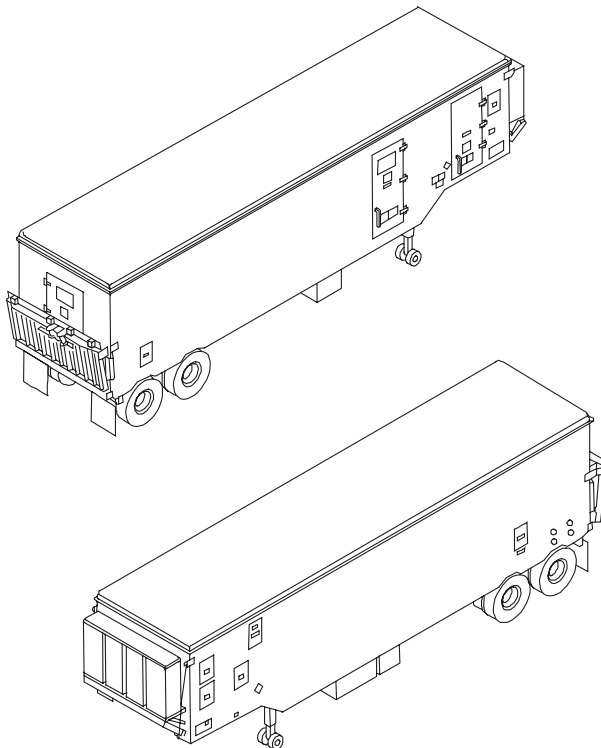


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TECHNICAL MANUAL  
**OPERATOR, UNIT, AND DIRECT SUPPORT  
MAINTENANCE MANUAL**  
FOR  
**SEMI-TRAILER MOUNTED  
PETROLEUM LABORATORY  
(MOD LAB A)**  
(NSN 6640-01-485-5434) (EIC: ZBQ)



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Distribution Statement A: Approved for public release; distribution is unlimited.

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HEADQUARTERS, DEPARTMENT OF THE ARMY  
30 JUNE 2002



**WARNINGS****WARNING**

**HAZARDOUS MATERIAL STORAGE** - Proper Storage of Hazardous Material will be as follows:

Proper Storage of Hazardous Materials shall be per MKP-1480. All Materials should have MDS (Material Data Sheets) attached. Improper storage of these Hazardous Materials next to each other is **DANGEROUS**. Failure to comply with this warning could result in serious injury or death. When in doubt, notify your supervisor. All personnel shall have Hazardous Material Training before handling any Hazardous Material on, in or near the Petroleum Laboratory.

**WARNING**

**HAZARDOUS MATERIAL TRANSPORTATION** - Proper Transportation of Hazardous Material will be as follows:

Proper Storage of Hazardous Materials shall be per MKP-1480. All Materials should have MDS (Material Data Sheets) attached. Improper transportation of these Hazardous Materials next to each other is **DANGEROUS**. Failure to comply with this warning could result in serious injury or death. When in doubt, notify your supervisor. All personnel shall have Hazardous Material Training before handling any Hazardous Material on, in or near the Petroleum Laboratory.

**WARNING**

Refer to material safety data sheets for proper handling procedures and protection required when storing or transporting of hazardous materials. Failure to comply with this warning could result in serious injury or death.

**WARNING**

Refer to material safety data sheets for proper handling procedures and protection required when storing or transporting of chemicals. Failure to comply with this warning could result in serious injury or death.

**WARNING**

Dispose of hazardous waste in accordance with federal, state and local regulations. Refrigerant R-22, diesel fuel, diesel engine oil, and ethylene glycol all require special handling. For guidance, contact local environmental management and/or bio-environmental engineering services.

**WARNING**

**FUEL FLAMMABLE/NO SMOKING** - Fuel is flammable and toxic to eyes, skin, and respiratory tract. Skin/eye protection is required. Avoid repeated/prolonged contact. Use only in well ventilated areas. Keep away from open flames or other sources of ignition. Post FUEL FLAMMABLE/NO SMOKING signs around the area. Suitable fire extinguisher must be present.

Fuel on clothing can be fatal if ignited by a static discharge. If fuel gets on your clothes, leave the refueling area as soon as possible, remove clothes and wash skin with warm soapy water before getting dressed.

Spilled fuel creates a flammable, vapor-air mixture and fire can take place. Stop refueling immediately if fuel spill occurs.

**WARNING**

**FROSTBITE** - Touching cold metal with exposed skin will cause skin to bond to metal. Gloves are required when touching cold metal objects. Do not touch cold metal parts with bare hands.

**SOLVENT HAZARD** - Dry-cleaning solvent, P-D-680, Type III, used to clean parts, is potentially dangerous to personnel and property. Combustible - do not use near welding areas open flames or on hot surfaces. Use only adequate ventilation. Avoid prolonged or repeated breathing of vapors. Do not smoke while using it. Use protective creams; wear apron and goggles (or face shield) to protect the skin. Store in approved metal safety containers.

**WARNING**

**COMPRESSED AIR HAZARD** - When using compressed air for cooling, cleaning, or drying operation, do not exceed 30 psig at the nozzle. Eyes can be permanently damaged by contact with liquid and large particles or solvent vapor can damage lungs. When using air for cleaning at an air-exhausted workbench, wear approved goggles or face shield. When using air for cleaning at an unexhausted workbench, wear approved respirator and goggles.

**WARNING**

**ELECTRICAL HIGH VOLTAGE CAN KILL YOU** - Electrical high voltage cannot be seen, but it can kill you. Electricity is unlike most other dangerous things you can come in contact with because it gives no warning and no symptoms to be wary of. Its effect is immediate. It can kill you, render you unconscious, or severely burn you. To ensure your safety and that of other maintenance personnel, always observe the following precautions:

DO NOT perform any maintenance on electrical equipment unless all power is removed.

BE CERTAIN that there is someone assisting you who can remove power immediately.

ALWAYS place POWER OFF warning tags on power supply switches so that no one will apply power while you are performing maintenance.

**WARNING**

**CARBON MONOXIDE (EXHAUST GAS) CAN KILL YOU** - Carbon monoxide is without color or smell, but can kill you. Breathing carbon monoxide produces symptoms of headache, dizziness, loss of muscular control, a sleepy feeling, and coma. Brain damage or death can result from heavy exposure. Carbon monoxide occurs in the exhaust fumes of fuel-burning heaters and internal combustion engines. Carbon monoxide can become dangerously concentrated under conditions of no ventilation.

Precautions must be followed to ensure operator's safety when the Modular Petroleum Laboratory is in operation.

OPERATE the Modular Petroleum Laboratory with the exhaust pipe attached in a well-ventilated area.

DO NOT operate the Modular Petroleum Laboratory with a known exhaust (combustion air) leak.

BE ALERT at all times during operating procedures for carbon monoxide poisoning. If exposure is present, IMMEDIATELY evacuate personnel to fresh air.

BE AWARE the field protection mask used for nuclear-biological-chemical attack WILL NOT protect you from carbon monoxide poisoning.

THE BEST DEFENSE AGAINST CARBON MONOXIDE POISONING IS GOOD VENTILATION.

DO NOT operate fume hood and gum bath at the same time.

**WARNING**

**JEWELRY** - Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock. Remove rings, bracelets, wrist watches, and neck chains before working around or on the unit.

**WARNING**

**HOT COMPONENTS** - Contact with hot components can cause burns. Allow unit to cool down before attempting service/inspection/maintenance activity.

**WARNING**

**STEEL BANDING** - Steel banding, cut under tension, can snap free and cause injury. Leather gloves and face shield are required.

**WARNING**

**FUEL SPILL** - Fuel is toxic and flammable and can cause injury to personnel and damage equipment. Improper positioning of external fuel source can cause the internal fuel tank to overflow. Properly position external fuel source.

**WARNING**

**CLEANING AGENTS** - DO NOT use diesel fuel, gasoline, or benzene (benzol) for cleaning.

DO NOT SMOKE when using cleaning solvent. NEVER USE IT NEAR AN OPEN FLAME. Be sure there is a fire extinguisher nearby and use cleaning solvent only in well ventilated places. Flash point of solvent is 138° F (60°C).

USE CAUTION when using cleaning solvents. Cleaning solvents evaporate quickly and can irritate exposed skin if solvents contact skin. In cold weather, contact of exposed skin with cleaning solvents can cause frostbite.

**WARNINGS**

The following WARNINGS appear within the text and are listed here for emphasis:

**WARNING**

Do not connect Power Distribution Module power cable to Generator set until both Laboratories and Power Distribution Module are properly grounded. Failure to comply with this warning could result in serious injury or death.

**WARNING**

Do not connect Power Distribution Module main power cable to Generator set until Power Distribution Module is properly grounded. Failure to comply with this warning could result in serious injury or death.

**WARNING**

Do not attempt to enter Labs during start up until automatic purge cycle (5 minutes) is completed. Dangerous combustible gasses or vapors may be present which could ignite and cause death or serious injury.

**WARNING**

Never gage or sample a product in a tank if there is an electrical storm or a source of sparks in the area. Failure to comply with this warning could result in serious injury or death.

**WARNING**

Do not come in contact with main power cable connection on generator set with power applied to laboratory. Death or serious injury may result.

**WARNING**

Do not attempt to disconnect or connect main power cable to laboratory electrical receptacle with generator set applying power to the cable. Death or serious injury may result.

**WARNING**

IF purge cycle has not taken place, do not enter Petroleum Laboratory without first allowing laboratory to vent to atmosphere via two laboratory doors for a minimum of 20 minutes. Death or serious injury could result.

**WARNING**

Do not enter laboratory for at least 10 minutes after door is opened to allow any gas accumulation to be vented to the atmosphere. Failure to comply with this warning could result in death or serious injury.

**WARNING**

**ELECTRICAL SHOCK**

Before performing any maintenance actions on electrical equipment, ensure all electrical power has been turned off. Failure to comply with this warning may result in serious injury or death.

**WARNING**

Serious injury to personnel or damage to equipment may occur unless two or more personnel are used to remove ECU because of weight and balance of units.

**WARNING**

Serious injury to personnel or damage to equipment may occur unless two or more personnel are used to install air conditioner because of weight and balance of the ECU.

**WARNING**

Two people are required to remove RVP bath because of its weight. Failure to comply with this warning could result in serious injury to personnel or damage to equipment.

**WARNING**

Never handle mercury with bare hands; never heat mercury in an open container; and never shake more than 20 milliliters of mercury in a glass container.

**WARNING**

Two people are required to install RVP bath because of its weight. Failure to comply with this warning could result in serious injury to personnel or damage to equipment.

**WARNING**

**PHYSICAL LIFTING**

Serious injury could occur if heavy equipment is moved/lifted without sufficient personnel to do the job. Use proper physical lifting procedures or use a suitable lifting device or dolly. Wear safety shoes, gloves and other suitable protective clothing.



**WARNING**

Two people are required to remove JFTOT tester because of its weight. Failure to comply with this warning could result in serious injury to personnel or damage to equipment.

**WARNING**

Pressure systems safety precautions apply to all ranges of pressure. Care must be taken during testing to ensure that all test connections are properly and tightly made prior to applying pressure to the test setup. Ensure gas cylinder valves are tightly closed prior to removing/replacing gas cylinders. Use care in moving gas cylinders.

**WARNING**

To prevent injury to personnel, be sure gum bath has had time to cool before performing any maintenance. Steam temperature as high as 600°F (279.9°C) can be obtained in this unit.

**WARNING**

The gum bath unit is heavy (160 lbs/71 kg). To prevent injury, two people are required to remove the gum bath from the countertop.

**WARNING**

The gum bath unit is heavy (160 lbs/71 kg). To prevent injury, two people are required to install the gum bath into the countertop.

**WARNING**

To prevent injury to personnel, be sure electric steam boiler has had time to cool before performing any maintenance. Steam temperature as high as 600°F (279.9°C) can be obtained in this unit.

**WARNING**

To prevent injury, two personnel are required to remove electric steam boiler. Boiler is very heavy.

**WARNING**

To prevent injury, two personnel are required to install electric steam boiler. Boiler is very heavy.

**WARNING**

To prevent injury to personnel, be sure high pressure steam boiler has had time to cool before performing any maintenance. Steam temperature as high as 600°F (279.9°C) can be obtained in this unit.

**WARNING**

The freezer is heavy. To prevent injury, two people are required to remove freezer from mounting base.

**WARNING**

The freezer is heavy. To prevent injury, two people are required to install freezer from mounting base.

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TECHNICAL MANUAL

NO. 10-6640-238-13

HEADQUARTERS  
DEPARTMENT OF THE ARMY  
WASHINGTON, D.C., 30 JUNE 2002

**OPERATOR, UNIT, AND DIRECT SUPPORT MAINTENANCE MANUAL  
FOR  
SEMI-TRAILER MOUNTED PETROLEUM LABORATORY (MOD LAB A)  
NSN: 6640-01-485-5434 (EIC: ZBQ)**

REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

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## HOW TO USE THIS MANUAL

### Be sure to read all Warnings before using this Laboratory

This manual contains operating instructions and Operator, Unit and Direct Support Maintenance instructions for the Semi-Trailer Mounted Petroleum Laboratory. Becoming familiar with this manual will enable one to operate and maintain the equipment in good working order.

#### MANUAL OVERVIEW

a. Index Tabs.

The front cover index lists, and is a guide to each Chapter of the manual.

b. Contents.

The following provides a summary of each Chapter and Appendix. Before beginning a maintenance task, a person must be familiar with Semi-Trailer Mounted Petroleum Laboratory and the entire maintenance procedure.

- Chapter 1 - Provides general information on the laboratory, such as abbreviations and nomenclature cross reference list, equipment purpose, capabilities and features, location and description of major components, equipment data, and principles of operation.

- Chapter 2 - Provides description and use of controls and indicators, preventive maintenance instructions needed to inspect and service the laboratory, and operating procedures for usual and unusual weather conditions.

- Chapter 3 - Provides operator lubrication and maintenance instructions for troubleshooting equipment malfunctions, maintenance procedures for performing operator maintenance tasks, and storage and shipment instructions.

- Chapter 4 - Provides unit maintenance instructions for servicing, preventive maintenance, troubleshooting equipment malfunctions, maintenance and repair procedures.

- Chapter 5 - Provides Direct Support maintenance and repair instructions.

- Appendix A - Provides a list of frequently used forms and referenced manuals/publications.

- Appendix B - Provides the Maintenance Allocation Chart (MAC) identifying repairable components and the maintenance level authorized to perform the repairs.

- Appendix C - Lists the Components of the End Item (COEI) that are removed from the laboratory and separately packaged or stowed for transportation or movement. It also lists Basic Issue Items (BII) required to make the system functional. All components in the COEI and BII Lists are illustrated for easy identification.

- Appendix D - Lists additional equipment authorized for use with the laboratory, but are not supplied as part of the laboratory.
- Appendix E - Provides a list of expendable/durable supplies and materials required during operation or maintenance of the laboratory.
- Appendix F - Provides a list of mandatory replacement parts needed to operate and maintain the laboratory.
- Appendix G - Provides torque limits for parts needed to operate and maintain the laboratory.
- Appendix H - Provides a wire list for the laboratory.
- Index -Alphabetical Index of subject matter contained in the manual.



# CHAPTER 1

## INTRODUCTION

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### Section I. GENERAL INFORMATION

#### Alphabetical Index

Paragraph Title	Paragraph
Destruction of Army Material to Prevent Enemy Use .....	1-3
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Nomenclature Cross-Reference List .....	1-8
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Quality Assurance/Quality Control (QA/QC).....	1-5
Reporting Equipment Improvement Recommendations (EIRs).....	1-6
Safety, Care, and Handling .....	1-7
Scope.....	1-1

**1-1. SCOPE.**

- a. Type of Manual. This manual contains operation and maintenance instructions for the Operator, Unit and Direct Support maintenance personnel of the Semi-Trailer Mounted Petroleum Laboratory (Refer to Figure 1-1).
- b. Equipment Name. Petroleum Laboratory, Semi-Trailer Mounted (NSN 6640-01-485-5434).
- c. Purpose of Equipment. The Petroleum Laboratory is to be used by Army personnel to test petroleum and petroleum products during tactical military operations.

**1-2. MAINTENANCE FORMS, RECORDS, AND REPORTS.**

Department of the Army forms and procedures used for equipment maintenance will be those prescribed by DA Pam 738-750, The Army Maintenance Management System (TAMMS).

**1-3. DESTRUCTION OF ARMY MATERIAL TO PREVENT ENEMY USE.**

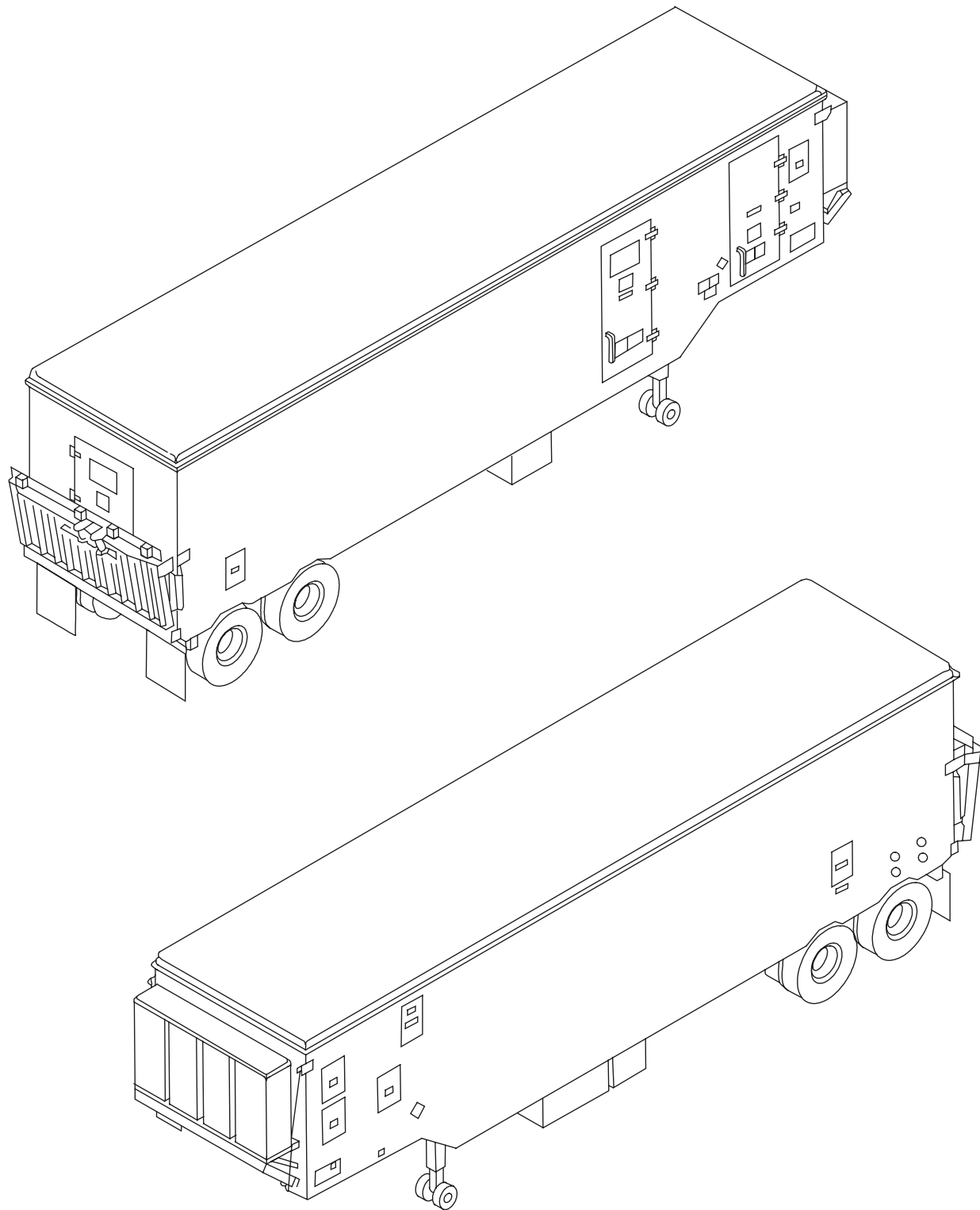
Command decisions, according to tactical situation, will determine when destruction of the Petroleum Laboratory will be accomplished. A destruction plan will be prepared by the using organization, unless one has been prepared by higher authority. For general destruction procedures for this equipment, refer to TM 750-244-3, Procedures For Destruction of Equipment to Prevent Enemy Use.

**1-4. PREPARATION FOR STORAGE OR SHIPMENT.**

Refer to Section IV of Chapter 3.

**1-5. QUALITY ASSURANCE/QUALITY CONTROL (QA/QC).**

The quality of the Petroleum Laboratory must at all times be in accordance with the requirements set forth in MIL-L-0051050C(ME), paragraph 4. If a discrepancy is found to exist between your laboratory and MIL-L-0051050C(ME), notify your supervisor. When reporting a Quality Deficiency, use Standard Form 368, Product Quality Deficiency Report. The form should be submitted to: Commander, U.S. Army Tank-automotive & Armaments Command, ATTN: AMSTA-TR-D/210, 6501 E. 11 Mile Road, Warren, MI 48397-5000. For electronic methods use DODAC: W56HZV.



MBPLA-1-1A

Figure 1-1. Semi-Trailer Mounted Petroleum Laboratory

## 1-6. REPORTING EQUIPMENT IMPROVEMENT RECOMMENDATIONS (EIRS).

If your Petroleum Laboratory needs improvement, let us know. Send us an EIR. You, the user, are the only one who can tell us what you don't like about your equipment. Let us know why you don't like the design or performance. Put it on an SF 368 (Product Quality Deficiency Report). Mail it to us at Commander, U.S. Army Tank-automotive & Armaments Command, 6501 E. 11 Mile Road, ATTN: AMSTA-LC-CJA, Bldg. 210 - MS #111, Warren, MI 48397-5000. We will send you a reply.

## 1-7. SAFETY, CARE, AND HANDLING.

Safe and efficient Petroleum Laboratory operations depend on the observance of well established safety practices and a thorough knowledge of testing procedures. The testing procedures often involve using equipment and materials that are potentially hazardous. Injury to personnel and damage to equipment by fire, chemicals, dangerous pressures and vacuums, or misuse of equipment can be avoided by alert and responsible laboratory technicians. Strict observance of established safety, care, and handling procedures will allow laboratory personnel to perform their duties in a safe and hazard-free environment.

- a. General Precautions. The following general safety precautions shall be observed by all operators of the Petroleum Laboratory.
  - Always be mindful of tests in progress. Never allow horseplay or loud talking that would divert the attention of laboratory technicians. If it is necessary to leave the laboratory or to leave a test in progress, make certain no safety hazard will result from your absence.
  - Do not attempt to perform tests simultaneously unless each test can be given the required attention.
  - Whenever in doubt concerning any operation, consult qualified authority for advice.
  - Do not attempt unauthorized shortcuts to save time, as they generally are not in accordance with safe laboratory procedures.
  - Be prepared for any emergencies which may arise, and be familiar with the proper action to take in event of emergencies.
  - When ending daily operations, make a thorough and orderly check of laboratory, equipment and facilities to ensure that no hazards may develop during the time the laboratory is unattended.
- b. Preventing Fires. The following fire prevention rules shall be observed in all laboratory procedures:
  - Do not smoke in the Petroleum Laboratory.
  - Never leave open flames or heating elements unattended.
  - Never pour hot liquids into drains. Set aside hot liquids to cool thoroughly in covered containers before discarding.
  - Chemicals which may react to produce dangerous fumes, fires, or explosion shall be stored in their proper places.
  - Volatile liquids and flammable products shall be kept away from heat sources, open flames, direct sunlight, and electrical switches.
  - No open flame or exposed heating element shall be nearby when pouring highly volatile liquids.
  - Clean up chemical and liquid spills immediately.
  - Always pour acid into water; never pour water into acid.
  - Keep oily rags in a metal, airtight, closed container. Do not store oily rags in cabinets or drawers.



- Laboratory shall be adequately ventilated.
  - Fire fighting equipment shall be checked periodically to assure it is properly serviced and ready for use. This is done by checking seals, tags, pressure gauges, and hoses.
- c. Extinguishing Fires. Be familiar with the nature of petroleum fires; with procedures for fighting fires; and with the fire extinguishing equipment in the laboratory. Do not use water for extinguishing oil fires because it will spread the fire. Water is a conductor of electricity and should not be used on electrical fires.
- d. Handling Chemicals. The following safety precautions shall be observed by all personnel while handling chemicals.
- Store heavy and large containers of chemicals on or as near the floor as possible.
  - Never fill a container with material other than that indicated on the label. Every container shall be properly labeled.
  - Bottles containing acids or alkalis shall not be placed on high shelves or on top of equipment.
  - Always wear goggles when breaking up solid chemicals which might chip, or when handling quantities of corrosive liquids such as strong acids and strong bases.
  - When opening new bottles of acid, always wear goggles.
  - When pouring a sample from a container, hold the container cap or stopper in your hand. Never place the cap or stopper on a counter where it may come in contact with a contaminating agent.
  - Always wipe up any acid that spills or splashes on benches, tables, or floors.
  - If any chemical is spilled or splashed on the body, immediately wash the contaminated area thoroughly with water.
  - Keep all sample containers that are in use capped or stoppered at all times except when pouring out test portions. Always replace the same cap or stopper on the container from which it was removed.
  - Never handle mercury with bare hands; never heat mercury in an open container; and never shake more than 20 millimeters of mercury in a glass container.
  - Never taste laboratory chemicals. Smell a chemical only when necessary and then only by wafting a small amount of vapor with the hand toward the nose.
  - Dispose of all unlabeled chemicals.
- e. Controlling Pressure and Vacuum. The following safety precautions shall be observed by all personnel while operating the air/vacuum systems.
- Do not use faulty copper, plastic, or rubber tubing when performing operations requiring pressure or vacuum.
  - Glass vacuum apparatus shall be properly shielded when it is in use.
  - Always wear goggles when opening air valves that are close to the face.
  - Make sure that chemical containers having vent caps are inspected, and that containers which do not have vent caps are vented properly.
  - Keep containers of volatile liquids as cool as possible. Exercise caution in releasing any pressure which may have formed in the container; always release the pressure gradually. Remove caps or stoppers periodically to vent the vapor. After venting containers, return the cap or stopper to the container from which it was removed. The practice of venting containers of volatile liquids does not apply to those samples collected for vapor pressure tests.

- Vent separator funnels frequently when shaking volatile liquids. The funnel shall be wrapped with a rag when shaking an extremely volatile liquid.
  - Store propane cylinders in the propane stowage locker, away from heat or ignition sources.
- f. Controlling Fumes. The following safety precautions are presented to aid operators of the Petroleum Laboratory in controlling toxic fumes.
- The laboratory shall be properly ventilated at all times.
  - Perform all gas alarm system tests and calibrations as specified to ensure proper operation of system.
  - If any material is spilled which gives off toxic fumes, all personnel shall leave the area immediately and return only after the area has been adequately purged.
- g. Electrical Safety. The following electrical safety precautions apply to all operators and maintenance personnel for the Petroleum Laboratory.
- Equipment producing a tingle sensation will be reported promptly for repair.
  - Keep the use of extension cords to a minimum and the cords as short as possible. Insulation and wire size shall be adequate for the voltage and current to be carried.
  - Work on electrical devices shall be done after the power has been disconnected or shut off, and suitable precautions taken to keep the power off during the work.
  - Never use metallic pencils or rulers, or wear rings or watches when working on electrical equipment.
  - Flammable liquids shall not be stored near electrical equipment.
- h. Chemical Spills. Spill control procedures are provided in the SPILL CONTROL PROCEDURES GUIDE (MKP-1479). A copy of the guide is provided with the Mod Lab and is stored inside the bookcase.

**1-8. NOMENCLATURE CROSS-REFERENCE LIST.**

<u>Common Name or Abbreviation</u>	<u>Official Nomenclature</u>
% V	Percent of Volume
A Lab	Petroleum Laboratory, Model-A
AC	Alternating Current
amp	Ampere
ASTM	American Society for Testing and Materials
BII	Basic Issue Items
COE	Components of End Item
COTS	Commercial off the Shelf
DC	Direct Current
ECU	Environmental Control Unit
FSII	Fuel System Icing Inhibitor
FTMS	Federal Test Methods Standards
Gas Alarm	Gas Detection and Alarm System
GFI	Ground Fault Interrupt
gph or GPH	Gallons per Hour
gpm or GPM	Gallons per Minute
Hg	Mercury
hp	Horsepower
Hz	Hertz
JFTOT	Jet Fuel Thermal Oxidation Tester
LCD	Liquid Crystal Display
lel	Lower Explosive Limit
MAC	Maintenance Allocation Chart
Modular Base Petroleum Laboratory (MBPL)	Petroleum Laboratory, Semi-Trailer Mounted
MTOE	Modified Table of Organization and Equipment
MWO	Modification Work Order
pH	Degree of Acidity or Alkalinity
psi	Pounds per Square Inch
PMCS	Preventive Maintenance Checks and Services
RPM	Revolution per Minute
RPSTL	Repair Parts and Special Tools List
RVP	Reid Vapor Pressure
Steam Generator	Low Pressure Boiler
Steam Super Heater	High Pressure Boiler
V	Volts
W	Watt

## Section II. EQUIPMENT DESCRIPTION AND DATA

### Alphabetical Index

Paragraph Title	Paragraph
Equipment Data .....	1-11
Equipment Purpose, Capabilities and Features .....	1-9
Location and Description of Major Components .....	1-10

#### 1-9. EQUIPMENT PURPOSE, CAPABILITIES AND FEATURES.

- a. Purpose. The Petroleum Laboratory is used to test petroleum products in the field. Tests include qualitative and quantitative analyses of a wide range of military fuels and lubricants.
- b. Capabilities and Features. The Petroleum Laboratory is capable of performing the following American Society for Testing and Materials (ASTM) tests and Federal Test Methods Standards (FTMS):

<u>ASTM</u>	<u>Standard Test Method for</u> (* indicates title is as shown.)
D-56	Flash Point by Tag Closed Tester
D-86	Distillation of Petroleum Products at Atmospheric Pressure
D-91	Precipitation Number by Lubricating Oils
D-92	Flash and Fire points by Cleveland Open Cup
D-93	Flash-point by Pensky-Martens Closed Cup Tester
D-94	Saponification Number of Petroleum Products
D-95	Water in Petroleum Products and Bituminous Materials by Distillation
D-96	Water and Sediment in Crude Oil by Centrifuge Method (Field Procedure)
D-97	Pour Point of Petroleum Products
D-130	Detection of Copper Corrosion From Petroleum Products by the Copper Strip Tarnish Test
D-189	Conradson Carbon Residue of Petroleum Products
D-217	Cone Penetration of Lubricating Grease
D-287	API Gravity of Crude Petroleum and Petroleum Products (Hyrometer Method)
D-322	Gasoline Diluent in Used Gasoline Engine Oils by Distillation
D-323	Vapor Pressure of Petroleum Products (Reid Method)
D-341	Standard Viscosity – Temperature Charts for Liquid Petroleum Products *
D-381	Existing Gum in Fuels by Jet Evaporation
D-445	Kinematic Viscosity of Transparent and Opaque Liquids (the Calculation of Dynamic Viscosity)
D-446	Films Deposited from Bituminous Emulsions*

<u>ASTM</u>	<u>Standard Test Method for</u> (* indicates title is as shown.)
D-473	Sediment in Crude Oils and Fuel Oils by the Extraction Method
D-482	Ash from Petroleum Products
D-483	Un sulfonated Residue of Petroleum Plant Spray Oils
D-525	Standard Test Method for Oxidation Stability of Gasoline (Introduction Period Method)
D-566	Dropping Point of Lubricating Grease
D-611	Aniline Point and mixed Aniline Point of Petroleum Products and Hydrocarbon solvents
D-873	Oxidation Stability of Aviation Fuels (Potential Residue Method)
D-874	Sulfated Ash from Lubrication Oils and Additives
D-892	Foaming Characteristics of Lubricating Oils
D-893	Insolubles in Used Lubricating Oils
D-942	Oxidation Stability of Lubrication Greases by the Oxygen Bomb Method
D-974	Acid and Base Number by Color-Indicator Titration
D-1094	Water Reaction of Aviation Fuels
D-1250	Standard Guide for Petroleum Measurement Tables*
D-1267	Gage Vapor Pressure of Liquefied Petroleum (PL) Gases (LP-Gas Method)
D-1287	pH of Engine Coolants and Antirusts
D-1290	Sediment in Water-Emulsion Polishes by Centrifuge
D-1298	Standard Practice for Density, Relative Density (Specific Gravity) or API Gravity of Crude Petroleum and Liquid Petroleum Products by Hydrometer method*
D-1796	Water and Sediment in Fuel Oils by the Centrifuge Method (Laboratory Procedure)
D-2270	Standard Practice for Calculating Viscosity Index from Kinematic Viscosity at 40 and 100°C
D-2273	Trace Sediment in Lubricating Oils
D-2276	Particulate Contamination in Aviation Fuels
D-2386	Freezing Point of Aviation Fuels
D-2392	Color of Dyed Aviation Gasolines
D-2500	Cloud Point of Petroleum Products
D-2517	Standard Specification for Reinforced Epoxy Resin Gas Pressure Pipe and Fittings*
D-2709	Water and Sediment in Middle Distillate Fuels by Centrifuge
D-3240	Undissolved Water in Aviation Turbine Fuels
D-3241	Thermal Oxidation Stability of Aviation Turbine Fuels (JFTOT Procedure)
D-3948	Determining Water Separation Characteristics of Aviation Turbine Fuels by Portable Separometer
D-4057	Standard Practice for Manual Sampling of Petroleum and Petroleum Products*

**FTMS**

FTM5101	Neutrality (Qualitative)
FTM5327	Determination of Fuel System Icing Inhibitor in Hydrocarbon Fuels
FTM5329	Humidity Cabinet Protection
FTM5330	Visual Colorimetric Determination of Fuel System Icing Inhibitor in hydrocarbon Fuels
FTM5340	Inhibitor in Hydrocarbon Fuels
FTM5415	Resistance of Greases to Aqueous Solutions

The Petroleum Laboratory incorporates the following features:

- Air and ground transportable for rapid deployment
- Rigid wall construction
- All weather operation
- Rapid set-up for use
- Self-contained environmental control system
- Self-contained water system
- Self-contained air system
- Self-contained vacuum system
- Trailer mounted for long distance towing
- Designed to operate under blackout conditions with door activated blackout switches.

1-10. LOCATION AND DESCRIPTION OF MAJOR COMPONENTS.

**NOTE**

Van exterior sides and interior walls are designated "curbside" (right) and "roadside" (left) when viewed from the rear of the van.

a. Rear and Curbside Exterior. (Refer to Figure 1-2.)

Purge Intake Door (1): Hinged, double latched access door for purge intake damper. Purge Intake Door shall be open during purge cycle to allow environmental control unit to ventilate the laboratory.

Mechanical Room Entrance Door (2): Provides the only entrance/exit for mechanical room. Provided with an internal door lock release mechanism to facilitate an emergency exit.

Laboratory Entrance Door (3): Primary entry/exit for laboratory section of trailer. Provided with an internal door lock release mechanism to facilitate an emergency exit.

Purge Exhaust Door (4): Hinged, double latched access door for purge exhaust damper. Purge Exhaust Door shall be open during purge cycle to allow air to be exhausted from laboratory.

Rear Door (5): Primarily used to load and unload overpack boxes. Provides a secondary entrance/exit for laboratory. Provided with an internal door lock release mechanism to facilitate emergency exit.

Sink Drain Connection (6): Located under the trailer, the sink drain connection provides a means of connecting a drain hose to sink drain.

Curbside Storage Box (7): Provides storage area for miscellaneous equipment. Provided with fork truck lift slots and retaining pins for removal/installation. Provides storage area for power input cable that connects power distribution module to power source.

Trailer Accessories Storage Door (8): Provides access to storage area for trailer accessories; i.e., roadside reflectors, wheel chocks, various tools, wiping rags, etc.

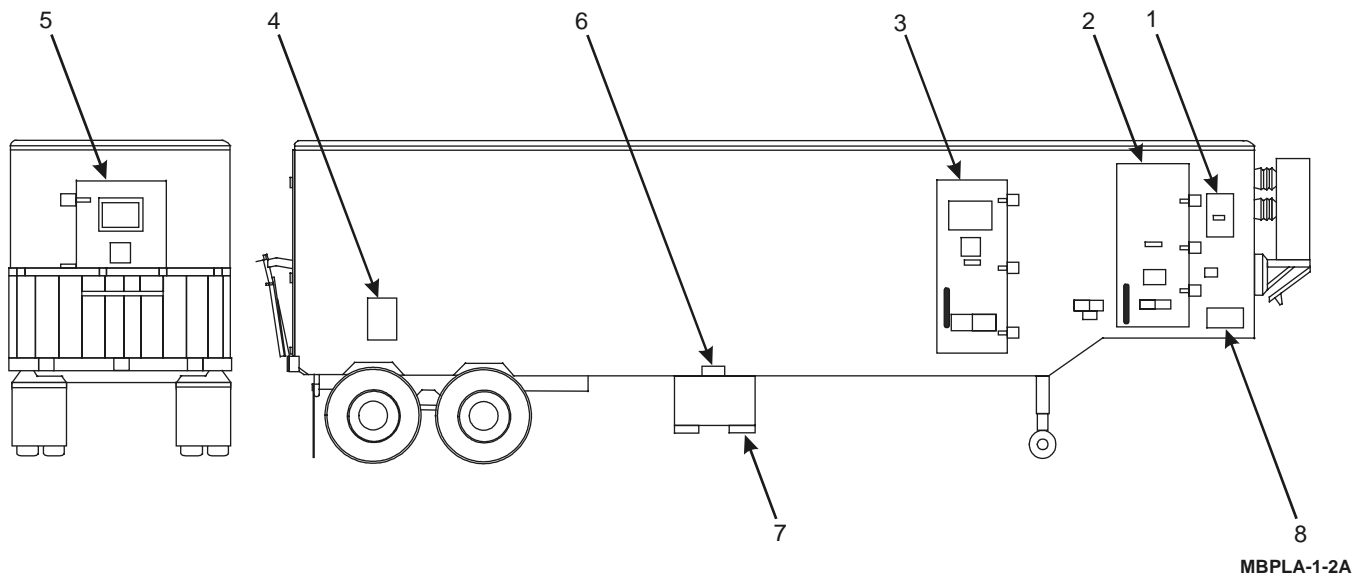


Figure 1-2. Rear and Curbside Exterior

b. Front and Roadside Exterior. (Refer to Figure 1-3.)

Environmental Control Units (1): Provides heating and cooling of laboratory. The four units are identical, but each has its own individual controls.

Purge Intake Door (2): Hinged, double latched access door for purge intake damper. Purge Intake Door shall be open during purge cycle to allow environmental control unit to ventilate laboratory.

Fume Hood and Gum Bath Vent Door (3): Hinged, double latched access door for fume hood and gum bath vent. Fume Hood and Gum Bath Vent Door shall be open and exhaust vent attached when operating exhaust blowers.

Fume Hood Exhaust Vent Extension (4): Connects to fume hood vent door and used to exhaust fumes away from purge intake door and environmental control units. Stores in mechanical room during transit.

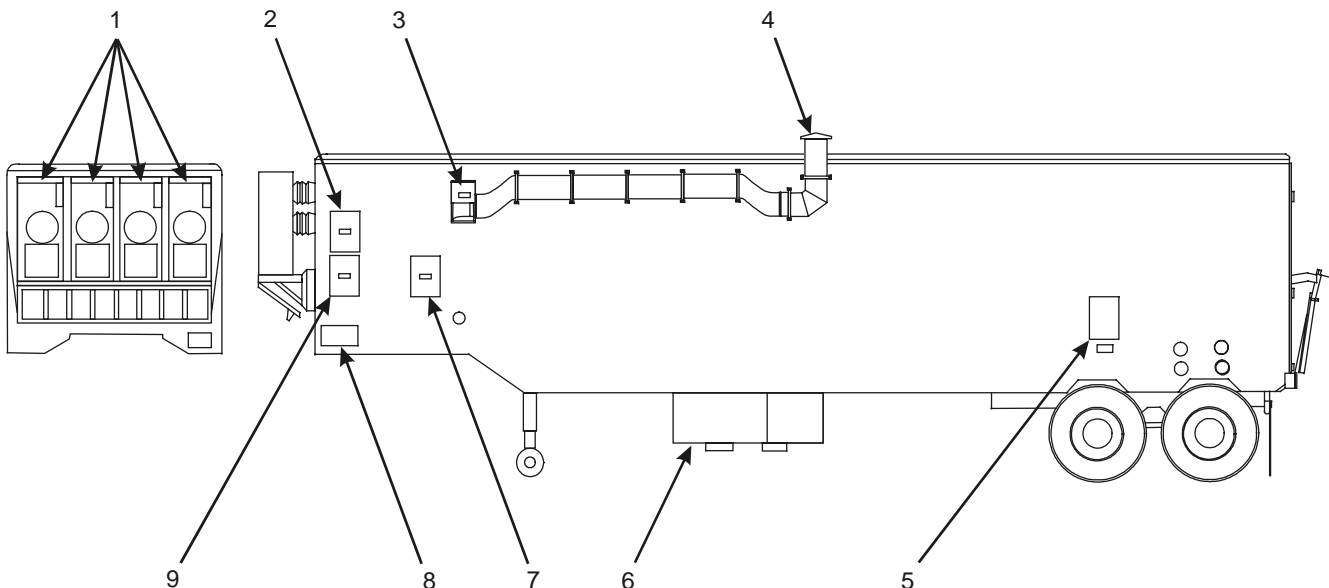
Power Input Panel Door (5): Hinged, double latched access door to electrical and telephone connection points. An alarm buzzer which indicates a purge door closed during a purge cycle is also located behind this door.

Roadside Storage Box (6): Provides storage area for power input cable that connects laboratory to power distribution module, ground rod, ground rod driver/puller, hose adapter, coupler and fire hose. It is equipped with fork truck lift slots and retaining pins for installation/removal.

Utilities Box Door (7): Hinged, double latched access door to water connections for hoses to fill, supply or drain water system.

Trailer Accessories Storage Door (8): Provides access to storage area for trailer accessories,; i.e., roadside reflectors, wheel chocks, various tools, wiping rags, etc.

Purge Exhaust Door (9): Hinged, double latched access door for purge exhaust damper. Purge Exhaust Door shall be open during purge cycle to allow air to be exhausted from laboratory.



MBPLA-1-3A

Figure 1-3. Front and Roadside Exterior



c. Interior. (Refer to Figure 1-4.)

Anti-Icing Additive Test Kit (Sheet 1, Item 1): Used to determine the percent volume (%V) of anti-icing additive in jet turbine engine fuels.

Emergency Light Ballast Box (2): Contains components for turning emergency lights on when normal power is lost, and for recharging the battery when normal power is restored.

Separometer (3): Provides a quick, portable means for field and laboratory use to rate the ability of turbine fuels to release entrained or emulsified water when passed through fiberglass coalescence material.

Storage Locker (4): Provides a storage space for miscellaneous equipment and supplies.

MAIN POWER PANEL A1 (5): Main entry and control point for power supplied to laboratory. Contains purge control relay A1K1, one 5-amp fuse, three 25-amp fuses, the main circuit breaker and circuit breaker that supplies power to POWER PANEL NO. 2 in mechanical room. Also contains circuit breakers that supply power for lighting, convenience outlets, the gas alarm system and all other equipment located in laboratory section.

First Aid Kit / Burn Kit (6): Provides essential items required to treat minor injuries and burns.

Gas Alarm Control (7): A calibrated instrument designed to continuously monitor for combustible gas air mixtures. It alerts personnel to hazardous conditions and automatically activates air purging system.

Desiccating Cabinets (8): Two desiccating cabinets designed to comply with requirement of ASTM Method ASTM D-2276.

Environmental Control Unit Remote Control (9): There is one control module for each ECU. They are used to control ECUs in heating, cooling, or venting modes of operation.

Oil Thief (10): Provides a means for collecting petroleum samples in accordance with ASTM test D-4057.

Flashlight (11): Provides emergency lighting. There are four flashlights positioned throughout laboratory, one near each of the laboratory doors, one on roadside wall, and one in machinery room.

Centrifuge (12): Used to conduct ASTM tests D-91, D-893, D-1796, D-2273 and FTMS test F-5105.5. It is rheostat controlled and can operate at 2250 rpm.

ECU Duct Work (13): Used to direct air flow from ECU units throughout interior.

Water Chiller (14): A 30-gph unit that provides chilled water for laboratory.

Air Tank (15): A 30-gallon tank capable of acting as an air accumulator at a pressure of up to 200 psi.

Sampling and Gaging Kit (16): A portable petroleum test kit used in performing ASTM test D-287, D-4057, D-1250, and D-1298.

Roadside Cabinets (17): Provides storage for equipment and supplies.

Burnout Furnace (18): Used in performing ASTM test D-482, D-874, and D-2276. It has a maximum operating temperature of 20005F (10935C).

Laboratory Ovens (19): Two laboratory ovens that employ gravity convection as a method of heat transfer and are used for baking, drying, and condition preheating.

Viscosity Baths (20): Two viscosity baths used to perform ASTM test D-445 which determines kinematic viscosity of petroleum products.

Analytical Balance and vibration damping support (21): Used to perform ASTM test D-2276. It is fully automatic, top loading with up front, one finger control of all balance functions.

Purge Control Distribution Box A3 (22): Located below MAIN POWER PANEL A1 and behind an access panel the purge control distribution box A3 contains components to operate the purge cycle that moves outside air into the ECU ducting system and forces any gases or contaminated air outside via the purge exhaust doors.

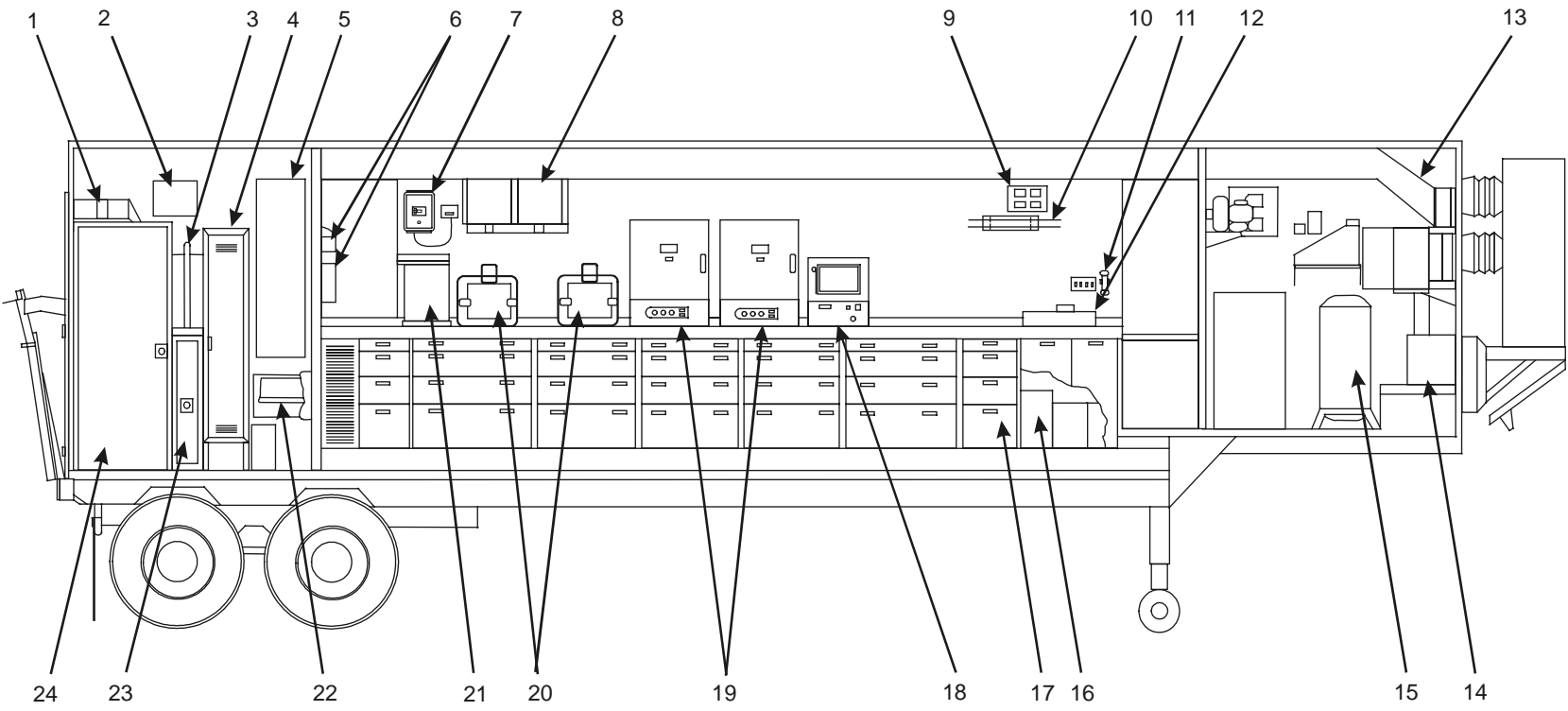
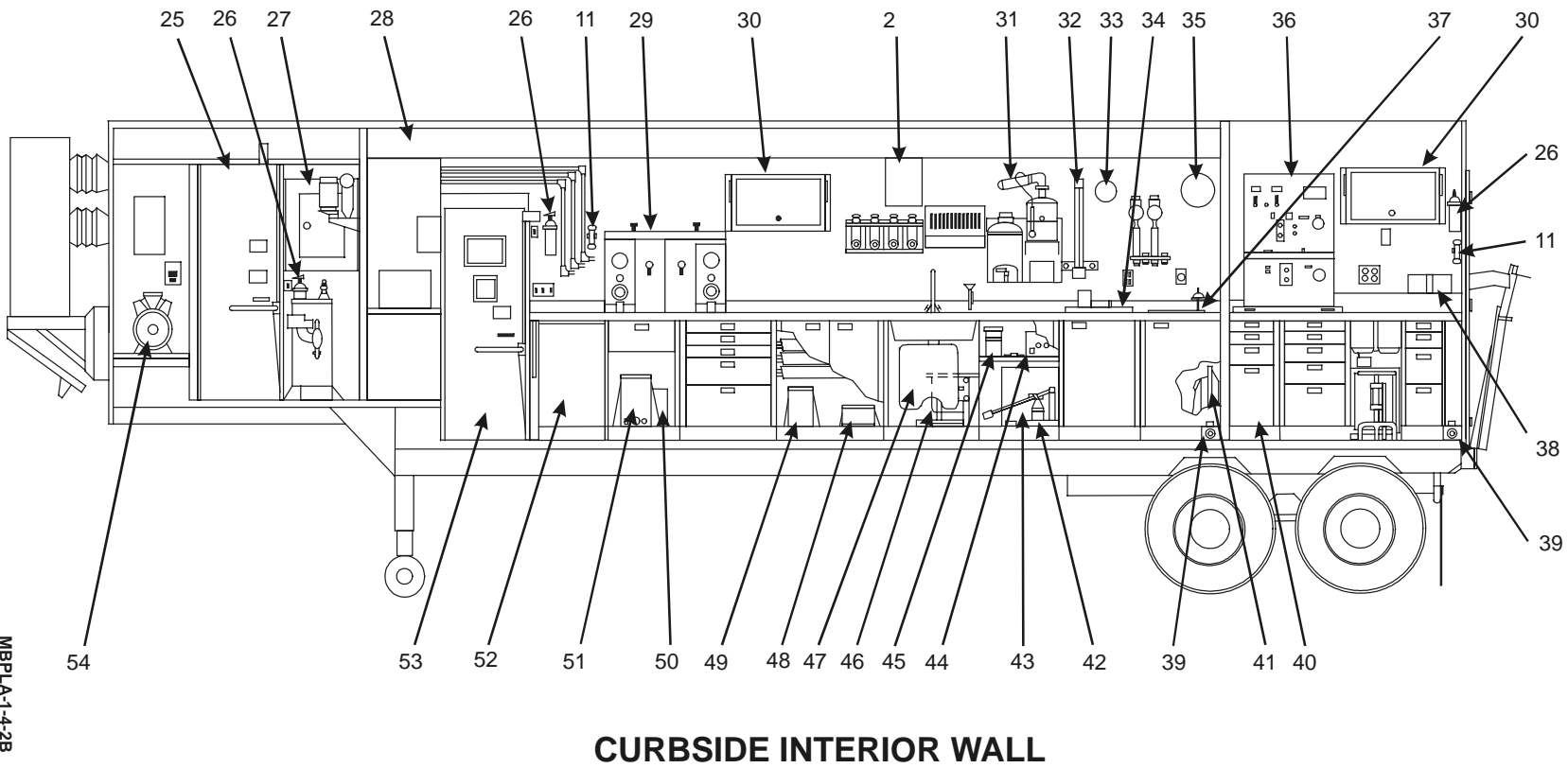


Figure 1-4. Petroleum Laboratory Interior (Sheet 1 of 3)

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**ROADSIDE INTERIOR WALL**



MBPLA-1-4-2B

Figure 1-4. Petroleum Laboratory Interior (Sheet 2 of 3)

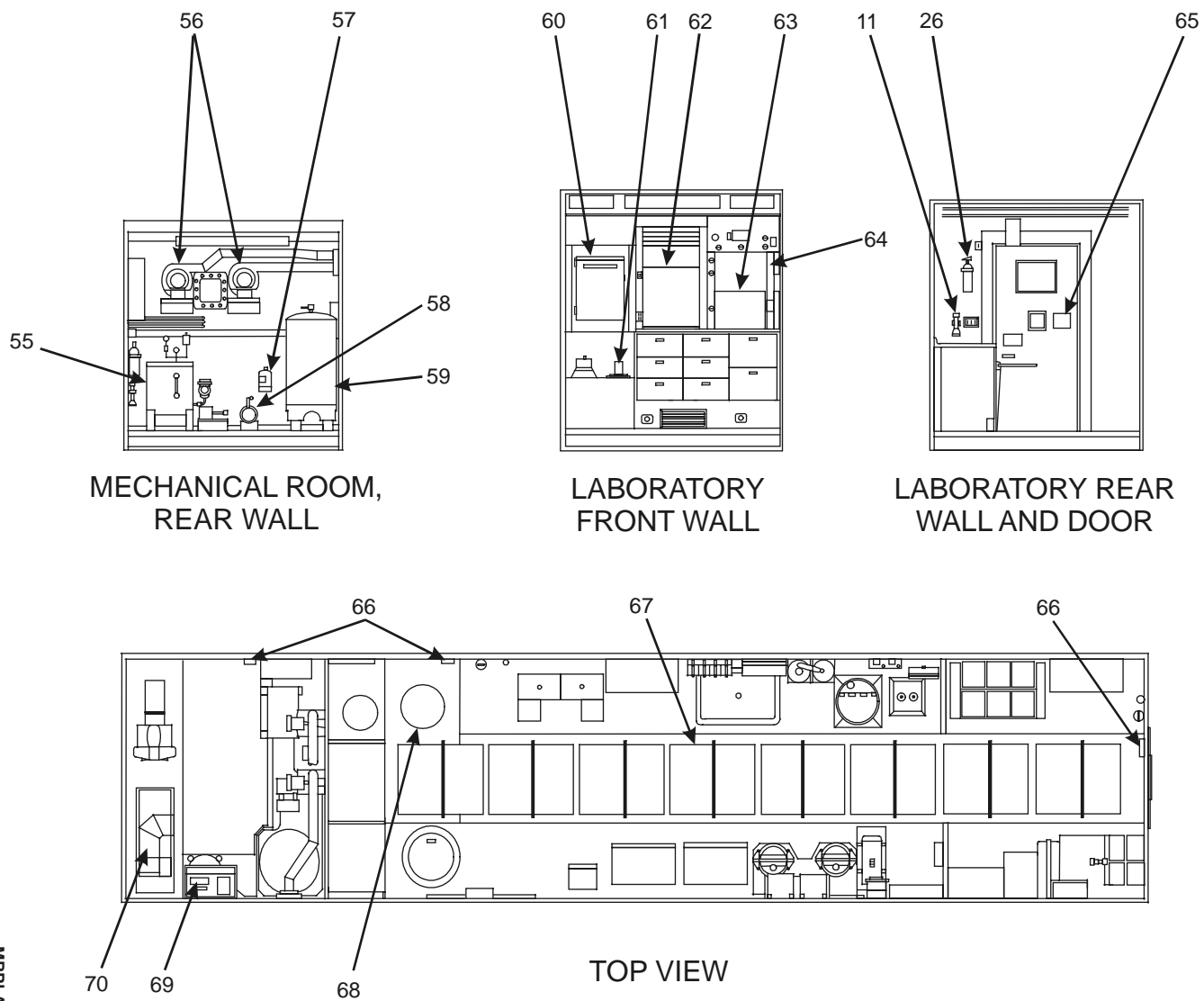


Figure 1-4. Petroleum Laboratory Interior (Sheet 3 of 3)

MBPLA-1-4-3B

Propane Storage Locker (23): Provides a secure, well-ventilated storage for propane cylinders.

Gas Cylinder Storage Locker (24): Provides secure storage for oxygen, carbon dioxide, and nitrogen cylinders.

Entrance, Machinery Room: (Sheet 2, Item 25): Used to gain access to Machinery Room. Located on the curbside of trailer.

Fire Extinguisher (26): The three fire extinguishers are 5-pound, Halon, Type 1211 extinguishers. Two are located in the laboratory and one in the mechanical room.

POWER PANEL NO. 2 (27): This panel is located in the mechanical room and contains circuit breakers that supply power to the four environment control units, mechanical room lighting, convenience outlets, and all electrically operated equipment located in the mechanical room.

ECU Duct Work (28): Used to direct air flow from ECU units throughout the interior.

Gas-Oil Distillation Units (29): There are two of these units. The right-hand unit is a gas oil unit and has an immersion heater in its condenser. Both units are used to perform ASTM test method D-86.

Bookcases (30): Provide storage for manuals and other books.

Emergency Light Ballast Box (2): Contains components for turning emergency lights on when normal power is lost, and for recharging battery when normal power is restored.

Water Still (31): An electrically heater portable still used to provide pure distilled water for use in laboratory.

Manometer (32): A dual-scale (psi and Hg) indicator which provides a means of accurately testing RVP gauges before and after use.

Aneroid Barometer (33): The aneroid barometer is designed to meet the requirements of ASTM test D-86. It is temperature compensated and graduated in both English and metric systems.

Reid Vapor Pressure Bath (RVP) (34): Used with Reid Vapor Pressure Bombs to perform ASTM tests D-323 and D-1267.

Pressure Recording Gauge (35): Provides a means to measure and record pressure changes in a system. Changes are plotted against time. It is used in conjunction with the Oxidation Stability Bath.

Jet Fuel Thermal Oxidation Tester (36): A closed loop fuel system with pump circulation and nitrogen pressurization used in performing ASTM test D-3241.

Oxidation Stability Bath (37): Used with Oxidation stability of Gasoline Bomb to perform ASTM tests D-525 and D-873.

Printer (38): A portable printer used to print test results.

Gas Detector (39): There are two Gas Detectors to monitor dangerous accumulation of gases in the laboratory.

Curbside Cabinets (40): Provide storage for equipment and supplies.

Flowmeter Kit (41): Kit consists of four flowmeters and housing with removable stand for countertop use or with panel support mount. It is used to measure and calculate flow rate.

Grease Working Machine (42): Used to perform ASTM test D-217. It is hand operated.

Water Heater (43): Provides hot water to the system. It is an electric heater with a 6-gallon capacity.

Utility Bath (44): Used to perform ASTM test D-91 and D-1796. This is a constant temperature general purpose bath.

Hot Plate (45): Used to warm test specimens.

Drain Tank and Sump Pump (46): The still, oxidation bath and distillation unit drain into this tank which contains the sump pump. The sump pump discharges the tank's contents into the water return line for recirculation.

Thermometer Case (47): Used to store thermometers. During transit all thermometers are stored in overpack box 25.

Fuel Sampling Kit (48): Used to perform field sampling of liquids from pressurized systems as specified in ASTM method D-2275.

General Mechanics Tool Kit (49): Used to perform maintenance procedures.

Cloud and Pour Point Tester (50): Used to perform ASTM test D-97.

Copper Strip Corrosion Bath (51): Used with copper corrosion test bombs to perform ASTM test D-130.

Refrigerator (52): The refrigerator provides 6.5 cubic feet (182 cmm) of refrigerated space and is explosion proof.

Entrance, Laboratory (53): Located on curbside of trailer.

Air Compressor (54): A base mounted, 2-cylinder, single stage compressor driven by a 3-hp electric motor. The compressor is capable of providing air at 120 psi.

Steam Boiler / Generator (Sheet 3, Item 55): An electrically heated low pressure boiler which produces steam for use in the gum bath.

Fume Hood and Gum Bath Exhaust Blowers (56): Used to exhaust noxious and dangerous fumes from fume hood and gum bath. Do not operate both exhaust blowers at the same time.

Surge Tank (57): Prevents oscillations in water system.

Water Supply Pump (58): A centrifugal self-priming pump used to pump water from the water tank or from an outside source.

Water Tank (59): A 60-gallon fiberglass tank used as a supply source when operating water system as a closed system.

Freezer/Icemaker (60): The freezer is specifically designed as an ice producing and storage unit. It has 16 ice cube trays with a storage capacity of 23 pounds.

Water Detector Kit (61): A portable, self-contained kit used to detect the presence of undissolved water in automotive and aviation fuel.

Fume Hood (62): The fume hood is used to protect the operator from toxic, corrosive, poisonous, explosive, radioactive, odoriferous, and other harmful and dangerous materials.

Gum Content Test Bath (63): Used to determine the existent gum in petroleum products in accordance with ASTM test D-381.

High Pressure Boiler (64): This boiler is used to fulfill the requirements of ASTM test D-381. It provides superheated steam to the gum bath.

Entrance, Rear (65): Used for loading and unloading.

Blackout Micro Switches (66): Automatically switches off the white lights and leaves on the blue blackout lights when entrance doors are opened.

Overpack Boxes (67): Twenty five overpack boxes provide storage for supplies and equipment shipped with the Petroleum Laboratory.

Spill Kit (68): Used to clean and store spilled chemicals.

Vacuum Pump (69): The vacuum pump is a 2-stage rotary pump which provides vacuum to the laboratory vacuum system.

Fume Hood Exhaust Vent Extension (70): The fume hood exhaust vent extension is located on top of the water chiller during transit. It is used in conjunction with flexible duct and connects to fume hood vent door to vent exhaust fumes away from Mod Lab purge doors and environmental control units.

**1-11. EQUIPMENT DATA.**

Exterior Dimensions (Refer to TM 9-2330-362-14&P)

Length.....	35.42 ft (10.80 m)
Width.....	8.00 ft (2.44 m)
Height.....	11.71 ft (3.57 m)
Weight (w/o trailer).....	19,960 lbs

Interior Dimensions

Length (Laboratory Compartment).....	27.29 ft (8.32 m)
Length (Mechanical Room).....	7.75 ft (2.36 m)
Width (Both).....	7.50 ft (2.29 m)
Height (Laboratory Compartment).....	7.55 ft (2.30 m)
Height (Mechanical Room).....	6.64 ft (2.03 m)
Total Interior Cubage (Laboratory Compartment).....	1545.30 ft3 (43.77 m3)
Total Interior Cubage (Mechanical Room).....	385.95 ft3 (10.93 m3)

Power Requirements

Power.....	208V, 60Hz, 3-phase, 5-wire, 20-25Kw
------------	--------------------------------------

Electrical Connections

Power.....	One 208V, 60Hz, 3-phase, 5-wire power input cable
Ground.....	Ground lug to ground rod cable

Environmental Control (Heating and Cooling)

Model.....	Four Model F18T-2S Vertical Compact Units
Rating.....	(Cooling) 18,000 BTU/Hr
.....	(Heating) 12,000 BTU/Hr
Power.....	208V, 3-phase, 50/60 Hz
Control.....	Individual

Air System

Air Compressor.....	Model LE22, with 208V, 60Hz, 3-phase, 3-hp motor
Air Tank Capacity.....	30 gallon (113.55 l)
Vacuum Pump.....	Model 1405B
Free Air Capacity.....	.58 liters per minute
Motor.....	1/2-hp, 115V, 60Hz

Water System

Water Pump.....	Model 2P373
Capacity.....	.75 gpm at zero total head in feet
Motor.....	3/4-hp, 115V, 60Hz

Water Tank..... 60 gallon (227.10 l) fiberglass

Water Chiller..... Remote model

Capacity.....	30 gph (113.55 l)
Power.....	115V, 60Hz

Water Connections

Suction and Discharge.....	Quick disconnect with standard garden hose fitting
Tank Drain.....	Gate valve open to gravity deck drain
Sink Drain.....	Gravity deck drain with hose connection

## Section III. PRINCIPLES OF OPERATION

### Alphabetical Index

Paragraph Title	Paragraph
Functional Description of Petroleum Laboratory Support Systems.....	1-12
Functional Description of Petroleum Laboratory Unique Equipment.....	1-13

#### 1-12. FUNCTIONAL DESCRIPTION OF PETROLEUM LABORATORY SUPPORT SYSTEMS.

The following paragraphs describe the systems designed to support the Petroleum Laboratory. For details of major equipment, refer to the appropriate equipment manual.

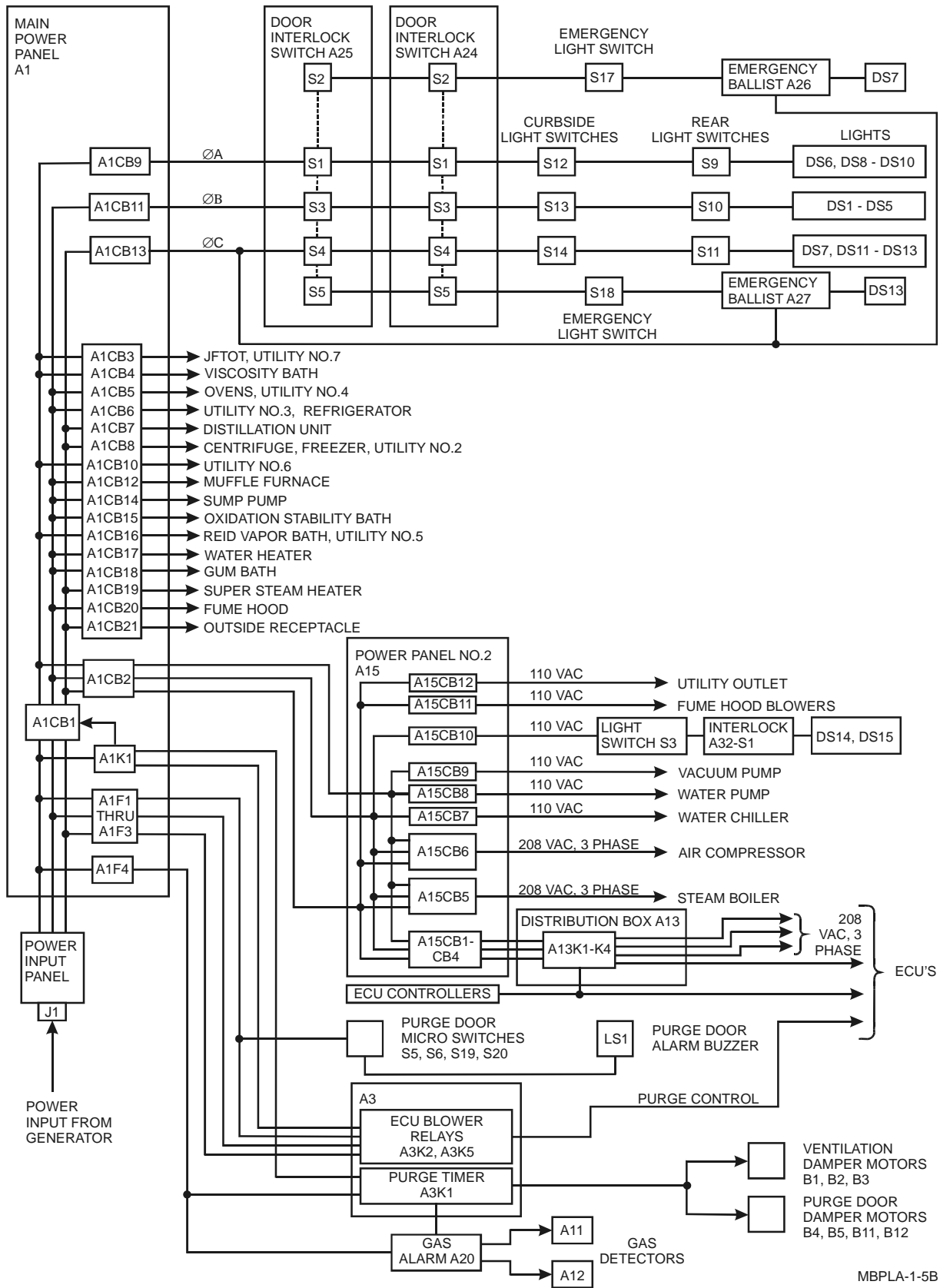
- a. Electrical System (Refer to Figure 1-5 and FO-1). The Petroleum Laboratory has an input power requirement of 208V, 60Hz, 3-phase power. Power is supplied by an external generator via a 50-foot (15 meter), 5-wire cable. Power enters the Laboratory through connector J1 located in the POWER INPUT PANEL. From connector J1 power is applied to Main Circuit Breaker A1CB1 in MAIN POWER PANEL A1 after a 5-minute time delay for a purge cycle. When the purge cycle is completed, A1CB1 may be closed. The panel will now supply 110V, 60Hz, single-phase power to the laboratory compartment normal and emergency lighting, convenience outlets, and various equipment located in the laboratory compartment. It also supplies 208V, 60Hz, 3-phase power to POWER PANEL NO. 2 through A1CB2. POWER PANEL NO.2 is located in the mechanical room and supplies 110V, 60Hz, single-phase power for lighting, convenience outlets and various equipment located in the mechanical room. POWER PANEL NO.2 also supplies 208V, 60Hz, 3-phase power to the four environmental control units, the boiler, and air compressor located in the mechanical room.

#### NOTE

Circuit breakers in MAIN POWER PANEL A1 are coded A1 and circuit breakers in POWER PANEL NO. 2 are coded A15.

- (1) MAIN POWER PANEL A1 houses 22 circuit breakers. This includes Main Circuit Breaker A1CB1. A1CB2 is a 100-amp circuit breaker that supplies POWER PANEL NO. 2. There are twelve 15-amp, five 20-amp, and two 30-amp circuit breakers that supply power for compartment lighting, convenience outlets and other equipment in the compartment. Also located in MAIN POWER PANEL A1 are the following items:
  - (a) Fuses A1F1, A1F2, and A1F3. These are 25-amp fuses used to protect the ECU blowers during the purge cycle.
  - (b) Fuse A1F4. This 5-amp fuse supplies power to the gas alarm control unit.
  - (c) Relay A1K1. This relay is used to turn on the control devices for the purge system. It also prevents the Main Circuit Breaker A1CB1 from being closed until the purge cycle is completed.
- (2) POWER PANEL NO. 2. This panel is located in the mechanical room. It receives an input of 208V, 60Hz, 3-phase power from MAIN POWER PANEL A1 via circuit breaker A1CB2. POWER PANEL NO. 2 houses 12 circuit breakers. There are six 20-amp circuit breakers, one of which supplies 110V, 60Hz, single-phase power to the water chiller and four which supply 208V, 60Hz, 3-phase power to the four environmental control units via control relays located in the Purge Control Distribution Box A13. The other 20-amp circuit breaker supplies 208V, 60Hz, 3-phase power to the air compressor. One 45-amp circuit breaker in the POWER PANEL NO. 2 supplies 208V, 60Hz, 3-phase power to the low pressure boiler and its pump. The remaining five circuit breakers are 15-amp and supply 110V, 60Hz, single-phase power to the vacuum pump, the water pump, the fume and gum bath exhaust blowers, convenience outlets, and the mechanical room lighting.

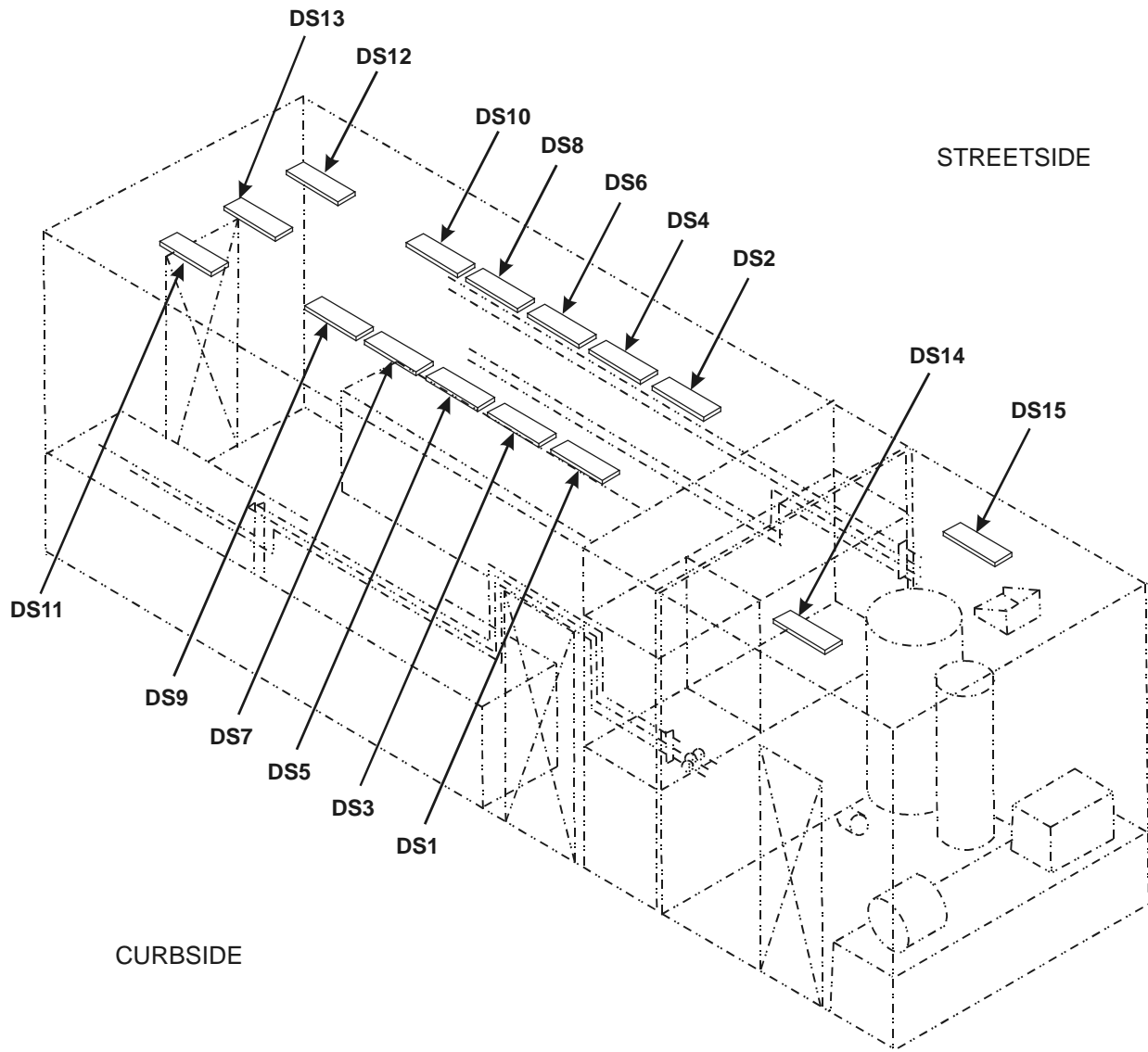




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Figure 1-5. Electrical System Functional Diagram

- (3) Lighting System (Refer to Figures 1-5 and 1-6). Lighting for the Petroleum Laboratory is provided by 15 fluorescent ceiling light fixtures. Thirteen are located in the laboratory compartment and two are in the mechanical room. Power for the laboratory compartment lights is provided by circuit breakers A1CB9, A1CB11, and A1CB13 located in the MAIN POWER PANEL A1. A1CB9 provides phase A power via rear and curbside door interlock switches S1, and rear and curbside light switches S9 and S12 to lights DS6, DS8, DS9, and DS10. A1CB11 provides phase B power via door interlock switches S3 and light switches S10 and S13 to lights DS1, DS2, DS3, DS4 and DS5. A1CB13 provides phase C power via door interlock switches S4 and light switches S11 and S14 to lights DS7, DS11, DS12, and DS13. Power for lighting in the mechanical room is phase B power provided by circuit breaker A15CB10 via door interlock switch S1 and light switch S3 to lights DS14 and DS15.
- (a) Blackout Lighting. The center lamp in each of the light fixtures is covered with a blue filter. When an access door is opened, the door interlock switch is activated. This will turn off all white lights and leave on all blue filtered lights. When the access door is closed, the interlock switch is again activated, returning power to the white lights. As a safety feature, when the light switches are turned off all blue filtered lights will remain on until power to Mod Lab A is removed.
- (b) Emergency Lighting. Emergency lighting is provided to the laboratory compartment by light fixtures DS7 and DS13 and two emergency light ballast boxes A26 and A27. When normal power is available, phase C power continually charges the battery device in ballast box A26 and A27. When normal power is lost, power from ballast box A26 will be provided to DS7 via the Forward Emergency Light Switch S17 in the ON position and the rear and curbside door interlock switches S2. Power from ballast box A27 will be provided to DS13 via the Rear Emergency Light Switch S18 in the ON position and the rear and curbside door interlock switches S5.
- b. Purge System (Refer to Figure 1-5 and FO-1). The purge system is used to exhaust potentially dangerous contaminated air from inside the Petroleum Laboratory. The system consists of the following components:
- (1) A1K1 power control relay located in the MAIN POWER PANEL A1.
  - (2) A3K1 time delay relay located in Purge Control Distribution Box A3.
  - (3) A3K2, and A3K5 blower control relays located in Purge Control Distribution Box A3.
  - (4) Two purge intake doors and two purge exhaust doors located on the outside wall of the Petroleum Laboratory.
  - (5) Four purge door limit switches.
  - (6) Two intake dampers and two exhaust dampers located behind the external purge doors.
  - (7) Three ventilation dampers mounted in the ECU plenum located in the mechanical room.
  - (8) Seven purge damper motors.
  - (9) One purge alarm buzzer located at the POWER INPUT PANEL A34.



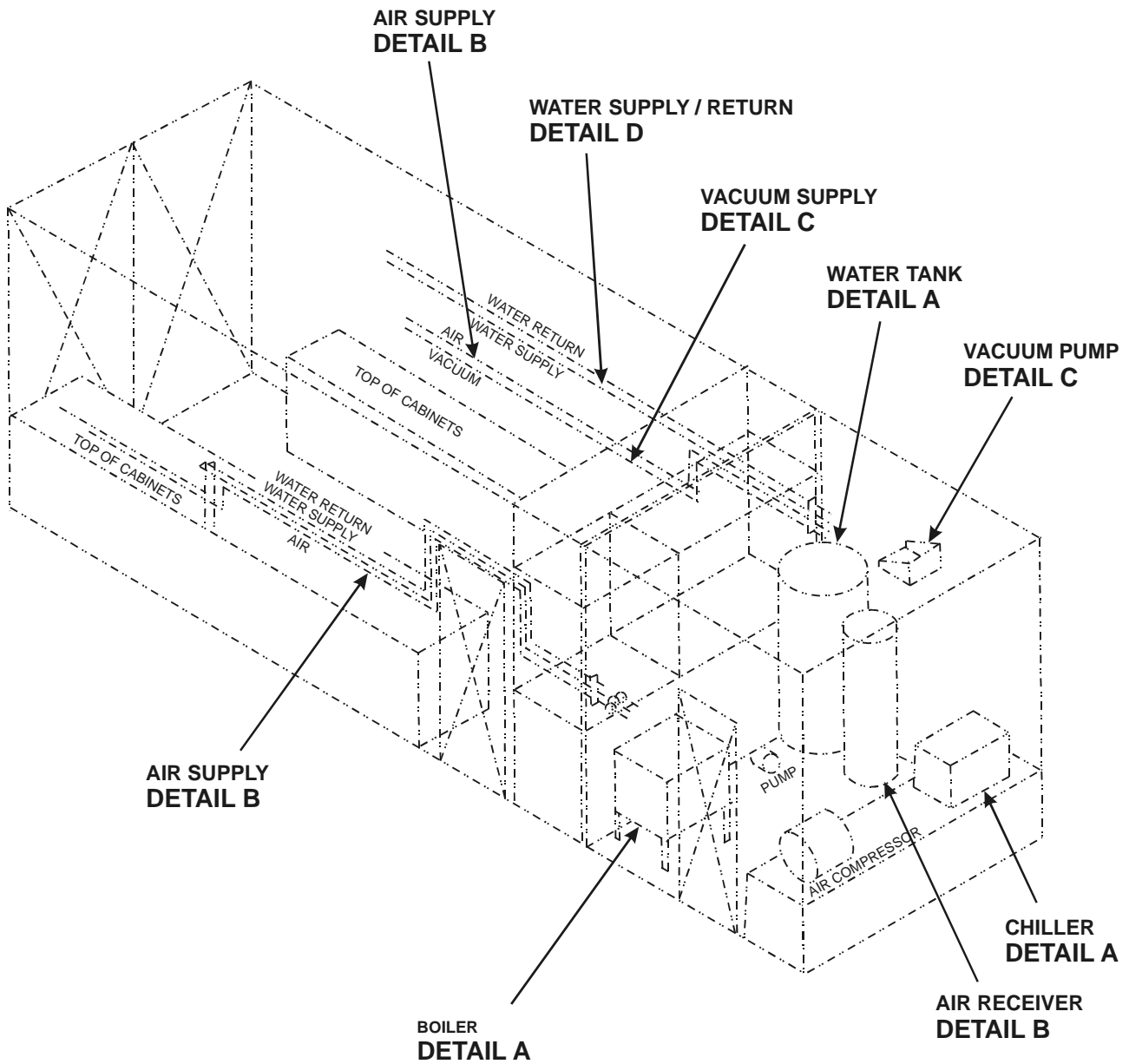
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Figure 1-6. Mod Lab A Lighting

A purge cycle can be initiated in two ways; by the application of external power after a power shutdown or by an alarm signal from the gas detector system.

When external power is first applied at connector J1, the power required for a purge cycle is supplied ahead of the Main Circuit Breaker A1CB1. A1CB1 is held open by power control relay A1K1. This prevents power from being applied to any equipment or lighting in the Petroleum Laboratory until the purge cycle is completed. Relay A1K1 supplies power to start the 5-minute time delay relay A3K1 and to energize the two blower control relays (A3K2 and A3K5) which provide power to the ECU blowers. Power is also routed to the purge door damper motors and to the ventilation damper motors so that the purge door dampers are opened and the ventilation dampers are closed. The ECU blowers move outside air into the ECU ducting creating pressure which forces any gases or contaminated air outside via the purge exhaust doors. After 5 minutes have elapsed, time delay relay A3K1 de-energizes. This causes power control relay A1K1 to de-energize relays A3K2 and A3K5. Power is removed from the ECU blowers, the dampers are driven to their normal positions and the Main Circuit Breaker may now be closed to supply normal power to the Petroleum Laboratory. If at the end of the purge cycle the gas detector alarm system is in an alarm condition, the time delay relay is activated causing the cycle to be repeated. This will continue until the alarm clears. If when power is applied at connector J1 and a purge cycle initiated, and one of the external purge doors is closed, the purge alarm buzzer will be activated by the purge door limit switch and will remain activated until the door is opened.

- c. Water System (Refer to Figure 1-7). The water system consists of the water pump, pressure switch, water tank, water surge tank, filter, water chiller, water heater and associated piping and valves. The water pump operates on 110V, 60 Hz, single-phase power supplied by A15CB8 located in POWER PANEL NO. 2 and is controlled by the pressure switch. The water pump turns on when a water outlet is opened and off when the outlets are all closed. The water surge tank removes oscillations from the system while the water tank acts as the system supply source. The water cooler operates on 110V, 60 Hz, single-phase power supplied by A15CB7 located in POWER PANEL NO. 2. The water heater operates on 110V, 60 Hz, single-phase power supplied by A1CB17 located in MAIN POWER PANEL A1. The system may be supplied with water from an outside pressurized source, from an outside unpressurized source, by using the system pump, or by its own water tank. Water supply piping and valves are color coded blue. Water return piping and valves are color coded white. Drain piping is colored black. Water supply valves are located at the distillation unit, the RVP Bath, the JFTOT, the sink (both hot and cold), the freezer, the laboratory ovens, the viscosity baths, and the fume hood. Water return valves are located at the freezer, the laboratory ovens, the viscosity baths, and the fume hood.
- d. Air System (Refer to Figure 1-7). The air system consists of the air compressor, air tank, pressure switch, moisture trap, and associated piping and valves. The air compressor, located in the mechanical room, operates on 208V, 60Hz, 3-phase power supplied from A15CB6 located in POWER PANEL NO. 2 and can supply air at 120 psi to the system. In automatic operation, the compressor is controlled by a pressure switch which shuts it off when the pressure has reached 120 psi and turns it back on when the pressure in the system drops to 60 psi. The air tank relief valve is set to operate at 150 psi. Air piping is color coded green and valves are color coded orange. Air supply valves are located next to the distillation unit, behind the viscosity baths, above the centrifuge, in the fume hood, at the manometer, the bomb manifold, and the gauge test fitting.
- e. Vacuum System (Refer to Figure 1-7). The vacuum system consists of the vacuum pump and associated piping and valves. The vacuum pump is located in the mechanical room and operates on 110V, 60Hz, single-phase power supplied from A15CB9 located in POWER PANEL NO. 2. It has a free air capacity of 58 liters per minute and supplies vacuum where required. Vacuum piping and valves are color coded yellow. Vacuum supply valves are located behind the viscosity baths, above the centrifuge, and in the fume hood.
- f. Water Still. The water still is electrically operated and supplies pure water for use in the laboratory. Located on the curbside wall it operates on 110V, 60Hz, single-phase power supplied from a convenience outlet.



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Figure 1-7. Water, Air, and Vacuum System Functional Diagram (Sheet 1 of 5)

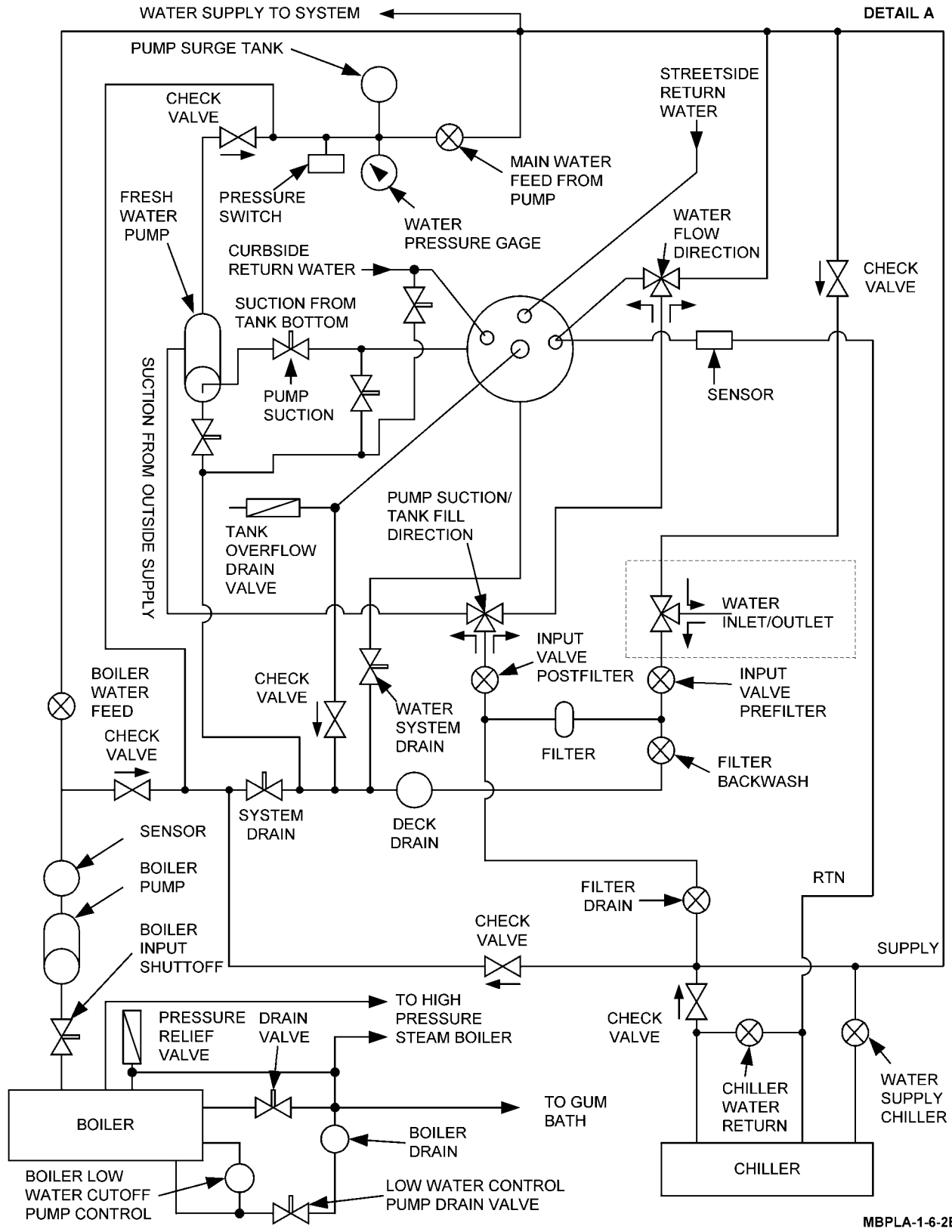


Figure 1-7. Water, Air, and Vacuum System Functional Diagram (Sheet 2 of 5)

DETAIL B

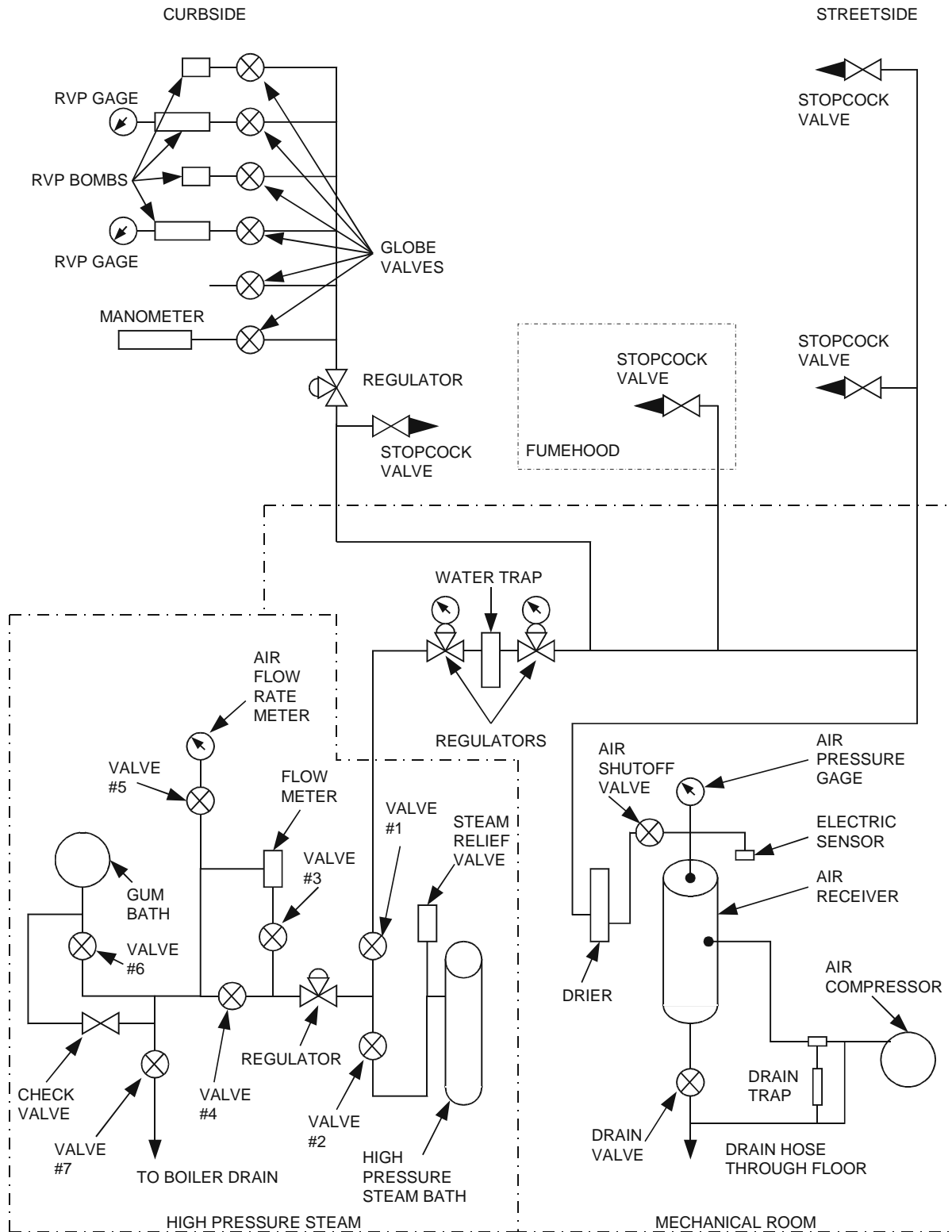


Figure 1-7. Water, Air, and Vacuum System Functional Diagram (Sheet 3 of 5)

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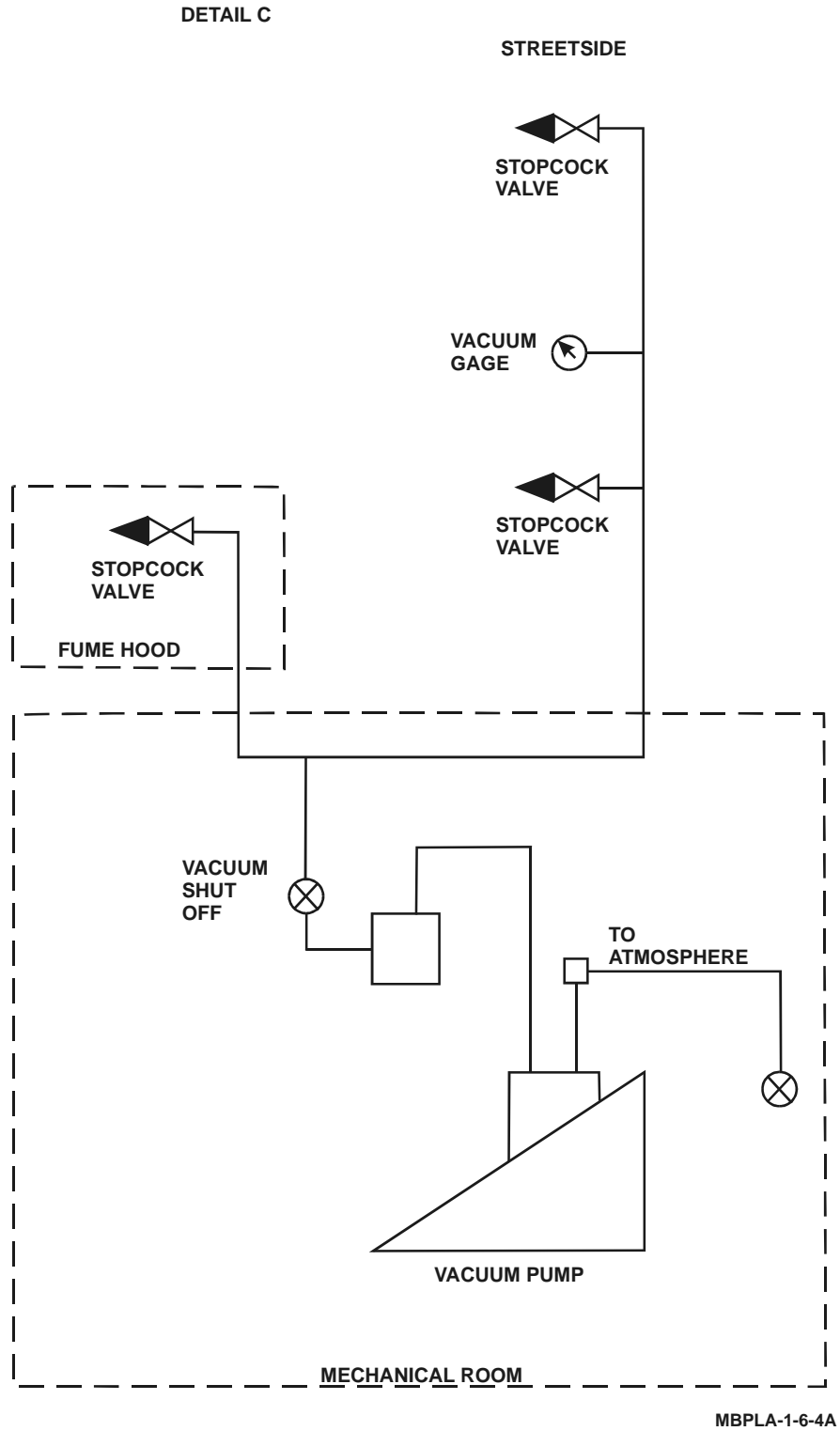
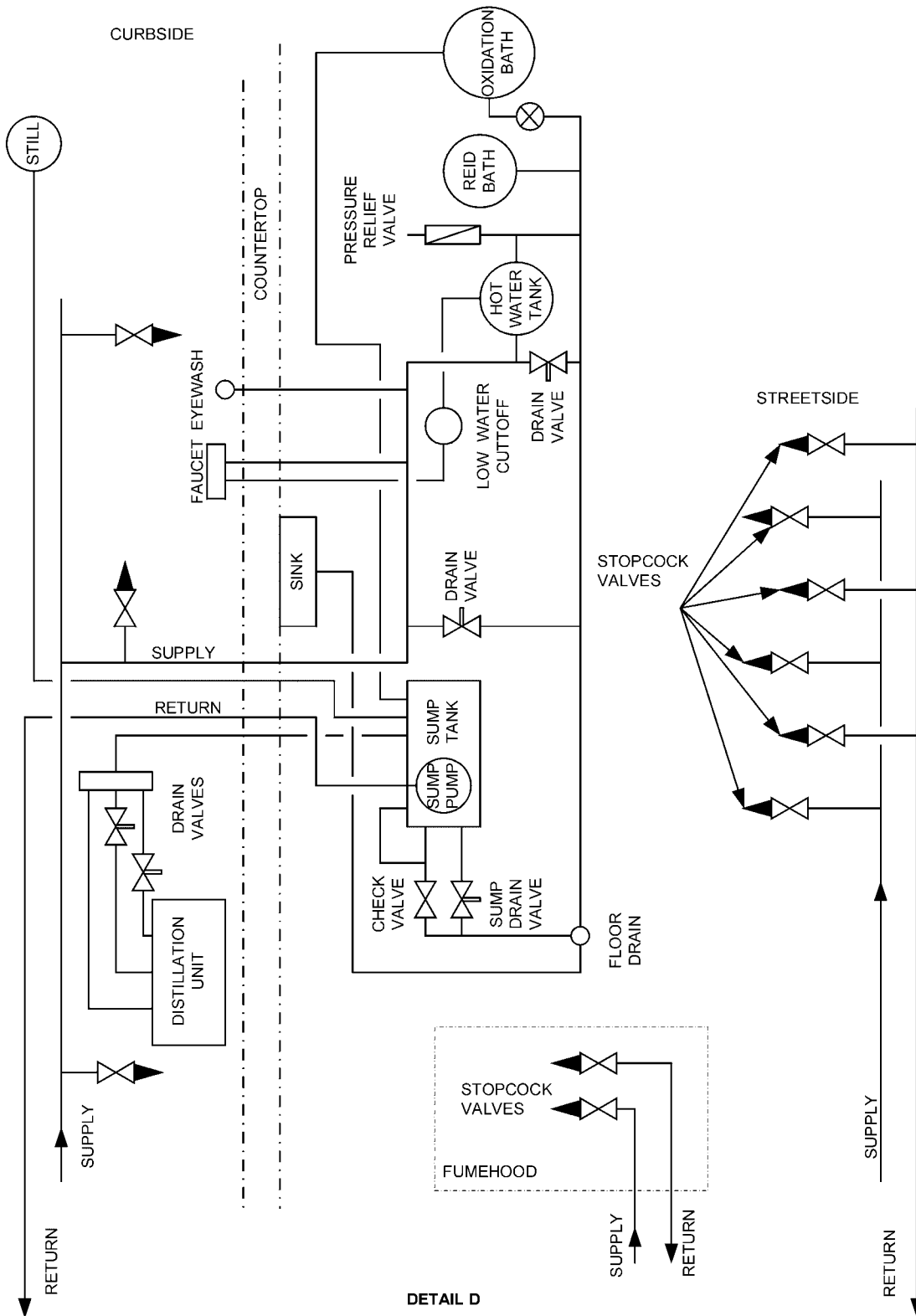


Figure 1-7. Water, Air, and Vacuum System Functional Diagram (Sheet 4 of 5)





DETAIL D

Figure 1-7. Water, Air, and Vacuum System Functional Diagram (Sheet 5 of 5)

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- g. Drain System. The drain system consists of valving and piping required to route condensate and waste water from the sink and equipment to one of two deck drains located in the Petroleum Laboratory. The sink and most of the equipment in the laboratory compartment drain through the trailer floor to a quick-disconnect coupling and hose. The equipment located in the mechanical room drains to the forward deck drain. The system is provided with a drain tank mounted under the sink which contains a submersible pump. Waste water from the RVP bath, oxidation bath, and sump pump tank overflow drain through the trailer floor (sink drain).
- h. Submersible Pump (Sump Pump). The sump pump, located under the sink, is constructed of high-impact, corrosion-resistant plastic with a built-in carrying handle. A screened inlet prevents large solids from entering the pump. It operates on 110V, 60 Hz, single-phase power supplied from A1CB14 located in MAIN POWER PANEL A1. Return water from the electric still, distillation unit, and oxidation bath drains into the sump pump tank and is returned to the water tank via the water return line and sump pump.
- i. Environmental Control Unit. The four ECUs are identical. Each has its own controller. They operate on 208V, 60Hz, 3-phase power and are rated at 18,000 BTUs per hour when cooling and 12,000 BTUs per hour when heating. During the purge cycle, ECU blowers pressurize the Petroleum Laboratory to expel any explosive gases.

### 1-13. FUNCTIONAL DESCRIPTION OF PETROLEUM LABORATORY UNIQUE EQUIPMENT.

The following paragraphs describe some of the equipment mounted or stored within the Petroleum Laboratory. For equipment not described in these paragraphs, refer to the appropriate equipment manual.

- a. Analytical Balance. The analytical balance is mounted on a damping vibration support which is located on the roadside countertop and is used in the performance of ASTM test D-2276. The analytical balance comes with its own power supply unit which receives 110V, 60Hz, single-phase power from a convenience outlet in the laboratory compartment. It is a fully automatic, top-loading balance with up front one-finger control of all balance functions. It provides digital readout that can be viewed from any angle. The door on top and one on each side make the weighing chamber fully accessible for formulations and liquid transfer operations. The weighing chamber is housed in glass for unobstructed viewing.
- b. Anti-Icing Additive Testing Kit. The anti-icing additive testing kit is contained in a carrying case and is stored above the oxygen/nitrogen cylinder cabinet and is used to determine the percent volume of anti-icing additive in jet turbine engine fuels. It consists of a hand held, direct reading refractometer, support base rod and ring, separatory funnel, graduated cylinder, aluminum dishes, piston pipets, and a polypropylene bottle.
- c. Burnout Furnace. The burnout furnace is used for ASTM tests D-482, D-874 and D-2276 and is mounted on the roadside countertop. It operates on 110V, 60Hz, single-phase power supplied by A1CB12 located in the MAIN POWER PANEL. The furnace has a maximum operating temperature of 2005F (1093C), a capacity of six medium or three large flasks, eight heat rate settings to vary power to heating plates to accommodate any workload, and an automatic soak timer with settings from 0 to 4 hours. It is used for heat treating, precipitate drying, ashing, igniting and fusing. It is supplied with a pyrometer.
- d. Calculator. The calculator is stored in laboratory cabinet M2. It has both a display and a built-in printer. It is solid state and operates on four "AA" alkaline batteries or an AC adapter that will plug into a 110V, 60Hz, single-phase convenience outlet.
- e. Carbon Residue Test Apparatus. The carbon residue test apparatus is stored in laboratory cabinet B2 and is used to determine the carbon residue of petroleum products in accordance with ASTM test D-189. This method determines the amount of carbon residue left after evaporating an oil under specified conditions, and is intended to provide an indication of the relative carbon forming propensity of the oil. The apparatus consists of a burner, metal funnel, iron crucible, wood block, stand, and sand cup, wire stand, ceramic cup, porcelain ring and a gas control valve.

- f. Centrifuge. The centrifuge is mounted in the roadside countertop and is used in ASTM tests D-91, D-96, D-483, D-484, D-872, D-875, D-893, D-1019, D-1290, and D-1796. It operates on 110V, 60 Hz, single-phase power supplied by A1CB8 located in the MAIN POWER PANEL. It is equipped with a stepless solid-state speed control that provides an accurate digital display of the rotating head RPM, and uses automatic power assist braking. The cover is equipped with an electronic safety latch. The cover cannot be opened if the centrifuge is operating or the line switch is in the OFF position. Conversely, the centrifuge will not operate if the cover is open.
- g. Cleveland Flash Point Tester. The Cleveland flash point tester is stored in laboratory cabinet D. It operates on 110V, 60Hz, single-phase power supplied by a convenience outlet and is designed to comply with the requirements specified in ASTM test D-92. The apparatus is an open-cup type flash point tester and is electrically heated by a 750W 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 1755F (795C). The heat range is from 20 to 7605F (-6.675C to 4045C). 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.
- h. Cloud and Pour Point Apparatus. The cloud and pour point chamber is stored in laboratory cabinet Y and is designed to comply with the requirements specified in ASTM Method D-97. 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.
- i. Copper Strip Corrosion Bath. The copper strip corrosion bath is stored in laboratory cabinet Y and is used to perform ASTM test D-130. It requires 110V, 60Hz, single-phase power which is provided from one of the convenience outlets in the laboratory compartment. It is used to determine relative corrosivity caused by sulfur compounds in petroleum products. The apparatus consists of a constant temperature bath having a temperature range from ambient to 2215F + 15 (1055C + 0.55C), a 750W copper immersion heater, a thermoregulator, a Soxhlet condenser and a constant water level device. It has a removable top plate and is provided with a test tube rack, test bombs, a thermometer, four rubber stoppers, copper strips, copper strip corrosion standards and has the capacity to hold four bombs.
- j. Desiccating Cabinets. The desiccating cabinets are mounted on the roadside wall above the countertop and are designed for ASTM test D-2276. The cabinets are constructed of stainless steel with glass side panels. Molded rubber door gaskets provide an airtight fit for the doors. The cabinets also are provided with manual relief valves.
- k. Field pH Meter. The pH meter is stored in laboratory cabinet G5. It is housed in a carrying case and is fully portable. It operates on a rechargeable battery and is supplied with a battery charger which operates on 110V, 60Hz, single-phase power. The pH meter has an analog readout and is used to take pH and oxidation readings directly at the sampling site.
- l. Foaming Test Bath. The foaming test bath is designed for use in ASTM test D-892 and is stored in overpack box 1. It is a fully equipped constant temperature bath that tests foaming characteristics of lubricating oils to determine their suitability for high speed gearing, splash lubrication, high volume pumping and other applications. It aerates the sample through diffuser stone at 94 + 5 mi/min. and maintains sample temperature at 75 and 200 + 15F (24.5 and 93.5 + 0.55C ) for three-sequence testing. It uses precise solid state temperature control with a thermistor sensor probe. A silent 1/20-hp ball bearing stirrer provides complete circulation to assure temperature uniformity. The apparatus operates on 110V, 60Hz, single-phase power from a convenience outlet. It has a temperature range from ambient to 2755F (1345C), controller sensitivity of + 15F (+ 0.55C), and a heater range from 0 to 1500W. The bath capacity is 9 gal. (38.5 l).

- m. Flowmeter Kit. The flowmeter kit is housed in a carrying case and is stored in laboratory cabinet S. It is designed to accurately measure flow rate and permit calculations 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 support panel mounting.
- n. Fume Hood. The fume hood is built into the front wall of the laboratory to the left of the gum bath. The exhaust blower is activated by a switch located on the left side wall near the freezer. The fume hood incorporates two vapor proof electrical receptacles. The glass window moves vertically for access to the interior. Four stopcocks in the unit provide capability for the use of water supply, water return, air and vacuum. The fume hood protects 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 exhausted. The fume hood exhaust blower and gum bath exhaust blower should not be operated at the same time.
- o. Gas Alarm System. The gas alarm system consists of a main control unit (cabinet assembly) and two remote detector assemblies. The main control unit is wall mounted on the roadside and connects electrically to the two detector assemblies. The system operates on 110V, 60Hz, single-phase power supplied by A1CB22 located in the MAIN POWER PANEL. The main control unit supplies 5.5 VDC to the detectors. The alarm is calibrated for propane and has a setting of 20 to 40 percent of the lower explosive limit (lel) of gasoline. An indicating meter in the control unit shows the concentration being monitored and adjustable dual-level alarm circuits are triggered whenever a concentration exceeds the lel. The alarm alerts personnel of combustible mixtures that could cause explosions or cause fires, and automatically activates the air purge system.
- p. Gas-Oil Distillation Unit. The gas-oil distillation unit is mounted on the countertop to the left of the side door. This unit is used to conduct ASTM test D-86.
- q. Grease Dropping Point Apparatus. The dropping point apparatus is stored in overpack box 6 and is used for ASTM test D-566. It performs dropping point determinations for quality control and classification of lubricating greases and is equipped with 400-ml oil bath, 1/40 hp stirrer, heater and dropping point assembly. It includes a chromium plated grease cup, test tube with cup support indentations, thermometer depth gauge, polished metal rod and cork ring guide. The bath rests on a 550W stepless control heater with reference dial and refractory top plate. It has a temperature range from ambient to 350°F (177°C) and a heater range from 0 to 550W.
- r. Grease Working Machine. The grease working machine is for ASTM test D-217. It is hand-operated, portable and stored in laboratory cabinet U. The machine measures the consistency of lubricating grease by penetration of standard cone.
- s. Gum Bath. The gum bath is mounted on the front wall curbside and is used in ASTM test D-381. It is used to determine the existent gum in motor gasoline, aviation gasoline and turbine fuels. It operates on 110V, 60Hz, single-phase power supplied by A1CB18 located in the MAIN POWER PANEL. There is a thermometer well provided in the center of the bath to accommodate a thermometer with a temperature range of 20 to 760°F (-5 to 400°C). An indicating and controlling pyrometer, and an air flowmeter and an air regulator valve. The gum bath utilizes steam supplied from the high pressure boiler which is located adjacent to the bath and connected to it by appropriate valving and piping. The exhaust blower is activated by a switch located on the left side wall near the freezer. The gum bath exhaust blower and fume hood exhaust blower should not be operated at the same time.
- t. Harvard Trip Laboratory Balance. This balance is stored in laboratory cabinet G5. It is a double-beam balance. The upper beam is graduated from 0 to 10 grams in 0.1 gram divisions. The lower beam is graduated from 0 to 200 grams in 10 gram divisions. The capacity of the scale is 2000 grams. It has a sensitivity of 0.1 gram. It is provided with two removable stainless steel pans.

- u. High Pressure Boiler (Steam Super Heater). The high pressure boiler is mounted on the front wall curbside to the right of the gum bath and is designed for use in ASTM test D-381. It operates on 110V, 60Hz, single-phase power supplied by A1CB19 located in the MAIN POWER PANEL. It is a circulation heater used to raise the temperature of steam which it receives from the low pressure boiler (steam generator) located in the mechanical room. It, in turn, then supplies this super heated steam to the gum bath. The high pressure boiler is equipped with a thermostatic control which can be set to desired temperatures up to 5505F (2885C). The auxiliary switch on the gum bath turns the high pressure boiler on or off.
- v. Ice Maker (Freezer). The ice maker is mounted into the front wall of the laboratory compartment to the left of the fume hood. It operates on 110V, 60Hz, single-phase power supplied by A1CB8 located in the MAIN POWER PANEL. It is a plug-in-type freezer unit.
- w. Ice Making Bag. The ice making bag is stored in the gas cylinder storage locker. It is used with the carbon dioxide gas to make dry ice which is used in performing certain tests in the laboratory. The bag is provided with fittings to attach it to the carbon dioxide gas cylinder.
- x. Jet Fuel Thermal Oxidation Tester. The JFTOT is designed to fulfill the test requirements of ASTM test D-3241. It operates on 110V, 60 Hz, single-phase power supplied by A1CB3 located in the MAIN POWER PANEL. It consists of a closed loop fuel system with a heater tube section, test filter and associated equipment for controlling and measuring the heater tube temperature. It uses water for bus connector and fuel cooling, and nitrogen to pressurize the fuel system.
- y. Kinematic Viscosity Baths. The kinematic viscosity baths are mounted on the roadside countertop and are designed to be used for ASTM test D-445. They operate on 110V, 60Hz, single-phase power supplied by A1CB5, located in the MAIN POWER PANEL. The baths each hold six glass capillary viscometers. Their temperature range is from ambient to 2125F (1005C). The solid-state controllers have a sensitivity of +0.015F (+0.0055C). Each bath has a motor driven stirrer to circulate the bath liquid, a pyrex bath jar, thermistor probe, thermometer holder, and stainless steel part covers, viscometer holders, viscometers and a bath thermometer.
- z. Laboratory Ovens. The laboratory ovens are mounted on the roadside countertop and are used for ASTM test D-2276. They operate on 110V, 60Hz, single-phase power supplied by A1CB4 located in the MAIN POWER PANEL. The ovens employ gravity convection as a method of heat transfer within their respective chambers. They are provided with two highly accurate hydraulic thermostats (one for control and one for high limit safety) from a single control. This provides a sensitivity to .455F (.255C). The ovens have a maximum operating temperature of 4375F (2255C). They are supplied with a thermometer with a temperature range of 0 to 4825F (2505C).
- aa. Low Pressure Boiler (Steam Generator). The low pressure boiler is located in the mechanical room, on the left side as you enter the compartment. It operates on 208V, 60Hz, 3-phase power supplied by A15CB5 located in POWER PANEL NO. 2. The low pressure steam boiler is used to preheat water from the water tank for the high pressure steam boiler which is used with the gum bath. The low pressure steam boiler has its own circulator pump 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 and sightglass. The automatic water feeder system will automatically fill the boiler to proper level and shut off water via an internal neat valve. The low pressure boiler also contains a pressure gauge, pressure cutoff switch and a pressure release valve to protect the boiler from damage if boiler pressure is too high, or water level is too low.
- ab. Manometer. The manometer is mounted on the laboratory curbside wall, above the RVP bomb bath and provides the basic standard of pressure measurement. It is used in the laboratory to calibrate the RVP gauges. 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 knob.

- ac. Oxidation Stability Bath. The oxidation stability bath is mounted on the curbside countertop and is designed to accomplish the requirements of ASTM tests D-525 and D-873. It operates on 110V, 60Hz, single-phase power supplied by A1CB15 located in the MAIN POWER PANEL. It consists of an electrically heated oxidation bath with a two-bomb capacity and a three-heat switch. It is provided with a condenser to reduce evaporation of the bath water and two stainless steel bombs for conducting tests.
- ad. Pensky Martens Flash Point Tester. The Pensky Martens flash point tester is stored in laboratory cabinet A2 and is designed to comply with the requirements specified in ASTM test D-93. It operates on 110V, 60Hz, single-phase power supplied from a convenience outlet. It is an electrically heated closed-type unit, with two thermometers, one with a range of 20 to 2305F (-6.15C to 1105C), and the other with a range of 200 to 7005F (935C to 3715C). The apparatus is used to determine the flash point of fuel oils.
- ae. Penetrometer. The penetrometer is stored in laboratory cabinet K4 and is designed to meet the requirements of ASTM test D-217. The penetrometer is used to measure penetration of grease with a penetration cone. The penetrometer has a dial for measuring depth of penetration up to 38 millimeters on a single sweep of the dial needle. The unit is supplied with stainless steel plunger bearings, preliminary setting and fine pitch micrometer adjustments, clutch, ASTM 2.5 gram needle, and a 50 gram weight.
- af. Pressure Recording Gauge. The pressure recording gauge is mounted on the wall adjacent to the oxidation stability bath and is used to perform ASTM tests D-525 and D-873. It is a two-pen-type recording gauge with clock mechanism. It has a range of from 0 to 200 pounds (90.8 Kg/sq cm) in 8-pound divisions (.9 Kg/sq cm) recording charts and an ink set. One complete revolution around the circular chart is equivalent to 24 hours. The recording pressure gauge is used to provide a continuous record of test results of the bombs under test in the oxidation stability bath.
- ag. Reid Vapor Testing Bath. The RVP bath is mounted on the curbside countertop and is designed for ASTM tests D-323 and D-1267. It operates on 110V, 60Hz, single-phase power supplied by A1CB16 located in MAIN POWER PANEL. It consists of the bath, a rack with a 3 bomb capacity, a 1/30-hp motor and stirrer, a thermometer, an immersion heater, a thermoregulator. It is provided with bombs for testing that are stored in a rack on the wall adjacent to the RVP bath and pressure gauges which hang in brackets above the bomb rack.
- ah. Refrigerator. The refrigerator is mounted on the curbside of the laboratory. It operates on 110V, 60Hz, single-phase power supplied from A1CB6 located in the MAIN POWER PANEL. It is designed and constructed for explosion-proof operation. Components that might create sparks or arcing have been enclosed and insulated against volatile, explosive fumes and gases that might escape from containers stored in its interior or envelope its exterior. It provides 6.5 cubic feet (0.182 cubic meters) of refrigerated storage.
- ai. Sampling and Gaging Kit. The sampling and gaging kit is used to perform ASTM tests D-4057, D-287, D-1085, D-1086, D-1250, and D-1298. It is a portable petroleum testing kit which is stored in laboratory cabinet D. It consists of the carrying case, shoulder strap, gravity computer, cupcase thermometer, hydrometer cylinder, gasoline indicating paste, water indicating paste, image tape and bob, weighted beaker sampler, and standard hydrometers.
- aj. Separometer. The separometer provides a quick, portable means for field and laboratory use to rate the ability of aviation turbine fuels to release entrained or emulsified water when passed through fiberglass coalescence material. The test provides a measure of surface active materials in aviation turbine fuels, which are known to affect the ability of filter separators to separate free water from fuel. The apparatus is a portable self-contained unit operating on an internal rechargeable battery. The unit may be operated at sites where no AC power is available or it may also be operated while connected to an AC power line.
- ak. Tag Closed Cup Flash Point Tester. The tag flash point tester is stored in laboratory cabinet J2 and is designed to comply with the requirements specified in ASTM test D-56. It operates on 110V, 60 Hz, single-phase power supplied from a convenience outlet. It is a closed type, electrically operated unit and is used to determine the flash point of mobile liquids except fuel oils, flashing below 1755F (675C). It consists of a water bath and cover mounted on the base, overflow drain, brass test cup and standard flashing mechanism mounted on the cover. Two 20 to 2305F (6.65 to 1105C), thermometers are used with the equipment.

- al. Tetraethyl Lead Apparatus. The tetraethyl lead apparatus is stored in laboratory cabinet G2 and is used to test for tetraethyl lead in petroleum in accordance with ASTM test D-2547. The tetraethyl lead apparatus consists of a boiling flask, heating tube, glassware and a rheostat.
- am. Utility Bath. The utility bath is stored in laboratory cabinet U and is designed for ASTM tests D-91 and D-1796. The bath is a constant temperature general utility bath and is thermostatically controlled. It operates on 110V, 60Hz, single-phase power supplied from a laboratory convenience outlet. It is provided with an adjustable support shelf and thermometer with holder and O-ring.
- an. Water Detector Kit. The water detector kit is contained in a carrying case and is stored in laboratory cabinet G5. It operates on power supplied by either an external battery, an internal rechargeable battery, or 110V, 60Hz, single-phase power. It is used for ASTM test D-3240 measures the amount of undissolved water in kerosene-type jet fuels. It can be used on other fluids by following the proper procedures.

## CHAPTER 2

### OPERATING INSTRUCTIONS

#### Section I. DESCRIPTION AND USE OF CONTROLS AND INDICATORS

##### Alphabetical Index

Paragraph Title	Paragraph
Operator Controls and Indicators .....	2-1

#### 2-1. OPERATOR CONTROLS AND INDICATORS.

All operators should become thoroughly familiar with the operator’s controls and indicators and with the proper operating procedures for Modular Base Petroleum Laboratory (MBPL). Certain precautions must be observed in the operation of equipment and its components. Exterior controls and indicators are shown in Figure 2-1 and described in Table 2-1. Circuit breaker locations are shown in Figures 2-2 and 2-3 and described in Tables 2-2 and 2-3. Interior operator’s controls and indicators are shown in Figures 2-4 through 2-13 and are described in Tables 2-4 through 2-13. Operator’s controls and indicators for items not listed in these tables are described in their respective TMs (See Appendix A for TM number).

- a. Exterior Controls and Indicators. Figure 2-1 and Table 2-1 list exterior controls and indicators.

**Table 2-1. Exterior Controls and Indicators**

Index Number	Control or Indicator	Function
1	Water Inlet Water Inlet Adapter	Connection mates to a MS27020-10 male connector.
2	Garden Hose Adapter	Two adapters provided to connect a standard garden hose to the MBPL. One with male and one with female connector.
3	Water Inlet/Outlet Valve Selection Lever	Selects position of water inlet/outlet valve. Either IN or OUT for water directional flow.
4	Power Panel Purge Alarm Buzzer	Indicates by sound if one of purge doors is not opened when purge cycle is initiated.
5	Power Input Connector/ Receptacle	Input power connector for MBPL.
6	Outlet, 120V, 60 Hz	Receptacle for supplying generator power.
7	Ground Lug	Attach point for ground cable to ground MBPL.
8	Telephone Connection	External convenience outlet.



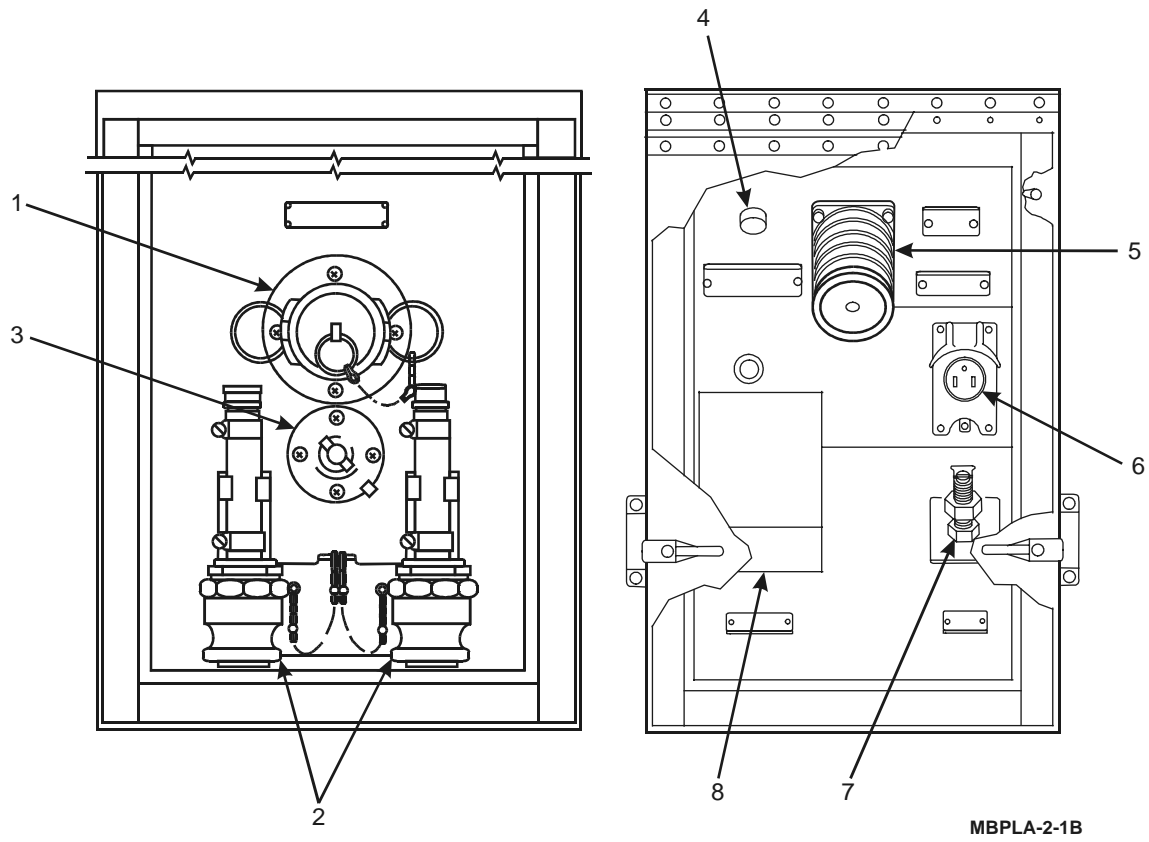
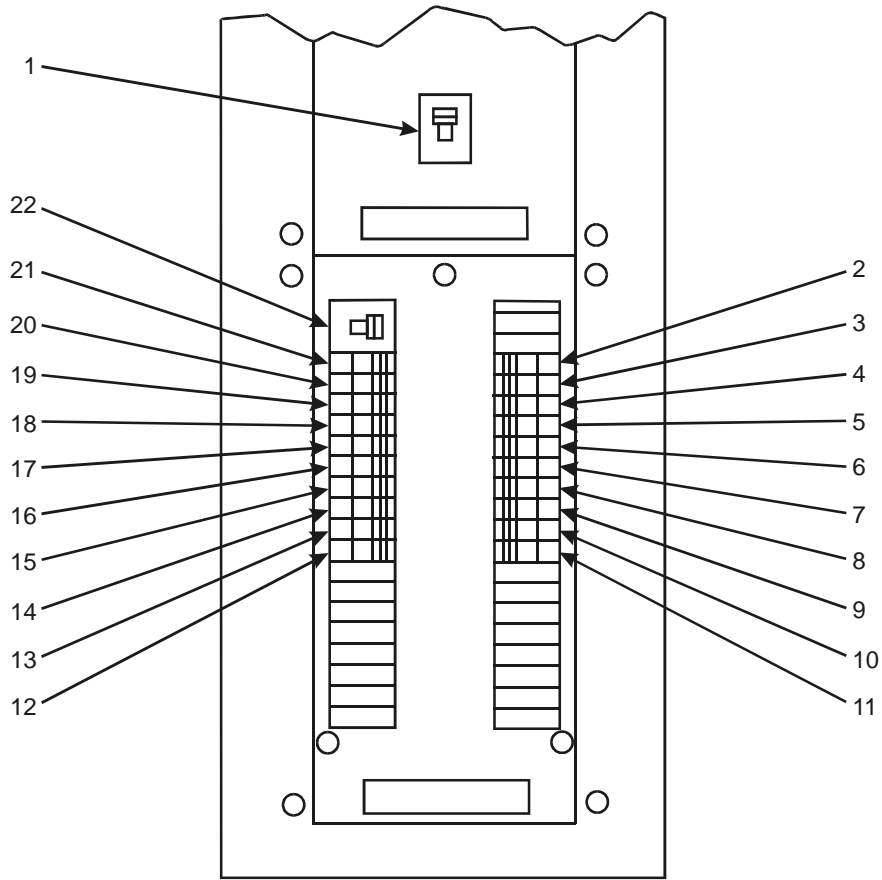


Figure 2-1. Exterior Controls and Indicators

- b. Power Panel Assemblies. Figure 2-2 and 2-3 and Tables 2-2 and 2-3 list the circuit breakers located in Main Power Panel and Power Panel No. 2.

**Table 2-2. Main Power Panel Controls and Indicators**

Index Number	Control or Indicator	Function
1	A1CB1	Main circuit breaker. Provides 225A circuit protection for main power input. In the ON position, applies power to all system circuit breakers.
2	A1CB3	Provides 20A circuit protection for JFTOT and Utility No. 7.
3	A1CB5	Provides 15A circuit protection to Ovens and Utility No. 4.
4	A1CB7	Provides 20A circuit protection to Distillation Units.
5	A1CB9	Provides 15A circuit protection for Phase A, rear laboratory overhead lights.
6	A1CB11	Provides 15A circuit protection for Phase B, front laboratory overhead lights.
7	A1CB13	Provides 15A circuit protection for Phase C, blackout lights, three overhead lights (just forward of rear door) and gum bath and fume hood wall switch.
8	A1CB15	Provides 30A circuit protection for Oxidation Stability Bath and wall switch.
9	A1CB17	Provides 15A circuit protection for Water Heater.
10	A1CB19	Provides 15A circuit protection for Steam Super Heater (High Pressure Boiler).
11	A1CB21	Provides 20A circuit protection for Outside Receptacle (GFI).
12	A1CB22	Not Used
13	A1CB20	Provides 15A circuit protection for Fume Hood Utility Receptacle.
14	A1CB18	Provides 30A circuit protection for Gum Bath.
15	A1CB16	Provides 15A circuit protection for RVP Bath and Utility No. 5.
16	A1CB14	Provides 15A circuit protection for the Sump Pump.
17	A1CB12	Provides 20A circuit protection for Muffle (Burnout) Furnace.
18	A1CB10	Provides 15A circuit protection for Utility No. 6.
19	A1CB8	Provides 15A circuit protection for Centrifuge, Freezer, and Utility No. 2 in mechanical room.
20	A1CB6	Provides 15A circuit protection for Refrigerator and Utility No. 3.
21	A1CB4	Provides 20A circuit protection to Viscosity Bath.
22	A1CB2	Provides 100A circuit protection for power input to Power Panel No. 2.

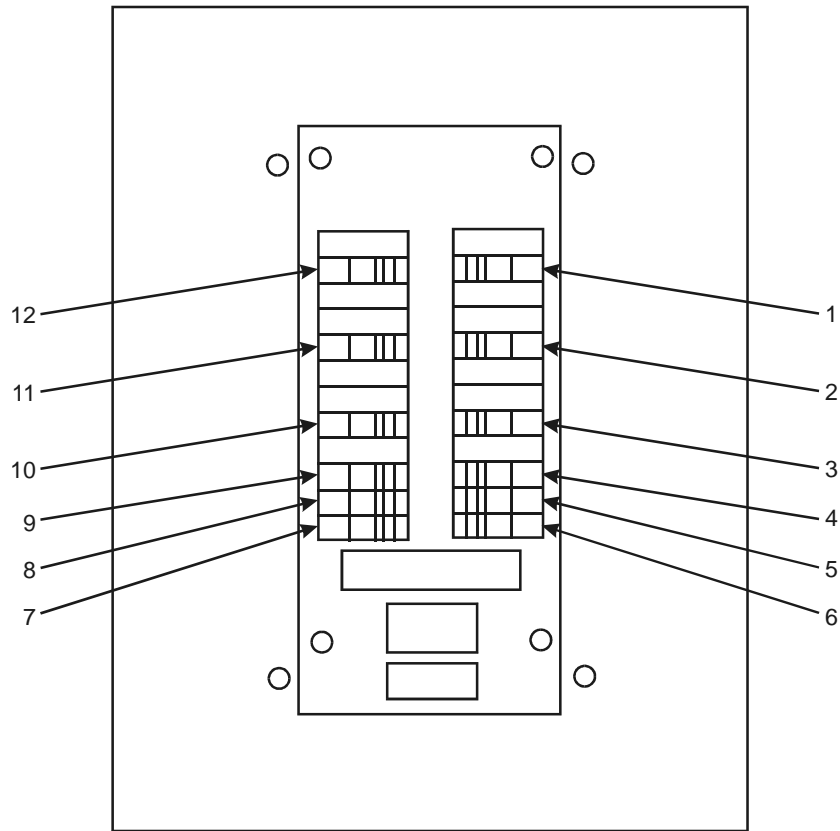


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Figure 2-2. Main Power Panel Controls and Indicators

**Table 2-3. Power Panel No. 2 Controls and Indicators**

Index Number	Control or Indicator	Function
1	A15CB2	Provides 20A circuit protection for ECU number 2.
2	A15CB4	Provides 20A circuit protection for ECU number 4.
3	A15CB6	Provides 20A circuit protection for Air Compressor.
4	A15CB8	Provides 15A circuit protection for Water Pump.
5	A15CB10	Provides 15A circuit protection for Mechanical Room Door Interlock and Lighting.
6	A15CB12	Provides 15A circuit protection for Utility No. 1.
7	A15CB11	Provides 15A circuit protection for Fume-Gum Bath and Fume Hood
8	A15CB9	Provides 15A circuit protection for Vacuum Pump.
9	A15CB7	Provides 20A circuit protection for Water Chiller.
10	A15CB5	Provides 45A circuit protection for Steam Generator (Low Pressure Steam Boiler).
11	A15CB3	Provides 20A circuit protection for ECU number 3.
12	A15CB1	Provides 20A circuit protection for ECU number 1.



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**Figure 2-3. Power Panel No. 2 Controls and Indicators**

c. Lighting Controls and Indicators. Figure 2-4 and Table 2-4 list the lighting controls and indicators.

**Table 2-4. Lighting Control and Indicators**

Index Number	Control or Indicator	Function
1	Rear Door Light Switches	Controls rear fluorescent light operation.
2	Rear Door Emergency Light Switch	Controls emergency light operation.
3	Rear Door Blackout Switch	Control laboratory blackout lights when rear door is opened.
4	Curbside Door Emergency Light Switch	Controls emergency light operation.
5	Curbside Door Light Switches	Controls forward fluorescent light operation.
6	Fume Hood Light Switch	Controls fume hood light in laboratory.
7	Mechanical Room Light Switch	Controls mechanical room fluorescent light operation.
8	Gum Bath Light Switch	Controls gum bath light in laboratory.
9	Mechanical Room Blackout Switch	Controls mechanical room blackout lights when mechanical room door is opened.
10	Curbside Door Blackout Switch	Controls laboratory blackout lights when curbside door is opened.

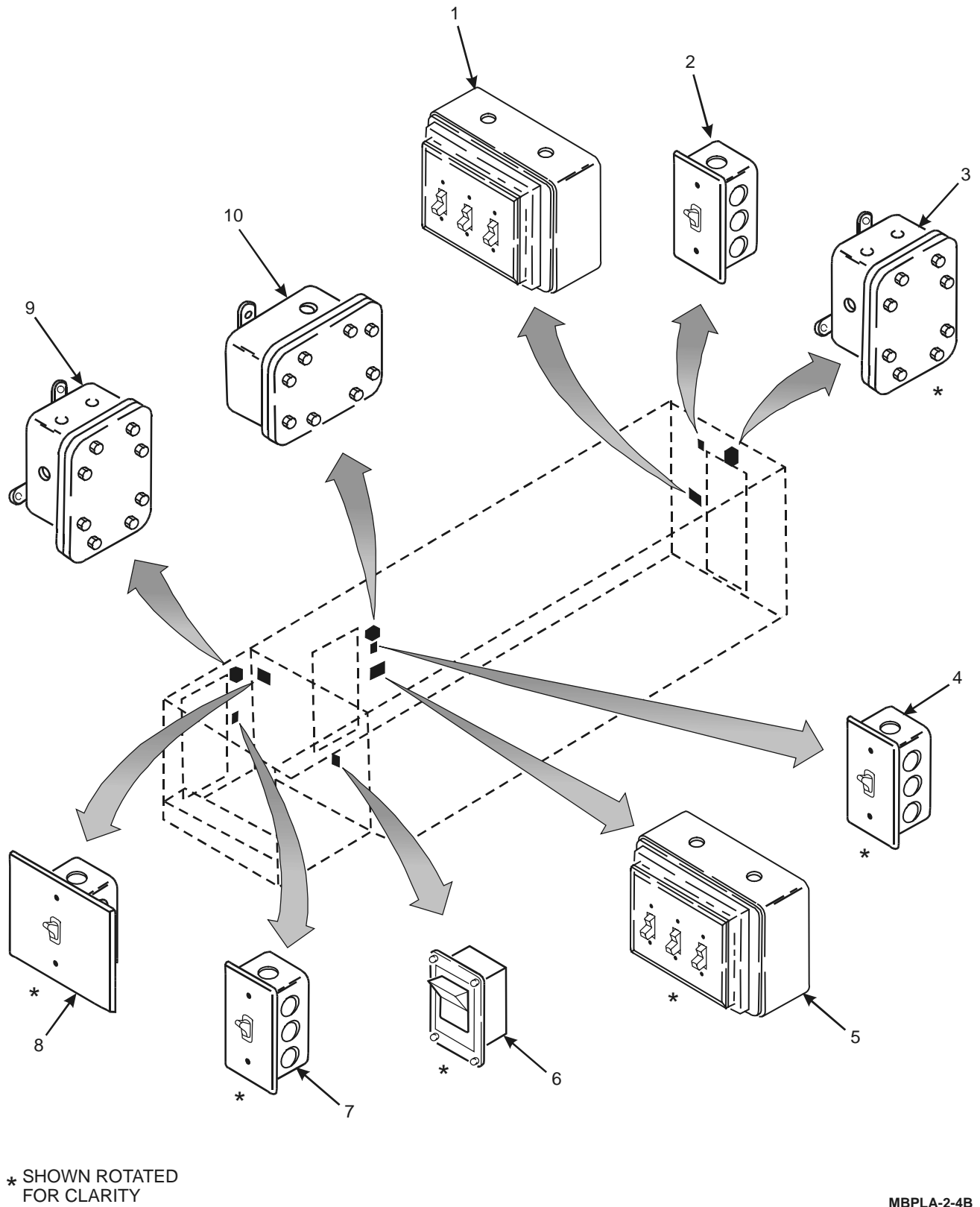
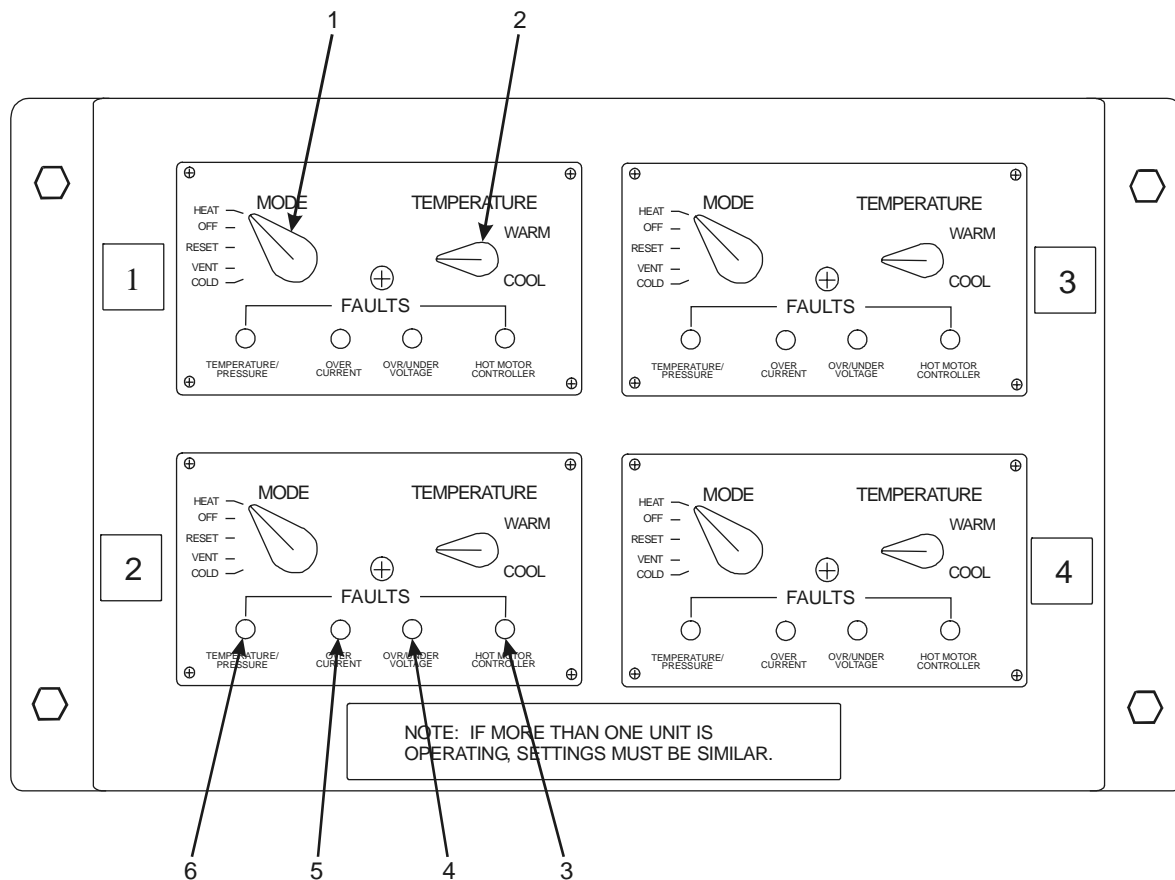


Figure 2-4. Lighting Controls and Indicators

d. ECU Controls and Indicators. Figure 2-5 and Table 2-5 list the controls and indicators for the ECU.

**Table 2-5. ECU Controls and Indicators**

Index Number	Control or Indicator	Function
1	Selector Switch	Selects mode of ECU operation.
2	Temperature Control (2) Fault Indicators	Controls temperature of Mod Lab A.
3	Hot Motor Controller	Illuminates if motor controller overheats.
4	Over/Under Voltage	Illuminates if motor controller is operating outside voltage range.
5	Over Current	Illuminates if motor controller is operating with too high amp draw.
6	Temperature/Pressure	Illuminates if the high pressure cutout, low pressure cutout, coil frost, or thermostatic switch opens.



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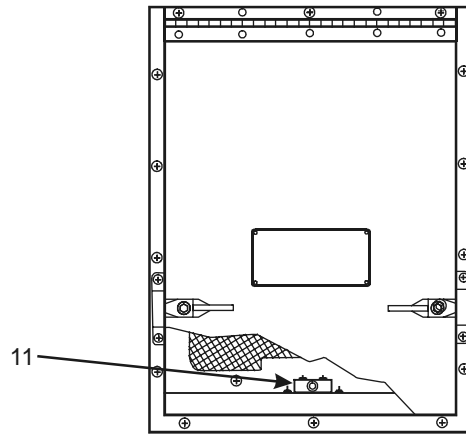
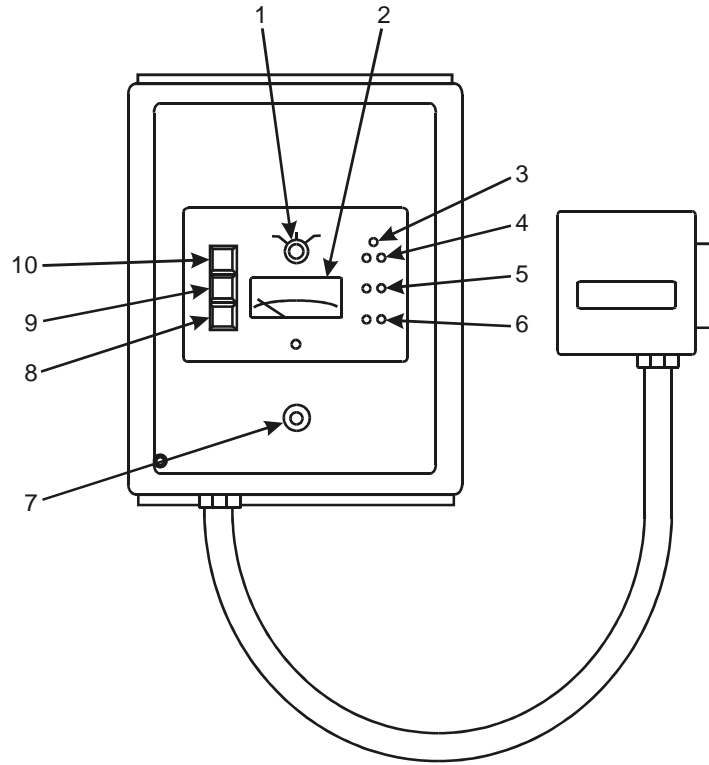
**Figure 2-5. ECU Controls and Indicators**

- e. Purge System and Gas Alarm Controls and Indicators. Figure 2-6 and Table 2-6 list the controls and indicators of the purge system and gas alarm system.

**Table 2-6. Purge System and Gas Alarm Controls and Indicators**

Index Number	Control or Indicator	Function
1	Detector Selector Switch	In AUTO mode meter responds to channel with strongest signal. Turned to channel 1 or channel 2 position meter responds to signal from selected channel.
2	Indicator Meter	Indicates concentration of combustible gas at detection point.
3	Gas Alarm Pilot Light, Green	Indicates gas alarm power is on and detector circuit is energized.
4	Alarm Indicators	Illuminates to indicate which remote detector an alarm condition is present at. Light goes out when alarm reset switch is pressed and no alarm conditions remains.
5	Warning Indicators	Illuminates to indicate which remote detector a warning condition is present at. Light goes out when alarm reset switch is pressed and no warning conditions remains.
6	Fail Indicators	Illuminates to indicate which remote detector a fail condition is present at. Light goes out when alarm reset switch is pressed and no fail conditions remains.
7	Alarm Reset Switch	When pressed, deactivates holding circuits of alarm and warning relays if a safe gas condition has been restored at remote detector. If a safe condition does not exist, unit cannot be reset.
8	Warn/Test Light, Yellow	Indicates combustible gas condition exceeding low alarm setting exists at remote detector, or when alarm test switch has been activated. When pressed, provides a simulation of an alarm level of gas concentration at remote detector. Also provides a functional check of the analyzer and remote alarm circuit.
9	Gas Alarm Fail Light, Blue	Indicates gas alarm failure or malfunction.
10	Gas Alarm Light, Red	Indicates combustible gas warning
11	Purge Doors Limit Switches	Provides signal to purge alarm buzzer if one of purge doors is not opened when purge cycle is initiated.





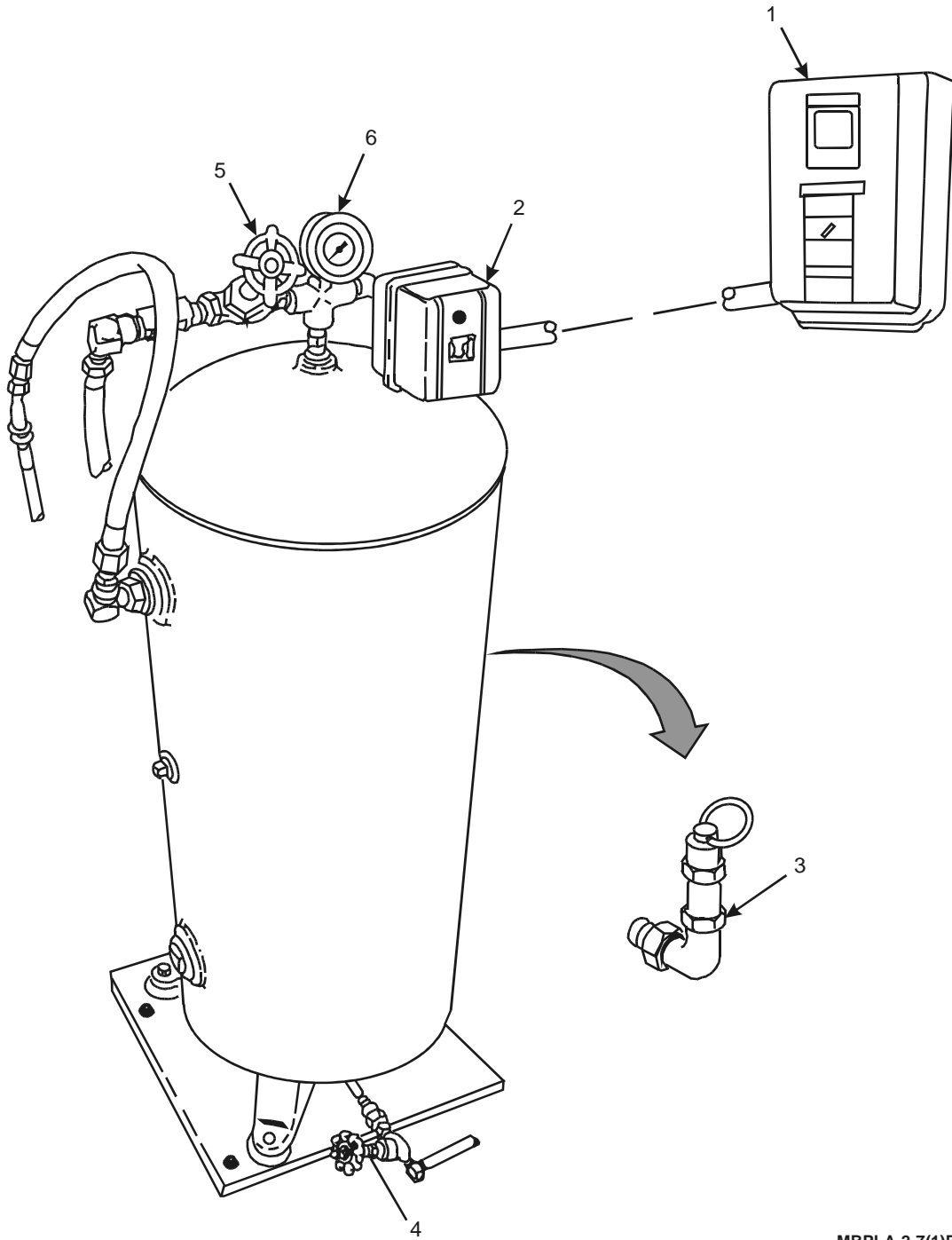
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Figure 2-6. Purge System and Gas Alarm Controls and Indicators

f. Air System Controls and Indicators. Figure 2-7 and Table 2-7 list the controls and indicators for the air system.

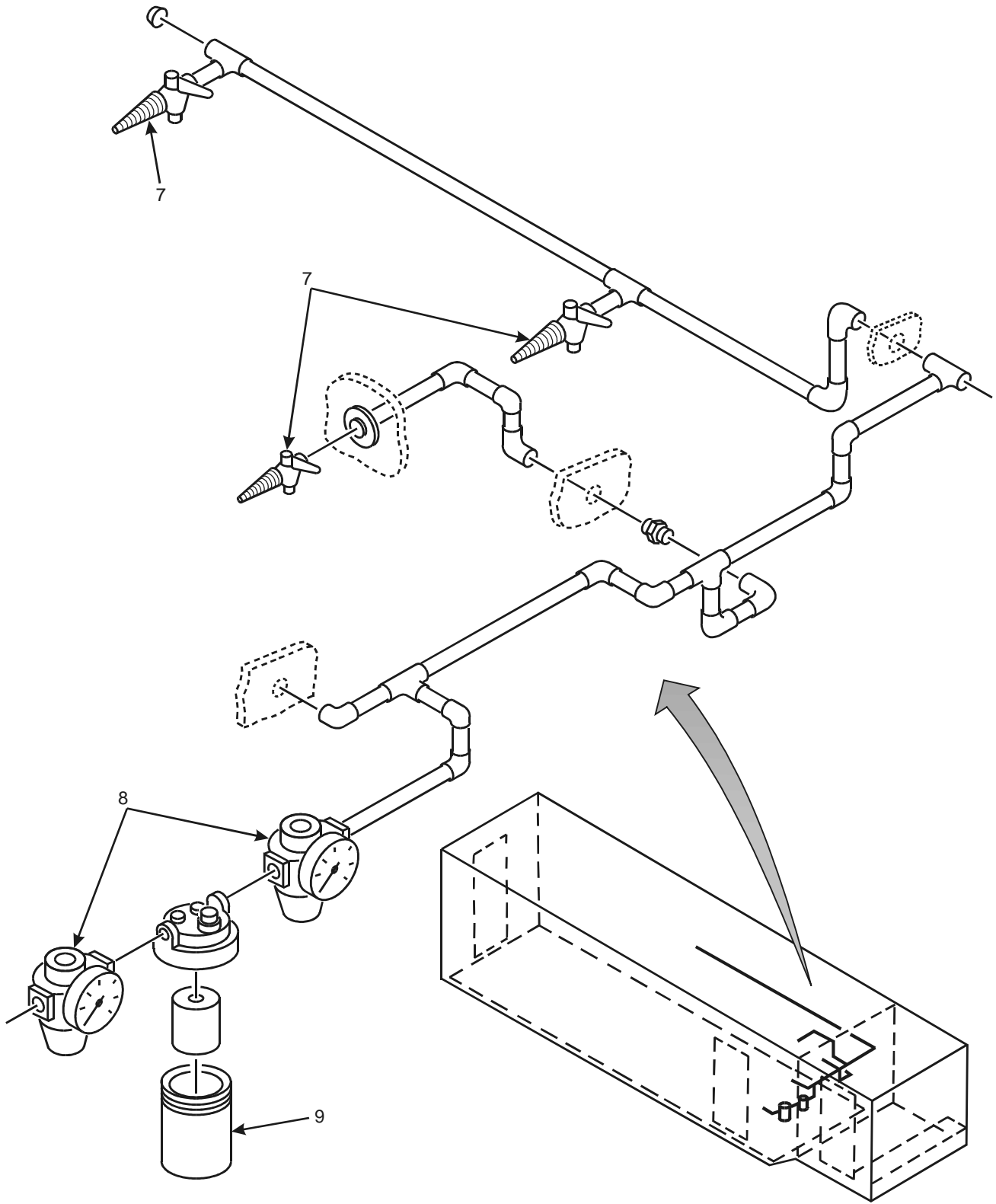
**Table 2-7. Air System Controls and Indicators**

Index Number	Control or Indicator	Function
1	Air Compressor ON/OFF Controller	Energizes motor start/stop circuit at pressure switch.
2	Pressure Switch	Starts and stops compressor automatically at required pressures. Compressor starts at 60 psi, and stops at 120 psi.
3	Safety Valve	Provides safety relief if air pressure in tank goes above 150 psi.
4	Tank Drain Valve	Provides tank moisture drain.
5	Air System Isolation Valve	Provides isolation of air system.
6	Air Pressure Gauge	Indicates air pressure in tank.
7	Air Service Valves	Provides service access to air system. Two stopcock valves are located on roadside wall, one on curbside wall, and one in fume hood.
8	Air Regulators	Provides adjustment for regulated air pressure. Two air regulators are located inside the mechanical room (behind boiler) and one on the curbside wall.
9	Air Filter	Provides filtered air to gum bath piping and has red pop up piston to indicate filter element replacement. The air filter is located inside the mechanical room (behind boiler).
10	Globe Valves	Provides regulated air pressure to RVP Test System components.



