TM 9-6920-430-14

TECHNICAL MANUAL

OPERATOR'S AND ORGANIZATIONAL DIRECT SUPPORT, AND GENERAL SUPPORT MAINTENANCE MANUAL

COOLANT RECHARGING UNIT, TRAINING GUIDED MISSILE SYSTEM M80

6920-01-024-9970

CHARGER, BATTERY PP-7309/T

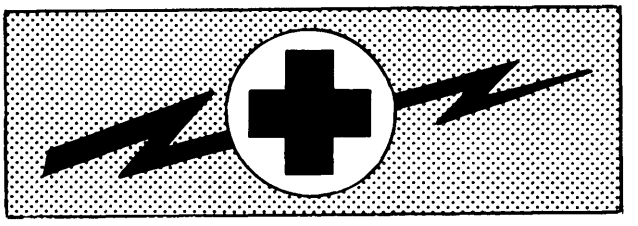
6130-01-024-6922

STINGER AIR DEFENSE GUIDED MISSILE SYSTEM

DEPARTMENT OF THE ARMY AUGUST 1980

This copy is a reprint which includes current pages from Changes 1 THROUGH 6.

WARNING



WARNING

HIGH VOLTAGE

is used in the operation of this equipment

DEATH ON CONTACT

may result if personnel fail to observe safety precautions

Never work on electronic equipment unless there is another person nearby who is familiar with the operation and hazards of the equipment and who is competent in administering first aid. When the technician is aided by operators, he must warn them about dangerous areas.

Whenever possible, the power supply to the equipment must be shut off before beginning work on the equipment. Take particular care to ground every capacitor likely to hold a dangerous potential. When working inside the equipment, after the power has been turned off, always ground every part before touching it.

Be careful not to contact high-voltage connections of 115 volt ac input connections when installing or operating this equipment.

Whenever the nature of the operation permits, keep one hand away from the equipment to reduce the hazard of current flowing through vital organs of the body.

Warning: Do not be misled by the term "low voltage". Potentials as low as 50 volts may cause death under adverse conditions.

For artificial respiration, refer to FM 21-11.

WARNING

DANGEROUS HIGH PRESSURE POTENTIAL

High pressure argon gas (up to 6200 psig) is present in the gas pumping unit, and the argon gas supply bottle.

DEATH

Death or severe injury may result if personnel fail to observe safety precautions.

INSERT LATEST CHANGED PAGES.
DESTROY SUPERSEDED PAGES.

LIST OF EFFECTIVE PAGES

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HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, D.C., 1 August 1980

Operator's and Organizational, Direct Support and General Support Maintenance Manual

COOLANT RECHARGING UNIT, TRAINING GUIDED MISSILE SYSTEM M80; CHARGE, BATTERY PP-7309/T (STINGER AIR DEFENSE GUIDED MISSILE SYSTEM)

REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

You can help improve this manual. If you find any mistakes or if you know of a way to improve the procedures, please let us know. Mail your letter or DA Form 2028 (Recommended Changes to Publications and Blank Forms), directly to: Commander, U.S. Army Missile Command, ATTN: AMSMI-LC-ME-PM, Redstone Arsenal, Alabama 35898-5238. A reply will be furnished to you.

TABLE OF CONTENTS

CHAPTER 1
INTRODUCTION

Section I. GENERAL

1.1 PURPOSE AND SCOPE. The purpose of this manual is to provide instructions for operating and maintaining the Battery Charger, PP-7309/T, and the Coolant Recharging Unit, M80, referenced in this manual as the Gas Pumping Unit (GPU).

1-2. MAINTENANCE FORMS AND RECORDS. 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). The DA PAM is published in the Maintenance Management UPDATE. Units may subscribe to the Maintenance Management UPDATE by submitting a completed DA Form 12-13.

1-3. REPORTING EQUIPMENT IMPROVEMENT RECOMMENDATIONS (EIR). If your battery charger or Gas Pumping Unit (GPU) needs improvement, let us know. Send us an EIR. You, the user, are the only one who can tell us what you do not like about your equipment. Let us know why you do not like the design. Tell us why a procedure is hard to perform. Put it on an SF 368 (Quality Deficiency Report). Mail it to the address stated in DA PAM 738-850. We'll send you a reply.

1-4. CALIBRATION. The Remote Pressure Measuring System (transducer and digital readout) will be turned in to the local calibration facility for calibration/repair as prescribed by TB 43-180 and TB 43-180-1.

Table 1-1. TAMMS Forms

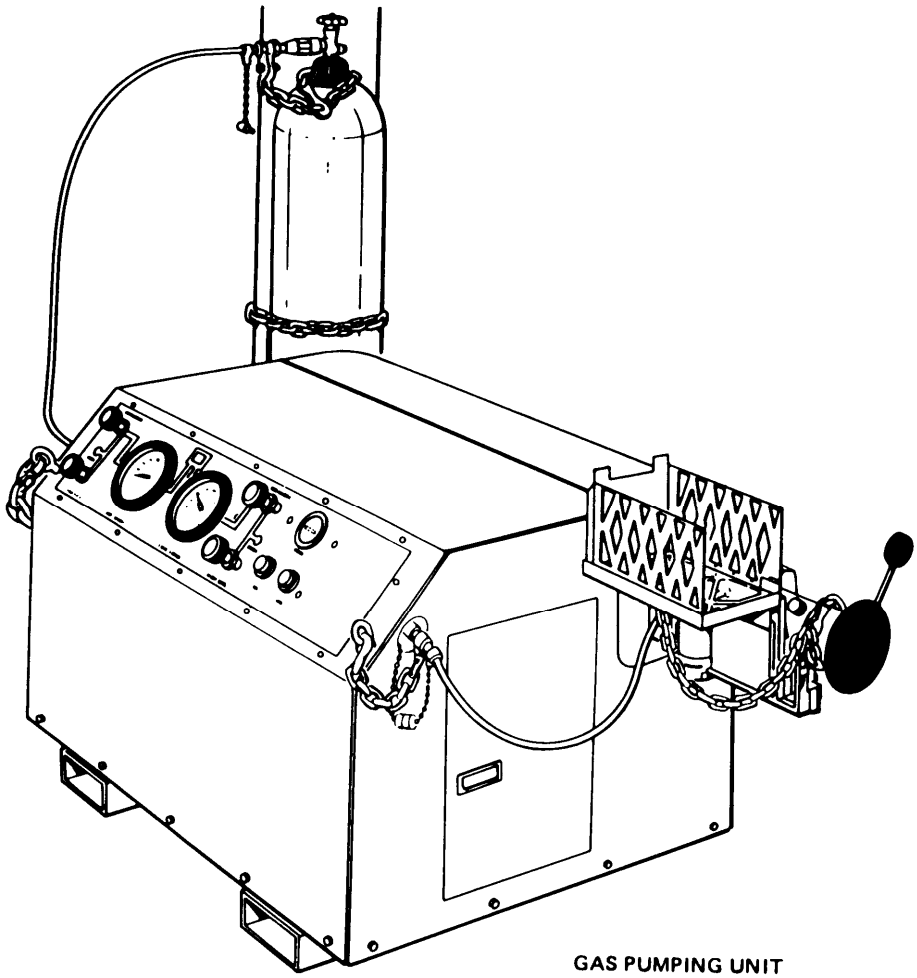
Equipment	Exchange Tag (DA Form 2402)	Equipment Inspection and Maintenance Worksheet (DA Form 2404)	Maintenance Request (DA Form 2407)	Equipment Control Record (DA Form 2408-9)
Trainer Set				
Battery Charger		X	X	X
Gas Pumping Unit		X	X	X

LIST OF ABBREVIATIONS

ACQ	Acquisition
AMP	Ampere
BCU	Battery Coolant Unit
DC	Direct Current
EL	Elevation
ERR	Error
F	Fahrenheit
Hz	Hertz
GPU	Gas Pumping Unit
IFF	Identification Friend or Foe
INT	Interrogate
IR	Infrared Radiation
LL	Left Lead
LOW V	Low Voltage
PSIG	Pounds per Square Inch Gage
RL	Right Lead
TAMMS	The Army Maintenance Management System
TRK	Track
UNC	Uncage
UNK	Unknown
VAC	Volts Alternating Current
CCW	Counterclockwise
CW	Clockwise

Section II. EQUIPMENT DESCRIPTION

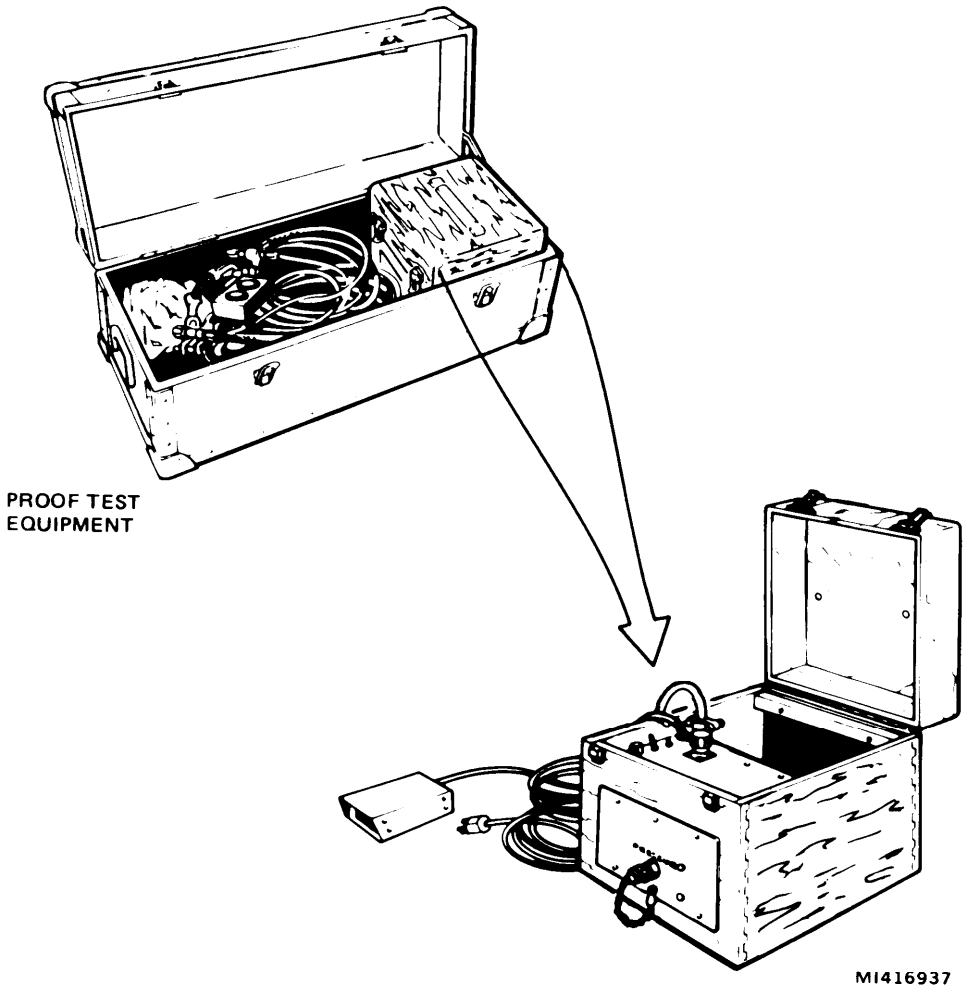
1-4. GAS PUMPING UNIT (CPU) DESCRIPTION



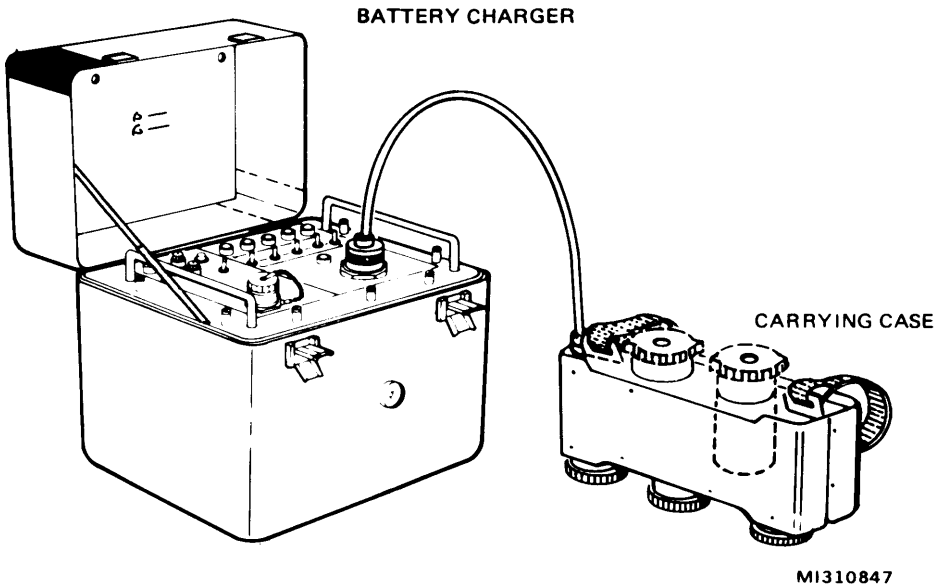
GAS PUMPING UNIT

MI416936A

- Refills and pressurizes argon gas to 6000 ± 200 psig in the Tracking Head Trainer gas bottle.
- Cleans argon gas via filter elements before entering trainer gas bottle.
- Operates on 115 VAC, 50/60 Hz, at 12 amps.
- Performs proof pressure test upon receipt, at 6 month intervals, or when equipment has been moved.
- Proofs GPU to 7750 ± 250 psig.
- Operates on 115 VAC, 50/400 Hz. (Proof Test Equipment)


PROOF TEST
EQUIPMENT
MI416937

1-5. BATTERY CHARGER/CARRYING CASE DESCRIPTION



- Recharges from 1 to 5 trainer batteries individually.
- Batteries are completely charged in 16 hours.
- Carrying Case contains electric heater blankets to heat batteries during severe cold weather.
- Built in self-test circuit in battery charger.
- Operates on 115 VAC, 50/400 Hz.

1-6 **PHYSICAL CHARACTERISTICS.** Physical characteristics for the battery charger, gas pumping unit, and proof test equipment storage box are listed in Table 1-2.

Table 1-2. Physical Characteristics

	Length (inches)	Width (inches)	Height (inches)	Volume (cubic feet)	Weight (pounds)
Battery Charger	19	11	14	1.7	28
Gas Pumping Unit	40	45	30	31.3	370
Test Equipment Storage Box	34	14	14	3.8	25
Carrying Case	20.5	6.5	8.5	0.7	8

1-7. SAFETY, CARE, AND HANDLING. All cautions and warnings must be strictly observed while refilling the trainer gas bottles and during recharging of the trainer batteries. DO NOT deviate from instructions as death or severe injury can result.

- Operate GPU in large, well-ventilated area.
- Argon gas displaces air and can cause dizziness and suffocation.
- Argon gas supply bottle must be firmly secured to an upright column or rigid, immovable structure.
- Secure argon gas cart to an immovable object.
- Secure trainer to GPU cradles.

Section III. GPU PRINCIPLES OF OPERATION

1-8. GENERAL. The Gas Pumping Unit is comprised of an electrically-driven compressor, in-line desiccant filters, relief valve, two pressure switches and various control valves. The GPU is basically a combined gas cleaning and pumping unit used to fill the internal trainer argon gas bottle up to 6000 ± 200 psig within a maximum period of 45 minutes. A 6000 psi in-line pressure switch automatically shuts off the pump when the outlet pressure gage reaches between 5800 and 6200 psig. The relief valve functions as a secondary safety valve by immediately releasing high pressure in the event the pressure switch fails. When the GPU is operated in the high proof pressure mode, the second pressure switch shuts off the pump at 7750 ± 250 psig.

1-9. GPU HIGH PRESSURE PUMPING SYSTEM OPERATION (Figures 1-1 and 1-2). Argon gas is routed to the GPU through the inlet flexible hose interconnecting the argon gas bottle to the inlet connector port on the left side of the GPU. The inlet pressure gage, located down line from the inlet shutoff valve, indicates gas pressure available from the argon gas bottle at the input of the pump. The argon gas enters the pump from the inlet side via the inlet port and in-line particle filter (1). The gas is pumped down line from compressor, past the relief valve and pressure switches, through molecular filters (1) and (2), where impurities such as water or oil are filtered from the gas. The pressurized argon gas is then routed through in-line particle filter (3) and to the trainer fill port via the outlet flexible hose. The outlet pressure gage indicates THT bottle pressure. The GPU has two primary electrical controls, OFF (Red pushbutton) and ON (Green pushbutton). When depressed, the ON switch S3 applies 115 V AC to one side of the Starter Relay K1 Coil via J1-1, S1 and S2. The other side of the Starter Relay Coil is connected to the supply source via J1-2. This energizes Starter Relay K1. AC power is applied to the compressor via contacts A and B, and terminals 2, 3, 5 and 6 of the Starter Relay K1. The starter Relay is self latched ON through contact C or K1 and S4, S2 and S1. Thus maintaining AC power to the compressor after the ON switch S3 is released. Timer M1 (running time meter) is connected in parallel with AC power applied to the compressor motor and records the compressor running time. Once activated, the compressor motor remains on until pressure switch S4 senses 5800 to 6200 psig at which time S4 opens, unlatching starter relay K1, removing AC power from the compressor. Momentarily depressing the OFF switch will also de-energize the starter relay. A safety switch S1 located in the cabinet will automatically shut down the system if the cover is opened during operation.

1-10. PROOF PRESSURE TEST OPERATION (Figure 1-3 and 1-4). Connector J2 permits connection of the proof test remote control cable to the GPU when performing proof test. The hand held control unit contains a RELIEF VALVE OVERRIDE switch and a COMPRESSOR RUN switch. Depressing the RELIEF VALVE OVERRIDE switch energizes the solenoid valve L3, closing the relief valve exhaust. The COMPRESSOR RUN switch is connected through S5 across the ON switch and provides for remote start capability of the GPU. Both switches are momentary type controls and must be held down to keep on. During the Proof Pressure Test, Pressure Switch S4 is bypassed by the COMPRESSOR RUN Switch S6 through Pressure Switch S5 allowing the compressor to pump above the normal 6000 ± 200 psig cutoff. When the pressure reaches 6900 ± 350 psig the relief valve will open, verifying its operation. Pressing the RELIEF VALVE OVERRIDE switch S7 closes the exhaust port of the relief valve and allows the compressor to continue pumping until the pressure switch S5 opens at 7750 ± 250 psig and stops the compressor motor. A remote digital readout device provides the operator with a constant pressure reading during the proof pressure test. The digital readout device connects to the pressure transducer unit via a 100 foot cable. A test hose connected in line with the closed system by means of a T connector permits pressure sensing by the transducer.

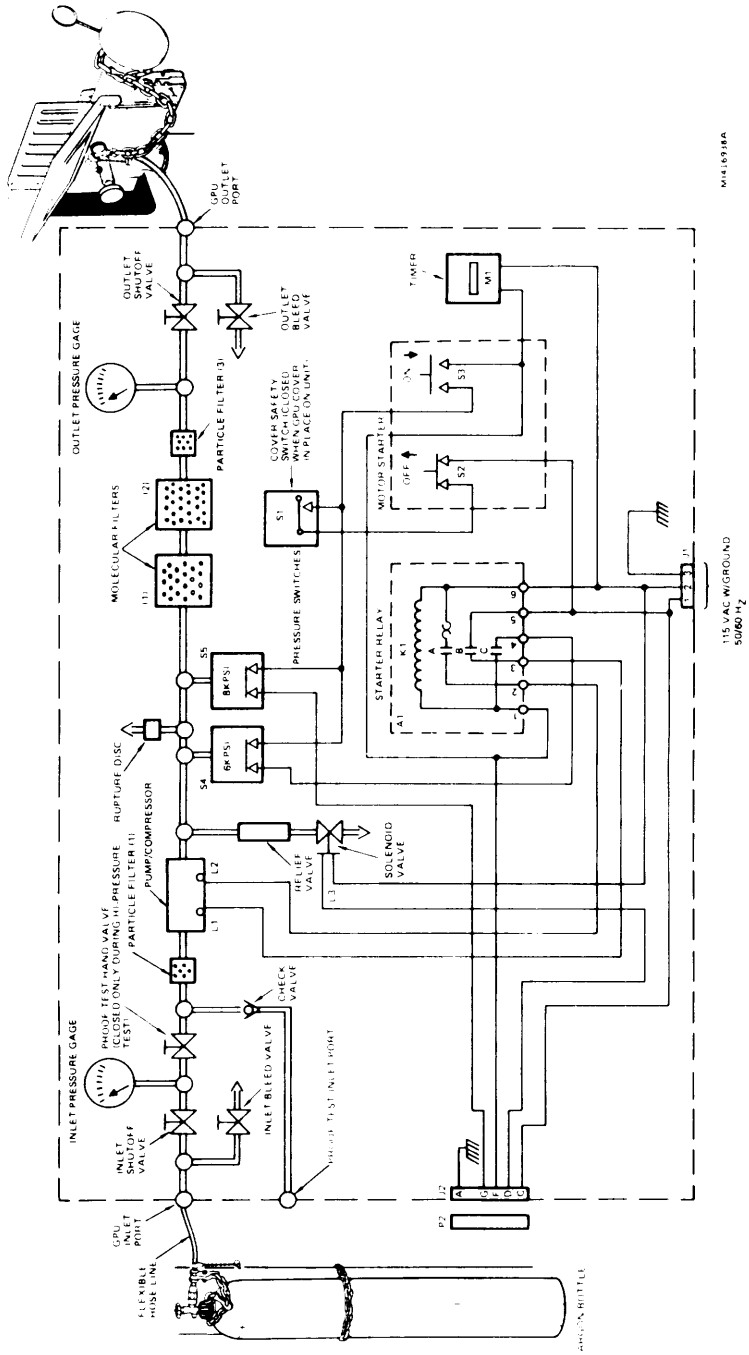


Figure 1-1. Gas Pumping Unit Functional Block Diagram

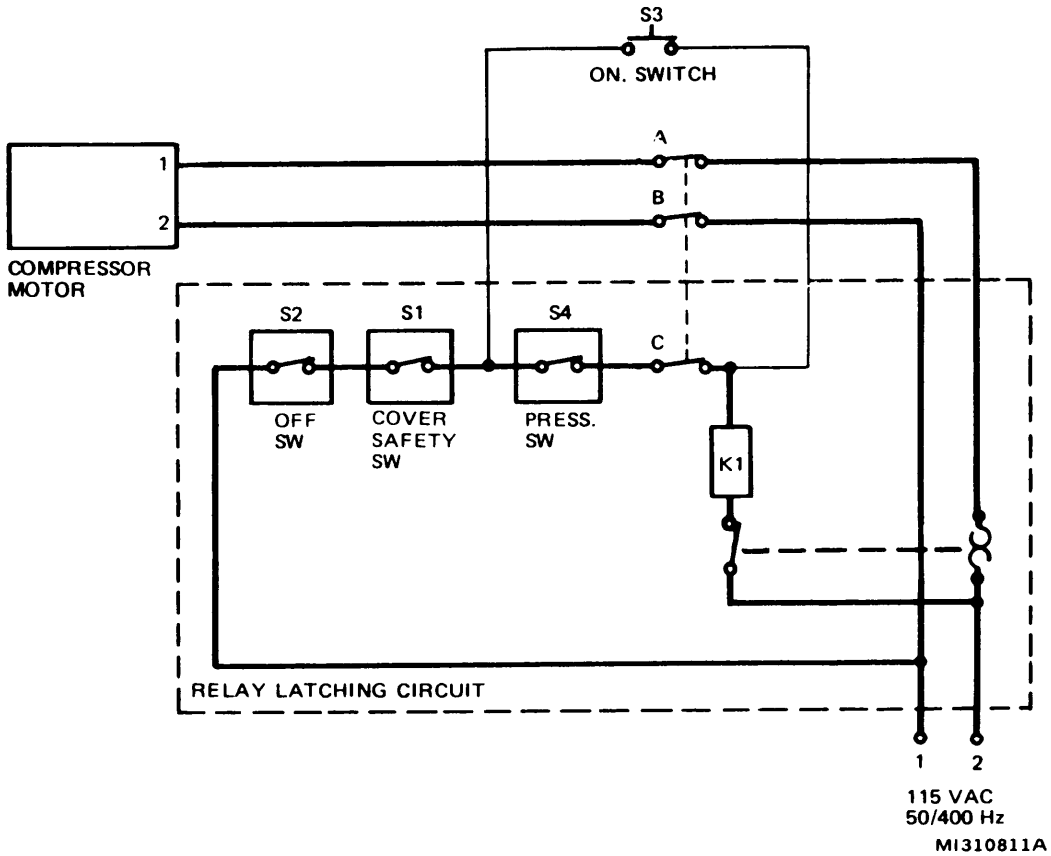


Figure 1-2. GPU Starter Relay in (LATCHED) Operate Mode

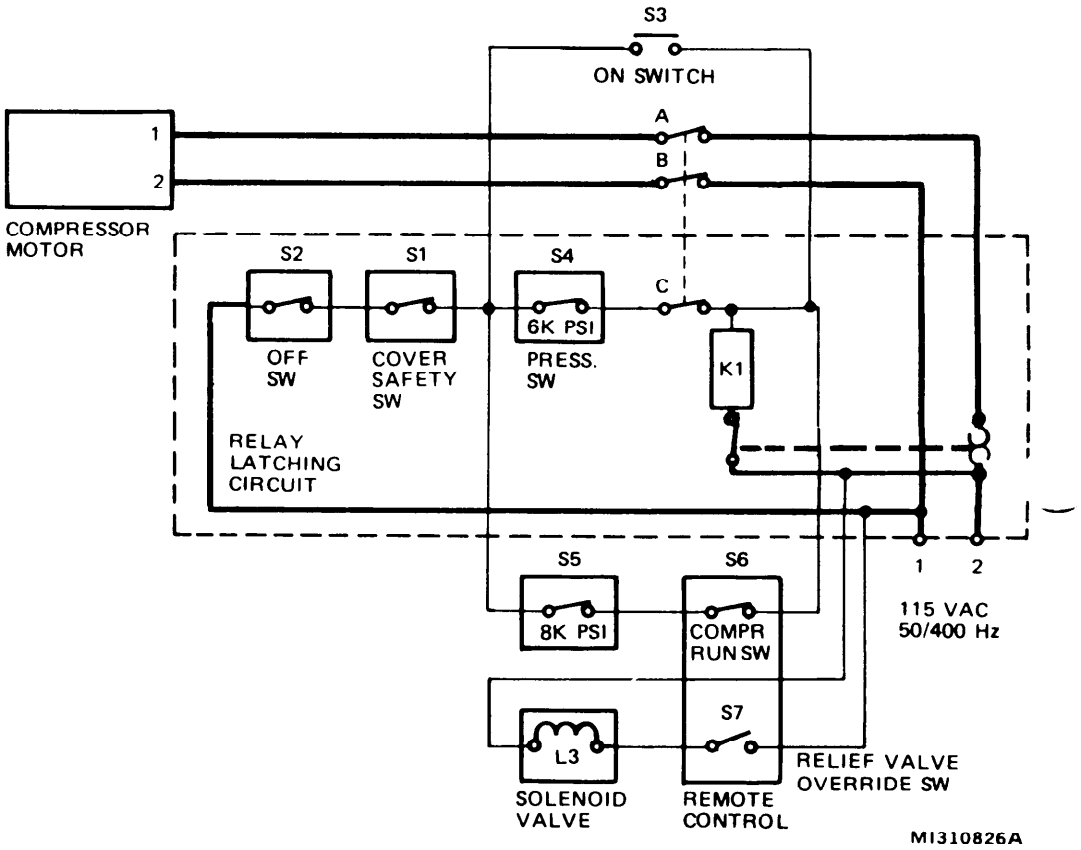


Figure 1-3. Proof Pressure Test Remote Control Interface

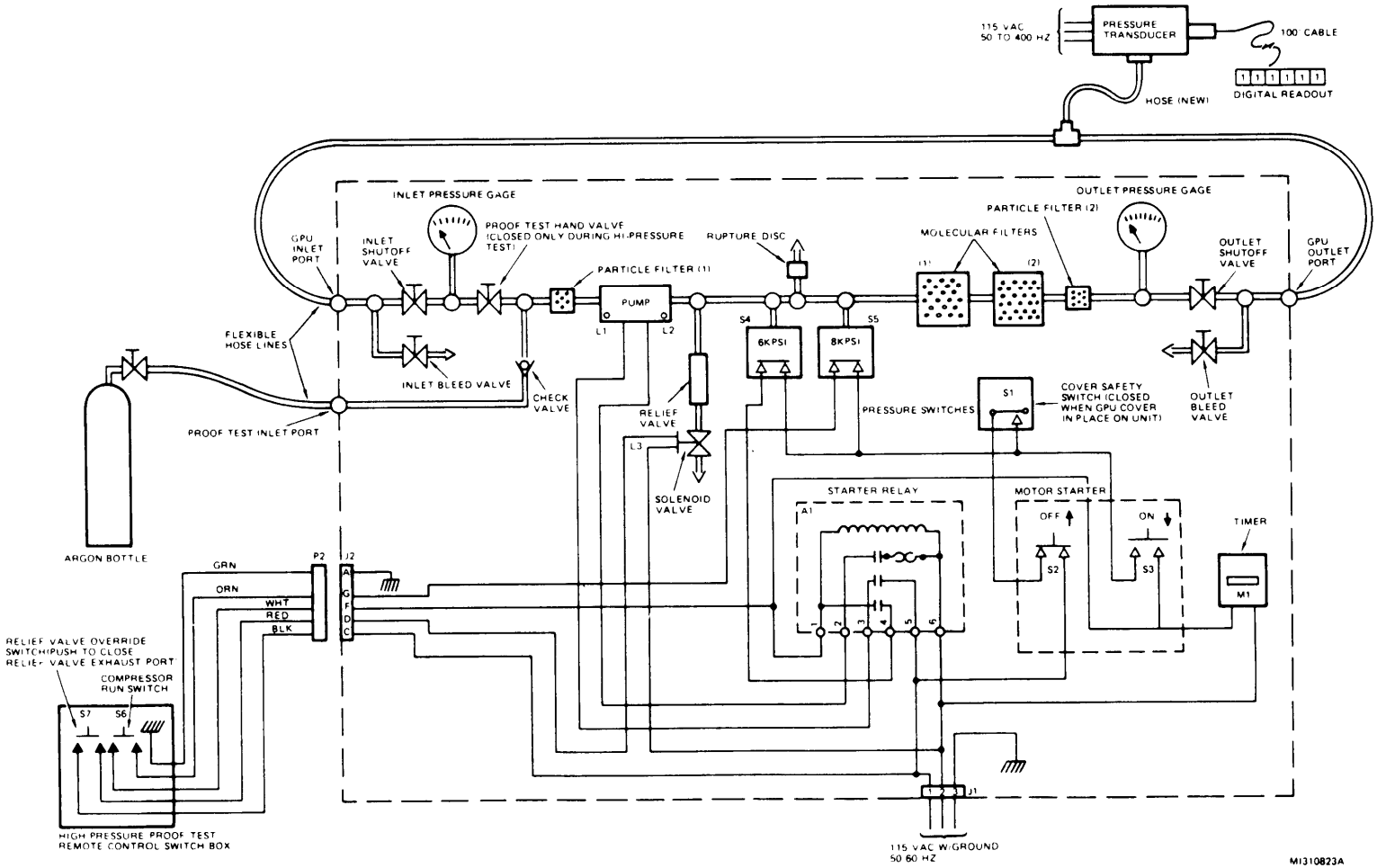


Figure 1-4. Gas Pumping Unit High Proof Pressure Mode, Functional Block Diagram

SECTION IV. BATTERY CHARGER PRINCIPLES OF OPERATION

1-11. GENERAL (Figure 1-5). The battery charger charges up to 5 nickel cadmium batteries housed in a carrying case for use during field training operations. The charger operates from 115 VAC, 50/400 Hz, single phase power, It charges 1 to 5 batteries independently or simultaneously within a maximum of 16 hours. The battery charger contains charging, charge test and power input circuits. The charger also supplies heater power to the carrying case. A heater control circuit within the carrying case thermostatically controls the battery compartment temperature in order to obtain optimum charging in low temperature environments. When AC power switch A1 (S1) is set to ON position, 115 volts AC is applied via 1 Amp fuse F2 to the primary winding of power transformer T1 (and to heater circuit via F1 described in para. 1- 13). Power transformer T1 transforms the 115 volts AC to 65 and 12 volts AC. The 65 volt AC output is supplied to a diode rectifier bridge located on subassembly A1A1. The 12 volt output illuminates POWER lamp AIXDS1.

1-12. CHARGING CIRCUIT (Figure 1-6). The full-wave rectified voltage from the bridge A1A1 CR1-CR4 is filtered by capacitors A1AlC1-C3 to produce a DC voltage for charging the batteries.

The battery charge voltage is applied to each of the five batteries via separate charging circuits. Thermal sensors located in the battery carrying case will disconnect the charging power to an individual battery if it is not above minimum charging temperature (see para. 1-13). The control circuit functions identically for all five batteries; therefore, only the circuit for battery number I is discussed. The positive output voltage from bridge network A 1AlCR1-4, is applied directly to the positive ring of the battery under charge via interlock switch S 1 and thermal sensor switch S1 contained inside the battery carrying case. The return battery path is from the negative battery terminal to the temperature thermal switch S2 also located inside the battery carrying case. From the thermal switch the return path continues through selector switch A1S2 to charge lamp A1XD AlA1CR5/A1A2Ql and A1A2R1 to bridge network A1A1CR1-4. A1XDS2 will be illumin during charging cycle. A regulated 3. 1 VDC reference voltage is applied to + input of amplifier A1A1U2A. The other input to AlAlU2A is from the emitter of A1A2Q1 via A1A1R25. Comparison of these two voltages by A1A1U2A provides bias for A1A2Q1 via A1A1R34 and A1A1Q5 such that a charging current of 70 ± 10 milliamps is maintained.

1-13. BATTERY CHARGER CARRYING CASE PRINCIPLES OF OPERATION (Figure 1-7). Each of the five battery compartments in the carrying case contains a heater to insure that the batteries are maintained above the minimum required temperature for charging. Power (115 VAC) is applied directly to these heaters through thermal switch S3, which closes at 18.3 ± 3°C (65 ± 5° F) and opens at 26.6 ± 3°C (80 ± 5° F). This switch is located in battery compartment 3, therefore, when charging less than five batteries, one battery must be in compartment 3 to insure proper control of the heater circuits.

Each battery compartment also contains two thermal switches (S1 and S2) which control the charging circuit to each battery. These switches insure that battery charging is not attempted if the battery temperature is either above or below the safe limits of the battery. Switch S 1 provides high temperature protection and opens when the temperature reaches 60± 3°C (140 ± 5° F) and prevents charging the battery until it cools to 43.3 ± 3°C (110 ± 5° F) at which point S1 closes. Switch S2 provides low temperature protection and opens at 10± 3° C (50 ± 5° F) and prevents charging the battery until the heater warms the battery to 18.3 ± 3°C (65 ± 5° F) at which point S2 closes.

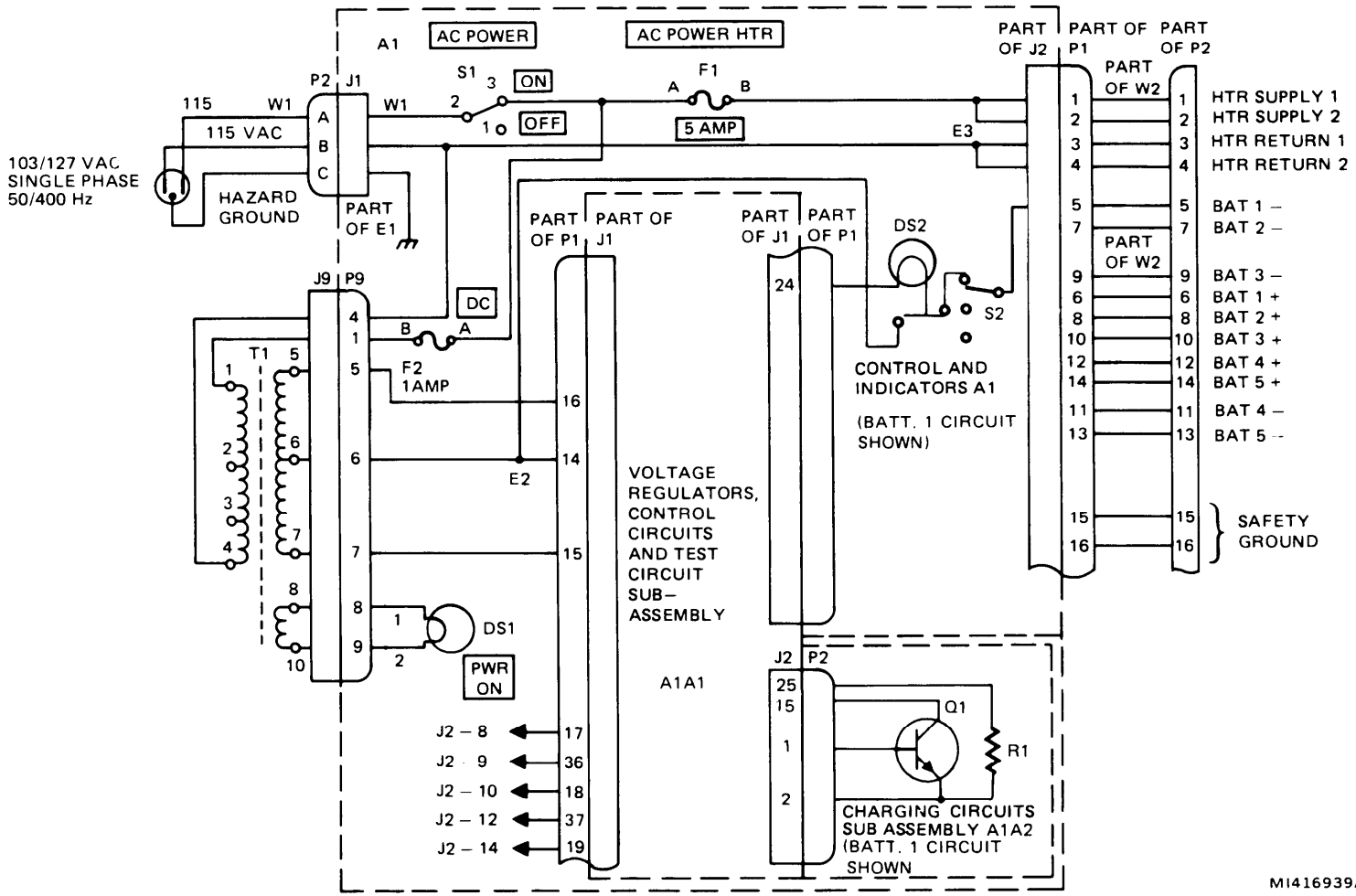


Figure 1-5. Battery Charger Interconnecting Diagram

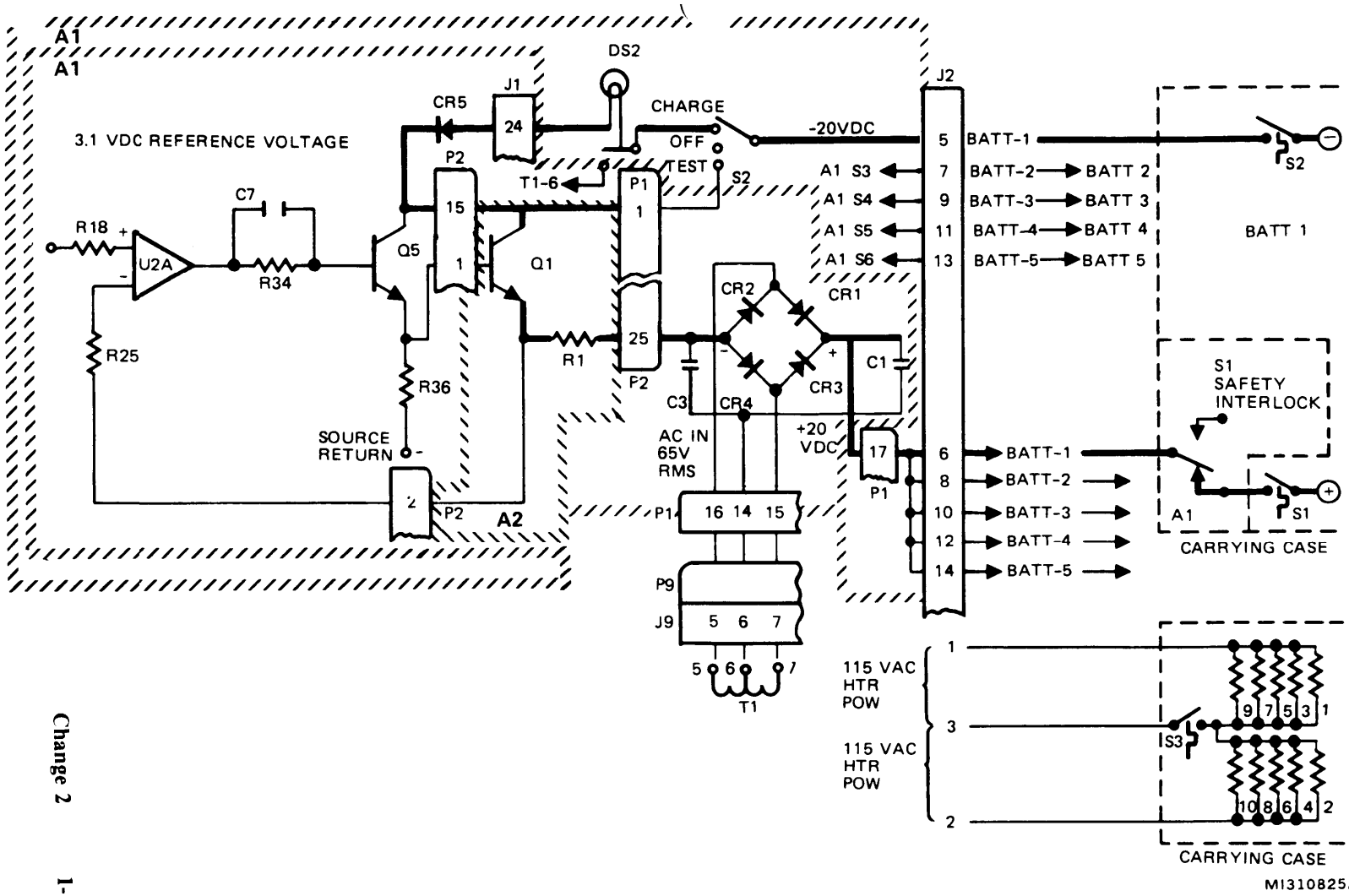
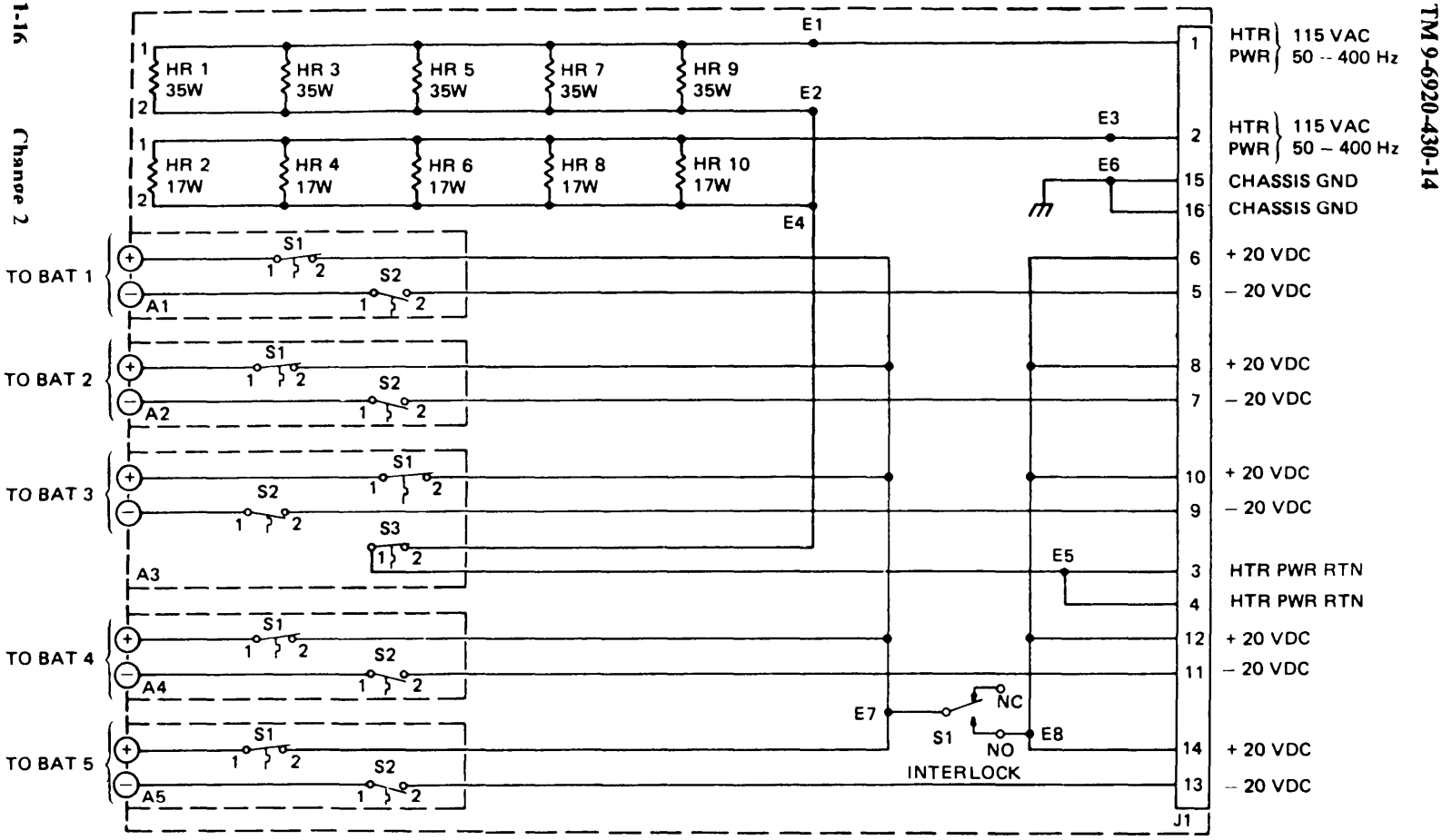


Figure 1-6. Charging Circuit, Partial Schematic Diagram



NOTES:

1. OPERATING TEMPERATURES FOR THERMOSTATIC SWITCHES S1, S2 AND S3 ARE AS FOLLOWS:
   S1 OPENS ON INCREASING TEMPERATURE AT 60±3°C (140±5°F) AND CLOSES ON DECREASING TEMPERATURE AT 43.3±3°C (110±5°F).
   S2 OPENS ON DECREASING TEMPERATURE AT 10±3°C (50±5°F) AND CLOSES ON INCREASING TEMPERATURE AT 18.3±3°C (65±5°F).
   S3 OPENS ON INCREASING TEMPERATURE AT 26.6±3°C (80±5°F) AND CLOSES ON DECREASING TEMPERATURE AT 18.3±3°C (65±5°F).

MI310806A

Figure 1-7. Battery Charger Charging Case, Schematic Diagram

1-14. BATTERY TEST CIRCUIT (Figure 1-8). This circuit is provided to check the charge/discharge condition of the trainer batteries. Each battery is individually tested by placing the appropriate CHARGE/OFF/TEST switch in the test position and holding in position momentarily. The green lamp will illuminate if the battery under test is maintaining a proper charge (42±2 VDC). Test connections for the five CHARGE/OFF/TEST switches S2-S6 are similar; thus only switch S2 for battery 1 will be discussed. Placing the CHARGE/OFF/TEST switch in the TEST position connects load resistors A1R21-29 across the negative side of the battery under test and the input terminal of voltage amplifier A1U1A. If the differential voltage sensed by resistor network A1R20-21-29 is correct, AIU1A amplifies the input signal to drive A1Q4 causing A1Q4 to conduct and illuminate TEST lamp A1DS7. A discharged battery will not provide the required bias voltage to drive voltage amplifier A1U1A.

