TM 9-4940-568-10

OPERATOR'S MAINTENANCE MANUAL

FOR

FORWARD REPAIR SYSTEM (FRS)

MODEL M7

NSN 4940-01-463-7940

DISTRIBUTION RESTRICTION
Approved for public release; distribution is unlimited.

HEADQUARTERS, DEPARTMENT OF THE ARMY

MARCH 2002

WARNING

The FRS has been designed to operate safely and efficiently within the limits specified in this TM. Operation beyond these limits is prohibited IAW AR 70-1 without written approval from the Commander, U.S. Army Tank-Automotive and Armaments Command, Attn: AMSTA-LC-AH, Warren, MI 48397-5000. Failure to comply could result in injury or death to personnel.

WARNING

Personnel must not ride, rest, or sleep on or inside the FRS. Failure to comply may result in injury or death to personnel.

WARNING

Do not lower/open doors in winds that exceed 30 mph. Failure to comply may result in injury or death to personnel.

WARNING

Do not use shelter roof or doors (when open) for loading or storage. Failure to comply may result in injury or death to personnel.

WARNING

Keep shelter roof and doors free of accumulated snow, ice, dirt and material buildup. Do not lower doors if buildup is in excess of 1/4 inch thick. Failure to comply may result in injury or death to personnel.

WARNING

Generator set engine must be shut off before performing PMCS walkaround. Severe injury to personnel may result.

WARNING

Drain air compressor reservoir before servicing the air lubricator. Failure to comply may result in injury to personnel.

WARNING

The exhaust pipe and muffler can become very hot during operation. Do not touch these parts with bare hands, or allow body to come in contact with exhaust pipe or muffler. Exhaust system parts can cause serious burns.

WARNING

Fuel is very flammable and can explode easily. To avoid serious injury or death, keep fuel away from open fire and keep fire extinguisher within easy reach when working with fuel. Do not work on fuel system when engine is hot. Fuel can be ignited by hot engine.

WARNING

Hydraulic oil may be hot and cause serious burns.

WARNING

Radiator coolant can be extremely hot and cause severe burns.

WARNING

Use extreme caution when checking radiator hoses and clamps or injury to personnel may result.

WARNING

Flatrack rollers must be supported while removing retaining pins or roller may drop causing injury to personnel.

WARNING

Remove all jewelry such as rings, ID tags, bracelets, etc. If jewelry or tools contact positive electrical circuits a direct short may result. Damage to equipment, injury or death to personnel may occur.

WARNING

Lead-acid battery gases can explode. Do not smoke, have open flames, or make sparks around a battery, especially if caps are off. If a battery is gassing, it can explode and cause injury to personnel.

WARNING

Do not operate crane unless both outrigger jacks are properly set up. Shelter could turn over causing serious injury or death.

WARNING

- Keep hands and feet away from outrigger jacks while operating lever to avoid injury.
- Outriggers should be deployed prior to crane operation to avoid injury.

WARNING

Care must be taken when disconnecting HOIST load hook from hook block tiedown. A swinging hook block can cause serious injury or death to personnel.

WARNING

Keep boom clear of shelter, all electrical lines and other obstacles while operating crane. Failure to comply may result in injury or death to personnel.

WARNING

Operator should be stationed to be able to see load at all times during crane operation. Boom and load moving out of control could cause serious injury or death.

WARNING

Ensure that area is clear of personnel before moving SWING control lever. Boom should be swung slow enough so crane operator has complete control. If operator cannot see load during operation, operate crane from REMOTE CONTROL UNIT. Boom moving out of control could cause serious injury or death.

WARNING

- Wire rope can become frayed or contain broken wires. Wear heavy leather-palmed work gloves when handling wire rope. Frayed or broken wires can injure hands.
- Never let moving wire rope slide through hands, even when wearing gloves. A broken wire could cut through glove and cut hand.

WARNING

Ensure REMOTE CONTROL/EMERGENCY STOP/ON/OFF POWER switch is in OFF position and switch guard is closed before connecting REMOTE CONTROL UNIT. Crane moving out of control could cause serious injury or death.

WARNING

Ensure that area is clear of personnel before moving SWING control lever. Boom should be swung slow enough so crane operator has complete control. Boom moving out of control could cause serious injury or death.

WARNING

If electrical power fails during crane operation, move switch on remote control unit to SHUTDOWN position. Serious injury could result from uncontrolled moving parts.

WARNING

Electric power generating equipment must be grounded as a safety precaution. Stray electrical current can injure or kill personnel and damage the equipment.

WARNING

Do not attempt to open doors and access platforms while FRS is loaded on vehicle. Failure to comply may result in injury or death to personnel.

WARNING

Secure all equipment on FRS before unloading or loading from vehicle. Failure to comply may result in injury to personnel.

WARNING

Opening shelter door is a two person operation. Ensure that upper door support arms lock over center. Failure to comply may result in injury to personnel.

WARNING

Keep hands clear of pivot points on support arms during door operation. Failure to comply will result in injury to personnel or damage to equipment.

WARNING

PLS hook arm must be disconnected from FRS hook bar of the flatrack after FRS is unloaded.

WARNING

FRS C-channels of the flatrack must NOT be in contact with the terrain or any object to prevent altering the critical reaction points of the FRS. Failure to comply could result in personnel injury or death.

WARNING

Generator has an automatic start sequence which will make several attempts to start. Ensure master switch is in the off position before reaching anywhere inside the generator enclosure/housing. Failure to comply could result in personnel injury or death.

WARNING

Exhaust emissions from the diesel generator can be hazardous to human health. Position FRS so the generator is downwind of work area. If the prevailing wind puts the operator downwind of the generator's exhaust, a conscious effort must be made to limit inhalation of exhaust fumes. Failure to comply may result in serious injury or death to personnel.

WARNING

Personnel hearing can be PERMANENTLY DAMAGED if exposed to constant high noise levels of 85 DBA or greater. Wear approved hearing protection devices when working in high noise level areas. Personnel exposed to high noise levels shall participate in a hearing observation program in accordance with TB MED 501. Hearing loss occurs gradually but becomes permanent over time.

WARNING

Never run generator while FRS access platforms/doors are closed. Build-up of combustible gases due to leaking hoses, fittings, etc., or if gas valves are not shut off, present a possible explosion if a short circuit should occur. Failure to comply may result in injury or death to personnel and damage to equipment.

WARNING

Failure to properly ground the FRS could result in serious injury or death to personnel.

WARNING

When refueling, shut down generator. Ensure no open flame is near area. Never smoke. Never add fuel with engine running. After fuel is added, securely close fuel tank cap; a loose cap can cause a fuel leak or be a fire hazard. Before starting generator, check that no fuel is spilled on or around FRS. Failure to comply may cause serious injury or death. Never overfill the tank or spill fuel. If fuel is spilled, clean it up immediately.

WARNING

Clothing fouled by Petroleum, Oil, or Lubricants (POL) must be changed at the earliest opportunity. Any POL contacting the skin should be washed off as soon as possible. Failure to comply may result in serious injury or death to personnel.

WARNING

Fuel cap and fuel gage are enclosed in a confined space. Care must be used when refueling fuel tank. Failure to comply may result in injury to personnel.

WARNING

Double hearing protection is required. Open drain valve slowly. Noise level in excess of 120 DBA can occur. Failure to comply may cause injury to personnel.

WARNING

Maximum allowable air pressure in air reservoir is 195 psi (1345 kPa). Failure to comply may result in injury or death to personnel.

WARNING

Hearing and eye protection required when disconnecting the air supply hose or injury to personnel may result.

WARNING

Unsafe welding practices can cause serious injury from fire, explosions, or harmful agents. Allow only authorized personnel to weld or cut metals, and follow safety precautions in TC 9–237. Protective clothing and goggles must be worn; adequate protection used, a suitable fire extinguisher kept nearby, and requirements of TC 9–237 strictly followed.

WARNING

Welding procedures must be performed beyond the enclosure of shelter, welding fumes can be harmful to personnel. Failure to comply may result in serious injury or death to personnel.

WARNING

Ensure primary power switch located on back of ARC welder is in the OFF position. Failure to comply may result in serious injury or death to personnel.

WARNING

If welding helmet has been stored for an extended period of time, place welding helmet in direct sun or fluorescent light for 1/2 hour prior to use or until low battery indicator is off.

WARNING

Welding helmet is only operational in temperatures above 25 degrees F. Welding personnel must use different PPE when in temperatures below 25 degrees F.

WARNING

Welding operation produces intense light and eye protection is required at all times. Failure to comply may result in serious injury to personnel.

WARNING

Do not disassemble torch when tip is hot. Tip can be extremely hot and cause severe burns.

WARNING

Do not disassemble ultrathermic cutting system while hot. Failure to comply could cause severe burns.

WARNING

Ensure tank standard cap is installed on tank prior to removing or installing pressurized tanks. Failure to comply may result in injury or death to personnel.

WARNING

Ensure crane power ON/OFF switch is in the OFF position. Crane moving out of control could cause serious injury or death.

WARNING

Ensure area is clear on both sides of crane before extending outrigger jacks. Failure to comply may result in injury to personnel or damage to equipment.

WARNING

Keep hands and feet clear outriggers during operation. Failure to comply may result in injury to personnel.

WARNING

Use caution when handling outrigger pads. Sharp edges can injure hands.

WARNING

Do not disconnect cable from stowage hook until boom is raised to a 45-degree angle. Hook assembly could fall. Failure to comply may result in injury to personnel.

WARNING

If either right-to-left level bubble and/or front-to-back level bubble move out of green area during lifting or moving load, immediately lower load and adjust outriggers as necessary.

WARNING

The crane must be operated with remote control if operator is not able to keep load in sight at all times during operation except in emergency and/or partial system failure. Failure to comply may result in injury or death to personnel.

WARNING

Ensure that area is clear of personnel before rotating boom. Boom must be rotated slowly enough so operator has complete control of load. If operator cannot see load during operation, operate crane with remote control. Failure to comply may result in injury or death to personnel.

WARNING

Operator must keep control of load at all times. Attach guide lines to load as required. Failure to comply may result in injury or death to personnel.

WARNING

Ensure that hook latch is closed and safety pin is installed before attempting to raise load. A hook latch that is not closed and locked in position could allow load to become disengaged from hook, allowing load to fall. Injury or death could result.

WARNING

Ensure there are at least two wraps of cable on hoist drum at all times. Failure to comply may result in injury or death to personnel.

WARNING

Keep all personnel clear of system when retracting O/R beams and jacks. The beams can crush hands, and retracting the jacks drops the flatrack back on the ground which could cause injury to personnel.

WARNING

Ensure that no tools, parts, personnel or objects are on outriggers before retracting, to prevent personnel injury.

WARNING

Prior to turning off MASTER DISCONNECT switch, allow shelter heater to perform cool down cycle (approx. 3 minutes) until fan stops. Failure to comply may result in a fire causing injury or death to personnel.

WARNING

Eye wash is to be refilled and testing by approved medical facility. Consult CHPPM (Center for Health Promotion and Preventive Medicine) for details.

WARNING

Ensure MASTER DISCONNECT switch is in the OFF position. Failure to comply may result in serious injury or death to personnel.

WARNING

Grounding rod must be driven in ground at least 8 feet. Failure to comply may result in serious injury or death to personnel.

WARNING

Sharp corners on doors could be present, use caution during door operation. Failure to comply may result in injury to personnel.

WARNING

Opening/closing shelter door is a two-person operation. Failure to comply may result in injury to personnel.

WARNING

Keep all personnel clear of FRS when operating outriggers. The beams can crush hands and retracting the jacks drops the flatrack back on the ground, which could cause injury to personnel.

WARNING

FRS cannot be placed on unstable uneven ground greater than 4 degrees. Failure to comply may result in injury or death to personnel and damage to equipment.

WARNING

Do not touch extremely cold metal (below -26° F [–32 C]). Bare skin may freeze to cold metal and cause injury to personnel.

WARNING

Hydraulic fluid is under great pressure. Engines on both PLS truck and FRS must be shut off while disconnecting hydraulic lines. Failure to do so could cause serious injury or death to personnel.

WARNING

Operator will have limited visibility of load when using the manual controls. Use a ground guide to relay signals to the operator. Boom and load moving out of control cause serious injury or death.

WARNING

Never attempt crane operations or lifting with crane mast not fully erected. Operating the crane with the crane mast not fully erected even slightly will disrupt the Overload Shutdown System. Failure to comply may result in injury to personnel and damage to equipment.

WARNING

Pressure of the fuel in fuel lines is sufficient to penetrate the skin and cause injury to personnel.

WARNING

Ensure fuel tank is full of fuel (Para 2-16).

WARNING

Upon removal of all wires and cables, ensure no contact is made with battery terminals or other wires and cables. Strap wires and cables away from battery terminals and other wires and cables as required to prevent damage to parts, personal injury, or death.

WARNING

Battery acid (electrolyte) is extremely harmful. Always wear safety goggles and rubber gloves, and do not smoke when performing maintenance on batteries. Injury will result if acid contacts skin or eyes. Wear rubber apron to prevent clothing being damaged.

WARNING

Terminal on battery post (3) must be removed before terminals on posts 4, 9 and 10 are touched or battery damage or personnel injury may occur.

WARNING

Corrosion inhibitor contains alkali. Do not get in eyes; wear goggles/safety glasses when using. Avoid contact with skin. In case of contact, immediately wash area with soap and water. If eyes are contacted, flush eyes with large amounts of water for at least 15 minutes and get immediate medical attention.

WARNING

Terminal on battery post (3) must be installed after terminals on posts 4, 9 and 10 are touched or battery damage or personnel injury may occur.

LIST OF EFFECTIVE PAGES Insert latest changed pages. Destroy superseded pages.

NOTE

The portion of the text effected by the changes is indicated by a vertical line in the outer margins of the page. Changes to illustrations are indicated by a shadowed or screened areas, or by miniature pointing hands.

Dates of issue for original and changed pages are:

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TOAL NUMBERTOF PAGES IN THIS PUBLICATION IS 394 CONSISTING OF THE FOLLOWING:

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TECHNICAL MANUAL **HEADQUARTERS**
DEPARTMENT OF THE ARMY
No. 9-4940-568-10 Washington, D.C. 15 March 2002

OPERATOR'S MAINTENANCE MANUAL
FOR
FORWARD REPAIR SYSTEM (FRS)

Current as of 15 December 2000

REPORTING OF ERRORS AND RECOMMENDING IMPROVEMENTS

You can help improve this publication. If you find any mistakes or if you know of a way to improve the procedures, please let us know. Submit your DA Form 2028-2 (Recommended Changes to Equipment Technical Publications), through the Internet, on the Army Electronic Product Support (AEPS) website. The Internet address is http://aeps.ria.army.mil. If you need a password, scroll down and click on "ACCESS REQUEST FORM." The DA Form 2028 is located in the ONLINE FORMS PROCESSING section of the AEPS. Fill out the form and click on SUBMIT. Using this form on the AEPS will enable us to respond quicker to your comments and better manage the DA Form 2028 program. You may also mail, fax or email your letter, DA Form 2028, or DA Form 2028-2, directly to: Commander, U.S. Army Tank-automotive and Armaments Command, ATTN: AMSTA-LC-CIP-WT, Rock Island, IL 61299-7630. The email address is TACOM-TECH-PUBS@ria.army.mil. The fax number is DSN 793-0726 or Commercial (309) 782-0726. A reply will be furnished to you.

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HOW TO USE THIS MANUAL

This manual is designed to help operate and maintain the Forward Repair System (FRS), NSN 4940-01-463-7940, Part Number RIA 149000. Listed below are some of the features included in this manual to help locate and use the needed information:

- Warning, caution and note headings, subject headings and other essential information are printed in bold type, making them easier to see.
- In addition to text, there are digital photos and some line art illustrations showing how to take a component off and put it back on. Cleaning and inspection criteria are also included where necessary.
- Chapter 1 of this manual describes the FRS and provides equipment description.
- Chapter 2 of this manual covers Operator's Controls and Indicators, Operating Instructions, Operator Preventive Maintenance Checks and Services (PMCS).
- Chapter 3 of this manual covers Lubrication Instructions, Troubleshooting, and Maintenance Procedures.
- Appendix A of this manual lists the References.
- Appendix B of this manual covers COEI and the Basic Issue Items (BII) list.
- Appendix C of this manual covers AAL.
- Appendix D of this manual covers EDS/ML.
- Appendix E of this manual covers Stowage and Sign Guide (for COEI, BII and AAL Items).
- Appendix F of this manual covers FRS Load Plan.
- Appendix G of this manual covers Lubrication Information.

Follow these guidelines when using this manual:

- The operator must read through this manual and become familiar with the contents before attempting to operate the FRS.
- Read all WARNINGS, CAUTIONS and NOTES prior to performing any procedure.
- The FRS is used with PLS M1074/M1075 or LHS HEMTT trucks. PLS M1075 truck shown.

CHAPTER 1

INTRODUCTION

Section I. GENERAL INFORMATION

1-1. SCOPE.

This manual is provided to maximize use of the Forward Repair System (FRS) by presenting operation and operator performed maintenance tasks. Read these instructions thoroughly before operating. This manual should be used in conjunction with the standard PLS vehicle and LHS HEMTT manuals set to operate and maintain a PLS vehicle or LHS HEMTT loaded with the FRS maintenance shop. PLS manualis referenced throughout this manual.

a. Type of Manual. Operation Instructions, TM 9-4940-568-10.

b. Equipment Name. Forward Repair System (FRS)

c. Purpose of Equipment. The purpose of FRS is to enable maintenance personnel to repair heavy equipment in the field or at a central location.

Figure 1-1. Forward Repair System

1-2. MAINTENANCE FORMS, RECORDS AND REPORTS.

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

1-3. CORROSION PREVENTION AND CONTROL (CPC).

The FRS has a total service life of ten years which allows for extended periods of operation in a corrosive environment. A corrosive environment includes exposure to high humidity, salt spray, road-deicing chemicals, gravel, and atmospheric contamination. No action beyond normal washing and repair of damaged areas is necessary to control corrosion. To prevent moisture accumulation, drain holes are provided on structural and sheet metal areas where necessary.

1-4. DESTRUCTION OF ARMY MATERIAL TO PREVENT ENEMY USE.

Refer to TM 750-244-6, Procedures for Destruction of Tank-Automotive Equipment to Prevent Enemy Use.

1-5. REPORTING EQUIPMENT IMPROVEMENT RECOMMENDATIONS (EIR).

If your FRS needs improvement, let us know. Send us an EIR. You, the user, are the only one who can tell us what you don't like about your equipment. Let us know why you don't like the design. Put it on an SF368 (Quality Deficiency Report). Mail it to us at: Commander, U.S. Army Tank-automotive and Armaments Command, ATTN: AMSTA-TR-E-PQDR; Warren, Michigan 48397-5000. We'll send you a reply.

1-6. WARRANTY INFORMATION.

There is no warranty, as such, for the FRS "box". The government is procuring the hardware from itself (the prime contractor is a government agency). By law, the government cannot make warranty type claims against itself; however, Rock Island Arsenal (RIA) for the FRS guarantees that the deliverables are free from defects or systemic defects in materiel and workmanship. In addition, there are "pass through" warranties on the major FRS components, i.e., the air compressor, generator, welding equipment, and crane. The FRS will conform to the design and manufacturing requirements specifically delineated in the contract and all future modifications. The FRS will conform to the essential performance requirements as defined in the system specification. If, during normal system operations, a defect/failure of FRS "box" component occurs, the using unit or contact will submit, to RIA Major Item and Product Assurance managers, an SF2407. RIA will replace the failed/damaged component. If a major component of the FRS (engine, air compressor, generator, welding equipment) fails during normal operations, upon notification of such failure, RIA will exercise the "pass through" warranty with the appropriate component contractor. How to process "pass through" warranty claims is currently being assessed. As stated above, the contractor will provide a hand-off warranty during all fieldings. Under this warranty, the contractor will be liable for the supply of components required to correct all failures from the time of system final acceptance up to and including hand-off to the user. The contractor will supply all repair parts required during deprocessing within seventy-two (72) hours after notification. The deprocessing team, not the contractor field technical representative, will perform all labor necessary to correct hand-off deficiencies.

1-7. LIST OF ACRONYMS.

Forward Repair System	FRS
Ground Fault Circuit Interrupt	GFCI
Material Handling Crane	MHC
Palletized Loading System	PLS
Shielded Metal Arc Welding	SMAW

SECTION II. EQUIPMENT DESCRIPTION

1-8. EQUIPMENT CHARACTERISTICS, CAPABILITIES AND FEATURES.

a. Equipment Characteristics.

The FRS is a flatrack based repair system.

b. Capabilities.

The FRS is capable of supporting the repair of heavy tracked and wheel vehicles. The FRS is also capable of:

10K lift @ 14’ RAD

50 cfm @ 175 psi

230 amps @ 100 duty cable stick/MIG

c. Features.

The FRS is an autonomous system that can be delivered by a PLS vehicle to a central position or to a damaged vehicle to make repairs. The FRS is downloaded and operated as a stand-alone unit.

The FRS is comprised of a 35KW diesel power generator, a fifteen horsepower air compressor, a Material Handling Crane (MHC), and sufficient storage space for tools and equipment. The generator is the primary power source to run the air compressor, the MHC, and supply power for lighting and tools. The air compressor provides air to run impact wrenches, drills or fill tires. The MHC performs all heavy lifting functions including removal and replacement of a vehicle powerpack. The storage space is enclosed for moisture control and security. It houses cabinets for the storage of tools, equipment, and spare parts.

1-9. EQUIPMENT DATA.

Table 1-1. Forward Repair (FRS) System

CENTER OF GRAVITY LOCATION			
Parameter	Measurement		
	cm	in.	Remarks
Longitudinal	283.8	111.8	From the rear of the flat rack
Vertical	99.1	39.0	Above ground level
Lateral	2.3	0.9	Left of the flat rack centerline

WEIGHT DISTRIBUTION					
LEFT SIDE		RIGHT SIDE		TOTAL	
kg	lb	kg	lb	kg	lb
5,487	12,096	5,254	11,584	10,741	23,680

PHYSICAL DIMENSIONS			
Parameter	Measurement		
	cm	in.	Remarks
Overall: Length Width Height	607.4	239.1	Length of flat rack plus crane control panel covers
	243.8	96.0	Width of flat rack
	242.9	95.6	Top of maintenance box
Maintenance Unit	241.0	94.9	Sides-retracted
	656.0	258.3	Sides-extended
Outriggers	243.8	96.0	Retracted-overall width
	416.6	164.0	Extended-overall width
	396.2	156.0	Cylinder centerline extended
Crane Hook Clearance	203.2	80.0	Working clearance to outrigger

1-9. EQUIPMENT DATA (CONT).

Table 1-2. Capacities

Item	Specification
Engine Oil w/ Filter	12 qt. (11 L)
Cooling System	5.5 gal. (21 L)
Hydraulic Reservoir w/ Filters	100 qt. (94.6 L)
Radiator	20 qt. (18.9 L)

Table 1-3. Generator Set Engine Configuration

Item	Specification
Make	Cummins Diesel
Model	4B3.9-G2
Type	2 stroke, in line
Cylinders	4
Bore	4.02 in. (102 mm)
Stroke	4.72 in. (120 mm)
Displacement	239 CID (3.9 L)
Aspiration	Naturally aspirated
Oil Filter	
Type	Full flow, spin on
Quantity	1

Table 1-4. Fuel System Configuration

Item	Specification
Type	Diesel injection (electronically controlled)
Tank Quantity	Single
Air Cleaner Type	Element (service indicator)
Element Quantity	1 primary, 1 secondary

Table 1-5. Cooling System

Item	Specification
Radiator Working Pressure	7 psi (48 kPa)

Table 1-6. Generator Set Engine Electrical System

Item	Specification
Voltage	24 dual voltage
Alternator	28 volts
System Amps	145/200
Voltage	14/28
Ground	Neg
Rotation	Reversible
Rpm Rated Output	
Constant	1800
Drive Type	Pulley
RFI Suppression Ability	YES
Batteries	
Number of	2
Voltage (each)	12-volts
Connection	Series - parallel
Capacity (at 20 hour rate)	900 amp
Reserve Capacity	
(each, at 80 degree F (27 degree C))	180 minutes
Cold Cranking Amps	
(each, at 0 degree F (–18 degree C))	575 CCA
Amp Hours	
(each, at 20 hour rate)	100 amp
Starter	24 volts solenoid attached
Control Panel	Detector 12 control

Table 1-7. Generator Set Generator Electrical System

Item	Specification
Frequency	60 HZ
Phase	3–Phase
Rated KW	35.5
Power Factor	0.8
Rated KVA	43.8
Exciter Field	PMG - excited

1-9. EQUIPMENT DATA (CONT).

Table 1-8. Material Handling Crane (MHC)

Item	Specification
Make	Grove
Model	FRS
Maximum Capacity At boom length of 18.4 ft. (5.6 m)	6,500 lb. (2,951 kg)

Table 1-9. Hydraulic Pump

Item	Specification
Make	Parker Hannifin
Pump Model	PVP33
Pressure (Compensator controlled)	
Low Side	325 ± 10 psi
High Side	3100 to 3500 ± 10 psi
Flow	15.6 GPM

Table 1-10. Air System

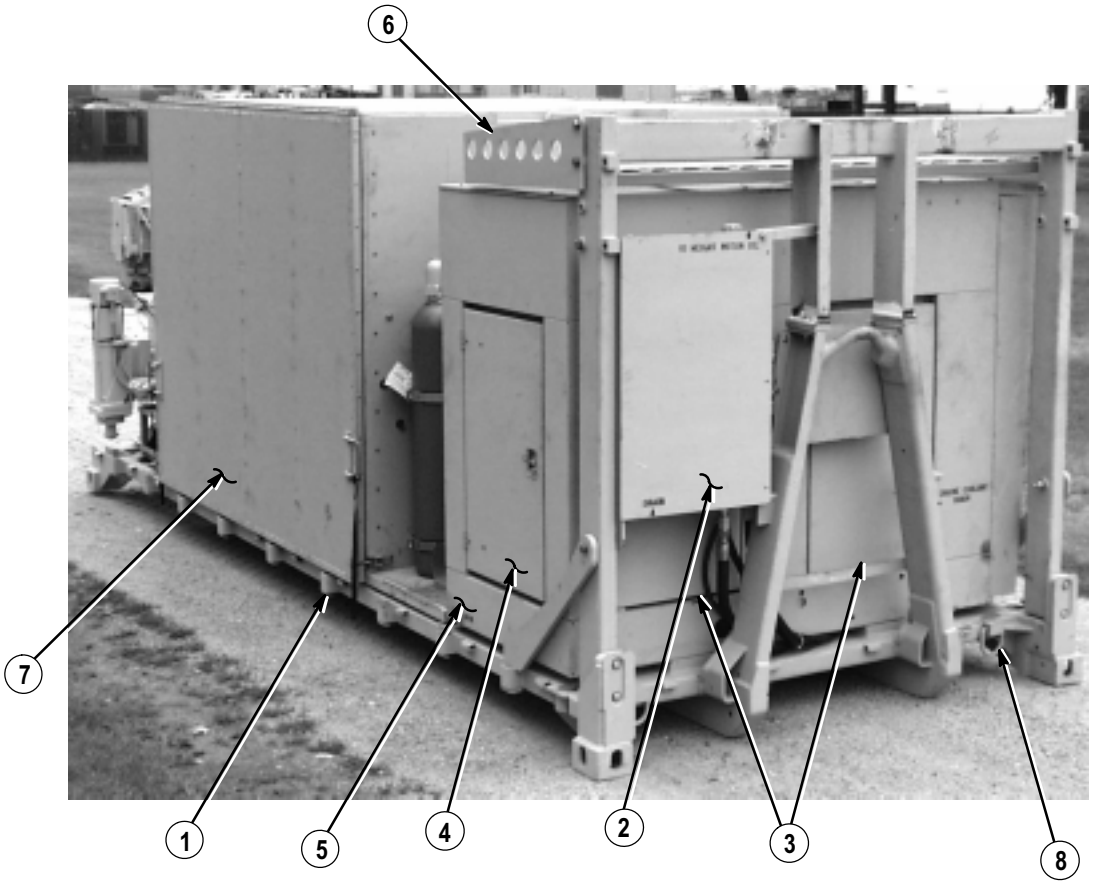
Item	Specification
Air Compressor	
Model	Ingersoll Rand Model 7100
Number of Cylinders	2
Cylinder Configuration	V–type
Motor	15 HP TEFC
Phase	3
Rated	208-230/460V at 60 HZ and 190/380V at 50 HZ

Table 1-11. Heater

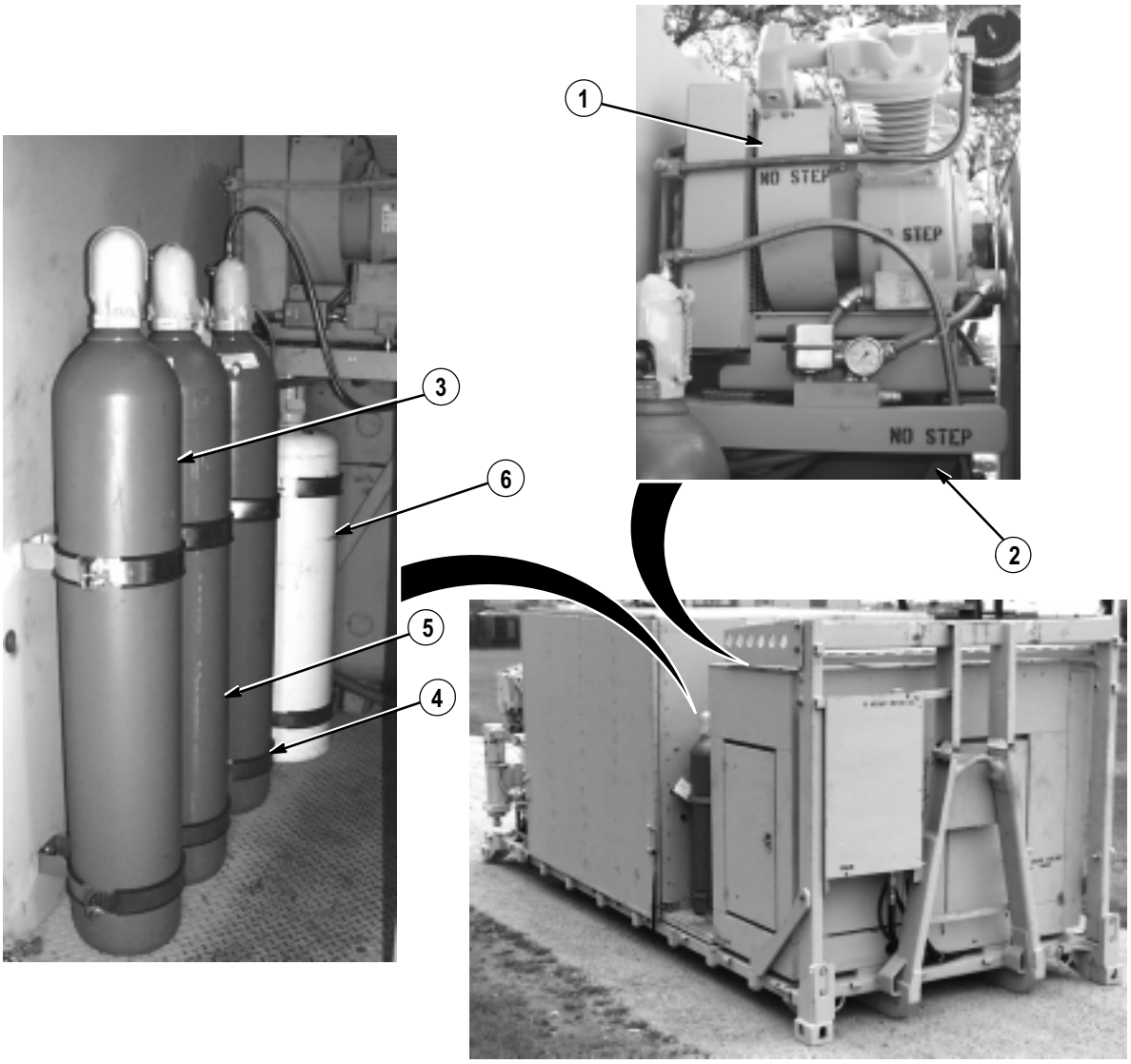
Item	Specification
Heater	Eberspacher
Model	D8LC
Heating Medium	Air
Fuel	Diesel
Voltage	24V
Electrical Power Consumption	
Start	335W ± 10%
Operation	115W ± 10%
Regulation of heat	High/Low/Off
Heating Capacity	
High	8000W ± 10%
Low	3500W ± 10%

1-10. LOCATION AND DESCRIPTION OF MAJOR COMPONENTS.

Major components and accessories found on the FRS are illustrated and described below.

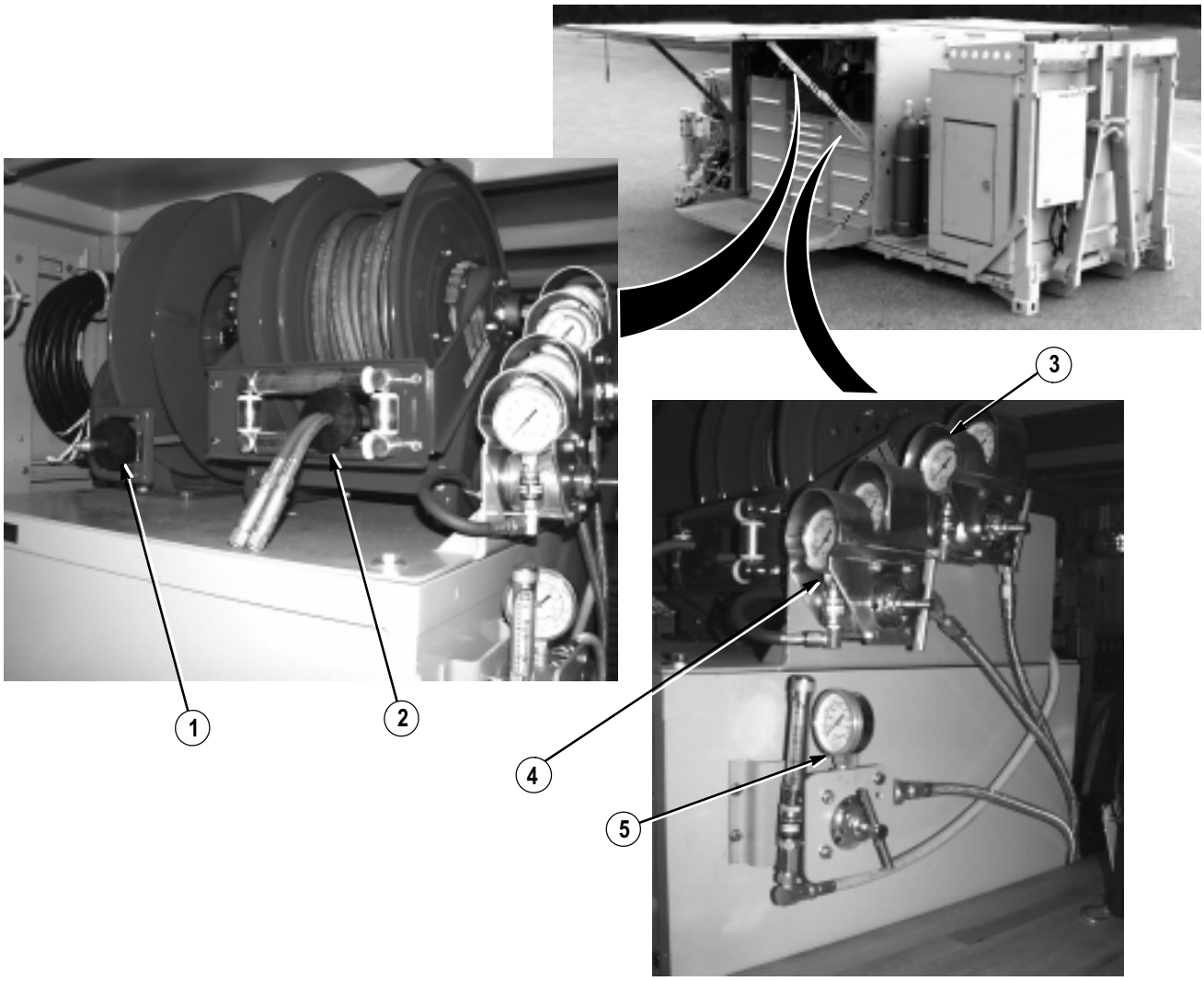


1. **GENERATOR SET.** Engine supplies power for the generator and the hydraulic pump. Generator supplies power for lights and operation of tools, equipment and accessories.
2. **HYDRAULIC TANK.** Stores 25 gallons of oil for MHC crane.
3. **GENERATOR SET ACCESS PANELS.** Provides access to generator, engine, batteries and hydraulic pump.
4. **GENERATOR SET CONTROL ACCESS DOOR.** Provides access to generator and engine controls, master disconnect switch, fuel tank and grounding rod.
5. **FUEL TANK.** Stores 28 gallons of fuel used to operate engine and heater and allows 8.5 hours of running time (without heater operation).
6. **BUSTLE RACK.** Use to stow excess items.
7. **SHELTER ACCESS DOOR (RIGHT).** Provides protection from weather and access to welding, air and accessory tools.
8. **FLATRACK ASSEMBLY.** Is a flat cargo body used as a lifting point for securing the FRS during all modes of transportation and during all specified load/unload operations.

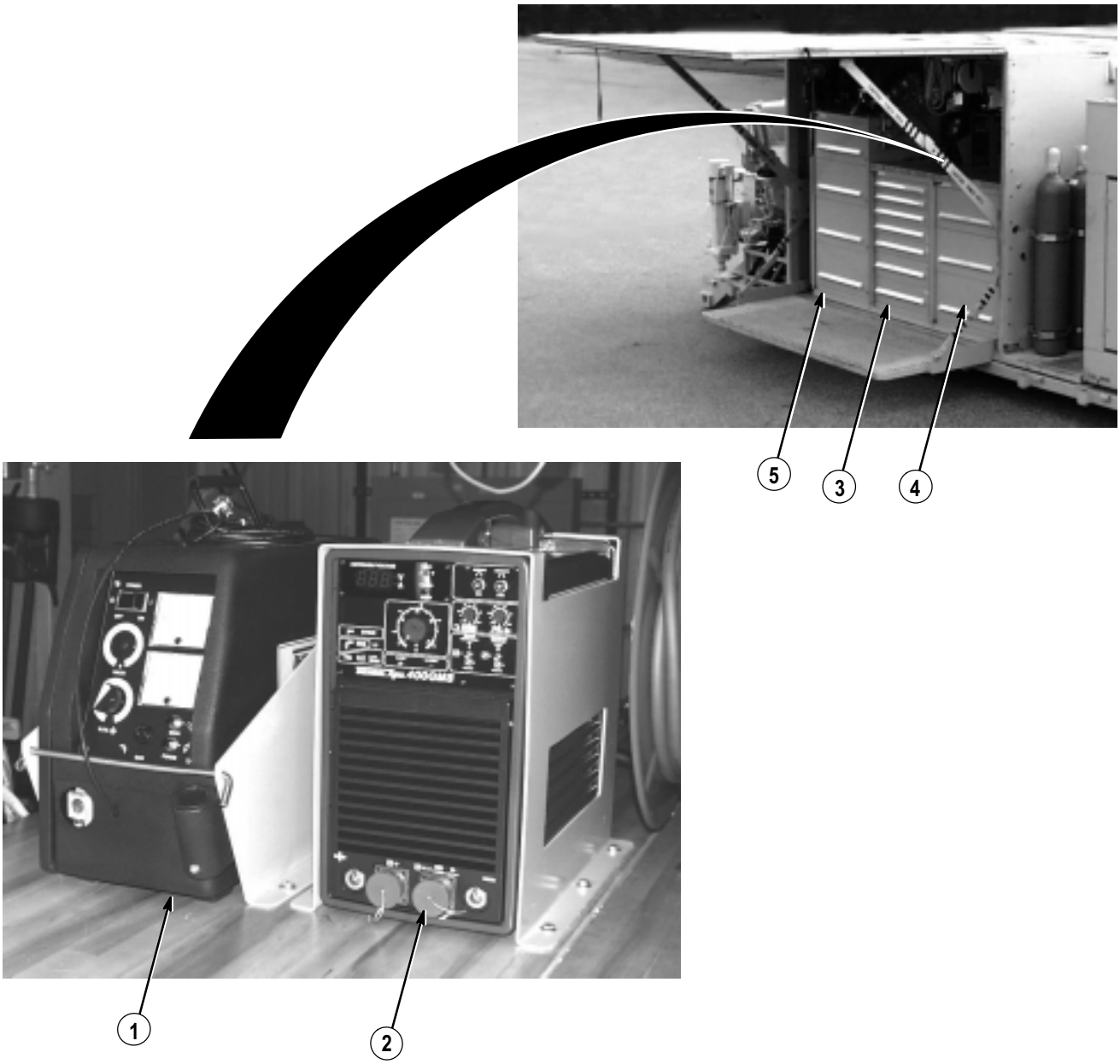


1. **AIR COMPRESSOR.** Provides up to 175 psi of regulated compressed air to power pneumatic tools and other air operations.
2. **AIR RESERVOIR.** Is a 80 gallon air storage tank, receives air from air compressor (or external source) and stores air for pneumatic tools and other air operations.
3. **NITROGEN BOTTLE.** Used for purging sight assemblies on combat vehicles.
4. **OXYGEN BOTTLE.** Part of the oxygen-propylene outfit, burned with proyplene for heating, welding and cutting tasks.
5. **ARGON BOTTLE.** Part of the MIG welding outfit, used as shielding gas through the MIG welding gun.
6. **PROPYLENE BOTTLE.** Part of the oxygen-propylene outfit, burned with oxygen for heating, welding and cutting tasks.

1-10. LOCATION AND DESCRIPTION OF MAJOR COMPONENTS (CONT).

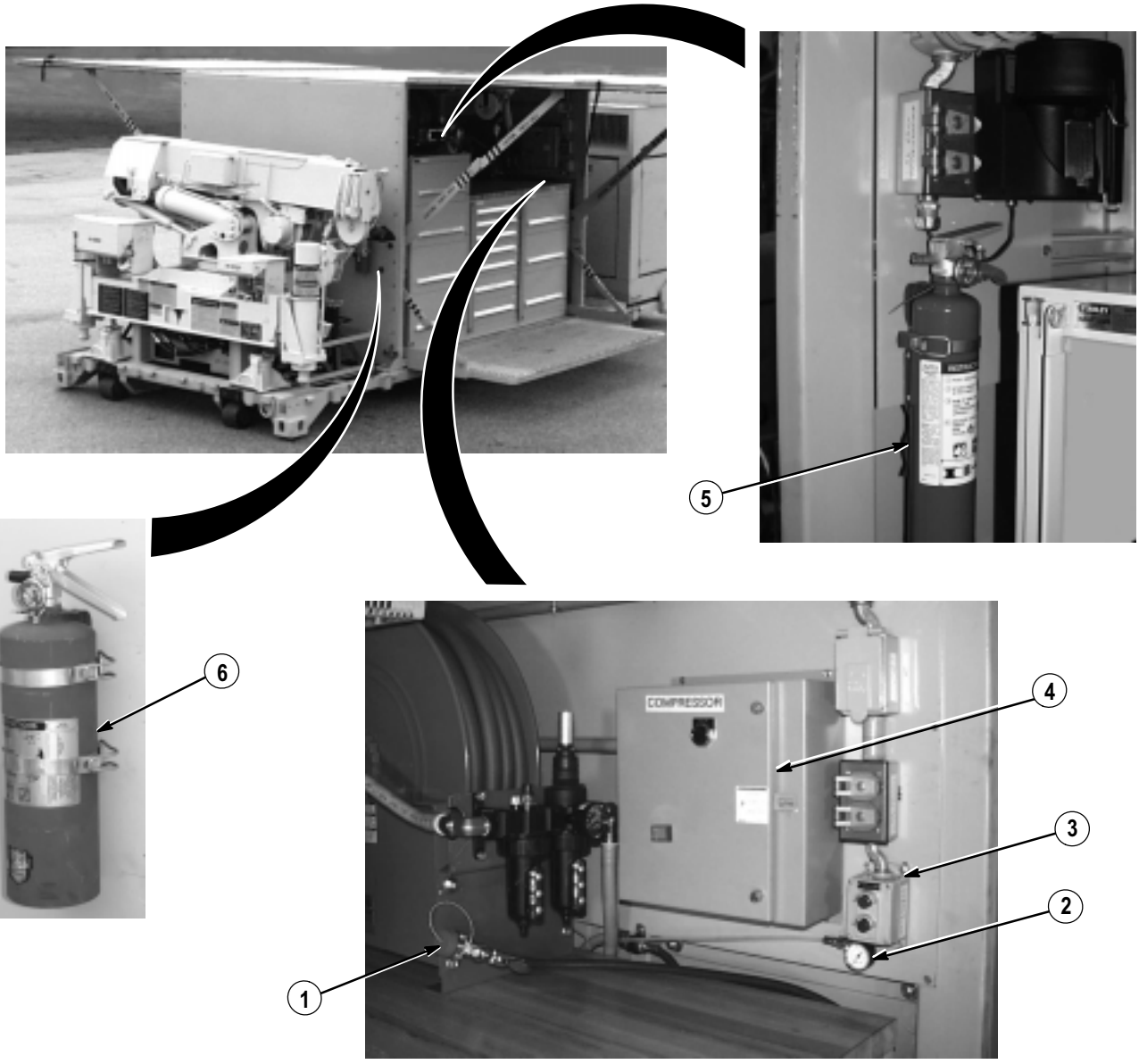


1. **ARGON HOSE REEL.** Holds 50 feet of 3/8 in. ID hose, used to supply MIG welder with argon gas.
2. **OXYGEN-PROPYLENE HOSE REEL.** Holds 50 feet of 1/4 in. ID twin hoses, used to supply a welding torch or a cutting torch with oxygen and propylene gas.
3. **PROPYLENE GAS REGULATOR.** The propylene regulator is a two stage regulator. The high pressure gage, the inlet side, shows the pressure from the cylinder and is graduated from 0 to 400 psi. The low pressure gage, the outlet side, shows the working pressure and is graduated from 0 to 30 psi.
4. **OXYGEN GAS REGULATOR.** The oxygen regulator is a two stage regulator. The high pressure gage, the inlet side, shows the pressure from the cylinder and is graduated from 0 to 4000 psi. The low pressure gage, the outlet side, shows the working pressure and is graduated from 0 to 200 psi.
5. **ARGON GAS REGULATOR**. The low pressure flowmeter, the outlet side, provides 0–4000 psi and it provides better gas flow control for working pressure than a regulator. The flowmeter is calibrated in cubic feet per hour (cfh). The correct flow of argon to the torch is set by turning the adjusting screw on the regulator. The rate of flow depends on the kind and thickness of the metal to be welded.

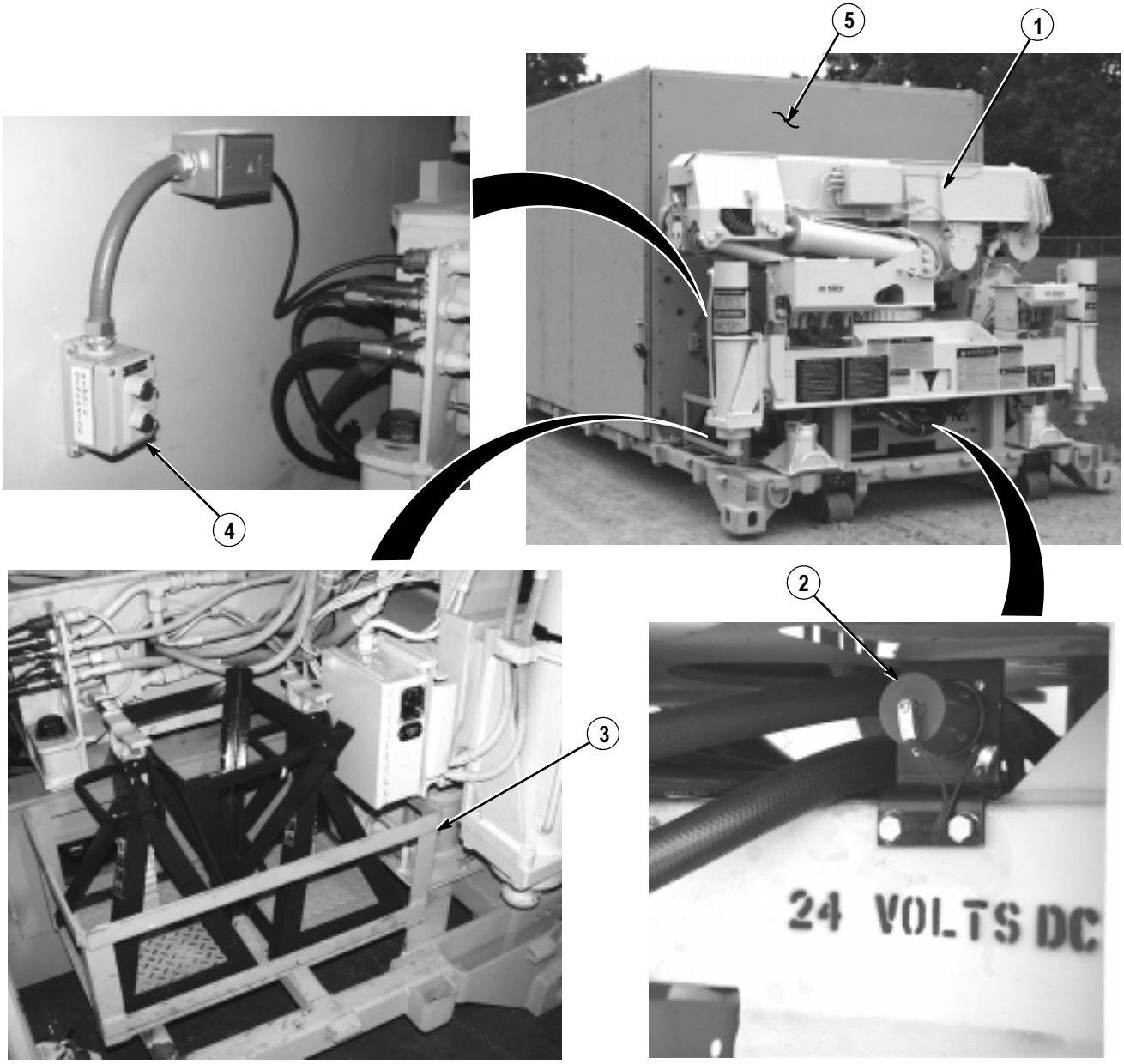


1. **MIG WELDER.** Gas metal-ARC (MIG) welder is designed for manual welding with small diameter wire electrodes fed into a weld at a controled rate of speed.
2. **STICK (SHIELDED METAL ARC WELDING [SMAW]) WELDER.** Stick (SMAW) welder is a three-phase DC arc welding power source with Constant Current (CC) output and Constant Voltage (CV) output characteristics and a digital panel meter.
3. **WELDERS STORAGE CABINET.** Holds tools and material used to support welding operations by the FRS.
4. **BULK STORAGE CABINET.** Holds bulk material used to support maintenance operations by the FRS.
5. **TOOL STORAGE CABINET.** Holds tools used to support maintenance operations by the FRS.

1-10. LOCATION AND DESCRIPTION OF MAJOR COMPONENTS (CONT).

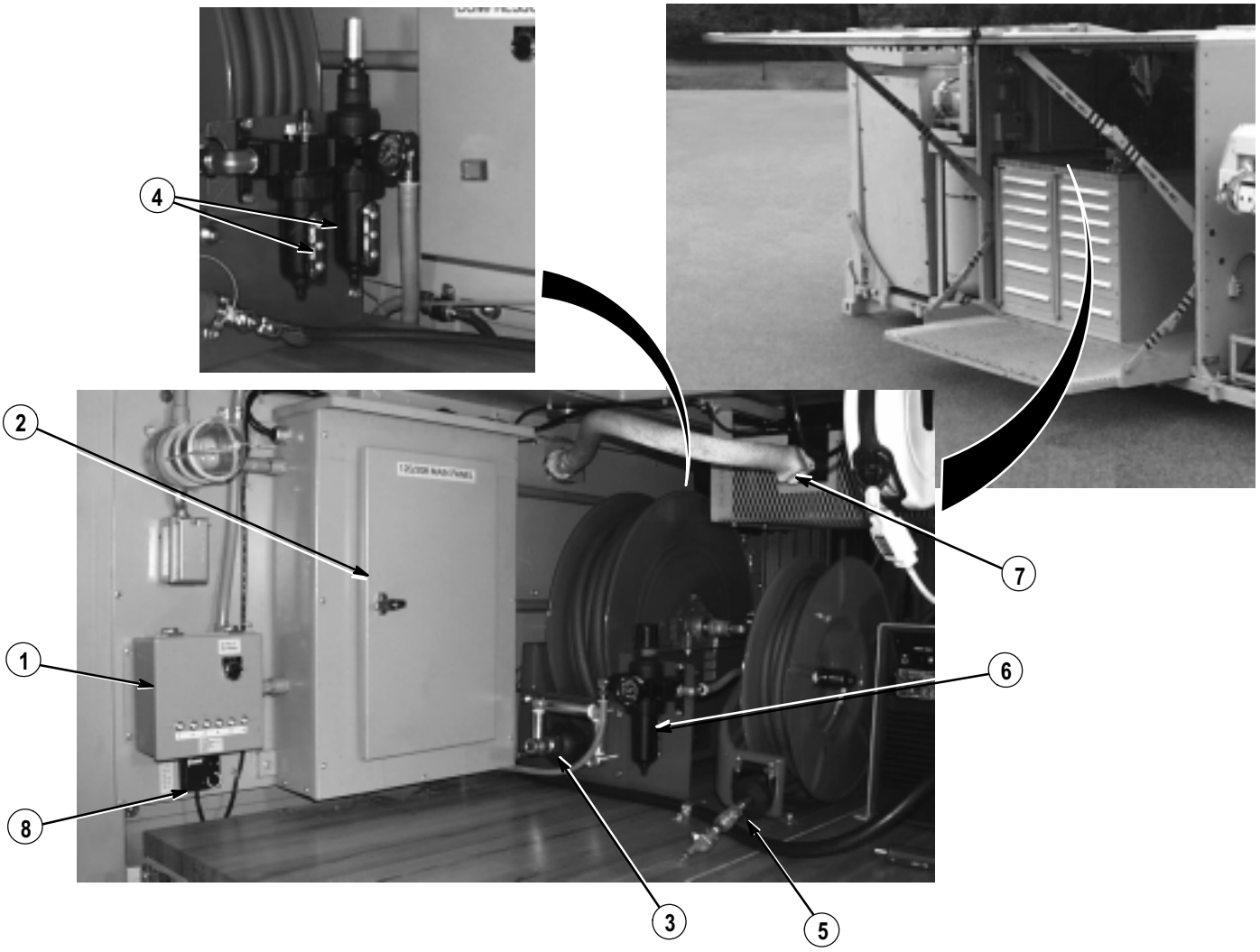


1. **EYE WASH FOUNTAIN SPRAY HANDLE.** Used as an emergency measure to flush contaminated area with water.
2. **EYE WASH FOUNTAIN PRESSURE GAGE.** Valve is used to fill eye wash fountain tank with clean compressed air to 95 P.S.I. (not to exceed 110 P.S.I.) as indicated on eye wash fountain pressure gage.
3. **REMOTE START SWITCH.** Used by crew to start or stop generator set from the inside right front of shelter.
4. **AIR COMPRESSOR CONTROL BOX.** Turns air compressor ON and OFF. Air compressor control boxhas a built in overload reset button.
5. **FIRE EXTINGUISHER.** Used in an emergency to extinguish a fire and is located inside right and left rear wall of shelter.
6. **FIRE EXTINGUISHER.** Used in an emergency to extinguish a fire and is located on the outside right rear of shelter for easy access from outside of shelter.

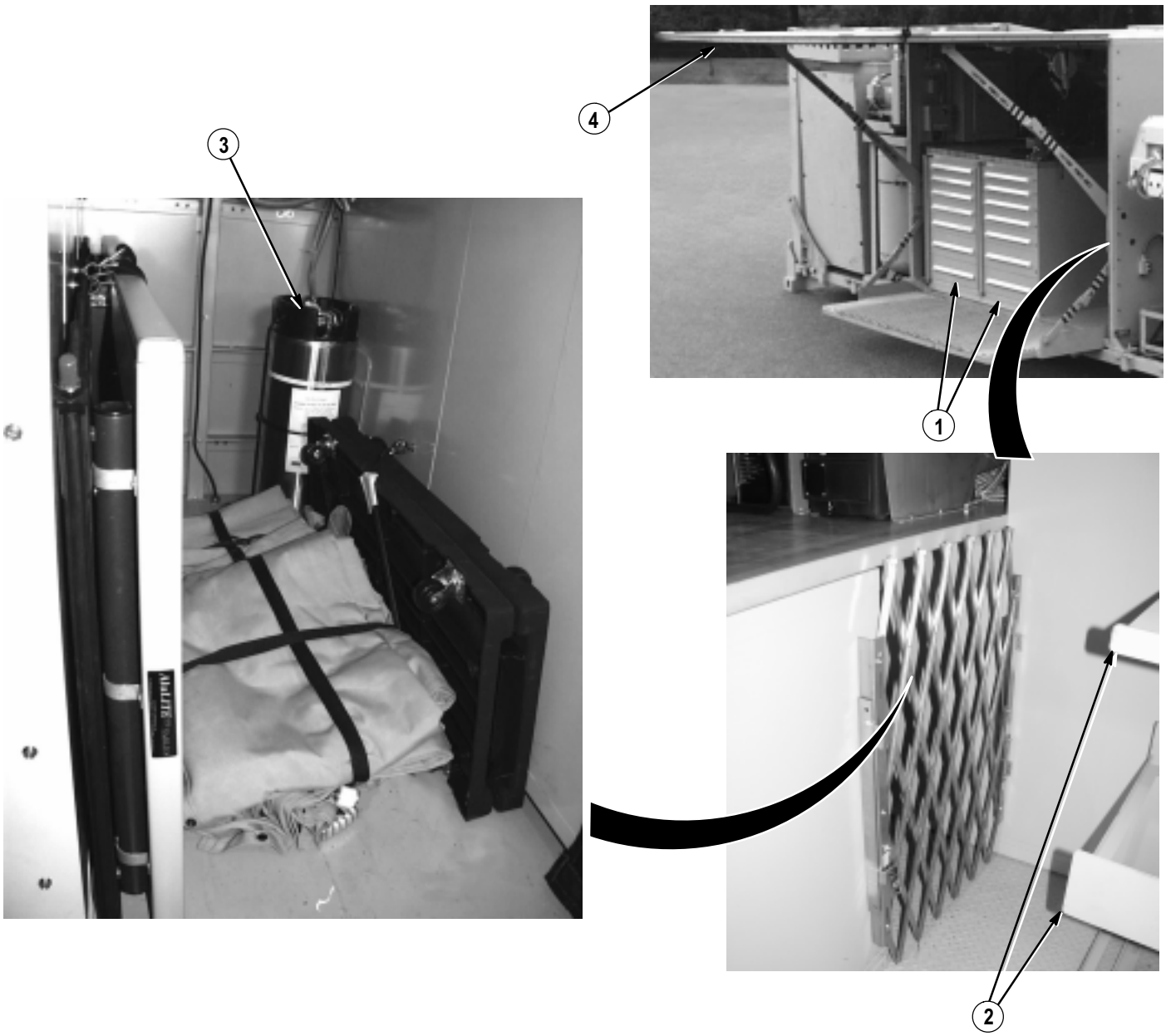


1. **MATERIAL HANDLING CRANE (MHC).** Used for lifting material during maintenance operations for the FRS.
2. **NATO TYPE 24 VDC (2 EACH) POWER RECEPTACLE.** Provides capability to receive or transfer power from an outside source.
3. **JACKSTAND-TRESTLE STORAGE BOX.** Used to stow three trestles (seven ton capacity), one trustle storage box located on left and right side of crane.
4. **REMOTE START SWITCH**. Used by crew to start or stop generator set from outside left rear of shelter.
5. **SHELTER ASSEMBLY.** Provides storage and protection from weather for tools and equipment supplied with the FRS.

1-10. LOCATION AND DESCRIPTION OF MAJOR COMPONENTS (CONT).



1. **24 VOLT DC PANEL.** Controls 24 VDC power for crane, dome lights, heater and portable flashlights.
2. **120/208 VOLT AC MAIN PANEL.** Controls 120 VAC power for recepticles, reel lights and fixed lighting system. Controls 208 VAC power for welder and air compressor.
3. **PNEUMATIC AIR HOSE REEL.** Holds 50 feet of 3/4 in. hose, used to supply air for general use.
4. **PNEUMATIC AIR REGULATOR/WATER SEPARATOR AND LUBRICATOR.** Filters air and controls air pressure to pneumatic tools. The lubricator adds oil to the air supplied to pneumatic tools.
5. **GENERAL AIR HOSE REEL.** Holds 50 feet of 3/8 in. hose, used to supply air for general use.
6. **GENERAL AIR REGULATOR/WATER SEPARATOR.** Filters air and controls air pressure for general use.
7. **SHELTER HEATER.** The shelter heater is a diesel-fueled air heater mounted on the inside front center ceiling of shelter.
8. **SHELTER HEATER CONTROL.** Controls the operation of shelter heater, has on-off switch, temperature control dial, red operating light and green diagnostic light.



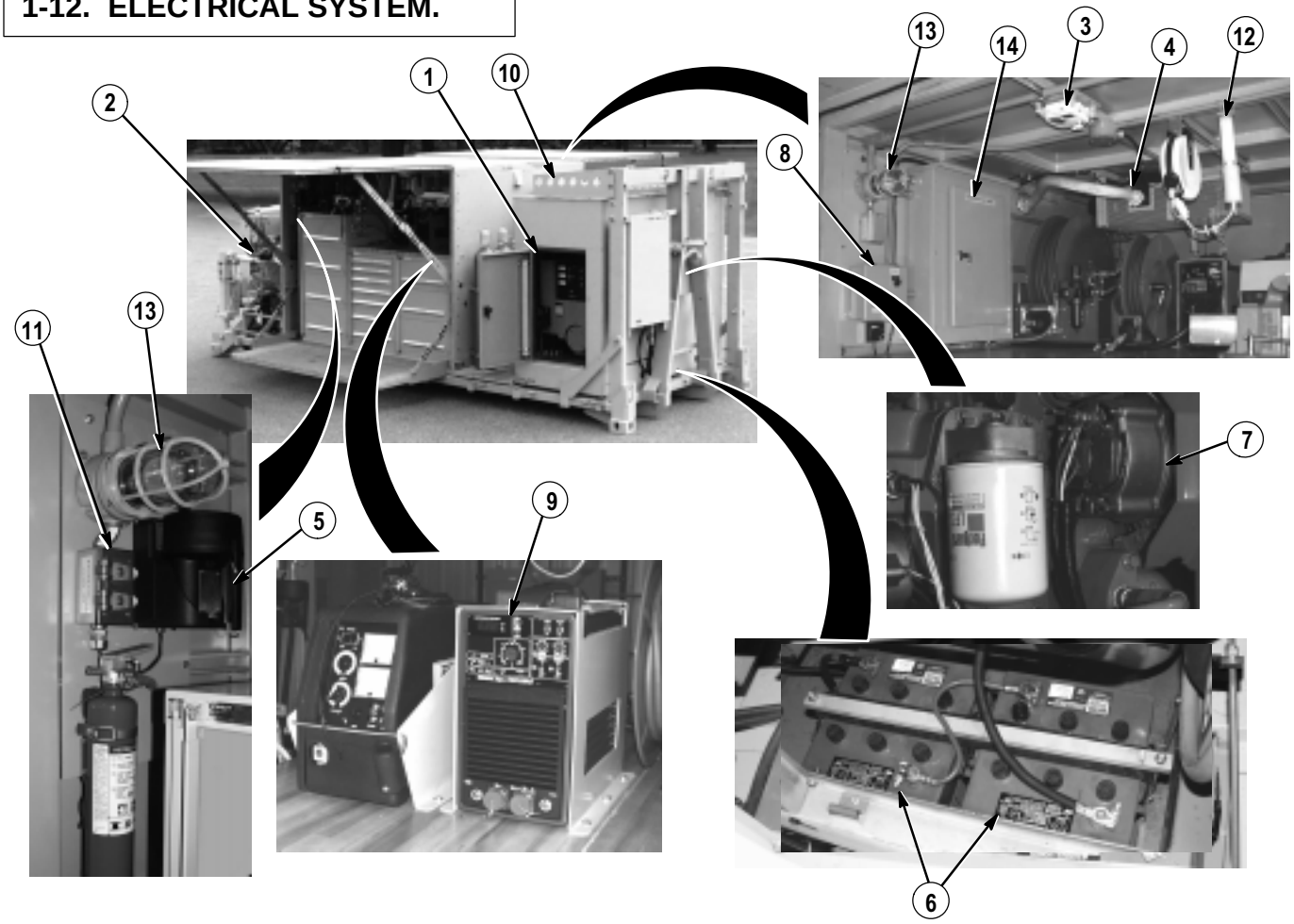
1. **TOOL CABINETS.** Holds tools used to support maintenance operations by the FRS.
2. **TOOL BOX STORAGE RACK.** Used to store general mechanics tool kits.
3. **EYE WASH FOUNTAIN TANK.** Stores water that is pressurized to 95 psi, used for emergency measures to flush the contaminated area.
4. **SHELTER ACCESS DOOR (LEFT).** Provides protection from weather and access to welding, air and accessory tools.

Section III. PRINCIPLES OF OPERATION

1-11. SYSTEMS INTRODUCTION.

This section provides a basic explanation of major systems on the FRS. Detailed operation information is provided in Chapter 2.

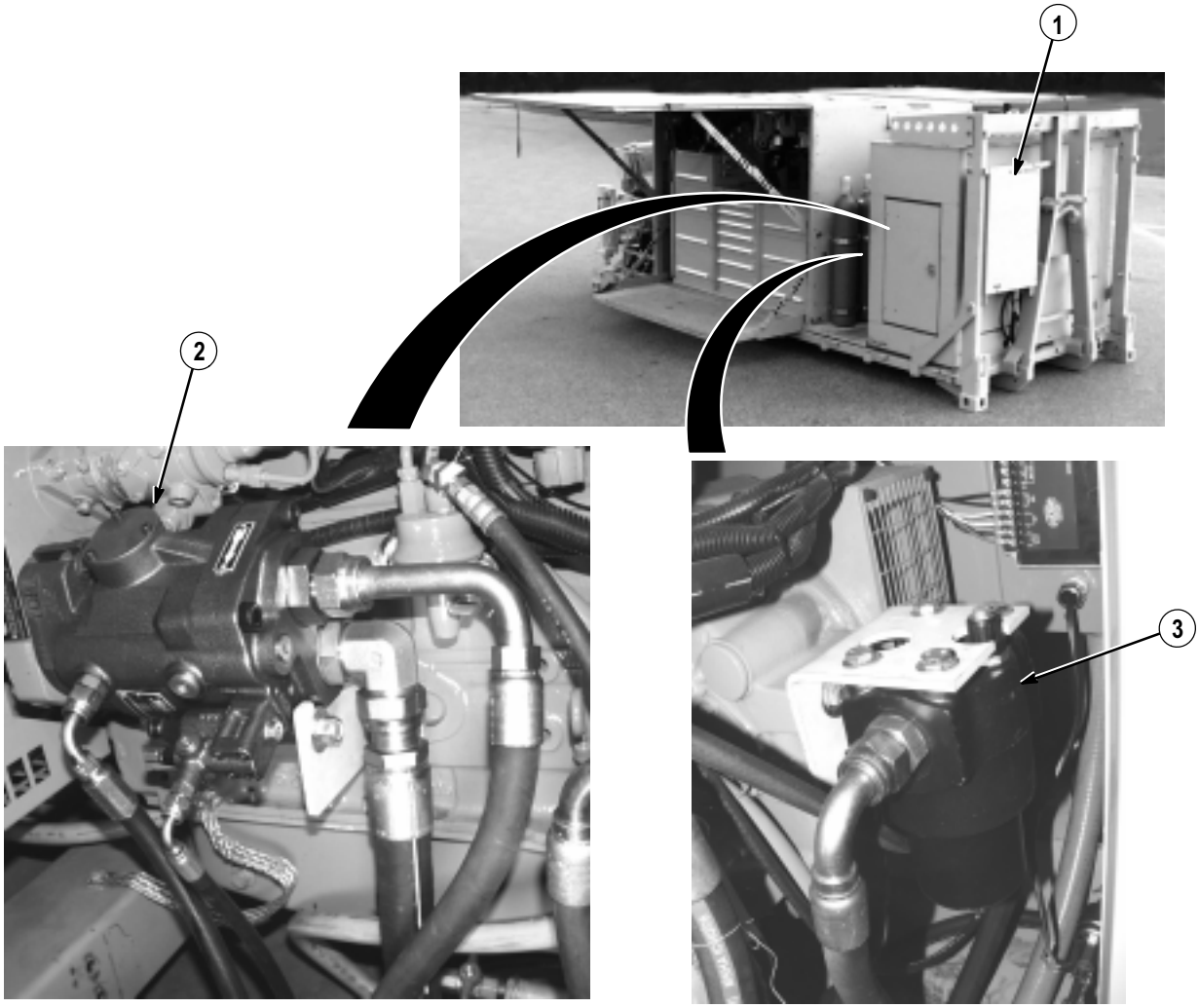
1-12. ELECTRICAL SYSTEM.



The electrical power for the FRS unit is provided by a 35KW Generator Set (1). The electrical system is composed of a 24 VDC system and 120/208 AC system. The 24 VDC system provides electrical current for the crane (2), domelights (3), heater (4) and portable flashlights (5). Electrical power for the 24 VDC system is provided by two 12 volt series connected batteries (6). The alternator (7) on the engine of the generator set maintains battery charging and equipment operation. Manual resetting circuit breakers are used for the different systems. Circuit breakers are located in the 24 VDC control panel (8) inside shelter of the FRS.

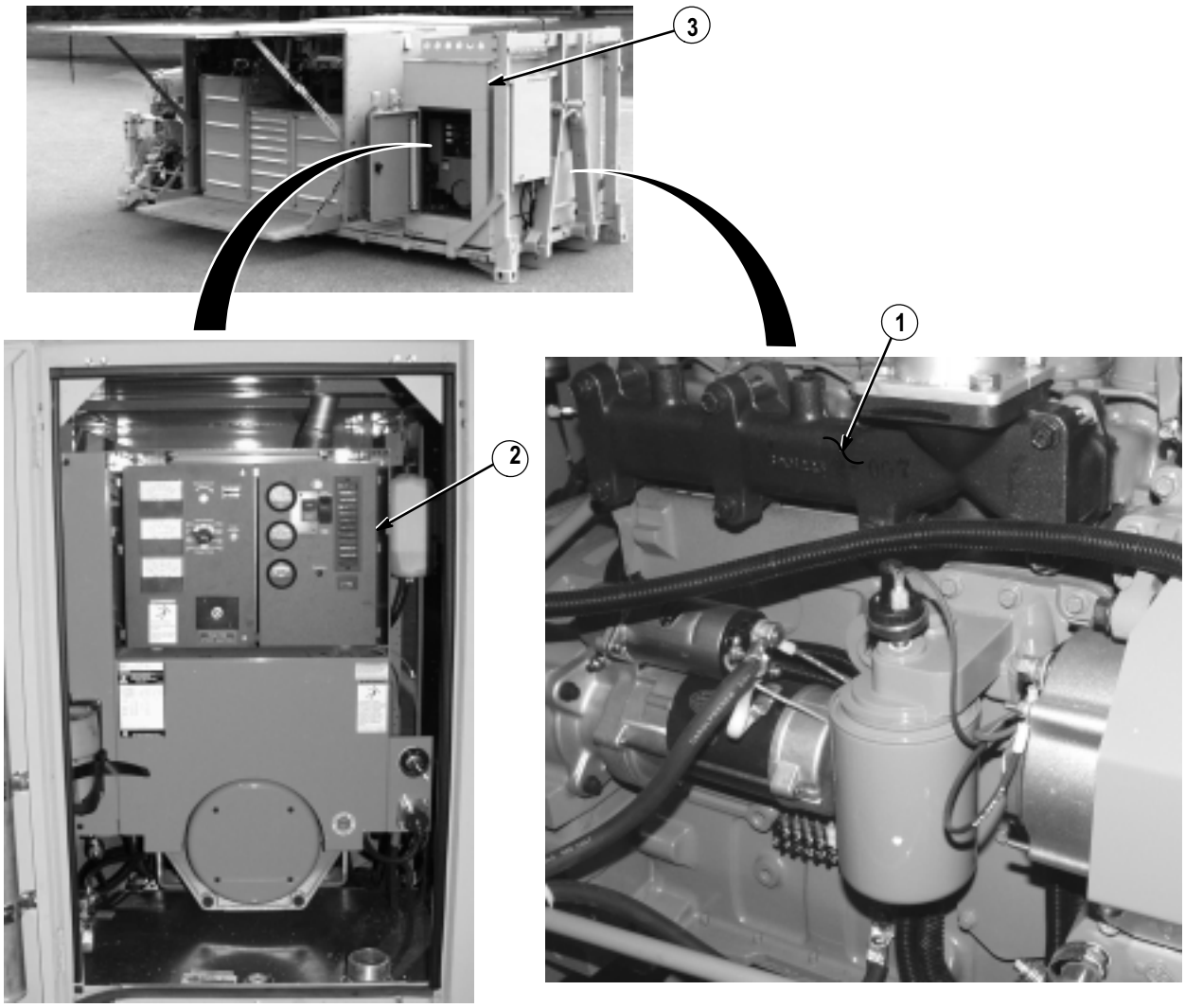
The 120/208 VAC system provides power for the welder (9), air compressor (10), 110 receptacles (11), reel lights (12) and fixed lighting system (13). Electrical power for the 120/208 VAC system is provided by the 35KW generator set which is powered by a 239 cubic inch (3.9 L) diesel engine. Circuit breakers for the 120/208 VAC system are located in main panel (14) inside shelter of the FRS.

1-13. HYDRAULIC SYSTEM.



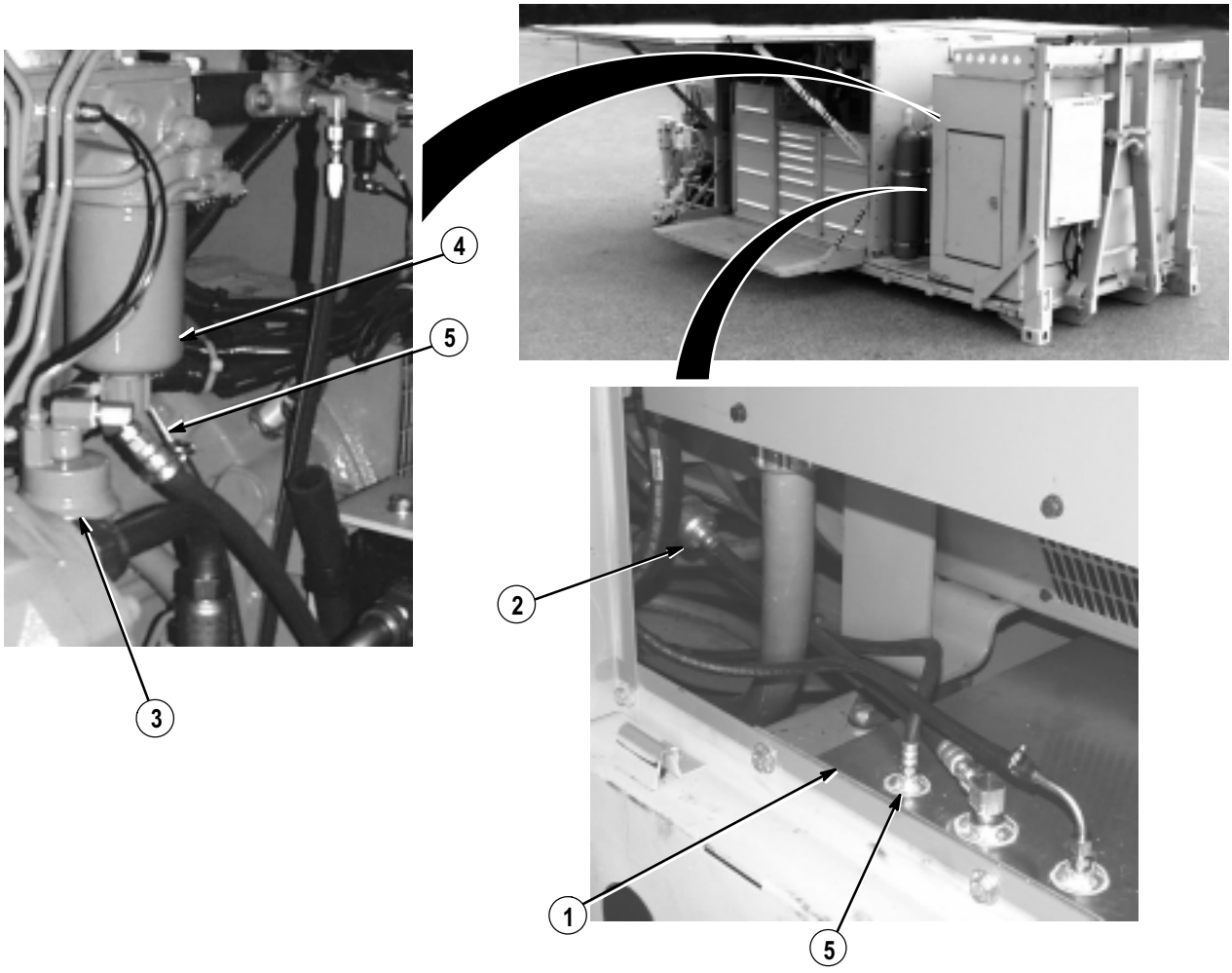
The hydraulic reservoir (1) holds 25 gallons of hydraulic fluid used during operation of the crane. Hydraulic fluid is drawn from the hydraulic reservoir to the hydraulic pump (2) through the hydraulic filter (3). The hydraulic pump is mounted on left front side of the engine. It provides hydraulic pressure for the crane hydraulic system.

1-14. GENERATOR ENGINE SET.



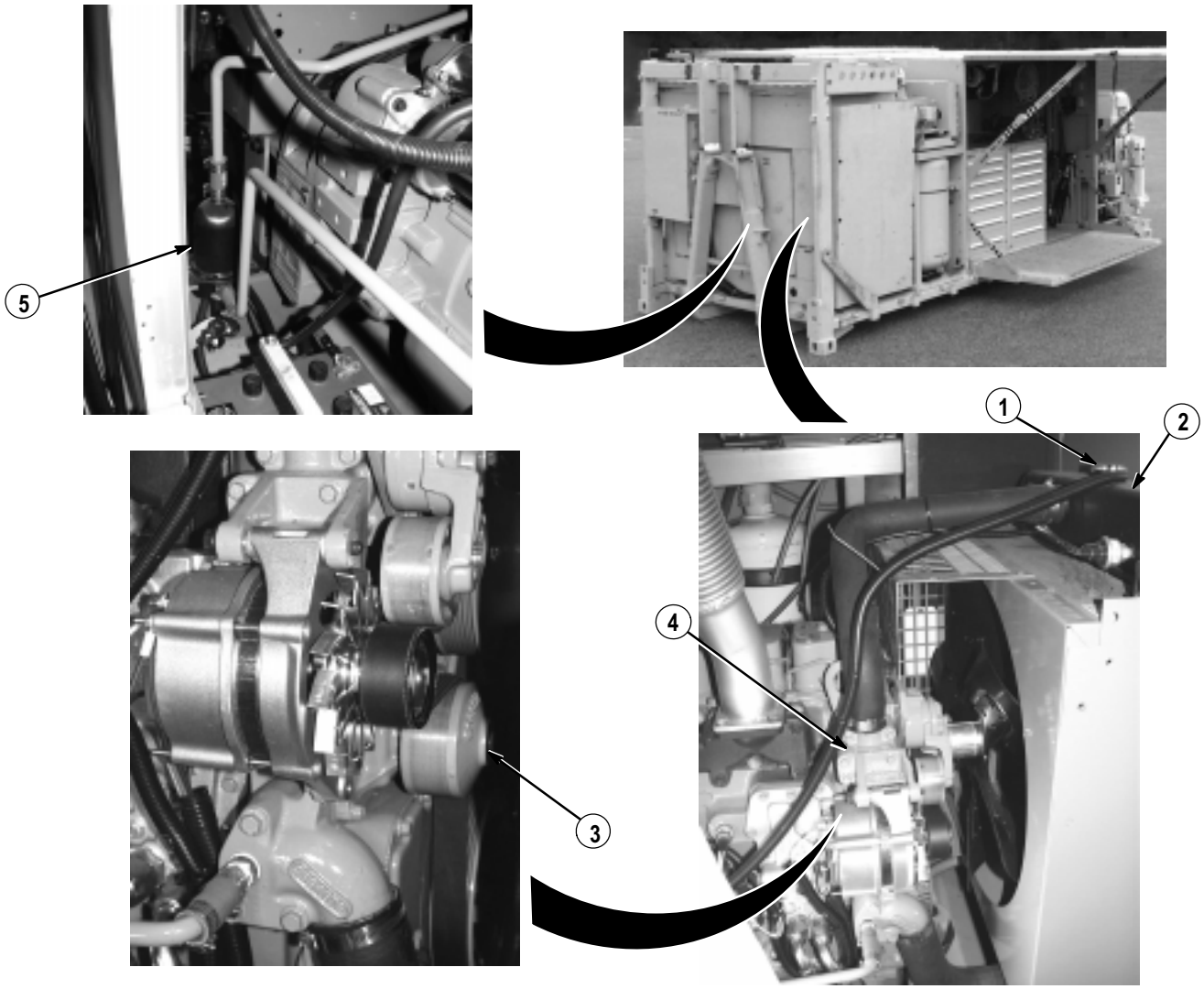
The FRS is equipped with a 4 cylinder, in-line 239 cubic in. (3.9 L) diesel powered engine (1), standby generating system, 35KW/44 KVA, continuous standby, 120/208 VAC, 0 three phase (broad range), 60Hz, 1800RPM. The engine contoller (2) is unit mounted. The engine is mounted in the weather protective housing (3).

