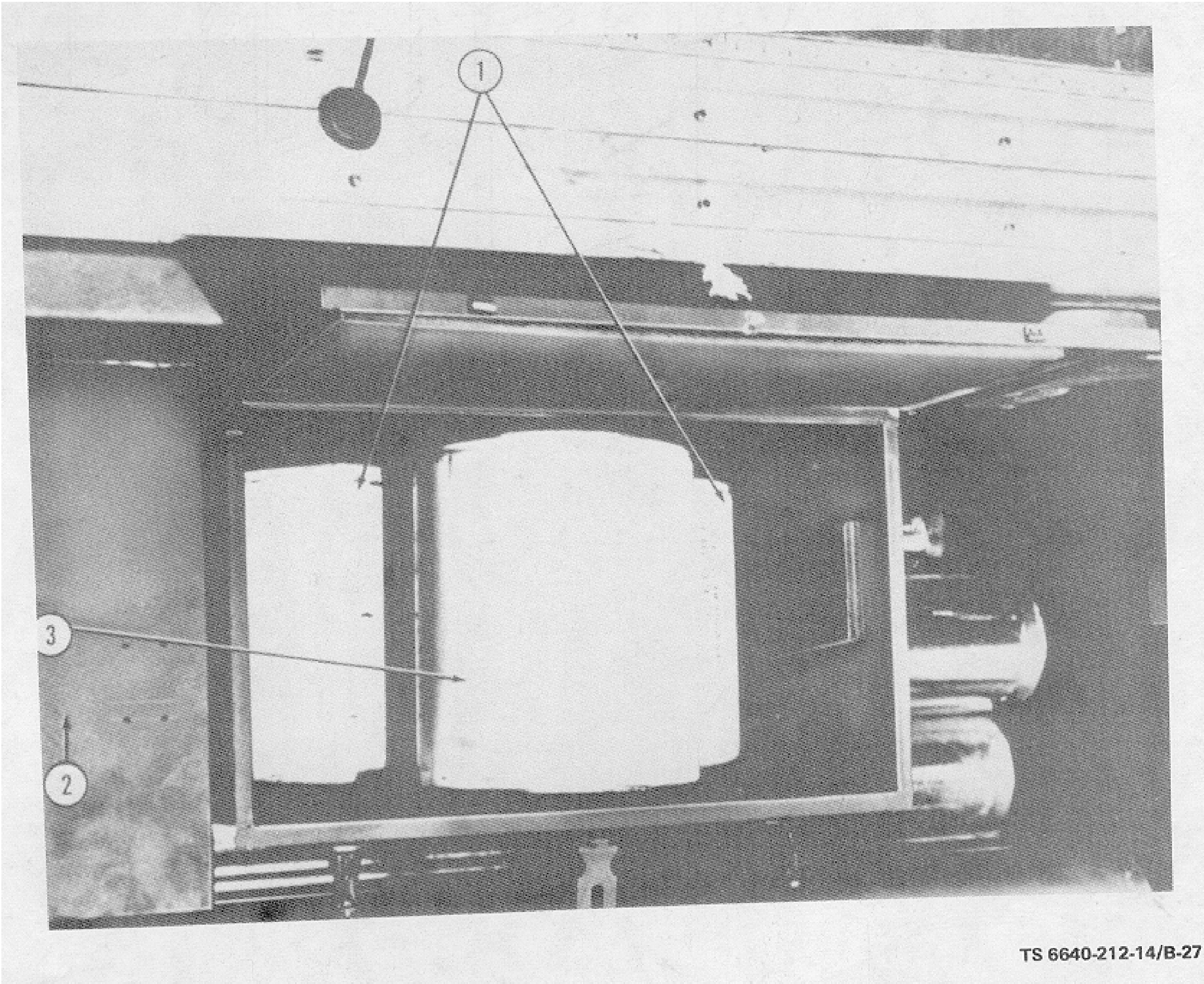


Figure B-27. Storage Compartment Under Semitrailer

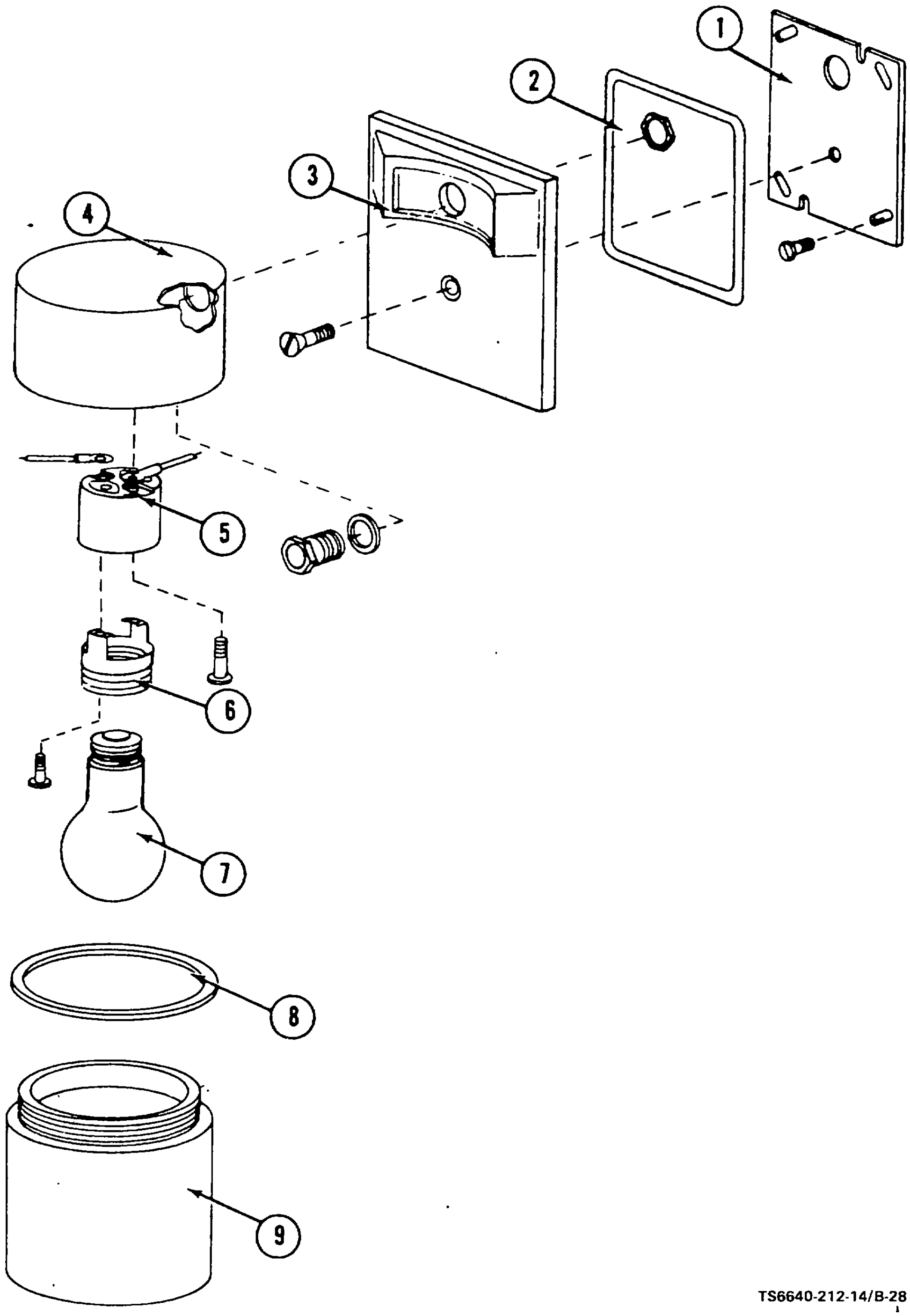


Figure B-28. Vapor Tight Light Fixture

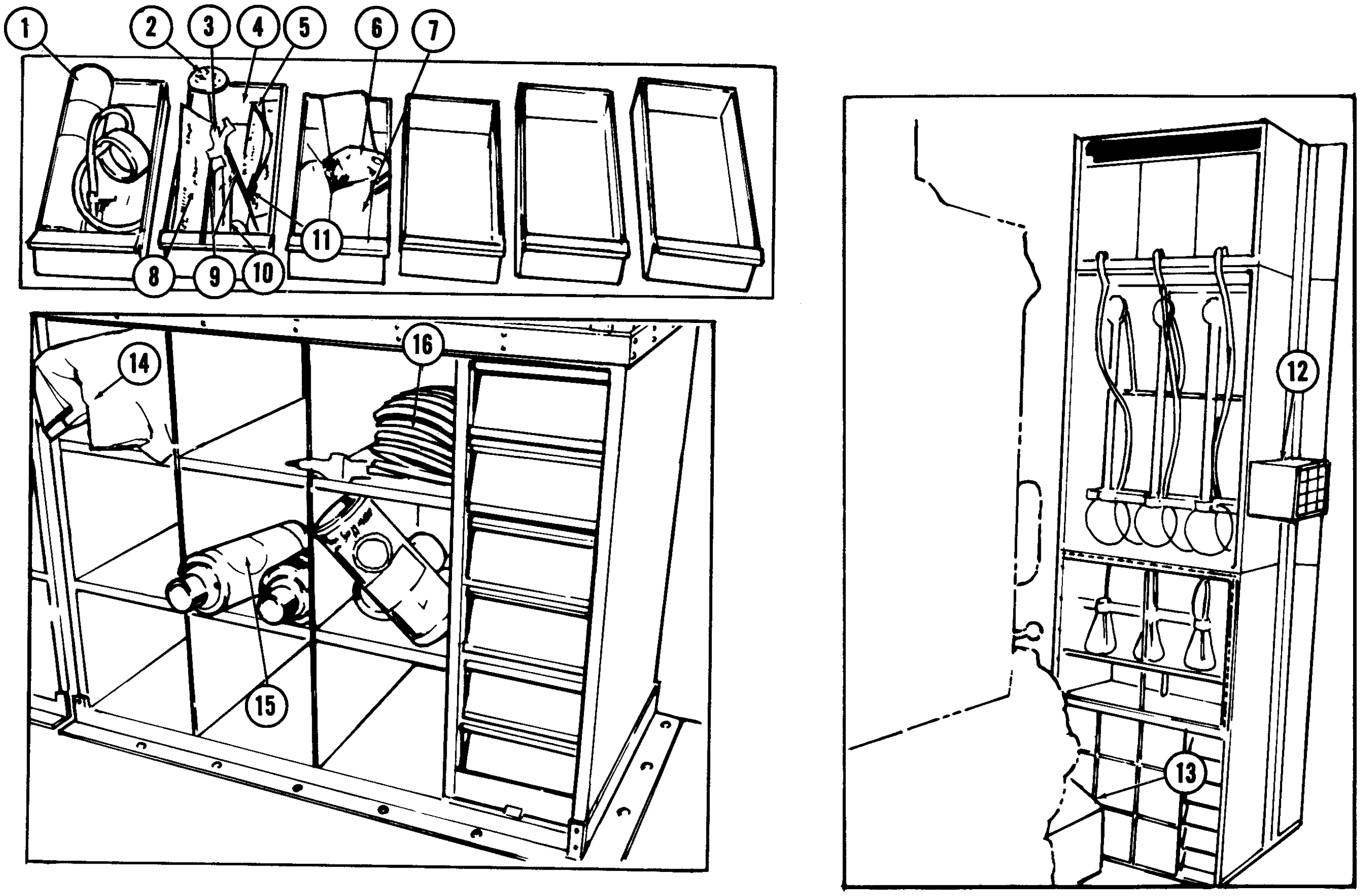


Figure B-29. Drawers Under Blending Kit.

APPENDIX C
MAINTENANCE ALLOCATION CHART

Section I. INTRODUCTION

a. This section provides a general explanation of all maintenance and repair functions authorized at various maintenance levels.

b. Section II designates overall responsibility for the performance of maintenance functions on the identified end item or component. The implementation of the maintenance functions upon the identified end item or component will be consistent with the assigned maintenance functions.

c. Section III lists the tools and test equipment required for each maintenance function as referenced from Section II.

d. Section IV contains supplemental instructions or explanatory notes for a partial maintenance function.