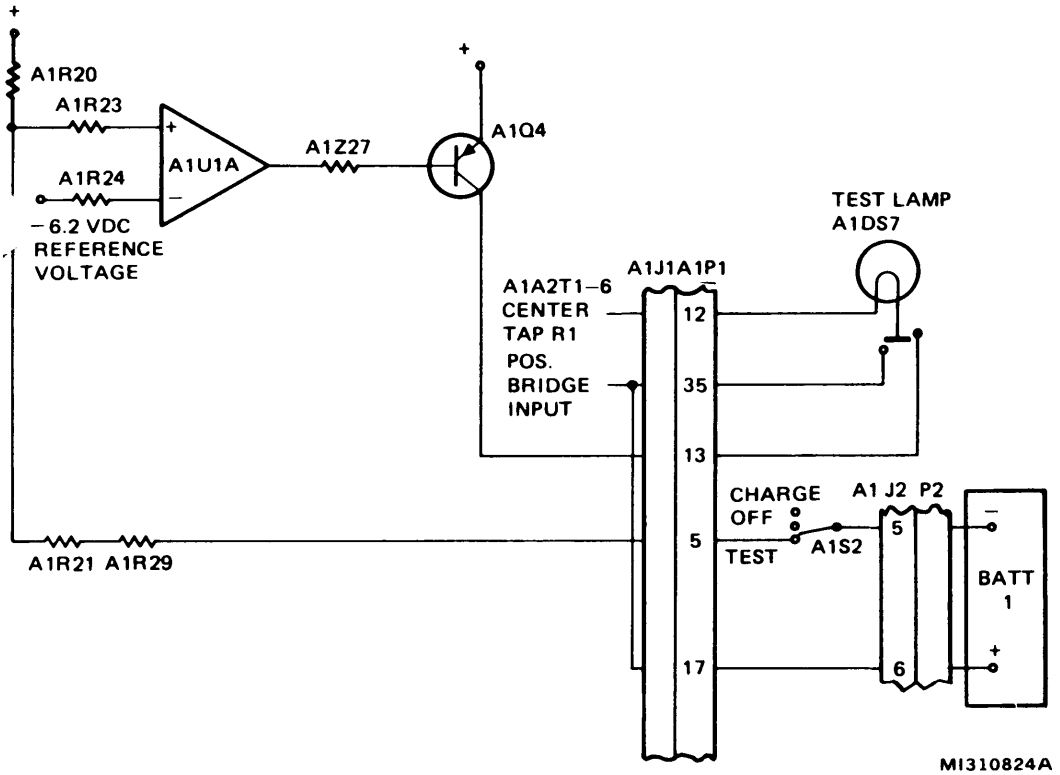


Figure 1-8. Battery Test Circuit, Partial Schematic Diagram

CHAPTER 2
OPERATION

Section I. CONTROLS AND INDICATORS

2-1. KNOW YOUR GPU AND BATTERY CHARGER CONTROLS AND INDICATORS. Before you operate your equipment make certain that you are familiar with the location and operation of all controls and indicators. Figure 2-1 shows the general locations of controls and indicators on the GPU and Battery Charger. Figure 2-2 shows the GPU controls and indicators in detail. The proof pressure test equipment controls and indicators are shown in Figure 2-3. The details of the Battery Charger Controls and Indicators are shown in Figure 2-4.

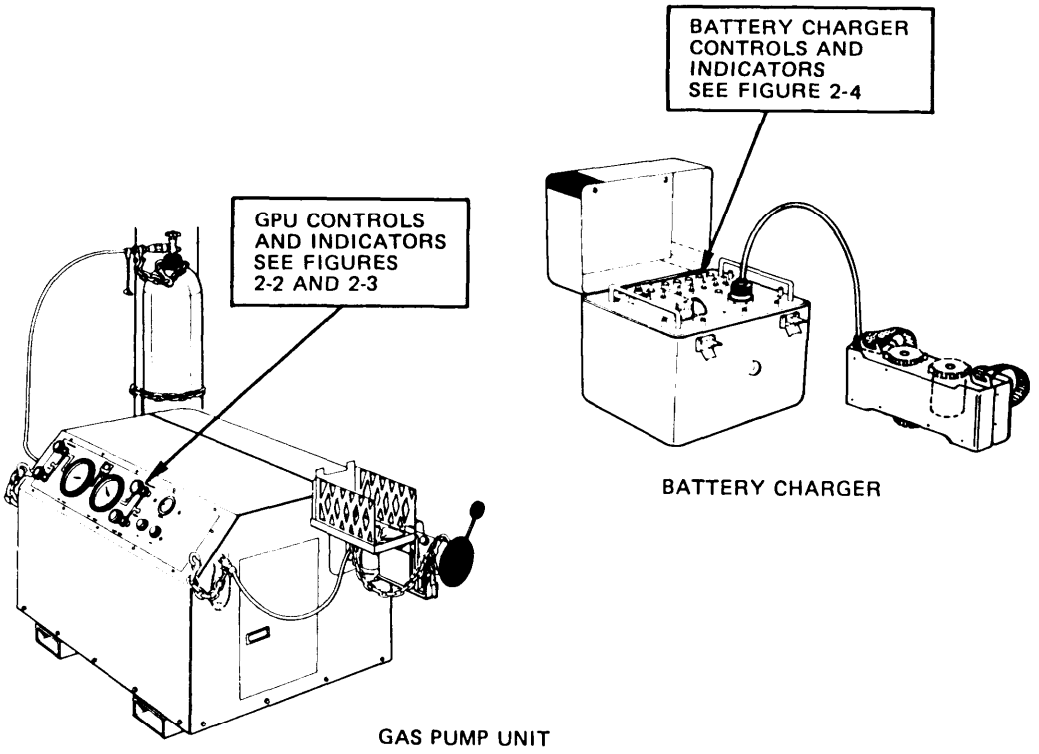


Figure 2-1. GPU and Battery Charger, Controls and Indicators

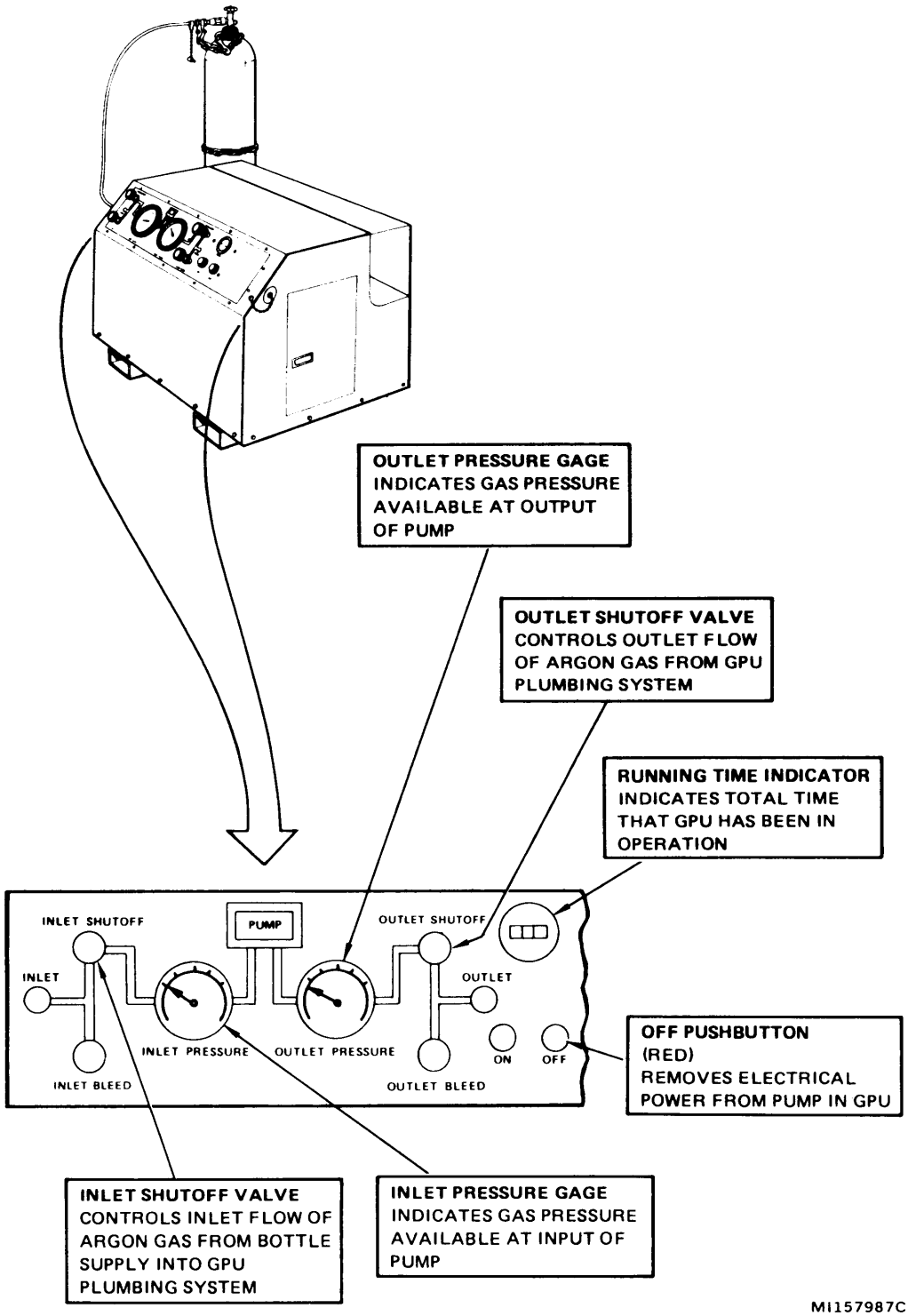


Figure 2-2. Gas Pumping Unit, Controls and Indicators (Sheet 1 of 3).

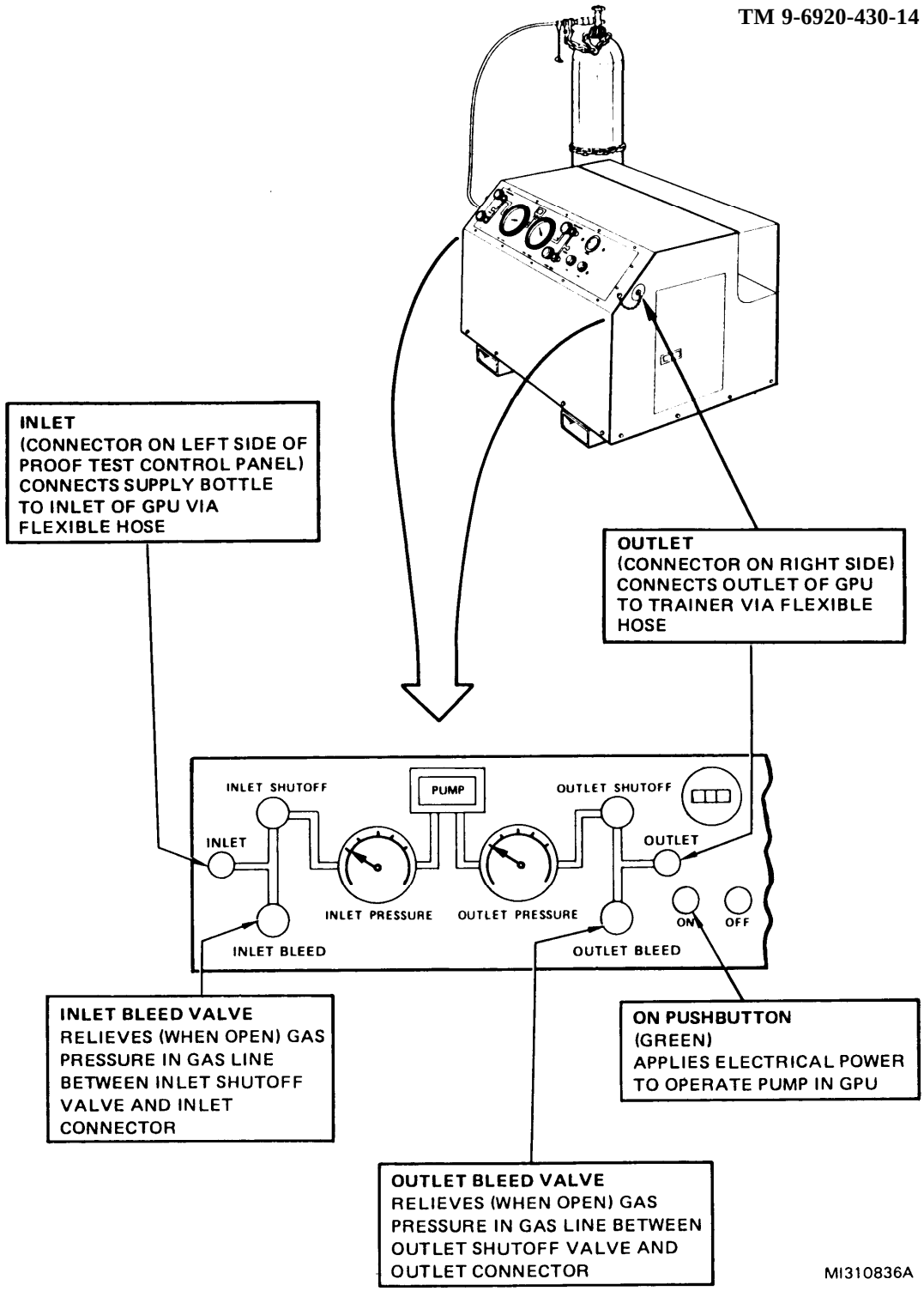


Figure 2-2. Gas Pumping Unit, Controls and Indicators (Sheet 2 of 3).

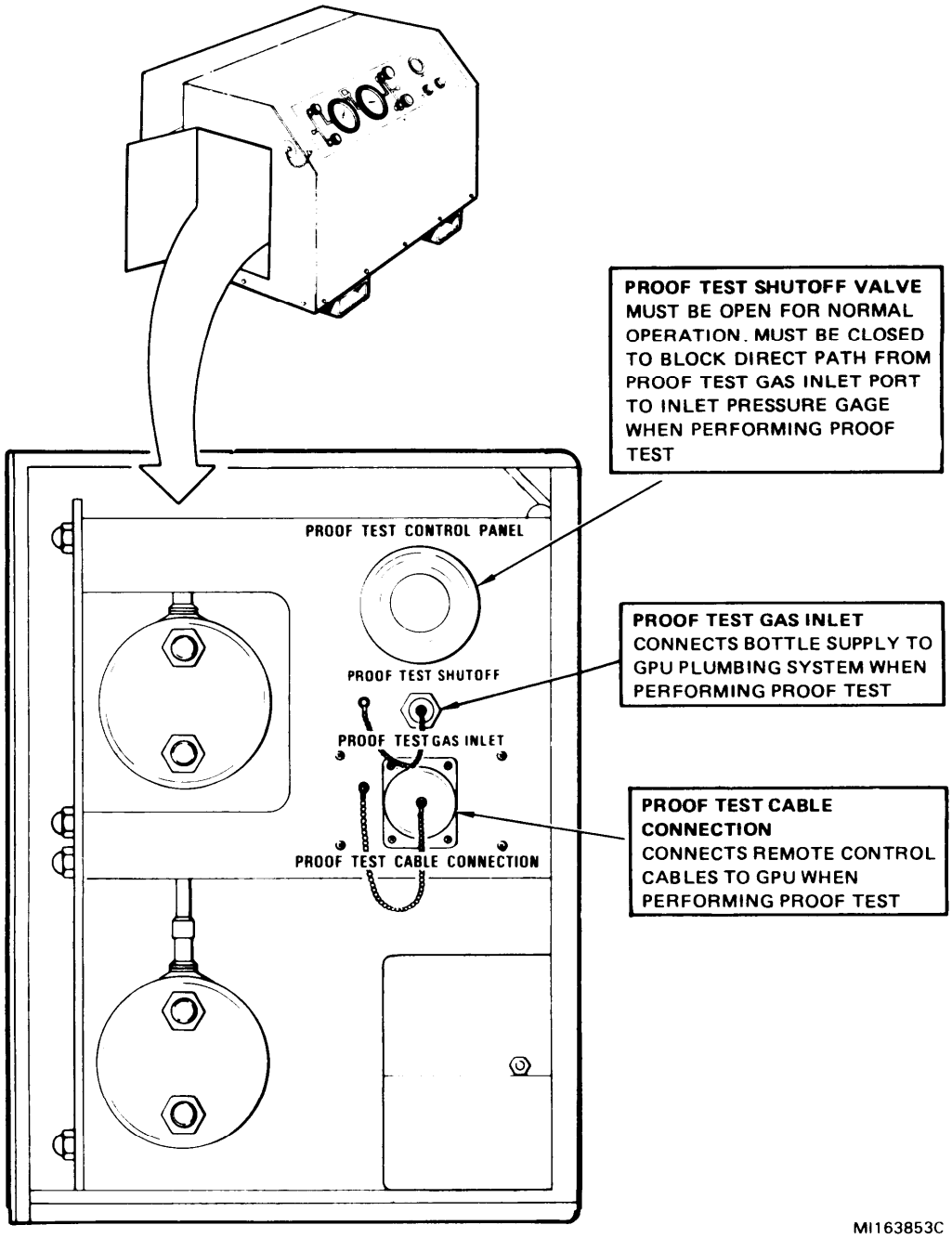


Figure **2-2. Gas** *Pumping Unit, Controls and Indicators (Sheet 3 of 3).*

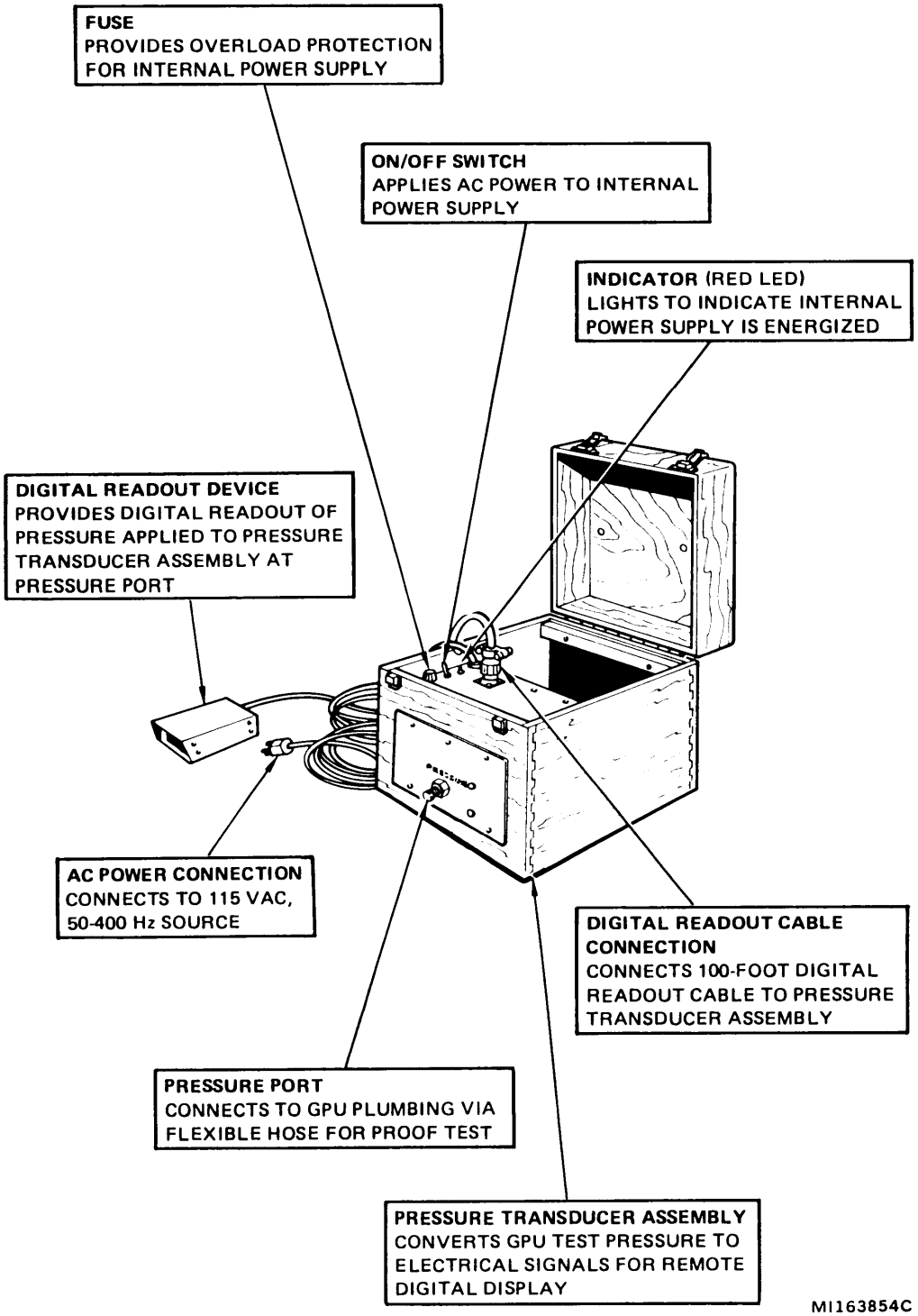


Figure 2-3. GPU Proof Test Equipment, Controls and Indicators (Sheet 1 of 2)

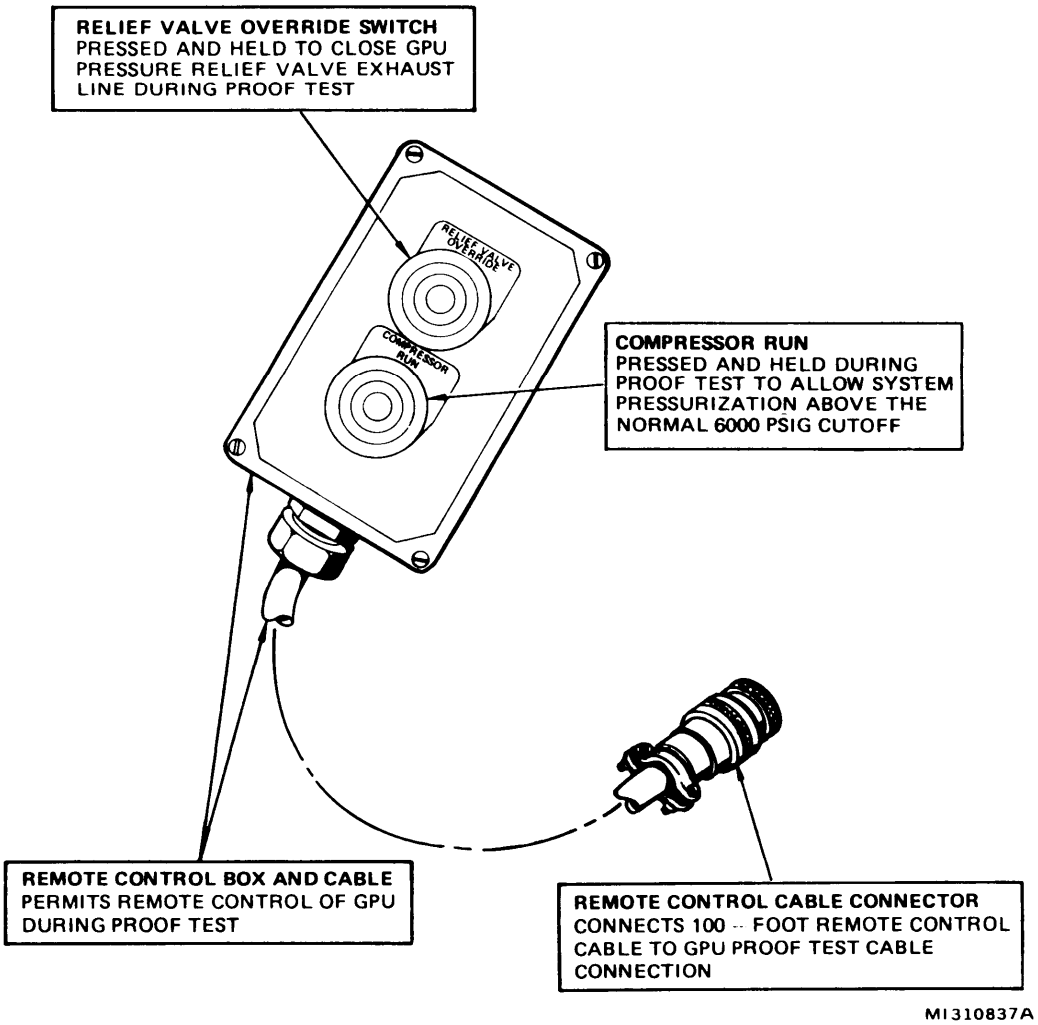


Figure 2-3. GPU Proof Test Equipment, Control and Indicators (Sheet 2 of 2)

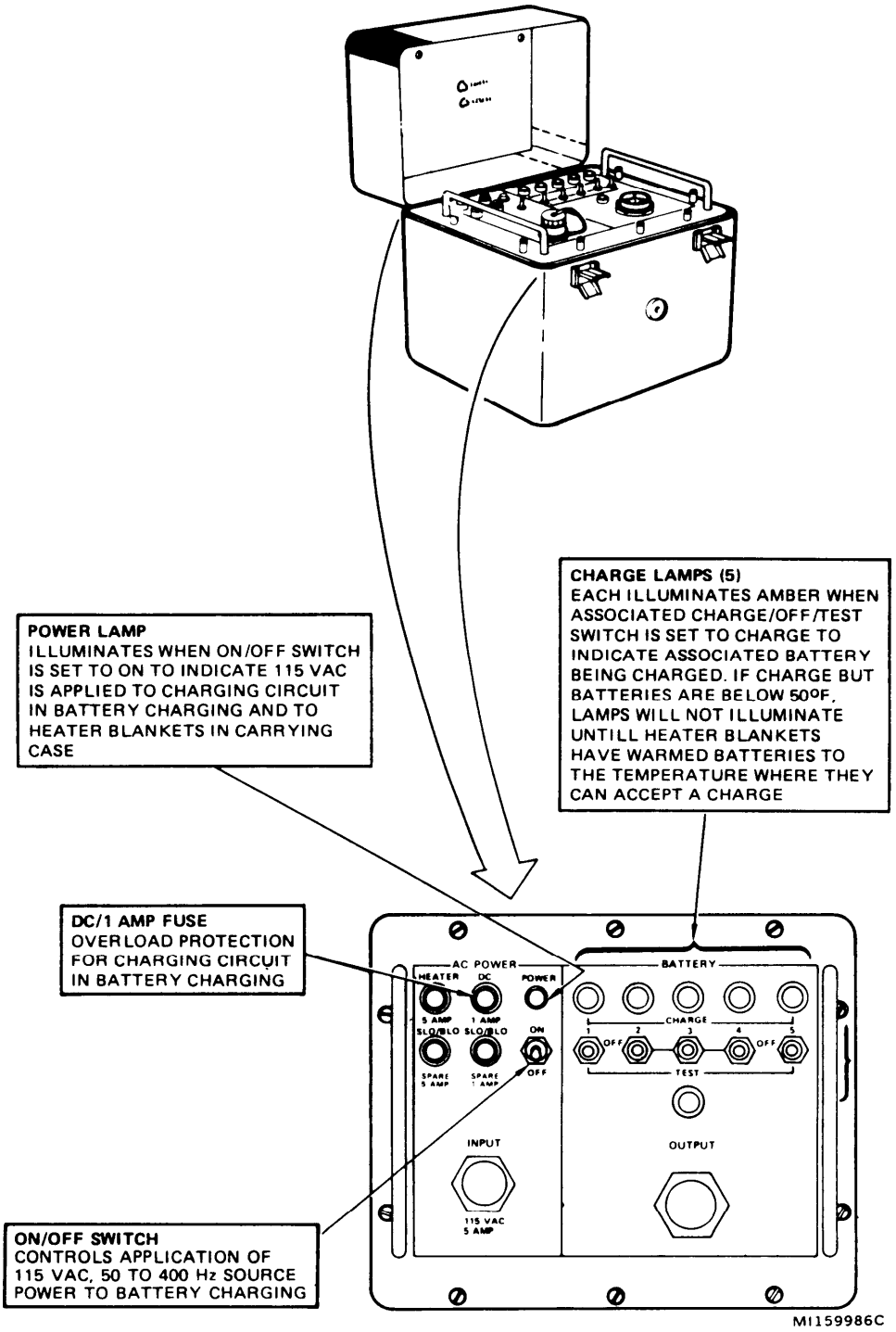


Figure 2-4. Battery Charger, Controls and Indicators (Sheet 1 of 3)

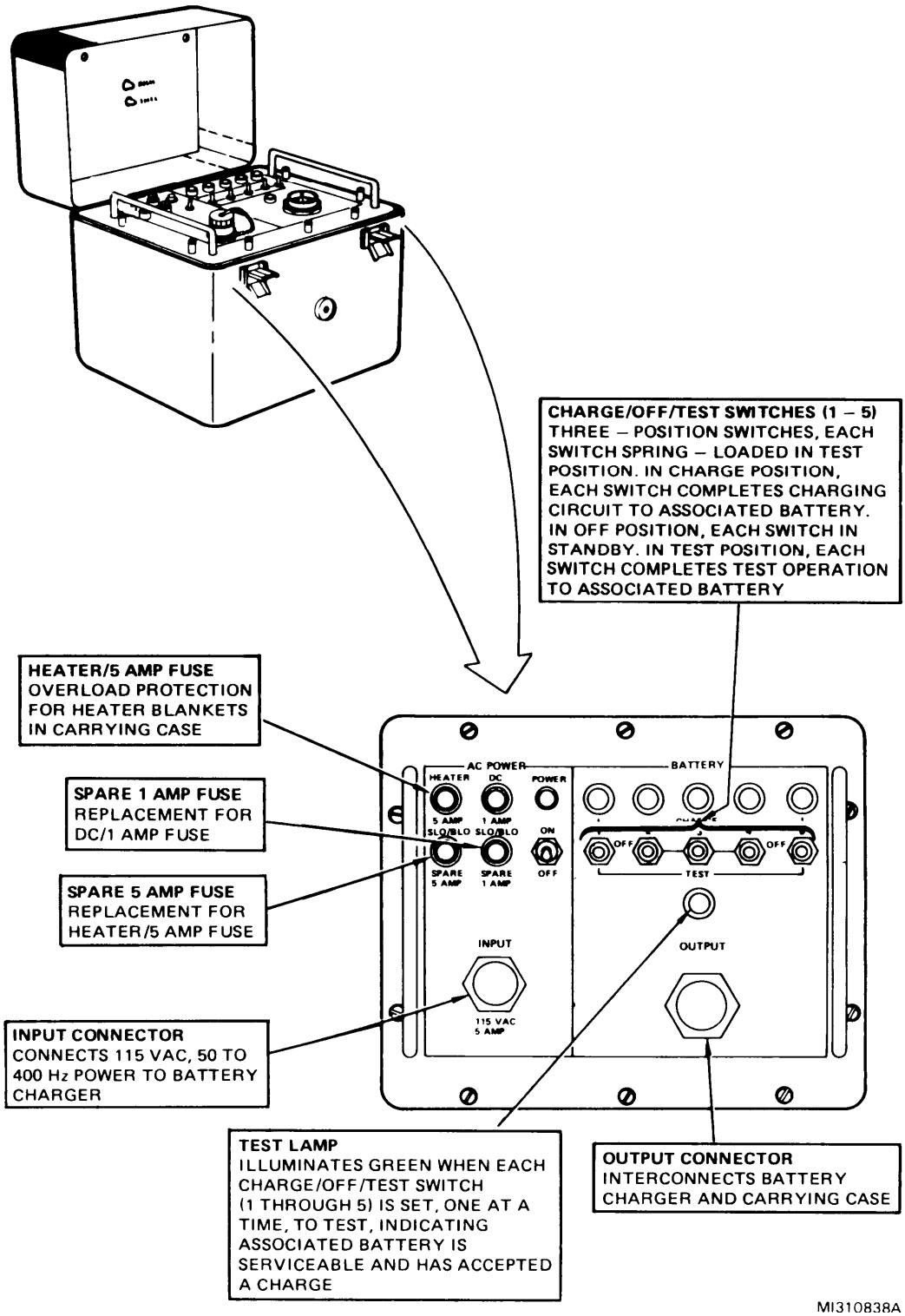


Figure 2-4. Battery Charger, Controls and Indicators (Sheet 2 of 3)

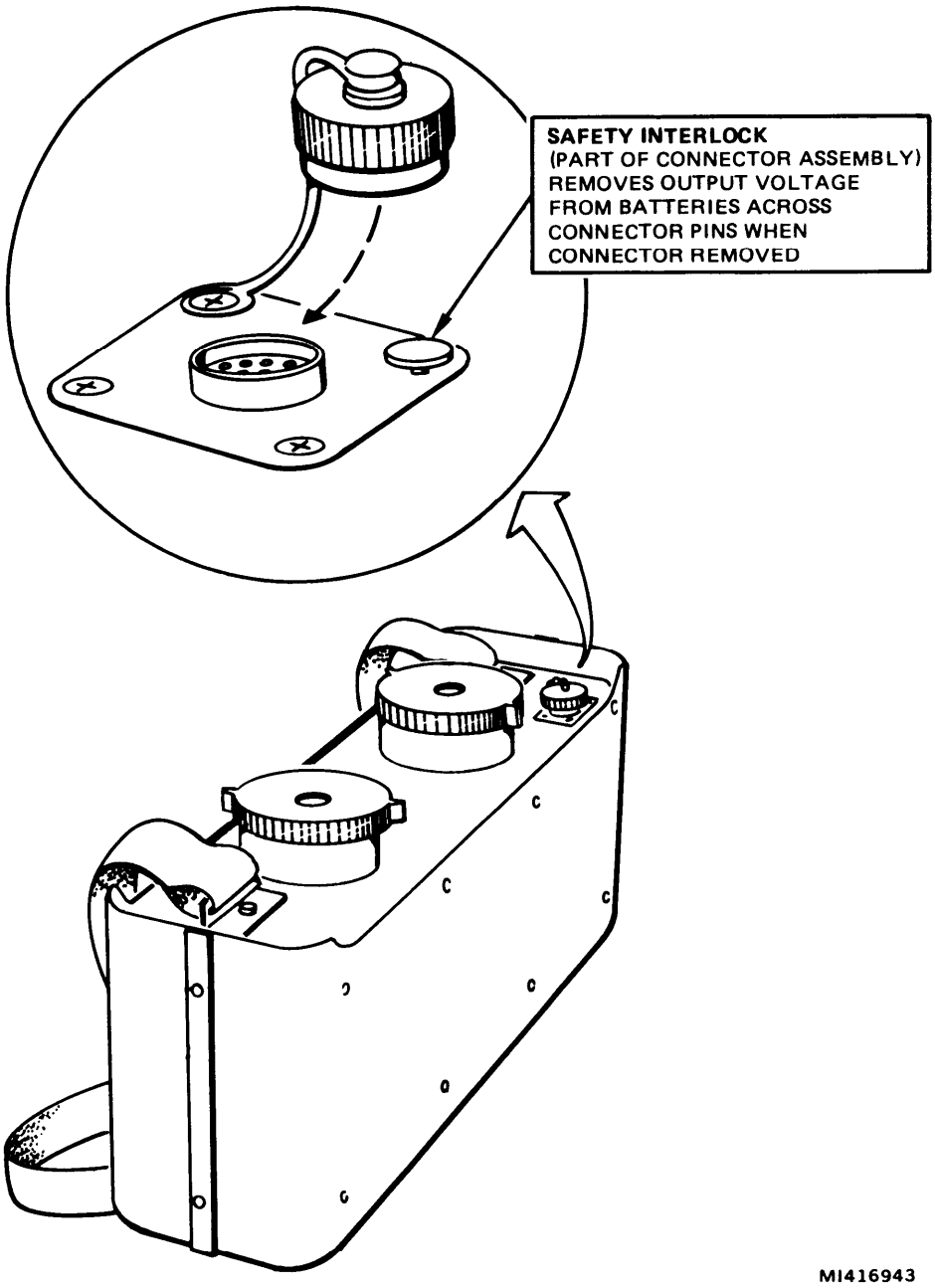


Figure 2-4. Battery Charger, Controls and Indicators (Sheet 3 of 3)

Section II. GAS PUMPING UNIT OPERATION

This section contains the information you will need to operate the GPU when refilling the trainer coolant supply. Before operating the GPU be sure you have performed all of the Before (B) operation maintenance checks in table 3-1. If equipment failure occurs during normal operation, refer to the troubleshooting procedures contained in Section V, Chapter 3.

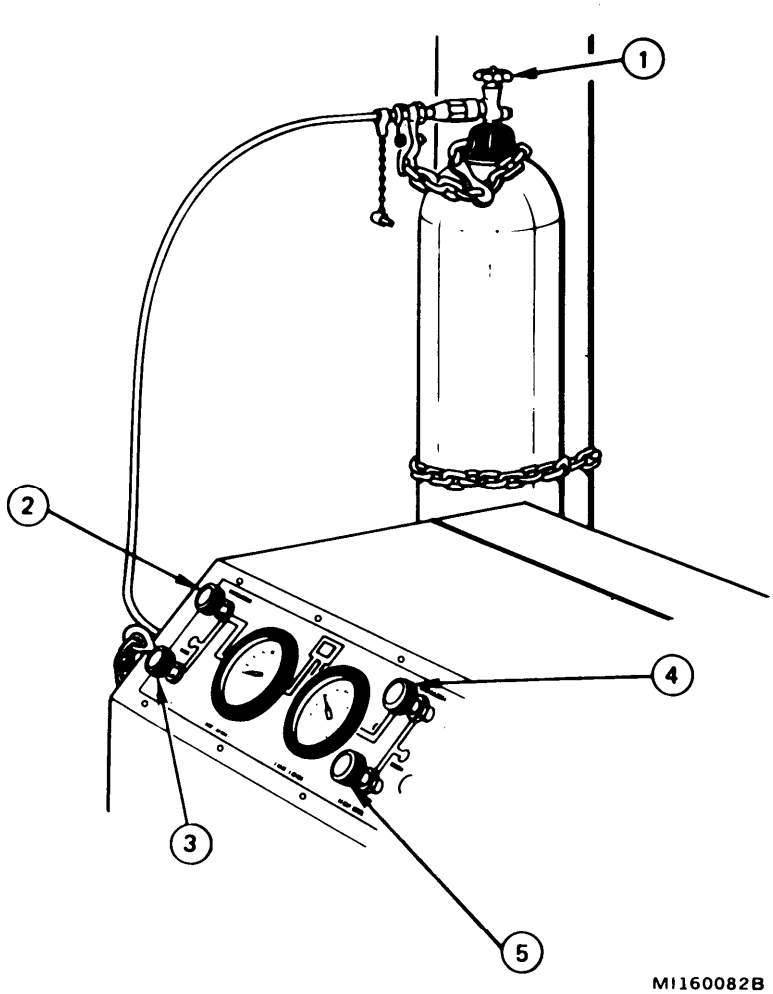
2.2 PREPARATION FOR USE

WARNING

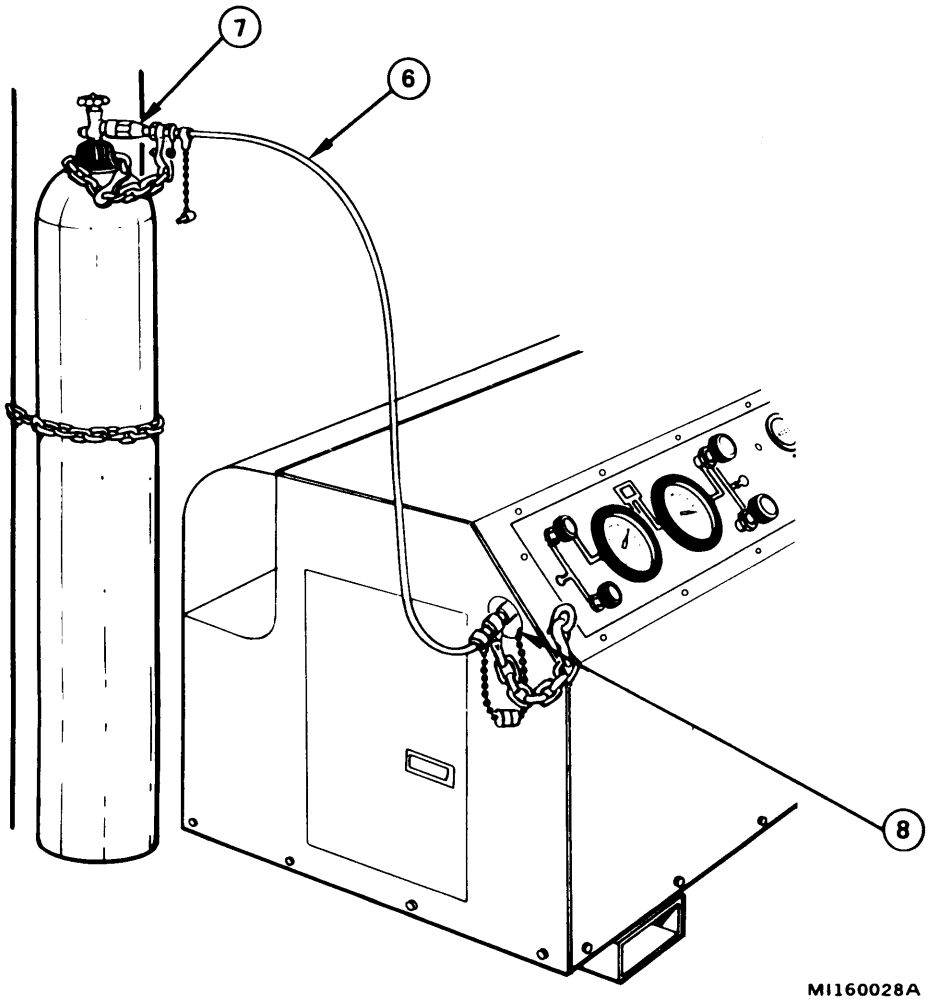
Operation of the GPU must be performed in a large, well ventilated area. Argon is a colorless, odorless, inert gas which displaces air and in high concentrations can cause dizziness and suffocation. If you become light headed while operating this equipment, evacuate work area. High gas pressure (up to 6200 psig) is used to refill the gas bottle in the trainer. Death or severe injury may result if you fail to observe safety precautions.

NOTE

Argon gas is still usable even though more than 5 years have elapsed since the last hydrostatic inspection date stamped on the cylinder.



a. Be sure that the argon gas supply valve (1) is turned fully clockwise to the closed position. Be sure that the INLET SHUTOFF valve (2), INLET BLEED valve (3), OUTLET SHUTOFF valve (4), and OUTLET BLEED valve (5) are turned fully clockwise to the closed position. Be sure that PROOF TEST SHUTOFF valve is open fully CCW (reference Figure 2-2).

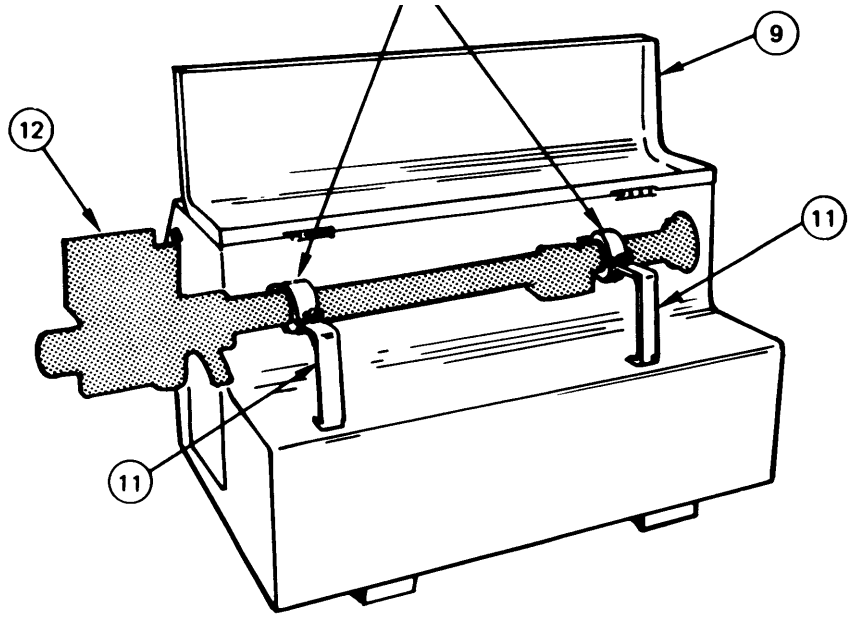


WARNING

Argon gas supply bottle must be secured (chain, wire rope) upright to a building column or any available rigid, immovable structure. If bottle is used while in cart, secure cart in identical manner.

b. If the inlet flexible hose (6) is not attached, install as follows. Check that the supply bottle adapter (7) is threaded (left hand) onto the gas supply valve and tightened. Use large adjustable wrench. Remove inlet flexible hose from proof pressure equipment storage box. Remove the protective plug from the fitting of the inlet hose and thread the fitting onto the supply bottle adapter (7). Tighten using a 9/16-inch wrench to tighten. Wrap the chain around the gas supply valve housing and latch the chain lock to a chain link. Remove the protective plug from the end of the inlet flexible hose. Connect that end of the hose to the GPU inlet fitting (8) using a 9/16-inch wrench to tighten. Attach the safety chain to the GPU eyebolt. Connect the protective plug and cap at the GPU inlet finger tight.

2-3. TRAINER INSTALLATION



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a. Lift the safety cover (9) at the rear of the GPU and open the two latches (10).

b. Facing the rear of the GPU, install the trainer onto the two cradles (11) with the forward end to your left. Butt the performance indicator assembly against the inside of the right cradle and fasten the latches (10).

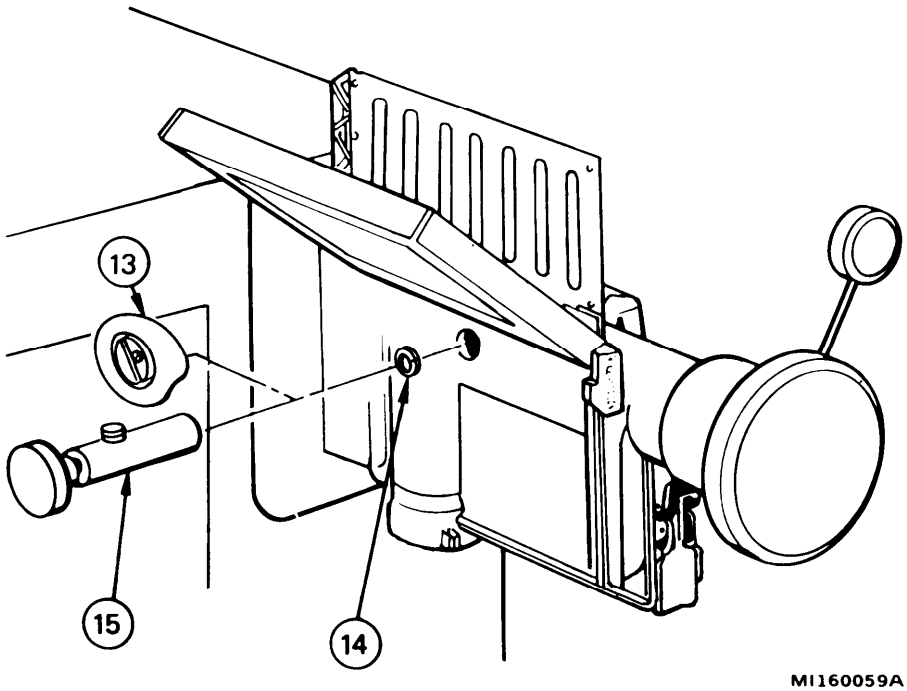
WARNING

Be sure that the trainer is physically secured in its cradles.

c. Close and latch the safety cover (9). Raise the IFF antenna (12), but do not allow it to unfold until completion of step e.

CAUTION

Before removing fill cover from trainer in step d below, loosen small bleed screw located on fill port cover 2 turns counterclockwise. This will permit safe venting of any gas trapped in the launch tube.