1-15. GENERATOR FUEL SYSTEM.



Fuel is pumped from fuel tank (1), passes through a primary fuel filter (2) to a mechanical fuel pump (3). From the fuel pump, fuel is pumped through the secondary fuel filter (4) to the engine. Excess fuel from the engine is returned to the fuel tank through the return line (5). The primary fuel filter removes large solid particles from the fuel. The smaller particles are removed by the secondary fuel filter before they can enter the engine fuel injectors.

1-16. COOLING SYSTEM.



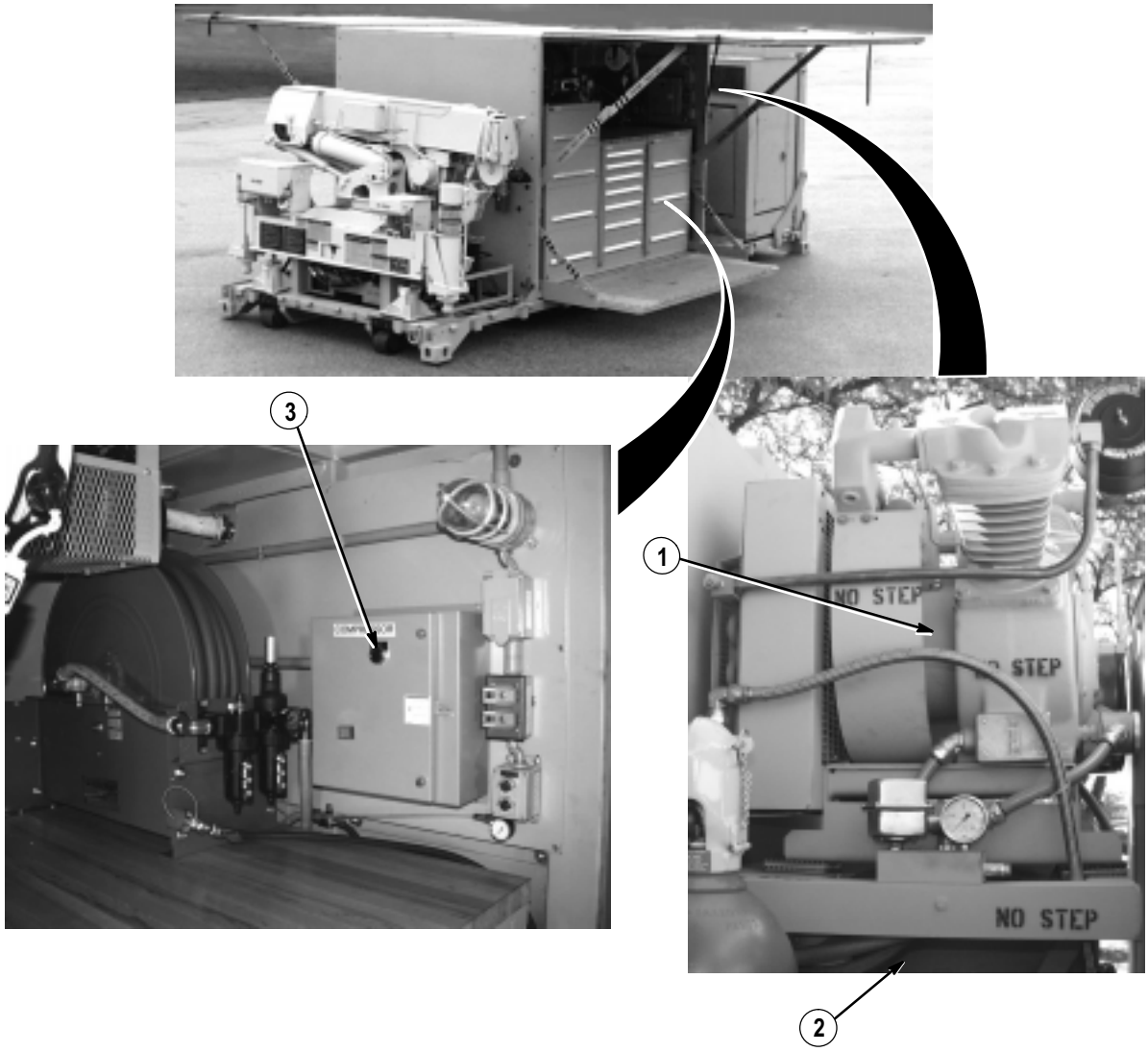
a. Cooling System.

The pressure-type cooling system protects the engine by removing the heat generated during combustion process. Pressure within the cooling system is limited by a pressure release in the radiator filler cap (1). The hot coolant flows from the engine to the radiator tank (2) and through the radiator core where a stream of air removes heat. This stream of air is blown through the core by the fan. The water pump (3) draws coolant from the radiator and pushes it through the engine, repeating the cooling process. Thermostat (4) mounted on the coolant outlet elbow, remains closed until the coolant approaches 180° – 185°F (82°C – 85°C), when it opens. When coolant temperature drops below thermostat rating, the thermostat closes.

b. Engine Block Heating System (Cold Operations Below 15° F (–9° C)).

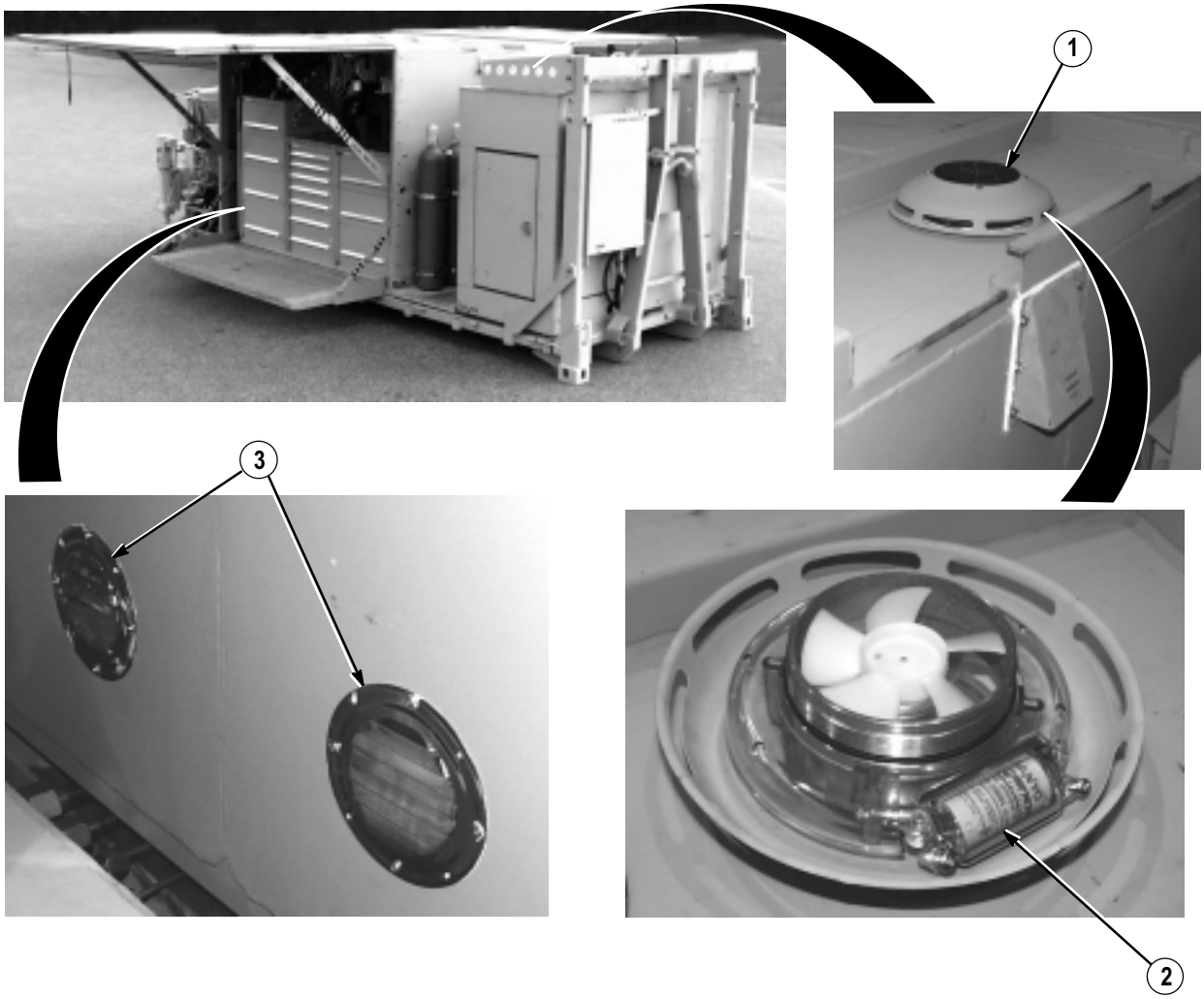
A coolant tank heater (5) is used to keep the engine coolant warm when the engine is shut down. It heats and circulates the coolant within the engine. This reduces startup time and lessens engine wear caused by cold starts. It is electrically operated and thermostatically controlled (ON at 70°F (21°C) and OFF at 100°F (38°C)). Heater operates when connected to a 110 VAC.

1-17. AIR COMPRESSOR SYSTEM.



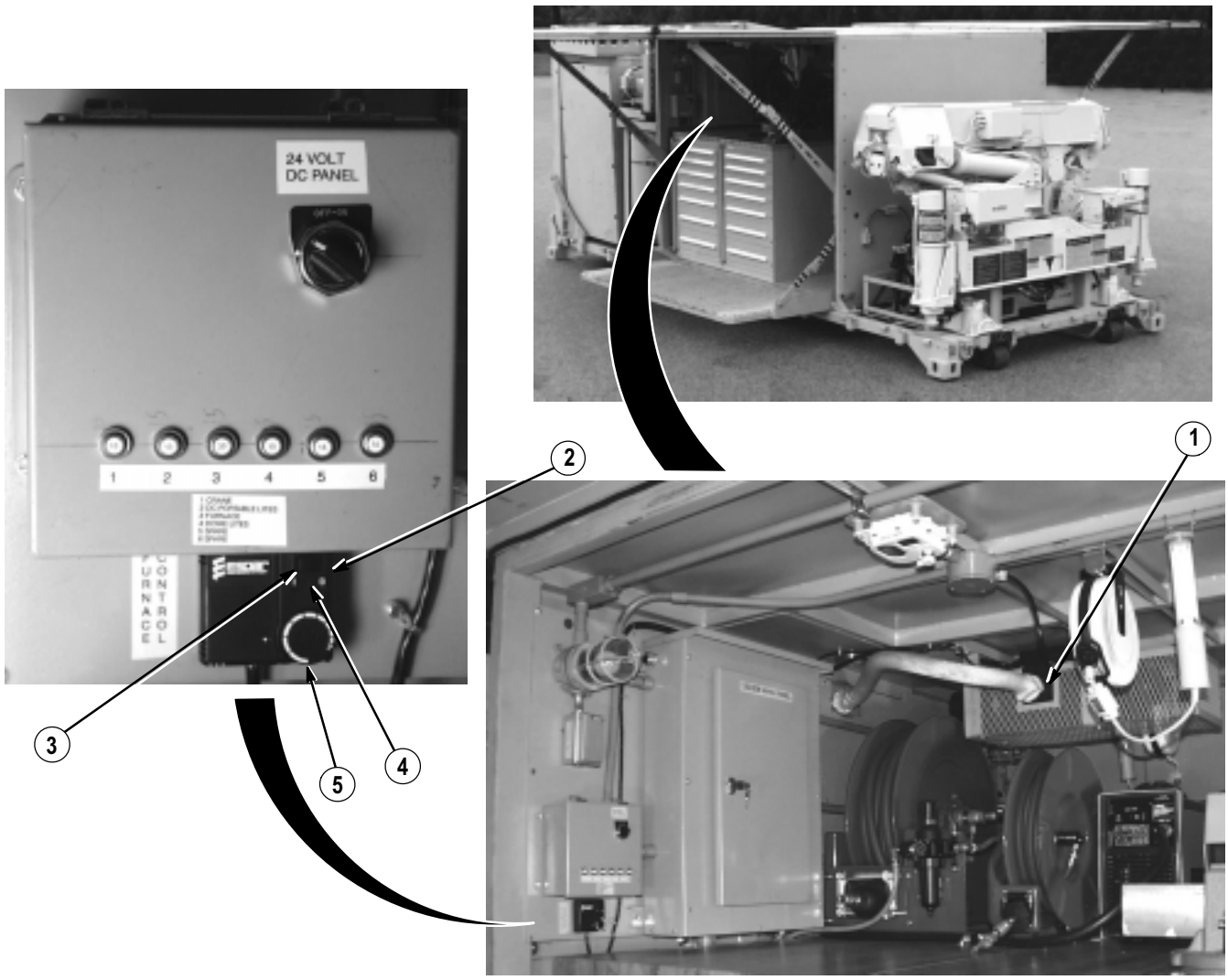
The air compressor system consists of air compressor (1) and a 80 gallon air reservoir (2). It can provide up to 175 psi of regulated compressed air to power pneumatic tools and any other operation. The air compressor is driven by 208 volt three phase electrical motor which can be manually controlled by a switch (3) located inside the shelter.

1-18. SOLAR AIR VENT.



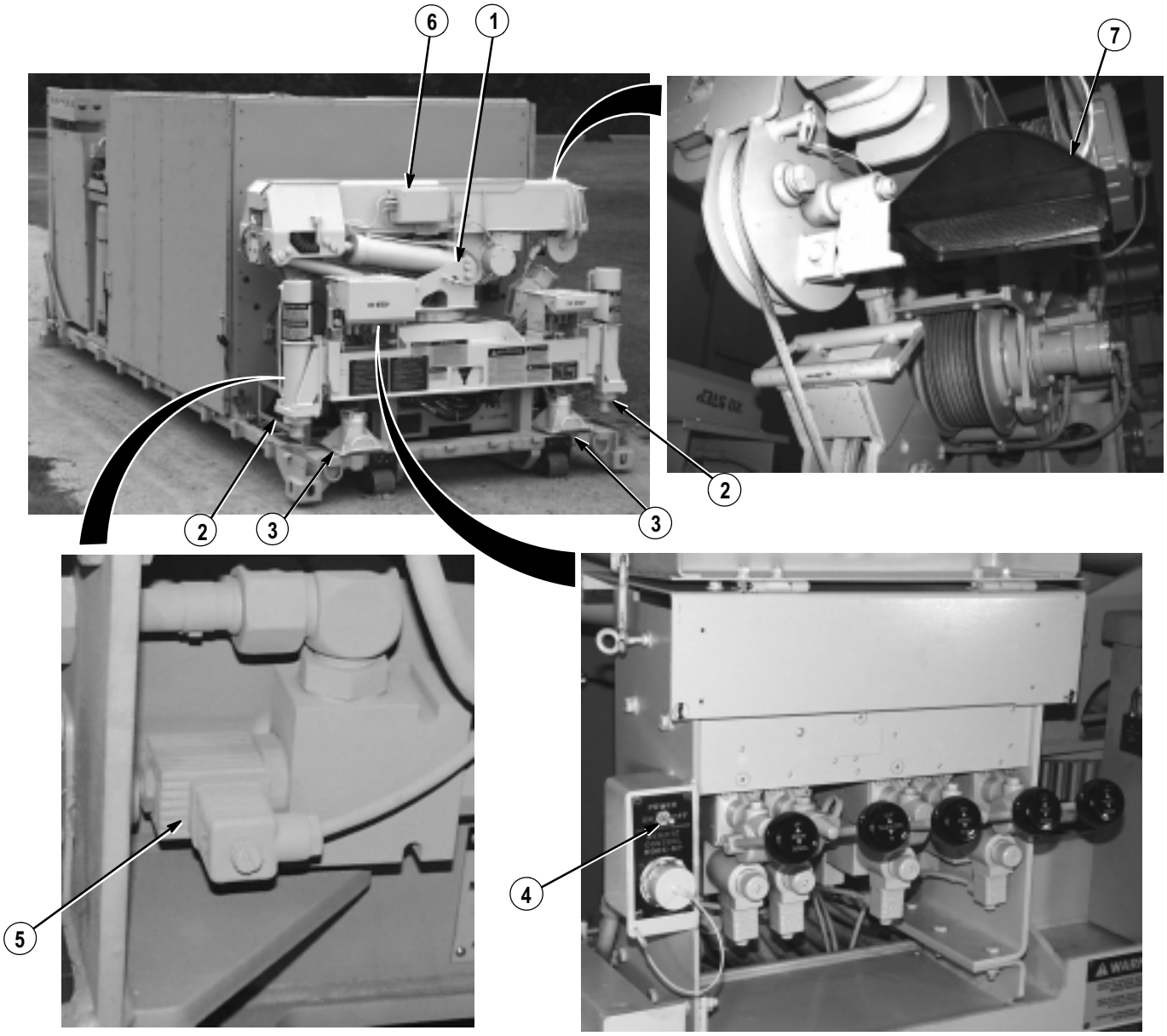
The solar air vent (1) combines solar cell technology with a standard Ni-Cad battery (2) to provide round-the clock ventilation. Air is drawn in two vents (3) on rear wall of shelter and exhausted through solar air vent. The solar air vent is used to equalize the humidity level inside and outside the shelter to reduce condensation buildup.

1-19. SHELTER HEATER.

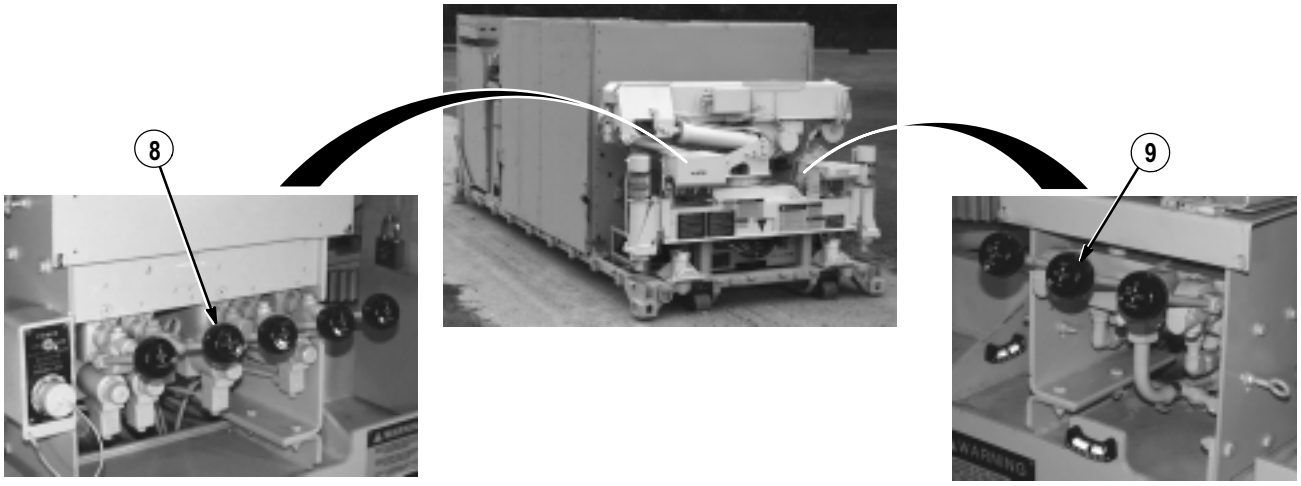


The shelter heater (1) is a diesel-fueled air heater, 24 VDC system. Controlled by a thermostat with ON/OFF switch (2), red operating light (3) and green diagnostic light (4). The thermostat control dial (5) has a variable setting of approx. 50° F to approx. 85° F.

1-20. CRANE.



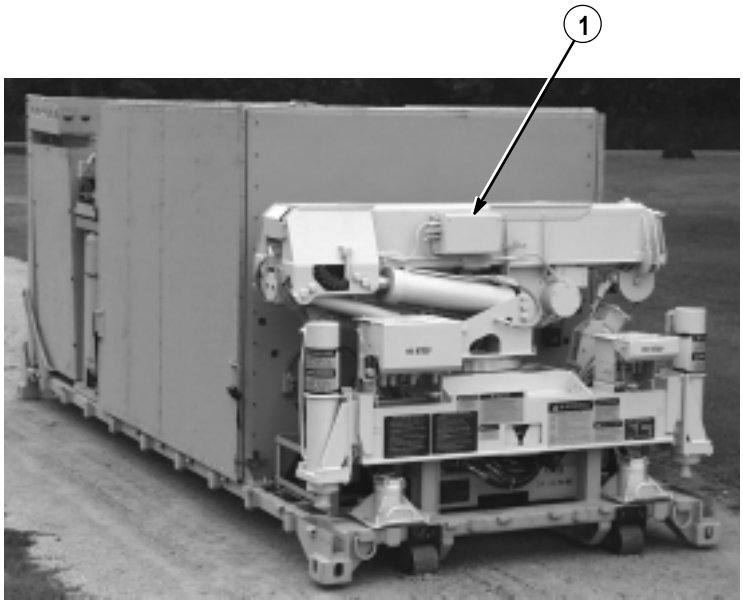
a. Crane. The FRS crane (1) is fully hydraulic and is powered by the FRS hydraulic system. The boom can rotate 300 degrees. The crane is capable of lifting up to 10,000 lbs. (4,534 kg) load at a 14 ft. (4.3 m) radius. The FRS stability and leveling is accomplished with the left and right side hydraulically operated outrigger jacks (2). The outrigger pads (3) are attached to the outrigger jacks by means of retaining pins and are stowed on the crane base. The pads swivel 360 degrees when installed on the jacks. The crane is energized by turning power ON/OFF switch (4) to ON supplying electrical power to the hydraulic system solenoid (5) and the overload shutdown system (6). The boom light (7) is powered directly from the FRS unit and works independently from the crane power.

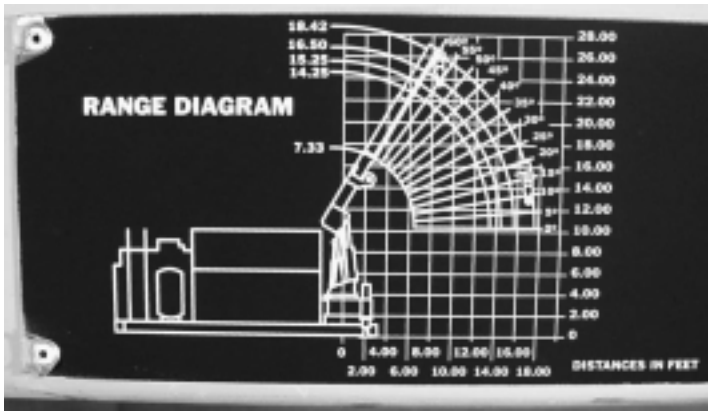


b. Fixed Controls. All crane controls and indicators are located to the rear of the crane. The crane controls (8) are to the left, the outrigger jack controls (9) are to the right and both are accessible to the operator while standing on the ground. Control valves, both crane and outrigger jack, automatically return to the neutral position should operator inadvertently or intentionally release control.

c. Remote Controls. The remote control (10) has multiple functions to match control levers on the crane controls. It provides operator the ability to operate the crane remotely within 30 ft (9.2 m) of the crane base. Remote control is also provided with an emergency shutdown capability designed so that when activated, all remote control crane functions cease.

1-20. CRANE (CONT).

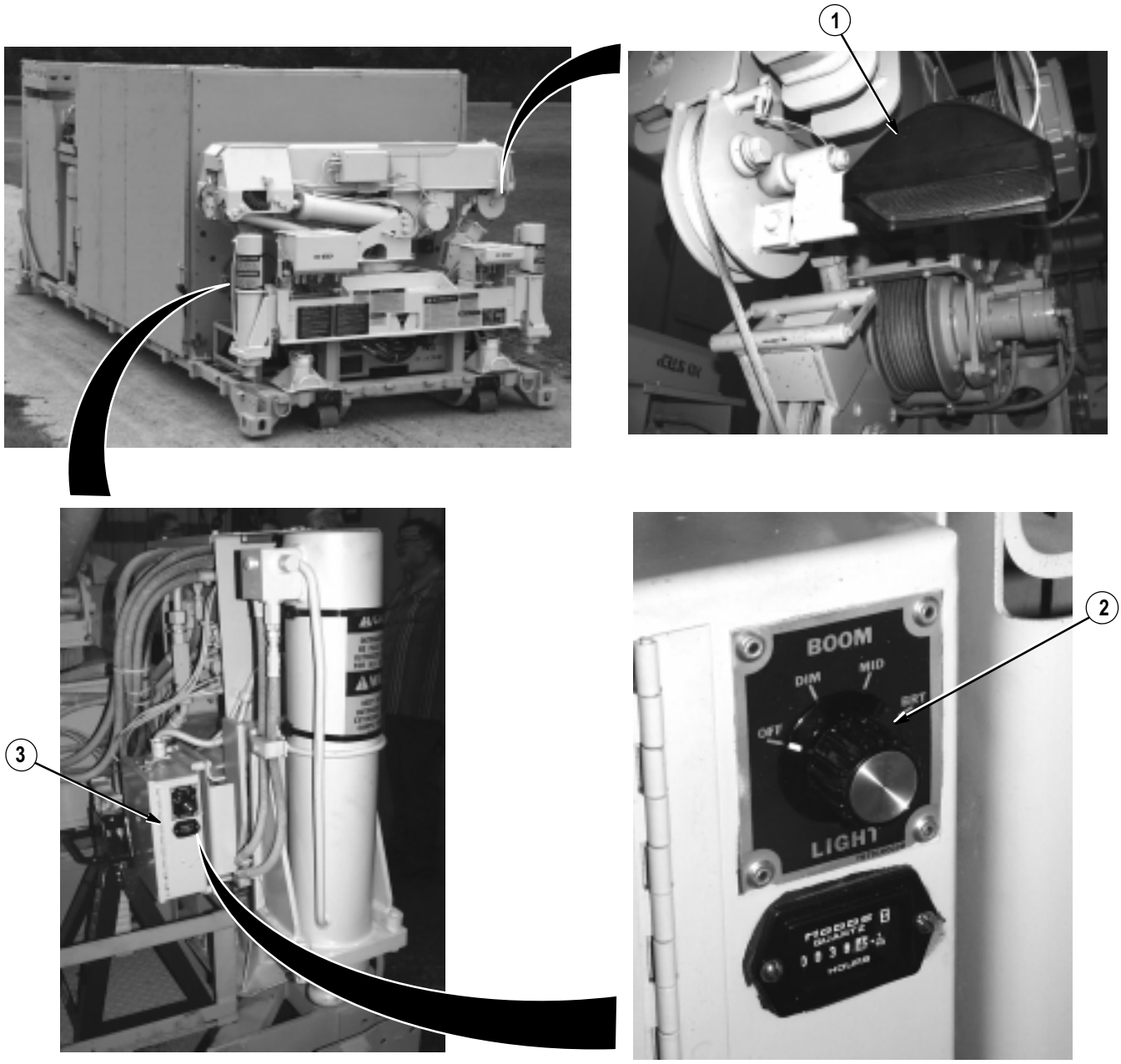




RADIUS (FT)	ON OUTRIGGERS, 300° LIFTING AREA BOOM LENGTH (FT)				
	7.33	14.25	15.25	16.50	18.42
4.00	10500				
7.00	10500				
8.00		10500	10500		
9.00		10500	10500	10000	
10.00		10500	10500	10000	9000
12.00		10000	10000	10000	9000
14.00		10000	10000	9000	8000
15.00			9000	8400	7900
16.00				8000	7500
18.20					6500

CAPACITIES ARE NET HOOK LOADS, IN LBS

d. Overload Shutdown. The crane is provided with an overload shutdown (1) which prevents structural overloading. Two block and overload conditions are sensed through line-pull of the hoist. A preprogramed microprocessor that is constantly comparing boom angle, boom length and hoist line pull, activates solenoid valves to prevent telescope out, lift up, lift down and hoist up functions when unit is overloaded or two-blocked. During an overload condition, the crane's functions cease except for hoist down.



e. Boom Light. The 24 VDC boom light (1) is powered directly from the FRS. As long as the FRS has power directed to the crane the light can be utilized even when the crane is not energized. The boom light switch (2) is located on the crane electrical box (3) and can be operated at three switchable intensities (DIM, MID & BRIGHT).

CHAPTER 2

OPERATING INSTRUCTIONS

Section I. DESCRIPTION AND USE OF OPERATOR'S CONTROLS AND INDICATORS

2-1. PREPARATION FOR USE.

WARNING

- The FRS has been designed to operate safely and efficiently within the limits specified in this TM. Operation beyond these limits is prohibited IAW AR 70-1 without written approval from the Commander, U.S. Army Tank-automotive and Armaments Command, ATTN: AMSTA-LC-AH, Warren, MI 48397-5000. Failure to comply could result in injury or death to personnel.
- Personnel must not ride, rest, or sleep on or inside the FRS. Failure to comply may result in injury or death to personnel.
- Do not lower doors/roof in winds that exceed 30 mph. Failure to comply may result in injury or death to personnel.
- Do not use shelter roof or doors (when open) for loading or storage. Failure to comply may result in injury or death to personnel.
- Keep shelter roof and doors free of accumulated snow, ice, dirt and material buildup. Do not lower doors if buildup is in excess of 1/4 inch thick. Failure to comply may result in injury or death to personnel.

When a Forward Repair System (FRS) is first received by the using organization, it is the responsibility of the officer-in-charge to determine whether it has been properly prepared for service by the supplier. It is also the responsibility of the officer-in-charge to be sure the FRS is in condition to perform its functions. Unit Maintenance will provide any additional service required to bring the FRS to operating standards. Before operating the FRS, the operator must become familiar with the FRS controls and indicators as described in this chapter.

2-2. KNOW YOUR CONTROLS AND INDICATORS.

This section shows the location and describes the use of controls and indicators used to operate the FRS. Controls and indicators described in this section are the same for all vehicles, except where otherwise indicated.

Know location and proper use of every control and indicator before operating the FRS. Use this section to learn about each control and indicator to be used. Separate illustrations are provided for each group of controls and indicators.

2-3. LOCATION AND USE OF CONTROLS AND INDICATORS.

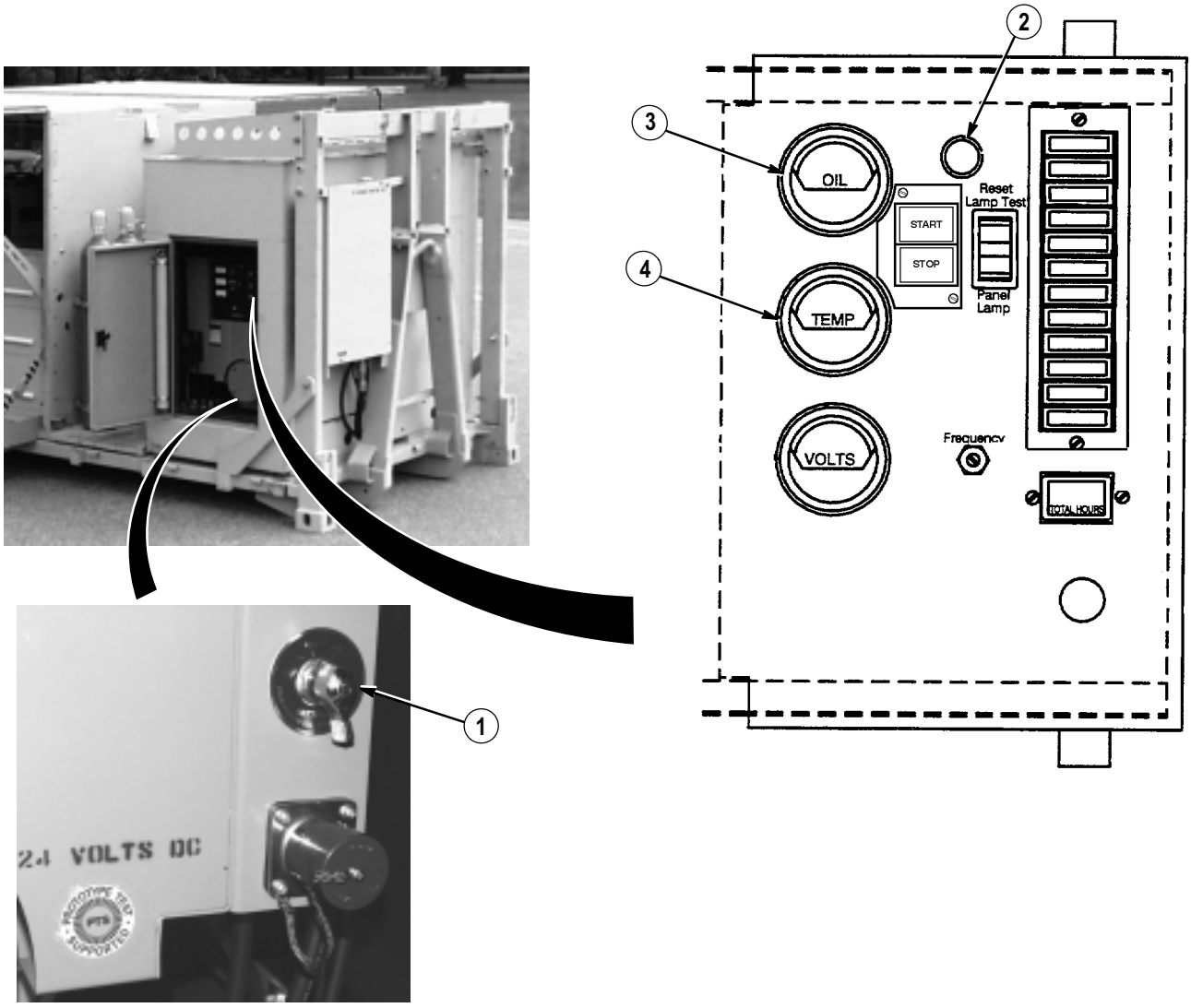


Figure 2-1. Generator Set DC Instrument Panel Controls and Indicators.

Key	Control or Indicator	Function
1	Master Disconnect Switch	Turns power ON/OFF from the 24 volt batteries to the generator set, shelter and crane.
2	Panel Lamp	Illuminates control panel.
3	Oil Pressure Gage	Indicates pressure of lubricating oil in engine. Normal oil pressure is 30 to 65 psi (207 to 449 kPa) at normal operating temperature.
4	Coolant Temperature Gage	Indicates temperature of circulating coolant in engine. Engine coolant temperature should be between 165° to 195°F (74° to 91°C).

2-3. LOCATION AND USE OF CONTROLS AND INDICATORS (CONT).

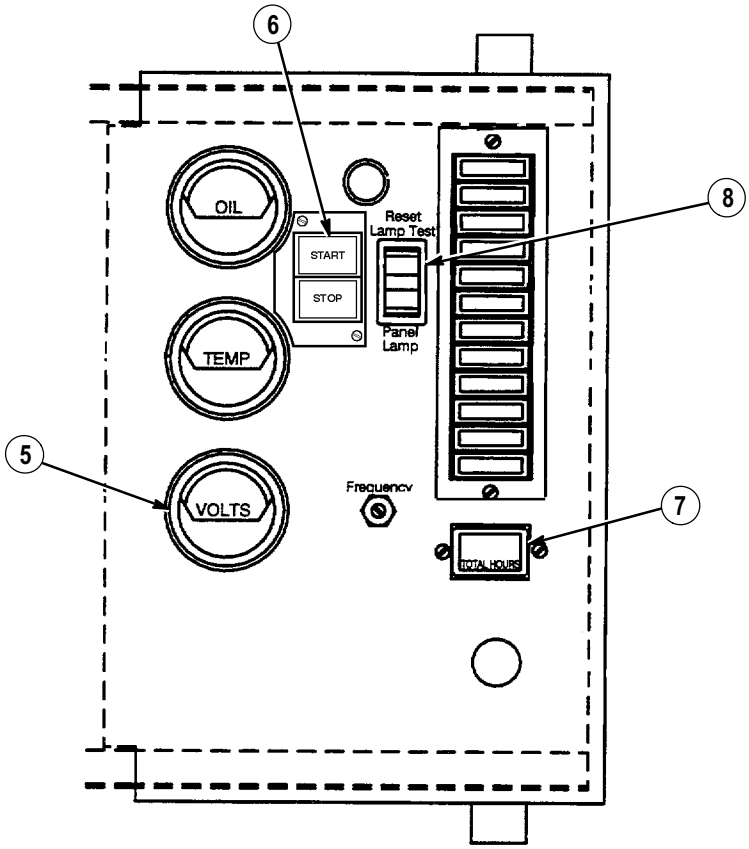


Figure 2-1. Generator Set DC Instrument Panel Controls and Indicators (Cont).

Key	Control or Indicator	Function
5	DC Voltmeter	Indicates the battery charging system voltage. Normal charging voltage is 22 to 28 volts.
6	START/STOP Switch	Starts and stops the generator set locally.
7	Running Time Meter	Registers the total number of hours the unit has run. Use it to keep a record of periodic servicing. Time is cumulative; meter cannot be reset.
8	Reset/Lamp Test/Panel Lamp Switch	Resets the fault circuit only when the Run/Stop/Remote switch is in the Stop (Reset) position. Tests fault lamps and turns on the control panel lamp.

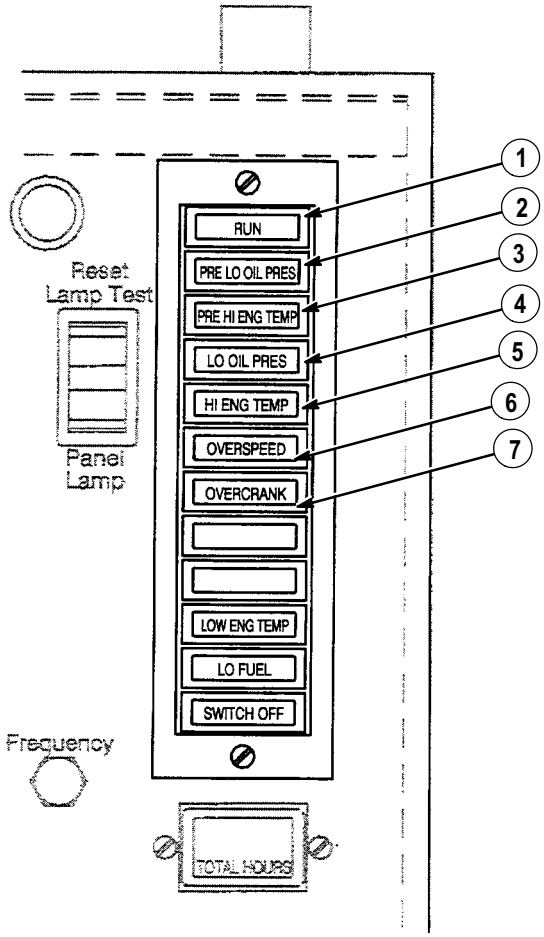


Figure 2-1. Generator Set DC Instrument Panel Controls and Indicators (Cont).

Key	Control or Indicator	Function
1	RUN (green)	Lamp comes on when starter circuit opens after set starting.
2	PRE LO OIL PRES (yellow)	Indicates engine oil pressure is marginally low.
3	PRE HI ENG TEMP (yellow)	Indicates engine temperature is marginally high.
4	LO OIL PRES (red)	Indicates engine has shut down because of critically low oil pressure.
5	HI ENG TEMP (red)	Indicates engine has shut down because of critically high engine temperature.
6	OVERSPEED (red)	Indicates engine has shut down because of excessive speed.
7	OVERCRANK (red)	Indicates engine has failed to start during the cranking period.

2-3. LOCATION AND USE OF CONTROLS AND INDICATORS (CONT).

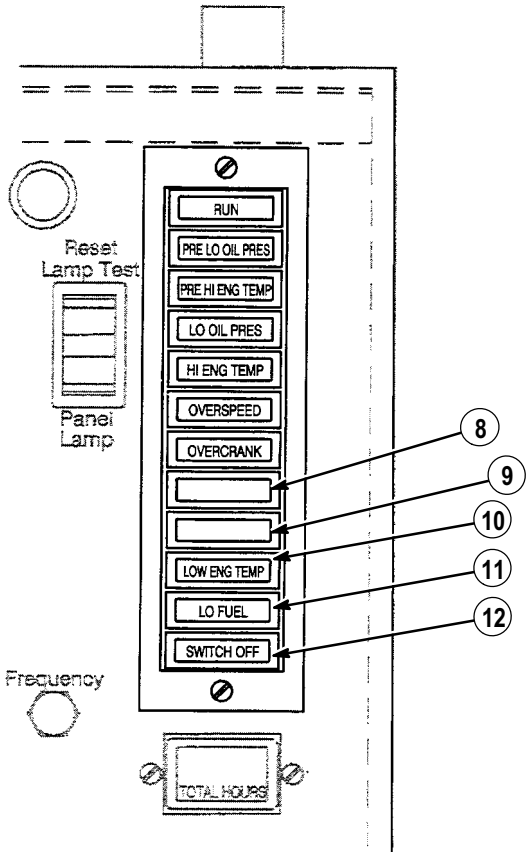


Figure 2-1. Generator Set DC Instrument Panel Controls and Indicators (Cont).

Key	Control or Indicator	Function
8	NOT USED	
9	NOT USED	
10	LOW ENG TEMP (yellow)	Lamp lights if engine temperature is marginally low for starting. It may indicate an inoperative coolant heater.
11	LO FUEL (yellow)	Not used.
12	SWITCH OFF (flashing red)	Indicates generator set is not in automatic start mode.

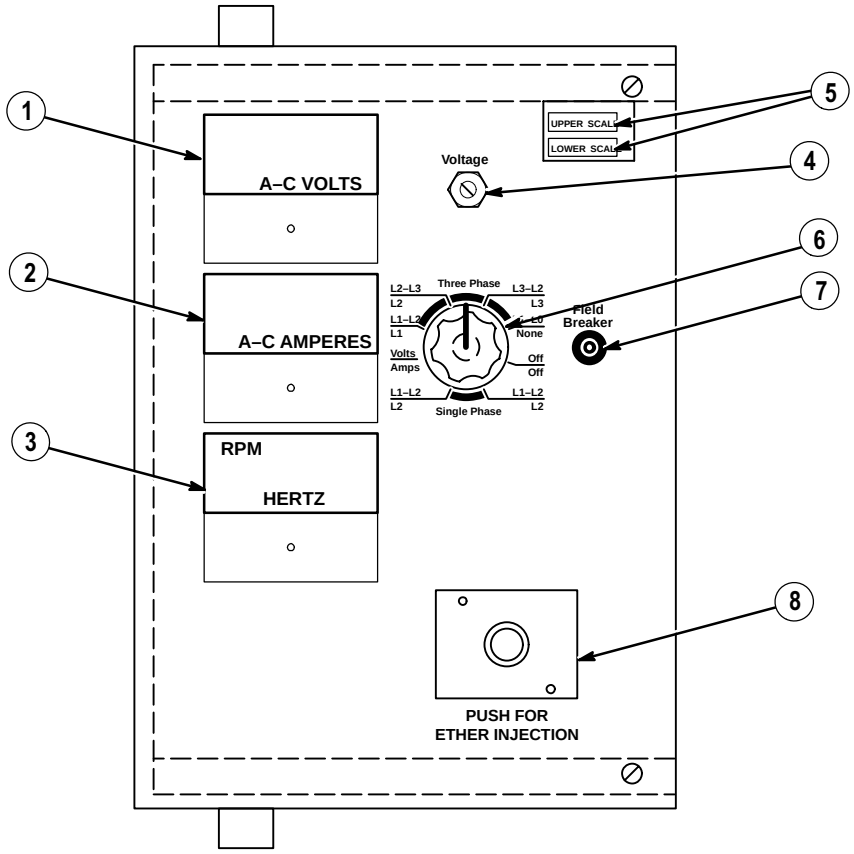


Figure 2-2. Generator Set AC Instrument Panel Controls and Indicators.

Key	Control or Indicator	Function
1	AC Voltmeter	Dual range instrument indicating AC voltage.
2	AC Ammeter	Dual range instrument indicates AC generator line current.
3	Frequency/RPM Meter	Indicates generator output frequency in hertz and engine speed in revolutions–per–minute (RPM).
4	Voltage Adjusting Rheostat	Provides approximately plus or minus five percent adjustment of the rated output voltage.
5	Upper and Lower Scale Indicator Lamps	Indicates which scale to use on the AC voltmeter and ammeter.
6	Phase Selector Switch	Selects phases of generator output to be measured by AC voltmeter and ammeter.
7	Field Breaker	Provides over-current protection.
8	Ether Start	Injects ether into the engine intake manifold for cold weather starting.

2-3. LOCATION AND USE OF CONTROLS AND INDICATORS (CONT).

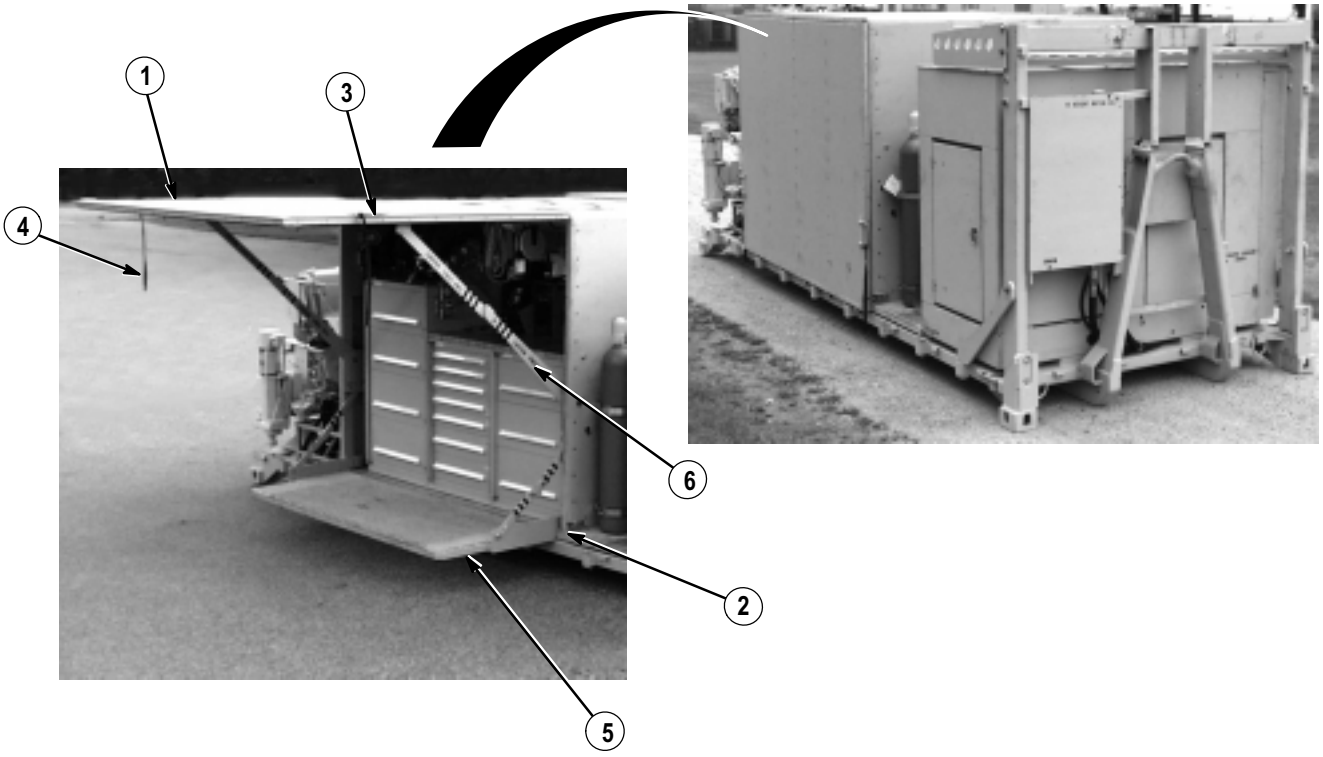


Figure 2-3. Shelter Door and Platform Controls.

Key	Control or Indicator	Function
1	Shelter Door (One each side)	Provides protection from weather and access to welding, air and accessory tools.
2	Door Latch (Two each door)	Holds door in a closed position and secured with a padlock.
3	Door Handle (Two each door)	Pull to open shelter door and held to support door when closing.
4	Door Tether Strap (Two each door)	Pull to close shelter door.
5	Shelter Platform (One each side)	Area for personnel to stand on to gain access to tools for maintenance and other operations.
6	Shelter Door and Platform Arms (Two each door and platform)	Used to lock door and platform in open position and support door and platform during closing.

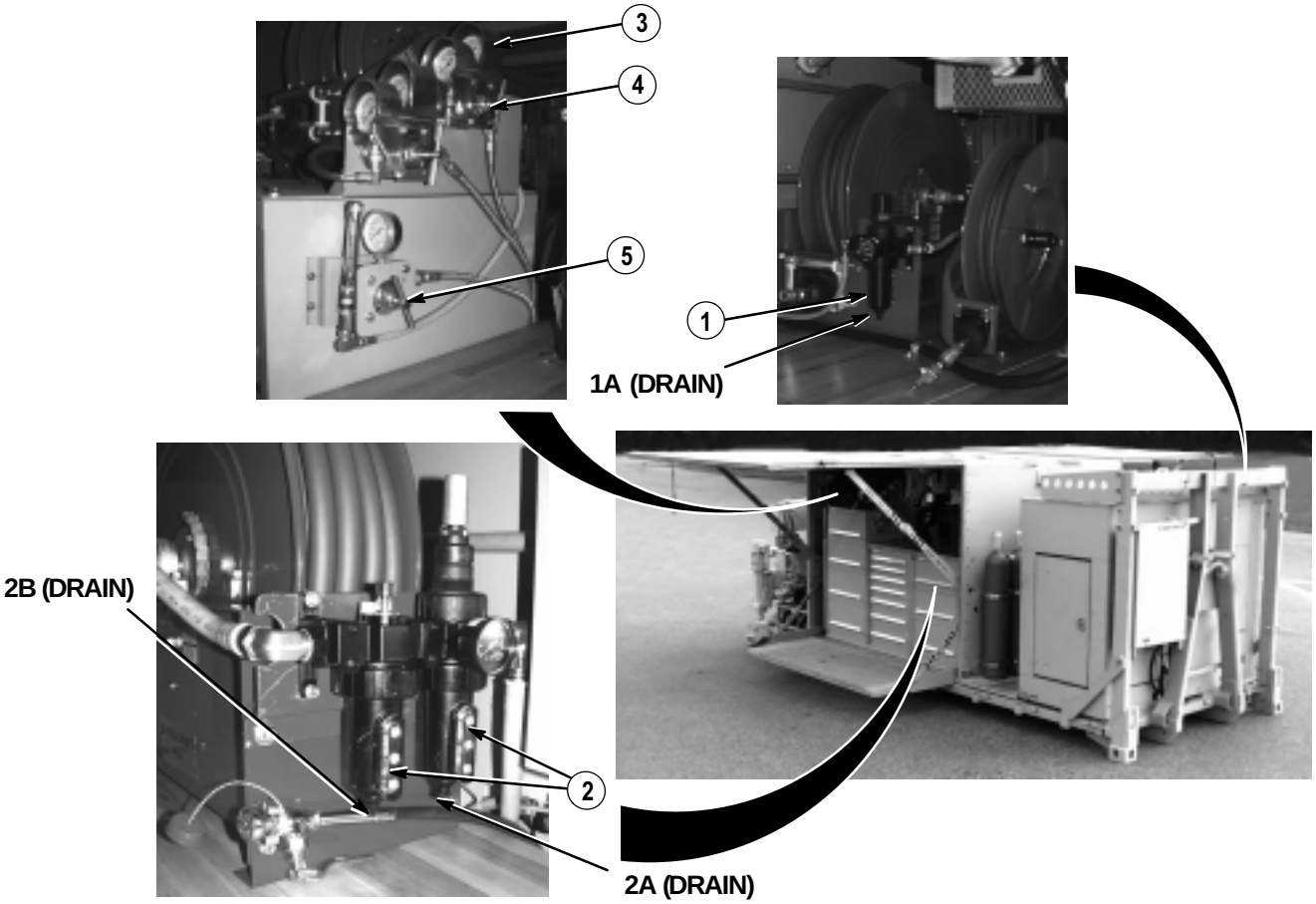


Figure 2-4. Air and Gas Regulators Controls and Indicators.

Key	Control or Indicator	Function
1	General Air Regulator/Water Separator	The general air regulator/water separator filters air, separates water and controls air pressure to pneumatic tools.
2	Pneumatic Air Regulator/Water Separator and Lubricator	The pneumatic regulator/water separator filters air, separates water and controls air pressure to pneumatic tools. The lubricator adds oil to the air supplied to pneumatic tools.
3	Propylene Regulator	The propylene regulator is a two stage regulator. The high-pressure gage, the inlet side, shows the pressure from the cylinder and is graduated from 0 to 400 psi. The low pressure gage, the outlet side, shows the working pressure and is graduated from 0 to 30 psi (3 – 5 psi is normal).
4	Oxygen Regulator	The oxygen regulator is a two stage regulator. The high pressure gage, the inlet side, shows the pressure from the cylinder and is from 0 to 4000 psi. The low pressure gage, the outlet side, shows the working pressure and is graduated from 0 to 200 psi (20 – 40 psi is normal).
5	Argon Regulator	The argon regulator is designed with a low pressure flow meter. The high pressure gage, the inlet side, shows the pressure from the cylinder and is from 0-4000 psi. The low pressure flow meter, the outlet side, shows the working pressure and is graduated from 0 to 30 CFH (5 – 20 CFH is normal).

2-3. LOCATION AND USE OF CONTROLS AND INDICATORS (CONT).

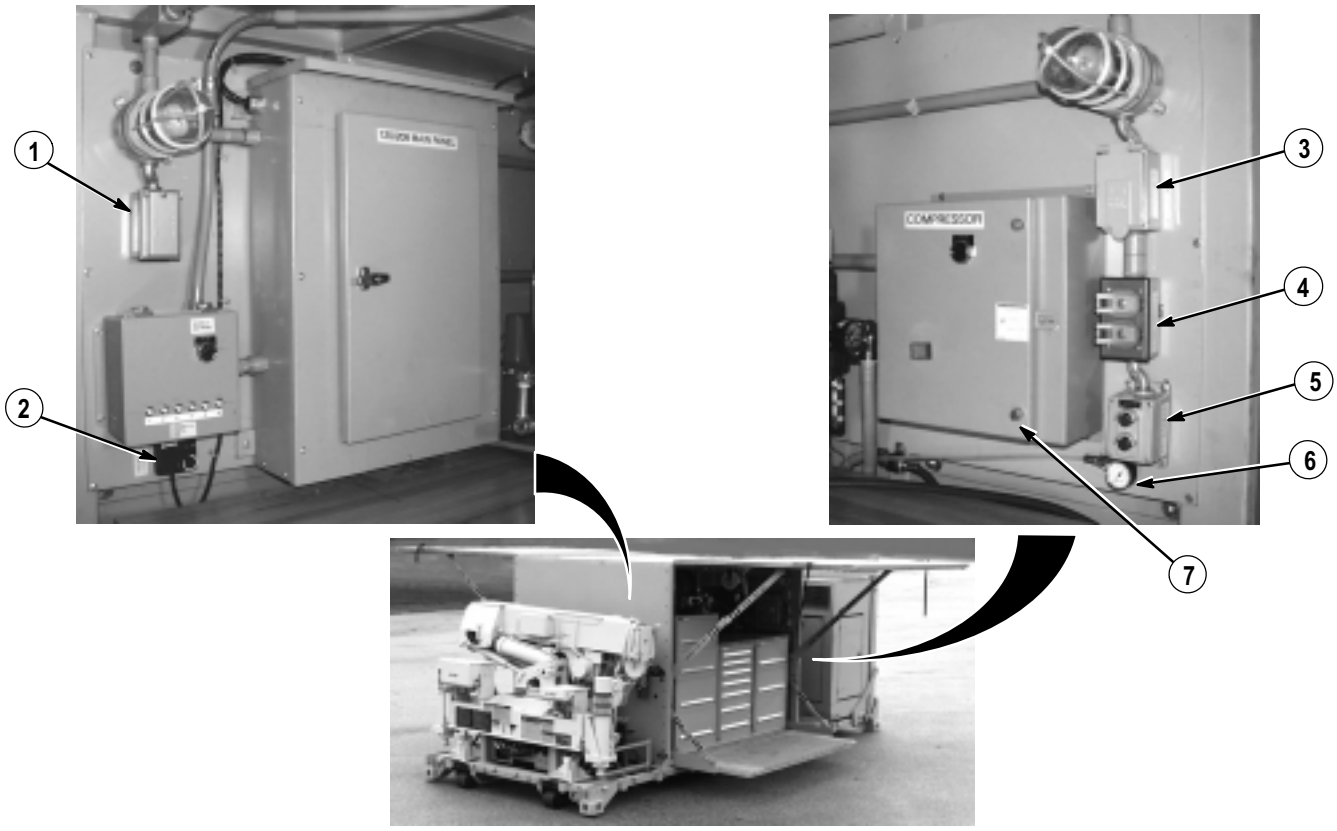


Figure 2-5. Shelter Front and Rear Wall Controls and Indicators.

Key	Control or Indicator	Function
1	GFCI Receptacle (One on front and back wall)	In event of a ground fault a GFCI will trip and quickly stop the flow of electricity to prevent serious injury. Delivers power (120 VOLTS) from breaker panel for electrical tools and other general uses.
2	Shelter Heater Control	ON/OFF SWITCH/TEMPERATURE CONTROL.
3	Dimmer Light Switch (One on front and rear wall)	Push switch lever to turn on, raise, lower and turn off general lighting. Both switches up to turn on. Only one at at time to dim lights.
4	Electrical Receptacle (One on front and rear wall) (20 AMP)	Delivers power (120 VOLTS) from breaker panel for electrical tools and other general uses.
5	Remote Start/Stop Switch	Used by crew to start or stop generator set from the inside right front of shelter. (One on outside rear shelter.)
6	Eye Wash Pressure Gage	Indicates the amount of air pressure in eye wash tank.
7	Air Compressor Control Box	Turns air compressor ON and OFF. Has a built in overload reset button.

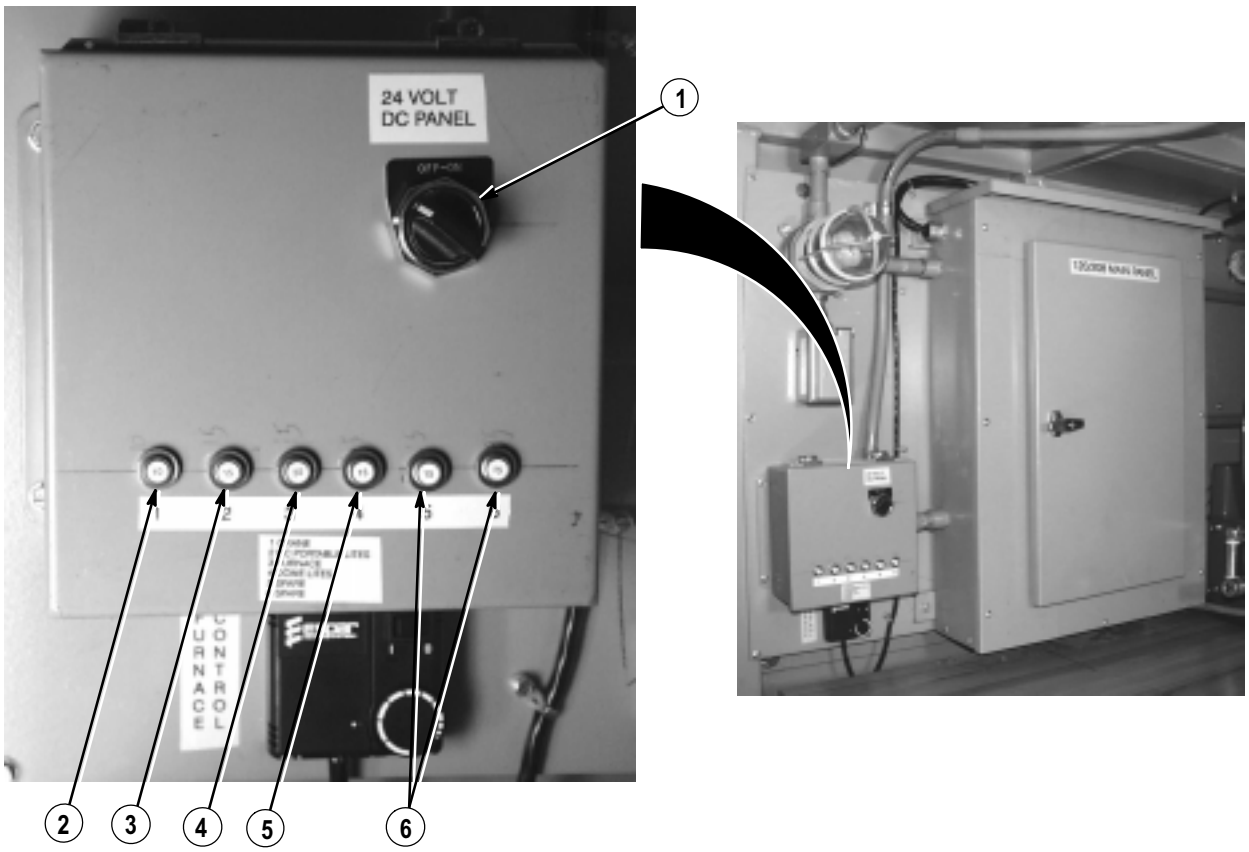


Figure 2-6. 24 Volt DC Control Panel and Circuit Breakers.

Key	Control or Indicator	Function
1	DC Power ON/OFF switch	Turns ON/OFF power to the 24VOLT system.
2	Crane Circuit Breaker	Crane 24VOLT 10AMP circuit breaker (Push/Pull).
3	DC Portable Light	Charge portable lights 24VOLT 15AMP circuit breaker (Push/Pull).
4	Furnace	Shelter heater 30AMP circuit breaker (Push/Pull).
5	Dome Lights	Dome light 15AMP circuit breaker (Push/Pull).
6	Spare	Two spare 24VOLT 15AMP circuit breakers (Push/Pull).

2-3. LOCATION AND USE OF CONTROLS AND INDICATORS (CONT).

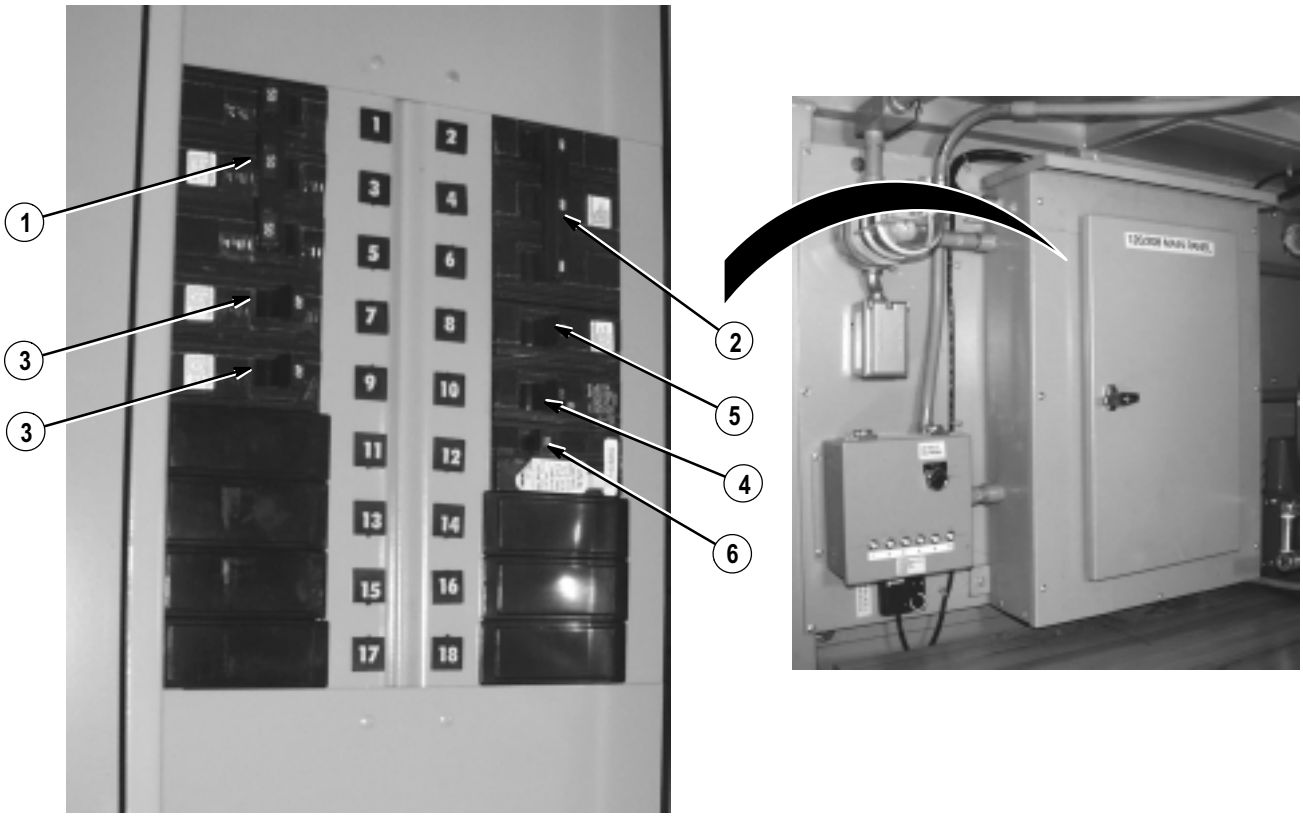


Figure 2-7. 120/208 AC Control Panel and Circuit Breakers.

Key	Control or Indicator	Function
1	Welder	Welder 50AMP circuit breaker.
2	Air Compressor	Air compressor 60AMP circuit breaker.
3	110 Receptacle	110 receptacle 20AMP circuit breaker.
4	110V Lights	110VOLT light 20AMP circuit breaker.
5	Reel Lights	Reel light 20AMP circuit breaker.
6	Air Compressor Heater/Thermostat	Air compressor heater/thermostat 20 AMP circuit breaker.

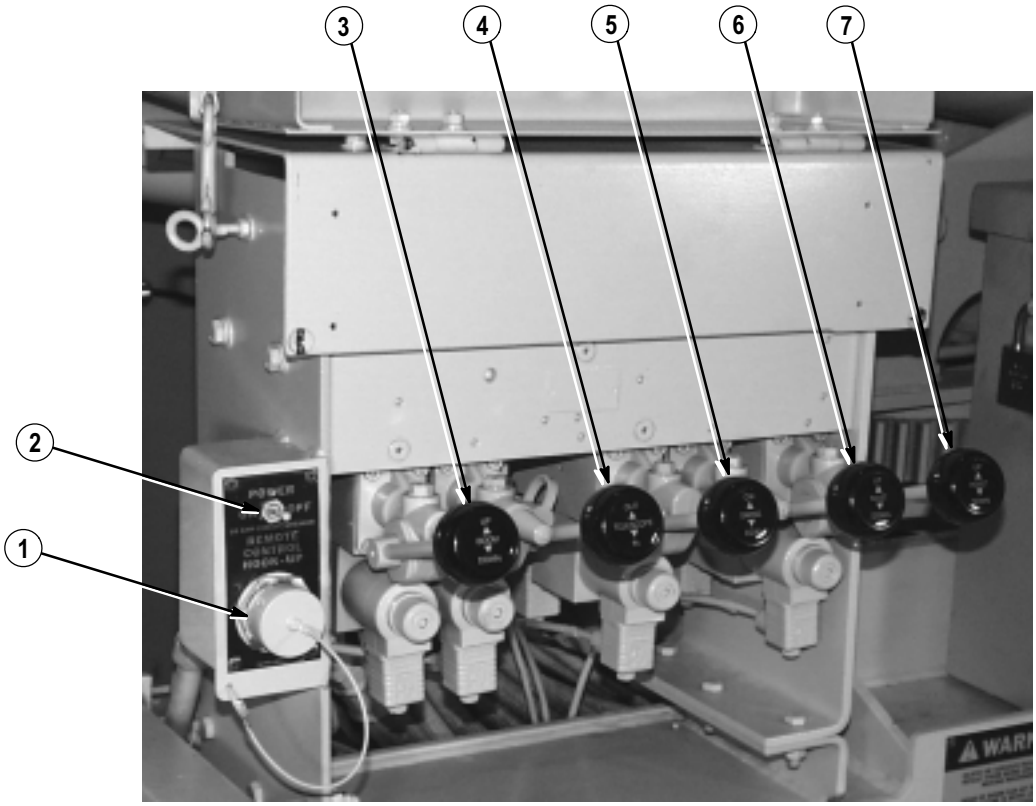


Figure 2-8. Crane Main and Auxiliary Valve Controls.

Key	Control or Indicator	Function
1	Remote Control Hookup	Connection for the remote control when used.
2	Crane Power Switch	Provides electrical power to the crane and outrigger jacks.
3	BOOM Lift Control Lever	Raises and lowers the boom.
4	TELESCOPE Control Lever	**CAUTION** TELESCOPE and HOIST control levers should be operated at the same time or hook block will contact boom tip and cause damage. Move TELESCOPE control lever to OUT or IN position to extend or retract the boom.
5	SWING Control Lever	**CAUTION** Boom must be above shelter for clearance. Hitting obstacles with boom may cause damage to boom or shelter. Moves boom clockwise and counterclockwise.
6	MAST Control Lever	Raises the mast to operating position and lowers the mast to stowage position.
7	HOIST Control Lever	Reels in and pays out the cable.

2-3. LOCATION AND USE OF CONTROLS AND INDICATORS (CONT).

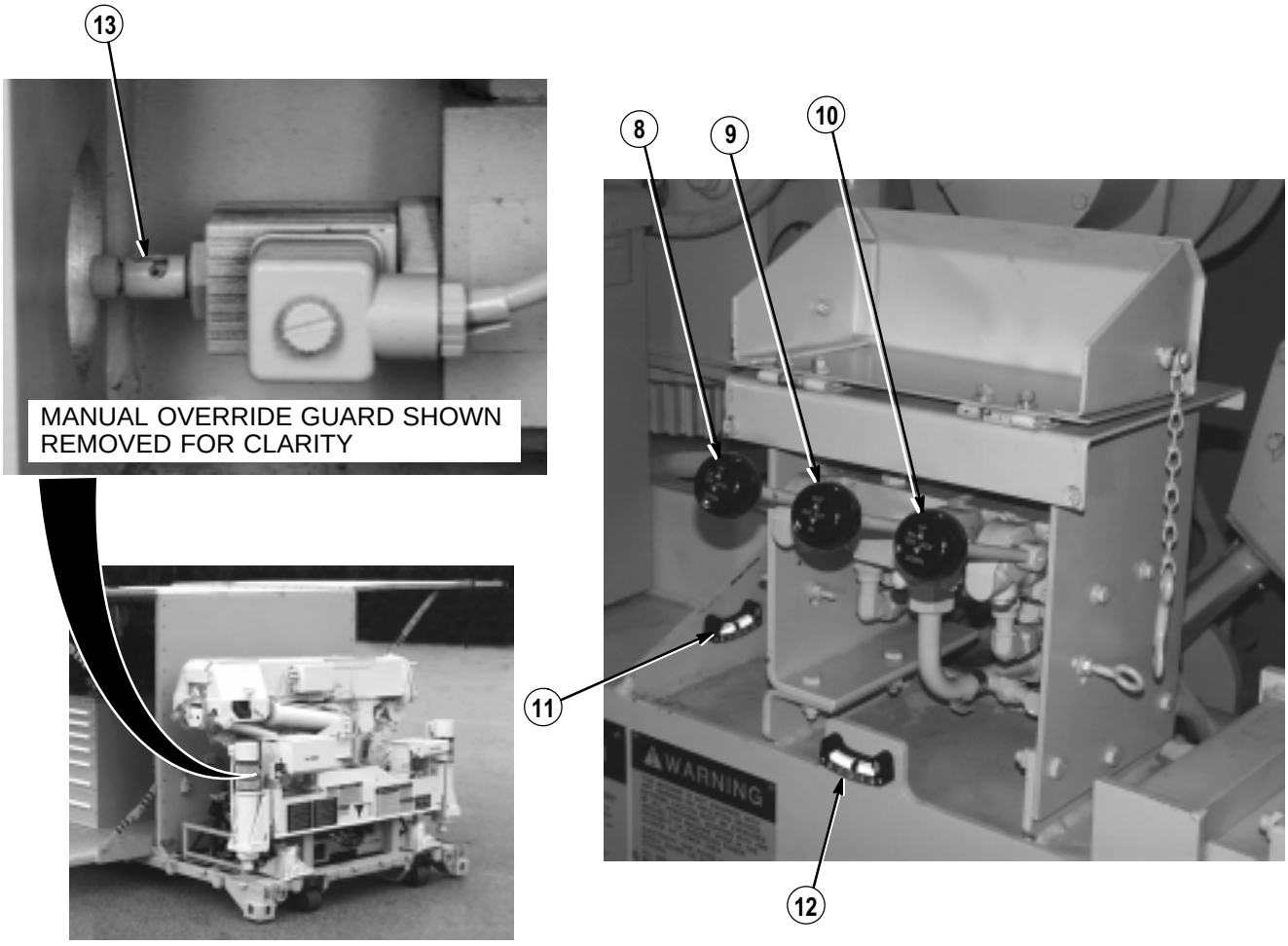


Figure 2-8. Crane Main and Auxiliary Valve Controls (Cont).

Key	Control or Indicator	Function
8	LH O/R JACK Control	Lowers and raises the left outrigger jack.
9	O/R EXT Control Lever	Move O/R EXT control lever to OUT or IN position to extend or retract both outriggers.
10	RH O/R JACK Control Lever	Lowers and raises the outrigger jack.
11	Front to Back Level Gage	Used as an indicator for front to back leveling of FRS.
12	Left to Right Level Gage	Used as an indicator for left to right leveling of FRS.
13	MHC Main Hydraulic Pressure Manual Override	Provides emergency hydraulic power when electrical power fails that results in loss of outrigger jack and crane functions.

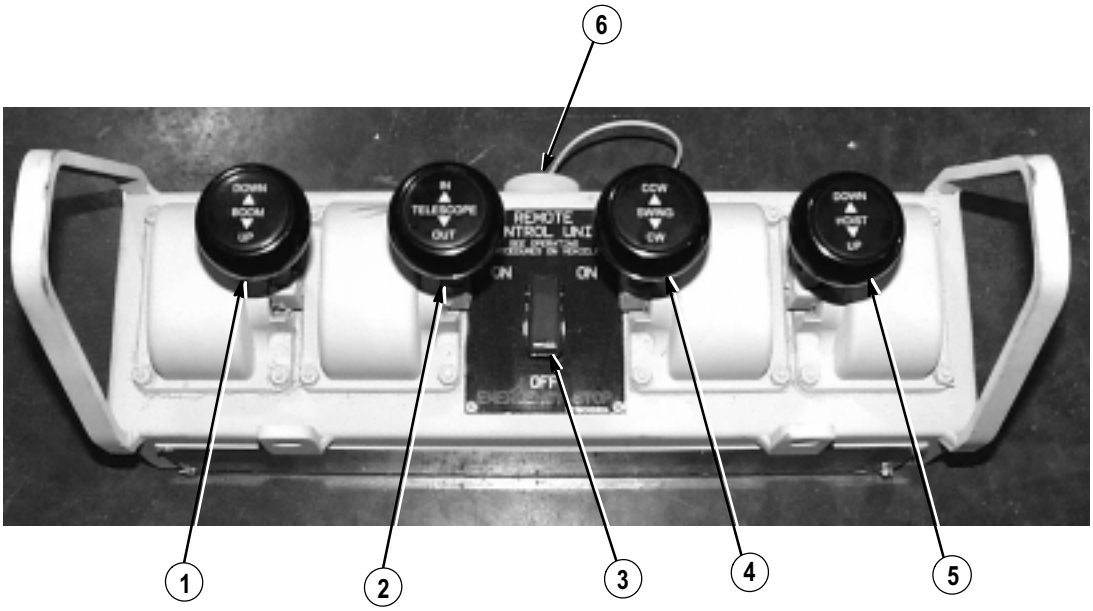


Figure 2-9. Crane Remote Control Unit.

Key	Control or Indicator	Function
1	BOOM Control Lever	Raises and lowers the boom.
2	TELESCOPE Control Lever	**CAUTION** TELESCOPE and HOIST control levers should be operated at the same time or hook block will contact boom tip and cause damage. Move TELESCOPE control lever to OUT or IN position to extend or retract the boom.
3	REMOTE CONTROL UNIT ON/OFF EMERGENCY STOP Switch	Supplies and shuts off electrical power to the crane and allows the operator to shut down the crane in an emergency situation from the REMOTE CONTROL UNIT.
4	SWING Control Lever	**CAUTION** Boom must be above shelter for clearance. Hitting obstacles with boom may cause damage to boom or shelter. Moves the crane clockwise and counterclockwise.
5	HOIST Control Lever	Reels in and pays out the cable.
6	REMOTE Hookup Wire Outlet	Allows cable hookup between the crane and remote.

2-3. LOCATION AND USE OF CONTROLS AND INDICATORS (CONT).