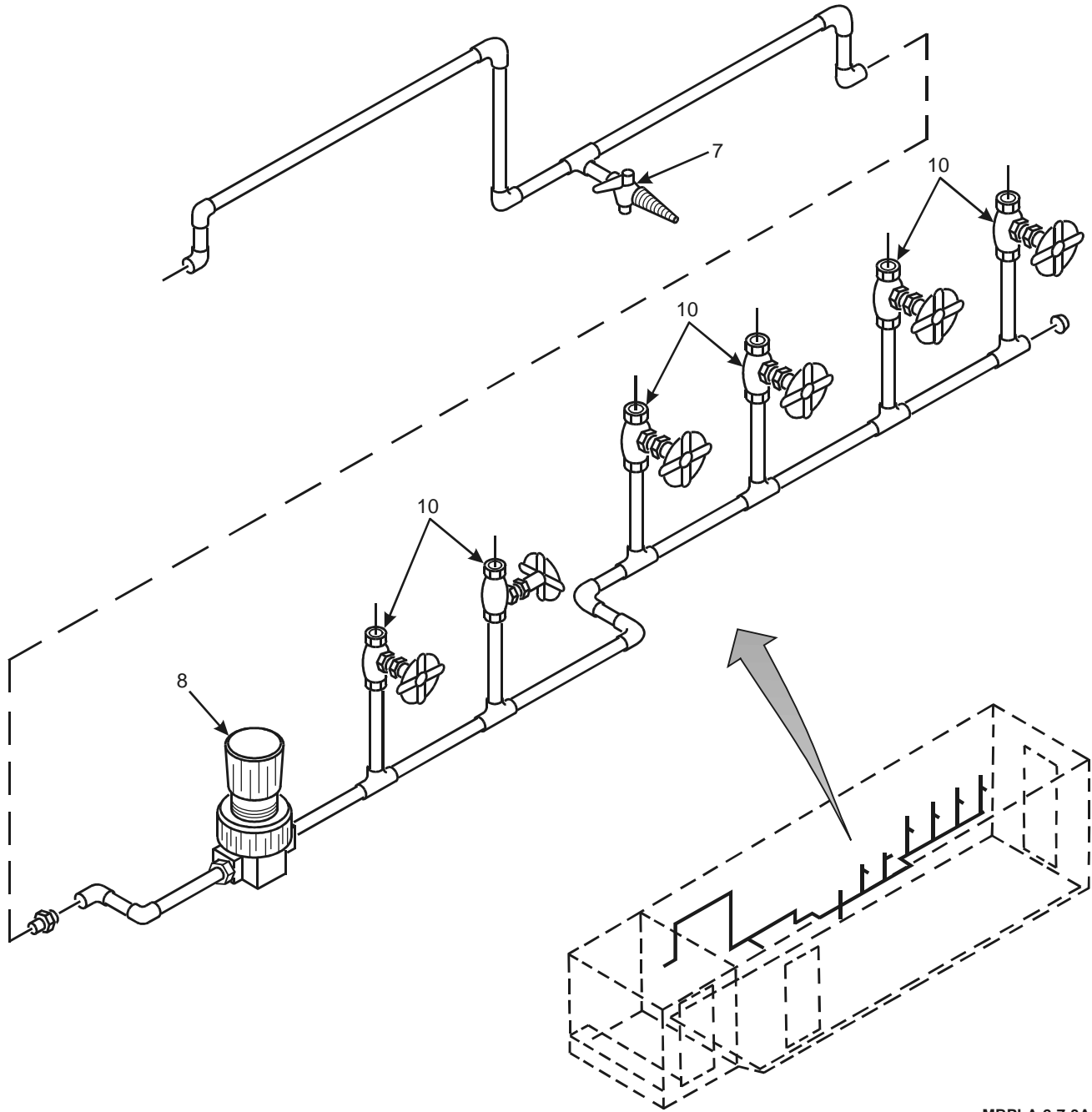
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Figure 2-7. Air System Controls and Indicators (Sheet 1 of 3)



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Figure 2-7. Air System Controls and Indicators (Sheet 2 of 3)



MBPLA-2-7-3A

Figure 2-7. Air System Controls and Indicators (Sheet 3 of 3)

g. Vacuum System Controls and Indicators. Figure 2-8 and Table 2-8 list the controls and indicators for the vacuum system.

**Table 2-8. Vacuum System Controls and Indicators**

Index Number	Control or Indicator	Function
1	Vacuum Pump START/STOP Controller	Starts and stops vacuum pump for system operation.
2	Vacuum System Oil Overflow Drainage Valve	Provides oil overflow drainage.
3	Vacuum System Isolation Valve	Provides system isolation (Removes vacuum from laboratory lines).
4	Vacuum System Service Valves	Provides system service access to vacuum system. Two are located on roadside wall and one in fume hood.
5	Vacuum Gauge Isolation Valve	Provides isolation of gauge to system.
6	Vacuum/Pressure Gauge	Indicates system vacuum in inches of mercury (HG).

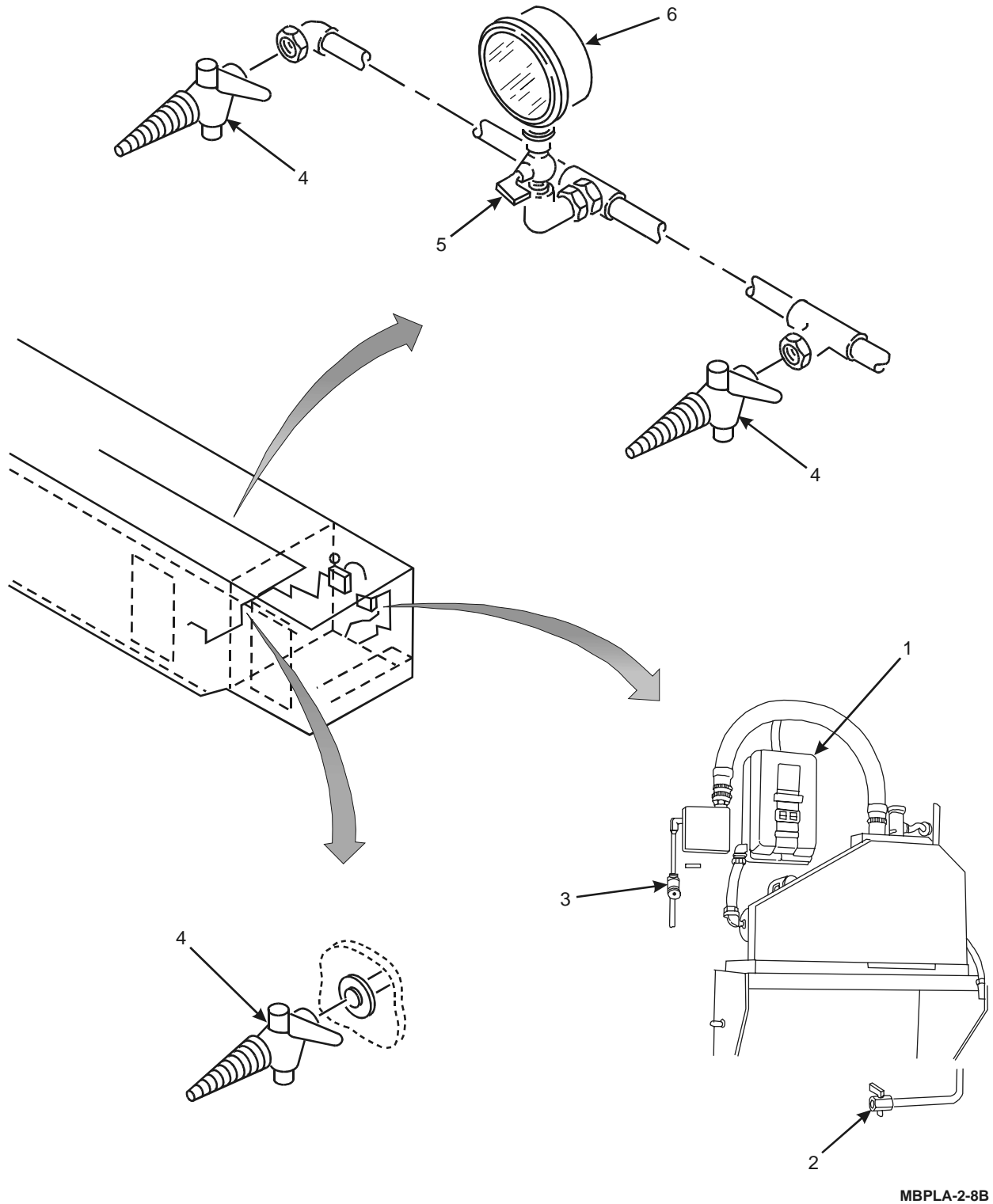


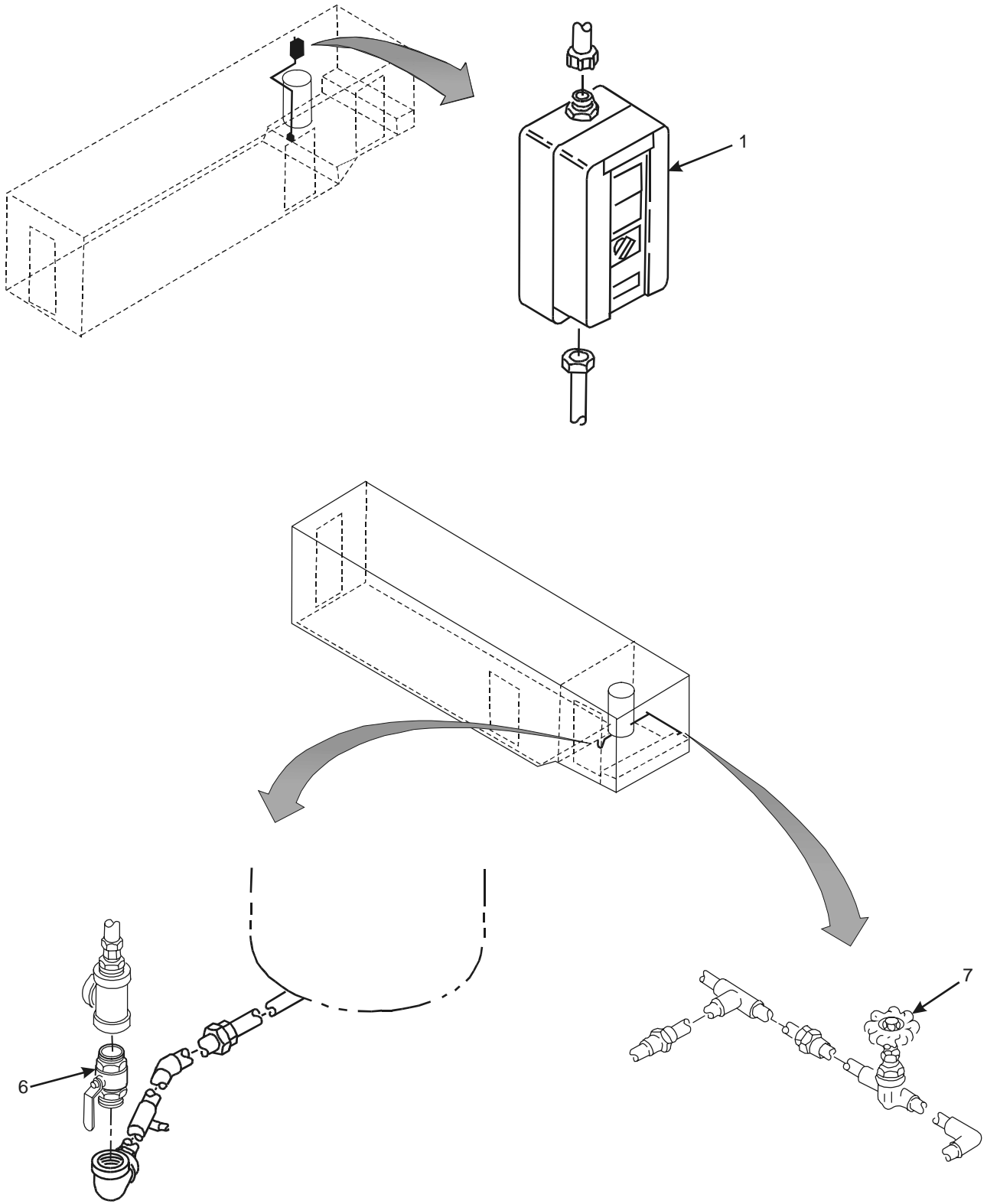
Figure 2-8. Vacuum System Controls and Indicators

- h. Water System Controls and Indicators. Figure 2-9 and Table 2-9 list the controls and indicators for the water system.

**Table 2-9. Water System Controls and Indicators**

Index Number	Control or Indicator	Function
1	Water Pump ON/OFF Controller	Energizes motor start/stop circuit at pressure switch.
2	Pressure Switch	Starts and stops water pump automatically at required pressures.
3	Water Pressure Gauge	Indicates water pressure maintained by water pump during operation.
4	Water System Service Valves (Supply)	Provides system service access to water system in MBPL. Three supply valves are located on the roadside, one in the fume hood and three on the curbside.
5	Water System Service Valves (Return)	Provides system service access to water system in MBPL. Three return valves are located on the roadside and one in the fume hood.
6	Pump Suction Valve from Water Tank Bottom	Isolates water to water pump.
7	Water Supply Chiller	Isolates water supply to chiller.
8	Main Water Feed from Pump	Isolates water from water pump to system lines.
9	Boiler Water Feed	Isolates water supply to boiler.
10	Water Flow Direction	Provides water flow direction to system.
11	Pump Suction Tank Fill	Provides directional path of water flow to either the water pump or water tank.
12	Input Valve Postfilter	Isolates water from water filter.
13	Input Valve Prefilter	Isolates water to water filter.
14	Return Water Drain	Provides drainage of water return lines.
15	Distillation Drain	Provides drainage of distillation unit.
16	Distillation Drain	Provides drainage of distillation unit.
17	Water System Drain	Provides drainage of water system lines.
18	Water Tank Drain	Provides drainage of water tank.
19	Filter Backwash	Provides drainage to backwash filter.
20	Water Pump Drain	Provides drainage of water pump.
21	Pump Suction Drain	Provides drainage of pump suction line from water tank bottom.
22	Chiller Water Return	Provides drainage of water chiller.
23	Water Supply Drain	Provides drainage of water supply line to laboratory.
24	Sump Tank Drain	Provides drainage of sump tank.
25	Hot Water Tank Supply Drain	Provides drainage of water supply line to hot water tank.
26	Oxidation Bath Drain	Provides drainage of oxidation bath.





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Figure 2-9. Water System Controls and Indicators (Sheet 1 of 7)

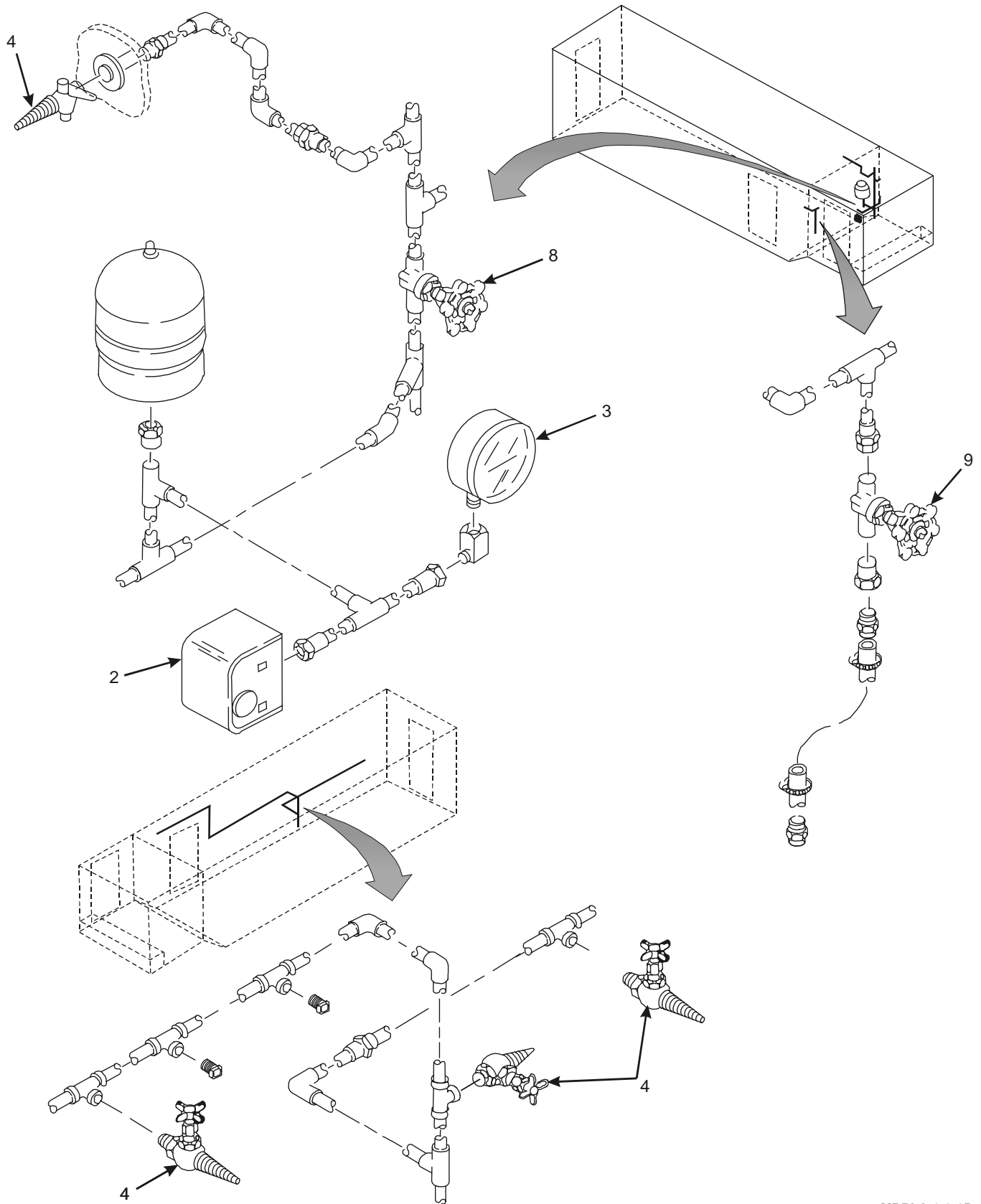
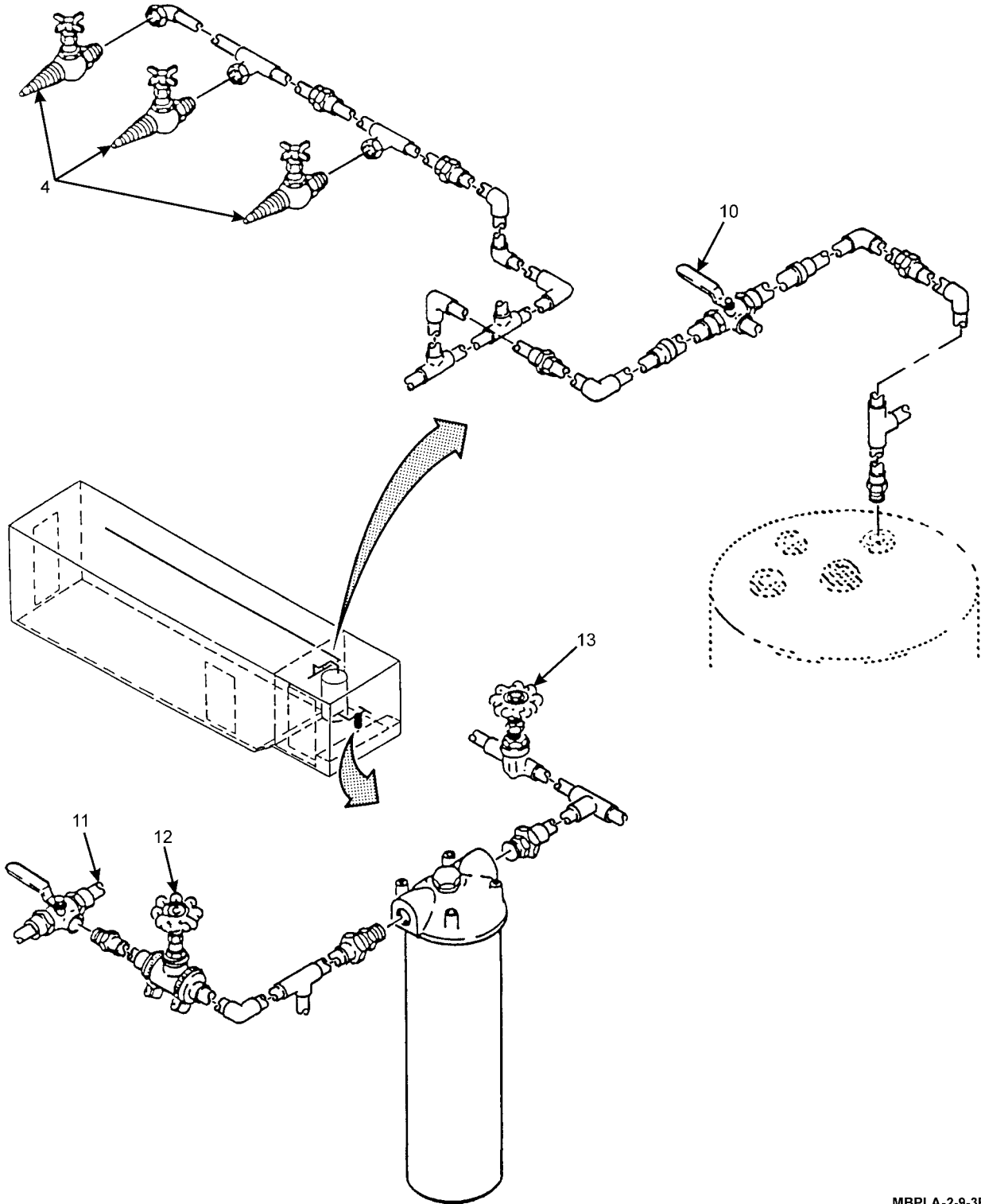


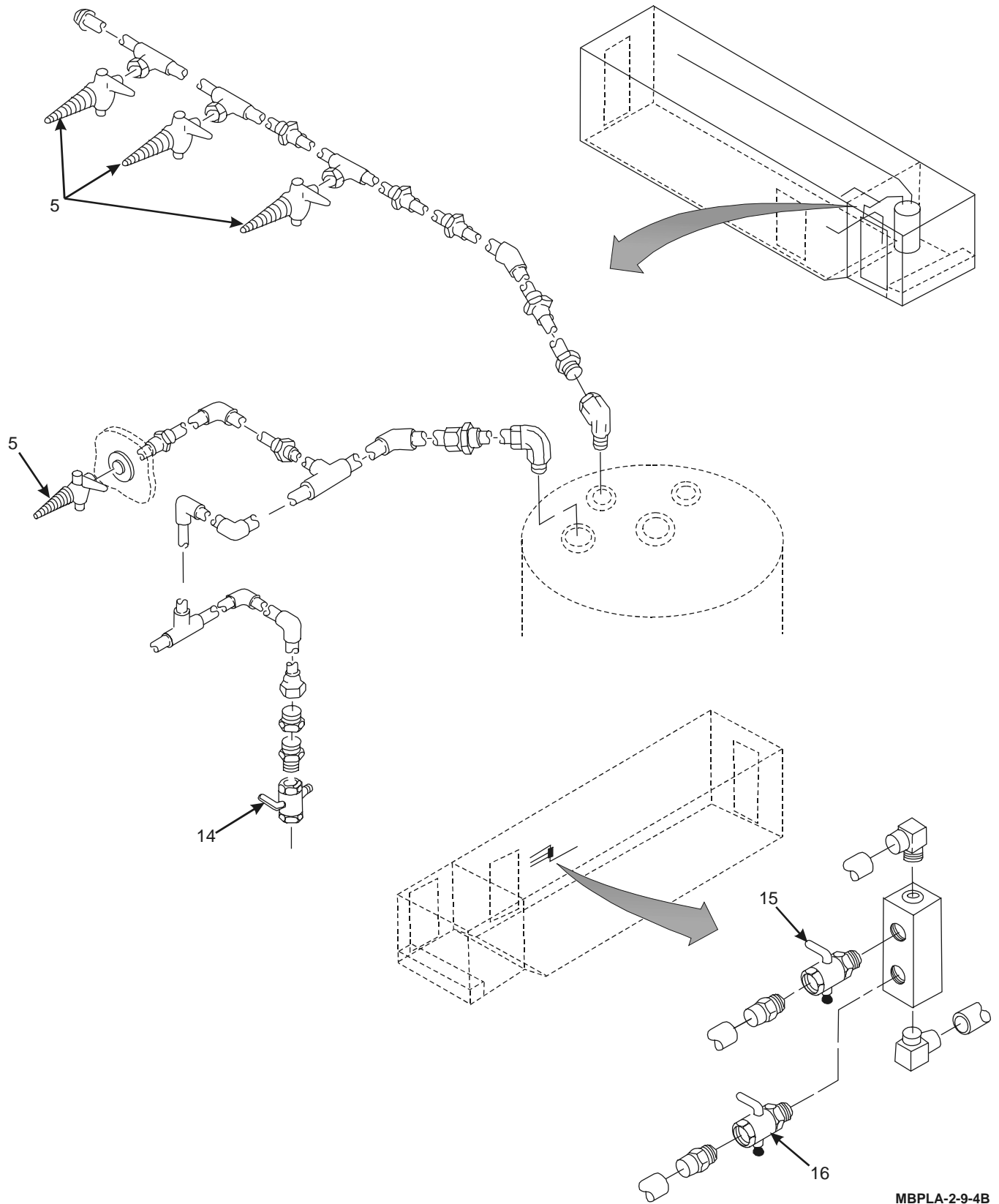
Figure 2-9. Water System Controls and Indicators (Sheet 2 of 7)

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Figure 2-9. Water System Controls and Indicators (Sheet 3 of 7)



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Figure 2-9. Water System Controls and Indicators (Sheet 4 of 7)

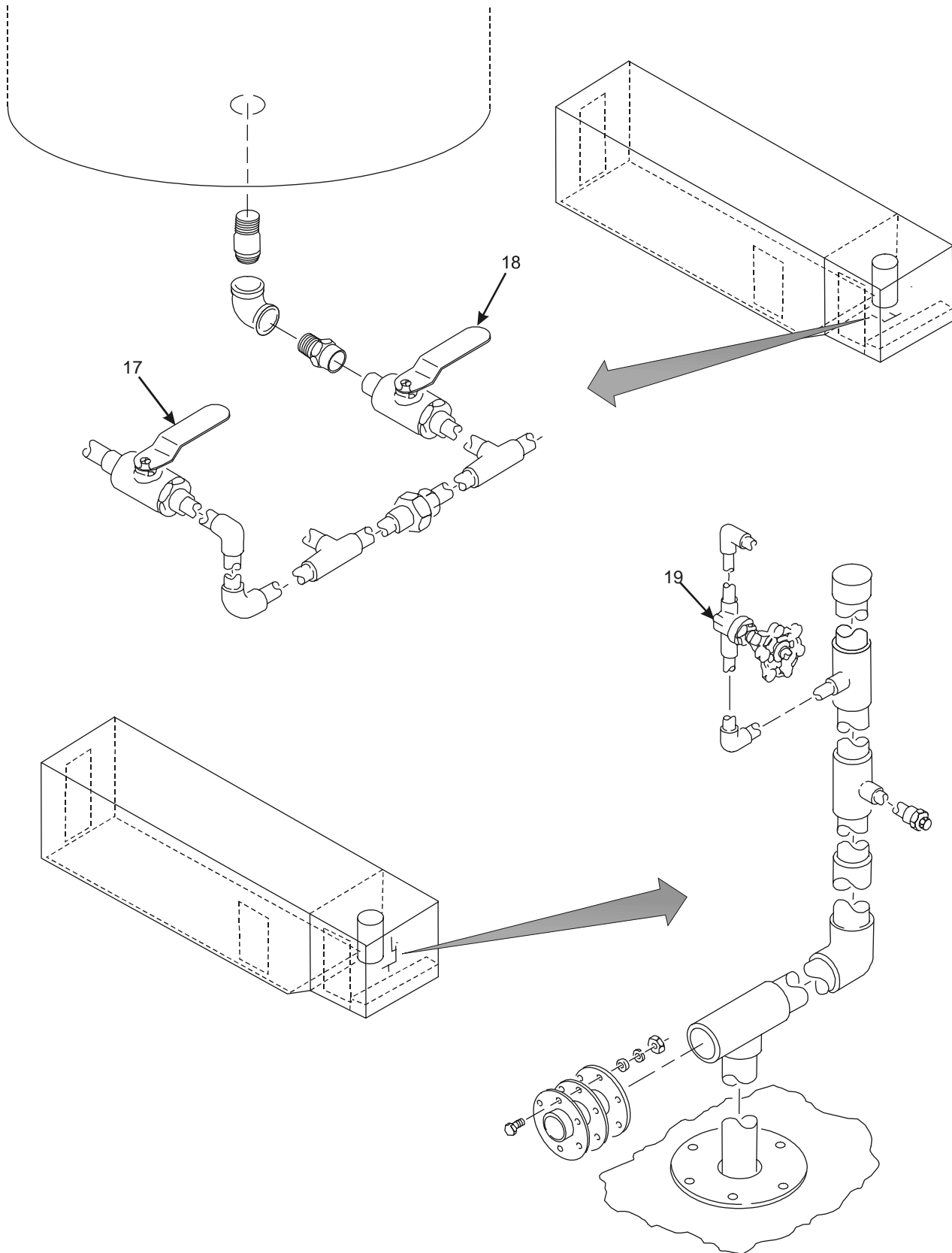
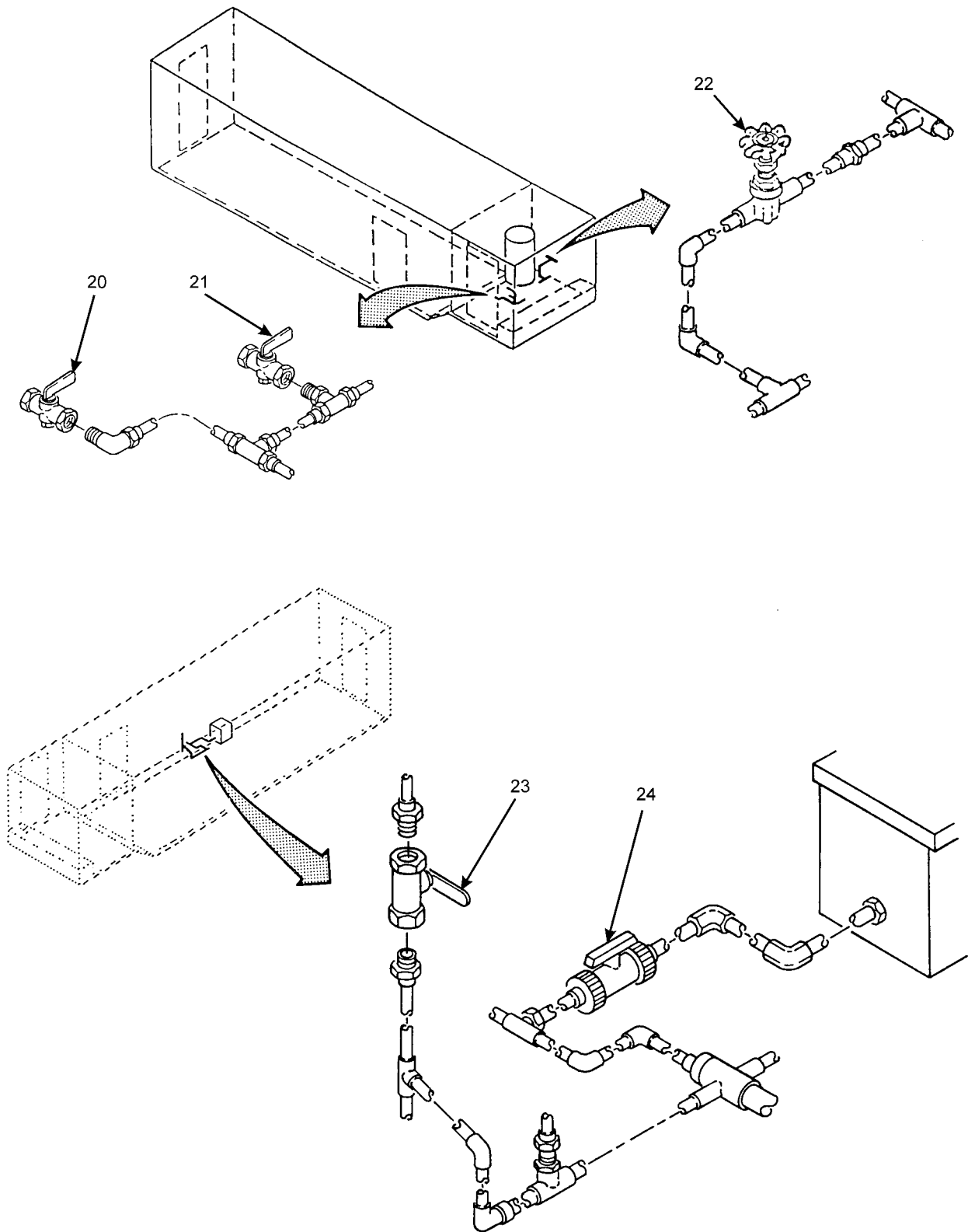


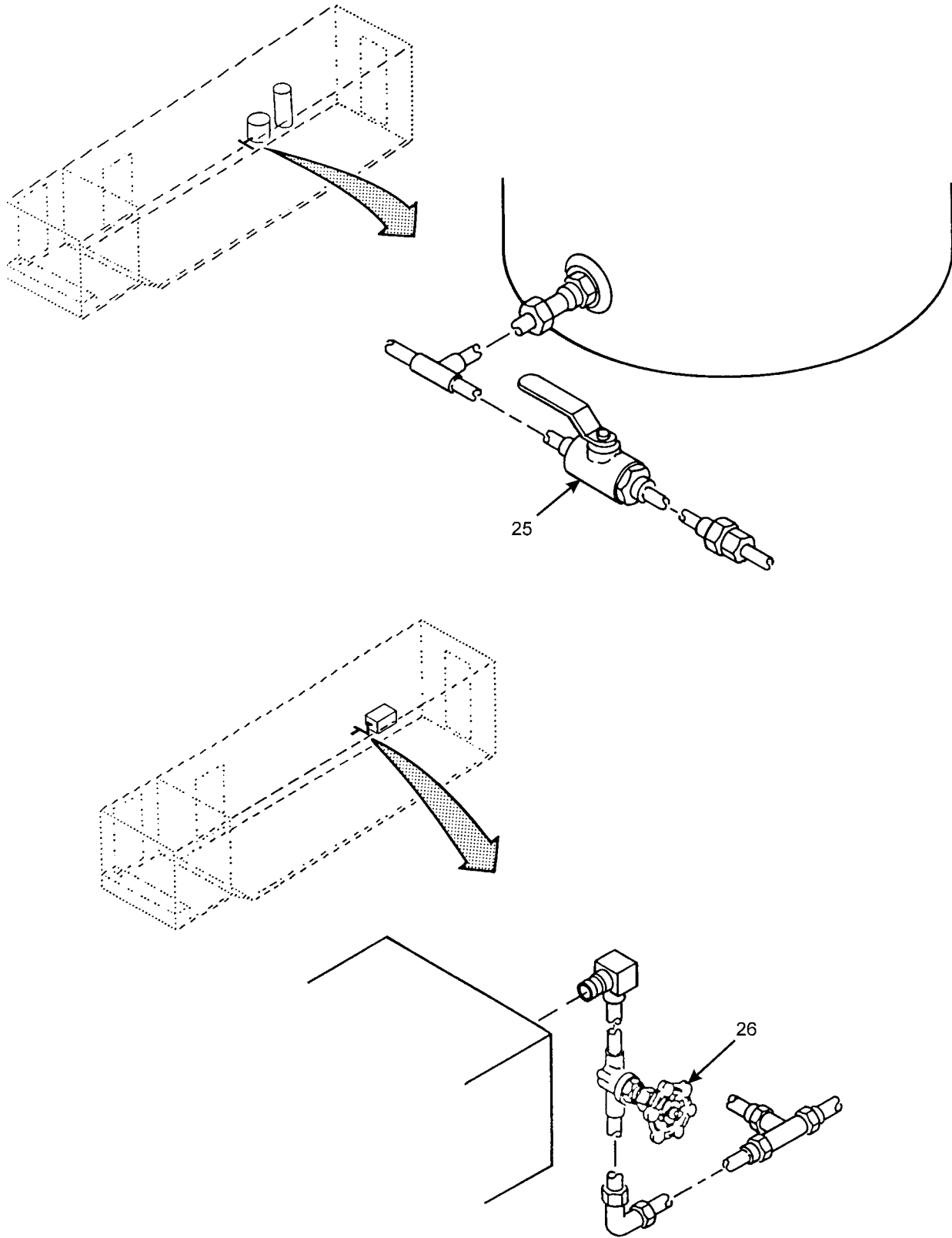
Figure 2-9. Water System Controls and Indicators (Sheet 5 of 7)

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Figure 2-9. Water System Controls and Indicators (Sheet 6 of 7)



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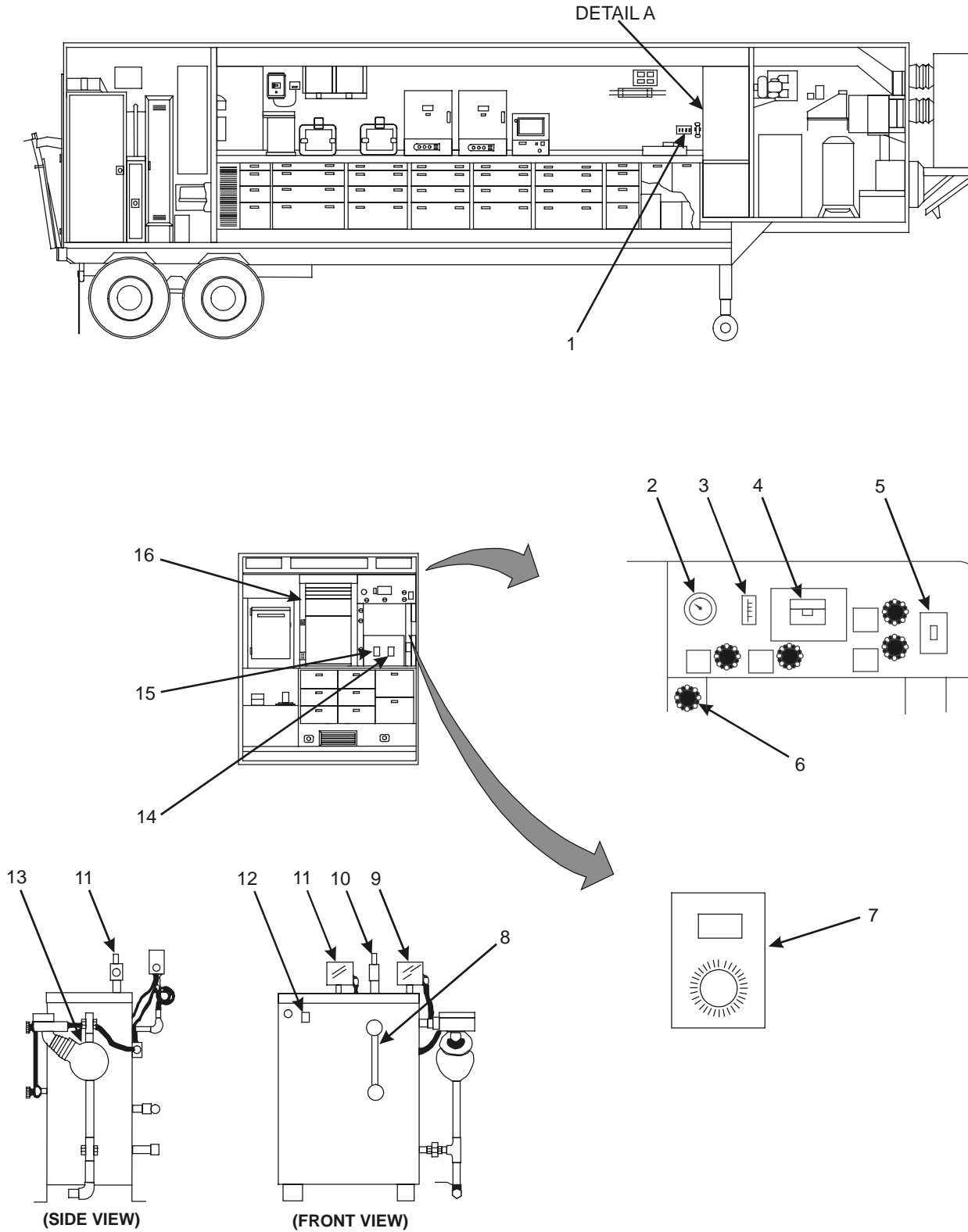
Figure 2-9. Water System Controls and Indicators (Sheet 7 of 7)

- i. Gum Bath System Controls and Indicators. Figure 2-10 and Table 2-10 list the controls and indicators for the gum bath system.

**Table 2-10. Gum Bath System Controls and Indicators**

Index Number	Control or Indicator	Function
1	Exhaust Fan Switches and Indicator Lights	Indicator lights are on to indicate exhaust fan operation.
2	Air Flow Indicator	Provides indication of air flow to gum bath. Calibrated in pounds and ounces, corresponding to flow of air in liters per second.
3	Steam Flowmeter	Indicates steam flow rate.
4	Pyrometer	Indicating and controlling device for gum bath preset temperatures.
5	Gum Bath Hood Light Switch	Controls hood light operation.
6	Air Flow Regulator	Regulates air to gum bath. Rate of flow required is 1 liter per second ( $\pm 15\%$ ).
7	Temperature Control (Steam)	Temperature control of high pressure boiler steam output up to 550°F (228°C).
8	Boiler Sightglass	Indicates water level in low pressure boiler.
9	Operating Control	Maintains low pressure boiler steam output to gum bath.
10	Pressure Gauge	Indicates boiler pressure.
11	HI Limit Control and Pressure Relief Valve	Protects boiler from damage if boiler pressure is too high.
12	Boiler On/Off Switch	Controls operation of low pressure boiler.
13	Low Pressure Boiler Automatic Water Feeder System	Maintains low pressure boiler water level.
14	INT Switch	Turns gum bath circuit On or OFF.
15	AUX Switch	Turns high pressure boiler heater circuit ON or OFF.
16	Fume Hood Light Switch	Controls exhaust fans operation.





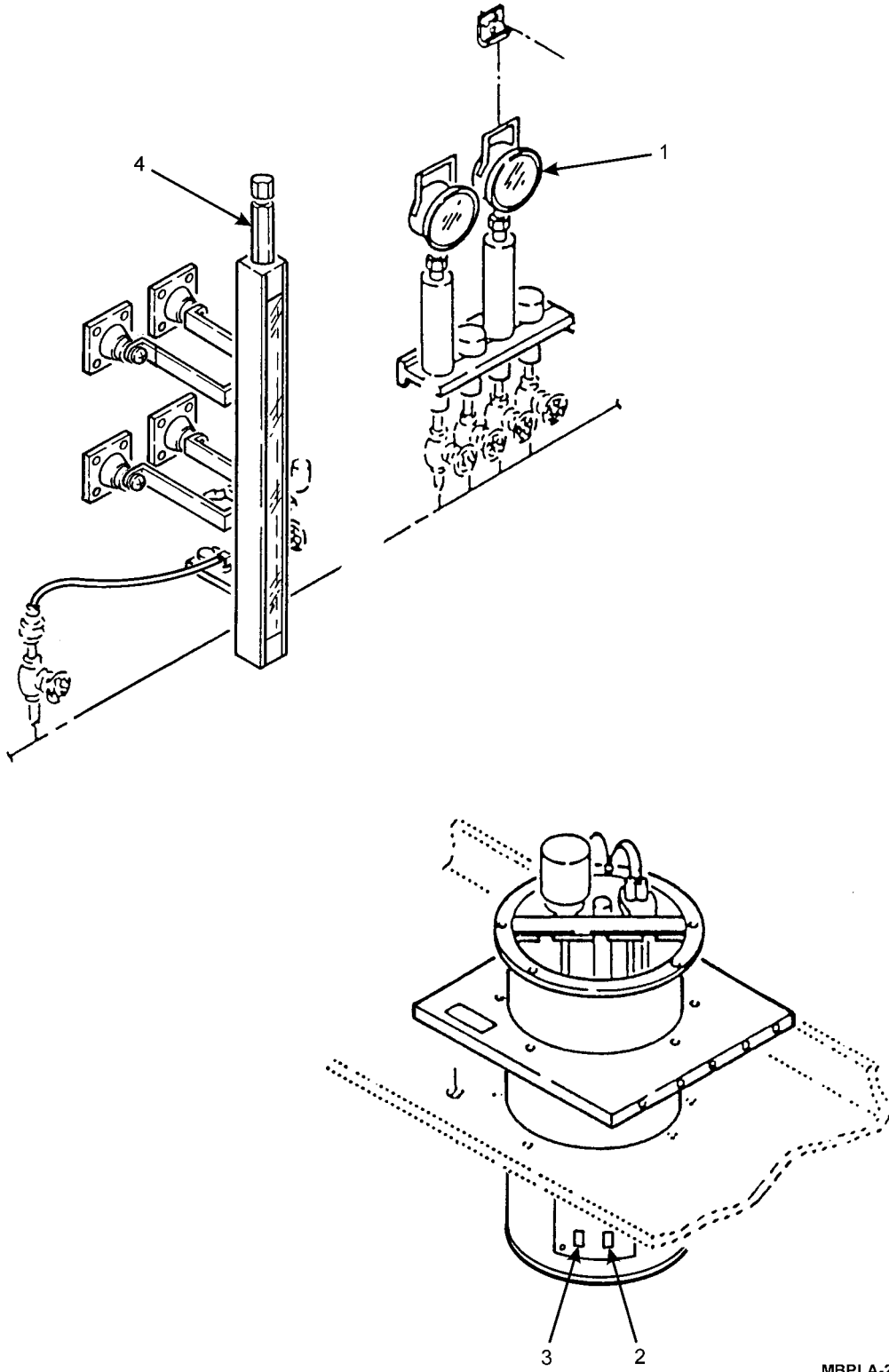
MBPLA-2-10B

Figure 2-10. Gum Bath System Controls and Indicators

- j. RVP Test System Controls and Indicators. Figure 2-11 and Table 2-11 list the controls and indicators for the RVP Test System.

**Table 2-11. RVP Test System Controls and Indicators**

Index Number	Control or Indicator	Function
1	RVP Gauges	Indicates pressure when performing RVP testing.
2	ON/OFF Toggle Switch	Controls RVP bath operation.
3	Pilot Light	Indicates RVP bath operation.
4	Manometer	Provides primary basic standard of measurement. Used in laboratory to calibrate RVP gauges.
5	Vacuum Gauge (Not shown)	Stored in drawer A1. Indicates negative pressure when RVP testing.



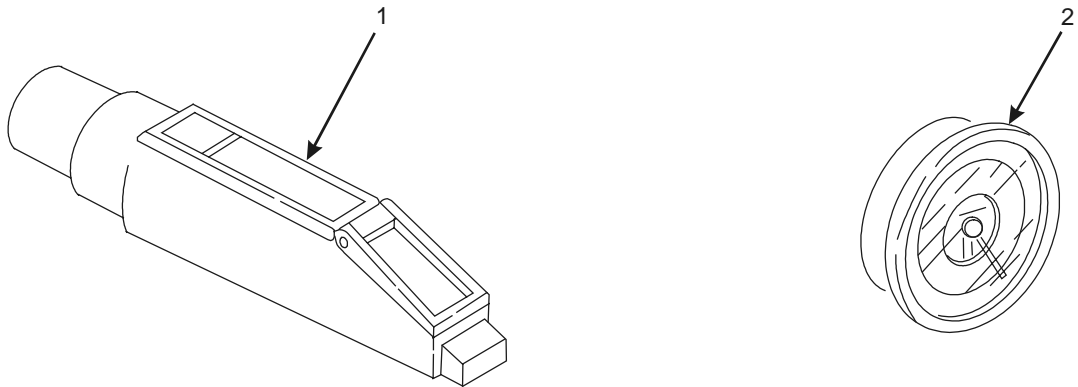
MBPLA-2-11A

Figure 2-11. RVP Test System Controls and Indicators

- k. Support Items Controls and Indicators. Figure 2-12 and Table 2-12 list controls and indicators for the Anti-Icing Additive Test Kit and the aneroid barometer.

**Table 2-12. Support Items Controls and Indicators**

Index Number	Control or Indicator	Function
1	Refractometer	Indicates percent volume additive of fuel (FSII).
2	Barometer	Indicates barometric pressure.



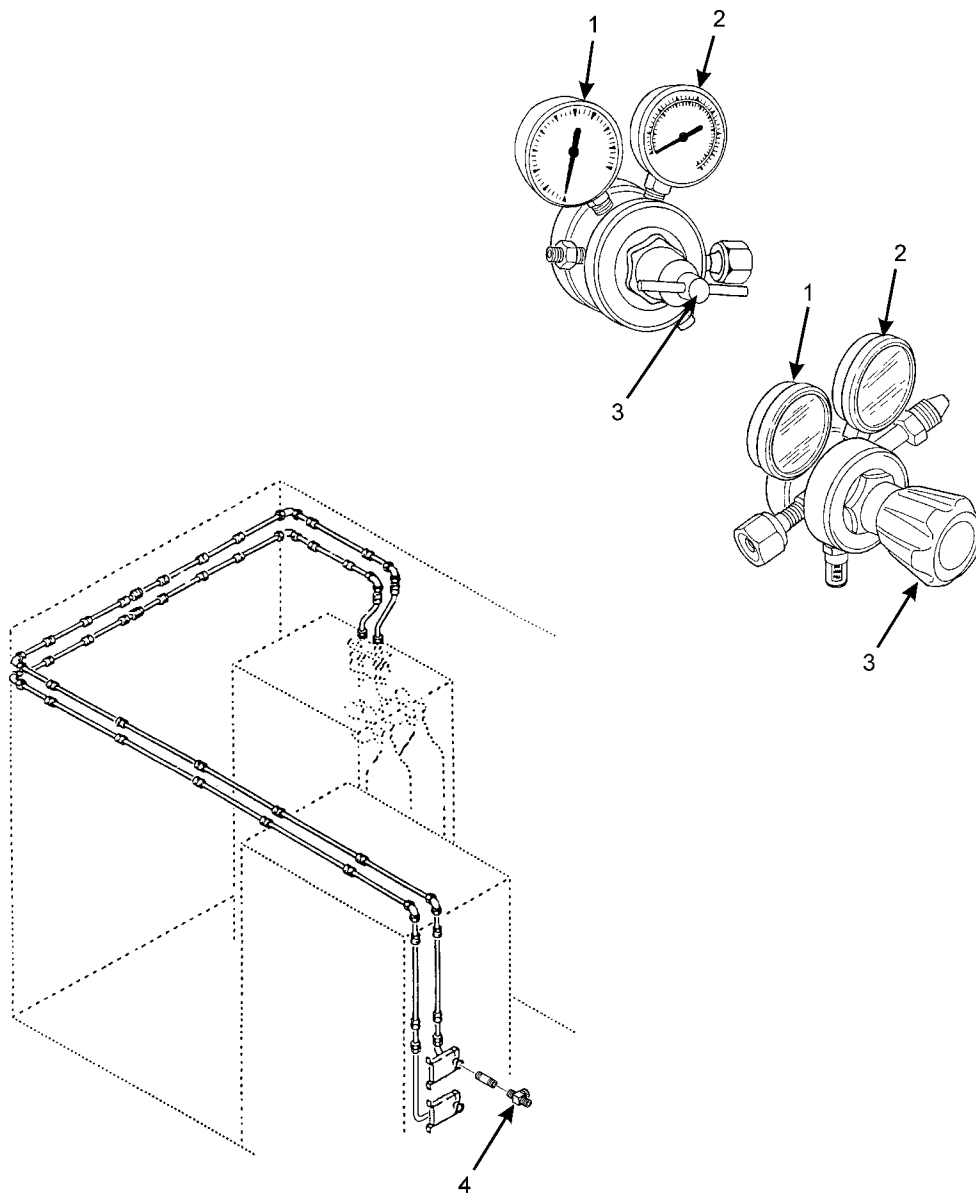
MBPLA-2-12A

**Figure 2-12. Support Items Controls and Indicators**

1. Oxygen and Nitrogen Cylinders Controls and Indicators. Figure 2-13 and Table 2-13 list controls and indicators for the gauges and regulators for the oxygen and nitrogen cylinders.

**Table 2-13. Oxygen and Nitrogen Cylinder Gauge Controls and Indicators**

Index Number	Control or Indicator	Function
1	Regulator Output Gauge	Indicates regulator output pressure to system.
2	Regulator Input Gauge	Indicates regulator input pressure from gas cylinder.
3	Regulator adjustment key/knob	Opens/closes gas cylinder flow from regulator.
4	Control Valve	Opens and closes gas cylinder flow from oxygen and nitrogen gauges.



MBPLA-2-13B

**Figure 2-13. Oxygen and Nitrogen Cylinders Controls and Indicators**

- m. Field Testing Kits Controls and Indicators. Refer to appropriate equipment TM listed in Appendix A for controls and indicators for the field testing kits.
- n. Balance System Controls and Indicators. Refer to appropriate equipment TM listed in Appendix A for balance system controls and indicators.
- o. Burn-Out Furnace Controls and Indicators. Refer to commercial manual for controls and indicators of the burn-out furnace.
- p. Calculator. Refer to commercial manual for controls and indicators of the calculator.
- q. Centrifuge System Controls and Indicators. Refer to appropriate equipment TM listed in Appendix A for controls and indicators of the centrifuge system.
- r. Copper Strip Corrosion Testing Bath Controls and Indicators. Refer to appropriate equipment TM listed in Appendix A for controls and indicators of the corrosion testing system.
- s. Distillation Test Apparatus Controls and Indicators. Refer to appropriate equipment TM listed in Appendix A for controls and indicators of the distillation test apparatus.
- t. Explosion Proof Refrigerator Controls and Indicators. Refer to commercial manual for controls and indicators of the explosion proof refrigerator.
- u. Field pH Meter. Refer to appropriate equipment TM listed in Appendix A for controls and indicators for the field pH meter.
- v. Flash Point Testing System Controls and Indicators. Refer to appropriate equipment TM listed in Appendix A for controls and indicators of the flash point testing system.
- w. Foaming Test Bath Controls and Indicators. Refer to appropriate equipment TM listed in Appendix A for controls and indicators of the foaming test bath.
- x. Freezer Controls and Indicators. Refer to commercial manual for controls and indicators of the freezer.
- y. JFTOT Controls and Indicators. Refer to commercial manual for controls and indicators of the JFTOT.
- z. Kinematic Viscosity Bath Controls and Indicators. Refer to commercial manual for controls and indicators of the kinematic viscosity bath.
- aa. Laboratory Ovens Controls and Indicators. Refer to commercial manual for controls and indicators of the laboratory ovens.
- ab. Oxygen Stability Unit Controls and Indicators. Refer to appropriate equipment TM listed in Appendix A for controls and indicators of the oxygen stability unit and for controls and indicators of the oxygen stability unit.
- ac. Penetrometer Controls and Indicators. Refer to appropriate equipment TM listed in Appendix A for penetrometer controls and indicators.
- ad. Petroleum Dropping Point Apparatus Controls and Indicators. Refer to appropriate equipment TM listed in Appendix A for controls and indicators for the petroleum dropping point apparatus.
- ae. Reid Vapor Pressure (RVP) Bath. Refer to appropriate equipment TM listed in Appendix A for controls and indicators for the RVP Bath.
- af. Separometer Unit Controls and Indicators. Refer to appropriate equipment TM listed in Appendix A for controls and indicators for the separometer unit.

## Section II. OPERATOR PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS)

### Alphabetical Index

Paragraph Title	Paragraph
General .....	2-2
Leakage Definitions for Operator PMCS .....	2-4
PMCS Procedures .....	2-3

### 2-2. GENERAL.

Preventive Maintenance Checks and Services (PMCS) means systematic caring, inspecting, and servicing of MBPL equipment to keep it in good working condition and to prevent breakdown. The operators mission is to:

- a. Perform PMCS each time MBPL is put into operation. Always perform PMCS in the same order, so it becomes a habit.
- b. Perform BEFORE (BE) PMCS prior to operating the equipment. Pay attention to WARNINGS, CAUTIONS, and NOTES.
- c. Perform DURING (DU) PMCS while operating equipment, monitoring equipment and its related components. Pay attention to WARNINGS, CAUTIONS, and NOTES.
- d. Perform AFTER (AF) PMCS immediately after operating equipment. Pay attention to WARNINGS CAUTIONS, and NOTES.
- e. If equipment does not perform as required, refer to Chapter 3, Section II, Troubleshooting for possible problems. Use DA Form 2404 (Equipment Inspection and Maintenance Worksheet) to record any malfunctions or failures that are discovered before, during, and after operation; or refer to DA Pam 738-750. If a malfunction or failure cannot be corrected, report it to unit maintenance. Should malfunctions or failures be repaired, they are not required to be recorded.
- f. Assist unit maintenance when required.
- g. When an Inspect and service procedure is required for both WEEKLY and BEFORE intervals, it is not necessary to do procedures twice if equipment is operated during the weekly period.
- h. Perform PMCS procedures for equipment covered by individual TMs, see Appendix A for TM numbers.

### 2-3. PMCS PROCEDURES.

The following paragraphs describe the PMCS and each Column. See Table 2-14.

- a. Purpose of PMCS Table. The PMCS table lists Inspections required to keep the MBPL in good operating condition.
- b. Item Number. Item numbers are assigned in chronological, ascending sequence regardless of interval designation. These numbers are used for the TM number column on DA Form 2404, Equipment Inspection and Maintenance Worksheet, in recording results of PMCS.
- c. Interval. Tells when to do specified Inspections.
- d. Item to Inspect. Identifies item to be Inspected.

- e. Procedures. Provides Inspection criteria for each item. Repair or adjustments must be performed before the MBPL can be put into operation. Unit maintenance must perform the work, if tools are not available or instructed by the procedure.
- f. Not Fully Mission Capable If. Defines what makes the equipment not ready to perform the mission.

#### 2-4. LEAKAGE DEFINITIONS FOR OPERATOR PMCS.

It is necessary to know how fluid leakage affects the status of equipment. The following are types/classes of leakage an operator needs to know to be able to determine the status of the MBPL.

##### **CAUTION**

Equipment operation is allowable with minor leakage (Class I or II). The fluid capacity in the item/system being Inspected/Inspected shall be considered. When in doubt, notify supervisor.

When operating with Class I or Class II leaks, continue to Inspect fluid levels as required in PMCS.

Class III leaks should be reported immediately to supervisor or unit maintenance.

- a. Leakage. Leakage definitions for operator/crew PMCS shall be classified as follows:
  - Class I Seepage of fluid (as indicated by wetness or discoloration) not great enough to form drops.
  - Class II Leakage of fluid great enough to form drops but not enough to cause drops to drip from item being Inspected/Inspected.
  - Class III Leakage of fluid great enough to form drops that fall from the item being Inspected/Inspected.



**Table 2-14. Operator Preventive Maintenance Checks and Services (PMCS)**

**NOTE**

If equipment must be kept in continuous operation, only do procedures that can be performed without disturbing operation. Make the complete checks and services when equipment can be shut down.

BE - Before  
DU - During

AF - After  
WE - Weekly

MO - Monthly

Item No.	Interval					Item to Inspect	Procedures	Not Fully Mission Capable If:
	B E	D U	A F	W E	M O			
1				• •		Exterior Walls  Storage Boxes	Inspect skin surface. Refer to TM 9-2330-362-14&P.  Inspect access doors.	Wall skin cracked, or punctured. Corrosion on hinges.  Boxes or hardware missing.
2	•  • •				•	Water Supply Box	a. Inspect for damage. Inspect access door for defective or missing latches, keepers, seal, ball studs, and hinge. Inspect water inlet connection for damaged threads and condition of gasket.  b. Inspect inlet connection plug.  c. Inspect hose and adapters for deterioration or damage to threads.  d. Inspect direction valve lever for damage.	Defective coupling or defective gasket.  Defective or missing plug or caps.  Defective or missing hose adapters. Damaged threads, deteriorated/damaged hose.  Damaged handle or missing screws.
3	• • •			•	• •	Power Panel	a. Inspect for damage.  b. Inspect power cable connector.  c. Inspect ground cable for proper connection to ground lug and grounding rod.	Panel damaged or missing hinge.  Defective connector. Loose, missing or damaged pins.  Grounding connections are damaged. Safety clip missing.
4	•		•			Power Cables	Inspect cable for damage.	Cable connector or cable has cuts and deep abrasions.

**Table 2-14. Operator Preventive Maintenance Checks and Services (PMCS) - CONT**

**NOTE**

If equipment must be kept in continuous operation, only do procedures that can be performed without disturbing operation. Make the complete checks and services when equipment can be shut down.

BE - Before AF – After

MO - Monthly

DU- During WE – Weekly

Item No.	Interval					Item to Inspect	Procedures	Not Fully Mission Capable If:
	B E	D U	A F	W E	M O			
5	•	•	•			Environmental Control Units (ECUs)	Inspect bellows.	Bellows damaged. Mounts loose or missing. ECUs do not operate. Retaining cable damaged or missing.
6	•				•	Purge Exhaust Doors	a. Inspect access door.  b. Inspect door microswitches.  c. Inspect gasket. d. Inspect motor operation. e. Inspect filters.	Latches, keepers, seals, ball studs, or hinges damaged or missing.  Microswitches do not activate properly when door is closed and deactivate when door is opened.  Defective gasket. Motor does not operate.  Clogged, dirty, or defective filter.
7	•				•	Purge Intake Doors	a. Inspect access doors.  b. Inspect door microswitches.  c. Inspect gasket. d. Inspect motor for operation. e. Inspect filters.	Latches, keepers, seals, ball studs, or hinges damaged or missing.  Microswitches do not activate properly when door is closed and deactivate when door is opened.  Defective gasket. Motor does not operate  Clogged, dirty, or defective filter.

**Table 2-14. Operator Preventive Maintenance Checks and Services (PMCS) - CONT**

**NOTE**

If equipment must be kept in continuous operation, only do procedures that can be performed without disturbing operation. Make the complete checks and services when equipment can be shut down.

BE – Before AF – After  
DU- During WE – Weekly

MO - Monthly

Item No.	Interval					Item to Inspect	Procedures	Not Fully Mission Capable If:
	B E	D U	A F	W E	M O			
8	•					Main Power Panel No. 1	a. Inspect access doors for defective or missing latches, and hinges. b. Inspect circuit breakers for damaged.	Door missing. Circuit breakers loose or damaged.
9	•					Power Panel No. 2	a. Inspect access doors. b. Inspect circuit breakers for damaged.	Door missing. Circuit breakers loose or damaged.
10	•	•				Emergency Lights	Inspect for illumination.	Lights do not illuminate.
11	•					Air Compressor	a. Inspect mounting bolts. b. Inspect crankcase oil level. c. Inspect intake filter for obstruction. d. Check for rattles, knocks, squeaks, or hums that may indicate trouble in air compressor or motor. e. Inspect motor for indication of overheating and smoke.	Loose or missing mounting bolts. Low oil level. Clogged or dirty filter. Vibration or unusual noise occurs. Motor overheats or emits smoke.
12	•					Ladder	Inspect for presence.	Ladder missing.
13	•					Air Tank and System Piping	a. Inspect mounting bolts. b. Inspect valves.	Loose or missing mounting bolts. Air leaks or defective valves.

**Table 2-14. Operator Preventive Maintenance Checks and Services (PMCS) - CONT**

**NOTE**

If equipment must be kept in continuous operation, only do procedures that can be performed without disturbing operation. Make the complete checks and services when equipment can be shut down.

BE – Before AF - After

MO - Monthly

DU- During WE - Weekly

Item No.	Interval					Item to Inspect	Procedures	Not Fully Mission Capable If:
	B E	D U	A F	W E	M O			
14	• • •	•				Vacuum Pump	a. Inspect mounting. b. Inspect crankcase oil level. c. Inspect drive belts for cracks and/or excessive wear. Check for proper drivebelt deflection (3/4 inches under moderate thumb pressure). d. Check for rattles, knocks, squeaks, or hums that may indicate trouble in air compressor or motor. e. Inspect motor for indication of overheating and smoke damage.	Mounting bolts loose or missing. Low oil level. Drive belts are loose or cracked or excessively worn. Vibration or unusual noise occurs. Motor overheats or emits smoke.
15	•	• •				Water Supply Pump	a. Inspect mounting bolts. b. Inspect pump and motor. c. Check pump at shaft seal.	Loose or missing mounting bolts. Pump or motor overheats or unusual noise occurs. Shaft seal leaks.
16	• •	• •				Water Supply Valves, and Piping	a. Inspect all outlet valves. b. Inspect water piping.	Defective valves. Class III leaks detected. Class III leaks detected.
17	•	•				Surge Tank	Inspect for leaks.	Class III leaks detected.
18	•	•				Water Tank and drain.	a. Inspect mounting. b. Inspect for leaks.	Loose or missing bolts. Class III leaks detected.

**Table 2-14. Operator Preventive Maintenance Checks and Services (PMCS) - CONT**

**NOTE**

If equipment must be kept in continuous operation, only do procedures that can be performed without disturbing operation. Make the complete checks and services when equipment can be shut down.

BE - Before  
DU - During

AF - After  
WE - Weekly

MO - Monthly

Item No.	Interval					Item to Inspect	Procedures	Not Fully Mission Capable If:
	B E	D U	A F	W E	M O			
19	•	•				Water Chiller	a. Inspect mounting. b. Inspect for leaks. c. Inspect for proper operation.	Loose or missing mounting bolts. Class III leaks detected. Water is not chilled.
20		•				Water Pressure Switch	Check for proper starting and stopping of water pump.	Pump does not operate automatically at the set pressure settings.
21	•	•	•			Water Heater	a. Inspect for proper operation. b. Inspect for leaks.	Water is not hot. Class III leaks detected.
22	•	•				Still	a. Inspect mounting. b. Inspect for leaks. c. Inspect for improper operation caused by scale or crud buildup.	Loose or missing mounting bolts. Class III leaks detected. Still is inoperative.
23	•					Analytical Balance and Damping Support	Inspect for damage.	Missing screws. Cracked or broken glass.
24				•		Low Pressure Steam Boiler	Inspect for damage and leakage.	Missing fasteners. Class III leaks detected.
25	•	•		•		Fume Hood and Gum Bath Exhaust Blowers	a. Inspect hoses and clamps. b. Inspect for proper operation.	Missing clamps or hose damaged. Inoperative exhaust blower (s).
26	•	•				RVP Bath, Gauges, and Bombs, and Manometer	a. Inspect for damage. b. Inspect for proper operation.	Loose or missing bolts or clamps. Inoperative RVP bath, gauges, or manometer. Broken glass.

**Table 2-14. Operator Preventive Maintenance Checks and Services (PMCS) - CONT**

**NOTE**

If equipment must be kept in continuous operation, only do procedures that can be performed without disturbing operation. Make the complete checks and services when equipment can be shut down.

BE – Before  
DU- During

AF - After  
WE - Weekly

MO - Monthly

Item No.	Interval					Item to Inspect	Procedures	Not Fully Mission Capable If:
	B E	D U	A F	W E	M O			
27	•	•				Kinematic Viscosity Bath	a. Inspect for damage. b. Inspect for proper operation.	Missing bolts or clamps. Inoperative kinematic bath and heater.
28	•	•		•		Petroleum Distillation Apparatus	a. Inspect for damage. b. Inspect for proper operation.	Missing screws. Apparatus is damaged or inoperative.
29		•		•		Oxidation Stability Bath	a. Inspect for damage. b. Inspect for proper operation. c. Inspect condition of pressure recording gauge.	Missing screws. Bath inoperative. Gauge is broken or inoperative.
30	•	•		•		Laboratory Ovens	a. Inspect for damage. b. Inspect for proper operation.	Missing screws, knobs, or latch. Damaged cord or plug. Ovens does not heat.
31	•	•		•		Burnout Furnace	a. Inspect for damage. b. Inspect for proper operation.	Missing screws. Furnace is inoperative.
32	•	•			•	JFTOT	a. Inspect for damage. b. Inspect for proper operation.	Defective or missing fasteners. JFTOT is inoperative.
33	•				•	Cloud and Pour Point Apparatus	Inspect for damage.	Apparatus incomplete or inoperative.
34	•				•	Support Items	a. Inspect Halon fire extinguishers. b. Inventory first aid kit.	Broken seal or low charge indication. Low supplies.
35		•				Fluorescent Light Assembly	Inspect bulbs and starter for illumination.	Lights do not illuminate.
36		•				Motor Controllers	Inspect for proper operation.	Equipment does not operate.

**Table 2-14. Operator Preventive Maintenance Checks and Services (PMCS) - CONT**

**NOTE**

If equipment must be kept in continuous operation, only do procedures that can be performed without disturbing operation. Make the complete checks and services when equipment can be shut down.

BE - Before AF – After  
DU- During WE – Weekly

MO - Monthly

Item No.	Interval					Item to Inspect	Procedures	Not Fully Mission Capable If:
	B E	D U	A F	W E	M O			
37		•				Vacuum System, Valves and Piping	Inspect for leaks, leaky valves, or inoperative valves.	Leaks or defective valves.
38		•		•	•	Water Filter	a. Inspect mounting. b. Inspect for leaks. c. Inspect for clogged filter.	Missing mounting screws. Class III leaks detected. Filter is clogged.
39		•				High Pressure Steam Boiler	a. Inspect for damage. b. Inspect for proper operation.	Missing fasteners. Class III leaks detected. Inoperative boiler.
40		•				Centrifuge	a. Inspect shock mounts. b. Inspect for proper operation.	Missing screws or shock mounts. Inoperative centrifuge.
41		•				Field Testing Kits	Inspect kits contained in cases.	Defective kits and missing components.
42		•			•	Freezer	a. Inspect for damage. b. Inspect for proper operation.	Missing fasteners. Freezer is inoperative.
43		•		•		Gas Cylinder Storage Locker	a. Inspect cylinders for leaks. b. Inspect for ice maker bag.	Gas supply cylinder leaking Ice bag missing.
44		•			•	Refrigerator	a. Inspect for damage. b. Inspect for proper operation.	Missing screws. Refrigerator is inoperative.
45	•	•				Separometer	a. Inspect damage. b. Inspect for proper operation.	Separometer is missing items. Separometer is inoperative.
46				•		Gas Cylinder and Propane Lock Vents	Inspect for damage.	Clogged vents.

**Table 2-14. Operator Preventive Maintenance Checks and Services (PMCS) - CONT**

**NOTE**

If equipment must be kept in continuous operation, only do procedures that can be performed without disturbing operation. Make the complete checks and services when equipment can be shut down.

BE – Before AF – After

MO - Monthly

DU- During WE – Weekly

Item No.	Interval					Item to Inspect	Procedures	Not Fully Mission Capable If:
	B E	D U	A F	W E	M O			
47				●	●	Fume Hood and Gum Bath Vent Door	Inspect for damage.	Defective door, broken glass or any damage that prevents proper venting.
48				●	●	Cabinets	a. Inspect latches and hinges. b. Inspect contents.	Hinge or latch broken. Mission essential items damaged or missing.
49				●		Sink	Inspect for snap-in fit in cabinet.	Sink is not secure and drain is not properly connected.
50					●	Storage Locker	Inspect mounting.	Loose or missing mounting bolts.
51					●	Desiccating Cabinets	Inspect mounting.	Loose or missing mounting bolts.
52				●		Propane Storage Locker	Inspect bolts.	Missing bolts.
53				●		Fume Hood	a. Inspect for damage.	Defective door, or missing screws.
54				●	●	Gum Content Test Bath	a. Inspect for exterior damage. b. Inspect for leaks.	Missing fasteners or broken switches. Class III leaks detected.
55					●	ECU Remote Control	Inspect for damage.	Damage to control or missing capscrews.



## Section III. OPERATION UNDER USUAL CONDITIONS

### Alphabetical Index

Paragraph Title	Paragraph
Assembly and Preparation for Use.....	2-6
Operating Procedures.....	2-7
Preparation for Movement.....	2-8
Shelter and Site Requirements.....	2-5

### 2-5. SITE AND SHELTER REQUIREMENTS.

- a. Site Selection. Select a site that provides or has the following features:

Ample space for maneuvering vehicles that may be used to move trailer-mounted generator set and the Modular Base Petroleum Laboratory (MBPL).

Firm, reasonably level; well drained terrain.

At least 500 feet away from other areas of operation, and is not uphill or upstream from other facilities which might be in path of escaping fuel or vapor.

Not adjacent to low areas where dangerous vapors might collect.

Near a stream, a pond, or an established water facility. This provides an outside water source for the MBPL water system, and aids in control of potential fires.

Easy access to roads. At least one road should run in the vicinity of the MBPL.

### 2-6. ASSEMBLY AND PREPARATION FOR USE.

- a. Inspection. Inspect exterior of Mod Lab A to make sure everything is in good condition. Check semi-trailer body, doors, rear axle assembly and front landing gear to see that they are secure, clean, and correctly lubricated. Inspect vents, water inlet, purge doors and power input panel for damage. If damage is found, notify supervisor. See Appendix A for authorized repair TMs of mobile semi-trailer mounted petroleum laboratory.

#### **CAUTION**

If Mod Lab A is not level some test equipment may be adversely affected causing improper functioning or incorrect readings.

- b. Leveling. Level Mod Lab A by use of independently crank operated landing gear legs on front and independently screw operated jacks at rear. Check level with level at front, middle, and rear of MBPL.
- c. Setting Up Modular Base Petroleum Laboratory. When setting up Mod Lab A (1, Figure 2-14) and Supplemental Petroleum Lab (Mod Lab B (2)) as part of the Petroleum Modular Base Laboratory, the two trailers are positioned back to back with the bridge (3) connecting them. Mod Lab A rear platform should be positioned  $28'' \pm 0.75''$  from Mod Lab B rear platform and both platforms should be at the same height. The centerline of both Mod Labs should be no more than 4'' off center. When Mod Lab A is properly positioned level Mod Lab A by use of independently crank operated landing gear legs on front and independently screw operated jacks at rear. Check level with level at front, middle, and rear of MBPL.

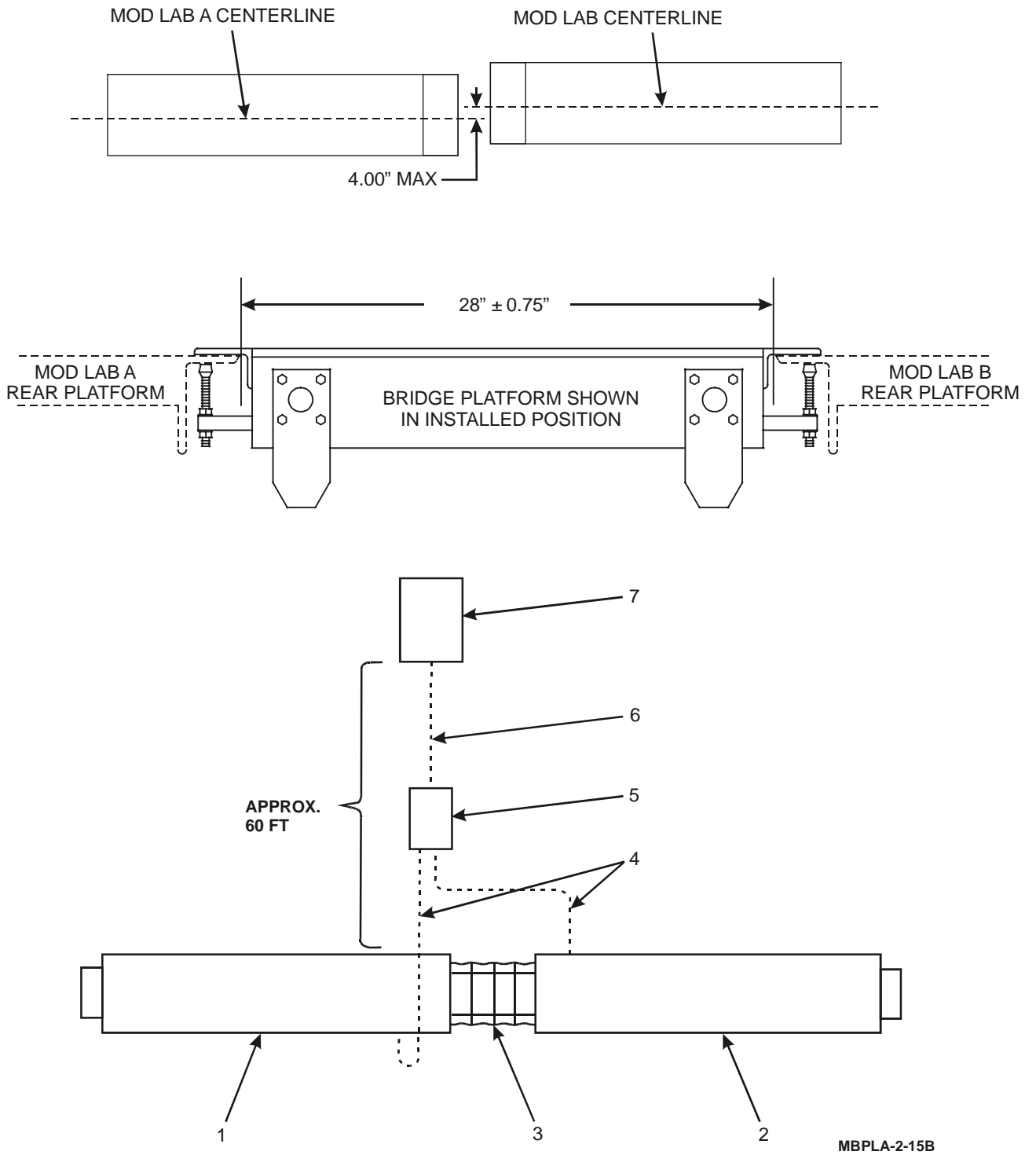


Figure 2-14. Mod Lab A Deployment Configuration (Labs A and B)

- d. Install Boarding Ladders, Bridge, and Rear Platform. Remove Bridge (3) from bottom of rear platform on Mod Lab B (2) before lowering rear platforms on Mod Lab A (1) and Mod Lab B. Remove three boarding ladders from their storage racks beneath Laboratory. Place one three-step ladder at end of each bridge and the other three-step ladder at laboratory entrance doors. Place four-step ladder at front curbside mechanical room doors. Raise ECU maintenance platforms by removing two center key and retaining pins. Lift platform to operating position and reattach cable with pins and cotter key.
- e. Drain Hose Connection. Connect drain hoses to sink deck drain located adjacent to curbside storage box, and to forward deck drain located on roadside beneath mechanical rooms. Dig a drainage ditch or sump, and place ends of the drainage hoses in it.
- f. Laboratory Grounding and Power Cables. The following procedure is used to properly ground Labs.

**WARNING**

Do not connect Power Distribution Module power cable to Generator set until both Laboratories and Power Distribution Module are properly grounded. Failure to comply with this warning could result in serious injury or death.

- (1) Remove grounding rods, driver/pullers, and grounding cables from Mod Lab A (1) road side and Mod Lab B (2) curbside storage boxes.
- (2) Select an area as close possible to Laboratory input power panels.
- (3) Attach first grounding rod (1, figure 2-15) and coupling (2) to driver/puller rod (4). Ensure driver/puller rod and grounding rod are fully threaded into coupling.

**NOTE**

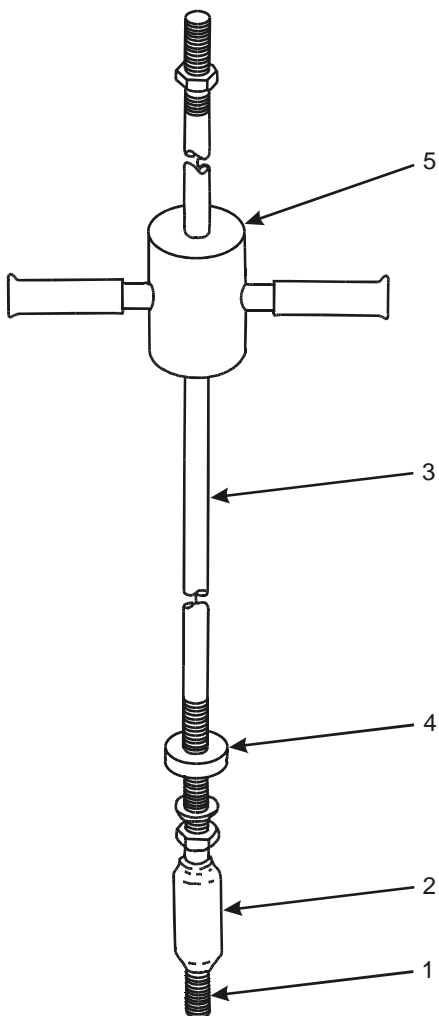
Before driving grounding rod, ensure collar is hand tight against coupling.

- (4) Hand tighten collar (4) against coupling (2).
- (5) Place driver/puller (5) on driver/puller rod (3) and drive grounding rod (1) into ground approximately 30 inches.

**CAUTION**

Do not allow grounding rod to rotate when disconnecting driver/puller rod from grounding rod. Grounding rod sections must be kept tightly screwed together to ensure a good electrical ground.

- (6) Remove driver/puller rod (3) and driver/puller (5) from first grounding rod (1) section.
- (7) Attach second section of grounding rod to first section of grounding rod and attach driver/puller rod (3) to second section and drive into ground.
- (8) Repeat step 7, driving third section of grounding rod into ground until only about 12 inches (30.5 cm) of rod is above ground.
- (9) Remove driver/puller (5) and driver/puller rod (3) from third section of grounding rod.
- (10) Slide grounding cable clamp over grounding rod.
- (11) Attach grounding cable to grounding rod with grounding clamp.
- (12) Attach grounding cable to power panel GROUND.
- (13) Repeat steps 2 through 12 for the other Laboratory.



MBPLA-2-16A

**Figure 2-15. Grounding Rod and Driver/Puller**

- (14) Remove power cables from Mod Lab A (1, figure 2-14) roadside and Mod Lab B (2) curbside storage boxes.
- (15) Remove power panel cable connector protective cap on each trailer and firmly connect the laboratory power cable (4), female end, to each Lab power panel, male connector.
- (16) Remove Power Distribution Module (5) from Mod Lab B (2) mechanical room by loosening straps.
- (17) Route laboratory power cable (4) from each Mod Lab to Power Distribution Module (5).
- (18) Locate Power Distribution Module (5) at end of laboratory power cable (4) and as far from Mod Labs as possible.

**CAUTION**

Power Distribution Module power output connectors are marked LAB A POWER SOURCE for Mod Lab A and LAB B POWER SOURCE for Mod Lab B. Failure to connect cables properly will restrict protective features designed into Power Distribution Module.

- (19) Remove Power Distribution Module (5) power cable connectors protective cap and firmly connect laboratory power cables (4), male end, to Power Distribution Module proper female connectors.

**WARNING**

Do not connect Power Distribution Module main power cable to Generator set until Power Distribution Module is properly grounded. Failure to comply with this warning could result in serious injury or death.

- (20) Select an area as close as possible to Power Distribution Module (5) power inlet for grounding Power Distribution Module.
- (21) Repeat steps 3 through 11 to ground Power Distribution Module (5).
- (22) Attach grounding cable to Power Distribution Module (5) GND grounding lug.
- (23) Return driver/puller (5, figure 2-15) and driver/puller rod (3) to Mod Lab A (1, figure 2-14) roadside and Mod Lab B (2) curbside storage boxes.
- (24) Firmly connect female end of main power cable (6) to Power Distribution Module (5) power input male connector, GEN SET POWER SOURCE.
- (25) Route main power cable (6) to Generator Set (7).

**CAUTION**

Ensure main power cable is properly connected to generator set to prevent damage to Mod Lab electrical system.

- (26) Attach main power cable (6) to generator set (7) as follows: black wire (phase A) to L1; red wire (phase B) to L2; blue wire (phase C) to L3; white wire (Neutral) to L4; green wire (ground) to GND.
- g. Mod Lab A and Mod Lab B Electrical Startup and Purge Cycle. Perform the following procedures to apply power to Labs.

**WARNING**

Do not attempt to enter Mod Labs during start up until automatic purge cycle (5 minutes) is completed. Dangerous combustible gases or vapors may be present which could ignite and cause death or serious injury.

- (1) Unlatch and open two PURGE INTAKE and two PURGE EXHAUST doors on each Mod Lab.
- (2) Unlatch and open FUME HOOD AND GUM BATH VENT door on each Mod Lab.
- (3) Roll up and secure four Environmental Control Unit (ECU) canvas covers on each Mod Lab.

**NOTE**

When power is applied to Laboratory an air purge cycle is automatically started utilizing blowers in ECUs to pressurize Laboratory and expel any accumulation of gases. During purge cycle all normal electrical circuits within Laboratory are disabled.

- (4) Apply power at Generator set (7) in accordance applicable equipment TM. Set power to 208Vac and frequency to 60Hz.
- (5) Apply power to Mod Lab A (1) at Power Distribution Module (5) by pulling out switch Lab-A ON/OFF.
- (6) Apply power to Mod Lab B (2) at Power Distribution Module (5) by pulling out switch Lab-B ON/OFF.
- (7) After ECU blowers shut off INDICATING purging cycle is complete, unlock and open laboratory entrance doors.
- (8) Loosen retaining straps and remove spill kit.
- (9) Loosen retaining straps securing overpack boxes to Mod Lab A floor.
- (10) Loosen retaining straps securing overpack boxes to retaining frame and remove overpack boxes and retaining frames from Mod Lab A. Store straps in boxes.
- (11) Open Main Power Panel and position main circuit breaker A1CB1 (1, figure 2-2) and circuit breaker A1CB2 (22) (input power for Power Panel No. 2), to ON.
- (12) Position all remaining Main Power Panel circuit breakers to ON.
- (13) Position all Mod Lab fluorescent light switches to on (See Figure 2-4).
- (14) Position forward curbside door emergency light switch and rear door emergency light switch on.

#### NOTE

Emergency light switches will remain on until Mod Labs are prepared for movement or storage.

- (15) In mechanical room, position mechanical room fluorescent light switch to on.
  - (16) Open Power Panel No. 2 and position ECU circuit breakers A15CB1 (12, figure 2-3) A15CB2 (1), A15CB3 (11), and A15CB4 (2) to ON.
  - (17) Position all remaining Power Panel No. 2 circuit breakers except A15CB7 to ON.
  - (18) Energize and adjust ECUs using ECU controllers (figure 2-5) in laboratory compartment. All ECU controller selector switches and temperature controls should be set the same.
  - (19) Remove fume hood and exhaust bath vent extension from water chiller and install onto fume hood and gum bath vent exhaust door.
- h. Unpacking and Inspection. Inspect each item of equipment and supply for damage. Check for broken or cracked glassware. Remove all shipment retainer brackets, straps, etc. and store for future use. Report any breakage or damage to the supervisor. Unpack overpack boxes as follows:
- (1) Open overpack boxes and remove material safety data sheets (MSDS) for all chemicals and store sheets in Lab Storage Requirement Book located in the bookcases.
  - (2) When chemicals have been removed from cardboard boxes, retain and store cardboard boxes inside overpack box.
- i. Storage of Chemicals. To prevent chemicals from being stored with incompatible materials they must be stored in their proper overpack storage box. A packing list is provided with each overpack storage box. The storage requirements for each chemical are located in the Lab Storage Requirements Book located in each Lab. When the overpack storage boxes are removed from the trailer they must be stored in a dry location, out of direct sunlight and protected from extreme temperatures (Hot and Cold). The storage area should be posted “NO SMOKING. DO NOT EXPOSE TO HEAT, SPARKS, OR FLAMES”.

**NOTE**

Perform the following steps when setting up Mod Lab A for initial use at a site. After initial set up, perform only necessary steps to place Mod Lab in operation.

j. Water System. Perform the following steps to place the water system in operation. (Refer to figure 2-9 for location of control valves.)

- (1) Fill Water Tank From Pressurized Source.
  - (a) Open sink and water tank cam drains from under the trailer.
  - (b) Unlatch and open Water Inlet access door.
  - (c) Connect garden hose adapter (1, figure 2-16) to water system connector (2).
  - (d) Attach 50-foot (15.25 m) garden hose to water inlet adapter (1).
  - (e) Position WATER OUT/IN valve (3) to the IN position.
  - (f) Secure opposite end of hose to pressurized water source.

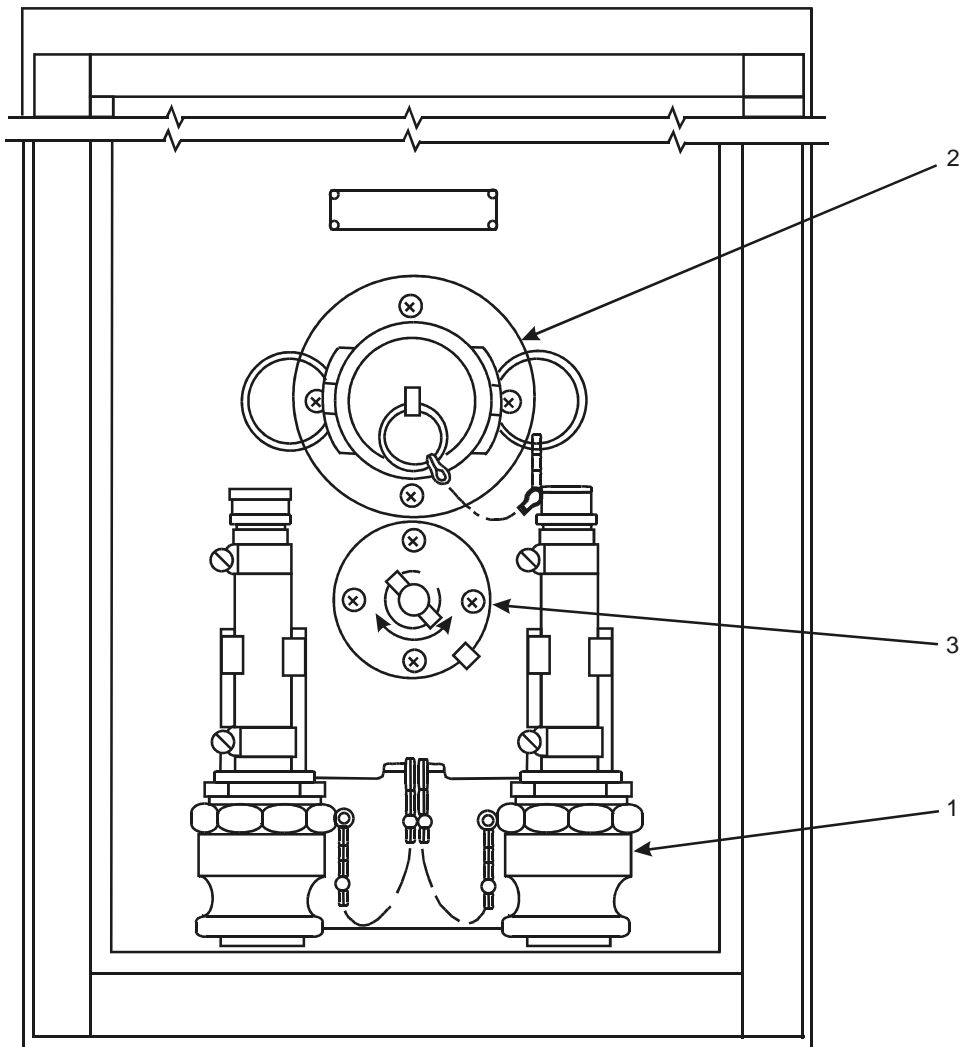


Figure 2-16. Water Inlet.

MBPLA-2-17B

**NOTE**

In Mod Lab B ensure input valve prefilter is closed.

- (g) In mechanical room, position water system valves as follows:
  - 1 Input valve prefilter - OPEN
  - 2 Input valve postfilter - OPEN
  - 3 Pump suction or tank fill directional flow valve - OPEN to Tank Fill
  - 4 Water flow direction valve - OPEN to Tank Fill
  - 5 Water tank drain valve - CLOSED
  - 6 Water system drain valve - CLOSED
  - 7 Pump suction valve from water tank bottom - CLOSED
  - 8 Filter backwash valve - CLOSED
  - 9 Water return drain valve - CLOSED
  - 10 Water pump drain valve - CLOSED
  - 11 Pump suction drain valve - CLOSED

- (h) Slowly turn on water supply at source.
- (i) Continue to fill water tank until water flows out from overflow drain under trailer.
- (j) Turn off water supply at source.

(2) Operate Water System Using Water Supply Tank As Source.

**NOTE**

Keep water tank level at least 1/4 full to ensure fail free operation of water system.

Pump water pressure switch is set to turn water pump on when pressure drops to 10 psi and to turn pump off when pressure reaches 20 psi.

- (a) In laboratory, position water system valves as follows:
  - 1 All water supply valves located above countertop. - CLOSED
  - 2 Water supply drain valve under sink. - CLOSED
  - 3 Water supply drain valve to hot water. - CLOSED
- (b) In mechanical room, position water system valves as follows:
  - 1 Input valve prefilter - CLOSED
  - 2 Input valve postfilter - CLOSED
  - 3 Pump suction or tank fill directional flow valve - CLOSED to Pump Suction
  - 4 Water flow directional valve - CLOSED to Water System
  - 5 Water tank drain valve - CLOSED
  - 6 Water system drain valve - CLOSED
  - 7 Water return drain valve - CLOSED
  - 8 Water pump drain valve - CLOSED



- |           |   |   |        |
|-----------|---|---|--------|
| <u>9</u>  | Pump suction drain valve                  | - | CLOSED |
| <u>10</u> | Pump suction valve from water tank bottom | - | OPEN   |
| <u>11</u> | Main water feed from pump valve           | - | OPEN   |
| <u>12</u> | Water supply chiller valve                | - | OPEN   |
| <u>13</u> | Chiller water return valve                | - | OPEN   |
- (c) Place pump controller pump switch to ON. Pump should run until pressure reaches cutoff point.
- (d) Open sink faucet to purge air from system. Pump will start when water pressure drops to starting point.
- (e) When a solid stream of water is flowing from faucet, close faucet and check system for leaks.
- (3) Operate Water System Using an Outside Pressurized Source.
- (a) Open sink and water tank cam drains from under the trailer.
- (b) Unlatch and open Water Inlet access door.
- (c) Connect garden hose adapter (1) to water system connector (2).
- (d) Attach 50-foot (15.25 m) garden hose to garden hose adapter (1).
- (e) Position WATER OUT/IN valve (3) to IN position.
- (f) Secure opposite end of hose to pressurized water source.
- (g) In mechanical room, position water system valves as follows:
- |           |  |   |                      |
|-----------|--|---|----------------------|
| <u>1</u>  | Input valve prefilter                            | - | OPEN                 |
| <u>2</u>  | Input valve postfilter                           | - | OPEN                 |
| <u>3</u>  | Pump suction or tank fill directional flow valve | - | OPEN to Tank Fill    |
| <u>4</u>  | Water flow direction valve                       | - | OPEN to System Input |
| <u>5</u>  | Water tank drain valve                           | - | CLOSED               |
| <u>6</u>  | Pump suction valve from water tank bottom        | - | CLOSED               |
| <u>7</u>  | Water system drain valve                         | - | CLOSED               |
| <u>8</u>  | Return water drain valve                         | - | CLOSED               |
| <u>9</u>  | Water pump drain valve                           | - | CLOSED               |
| <u>10</u> | Pump suction drain valve                         | - | CLOSED               |
| <u>11</u> | Main water feed from pump valve                  | - | CLOSED               |
- (h) Slowly turn on water supply at source.
- (i) Open sink faucet and purge air from system.
- (j) When a solid stream of water flows from faucet, close faucet and check system for leaks.
- (4) Operate Water System Using an Outside Unpressurized Source.
- (a) Open sink and water tank cam drains from under the trailer.
- (b) Unlatch and open Water Inlet access door.
- (c) Connect garden hose adapter (1) to water system connector (2).
- (d) Attach 50-foot (15.25 m) garden hose to garden hose adapter (1).

- (e) Position WATER OUT/IN valve (3) to IN position.
  - (f) Secure opposite end of hose to unpressurized water source.
  - (g) In mechanical room, position water system valves as follows:
 

<u>1</u>	Input valve prefilter	-	OPEN
<u>2</u>	Input valve postfilter	-	OPEN
<u>3</u>	Pump suction or tank fill directional flow valve	-	CLOSED to Pump Suction
<u>4</u>	Water flow direction valve	-	CLOSED to Water System
<u>5</u>	Main water feed from pump valve	-	OPEN
<u>6</u>	Water tank drain valve	-	CLOSED
<u>7</u>	Supply system valve	-	CLOSED
<u>8</u>	Water return drain valve	-	CLOSED
<u>9</u>	Water pump drain valve	-	CLOSED
<u>10</u>	Pump suction drain valve	-	CLOSED
<u>11</u>	Pump suction valve from water tank bottom	-	CLOSED
  - (h) Open valve at supply source.
  - (i) Place water pump controller pump switch to ON.
  - (j) Open faucet at sink to purge air from system.
  - (k) When solid stream of water is flowing, shut faucet and check system for leaks.
- (5) Operate Water System to Supply Water For Outside Use.
- (a) Open sink and water tank cam drains from under trailer.
  - (b) Unlatch and open Water Inlet access door.
  - (c) Connect garden hose adapter (1) to water system connector (2).
  - (d) Attach 50-foot (15.25 m) garden hose to garden hose adapter (1).
  - (e) Attach opposite end of hose to tank, container, etc. to be filled.
  - (f) Position WATER OUT/IN valve (3) to the OUT position.
  - (g) In mechanical room, position water system valves as follows:
 

<u>1</u>	Pump suction valve from water tank bottom	-	OPEN
<u>2</u>	Water tank drain valve	-	CLOSED
<u>3</u>	Water system drain valve	-	CLOSED
<u>4</u>	Return water drain valve	-	CLOSED
<u>5</u>	Water pump drain valve	-	CLOSED
<u>6</u>	Pump suction drain valve	-	CLOSED
<u>7</u>	Pump suction or tank fill directional control valve	-	CLOSED to Pump Suction
<u>8</u>	Water flow direction valve	-	CLOSED to Tank
<u>9</u>	Main water feed from pump valve	-	OPEN
  - (h) Place water pump controller pump switch to ON.

- (i) Open any existing inlet valve on tank, container, etc. to be filled.
- k. Air System. Perform the following steps to place air system in operation.
  - (1) Ensure all air supply valves in Mod Lab A are closed.
  - (2) Open one at a time, the drain valves located on air compressor discharge line and on bottom of air tank. Drain condensation and close valves.
  - (3) Start air compressor by positioning compressor controller switch to ON.
  - (4) Verify proper operation of compressor pressure switch. Switch is set to stop compressor when pressure in accumulator reaches 120 psi and to start compressor when pressure drops to 60 psi.
  - (5) To shut down automatic operation of compressor, position compressor controller to OFF.
- l. Vacuum System. Perform the following steps to place vacuum system in operation.
  - (1) Close all vacuum outlet valves.
  - (2) Ensure oil level falls between two oil level marks on vacuum pump oil level observation window.
  - (3) Open pump intake valve.
  - (4) Start vacuum pump by positioning vacuum pump controller switch to START.
  - (5) Verify operation by observing vacuum pressure gauge. Vacuum is indicated on gauge in inches of mercury (Hg). The vacuum pump has a 58-liter per minute free air capacity with a vacuum of 0.1 micron (0.0001 mm Hg).

**NOTE**

Gurgling sound occurs during operation in varying degrees under four conditions of performance: when operating at high pressure as in the beginning cycles of evacuation of a chamber; when oil level in pump reservoir is too low; when a large leak is present in system; or when vented exhaust valve is open.

- (6) To shut down vacuum pump, close pump intake, and position vacuum pump controller switch to STOP position.

## 2-7. OPERATING PROCEDURES.

This paragraph provides procedures necessary to operate the basic laboratory equipment; fuel sampling kit, and anti-icing test kit. For operating instructions pertaining to all other specific laboratory testing equipment see appropriate TM listed in Appendix A.

- a. Sampling and Gaging Kit Operation (See Figure 2-17). This kit is completely portable and self-contained. It consists of a carrying case, which is divided into sections to hold the major items of equipment, a weighted beaker sampler (1), hydrometer cylinder (2), standard hydrometers (3), a cup case thermometer (4), gasoline and water indicating paste (5), an API gravity computer (6), and a innage tape and bob (7).

Setting the Kit Up for Operation.

- (1) Clean innage tape (7) with cheesecloth. Ensure equipment is clean, dry, and free of dirt.
- (2) Check mercury columns in hydrometer and cup case thermometer (4). If mercury column is separated or glass cracked, replace instrument.
- (3) Check cup case thermometer (4) readings with other thermometers in area to ensure they read the same.
- (4) Before a product is sampled or gaged, rinse containers with same type of product to be sampled or gaged.

**WARNING**

Never gage or sample a product in a tank if there is an electrical storm or a source of sparks in the area. Failure to comply with this warning could result in serious injury or death.

- (5) Conduct tests in accordance with pamphlets stored in packet of case, which contain ASTM test methods.
- b. Anti-Icing Additive Test Kit Operation (See Figure 2-18). The kit is portable and self-contained. It consists of a carrying case, separatory funnel (1), support base (2) with rod and ring (3), refractometer (4), aluminum dishes, piston pipets, a graduated cylinder and a bottle with screw cap.

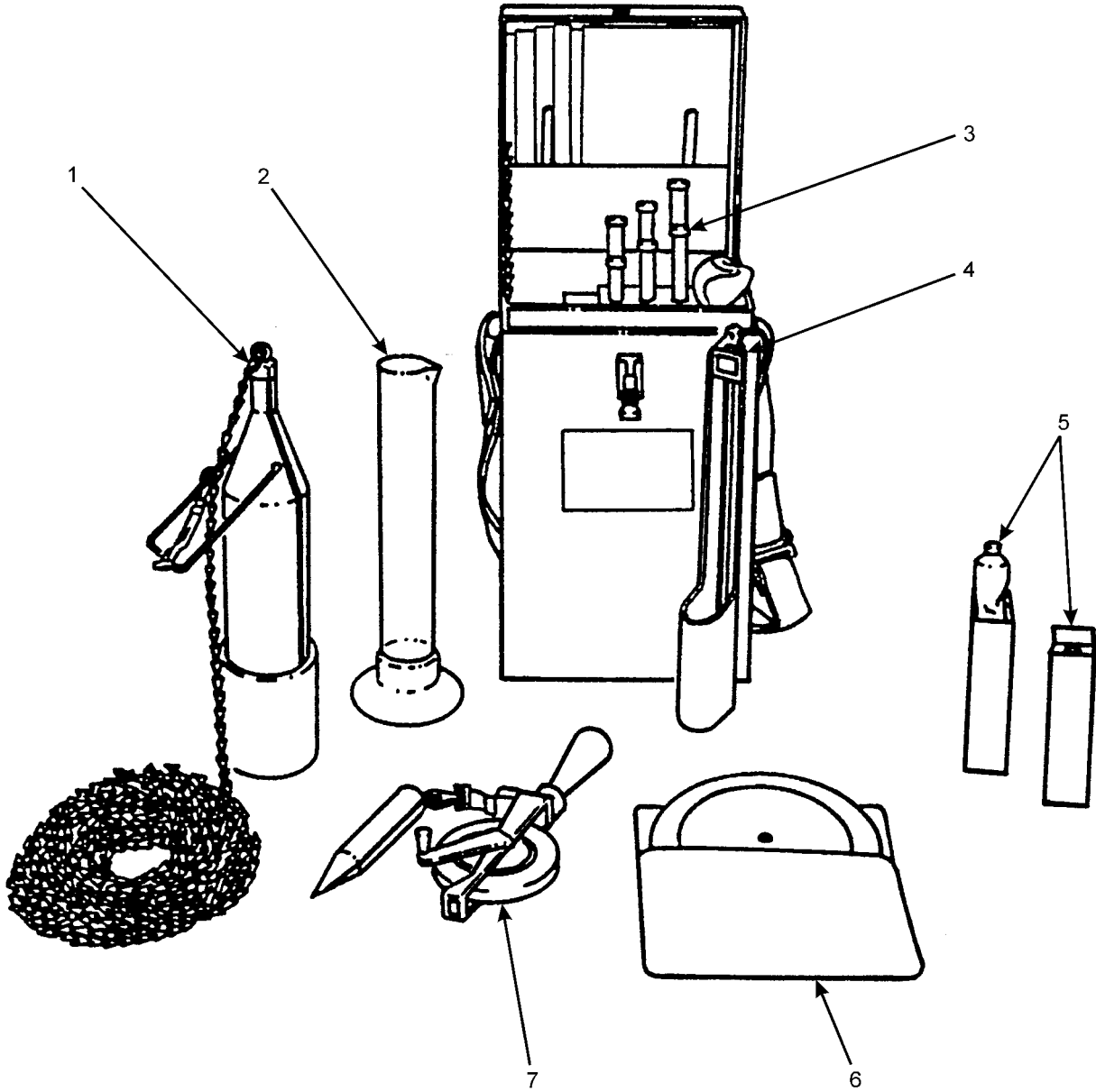
Anti-Icing Additive Test Kit Setup and Operation.

- (1) Using a clean, dry container, obtain a 1-pint (0.473 l) sample of fuel to be tested.
- (2) Set up separatory funnel (1) with its support base (2), rod and ring (3).
- (3) Fill an aluminum dish one half full of water.
- (4) Using a graduated cylinder, transfer exactly 160 ml of fuel from step (1), to separatory funnel.
- (5) Using a piston pipet, add exactly 2 ml of water from aluminum dish to separatory funnel. Cap funnel and shake vigorously for 3 minutes. Place separatory funnel (1) in support stand.

**NOTE**

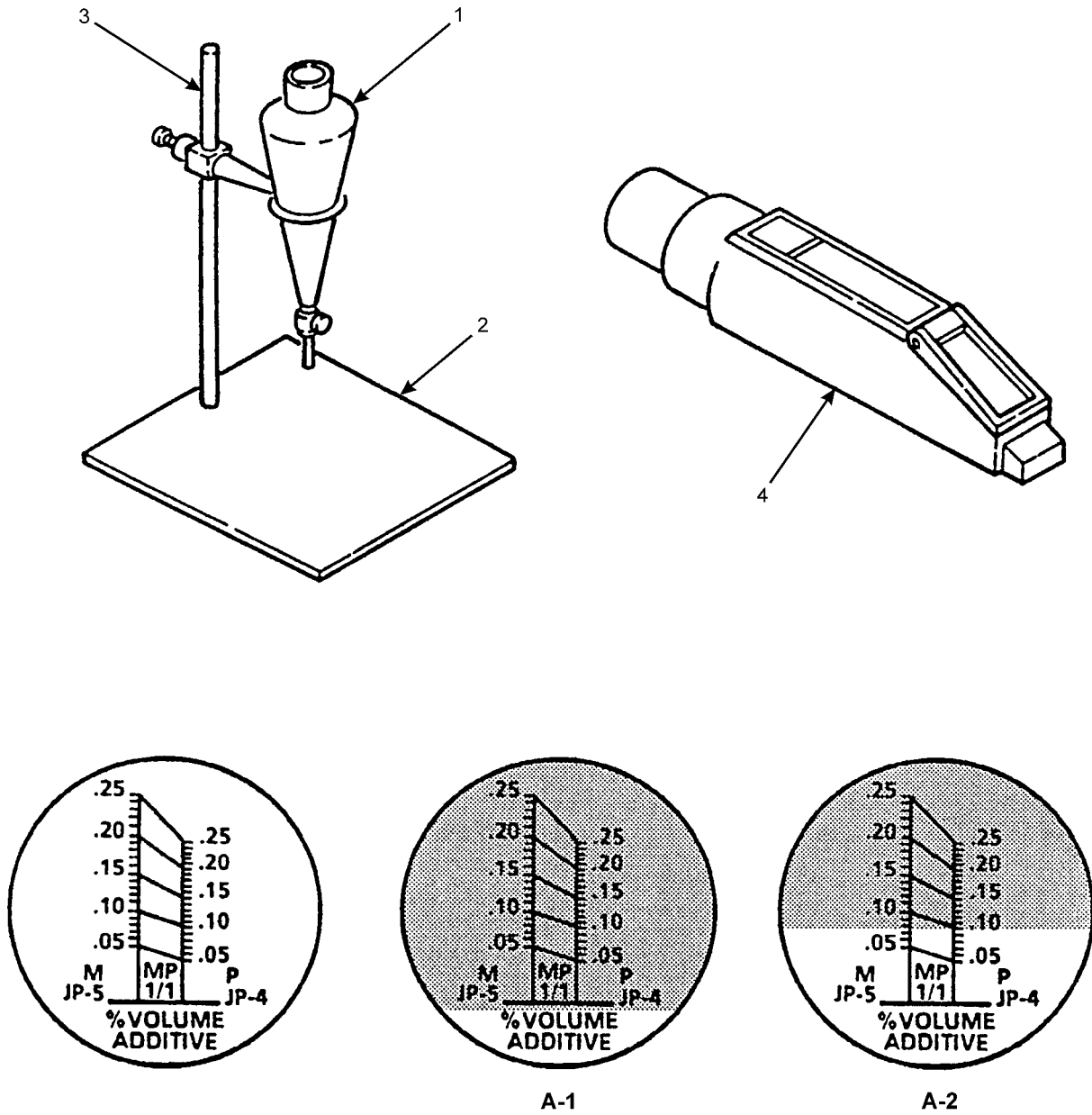
Refractometer should be treated as an optical instrument.

- (6) Open cover of refractometer (4) window. Ensure window is clean.



MBPLA-2-18A

Figure 2-17. Sampling and Gaging Kit



DETAIL A VIEWER SHADOW LINE

MBPLA-2-19A

Figure 2-18. Anti-Icing Additive Test Kit

- (7) Apply several drops of water from aluminum dish to refractometer (4) window. Close cover and through eyepiece observe location of shadow line in viewer. Using plastic adjusting rod contained in refractometers base, adjust setscrew located in base so that shadow line intersects zero line of scale (see Detail A-1). Refractometer is now correctly zeroed.
  - (8) Clean refractometer (4) cover and window.
  - (9) Carefully rotate separatory funnel (1) drain cock so that a trickle of fluid can be collected in clean dry aluminum dish. Two to three drops is sufficient.
  - (10) Open cover of refractometer (4) window and transfer fluid from aluminum dish to refractometer window. Close cover and observe position of shadow line. Detail A-2 shows a typical test result for JP-4 fuel treated with anti-icing additive at 0-.1% v. test run may show differently as fuel may have different % v. of additive, but readings will be accurate and reflect fuel condition.
  - (11) Properly dispose of liquids. Wash apparatus with soap and water and dry thoroughly.
  - (12) Report out of specification results at once.
- c. Freezer, Ice-Cube Maker Operation (See COTS Manual with Freezer). The ice maker is a plug-in unit powered by a hermetically sealed condensing unit.
- (1) Ice Maker Setup and Operation.
    - (a) Apply power to ice maker by placing circuit breaker A1CB8 (19, figure 2-2), to ON position.
    - (b) Allow unit to operate 4 to 6 hours then load interior with water filled ice cube trays.
    - (c) When ice cube trays are frozen, cubes may be stored in area below shelves of freezing compartment.
    - (d) If required, adjust cold control for proper operating temperatures.
  - (2) Defrosting Ice Maker.
    - (a) Remove power from unit by placing circuit breaker A1CB8 (19, figure 2-2) to OFF position.
    - (b) Open door until accumulated ice has melted and drained from cabinet.
    - (c) Place several pans of hot water in freezing compartment to accelerate melting.
    - (d) Wipe interior completely dry.
    - (e) Apply power to ice maker and allow unit to operate for at least 1 hour before replacing water-filled ice cube trays.

## 2-8. PREPARATION FOR MOVEMENT.

The following paragraphs are used to prepare Mod Lab A for movement.

- a. Interior. Prepare as follows:
  - (1) Place all chemicals in designated storage. Refer to Appendix C. Ensure all caps are tight.
  - (2) Place all loose test equipment, support equipment, and supplies in their designated storage.
  - (3) Drain and clean the following equipment:
    - (a) RVP Bath
    - (b) Gum Bath
    - (c) Oxidation Stabilization Bath
    - (d) Electric Still

- (e) Refrigerator
  - (f) Drain Tank
  - (g) Freezer
  - (h) Viscosity Bath
  - (i) Gas-Oil Distillation Unit
- (4) Ensure that manometer, pressure recording gauge, and barometer are properly secured.
  - (5) Turn off oxygen, carbon dioxide and nitrogen at their respective gas bottles. Remove gauges and install bottle caps. Ensure that bottles are firmly secure in their mounting brackets.
  - (6) Ensure that propane bottles are removed from propane locker and stored in correct overpack box.
  - (7) Ensure that thermometers are removed from thermometer case and stored in correct overpack box.
  - (8) Empty and clean interiors of laboratory ovens and burn out furnace. Remove and store desiccant from desiccating cabinets.
  - (9) Place cover over analytical balance and secure to vibration mount with snap clamps.
  - (10) Install shipping straps and brackets where required and ensure all retaining screws are tight.
  - (11) Check contents of all cabinets to ensure all items are properly stored for movement. Secure glass objects in drawers as necessary using suitable tape.
  - (12) Test gas alarm system.
  - (13) In MAIN POWER PANEL, position circuit breakers except A1CB1, A1CB2, A1CB9, A1CB11, and A1CB13 to OFF.
  - (14) In POWER PANEL NO. 2, position all circuit breakers except A15CB10 to OFF.
  - (15) Drain the following:
    - (a) Water Tank
    - (b) Steam Generator
    - (c) High Pressure Boiler
    - (d) Air System Moisture Trap
  - (16) In POWER PANEL NO. 2, position circuit breaker A15CB10 to OFF.
  - (17) Through rear door, load overpack boxes into laboratory compartment and secure with tiedown straps in accordance with loading diagram located on rear door and Figure 3-6.
  - (18) Through side door, load spill kit into laboratory compartment and secure with tiedown straps.
  - (19) In MAIN POWER PANEL, position circuit breakers A1CB1, A1CB2, A1CB9, A1CB11, and A1CB13 to OFF.
  - (20) Position EMERGENCY LIGHT switches S17 and S18 to OFF.
- b. Exterior. Prepare as follows:
- (1) Turn off Generator Set external power. Refer to appropriate TM.
  - (2) Disconnect main power cable from Generator Set. Disconnect main power cable from Power Distribution Module and install protective cap on connector. Clean cable and store in Mod Lab A roadside storage box.
  - (3) Disconnect Power Distribution Module grounding cable from GND.
  - (4) Remove grounding cable and clamp from ground rod.



- (5) Attach driver/puller to ground rod and remove rod from ground, uncoupling each rod section as it emerges from ground.
- (6) Clean grounding rod, grounding cable and clamp, and store in surpassed storage box with main power cable.
- (7) Disconnect laboratory power cables from Power Distribution Module. Remove cable from power panel on each Lab, and install protective caps on connector.
- (8) Clean cable and store one in Mod Lab A roadside and one in Mod Lab B curbside storage boxes.
- (9) Disconnect grounding cable from grounding lug on power panel.
- (10) Close and latch power panel door.
- (11) Remove grounding cables and clamps from ground rods.
- (12) Attached driver/puller to ground rod and remove grounding rods uncoupling each rod section as it emerges from ground.
- (13) Clean grounding rods, grounding cables, clamps, driver/puller and driver/puller rods, and store one set in Mod Lab A roadside and one set in Mod Lab B curbside storage box.
- (14) Disconnect fume hood and gum bath vent exhaust and flexible duct. Secure fume hood and gum bath vent exhaust to water chiller in mechanical room and stow flexible duct in roadside stowage box.
- (15) Store Power Distribution Module in mechanical room of Mod Lab B and secure to floor tiedown rings with straps provided.
- (16) Disconnect drain hoses from deck drains. Clean and store hoses in curbside storage boxes.
- (17) Disconnect hose adapters from deck drains and store. Place protective caps on deck drains.
- (18) Close and latch water inlet access door.
- (19) Close and latch two PURGE INTAKE and two PURGE EXHAUST doors on each trailer.
- (20) Close and latch FUME HOOD AND GUM BATH VENT on each trailer.
- (21) Roll down and secure ECU canvas covers.
- (22) Return ECU maintenance platform to stored position and secure.
- (23) Remove ladders from Laboratory compartment side access door, mechanical room, and side of bridge at rear platform.
- (24) Remove Bridge from between rear platforms.
- (25) Store rear platforms in upright position, and store bridge on underside of Mod Lab B rear platform.
- (26) Store and secure ladders in storage racks under Laboratory.

## Section IV. OPERATION UNDER UNUSUAL CONDITIONS

### Alphabetical Index

Paragraph Title	Paragraph
Emergency Stopping Procedures .....	2-10
Operation in Extreme Climates .....	2-9

#### 2-9. OPERATION IN EXTREME CLIMATES.

Mod Lab A is insulated and weatherproofed for operation in hot, cold, or moderate climates. The shelter facility provides complete protection from the elements for personnel and equipment; however, under extreme conditions, the following precautions are necessary.

- a. Cold Climates. Extreme cold causes cables and wires to become hard, brittle and difficult to handle. Be careful when handling cables and connecting them to Mod Lab A, so that kinks and unnecessary loops will not result in permanent damage. Make sure connectors in entrance boxes are free of frost, snow, and ice. Replace connector covers on receptacles as soon as a cable is disconnected. Never drag or place an open cable connector on the ground.
- b. Hot Climates. In hot, dry climates, connectors, and receptacles are subject to damage from dust and dirt. Replace connector covers on receptacles when they are not in use. Never drag or place an open cable connector on the ground.
- c. Warm, Damp Climates. In warm, damp climates, the equipment is subject to damage from moisture and fungi. Wipe all moisture and fungi from equipment with a lint-free cloth.

#### 2-10. EMERGENCY STOPPING PROCEDURES.

To turn equipment off in an emergency, set Main Power Panel circuit breaker A1CB1 to OFF.



# CHAPTER 3

## OPERATOR MAINTENANCE INSTRUCTIONS

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### Section I. LUBRICATION INSTRUCTIONS

Lubrication instructions for the mobile semitrailer-mounted petroleum laboratory, doors, leveling jacks, landing gear, may be found in TM 9-2330-362-14&P. For lubrication instructions concerning the environmental control units (ECU), refer to TM 9-4120-371-14. Lubrication requirements for other equipment used in Mod Lab A are contained in their respective Technical Manual (TM) or commercial manual.

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### Section II. TROUBLESHOOTING PROCEDURES

#### Alphabetical Index

Paragraph Title	Paragraph
Introduction.....	3-1
Troubleshooting .....	3-2

#### **3-1. INTRODUCTION.**

This section contains operator troubleshooting information and procedures for locating and correcting common malfunctions which may develop in Mod Lab A.

Table 3-1 lists common malfunctions which may occur during operation or maintenance of Mod Lab A or its components. The test/inspection and corrective actions are to be performed in the order listed.

This manual does not list all malfunctions or corrective actions that may occur. If a malfunction is not listed or is not corrected by corrective actions, notify your supervisor.

#### **3-2. TROUBLESHOOTING.**

Use the symptom index in Table 3-1 for quick access to the troubleshooting procedures in Table 3-2.

**Table 3-1. Symptom Index**

Troubleshooting Table Item Number	Title
1.	No electrical power to laboratory (purge system does not operate).
2.	All ceiling lights fail to illuminate.
3.	Ceiling lights DS1, DS2, DS3, DS4, and DS5 fail to illuminate.
4.	Ceiling lights DS6, DS8, DS9, and DS10 fail to illuminate.
5.	Ceiling lights DS7, DS11, DS12, and DS13 fail to illuminate.
6.	Group of white ceiling lights fail to illuminate (group blackout lights are illuminated).
7.	Mechanical room ceiling lights DS14 and DS15 fail to illuminate.
8.	When one of the Petroleum Laboratory doors is opened, a group of white lights fail to go off and the group's blackout lights fail to illuminate.
9.	Emergency light DS7 or DS13 fail to illuminate when a power failure occurs.
10.	Ceiling light inoperative or dim.
11.	No power at one or more convenience (utility) outlets.
12.	Environmental control unit(s) fail to operate.
13.	Purge system continuously repeats purge cycle.
14.	Air compressor motor fails to run when ON/OFF controller switch is on.
15.	Air compressor motor runs but fails to drive compressor.
16.	Air compressor continually cycles ON and OFF.
17.	Vacuum pump fails to run when START button on motor controller is depressed.
18.	Vacuum pump fails to develop a vacuum (motor running).
19.	Low vacuum pressure.
20.	Water pump fails to run when ON/OFF controller switch is on.
21.	Water pump fails to deliver water at proper pressure.
22.	Water pump continually cycles on and off.
23.	Water chiller fails to run.
24.	Water chiller runs but fails to produce chilled water.
25.	Water heater fails to produce hot water.
26.	Drain tank overflows (sump pump does not operate).
27.	Electric still does not operate.
28.	Gum bath fails to operate properly (pyrometer does not indicate).

Table 3-1. Symptom Index - Cont

Troubleshooting Table Item Number	Title
29.	High pressure boiler fails to raise steam supplied by low pressure boiler to desired temperature (valve lineup is correct and low pressure boiler is operating).
30.	Low pressure boiler fails to provide steam to high pressure boiler.
31.	Gum bath/fume hood exhaust blower(s) fail to operate.
32.	Reid Vapor Pressure (RVP) bath fails to operate (stirrer motor will not run and pilot light fails to illuminate).
33.	Manometer gives no pressure reading.
34.	Manometer gives inaccurate (high/low) pressure reading.
35.	Kinematic viscosity bath does not operate.
36.	Centrifuge fails to operate (run pushbutton on, lamp out).
37.	Distillation test apparatus fails to operate.
38.	Freezer (ice cube maker) fails to operate.
39.	Oxygen stability bath fails to operate.
40.	Laboratory oven fails to operate (does not heat).
41.	Burn-out furnace fails to heat (power switch on; power switch light not lit).
42.	Burn-out furnace fails to heat (power switch on; power switch light lit; heater on light not lit).
43.	Explosion proof refrigerator fails to operate.
44.	Jet Fuel Thermal Oxidation Tester (JFTOT) fails to operate (power switch on; red power indicator and cabinet lights not on).

**Table 3-2. Troubleshooting**

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
1.	<p><b>NO ELECTRICAL POWER TO LABORATORY, PURGE SYSTEM DOES NOT OPERATE.</b></p> <p>Step 1. Check generator set circuit breaker switch is in close position. Place generator power output switch in close position.</p> <p>Step 2. Check generator set voltmeter for correct setting. Adjust voltage to 208-220 VAC.</p>	
<p style="text-align: center;"><b>WARNING</b></p> <p style="text-align: center;">Do not come in contact with main power cable connection on generator set with power applied to laboratory. Death or serious injury may result.</p>		
	<p>Step 3. Check that main power cable is properly connected to generator set.</p> <ul style="list-style-type: none"> <li>a. Turn generator set circuit breaker switch to open.</li> <li>b. Shut off generator set.</li> <li>c. Properly secure main power cable to connectors.</li> </ul> <p>Step 4. Check that main power cable is properly connected to laboratory electrical power receptacle.</p>	
<p style="text-align: center;"><b>WARNING</b></p> <p style="text-align: center;">Do not attempt to disconnect or connect main power cable to laboratory electrical receptacle with generator set applying power to the cable. Death or serious injury may result.</p>		
	<ul style="list-style-type: none"> <li>a. Place generator set circuit breaker switch to open.</li> <li>b. Shut off generator set.</li> <li>c. Make proper power cable connection.</li> <li>d. Start generator set.</li> <li>e. If purge system still fails to operate, notify unit maintenance.</li> </ul>	
<p style="text-align: center;"><b>WARNING</b></p> <p style="text-align: center;">IF purge cycle has not taken place, do not enter Petroleum Laboratory without first allowing laboratory to vent to atmosphere via two laboratory doors for a minimum of 20 minutes. Death or serious injury could result.</p>		
2.	<p><b>ALL CEILING LIGHTS FAIL TO ILLUMINATE.</b></p> <p>Check and reset circuit breaker A1CB1.</p> <p>If lights still fail to operate, notify unit maintenance.</p>	

**Table 3-2. Troubleshooting - continued**

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
3.	<p><b>CEILING LIGHTS DS1, DS2, DS3, DS4, AND DS5 FAIL TO ILLUMINATE.</b></p> <p>Step 1. Check operation of forward door, center switch and rear door, center switch.</p> <p>Step 2. Check and reset circuit breaker A1CB11.</p> <p>If lights still fail to operate, notify unit maintenance.</p>	
4.	<p><b>CEILING LIGHTS DS6, DS8, DS9, AND DS10 FAIL TO ILLUMINATE.</b></p> <p>Step 1. Check operation of forward door, forward switch and rear door, roadside switch.</p> <p>Step 2. Check and reset circuit breaker A1CB9.</p> <p>If lights still fail to operate, notify unit maintenance.</p>	
5.	<p><b>CEILING LIGHTS DS7, DS11, DS12, AND DS13 FAIL TO ILLUMINATE.</b></p> <p>Step 1. Check operation of forward door, rear switch and rear door, curbside switch.</p> <p>Step 2. Check and reset circuit breaker A1CB13.</p> <p>If lights still fail to operate, notify unit maintenance.</p>	
6.	<p><b>GROUP OF WHITE CEILING LIGHTS FAIL TO ILLUMINATE, GROUP BLACKOUT LIGHTS ARE ON.</b></p> <p>Check operation of the group's door interlock switches.</p> <ol style="list-style-type: none"> <li>a. Ensure door interlock switches are closed. White lights should illuminate.</li> <li>b. If white light does not illuminate, notify unit maintenance.</li> </ol>	
7.	<p><b>MECHANICAL ROOM CEILING LIGHTS DS14 AND DS15 FAIL TO ILLUMINATE.</b></p> <p>Step 1. Check operation of mechanical room door switch.</p> <p>Step 2. Check and reset circuit breaker A15CB10.</p> <p>If lights still fail to illuminate, notify unit maintenance.</p>	
8.	<p><b>WHEN ONE OF THE PETROLEUM LABORATORY DOORS IS OPENED, A GROUP OF WHITE LIGHTS FAIL TO GO OFF AND THE GROUP'S BLACKOUT LIGHTS FAIL TO ILLUMINATE.</b></p> <p>Check operation of the light group's door interlock switch.</p> <ol style="list-style-type: none"> <li>a. Adjust door interlock switch.</li> <li>b. If lights still fail to operate, notify unit maintenance.</li> </ol>	
9.	<p><b>EMERGENCY LIGHT DS7 OR DS13 FAIL TO ILLUMINATE WHEN A POWER FAILURE OCCURS.</b></p> <p>Check operation of forward or rear door emergency light switches.</p> <ol style="list-style-type: none"> <li>a. Ensure switch is in the ON position.</li> <li>b. If emergency light still fails to operate, notify unit maintenance.</li> </ol>	



Table 3-2. Troubleshooting - continued

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
<p><b>10.</b></p>	<p><b>CEILING LIGHT INOPERATIVE OR DIM.</b></p> <p>Step 1. Check fixture for burned out or weak lamps. Replace defective lamps.</p> <p>Step 2. Check lamp starter by replacing with a known good starter. Replace defective starter.</p>	
<p><b>11.</b></p>	<p><b>NO POWER AT ONE OR MORE CONVENIENCE (UTILITY) OUTLET(S).</b></p> <p>Check and reset associated circuit breaker(s). See Tables 2-2 and 2-3. If power is still not available at the outlet(s), notify unit maintenance.</p>	
<p><b>12.</b></p>	<p><b>ENVIRONMENTAL CONTROL UNIT(S) FAIL TO OPERATE.</b></p> <p>Step 1. Check and reset associated POWER PANEL NO. 2 circuit breaker(s). If unit still fails to operate, notify unit maintenance.</p> <p>Step 2. Check that electrical input connector on ECU(s) is properly mated. Properly connect power input connector.</p>	
<p><b>13.</b></p>	<p><b>PURGE SYSTEM CONTINUOUSLY REPEATS PURGE CYCLE.</b></p>	
<div style="border: 2px solid black; padding: 5px; display: inline-block; margin-bottom: 10px;"><b>WARNING</b></div> <p>Do not enter laboratory for at least 10 minutes after door is opened to allow any gas accumulation to be vented to the atmosphere. Failure to comply with this warning could result in death or serious injury.</p>		
<p><b>14.</b></p>	<p>Step 1. Carefully open rear laboratory door.</p> <p>Step 2. Enter laboratory and attempt to reset the gas alarm system.</p> <p style="margin-left: 20px;">a. If alarm system will not reset, place generator set circuit breaker to open.</p> <p style="margin-left: 20px;">b. Shut off generator set and call unit maintenance.</p> <p><b>AIR COMPRESSOR MOTOR FAILS TO RUN WHEN ON/OFF CONTROLLER SWITCH IS ON.</b></p> <p>Step 1. Check and reset POWER PANEL NO. 2 circuit breaker A15CB6.</p> <p>Step 2. Check operation of controller ON/OFF switch. If motor still fails to run, notify unit maintenance.</p>	
<p><b>15.</b></p>	<p><b>AIR COMPRESSOR CONTINUALLY CYCLES ON AND OFF.</b></p> <p>Step 1. Check system valves for partially open valves. Close all system valves.</p>	

**Table 3-2. Troubleshooting - continued**

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
	<p>Step 2. Check operation of air system pressure switch.</p> <p>a. Adjust pressure switch in accordance with commercial manual listed in Appendix A.</p> <p>b. If pressure switch will not adjust properly, notify unit maintenance.</p> <p>Step 3. Check system piping for leaks.</p> <p>If leaks are found, notify unit maintenance.</p>	
<p><b>16.</b></p>	<p><b>VACUUM PUMP FAILS TO RUN WHEN START BUTTON ON MOTOR CONTROLLER IS DEPRESSED.</b></p> <p>Check and reset POWER PANEL NO.2 circuit breaker A15CB9.</p> <p>If vacuum pump still fails to run, notify unit maintenance.</p>	
<p><b>17.</b></p>	<p><b>VACUUM PUMP FAILS TO DEVELOP A VACUUM WITH MOTOR RUNNING.</b></p> <p>Check for broken or loose drive belt.</p> <p>Replace or tighten belt as required in accordance with TM 10-4310-391-13&amp;P.</p>	
<p><b>18.</b></p>	<p><b>LOW VACUUM PRESSURE.</b></p> <p>Step 1. Check for open valves in the system.</p> <p>Close all valves.</p> <p>Step 2. Check for leaks in the system.</p> <p>If leaks are found, notify unit maintenance.</p>	
<p><b>19.</b></p>	<p><b>WATER PUMP FAILS TO RUN WHEN ON/OFF CONTROLLER SWITCH IS ON.</b></p> <p>Step 1. Check operation of controller ON/OFF switch.</p> <p>Step 2. Check and reset POWER PANEL NO. 2 circuit breaker A15CB8.</p> <p>If motor still fails to run, notify unit maintenance.</p>	
<p><b>20.</b></p>	<p><b>WATER PUMP FAILS TO DELIVER WATER AT PROPER PRESSURE.</b></p> <p>Step 1. Check level in water tank.</p> <p>If level is low, fill water tank.</p> <p>Step 2. Check for leaks in the system valves, piping and at the pump shaft seal.</p> <p>If leaks are found, notify unit maintenance.</p> <p>Step 3. Check for dirty filter.</p> <p>If filter is dirty, backflush filter.</p>	

**Table 3-2. Troubleshooting - continued**

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
<b>21.</b>	<b>WATER PUMP CONTINUALLY CYCLES ON AND OFF.</b>	<p>Step 1. Check system access valves for partially open valve(s). Close all access valves.</p> <p>Step 2. Check system piping for leaks. If leaks are found, notify unit maintenance.</p> <p>Step 3. Check operation of water system pressure switch.</p> <p>a. Adjust pressure switch. Refer to TM 10-4320-321-13&amp;P.</p> <p>b. If pressure switch will not adjust properly, notify unit maintenance.</p>
<b>22.</b>	<b>WATER CHILLER FAILS TO RUN.</b>	<p>Check and reset POWER PANEL NO. 2 circuit breaker A15CB7.</p> <p>If chiller still fails to operate, notify unit maintenance.</p>
<b>23.</b>	<b>WATER CHILLER RUNS BUT FAILS TO PRODUCE CHILLED WATER.</b>	<p>Check and adjust thermostat.</p> <p>If chiller still fails to produce chilled water, notify unit maintenance.</p>
<b>24.</b>	<b>WATER HEATER FAILS TO PRODUCE HOT WATER.</b>	<p>Check and reset MAIN POWER PANEL circuit breaker A1CB17.</p> <p>If heater still fails to produce hot water, notify unit maintenance.</p>
<b>25.</b>	<b>DRAIN TANK OVERFLOWS, SUMP PUMP DOES NOT OPERATE.</b>	<p>Step 1. Check and reset MAIN POWER PANEL circuit breaker A1CB14.</p> <p>Step 2. Check to see that sump pump is plugged into convenience outlet. If sump pump still fails to operate, notify unit maintenance.</p>
<b>26.</b>	<b>ELECTRIC STILL DOES NOT OPERATE.</b>	<p>Step 1. Check to see that the still is plugged into convenience outlet.</p> <p>Step 2. Check and reset MAIN POWER PANEL circuit breaker A1CB16. If still remains inoperative, notify unit maintenance.</p>
<b>27.</b>	<b>GUM BATH FAILS TO OPERATE PROPERLY, PYROMETER DOES NOT INDICATE.</b>	<p>Step 1. Check operation of INT and AUX switches. Place both switches ON.</p> <p>Step 2. Check and reset MAIN POWER PANEL circuit breaker A1CB18. If gum bath still does not operate properly, notify unit maintenance.</p>

Table 3-2. Troubleshooting - continued

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
28.	<p><b>HIGH PRESSURE BOILER FAILS TO RAISE THE STEAM SUPPLIED BY THE LOW PRESSURE BOILER TO THE DESIRED TEMPERATURE, WITH CORRECT VALVE LINEUP AND LOW PRESSURE BOILER OPERATING.</b></p> <p>Step 1. Check position of gum bath AUX switch. Place switch ON.</p> <p>Step 2. Check and reset MAIN POWER PANEL circuit breaker A1CB19.</p> <p>Step 3. Check position of high pressure boiler thermostat control. If boiler still fails to operate properly, notify unit maintenance.</p>	
29.	<p><b>LOW PRESSURE BOILER FAILS TO PROVIDE STEAM TO HIGH PRESSURE BOILER.</b></p> <p>Step 1. Check boiler ON/OFF switch in ON position.</p> <p>Step 2. Check valve lineup. Open water feed valve, and close boiler drain valve.</p> <p>Step 3. Check and reset POWER PANEL NO. 2 circuit breaker A15CB5. If low pressure boiler still fails to operate, notify unit maintenance.</p>	
30.	<p><b>GUM BATH/FUME HOOD EXHAUST BLOWER(S) FAIL TO OPERATE.</b></p> <p>Step 1. Check operation of blower GFI switch(es). Reset GFI switch.</p> <p>Step 2. Check exhaust door is open.</p> <p>Step 3. Check and reset POWER PANEL NO. 2 circuit breaker A15CB11. If exhaust blower(s) still does not operate, notify unit maintenance.</p>	
31.	<p><b>REID VAPOR PRESSURE BATH FAILS TO OPERATE, STIRRER MOTOR WILL NOT RUN AND PILOT LIGHT FAILS TO ILLUMINATE.</b></p> <p>Step 1. Check operation of line switch. Reset switch ON.</p> <p>Step 2. Check and reset MAIN POWER PANEL circuit breaker A1CB16. If RVP bath still fails to operate, notify unit maintenance.</p>	
32.	<p><b>MANOMETER GIVES NO PRESSURE READING.</b></p> <p>Step 1. Check to see if pressure is being supplied to either or both sides of the instrument.</p> <p>Step 2. Check for plugged or leaking pressure lines. Make applicable corrections.</p> <p>Step 3. Inspect atmosphere pressure connection for proper venting to atmosphere. a. Make applicable correction to ensure proper venting.</p>	

Table 3-2. Troubleshooting - continued

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
33.	<p><b>MANOMETER GIVES INACCURATE (HIGH/LOW) PRESSURE READING.</b></p>	<p>b. If manometer still fails to operate, notify unit maintenance.</p> <p>Step 1. Check zero setting. Adjust zero setting if required.</p> <p>Step 2. Check for leaks or obstructions. a. Make applicable corrections. b. If manometer still gives inaccurate readings, notify unit maintenance.</p>
34.	<p><b>KINEMATIC VISCOSITY BATH DOES NOT OPERATE.</b></p>	<p>Step 1. Check that unit's power cord is plugged into convenience outlet for viscosity bath.</p> <p>Step 2. Check that line switch is ON.</p> <p>Step 3. Check and reset MAIN POWER PANEL circuit breaker A1CB4. If bath still fails to operate, notify unit maintenance.</p>
35.	<p><b>CENTRIFUGE FAILS TO OPERATE, RUN PUSHBUTTON ON, LAMP OUT.</b></p>	<p>Step 1. Ensure that unit's power cord is plugged into convenience outlet.</p> <p>Step 2. Check position of line switch. Place line switch ON.</p> <p>Step 3. Check and reset MAIN POWER PANEL circuit breaker A1CB8. If centrifuge still fails to operate, notify unit maintenance.</p>
36.	<p><b>DISTILLATION TEST APPARATUS FAILS TO OPERATE.</b></p>	<p>Step 1. Ensure that unit's power cord is plugged into convenience outlet.</p> <p>Step 2. Check position of line switch. Place line switch ON.</p> <p>Step 3. Check and reset MAIN POWER PANEL circuit breaker A1CB7. If distillation test apparatus still fails to operate, notify unit maintenance.</p>
37.	<p><b>FREEZER FAILS TO OPERATE.</b></p>	<p>Step 1. Ensure that unit's power cord is plugged into convenience outlet located in mechanical room.</p> <p>Step 2. Check and reset MAIN POWER PANEL circuit breaker A1CB8.</p> <p>Step 3. Check thermostat control. a. Turn thermostat control knob to maximum cold setting. b. If freezer still fails to operate, notify unit maintenance.</p>

**Table 3-2. Troubleshooting - continued**

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
38.	<b>OXYGEN STABILITY BATH FAILS TO OPERATE.</b>	Step 1. Check the 3-position heat switch. Place switch in the HIGH HEAT position. Step 2. Check and reset MAIN POWER PANEL circuit breaker A1CB15. If bath still fails to operate, notify unit maintenance.
39.	<b>LABORATORY OVEN FAILS TO OPERATE, DOES NOT HEAT.</b>	Step 1. Ensure that unit's power cord is plugged into convenience outlet. Step 2. Check position of line switch. Place line switch ON. Step 3. Check and reset MAIN POWER PANEL circuit breaker A1CB5. If oven still fails to operate, notify unit maintenance.
40.	<b>BURN-OUT FURNACE FAILS TO HEAT. POWER SWITCH ON, BUT POWER SWITCH LIGHT NOT ILLUMINATED.</b>	Step 1. Ensure that unit's power cord is plugged into convenience outlet. Step 2. Check and reset MAIN POWER PANEL circuit breaker A1CB12. If furnace still fails to heat, notify unit maintenance.
41.	<b>BURN-OUT FURNACE FAILS TO HEAT. POWER SWITCH ON, POWER SWITCH LIGHT ILLUMINATED, BUT CYCLE LIGHT NOT ILLUMINATED.</b>	Ensure door is completely closed. If furnace still fails to heat, notify unit maintenance.
42.	<b>REFRIGERATOR FAILS TO OPERATE.</b>	Step 1. Ensure that unit's power cord is plugged into convenience outlet. Step 2. Check and reset MAIN POWER PANEL circuit breaker A1CB6. If refrigerator still fails to operate, notify unit maintenance.
43.	<b>JET FUEL THERMAL OXIDATION TESTER (JFTOT) FAILS TO OPERATE. POWER SWITCH ON, BUT RED POWER INDICATOR AND CABINET LIGHTS NOT ILLUMINATED.</b>	Step 1. Ensure that unit's power cord is plugged into convenience outlet. Step 2. Check and reset MAIN POWER PANEL circuit breaker A1CB3. Step 3. Check convenience outlet. If JFTOT still fails to operate, notify unit maintenance.

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## Section III. OPERATOR MAINTENANCE PROCEDURES

### Alphabetical Index

Paragraph Title	Paragraph
Aneroid Barometer .....	3-7
Electric Still.....	3-8
Fluorescent Light Fixture Lamp and Starter.....	3-4
Introduction .....	3-3
Portable Equipment.....	3-9
Pressure Recording Gauge .....	3-6
Purge Intake and Exhaust Door Filter .....	3-5

### 3-3. INTRODUCTION.

This section contains Mod Lab A operator maintenance instructions. Personnel required are listed only if the task requires more than one.

After completing each maintenance procedure, perform operational check to ensure equipment is properly functioning.

### 3-4. FLUORESCENT LIGHT FIXTURE LAMP AND STARTER.

---

This task consists of:

a. Remove

b. Install

---

#### **INITIAL SET-UP**

##### Tools Required

General Mechanics Tool Kit, (Appendix B, Section III, Item 1)

##### Equipment Conditions

Place appropriate circuit breaker in the OFF position.

##### General Safety Instructions

<b>WARNING</b>
----------------

#### **ELECTRICAL SHOCK**

Before performing any maintenance actions on electrical equipment, ensure all electrical power has been turned off. Failure to comply with this warning may result in serious injury or death.

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#### **NOTE**

Procedures for removing and installing fluorescent lamps and lamp starters in the emergency light fixtures are identical to the procedures outlined in Paragraph 3-4. To test emergency lights, place MAIN CIRCUIT BREAKER A1CB1 in OFF position. Emergency lights should illuminate.

#### REMOVE

1. Remove Fluorescent Lamp. See Figure 3-1.
  - a. Loosen four captive screws (1) holding diffuser (2) to lamp fixture and carefully remove diffuser from light fixture.
  - b. Release lamp retaining clip (3) and rotate lamp (4) until lamp prongs are free from slot. Remove lamp.

#### **NOTE**

If center (blackout) lamp (5) is the defective lamp, perform steps c and d.

- c. Loosen four screws (6) and rotate two standoff brackets (7) 180 degrees. Release lamp retaining clip (3) and rotate lamp (5) until lamp prongs are free from slot.
  - d. Remove tape from both ends of blue filter tube (8) and remove lamp (5). Retain blue filter tube for installation.
2. Remove Fluorescent Lamp Starter.
  - a. Loosen four captive screws (1) holding diffuser (2) to lamp fixture and carefully remove diffuser from light fixture.
  - b. Rotate starter (9) until prongs are free from slots and remove starter.



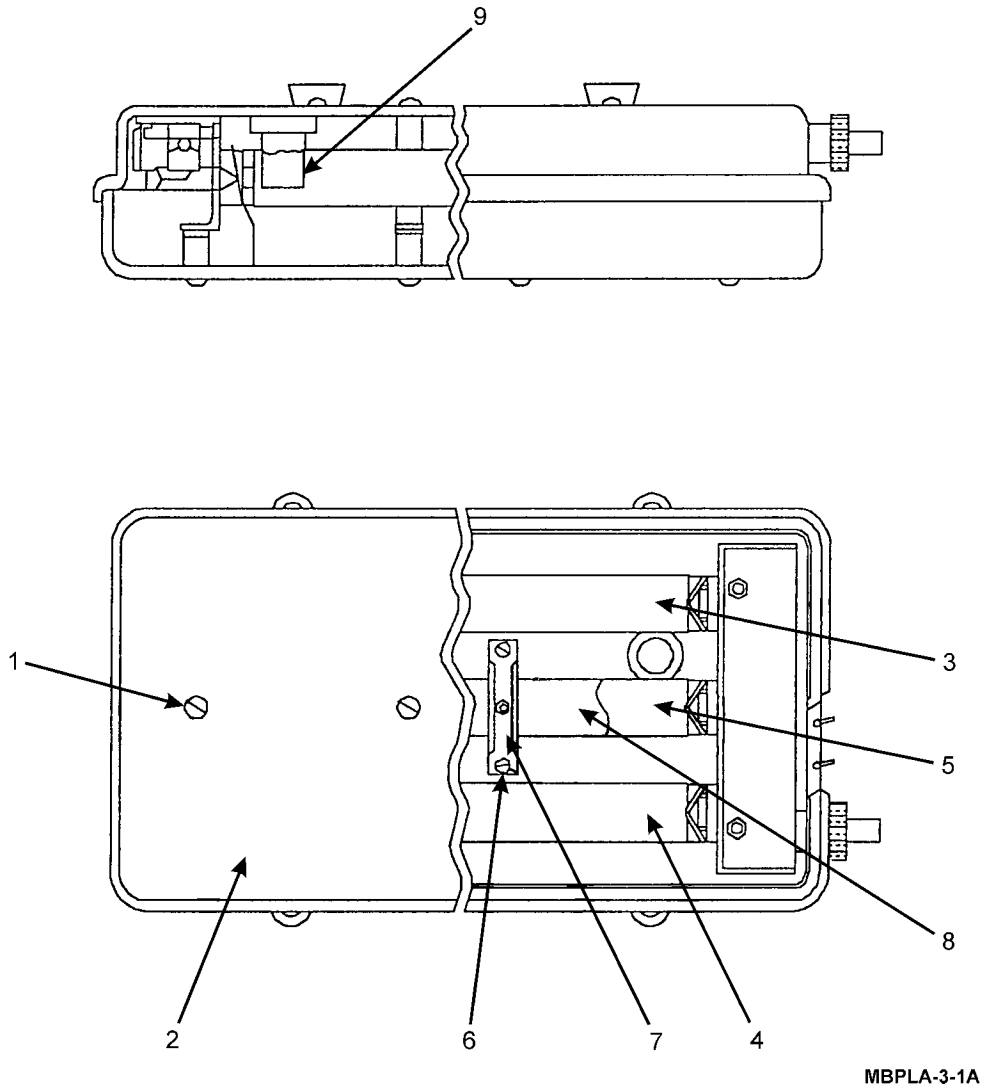


Figure 3-1. Fluorescent Light Fixture Lamp and Starter

**INSTALL**

1. Install Fluorescent Lamp. See Figure 3-1.

**NOTE**

If center (blackout) lamp (5) is being replaced perform steps a through d. If replacing white lights, proceed to step e.

- a. Insert lamp (5) into blue filter tube (8).
  - b. Wrap one layer of 3/4 inch tape on both ends of lamp (5) to extend onto blue filter tube (8) 3/8 inch.
  - c. Insert lamp (5) with blue filter tube (8) into slots and rotate 90 degrees. Reposition lamp retaining clips (3).
  - d. Rotate two standoff brackets (7) 180 degrees and tighten four screws (6).
  - e. Position lamp retaining clips (3) and align lamp (4) prongs with slots in light assembly.
  - f. Insert lamp (4) into slots and rotate 90 degrees. Reposition lamp retaining clips (3).
  - g. Install lamp diffuser (2) and secure by tightening four captive screws (1).
  - h. Place appropriate circuit breaker in the ON position. (See Table 2-2 or 2-3).
2. Install Fluorescent Lamp Starter.

**NOTE**

It may be necessary to remove adjacent lamp prior to installing starter.

- a. Align starter (9) prongs with starter slots in light fixture.
- b. Insert starter (9) into slots and rotate 90 degrees.
- c. Install lamp diffuser (2) and secure by tightening four captive screws (1).
- d. Place appropriate circuit breaker in the ON position. (See Table 2-2 or 2-3).

**3-5. PURGE INTAKE AND EXHAUST DOOR FILTER.**

---

This task consists of:

a. Remove	b. Install
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---

**INITIAL SET-UP**

Tools Required

General Mechanics Tool Kit, (Appendix B, Section III, Item 1)

Materials/Parts Required

Lockwashers, (4)

---

REMOVE

Remove Purge Door Filter. See Figure 3-2.

- a. Unlatch and open purge door.
- b. Remove four screws (1), lockwashers (2), screen (3) and filter (4). Discard lockwashers.

INSTALL

Install Purge Door Filter. See Figure 3-2.

- a. Install filter (4) and screen (3) and secure with four screws (1) and lockwashers (2).
- b. Close purge door and latch.

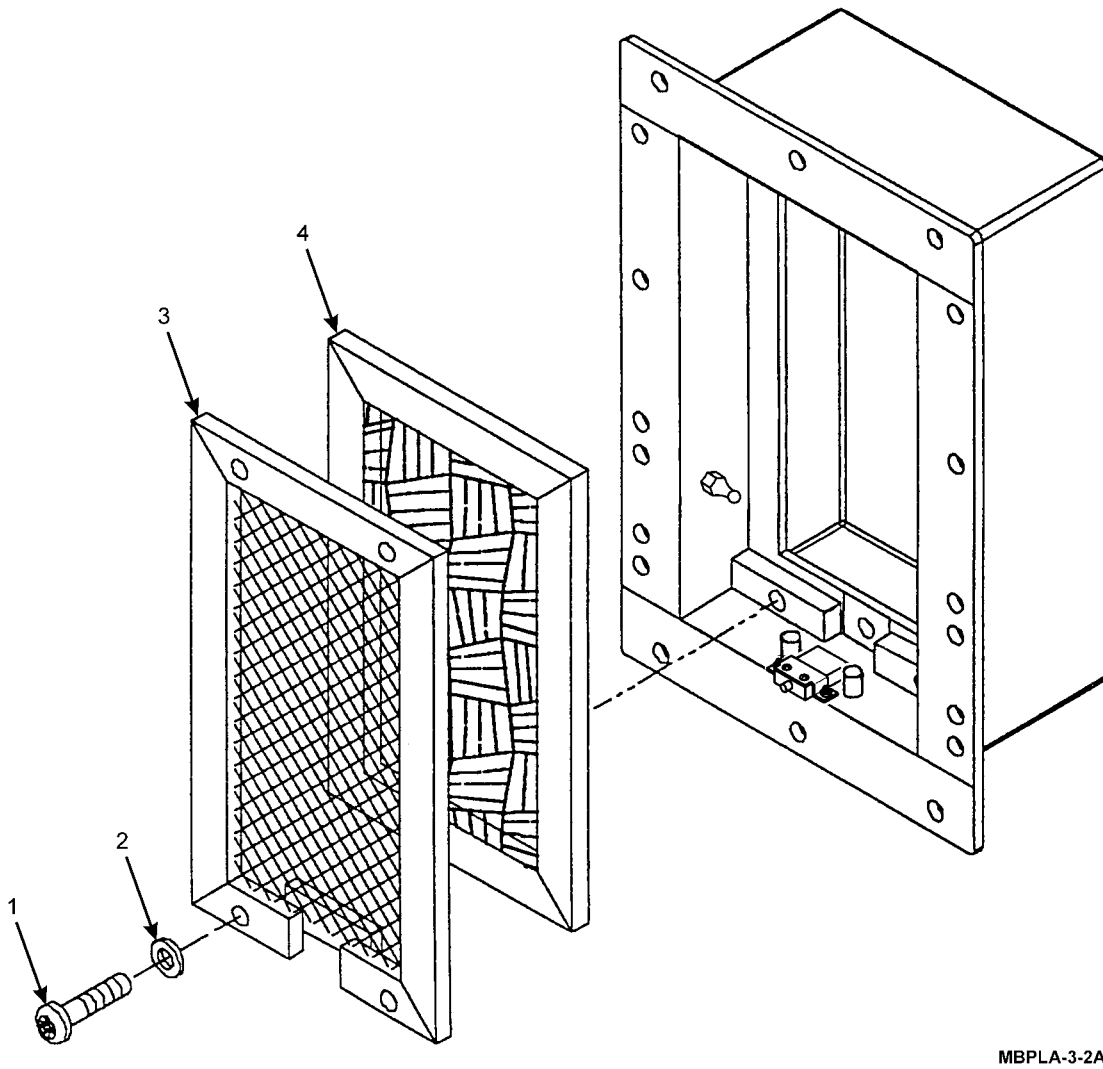


Figure 3-2. Purge Intake and Exhaust Door Filter

### 3-6. PRESSURE RECORDING GAUGE.

---

This task consists of:	a. Remove	b. Install	c. Calibrate
------------------------	-----------	------------	--------------

---

#### **INITIAL SET-UP**

##### Tools Required

General Mechanics Tool Kit, (Appendix B, Section III, Item 1)

##### Materials/Parts Required

Lockwashers, (15)

##### Equipment Conditions

All inputs to pressure gauge disconnected.

---

#### REMOVE

Remove Pressure Recording Gauge. See Figure 3-3.

- a. Remove 12 screws (1), lockwashers (2) and carefully remove pressure recording gauge (3) with three mounts (4). Discard lockwashers.
- b. Remove three screws (5), washers (6), lockwashers (7), nuts (8), and wall mounts (4) from pressure recording gauge (3). Discard lockwashers.
- c. Refer to TM 10-6685-365-13&P for adjustment or repair procedures required for the pressure recording gauge.