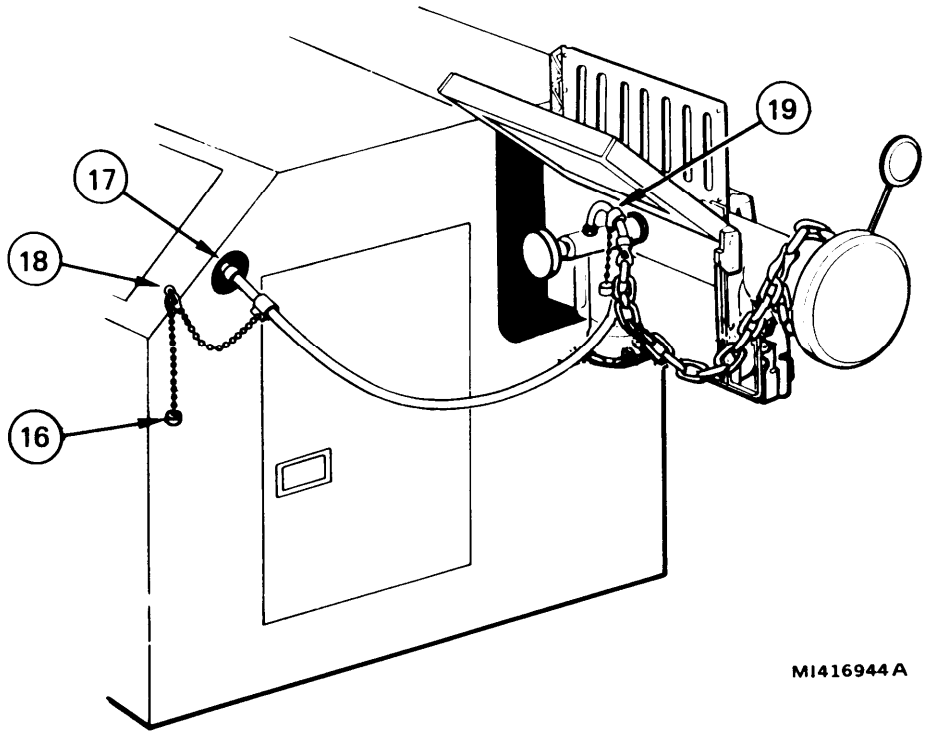


d. Using a large flat-blade screwdriver, loosen (CCW) and remove the fill port cover (13). Check the preformed packing (14) around the fill port inlet for snug fitting. Replace if damaged. Verify presence of locking ring. Return for repair through normal supply channels if missing or damaged.

WARNING

To prevent accidental release of high pressure gas, be sure that the valve on trainer adapter (15) in step (e) below is opened, turned fully counterclockwise, before installing into trainer fill port. VALVE MUST REMAIN IN THIS POSITION (OPEN) THROUGHOUT PROCEDURE.

e. Obtain the trainer adapter (15) and turn its valve fully counterclockwise (CCW). Then, thread the trainer adapter (15) into the fill port inlet. Hand tighten the adapter until contact is made with the fill port preformed packing (O-ring), then hand tighten 1/4 turn after contact.



NOTE

Perform step (f) below if hose is not connected to GPU; otherwise proceed to step (g). The hose end having the shorter chain is connected to the GPU outlet fitting (17).

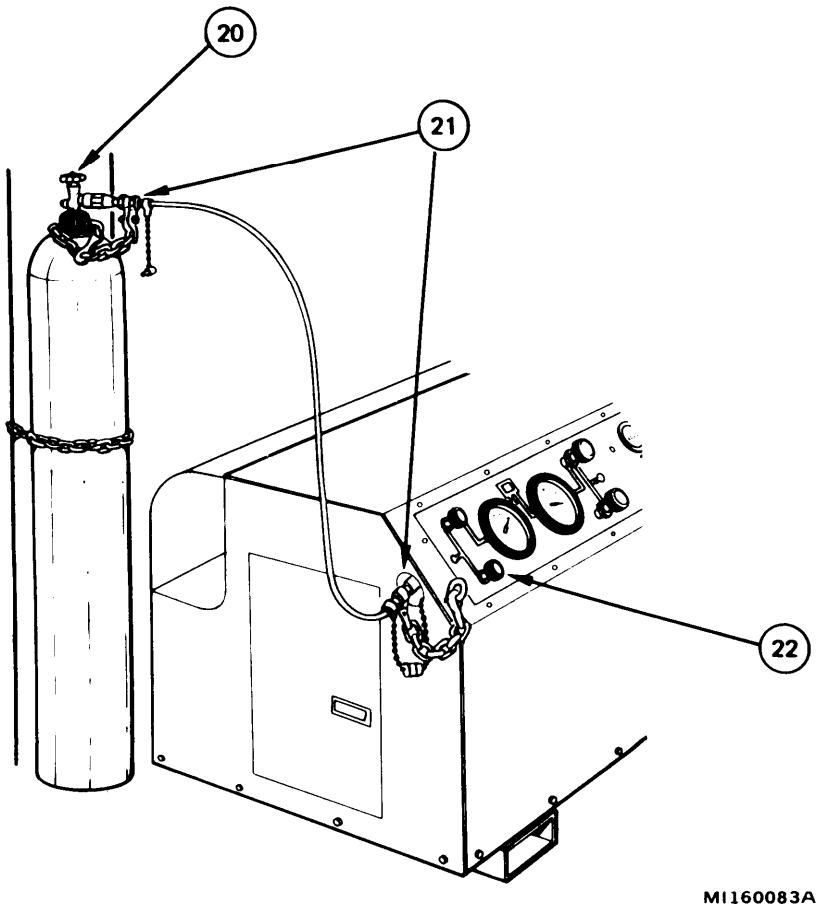
f. Remove protective cap (16) from the GPU outlet fitting (17), and the protective plug from the end of the GPU outlet flexible hose. Connect that end of the hose to the GPU fitting (17) using a 9/16-inch wrench to tighten. Attach the safety chain to the GPU eyebolt (18).

g. Remove the protective plug from the other end of the outlet flexible hose, and thread the hose fitting to the trainer adapter (19) using a l/2-inch wrench to hold and a 9/16-inch wrench to tighten. Wrap the chain around the front end of the launch tube and latch the chain lock to a chain link.

2-4. REFILLING PROCEDURE.

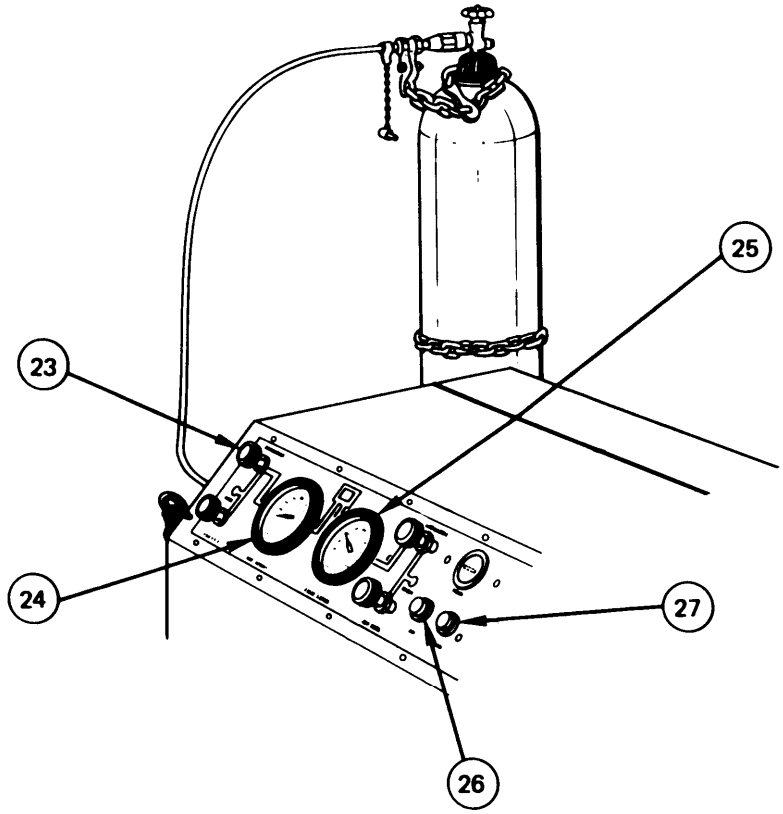
a. Operation

(1) Connect the GPU to a 115 VAC 50/60 Hz power source.



(2) Very slowly open the argon gas supply valve (20) two complete turns counterclockwise.

(3) Squirt leak detecting liquid around the two inlet hose fittings (21). Visually check for gas bubbles indicating leakage. If leaks are detected, close argon gas supply valve (20) fully clockwise. Open INLET BLEED valve (22) counterclockwise to relieve gas. Tighten fitting. Close INLET BLEED valve fully clockwise and repeat steps (2) and (3).



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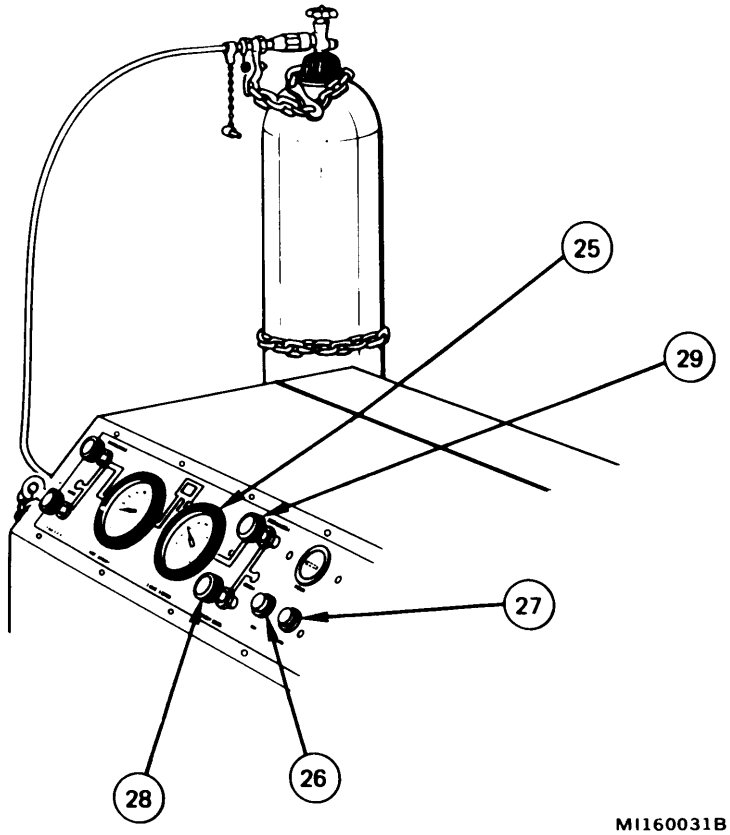
(4) Slowly open the INLET SHUTOFF valve (23) one-half to one turn counterclockwise for a slow rise in pressure as read on the INLET PRESSURE gage (24). Wait until the reading stabilizes; then turn the INLET SHUTOFF valve (23) two complete turns counterclockwise.

NOTE

If the pressure reading on the INLET PRESSURE gage (24) is 2000 psig or less, replace gas supply bottle (para. 3-13, page 3-63).

If the OUTLET PRESSURE gage (25) does not rise, momentarily press the ON pushbutton (26) and then the OFF pushbutton (27). The OUTLET PRESSURE gage (25) should read the same (±200 psig) as the INLET PRESSURE gage (24). If not, repeat the above operation to equalize pressure in pump.



(5) Open the OUTLET SHUTOFF valve (29) two complete turns counterclockwise.

(6) Squirt leak detecting liquid around the two outlet hose fittings. Visually check for gas bubbles indicating leakage. If leaks are detected, close OUTLET SHUTOFF valve (29) fully clockwise. Open OUTLET BLEED valve (28) to relieve gas. Tighten fitting. Close OUTLET BLEED valve fully clockwise and repeat steps (5) and (6).

NOTE

If a squeaking noise is heard when the pump is operating, press the OFF pushbutton and perform the During (D) preventive maintenance checks and services described in item number 11 in table 3-1 (page 3-10).

(7) Press the ON pushbutton (26) to start the pump. If the pump does not go on, open the left access door and momentarily press the reset button on the starter relay. Close the access door and press the ON pushbutton (26). If the OUTLET PRESSURE gage does not show an increased pressure reading after one minute of operation, the compressor may have lost its prime. Turn the GPU off and perform the priming procedures contained in Chapter 3, Section VI, Corrective Maintenance.

Escaping gas is hazardous. Do not feel for leaks with your hands. Frostbite or lacerations can result.

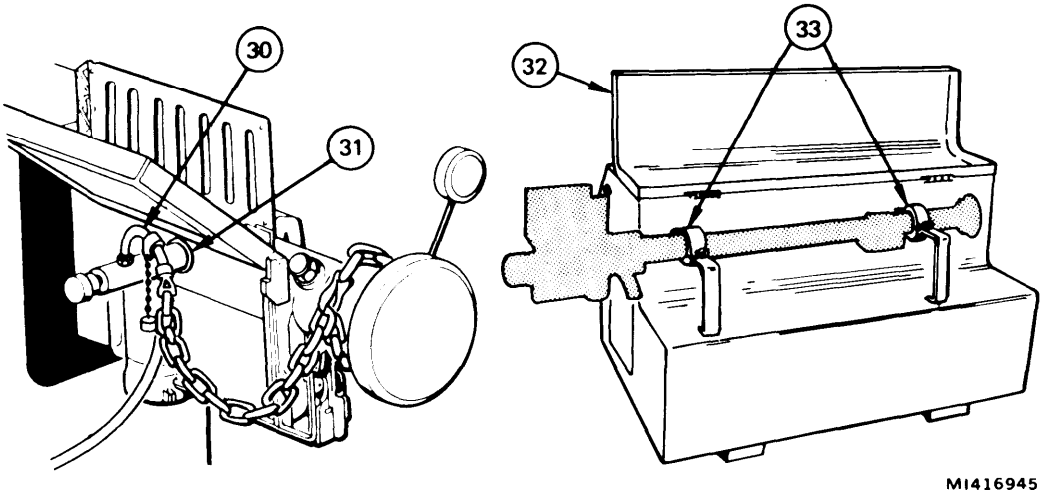
NOTE

The pump automatically shuts off when OUTLET PRESSURE gage reads 6000 ± 200 psig. However if the temperature where GPU is located is 60°F or less, manually stop the pump at 5200 psig. The GPU should not be left unattended during charging process. If at any time during the charging process gas is heard escaping, turn off GPU (press OFF pushbutton) and close argon gas supply valve.

(8) Determine the temperature where the GPU is located and look at the OUTLET PRESSURE gage (25). At 60°F or below, press the OFF pushbutton (27) when you read 5200 psig on the OUTLET PRESSURE gage (25). At 60°F or above, wait until the pump shuts itself off or 6200 psig is reached; in which case, press OFF pushbutton (27).

(9) Close the OUTLET SHUTOFF valve (29) fully clockwise and slowly open the OUTLET BLEED valve (28) to remove high pressure from that portion of the line to the trainer.

b. Removing Trainer from GPU



(1) Disconnect the GPU outlet flexible hose fitting (30) from the adapter (31) using the 1/2-inch wrench to hold and the 9/16-inch wrench to loosen. Install the protective cap onto the hose fitting.

(2) Close the OUTLET BLEED valve, turning it fully clockwise.

(3) Remove adapter (31) from the fill port. Remove the chain from the front end of the launch tube.

(4) Install fill port cover and tighten using the large flat-blade screwdriver. Tighten small bleed screw. Fold the IFF antenna.

(5) Open the safety cover (32). Unhook the two latches (33) and remove the trainer from the cradles.

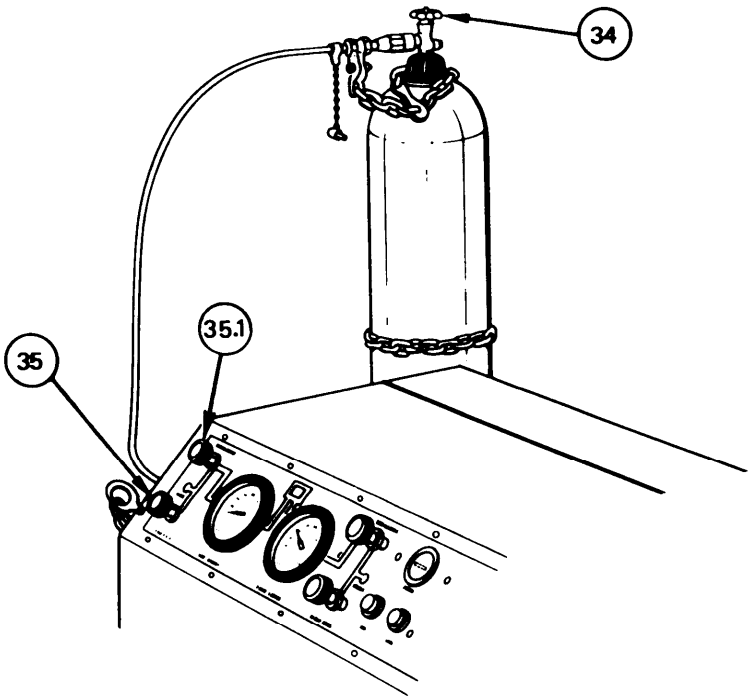
NOTE

If you want to refill more trainer bottles, perform all the steps in para. 2-3, page 2-13, steps (5) through (10) in para. 2-4a, and all the steps in para. 2-4b.

c. *Operational Standby*

NOTE

System may be left in the operational standby mode during interim operation.



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(1) Close the argon gas supply valve (34) fully clockwise.

(2) Close INLET SHUTOFF valve (35.1) fully clockwise.

(3) Slowly open the INLET BLEED valve (35) one turn counterclockwise to relieve high pressure in the hose. Close the INLET BLEED valve (35) fully clockwise as soon as gas has vented.

2-4.1 SERVICING THE COOLANT RESERVOIR USING GPU WITH FRAGMENTATION CHAMBER INSTALLED

a. Perform the before operation (B) PMCS in table 3-1 and preparation for use (par. 2-2) prior to servicing the coolant reservoir.

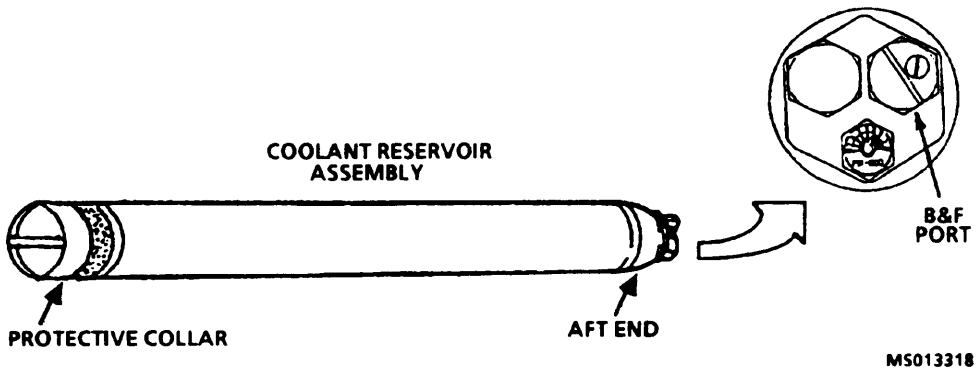
WARNING

If fill valve lockwire on reservoir assembly is broken or missing, do not attempt refilling. Failure to comply could result in injury or death to personnel.

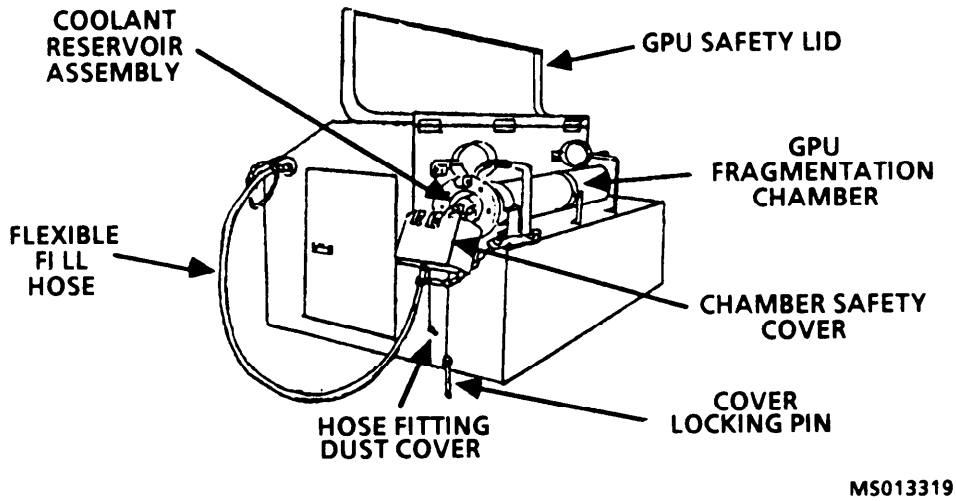
CAUTION

Inspect coolant reservoir assembly for damage such as cracks, nicks and/or dents before refilling.

b. Remove protective collar from coolant reservoir assembly.



c. Position coolant reservoir assembly in GPU fragmentation chamber with aft end facing out (B&F port at 12 o'clock position).

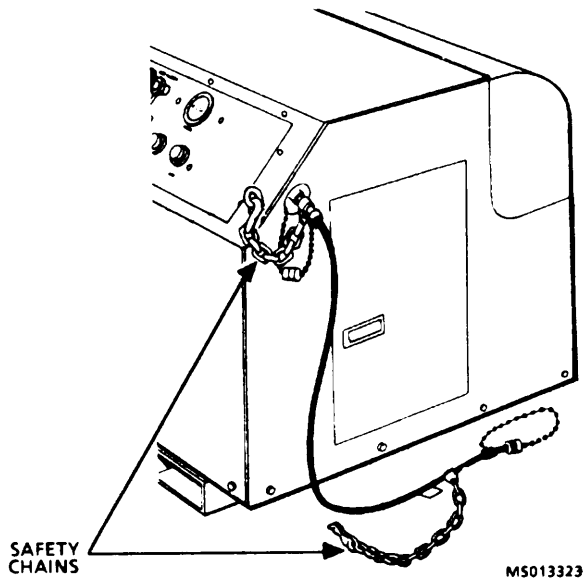


d. Loosen small screw on top of bleed and fill (B&F) port cover nut. When screw is turned, escaping gas may be heard, but is of no danger to the operator.

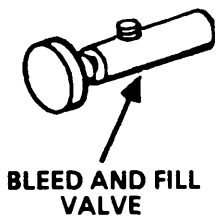
WARNING

All personnel must stay clear of B&F port during step e. Failure to comply could result in injury or death to personnel.

e. Remove B&F port cover nut by turning CCW.



f. Close chamber safety cover and insert cover locking pin through lugs securing safety cover to chamber.



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WARNING

Be sure that the valve on the B&F adapter installed in step g below is opened (turned fully CCW) before installing on reservoir assembly. Valve must remain in the open position throughout the procedure. Failure to comply could result in death or injury to personnel.

g. Insert fingers through slot in the chamber safety cover to hold reservoir assembly and handtighten the B&F adapter to the B&F port.

NOTE

If outlet flexible hose is connected to GPU, proceed to step *i.*

h. Remove protective cap from the GFU outlet fitting and the protective plug from the end of the GPU outlet flexible hose. Connect that end of the hose to the GPU fitting. Attach the safety chain to the GPU eyebolt.

i. Remove the protective cap from the other end of the outlet flexible hose. Attach GPU flexible fill hose to B&F adapter.

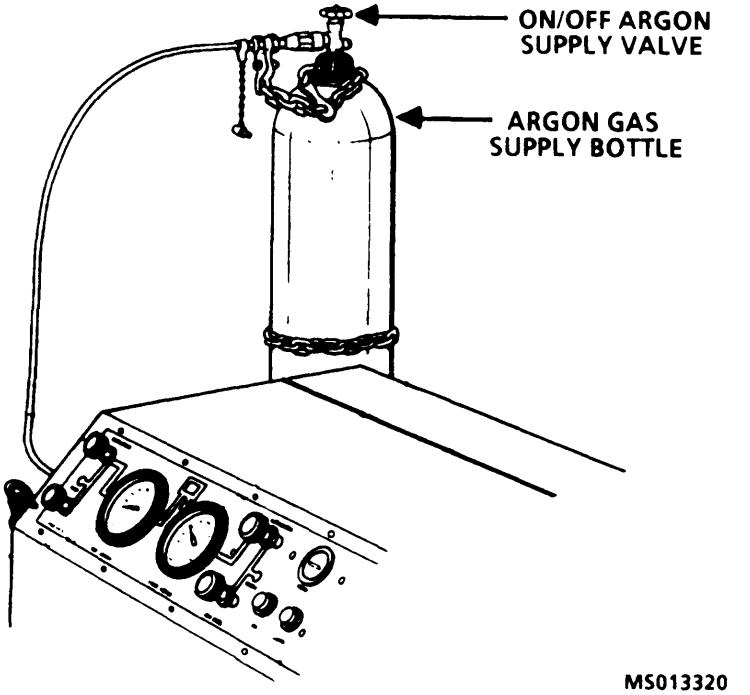
j. Attach safety chain at fill end of flexible fill hose around chamber mounting bracket.

k. Verify that safety chain at GPU end of flexible fill hose is attached to GPU eyebolt on front of GPU.

1. Close safety lid on GPU and secure both latches on rear of lid.

WARNING

Install ballistic blanket around GPU before refilling procedures are initiated. Failure to **comply could result in injury or death** to **personnel.**



NOTE

Ensure that the CPU INLET SHUTOFF, INLET BLEED, OUTLET SHUTOFF, and OUTLET BLEED valves are turned fully CW (closed) before continuing,

m. Slowly open the argon supply bottle valve two turns CCW.

n. Slowly open the INLET SHUTOFF valve one-half to one turn CCW for a slow rise in pressure as read on the INLET PRESSURE gauge. Once the reading stabilizes, turn the INLET SHUTOFF valve two complete turns CCW.

o. If pressure indicated on INPUT PRESSURE gauge is 2000 psi or below, replace argon gas supply bottle. If the OUTLET PRESSURE gauge does not rise, momentarily press the ON pushbutton and then the OFF pushbutton. The OUTLET PRESSURE gauge should read the same (± 200 psig) as the INLET

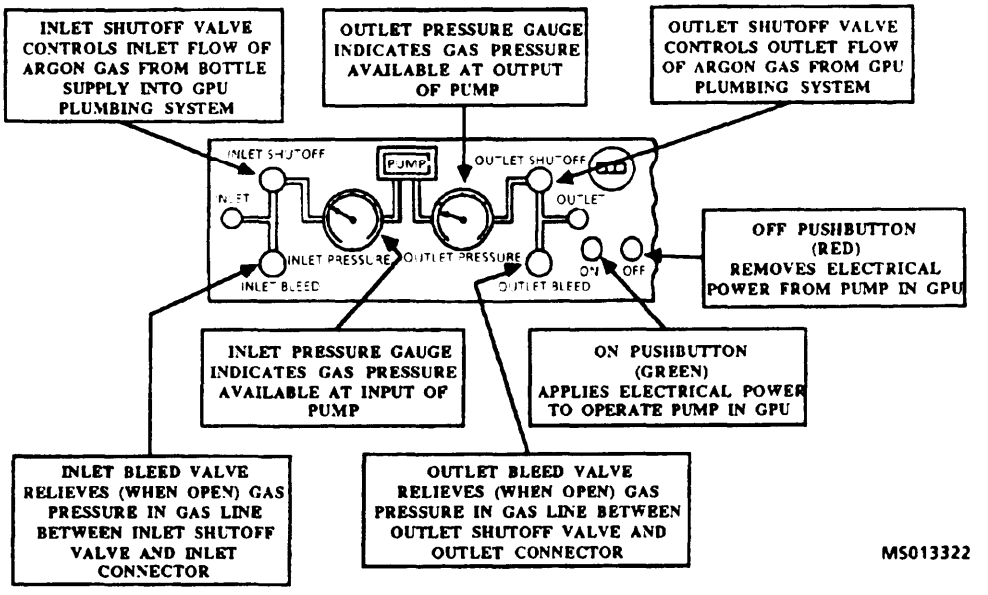
PRESSURE gauge. If not, repeat the above operation to equalize pressure in pump.

p. Slowly open OUTLET SHUTOFF valve two turns CCW.

WARNING

Escaping gas is hazardous. Do not feel for leaks. Frostbite or lacerations can result.

q. Squirt leak detecting liquid around the two outlet hose fittings. Visually check for gas bubbles indicating leakage. If leaks are detected, close OUTLET SHUTOFF valve fully CW. Open OUTLET BLEED valve to relieve gas. Tighten fitting. Close OUTLET BLEED valve fully CW and repeat steps *p* and *q.*



CAUTION

Monitor operation of GPU during refilling procedure for shutoff switch failure.

NOTE

If ambient temperature is 60 °F or below, coolant reservoir assembly can only be charged to 5200 psig.

r. Depress green ON pushbutton on GPU control panel. Compressor should continuously run until coolant reservoir assembly is filled to 6000 ± 200 psi. If ambient temperature is below 60 ^{0}F, manually depress red OFF pushbutton on GPU control panel when OUTLET PRESSURE gauge registers 5200 psig.

s. When the reservoir has been filled and the GPU is manually or automatically shut off, close the OUTLET SHUTOFF valve (fully CW).

t. Slowly open (CCW) the OUTLET BLEED valve to relieve pressure in flexible hose.

u. Release two latches on rear of GPU safety lid and lift lid.

v. Remove flexible fill hose fitting from B&F adapter.

w. Replace dust cover on hose fitting.

x. Close GPU OUTLET BLEED valve by turning it fully CW.

y. Remove safety chain securing flexible fill hose to chamber mounting bracket.

z. Remove B&F adapters from reservoir assembly.

aa. Pull cover locking pin from lugs on chamber safety cover and lower cover.

CAUTION

DO NOT exceed stated torque value in the following step.

ab. Install B&F port cover nut. Tighten nut to a torque value of 2 ± 1 ft lbs.

ac. Tighten small screw on B&F port cover nut.

ad. Remove coolant reservoir assembly from chamber.

ae. Install protective collar on forward end of coolant reservoir assembly.

af. Place coolant reservoir assembly in shipping and storage container.

ag. Place the system in the operational standby mode (par. 2-1.c) or perform post-operating instructions (par. 2-.5).

2-4.2 COOLANT RESERVOIR BLEED-DOWN PROCEDURE

a. Ensure that the GPU INLET SHUTOFF, INLET BLEED, OUTLET SHUTOFF, and OUTLET BLEED valves are closed (fully CW).

b. Place the coolant reservoir in the fragmentation chamber IAW steps *b* through *l.*

c. Open the OUTLET SHUTOFF valve two complete turns CCW. Observe OUTLET PRESSURE gauge indication.

d. Slowly open the OUTLET BLEED valve CCW until you hear gas escaping.

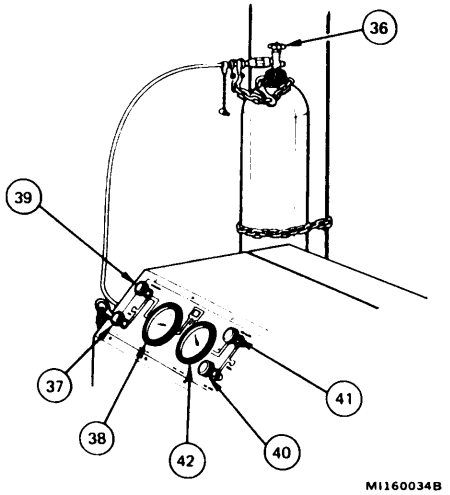
e. After 10 seconds, close the OUTLET BLEED valve fully CW. Observe OUTLET PRESSURE gauge indication. Continue bleed-down procedure untl the desired coolant reservoir pressure indication is obtained.

f. Close OUTLET SHUTOFF valve by turning fully CW.

g. Slowly open the OUTLET BLEED valve, by turning CCW to relieve pressure in outlet flexible hose.

h. Remove coolant reservoir from fragmentation chamber IAW steps *u* through *af.*

2-5. POST-OPERATING INSTRUCTIONS.



a. Close the argon gas supply valve (36) fully clockwise.

b. Verify that the INLET SHUTOFF valve (39) is open (two turns counterclockwise). Slowly open the INLET BLEED valve (37) one turn counterclockwise to sufficiently relieve high pressure down to 500 psig as read on the INLET PRESSURE gage (38). Close the INLET SHUTOFF valve (39) and then the INLET BLEED valve (37) fully clockwise after gas in hose has been relieved.

c. Carefully disconnect (turning counterclockwise) the hose fitting at the GPU outlet connector using a 9/16-inch wrench to loosen. Seal the GPU outlet connector with the GPU outlet protective cap and seal the outlet flexible hose with its protective cap. Remove chain.

d. Slowly open the OUTLET BLEED valve (40) one turn counterclockwise. Then slowly open (turning counterclockwise) the OUTLET SHUTOFF valve (41) sufficiently to relieve the high pressure down to 500 psig on the OUTLET PRESSURE gage (42). Close the OUTLET SHUTOFF valve (41) and OUTLET BLEED valve (40) fully clockwise.

2-5.1 TRAINER BLEED DOWN PROCEDURE

a. Ensure that the OUTLET SHUTOFF and OUTLET BLEED valves (40) (41) are closed fully clockwise.

b. Install THT on GPU in accordance with paragraph 2-3, steps a through g.

c. Slowly open TRAINER ADAPTER valve fully clockwise.

d. Open the OUTLET SHUTOFF valve (41) two complete turns counterclockwise. Observe OUTLET PRESSURE GAGE (42) indication.

e. Slowly open the OUTLET BLEED valve (40) counterclockwise until you hear gas escaping.

f. After 10 seconds, close the OUTLET BLEED valve (40) fully clockwise. Observe OUTLET PRESSURE GAGE (42) indication. Continue bleed down procedure until the desired trainer gas bottle pressure indication is obtained.

g. Slowly open the TRAINER ADAPTER valve fully counterclockwise.

WARNING

Ensure that the valve on the trainer adapter is open before continuing.

h. Remove trainer from GPU in accordance with paragraph 2-4, step *b*.

NOTE

A residual trainer gas bottle pressure of 200 psig must be maintained to prevent contamination of the trainer gas bottle.

Section III. BATTERY CHARGER OPERATION

2-6. GENERAL. This section contains operating instructions that you will need for recharging the trainer batteries. Before operating the battery charger, be sure you have performed all of the Before (B) steps in table 3-1.

2-7. RECHARGING TRAINER BATTERIES

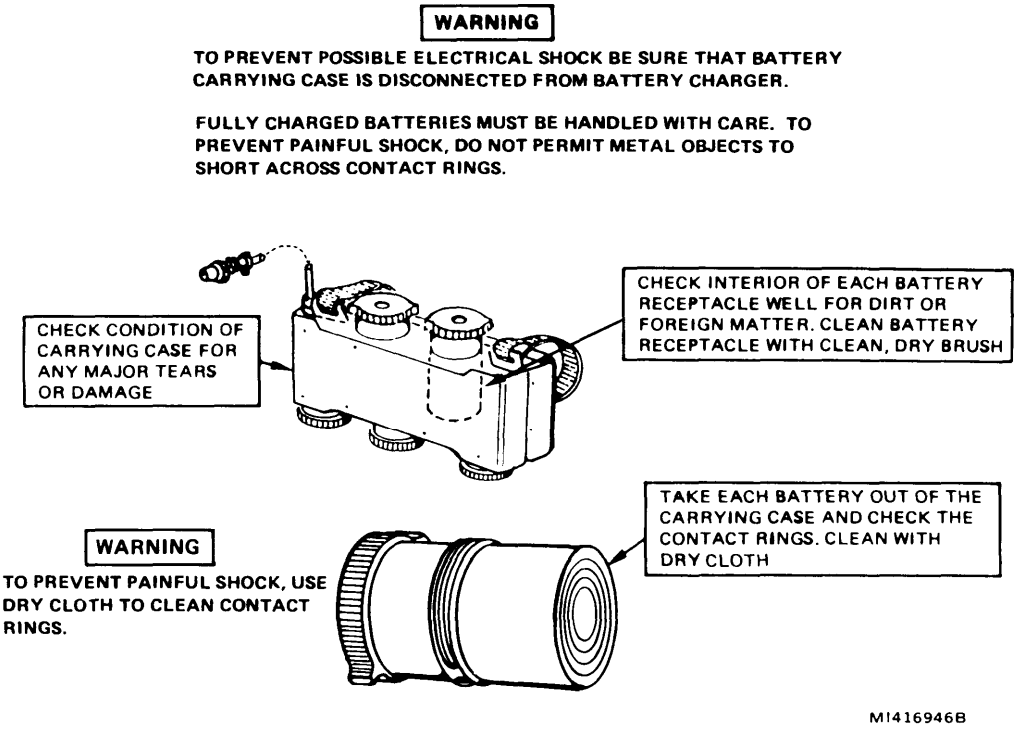
a. Preparation

NOTE

From one to five batteries can be charged at the same time. However, one battery must be placed in battery compartment no. 3 to assure proper functioning of the heater circuitry.

To ensure full battery life, the batteries must be charged 16 hours each time before being returned to service.

(1) Remove the batteries from the carrying case and inspect the batteries and case as follows:

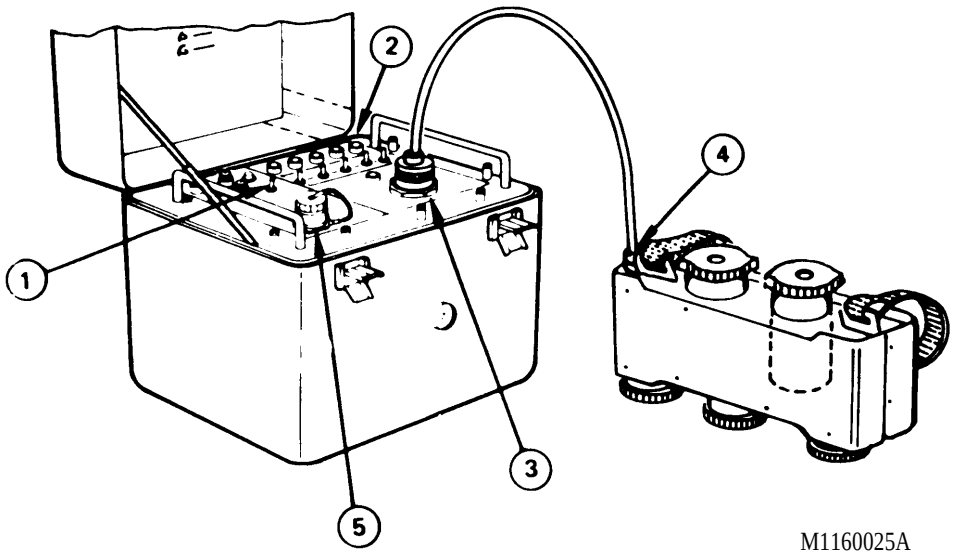


CAUTION

All battery charger switches must be in the OFF position and power cable disconnected from power source before installing or removing batteries from the carrying case. Failure to follow procedures may damage batteries, making them unserviceable.

Do not overtighten batteries when inserting into battery carrying case. Excessive tightening will cause damage to battery carrying case.

(2) Install the batteries to be charged into the receptacles of the carrying case.



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(3) Press relief valve on battery charger and release inside pressure. Open the lid of the battery charger and remove the two cables from the lid compartment. Be sure that the POWER ON/OFF switch (1) and the five CHARGE/OFF/TEST switches (2) are in the OFF position.

NOTE

In Steps (4) and (5) below, when connecting the power cable and carrying case/ battery charger cable, inspect each cable connector and its mating panel connector. Align the key on the cable connector with the keyway on the panel connector.

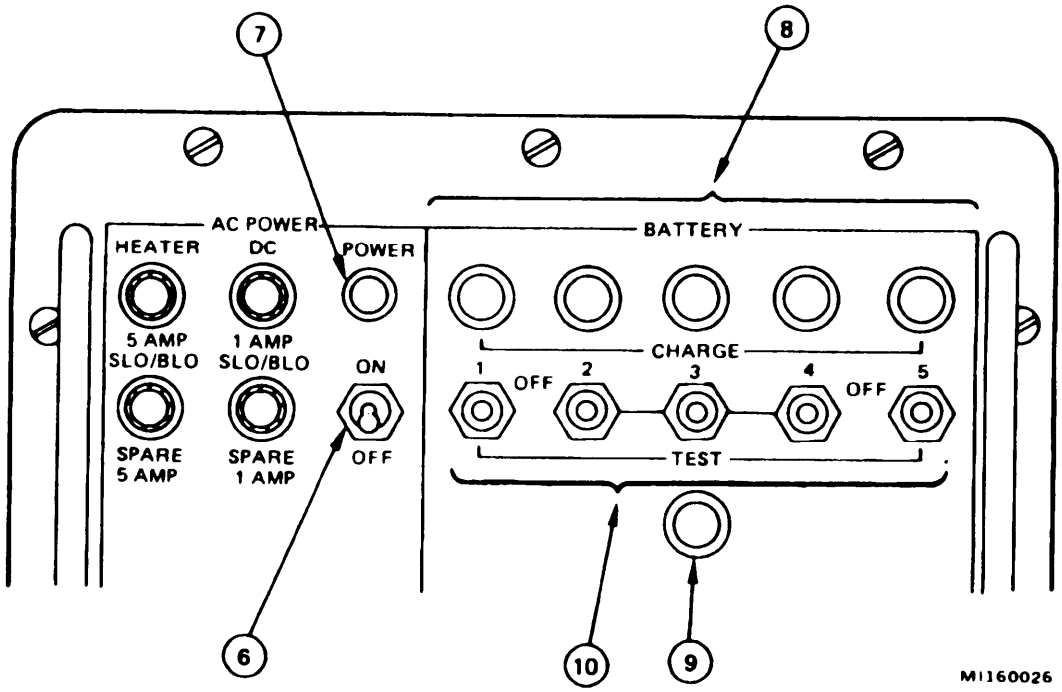
(4) Connect the carrying case/ battery charger cable to battery charger OUTPUT connector (3) first and then to carrying case connector J1 (4).

(5) Connect power cable to the battery charger INPUT connector (5) and to a 115 volt, 50-400 Hz power source.

b. Battery Recharging Procedure.

NOTE

In the steps below, if a proper indication is not obtained, refer to troubleshooting procedures contained in table 3-4 (page 3-60).



(1) Set the POWER ON/OFF switch (6) to ON. Observe that the POWER lamp (7) illuminates.

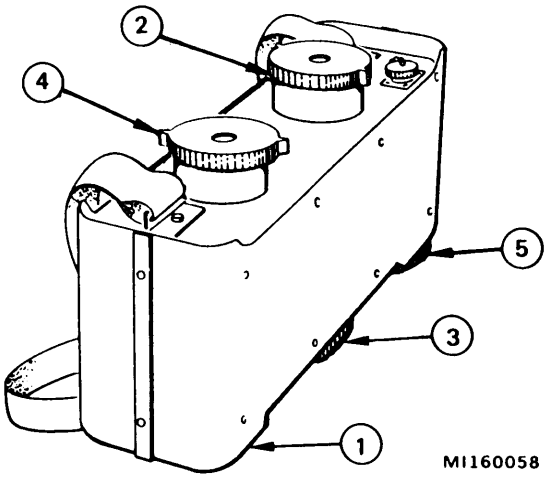
NOTE

A battery wilt not charge if its corresponding amber CHARGE indicator bulb is burned out.

(2) Press the five charge amber lens assemblies (8) and TEST green lamp assembly (9). Observe that the associated lamps illuminate.

NOTE

The receptacles on the carrying case are identified as BATTERY 1, 2, 3, 4, and 5. These numbers correspond to the five CHARGE/OFF/TEST switches (10) on the battery charger.



NOTE

If all the CHARGE lamps do not illuminate, determine ambient temperature. If below 50 °F, allow sufficient time (up to 2 hours) for the heater blankets to warm the batteries in the carrying case.

(3) Set the appropriate CHARGE/OFF/TEST switches (10) to the CHARGE position. Observe that the corresponding CHARGE lamps (8) illuminate. If a lamp does not illuminate, be sure that the associated battery is properly seated in the battery compartment.

NOTE

If charging of batteries exceeds 16 hours, no damage will result.

(4) At the end of 16 hours of charge, set all CHARGE/OFF/TEST switches (10) to the OFF position. Observe that the corresponding CHARGE lamps extinguish. Do not remove batteries before performing the Operational Check.

c. ***Operational*** *Check.*

(1) Press and hold the appropriate CHARGE/OFFITEST switch (10) to the TEST position. Observe that the TEST lamp (9) illuminates. If the TEST lamp (9) does not illuminate, the associated battery is defective and is disposed of through normal supply channels.

(2) Release the switch and observe that the TEST lamp extinguishes.

(3) Repeat steps (1) and (2) above to check each of the remaining batteries in the carrying case.

(4) Set the POWER ON/ OFF switch (6) to the OFF position and remove the power cable from the power source.

d. Post Operating Instructions. Disconnect the power cable and battery charging cable and place them in the compartment of the battery charger lid. Close and latch lid of battery charger.

CHAPTER 3
MAINTENANCE

Section I. REPAIR PARTS, SPECIAL TOOLS, TMDE, AND SUPPORT EQUIPMENT

Repair Parts are listed in TM9-1425-429-24-P. There is no special test, maintenance, or diagnostic equipment required.

Section II. SERVICE UPON RECEIPT

3-1. GENERAL

a. Gas Pumping Unit (GPU). After uncrating the GPU upon initial receipt perform the Before (B) steps in Preventive Maintenance Checks and Services Table 3-1 (page 3-7). The GPU must also be high pressure tested upon receipt, at six month intervals, or when equipment is moved. Perform this procedure in accordance with para. 3-6 (page 3-16).

b. Proof Test Equipment. Upon initial receipt, perform the Before (B) steps listed in Preventive Maintenance Checks and Services Table 3-2 (page 3-13).

c. Battery Charger. Upon initial receipt, perform the Before (B) steps listed in Preventive Maintenance Checks and Services Table 3-1 (page 3-12).

Section III. PREVENTIVE MAINTENANCE CHECKS AND SERVICE

3-2. GENERAL. Preventive maintenance checks and services you are authorized to perform on the gas pumping unit and battery charger include inspection, cleaning, painting and parts replacement in accordance with paragraphs 3-3 through 3-5. Upon initial receipt and before use, check equipment for obvious damage and missing or broken parts. If severe damage is evident, determine whether or not the required repairs can be accomplished within your level of maintenance. Refer to Appendix E, List of Expendable Supplies and Materials authorized for use when performing preventive maintenance on either the GPU or battery charger.

3-3. GENERAL CLEANING INSTRUCTIONS. Clean the exterior of the gas pumping unit/battery charger and proof test equipment as necessary. If you cannot remove the dirt with a dry, clean cloth (Item No. 9, Appendix E) or brush, wipe with a cloth moistened with a little soapy water using general detergent (Item No. 4, Appendix E) (one packet per 3 gallons of water). Remember to wipe the cleaned area thoroughly dry. Do not use water to clean connectors; use dry brush.

3-4. GENERAL PAINTING INSTRUCTIONS

a. Touch up the battery charger and gas pumping unit if required. Figure 3-1 and 3-2 show the identification markings on the gas pumping unit and battery charger respectively. Damaged markings called out in these illustrations should be corrected. Do not paint identification plates.

b. Lightly sand the areas to be painted using fine grit sandpaper (Item No. 7, Appendix E). Clean with a soft cloth to remove sanding dust. Prime aluminum surfaces with zinc chromate (Item No. 8, Appendix E). Allow to dry and paint with the color specified in Figure 3-1, 3-2.

3-5. PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS)

a. At the specified intervals the applicable Preventive Maintenance Checks and Services listed in tables 3-1 and 3-2 will be performed. The specified checks represent the minimum number of essential checks. Before you begin the Preventive Maintenance Checks and Services, keep in mind the following general information which is as important as the specific checks.

(1) Before you operate, always keep in mind the CAUTIONS and WARNINGS. Perform your Before (B) operation Preventive Maintenance Checks and Services.

(2) After you operate, be sure to perform your After (A) Preventive Maintenance Checks and Services.

(3) Once a month, at the time decided upon by the squad leader, be sure to perform your monthly (M) Preventive Maintenance Checks and Services.

(4) Other services and checks that must be provided during power on are listed in operational procedures as required.

(5) If your equipment fails to operate, troubleshoot with proper equipment. Report any deficiencies which cannot be corrected on DA Form 2404.

b. Inspection is necessary to see if items are in good condition, correctly assembled or stored, secured, not excessively worn or corroded, not leaking, and adequately lubricated. Any or all of these checks that are pertinent to any item (including supporting, attaching, or connecting members) will be performed automatically as a general procedure in addition to any specific procedure given.