C-2. Explanation of Columns in Section II.

a. Group Number, Column (1). A number is assigned to each group in a top-down breakdown sequence. The applicable groups are listed in the MAC in disassembly sequence beginning with the first group removed.

b. Assembly Group, Column (2). This column contains a brief description of the components of each numerical group.

c. Maintenance Functions, Column (3). This column lists the functions to be performed on the items listed in Column 2. The lowest maintenance level authorized to perform these functions is indicated by a symbol in the appropriate column. The symbol designators for the various maintenance levels are as follows:

C-Operator or crew.
O-Organizational Maintenance.
F-Direct Support Maintenance.
H-General Support Maintenance.
D-Depot Maintenance.

The maintenance functions are defined as follows:

(1) Inspect. To determine serviceability of an item by comparing its physical, mechanical, and electrical characteristics with established standards through examination.

(2) Test. To verify serviceability and detect incipient failure by measuring the mechanical or electrical characteristics of an item and comparing those characteristics with prescribed standards.

(3) Service. Operations required periodically to keep an item in proper operating condition, i.e., to clean, preserve, drain, paint, or to replenish fuel/lubricants/hydraulic fluids or compressed air supplies.

(4) Adjust. Maintain within prescribed limits by bringing into proper or exact position, or by set-ting the operating characteristics to the specified parameters.

(5) Align. To adjust specified variable elements of an item to bring about optimum or desired performance.

(6) Calibrate. To determine and cause corrections to be made or to be adjusted on instruments or test measuring and diagnostic equipment used in precision measurement. Consists of comparisons of two instruments, one of which is a certified standard of known accuracy, to detect and adjust any discrepancy in the accuracy of the instrument being compared.

(7) Install. The act of emplacing, seating, or fixing into position an item, part, or module (component or assembly) in a manner to allow the pro-per functioning of an equipment or system.

(8) Replace. The act of substituting a serviceable like type part, subassembly, or module (component or assembly) for an unserviceable counterpart.

(9) Repair. The application of maintenance services (inspect, test, service, adjust, align, calibrate, or replace) or other maintenance actions (welding, grinding, riveting, straightening, facing, remachining or resurfacing) to restore serviceability to an item by correcting specific damage, fault, malfunction, or failure in a part, subassembly, module (component or assembly), end item, or system.

(10) Overhaul. That maintenance effort (service/action) necessary to restore an item to a completely serviceable/operational condition as prescribed by maintenance standards (i.e., DMWR) in appropriate technical publications. Overhaul is normally the highest degree of maintenance performed by the Army. Overhaul does not normally return an item to a like-new condition.

(11) Rebuild. Consists of those services/actions necessary for the restoration of unserviceable equipment to a like-new condition in accordance with original manufacturing standard Rebuild is the highest degree of mater maintenance applied to Army equipment. '[rebuild operation includes the act of returning zero those age measurements (hours/miles, e considered in classifying Army equipment/components.

d. Maintenance Level, **Column (4).** This column is made up of subcolumns for each category maintenance. Work time figures are listed in the subcolumns for the lowest level of maintenance authorized to perform the function listed in Column 3. These figures (shown directly below symbol) indicate the average active time required to perform the maintenance function at the dicated category of maintenance under typical field operating conditions.

e. Tools and Equipment, Column (5). This column is provided for references by code, the spec tools and test equipment (Section III) required perform the maintenance functions (Section II).

f. Remarks, Column (6). This column shall contain a letter code in alphabetical order which shall be keyed to the remarks contained in Section IV

C-3. Explanation of Columns in Section III. '

a. Reference Code. This column consists of an Arabic number listed in sequence from column (5) of Section II. The number references the special tools and test equipment requirements.

b. Maintenance Level. This column shows the lowest level of maintenance authorized to use the special tools or test equipment.

c. Nomenclature. This column lists the name or identification of the tools or test equipment.

d**. National/NATO Stock Number**. This column is provided for the NSN of special tools and test equipment listed in the nomenclature column.

e. Tool Number. This column lists the manufacturer's code and part number of tools and test equipment.

C-4. Explanation of Columns in Section IV.

a. Reference Code. This column consists of a letter code in alphabetical order which is keyed to column 6 of Section II.

b. Remarks. This column lists information pertinent to the maintenance function being performed, as indicated on the MAC, Section II.

Section II. MAINTENANCE ALLOCATION CHART

(1) Group number	(2) Component/assembly	(3) Maint. function	(4) Maint. category C	O	F	H	D	(5) Tool/ equipment	(6) Remarks
01	SEMI-TRAILER VAN								A
02	MUFFLE FURNACE	Inspect	0.2					04	
		Replace		0.5				09	
		Repair			2.0			12	
03	UTILITY OVEN	Inspect	0.5					04	
		Replace		0. 5				09	
		Repair			2. 0			12	
04	KINEMATIC VISCOSITY BATH	Inspect	0.2					04	
		Replace		0.5				09	
		Repair			1.5			12	
05	CENTRIFUGE	Inspect	0.2					09	
		Replace		1.0					
		Repair			3.0				
06	REFRIGERATOR-ICEMAKER	Inspect	0. 5					04	
		Replace		3.0				09	
		Repair			12.0			12	
07	PYROMETER	Inspect	0.2					09	
		Replace		2.0					
		Repair			1.5				
		Calibrate		2.0					B
08	BOILER, HIGH PRESSURE STEAM	Inspect	0.3					04	
		Replace		2.0				09	
		Repair			8.0			12	
09	GUM BATH	Inspect	0.2					04	
		Replace		4. 0				09	
		Repair			8.0			12	
10	ANALYTICAL BALANCE	Inspect	0.2					09	
		Replace	0.5						
		Repair		1.0					
		Calibrate	1.0						C
11	DISTILLIATION TEST APPARATUS	Inspect	0.3					04	
		Replace		0. 5				09	
		Repair			4.0			12	
12	REID VAPOR PRESSURE BOMB BATH	Inspect	0.3					04	
		Replace		1.5				09	
		Repair				8.0		12	
		Calibrate	1.0						D
13	MANOMETER	Inspect	0.2					09	
		Replace		0.5					
		Repair		1.0					
		Calibrate	1.0						E
14	PRESSURE RECORDING GAGE	Inspect	0.2					09	
		Replace	0.5						
		Calibrate		2.0					F

Subcolumns are as follows: C - Operator/Crew O - Organizational H - General Support F - Direct Support D - Depot