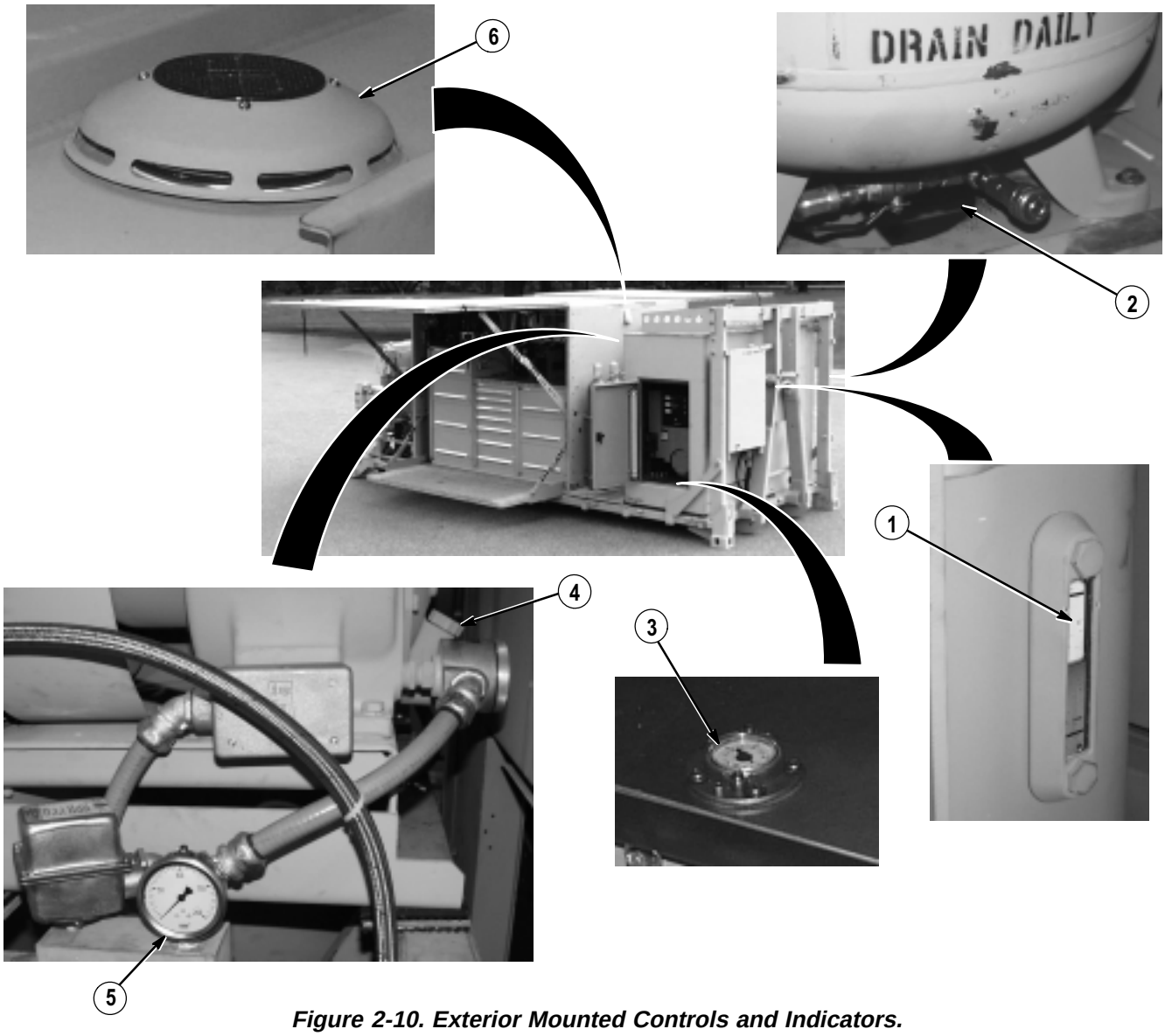


Figure 2-10. Exterior Mounted Controls and Indicators.

Key	Control or Indicator	Function
1	Hydraulic Tank Fill Sight Glass	Indicates hydraulic oil level in hydraulic tank.
2	Air Reservoir Drain and Fill Valve	Drains air pressure and water from air reservoir. Used to fill air reservoir with air from an external source.
3	Fuel Tank Gage	Indicates the amount of fuel in fuel tank.
4	Air Compressor Dipstick	Indicates air compressor oil level.
5	Air Compressor Pressure Gage	Indicates the amount of air pressure in air reservoir.
6	Solar Air Vent	The solar air vent is used to equalize the humidity level inside and outside the shelter to reduce condensation buildup.

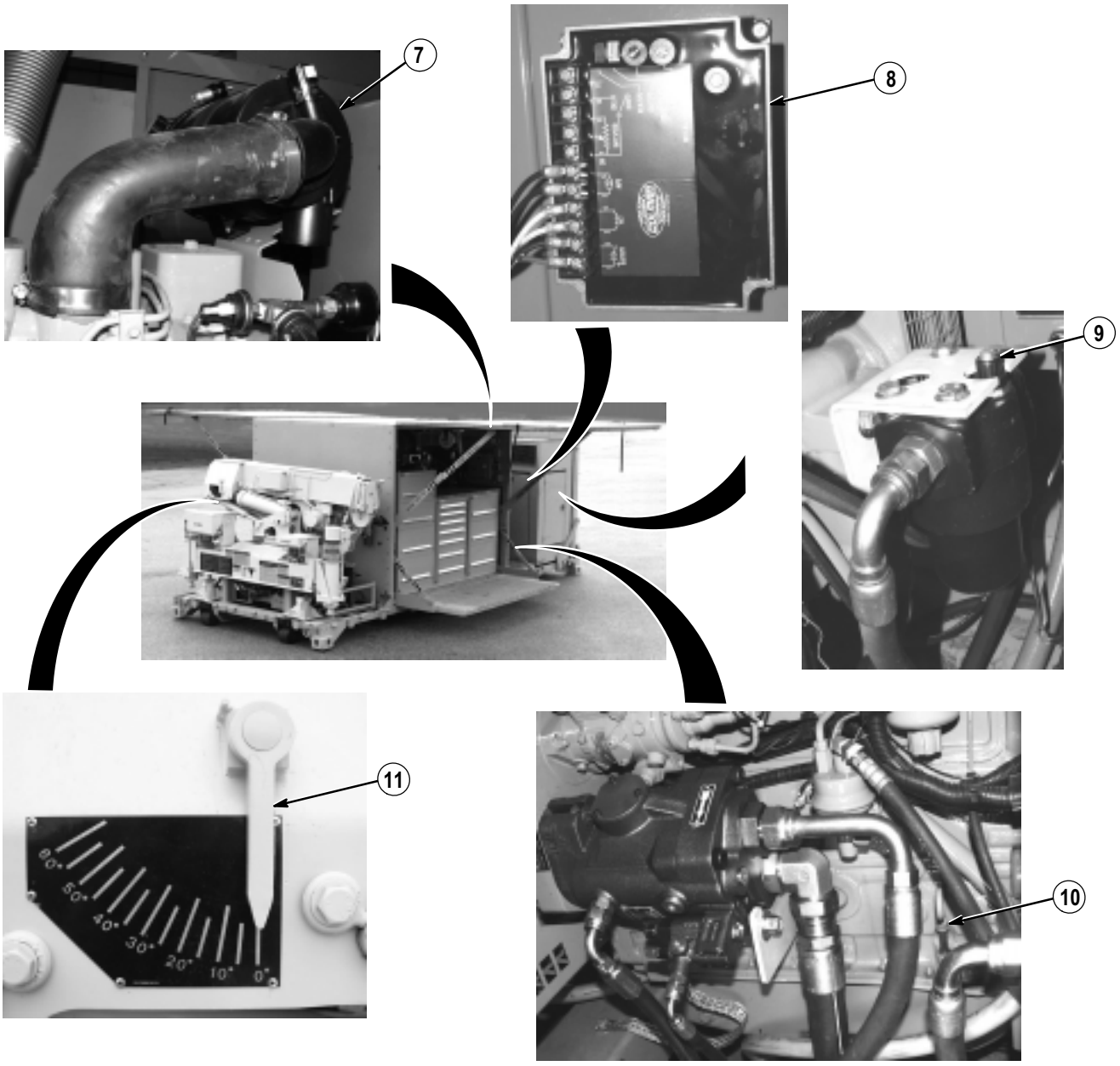


Figure 2-11. Exterior Mounted Controls and Indicators.

Key	Control or Indicator	Function
7	Air Filter Restriction Indicator	Indicates when air filter needs servicing.
8	Governor Controller	Controls engine speed under various loads for stable operation.
9	Hydraulic Oil Filter Indicator	Indicates when hydraulic oil filter needs servicing.
10	Engine Oil Dipstick	Indicates the engine oil level.
11	Boom Angle Indicator	Indicates the angle of the boom.

2-4. DECALS AND INSTRUCTION PLATES.

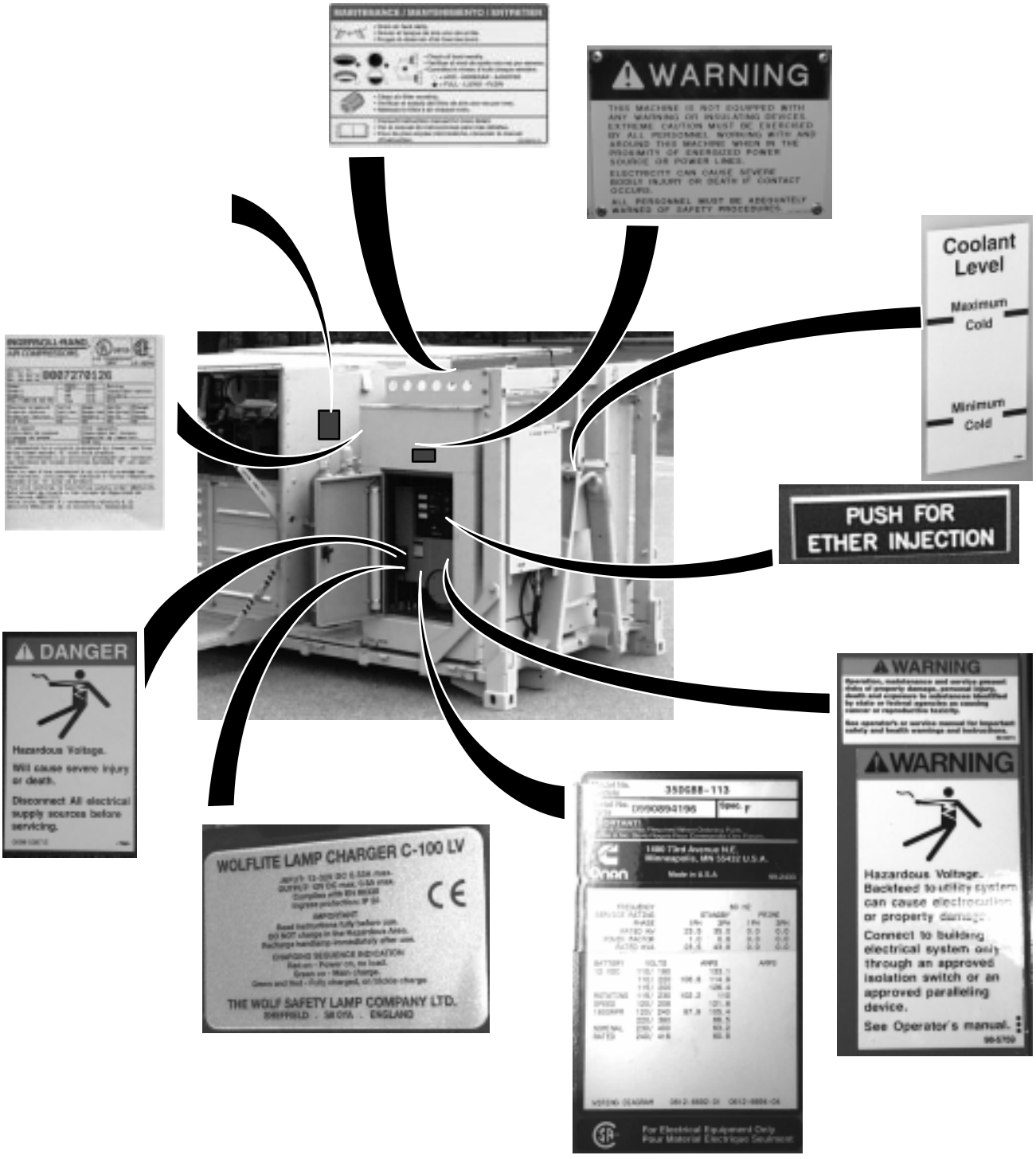


Figure 2-12. Decals and Instruction Plates.

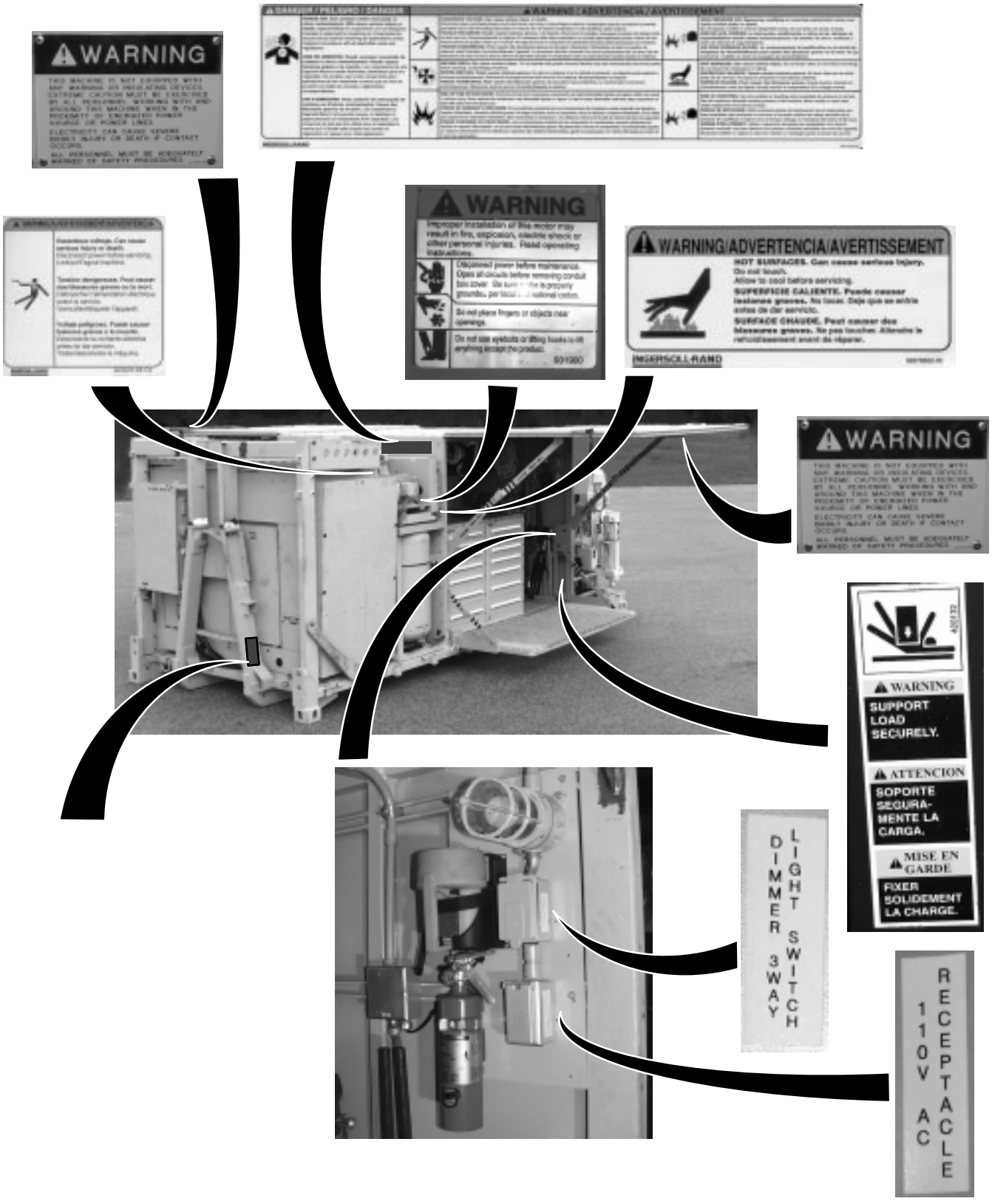


Figure 2-12. Decals and Instruction Plates (Cont).

2-4. DECALS AND INSTRUCTION PLATES (CONT).

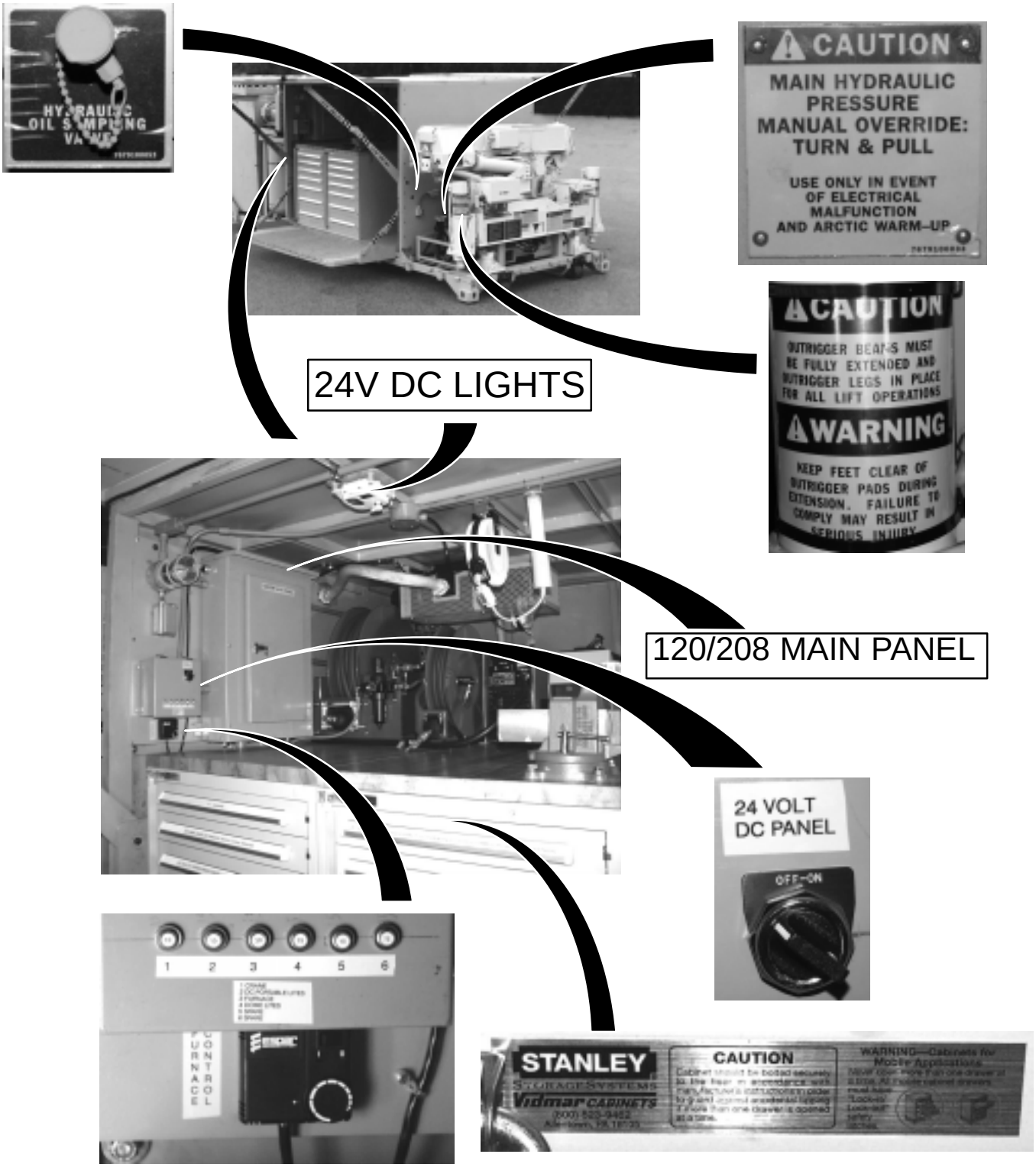


Figure 2-12. Decals and Instruction Plates (Cont).

Figure 2-12. Decals and Instruction Plates (Cont).

2-4. DECALS AND INSTRUCTION PLATES (CONT).

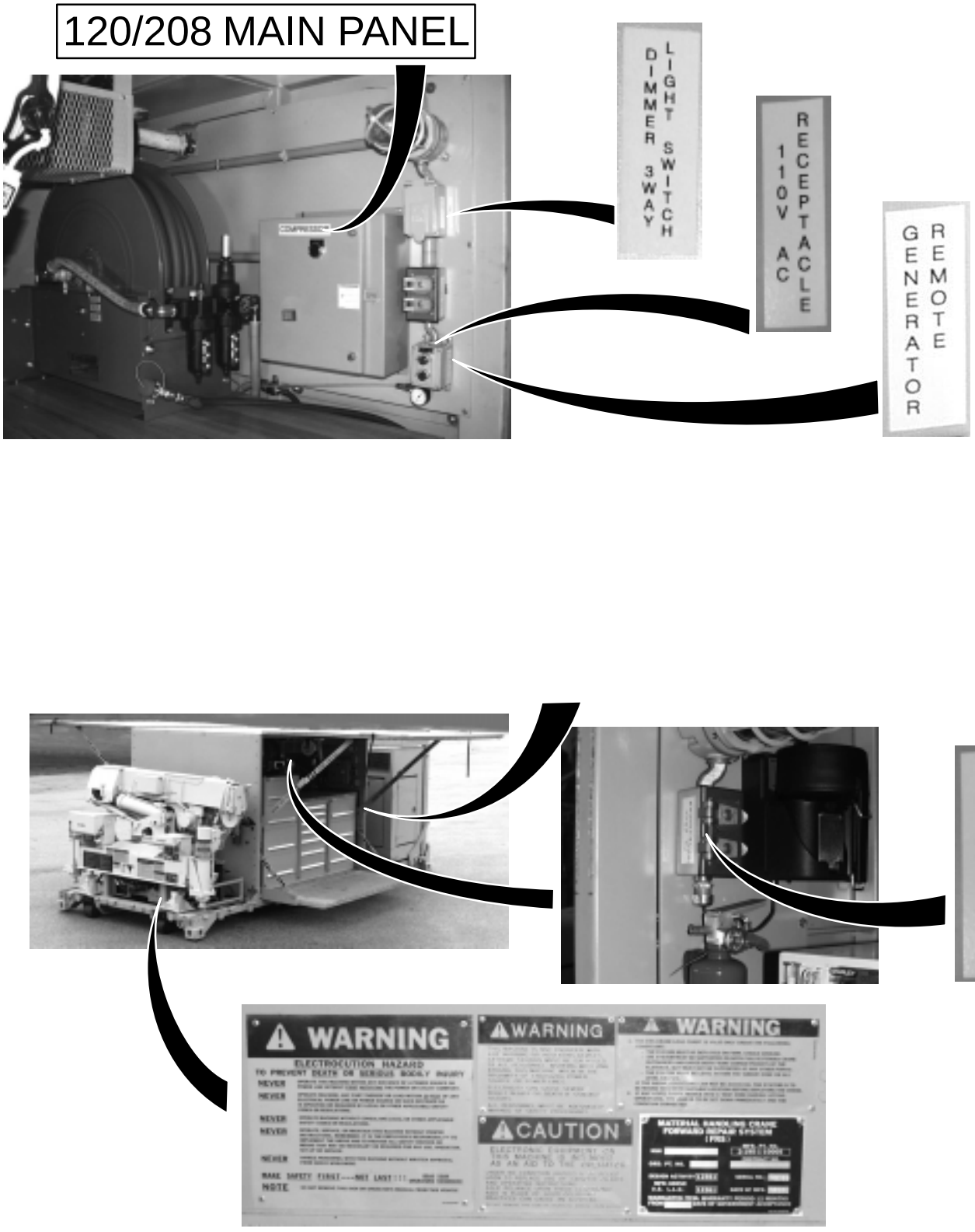


Figure 2-12. Decals and Instruction Plates (Cont).

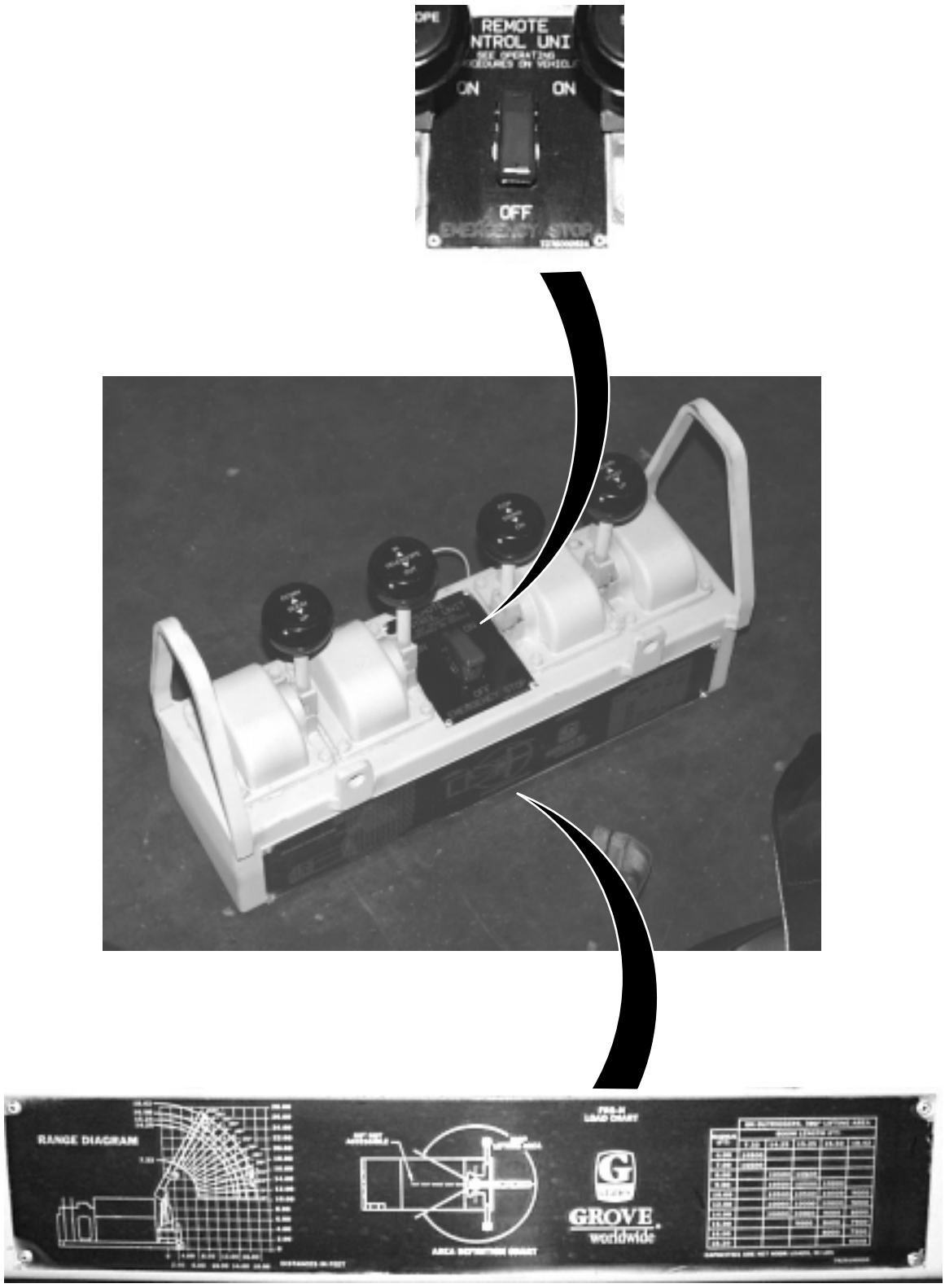


Figure 2-12. Decals and Instruction Plates (Cont).

Section II. PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS)

2-5. GENERAL.

This section contains PMCS requirements for the FRS. The PMCS tables contain checks and services necessary to ensure that the FRS is ready for operation. Using PMCS tables, perform maintenance at specified intervals.

a. Cleaning Instructions and Precautions. During PMCS keep the following general maintenance procedures in mind:

(1) *Cleanliness*. Dirt, grease, oil and debris may cause or cover a serious problem. Clean all metal surfaces.

(2) *Bolts, nuts and screws*. Check bolts, nuts and screws for obvious looseness, missing, bent, or broken condition. Look for chipped paint, bare metal, or rust around bolt heads. If any part seems loose, tighten it, or have the part repaired or replaced.

(3) *Welds*. Look for loose or chipped paint, rust, or gaps on welds. If a bad weld is found, notify Unit Maintenance.

(4) *Electrical wires and connectors*. Look for cracked or broken insulation, bare wires and loose or broken connectors. Tighten loose connectors and make sure wires are in good shape. If a wire or connector is bad, notify Unit Maintenance.

(5) *Fluid lines and fittings*. Look for wear, damage and leaks, and make sure clamps and fittings are tight. If a leak comes from a loose fitting or connector, tighten it. If something is broken or worn out and can not be fixed with tools available, notify Unit Maintenance.

(6) *Air system components*. Look for worn, damaged or leaking components. Make sure clamps and fittings are tight. If a leak comes from a loose fitting or connector, tighten it. If something is broken or worn out, either repair or replace it, or notify Unit Maintenance.

2-6. WARNINGS AND CAUTIONS.

Always observe the warnings and cautions appearing in your PMCS table. Warnings and cautions appear before applicable procedures. You must observe these warnings and cautions to prevent serious injury to yourself and others or prevent equipment from being damaged.

2-7. EXPLANATION OF TABLE ENTRIES.

a. Item Number Column. Items in this column are for reference. When completing DA Form 2404 or DA Form 5988-E (Equipment Inspection and Maintenance Worksheet), include the item number for the check/service indicating a fault. Item numbers also appear in the order that you must do the checks and services for the intervals listed.

b. Interval Column. This column describes when, and how often, the check is to be made. Thus, if a given check is performed before operation, the word Before is opposite the check in the Interval column.

(1) Perform the (Before) CHECKS before operating FRS.

(2) Perform the (During) CHECKS while operating FRS. During operation means to monitor the FRS and its related components while being operated.

(3) Perform the (After) CHECKS right after operating the FRS.

(4) Perform the (Weekly) CHECKS once a week.

(5) Perform the (Monthly) CHECKS once a month.

c. Item To Be Inspected Column. The items listed in this column are divided into groups indicating the portion of the equipment of which they are a part, i.e. front, left, engine. Under these groupings a few common words are used to identify the specific item being checked.

d. Procedures Column. This column contains a brief description of the procedure by which the check is performed.

e. Equipment Is Not Fully Mission Capable If: Column. This column contains the criteria that causes the equipment to be classified as NOT READY/NOT AVAILABLE because of inability to perform its primary mission. An entry in this column will:

(1) Identify conditions that will make the equipment not ready/available for readiness reporting purposes.

2-8. SHORTENED MAINTENANCE INTERVALS.

Extreme weather conditions, periods of high use, or combat conditions may dictate that PMCS is performed more often than is required in the PMCS Tables.

2-9. LUBRICATION REQUIREMENTS.

For lubrication requirements and procedures, refer to Appendix G.

2-10. LEAKAGE CLASSIFICATION AND DEFINITION.

CAUTION

Equipment operation is allowable with minor leak (Class I or II). Consideration must be given to the fluid capacity in the item/system being checked/inspected. When in doubt, notify the supervisor. When operating with Class I or II leaks, continue to check fluid levels as required in the PMCS. Class III leaks should be repaired using tools available, if possible. If not, use "Not Fully Mission Capable" column criteria.

NOTE

If leakage is detected, further investigation is needed to determine the location and cause of the leak. If there is any doubt, contact your supervisor or Unit Maintenance.

a. Class I. Leakage of fluid as indicated by wetness or discoloration not great enough to form drops.

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

c. Class III. Leakage of fluid great enough to form drops that fall from the item being checked/inspected. Try to fix leak using tools available.

2-11. OPERATORS PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS) TABLES.

WARNING

Generator set engine must be shut off before performing PMCS walkaround. Severe injury to personnel may result.

Refer to Table 2-1 through 2-5 for Operator's Preventive Maintenance Checks and Services (PMCS) for the FRS. The routing diagram (Figure 2-13) will be of help to complete the PMCS. It shows the general path an operator will follow to complete the PMCS.

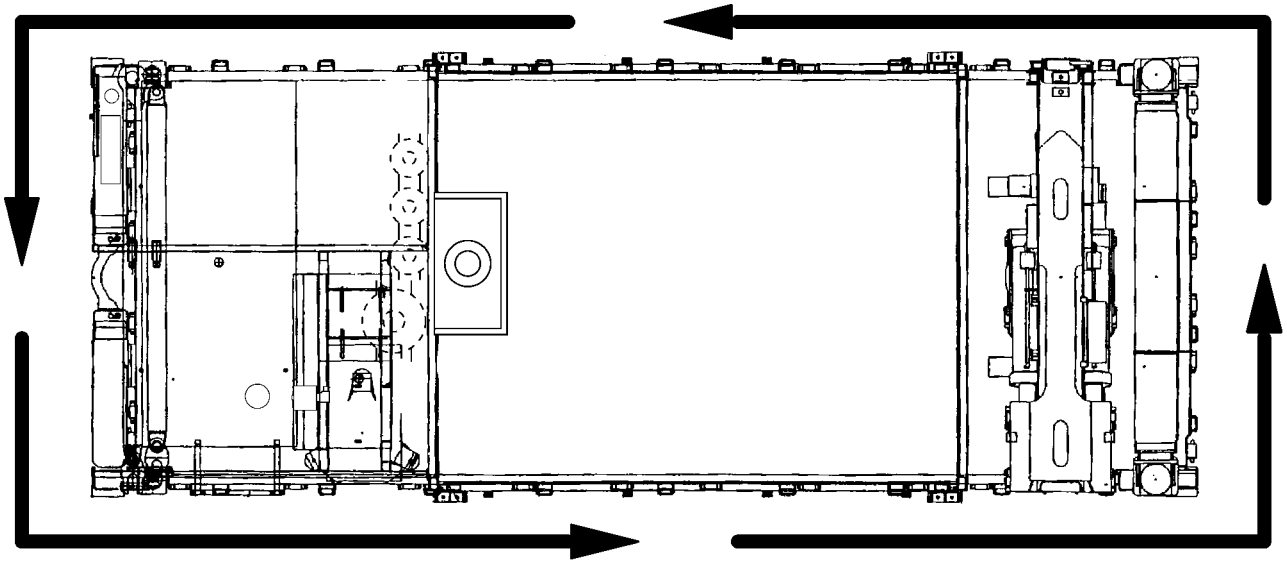


Figure 2-13. PMCS Walkaround.

Table 2-1. Operator's Level Preventive Maintenance Checks and Services (Before).

Item No.	Interval	Item to Check/ Service	Procedure	Not Fully Mission Capable If:
			NOTE If leakage is detected, further investigation is needed to determine the location and cause of the leak. If there is any doubt, contact your supervisor or Unit Maintenance.	
1	Before	Leaks	Check underneath FRS for evidence of obvious fluid leakage.	Class III leak is evident.
2	Before	Shelter	Visually check outside of shelter for obvious damage that would impair operation.	

2-11. PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS) TABLES (CONT).

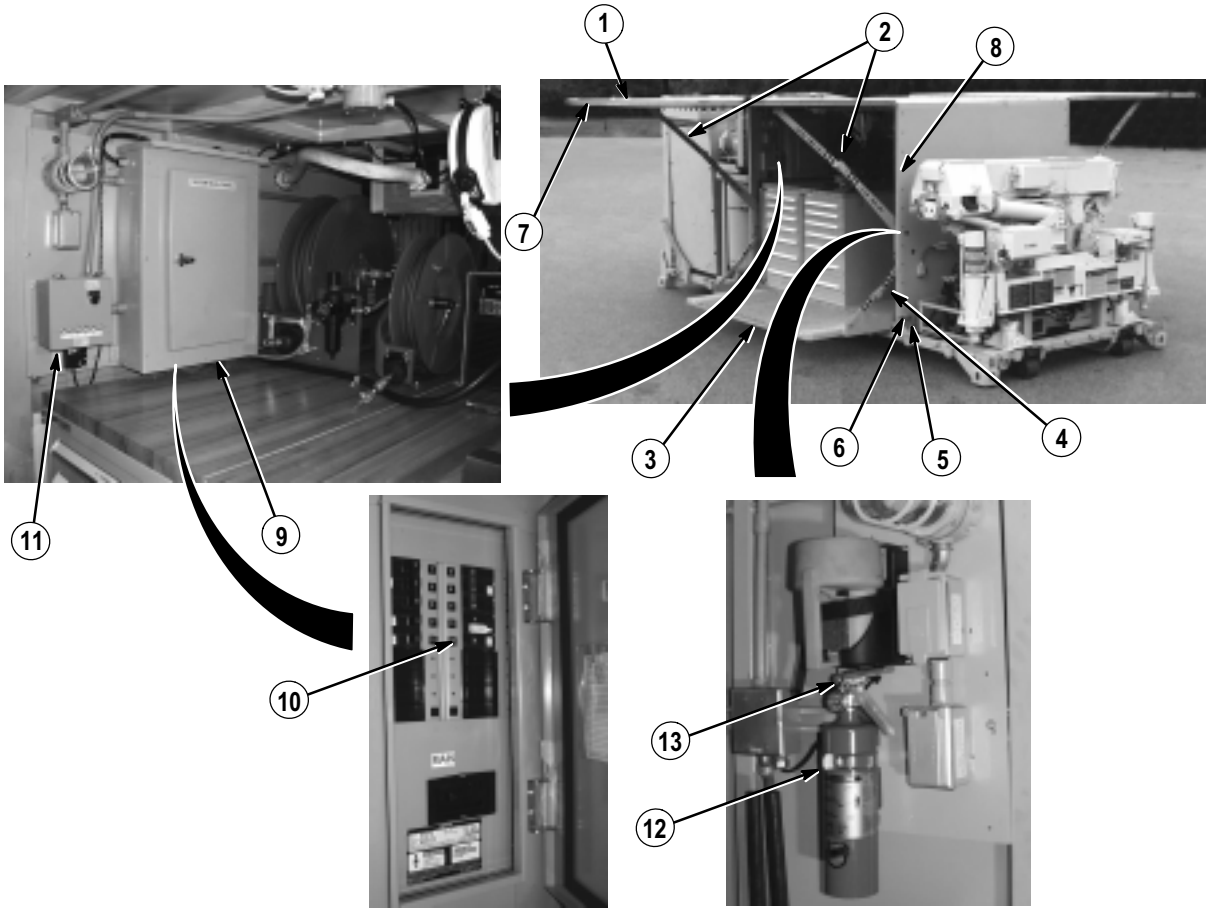


Table 2-1. Operator's Level Preventive Maintenance Checks and Services (Before) (CONT).

Item No.	Interval	Item to Check/ Service	Procedure	Not Fully Mission Capable If:
3	Before	Doors	Open left door (Para 2-33) and check operation of door (1), door support arms (2), platform (3) and platform support arms (4). Check latches (5), pins (6), seals (7) and snaps (8) are not broken or missing.	Door struts do not lock open or loose or missing hardware.
4	Before	Circuit Breaker Boxes	Check outside of circuit breaker boxes (9) for dents, cracks or missing hardware. Open door of main circuit breaker box and check breakers (10) are not tripped and 24V breaker (11) is on. Ensure correct position of breakers per operation.	
5	Before	Interior Fire Extinguisher	Check for missing, damaged and loose fire extinguisher (12). Check for proper pressure/seal (13) condition.	Fire extinguisher is missing, or damaged. Pressure gage needle in red area or seal is broken.

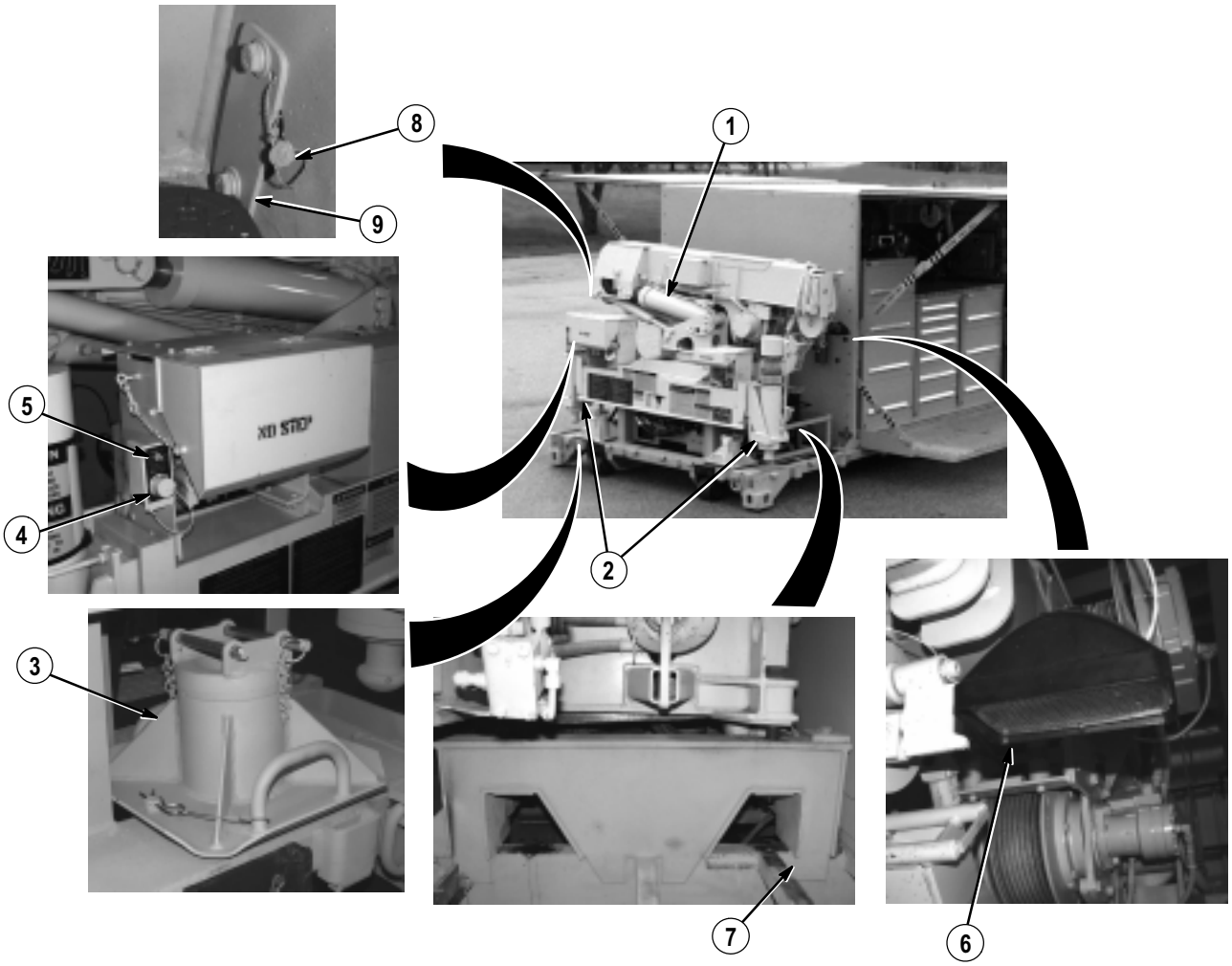


Table 2-1. Operator's Level Preventive Maintenance Checks and Services (Before) (CONT).

Item No.	Interval	Item to Check/ Service	Procedure	Not Fully Mission Capable If:
6	Before	Crane	Check crane (1) for obvious damage and loose parts. Check left and right outrigger jacks (2) and pads (3) for damage, leaks, missing and loose parts. Check condition of remote control hookup socket (4) and check operation of crane power switch (5). Check boom light (6) for obvious damage and loose parts. Check crane for current load test dates. Check crane frame base (7) for cracks or visible structure damage. Ensure there is no paint on crane hook. Check for cut, broken or missing safety lock seal (8) on manual override guard (9). Possible crane damage, notify supervisor.	Class III leak is evident. Crane is damaged or parts are missing. Load test date missing or expired. Crane frame cracked or damaged.

2-11. PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS) TABLES (CONT).

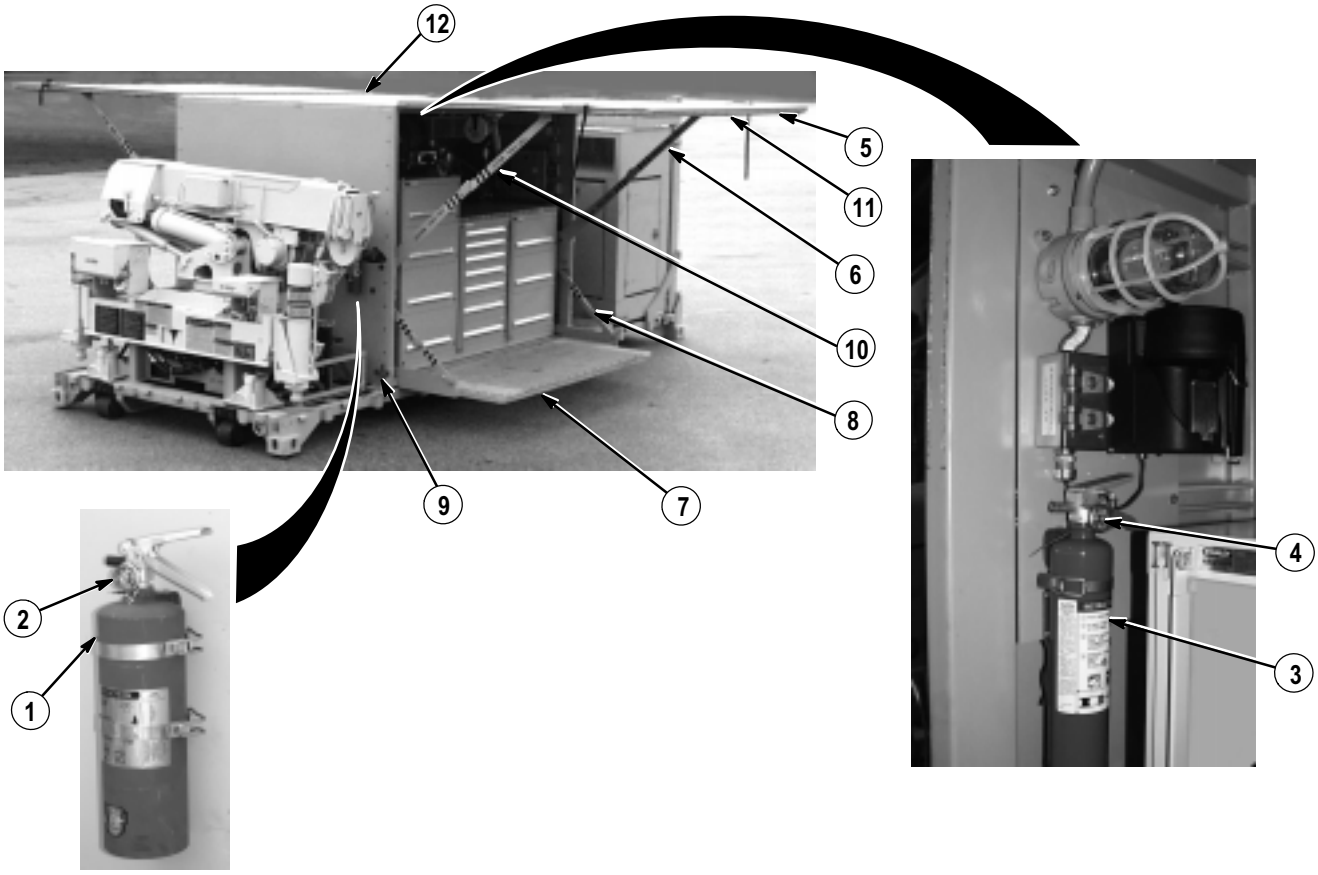


Table 2-1. Operator's Level Preventive Maintenance Checks and Services (Before) (CONT).

Item No.	Interval	Item to Check/ Service	Procedure	Not Fully Mission Capable If:
7	Before	Exterior Fire Extinguisher	Check for missing, damaged and loose fire extinguisher (1). Check for proper pressure/seal (2) condition.	Fire extinguisher is missing, or damaged. Pressure gage needle in red area or seal is broken.
8	Before	Doors	Check for missing or damaged fire extinguisher (3). Check for proper pressure/seal (4) condition.	Door struts do not latch over center or loose or missing hardware.
9	Before	Interior Fire Extinguisher	Open right door (Para 2-33) and check operation of door (5), door support arms (6), platform (7) and platform support arms (8). Check latches (9), pins (10), seals (11) and snaps (12) are not broken or missing.	Fire extinguisher is missing, or damaged. Pressure gage needle in red area or seal is broken.

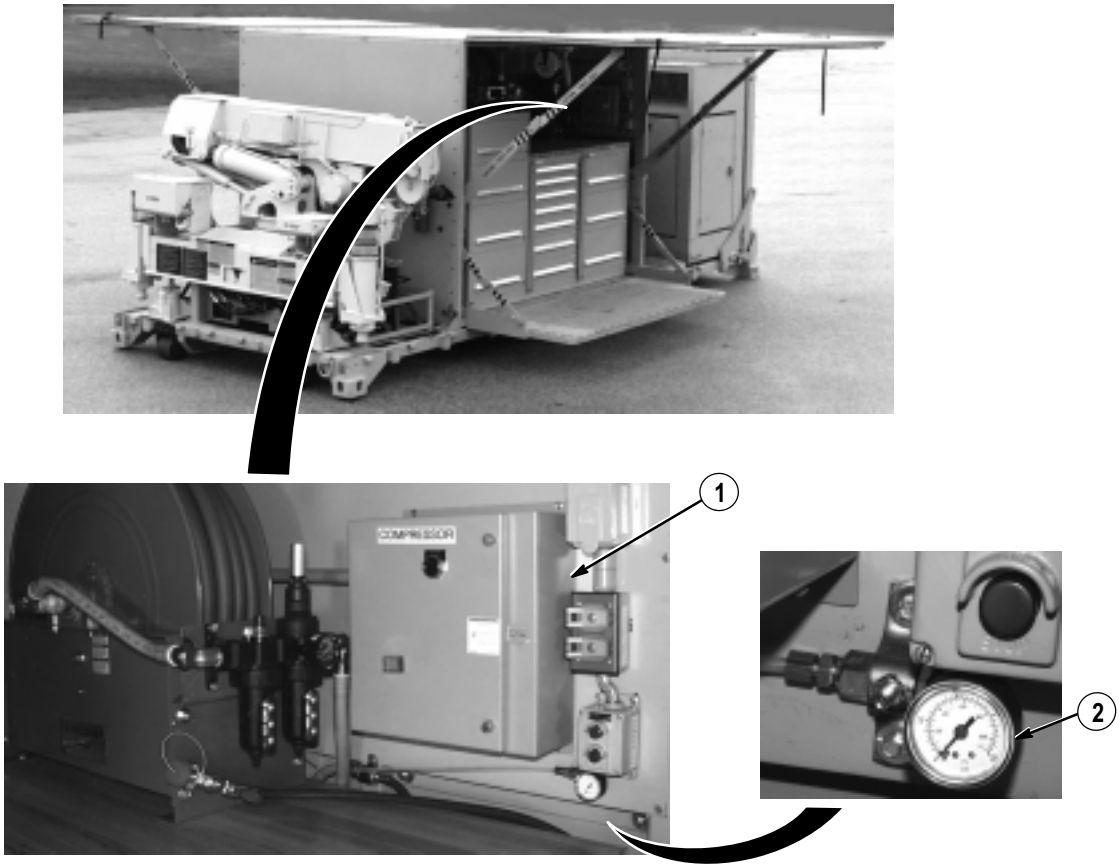


Table 2-1. Operator's Level Preventive Maintenance Checks and Services (Before) (CONT).

Item No.	Interval	Item to Check/ Service	Procedure	Not Fully Mission Capable If:
10	Before	Air Compressor Circuit Box	Check outside of air compressor breaker box (1) for dents, cracks or missing hardware. Check that switch is in off position.	
11	Before	Eyewash Gage	Check eyewash gage (2) for proper reading of 95 to 110 psi.	Gage is inoperable or reads less than 95 psi or over 110 psi.

2-11. PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS) TABLES (CONT).

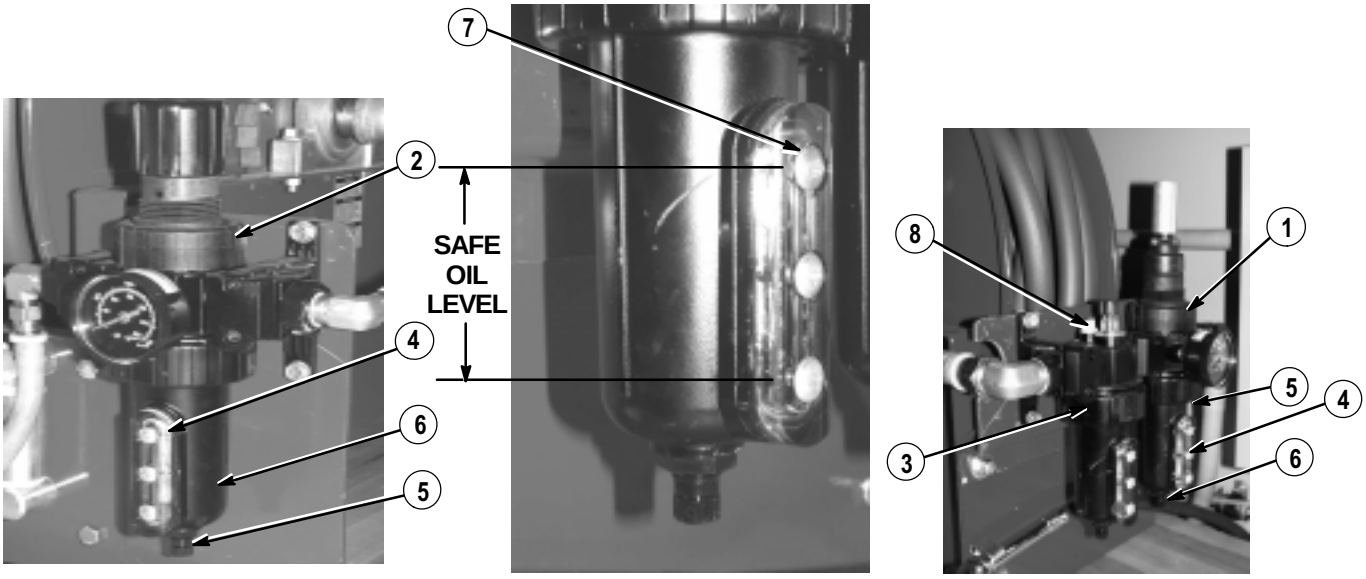


Table 2-1. Operator's Level Preventive Maintenance Checks and Services (Before) (CONT).

Item No.	Interval	Item to Check/ Service	Procedure	Not Fully Mission Capable If:
			WARNING Drain air compressor reservoir before servicing the air lubricator. Failure to comply may result in injury to personnel.	
12	Before	General Air Regulator/ Water Separator, Pnuematic Air Regulator/ Water Separator and Air Lubricator	(a) Check overall condition of both air regulators/water separators (1) and (2) and air lubricator (3). Check for damaged or missing parts. (b) Check both water separator site gages (4) for presence of water. Turn drain valve (5) and drain water from both regulator bowls (6). Close drain valves. (c) Check air lubricator (3) oil level. Oil level should be kept between hatchmarks on air lubricator site gage (7), as shown. To add oil, remove oil fill plug (8) and fill as required (refer to Appendix G). Install oil fill plug.	

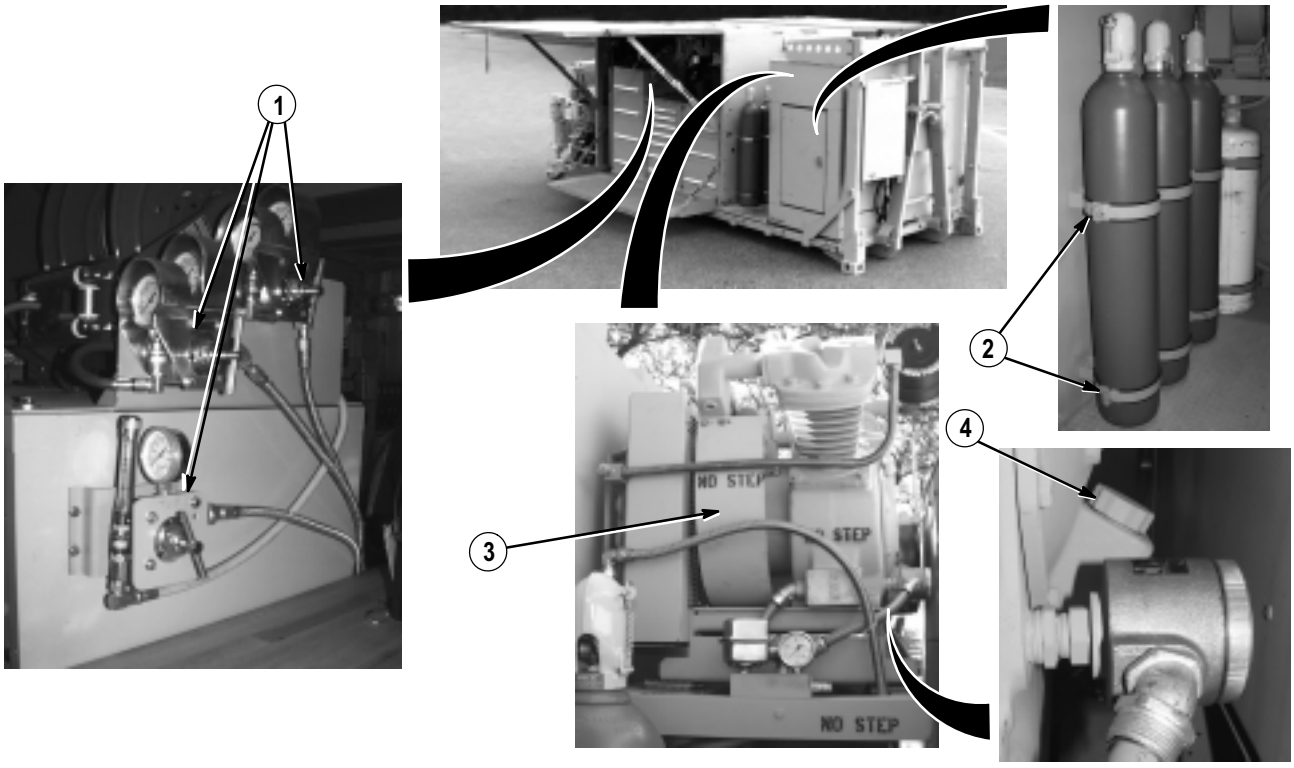


Table 2-1. Operator's Level Preventive Maintenance Checks and Services (Before) (CONT).

Item No.	Interval	Item to Check/ Service	Procedure	Not Fully Mission Capable If:
13	Before	Gas Regulators	Check overall condition of gas regulators (1). Check for damaged or missing parts. Check gas regulators for any gas leaks. Check gas regulator valves are closed.	
14	Before	Gas Bottles and Brackets	Check bottle brackets (2) for loose or missing hardware. Check that all bottles are present and serviceable. **NOTE** After using air compressor the air reservoir should be drained or drained daily.	
15	Before	Air Compressor	Check air compressor (3) for damaged or missing parts. Check air compressor reservoir oil (4). Check air lines, hoses and fittings for leaks, cracks and kinks.	

2-11. PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS) TABLES (CONT).

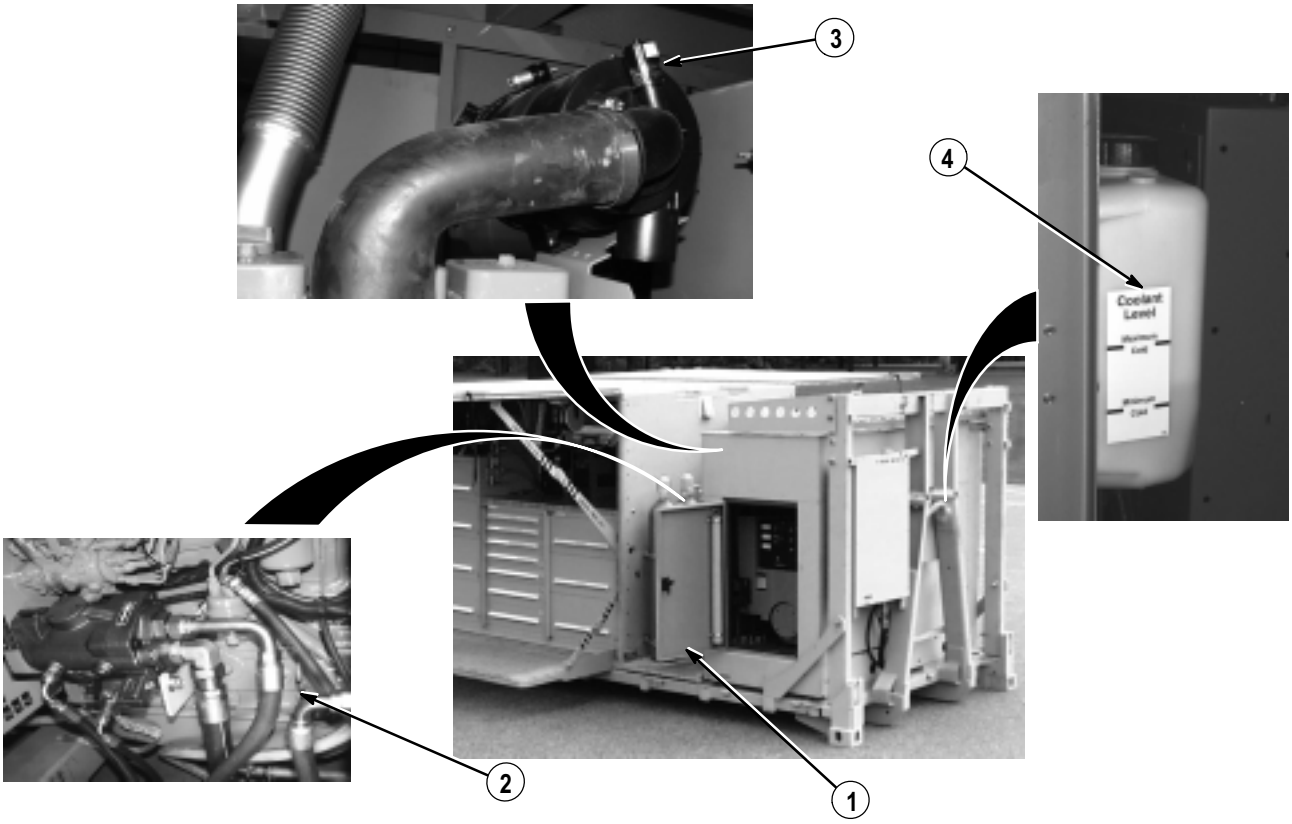


Table 2-1. Operator's Level Preventive Maintenance Checks and Services (Before) (CONT).

Item No.	Interval	Item to Check/ Service	Procedure	Not Fully Mission Capable If:
16	Before	Generator/ Engine Set	**NOTE** Remove access panels as necessary for checks and services. (a) Check generator engine set housing for loose or missing parts and hardware. Check access panel doors and control panel door (1) for obvious damage and any loose or missing hardware or seals. (b) Visually check for evidence of leaks. (c) Check engine oil level (2). Check air filter restriction indicator (3). (d) Check generator/engine set for any broken, missing or damaged hardware. (e) Check surge tank coolant level (4).	Class II fuel leak and/or Class III oil leak is evident.

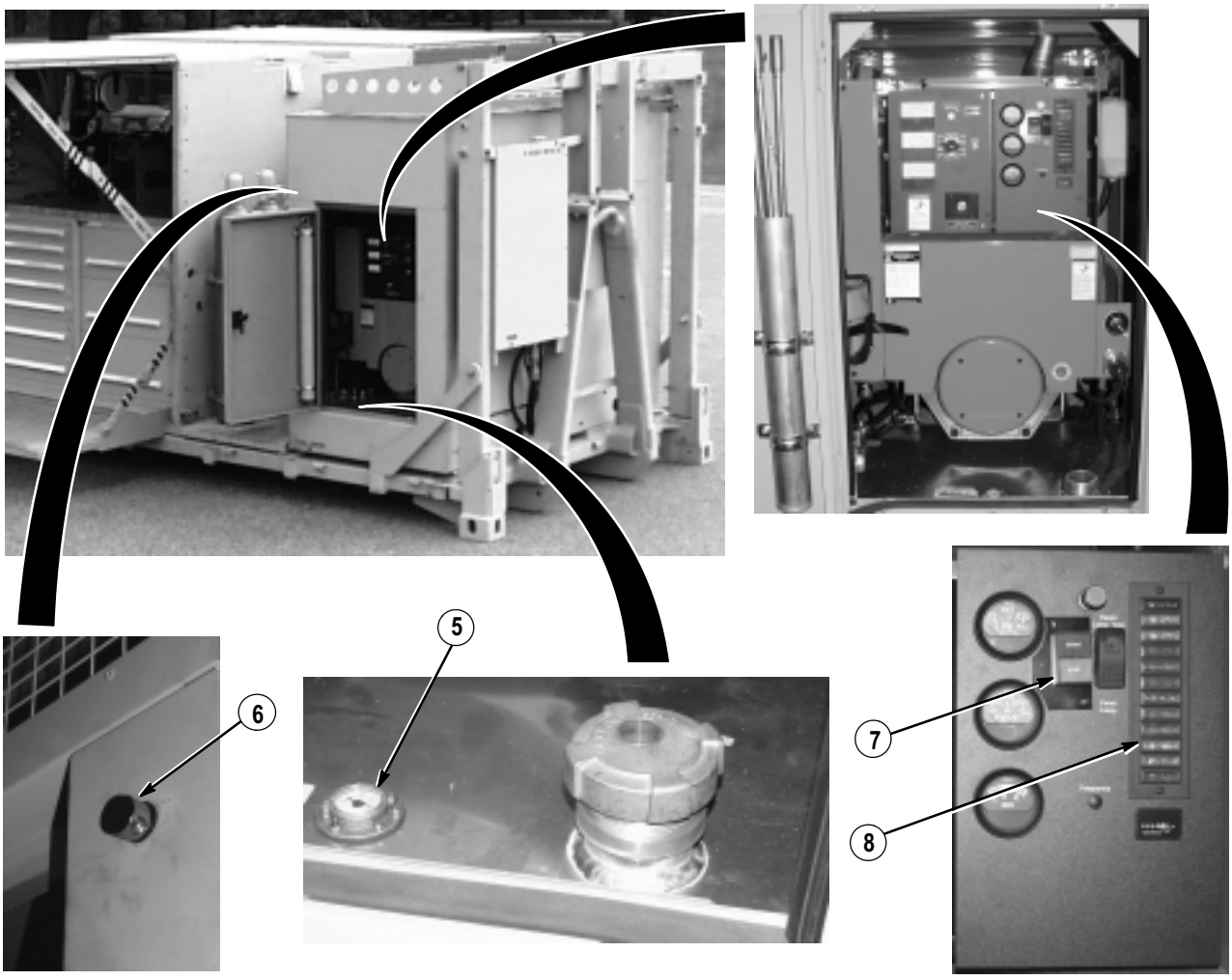


Table 2-1. Operator's Level Preventive Maintenance Checks and Services (Before) (CONT).

Item No.	Interval	Item to Check/ Service	Procedure	Not Fully Mission Capable If:
16	Before	Generator/ Engine Set	(f) Check for proper operation of fuel gage (5). Check that fuel vent (6) is not clogged. (g) Push lamp test switch (7) to check all indicator lights (8), are working on generator.	
17	Before	Grounding Rod	Check grounding rod sections and brackets for any loose or missing parts and hardware.	Grounding rod sections are missing or damaged.

2-11. PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS) TABLES (CONT).

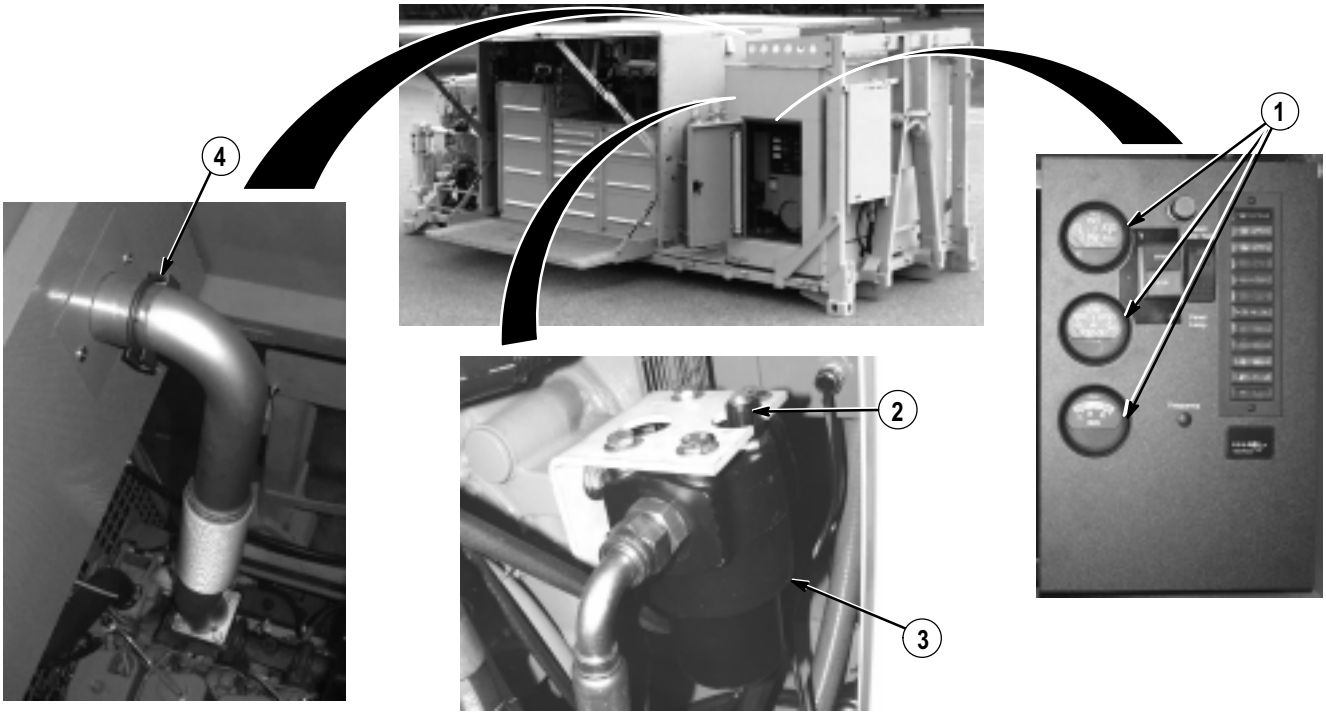


Table 2-2. Operator's Level Preventive Maintenance Checks and Services (During).

Item No.	Interval	Item to Check/ Service	Procedure	Not Fully Mission Capable If:
18	During	Generator/ Engine Set	(a) Start generator (Para 2-15) and check all gages on panel (1) to ensure operation. Recheck panel after 30 minutes of operation to make sure no indicator lights are lit.	
			(b) Check hydraulic filter (2) indicator (3) is not in by-pass mode.	Cannot do if not visible.
			(c) Listen for unusual engine noise, misfiring, and rough operation of generator/engine. Check for hunting and oscillation speed of engine.	Generator/engine operation rough, misfiring or makes unusual noise.
			WARNING The exhaust pipe and muffler are very hot during operation. Do not touch these parts with bare hands, or allow body to come in contact with exhaust pipe or muffler. Exhaust system parts can cause serious burns.	
19	During	Exhaust System	Listen to exhaust system (4) for leaks.	Muffler or exhaust pipes are leaking exhaust fumes.

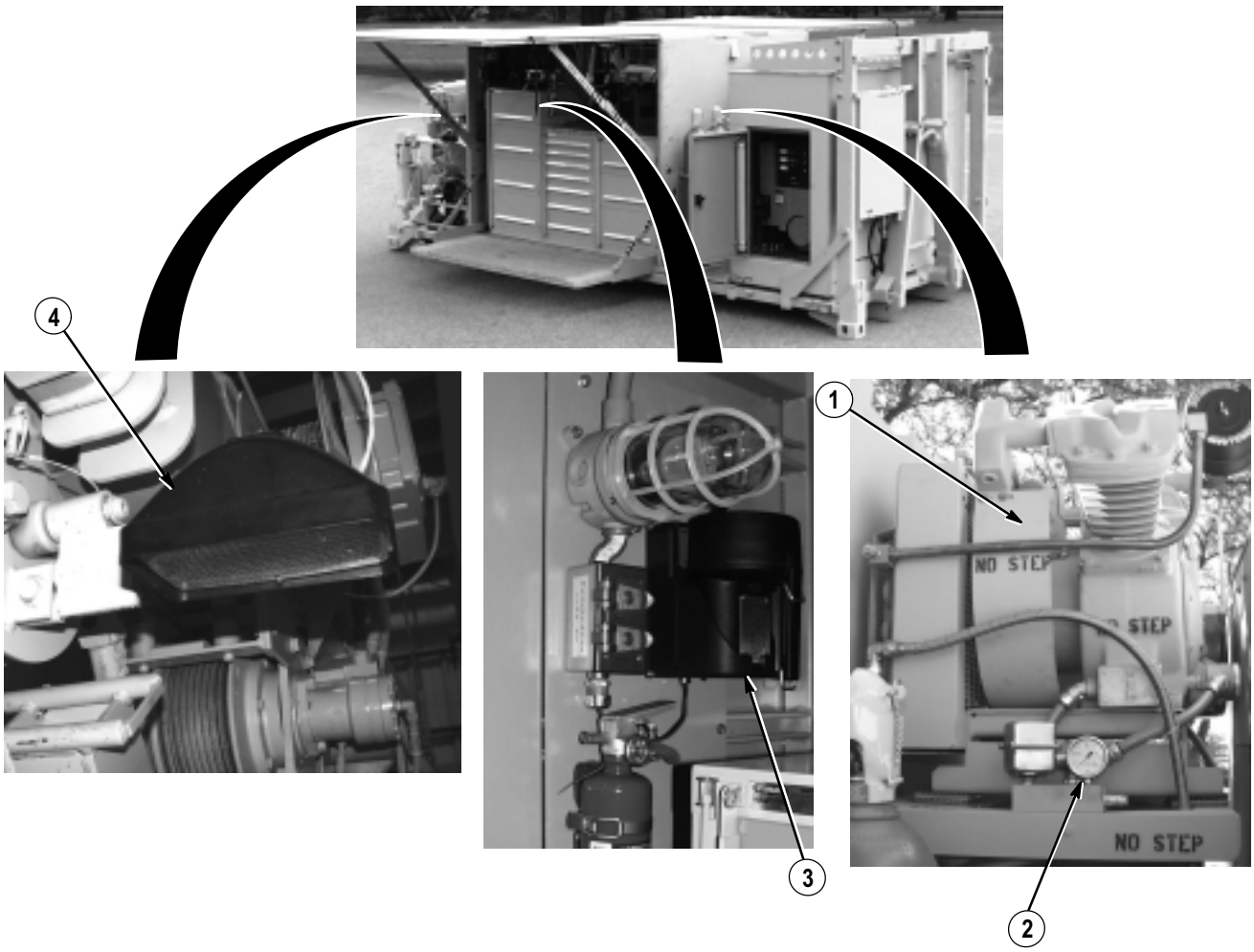


Table 2-2. Operator's Level Preventive Maintenance Checks and Services (During) (CONT).

Item No.	Interval	Item to Check/ Service	Procedure	Not Fully Mission Capable If:
20	During	Air Compressor	Listen for any unusual noise and check for evidence of air leaks in air compressor (1). Check air compressor gage (2) for proper reading of 110 to 195 PSI.	Belt loose, unusual noise. If reading is below 110 PSI.
21	During	Electrical Components	While generator is running, check all lights, handlamp (3), switches and crane boom light (4).	
22	During	Shelter Doors	Check shelter roof and doors for accumulated snow, ice, dirt and material buildup. Clear shelter roof and doors.	

2-11. PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS) TABLES (CONT).

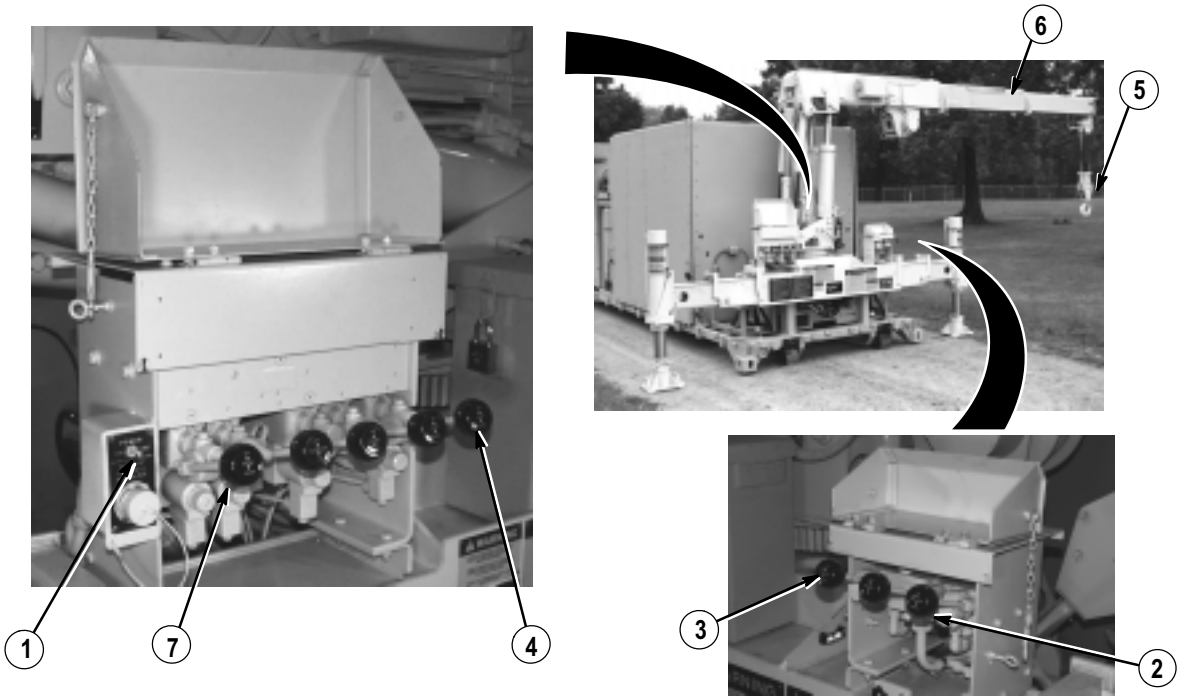


Table 2-2. Operator's Level Preventive Maintenance Checks and Services (During) (CONT).

Item No.	Interval	Item to Check/ Service	Procedure	Not Fully Mission Capable If:
23	During	Material Handling Crane Manual Override	Check manual overide valve is locked in closed position. (a) Position crane main power switch (1) in the OFF position. (b) Move RH O/R JACK (2) or LH O/R JACK (3) to DOWN.	Outrigger jack lowers.
24	During	Material Handling Crane	Check for proper boom operation: (a) Erect crane (Para 2-29). Move HOIST control lever (4) to UP and slowly raise hook block (5) to contact boom (6). Hold HOIST control lever in UP position and move BOOM control lever (7) to UP then DOWN. (b) Move HOIST control lever (4) to DOWN and slowly lower hook block one foot. Move BOOM control lever (7) to UP then DOWN. (c) Stow crane (Para 2-29).	Boom will raise and/or lower. Boom will not raise and/or lower.

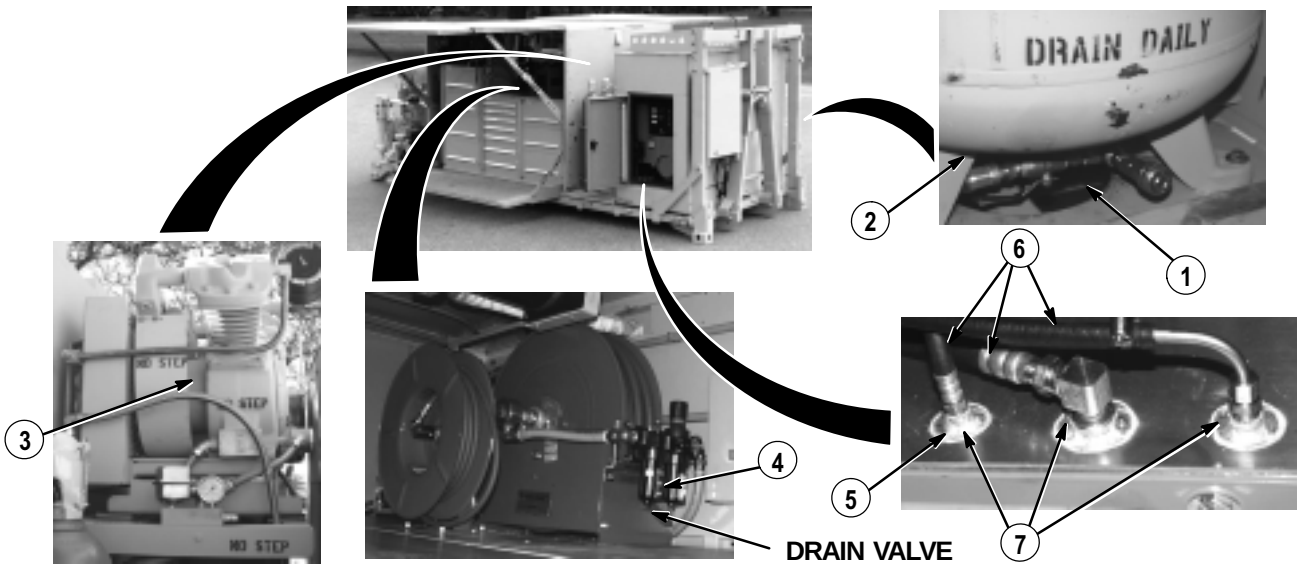


Table 2-3. Operator's Level Preventive Maintenance Checks and Services (After).