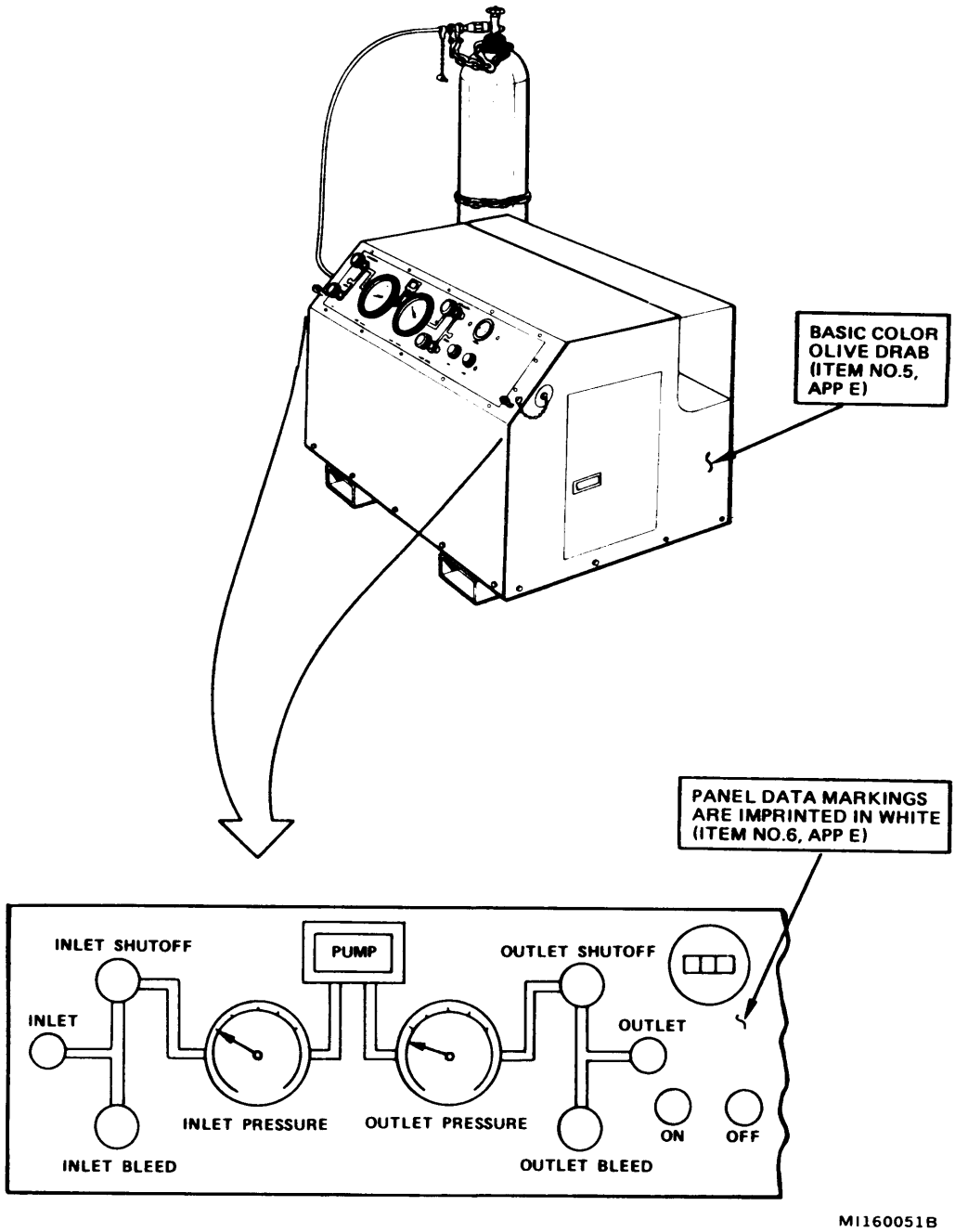
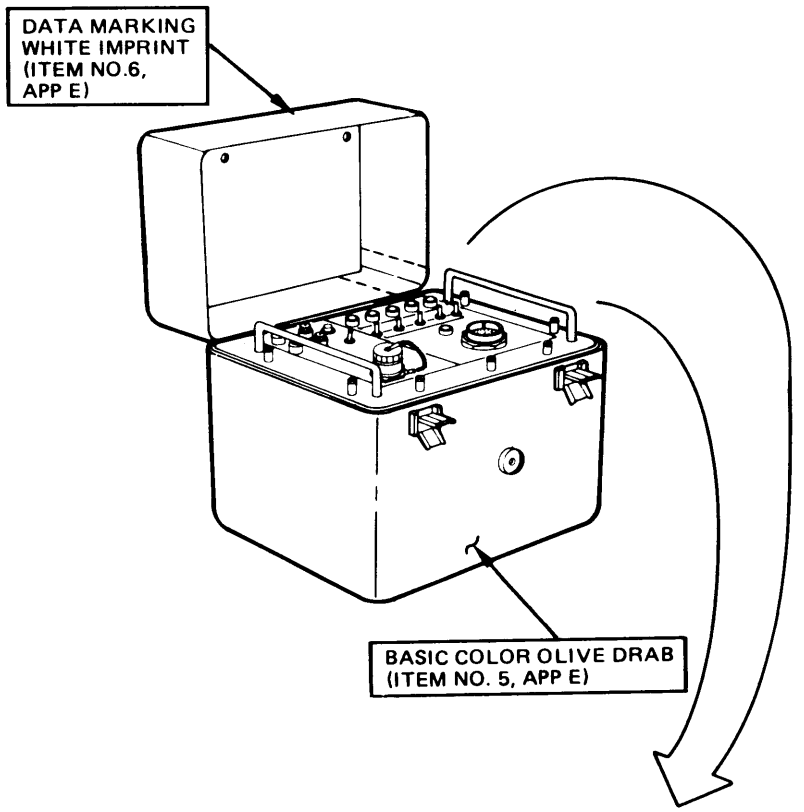


Figure 3-1. Gas Pumping Unit Markings



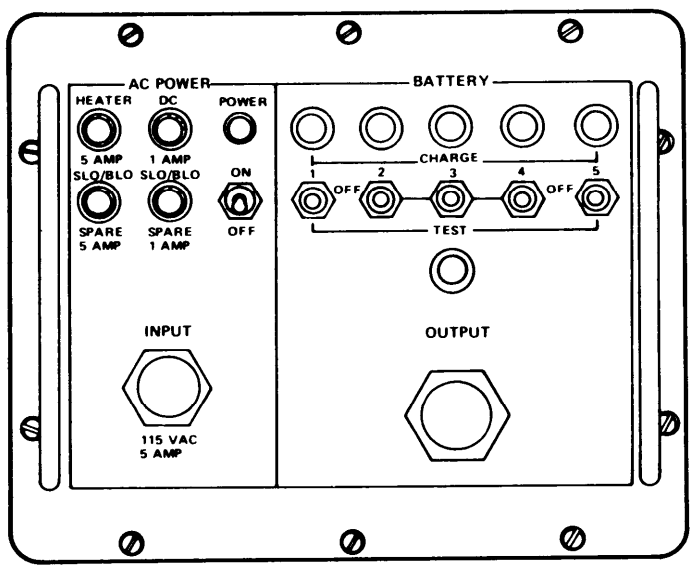


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Figure 3-2. Battery Charger Markings

(1) Inspection for good conditions

• Visual inspection for damage beyond safe or serviceable limits. Includes check of flexible materials for hardness, cracks, or breaks.

(2) Inspection for correct assembly and storage

• Visual inspection for improperly assembled or stowed items.

(3) Inspection for security

• Visual inspection or check by hand, wrench, or pry bar for looseness.

(4) Inspection for wear or corrosion

• Visual inspection or check by hand for item worn or corroded beyond serviceable limits. Also applicable to markings, data, caution plates and printed matter that is legible.:

NOTE

Where the instruction "tighten" appears in the procedure, it means tighten with the proper tool, even if the item appears to be secure.

c. Column Entries Used in Preventive Maintenance Checks and Services

(1) Column 1, Item No. Column 1 numbers the checks and services to be performed in chronological order. This column will also be used as a source of item numbers for the "TM Number" column on DA Form *2404,* Equipment Inspection and Maintenance worksheet, in recording results of PMCS.

(2) Column 2, Interval. Column 2 specifies the intervals at which the Preventive Maintenance Checks and Services will be performed. The "B" interval requires the check to be performed "Before Operation". The "D' interval requires the check to be performed "During" power on. The "A" interval requires the check to be performed "After Operation." The "M" interval requires the check to be performed "Monthly. "

(3) Column 3, Procedures. Column 3 provides the procedures for performing the check.

(4) Column 4, Corrective Action. Column 4 contains the corrective action procedures.

Table 3-1. Gas Pumping Unit (GPU) and Battery Charger Preventive Maintenance Checks and Services

B – BEFORE OPERATION D – DURING OPERATION A – AFTER OPERATION M – MONTHLY

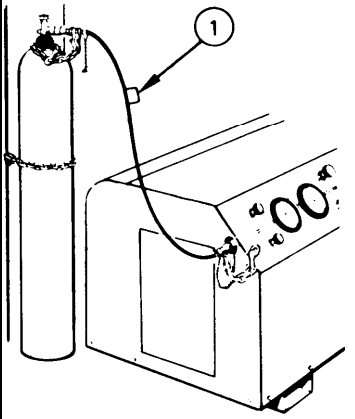
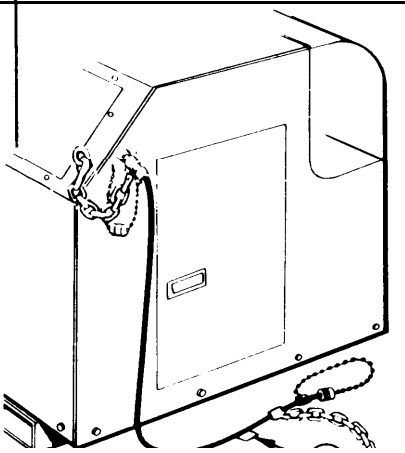
ITEM NO.	INTERVAL B	D	A	M	PROCEDURE	CORRECTIVE ACTION
					GAS PUMPING UNIT  	
					WARNING HIGH GAS PRESSURE (UP TO 6200 PSIG). DEATH OR SEVERE INJURY MAY RESULT IF YOU FAIL TO OBSERVE SAFETY PRECAUTIONS. TO PREVENT ELECTRICAL SHOCK, BE SURE THAT POWER CABLE IS IN PLUGGED BEFORE PERFORMING PREVENTIVE MAINTENANCE CHECKS AND SERVICES ON GPU.	
1	●				CHECK DATE ON INLET/OUTLET FLEXIBLE HOSES (1) (2). IT MUST NOT EXCEED 6 MONTH PROOF TEST INTERVAL. **NOTE** IF INITIAL PROOF TEST DATE EXCEEDS 5 YEARS, THE HOSES MUST BE REPLACED	IF DATE EXCEEDS 6 MONTH CHECK DATA PERFORM PROOF PRESSURE TEST. (PARA 34 THRU 3-9, PAGE 3-16)
2	●				INSPECT INLET/OUTLET FLEXIBLE HOSES FOR EVIDENCE OF CRACKS, HOLES, CUTS OR FRAYED SURFACES.	REPLACE DEFECTIVE HOSES (PARA 3-14 AND 3-15, PAGES 3-66 AND 3-68)

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Table 3-1. Gas Pumping Unit (GPU) and Battery Charger Preventive Maintenance Checks and Services (Continued)

B – BEFORE OPERATION D – DURING OPERATION A – AFTER OPERATION M – MONTHLY

ITEM NO.	INTERVAL B	D	A	M	PROCEDURE	CORRECTIVE ACTION
3	●				CHECK CONDITION OF POWER CABLE END CONNECTOR FOR VISIBLE DAMAGE	REPLACE DEFECTIVE POWER CABLE.
4	●				INSPECT LINKS AND SNAP HOOK ON GAS BOTTLE SAFETY CHAINS (3). INSURE THAT LINKS ARE STRUCTURALLY SOUND.	REPLACE DEFECTIVE LINKS ON SAFETY CHAIN ASSEMBLY.
5	●		●		INSPECT CRADLES (4) AND LATCHES (5) FOR DAMAGE.	RETURN GPU THROUGH NORMAL SUPPLY CHANNELS FOR REPLACEMENT.
6	●				INSPECT INTERLOCK SWITCH (6) ON REAR HOUSING ENCLOSURE FOR DAMAGE	REPLACE IF DAMAGED.

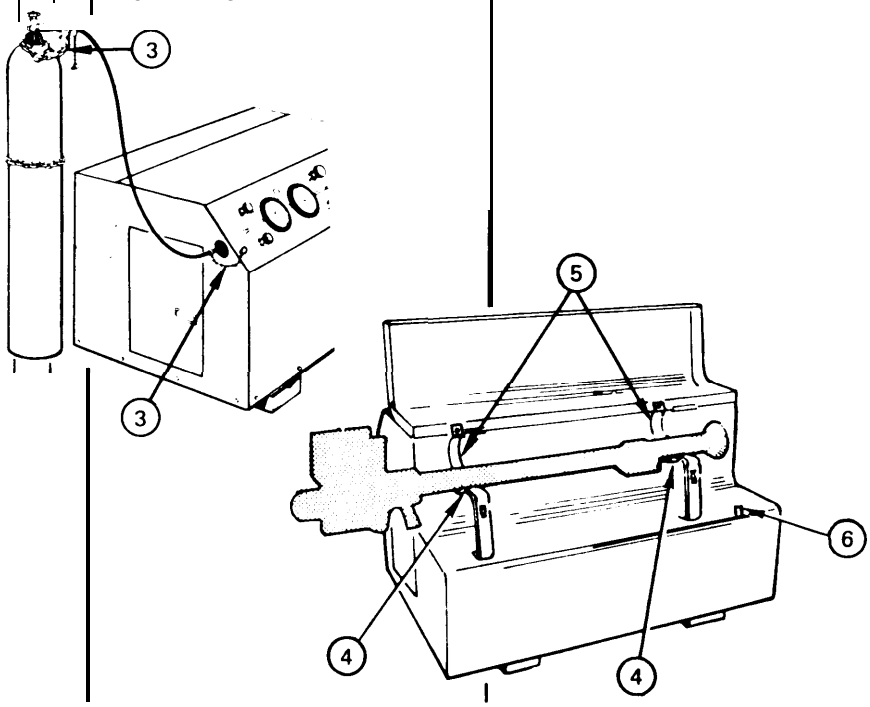

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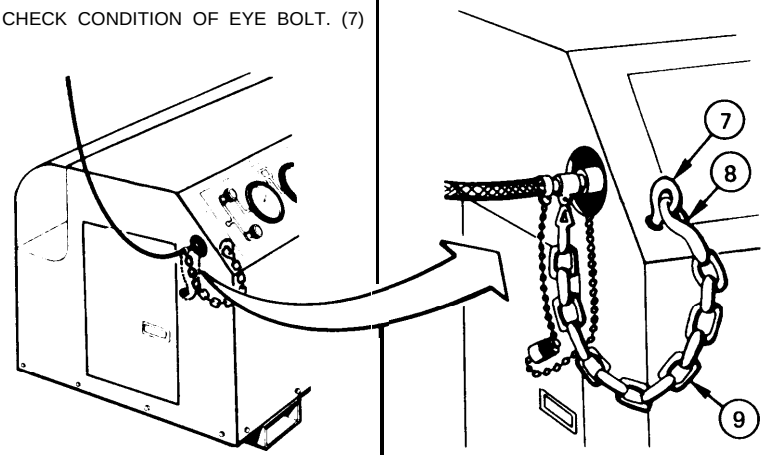
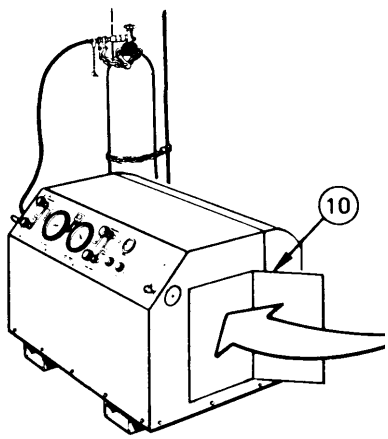
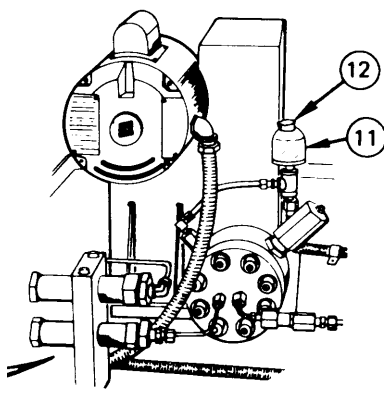
Table 3-1. Gas Pumping Unit (GPU) and Battery Charger Preventive Maintenance Checks and Services (Continued)

B – BEFORE OPERATION D – DURING OPERATION A – AFTER OPERATION M – MONTHLY

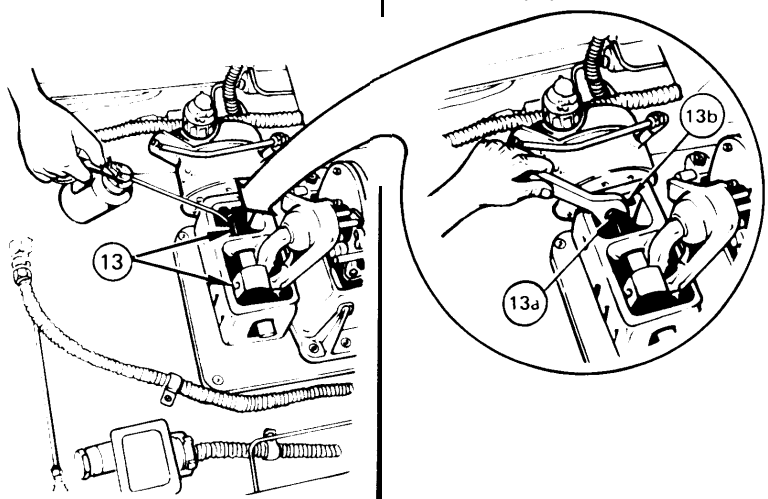
ITEM NO.	SEQ B	SEQ D	SEQ A	SEQ M	PROCEDURE	CORRECTIVE ACTION
7	●				CHECK CONDITION OF EYE BOLT. (7) 	
8	●				CHECK SNAP HOOK AND CHAIN LINK (8) ON GPU AND LOCK LINKS (9).	IF MISSING, BROKEN OR UNUSABLE, REPLACE.
9	●				OPEN THE RIGHT-HAND ACCESS DOOR (10) AND INSPECT THE GLASS OIL BOWL (11) FOR PRESENCE OF OIL. 	 IF OIL BOWL IS LESS THAN HALF FULL LIFT COVER (12) AND REPLENISH OIL SUPPLY, USING SAE 10 WEIGHT OIL. CLOSE THE ACCESS DOOR.

MI416949

Table 3-1. Gas Pumping Unit (GPU) and Battery Charger Preventive Maintenance Checks and Services (Continued)

B – BEFORE OPERATION D – DURING OPERATION A – AFTER OPERATION M – MONTHLY

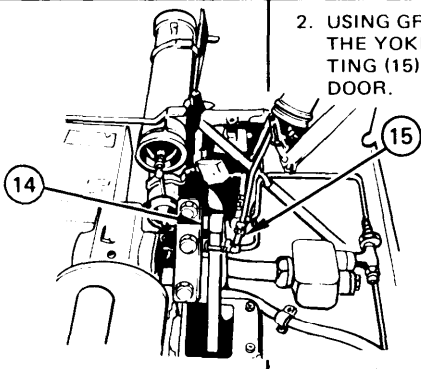
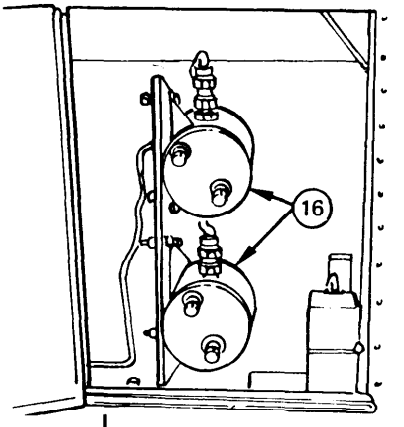
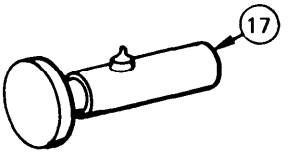
ITEM NO.	INTERVAL B	D	A	M	PROCEDURE	CORRECTIVE ACTION
10	●				CHECK DATE OF LOGBOOK DATA ON GPU. IT MUST NOT EXCEED 6 MONTH PROOF TEST.	IF MORE THAN SIX MONTHS PROOF TEST GPU (PARA. 3-6 THRU 3-9).
11	●				CHECK LOG BOOK TO DETERMINE WHEN LUBRICATION WAS LAST PERFORMED ON DRIVE MECH-AN ISM. CHECK RUNNING TIME INDICATOR.	IF OVER 150 HOURS HAVE ELAPSED, OR AS REQUIRED, OPEN THE REAR ACCESS DOOR AND PERFORM THE FOLLOWING OPERATION. 1. USING OIL CAN WITH SAE NUMBER 10 OIL, SQUIRT SOME DROPS ONTO POSITION ROD AND PIN (13).
11.1	●				CHECK BOTTOM OF WELL AREA (13b) FOR PRESENCE OF OIL (THIN FILM OF OIL ON PISTON ROD IS NORMAL)	REMOVE HOUSING ENCLOSURE PER INSTRUCTIONS IN PARA. 3-18 (PAGE 3-76). ADJUST THE PACKING GLAND NUT (13a) USING A 1-1/8-INCH OPEN END WRENCH. TIGHTEN THE PACKING GLAND NUT UNTIL A SLIGHT PRESSURE IS FELT AGAINST THE PACKING. DO NOT OVERTIGHTEN.



M1416950B

Table 3-1. Gas Pumping Unit (GPU) and Battery Charger Preventive Maintenance Checks and Services (Continued)

B – BEFORE OPERATION D – DURING OPERATION A – AFTER OPERATION M – MONTHLY

ITEM NO.	INTERVAL B	D	A	M	PROCEDURE	CORRECTIVE ACTION
						2. USING GREASE GUN, GREASE THE YOKE (14) AT GREASE FITTING (15). CLOSE REAR ACCESS DOOR. **NOTE:** THE PISTON YOKE MAY BE CYCLED FOR EASIER ACCESS TO THE GREASE FITTING. 3. REFILL OIL BOWL.
12	●				CHECK LOG BOOK TO DETERMINE WHEN DESICCANT WAS LAST REPLACED. CHECK RUNNING TIME INDICATOR.	IF OVER 200 HOURS OR 1 YEAR ELAPSED, REPLACE THE CARTRIDGE IN EACH OF THE TWO DESICCANT CHAMBERS (16) PER THE INSTRUCTIONS IN PARA 3-14.
						
13	●				CHECK FILL VALVE ASSEMBLY (TRAINER ADAPTER) (17) FOR ANY VISIBLE EVIDENCE OF DAMAGE TO INLET PORT OR THREADS.	 REPLACE VALVE ASSEMBLY

MI416951B

Table 3-1. Gas Pumping Unit (GPU) and Battery Charger Preventive Maintenance Checks and Services (Continued)

B – BEFORE OPERATION D – DURING OPERATION A – AFTER OPERATION M – MONTHLY

ITEM NO.	SEQ B	SEQ D	SEQ A	SEQ M	PROCEDURE	CORRECTIVE ACTION
					BATTERY CHARGER **WARNING** BE SURE BATTERY CHARGER IS DISCONNECTED FROM THE POWER SOURCE BEFORE PROCEEDING. **CAUTION** BEFORE OPENING CONTAINER, PRESS RELIEF VALVE (1) TO EQUALIZE CONTAINER INTERNAL PRESSURE WITH AMBIENT PRESSURE. DO NOT USE SHARP INSTRUMENT TO OPERATE VALVE.	
14	●				CHECK CONDITION OF POWER CABLE AND INTERCONNECTING CABLE IN LID FOR VISIBLE DAMAGE OR BREAKAGE. THESE CABLES ARE LOCATED IN LID COMPARTMENT (2). RETURN TO LID COMPARTMENT.	REPLACE DAMAGED CABLES.

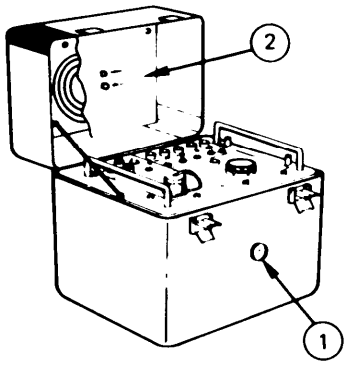


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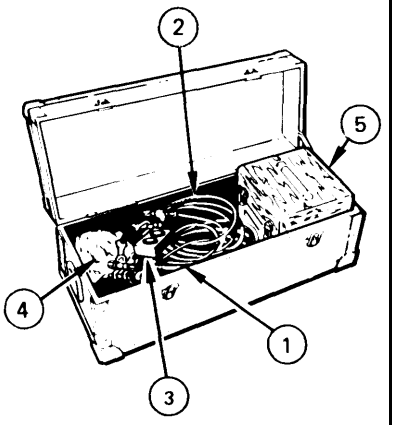
Table 3-2. Proof Test Equipment Preventive Maintenance Checks and Services

B -- BEFORE OPERATION D – DURING OPERATION A – AFTER OPERATION M – MONTHLY

ITEM NO.	INTERVAL B	INTERVAL D	INTERVAL A	INTERVAL M	PROCEDURE	CORRECTIVE ACTION
						
1	●				CHECK CONDITION OF FLEXIBLE HOSES (1) AND (2) FOR VISIBLE DAMAGE OR BREAKAGE.	REPLACE DEFECTIVE HOSES.
2			●		CHECK THAT PROTECTIVE PLUGS IN ENDS OF HOSES ARE FINGER TIGHT	TIGHTEN LOOSE PLUGS.
3	●				CHECK SAFETY CHAINS ON FLEXIBLE HOSES.	REPLACE FLEXIBLE HOSE IF SAFETY CHAINS ARE NOT PROPERLY SECURED TO FLEXIBLE HOSE.

M1416953A

Table 3-2. Proof Test Equipment Preventive Maintenance Checks and Services (Continued)

B – BEFORE OPERATION D - DURING OPERATION A - AFTER OPERATION

ITEM NO.	SEQ B	SEQ D	SEQ A	SEQ M	PROCEDURE	CORRECTIVE ACTION
4				●	CHECK DATE OF INITIAL PROOF TEST ON METAL TAG AT END OF FLEXIBLE HOSE (1).	IF MORE THAN 5 YEARS OLD, DO NOT USE; REPLACE.
5	●				CHECK DATE OF LAST PROOF TEST MARKED ON EMBOSSED TAPE ON FLEXIBLE HOSE (1)	IF DATE IS MORE THAN 6 MONTHS PAST, PERFORM PROOF TEST AND LOG DATE (PARA 3-6 THRU 3-9)
6	●				CHECK CONDITION OF REMOTE CONTROL CABLE AND CONTROL BOX (3) FOR VISIBLE DAMAGE OR BREAKAGE	REPLACE IF DAMAGED OR DEFECTIVE.
7	●				CHECK CONDITION OF CROSS FIT TING (4) FOR EVIDENCE OF THREAD DAMAGE	REPLACE IF DAMAGED.
8	●				REMOVE PRESURE TRANSDUCER ASSEMBLY (5) FROM STORAGE BOX AND CHECK FOR EVIDENCE OF HAVING BEEN DROPPED OR OTHERWISE MISHANDLED	REPLACE IF DAMAGED.
9				●	CHECK CALIBRATION DUE DATE AS SHOWN BY STICKER OR TAG ON PRESSURE TRANSDUCER ASSEMBLY	IF PAST CALIBRATION DUE DATE DO NOT USE. PRESSURE TRANSDUCER ASSEMBLY MUST BE CALIBRATED.
10			●		WHEN STORING PRESSURE TRANSDUCER ASSEMBLY, BE SURE THAT PROTECTIVE COVERS ARE TIGHTLY SECURED	

M1416954A

Section IV. PROOF PRESSURE TEST PROCEDURE

3-6. GENERAL. The proof pressure test will be performed upon receipt, every six (6) months thereafter, or at any time a malfunction or erratic operation indicates the need. The test ensures that the safety relief valve, pressure switches, pressure gages and high pressure service hoses are not defective. Before proof testing, perform Before (B) Preventive Maintenance Checks and Services in accordance with table 3-1 (page 3-7).

The inlet, outlet, and proof test hoses will have a maximum total life of five years from the initial proof test date on the manufacturer's identification tag attached to one end of the hose.

NOTE

All hoses in storage with test dates older than 12 months will be tested prior to use. Any hose that fails test will be disposed of immediately. If the GPU does not operate within the tolerances as stated in this procedure, return the GPU to the depot for repair.

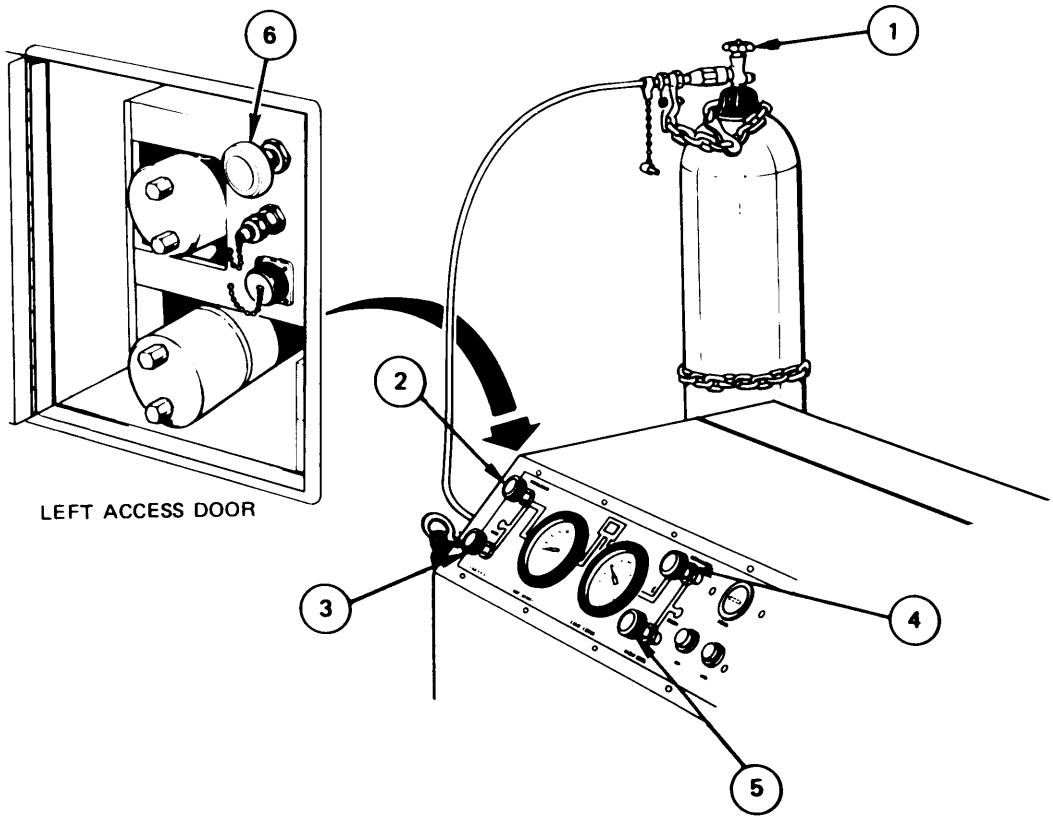
3-7. PREPARING THE CPU FOR HIGH PROOF PRESSURE TEST.

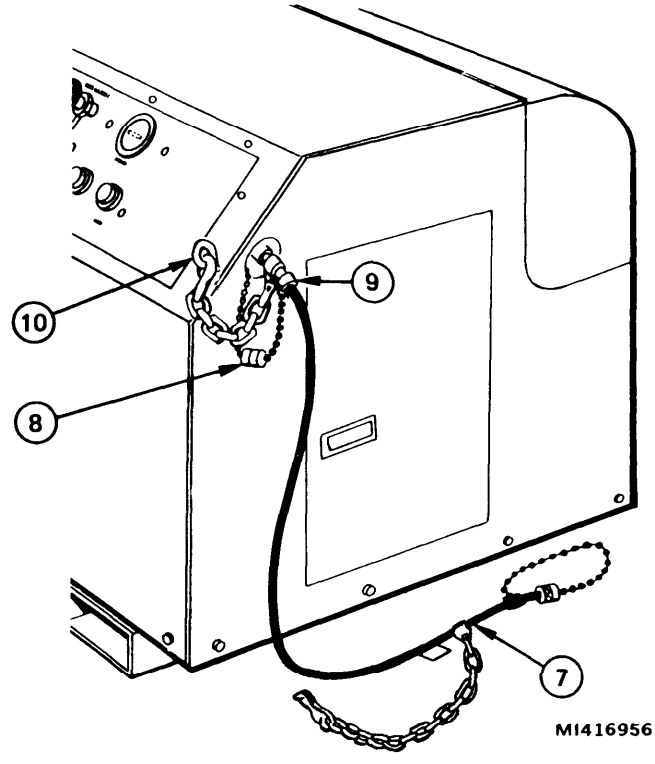
WARNING

Death or serious injury may result if you fail to observe the safety precautions. The proof test should be performed in a well ventilated room with a protective blast enclosure, or have a minimum wall construction of 8-inch width reinforced concrete block or equivalent. The GPU should beat least four (4) feet from any wall. The operator should be outside the room containing the GPU and positioned behind a protective wall at a distance as far as the control cable will allow. The area within 100 feet of the GPU room should be cleared of all personnel. If the GPU is installed in an area that does not conform to above requirements, place sand bags of minimum thickness of 16 inches around the GPU. The bags should be placed 2 feet from the GPU and 4 feet high. In this case the area should be cleared of all other personnel for a minimum distance of 300 feet. High gas pressure (up to 8000 psig) exists when performing the proof test procedure.

The 5/8-inch 9/16-inch, 1/2-inch and 7/16-inch wrenches used in this procedure must be open-end type, not more than 8 inches long, and in near new condition. Wrenches longer than 8 inches in length can cause excessive tightening to over-stress or break the high pressure fittings which, in turn, can result in death or injury to personnel.

(1) Be sure that the argon supply valve (1) is turned fully clockwise to the closed position. Be sure that the INLET SHUTOFF valve (2), INLET BLEED valve (3), OUTLET SHUTOFF valve (4), and OUTLET BLEED valve (5) are turned fully clockwise to the closed position. Open access door on left side of GPU and make sure PROOF TEST SHUTOFF valve (6) is opened fully counterclockwise.



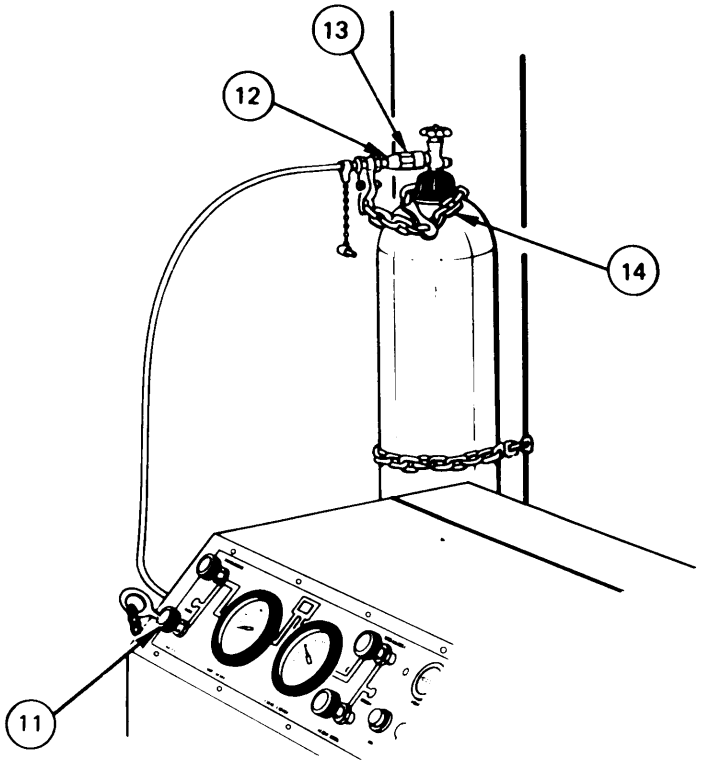


NOTE

Argon Gas Supply Bottle must be connected as in paragraph 2-2

(2) Install the outlet flexible hose (7) as follows if not attached. Open the OUTLET BLEED valve two turns counterclockwise to relieve any pressure in the outlet line, then close OUTLET after pressure is relieved. Remove the protective cap (8) from the GPU outlet fitting (9) and the protective plug from the end of the GPU outlet flexible hose. Connect that end of the hose to the GPU outlet fitting (9) using a 9/16-inch wrench to tighten. Connect the protective plug and cap finger tight. Attach the safety chain to the GPU eyebolt (10).

(2.1) Install inlet flexible hose as follows if not attached to GPU and/or gas supply bottle. Open and close correct valve to relieve pressure as required. Locate inlet flexible hose in proof pressure equipment storage box, remove protective plug from the fitting of the inlet hose and thread the fitting onto the GPU inlet connection using a 9/16-inch wrench to tighten. Attach the safety chain to the GPU eyebolt. The loose end of the inlet hose with safety chain should be placed under the two latch frames of the safety cover (16). Wrap the inlet hose safety chain (17) around the latch frame and hook the snap to a chain link. Proceed to step 6. If any hose requires changing, perform steps 3, 4 and 5.



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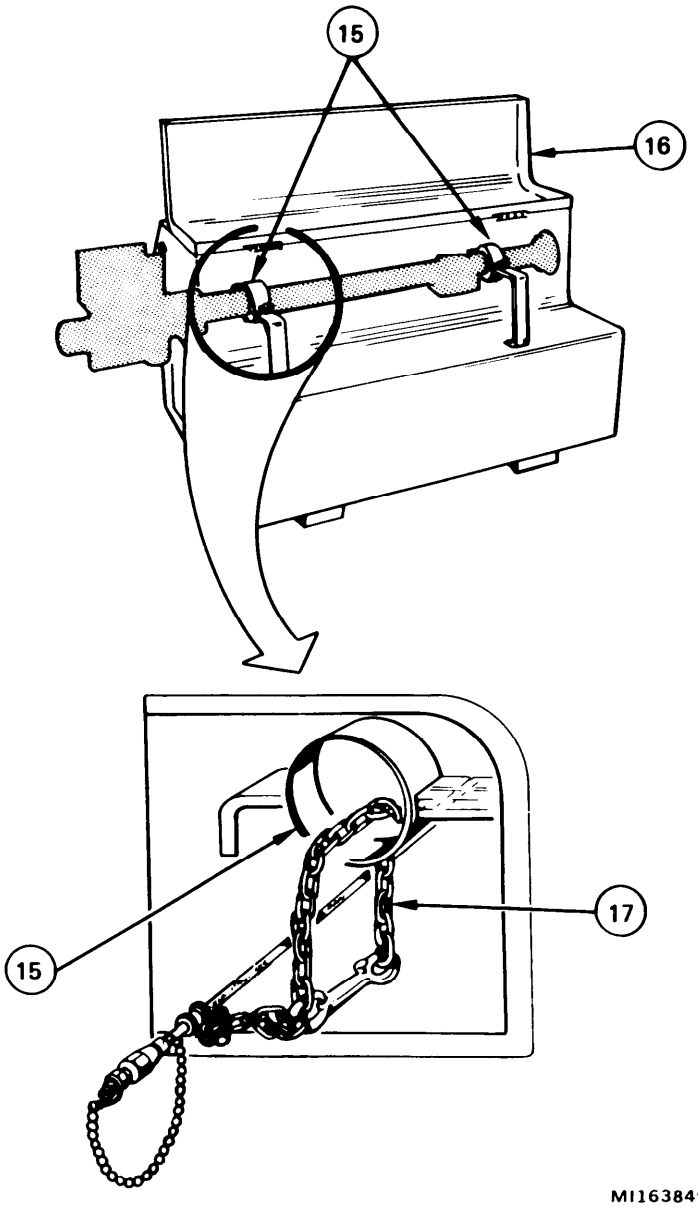
WARNING

Be sure that step (3) below is performed to vent trapped gas in the inlet flexible hose before disconnecting the hose fitting. Death or severe injury may result if you fail to observe the safety precautions.

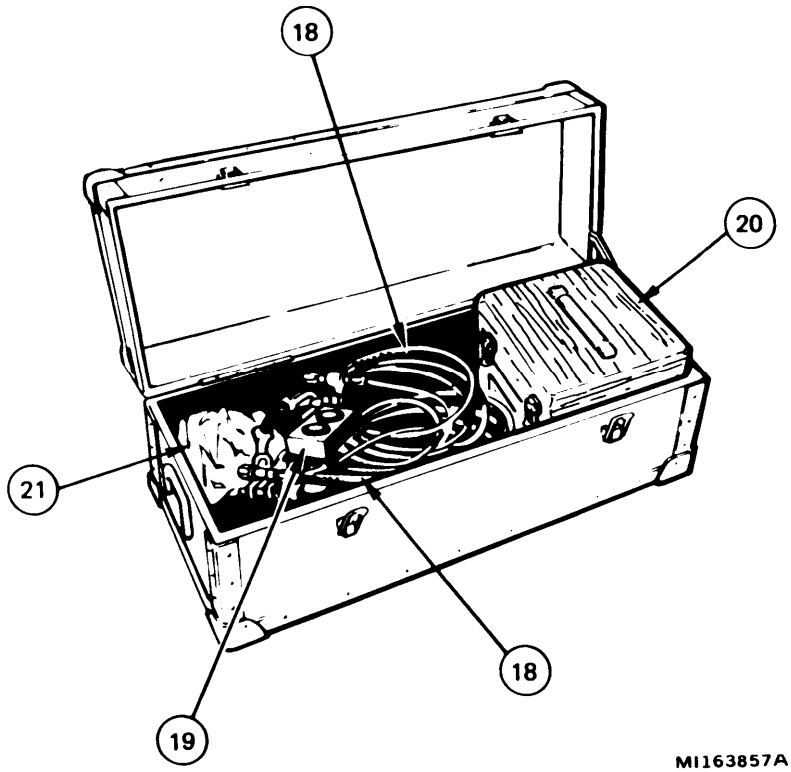
(3) Slowly open the INLET BLEED valve (11) counterclockwise two complete turns (you may hear gas escaping). Close INLET BLEED valve.

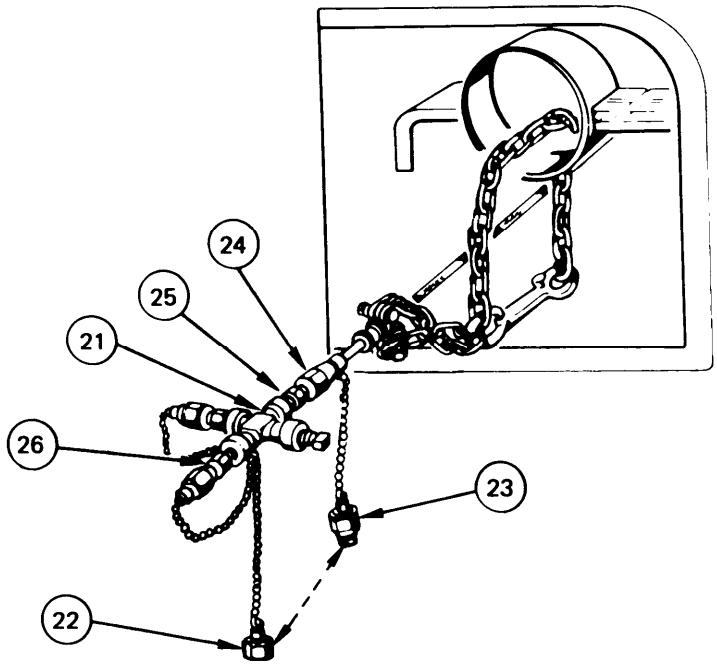
(4) Carefully disconnect (turning counterclockwise) the hose fitting (12) at the supply bottle adapter (13) using a 9/16-inch wrench to hold and a 9/16-inch wrench to loosen. Replace the protective plug on the end of the inlet flexible hose finger tight.

(5) Disconnect the inlet flexible hose safety chain (14) from the supply bottle. The loose end of the inlet hose with safety chain should be placed under the two latch frames (15) of the safety cover (16). Wrap the inlet hose safety chain (17) around the latch frame and hook the snap to a chain link.



(6) Locate the proof pressure test equipment storage box and open the lid. The storage box contains two flexible hoses (18), 100 feet of cable with attached control box (19), Pressure Transducer Assembly (20), a cross fitting (21), embossing machine, and embossing tape. Remove the cross fitting (21) from the storage box.





(7) Remove the inlet port protective cap (22) from the cross fitting using a l/2-inch wrench to hold and 9/16-inch to loosen.

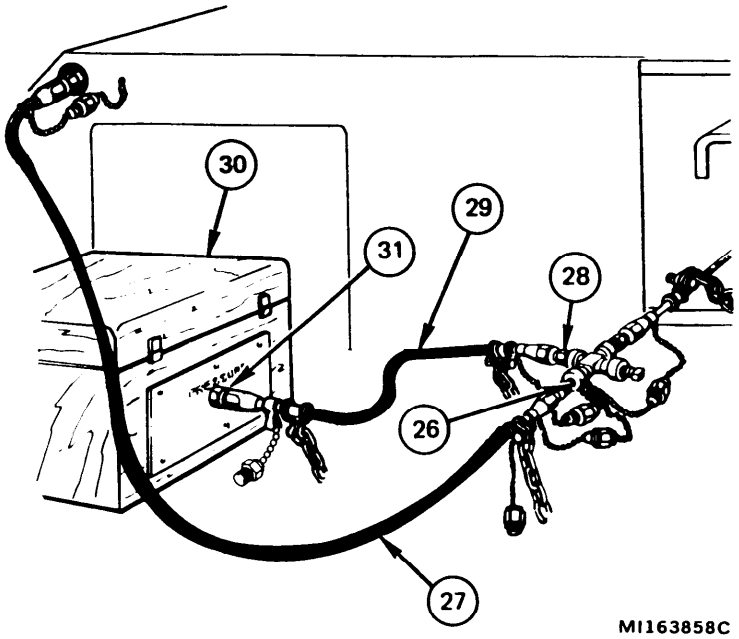
(8) Remove the protective plug (23) from the inlet flexible hose fitting (24). Connect the inlet port (25) of the cross fitting to the inlet flexible hose fitting (24) using a l/2-inch wrench to hold and a 9/16-inch wrench to tighten. Connect protective plug (23) to protective cap (22) finger tight.

(9) Remove the protective cap from the cross fitting outlet port (26) using a l/2-inch wrench to hold and a 9/16-inch wrench to loosen.

(10) Open OUTLET BLEED valve two turns counterclockwise, then fully close valve.

NOTE

Safety chains omitted for clarity



(11) Remove the protective plug from the loose end of the GPU outlet flexible hose (27).

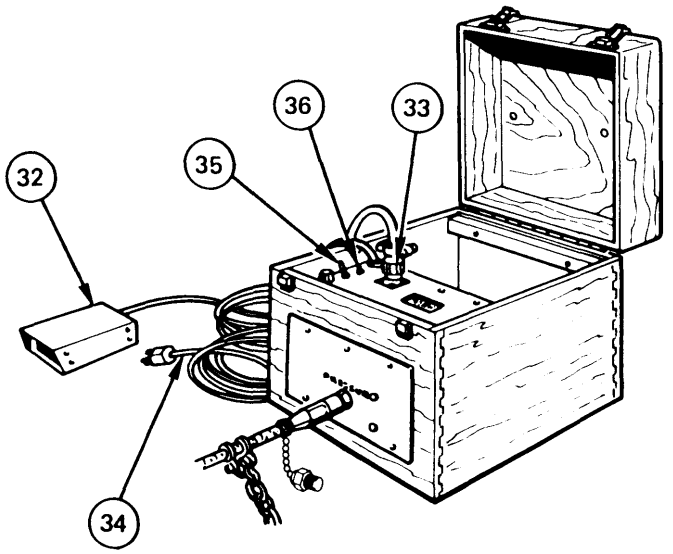
(12) Connect the outlet flexible hose (27) to the cross fitting outlet port (26) using a 1/2-inch wrench to hold and a 9/16-inch wrench to tighten. Connect the loose protective plug and cap together for cleanliness.