Section II. MAINTENANCE ALLOCATION CHART - Continued

(1) Group number	(2) Component/assembly	(3) Maint. function	(4) Maint. category C	O	F	H	D	(5) Tool/ equipment	(6) Remarks
15	REFRACTOMETER	Inspect	0.2					09	
		Replace	0.5						
		Repair	0.5						G
16	PENETROMETER	Inspect	0.2					09	
		Replace	0.5						
		Repair		1.0					
17	FLASH POINT TESTER	Inspect	0.2					09	
		Replace	0.5						
		Repair		1.5					
18	FOAM TEST APPARATUS	Inspect	0.2					09	
		Replace	0.5						
		Repair		1.5					
19	DRY ICE MACHINE	Inspect	0.2					09	
		Replace	0.5						
		Repair	1.0						
20	UTILITY BATH	Inspect	0.2					04	
		Replace	0.2					09	
		Repair		2.0				12	
21	COPPER STRIP CORROSION BATH	Inspect	0.2					04	
		Replace	0.2					09	
		Repair		1.0				12	
22	CLOUD AND POUR POINT TEST BATH	Inspect	0.2					04	
		Replace	0.2					09	
		Repair		1.0				12	
23	ANALINE POINT APPARATUS	Inspect	0.2					04	
		Replace	0.2						
		Repair	0.5						
24	GREASE DROPPING POINT APPARATUS	Inspect	0.2					04	
		Replace	0.2						
		Repair		2.0					
25	WATER DETECTOR KIT, AUTOMOTIVE AVIATION FUEL	Inspect	1.5					04	
		Replace	0.2						
		Repair	6.0						
		Calibrate	1.0						H
26	COLOR COMPARATOR	Inspect	0.2					04	
		Replace	0.2						
		Repair	1.0						
27	DOUBLE BEAM BALANCE	Inspect	0.2					04	
		Replace	0.2						
		Repair	0.2						I
28	ANEROID BAROMETER	Inspect	0.2						
		Replace	0.5						
		Repair	0.2				2.0		J

Subcolunmns are as follows: C - Operator/Crew O - Organizational H - General Support F - Direct Support D - Depot

Section II. MAINTENANCE ALLOCATION CHART - Continued

(1) Group number	(2) Component/assembly	(3) Maint. function	(4) Maint. category C	O	F	H	D	(5) Tool/ equipment	(6) Remarks
29	WATER DEMINERALIZER UNIT	Inspect	0.2					04	
		Replace	0.5						
		Repair	0.2						K
30	DESICCATING CABINET	Inspect	0.2					04	
		Replace	1.0						
		Repair	0.5						L
31	GAS ANALYZER ALARM SYSTEM	Inspect	0.2					04	
		Test	0.2					09	
		Replace		1.0				12	
		Repair		4.0				21	
		Calibrate		4.0					M
32	VACUUM PUMP	Inspect	0.2					04	
		Replace	1.0					09	
		Repair			6.0			12	
								21	
33	WATER PUMP	Inspect	0.2					04	
		Replace	1.5		8.0			09	
		Repair						12	
								21	
34	WATER TANK	Inspect	0.2					04	
		Replace			4.0				
		Repair			8.0				
35	PURGING BLOWERS	Inspect	0.3					04	
		Replace		3.0				09	
		Repair			8.0			12	
								21	
36	AIR COMPRESSOR	Inspect	0.3					04	
		Replace		4.0				09	
		Repair			8.0			12	
								21	
37	WATER SEPAROMETER	Inspect	0.3					04	
		Replace		2.0				09	
		Repair			16.0			12	
								21	
38	MULTIMETER	Inspect	0.2					04	
		Replace	0.2						
		Repair			3.0				
		Calibrate					2.0		N
39	HOTPLATE	Inspect	0.2					04	
		Replace	0.2						
		Repair		2.0					
40	THERMOMETERS	Inspect	1.0						
		Replace	1.0						
		Repair							
41	HEATER, INFRARED	Inspect	0.2					04	
		Replace	0.2						
		Repair	0.5						

Subcolumns are as follows: C - Operator/Crew O - Organizational H - General Support F - Direct Support D - Depot

Section II. MAINTENANCE ALLOCATION CHART - Continued

(1) Group number	(2) Component/assembly	(3) Maint. function	(4) Maint. category C	O	F	H	D	(5) Tool/ equipment	(6) Remarks
42	WEIGHT SET, BALANCE	Inspect	0.2						
		Replace	0.2						
		Calibrate					1.0		O
43	EXTRACTION HEATER	Inspect	0.2					04	
		Replace	0.2					09	
		Repair	6.0					12	
								21	
44	OXIDATION STABILITY BATH	Inspect	0.2					04	
		Replace		4.0				09	
		Repair			6.0			12	
								21	

Subcolumns are as follows: C - Operator/Crew, O - Organizational, H - General Support, F - Direct Support, D - Depot

SECTION III. TOOL AND TEST EQUIPMENT REQUIREMENTS

(1) REFERENCE CODE	(2) MAINTENANCE CATEGORY	(3) NOMENCLATURE	(4) NATIONAL STOCK NUMBER	(5) TOOL NUMBER
01	c	PROBE LIGHT, INSPECTION, (1 each), (83303) MVX-F	6230-00-411-1185	(Fig. B-29, Item 1) (In drawers under blending kit)
02	C	WRENCH BUNG, MULTIPLE SIZE, NON SPARKING AND NON MAGNETIC, FED. SPEC GGG-W-642B, (1 each)	5120-00-244-4389	(Fig. B-29, Item 3) (In drawers under blending kit)
03	C	PULLER, RIVNUT, W/MANDREL AND ALLEN WRENCH (1 each) (76500) C-4B5		(Fig. B-29, Item 4) (In drawers under blending kit)
04	C	CIRCUIT TESTER, INDICATOR TYPE, HIGH VOLTAGE, TESTS AC AND DC LIVE LINES 60 to 550 VOLTS, WITH COLOR CODED INSULATED GRIPS AND LEADS, (1 each) (80740) 31-952	6625-00-437-6912	(Fig. B-29, Item 5) (In drawers under ' blending kit)
05	C	S DRILL SET, TWIST, HSS, ST RD SHANK, FRACTIONAL SERIES, RH CUT, 1/64 in to 1/4 in. FED. SPEC. GGG-D-751C, TYPE 15, CLASS 1, (1 each), 16 DRILLS, C/O: 1 ea. 1/64 in., 5133-00-266-9233 1 ea. 1/32 in., 5133-00-255-9234 1 ea. 3/64 in., 5133-00-227-(9645 1 ea. 1/16 in., 5133-00-227-9646 1 ea. 5/64 in., 5133-00-227-9647 1 ea. 3/32 in., 5133-00-227 9648 1 ea. 7/64 in., 5133-00-227-1 9649 1 ea. 1/8 in., 5133-00-227-9650 1 ea. 9/64 in., 5133-00-227-9651	5133-00-278-0237 (In drawers under ! blending kit)	(Fig. B-29 item 7)'