Item No.	Interval	Item to Check/ Service	Procedure	Not Fully Mission Capable If:
25	After	Leaks	Check underneath FRS for evidence of fluid leakage.	Class III leak is evident.
26	After	Air Reservoir	Turn air reservoir valve (1) and drain air from air reservoir (2), close valve.	Tank will not drain.
27	After	Air Lines, Hoses, Fittings and Clamps	Check air lines, hoses and fittings for leaks, cracks or kinks. Check clamps for looseness and missing or broken hardware.	
			NOTE After using air compressor the air reservoir should be drained or drained daily.	
28	After	Air Compressor, Hoses and Fittings	(a) Check air compressor (3) for damaged or missing parts. (b) Open drain valve and drain water from air compressor air lubricator (4), close drain valve. (c) Check air compressor air lubricator (4) for proper oil level. Check air lines, hoses and fittings for leaks, cracks and kinks.	
			WARNING Fuel is very flammable and can explode easily. To avoid serious injury or death, keep fuel away from open fire and keep fire extinguisher within easy reach when working with fuel. Do not work on fuel system when engine is hot. Fuel can be ignited by hot engine.	
29	After	Fuel Tank	Check fuel tank (5), hoses (6) and fittings (7) for leaks and cracks.	Class II leak is evident. Cracks that will impair operation are present.

2-11. PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS) TABLES (CONT).

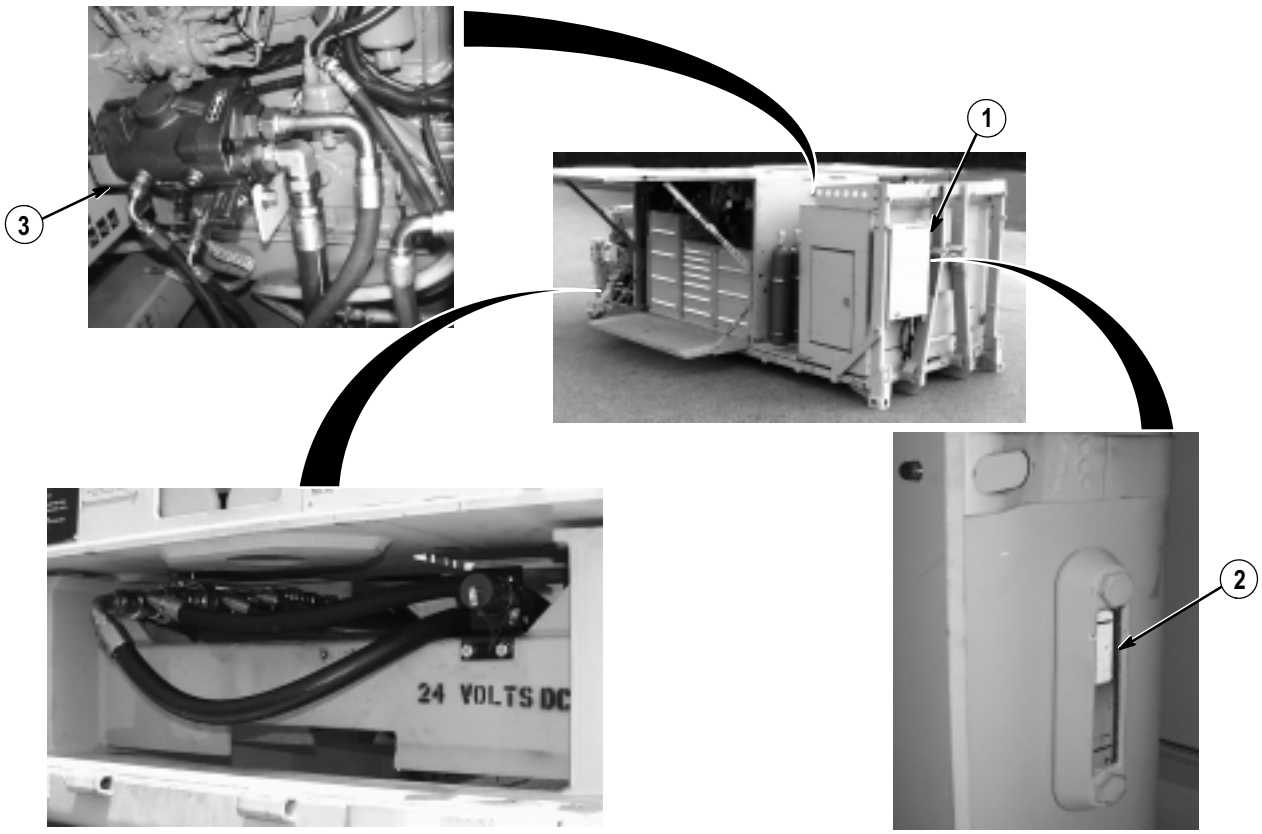


Table 2-3. Operator's Level Preventive Maintenance Checks and Services (After) (CONT).

Item No.	Interval	Item to Check/ Service	Procedure	Not Fully Mission Capable If:
			WARNING Hydraulic oil may be hot and cause serious burns.	
30	After	Hydraulic Reservoir	Check hydraulic reservoir fluid (1). If oil level is within the marks on sight glass (2) the quantity of hydraulic oil is safe for operation.	Class III leak is evident.
31	After	Hydraulic Pump, Hoses and Fittings	Check hydraulic pump (3), hoses and fittings for cracks or leaks.	Class III leak is evident. Cracked or broken fittings or hoses are present.
32	After	Hydraulic Lines and Hoses	Check for leaking and damaged hydraulic lines and hoses.	Class III leak is evident. Cracks or kinks that will impair operation are present.

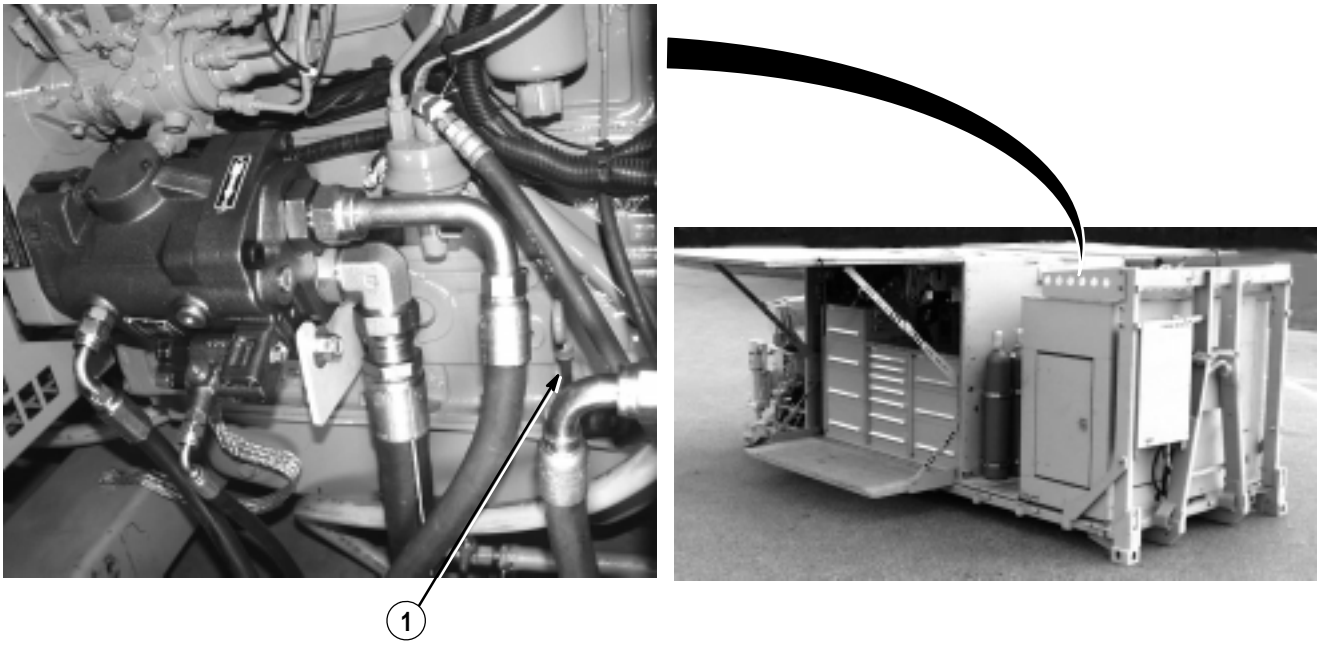


Table 2-3. Operator's Level Preventive Maintenance Checks and Services (After) (CONT).

Item No.	Interval	Item to Check/ Service	Procedure	Not Fully Mission Capable If:
	CAUTION • Never allow engine oil level to drop below the LOW (L) mark or above the High (H) mark. Damage to engine may result. • Allow at least 5 minutes after shutdown before checking oil to allow time for the oil to drain to the oil pan.			
33	After	Generator/ Engine Oil Level	Check that oil level is between Low (L) and Full (F) on the dipstick (1). If below Low (L) fill as required.	Oil level is not between Low (L) and Full (F) on dipstick.

2-11. PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS) TABLES (CONT).

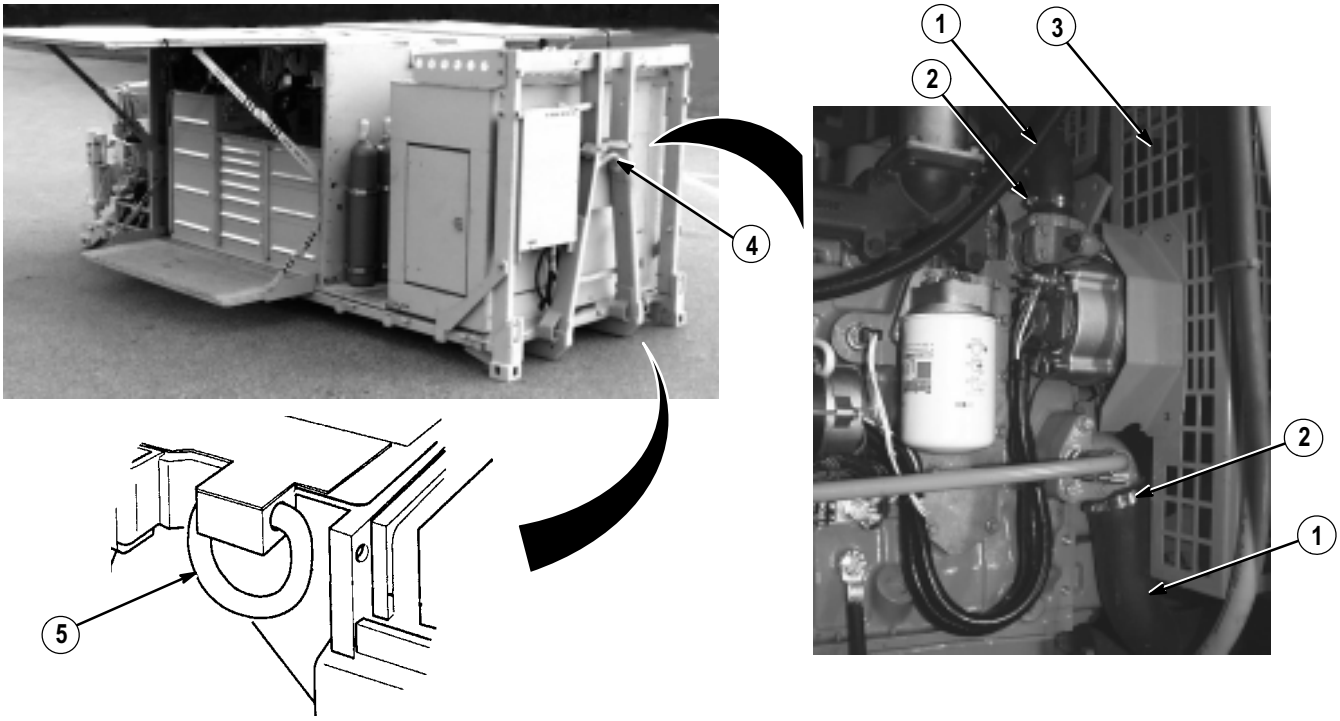


Table 2-3. Operator's Level Preventive Maintenance Checks and Services (After) (CONT).

Item No.	Interval	Item to Check/ Service	Procedure	Not Fully Mission Capable If:
	WARNING • Radiator coolant can be extremely hot and cause severe burns. • Use extreme caution when checking radiator hoses and clamps or injury to personnel may result.			
34	After	Radiator Hoses and Clamps	Check radiator hoses (1) for leaks and clamps (2) for looseness.	Class III leak is evident.
35	After	Radiator	Check radiator (3) for leaks.	Class III leak is evident.
36	After	Radiator Coolant Level	Check radiator coolant fluid level in surge tank. Add fluid, if necessary.	
37	After	Hook Bar	Check hook bar (4) for cracks and bent bar.	Hook bar has cracks or is bent.
38	After	Sling Rings	Ensure all sling rings (5) can be moved up and down and are not damaged.	

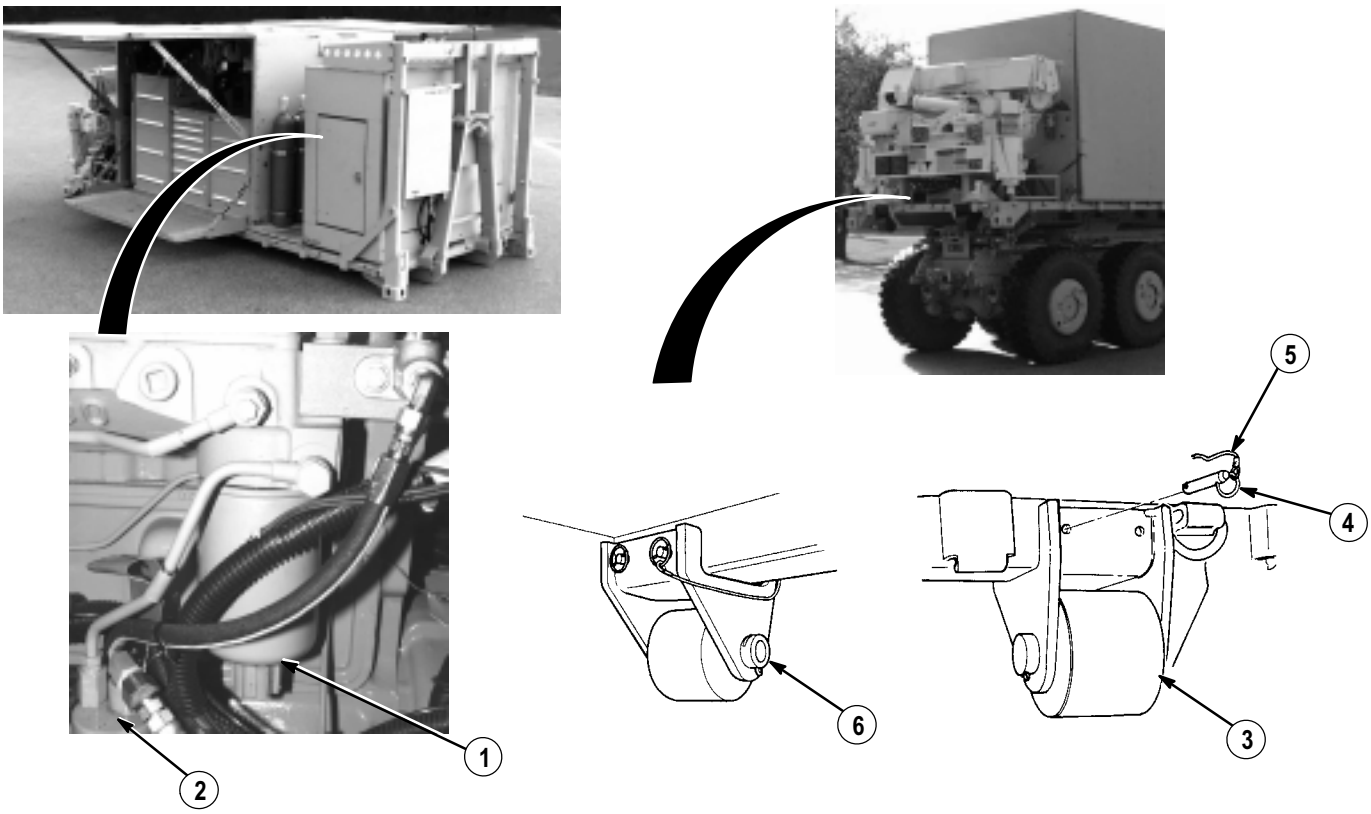


Table 2-3. Operator's Level Preventive Maintenance Checks and Services (After) (CONT).

Item No.	Interval	Item to Check/ Service	Procedure	Not Fully Mission Capable If:
39	After	Fuel Water Separator	(a) Turn drain valve (1) counterclockwise four complete turns. (b) Pump fuel pump handle on fuel pump (2). (c) Drain water until clear fuel is visible, close drain valve (1).	
			WARNING Flatrack roller must be supported while removing retaining pins or roller may drop causing injury to personnel.	
40	After	Rollers	(a) Hold roller (3) in place. Lift on ring (4), pull retaining pin (5) out far enough to ensure it is removeable, then push back in. Perform same with other pin. (b) Ensure that roller (3) will rotate. (c) Ensure roll pins (6) are not damaged.	Neither roller functions correctly.

2-11. PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS) TABLES (CONT).

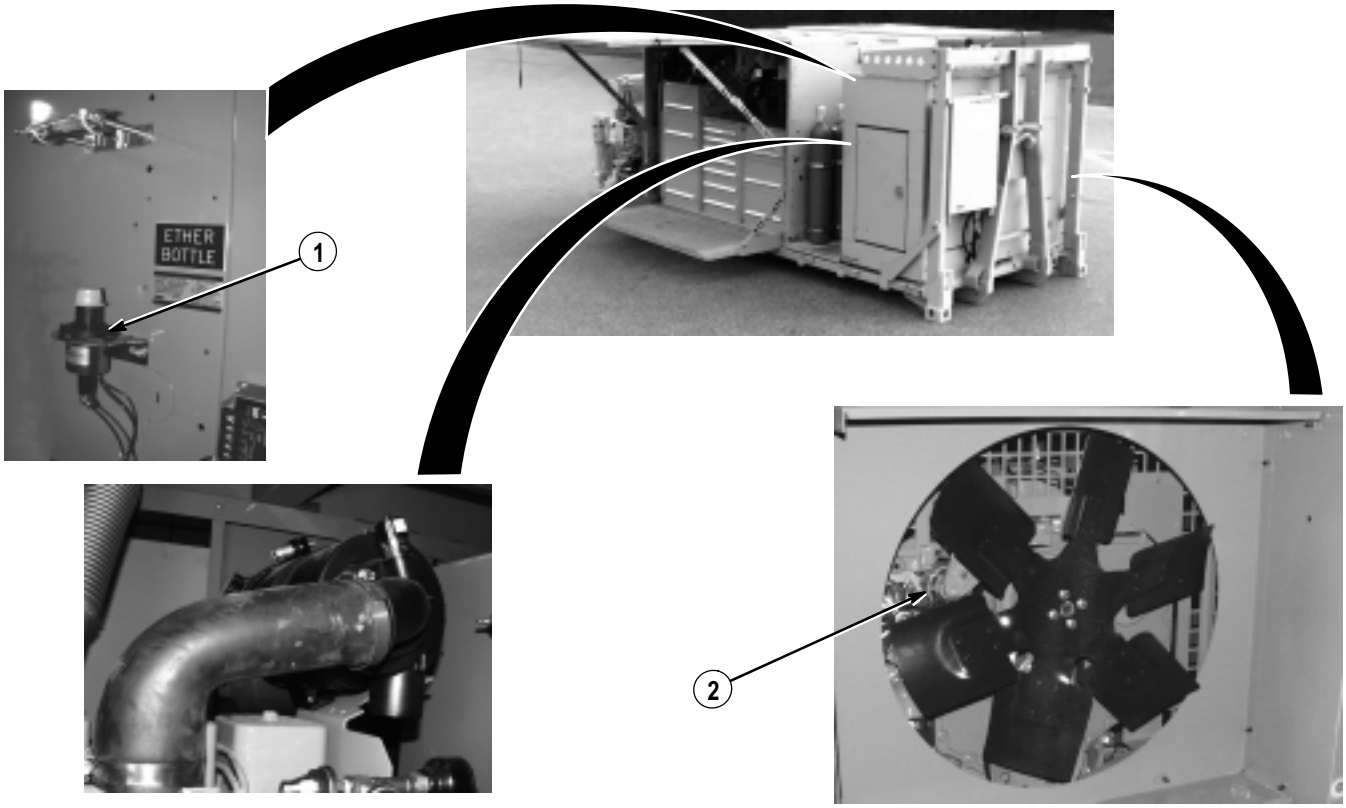


Table 2-4. Operator's Level Preventive Maintenance Checks and Services (Weekly).

Item No.	Interval	Item to Check/ Service	Procedure	Not Fully Mission Capable If:
	NOTE Perform the following check only as required during cold weather operation.			
41	Weekly	Ether Starting Aid	Check hardware, mounts and canister of ether starting aid (1), if present.	
42	Weekly	Engine Air Filter	Check engine air restriction indicator for dirty air filter.	Engine air filter is dirty or unserviceable.
43	Weekly	Engine Accessory Drive Belt	Check engine accessory drive belt (2) for cracking, fraying, and breaks. Check for tightness.	Belt is broken or cracked to the belt fiber, has more than one crack (1/8 in. [3.2 mm] in depth or 50 percent of belt thickness) or has frays more than two in. (51 mm) long.
44	Weekly	Engine Cooling Fan	Check cooling fan for cracks, loose or missing hardware, and bent or loose blades. Check that fan is securely mounted.	

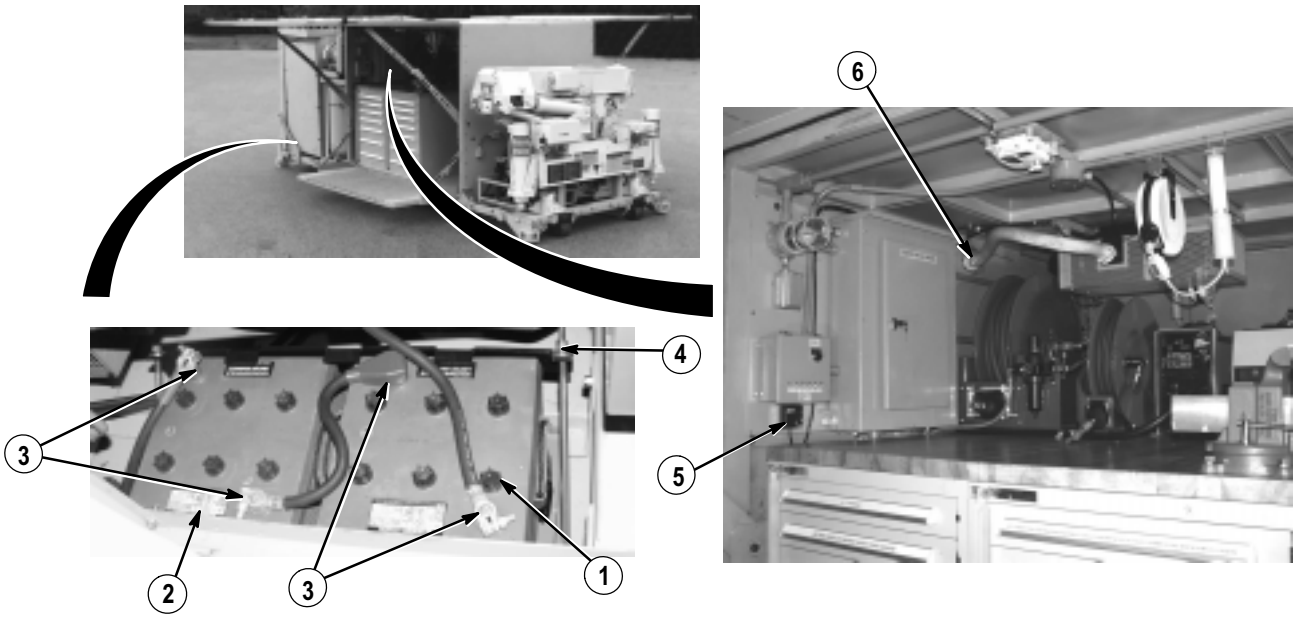


Table 2-4. Operator's Level Preventive Maintenance Checks and Services (Weekly) (CONT).

Item No.	Interval	Item to Check/ Service	Procedure	Not Fully Mission Capable If:
			WARNING • Remove all jewelry such as rings, ID tags, bracelets, etc. If jewelry or tools contact positive electrical circuits a direct short may result. Damage to equipment, injury or death to personnel may occur. • Lead-acid battery gases can explode. Do not smoke, have open flames, or make sparks around a battery, especially if caps are off. If a battery is gassing, it can explode and cause injury to personnel.	
45	Weekly	Batteries	Visually check for missing battery caps (1). Check electrolyte level. Electrolyte should be filled to approximately 1/8 in. (3.2 mm) below level/split ring in the battery filler opening (vent). Visually inspect batteries for cracked and leaking casing (2), broken, loose, burned, and corroded terminal posts (3), loose, or missing hold down bar (4).	Battery is unserviceable, missing, leaking, terminals or cables are loose, corroded, burnt, or hold downs are not secure.
			NOTE Perform the following check below 50° F (10° C) only.	
46	Monthly	Heater	Check operation of heater control (5) by turning clockwise. Warm air flow should be present within five minutes. Check heater vent exhaust (6) for leaks or obstructions.	Heater exhaust is leaking.

2-11. PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS) TABLES (CONT).

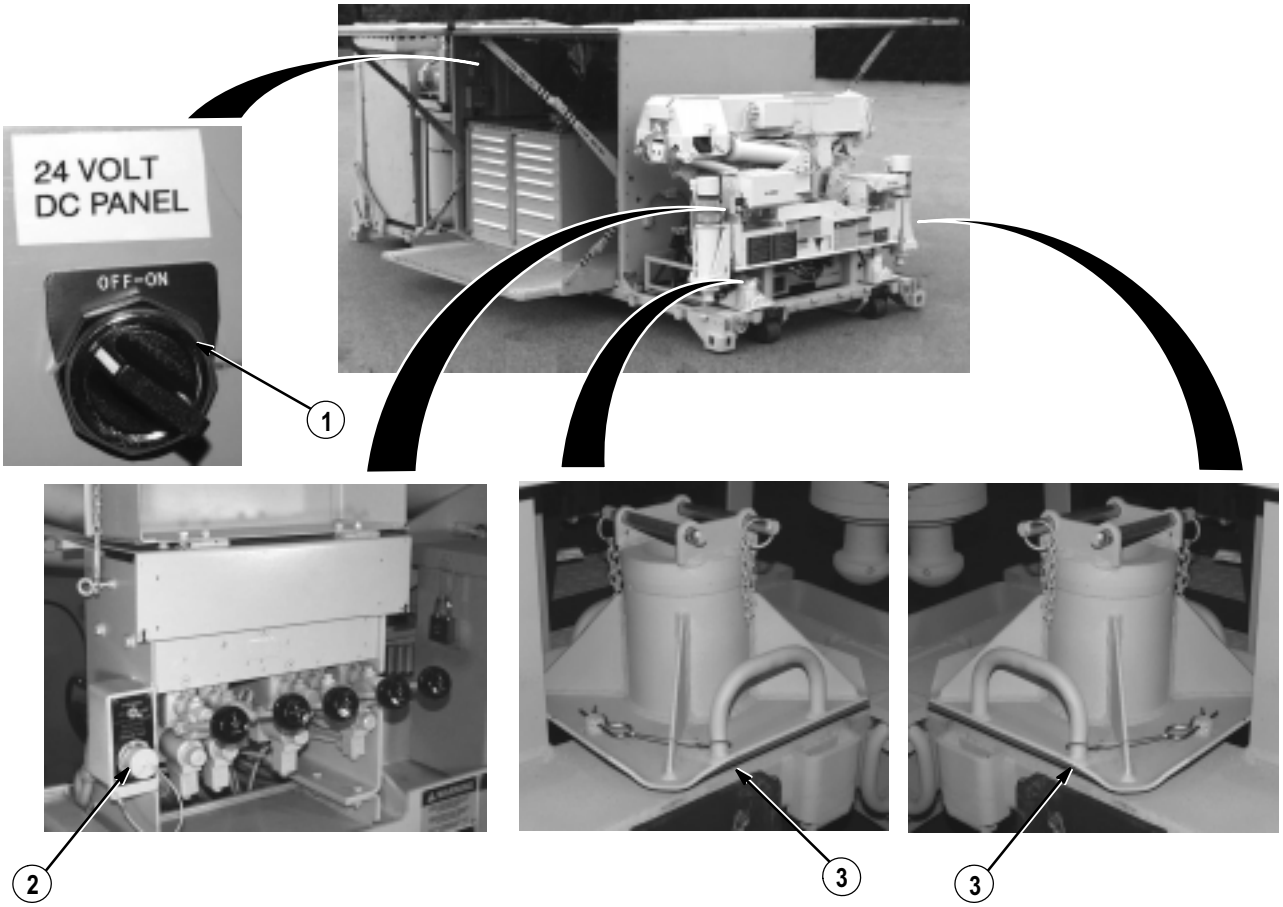


Table 2-5. Operator's Level Preventive Maintenance Checks and Services (Monthly).

Item No.	Interval	Item to Check/ Service	Procedure	Not Fully Mission Capable If:
			WARNING Do not operate crane unless both outrigger jacks are properly set up. Shelter could turn over causing serious injury or death.	
47	Monthly	Outrigger Jacks	(a) Start generator (Para 2-15). (b) Set DC panel switch (1) to ON. (c) Set crane power switch (2) to ON. (d) Set outrigger pads (3). Check that each pad has two retaining pins.	

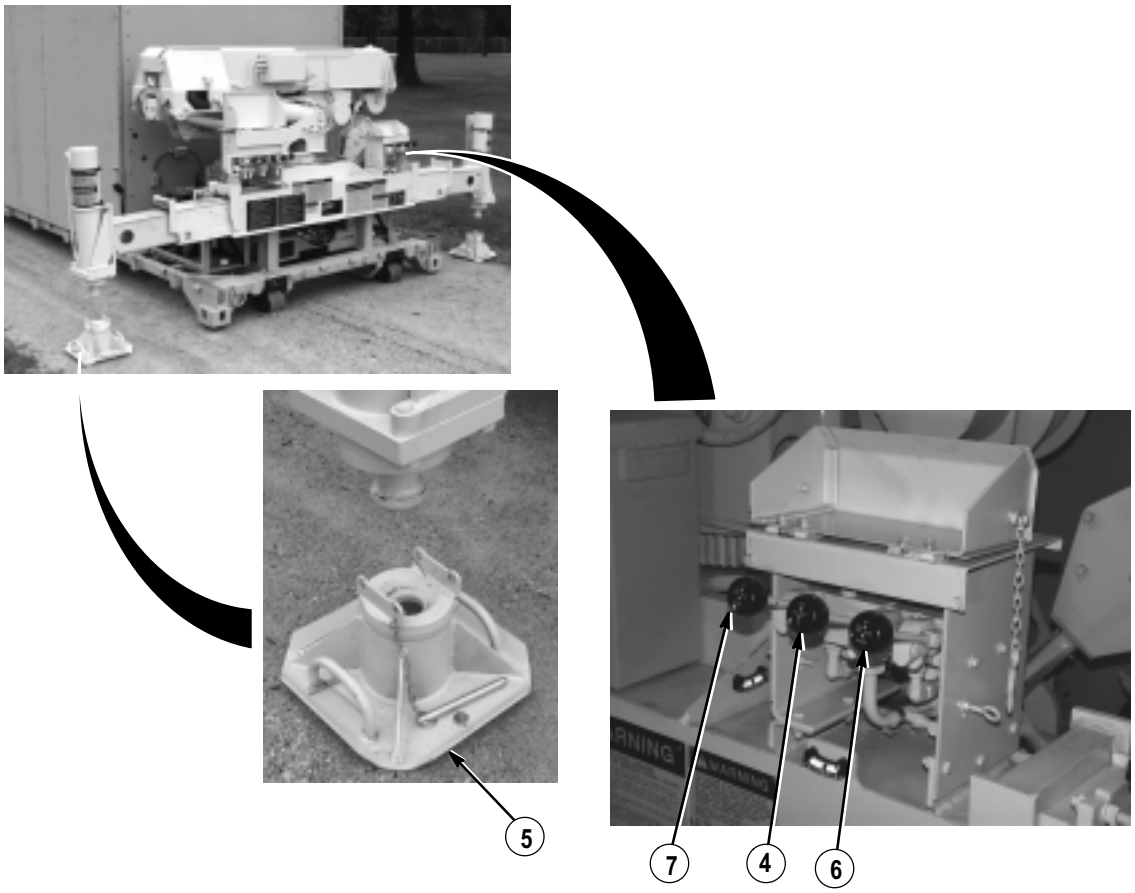


Table 2-5. Operator's Level Preventive Maintenance Checks and Services (Monthly) (CONT).

Item No.	Interval	Item to Check/ Service	Procedure	Not Fully Mission Capable If:
			WARNING • Keep hands and feet away from outrigger jacks while operating lever to avoid injury. • Outriggers should be deployed prior to crane operation to avoid injury. **NOTE** Adjust outrigger pad position as required so ball end will lower into pad socket.	
47	Monthly	Outrigger Jacks	(e) Move control lever (4) to OUT position until outrigger jack cylinders are positioned over outrigger pads (5). Move RH control lever to DOWN position and lower outrigger jack cylinder (6) until ball end firmly seats in outrigger pad. Install retaining pins (7). Move LH control lever to DOWN position and lower outrigger jack cylinder (6) until ball end firmly seats in outrigger pad. Install retaining pins (7).	Outrigger jacks and/or beams will not extend.

2-11. PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS) TABLES (CONT).

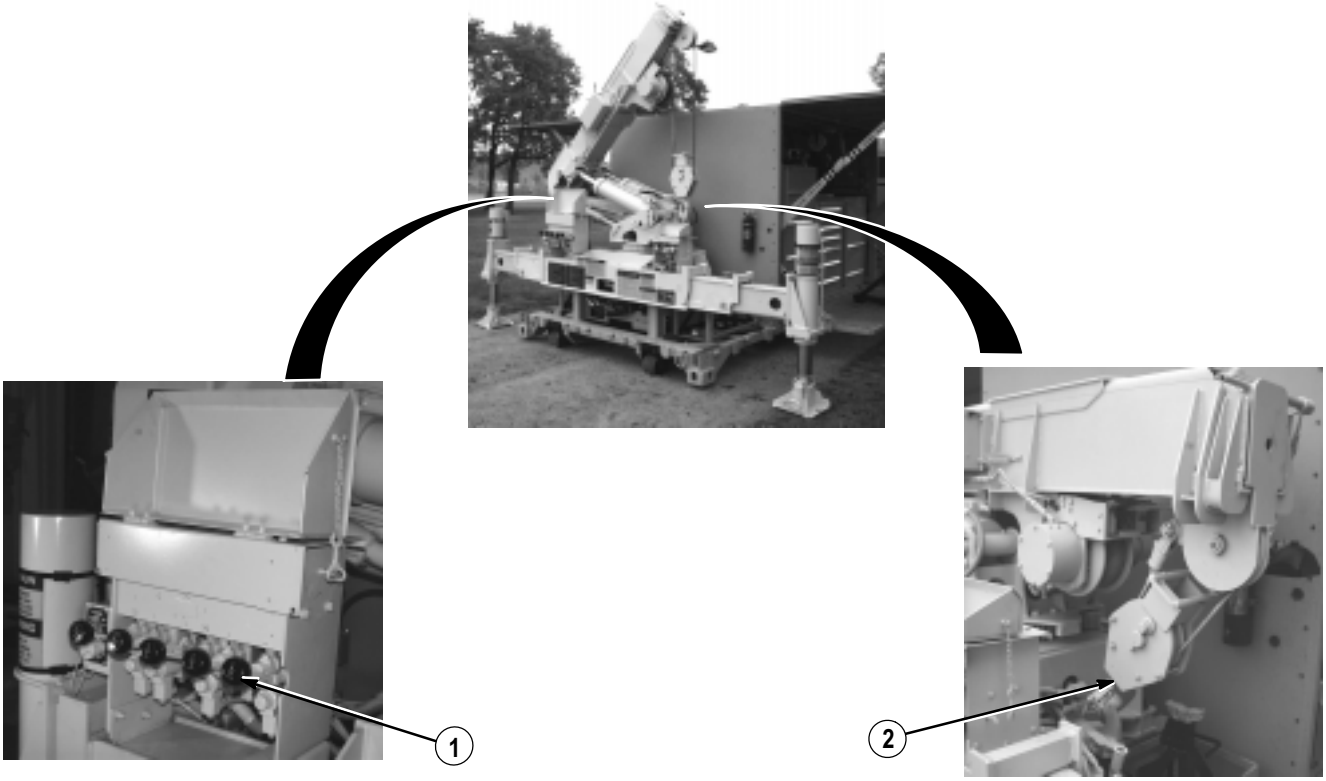


Table 2-5. Operator's Level Preventive Maintenance Checks and Services (Monthly) (CONT).

Item No.	Interval	Item to Check/ Service	Procedure	Not Fully Mission Capable If:
			WARNING Do not operate crane unless both outrigger jacks are properly set up. Shelter could turn over causing serious injury or death.	
48	Monthly	Crane Control Levers	(a) Move HOIST control lever (1) to DOWN position and lower hoist cable about 12 in. (305 mm).	Cable will not pay out.
			WARNING Care must be taken when disconnecting HOIST load hook from hook block tiedown. A swinging hook block can cause serious injury or death to personnel.	
			(b) Disconnect load hook (2) from hook block tie down.	
			(c) Check load hook for cracks. Hook will have to be replaced if cracked.	Hook is cracked.

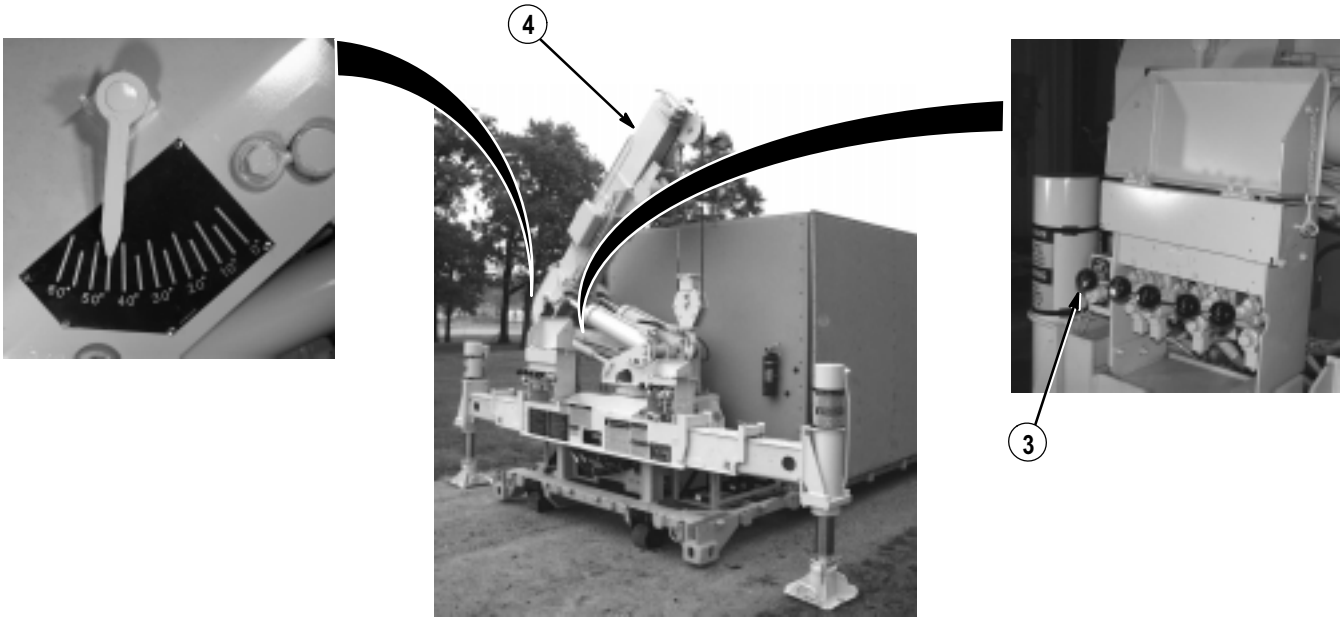


Table 2-5. Operator's Level Preventive Maintenance Checks and Services (Monthly) (CONT).

Item No.	Interval	Item to Check/ Service	Procedure	Not Fully Mission Capable If:
			WARNING • Keep boom clear of shelter, all electrical lines and other obstacles while operating crane. Failure to comply may result in injury or death to personnel. • Do not operate crane unless both outrigger jacks are properly set up. Shelter could turn over causing serious injury or death. • Operator should be stationed to be able to see load at all times during crane operation. Boom and load moving out of control could cause serious injury or death. **CAUTION** • Do not hit outrigger jack with load hook or damage to equipment may occur. • Do not swing crane until boom is at 0 degrees and mast is fully extended or damage to equipment may occur.	
48	Monthly	Crane Control Levers	(d) Move BOOM control lever (3) to UP position until boom (4) is at 45 degree angle as shown on boom indicator.	Boom will not raise.

2-11. PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS) TABLES (CONT).

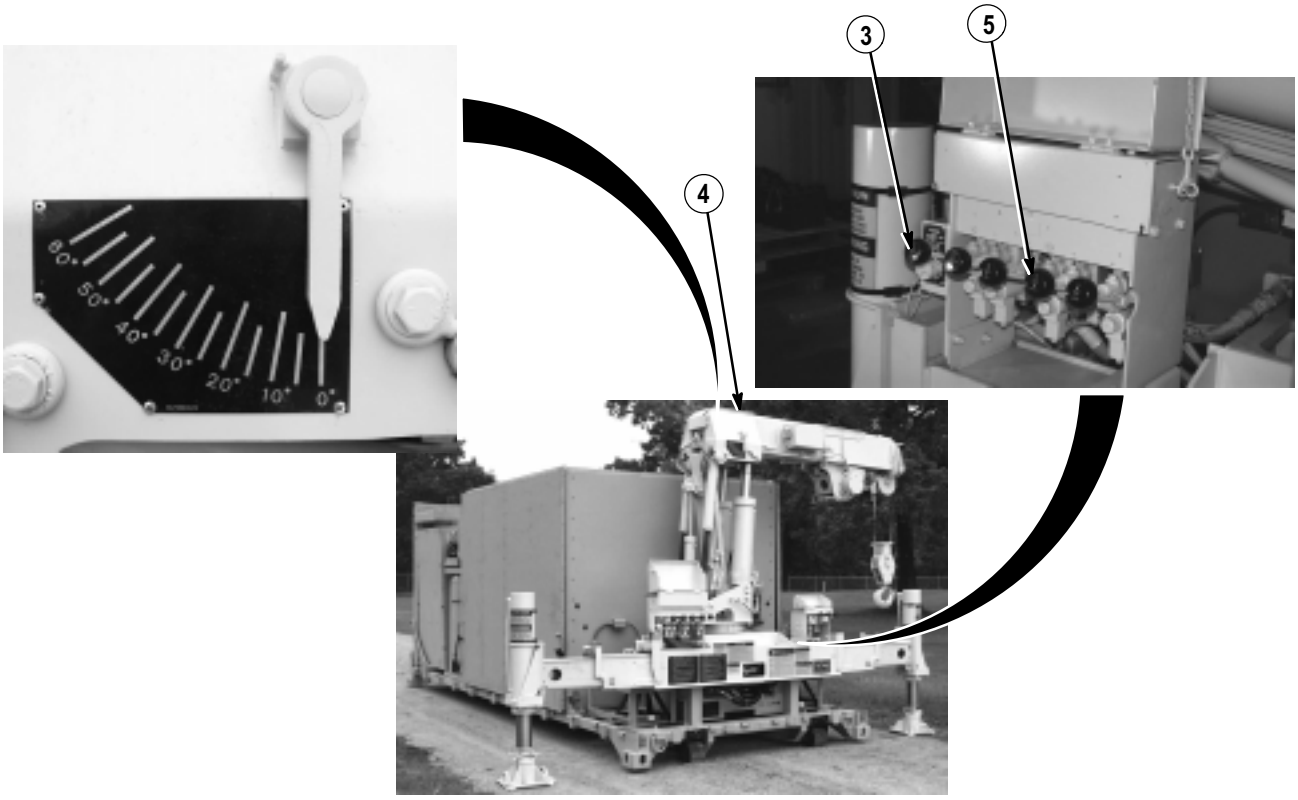


Table 2-5. Operator's Level Preventive Maintenance Checks and Services (Monthly) (CONT).

Item No.	Interval	Item to Check/ Service	Procedure	Not Fully Mission Capable If:
	WARNING Keep boom clear of shelter, all electrical lines and other obstacles while operating crane. Failure to comply may result in serious injury or death to personnel.			
48	Monthly	Crane Control Levers	(e) Move MAST control lever (5) to UP position until mast cylinder is fully extended. (f) Move BOOM control lever (3) to raise boom (4) until boom indicator reads 0 degrees.	Mast will not raise.

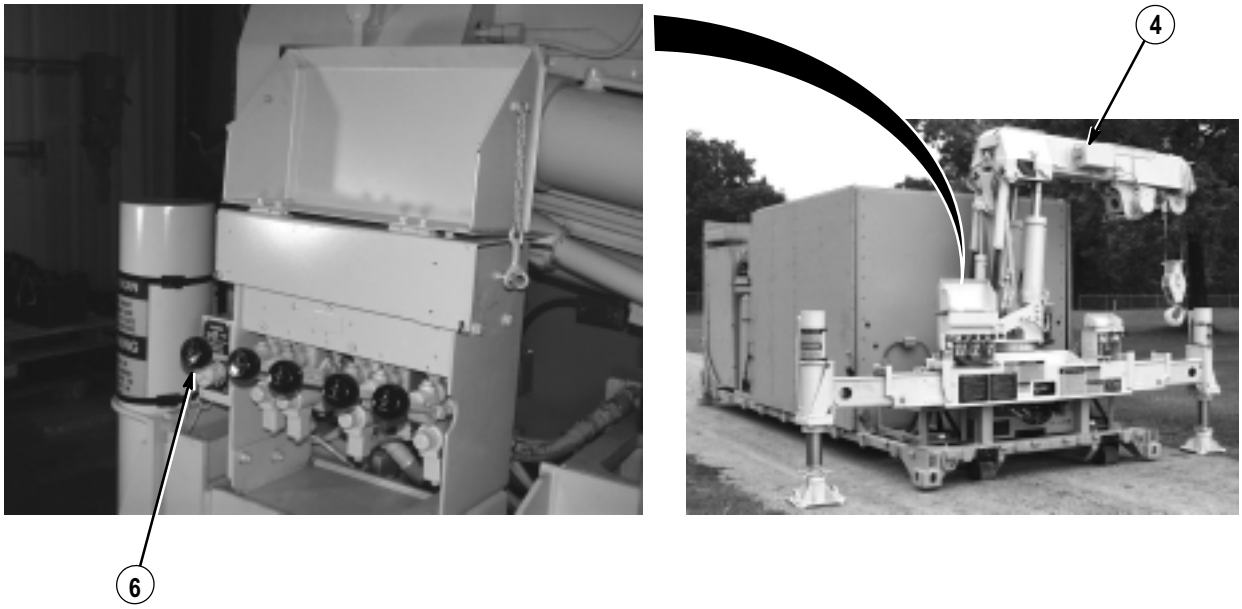


Table 2-5. Operator's Level Preventive Maintenance Checks and Services (Monthly) (CONT).

Item No.	Interval	Item to Check/ Service	Procedure	Not Fully Mission Capable If:
			WARNING Ensure that area is clear of personnel before moving SWING control lever. Boom should be swung slow enough so crane operator has complete control. If operator cannot see load during operation, operate crane from REMOTE CONTROL UNIT. Boom moving out of control could cause serious injury or death. **CAUTION** Do not touch SWING mode until crane is fully deployed. Boom must be above shelter and doors for clearance to avoid damage to shelter or boom. **NOTE** Crane rotation is limited to 300 degrees.	
48	Monthly	Crane Control Levers	(g) Move SWING control lever (6) to clockwise position to move boom (4) clockwise. Check that boom does not turn counterclockwise	Boom will not swing or moves in wrong direction.
			(h) Move SWING control lever (6) to CCW position to move boom (4) counterclockwise. Check that boom does not move clockwise.	Boom will not swing or moves in wrong direction.

2-11. PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS) TABLES (CONT).

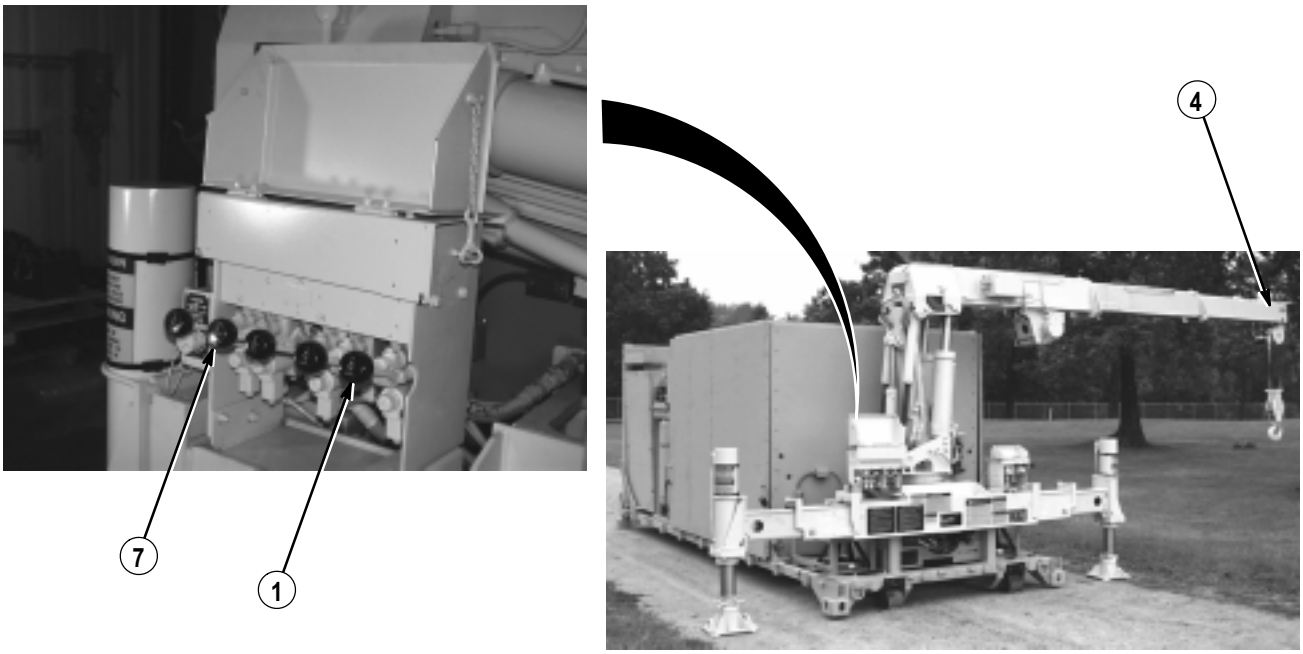


Table 2-5. Operator's Level Preventive Maintenance Checks and Services (Monthly) (CONT).

Item No.	Interval	Item to Check/ Service	Procedure	Not Fully Mission Capable If:
			CAUTION • Keep hook block at least two ft. (0.61 m) from end of boom. If hook block hits end of boom it may damage cable or hook block and crane will lose control functions. Wait six seconds for power to return and check crane for damage. • Do not let cable unwind and become slack or cable may get tangled on drum. **NOTE** • Operate TELESCOPE and HOIST levers at the same time. • Crane movements from one lever may be faster or slower than other when operating two levers together.	
48	Monthly	Crane Control Levers	(i) Move TELESCOPE control lever (7) to OUT position to extend boom (4) while moving HOIST control lever (1) to DOWN position to pay out cable.	Boom will not telescope.

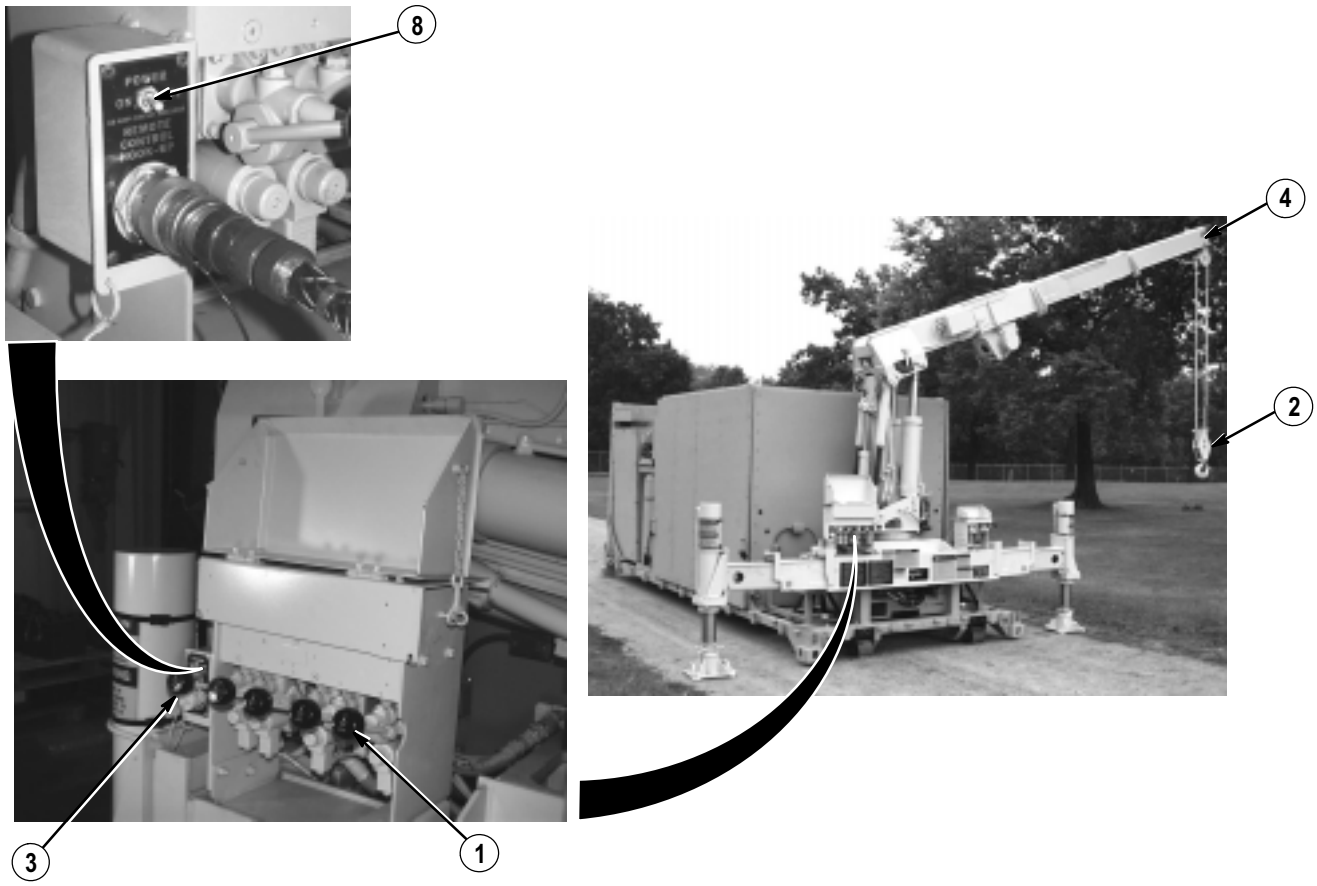


Table 2-1. Operator's Level Preventive Maintenance Checks and Services (Monthly) (CONT).

Item No.	Interval	Item to Check/ Service	Procedure	Not Fully Mission Capable If:
48	Monthly	Crane Control Levers	(j) Move BOOM control lever (3) to up position until boom (4) is at 45 degree angle.	
			CAUTION Do not let cable unwind and become slack or cable may get tangled on drum.	
			(k) Move HOIST control lever (1) to down position to pay out cable until hook (2) touches ground. Observe that the cable moves freely. (l) Move BOOM control lever (3) to down position and lower boom as far as possible. (m) Turn crane POWER switch (8) to OFF.	

2-11. PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS) TABLES (CONT).

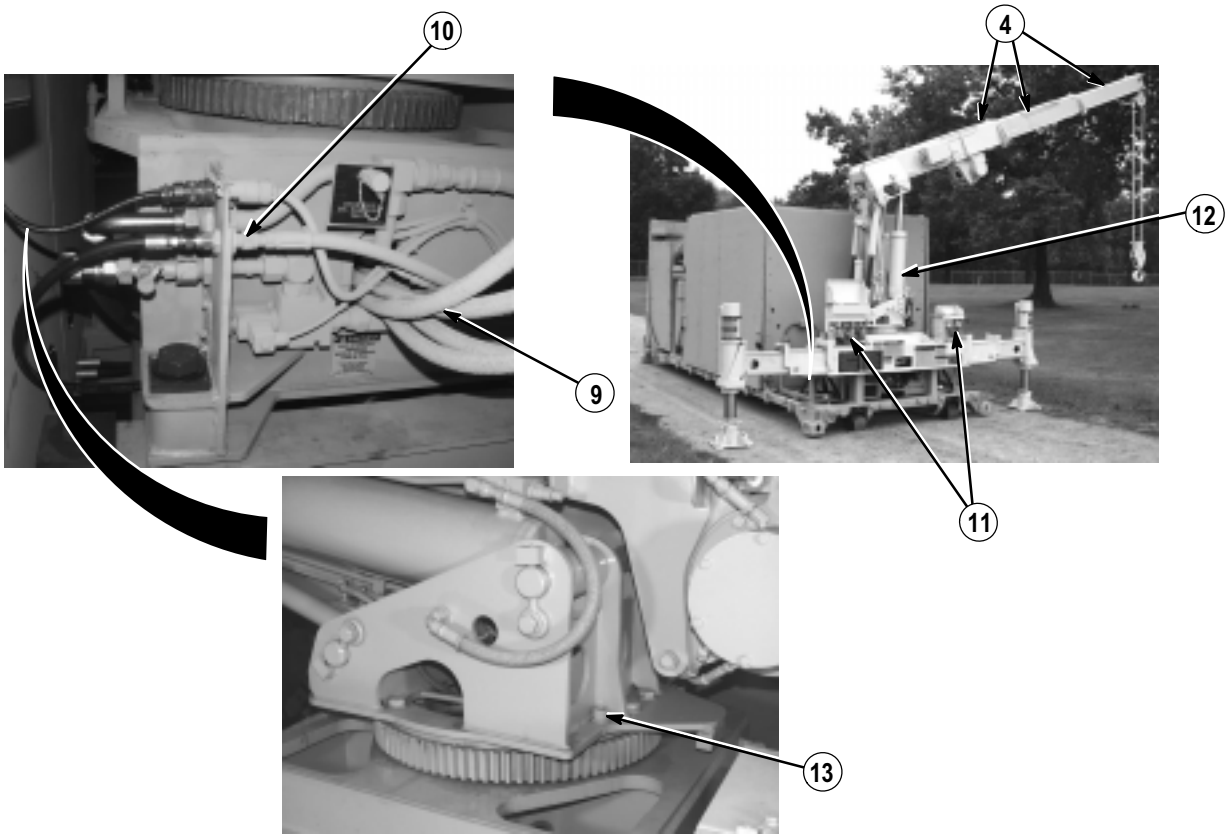
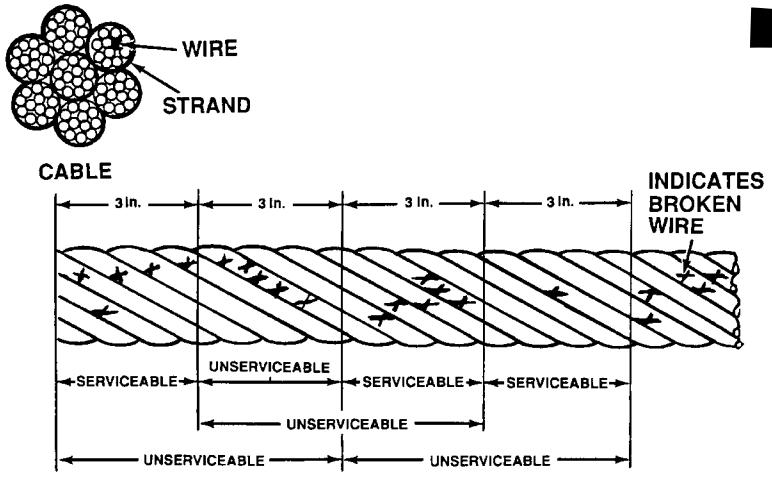


Table 2-5. Operator's Level Preventive Maintenance Checks and Services (Monthly) (CONT).

Item No.	Interval	Item to Check/ Service	Procedure	Not Fully Mission Capable If:
48	Monthly	Crane Control Levers	(n) Check first, second, and third extensions of boom (4) for broken welds and obvious damage.	
			WARNING Operator should be stationed to be able to see load at all times during crane operation. Boom and load moving out of control could cause serious injury or death.	
			(o) Check all hoses (9), fittings (10), valves (11) and cylinders (12) for leaks. (p) Check for cracked and broken welds. (q) Check turntable bearing bolts (13) for obvious looseness.	Class III leak is evident.



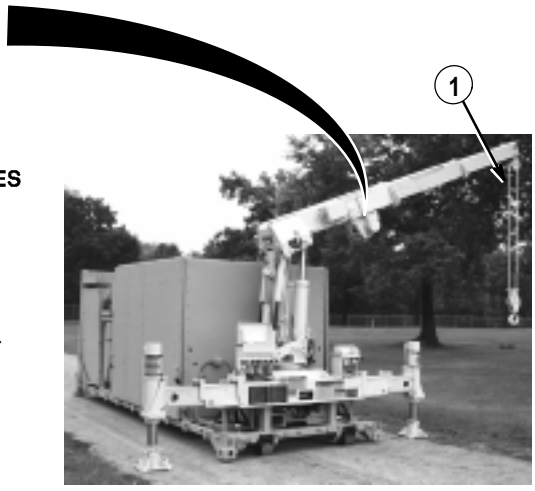
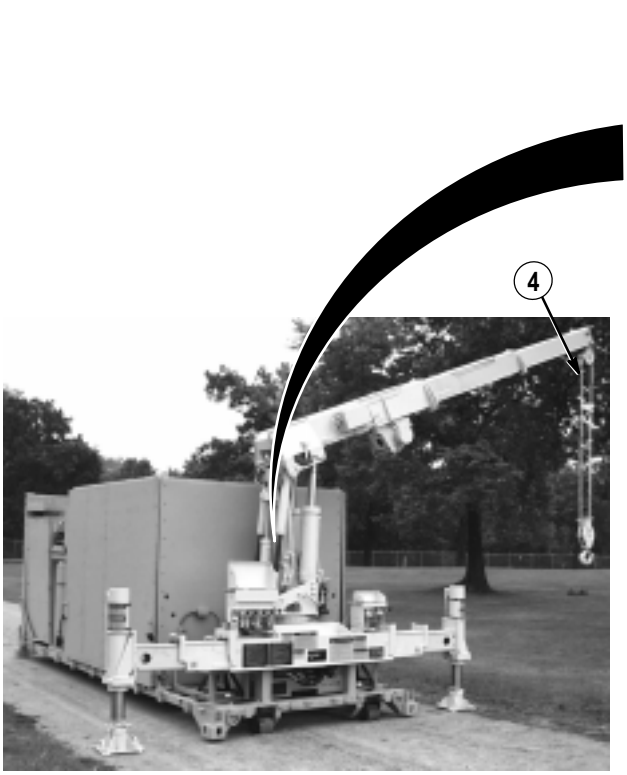


Table 2-5. Operator's Level Preventive Maintenance Checks and Services (Monthly) (CONT).

Item No.	Interval	Item to Check/ Service	Procedure	Not Fully Mission Capable If:
			WARNING • Wire rope can become frayed or contain broken wires. Wear heavy leather-palmed work gloves when handling wire rope. Frayed or broken wires can injure hands. • Never let moving wire rope slide through hands, even when wearing gloves. A broken wire could cut through glove and cut hand.	
49	Monthly	Hoist Cable	(a) Check hoist cable (1) for broken wires and kinks. If in doubt notify Unit Maintenance.	Hoist cable has more than three broken wires per three in. section on same strand. The maximum number of broken wires shall not occur in any two consecutive three in. sections of cable. That is, if six wires are broken in one three in. section of cable, none would be allowed in the next consecutive three in. section.

2-11. PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS) TABLES (CONT).



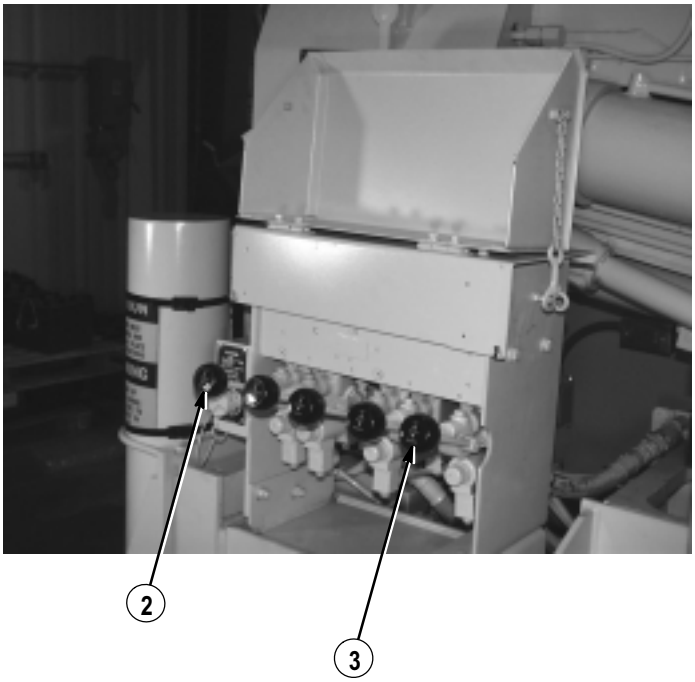


Table 2-5. Operator's Level Preventive Maintenance Checks and Services (Monthly) (CONT).

Item No.	Interval	Item to Check/ Service	Procedure	Not Fully Mission Capable If:
			CAUTION Do not let cable unwind and become slack or cable may get tangled on drum.	
49	Monthly	Hoist Cable	(b) Move BOOM control lever (2) to UP position until boom is at 45 degrees and cable is off ground.	
			(c) Move HOIST control lever (3) in UP position to reel in cable (4) and check cable for kinks and uneven winding as it moves.	Hoist cable is kinked.

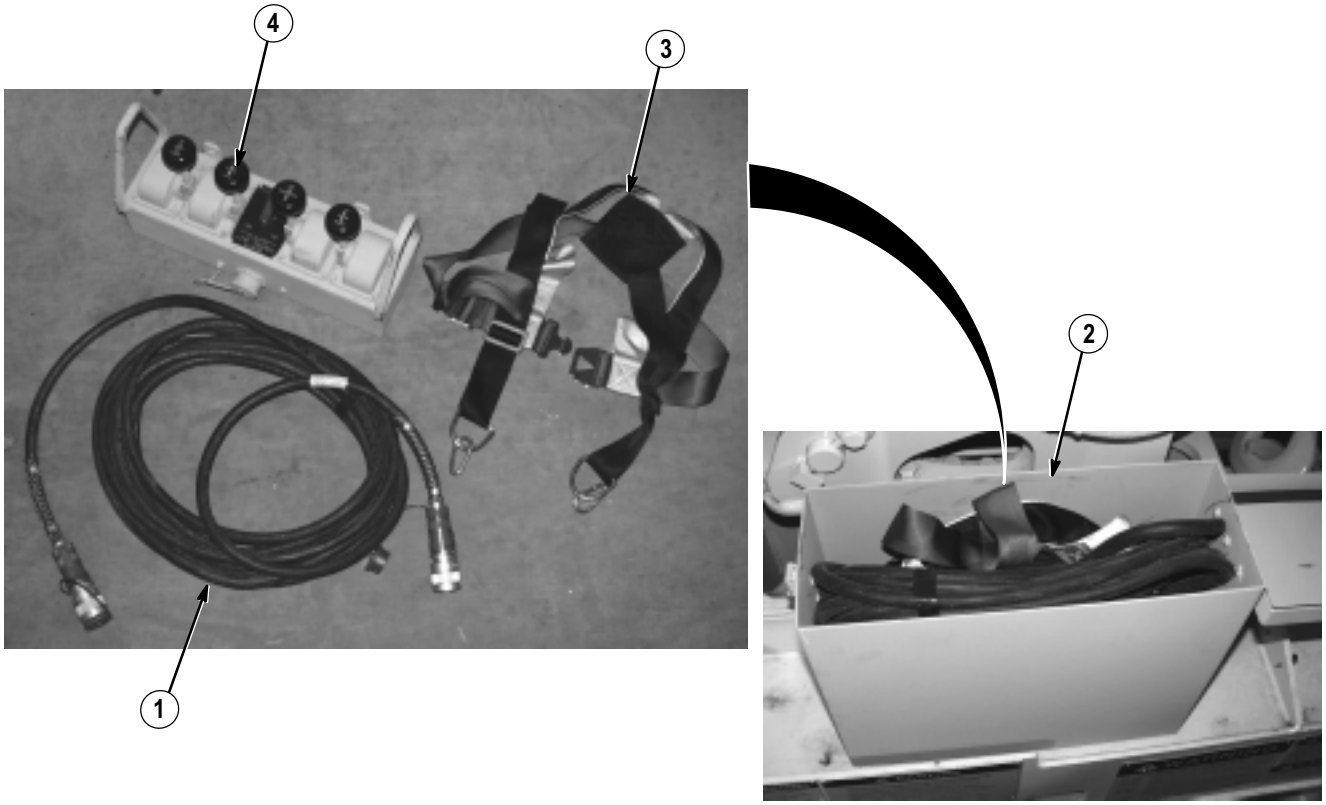


Table 2-5. Operator's Level Preventive Maintenance Checks and Services (Monthly) (CONT).

Item No.	Interval	Item to Check/ Service	Procedure	Not Fully Mission Capable If:
50	Monthly	Crane Remote Controls	(a) Remove remote control cable (1) from remote control stowage box (2). (b) Remove remote control shoulder harness (3) from remote control stowage box (2). (c) Remove REMOTE CONTROL UNIT (4) from remote control stowage box (2). (d) Check crane REMOTE CONTROL UNIT (4), remote control cable (1) and remote control shoulder harness (3) for obvious damage.	

2-11. PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS) TABLES (CONT).

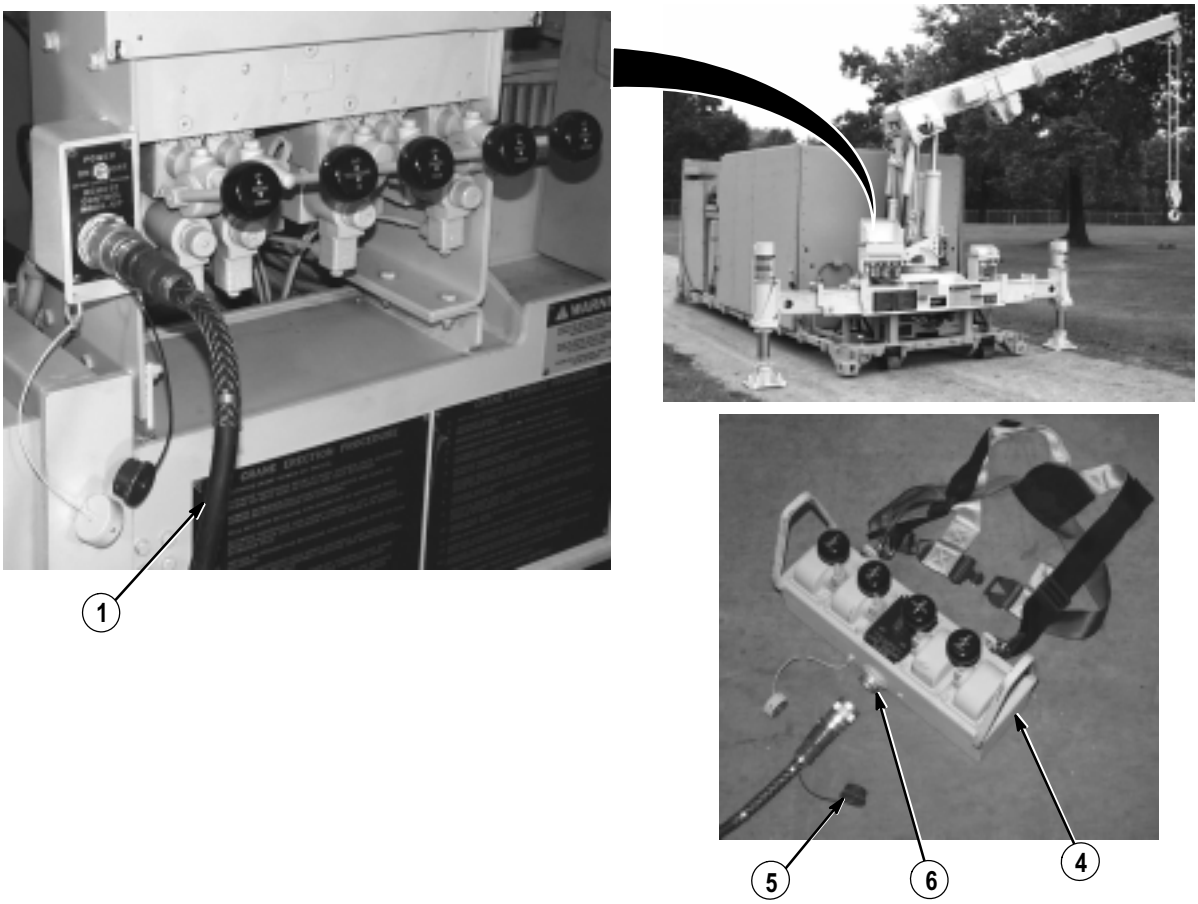


Table 2-5. Operator's Level Preventive Maintenance Checks and Services (Monthly) (CONT).

Item No.	Interval	Item to Check/ Service	Procedure	Not Fully Mission Capable If:
			WARNING Ensure REMOTE CONTROL/EMERGENCY STOP/ON/OFF POWER switch is in OFF position and switch guard is closed before connecting REMOTE CONTROL UNIT. Crane moving out of control could cause serious injury or death.	
50	Monthly	Crane Remote Controls	(e) Remove protective caps from cable (5), REMOTE CONTROL UNIT (4) and REMOTE CONTROL OUTLET (6). Connect REMOTE CONTROL UNIT (4) to REMOTE CONTROL OUTLET (6) with cable (1). Connect protective caps.	

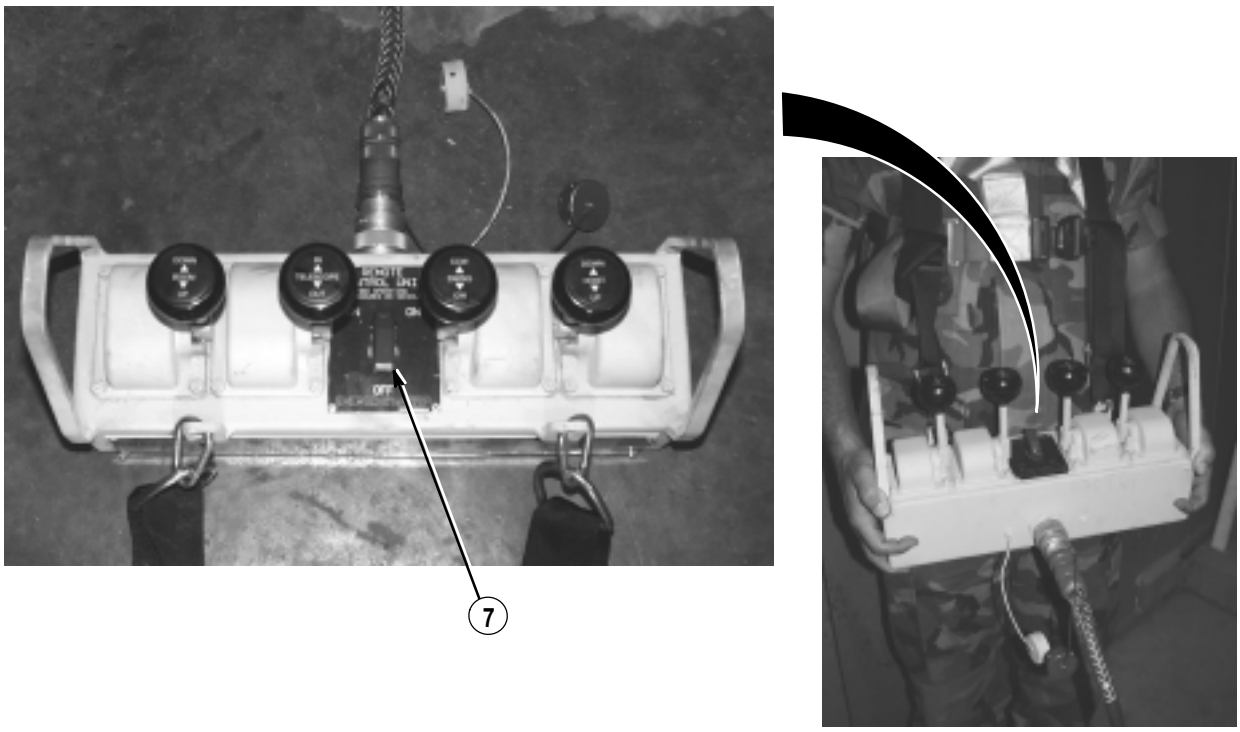


Table 2-5. Operator's Level Preventive Maintenance Checks and Services (Monthly) (CONT).

Item No.	Interval	Item to Check/ Service	Procedure	Not Fully Mission Capable If:
	WARNING Keep boom clear of shelter, all electrical lines and other obstacles while operating crane. Failure to comply may result in injury or death to personnel.			
50	Monthly	Crane Remote Controls	(f) Check that remote control does not operate when REMOTE CONTROL/EMERGENCY STOP/ON/OFF POWER switch (7) is in OFF position. (g) Turn REMOTE CONTROL/ EMERGENCY STOP/ON/OFF POWER switch (7) to ON position.	

2-11. PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS) TABLES (CONT).