(13) Remove the protective cap from the pressure transducer port (28) of cross fitting.

(14) Remove the flexible hose (29) from the storage box. Remove one protective plug from the short hose. Connect the short flexible hose (29) to the pressure transducer port (28) on the cross fitting using a 1/2-inch wrench to hold and a 9/16-inch wrench to tighten. Connect the loose protective plug and cap finger tight.

(15) Remove the Pressure Transducer Assembly (30) from the storage box and place on floor near the right access door of the GPU.

(16) Remove the protective cap from the PRESSURE fitting (31) on the Pressure Transducer Assembly.



(17) Remove the protective plug from the flexible hose.

(18) Connect the loose end of the flexible hose (29) to the PRESSURE fitting (31) on the Pressure Transducer Assembly using a 9/16-inch wrench to tighten securely. Connect the loose protective plug and cap finger tight.

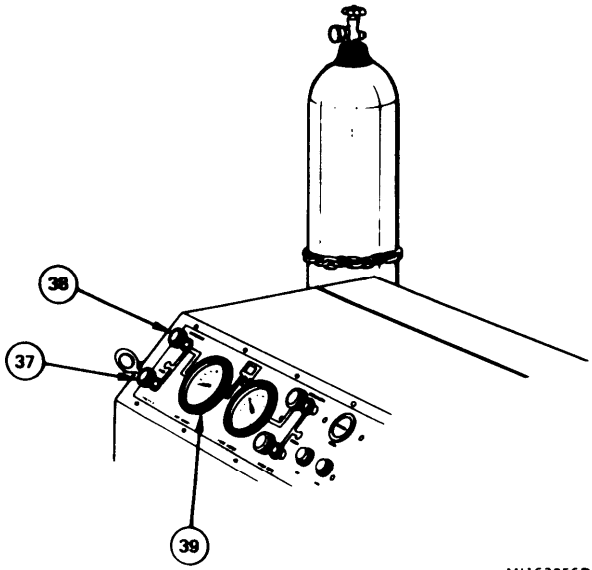
(19) Hook all loose safety chains to the eyebolt on the right side of the GPU front panel.

(20) Open the lid of the Pressure Transducer Assembly (30). Remove the digital readout device and cable (32). Check calibration sticker on front panel of Transducer Assembly, if past calibration due date, do not use. Transducer Assembly must be recalibrated.

(21) Connect the digital readout cable connector (33) to the Pressure Transducer Assembly.

(22) Connect the Pressure Transducer Assembly power cable (34) to 115 VAC, 50 to 400 Hz power outlet. Place the AC power ON/OFF switch (35) to ON. Observe that the red power indicator (36) illuminates (if not, verify power and check the fuse and lamp). The digital readout device should indicate 00200 or below.

(23) Arrange the cables through the cutout in the Pressure Transducer Assembly; close and secure the lid. Place the digital readout device in a position on top of the GPU so that you can easily read it.



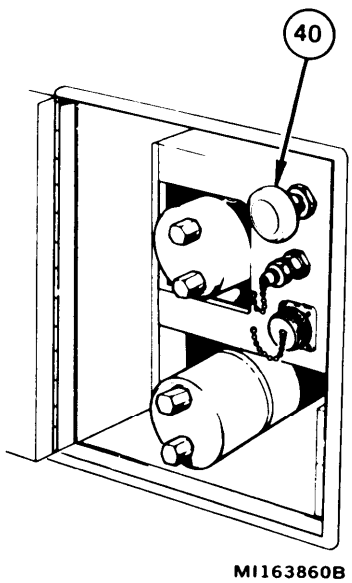
(24) Open the INLET BLEED valve (37) two turns counterclockwise. Slowly open INLET SHUTOFF valve (38) until you hear gas escaping. When gas stops escaping, open the INLET SHUTOFF valve (38) two complete turns.

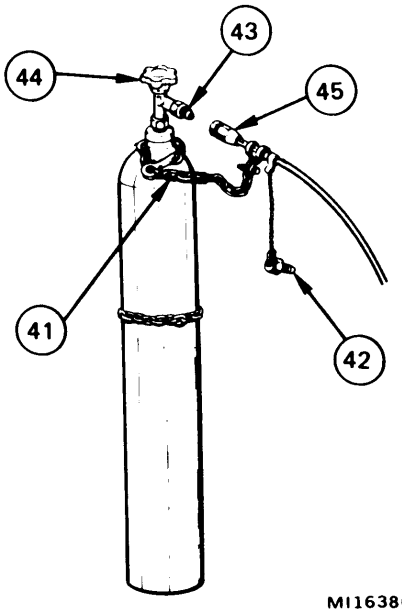
NOTE

The INLET PRESSURE gage (39) may read more than zero due to gage inaccuracy at low pressure.

(25) Close the INLET SHUTOFF (38) and INLET BLEED (37) valves fully clockwise.

(26) Close the PROOF TEST SHUTOFF valve (40) located on the PROOF TEST CONTROL PANEL fully clockwise to the closed position.





(27) Remove the flexible hose from the storage box and connect the safety chain (41) on one end of the hose around the gas supply bottle adapter.

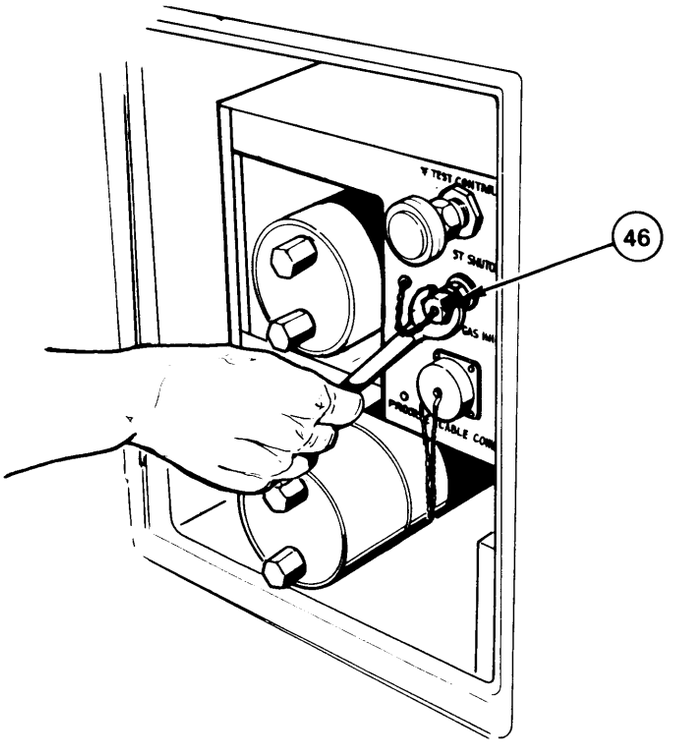
(28) Remove the protective plug (42) nearest the gas bottle, on one end of the flexible hose.

WARNING

Be sure that personnel are not in line with the gas supply valve outlet when performing the next step. Escaping gas can damage skin or eyes, and direct inhalation of the gas can result in suffocation.

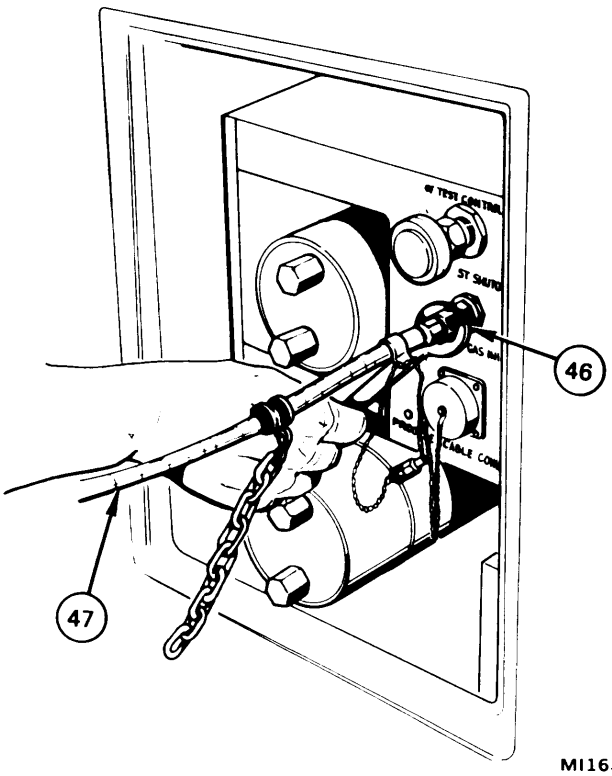
(29) Purge the gas supply adapter (43) by slowing opening (counterclockwise) the gas bottle valve (44) until gas can be heard escaping. Close the gas bottle valve (44) after allowing gas to escape slowly for approximately 10 seconds.

(30) Connect the flexible hose fitting (45) to the gas bottle adapter (43) using a 3/4-inch wrench to hold and a 9/16-inch wrench to tighten.



(31) Stand to the side of the left access door and loosen the PROOF TEST GAS INLET (46) protective cap using a 9/16-inch wrench to loosen. Remove the protective cap.

(32) Remove the protective plug from the fitting on the end of the flexible hose connected to the gas supply. Use a 9/16-inch wrench to hold and a 7/16-inch wrench to loosen.



(33) Connect the flexible hose (47) to the PROOF TEST GAS INLET (46) fitting using a 9/16-inch wrench to tighten. Connect the loose protective plug and cap together finger tight.

(34) Hook the loose safety chain to the eyebolt on the left side of the GPU.

(35) Be sure that the GPU power cable is connected to a 115 VAC, 50/60 Hz, 20 ampere power source.

(36) Check to be sure that the safety cover located at the rear of the GPU is securely latched. If this lid is not latched, the GPU will not operate.

3-8. PROOF TEST PROCEDURE

a. Initial Preparation and Hookup

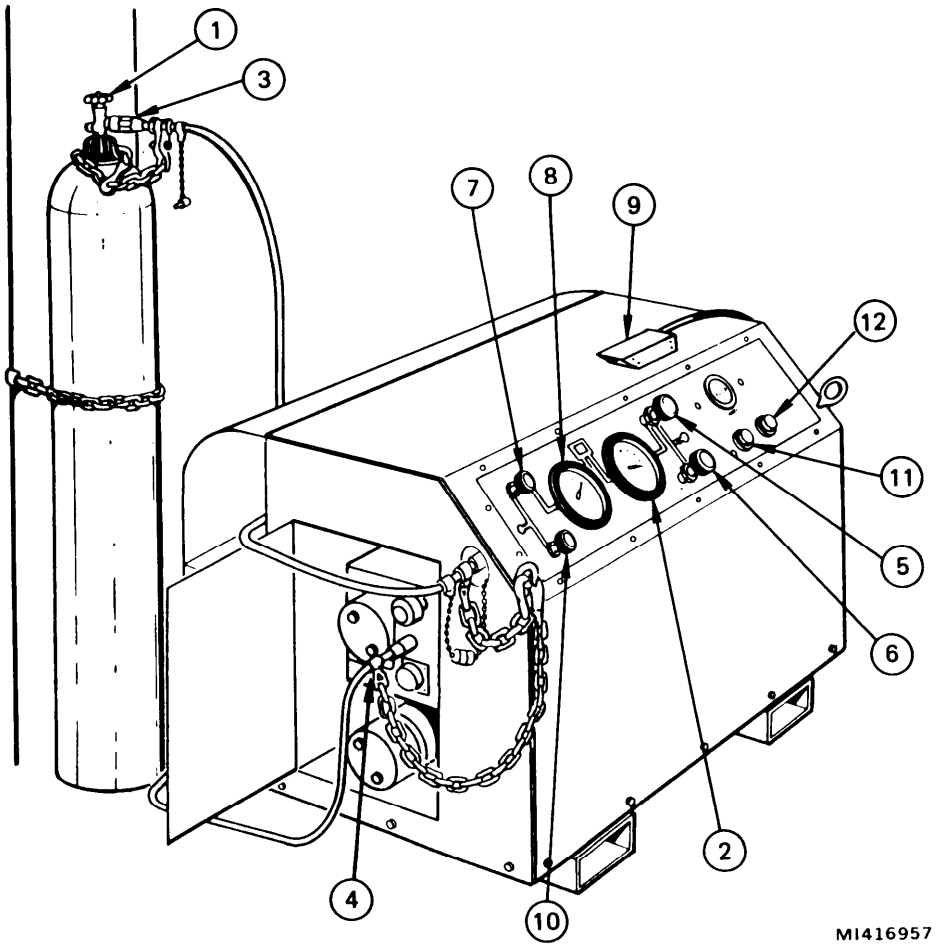
WARNING

Protective eyewear must be worn while performing this test.

NOTE

- Ensure PROOF TEST shutoff valve is closed.
- If the OUTLET PRESSURE gage (2) reading does not rise, momentarily press the ON pushbutton (11) and then the OFF pushbutton (12).

(1) Very slowly open (turning counterclockwise) the gas supply bottle valve (l), observing that the OUTLET PRESSURE gage (2) rises slowly. Open the gas supply bottle valve (1) two turns counterclockwise.



WARNING

If leaks are detected in the next step, serious injury can result if the fittings are loosened by mistake instead of tightened.

(2) Squirt leak detecting liquid around the gas supply bottle fitting (3) and PROOF TEST GAS INLET (4) fittings. Visually check for gas bubbles indicating leakage. If leaks are detected, close the gas supply bottle valve (1) fully clockwise. Slowly open the OUTLET SHUTOFF valve (5) and the OUTLET BLEED valve (6) until all gas escapes, then close the OUTLET SHUTOFF valve and OUTLET BLEED valve fully clockwise. Carefully tighten the leaking fitting (turning clockwise) and repeat steps *a.* (1) and (2).

(3) Slowly open the OUTLET SHUTOFF valve (5) two turns counterclockwise.

(4) Slowly open the INLET SHUTOFF valve (7) two turns counterclockwise.

(5) Observe that the INLET PRESSURE (8) and OUTLET PRESSURE gages (2) and the digital readout device (9) read approximately the same.

(6) Check the following high pressure fittings for leaks using leak detecting fluid:

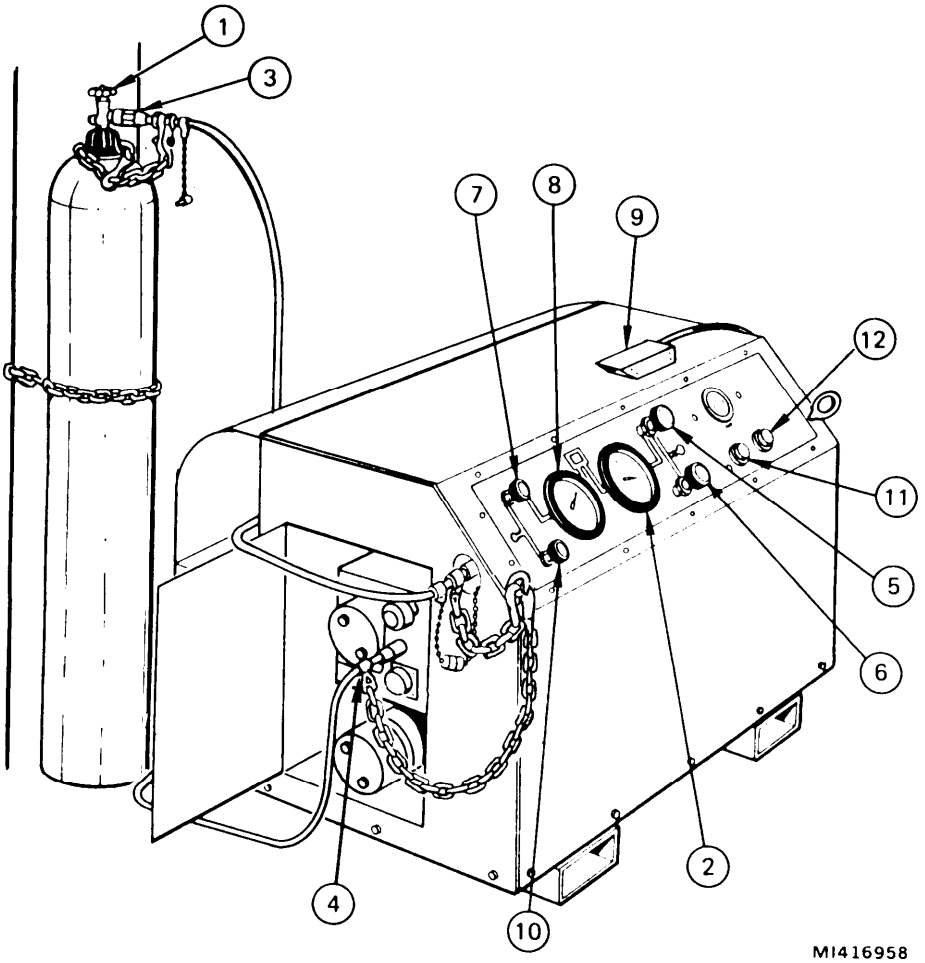
(a) Inlet fitting at upper left front corner of GPU.

(b) Outlet fitting at upper right front corner of GPU.

(c) PRESSURE fitting at Pressure Transducer Assembly.

(d) Four port fittings at the cross fitting.

If leaks are detected, perform steps (7) through (12), otherwise go to step (13).



(7) Close the gas supply bottle valve (l), OUTLET SHUTOFF valve (5), and INLET SHUTOFF valve (7) fully clockwise. Open the OUTLET BLEED valve (6) slowly two turns counterclockwise. Tighten the leaking fittings using appropriate wrenches.

(8) Slowly open the gas supply bottle valve (1) two turns counterclockwise.

(9) Close the OUTLET BLEED valve (6).

(10) Open the OUTLET SHUTOFF valve (5) two turns counterclockwise.

(11) Open the INLET SHUTOFF valve (7) two turns counterclockwise. The INLET PRESSURE (8) and OUTLET PRESSURE (2) gages and the digital readout device (9) should all read approximately the same.

(12) Check for leaks as prescribed in para. 3-8, step a.6.

NOTE

If the pressure reading on the INLET PRESSURE gage (8) is 1000 psig or less, replace the gas supply bottle.

NOTE

Very small leaks at the cross fitting are acceptable.

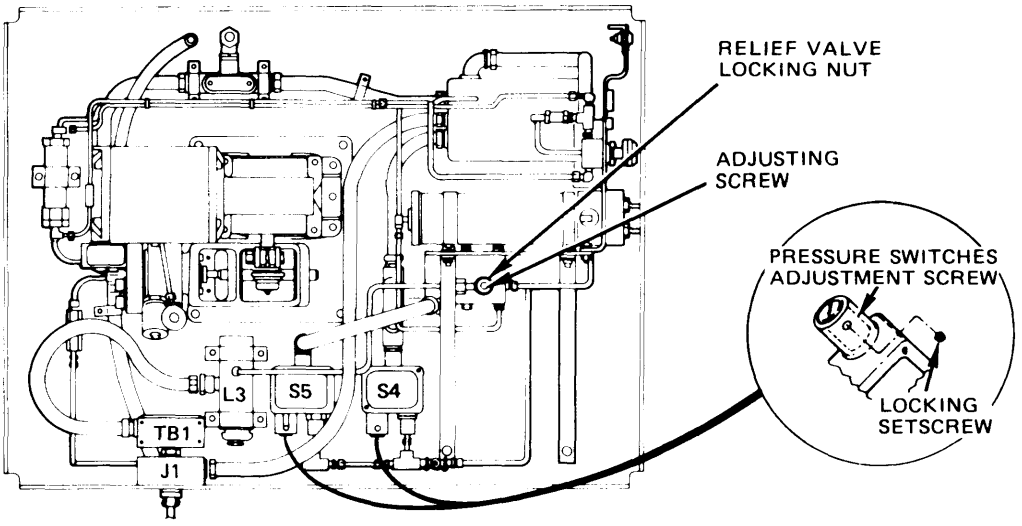
(13) If the digital readout device (9) reads between 5400 and 5800, open the INLET BLEED valve (10) to relieve the pressure down to between 4700 and 5300 psig. Close the INLET BLEED valve (10) fully clockwise after bleeding to the required pressure. This must be performed to allow the GPU to operate when the ON pushbutton is pressed.

(14) Push the ON pushbutton (11) on the GPU. The GPU will start operating, and automatically shut off when a pressure of 5800 to 6200 psig is reached on the digital readout device. If the pump does not stop in the above range, record pressure reading, push the OFF pushbutton (12), and perform substeps (a) through (i) below, otherwise continue with step (15). If the OUTLET PRESSURE gage does not show an increased pressure reading after one minute of operating, the compressor may have lost its prime. Turn the GPU off and perform the priming procedures contained in Chapter 3, Section VI, Corrective Maintenance.

(a) Ensure that the gas supply valve on the supply bottle is closed fully clockwise.

(b) Verify that INLET BLEED and OUTLET BLEED are closed fully clockwise, and INLET SHUTOFF and OUTLET SHUTOFF are open fully counterclockwise. Open PROOF TEST SHUTOFF valve.

(c) Slowly open INLET BLEED valve 1/4 to 1 turn counterclockwise to allow pressure to bleed off. The pressure on the pressure gages will slowly bleed down to 500 psig in approximately 2 to 4 minutes. Close the INLET BLEED valve when pressure has reached 500 psig. Close the OUTLET SHUTOFF valve fully clockwise. Open INLET BLEED valve counterclockwise until all gas has escaped. Pressure will be bled from the inlet and outlet hoses. Close INLET BLEED and INLET SHUTOFF valves fully clockwise.



(d) Remove housing enclosure in accordance with paragraph 3-l8, steps a through c.

(e) On S4, loosen the locking setscrew that holds the pressure adjustment screw using a 3/32-inch hex wrench.

(f) Using a large flatblade screwdriver, turn the adjustment screw counterclockwise to lower or clockwise to raise the pressure. Tighten locking set screw. One eighth turn will change the pressure by approximately 250 psig. Adjust S4 to shut the pump off at 6000 ± 200 psig.

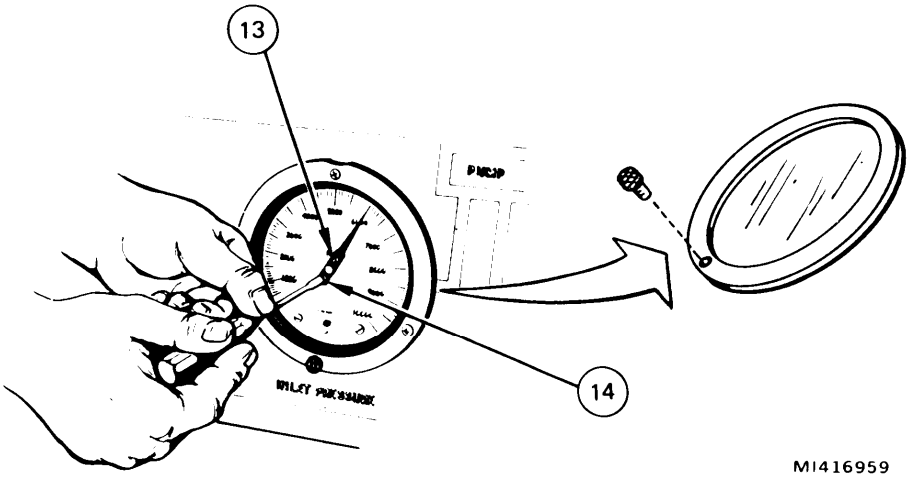
(g) Replace housing enclosure in reverse order of removal para. 3-18c.

(h) Check results of S4 adjustment by performing procedures in accordance with paragraph 3-7, steps (1) through (36), and paragraph 3-8a, steps (1) through (14). If another adjustment is necessary, turn off the pump by depressing S2 OFF switch and repeat steps (a) through (h).

(i) If S4 cannot be adjusted within tolerance, replace S4 in accordance with instructions in paragraph 3-22.

(15) If the INLET PRESSURE (8) and the OUTLET PRESSURE (2) gages do not read within ± 100 psig of the digital readout (9), perform steps (16) through (18) to correct out of tolerance gage; otherwise, go to step (19).

(16) Loosen knob on gage cover and remove glass assembly from gage.

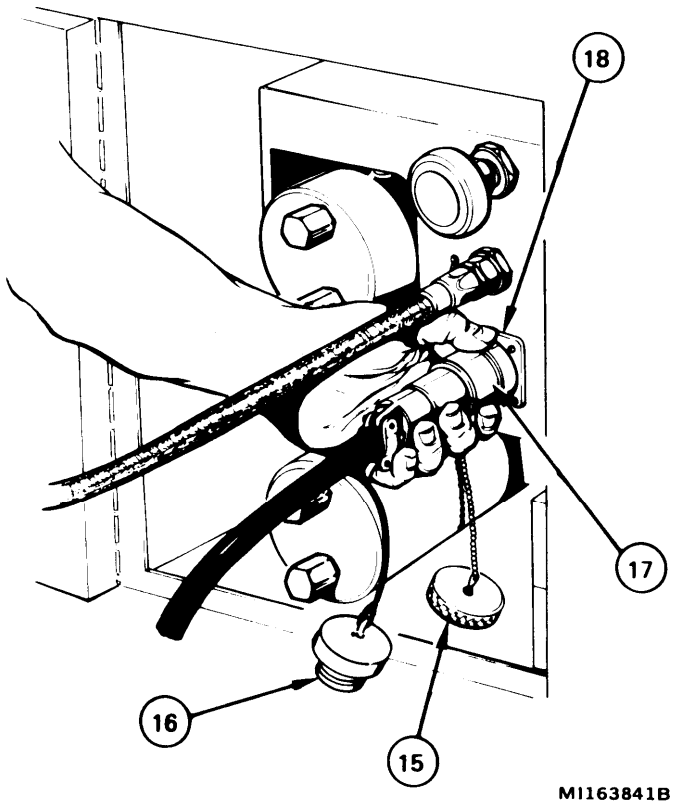


NOTE

Not all GPUs have locking screws (13); if not present, disregard reference to (13).

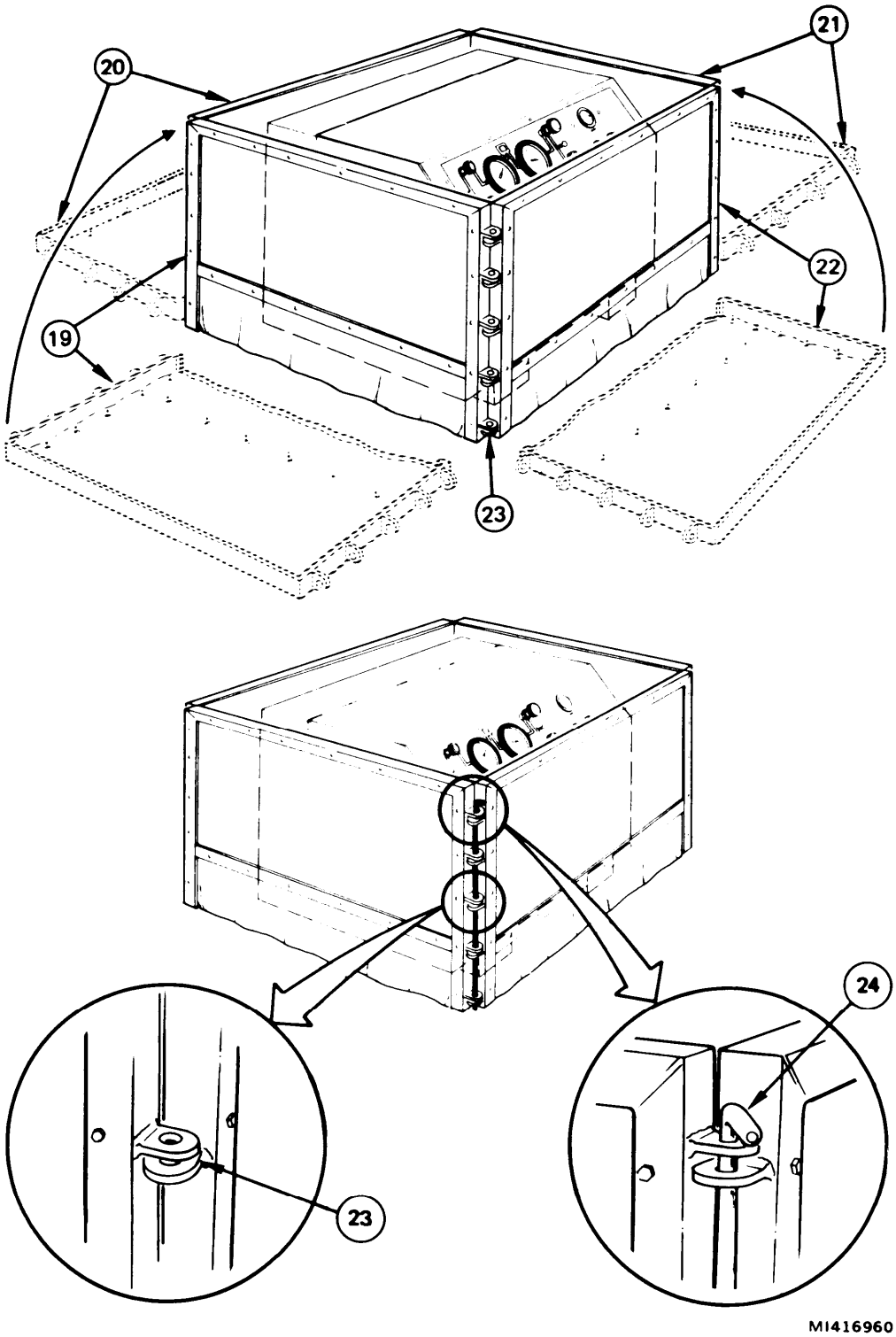
(17) Using a small flatblade screwdriver, loosen screw (13). Adjust screw (14) to match reading on digital readout, then tighten screw (13).

(18) Replace the glass assembly and tighten the attaching screw.



(19) Remove the control cable from the storage box.

(20) Remove the protective caps (15) and (16) from the GPU PROOF TEST CABLE CONNECTION connector (18) from the end of the control cable (17). Rotate the control cable connector (17) until the widest keyway is up, and connect the control cable to the PROOF TEST CABLE CONNECTION (18).



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WARNING

Do not attempt to assemble protective barrier with fewer than four men. Each panel weighs 120 lbs and will require two men to position assemblies in place.

(21) To assemble the proof pressure test protective enclosure, position panel assemblies (19), (20), (21), and (22) around GPU as shown.

(22) Center panel assembly (19) to assure equal front and rear spacing. Proper positioning of this panel will correctly locate the remaining panels (20), (21), and (22).

(23) When side panel (19) has been correctly positioned, raise into place and hold in position.

(24) Raise front panel assembly (22) and reposition as required so that overlapping hinge slots (23) are properly aligned.

(25) Insert hinge pins (24).

(26) Raise remaining panels (20) and (21) respectively and align hinge slots for insertion of hinge pins as described in steps 24 and 25 above.

(27) When the protective enclosure is in place, carry the digital readout device and control box as far beyond the protective barrier as allowed by the control cables. Be sure area is cleared of other personnel.

WARNING

High gas pressure (up to 8000 psig) exists at the GPU when performing the procedure below. Death or severe injury may result if you fail to follow instructions — if the proof test fails at any time during the procedure you will probably hear a loud noise or explosion or a loud hiss of gas escaping. A rapid decrease in pressure on the digital readout device is also an indication of proof test failure. If a failure occurs:

(1) immediately release override button on the control box;

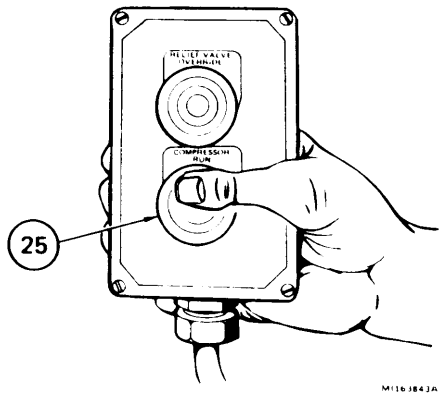
(2) remain in a position sheltered from the GPU, and;

(3) do not allow anyone to approach the GPU for at least 30 minutes. After 30 minutes, shut down the GPU in accordance with paragraph 3-9, page 3-44.

(28) At the maximum distance permitted by the cable, hold the control box in your hand and position the digital readout so that you can read it.

(29) Start the operation of the GPU by pressing and holding the black pushbutton labeled COMPRESSOR RUN (25) on the control box. This button must be held down for the GPU to continue operating until the relief valve opens.

(30) Hold the COMPRESSOR RUN pushbutton down, while observing the increasing pressure displayed on the digital readout device, until the GPU relief valve opens between 6550 and 7250 psig. The escaping gas may be heard when the relief valve opens, and the digital readout device will begin to indicate a decrease in pressure. Record the pressure at which the relief valve opens and release the COMPRESSOR RUN

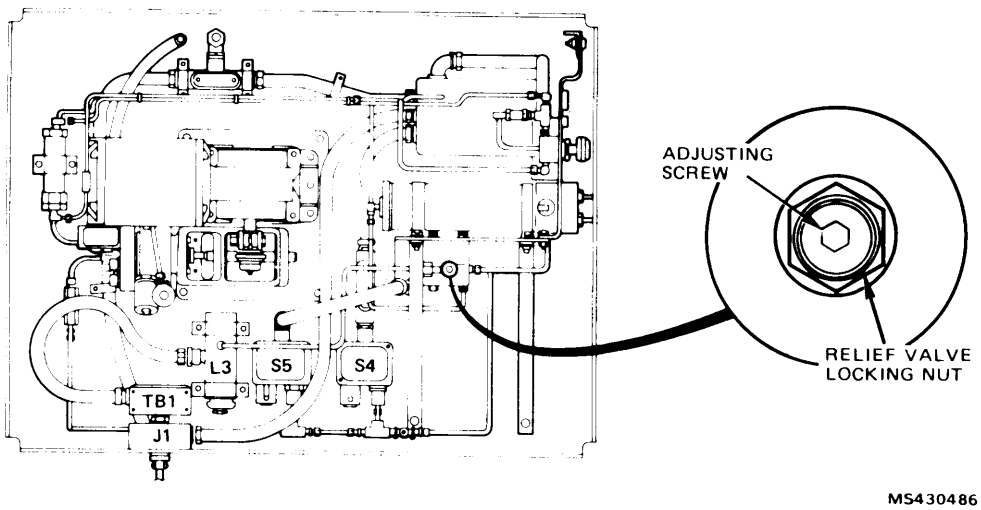


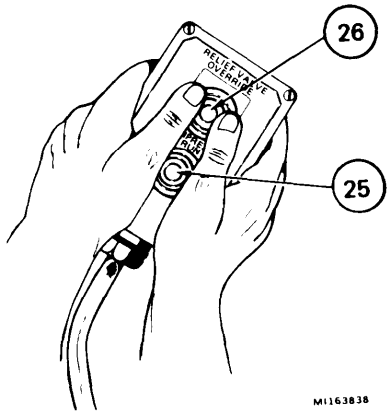
pushbutton (25). Note that the relief valve will stop venting gas between 4000 and 7000 psig. If the relief valve fails to open between the limits of 6550 and 7250 psig, release the COMPRESSOR RUN pushbutton (25), and perform substeps (a) through (d) below, otherwise continue with step (31).

(a) Vent system in accordance with paragraph 3-8a(14), steps (a) through (c).

(b) Relief valve adjustment is accomplished through left access door.

(c) Using a 12-inch adjustable wrench, loosen the relief valve locking nut. use a 3/8 Hex wrench to adjust the screw in the top of the valve clockwise to increase pressure and counterclockwise to reduce pressure. One quarter turn of the adjustment screw will change the setting by approximately 500 psig. The valve should be adjusted for 6900 ± 350 psig. Tighten locking nut after adjustment has been made.





(d) Check results of adjustment by performing procedures in accordance with paragraph 3-8a, steps (28) through (30).

(31) Restart the GPU by pressing the COMPRESSOR RUN pushbutton (25). The pressure that is displayed on the digital readout will begin to rise. At the sometime, press the RELIEF VALVE OVERRIDE (26) pushbutton to prevent the relief valve from venting the system pressure.

(32) Continue to press both switches until the digital readout stops increasing and begins decreasing slightly. Note that the highest pressure reached on the digital readout device is between 7500 and 8000 psig. Release the pushbutton switches and note that the relief valve vents as indicated by a rapid decrease in digital readout. If the GPU continues to operate past 8000 psig, release both pushbuttons. The GPU will stop pumping and the relief valve will open, bleeding the system down to between 4000 and 7000 psig.

(33) If the pressure switch does not shut the GPU off between 7500 and 8000 psig, perform substeps (a) through (g) below; otherwise, continue with step (34).

(a) Vent system in accordance with paragraph 3-8a(14), steps (a) through (c).

(b) Remove housing enclosure in accordance with paragraph 3-18, steps (a) through (c).

(c) On S5, loosen the locking setscrew that holds the pressure adjustment screw (see paragraph 3-8a (14)) using a 3/32-inch hex wrench.

(d) Using a large flatblade screwdriver, turn the adjustment screw counterclockwise to lower or clockwise to raise the pressure. Tighten locking set screw. One eighth turn with change the pressure by approximately 250 psig. Adjust S5 to shut off the pump at 7750±250 psig.

(e) Replace housing enclosure in the reverse order of removal (para. 3-18c).

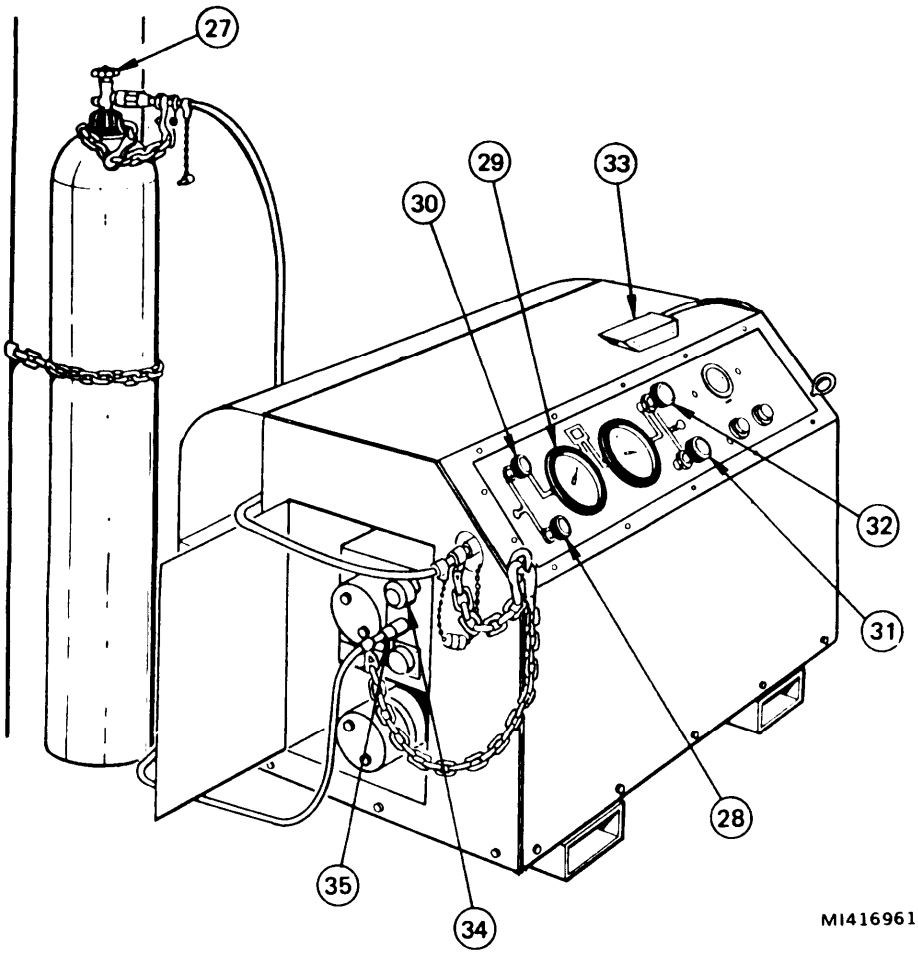
(f) Check results of S5 adjustment by performing procedures in accordance with paragraph 3-7a, steps (1) through (36) and paragraph 3-8a, steps (1) through (32).

(g) If further adjustment is required release both RELIEF VALVE OVERRIDE and COMPRESSOR RUN and repeat steps (a) through (f).

(h) If S5 cannot be adjusted to shut off the pump at 7750 ± 250 psig, replace S5 in accordance with instructions in paragraph 3-22.

(34) Return to the GPU.

(35) Lift the GPU rear safety cover. Inspect all GPU external fittings, flexible hoses, and gages for any visible damage. If the gages or any other item on the GPU is damaged as a result of this test, the GPU must be shut down in accordance with paragraph



3-9. If hoses are damaged they must be replaced. If any other item on the GPU is damaged beyond your level of repair, the GPU must be returned to for repair through normal supply channels.

(36) Close the gas supply valve (27) fully clockwise.

(37) Slowly open the INLET BLEED valve (28) 1/4 to one turn counterclockwise to allow pressure to bleed off slowly. The pressure on the INLET PRESSURE gage (29) will slowly bleed down to 500 psig in approximately 2 to 4 minutes. Close the INLET BLEED valve (28) when pressure has reached 500 psig.

(38) Close the INLET SHUTOFF (30) and OUTLET SHUTOFF (32) valves fully clockwise.

(39) Slowly open the OUTLET BLEED valve (31) counterclockwise. The pressure will be bled from the flexible hoses. After all gas has escaped, close the OUTLET BLEED valve (31).

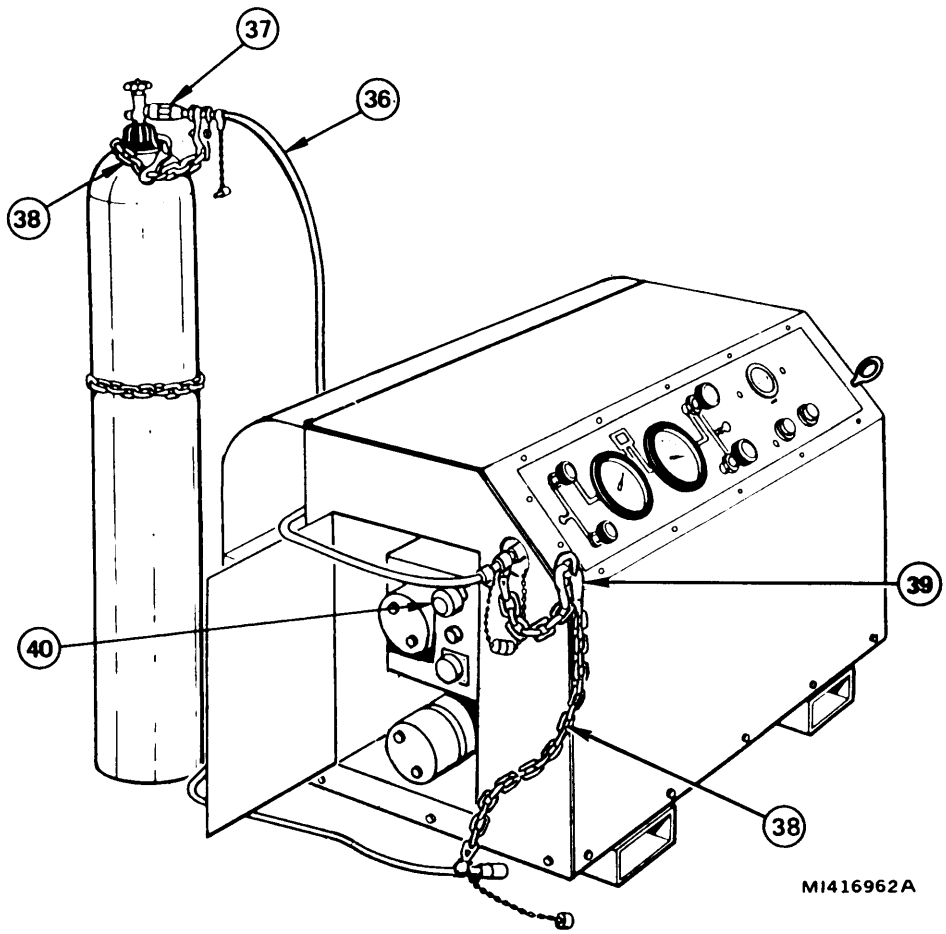
(40) Open the PROOF TEST SHUTOFF valve (34) fully counterclockwise. This valve must be opened for normal operation of the GPU. Open the INLET SHUTOFF (30) and INLET BLEED (28) valves two turns counterclockwise until gas has escaped. Close INLET SHUTOFF and INLET BLEED valves.

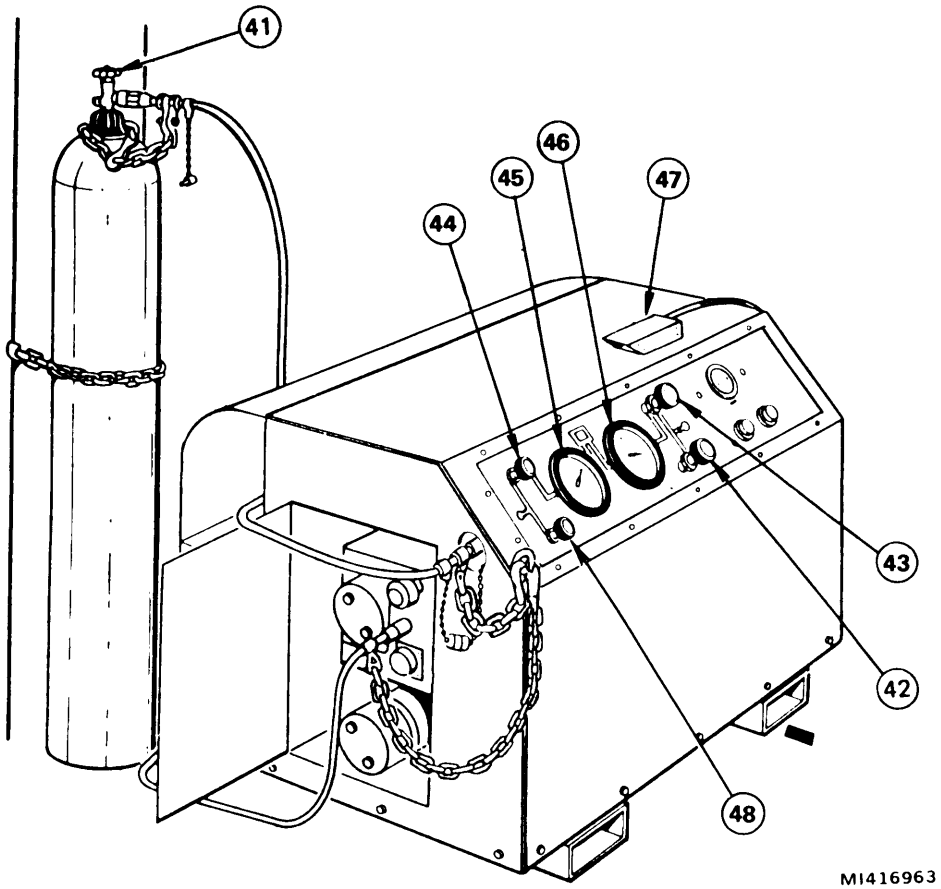
(41) Disconnect the flexible hose at the PROOF TEST GAS INLET (35).

(42) Disconnect the flexible hose (36) at the gas supply adapter (37) using a 9/16-inch wrench to hold and a 9/16-inch wrench to loosen.

(43) Remove safety chains (38) from the neck of the gas supply bottle and GPU eyebolt (39). Exchange this inlet hose with the outlet hose connected between the outlet connector of the GPU and the input port of the cross fitting. Insure hose fittings are tight and all safety chains are attached.

(44) Close the PROOF TEST SHUTOFF valve (40) located on the PROOF TEST CONTROL PANEL fully clockwise to the closed position.





(45) Slowly open the gas supply bottle valve (41) two turns counterclockwise.

(46) Check to assure that OUTLET BLEED valve (42) and INLET BLEED valve (48) are closed.

(47) Open the OUTLET SHUTOFF valve (43) two turns counterclockwise.

(48) Open the INLET SHUTOFF valve (44) two turns counterclockwise. The INLET PRESSURE (45) and OUTLET PRESSURE (46) gages and the digital readout device (47) should all read approximately the same ± 200 psi.