SECTION III. TOOL AND TEST EQUIPMENT REQUIREMENTS

(1) REFERENCE CODE	(2) MAINTENANCE CATEGORY	(3) NOMENCLATURE	(4) NATIONAL STOCK NUMBER	(5) TOOL NUMBER
		1 ea. 5/32 in., 5133-00-227-9652 1 ea. 11/64 in., 5133-00-227-9653 1 ea. 3/16 in., 5133-00-227-9654 1 ea. 13/64 in., 5133-00-243-9612 1 ea. 7/32 in., 5133-00-227-9656 1 ea. 15/64 in., 5133-00-243-I 9611 1 ea. 1/4 in., 5133-00-227-9658		
06	C	FILE HAND, AMERICAN, PATTERN, THREE SQ TYPE, DOUBLE CUT, 6 INCHES LG FED. SPEC. GGG-F-325B, TYPE XIX, STYLE C, (22527) 15-223-10C (1 each)	| 5110-00-241-9160 (In drawers under ;	(Fig. B-29, Item 9) blending kit)
07	C	FILE, HAND, AMERICAL PATTERN, RD TYPE, SINGLE CUT, 15/64 IN. DIA., 6 in. LG, FED. SPEC GGG-F-325B, TYPE XVI, CLASS 1, STYLE C, (2 each)	5110-00-234-6550	(Fig. B-29, Item 10), (In drawers under blending kit),
08	C	SCRIBER, DIAMOND POINT MIL. SPEC. MIL-S-15825A, (3 each)	5120-00-421-0000	(Fig. B-29, Item 11), (In drawers under blending kite
09	C	TOOL KIT, GENERAL MECHANICS: AUTOMOTIVE, SC 5180-90-CL-N26 (1 each)	5180-00-177-7033	(Fig. B-29, Item 13)
10	C	HOSE FLEXIBLE, AIR, 1 (84421) 205-535 (1 each) WITH:		
	C	NOZZLE, FLEXIBLE AIR HOSE, (94894) S-107 (1 each)		(Fig. B-29, Item 16)
11	O	CUTTER AN. FLARING TOOL KIT, TUBE, HAND: W/SWIVEL CONE TYPE FLARING TOOL, 1/8 to 3/4 in. TUBE SIZES,		

SECTION III. TOOL AND TEST EQUIPMENT REQUIREMENTS

(1) REFERENCE CODE	(2) MAINTENANCE CATEGORY	(3) NOMENCLATURE	(4) NATIONAL STOCK NUMBER	(5) TOOL NUMBER
		FED. SPEC. GGG-C-744A, TYPE II, (30327) 1226 FA, (1 each), C/O: (1 ea. Bender, 1/4 in., 5120-00-234-8739 1 ea. Bender, 3/8 in., 5120-00-254-8741 1 ea. Bender, 1/2 in., 5120-00-234-8743 1 ea. Flaring Tool, 90 DEG, 5120-00-240-5477 1 ea. Tubing Cutter, 1/8 in., TO 1-1/8 in., O.D. 5110-00-288-6520 1 ea. Wheel, Cutting, 5110-00-970-8967 1 ea. Wrench, Ratchet, 5120-00-970-8966		
12	C	SOLDERING GUN, 115 V, 60 HZ, SINGLE PHASE, 3 WIRE PLUG, W/PISTOL GRIP AND SPOT LIGHT, W/O THERMOSTAT CONTROL, FED. SPEC. W-S-564A, TYPE-1, CORD AyB, CLASS 1, (22527) 15-231-12 (1 each)		(Fig. B-23, Item 2), (Drawer R2)
13	C	SOLDERING GUN TIP (22527) 15-231-15 (3 each)		(Fig. B-29, Item 8), (In drawers under blending kit)
14	C	OILER, HAND, 502., FED	4930-00-287-8474	(Fig. B-23, Item
3)		SPEC. GGG-O-591E, TYPE I, CLASS A, (1 each)		(Drawer R1)
15	C	/ DRILL, ELECTRIC, PORTABLE 1/4 in., 2200 RPM, NON- REVERSIBLE, 115 V, AC/DC FED. SPEC. W-D-661D, TYPE III, CLASS B, (1 each)	5130-00-889-8996' 4), (In drawer R2)	(Fig. B-23, Item
16	C	CABINET, SMALL PARTS, STEEL, 15 PLASTIC DRAWERS, (1 each) (01717) 17-715	7125-00-952-9791 12)	(Fig. B-29, Item

SECTION III. TOOL AND TEST EQUIPMENT REQUIREMENTS

(1) REFERENCE CODE	(2) MAINTENANCE CATEGORY	(3) NOMENCLATURE	(4) NATIONAL STOCK NUMBER	(5) TOOL NUMBER
17	C	LIGHT EXTENSION, W/50 FT. CABLE, 18 AWG, 2 CONDUCTOR, FED. SPEC W-L-661C, TYPE III, (1 each)	6230-00-162-1227 1), (In drawer S 1)	(Fig. B-24, Item
18	C	CABLE ASSEMBLY, POWER, 16 AWG, 2 CONDUCTOR, 300 V MAXIMUM RATED WORKING VOLTAGE, FED. SPEC. J-C-1270B, TYPE I, SIZE A, (1 each)	6150-00-665-9971	(Fig. B-24, Item 2), (In drawer S 1)'
19	C	HOSE ASSEMBLY, RUBBER, 3/4 in. ID, 50 FILE, FED SPEC. L-H-520E, TYPE I, GRADE A, (3 each)	4720-00-302-3912,	(Fig. B-27, Item , 2)
20	C	TAPE, MEASURING, GENERAL PURPOSE, 72 in. LG., GRADUATED IN STD. UNITS OF 1/32, 1/16 and 1 in. PULL-PUSH REQIND, FED. SPEC. GGG-T-106D, TYPE V, S CLASS B, STYLE 2	5210-00-287-3335 55), (In drawer D 3)	(Fig. B-10, Item
21	C	MULTIMETER, RANGE 0 TO 1200 VOLTS, INTERNAL BATTERY SOURCE, W/CARRYING CASE, (1 each) (60741)	6625-00-691-6605	(Fig. B-7, Item 45), (In drawer A 4)