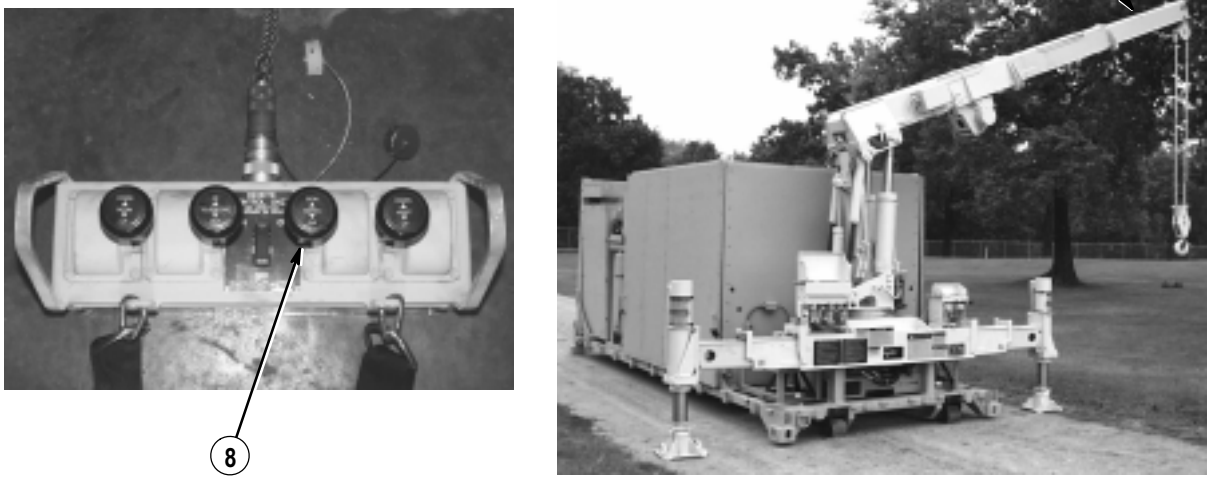
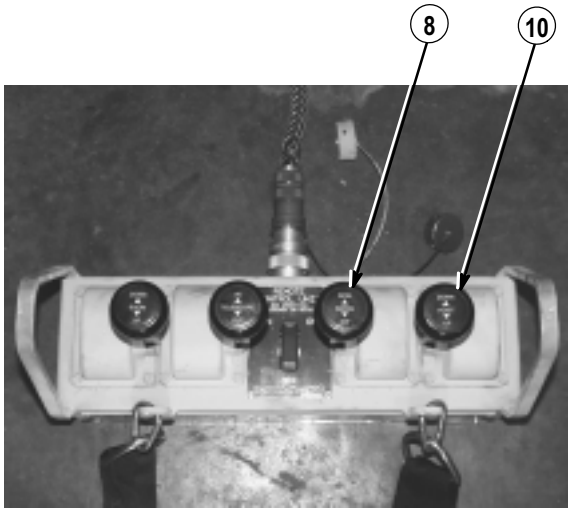


Table 2-5. Operator's Level Preventive Maintenance Checks and Services (Monthly) (CONT).

Item No.	Interval	Item to Check/ Service	Procedure	Not Fully Mission Capable If:
			WARNING • Ensure that area is clear of personnel before moving SWING control lever. Boom should be swung slow enough so crane operator has complete control. Boom moving out of control could cause serious injury or death. • If electrical power fails during crane operation, move switch on remote control unit to SHUTDOWN position. Serious injury could result from uncontrolled moving parts. **CAUTION** Boom must be 15 degrees or above for clearance over shelter and doors to avoid damage to truck boom, hook arm or hoist motor. **NOTE** Operate control levers with light even pressure. Moving lever slightly will cause slow movement of crane. Moving lever to full travel will cause faster movement of crane. Crane rotation is limited to 300 degrees.	
50	Monthly	Crane Remote Controls	(h) Move SWING control lever (8) to CW position to turn boom (9) clockwise. Be sure boom turns in the clockwise direction.	



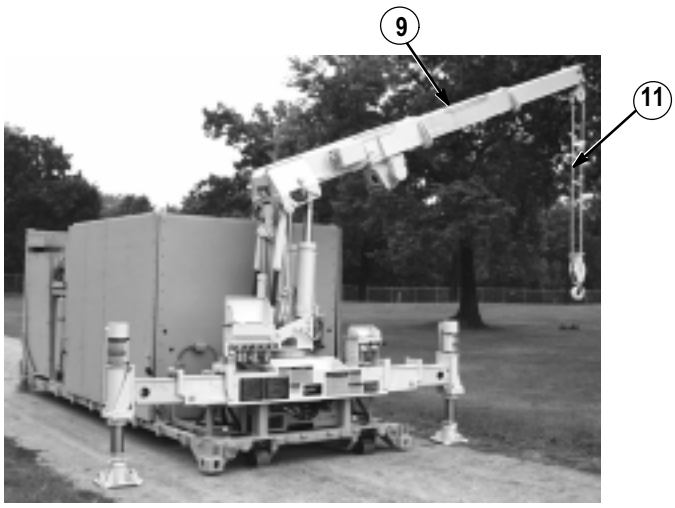


Table 2-5. Operator's Level Preventive Maintenance Checks and Services (Monthly) (CONT).

Item No.	Interval	Item to Check/ Service	Procedure	Not Fully Mission Capable If:
50	Monthly	Crane Remote Controls	(i) Move SWING control lever (8) in CCW position to turn boom (9) counterclockwise. Be sure boom rotates counterclockwise.	

WARNING

Keep boom clear of shelter, all electrical lines and other obstacles while operating crane. Failure to comply may result in injury or death to personnel.

CAUTION

- Keep hook block at least two ft. (0.61 m) from end of boom. If hook block hits end of boom it may damage cable or hook block and crane will lose control functions. Wait six seconds for power to return and check crane for damage.
- Do not let cable become slack or cable may get tangled on drum.

			(j) Move HOIST control lever (10) to DOWN position to pay out cable (11) approximately two ft. (0.61 m). Move HOIST control lever (10) to UP position to take up cable (11).	

2-11. PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS) TABLES (CONT).

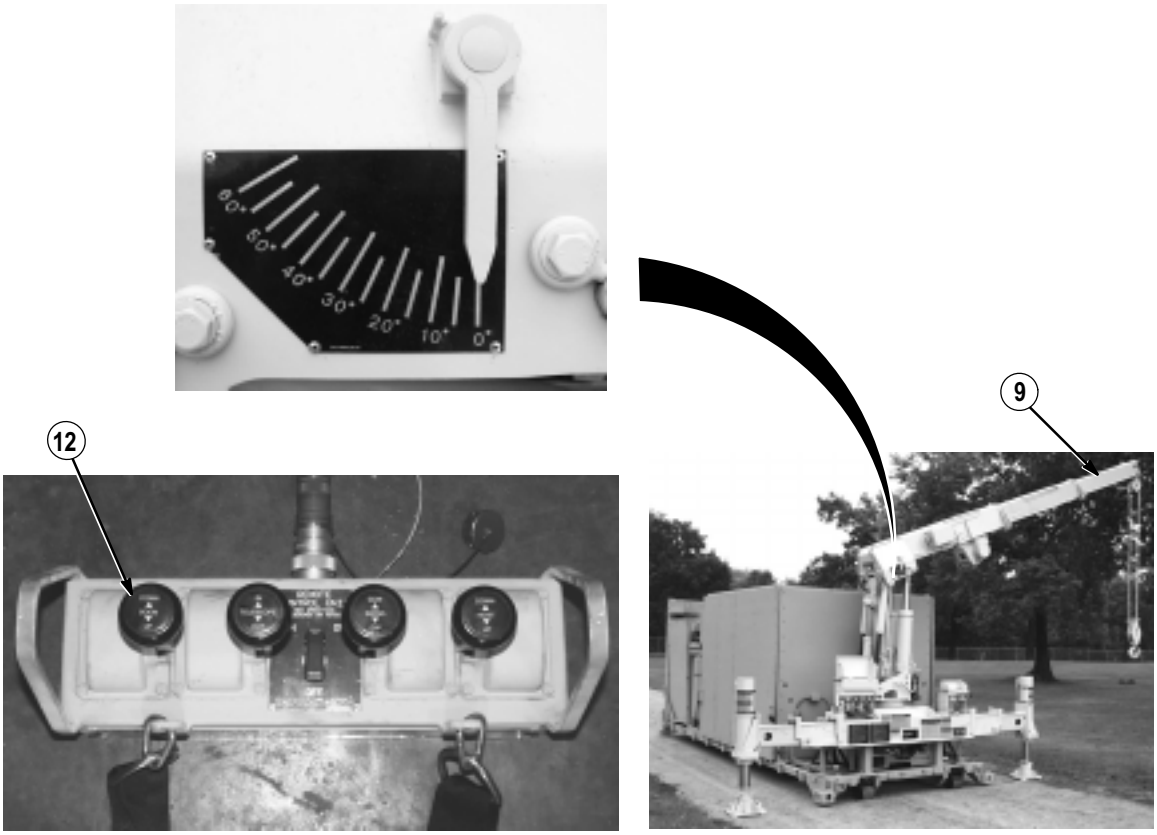


Table 2-5. Operator's Level Preventive Maintenance Checks and Services (Monthly) (CONT).

Item No.	Interval	Item to Check/ Service	Procedure	Not Fully Mission Capable If:
50	Monthly	Crane Remote Controls	(k) Move BOOM control lever (12) to UP position to raise boom (9). Move BOOM control lever (12) to DOWN position to lower boom (9) to 0 degrees on boom angle indicator.	

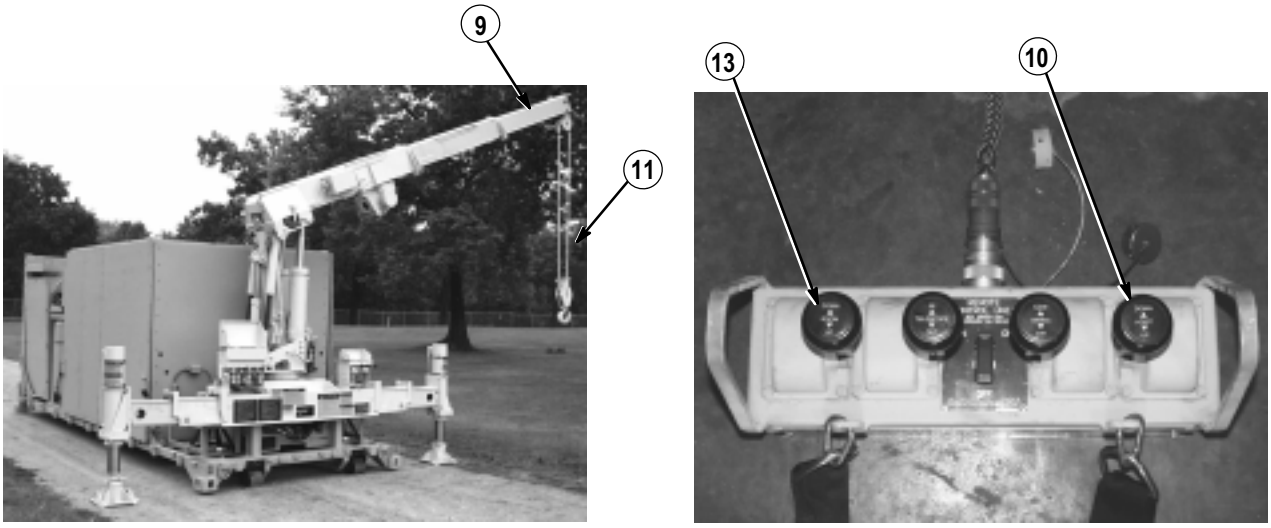


Table 2-5. Operator's Level Preventive Maintenance Checks and Services (Monthly) (CONT).

Item No.	Interval	Item to Check/ Service	Procedure	Not Fully Mission Capable If:
			CAUTION • Keep hook block at least two ft. (0.61 m) from end of boom. If hook block hits end of boom it may damage cable or hook block and crane will lose control functions. Wait six seconds for power to return and check crane for damage. • Do not let cable become slack or cable may get tangled on drum. **NOTE** • When using telescope, operate TELESCOPE and HOIST levers at the same time. • Crane movement from one lever may be faster or slower than other when operating two levers together.	
50	Monthly	Crane Remote Controls	(l) Move TELESCOPE control lever (13) to IN position to retract boom (9) approximately two ft. (0.61 m) while moving HOIST control lever (10) in UP position to reel in cable (11). Check that cable reels in.	

2-11. PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS) TABLES (CONT).

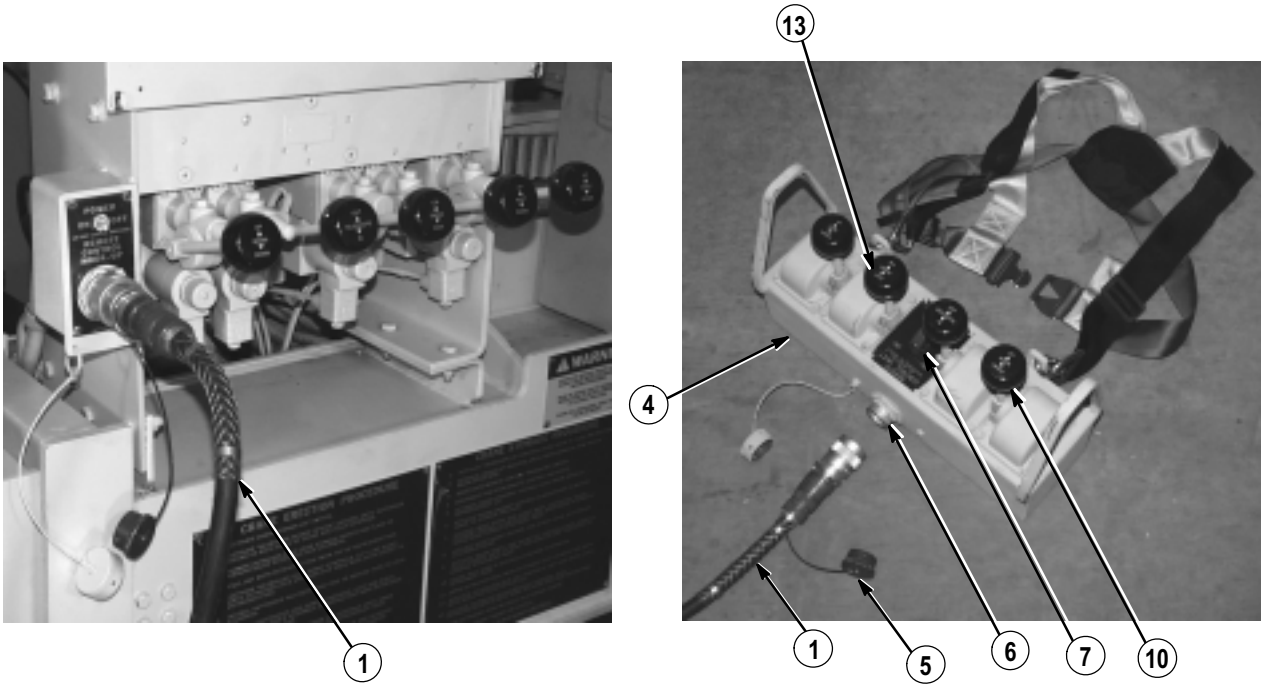


Table 2-5. Operator's Level Preventive Maintenance Checks and Services (Monthly) (CONT).

Item No.	Interval	Item to Check/ Service	Procedure	Not Fully Mission Capable If:
50	Monthly	Crane Remote Controls	(m) Move TELESCOPE control lever (13) to OUT position to extend boom while moving HOIST control lever (10) to DOWN position to pay out cable. (n) Shut off REMOTE CONTROL/ EMERGENCY STOP/ON/OFF POWER switch (7). (o) Disconnect cable (1) from REMOTE CONTROL UNIT (4) and REMOTE CONTROL OUTLET (6) and install protective cap (5). (p) Disconnect cable (1) from REMOTE CONTROL HOOK-UP and install protective cap.	

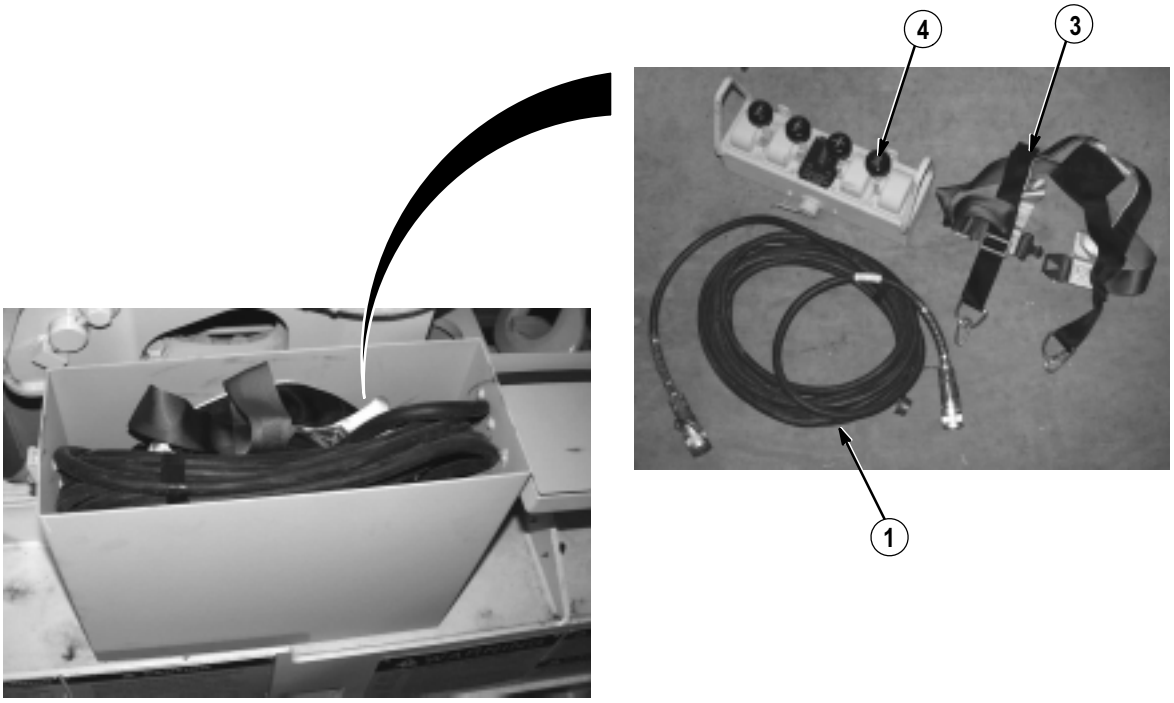


Table 2-5. Operator's Level Preventive Maintenance Checks and Services (Monthly) (CONT).

Item No.	Interval	Item to Check/ Service	Procedure	Not Fully Mission Capable If:
50	Monthly	Crane Remote Controls	(q) Disconnect and stow REMOTE CONTROL UNIT (4) remote control shoulder harness (3) and cable (1). (r) Stow crane (Para 2-29). (s) Stow outrigger jacks (Para 2-29).	

2-11. PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS) TABLES (CONT).

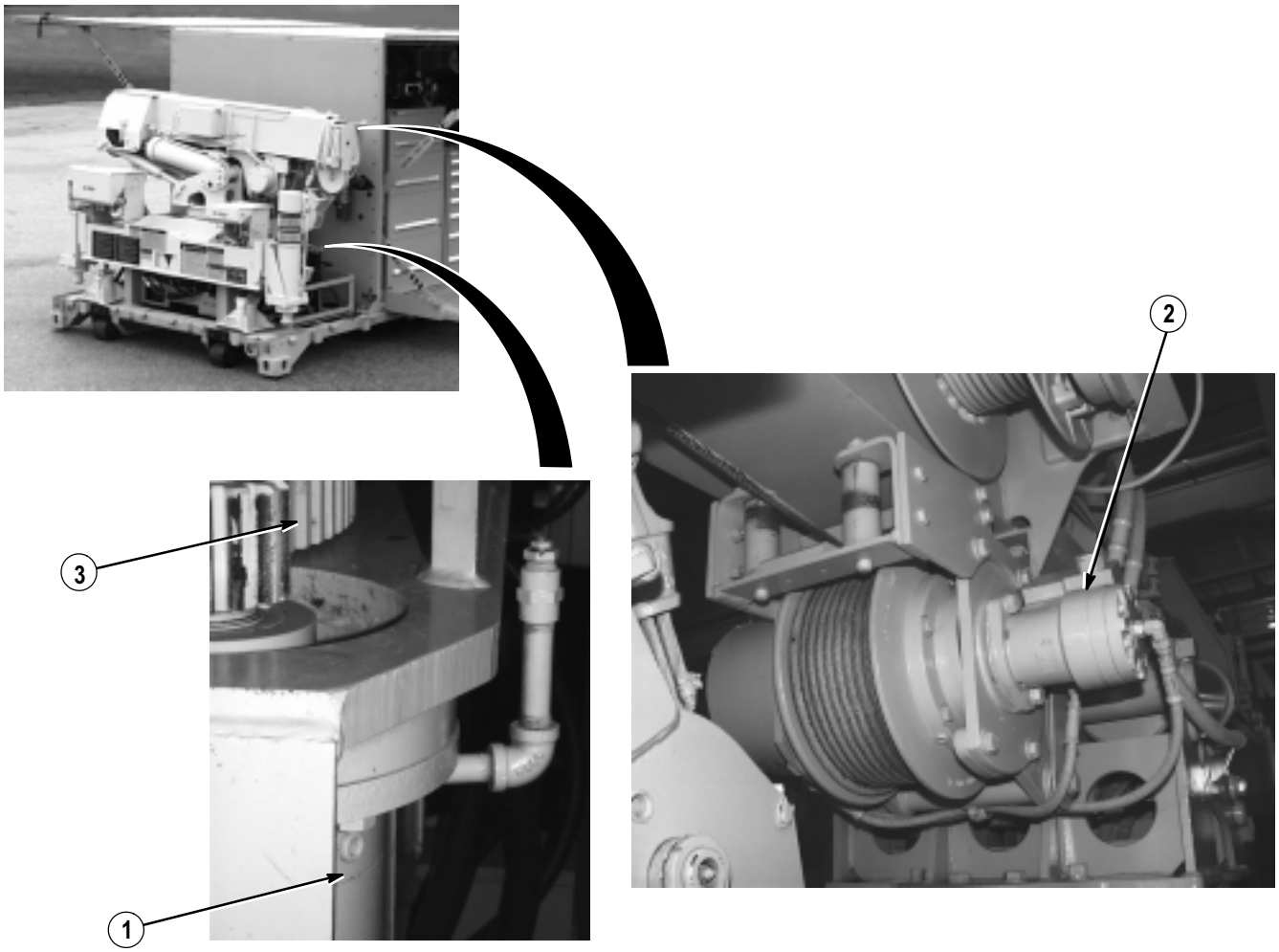


Table 2-5. Operator's Level Preventive Maintenance Checks and Services (Monthly) (CONT).

Item No.	Interval	Item to Check/ Service	Procedure	Not Fully Mission Capable If:
51	Monthly	Crane Swing Gear and Motor	Check for loose and leaking connections and mountings around crane swing gear motor (1).	Class III leak is evident.
52	Monthly	Crane Hoist	Check crane hoist oil level (2). If oil level is low, notify Unit Maintenance.	Class III leak is evident.
53	Monthly	Crane Turntable Gear Box	Check turntable gear box (3) oil level. If oil level is low, notify Unit Maintenance.	Class III leak is evident.

Section III. OPERATION UNDER USUAL CONDITIONS

2-12. PREPARING PLS FORWARD REPAIR SYSTEM (FRS) FOR OPERATION.

WARNING

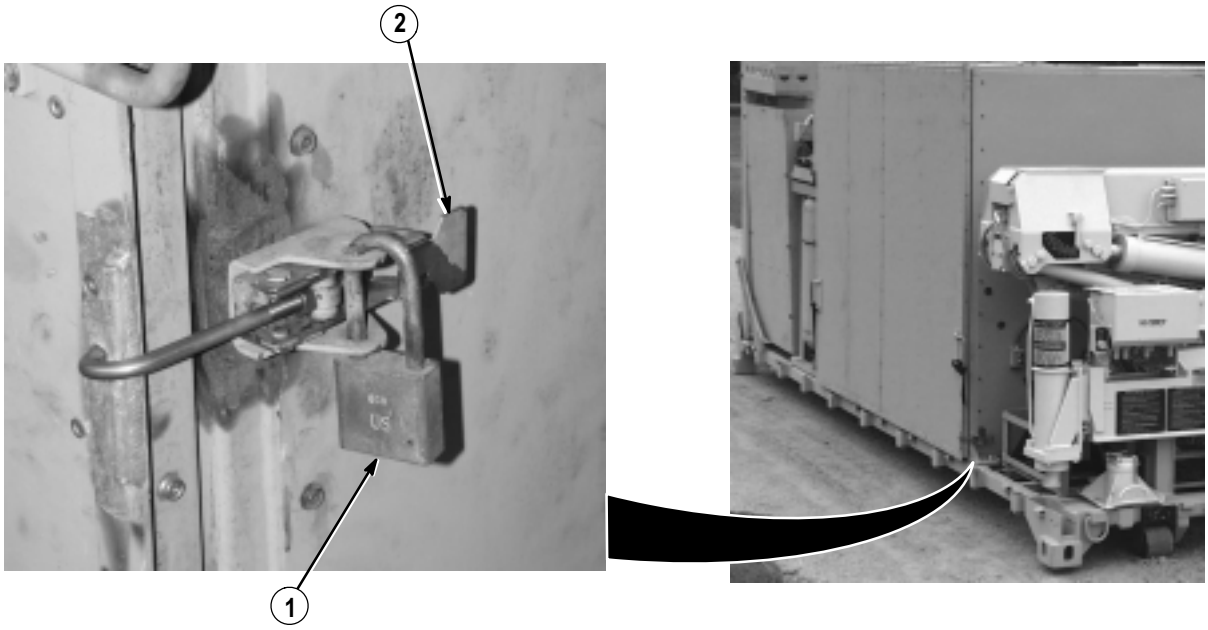
- Do not attempt to open doors and access platforms while FRS is loaded on vehicle. Failure to comply may result in injury or death to personnel.
- Secure all equipment on FRS before unloading or loading from vehicle. Failure to comply may result in injury to personnel.

a. Unload FRS from vehicle (TM 9-2320-364-10).

WARNING

Electric power generating equipment must be grounded as a safety precaution. Stray electrical current can injure or kill personnel and damage the equipment.

b. Ground FRS (Para 2-32).



NOTE

- The following procedures are identical for both doors. Left side is shown.
- Shelter door has two latches, right side shown.

c. Remove lock (1) from door latch (2).

d. Release and open door latch (2).

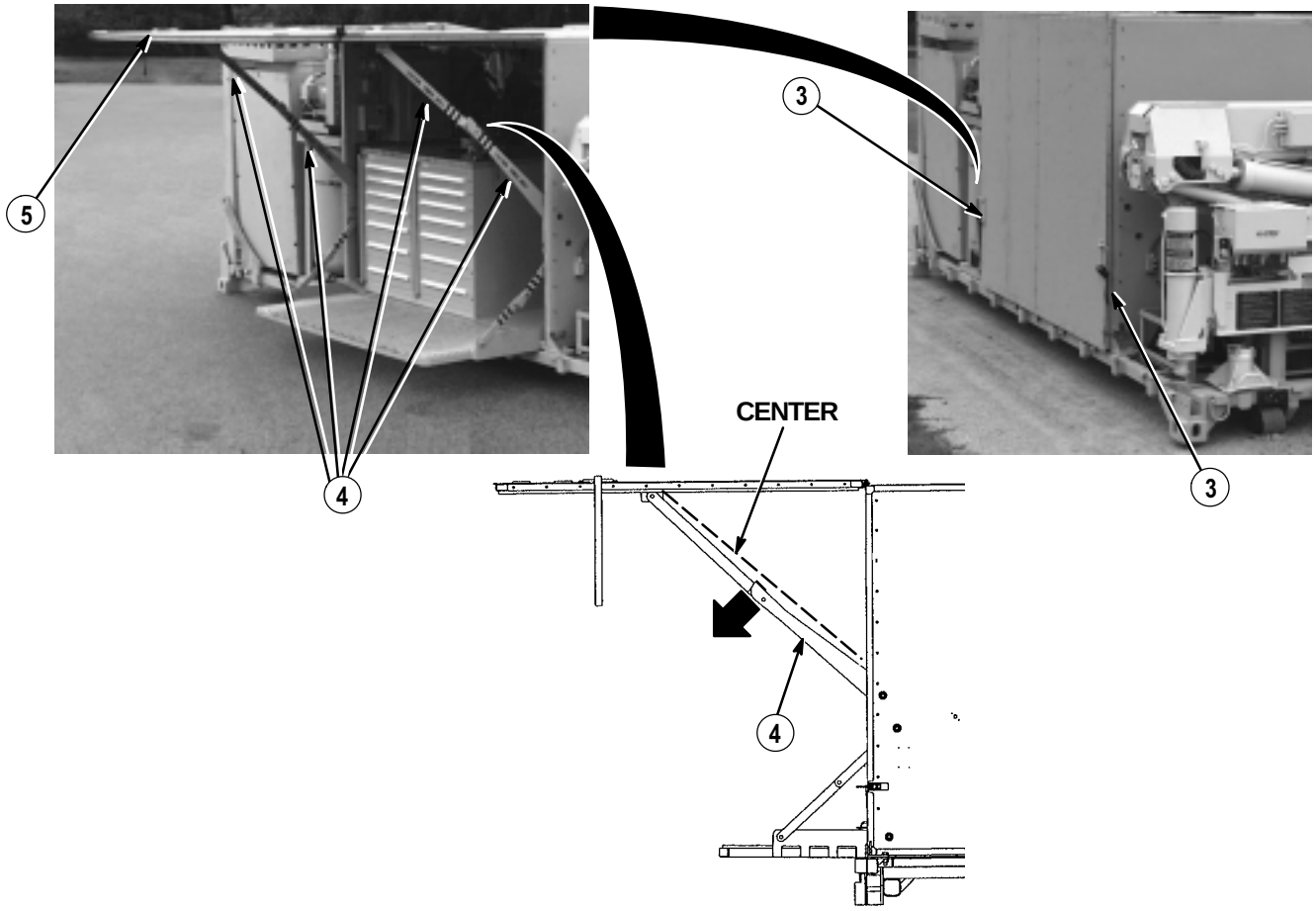
e. Stow lock (1) on door latch (2).

f. Repeat Steps ***c.*** through ***e.*** for left door latch.

2-12. PREPARING PLS FORWARD REPAIR SYSTEM (FRS) FOR OPERATION (CONT).

WARNING

- Keep hands clear of pivot points on support arms during door operation. Failure to comply will result in injury to personnel or damage to equipment.
- Sharp corners on door could be present, use caution during door operation. Failure to comply may result in injury to personnel.
- Opening/closing shelter door is a two person operation. Ensure that upper door support arms lock over center. Failure to comply may result in injury to personnel.
- Do not lower/open doors in winds that exceed 30 mph. Failure to comply may result in injury or death to personnel.



g. With aid of an assistant, pull upward on door handles (3) and step on lower platform until door support arms (4) lock over center in open position and shelter door (5) is open.

h. Repeat Steps ***g.*** for left shelter door.

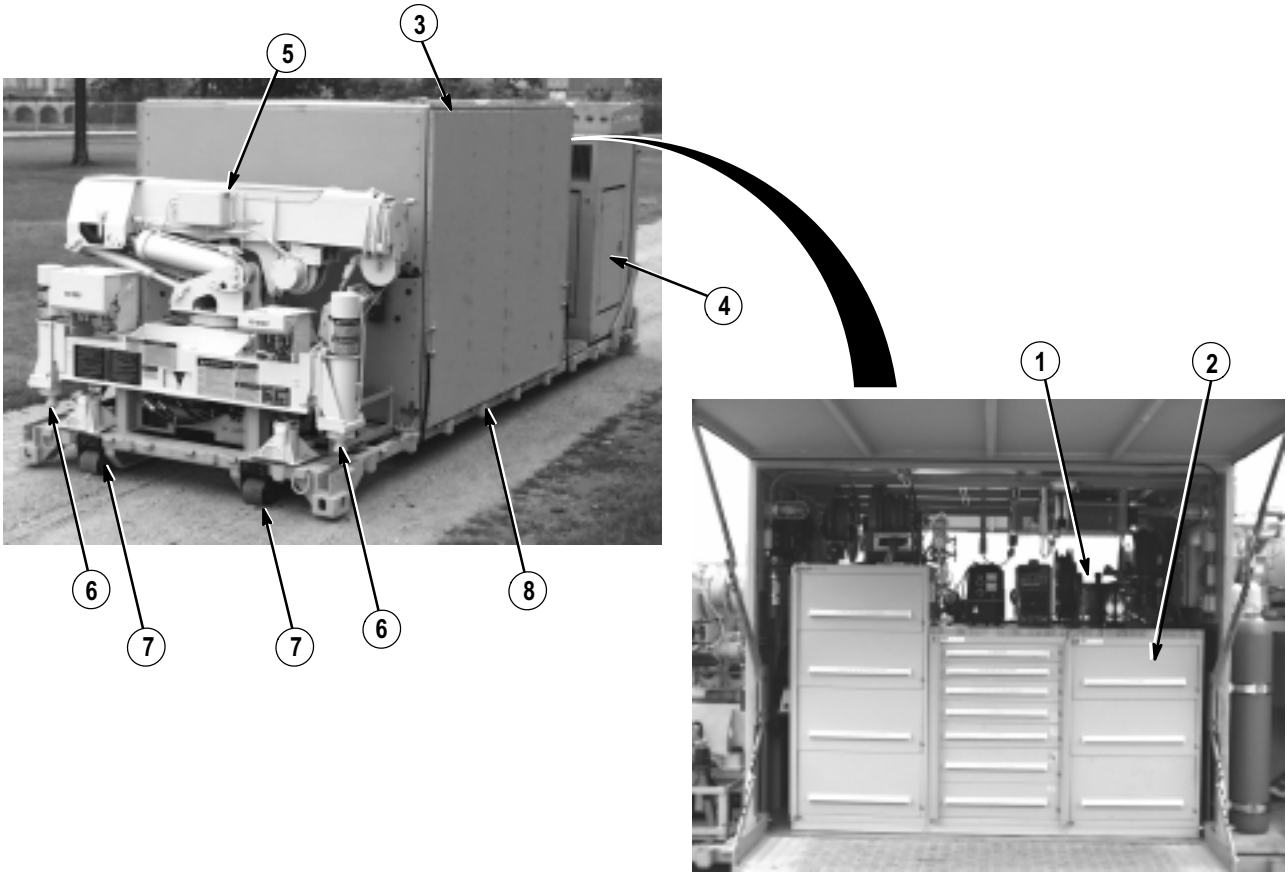
2-13. HANDLING AND TRANSPORTATION PROCEDURES.

The FRS is capable of being loaded or unloaded on any PLS truck and/or PLS trailer (PLST).

The flatrack portion of the module contains rail transport pins for securing during rail transport. Lift pockets are also provided for forklift handling.

2-14. LOADING AND UNLOADING FORWARD REPAIR SYSTEM (FRS).

a. Loading.



WARNING

Secure all equipment on FRS before unloading or loading from vehicle. Failure to comply may result in injury to personnel.

(1) Ensure generator engine is “OFF” (Para 2-15).

(2) Ensure all shelter tools (1) and equipment are stowed and cabinets (2) are secure.

(3) Ensure shelter doors (3) are closed and secure (Para 2-33).

(4) Ensure generator door (4) is closed and panels secure.

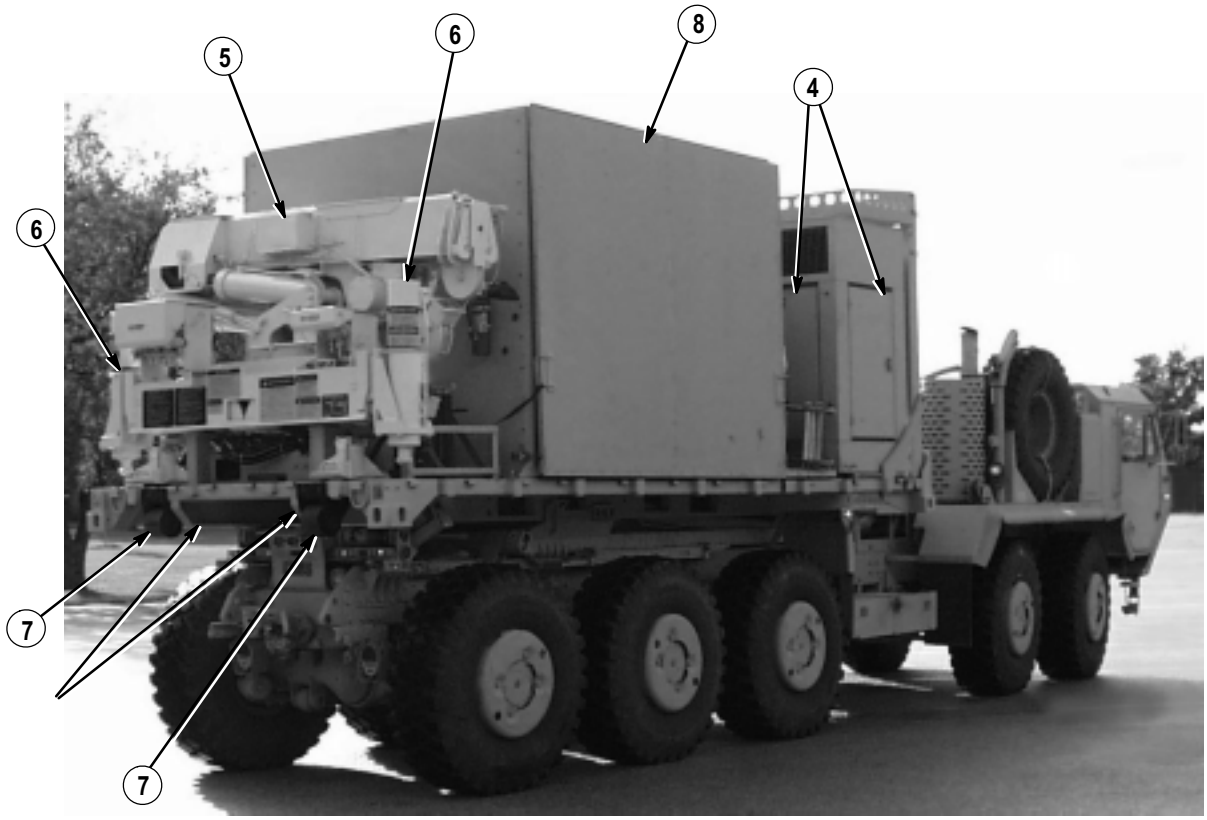
(5) Ensure crane (5) and outriggers (6) are stowed and secure (Para 2-29).

(6) Ensure rear rollers (7) are installed.

(7) To load the FRS (8) on a PLS truck, refer to the PLS Operator’s Manual, TM 9-2320-364-10, “Picking Up a Flatrack in Auto Mode.”

2-14. LOADING AND UNLOADING FORWARD REPAIR SYSTEM (FRS) (CONT).

b. Unloading.



WARNING

- FRS C–channels of the flatrack must NOT be in contact with the terrain or any object to prevent altering the critical reaction points of the FRS. Failure to comply could result in personnel injury or death.
- Secure all equipment on FRS before unloading or loading from vehicle. Failure to comply may result in injury to personnel.
- PLS hook arm must be disconnected from FRS hook bar of the flatrack after FRS is unloaded.

NOTE

To determine unstable ground, observe a PLS tire track imprint left in the ground near the FRS. If the tire track imprint depth is greater than 1/8", follow procedures in Para 2-39 "Operating FRS on Unstable or Uneven Ground".

(1) Ensure generator door (4) is closed and panels secure.

(2) Ensure crane (5) and outriggers (6) are stowed and secure (Para 2-29).

(3) Ensure rear rollers (7) are installed.

(4) Ensure the FRS (8) is unloaded on semi-level hard surface when possible.

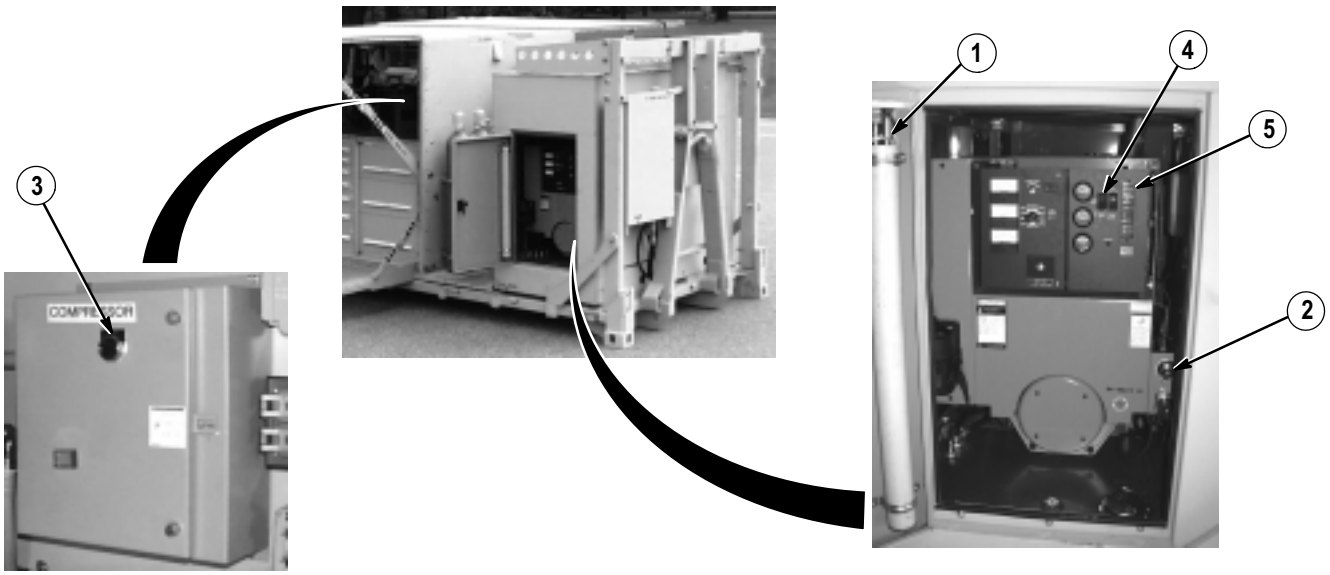
(5) To unload the FRS (8) from a PLS truck, refer to the PLS Operator's Manual, TM 9-2320-364-10, "Off-Loading a Flatrack in Auto Mode."

2-15. NORMAL GENERATOR START/SHUTDOWN PROCEDURES.

a. Generator Start-up.

WARNING

- Exhaust emissions from the diesel generator can be hazardous to human health. Position FRS so the generator is downwind of work area. If the prevailing wind puts the operator downwind of the generator's exhaust, a conscious effort must be made to limit inhalation of exhaust fumes. Failure to comply may result in serious injury or death to personnel.
- Personnel hearing can be PERMANENTLY DAMAGED if exposed to constant high noise levels of 85 DBA or greater. Wear approved hearing protection devices when working in high noise level areas. Personnel exposed to high noise levels shall participate in a hearing observation program in accordance with TB MED 501. Hearing loss occurs gradually but becomes permanent over time.
- Never run generator while FRS access platforms/doors are closed. Build–up of combustible gases due to leaking hoses, fittings, etc., or if gas valves are not shut off, present a possible explosion if a short circuit should occur. Failure to comply may result in injury or death to personnel damage to equipment.
- Failure to properly ground the FRS could result in serious injury or death to personnel.
- Generator has an automatic start sequence which will make several attempts to start. Ensure master switch is in the off position before reaching anywhere inside the generator enclosure/housing. Failure to comply could result in personnel injury or death.



(1) Prepare shelter for startup (Para 2-12).

(2) Install grounding rod (1) in ground and attach static cable (Para 2-32).

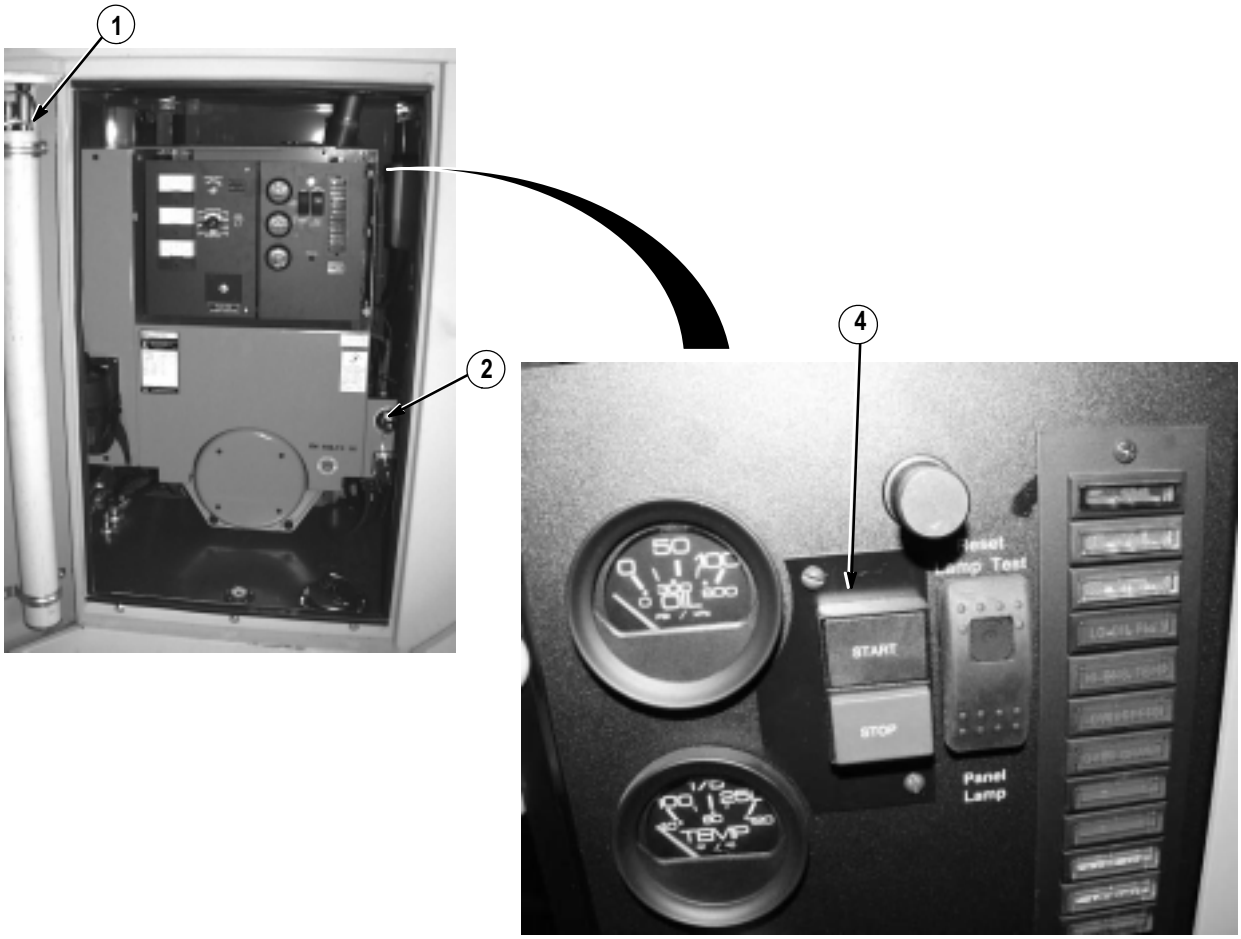
(3) Position master disconnect switch (2) to the ON position.

(4) Ensure air compressor ON/OFF switch (3) is in OFF position.

(5) Push generator START/STOP switch START button (4) until generator starts and the green RUN lamp (5) illuminates.

2-15. NORMAL GENERATOR START/SHUTDOWN PROCEDURES (CONT).

b. Generator Shutdown.



(1) Push generator START/STOP switch STOP button (4) until generator stops.

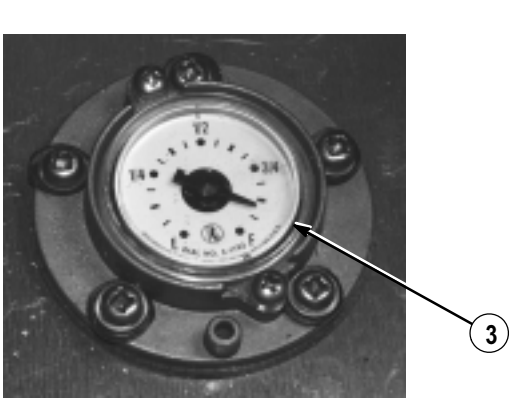
(2) Position master disconnect switch (2) to the OFF position.

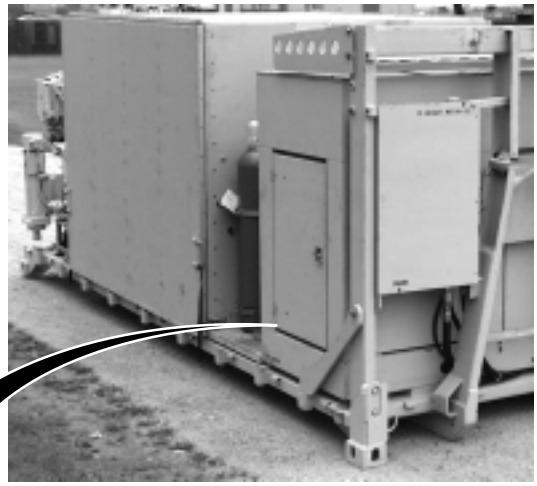
(3) Remove ground rod (1) from ground and stow (Para 2-32).

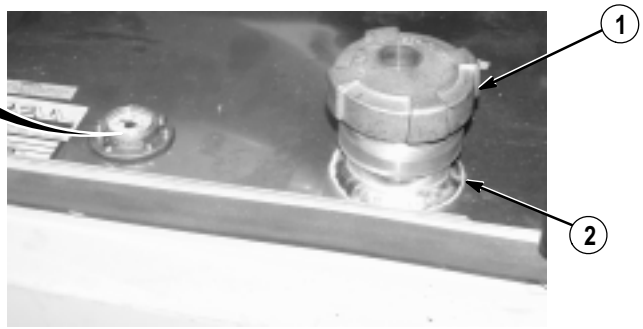
2-16. REFUELING GENERATOR.

WARNING

- When refueling, shut down generator. Ensure no open flame is near area. Never smoke. Never add fuel with engine running. After fuel is added, securely close fuel tank cap; a loose cap can cause a fuel leak or be a fire hazard. Before starting generator, check that no fuel is spilled on or around FRS. Failure to comply may cause serious injury or death. Never overfill the tank or spill fuel. If fuel is spilled, clean it up immediately.
- Clothing fouled by Petroleum, Oil, or Lubricants (POL) must be changed at the earliest opportunity. Any POL contacting the skin should be washed off as soon as possible. Failure to comply may result in serious injury or death to personnel.
- Fuel cap and fuel gage are enclosed in a confined space. Care must be used when refueling fuel tank. Failure to comply may result in injury to personnel.







(1) Remove fuel cap (1) on fuel tank (2).

CAUTION

- Refuel generator with diesel fuel no. 2, JP-8, or DF-A only or damage to equipment may occur.
- Leave at least 1/2 inch air space between fuel level and top of filler neck.

(2) While observing fuel gage (3), fill fuel tank (2) until desired level is reached.

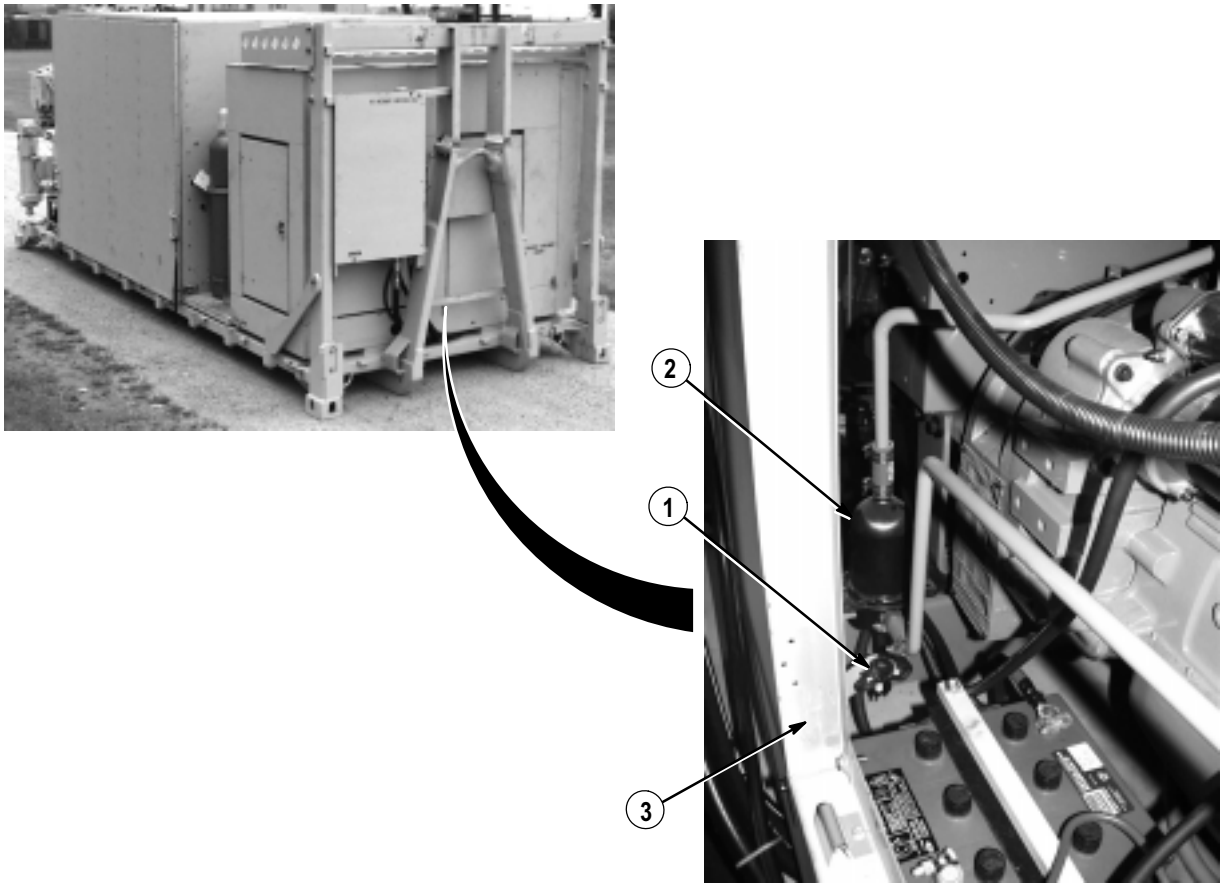
(3) Install fuel cap (1) on fuel tank (2).

2-17. GENERATOR ENGINE BLOCK HEATER OPERATION.

a. Engine Block Heater Start-up.

CAUTION

- The coolant heater must not be operated while the cooling system is empty or damage to the heater will occur.
- Ensure the source of power voltage rating is correct for the heater element rating (110 VAC).



NOTE

Coolant tank heater is used to keep engine coolant warm when engine is not running.

(1) Route power cord (1) from coolant tank heater (2) through generator set enclosure (3).

(2) Connect power cord (1) to external power source (110 VAC).

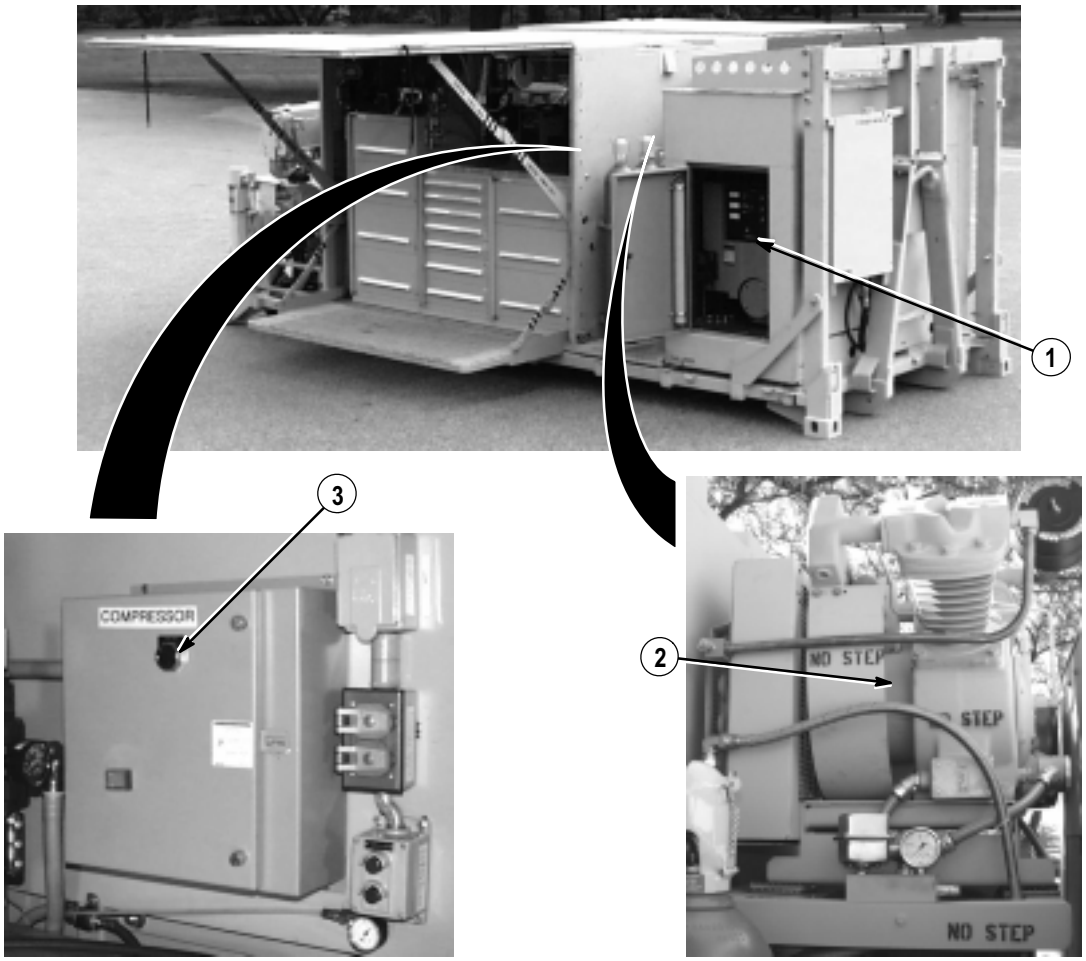
b. Engine Block Heater Shutdown.

(1) Disconnect power cord (1) from external power source (110 VAC).

(2) Pull power cord (1) through generator set enclosure (3) and stow with coolant tank heater (2).

2-18. AIR COMPRESSOR OPERATION.

a. Air Compressor Start-up.



WARNING

Personnel hearing can be PERMANENTLY DAMAGED if exposed to constant high noise levels of 85 DBA or greater. Wear approved hearing protection devices when working in high noise level areas. Personnel exposed to high noise levels shall participate in a hearing observation program in accordance with TB MED 501. Hearing loss occurs gradually but becomes permanent over time.

(1) Start generator (1) (Para 2-15).

(2) Turn air compressor (2) ON/OFF switch (3) to ON.

b. Air Compressor Shutdown

(1) Turn air compressor (2) ON/OFF switch (3) to OFF.

(2) Shutdown generator (1) (Para 2-15).

2-19. AIR RESERVOIR DRAIN/FILL.

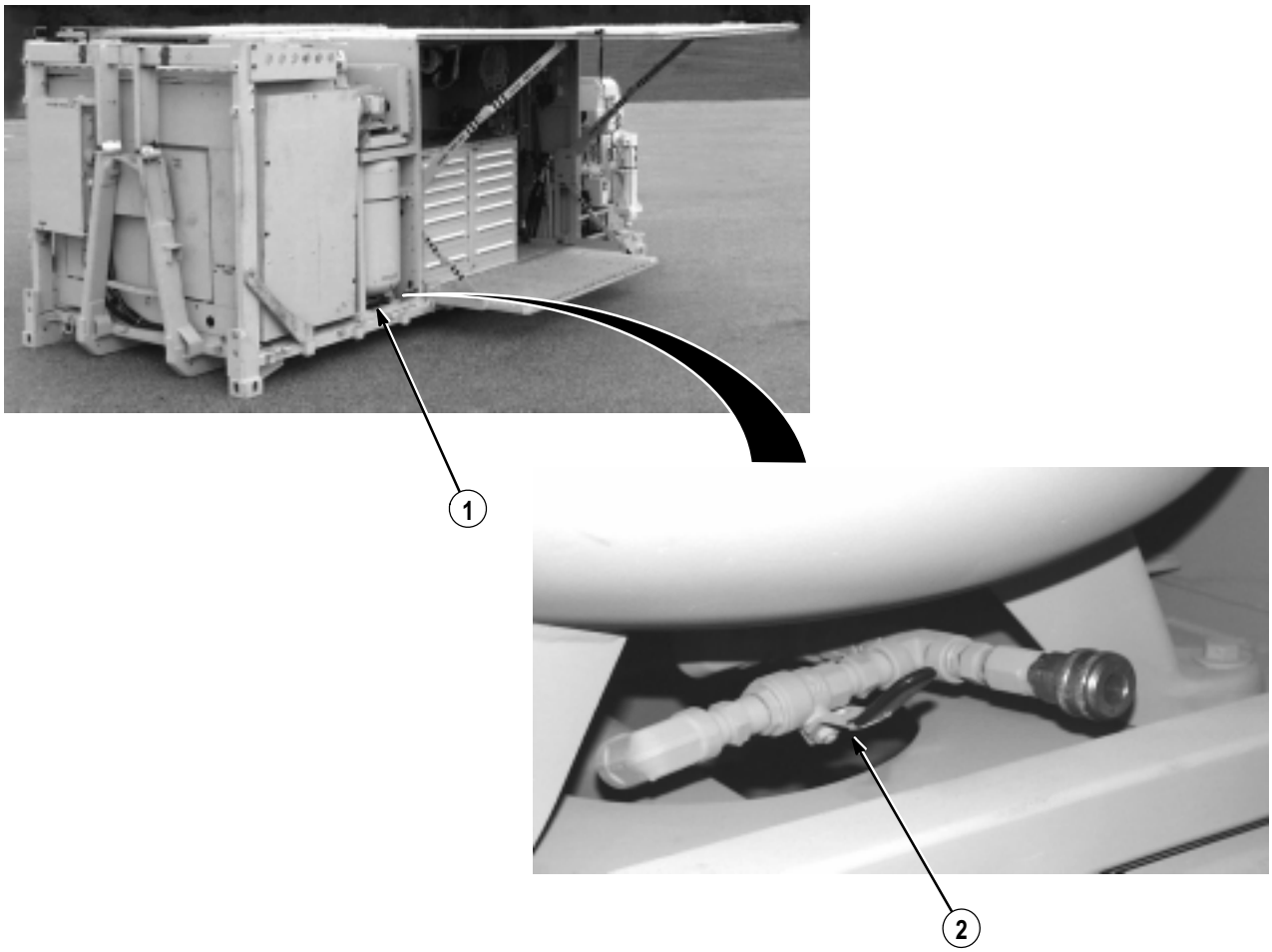
a. Draining.

WARNING

Double hearing protection is required. Open drain valve slowly. Noise level in excess of 120 DBA can occur. Failure to comply may cause injury to personnel.

CAUTION

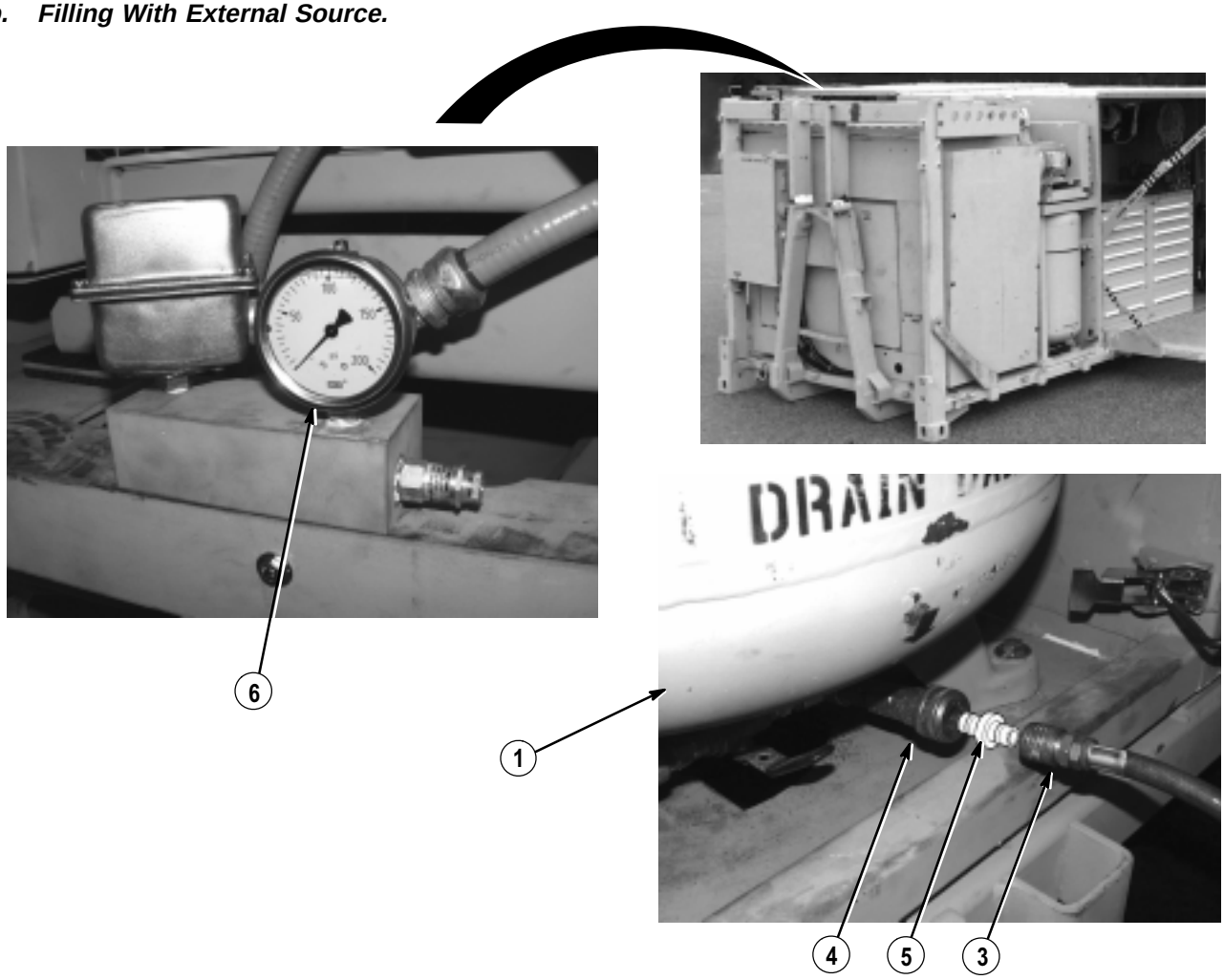
- During extreme cold weather (below 32°F [0°C]), air reservoir must be drained at end of operation or damage to equipment may occur.
- Air reservoir must be drained daily to prevent corrosion. Failure to comply may result in damage to equipment.



(1) To drain air from reservoir (1), turn air reservoir drain valve (2) clockwise until air is completely drained from reservoir.

(2) After air is completely drained from reservoir (1), turn air reservoir drain valve (2) counterclockwise until closed.

b. Filling With External Source.



(1) Connect external air hose (3) to air reservoir (1) quick disconnect (4) using the adapter (5) provided with FRS.

(2) Check air compressor gage (6) for proper pressure.

WARNING

- Maximum allowable air pressure in air reservoir is 195 psi (1345 kPa). Failure to comply may result in injury or death to personnel.
- Hearing and eye protection required when disconnecting the air supply hose or injury to personnel may result.

NOTE

- Valve does not control air supply.
- Constant resupply required for tools operation.

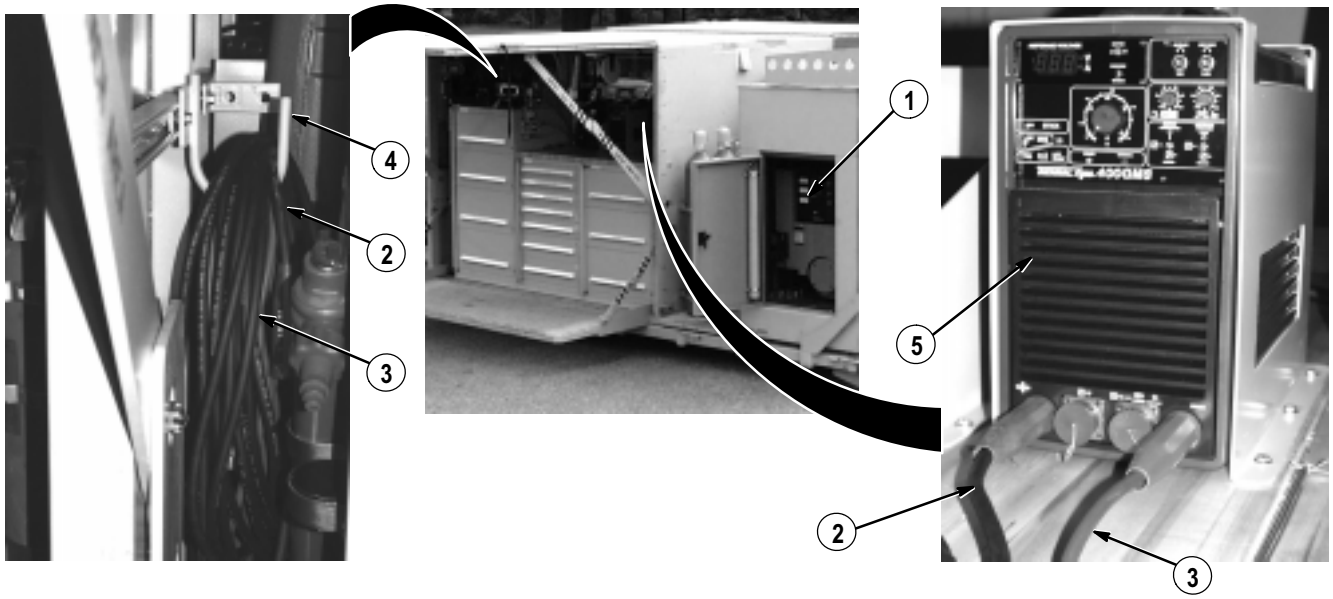
(3) When air reservoir (1) is filled to desired pressure, disconnect external air hose (3) from air reservoir (1) and remove adapter (5).

2-20. WELDER OPERATION.

a. STICK (Shielded Metal ARC Welding [SMAW]) Welder Start/Set-Up.

WARNING

- Unsafe welding practices can cause serious injury from fire, explosions, or harmful agents. Allow only authorized personnel to weld or cut metals, and follow safety precautions in TC 9–237. Protective clothing and goggles must be worn; adequate protection used, a suitable fire extinguisher kept nearby, and requirements of TC 9–237 strictly followed.
- Personnel hearing can be PERMANENTLY DAMAGED if exposed to constant high noise levels of 85 DBA or greater. Wear approved hearing protection devices when working in high noise level areas. Personnel exposed to high noise levels shall participate in a hearing observation program in accordance with TB MED 501. Hearing loss occurs gradually but becomes permanent over time.
- Remove all jewelry such as rings, ID tags, bracelets, etc. If jewelry or tools contact positive electrical circuits a direct short may result. Damage to equipment, injury or death to personnel may occur.
- Welding procedures must be performed beyond the enclosure of shelter, welding fumes can be harmful to personnel. Failure to comply may result in serious injury or death to personnel.
- Ensure primary power switch located on back of ARC welder is in the OFF position. Failure to comply may result in serious injury or death to personnel.
- If welding helmet has been stored for an extended period of time, place welding helmet in direct sun or fluorescent light for 1/2 hour prior to use or until low battery indicator is off.
- Welding helmet is only operational in temperatures above 25 degrees F. Welding personnel must use different PPE when in temperatures below 25 degrees F.
- Welding operation produces intense light and eye protection is required at all times. Failure to comply may result in serious injury to personnel.



NOTE

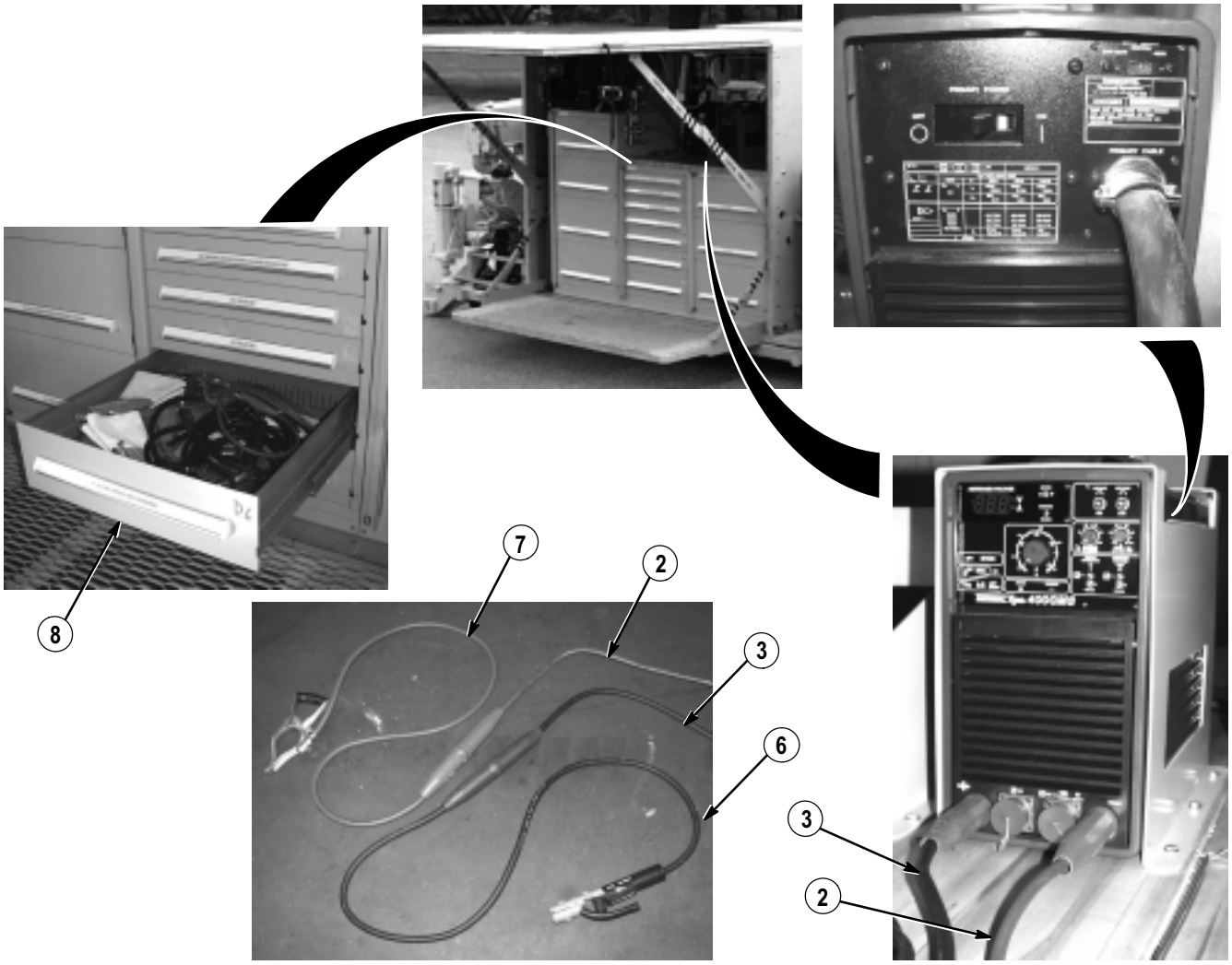
The following steps are basic set–up procedures for the ARC welder. For additional information, refer to vendor data supplied with FRS. For complete welding practices reference TC 9–237.

(1) Start generator (1) (Para 2-15).

(2) Remove negative welding extension cable (2) and positive welding extension cable (3) from hook (4) on rear shelter wall.

(3) Connect welding extension cables (2) and (3) to ARC welder (5).

2-20. WELDER OPERATION (CONT).



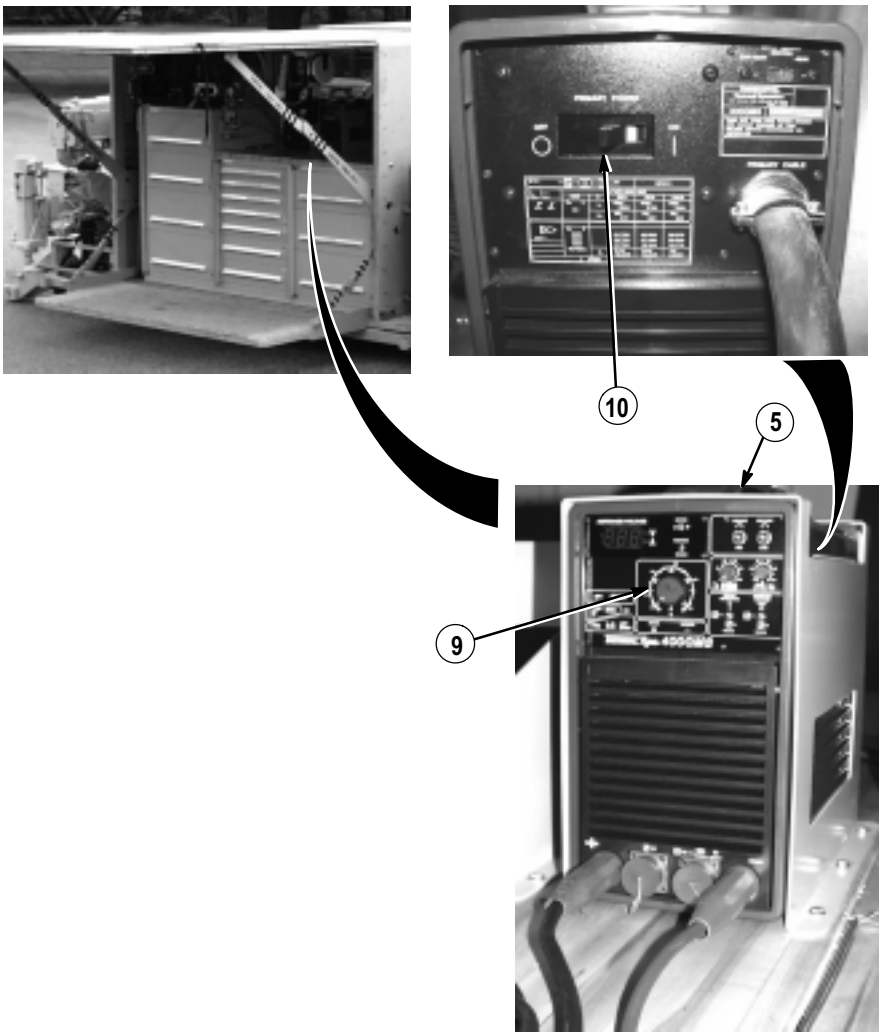
(4) Remove ARC welding lead (6) and grounding clamp cable (7) from welding cabinet (8).

CAUTION

- Do not attempt to weld on the vehicle without following the general welding maintenance procedures or damage to the vehicles electical system may result.
- Disconnect batteries on item to be welded.
- Do not weld on or near electronic components or damage to the component may result.
- Do not connect welding cables to electronic components or damage to the component may result.
- Place grounding clamp on or near part being welded or damage to other components may result.

(5) Attach grounding clamp cable (7) to negative extension cable (2) and item to be welded.

(6) Connect ARC welding lead (6) to positive extension cable (3).