(49) Check the following high pressure fittings for leaks using leak detecting fluid. If leaks are detected, do steps 50 through 54. If no leaks are detected, go to step 55.

NOTE

Very small leaks at the following fittings are acceptable:

a. Inlet fitting at upper left side of GPU.
b. Outlet fitting at upper right side of GPU.
c. Inlet port of cross connector.
d. Proof test inlet port.
e. Gas supply bottle adapter.

(50) Close the gas supply valve (41), OUTLET SHUTOFF valve (43), and INLET SHUTOFF valve (44) fully clockwise. Slowly open the OUTLET BLEED valve (42) two turns counterclockwise. Tighten the leaking fittings using appropriate size wrenches.

(51) Close the OUTLET BLEED valve (42).

(52) Slowly open the gas supply bottle valve two turns counterclockwise.

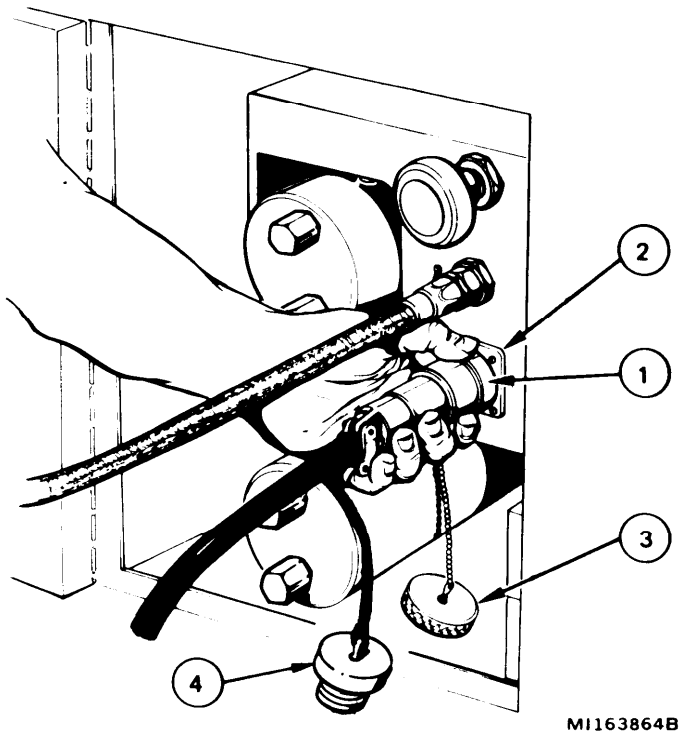
(53) Open the OUTLET SHUTOFF valve (43) two turns CCW.

(54) Open the INLET SHUTOFF valve (44) two turns CCW. The INLET PRESSURE (45) and OUTLET PRESSURE (46) gages and the digital readout device (47) should all read approximately the same ±200 psi. Perform step 49.

(55) Return to location of control box and perform proof test per steps 31 through 35.

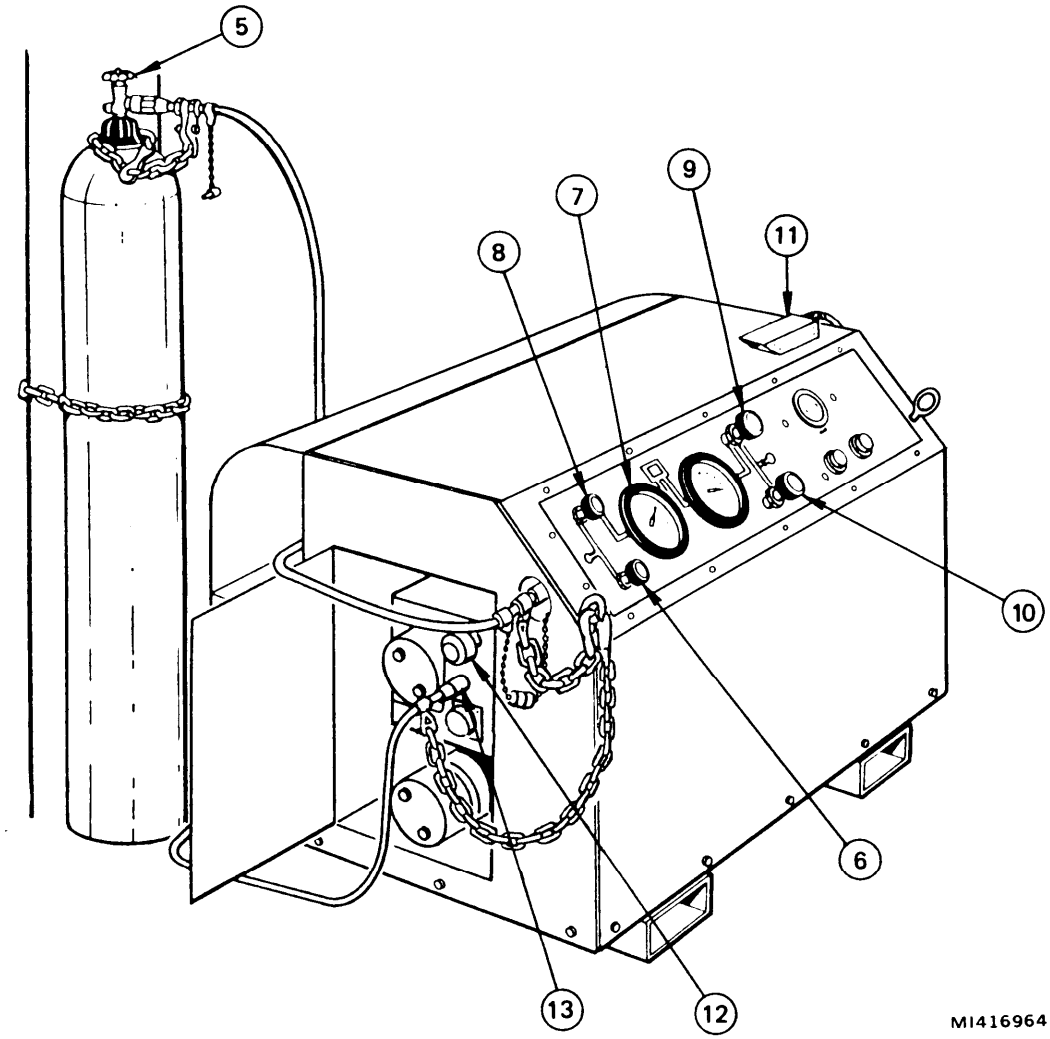
(56) Record date of high proof pressure test in applicable columns of DA Form 2408-9.

3-9. PROOF TEST SHUT DOWN AND DISASSEMBLY PROCEDURE



Preparation for Disassembly

(1) Disconnect the control cable connector (1) from the PROOF TEST CABLE CONNECTION connector (2) and install protective connector covers (3) and (4). Inspect the control cable for damage and wipe clean with a rag if necessary. Set the cable and control box aside.



(2) Close the gas supply valve (5) fully clockwise.

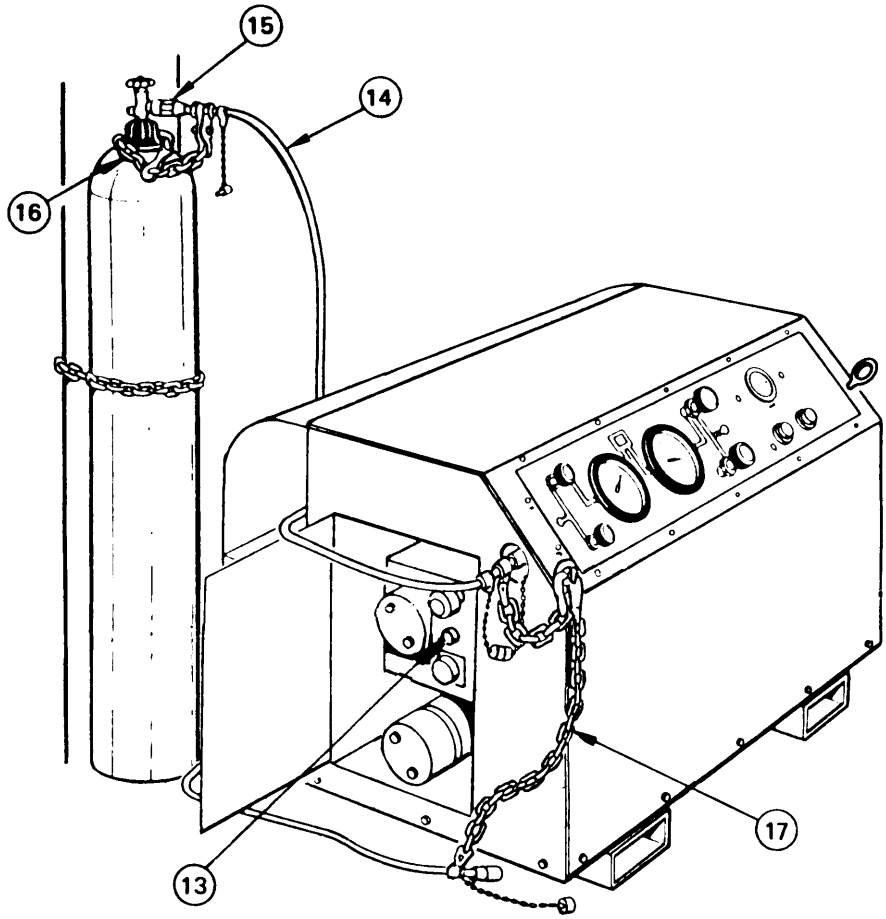
(3) Slowly open the INLET BLEED valve (6) 1/4 to one turn counterclockwise to allow pressure to bleed off slowly. The pressure on the INLET PRESSURE gage (7) will slowly bleed down to 500 psig in approximately 2 to 4 minutes. Close the INLET BLEED valve (6) when pressure has reached 500 psig.

(4) Close the INLET SHUTOFF (8) and OUTLET SHUTOFF (9) valves fully clockwise.

(5) Slowly open the OUTLET BLEED valve (10) counterclockwise. The pressure will be bled from the flexible hoses. The digital readout (11) should read less than 100 psig. After all gas has escaped, close the OUTLET BLEED valve (10).

(6) Open the PROOF TEST SHUTOFF valve (12) fully counterclockwise. This valve must be opened for normal operation of the CPU. Open the INLET SHUTOFF (8) and INLET BLEED (6) valves two turns counterclockwise until gas has escaped.

(7) Disconnect the flexible hose at the PROOF TEST GAS INLET (13) using a 9/16-inch wrench to loosen.

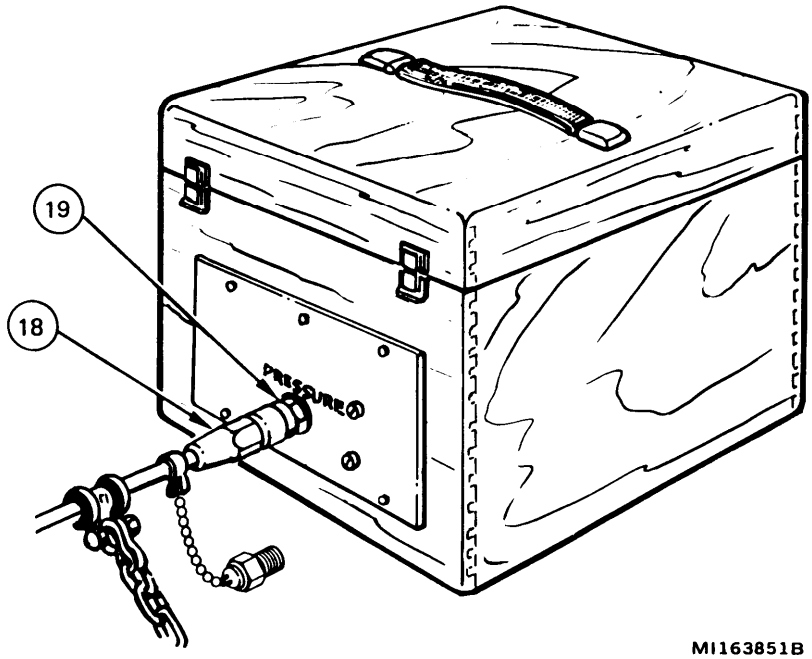


(8) Install the protective capon the PROOF TEST GAS INLET (13) using a 9/16-inch wrench to tighten.

(9) Install the protective plug on the flexible hose using a 9/16-inch wrench to hold and a 7/16-inch wrench to tighten.

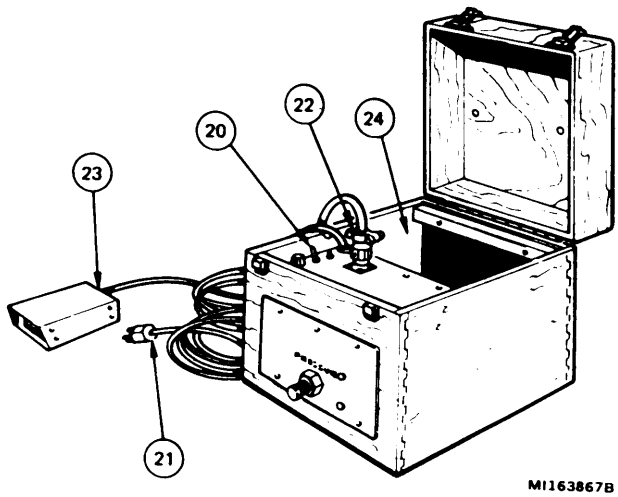
(10) Disconnect the flexible hose (14) at the gas supply adapter (15) using a 3/4-inch wrench to hold and a 9/16-inch wrench to loosen. Reinstall the protective plug into the flexible hose fitting using a 9/16-inch wrench to hold and a 7/16-inch wrench to tighten.

(11) Remove safety chain (16) from the neck of the gas supply bottle and safety chain (17) from the GPU eyebolt and place the flexible hose (14) in the storage box.



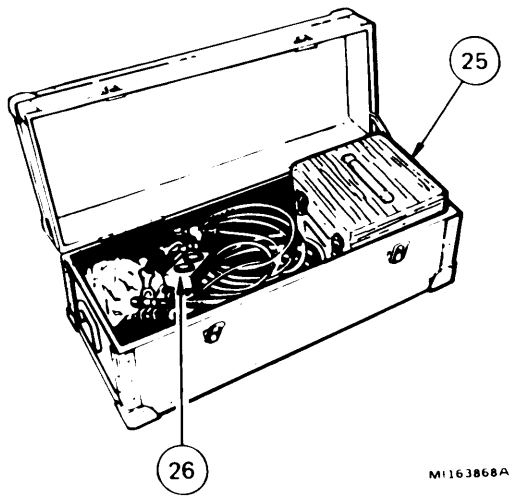
(12) Disconnect the flexible hose fitting (18) from the PRESSURE fitting (19) on the Pressure Transducer Assembly, using a 9/16-inch wrench.

(13) Install the protective capon the PRESSURE fitting. Replace the protective plug in the flexible hose.



(14) Open the lid on the Pressure Transducer Assembly and set the Pressure Transducer Assembly ON/OFF switch (20) to OFF. Disconnect the Pressure Transducer Assembly power cable (21) from the AC power outlet. Coil the power cable and place in the Pressure Transducer Assembly cable storage area (24).

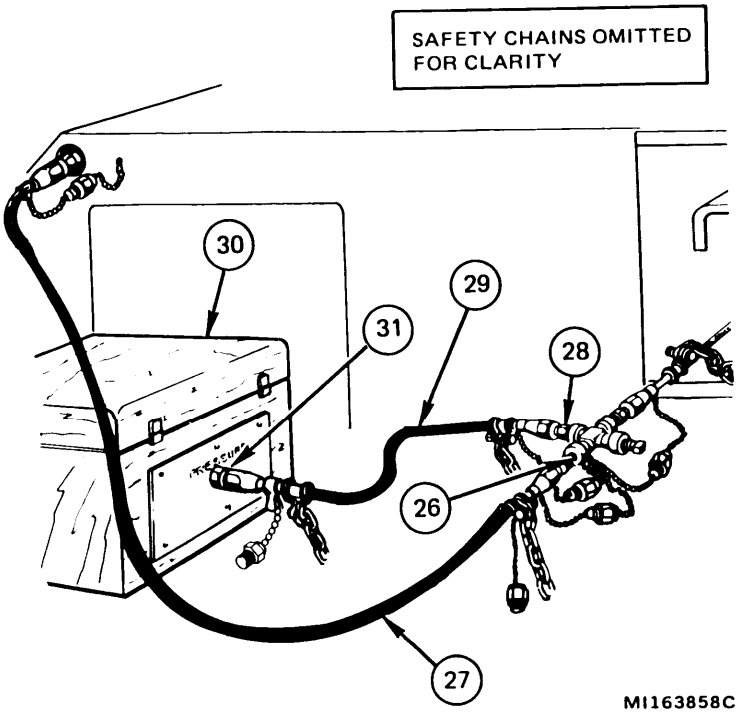
(15) Disconnect the digital readout cable connector (22) at the Pressure Transducer Assembly. Inspect the digital readout cable for damage and wipeclean with a rag if necessary. Coil the cable attached to the digital readout device (23) and place the device with the cable into the Pressure Transducer Assembly cable storage area (24).



(16) Close and secure the Pressure Transducer Assembly lid and place the assembly (25) in one end of the storage box.

(17) Coil the control box cable assembly (26) and place in the storage box with the Pressure Transducer Assembly.

(18) Using a 1/2-inch wrench to hold and a 9/16-inch wrench to loosen, disconnect the three flexible hoses (27) and (31) from the cross fitting (28). As each hose is disconnected, reinstall the protective caps (29) in the cross fitting using a 1/2-inch wrench to hold and a 9/16-inch wrench to tighten. Also, reinstall the protective plugs (30) in the flexible hoses, using a 9/16-inch wrench to hold and a 7/16-inch wrench to tighten. This will protect the flexible hoses and cross fitting from contamination.



(19) Place the cross fitting (28) in a protective bag and place in the storage box.

(20) Using an embossing machine and embossing tape (item 22, Appendix E), mark “PROOF TESTED” and the proof date on the tape. Secure an embossed tape to each of the flexible hoses and front of GPU.

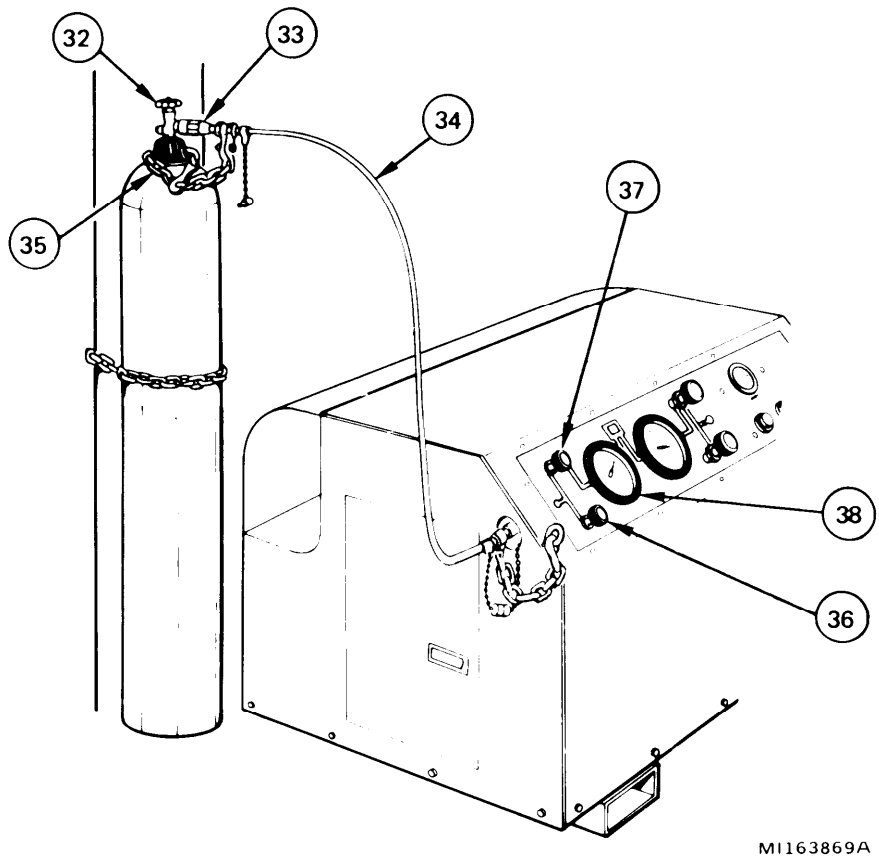
(21) Disconnect all safety chains from the GPU eyebolts and from around the latch frame under the GPU cover.

(22) Place the flexible hose in the storage box. Close and secure the storage box lid. Return the storage box to its storage location.

(23) Remove the inlet flexible hose from under the two latch frames at the rear of the GPU. Close and secure the GPU rear safety cover. Remove the protective plug from the loose end of the inlet flexible hose using a 9/16-inch wrench to hold and a 9/16-inch wrench to loosen.

WARNING

Be sure that personnel are not in line with the gas supply valve outlet when performing the next step. Escaping gas can damage the eyes and skin, and direct inhalation of the gas can result in suffocation.



(24) Slowly open the gas supply valve (32) counterclockwise to purge any contaminants from the adapter (33). Purge for 10 seconds and then close the gas supply valve fully clockwise.

(25) Connect the inlet flexible hose (34) to the gas supply adapter using a 3/4-inch wrench to hold and a 9/16-inch wrench to tighten.

(26) Wrap the inlet flexible hose safety chain (35) around the neck of the gas supply and hook the snap into a chain link.

(27) Connect the safety chains for the inlet and outlet flexible hoses to the eyebolts on the left and right front sides of the GPU.

(28) Close and secure the access door on the left side of the GPU.

(29) Close the INLET BLEED (36) and INLET SHUTOFF (37) valves fully clockwise.

(30) Slowly open the gas supply valve (32) two turns counterclockwise.

(31) Check the inlet hose fitting at the gas supply adapter (33) for leaks using leak detector fluid. If leaks are detected, perform steps 32 through 34, otherwise go to step 35.

(32) Close the gas supply valve (32) fully clockwise.

(33) Open INLET BLEED valve (36) two turns counterclockwise.

(34) Tighten the leaking fitting (turning clockwise) and repeat steps (29) through (31).

(35) Slowly open INLET SHUTOFF valve (37) counterclockwise until INLET PRESSURE gage (38) reads approximately 500 psig, then close INLET SHUTOFF valve (37).

(36) Close gas supply valve (32) fully clockwise.

(37) Open INLET BLEED valve (36) until gas stops escaping, then close fully clockwise.

Section V. TROUBLESHOOTING

3-10. GENERAL

a. The troubleshooting procedures contained in this section will assist you in isolating equipment failure to the replaceable component level. Tables 3-3 and 3-4 provide troubleshooting procedures for the gas pumping unit and battery charger respective}'. Refer to Section VI for parts replacement procedures when performing corrective maintenance on either unit. Special tools or test equipment will not be required to remove and replace these components.

b. The tables list the common malfunctions which you may find during operation of the GPU or battery charger. You should perform the tests inspection and corrective action in the order listed. Steps marked with an asterisk (*) contain repair instructions that are to be performed by Moving Target Simulator personnel only.

c. This manual cannot list all malfunctions that may occur; if a malfunction is not listed in the symptom index or is not corrected by the listed corrective action, notify your supervisor.

d. Symptoms Index

Table 3-3. *CPU Troubleshooting Guidance Chart*

NOTE:
THOSE STEPS MARKED WITH AN ASTERISK (*) SYMBOL ARE FOR REPAIRS TO BE ACCOMPLISHED AT MTS LOCATION ONLY. OTHER USERS WILL TURN IN GPU THROUGH SUPPLY CHANNELS FOR REPAIR.

MALFUNCTION

→ TEST OR INSPECTION

→ CORRECTIVE ACTION

1. GPU FAILS TO START WHEN ON PUSHBUTTON IS DEPRESSED.

→ IS AC POWER CABLE CONNECTED TO SOURCE?

→ IF NOT, CONNECT TO AC SOURCE.

→ IS ON SWITCH DEFECTIVE?

→ REMOVE ON/OFF SWITCH ASSEMBLY ACCESS PLATE. USING AN OHMETER TEST ON SWITCH FOR CONTINUITY BY PLACING TEST LEADS ACROSS THE REAR SWITCH ASSEMBLY TERMINALS AND PRESSING THE PUSHBUTTON. IF A CONTINUITY INDICATION IN NOT OBTAINED THE SWITCH IS DEFECTIVE.

: REPLACE DEFECTIVE SWITCH IN ACCORDANCE WITH PARA. 3-24,

→ HAS THERMAL OVERLOAD SWITCH OPENED?

→ OPEN THE LEFT ACCESS DOOR AND PRESS THE STARTER RELAY–RESET BUTTON

→ IS SAFETY COVER PROPERLY SECURED?

→ IF NOT, SECURE SAFETY COVER.

→ IS GPU SAFETY INTERLOCK SWITCH (l), STARTER RELAY (2), OR MOTOR (3) DEFECTIVE?

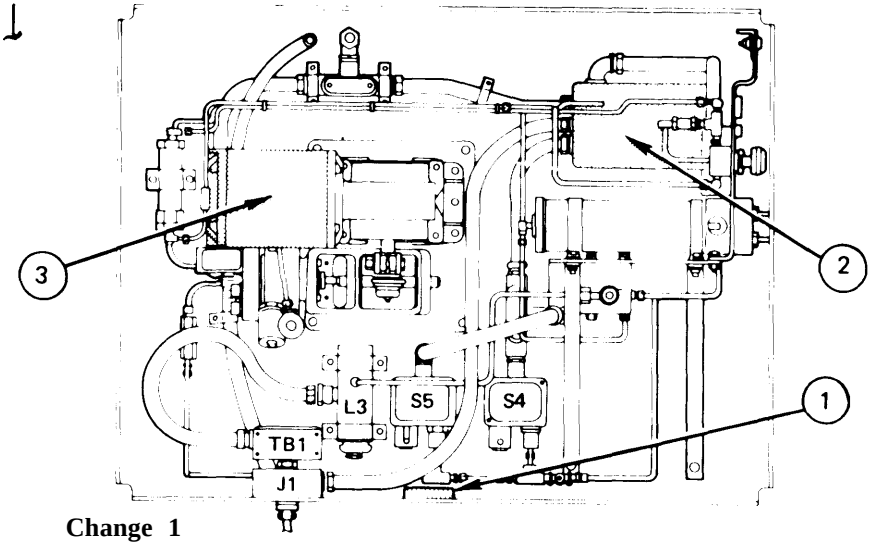


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Table 3-3. ***CPU Troubleshooting Guidance Chart (Continued)***

MALFUNCTION

TEST OR INSPECTION

CORRECTIVE ACTION

IF GPU DOES NOT START WITH AC POWER APPLIED AND THE SAFETY COVER IS PROPERLY SECURED, THE SAFETY INTERLOCK SWITCH, STARTER RELAY, OR COMPRESSOR MOTOR MAY BE DEFECTIVE. USING AN OHMMETER CHECK THE SAFETY INTERLOCK SWITCH FOR CONTINUITY WITH BUTTON DEPRESSED. IF CONTINUITY IS NOT OBSERVED SWITCH IS DEFECTIVE.

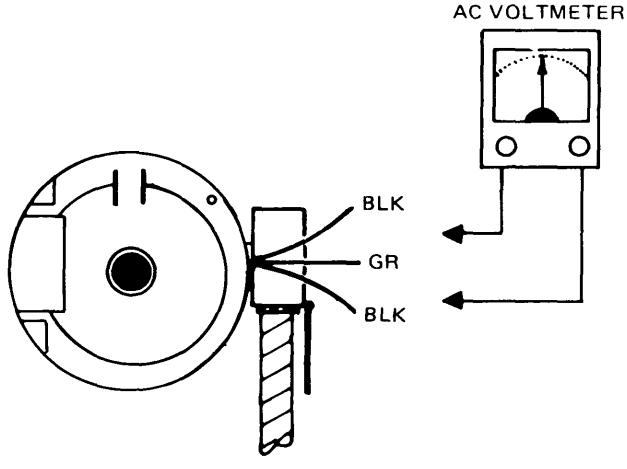
* REPLACE DEFECTIVE SWITCH IN ACCORDANCE WITH PARA. 3-25.

REMOVE ACCESS COVER FROM MOTOR JUNCTION BOX, USING AN AC VOLTMETER MEASURE MOTOR INPUT VOLTAGE ACROSS BLACK LEADS. IF VOLTAGE IS NOT MEASURED ACROSS BLACK INPUT LEADS RELAY IS DEFECTIVE.

* REPLACE DEFECTIVE RELAY IN ACCORDANCE WITH PARA. 3-21 (PAGE 3-81).

IF 110 VAC IS MEASURED ACROSS MOTOR INPUT LEADS COMPRESSOR MOTOR IS DEFECTIVE

* REPLACE COMPRESSOR ASSEMBLY IN ACCORDANCE WITH PARA. 3-18 (PAGE 3-76).



2. GPU FAILS TO STOP WHEN OFF PUSHBUTTON IS DEPRESSED.

IS OFF SWITCH DEFECTIVE?

LIFT SAFETY COVER, IF GPU STOPS OFF SWITCH IS DEFECTIVE.

* REPLACE DEFECTIVE OFF SWITCH IN ACCORDANCE WITH PARA. 3-24.

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Table 3-3. GPU Troubleshooting Guidance Chart (Continued)

MALFUNCTION
→ TEST_OR INSPECTION
→ CORRECTIVE ACTION

3. GPU STARTS BUT PRESSURE GAGE DOES NOT INCREASE ABOVE 4000 PSIG AND COMPRESSOR CONTINUES TO OPERATE.

→ ARE INLET AND OUTLET FITTINGS PROPERLY SECURED?
→ SHUT DOWN GPU. IF LEAK CANNOT BE HEARD, CHECK FITTINGS USING LEAK DETECTING LIQUID. SQUIRT LEAK DETECTING LIQUID AROUND INLET AND OUTLET HOSE FITTINGS. IF LEAKS ARE DETECTED, CLOSE ARGON GAS SUPPLY VALVE FULLY CLOCKWISE. OPEN OUTLET BLEED VALVE TO RELIEVE GAS, THEN CLOSE OUTLET BLEED VALVE FULLY CLOCKWISE. TIGHTEN FITTINGS IN ACCORDANCE WITH PARA. 3-13 AND 3-14

→ CAN GAS BE HEARD LEAKING FROM RUPTURE DISC (3)?
* → IF GAS IS LEAKING FROM RUPTURE DISC, TIGHTEN OR REPLACE RUPTURE DISC IN ACCORDANCE WITH PARA. 3-23,

→ IS COMPRESSOR (4) PROPERLY FUNCTIONING?
* → IF ALL HOSE FITTINGS ARE PROPERLY SECURED AND NO LEAKAGE IS EVIDENT, COMPRESSOR MAY HAVE LOST PRIME OR THE COMPRESSOR MAY BE FAULTY. PERFORM THE PRIMING PROCEDURE IN SECTION VI, BEFORE YOU ATTEMPT TO REPLACE COMPRESSOR. (SEE PARAGRAPH 3-1 8).

3.1 GPU STARTS BUT OUTLET PRESSURE DOES NOT INCREASE ABOVE INLET PRESSURE READING.

→ BOTH PRIME OR FAULTY COMPRESSOR(S), SEE PARA 3-11.1

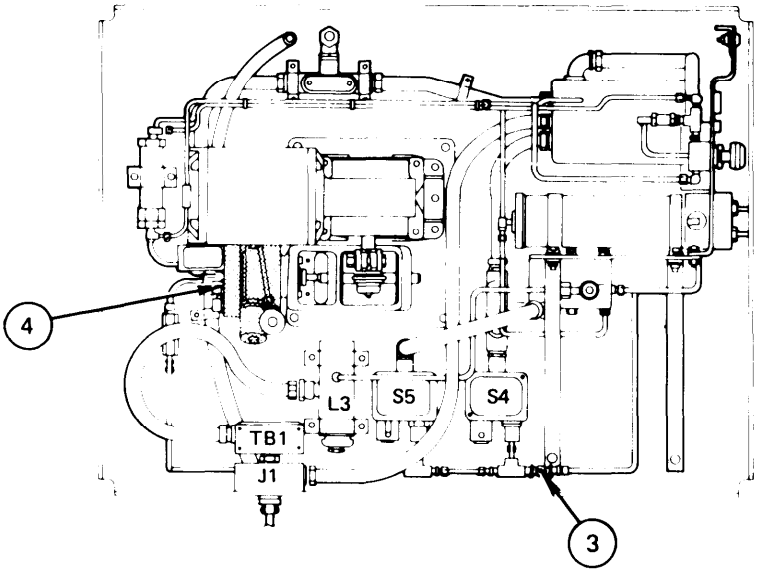

Table 3-3. GPU Troubleshooting Guidance Chart (Continued)

MALFUNCTION

TEST OR INSPECTION

CORRECTIVE ACTION

4. INLET AND OUTLET GAGES DO NOT READ THE SAME (± 200 PSIG) FOLLOWING INSTALLATION OF NEW ARGON GAS BOTTLE.

IS ARGON GAS SUPPLY VALVE FULLY OPEN?

IF NOT, OPEN GAS SUPPLY VALVE.

IS GAS PRESSURE EQUALIZED?

MOMENTARILY PRESS THE ON PUSHBUTTON AND THEN OFF PUSHBUTTON ON FRONT PANEL. THE OUTLET PRESSURE GAGE SHOULD READ THE SAME AS THE INLET PRESSURE GAGE. IF PRESSURE DOES NOT EQUALIZE DURING INITIAL ON/OFF CYCLE, REPEAT ON–OFF RECYCLING.

ARE DESICCANT CHAMBERS (5) CLEAR?

REPLACE THE TWO DESICCANT CARTRIDGES IN ACCORDANCE WITH PARA 3-16 (PAGE 3-69).

IS INLET OR OUTLET GAGE OUT OF ADJUSTMENT?

PERFORM PROOF TEST PROCEDURE IN ACCORDANCE WITH PARA. 3-7 THROUGH 3-9.

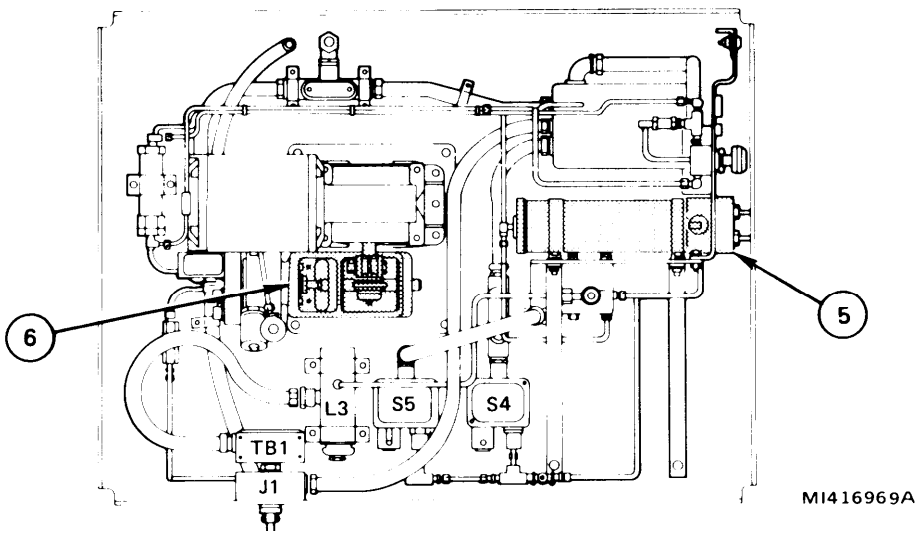

Table 3-3. GPU Troubleshooting Guidance Chart (Continued)

MALFUNCTION
→ TEST OR INSPECTION
→ CORRECTIVE ACTION

5. HIGH SQUEAL OR SQUEAK NOISE IS HEARD WHEN PUMP IS OPERATING.
→ CHECK RUNNING TIME METER TO DETERMINE HOW MANY HOURS HAVE ELAPSED SINCE DRIVE MECHANISM (6) WAS LAST LUBRICATED.
→ IF OVER 150 HOURS HAVE ELAPSED SINCE LAST LUBRICATION, SERVICE UNIT AS FOLLOWS: OPEN REAR ACCESS DOOR FOR ACCESS TO DRIVE MECHANISM AND USING OIL CAN WITH SAE-10 OIL, SQUIRT OIL ONTO PISTON ROD. IF NOISE PERSISTS, DRIVE MECHANISM IS DEFECTIVE, SHUT DOWN SYSTEM.
✱→ REPLACE COMPRESSOR ASSEMBLY IN ACCORDANCE WITH PARA. 3-18, (PAGE 3-76).

6. COMPRESSOR MOTOR RUNS WHEN ON SWITCH IS DEPRESSED THEN STOPS WHEN ON SWITCH IS RELEASED.
→ IS STARTER RELAY REMAINING CLOSED?
→ USING AN AC VOLTMETER, CHECK VOLTAGE ACROSS STARTER RELAY TERMI-

CONTACTS ARE DEFECTIVE.
✱→ REPLACE STARTER RELAY IN ACCORDANCE WITH PAR A. 3-21, (PAGE 3-811.

7. RUNNING TIME METER DOES NOT OPERATE WHEN COMPRESSOR IS RUNNING.
→ IS POWER BEING APPLIED TO METER TERMINALS WHEN COMPRESSOR IS RUNNING?
→ USING AN AC VOLTMETER, CHECK VOLTAGE ACROSS METER TERMINALS LABELED M1 AND M2 WITH COMPRESSOR RUNNING. IF 110 VAC IS PRESENT RUNNING TIME METER IS DEFECTIVE.
✱→ REPLACE IN ACCORDANCE WITH PARA. 3-19, (PAGE 3-79).

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Table 3-3. GPU Troubleshooting Guidance Chart (Continued)

MALFUNCTION

→ TEST OR INSPECTION

→ CORRECTIVE ACTION

8. GPU DOES NOT STOP WHEN PRESSURE GAGES INDICATE A MAXIMUM OF 6200 PSIG.

CALIBRATE PRESSURE GAGES AS DESCRIBED IN PROOF TEST PROCEDURE, PARA. 3-7 (PAGE 3-16) AND 3-8 (PAGE 3-20). IF GAGES ARE PROPERLY CALIBRATED, THE 6K PSI PRESSURE SWITCH IS OUT OF ADJUSTMENT OR DEFECTIVE.

* → ADJUST IN ACCORDANCE WITH PROOF TEST PROCEDURE OR REPLACE IN ACCORDANCE WITH PARA. 3-22 (PAGE 3-82).

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Table 3-4. Battery Charger Troubleshooting Guidance Chart

NOTE: THOSE STEPS MARKED WITH AN ASTERISK (*) SYMBOL ARE FOR REPAIRS TO BE ACCOMPLISHED AT MTS LOCATION ONLY. OTHER USERS WILL TURN IN BATTERY CHARGER THROUGH SUPPLY CHANNELS FOR REPAIR.

MALFUNCTION

→ TEST OR INSPECTION

→ CORRECTIVE ACTION

1. POWER LAMP DOES NOT ILLUMINATE.

→ IS AC POWER CABLE CONNECTED TO SOURCE?

→ IF NOT, CONNECT TO AC SOURCE

→ IS POWER LAMP DEFECTIVE?

→ REPLACE WITH SPARE LAMP IN LID COVER.

IS OVERLOAD PROTECTION FUSE (DC 1 AMP) FUSE OPEN?

→ VISUALLY INSPECT FUSE. IF OPEN, REPLACE WITH SPARE FUSE IN PANEL ASSEMBLY SPARE FUSE HOLDER.

2. ALL CHARGE LAMPS DO NOT ILLUMINATE WITH SELECTOR SWITCH IN CHARGE POSITION.

→ PRESS TO TEST

→ IF LAMP ILLUMINATES IN TEST POSITION, BUT DOES NOT ILLUMINATE IN CHARGE MODE, THE TEMPERATURE OF BATTERY MAY BE BE LOW 50°F. LEAVE SWITCH IN CHARGE MODE TO AL LOW SUFFICIENT TIME (UP TO 2 HOURS) FOR THE HEATER BLANKETS TO WARM BATTERIES IN THE CARRYING CASE.

→ CHECK BATTERY CARRYING CASE TO ASSURE THAT BATTERY IS PROPERLY SEATED IN BATTERY COMPARTMENT,

→ REMOVE AND REINSERT TO ASSURE GOOD TERMINAL CONTACT.

→ IS BATTERY DEFECTIVE?

→ REPLACE WITH KNOWN GOOD BATTERY.

→ IS TOGGLE SWITCH DEFECTIVE?

→ CHECK TOGGLE SWITCH FOR CONTINUTY. IF DEFECTIVE, REPLACE IN ACCORDANCE WITH PARA 3-29, PAGE 3-85.

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Table 3-4. Battery Charger Troubleshooting Guidance Chart (Continued)

MALFUNCTION

TEST OR INSPECTION

CORRECTIVE ACTION

3. TEST LAMP DOES NOT ILLUMINATE.

PRESS TO TEST

IF LAMP DOES NOT ILLUMINATE IN TEST POSITION' REPLACE LAMP WITH 'SPARE IN LID COVER.

4. TEST LAMP ILLUMINATES IN TEST POSITION FOR ALL COMPARTMENTS BUT ONE

CHECK SUSPECT COMPARTMENT FOR DEFECTIVE BATTERY

REPLACE SUSPECT BATTERY WITH A KNOWN FULLY CHARGED BATTERY FROM OPPOSITE COMPARTMENT. IF TEST LAMP ILLUMINATES EITHER CHARGING CIRCUIT OR BATTERY IS DEFECTIVE, PLACE SUSPECT BATTERY IN ANOTHER CHARGING COMPARTMENT AND ALLOW BATTERY AMPLE TIME TO CHARGE (16 HOURS). RETURN BATTERY TO SUSPECT COMPARTMENT AND REPEAT TEST. IF TEST LAMP ILLUMINATES CHARGING CIRCUIT IS DEFECTIVE.

* REPLACE THE CHARGING CIRCUIT ASSEMBLY CARD IN ACCORDANCE WITH PARA. 3-28a THROUGH 3-28g, PAGE 3-84.

IF TEST LAMP DOES NOT ILLUMINATE, ORIGINAL SUSPECT BATTERY WAS DEFECTIVE.

5. HEATER CIRCUITS NOT WORKING.

CHECK AC HEATER 5 AMPERE FUSE.

VISUALLY INSPECT FUSE. IF FUSE IS OPEN, REPLACE WITH SPARE IN FRONT PANEL ASSEMBLY.

CHECK CABLE CONNECTION AT BATTERY CARRYING CASE CONNECTOR.

IF CONNECTOR IS LOOSE TIGHTEN UNTIL SNUG TO ASSURE CONTACT CLOSURE OF SAFETY SWITCH AT CONNECTOR RECEPTACLE.

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Section VI. CORRECTIVE MAINTENANCE

3-11. GENERAL. Parts that you can replace on the gas pumping unit (para 3-12) and battery charger (para 3-27) are called out in the preventive maintenance checks and services table 3-1 and in the replacement instructions in this section. Apply sealant tape MIL-T-27730, to all pipe threads. Tape should not be applied to the first two threads that engage. If maintenance not authorized in this manual is required, return the end item through normal supply channels for repair. To prepare the gas pumping unit for shipment, perform the instructions described in chapter 4 of this manual.

3-11.1 PRIMING PROCEDURES.

NOTE

The compressor should be primed only if the compressor fails to build up pressure after one minute of operation.

a. Stop compressor operation.

b. Close the outlet shut-off valve.

c. Open the access door on the right side of the GPU.

d. Momentarily turn the GPU on, then off while watching the compressor yoke, stop the GPU when the compressor yoke is at its furthest point from the compressor cylinder head.

e. Check oil level of reservoir and add oil if required.

f. Tap the oil bowl with your finger and continue to tap until no more air bubbles are seen rising in the oil bowl.

g. While observing oil in the reservoir, cycle compressor. Continue to cycle compressor until no air bubbles show in the reservoir. Compressor should now be primed.

h. If output pressure fails to build up, perform steps i, j and k for further priming.

i. Stop the compressor when the yoke is at its furthest point from the compressor cylinder head.

CAUTION

Do not exceed 30 psi on air applied to oil bowl.

j. Lift cover in the top of the oil bowl and apply a low air pressure to the oil bowl. Be sure the top of the oil bowl is sealed so the air pressure remains applied.

k. Cycle the compressor to complete the priming. Output pressure should rise indicating compressor is primed.

3-12. REPLACEMENT OF GAS PUMPING UNIT PARTS

WARNING

Prior to performing the GPU parts replacement procedures, unplug power cable to prevent possible electrical shock.

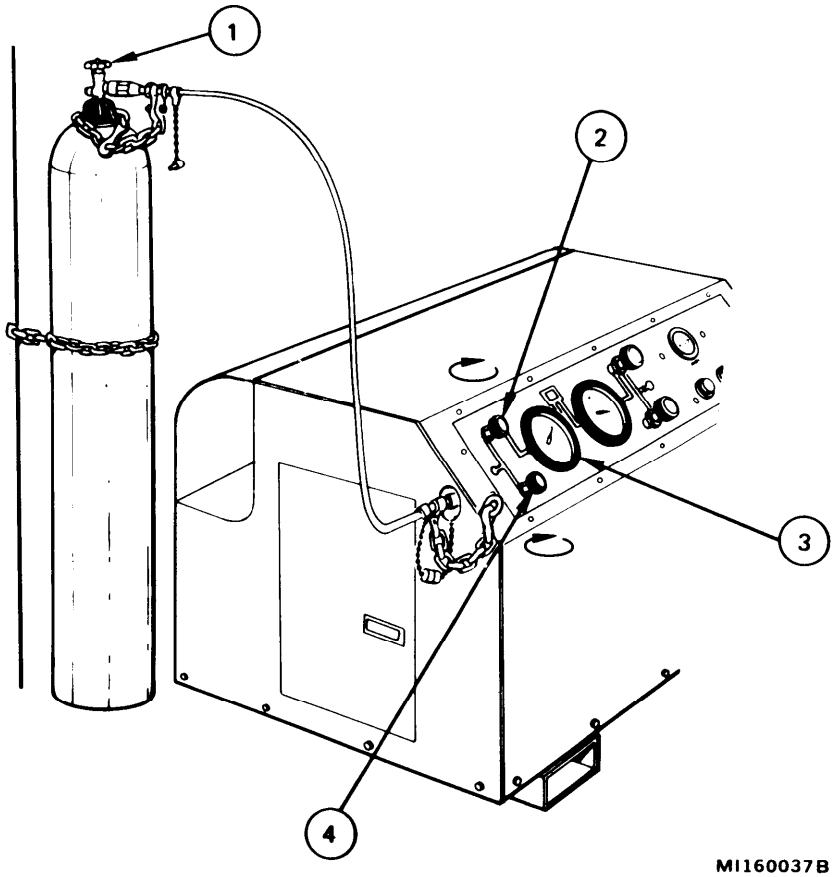
The parts that you can replace on the GPU are listed as follows:

*These procedures will be performed at MTS locations only.

3-13. GAS SUPPLY BOTTLE REPLACEMENT

WARNING

High gas pressure (up to 6200 psig) exists when performing the procedure below. Death or severe injury may result if you fail to observe safety precautions.



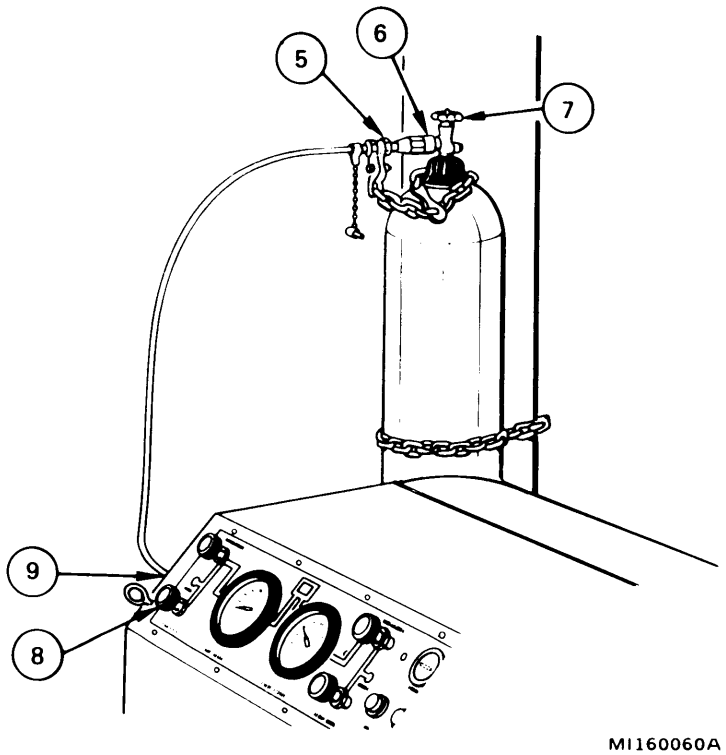
a. Close the argon gas supply valve (1) fully clockwise.

b. Check that the INLET SHUTOFF valve (2) is closed fully clockwise.

c. Slowly open the INLET BLEED valve (4) counterclockwise until you hear gas escaping. After gas has vented, further open the INLET BLEED valve (4) two complete turns counterclockwise.