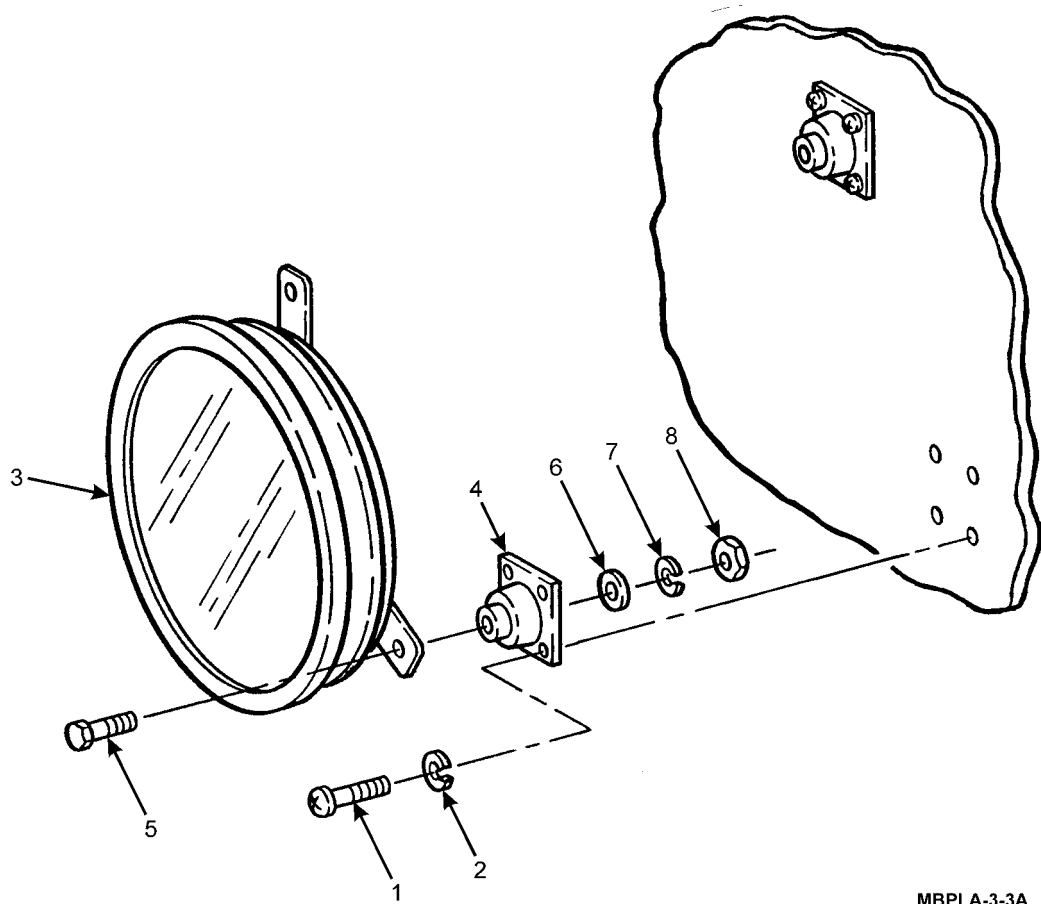
#### INSTALL

Install Pressure Recording Gauge. See Figure 3-3.

- a. Install wall mounts (4) on pressure recording gauge (3) and secure each wall mount with screw (5), washer (6), lockwasher (7), and nut (8).
- b. Align three wall mounts (4) and secure each wall mount with four screws (1) and lockwashers (2).

#### CALIBRATE

Refer to technical manual listed in Appendix A for calibration procedures.



MBPLA-3-3A

Figure 3-3. Pressure Recording Gauge

### 3-7. ANEROID BAROMETER.

---

This task consists of:                      a. Remove    b. Install

---

#### **INITIAL SET-UP**

##### Tools Required

General Mechanics Tool Kit, (Appendix B, Section III, Item 1)

##### Materials/Parts Required

Lockwashers, (3)

---

#### REMOVE

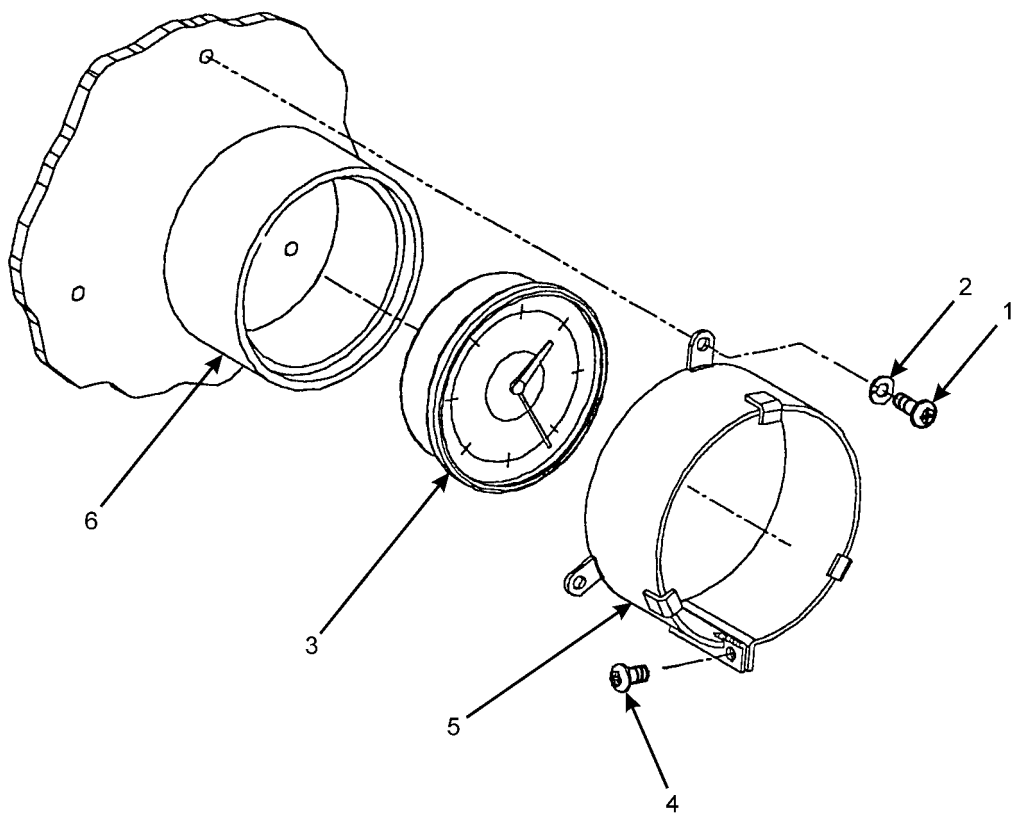
Remove Aneroid Barometer. See Figure 3-4.

- a. Remove three screws (1), lockwashers (2) and carefully remove aneroid barometer (3) from wall. Discard lockwashers.
- b. Loosen two retaining ring clamp screws (4).
- c. Remove retaining ring (5) from barometer (3) and mounting cushion (6).
- d. Remove barometer (3) from mounting cushion (6). Retain cushion for installation.

#### INSTALL

Install Aneroid Barometer. See Figure 3-4.

- a. Install mounting cushion (6) on aneroid barometer (3) and insert into retaining ring (5).
- b. Tighten two retaining ring clamp screws (4) until aneroid barometer (3) is held securely in place.
- c. Install aneroid barometer (3) in place on wall and secure with three screws (1) and lockwashers (2).



MBPLA-3-5A

Figure 3-4. Aneroid Barometer



### 3-8. ELECTRIC STILL.

---

This task consists of:                      a. Remove                      b. Service                      c. Install

---

#### **INITIAL SET-UP**

##### Tools Required

General Mechanics Tool Kit, (Appendix B, Section III, Item 1)

##### Materials/Parts Required

Lockwashers, (5)

10% Acidic Acid

##### General Safety Instructions

**WARNING**

#### ELECTRICAL SHOCK

Before performing any maintenance actions on electrical equipment, ensure all electrical power has been turned off. Failure to comply with this warning may result in serious injury or death.

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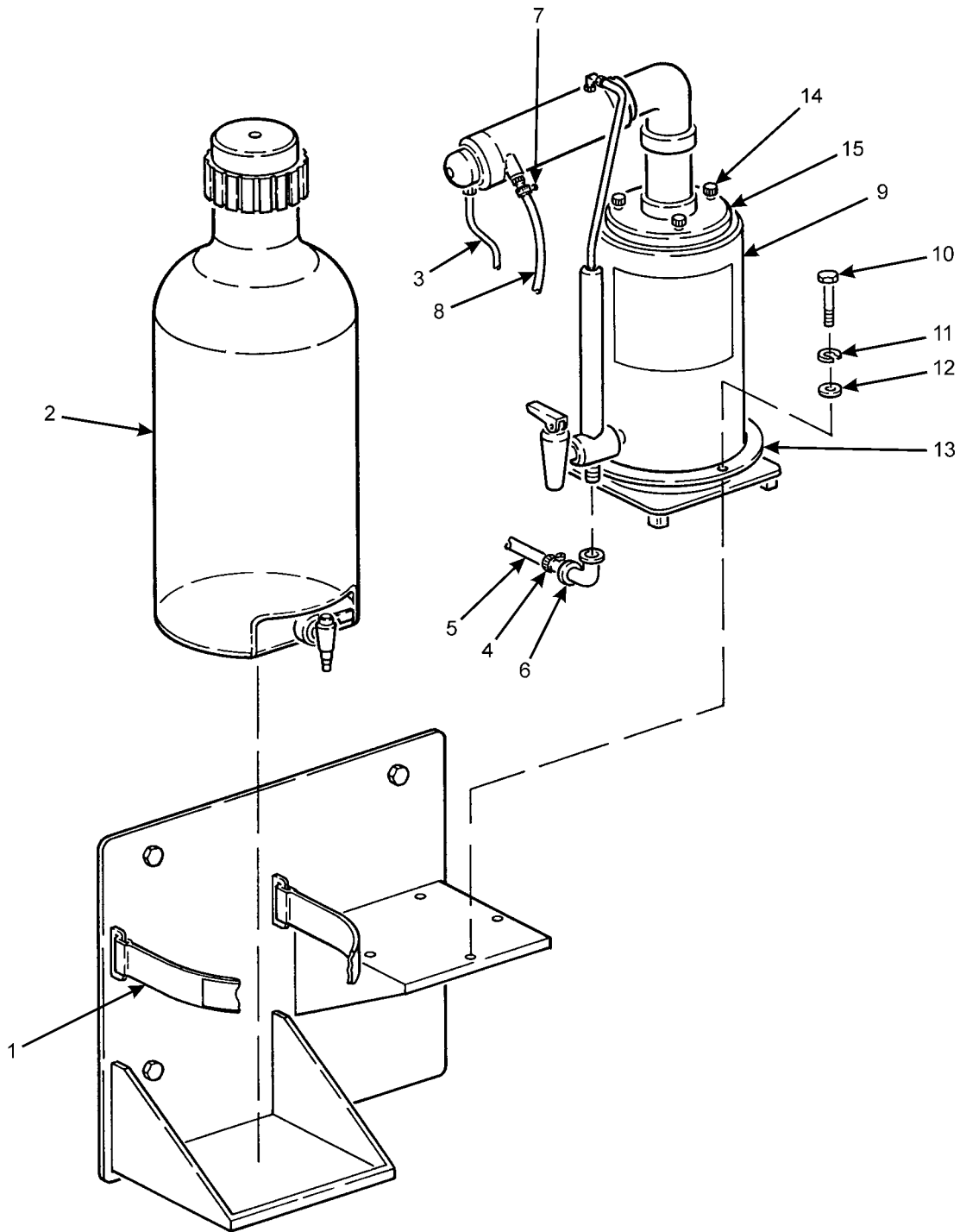
#### REMOVE

1. Remove Distilled Water Container. See Figure 3-5.
  - a. Remove retaining strap (1) and remove container (2) from still shelf by lifting up container and tilting bottom out and down to clear tube (3).
2. Remove Still.
  - a. Remove still's power cord from convenience outlet.
  - b. Loosen clamp (4) and remove drain hose (5) from elbow (6).
  - c. Loosen clamp (7) and remove supply hose (8) from still (9).
  - d. Remove five screws (10), lockwashers (11), and washers (12) securing retaining ring (13) and still (9). Discard lockwashers.
  - e. Lift still (9) and retaining ring (13) from still shelf. Drain residual water from still.
  - f. Remove elbow (6) from still (9).
  - g. Remove retaining ring (13) from still (9).

#### SERVICE

##### Clean Still.

- a. Remove three thumb nuts (14) and remove lid (15) from still (9).
- b. Remove any loose scale or residue from still (9) by blowing out with low pressure (20 psi) air.
- c. Clean still's interior with a solution of 10% acidic acid to remove any buildup of scale.
- d. Rinse with fresh water, dry interior and exterior thoroughly.



MBPLA-3-6A

Figure 3-5. Electric Still

INSTALL

1. Install Electric Still. See Figure 3-5.
  - a. Install retaining ring (13) on still (9).
  - b. Install elbow (6) on still (9).
  - c. Place still (9) with retaining ring (13) on still shelf and secure with five screws (10), lockwashers (11), and washers (12).
  - d. Attach supply hose (8) to still (9) and tighten clamp (7).
  - e. Attach drain hose (5) to elbow (6) and tighten clamp (4).
2. Install Distilled Water Container.
  - a. Lift up on container (2) inserting tube (3) into top of container and lower container into place on still shelf.
  - b. Secure container (2) with retaining strap (1).
  - c. Plug still's power cord into convenience outlet.
  - d. Perform an operational check on still.

**3-9. PORTABLE EQUIPMENT.**

**NOTE**

When maintenance is required for portable equipment and requires no permanent mounting, the equipment should be removed from its storage in Mod Lab A and handled, packaged, adjusted, repaired or replaced in accordance with their respective TMs listed in Appendix A.

## Section IV. PREPARATION FOR STORAGE AND SHIPMENT

### Alphabetical Index

Paragraph Title	Paragraph
Air Shipment.....	3-10e
Introduction.....	3-10
Preparation for Shipment .....	3-10d
Prior to Placing Unit in Storage .....	3-10b
Storage Length and Readiness .....	3-10a
Storage Site Selection .....	3-10c

### 3-10. INTRODUCTION.

This section contains information on administrative storage procedures. If additional information is required, refer to TM 740-90-1.

- a. Storage Length and Readiness. Placement of equipment in administrative storage shall be for short periods of time (1 to 45 days) when a shortage of maintenance efforts exists. Items shall be in mission readiness within 24 hours or within the time factors as determined by directing authority. During the storage period, appropriate maintenance records will be kept.
- b. Prior to Placing Unit in Storage. Before placing equipment in administrative storage, current maintenance services and Preventive Maintenance Checks and Services (PMCS) evaluations shall be completed, shortcomings and deficiencies shall be corrected, and all Modification Work Orders (MWO's) shall be applied. Drain water from piping as follows (Refer to figure 2-9 for location of drain valves):

#### **CAUTION**

Failure to drain water from piping in climates below freezing may cause piping to develop cracks and leak. Always drain piping of water.

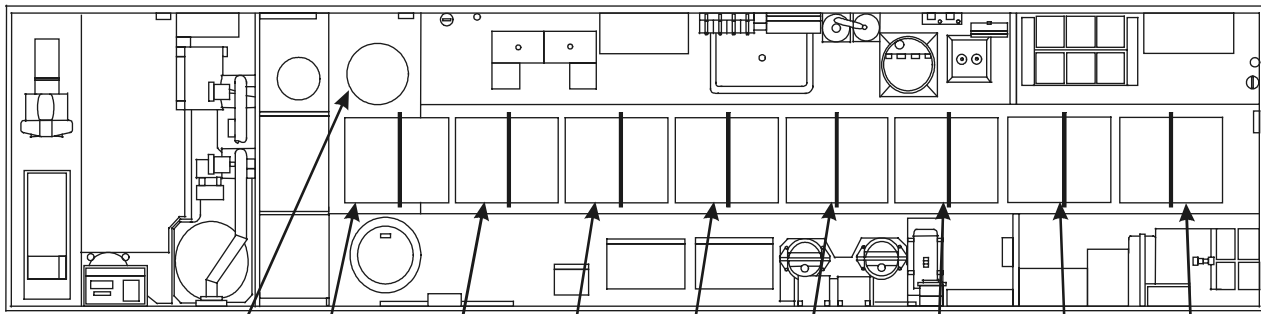
#### **NOTE**

Draining may be accomplished quickly by applying slight air pressure to supply and return lines.

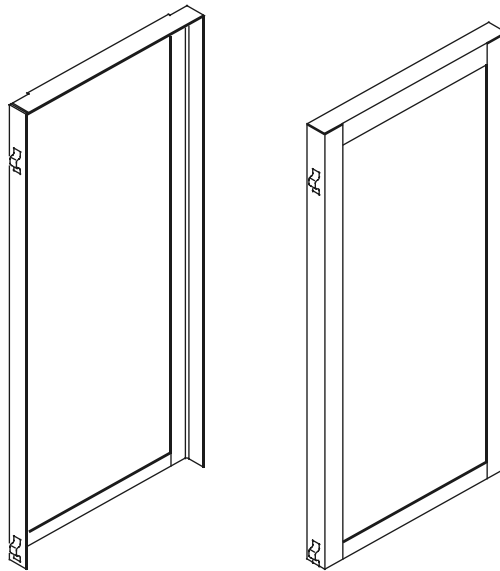
1. Remove two camlocks from under trailer.
2. Open water tank drain valve.
3. Open water system drain valve.
4. Open return water drain valve.
5. Open water pump drain valve
6. Open pump suction drain valve
7. Open water supply drain located in laboratory next to sump tank.
8. Open sump tank drain in located in laboratory next to sump tank.
9. Open water supply drain in located in laboratory next to hot water tank.
10. Open spigot in sink.

- c. Storage Site Selection. Inside storage is preferred for items selected for administrative storage. If inside storage is not available, the sites selected should provide required protection from the elements and allow access for visual inspection when applicable.
- d. Preparation for Shipment. Prior to shipment all overpack containers (and their contents) and spill kit shall be secured inside Mod Lab A in accordance with Figure 3-6. Each group of containers is secured using a supplied 2-piece frame and strapping. Two straps are used to secure the 2-piece frame to the overpack boxes. A third strap is used to secure the 2-piece frame and overpack box group to the trailer tie down rings located along the laboratory aisle floor. Boxes 1 thru 16 are large overpack boxes, 17, 18, and 24 are medium sized boxes, and 19 thru 23, and 25 are small overpack boxes. Starting with the front of the trailer the overpack boxes are installed in groups as follows: Boxes 18, 22, 23, and 25, 8, 9, and 14, 11 thru 13, 10, 17, and 19, 2, 15, and 16, 1, 3, and 7, 4 thru 6, and 20, 21, and 24.
- e. Air Shipment. Chemicals must be stored in original or same as cardboard boxes when received so that movement in overpack boxes is minimized to maximum extent. Only unopened chemicals can be packed for air shipment.

TOP VIEW



- |              |                               |                       |                         |                         |                        |                      |                      |                         |
|--------------|-------------------------------|-----------------------|-------------------------|-------------------------|------------------------|----------------------|----------------------|-------------------------|
| SPILL<br>KIT | BOXES<br>18<br>22<br>23<br>25 | BOXES<br>8<br>9<br>14 | BOXES<br>11<br>12<br>13 | BOXES<br>10<br>17<br>19 | BOXES<br>2<br>15<br>16 | BOXES<br>1<br>3<br>7 | BOXES<br>4<br>5<br>6 | BOXES<br>20<br>21<br>24 |
|--------------|-------------------------------|-----------------------|-------------------------|-------------------------|------------------------|----------------------|----------------------|-------------------------|

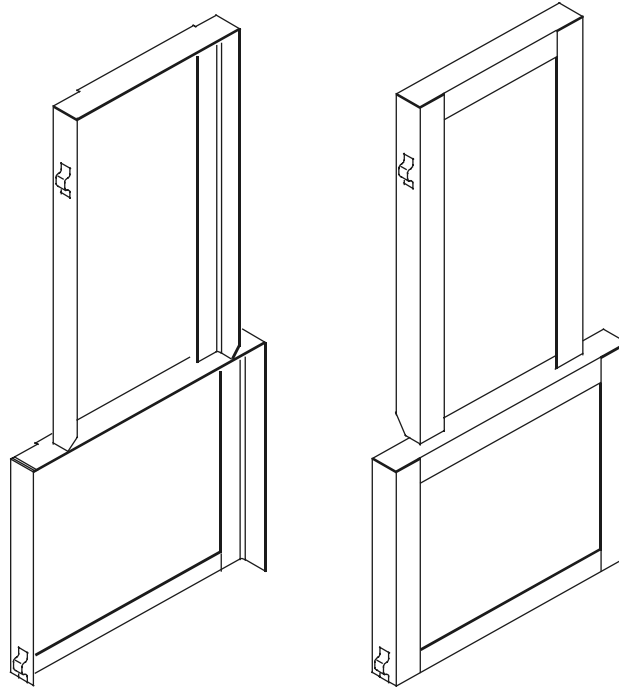


FRAMES FOR BOX GROUPS:

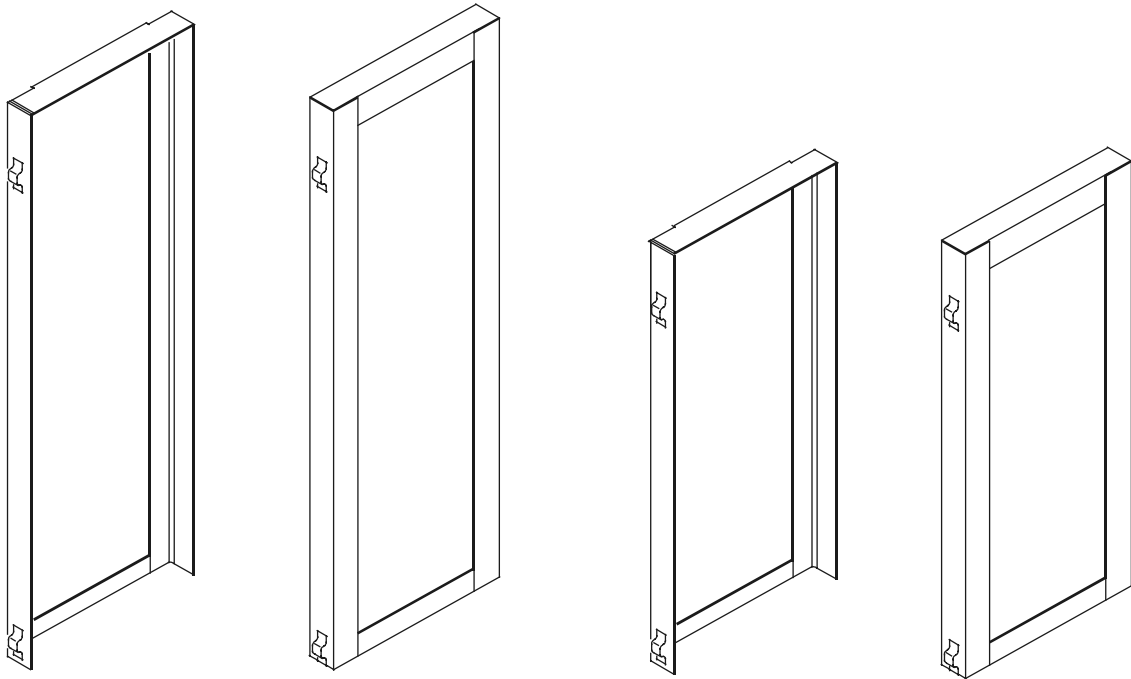
- 1, 3, 7
- 4, 5, 6
- 2, 15, 16
- 8, 9, 14
- 11, 12, 13

MBPLA-3-7-1B

Figure 3-6. Overpack Box Location and Layout (Sheet 1 of 2)



FRAMES FOR BOX GROUPS: 10, 17, 19



FRAMES FOR BOX GROUPS: 18, 22, 23, 25

FRAMES FOR BOX GROUPS: 20, 21, 24

MBPLA-3-7-2B

Figure 3-6. Overpack Box Location and Layout (Sheet 2 of 2)





# CHAPTER 4

## UNIT MAINTENANCE INSTRUCTIONS

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### Section I. REPAIR PARTS, TOOLS, SPECIAL TOOLS, TEST, MEASUREMENT AND DIAGNOSTIC EQUIPMENT

#### Alphabetical Index

Paragraph Title	Paragraph
Common Tools and Equipment.....	4-1
Repair Parts.....	4-3
Special Tools; Test, Measurement and Diagnostic Equipment.....	4-2

**4-1. COMMON TOOLS AND EQUIPMENT.**

Appendix B, Section III contains the authorized common tools. For authorized equipment, refer to Modified Table of Organization and Equipment (MTOE) applicable to your unit.

**4-2. SPECIAL TOOLS, TEST, MEASUREMENT, AND DIAGNOSTIC EQUIPMENT**

No special tools, test, measurement, and diagnostic equipment are required for Mod Lab A maintenance at the unit level.

**4-3. REPAIR PARTS.**

- a. Repair parts for Mod Lab A are listed in TM 10-6640-238-23P, covering Mod Lab A operator, unit, and direct support maintenance.

## Section II. SERVICE UPON RECEIPT

### Alphabetical Index

Paragraph Title	Paragraph
General .....	4-4
Inspecting and Preliminary Servicing of Equipment Upon Receipt .....	4-5

#### 4-4. GENERAL.

When new, used or reconditioned equipment is first received, it is the responsibility of the person in charge to determine whether the equipment has been properly prepared for service by the supplying organization and to be sure it is in condition to perform its function. For this purpose, inspect all assemblies, subassemblies, and accessories to be sure they are properly assembled, secure, clean and correctly adjusted and/or lubricated. Check all tools and equipment to be sure every item is present, in good condition, clean and properly mounted or stowed.

#### 4-5. INSPECTING AND PRELIMINARY SERVICING OF EQUIPMENT UPON RECEIPT.

##### a. General Procedures.

- (1) Visually inspect Petroleum Laboratory body exterior starting at the rear to cover rear, curbside, roadside, front, top, and bottom. Inspect for damage, tears, breaks, or corrosion.
- (2) Service Petroleum Laboratory exterior and trailer in accordance with TM 9-2330-362-14&P.
- (3) Inspect and service the ECUs in accordance with TM 9-4120-371-14.
- (4) Remove spill kit.
- (5) Remove overpack boxes.
- (6) Enter Petroleum Laboratory and inspect for broken equipment or equipment loose and not secured.
- (7) Close doors/vents to determine if light leaks exist.
- (8) Inspect doors for damage, torn or rotted seals, and tightness of closure.
- (9) Inspect interior for evidence of water damaged, fungi, mildew, and corrosion.
- (10) Inventory section contents against Components of End Item and Basic Issue Items Lists (Appendix C).
- (11) Inventory consumable supplies as shown in Appendix E.
- (12) Remove thermometers from overpack box 25 and store in thermometer case located on cabinet door V.
- (13) Remove propane bottles from overpack box 15 and store in propane locker.
- (14) Have fire extinguishers inspected and filled in accordance with local procedures.

##### b. Special Procedures.

- (1) Set Petroleum Laboratory up for operation and conduct operational checks on equipment in accordance with Chapter 2 in this manual when operators are available and power can be safely provided to the van body.
- (2) Report damage or discrepancies in accordance with AR 735-11 and AR 735-11-2.
- (3) Store chemicals in accordance with Chapter 2.

## Section III. UNIT PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS)/LUBRICATION INSTRUCTIONS

### Alphabetical Index

Paragraph Title	Paragraph
General.....	4-6
Leakage Definitions For Unit PMCS.....	4-8
Unit Preventive Maintenance Checks and Services .....	4-7

#### 4-6. GENERAL.

Preventive Maintenance Checks and Services (PMCS) means systematic caring, inspecting, and servicing of Mod Lab A equipment to keep it in good working condition and to prevent breakdown. The operator's mission is to:

- a. Perform PMCS each time Mod Lab A is put into operation. Always perform PMCS in the same order, so it becomes a habit.
- b. Perform Quarterly (Q) once each 3 months.
- c. Perform Semi-Annually (S) once each 6 months.
- d. Perform Annually (A) once each year.
- e. Perform Bi-Annually (B) once each 2 years.
- f. If equipment does not perform as required, refer to Section IV, Troubleshooting for possible problems. Use DA Form 2404 (Equipment Inspection and Maintenance Worksheet) to record any malfunctions or failures that are discovered before, during, and after operation; or refer to DA Pam 738-750. If a malfunction or failure can not be corrected, report it to direct support maintenance. Should malfunctions or failures be repaired, they are not required to be recorded.
- g. General maintenance practices are as follows:
  - (1) Keep It Clean: Dirt, grease, oil and debris get in the way and may cover up serious problems. Keep work area clean. Use soap and warm water when cleaning rubber or plastic material.
  - (2) Bolts, Nuts and Screws: Check that they are not loose, missing, bent, broken, or corroded. Tighten any that are found loose.
  - (3) Welds: Look for loose or chipped paint, rust or gaps where parts are welded together. Report a bad weld to direct support maintenance or supervisor.
  - (4) Electric Wires and Connectors: Look for cracked or broken insulation, bare wires and loose or broken connectors. Tighten loose connections and make sure the wires are in good condition.
  - (5) Hoses and Fluid Lines: Look for wear, damage, and leaks. Make sure clamps and fittings are tight. Wet spots or stains around a fitting or connector indicates a leak. If a leak comes from a loose fitting or connector, tighten it. If something is broken or worn out, either correct or report it to direct support maintenance, or as directed by the MAC.
- h. Perform Unit PMCS procedures for equipment covered by individual TMs, see Appendix A for TM numbers.

#### 4-7. PMCS PROCEDURES.

The following paragraphs describe the PMCS and each Column. See Table 4-1.

- a. Purpose of PMCS Table. The PMCS table lists the inspections and care equipment required to keep it in good operating condition.
- b. Item Number . Item numbers are assigned in chronological, ascending sequence regardless of interval designation. These numbers are used for the TM number column on DA Form 2404, Equipment Inspection and Maintenance Worksheet, in recording results of PMCS.
- c. Interval. Tells when to do specified Inspections.
- d. Item to Inspect. Identifies the item to be Inspected.
- e. Procedures. Provides Inspection criteria for each item. Repair or adjustments must be performed before Mod Lab A can be put into operation. Direct support maintenance must perform the work, if tools are not available or instructed by the procedure.
- f. Not Fully Mission Capable If:. Defines what makes the equipment is not ready to perform mission.

#### 4-8. LEAKAGE DEFINITIONS FOR UNIT PMCS.

It is necessary to know how fluid leaks affect the status of equipment. The following are definitions of the types/classes of leakage needed to know to be able to determine the status of equipment. Learn and be familiar with them and REMEMBER - WHEN IN DOUBT, NOTIFY YOUR SUPERVISOR.

**Class I** Seepage of fluid (as indicated by wetness or discoloration) not great enough to form drops.

**Class II** Leakage of fluid great enough to form drops but not enough to cause drops to drip from item being checked/inspected.

**Class III** Leakage of fluid great enough to form drops that fall from the item being checked/inspected.

**Table 4-1. Unit Preventive Maintenance Checks and Services (PMCS)**

Q - Quarterly S - Semi-Annually A - Annually B-Bi-Annually

**NOTE**

If equipment must be kept in continuous operation, inspect and service those items that can be inspected and serviced without disturbing operation. Make complete Inspections and services when equipment can be shut down. Within designated interval, these checks are to be performed in the order listed. Perform operator/crew PMCS prior to or in conjunction with unit PMCS if: There is a delay between the daily operation of the equipment and the unit or regular operator is not assisting/participating.

Item No.	Interval				Item to Inspect	Procedures	Not Fully Mission Capable If:
	Q	S	A	B			
1	•	•	•	•	Mod Lab A Trailer	Perform PMCS per TM listed in Appendix A.	Fails inspection per TM.
2	• • •				Water Inlet Box	a. Check door panel and gasket for correct assembly and good condition. Check water hose adapters for correct assembly and good condition. b. Check directional valve lever for proper operation.	Water hose adapters incorrectly assembled or damaged.  Directional valve lever inoperable.
3	• • • • •				Power Panel	a. Check door panel and gasket for correct assembly and good condition. b. Check electrical connector and cover for damage. c. Check grounding lug for damage and presence of safety clip. d. Check 110V, 60Hz service outlet and cover for damage. e. Check phone connector for damage.	Door or hinge damaged or missing.  Electrical connector and cover damaged.  Grounding lug damaged or safety clip missing  110V, 60Hz service outlet and cover damaged.  Phone connector damaged.
4		•			Gas Cylinder and Propane Locker Vents	Check vents and screens for good condition.	Vents clogged. Bent or broken screens.
5	•				Fume Hood and Gum Bath Vent Door	Check door panel and gasket for correct assembly and good condition.	Any damage that prevents proper venting.

**Table 4-1. Unit Preventive Maintenance Checks and Services (PMCS) – CONT**

Q - Quarterly S - Semi-Annually A - Annually B-Bi-Annually

Item No.	Interval				Item to Inspect	Procedures	Not Fully Mission Capable If:
	Q	S	A	B			
6	•	•			Electrical System	a. Check power cable and its connectors for damage. b. Check emergency light ballast boxes for good condition. c. Check power panels for good condition. d. Check explosion proof distribution boxes for good condition. e. Check all wall switches and electrical receptacles for good condition. f. Check all blackout microswitches for proper operation and good condition. g. Check all ECU remote controls for proper operation and good condition. h. Check all motor controllers for good condition.	Power cable and/ connectors are damaged.  Ballast boxes have missing or loose internal fasteners or loose electrical connections.  Power panel has missing door, broken or damaged circuit breakers or fuse holders.  Distribution box has damage to cover or connectors.  Wall switches or electrical receptacles have damaged covers, damaged switches or receptacles.  Blackout microswitches have missing hardware or loose electrical connections.  ECU remote controls have missing fasteners. ECU remote controls damaged.  Motor controllers have damage to covers, missing or loose fasteners, or loose or broken electrical connections.
7	•	•	•	•	Environmental Control Units (ECUs)	Perform PMCS in accordance with TM 9-4120-371-14.	Failed PMCS.

**Table 4-1. Unit Preventive Maintenance Checks and Services (PMCS) - CONT**

Item No.	Interval				Item to Inspect	Procedures	Not Fully Mission Capable If:
	Q	S	A	B			
8	•				Purge System	<p>a. Check purge intake and exhaust doors for good condition.</p> <p>b. Check purge intake and exhaust door dampers and motors for good condition.</p> <p>c. Check ECU intake ducts located in the machinery room for good condition..</p> <p>d. Check purge door limit switches for proper operation.</p>	<p>Purge intake and exhaust doors have damage to gaskets, or latches, clogged/damaged screen or filter, or missing or loose fasteners.</p> <p>Purge intake and exhaust door dampers and motors have missing or loose fasteners, or loose or broken motor electrical connections.</p> <p>ECU intake ducts have missing or loose fasteners, damage to screens, gaskets, or filters.</p> <p>Dampers have loose or broken electrical connections to motors.</p> <p>Purge door limit switches do not operate properly. Purge door limit switches have missing hardware or loose electrical connections.</p>
9	•				Air System	<p>a. Check the compressor for good condition and proper operation. Refer to TM 10-4310-392-13&amp;P for further PMCS instructions.</p> <p>b. Check air tank for good condition.</p> <p>c. Check pressure switch and gauge for good condition and proper operation.</p> <p>d. Check system tubing and piping for good condition.</p> <p>e. Check system valves for good condition.</p>	<p>Compressor inoperative.</p> <p>Compressor has missing or loose mounting hardware, or loose or broken electrical connections.</p> <p>Air leaks from tank or fittings, or has missing or loose tank mounting hardware.</p> <p>Pressure switch and gauge inoperative, or has broken or loose electrical connections.</p> <p>System tubing or piping has leaks.</p> <p>System valves have leaks.</p>



**Table 4-1. Unit Preventive Maintenance Checks and Services (PMCS) – CONT**

Item No.	Interval				Item to Inspect	Procedures	Not Fully Mission Capable If:
	Q	S	A	B			
10	•				Vacuum System	a. Check vacuum pump for good condition and proper operation. Refer to TM 10-4310-391-13&P for further PMCS instructions. b. Check system tubing and piping for good condition. c. Check system valves for good condition.	Vacuum pump inoperative, has missing or loose mounting hardware or fasteners, or loose or broken electrical connections  System tubing and piping has leaks.  System valves have leaks.
11	•				Water System	a. Check water pump for good condition. Refer to TM 10-4320-321-13&P for further PMCS instructions. b. Check water tank for good condition. c. Check surge tank for good condition. d. Check water pressure switch and gauge for good condition. e. Check water filter for good condition. f. Check water chiller for good condition. Refer to commercial manual for further instructions. g. Check water heater for good condition and proper operation.	Water pump has missing or loose mounting hardware or fasteners, or loose or broken electrical connections.  Water leaks from tank or fittings, or has missing or loose tank mounting hardware or fasteners  Water leaks from tank or fittings, or has missing or loose tank mounting hardware or fasteners  Water pressure switch has loose electrical connections or gauge is broken or inoperative.  Water filter has leaks, or missing mounting screws  Water chiller inoperative or has leaks. Water chiller has missing or loose mounting hardware or fasteners, or loose or broken electrical connections.  Water heater inoperative, water leaks from heater, fittings, has missing or loose mounting hardware or fasteners, or loose or broken electrical connections.

**Table 4-1. Unit Preventive Maintenance Checks and Services (PMCS) – CONT**

Item No.	Interval				Item to Inspect	Procedures	Not Fully Mission Capable If:
	Q	S	A	B			
	•					h. Check electric still for good condition.  i. Check sump tank for good condition.  j. Check drain tubing, piping, valves and hose connections for good condition.	Water leaks from electric still, has missing or loose mounting hardware or fasteners, or loose or broken electrical connections.  Water leaks from tank or fittings, or has missing or loose mounting hardware.  Drain tubing, piping, valves and hose connections leak or have physical damage.
12	•				Gas Alarm System	Check gas alarm control unit and gas detector for good condition. Refer to TM 10-6665-297-13&P for further PMCS instructions.	Gas alarm control unit and gas detector have physical damage, missing or loose mounting hardware or fasteners, or loose or broken electrical connections.
13	•				Cabinet System	a. Check wall cabinets for good condition. Check bookcases for good condition.  b. Check metal lockers for good condition.  c. Check desiccating cabinets for good condition.  d. Check fume chamber for good condition.	Cabinets have binding or jamming of drawers or doors, broken latches or hinges, or missing or loose fasteners. Bookcases have binding or jamming of door, or missing or loose mounting hardware fasteners.  Lockers have binding or jammed doors, broken latches, or missing or loose mounting hardware fasteners.  Desiccating cabinets have missing or loose mounting hardware fasteners, or damage to door gasket or relief valve. Desiccating cabinets have broken glass.  Fume chamber has binding or jamming of door, missing or loose mounting hardware fasteners, or leaking fittings or air, vacuum, or water valves.

## Section IV. TROUBLESHOOTING PROCEDURES

### 4-9. TROUBLESHOOTING.

Unit troubleshooting procedures listed in Table 4-3 cover the most common malfunctions that may be repaired at the unit level. Troubleshooting procedures used by the operator should be conducted prior to the unit troubleshooting procedures. This manual cannot list all the possible malfunctions or ever possible test/inspection and corrective action. If a malfunction is not listed or corrected by a listed corrective action, notify your supervisor.

**Table 4-2. Symptom Index**

Troubleshooting Table Item Number	Title
1.	No electrical power to laboratory, generator output switch on and power cable properly connected.
2.	Fluorescent light bulb fails to illuminate after starter replacement.
3.	Forward or Rear Emergency light fails to illuminate when power failure occurs.
4.	No power available in Petroleum Laboratory, purge cycle completed and circuit breaker A1CB1 in ON position.
5.	A group of ceiling lights fail to illuminate all other ceiling lights illuminated.
6.	Door interlock switch inoperative.
7.	Convenience outlet, receptacle inoperative.
8.	ECU remote control unit inoperative, power available.
9.	Environmental Control Unit inoperative properly, power available.
10.	Purge damper, intake, exhaust, or ECU intake, inoperative.
11.	Purge door limit switch inoperative.
12.	Air compressor motor inoperative, power available to motor controller.
13.	Leaks in system cause compressor to cycle on and off.
14.	Air pressure switch causing compressor to cycle on and off.
15.	Vacuum pump motor, inoperative, power available to motor controller.
16.	Vacuum pressure low due to leaks in system.
17.	Water pump inoperative, power available to motor controller.
18.	Water pressure low due to leaks in the system.
19.	Water pressure switch inoperative.
20.	Water chiller fails to produce chilled water (power available).
21.	Water heater fails to produce hot water, power available.
22.	Submersible pump inoperative, power available.

Table 4-2 Symptom Index - CONT

Troubleshooting Table Item Number	Title
23.	Gas alarm system inoperative or operates improperly.
24.	Gum bath inoperative, power available.
25.	High pressure boiler inoperative, power available.
26.	Low pressure boiler inoperative, power available.
27.	Reid Vapor Pressure (RVP) bath inoperative, power available.
28.	Manometer inoperative, no physical damage apparent.
29.	Kinematic viscosity test bath inoperative, power available.
30.	Centrifuge inoperative, power available.
31.	Distillation test apparatus inoperative, power available.
32.	Freezer fails to produce ice cubes, power available.
33.	Oxygen stability bath inoperative, power available.
34.	Laboratory oven inoperative, power available.
35.	Burnout furnace inoperative, power available.
36.	Refrigerator inoperative, power available.
37.	Jet Fuel Thermal Oxidation Tester (JFTOT) inoperative, power available.

**Table 4-3. Troubleshooting**

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
<div style="text-align: center; border: 2px solid black; padding: 5px; width: fit-content; margin: 0 auto;"><b>WARNING</b></div> <p style="text-align: center;">Before performing any maintenance actions on electrical equipment, ensure all electrical power has been turned off. Failure to comply with this warning may result in serious injury or death.</p>		
<div style="text-align: center;"><b>NOTE</b></div> <p style="text-align: center;">Refer to electrical schematic diagram FO-1 located in the back of the manual when troubleshooting electrical system.</p>		
<b>1.</b>	<p><b>NO ELECTRICAL POWER TO LABORATORY, GENERATOR OUTPUT SWITCH ON AND POWER CABLE PROPERLY CONNECTED.</b></p>	
<div style="text-align: center; border: 2px solid black; padding: 5px; width: fit-content; margin: 0 auto;"><b>WARNING</b></div> <p style="text-align: center;">Do not come in contact with main power cable connections on generator set with power applied to Mod Lab A. Failure to comply with this warning may result in serious injury or death.</p>		
	<p>Step 1. Position generator set circuit breaker to open position.</p> <p>Step 2. Disconnect generator and Mod Lab A power cables.</p> <p>Step 3. Check power cable for open or shorted leads using multimeter.</p> <p style="padding-left: 40px;">If open or shorted lead is found, replace power cable.</p> <p><b>2. INDIVIDUAL FLUORESCENT LIGHT BULB FAILS TO ILLUMINATE AFTER STARTER REPLACEMENT.</b></p> <p>Step 1. Replace ballast. See paragraph 4-15.</p> <p>Step 2. Replace switch. See paragraph 4-22.</p> <p>Step 3. Replace applicable circuit breaker. See paragraph 4-18.</p> <p><b>3. FORWARD OR REAR EMERGENCY LIGHT FAILS TO ILLUMINATE WHEN POWER FAILURE OCCURS.</b></p> <p>Step 1. Replace ballast in appropriate ballast box. See paragraph 4-16.</p> <p>Step 2. Replace switch. See paragraph 4-22.</p> <p>Step 3. Replace applicable circuit breaker. See paragraph 4-18.</p> <p><b>4. NO POWER AVAILABLE IN PETROLEUM LABORATORY, PURGE CYCLE COMPLETED AND CIRCUIT BREAKER A1CB1 IN ON POSITION.</b></p> <p>Reset circuit breaker A1CB1.</p> <p style="padding-left: 40px;">If power still not available, replace circuit breaker A1CB1. See paragraph 4-18.</p>	

Table 4-3 Troubleshooting - CONT

MALFUNCTION	TEST OR INSPECTION CORRECTIVE ACTION
5.	<p><b>A GROUP OF CEILING LIGHTS FAIL TO ILLUMINATE, ALL OTHER CEILING LIGHTS ILLUMINATED.</b></p> <p>Step 1. Check that power is available to appropriate wall light switch.</p> <ol style="list-style-type: none"> <li>a. If power is available, replace switch. Refer to paragraph 4-22.</li> <li>b. If power is not available, proceed to Step 2.</li> </ol> <p>Step 2. Check and reset appropriate circuit breaker.</p> <p>If power is still not available, replace circuit breaker. See paragraph 4-18.</p>
6.	<p><b>DOOR INTERLOCK SWITCH INOPERATIVE.</b></p> <p>Step 1. Check switch electrical connection.</p> <p>Step 2. Adjust switch.</p> <p>If switch is inoperative, replace the door interlock switch. See paragraph 4-23.</p>
7.	<p><b>CONVENIENCE OUTLET, RECEPTACLE, INOPERATIVE.</b></p> <p>Step 1. Check that power is available at outlet.</p> <ol style="list-style-type: none"> <li>a. If power is available, replace outlet. See paragraph 4-24.</li> <li>b. If power is not available, proceed to Step 2.</li> </ol> <p>Step 2. Check and reset appropriate circuit breaker.</p> <p>If power is still not available, replace circuit breaker. See paragraph 4-18.</p>
8.	<p><b>ECU REMOTE CONTROL UNIT INOPERATIVE, POWER AVAILABLE.</b></p> <p>Troubleshoot per TM 5-4120-388-14. If necessary, replace faulty remote control unit. See paragraph 4-25.</p>
9.	<p><b>ENVIRONMENTAL CONTROL UNIT INOPERATIVE, POWER AVAILABLE.</b></p> <p>Troubleshoot per TM 5-4120-388-14.</p>
10.	<p><b>PURGE DAMPER, INTAKE, EXHAUST, OR ECU INTAKE, INOPERATIVE.</b></p> <p>Step 1. Check that damper operating linkage is not loose or broken.</p> <p>Repair linkage. See paragraphs 4-28 thru paragraph 4-33 for specific motor.</p> <p>Step 2. Check that electrical power is available to damper motor.</p> <p>If power available to motor, replace motor. See paragraphs 4-28 thru paragraph 4-33 for specific motor.</p>
11.	<p><b>PURGE DOOR LIMIT SWITCH INOPERATIVE.</b></p> <p>Step 1. Check for loose electrical connections.</p> <p>Step 2. Check that power is available to switch.</p> <p>If power is available, replace switch. See paragraph 4-30 or 4-32 for specific switch.</p>

Table 4-3 Troubleshooting - CONT

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
12.	<b>AIR COMPRESSOR MOTOR INOPERATIVE, POWER AVAILABLE TO MOTOR CONTROLLER.</b>	<p>Step 1. Check operation of controller, (See FO-1).</p> <p>Step 2. Check operation of air pressure switch.</p> <p>Step 3. If controller and pressure switch are operating properly, continue to troubleshoot per commercial manual.</p> <p>If failure cannot be corrected, replace the air compressor. See paragraph 4-34.</p>
13.	<b>LEAKS IN SYSTEM CAUSE COMPRESSOR TO CYCLE ON AND OFF.</b>	<p>Step 1. Check air system piping, tubing, and unions for leaks.</p> <p>If leaks are found, repair or replace the leaking item. See paragraph 4-36.</p> <p>Step 2. Check for leaking air system valves.</p> <p>Replace faulty valves. See paragraph 4-36.</p>
14.	<b>AIR PRESSURE SWITCH CAUSING COMPRESSOR TO CYCLE ON AND OFF.</b>	<p>Adjust pressure switch. Refer to commercial manual.</p> <p>If switch will not adjust to operate properly, replace the pressure switch. See paragraph 4-35.</p>
15.	<b>VACUUM PUMP MOTOR INOPERATIVE, POWER AVAILABLE TO MOTOR CONTROLLER.</b>	<p>Step 1. Check operation of controller.</p> <p>If controller does not operate, refer to paragraph 4-26.</p> <p>Step 2. Troubleshoot per TM 10-4310-391-13&amp;P.</p> <p>If failure cannot be corrected, replace the vacuum pump. See paragraph 4-37.</p>
16.	<b>VACUUM PRESSURE LOW DUE TO LEAKS IN SYSTEM.</b>	<p>Check vacuum system piping, tubing, and unions for leaks.</p> <p>If leaks are found, repair or replace the leaking item. See paragraph 4-37.</p>
17.	<b>WATER PUMP INOPERATIVE, POWER AVAILABLE TO MOTOR CONTROLLER.</b>	<p>Step 1. Check operation of motor controller (See FO-1).</p> <p>Step 2. Check operation of water pressure switch.</p> <p>Step 3. If controller and pressure switch are operating properly, troubleshoot per TM 10-4320-321-13&amp;P.</p> <p>If failure cannot be corrected, notify direct support maintenance.</p>
18.	<b>WATER PRESSURE LOW DUE TO LEAKS IN SYSTEM.</b>	<p>Check system for leaking piping, tubing, unions, valves, supply tank, surge tank, or pump.</p> <p>When leak is isolated, notify direct support maintenance.</p>

Table 4-3 Troubleshooting - CONT

MALFUNCTION	TEST OR INSPECTION CORRECTIVE ACTION
19.	<p><b>WATER PRESSURE SWITCH INOPERATIVE.</b></p> <p>Step 1. Check that electrical power is available at the switch.</p> <p>Step 2. Adjust the switch, per TM 10-4320-321-13&amp;P.</p> <p>If pressure switch still inoperative, replace the switch. See paragraph 4-39.</p>
20.	<p><b>WATER CHILLER FAILS TO PRODUCE CHILLED WATER, POWER AVAILABLE.</b></p> <p>Troubleshoot per commercial manual.</p> <p>If failure cannot be corrected, notify direct support maintenance to replace water chiller.</p>
21.	<p><b>WATER HEATER FAILS TO PRODUCE HOT WATER, POWER AVAILABLE.</b></p> <p>Check water input/output valve line up.</p> <p>If valve line up is correct, notify direct support maintenance.</p>
22.	<p><b>SUBMERSIBLE PUMP INOPERATIVE, POWER AVAILABLE.</b></p> <p>Troubleshoot per TM 10-4320-320-13&amp;P.</p> <p>If failure cannot be corrected, notify direct support maintenance.</p>
23.	<p><b>GAS ALARM SYSTEM INOPERATIVE OR OPERATES IMPROPERLY.</b></p> <p>Step 1. Calibrate per TM 10-6665-297-13&amp;P.</p> <p>System will not calibrate or adjust.</p> <p>Step 2. Troubleshoot system per TM 10-6665-297-13&amp;P.</p> <p>If failure cannot be corrected, replace detector element and/or alarm control unit. See paragraph 4-40.</p>
24.	<p><b>GUM BATH INOPERATIVE, POWER AVAILABLE.</b></p> <p>Troubleshoot per TM 10-6630-234-13&amp;P.</p> <p>If failure cannot be corrected, notify direct support maintenance.</p>
25.	<p><b>LOW PRESSURE BOILER INOPERATIVE, POWER AVAILABLE.</b></p> <p>Step 1. Check water supply to the boiler.</p> <p>Water is available.</p> <p>Step 2. Check output valve line up.</p> <p>Line up is correct.</p> <p>If boiler still inoperative, notify direct support maintenance.</p>
26.	<p><b>HIGH PRESSURE BOILER INOPERATIVE, POWER AVAILABLE.</b></p> <p>Step 1. Check water supply to the boiler.</p> <p>Water is available.</p>



Table 4-3 Troubleshooting - CONT

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
	Step 2. Check input/output valve line up. Line up is correct. If boiler still inoperative, notify direct support maintenance.	
<b>27.</b>	<b>RVP BATH INOPERATIVE, POWER AVAILABLE.</b>	Troubleshoot per TM 10-6640-226-13&P. If failure cannot be corrected, replace the RVP bath. See paragraph 4-44.
<b>28.</b>	<b>MANOMETER INOPERATIVE, NO PHYSICAL DAMAGE APPARENT.</b>	Replace the manometer. See paragraph 4-43.
<b>29.</b>	<b>KINEMATIC VISCOSITY TEST BATH INOPERATIVE, POWER AVAILABLE.</b>	Troubleshoot per commercial manual. If failure cannot be corrected, replace the kinematic viscosity test bath. See paragraph 4-45.
<b>30.</b>	<b>CENTRIFUGE INOPERATIVE (POWER AVAILABLE).</b>	Troubleshoot per TM 10-6640-230-13&P. If failure cannot be corrected, replace the centrifuge. See paragraph 4-46.
<b>31.</b>	<b>DISTILLATION TEST APPARATUS INOPERATIVE, POWER AVAILABLE.</b>	Troubleshoot per commercial manual. If failure cannot be corrected, replace test apparatus. See paragraph 4-47.
<b>32.</b>	<b>FREEZER FAILS TO PRODUCE ICE CUBES, POWER AVAILABLE.</b>	Troubleshoot per commercial manual. If failure cannot be corrected, notify direct support maintenance.
<b>33.</b>	<b>OXYGEN STABILITY BATH INOPERATIVE, POWER AVAILABLE.</b>	Troubleshoot per commercial manual. If failure cannot be corrected, replace the oxygen stability bath. See paragraph 4-48.
<b>34.</b>	<b>LABORATORY OVEN INOPERATIVE, POWER AVAILABLE.</b>	Troubleshoot per commercial manual. If failure cannot be corrected, replace the oven. See paragraph 4-49.
<b>35.</b>	<b>BURNOUT FURNACE INOPERATIVE, POWER AVAILABLE.</b>	Troubleshoot per commercial manual. If failure cannot be corrected, replace the burnout furnace. See paragraph 4-50.
<b>36.</b>	<b>REFRIGERATOR INOPERATIVE, POWER AVAILABLE.</b>	Troubleshoot per commercial manual. If failure cannot be corrected, replace the refrigerator. See paragraph 4-51.

**Table 4-3 Troubleshooting - CONT**

	MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION
<p><b>37.</b></p>	<p><b>JFTOT INOPERATIVE, POWER AVAILABLE.</b></p> <p>Troubleshoot per commercial manual.</p> <p>If failure cannot be corrected, replace JFTOT. See paragraph 4-52.</p>

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#### 4-10. INTRODUCTION

- a. This section contains instructions covering unit maintenance functions for the Petroleum Laboratory. Personnel required are listed only if the task requires more than one.
- b. After completing each maintenance procedure, perform operational check to be sure that equipment is properly functioning.

#### 4-11. WATER INLET BOX.

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This task consists of:	a. Remove	b. Repair	c. Install
------------------------	-----------	-----------	------------

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##### INITIAL SET-UP

###### Tools Required

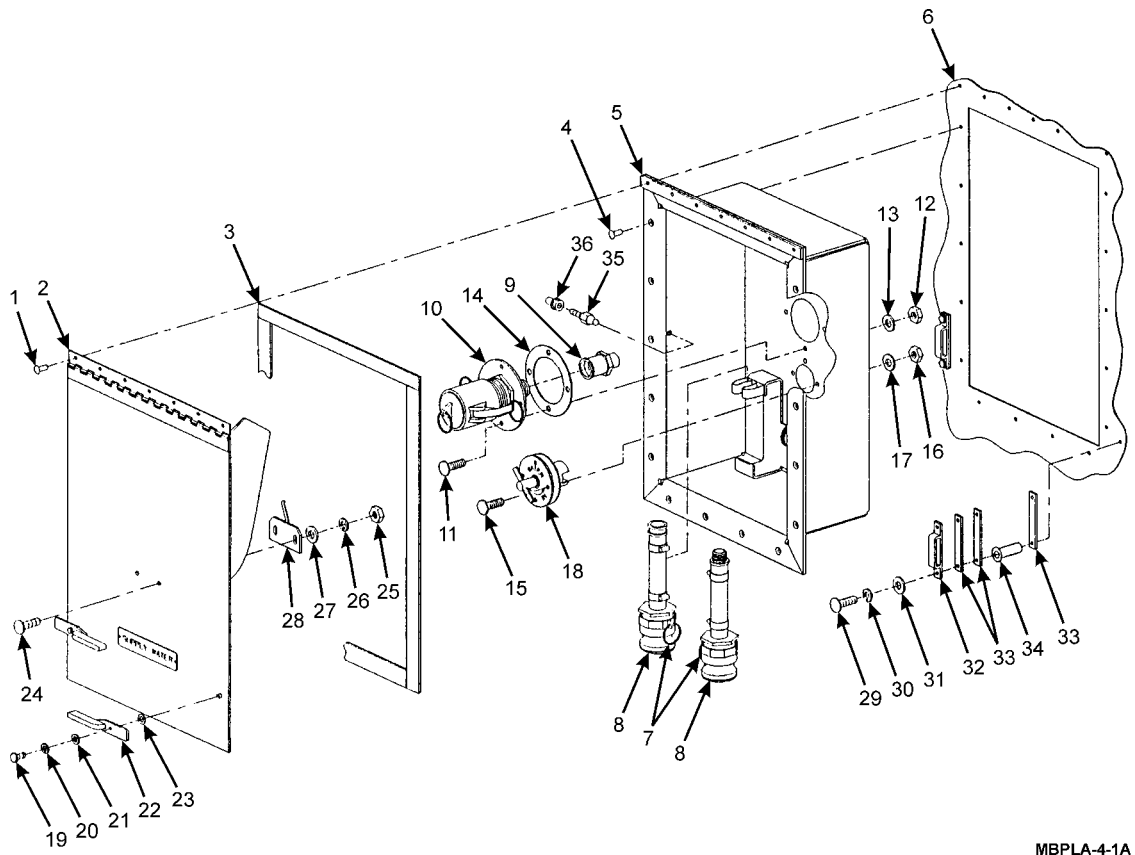
- General Mechanics Tool Kit, (Appendix B, Section III, Item 1)
- Portable Electric Drill, (Appendix B, Section III, Item 2)
- Twist Drill Set, (Appendix, B, Section III, Item 2)
- Hand Blind Riveter, (Appendix B, Section III, Item 3)

###### Materials/Parts Required

- Gasket, (1)
  - Lockwashers, (6)
  - Rivets (21)
  - Rivnut (4)
  - Adhesive, (Appendix E, Section II, Item 3)
- 

##### REMOVE

1. Remove Door Assembly. See Figure 4-1.
  - a. Remove seven rivets (1) from door assembly (2).
  - b. Unlatch and remove door assembly (2).
2. Remove Water Inlet Box and Gasket.
  - a. Remove gasket (3).
  - b. Remove 14 rivets (4) that secure water inlet box (5) to Mod Lab A (6) and remove water inlet box.
3. Remove Hose Adapters.
  - a. Remove retaining ring with chain (7) from hose adapters (8).
  - b. Remove hose adapters (8).
4. Remove Coupling Assembly.
  - a. Disconnect union (9) from coupling assembly (10).
  - b. Remove four screws (11), nuts (12), and washers (13) that secure coupling assembly (10) to water inlet box (5).
  - c. Remove coupling assembly (10) and gasket (14). Discard gasket.
5. Remove Direction Valve.
  - a. Remove four screws (15), nuts (16), and washers (17) that secure direction valve (18) to water inlet box (5) and remove direction valve.



MBPLA-4-1A

Figure 4-1. Water Inlet Box

REPAIR

1. Repair Door Assembly. See Figure 4-1.
  - a. Remove screw (19), lockwasher (20), and washer (21) from each latch (22). Discard lockwasher.
  - b. Remove latch (22) and wave washer (23).
  - c. Install latch (22) and wave washer (23) and secure with screw (19), lockwasher (20), and washer (21).
  - d. Remove two screws (24), nuts (25), lockwashers (26), washers (27) and clamp cover (28). Discard lockwasher.
  - e. Install clamp cover (28) and secure with two screws (24), nuts (25), lockwashers (26), and washers (27).
  - f. Remove two screws (29), lockwashers (30), washers (31), latch keeper (32) and spacers (33). Discard lockwasher.
  - g. Remove two rivnuts (34) and spacer (33).
  - h. Install spacer (33) and secure with two rivnuts (34).
  - i. Install latch keeper (32) and spacers (33) and secure with two screws (29) lockwashers (30), and washers (31).
2. Repair Water Inlet Box
  - a. Remove two ball studs (35) from rivnuts (36).
  - b. Install ball studs (35) into rivnuts (36).

INSTALL

1. Install water Inlet Box and Gasket. See Figure 4-1.
  - a. Install water inlet box (5) on Mod Lab A (6) and secure with 14 rivets (4).
  - b. Install gasket (3) on water inlet box (5) and secure in place with adhesive.
2. Install Direction Valve.
  - a. Install direction valve (18) on water inlet box (5) and secure with four screws (15), washers (17), and nuts (16).
3. Install Coupling Assembly.
  - a. Install gasket (14) on coupling assembly (10) and secure with four screws (11), washers (13), and nuts (12).
  - b. Connect union (9) to coupling assembly (10).
4. Install Door Assembly.
  - a. Install door assembly (2) over water inlet box (5) and align rivet holes.
  - b. Install seven rivets (1) through door assembly (2), water inlet box (5), and into Mod Lab A (6).
  - c. Latch door assembly (2).
5. Install Hose Adapters
  - a. Attach retaining ring (7) with chain to hose adapters (8).
  - b. Install Hose Adapters (8).

**4-12. POWER ENTRY PANEL.**

---

This task consists of:                                    a. Remove                                    b. Repair                                    c. Install

---

**INITIAL SET-UP**Tools Required

General Mechanics Tool Kit, (Appendix B, Section III, Item 1)  
Portable Electric Drill, (Appendix B, Section III, Item 2)  
Twist Drill Set, (Appendix B, Section III, Item 2)  
Hand Blind Riveter, (Appendix B, Section III, Item 3)  
Soldering Gun, (Appendix B, Section III, Item 2)

Materials/Parts Required

Gasket (1)  
Lockwashers (21)  
Rivets (29)  
Rivnuts (4)  
Adhesive (Appendix E, Section II, Item 3)

General Safety Instructions**WARNING****ELECTRICAL SHOCK**

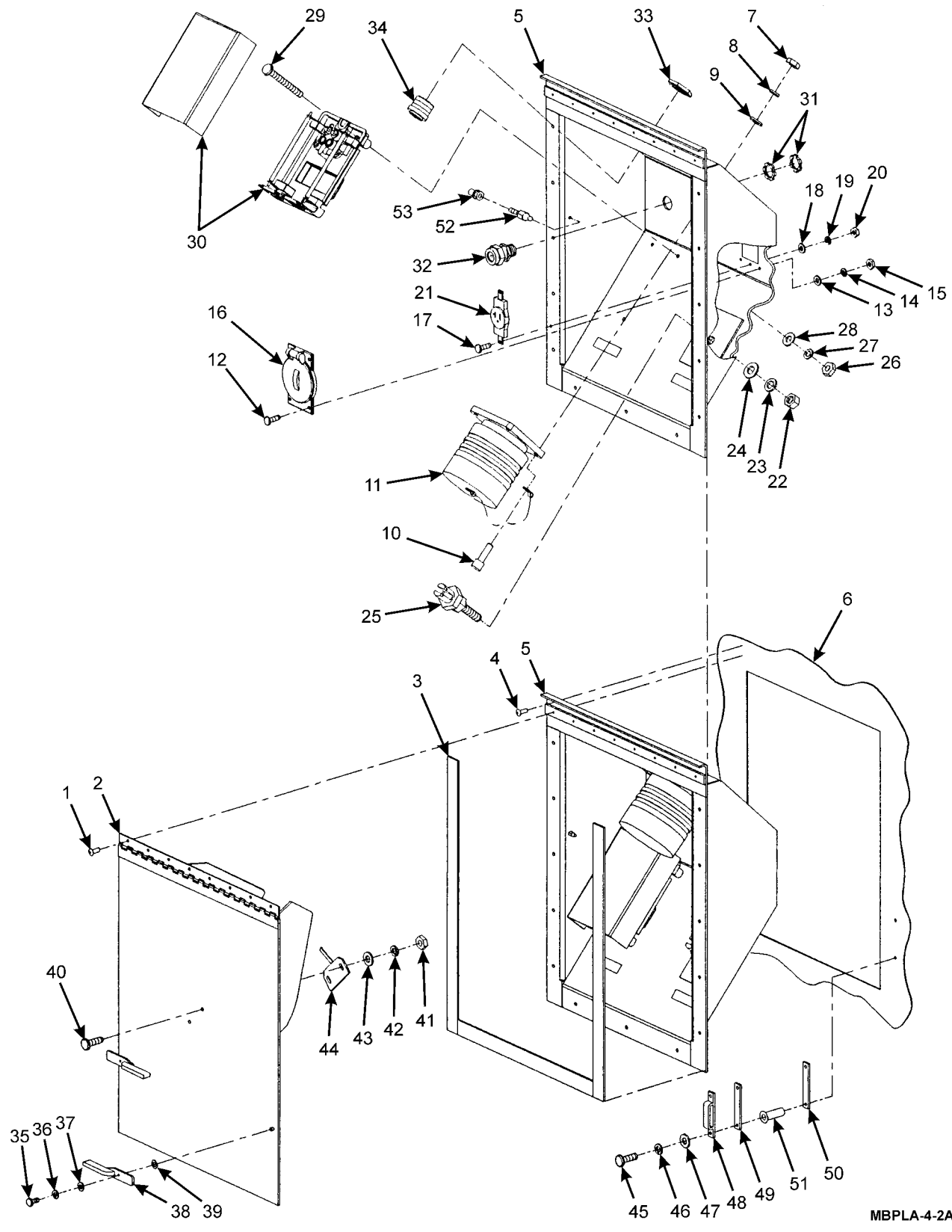
Before performing any maintenance actions on electrical equipment, ensure all electrical power has been turned off. Failure to comply with this warning may result in serious injury or death.

---

REMOVE

1. Remove Power.
  - a. Remove power from all equipment.
  - b. Position all Main Power Panel circuit breakers to OFF.
  - c. Shut down generator.
  - d. Disconnect power cable, ground wire, telephone cables and electrical cords from power panel.
2. Remove Door Assembly. See Figure 4-2.
  - a. Remove eight rivets (1) from door assembly (2).
  - b. Unlatch and remove door assembly (2).
3. Remove Power Panel and Gasket.
  - a. Remove gasket (3).
  - b. Remove 21 rivets (4) that secure power panel (5) to Mod Lab A (6).
  - c. Remove power panel (5) from Mod Lab A (6) far enough to allow leads to be tagged.
  - d. Tag and disconnect electrical leads.





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Figure 4-2. Power Entry Panel

4. Remove Input Power Connector/Receptacle.
  - a. Remove four nuts (7), lockwashers (8), washers (9), and screws (10). Discard lockwashers.
  - b. Remove Input Power Connector/Receptacle (11).
5. Remove Auxiliary Power Receptacle.
  - a. Remove four screws (12), washers (13), lockwashers (14), nuts (15), and receptacle plate (16). Discard lockwashers.
  - b. Remove two screws (17), washer (18), lockwashers (19), nuts (20), and receptacle (21). Discard lockwashers.
6. Remove Ground Lug.
  - a. Remove nut (22), lockwasher (23), washer (24) and ground lug (25). Discard lockwasher.
7. Remove Telephone Connector.
  - a. Remove three nuts (26), lockwashers (27), washers (28), screws (29) and telephone connector (30). Discard lockwashers.
8. Remove Telephone Conduit Fitting.
  - a. Remove two nuts (31) and telephone conduit fitting (32).
9. Remove Alarm.
  - a. Remove nut (33) and alarm (34).

#### REPAIR

1. Repair Door Assembly. See Figure 4-2.
  - a. Remove screw (35) lockwasher, (36) and washer (37) from latch (38). Discard lockwasher.
  - b. Remove latch (38) and wave washer (39) from door assembly (2).
  - c. Install latch (38) with wave washer (39), and secure with screw (35), lockwasher (36), and washer (37).
  - d. Remove two screws (40), nuts (41), lockwashers (42), washers (43) and clamp cover (44). Discard lockwashers.
  - e. Install clamp cover (44) and secure with two screws (40), washers (43), lockwashers (42), and nuts (41).
  - f. Remove two screws (45), lockwashers (46), washers (47), latch keeper (48), and spacer (49) from spacer (50). Discard lockwashers.
  - g. Remove two rivnuts (51) and spacer (50).
  - h. Install spacer (50) and secure with two rivnuts (51).
  - i. Install latch keeper (48) and spacer (49) to spacer (50) and secure with two screws (45) lockwashers (46), and washer (47).
2. Repair Power Panel Box.
  - a. Remove ball stud (52) from rivnut (53).
  - b. Install ball stud (52) into rivnut (53).

#### INSTALL

1. Install Alarm. See Figure 4-2.
  - a. Install alarm (34) and secure with nut (33).
2. Install Telephone Conduit Fitting.
  - a. Install telephone conduit fitting (32) and secure with two nuts (31).

3. Install Telephone Connector.
  - a. Install telephone connector (30) into power panel (5) and secure with three screws (29), washers (28), lockwashers (27), and nuts (26).
4. Install Ground Lug.
  - a. Install ground lug (25) into power panel (5) and secure with washer (24), lockwasher (23) and nut (22).
5. Install Auxiliary Power Receptacle.
  - a. Install auxiliary power receptacle (21) into power panel (5) and secure with two screws (17), washers (18), lockwashers (19), and nuts (20).
  - b. Install plate (16) and secure with four screws (12), washers (13), lockwashers (14), and nuts (15).
6. Install Input Power Connector/Receptacle.
  - a. Install input power connector/receptacle (11) into power panel (5) and secure with four screws (10), washers (9), lockwashers (8), and nuts (7).
7. Install Power Panel and Gasket.
  - a. Position power panel (5) in place for connecting electrical leads.
  - b. Attach leads as tagged to proper connection points. Remove tags.
  - c. Install power panel (5) into wall opening of Mod Lab A (6) and secure with 21 rivets (4).
  - d. Install gasket (3) on power panel (5) and secure in place with adhesive.
8. Install Door Assembly.
  - a. Install door assembly (2) over power panel (5) and secure with eight rivets (1).

#### 4-13 GAS CYLINDER AND PROPANE STORAGE LOCKER VENTS.

---

This task consists of: a. Remove b. Install

---

##### INITIAL SET-UP

##### Tools Required

- Portable Electric Drill, (Appendix B, Section III, Item 2)
- Twist Drill Set, (Appendix B, Section III, Item 2)
- Hand Blind Riveter, (Appendix B, Section III, Item 3)

##### Materials/Parts Required

- Rivets, (8)
- 

##### REMOVE

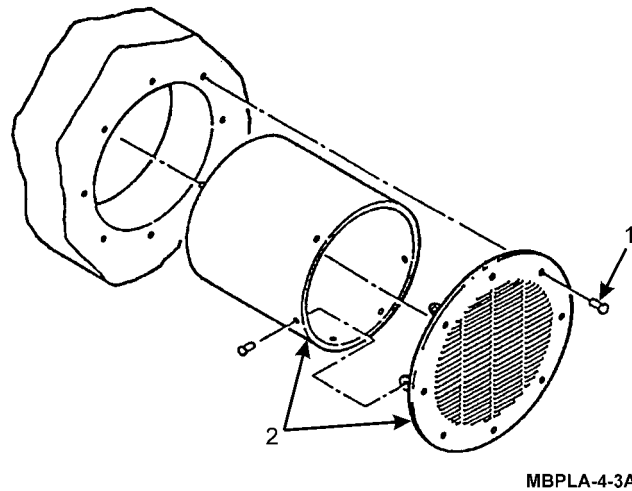
Remove Storage Locker Vents. See Figure 4-3.

- a. Remove eight rivets (1) and storage locker vent (2) from Mod Lab A.

##### INSTALL

Install Storage Locker Vents. See Figure 4-3.

- a. Install storage locker vent (2) into openings of Mod Lab A and secure with eight rivets (1).



**Figure 4-3. Gas Cylinder and Propane Storage Locker Vents**

#### 4-14 FUME HOOD AND GUM BATH VENT EXHAUST DOOR ASSEMBLY.

---

This task consists of:	a. Remove	b. Repair	c. Install
------------------------	-----------	-----------	------------

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##### **INITIAL SET-UP**

###### Tools Required

- General Mechanics Tool Kit, (Appendix B, Section III, Item 1)
- Portable Electric Drill, (Appendix B, Section III, Item 2)
- Twist Drill Set, (Appendix, B, Section III, Item 2)
- Hand Blind Riveter, (Appendix B, Section III, Item 3)
- Soldering Gun, (Appendix B, Section III, Item 2)

###### Materials/Parts Required

- Gaskets, (1)
  - Lockwashers, (6)
  - Rivets, (36)
  - Rivnuts (4)
  - Adhesive (Appendix E, Section II, Item 2)
- 

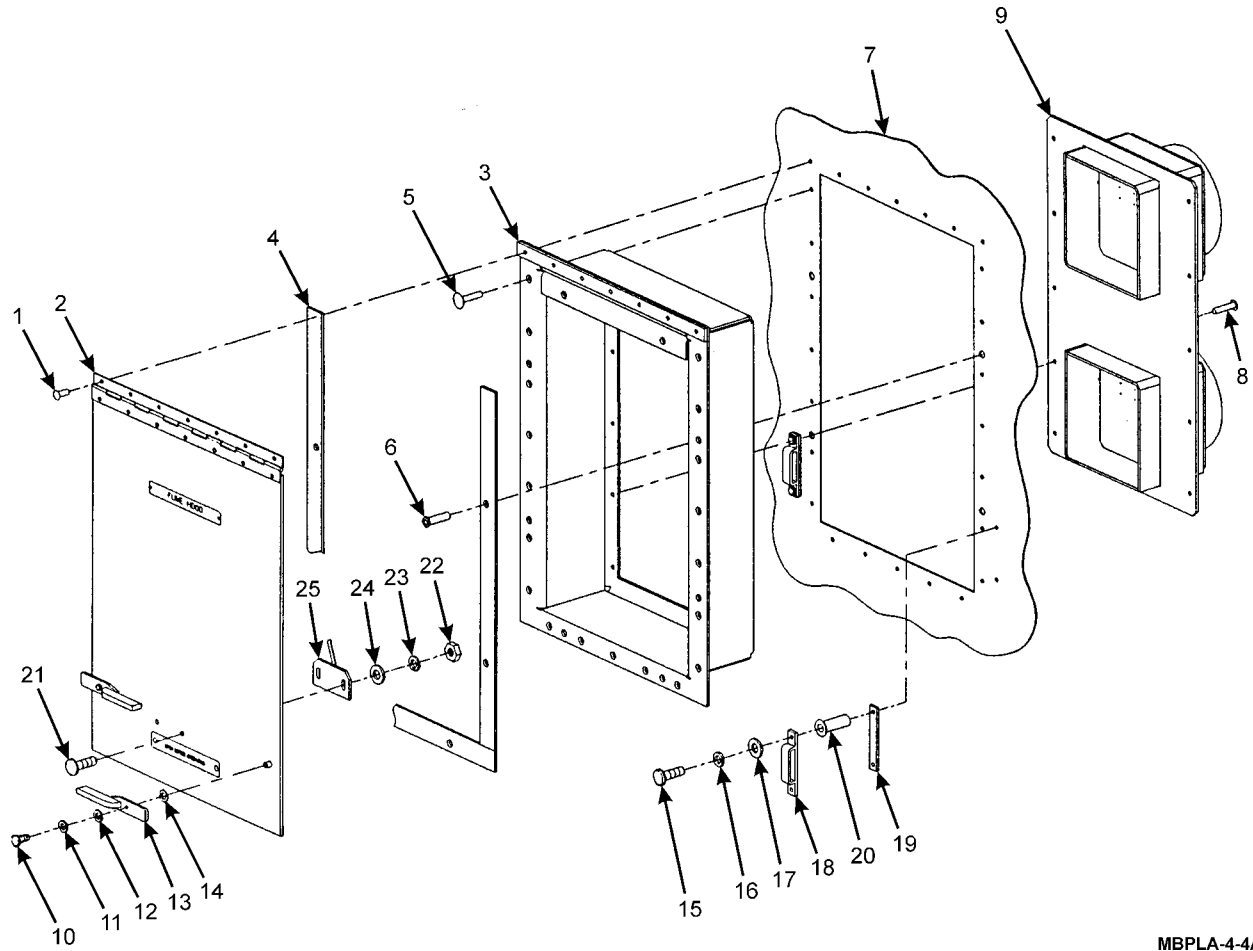
##### REMOVE

1. Remove Door. See Figure 4-4.
  - a. Remove seven rivets (1) securing door assembly (2) to vent box (3).
  - b. Unlatch and remove door assembly (2).
2. Remove Vent Box and Gasket.
  - a. Remove gasket (4).
  - b. Remove 19 rivets (5), six rivnuts (6) and vent box (3) from Mod Lab A (7).
3. Remove Damper.
  - a. Remove 10 rivets (8) and damper frame (9).

##### REPAIR

Repair Door Assembly. See Figure 4-4.

- a. Remove screw (10) lockwasher, (11) and washer (12), latch (13), and wave washer (14) from door assembly (2). Discard lockwasher.
- b. Install wave washer (14) and latch (13) and secure with screw (10), lockwasher (11), and washer (12).
- c. Remove two screws (15), lockwashers (16), washers (17), and latch keeper (18) from spacer (19). Discard lockwashers.
- d. Remove two rivnuts (20) and spacer (19).
- e. Install spacer (19) and secure with two rivnuts (20).
- f. Install latch keeper (18) to spacer (19) and secure with two screws (15) lockwashers (16), and washers (17).
- g. Remove two screws (21), nuts (22), lockwashers (23), washers (24), and clamp cover (25).
- h. Install clamp cover (25) and secure with two screws (21), washers (24), lockwashers (23), and nuts (22).



MBPLA-4-4A

Figure 4-4. Fume Hood and Gum Bath Vent Exhaust Door Assembly

INSTALL

1. Install Dampers.
  - a. Install damper frame (9) into vent box (3) and secure with 10 rivets (8).
2. Install Vent Box and Gasket.
  - a. Install vent box (3) into wall opening of Mod Lab A (7) and secure with 19 rivets (5) and six rivnuts (6).
  - b. Install gasket (4) on vent box (3) and secure in place with adhesive.
3. Install Door Assembly.
  - a. Install door assembly (2) over vent box (3) and secure with seven rivets (1).
  - b. Latch door assembly (2).

**4-15 LIGHT BALLAST.**

This task consists of:

a. Remove

b. Install

**INITIAL SET-UP**

Tools Required

General Mechanics Tool Kit, (Appendix B, Section III, Item 1)

Materials/Parts Required

Lockwashers, (2)

Wire Nuts, (3)

Equipment Condition

Power to lights removed by positioning Main Power Panel circuit breakers; A1CB9, A1CB11, and A1CB13 to OFF.

General Safety Instructions

**WARNING**

**ELECTRICAL SHOCK**

Before performing any maintenance actions on electrical equipment, ensure all electrical power has been turned off. Failure to comply with this warning may result in serious injury or death.

REMOVE

Remove Ballast. See Figure 4-5.

- a. Loosen four captive screws (1) and remove diffuser (2).

**NOTE**

There are three ballast in each light fixture. Two are located at one end and one at the opposite end of the fixture.

- b. Remove two screws (3) and ballast cover (4).

**NOTE**

If wires are connected with clinched wire nuts, use side cutter to remove.

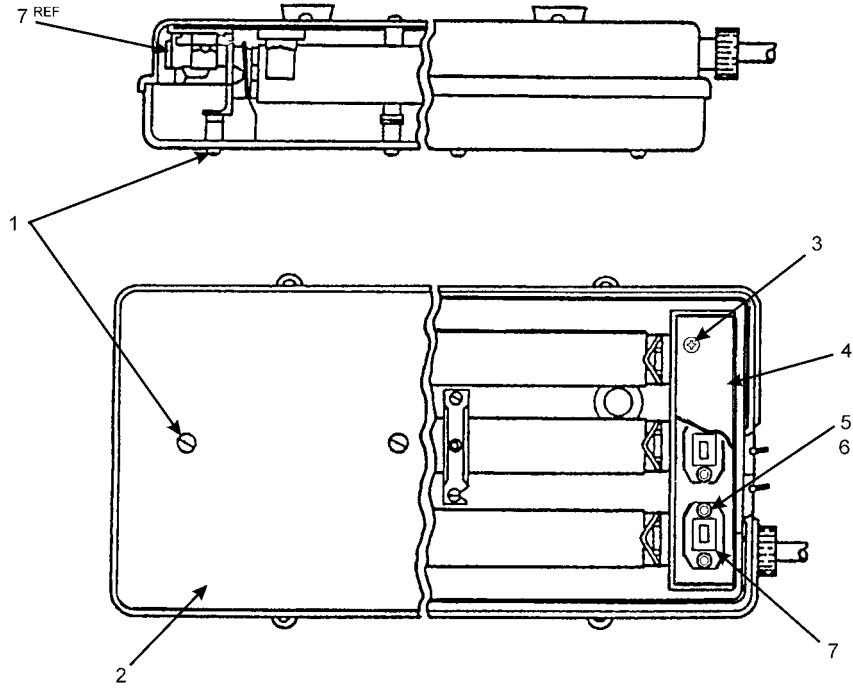
- c. Tag and disconnect electrical wires from ballast (7).
- d. Remove two nuts (5), lockwashers (6), and ballast (7). Discard lockwashers.

INSTALL

Install Ballast. See Figure 4-5.

- a. Install ballast (7) in light fixture and secure using two lockwashers (6) and nuts (5).
- b. Connect wires, as tagged, using wire nuts. Remove tags.
- c. Install ballast cover (4) and secure with two screws (3).
- d. Install diffuser (2) and secure by tightening four captive screws (1).
- e. Restore power to lights by positioning Main Power Panel circuit breakers; A1CB9, A1CB11, and A1CB13 to ON.





MBPLA-4-5A

Figure 4-5. Light Ballast

#### 4-16 EMERGENCY LIGHT BALLAST.

---

This task consists of:

a. Remove	b. Install
-----------	------------

---

##### **INITIAL SET-UP**

###### Tools Required

General Mechanics Tool Kit, (Appendix B, Section III, Item 1)

###### Equipment Condition

Power to lights removed by positioning Main Power Panel circuit breakers; A1CB9, A1CB11, and A1CB13 to OFF.

###### General Safety Instructions

**WARNING**

**ELECTRICAL SHOCK**

Before performing any maintenance actions on electrical equipment, ensure all electrical power has been turned off. Failure to comply with this warning may result in serious injury or death.

---

##### REMOVE

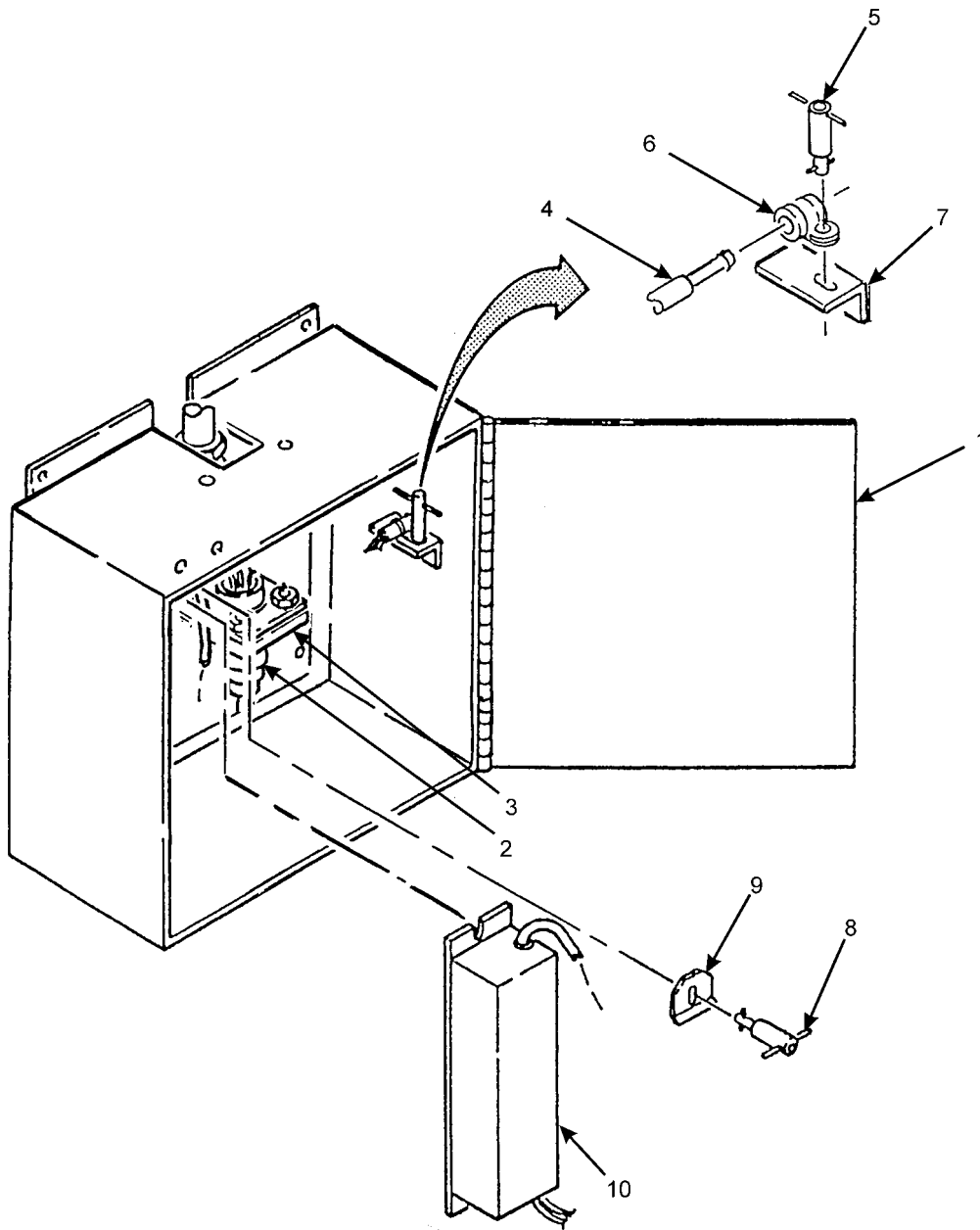
Remove Ballast. See Figure 4-6.

- a. Unlatch and open ballast box door (1).
- b. Disconnect ballast plug (2) from connector (3).
- c. Remove indicator light (4) by removing tee handle (5) and clamp (6) from bracket (7). Retain clamp for reuse.
- d. Remove tee handle (8) and clamp (9) at top of ballast (10) and remove ballast by lifting up from bottom support bracket. Retain clamp for reuse.

##### INSTALL

Install Ballast. See Figure 4-6.

- a. Install ballast (10) into bottom support bracket and secure top of ballast with clamp (9) and tee handle (8).
- b. Install indicator light (4) on bracket (7) and secure with clamp (6) and tee handle (5).
- c. Connect ballast plug (2) to connector (3).
- d. Close and latch ballast box door (1).



MBPLA-4-6A

Figure 4-6. Emergency Light Ballast

**4-17 EMERGENCY LIGHT BALLAST BOX.**


---

This task consists of:

a. Remove

b. Install

---

**INITIAL SET-UP**Tools Required

General Mechanics Tool Kit, (Appendix B, Section III, Item 1)

Materials/Parts Required

Lockwashers, (4)

Equipment Condition

Power to lights removed by positioning Main Power Panel circuit breakers; A1CB9, A1CB11, and A1CB13 to OFF.

General Safety Instructions

<b>WARNING</b>
----------------

**ELECTRICAL SHOCK**

Before performing any maintenance actions on electrical equipment, ensure all electrical power has been turned off. Failure to comply with this warning may result in serious injury or death.

---

REMOVE

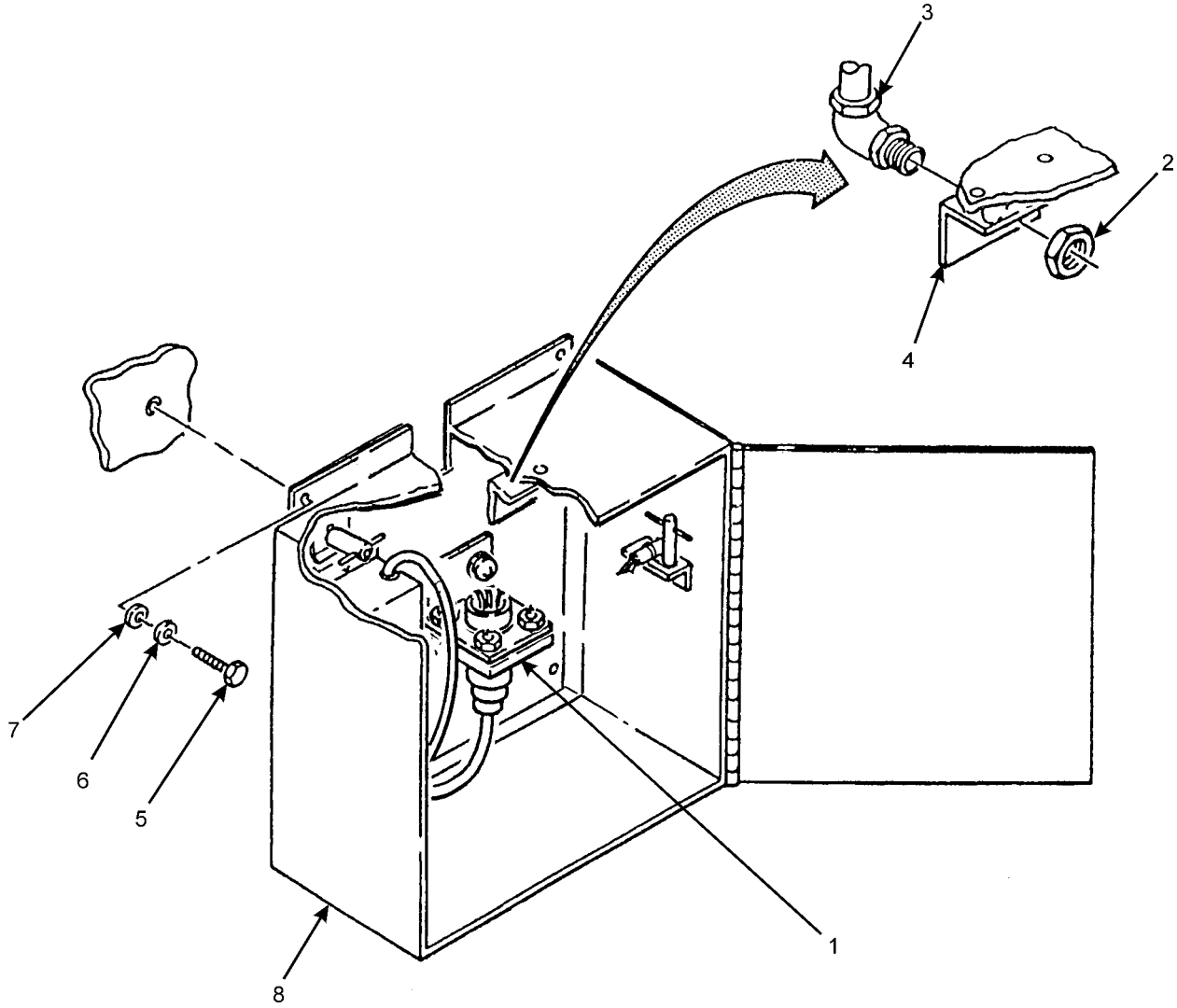
Remove Ballast Box. See Figure 4-7.

- a. Tag and disconnect wires to plug connector (1) from lighting circuit.
- b. Remove nut (2) securing conduit elbow (3) to bracket (4).
- c. Remove four screws (5), lockwashers (6), and washers (7) from rivnuts mounted on Mod Lab A wall. Discard lockwashers.
- d. Guide wires from lighting circuit through conduit opening while removing ballast box (8) from wall mounting.

INSTALL

Install Ballast Box. See Figure 4-7.

- a. Guide wires from lighting circuit through conduit opening while positioning ballast box (8) to wall mounting.
- b. Secure ballast box (8) to rivnuts of wall mounting with four screws (5), lockwashers (6), and washers (7).
- c. Secure electrical conduit elbow (3) to bracket (4) with nut (2).
- d. Connect wires from lighting circuit as tagged to plug connector (1). Remove tags.



MBPLA-4-7A

Figure 4-7. Emergency Light Ballast Box

**4-18 MAIN POWER PANEL COMPONENTS.**

---

This task consists of:    a. Remove    b. Install

---

**INITIAL SET-UP**Tools Required

- General Mechanics Tool Kit, (Appendix B, Section III, Item 1)
- Fusepuller, (Appendix B, Section III, Item 2)
- Socket Wrench, (Appendix B, Section III, Item 2)

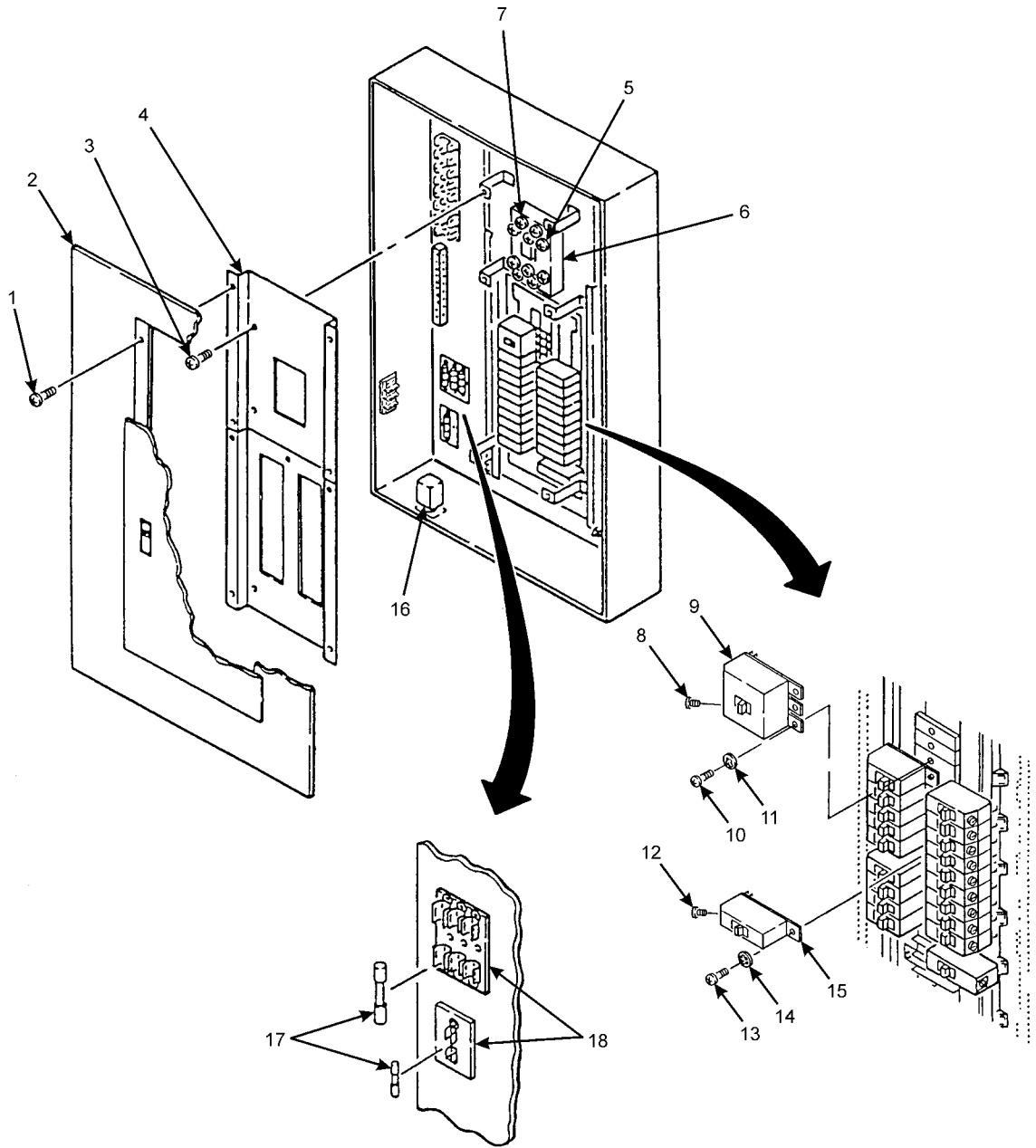
General Safety Instructions**WARNING****ELECTRICAL SHOCK**

Before performing any maintenance actions on electrical equipment, ensure all electrical power has been turned off. Failure to comply with this warning may result in serious injury or death.

---

REMOVE

1. Disassemble Main Power Panel Assembly. See Figure 4-8.
  - a. Turn off all equipment.
  - b. Open all circuit breakers located in main power panel.
  - c. Shut down generator.
  - d. Disconnect power input cable from Petroleum Laboratory.
  - e. Remove six screws (1) and outside panelboard cover (2).
  - f. Remove six screws (3) and circuit breaker cover (4).
2. Remove Main Circuit Breaker A1CB1.
  - a. Loosen six terminal screws (5).
  - b. Tag and disconnect all wires from main circuit breaker A1CB1 (6).
  - c. Remove four screws (7) and withdraw main circuit breaker A1CB1 (6).
3. Remove 100A Circuit Breaker A1CB2.
  - a. Loosen three terminal screws (8), then tag and disconnect all wires from circuit breaker A1CB2 (9).
  - b. Remove three screws (10) and starwashers (11) and withdraw circuit breaker A1CB2 (9).



MBPLA-4-8A

Figure 4-8. Main Power Panel Components

**NOTE**

All remaining circuit breakers are removed as follows.

4. Remove Circuit Breakers.
  - a. Loosen terminal screw (12), then tag and disconnect wire.
  - b. Remove screw (13) and starwasher (14) and withdraw circuit breaker (15).
5. Remove Relay A1K1.

Relay A1K1 (16) is a plug-in type relay. It is removed by simply lifting relay from socket in main power panel.

6. Remove Fuses.

Remove fuse(s) (17) from fuseholder (18) clips by grasping fuse with fusepuller and pulling fuse free from holder.

**INSTALL**

1. Install Main Circuit Breaker A1CB1. See Figure 4-8.
  - a. Install main circuit breaker A1CB1 (6) and secure with four screws (7).
  - b. Install electrical leads as tagged to main circuit breaker A1CB1 (6) and secure with terminal screw (5).
2. Install 100A Circuit Breaker A1CB2.
  - a. Snap circuit breaker A1CB2 (9) in place and secure with three screws (10) and starwashers (11).
  - b. Attach electrical leads as tagged to circuit breaker A1CB2 (9) and tighten terminal screws (8). Remove tags.

**NOTE**

All remaining circuit breakers are installed as follows.

3. Install Circuit Breakers.
  - b. Snap circuit breaker (15) in place and secure with screw (13) and starwasher (14).
  - a. Attach electrical lead(s) as tagged to circuit breaker (15) and tighten terminal screws (8). Remove tags.
4. Install Relay A1K1.
 

Align relay A1K1 (16) pins with socket and plug relay into socket.
5. Install Fuses.
  - b. Grasp fuse(s) (17) with fusepuller and insert into fuseholder (18).
6. Assemble Main Power Panel Assembly.
  - a. Install circuit breaker cover (4) and secure with six screws (3).
  - b. Install outside panelboard cover (2) and secure with six screws (1).
  - c. Reconnect power input cable from generator to petroleum laboratory.
  - d. Close all circuit breakers in Main Power Panel.
  - e. Connect power input cable, power up generator, turn on equipment and verify operation.



#### 4-19 EXPLOSION PROOF DISTRIBUTION BOX A3 COMPONENTS.

---

This task consists of:                              a. Remove    b. Install

---

##### **INITIAL SET-UP**

##### Tools Required

General Mechanics Tool Kit, (Appendix B, Section III, Item 1)

##### Materials/Parts Required

Lockwashers, (52)  
Self locking Nuts (2)

##### Equipment Condition

Access panel below main power panel removed.

##### General Safety Instructions

**WARNING**

##### **ELECTRICAL SHOCK**

Before performing any maintenance actions on electrical equipment, ensure all electrical power has been turned off. Failure to comply with this warning may result in serious injury or death.

---

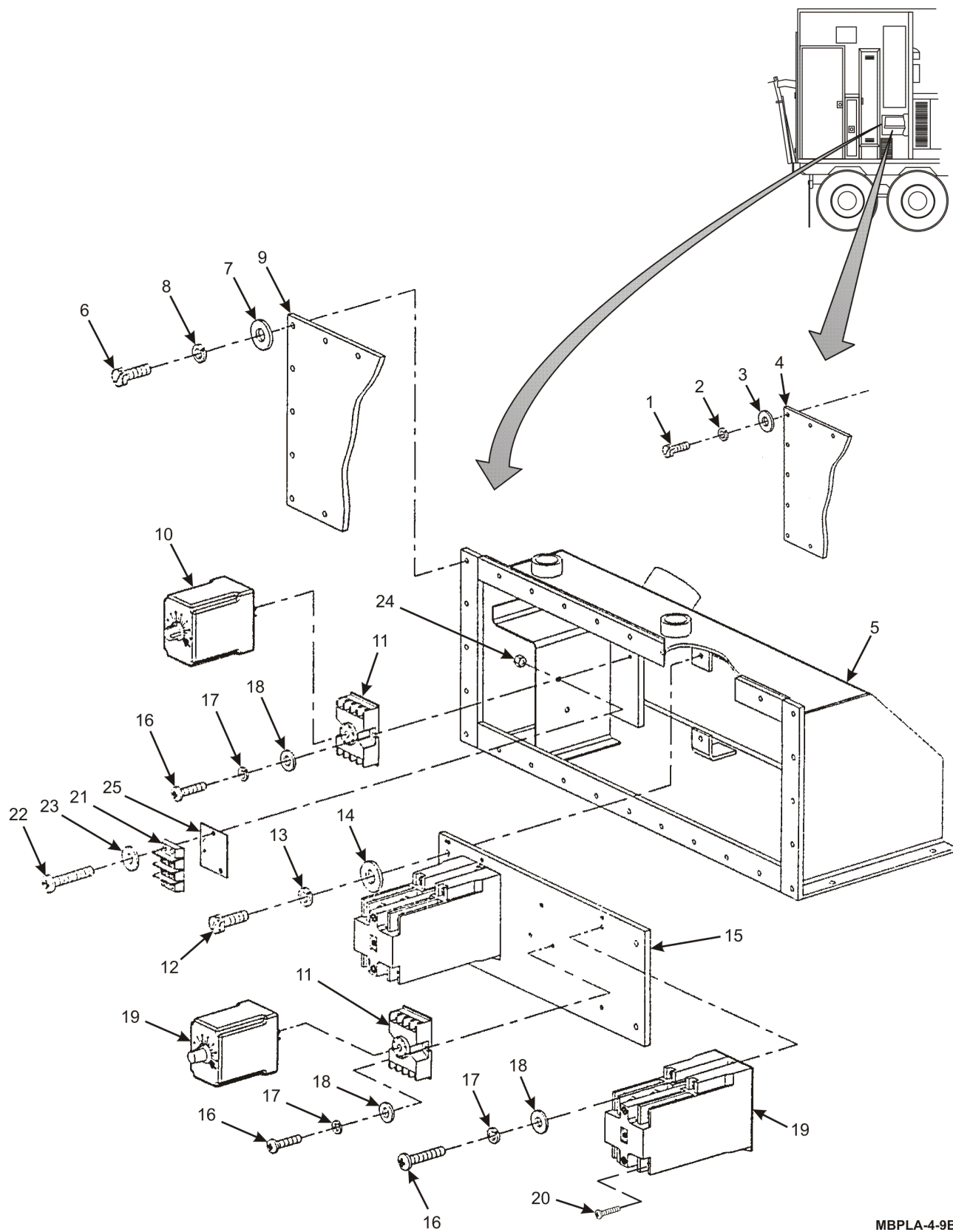
##### REMOVE

1. Disassemble Explosion Proof Distribution Box A3. See Figure 4-9.
  - a. Open main circuit breaker A1CB1 and turn generator off.

##### **NOTE**

Mark distribution box cover left side before removing.

- b. Remove 18 screws (1), lockwashers (2), washers (3), and access panel (4) to gain access to distribution box A3 (5) which is located below Main Power Panel. Discard lockwashers.
  - c. Remove 28 mounting screws (6), lockwashers (7), washers (8) and cover (9). Discard lockwashers.
2. Remove Timer Relay A3K1 or A3K6.
  - a. Pull relay (10) from socket (11).
3. Remove Relay A3K2 or A3K5.
  - a. Remove four screws (12), lockwashers (13), and washers (14) and pull relay mounting plate (15) forward to gain access to relay mounting hardware. Discard lockwashers.
  - b. Remove two screws (16), lockwashers (17), washers (18) and relay A3K2 or A3K5 (19). Discard lockwashers.
  - c. Tag and disconnect wiring from relay A3K2 or A3K5 (19) by removing terminal screw (20).
4. Remove Terminal Board TB1.
  - a. Tag and disconnect wiring from terminal board TB1 (21).
  - b. Remove two screws (22), washers (23), self locking nuts (24), terminal board TB1 (21), and terminal board marker strip (25). Discard self locking nuts.



MBPLA-4-9B

Figure 4-9. Explosion Proof Distribution Box A3 Components

INSTALL

1. Install Timer Relay A3K1 or A3K6. See Figure 4-9.

Timer relay A3K1 or A3K6 (10) is installed by simply aligning relay pins with socket (11) and plugging the relay into socket.
2. Install Relay A3K2 or A3K5.
  - a. Install relay A3K2 or A3K5 (19) on relay mounting plate (15) and secure with two screws (12), lockwashers (13), and washers (14).
  - b. Connect wires as tagged to relay A3K2 or A3K5 (19) and secure with terminal screw (20). Remove tags.
  - c. Install relay mounting plate (15) into distribution box (5) and secure with four screws (12), lockwashers (13), and washers (14).
3. Install Terminal Board TB1.
  - a. Install terminal board TB1 (21) and secure with two screws (22), washers (23), self locking nuts (24), and terminal board marker strip (25).
  - b. Connect wires as tagged to terminal board TB1 (21). Remove tags.
4. Assembly Explosion Proof Distribution Box A3.
  - a. Install cover (9) on distribution box (5) and secure with 28 screws (6) lockwashers (7), and washers (8).
  - b. Install access panel (4) and secure with 18 screws (1), lockwashers (2), and washers (3).
  - c. Run operational test to verify components.

**4-20. POWER PANEL NO. 2 COMPONENTS.**

---

This task consists of:                                      a. Remove    b. Install

---

**INITIAL SET-UP**Tools Required

- General Mechanics Tool Kit, (Appendix B, Section III, Item 1)
- Fusepuller, (Appendix B, Section III, Item 2)

Equipment Condition

- Power Input Cable Disconnected (Paragraph 2-8)

General Safety Instructions

<b>WARNING</b>
----------------

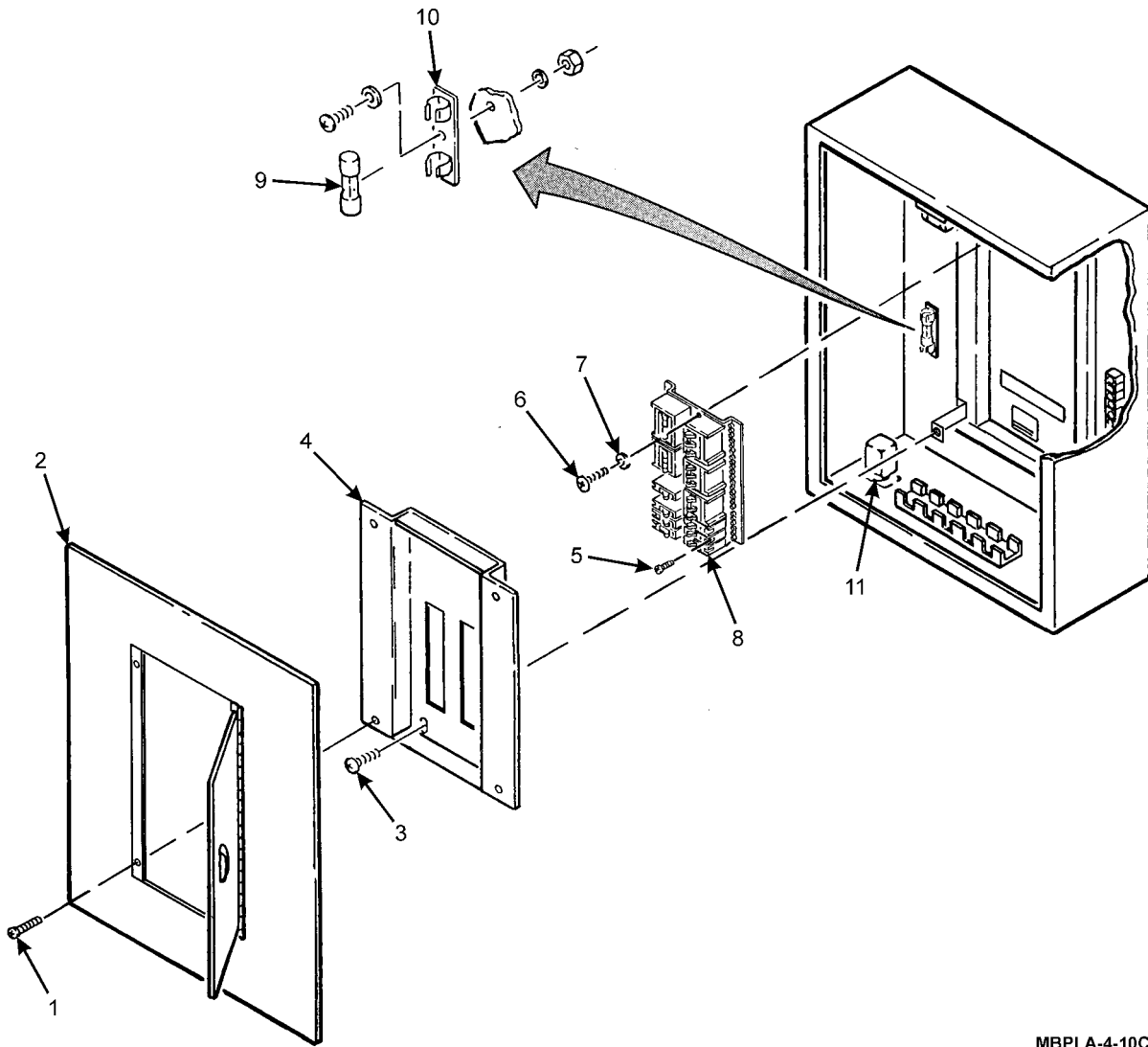
**ELECTRICAL SHOCK**

Before performing any maintenance actions on electrical equipment, ensure all electrical power has been turned off. Failure to comply with this warning may result in serious injury or death.

---

REMOVE

1. Disassembly Panelboard Front Assembly. See Figure 4-10.
  - a. Turn off all equipment.
  - b. Open all circuit breakers located in panelboard.
  - c. Open circuit breaker A1CB2 in Main Power Panel.
  - d. Remove four screws (1) and outside panelboard cover (2).
  - e. Remove four screws (3) and circuit breaker cover (4).
2. Remove Circuit Breakers.
  - a. Loosen terminal screw(s) (5), then tag and disconnect wiring.
  - b. Remove screw(s) (6) and starwasher(s) (7) and withdraw circuit breaker (8).
3. Remove Fuse.
  - a. Remove fuse (9) from fuseholder (10) by grasping fuse with fusepuller and pulling fuse free from holder.



MBPLA-4-10C

Figure 4-10. Power Panel No. 2 Components

INSTALL

1. Install Circuit Breakers. See Figure 4-10.
  - a. Install circuit breaker (8) in panelboard and fasten in place with screw(s) (6) and starwasher(s) (7).
  - b. Attach electrical wiring to circuit breaker (8) and tighten terminal screw (5). Remove tags.
2. Install Fuse.
  - a. Grasp fuse (9) with fusepuller and insert into fuseholder (10).
3. Assemble Panelboard Front Assembly.
  - a. Install circuit breaker cover (4) and secure with four screws (3).
  - b. Install outside panelboard cover (2) and secure with four screws (1).
  - c. Close circuit breaker A1CB2 in Main Power Panel.
  - d. Close all circuit breakers in Power Panel No. 2.
  - e. Connect power cable (paragraph 2-6).
  - f. Turn on equipment and verify operation.

#### 4-21. EXPLOSION PROOF DISTRIBUTION BOX A13 COMPONENTS.

---

This task consists of:	a. Remove	b. Install
------------------------	-----------	------------

---

##### INITIAL SET-UP

###### Tools Required

General Mechanics Tool Kit, (Appendix B, Section III, Item 1)

###### Materials/Parts Required

Lockwashers, (24)

###### General Safety Instructions

<b>WARNING</b>
----------------

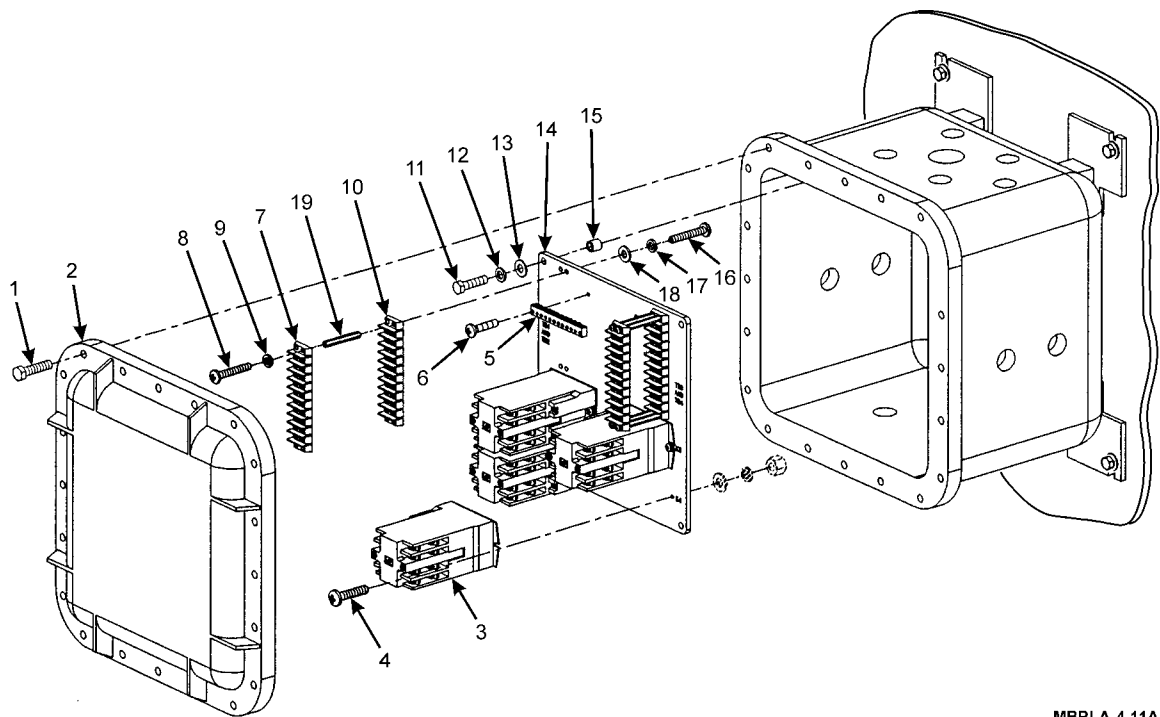
##### ELECTRICAL SHOCK

Before performing any maintenance actions on electrical equipment, ensure all electrical power has been turned off. Failure to comply with this warning may result in serious injury or death.

---

##### REMOVE

1. Disassemble Explosion Proof Distribution Box A13. See Figure 4-11.
  - a. Open circuit breakers A1CB1 and A1CB2 located in Main Power Panel. Disconnect power input cable (paragraph 2-9).
  - b. Remove 20 screws (1) and cover (2).
2. Remove Control Relay K1 thru K4.
  - a. Tag and disconnect relay K1 thru K4 (3) electrical leads by loosening relay terminal screws.
  - b. Loosen two screws (4) and remove relay K1 thru K4 (3).
3. Remove Terminal Board TBGND.
  - a. Tag and disconnect terminal board TBGND (5) electrical leads by loosen terminal board screws.
  - b. Remove two screws (6) and terminal board TBGND (5).
4. Remove Terminal Board TB1 thru TB4.
  - a. Tag and disconnect terminal board TB1 or TB3 (7) electrical leads by removing terminal board screws.
  - b. Remove four screws (8), lockwashers (9), and terminal board TB1 or TB3 (7). Discard lockwashers.
  - c. Tag and disconnect terminal board TB2 or TB4 (10) electrical leads by removing terminal board screws.
  - d. Remove four screws (11), lockwashers (12), and washers (13) and carefully withdraw mounting panel (14) to gain access to terminal board TB2 or TB4 (10) mounting hardware. Retain four standoffs (15) for reassembly. Discard lockwashers.
  - e. Remove four screws (16), lockwashers (17), washers (18), standoffs (19) and terminal board TB2 or TB4 (10). Discard Lockwashers.



MBPLA-4-11A

Figure 4-11. Explosion Proof Distribution Box A13 Components



INSTALL

1. Install Terminal Board TB1 thru TB4. See Figure 4-11.
  - a. Install terminal board TB2 or TB4 (10) and secure with four screws (16), lockwashers (17), washers (18), standoffs (19)
  - b. Install mounting panel (14) and secure with four screws (11), lockwashers (12), washers (13), and standoffs (15).
  - c. Connect electrical leads as tagged to terminal board TB2 or TB4 (10). Remove tags.
  - d. Install terminal board TB1 or TB3 (7) and secure with four screws (8) and lockwashers (9).
  - e. Connect electrical leads as tagged to terminal board TB1 or TB3 (7). Remove tags.
2. Install Terminal Board TBGND.
  - a. Install terminal board TBGND (5) and secure with two screws (6).
  - b. Connect electrical leads as tagged to terminal board TBGND (5). Remove tags.
3. Install Control Relay K1 thru K4.
  - a. Install relay K1 thru K4 (3) and secure by tightening two screws (4).
  - b. Connect electrical leads as tagged to relay K1 thru K4 (3). Remove tags.
4. Assembly Explosion Proof Distribution Box A13.
  - a. Install cover (2) and secure with 20 screws (1).
  - b. Connect power input cable (paragraph 2-6).
  - c. After purge cycle close circuit breakers A1CB1 and A1CB2.
  - d. Run operational test to verify components.

**4-22. WALL SWITCH.**


---

This task consists of:                      a. Remove                                      b. Install

---

**INITIAL SET-UP**Tools Required

General Mechanics Tool Kit, (Appendix B, Section III, Item 1)

General Safety Instructions**WARNING****ELECTRICAL SHOCK**

Before performing any maintenance actions on electrical equipment, ensure all electrical power has been turned off. Failure to comply with this warning may result in serious injury or death.

---

REMOVE

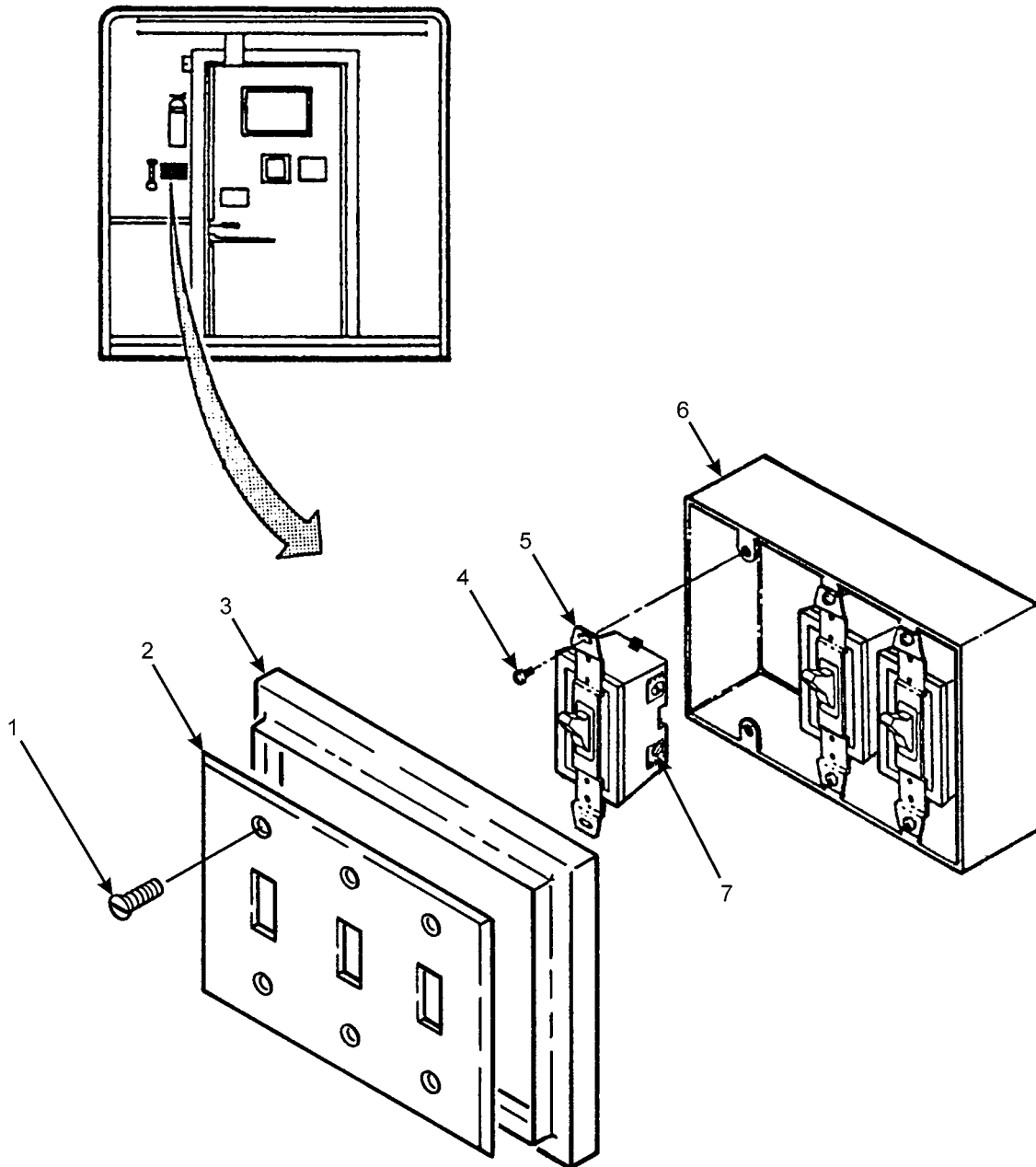
Remove Wall Switch. See Figure 4-12.

- a. Position Main Power Panel or Power Panel No. 2 appropriate circuit breaker(s) to OFF. (See Chapter 2, Section 1, Table 2-2 and Table 2-3).
- b. Turn switch to on position and verify no electrical power to switch.
- c. Remove six screws (1) cover (2), and extension (3).
- d. Remove two screws (4) and withdraw switch (5) from junction box (6) to gain access to wire.
- e. Tag and disconnect wires by loosening screws (7) and remove switch (5).

INSTALL

Install Wall Switch. See Figure 4-12.

- a. Connect wires as tagged to switch (5), tighten screws (7), and remove tags.
- b. Install switch (5) into junction box (6). Ensure wires are not kinked or strained.
- c. Secure switch (5) with two screws (4).
- d. Install extension (3) and cover plate (2) on junction box (6) and secure with six screws (1).
- e. Position Main Power Panel or Power Panel No. 2 appropriate circuit breaker(s) to ON.
- f. Turn switch to on position and verify proper operation.



MBPLA-4-12A

Figure 4-12. Wall Switch (Typical)

**4-23. BLACKOUT MICROSWITCH.**


---

This task consists of:                      a. Remove                      b. Install                      c. Adjust

---

**INITIAL SET-UP**Tools Required

General Mechanics Tool Kit, (Appendix B, Section III, Item 1)

General Safety Instructions**WARNING****ELECTRICAL SHOCK**

Before performing any maintenance actions on electrical equipment, ensure all electrical power has been turned off. Failure to comply with this warning may result in serious injury or death.

---

REMOVE

Remove Blackout Microswitch. See Figure 4-13.

- a. Position circuit breaker(s) to OFF.
  - (1). Microswitch for rear or curbside door, position Main Power Panel circuit breakers A1CB9, A1CB11, and A1CB13 to OFF.
  - (2). Microswitch for mechanical room door, position Power Panel No. 2 circuit breaker A15CB10 to OFF.
- b. Verify all lighting is off to ensure power has been removed from microswitch.
- c. Remove eight screws (1), washers (2), NSN plate (3) and cover plate (4) for rear or curbside blackout microswitch or six screws (1), washers (2), NSN plate (3) and cover plate (4) for mechanical room blackout microswitch.
- d. Remove eight screws (5), lockwashers (6) and pull both microswitches (7) forward from door switch box (8).
- f. Tag and disconnect wires from back of microswitches (7).
- g. Remove three screws (9), lockwashers (10), washers (11), spacers (12), and door switch box (8) for rear or curbside blackout microswitch or two screws (9), lockwashers (10), washers (11), spacers (12), and door switch box (8) for mechanical room blackout microswitch.

INSTALL

Install Blackout Microswitch. See Figure 4-13.

- a. Install door switch box (8) and secure with three screws (9), lockwashers (10), washers (11), and spacers (12) for rear or curbside blackout microswitch or two screws (9), lockwashers (10), washers (11), and spacers (12) for mechanical room blackout microswitch.
- b. Connect wires as tagged to back of microswitches (7). Remove tags.
- c. Install microswitches (7) in door switch box (8) and secure with eight screws (5), and lockwashers (6).
- d. Install cover late (4) and secure with eight screws (1), washers (2), and NSN plate (3) for rear or curbside blackout microswitch or six screws (1), washers (2), and NSN plate (3) for mechanical room blackout microswitch.
- e. Position appropriate circuit breaker(s) to ON and verify proper operation.

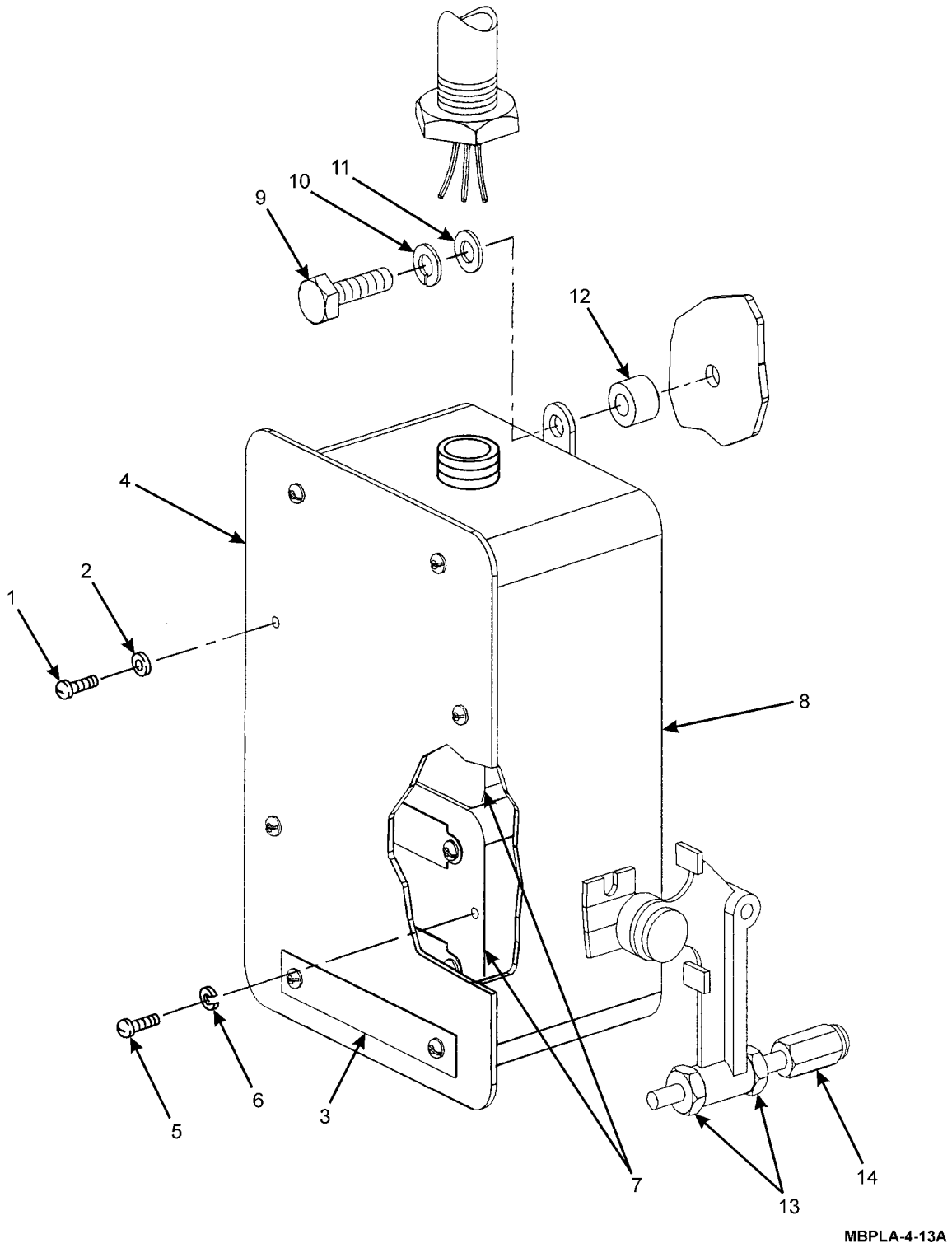


Figure 4-13. Blackout Microswitch (Typical)

ADJUST

1. Adjust Blackout Microswitch. See Figure 4-13.
  - a. Loosen nuts (13).
  - b. Rotate adjustable plunger (14) until closing door activates switch.
  - c. Tighten nuts (13).

#### 4-24. RECEPTACLES.

---

This task consists of:                      a. Remove    b. Install

---

##### **INITIAL SET-UP**

###### Tools Required

General Mechanics Tool Kit, (Appendix B, Section III, Item 1)

###### General Safety Instructions

<b>WARNING</b>
----------------

##### **ELECTRICAL SHOCK**

Before performing any maintenance actions on electrical equipment, ensure all electrical power has been turned off. Failure to comply with this warning may result in serious injury or death.

---

##### REMOVE

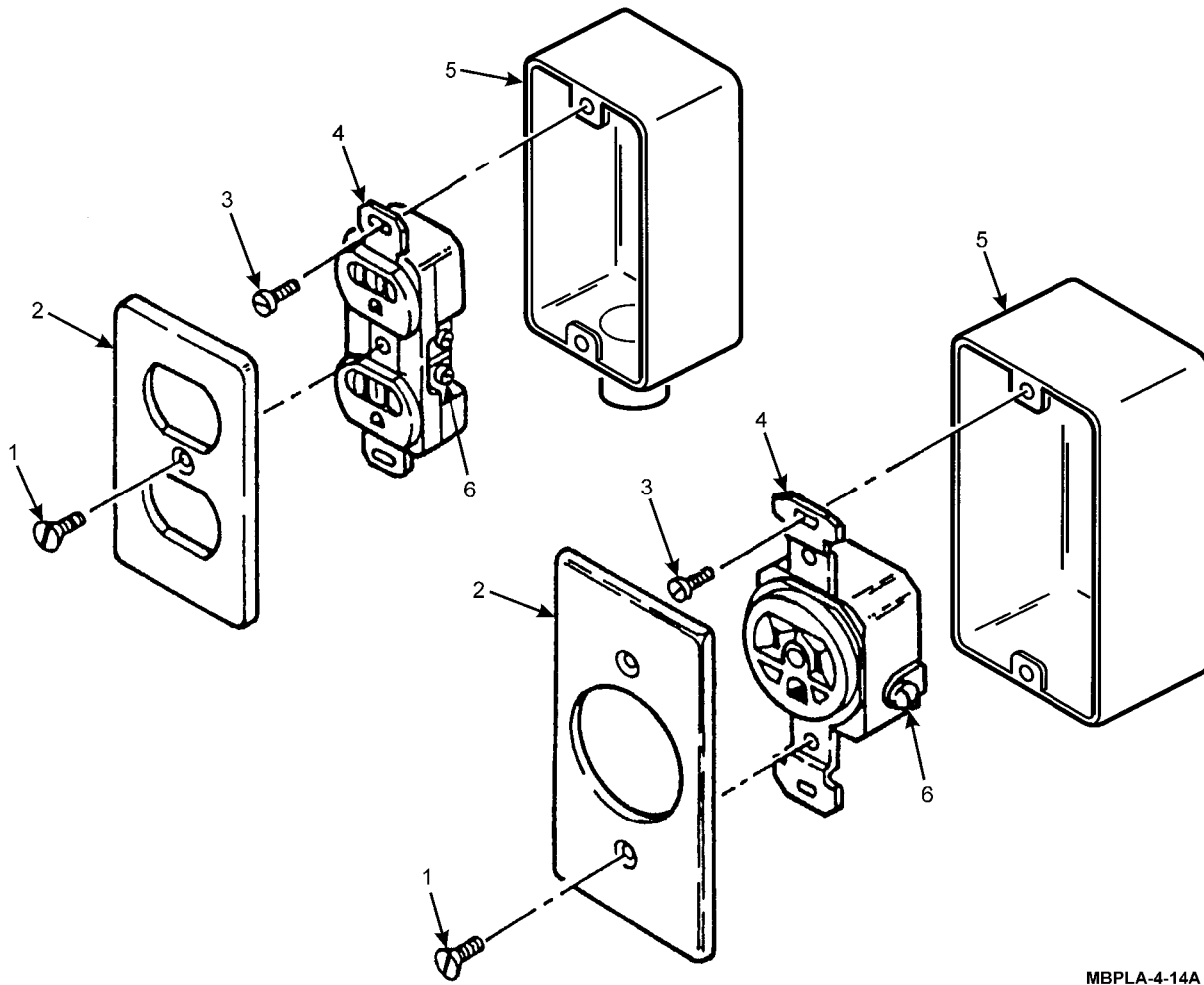
Remove Receptacle. See Figure 4-14.

- a. Position Main Power Panel or Power Panel No. 2 appropriate circuit breaker(s) to OFF. (See Chapter 2, Section 1, Table 2-2 and Table 2-3).
- b. Verify no electrical power to receptacle.
- c. Remove screw(s) (1) and cover plate (2).
- d. Remove two screws (3) and withdraw receptacle (4) from junction box (5) to gain access to wires.
- e. Tag and disconnect wires by loosening terminal screws (6) and remove receptacle (4).

##### INSTALL

Install Receptacle. See Figure 4-14.

- a. Connect wires as tagged to receptacle (4) connecting ground wire (green) first, tighten terminal screws (6), and remove tags.
- b. Install receptacle (4) into junction box (5) and secure with two screws (3).
- c. Install cover plate (2) on junction box and secure with screw(s) (1).
- d. Position Main Power Panel or Power Panel No. 2 appropriate circuit breaker(s) to ON.
- e. Plug in an electrical appliance to verify proper operation of receptacle.



MBPLA-4-14A

Figure 4-14. Receptacles



#### 4-25. ENVIRONMENTAL CONTROL UNIT REMOTE CONTROL.

---

This task consists of:                                  a. Remove    b. Install

---

##### **INITIAL SET-UP**

###### Tools Required

General Mechanics Tool Kit, (Appendix B, Section III, Item 1)

###### General Safety Instructions

**WARNING**

##### **ELECTRICAL SHOCK**

Before performing any maintenance actions on electrical equipment, ensure all electrical power has been turned off. Failure to comply with this warning may result in serious injury or death.

---

##### REMOVE

Remove Environmental Control Unit (ECU) Remote Control. See Figure 4-15.

- a. Position ECU mode switch (1) to OFF.
- b. Position Power Panel No. 2 circuit breakers A15CB1, A15CB2, A15CB3, or A15CB4 to OFF.

##### **NOTE**

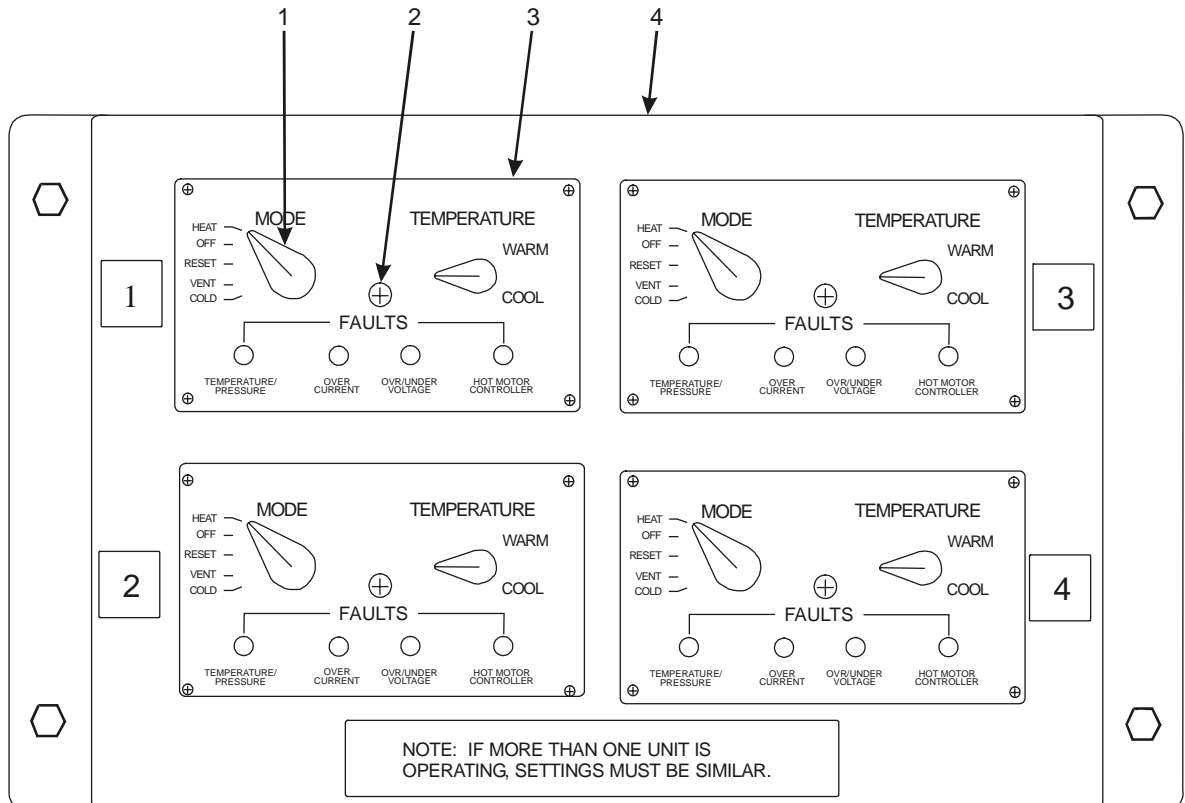
To prevent damage to ECU control connector pull ECU control straight out.

- c. Loosen captive screw (2) and remove ECU control (3) from panel (4).

##### INSTALL

Install Environmental Control Unit (ECU) Remote Control. See Figure 4-15.

- a. Install ECU control (3) into panel (4) by ensuring ECU control connector is aligned with mating connector and secure by tightening captive screw (2).
- b. Position Power Panel No. 2 circuit breakers A15CB1, A15CB2, A15CB3, or A15CB4 to ON.
- c. Position ECU mode switch (1) to an operational mode and verify ECU operation.



MBPLA-4-15B

Figure 4-15. Environmental Control Unit Remote Control

#### 4-26. MOTOR CONTROLLER.

---

This task consists of:

a. Remove	b. Install
-----------	------------

---

##### **INITIAL SET-UP**

##### Tools Required

General Mechanics Tool Kit, (Appendix B, Section III, Item 1)

##### General Safety Instructions

<b>WARNING</b>
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##### **ELECTRICAL SHOCK**

Before performing any maintenance actions on electrical equipment, ensure all electrical power has been turned off. Failure to comply with this warning may result in serious injury or death.

---

##### REMOVE

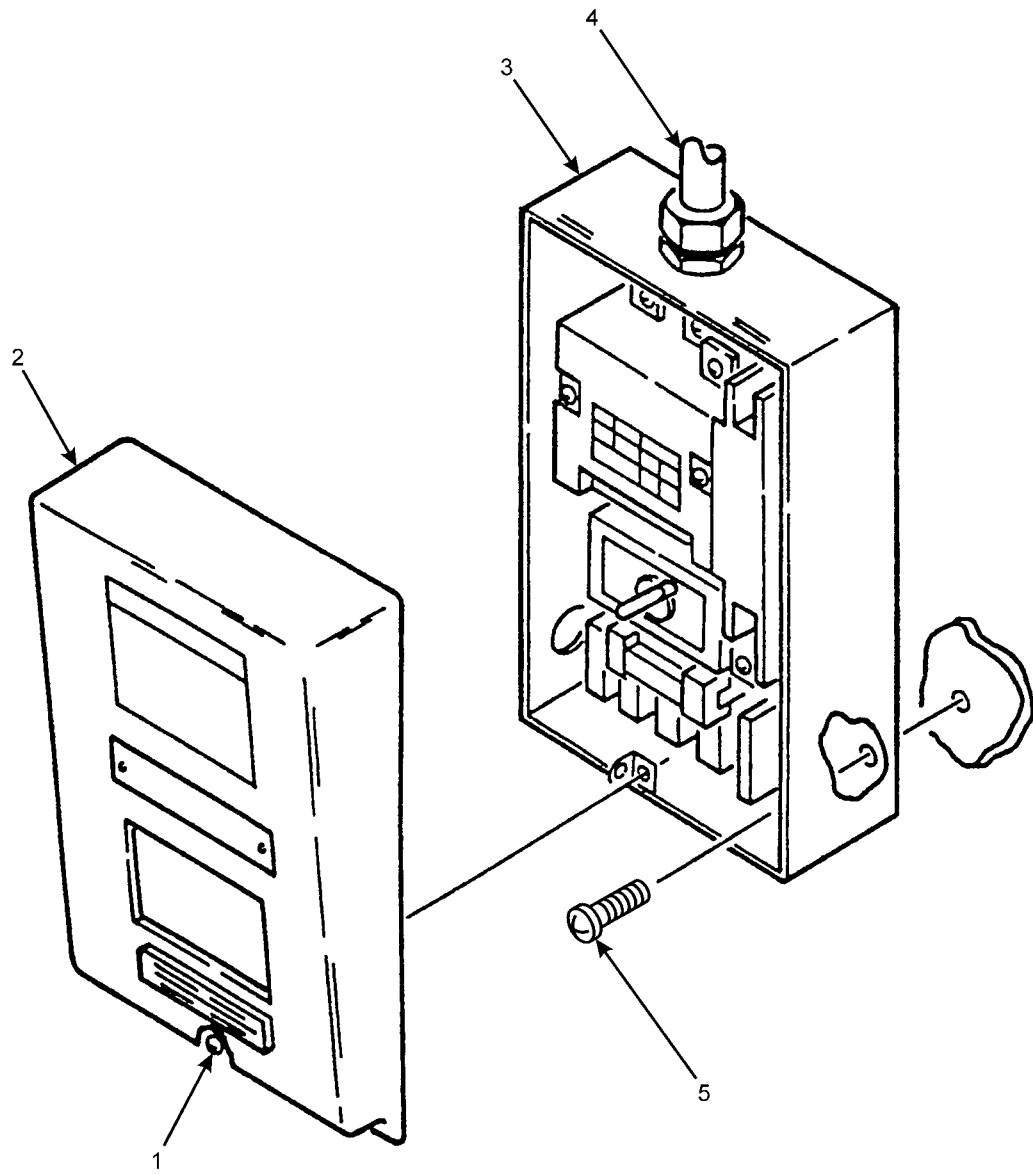
Remove Motor Controller (Typical). See Figure 4-16.

- a. Switch appropriate circuit breaker to OFF on Power Panel No. 2.
- b. Loosen captive screw (1) and remove cover (2). Tag and disconnect motor controller (3) wiring.
- c. Remove strain relief (4) retaining nut inside motor controller.
- d. Remove three screws (5) securing motor controller (3) to wall.
- e. Remove motor controller (3) feeding wires thru strain relief hole.

##### INSTALL

Install Motor Controller (Typical). See Figure 4-16.

- a. Place motor controller (3) in position on wall and secure with three screws (5).
- b. Install wires thru strain relief holes and secure strain relief (4) using retaining nut.
- c. Connect wires as tagged to motor controller (3). Remove tags.
- d. Install cover (2) and secure with captive screw (1).
- e. Verify proper operation of equipment.



MBPLA-4-16A

Figure 4-16. Motor Controller

#### 4-27. PURGE INTAKE/EXHAUST DOOR.

---

This task consists of:	a. Remove	b. Repair	b. Install
------------------------	-----------	-----------	------------

---

##### **INITIAL SET-UP**

###### Tools Required

- General Mechanics Tool Kit, (Appendix B, Section III, Item 1)
- Drill and Bits, (Appendix B, Section III, Item 2)
- Drill Set, (Appendix B, Section III, Item 2)
- Hand Blind Riveter, (Appendix B, Section III, Item 3)

###### Materials/Parts Required

- Gasket, (1)
  - Lockwashers (6)
  - Rivets, (38)
  - Wave Washers, (2)
  - Adhesive MM-A-1617, Type II, (Appendix E, Section II, Item 3)
- 

##### REMOVE

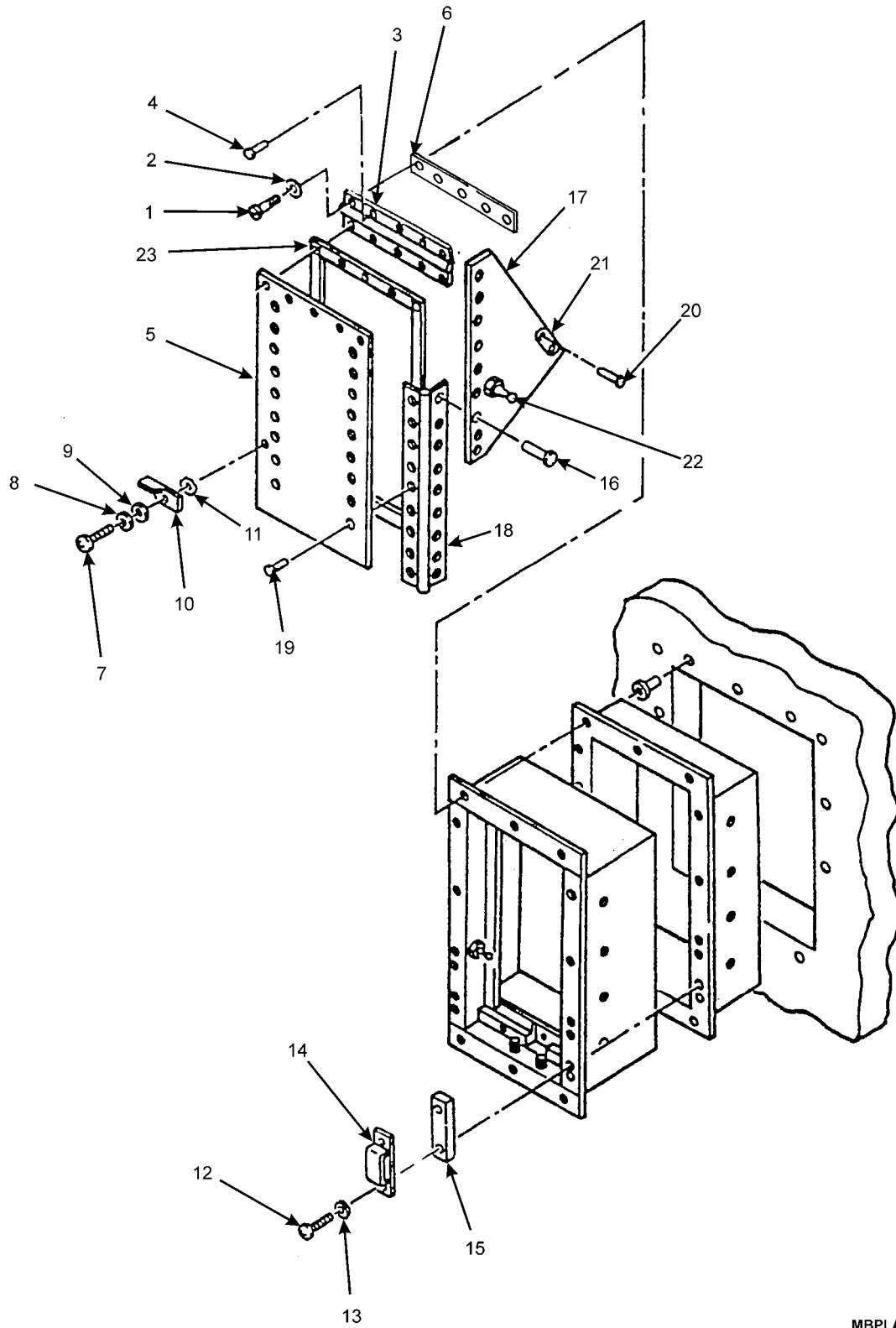
Remove Door Assembly. See Figure 4-17.

- a. Remove three screws (1), and lockwashers (2) from door hinge (3). Discard lockwashers.
- b. Remove two rivets (4) door (5) and spacer (6) from Mod Lab. Retain spacer for reuse.

##### REPAIR

Repair Door Assembly. See Figure 4-17.

- a. Remove screw (7), lockwasher (8), washer (9), latch (10), and wave washer (11). Discard lockwasher and wave washer.
- b. Install latch (10) and wave washer (11) and secure with screw (7), lockwasher (8), and washer (9).
- c. Remove two screws (12), lockwashers (13), latch keeper (14), and spacer (15) from Mod Lab. Discard lockwasher.
- d. Install spacer (15) and latch keeper (14) and secure with two screws (12) and lockwashers (13).
- e. Drill out nine rivets (16) attaching door support (17) to hinge (18) and remove door support.
- f. Install door support (17) onto hinge (18) and secure with nine rivets (16).
- g. Drill out nine rivets (19) attaching hinge (18) to door (5) and remove hinge.
- h. Install hinge (18) to door (5) and secure with nine rivets (19).
- i. Drill out two rivets (20) attaching ball stud receiver (21) to door support (17) and remove ball stud receiver.
- j. Install ball stud receiver (21) to door support (17) and secure with two rivets (20).
- k. Unscrew and remove ball stud (22).
- l. Install ball stud (22) and screw in place.
- m. Remove gasket (23) from door (5).
- n. Ensure no gasket (23) remnants are left adhering to door (5) bonding surface.
- o. Install gasket (23) to door (5) and secure with adhesive.



MBPLA-4-18A

Figure 4-17. Purge Intake/Exhaust Door

INSTALL

Install Door Assembly. See Figure 4-17.

- a. Install spacer (6) and door (5) on Mod Lab and secure with two rivets (4) three screws (1) and lockwashers (2).

**4-28. PURGE INTAKE DOOR DAMPER MOTOR.**


---

This task consists of:                                      a. Remove    b. Install

---

**INITIAL SET-UP**Tools Required

General Mechanics Tool Kit, (Appendix B, Section III, Item 1)

Materials/Parts Required

Lockwashers, (8)

---

General Safety Instructions**WARNING****ELECTRICAL SHOCK**

Before performing any maintenance actions on electrical equipment, ensure all electrical power has been turned off. Failure to comply with this warning may result in serious injury or death.

---

**NOTE**

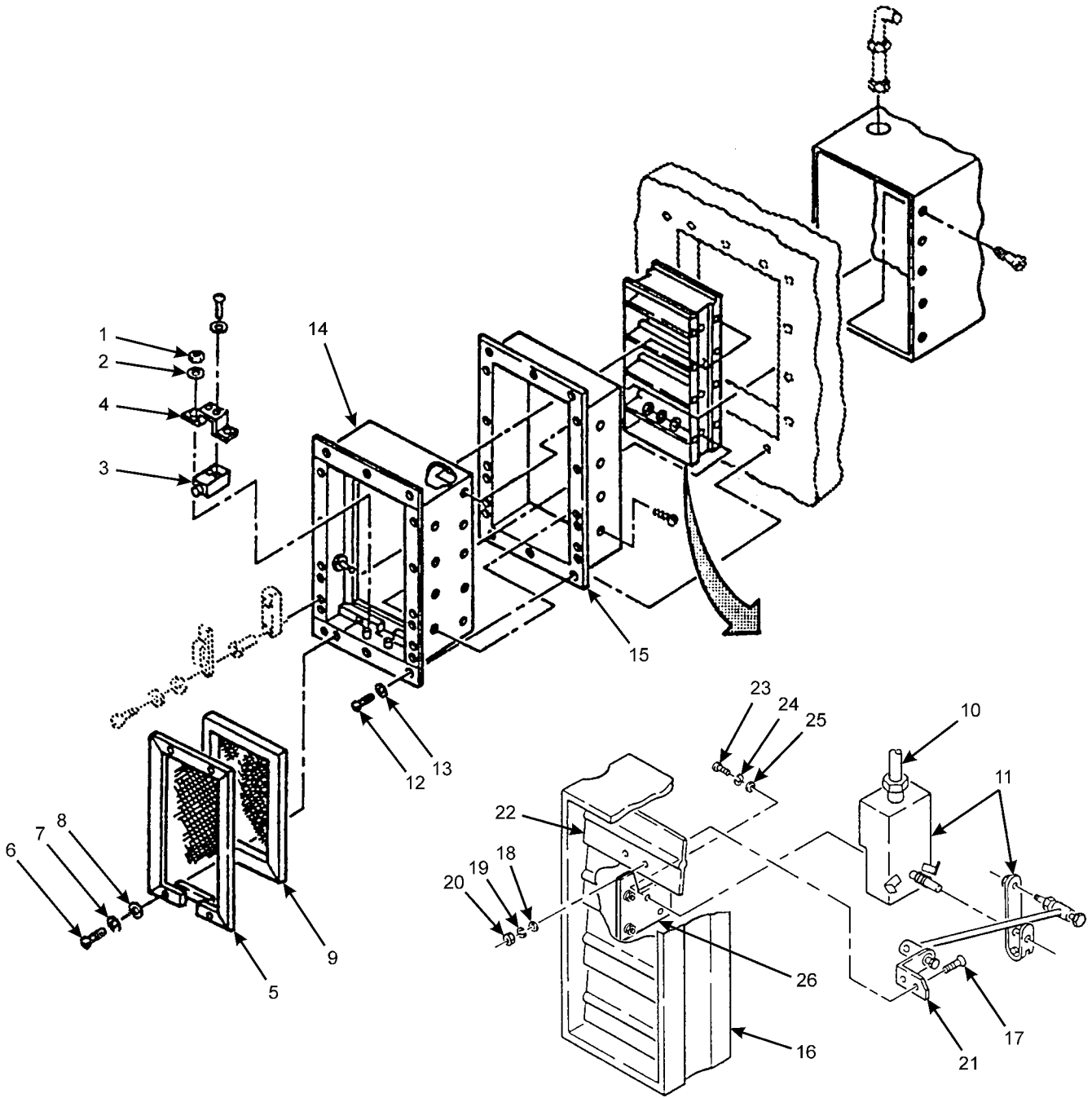
Procedures for removing and replacing the opposite purge intake door damper motor are identical to those outlined in the preceding paragraphs.