Section IV. REMARKS

Reference Code	Remarks
A	Refer to TM9-2330-271-14 for Maintenance.
B	Refer to TB9-6685-324-50 for Calibration.
C	Repair is restricted to the replacement of only those parts listed in the Integral components of End Item List (ICOEIL). All other maintenance will be accomplished by returning the balance to the manufacturer. Refer to TB 750-25 and TB9-5200-201-50 for calibration.
D	Refer to Chapter III, Section II for calibration of the Thermoregulator.
E	Refer to Chapter III, Section II for calibration of the Manometer.
F	Refer to Chapter III, Section I and II for calibration of the Pressure Recording Gage.
G	Repair is restricted to the replacement of those parts listed in the ICOEIL. All other maintenance will be accomplished by returning the Refractometer to the manufacturer.
H	Operator will calibrate the Torsion Balance and the Meter Pack in accordance with the instructions in TM5-6630-216-12.
I	Repair is restricted to the replacement of the Pans All other maintenance will be accomplished by returning the balance to the manufacturer.
J	Repair is restricted to the replacement of the Glass Bezel. All other maintenance will be performed at depot level.
K	Repair is restricted to the replacement of the Demineralizer Cartridges.
L	Repair is restricted to the replacement of the Rubber Door Gasket.
M	Analyzer will be calibrated in accordance with the instructions in Chapter III, Section II.
N	Multimeter will be calibrated in accordance with TB9-6625 -1250-50.
O	Weight Set must be calibrated in accordance with TB9-5200-201-50.

APPENDIX D
EXPENDABLE SUPPLIES AND MATERIALS LIST

Not Applicable

INDEX

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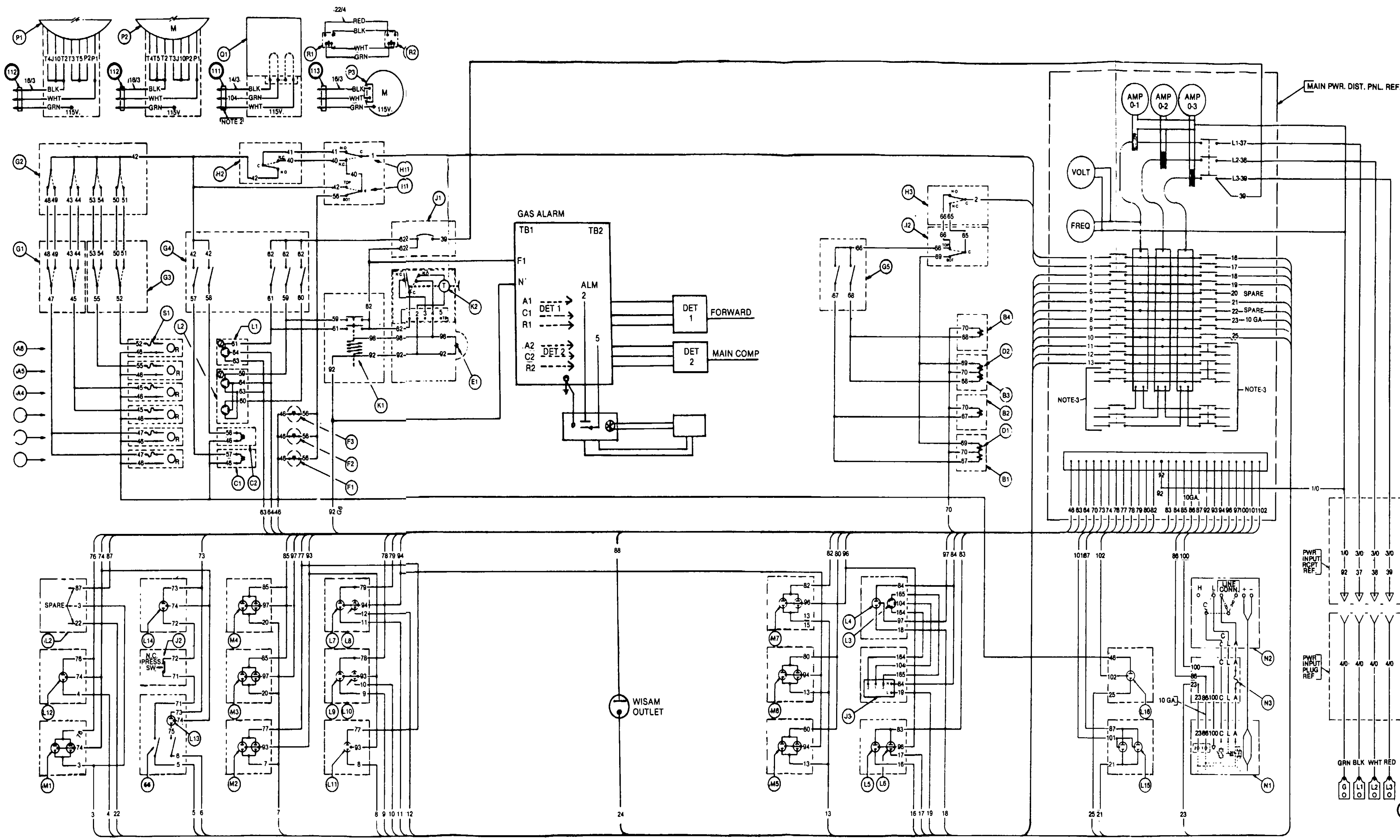
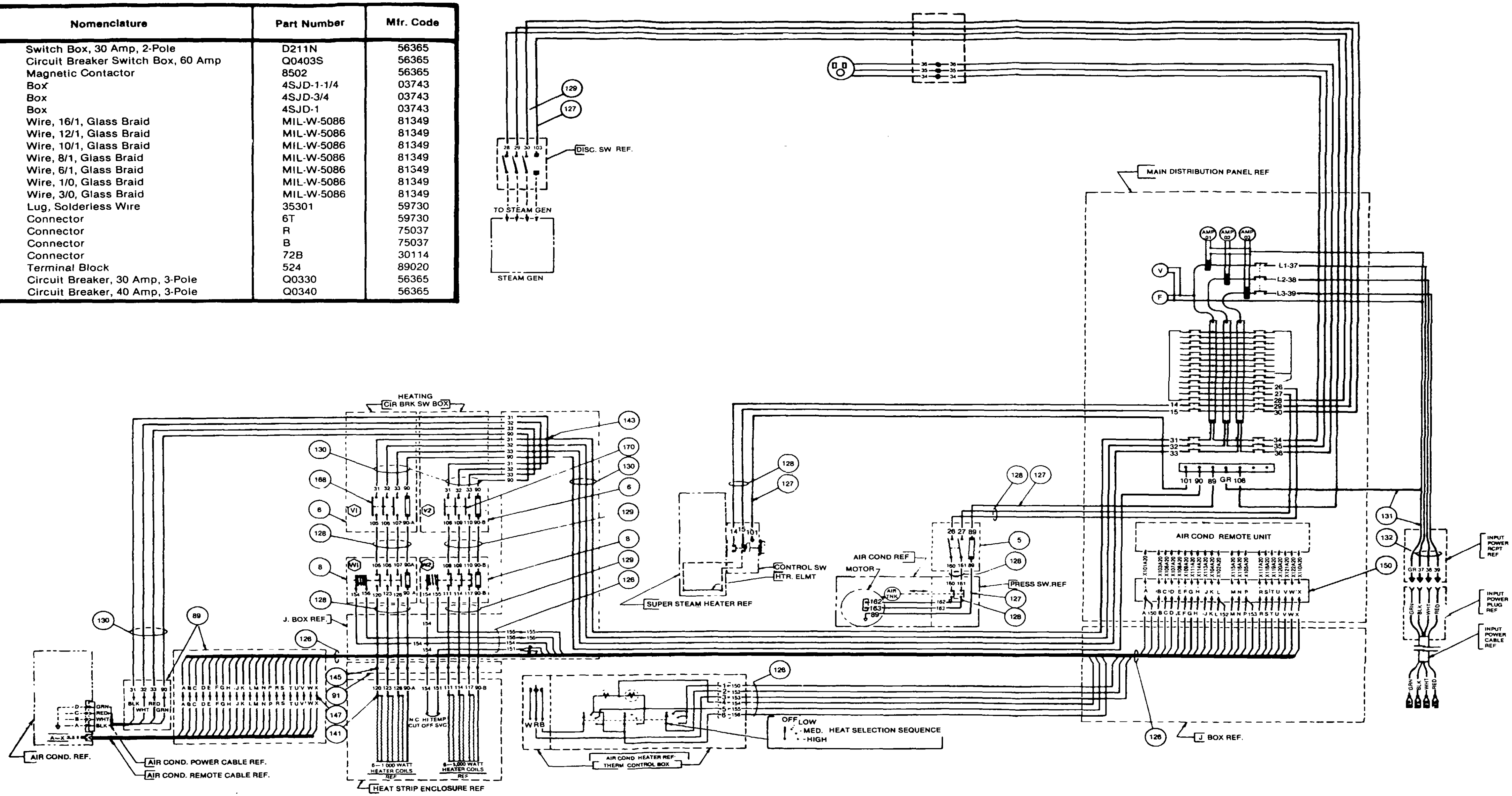