WARNING

Be sure that step c above is performed to vent trapped gas in the flexible hose before performing the next step.



d. Carefully disconnect (turning counterclockwise), the hose fitting (5) at the gas supply bottle adapter (6) using a 3/4-inch wrench to hold and a 9/16-inch-wrench to loosen. Install the protective plug into the hose fitting.

e. Unlock the chain and remove from around the gas supply valve (7) housing.

f. Using a large adjustable wrench, carefully disconnect (turning clockwise) the supply bottle adapter (6) from the gas supply valve (7).

WARNING

Argon gas supply bottle must be secured (chain, wire rope) upright to a building column or any available rigid, immovable structure. If bottle is used while in cart, secure cart in identical manner.

g. Requisition a filled gas supply bottle. Thread the supply bottle adapter (6) into the gas supply valve (7). Tighten, using large adjustable wrench.

h. Remove the protective plug from the fitting of the hose and thread the fitting into the supply bottle adapter (6). Tighten, using a 3/4-inch wrench to hold and 9/16-inch wrench to tighten.

i. Wrap the chain around the gas supply valve (7) housing and latch the chain lock to a chain link.

j. Close the INLET BLEED valve (8) fully clockwise.

WARNING

Be sure that the adapter (6) and hose fitting (5) are properly installed, and chain is wrapped and secured around gas supply valve housing before performing the step below.

k. Slowly open the argon gas supply valve (7) two complete turns counterclockwise.

l. Squirt leak detecting liquid around the adapter (6) and hose fittings (5 and 9). Visually check for gas bubbles indicating leakage. If leaks are detected, close argon gas supply valve (7) fully clockwise. Open INLET BLEED valve (8) to relieve gas; then close INLET BLEED valve (8) fully clockwise. Tighten fitting and repeat steps ***k*** and 1.

m. Slowly open the INLET BLEED valve (8) counterclockwise until you hear gas escaping. Bleed for 10 seconds. Then, close the INLET BLEED valve fully clockwise.

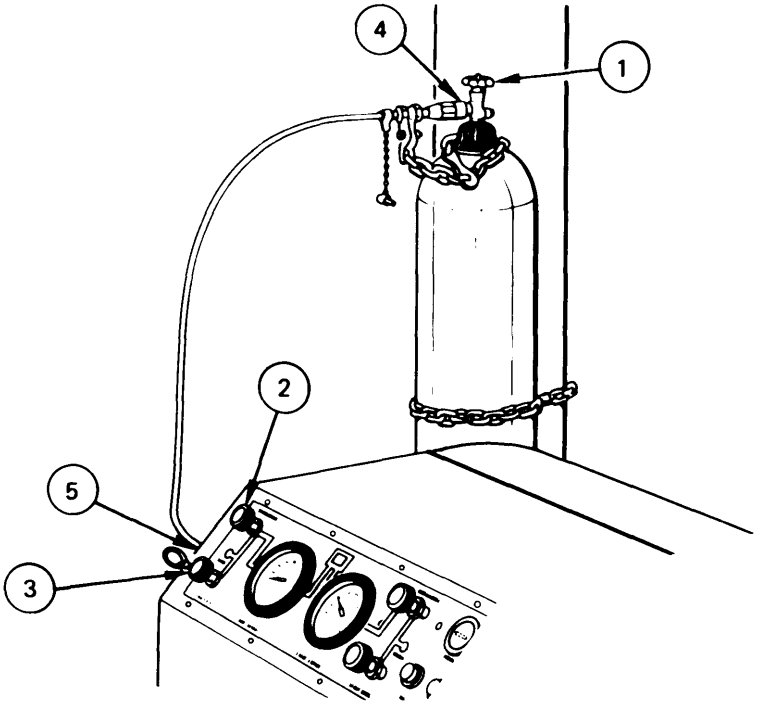
n. Close the gas supply valve (7) fully clockwise.

o. Slowly open the INLET BLEED valve (8) counterclockwise until you hear gas escaping. Immediately after gas has vented, close the INLET BLEED valve (8) fully clockwise.

3-14. INLET FLEXIBLE HOSE REPLACEMENT

WARNING

High gas pressure (up to 6200 psig) exists when performing the procedure below. Death or severe injury may result if you fail to observe safety precautions.



MI160061A

a. Close the argon gas supply valve (1) fully clockwise.

b. Check that the INLET SHUTOFF valve (2) is closed fully clockwise.

c. Slowly open the INLET BLEED valve (3) counterclockwise until you hear gas escaping. After gas has vented, further open the INLET BLEED valve (3) two complete turns counterclockwise.

WARNING

Be sure that step c above is performed to vent trapped gas in flexible hose before performing next step.

d. Carefully disconnect (turning counterclockwise) the hose fitting at the gas supply bottle adapter (4) using an 11/16-inch wrench to hold and a 9/16-inch wrench to loosen.

e. Unlock the chain lock and remove chain from around gas supply bottle valve (1) housing.

f. Carefully disconnect (turning counter-clockwise) the hose fitting at the GPU inlet connector (5) using a 9/16-inch wrench to loosen.

g. Unlock the chain lock at the GPU eyebolt.

h. Requisition a replacement inlet flexible hose. Remove the protective plug and its chain and safety chain from each end of the original hose and install onto the replacement hose.

i. Connect one end of the hose to the GPU inlet connector (5) using a 9/16-inch wrench to tighten.

j. Lock the chain to the GPU eyebolt.

k. Connect other end of the hose fitting onto the gas supply bottle adapter (4) using a 3/4-inch wrench to hold and a 9/16-inch wrench to tighten.

l. Wrap the chain twice around the gas supply valve (1) housing and latch the chain lock to a chain link.

m. Close the INLET BLEED valve (3) fully clockwise.

WARNING

Be sure that the hose fittings and safety chains are properly installed before performing the next step.

n. Slowly open the argon gas supply valve (1) two complete turns counterclockwise.

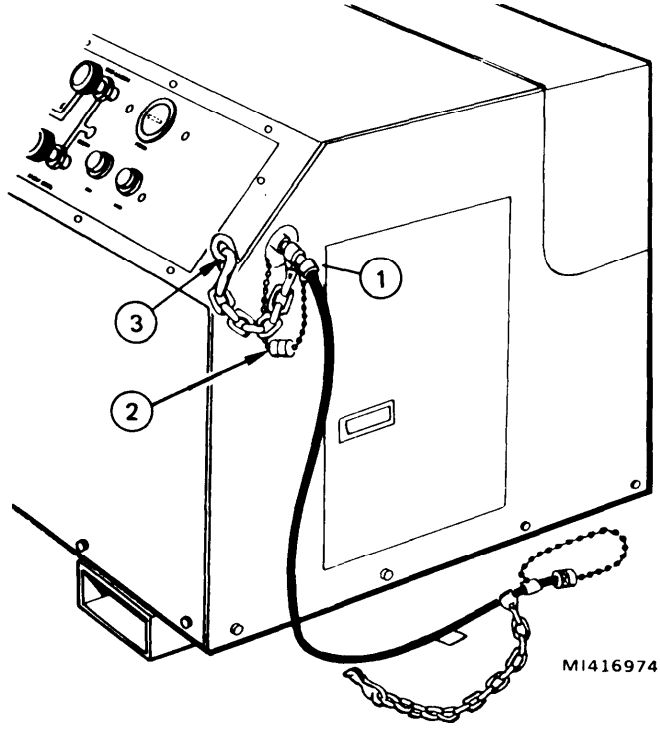
o. Squirt leak detecting liquid around the two hose fittings. Visually check for gas bubbles indicating leakage. If leaks are detected, close argon gas supply valve (1) fully clockwise. Open INLET BLEED valve (3) to relieve gas; then close INLET BLEED valve (3) fully clockwise. Tighten fitting and repeat steps *n* and o above.

p. Slowly open the INLET BLEED valve (3) counterclockwise until you hear gas escaping. Bleed for 10 seconds. Then, close the INLET BLEED valve fully clockwise.

q. Close the gas supply valve (1) fully clockwise.

r. Slowly open the INLET BLEED valve (3) counterclockwise until you hear gas escaping. Close the INLET BLEED valve (3) fully clocktwise after gas has vented.

3-15. OUTLET FLEXIBLE HOSE REPLACEMENT



WARNING

High gas pressure (up to 6200 psig) exists when performing the procedure below. Death or severe injury may result if you fail to observe safety precautions.

a. Open OUTLET BLEED valve to relieve any gas contained in outlet flexible hose; then close OUTLET BLEED valve fully clockwise.

b. Carefully disconnect (turning counterclockwise) the hose fitting at the GPU outlet connector (l) using a 5/8-inch wrench to hold and a 9/16-inch wrench to loosen. Disconnect the safety chain from the GPU eyebolt (3).

c. Seal the GPU outlet connector (l) with the GPU outlet protective cap (2).

d. Requisition a replacement outlet flexible hose. Remove the protective plug and its chain and safety chain from each end of the original hose and install into the replacement hose. Install the respective plug into each end of the outlet flexible hose to seal the hose.

e. Remove the protective cap from the GPU outlet fitting and the protective plug from the end of the GPU outlet flexible hose with shorter safety chain. Connect that end of the hose to the GPU fitting (1) using a 9/16-inch wrench to tighten. Attach the safety chain to the GPU eyebolt (3).

3-16. DESICCANT REPLACEMENT

WARNING

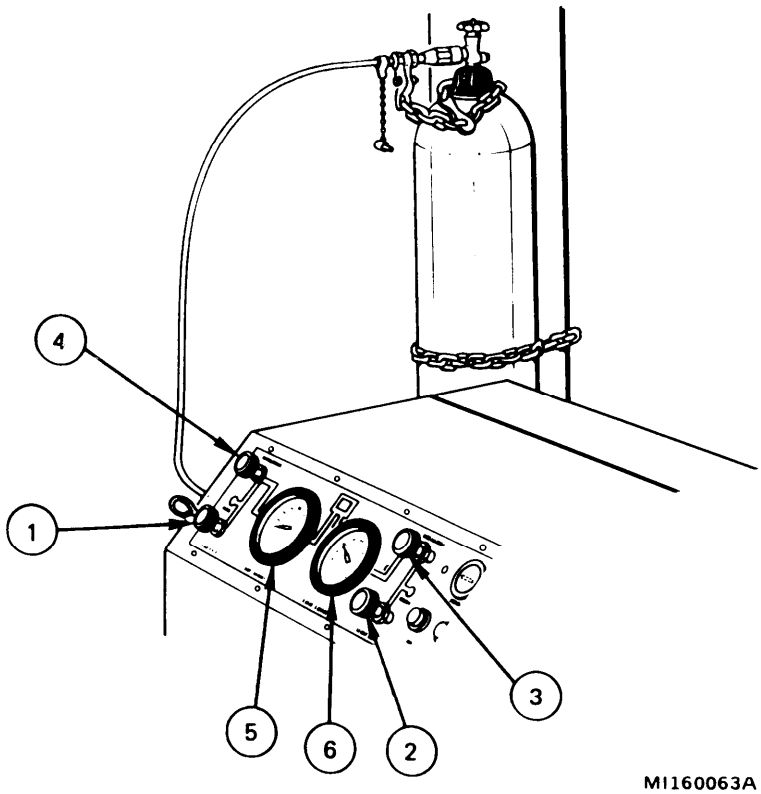
During non-operating use, GPU is pressurized at 500 psig with argon gas to minimize system contamination. This pressure must be vented before replacing desiccant cartridge.

a. Insure that the gas supply valve on the supply bottle is closed fully clockwise.

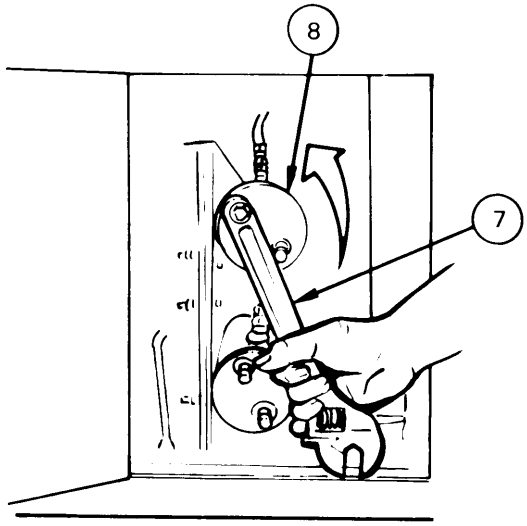
b. Disconnect the power cable from the ac source. Disconnect the gas supply bottle according to the instructions contained para. 3-13 steps a through d.

CAUTION

When performing the steps below, care must be taken to minimize system contamination. The area must be free of wind, drafts or dust movement.



c. Insure that INLET BLEED valve (1) is opened (two turns counterclockwise). Open the OUTLET BLEED valve (2) two complete turns counterclockwise. Very slowly open the OUTLET SHUTOFF valve (3) and the INLET SHUTOFF valve (4) to relieve all the gas in the system. The INLET PRESSURE gage (5) and outlet PRESSURE gage (6) must read 0 psig.



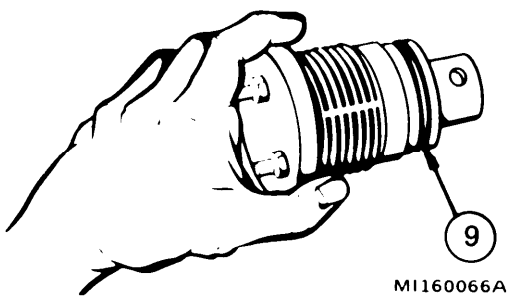
d. Using the wrench (7) as shown, carefully turn the desiccant chamber cover (8) counterclockwise, unscrewing the cover from the chamber.

e. Withdraw the cover with desiccant cartridge from the chamber and remove used cartridge.

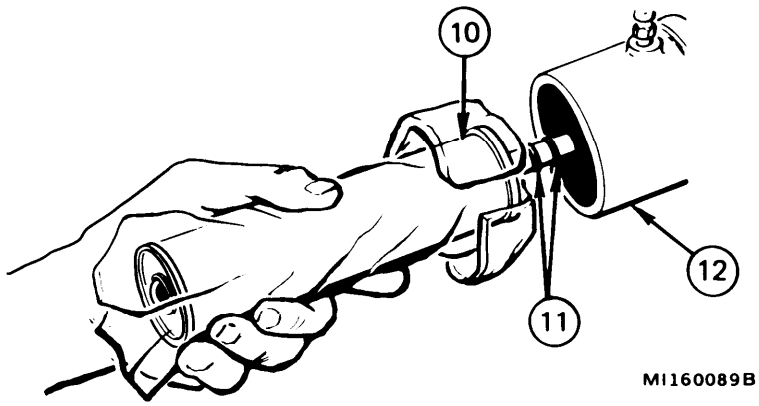
f. Examine inner chamber for oil or foreign matter.

NOTE

Oil in outer section of chamber is for lubrication of preformed packing and is therefore acceptable.



g. Replace the back-up ring and O-ring (9) on the cover assembly. Apply a light coat of grease lubricant (Item No. 15, App. E) to O-ring before installation.



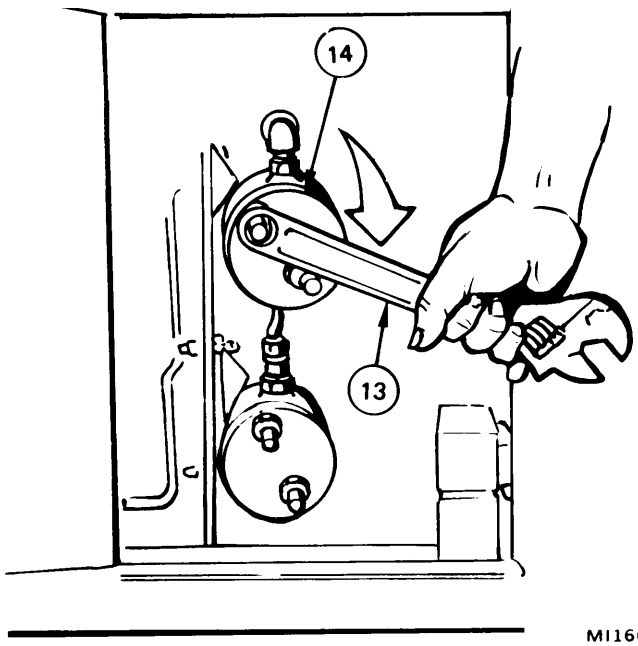
NOTE

Element for the top canister is MIS-23455/1-001. Element for the bottom canister is MIS-23455/1-002.

h. Replace desiccant cartridge (10). Before installing, examine the plunger assembly preformed packing (11). If damage to preformed packing is obvious, replace desiccant cartridge.

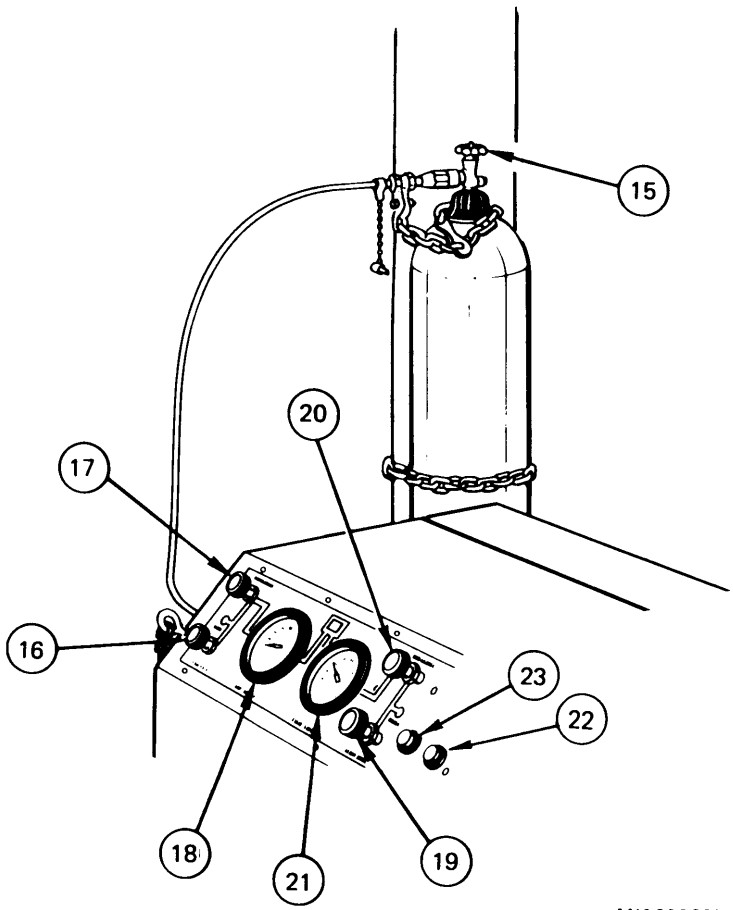
i. Grasping the cartridge with the plastic bag, insert the cartridge into chamber (12) being careful not to touch the cartridge with your hands.

j. Immediately install the cover assembly into the chamber, threading it in the clockwise direction.



k. Using the wrench (13) as shown, carefully turn the desiccant chamber cover (l4) clockwise to seal the cover to the chamber.

1. Repeat steps d through j (page3-70) to replace the other desiccant cartridge.



m. Close INLET BLEED (16), INLET SHUTOFF (17), OUTLET SHUTOFF (20), and OUTBLEED (19) valves fully clockwise.

n. Connect the gas supply bottle and check for leaks around inlet hose per the instructions in para. 3-13, steps j and k (page 3-65).

o. Slowly open the INLET SHUTOFF valve (17) counterclockwise until INLET PRESSURE gage (18) indicates 1000 to 1500 psig; then, close INLET SHUTOFF valve (17) full clockwise. The OUTLET PRESSURE gage (21) should read the same pressure as the INLET PRESSURE gage (18). If not, connect the power cable and momentarily press the ON (23) and then the OFF (22) pushbutton to obtain positive reading on the OUTLET PRESSURE gage (21).

NOTE

If pump does not go on, open left access door and momentarily press the reset switch. Close access door and again press ON pushbutton.

p. Squirt leak detecting fluid around the seal area of the two desiccant chamber covers. Visually check for gas bubbles indicating leakage. If a leak occurs, repeat steps *a* through *p* above and replace the two preformed packings. Continue with remaining steps in this procedure.

q. Slowly open the INLET SHUTOFF valve (19) two complete turns counterclockwise.

r. Press the ON pushbutton to start the pump.

s. After pump stops operating, repeat leak check in step *p*.

t. Slowly open the OUTLET BLEED valve (19) one turn counterclockwise. Very slowly open the OUTLET SHUTOFF valve (20) just until you hear gas escaping. Purge the system for 10 minutes; then. close OUTLET SHUTOFF and OUTLET BLEED valves fully clockwise. Close INLET SHUTOFF valve CW.

u. Close the argon gas supply valve (15) fully clockwise.

v. Slowly open the INLET BLEED valve (16) one turn counterclockwise. Then, slowly open (turning counterclockwise) the INLET SHUTOFF valve (17) sufficiently to relieve high pressure down to 500 psig as read on the INLET PRESSURE gage (18). Immediately close the INLET SHUTOFF valve (17) and then the INLET BLEED valve (16) fully clockwise.

w. Slowly open the OUTLET BLEED valve (19) one turn counterclockwise. Then, slowly open (turning counterclockwise) the OUTLET SHUTOFF valve (20) sufficiently to relieve the high pressure down to 500 psig on the OUTLET PRESSURE gage (21). Close the OUTLET SHUTOFF valve (20) and OUTLET BLEED valve (19) fully clockwise.

3-17. TRAINER FILL PORT COVER, RETAINING RING, AND PREFORMED PACKING REPLACEMENT (Figure 3-3).

a. Loosen the small bleed screw (2) located on the fill port cover (1) two turns counterclockwise to permit safe venting of any gas trapped in fill port well.

b. Using a large flat-blade screwdriver, loosen (turning counterclockwise) and remove the fill port cover (l).

c. Remove the preformed packing (5) from the fill port inlet (3) using a spudger (Item No. 17, Appendix E).

d. Inspect retaining ring (4) to assure proper seating.

e. Insert replacement preformed packing into fill port inlet and reinstall the fill port cover (1).

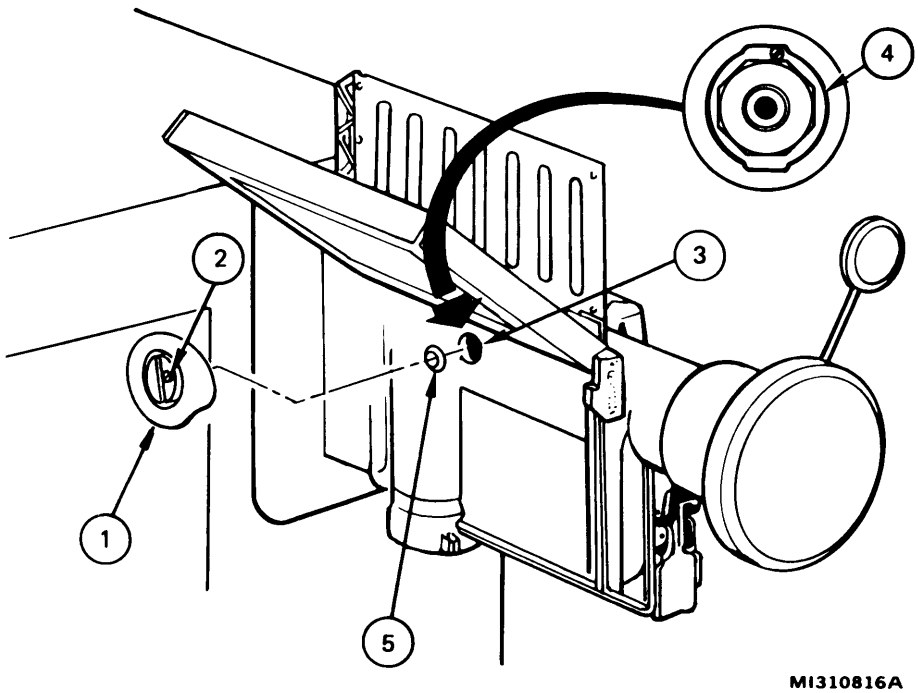


Figure **3-3.** *Retaining Ring and Packing Replacement*

3-18. COMPRESSOR ASSEMBLY REPLACEMENT (Figure 3-4)

a. Disconnect the power cable from ac source.

b. Vent system in accordance with para. 3-16 steps a. through c (page 3-69).

NOTE

If the inlet and outlet hoses are connected they must be removed before removing the enclosure.

c. Remove housing enclosure (3) by removing 18 retaining screws (1) from the lower edge of enclosure and 14 screws (2) from the front panel assembly. Retain securing hardware for reinstallation and lift enclosure upward to remove. Remove 4 mounting screws securing safety switch to rear of enclosure and tape safety switch in closed position.

d. Remove the compressor motor (7), power cable (9) connections, by first removing the access plate cover (5), then disconnecting the three power leads to the motor terminals and tag to identify. Remove right-angle connector assembly (4) and retain for reinstallation on replacement motor.

e. Using a 9/16-inch open end wrench, remove the inlet (13) and outlet (14) gas line connections.

f. Remove retaining bolts (11) and lockwasher (12) from the base of the compressor assembly using a 1/2-inch socket wrench and retain.

g. Lift compressor assembly (15) upward to remove from mounting platform. Install replacement compressor assembly in reverse order of removal, using existing hardware.

h. Purge system as described in the following steps.

(1) Close INLET SHUTOFF (2), INLET BLEED (l), OUTLET SHUTOFF (7), and OUTLET BLEED (4) valves fully clockwise. Insure that PROOF TEST SHUTOFF valve (17) is open.

(2) Connect the gas supply bottle inlet hose to GPU inlet port and check for leaks around inlet hose in accordance with para. 3-13k and 1 (page 3-65).

(3) Slowly open the INLET SHUTOFF VALVE (2) counterclockwise until INLET Pressure gage (3) indicates 1000 to 1500 psig; then close INLET SHUTOFF valve (2) fully clockwise. The OUTLET PRESSURE gage (6) should read the same pressure as the INLET PRESSURE gage (3). If not, connect the power cable and momentarily press the ON (8) and OFF (9) pushbutton to obtain positive reading on the OUTLET PRESSURE gage (6).

NOTE

If pump does not go on, momentarily press the reset switch. Again press the ON pushbutton.

(4) Squirt leak detecting liquid around all gas line connections opened during replacement of defective assembly and visually check for gas bubbles indicating leakage. If a leak occurs, bleed system down in accordance with para. 3-16 (page 3-69) steps *a* and *c* and tighten loose coupling.

(5) Slowly open the INLET SHUTOFF valve (2) two complete turns counterclockwise.

(6) Press the ON (8) pushbutton to start the pump.

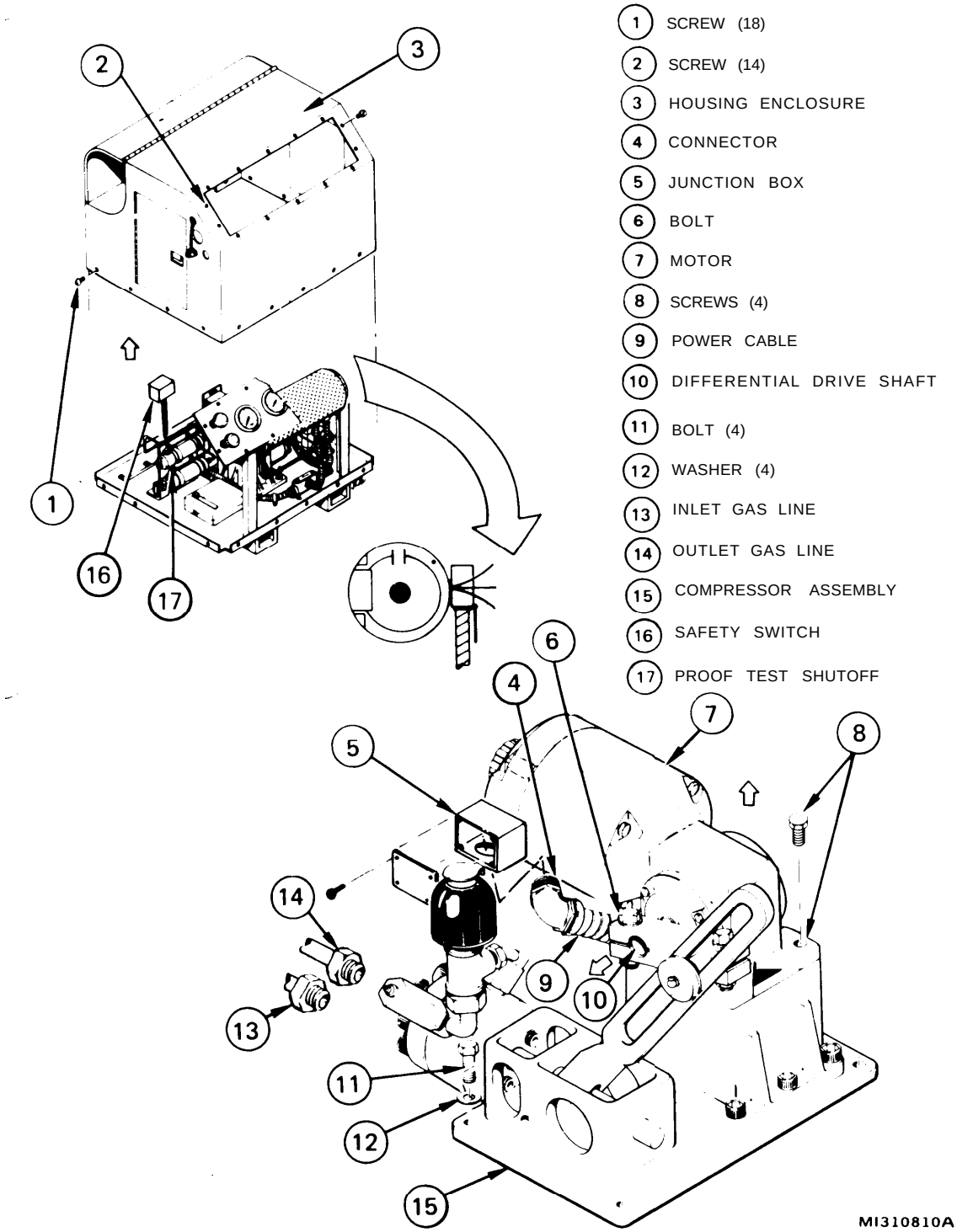
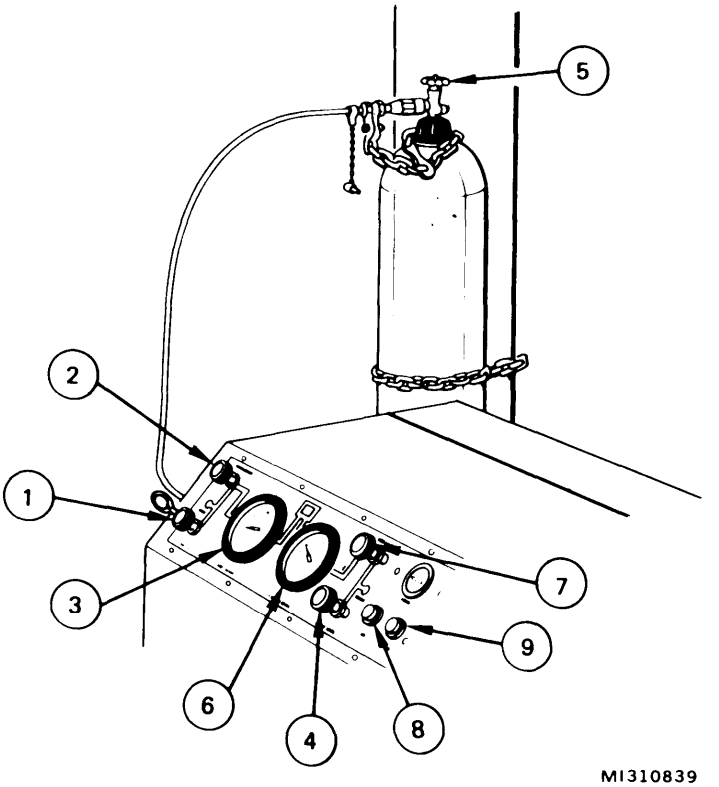


Figure 3-4. Gas Pumping Unit Compressor Assembly Replacement



(7) After the pump stops operating, repeat leak check in step 4.

(8) Slowly open the OUTLET BLEED valve (4) one turn counterclockwise. Very slowly open the OUTLET SHUTOFF valve (7) just until you hear gas escaping. Purge the system for ten minutes; then, close OUTLET SHUTOFF and OUTLET BLEED valve fully clockwise. Close INLET SHUTOFF valve counterclockwise.

(9) Close the argon gas supply valve (5) fully clockwise. Slowly open the INLET BLEED valve (1) one turn counterclockwise. Then slowly open (turning counterclockwise) the INLET SHUTOFF valve (2) sufficiently to relieve high pressure down to 500 psig as read on the INLET PRESSURE gage (3). Immediately close the INLET SHUTOFF valve (2) and then the INLET. BLEED valve (1) fully clockwise.

(10) Slowly open the OUTLET BLEED valve (4) one turn counterclockwise. Then, slowly open (turning counterclockwise) the OUTLET SHUTOFF valve (7) sufficiently to relieve the high pressure down to 500 psig on the OUTLET PRESSURE gage (6). Close the OUTLET SHUTOFF valve (7) and OUTLET BLEED valve (4) fully counterclockwise.

(11) Remove the inlet hose from the inlet connector.

(12) Remove tape from safety switch.

(13) Replace housing enclosure, figure 3-4, (3) by placing enclosure over assembly and reinstalling the safety switch (16) on rear of enclosure. Install the 18 retaining screws (1) in lower end of enclosure and 14 screws (2) in the front panel assembly.

3-19. CPU RUNNING TIME METER REPLACEMENT (Figure 3-5)

a. Remove housing enclosure in accordance with para. 3-18, steps *a* through *c.*

b. Remove rear access cover from running time meter enclosure at rear of front panel assembly by removing retaining screws from lower edge of cover plate.

c. Disconnect leads from rear of meter and remove rear retaining hardware.

d. Meter is removed by lifting out through front panel assembly.

e. Install replacement meter through front panel assembly and secure in place with existing securing hardware.

f. Connect leads to terminals at rear of meter.

g. Replace cover on meter enclosure and secure in place with existing screws removed in step b.

h. Enter reading from replaced meter in the CPU logbook in order to maintain a complete history of the running time.

i. Replace housing enclosure in accordance with para. 3-18h step 13.

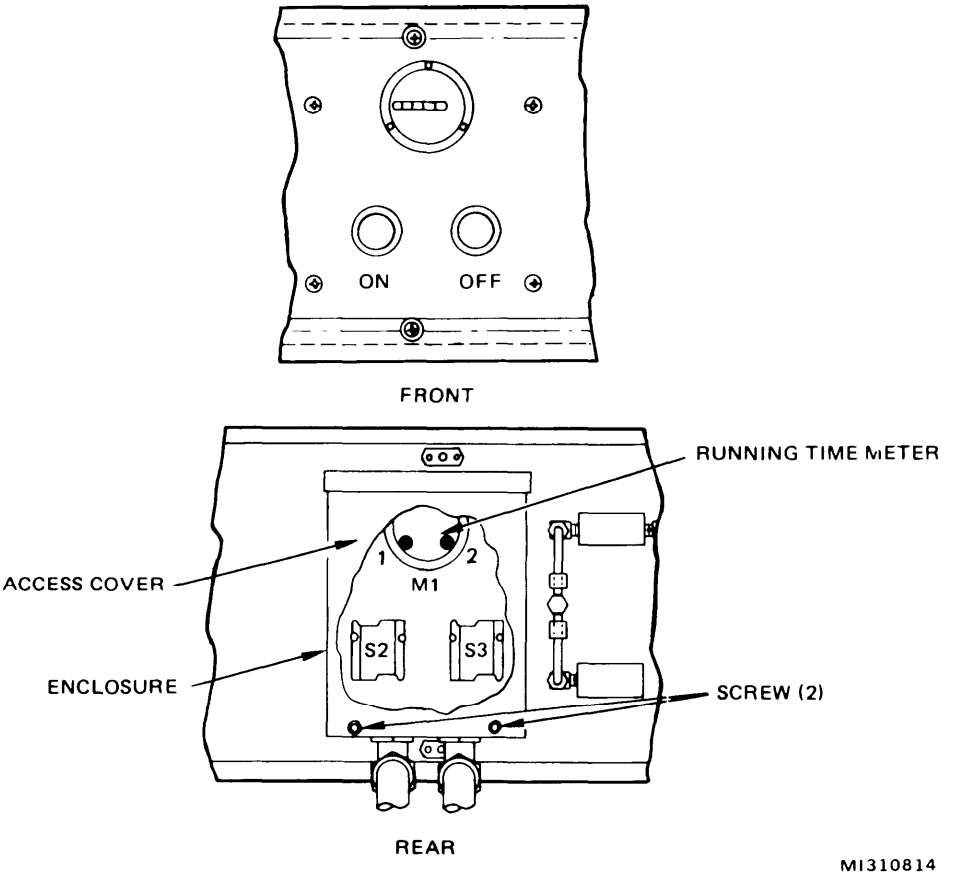


Figure 3-5. Running Time Meter Replacement

3.20. INPUT OR OUTPUT PRESSURE GAGE REPLACEMENT (Figure 3-6)

a. Remove housing enclosure in accordance with para. 3-18, steps *a* through c.

b. Using a 3/4 inch open end wrench, disconnect adapter assembly coupling from gage input port.

c. Remove retaining nuts and washers from rear of defective gage and retain securing hardware.

d. Remove gage by lifting out through front panel assembly.

e. Install replacement gage through the front panel assembly.

f. Install adapter assembly coupling on replacement gage input port and secure in place using a 3/4 inch open end wrench.

g. Secure gage in place with retaining hardware removed in step c.

h. Purge system in accordance with para. 3-18h steps 1 through 10 (page 3-76).

i. Replace housing enclosure in accordance with para. 3-18h step 13.

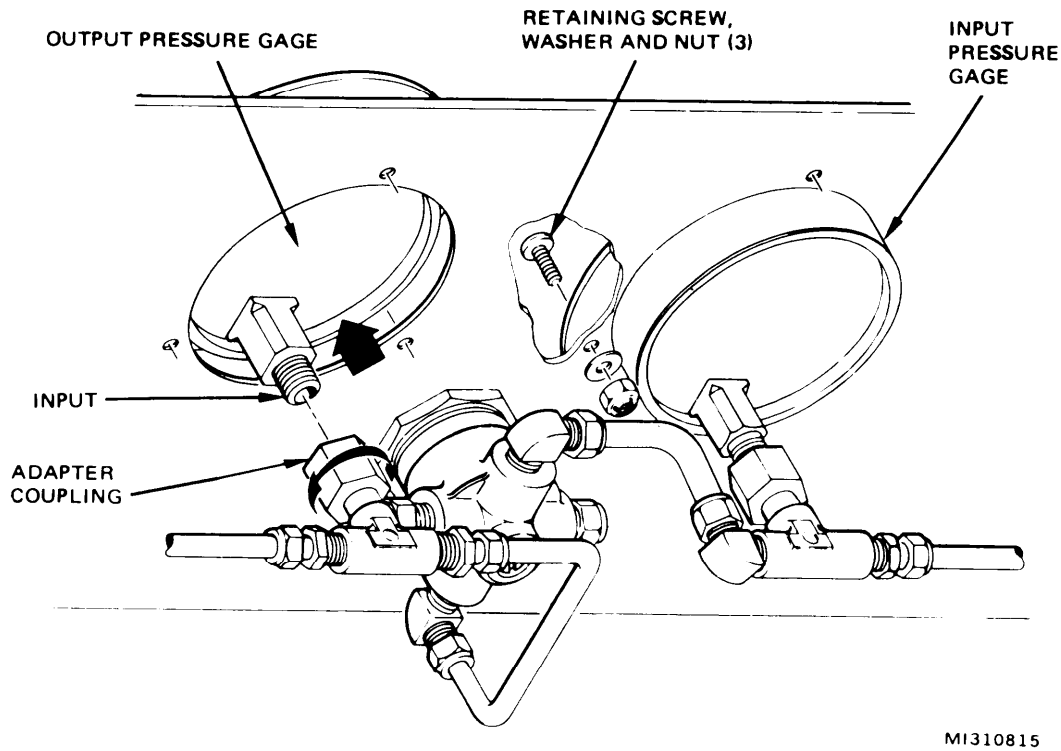


Figure 3-6. input/Output Pressure Gage Replacement

3-21. STARTER RELAY REPLACEMENT (Figure 3-7)

a. Disconnect 115 volt ac power to GPU.

b. Remove housing enclosure in accordance with para. 3-18 steps *a* through c.

c. Remove starter relay cover assembly.

d. Disconnect electrical connections at the relay terminals by loosening lug retaining screws and removing lug. Be sure that you label wires as you remove them.

e. Remove relay jumper cables for reinstallation on replacement relay. Note exact termination of jumper cables so that they are reinstalled on identical terminals of replacement relay.

f. Loosen relay assembly retaining screw at base of mounting plate and slide relay to the left. Lift relay upward to remove from enclosure.

g. Install replacement relay in enclosure inserting retaining screw through mounting slot and slide relay to the right.

h. Secure relay in place by tightening retaining screw.

i. Connect wires to terminals designated by label.

j. Connect jumper cables to terminals designated by label.

k. Replace housing enclosure in accordance with para. 3-18h step 13.

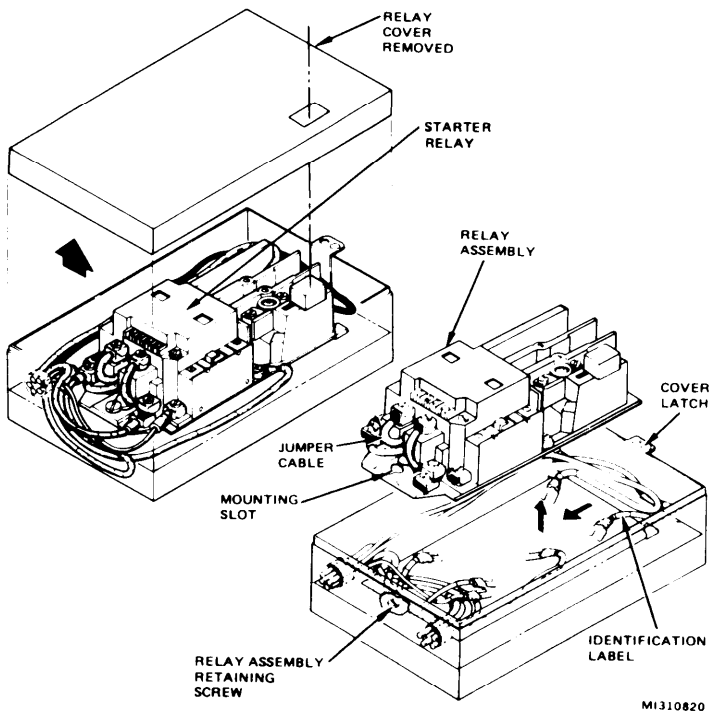


Figure 3-7. GPU Starter Relay Replacement

3-22. PRESSURE SWITCH REPLACEMENT (Figure 3-8)

a. Remove housing enclosure in accordance with para. 3-18 steps *a* through *c* page 3-76).

b. Remove cover plate (4) from pressure switch assembly (3) and remove wire lugs from pressure switch terminals.

c. Remove connector (6) from conduit box (5) by rotating counterclockwise.

d. Using a 9/16-inch wrench, loosen gas line coupling (2) until free from T connector (1).

e. Lift safety switch upward to remove.

f. Install replacement pressure switch by aligning the switch assembly (3) inlet line with T connector coupling (2) and secure with a 9/16-wrench.

g. Secure connector (6) to conduit box (5) by rotating clockwise.

h. Connect wire lugs to pressure switch terminals and attach cover plate (4).

i. Purge system as described in para. 3-18h-l through 10 (page 3-76).

j. Adjust switch in accordance with para. 3-8a step 33 (page 3-39).

k. Replace housing enclosure in accordance with para. 3-18h step 13 (page 3-78).

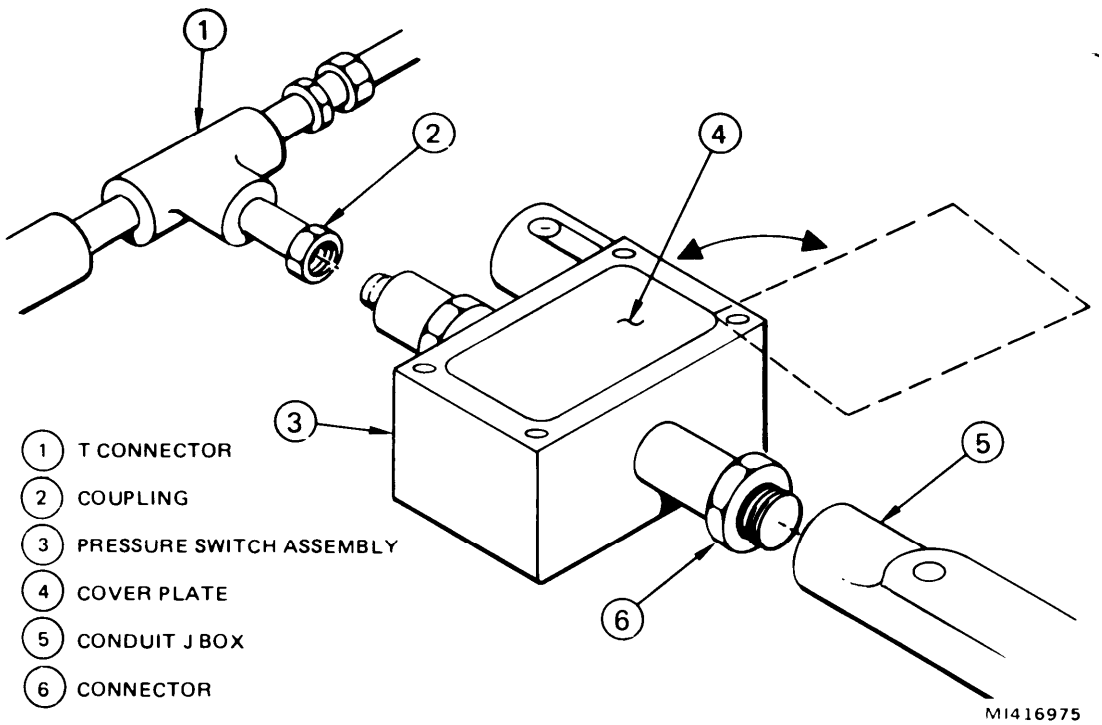


Figure **3-8.** ***Pressure Switch Replacement***

3-23. RUPTURE DISC REPLACEMENT (Figure 3-9).

a. Disconnect the power cable from the AC source.

b. Close the argon gas supply valve fully clockwise.

c. Remove housing enclosure by removing 18 retaining screws from the lower edge of enclosure and 14 screws from the front panel assembly. Remove 4 mounting screws holding interlock safety switch to rear of enclosure. Retain securing hardware for reinstallation. Disconnect inlet and outlet flexible hoses from the GPU. Replace the protective plugs on the ends of the hoses, finger tight. Lift enclosure upward to remove. Tape interlock safety switch in closed position.

d. Remove rupture disc with 1/4-inch hex wrench and replace with a new disc. Apply sealant tape, MIL-T-27730, to threads of rupture disc. Tape should not be applied to first two threads that engage.

e. Reconnect flexible hose from gas bottle to GPU inlet port.

f. Close INLET SHUTOFF, lNLET BLEED, OUTLET SHUTOFF, OUTLET BLEED valves fully clockwise. Open PROOF TEST SHUTOFF valve fully counterclockwise.

g. Slowly open the argon gas supply valve two complete turns counterclockwise. Squirt leak detecting fluid around the inlet hose fitting at the GPU. Check for gas bubbles indicating leakage. If leaks are detected, close argon gas supply valve fully clockwise. Open INLET BLEED valve to relieve gas then, close INLET BLEED valve fully clockwise. Tighten leaking fitting and repeat this step.

h. Purge the system in accordance with paragraph 3-18h, steps (3) through (10) (page 3-76).

i. Disconnect inlet flexible hose and replace protective plug finger tight. Replace housing.