REMOVE

Remove Intake Door Damper Motor. See Figure 4-18.

- a. Open purge intake door.
- b. Remove two nuts (1) and washers (2) and lift purge door limit switch (3) with mounting bracket (4) attached, clear of screen (5).
- c. Remove four screws (6), lockwashers (7), washers (8), screen (5), and filter (9). Discard lockwashers.
- d. At 2" x 4" electrical junction box mounted on ECU plenum, remove two screws and cover. Tag and disconnect three electrical leads from damper motor. Attach a line to electrical leads to facilitate pulling electrical leads through conduit during installation.
- e. Disconnect electrical conduit (10) from motor (11).
- f. Remove 14 screws (12) and washers (13) from damper enclosure (14) flange and remove enclosure with damper frame (15), damper (16) and motor (11). Carefully pull motor leads from electrical junction box and through electrical conduit (10) until electrical leads are clear and attached line is visible. Disconnect line.
- g. Remove two screws (17), washers (18), lockwashers (19) and nuts (20) attaching motor linkage (21) to damper blade (22). Discard lockwashers.
- h. Remove two screws (23), lockwashers (24), and washers (25) attaching motor (11) to mounting plate (26) and remove motor with linkage (21). Discard lockwashers.
- i. Remove linkage (21) and remove from motor (11).





MBPLA-4-19A

Figure 4-18. Purge Intake Door Damper Motor

INSTALL

Install Intake Door Damper Motor. See Figure 4-18.

- a. Install linkage (21) to motor (11).
- b. Attach motor (11) to mounting plate (26) and secure with two screws (23), lockwashers (24), and washers (25).
- c. Attach motor linkage (21) to damper blade (22) and secure with two screws (17), washers (18), lockwashers (19), and nuts (20).
- d. Attach a line to motor electrical leads and pull leads through conduit (10) and into 2" x 4" electrical junction box. Disconnect line.
- e. Install damper enclosure (14) with damper frame (15), damper (16) and motor (11) and secure with 14 screws (12) and washers (13).
- f. Connect electrical conduit (10) to motor (11).
- g. Install filter (9) and screen (5) and secure with four screws (6), lockwashers (7) and washers (8).
- h. Install purge door limit switch (3) and mounting bracket (4) and secure with two washers (2) and nuts (1).
- i. At 2" x 4" electrical junction box, connect motor leads and remove tags.
- j. Install junction box cover and secure with two screws.
- k. Run an operational test to check motor.

**4-29. ENVIRONMENTAL CONTROL UNIT INTAKE DAMPER/MOTOR.**

---

This task consists of:                      a. Remove                                      b. Install

---

**INITIAL SET-UP**

Tools Required

General Mechanics Tool Kit, (Appendix B, Section III, Item 1)

Materials/Parts Required

- Lockwashers, (12)
  - Electrical Wire Splice (3)
- 

General Safety Instructions

**WARNING**

**ELECTRICAL SHOCK**

Before performing any maintenance actions on electrical equipment, ensure all electrical power has been turned off. Failure to comply with this warning may result in serious injury or death.

---

**NOTE**

Procedures for removing and replacing any of the ECU intake dampers and motors are identical to those outlined in the following paragraph.

REMOVE

Remove ECU Intake Damper Motor. See Figure 4-19.

- a. Loosen eight captive screws (1) and remove screen (2) and filter (3) from ECU intake.
- b. Remove two screws (4) and cover (5) from electrical junction box (6) located on plenum (7). Tag and disconnect motor leads. Attach line to leads to facilitate installation.
- c. From plenum, remove eight screws (8), lockwashers (9), 16 washers (10), and eight nuts (11) that fasten damper enclosure (12) to plenum (7). Discard lockwashers.
- d. From electrical junction box (6), remove lock nut (13) from conduit (14) and carefully remove damper enclosure (12) and motor (15) from plenum (7).
- e. Loosen conduit nut and remove conduit (14) from motor (15). Disconnect line attached to motor leads.
- f. Remove two screws (16), washers (17), lockwasher (18), and nuts (19) that attach motor linkage (20) to damper blade (21). Discard lockwashers.
- g. Remove two screws (22), lockwashers (23), washers (24) and separate motor (15) with linkage (20) from damper motor mounting plate (25). Discard lockwashers.
- h. Detach linkage (20) from motor (15).

INSTALL

Install ECU Intake Damper Motor. See Figure 4-19.

- a. Attach linkage (20) to motor (15) and fasten motor in place on damper mounting plate (25) with two screws (22), lockwashers (23), and washers (24).

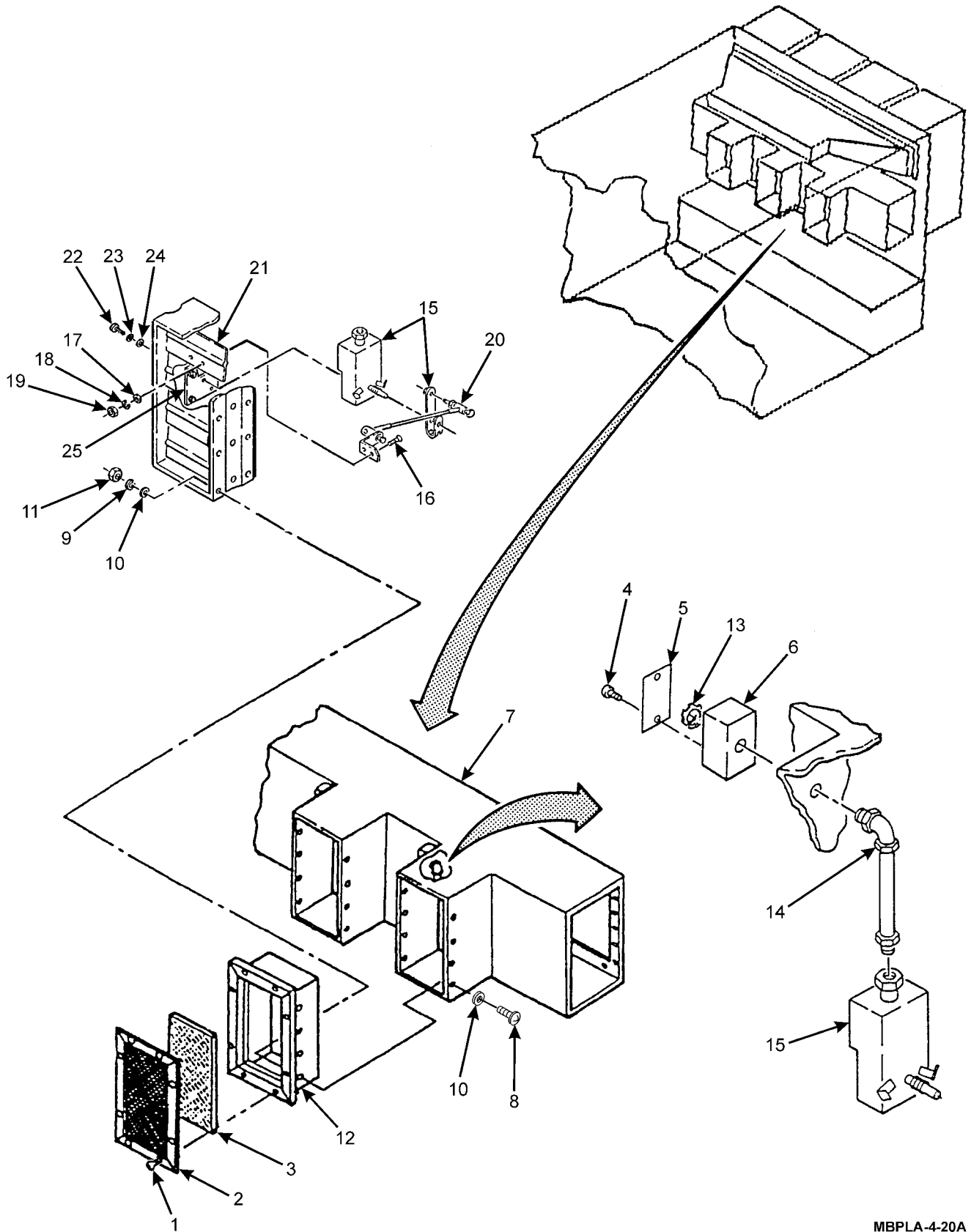


Figure 4-19. ECU Intake Damper/Motor

MBPLA-4-20A

- b. Attach motor linkage (20) to damper blade (21) using two screws (16), washers (17), lockwashers (18), and nuts (19).
- c. Attach line to motor leads and draw motor leads through conduit (14) and attach conduit to motor with conduit nut.
- d. Insert damper enclosure (12) and motor (15) into plenum (7) and align so that end of conduit (14) with motor lead is inside electrical junction box (6). Install lock nut (13) on conduit and tighten in place. Disconnect line attached to motor leads.
- e. Connect motor leads as tagged in electrical junction box (6) and fasten junction box cover (5) in place with two screws (4).
- f. Fasten damper enclosure (12) to plenum (7) using eight screws (8), lockwashers (9), 16 washers (10) and eight nuts (11).
- g. Place filter (3) and screen (2) on plenum (7) intake and fasten with eight captive screws (1).
- h. Run an operational test to check damper/motor.

**4-30. PURGE EXHAUST DOOR, ROADSIDE.**

---

This task consists of:                                    a. Remove                                    b. Repair                                    c. Install

---

**INITIAL SET-UP**Tools Required

General Mechanics Tool Kit, (Appendix B, Section III, Item 1)  
Drill and Bits, (Appendix B, Section III, Item 2)  
Drill Set, (Appendix B, Section III, Item 2)  
Hand Blind Riveter, (Appendix B, Section III, Item 3)

Materials/Parts Required

Gasket, (1)  
Lockwashers (6)  
Rivets, (20)  
Wave Washers (2)  
Adhesive MM-A-1617, Type II, (Appendix F, Section II, Item 3)

---

**NOTE**

Procedures for performing this task are identical to those outlined in paragraph 4-27. Refer to that paragraph and Figure 4-17.

#### 4-31. MECHANICAL ROOM PURGE EXHAUST DAMPER MOTOR.

---

This task consists of:                      a. Remove                                      b. Install

---

##### **INITIAL SET-UP**

###### Tools Required

General Mechanics Tool Kit, (Appendix B, Section III, Item 1)

###### Equipment Condition

Air Tank Removed (Paragraph 4-35)

###### Materials/Parts Required

Lockwashers (15)

###### General Safety Instructions

**WARNING**

##### **ELECTRICAL SHOCK**

Before performing any maintenance actions on electrical equipment, ensure all electrical power has been turned off. Failure to comply with this warning may result in serious injury or death.

---

##### REMOVE

Remove Mechanical Room Exhaust Damper Motor. See Figure 4-20.

- a. Remove nine screws (1), lockwashers (2), and housing (3) covering damper housing (4). Discard lockwashers.
- b. Remove cover from electrical junction box (5) located on bottom of motor (6). Tag and disconnect motor leads and conduit (7).
- c. Remove six screws (8), washers (9), lockwashers (10), nuts (11), spacers (12), and damper assembly (13) with motor (6). Discard lockwashers.

##### INSTALL

Install Mechanical Room Exhaust Damper Motor. See Figure 4-20.

- a. Install damper assembly (13) with motor (6) and secure with six screws (8), lockwashers (9), washers (10), nuts (11), and spacers (12).
- b. Connect conduit (7) and motor leads as tagged to electrical junction box (5). Remove tags and install cover.
- c. Install housing (3) and secure with nine screws (1) and lockwashers (2).
- d. Install air tank (paragraph 4-35).
- e. Run an operational test to check damper motor.

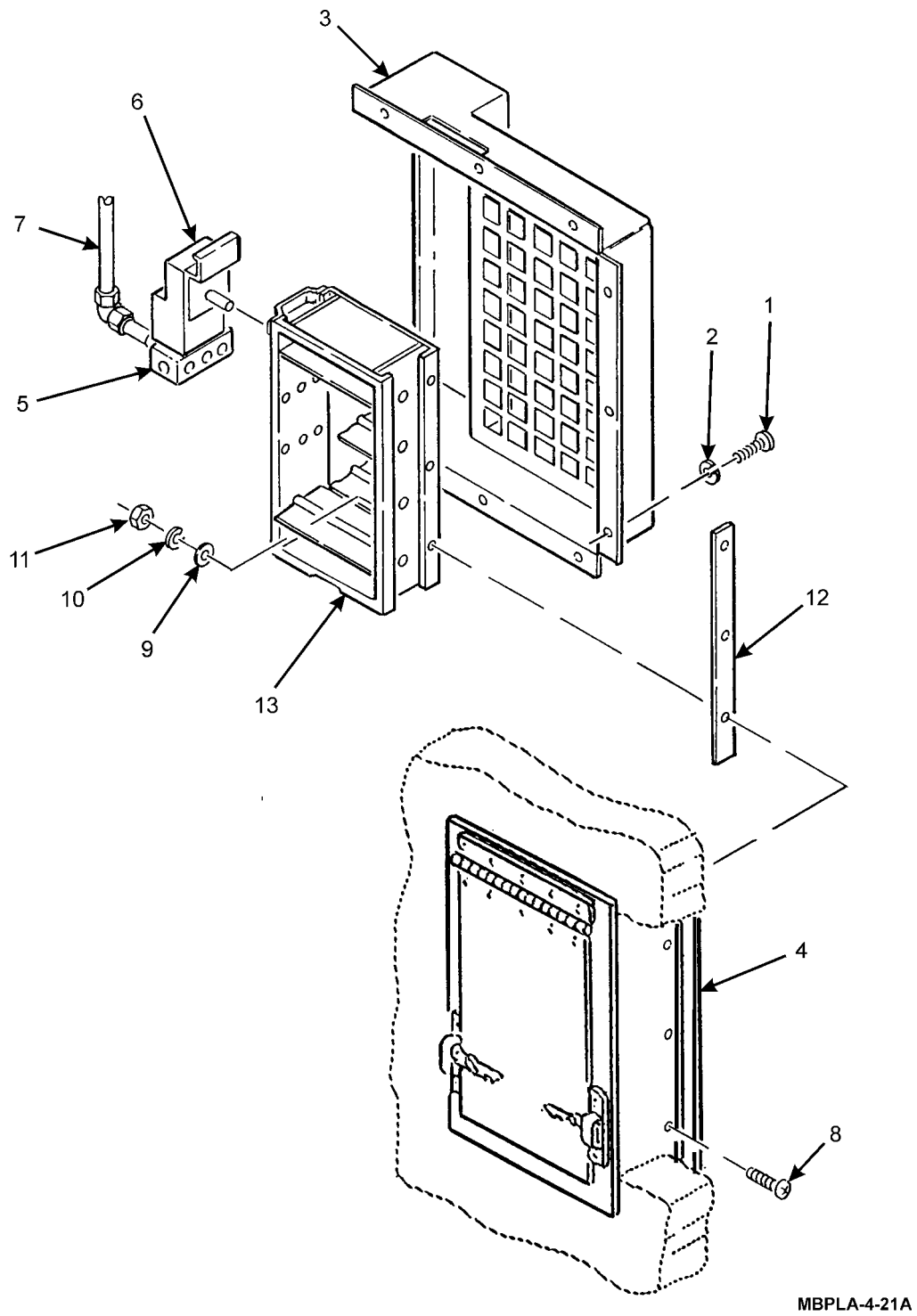


Figure 4-20. Mechanical Room Purge Exhaust Damper Motor



**4-32. PURGE EXHAUST DOOR, CURBSIDE.**

---

This task consists of:                      a. Remove                      b. Repair                      c. Install

---

**INITIAL SET-UP**

Tools Required

- General Mechanics Tool Kit, (Appendix B, Section III, Item 1)
- Drill and Bits, (Appendix B, Section III, Item 2)
- Drill Set, (Appendix B, Section III, Item 2)
- Hand Blind Riveter, (Appendix B, Section III, Item 3)

Materials/Parts Required

- Gasket, (1)
  - Lockwashers (6)
  - Rivets, (20)
  - Wave Washers (2)
  - Adhesive MM-A-1617, Type II, (Appendix F, Section II, Item 3)
- 

**NOTE**

Procedures for performing this task are identical to those outlined in paragraph 4-27. Refer to that paragraph and Figure 4-17.

---

**4-33. CURBSIDE EXHAUST DAMPER MOTOR.**

---

This task consists of:                      a. Remove                      b. Install

---

**INITIAL SET-UP**Tools Required

General Mechanics Tool Kit, (Appendix B, Section III, Item 1)

Materials/Parts Required

Lockwashers (15)

Equipment Condition

Stool and Bracket Removed (Paragraph 4-41)

General Safety Instructions**WARNING****ELECTRICAL SHOCK**

Before performing any maintenance actions on electrical equipment, ensure all electrical power has been turned off. Failure to comply with this warning may result in serious injury or death.

---

REMOVE

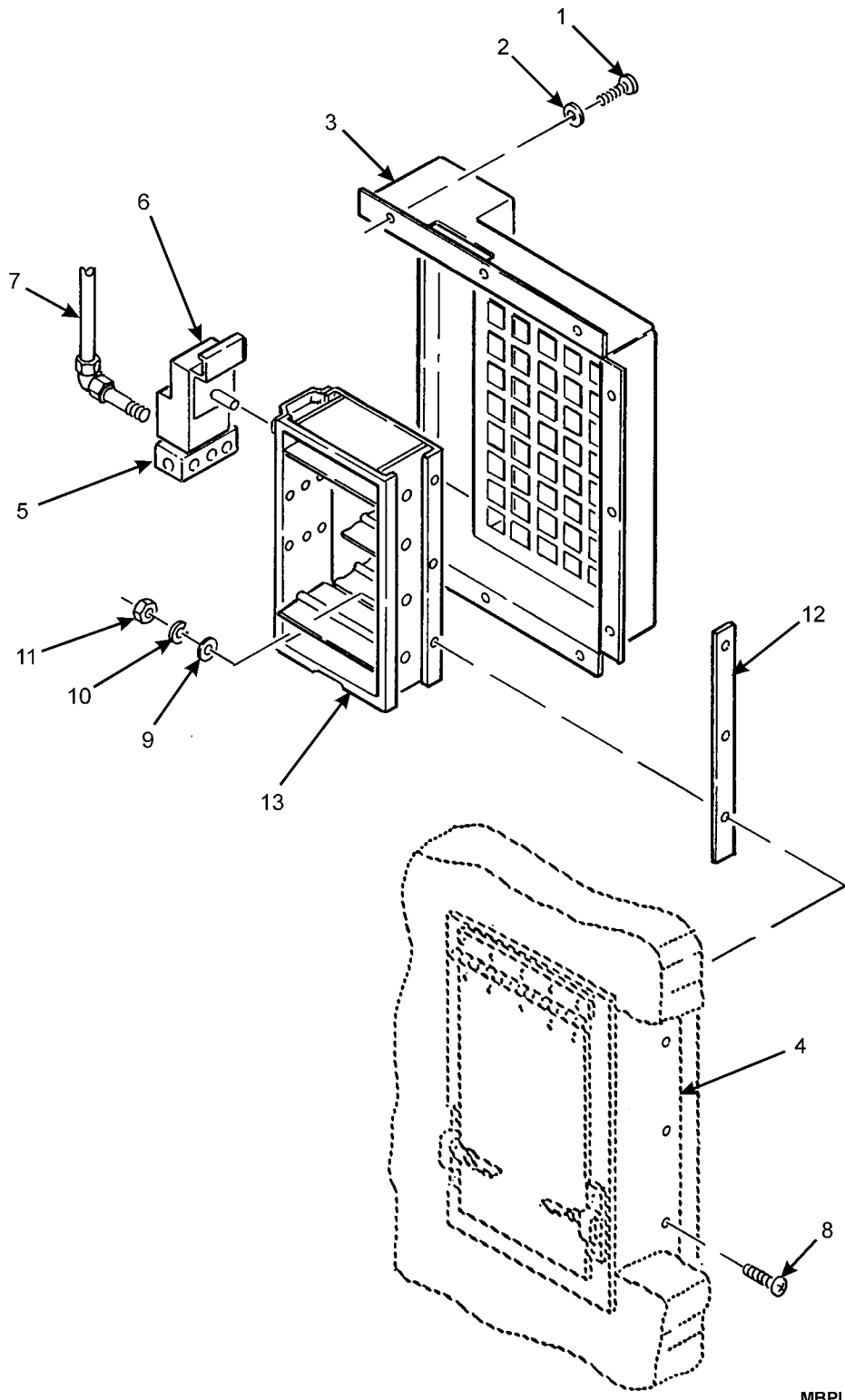
Remove Curbside Exhaust Damper Motor. See Figure 4-21.

- a. Inside laboratory, remove drawers P3 and P4 to gain access to mounting hardware.
- b. Remove nine screws (1), lockwashers (2) and housing (3) covering damper housing (4). Discard lockwashers.
- c. Remove cover from electrical junction box (5) located on bottom of motor (6). Tag and disconnect motor leads and conduit (7).
- d. Remove six screws (8), washers (9), lockwashers (10), nuts (11), spacers (12), and damper assembly (13) with motor (6). Discard lockwashers.

INSTALL

Install Curbside Exhaust Damper Motor. See Figure 4-21.

- a. Install damper assembly (13) with motor (6) and secure with six screws (8), lockwashers (9), washers (10), nuts (11), and spacers (12).
- b. Connect conduit (7) and motor leads as tagged to electrical junction box (5). Remove tags and install cover.
- c. Install housing (3) and secure with nine screws (1) and lockwashers (2).
- d. Install drawers P3 and P4.
- e. Install stool and bracket (paragraph 4-41).



MBPLA-4-22A

Figure 4-21. Curbside Exhaust Damper Motor

**4-34. AIR COMPRESSOR.**

---

This task consists of:	a. Remove	b. Install	c. Test
------------------------	-----------	------------	---------

---

**INITIAL SET-UP**Tools Required

General Mechanics Tool Kit, (Appendix B, Section III, Item 1)

Materials/Parts Required

Lockwashers (8)

Personnel Required

Two (2)

General Safety Instructions

<b>WARNING</b>
----------------

**ELECTRICAL SHOCK**

Before performing any maintenance actions on electrical equipment, ensure all electrical power has been turned off. Failure to comply with this warning may result in serious injury or death.

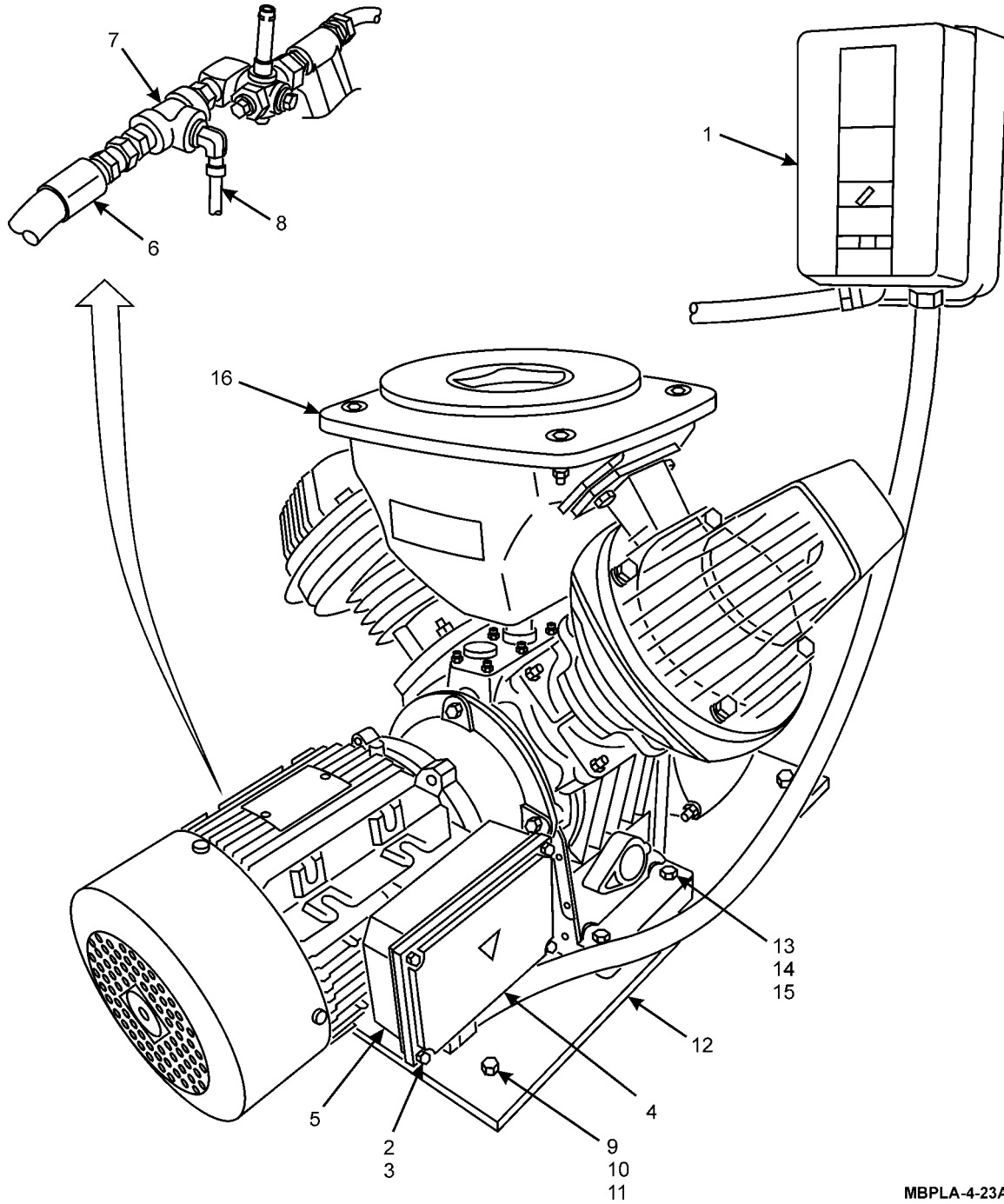
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REMOVE**NOTE**

Before removing air system components purge by opening any system valve.

Remove Air Compressor. See Figure 4-22.

- a. Set switch on compressor controller (1) to OFF.
- b. Open circuit breaker A15CB8 on Power Panel No. 2.
- c. Remove four screws (2), nylon washers (3), and cover (4) from adjustment junction box (5). Tag and disconnect motor leads.
- d. Disconnect conduit from adjustment junction box (5).
- e. Disconnect discharge hose (6) from tee fitting (7) at compressor discharge.
- f. Disconnect drain tubing (8) at tee fitting (7) at compressor discharge.
- g. Remove four screws (9), lockwashers (10), and washers (11) that secure compressor foundation (12) to floor of mechanical room. Discard lockwashers.
- h. Remove four screws (13), lockwashers (14), washers (15) and remove compressor (16) from compressor foundation (12). Discard lockwashers.



MBPLA-4-23A

Figure 4-22. Air Compressor

INSTALL

Install Air Compressor. See Figure 4-22.

- a. Install compressor (16) onto foundation (12) and secure with four screws (13), lockwashers (14) and washers (15).
- b. Place compressor (16) with foundation (12) in position on floor of mechanical room and secure with four screws (9), lockwashers (10), and washers (11).
- c. Connect drain tubing (8) to tee fitting (7) at compressor discharge.
- d. Connect discharge hose (6) to tee fitting (7) at compressor discharge.
- e. Connect compressor wires as tagged at adjustment junction box (5). Remove tags.
- f. Secure conduit to electrical junction box (5).
- g. Install junction box cover (4) and fasten in place with four screws (2) and nylon washers (3).

TEST

Test air system in accordance with operating procedures listed in paragraph 2-6k.

#### 4-35. AIR TANK.

---

This task consists of:                      a. Remove                      b. Install                      c. Test

---

#### **INITIAL SET-UP**

##### Tools Required

General Mechanics Tool Kit, (Appendix B, Section III, Item 1)

##### Personnel Required

Two (2)

##### General Safety Instructions

**WARNING**

#### **ELECTRICAL SHOCK**

Before performing any maintenance actions on electrical equipment, ensure all electrical power has been turned off. Failure to comply with this warning may result in serious injury or death.

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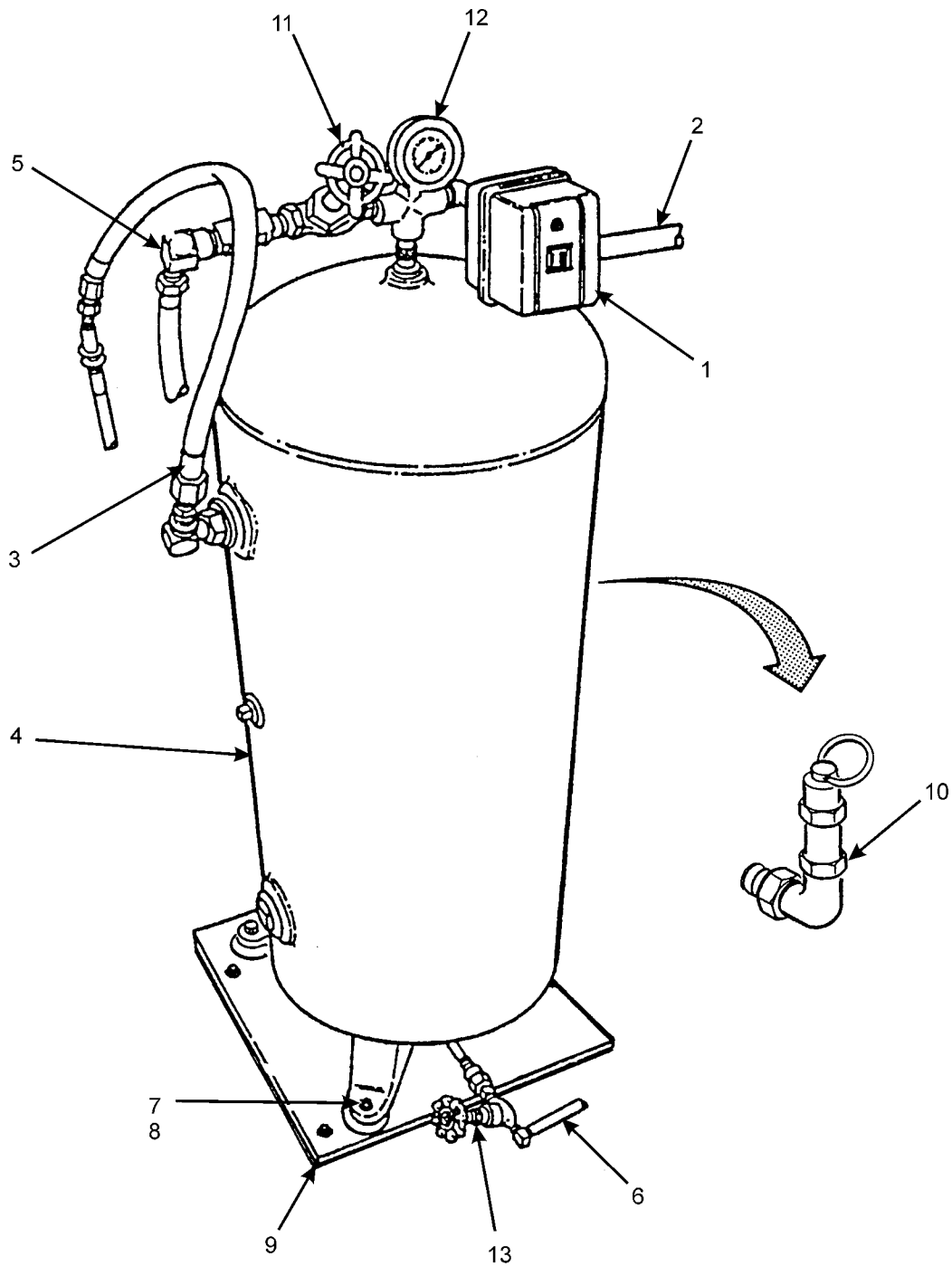
#### REMOVE

#### **NOTE**

Before removing air system components purge by opening any system valve.

Remove Air Tank. See Figure 4-23.

- a. Set switch on compressor controller to OFF and open circuit breaker A15CB6 on Power Panel No. 2.
- b. Open pressure switch (1) then, tag and disconnect wires.
- c. Remove conduit nut from inside of pressure switch (1) and remove conduit (2) and wires from pressure switch.
- d. Disconnect air hose (3) on side of air tank (4) from discharge side of air compressor.
- e. Disconnect air outlet hose (5) at top of air tank (4).
- f. Disconnect drain line (6) at bottom of air tank (4).
- g. Remove three screws (7), washers (8), and air tank (4) from foundation (9).
- h. Remove air purge (10), air outlet valve (11), air gauge (12), pressure switch (1) and drain valve (13), tubing and fittings from air tank (4).



MBPLA-4-24A

Figure 4-23. Air Tank



INSTALL

Install Air Tank. See Figure 4-23.

- a. Install air purge (10), air outlet valve (11), air gauge (12), pressure switch (1) and drain valve (13), tubing and fittings on air tank (4).
- b. Position air tank (4) in place on foundation in mechanical room and secure with three washers (8) and screws (7).
- c. Connect drain line (6) at bottom of air tank (4).
- d. Connect air outlet hose (5) at top of air tank (4).
- e. Connect air hose (3) from compressor discharge to side of air tank (4).
- f. Connect wires as tagged to pressure switch (1) at top of air tank (4). Remove tags.
- g. Secure conduit (2) to pressure switch (1) with conduit nut.

TEST

Test air system in accordance with operating procedures listed in paragraph 2-6k.

**4-36. AIR FLOW CONTROL DEVICES AND PIPING SYSTEM.**

---

This task consists of:

a. Remove	b. Install	c. Test
-----------	------------	---------

---

**INITIAL SET-UP**Tools Required

General Mechanics Tool Kit, (Appendix B, Section III, Item 1)

Materials/Parts Required

Teflon Tape, (Appendix E, Section II, Item 139)

General Safety Instructions

<b>WARNING</b>
----------------

**ELECTRICAL SHOCK**

Before performing any maintenance actions on electrical equipment, ensure all electrical power has been turned off. Failure to comply with this warning may result in serious injury or death.

---

REMOVE**NOTE**

Before removing air system components purge by opening any system valve.

1. Remove Flow Control Devices. See Figure 4-24.

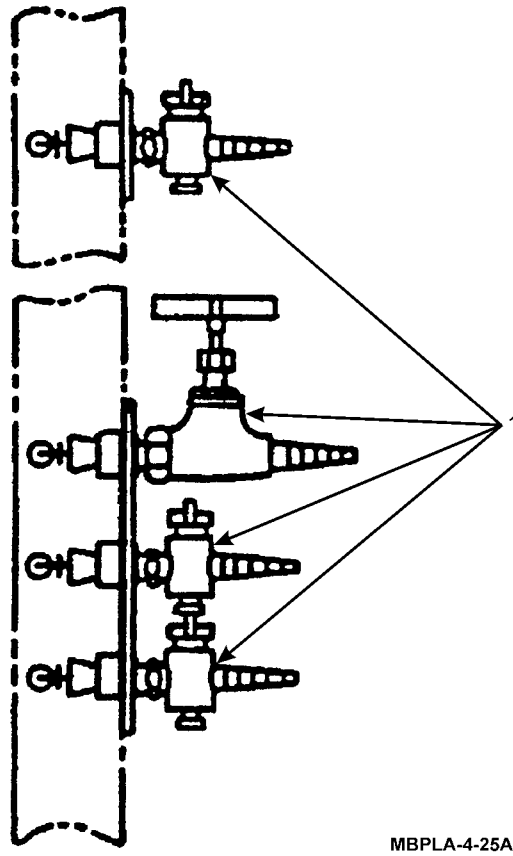
Remove laboratory stopcock valves (1) by unscrewing valves from tees or elbows located in the air system mounting to laboratory walls.
2. Remove System Piping. See Figure 4-25.
  - a. Remove sections of system piping (1) by locating nearest pipe union (2) and threaded pipe fittings.
  - b. Disconnect union (2).
  - c. Disconnect pipe nipple from elbow (3), coupling (4), or valve (5).
  - d. If section of pipe (1) contains brazed joints or unions (2) refer to direct support maintenance.

INSTALL

1. Install Flow Control Devices. See Figure 4-24.
  - a. Apply teflon tape on male fittings. Be sure to wrap teflon tape in same direction of pipe thread.
  - b. Install stopcock valves (1) by screwing valves into air system piping tees or elbows.
2. Install System Piping. See Figure 4-25.
  - a. Apply teflon tape on male fittings. Be sure to wrap teflon tape in same direction of pipe thread.
  - b. Connect pipe nipple to elbow (3), coupling (4) or valve (5).
  - c. Connect pipe to union (1).

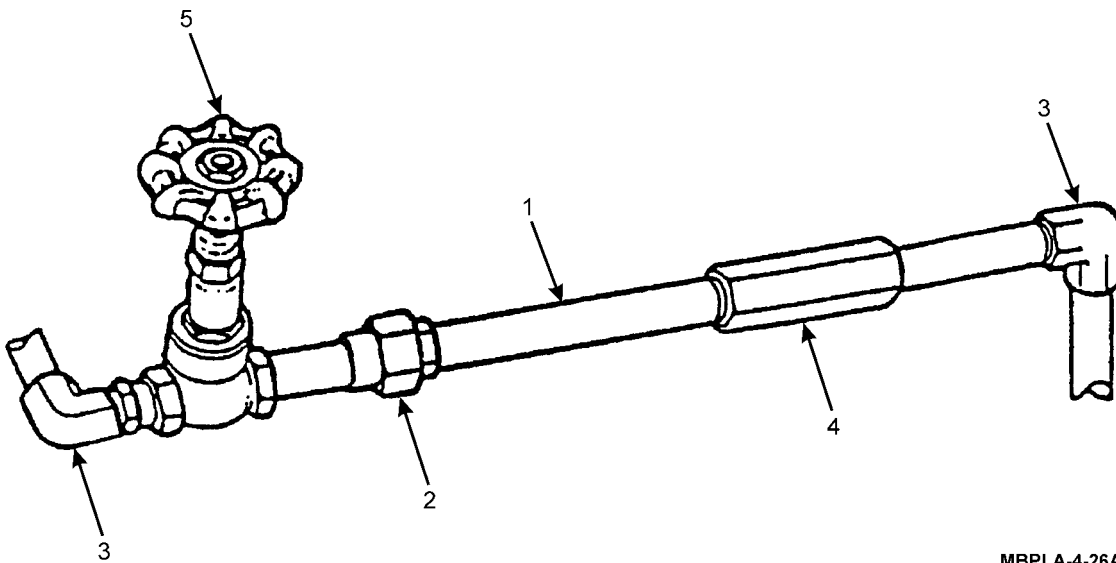
TEST

Test air system in accordance with operating procedures listed in paragraph 2-6k.



MBPLA-4-25A

Figure 4-24. Flow Control Devices



MBPLA-4-26A

Figure 4-25. Piping System

#### 4-37. VACUUM SYSTEM COMPONENTS.

---

This task consists of:                      a. Remove                      b. Install                      c. Test

---

##### INITIAL SET-UP

###### Tools Required

General Mechanics Tool Kit, (Appendix B, Section III, Item 1)

###### Materials/Parts Required

Teflon Tape, (Appendix E, Section II, Item 157)

###### General Safety Instructions

**WARNING**

##### ELECTRICAL SHOCK

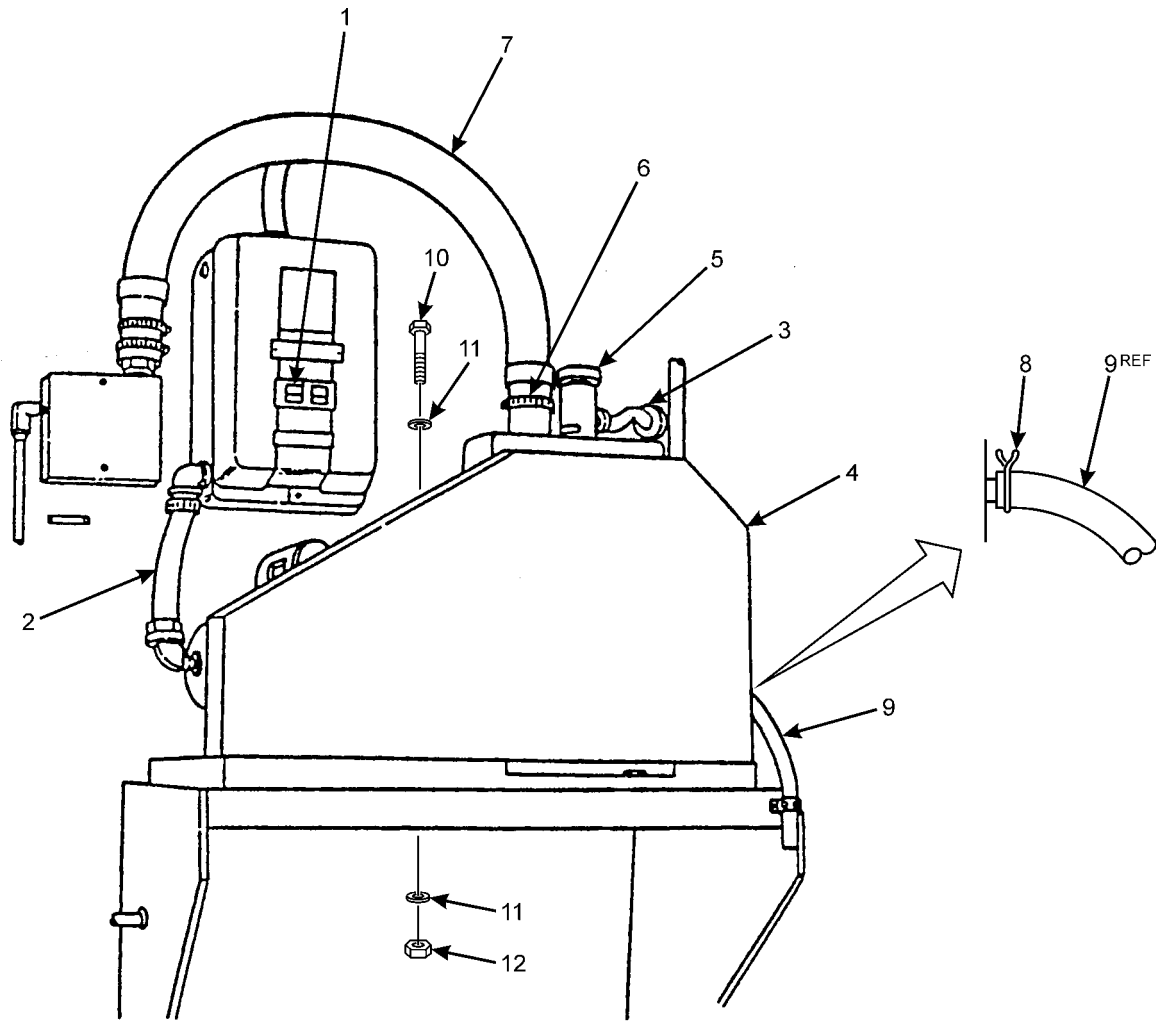
Before performing any maintenance actions on electrical equipment, ensure all electrical power has been turned off. Failure to comply with this warning may result in serious injury or death.

---

##### REMOVE

1. Remove Vacuum Pump. See Figure 4-26.
  - a. Set switch on vacuum pump controller (1) to stop.
  - b. Open circuit breaker A15CB9 on Power Panel No. 2.
  - c. Remove cover from controller (1), tag and disconnect motor leads.
  - d. Loosen conduit nut inside controller (1) and remove conduit (2) and wires.
  - e. Disconnect discharge line (3) on vacuum pump (4) at discharge valve (5).
  - f. Loosen hose clamp (6) and disconnect suction hose (7) from vacuum pump (4).
  - g. Loosen hose clamp (8) and disconnect drain line (9) from vacuum pump (4).
  - h. Remove five screws (10), ten washers (11), and five nuts (12) that secure foundation of vacuum pump (4) to mechanical room wall foundation.
  - i. Remove vacuum pump (4) from mechanical room wall foundation.
  - j. Remove conduit (2) from vacuum pump motor.
2. Remove Flow Control Devices. See Figure 4-24.

Remove laboratory stopcock valves (1) by unscrewing valves from tees and elbows located in the vacuum system mounted to the laboratory walls.
3. Remove System Piping. See Figure 4-25.
  - a. Remove sections of system piping (1) by locating nearest pipe union (2) and threaded pipe fittings.
  - b. Disconnect union (2).
  - c. Disconnect pipe nipple from elbow (3), coupling (4) or valve (5).
  - d. If damaged section of piping (1) contains brazed joints or union (2) refer to direct support maintenance.



MBPLA-4-27A

Figure 4-26. Vacuum Pump

## INSTALL

1. Install Vacuum Pump. See Figure 4-26.
  - a. Install conduit (2) on vacuum pump (4) motor.
  - b. Position vacuum pump (4) on mechanical room wall foundation and secure with five screws (10), ten washers (11), and five nuts (12).
  - c. Connect drain line (9) to vacuum pump (4) and secure with hose clamp (8).
  - d. Connect suction hose (7) to vacuum pump (4) and secure with hose clamp (6).
  - e. Connect discharge line (3) at discharge valve (5) and secure with union.
  - f. Install motor leads and conduit (2) to controller (1) and tighten conduit nut. Connect motor leads as tagged to controller and remove tags.
  - g. Replace controller (1) cover.
2. Install Flow Control Devices. See Figure 4-24.
  - a. Replace teflon tape on male fittings. Be sure to wrap teflon tape in same direction of pipe thread.
  - b. Install stopcock valves (1) by screwing valves into vacuum system piping tees or elbows.
3. Replace System Piping. See Figure 4-25.
  - a. Apply teflon tape on male fittings. Be sure to wrap teflon tape in same direction of pipe thread.
  - b. Connect pipe nipple to elbow (3), coupling (4) or valve (5).
  - c. Connect pipe to union (1).

## TEST

Test Vacuum System.

Test vacuum system in accordance with procedures listed in paragraph 2-6l.

#### 4-38. MANOMETER AIR REGULATOR VALVE.

---

This task consists of:

a.	Remove	b.	Install
----	--------	----	---------

---

##### **INITIAL SET-UP**

###### Tools Required

General Mechanics Tool Kit, (Appendix B, Section III, Item 1)

###### Materials/Parts Required

Teflon Tape, (Appendix E, Section II, Item 157)

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##### REMOVE

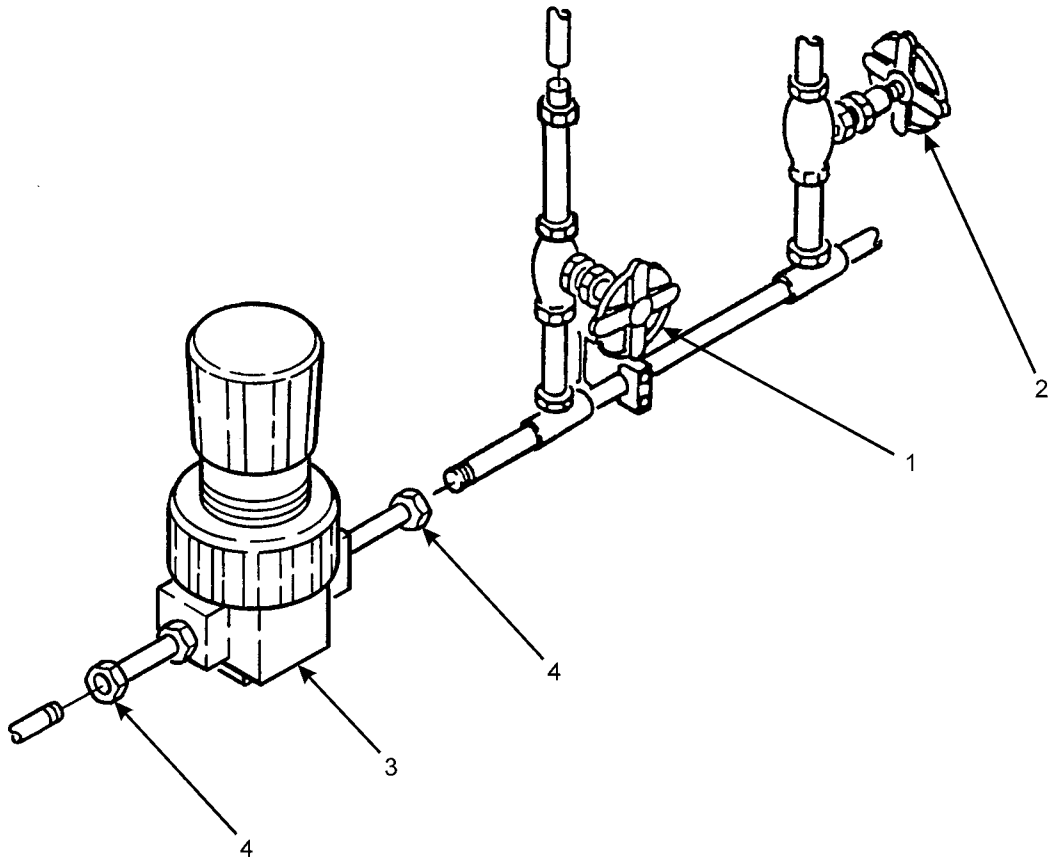
Remove Manometer Air Regulator Valve. See Figure 4-27.

- a. Close air outlet valve on air tank. See Figure 4-23.
- b. Close air supply valve (1).
- c. Open air valve (2) and purge air from air lines.
- d. Remove air regulator valve (3) by disconnecting unions (4) on both sides of air regulator valve.
- e. Remove air lines with unions (4) and retain for reuse.

##### INSTALL

Install Manometer Air Regulator Valve. See Figure 4-27.

- a. Install air lines and unions (4) to air regulator valve (3).
- b. Install air regulator valve (3) by connecting unions (4) on both sides of air regulator valve.
- c. Close air valve (2) and open air supply valve (1).
- d. Open air discharge valve on air tank. See Figure 4-23.
- e. Verify proper operation of equipment.



MBPLA-4-28A

Figure 4-27. Manometer Air Regulator



#### 4-39. WATER SYSTEM COMPONENTS.

---

This task consists of:                      a. Remove              b. Install              c. Test              d. Adjust

---

##### **INITIAL SET-UP**

###### Tools Required

General Mechanics Tool Kit, (Appendix B, Section III, Item 1)

###### General Safety Instructions

**WARNING**

##### **ELECTRICAL SHOCK**

Before performing any maintenance actions on electrical equipment, ensure all electrical power has been turned off. Failure to comply with this warning may result in serious injury or death.

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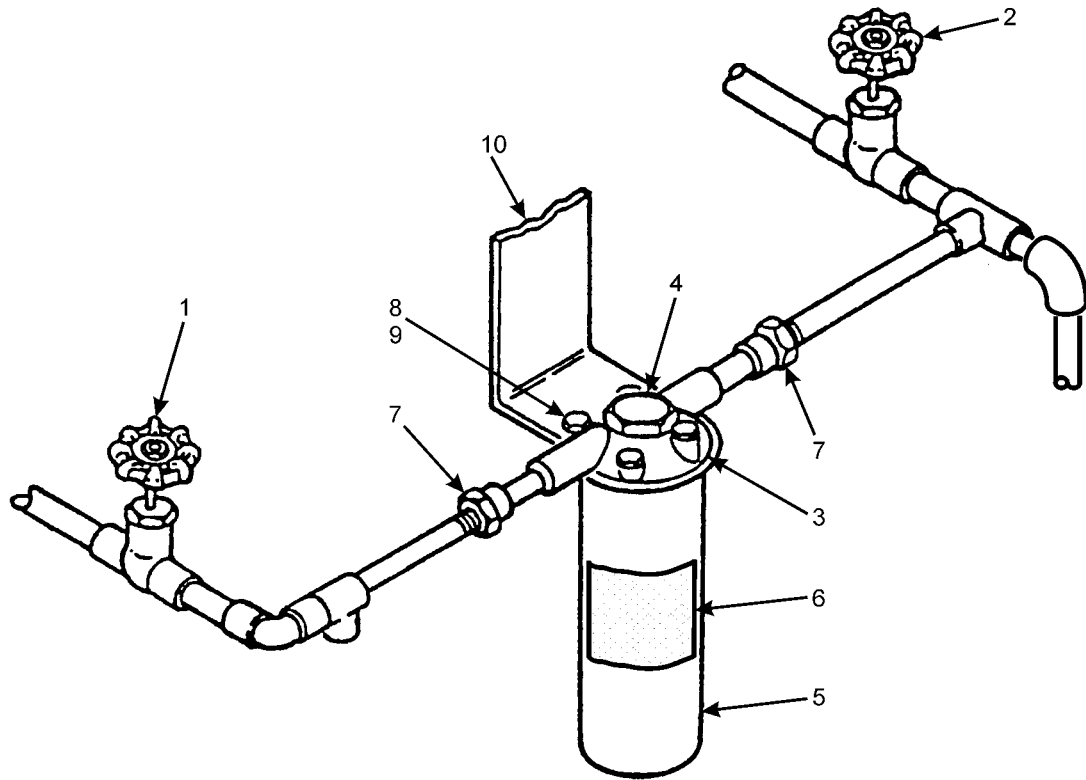
##### REMOVE

1. Remove Water Filter. See Figure 4-28.

##### **NOTE**

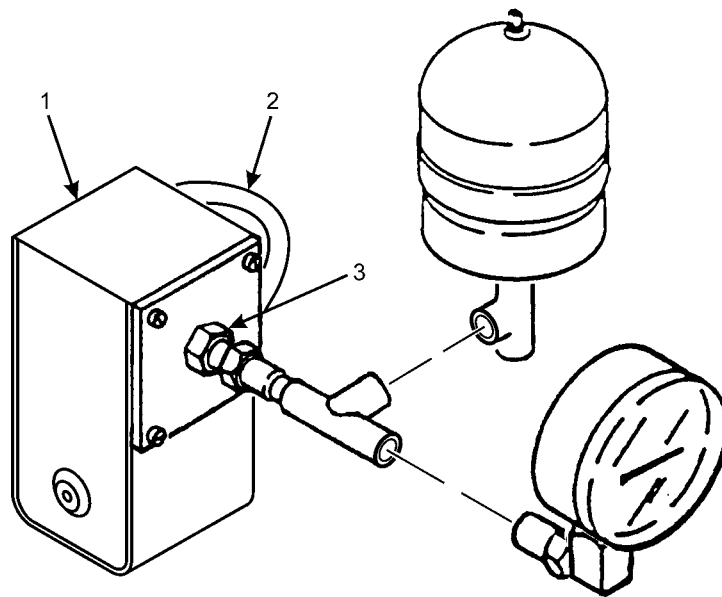
Filter element replacement requires only that the bowl be unscrewed from filter cover.

- a. Set switch on pump controller to OFF.
  - b. Open circuit breaker A15CB8 on Power Panel No. 2.
  - c. Remove Air/Gas drying apparatus (Paragraph 4-67).
  - d. Close prefilter valve (1) and postfilter valve (2) on each side of water filter (3).
  - e. Remove cover nut (4) and lower filter bowl (5).
  - f. Remove filter element (6).
  - g. Disconnect two unions (7) securing water filter (3) to piping.
  - h. Remove two screws (8), washers (9) and filter (3) from support bracket (10).
2. Remove Water Pressure Switch. See Figure 4-29.
    - a. Remove cover from switch (1), tag and disconnect switch leads.
    - b. Remove lock nut from conduit (2) and remove conduit with switch leads.
    - c. Unscrew pressure switch (1) from water piping union (3).
  3. Remove Eyewash. See Figure 4-30.
    - a. Set switch on pump controller to OFF. Actuate eyewash to relieve water pressure.
    - b. Loosen retaining nut (1) on hose (2) and remove eyewash (3) from hose.
  4. Remove Sink Drain. See Figure 4-30.
    - a. Disconnect union (4) at top of sink trap (5).
    - b. Pop up the form fitting sink (6) from countertop.
    - c. Remove sink drain tailpiece (7) from sink (6).



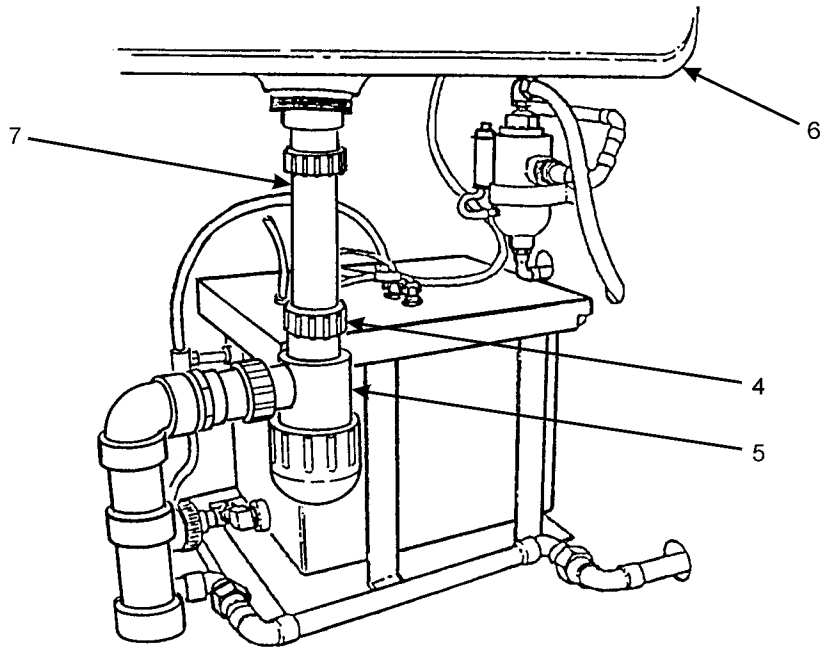
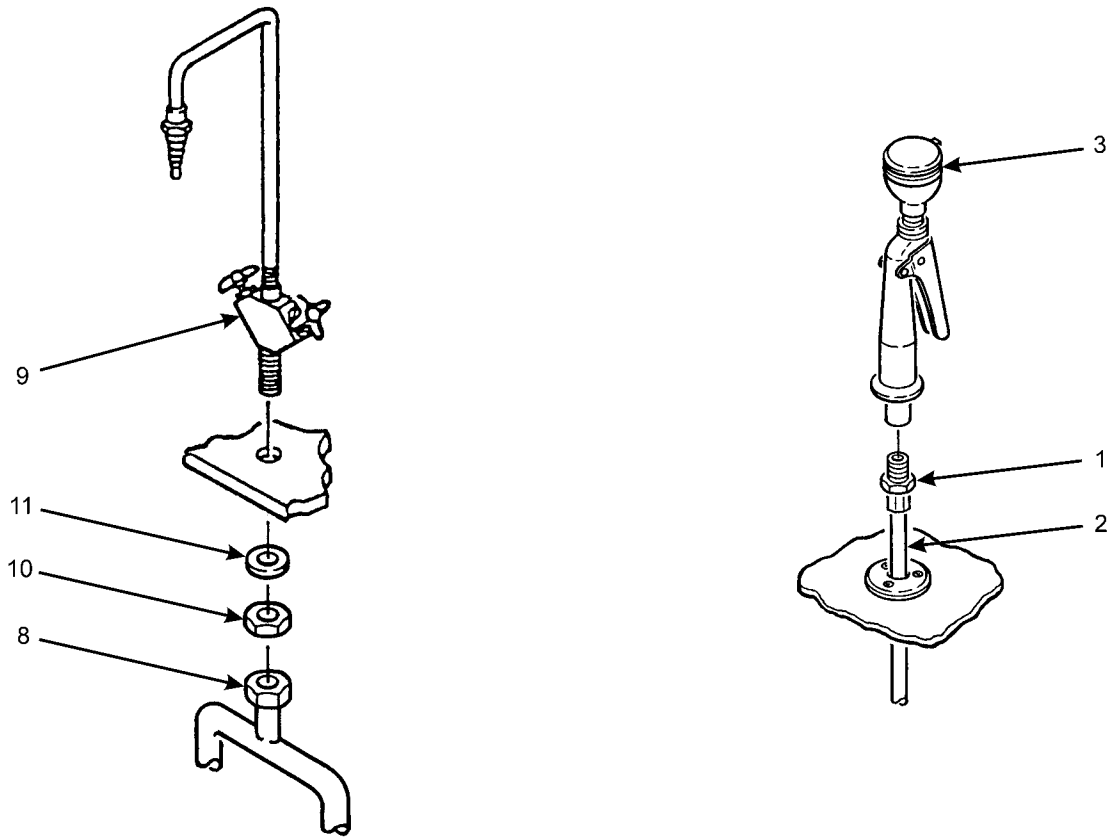
MBPLA-4-29C

Figure 4-28. Water Filter



MBPLA-4-30A

Figure 4-29. Water Pressure Switch



MBPLA-4-31A

Figure 4-30. Sink Components

5. Remove Faucet Assembly. See Figure 4-30.
  - a. Set switch on pump controller to OFF. Open faucet to relieve water pressure.
  - b. With sink removed from countertop, loosen and remove reducer fitting (8) from faucet (9).
  - c. Remove faucet mounting nut (10) and washer (11).
  - d. Carefully pull faucet (9) from countertop. Place faucet and attached fittings on a working surface.

### INSTALL

1. Install Water Filter. See Figure 4-28.
  - a. Install water filter (3) to support bracket (10) and secure with two screws (8) and washers (9).
  - b. Secure water filter (3) to piping by connecting two unions (7).
  - c. Install filter element (6) into filter bowl (5).
  - d. Secure filter bowl (5) using cover nut (4).
  - e. Open prefilter valve (1) and postfilter valve (2) on each side of water filter (3).
2. Install Water Pressure Switch. See Figure 4-29.
  - a. Ensure water pressure range adjustable screw is set to 20 psi.
  - b. Screw water pressure switch (1) to water piping and tighten union (3).
  - c. Position electrical leads in water pressure switch (1) and install lock nut on conduit (2).
  - d. Connect water pressure switch (1) electrical leads.
  - e. Install cover onto water pressure switch (1).
3. Install Eyewash. See Figure 4-30.
  - a. Apply teflon tape on male fittings. Be sure to wrap teflon tape in same direction of pipe thread.
  - b. Connect hose (2) to eyewash (3) and tighten retaining nut (1).
4. Install Faucet Assembly. See Figure 4-30.
  - a. Apply teflon tape on male fittings. Be sure to wrap teflon tape in same direction of pipe thread.
  - b. Install faucet (9) in opening on countertop and secure with washer (11) and faucet mounting nut (10).
  - c. Tighten reducer fitting (8) onto faucet (9).
5. Install Sink Drain. See Figure 4-30.
  - a. Apply teflon tape on male fittings. Be sure to wrap teflon tape in same direction of pipe thread.
  - b. Connect sink drain tailpiece (7) to sink (6).
  - c. Install sink (6) into opening on countertop and snap down into place.
  - d. Connect union (4) at top of sink trap (5).

### TEST

Test Water System.

Test water system in accordance with operating procedures listed in paragraph 2-6j.

### ADJUST

Adjust water pressure switch (as shown on inside of cover) to turn water pump on at 10 psi and off at 20 psi.

#### 4-40. GAS ALARM SYSTEM.

---

This task consists of:                      a. Remove                      b. Install                      c. Test                      d. Calibrate

---

##### INITIAL SET-UP

###### Tools Required

General Mechanics Tool Kit, (Appendix B, Section III, Item 1)

###### Materials/Parts Required

Lockwashers, (4)

###### General Safety Instructions

**WARNING**

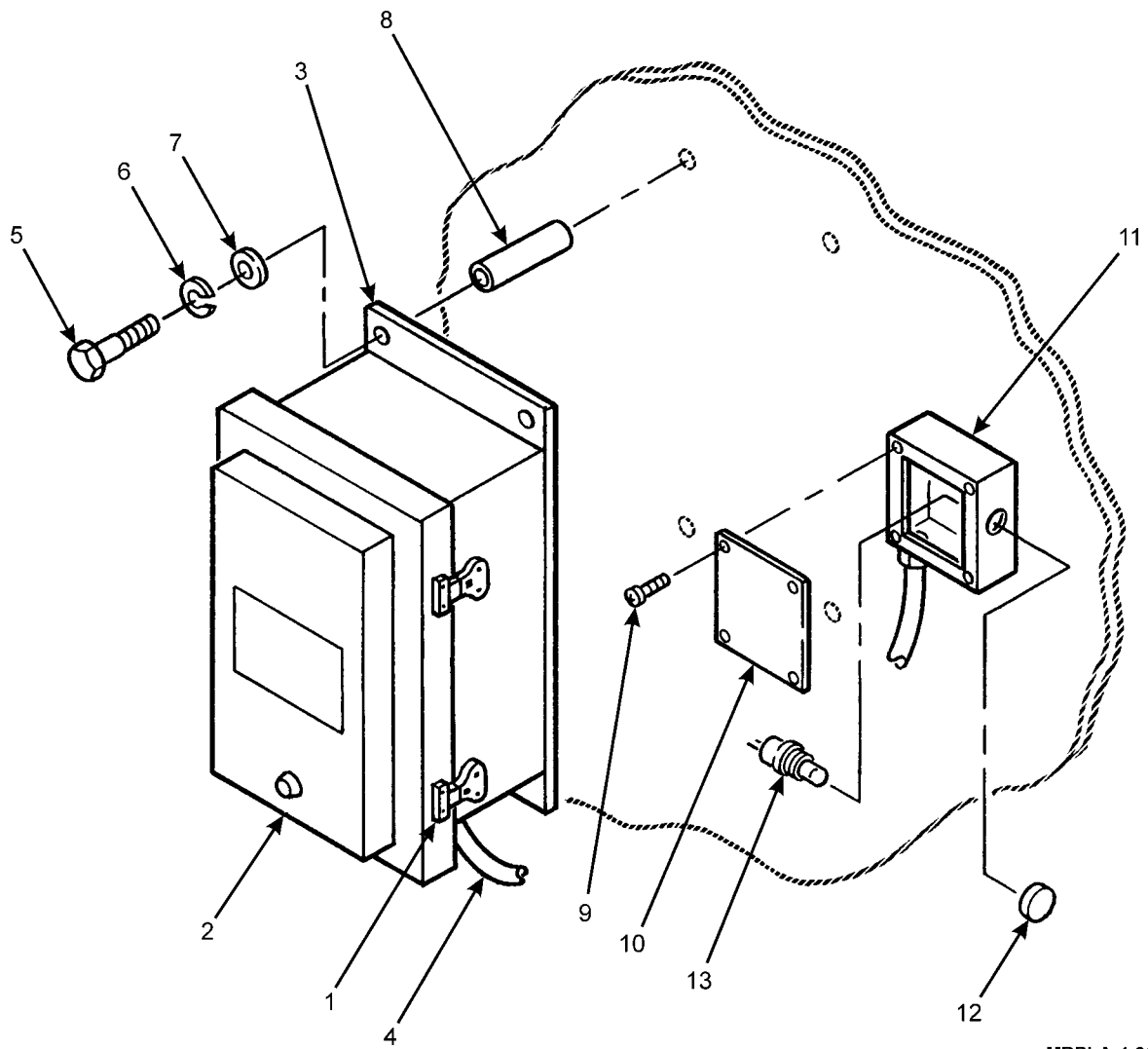
##### ELECTRICAL SHOCK

Before performing any maintenance actions on electrical equipment, ensure all electrical power has been turned off. Failure to comply with this warning may result in serious injury or death.

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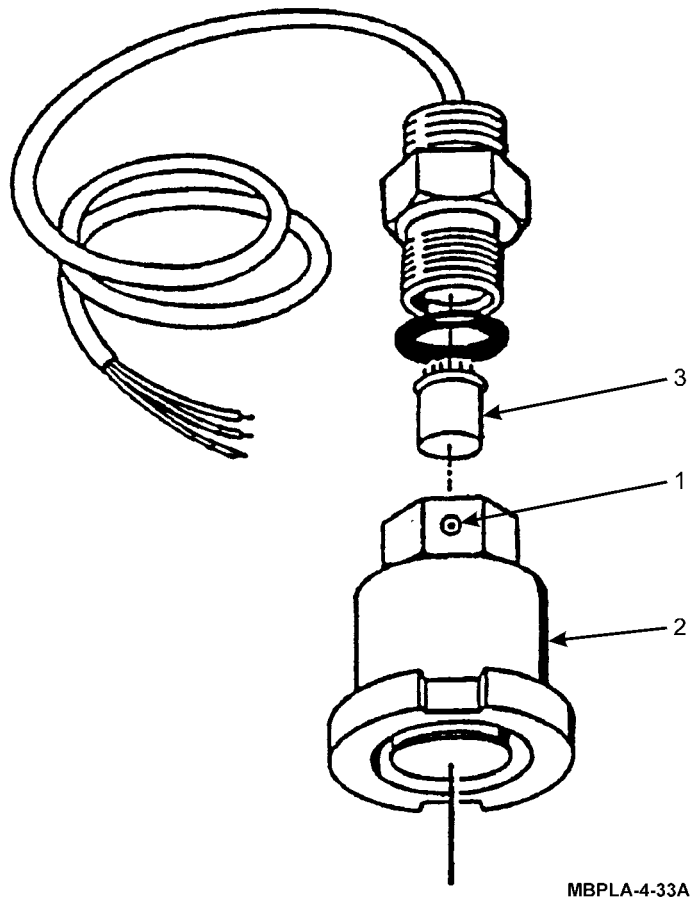
##### REMOVE

1. Remove Gas Alarm. See Figure 4-31.
  - a. Remove power from all equipment.
  - b. Position all Main Power Panel circuit breakers to OFF.
  - c. Shut down generator.
  - d. Loosen latch (1) and swing open door (2) of gas alarm unit (3).
  - e. Loosen captive release screw and swing panel out.
  - f. Carefully remove circuit board.
  - g. Tag and disconnect wires, by removing terminal screw, from the following terminals:  
Terminal board TB-1      A1, C1, R1, A2, C2, R2, and N  
Terminal Board TB-2      1, 5, 6, and 8  
Disconnect shield wires from ground stud.  
Disconnect ground wires (green) at conduit retaining nut last.
  - h. Loosen two conduit fittings and disconnect flexible conduit (4) and wiring to buzzer and power input.
  - i. Reinstall circuit board, shut and latch alarm panel, and close door (2).
  - j. Remove four screws (5), lockwashers (6), washers (7), and spacers (8) and carefully remove gas alarm (3). Discard lockwashers.
2. Remove Gas Alarm Buzzer. See Figure 4-31.
  - a. Disconnect power input cable to laboratory.
  - b. Remove four screws (9) and cover (10) from junction box (11).
  - c. Remove mounting collar (12) and pull buzzer (13) from junction box (11) to gain access to wires.
  - d. Tag and disconnect two wires from buzzer (13).



MBPLA-4-32A

Figure 4-31. Gas Alarm Unit



MBPLA-4-33A

Figure 4-32. Gas Alarm Detector

3. Remove Gas Alarm Detector Element. See Figure 4-32.
  - a. Remove power from all equipment.
  - b. Position all Main Power Panel circuit breakers to OFF.
  - c. Shut down generator.
  - d. Loosen set screw (1) on shield assembly (2). Unscrew and remove shield assembly.
  - e. Unplug element (3).

### INSTALL

1. Install Gas Alarm. See Figure 4-31.
  - a. Carefully place gas alarm (3) into position on wall and secure with four screws (5), lockwasher (6), washers (7) and spacers (8).
  - b. Loosen latch (1) and swing open door (2) of gas alarm unit (3).
  - c. Loosen captive release screw and swing panel out.
  - d. Carefully remove circuit board.
  - e. Connect flexible conduits (4) from buzzer and power input fitting and tighten conduit nuts.
  - f. Connect wires as tagged and secure with terminal screws. Remove tags.
  - g. Carefully install circuit board.
  - h. Close panel and tighten captive screw.
  - i. Close door (2) and secure with latch (1).
2. Install Gas Alarm Buzzer. See Figure 4-31.
  - a. Connect wires as tagged to buzzer (13). Remove tags.
  - b. Place buzzer (13) in junction box (11) and secure with mounting collar (12).
  - c. Place cover plate (10) on junction box (11) and secure with four screws (9).
  - d. For calibration procedure, refer to TM 10-6665-297-13&P.
3. Install Gas Alarm Detector Element. See Figure 4-32.
  - a. Plug detector element (3) into detector body.
  - b. Carefully screw shield assembly (2) over detector element (3) ending with setscrew (1) up.
  - c. Tighten setscrew (1) on shield assembly (2).
  - d. For calibration procedure, refer to TM 10-6665-297-13&P.

### TEST

Test Gas Alarm System.

- a. Power up generator set and apply power to laboratory. After purge cycle is completed turn on electrical power.
- b. Depress the alarm test pushbutton located on the control module front panel.
- c. Depress reset button to silence alarm.

### CALIBRATE

Refer to technical manual listed in Appendix A for calibration procedures.



#### 4-41. LOCKER, DESICCATING CABINETS, STOOL STORAGE BRACKET AND BOOKCASE.

---

This task consists of:                      a. Remove                      b. Install

---

##### INITIAL SET-UP

###### Tools Required

- General Mechanics Tool Kit, (Appendix B, Section III, Item 1)
- Hand Blind Riveter, (Appendix B, Section III, Item 3)
- Portable Electric Drill, (Appendix B, Section III, Item 2)
- Twist Drill Set, (Appendix B, Section III, Item 2)

###### Materials/Parts Required

- Lockwashers, (16)
  - Rivets (3)
- 

##### REMOVE

1. Remove Steel Storage Locker. See Figure 4-33.
  - a. Remove two screws (1), lockwashers (2), and washers (3)
  - b. Remove three rivets (4).
  - c. Slide steel storage locker (5) and locker mounting plate (6) out to gain access to hardware.
  - d. Remove two screws (7), lockwashers (8), and nuts (9) from each of the four locker legs (10). Discard lockwashers.
  - e. Remove locker (5) from locker mounting plate (6).
2. Remove Desiccating Cabinet. See Figure 4-34.
  - a. Remove two nuts (1), lockwashers (2), and washers (3) from mounting bracket (4).
  - b. Remove desiccating cabinet (5) from support shelf (6).
3. Remove Stool Storage Bracket. See Figure 4-35.
  - a. Release retaining straps (1) and remove stool (2) from bracket (3).
  - b. Remove four nuts (4), lockwashers (5), and washers (6) and stool storage bracket (3).
4. Remove Steel Bookcase. See Figure 4-36.
  - a. Remove two screws (1) and washers (2) from each of the two mounting bracket arms (3).
  - b. Slide and remove bookcase (4) off bracket arms (3).

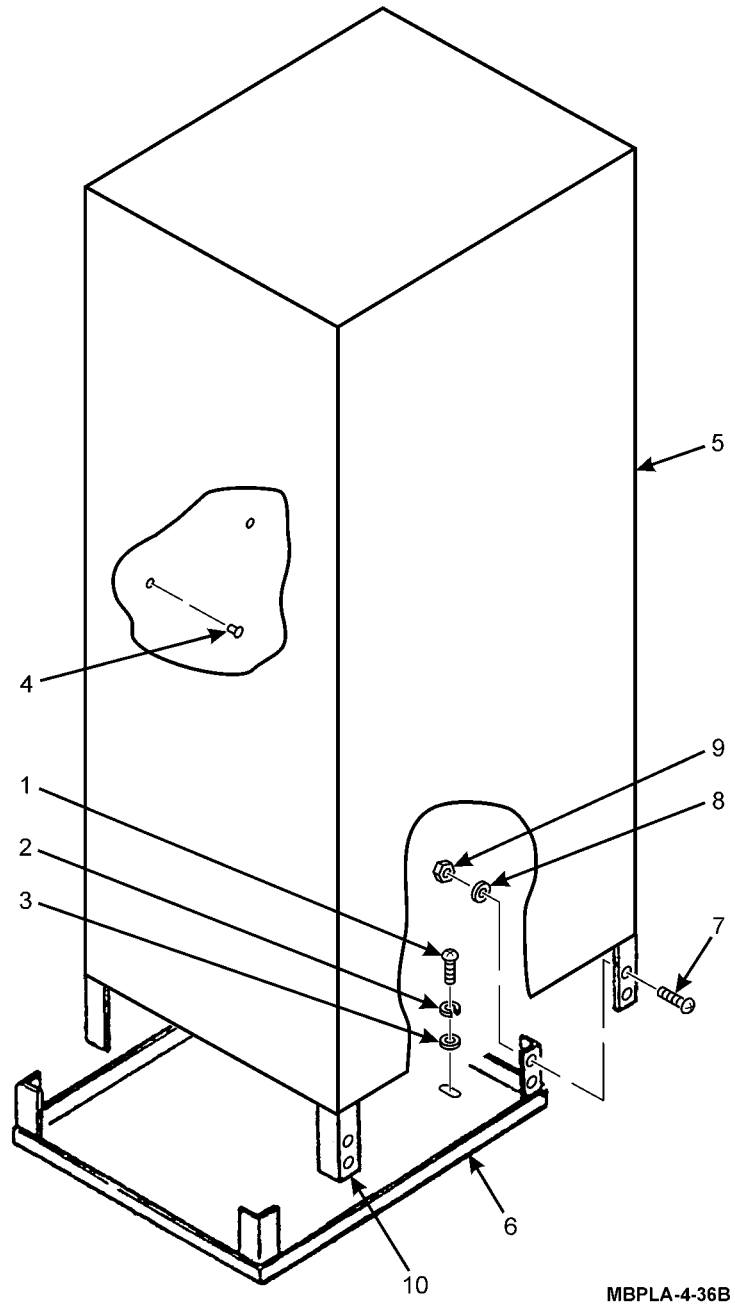


Figure 4-33. Steel Storage Locker

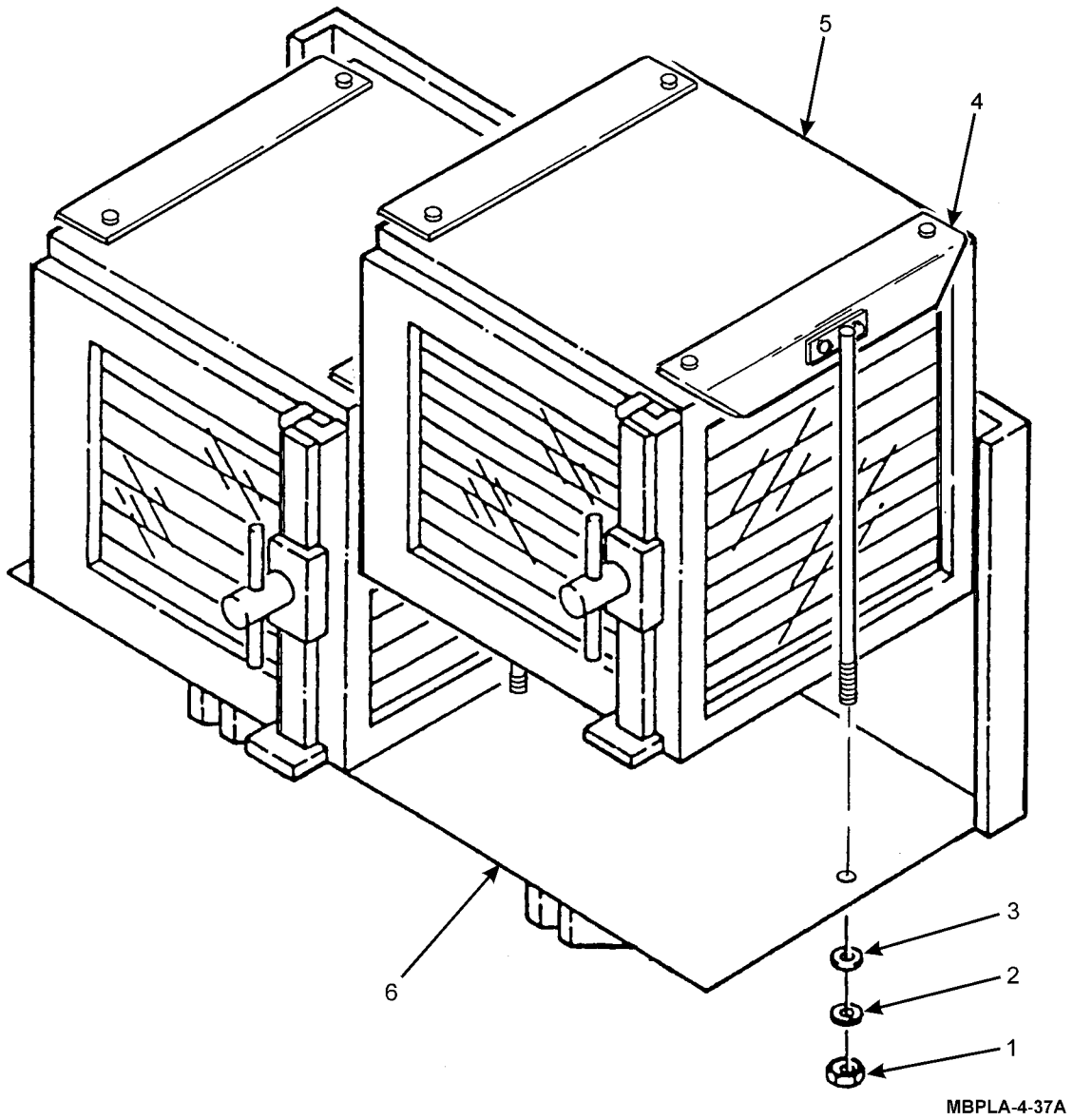
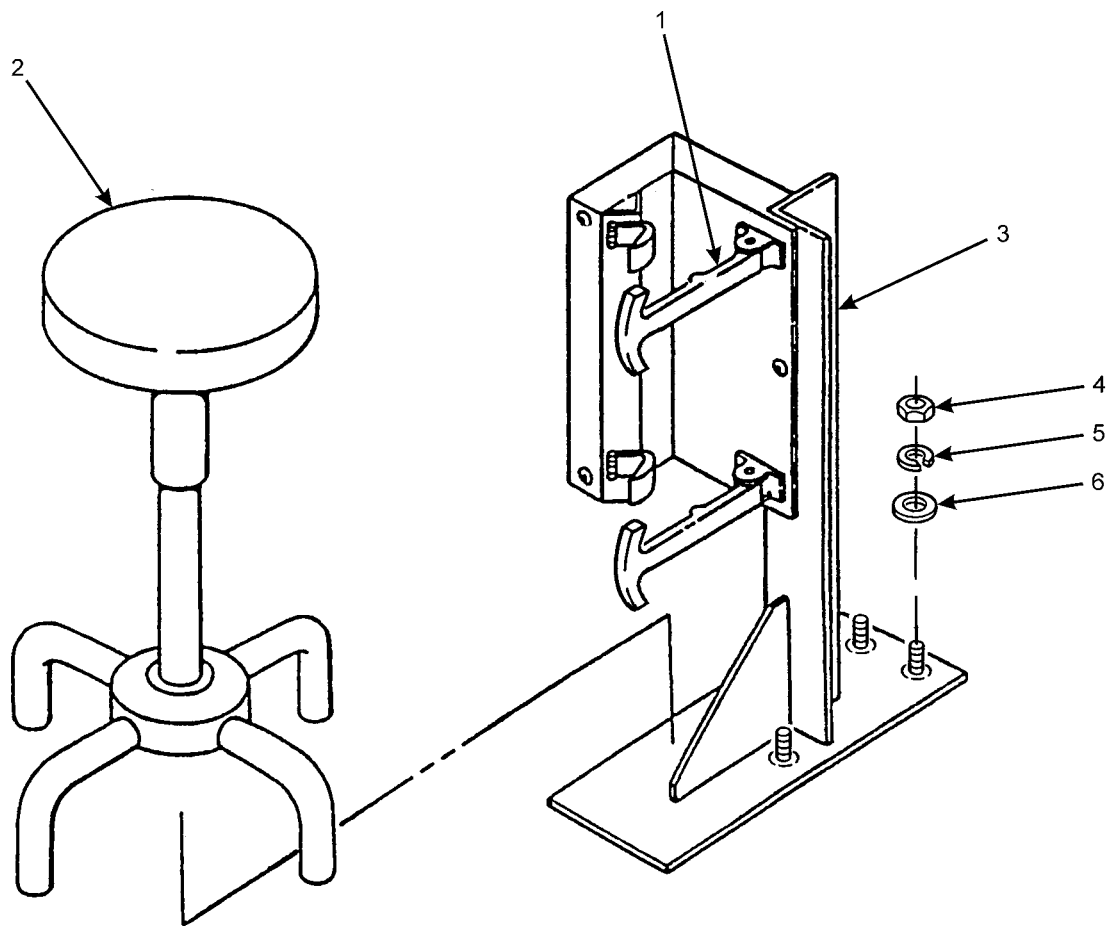
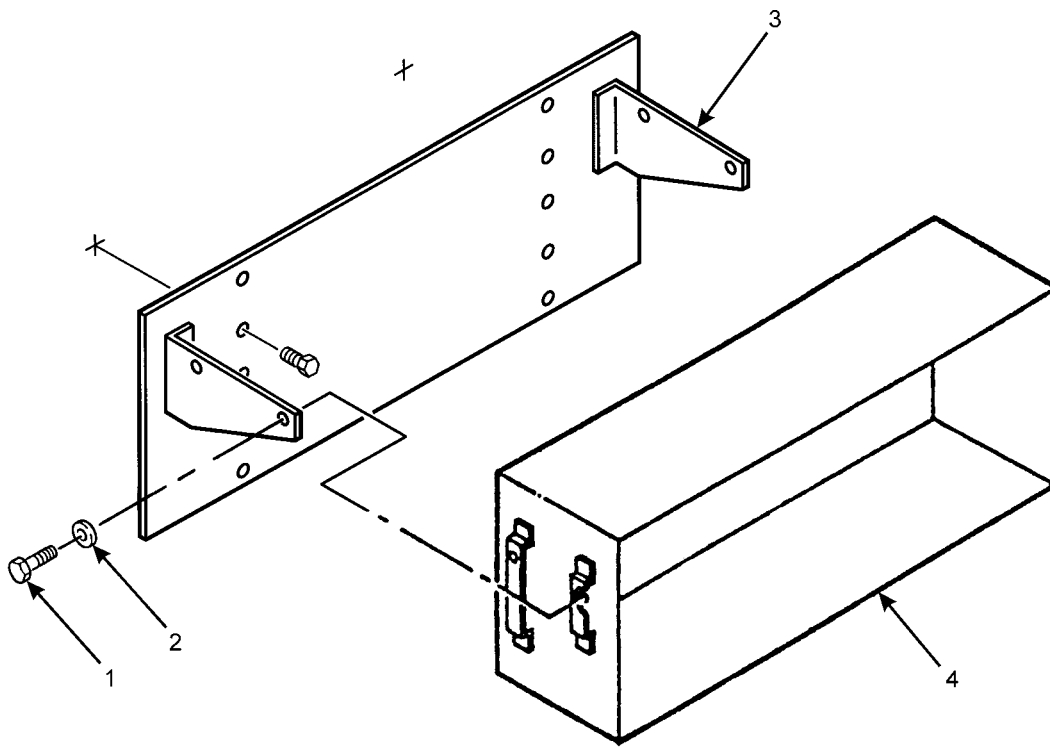


Figure 4-34. Desiccating Cabinet



MBPLA-4-38A

Figure 4-35. Stool Storage Bracket



MBPLA-4-39A

Figure 4-36. Steel Bookcase

INSTALL

1. Install Steel Storage Locker. See Figure 4-33.
  - a. Align locker (5) on locker mounting plate (6).
  - b. Attach each of the four locker legs (10) with two screws (7), lockwashers (8), and nuts (9).
  - c. Slide locker (5) and locker mounting plate (6) into position and secure to floor using two screws (1), lockwashers (2), and washers (3).
  - d. Secure locker (5) with three rivets (4).
2. Install Desiccating Cabinet. See Figure 4-34.
  - a. Install desiccating cabinet (5) on support shelf (6).
  - b. Align mounting bracket (4) and fasten bracket in place with two washers (3), lockwashers (2), and nuts (1).
3. Install Stool Storage Bracket. See Figure 4-35.
  - a. Align bracket (3) and secure with four washers (6), lockwashers (5) and nuts (4).
  - b. Place stool in bracket (3) and secure with two retaining straps (1).
4. Install Steel Bookcase. See Figure 4-36.
  - a. Slide bookcase (4) onto bracket arms (3).
  - a. Secure bookcase (4) with two screws (1) and washers (2).

#### 4-42. ANALYTICAL BALANCE AND VIBRATION DAMPING SUPPORT.

---

This task consists of:	a. Remove	b. Install	c. Calibrate
------------------------	-----------	------------	--------------

---

**INITIAL SET-UP**

Tools Required  
General Mechanics Tool Kit, (Appendix B, Section III, Item 1)

Materials/Parts Required  
Lockwashers, (6)

---

#### REMOVE

1. Remove Cover and Analytical Balance. See Figure 4-37.
  - a. Unsnap four retaining latches (1) and lift cover (2) clear of analytical balance (3).
  - b. Remove analytical balance (3) from vibration damping support (4).
2. Remove Vibration Damping Support.
  - a. Remove drawers K1 and K2.
  - b. Remove six screws (5), washers (6), lockwashers (7), and nuts (8) attaching vibration damping support (4) to counter. Discard lockwashers.
  - c. From each retaining latch (1), remove four screws (9) and retaining latch.
  - d. Remove 16 screws (10), washers (11), and nuts (12) and separate vibration damping support (4) from plate (13).

#### INSTALL

1. Install Vibration Damping Support. See Figure 4-37.
  - a. Align plate (13) with vibration damping support (4) and secure with 16 screws (10), washers (11) and nuts (12).
  - b. Align each retaining latch (1) to vibration damping support (4), and secure with four screws (9).
  - c. Align vibration damping support (4) on countertop and secure with six screws (5), washers (6), and nuts (7).
2. Install Analytical Balance and Cover.
  - a. Place analytical balance (3) on vibration damping support (4).

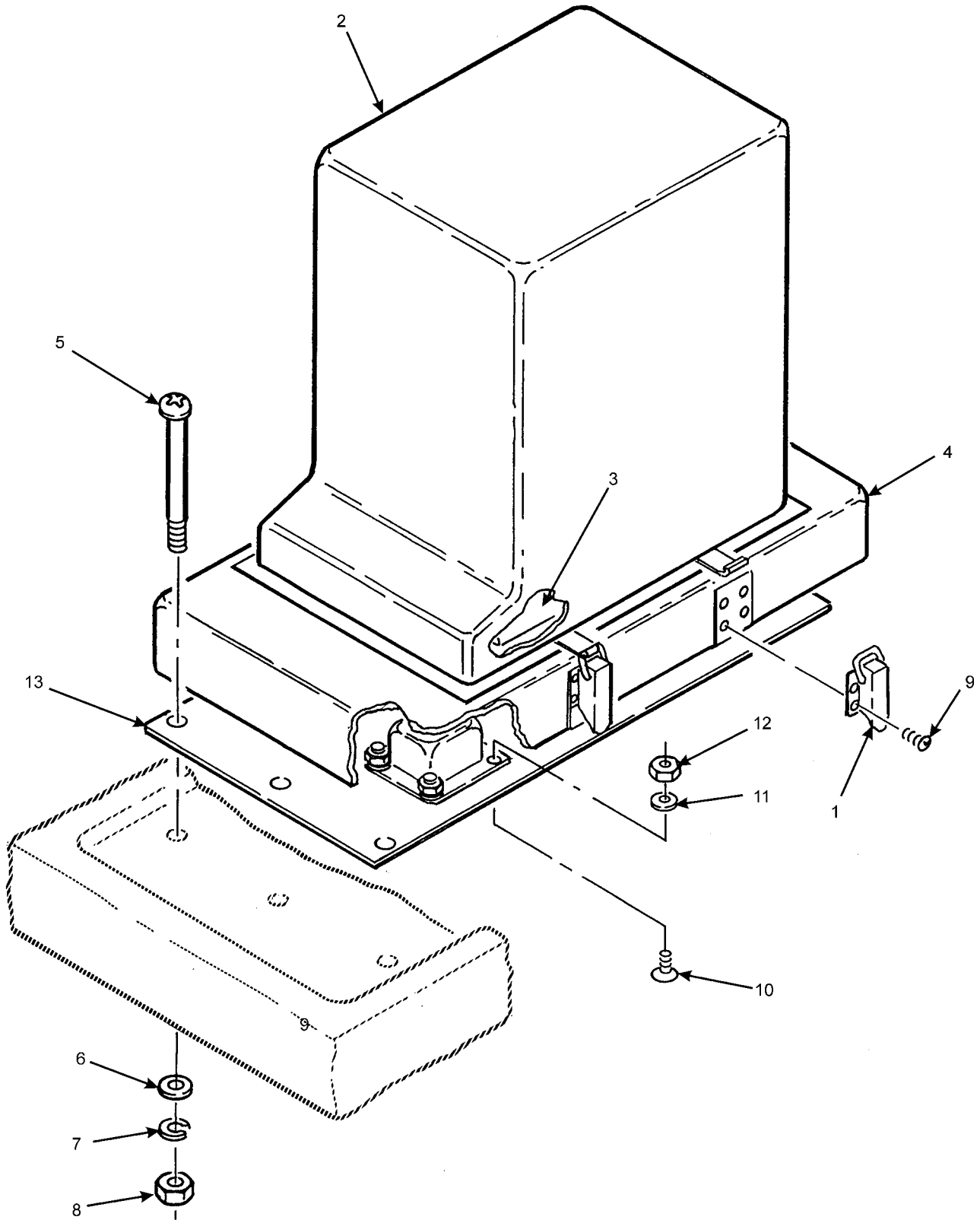
#### **CAUTION**

To prevent damage to equipment, ensure all doors are pulled forward.

- b. Pull doors on analytical balance (3) forward.
- c. Place cover (2) over analytical balance (3) and secure in place with four retaining latches (1).

#### CALIBRATE

Refer to vendor manual for analytical balance calibration procedures.



MBPLA-4-40A

Figure 4-37. Analytical Balance



**4-43. GUM BATH/FUME HOOD EXHAUST BLOWER HOSES.**

---

This task consists of:                      a. Remove    b. Install

---

**INITIAL SET-UP**

Tools Required

General Mechanics Tool Kit, (Appendix B, Section III, Item 1)

General Safety Instructions

**WARNING**

**ELECTRICAL SHOCK**

Before performing any maintenance actions on electrical equipment, ensure all electrical power has been turned off. Failure to comply with this warning may result in serious injury or death.

---

REMOVE

Remove Exhaust Hose.

The exhaust hose for the gum bath or the fume hood exhaust blower is removed by loosening the screws on the hose clamps at both ends of the hose and sliding hose free of the blower discharge and the discharge ducting.

INSTALL

Install Exhaust Hose.

- a. Place one end of the exhaust hose on the exhaust ducting with hose clamp. Tighten clamp screw until hose is securely in place on ducting.
- b. Place opposite end of hose with hose clamp on exhaust blower discharge. Tighten clamp screw until hose is securely in place on blower discharge.
- c. Energize blower and check blower and exhaust hose for leaks.

**4-44. REID VAPOR PRESSURE TESTING SYSTEM.**

---

This task consists of:	a. Remove	b. Install	c. Calibrate
------------------------	-----------	------------	--------------

---

**INITIAL SET-UP**

Tools Required

General Mechanics Tool Kit, (Appendix B, Section III, Item 1)

Materials/Parts Required

Lockwashers, (20)

Personnel Required

Two (2)

General Safety Instructions

**WARNING**

**ELECTRICAL SHOCK**

Before performing any maintenance actions on electrical equipment, ensure all electrical power has been turned off. Failure to comply with this warning may result in serious injury or death.

**REMOVE**

1. Remove RVP Bath. See Figure 4-38.
  - a. At Main Power Panel place circuit breaker A1CB16 to OFF.
  - b. Unplug RVP bath power cord from convenience outlet.
  - c. Disconnect RVP bath drain (1) by loosening hose clamp (2).
  - d. Remove four screws (3).

**WARNING**

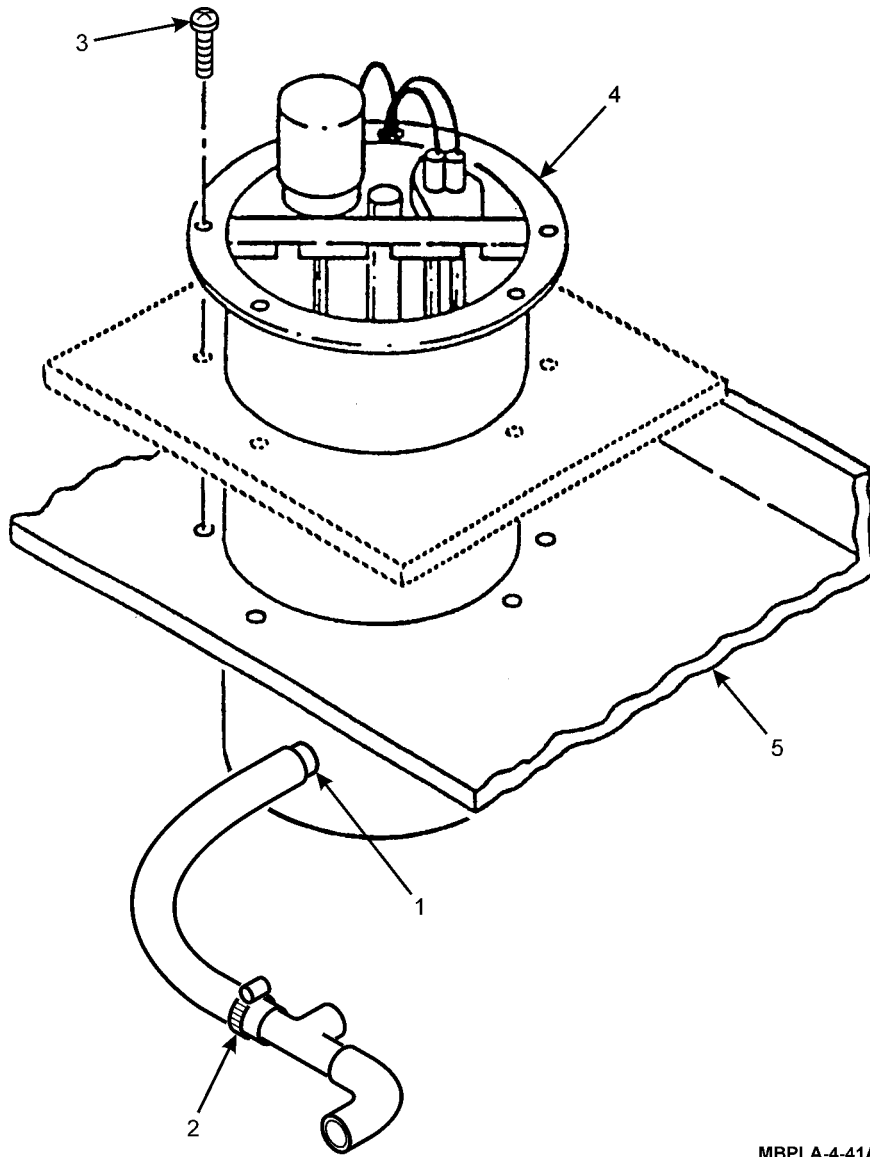
Two people are required to remove RVP bath because of its weight. Failure to comply with this warning could result in serious injury to personnel or damage to equipment.

- e. Lift RVP bath (4) up from cabinet until it clears countertop (5).

**NOTE**

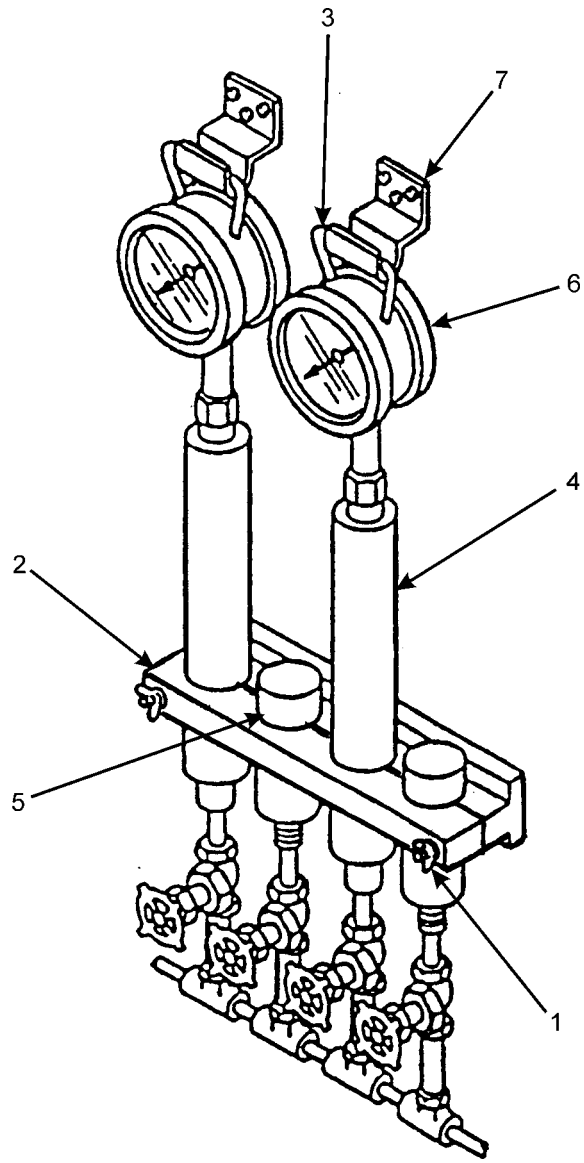
For component Remove refer to TM 10-6640-226-13&P.

2. Remove RVP Test Bomb and Gauge. See Figure 4-39.
  - a. Loosen two wing nut bolts (1) and loosen bomb rack (2).
  - b. Grasp gauge support handle (3) and lift RVP bomb (4) clear of air manifold. Lift liquid chamber (5) clear of air manifold.
  - c. Remove RVP gauge (6) from RVP bomb (4).



MBPLA-4-41A

Figure 4-38. RVP Bath



MBPLA-4-42A

Figure 4-39. RVP Test Bomb

3. Remove Manometer. See Figure 4-40.

**WARNING**

Never handle mercury with bare hands; never heat mercury in an open container;  
and never shake more than 20 milliliters of mercury in a glass container.

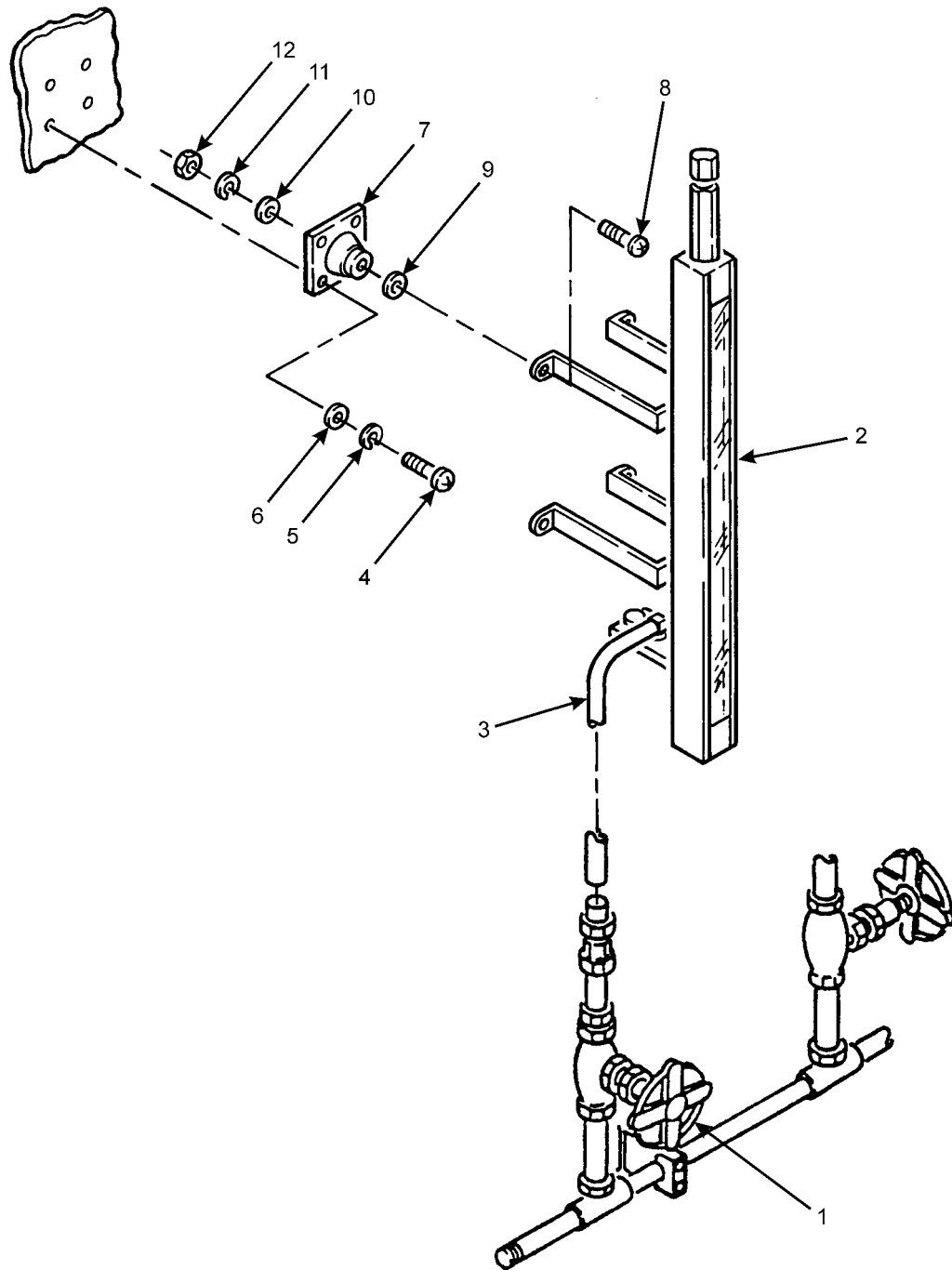
- a. Close air supply valve (1) to manometer (2).
- b. Remove air line tubing (3) from manometer (2).
- c. Remove four screws (4), lockwashers (5) and washers (6) from each mount (7) and remove manometer (2). Discard lockwashers.
- d. Remove four screws (8), washers (9), washers (10), lockwashers (11), nuts (12) and mounts (7) from manometer (2). Discard lockwashers.

INSTALL

1. Install Manometer. See Figure 4-40.
  - a. Install four mounts (7) and secure each mount to manometer (2) using screw (8), washer (9), washer (10), lockwashers (11), and nut (12).
  - b. Align each mount (7) with wall holes and secure with four screws (4), lockwashers (5), and washers (6).
  - c. Connect air line tubing (3) to manometer (2).
  - d. Open air supply valve (1) to manometer (2).
2. Install RVP Test Bomb and Gauge. See Figure 4-39.
  - a. Align RVP gauge (6) with RVP bomb (4) and tighten.
  - b. Align RVP bomb (4) and liquid chamber (5) in bomb rack (2) and over air manifold.
  - c. Place RVP gauge handle (3) on support bracket (7).
  - d. Tighten outer half of bomb rack (2) with two wing nut bolts (1).

CALIBRATE

Refer to vendor manual for manometer calibration procedures.



MBPLA-4-44A

Figure 4-40. Manometer

4. Install RVP Bath. See Figure 4-38.

**WARNING**

Two people are required to install RVP bath because of its weight. Failure to comply with this warning could result in serious injury to personnel or damage to equipment.

- a. Lift RVP bath (4) into position on countertop (5). Plug RVP bath power cord into convenience outlet and lower RVP bath into place.
- b. Align RVP bath on countertop (5) and secure with four screws (3).
- c. Connect RVP bath drain (1) with hose clamp (2).
- d. At Main Power Panel place circuit breaker A1CB16 to ON.
- e. Run an operational check to test RVP bath system.

**4-45. KINEMATIC VISCOSITY BATH.**

---

This task consists of:

a. Remove

b. Install

---

**INITIAL SET-UP**Tools Required

General Mechanics Tool Kit, (Appendix B, Section III, Item 1)

General Safety Instructions**WARNING****ELECTRICAL SHOCK**

Before performing any maintenance actions on electrical equipment, ensure all electrical power has been turned off. Failure to comply with this warning may result in serious injury or death.

---

REMOVE

Remove Kinematic Viscosity Baths. See Figure 4-41.

- a. Unplug controller (1) for viscosity bath (2) from wall receptacle.
- b. Disconnect strap (3) and remove top bracket (4) from viscosity bath (2).
- c. Lift controller (1) from viscosity bath (2).
- d. Loosen four captive wing bolts (5) and remove two hold down brackets (6).
- e. Remove viscosity bath (2).

INSTALL

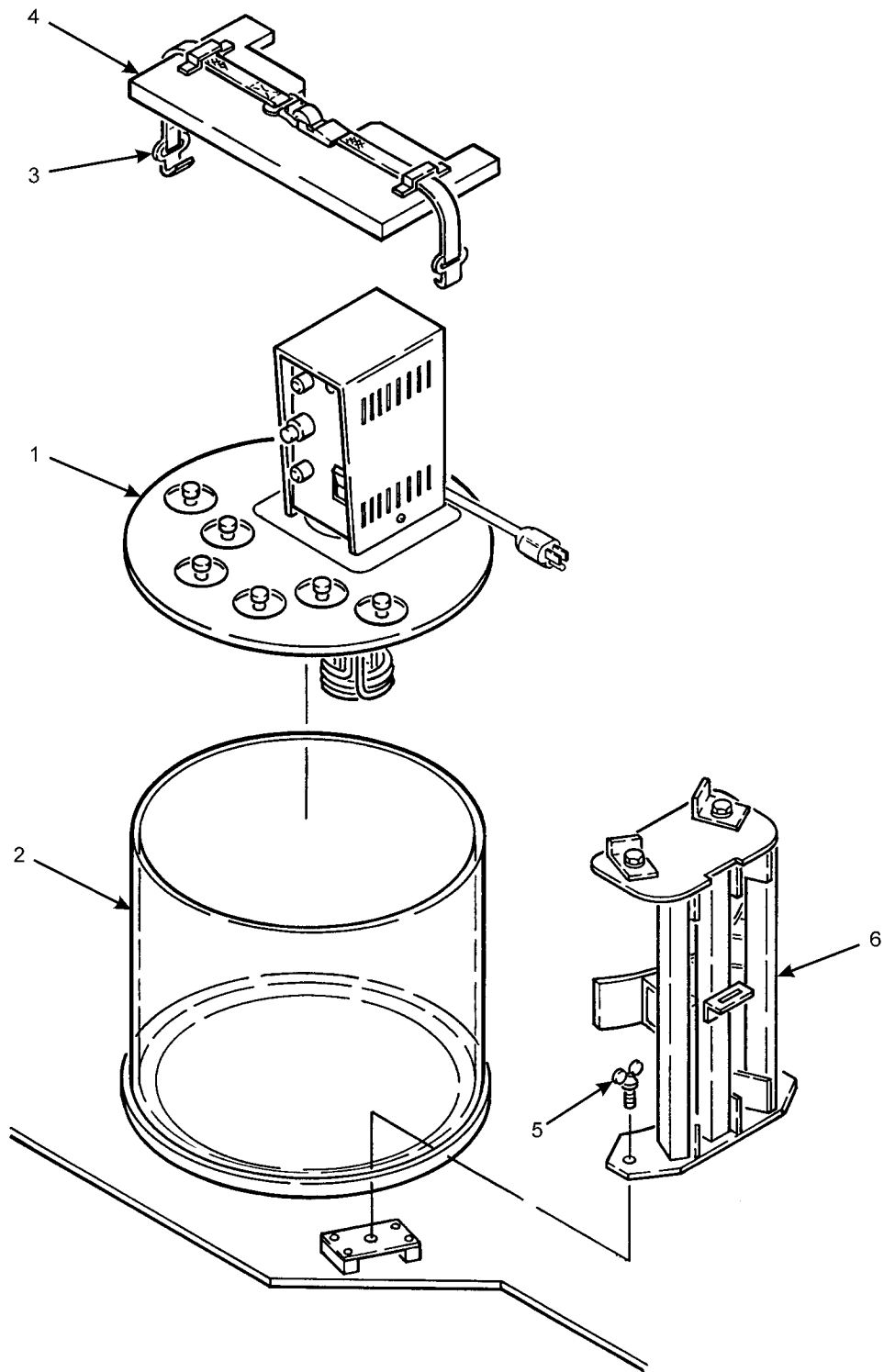
Install Kinematic Viscosity Baths. See Figure 4-41.

- a. Install viscosity bath (2) in place on foundation.
- b. Install two hold down brackets (6) and secure with four captive wing bolts (5).
- c. Lower controller (1) into viscosity bath (2).
- d. Place top bracket (4) with strap (3) in position on viscosity bath (2) and secure strap.
- e. Plug controller (1) for viscosity bath (2) into wall receptacle.
- f. Verify viscosity bath operation.

**NOTE**

For component removal refer to commercial manual.





MBPLA-4-45A

Figure 4-41. Kinematic Viscosity Bath

**4-46. CENTRIFUGE.**


---

This task consists of:                      a. Remove                                      b. Install

---

**INITIAL SET-UP**Tools Required

General Mechanics Tool Kit, (Appendix B, Section III, Item 1)

Materials/Parts Required

Lockwashers, (16)

General Safety Instructions

<b>WARNING</b>
----------------

**ELECTRICAL SHOCK**

Before performing any maintenance actions on electrical equipment, ensure all electrical power has been turned off. Failure to comply with this warning may result in serious injury or death.

---

REMOVE

Remove Centrifuge. See Figure 4-42.

- a. At Main Power Panel, place circuit breaker A1CB8 to OFF.
- b. Unplug centrifuge (1) power cord from convenience outlet.
- c. Remove four screws (2), washers (3), lockwashers (4), and nuts (5) that attach each shock mount (6) to shelf (7). Discard lockwashers.
- d. Lift and remove centrifuge (1) from countertop.

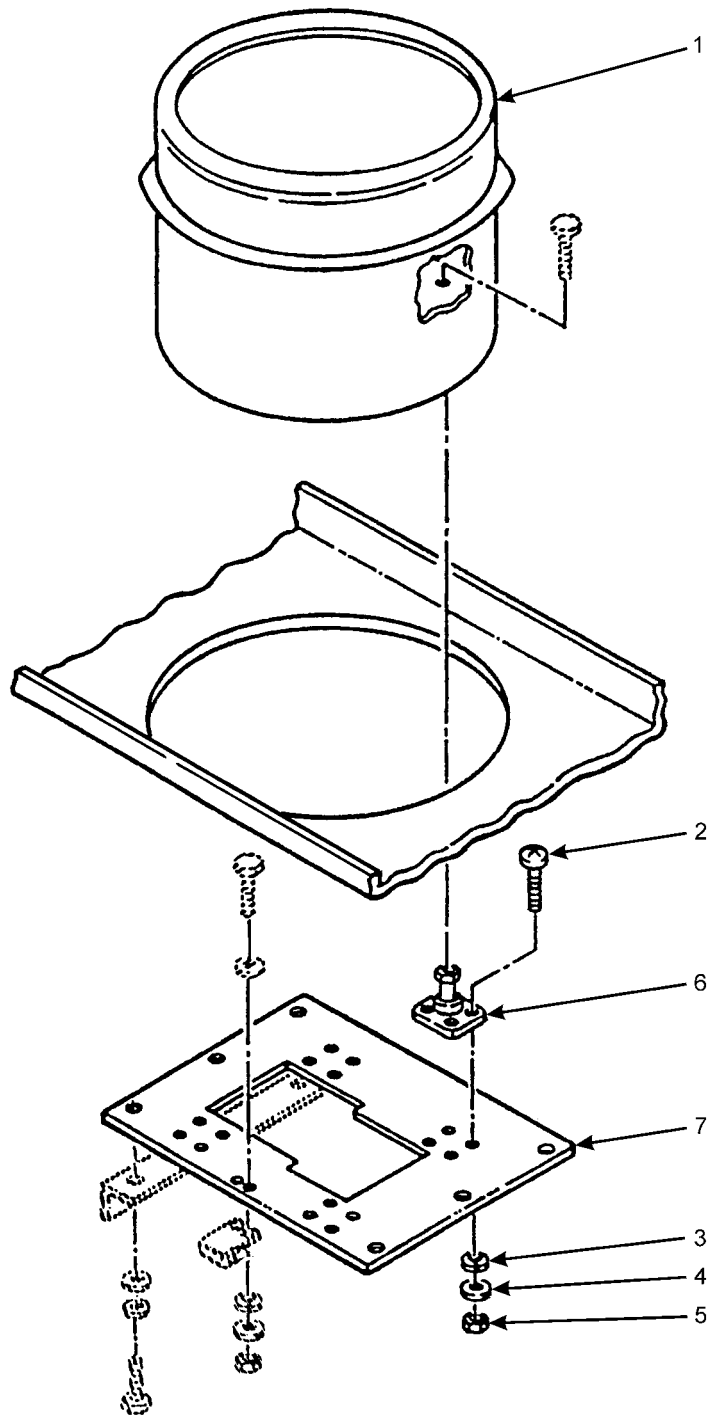
**NOTE**

For component removal refer to TM 10-6640-230-13&P.

INSTALL

Install Centrifuge. See Figure 4-42.

- a. Lower centrifuge (1) into cut-out on countertop.
- b. Align shock mounts (6) with screw holes on shelf (7) and attach each shock mount with four screws (2), washers (3), lockwashers (4), and nuts (5).
- c. Plug centrifuge power cord into convenience outlet.
- d. At Main Power Panel, place circuit breaker A1CB8 to ON.
- e. Run operational test to check centrifuge.



MBPLA-4-46A

Figure 4-42. Centrifuge

**4-47. DISTILLATION TEST APPARATUS.**


---

This task consists of:	a. Remove	b. Install
------------------------	-----------	------------

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**INITIAL SET-UP**Tools Required

- General Mechanics Tool Kit, (Appendix B, Section III, Item 1)
- Portable Electric Drill (Appendix B, Section III, Item 2)
- Twist Drill Set, (Appendix B, Section III, Item 2)

General Safety Instructions**WARNING****ELECTRICAL SHOCK**

Before performing any maintenance actions on electrical equipment, ensure all electrical power has been turned off. Failure to comply with this warning may result in serious injury or death.

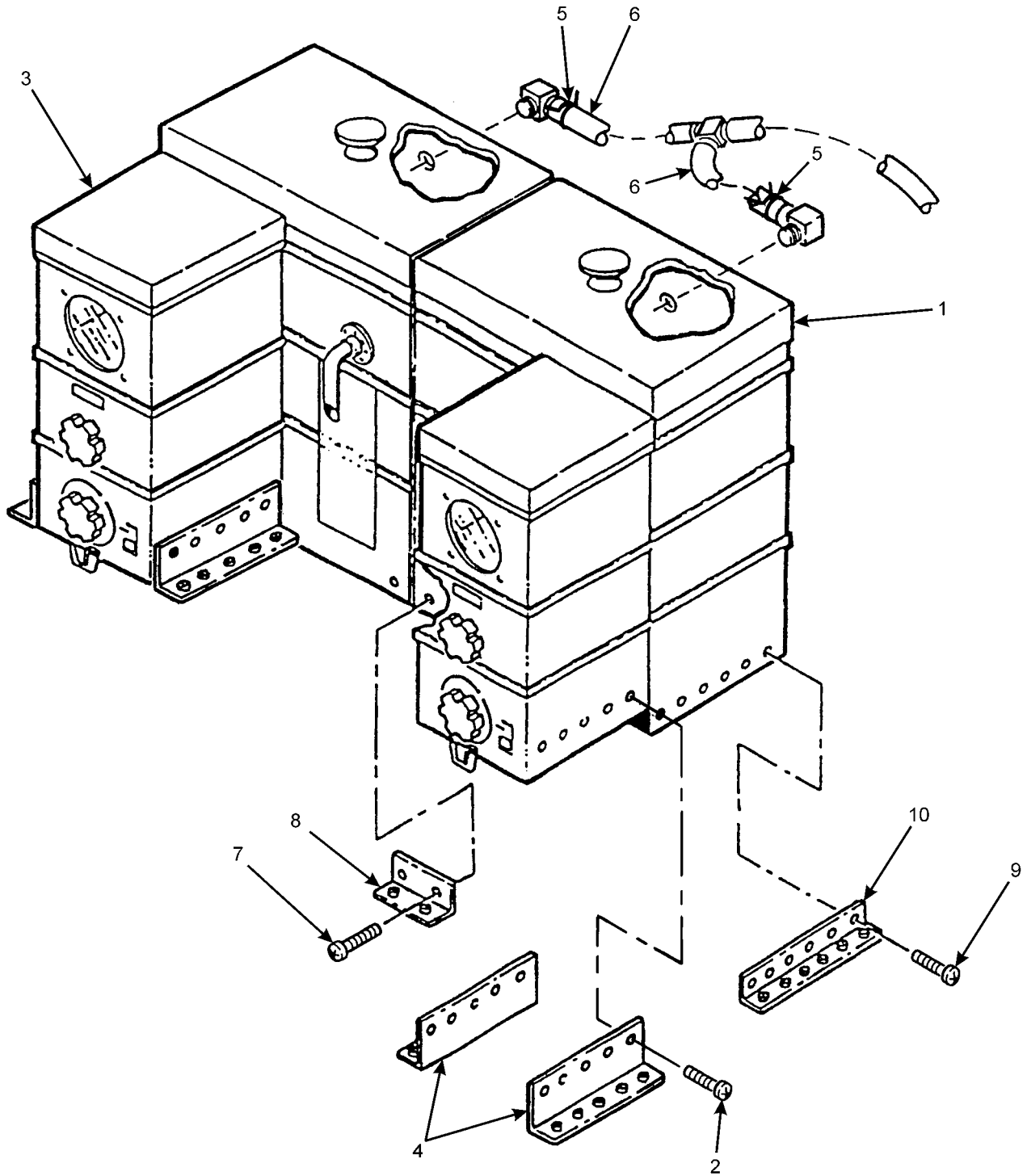
---

REMOVE

1. Remove Shield Assembly. See Figure 4-43.
  - a. Unplug condenser (1) from wall receptacle.
  - b. Remove ten screws (2) securing shield assembly (3) to mounting bracket (4).
  - c. Lift shield assembly (3) up and forward disconnecting shield assembly from condenser assembly (1).
2. Remove Condenser Assembly.
  - a. Remove shield assembly as in paragraph 1 above.
  - b. Squeeze clamp (5) and remove drain line (6).
  - c. Remove two screws (7) securing connecting bracket (8) to both condenser assemblies (1).
  - d. Remove six screws (9) securing condenser assembly (1) to mounting bracket (10) and remove condenser.

INSTALL

1. Install Condenser Assembly. See Figure 4-43.
  - a. If necessary, using mounting plate (10) as template, scribe and drill holes in condenser (1).
  - b. Install mounting bracket (10) on condenser (1) and secure with six screws (9).
  - c. Install connecting bracket (8) and secure with two screws (7).
  - d. Squeeze clamp (5) and connect drain line (6).
  - e. Plug in condenser assembly and verify operation.



MBPLA-4-47A

Figure 4-43. Distillation Test Apparatus

2. Install Shield Assembly.
  - a. If necessary, using mounting plate (4) as template, scribe and drill holes in shield assembly (3).
  - b. Lift shield assembly (3) up and lower onto condenser assembly (1) channels.
  - c. Place mounting bracket (4) on shield assembly (1) and secure with five screws (2).
  - d. Plug in condenser assembly and verify operation.

#### 4-48. OXIDATION STABILITY BATH.

---

This task consists of:                      a. Remove                                      b. Install

---

##### **INITIAL SET-UP**

##### Tools Required

General Mechanics Tool Kit, (Appendix B, Section III, Item 1)

##### General Safety Instructions

**WARNING**

##### ELECTRICAL SHOCK

Before performing any maintenance actions on electrical equipment, ensure all electrical power has been turned off. Failure to comply with this warning may result in serious injury or death.

---

##### REMOVE

Remove Oxidation Stability Bath. See Figure 4-44.

- a. At Main Power Panel, place circuit breaker A1CB15 to OFF.
- b. Disconnect two drain lines (1) from rear of oxidation stability bath (2) located inside cabinet "S1".
- c. Remove junction box (3) cover and tag and disconnect electrical leads.
- d. Disconnect conduit (4) and withdraw with leads from junction box (3).
- e. Remove six screws (5), nuts (6), lockwashers (7), washers (8) and oxidation stability bath (2) from countertop.
- f. Remove elbows, valve, fittings, and coupler from drain pipes. Retain for reuse.

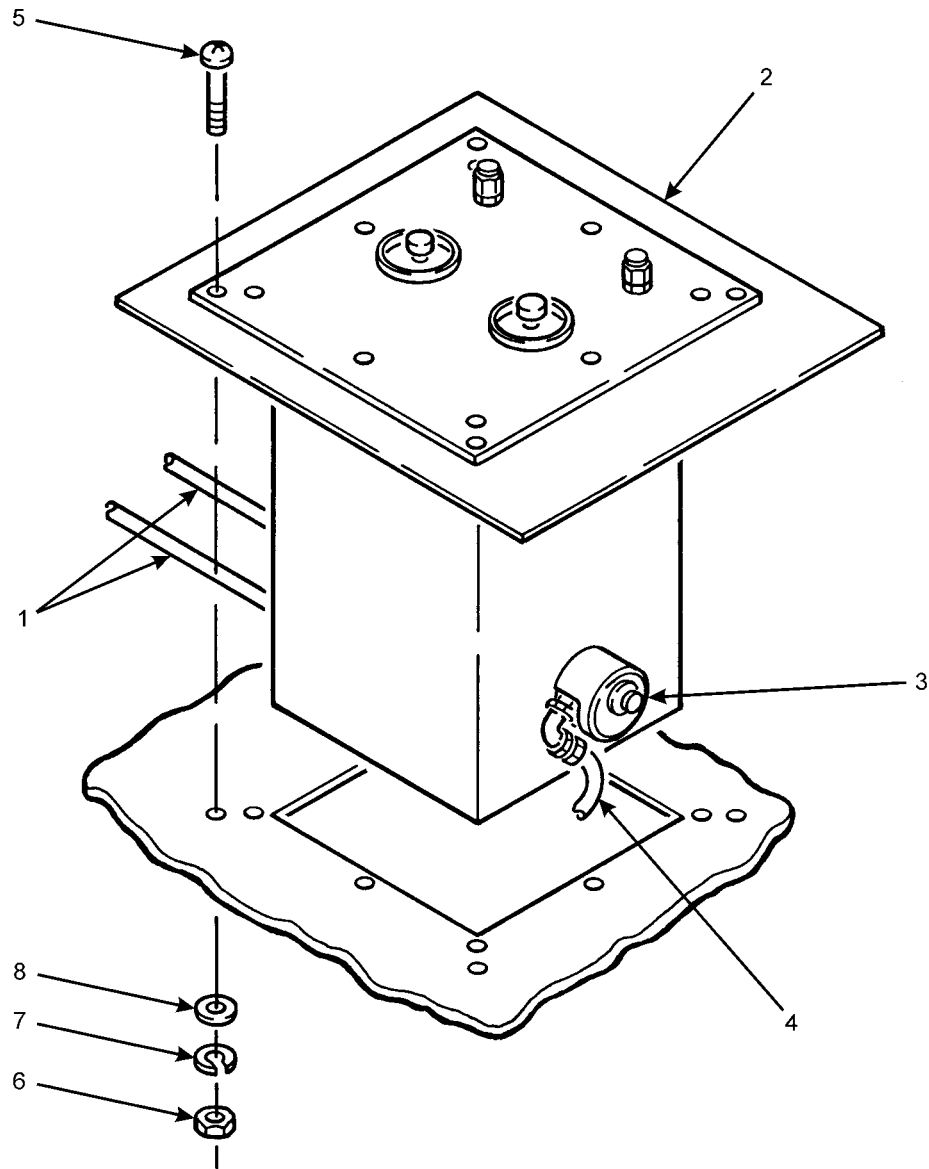
##### INSTALL

Install Oxidation Stability Bath. See Figure 4-44.

- a. Connect coupler, fittings, valve, and elbows to drain pipes.
- b. Install oxidation stability bath (2) in opening of countertop and secure with six screws (5), washers (8), lockwashers (7), and nuts (6).
- c. Install conduit (4) and connect electrical leads in junction box (3). Remove tags
- d. Replace cover on junction box (3).
- e. Connect two drain lines (1) to oxidation stability bath (2).
- f. At Main Power Panel, place circuit breaker A1CB15 to ON.
- g. Verify proper operation of oxidation stability bath.

##### **NOTE**

For component removal refer to commercial manual.



MBPLA-4-48A

Figure 4-44. Oxidation Stability Bath



#### 4-49. LABORATORY OVEN.

---

This task consists of:                      a. Remove                      b. Install                      c. Calibrate

---

##### **INITIAL SET-UP**

###### Tools Required

- General Mechanics Tool Kit, (Appendix B, Section III, Item 1)
- Portable Electric Drill (Appendix B, Section III, Item 2)
- Twist Drill Set, (Appendix B, Section III, Item 2)

###### Materials/Parts Required

- Lockwashers, (12)

###### Personnel Required

- Two (2)

###### General Safety Instructions

**WARNING**

##### **ELECTRICAL SHOCK**

Before performing any maintenance actions on electrical equipment, ensure all electrical power has been turned off. Failure to comply with this warning may result in serious injury or death.

---

##### REMOVE

Remove Laboratory Oven. See Figure 4-45.

- a. Unplug laboratory oven (1) power cord from wall receptacle.
- b. Open drawer G1, H1, or J1 and remove 12 screws (2), washers (3), lockwashers (4), and nuts (5) securing support brackets (6) to countertop. Discard lockwashers.

**WARNING**

Two people are required to remove laboratory oven because of its weight. Failure to comply with this warning could result in serious injury to personnel or damage to equipment.

- c. Remove laboratory oven (1) from countertop.
- d. Remove 12 screws (7) and two support brackets (6) from laboratory oven (1).

##### INSTALL

Install Laboratory Ovens. See Figure 4-45.

- a. If necessary, using support bracket (6) as template, scribe and drill holes in laboratory oven (1).
- b. Install two support brackets (6) to laboratory oven (1) and secure with 12 screws (7).
- c. Place laboratory oven (1) with support brackets (6) onto countertop, and secure with 12 screws (2), washers (3), lockwashers (4), and nuts (5).
- d. Plug power cord into convenience outlet and run operational test.

##### **NOTE**

For component removal refer to commercial manual.

##### CALIBRATE

Refer to vendor manual for laboratory oven calibration procedures.

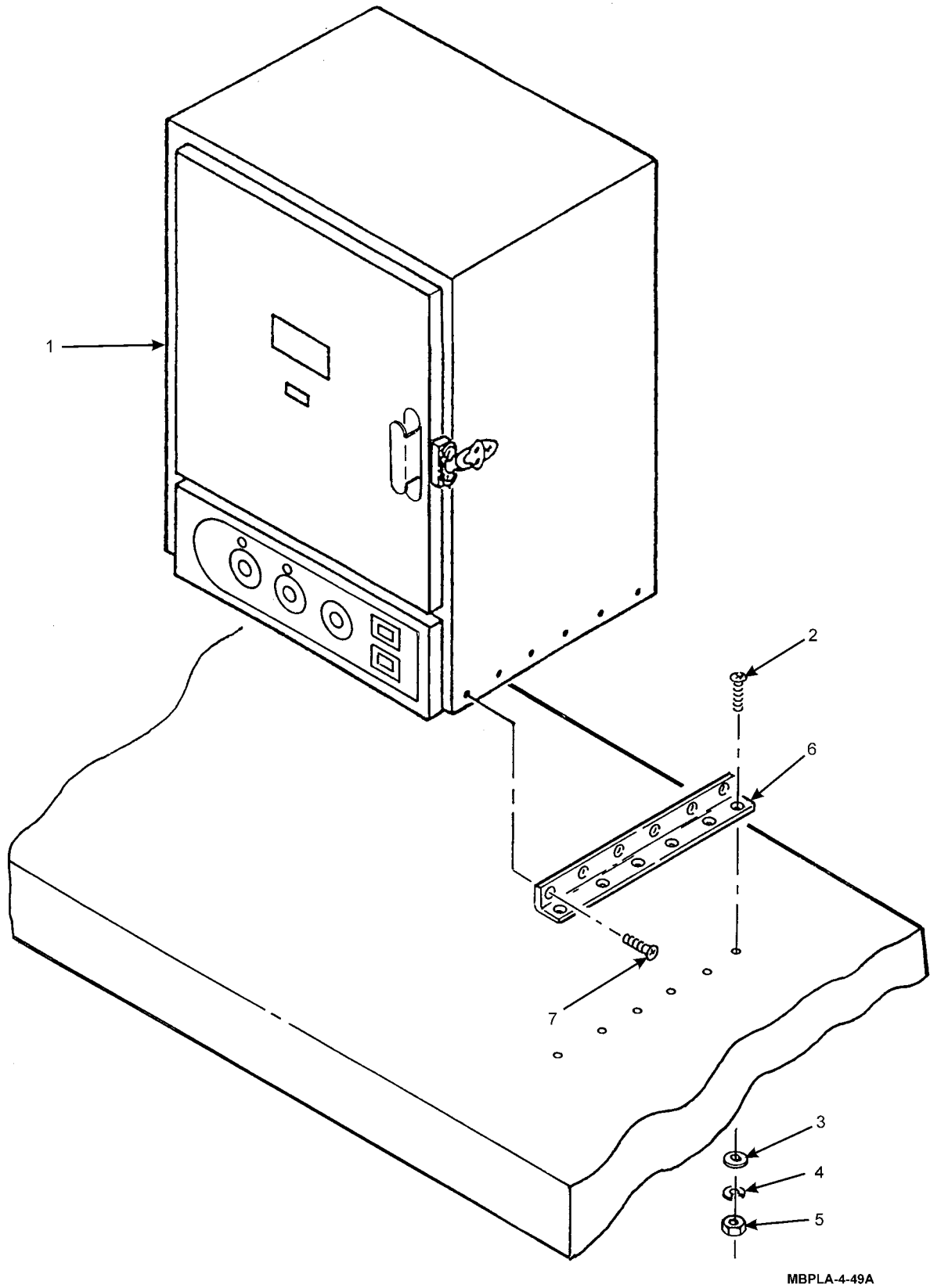


Figure 4-45. Laboratory Oven

MBPLA-4-49A

#### 4-50. BURNOUT FURNACE.

---

This task consists of:    a. Remove    b. Install

---

##### **INITIAL SET-UP**

###### Tools Required

- General Mechanics Tool Kit, (Appendix B, Section III, Item 1)
- Portable Electric Drill (Appendix B, Section III, Item 2)
- Twist Drill Set, (Appendix B, Section III, Item 2)

###### Materials/Parts Required

- Lockwashers, (8)

###### General Safety Instructions

**WARNING**

##### ELECTRICAL SHOCK

Before performing any maintenance actions on electrical equipment, ensure all electrical power has been turned off. Failure to comply with this warning may result in serious injury or death.

---

##### REMOVE

Remove Burnout Furnace. See Figure 4-46.

- a. Unplug burnout furnace (1) power cord from wall receptacle.
- b. Open drawers F1 and G1 and remove eight screws (2), washers (3), lockwashers (4), and nuts (5) that secure two brackets (6) to countertop. Discard lockwashers.
- c. Remove burnout furnace (1).
- d. Remove eight screws (7) attaching brackets (6) to burnout furnace (1) and remove bracket.

##### INSTALL

Install Burnout Furnace. See Figure 4-46.

- a. Using bracket (6) as template, scribe and drill holes in burn-out furnace (1).
- b. Install eight screws (7) that secure brackets (6) to burnout furnace (1).
- c. Place burnout furnace (1) with brackets (6) onto countertop and secure with eight screws (2), washers (3), lockwashers (4), and nuts (5).
- d. Plug burnout furnace (1) power cord into wall receptacle.
- e. Verify proper operation.

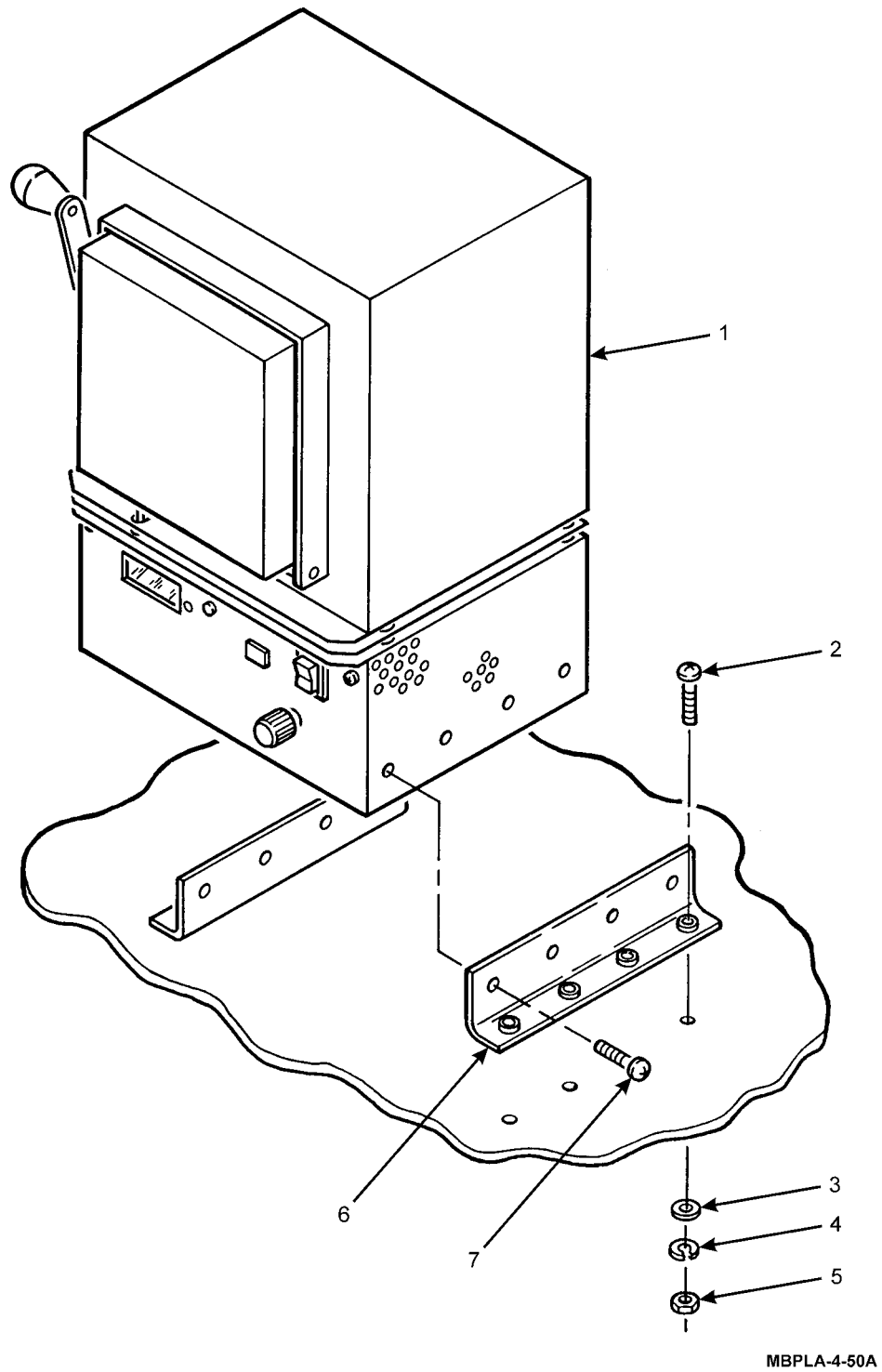


Figure 4-46. Burnout Furnace

**4-51. EXPLOSION PROOF REFRIGERATOR.**

---

This task consists of:

a. Remove	b. Install
-----------	------------

---

**INITIAL SET-UP**

Tools Required

General Mechanics Tool Kit, (Appendix B, Section III, Item 1)

Materials/Parts Required

Lockwashers, (2)

General Safety Instructions

**WARNING**

**ELECTRICAL SHOCK**

Before performing any maintenance actions on electrical equipment, ensure all electrical power has been turned off. Failure to comply with this warning may result in serious injury or death.

---

REMOVE

Remove Explosion Proof Refrigerator. See Figure 4-47.

- At Main Power Panel, place circuit breaker A1CB6 to OFF.
- Remove two screws (1), lockwashers (2), and washers (3) securing refrigerator (4) to plate (5). Discard lockwashers.
- Remove three screws (6) securing refrigerator (4) to plate (7).
- Move refrigerator (4) out from wall far enough to unplug power cord from convenience outlet.
- Remove refrigerator from beneath countertop.

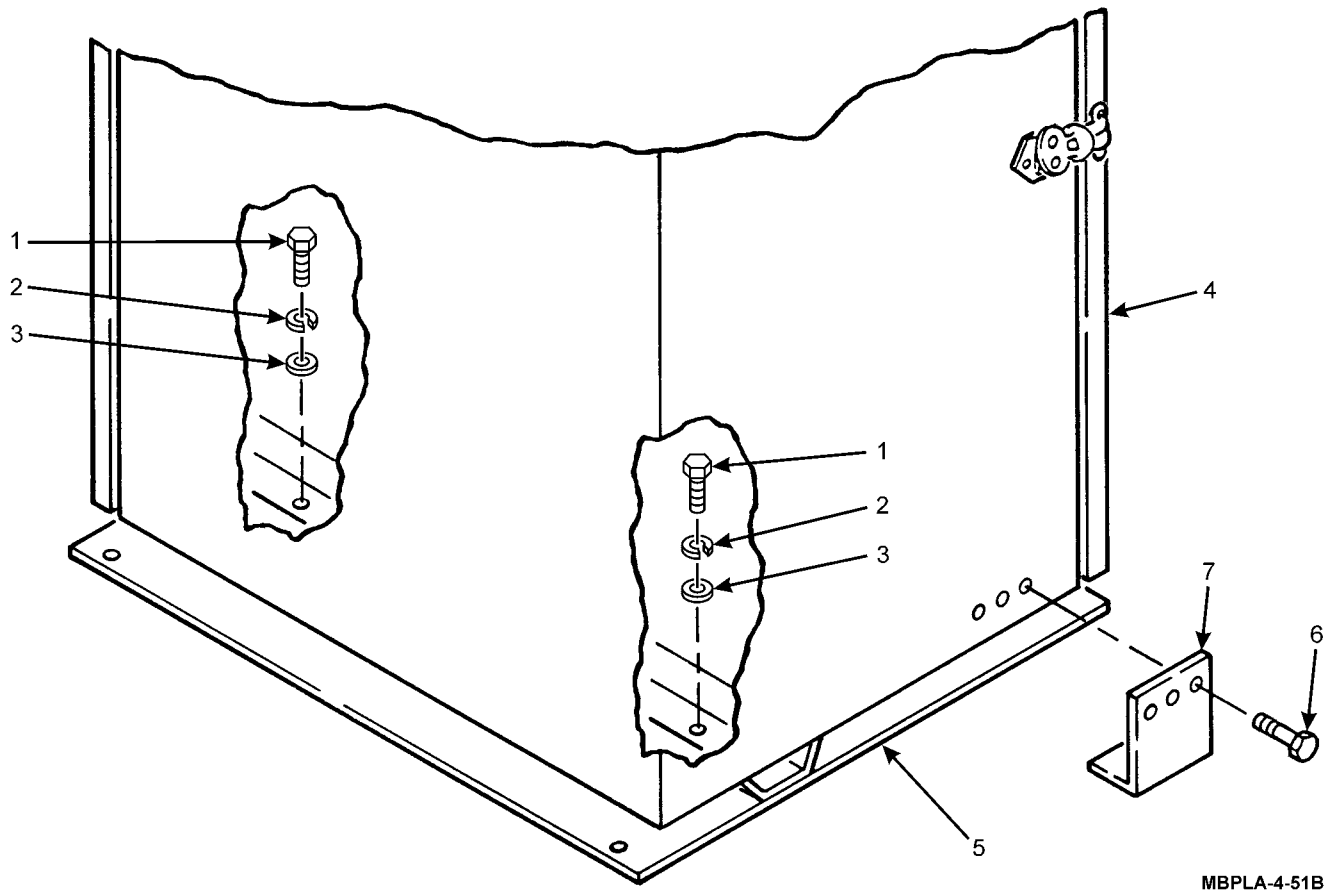
INSTALL

Install Explosion Proof Refrigerator. See Figure 4-47.

- Slide new refrigerator in place beneath countertop far enough to plug power cord into convenience outlet.
- Align refrigerator with holes in plate (7) and secure with three screws (6).
- Secure rear of refrigerator (4) to plate (5) using two screws (1), lockwashers (2), and washers (3).
- At Main Power Panel, place circuit breaker A1CB6 to ON.
- Turn refrigerator (4) on and check operation.

**NOTE**

For component replacement refer to commercial manual.



MBPLA-4-51B

Figure 4-47. Explosion Proof Refrigerator

#### 4-52. JET FUEL THERMAL OXIDATION TESTER (JFTOT).

---

This task consists of:                      a. Remove                      b. Install                      c: Calibrate

---

##### **INITIAL SET-UP**

###### Tools Required

General Mechanics Tool Kit, (Appendix B, Section III, Item 1)

###### Personnel Required

Two (2)

###### General Safety Instructions

**WARNING**

##### **ELECTRICAL SHOCK**

Before performing any maintenance actions on electrical equipment, ensure all electrical power has been turned off. Failure to comply with this warning may result in serious injury or death.

##### **PHYSICAL LIFTING**

Serious injury could occur if heavy equipment is moved/lifted without sufficient personnel to do the job. Use proper physical lifting procedures or use a suitable lifting device or dolly. Wear safety shoes, gloves and other suitable protective clothing.

---

##### REMOVE

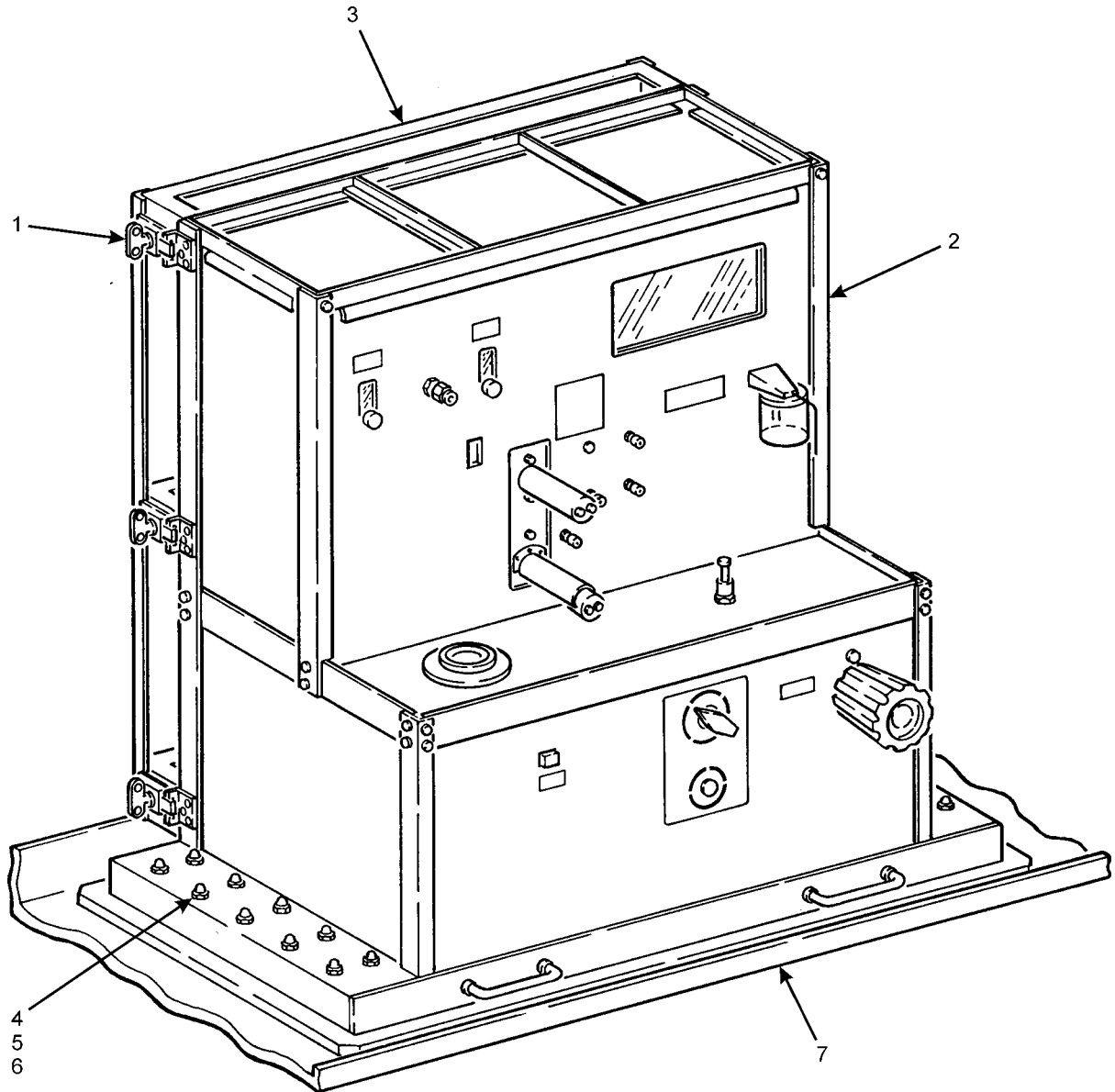
Remove JFTOT. See Figure 4-48.

- a. Unplug JFTOT power cord from wall receptacle.
- b. Unlatch three retaining latches (1) on both sides of JFTOT (2) from mounting frame (3).
- c. Slide unit out approximately two inches.
- d. Remove 12 cap nuts (4), nuts (5), and washers (6) that secure JFTOT foundation to countertop (7).

**WARNING**

Two people are required to remove JFTOT tester because of its weight. Failure to comply with this warning could result in serious injury to personnel or damage to equipment.

- e. Remove JFTOT (2) with mounting frame (3) from countertop (7).
- f. Remove JFTOT (2) from mounting frame (3).



MBPLA-4-52A

Figure 4-48. Jet Fuel Thermal Oxidation Tester (JFTOT)



INSTALL

Install JFTOT. See Figure 4-48.

**WARNING**

Two people are required to install JFTOT tester because of its weight. Failure to comply with this warning could result in serious injury to personnel or damage to equipment.

- a. Install JFTOT (2) into mounting frame (3).
- b. Place JFTOT (2) with foundation in position on countertop (7).
- c. Install 12 washers (6), nuts (5), and cap nuts (4) that secure JFTOT foundation to countertop (7).
- d. Slide JFTOT (2) unit into its retracted position.
- e. Latch three retaining latches (1) on both sides of JFTOT to mounting frame (3).
- f. Plug JFTOT power cord into wall receptacle.
- g. Verify proper operation.

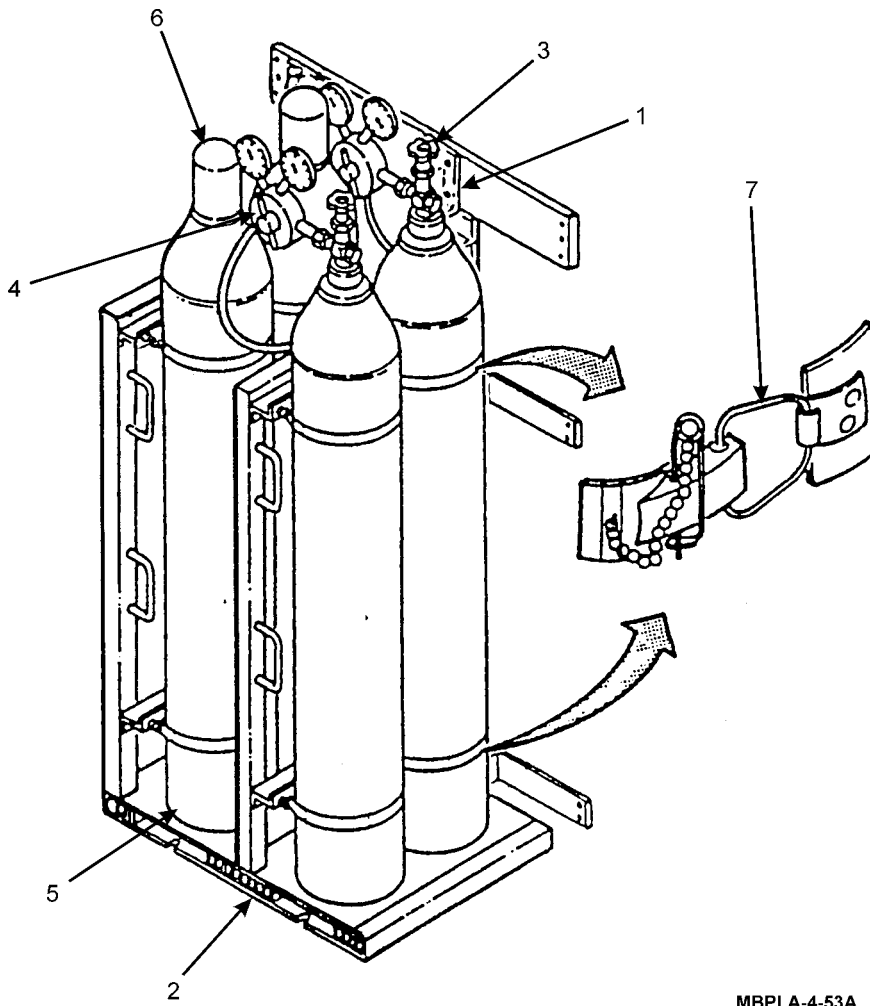
**NOTE**

For component replacement refer to commercial manual.

CALIBRATE

Refer to vendor manual for JFTOT calibration procedures.