WARNING

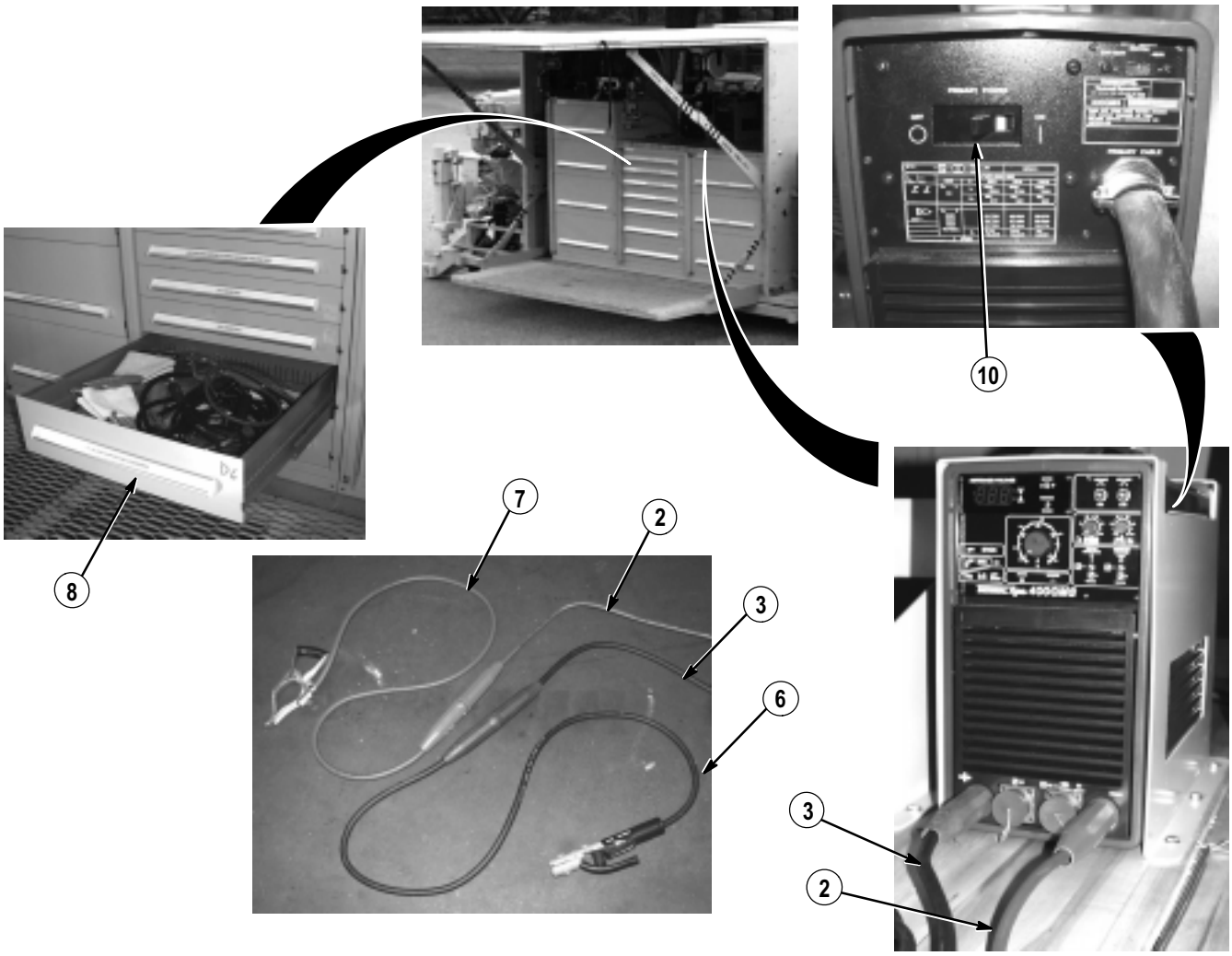
Unsafe welding practices can cause serious injury from fire, explosions, or harmful agents. Allow only authorized personnel to weld, and follow safety precautions in TC 9–237. Protective clothing and goggles must be worn; adequate protection used, a suitable fire extinguisher kept nearby, and requirements of TC 9–237 strictly followed.

(7) Turn amperage/voltage control (9) to proper position for desired application. Refer to TC 9–237.

(8) Position primary power switch (10), located on back of ARC welder (5), in the ON position.

2-20. WELDER OPERATION (CONT).

b. STICK (Shielded Metal ARC Welding [SMAW]) Welder Shutdown.

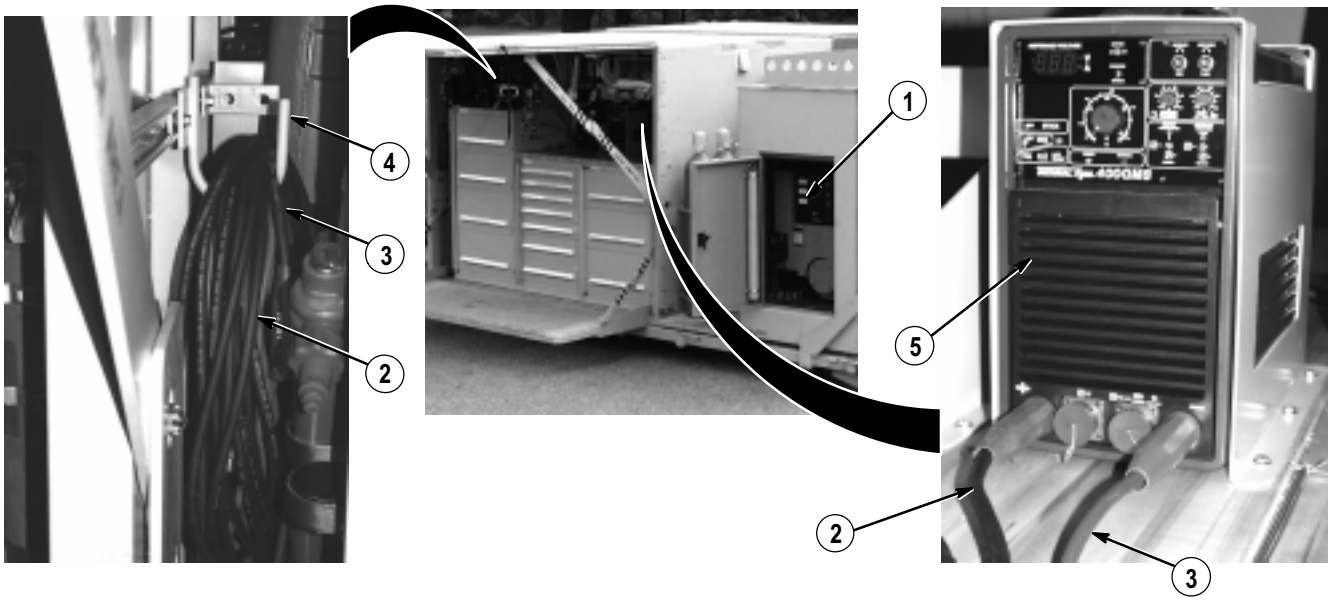


(1) Position primary power switch (10) to the OFF position.

(2) Remove ARC welding lead (6) from positive extension cable (3).

(3) Remove grounding clamp cable (7) from negative extension cable (2).

(4) Stow ARC welding lead (6) and grounding clamp cable (7) in welding cabinet (8).



(5) Remove welding extension cables (2) and (3) from ARC welder (5).

(6) Stow welding extension cables (2) and (3) to hook (4) on rear shelter wall.

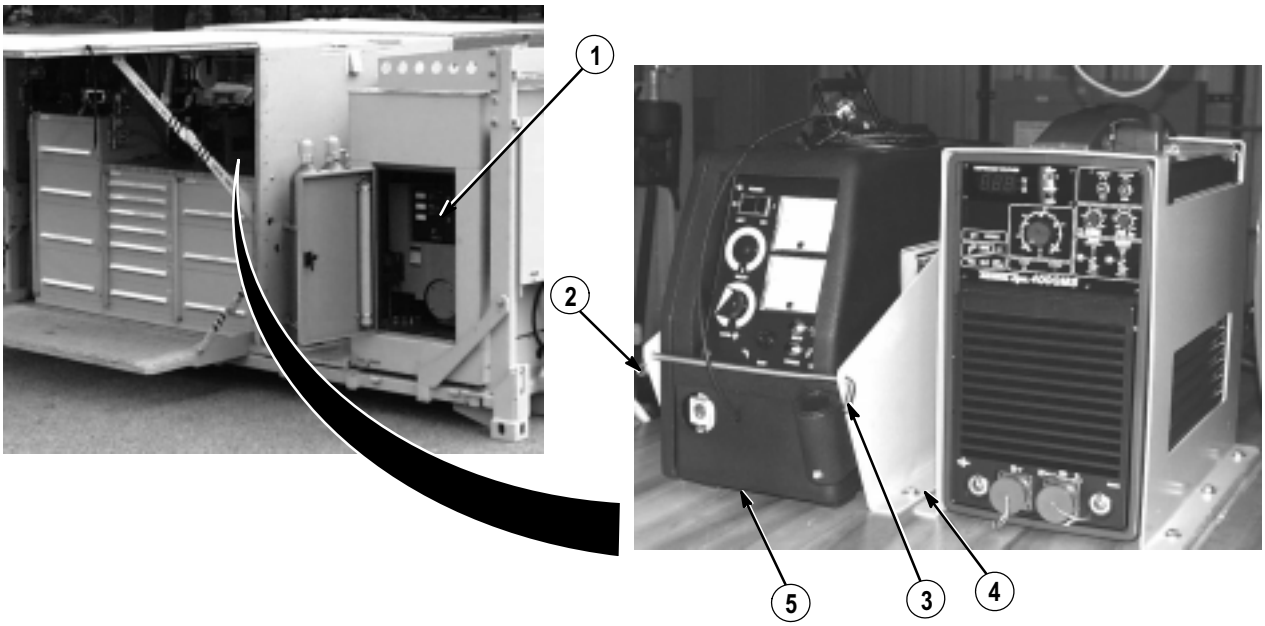
(7) Shutdown generator (1) (Para 2-15).

2-20. WELDER OPERATION (CONT).

c. MIG Welder Start/Set-Up.

WARNING

- Unsafe welding practices can cause serious injury from fire, explosions, or harmful agents. Allow only authorized personnel to weld or cut metals, and follow safety precautions in TC 9–237. Protective clothing and goggles must be worn; adequate protection used, a suitable fire extinguisher kept nearby, and requirements of TC 9–237 strictly followed.
- Personnel hearing can be PERMANENTLY DAMAGED if exposed to constant high noise levels of 85 DBA or greater. Wear approved hearing protection devices when working in high noise level areas. Personnel exposed to high noise levels shall participate in a hearing observation program in accordance with TB MED 501. Hearing loss occurs gradually but becomes permanent over time.
- Remove all jewelry such as rings, ID tags, bracelets, etc. If jewelry or tools contact positive electrical circuits a direct short may result. Damage to equipment, injury or death to personnel may occur.
- Welding procedures must be performed beyond the enclosure of shelter, welding fumes can be harmful to personnel. Failure to comply may result in serious injury or death to personnel.
- Ensure primary power switch located on back of ARC welder is in the OFF position. Failure to comply may result in serious injury or death to personnel.
- Ensure argon gas regulator is OFF. Close argon tank valve and purge argon with the wire feeder purge button. Failure to comply may result in serious injury or death to personnel.
- If welding helmet has been stored for an extended period of time, place welding helmet in direct sun or fluorescent light for 1/2 hour prior to use or until low battery indicator is off.
- Welding helmet is only operational in temperatures above 25 degrees F. Welding personnel must use different PPE when in temperatures below 25 degrees F.
- Welding operation produces intense light and eye protection is required at all times. Failure to comply may result in serious injury to personnel.



NOTE

The following steps are basic set–up procedures for the MIG welder. For additional information, refer to vendor data supplied with FRS. For complete welding practices reference TC 9–237.

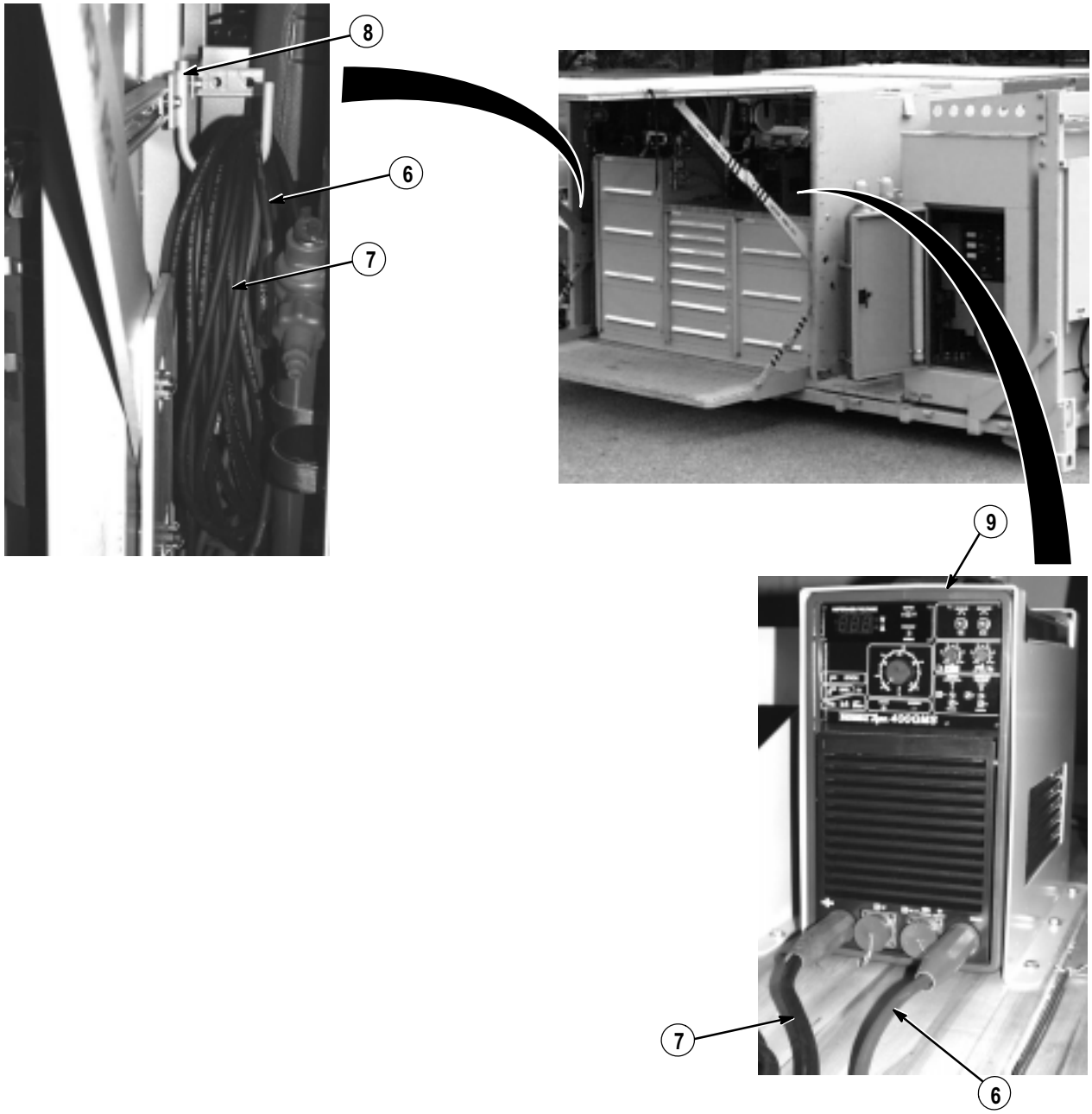
(1) Start generator (1) (Para 2-15).

(2) Remove retaining clip (2) and retaining rod (3) from wire feeder bracket (4).

(3) Remove portable wire feeder (5) from counter and place on ground before operation.

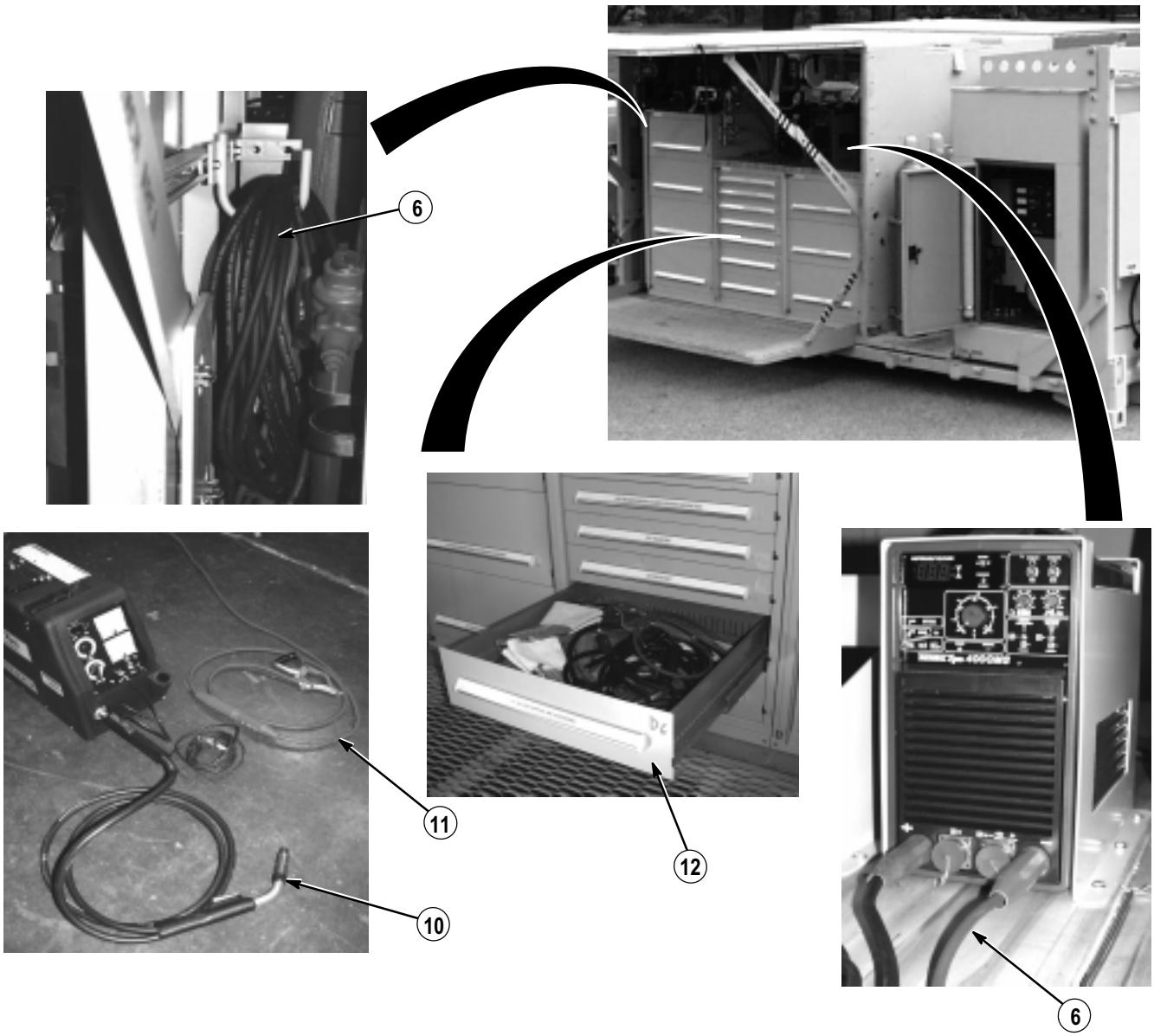
(4) Replace retaining rod (3) and retaining clip (2) in wire feeder bracket (4).

2-20. WELDER OPERATION (CONT).



(5) Remove positive welding extension cable (6) and negative extension cable (7) from hook (8) on rear shelter wall.

(6) Connect welding extension cables (6) and (7) to ARC welder (9).



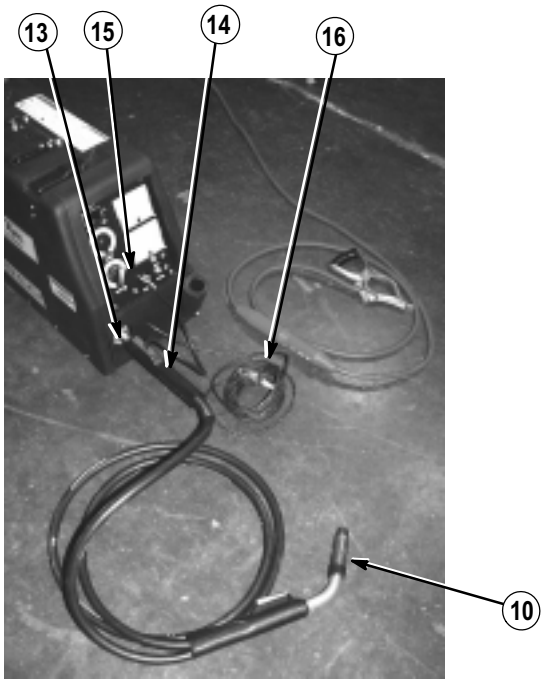
(7) Remove wire feeder gun (10) and grounding clamp cable (11) from welding cabinet (12).

CAUTION

- Do not attempt to weld on the vehicle without following the general welding maintenance procedures or damage to the vehicles electical system may result.
- Disconnect batteries on item to be welded.
- Do not weld on or near electronic components or damage to the component may result.
- Do not connect welding cables to electronic components or damage to the component may result.
- Place grounding clamp on or near part being welded or damage to other components may result.

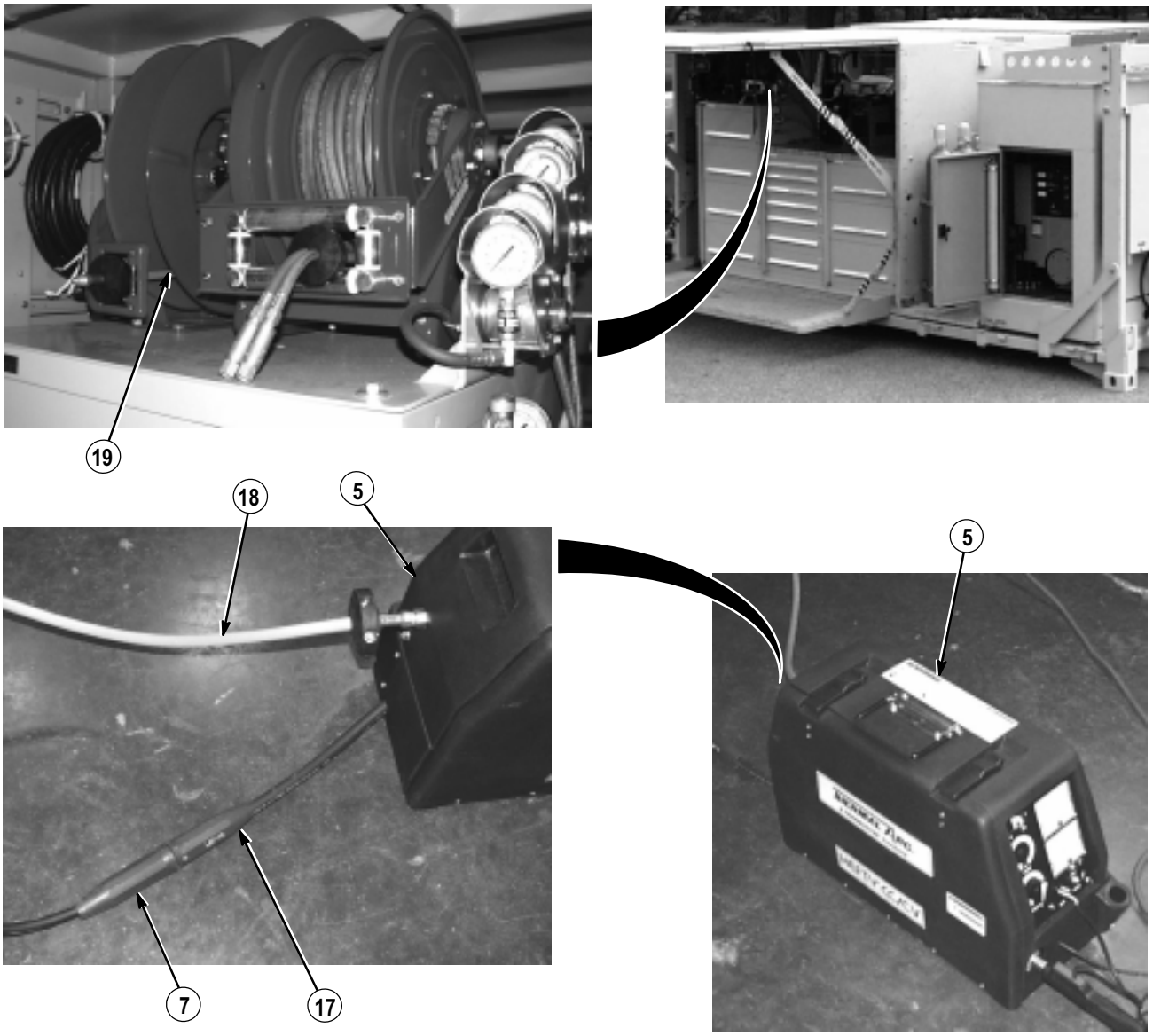
(8) Attach grounding clamp cable (11) to negative extension cable (6).

2-20. WELDER OPERATION (CONT).



(9) Connect wire feeder gun (10) to wire feeder connector (13) and wire feeder gun wires (14) to gun switch receptacle (15).

(10) Clamp wire feeder ground (16) to bare metal ground on item to be welded. Attach wire feeder ground (16) in accordance with TC 9–237.

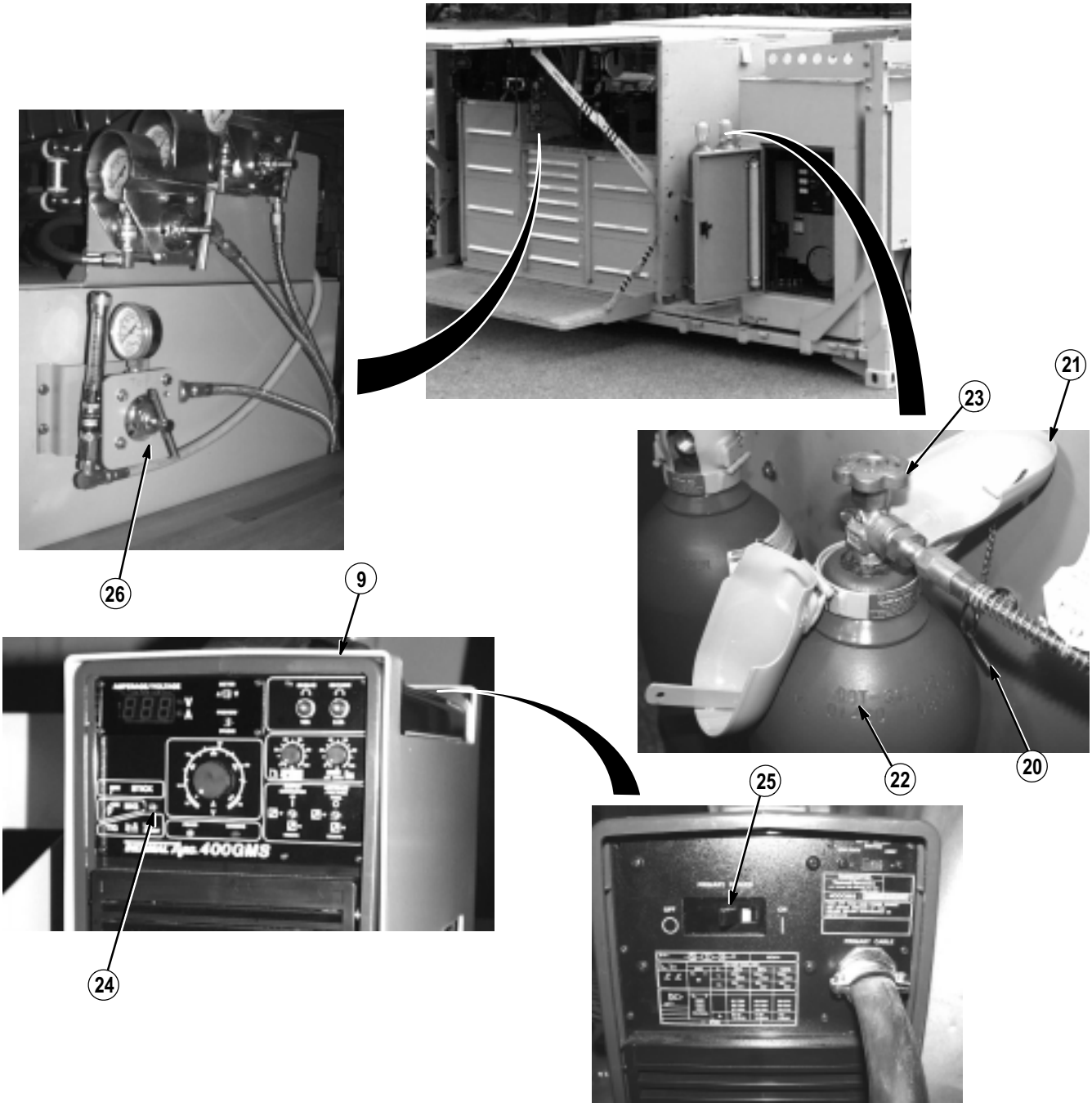


(11) Connect positive welding extension cable (7) to wire feeder (17).

(12) Unwind argon hose (18) from argon hose reel (19).

(13) Attach argon hose (18) to back of wire feeder (5).

2-20. WELDER OPERATION (CONT).



(14) Remove clip (20) and open tank safety cap (21) on argon tank (22).

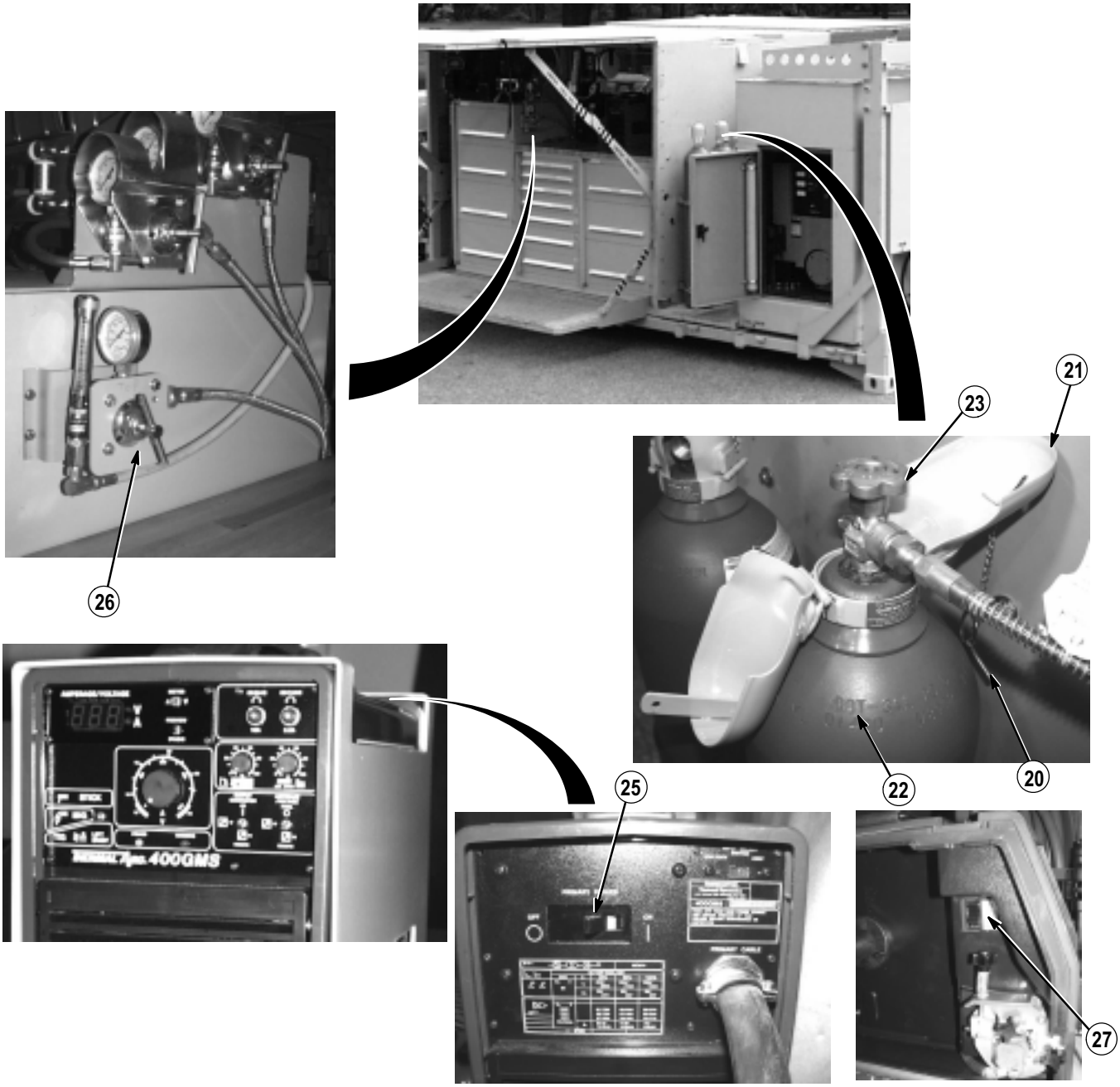
(15) Turn handle (23) counterclockwise and open valve fully to engage upper seal.

(16) Close tank safety cap (21) and install clip (20).

(17) Turn process selector switch (24) on ARC welder (9) to MIG middle position.

(18) Position primary power switch (25), located on back of ARC welder (9) in the ON position.

(19) Adjust argon regulator (26) to desired level. Refer to TC 9–237.



d. MIG Welder Shutdown.

(1) Position primary power switch (25) in the OFF position.

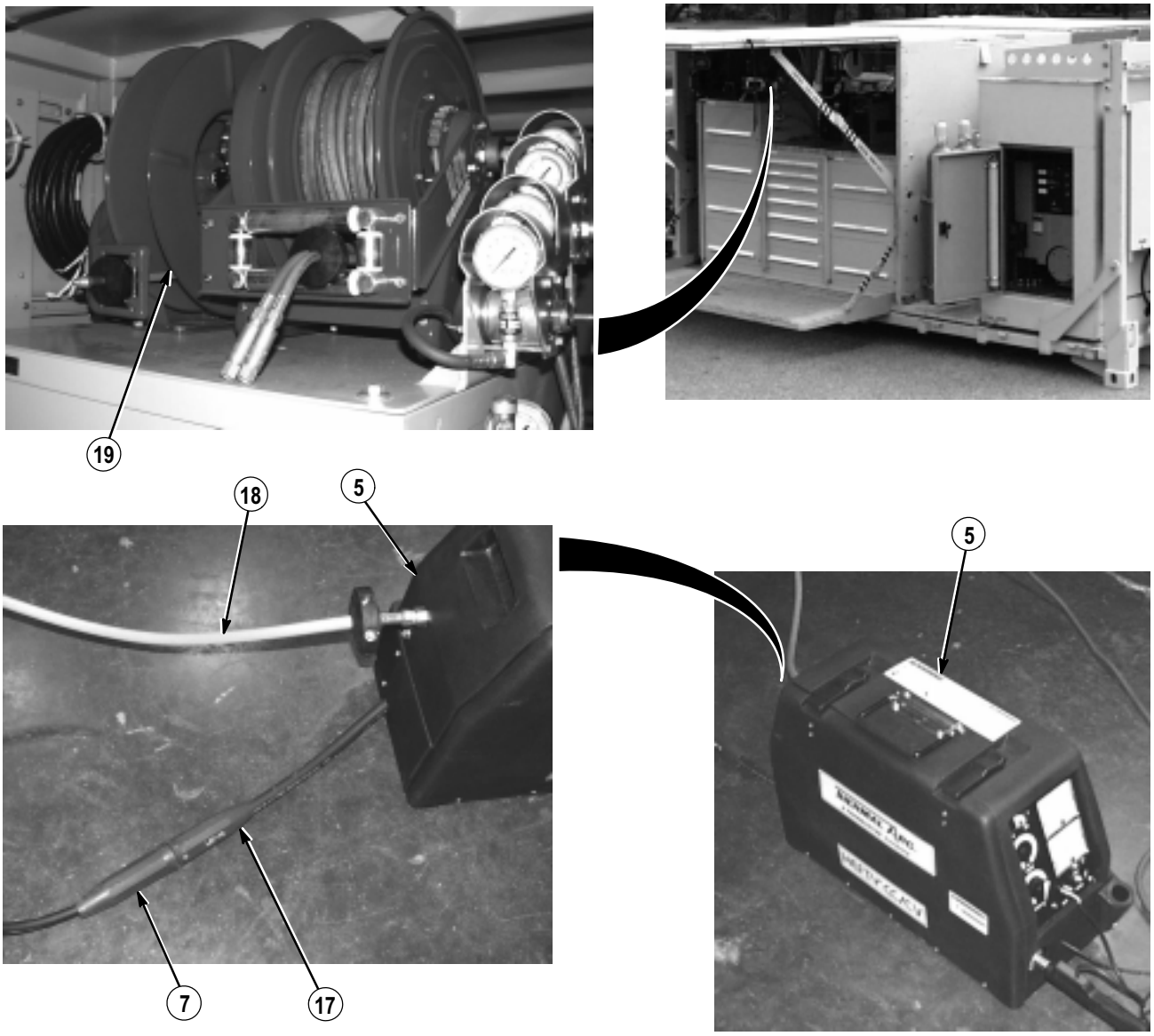
(2) Remove clip (20) and open tank safety cap (21) on argon tank (22).

(3) Turn handle (23) clockwise and close valve.

(4) Close tank safety cap (21) and install clip (20).

(5) Turn argon regulator valve (26) counterclockwise to bleed, and purge using the wire feeder purge button (27).

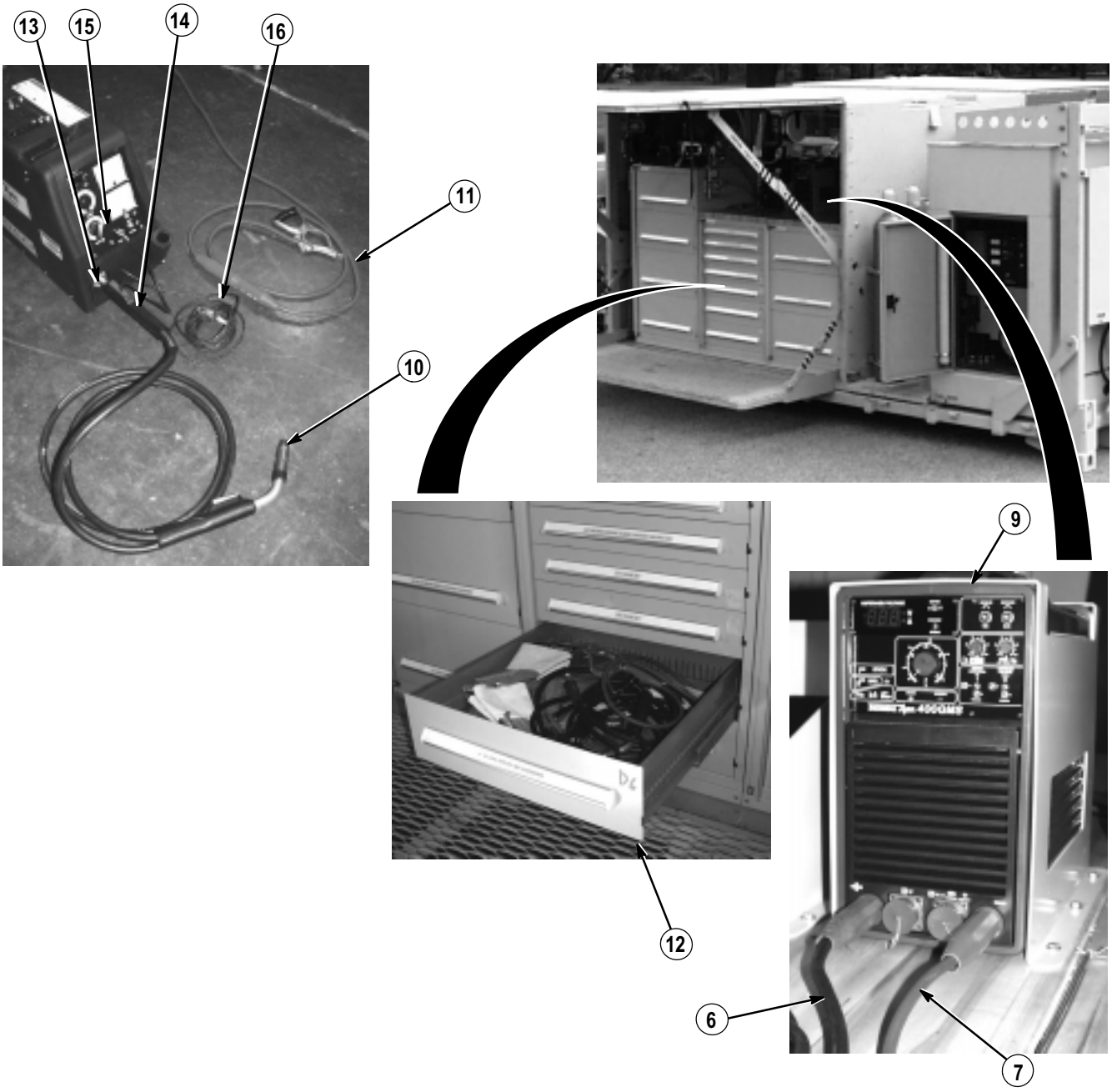
2-20. WELDER OPERATION (CONT).



(6) Remove argon hose (18) from wire feeder (5).

(7) Rewind argon hose (18) on argon hose reel (19).

(8) Remove positive welding extension cable (7) from wire feeder cable (17).



(9) Unclamp wire feeder ground (16) from welded item.

(10) Remove wire feeder gun wires (14) from gun switch receptacle (15).

(11) Remove wire feeder gun (10) from wire feeder connector (13).

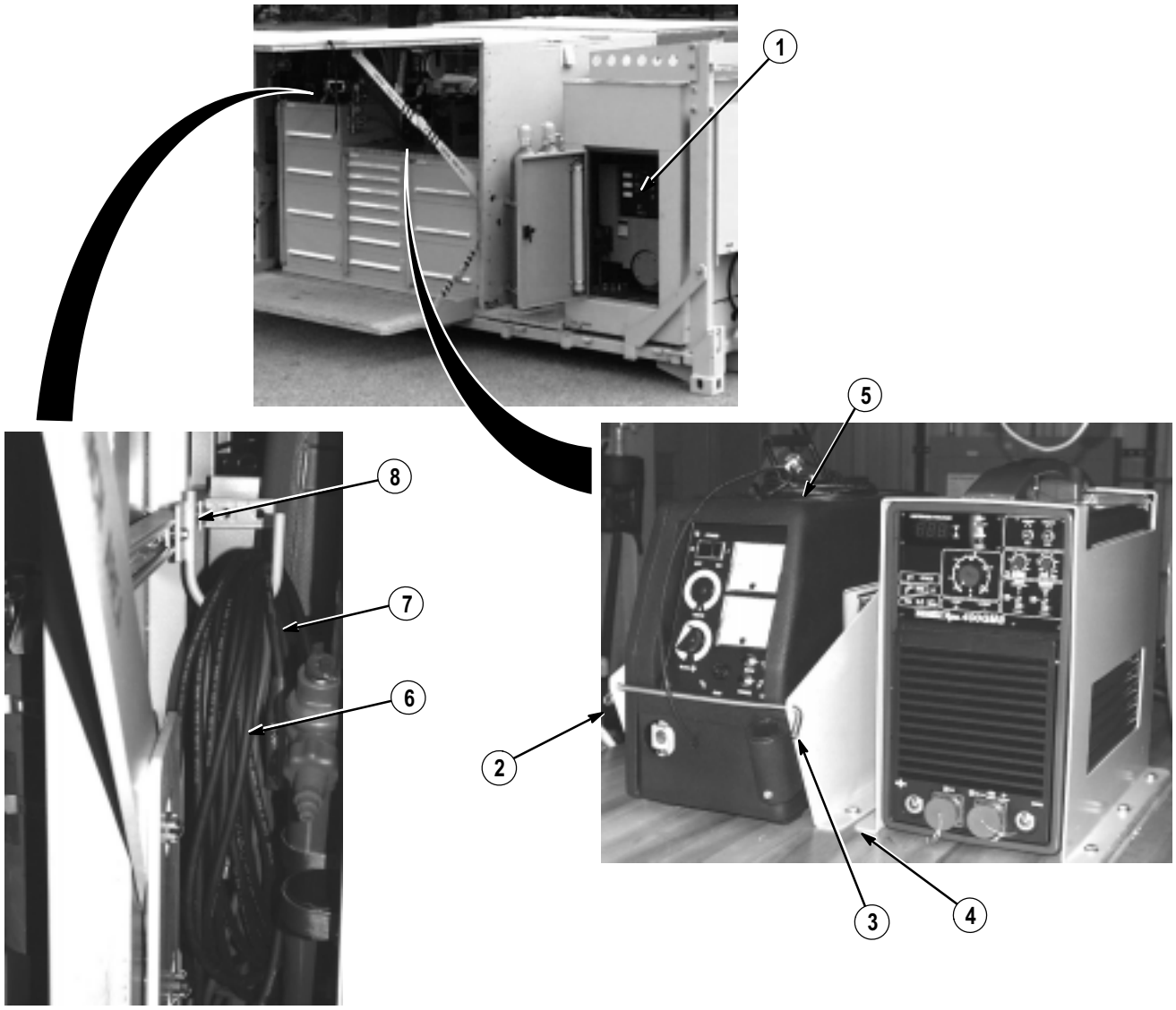
(12) Unclamp grounding clamp cable (11) from welded item.

(13) Remove grounding clamp cable (11) and negative extension cable (7) from welded item.

(14) Stow wire feeder gun (10) and grounding clamp cable (11) in welding cabinet (12).

(15) Remove welding extension cables (6) and (7) from ARC welder (9).

2-20. WELDER OPERATION (CONT).



(16) Stow welding extension cables (6) and (7) to hook (8) on rear shelter wall.

(17) Remove retaining clip (2) and retaining rod (3) from wire feeder bracket (4).

(18) Install wire feeder (5) in wire feeder bracket (4).

(19) Install retaining rod (3) and retaining clip in wire feeder bracket (4).

(20) Shutdown generator (1) (Para 2-15).

2-21. CUTTING TORCH OPERATION.

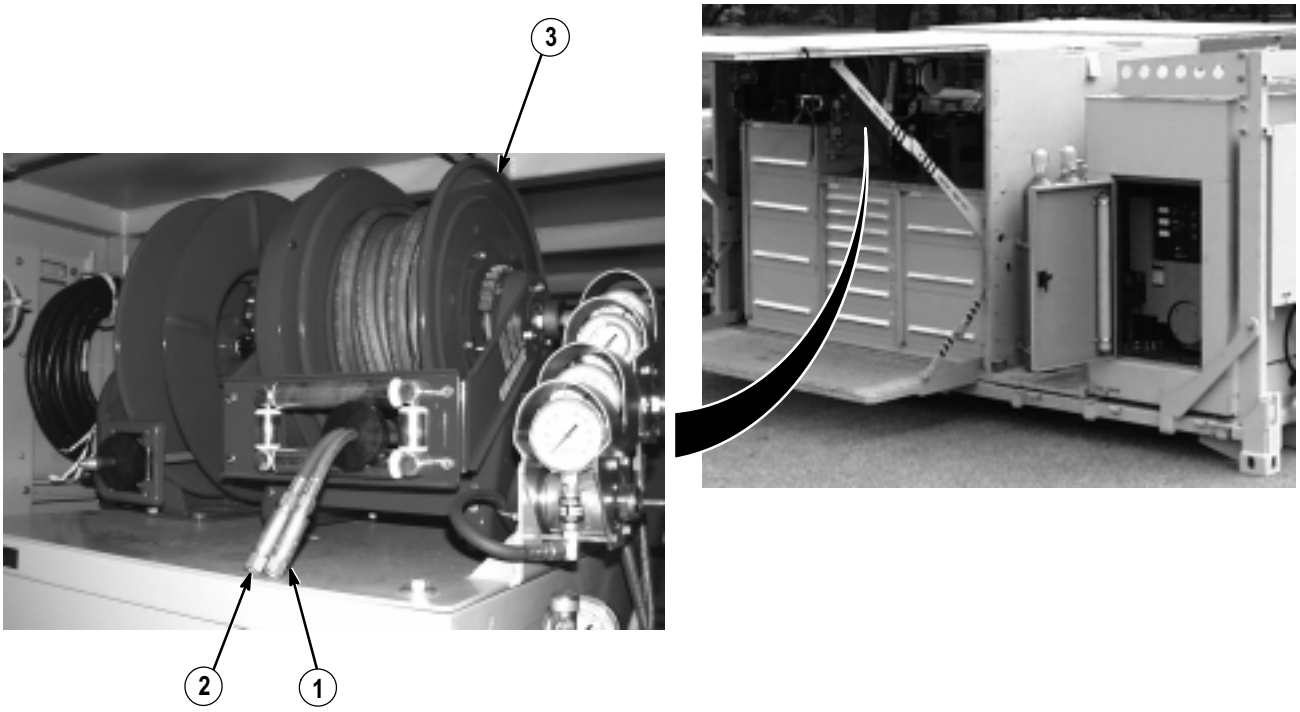
a. Cutting Torch Assembly.

WARNING

- Unsafe welding practices can cause serious injury from fire, explosions, or harmful agents. Allow only authorized personnel to weld or cut metals, and follow safety precautions in TC–237. Protective clothing and goggles must be worn; adequate protective used, a suitable fire extinguisher kept nearby, and requirements of TC 9–237 strictly followed.
- Welding procedures must be performed beyond the enclosure of shelter, welding fumes can be harmful to personnel. Failure to comply may result in serious injury or death to personnel.

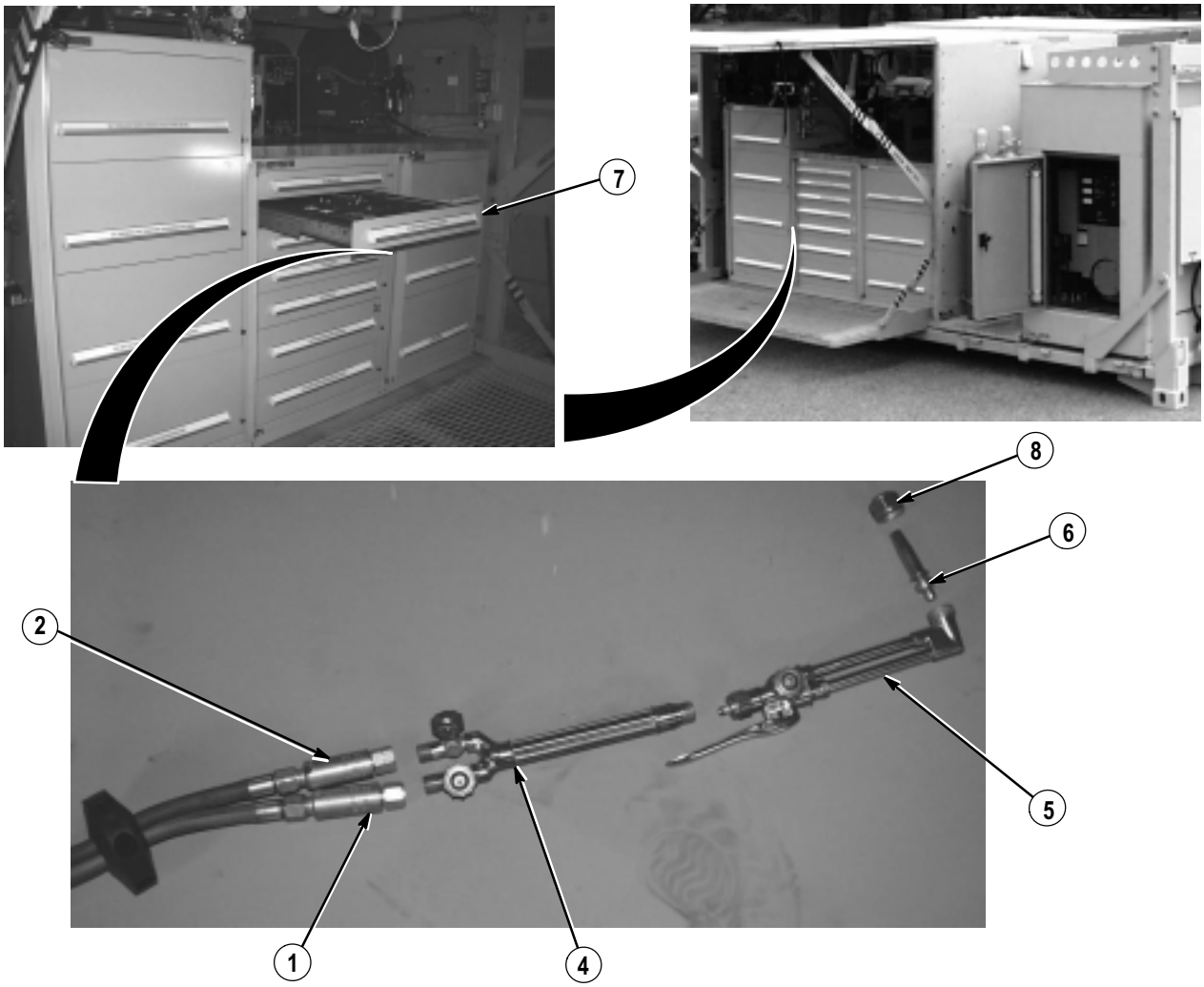
NOTE

The following steps are basic set–up procedures for the cutting torch. For additional information, refer to vendor data supplied with FRS. For complete welding practices reference TC 9–237.



(1) Unwind oxygen hose (1) and propylene hose (2) from hose reel (3).

2-21. CUTTING TORCH OPERATION (CONT).



NOTE

Choose the type of cutting tip needed for the procedure to be preformed. (Refer to TC 9–237.)

(2) Remove mixing chamber (4), torch head (5) and tip (6) from welding cabinet (7).

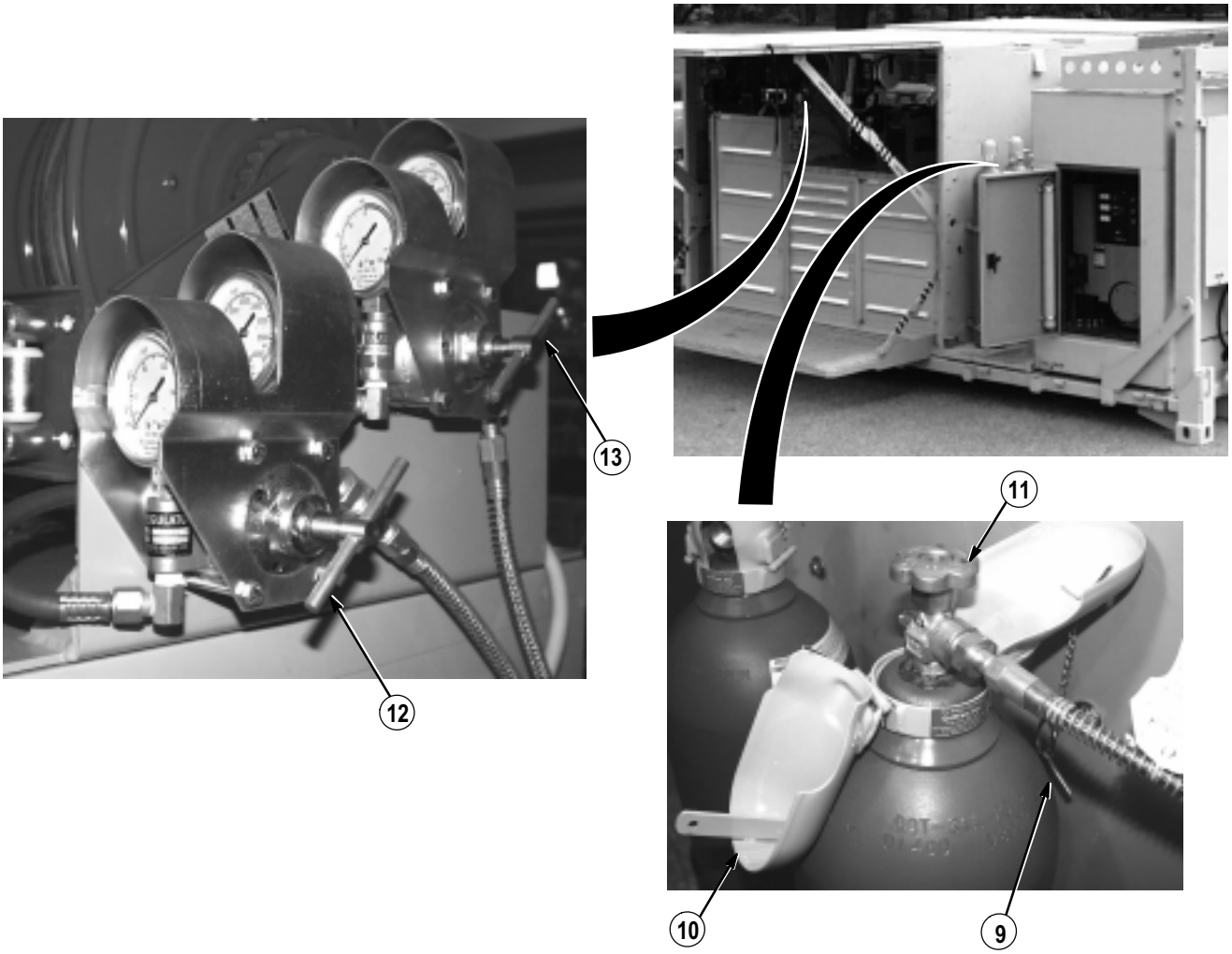
(3) Attach torch head (5) to mixing chamber (4).

(4) Remove retaining nut (8) form torch head (5) and install tip (6) and retaining nut to torch head.

NOTE

Insure oxygen hose and propylene hose are attached to the corresponding inlet port on mixing chamber. Oxygen hose is green in color with right-hand threads. Propylene hose is red in color with left-hand threads and the attaching nut has a notch around the outside.

(5) Attach oxygen hose (1) and propylene hose (2) to mixing chamber (4).



NOTE

Opening oxygen tank valve and propylene tank valve are the same. Oxygen tank valve is shown.

(6) Remove clip (9) and open tank safety cap (10).

(7) Turn handle (11) counterclockwise and open valve.

(8) Close tank safety cap (10) and install clip (9).

(9) Repeat Steps (6) through (8) for propylene tank valve.

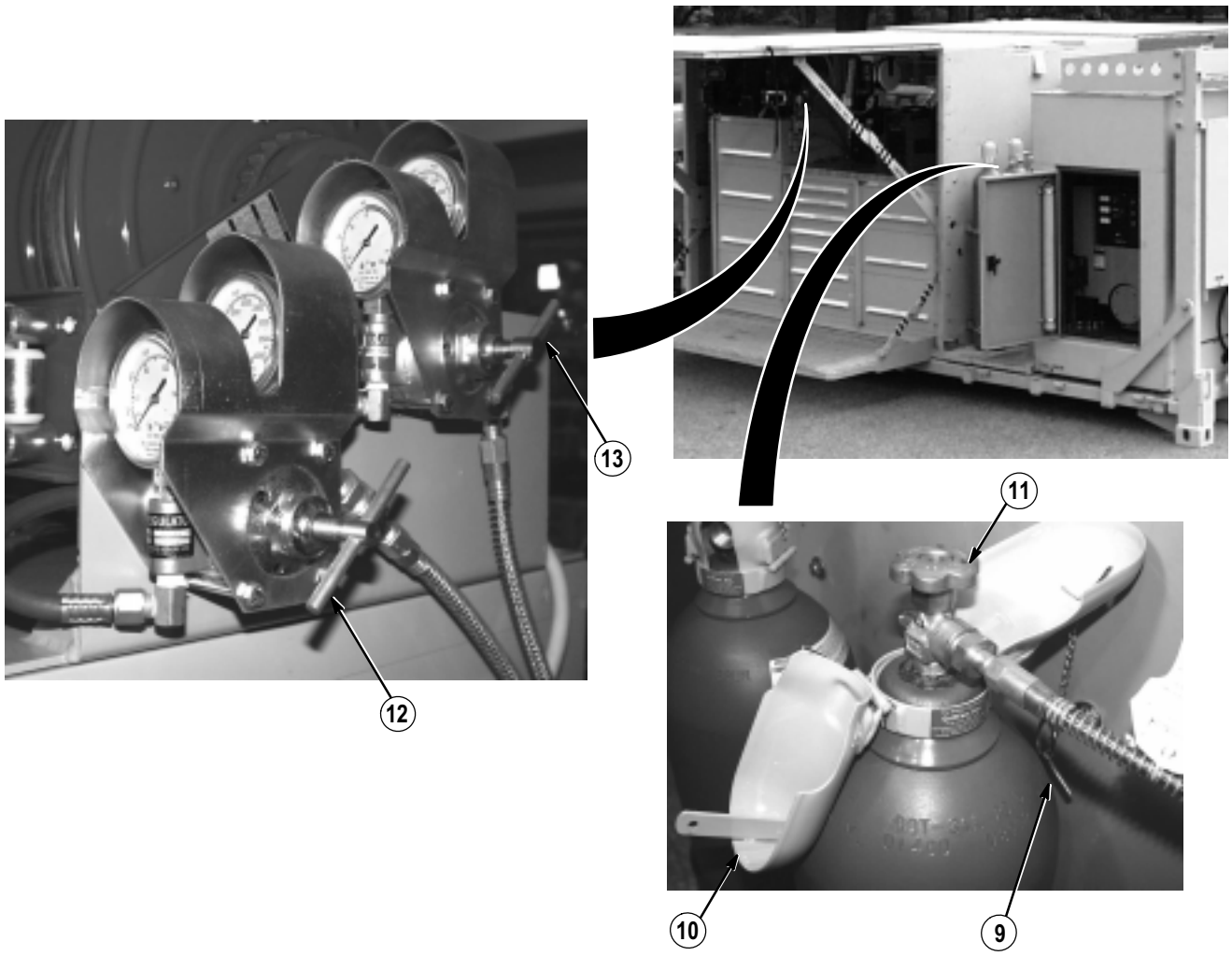
NOTE

Open oxygen valve fully. Open proplyene valve only 1/4 turn.

(10) Adjust oxygen regulator (12) and propylene regulator (13) to desired level. Maximum proplyene pressure is 10 psi (3–5 recommended), oxygen 20 – 40 psi recommended.

2-21. CUTTING TORCH OPERATION (CONT).

b. Cutting Torch Disassembly.



(1) Close oxygen regulator (12) and propylene gas regulator (13).

NOTE

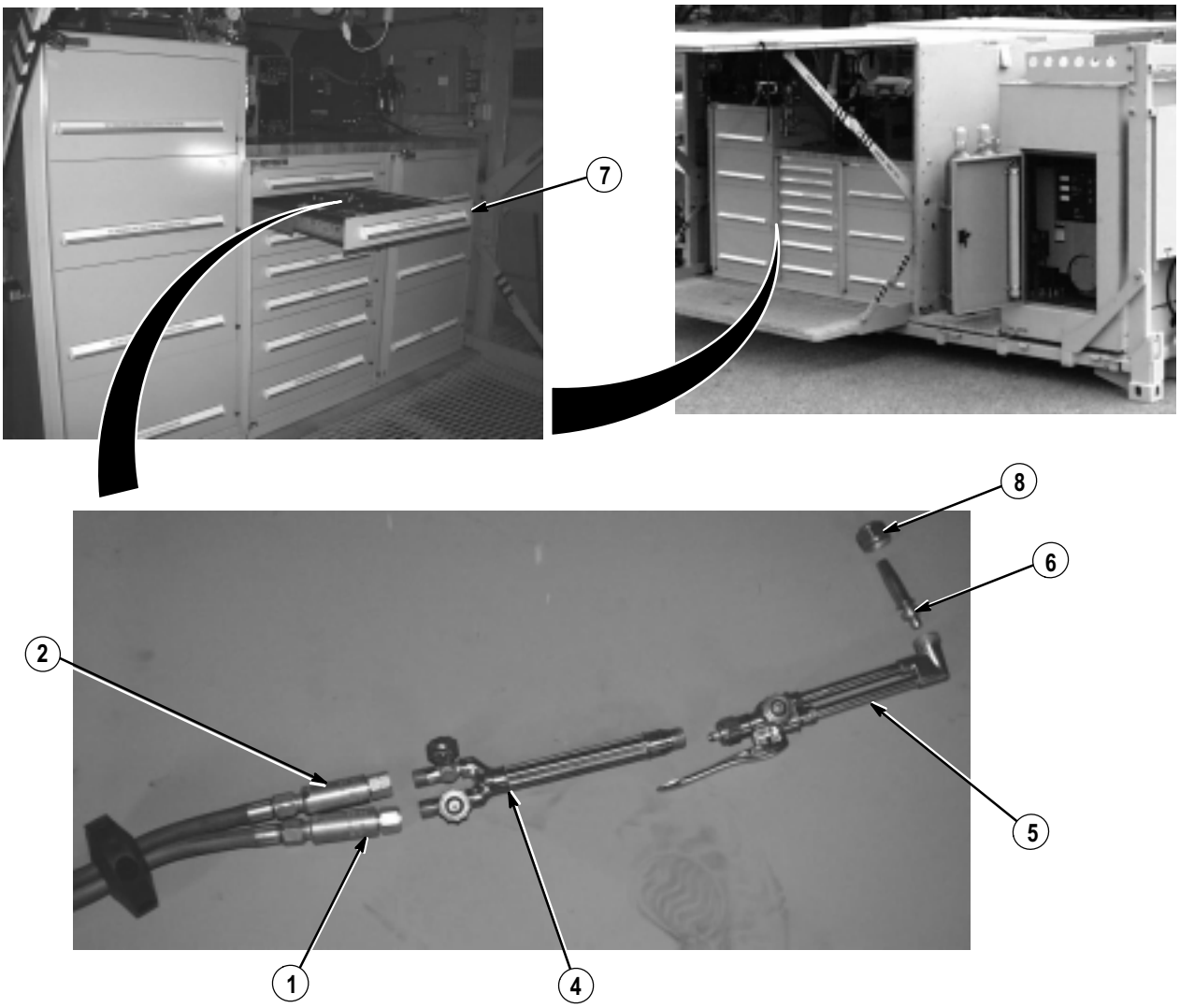
Closing oxygen tank valve and propylene tank valve are the same. Oxygen tank valve is shown.

(2) Remove clip (9) and open tank safety cap (10).

(3) Turn handle (11) clockwise and close valve.

(4) Close tank safety cap (10) and install clip (9).

(5) Repeat Steps (2) through (4) for propylene tank valve.



(6) Remove oxygen hose (1) and propylene hose (2) from mixing chamber (4).

WARNING

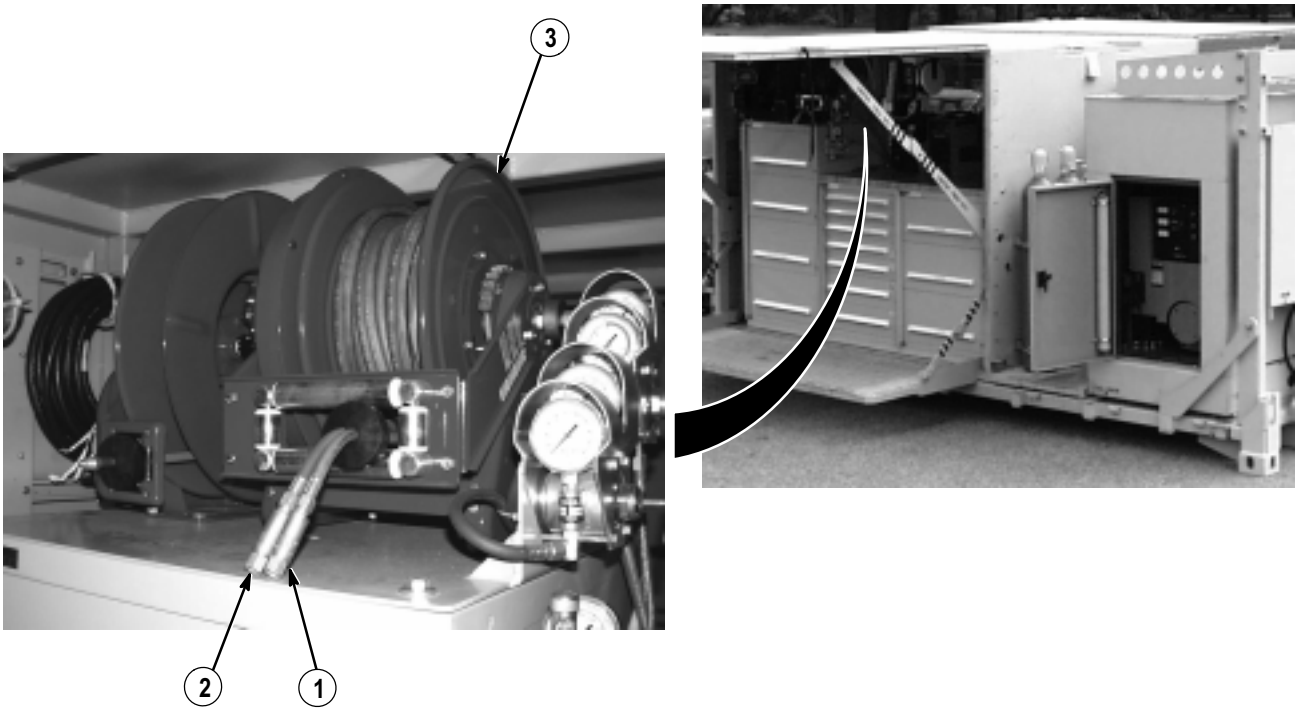
Do not disassemble torch when tip is hot. Tip can be extremely hot and cause severe burns.

(7) Remove retaining nut (8) and tip (6) form torch head (5) and assemble retaining nut to torch head.

(8) Remove torch head (5) from mixing chamber (4).

(9) Stow mixing chamber (4), torch head (5) and tip (6) in welding cabinet (7).

2-21. CUTTING TORCH OPERATION (CONT).



(10) Rewind oxygen hose (1) and propylene hose (2) on hose reel (3).

2-22. EXOTHERMIC CUTTING SYSTEM OPERATION.

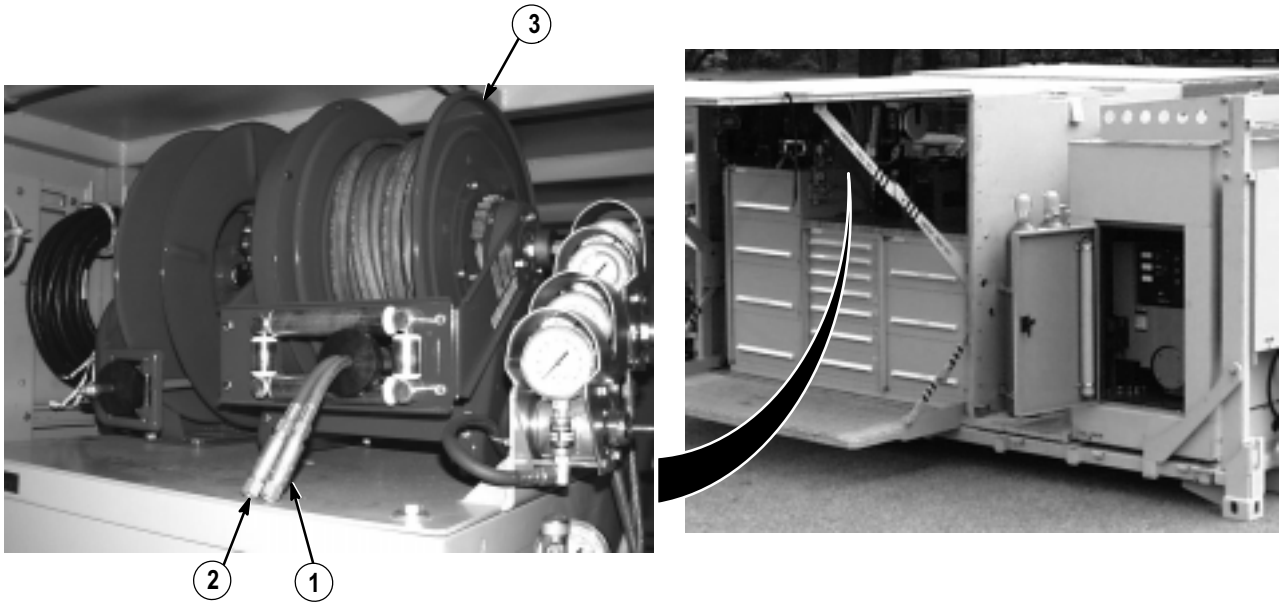
a. Exothermic Cutting System Assembly.

WARNING

- Unsafe welding practices can cause serious injury from fire, explosions, or harmful agents. Allow only authorized personnel to weld or cut metals, and follow safety precautions in TC–237. Protective clothing and goggles must be worn; adequate protective used, a suitable fire extinguisher kept nearby, and requirements of TC 9–237 strictly followed.
- Welding procedures must be performed beyond the enclosure of shelter, welding fumes can be harmful to personnel. Failure to comply may result in serious injury or death to personnel.
- Remove all jewelry such as rings, ID tags, bracelets, etc. If jewelry or tools contact positive electrical circuits a direct short may result. Damage to equipment, injury or death to personnel may occur.
- Ensure primary power switch located on back of ARC welder is in the OFF position. Failure to comply may result in serious injury or death to personnel.
- If welding helmet has been stored for an extended period of time, place welding helmet in direct sun or fluorescent light for 1/2 hour prior to use or until low battery indicator is off.
- Welding helmet is only operational in temperatures above 25 degrees F. Welding personnel must use different PPE when in temperatures below 25 degrees F.
- Welding operation produces intense light and eye protection is required at all times. Failure to comply may result in serious injury to personnel.

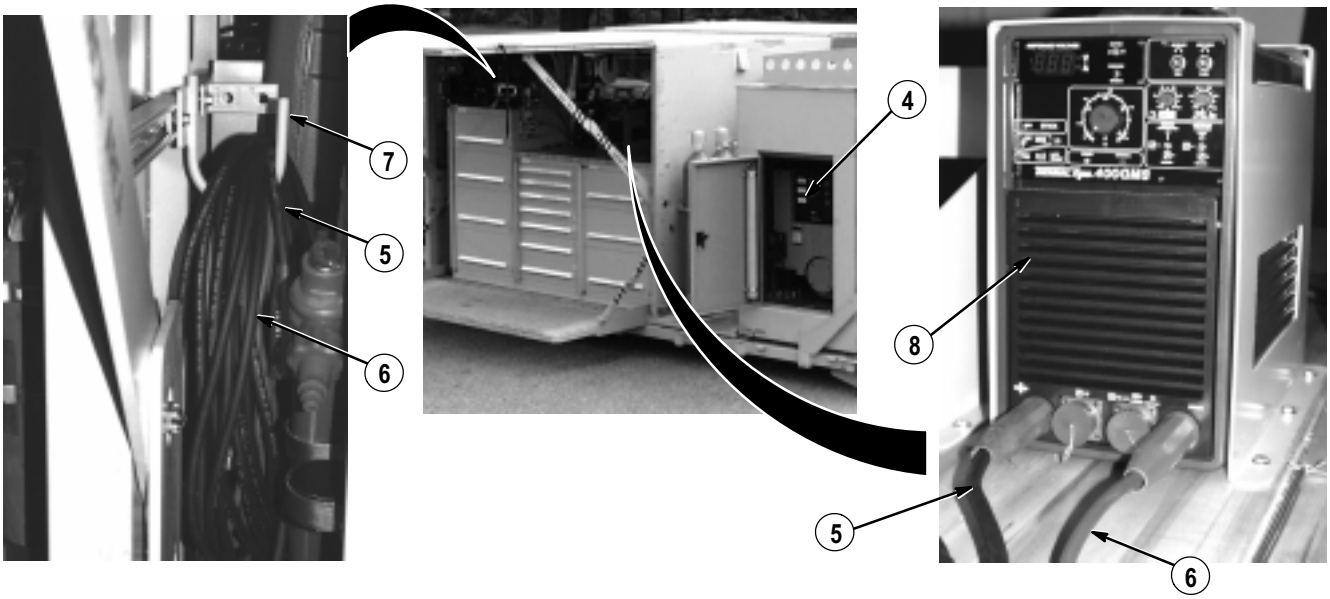
NOTE

The following steps are basic set–up procedures for the exothermic cutting system. For additional information, refer to vendor data supplied with FRS. For complete welding practices reference TC 9–237.



(1) Unwind oxygen hose (1) and propylene hose (2) from hose reel (3).

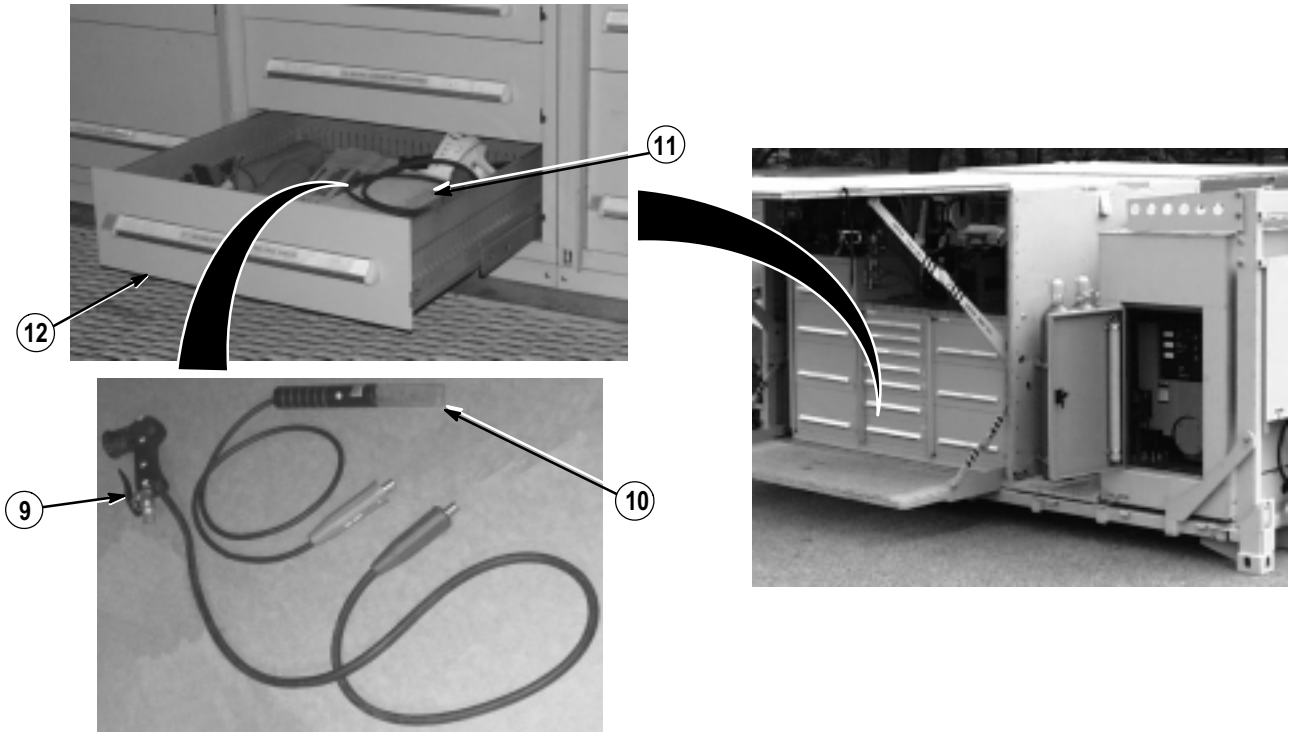
2-22. EXOTHERMIC CUTTING SYSTEM OPERATION (CONT).



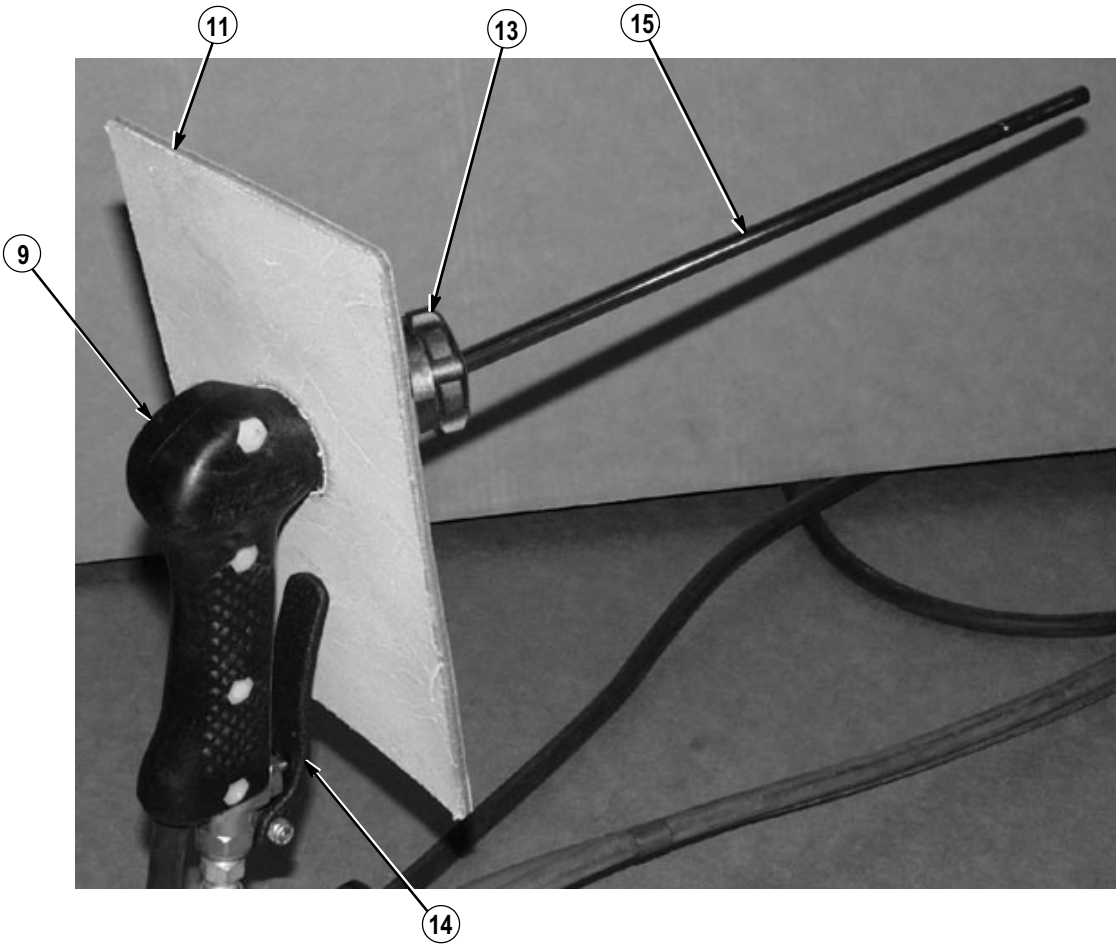
(2) Start generator (4) (Para 2-15).