S1	173/174	FUSE, A1 THRU A6 LIGHT FIX		x	x	x			x	x	x	x
R2	123	RECPT, TELEPHONE OUTPUT		x			x			x	x	
R1	123	RECPT, TELEPHONE INPUT					OUTDR			x	x	
O1	REF	UNIT, OXIDATION		x			x			x		x
P3	REF	MOTOR, WATER PUMP	x								x	
P2		C C W ROT PURGING	x				x		x		x	
P2		C C.W ROT GUM BATH	x					x				x
P1	REF	MOTOR, C W ROT FUME HOOD	x					x				
N3	172/174	FUSE, PYROM FUSE HOLDER		x				x	x			x
N2	REF	UNIT, PYROMETER		x				x	x			x
N1	REF	UNIT, GUM BATH		x				x	x			x
M7	110	RECPT, C/R 3 CONVIENCE		x			x		x			x
M6	110	3			x		x				x	
M5	110	3		x			x			x	x	
M4	110	2			x		x					x
M3	110	2		x			x					x
M2	110	2		x			x				x	
M1	110	CIR 1 CONVIENCE	x				x				x	
L16	107	RECPT, RECORDING CHART		x				x		x		
L15	107	COPPER STRIP		x				x	x			
L14	105	WATER PUMP	x				x				x	
L13	107	VACUUM PUMP	x				x				x	
L12	107	REFRIGERATOR	x				x				x	
L11	107	CENTRIFUGE		x			x				x	
L10	107	VISCOSITY R		x			x				x	
L9	107	VISCOSITY L		x			x				x	
L8	107	FURNACE R		x			x				x	
L7	107	OVEN L		x			x				x	
L6	107	DISTILLATION R		x			x					x
L5	107	DISTILLATION L		x			x					x
L4	107	REED VAPOR L		x			x			x		x
L3	108	OXIDATION R		x			x			x		x
L2	112	FUME & GUM/B Y BLWR	x					x		x		
L1	112	RECPT PURGINS Z BLOWER	x				x		x			
K2	164	TIMER, PURGING SYSTEM			OUTDOOR		x			x	x	
K1	9	RELAY, PURGING SYSTEM			x		x				x	
J3	AR	SWITCH, OXIDATION UNIT		x			x			x		x
J2	REF	WATER PRESSURE	x								x	
J1	169	PURGING SYSTEM BRK			x		x				x	
I2	101	OVER-RIDE (B/O)	x				x					x
I1	101	OVER-RIDE (B/O)		x			x		x			x
H3	100	BLACK-OUT (DOOR)	x				x					x
H2	100	BLACK-OUT (DOOR)			x		x			x		
H1	100	BLACK-OUT (DOOR)		x			x		x			x
G6	105	VACUUM/WATER PMP	x				x				x	
G5	102	A/COND RM LIGHT	x				x					x
G4	102	HOOD LT & BLOWER		x			x		x		x	
G3	103	K/ENG RM LIGHT			x		x			x		
G2	104	LAB&K/E RM LIGHT		x				x		x		x
G1	103	SWITCH, LAB LIGHT		x			x		x			x
F3	156	FIXTURE, BLACK-OUT (RED)			x	x			x			
F2	156			x		x						x
F1	156	FIXTURE, BLACK-OUT (RED)		x		x					x	
E1	160	LAMP, PURGE INDICATOR			OUTDOOR		x			x	x	
D2	158	BLACK-OUT (RED)	x			x			x			x
D1	158	LAMP, BLACK-OUT (RED)	x			x			x		x	
C2	162	FIXTURE, HOOD LIGHT		x				x	x			
C1	162	HOOD LIGHT		x				x	x			
B4	154	INCANDESCENT LIGHT	x			x				x		x
B3	154		x			x			x			x
B2	154		x			x				x	x	
B1	154	INCANDESCENT	x			x			x		x	
A6	155	FLOURESCENT LIGHT			x	x				x		
A5	155				x	x			x			
A4	155			x		x			x			x
A3	155			x		x				x		x
A2	155			x		x			x		x	
A1	155	FIXTURE, FLOURESCENT LIGHT		x		x				x	x	
UNIT	ITEM NO	UNIT DESCRIPTION	A/COND RM	LAB	K/ENG RM	CEILING	WALL	PARTN	FRONT	REAR	R/S	C/S
			UNIT LOCATION									