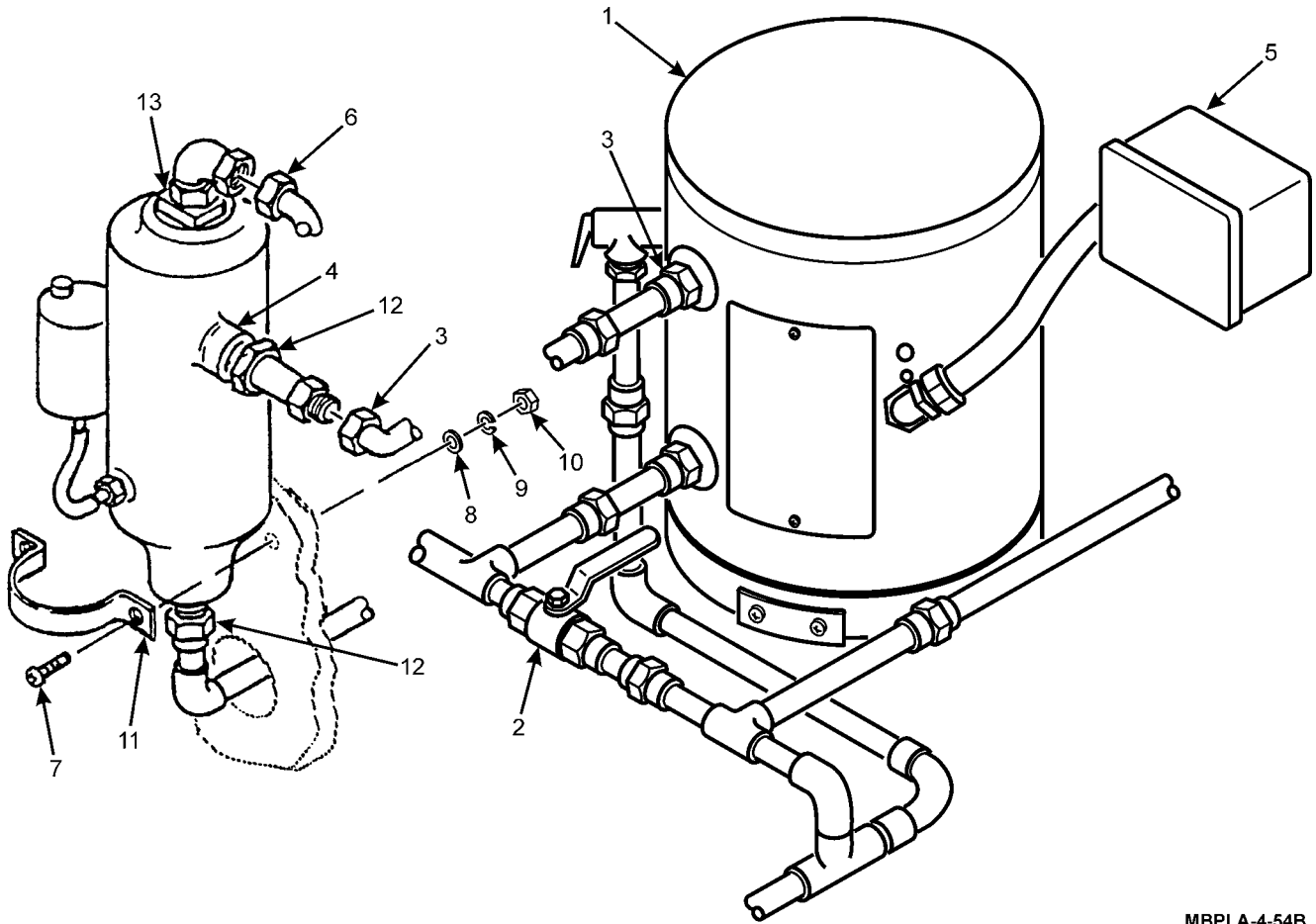




MBPLA-4-53A

Figure 4-49. Gas Cylinder and Gas Regulator Valve





MBPLA-4-54B

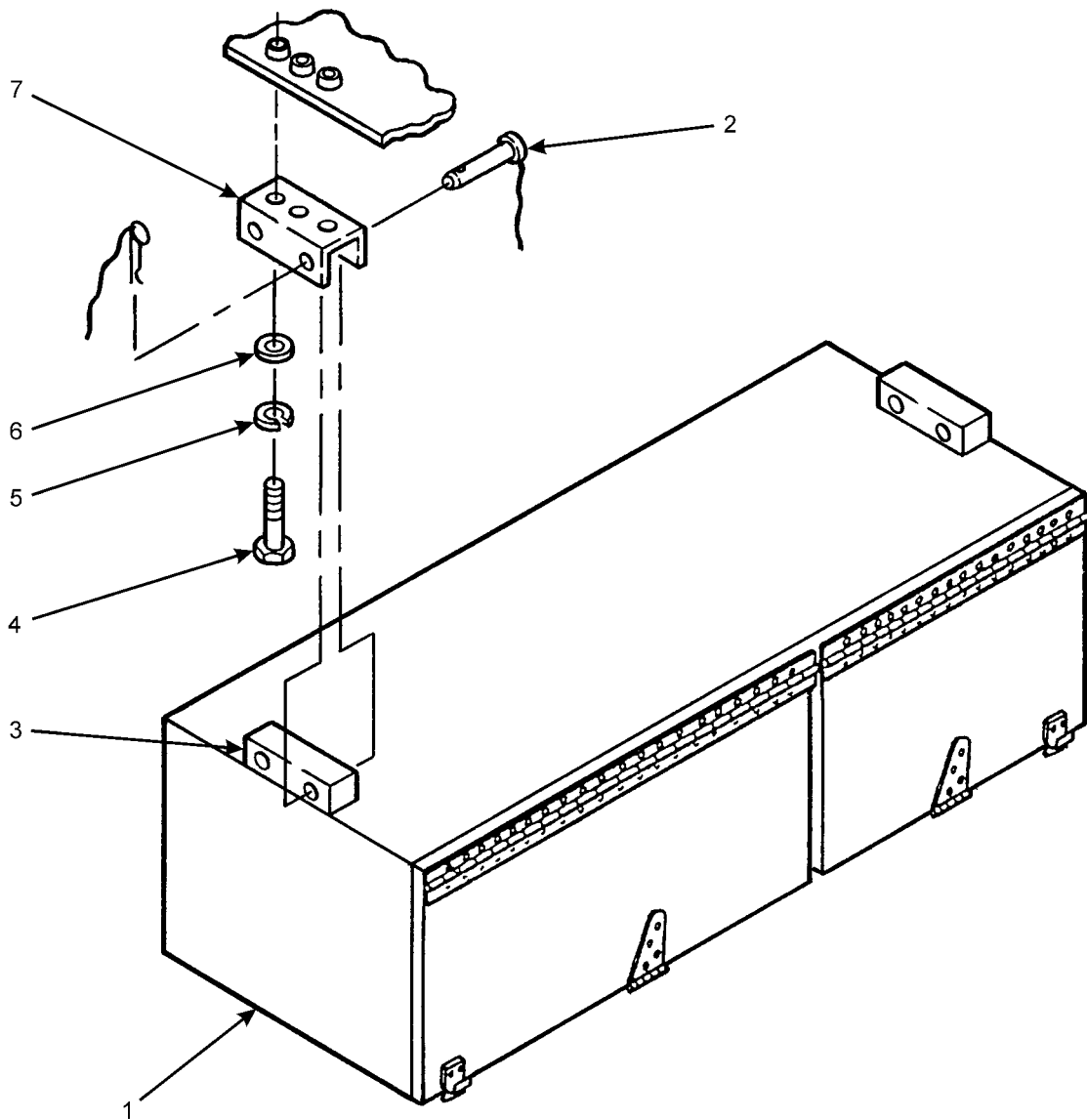
Figure 4-50. Water Level Regulator

INSTALL

Install Water Level Regulator. See Figure 4-50.

- a. Apply teflon tape on male fittings. Be sure to wrap teflon tape in same direction as pipe thread.
- b. Install wires as tagged to water level regulator (4) and install cap (13).
- c. Install two threaded pipe adapters (12) on water level regulator (4).
- d. Install water level regulator (4) and secure with two screws (7), washers (8), lockwashers (9), nuts (10) and retaining bracket (11).
- e. Draw electrical leads through conduit (6) with line previously attached and connect conduit to water level regulator (4). Connect leads as tagged inside junction box. Remove tags.
- f. Connect water level regulator (4) to system piping by connecting two pipe unions (3).
- g. Close valve (2) and verify operation.





MBPLA-4-55A

Figure 4-51. Roadside Stowage Box



**4-56. CURBSIDE STOWAGE BOX.**

---

This task consists of:	a. Remove	b. Install
------------------------	-----------	------------

---

**INITIAL SET-UP**

Tools Required

General Mechanics Tool Kit, (Appendix B, Section III, Item 1)

Personnel Required

Three (3)

Materials/Parts Required

Lockwashers, (6)

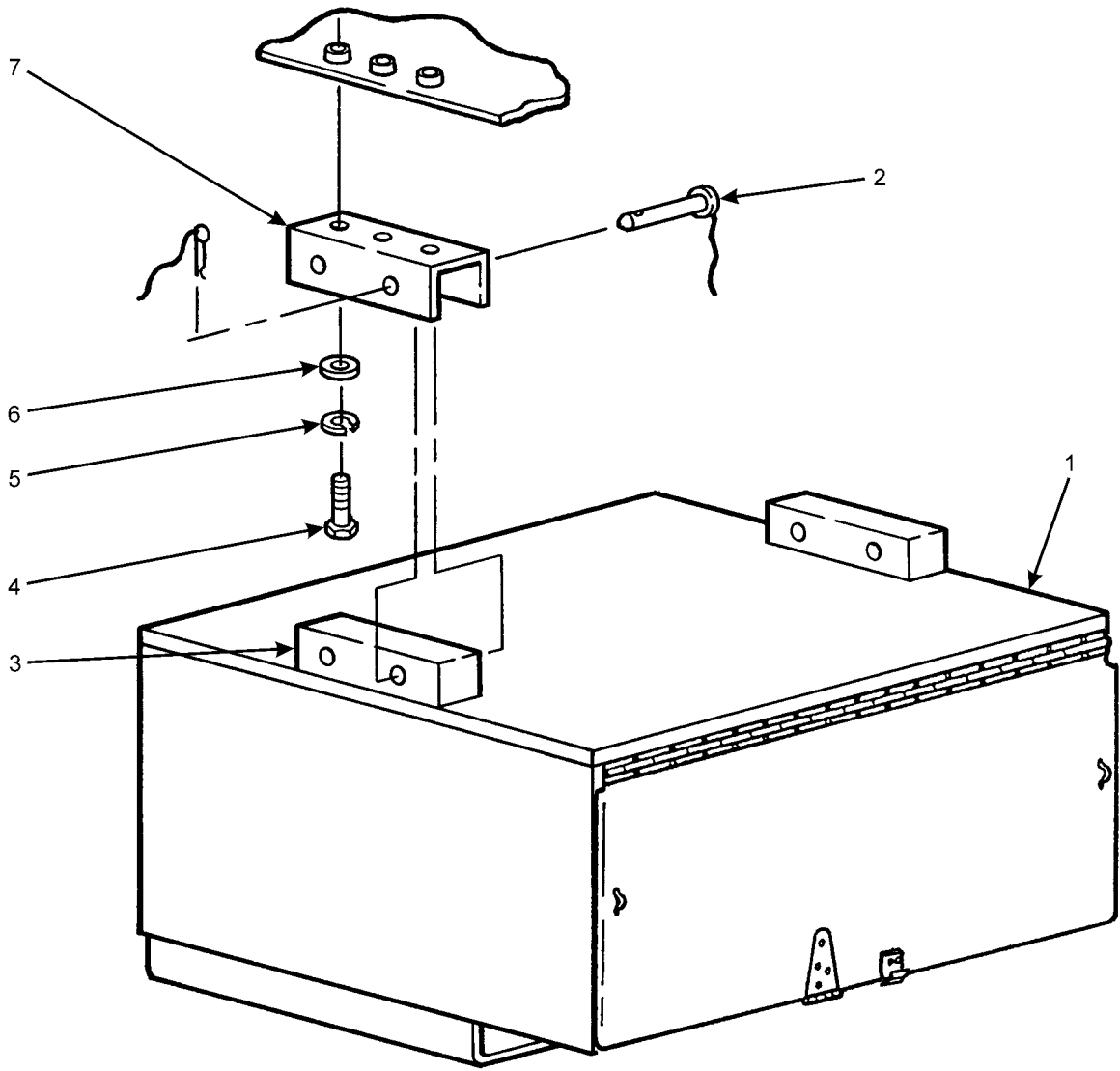
---

REMOVE

1. Remove Curbside Stowage Box. See Figure 4-52.
  - a. Empty stowage box (1) of contents before attempting removal.
  - b. Position one person on each end of stowage box (1) and have them apply upward pressure while a third individual removes two pins (2) securing stowage box hanger channel (3).
  - c. Remove stowage box (1).
2. Remove Stowage Box Hanger Channels.
  - a. Remove three screws (4), lockwashers (5), washers (6) and hanger channel (7). Discard lockwashers.

INSTALL

1. Install Stowage Box Hanger Channels. See Figure 4-52.
  - a. Position hanger channel (7) into position and secure with screw (4), lockwasher (5), and washer (6).
2. Install Curbside Stowage Box.
  - a. Place one person on each end of the stowage box (1) and lift box into position hanger channels (7).
  - b. Attach stowage box (1) to hanger channels (7) with pins (2) then, secure pins with safety pins.



MBPLA-4-56A

Figure 4-52. Curbside Stowage Box

#### 4-57. GFI INDICATING SWITCHES.

---

This task consists of:                      a. Remove                                      b. Install

---

##### **INITIAL SET-UP**

###### Tools Required

General Mechanics Tool Kit, (Appendix B, Section III, Item 1)

###### General Safety Instructions

**WARNING**

##### **ELECTRICAL SHOCK**

Before performing any maintenance actions on electrical equipment, ensure all electrical power has been turned off. Failure to comply with this warning may result in serious injury or death.

---

##### REMOVE

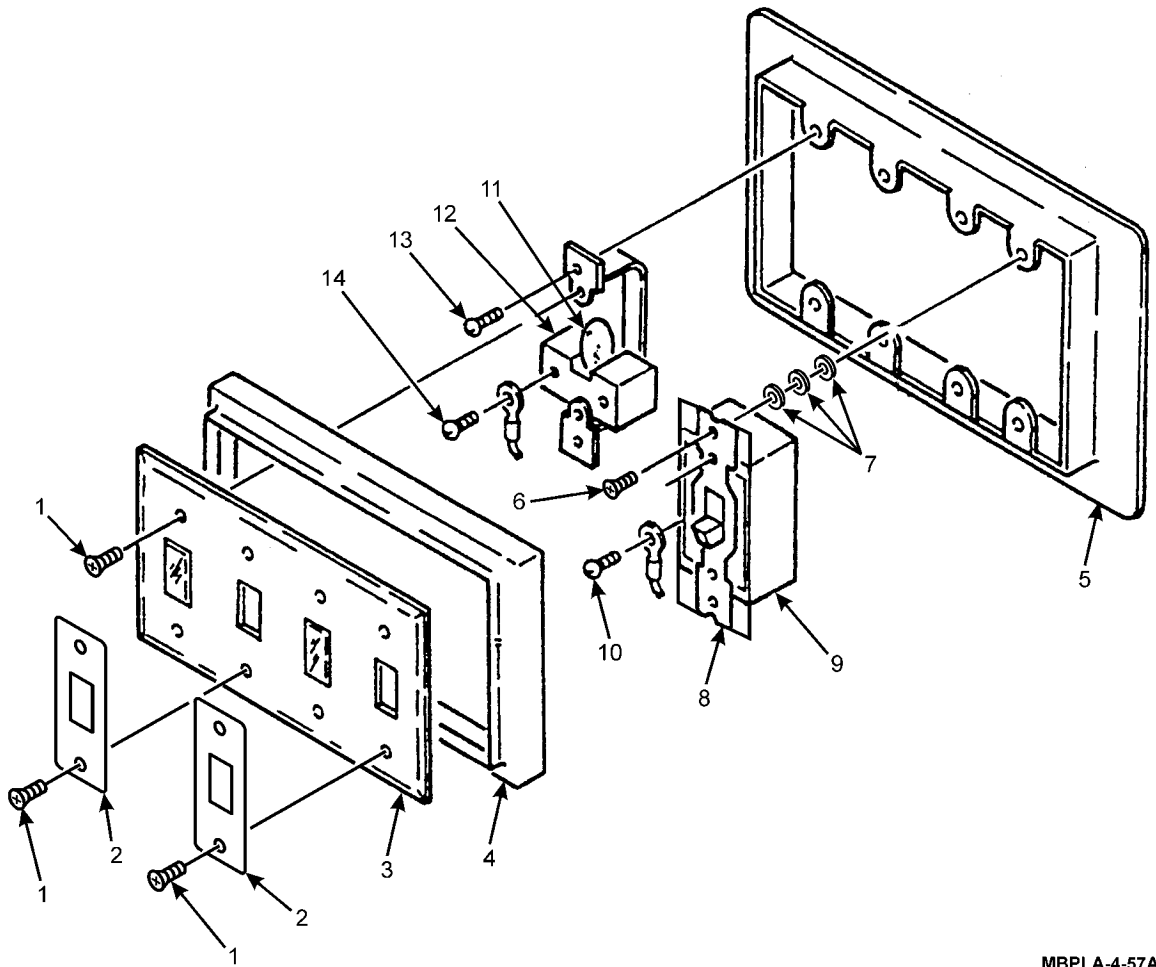
Remove GFI Indicating Switches. See Figure 4-53.

- a. Turn circuit breaker A15CB11 OFF in Power Panel No. 2.
- b. Remove eight screws (1), two covers (2), cover (3), and extender (4) from mounting plate (5).
- c. Remove two screws (6), six washers (7), and pull switch (8) forward from mounting plate (5).
- d. Remove insulating cover (9) from switch (8).
- e. Tag and disconnect electrical leads by removing two screws (10).
- f. Remove switch (8).
- g. Remove indicating light (11) by unscrewing from socket (12).
- h. Remove two screws (13).
- i. Tag and disconnect electrical leads by removing screws (14).
- j. Remove socket (12).

##### INSTALL

Install GFI Indicating Switches. See Figure 4-53.

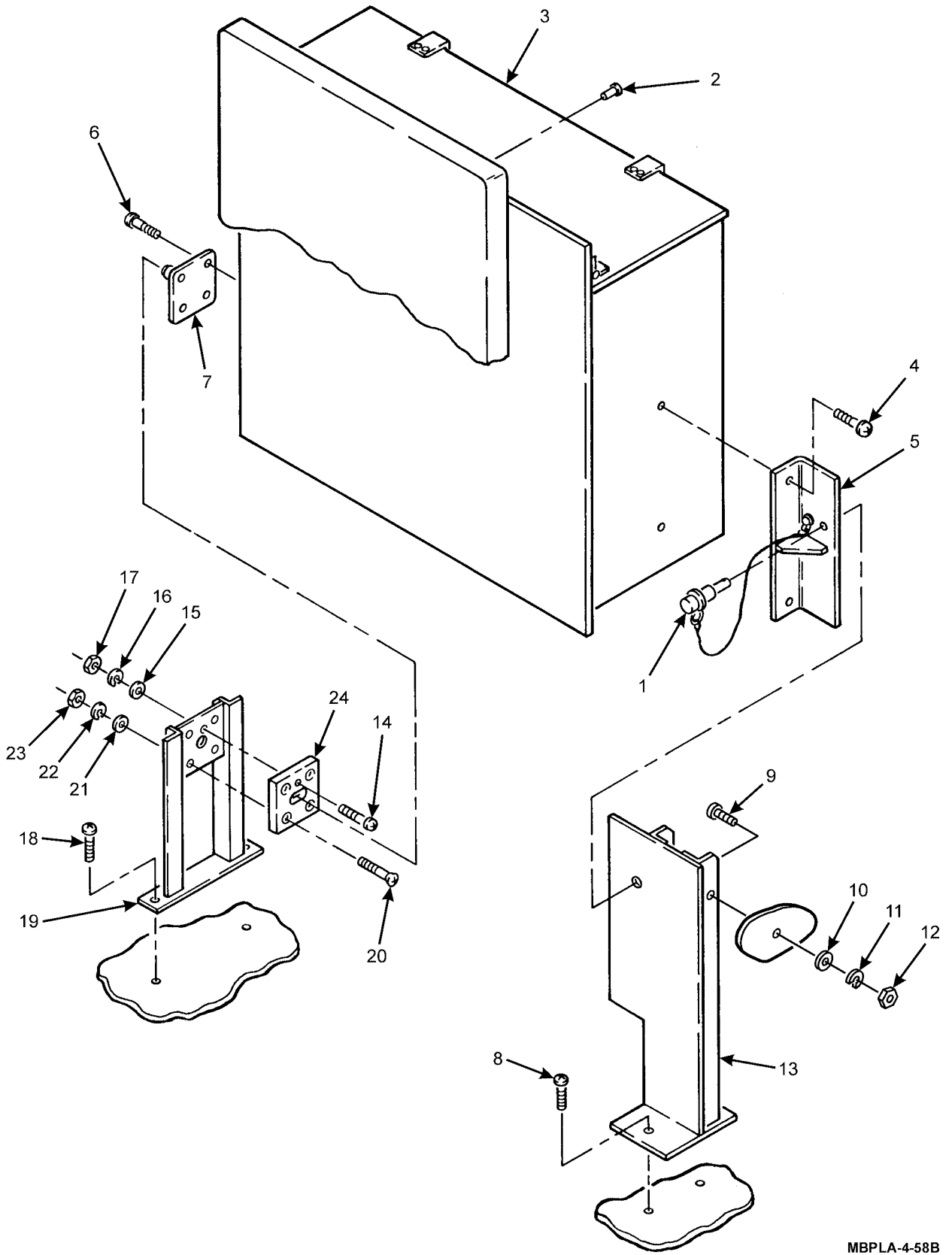
- a. Install socket (12) and secure with two screws (13).
- b. Connect electrical leads as tagged and secure with screws (14). Remove tags.
- c. Install indicating light (11).
- d. Connect electrical leads as tagged and secure with screws (10). Remove tags.
- e. Install insulating cover (9) around switch (8).
- f. Install switch (8) and secure with two screws (6) and six washers (7).
- g. Install extender (4), cover (3) two covers (2) and secure to mounting plate (5) with eight screws (1).
- h. Verify operation of GFI indicating switches.



MBPLA-4-57A

Figure 4-53. GFI Indicating Switches





MBPLA-4-58B

Figure 4-54. Thermometer Case

3. Install Thermometer Case.
  - a. Install pin support (7) and secure with four screws (6).
  - b. Install retaining bracket (5) and secure with two screws (4).
  - c. Install thermometer case (3) onto cabinet V and secure with eight rivets (2)
  - d. Close cabinet V and secure with quick release pin (1).

**4-59. OIL THIEF RACK.**


---

This task consists of:    a. Remove    b. Install

---

**INITIAL SET-UP**Tools Required

- General Mechanics Tool Kit, (Appendix B, Section III, Item 1)
- Portable Electric Drill, (Appendix B, Section III, Item 2)
- Twist Drill Set, (Appendix B, Section III, Item 2)
- Hand Blind Riveter, (Appendix B, Section III, Item 3)

Materials/Parts Required

Rivets, (6)

---

REMOVE

Remove Oil Thief Rack. See Figure 4-55.

- a. Remove two oil thief tubes (1).
- b. Remove four screws (2), washers (3), and oil thief rack (4).
- c. Remove three rivets (5) from each angle bracket (6) and remove angle bracket.

INSTALL

Install Oil Thief Rack. See Figure 4-55.

- a. Install angle bracket (6) and secure each angle bracket with three rivets (5).
- b. Install oil thief rack (4) and secure with four screws (2) and washers (3).
- c. Install two oil thief tubes (1).



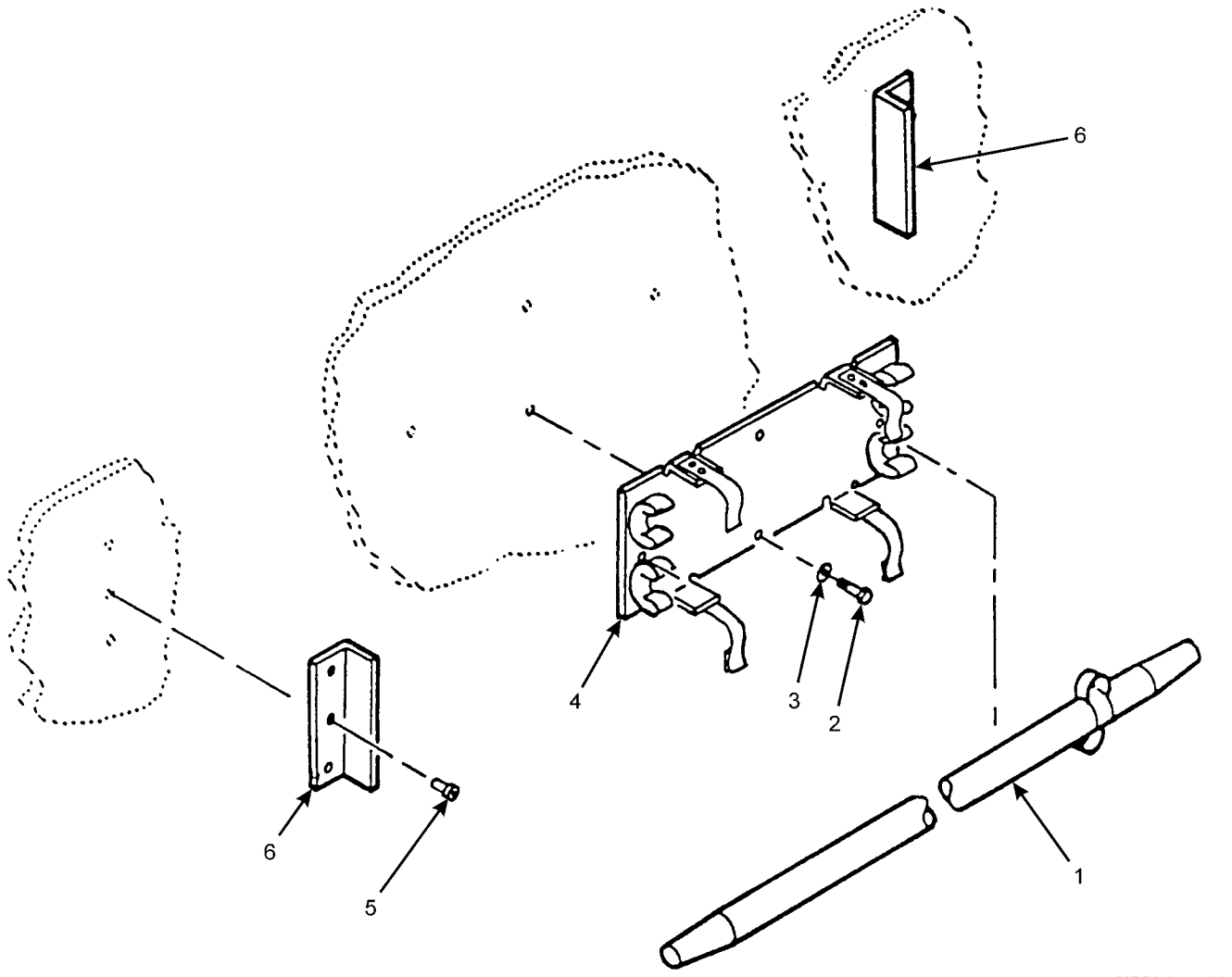


Figure 4-55. Oil Thief Rack

**4-60. DRYING RACK.**


---

This task consists of:    a. Remove    b. Install

---

**INITIAL SET-UP**Tools Required

General Mechanics Tool Kit, (Appendix B, Section III, Item 1)

Materials/Parts Required

Lockwashers, (2)

---

REMOVE

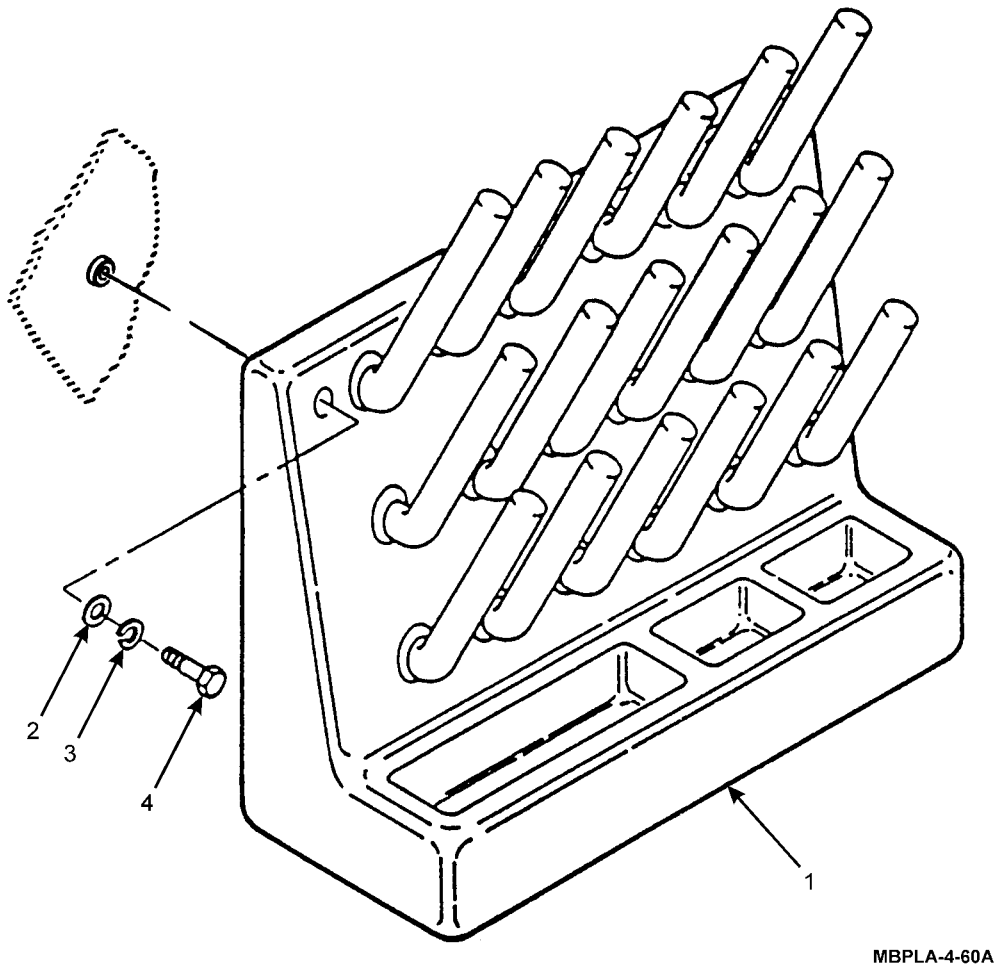
Remove Drying Rack. See Figure 4-56.

- a. Remove two screws (1), lockwashers (2), washers (3) and drying rack (4) from curbside wall. Discard lockwashers.

INSTALL

Install Drying Rack. See Figure 4-56.

- a. Install drying rack (4) onto curbside wall and secure with two screws (1), lockwashers (2), and washers (3).



MBPLA-4-60A

Figure 4-56. Drying Rack

**4-61. JERRY JUG SHELF.**


---

This task consists of:	a. Remove	b. Install
------------------------	-----------	------------

---

**INITIAL SET-UP**Tools Required

General Mechanics Tool Kit, (Appendix B, Section III, Item 1)

Tools Required

Lockwashers (10)

---

**REMOVE**

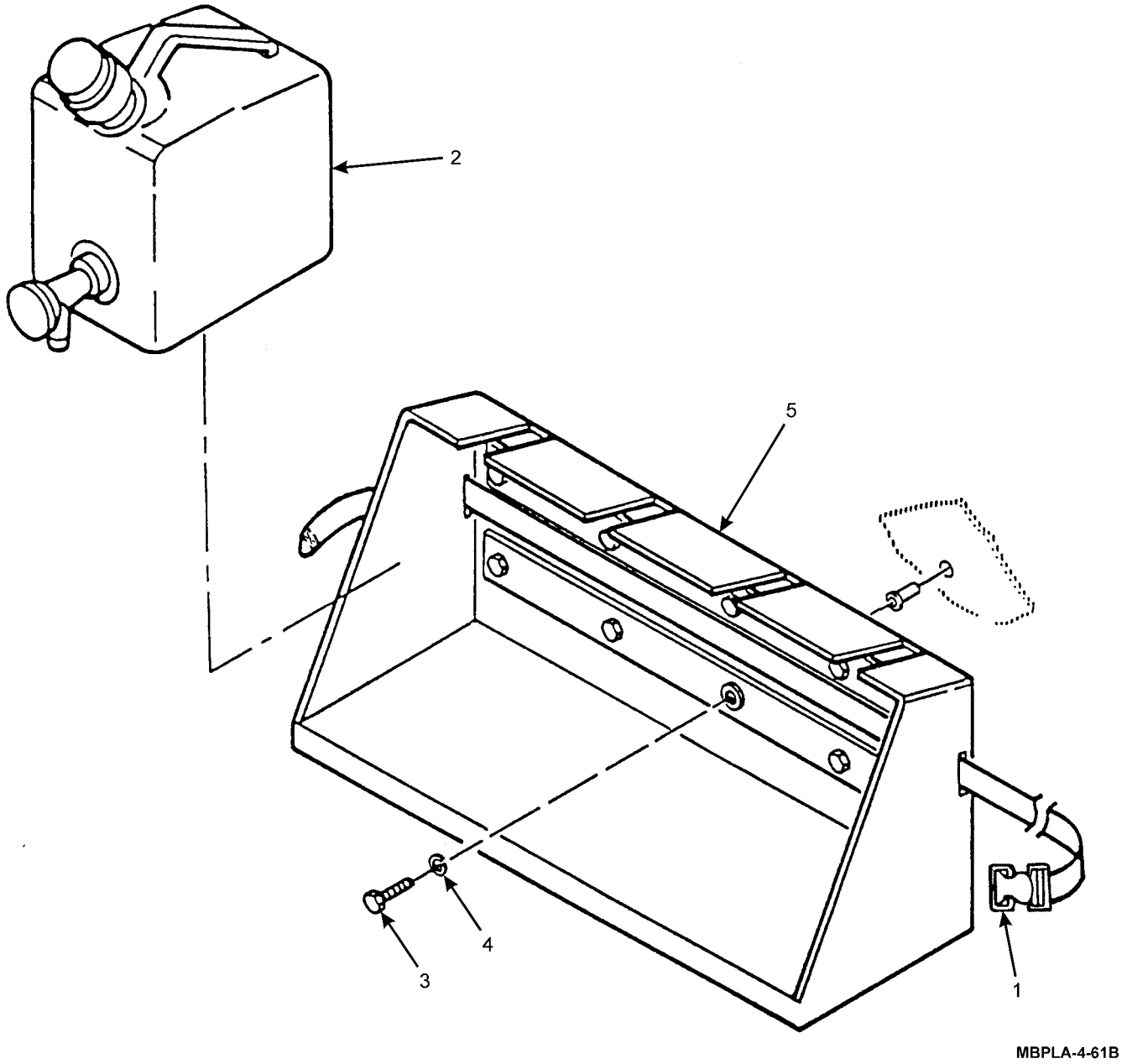
Remove Jerry Jug Shelf. See Figure 4-57.

- a. Unhook strap (1) and remove four jerry jugs (2).
- b. Remove ten screws (3), lockwashers (4) and jerry jug shelf (5). Discard lockwashers.

**INSTALL**

Install Jerry Jug Shelf. See Figure 4-57.

- a. Install jerry jug shelf (5) and secure with ten screws (3) and lockwashers (4).
- b. Install four jerry jugs (2) and secure with strap (1).



MBPLA-4-61B

Figure 4-57. Jerry Jug Shelf

**4-62. SEPAROMETER SHELF.**

---

This task consists of:	a. Remove	b. Install
------------------------	-----------	------------

---

**INITIAL SET-UP**

Tools Required

- General Mechanics Tool Kit, (Appendix B, Section III, Item 1)
- Portable Electric Drill, (Appendix B, Section III, Item 2)
- Twist Drill Set, (Appendix B, Section III, Item 2)
- Hand Blind Riveter, (Appendix B, Section III, Item 3)

Materials/Parts Required

- Rivets, (10)
- 

REMOVE

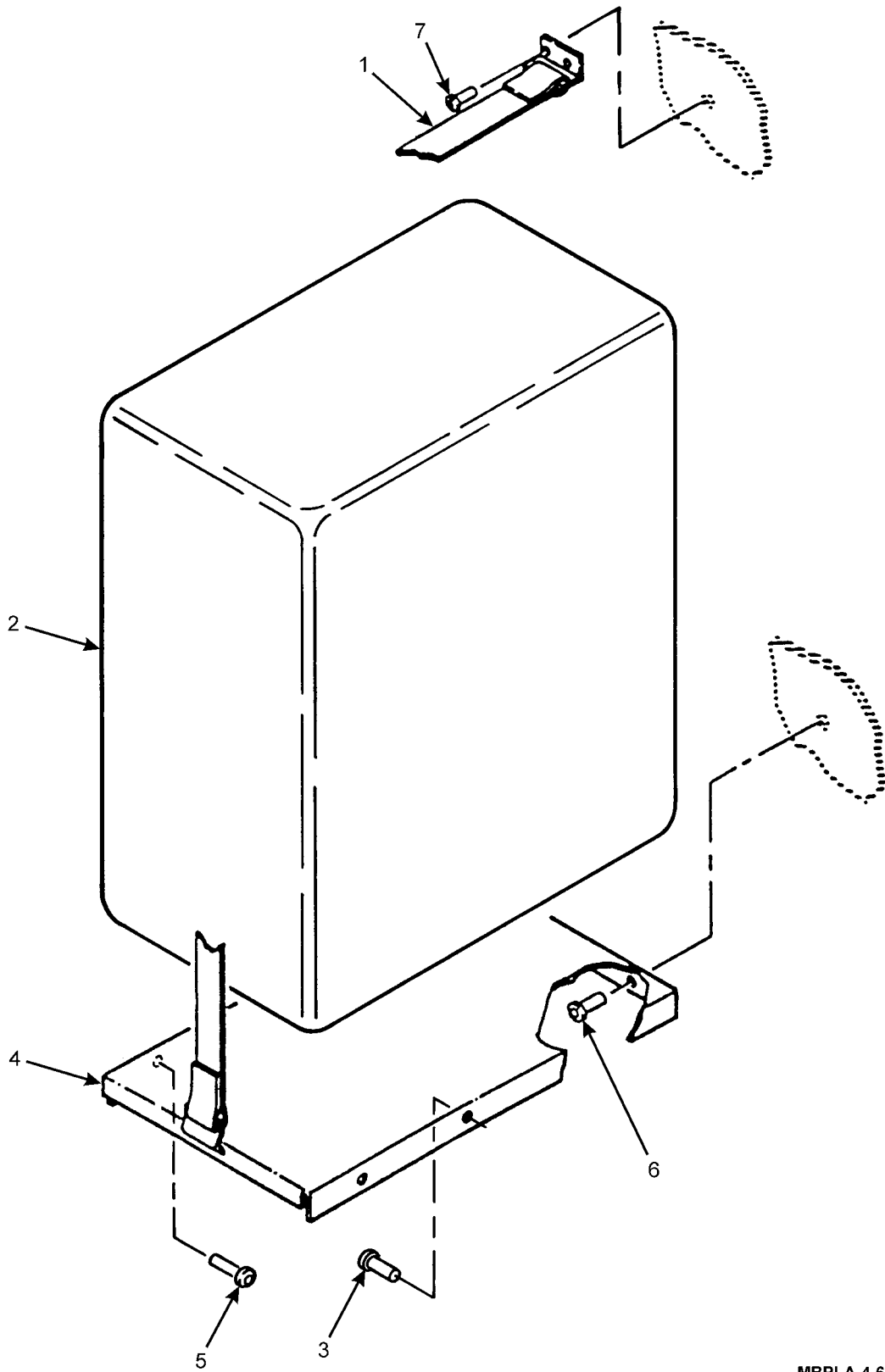
Remove Separometer Shelf. See Figure 4-58.

- a. Loosen strap (1) and remove separometer (2).
- b. Remove three rivets (3) securing separometer shelf (4) to locker.
- c. Remove three rivets (5) securing separometer shelf (4) to cylinder storage cabinet.
- d. Remove two rivets (6) securing separometer shelf (4) to laboratory roadside wall.
- e. Remove two rivets (7) and strap (1).

INSTALL

Install Separometer Shelf. See Figure 4-58.

- a. Install strap (1) and secure with two rivets (7).
- b. Install separometer shelf (4) onto roadside wall and secure with two rivets (6).
- c. Secure separometer shelf (4) onto cylinder storage cabinet with three rivets (5).
- d. Secure separometer shelf (4) onto locker with three rivets (3).
- e. Install separometer (2) and secure with strap (1).



MBPLA-4-62A

Figure 4-58. Separometer Shelf

**4-63. DE-ICE KIT BRACKET.**

---

This task consists of:	a. Remove	b. Install
------------------------	-----------	------------

---

**INITIAL SET-UP**

Tools Required

General Mechanics Tool Kit, (Appendix B, Section III, Item 1)

Materials/Parts Required

Lockwashers, (1)

---

REMOVE

Remove De-Ice Kit Bracket. See Figure 4-59.

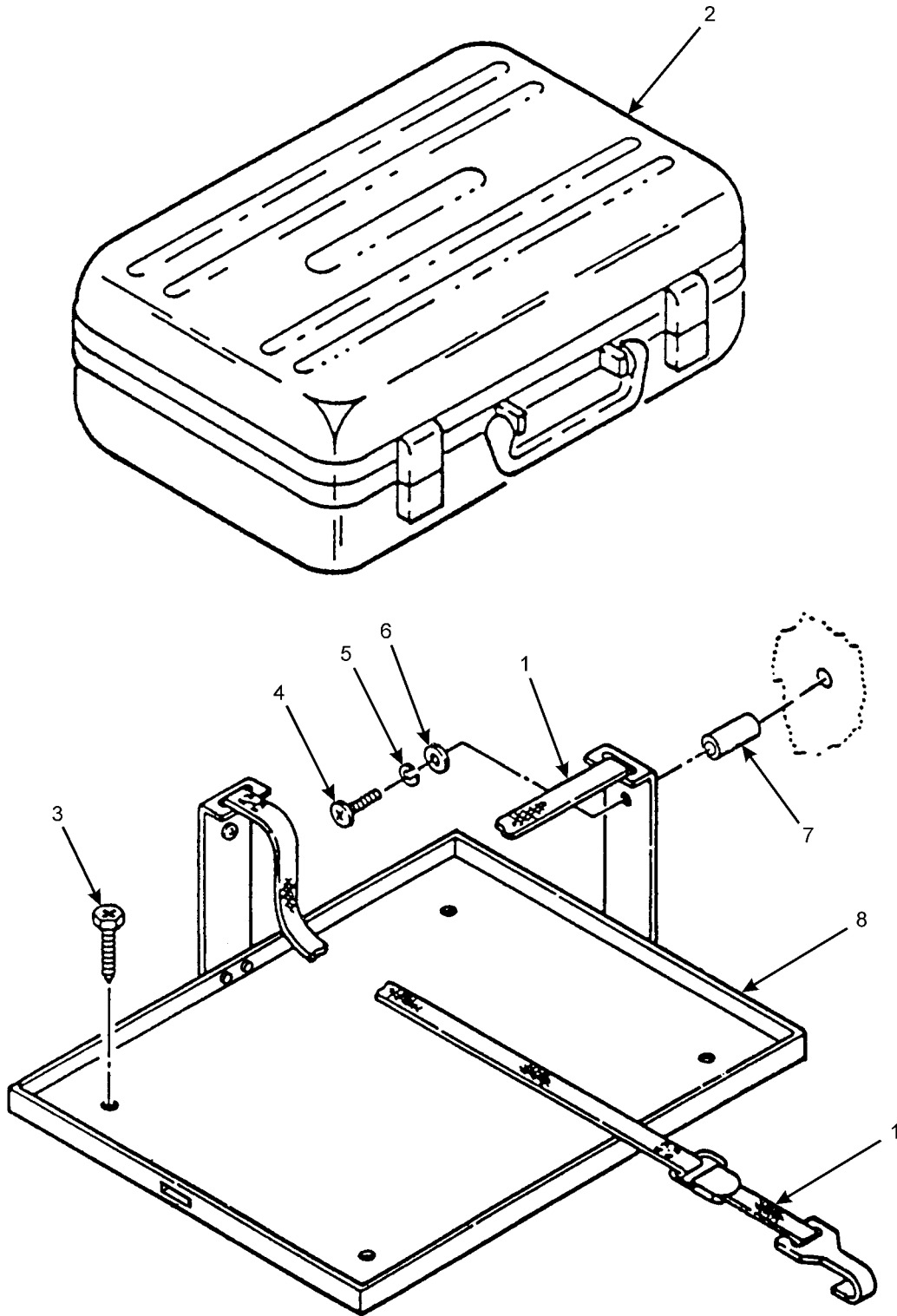
- a. Loosen two straps (1) and remove De-Ice Kit (2).
- b. Remove four screws (3), screw (4), lockwasher (5), washer (6), spacer (7), and De-Ice Kit Bracket (8). Discard Lockwasher.

INSTALL

Install De-Ice Kit Bracket. See Figure 4-59.

- a. Install De-Ice Kit Bracket (8) and secure with four screws (3), screw (4), lockwasher (5), washer (6), and spacer (7).
- b. Install De-Ice Kit (2) and secure with two straps (1).





MBPLA-4-63A

Figure 4-59. De-Ice Kit Bracket

**4-64. GAS CYLINDER RACK.**


---

This task consists of:                      a. Remove                                      b. Install

---

**INITIAL SET-UP**Tools Required

General Mechanics Tool Kit, (Appendix B, Section III, Item 1)

Equipment Condition

Gas Cylinders and Gas Regulators Valves Removed (Paragraph 4-53)

Materials/Parts Required

Lockwashers, (35)

---

REMOVE

Remove Gas Cylinder Rack. See Figure 4-60.

- a. Remove five screws (1) securing each slide (2) to plate (3) and remove gas cylinder rack. Repeat step for remaining gas cylinder rack.
- b. Remove four screws (4), washers (5), and plate (3) from cabinet.
- c. Remove ten screws (6) from each slide (2) and remove slide.

**NOTE**

Perform steps b, c and e thru o for right gas cylinder rack and steps d thru o for left gas cylinder rack.

- d. Remove two screws (7), washers (8), nuts (9) and angle bracket (10).
- e. Remove two screws (11), screws (12), four washers (13), nuts (14), and top cylinder brace (15).
- f. Remove two screws (11), screws (12), four washers (13), nuts (14), angle bracket (10) and top cylinder brace (15).
- g. Remove four screws (12), washers (13), nuts (14), and bottom cylinder brace (15). Repeat step for remaining bottom cylinder brace.
- h. Remove two screws (16) lockwashers (17), washers (18) and top handle (19). Discard lockwashers.
- i. Remove two screws (20), lockwashers (21), and bottom handle (19). Discard lockwashers.
- j. Remove two screws (22), washers (23), lockwashers (24), nuts (25), and top catch (26). Discard lockwashers.
- k. Remove two screws (27), washers (28), lockwashers (29), nuts (30), and bottom catch (31). Discard lockwashers.
- l. Remove two screws (32), washers (33), lockwashers (34), nuts (35) and bracket (36). Discard lockwashers.
- m. Remove four screws (37), and locking bar keeper (38). Repeat step for remaining three keepers.
- n. Remove screw (39), lockwasher (40), washer (41), and locking bar (42). Discard lockwashers. Repeat step for remaining locking bar.
- o. Remove six screws (43), lockwashers (44), washers (45), and latch (46). Discard lockwashers. Repeat step for remaining latch.

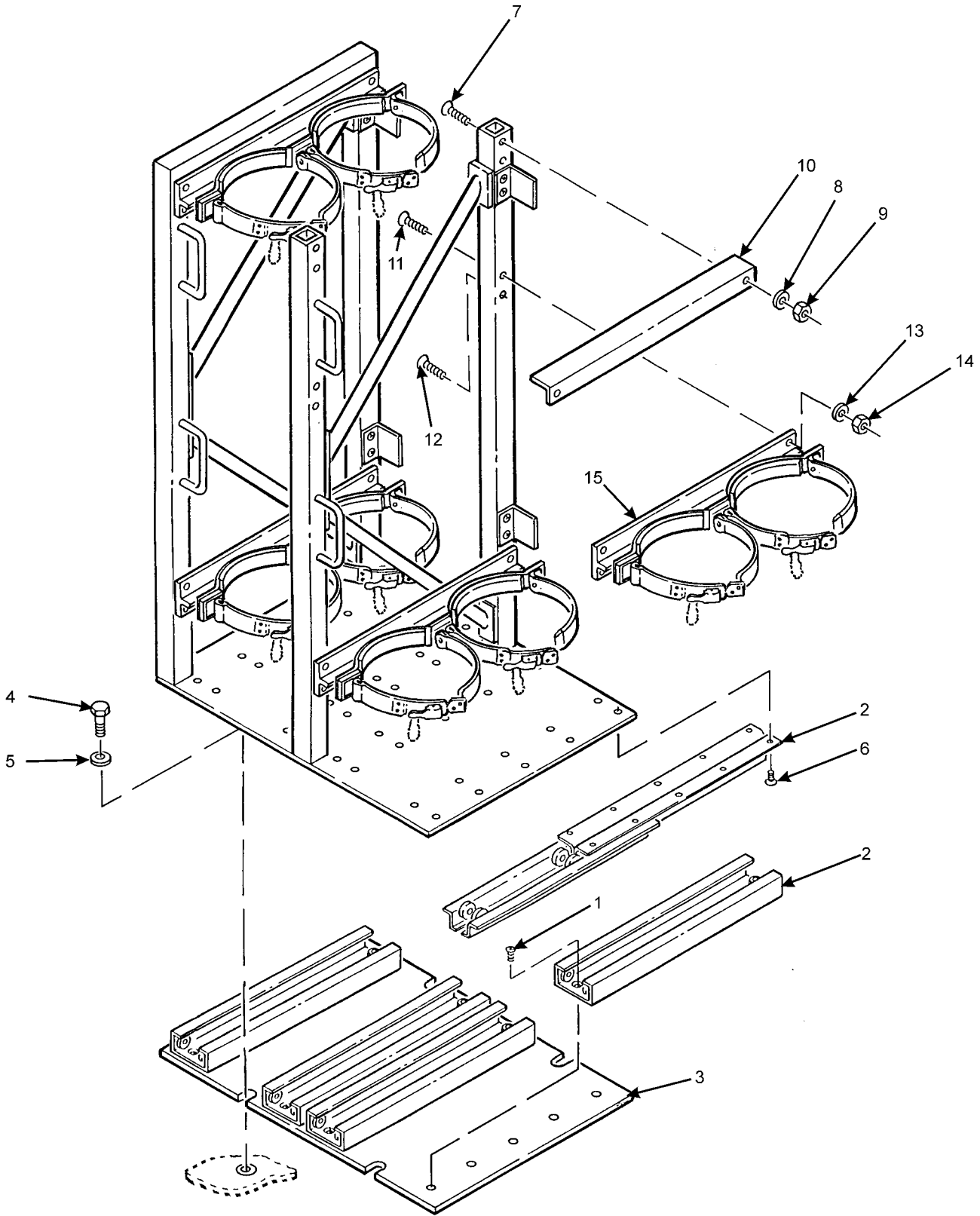
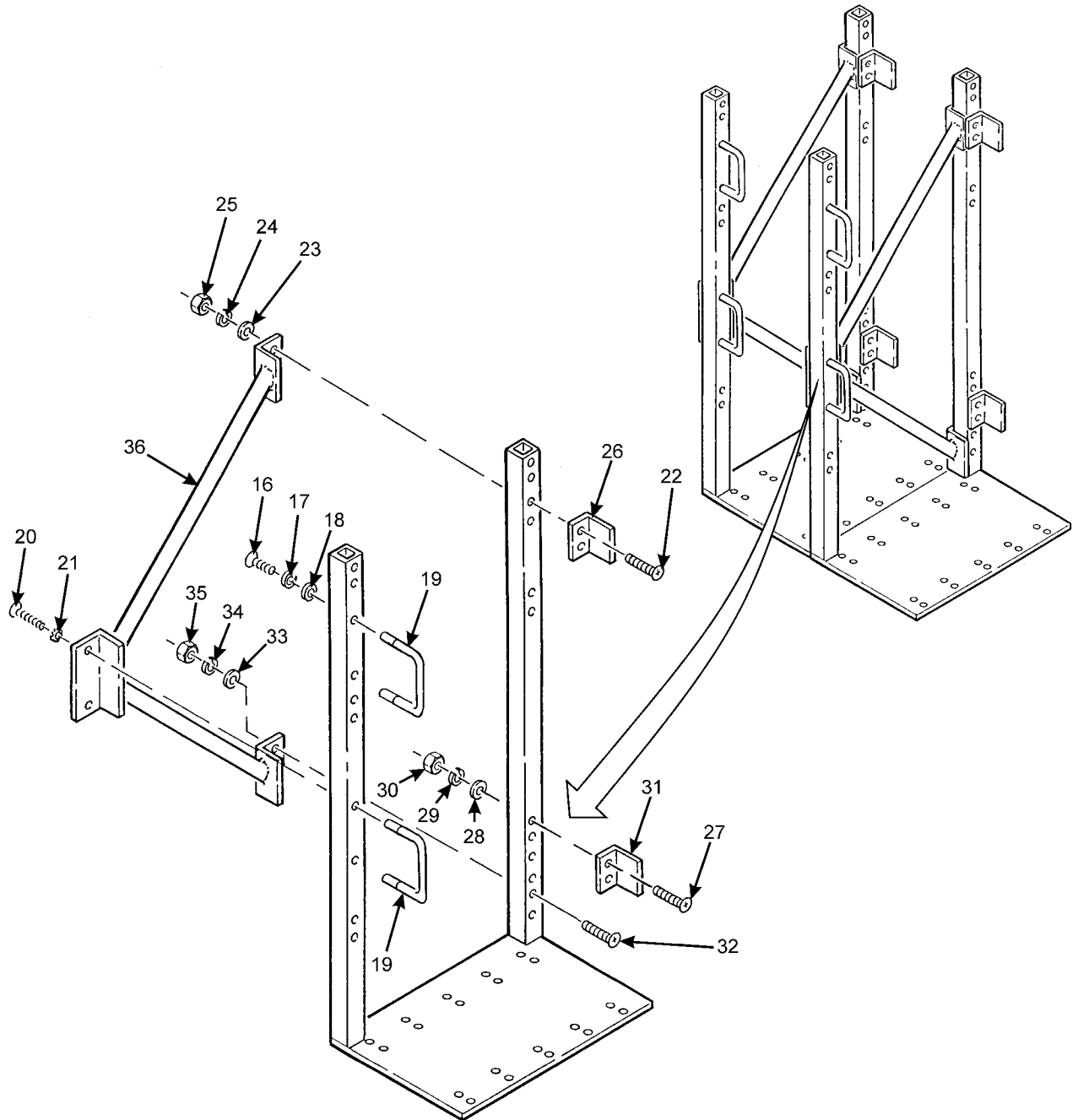


Figure 4-60. Gas Cylinder Rack (Sheet 1 of 3)

MBPLA-4-64-1A



MBPLA-4-64-2A

Figure 4-60. Gas Cylinder Rack (Sheet 2 of 3)

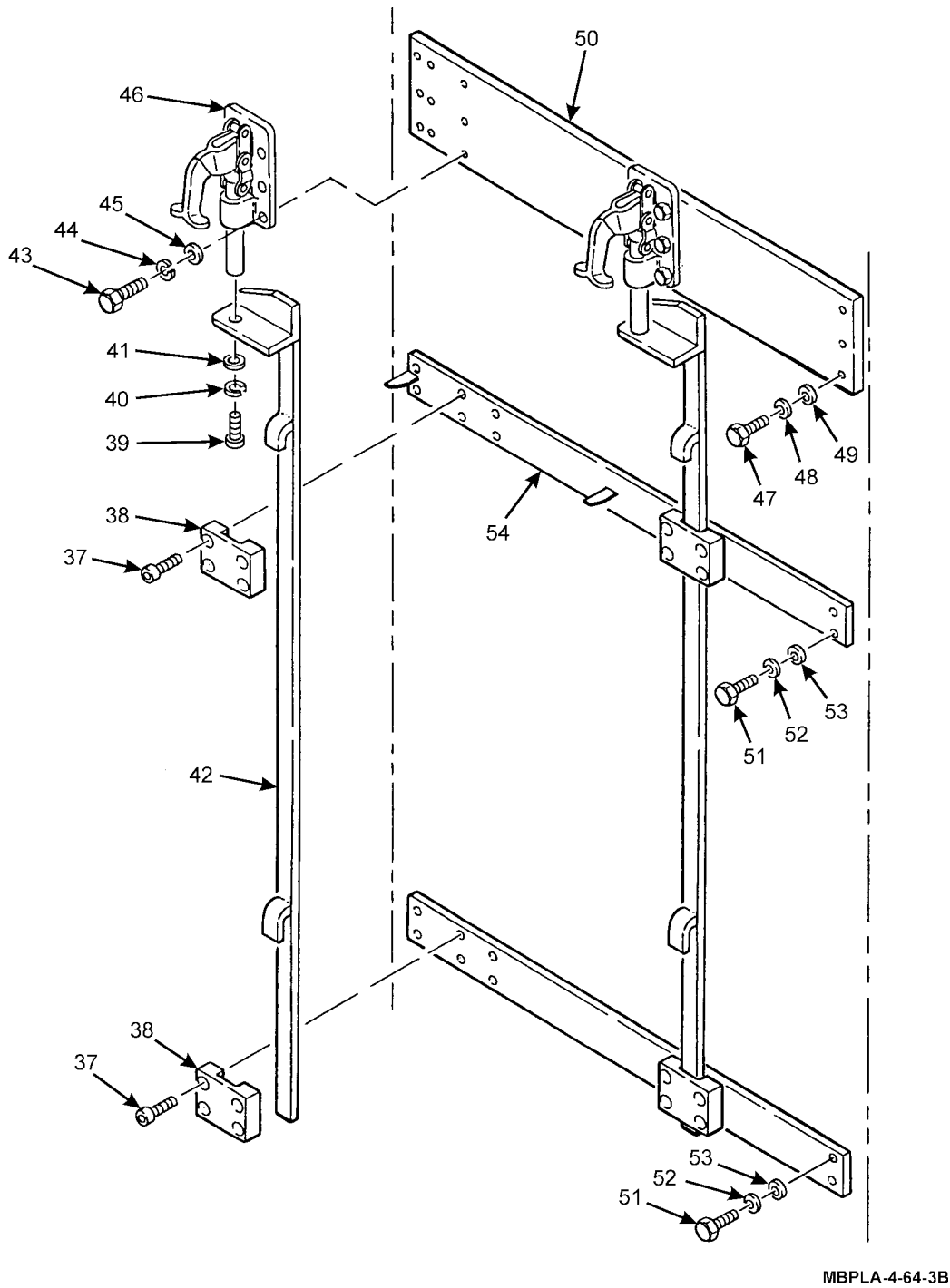


Figure 4-60. Gas Cylinder Rack (Sheet 3 of 3)

- p. Remove six screws (47), lockwashers (48), washers (49), and top plate (50). Discard lockwashers.
- q. Remove four screws (51), lockwashers (52), washers (53), and center keeper (54). Discard lockwashers. Repeat step for bottom keeper.

### INSTALL

Install Gas Cylinder Rack. See Figure 4-60.

- a. Install center keeper (54) and secure with four screws (51), lockwashers (52), and washers (53). Repeat step for bottom keeper.
- b. Install top plate (50) and secure with six screws (47), lockwashers (48), and washers (49).
- c. Install latch (46) and secure with six screws (43), lockwashers (44), and washers (45). Repeat step for remaining latch.
- d. Install locking bar and secure with screw (39), lockwasher (40), and washer (41). Repeat step for remaining locking bar.
- e. Install locking bar keeper (38) and secure with four screws (37). Repeat step for remaining three keepers.
- f. Install bracket (36) and secure with two screws (32), washers (33), lockwashers (34), and nuts (35).
- g. Install bottom catch (31) and secure with two screws (27), washers (28), lockwashers (29), and nuts (30).
- h. Install top catch (26) and secure with two screws (22), washers (23), lockwashers (24), and nuts (25).
- i. Install bottom handle (19) and secure with two screws (20) and lockwashers (21).
- j. Install top handle and secure with two screws (16) lockwashers (17) and washers (18).
- k. Install bottom cylinder brace (15) and secure with four screws (12), washers (13), and nuts (14). Repeat step for remaining bottom cylinder brace.

### **NOTE**

Perform steps l, n and o for left gas cylinder rack and steps m thru o for right gas cylinder rack.

- l. Install top cylinder brace (15) and secure with two screws (11), screws (12), four washers (13), nuts (14), and angle (10).
- m. Install top cylinder brace (15) and secure with two screws (11), screws (12), four washers (13), and nuts (14).
- n. Install angle (10) and secure with two screws (7), washers (8), and nuts (9).
- o. Install slide (2) and secure with ten screws (6).
- p. Install plate (3) into cabinet and secure with four screws (4), and washers (5).
- q. Install gas cylinder rack and secure each slide with five screws (1). Repeat step for remaining gas cylinder rack.

#### 4-65. GAS CYLINDER STORAGE CABINET.

---

This task consists of:                      a. Remove                                      b. Install

---

##### INITIAL SET-UP

###### Tools Required

- General Mechanics Tool Kit, (Appendix B, Section III, Item 1)
- Portable Electric Drill, (Appendix B, Section III, Item 2)
- Twist Drill Set, (Appendix B, Section III, Item 2)
- Hand Blind Riveter, (Appendix B, Section III, Item 3)

###### Equipment Condition

- Gas Cylinders and Gas Regulators Valves Removed (Paragraph 4-53)
- De-Ice Kit Bracket Removed (Paragraph 4-63)
- Gas Cylinder Rack Removed (Paragraph 4-64)

###### Materials/Parts Required

- Lockwashers, (13)
  - Rivets, (68)
- 

##### REMOVE

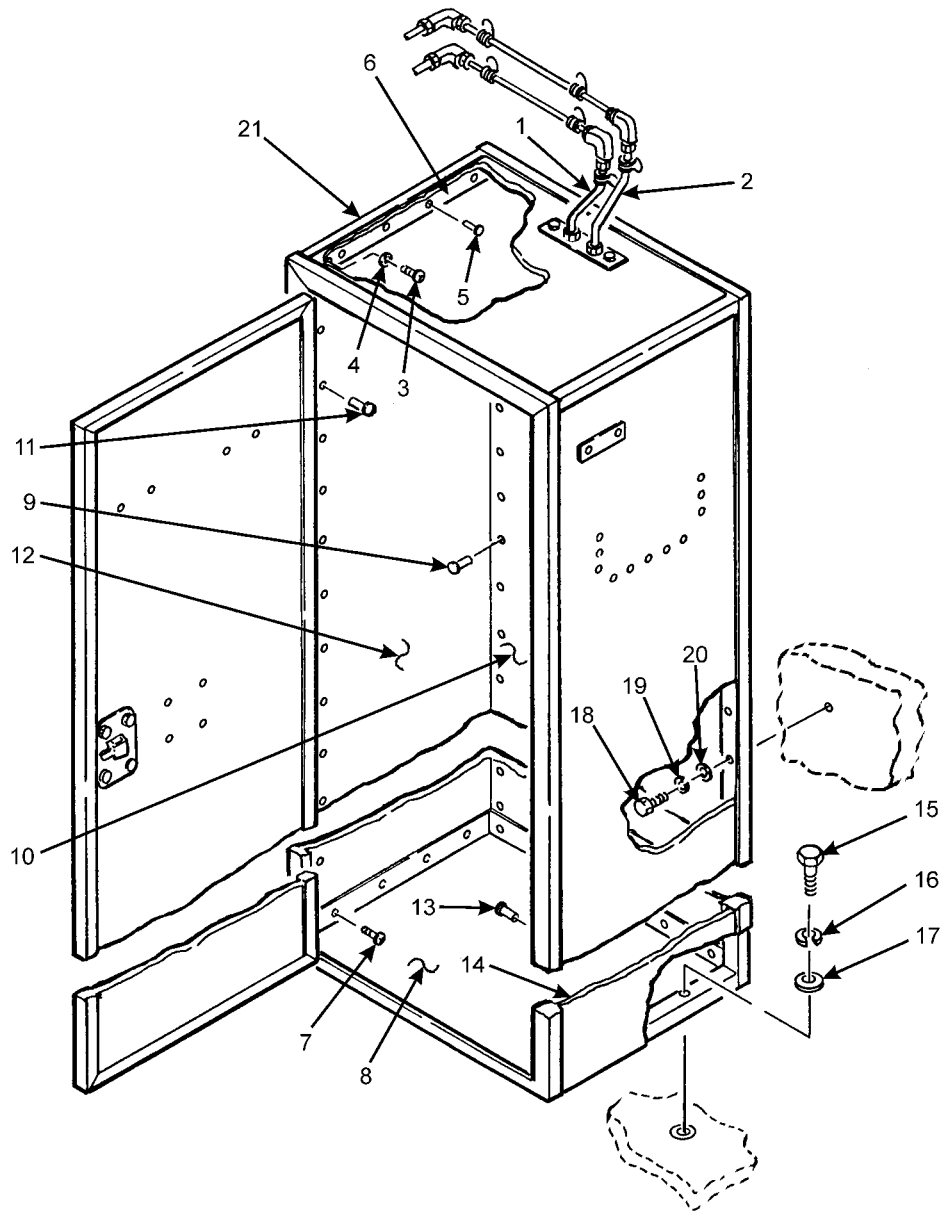
Remove Gas Cylinder Storage Cabinet. See Figure 4-61.

- a. Disconnect nitrogen (1) and oxygen (2) lines.
- b. Remove seven screws (3), lockwashers (4) 13 rivets (5) and top inside panel (6). Discard lockwashers.
- c. Remove 13 rivets (7) and bottom inside panel (8).
- d. Remove 20 rivets (9) and back panel (10).
- e. Remove 11 rivets (11) and left inside panel (12).
- f. Remove 11 rivets (13) and right inside panel (14).
- g. Remove two screws (15), lockwashers (16), and washers (17). Discard lockwashers.
- h. Remove four screws (18), lockwashers (19), washers (20) and cabinet (21). Discard lockwashers.

##### INSTALL

Install Gas Cylinder Rack. See Figure 4-61.

- a. Install cabinet (21) and secure to streetside wall with four screws (18), lockwashers (19), and washers (20).
- b. Install two screws (15), lockwashers (16), and washers (17) securing cabinet (21) to floor.
- c. Install right inside panel (14) and secure with 11 rivets (13).
- d. Install left inside panel (12) and secure with 11 rivets (11).
- e. Install back panel (10) and secure with 20 rivets (9).
- f. Install bottom inside panel (8) and secure with 13 rivets (7).
- g. Install top inside panel (6) and secure with 13 rivets (5), seven screws (3) and lockwashers (4).
- h. Connect nitrogen (1) and oxygen (2) lines.



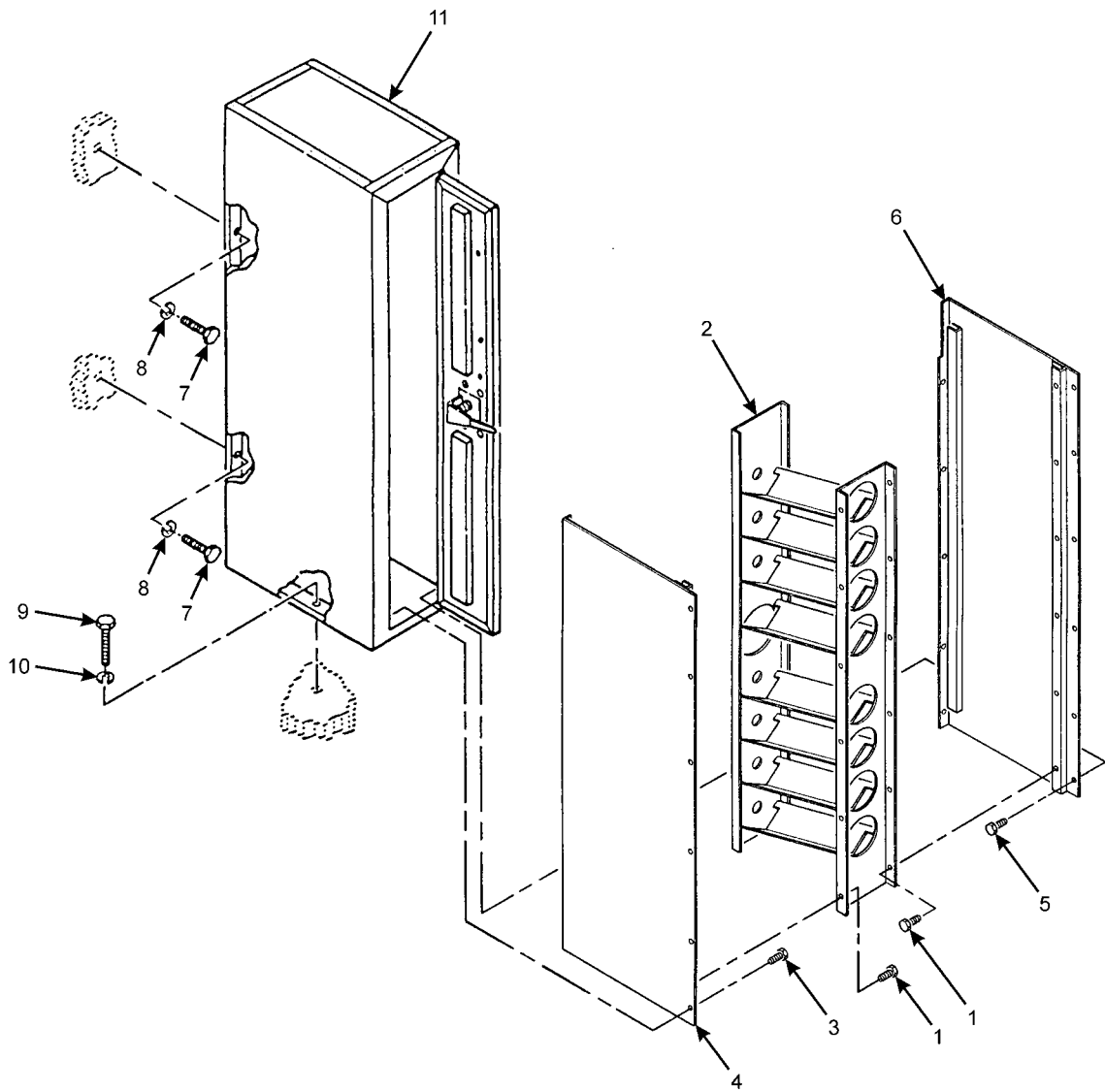
MBPLA-4-65A

Figure 4-61. Gas Cylinder Storage Cabinet



- i. Install De-Ice Kit Bracket. (Paragraph 4-63)
- j. Install Gas Cylinder Rack. (Paragraph 4-64)
- k. Install Gas Cylinders and Gas Regulators Valves. (Paragraph 4-53)

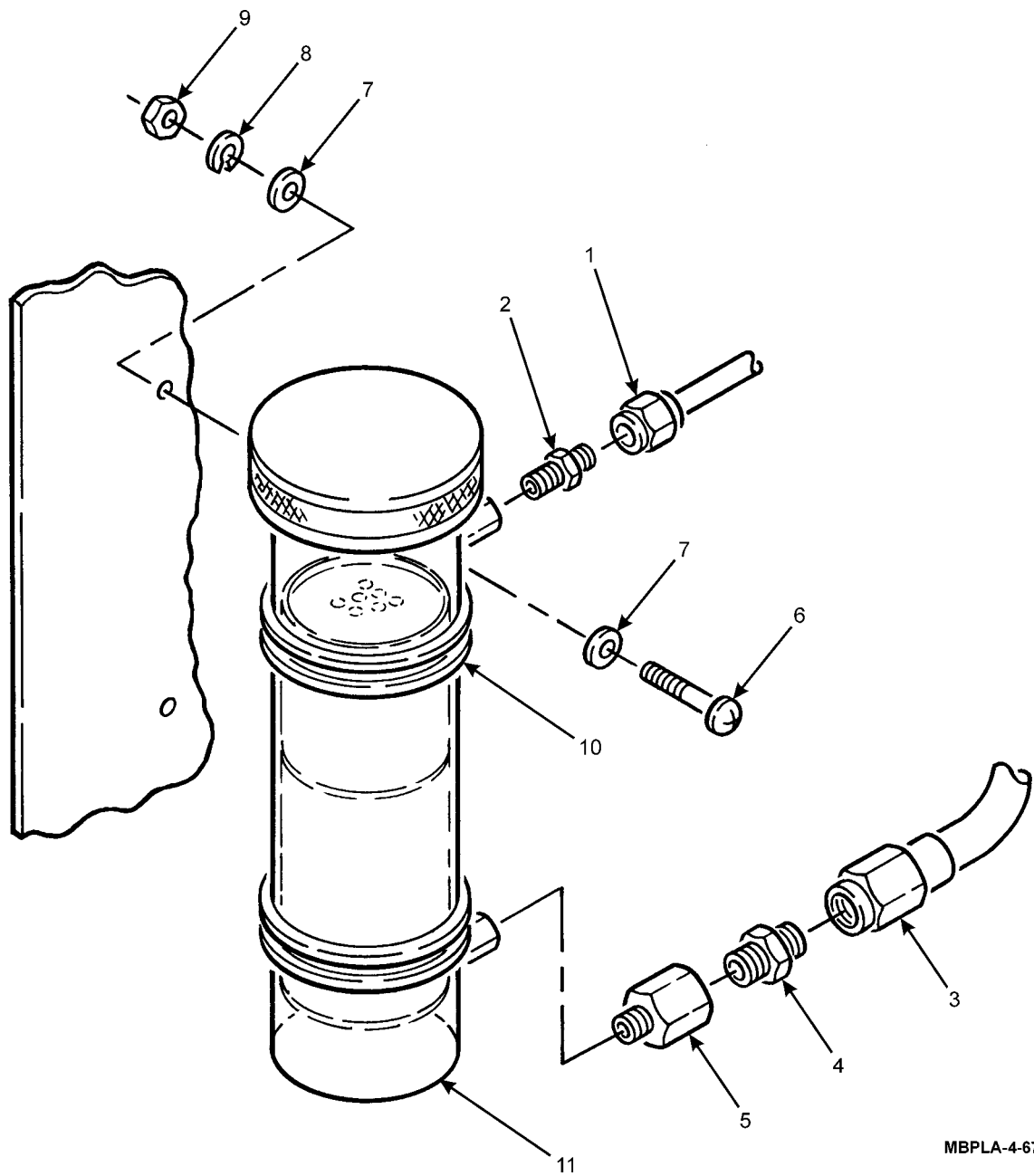




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Figure 4-62. Propane Cylinder Storage Cabinet

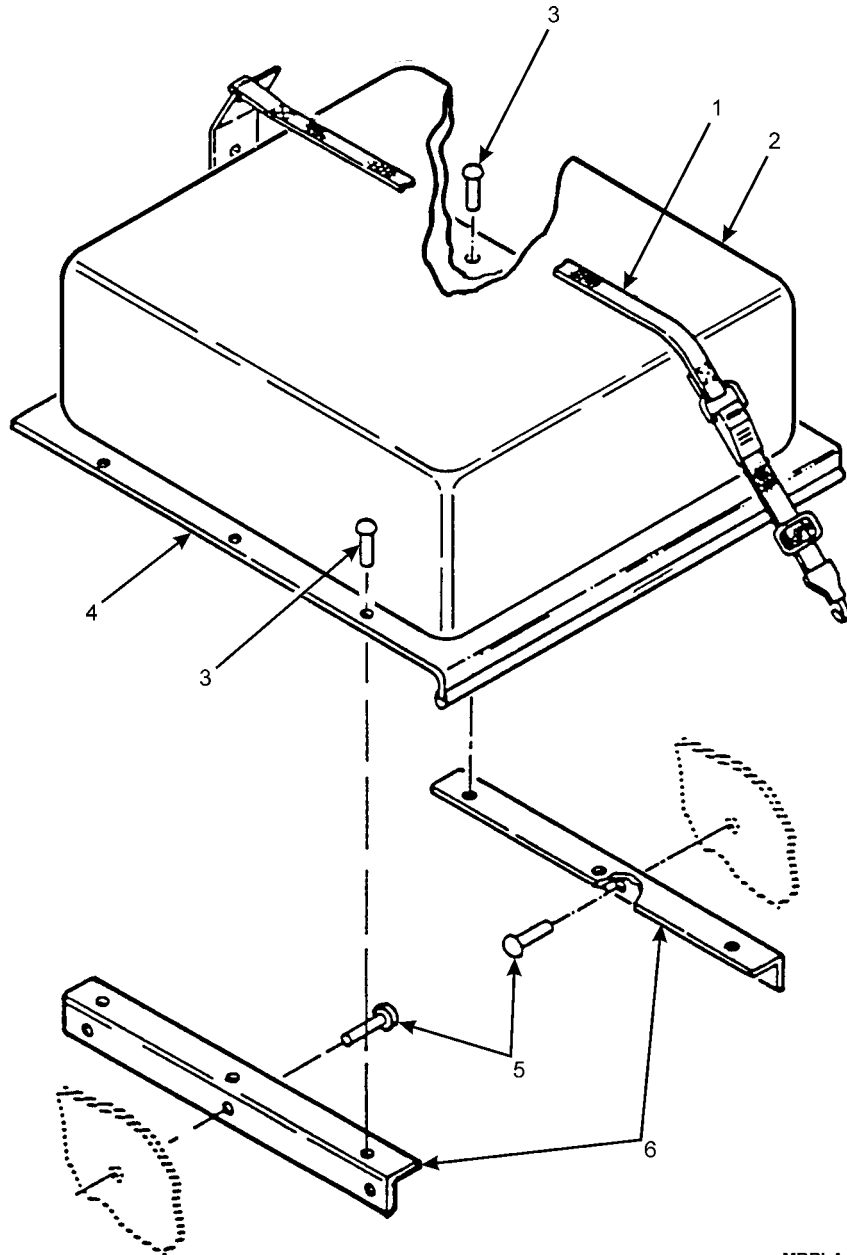




MBPLA-4-67B

Figure 4-63. Air-Gas Drying Apparatus





MBPLA-4-68A

Figure 4-64. Typewriter Shelf

**4-69. FLASHLIGHT, FIRE EXTINGUISHER, FIRST AID KIT, BURN KIT, AND BRACKETS.**


---

This task consists of:

a. Remove

b. Install

---

**INITIAL SET-UP**Tools Required

General Mechanics Tool Kit, (Appendix B, Section III, Item 1)  
 Portable Electric Drill, (Appendix B, Section III, Item 2)  
 Twist Drill Set, (Appendix B, Section III, Item 2)  
 Hand Blind Riveter, (Appendix B, Section III, Item 3)

Materials/Parts Required

Lockwashers, (8)  
 Rivets, (7)

---

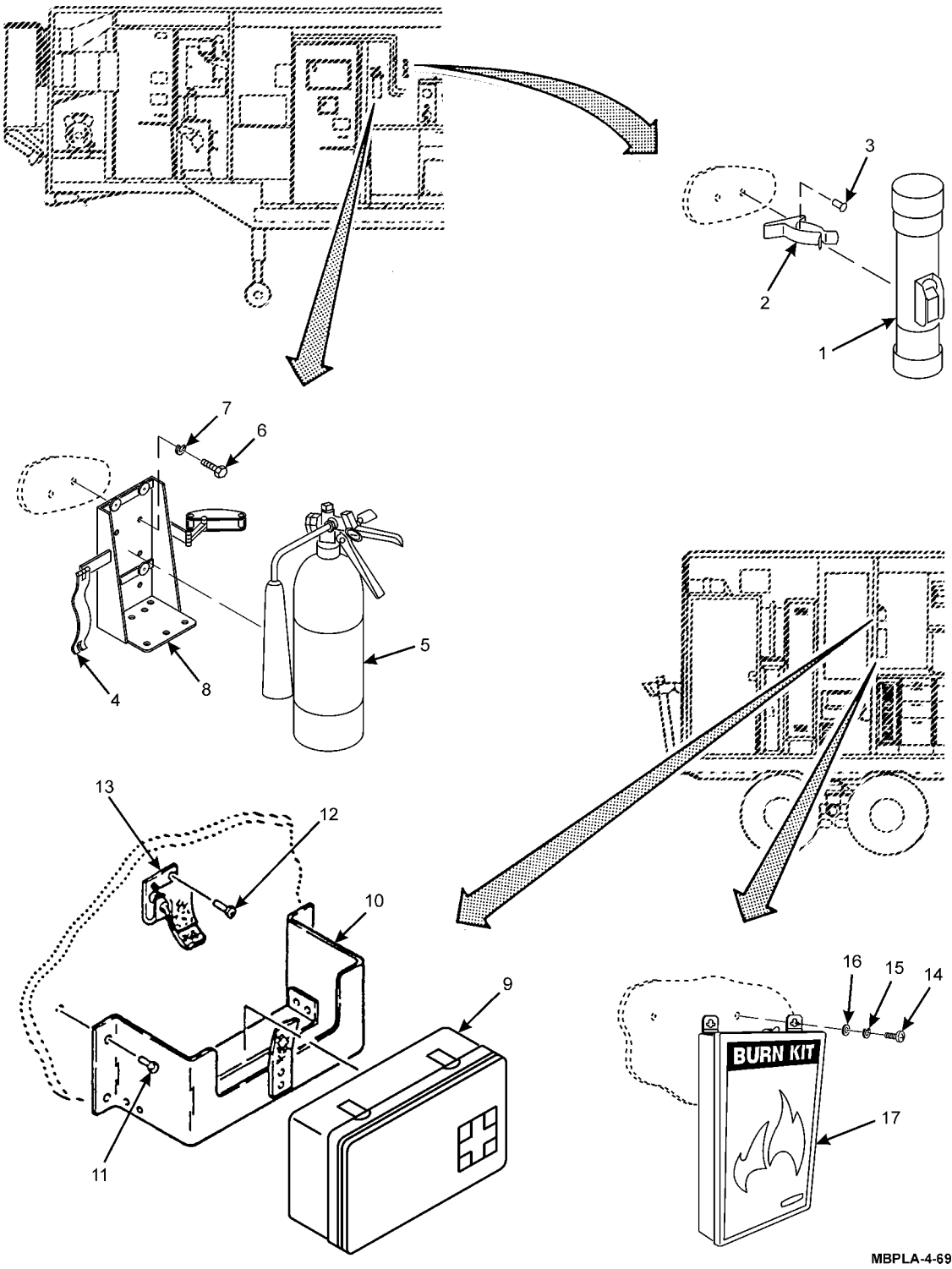
REMOVE

1. Remove Flash Light Bracket. See Figure 4-65.
  - a. Remove flashlight (1) from flashlight bracket (2).
  - b. Remove rivet (3) and flashlight bracket (2).
2. Remove Fire Extinguisher Bracket.
  - a. Open fire extinguisher latch (4) and remove fire extinguisher (5).
  - b. Remove six screws (6) lockwashers (7) and fire extinguisher bracket (8). Discard lockwashers.
3. Remove First Aid Bracket.
  - a. Remove first aid kit (9) from first aid bracket (10).
  - b. Remove four rivets (11) and first aid bracket (10).
  - c. Remove two rivets (12) and strap (13).
4. Remove Burn Kit.
  - a. Remove two screws (14), lockwashers (15), washers (16), and burn kit (17). Discard lockwashers.

INSTALL

1. Install Flash Light Bracket. See Figure 4-65.
  - a. Install flashlight bracket (2) and secure with rivet (3).
  - b. Install flashlight (1) into flashlight bracket (2).
2. Install Fire Extinguisher Bracket.
  - a. Install fire extinguisher bracket (8) and secure with six screws (6) and lockwashers (7).
  - b. Install fire extinguisher (5) and secure with fire extinguisher latch (4).



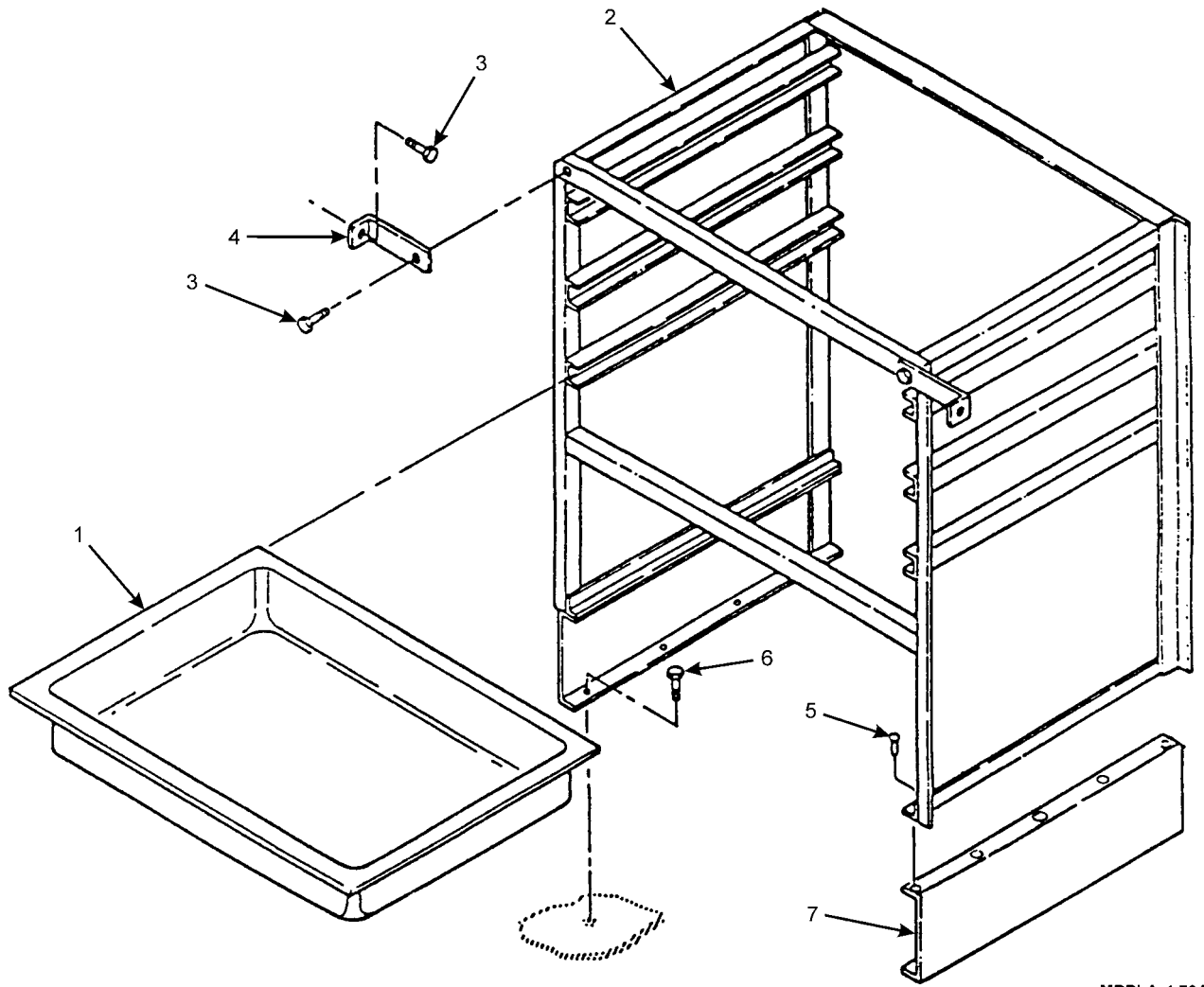


MBPLA-4-69A

Figure 4-65. Flashlight, Fire Extinguisher, First Aid Kit, Burn Kit, and Brackets

3. Install First Aid Bracket.
  - a. Install strap (13) and secure with two rivets (12).
  - b. Install first aid bracket (10) and secure with four rivets (11).
  - c. Install first aid kit (9) into first aid bracket (10).
4. Install Burn Kit.
  - a. Install burn kit (17) and secure with two screws (14), lockwashers (15), and washers (16).

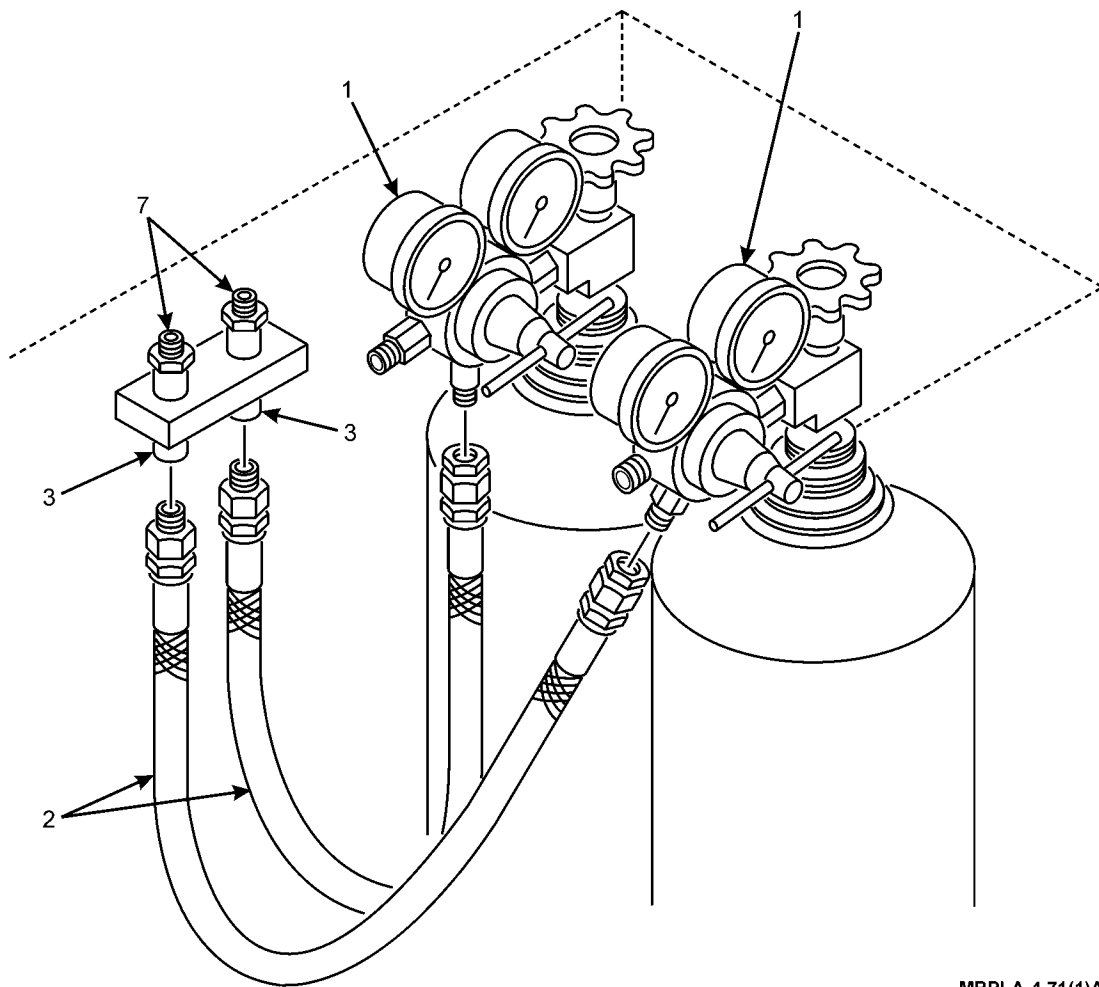




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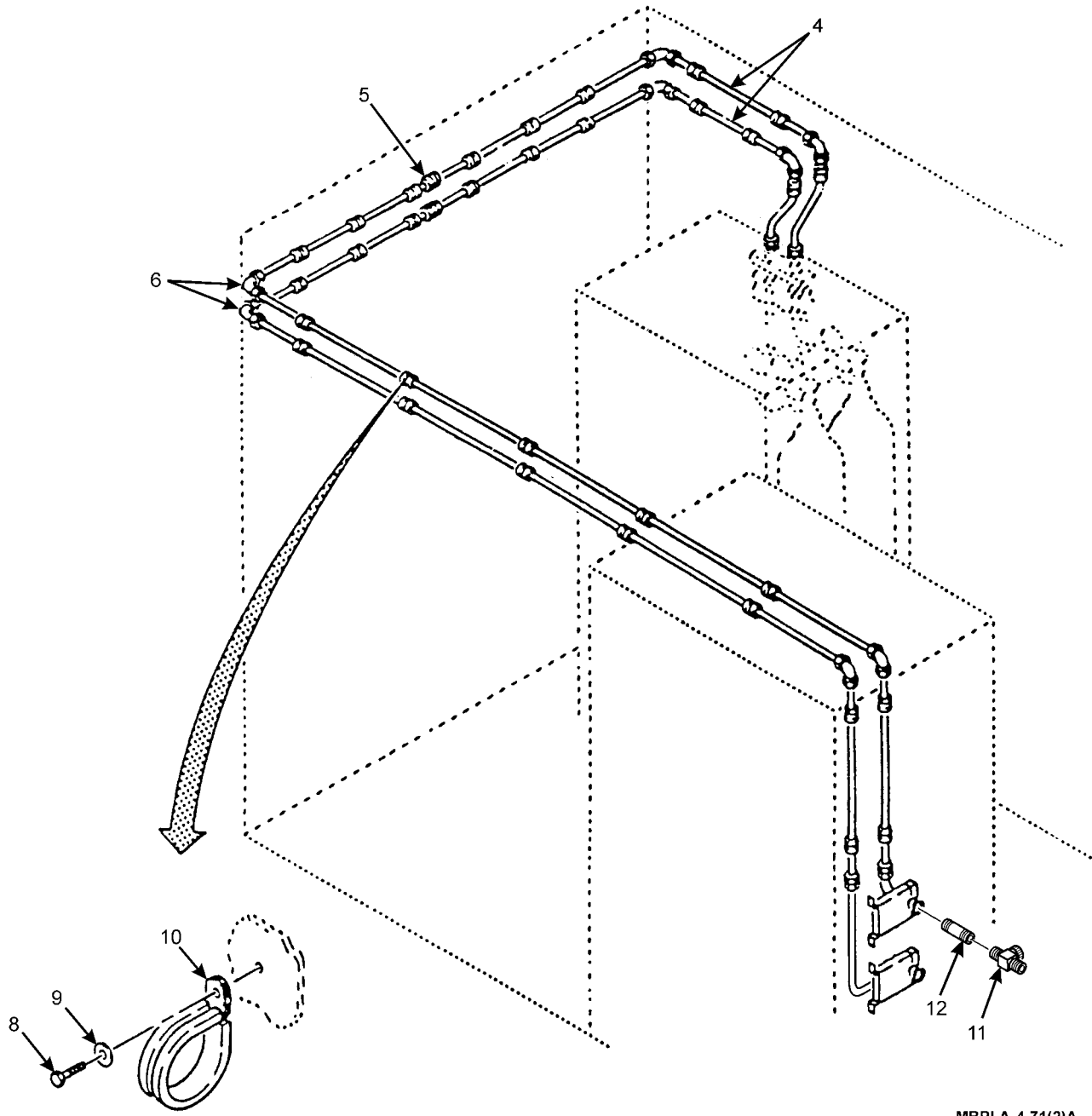
Figure 4-66. Tray Rack





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Figure 4-67. Oxygen and Nitrogen Gas Supply Lines (Sheet 1 of 2)



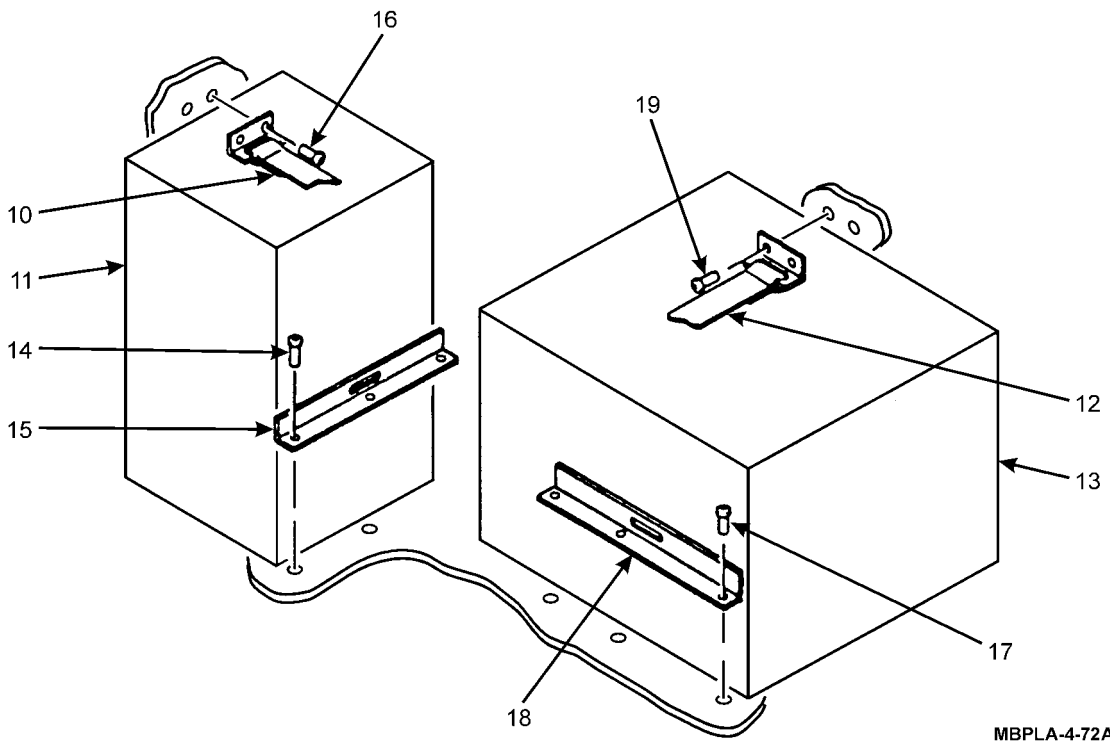
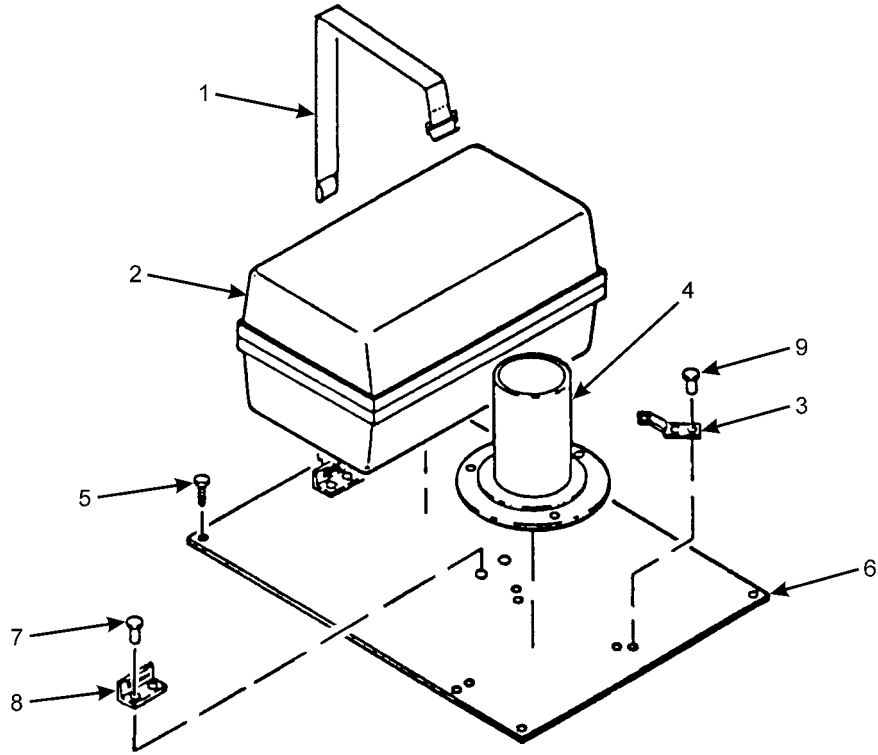
MBPLA-4-71(2)A

Figure 4-67. Oxygen and Nitrogen Gas Supply Lines (Sheet 2 of 2)

3. Install Oxygen and Nitrogen Supply Hoses.
  - a. Apply teflon tape on male fittings. Be sure to wrap teflon tape in same direction of pipe thread.
  - b. Connect oxygen and nitrogen supply hoses (2) to pipe nipple (3).
  - c. Connect oxygen and nitrogen supply hoses (2) to gas cylinder discharge valve (1).
  - d. Open gas cylinder discharge valve (1).
  - e. Run an operational test to check oxygen and nitrogen supply lines.
  - f. Close gas cylinder cabinet door.







MBPLA-4-72A

Figure 4-68. Gas Alarm Kit, Sampling Kit, Flashpoint Tester, and Brackets

2. Install Sampling Kit, Flashpoint Tester and Brackets.
  - a. Install strap (12) and secure with two rivets (19).
  - b. Install bracket (18) and secure with three rivets (17).
  - c. Install strap (10) and secure with two rivets (16).
  - d. Install bracket (15) and secure with three rivets (14).
  - e. Install flashpoint tester (13) and tighten strap (12).
  - f. Install sampling kit (11) and tighten strap (10).



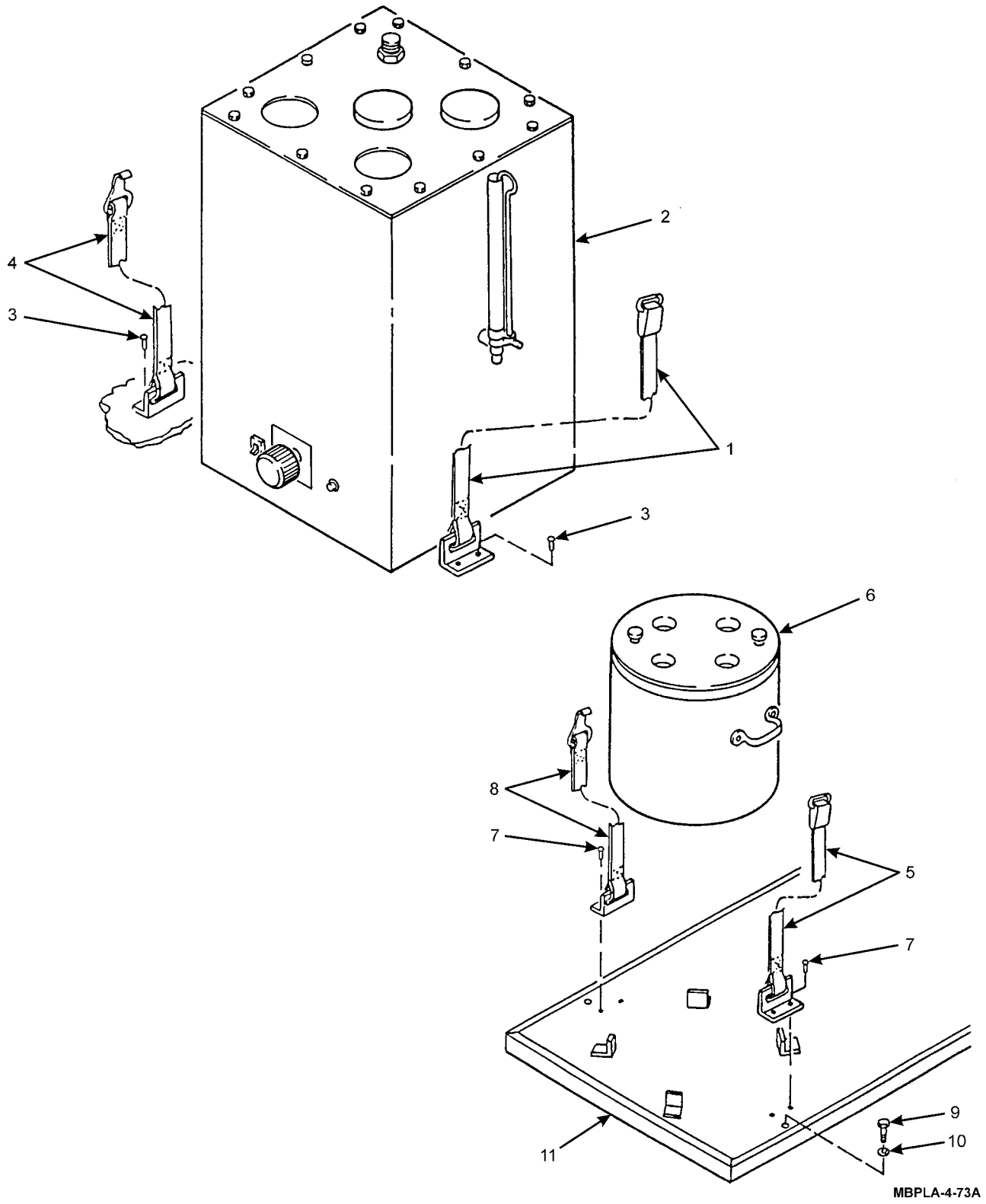
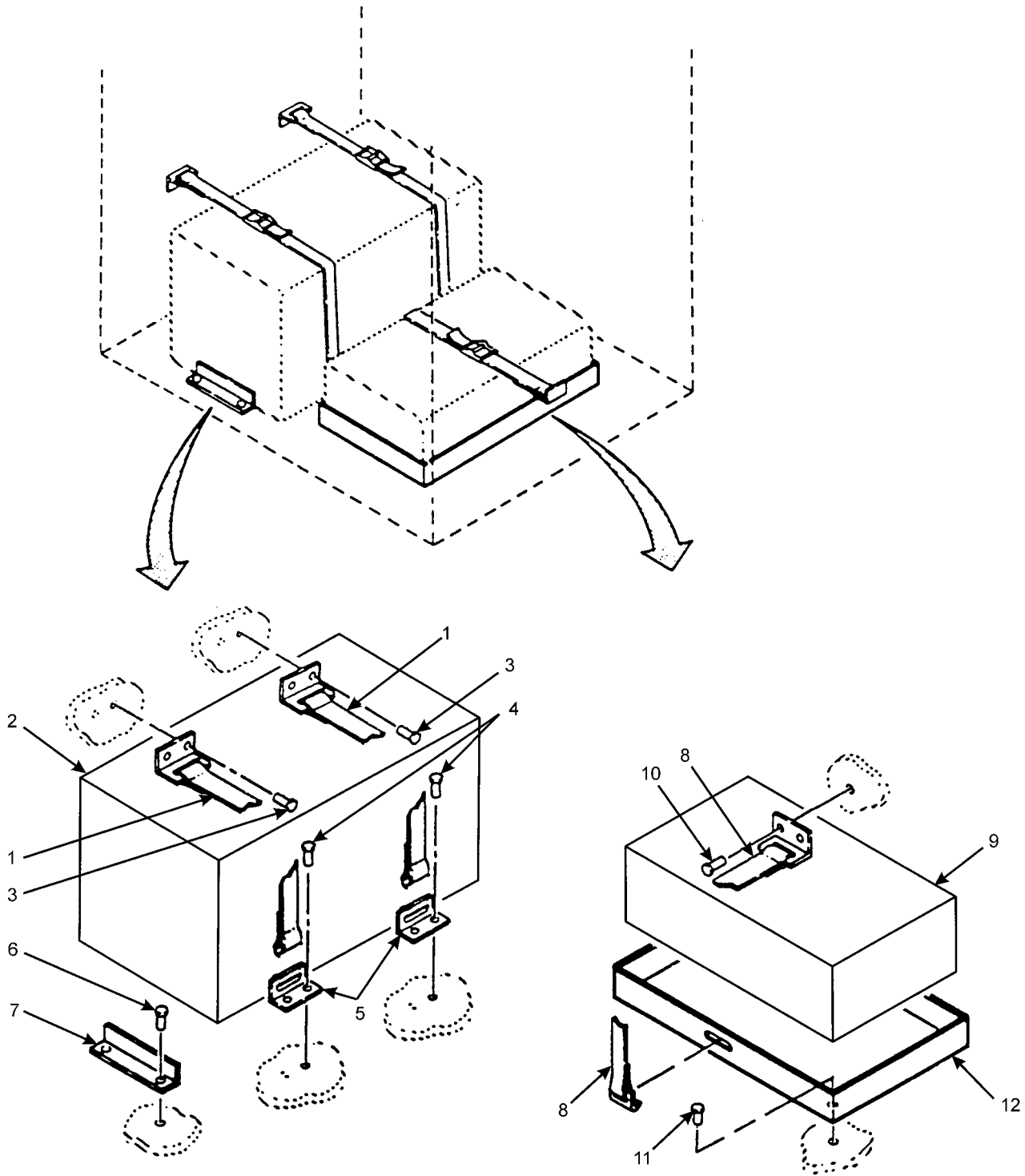


Figure 4-69. Copper Strip Corrosion Bath, Cloud and Pour Point Tester, and Brackets



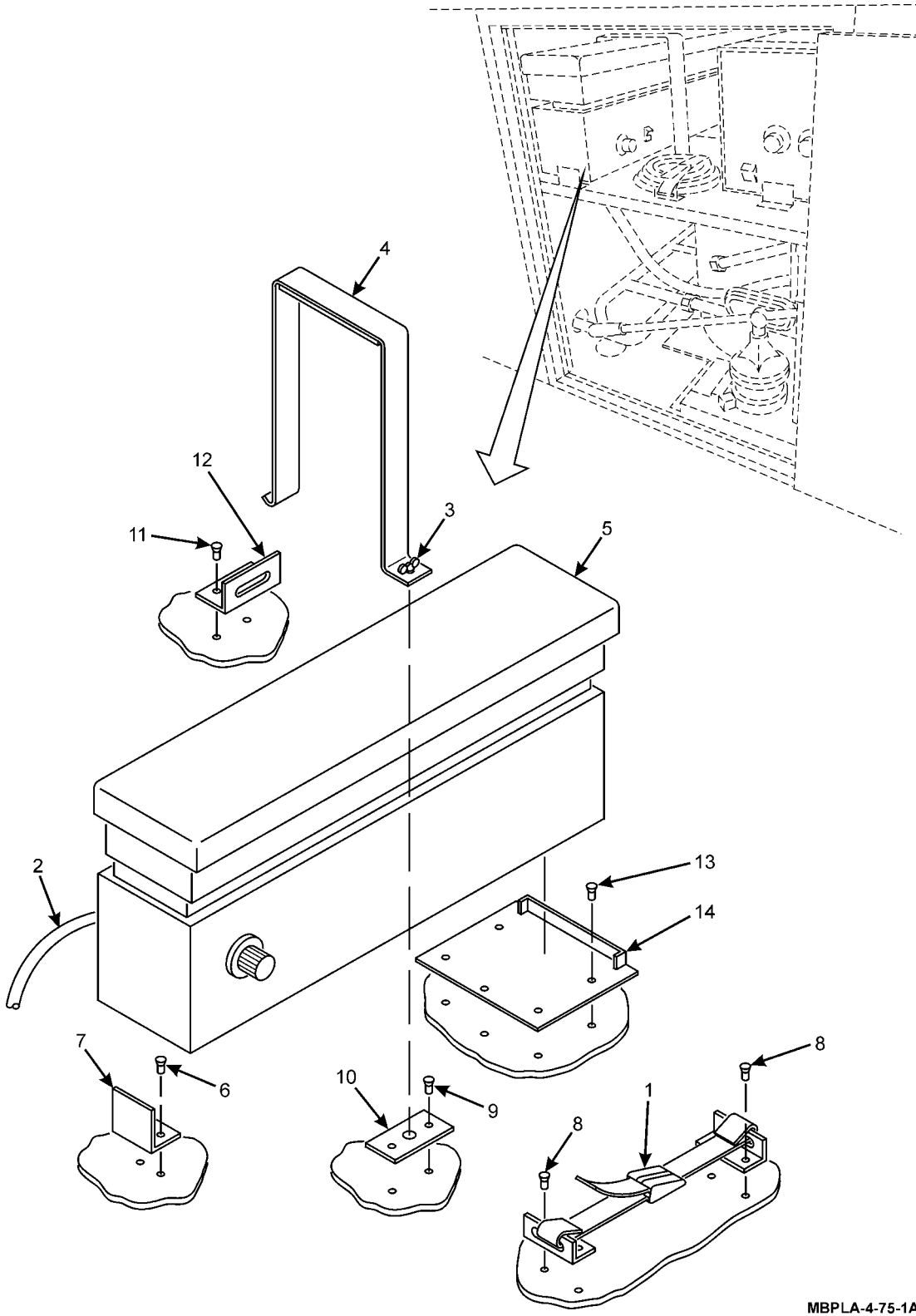


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Figure 4-70. Fuel Sampling Kit, Tool Kit, and Brackets

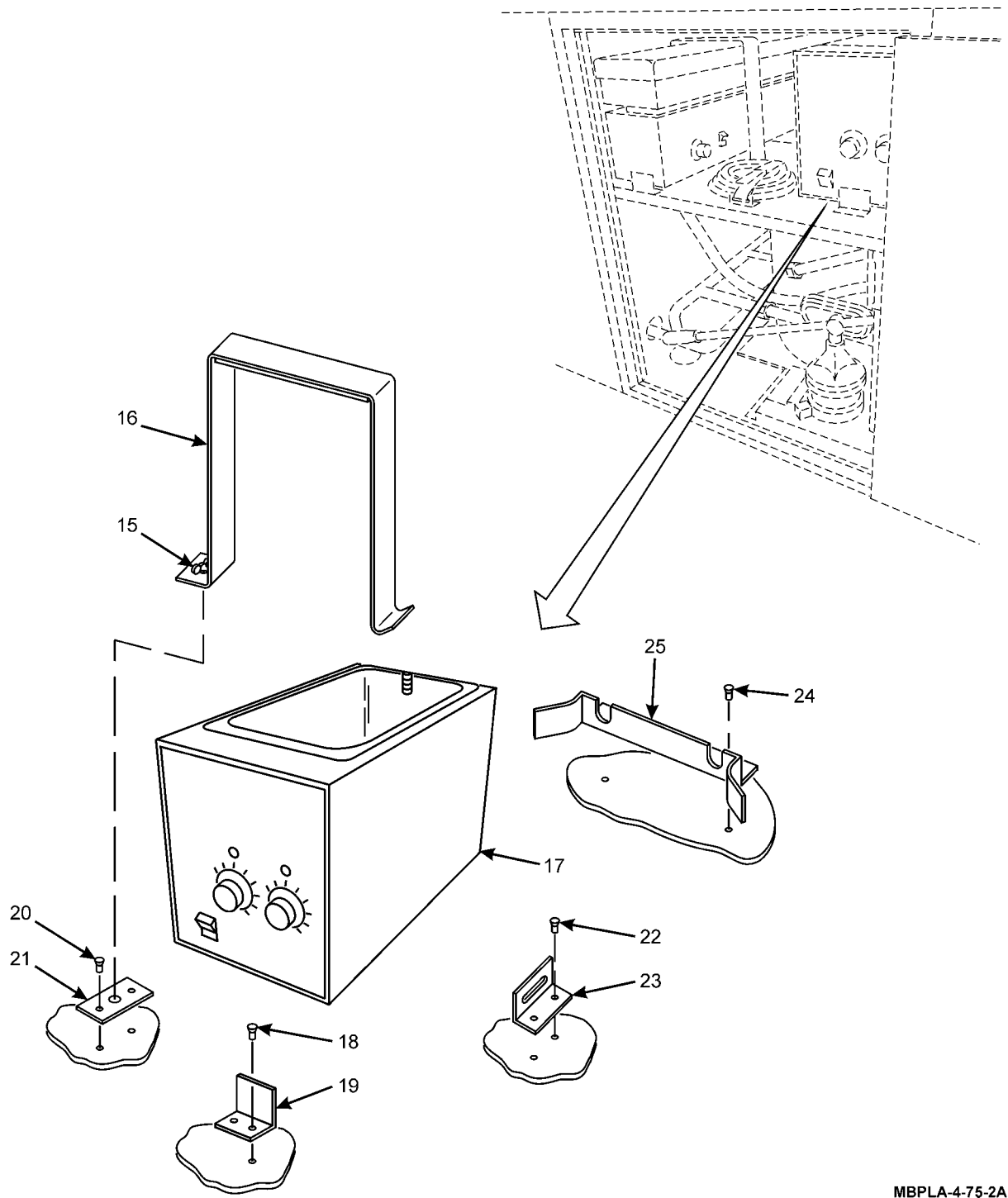






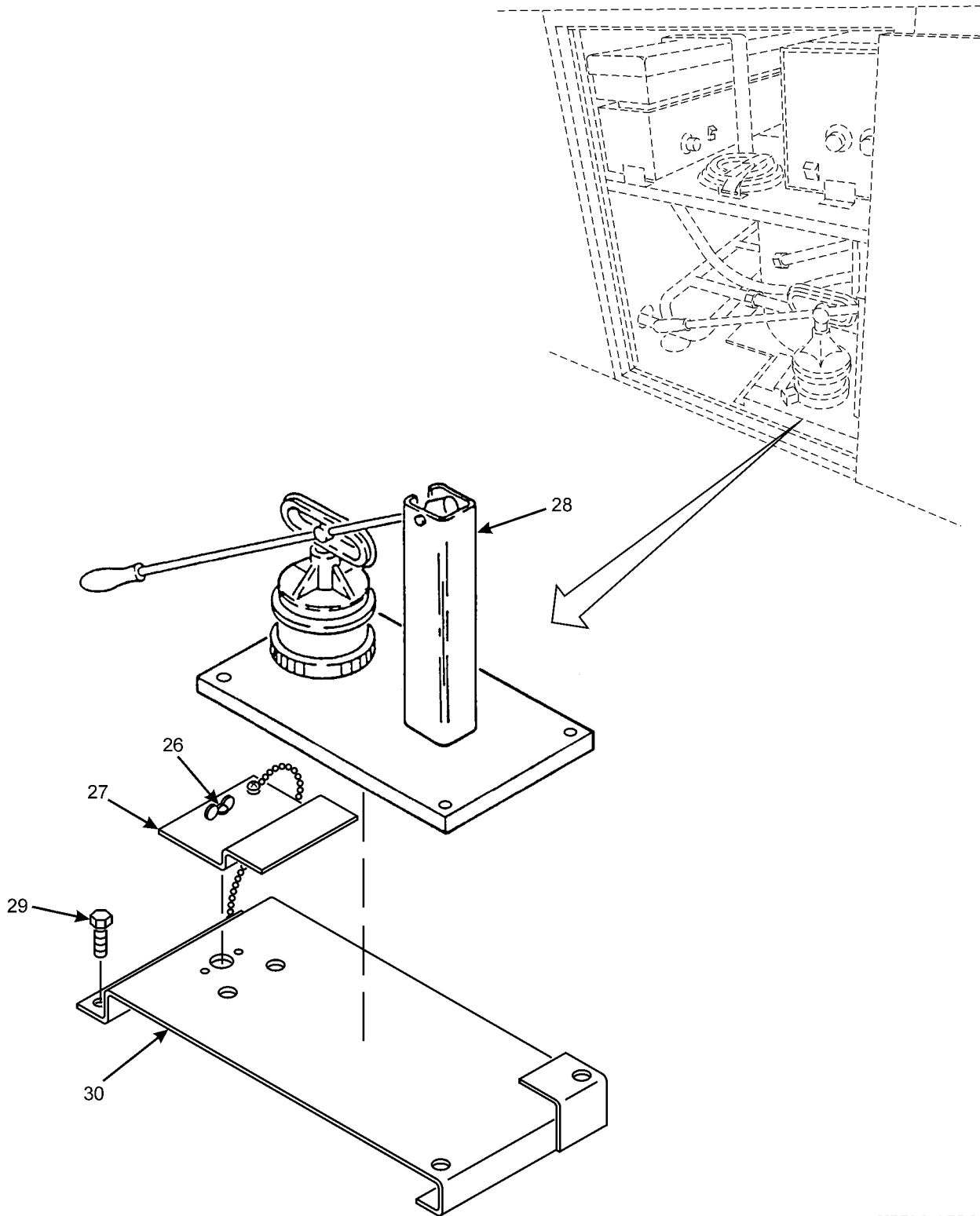
MBPLA-4-75-1A

Figure 4-71. Hot Plate, Water Bath, Grease Working Machine, and Brackets (Sheet 1 of 3)



MBPLA-4-75-2A

Figure 4-71. Hot Plate, Water Bath, Grease Working Machine, and Brackets (Sheet 2 of 3)



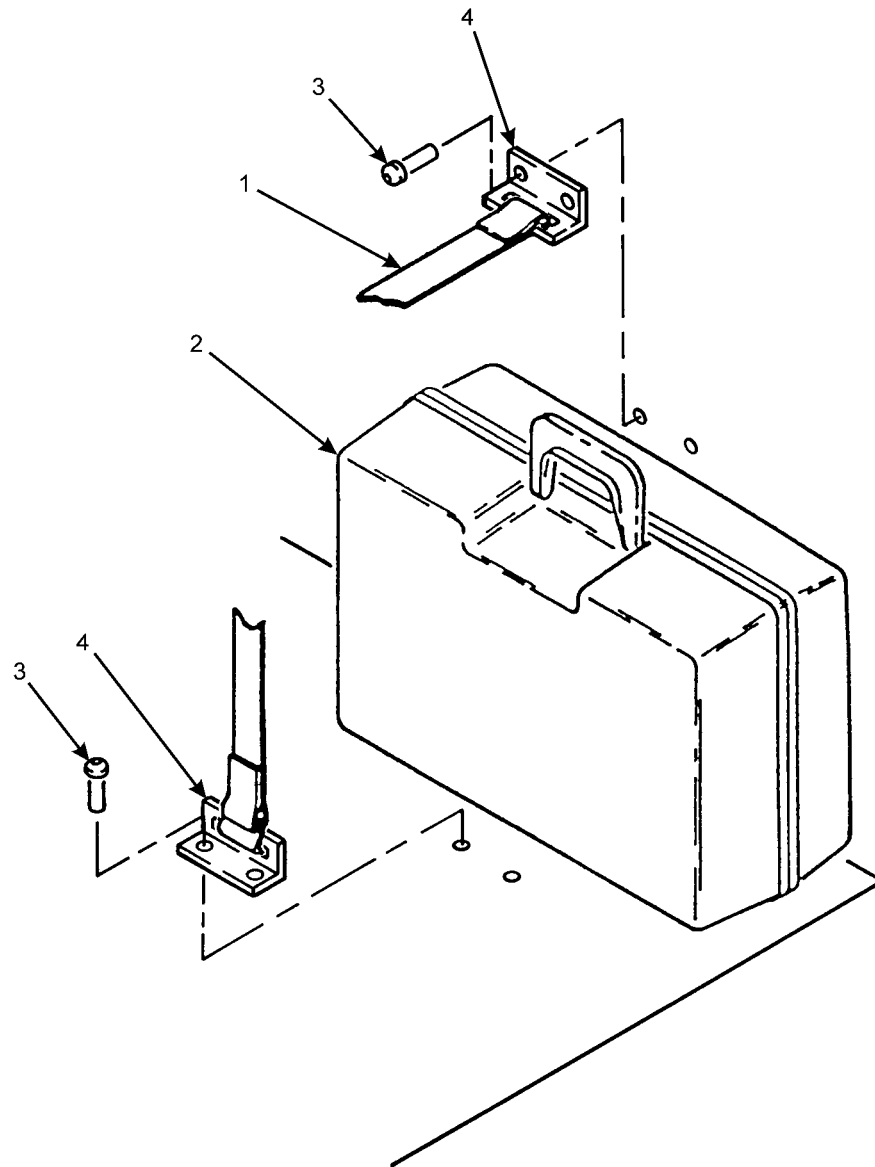
MBPLA-4-75-3A

Figure 4-71. Hot Plate, Water Bath, Grease Working Machine, and Brackets (Sheet 3 of 3)

INSTALL

1. Install Hot Plate and Brackets. See Figure 4-71.
  - a. Install bracket (14) and secure with five rivets (13).
  - b. Install bracket (12) and secure with two rivets (11).
  - c. Install bracket (10) and secure with two rivets (9).
  - d. Install strap (1) and secure with four rivets (8).
  - e. Install bracket (7) and secure with two rivets (6).
  - f. Install hot plate (5), bracket (4) and secure with captive screw (3).
  - g. Install power cord (2) and secure with strap (1).
2. Install Water Bath and Brackets.
  - a. Install bracket (25) and secure with two rivets (24).
  - b. Install bracket (23) and secure with two rivets (22).
  - c. Install bracket (21) and secure with two rivets (20).
  - d. Install bracket (19) and secure with two rivets (18).
  - e. Install water bath (17), bracket (16), and secure with captive screw (15).
3. Install Grease Working Machine and Bracket.
  - a. Install bracket (30) and secure with four screws (29).
  - b. Install grease working machine (28), bracket (27), and secure with captive screw (26).





MBPLA-4-76A

Figure 4-72. Flowmeter Kit and Brackets



# CHAPTER 5

## DIRECT SUPPORT MAINTENANCE INSTRUCTIONS

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### Section I. REPAIR PARTS, SPECIAL TOOLS, TMDE AND SUPPORT EQUIPMENT

#### Alphabetical Index

Paragraph Title	Paragraph
Common Tools and Equipment .....	5-1
Repair Parts.....	5-3
Special Tools; Test, Measurement and Diagnostic Equipment; and Support Equipment .....	5-2

**5-1. COMMON TOOLS AND EQUIPMENT.**

Appendix B, Section III contains the authorized common tools. For authorized equipment, refer to Modified Table of Organization and Equipment (MTOE) applicable to your unit.

**5-2. SPECIAL TOOLS; TEST, MEASUREMENT, AND DIAGNOSTIC EQUIPMENT; AND SUPPORT EQUIPMENT.**

No special tools; test, measurement, and diagnostic equipment; or support equipment are required for the repair of the Petroleum Laboratory at the direct support level of maintenance.

**5-3. REPAIR PARTS.**

Repair parts for the Petroleum Laboratory are listed in TM 10-6640-238-23P covering operator, unit, and direct support maintenance of the Petroleum Laboratory.



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## Section II. DIRECT SUPPORT MAINTENANCE PROCEDURES

### Alphabetical Index

Maintenance Title	Paragraph
Air/Steam Flow Rate Indicator Meters .....	5-20
Boiler Low Water Cutoff Pump Control .....	5-14
Boiler Low Water Pump .....	5-15
Electric Steam Boiler .....	5-16
Environmental Control Unit .....	5-25
Flow Control Devices (Gum Bath System) .....	5-17
Flow Control Devices (Water System) .....	5-9
Freezer (Ice Cube Maker) .....	5-22
Gum Bath Vent/Fume Vent Blower and Motor .....	5-21
Gum Content Test Bath .....	5-13
High Pressure Steam Boiler .....	5-18
Hot Water Heater Distribution Box .....	5-23
Introduction .....	5-4
Pyrometer Fuse Box .....	5-24
Pyrometer Indicator/Control .....	5-19
Sump Pump .....	5-12
Surge Tank .....	5-7
Water Chiller .....	5-8
Water Heater .....	5-11
Water Pump .....	5-5
Water Tank .....	5-6
Water System System Piping (Typical) .....	5-10

#### 5-4. INTRODUCTION.

- a. This section contains instructions covering maintenance functions for direct support level maintenance on the Petroleum Laboratory. Personnel required are listed only if the task requires more than one.
- b. After completing each maintenance procedure, perform operational check to be sure that equipment is properly functioning.

## 5-5. WATER PUMP.

---

This task consists of:	a. Remove	b. Install
------------------------	-----------	------------

---

### INITIAL SET-UP

Tools Required

General Mechanics Tool Kit, (Appendix B, Section III, Item 1)

Materials/Parts Required

Teflon Tape, (Appendix E, Section II, Item 157)

Lockwashers (4)

General Safety Instructions

<b>WARNING</b>
----------------

#### ELECTRICAL SHOCK

Before performing any maintenance actions on electrical equipment, ensure all electrical power has been turned off. Failure to comply with this warning may result in serious injury or death.

---

### REMOVE

Remove Water Pump. See Figure 5-1.

- a. Set switch on Water Pump controller to OFF.
- b. Set A15CB8 at Power Panel No. 2 to OFF.
- c. Tag and disconnect pump motor electrical leads at motor connection box (1).
- d. Disconnect conduit (2) from motor connection box (1).
- e. Disconnect union (3) on pump discharge line to surge tank.
- f. Disconnect union (4) on suction supply line from water filter.
- g. Disconnect union (5) on suction supply line from water tank.
- h. Disconnect hose from drain petcock (6).
- i. Disconnect two hoses from drain petcock (7).
- j. Remove four bolts (8), lockwashers (9), and washers (10) that secure water pump (11) to foundation (12). Discard lockwashers.
- k. Remove water pump (11).
- l. Remove pipe fittings from water pump (11) and retain for use.

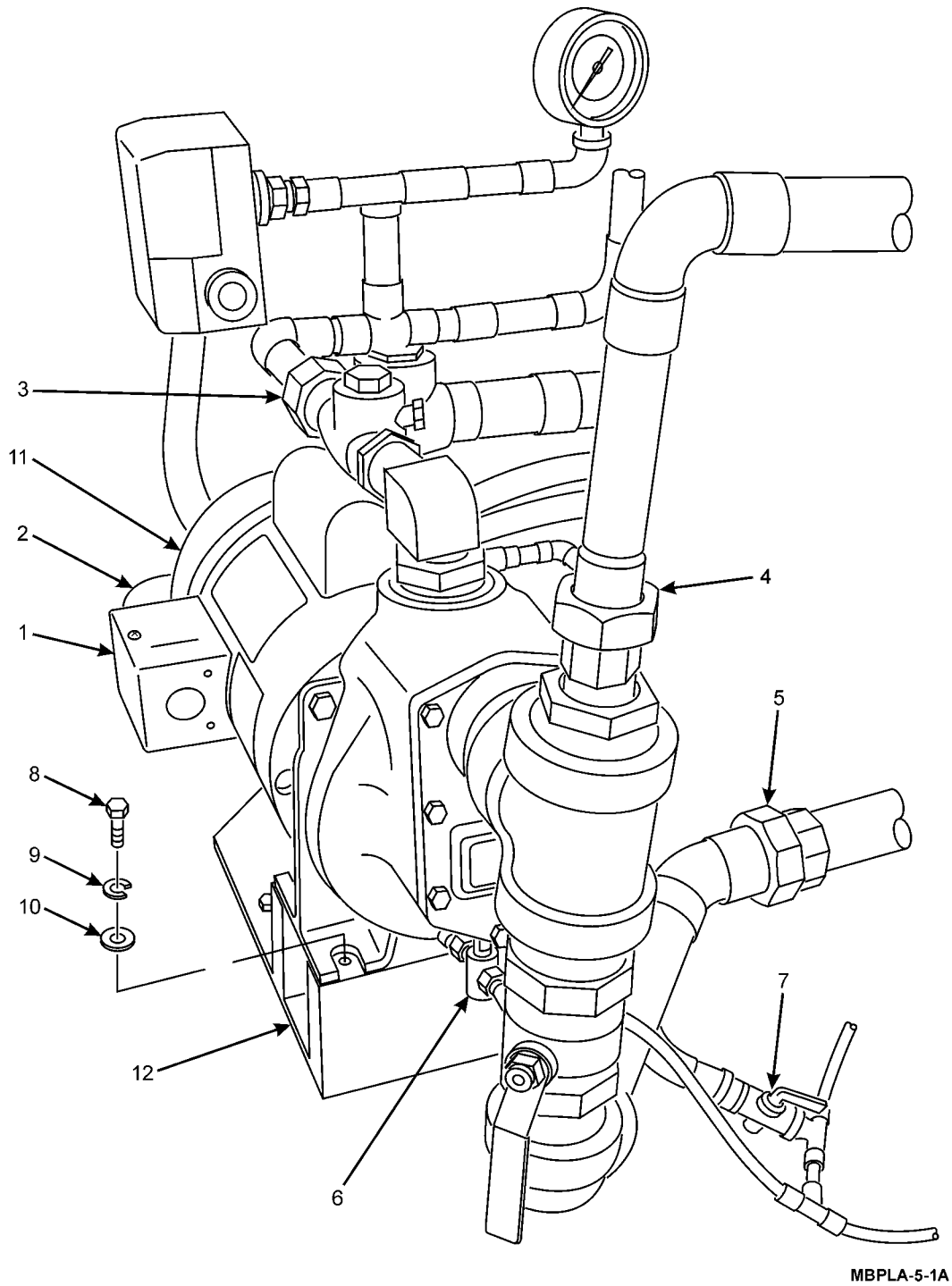


Figure 5-1. Water Pump

INSTALL

Install Water Pump. See Figure 5-1.

- a. Apply teflon tape to male fittings. Be sure to wrap tape in same direction as pipe thread.
- b. Install pipe fittings on water pump (11).
- c. Install water pump (11) on foundation (12) and secure with four bolts (8), lockwashers (9), and washers (10).
- d. Connect hose to drain petcock (6).
- e. Connect two hoses to drain petcock (7).
- f. Connect union (3) on pump discharge line to water tank.
- g. Connect union (4) on suction supply line from water filter.
- h. Connect union (5) on suction supply line from water tank.
- i. Connect conduit (2) with motor electrical leads to motor connection box (1).
- j. Connect pump motor electrical leads as tagged to motor connection box (1). Remove tags.
- k. Set A15CB8 at Power Panel No. 2 to ON.
- l. Set switch on Water Pump controller to ON.
- m. Prepare and operate water system using internal water tank as source in accordance with procedures listed in paragraph 2-6j.
- n. Inspect for leaks and check for proper operation.

5-6. WATER TANK.

---

This task consists of:                      a. Remove                                      b. Install

---

**INITIAL SET-UP**

Tools Required

General Mechanics Tool Kit, (Appendix B, Section III, Item 1)

Materials/Parts Required

Teflon Tape, (Appendix E, Section II, Item 157)  
Flange Gasket, (Appendix E, Section II, Item 158)  
Lockwashers (8)

Personnel Required

Two (2)

Equipment Conditions

Water Pump Removed (Paragraph 5-5).

General Safety Instructions

**WARNING**

**ELECTRICAL SHOCK**

Before performing any maintenance actions on electrical equipment, ensure all electrical power has been turned off. Failure to comply with this warning may result in serious injury or death.

---

REMOVE

Remove Water Tank. See Figure 5-2.

- a. Open drain valve (1) at bottom of water tank (2). Allow water to drain from tank and system plumbing.
- b. Disconnect three unions (3) and water flow direction valve (4) from top of water tank (2).
- c. Disconnect two unions (5) and switch (6) from top of water tank (2).
- d. Disconnect union (7) at overflow drain line.
- e. Disconnect two unions (8) at water return lines.
- f. Disconnect union (9) on suction line from water pump.
- g. Disconnect drain line union (10).
- h. Remove six screws (11), nuts (12), lockwashers (13), washers (14), and gasket (15) from tee flange (16). Discard gasket and lockwashers.
- i. Remove two screws (17), nuts (18), lockwashers (19), and washers (20) from each tank support leg (21). Discard lockwashers.
- j. Disconnect unions and remove any obstructing plumbing as required.
- k. Remove water tank (2).
- l. Remove pipe fittings from water tank (2).
- m. Remove drain valve (1) and tee (22) from water tank (2).

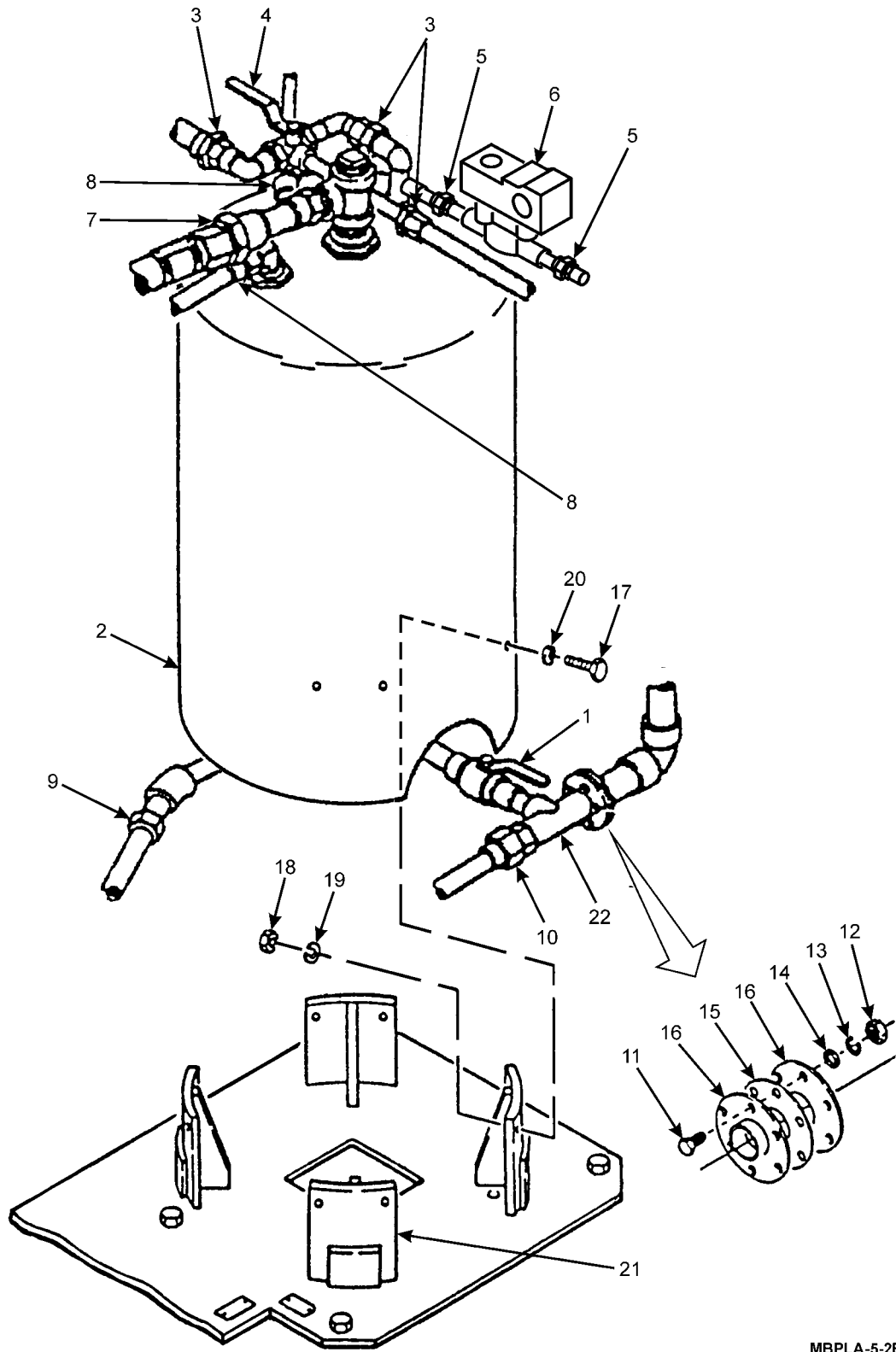


Figure 5-2. Water Tank

MBPLA-5-2B

INSTALL

Install Water Tank. See Figure 5-2.

- a. Apply teflon tape to male fittings. Be sure to wrap tape in same direction as pipe thread.
- b. Install drain valve (1) and tee (22) on water tank (2). Close drain valve.
- c. Install pipe fittings on water tank (2).
- d. Position water tank (2) on tank support legs (21) and secure with two screws (17), nuts (18), lockwashers (19), and washers (20) in each tank support leg.
- e. Install tee flange (16) and gasket (15) to tank drain line and secure with six screws (11), nuts (12), lockwashers (13), and washers (14).
- f. Connect drain line union (10).
- g. Connect union (9) on suction line from water pump.
- h. Connect two unions (8) at water return lines.
- i. Connect union (7) at overflow drain line.
- j. Connect two unions (5) and switch (6) at top of water tank (2).
- k. Connect three unions (3) and water flow direction valve (4) at top of water tank (2).
- l. Connect unions and any obstructing plumbing disconnected during removal.
- m. Install water pump (Paragraph 5-5).
- n. Prepare and operate water system using internal water tank as source in accordance with procedures listed in paragraph 2-6j.
- o. Inspect for leaks and check for proper operation.

**5-7. SURGE TANK.**

---

This task consists of:

a. Remove

b. Install

---

**INITIAL SET-UP**

Tools Required

General Mechanics Tool Kit, (Appendix B, Section III, Item 1)

Materials/Parts Required

Teflon Tape, (Appendix E, Section II, Item 157)

Equipment Conditions

Water Pump Turned Off.

---

REMOVE

Remove Surge Tank. See Figure 5-3.

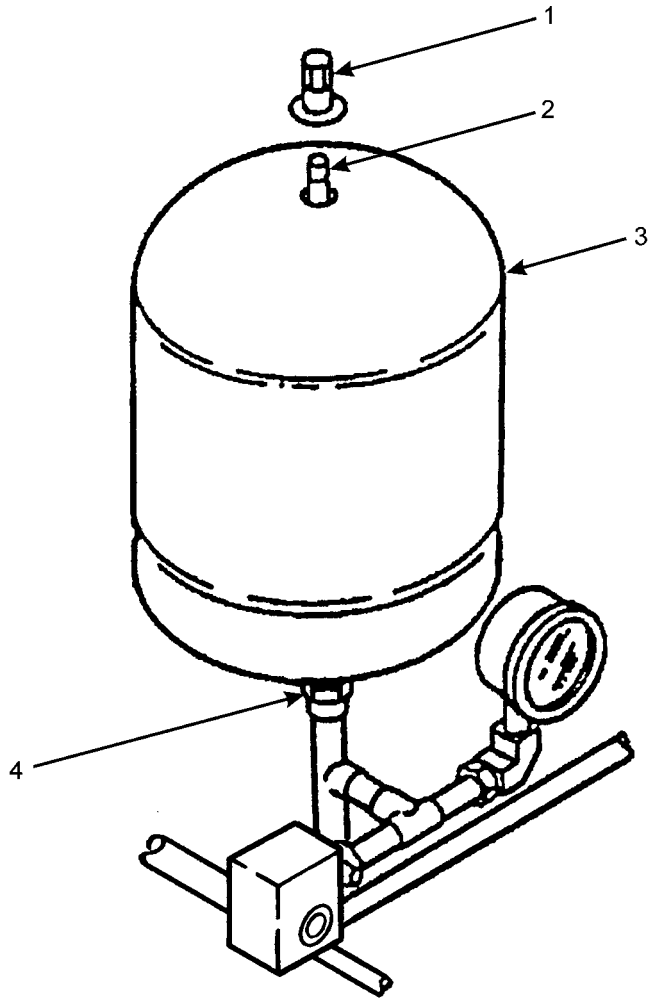
- a. Remove cap (1) and depress air valve stem (2) to bleed pressure from surge tank (3).
- b. Unscrew and remove surge tank (3) from threaded fitting (4).

INSTALL

Install Surge Tank. See Figure 5-3.

- a. Apply teflon tape to male fittings. Be sure to wrap tape in same direction as pipe thread.
- b. Screw surge tank (3) with cap (1) onto threaded fitting (4).
- c. Prepare and operate water system using internal water tank as source in accordance with procedures listed in paragraph 2-6j.
- d. Inspect for leaks and check for proper operation.





MBPLA-5-4A

Figure 5-3. Surge Tank

**5-8. WATER CHILLER.**

---

This task consists of:                      a. Remove                                      b. Install

---

**INITIAL SET-UP**Tools Required

General Mechanics Tool Kit, (Appendix B, Section III, Item 1)

Materials/Parts Required

Teflon Tape, (Appendix E, Section II, Item 157)

Lockwashers (4)

Personnel Required

Two (2)

General Safety Instructions**WARNING****ELECTRICAL SHOCK**

Before performing any maintenance actions on electrical equipment, ensure all electrical power has been turned off. Failure to comply with this warning may result in serious injury or death.

---

**REMOVE**

Remove Water Chiller. See Figure 5-4.

- a. On Power Panel No. 2, set circuit breaker A15CB7 to OFF.
- b. On Power Panel No. 2, set circuit breaker A15CB8 to OFF and drain water lines.
- c. Remove six screws (1) from left panel (2) and two screws (3) from screen (4). Remove left panel.
- d. Tag and disconnect wiring from water chiller (5).
- e. Disconnect and remove conduit (6) from water chiller (5).
- f. Disconnect three unions (7) that connect water supply, water return, and drain lines on roadside end of water chiller (5).
- g. Remove four screws (8) and washers (9) that secure foundation mounting plate (10) to mechanical room floor.
- h. Remove two screws (11), lockwashers (12), and washers (13) and separate water chiller (5) from foundation mounting plate (10). Discard lockwashers.
- i. Remove foundation mounting plate (10).
- j. Remove pipe fittings from water chiller (5).

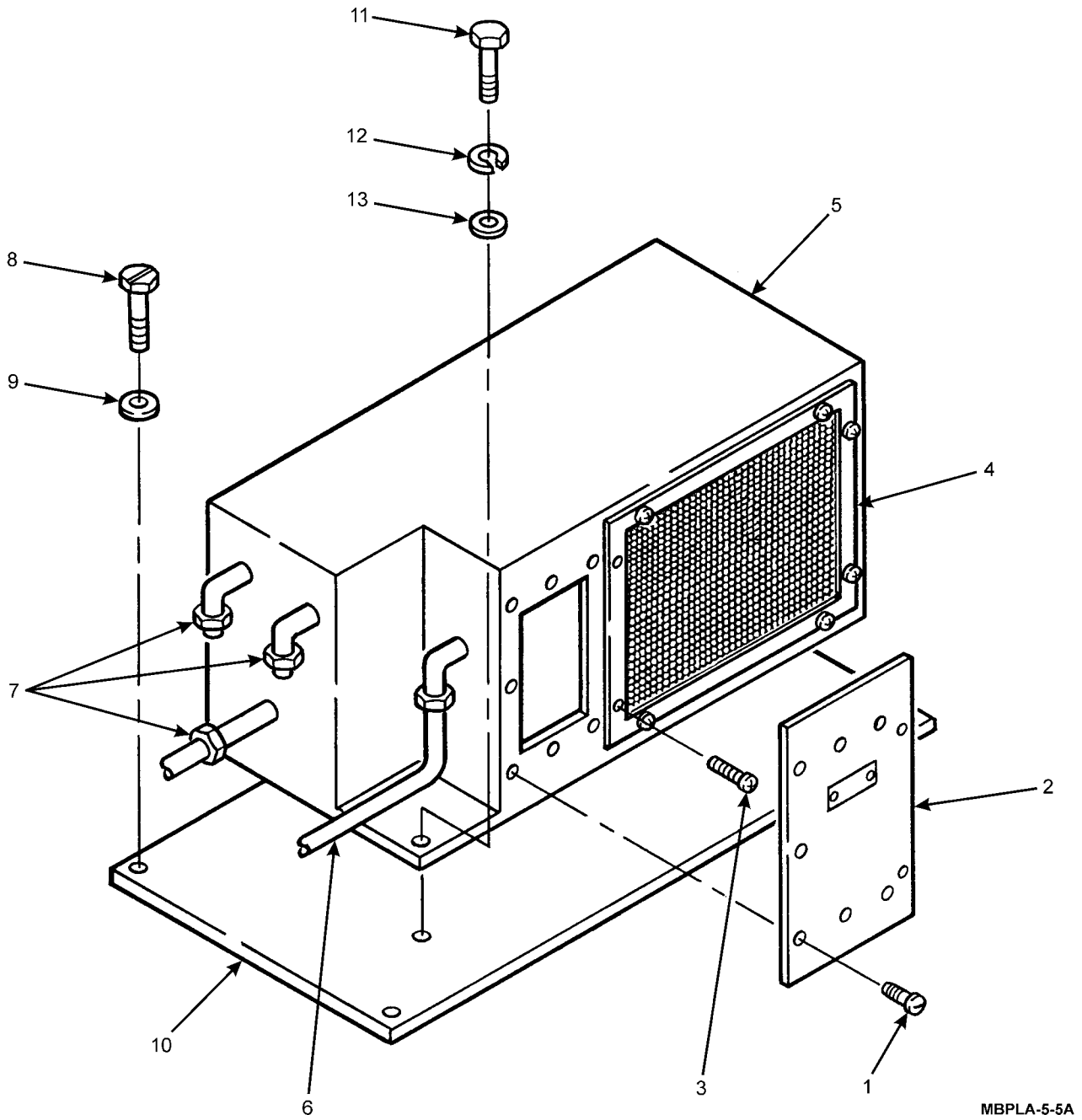


Figure 5-4. Water Chiller

INSTALL

Install Water Chiller. See Figure 5-4.

- a. Apply teflon tape to male fittings. Be sure to wrap tape in same direction as pipe thread.
- b. Install pipe fittings on water chiller (5).
- c. Install foundation mounting plate (10) on mechanical room floor and secure with four screws (8) and washers (9).
- d. Install water chiller (5) on foundation mounting plate (10) and secure with two screws (11), lockwashers (12), and washers (13).
- e. Connect three unions (7) that connect water supply, water return, and drain lines.
- f. Connect conduit (6) to water chiller (5). Connect water chiller wiring and remove tags.
- g. Position left panel (2) on water chiller (5) and secure with two screws through screen (4) and six screws (1) in left panel.
- h. On Power Panel No. 2, set circuit breaker A15CB8 to ON.
- i. On Power Panel No. 2, set circuit breaker A15CB7 to ON.
- j. Prepare and operate water system using internal water tank as source in accordance with procedures listed in paragraph 2-6j.
- k. Inspect for leaks and check for proper operation.

**5-9. CONTROL DEVICES (WATER SYSTEM).**

---

This task consists of:	a. Remove	b. Install
------------------------	-----------	------------

---

**INITIAL SET-UP**

- Tools Required  
General Mechanics Tool Kit, (Appendix B, Section III, Item 1)  
Soldering Kit, (Appendix B, Section III, Item 2)

- Materials/Parts Required  
Teflon Tape, (Appendix E, Section II, Item 157)

- Reference  
TB-SIG-222, Soldering Methods and Equipment

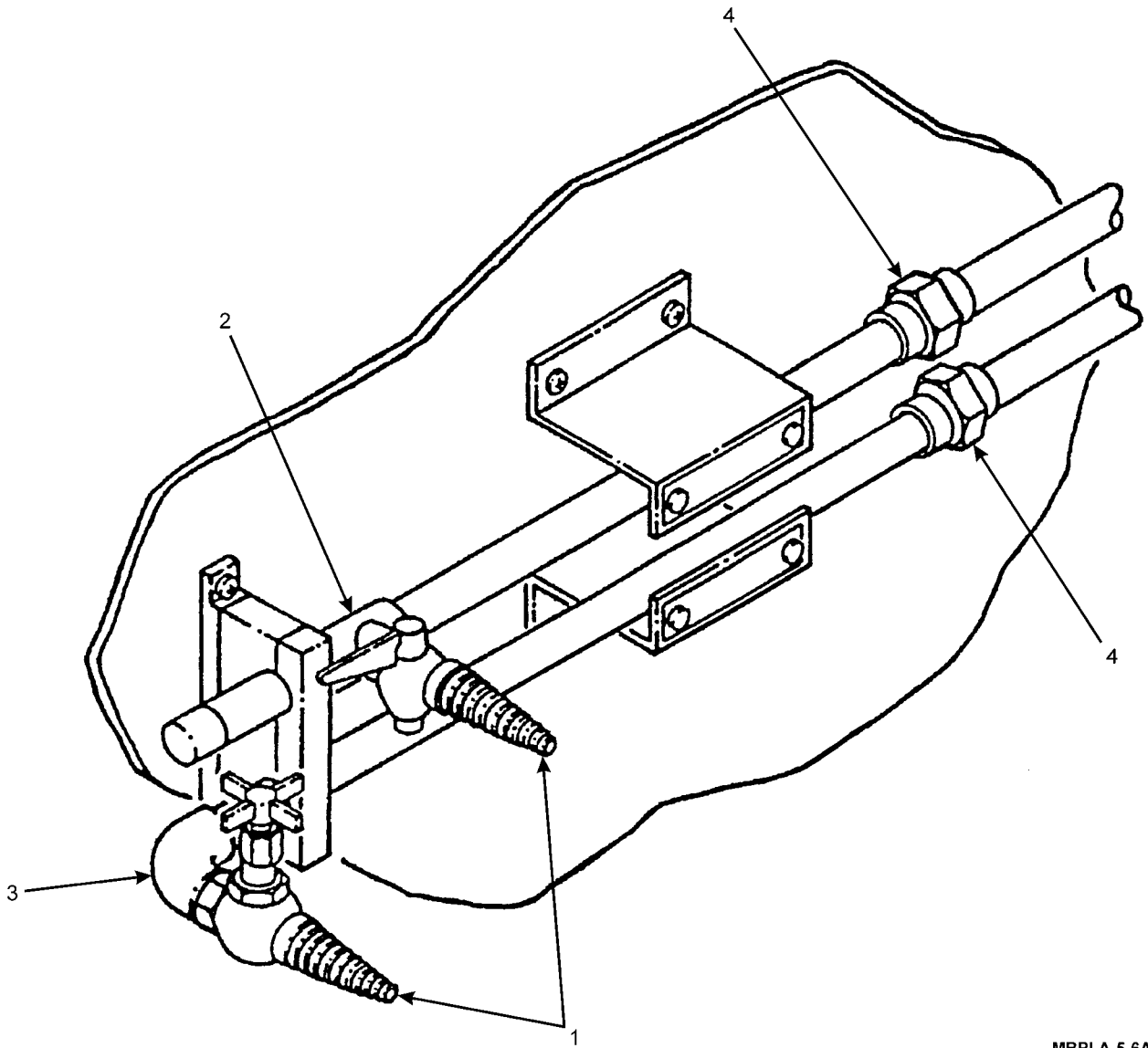
- Equipment Conditions  
Water Pump Turned Off.  
Water Pressure Relieved by Opening Sink Faucet.
- 

REMOVE

- Remove Water System Control Devices. See Figure 5-5.
- a. Remove threaded stopcock valves (1) by unscrewing valves from tees (2) or elbows (3) located in water system piping.
  - b. To remove soldered/brazed valves or flow control devices, proceed as follows:
    - (1) Disconnect pipe union(s) (4) closest to control device to being removed.
    - (2) Remove pipe section with control device attached.
    - (3) Unsolder/unbraze control device from piping.