(3) Remove negative welding extension cable (5) and positive welding extension cable (6) from hook (7) on rear shelter wall.

(4) Connect welding extension cables (5) and (6) to ARC welder (8).



(5) Remove torch head (9), striker plate (10) and leather shield (11) from welding cabinet (12).



(6) Remove collet nut (13) from torch head (9).

NOTE

Smooth side of leather shield should face away from the torch head.

(7) Install leather shield (11) onto torch head (9).

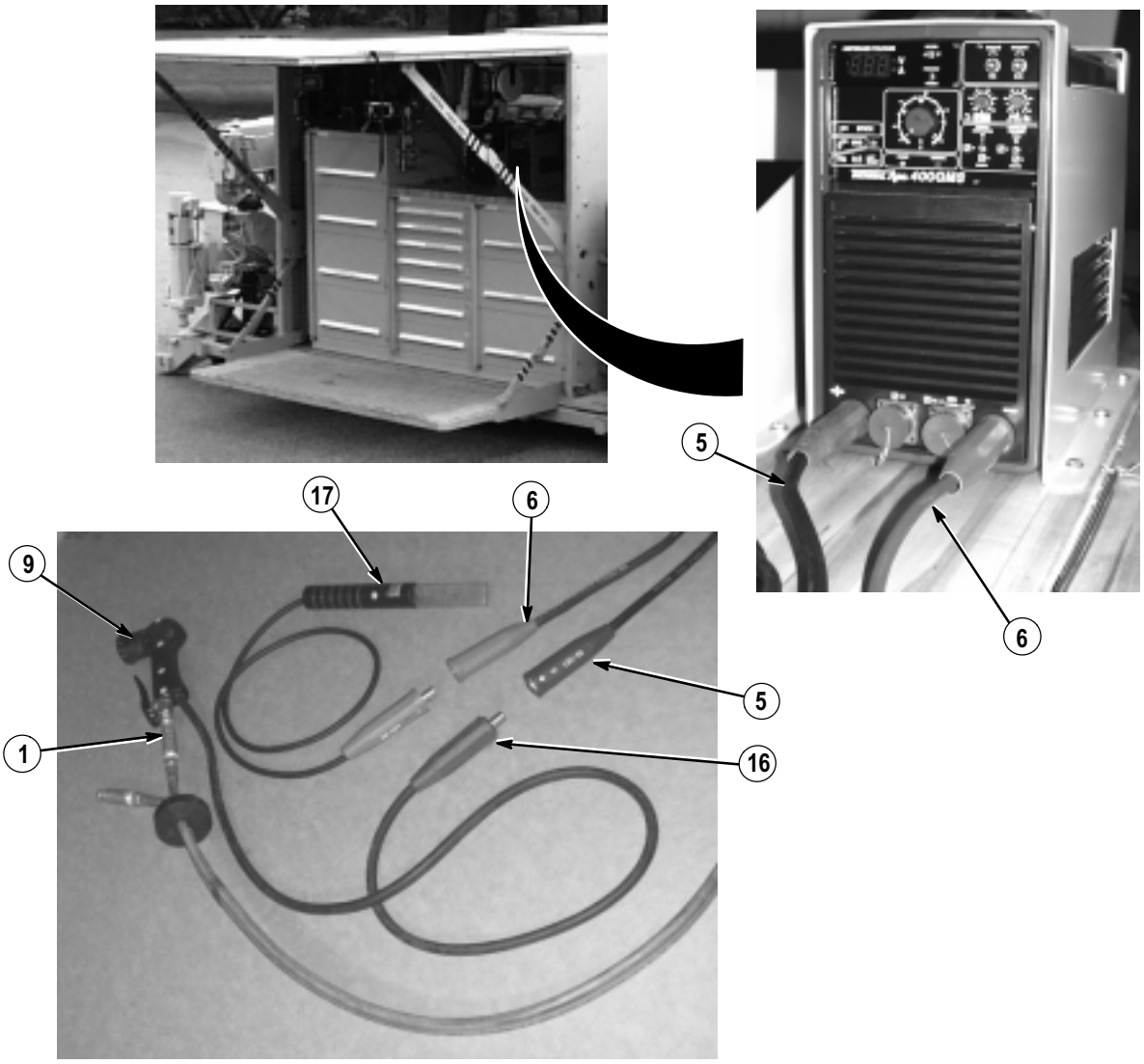
(8) Install collet nut (13) onto torch head (9).

(9) Position leather shield (11) so long end covers the oxygen control lever (14).

(10) Loosen collet nut (13) 1/2 turn.

(11) Insert recessed rod end (15) into the collet nut (13) until bottomed out on the collet washer and tighten collet nut.

2-22. EXOTHERMIC CUTTING SYSTEM OPERATION (CONT).



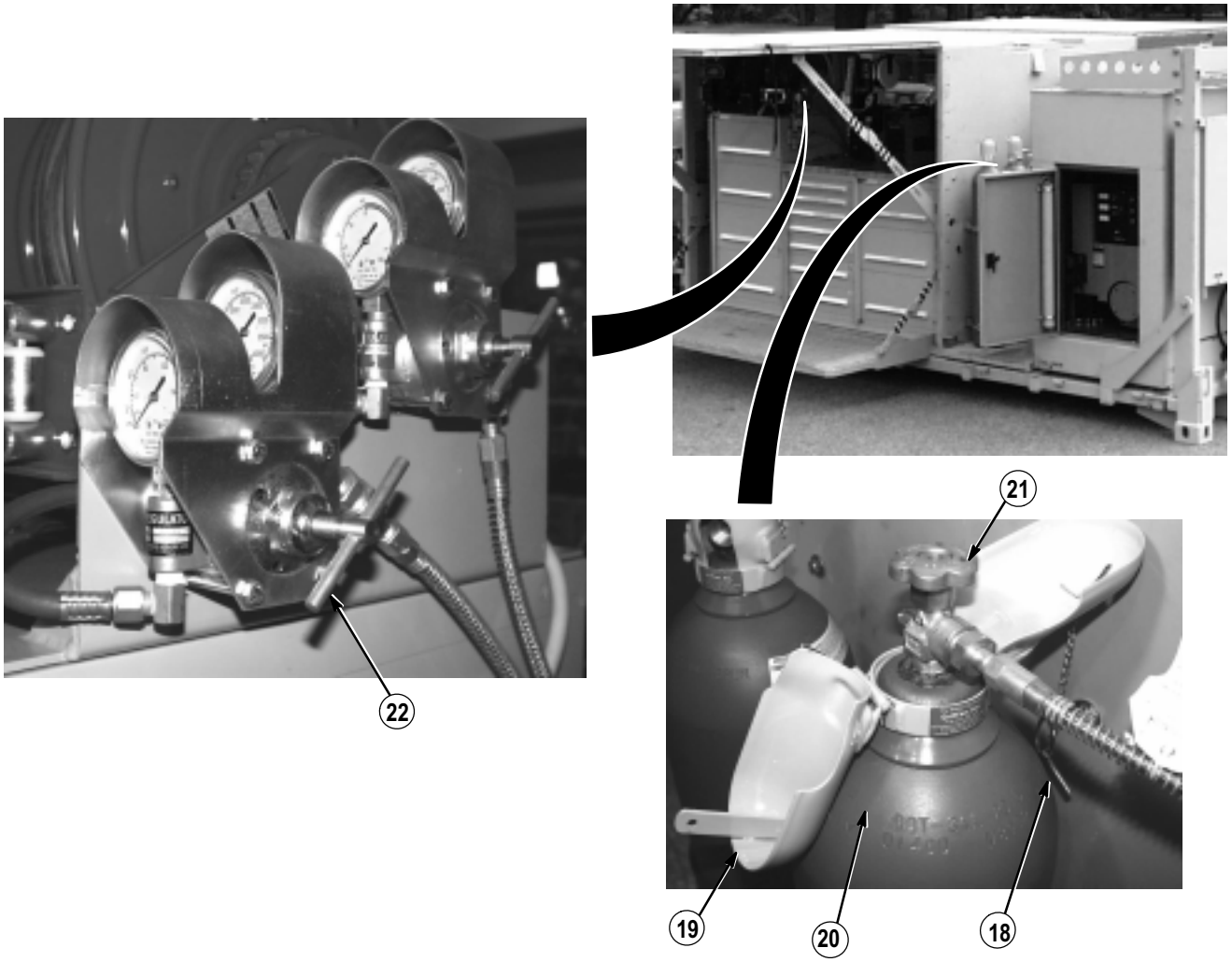
CAUTION

- Do not attempt to weld on the vehicle without following the general welding maintenance procedures or damage to the vehicles electical system may result.
- Disconnect batteries on item to be welded.
- Do not weld on or near electronic components or damage to the component may result.
- Do not connect welding cables to electronic components or damage to the component may result.

(12) Attach oxygen hose (1) to torch head (9).

(13) Attach torch head cable (16) to negative extension cable (5).

(14) Connect striker plate cable (17) to positive extension cable (6).



(15) Remove clip (18) and open tank safety cap (19) on oxygen tank (20).

(16) Turn handle (21) counterclockwise and open valve.

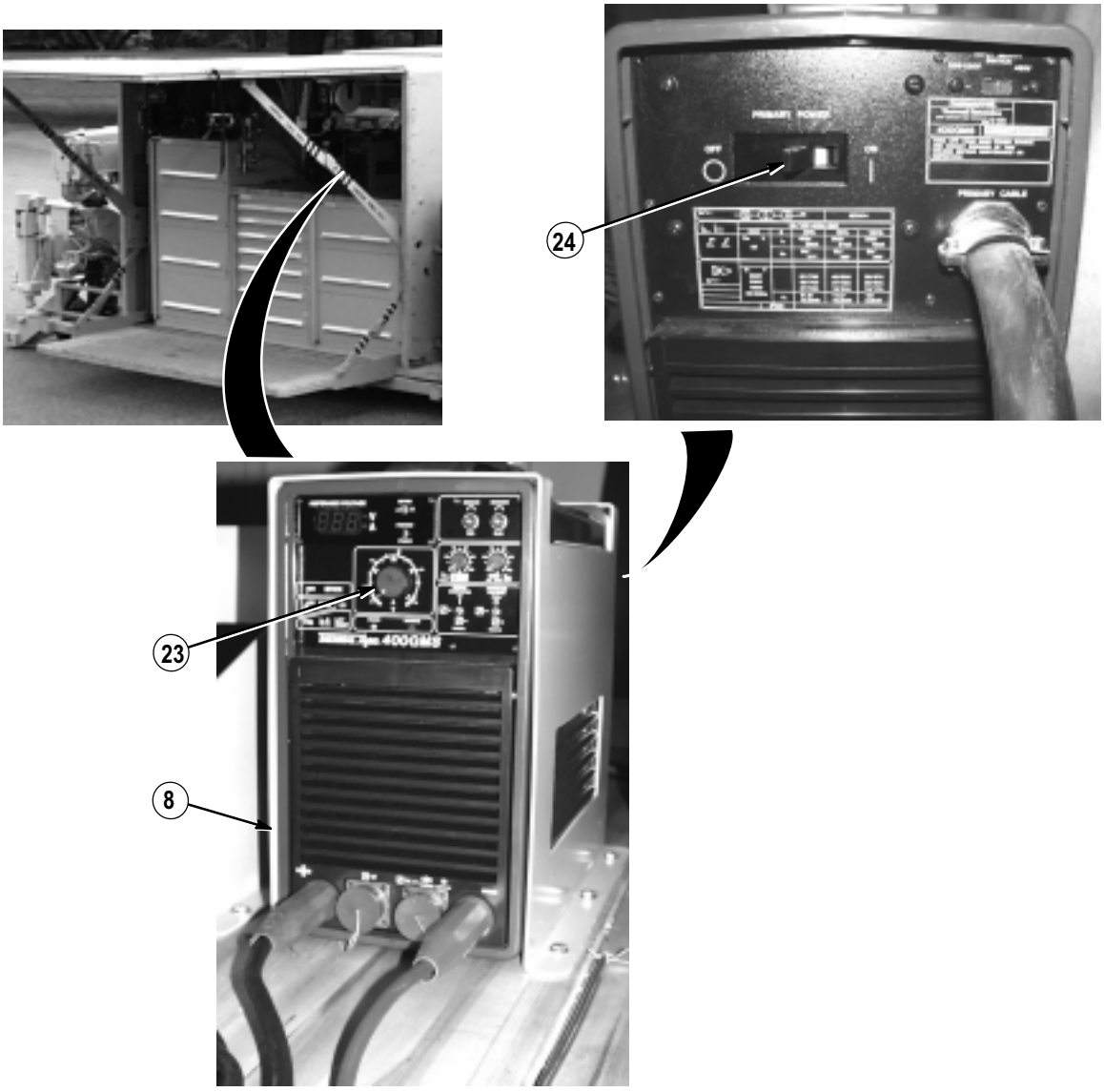
(17) Close tank safety cap (19) and install clip (18).

NOTE

Open oxygen valve fully.

(18) Adjust oxygen regulator (22) between 10 and 80 psi, depending on the cutting material and type of work being performed. See vendor data for recommended settings.

2-22. EXOTHERMIC CUTTING SYSTEM OPERATION (CONT).



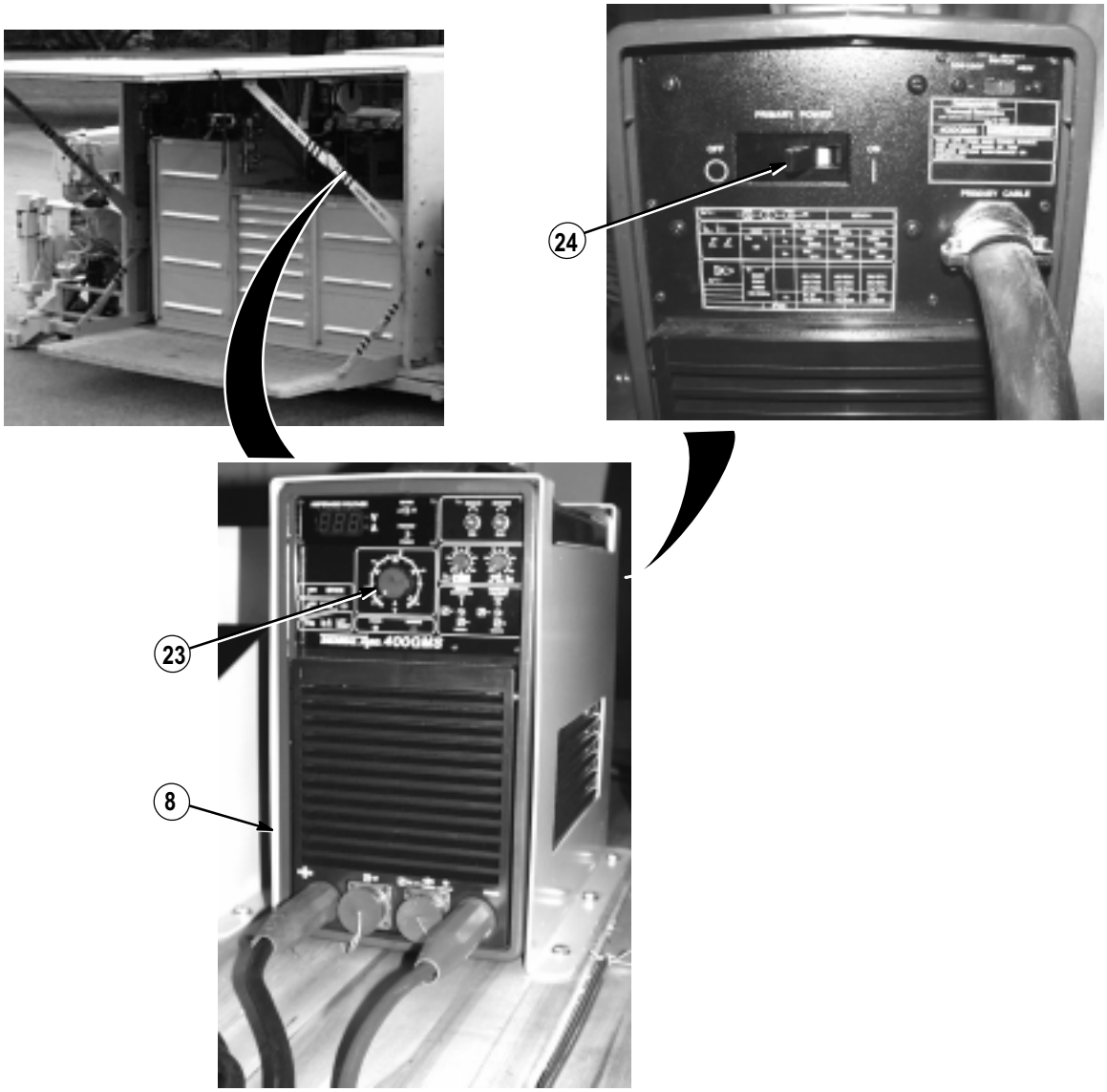
WARNING

Unsafe welding practices can cause serious injury from fire, explosions, or harmful agents. Allow only authorized personnel to weld, and follow safety precautions in TC 9-237. Protective clothing and goggles must be worn; adequate protection used, a suitable fire extinguisher kept nearby, and requirements of TC 9-237 strictly followed.

(19) Turn amperage/voltage control (23) to 12 volts.

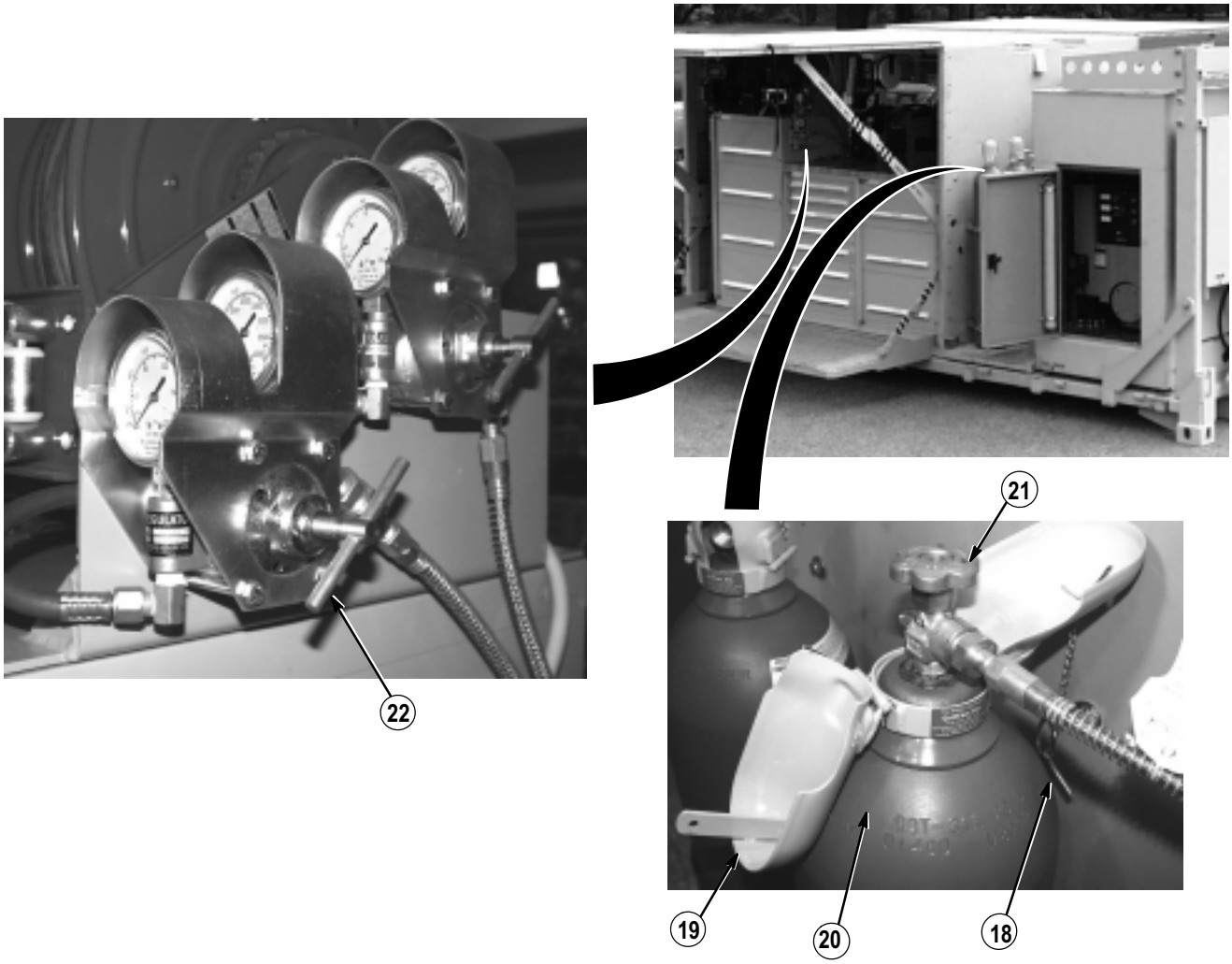
(20) Position primary power switch (24), located on back of ARC welder (8), in the ON position.

b. Exothermic Cutting System Disassembly.



(1) Position primary power switch (24) on back of ARC welder (8) to the OFF position.

2-22. EXOTHERMIC CUTTING SYSTEM OPERATION (CONT).

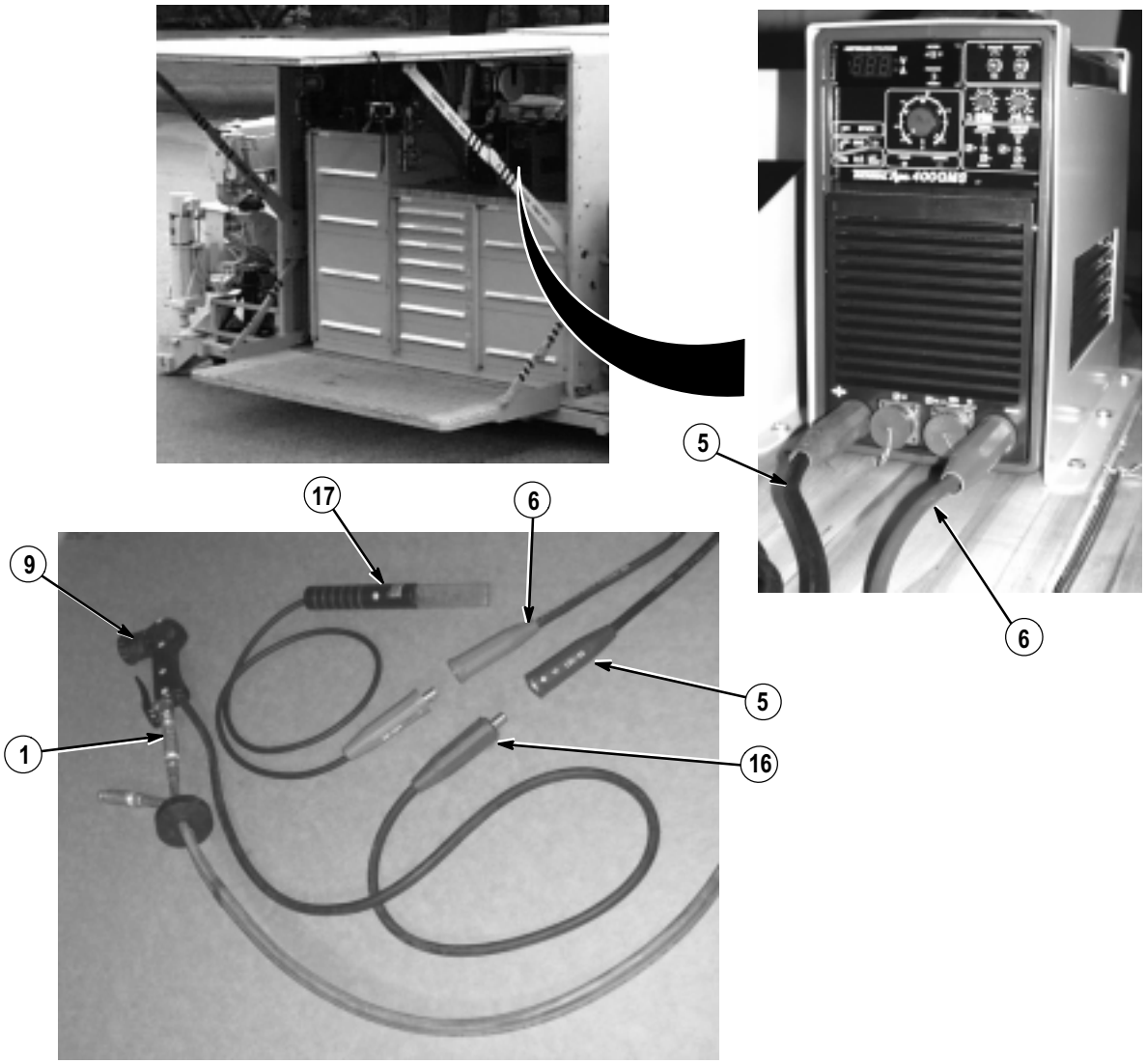


(2) Close oxygen regulator (22).

(3) Remove clip (18) and open tank safety cap (19) on oxygen tank (20).

(4) Turn handle (21) clockwise and close valve.

(5) Close tank safety cap (19) and install clip (18).



WARNING

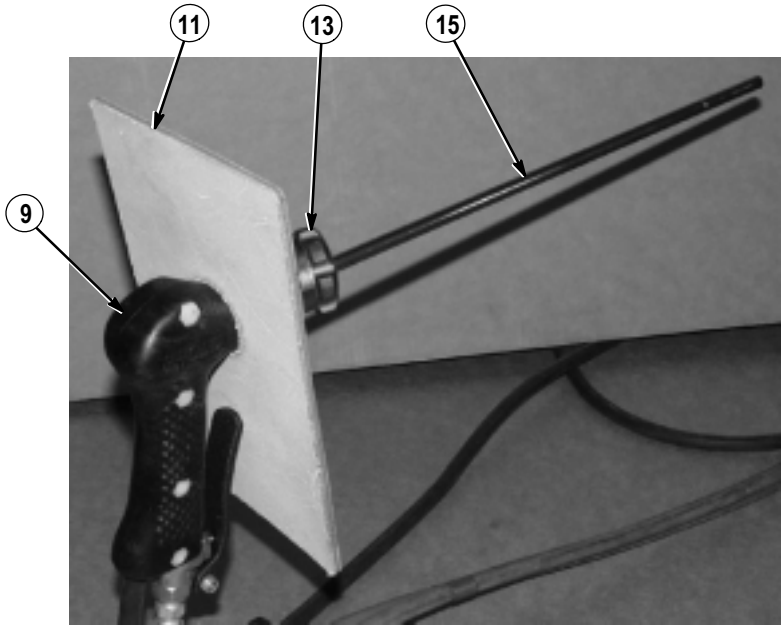
Do not disassemble exothermic cutting system while hot. Failure to comply could cause severe burns.

(6) Remove oxygen hose (1) from torch head (9).

(7) Remove striker plate (17) cable from positive extension cable (6).

(8) Remove torch head (16) cable from negative extension cable (5).

2-22. EXOTHERMIC CUTTING SYSTEM OPERATION (CONT).

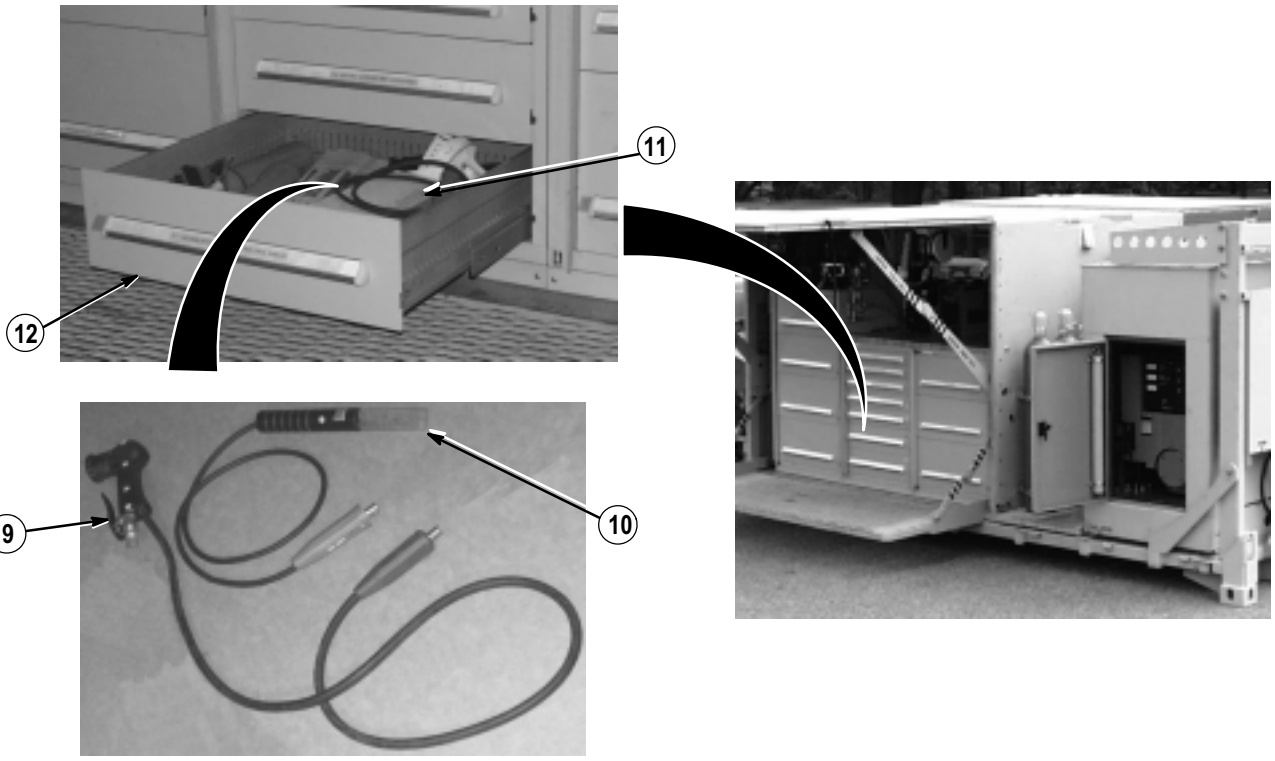


(9) Loosen collet nut (13) 1/2 turn and remove recessed rod (15), if necessary.

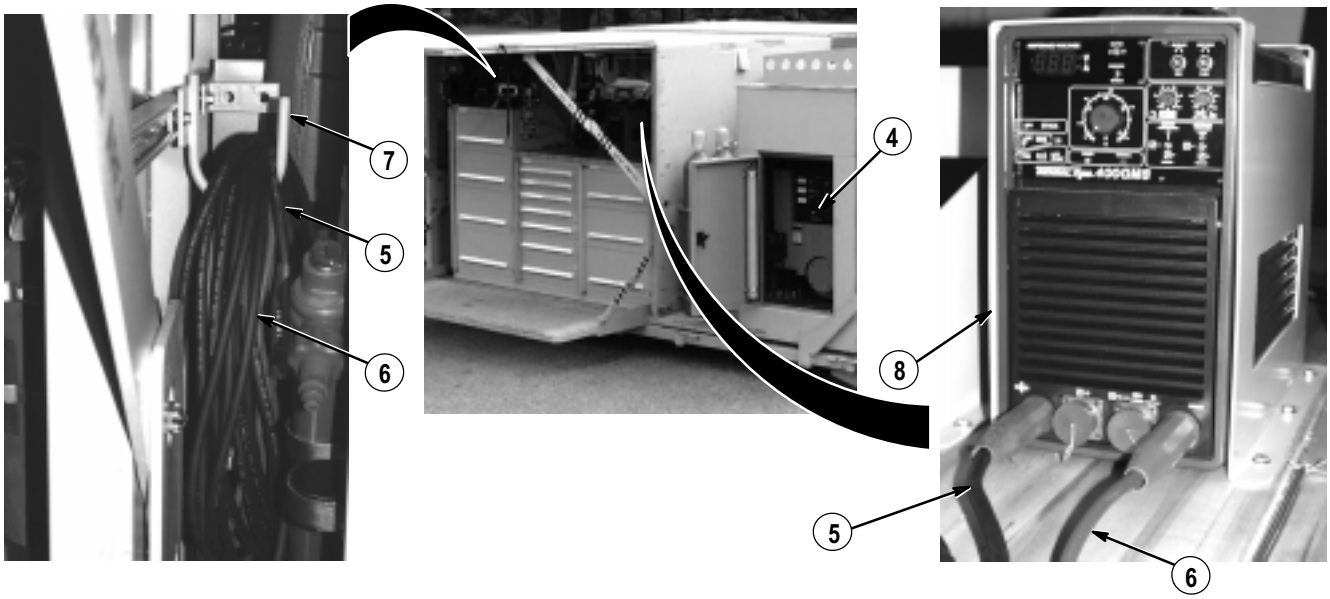
(10) Remove collet nut (13) from torch head (9).

(11) Remove leather shield (11) from torch head (9).

(12) Install collet nut (13) onto torch head (9) and tighten collet nut.



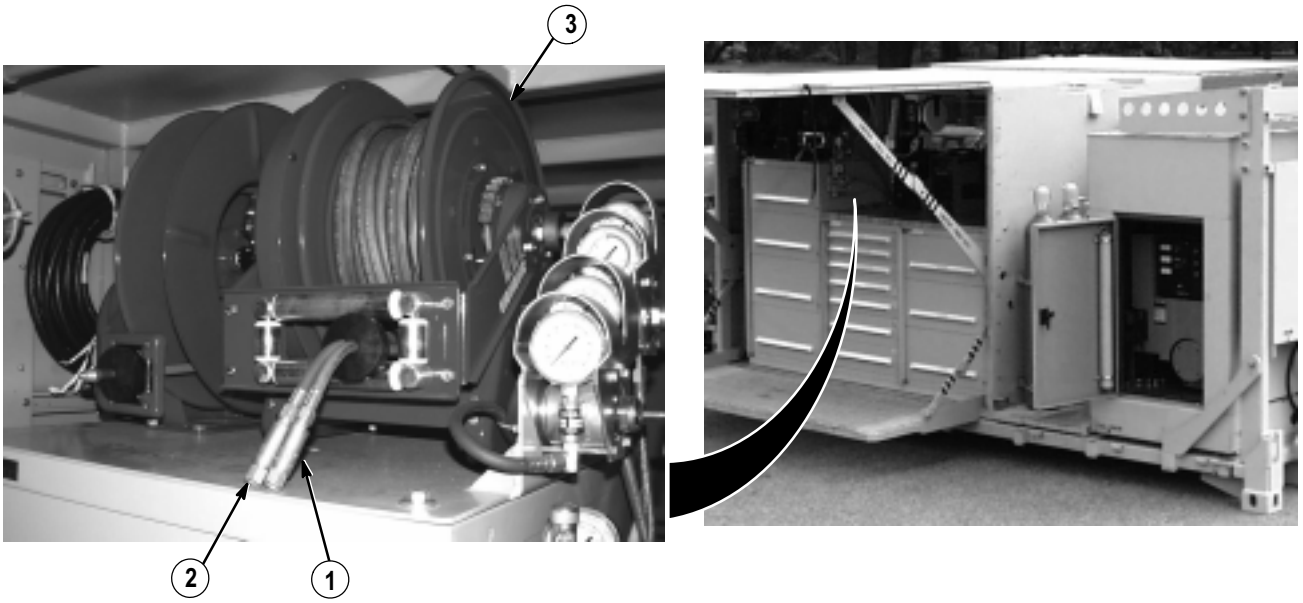
(13) Stow striker plate (10), torch head (9), and leather shield (11) in welding cabinet (12).



(14) Remove welding extension cables (5) and (6) from ARC welder (8).

(15) Stow welding extension cables (5) and (6) to hook (7) on rear shelter wall.

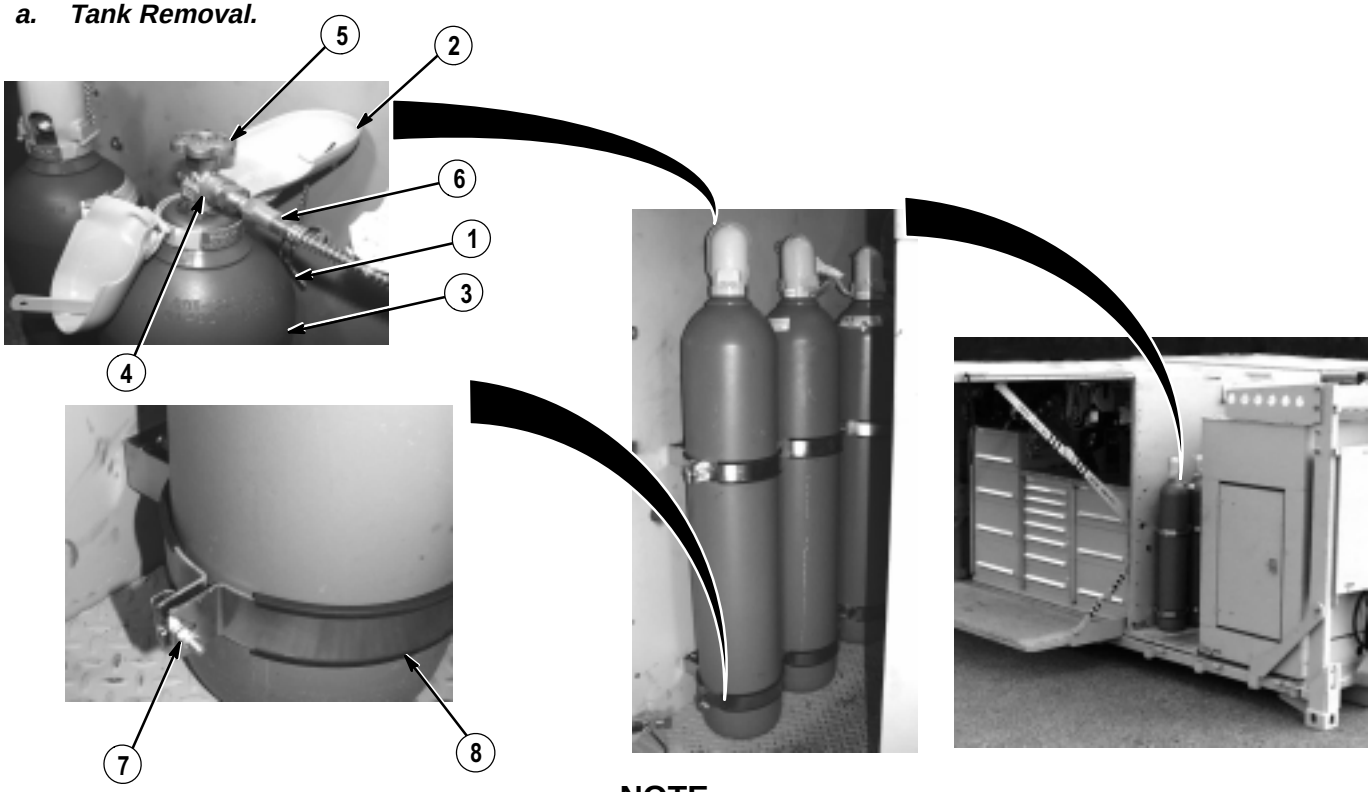
(16) Shutdown generator (4) (Para 2-15).



(17) Rewind oxygen hose (1) and propylene hose (2) on hose reel (3).

2-23. ARGON, OXYGEN, OR PROPYLENE TANK REPLACEMENT.

a. Tank Removal.



NOTE

Tank replacement procedures are identical for all four tanks.

(1) Remove pin (1) and open tank safety cap (2) on tank (3).

(2) Turn handle (4) clockwise and close valve (5) on tank (3).

NOTE

Note position of valve and tank safety cap prior to removal.

(3) Remove hose assembly (6) from tank (3).

WARNING

Ensure tank standard cap is installed on tank prior to removing or installing pressurized tanks. Failure to comply may result in injury or death to personnel.

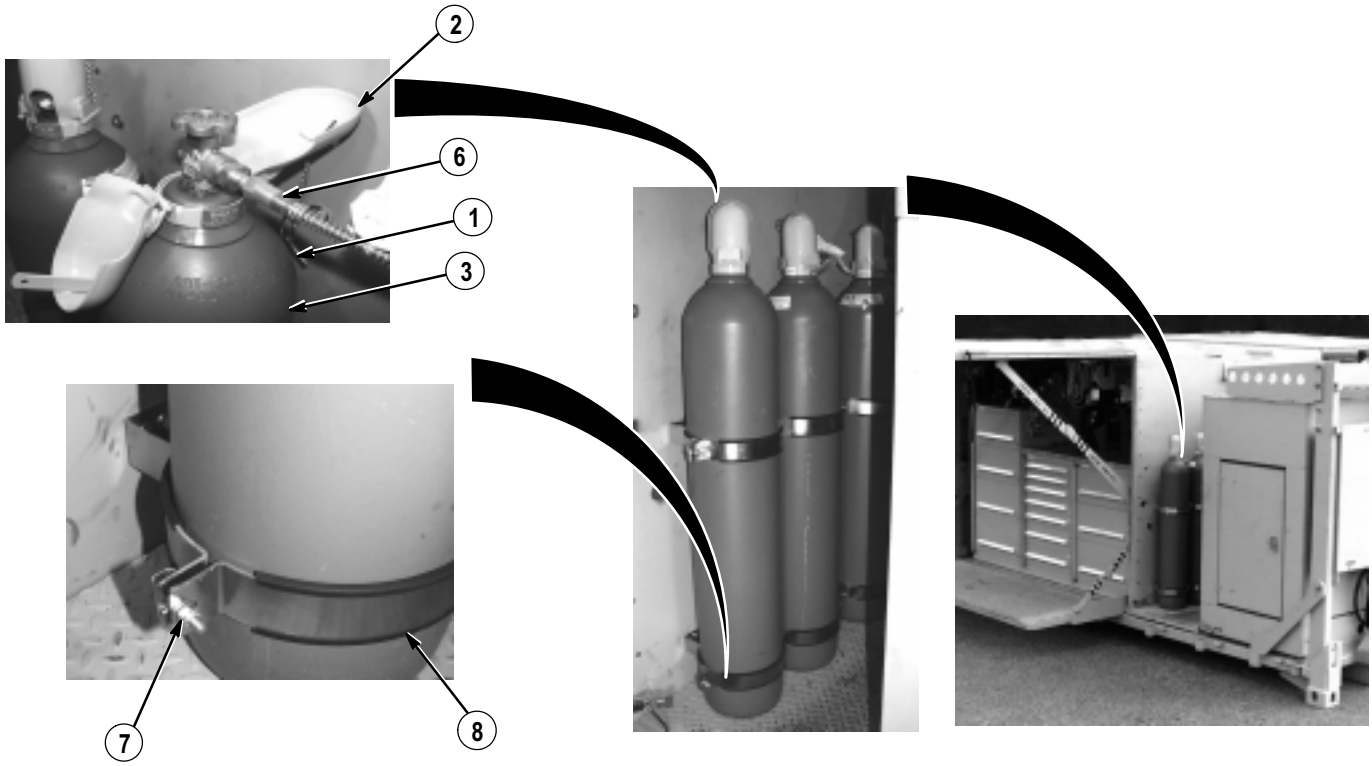
NOTE

Standard cap should be stowed in bulk storage drawer.

(4) Remove tank safety cap (2) from tank (3) and install standard cap on tank.

(5) Loosen two nuts (7) and open tank brackets (8).

(6) With the aid of an assistant, remove tank (3) from tank brackets (8).



b. Tank Installation.

WARNING

Ensure tank standard cap is installed on tank prior to removing or installing pressurized tanks. Failure to comply may result in injury or death to personnel.

(1) With the aid of an assistant, position tank (3) in tank brackets (8).

(2) Rotate tank brackets (8) closed and install nuts (7). Do not tighten nuts.

NOTE

Position tank safety cap and regulator valve as noted during removal.

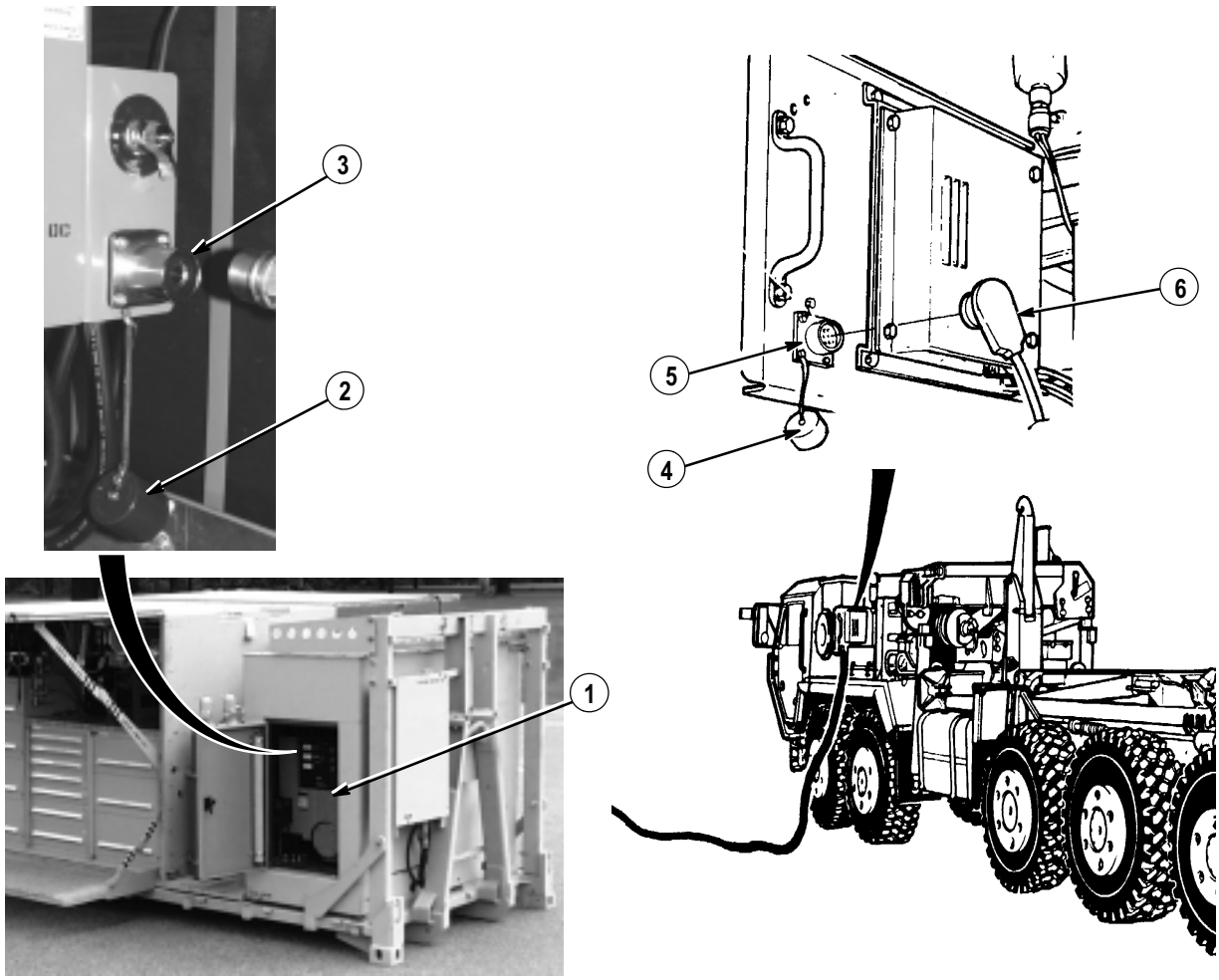
(3) Remove standard cap from tank (3) and install tank safety cap (2) on tank.

(4) Install hose assembly (6) on tank (3).

(5) Position tank (3) and tighten nuts (7).

(6) Close tank safety cap (2) and install pin (1).

2-24. SLAVE STARTING PROCEDURE.



CAUTION

Ensure CTIS ON/OFF switch is in the OFF position and the LHS selector switch is in the OFF position on PLS truck while performing the slave starting procedure. Failure to comply may result in damage to equipment.

NOTE

Slave starting is a two person task.

(1) Start PLS truck (TM 9-2320-364-10).

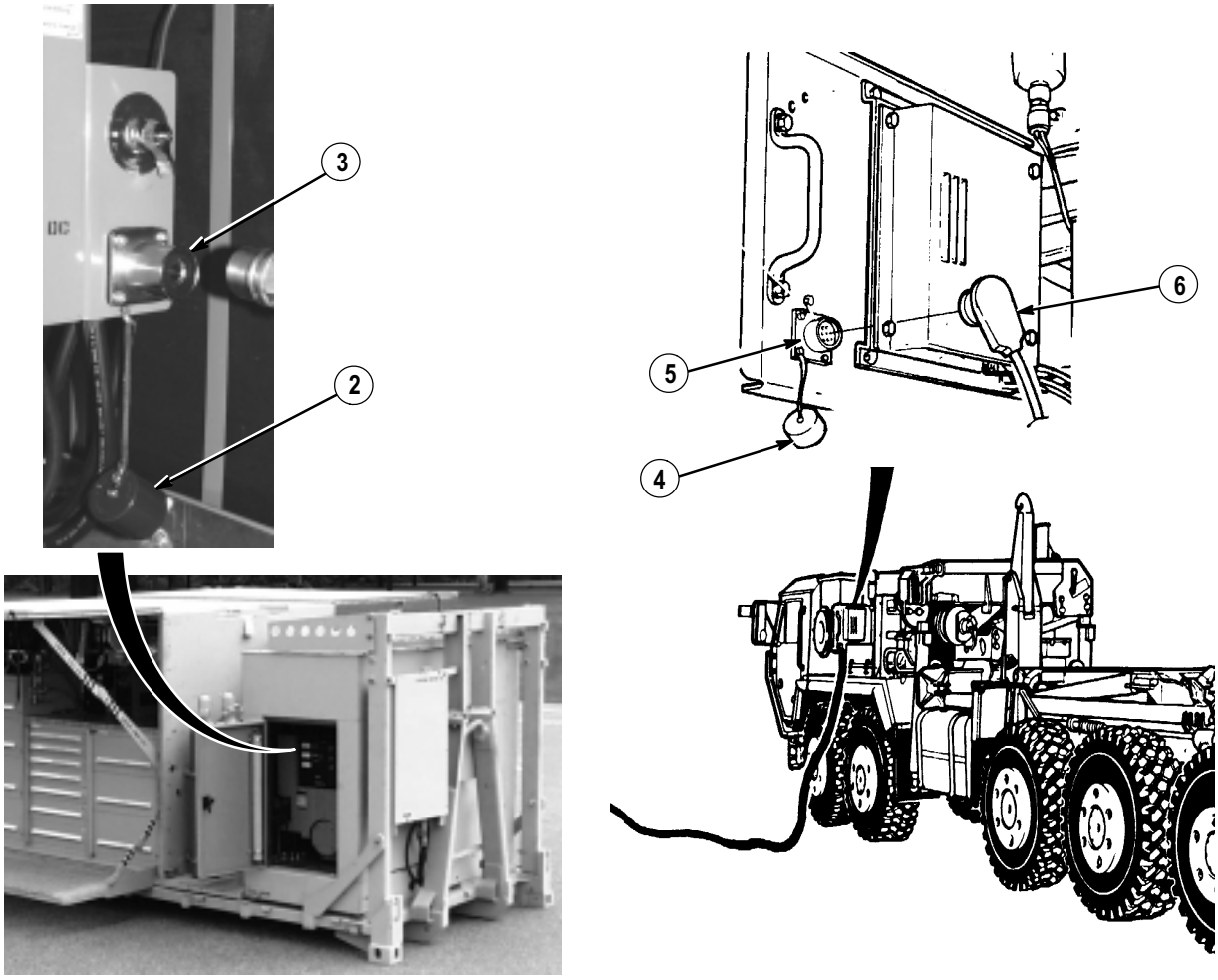
(2) Position PLS truck next to the right side of FRS generator (1).

(3) Shut OFF PLS truck.

(4) Remove cover (2) from nato slave receptacle (3) on FRS and cover (4) from nato slave receptacle (5) on PLS truck.

(5) Connect nato slave cable (6) to PLS truck.

(6) Connect other end of nato slave cable (6) on FRS nato slave receptacle (3).



(7) Start engine of PLS truck (TM 9-2320-364-10).

NOTE

Charge period is five minutes.

(8) Start FRS generator engine (Para 2-15).

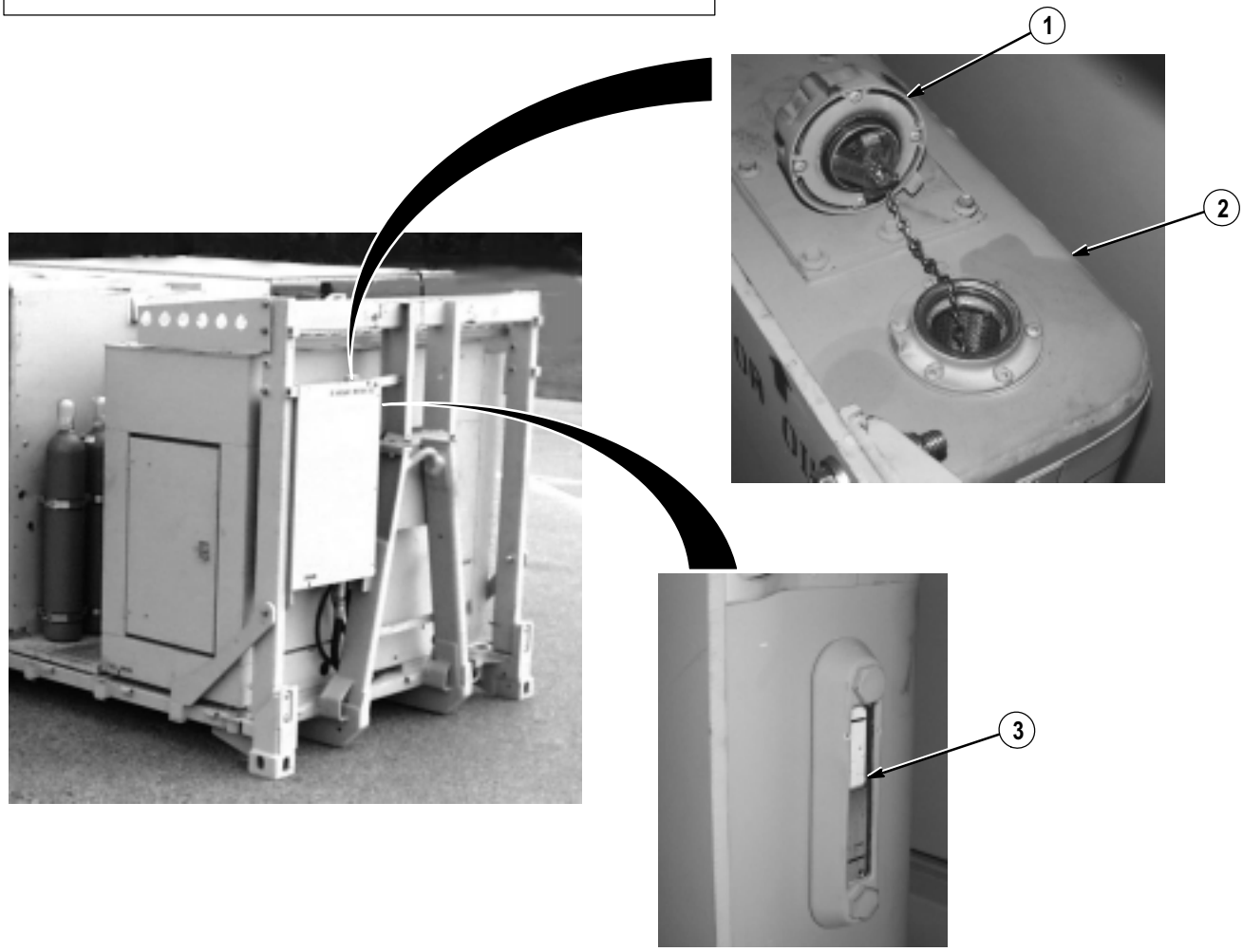
(9) After FRS generator engine starts and is running smoothly, disconnect slave cable (6) from nato slave receptacles (3) and (5).

(10) Install covers (2) and (4) and stow nato slave cable (6).

(11) Move and park PLS truck.

(12) Shut OFF PLS truck.

2-25. FILLING HYDRAULIC RESERVOIR.



WARNING

Hydraulic oil may be hot and cause serious burns.

CAUTION

- Clean area before removing filler breather to keep foreign matter out of hydraulic reservoir and to prevent damage.
- When installing breather cap, ensure that tether chain lowers into reservoir hole or damage to breather cap gasket will result.

NOTE

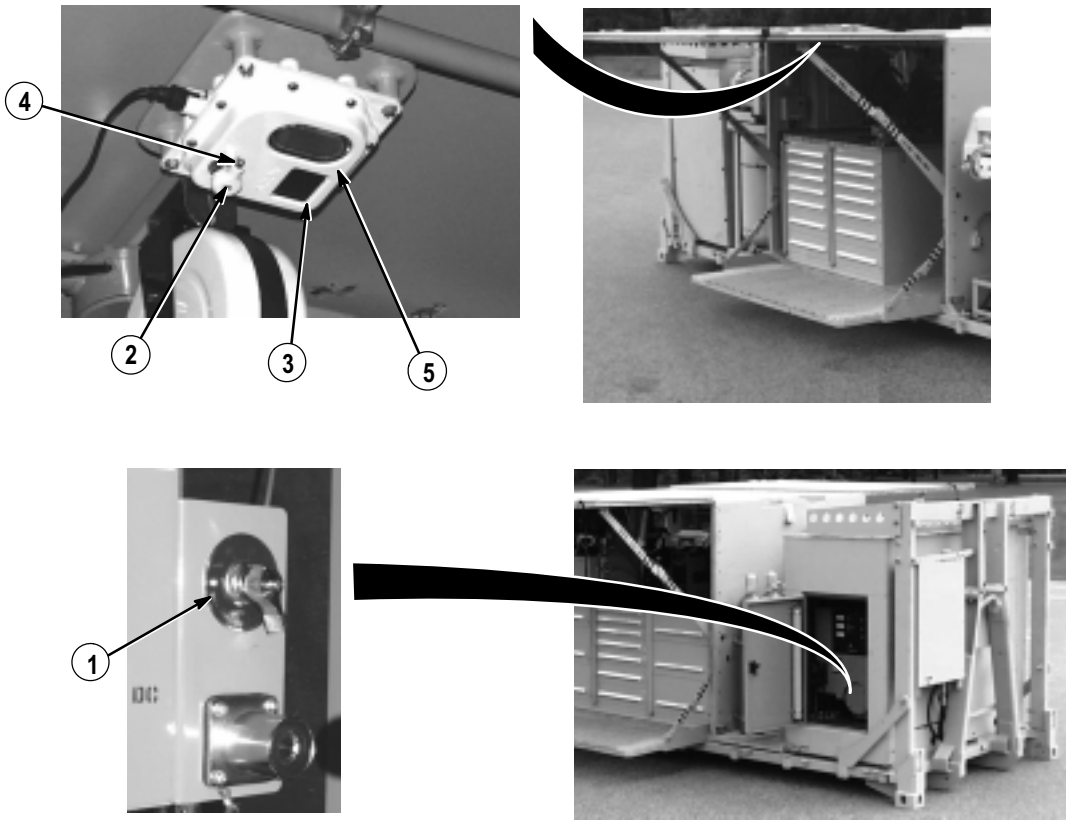
- Boom and outriggers must be in stowed position to attain proper hydraulic fluid level.
- At high temperature, oil level should be near minimum mark to allow for expansion.

(1) Remove breather cap (1) from hydraulic reservoir (2).

(2) Fill with oil (Appendix G) until oil level is between minimum and maximum levels as indicated in the sight glass (3).

(3) Install breather cap (1) on hydraulic reservoir (2).

2-26. DOME LIGHT OPERATION.



a. Black-Out Light Operation.

NOTE

- 24 VOLT DC PANEL power switch must be in the ON position.
- Two dome lights are located inside left and right ceiling of the shelter. Left side is shown.

(1) Turn MASTER DISCONNECT switch (1) to ON.

(2) Turn switch (2) counterclockwise to turn on black-out light (3).

(3) Turn switch (2) clockwise to the center position to turn off black-out light (3).

(4) Turn MASTER DISCONNECT switch (1) to OFF.

b. White Light Operation.

NOTE

- 24 VOLT DC PANEL power switch must be in the ON position.
- Two dome lights are located inside left and right ceiling of the shelter. Left side is shown.

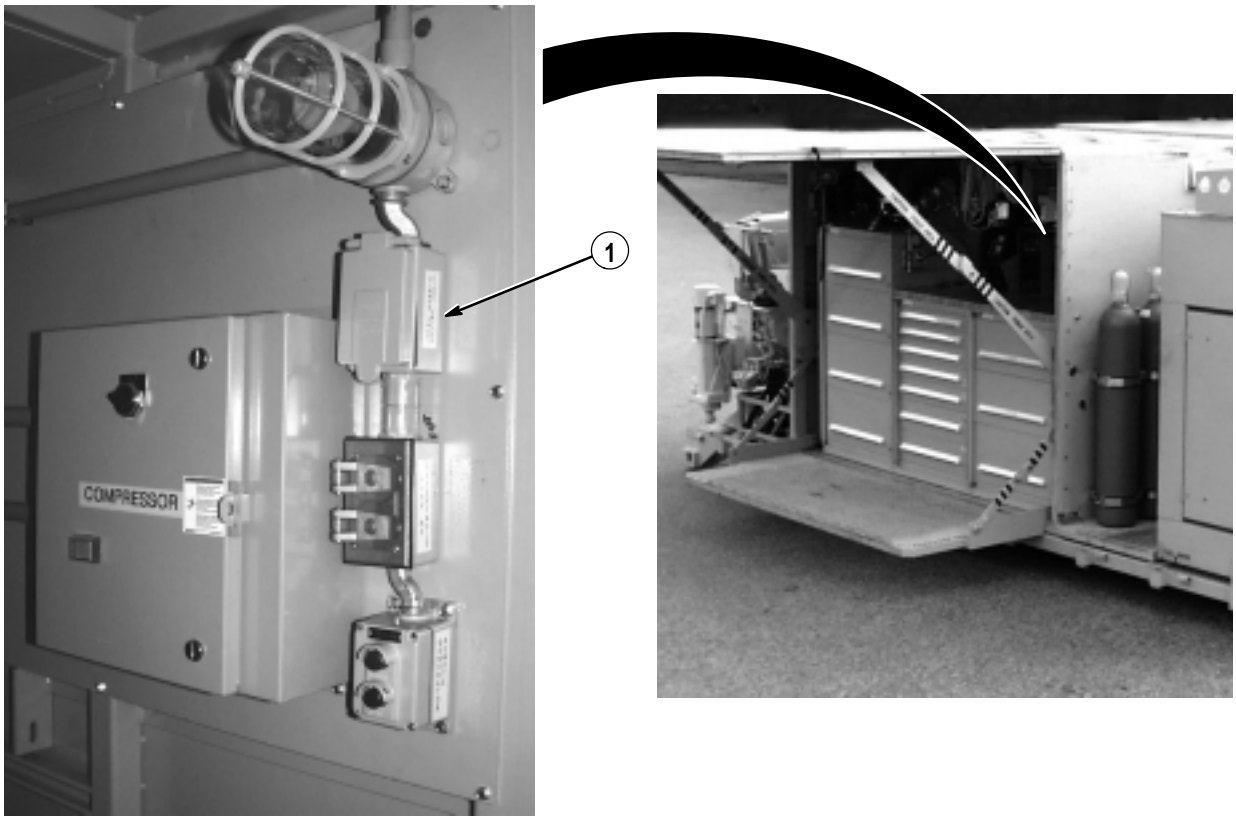
(1) Turn MASTER DISCONNECT switch (1) to ON.

(2) Push in lock button (4) and turn switch (2) clockwise to turn on white light (5).

(3) Push in lock button (4) and turn switch (2) counterclockwise to the center position to turn off white light (5).

(4) Turn MASTER DISCONNECT switch (1) to OFF.

2-27. FIXED LIGHT OPERATION.



NOTE

- Four sidewall lights are located inside left and right front and rear of shelter. Two sidewall switches are located inside right front and rear of shelter. Front right side shown.
- Light switches are three way dimmers and will turn on and off in either direction.
- One switch must be in top latched position. Second switch will then control on and dim functions.

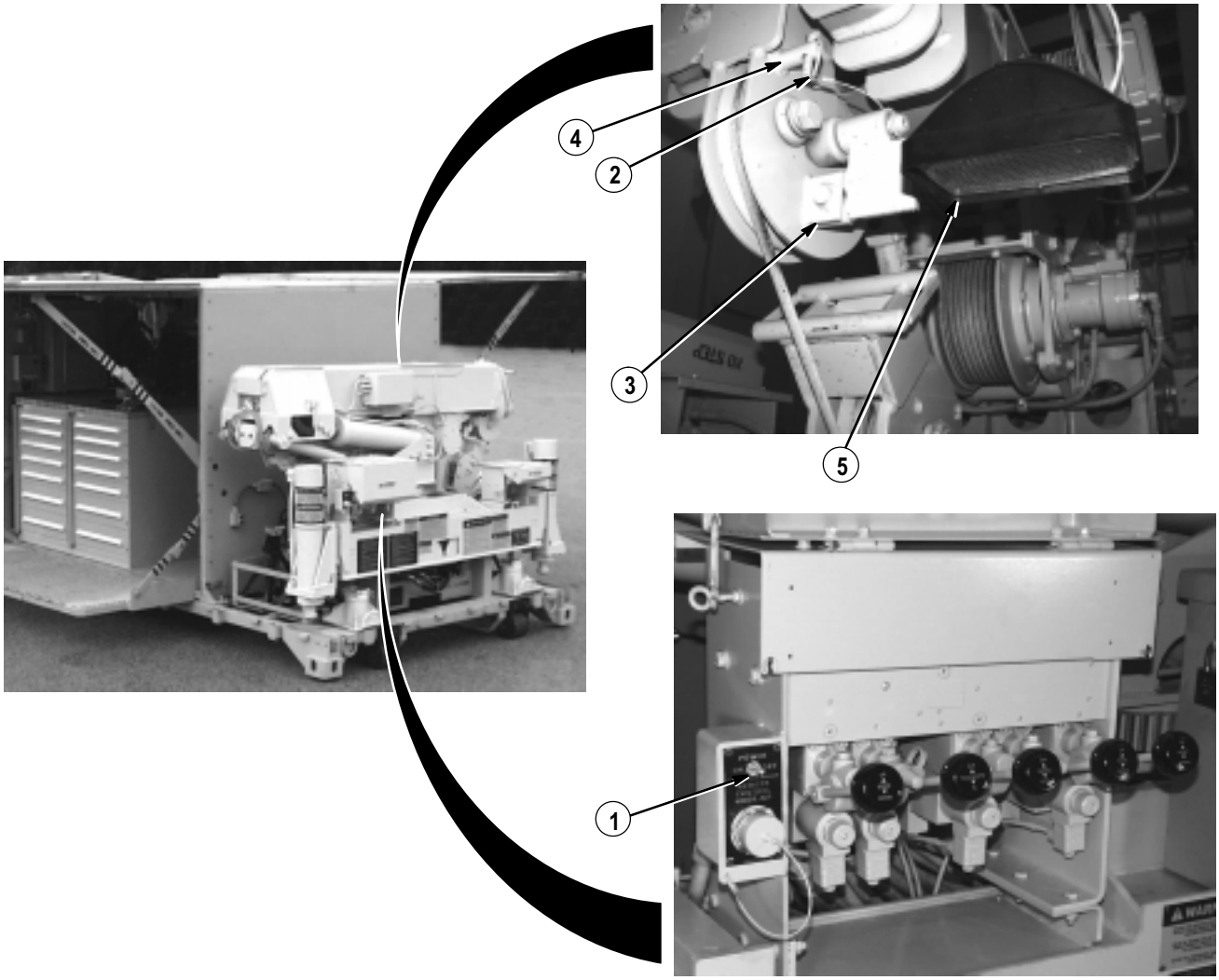
(1) Start generator (Para 2-15).

(2) Lift up switch cover (1) and flip switch up or down to turn on light.

(3) Lift up switch cover (1) and flip switch up or down to turn off light.

(4) Shut down generator (Para 2-15).

2-28. CRANE BOOM LIGHT OPERATION.



WARNING

Ensure crane power ON/OFF switch is in the OFF position. Crane moving out of control could cause serious injury or death.

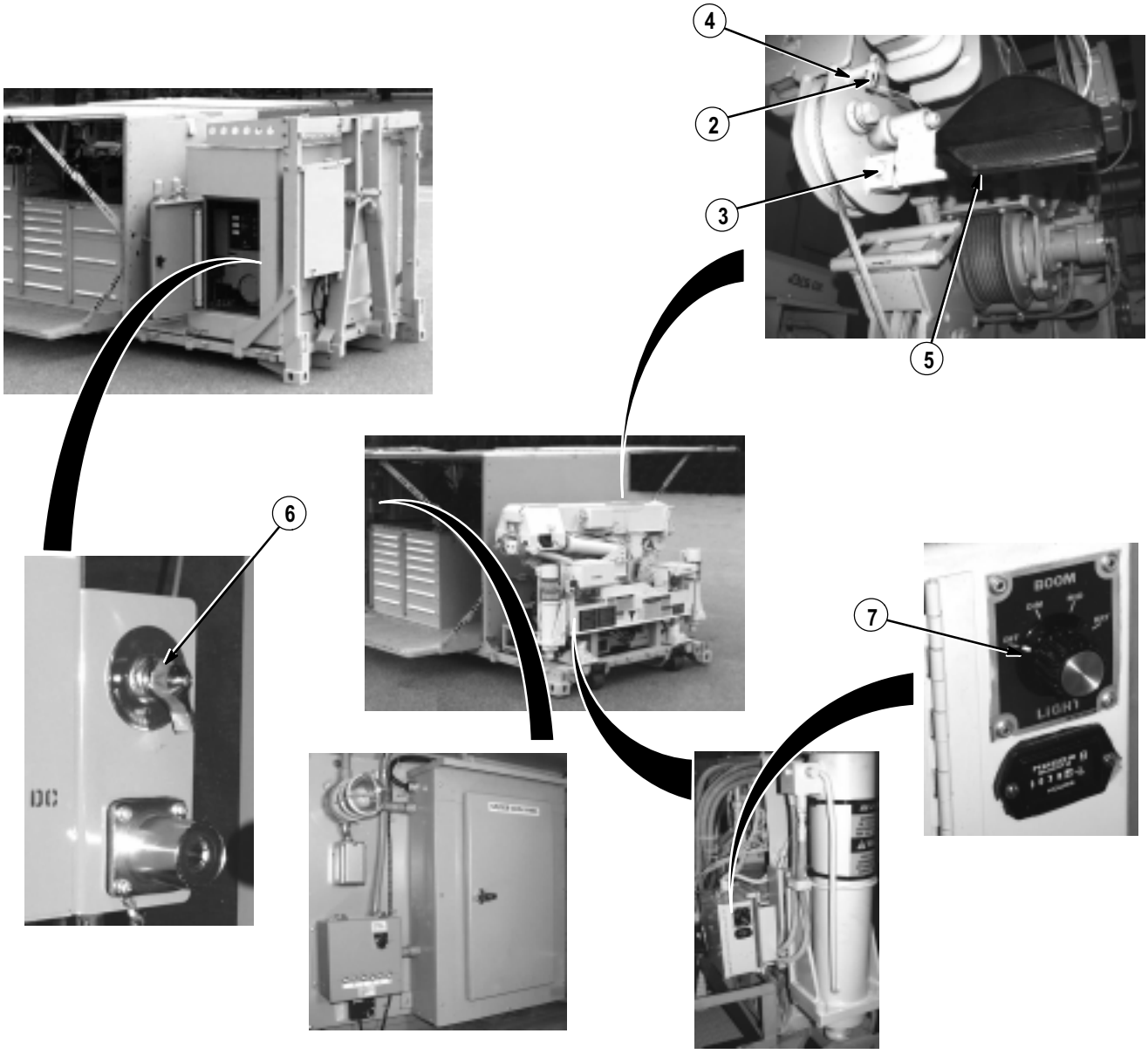
NOTE

- The boom light is powered directly from the FRS, bypassing the crane power ON/OFF switch. As long as the FRS has power directed to the crane, the light can be utilized even when the crane is not energized.
- The boom light can be operated at three switchable intensities. (DIM, MID and BRIGHT).

(1) Position crane POWER ON/OFF switch (1) to OFF.

(2) Remove pin (2) from mount (3) and install pin on stud (4) to unstow boom light (5).

2-28. CRANE BOOM LIGHT OPERATION (CONT).



NOTE

24 VOLT DC PANEL power switch must be in the ON position.

(3) Turn MASTER DISCONNECT switch (6) to ON.

(4) Turn BOOM LIGHT switch (7) to desired setting DIM/MID/BRT.

(5) Turn BOOM LIGHT switch (7) to OFF.

(6) Turn MASTER DISCONNECT switch (6) to OFF.

(7) Remove pin (2) from stud (4) and install pin on mount (3) to stow boom light (5).

2-29. MATERIAL HANDLING CRANE (MHC) OPERATION.

a. General Description.

During operation, the material handling crane (MHC) has four basic functions: boom telescoping, boom elevation, swing and hoist. The boom can rotate 300 degrees. The crane has a lifting capacity up to 10,000 lbs (4,536 kgs) at 14 ft. (4.3 M) radius (see lifting capacity chart located at control panel for further information).

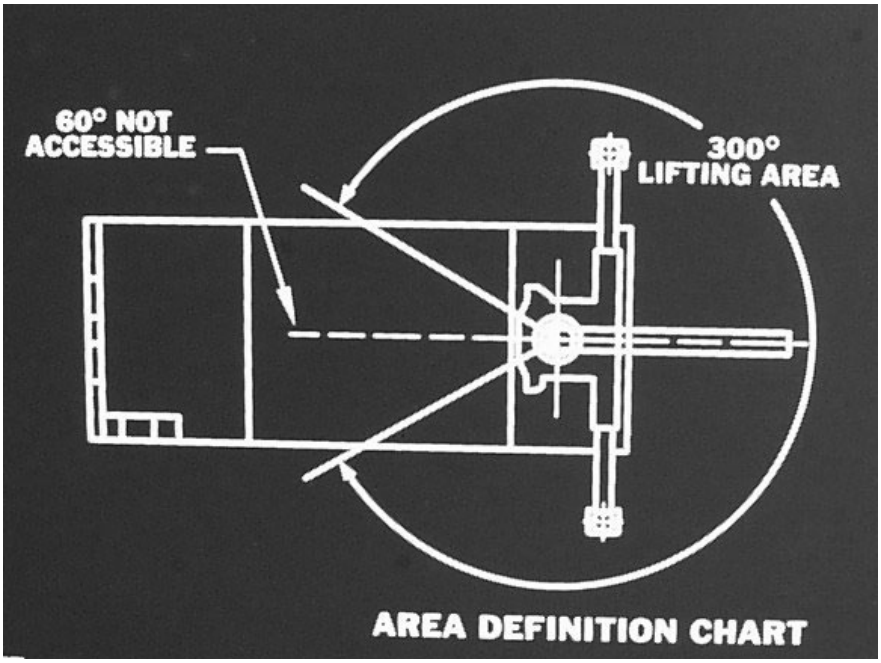
The crane is operated by hydraulics supplied by a hydraulic pump mounted on the diesel engine through the crane's main control panel. The main control panel provides the controls to operate all functions of the crane. The outrigger control panel provides the controls to operate the outrigger functions.

Each control on the crane's main control panel is proportional. The more travel of the control, the faster the selected crane movement. The crane may also be operated by a remote control unit with the same operating functions, except for outrigger controls and mast control, as the main control. Left and right retractable outrigger jack cylinders are provided to stabilize, support, and level the system while the crane is operated. Built within the crane's hydraulic system are several safety features that protect the equipment and operating personnel. They are as follows:

- Hold valves will prevent a load from falling in the event of pressure loss because of hydraulic line failure.
- A suspended load on the crane can be lowered if hydraulic pressure is lost at the hydraulic pump on the diesel engine if external hydraulic lines from the PLS truck are attached to the quick disconnect couplings at the back of the crane. Should hydraulic failure occur in the crane, the suspended load can be lowered by using the emergency hand pump. This procedure should be done by Unit Maintenance personnel.
- An overload protection system that prevents lifting greater loads, at a given distance, than the crane can handle. All functions that decrease overload remain functional: hoist down, telescope in, and swing left or right.

2-29. MATERIAL HANDLING CRANE (MHC) OPERATION (CONT).

b. Determine Required Crane Settings from Range Diagram.



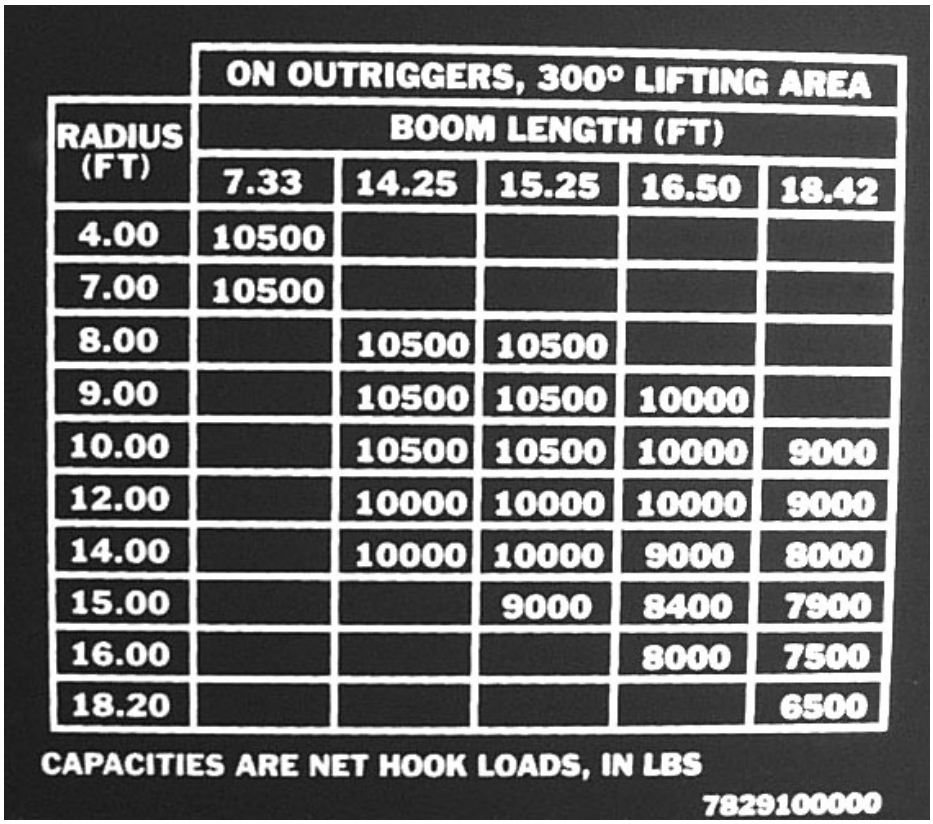
Area Definition Chart

(1) Use Area Definition Chart which is located above MHC main control panel and on remote control, to determine position of crane.