ITEM NO	QTY REQD	CODE IDENT NO.	DWG SIZE	PART OR IDENTIFYING NO	NOMENCLATURE OR DESCRIPTION	MATERIAL OR NOTE	UNIT WT	ZONE
LIST OF MATERIALS								

FO-1. 110-Volt Electrical System, Schematic

Item No.	Nomenclature	Part Number	Mfr. Code
5	Switch Box, 30 Amp, 2-Pole	D211N	56365
6	Circuit Breaker Switch Box, 60 Amp	Q0403S	56365
8	Magnetic Contactor	8502	56365
89	Box	4SJD-1-1/4	03743
90	Box	4SJD-3/4	03743
91	Box	4SJD-1	03743
126	Wire, 16/1, Glass Braid	MIL-W-5086	81349
127	Wire, 12/1, Glass Braid	MIL-W-5086	81349
128	Wire, 10/1, Glass Braid	MIL-W-5086	81349
129	Wire, 8/1, Glass Braid	MIL-W-5086	81349
130	Wire, 6/1, Glass Braid	MIL-W-5086	81349
131	Wire, 1/0, Glass Braid	MIL-W-5086	81349
132	Wire, 3/0, Glass Braid	MIL-W-5086	81349
141	Lug, Solderless Wire	35301	59730
143	Connector	6T	59730
145	Connector	R	75037
146	Connector	B	75037
147	Connector	72B	30114
150	Terminal Block	524	89020
168	Circuit Breaker, 30 Amp, 3-Pole	Q0330	56365
170	Circuit Breaker, 40 Amp, 3-Pole	Q0340	56365



FO-2. 220-Volt Electrical System, Schematic

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The Metric System and Equivalents

Linear Measure

1 centimeter = 10 millimeters = .39 inch
1 decimeter = 10 centimeters = 3.94 inches
1 meter = 10 decimeters = 39.37 inches
1 dekameter = 10 meters = 32.8 feet
1 hectometer = 10 dekameters = 328.08 feet
1 kilometer = 10 hectometers = 3,280.8 feet

Weights

1 centigram = 10 milligrams = .15 grain
1 decigram = 10 centigrams = 1.54 grains
1 gram = 10 decigram = .035 ounce
1 dekagram = 10 grams = .35 ounce
1 hectogram = 10 dekagrams = 3.52 ounces
1 kilogram = 10 hectograms = 2.2 pounds
1 quintal = 100 kilograms = 220.46 pounds
1 metric ton = 10 quintals = 1.1 short tons

Liquid Measure

1 centiliter = 10 milliters = .34 fl. ounce
1 deciliter = 10 centiliters = 3.38 fl. ounces
1 liter = 10 deciliters = 33.81 fl. ounces
1 dekaliter = 10 liters = 2.64 gallons
1 hectoliter = 10 dekaliters = 26.42 gallons
1 kiloliter = 10 hectoliters = 264.18 gallons

Square Measure

1 sq. centimeter = 100 sq. millimeters = .155 sq. inch
1 sq. decimeter = 100 sq. centimeters = 15.5 sq. inches
1 sq. meter (centare) = 100 sq. decimeters = 10.76 sq. feet
1 sq. dekameter (are) = 100 sq. meters = 1,076.4 sq. feet
1 sq. hectometer (hectare) = 100 sq. dekameters = 2.47 acres
1 sq. kilometer = 100 sq. hectometers = .386 sq. mile

Cubic Measure

1 cu. centimeter = 1000 cu. millimeters = .06 cu. inch
1 cu. decimeter = 1000 cu. centimeters = 61.02 cu. inches
1 cu. meter = 1000 cu. decimeters = 35.31 cu. feet

Approximate Conversion Factors

To change	*To*	*Multiply by*
inches	centimeters	2.540
feet	meters	.305
yards	meters	.914
miles	kilometers	1.609
square inches	square centimeters	6.451
square feet	square meters	.093
square yards	square meters	.836
square miles	square kilometers	2.590
acres	square hectometers	.405
cubic feet	cubic meters	.028
cubic yards	cubic meters	.765
fluid ounces	milliliters	29,573
pints	liters	.473
quarts	liters	.946
gallons	liters	3.785
ounces	grams	28.349
pounds	kilograms	.454
short tons	metric tons	.907
pound-feet	newton-meters	1.356
pound-inches	newton-meters	.11296

To change	*To*	*Multiply by*
ounce-inches	newton-meters	.007062
centimeters	inches	.394
meters	feet	3.280
meters	yards	1.094
kilometers	miles	.621
square centimeters	square inches	.155
square meters	square feet	10.764
square meters	square yards	1.196
square kilometers	square miles	.386
square hectometers	acres	2.471
cubic meters	cubic feet	35.315
cubic meters	cubic yards	1.308
milliliters	fluid ounces	.034
liters	pints	2.113
liters	quarts	1.057
liters	gallons	.264
grams	ounces	.035
kilograms	pounds	2.205
metric tons	short tons	1.102

Temperature (Exact)

°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C

PIN: 047813