INSTALL

- Install Water System Control Devices. See Figure 5-5.
- a. Apply teflon tape to male fittings. Be sure to wrap tape in same direction as pipe thread.
  - b. Install threaded stopcock valves (1) into tees (2) or elbows (3) located in system piping.
  - c. To install soldered/brazed valves or flow control devices, proceed as follows:
    - (1) Solder/braze control device to piping.
    - (2) Install pipe section with control device attached.
    - (3) Connect pipe unions (4).
  - d. Prepare and operate water system using internal water tank as source in accordance with procedures listed in paragraph 2-6j.
  - e. Inspect for leaks and check for proper operation.



MBPLA-5-6A

Figure 5-5. Water System Control Devices

**5-10. WATER SYSTEM PIPING (TYPICAL).**

---

This task consists of:	a. Remove	b. Install
------------------------	-----------	------------

---

**INITIAL SET-UP**

- Tools Required  
General Mechanics Tool Kit, (Appendix B, Section III, Item 1)
- Materials/Parts Required  
Teflon Tape, (Appendix E, Section II, Item 157)
- Reference  
TB-SIG-222, Soldering Methods and Equipment
- 

REMOVE

- Remove Water System Piping. See Figure 5-6.
- a. Disconnect union(s) (1) closest to elbow (2), valve (3), coupling (4) or piping component to be removed.
  - b. Remove pipe clamps (5), supports, and braces from pipe section (6) as required.
  - c. Remove pipe section (6) from unit.
  - d. Unsolder/unbraze to remove union (1), elbow (2), valve (3), couplings (4) or pipe component from pipe section (6).

INSTALL

- Install Water System Piping. See Figure 5-6.
- a. Solder/braze unions (1), elbow (2), valves (3), coupling (4), or pipe components to pipe section (6).
  - b. Position pipe section (6) in unit.
  - c. Connect unions (1) to pipe section (6).
  - d. Install braces, supports and pipe clamps (5) on pipe section (6) as required.
  - e. Prepare and operate water system using internal water tank as source in accordance with procedures listed in paragraph 2-6j.
  - f. Inspect for leaks and check for proper operation.

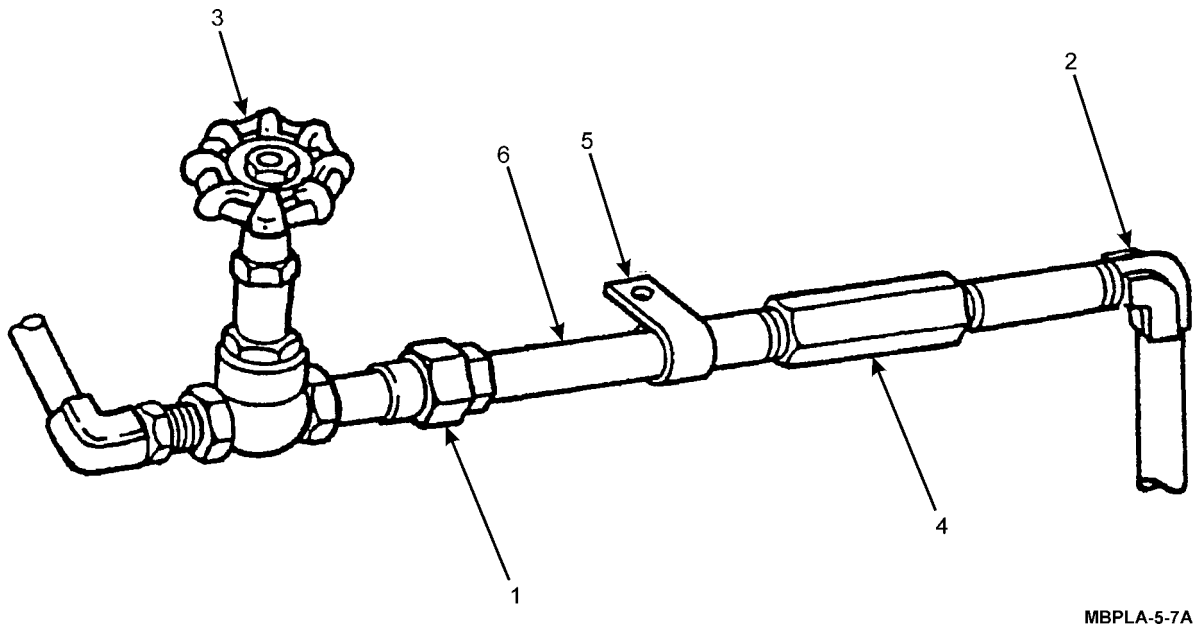
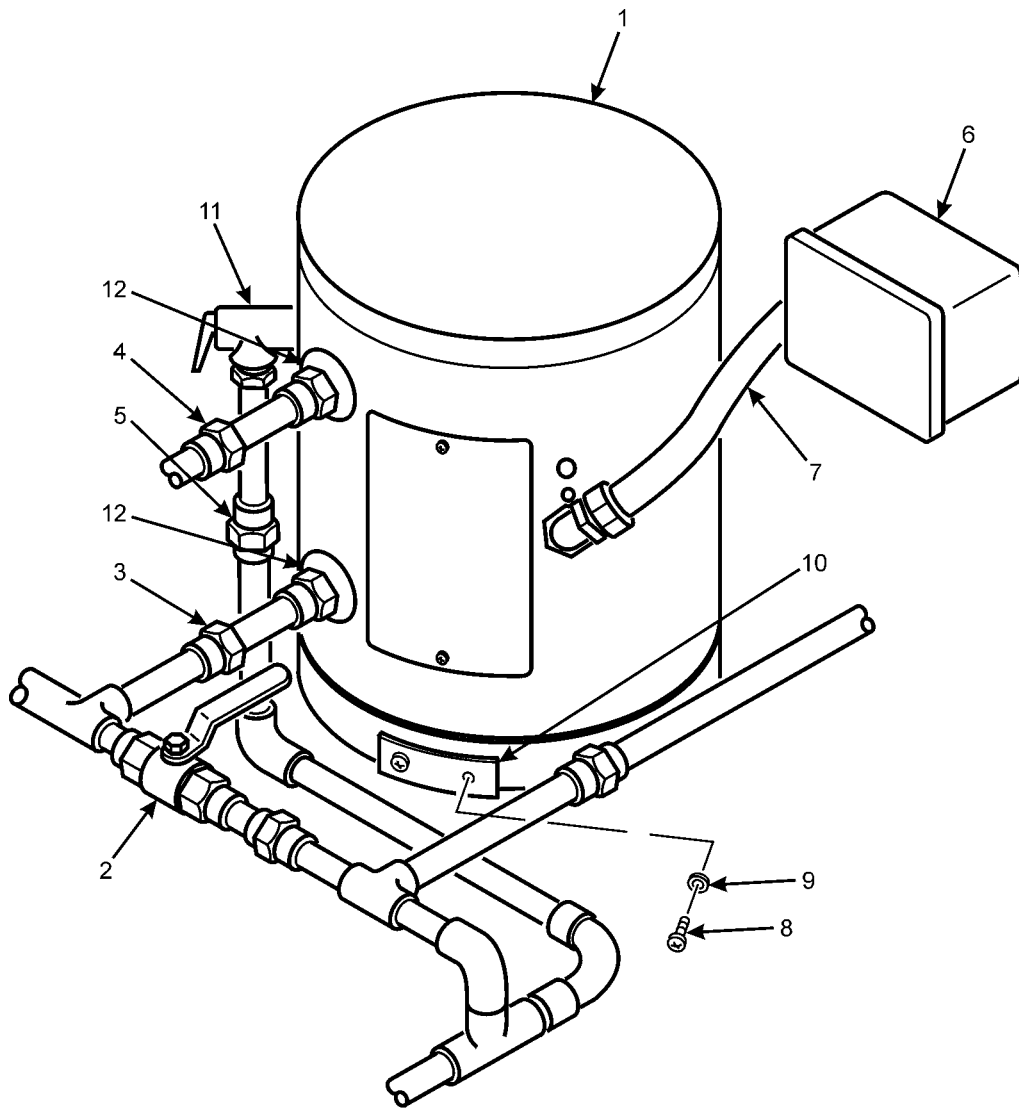


Figure 5-6. Water System Piping







MBPLA-5-8B

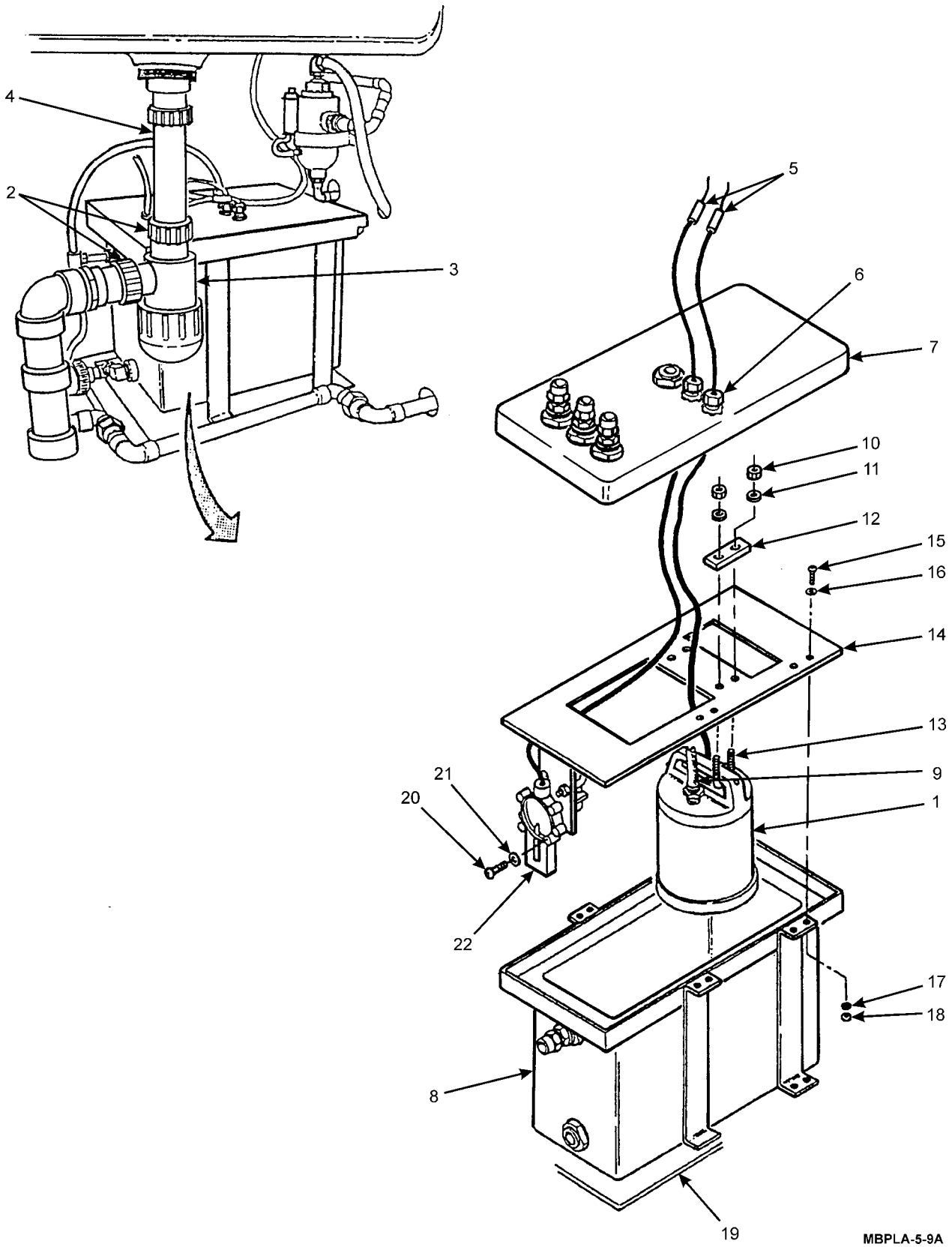
Figure 5-7. Water Heater

INSTALL

Install Water Heater. See Figure 5-7.

- a. Connect conduit (7) and wiring as tagged to water heater (1). Remove tags.
- b. Install two threaded pipe adapters (12) and relief valve (11) on water heater (1).
- c. Position water heater (1) on mounting supports (10) and secure with two screws (8) and lockwashers (9) in each of four mounting supports (10).
- d. At junction box (6) in cabinet U, connect wiring as tagged and conduit (7). Remove tags.
- e. Apply teflon tape to male fittings. Be sure to wrap tape in same direction as pipe thread.
- f. Connect water heater outlet line union (3).
- g. Connect water heater inlet line union (4).
- h. Connect water heater relief valve union (5).
- i. Close hot water faucet and water heater drain valve (2).
- j. Install shelf in cabinet U.
- k. Set water heater circuit breaker A1CB17 to ON.
- l. Prepare and operate water system using internal water tank as source in accordance with procedures listed in paragraph 2-6j.
- m. Inspect for leaks and check for proper operation.
- n. Install water bath (Paragraph 4-75).
- o. Install grease working machine (Paragraph 4-75).
- p. Install hot plate (Paragraph 4-75).





MBPLA-5-9A

Figure 5-8. Sump Pump

INSTALL

Install Sump Pump. See Figure 5-8.

- a. Position sump pump (1) in drain tank (8).
- b. Install switch (22) to retaining bracket (14) and secure with two screws (20) and washers (21).
- c. Position retaining bracket (14) on drain tank stand (19) and secure with eight screws (15), washers (16), lockwashers (17) and nuts (18).
- d. Install sump pump (1) on retaining bracket (14) and secure with two u-bolts (13), spacers (12), four washers (11) and nuts (10).
- e. Position cover (7) over drain tank (8) and connect discharge hose (9) to top of sump pump (1).
- f. Connect two electrical leads at wire splices (5) and install heat shrink tubing.
- g. Tighten two strain reliefs (6) to top of cover (7).
- h. Install drain trap (3) on sink drain (4) and tighten two unions (2).
- i. Plug sump pump connectors into receptacle located in cabinet W2.
- j. Prepare and operate water system using internal water tank as source in accordance with procedures listed in paragraph 2-6j.
- k. Inspect for leaks and check for proper operation.
- l. Install water level regulator (Paragraph 4-54).



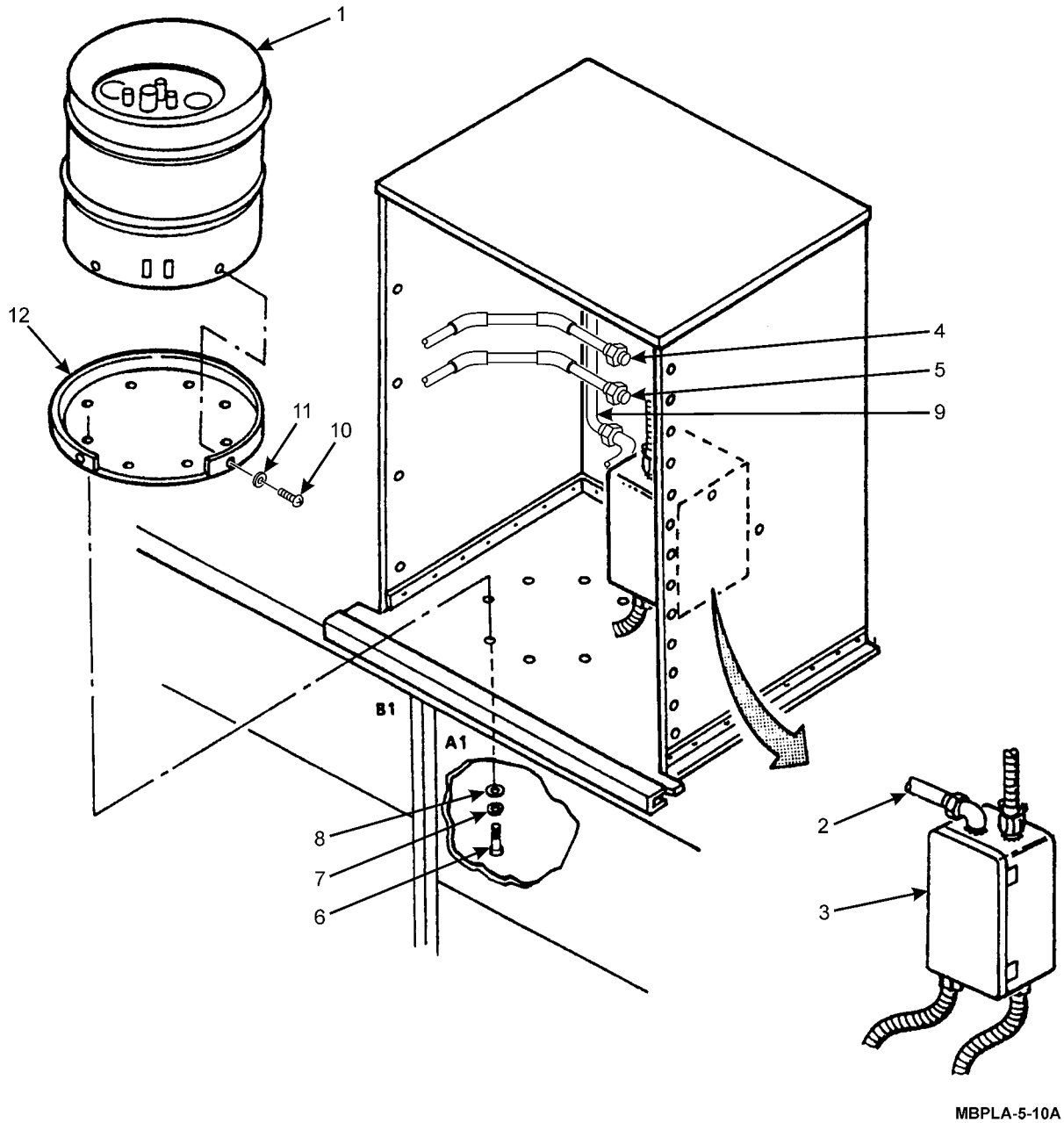


Figure 5-9. Gum Content Test Bath



**WARNING**

The gum bath unit is heavy (160 lbs/71 kg). To prevent injury, two people are required to remove gum bath from countertop.

- i. Lift and remove gum bath (1) from countertop.
- j. Tag and disconnect wiring and conduit (2) from pyrometer fuse box (3).
- j. Remove four screws (10) and washers (11) and separate gum bath (1) from mounting bracket (12).

**INSTALL**

Install Gum Content Test Bath. See Figure 5-9.

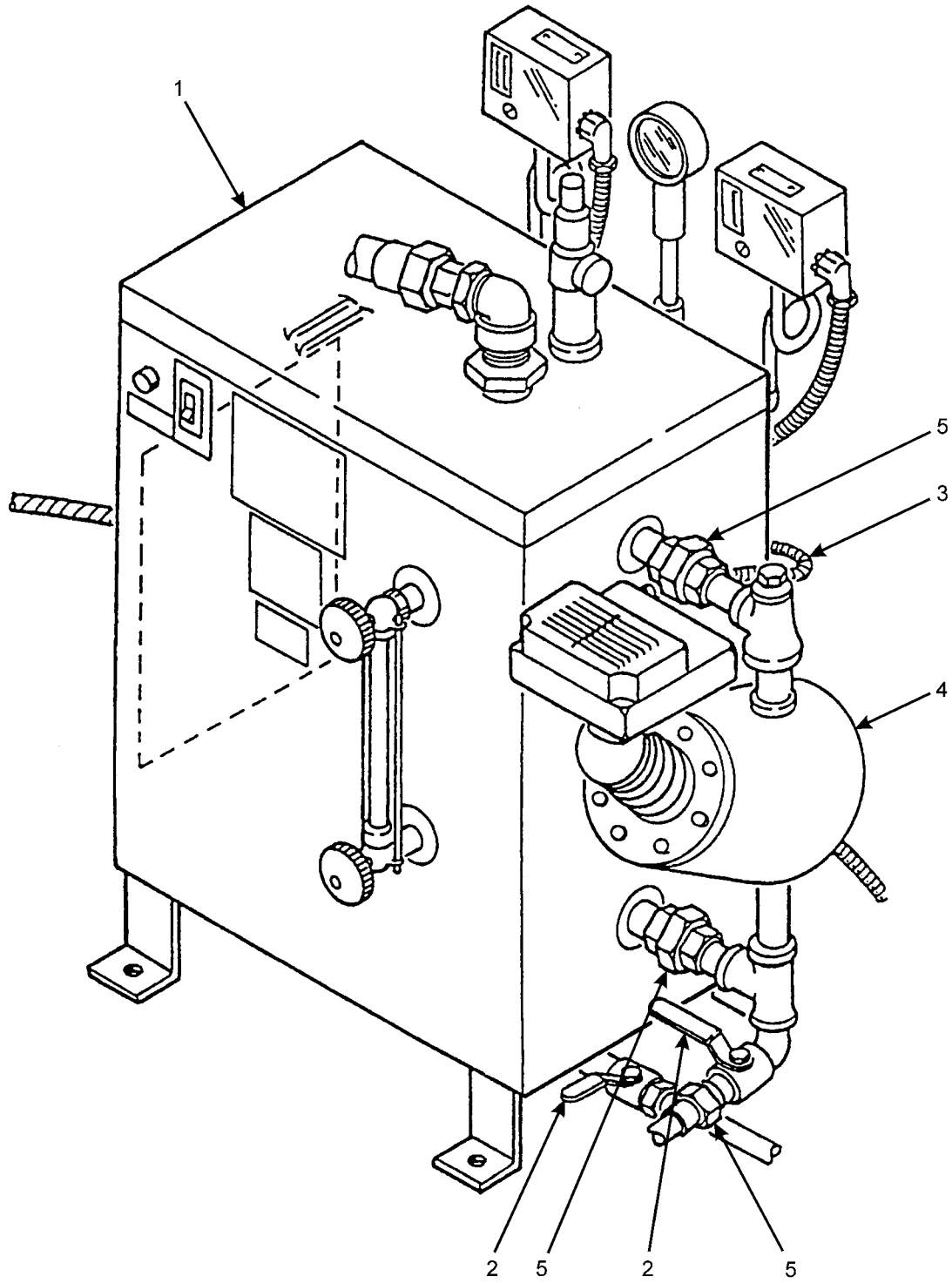
- a. Position mounting bracket (12) on bottom of gum bath (1) and secure with four screws (10) and washers (11).
- b. Connect conduit (2) and wiring (from pyrometer fuse box (3)) as tagged to gum bath (1). Remove tags.

**WARNING**

The gum bath unit is heavy (160 lbs/71 kg). To prevent injury, two people are required to install the gum bath into the countertop.

- c. Position gum bath (1) on countertop.
- d. Connect conduit (2) and wiring (from pyrometer) as tagged to gum bath (1). Remove tags.
- e. Align gum bath (1) mounting holes and secure with eight screws (6), lockwashers (7) and washers (8) through bottom of countertop.
- f. Apply teflon tape to male fittings. Be sure to wrap tape in same direction as pipe thread.
- g. Connect drain line union (5) to gum bath (1).
- h. Connect steam line union (4) to gum bath (1).
- i. Connect wiring as tagged and conduit (2) to pyrometer fuse box (3). Remove tags.
- j. Close drain valve No. 7.
- k. At Power Panel No. 2, set circuit breaker A15CB5 to ON.
- l. At Main Power Panel, set circuit breakers, A1CB18 and A1CB19 to ON.
- m. Prepare and operate water system using internal water tank as source in accordance with procedures listed in paragraph 2-6j.
- n. Inspect for leaks and check for proper operation.





MBPLA-5-11B

Figure 5-10. Boiler Low Water Cutoff Pump Control

**5-15. BOILER LOW WATER PUMP.**

---

This task consists of:                      a. Remove                                      b. Install

---

**INITIAL SET-UP**Tools Required

General Mechanics Tool Kit, (Appendix B, Section III, Item 1)

Materials/Parts Required

Lockwashers (4)

Teflon Tape, (Appendix E, Section II, Item 157)

Equipment Condition

Boiler Low Water Cutoff Pump Control Removed (Paragraph 5-14)

General Safety Instructions**WARNING****ELECTRICAL SHOCK**

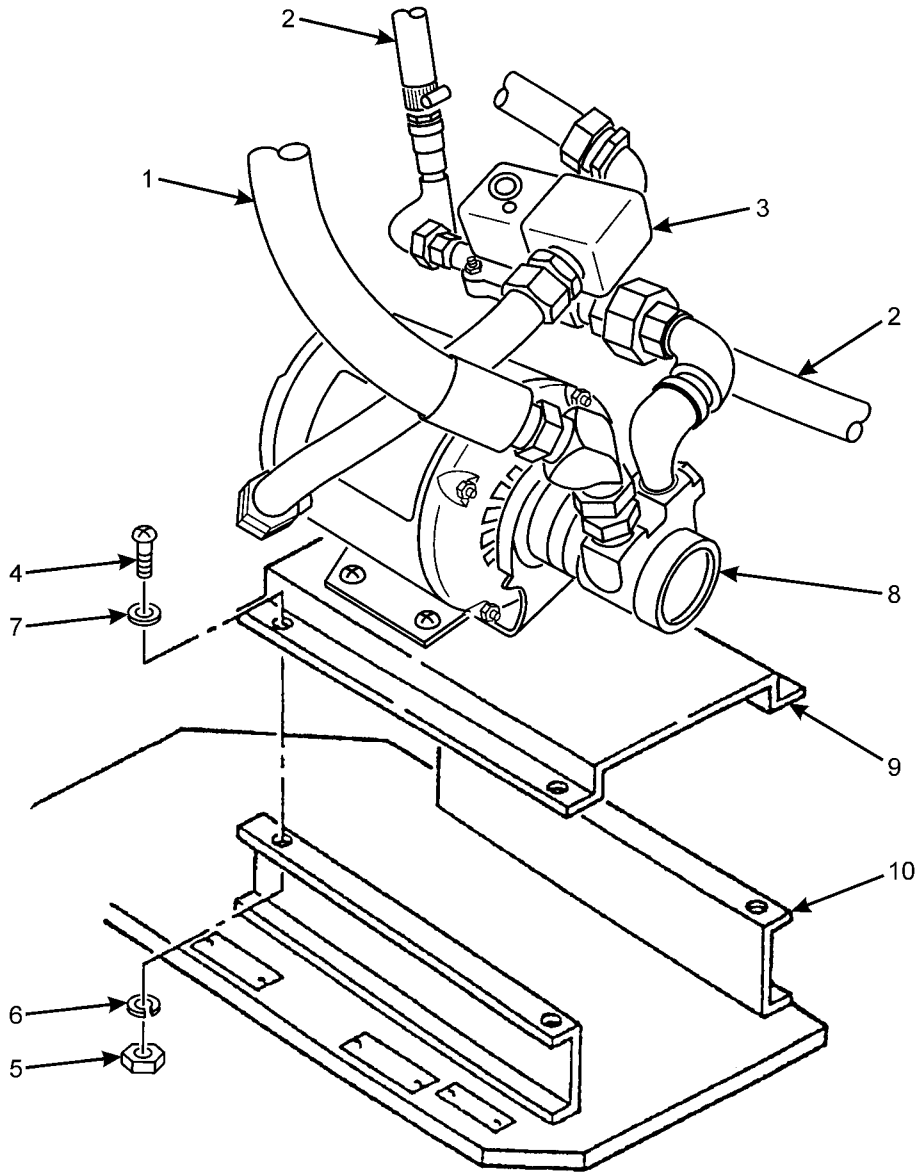
Before performing any maintenance actions on electrical equipment, ensure all electrical power has been turned off. Failure to comply with this warning may result in serious injury or death.

---

REMOVE

Remove Boiler Low Water Pump. See Figure 5-11.

- a. At Power Panel No. 2, set circuit breaker A15CB5 to OFF.
- b. Close water feed boiler valve located on equipment wall behind electric steam boiler and drain boiler.
- c. Tag and disconnect low water pump wiring from junction box on back of electric steam boiler.
- d. Disconnect high pressure flexible hose (1) from boiler inlet line.
- e. Disconnect two hoses (2) from motor sensing valve (3).
- f. Remove four screws (4), nuts (5), lockwashers (6), and washers (7). Discard lockwashers.
- g. Remove boiler low water pump (8) and mounting bracket (9) from floor mount (10).



MBPLA-5-12A

Figure 5-11. Boiler Low Water Pump

INSTALL

Install Boiler Low Water Pump. See Figure 5-11.

- a. Install boiler low water pump (8) and mounting bracket (9) on floor mount (10) and secure with four screws (4), lockwashers (6), washers (7), and nuts (5).
- b. Connect two hoses (2) to motor sensing valve (3).
- c. Apply teflon tape to male fittings. Be sure to wrap tape in same direction as pipe thread.
- d. Connect high pressure flexible hose (1) to boiler inlet line.
- e. Connect boiler low water pump wiring and conduit to junction box on back of electric steam boiler.
- f. Install boiler low water cutoff pump control (paragraph 5-14).
- g. Open water feed boiler valve located on equipment wall.
- h. Set circuit breaker A15CB5 on Power Panel No. 2 to ON.
- i. Prepare and operate water system using internal water tank as source in accordance with procedures listed in paragraph 2-6j.
- j. Inspect for leaks and check for proper operation.

5-16. ELECTRIC STEAM BOILER.

---

This task consists of:                                a. Remove    b. Install

---

**INITIAL SET-UP**

Tools Required

General Mechanics Tool Kit, (Appendix B, Section III, Item 1)

Materials/Parts Required

Teflon Tape, (Appendix E, Section II, Item 157)

Personnel Required

Two (2)

Equipment Conditions

Boiler Low Water Cutoff Pump Control Removed (Paragraph 5-14)

Boiler Low Water Pump Removed (Paragraph 5-15)

General Safety Instructions

**WARNING**

ELECTRICAL SHOCK

Before performing any maintenance actions on electrical equipment, ensure all electrical power has been turned off. Failure to comply with this warning may result in serious injury or death.

---

REMOVE

Remove Electric Steam Boiler. See Figure 5-12.

**WARNING**

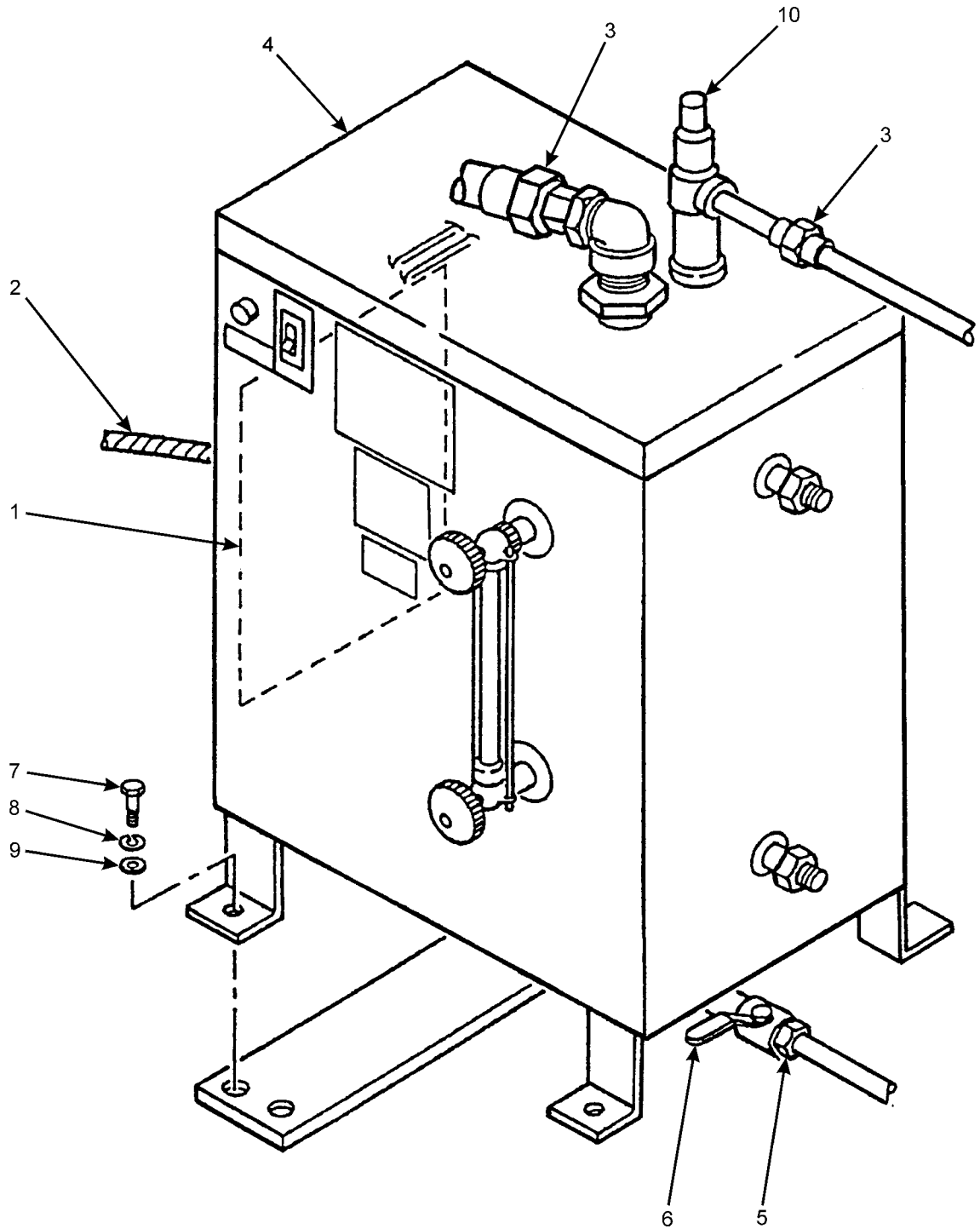
To prevent injury to personnel, be sure electric steam boiler has had time to cool before performing any maintenance. Steam temperature as high as 600°F (279.9°C) can be obtained in this unit.

- a. Open boiler access door (1). Tag and disconnect power input electrical wiring and conduit (2).
- b. Disconnect two pipe unions (3) located on top of boiler (4).
- c. Disconnect pipe union (5) at drain valve (6).
- d. Remove four bolts (7), lockwashers (8), and washers (9).

**WARNING**

To prevent injury, two personnel are required to remove electric steam boiler. Boiler is very heavy.

- e. Remove electric steam boiler (4) from mechanical room.
- f. Remove drain valve (6), safety valve (10), and pipe fittings from electric steam boiler (4). Save components for installation.
- g. Remove junction boxes, conduit, and external wiring from back of boiler. Save components for installation.



MBPLA-5-15A

Figure 5-12. Electric Steam Boiler



INSTALL

Install Electric Steam Boiler. See Figure 5-12.

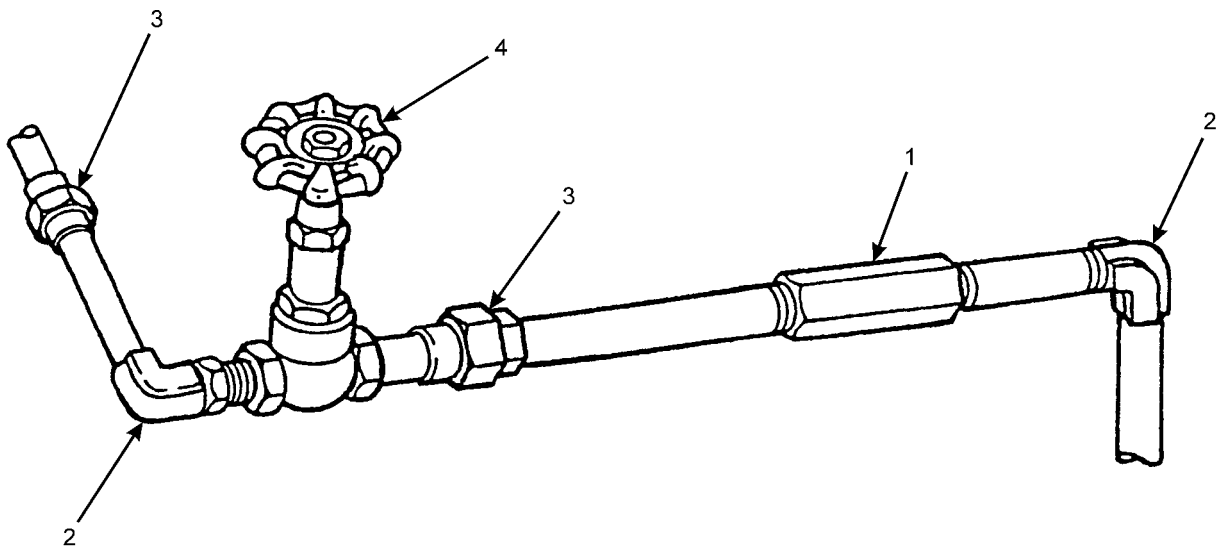
- a. Install wiring as tagged, conduit and junction boxes onto back of boiler. Remove tags.
- b. Apply teflon tape to male fittings. Be sure to wrap tape in same direction as pipe thread.
- c. Install pipe fittings, drain valve (6) and safety valve (10) on electric steam boiler (4).

**WARNING**

To prevent injury, two personnel are required to install electric steam boiler. Boiler is very heavy.

- d. Position electric steam boiler (4) in mechanical room.
- e. Install four bolts (7), lockwashers (8), and washers (9).
- f. Connect pipe union (5) at drain valve (6).
- g. Connect two pipe unions (3) located on top of electric steam boiler (4).
- h. Open access door (1) and connect power input electrical wiring as tagged and conduit. Remove tags.
- i. Close drain valve (6).
- j. Install electric steam boiler low water pump (paragraph 5-15).
- k. Install electric steam boiler low water cutoff pump control (paragraph 5-14).
- l. Open water feed boiler valve located on equipment wall.
- m. At Power Panel No. 2, set circuit breaker A15CB5 to ON.
- n. Prepare and operate water system using internal water tank as source in accordance with procedures listed in paragraph 2-6j.
- o. Inspect for leaks and check for proper operation.

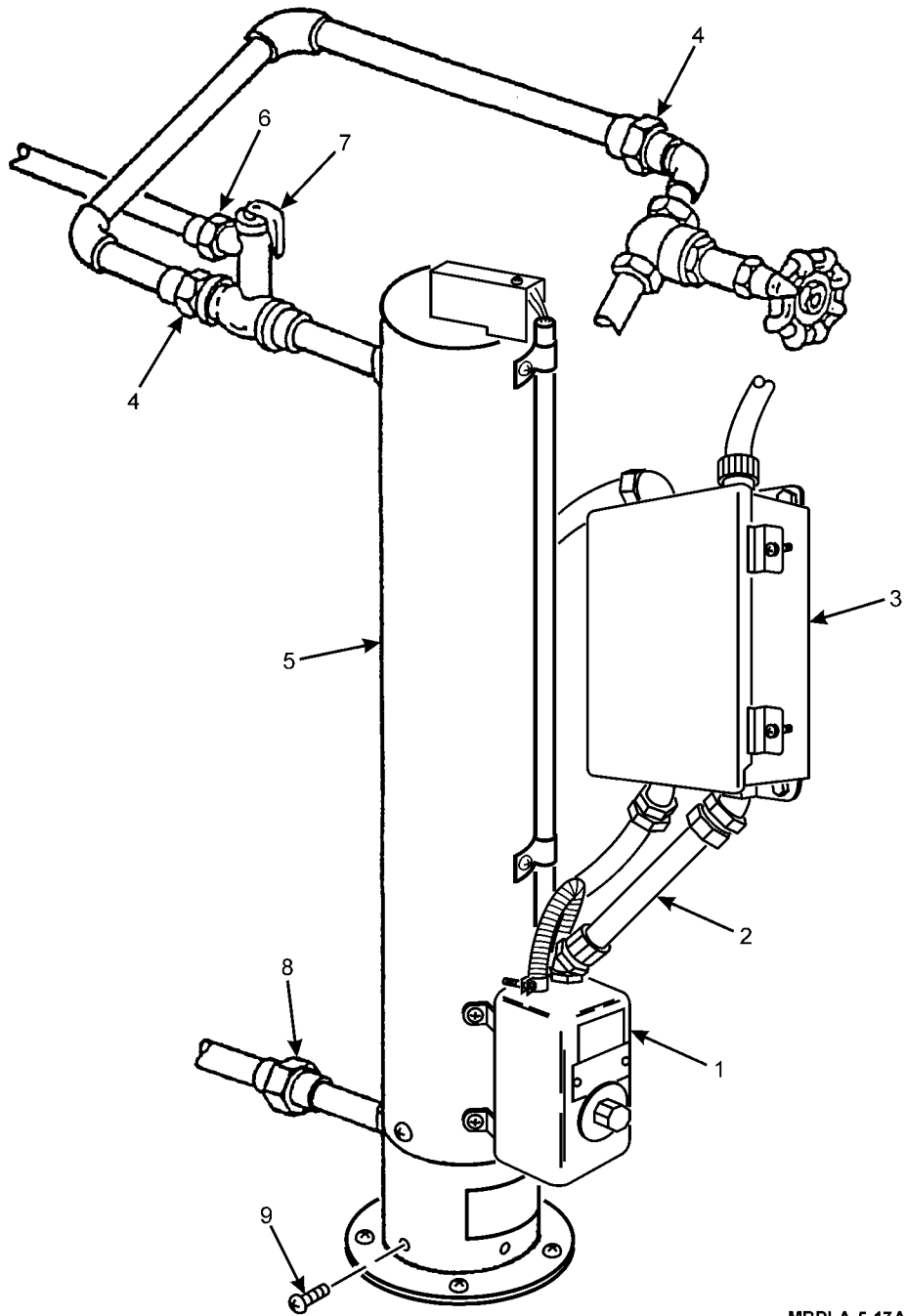




MBPLA-5-16A

Figure 5-13. Gum Bath System Flow Control Devices





MBPLA-5-17A

Figure 5-14. High Pressure Steam Boiler

INSTALL

Install High Pressure Steam Boiler. See Figure 5-14.

- a. Apply teflon tape to male fittings. Be sure to wrap tape in same direction as pipe thread.
- b. Install pipe fittings and relief valve (7) on boiler (5).
- c. Install boiler (5) onto mount (10) and secure with three screws (9).
- d. Connect inlet union (8) to bottom of boiler (5).
- e. Connect union (6) at steam boiler relief valve (7).
- f. Connect two unions (4) at each end of pipe from valve No. 2 to boiler (5).

**NOTE**

When connecting wiring from boiler to temperature control box, attach one wire to each bus bar.

- g. Connect conduit (2) and two electrical leads as tagged to steam temperature control box (1). Remove tags and install cover.
- h. At Main Power Panel, set circuit breaker A1CB19 to ON.
- i. Prepare and operate water system using internal water tank as source in accordance with procedures listed in paragraph 2-6j.
- j. Inspect for leaks and check for proper operation.

## 5-19. PYROMETER INDICATOR/CONTROL.

---

This task consists of:                      a. Remove                                      b. Install

---

### **INITIAL SET-UP**

#### Tools Required

General Mechanics Tool Kit, (Appendix B, Section III, Item 1)

#### Materials/Parts Required

Lockwashers, (2)

#### General Safety Instructions

**WARNING**

#### ELECTRICAL SHOCK

Before performing any maintenance actions on electrical equipment, ensure all electrical power has been turned off. Failure to comply with this warning may result in serious injury or death.

---

### REMOVE

Remove Pyrometer Indicator/Control. See Figure 5-15.

- a. At Main Power Panel, set circuit breaker A1CB18 to OFF.
- b. Remove four screws (1) securing pyrometer (2) to front panel.
- c. Remove two screws (3), lockwashers (4), washers (5), bracket (6), and pyrometer (2). Discard lockwashers.
- d. Tag and disconnect electrical leads and conduit (7) from pyrometer (2).

### INSTALL

Install Pyrometer Indicator/Control. See Figure 5-15.

- a. Connect conduit (7) and electrical leads as tagged to housing assembly. Remove tags.
- b. Install pyrometer into front panel and secure with bracket (6), two screws (3), lockwashers (4), and washers (5).
- c. Secure pyrometer (2) to front panel with four screws (1).
- d. At Main Power Panel, set circuit breaker A1CB18 to ON.
- e. Prepare and operate water system using internal water tank as source in accordance with procedures listed in paragraph 2-6j.
- f. Inspect for leaks and check for proper operation.

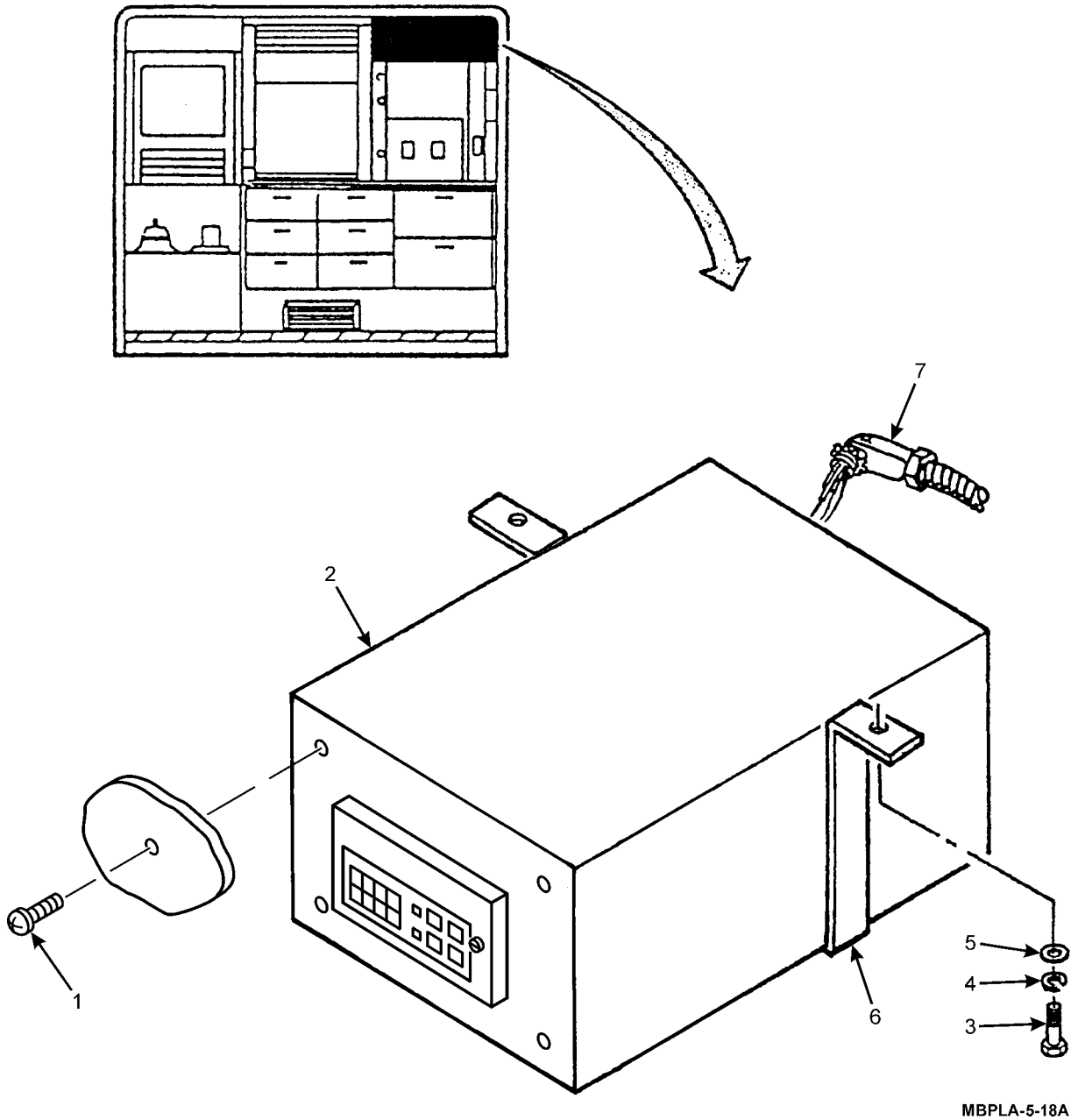


Figure 5-15. Pyrometer Indicator/Control



## 5-20. AIR/STEAM FLOW RATE INDICATOR METERS.

---

This task consists of:	a. Remove	b. Install
------------------------	-----------	------------

---

### **INITIAL SET-UP**

#### Tools Required

General Mechanics Tool Kit, (Appendix B, Section III, Item 1)

#### Materials/Parts Required

Teflon Tape, (Appendix E, Section II, Item 157)

#### Equipment Condition

Steam Boiler Shut Down and appropriate Circuit Breaker Switch OFF.

---

### REMOVE

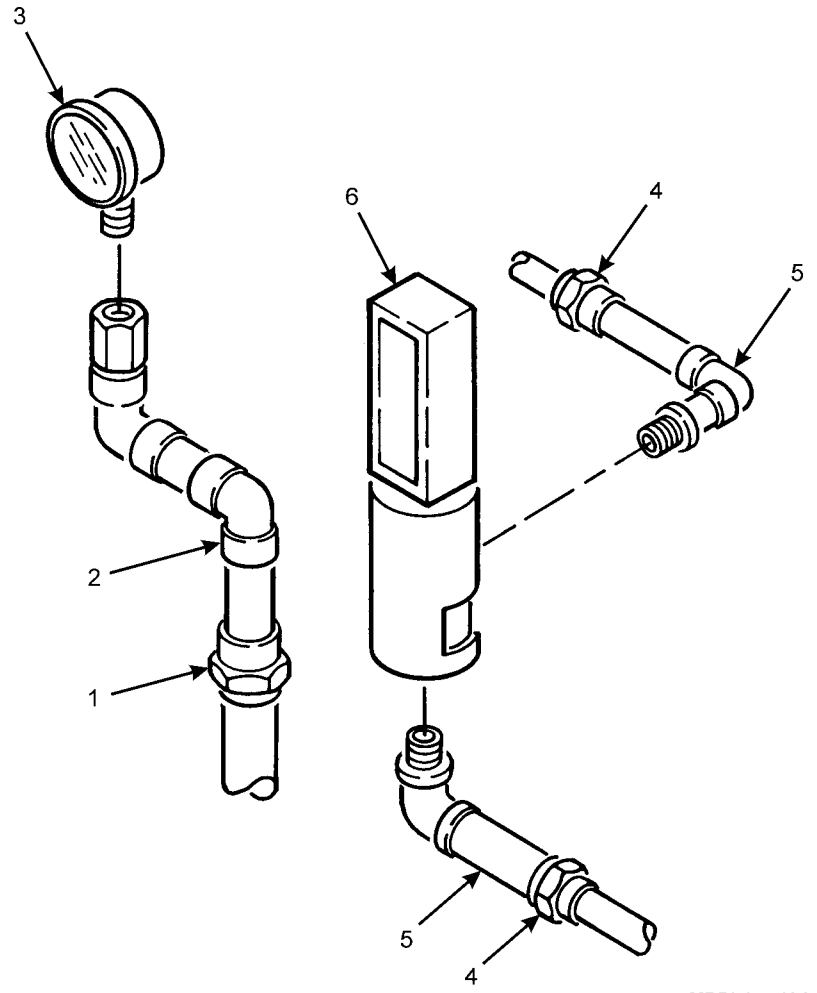
Remove Air/Steam Flow Rate Indicator Meters. See Figure 5-16.

- a. Disconnect union (1) from air flow rate indicator meter piping (2) and remove meter (3).
- b. Disconnect unions (4) from steam flow rate indicator meter piping (5) and remove meter (6).
- c. Remove piping (2 and 5) from meters (3 and 6).

### INSTALL

Install Air/Steam Flow Rate Indicator Meters. See Figure 5-16.

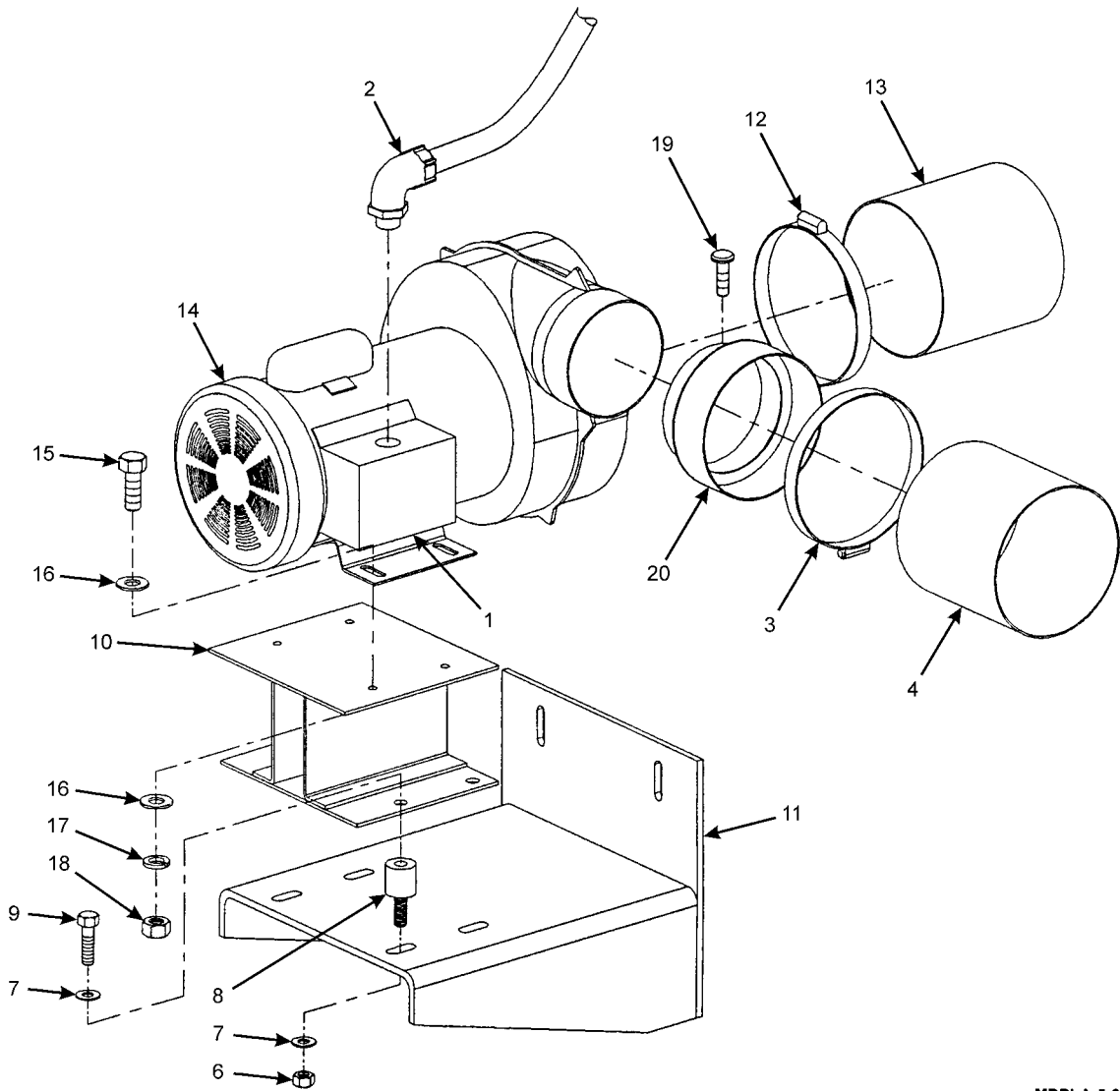
- a. Apply teflon tape to male fittings. Be sure to wrap tape in same direction as pipe thread.
- b. Install piping (2 and 5) on meters (3 and 6).
- c. Position steam flow rate indicator meter (6) behind panel and connect union (4).
- d. Position air flow rate indicator meter (3) behind panel and connect union (1).
- e. Prepare and operate water system using internal water tank as source in accordance with procedures listed in paragraph 2-6j.
- f. Inspect for leaks and check for proper operation.



MBPLA-5-19A

Figure 5-16. Air/Steam Flow Rate Indicator Meters





MBPLA-5-20A

Figure 5-17. Gum Bath Vent/Fume Vent Blower and Motor

- d. Secure motor bracket (10) to equipment shelf (11) with four nuts (6), eight washers (7), four dampers (8), and screws (9).
- e. Install discharge duct (4) and secure by tightening clamp (3).
- f. Connect wiring and conduit (2) to junction box (1). Remove tags.
- g. Install access panel on blower motor junction box (1).
- h. At Power Panel No. 2, set circuit breaker A15CB11 to ON.

## 5-22. FREEZER (ICE CUBE MAKER).

---

This task consists of:

	a. Remove	b. Install
--	-----------	------------

---

### **INITIAL SET-UP**

Tools Required

General Mechanics Tool Kit, (Appendix B, Section III, Item 1)

Materials/Parts Required

Lockwasher, (6)

Personnel Required

Two (2)

Equipment Conditions

Centrifuge Removed (Paragraph 4-46)

General Safety Instructions

**WARNING**

**ELECTRICAL SHOCK**

Before performing any maintenance actions on electrical equipment, ensure all electrical power has been turned off. Failure to comply with this warning may result in serious injury or death.

---

### REMOVE

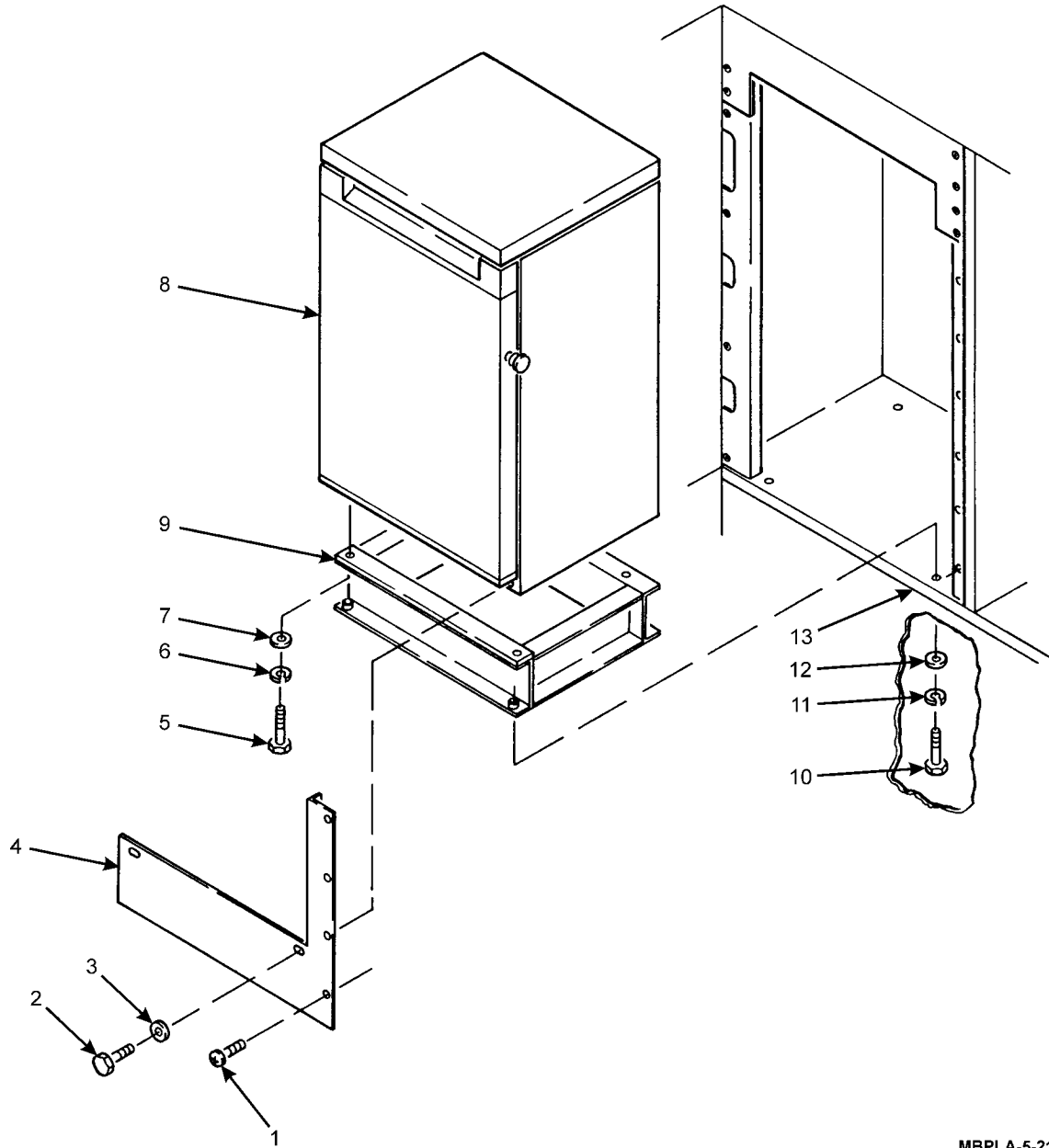
Remove Freezer. See Figure 5-18.

- a. Unplug freezer from wall receptacle in mechanical room.
- b. Remove four screws (1), two screws (2), washers (3), and front panel (4).

**WARNING**

The freezer is heavy. To prevent injury, two people are required to remove freezer from mounting base.

- c. Remove two screws (5), lockwashers (6), and washers (7), and lift freezer (8) from mounting base (9). Discard lockwashers.
- d. Open cabinet doors D for access to mounting base (9) hardware.
- e. Remove four screws (10), lockwashers (11), and washers (12) from bottom of countertop (13). Discard lockwashers.
- f. Remove mounting base (9) from countertop (13).



MBPLA-5-21A

Figure 5-18. Freezer

INSTALL

Install Freezer. See Figure 5-18.

- a. Install mounting base (9) on countertop (13) and secure with four screws (10), lockwashers (11), and washers (12).

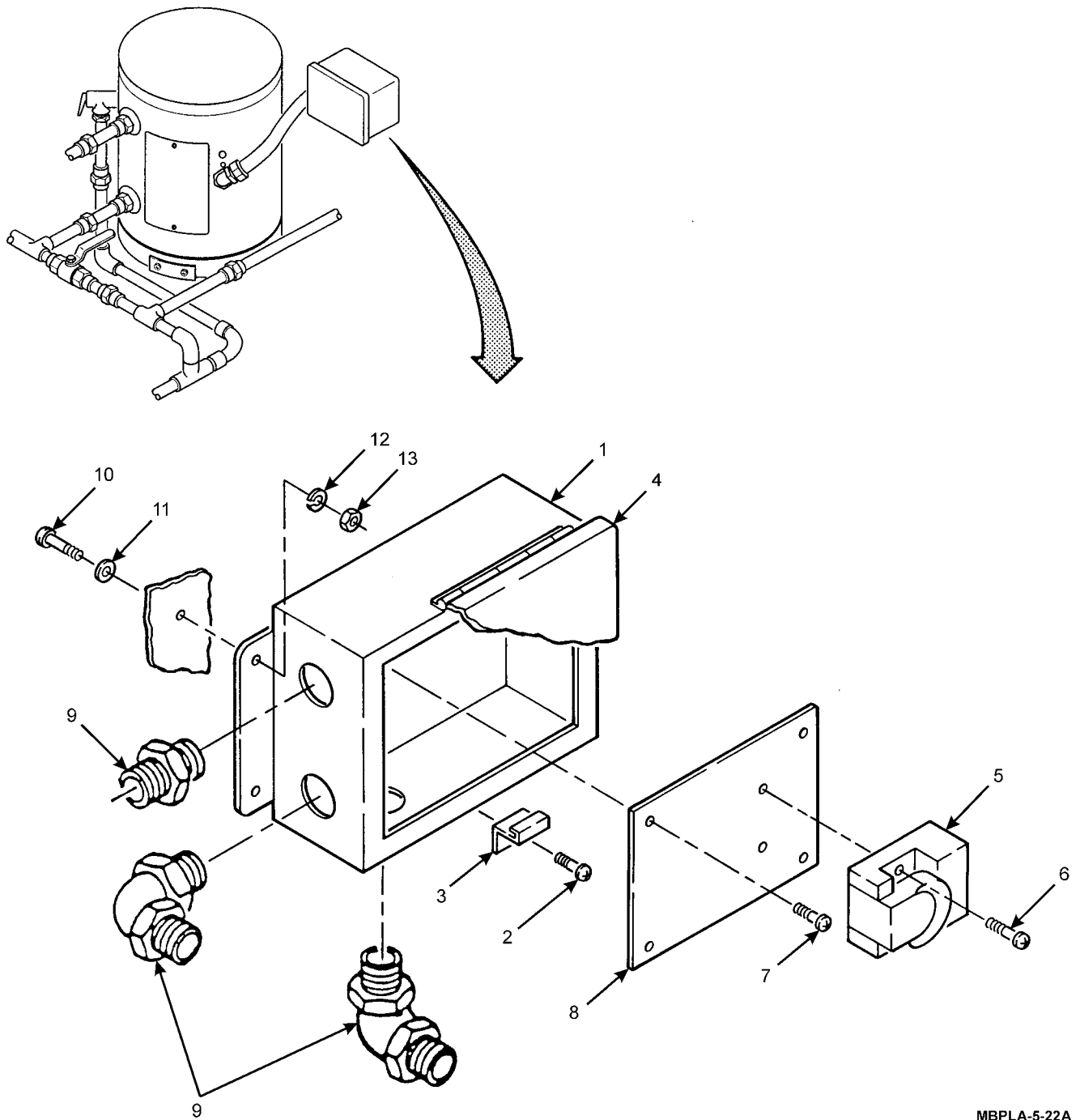
**WARNING**

The freezer is heavy. To prevent injury, two people are required to install freezer on mounting base.

- b. Position freezer (8) on mounting base (9) and secure with two screws (5), lockwashers (6) and washers (7).
- c. Install front panel (4) and secure with four screws (1), two screws (2), and washers (3).
- d. Close cabinet doors D.
- e. Plug freezer into wall receptacle located in mechanical room.
- f. Start freezer and check for proper operation.
- g. Install centrifuge (Paragraph 4-46).







MBPLA-5-22A

Figure 5-19. Hot Water Heater Distribution Box

INSTALL

Install Hot Water Heater Distribution Box. See Figure 5-19.

- a. Install hot water heater distribution box (1) and secure with four screws (10), lockwashers (11), washers (12), and nuts (13).
- b. Install conduit (9) and wiring into hot water heater distribution box (1).
- c. Install panel (8) and secure with four screws (7).
- d. Install relay (5) and secure with two screws (6).
- e. Connect wiring as tagged to relay (5). Discard tags.
- f. Close cover (4) and secure with screw (2), and latch (3).
- g. Install shelf into cabinet U.
- h. On Main Power Panel set water heater circuit breaker A1CB17 to ON.
- i. Install water bath (Paragraph 4-75).
- j. Install grease working machine (Paragraph 4-75).
- k. Install hot plate (Paragraph 4-75).

**5-24. PYROMETER FUSE BOX.**


---

This task consists of:

a. Remove

b. Install

**INITIAL SET-UP**Tools Required

General Mechanics Tool Kit, (Appendix B, Section III, Item 1)

Materials/Parts Required

Lockwashers, (4)

**WARNING****ELECTRICAL SHOCK**

Before performing any maintenance actions on electrical equipment, ensure all electrical power has been turned off. Failure to comply with this warning may result in serious injury or death.

---

REMOVE

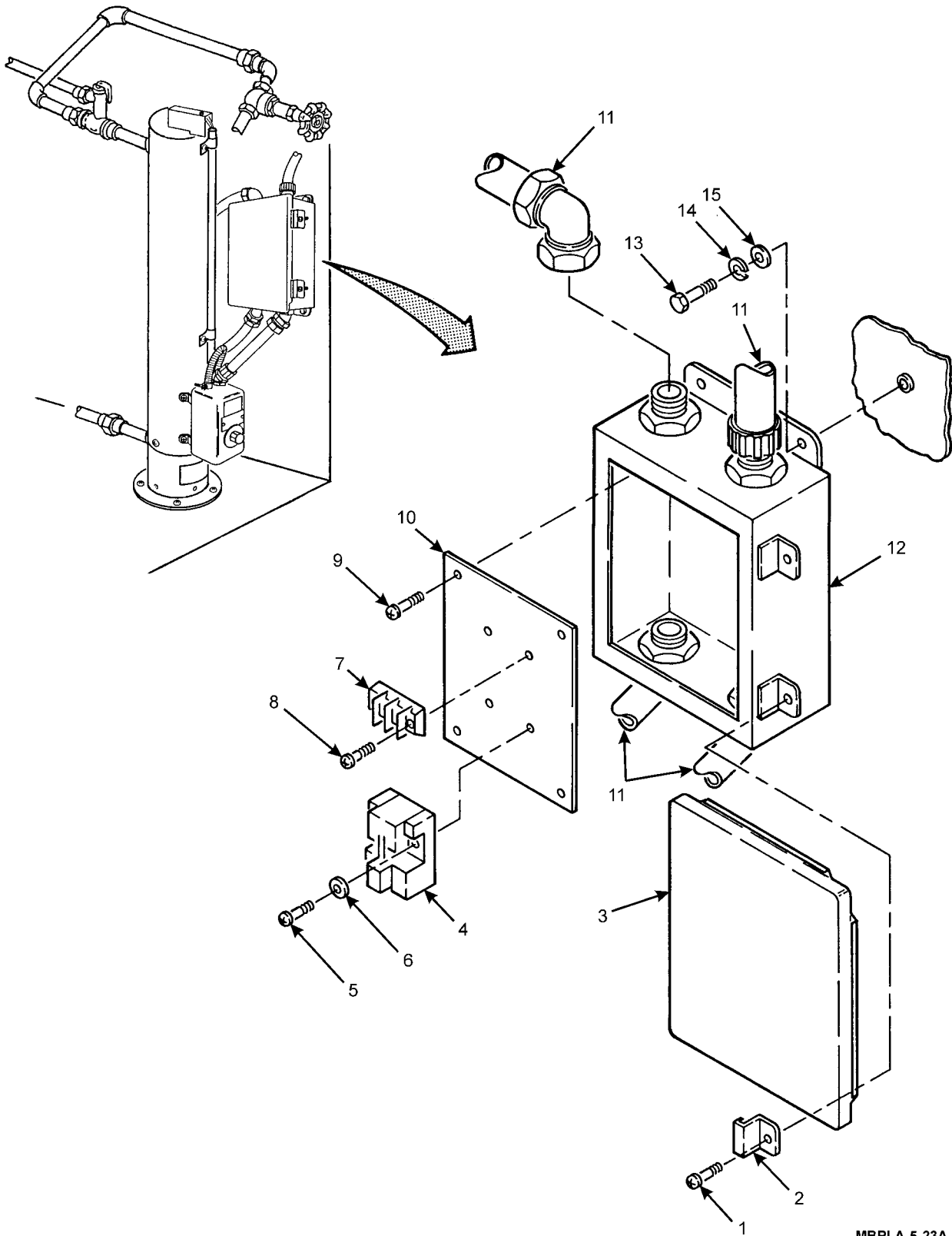
Remove Pyrometer Fuse Box. See Figure 5-20.

- a. On Main Power Panel set circuit breaker A1CB19 to OFF.
- b. Remove two screws (1), latches (2), and open cover (3).
- c. Tag and disconnect wiring from relay (4).
- d. Remove two screws (5), washers (6), and relay (4).
- e. Tag and disconnect wiring from terminal board (7).
- f. Remove two screws (8) and terminal board (7).
- g. Remove four screws (9) and panel (10).
- h. Remove conduit (11) and wiring from pyrometer fuse box (12).
- i. Remove four screws (13), lockwashers (14), washers (15), and pyrometer fuse box (12). Discard lockwashers.

INSTALL

Install Pyrometer Fuse Box. See Figure 5-20.

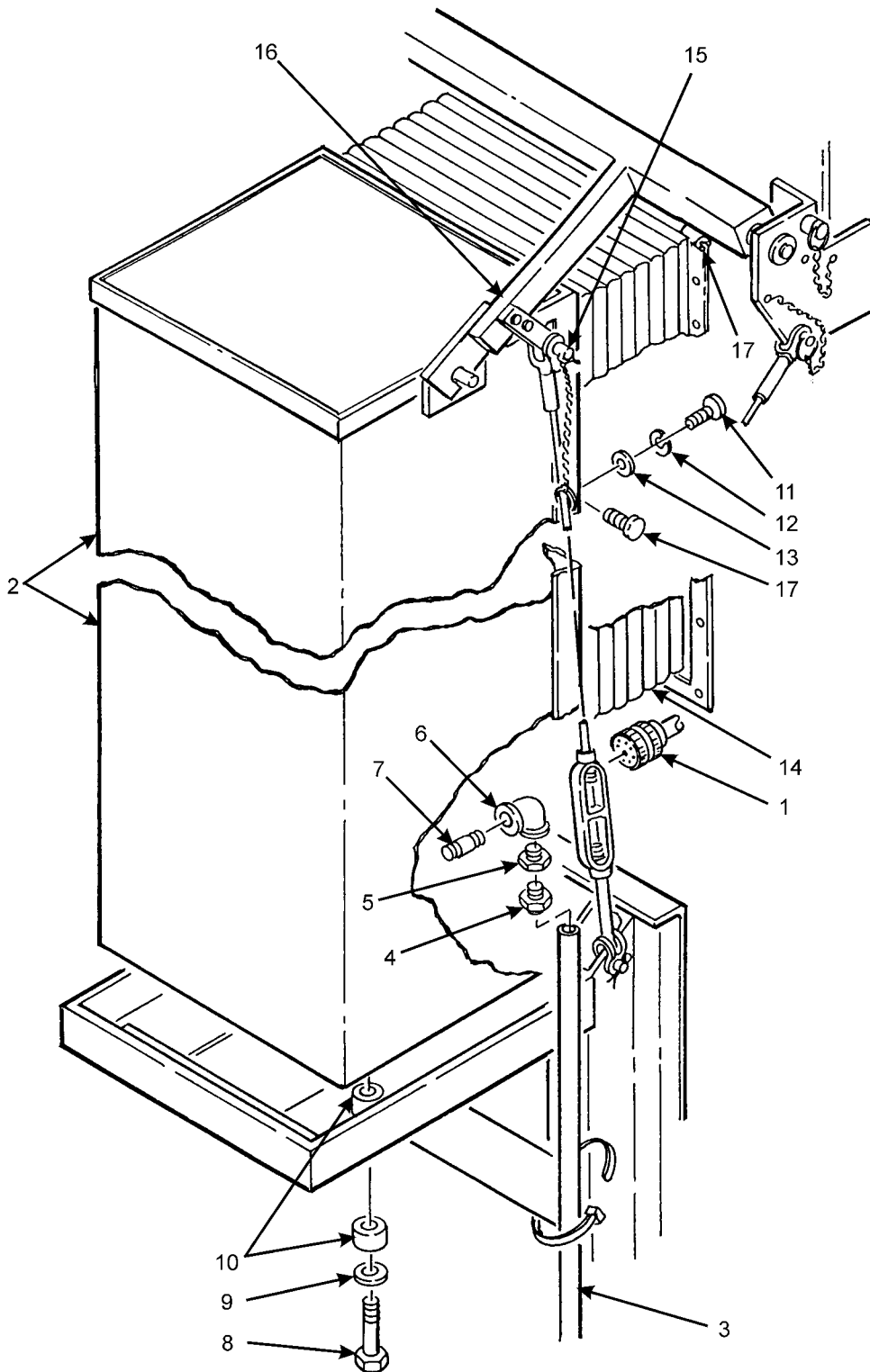
- a. Install pyrometer fuse box (12) and secure with four screws (13), lockwashers (14), and washers (15).
- b. Install conduit (11) and wiring to pyrometer fuse box (12).
- c. Install panel (10) and secure with four screws (9).
- d. Install terminal board (7) and secure with two screws (8).
- e. Connect wiring as tagged to terminal board (7).
- f. Install relay (4) and secure with two screws (5) and washers (6).
- g. Connect wiring as tagged to relay (4).
- h. Close cover (3) and secure with two latches (2) and screws (1).
- i. On Main Power Panel set circuit breaker A1CB19 to ON.



MBPLA-5-23A

Figure 5-20. Pyrometer Fuse Box





MBPLA-4-17B

Figure 5-21. Environmental Control Unit

**CAUTION**

Mod Lab ECU opening must be covered to prevent dirt, dust or moisture from entering laboratory, unless replacement is to be immediately installed.

4. Cover Mod Lab ECU opening.
  - a. Cover ECU opening with plastic or suitable covering.

**INSTALL**

1. Remove Mod Lab ECU covering.
  - a. Remove ECU opening covering and clean area.
2. Install Flexible Duct. See Figure 5-21.
  - a. Install flexible duct (14) on Mod Lab and secure with four bolts (17).
3. Install Environmental Control Unit (ECU).

**WARNING**

Serious injury to personnel or damage to equipment may occur unless two or more personnel are used to install air conditioner because of weight and balance of the ECU.

- a. Carefully position ECU (2) onto ECU mounting platform.
  - b. Install flexible duct (14) to ECU (2) and secure with 12 screws (11), lockwashers (12), and washers (13).
  - c. Slide ECU (2) into position and secure to with four bolts (8), washers (9) and eight isolation mounts (10).
  - d. Lower upper hold down bar (16).
  - e. Install cable and secure with quick release pin (15) to secure ECU (2) in position.
  - f. Install nipple (7), elbow (6), and fittings (4 and 5).
  - g. Install drain line (3) and connect to adapter (4).
  - h. Connect the two ECU input power cables (1).
4. Apply Electrical Power
    - a. Position Power Panel No. 2 circuit breakers A15CB1, A15CB2, A15CB3, or A15CB4 to ON.
    - b. Position ECU remote control mode switch to operational position and verify ECU operation. (See Figure 4-15).





## APPENDIX A

### REFERENCES

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#### A-1. SCOPE.

This appendix contains all forms, pamphlets and technical manuals referenced in both the Airmobile and Semi-Trailer Mounted Laboratories.

#### A-2. FORMS.

Recommended Changes to Publications and Blank Forms.....	DA Form 2028
Recommended Changes to Equipment Technical Publications .....	DA Form 2028-2
Product Quality Deficiency Report.....	SF 368
Equipment Inspection and Maintenance WorkSheet .....	DA Form 2404
Hand Receipts .....	DA Form 2062

#### A-3. FIELD MANUALS.

Petroleum Testing Facilities: Laboratories and Kits .....	FM 10-67-2
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#### A-4. TECHNICAL MANUALS.

Air Conditioner, Vertical Compact, 18,000 BTU/HR .....	TM 5-4120-388-14
Air Conditioner, Vertical Compact, 18,000 BTU/HR .....	TM 5-4120-388-24P
Administrative Storage of Equipment.....	TM 740-90-1
Bacharach Gas Alarm and Calibration Data .....	TM 10-6665-297-13&P
Destuction of Equipment to Prevent Enemy Use .....	TM 750-244-3
Emcee Micro-Separometer .....	TM 10-6640-222-13&P
Foxboro Pressure Recording Gauge .....	TM 10-6685-365-13&P
Koehler Cleveland Open Tester .....	TM 10-6630-236-13&P
Koehler Cloud and Pour Point Chamber.....	TM 10-6630-238-13&P
Koehler Copper Strip Corrosion Bomb Bath.....	TM 10-6640-220-13&P
Koehler Dropping Point Apparatus.....	TM 10-6635-211-13&P
Koehler Electric Pensky-Martins Tester .....	TM 10-6630-231-13&P
Koehler Tag Closed Cup Flash Tester .....	TM 10-6630-235-13&P
Labline Explosion Proof Refrigerator.....	TM 10-6640-219-13&P
Ohaus Harvard Trip Balance.....	TM 10-6670-278-13&P
Precision Distillation Testing Equipment .....	TM 10-6630-219-13&P
Precision High Temperature Bronze Block Gum Bath.....	TM 10-6630-234-13&P
Precision Oxidation Stability Bath.....	TM 10-6640-232-13&P
Precision Pensky-Martens Flash Testers.....	TM 10-6630-231-13&P
Precision Reid Vapor Pressure Bath .....	TM 10-6640-226-13&P
Precision Slo-Speed Stirrer .....	TM 10-6640-224-13&P
Precision Universal Centrifuge .....	TM 10-6640-230-13&P
Precision Universal Penetrometer.....	TM 10-6635-212-13&P
Sargent-Welch Vacuum Pump.....	TM 10-4310-391-13&P
Teel Self-Priming Centrifugal Pump .....	TM 10-4320-321-13&P
Teel Submersible Pump .....	TM 10-4320-320-13&P

**A-5. PAMPHLETS.**

The Army Maintenance Management System (TAMMS) .....DA Pam 738-750

**A-6. MISCELLANEOUS PUBLICATIONS.**

The Army Integrated Publishing and Printing Program ..... TM &P  
 Laboratory, Airmobile, Aviation Fuel..... MIL-L-52733A(ME)  
 Material Base Petroleum Laboratory Control Procedures Manual.....MKP-1479  
 Material Base Petroleum Laboratory Chemical Storage Procedures Manual .....MKP-1480  
 North American Emergency Response Guidebook.....NAERG  
 Apparatus, Instruments, Chemicals, Furniture, and Supplies  
     for Industrial, Clinical, College and Government Laboratories ..... Fischer Scientific Laboratories Catalog  
 Petroleum-Petrochemical Testing Equipment..... Precision Scientific Catalog

**A-7. VENDOR MANUALS.**

Title	Vendor Manual Part Number
Alcor Jet Fuel Thermal Oxidation Tester .....	59231
Aneroid Barometer.....	N/A
Atlas Copco Piston Compressor .....	2920-1257-00
Bacharach Gas Calibration Kit.....	23-7260 and Tech Bulletin 23-9860
Barnstead/Thermolyne Corporation Furnaces .....	N/A
Barnstead/Thermolyne Electrically Heated Portable Still .....	LT919X1
Bel-Art Floweter Kit .....	N/A
Brooks Instrument Division High Pressure Purge Meter.....	X-3600
Chromalox Circulation Heaters for Steam, Gas and Air Heating .....	3002D
Chromalox Pump, Water High Pressure .....	226-300178-000
Cincinnati LM-4 Fan.....	PMA-793
Denver Instruments Electronic Analytical Balance.....	700122.3
Elkay Water Chiller.....	92881C
Emcee Electronics Inc Digital Conductivity Meter .....	N/A
Epson Printer .....	4004166
Fisher Scientific ISOTEMP Refrigerators/Refrigerator/Freezers/Freezers.....	9-057-170-00
Gammon Aqua-Glo Series III Water Detector Kit .....	Bulletin 76
GS Lindberg Hot Plate .....	L-8299-53013
HB Industries Inc B/2 Anti-Icing Additive Test Kit.....	N/A
Koehler Freezing Point Apparatus.....	N/A
Koehler Grease Working Machine .....	N/A
Koehler K10400 and K10402 2 Unit Oxidation Stability of Gasoline Bomb Bath .....	N/A
Koehler K23370 Series Constant Temperature Kinematic Viscosity Bath.....	N/A
Koehler K33850 Series Boilers and Steam Generators .....	N/A
Koehler K43002 and K43092 Dual Twin Unit Foam Test Apparatus .....	N/A
Meriam Instrument Manometer.....	A-35295-1
Orbeco-Hellige Aqua Tester.....	N/A
Precision General Purpose Water Baths .....	36100124
Precision Laboratory Heater .....	TS-61510-AU-1
Precision Scientific Oven .....	316029312
Precision Scientific Temperature Controller .....	TS-3128-AY-9
Texas Instruments Calculator .....	9807247-0101
Thermolyne Cimarec Stirring Hot Plate Operation Manual and Parts List.....	LT1072X1
Triplett Corporation Hand Size VOM .....	84-731
Typewriter, Portable.....	N/A
Vanguard Electric Water Heater.....	AP 10227-8
VWR Scientific ph/mv/temperature Meter.....	219895-001
Western Emergency Equipment Hose Spray.....	2081441(2)

## APPENDIX B

# MAINTENANCE ALLOCATION CHART (MAC)

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### Section I. INTRODUCTION

#### B-1. GENERAL.

- a. This section provides a general explanation of all maintenance and repair functions authorized at various maintenance categories.
- b. The Maintenance Allocation Chart (MAC) in Section II designates overall authority and responsibility for performance of maintenance functions on the identified end item or component. The application of the maintenance functions to the end item or component will be consistent with the capacities and capabilities of the designated maintenance categories.
- c. Section III lists the tools and test equipment (both special tools and common tool sets) required for each maintenance function as referenced from Section II.
- d. Section IV contains supplemental instructions and explanatory notes for a particular maintenance function.

#### B-2. MAINTENANCE FUNCTIONS.

Maintenance functions will be limited to and are defined as follows:

- a. Inspect. To determine the serviceability of an item by comparing its physical, mechanical, and/or electrical characteristics with established standards through examination (e.g., by sight, sound, or feel).
- b. Test. To verify serviceability by measuring the mechanical, pneumatic, hydraulic, or electrical characteristics of an item and comparing those characteristics with prescribed standards.
- c. Service. Operations required periodically to keep an item in proper operating condition, i.e., to clean (includes decontaminate, when required), to preserve, to drain, to paint, or to replenish fuel, lubricants, chemical fluids, or gases.
- d. Adjust. To maintain or regulate, within prescribed limits, by bringing into proper or exact position, or by setting the operating characteristics to specified parameters.
- e. Align. To adjust specified variable elements of an item to bring about the optimum performance.
- f. 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.
- g. Remove/Install. To remove and install the same item when required to perform service or other maintenance functions. Install may be the act of emplacing, seating, or fixing into position a spare, repair part, or module (component or assembly) in a manner to allow the proper functioning of an equipment or system.
- h. Replace. To remove an unserviceable item and install a serviceable counterpart in its place. "Replace" is authorized by the MAC and is shown as the 3rd position code of the SMR code.
- i. Repair. The application of maintenance services, including fault location/troubleshooting, removal/installation,

and disassembly/assembly procedures, and maintenance actions to identify troubles, and 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.

- j. Overhaul. That maintenance effort (service/action) prescribed to restore an item to a completely serviceable/operational condition as required by maintenance standards in appropriate technical publications (i.e., DMWR). Overhaul is normally the highest degree of maintenance performed by the Army. Overhaul does not normally return an item to like new condition.
- k. Rebuild. Consists of those services/actions necessary for the restoration of unserviceable equipment to a like new condition in accordance with original manufacturing standards. Rebuild is the highest degree of material maintenance applied to Army equipment. The rebuild operation includes the act of returning to zero those age measurements (hours/miles, etc.) considered in classifying Army equipment/components.

**B-3. EXPLANATION OF COLUMNS IN THE MAC - SECTION II.**

- a. Column 1, Group Number. Column 1 lists functional group code numbers, the purpose of which is to identify maintenance significant components, assemblies, subassemblies, and modules with the next higher assembly. End item group numbers are “00”.
- b. Column 2, Component/Assembly. Column 2 contains the names of components, assemblies, subassemblies, and modules for which maintenance is authorized.
- c. Column 3, Maintenance Function. Column 3 lists the functions to be performed on the item listed in Column 2. (For a detailed explanation of these functions, see paragraph B-2).
- d. Column 4, Maintenance Level. Column 4 specifies, by the listing of a work time figure (expressed as man-hours shown as whole hours or decimals) in the appropriate subcolumn(s), the level of maintenance authorized to perform the function listed in Column 3. This figure represents the active time required to perform that maintenance function at the indicated level of maintenance. If the number or the complexity of the tasks within the listed maintenance function vary at difference maintenance levels, appropriate work time figures will be shown for each level. The work time figure represents the average time required to restore an item (assembly, subassembly, component, module, end item, or system) to a serviceable condition under typical field operating conditions. This time includes preparation item including any necessary disassembly/assembly time), troubleshooting/fault location time, and quality assurance/quality control time in addition to the time required to perform the specific tasks identified for the maintenance functions authorized in the maintenance allocation chart. The system designations for the various maintenance levels are shown below.

- C .....Operator or Crew
- O .....Unit Maintenance
- F.....Direct Support Maintenance
- H .....General Support Maintenance
- D .....Depot Maintenance

- e. Column 5, Tools and Equipment. Column 5 specifies, by code, those common tool sets (not individual tools) common TMDE, and special tools, special TMDE, and support equipment required to perform the designated function.
- f. Column 6, Remarks. This column, when applicable, contains a letter code, in alphabetical order, which is keyed to the remarks contained in Section IV.

**B-4. EXPLANATION OF COLUMNS IN TOOL AND TEST EQUIPMENT REQUIREMENTS, SECTION III.**

- a. Column 1, Reference Code. The tool and test equipment reference code correlates with a code used in the MAC, Section II, Column 5.
- b. Column 2, Maintenance Level. The lowest category of maintenance authorized to use the tool or test equipment.
- c. Column 3, Nomenclature. Name or identification of the tool or test equipment.
- d. Column 4, National Stock Number. The national stock number of the tool or test equipment.
- e. Column 5, Tool Number. The manufacturer's part number.

**B-5. EXPLANATION OF COLUMNS IN REMARKS, SECTION IV.**

- a. Column 1, Reference Code. The code recorded in Column 6, Section II.
- b. Column 2, Remarks. This column lists information pertinent to the maintenance function being performed as indicated in the MAC, Section II.

## SECTION II. MAINTENANCE ALLOCATION CHART FOR MODULAR BASE LAB

(1) Group Number	(2) Component Assembly	(3) Maintenance Function	(4) Maintenance Level					(5) Tools and Equipment Ref Code	(6) Remarks Code
			Unit		Direct Support	General Support	Depot		
			C	O	F	H	D		
00	Petroleum Laboratory Semi- Trailer Mounted,	Inspect Remove/Install Repair	.1	.3					
01	Semi-Trailer Assembly	Inspect Remove/Install Repair					1, 2, 3	A	
01	Flashlight, Fire Extinguisher, First Aid Kit, and Burn Kit	Inspect Remove/Install	.1	.4			1, 2, 3		
01	Gas Cylinder and Propane Storage Locker Vents	Inspect Remove/Install	.1	.3			2, 3		
01	Emergency Light Ballast Box	Inspect Remove/Install		.1 .5			1		
01	Main Power Panel Components	Inspect Remove/Install	.1	1.0			1, 2		
01	Power Panel No. 2 Components	Inspect Remove/Install	.1	.5			1, 2		
01	Explosion Proof Distribution Box A3 Components	Inspect Remove/Install		.1 1.0			1		
01	GFI Indicating Switches	Inspect Remove/Install	.1	.4			1		
01	Motor Controller	Inspect Remove/Install	.1	.3			1		
01	Wall Switch	Inspect Remove/Install	.1	.3			1		
01	Receptacles	Inspect Remove/Install	.1	.2			1		
01	Blackout Microswitch	Inspect Remove/Install Adjust	.1	.5 .1			1		

## SECTION II. MAINTENANCE ALLOCATION CHART FOR MODULAR BASE LAB – Continued

(1) Group Number	(2) Component Assembly	(3) Maintenance Function	(4) Maintenance Level					(5) Tools and Equipment Ref Code	(6) Remarks Code
			Unit		Direct Support	General Support	Depot		
			C	O	F	H	D		
01	Hot Water Heater Distribution Box	Inspect Remove/Install	.1		.4			1	
01	Fluorescent Light Fixture Lamp and Starter	Inspect Remove/Install	.1 .4					1	
01	Light Ballast	Inspect Remove/Install		.4				1	
01	Emergency Light Fixture Lamp and Starter	Inspect Remove/Install	.1 .4					1	
01	Emergency Light Ballast	Inspect Remove/Install		.1 .2				1	
01	Explosion Proof Distribution Box A13 Components	Inspect Remove/Install		.1 2.0				1	
01	Pyrometer Fuse Box	Inspect Remove/Install		.1 .3				1	
01	Gas Alarm Unit	Inspect Test Remove/Install Calibrate		.1 .2 .7 1.0				1 1	A
01	Water Inlet Box	Inspect Remove/Install Repair	.1	.1 2.0 .5				1, 2, 3 1, 2, 3	
01	Power Entry Panel	Inspect Remove/Install Repair	.1		2.0 1.0			1, 2, 3 1, 2, 3	
01	Roadside Stowage Box	Inspect Remove/Install	.1	.4				1	
01	Curbside Stowage Box	Inspect Remove/Install	.1	.4				1	
01	Fume Hood and Gum Bath Vent Exhaust Door Assembly	Inspect Remove/Install Repair		.1 2.0 .5				1, 2, 3 1, 2, 3	
02	Environmental Control Unit	Inspect Remove/Install	.1		.7			1	A
02	Environmental Control Unit Remote Control	Inspect Remove/Install	.1	.3				1	A
03	ECU Intake Damper/Motor	Inspect Remove/Install		.1 .7				1	



## SECTION II. MAINTENANCE ALLOCATION CHART FOR MODULAR BASE LAB – Continued

(1) Group Number	(2) Component Assembly	(3) Maintenance Function	(4) Maintenance Level					(5) Tools and Equipment Ref Code	(6) Remarks Code
			Unit		Direct Support	General Support	Depot		
			C	O	F	H	D		
04	Purge Intake/Exhaust Door	Inspect Remove/Install Repair	.1	.3 1.7				1, 2, 3	
04	Purge Intake Door Damper Motor	Inspect Remove/Install	.1	.3				1	
04	Purge Exhaust Door, Roadside	Inspect Remove/Install Repair	.1	.3 1.7				1, 2, 3	
04	Purge Exhaust Door, Curbside	Inspect Remove/Install Repair	.1	.3 1.7				1, 2, 3	
04	Purge Intake and Exhaust Door Filter	Inspect Remove/Install	.1	.3				1	
05	Mechanical Room Purge Exhaust Damper Motor	Inspect Remove/Install	.1	.4				1	
05	Curbside Exhaust Damper Motor	Inspect Remove/Install	.1	.4				1	
06	Air Compressor	Inspect Remove/Install Test	.1	.7 .1				1	
06	Air Tank	Inspect Remove/Install Test	.1	.7 .1				1	
06	Vacuum Pump	Inspect Remove/Install Test	.1	1.0 .1				1	A
06	Water Pump	Inspect Remove/Install		.1	.5			1	A
06	Water Tank	Inspect Remove/Install	.1		2.0			1	A
06	Water Chiller	Inspect Remove/Install	.1		.7			1	A
06	Electric Steam Boiler	Inspect Remove/Install	.1		.5			1	A
06	Boiler Low Water Cutoff Pump Control	Inspect Remove/Install	.1		.5			1	A
06	Boiler Low Water Pump	Inspect Remove/Install	.1		.4			1	A

## SECTION II. MAINTENANCE ALLOCATION CHART FOR MODULAR BASE LAB – Continued

(1) Group Number	(2) Component Assembly	(3) Maintenance Function	(4) Maintenance Level					(5) Tools and Equipment Ref Code	(6) Remarks Code
			Unit		Direct Support	General Support	Depot		
			C	O	F	H	D		
06	Gum Bath Vent/Fume Vent Blower and Motor	Inspect Remove/Install	.1		.5			1, 2, 3	
07	Piping System	Inspect Remove/Install Test	.1	.1 .5				1	
07	Flow Control Devices	Inspect Remove/Install Test	.1	.1 .1				1	
07	Air-Gas Drying Apparatus	Inspect Remove/Install	.1	.2				1	
07	Water Level Regulator	Inspect Remove/Install	.1	1.0				1	
07	Surge Tank	Inspect Remove/Install	.1		.1			1	
07	Water System Components	Inspect Remove/Install	.1	.9				1	
07	Manometer	Inspect Remove/Install Calibrate	.1	.2 1.0				1	A
07	Reid Vapor Pressure Test Bomb	Inspect Remove/Install	.1	.1				1	A
08	Water Heater	Inspect Remove/Install	.1		1.5			1	A
09	Sump Pump	Inspect Remove/Install		.1	.5			1	A
10	Electric Still	Inspect Remove/Install Clean	.1 .5 .2					1	A
11	Gas Alarm Kit	Inspect Remove/Install	.1	.4				1, 2, 3	
12	Cabinet	Inspect	.1						
14	Steel Storage Locker	Inspect Remove/Install	.1	.4				1, 2, 3	
15	Desiccating Cabinet	Inspect Remove/Install	.1	.2				1	
16	Stool Storage Bracket	Inspect Remove/Install	.1	.2				1	
17	Steel Bookcase	Inspect Remove/Install	.1	.2				1	

## SECTION II. MAINTENANCE ALLOCATION CHART FOR MODULAR BASE LAB – Continued

(1) Group Number	(2) Component Assembly	(3) Maintenance Function	(4) Maintenance Level					(5) Tools and Equipment Ref Code	(6) Remarks Code
			Unit		Direct Support	General Support	Depot		
			C	O	F	H	D		
18	Propane Cylinder Storage Cabinet	Inspect Remove/Install	.1	.5				1	
19	Gum Content Test Bath	Inspect Remove/Install	.1		.7			1	
19	Air/Steam Flow Rate Indicator Meters	Inspect Remove/Install	.1		.2			1	
19	Freezer	Inspect Remove/Install	.1		.7			1	A
20	Gas Cylinder Storage Cabinet	Inspect Remove/Install	.1	2.0				1, 2, 3	
21	Gas Cylinder Rack	Inspect Remove/Install	.1	1.5				1	
22	Separometer Shelf	Inspect Remove/Install	.1	.3				1, 2, 3	
23	Jerry Jug Shelf	Inspect Remove/Install	.1	.3				1	
23	Drying Rack	Inspect Remove/Install	.1	.2				1	
23	Typewriter Shelf	Inspect Remove/Install	.1	.3				1, 2, 3	
24	Thermometer Case	Inspect Remove/Install	.1	.5				1, 2, 3	
25	Tray Rack	Inspect Remove/Install	.1	.6				1, 2, 3	
26	De-Ice Kit Bracket	Inspect Remove/Install	.1	.1				1	
27	Oil Thief Rack	Inspect Remove/Install	.1	.2				1, 2, 3	
28	Fuel Sampling and Tool Kit	Inspect Remove/Install Calibrate	.1	.7 1.0				1, 2, 3	
29	Aneroid Barometer	Inspect Remove/Install	.1 .2					1	
30	Sampling Kit, Flashpoint Tester	Inspect Remove/Install	.1	.3				1, 2, 3	
31	Analytical Balance	Inspect Remove/Install Calibrate	.1	.4 1.0				1	A

## SECTION II. MAINTENANCE ALLOCATION CHART FOR MODULAR BASE LAB – Continued

(1) Group Number	(2) Component Assembly	(3) Maintenance Function	(4) Maintenance Level					(5) Tools and Equipment Ref Code	(6) Remarks Code
			Unit		Direct Support	General Support	Depot		
			C	O	F	H	D		
32	Reid Vapor Pressure (RVP) Bath	Inspect Remove/Install	.1	.2				1	A
33	Copper Strip Corrosion Bath and Brackets	Inspect Remove/Install	.1	.2				1, 2, 3	A
33	Cloud and Pour Point Tester and Brackets	Inspect Remove/Install	.1	.2				1, 2, 3	A
34	Kinematic Viscosity Bath	Inspect Remove/Install	.1	.1				1	A
35	Centrifuge	Inspect Remove/Install	.1	.2				1	A
36	Grease Working Machine	Inspect Remove/Install	.1	.2				1	A
37	Distillation Test Apparatus	Inspect Remove/Install	.1	.3				1, 2	A
38	Oxidation Stability Bath	Inspect Remove/Install	.1	.2				1	A
39	Oxygen and Nitrogen Gas Supply Lines	Inspect Remove/Install	.1	.7				1	
39	Gas Cylinder and Gas Regulator Valve	Inspect Remove/Install	.1	.3				1	
40	Pressure Recording Gauge	Inspect Remove/Install Calibrate	.1 .4 .5					1	A
41	Laboratory Oven	Inspect Remove/Install Calibrate	.1	.2 1.0				1, 2	A
42	Burnout Furnace	Inspect Remove/Install	.1	.2				1, 2	A
43	Explosion Proof Refrigerator	Inspect Remove/Install	.1	.6				1	A
44	Jet Fuel Thermal Oxidation Tester	Inspect Remove/Install Calibrate	.1	.3 1.0				1	A
46	Water Bath and Hot Plate	Inspect Remove/Install	.1	.8				1, 2, 3	A
49	Flowmeter Kit and Brackets	Inspect Remove/Install	.1	.2				1, 2, 3	
51	Gum Bath/Fume Hood Exhaust Blower Hoses	Inspect Remove/Install	.1	.1				1	

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### Section III. TOOLS AND TEST EQUIPMENT REQUIREMENTS

(1) REFERENCE CODE	(2) MAINTENANCE CATEGORY	(3) NOMENCLATURE	(4) NATIONAL STOCK NUMBER (NSN)	(5) TOOL NUMBER
1	O	General Mechanics Tool Kit	5180-00-177-7033	(50980) SC 5180-90-CL-N26
2	O, F	Shop Equipment, Automotive Maintenance and repair, Unit Maintenance Common #1 (Less Power)	4901-00-754-0654	(19204) SC5+20-95-CL-A74
3	O, F	Riveter, Blind	5120-01-289-5310	(10054) HP2

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### Section IV. REMARKS

REFERENCE CODE	REMARKS
A	Refer to this equipment's technical manual for testing, calibration, maintenance, repair, and replacement parts authorized at the operator, unit and direct support levels of maintenance.
B	Follow local procedures for servicing or replacing fire extinguishers.
C	Refer to Chapter 3, Section II for testing procedures.
D	Not part of MOD LAB, authorized under another allowance.

## APPENDIX C

### COMPONENTS OF END ITEM AND BASIC ISSUE ITEMS LIST

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#### Section I. INTRODUCTION

##### C-1. SCOPE.

This appendix lists components of end item and basic issue items for the Petroleum Laboratory to help you inventory the items required for safe and efficient operation of the equipment.

##### C-2. GENERAL.

The Components of End Item and Basic Issue Items List are divided into the following sections:

- a. Section II, Components of End Items. This listing is for informational purposes only, and is not authority to requisition replacements. These items are part of the Petroleum Laboratory. As part of the end item, these items must be with the end item whenever it is issued or transferred between property accounts. Items of COEI are removed and separately packaged for transportation or shipment only when necessary. Illustrations are furnished to assist you in identifying the items.
- b. Section III, Basic Issue Items. These essential items required to place the Petroleum Laboratory in operation, operate it, and to do emergency repairs. Although shipped separately packaged, BII must be with the Petroleum Laboratory during operation and when it is transferred between property accounts. This list is your authority to request/requisition them for replacement based on authorization of the end item by the TOE/MTOE. Illustrations are furnished to help you find and identify the items.
- c. Section IV, Basic Issue Items - Overpack Boxes. This section identifies items (excluding chemicals) packaged inside each overpack box issued with Mod Lab A.
- d. Section V, Basic Issue Items - Chemicals - Overpack Boxes. This section identifies chemicals packaged inside each overpack box issued with Mod Lab A.
- e. Section VI, Manuals. This section identifies Manual, Catalogs, and Publication issued with Mod Lab A.

##### C-3. EXPLANATION OF COLUMNS.

The following provides an explanation of columns found in the tabular listing for Sections II and III:

- a. Column 1, Illustration Number (Illus Number). Identifies the number of the item illustrated. An illustration number preceded by a dash (-) is not illustrated.
- b. Column 2, National Stock Number. Identifies the stock number of the item to be used for requisitioning purposes.
- c. Column 3, Description. Identifies the Federal item name (in all capital letters) followed by a minimum description when needed. The last line below the description is the Commercial And Government Entity Code (CAGE) (in parentheses) and the part number.
- d. Column 4, Unit of Measure (U/M). Indicates how the item is issued for the National Stock Number shown in column two.
- e. Column 5, Quantity Required (Qty. Rqd.). Indicates the quantity required.

## Section II. COMPONENTS OF END ITEM

(1) ILLUS NUMBER	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION CAGE and Part Number	(4) U/M	(5) QTY. RQD.
1	4120-01-114-2471	AIR CONDITIONER: 18,000 BTU/Hr, vertical, compact, 208 volt, 50/60 Hz: (94833) PN F18T-2S	EA	4
2	6665-00-410-4982	ALARM, GAS, AUTOMATIC: with detector housing No. 23-4012, mounting bracket No. 23-4028, (05083) PN 71-7048	EA	1
3		BALANCE, ANALYTICAL, SARTORIUS: Fully automatic, top loading (59728) PN A250	EA	1
4	6670-00-436-9857	BALANCE, DOUBLE-BEAM, OHAUS: (Drawer G5) (85973) PN MDL1510	EA	1
5	6250-01-324-8621	BALLAST, EMERGENCY LIGHT: 120/227 Volts, 3.5 watts, 60 Hz (56714) PN B70A	EA	2
6	6685-00-255-9507	BAROMETER, ANEROID: 27.5 to 31.5 in. scale PN C-1253-B; (0NG08) PN Proteus Barometer	EA	1
7	6640-00-522-1886	BATH, CORROSION, LABORATORY: (Drawer Y2) (23035) PN K25310	EA	1
-8		BATH, FOAMING TEST: (Overpack Box 1) (23035) PN K43002	EA	2
9	6630-00-895-1259	BATH GUM, HIGH TEMPERATURE: (48619) PN 74801	EA	1
10		BATH, GUM TEST OXIDATION: (23035) PN K10400	EA	1
11	6630-00-404-2753	BATH, KINEMATIC VISCOSITY: (23035) PN K23370	EA	2
12	6640-00-359-9629	BATH, CONSTANT TEMPERATURE, RVP: (Drawer T1) (48619) PN 74893	EA	1
13		BATH, UTILITY LABORATORY: (48619) PN 182	EA	1
14	4410-01-229-6213	BOILER, HEATING, HIGH TEMPERATURE: Electric, portable, 30 lb. steam/hr, Max 100 lb., 208V, 60Hz, three phase (65583) PN CES-12B	EA	1
15		BOILER, STEAM, HIGH PRESSURE: 120V, 1500W (65586) PN GCH-2155	EA	1
16		BOOKCASE, STEEL: (15599) PN 860130	EA	2
17	6640-00-986-5033	CABINET, DESICCATING: (07836) 1340, MS536217-3	EA	2
18	6665-01-188-4542	CALIBRATION KIT, GAS ALARM (Drawer D) (05083) PN 23-7260	EA	1
19	6630-00-359-9706	CARBON RESIDUE APPARATUS: CSC (Drawer B2) (23035) PN K80030	ST	1

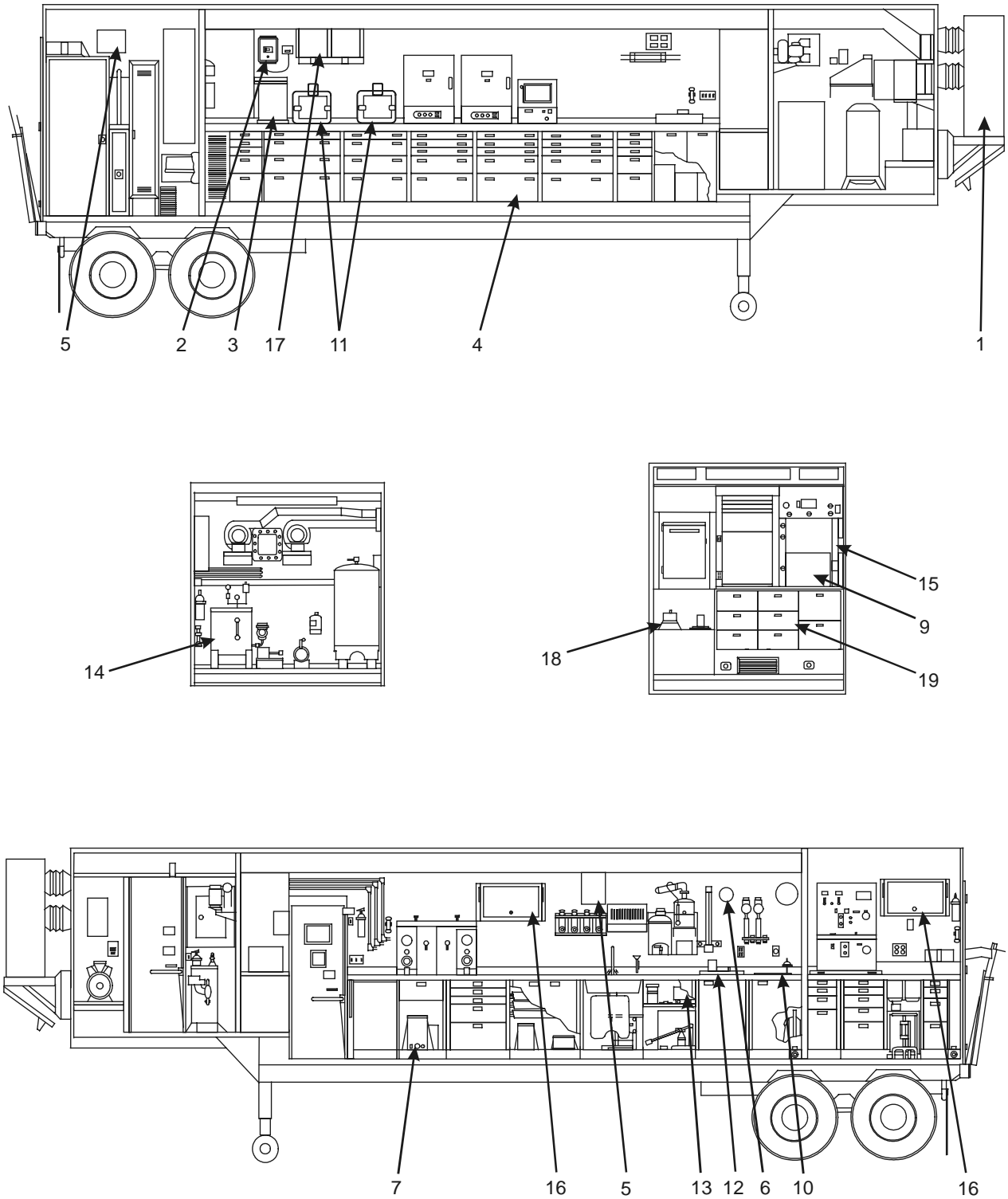


Figure C-1. Components of End Item (Sheet 1 of 4)

MBPLA-C-1-1A



## Section II. COMPONENTS OF END ITEM - continued

(1) ILLUS NUMBER	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION CAGE and Part Number	(4) U/M	(5) QTY. RQD.
20	6640-01-388-6663	CENTRIFUGE, LABORATORY: Electric operated, 100V, 50/60 Hz, 2,250 rpm (48619) PN 67310	EA	1
21	4130-01-388-6620	CHILLER, WATER: 115V, 50/60 Hz (20247) Model No. ER-30	EA	1
22	6630-00-713-2097	COMPARATOR, COLOR: Disk, corrected for artificial light, prism viewing metal housing, with plastic cover; (Drawer F5) (90767) PN 611A	EA	3
23	4310-01-388-6645	COMPRESSOR, RECIPROCATING, AIR: 3.5 HP single stage (59379) PN D3PP Model LE22	EA	1
24	6640-01-138-2563	DETECTOR KIT, WATER, AUTO-AVIATION FUEL: Water and solid contamination, u/w 4730-00-978-8760 coupler, quick disconnect; 1/4 in. internal AVEC-4-417 (Drawer G5) (32218) GTP-323, Syringe P/N GTP-165, Battery PN CGTP-191	KT	1
25	6630-00-359-9772	DISTILLATION TEST APPARATUS, PETROLEUM: Electric heated, 110V, 50/60 Hz, ice refrigerated single unit (48619) PN 74730	EA	1
26		DISTILLATION TEST APPARATUS, GAS-OIL: Electric heated, 110V, 50/60 Hz (48619) 76002	EA	1
27	4240-01-381-5126	EYE WASH: with hose connection (53483) Model No. 901F	EA	1
-28	4330-01-376-1098	FILTER, WATER: 10 in. long, flows 10 GPM (with cartridge PN PSP-10) (05430) PN LMOSS10B-3/4	EA	1
29	6680-00-762-4057	FLOWMETER KIT: Calibrated (Drawer S1) (0PCJ6) PN 36-546 (0J366) PN 5019550	EA	1
30	6665-00-496-9623	FUEL SAMPLING KIT: (Drawer W4) (08071) PN XX64-037-30	EA	1
31		FREEZER/ICE CUBE MAKER: with 16 ice trays (22527) PN 97-928-1	EA	1
32	6640-00-359-9814	FURNACE, BURN-OUT: 100 to 2000 degrees F range, 120 Vac, 1500W (05852) PN FB1415B	EA	
33		GAUGE, PRESSURE RECORDING: Bronze, double bourbon tube; Precision (23035) PN M0152KF	EA	1
34		GAUGE, VACUUM, MERCURY MANOMETER: Negative pressure readings down to 0.1 mm, adjustable scale graduated over a length of 160 mm (Drawer A1) (40845) PN 31738-001	EA	1
35		GREASE WORKING MACHINE: (23035) PN K18000	EA	1

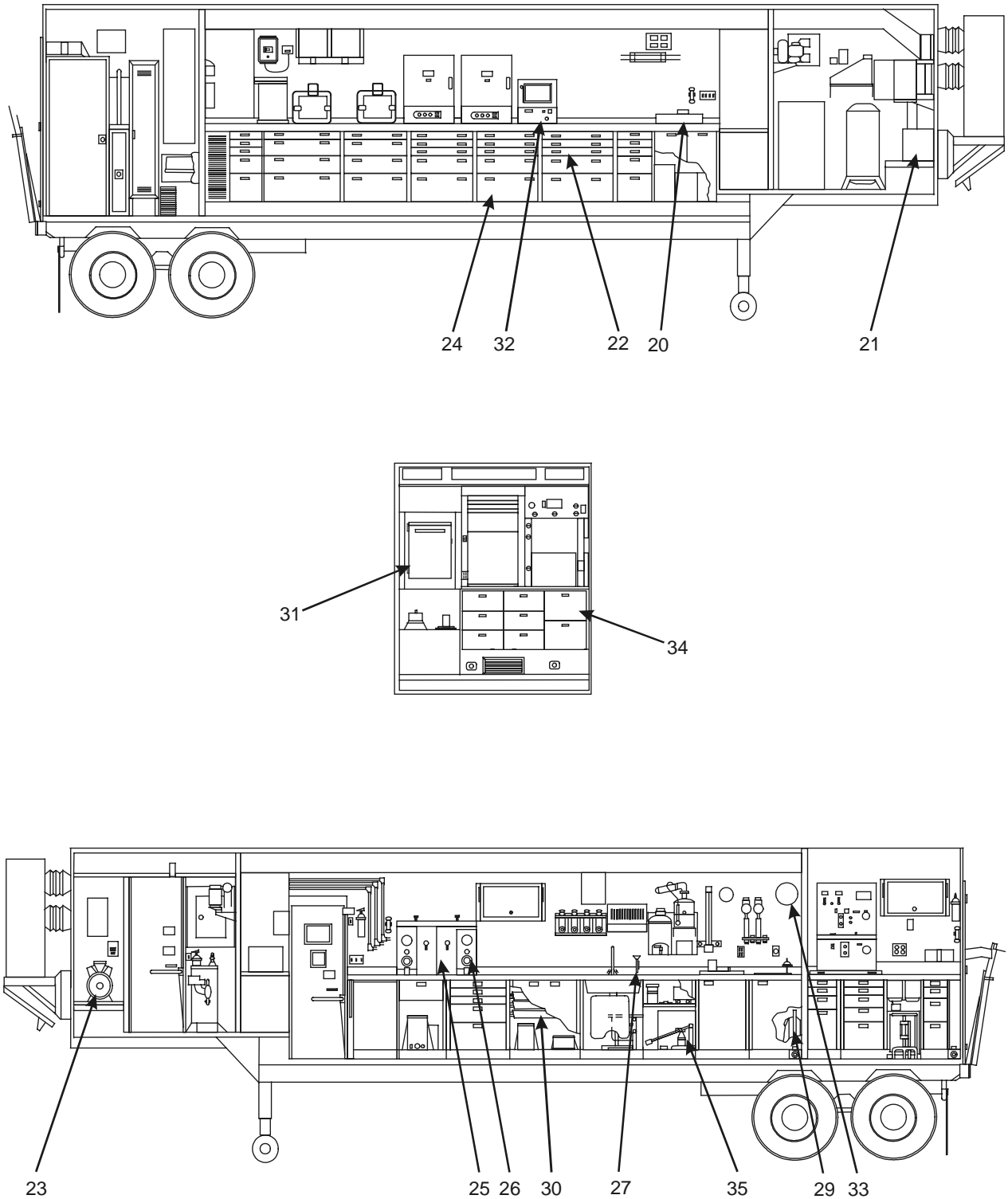


Figure C-1. Components of End Item (Sheet 2 of 4)

MBPLA-C-1-2A

**Section II. COMPONENTS OF END ITEM - continued**

(1) ILLUS NUMBER	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION CAGE and Part Number	(4) U/M	(5) QTY. RQD.
36		HEATER, WATER, ELECTRICAL: 6 gal. (3S126) PN 6E729	EA	1
37	6630-01-165-7133	KIT, ANTI-ICING: Battery operated (62935) PN B2	EA	1
38		LOCKER, STEEL: 15" wide x 18" deep x 72" high (37296) PN 5062	EA	1
39	6685-01-187-7270	MANOMETER: Wall mounted; 24 in., with No. SC 4606-Duplex Scale PSI Mercury; calibrated (39739) PN 30-EBX-25WM	EA	1
40	6680-00-063-4116	METER, FLOW RATE INDICATOR, FLOAT TYPE: Calibrated for direct reading (91556) PN 3602	EA	1
41	6640-00-977-3341	OVEN, LABORATORY: Integral heat source; 110/120V, 60Hz (48619) PN 31604	EA	2
42	6635-00-359-2232	PENETROMETER: 39mm penetration; loading weight, one 100 gm, one 50 gm; with leveling screw (Drawer K4) (48619) PN 73510	EA	1
43	4320-01-388-9026	PUMP, WATER: 115V, 60Hz (25795) PN 2P373	EA	1
44		PUMP, WATER HIGH PRESSURE (65583) ES38002	EA	1
45	6685-00-401-1423	PYROMETER INDICATOR/CONTROL: 0 to 600 degrees F, with corresponding c scale, calibrated, 120/240V, 50/60 Hz (48619) PN 74802	EA	1
46	4110-01-319-0266	REFRIGERATOR, EXPLOSION PROOF: 6.5 Cubic Foot (22527) 97-950	EA	1
47	6680-00-496-9611	REGULATOR, AIR/STEAM, PETROLEUM TEST: (48619) PN 78403	EA	1
48	6680-00-151-5310	SAMPLING AND GAGING KIT, PETROLEUM: (Drawer D1) (85483) PN 5310	EA	1
49	6640-01-149-1436	SEPAROMETER, WATER, KIT: (23299) PN 140-00- 0005 (with spare six-pack kit PN 840-99-5944)	EA	1
50		SINK, STAINLESS STEEL: single tub, 16 in. long x 28 in. wide x 7-1/2 in. deep (32417) PN R750D	EA	1
51	6640-01-059-5480	STILL, ELECTRICAL, PORTABLE: 1.8 liters/hr (05852) PN A1007	EA	1
52		STOOL: adjustable height (0W7N7) PN 1G65	EA	1
53	4320-01-384-0773	SUMP PUMP: with level switch, 1/6 HP submersible pump; (25795) PN 1P914 (Switch P/N 2P353)	EA	1

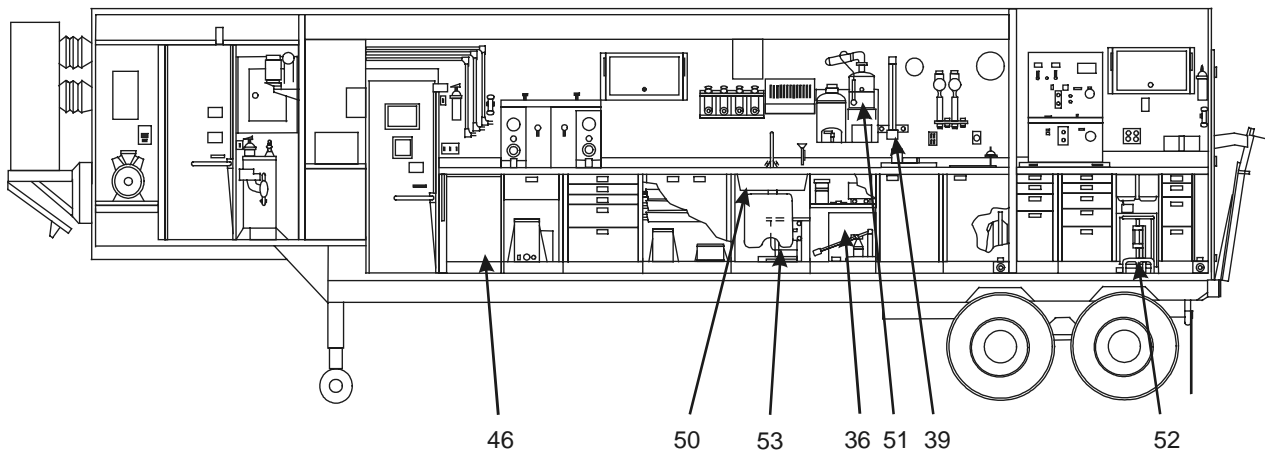
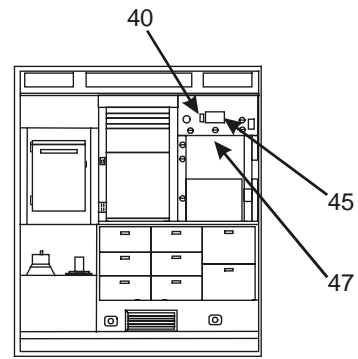
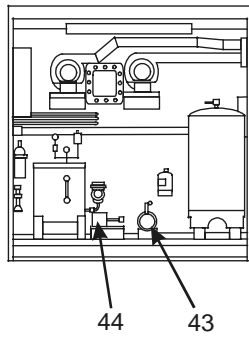
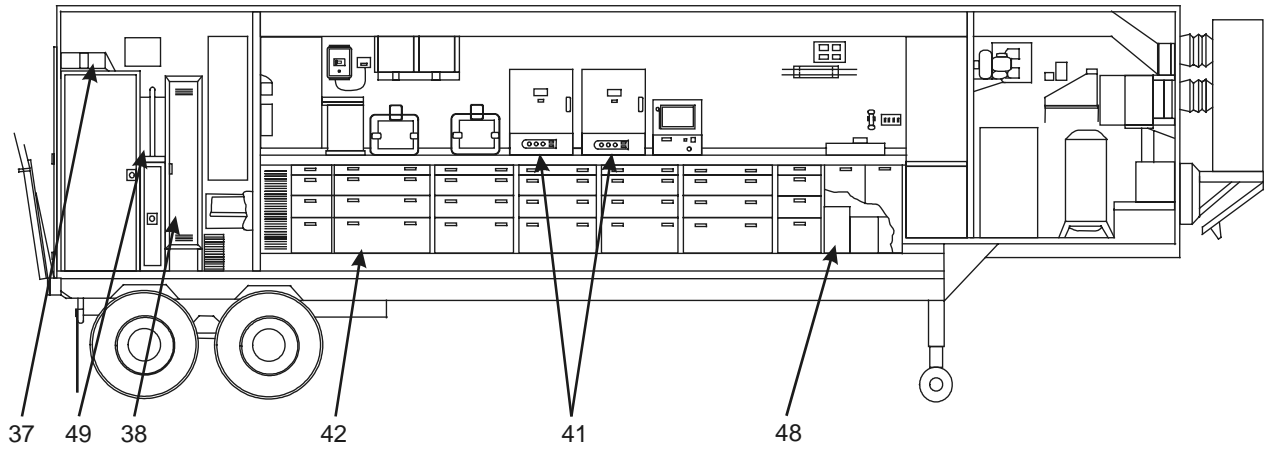


Figure C-1. Components of End Item (Sheet 3 of 4)

MBPLA-C-1-3B

**Section II. COMPONENTS OF END ITEM - continued**

(1) ILLUS NUMBER	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION CAGE and Part Number	(4) U/M	(5) QTY. RQD.
54		SUPPORT, VIBRATION, DAMPING, ANALYTICAL BALANCE: Non-magnetic, nonferrous reinforced concrete platform, mounted on 4 shock absorbers, 10 Hz per minute minimum frequencies absorbed (19215) PN 9720	EA	1
55	2530-01-164-6217	TANK, AIR: 200 PSI ASME 16 in. dia. x 42 in. high, 30 gallon (53711) PN 521308	EA	1
56	4520-01-381-8681	TANK, WATER: 60 Gallon, fiberglass construction (8R545) PN 84115-3	EA	1
57	6630-01-388-6631	TEST BATH, CLOUD AND POUR POINT: (Drawer Y2) (23035) PN K46000	EA	1
58	6630-00-359-9787	TESTER, CLEVELAND, OPEN CUP: (Drawer D) (23035) PN K13900	ST	1
59	6630-00-222-3539	TESTER, JFTOT: C/o expendable spare parts (05647) PN JFOT-230	ST	1
60	6630-00-244-9415	TESTER, PENSKY-MARTIN: Closed type (Drawer A2) (48619) No. 74537	EA	1
61		TESTER, FLASHPOINT: (Drawer J2) (23035) PN K14600	EA	1
62		VACUUM PUMP, ROTARY, POWER, DRIVEN: 2 stage 1/2 HP motor, 115V, 60Hz (64484) No. SWC 1405B-01 (40845) No. 54974-238	EA	1

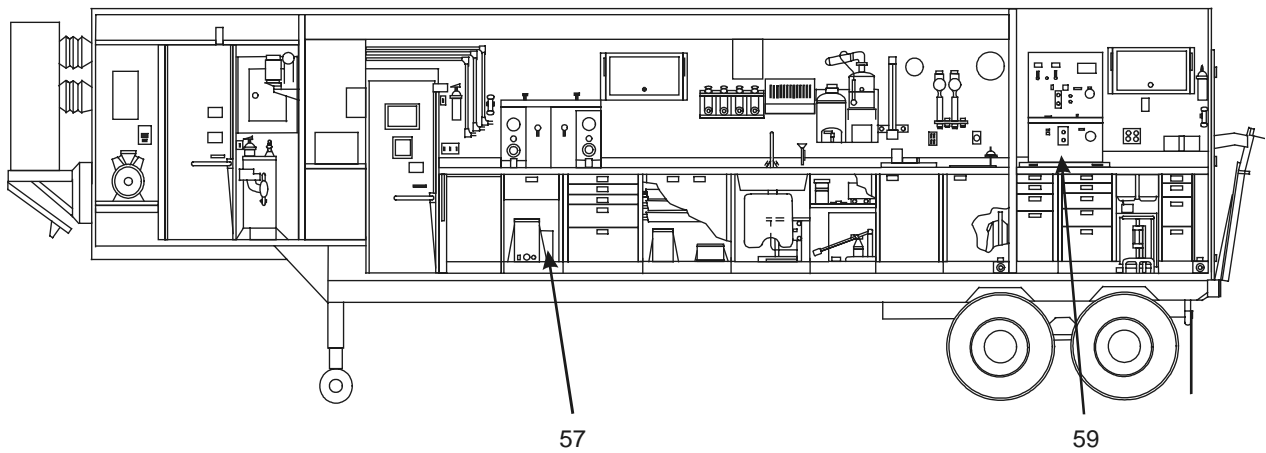
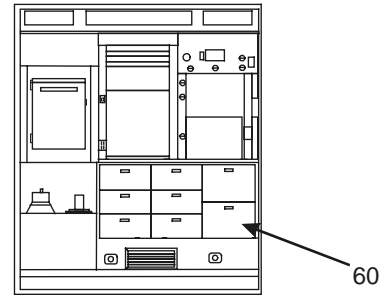
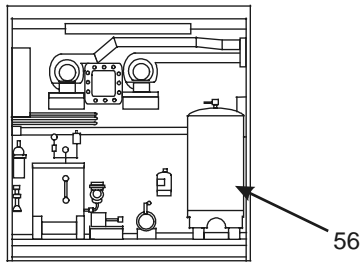
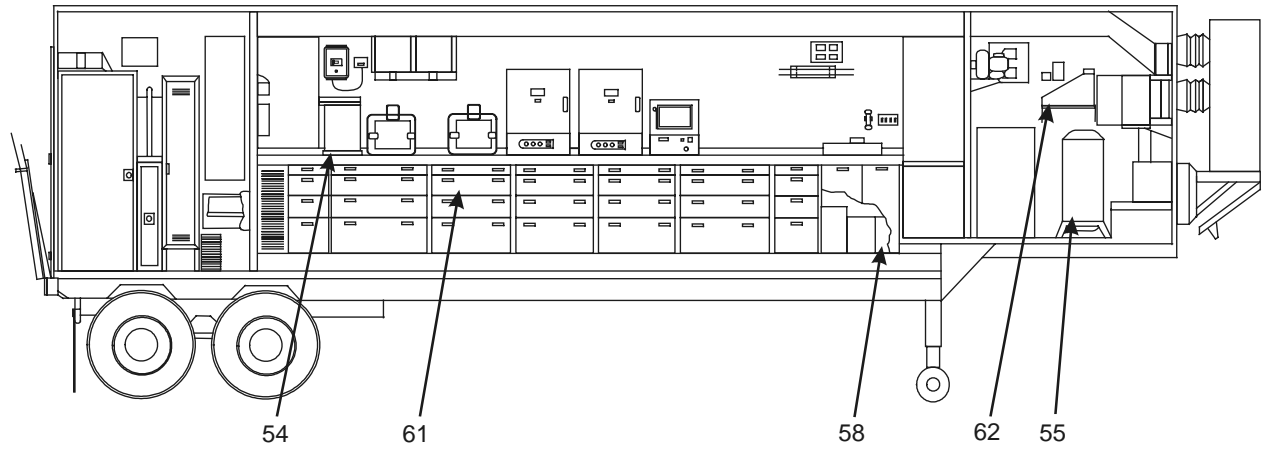


Figure C-1. Components of End Item (Sheet 4 of 4)

MBPLA-C-1-4A

**Section III. BASIC ISSUE ITEMS**

(1) ILLUS NUMBER	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION CAGE and Part Number	(4) U/M	(5) QTY. RQD.
1	5935-00-990-2421	ADAPTER, CONNECTOR: 2-pole to 3-pole electric plug (Drawer W3) (8R649) 419GY	EA	3
2	6640-00-403-9344	ADAPTER, CRUCIBLE, LABORATORY: (Drawer W1) (22527) 08-239B	PK	1
3	6640-00-494-3922	ADAPTER, LABORATORY GLASSWARE: Glass, 24/40 external and internal joint (Drawer F4) (22527) 15-322-10	EA	2
4	6640-00-852-3013	ADAPTER, LABORATORY GLASSWARE: Glass, Pyrex (Drawer F4) (0PCJ6) 1-130-01	EA	2
5	6640-00-494-3923	ADAPTER, LABORATORY GLASSWARE: Three way (10/30, 24/40 24140 joint sizes) (Drawer F4) (22527) 15-323-2	EA	2
6	8415-00-082-6108	APRON, UTILITY: (Drawer L5) (81349) MIL-A-41829	EA	1
7	6640-01-147-9563	BASKET, TEST TUBE: (Drawer E5) (81348) NNN-B-1291, Type II	EA	1
8	6640-00-403-1000	BEAD, LABORATORY (Drawer H1) (58536) A-A-53020	EA	1
9	6640-01-329-6487	BEAKER, GRIF, LOW 250 ml (Drawer H4)	EA	3
10	6640-01-329-7539	BEAKER, GRIFFIN, LOW 400 ml (Drawer H4)	EA	4
11	6640-01-141-1222	BEAKER, GRIFFIN: 100 ml, (Drawer K3)	EA	4
12	6640-01-328-9682	BEAKER, GRIFFIN, LOW FORM 1000 ml (Drawer H5)	EA	3
13	6640-01-328-9681	BEAKER, GRIFFIN, LOW FORM 2000 ml (Drawer H5)	EA	3
14	6640-01-328-9683	BEAKER, GRIFFIN, LOW FORM 600 ml (Drawer H5)	EA	3
15	6640-00-200-6817	BEAKER, LABORATORY: 100 ml, Borosilicate glass (Drawer K3) (14674) NNN-B-175, 1040-100	EA	10
16	6640-00-526-8491	BEAKER, LABORATORY: 500 ml, Borosilicate glass (Drawer H5) (15747) G1716F	EA	12
17	6640-01-328-9684	BEAKER, LOW: 50ml (Drawer H3)	EA	3
18		BEAKER, STAINLESS STEEL: 1200 ml, (Drawer K4) (15741) G1782D	EA	1
19	3030-00-478-8368	BELT, DRIVE: Pensky-Martin (Drawer W2) (48619) 503480	EA	5
20	6630-00-522-1893	BOMB, CORROSION TEST: Copper strip (Drawer F3) (22527) 13-420-20	EA	2
21	6630-00-359-9655	BOMB, GUM STABILITY: (Drawer J2) (23035) K10500	EA	2
22	6640-00-131-4566	BORER SET, CORK: (Drawer W3) (25518) 27-084-15	EA	1
23	6640-00-404-8001	BOTTLE, DROPPER: Glass 60 ml. (Drawers H2 and X1) (25518) NNN-B-1194	EA	6

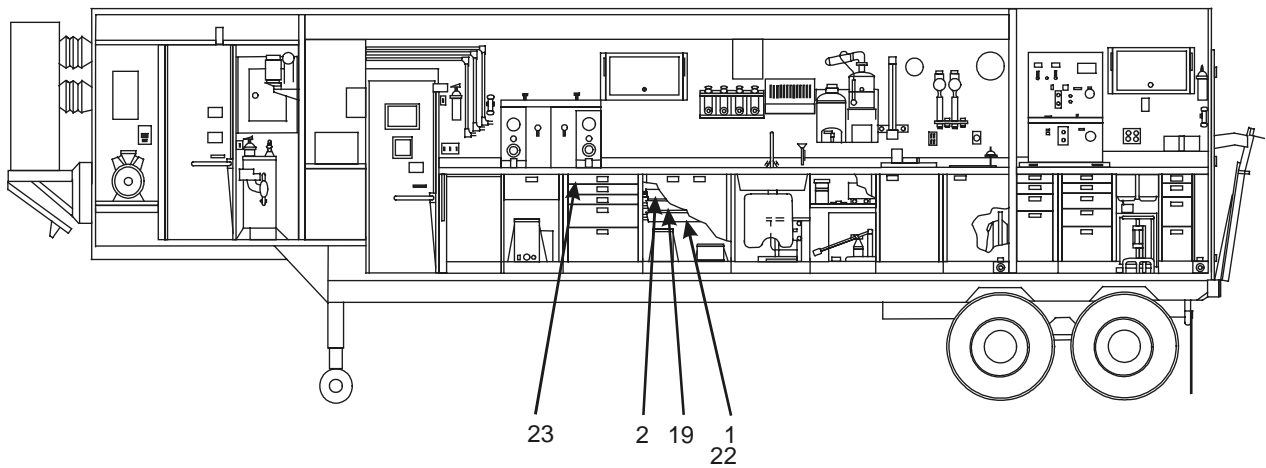
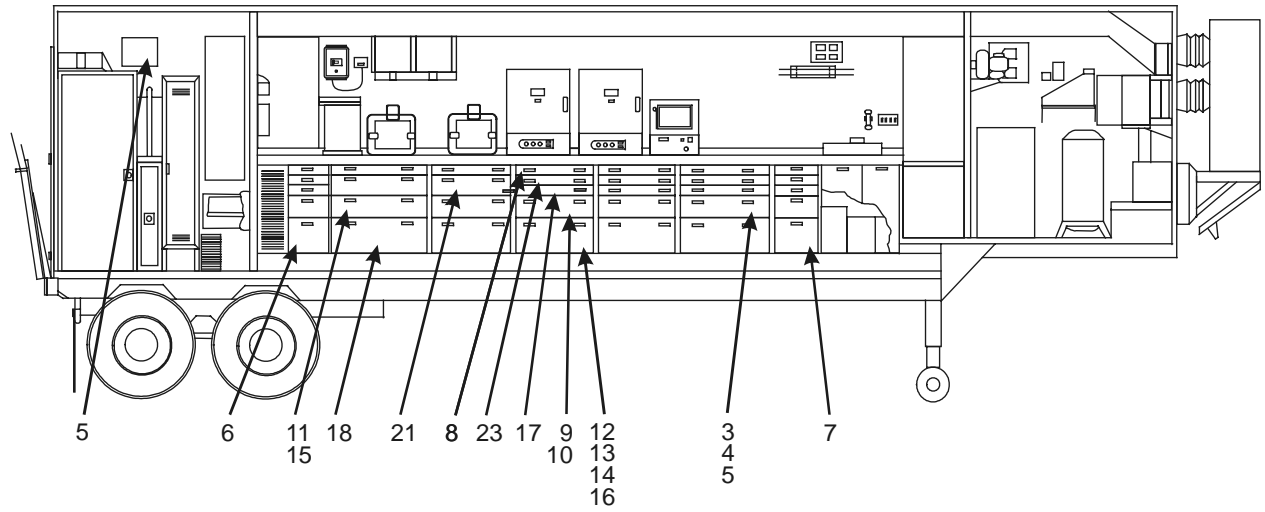


Figure C-2. Basic Issue Items (Sheet 1 of 20)

MBPLA-C-2-1A



**Section III. BASIC ISSUE ITEMS – continued**

(1) ILLUS NUMBER	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION CAGE and Part Number	(4) U/M	(5) QTY. RQD.
24		BOTTLE, SCREW CAP: 32 oz. soda lime glass (Drawers C1 and C3) (25518) 05-7220-32	EA	2
25	8125-00-174-0852	BOTTLE, SCREW CAP: Polyethylene 1 gallon (Drawer X5) (1V571) G02527A	EA	4
26	6640-00-410-4461	BOTTLE, SCREW CAP: Polypropylene 1 gallon (Drawer X5) (15747) G2231E	EA	2
27	6640-00-404-0659	BOTTLE, SCREW CAP; Amber (Drawer C2) (15747) G2232P	EA	2
28	6640-00-405-3000	BOTTLE, STOPPER: 1000 ml, size 6 (Drawer B1) (25518) 216020	EA	1
29		BOTTLE, STOPPER: 250 ml, Reagent Glass (Drawer K3) (22527) 14-641D	EA	1
30	6640-00-405-1000	BOTTLE, STOPPER: 250 ml, size 4 (Drawer B1) (25518) 05-6740-48	EA	3
31	6640-00-408-9095	BOTTLE, STOPPER: 500 ml, size 5 (Drawer B1) (25518) 216019	EA	2
32	6640-00-069-2747	BOTTLE, WASHING: 500 ml, Borosilicate Glass (Drawer F4) (22527) 03-403-10	EA	2
33		BOTTLE, WASHING: Polyethylene graduated, 500 ml, (Drawer X5) (25518) 30-867-10	EA	4
34	5340-00-522-1882	BRACKET, WATER DEMINERALIZER (Drawer A2) (05852) D8900	EA	2
35	7920-00-023-1056	BRUSH, BOTTLE AND BURET; 1/2 in. DIA (Drawer W1) (22527)	EA	1
36	7920-00-409-2000	BRUSH, BOTTLE AND BURET; TUFTED TIP (Drawer W1)	EA	1
37	7920-00-178-8315	BRUSH, DUSTING, BENCH (Drawer W1)	EA	1
38	7920-00-205-0565	BRUSH, DUSTING, LENS AND PHOTO NEG (Drawer W1)	EA	1
39		BRUSH, FLASK; 2 in. DIA (Drawer W3) (40845) 17155-001	W3	1
40	7920-00-494-3688	BRUSH, FLASK; 3 in. DIA (Drawer W1)	EA	1
41	8020-00-260-1302	BRUSH, PAINT (Drawer W1)	EA	1
42	7020-00-240-6359	BRUSH, PIPET (Drawer W1)	EA	2
43	7920-00-297-1510	BRUSH, TEST TUBE; 1 1/2 in. DIA (Drawer W1)	EA	2
44	7920-00-889-3381	BRUSH, TEST TUBE; 1 1/4 in. DIA (Drawer W1)	EA	2
45	7920-00-917-5843	BRUSH, TEST TUBE; 1 3/4 in. DIA (Drawers W3 and X5)	EA	12
46	7920-00-402-2379	BRUSH, TEST TUBE; 1 in. DIA (Drawer W1)	EA	12
47	7920-00-753-5260	BRUSH, TEST TUBE; 1-3/8 in. DIA (Drawer W1) (40845)	EA	1
48	7920-00-917-5844	BRUSH, TEST TUBE; 2 3/8 in. DIA (Drawer W1)	EA	4
49	7920-00-282-7784	BRUSH, TEST TUBE; 3/4 in. DIA (Drawer W1)	EA	4

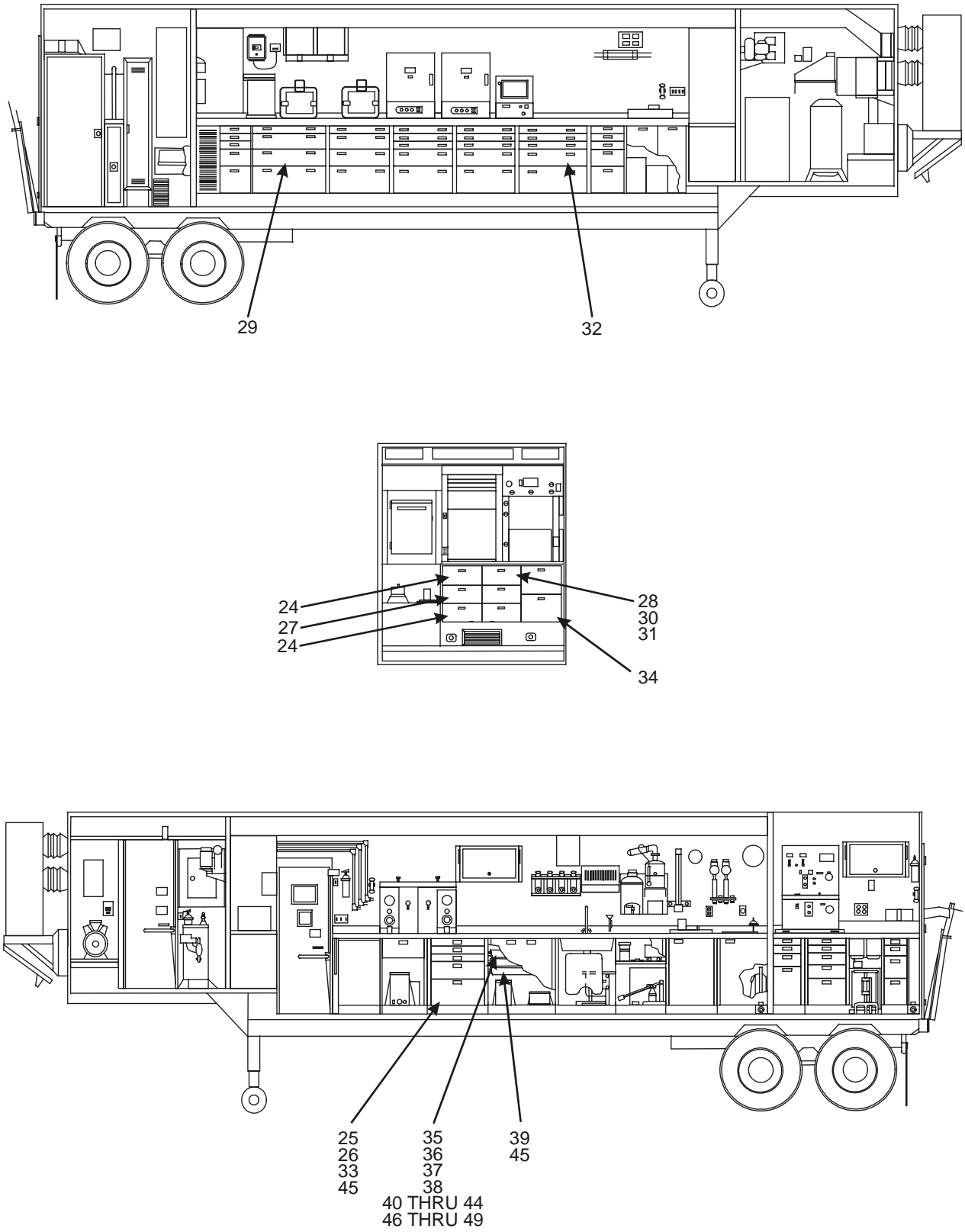


Figure C-2. Basic Issue Items (Sheet 2 of 20)

MBPLA-C-2-2A

## Section III. BASIC ISSUE ITEMS - continued

(1) ILLUS NUMBER	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION CAGE and Part Number	(4) U/M	(5) QTY. RQD.
50	6640-00-494-3726	BULB, PRESSURE AND CIRCULATING LABORATORY: (Drawer K2) (96906) MS36074-1	EA	2
51	6640-00-409-8500	BURET, STRAIGHT: 10 ml, size 4 (Drawer F1) (96906) MS35971-1	EA	8
52	6640-00-409-9000	BURET, STRAIGHT: 25 ml, size 5 (Drawer F1, G1 and K1) (96906) MS35971-2	EA	8
53	6640-00-410-0000	BURET, STRAIGHT: 50 ml, size 6 (Drawer F1 and K1) (96906) MS35971-3	EA	8
54		BURN KIT, EMERGENCY: (6M644) YC5631	EA	1
55	6640-00-359-9683	BURNER, GAS: Single combustion unit, with removable flat grid burner tip, high temperature, designed for liquified gas, 2400-3300 BTU per cu. ft. (Drawer F5) (22527) 03-902P	EA	2
56	6150-00-176-1801	CABLE ASSEMBLY, POWER, ELECTRICAL: 2 conductor, No. 16 AWG, rubber insulation, 300 volt, 25 ft. long (Drawer L5) (81348) J-C-1270	EA	1
-57	6150-01-383-6501	CABLE, MAIN POWER: w/plug connector, rubber insulation, 600v, 300 in. long (97403) 13226E6481	EA	1
58		CALCULATOR: (Drawer M2) (01295) TI5032	EA	1
59	6640-00-194-9728	CAP, SCREW, BOTTLE AND JAR (Drawer Y1) (22527) 02-883-2E	EA	4
-60	8125-01-381-7038	CARBOY: with spigot, 20 liters / 5-1/2 gal. (15747) G2343B	EA	1
61	6640-00-404-2749	CHART, PAPER, TEMPERATURE VISCOSITY INDEX: (Drawer M3) (0PCJ6) 69-889	EA	1
62	6640-00-248-4490	CHART, PAPER: Type C (Locker) (0PCJ6) 69-883	PD	1
63	6640-00-248-4491	CHART, PAPER: Type D (Locker) (0PCJ6) 69-884	PD	1
64	6640-00-248-4492	CHART, PAPER: Type E (Drawer M3) (0PCJ6) 69-885	PD	1
65	5340-00-252-5317	CLAMP (JOINT) LABORATORY, PETROLEUM TEST: (Drawer W2) (15747) TX28109E	EA	4
66	4730-00-908-3193	CLAMP, HOSE: 2 in. dia (Drawer W1)	EA	12
67	6640-00-428-2460	CLAMP, LABORATORY SUPPORT ROD: 11/16 in. dia., double swivel jaw (Drawer W2) (96906) MS36001-3	EA	6
68	6640-00-024-2279	CLAMP, RUBBER TUBING, REGULATING: 3/4 in. dia. (Drawer W2) (96906) MS36003-1	EA	6
69	6640-00-418-1000	CLAMP, TEST TUBE: 1-1/2 in. jaw opening, stoddard (Drawer W3) (96906) MS36009-1	EA	8
70	6640-00-962-9820	CLAMP, UTILITY LABORATORY: 1-1/2 in. swivel jaws (Drawer W2) (22527) 05-769-5	EA	3
71	6640-00-264-5024	CLAMP, UTILITY LABORATORY: 2-1/2 in. dia. grip (Drawer W2) (40845) 21570-007	EA	4

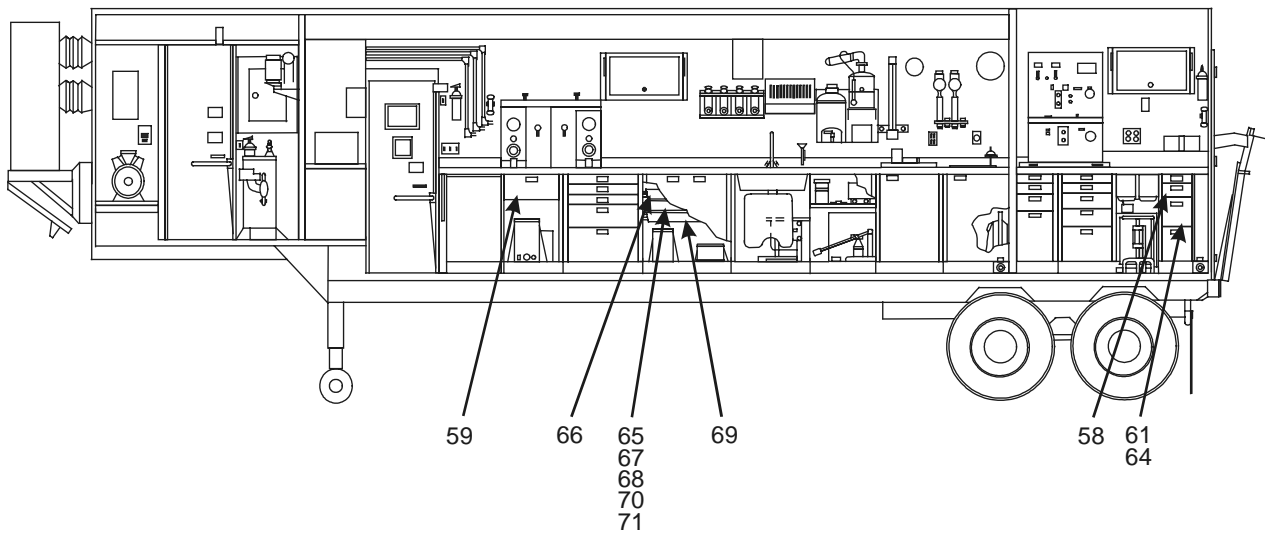
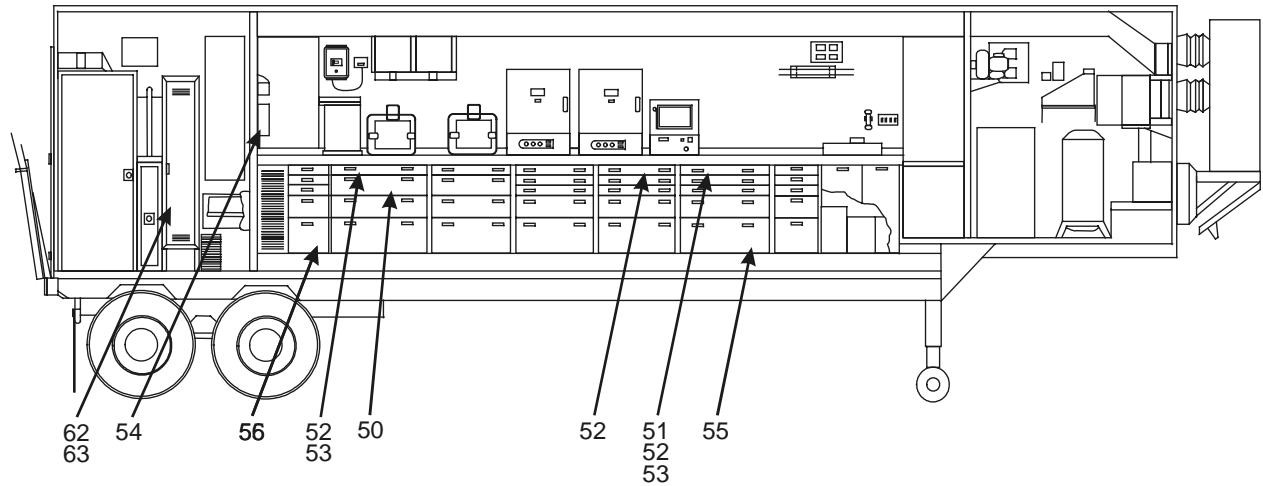


Figure C-2. Basic Issue Items (Sheet 3 of 20)

MBPLA-C-2-3A

## Section III. BASIC ISSUE ITEMS - continued

(1) ILLUS NUMBER	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION CAGE and Part Number	(4) U/M	(5) QTY. RQD.
72	6640-00-526-7989	CLAMP, UTILITY LABORATORY: 3-1/2 in. swivel jaws (Drawer W2) (40854) 21570-127	EA	2
73	6640-00-417-6000	CLAMP, UTILITY, LABORATORY: 1-1/2 in. fixed jaw (Drawer W2) (22527) 05-769-3	EA	2
74	6640-00-267-1784	CLEANER, INSTRUMENT TUBING 3mm (Drawer R4) (15747) G2925A	EA	1
75	6640-00-267-1783	CLEANER, INSTRUMENT TUBING 5mm (Drawer R4) (15747) G2925B	EA	1
76	6640-00-494-3846	CLEANER, INSTRUMENT TUBING 8mm (Drawer R4) (15747) G2925C	EA	1
77	5999-00-263-1051	CLIP, ELECTRICAL: Alligator (Drawer W1) (81348) W-C-440	EA	10
78	5999-00-939-7462	CLIP, ELECTRICAL: Battery, uninsulated, 25 amp (Drawer H1) (39428) 7236K14	EA	10
79		COCK, PLUG: External thread (Drawer W2) (39428) 5458K3	EA	3
80	6630-00-789-0486	COLOR DISK: (Drawer F3) (90767) 611-95	EA	1
81	6630-00-789-0487	COLOR DISK: (Drawer F3) (90767) 611-96	EA	1
82	6630-00-789-0488	COLOR DISK: (Drawer F3) (90767) 611-97	EA	1
83	6640-00-081-6553	CONDENSER, LABORATORY: Borosilicate Glass (Drawer G1) (22527) 07-722B	EA	5
84	6640-00-359-2218	CONE, PENTROMETER: (Drawer J2) (48619) 73526	EA	1
85	6640-00-974-3611	CONNECTOR, LABORATORY FRAME: (Drawer E2) (22527) 14-666-27	EA	2
86		CONNECTOR, TUBING; "T" SHAPED (Drawer W3)	EA	6
87		CONNECTOR, TUBING; "Y" SHAPED (Drawer W3)	EA	6
88	6640-00-074-3339	COPPER STRIP CORROSION STANDARDS: (Drawer F3) (0LR96) 12-401300-00	EA	1
89		CORK, TEST JAR (Drawer W1) (23035) K46010	EA	8
90	6640-00-404-2762	CORK, TEST JAR (Drawer X3) (23035) K460-0-8	EA	12
91	6640-00-323-8689	CORROSION TEST STRIP,CU (Drawer F3)	EA	24
92	6510-00-201-4000	COTTON, PURIFIED (Drawer R4)	EA	1
-93	4730-01-192-1624	COUPLING, HALF: 1-1/2 in. (Trailer Storage) (96906) MS49002-9	EA	1
-94	4730-00-948-1719	COUPLING, HALF: 1-1/2 in. (Trailer Storage) (96906) MS27020-9	EA	1
95	6640-00-410-1913	COVER, GRADUATION: (Drawer B3) (0PCJ6) 90-006-40	EA	2
96	6640-00-404-0657	CRUCIBLE, FILTERING, LABORATORY: 25 ml porcelain (Drawer G3) (64484) S-24442	EA	6