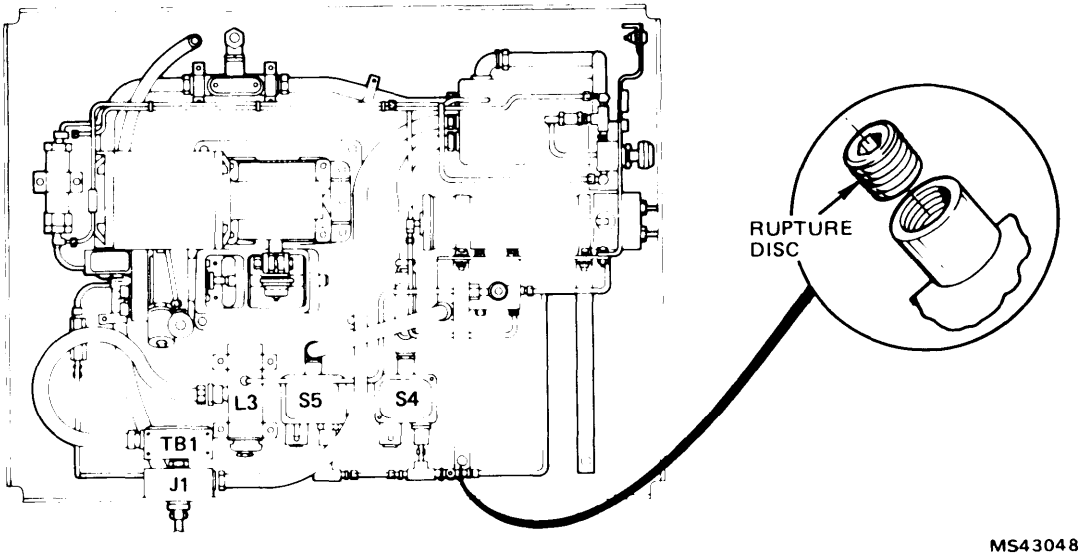


Figure 3-9. Rupture Disc Replacement

3-24. ON/OFF PUSHBUTTON SWITCH REPLACEMENT (Figure 3-10).

a. Disconnect the power cable from AC source.

b. Remove housing enclosure in accordance with para. 3-18, steps a through c (page 3-76).

c. Remove rear access cover from switch assembly enclosure at rear of front panel by removing retaining screws from lower edge of cover plate.

d. Disconnect attaching leads from rear of defective switch.

e. Remove the retaining nut and gasket from the pushbutton assembly on front panel.

f. Switch is removed by lifting out through rear panel assembly.

g. Reinstall replacement switch through rear panel assembly and reinstall front panel gasket and retaining nut.

h. Attach leads removed in step c to switch terminals.

i. Replace rear access cover on switch assembly enclosure and secure in place with upper and lower retaining screws.

j. Replace housing enclosure in accordance with para. 3-18h, step 13 (page 3-78).

k. Reconnect AC power cable.

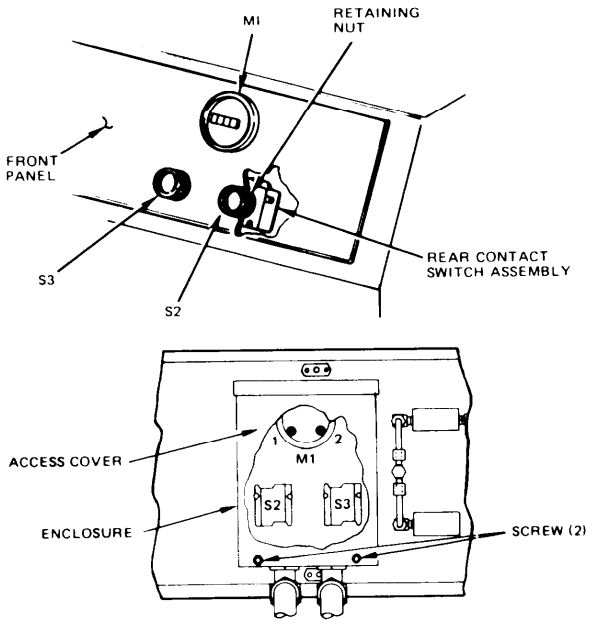


Figure 3-10. ON/OFF Pushbutton Switch Replacement

3-25. SAFETY INTERLOCK SWITCH REPLACEMENT (Figure 3-11).

a. Disconnect the power cable from AC source.

b. Remove the four retaining screws securing the safety interlock switch to the rear of the GPU housing enclosure.

c. Disconnect attaching leads from defective switch.

d. Connect leads to replacement switch and secure switch to rear of housing enclosure using retaining screws removed in step b.

e. Replace housing enclosure in accordance with para. 3-18h step 13 (page 3-78).

f. Reconnect AC power cable.

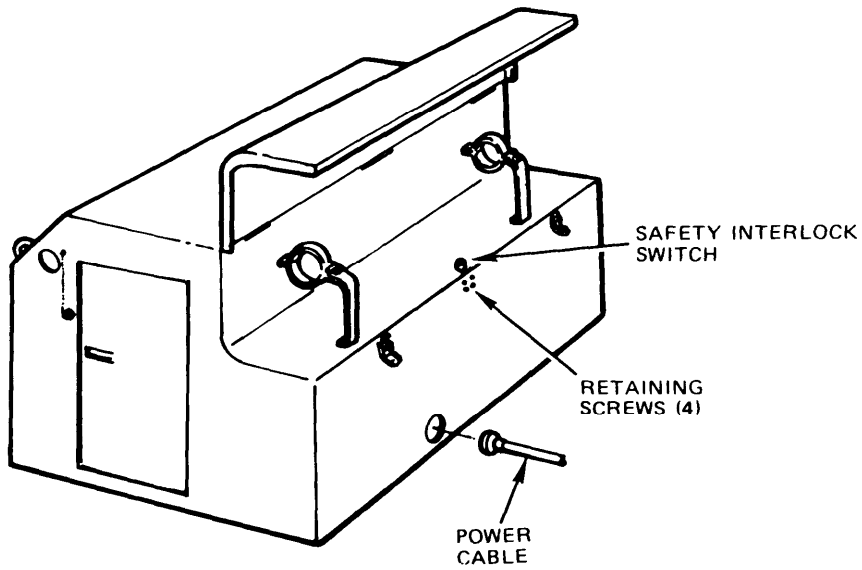


Figure 3-11. Safety Interlock Switch Replacement

3-26. INLET/OUTLET SHUTOFF OR BLEED VALVE REPLACEMENT. (Figure 3-2.)

a. Disconnect the power cable from AC source.

b. Vent system in accordance with para. 3-16, steps a through c.

c. Lift the trainer cover (1) at the rear of the GPU and open the rear access door (2) to gain access to either the INLET SHUTOFF, INLET BLEED, OUTLET SHUTOFF, or OUTLET BLEED valve assemblies (3).

d. Using a 9/16 inch open end wrench, loosen the coupling nuts (4) located on both sides of the valve assembly (only one side of the bleed valve) to be removed.

e. Remove the seal cap (5) from the valve knob (6) using a small thin blade screwdriver.

f. Remove the knob retaining nut and washer (7) from the valve shaft using a 5/ 16 inch socket wrench and pull knob forward to remove from shaft.

g. Remove the front panel locking nut (8) using a 1-1/8 inch open end wrench.

h. Remove coupling nuts (4) loosened in step e and remove valve from rear of panel by tilting valve downward and out of its mounting hole.

h.i. Remove elbow (9) from old valve (3) and install on replacement valve using anti-seize tape (Item No. 14, Appendix E).

i. Install replacement valve in mounting hole from rear of panel and attach coupling nuts (4).

j. Install front panel locking nut (8) and secure in place using a 1-1/8 inch open end wrench.

k. Tighten coupling nut(s) using a 9/16 inch open end wrench.

l. Install knob (6) and secure in place with washer and nut (7) using a 5/16 inch socket wrench.

m. Install knob seal cap (5) by centering over indent hole of knob and pressing in place.

n. Connect power cable to AC source and purge system as described in para. 3-18h.

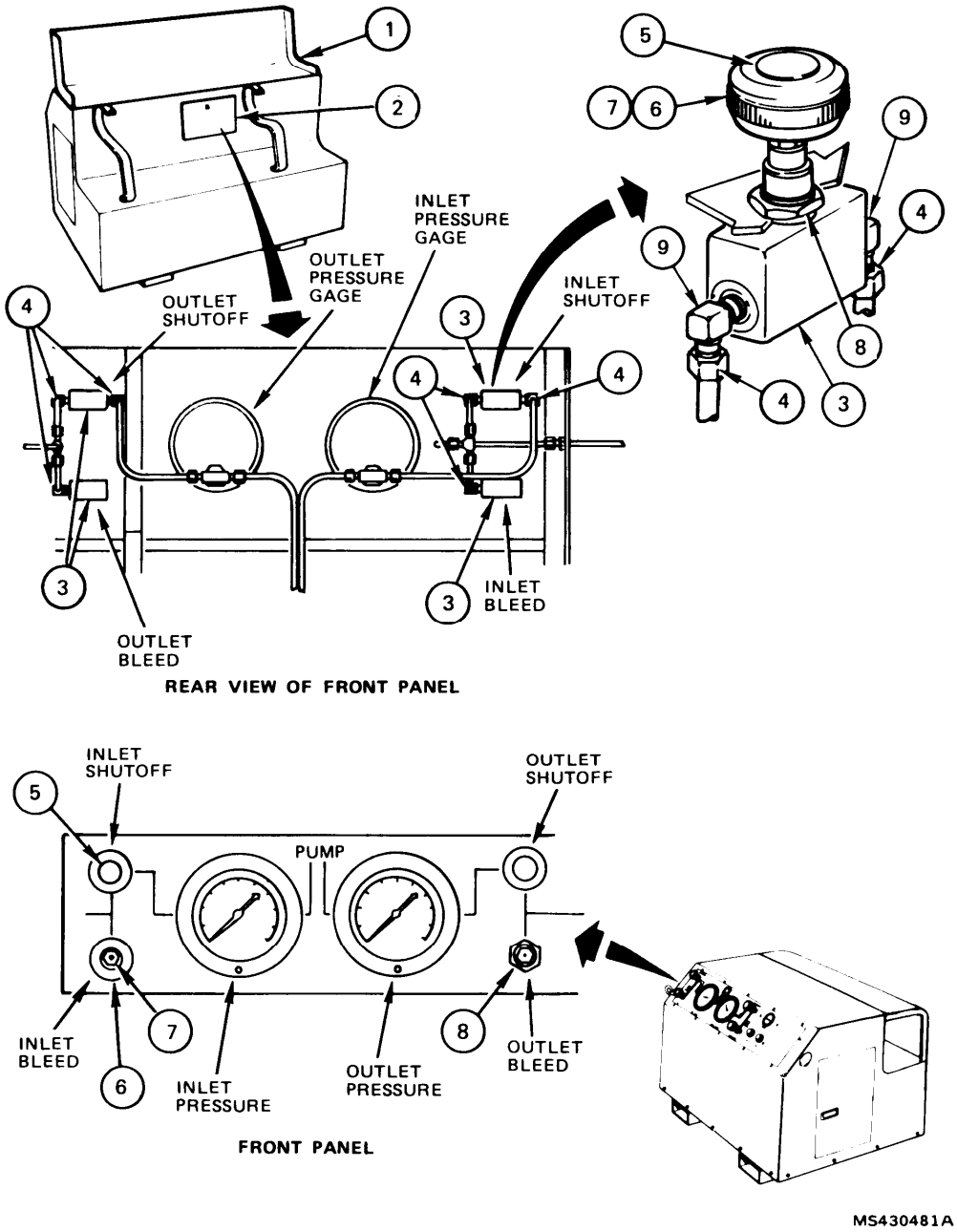


Figure 3-12. Inlet Shutoff Inlet Bleed, Outlet Shutoff and Outlet Bleed Valve Replacement

3-26.1 RELIEF VALVE REPLACEMENT PROCEDURE (Figure 3-12.1).

a. Remove housing enclosure in accordance with paragraph 3-18, steps a and b.

b. Using a 7/16-inch wrench, remove support bracket retaining screws (6) and bracket assembly (1) form relief valve (2).

c. Remove both the filter (4) and high pressure input lines (5) from the relief valve tee connector (3) using a 9/16-inch wrench.

d. Remove relief valve exhaust line (7) from relief valve coupling adapter (8) by securing coupling in place with a 1-inch open end wrench and rotating connector counterclockwise using a 5/8-inch open end wrench.

e. Remove tee connector (3) from relief valve assembly (2) and retain.

f. Remove relief valve assembly.

g. Install replacement relief valve in the reverse order of removal described in steps b through f.

h. Perform proof pressure test in accordance with Section IV.

3-26.2 SOLENOID VALVE REPLACEMENT PROCEDURE (figure 3-12.1).

a. Remove housing enclosure in accordance with paragraph 3-18, steps a and b.

b. Remove inlet exhaust line (7) input to solenoid assembly (11) using a 5/8-inch open end wrench.

c. Using a 7/16-inch wrench, remove bracket retaining screws (14) and bracket assembly (12) from solenoid valve (10) and retain.

d. Remove screws (9) and cover plate (10) from TB1 function box (15) and disconnect solenoid lead-in wires from terminals 1 and 2 on TB1.

e. Install replacement solenoid valve in the reverse order of removal described in steps a through h.

f. Perform proof pressure test in accordance with Section IV.

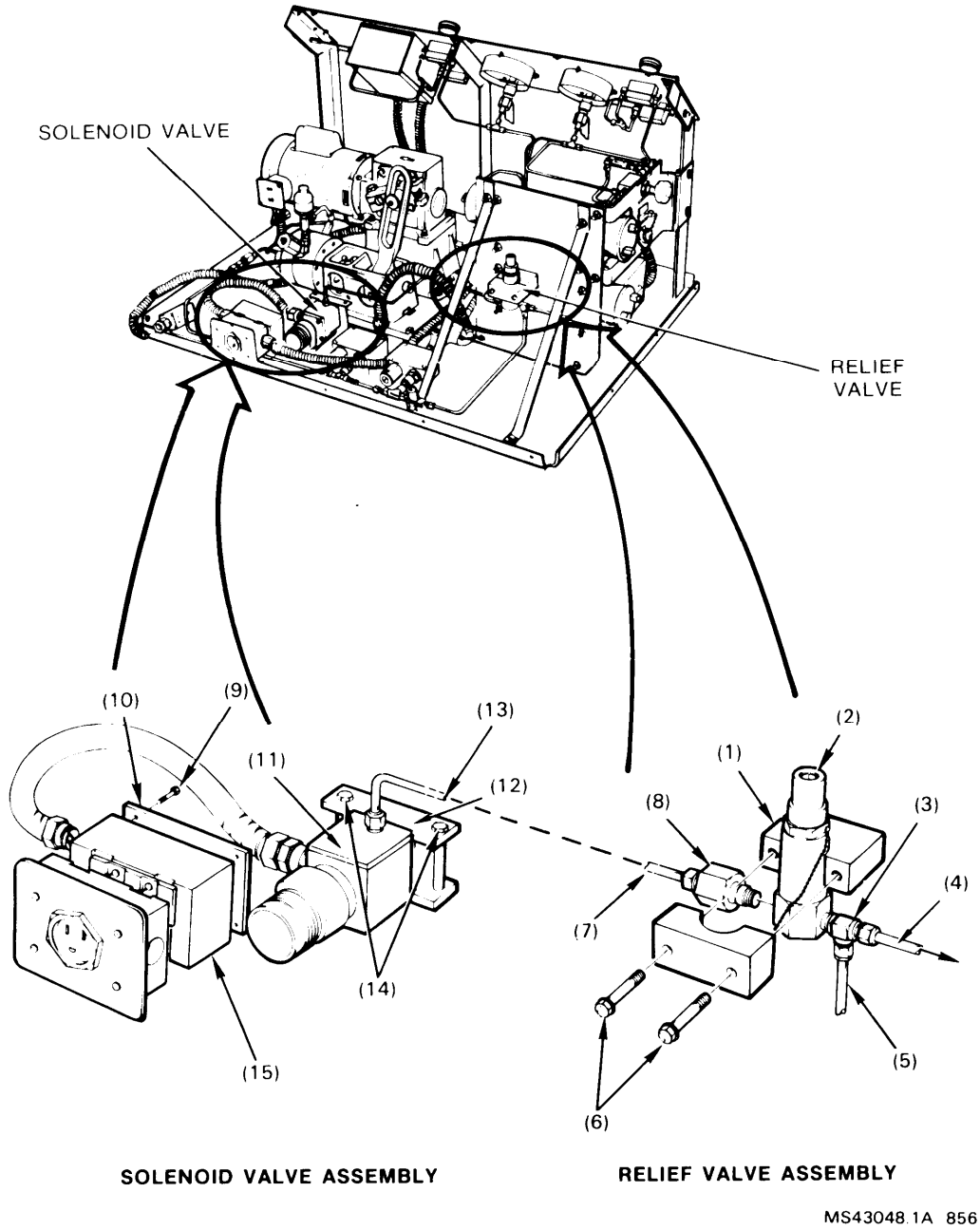


Figure 3-12.1. Relief Valve and Solenoid Valve Replacement

3-27. REPLACEMENT OF BATTERY CHARGER PARTS (Figure 3-13). Direct access parts that you can replace on the battery charger are the two fuses and the bulbs for the white, amber. and green lamps. The 1 ampere (1) and 5 ampere (2) spare fuses are located on the front panel. The two spare bulbs PWR TEST (3) and CHARGE (4) indicator lamps are located on the underside of the lid (5). In addition, either of the two cables (located in the lid compartment) are replaceable. The parts you can replace on the battery charger are listed in the following index.

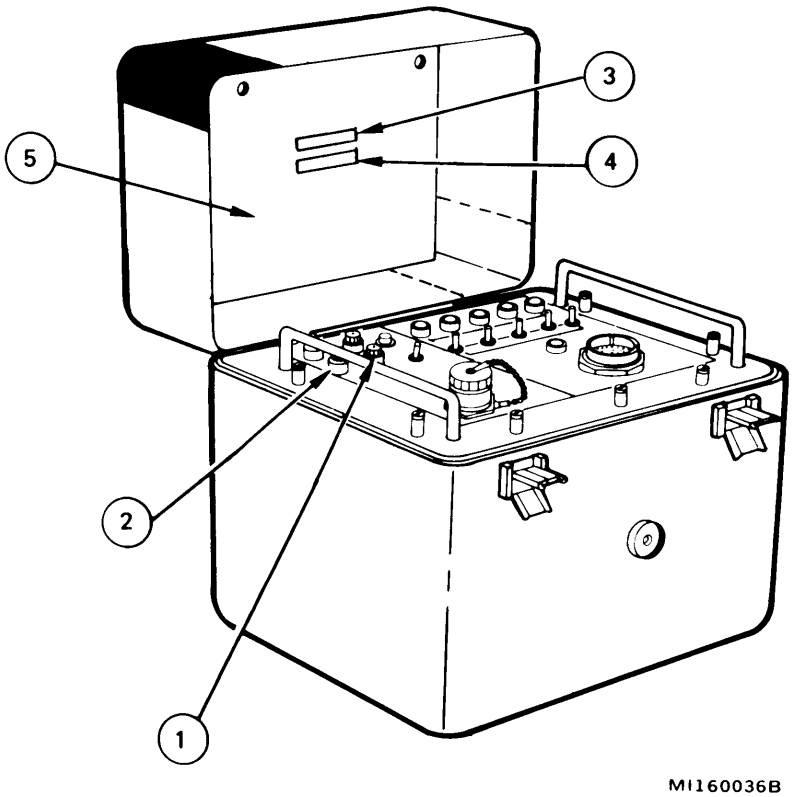


Figure* 3-13. *Battery Charger Parts Location

The parts listed below require removal of the front panel assembly.

*These operations to be performed at MTS locations only,

3-28. CIRCUIT CARD ASSEMBLY REPLACEMENT (Figure 3-14).

a. Disconnect unit from AC power source.

b. Loosen the 10 front panel retaining screws (1) and lift assembly from cabinet.

c. Lay panel assembly face down on cabinet.

d. Remove rear circuit card assembly in accordance with para. 3-29 steps h and c.

e. Remove the 10 circuit board retaining screws (5), spacers (7), washers (8), lockwashers (9) and nuts (10) securing mounting brackets (3) to the rear of the circuit card assembly and retain hardware.

f. Disconnect connectors J1 (11) and J2 (12) from circuit card.

g. Install mounting brackets (3) to the rear of replacement circuit card by reinstalling the 10 circuit board retaining screws (5), washers (6), spacers (7), washers (8), lockwashers (9) and nuts (10).

h. Connect J1 (11) and J2 (12) connectors to circuit card assembly.

i. Install reassembled circuit card assembly in accordance with para. 3-29 step h.

j. Reinstall front panel in cabinet and secure in place by tightening the 10 front panel retaining screws (1).

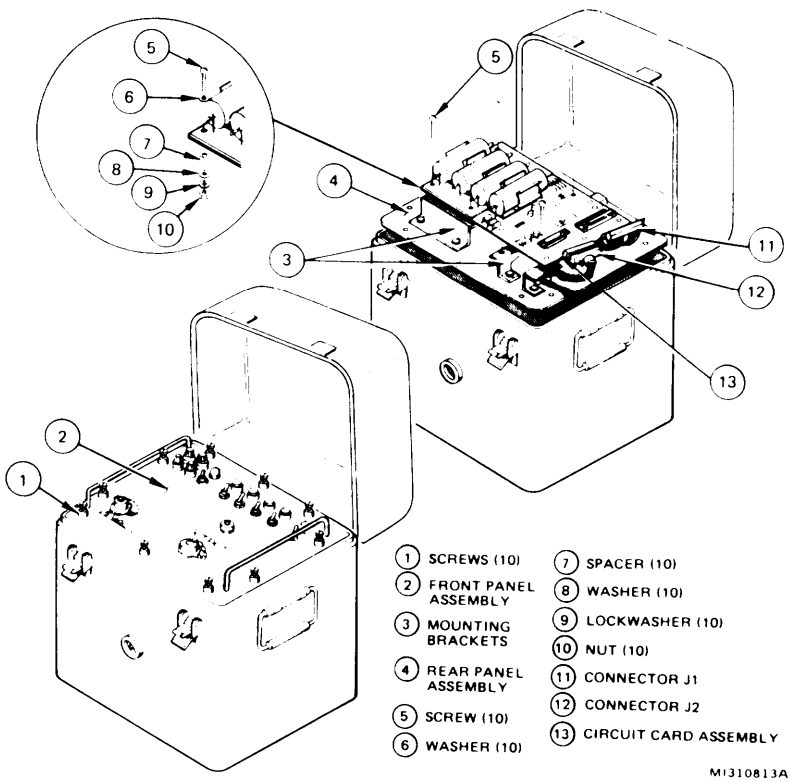


Figure 3-14. Battery Charger Circuit Card "Assembly Replacement

3-29. TOGGLE SWITCH REPLACEMENT (Figure 3-15).

a. Remove the front panel assembly in accordance with para. 3-28, steps a through c.

b. Remove circuit card assembly (11) with mounting brackets attached by removing each of the 9 retaining nuts (4), and washers (2) and (3) and retain hardware.

c. Lift circuit card assembly (11) clear of panel (9).

d. Tag wires and remove the terminal lugs from defective switch (7) by removing lugs (8) screws and lockwashers and retain.

e. Using a 9/16-inch wrench, remove toggle switch front panel retaining nut (5) and flat washer (6). Remove switch from rear of panel assembly.

f. Reinstall replacement toggle switch through rear of panel assembly and secure in place with retaining nut (5) and flat washer (6) using a 9/16 wrench to tighten.

g. Reinstall terminal lugs on original terminals as tagged.

h. Reinstall circuit card assembly by installing the 9 retaining nuts (4). and washers (2) and (3) removed in step b.

i. Reinstall front panel assembly in accordance with para. 3-28 step j.

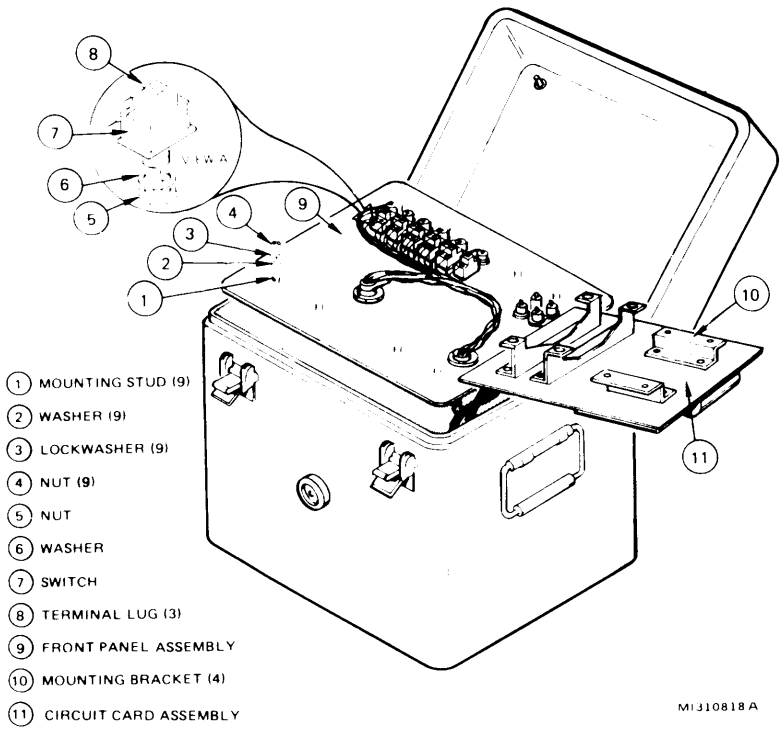


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Figure 3-15. Battery Charger, Toggle Switch Replacement

3-30. INDICATOR LAMP ASSEMBLY REPLACEMENT (Figure 3-16).

a. Remove circuit card assembly (7) in accordance with para. 3-28, steps *a* through *c*.

b. Tag and unsolder leads from rear of lamp assembly (6).

c. Remove lens assembly (1) with lamp (2) and flat washer (3).

d. Using a 9/16 inch socket wrench, remove front panel retaining nut (4).

e. Remove lower lamp mounting assembly (6) from rear of panel with nut (5).

f. Install replacement indicator lamp assembly from rear of front panel and secure in place with retaining nut (4) using a 9/16 inch socket wrench to tighten.

g. Solder leads to original terminals as tagged.

h. Install flat washer (3) and lens assembly (1) with lamp (2) from front side of panel.

i. Reinstall front panel assembly in accordance with para. 3-28 step j.

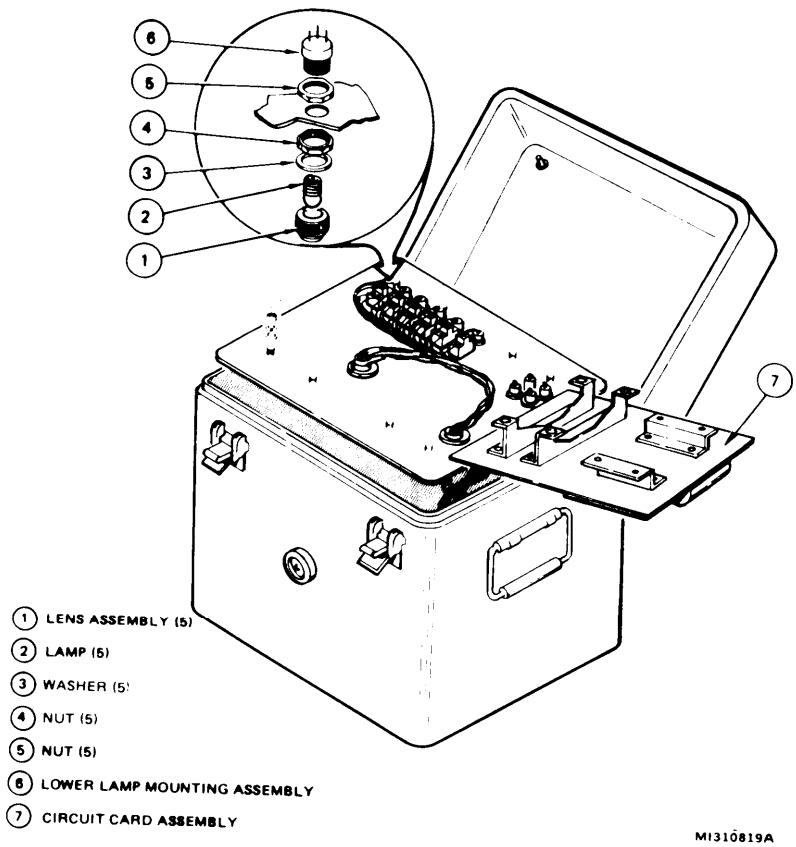


Figure 3-16. Battery Charger, Indicator Lamp Assembly—Replacement

CHAPTER 4
SHIPMENT AND STORAGE

4-1. GENERAL. Procedures for shipment and storage of both the Gas Pumping Unit and Battery Charger are contained in para. 4-2.

4-2. PREPARATION. Prepare the GPU for shipment in accordance with the procedure below. Note that a positive pressure between 0 and 100 psig must be maintained to prevent system contamination.

a. Disconnect the inlet flexible hose in accordance with steps 3-14a through 3-14g. Seal the ends of the hose with the protective plug provided at each end.

b. Disconnect the outlet flexible hose in accordance with steps 3-15a through 3-15c. Seal the ends of the hose with the protective plugs provided at each end.

c. Slowly open the INLET SHUTOFF valve and the INLET BLEED valve one turn counterclockwise to relieve the 500 psig down to 100 psig as read on the INLET PRESSURE gage; then close the INLET SHUTOFF and INLET BLEED valves fully clockwise.

d. Slowly open the OUTLET SHUTOFF valve and the OUTLET BLEED valve one turn counterclockwise to relieve the 500 psig down to 100 psig as read on the OUTLET PRESSURE gage; then close the OUTLET SHUTOFF and OUTLET BLEED valves fully clockwise.

e. Using the protective covers provided, seal the GPU inlet and outlet connectors.

f. Unlatch and open the storage box for the proof test equipment (para. 1-4, page 1-4).

g. Be sure that the following items are in the storage box:

(1) Pressure Transducer Assembly, including remote digital readout device and cable.

(2) Remote Control Cable.

(3) Cross fitting, with protective caps wrench tight, in protective bag.

(4) Two flexible hoses with protective plugs wrench tight.

h. Place the following GPU loose items in the storage box:

(1) Flexible inlet and outlet hoses with protective plugs wrench tight.

(2) Trainer filling adapter.

(3) GPU log book.

(4) Embossing machine (7490-00-835-0443).

(5) Embossing tape (7510-00-826-1878).

i. Fill the empty space in the storage container with loose packing material such as crumpled paper. Close the storage box lid and secure the latches.

NOTE

The battery charger is housed in its own shipping and storage container. Both the input and output connectors are in place and the flex interconnecting cables are located in the cover compartment.

APPENDIX A
REFERENCES

1. APPLICABLE PUBLICATIONS.

For a list of applicable publications, refer to TM9-1425-429-L (LOAP).

APPENDIX B
MAINTENANCE ALLOCATION CHART

Section I. INTRODUCTION

B-1. GENERAL

a. This section provides a general explanation of all maintenance and repair functions authorized at various maintenance levels.

b. The Maintenance Allocation Chart (MAC) in section II designates overall responsibility for the performance of maintenance functions on the identified end item or component. The implementation of the maintenance functions upon the end item or component will be consistent with the assigned maintenance functions.

c. Section III lists the special tools and test equipment 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

a. Inspect. To determine the serviceability of an item by comparing its physical, mechanical d/or electrical characteristics with established standards through examination.

b. Test. To verify serviceability and detect incipient failure by measuring the mechanical or electrical characteristics of an item and comparing those characteristics with prescribed standards.

c. Service. Operations required periodically to keep an item in proper operating condition, i.e., to clean (decontaminate), to preserve, to drain, to paint, or to replenish fuel, lubricants, hydraulic fluids, or compressed air supplies.

d. Adjust. To maintain, 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 optimum or desired 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. Install. The act of emplacing, seating, or fixing into position an item, part, or module (component or assembly) in a manner to allow the proper functioning of an equipment or system.

h. Replace. The act of substituting a serviceable like type part, subassembly, or module (component or assembly) for an unserviceable counterpart.

i. Repair. The application of maintenance services[1] or other maintenance actions[2] to restore serviceability to an item by correcting specific damage, fault, malfunction, or failure in a part, subassembly, module (component or assembly), and item, or system.

[1] Services-inspect, test, service, adjust, align, calirbate, or replace.
[2] Action-welding, grinding, riveting, straightening, facing, remachining, or resurfacing.

j. Overhaul. That maintenance effort (services/actions) necessary to restore an item to a completely serviceable/operational condition as prescribed by maintenance standards (i.e., DMWR) in appropriate technical publications. Overhaul is normally the highest degree of maintenance performed by the Army. Overhaul does not normally return an item to 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 materiel 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 equipments/components.

B-3. EXPLANATION OF COLUMNS IN THE MAC, Section II.

a. Column 1. Group Number. Column 1 lists group numbers, the purpose of which is to identify components, assemblies, subassemblies, and modules with the next higher assembly.

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 Functions. Column 3 lists the functions to be performed on the item listed in column 2. (For detailed explanation of these functions, see para. B-2.)

d. Column 4. Maintenance Level. Column 4 specifies, by the listing of a "work time" figure in the appropriate subcolumn(s), the lowest level of maintenance authorized to perform the function listed in column 3. This figure represents the active time required to perform the maintenance function at the indicated level of maintenance. If the number or complexity of the tasks within the listed maintenance function vary at different maintenance levels, appropriate "work time" figures will be shown for each level. The number of man-hours specified by 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 operation conditions. This time includes preparation time, troubleshooting 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 symbol designations for the various maintenance levels are as follows:

C . . . . . Operator or crew
O . . . . . Organizational maintenance
F . . . . . Direct support maintenance
H . . . . . General support maintenance
D . . . . . Depot maintenance

e. Column 5, Tools and Equipment. Column 5 specifies, by code, those common tool sets (not individual tools) and special tools, TMDE, and support equipment required to perform the designated function.

f. Column 6. Remarks. This column shall, when applicable, contain a letter code, in alphabetic order, which shall be keyed to the remarks contained in Section IV.

B-4. EXPLANATION OF COLUMNS IN TOOL AND TEST EQUIPMENT REQUIREMENTS, SECTION III

a. Column I. Reference Code. The tool and TMDE reference code correlates with a code used in the MAC, Section II, Column 5.

b. Column 2. Maintenance Level. The lowest level 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 TMDE.

e. Column 5. Tool Part Number. The manufacturer's part number.

B-5. EXPLANATION OF COLUMNS IN REMARKS, SECTION IV

a. Reference Code. The code recorded in column 6, section II.

b. 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 CHARGER, BATTERY PP-7309 (XO-1)/T AND RECHARGING UNIT, COOLANT TRAINING GUIDED MISSILE SYSTEM 80

(1) Group Number	(2) Component/Assembly	(3) Maintenance Function	(4) Maintenance Category C	O	F	H	D	(5) Tools and Equipment	(6) Remarks
0700	Battery Charger, 11486988	Inspect	0.3						F
		Service	0.1						I, J
		Replace	0.1						H
		Test	0.2						M
	Circuit board 11488290	Replace		.6				9	A
0750	Battery Carrying Case 11488393	Inspect	0.2					9	CF
		Service	0.1						K
		Replace	0.1						
		Test	0.2					9	I
0800	Gas Pumping Unit 11487355	Inspect		0.6					I
		Service		0.2				9	C,L
		Replace		0.8					
		Test		0.3					
		Adjust		0.8					
	Compressor Assembly 11509788	Test		1.2				9	A,B,
		Replace		0.1					C,I.
									L

Section III. CHARGER, BATTERY PP-7309(X0-1)\T END ITEM AND RECHARGING UNIT, COOLANT, TRAINING GUIDED MISSILE SYSTEM M80

TOOL AND TEST EQUIPMENT REQUIREMENTS

Tool or Test Equipment Reference Code	Maintenance Category	Nomenclature	National (NATO)	Tool Number
9		General Mechanics Tool Kit	5180-00-177-7033	
9		Refrigeration Tool Kit	5180-00-596-1474	
9	0	Cylinder Hand Truck	6920-0 I -09 I -7270	
9	0	Grease Gun	4930-00-253-2478	

Section IV. REMARKS

Reference Code	Remarks
A	Inspect for damage, moisture and foreign matter.
B	WARNING: High Gas pressure (up to 6200 psi) is available in this area. Death or severe injury may result if you fail to observe safety precautions.
C	Remove foreign matter. Clean all areas to be painted.
F	CAUTION: Failure not to place protective covers over connector receptacles when not in use could degrade system operation and even cause a system failure.
H	WARNING: Be sure power cable is unplugged prior to performing preventive maintenance checks and services. Death or severe injury may result if you fail to observe safety precautions.
I	Immediately place protective covers over connectors when not in use.
J	Clean cable connectors with a dry cloth and brush.
K	CAUTION: Do not allow thinner to come into contact with the batter) carrying case.
L	WARNING: Argon gas supply bottle must be secured to a building column. carrying cart, or any available upright objects to minimize movement of bottle should its gas supply be released unintentionally.
M	If color of indicator is pink, replace desiccant in the container.

APPENDIX C
COMPONENTS OF END ITEM AND BASIC ISSUE ITEMS LISTS

Section I. INTRODUCTION

C-1. SCOPE. This appendix lists components of end item and basic issue items for the Coolant Recharging Unit M80, to help you inventory items required for safe and efficient operation. There are no components of end items for Battery Charger PP-7309/T.

C-2. GENERAL. The Components of End Item and Basic Issue Items Lists are divided into the following sections:

a. Section II. Components of End Item. This listing is for informational purposes only, and is not authority to requisition replacements. These items are part of the end item, but are removed and separately packaged for transportation or shipment. As part of the end item, these items must be with the end item whenever it is issued or transferred between property accounts. Illustrations are furnished to assist you in identifying the items.

b. Section III. Basic Issue Items. There are no basic issue items for the Coolant Recharging Unit M80 or the Battery Charger.

C-3. EXPLANATION OF COLUMNS. The following provides an explanation of columns found in the tabular listings:

a. Column (1) — Illustration Number (Illus Number). This column indicates the number of the illustration in which the item is shown.

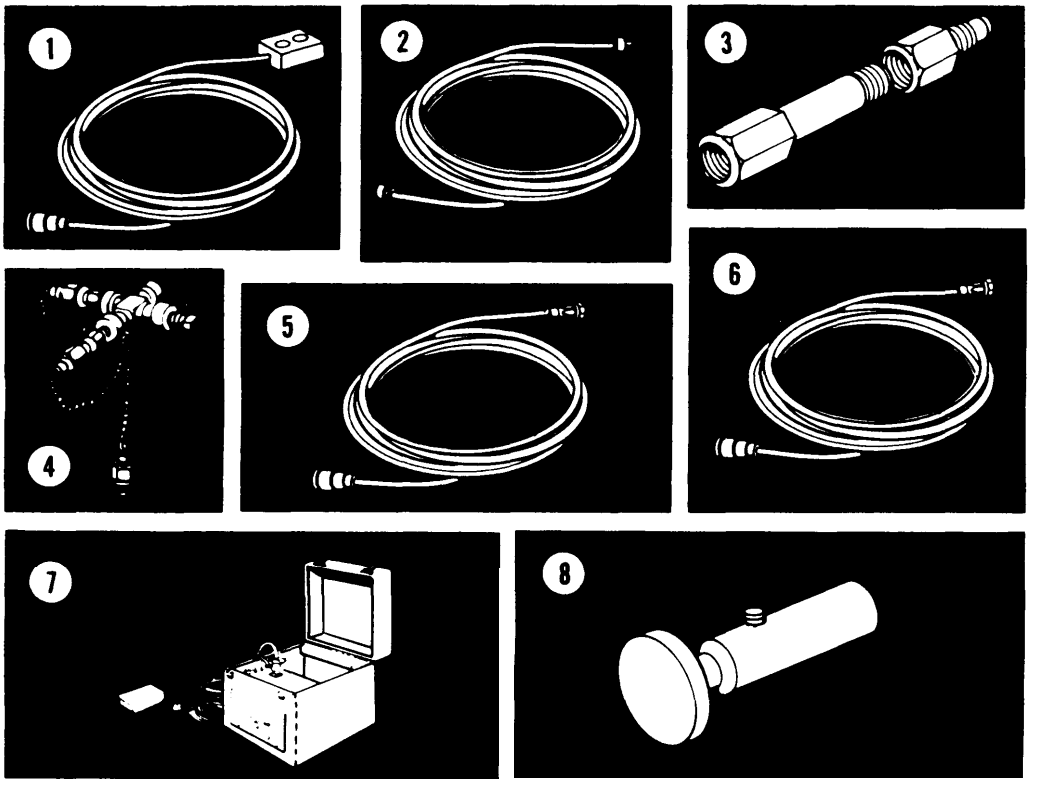
b. Column (2) — National Stock Number. Indicates the National Stock Number assigned to the item and will be used for requisitioning purposes.

c. Column (3) — Description. Indicates the National item name and, if required, a minimum description to identify and locate the item. The last line for each item indicates the FSCM (in parentheses) followed by the part number.

d. Column (4) — Unit of Measure (U/M). Indicates the measure used in performing the actual operational/maintenance function. This measure is expressed by a two-character alphabetical abbreviation (e.g., ea, in, pr).

e. Column (5) — Quantity required (Qty rqr). Indicates the quantity of the item authorized to be used with/on the equipment.

Section II. COMPONENTS OF END ITEM



(1) ILLUS NUMBER	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION FSCM AND PART NUMBER	(4) U/M	(5) QTY REQD
1	6920-01-047-8354	CABLE ASSY, TEST (18876) 11567535		1
2	6920-01-044-0347	CABLE ASSY, POWER (18876)11567495		1
3.a	4730-00-322-8278	ADAPTER, STRAIGHT (30780) 4-4GTXSS		1
3.b	6920-01-044-5070	CONNECTOR (18876) 11567496		1
4	6920-01-044-5083	CROSS ASSY (18876) 11567562		1
5.a	4720-01-046-0259	HOSE ASSY (18876) 11509720-002		1
5.b	4720-01-223-9037	HOSE ASSY (18876) 13056964 (THIS HOSE REPLACES 5a, 6a, and 6b.)		4
6.a	4720-01-099-3185	HOSE ASSY (18876) 11509720-001		1
6.b	6920-01-044-5082	HOSE ASSY (18876) 11567563		2
7	6920-01-045-0563	PRESSURE MEASURING SYSTEM (18876)11567561		1
8	6920-01-044-0321	VALVE ASSY (18876) 11509746		1

Section III. BASIC ISSUE ITEMS

(1) ILLUS NUMBER	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION	(4) (U/M)	(5) QTY RQR
		TM 9-6920-430-14, Operator's, Organizational, Direct Support, and General Support Maintcnancc Manual: Coolant Recharging Unit, Training Guided Missile System M80 (6920-01-024-9970), and Battery Charger PP-7309/T (6130-01-024-6922) STINGER Air Defensc Guided Missile System	EA	1

APPENDIX D
ADDITIONAL AUTHORIZATION LIST

Section I. INTRODUCTION

1. SCOPE. This appendix lists additional items you are authorized for the support of the Gas Pumping Unit.

2. GENERAL. This list identifies items that do not have to accompany the gas pumping unit and that do not have to be turned in with it. These items are all authorized to you by CTA, MTOE, TDA, or JTA.

3. EXPLANATION OF LISTING. National stock numbers, descriptions, and quantities are provialed 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 (i.e, CTA, MTOE, TDA, or JTA) which authorizes the item(s) to you.

(1) National Stock Number	(2) Description FSCM and Part Number / Usable on Code	(3) U/M	(4) Qty Auth
	GPU, (18876) PN 11508919 proof pressure test, protective barrier		1

APPENDIX E
EXPENDABLE SUPPLIES AND MATERIALS LIST

Section I. INTRODUCTION

E-1. SCOPE. This appendix lists expendable supplies and materials you will need to operate and maintain the gas pumping unit and battery charger. These items are authorized to you by CTA 50-970, Expendable Items (except medical Class V, repair parts, and heraldic items).

E-2 EXPLANATION OF COLUMNS

a. Column 1 — Item number. This number is assigned to the entry in the listing and is referenced in the narrative instructions to identify the material (e.g., "Use 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/Crew

O — Organizational 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 Federal Supply Code for Manufacturer (FSCM) in parentheses, if applicable.

e. Column 5 — Unit of Issue. Indicates the measure delineated by the NSN. This measure is expressed by a t we-character alphabetical abbreviation (e.g., EA, LB, KT). Nondefinitive units of issue are followed by quantities in parentheses (e.g., TU (4 OZ)).

Section II. EXPENDABLE SUPPLIES AND MATERIALS LIST

(1) Item Number	(2) Level	(3) National Stock Number	(4) Description	(5) u/I
		GAS PUMPING UNIT		
1	C	8020-00-224-8010	Artist Brush	EA
2	O	8020-00-260-1298	Varnish Brush	EA
3	O	8010-01-023-7473	Epoxy Primer, MIL-P-23377	KT
4	C	7930-00-093-4909	Detergent	BX
5	O	8010-00-221-6455	Paint, FED-STD-595 (Olive Drab)	KT
6	O	8010-00-782-9356	Paint, TT-E—527, Color No. 37875 (White)	PT
7	O	5350-00-174-0998	Sandpaper (280 Grit)	BD
8	O	8010-00-535-9780	Wash Primer MIS 13097	KT
9	C	8305-00-205-3496	Wiping Rags	
10	C	9150-00-786-6681	Lub, Oil, SAE 10W	QT
11	C	4930-00-253-2478	Grease Gun	EA
12	C	9150-00-935-1017	Grease Cartridge	CA
13	O	8010-00-181-8079	Thinner Solvent	CN
14	O	8030-00-889-3535	Tape Anti-Seize MIL-T-27730, Size II	RO
15	C	9150-00-754-2826	Lubricant (102105 19)	LB
16	C	6850-00-621-1820	Leak Detector	BT
17	C	5120-00-293-3112	Spudger (orange stick)	EA
18	O	7510-00-266-6714	Masking Tape	RO
19	O	7510-00-290-2023	Masking Tape	RO
20	C	4240-00-052-3776	Goggles, Safety	PR
21	O	*9135-00-882-1793	Propellant, Pressurizing	CY
22	O	7510-00-826-1878	Embossing Tape	EA
		BATTERY CHARGER		
23	C	7920-00-514-2417	Brush, Acid Swabbing	GR
24	C	8020-00-257-0379	Artist Brush	EA
25	O	8010-00-935-7080	Epoxy Primer	KT
26	C	7930-00-093-4909	Detergent	BX
27	O	8030-00-221-6455	Paint FED-STD—34087 (Green Olive Drab)	KT
28	O	5350-00-174-1000	Sandpaper (220 Grit)	BD
29	O	8010-00-181-8079	Thinner Solvent	CN
30	O	8030-00-535-9780	Coating Compound	KT
31	C	8305-00-205-3496	Cloth, Cheesecloth	PG
32	O	8010-00-297-0568	Paint, TT-E-527, No. 37875 (White)	GL

*Empty cylinders will be returned to the supply system under NSN 8120-00-803-4467.

By Order of the Secretary of the Army:

CARL E. VUONO
General *United* States Army
Chief of Staff

Official:

WILLIAM J. MEEHAN II
Brigadier Gcneral, United States Army
The Adjutant General

DISTRIBUTION:

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