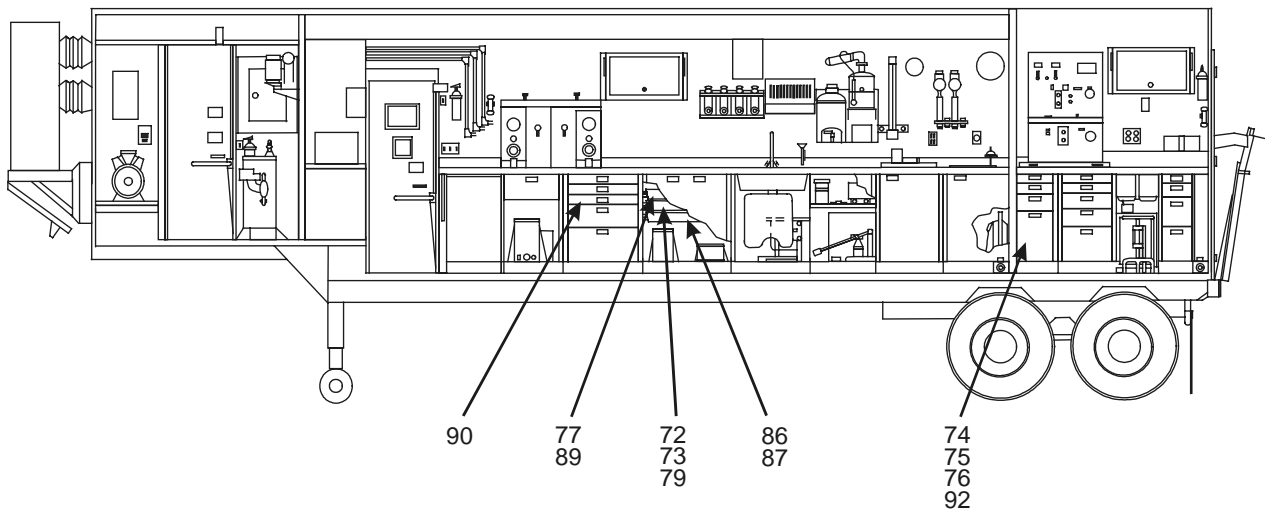
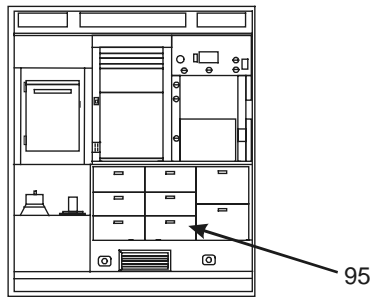
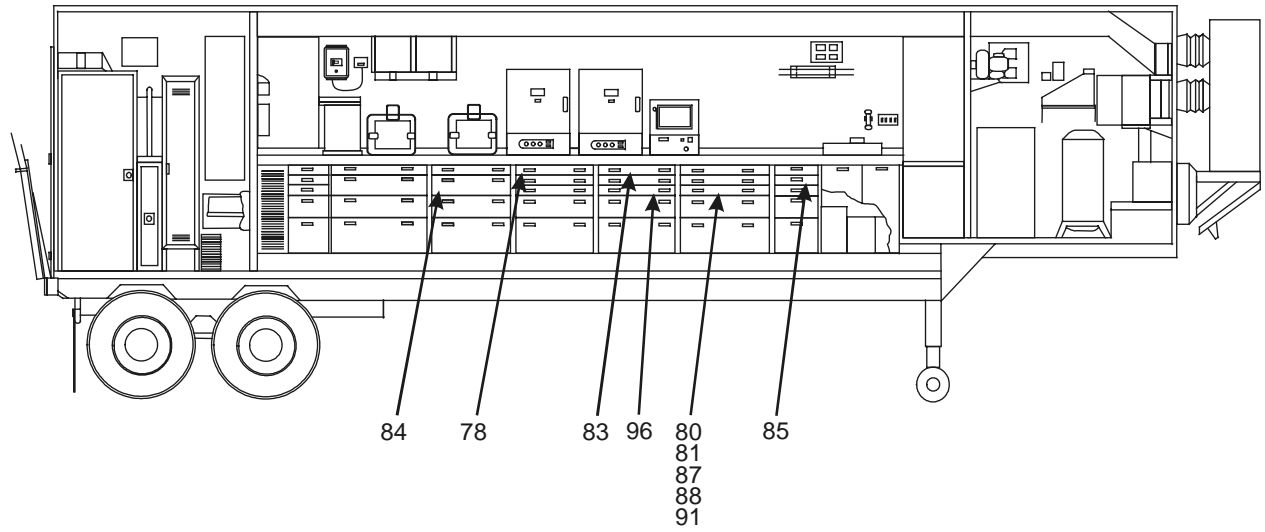


Figure C-2. Basic Issue Items (Sheet 4 of 20)

MBPLA-C-2-4A

## Section III. BASIC ISSUE ITEMS - continued

(1) ILLUS NUMBER	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION CAGE and Part Number	(4) U/M	(5) QTY. RQD.
97	6640-00-419-3050	CRUCIBLE, FILTERING, LABORATORY: 30 ml, Borosilicate Glass (Drawer G3 and H2) (81349) MIL-C-3659	EA	6
98	6640-00-290-6551	CRUCIBLE, FILTERING, LABORATORY: 50 ml glass (Drawer H2) (22527) 08-237-1C	EA	2
99	6640-00-899-8976	CRUCIBLE, FILTERING, LABORATORY: 30 ml (Drawer H2) (25518) 08-226-10C	EA	4
100	6640-00-550-6287	CRUCIBLE, IGNITION, LABORATORY: 100 ml (Drawers H4 and G3) (96906) MS35966-6	EA	6
101	6640-00-290-6790	CRUCIBLE, IGNITION, LABORATORY: 30 ml, procelain (Drawers H2 and G3) (25518) MS35966-4	EA	6
102	6640-00-290-6791	CRUCIBLE, IGNITION, LABORATORY: 50 ml (Drawers H2 and G3) (96906) MS35966-5	EA	6
103	6640-00-936-2065	CRUCIBLE, SKIDMORE, PETROLEUM TEST: 70 ml (Drawer J2) (48619) 68245	EA	1
104	6640-00-090-4469	CUP, GLASS: (Drawer G2) (0PCJ6) 68-825-09	EA	2
105	6640-00-403-9349	CUP, GREASE DROPPING: (Drawer H1) (23035) K194-018	EA	2
106	6630-00-359-9757	CUP: Flash and fire point, Cleveland open (Drawer J2) (22527) 13-533	EA	1
107	6630-00-359-9759	CUP: Flash point, Pensky-Martin closed (Drawer J2) (80740) G7-946	EA	1
108	6630-00-359-9758	CUP: Tag closed (Drawer J2) (23035) 14520	EA	1
109	5180-00-596-1038	CUTTER AND FLARING TOOL KIT, TUBE, HAND: Case container, Metal c/o: (30327) (Drawer R3)	KT	1
110	5110-00-489-8135	CUTTER, HAWSER, HAND-OPERATED: (Drawer W3) (22527) 11-340	EA	1
111	5110-00-658-8101	CUTTING WHEEL, GLASS (Drawer W3) (22527) 11-345	EA	1
-112	8120-00-285-4725	CYLINDER, CARBON DIOXIDE, COMPRESSED GAS 50lb cylinder w/valve	EA	2
113	6640-00-290-6570	CYLINDER, GRADUATED, LABORATORY: 10 ml hex base (Drawers H5 and X1) (25518) 28-476-5	EA	3
114	6640-00-883-8516	CYLINDER, GRADUATED, LABORATORY: 100 ml (Drawers C3 and H5) (22527) 8-552E	EA	12
115	6640-00-420-6000	CYLINDER, GRADUATED, LABORATORY: 100 ml circular base (Drawer H5) (96906) MS35947-6	EA	4
116	6640-00-494-3959	CYLINDER, GRADUATED, LABORATORY: 25 ml (Drawer H2) (96906) MS35943-4	EA	4
117	6640-00-290-6543	CYLINDER, GRADUATED, LABORATORY: 250 ml (Drawers F4 and G4) (81348) NNN-C-940	EA	4
118		CYLINDER, GRADUATED: 50 ml (Drawer H3) (22527) 08-551C	EA	3

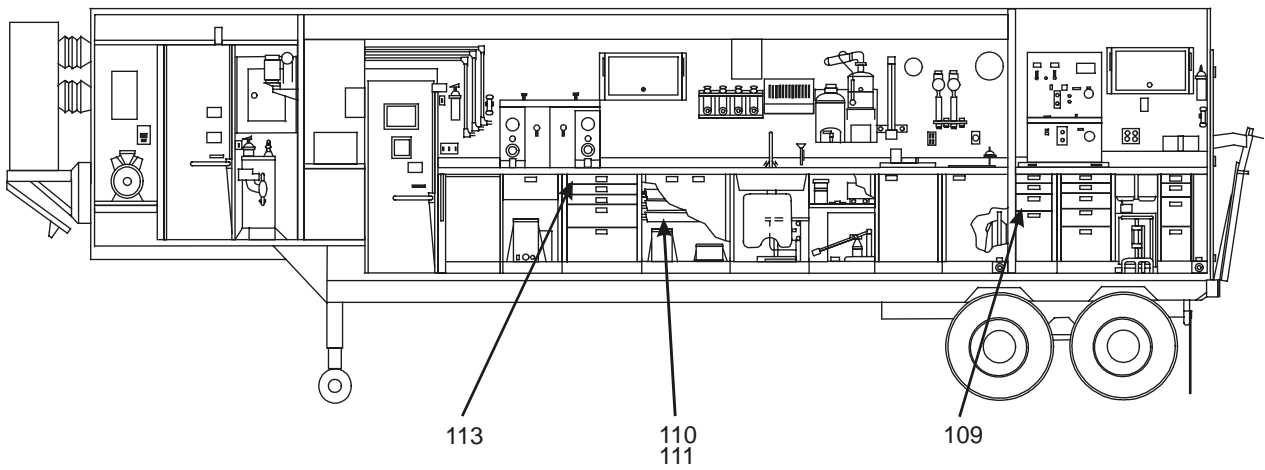
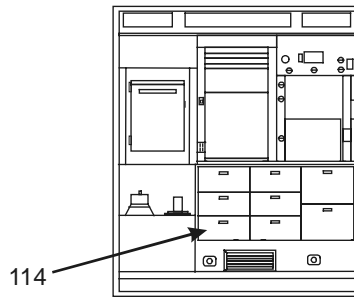
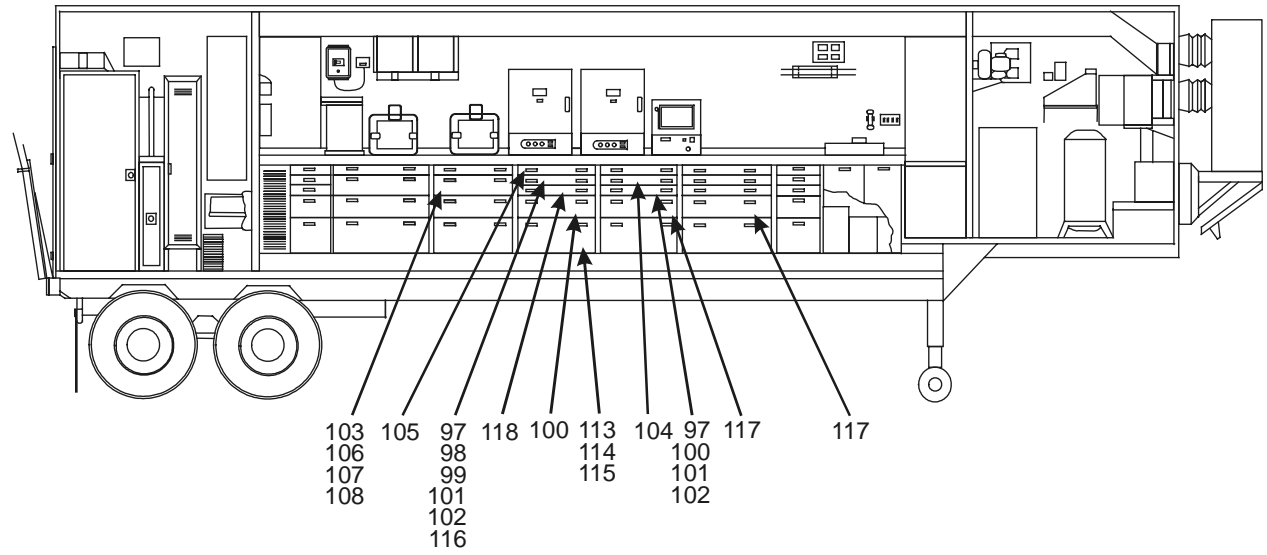


Figure C-2. Basic Issue Items (Sheet 5 of 20)

MBPLA-C-2-5A



## Section III. BASIC ISSUE ITEMS - continued

(1) ILLUS NUMBER	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION CAGE and Part Number	(4) U/M	(5) QTY. RQD.
119	8120-00-985-7275	CYLINDER, NITROGEN, TECHNICAL: 231 cu. ft. cylinder , BB-N-411, Type I (Gas Cylinder Storage)	EA	1
120	8120-00-357-7992	CYLINDER, OXYGEN, TECHNICAL: 230 cu. ft. cylinder , BB-0-925, Type I (Gas Cylinder Storage)	EA	1
121	6640-00-244-4341	CYLINDER, UNGRADUATED, LABORATORY: 125 ml (Drawer F4) (80740) 28-395	EA	4
122	6640-00-235-3820	DETECTOR, PAD, FREE H2O (Drawer F3) (32218) GTP-25	EA	100
123	7930-00-558-1111	DETERGENT, GENERAL (Drawer C2)	EA	1
124	6640-00-360-2156	DISH, CULTURE PETRI, LARGE (Drawers M3 and X4)	EA	4
125	6640-01-030-9012	DISH, CULTURE, PETRI (Drawer R4)	EA	500
126	6640-00-404-2761	DISK, CORK, LAB (Drawer W1) (23035) K46020	EA	12
127	6640-00-985-2096	DISK, FILTER, 25mm (Drawer F2) (08071) RAWP-025-00	EA	200
128	6640-00-985-2099	DISK, FILTER, 25mm (Drawer F2) (08071) HAWP-025-00	EA	100
129	6640-00-083-5308	DISK, FILTER, 47mm (Drawer F2) (08071) HAWP-047-00	EA	100
130	6640-00-967-0501	DISK, FILTER, 47mm (Drawer F2) (08071) AAWP-047-00	EA	100
131	6640-00-688-7882	DISPENSER, FILTERING, SOLVENT: (Drawer J4) (08071) XX66-025-00	EA	2
132	7520-00-240-2411	DISPENSER, PRESSURE SENSITIVE ADHESIVE TAPE: Metal (Drawer M2) (81348) GG-D-458	EA	1
133	6640-00-988-2936	DISTILLING RECEIVER: Oil dilution, 5 ml (Drawer G1) (14674) 3580	EA	1
134	6640-00-925-6649	DISTILLING RECEIVER: Water determination 10 ml (Drawer G1) (0PCJ6) 31-196, STYLE a	EA	1
135	5130-00-293-1846	DRILL, PORTABLE, ELECTRIC: 1/4 in. (Drawer L4) (81348) W-D-661	EA	1
136	5133-00-618-7783	DRILL, SET, TWIST: High speed steel, fractional series, 13 drill set (Drawer L3) (81348) GGG-D-751	ST	1
-137	4440-NIIN	DRYING APPARATUS: 1/4" connections, (98963) X03-02-000	EA	1
138	7490-00-835-0443	EMBOSSING MACHINE, IDENTIFICATION TAPE: (Drawer J2) (81348) 00-E-491	EA	1
139	4210-00-595-1777	EXTINGUISHER, FIRE: Carbon Dioxide 5 lb. (98752) IRA 4210-031	EA	3
140	6640-00-450-5700	EXTRACTION ASSEMBLY: (Drawers L1 and P2) (22527) 09-585	EA	3
141	4240-00-202-9473	FACE SHIELD, INDUSTRIAL: L-F-36, Style B (Drawer A1)	EA	1
142	5110-00-234-6550	FILE, HAND: 6 in., American pattern (Drawer L3) (81348) GGG-F-325	EA	2

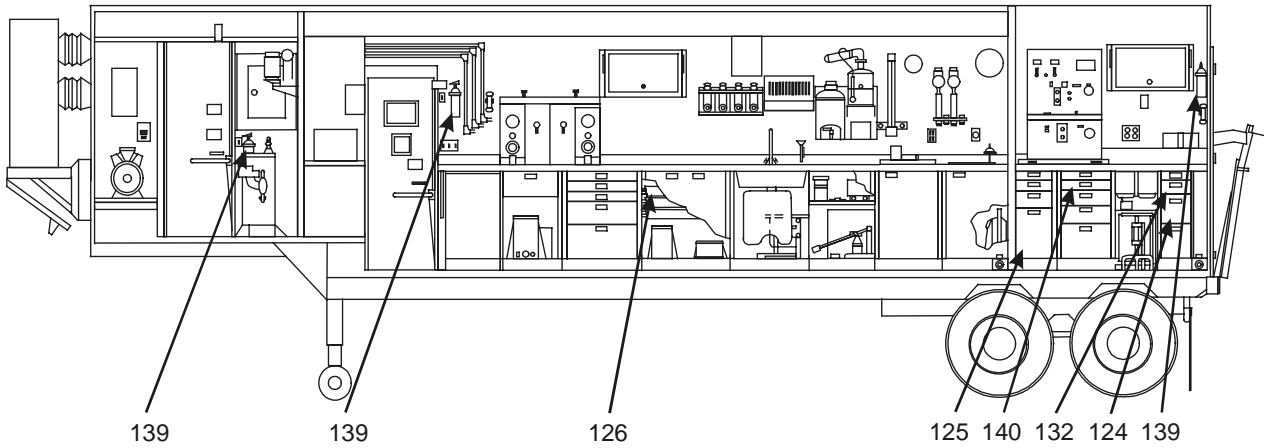
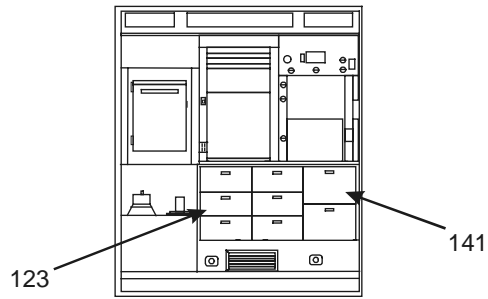
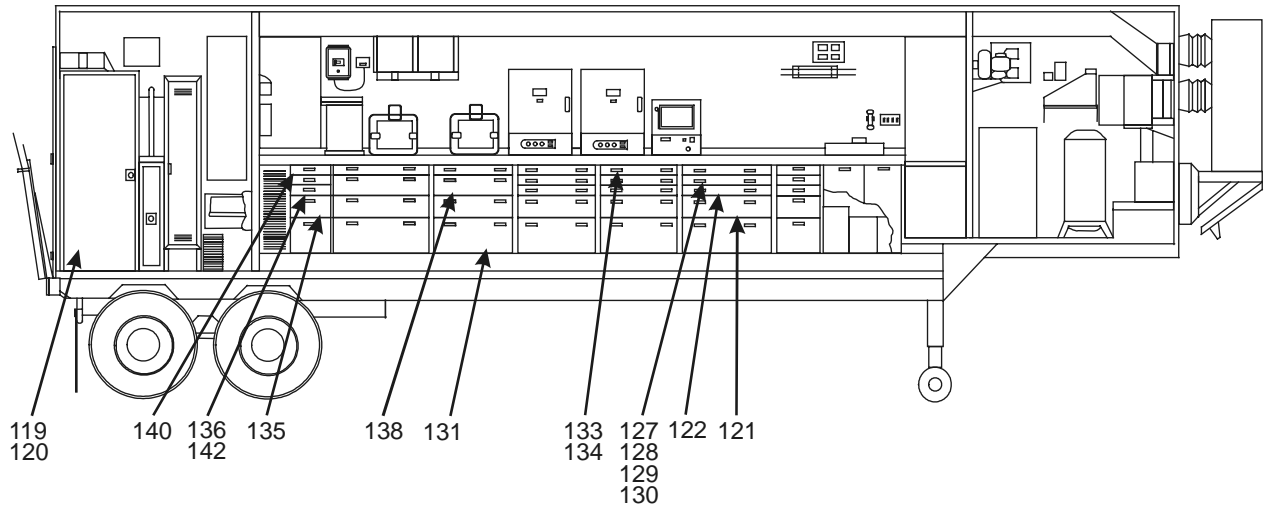


Figure C-2. Basic Issue Items (Sheet 6 of 20)

MBPLA-C-2-6B

**Section III. BASIC ISSUE ITEMS - continued**

(1) ILLUS NUMBER	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION CAGE and Part Number	(4) U/M	(5) QTY. RQD.
143	5110-00-241-9160	FILE, THREE SQUARE (Drawer L3)	EA	2
144	6640-00-404-2759	FILLER, PIPET, CAULFIED (Drawer K2)	EA	1
145		FILLER, PIPET; RUBBER BULB (Drawer L1) (59728) 7775-J40	EA	3
146	6545-00-922-1200	FIRST AID KIT: (0JAA4) 20-001	EA	1
147	6230-00-269-3034	FLASHLIGHT: Exposion Proof (80058) MX-992/U	EA	4
148	6640-00-425-1000	FLASK, BOILING (Drawer H4)	EA	2
149	6240-00-857-6877	FLASK, BOILING: 500 ml., Borosilicate Glass (Drawer F4) (72578) 25275-500	EA	2
150	6640-00-899-6375	FLASK, DEWAR: 1900 ml., Cylindrical (Drawer F5) (25518) 35-4840-64	EA	3
151	6640-00-423-8500	FLASK, DISTILLING: 125 ml., Borosilicate Glass (Drawer K3) (96906) MS36058-3	EA	10
152	6640-00-935-4287	FLASK, ERLLENMEYER: 1000ml., Ungraduated (Drawer K3) (22527) 10-939K	EA	2
153		FLASK, ERLLENMEYER: 250 ml., Boran Free (Drawer H5) (75278) 26510	EA	5
154	6640-00-935-4269	FLASK, ERLLENMEYER: 250 ml., Borosilicate Glass (Drawer G4) (22527) 10-039F	EA	7
155	6640-00-935-4286	FLASK, ERLLENMEYER: 50 ml., Borosilicate Glass Graduated (Drawer G2) (22527) 10-039C	EA	3
156	6640-00-935-4270	FLASK, ERLLENMEYER: 500 ml., Borosilicate Glass (Drawer G4) (22527) 10-039H	EA	9
157	6640-00-522-1888	FLASK, FILTERING: 1000 ml., Size 5 (Drawer E4) (40845) 29415-121	EA	1
158	6640-00-522-1889	FLASK, FILTERING: 4000 ml., Borosilicate Glass (Drawer E5) (40845) 29416-587	EA	4
159	6640-00-424-8000	FLASK, FILTERING: 500 ml., Size 4 (Drawers E4 and G4) (40845) 29415-100	EA	3
160	6640-00-290-6936	FLASK, LABORATORY: 250 ml., Iodine (Drawer K2) (40845) 29430-045	EA	8
161	6640-00-062-5949	FLASK, LABORATORY: 500 ml., Iodine (Drawer B1) (40845) 29430-067	EA	2
162	6640-00-425-6000	FLASK, VOLUMETRIC: Borosilicate Glass, 100 ml (Drawers H5 and K2 ) (96906) MS36068-4	EA	4
163	6640-00-425-9000	FLASK, VOLUMETRIC: Borosilicate Glass, 1000 ml (Drawer H4) (96906) MS36068-7	EA	4
164	6640-00-425-8000	FLASK, VOLUMETRIC: Borosilicate Glass, 500 ml (Drawer H4) (96906) MS36068-6	EA	4

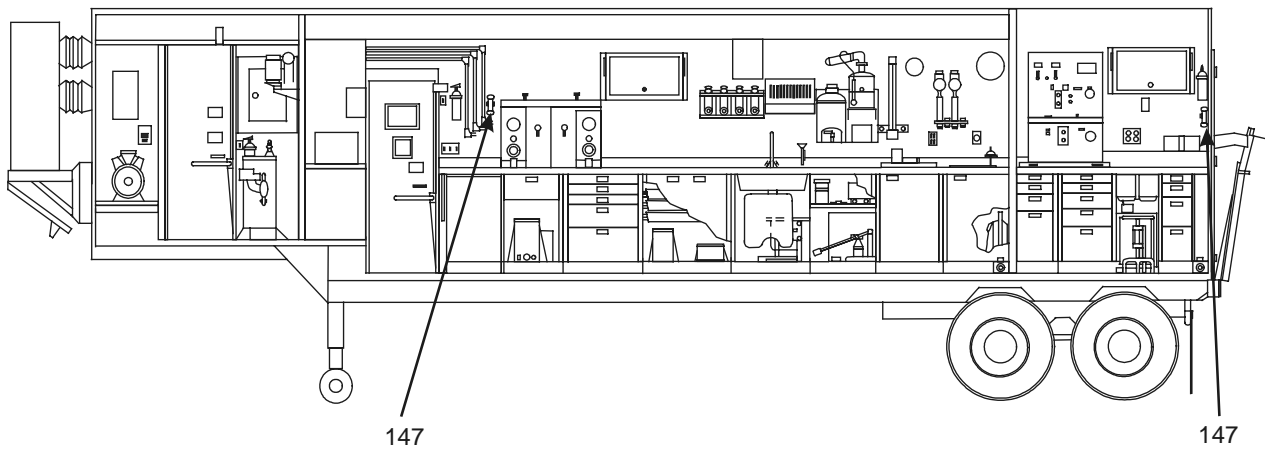
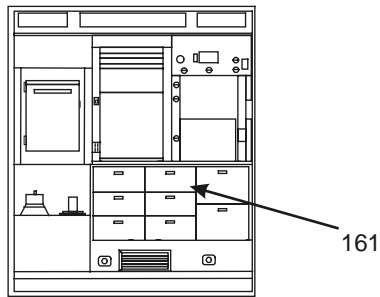
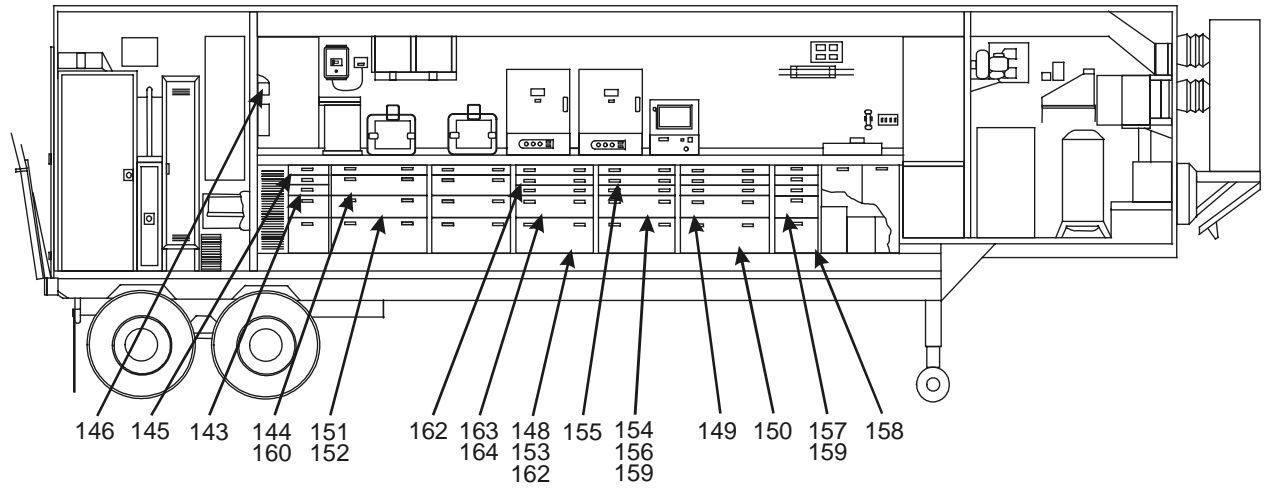


Figure C-2. Basic Issue Items (Sheet 7 of 20)

MBPLA-C-2-7B

## Section III. BASIC ISSUE ITEMS - continued

(1) ILLUS NUMBER	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION CAGE and Part Number	(4) U/M	(5) QTY. RQD.
165	5120-00-965-0603	FLINT TIP, FRICTION IGNITER (Drawer W3) (40845) 18385-202	EA	1
166	6640-00-404-2748	FOOT, LABORATORY FRAME: (Drawer E2) (48619) 69402	EA	2
167	6640-00-426-0300	FORCEPS, FLAT, BLADED: (Drawer F2) (08071) XX62-000-06	EA	1
168	6670-00-263-0249	FORCEPS: Crescent, 4 in. (Drawer F2) (40845) 25672-100	EA	2
169	6640-00-403-9338	FRAME ASSEMBLY, LABORATORY, RODS: (Drawer E2) (40845) 60075-009	EA	1
170	6640-00-290-6913	FUNNEL, COMMON LABORATORY: Glass, 60 deg., Ribbed (Drawer E5) (22527) 10-381D	EA	4
171	6640-00-290-6923	FUNNEL, COMMON, LABORATORY: Glass, 60 deg., Smooth (Drawers H5 and K2) (22527) 10-326A	EA	4
172	6640-00-426-8060	FUNNEL, COMMON, LABORATORY: Glass, Short Stem (Drawer K2) (22527) 10-329D	EA	2
173	6640-00-899-8993	FUNNEL, FILTERING LABORATORY: Buchner, 150 ml (Drawer H4) (22527) 10-358M	EA	4
174	6640-00-926-1313	FUNNEL, SEPARATOR: 125 ml (Drawer K3) (22527) 10-437-10B	EA	1
175	6640-00-926-1314	FUNNEL, SEPARATOR: Borosilicate Glass, 250 ml (Drawers C3 and G4) (22527) 10-437-10C	EA	3
176	6640-00-926-1315	FUNNEL, SEPARATOR: Borosilicate Glass, 500 ml (Drawer B1) (22527) 10-437-10D	EA	2
177	7420-00-230-2393	FUNNEL, STEEL (Drawer R4)	EA	1
178	6640-00-918-7719	FUNNELAIRE: (Drawer W1) (40845) 28292-004	EA	6
179		GAUGE (VACUUM) MERCURY MANOMETER (Drawer A1)	EA	1
180	6685-00-194-1683	GAUGE, 0-15 (PSI) PRESSURE: (Drawer S2) (48619) 74886	EA	4
181	6685-00-194-1699	GAUGE, 0-5 (PSI) PRESSURE: (Drawer S2) (48619) 74885	EA	4
182	6640-00-986-2721	GAUGE, CORK AND RUBBER: Plastics, 6 in. (Drawer W3) (22527) 11-284	PK	1
183		GAUGE, PRESSURE RECORDING; CLEANING WIRE (Drawer R1)	EA	2
184		GAUGE, PRESSURE RECORDING; KEY (Drawer R1)	EA	2
185	6680-00-318-2512	GAUGE, PRESSURE RECORDING; PENS (Drawer R1)	EA	2
186		GAUGE, PRESSURE RECORDING; RED INK (Drawer R1)	EA	2
-187		GAS, COMBUSTIBLE SENSOR KIT: Accessories for Gas Alarm (05083) 51-8317	EA	1
188		GASKET, CORK, BOTTOM DISC (Drawer W2)	EA	8
189	5330-00-088-9167	GASKET, COUPLING HALF (Drawer W2)	EA	1

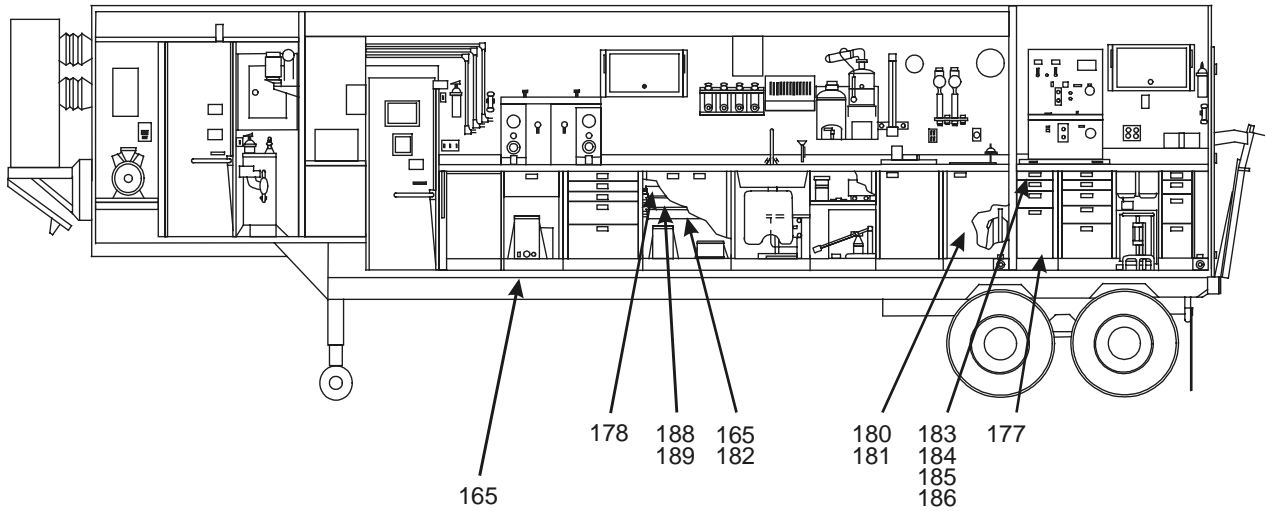
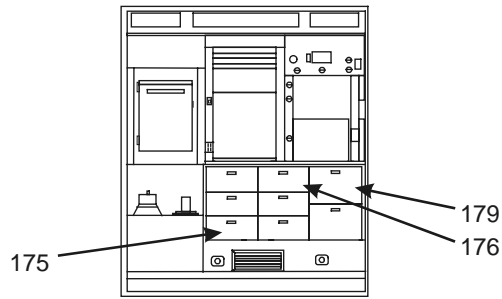
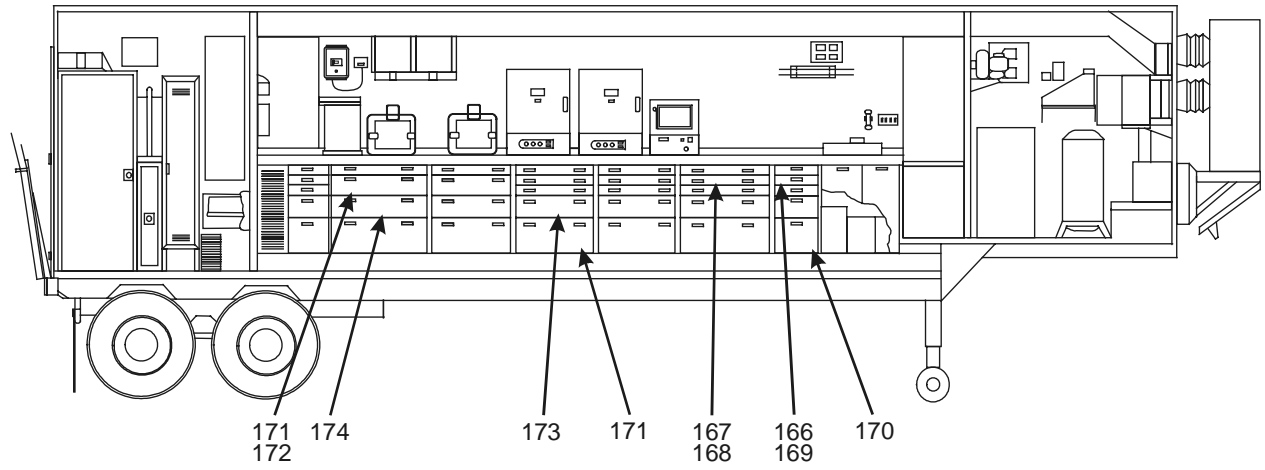


Figure C-2. Basic Issue Items (Sheet 8 of 20)

MBPLA-C-2-8B

## Section III. BASIC ISSUE ITEMS - continued

(1) ILLUS NUMBER	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION CAGE and Part Number	(4) U/M	(5) QTY. RQD.
190	5330-00-402-2209	GASKET: Composition (Drawer J2) (48619) 232240	EA	1
191	5330-00-401-9582	GASKET: For gum stability bomb, 100 per pack (Drawer B3) (48619) No. 74743	EA	1
192	5330-00-169-0557	GASKET; (R.V.P.) PETRO TEST (Drawer W1)	EA	25
193	5330-00-350-9438	GASKET; POLYTETRAFLUROETHYLENE (Drawer W1)	EA	5
194	6850-00-270-5526	GASOLINE INDICATING PASTE (Drawer F3)	EA	1
195	6640-00-459-5936	GLAND AND STIRRER: (Drawer H3) (80740) 67-990-09	EA	1
196	6640-01-333-4153	GLASS, TUBING, ROUND: (Locker) 10 mm OD (96906) MS36079-4	EA	2
197	6640-00-558-0292	GLASS, TUBING, ROUND: (Locker) 11 mm OD (96906) MS36079-5	EA	2
198	6640-00-558-0307	GLASS, TUBING, ROUND: (Locker) 4 mm OD (96906) MS36079-1	EA	2
199	6640-01-333-4152	GLASS, TUBING, ROUND: (Locker) 6 mm OD (96906) MS36079-2	EA	2
200	6640-00-245-7129	GLASS, TUBING, ROUND: (Locker) 8 mm OD (96906) MS36079-3	EA	2
201	6415-00-266-8675	GLOVES, CHEMICAL PROTECTIVE, SIZE 11 (Drawer L5)	EA	1
202	6415-00-266-8679	GLOVES, CHEMICAL PROTECTIVE, SIZE 9 (Drawer L5)	EA	1
203		GLOVES, HEAT PROTECTIVE (Drawer L5) (22527) 11-392-15	EA	2
204	4240-00-269-7912	GOGGLES, INDUSTRIAL (Drawer A1)	EA	1
205	5350-00-184-6255	GRAIN ABRASIVE (Drawer J2)	EA	1
206	9150-00-965-2408	GREASE, GROUND GLASS, JNT (Drawer F2) (76736)	EA	1
207		GRID, WIRE GAUZE, LABORATORY: (Drawer E2) (81348) NNN-G-698	EA	8
208	6640-00-269-8342	GRID, WIRE GAUZE, LABORATORY: (Drawer E2) (96906) MS36015-1	EA	4
209	6640-00-269-8345	GRID, WIRE GAUZE, LABORATORY: (Drawer E2) (96906) MS36015-3	EA	4
210	6640-00-427-3960	GRID, WIRE GAUZE, LABORATORY: (Drawer E2) (96906) MS36016-2	EA	8
211	6640-00-970-6220	HEATER, (INFRARED) LAB (Drawer F5) (22527) 11-504-50	EA	1
212	6640-00-980-5002	HEATER, ELECTRIC: (Drawer J4) (48619) 61600	EA	2
213	6640-00-522-1894	HEATER, ELECTRIC: Kinematic Viscosity Bath (Drawer R1) (22527) 13-580	EA	1

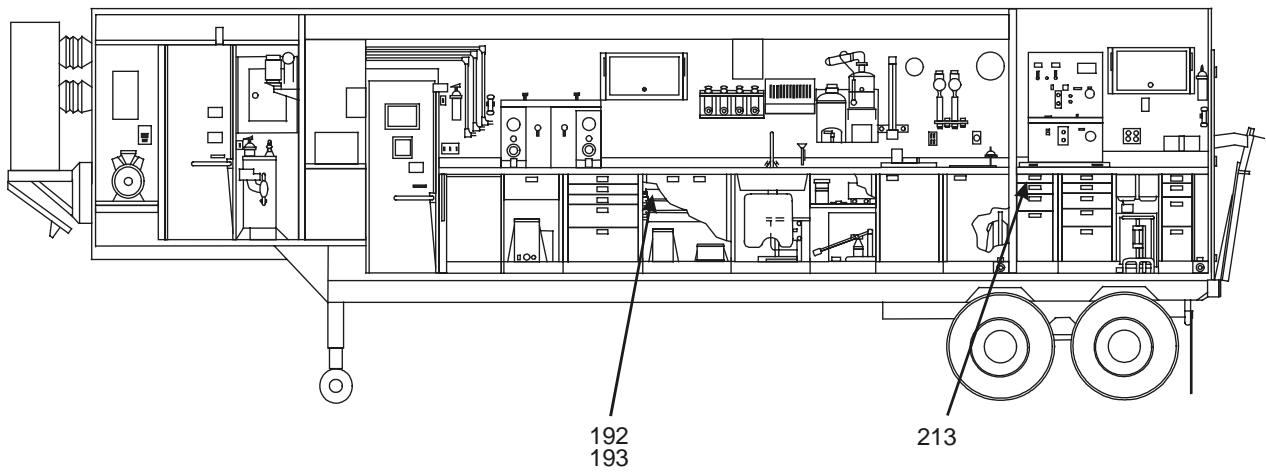
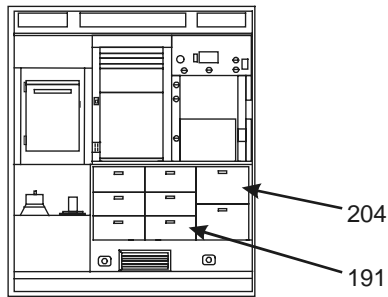
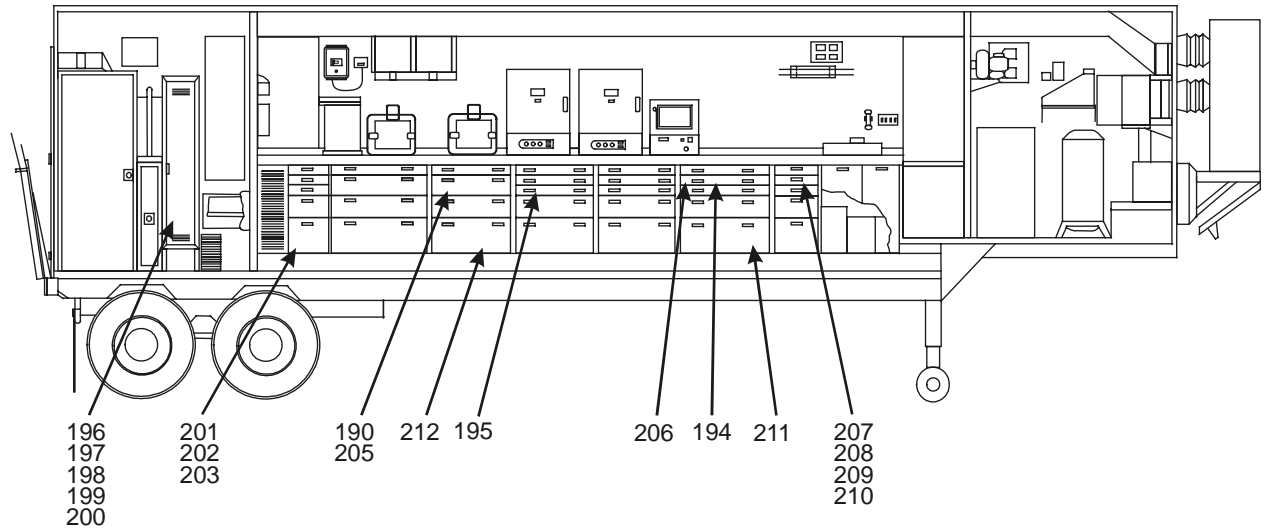


Figure C-2. Basic Issue Items (Sheet 9 of 20)

MBPLA-C-2-9B



## Section III. BASIC ISSUE ITEMS - continued

(1) ILLUS NUMBER	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION CAGE and Part Number	(4) U/M	(5) QTY. RQD.
214	6640-00-403-9347	HEATER, EXTRACTION, PETROLEUM TEST: Repeatable heater control, percentage timer, 1800W, 120V, AC/DC, 750 deg. F max. (Drawer U1) (50608) HP63016A	EA	1
215	6640-00-410-1915	HOLDER, CRUCIBLE: Borosilicate Glass, Size B (Drawer H5) (22527) 8-238B	EA	6
216	6640-00-359-9753	HOLDER, FILTERING, CRUCIBLE (Drawer H2) MS36091-1	EA	6
217	6640-00-893-3096	HOLDER, FILTER, HYDRO: (Drawer F5) (08071) XX20-047-20	EA	1
218	6640-00-404-2756	HOLDER, POLISHING: Bakelite, 4 units, (Drawer F3) (22527) 13-420-40	UN	1
219		HOT PLATE, LABORATORY: 110 to 600 degree F range (Drawer J2) (15747) G11885	EA	1
220	6630-00-265-7611	HYDROMETER, GRADUATED SCALE: Thermometer 19 to 31 degrees F (Drawer V) (81349) MIL-H-36343	EA	2
221	6630-00-265-7758	HYDROMETER, GRADUATED SCALE: Thermometer 29 to 41 degrees F (Drawer V) (81349) MIL-H-36343	EA	3
222	6630-00-265-7759	HYDROMETER, GRADUATED SCALE: Thermometer 39 to 51 degrees F (Drawer V) (81349) MIL-H-36343	EA	3
223	6630-00-265-7764	HYDROMETER, GRADUATED SCALE: Thermometer 49 to 61 degrees F (Drawer V) (81349) MIL-H-36343	EA	3
224	6630-00-265-7765	HYDROMETER, GRADUATED SCALE: Thermometer 59 to 71 degrees F (Drawer V) (81349) MIL-H-36343	EA	3
225	6630-00-815-2267	HYDROMETER, GRADUATED SCALE: Thermometer 69 to 81 degrees F (Drawer V) (81349) MIL-H-36343	EA	2
226	6630-00-404-2754	HYDROMETER, GRADUATED SCALE: Thermometer 79 to 91 degrees F (Drawer V) (15747) G13005-J	EA	2
227	6630-00-404-2755	HYDROMETER, GRADUATED SCALE: Thermometer 89 to 101 degrees F (Drawer V) (15747) G13005-K	EA	2
228	6630-00-265-7610	HYDROMETER, GRADUATED SCALE: Thermometer 9 to 21 degrees F (Drawer V) (81349) MIL-H-36343	EA	2
229	6640-01-383-2728	ICE MAKER BAG AND FITTINGS: U/w compressed carbon dioxide gas (Gas Cylinder Storage) (00SF9) ME-302	ST	1
230	5120-00-965-0326	IGNITER, FRICTION: Wire frame (Drawer W3) (40845) 18358-201	EA	2
231	7510-00-267-9249	INK, RECORDING INSTRUMENT, GREEN (Drawer F5)	EA	1
232	7510-00-821-0258	INK, RECORDING INSTRUMENT, RED (Drawer F5)	EA	1
233		JAR, CHROMATOGRAPHY: 1 gal. (Drawer A1) (40845) 36363-028	EA	1
234	6635-00-025-9152	JAR, CLOUD AND POUR: (Drawer X3) (40845) 5294-771	EA	6
235	6640-00-359-9870	JAR, CYLINDRICAL LABORATORY: 4-5/8 x 9-1/2 in. (Drawer K2) (75278) 32900-4129	EA	1

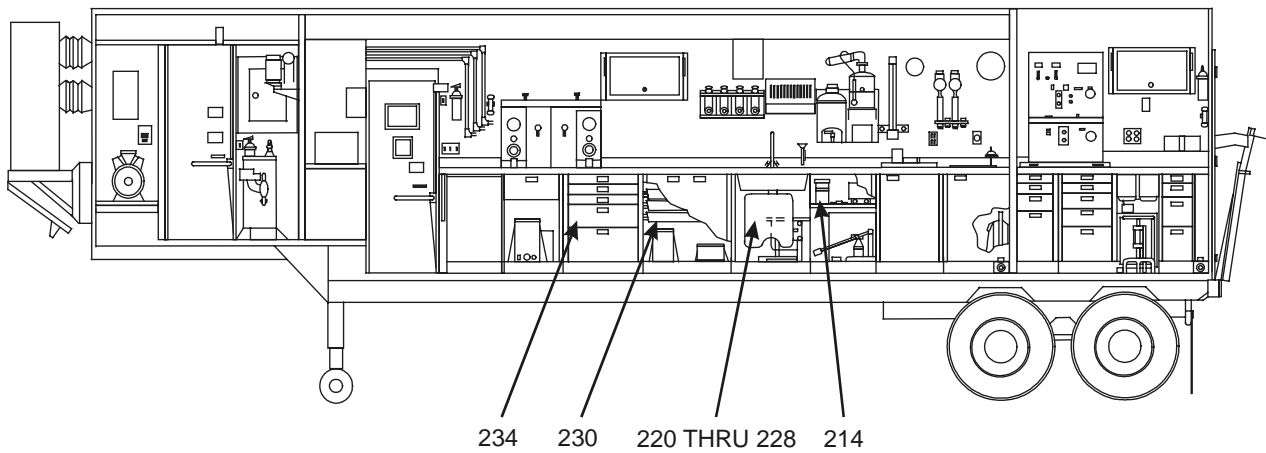
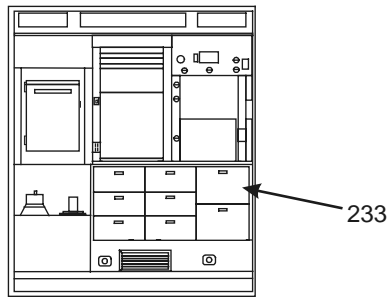
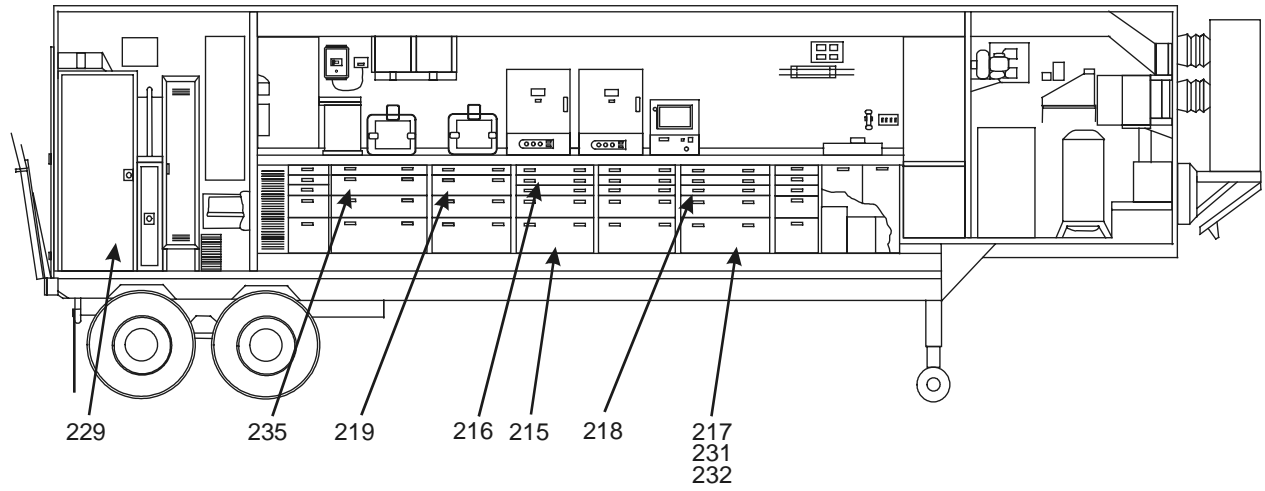


Figure C-2. Basic Issue Items (Sheet 10 of 20)

MBPLA-C-2-10B

## Section III. BASIC ISSUE ITEMS - continued

(1) ILLUS NUMBER	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION CAGE and Part Number	(4) U/M	(5) QTY. RQD.
236	6640-00-899-8980	JAR, DRYING, LABORATORY: Borosilicate Glass (Drawer F4) (75278) 19505-300	EA	1
237		JERRY JUG: Polyethylene (15747) G14798A	EA	4
238	6640-00-436-9926	KIT, LABORATORY GLASS REPAIR: (Drawer F5) (21519) 82-460-512	EA	1
239	5110-00-223-7782	KNIFE, CRAFTSMAN'S: (Drawer W3) (81348) GGG-K-481	EA	1
240	7530-00-526-9792	LABEL, PAPER (Drawer F2)	EA	250
241		LABEL, PLASTIC, LAMINATED (Drawer F2)	EA	2
242		LABEL; PLASTIC, LAMINATED (Drawer H3)	EA	1
243	6240-00-319-4549	LAMP, FLUORESCENT: 4 watts, miniature, ultraviolet (Drawer G5) (08108) F4T5/BLB	EA	1
244	6240-00-155-8675	LAMP, INCANDESCENT: Clear, white light, 2.4 volts, miniature flange (Drawer H1) (08109) PR-6	EA	2
245	6240-00-797-3750	LAMP, INCANDESCENT: Clear, white light, 3.7 volts, miniature screw base (Drawer H1) (28461) 5240-1135	EA	2
246	5210-00-619-7036	LEVEL AND PLUMB: Cast iron (Drawer K2) GGG-L-211, Type II, Class I	EA	1
247	6230-00-146-8898	LIGHT, EXTENSION: 50 ft. long (Drawer L5) (81348) W-L-661	EA	1
248	6230-00-146-9318	LIGHT, INSPECTION: (Drawer R3) (83303) MVFX	EA	1
249	6630-00-337-6890	LINER, BOMB: (Drawer K2) (23035) K105-4	EA	4
250	6640-00-290-0146	LITMUS PAPER, BLUE (Drawer F2)	EA	4
251	6640-00-290-0147	LITMUS PAPER, RED (Drawer F2)	EA	4
-252		MATT, Rubber, color, black 3 x 0.25 yds. (61887) MC-25	EA	1
253	6810-00-281-7450	MERCURY, LIQUID: 5lb. bottle (Drawer C2)	EA	2
254	9530-00-978-1867	METAL BAR (Drawer J4) (22527) 14-666-10C	EA	4
255	9535-00-541-2453	METAL FOIL (Drawer W4)	EA	1
256	6630-01-115-2398	METER, CONDUCTIVITY: Battery operated (Drawer K3) (23299) 1152	EA	1
257		METER, PH, CHEMTRIX: W/temperature compensation, solid state electronics, interchangeable battery, w/115V AC conversion kit (Drawer G5) (40854) 2000	EA	1
258	6625-00-914-4113	MULTIMETER, 0-6000 V DC/AC: (Drawer M2) (60741) No. 310	EA	1
-259	4730-01-009-1735	NIPPLE, QUICK DISCONNECT 2:00: (96906) MS39352-9	EA	1
260	4930-00-537-8977	OILER, HAND (Drawer F5)	EA	1
261	5330-00-292-0570	PACKING, PREFORMED (Drawer W1) (48619) 232069	EA	25
262	6640-00-866-1427	PAPER FILTER, WHATMAN 2 (Drawer F2)	EA	2

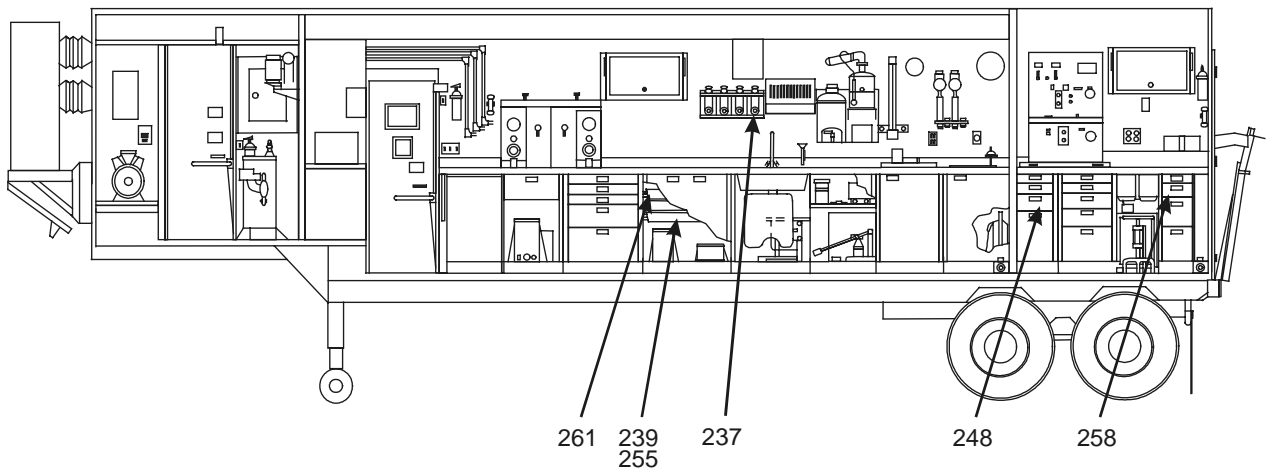
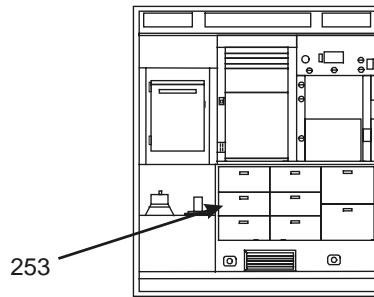
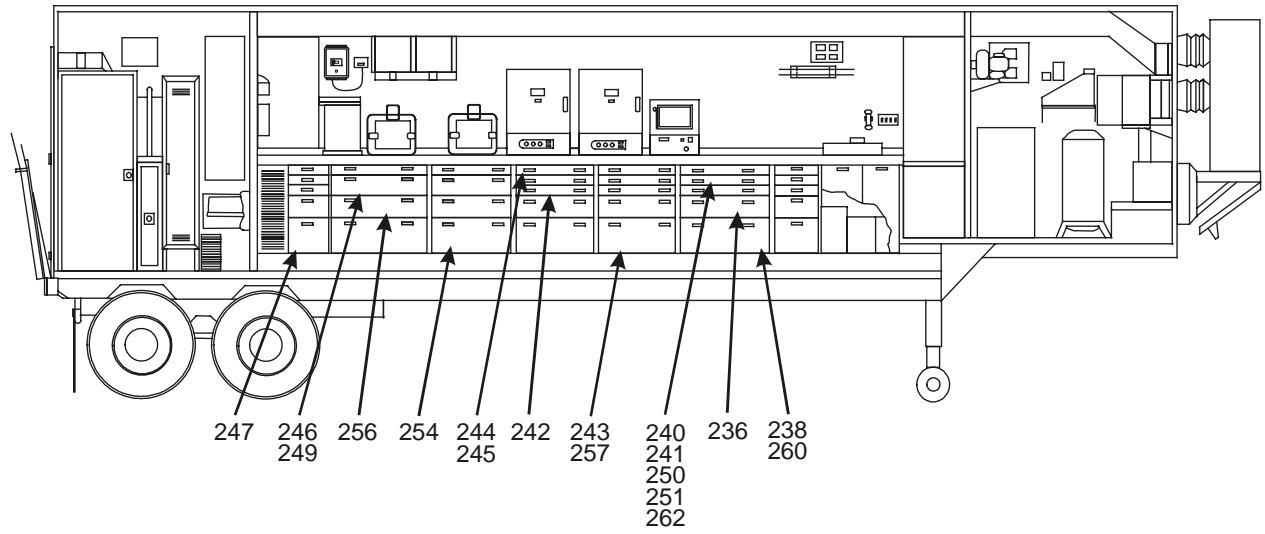


Figure C-2. Basic Issue Items (Sheet 11 of 20)

MBPLA-C-2-11B

## Section III. BASIC ISSUE ITEMS - continued

(1) ILLUS NUMBER	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION CAGE and Part Number	(4) U/M	(5) QTY. RQD.
263	6640-00-252-5198	PAPER FILTER, WHATMAN 4 (Drawer F2)	EA	2
264	6640-00-252-5202	PAPER FILTER, WHATMAN 40 (Drawer F2)	EA	1
265		PAPER FILTER, WHATMAN 42 (Drawer F2)	EA	2
266	6640-00-252-5205	PAPER FILTER, WHATMAN 44 (Drawer F2)	EA	2
267	6640-00-084-5080	PAPER, BIBULOUS (Drawer F3) (25518) 65-4800	EA	1
268	7510-00-240-1526	PENCIL, BLACK (Drawer P1)	EA	2
269	6640-00-442-9621	PIPET, DROPPING: Glass (Drawer L1) (25518) 71-5700	EA	12
270	6640-00-437-9000	PIPET, VOLUMETRIC: Borosilicate Glass, 10 ml (Drawers F1 and X2) (96906) MS35985-6	EA	12
271	6640-00-558-0575	PIPET, VOLUMETRIC: Borosilicate Glass, 2 ml (Drawers F1 and X2) (96906) MS35985-2	EA	6
272	6640-00-438-0000	PIPET, VOLUMETRIC: Borosilicate Glass, 25 ml, granulated (Drawer F1) (96906) MS35985-9	EA	16
273	6640-00-437-8000	PIPET, VOLUMETRIC: Borosilicate Glass, 5 ml (Drawers F1 and X2) (96906) MS35985-5	EA	12
274	6640-00-438-0250	PIPET, VOLUMETRIC: Borosilicate Glass, 50 ml, granulated (Drawers F2 and G3) (96906) MS35985-10	EA	5
275		PIPET: Graduated 10 ml (Drawer G1) (40845) 53083-119	EA	1
276	8135-00-043-5331	PLASTIC SHEET (Drawer W4)	EA	2
277	7930-00-266-7137	POLISH, METAL (Drawer A2)	EA	1
278	6640-00-438-2150	PRESS, CORK, LABORATORY: Accommodates 1-1/4 in. cork (Drawer K4) (25518) 27-1600	EA	1
279		PRINTER, EPSON RX-80 or equivalent, and necessary cables	EA	1
280	6830-00-584-3041	PROPANE, CYLINDER, DISPOSABLE, BB-G-110, TYPE II (stored in propane locker)	EA	8
281	6640-00-403-9341	PUMP, FILTER, LABORATORY: Borosilicate Glass (Drawer G3) (75278) 38004-99	EA	2
282	6640-01-354-8596	RACK, DRYING; 3tiers for holding tubes (11134) H18932-0000	EA	1
283		RACK, TEST TUBE, LABORATORY (Drawer F5) (22527) 14-911-1	EA	1
284	6640-00-494-3731	REMOVER, BOTTLE STOPPER, LABORATORY: Hinged arm (Drawer X5) (22527) 02-927	EA	1
285	6145-00-192-1698	RESISTANCE WIRE (Drawer J2)	EA	1
286	6640-00-835-0896	RING, LABORATORY APPARATUS SUPPORT: (Drawer H1) (22527) 14-050B	EA	3
287	6640-00-290-6699	RING, LABORATORY APPARATUS SUPPORT: Metal, 9-1/8 in. ID, with clamp (Drawer H1) (25518) 74-660-7	EA	3

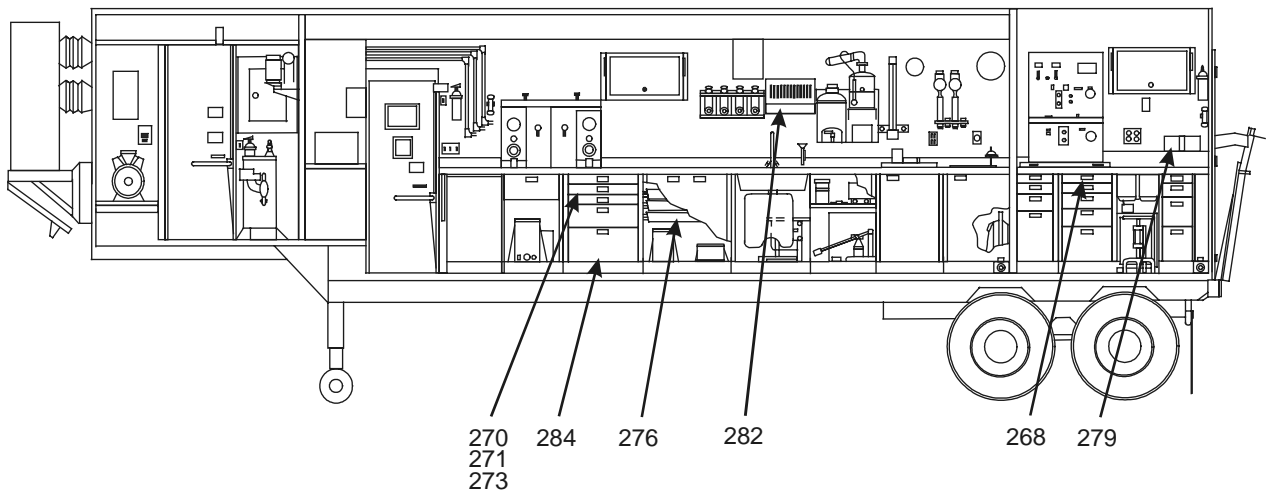
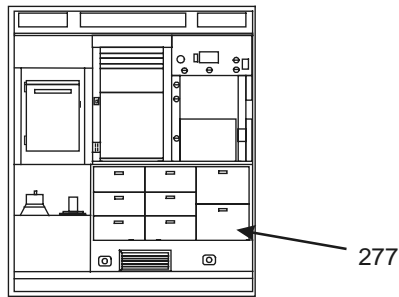
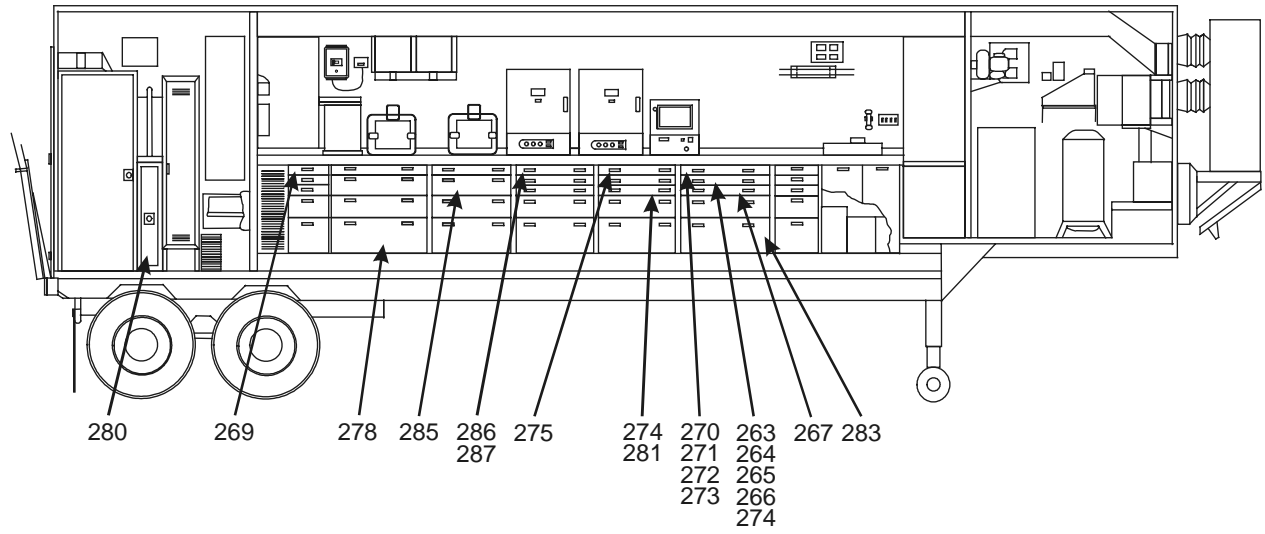


Figure C-2. Basic Issue Items (Sheet 12 of 20)

MBPLA-C-2-12B

## Section III. BASIC ISSUE ITEMS - continued

(1) ILLUS NUMBER	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION CAGE and Part Number	(4) U/M	(5) QTY. RQD.
288		RING, REDUCER (Drawer F2)	EA	2
289	6640-00-835-0898	RING, LABORATORY APPARATUS SUPPORT: (Drawer G2) (22527) 14-050D	EA	3
290	6640-00-440-1325	RING, SUPPORT: (Drawer G2) (22527) 14-050C	EA	3
291	6640-00-690-3269	RING, TRUNNION: Cone-shaped 100 ml (Drawer E4) (48619) 67313	EA	4
292	6640-00-690-3282	RING, TURNNION: Pear-shaped 100 ml (Drawer E4) (48619) 67314	EA	4
293		ROD ASSORTMENT; STIRRING (Drawer X3)	EA	
294	6640-00-436-9921	ROD, DROPPING POINT APPARATUS: (Drawer H1) (23035) K194-EG	EA	1
295	6640-00-410-1912	ROD, LABORATORY FRAME: (Stored in locker) (22527) 14-666-10E	EA	2
296	6670-00-436-9853	ROD, SUPPORT, VIBRATION DAMPING: (Drawer K4) (19217) 9725	EA	1
-297	7240-00-248-9620	SAFETY CAN: Steel; flexible spout; 3 gal; RR-S-30, Type II, GRC	EA	1
298	6695-00-946-3602	SAMPLER, LIQUID: 16 oz. (Drawer J2) (23035) K27790	EA	1
299		SCOOP, BALANCE, LABORATORY: Analytical Balance (Drawer G) (85973) 107-00	EA	1
-300	7330-00-080-6135	SCOOP, ICE, POLYETHYLENE: (94422) 02-0540-00	EA	1
301		SCRAPER; 1 3/8 in. LG (Drawer W3) (25518) 74-810-1-8	EA	12
302		SCRAPER; 25 mm LG (Drawer Y1) (25518) 74-800	EA	6
303	5120-00-421-0000	SCRIBER, DIAMOND POINT: (Drawer L3) (40845) 52865-005	EA	1
304	6680-00-496-9612	SHAFT, (EXTENSION) TACHOMETER: Petroleum test 12 in. (Drawer F3) (57733) 412850	EA	1
305		SHAFT, STIRRER, FLEXIBLE: 11-1/2 in. long with 1/4 in. chuck (Drawer J4) (23035) K160-9	EA	4
306	5110-00-113-0045	SHARPENER, CORD BORED: 22 mm cutting edges (Drawer W3) (40845) 23475-007	EA	1
307	5110-00-293-3444	SHEARS, STRAIGHT TRIMMERS: (Drawer H1) (81348) GG-S-278	EA	1
308	6640-00-359-9641	SHIELD, HEAT, DISTILLING FLASK: (Drawer X3) (48619) 61832	EA	4
309	6640-00-359-9642	SHIELD, HEAT, DISTILLING FLASK: (Drawer X4) (48619) 61834	EA	2
310	6640-00-359-9645	SHIELD, HEAT, PORCELAIN 4 3/4 in. DIA (Drawer X3) (48619) 61824	EA	2
311	6640-00-359-9646	SHIELD, HEAT, PORCELAIN 1 1/2 in. DIA (Drawer X4) (48619) 61825	EA	2
312	6640-00-360-1062	SHIELD: Cone-shaped, 100 ml (Drawer E4) (48619) 67359	EA	4

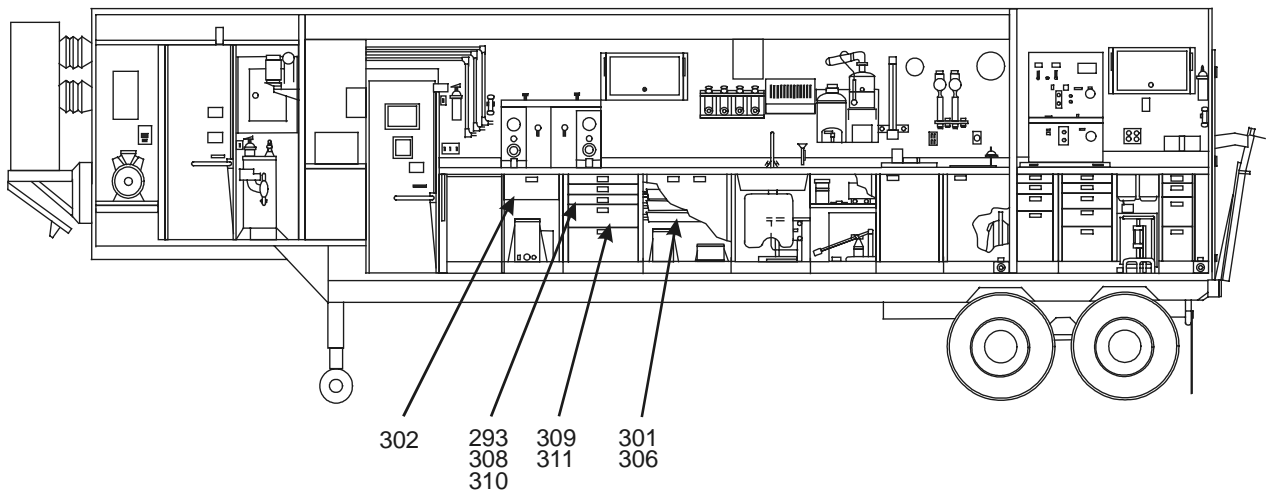
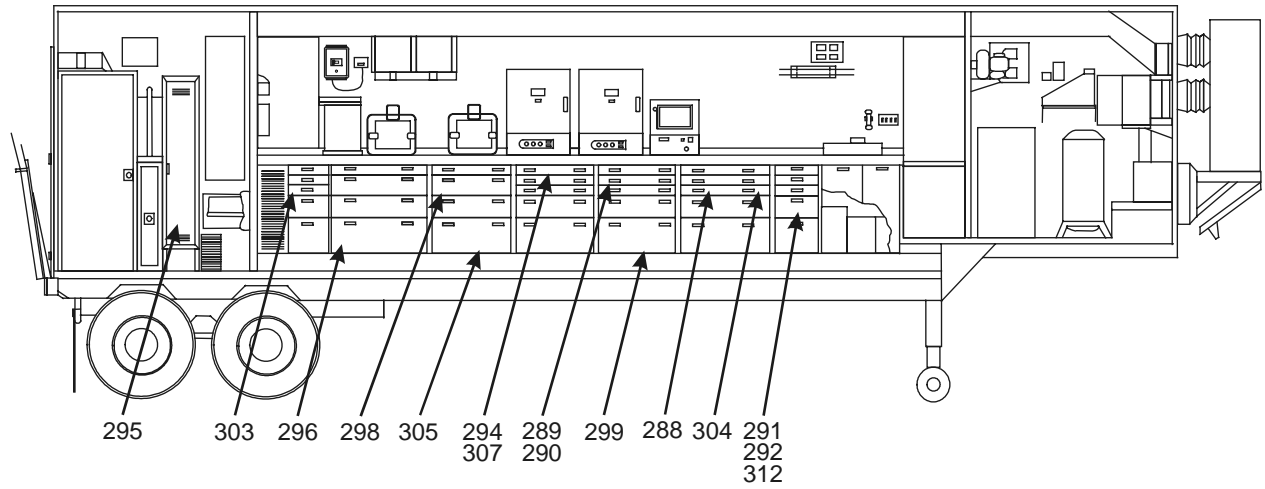


Figure C-2. Basic Issue Items (Sheet 13 of 20)

MBPLA-C-2-13B



## Section III. BASIC ISSUE ITEMS - continued

(1) ILLUS NUMBER	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION CAGE and Part Number	(4) U/M	(5) QTY. RQD.
313	6640-00-359-9951	SHIELD: Pear-shaped, 100 ml (Drawer E4) (48619) 67360	EA	4
314	6640-00-359-9646	SHILED, HEAT, DISTILLING FLASK: (Drawers X3 and X4) (96906) MS356345-2	EA	2
315	6635-00-359-9982	SIEVE, TEST: 100 mesh, 100 mesh replaceable cloth, and 200 mesh, (Drawer J3) (40845) 57334-294	EA	1
316	6640-00-403-9345	SOCKET, BOMB: (23035) K10530	EA	1
317	3439-00-269-9610	SOLDER, TIN ALLOY (Drawer L4)	EA	1
318	3439-00-618-6623	SOLDING GUN: 115V, 60 Hz, with pistol grip handle and spotlight (Drawer L4) (81348) W-S-564	EA	1
319	6640-00-439-7375	SPATULA, LABORATORY: Crescent blade, wood handle, 12-5/8 in. (Drawer W3) (22527) 14-365E	EA	2
320	6640-00-171-5198	SPATULA, LABORATORY: Crescent blade, wood handle, 7-3/8 in. (Drawer W3) (22527) 14-365B	EA	2
321	6640-00-975-0453	SPATULA, LABORATORY: Crescent blade, wood handle, thin flexible blade (Drawer W3) (22527) 14-371A	EA	2
322	7920-00-240-2559	SPONGE, CELLULOSE (Drawer L2)	EA	2
323		STAND, FREEZING POINT APPARATUS: U/w tubes (Drawer H3) (40845) 60110-244	EA	2
324	6640-00-290-6717	STAND, LABORATORY APPARATUS SUPPORT: Metal base (Drawer J3) (96906) MS36019-1	EA	2
325		STAND, LABORATORY APPARATUS SUPPORT: Porcelain base (Drawer J3) (22527) 14-667	EA	2
326	6640-00-326-7684	STANDARDS: Milipore (Drawer F5) (08071) P/N XX64-037-85	EA	1
327	6640-00-488-5221	STIRRER, AGITATOR LABORATORY: Crescent, 3 blade, 2 in. dia. (Drawer F2) (40845) 58958-404	EA	2
328	6640-00-531-5022	STIRRER, ELECTRIC LABORATORY: 115V, 50/60 Hz, 80-115 RPM, On/Off toggle switch, universal clamp mounting (Drawer J4) (48619) No. 75765	EA	1
329	6640-00-482-7235	STIRRER-HOT PLATE, MAGNETIC LABORATORY: 775W, variable stirring speed, 110V, 60 Hz (Drawer G5) (64484) SP46615	EA	1
330		STIRRING MAGNETS (Drawer W2)	EA	3
331	6640-00-310-8550	STONE: Foam test apparatus (Drawer K2) (25518) 68-758-01	EA	2
332		STOPCOCK, 2MM (Drawer G2) (0ZP50) LX6540-1008	EA	2
333	6640-00-852-3452	STOPCOCK, 4MM (Drawer G2) (0ZP50) LX6540-1012	EA	2
334	6640-00-410-1917	STOPCOCK; 3 MM (Drawer W1) (25518) F3089	EA	6
335	6640-00-179-2558	STOPPER, CORK QUALITY (Drawer X5) (15747) G6501A	EA	100

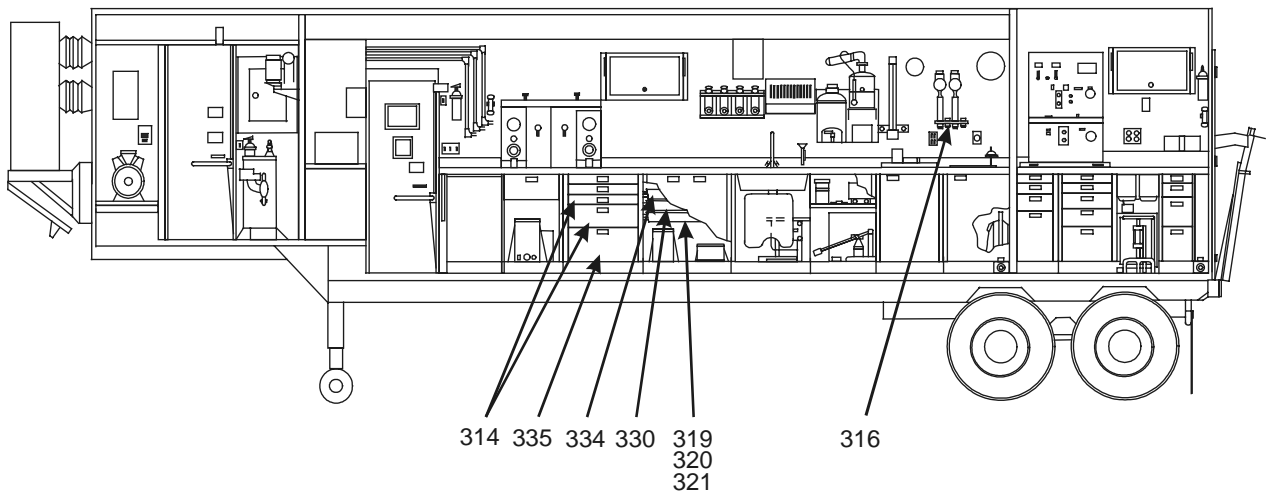
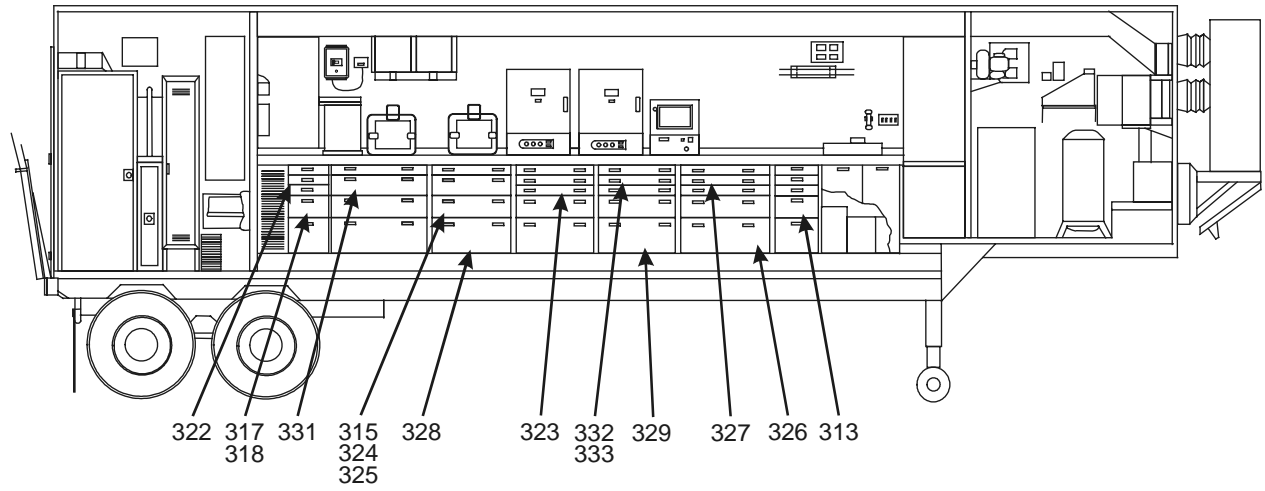


Figure C-2. Basic Issue Items (Sheet 14 of 20)

MBPLA-C-2-14B

## Section III. BASIC ISSUE ITEMS - continued

(1) ILLUS NUMBER	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION CAGE and Part Number	(4) U/M	(5) QTY. RQD.
336	6640-00-410-4466	STOPPER, SPLIT CORK: (Drawer H1) (23035) 19493	EA	6
337	6640-00-232-5991	STOPPER; CORK; .060 in. DIA (Drawer Y1) (15747) G6500H	EA	1
338	6640-00-116-2823	STOPPER; CORK; .063 in. DIA (Drawer Y1) (15747) G6500G	EA	1
339	6640-00-232-6014	STOPPER; CORK; .075 in. DIA (Drawer Y1) (25518) 26-970-06	EA	1
340	6640-00-232-5992	STOPPER; CORK; .081 in. DIA (Drawer Y1) (15747) G6500K	EA	1
341	8125-00-281-4107	STOPPER; NONBLOOMING, RUBBER (Drawer W3) (22527) 21-381	EA	12
342	6640-00-232-6012	STOPPER; SYNTHETIC; 0.787 in. DIA (Drawer Y1)	EA	5
343	6640-01-327-9504	STOPPER; SYNTHETIC; 1.024 in. DIA (Drawer Y1)	EA	12
344	6640-00-232-6009	STOPPER; SYNTHETIC; 1.063 in. DIA (Drawer Y1)	EA	12
345	6640-00-232-6008	STOPPER; SYNTHETIC; 1.260 in. DIA (Drawer Y1)	EA	12
346	6640-01-328-8491	STOPPER; SYNTHETIC; 1.614 in. DIA (Drawer Y1)	EA	12
347	6640-00-232-6007	STOPPER; SYNTHETIC; 1.457 in. DIA (Drawer Y1)	EA	12
348	6640-00-232-6011	STOPPER; SYNTHETIC; 0.945 in. DIA (Drawer Y1)	EA	12
349	6640-01-328-5217	STOPPER; SYNTHETIC; 1.772 in. DIA (Drawer Y1)	EA	12
350		STOPPER; SYNTHETIC; 2.204 in. DIA (Drawer Y1)	EA	5
351	6640-00-103-1845	STOPPER; SYNTHETIC; 2.524 in. DIA (Drawer Y1)	EA	5
352	6645-00-126-0286	STOPWATCH: Laboratory, 2 sweep hands, open face, shockproof (Drawer F3) (81348) GG-S-764	EA	4
353	6640-00-392-8643	SUPPORT ARM, FUNNEL, LABORATORY: With clamp and hardwood rod (Drawer J3) (22527) 14-740	EA	2
354	6640-00-410-1919	SUPPORT RACK, PIPET: (Drawer H1) (15747) F18955-0000	EA	1
355	6640-00-359-9985	SUPPORT: Sediment apparatus (Drawer J3) (0PCJ6) 68-825-06	EA	1
356	6640-00-359-9995	SWAB: (Drawer H1) (48619) 76018	EA	2
357		SYRINGE: General Purpose, 100 cc., 10 cc graduations, glass (Drawer K2) (08474) BD-2317	EA	1
358	8030-00-889-3535	TAPE, ANTISEIZING (Drawer F2 and R1) (04963) 48	EA	10
359	5210-00-287-3335	TAPE, MEASURING: (Drawer F3) (80244) GGG-T-106, Type V, Class A, Style 2	EA	1
360	7510-00-082-2520	TAPE, PRESSURE SENSITIVE (Drawer L3)	EA	1
361	6640-00-442-9005	TEST PAPER AND COLOR CHART (Drawers F2 and L1)	EA	1
362	6640-00-442-9015	TEST PAPER REFILL 1-11 pH (Drawers F2 and L1)	EA	1
363	6640-00-442-9025	TEST PAPER REFILL 2-10 pH (Drawers F2 and L1)	EA	1
364	6640-00-861-6215	TEST PAPER, LEAD ACETATE (Drawer E3) (22527) 14-862	EA	12

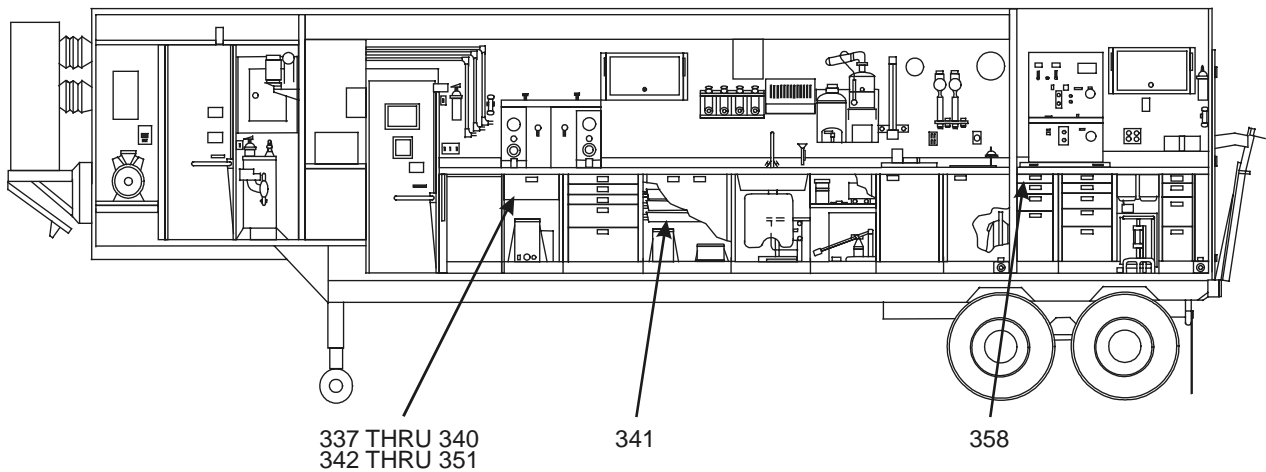
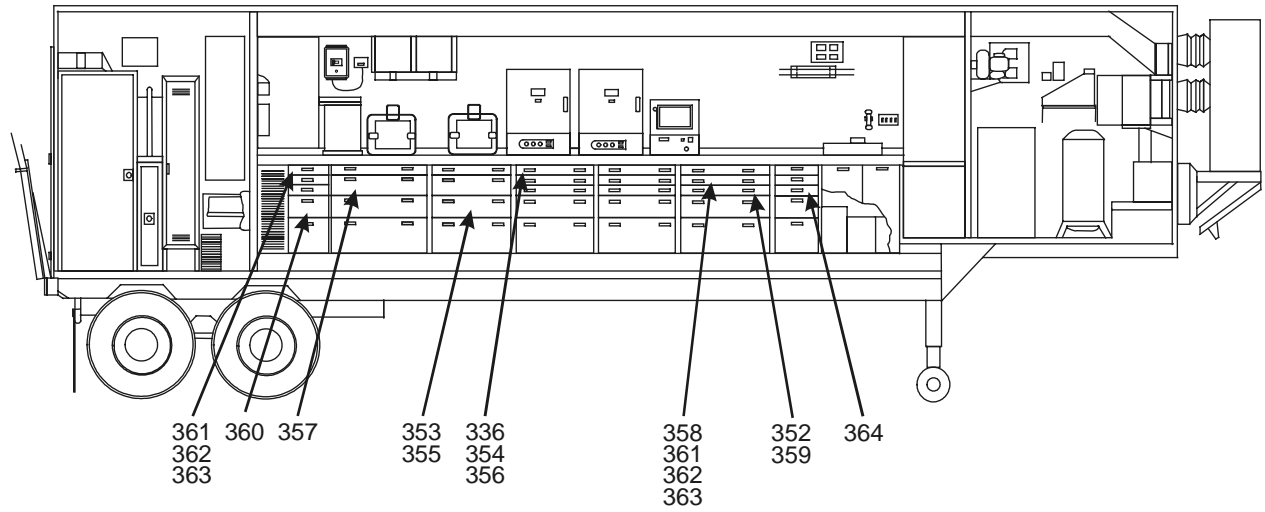


Figure C-2. Basic Issue Items (Sheet 15 of 20)

MBPLA-C-2-15B

**Section III. BASIC ISSUE ITEMS - continued**

(1) ILLUS NUMBER	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION CAGE and Part Number	(4) U/M	(5) QTY. RQD.
365	6640-00-404-2757	TEST TUBE: Borosilicate Glass, flat (Drawer H2) (25518) 322-004-002	EA	18
366	6640-01-333-4770	TEST TUBE: Glass, 150 mm x 25 mm (Drawer H2) (81348) NNN-T-189	EA	22
367	6640-00-061-8966	TEST TUBE: Glass, 175 mm x 22 mm (Drawer H2) (40845) 60820-265	EA	22
368	6640-00-298-7258	TEST TUBE: Heat Resistant, 150 mm x 18 mm (Drawer H2) (96906) MS36183-3	EA	10
369	6630-00-404-2750	TETRAETHYL LEAD APPARATUS PETROLEUM: W/3 glass parts (2A303 P/N 151-9151) (Drawer G2) (25518) No. JP3800	ST	2
370	6685-00-373-3436	THERMOMETER, SELF-INDICATING, BIMETALLIC: 0 to 200 deg F, dial (Drawer K2) (48619) 73503	EA	1
371	6685-00-247-3764	THERMOMETER, SELF-INDICATING, LIQUID IN GLASS: 127.5 to 132.5 deg F (Drawer V) (64484) S-80800E	EA	2
372		THERMOMETER, SELF-INDICATING, LIQUID IN GLASS: -18 to +82 deg C (Drawer V)	EA	2
373	6685-01-070-1821	THERMOMETER, SELF-INDICATING, LIQUID IN GLASS: -2 to +300 deg C (Drawer V)	EA	5
374		THERMOMETER, SELF-INDICATING, LIQUID IN GLASS: -2 to +400 deg C (Drawer V)	EA	5
375		THERMOMETER, SELF-INDICATING, LIQUID IN GLASS: -20 to +102 deg C (Drawer V)	EA	4
376	6685-00-843-7239	THERMOMETER, SELF-INDICATING, LIQUID IN GLASS: -20 to +150 deg D (Drawer V) (22527) 15-166A	EA	2
377		THERMOMETER, SELF-INDICATING, LIQUID IN GLASS: -20 to +50 deg C (Drawer V) (22527) 13-510-100	EA	2
378	6685-00-242-3763	THERMOMETER, SELF-INDICATING, LIQUID IN GLASS: 207.5 to 215.5 deg F (Drawer V) (22527) 13-618J	EA	2
379		THERMOMETER, SELF-INDICATING, LIQUID IN GLASS: 25 to 105 deg C (Drawer V)	EA	3
380		THERMOMETER, SELF-INDICATING, LIQUID IN GLASS: -34 to +49 deg C (Drawer V)	EA	3
381		THERMOMETER, SELF-INDICATING, LIQUID IN GLASS: 34 to 42 deg C, with case (Drawer V)	EA	3
382		THERMOMETER, SELF-INDICATING, LIQUID IN GLASS: -38 to +42 deg C (Drawer V)	EA	1
383		THERMOMETER, SELF-INDICATING, LIQUID IN GLASS: -38 to +50 deg C (Drawer V)	EA	4
384		THERMOMETER, SELF-INDICATING, LIQUID IN GLASS: -5 to +300 deg C (Drawer V)	EA	2

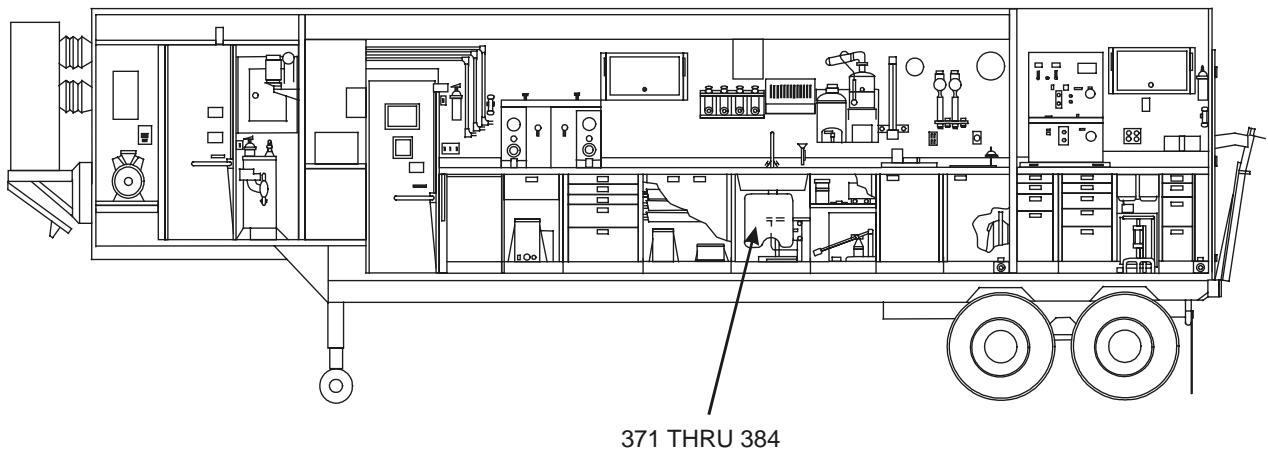
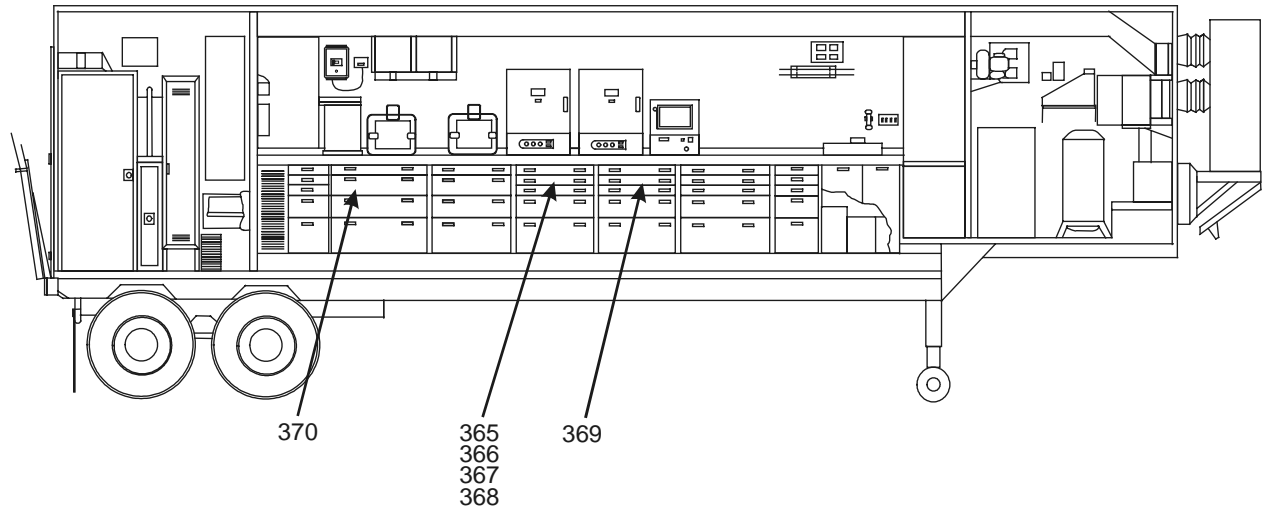


Figure C-2. Basic Issue Items (Sheet 16 of 20)

MBPLA-C-2-16B

## Section III. BASIC ISSUE ITEMS - continued

(1) ILLUS NUMBER	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION CAGE and Part Number	(4) U/M	(5) QTY. RQD.
385		THERMOMETER, SELF-INDICATING, LIQUID IN GLASS: -5 to +400 deg C (Drawer V)	EA	3
386		THERMOMETER, SELF-INDICATING, LIQUID IN GLASS: -6 to +400 deg C (Drawer V)	EA	4
387	6685-00-070-0716	THERMOMETER, SELF-INDICATING, LIQUID IN GLASS: -5 to +110 deg C (Drawer V) (22527) 13-501	EA	1
388		THERMOMETER, SELF-INDICATING, LIQUID IN GLASS: -80 to +20 deg C (Drawer V)	EA	4
389		THERMOMETER, SELF-INDICATING, LIQUID IN GLASS: 90 to 170 deg C (Drawer V)	EA	2
390		THERMOMETER, SELF-INDICATING, LIQUID IN GLASS: 90 to 370 deg C, with case (Drawer V)	EA	3
391		THERMOMETER, SELF-INDICATING, LIQUID IN GLASS: 95 to 103 deg C, with case (Drawer V)	EA	2
392	6685-00-247-3765	THERMOMETER, SELF-INDICATING, LIQUID IN GLASS: 97.5 to 102.5 deg F (Drawer V)	EA	2
393		THERMOMETER, SELF-INDICATING, LIQUID IN GLASS: Toluol, -80 to +20 deg C (Drawer V)	EA	4
394		THERMOMETER, SET: -36 to +761 deg F, -38 to +405 deg C, set of 9 (Drawer F5) (25518) 62-70F-FC	EA	2
395		THERMOREGULATE SOCKET (Drawer C2)	EA	5
396	6695-00-496-9624	THIEF, OIL: Transparent (25518) 68-875 LUX	EA	2
397	6640-00-360-0011	THIMBLE, EXTRACTION: Alundum, dense, 70 mm x 25.4 mm (Drawer K2) (25518) 33-5000-06	EA	2
398		TIMER, SWITCH, CLOCK, ELECTRICAL PETROLEUM TEST: Self-sorting, 115 volt, 10 amp (Drawer G5) (40845) 62344-723	EA	1
399	6640-00-360-0013	TONGS, LABORATORY: Beaker, jaws covered with mittens, 13 in. long (Drawer W3) (22527) 2-620	EA	2
400		TONGS, LABORATORY: Crucible, nickel plated finish, 9 in. Serated jaw (Drawer W3) (40845) 62466-006	EA	4
401	6640-00-444-8000	TONGS, LABORATORY: Crucible, riveted joint, 9 in. (Drawer W3) (96906) MS36023-2	EA	2
402	6640-00-280-1787	TONGS, LABORATORY: Crucible, steel, 9 in. smooth jaws (Drawer W3) (22527) 15-186	EA	2
403	5180-00-177-7033	TOOL KIT, GENERAL MECHANICS: Automotive (Drawer W4) SC 5180-90-CL-N26	EA	1
404	7920-00-965-1709	TOWEL, PAPER (Drawer R4)	EA	1
405	6950-00-933-7423	TRANSFORMER, POWER, AUTO (Drawer J2)	EA	1

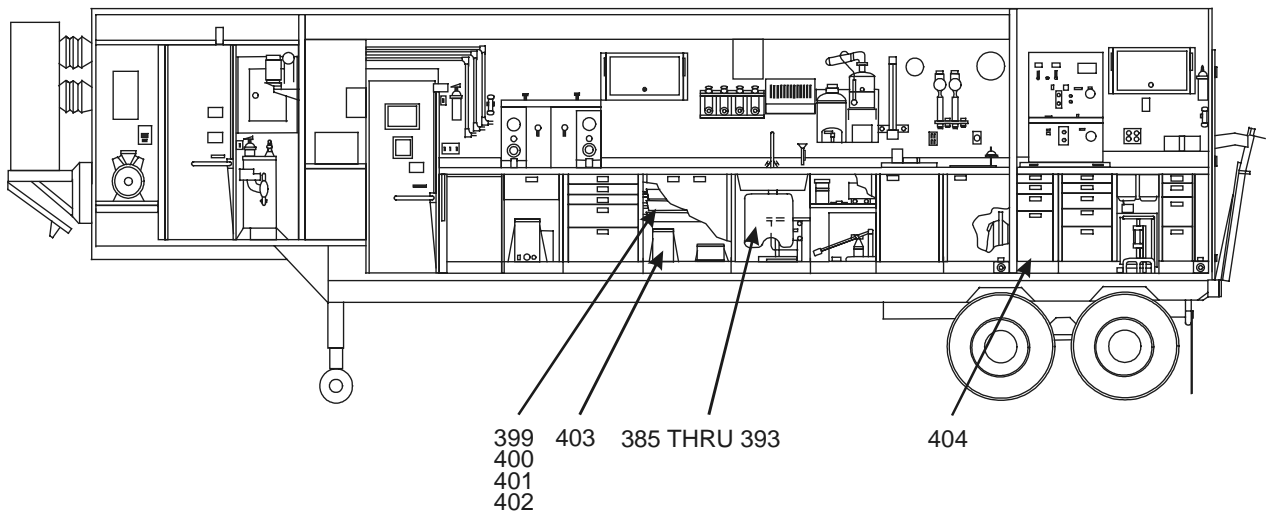
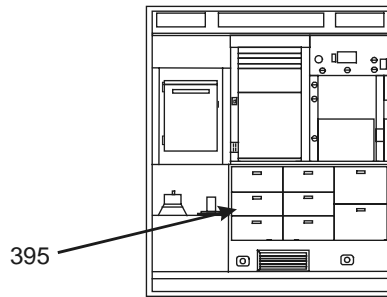
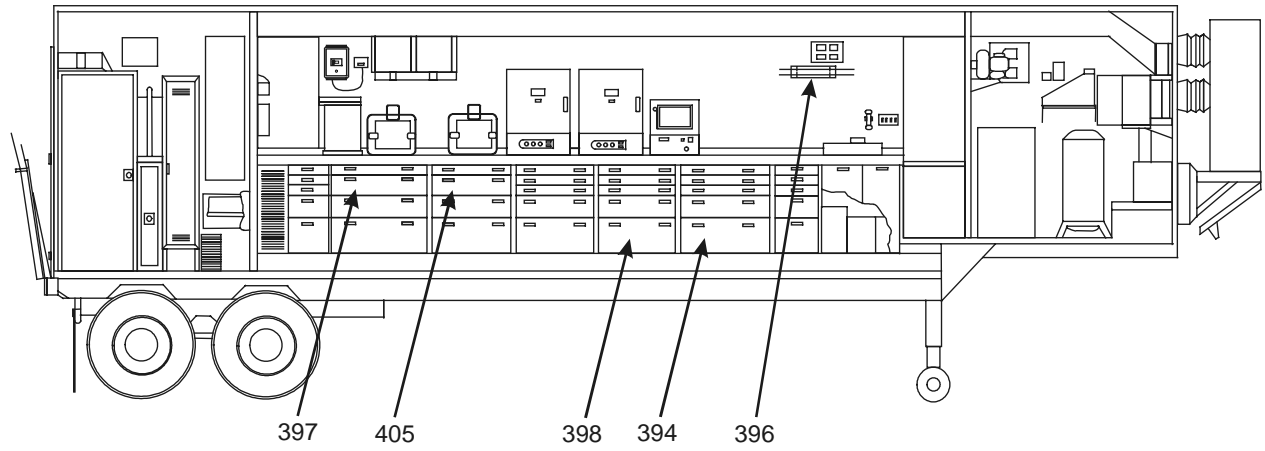


Figure C-2. Basic Issue Items (Sheet 17 of 20)

MBPLA-C-2-17B



## Section III. BASIC ISSUE ITEMS - continued

(1) ILLUS NUMBER	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION CAGE and Part Number	(4) U/M	(5) QTY. RQD.
406	6640-00-436-9941	TRAY, LABORATORY: 12 x 7-5/8 x 2 in. (Drawer H1) (80740) 82-005	EA	1
407		TRIANGE, WIRE, LABORATORY: Wire covered with silica tubes (Drawer H1) (80740) 82-060	EA	3
408	6640-00-403-9342	TUBE, CENTRIFUGE, PETROLEUM TEST: Borosilicate Glass (Drawer E1) (0ZP50) LX3698-1002	EA	4
409	6640-00-477-3274	TUBE, CENTRIFUGE: Borosilicate Glass, 100 ml (Drawer F2) (75278) 45241-100	EA	2
410	6640-00-445-6625	TUBE, CENTRIFUGE: Borosilicate Glass, granulated, conical bottom (Drawer E1) (22527) 05-610	EA	10
411	6640-01-308-5345	TUBE, DRYING (Drawer G3) (22527) 09-215B	G3	4
412	6640-00-436-9939	TUBE, FREEZING POINT APPARATUS: 1 large, 2 small (Drawers H3 and H4) (23035) K297-0-2	EA	3
413	6640-00-360-0046	TUBE, MELTING POINT DETERMINATION: Borosilicate Glass (Drawer H2) (23035) 19492	EA	2
414	4720-00-456-1036	TUBING, PLASTIC: Tygon, medical grade, polyvinylchloride, 1/4 in. ID (Drawer B3) (61501) R-4000	RL	6
415	4720-00-360-0047	TUBING: for 2-pen recorder (Drawer R4) (80740) No. 68-459-01	EA	1
416	4720-00-189-9715	TUBING: Natural, heavy wall, 1/4 in. ID (Drawer B3) (81346) S73645	FT	7.5
417	4720-00-927-5538	TUBING: Natural, heavy wall, 3/16 in. ID translucent, 3000 psi (Drawer B3) (81348) ZZ-T-831	FT	10
418	4720-00-640-0329	TUBING: Natural, heavy wall, translucent, 3000 psi (Drawer F2) (80071) No. XX7100004	FT	24
419	4720-00-729-6406	TUBING: Neoprene, 3/16 in. ID, black (Drawer B3) (22527) 14-171A	FT	50
420	7430-00-254-4319	TYPEWRITER, PORTABLE: Manual w/carrying case, elite type, standard keyboard, 42 keys, 9 in. carriage (61634) Lettera 22	EA	1
421	4820-00-111-1142	VALVE, CHECK, MANOMETER: (Gas Cylinder Locker) (39739) No. 942K50	EA	1
422	4820-00-957-5639	VALVE, REGULATOR: Air pressure (Gas Cylinder Locker) (22529) No. 1-088	EA	2
423		VALVE, REGULATOR: Carbon dioxide pressure (Gas Cylinder Locker)	EA	1
424		VALVE, REGULATOR: Nitrogen pressure (Gas Cylinder Locker)	EA	1
425	4820-00-641-3519	VALVE, REGULATOR: Oxygen pressure (Gas Cylinder Locker) MIL-V-13877, Type VI	EA	1
426	6630-00-359-9888	VISCOMETER, CAPILLARY TYPE: Size 100 (Drawer K1) (81346) D2515	EA	4

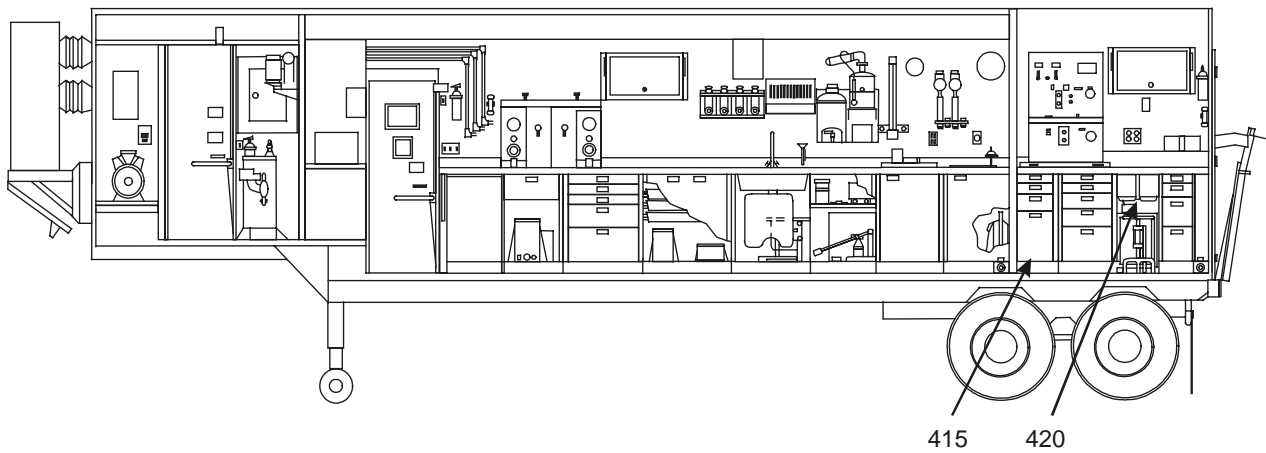
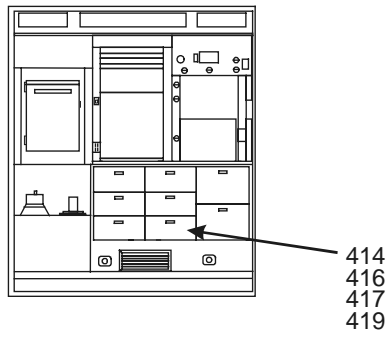
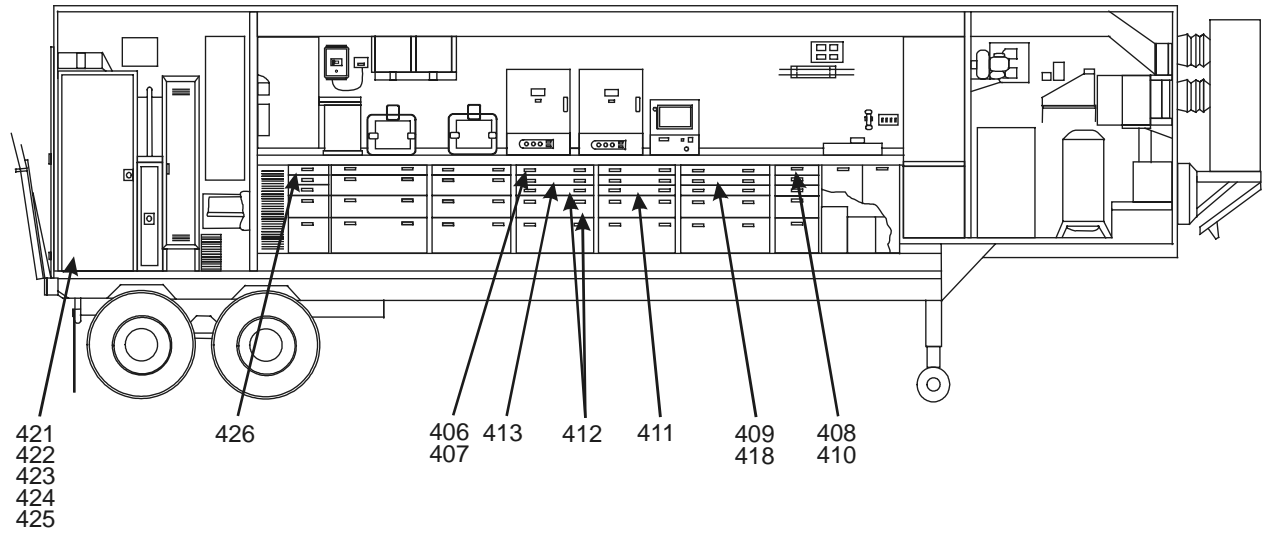


Figure C-2. Basic Issue Items (Sheet 18 of 20)

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## Section III. BASIC ISSUE ITEMS - continued

(1) ILLUS NUMBER	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION CAGE and Part Number	(4) U/M	(5) QTY. RQD.
427	6630-00-359-9903	VISCOMETER, CAPILLARY TYPE: Size 100 (Drawer J1) (22527) 13-617C	EA	4
428	6630-00-359-9889	VISCOMETER, CAPILLARY TYPE: Size 200 (Drawer K1) (81346) D2515	EA	4
429	6630-00-359-9904	VISCOMETER, CAPILLARY TYPE: Size 200 (Drawer J1) (22527) 13-617E	EA	4
430	6630-00-359-9886	VISCOMETER, CAPILLARY TYPE: Size 25 (Drawer J1) (22527) 13-617A	EA	3
431	6630-00-359-9890	VISCOMETER, CAPILLARY TYPE: Size 300 (Drawer K1) (22527) 13-615-5F	EA	4
432	6630-00-359-9905	VISCOMETER, CAPILLARY TYPE: Size 300 (Drawer J1) (22527) 13-617F	EA	4
433	6630-00-359-9891	VISCOMETER, CAPILLARY TYPE: Size 400 (Drawer K1) (81346) D2515	EA	4
434	6630-00-397-9309	VISCOMETER, CAPILLARY TYPE: Size 400 (Drawer J1) (81346) D2515	EA	3
435		VISCOMETER, CAPILLARY TYPE: Size 450 (Drawer J1) (81346) D2515	EA	2
436	6630-00-397-9293	VISCOMETER, CAPILLARY TYPE: Size 50 (Drawer J1) (22527) 13-617B	EA	4
437	6630-00-450-3479	VISCOMETER, CAPILLARY TYPE: Size 500 (Drawer K1) (22527) 13-615-5K	EA	3
438	6630-00-359-9892	VISCOMETER, CAPILLARY TYPE: Size 500 (Drawer J1) (22527) 13-615-500	EA	2
439	6630-00-359-9893	VISCOMETER, CAPILLARY TYPE: Size 600 (Drawer J1) (22527) 13-617-600	EA	3
440		VISCOMETER, CAPILLARY TYPE: Size 75 (Drawer J1)	EA	2
441	6630-00-450-5699	VISCOMETER, CAPILLARY TYPE: Size 600 (Drawer K1) (22527) 13-615-5J7-2	EA	2
442	6640-00-314-2097	WASH BOTTLE, POLYETHYLENE: 500 ml (Drawer P2)	EA	2
443	6640-00-290-6808	WATCH GLASS, LABORATORY: Circular, 65 mm dia. (Drawer X4) (96906) MS36000-1	EA	6
444		WATCH GLASS, LABORATORY: Circular, 75 mm dia. (Drawer X4)	EA	1
445	6640-00-282-5717	WATCH GLASS, LABORATORY: Circular, Borosilicate Glass, 100 mm dia. (Drawer X4) (15747) G1860C	EA	1
446	6640-00-848-8209	WATCH GLASS, LABORATORY: Circular, Borosilicate Glass, 150 mm dia. (Drawer X4) (96906) MS36000-5	EA	8

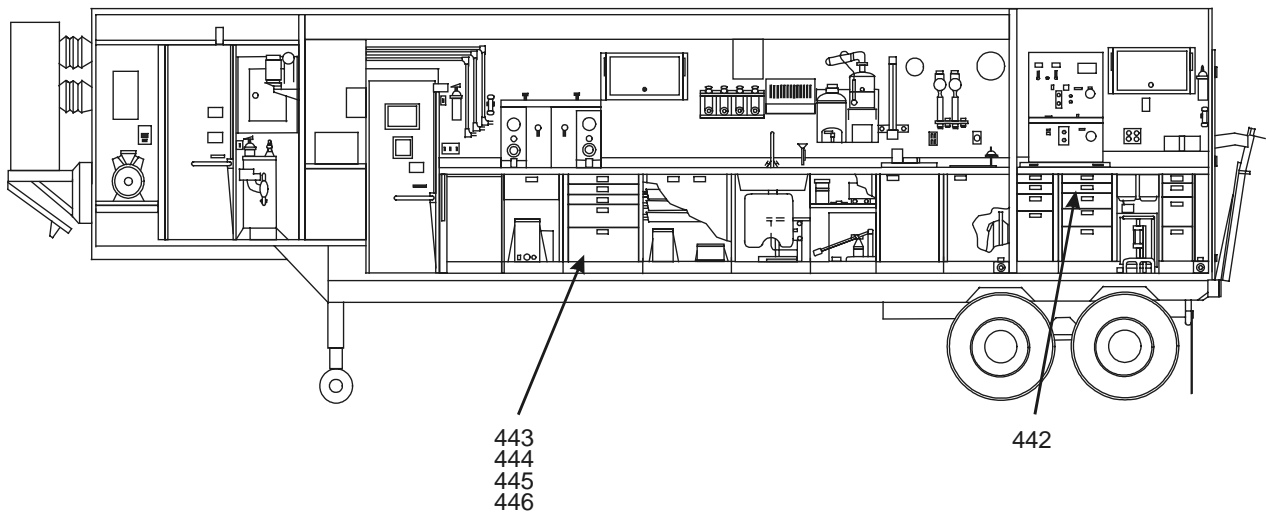
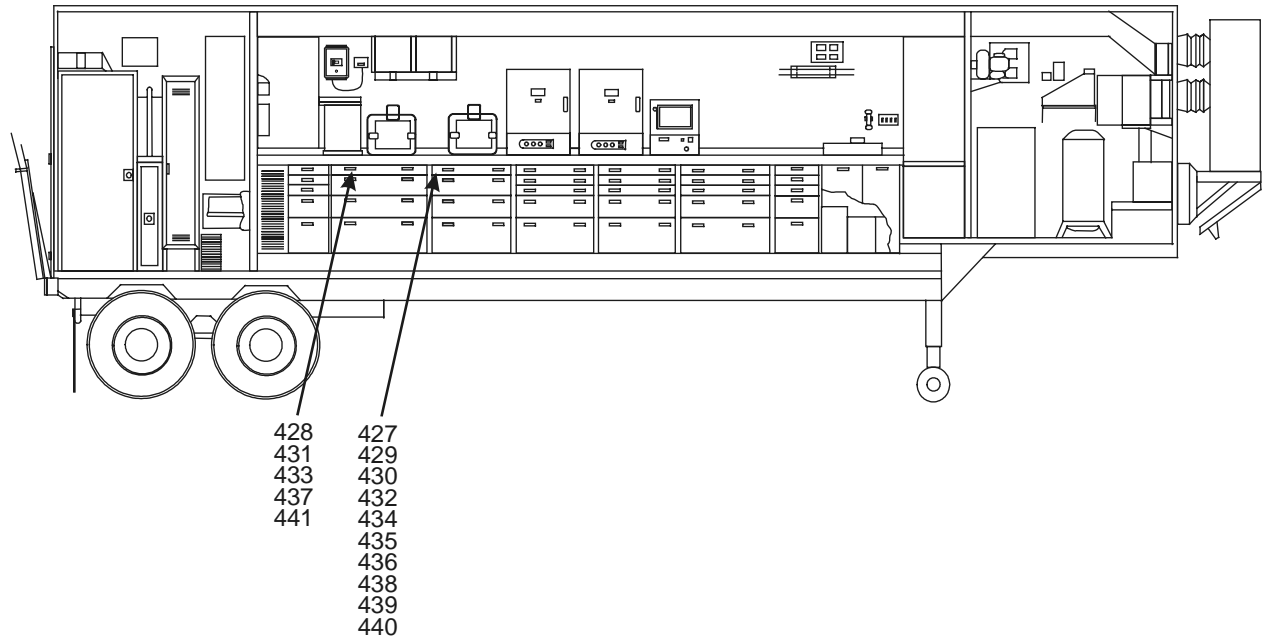


Figure C-2. Basic Issue Items (Sheet 19 of 20)

MBPLA-C-2-19B

**Section III. BASIC ISSUE ITEMS - continued**

(1) ILLUS NUMBER	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION CAGE and Part Number	(4) U/M	(5) QTY. RQD.
447	6640-00-290-6789	WATCH, GLASS, LABORATORY: Circular, 100 mm dia. (Drawer X4) (96906) MS36000-1	EA	8
448	6850-00-001-4194	WATER INDICATING PASTE (Drawer F3)	EA	3
449	6670-00-803-9680	WEIGHT SET, BALANCE: Brass, 1 to 1000 grams, tall form (Drawer F4) (81348) AAA-W-20C	EA	1
450	6640-00-290-2241	WING TOP LABORATORY GAS BURNER: Brass (Drawer F4) (15747) G39028	EA	1
451	5350-00-240-2920	WOOL, METALLIC (Drawer K4)	EA	1
452	5120-00-244-4389	WRENCH, BUNG: Multiple size, non-sparking/ non-magnetic (Drawer K4) (81348) GGG-W-642	EA	2
453	6640-00-360-0067	WRENCH: For gum stability bomb (Drawer H1) (80740) 68-465	EA	1

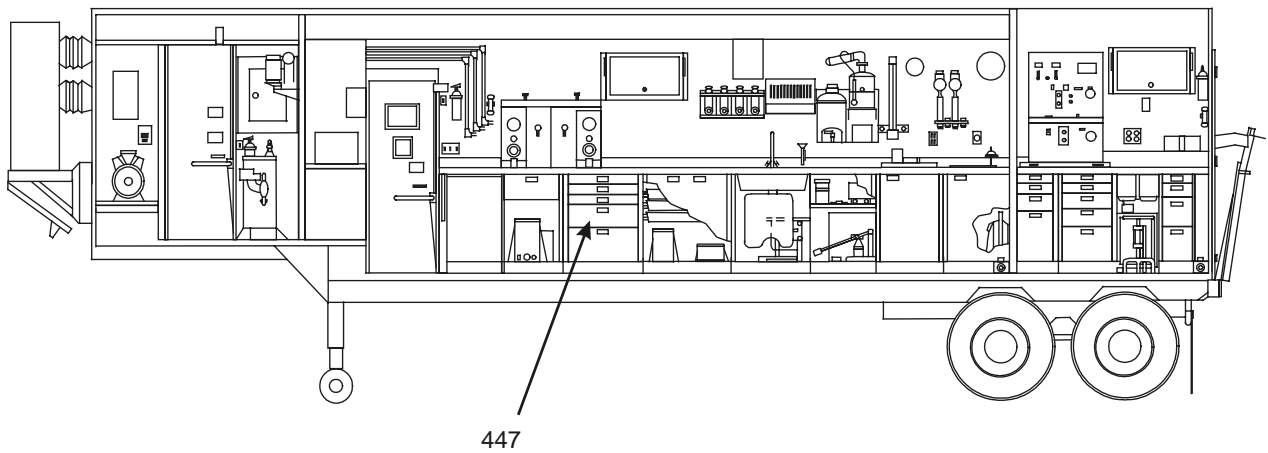
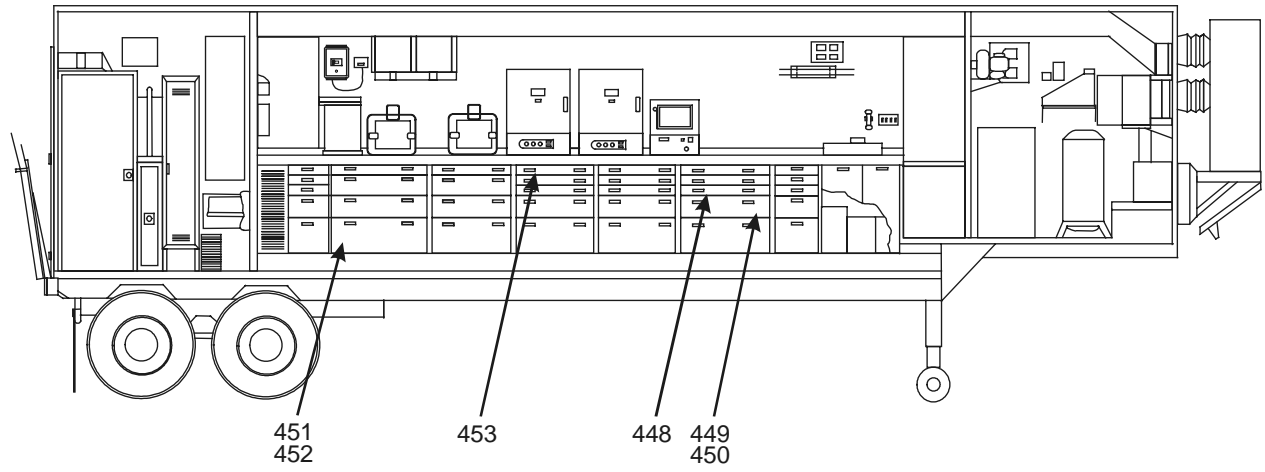


Figure C-2. Basic Issue Items (Sheet 20 of 20)

MBPLA-C-2-20B

## Section IV. BASIC ISSUE ITEMS – OVERPACK BOXES

(1) BOX	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION CAGE and Part Number	(4) U/M	(5) QTY. RQD.
4	8415-00-082-6108	APRON, UTILITY	EA	1
3	6640-01-141-1222	BEAKER, GRIFFIN LOW FORM; 100 ML	EA	8
3	6640-01-329-6487	BEAKER, GRIFFIN LOW FORM; 250 ML	EA	1
4	6640-01-329-7539	BEAKER, GRIFFIN LOW FORM; 400 ML	EA	7
3	6640-01-328-9684	BEAKER, GRIFFIN LOW FORM; 50 ML	EA	9
3	6640-01-328-9682	BEAKER; 1000 ML	EA	4
4	6640-01-328-9682	BEAKER; 2000 ML	EA	3
3	6640-00-526-8491	BEAKER; 500 ML; W/ SPOUT	EA	10
4	6640-01-328-9683	BEAKER; GRIFFIN LOW FORM; 600 ML	EA	1
4	6640-00-405-1000	BOTTLE STOPPER; 250 ML	EA	1
6	8125-00-174-0852	BOTTLE, SCREW CAP;	GAL	2
5		BOTTLE, SCREW CAP; 32 OZ	EA	4
7	7920-00-409-2000	BRUSH, BOTTLE & BURET; TUFTED TIP	EA	2
7	7920-00-494-3688	BRUSH, FLASK; 3 IN. DIA.	EA	1
7	7920-00-917-5844	BRUSH, TEST TUBE; 2-3/8 IN. DIA.	EA	8
2	6640-00-889-1712	BULB, SUCTION, 3 WAY	EA	4
7	6640-00-409-8500	BURET, LABORATORY, 10 ML	EA	6
7	6640-00-409-9000	BURET, LABORATORY, 25 ML	EA	4
6	4610-00-222-8261	CARTRIDGE, WATER DEMINERALIZER	EA	4
7	8605-00-205-3496	CLOTH, CHEESE CLOTH	EA	1
5		CONDENSER, HOPKINS REFLEX	EA	2
5	6640-00-081-6553	CONDENSER, LABORATORY	EA	3
3	6640-00-883-8516	CYLINDER, GRADUATED; 100 ML	EA	4
3	6640-00-420-3000	CYLINDER, GRADUATED; 1000 ML	EA	2
3	6640-00-420-3500	CYLINDER, GRADUATED; 2000 ML	EA	2
3	6640-00-494-3959	CYLINDER, GRADUATED; 25 ML	EA	2
3	6640-00-290-6543	CYLINDER, GRADUATED; 250 ML	EA	1
3		CYLINDER, GRADUATED; 50 ML	EA	2
3	6640-00-420-6000	CYLINDER, GRADUATED; CIR BASE; 100 ML	EA	3
3	6640-01-093-0462	CYLINDER, UNGRADUATED; 250 ML	EA	4
3	6640-00-244-4341	CYLINDER, UNGRADUATED; HEX BASE;	EA	2
3	6640-00-403-9339	CYLINDER; 1000 ML	EA	4

## Section IV. BASIC ISSUE ITEMS – OVERPACK BOXES

(1) BOX	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION CAGE and Part Number	(4) U/M	(5) QTY. RQD.
7	6640-01-149-1436	DETECTOR KIT, WATER (23299) 140-00-0005	EA	2
4	6640-00-235-3820	DETECTOR PAD, FREE WATER	EA	300
5	4820-00-957-5639	DIAPHRAGM, REGULATING VALVE	EA	1
6	6640-01-360-2156	DISH, CULTURE, PETRI; LARGE	EA	12
4	6640-00-967-0501	DISK, FILTERING; PLAIN; 47 MM DIA.	EA	200
7	6640-00-988-2936	DISTILLING RECEIVER, OIL; GLASS	EA	1
6	6635-01-154-5486	DROPPING POINT APPARATUS, PET (23035) K194A	EA	1
4	6640-00-425-1000	FLASK, BOILING; 1000 ML	EA	1
4	6640-00-423-8500	FLASK, DISTILLING	EA	8
2		FLASK, ERLLEN.; CORNING GLASS; 250 ML	EA	4
	6640-00-935-4269	FLASK, ERLLEN.; GLASS; 250 ML	EA	5
4	6640-00-935-4270	FLASK, ERLLEN.; GLASS; 500 ML	EA	6
4	6640-00-290-6936	FLASK, ERLLEN.; IODINE; 250 ML	EA	4
4	6640-00-062-5949	FLASK, ERLLEN.; IODINE; 500 ML	EA	1
4	6640-00-522-1889	FLASK, FILTERING; 4000 ML	EA	3
2	6640-00-425-9000	FLASK, VOLUMETRIC; 1000 ML	EA	2
7	6640-00-425-9000	FLASK, VOLUMETRIC; 1000 ML	EA	1
2	6640-00-425-8000	FLASK, VOLUMETRIC; 500 ML	EA	2
2	6640-00-899-6375	FLASK,DEWAR; 1900 ML	EA	2
2		FOAM TEST APPARATUS (1JAR+MISC)	EA	1
1		FOAM TEST APPARATUS (BASE+1JAR)	EA	1
6	6640-00-377-9383	FREEZING POINT APPARATUS (23035) K29700	EA	1
7	6640-00-290-6913	FUNNEL, COMMON; 1000 ML	EA	3
5	6640-00-899-8993	FUNNEL, FILTERING; 1000 ML	EA	2
7	6640-00-926-1315	FUNNEL, SEPARATOR; 500 ML	EA	1
7	6685-00-194-1699	GAUGE, PRESSURE, BOURDON	EA	2
7	6685-00-194-1683	GAUGE, PRESSURE, DIAL	EA	2
5	6640-00-359-9870	JAR, CYLINDRICAL	EA	3
4		LABEL, PLASTIC, LAMINATED	EA	2
4	6640-00-290-0146	LITMUS PAPER; BLUE	EA	8
4	6640-00-290-0147	LITMUS PAPER; RED	EA	8
7	9535-00-541-2453	METAL FOIL	EA	1
4	6640-00-084-5080	PAPER, (ABSORBENT) BIBULOUS	EA	5



**Section IV. BASIC ISSUE ITEMS – OVERPACK BOXES**

(1) BOX	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION CAGE and Part Number	(4) U/M	(5) QTY. RQD.
7	5350-00-721-8117	PAPER, ABRASIVE; NO. 180	EA	1
7	5350-00-224-7209	PAPER, ABRASIVE; NO. 220	EA	1
7	5350-00-224-7207	PAPER, ABRASIVE; NO. 240	EA	1
7	5350-00-224-7201	PAPER, ABRASIVE; NO. 400	EA	1
4		PAPER, FILTER	EA	2
4	6640-00-252-5205	PAPER, FILTER	EA	4
5	6640-00-438-0000	PIPET, VOLUMETRIC; 25 ML	EA	12
7	8135-00-043-5331	PLASTIC SHEET	EA	1
5		REGULATOR, WATER LEVEL (48619) 66985K	EA	1
4		SHAFT, STIRRER, FLEXIBLE	EA	3
5	6640-00-359-9641	SHIELD, HEAT; 1.0 ID	EA	2
5	6640-00-359-9645	SHIELD, HEAT; 1.25 ID	EA	2
4	6640-00-310-8550	STONE, FOAM TEST	EA	2
6		SUPPORT STAND, LAB APPARATUS	EA	1
6	6640-00-359-9985	SUPPORT, SEDIMENT APPARATUS	EA	1
5	6640-00-298-7258	TEST TUBE; 150 MM LG; 18 MM OD	EA	5
5	6640-01-333-4770	TEST TUBE; 150 MM LG; 25 MM OD	EA	17
5	6640-00-061-8966	TEST TUBE; 175 MM LG; 22 MM OD	EA	17
5	6640-00-404-2757	TEST TUBE; FLAT; 250 MM LG	EA	12
5	6640-00-404-2757	TEST TUBE; FLAT; 250 MM LG	EA	12
7	6630-00-404-2750	TETRAETHYL LEAD APPARATUS (21519) 69-007	EA	1
7		TOTE PAN, ICE	EA	1
4	7920-00-965-1709	TOWEL, PAPER	EA	2
5	6640-00-436-9939	TUBE, FREEZING POINT APPARATUS	EA	1
5	4720-00-137-9216	TUBING; FLEXIBLE; 1/2 IN. ID	FT	25
5	4720-00-410-9506	TUBING; FLEXIBLE; 3/8 IN. ID	FT	25
6	4720-00-273-1032	TUBING; NEOPRENE; 1/4 IN. ID	50 FT	1
6	4720-00-244-7790	TUBING; TRANSLUCENT; 3/16 IN. ID	50 FT	2
6	4720-00-640-0329	TUBING; TRANSLUCENT; 3/8 IN. OD	4 FT	5
5	4720-00-411-5450	TUBING; TYGON; 1/2 IN. BORE SIZE	FT	30
5	4720-00-456-1036	TUBING; TYGON; 1/4 IN. BORE SIZE	10 FT	3
5	4720-00-410-9505	TUBING; TYGON; 3/8 IN. BORE SIZE	50 FT	2
5	6630-00-359-9888	VISCOMETER; OPAQUE; SIZE 100	EA	2

**Section IV. BASIC ISSUE ITEMS – OVERPACK BOXES**

(1) BOX	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION CAGE and Part Number	(4) U/M	(5) QTY. RQD.
5	6630-00-359-9889	VISCOMETER; OPAQUE; SIZE 200	EA	2
5	6630-00-359-9890	VISCOMETER; OPAQUE; SIZE 300	EA	2
5	6630-00-359-9891	VISCOMETER; OPAQUE; SIZE 400	EA	2
5	6630-00-450-3479	VISCOMETER; OPAQUE; SIZE 500	EA	1
5	6630-00-359-9903	VISCOMETER; ROUTINE; SIZE 100	EA	2
5	6630-00-359-9904	VISCOMETER; ROUTINE; SIZE 200	EA	2
5	6630-00-359-9886	VISCOMETER; ROUTINE; SIZE 25	EA	2
5	6630-00-359-9905	VISCOMETER; ROUTINE; SIZE 300	EA	2
5	6630-00-397-9309	VISCOMETER; ROUTINE; SIZE 400	EA	1
5		VISCOMETER; ROUTINE; SIZE 450	EA	1
5	6630-00-397-9293	VISCOMETER; ROUTINE; SIZE 50	EA	2
5	6630-00-359-9892	VISCOMETER; ROUTINE; SIZE 500	EA	1
5	6630-00-359-9893	VISCOMETER; ROUTINE; SIZE 600	EA	1
5		VISCOMETER; ROUTINE; SIZE 75	EA	2
6	5120-00-244-4389	WRENCH, BUNG	EA	1

**Section V. BASIC ISSUE ITEMS – CHEMICALS**

(1) BOX	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION CAGE and Part Number	(4) U/M	(5) QTY. RQD.
22		Acetic Acid, glacial – (90598) MFG1435-1	EA	3
11		Acetone – (90598) MFG1435-3	EA	6
12		Acetone – (90598) MFG1435-3	EA	2
17		Acetone – (90598) MFG1435-3	EA	2
19		Activated Charcoal – (90598) MFG1435-56	EA	4
23		Ammonium Hydroxide – (90598) MFG1435-5	EA	3
18		Ascarite II - (90598) MFG1435-6	EA	1
18		Barium Hydroxide - (90598) MFG1435-8	EA	1
17		Brasso, metal polish – (90598) MFG1435-63	EA	1
20		Calcium Chloride – (90598) MFG1435-54	EA	10
23		Calcium Sulfate – (90598) MFG1435-55	EA	1
12		Denatured Alcohol – (90598) MFG1435-4	EA	3
17		Desiccants – (90598) MFG1435-57	EA	1
22		Desiccants – (90598) MFG1435-57	EA	1
24		Detergent, General – (90598) MFG1435 -58	EA	1
22		Diethylene Monomethyl Ether – (90598) MFG1435-59	EA	2
13		Dry Cleaning Solvent – (90598) MFG1435-13	EA	3
17		Ethylene Glycol Monomethyl Ether - (90598) MFG1435-15	EA	2
15		Glycerol – (90598) MFG1435-60	EA	1
24		Glycerol – (90598) MFG1435-60	EA	1
19		Grease, Ground Glass Joint – (90598) MFG1435-61	EA	7
19		Heptane – (90598) MFG1435-16	EA	1
8		Hydrochloric Acid – (90598) MFG1435-18	EA	6
9		Hydrochloric Acid – (90598) MFG1435-18	EA	6
16		Iso-Octane – (90598) MFG1435-22	EA	1
15		Isopropanol – (90598) MFG1435-23	EA	1
16		Isopropanol – (90598) MFG1435-23	EA	1
17		Lead Acetate – (90598) MFG1435-24	EA	1
24		Lead Acetate – (90598) MFG1435-24	EA	1
20		Lead Nitrate - (90598) MFG1435-25	EA	1
17		Lubricating oil, Vacuum Pump – (90598) MFG1435-66	EA	2
24		Lubricating oil, Vacuum Pump – (90598) MFG1435-66	EA	2

## Section V. BASIC ISSUE ITEMS – CHEMICALS – CONTINUED

(1) BOX	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION CAGE and Part Number	(4) U/M	(5) QTY. RQD.
25		Manometer – MFG1435-93	EA	1
18		MercSorb Powder – (90598) MFG1435-62	EA	1
24		Mercuric Iodide – (90598) MFG1435-26	EA	1
23		Mercury – (90598) MFG1435-27	EA	2
25		Mercury Thermometers – MFG1435-89	EA	1
25		Mercury Thermometer Kit – MFG1435-91	EA	1
25		Mercury Thermometer Kit – MFG1435-92	EA	1
10		Methyl Ethyl Ketone – (90598) MFG1435-29	EA	1
12		Methyl Ethyl Ketone – (90598) MFG1435-29	EA	1
18		Methyl Orange – (90598) MFG1435-30	EA	1
13		Naphtha – (90598) MFG1435-32	EA	3
14		Nitric Acid – (90598) MFG1435-33	EA	1
18		Nitric Acid – (90598) MFG1435-33	EA	2
10		Oil, bath viscosimeter – (90598) MFG1435-65	EA	2
11		Oil, bath viscosimeter – (90598) MFG1435-65	EA	1
12		Oil, bath viscosimeter – (90598) MFG1435-65	EA	2
13		Oil, bath viscosimeter – (90598) MFG1435-65	EA	3
19		Oil, bath viscosimeter – (90598) MFG1435-65	EA	2
24		Ottawa Sand – (90598) MFG1435-78	EA	1
24		Paste, gasoline finding – (90598) MFG1435-68	EA	4
24		Paste, water finding – (90598) MFG1435-69	EA	4
10		Petroleum Ether – (90598) MFG1435-38	EA	3
20		Phenolphthalein – (90598) MFG1435-70	EA	1
24		p-Naphtholbenzein – (90598) MFG1435-71	EA	3
24		p-Nitrophenol – (90598) MFG1435-35	EA	1
20		Potassium Chlorate – (90598) MFG1435-39	EA	4
21		Potassium Dichromate – (90598) MFG1435-40	EA	6
20		Potassium Hydrogen Phthalate – (90598) MFG1435-72	EA	3
23		Potassium Hydroxide – (90598) MFG1435-41	EA	2
19		Potassium Iodide – (90598) MFG1435-74	EA	5
15		Potassium Phosphate Dibasic – (90598) MFG1435-75	EA	2
24		Potassium Phosphate, monobasic – (90598) MFG1435-76	EA	1
15		Propane – (90598) MFG1435-43	EA	12

## Section V. BASIC ISSUE ITEMS – CHEMICALS – CONTINUED

(1) BOX	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION CAGE and Part Number	(4) U/M	(5) QTY. RQD.
8		Pumice – (90598) MFG1435-77	EA	1
8		Silicon Carbide – (90598) MFG1435-80	EA	1
20		Silver Nitrate – (90598) MFG1435-44	EA	1
19		Sodium Bicarbonate – (90598) MFG1435-81	EA	3
23		Sodium Bicarbonate – (90598) MFG1435-81	EA	7
20		Sodium Carbonate – (90598) MFG1435-82	EA	1
23		Sodium Chloride – (90598) MFG1435-84	EA	1
20		Sodium Dichromate – (90598) MFG1435-45	EA	2
21		Sodium Hydroxide – (90598) MFG1435-46	EA	2
15		Sodium Sulfate – (90598) MFG1435-85	EA	2
23		Sodium Sulphide – (90598) MFG1435-47	EA	1
20		Sodium Thiosulfate – (90598) MFG1435-86	EA	1
8		Starch, Soluble – (90598) MFG1435-87	EA	2
14		Sulfuric Acid – (90598) MFG1435-48	EA	5
10		Toluene – (90598) MFG1435-50	EA	2
16		Xylene – (90598) MFG1435-51	EA	2
23		Zinc Oxide – (90598) MFG1435-88	EA	1

## Section VI. MANUALS

(1)	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION CAGE and Part Number	(4) U/M	(5) QTY. RQD.
		ASTM TEST METHODS INDEX: Book 3, Vol 00.01; Petroleum Products and Lubricants	EA	1
		ASTM TEST METHOD HANDBOOK: Book 4, Vol 05.01; Petroleum Products and Lubricants (I) D56 – D1947	EA	1
		ASTM TEST METHOD HANDBOOK: Book 5, Vol 05.02; Petroleum Products and Lubricants (II) D1949 – D3601	EA	1
		ASTM TEST METHOD HANDBOOK: Book 6, Vol 05.03; Petroleum Products and Lubricants (I) D3602 – Latest	EA	1
	7530-00-222-3525	BOOK, MEMORANDUM; 8 x 10-1/2; cloth covered; (80244)	EA	1
		BOOK, TEXT; Book 2, Fundamentals of Analytical Chemistry Current Addition; Skoggs & West	EA	1
		BOOK, TEXT; Book 1, Chemistry and Technology of Petroleum – Author: James E. Speight, Pub: Marcel & Deckker		
	7610-00-250-6633	COMMERCIAL PUBLICATION: Chemical Engineers Handbook; By John H. Perry; McGraw Hill, Inc	EA	1
	7610-00-233-9597	COMMERCIAL PUBLICATION: Handbook of Chemistry and Physics; CRC Press Inc	EA	1
		COMMERCIAL SUPPLY CATALOG: Book 7, Malinkrodt Chemical Co; Chemicals and Reagents	EA	1
		COMMERCIAL SUPPLY CATALOG: Book 8, Precision Scientific Inc; Instruments and Equipment Catalog	EA	1
		COMMERCIAL SUPPLY CATALOG: Book 9, Fisher Scientific Company; Apparatus, Instruments, Chemicals, Furniture and Supplies	EA	1
		COMMERCIAL SUPPLY CATALOG: Book 10, Daigger and Company; Apparatus and Equipment	EA	1
		COMMERCIAL SUPPLY CATALOG: Book 11, Koehler Instrument Company, Inc; Petroleum Testing Equipment	EA	1
		DOD 4155.1, DFSCH 4120.1 DoD Manual: Reference List of Specifications and Standards for Petroleum and Related Products	EA	1
		FM 10-68: Field Manual, Aircraft Refueling	EA	1
		FM 10-69: Field Manual, Petroleum Supply Point Equipment and Operation	EA	1
		FM 10-70: Field Manual, Inspecting and Testing Petroleum Products	EA	1
		TECHNICAL MANUAL: TM9-4120-402-14; Air Conditioner Operation and Maintenance	EA	1
		TECHNICAL MANUAL: TM5-4120-371-14-HR; Hand Receipt, Air Conditioner	EA	1

**Section VI. MANUALS - CONTINUED**

(1)	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION CAGE and Part Number	(4) U/M	(5) QTY. RQD.
		TECHNICAL MANUAL: TM5-4120-371-24P; Air Conditioner Parts List  TECHNICAL MANUAL; TM5-6640-212-14; Operation and Maintenance for the Laboratory, Petroleum, Semitrailer Mounted	EA  EA	1  1

## APPENDIX D

### ADDITIONAL AUTHORIZATION LIST (AAL)

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#### Section I. INTRODUCTION

**D-1. SCOPE.**

This appendix lists additional items you are authorized for the support of the Petroleum Laboratory.

**D-2. GENERAL.**

This list identifies items that do not have to accompany the Mod Lab A and that do not have to be turned in with it. These items are all authorized to you by MTOE or CTA.

**D-3. EXPLANATION OF LISTING.**

National stock numbers, descriptions, and quantities are provided to help you identify and request the additional items you require to support this equipment. The items are listed in alphabetical sequence by item name under the type document (MTOE or CTA) which authorizes the item(s) to you.

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#### Section II. ADDITIONAL AUTHORIZATION LIST

(1) National Stock Number	(2) Description	(3) U/M	(4) Qty Auth
6115-00-394-9577	Power Unit PU-405A/M, 15 KW: 3-phase, 4-wire, 120/208/240/416 volt, trailer mounted Generator Set M200A1.	EA	1
6150-01-247-4781	Power Input Cable	EA	1





## APPENDIX E

### EXPENDABLE AND DURABLE SUPPLIES LIST

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#### Section I. INTRODUCTION

##### E-1. SCOPE.

This appendix lists expendable and durable supplies you will need to operate and maintain the Petroleum Laboratory. These items are authorized to you by CTA 50-970, Expendable Items.

##### E-2. EXPLANATION OF COLUMNS.

The following provides an explanation of columns found in the tabular listing:

- a. Column 1, Item Number. This number is assigned to the entry in the listing and is referenced in the initial set-up to identify the material (e.g., "Cleaning compound, Item 5, Appendix E").
- b. Column 2, Level. This column identifies the lowest level of maintenance that requires the listed item:

C	Operator or Crew
O	Unit Maintenance
F	Direct Support Maintenance
H	General Support Maintenance
- c. Column 3, National Stock Number. This is the national stock number assigned to the item; use it to request or requisition the item.
- d. Column 4, Description. Indicates the Federal item name, and, if required, a description to identify the item. The last line for each item indicates the Commercial and Government Entity Code (CAGE) in parentheses followed by the part number.
- e. Column 5, Unit of Measure (U/M). Indicates the measure used in performing the actual maintenance function. This measure is expressed by a two-character alphabetical abbreviation (e.g., EA, IN, PR). If the unit of measure differs from the unit of issue, requisition the lowest unit of issue that will satisfy your requirements.

##### E-3. SPECIAL CHEMICAL PROCURING INSTRUCTIONS.

When procuring chemicals the specific material safety data sheets (MSDS) for each chemical is to be procured for that chemical and stored in the Lab Storage Requirement Book located in the Petroleum Laboratory bookcases. When procuring chemicals always require that packaging for each chemical be department of transportation (DOT) certified for air, land, and sea transport.

**Section II. EXPENDABLE AND DURABLE SUPPLIES LIST**

(1) ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) DESCRIPTION CAGE and Part Number	(5) U/M
1	C		ACETIC ACID, GLACIAL, ACS: Liquid; 99.7 pot min assy as acetic acid, glacial, (90598) MFG1435-1	OZ
2	C		ACETONE, TECHNICAL: Liquid, 1 gal can, (90598) MFG1435-3	GL
3	O	8040-00-221-3811	ADHESIVE, TYPE III: Liquid, rubber, synthetic (81348) MMM-A1617, Type II	OZ
4	C		ALCOHOL, DENATURED: Alcohol formula No. 3A colorless, (90598) MFG1435-4	OZ
5	C	9535-00-541-2453	ALUMINUM FOIL: Dry-anneal surface, 75 ft lg (81348) QQ-A-1876, Type I, Grade B	FT
6	C		AMONIUM HYDROXIDE, ACS: 1 pt bottle, (90598) MFG1435-5	PT
7	C		ASCARITE II: light brown granules CO <sub>2</sub> absorbent; 8-20mesh; 500gm bottle, (90598) MFG1435-6	GM
8	C		BAG, DISPOSABLE (09061) 680008	CS
9	C		BARIUM HYDROXIDE, OCTAHYDRATE, ACS: Crystal, 98 pct min assy as barium hydroxide, 500gm bottle, (90598) MFG1435-8	GM
10			BASE, DRY (09061) 450001	CS
11	C	6640-00-403-1000	BEAD, LABORATORY: Glass per solid, 5 mm dia, box (96906) MS36259-2 DD-G-541, Type I, Class A	OZ
12	C	7920-00-023-1056	BRUSH, BOTTLE AND BURET: 13/16 inch lg (22527) PN 3-608	EA
13	C	7920-00-409-2000	BRUSH, BOTTLE AND BURET: Tufted tip, stiff hog bristle, 3/4 inch dia (80244)H-B-1050, Style B, Class I MDL TW	EA
14	C	7920-00-402-2379	BRUSH, TEST TUBE: Multifan tip, 1 inch lg, bristled portion (22527) PN 3-622	EA
15	C	7920-00-178-8315	BRUSH, DUSTING, BENCH: Horsetail hair, 8 inch lg (80244) H-B-190, Type I, Style 2, Class 2	EA
16	C	7920-00-205-0565	BRUSH, DUSTING, LENS AND PHOTOGRAPHIC NEGATIVE: Camel hair, metal ferrule (81348) H-B-1654	EA
17	C	7920-00-409-4000	BRUSH, FLASK: Hog bristle, circular tip, 4-1/2 inch lg, 2 inch dia brush, 13 inch lg handle (22527) PN 3-571	EA
18	C	7920-00-494-3688	BRUSH, FLASK: Synthetic fil, 3 inch dia, 5-1/2 inch lg brush part, 15 inch lg wood handle (81348) H-B-1049, Type VII	EA
19	C	7920-00-240-6359	BRUSH, PIPET: 7 inch lg (80244)H-B-1051, Type II, Style A, Class I	EA

## Section II. EXPENDABLE AND DURABLE SUPPLIES LIST - CONT

(1) ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) DESCRIPTION CAGE and Part Number	(5) U/M
20	C	7920-00-282-7784	BRUSH, TEST TUBE: Size 3/4, 3/4 inch dia, 3 inch lg (80244) H-B-1051, Type I, Style A, Class I	EA
21	C	7920-00-889-3381	BRUSH, TEST TUBE: Size 1-1/4, 1-1/4 inch dia, 3-1/4 inch lg (80244) H-B-1051, Type I, Style A, Class I	EA
22	C	7920-00-297-1510	BRUSH, TEST TUBE: Size 1-1/2, 1-1/2 inch dia, 3-1/2 inch lg (80244)H-B-1051, Type I, Style A, CLass I	EA
23	C	7920-00-917-5843	BRUSH, TEST TUBE: Size A 1-3/4 inch dia, 6 inch lg (22527) PN 3-621	EA
24	C	7920-00-917-5844	BRUSH, TEST TUBE: Size B 2-3/8 inch dia, 6 inch lg (22527) PN 3-621	EA
25	C	7920-00-753-5260	BRUSH, TEST TUBE: Single fan tip; 1-3/8 inch dia, 4 inch lg (35051) PN 44-34	EA
26	C		CALCIUM CHLORIDE, ANHYDRUOS, ACS: 500 gm bottle, (90598) MFG1435-54	GM
27	C		CALCIUM SULFATE, ANHYDROUS, TECHNICAL: 500 gm bottle, (90598) MFG1435-55	GM
28	C	6640-00-194-9728	CAP, SCREW, BOTTLE AND JAR: Plastic with plastic liner, Size 33 doz lot (22527) PN 02-883-2E	EA
29	C		CARBON DIOXIDE, TECHNICAL: Cylinder, compressed gas, (90598) MFG1435-10	OZ
30	C		CHARCOAL, ACTIVATED, TECHNICAL: 1 lb can, (90598) MFG1435-56	LB
31	C	4730-00-908-3193	CLAMP, HOSE: Cres, 2 inch ID, FED-STD-66 (08484) MS35842-12	EA
32	C	6640-00-267-1784	CLEANER, INSTRUMENT, TUBING: Steel wire, with cotton tufts, 50 ft lg, 3 mm dia (64484) PN S10055	EA
33	C	6640-00-267-1783	CLEANER, INSTRUMENT, TUBING: 5 mm dia (64484) PN S10055	EA
34	C	6640-00-494-3846	CLEANER, INSTRUMENT, TUBING: 8 mm dia (94480) PN 3-642	EA
35	C	8305-00-267-3015	CLOTH, CHEESECLOTH: Cotton 1.03 oz per sq yard, white, unshrunk, 36 inch width (81348) CCC-C-440, Type II, Class 2	YD
36	C		CONNECTOR, ELASTIC TUBING, BRANCHED: Polypropylene, for 1/4 inch ID tubing, "T"-shaped (22527) PN 15-319-C	EA

**Section II. EXPENDABLE AND DURABLE SUPPLIES LIST - CONT**

(1) ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) DESCRIPTION CAGE and Part Number	(5) U/M
37	C		CONNECTOR: Polypropylene, for 1/4 inch ID tubing, "Y"-shaped, uniform dia, serrated style connecting ends (22527) PN 15-320-10C	EA
38	C	6640-00-404-2762	CORK, DRILLED: (23035) PN K460-0-8	EA
39	C		CORK, RING, TEST, LAB: (23035) PN K460-1	EA
40	C	6640-00-323-8689	CORROSION TEST STRIP, COPPER: 1/16 to 1/8 inch thk, 1/2 inch width, 3 inch lg (96906) MS36252-1	EA
41	C	6510-00-201-4000	COTTON, PURIFIED: Rolled 12 inch x 10 ft lg, pkg (80244)JJJ-C-561, Grade A, Class 2, Size 4	FT
42	C	5110-00-685-8101	CUTTING WHEEL, GLASS: GGG-C-751, Fisher No. 11-345, Pack/10 (15747) PN G11041	EA
43	C		DESICCANT, ACTIVATED: (90598) MFG1435-57	OZ
44	C	6640-00-235-3820	DETECTOR, PAD, FREE H2O: 100 per box (32218) PN GTP-25	EA
45	C		DETERGENT, GENERAL PURPOSE: (90598) MFG1435-58	OZ
46	C		DISH, CULTURE, PETRI: Large (81348) NNN-D-1478, Type I, Class I	EA
47	C		DISH, CULTURE, PETRI: U/w bacterial filtering disk; disposal (81349) MIL-D-36425	EA
48	C	6640-00-404-2761	DISK, CORK, LAB: (21519) PN G-17482E	EA
49	C		DIETHYLENE GLYCOL MONOMETHYL ETHER, TECHNICAL: 1 pint bottle, (90598) MFG1435-59	PT
50	C	6640-00-985-2099	DISK, FILTERING, MICROPOROUS: Aerosol and hydrosol, 25 mm dia (08071) PN HAWP 025-00	EA
51	C	6640-00-967-0501	DISK, FILTERING, MICROPOROUS: Plain, aerosol, 47 mm dia (08071) PN AAWP-047-00	EA
52	C	6640-00-985-2096	DISK, FILTERING, MICROPOROUS: 100s (08071) PN RAWP-025-00	EA
53			DRY ACID (09061) 440001	CS
54	C		DRY CLEANING SOLVENT: Stoddard, liquid, for dry cleaning textiles, (90598) MFG1435-13	OZ
55	C		ETHYLENE GLYCOL MONOETHYL ETHER, TECHNICAL: Liquid, (90598) MFG1435-15	PT
56	C	4240-00-202-9473	FACE SHIELD, INDUSTRIAL: Replaceable, tiltable, headgear supported visor (81349) L-F-36, Style B	EA

## Section II. EXPENDABLE AND DURABLE SUPPLIES LIST - CONT

(1) ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) DESCRIPTION CAGE and Part Number	(5) U/M
57	C	5120-00-965-0603	FLINT TIP, FRICTION IGNITER: Sleeve, threaded 6-50 NF (81848) GG-I-271, Type I. Style B	EA
58			GAPSCAL (09061) 790204	EA
59	C	5330-00-401-9582	GASKET: For gum stability bomb (48619) PN 74743	EA
60	C	5330-00-402-2209	GASKET: Composition, petroleum test, accessory to gum stability bomb (48619) PN 232240	EA
61	C	5330-00-350-9438	GASKET, (POLYTETRAFLUOROETHYLENE) PETROLEUM TEST: Accessory to gum stability bomb (23085) PN K105-0-85	EA
62	C	5330-00-169-0557	GASKET, (RVP) PETROLEUM TEST: O-rings (48619) PN 232068	EA
63	C	8415-00-261-7015	GLOVES, CLOTH: Workmen's, gauntlet cuff, knitted, napped, cotton lines, natural, large size, HH-G-450, Type I, Class 2	PR
64	C	8415-00-266-8679	GLOVES, RUBBER: Size 9 (81348) ZZ-G-381, Type I, Style I	PR
65	C	8145-00-266-8675	GLOVES, RUBBER: Size 11 (81348) ZZ-G-381, Type I, Style I	PR
66	C		GLYCEROL, ACS: Liquid 1 pint bottle, (90598) MFG1435-60	PT
67	C	4240-00-269-7912	GOGGLES, INDUSTRIAL: With eye cups, plastic, ventilated, clear glass lenses, 50 mm dia, red, worn over personal spectacles (58536) A-A-1814, Class A	PR
68	C	5350-00-184-6255	GRAIN, ABRASIVE: Silicone carbide, 140 mesh (81349) MIL-A-21380, Type III	OZ
69	C		GREASE, GROUND GLASS JOINT: , (90598) MFG1435-61	TU
70	C		HEPTANE, TECHNICAL: With bending tables, (90598) MFG1435-16	OZ
71	C		HYDROCHLORIC ACID, ACS: Liquid; 5 pt bottle, (90598) MFG1435-18	PT
72			HYDROFLOURIC (09061) 472101	CS
73	C		ISO-OCTANE, Reference fuel; 5 gal can, (90598) MFG1435-22	GL
74	C		ISOPROPYL ALCOHOL, ACS: 5 gal can, (90598) MFG1435-23	GL
75	C	7510-00-267-9249	INK, RECORDING INSTRUMENT: Green (28480) PN 5080-3611	OZ
76	C	7510-00-821-0258	INK, RECORDING INSTRUMENT: Red (72264) PN 61100R	OZ
77			KIT, CLASSIFIED (09061) 57001	EA

**Section II. EXPENDABLE AND DURABLE SUPPLIES LIST - CONT**

(1) ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) DESCRIPTION CAGE and Part Number	(5) U/M
78	C	7530-00-526-9792	LABEL: Paper, white, with red border, single, no perforations, water activating adhesive, 1.00 inch lg, 11/16 inch width (81348) UU-L-49, Class A, Style A	EA
79	C		LABEL: Laminated, white, with blue border, transparent acetate film finish, acid, grease, sensitive adhesive, sealed in carbon, 0.625 inch width, 1 inch ID core (81348) A-A-204	EA
80	C		LEAD, ACETATE, TRIHYDRATE, ACS: Crystal 500 gm bottle, (90598) MFG1435-24	GM
81	C		LEAD, NITRATE, ACS: Crystal; 500 gm bottle, (90598) MFG1435-25	GM
82	C	6640-00-290-0146	LITMUS PAPER, ACS: Blue 5 cm lg, 0.6 cm with strip MS36253-2 (81348) O-C-265	EA
83	C	6640-00-290-0147	LITMUS PAPER, ACS: Red 5 cm lg, 0.6 cm with strip MS36235-1 (81348) O-C-265	EA
84	C		LUBRICATING OIL, VACUUM PUMP: (90598) MFG1435-66	OZ
85	C		MERCURIC IODIDE, RED, ACS: Powder; 100 gm bottle, (90598) MFG1435-26	GM
86	C		MERCURY, ACS: Liquid; 5 lb bottle, (90598) MFG1435-27	LB
87	C		METHYL ETHYL KETONE, TECHNICAL: Liquid , (90598) MFG1435-29	OZ
88	C		METHYL ORANGE, ACS: Powder; 25 gm bottle, (90598) MFG1435-30	GM
89	C		NAPHTHA, ALIPHATIC: Distilled from petroleum precipitation naphtha; 1 gal can, (90598) MFG1435-32	GL
90	C		NITRIC ACID, ACS: 5 pt bottle, (90598) MFG1435-33	PT
91	C		NITROGEN, TECHNICAL: cylinder, (90598) MS39224-7	CU FT
92	C		OIL, BATH, VISCOMETER: 1 gal can, (90598) MFG1435-65	GL
93	C		OTTAWA SAND: (90598) MFG1435-78	OZ
94	C		OXYGEN, TECHNICAL: compressed gas, (81348) C901/1.15	CU FT
95	C		P-NAPHTHOLBENZEIN, ANALYZED, REAGENT: Crystals, 25 gm per bottle, (90598) MFG1435-71	GM
96	C		P-NITROPHENOL, REAGENT: Crystal, 112 to 114 deg C, 100 gm per bottle, (90598) MFG1435-35	GM
97	C	5330-00-292-0570	PACKING, PREFORMED: Liquid chamber, O-rings (48619) PN 232069	EA

## Section II. EXPENDABLE AND DURABLE SUPPLIES LIST - CONT

(1) ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) DESCRIPTION CAGE and Part Number	(5) U/M
98			PAD (09061) 202012	CS
99			PAD, UNIVERSAL: CEP-UP100	CS
100			PILLOW (09061) 210003	CS
101			PILLOW, UNIVERSAL: CEP-HAZPIL10	CS
102	C	5350-00-721-8117	PAPER, ABRASIVE: Silicone carbide, 9 x 11 inch sheets, grit no. 180, closed coating waterproof package (81348) PP-101	EA
103	C	5350-00-224-7209	PAPER, ABRASIVE: Silicone carbide, 9 x 11 inch sheets, grit no. 220, closed coating waterproof package (81348) PP-101	EA
104	C	5350-00-224-7207	PAPER, ABRASIVE: Silicone carbide, 9 x 11 inch sheets, grit no. 240, closed coating waterproof package (81348) PP-101	EA
105	C	5350-00-224-7201	PAPER, ABRASIVE: Silicone carbide, 9 x 11 inch sheets, grit no. 400, electronically applied abrasive, package (81348) PP-101	EA
106	C	6640-00-084-5080	PAPER (ABSORBENT) BIBULOUS: 50 sheet book, bound with heavy paper covers, 13.5 mm x 10 cm sheets (80740) PN 65-480	SH
107	C	6640-00-083-5308	PAPER, FILTER: 47 mm (08071) PN HAWP-047-00, Type HA	EA
108	C	6640-00-252-5198	PAPER, FILTER: Qualitative, for course and gelatinous precipitates, 12.5 cm dia, 100s (81348) MS36097-1, NNN-P-1475, Type I, Class I, Grade, I, Style I	EA
109	C	6640-00-866-1427	PAPER, FILTER: Qualitative, for fine precipitates, 12.5 cm dia, 100s (81348) MS36097-1, NNN-P-1475, Type I, Class 3	EA
110	C	6640-00-252-5202	PAPER, FILTER: Qualitative, "Whatman" No. 40 double acid washed, dense, 12.5 cm dia, 100s (81348) MS36097-1, NNN-P-1475, Type II, Class 7	EA
111	C		PAPER, FILTER: Dense (81348) MS36097-24, NNN-P-1475, Type II, Class 7	EA
112	C	6640-00-252-5205	PAPER FILTER: Slow filtration (81348) MS36097-27, NNN-P-1475, Type II, Class 8	SH
113	C		PASTE: Gasoline indicating, (90598) MFG1435-68	TB
114	C		PASTE: Water indicating, (90598) MFG1435-69	TB
115	C	7510-00-240-1526	PENCIL: Black, wax, extra lead, glazed surface marking, paper casing (81348) SS-P-196	EA
116	C		PETROLEUM ETHER, ACS: 1 gal bottle; Liquid, (90598) MFG1435-38	GL
117	C		PHENOLPHTHALEIN, ACS: 100 gm bottle, (90598) MFG1435-70	GM



**Section II. EXPENDABLE AND DURABLE SUPPLIES LIST - CONT**

(1) ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) DESCRIPTION CAGE and Part Number	(5) U/M
118	C	8135-00-043-5331	PLASTIC FILM: 12 inch width, 100 ft roll handiwrap (58536) A-A-1742	RO
119	C		POLISH, METAL: (90598) MFG1435-63	OZ
120	C		POTASSIUM CHLORATE, ACS: Crystal, 100 gm bottle, (90598) MFG1435-39	GM
121	C		POTASSIUM DICHROMATE, ACS: Crystal, 500 gm bottle, (90598) MFG1435-40	GM
122	C		POTASSIUM HYDROGEN PHTHALATE ACID METRIC 100 gm bottle, (90598) MFG1435-72	GM
123	C		POTASSIUM HYDROXIDE, ACS: Pellets, 500 gm bottle, (90598) MFG1435-41	GM
124	C		POTASSIUM IODIDE, ACS: (90598) MFG1435-74	OZ
125	C		POTASSIUM PHOSPHATE, DIBASIC, ANHYDROUS, , (90598) MFG1435-75	GM
126	C		POTASSIUM PHOSPHATE MONOBASIC, ACS: (90598) MFG1435-76	GM
127	C		POWDER, MERCSORB, (90598) MFG1435-62	LB
128	C		PROPANE: Cylinder, disposable, odorized (small) 1 lb cylinder, (90598) MFG1435-43	EA
129	C		PUMICE, TECHNICAL: Powder; 1 lb can, (90598) MFG1435-77	LB
130	C	6145-00-192-1698	RESISTANCE WIRE: 22 AWG, 80 Ni-20 cr alloy conductor, 4.299 ohms per ft at 25 deg C resistivity (81348) QQR-175	FT
131	C	6640-00-438-5950	ROD ASSORTMENT, STIRRING, LABORATORY: Soft glass, 1 ft lg, or 4, 6, and 8 mm dia, fire polished ends (81348) NNN-R-560, Type I	EA
132	C	6640-00-063-5240	SCRAPPER, LABORATORY RUBBER: Diagonal, pure gum rubber, 1-3/8 inch lg, 7/16 inch width, 1/8 inch dia rod (22527) PN 14-105A	EA
133	C	6640-00-410-4463	SCRAPPER, LABORATORY RUBBER: Diagonal, 25 mm lg, 3.15 mm dia, 152.4 mm lg glass rod (21519) PN 74-800	EA
134	C		SILICON CARBIDE: (90598) MFG1435-80	OZ
135	C		SILVER NITRATE, ACS: Crystal, 100 gm bottle, (90598) MFG1435-44	GM
136			SOCKS (09061) 200304	EA
137	C		SODIUM BICARBONATE, ACS: 500 gm bottle, (90598) MFG1435-81	GM

## Section II. EXPENDABLE AND DURABLE SUPPLIES LIST - CONT

(1) ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) DESCRIPTION CAGE and Part Number	(5) U/M
138	C		SODIUM CARBONATE, ANHYDROUS, ACS: 500 gm bottle, (90598) MFG1435-82	GM
139	C		SODIUM CHLORIDE, ACS: 500 gm bottle, (90598) MFG1435-84	GM
140	C		SODIUM DICHROMATE, DIHYDRATE, ANALYZED REAGENT: Crystal, 1 lb bottle, (90598) MFG1435-45	OZ
141	C		SODIUM HYDROXIDE, ACS: Pellet, 500 gm bottle, (90598) MFG1435-46	GM
142	C		SODIUM SULFATE, ANHYDROUS, ACS: 500 gm bottle, (90598) MFG1435-85	GM
143	C		SODIUM SULFIDE, NONHYDRATE, ACS: Crystal, 4 oz bottle, (90598) MFG1435-47	OZ
144	C		SODIUM THIOSULFATE, PENTAHYDRATE: 500 gm bottle, (90598) MFG1435-86	GM
145	C	3439-00-269-9610	SOLDER, TIN ALLOY: 1 lb spool (81348) QQ-S-571, Type SN-60, Wrap 3	OZ
146	C	7920-00-240-2559	SPONGE, CELLULOSE: (80244) L-S-626, Type II, Class 2, Porosity A	EA
147	C		STARCH, SOLUBLE, ACS: Powder, 500 gm bottle, (90598) MFG1435-87	GM
148	C	6640-00-440-7000	STOPCOCK, LABORATORY APPARATUS: Glass, straight, 2 mm (96906) MS35989-2, DD-S-720, Type I, Grade A (with plugs)	EA
149	C	6640-00-852-3452	STOPCOCK, LABORATORY APPARATUS: Glass, straight, 4 mm, standard taper, MS35989-3, DD-S-720, Type I, Composition I, Grade A (with plugs)	EA
150	C	6640-00-410-1917	STOPCOCK, PLASTIC: Tapered ends, 3/8 to 1/4 inch (15747) PN G23025A	EA
151	C	6640-00-116-2823	STOPPER, BOTTLE: Cork, with standard taper, regular, No. 4 stopper, 0.63 inch top dia, 0.47 inch bottom dia (80740) PN 26-970-4	EA
152	C	6640-00-232-5991	STOPPER, BOTTLE, Cork, with standard taper, regular, No. 5 stopper, 0.69 inch top dia, 0.53 inch bottom dia, 100s (80740) PN 26-970-5	EA
153	C	6640-00-232-6014	STOPPER, BOTTLE, Cork, with standard taper, regular, No. 6 stopper, 0.75 inch top dia, 0.58 inch bottom dia, 100s (80740) PN 26-970-6	EA
154	C	6640-00-232-5992	STOPPER, BOTTLE: Cork, with standard taper, regular, No. 7 stopper, 0.81 inch top dia, 0.63 inch bottom dia, 100s (80740) PN 26-970-7	EA

**Section II. EXPENDABLE AND DURABLE SUPPLIES LIST - CONT**

(1) ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) DESCRIPTION CAGE and Part Number	(5) U/M
155	C	8125-00-281-4107	STOPPER, BOTTLE: Cork, with standard taper, regular, nonblooming red rubber, with low sulfur content, 0.413 inch top dia, 0.118 inch bottom dia, (15747) PN G21635	EA
156	C	6640-00-232-6007	STOPPER, BOTTLE: Cork, with standard taper, regular, No. 7 stopper, 1.457 inch top dia, 1.181 inch bottom dia, 100s (80740) PN 74-930-7	EA
157	C	6640-00-232-6012	STOPPER, BOTTLE: Synthetic rubber, No. 2 stopper, 0.78740 inch top dia, 0.62992 inch bottom dia (96906) MS36369-4	EA
158	C	6640-00-232-6011	STOPPER, BOTTLE: Synthetic rubber, No. 3 stopper, 0.94488 inch top dia, 0.70866 inch bottom dia (96906) MS36369-5	EA
159	C	6640-01-327-9504	STOPPER, BOTTLE: Synthetic rubber, No. 4 stopper, 1.0236 inch top dia, 0.78740 inch bottom dia (96906) MS36369-6	EA
160	C	6640-00-232-6009	STOPPER, BOTTLE: Synthetic rubber, No. 5 stopper, 1.0630 inch top dia, 0.9055 inch bottom dia (96906) MS36369-7	EA
161	C	6640-00-232-6008	STOPPER, BOTTLE: Synthetic rubber, No. 6 stopper, 1.2598 inch top dia, 1.0244 inch bottom dia (80740) PN 74-930-6	EA
162	C	6640-00-232-6006	STOPPER, BOTTLE: Synthetic rubber, No. 8 stopper, 1.6142 inch top dia, 1.2992 inch bottom dia (96906) MS36369-9	EA
163	C	6640-01-328-5217	STOPPER, BOTTLE: Synthetic rubber, No. 9 stopper, 1.771 inch top dia, 1.456 inch bottom dia (80470) PN 74-903-11	EA
164	C		STOPPER, BOTTLE: Synthetic rubber, No. 11 stopper, 2.205 inch top dia, 1.890 inch bottom dia (80740) PN 74-930-11	EA
165	C	6640-00-103-1845	STOPPER, BOTTLE: Synthetic rubber, No. 12 stopper, 2.524 inch top dia, 2.126 inch bottom dia (80470) PN 74-930-12	EA
166	C	6640-00-179-2558	STOPPER, CORK QUALITY: (80740) PN 27-000	EA
167	C		SULFURIC ACID, ACS: 9 lb bottle, (90598) MFG1435-48	LB
168	C	8030-00-889-3535	TAPE, ANTISEIZING: Polytetrafluoroethylene (81349) A-A-113, Type II, Class A	IN
169	C	7510-00-082-2520	TAPE, PRESSURE SENSITIVE: (58536) A-A-113, Type II, Class A	IN
170	C	6640-00-861-6215	TEST PAPER, LEAD ACETATE: Type "B", strips, 100 per vial (15741) PN G12500B	EA
171	C	6630-00-442-9005	TEST PAPER AND COLOR CHART, HYDROGEN: Color chart visible both sizes, 1 to 11 and 2 to 10 pH ranges, two 15 ft rolls in double refillable dispenser, with items 160 and 161 following.	FT
172	C	6330-00-442-9015	TEST PAPER REFILL: 5 roll/pack, 1 to 11 pH range (81348)	FT

**Section II. EXPENDABLE AND DURABLE SUPPLIES LIST - CONT**

(1) ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) DESCRIPTION CAGE and Part Number	(5) U/M
173	C	6330-00-442-9025	TEST PAPER REFILL: 5 roll/pack, 1 to 2 pH range, 2 to 10 pH range, and wide range (81348) NNN-T-001529, Style 1, Class A	FT
174	C		TOLUENE, TECHNICAL: Liquid; 1 gal can, (90598) MFG1435-50	GL
175	C		TOTE, PAN, ICE: Polyethylene (13147) PN 3509	EA
176	C	7920-00-965-1709	TOWEL, PAPER: Single fold, 15 inch with 72 per self-dispensing box (81348) UU-T-598	EA
177	C	6640-00-314-2097	WASH BOTTLE, LABORATORY: Polyethylene, 500 ml (22527) PN 3-409-10 (53078) PN S-9486C	EA
178	C	5350-00-240-2920	WOOL, METALIC: 1 lb roll, (81348) FF-W-1825, Type I, Class II Fine	OZ
179	C		XYLENE, ACS: 16 oz bottle, (90598) MFG1435-51	OZ
180	C		ZINC OXIDE, ACS: (90598) MFG1435-88	OZ



**APPENDIX F**  
**MANDATORY REPLACEMENT PARTS**

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**NOT APPLICABLE**



## APPENDIX G

### TORQUE TABLE

#### Section I. INTRODUCTION

##### G-1. GENERAL.

Use a torque wrench to check torque or tighten nuts and capscrews to specified torque. Special torque values are identified in the maintenance procedures. Standard torque values shown should be used for other threaded fasteners. Refer to table G1.

<b>STANDARD CAPSCREW MARKINGS AND TORQUE</b>				
Current Usage	Much Used	Much Used	Used at Times	Used at Times
Minimum Tensile Strength PSI MPa	To 1-2-69,000 (476) To 3/4-64,000 (421) To 1-55,000 (379)	To 3/4-120,000 (827) To 1-115,000 (793)	To 5/8-140,000 (965) To 3/4-133,000 (917)	150,000 (1034)
Quality of Material	Intermediate	Minimum Commercial	Medium Commercial	Best Commercial
SAE Grade Number	1 or 2	5	6 or 7	8
Capscrew Body Size (Inches) - (Thread)	Torque Ft.-Lb (N-m)	Torque Ft.-Lb (N-m)	Torque Ft.-Lb (N-m)	Torque Ft.-Lb (N-m)
1/4-20	5(7)	8(11)	10(14)	12(16)
-28	6(8)	10(14)		14(19)
5/16-18	11(15)	17(23)	19(26)	24(33)
-24	13(18)	19(26)		27(37)
3/8-16	18(24)	31(42)	34(46)	44(60)
-24	20(27)	35(47)		49(66)
7/17-14	28(38)	49(66)	55(75)	70(95)
-20	30(41)	55(75)		78(106)
1/2-13	39(53)	75(102)	85(115)	105(142)
-20	41(56)	85(115)		120(163)
9/16-12	51(69)	110(149)	120(163)	155(210)
-18	55(75)	120(163)		170(231)
5/6-11	83(113)	150(203)	167(226)	210(285)
-18	95(129)	170(231)		240(325)
3/4-10	105(142)	270(366)	280(380)	375(508)
-16	115(156)	295(400)		420(569)
7/8-9	160(217)	395(536)	440(597)	605(820)
-14	175(237)	435(590)		675(915)
1-8	235(319)	590(800)	660(895)	910(1234)
-14	250(339)	660(895)		990(1342)

1. Always use the torque values listed above when definite specifications are not available.

Note: Do not use standard values in place of those specified in other sections of this manual; special attention should be observed when using SAE Grade 6, 7, and 8 capscrews.

2. The above is based on use of clean and dry threads.
3. Reduce torque by 20% if new plated capscrews are used.

Caution: Capscrews threaded into aluminum may require reductions in torque by 30% or more, unless inserts are used.







Table H-1. Modular Base Petroleum Laboratory (Mod Lab A) Wire List - CONT

NOTES

1. Part of DS1.
2. Part of DS2.
3. Part of DS3.
4. Part of DS4.
5. Part of DS5.
6. Part of DS6.
7. Part of DS8.
8. Part of DS9.
9. Part of DS10.
10. Part of DS11.
11. Part of DS12.
12. Part of DS14.
13. Part of DS15.
14. Cable Assembly W9. Part Number 13226E6631-9.
15. Cable Assembly W10. Part Number 13226E6631-10.
16. Cable Assembly W11. Part Number 13226E6631-11.
17. Cable Assembly W12. Part Number 13226E6631-12.
18. Cable Assembly W9. Part Number 13226E6497-9.
19. Cable Assembly W10. Part Number 13226E6497-10.
20. Cable Assembly W11. Part Number 13226E6497-11.
21. Cable Assembly W12. Part Number 13226E6497-12.
22. Cable Assembly W25. Part Number 13226E6567-9.
23. Cable Assembly W26. Part Number 13226E6567-10.
24. Cable Assembly W27. Part Number 13226E6567-11.
25. Cable Assembly W28. Part Number 13226E6567-12.
26. Cable Assembly W41. Part Number 13226E6921-9.
27. Cable Assembly W42. Part Number 13226E6921-10.
28. Cable Assembly W43. Part Number 13226E6921-11.
29. Cable Assembly W44. Part Number 13226E6921-12.
30. Cable Assembly W33. Part Number 13226E6922-9.
31. Cable Assembly W34. Part Number 13226E6922-10.
32. Cable Assembly W35. Part Number 13226E6922-11.
33. Cable Assembly W36. Part Number 13226E6922-12.

Table H-1. Modular Base Petroleum Laboratory (Mod Lab A) Wire List - CONT

From Reference Designation		To Reference Designation		Wire Code Sequence	Remarks Remarks
Connector	Pin	Connector	Pin		
A1CB1	A	A1F1	1	A-10-0	
A1CB1	A	A34J1	A	G-04-0	
A1CB1	B	A1F2	1	A-10-2	
A1CB1	B	A34J1	B	G-04-2	
A1CB1	C	A1F3	1	A-10-6	
A1CB1	C	A34J1	C	G-04-6	
A1CB2	A	A15	A	F-01-0	
A1CB2	B	A15	B	F-01-2	
A1CB2	C	A15	C	F-01-6	
A1CB3	A	J2	1	B-12-9	
A1CB4	A	J3	1	B-12-9	
A1CB5	B	J5	1	C-14-9	
A1CB6	B	J6	1	C-14-9	
A1CB7	C	J8	1	B-12-9	
A1CB8	C	J11	1	C-14-9	
A1CB9	A	A25S1	1	C-14-9	
A1CB10	A	J12	1	C-14-9	
A1CB11	B	A25S3	1	C-14-9	
A1CB12	B	J13	1	B-12-9	
A1CB13	B	A10TB1	1	A-10-9	
A1CB13	C	A25S4	1	C-14-9	
A1CB13	C	A21TB1	5	C-14-9	
A1CB14	C	J14	1	C-14-9	
A1CB15	A	S7	L1	A-10-9	
A1CB16	A	J16	1	C-14-9	
A1CB17	B	A29K1	1	C-14-9	
A1CB19	C	A10K1	1	C-14-9	
A1CB20	C	A31J1	1	C-14-9	
A1CB21	B	A34J2	1	C-14-9	
A1F1	1	A1CB1	A	A-10-0	
A1F1	1	A1F4	1	A-10-9	
A1F1	2	A3K2	1A	A-10-0	
A1F1	2	A3TB1	1	A-10-0	
A1F2	1	A1CB1	B	A-10-2	
A1F2	2	A3K2	2A	A-10-2	
A1F3	1	A1CB1	C	A-10-6	
A1F3	2	A3K2	3A	A-10-6	
A1F4	1	A1F1	1	A-10-9	
A1F4	2	A3XK1	1	B-12-9	
A1F4	2	A20TB2	1	A-10-9	
A1K1	2	A1TB3	1	B-12-9	
A1K1	3	A3XK1	2	B-12-9	
A1K1	3	A20TB2	6	B-12-9	
A1K1	5	A3K2	X1	B-12-9	
A1K1	5	A20TB2	5	B-12-9	
A1K1	7	A1TB3	2	B-12-9	

Table H-1. Modular Base Petroleum Laboratory (Mod Lab A) Wire List - CONT

From		To		Wire	Remarks
Reference Designation		Reference Designation		Code Sequence	Remarks
Connector	Pin	Connector	Pin		
A1K1	8	A3XK1	4	B-12-9	
A1TB1	1	J2	2	B-12-9	
A1TB1	1	J3	2	B-12-9	
A1TB1	2	J5	2	C-14-9	
A1TB1	2	J6	2	C-14-9	
A1TB1	3	J8	2	B-12-9	
A1TB1	3	J11	2	C-14-9	
A1TB1	4	J12	2	C-14-9	
A1TB1	4	J13	2	B-12-9	
A1TB1	5	A15TB1	1	F-01-9	
A1TB1	6	S7	C	A-10-9	
A1TB1	7	A1TB2	7	G-04-9	
A1TB2	1	A34J1	N	G-04-9	
A1TB2	2	A1TB3	2	B-12-9	
A1TB2	2	A3K2	X2	B-12-9	
A1TB2	2	J14	2	C-14-9	
A1TB2	3	A29K1	X2	C-14-9	
A1TB2	3	J16	2	C-14-9	
A1TB2	4	A10TB1	2	A-10-9	
A1TB2	4	A19	4	C-14-9	
A1TB2	5	A31J1	2	C-14-9	
A1TB2	5	A34J2	2	C-14-9	
A1TB2	6	A20TB1	N	C-14-9	
A1TB2	6	A21TB1	4	C-14-9	
A1TB2	7	A1TB1	7	G-04-9	
A1TB3	1	A1K1	2	B-12-9	
A1TB3	1	A3XK1	3	B-12-9	
A1TB3	1	A13K1	1	D-16-0	
A1TB3	2	A1K1	7	B-12-9	
A1TB3	2	A1TB2	2	B-12-9	
A1TB3	2	A3XK1	7	B-12-9	
A1W1		A3	E1	A-10-5	
A1W1		A10	GND	A-10-5	
A1W1		A15W1		F-01-5	
A1W1		A19	GND	B-12-5	
A1W1		A20	GND	B-12-5	
A1W1		A21TB1	7	B-12-5	
A1W1		A24	GND	B-12-5	
A1W1		A25	GND	B-12-5	
A1W1		A29	GND	B-12-5	
A1W1		A31J1	GND	C-14-9	
A1W1		A34	E1	G-04-5	
A1W1		A34J1	G	G-04-5	
A1W1		A34J1	G	G-04-5	
A1W1		A34J1	G	G-04-5	
A1W1		A34J1	G	G-04-5	
A1W1		A34J2	GND	B-12-5	
A1W1		J2	GND	B-12-5	
A1W1		J3	GND	B-12-5	

**Table H-1. Modular Base Petroleum Laboratory (Mod Lab A) Wire List - CONT**

From Reference Designation		To Reference Designation		Wire Code Sequence	Remarks
Connector	Pin	Connector	Pin		
A1W1		J5	GND	B-12-5	
A1W1		J6	GND	B-12-5	
A1W1		J8	GND	B-12-5	
A1W1		J11	GND	B-12-5	
A1W1		J12	GND	B-12-5	
A1W1		J13	GND	B-12-5	
A1W1		J14	GND	B-12-5	
A1W1		J16	GND	B-12-5	
A1W1		S7	GND	A-10-5	
A3	E1	A1W1		A-10-5	
A3	E1	A43TB1	3	B-12-5	
A3K2	1A	A1F1	2	A-10-0	
A3K2	1B	A13K1	5B	B-12-0	
A3K2	2A	A1F2	2	A-10-2	
A3K2	2B	A13K1	6B	B-12-2	
A3K2	3A	A1F3	2	A-10-6	
A3K2	3B	A13K1	7B	B-12-0	
A3K2	5B	A13K2	5B	B-12-0	
A3K2	6B	A13K2	6B	B-12-2	
A3K2	7B	A13K2	7B	B-12-6	
A3K2	X1	A1K1	5	B-12-9	
A3K2	X2	A1TB2	2	B-12-9	
A3K3	X2	A43TB1	2	C-14-9	
A3K5	1B	A13K3	5B	B-12-0	
A3K5	2B	A13K3	6B	B-12-2	
A3K5	3B	A13K3	7B	B-12-6	
A3K5	5B	A13K4	5B	B-12-0	
A3K5	6B	A13K4	6B	B-12-2	
A3K5	7B	A13K4	7B	B-12-6	
A3TB1	1	A1F1	2	A-10-0	
A3TB1	1	A3TB1	2	N/A	
A3TB1	1	A28TB1	2	B-12-0	
A3TB1	1	A43TB1	6	C-14-9	
A3TB1	2	A3TB1	1	N/A	
A3TB1	2	A28TB1	3	B-12-0	
A3TB1	2	A28TB1	4	B-12-0	
A3XX1	1	A1F4	2	B-12-9	
A3XX1	2	A1K1	3	B-12-9	
A3XX1	3	A1TB3	1	B-12-9	
A3XX1	3	A43TB1	1	C-14-9	
A3XX1	4	A1K1	8	B-12-9	
A3XX1	7	A1TB3	2	B-12-9	
A4	GND	A15W1		B-12-5	
A4	GND	B6	GND	B-12-5	
A4	L1	A15CB9	A	C-14-9	
A4	L2	A15TB1	2	C-14-9	
A4	T1	B6	E1	C-14-9	
A4	T2	B6	E2	C-14-9	
A5	GND	A15W1		B-12-5	

Table H-1. Modular Base Petroleum Laboratory (Mod Lab A) Wire List - CONT

From		To		Wire	Remarks
Reference Designation		Reference Designation		Code Sequence	Remarks
Connector	Pin	Connector	Pin		
A5C1	2	A15TB1	3	B-12-9	
A5C1	2	K1	X2	H-14-9	
A5S1	1	A15CB7	B	B-12-9	
A5S1	1	K1	X1	H-14-0	
A6	GND	A15W1		B-12-5	
A6	GND	B1	GND	B-12-5	
A6C1	L1	A6TB1	1	C-14-9	
A6IFSTB	6	A10K1	X1	C-14-9	
A6K1	1	A15CB5	A	L-8-0	
A6K1	2	A15CB5	B	L-8-2	
A6K1	3	A15CB5	C	L-8-9	
A6K3	E1	B1	E1	C-14-9	
A6K3	E2	B1	E2	C-14-9	
A6TB1	1	A6C1	L1	C-14-9	
A6TB1	2	A15TB1	7	C-14-9	
A7	GND	A15W1		B-12-5	
A7	GND	B7	GND	B-12-5	
A7	L1	A15CB6	A	B-12-0	
A7	L2	A15CB6	B	B-12-2	
A7	L3	A15CB6	C	B-12-9	
A7	T1	B7	E1	B-12-9	
A7	T2	B7	E2	B-12-9	
A7	T3	B7	E3	B-12-9	
A7	X2	S1	2	H-14-0	
A7S1	2	S1	1	H-14-0	
A8	GND	A15W1		B-12-5	
A8	GND	B8	GND	B-12-5	
A8	L1	A15CB8	A	C-14-9	
A8	L2	A15TB1	4	C-14-9	
A8	L2	S2	2	E-18-9	
A8	T1	B8	E1	C-14-9	
A8	T2	B8	E2	C-14-9	
A8	X2	S2	1	E-18-0	
A9	GND	A10	GND	A-10-5	
A9	GND	A18	E2	B-12-5	
A9DS1	E1	A10TB1	2	C-14-9	
A9DS1	E1	A31DS1	E1	D-16-9	
A9DS1	E2	S16	2	C-14-9	
A9S11	1	A18A1	6	B-12-9	
A9S12	1	A18SSR1	2	B-12-2	
A9S16	1	A24S4	2	C-14-9	
A9TB11	1	A18F1	1	B-12-0	
A9TB11	H	A10TB1	1	A-10-9	
A9TB11	N	A10TB1	2	A-10-9	
A10	GND	A1W1		A-10-5	
A10	GND	A9	GND	A-10-5	
A10K1	1	A1CB19	C	C-14-9	
A10K1	2	A19	1	C-14-9	
A10K1	X1	A6IFSTB	6	C-14-9	

**Table H-1. Modular Base Petroleum Laboratory (Mod Lab A) Wire List - CONT**

From Reference Designation		To Reference Designation		Wire Code Sequence	Remarks
Connector	Pin	Connector	Pin		
A10TB1	1	A1CB13	B	A-10-9	
A10TB1	1	A9TB11	H	A-10-9	
A10TB1	2	A1TB2	4	A-10-9	
A10TB1	2	A9DS1	E1	C-14-9	
A10TB1	2	A9TB11	N	A-10-9	
A11	BLK	A20TB1	R1	C-14-0	
A11	GND	A20TB1	GND	B-12-5	
A11	R	A20TB1	A1	B-12-5	
A11	Y	A20TB1	C1	C-14-9	
A12	BLK	A20TB1	R2	C-14-0	
A12	GND	A20	GND	B-12-5	
A12	R	A20TB1	A2	C-12-5	
A12	Y	A20TB1	C2	C-14-9	
A13		A39			Note 30
A13		A40			Note 31
A13		A41			Note 32
A13		A42			Note 33
A13		A44	J1		Note 22
A13		A44	J2		Note 26
A13		A45	J1		Note 23
A13		A45	J2		Note 27
A13		A46	J1		Note 24
A13		A46	J2		Note 28
A13		A47	J1		Note 25
A13		A47	J2		Note 29
A13	E1	A15W1		B-12-5	
A13	E1	W25P1	E	B-12-9	Note 22
A13	E1	W26P1	E	B-12-9	Note 23
A13	E1	W27P1	E	B-12-9	Note 24
A13	E1	W28P1	E	B-12-9	Note 25
A13	E2	A15W1		B-12-5	
A13K1	1	A1TB3	1	D-16-0	
A13K1	1	A13K2	1	D-16-0	
A13K1	1A	A13K1	5A	B-12-0	
A13K1	1A	A15CB1	A	B-12-0	
A13K1	1B	A13K1	5B	B-12-0	
A13K1	1B	W25P1	A	B-12-9	Note 22
A13K1	2	A13K2	2	D-16-9	
A13K1	2	A15TB1	7	D-16-9	
A13K1	2A	A13K1	6A	B-12-2	
A13K1	2A	A15CB1	B	B-12-2	
A13K1	2B	A13K1	6B	B-12-2	
A13K1	2B	W25P1	B	B-12-9	Note 22
A13K1	3A	A13K1	7A	B-12-6	
A13K1	3A	A15CB1	C	B-12-9	
A13K1	3B	A13K1	7B	B-12-6	
A13K1	3B	W25P1	C	B-12-9	Note 22
A13K1	5A	A13K1	1A	B-12-0	
A13K1	5B	A3K2	1B	B-12-0	



**Table H-1. Modular Base Petroleum Laboratory (Mod Lab A) Wire List - CONT**

From		To		Wire	Remarks
Reference Designation		Reference Designation		Code Sequence	Remarks
Connector	Pin	Connector	Pin		
A13K1	5B	A13K1	1B	B-12-0	
A13K1	6A	A13K1	2A	B-12-2	
A13K1	6B	A3K2	2B	B-12-2	
A13K1	6B	A13K1	2B	B-12-2	
A13K1	7A	A13K1	3A	B-12-6	
A13K1	7B	A3K2	3B	B-12-0	
A13K1	7B	A13K1	3B	B-12-6	
A13K1	8B	A15TB1	1	B-12-9	
A13K1	8B	W25P1	D	B-12-9	Note 22
A13K1	10A	W33P15	G	K-20-N/A	Note 30
A13K1	10A	W41P14	G	K-20-N/A	Note 26
A13K1	10B	A13K1	11B	C-14-9	
A13K1	11A	W33P15	C	K-20-N/A	Note 30
A13K1	11B	A13K1	10B	C-14-9	
A13K1	11B	W41P14	C	K-20-N/A	Note 26
A13K2	1	A13K1	1	D-16-0	
A13K2	1	A13K3	1	D-16-0	
A13K2	1A	A13K2	5A	B-12-0	
A13K2	1A	A15CB2	A	B-12-0	
A13K2	1B	A13K2	5B	B-12-0	
A13K2	1B	W26P1	A	B-12-9	Note 23
A13K2	2	A13K1	2	D-16-9	
A13K2	2	A13K3	2	B-12-9	
A13K2	2A	A13K2	6A	B-12-2	
A13K2	2A	A15CB2	B	B-12-2	
A13K2	2B	A13K2	6B	B-12-2	
A13K2	2B	W26P1	B	B-12-9	Note 23
A13K2	3A	A13K2	7A	B-12-6	
A13K2	3A	A15CB2	C	B-12-9	
A13K2	3B	A13K2	7B	B-12-6	
A13K2	3B	W26P1	C	B-12-9	Note 23
A13K2	5A	A13K2	1A	B-12-0	
A13K2	5B	A3K2	5B	B-12-0	
A13K2	5B	A13K2	1B	B-12-0	
A13K2	6A	A13K2	2A	B-12-2	
A13K2	6B	A3K2	6B	B-12-2	
A13K2	6B	A13K2	2B	B-12-2	
A13K2	7A	A13K2	3A	B-12-6	
A13K2	7B	A3K2	7B	B-12-6	
A13K2	7B	A13K2	3B	B-12-6	
A13K2	8B	A15TB1	2	B-12-9	
A13K2	8B	W26P1	D	B-12-9	Note 23
A13K2	10A	W34P15	G	K-20-N/A	Note 31
A13K2	10A	W42P14	G	K-20-N/A	Note 27
A13K2	10B	A13K2	11B	C-14-9	
A13K2	11A	W34P15	C	K-20-N/A	Note 31
A13K2	11B	A13K2	10B	C-14-9	
A13K2	11B	W42P14	C	K-20-N/A	Note 27
A13K3	1	A13K2	1	D-16-0	

**Table H-1. Modular Base Petroleum Laboratory (Mod Lab A) Wire List - CONT**

From Reference Designation		To Reference Designation		Wire Code Sequence	Remarks
Connector	Pin	Connector	Pin		
A13K3	1	A13K4	1	D-16-0	
A13K3	2	A13K4	2	B-12-9	
A13K3	2	A13K2	2	B-12-9	
A13K3	1A	A13K3	5A	B-12-0	
A13K3	1A	A15CB3	A	B-12-0	
A13K3	1B	A13K3	5B	B-12-0	
A13K3	1B	W27P1	A	B-12-9	Note 24
A13K3	2A	A13K3	6A	B-12-2	
A13K3	2A	A15CB3	B	B-12-2	
A13K3	2B	A13K3	6B	B-12-2	
A13K3	2B	W27P1	B	B-12-9	Note 24
A13K3	3A	A13K3	7A	B-12-6	
A13K3	3A	A15CB3	C	B-12-9	
A13K3	3B	A13K3	7B	B-12-6	
A13K3	3B	W27P1	C	B-12-9	Note 24
A13K3	5A	A13K3	1A	B-12-0	
A13K3	5B	A3K5	1B	B-12-0	
A13K3	5B	A13K3	1B	B-12-0	
A13K3	6A	A13K3	2A	B-12-2	
A13K3	6B	A3K5	2B	B-12-2	
A13K3	6B	A13K3	2B	B-12-2	
A13K3	7A	A13K3	3A	B-12-6	
A13K3	7B	A3K5	3B	B-12-6	
A13K3	7B	A13K3	3B	B-12-6	
A13K3	8B	A15TB1	3	B-12-9	
A13K3	8B	W27P1	D	B-12-9	Note 24
A13K3	10A	W35P15	G	K-20-N/A	Note 32
A13K3	10A	W43P14	G	K-20-N/A	Note 28
A13K3	10B	A13K3	11B	C-14-9	
A13K3	11A	W35P15	C	K-20-N/A	Note 32
A13K3	11B	A13K3	10B	C-14-9	
A13K3	11B	W43P14	C	K-20-N/A	Note 28
A13K4	1	A13K3	1	D-16-0	
A13K4	2	A13K3	2	B-12-9	
A13K4	1A	A13K4	5A	B-12-0	
A13K4	1A	A15CB4	A	B-12-0	
A13K4	1B	A13K4	5B	B-12-0	
A13K4	1B	W28P1	A	B-12-9	Note 25
A13K4	2A	A13K4	6A	B-12-2	
A13K4	2A	A15CB4	B	B-12-2	
A13K4	2B	A13K4	6B	B-12-2	
A13K4	2B	W28P1	B	B-12-9	Note 25
A13K4	3A	A13K4	7A	B-12-6	
A13K4	3A	A15CB4	C	B-12-9	
A13K4	3B	A13K4	7B	B-12-6	
A13K4	3B	W28P1	C	B-12-9	Note 25
A13K4	5A	A13K4	1A	B-12-0	
A13K4	5B	A3K5	5B	B-12-0	
A13K4	5B	A13K4	1B	B-12-0	

**Table H-1. Modular Base Petroleum Laboratory (Mod Lab A) Wire List - CONT**

From		To		Wire	Remarks
Reference Designation		Reference Designation		Code Sequence	Remarks
Connector	Pin	Connector	Pin		
A13K4	6A	A13K4	2A	B-12-2	
A13K4	6B	A3K5	6B	B-12-2	
A13K4	6B	A13K4	2B	B-12-2	
A13K4	7A	A13K4	3A	B-12-6	
A13K4	7B	A3K5	7B	B-12-6	
A13K4	7B	A13K4	3B	B-12-6	
A13K4	8B	A15TB1	4	B-12-9	
A13K4	8B	W28P1	D	B-12-9	Note 25
A13K4	10A	W36P15	G	K-20-N/A	Note 33
A13K4	10A	W44P14	G	K-20-N/A	Note 29
A13K4	10B	A13K4	11B	C-14-9	
A13K4	11A	W36P15	C	K-20-N/A	Note 33
A13K4	11B	A13K4	10B	C-14-9	
A13K4	11B	W44P14	C	K-20-N/A	Note 29
A13TB1	1	W33P15	N	K-20-N/A	Note 30
A13TB1	1	W41P14	N	K-20-N/A	Note 26
A13TB1	2	W33P15	D	K-20-N/A	Note 30
A13TB1	2	W41P14	D	K-20-N/A	Note 26
A13TB1	3	W33P15	R	K-20-N/A	Note 30
A13TB1	3	W41P14	R	K-20-N/A	Note 26
A13TB1	4	W33P15	P	K-20-N/A	Note 30
A13TB1	4	W41P14	P	K-20-N/A	Note 26
A13TB1	5	W33P15	A	K-20-N/A	Note 30
A13TB1	5	W41P14	A	K-20-N/A	Note 26
A13TB1	6	W33P15	H	K-20-N/A	Note 30
A13TB1	6	W41P14	H	K-20-N/A	Note 26
A13TB1	7	W33P15	E	K-20-N/A	Note 30
A13TB1	7	W41P14	E	K-20-N/A	Note 26
A13TB1	8	W33P15	F	K-20-N/A	Note 30
A13TB1	8	W41P14	F	K-20-N/A	Note 26
A13TB1	9	W33P15	I	K-20-N/A	Note 30
A13TB1	9	W41P14	I	K-20-N/A	Note 26
A13TB1	10	W33P15	B	K-20-N/A	Note 30
A13TB1	10	W41P14	B	K-20-N/A	Note 26
A13TB2	1	W34P15	N	K-20-N/A	Note 31
A13TB2	1	W42P14	N	K-20-N/A	Note 27
A13TB2	2	W34P15	D	K-20-N/A	Note 31
A13TB2	2	W42P14	D	K-20-N/A	Note 27
A13TB2	3	W34P15	R	K-20-N/A	Note 31
A13TB2	3	W42P14	R	K-20-N/A	Note 27
A13TB2	4	W34P15	P	K-20-N/A	Note 31
A13TB2	4	W42P14	P	K-20-N/A	Note 27
A13TB2	5	W34P15	A	K-20-N/A	Note 31
A13TB2	5	W42P14	A	K-20-N/A	Note 27
A13TB2	6	W34P15	H	K-20-N/A	Note 31
A13TB2	6	W42P14	H	K-20-N/A	Note 27
A13TB2	7	W34P15	E	K-20-N/A	Note 31
A13TB2	7	W42P14	E	K-20-N/A	Note 27
A13TB2	8	W34P15	F	K-20-N/A	Note 31

**Table H-1. Modular Base Petroleum Laboratory (Mod Lab A) Wire List - CONT**

From		To		Wire	Remarks
Reference Designation		Reference Designation		Code Sequence	Remarks
Connector	Pin	Connector	Pin		
A13TB2	8	W42P14	F	K-20-N/A	Note 27
A13TB2	9	W34P15	I	K-20-N/A	Note 31
A13TB2	9	W42P14	I	K-20-N/A	Note 27
A13TB2	10	W34P15	B	K-20-N/A	Note 31
A13TB2	10	W42P14	B	K-20-N/A	Note 27
A13TB3	1	W35P15	N	K-20-N/A	Note 32
A13TB3	1	W43P14	N	K-20-N/A	Note 28
A13TB3	2	W35P15	D	K-20-N/A	Note 32
A13TB3	2	W43P14	D	K-20-N/A	Note 28
A13TB3	3	W35P15	R	K-20-N/A	Note 32
A13TB3	3	W43P14	R	K-20-N/A	Note 28
A13TB3	4	W35P15	P	K-20-N/A	Note 32
A13TB3	4	W43P14	P	K-20-N/A	Note 28
A13TB3	5	W35P15	A	K-20-N/A	Note 32
A13TB3	5	W43P14	A	K-20-N/A	Note 28
A13TB3	6	W35P15	H	K-20-N/A	Note 32
A13TB3	6	W43P14	H	K-20-N/A	Note 28
A13TB3	7	W35P15	E	K-20-N/A	Note 32
A13TB3	7	W43P14	E	K-20-N/A	Note 28
A13TB3	8	W35P15	F	K-20-N/A	Note 32
A13TB3	8	W43P14	F	K-20-N/A	Note 28
A13TB3	9	W35P15	I	K-20-N/A	Note 32
A13TB3	9	W43P14	I	K-20-N/A	Note 28
A13TB3	10	W35P15	B	K-20-N/A	Note 32
A13TB3	10	W43P14	B	K-20-N/A	Note 28
A13TB4	1	W36P15	N	K-20-N/A	Note 33
A13TB4	1	W44P14	N	K-20-N/A	Note 29
A13TB4	2	W36P15	D	K-20-N/A	Note 33
A13TB4	2	W44P14	D	K-20-N/A	Note 29
A13TB4	3	W36P15	R	K-20-N/A	Note 33
A13TB4	3	W44P14	R	K-20-N/A	Note 29
A13TB4	4	W36P15	P	K-20-N/A	Note 33
A13TB4	4	W44P14	P	K-20-N/A	Note 29
A13TB4	5	W36P15	A	K-20-N/A	Note 33
A13TB4	5	W44P14	A	K-20-N/A	Note 29
A13TB4	6	W36P15	H	K-20-N/A	Note 33
A13TB4	6	W44P14	H	K-20-N/A	Note 29
A13TB4	7	W36P15	E	K-20-N/A	Note 33
A13TB4	7	W44P14	E	K-20-N/A	Note 29
A13TB4	8	W36P15	F	K-20-N/A	Note 33
A13TB4	8	W44P14	F	K-20-N/A	Note 29
A13TB4	9	W36P15	I	K-20-N/A	Note 33
A13TB4	9	W44P14	I	K-20-N/A	Note 29
A13TB4	10	W36P15	B	K-20-N/A	Note 33
A13TB4	10	W44P14	B	K-20-N/A	Note 29
A14	GND	A15W1		B-12-5	
A14	T1	A15TB2	1	C-14-9	
A14	T2	A15K1	1	C-14-9	
A14DS1	2	A14DS2	2	C-14-9	

Table H-1. Modular Base Petroleum Laboratory (Mod Lab A) Wire List - CONT

From		To		Wire	Remarks
Reference Designation		Reference Designation		Code Sequence	Remarks
Connector	Pin	Connector	Pin		
A14DS2	2	A14DS1	2	C-14-9	
A14DS2	2	A15TB2	3	C-14-9	
A14S1	1	A14S2	1	C-14-9	
A14S2	1	A14S1	1	C-14-9	
A14S2	1	A15TB2	4	C-14-9	
A15	A	A1CB2	A	F-01-0	
A15	A	A15F1	1	B-12-9	
A15	B	A1CB2	B	F-01-2	
A15	C	A1CB2	C	F-01-6	
A15CB1	A	A13K1	1A	B-12-0	
A15CB1	B	A13K1	2A	B-12-2	
A15CB1	C	A13K1	3A	B-12-9	
A15CB2	A	A13K2	1A	B-12-0	
A15CB2	B	A13K2	2A	B-12-2	
A15CB2	C	A13K2	3A	B-12-9	
A15CB3	A	A13K3	1A	B-12-0	
A15CB3	B	A13K3	2A	B-12-2	
A15CB3	C	A13K3	3A	B-12-9	
A15CB4	A	A13K4	1A	B-12-0	
A15CB4	B	A13K4	2A	B-12-2	
A15CB4	C	A13K4	3A	B-12-9	
A15CB5	A	A6K1	1	L-8-0	
A15CB5	B	A6K1	2	L-8-2	
A15CB5	C	A6K1	3	L-8-9	
A15CB6	A	A7	L1	B-12-0	
A15CB6	B	A7	L2	B-12-2	
A15CB6	C	A7	L3	B-12-9	
A15CB7	B	A5S1	1	B-12-9	
A15CB8	A	A8	L1	C-14-9	
A15CB9	A	A4	L1	C-14-9	
A15CB10	B	S3	1	C-14-9	
A15CB11	C	A15TB2	4	C-14-9	
A15CB12	C	J19	1	C-14-9	
A15F1	1	A15	A	B-12-9	
A15F1	2	A28TB1	8	B-12-9	
A15K1	1	A14	T2	C-14-9	
A15K1	1	A31S2	1	C-14-9	
A15K1	2	A31S2	2	C-14-9	
A15K1	3	B10	L	C-14-9	
A15K1	4	A15TB2	3	C-14-9	
A15K1	4	B10	H	C-14-9	
A15TB1	1	A1TB1	5	F-01-9	
A15TB1	1	A13K1	8B	B-12-9	
A15TB1	2	A4	L2	C-14-9	
A15TB1	2	A13K2	8B	B-12-9	
A15TB1	2	A28TB1	6	B-12-9	
A15TB1	3	A5C1	2	B-12-9	
A15TB1	3	A13K3	8B	B-12-9	
A15TB1	4	A8	L2	C-14-9	

**Table H-1. Modular Base Petroleum Laboratory (Mod Lab A) Wire List - CONT**

From		To		Wire	Remarks
Reference Designation		Reference Designation		Code Sequence	Remarks
Connector	Pin	Connector	Pin		
A15TB1	4	A13K4	8B	B-12-9	
A15TB1	5	J19	2	C-14-9	
A15TB1	6	A33TB1	1	C-14-9	
A15TB1	7	A6TB1	2	C-14-9	
A15TB1	7	A13K1	2	D-16-9	
A15TB1	7	A15TB2	3	B-12-9	
A15TB2	1	A14	T1	C-14-9	
A15TB2	1	B9	L	C-14-9	
A15TB2	3	A14DS2	2	C-14-9	
A15TB2	3	A15K1	4	C-14-9	
A15TB2	3	A15TB1	7	B-12-9	
A15TB2	3	B9	C	C-14-9	
A15TB2	3	B10	C	C-14-9	
A15TB2	4	A14S2	1	C-14-9	
A15TB2	4	A15CB11	C	C-14-9	
A15W1		A1W1		F-01-5	
A15W1		A4	GND	B-12-5	
A15W1		A5	GND	B-12-5	
A15W1		A6	GND	B-12-5	
A15W1		A7	GND	B-12-5	
A15W1		A8	GND	B-12-5	
A15W1		A13	E1	B-12-5	
A15W1		A13	E2	B-12-5	
A15W1		A14	GND	B-12-5	
A15W1		A28TB1	9	B-12-5	
A15W1		A32	GND	B-12-5	
A15W1		A33TB1	5	B-12-5	
A15W1		B9	GND	B-12-5	
A15W1		B10	GND	B-12-5	
A15W1		J19	GND	B-12-5	
A15W1		S3	GND	B-12-5	
A17	E1	A29K1	2	C-14-9	
A17	E2	A29K1	X2	C-14-9	
A18	E2	A9	GND	B-12-5	
A18A1	6	A9S11	1	B-12-9	
A18F1	1	A9TB11	1	B-12-0	
A18SSR1	2	A9S12	1	B-12-2	
A19	1	A10K1	2	C-14-9	
A19	4	A1TB2	4	C-14-9	
A19	GND	A1W1		B-12-5	
A20	GND	A1W1		B-12-5	
A20	GND	A12	GND	B-12-5	
A20	GND	A30	GND	E-18-5	
A20TB1	18	A20TB1	H	C-14-9	
A20TB1	18	A20TB2	7	C-14-9	
A20TB1	19	A20TB1	N	C-14-9	
A20TB1	A1	A11	R	B-12-5	
A20TB1	A2	A12	R	C-12-5	
A20TB1	C1	A11	Y	C-14-9	

Table H-1. Modular Base Petroleum Laboratory (Mod Lab A) Wire List - CONT

From		To		Wire	Remarks
Reference Designation		Reference Designation		Code Sequence	Remarks
Connector	Pin	Connector	Pin		
A20TB1	C2	A12	Y	C-14-9	
A20TB1	F1	A20TB2	1	C-14-9	
A20TB1	GND	A11	GND	B-12-5	
A20TB1	H	A20TB1	18	C-14-9	
A20TB1	N	A1TB2	6	C-14-9	
A20TB1	N	A20TB1	19	C-14-9	
A20TB1	N	A30LS1	+	C-14-9	
A20TB1	R1	A11	BLK	C-14-0	
A20TB1	R2	A12	BLK	C-14-0	
A20TB2	1	A1F4	2	A-10-9	
A20TB2	1	A20TB1	F1	C-14-9	
A20TB2	3	A20TB2	4	C-14-9	
A20TB2	4	A20TB2	3	C-14-9	
A20TB2	5	A1K1	5	B-12-9	
A20TB2	6	A1K1	3	B-12-9	
A20TB2	7	A20TB1	18	C-14-9	
A20TB2	7	A20TB2	10	C-14-9	
A20TB2	8	A20TB2	11	C-14-9	
A20TB2	10	A20TB2	7	C-14-9	
A20TB2	11	A20TB2	8	C-14-9	
A20TB2	11	A30LS1	+	C-14-9	
A21TB1	1	DS11	B	N/A	Note 10
A21TB1	1	S11	COM	C-14-9	
A21TB1	2	A48TB1	5	C-14-9	
A21TB1	2	DS12	B	N/A	Note 11
A21TB1	3	A22TB1	9	C-14-9	
A21TB1	3	DS11	W	N/A	Note 10
A21TB1	4	A1TB2	6	C-14-9	
A21TB1	4	A48TB1	4	C-14-9	
A21TB1	4	DS12	W	N/A	Note 11
A21TB1	5	A1CB13	C	C-14-9	
A21TB1	5	DS11	R	N/A	Note 10
A21TB1	6	A22TB1	13	C-14-9	
A21TB1	6	A48TB1	3	C-14-9	
A21TB1	6	DS12	R	N/A	Note 11
A21TB1	7	A1W1		B-12-5	
A21TB1	7	DS11	GND	B-12-5	
A21TB1	7	DS12	GND	B-12-5	
A21TB1	8	A22TB1	7	C-14-9	
A21TB1	8	A48TB1	6	C-14-9	
A22TB1	1	A26J1	C	C-14-9	
A22TB1	1	DS7	BLU	D-16-6	
A22TB1	2	A26J1	D	C-14-9	
A22TB1	2	DS7	ORG	D-16-3	
A22TB1	3	A26J1	E	C-14-9	
A22TB1	3	DS7	W	D-16-4	
A22TB1	4	A26J1	F	C-14-9	
A22TB1	4	DS7	BLK/W	D-16-1	
A22TB1	5	A26	GND	C-14-9	

**Table H-1. Modular Base Petroleum Laboratory (Mod Lab A) Wire List - CONT**

From		To		Wire	Remarks
Reference Designation		Reference Designation		Code Sequence	Remarks
Connector	Pin	Connector	Pin		
A22TB1	5	DS7	GND	B-12-5	
A22TB1	5	DS8	GND	B-12-5	
A22TB1	6	DS6	GND	B-12-5	
A22TB1	6	DS9	GND	B-12-5	
A22TB1	7	A21TB1	8	C-14-9	
A22TB1	7	A23TB1	1	C-14-9	
A22TB1	7	DS10	GND	B-12-5	
A22TB1	8	A26J1	B	C-14-9	
A22TB1	8	DS7	RED	D-16-2	
A22TB1	8	DS8	W	N/A	Note 7
A22TB1	9	A21TB1	3	C-14-9	
A22TB1	9	DS9	W	N/A	Note 8
A22TB1	10	A23TB1	3	C-14-9	
A22TB1	10	DS6	W	N/A	Note 6
A22TB1	10	DS10	W	N/A	Note 9
A22TB1	11	A48TB1	5	C-14-9	
A22TB1	11	DS7	BLK	D-16-0	
A22TB1	12	A26J1	A	C-14-9	
A22TB1	12	DS6	R	N/A	Note 6
A22TB1	12	DS8	R	N/A	Note 7
A22TB1	13	A21TB1	6	C-14-9	
A22TB1	13	A23TB1	5	C-14-9	
A22TB1	13	DS9	R	N/A	Note 8
A22TB1	13	DS10	R	N/A	Note 9
A22TB1	14	DS8	B	N/A	Note 7
A22TB1	15	DS6	B	N/A	Note 6
A22TB1	15	DS9	B	N/A	Note 8
A22TB1	17	DS10	B	N/A	Note 9
A22TB1	17	S9	COM	C-14-9	
A22TB1	18	A24S2	2	C-14-9	
A22TB1	18	A26J1	G	C-14-9	
A22TB1	19	A26J1	H	C-14-9	
A22TB1	19	S17	2	C-14-9	
A23TB1	1	A22TB1	7	C-14-9	
A23TB1	1	DS2	GND	B-12-5	
A23TB1	1	DS3	GND	B-12-5	
A23TB1	2	DS1	GND	B-12-5	
A23TB1	2	DS4	GND	B-12-5	
A23TB1	2	DS5	GND	B-12-5	
A23TB1	3	A22TB1	10	C-14-9	
A23TB1	3	DS2	W	N/A	Note 2
A23TB1	3	DS3	W	N/A	Note 3
A23TB1	4	DS1	W	N/A	Note 1
A23TB1	4	DS4	W	N/A	Note 4
A23TB1	4	DS5	W	N/A	Note 5
A23TB1	5	A22TB1	13	C-14-9	
A23TB1	5	DS2	R	N/A	Note 2
A23TB1	5	DS3	R	N/A	Note 3
A23TB1	6	DS1	R	N/A	Note 1



Table H-1. Modular Base Petroleum Laboratory (Mod Lab A) Wire List - CONT

From		To		Wire	Remarks
Reference Designation		Reference Designation		Code Sequence	Remarks
Connector	Pin	Connector	Pin		
A23TB1	6	DS4	R	N/A	Note 4
A23TB1	6	DS5	R	N/A	Note 5
A23TB1	7	DS2	B	N/A	Note 2
A23TB1	7	DS3	B	N/A	Note 3
A23TB1	7	DS4	B	N/A	Note 4
A23TB1	9	DS1	B	N/A	Note 1
A23TB1	10	DS5	B	N/A	Note 5
A23TB1	10	S10	COM	C-14-9	
A24	GND	A1W1		B-12-5	
A24	GND	S12	GND	B-12-5	
A24	GND	S17	GND	B-12-5	
A24S1	1	A25S1	2	C-14-9	
A24S1	2	S12	COM	C-14-9	
A24S2	1	A25S2	2	C-14-9	
A24S2	2	A22TB1	18	C-14-9	
A24S3	1	A25S3	2	C-14-9	
A24S3	2	S13	COM	C-14-9	
A24S4	1	A25S4	2	C-14-9	
A24S4	2	A9S16	1	C-14-9	
A24S4	2	S14	COM	C-14-9	
A24S5	1	A25S5	2	C-14-9	
A24S5	2	A48TB1	1	C-14-9	
A25	GND	A1W1		B-12-5	
A25	GND	S9	GND	B-12-5	
A25	GND	S18	GND	B-12-5	
A25S1	1	A1CB9	A	C-14-9	
A25S1	2	A24S1	1	C-14-9	
A25S2	1	S17	1	C-14-9	
A25S2	2	A24S2	1	C-14-9	
A25S3	1	A1CB11	B	C-14-9	
A25S3	2	A24S3	1	C-14-9	
A25S4	1	A1CB13	C	C-14-9	
A25S4	2	A24S4	1	C-14-9	
A25S5	1	S18	1	C-14-9	
A25S5	2	A24S5	1	C-14-9	
A26	GND	A22TB1	5	C-14-9	
A26J1	A	A22TB1	12	C-14-9	
A26J1	B	A22TB1	8	C-14-9	
A26J1	C	A22TB1	1	C-14-9	
A26J1	D	A22TB1	2	C-14-9	
A26J1	E	A22TB1	3	C-14-9	
A26J1	F	A22TB1	4	C-14-9	
A26J1	G	A22TB1	18	C-14-9	
A26J1	H	A22TB1	19	C-14-9	
A27	GND	A48TB1	6	C-14-9	
A27J1	A	A48TB1	3	C-14-9	
A27J1	B	A48TB1	4	C-14-9	
A27J1	C	A48TB1	10	C-14-9	
A27J1	D	A48TB1	9	C-14-9	

**Table H-1. Modular Base Petroleum Laboratory (Mod Lab A) Wire List - CONT**

From		To		Wire	Remarks
Reference Designation		Reference Designation		Code Sequence	Remarks
Connector	Pin	Connector	Pin		
A27J1	E	A48TB1	8	C-14-9	
A27J1	F	A48TB1	7	C-14-9	
A27J1	G	A48TB1	2	C-14-9	
A27J1	H	A48TB1	1	C-14-9	
A28	GND	A28TB1	10	B-12-5	
A28TB1	1	A43TB1	5	B-12-9	
A28TB1	1	S5	1	C-14-9	
A28TB1	1	S6	1	C-14-9	
A28TB1	1	S19	1	C-14-9	
A28TB1	2	A3TB1	1	B-12-0	
A28TB1	2	S5	2	C-14-9	
A28TB1	3	A3TB1	2	B-12-0	
A28TB1	3	S6	2	C-14-9	
A28TB1	4	A3TB1	2	B-12-0	
A28TB1	4	S19	2	C-14-9	
A28TB1	5	B4	T1	C-14-9	
A28TB1	5	B5	T1	C-14-9	
A28TB1	5	B11	T1	C-14-9	
A28TB1	6	A15TB1	2	B-12-9	
A28TB1	6	B1	T1	C-14-9	
A28TB1	6	B2	T1	C-14-9	
A28TB1	6	B3	T1	C-14-9	
A28TB1	7	B4	T2	C-14-9	
A28TB1	7	B5	T2	C-14-9	
A28TB1	7	B11	T2	C-14-9	
A28TB1	8	A15F1	2	B-12-9	
A28TB1	8	B1	T2	C-14-9	
A28TB1	8	B2	T2	C-14-9	
A28TB1	8	B3	T2	C-14-9	
A28TB1	9	A15W1		B-12-5	
A28TB1	9	B1	GND	B-12-5	
A28TB1	9	B2	GND	B-12-5	
A28TB1	9	B3	GND	B-12-5	
A28TB1	9	S5	GND	B-12-5	
A28TB1	9	S6	GND	B-12-5	
A28TB1	9	S19	GND	B-12-5	
A28TB1	10	A28	GND	B-12-5	
A28TB1	10	B4	GND	B-12-5	
A28TB1	10	B5	GND	B-12-5	
A28TB1	10	B11	GND	B-12-5	
A29	GND	A1W1		B-12-5	
A29K1	1	A1CB17	B	C-14-9	
A29K1	1	S8	1	C-14-9	
A29K1	2	A17	E1	C-14-9	
A29K1	X1	S8	2	C-14-9	
A29K1	X2	A1TB2	3	C-14-9	
A29K1	X2	A17	E2	C-14-9	
A30	GND	A20	GND	E-18-5	
A30LS1	+	A20TB1	N	C-14-9	

Table H-1. Modular Base Petroleum Laboratory (Mod Lab A) Wire List - CONT

From		To		Wire	Remarks
Reference Designation		Reference Designation		Code Sequence	Remarks
Connector	Pin	Connector	Pin		
A30LS1	+	A20TB2	11	C-14-9	
A31DS1	E1	A9DS1	E1	D-16-9	
A31DS1	E2	S15	2	C-14-9	
A31J1	1	A1CB20	C	C-14-9	
A31J1	2	A1TB2	5	C-14-9	
A31J1	GND	A1W1		C-14-9	
A31S2	1	A15K1	1	C-14-9	
A31S2	2	A15K1	2	C-14-9	
A32	GND	A15W1		B-12-5	
A32S1	1	S3	2	C-14-9	
A32S1	2	A33TB1	3	C-14-9	
A33TB1	1	A15TB1	6	C-14-9	
A33TB1	1	DS14	W	N/A	Note 12
A33TB1	1	DS15	W	N/A	Note 13
A33TB1	2	DS14	R	N/A	Note 12
A33TB1	2	DS15	R	N/A	Note 13
A33TB1	2	S3	1	C-14-9	
A33TB1	3	A32S1	2	C-14-9	
A33TB1	3	DS14	B	N/A	Note 12
A33TB1	4	DS15	B	N/A	Note 13
A33TB1	5	A15W1		B-12-5	
A33TB1	5	DS14	GND	B-12-5	
A33TB1	5	DS15	GND	B-12-5	
A34	E1	A1W1		G-04-5	
A34J1	A	A1CB1	A	G-04-0	
A34J1	B	A1CB1	B	G-04-2	
A34J1	C	A1CB1	C	G-04-6	
A34J1	G	A1W1		G-04-5	
A34J1	G	A1W1		G-04-5	
A34J1	G	A1W1		G-04-5	
A34J1	G	A1W1		G-04-5	
A34J1	N	A1TB2	1	G-04-9	
A34J2	1	A1CB21	B	C-14-9	
A34J2	2	A1TB2	5	C-14-9	
A34J2	GND	A1W1		B-12-5	
A34LS1	-	A43TB1	2	E-18-9	
A34LS1	+	A43TB1	5	E-18-9	
A35	J1	W9	P2	N/A	Note 14
A35	P7	W9	P12	N/A	Note 18
A36	J1	W10	P2	N/A	Note 15
A36	P7	W10	P12	N/A	Note 19
A37	J1	W11	P2	N/A	Note 16
A37	P7	W11	P12	N/A	Note 20
A38	J1	W12	P2	N/A	Note 17
A38	P7	W12	P12	N/A	Note 21
A39		A13			Note 30
A40		A13			Note 31
A41		A13			Note 32
A42		A13			Note 33

Table H-1. Modular Base Petroleum Laboratory (Mod Lab A) Wire List - CONT

From		To		Wire	Remarks
Reference Designation		Reference Designation		Code Sequence	Remarks
Connector	Pin	Connector	Pin		
A43	E1	A43TB1	3	B-12-5	
A43TB1	1	A3XK1	3	C-14-9	
A43TB1	1	B12	T2	C-14-9	
A43TB1	2	A3K3	X2	C-14-9	
A43TB1	2	A34LS1	-	E-18-9	
A43TB1	2	B12	T1	C-14-9	
A43TB1	3	A3	E1	B-12-5	
A43TB1	3	A43	E1	B-12-5	
A43TB1	3	B12	GND	B-12-5	
A43TB1	4	S20	GND	C-14-5	
A43TB1	5	A28TB1	1	B-12-9	
A43TB1	5	A34LS1	+	E-18-9	
A43TB1	5	S20	2	C-14-9	
A43TB1	6	A3TB1	1	C-14-9	
A43TB1	6	S20	1	C-14-9	
A44	J1	A13			Note 22
A44	J1	W9	P1	N/A	Note 14
A44	J2	A13			Note 26
A44	J2	W9	P13	N/A	Note 18
A44	P1	W25	P1	N/A	Note 22
A44	P2	W41	P14	N/A	Note 26
A45	J1	A13			Note 23
A45	J1	W10	P1	N/A	Note 15
A45	J2	A13			Note 27
A45	J2	W10	P13	N/A	Note 19
A45	P1	W26	P1	N/A	Note 23
A45	P2	W42	P14	N/A	Note 27
A46	J1	A13			Note 24
A46	J1	W11	P1	N/A	Note 16
A46	J2	A13			Note 28
A46	J2	W11	P13	N/A	Note 20
A46	P1	W27	P1	N/A	Note 24
A46	P2	W43	P14	N/A	Note 28
A47	J1	W12	P1	N/A	Note 17
A47	J2	W12	P13	N/A	Note 21
A47	P1	W28	P1	N/A	Note 25
A47	P2	W44	P14	N/A	Note 29
A47	J1	A13			Note 25
A47	J2	A13			Note 29
A48TB1	1	A24S5	2	C-14-9	
A48TB1	1	A27J1	H	C-14-9	
A48TB1	10	A27J1	C	C-14-9	
A48TB1	10	DS13	BLU	I-16-6	
A48TB1	2	A27J1	G	C-14-9	
A48TB1	2	S18	2	C-14-9	
A48TB1	3	A21TB1	6	C-14-9	
A48TB1	3	A27J1	A	C-14-9	
A48TB1	4	A21TB1	4	C-14-9	
A48TB1	4	A27J1	B	C-14-9	

**Table H-1. Modular Base Petroleum Laboratory (Mod Lab A) Wire List - CONT**

From		To		Wire	Remarks
Reference Designation		Reference Designation		Code Sequence	Remarks
Connector	Pin	Connector	Pin		
A48TB1	4	DS13	RED	I-16-2	
A48TB1	5	A21TB1	2	C-14-9	
A48TB1	5	A22TB1	11	C-14-9	
A48TB1	5	DS13	BLK	I-16-0	
A48TB1	6	A21TB1	8	C-14-9	
A48TB1	6	A27	GND	C-14-9	
A48TB1	6	DS13	GND	B-12-5	
A48TB1	7	A27J1	F	C-14-9	
A48TB1	7	DS13	BLK/W	I-16-1	
A48TB1	8	A27J1	E	C-14-9	
A48TB1	8	DS13	YEL	I-16-4	
A48TB1	9	A27J1	D	C-14-9	
A48TB1	9	DS13	ORG	I-16-3	
B1	E1	A6K3	E1	C-14-9	
B1	E2	A6K3	E2	C-14-9	
B1	GND	A6	GND	B-12-5	
B1	GND	A28TB1	9	B-12-5	
B1	T1	A28TB1	6	C-14-9	
B1	T2	A28TB1	8	C-14-9	
B2	GND	A28TB1	9	B-12-5	
B2	T1	A28TB1	6	C-14-9	
B2	T2	A28TB1	8	C-14-9	
B3	GND	A28TB1	9	B-12-5	
B3	T1	A28TB1	6	C-14-9	
B3	T2	A28TB1	8	C-14-9	
B4	GND	A28TB1	10	B-12-5	
B4	T1	A28TB1	5	C-14-9	
B4	T2	A28TB1	7	C-14-9	
B5	GND	A28TB1	10	B-12-5	
B5	T1	A28TB1	5	C-14-9	
B5	T2	A28TB1	7	C-14-9	
B6	E1	A4	T1	C-14-9	
B6	E2	A4	T2	C-14-9	
B6	GND	A4	GND	B-12-5	
B7	E1	A7	T1	B-12-9	
B7	E2	A7	T2	B-12-9	
B7	E3	A7	T3	B-12-9	
B7	GND	A7	GND	B-12-5	
B8	E1	A8	T1	C-14-9	
B8	E2	A8	T2	C-14-9	
B8	GND	A8	GND	B-12-5	
B9	C	A15TB2	3	C-14-9	
B9	GND	A15W1		B-12-5	
B9	L	A15TB2	1	C-14-9	
B10	C	A15TB2	3	C-14-9	
B10	GND	A15W1		B-12-5	
B10	H	A15K1	4	C-14-9	
B10	L	A15K1	3	C-14-9	
B11	GND	A28TB1	10	B-12-5	

Table H-1. Modular Base Petroleum Laboratory (Mod Lab A) Wire List - CONT

From Reference Designation		To Reference Designation		Wire Code Sequence	Remarks
Connector	Pin	Connector	Pin		
B11	T1	A28TB1	5	C-14-9	
B11	T2	A28TB1	7	C-14-9	
B12	GND	A43TB1	3	B-12-5	
B12	T1	A43TB1	2	C-14-9	
B12	T2	A43TB1	1	C-14-9	
DS1	B	A23TB1	9	N/A	Note 1
DS1	GND	A23TB1	2	B-12-5	
DS1	R	A23TB1	6	N/A	Note 1
DS1	W	A23TB1	4	N/A	Note 1
DS2	B	A23TB1	7	N/A	Note 2
DS2	GND	A23TB1	1	B-12-5	
DS2	R	A23TB1	5	N/A	Note 2
DS2	W	A23TB1	3	N/A	Note 2
DS3	B	A23TB1	7	N/A	Note 3
DS3	GND	A23TB1	1	B-12-5	
DS3	R	A23TB1	5	N/A	Note 3
DS3	W	A23TB1	3	N/A	Note 3
DS4	B	A23TB1	7	N/A	Note 4
DS4	GND	A23TB1	2	B-12-5	
DS4	R	A23TB1	6	N/A	Note 4
DS4	W	A23TB1	4	N/A	Note 4
DS5	B	A23TB1	10	N/A	Note 5
DS5	GND	A23TB1	2	B-12-5	
DS5	R	A23TB1	6	N/A	Note 5
DS5	W	A23TB1	4	N/A	Note 5
DS6	B	A22TB1	15	N/A	Note 6
DS6	GND	A22TB1	6	B-12-5	
DS6	R	A22TB1	12	N/A	Note 6
DS6	W	A22TB1	10	N/A	Note 6
DS7	BLK	A22TB1	11	D-16-0	
DS7	BLK/W	A22TB1	4	D-16-1	
DS7	BLU	A22TB1	1	D-16-6	
DS7	GND	A22TB1	5	B-12-5	
DS7	ORG	A22TB1	2	D-16-3	
DS7	RED	A22TB1	8	D-16-2	
DS7	W	A22TB1	3	D-16-4	
DS8	B	A22TB1	14	N/A	Note 7
DS8	GND	A22TB1	5	B-12-5	
DS8	R	A22TB1	12	N/A	Note 7
DS8	W	A22TB1	8	N/A	Note 7
DS9	B	A22TB1	15	N/A	Note 8
DS9	GND	A22TB1	6	B-12-5	
DS9	R	A22TB1	13	N/A	Note 8
DS9	W	A22TB1	9	N/A	Note 8
DS10	B	A22TB1	17	N/A	Note 9
DS10	GND	A22TB1	7	B-12-5	
DS10	R	A22TB1	13	N/A	Note 9
DS10	W	A22TB1	10	N/A	Note 9
DS11	B	A21TB1	1	N/A	Note 10

**Table H-1. Modular Base Petroleum Laboratory (Mod Lab A) Wire List - CONT**

From		To		Wire	Remarks
Reference Designation		Reference Designation		Code Sequence	Remarks
Connector	Pin	Connector	Pin		
DS11	GND	A21TB1	7	B-12-5	
DS11	R	A21TB1	5	N/A	Note 10
DS11	W	A21TB1	3	N/A	Note 10
DS12	B	A21TB1	2	N/A	Note 11
DS12	GND	A21TB1	7	B-12-5	
DS12	R	A21TB1	6	N/A	Note 11
DS12	W	A21TB1	4	N/A	Note 11
DS13	BLK	A48TB1	5	I-16-0	
DS13	BLK/W	A48TB1	7	I-16-1	
DS13	BLU	A48TB1	10	I-16-6	
DS13	GND	A48TB1	6	B-12-5	
DS13	ORG	A48TB1	9	I-16-3	
DS13	RED	A48TB1	4	I-16-2	
DS13	YEL	A48TB1	8	I-16-4	
DS14	B	A33TB1	3	N/A	Note 12
DS14	GND	A33TB1	5	B-12-5	
DS14	R	A33TB1	2	N/A	Note 12
DS14	W	A33TB1	1	N/A	Note 12
DS15	B	A33TB1	4	N/A	Note 13
DS15	GND	A33TB1	5	B-12-5	
DS15	R	A33TB1	2	N/A	Note 13
DS15	W	A33TB1	1	N/A	Note 13
J1	1	J2	1	B-12-9	
J1	2	J2	2	B-12-9	
J1	GND	J2	GND	B-12-5	
J2	1	A1CB3	A	B-12-9	
J2	1	J1	1	B-12-9	
J2	2	A1TB1	1	B-12-9	
J2	2	J1	2	B-12-9	
J2	GND	A1W1		B-12-5	
J2	GND	J1	GND	B-12-5	
J3	1	A1CB4	A	B-12-9	
J3	2	A1TB1	1	B-12-9	
J3	GND	A1W1		B-12-5	
J4	1	J5	1	C-14-9	
J4	2	J5	2	C-14-9	
J4	GND	J5	GND	B-12-5	
J5	1	A1CB5	B	C-14-9	
J5	1	J4	1	C-14-9	
J5	2	A1TB1	2	C-14-9	
J5	2	J4	2	C-14-9	
J5	GND	A1W1		B-12-5	
J5	GND	J4	GND	B-12-5	
J6	1	A1CB6	B	C-14-9	
J6	1	J7	1	C-14-9	
J6	2	A1TB1	2	C-14-9	
J6	2	J7	2	C-14-9	
J6	GND	A1W1		B-12-5	
J6	GND	J7	GND	B-12-5	

**Table H-1. Modular Base Petroleum Laboratory (Mod Lab A) Wire List - CONT**

From Reference Designation		To Reference Designation		Wire Code Sequence	Remarks
Connector	Pin	Connector	Pin		
J7	1	J6	1	C-14-9	
J7	2	J6	2	C-14-9	
J7	GND	J6	GND	B-12-5	
J8	1	A1CB7	C	B-12-9	
J8	2	A1TB1	3	B-12-9	
J8	GND	A1W1		B-12-5	
J9	1	J10	1	C-14-9	
J9	2	J10	2	C-14-9	
J9	GND	J10	GND	B-12-5	
J10	1	J9	1	C-14-9	
J10	1	J11	1	C-14-9	
J10	2	J9	2	C-14-9	
J10	2	J11	2	C-14-9	
J10	GND	J9	GND	B-12-5	
J10	GND	J11	GND	B-12-5	
J11	1	A1CB8	C	C-14-9	
J11	1	J10	1	C-14-9	
J11	2	A1TB1	3	C-14-9	
J11	2	J10	2	C-14-9	
J11	GND	A1W1		B-12-5	
J11	GND	J10	GND	B-12-5	
J12	1	A1CB10	A	C-14-9	
J12	2	A1TB1	4	C-14-9	
J12	GND	A1W1		B-12-5	
J13	1	A1CB12	B	B-12-9	
J13	2	A1TB1	4	B-12-9	
J13	GND	A1W1		B-12-5	
J14	1	A1CB14	C	C-14-9	
J14	2	A1TB2	2	C-14-9	
J14	GND	A1W1		B-12-5	
J15	1	J16	1	C-14-9	
J15	2	J16	2	C-14-9	
J15	GND	J16	GND	B-12-5	
J16	1	A1CB16	A	C-14-9	
J16	1	J15	1	C-14-9	
J16	2	A1TB2	3	C-14-9	
J16	2	J15	2	C-14-9	
J16	GND	A1W1		B-12-5	
J16	GND	J15	GND	B-12-5	
J19	1	A15CB12	C	C-14-9	
J19	2	A15TB1	5	C-14-9	
J19	GND	A15W1		B-12-5	
K1	X1	A5S1	1	H-14-0	
K1	X2	A5C1	2	H-14-9	
S1	1	A7S1	2	H-14-0	
S1	2	A7	X2	H-14-0	
S2	1	A8	X2	E-18-0	
S2	2	A8	L2	E-18-9	
S3	1	A15CB10	B	C-14-9	



**Table H-1. Modular Base Petroleum Laboratory (Mod Lab A) Wire List - CONT**

From		To		Wire	Remarks
Reference Designation		Reference Designation		Code Sequence	Remarks
Connector	Pin	Connector	Pin		
S3	1	A33TB1	2	C-14-9	
S3	2	A32S1	1	C-14-9	
S3	GND	A15W1		B-12-5	
S5	1	A28TB1	1	C-14-9	
S5	2	A28TB1	2	C-14-9	
S5	GND	A28TB1	9	B-12-5	
S6	1	A28TB1	1	C-14-9	
S6	2	A28TB1	3	C-14-9	
S6	GND	A28TB1	9	B-12-5	
S7	C	A1TB1	6	A-10-9	
S7	GND	A1W1		A-10-5	
S7	L1	A1CB15	A	A-10-9	
S8	1	A29K1	1	C-14-9	
S8	2	A29K1	X1	C-14-9	
S9	1	S12	1	C-14-9	
S9	2	S12	2	C-14-9	
S9	COM	A22TB1	17	C-14-9	
S9	GND	A25	GND	B-12-5	
S9	GND	S10	GND	B-12-5	
S10	1	S13	1	C-14-9	
S10	2	S13	2	C-14-9	
S10	COM	A23TB1	10	C-14-9	
S10	GND	S9	GND	B-12-5	
S10	GND	S11	GND	B-12-5	
S11	1	S14	1	C-14-9	
S11	2	S14	2	C-14-9	
S11	COM	A21TB1	1	C-14-9	
S11	GND	S10	GND	B-12-5	
S12	1	S9	1	C-14-9	
S12	2	S9	2	C-14-9	
S12	COM	A24S1	2	C-14-9	
S12	GND	A24	GND	B-12-5	
S12	GND	S13	GND	B-12-5	
S13	1	S10	1	C-14-9	
S13	2	S10	2	C-14-9	
S13	COM	A24S3	2	C-14-9	
S13	GND	S12	GND	B-12-5	
S13	GND	S14	GND	B-12-5	
S14	1	S11	1	C-14-9	
S14	2	S11	2	C-14-9	
S14	COM	A24S4	2	C-14-9	
S14	GND	S13	GND	B-12-5	
S15	1	S16	1	D-16-9	
S15	2	A31DS1	E2	C-14-9	
S16	1	S15	1	D-16-9	
S16	2	A9DS1	E2	C-14-9	
S17	1	A25S2	1	C-14-9	
S17	2	A22TB1	19	C-14-9	
S17	GND	A24	GND	B-12-5	

**Table H-1. Modular Base Petroleum Laboratory (Mod Lab A) Wire List - CONT**

From		To		Wire	Remarks
Reference Designation		Reference Designation		Code Sequence	Remarks
Connector	Pin	Connector	Pin		
S18	1	A25S5	1	C-14-9	
S18	2	A48TB1	2	C-14-9	
S18	GND	A25	GND	B-12-5	
S19	1	A28TB1	1	C-14-9	
S19	2	A28TB1	4	C-14-9	
S19	GND	A28TB1	9	B-12-5	
S20	1	A43TB1	6	C-14-9	
S20	2	A43TB1	5	C-14-9	
S20	GND	A43TB1	4	C-14-5	
W9	P1	A44	J1	N/A	Note 14
W9	P2	A35	J1	N/A	Note 14
W9	P12	A35	P7	N/A	Note 18
W9	P13	A44	J2	N/A	Note 18
W9P1	A	W9P2	A	B-12-9	Note 14
W9P1	B	W9P2	B	B-12-9	Note 14
W9P1	C	W9P2	C	B-12-9	Note 14
W9P1	D	W9P2	D	B-12-9	Note 14
W9P1	E	W9P2	E	B-12-9	Note 14
W9P2	A	W9P1	A	B-12-9	Note 14
W9P2	B	W9P1	B	B-12-9	Note 14
W9P2	C	W9P1	C	B-12-9	Note 14
W9P2	D	W9P1	D	B-12-9	Note 14
W9P2	E	W9P1	E	B-12-9	Note 14
W9P12	A	W9P13	A	K-20-4	Note 18
W9P12	B	W9P13	B	K-20-2	Note 18
W9P12	C	W9P13	C	K-20-3	Note 18
W9P12	D	W9P13	D	K-20-1	Note 18
W9P12	E	W9P13	E	K-20-5	Note 18
W9P12	F	W9P13	F	K-20-0	Note 18
W9P12	G	W9P13	G	K-20-6	Note 18
W9P12	H	W9P13	H	K-20-8	Note 18
W9P12	I	W9P13	I	K-20-9	Note 18
W9P12	N	W9P13	N	K-20-9/0	Note 18
W9P12	P	W9P13	P	K-20-7	Note 18
W9P12	R	W9P13	R	K-20-9/3	Note 18
W9P13	A	W9P12	A	K-20-4	Note 18
W9P13	B	W9P12	B	K-20-2	Note 18
W9P13	C	W9P12	C	K-20-3	Note 18
W9P13	D	W9P12	D	K-20-1	Note 18
W9P13	E	W9P12	E	K-20-5	Note 18
W9P13	F	W9P12	F	K-20-0	Note 18
W9P13	G	W9P12	G	K-20-6	Note 18
W9P13	H	W9P12	H	K-20-8	Note 18
W9P13	I	W9P12	I	K-20-9	Note 18
W9P13	N	W9P12	N	K-20-9/0	Note 18
W9P13	P	W9P12	P	K-20-7	Note 18
W9P13	R	W9P12	R	K-20-9/3	Note 18
W10	P1	A45	J1	N/A	Note 15
W10	P2	A36	J1	N/A	Note 15

Table H-1. Modular Base Petroleum Laboratory (Mod Lab A) Wire List - CONT

From Reference Designation		To Reference Designation		Wire Code Sequence	Remarks
Connector	Pin	Connector	Pin		
W10	P12	A36	P7	N/A	Note 19
W10	P13	A45	J2	N/A	Note 19
W10P1	A	W10P2	A	B-12-9	Note 15
W10P1	B	W10P2	B	B-12-9	Note 15
W10P1	C	W10P2	C	B-12-9	Note 15
W10P1	D	W10P2	D	B-12-9	Note 15
W10P1	E	W10P2	E	B-12-9	Note 15
W10P2	A	W10P1	A	B-12-9	Note 15
W10P2	B	W10P1	B	B-12-9	Note 15
W10P2	C	W10P1	C	B-12-9	Note 15
W10P2	D	W10P1	D	B-12-9	Note 15
W10P2	E	W10P1	E	B-12-9	Note 15
W10P12	A	W10P13	A	K-20-4	Note 19
W10P12	B	W10P13	B	K-20-2	Note 19
W10P12	C	W10P13	C	K-20-3	Note 19
W10P12	D	W10P13	D	K-20-1	Note 19
W10P12	E	W10P13	E	K-20-5	Note 19
W10P12	F	W10P13	F	K-20-0	Note 19
W10P12	G	W10P13	G	K-20-6	Note 19
W10P12	H	W10P13	H	K-20-8	Note 19
W10P12	I	W10P13	I	K-20-9	Note 19
W10P12	N	W10P13	N	K-20-9/0	Note 19
W10P12	P	W10P13	P	K-20-7	Note 19
W10P12	R	W10P13	R	K-20-9/3	Note 19
W10P13	A	W10P12	A	K-20-4	Note 19
W10P13	B	W10P12	B	K-20-2	Note 19
W10P13	C	W10P12	C	K-20-3	Note 19
W10P13	D	W10P12	D	K-20-1	Note 19
W10P13	E	W10P12	E	K-20-5	Note 19
W10P13	F	W10P12	F	K-20-0	Note 19
W10P13	G	W10P12	G	K-20-6	Note 19
W10P13	H	W10P12	H	K-20-8	Note 19
W10P13	I	W10P12	I	K-20-9	Note 19
W10P13	N	W10P12	N	K-20-9/0	Note 19
W10P13	P	W10P12	P	K-20-7	Note 19
W10P13	R	W10P12	R	K-20-9/3	Note 19
W11	P1	A46	J1	N/A	Note 16
W11	P2	A37	J1	N/A	Note 16
W11	P12	A37	P7	N/A	Note 20
W11	P13	A46	J2	N/A	Note 20
W11P1	A	W11P2	A	B-12-9	Note 16
W11P1	B	W11P2	B	B-12-9	Note 16
W11P1	C	W11P2	C	B-12-9	Note 16
W11P1	D	W11P2	D	B-12-9	Note 16
W11P1	E	W11P2	E	B-12-9	Note 16
W11P2	A	W11P1	A	B-12-9	Note 16
W11P2	B	W11P1	B	B-12-9	Note 16
W11P2	C	W11P1	C	B-12-9	Note 16
W11P2	D	W11P1	D	B-12-9	Note 16

Table H-1. Modular Base Petroleum Laboratory (Mod Lab A) Wire List - CONT

From		To		Wire	Remarks
Reference Designation		Reference Designation		Code Sequence	Remarks
Connector	Pin	Connector	Pin		
W11P2	E	W11P1	E	B-12-9	Note 16
W11P12	A	W11P13	A	K-20-4	Note 20
W11P12	B	W11P13	B	K-20-2	Note 20
W11P12	C	W11P13	C	K-20-3	Note 20
W11P12	D	W11P13	D	K-20-1	Note 20
W11P12	E	W11P13	E	K-20-5	Note 20
W11P12	F	W11P13	F	K-20-0	Note 20
W11P12	G	W11P13	G	K-20-6	Note 20
W11P12	H	W11P13	H	K-20-8	Note 20
W11P12	I	W11P13	I	K-20-9	Note 20
W11P12	N	W11P13	N	K-20-9/0	Note 20
W11P12	P	W11P13	P	K-20-7	Note 20
W11P12	R	W11P13	R	K-20-9/3	Note 20
W11P13	A	W11P12	A	K-20-4	Note 20
W11P13	B	W11P12	B	K-20-2	Note 20
W11P13	C	W11P12	C	K-20-3	Note 20
W11P13	D	W11P12	D	K-20-1	Note 20
W11P13	E	W11P12	E	K-20-5	Note 20
W11P13	F	W11P12	F	K-20-0	Note 20
W11P13	G	W11P12	G	K-20-6	Note 20
W11P13	H	W11P12	H	K-20-8	Note 20
W11P13	I	W11P12	I	K-20-9	Note 20
W11P13	N	W11P12	N	K-20-9/0	Note 20
W11P13	P	W11P12	P	K-20-7	Note 20
W11P13	R	W11P12	R	K-20-9/3	Note 20
W12	P1	A47	J1	N/A	Note 17
W12	P2	A38	J1	N/A	Note 17
W12	P12	A38	P7	N/A	Note 21
W12	P13	A47	J2	N/A	Note 21
W12P1	A	W12P2	A	B-12-9	Note 17
W12P1	B	W12P2	B	B-12-9	Note 17
W12P1	C	W12P2	C	B-12-9	Note 17
W12P1	D	W12P2	D	B-12-9	Note 17
W12P1	E	W12P2	E	B-12-9	Note 17
W12P2	A	W12P1	A	B-12-9	Note 17
W12P2	B	W12P1	B	B-12-9	Note 17
W12P2	C	W12P1	C	B-12-9	Note 17
W12P2	D	W12P1	D	B-12-9	Note 17
W12P2	E	W12P1	E	B-12-9	Note 17
W12P12	A	W12P13	A	K-20-4	Note 21
W12P12	B	W12P13	B	K-20-2	Note 21
W12P12	C	W12P13	C	K-20-3	Note 21
W12P12	D	W12P13	D	K-20-1	Note 21
W12P12	E	W12P13	E	K-20-5	Note 21
W12P12	F	W12P13	F	K-20-0	Note 21
W12P12	G	W12P13	G	K-20-6	Note 21
W12P12	H	W12P13	H	K-20-8	Note 21
W12P12	I	W12P13	I	K-20-9	Note 21
W12P12	N	W12P13	N	K-20-9/0	Note 21

Table H-1. Modular Base Petroleum Laboratory (Mod Lab A) Wire List - CONT

From		To		Wire	Remarks
Reference Designation		Reference Designation		Code Sequence	Remarks
Connector	Pin	Connector	Pin		
W12P12	P	W12P13	P	K-20-7	Note 21
W12P12	R	W12P13	R	K-20-9/3	Note 21
W12P13	A	W12P12	A	K-20-4	Note 21
W12P13	B	W12P12	B	K-20-2	Note 21
W12P13	C	W12P12	C	K-20-3	Note 21
W12P13	D	W12P12	D	K-20-1	Note 21
W12P13	E	W12P12	E	K-20-5	Note 21
W12P13	F	W12P12	F	K-20-0	Note 21
W12P13	G	W12P12	G	K-20-6	Note 21
W12P13	H	W12P12	H	K-20-8	Note 21
W12P13	I	W12P12	I	K-20-9	Note 21
W12P13	N	W12P12	N	K-20-9/0	Note 21
W12P13	P	W12P12	P	K-20-7	Note 21
W12P13	R	W12P12	R	K-20-9/3	Note 21
W25	P1	A44	P1	N/A	Note 22
W25P1	A	A13K1	1B	B-12-9	Note 22
W25P1	B	A13K1	2B	B-12-9	Note 22
W25P1	C	A13K1	3B	B-12-9	Note 22
W25P1	D	A13K1	8B	B-12-9	Note 22
W25P1	E	A13	E1	B-12-9	Note 22
W26	P1	A45	P1	N/A	Note 23
W26P1	A	A13K2	1B	B-12-9	Note 23
W26P1	B	A13K2	2B	B-12-9	Note 23
W26P1	C	A13K2	3B	B-12-9	Note 23
W26P1	D	A13K2	8B	B-12-9	Note 23
W26P1	E	A13	E1	B-12-9	Note 23
W27	P1	A46	P1	N/A	Note 24
W27P1	A	A13K3	1B	B-12-9	Note 24
W27P1	B	A13K3	2B	B-12-9	Note 24
W27P1	C	A13K3	3B	B-12-9	Note 24
W27P1	D	A13K3	8B	B-12-9	Note 24
W27P1	E	A13	E1	B-12-9	Note 24
W28	P1	A47	P1	N/A	Note 25
W28P1	A	A13K4	1B	B-12-9	Note 25
W28P1	B	A13K4	2B	B-12-9	Note 25
W28P1	C	A13K4	3B	B-12-9	Note 25
W28P1	D	A13K4	8B	B-12-9	Note 25
W28P1	E	A13	E1	B-12-9	Note 25
W33P15	A	A13TB1	5	K-20-N/A	Note 30
W33P15	B	A13TB1	10	K-20-N/A	Note 30
W33P15	C	A13K1	11A	K-20-N/A	Note 30
W33P15	D	A13TB1	2	K-20-N/A	Note 30
W33P15	E	A13TB1	7	K-20-N/A	Note 30
W33P15	F	A13TB1	8	K-20-N/A	Note 30
W33P15	G	A13K1	10A	K-20-N/A	Note 30
W33P15	H	A13TB1	6	K-20-N/A	Note 30
W33P15	I	A13TB1	9	K-20-N/A	Note 30
W33P15	N	A13TB1	1	K-20-N/A	Note 30
W33P15	P	A13TB1	4	K-20-N/A	Note 30

Table H-1. Modular Base Petroleum Laboratory (Mod Lab A) Wire List - CONT

From		To		Wire	Remarks
Reference Designation		Reference Designation		Code Sequence	Remarks
Connector	Pin	Connector	Pin		
W33P15	R	A13TB1	3	K-20-N/A	Note 30
W34P15	A	A13TB2	5	K-20-N/A	Note 31
W34P15	B	A13TB2	10	K-20-N/A	Note 31
W34P15	C	A13K2	11A	K-20-N/A	Note 31
W34P15	D	A13TB2	2	K-20-N/A	Note 31
W34P15	E	A13TB2	7	K-20-N/A	Note 31
W34P15	F	A13TB2	8	K-20-N/A	Note 31
W34P15	G	A13K2	10A	K-20-N/A	Note 31
W34P15	H	A13TB2	6	K-20-N/A	Note 31
W34P15	I	A13TB2	9	K-20-N/A	Note 31
W34P15	N	A13TB2	1	K-20-N/A	Note 31
W34P15	P	A13TB2	4	K-20-N/A	Note 31
W34P15	R	A13TB2	3	K-20-N/A	Note 31
W35P15	A	A13TB3	5	K-20-N/A	Note 32
W35P15	B	A13TB3	10	K-20-N/A	Note 32
W35P15	C	A13K3	11A	K-20-N/A	Note 32
W35P15	D	A13TB3	2	K-20-N/A	Note 32
W35P15	E	A13TB3	7	K-20-N/A	Note 32
W35P15	F	A13TB3	8	K-20-N/A	Note 32
W35P15	G	A13K3	10A	K-20-N/A	Note 32
W35P15	H	A13TB3	6	K-20-N/A	Note 32
W35P15	I	A13TB3	9	K-20-N/A	Note 32
W35P15	N	A13TB3	1	K-20-N/A	Note 32
W35P15	P	A13TB3	4	K-20-N/A	Note 32
W35P15	R	A13TB3	3	K-20-N/A	Note 32
W36P15	A	A13TB4	5	K-20-N/A	Note 33
W36P15	B	A13TB4	10	K-20-N/A	Note 33
W36P15	C	A13K4	11A	K-20-N/A	Note 33
W36P15	D	A13TB4	2	K-20-N/A	Note 33
W36P15	E	A13TB4	7	K-20-N/A	Note 33
W36P15	F	A13TB4	8	K-20-N/A	Note 33
W36P15	G	A13K4	10A	K-20-N/A	Note 33
W36P15	H	A13TB4	6	K-20-N/A	Note 33
W36P15	I	A13TB4	9	K-20-N/A	Note 33
W36P15	N	A13TB4	1	K-20-N/A	Note 33
W36P15	P	A13TB4	4	K-20-N/A	Note 33
W36P15	R	A13TB4	3	K-20-N/A	Note 33
W41	P14	A44	P2	N/A	Note 26
W41P14	A	A13TB1	5	K-20-N/A	Note 26
W41P14	B	A13TB1	10	K-20-N/A	Note 26
W41P14	C	A13K1	11B	K-20-N/A	Note 26
W41P14	D	A13TB1	2	K-20-N/A	Note 26
W41P14	E	A13TB1	7	K-20-N/A	Note 26
W41P14	F	A13TB1	8	K-20-N/A	Note 26
W41P14	G	A13K1	10A	K-20-N/A	Note 26
W41P14	H	A13TB1	6	K-20-N/A	Note 26
W41P14	I	A13TB1	9	K-20-N/A	Note 26
W41P14	N	A13TB1	1	K-20-N/A	Note 26
W41P14	P	A13TB1	4	K-20-N/A	Note 26

Table H-1. Modular Base Petroleum Laboratory (Mod Lab A) Wire List - CONT

From		To		Wire	Remarks
Reference Designation		Reference Designation		Code Sequence	Remarks
Connector	Pin	Connector	Pin		
W41P14	R	A13TB1	3	K-20-N/A	Note 26
W42	P14	A45	P2	N/A	Note 27
W42P14	A	A13TB2	5	K-20-N/A	Note 27
W42P14	B	A13TB2	10	K-20-N/A	Note 27
W42P14	C	A13K2	11B	K-20-N/A	Note 27
W42P14	D	A13TB2	2	K-20-N/A	Note 27
W42P14	E	A13TB2	7	K-20-N/A	Note 27
W42P14	F	A13TB2	8	K-20-N/A	Note 27
W42P14	G	A13K2	10A	K-20-N/A	Note 27
W42P14	H	A13TB2	6	K-20-N/A	Note 27
W42P14	I	A13TB2	9	K-20-N/A	Note 27
W42P14	N	A13TB2	1	K-20-N/A	Note 27
W42P14	P	A13TB2	4	K-20-N/A	Note 27
W42P14	R	A13TB2	3	K-20-N/A	Note 27
W43	P14	A46	P2	N/A	Note 28
W43P14	A	A13TB3	5	K-20-N/A	Note 28
W43P14	B	A13TB3	10	K-20-N/A	Note 28
W43P14	C	A13K3	11B	K-20-N/A	Note 28
W43P14	D	A13TB3	2	K-20-N/A	Note 28
W43P14	E	A13TB3	7	K-20-N/A	Note 28
W43P14	F	A13TB3	8	K-20-N/A	Note 28
W43P14	G	A13K3	10A	K-20-N/A	Note 28
W43P14	H	A13TB3	6	K-20-N/A	Note 28
W43P14	I	A13TB3	9	K-20-N/A	Note 28
W43P14	N	A13TB3	1	K-20-N/A	Note 28
W43P14	P	A13TB3	4	K-20-N/A	Note 28
W43P14	R	A13TB3	3	K-20-N/A	Note 28
W44	P14	A47	P2	N/A	Note 29
W44P14	A	A13TB4	5	K-20-N/A	Note 29
W44P14	B	A13TB4	10	K-20-N/A	Note 29
W44P14	C	A13K4	11B	K-20-N/A	Note 29
W44P14	D	A13TB4	2	K-20-N/A	Note 29
W44P14	E	A13TB4	7	K-20-N/A	Note 29
W44P14	F	A13TB4	8	K-20-N/A	Note 29
W44P14	G	A13K4	10A	K-20-N/A	Note 29
W44P14	H	A13TB4	6	K-20-N/A	Note 29
W44P14	I	A13TB4	9	K-20-N/A	Note 29
W44P14	N	A13TB4	1	K-20-N/A	Note 29
W44P14	P	A13TB4	4	K-20-N/A	Note 29
W44P14	R	A13TB4	3	K-20-N/A	Note 29

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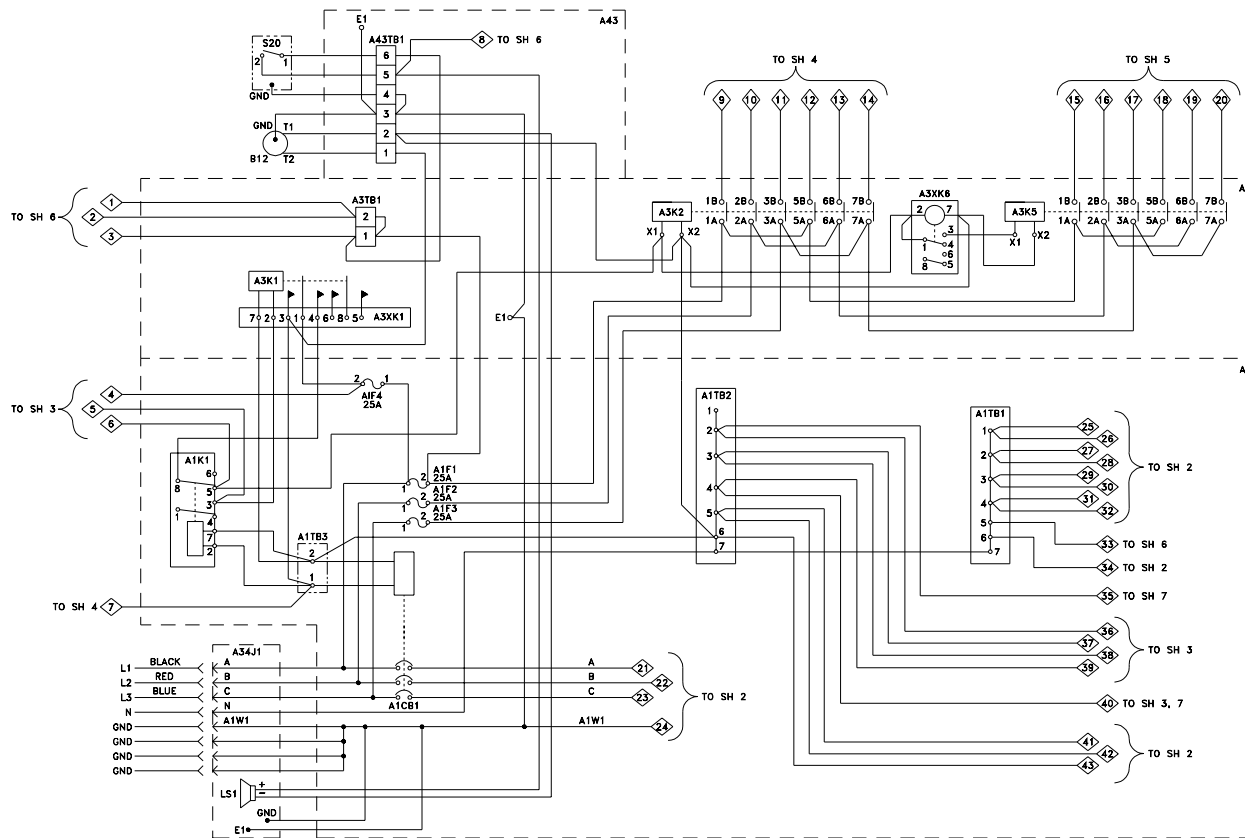
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LEGEND LAB A

- |             |                                   |              |                                |
|-------------|-----------------------------------|--------------|--------------------------------|
| <b>A-</b>   | <b>DISTRIBUTION PANELS</b>        |              |                                |
| A1          | MAIN LOAD CENTER                  | A1CB21       | OUTSIDE RECEPTACLE             |
| A3          | PURGE CONTROL                     | A1CB22       | GAS ALARM CONTROL UNIT         |
| A4          | VACUUM PUMP                       | A1SCB1,2,3,4 | AIR CONDITIONER NO.1,2,3,4     |
| A5          | WATER CHILLER                     | A1SCB5       | STEAM GENERATOR                |
| A6          | STEAM GENERATOR                   | A1SCB6       | AIR COMPRESSOR                 |
| A7          | AIR COMPRESSOR                    | A1SCB7       | WATER CHILLER                  |
| A8          | WATER PUMP                        | A1SCB8       | WATER PUMP                     |
| A9          | GUM BATH                          | A1SCB9       | VACUUM PUMP                    |
| A10         | GUM BATH/PYROMETER                | A1SCB10      | LIGHTS, MECHANICAL ROOM        |
| A11,12      | GAS ALARM DETECTORS               | A1SCB11      | FANS- GUM BATH AND FUME HOOD   |
| A13         | A/C CONTRACTORS                   | A1SCB12      | UTILITY NO.1                   |
| A14         | FUME HOOD BLOWER                  |              |                                |
| A15         | MECHANICAL ROOM LOAD CENTER       | <b>DS-</b>   | <b>LIGHTS</b>                  |
| A16         | OXIDATION STABILITY BATH          | E-           | EQUIPMENT GROUND               |
| A17         | WATER HEATER                      | F-           | FUSE                           |
| A19         | STEAM SUPER HEATER                | J-           | JUNCTION BOX                   |
| A20         | GAS ALARM                         | J1           | JFOT                           |
| A21         | LIGHTS AT REAR OF LAB             | J2           | UTILITY NO.7                   |
| A22,23      | LIGHTS AT CENTER OF LAB           | J3           | OVENS                          |
| A24,25      | BLACK-OUT LIGHTS                  | J4           | UTILITY NO.4                   |
| A26,27      | EMERGENCY LIGHTS                  | J5           | VISCOSITY BATH                 |
| A28         | PURGE/VENT DAMPERS                | J6           | UTILITY NO.3                   |
| A29         | WATER HEATER RELAY                | J7           | REFRIGERATOR                   |
| A30         | GAS ALARM BUZZER                  | J8           | DISTILLATION UNITS             |
| A31         | FUME HOOD LIGHT                   | J9           | UTILITY NO.2                   |
| A32         | BLACK-OUT LIGHT SWITCH            | J10          | FREEZER                        |
| A33         | LIGHTS IN MECHANICAL ROOM         | J11          | CENTRIFUGE                     |
| A34         | POWER INLET PANEL                 | J12          | UTILITY NO.6                   |
| A35         | ECU NO.1                          | J13          | MUFFLE FURNACE                 |
| A36         | ECU NO.2                          | J14          | SUMP PUMP                      |
| A37         | ECU NO.3                          | J15          | RVP BATH                       |
| A38         | ECU NO.4                          | J16          | UTILITY NO.5                   |
| A39         | ECU NO.1 CONTROLLER               | J19          | UTILITY NO.1                   |
| A40         | ECU NO.2 CONTROLLER               | <b>K-</b>    | <b>RELAYS</b>                  |
| A41         | ECU NO.3 CONTROLLER               | <b>S-</b>    | <b>SWITCHES</b>                |
| A42         | ECU NO.4 CONTROLLER               | S1-S5        | DOOR INTERLOCK LIGHT SWITCHES  |
| A43         | REAR DAMPER CONTROL BOX           | S3           | LIGHTS, MECHANICAL ROOM        |
| A48         | LIGHTS AT REAR OF LAB             | S5,6         | DOOR ALARM PURGE INTAKE        |
| <b>B-</b>   | <b>MOTORS/OPERATORS</b>           | S7           | OXIDATION STABILITY BATH       |
| B1          | STEAM GENERATOR WATER PUMP        | S9,10,11     | LIGHT SWITCHES AT REAR DOOR    |
| B1,2,3      | RETURN AIR DAMPER                 | S12,13,14    | LIGHT SWITCHES AT SIDE DOOR    |
| B4,5        | FRESH AIR INTAKE DAMPER           | S15          | FUME HOOD LIGHT                |
| B6          | VACUUM PUMP                       | S16          | GUM BATH LIGHT                 |
| B7          | AIR COMPRESSOR                    | S17          | EMERGENCY LIGHTS, SIDE DOOR    |
| B8          | WATER PUMP                        | S18          | EMERGENCY LIGHTS, REAR DOOR    |
| B9          | GUM BATH BLOWER                   | S19          | DOOR ALARM, FRONT EXHAUST VENT |
| B10         | FUME HOOD BLOWER                  | S20          | DOOR ALARM, REAR EXHAUST VENT  |
| B11         | PURGE EXHAUST DAMPER (FRONT)      | <b>T-</b>    | <b>TERMINAL</b>                |
| B12         | PURGE EXHAUST DAMPER (REAR)       | <b>TB-</b>   | <b>TERMINAL BOARD</b>          |
| <b>CB-</b>  | <b>CIRCUIT BREAKERS</b>           |              |                                |
| A1CB1       | SYSTEM MAIN BREAKER               |              |                                |
| A1CB2       | PANEL BOARD NO.2                  |              |                                |
| A1CB3       | JFOT, UTILITY NO.7                |              |                                |
| A1CB4       | OVENS                             |              |                                |
| A1CB5       | VISCOSITY BATH, UTILITY NO.4      |              |                                |
| A1CB6       | REFRIGERATOR, UTILITY NO.3        |              |                                |
| A1CB7       | DISTILLATION UNITS                |              |                                |
| A1CB8       | CENTRIFUGE, FREEZER, UTILITY NO.2 |              |                                |
| A1CB9,11,13 | LIGHTS                            |              |                                |
| A1CB10      | UTILITY NO.6                      |              |                                |
| A1CB12      | MUFFLE FURNACE                    |              |                                |
| A1CB14      | SUMP PUMP                         |              |                                |
| A1CB15      | OXIDATION STABILITY BATH          |              |                                |
| A1CB16      | RVP BATH, UTILITY NO.5            |              |                                |
| A1CB17      | WATER HEATER                      |              |                                |
| A1CB18      | GUM BATH                          |              |                                |
| A1CB19      | STEAM SUPER HEATER                |              |                                |
| A1CB20      | FUME HOOD UTILITY RECEPTACLE      |              |                                |

- NOTES:**  
 UNLESS OTHERWISE SPECIFIED:  
 1. GROUNDS ARE REPRESENTED BY THE FOLLOWING:  
 □ CIRCUIT GROUND.  
 2. ⬡ NUMBER REFERS TO INTERCONNECTION BEARING SAME NUMBER.

Figure F0-1. Semi-Trailer Mounted Petroleum Laboratory (MOD LAB A) - Schematic Diagram (Sheet 1 of 7)

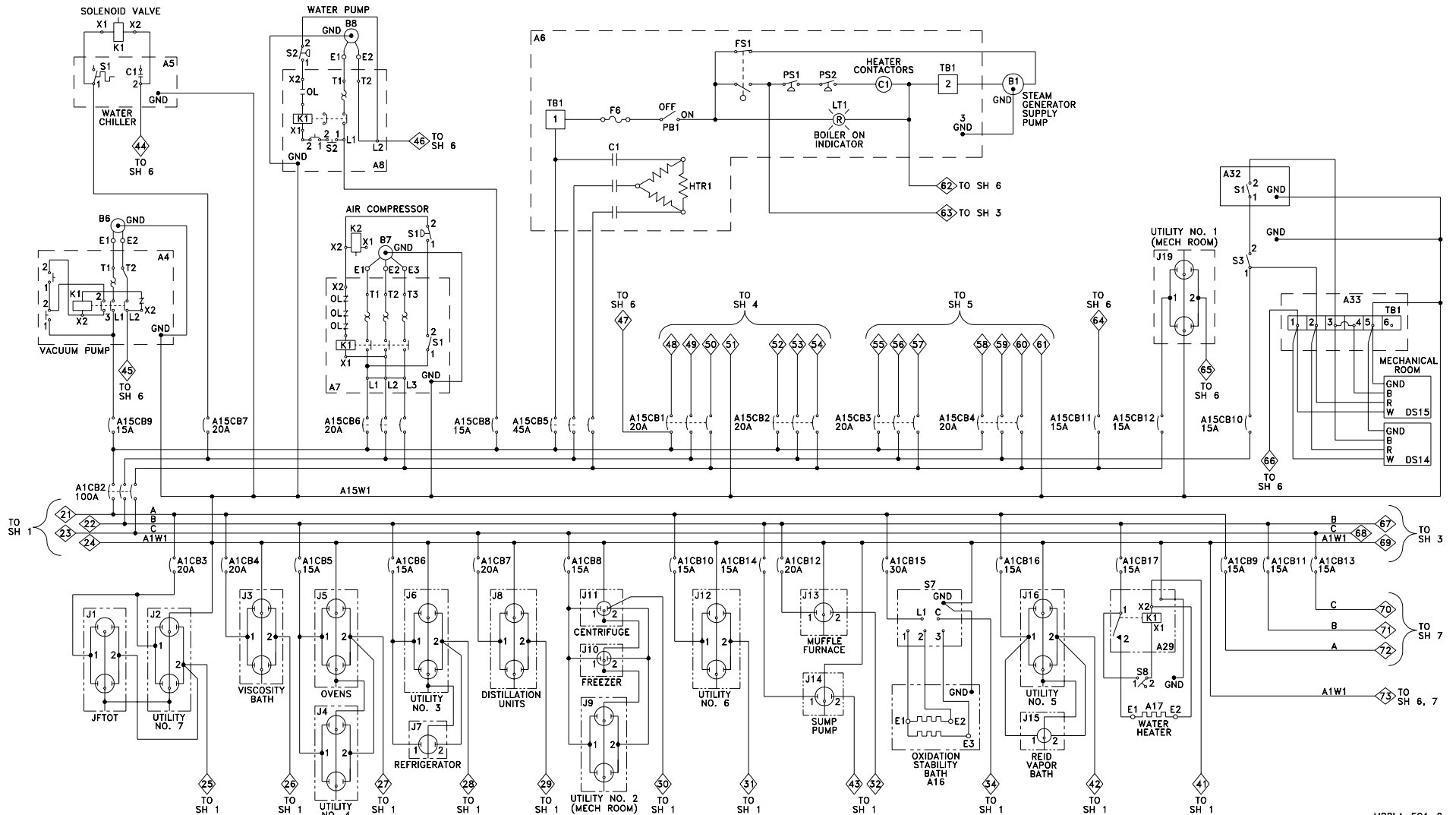
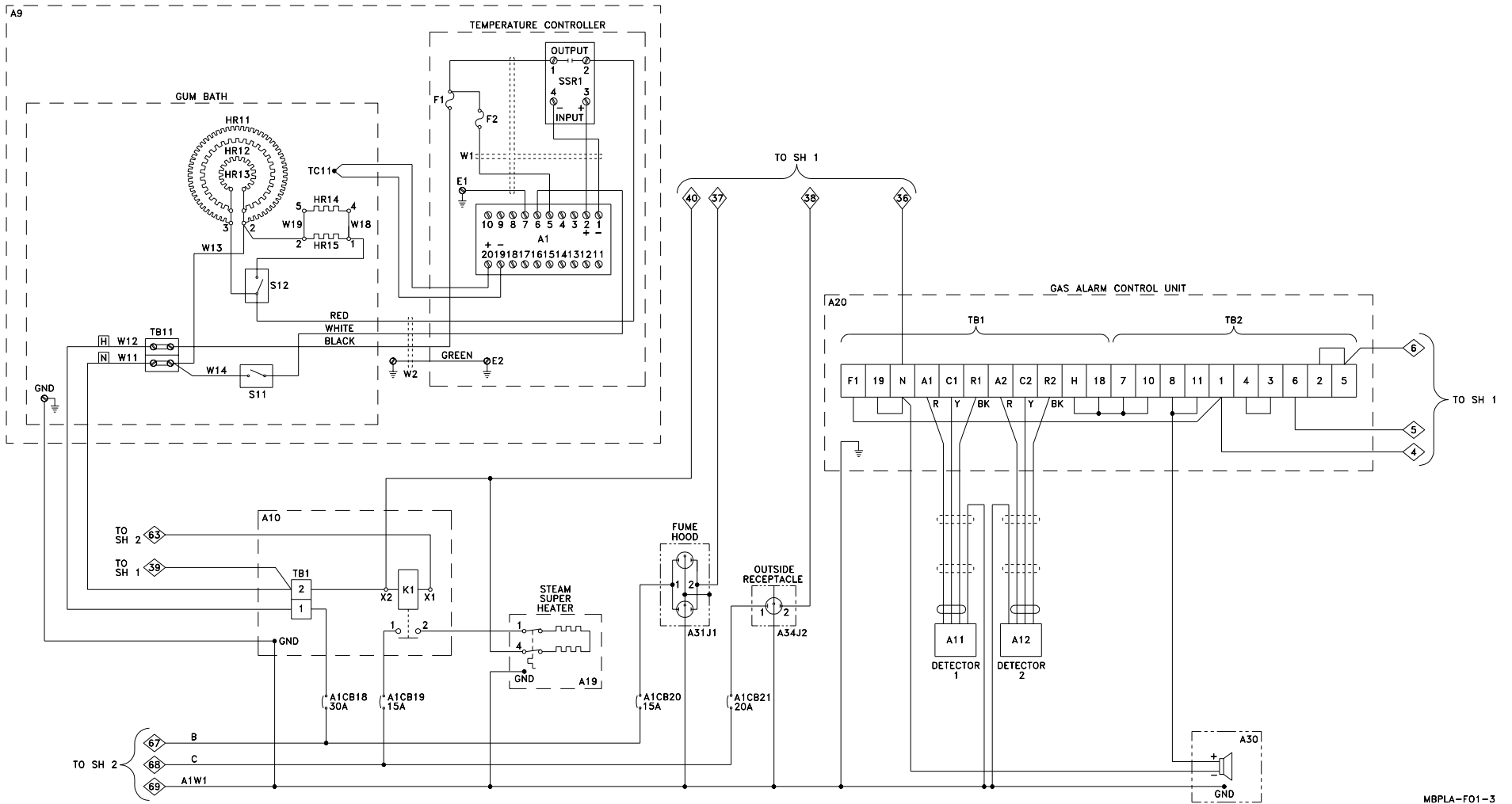


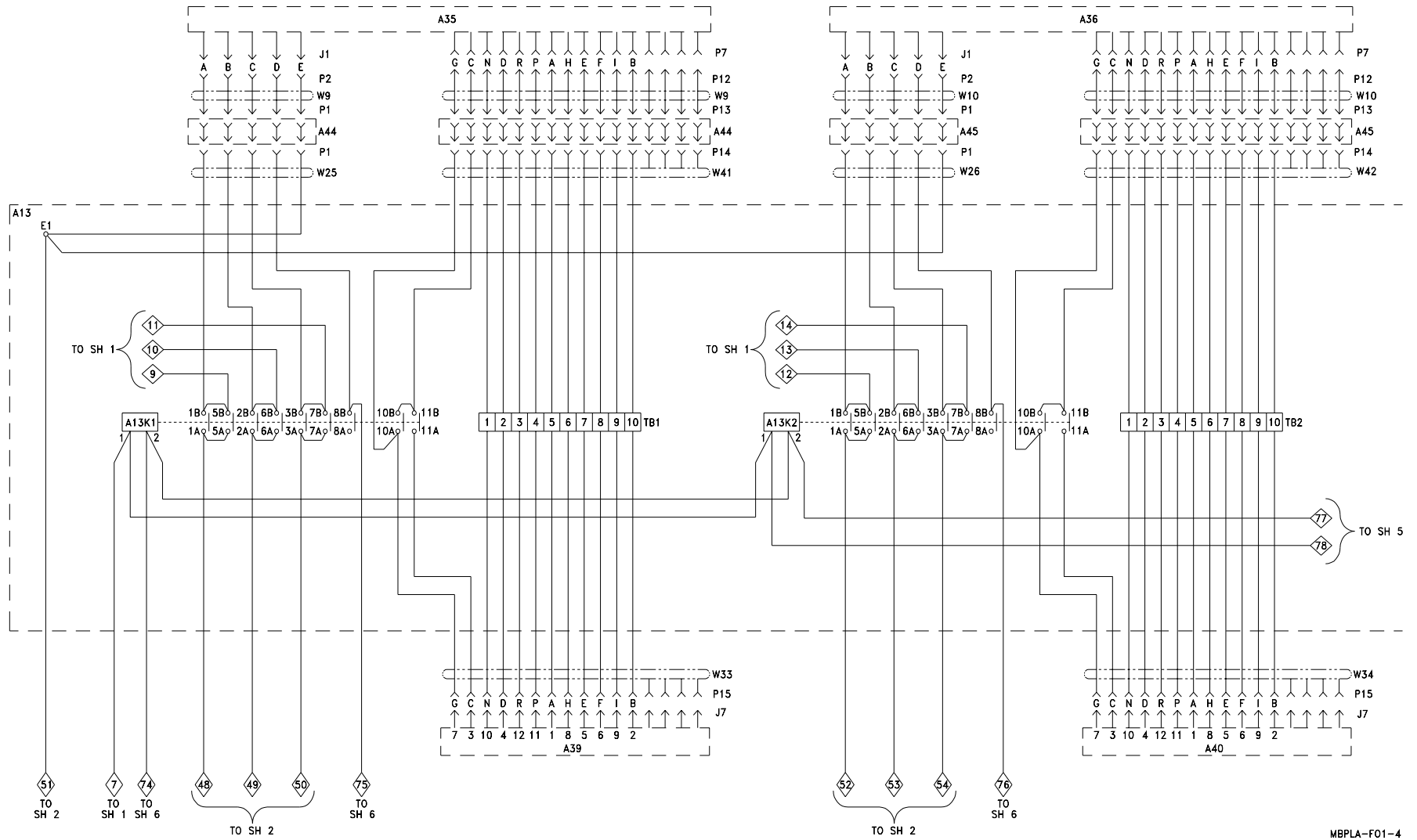
Figure FO-1. Semi-Trailer Mounted Petroleum Laboratory (MOD LAB A) - Schematic Diagram (Sheet 2 of 7)

MBPLA-F01-2



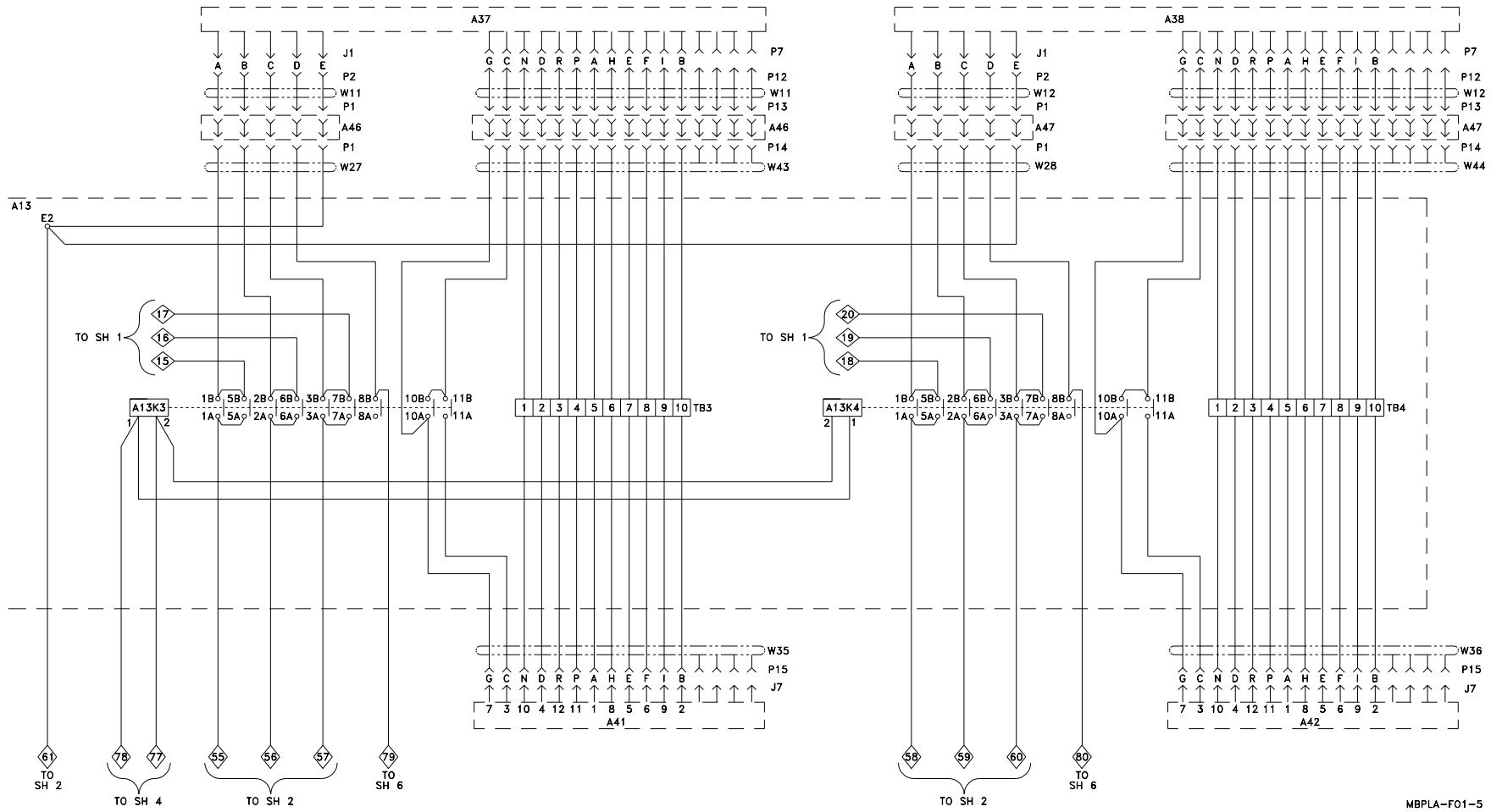
MBPLA-F01-3

Figure FO-1. Semi-Trailer Mounted Petroleum Laboratory (MOD LAB A) - Schematic Diagram (Sheet 3 of 7)



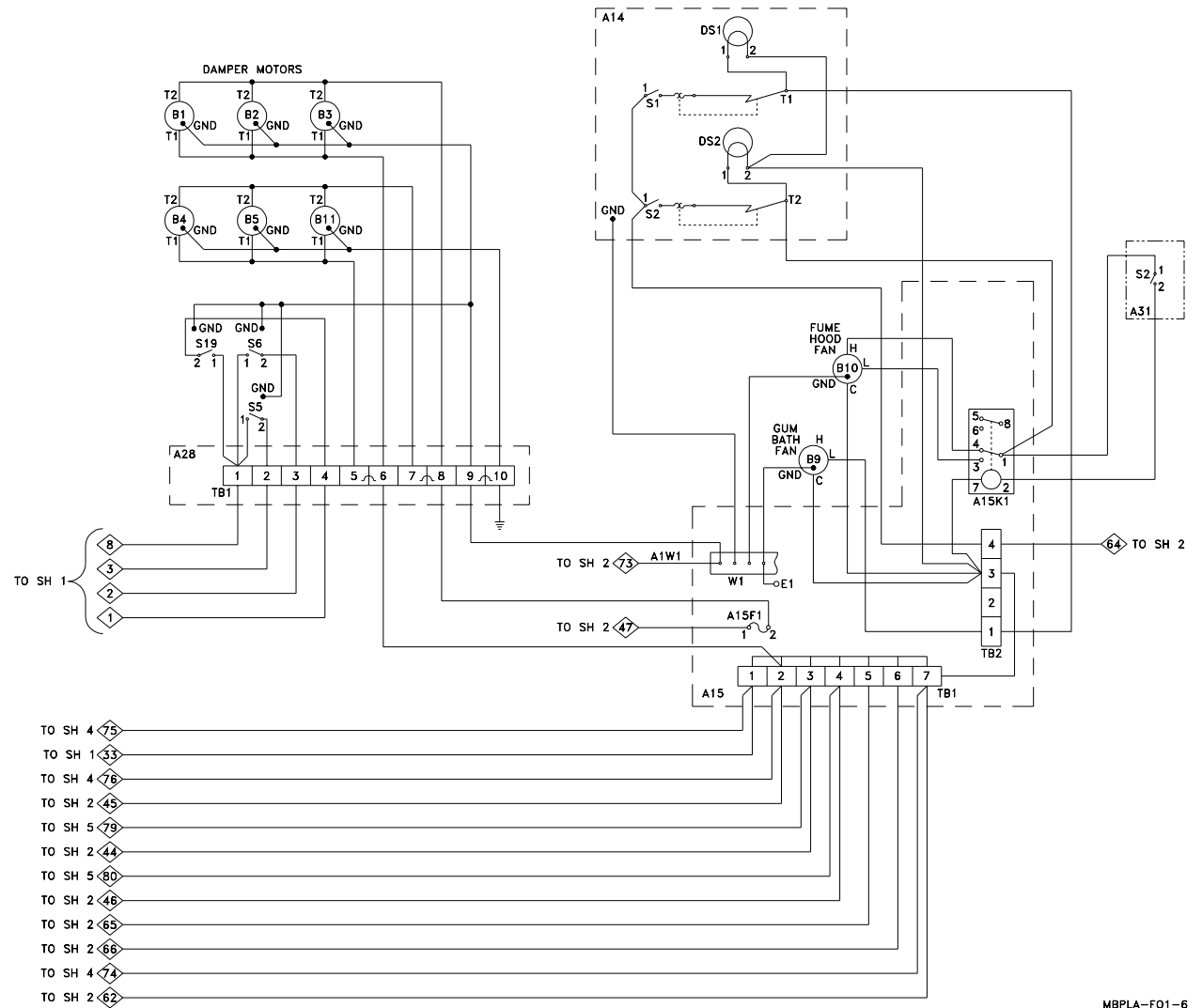
MBPLA-F01-4

Figure FO-1. Semi-Trailer Mounted Petroleum Laboratory (MOD LAB A) - Schematic Diagram (Sheet 4 of 7)



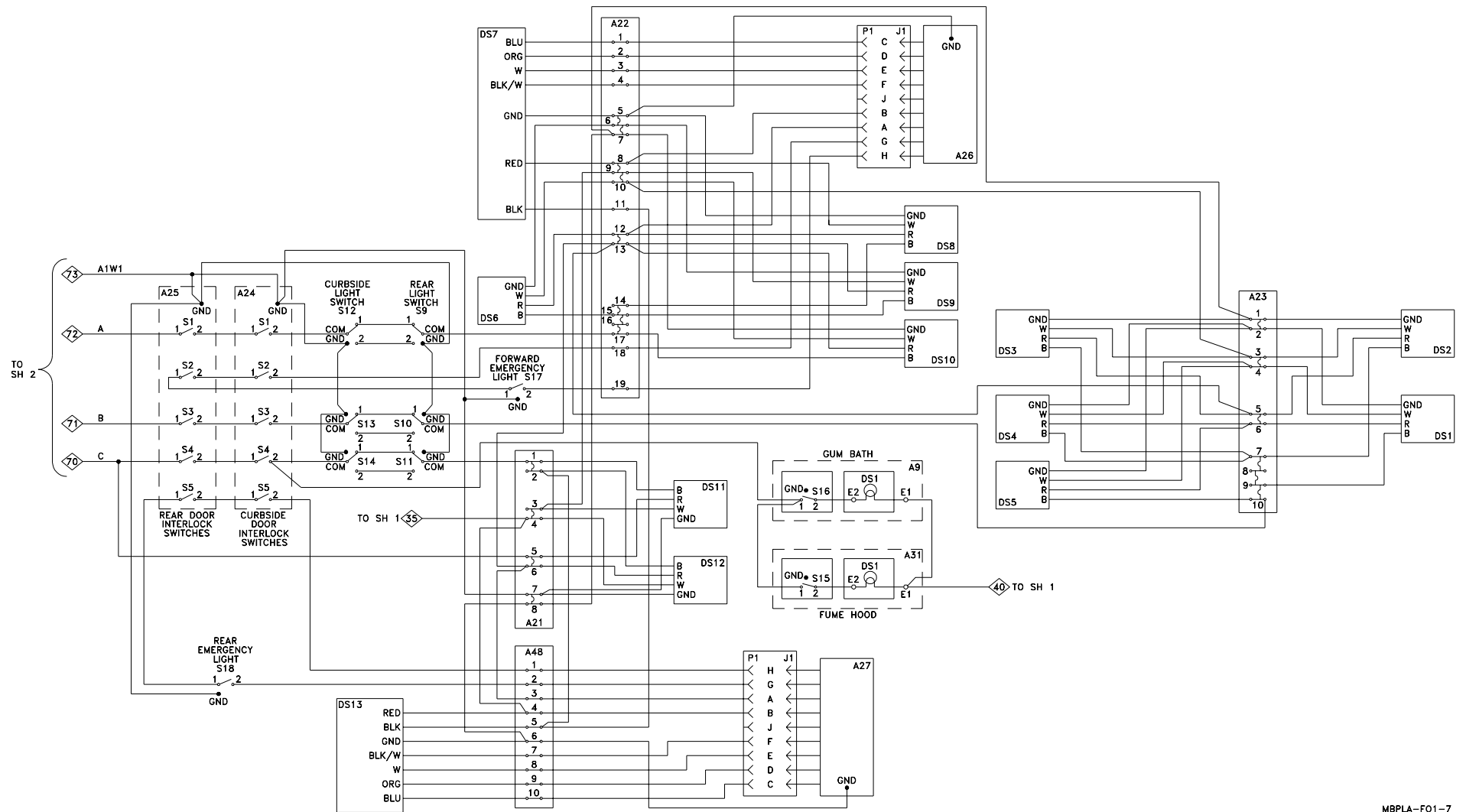
MBPLA-F01-5

Figure F0-1. Semi-Trailer Mounted Petroleum Laboratory (MOD LAB A) - Schematic Diagram (Sheet 5 of 7)



MBPLA-F01-6

Figure FO-1. Semi-Trailer Mounted Petroleum Laboratory (MOD LAB A) - Schematic Diagram (Sheet 6 of 7)



MBPLA-F01-7

Figure FO-1. Semi-Trailer Mounted Petroleum Laboratory (MOD LAB A) - Schematic Diagram (Sheet 7 of 7)



**HAZARDOUS MATERIAL SHIPPING PAPER**

page 1 of 5

<b>To:</b> consignee		<b>From:</b> shipper	
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<b>Phone #:</b>		<b>Phone #:</b>	
<b>Delivering Carrier:</b>	<b>Vehicle#:</b>	<b>U.S. DOT HazMat Reg. #:</b>	

Qty	UNIT SIZE	HM	Shipping Description (Shipping name, Hazard Class, ID #, Packing Group)	Total Amount	Labels
3	500 ml	X	Acetic Acid, glacial, 8, UN2789, II	1500 ml	Corrosive Flammable Liq.
10	4L	X	Acetone, 3, UN1090, II	40 liters	Flammable Liq.
3	4L	X	Alcohols, flammable, toxic, n.o.s. (Ethanol, Methanol), 3, UN1986, II {Denatured Alcohol}	12 liters	Flammable Liq., Toxic
3	500 ml	X	Ammonia Solution, 8, UN6272, III	1500 ml	Corrosive
10	500 grams		Calcium Chloride	5000 gms	
1	500 grams		Calcium Sulfate	500 gm	
2	50 lb. cyl.	X	Carbon Dioxide, 2.2, UN1013	100 lbs	Non-flammable gas
4	1 lb.		Charcoal, activated	4 lbs	
1	500 grams	X	Corrosive solid, toxic, n.o.s. (Barium Hydroxide), 8, UN2923, II	500 gm	Corrosive Toxic
2	2 kg		Desiccant	4 kg	
1	100 grams	X	Dye, solid, toxic, n.o.s. (Methyl Orange), 6.1, UN3143, III	100 grams	Toxic
2	500 ml	X	Ethylene Glycol Monomethyl Ether, 3, UN1188, III	1000 ml	Flammable Liquid
1	16 oz.	X	Flammable Liquid, nos (Stoddard Solvent), 3, UN1993, III {Brasso}	16 oz.	Flammable Liquid
2	500 grams	X	Flammable Liquid, toxic, n.o.s., (Diethylene Monomethyl Ether), 3, UN1992, III	1000 grams	Flammable Liq. Toxic

**This is to certify that the above named materials are properly classified, described, packaged, marked and labeled, and are in proper condition for transportation according to the applicable regulations of the Department of Transportation.**

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<b>Delivering Carrier:</b>	<b>Vehicle#:</b>	<b>U.S. DOT HazMat Reg. #:</b>	

Qty	UNIT SIZE	HM	Shipping Description (Shipping name, Hazard Class, ID #, Packing Group)	Total Amount	Labels
1	1.8 kg		General Purpose Detergent	1.8 kg	
2	500 ml		Glycerol	1000 ml	
7	150 grams		Grease, Ground Glass Joint	1050 grams	
1	5 gals	X	Heptanes, 3, UN1206, II	5 gallon	Flammable Liquid
12	2.5 L	X	Hydrochloric Acid, 8, UN1789, II	30 liters	Corrosive
2	5 gals	X	Isopropanol, 3, UN1219, II	10 gallons	Flammable Liquid
2	500 grams	X	Lead Acetate, 6.1, UN1616, III, Poison, Marine Pollutant	1000 gms	Toxic Marine Pollutant
1	500 grams	X	Lead Nitrate, 5.1, UN1469, II, Poison, Marine Pollutant	500 gm	Oxidizer, Toxic, Marine Pollutant
4	1 liter		Lubricating Oil, Vacuum Pump	4 liters	
1	8 lbs		Merc Sorb Powder	8 lb.	
1		RQ	Mercury contained in Manufactured Articles, 8, UN2809, III	1 Manometer	Corrosive
1		X	Mercury contained in Manufactured Articles, 8, UN2809, III	1 Mercury Kit	Corrosive
1		X	Mercury contained in Manufactured Articles, 8, UN2809, III	1 Mercury Kit	Corrosive
71		X	Mercury contained in Manufactured Articles, 8, UN2809, III	71 Thermometers	Corrosive
1	100 grams	X	Mercury Iodide, solid, 6.1, UN1638, II, Poison, Marine Pollutant	100 gm	Toxic Marine Pollutant

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<b>Phone #:</b>		<b>Phone #:</b>			
<b>Delivering Carrier:</b>		<b>Vehicle#:</b>		<b>U.S. DOT HazMat Reg. #:</b>	
Qty	UNIT SIZE	HM	Shipping Description (Shipping name, Hazard Class, ID #, Packing Group)	Total Amount	Labels
2	5 lbs	RQ	Mercury, 8, UN2809, II, Marine Pollutant	10 lbs	Corrosive Marine Pollutant
2	4 L	X	Methyl Ethyl Ketone, 3, UN1193, II	8 liters	Flammable Liquid
3	2.5 L	X	Nitric Acid, 8, UN2031, I	7.5 liters	Corrosive Oxidizer
1	231 cu. ft.	X	Nitrogen, compressed, 2.2, UN1066	231 cu ft Cyl.	Non-flammable gas
1	100 grams	X	Nitrophenols, 6.1, UN1663, III	100 grams	Keep away from food stuff
1	5 gals	X	Octanes, 3, UN1262, II	5 gallon	Flammable Liquid
10	1 gal.		Oil, Bath, Viscosimeter	10 gallons	
1	3 kg.		Ottawa Sand	3 kg.	
2	500 mg	X	Oxidizing Solid, n.o.s. (Sodium Dichromate), 5.1, UN1479, II	1000 mg	Oxidizer
6	100 grams	X	Oxidizing Solid, Toxic, n.o.s. (Potassium Dichromate), 5.1, UN3087, III	600 grams	Oxidizer, Toxic
1	230 cu. ft.	X	Oxygen, compressed, 2.2, UN1072	230 cu ft. cyl.	Non-flammable gas, Oxidizer
3	1 gal.	X	Paint Related Materials, 3, UN1263, II {Naphtha}	3 gallons	Flammable Liquid
4	2.25 oz.		Paste, Gasoline Finding	9 oz.	
4	3 oz.		Paste, Water Finding	12 oz.	
3	1 gal.	X	Petroleum Distillates n.o.s., 3, UN1268, III {Dry Cleaning Solvent}	3 gallons	Flammable Liquid

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<b>Phone #:</b>			<b>Phone #:</b>		
<b>Delivering Carrier:</b>		<b>Vehicle#:</b>	<b>U.S. DOT HazMat Reg. #:</b>		
Qty	UNIT SIZE	HM	Shipping Description (Shipping name, Hazard Class, ID #, Packing Group)	Total Amount	Labels
3	4 L	X	Petroleum distillates, n.o.s., 3, UN1268, III {Petroleum Ether}	12 liters	Flammable Liquid
1	100 grams		Phenolphthalein, ACS	100 grams	
3	10 grams		p-Naphtholbenzein Analyzed Reagent	30 grams	
4	100 grams	X	Potassium Chlorate, 5.1, UN1485, II	400 grams	Oxidizer
3	100 grams		Potassium Hydrogen Phthalate	300 grams	
2	500 grams	X	Potassium Hydroxide, solid, 8, UN1813, II	1000 gms	Corrosive
5	500 grams		Potassium Iodide	2500 grams	
2	500 grams		Potassium Phosphate Dibasic	1000 grams	
1	500 grams		Potassium Phosphate Monobasic	500 grams	
12	1 lb. cyl	X	Propane, 2.1, UN1978	12 lbs	Flammable Gas
1	500 grams		Pumice, technical	500 grams	
1	1 lb		Silicon Carbide	1 lb.	
1	125 grams	X	Silver Nitrate, 5.1, UN1493, II	125 grams	Oxidizer

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**HAZARDOUS MATERIAL SHIPPING PAPER**

page 5 of 5

<b>To:</b> consignee			<b>From:</b> shipper		
<b>Street:</b>			<b>Street:</b>		
<b>City:</b>		<b>Zip:</b>	<b>City:</b>		<b>Zip:</b>
<b>Phone #:</b>			<b>Phone #:</b>		
<b>Delivering Carrier:</b>		<b>Vehicle#:</b>	<b>U.S. DOT HazMat Reg. #:</b>		
Qty	UNIT SIZE	HM	Shipping Description (Shipping name, Hazard Class, ID #, Packing Group)	Total Amount	Labels
1	500 grams		Sodium Chloride	500 grams	
2	500 grams	X	Sodium Hydroxide, solid, 8, UN1823, II	1000 grams	Corrosive
1	500 grams		Sodium Thiosulfate, pentahydrate	500 grams	
2	500 grams		Starch, Soluble	1000 grams	
5	2.5 L	X	Sulphuric acid, 8, UN1830, II	12.5 L	Corrosive
2	4 L	X	Toluene, 3, UN1294, II	8 liters	Flammable Liquid
2	500 ml	X	Xylenes, 3, UN1307, III	1000 mls	Flammable Liquid
1	500 grams		Zinc Oxide	500 grams	
1	500 grams		Sodium Carbonate, anhydrous	500 grams	
10	500 grams		Sodium Bicarbonate, ACS	5000 grams	

**This is to certify that the above named materials are properly classified, described, packaged, marked and labeled, and are in proper condition for transportation according to the applicable regulations of the Department of Transportation.**

Signed: \_\_\_\_\_

Date: \_\_\_\_\_

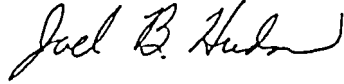
**EMERGENCY CONTACT:** \_\_\_\_\_



By Order of the Secretary of the Army:

ERIC K. SHINSEKI  
*General, United States Army*  
*Chief of Staff*

Official:



JOEL B. HUDSON  
*Administrative Assistant to the*  
*Secretary of the Army*  
0127501

Distribution:

To be distributed in accordance with the initial distribution number (IDN), 256453, requirements for TM 10-6640-238-13.





<b>RECOMMENDED CHANGES TO PUBLICATIONS AND BLANK FORMS</b>						Use Part II ( <i>reverse</i> ) for Repair Parts and Special Tool Lists (RPSTL) and Supply Catalogs/Supply Manuals (SC/SM).	<b>DATE</b>
For use of this form, see AR 25-30; the proponent agency is ODISC4.							
<b>TO:</b> ( <i>Forward to proponent of publication or form</i> ) ( <i>Include ZIP Code</i> ) AMSTA-LC-CI / TECH PUBS, TACOM-RI, 1 Rock Island Arsenal, Rock Island, IL 61299-7630						<b>FROM:</b> ( <i>Activity and location</i> ) ( <i>Include ZIP Code</i> )	
<b>PART I - ALL PUBLICATIONS (EXCEPT RPSTL AND SC/SM) AND BLANK FORMS</b>							
PUBLICATION /FORM NUMBER TM 10-6640-238-13				DATE 30 June 2002		TITLE Operator, Unit, and Direct Support Maintenance, Semitrailer, Mounted Petroleum Laboratory (Mod Lab A)	
ITEM NO.	PAGE NO.	PARA-GRAPH	LINE NO.	FIGURE NO.	TABLE NO.	RECOMMENDED CHANGES AND REASON	
<i>* Reference to line numbers within the paragraph or subparagraph.</i>							
TYPED NAME, GRADE OR TITLE				TELEPHONE EXCHANGE/AUTOVON, PLUS EXTENSION		SIGNATURE	

<b>TO:</b> <i>(Forward direct to addressee listed in publication)</i>	<b>FROM:</b> <i>(Activity and location) (Include ZIP Code)</i>	<b>DATE</b>
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**PART II – REPAIR PARTS AND SPECIAL TOOLS LISTS AND SUPPLY CATALOGS/SUPPLY MANUALS**

PUBLICATION /FORM NUMBER	DATE	TITLE
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PAGE NO.	COLM NO.	LINE NO.	NATIONAL STOCK NUMBER	REFERENCE NO.	FIGURE NO.	ITEM NO.	TOTAL NO. OF MAJOR ITEMS SUPPORTED	RECOMMENDED ACTION

**PART III – REMARKS** *(Any general remarks or recommendations, or suggestions for improvement of publications and blank forms. Additional lank sheets may be used if more space is needed.)*

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# THE METRIC SYSTEM AND EQUIVALENTS

## LINEAR MEASURE

1 Centimeter = 10 Millimeters = 0.01 Meters = 0.3937 inch  
 1 Meter = 100 Centimeters = 1000 Millimeters = 39.37 Inches  
 1 Kilometer = 1000 Meters = 0.621 Miles

## WEIGHTS

1 Gram = 0.001 Kilograms = 1000 Milligrams = 0.035 Ounces  
 1 Kilogram = 1000 Grams = 2.2 Lb.  
 1 Metric Ton = 1000 Kilograms = 1 Megagram = 1.1 Short Ton

## LIQUID MEASURE

1 Milliliter = 0.001 Liters = 0.0338 Fluid Ounces  
 1 Liter = 1000 Milliliters = 33.82 Fluid Ounces

## SQUARE MEASURE

1 Sq. Centimeter = 100 Sq. Millimeters = 0.155 Sq. Inches  
 1 Sq. Meter = 10,000 Sq. Centimeters = 10.76 Sq. Feet  
 1 Sq. Kilometer = 1,000,000 Sq. Meters = 0.386 Sq. Miles

## CUBIC MEASURE

1 Cu. Centimeter = 1000 Cu. Millimeters = 0.06 Cu. Inches  
 1 Cu. Meter = 1,000,000 Cu. Centimeters = 35.31 Cu. Feet

## TEMPERATURE

$5/9 (°F - 32) = °C$   
 212° Fahrenheit is equivalent to 100° Celsius  
 90° Fahrenheit is equivalent to 32.2° Celsius  
 32° Fahrenheit is equivalent to 0° Celsius  
 $9/5 (°C + 32) = °F$

## APPROXIMATE CONVERSION FACTORS

TO CHANGE	TO	MULTIPLY BY
Inches	Centimeters	2.540
Feet	Meters	0.305
Yards	Meters	0.914
Miles	Kilometers	1.609
Square Inches	Square Centimeters	6.451
Square Foot	Square Meters	0.093
Square Yards	Square Meters	0.836
Square Miles	Square Kilometers	2.590
Acres	Square Hectometers	0.405
Cubic Feet	Cubic Meters	0.028
Cubic Yards	Cubic Meters	0.765
Fluid Ounces	Milliliters	29.573
Pints	Liters	0.473
Quarts	Liters	0.946
Gallons	Liters	3.785
Ounces	Grams	28.349
Pounds	Kilograms	0.454
Short Tons	Metric Tons	0.907
Pound-Feet	Newton-Meters	1.356
Pound per Square Inch	Newton-Meters	6.895
Miles per Gallon	Kilometers per Liter	0.425
Miles per Hour	Kilometers per Hour	1.609

TO CHANGE	TO	MULTIPLY BY
Centimeters	Inches	0.394
Meters	Feet	3.280
Meters	Yards	1.094
Kilometers	Miles	0.621
Square Centimeters	Square Inches	0.155
Square Meters	Square Feet	10.764
Square Meters	Square Yards	1.196
Square Kilometers	Square Miles	0.386
Square Hectometers	Acres	2.471
Cubic Meters	Cubic Feet	35.315
Cubic Meters	Cubic Yards	1.308
Milliliters	Fluid Ounces	0.034
Liters	Pints	2.113
Liters	Quarts	1.057
Liters	Gallons	0.264
Grams	Ounces	0.035
Kilograms	Pounds	2.205
Metric Tons	Short Tons	1.102
Newton-Meters	Pound-Feet	0.738
Kilopascals	Pounds per Square Inch	0.145
Kilometers per Liter	Miles per Gallon	2.354
Kilometers per Hour	Miles per Hour	0.621