NOTE

When either boom length or load radius or both are between values listed below, the smallest load shown at either the next larger boom length or radius must be used.

Load Chart



ON OUTRIGGERS, 300° LIFTING AREA					
RADIUS (FT)	BOOM LENGTH (FT)				
	7.33	14.25	15.25	16.50	18.42
4.00	10500				
7.00	10500				
8.00		10500	10500		
9.00		10500	10500	10000	
10.00		10500	10500	10000	9000
12.00		10000	10000	10000	9000
14.00		10000	10000	9000	8000
15.00			9000	8400	7900
16.00				8000	7500
18.20					6500

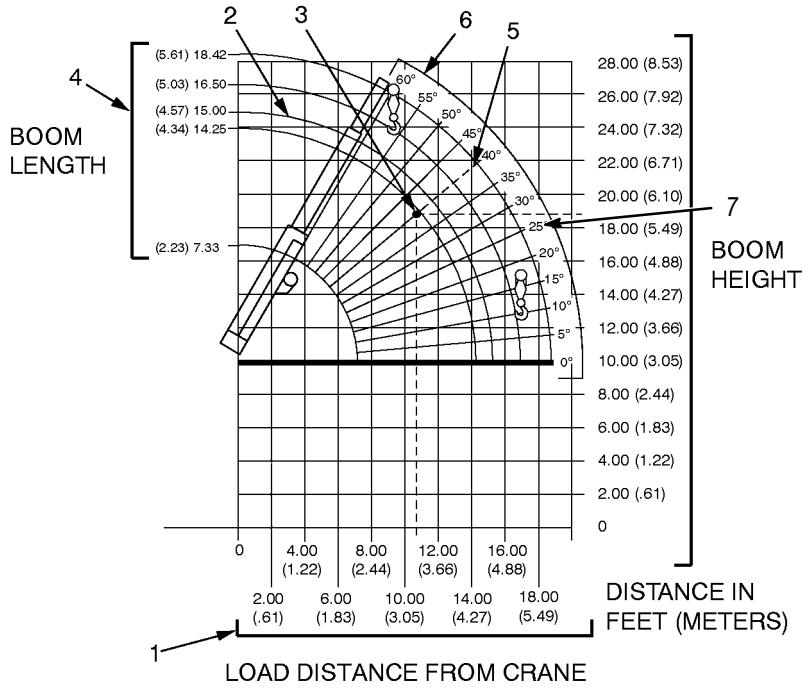
CAPACITIES ARE NET HOOK LOADS, IN LBS

7829100000

Capacities in Pounds (kilograms)

(2) Use Load Chart which is located above MHC main control panel and on remote control, for load capacities.

2-29. MATERIAL HANDLING CRANE (MHC) OPERATION (CONT).



Range Diagram

(3) Determine what distance load is from crane and locate dimension along the bottom horizontal line (1). (Example: Load is 11 ft (3m) from crane.)

(4) Follow line vertically up graph until it intersects with boom length arc (2). Make intersection mark (3).

(5) Follow line along arc and make note of boom length (4). (Example: If load is 11 ft. (3m) from crane, boom length is 14.25 ft (4m).)

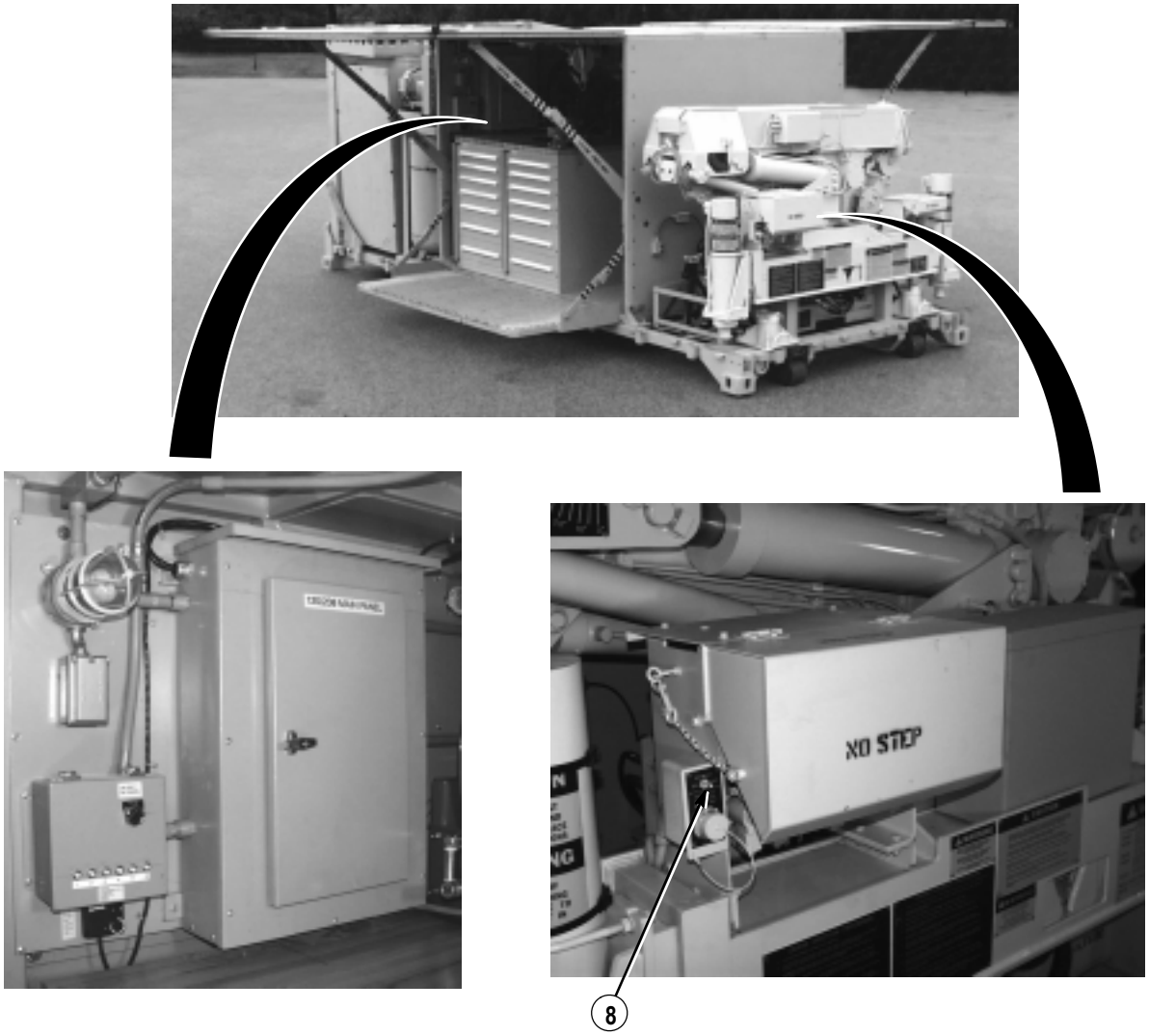
(6) Return to intersection mark (3). Follow diagonal line (5) to determine boom angle setting (6). (Example: Boom angle setting is 40-degrees from intersection mark.)

(7) Return to intersection mark (3). Follow horizontal line to determine boom height (7). (Example: Boom height is 19 ft (5m) from intersection mark.)

(8) Locate distance the load is from crane in the Crane Range Diagram Summary.

(9) Follow across Crane Range Diagram Summary to verify height of boom and to determine maximum load. (Example: Boom height is 19 ft (5m) and maximum crane load is 10,000 lbs (4,536 kgs).)

c. Prepare Crane for Use.



(1) Prepare FRS for operation (Para 2-12).

(2) Unstow crane boom light (Para 2-28).

NOTE

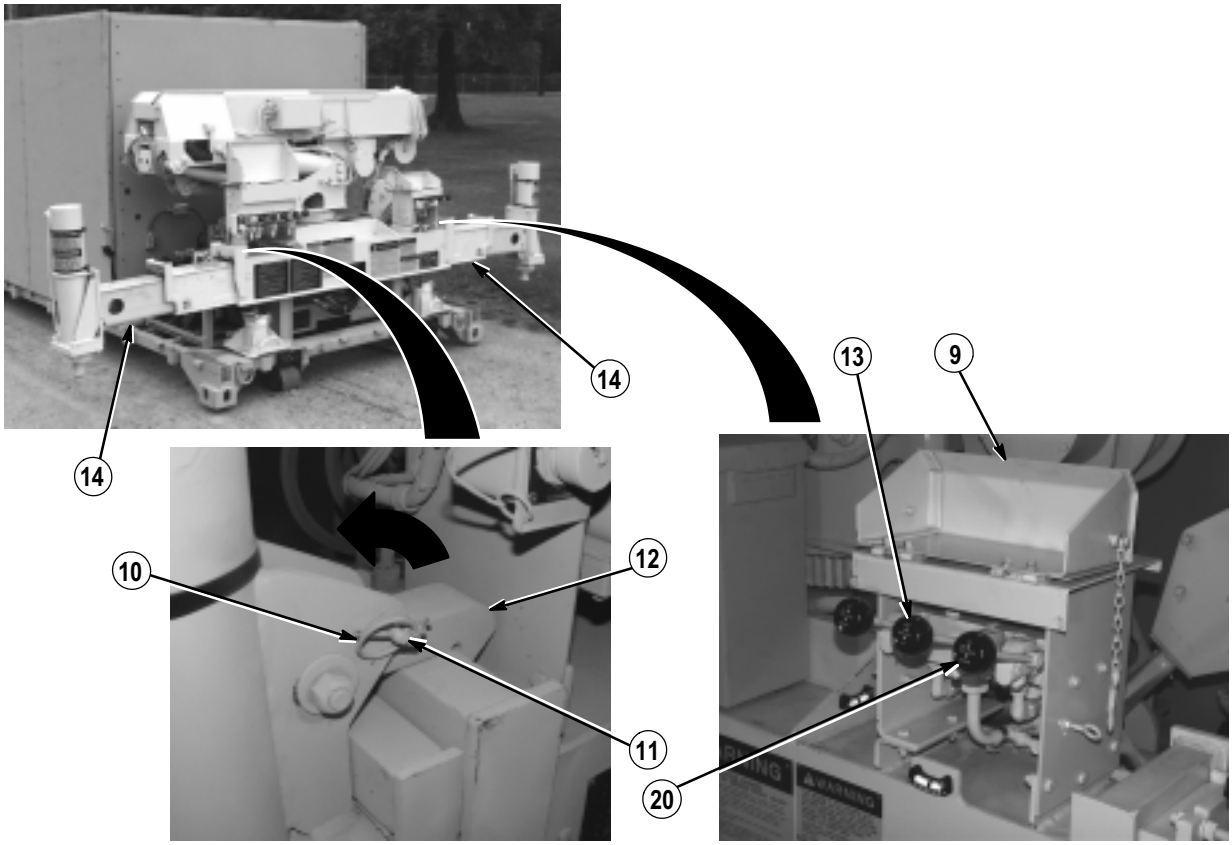
24 VOLT DC PANEL power switch must be in the ON position.

(3) Start FRS generator (Para 2-15).

(4) Position crane POWER switch (8) to ON.

2-29. MATERIAL HANDLING CRANE (MHC) OPERATION (CONT).

d. Deploying Outrigger and Jack Cylinders.



WARNING

- Ensure area is clear on both sides of crane before extending outrigger jacks. Failure to comply may result in injury to personnel or damage to equipment.
- Keep hands and feet clear of outriggers during operation. Failure to comply may result in injury to personnel.

(1) Open outrigger control cover (9).

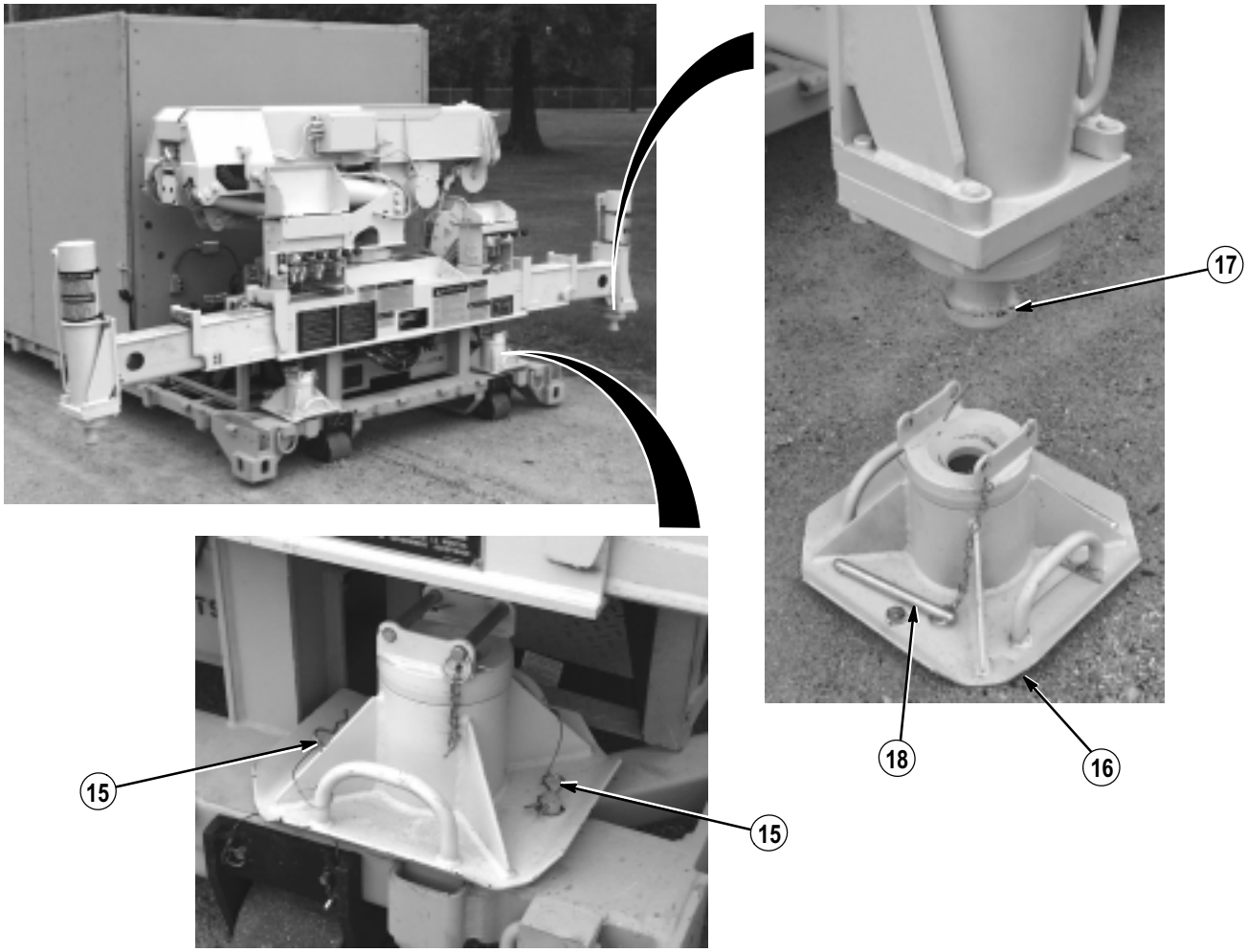
NOTE

Ensure chain of pin is looped over top of outrigger latch.

(2) Remove pin (10) and retaining pin (11) and place left outrigger latch (12) in open position. Install retaining pin and pin.

(3) Repeat Step (2) for right outrigger latch.

(4) Move O/R EXT lever (13) to OUT position until outriggers (14) are fully extended.



WARNING

Use caution when handling outrigger pads. Sharp edges can injure hands.

NOTE

Left and right outrigger pads are removed/installed the same way. Right side is shown.

(5) Remove pin (15) and outrigger pad (16) from stowage post.

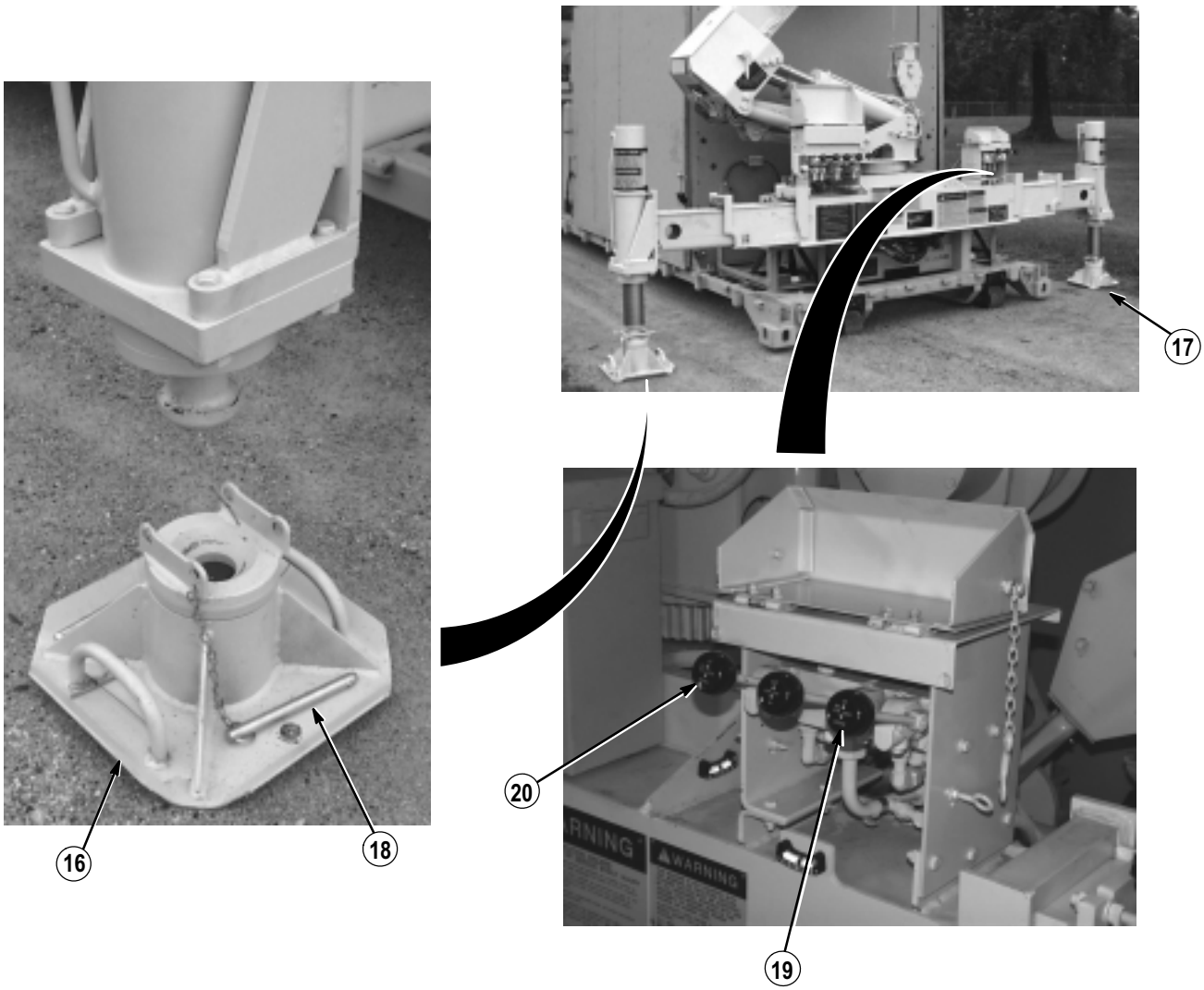
(6) Position outrigger pad (16) directly under jack cylinder (17).

(7) Remove two retaining pins (18) from outrigger pad (16).

(8) Clean all dirt from outrigger pad (16) and jack cylinder (17).

(9) Repeat Steps (5) through (8) for remaining outrigger pad.

2-29. MATERIAL HANDLING CRANE (MHC) OPERATION (CONT).

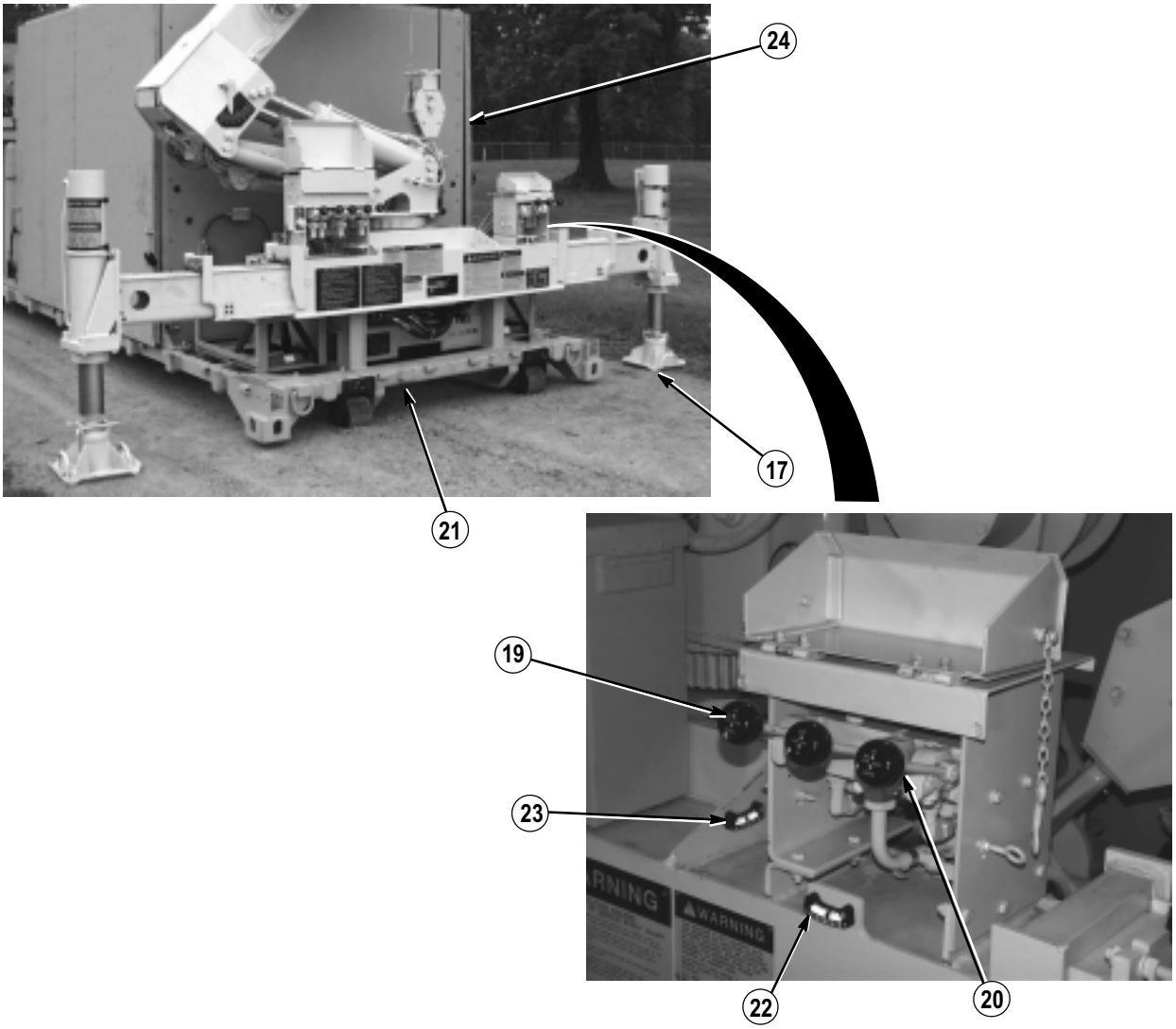


(10) Move RH O/R JACK lever (19) to DOWN position and lower jack cylinder (17) until ball end is seated in outrigger pad (16).

(11) Install retaining pins (18) on outrigger pad (16).

(12) Move LH O/R JACK lever (20) to down position and lower jack cylinder (17) until ball end is seated in outrigger pad (16).

(13) Install retaining pins (18) on outrigger pad (16).



WARNING

FRS C–channels of the flatrack must NOT be in contact with the terrain or any object to prevent altering the critical reaction points of the FRS. Failure to comply could result in personnel injury or death.

NOTE

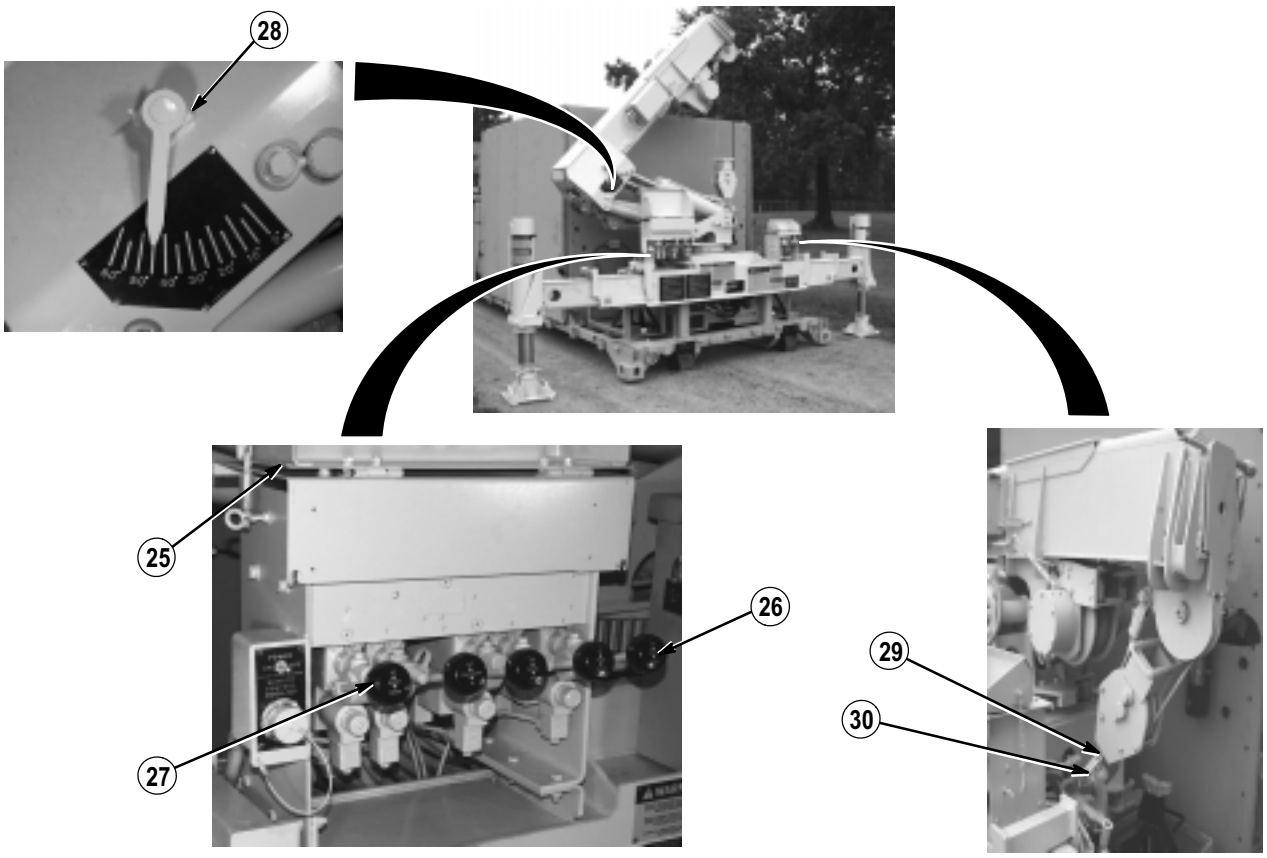
- Lower outrigger jacks individually as necessary to level the FRS side-to-side and front-to-back. The FRS is level when the black ball is under the "0" indicator (a portion of the ball must be under the "0") before the crane is loaded. Perform a final check of all three level indicators before placing a load on the crane.
- Ensure that both outrigger jacks are taking load.
- If FRS is being leveled on unstable/uneven ground, refer to Operating FRS on Unstable or Uneven Ground (Para 2-39).

(14) Using both RH O/R JACK and LH O/R JACK levers (19) and (20), lower jack cylinders (17) until rear of flatrack (21) is clear of ground, and side-to-side level gage (22) shows FRS is level.

(15) Using both RH O/R JACK and LH O/R JACK levers (19) and (20), adjust jack cylinders until front-to-back level gage (23) shows FRS (24) is level.

2-29. MATERIAL HANDLING CRANE (MHC) OPERATION (CONT).

e. Unstowing Crane.



WARNING

- Do not disconnect cable from stowage hook until boom is raised to a 45-degree angle. Hook assembly could fall. Failure to comply may result in injury to personnel.
- If either right-to-left level bubble and/or front-to-back level bubble move out of green area during lifting or moving load, immediately lower load and adjust outriggers as necessary.

CAUTION

Do not allow excessive slack to build-up when paying out cable. Cable may get tangled on drum. Failure to comply may result in damage to equipment.

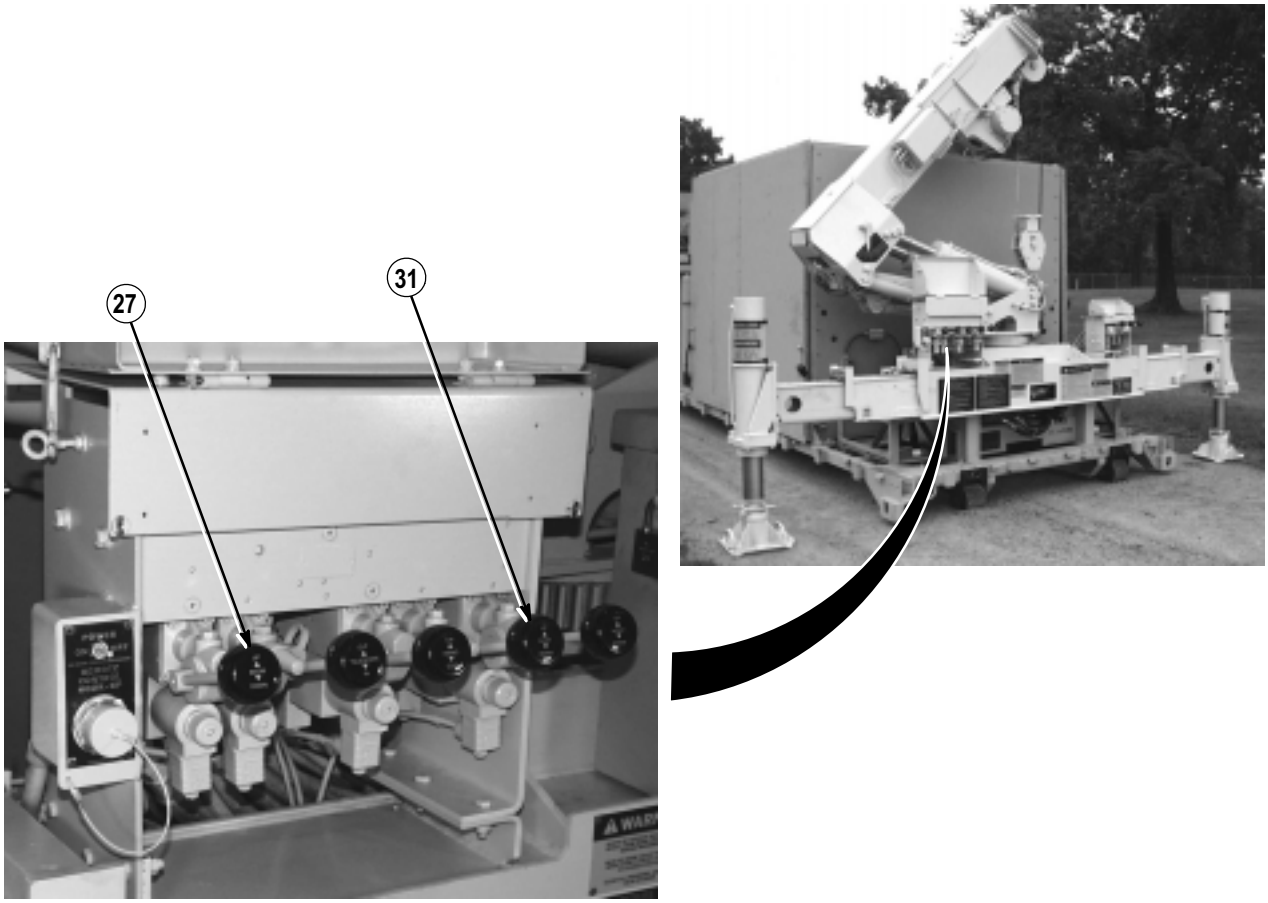
NOTE

Operate HOIST lever and BOOM lever at the same time.

(1) Open crane control cover (25).

(2) Move HOIST lever (26) to DOWN position and BOOM lever (27) to UP position until boom is at a 45-degree angle as indicated on boom angle indicator (28).

(3) Disconnect hook assembly (29) from stowage hook (30).



WARNING

Keep boom clear of shelter, all electrical lines, and other obstacles while operating crane. Failure to comply may result in injury or death to personnel.

CAUTION

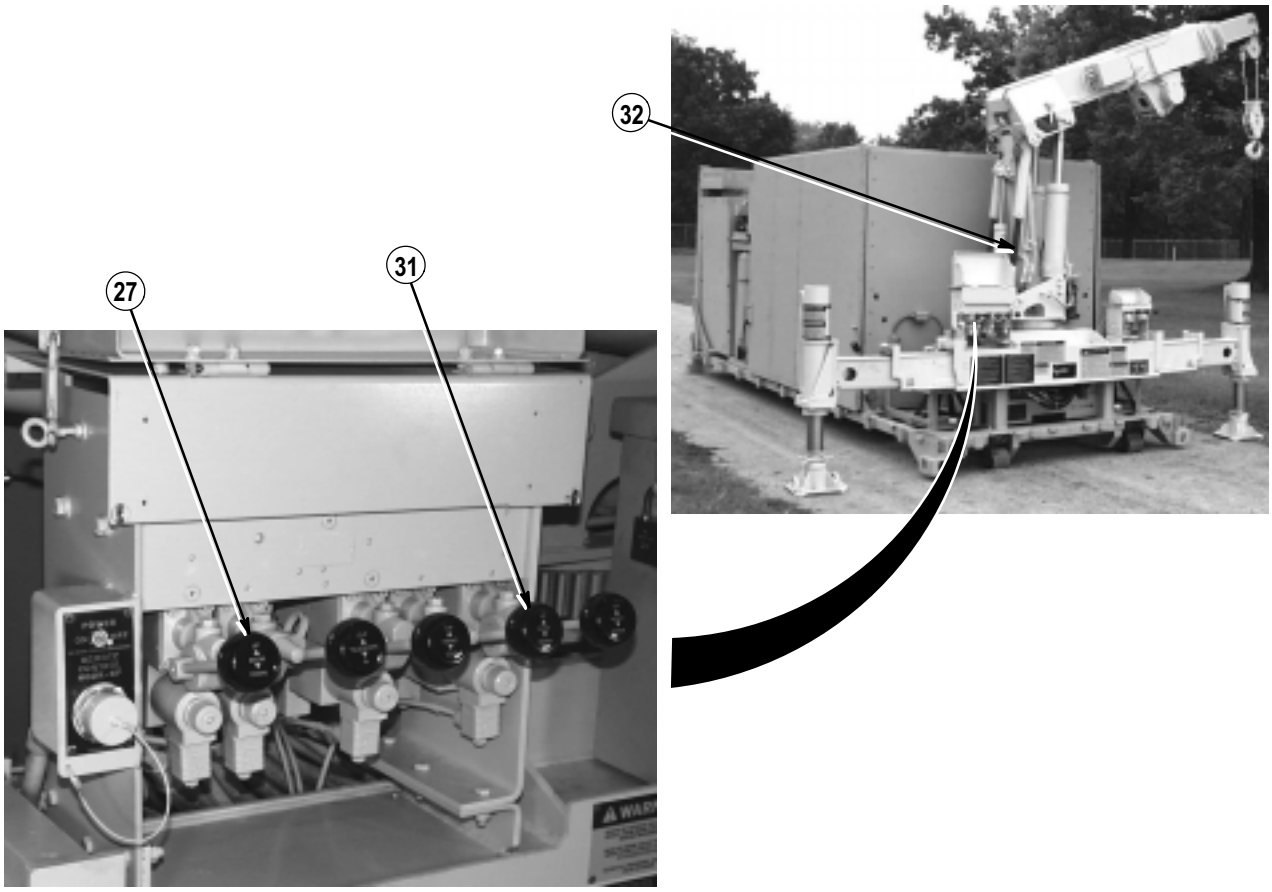
Never telescope boom and lift load unless mast is fully raised. Failure to comply may result in damage to equipment.

NOTE

Operate BOOM lever and MAST lever at the same time to maintain boom at approximately a 30-degree angle.

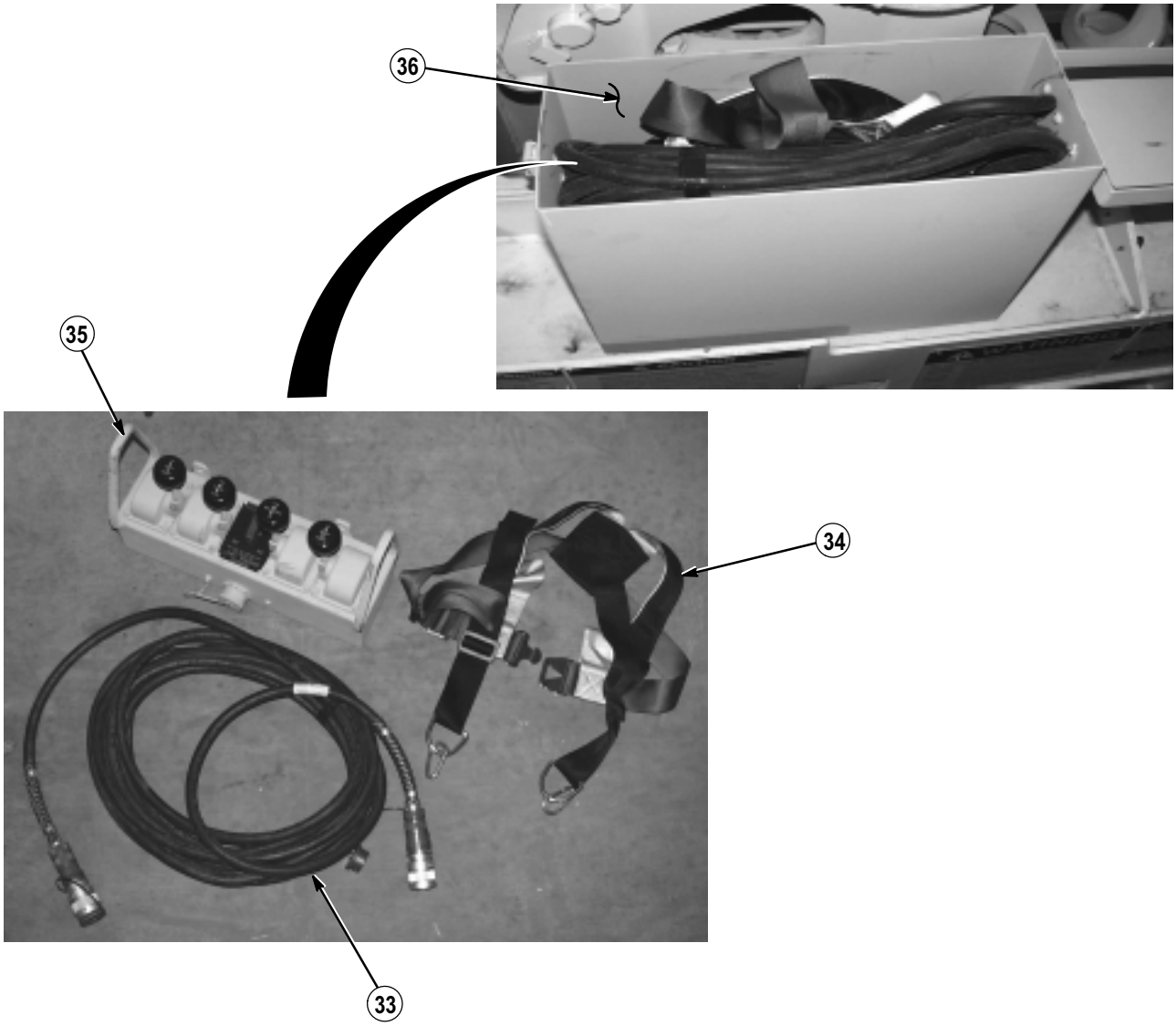
(4) Move BOOM lever (27) to UP position and MAST lever (31) to UP position until boom angle is approximately 30-degrees.

2-29. MATERIAL HANDLING CRANE (MHC) OPERATION (CONT).



(5) Move BOOM lever (27) to UP position and MAST lever (31) to UP position until mast (32) is fully raised.

f. Connect Remote Control.

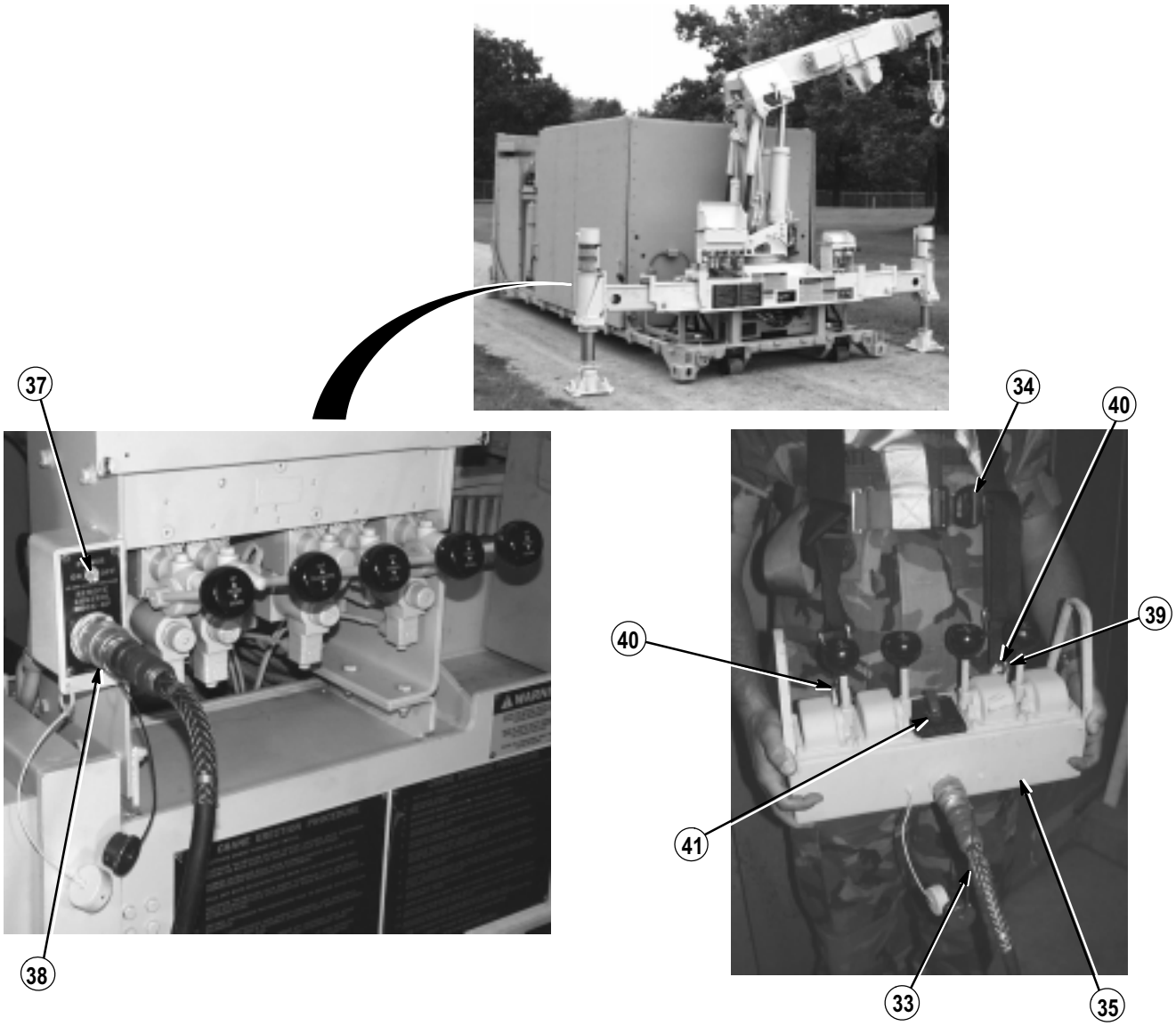


WARNING

The crane must be operated with remote control if operator is not able to keep load in sight at all times during operation except in emergency and/or partial system failure. Failure to comply may result in injury or death to personnel.

(1) Remove cable (33), remote control strap (34) and crane remote control (35) from crane remote stowage box (36).

2-29. MATERIAL HANDLING CRANE (MHC) OPERATION (CONT).



(2) Position crane POWER switch (37) to OFF.

(3) Connect cable (33) to REMOTE CONTROL HOOK UP receptacle (38).

(4) Connect other end of cable (33) to crane remote control (35).

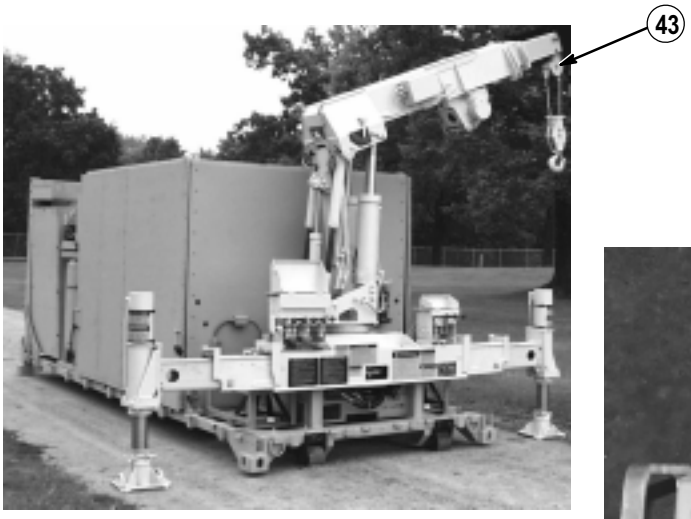
NOTE

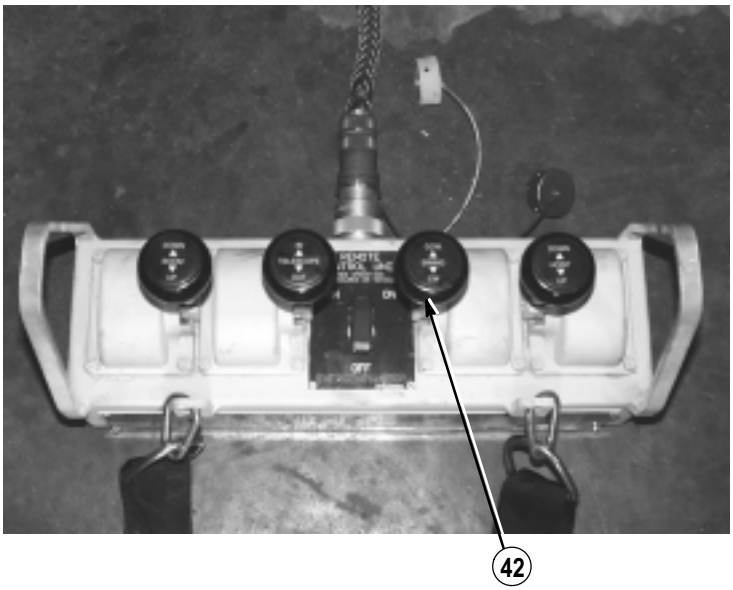
Remote control strap can be adjusted for comfort.

(5) Position remote control strap (34) on operator and buckle, attach two hooks (39) to two rings (40) on remote control.

(6) Position crane POWER switch (37) to ON.

(7) Position EMERGENCY STOP switch (41) on crane remote control (35) to ON.





g. Rotate and Telescope Boom.

WARNING

- Keep boom clear of shelter, all electrical lines, and other obstacles while operating the crane. Failure to comply may result in injury or death to personnel.
- Ensure that area is clear of personnel before rotating boom. Boom must be rotated slowly enough so operator has complete control of load. If operator cannot see load during operation, operate crane with remote control. Failure to comply may result in injury or death to personnel.
- Keep hands and feet clear of outriggers during operation. Failure to comply may result in injury to personnel.

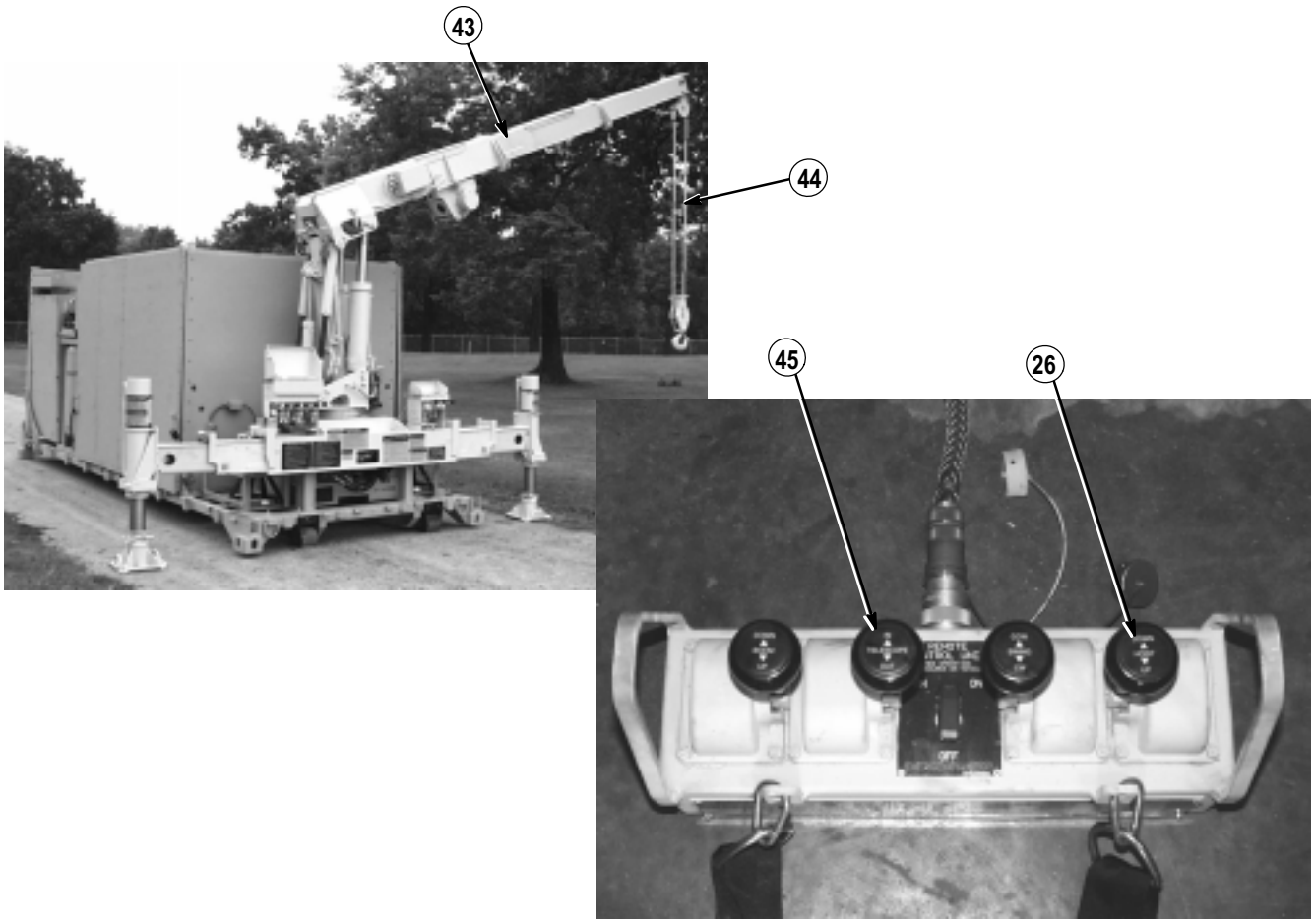
NOTE

Operate crane control levers using even pressure. Moving lever slightly will cause slow movement of crane. Moving lever to full travel will cause faster movement of the crane.

(1) Move SWING lever (42) to CW position to move boom (43) to the right (when viewed from behind the boom).

(2) Move SWING lever (42) to CCW position to move boom (43) to the left (when viewed from behind the boom).

2-29. MATERIAL HANDLING CRANE (MHC) OPERATION (CONT).



WARNING

Operator must keep control of load at all times. Attach guide lines to load as required. Failure to comply may result in injury or death to personnel.

CAUTION

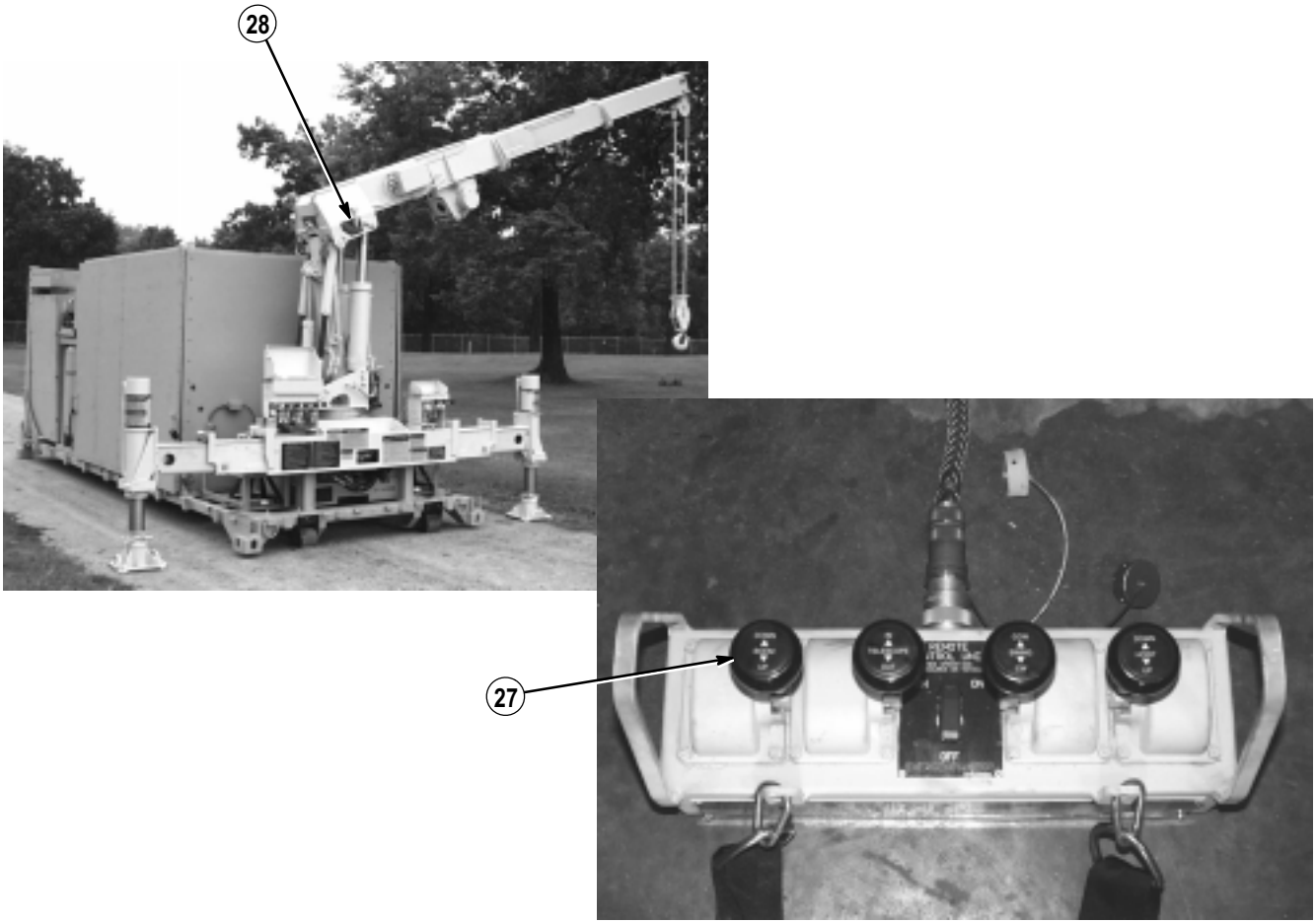
Keep hook assembly at least 2 ft (0.6m) from end of boom. If hook assembly hits end of boom, crane will lose power for several seconds and cable or hook assembly may be damaged.

NOTE

Operate HOIST lever and TELESCOPE lever at the same time.

(3) Move HOIST lever (26) to DOWN position to pay out cable (44) and TELESCOPE lever (45) to OUT position to extend boom (43).

h. Raise and Lower Load.



NOTE

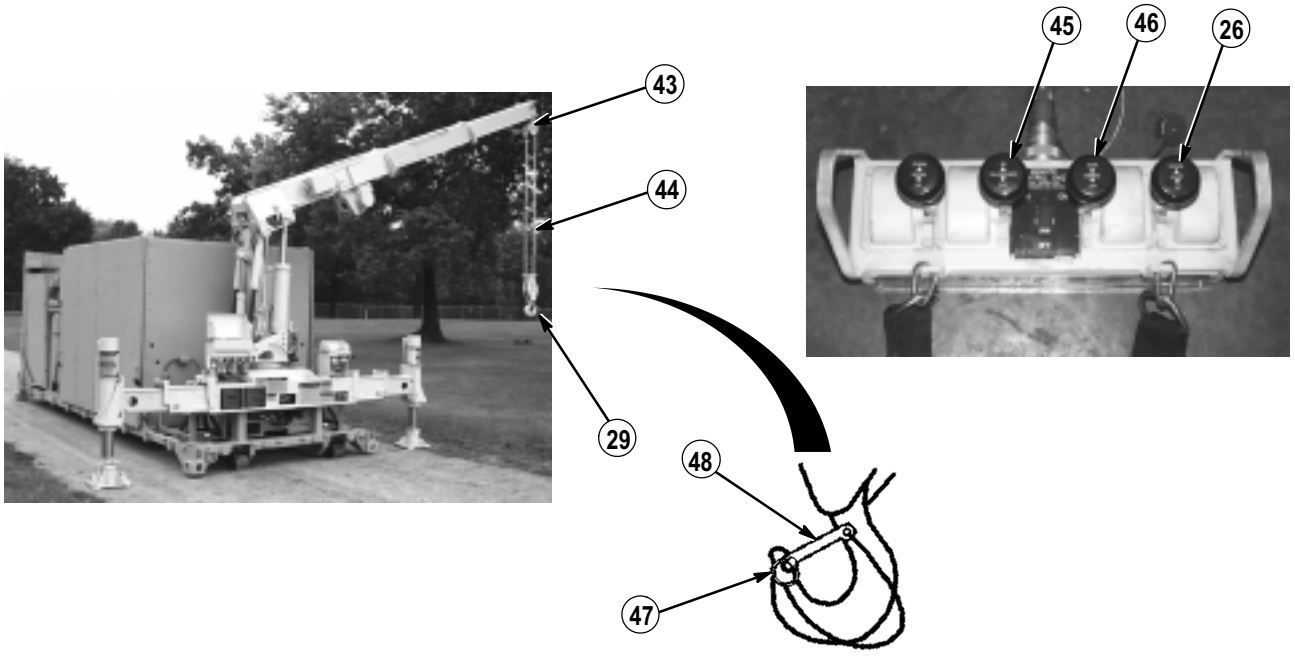
Range diagram boom angles are reference only. Each lift is to be planned in advance:

- Know the weight of the load.
- Know the distance of the load from the crane.
- Check on the load chart if the lift is achievable.
- Configure the crane appropriately (in terms of boom length) or relocate FRS or load as necessary.

(1) Refer to range diagram and load chart on MHC main control panel or on remote control, (Para 2-29b) to determine correct boom angle and boom length setting.

(2) Move BOOM lever (27) to UP position until boom angle indicator (28) shows correct boom angle as determined in Step (1).

2-29. MATERIAL HANDLING CRANE (MHC) OPERATION (CONT).



CAUTION

- Do not allow excessive slack to build-up when paying out cable. Failure to comply may result in damage to equipment.
- Do not allow the weight of the hook to be removed from the cable. Failure to comply may result in damage to equipment.
- Use only a straight pull when lifting load. The crane structures and associated hydraulic systems are to be used only for vertical lifting of a load, any sustained loading which results in the hoist cable deviating from the vertical in any direction (attempting to pull or drag a load) is specifically prohibited. Failure to comply may result in damage to equipment.
- Telescope boom within range determined in Step (1). Failure to comply may result in damage to equipment.

(3) Operate SWING lever (46) and TELESCOPE lever (45) to center end of boom (43) directly over load.

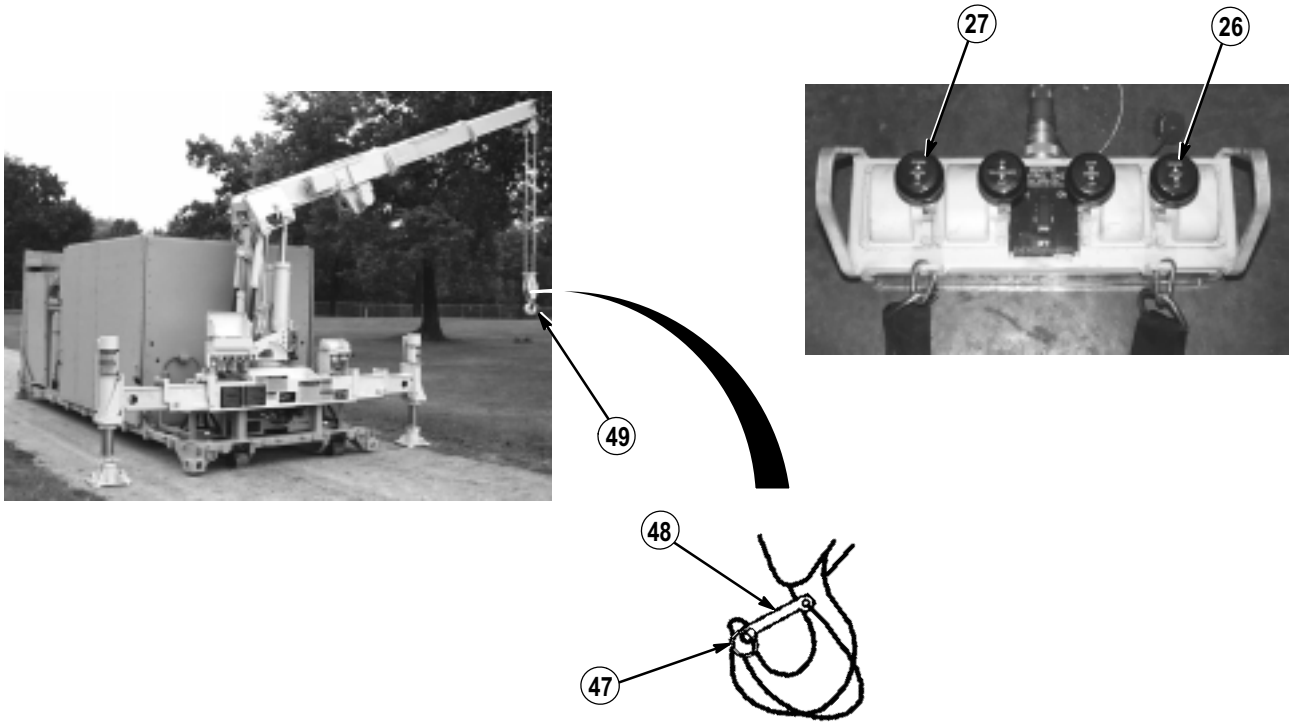
(4) Remove safety pin (47) from hook assembly latch (48).

(5) Operate HOIST lever (26) to pay in or pay out cable (44) and connect hook assembly (29) to load.

WARNING

Ensure that hook latch is closed and safety pin is installed before attempting to raise load. A hook latch that is not closed and locked in position could allow load to become disengaged from hook, allowing load to fall. Injury or death could result.

(6) Install safety pin (47) in hook assembly latch (48).



WARNING

Ensure there are at least two wraps of cable on hoist drum at all times. Failure to comply may result in injury or death to personnel.

CAUTION

- Do not jerk HOIST lever. Load may bounce and result in damage to equipment or load.
- Do not attempt to lift more than maximum load rating for crane. Failure to comply may result in damage to equipment.
- Ensure boom and load are clear of shelter sides when loading and unloading cargo. Hitting side of shelter with boom or load may damage crane, load, or shelter.
- Do not lower boom below horizontal with a load suspended from the hook, or raise a load from below horizontal using the boom. Failure to comply may result in damage to equipment

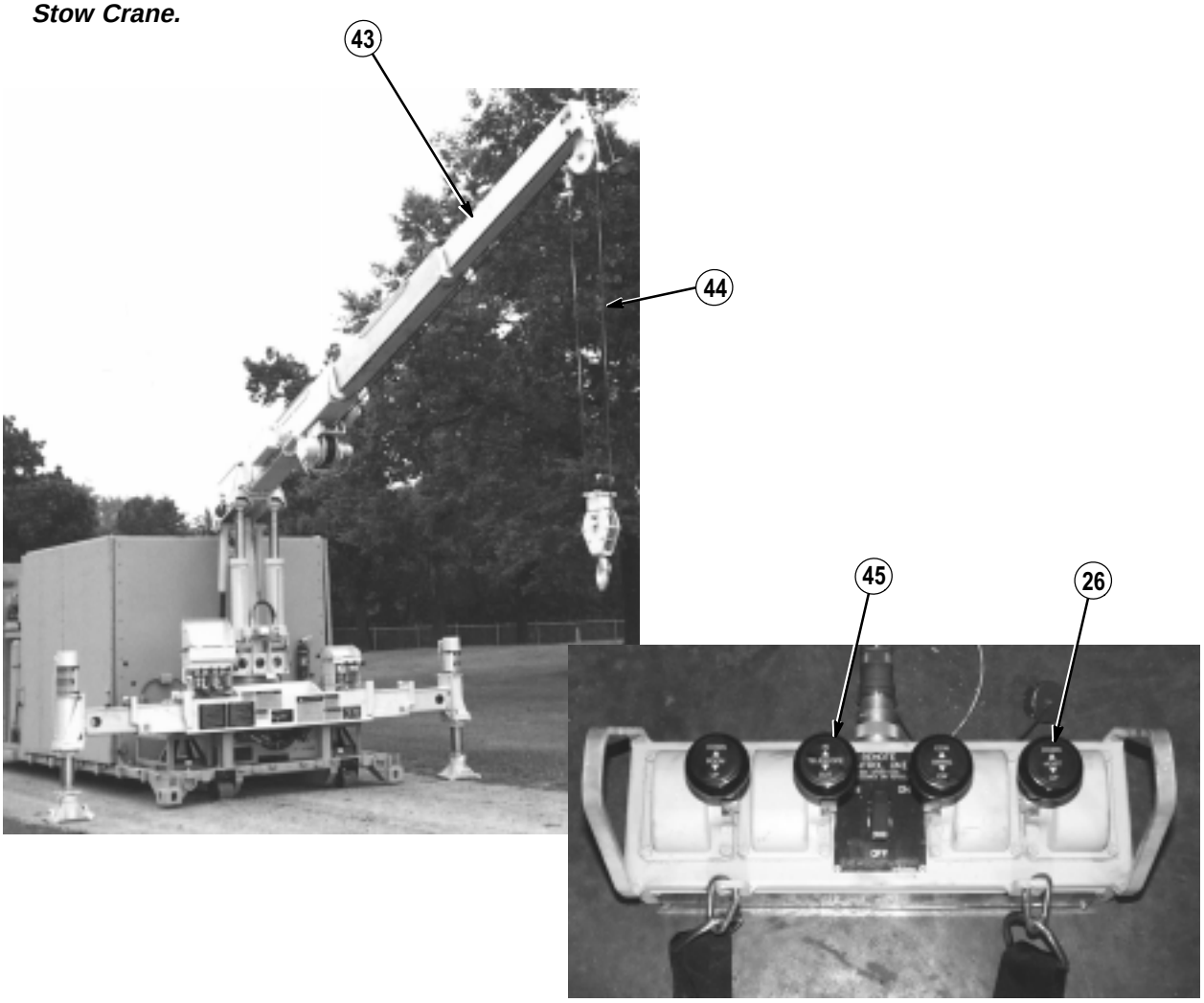
(7) Move HOIST lever (26) to UP position to lift load. Move BOOM lever (27) to UP position to lift load higher as required.

(8) Move HOIST lever (26) to DOWN position to lower load. Move BOOM lever (27) to DOWN position to lower load. Move BOOM lever to DOWN position to lower load further as required.

(9) When lifting operations are completed, disconnect hook block (49) from load and install safety pin (47) in hook assembly latch (48).

2-29. MATERIAL HANDLING CRANE (MHC) OPERATION (CONT).

i. Stow Crane.



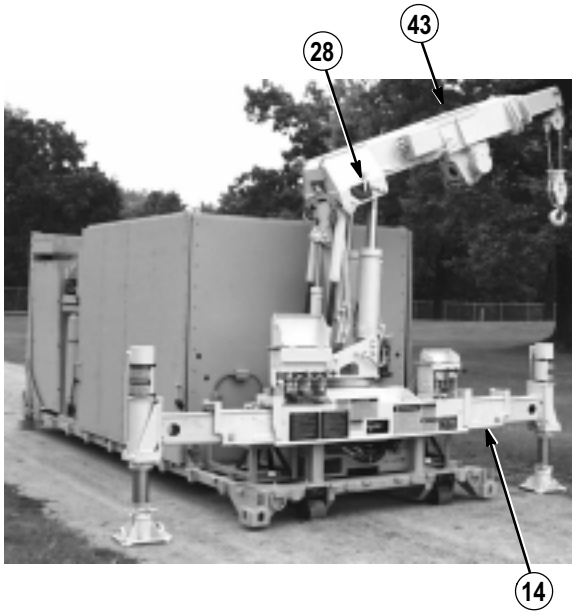
CAUTION

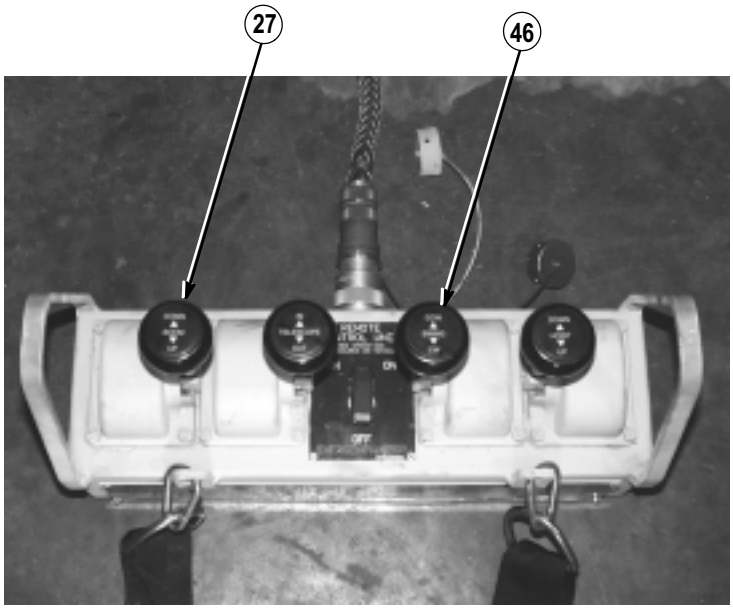
Boom must be positioned in line with outrigger beam and fully retracted before lowering. Observe boom during lowering to ensure no contact is made with rear of shelter or crane outrigger jacks. Failure to comply may result in damage to equipment.

NOTE

- Operate HOIST lever and TELESCOPE lever at the same time.
- Reel in cable until approximately 2 ft. (0.6m) of cable hangs from boom.

(1) Move HOIST lever (26) to UP position to reel in cable (44) and TELESCOPE lever (45) to IN position to retract boom (43).





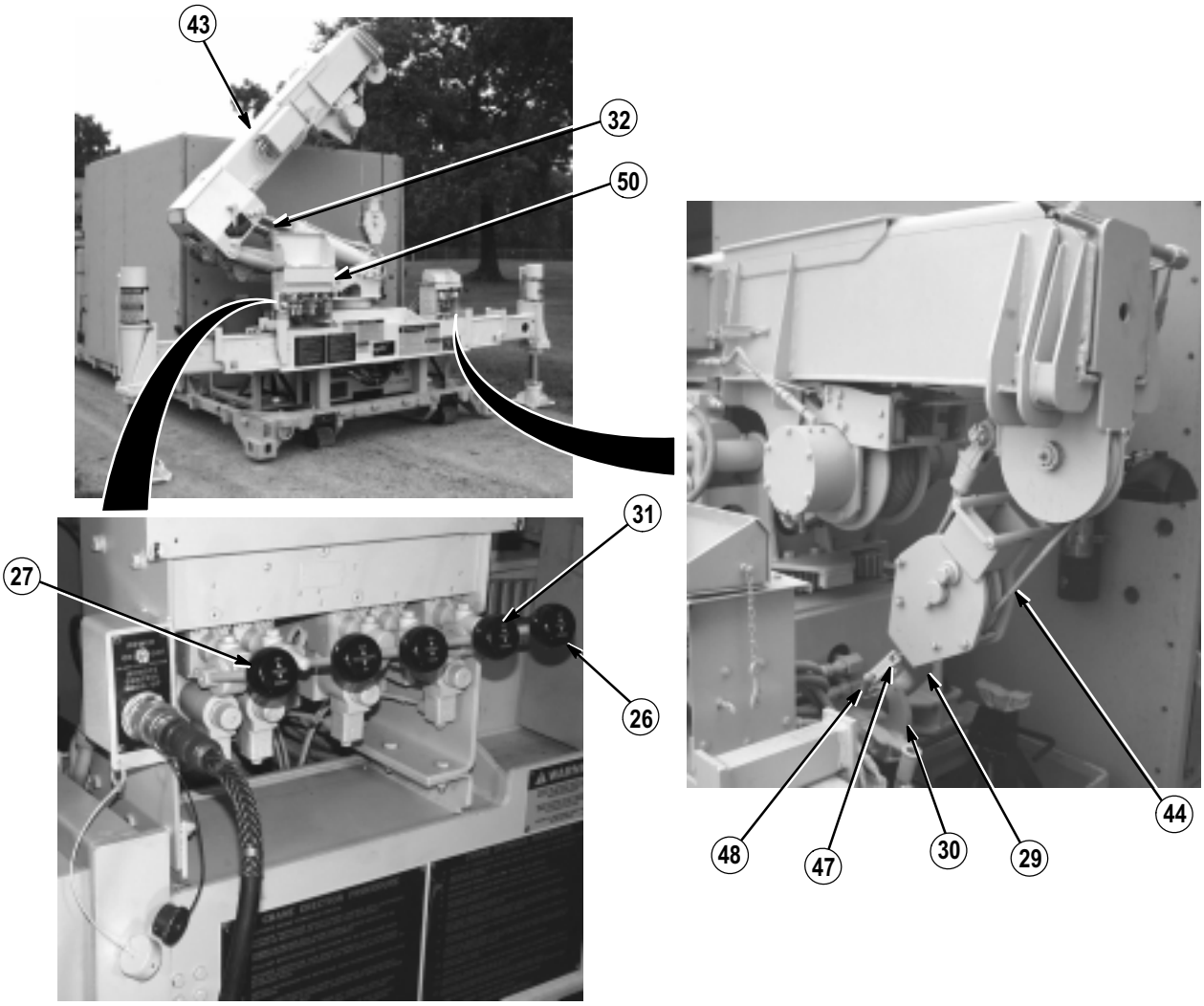
NOTE

Position boom so that cable and hook assembly are on right side of FRS.

(2) Operate SWING lever (46) to position boom (43) in line with outrigger beam (14) .

(3) Operate BOOM lever (27) so that boom angle indicator (28) reads approximately 30-degrees.

2-29. MATERIAL HANDLING CRANE (MHC) OPERATION (CONT).



NOTE

Operate BOOM lever and MAST lever at the same time so that 45-degree reading is maintained on boom angle indicator.

(4) Move BOOM lever (27) and MAST lever (31) to DOWN position until mast (32) is fully lowered and boom (43) is at 45 degrees.

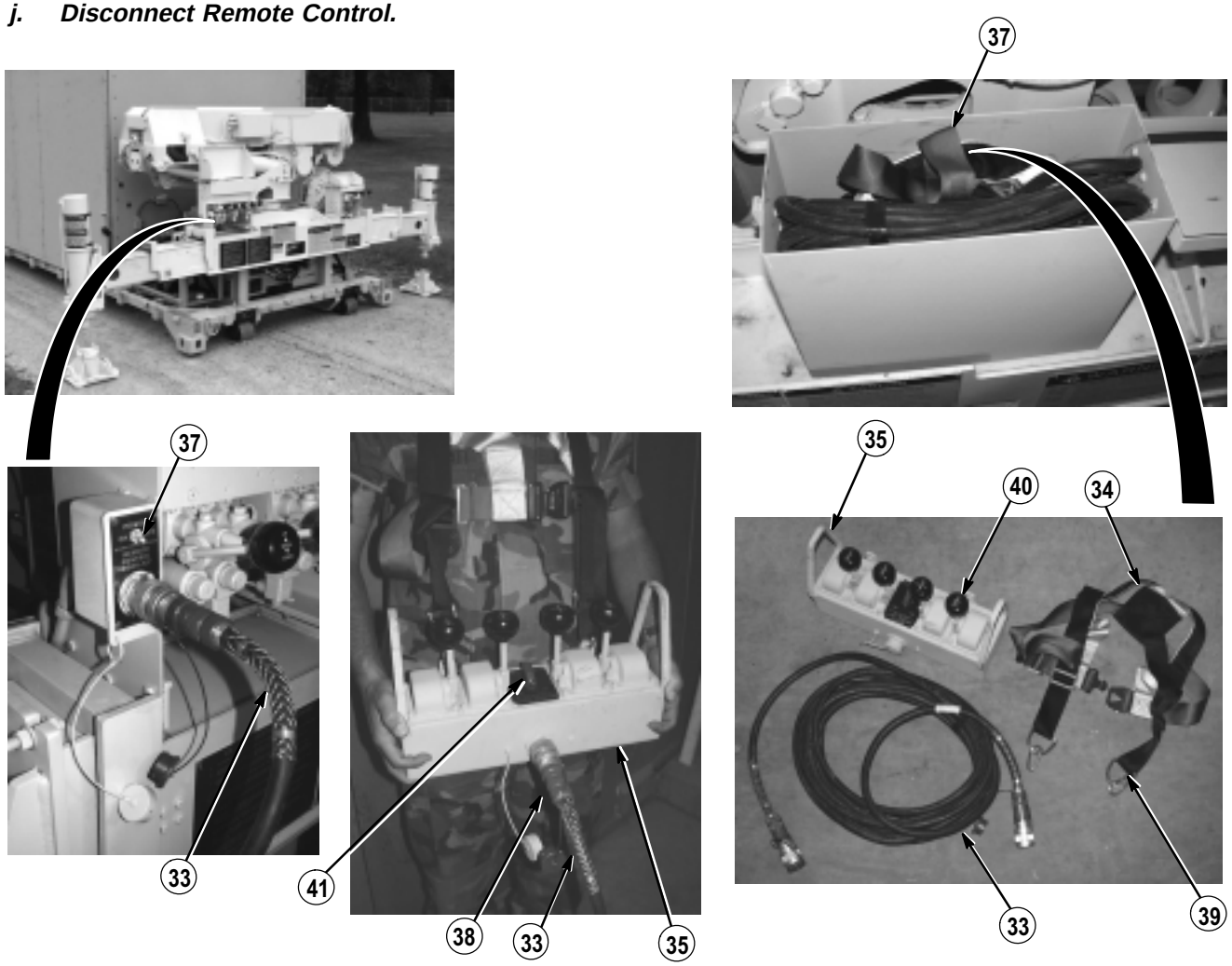
(5) Move HOIST lever (26) to DOWN position and connect hook assembly (29) to stowage hook (30).

(6) Ensure safety pin (47) is installed in hook assembly latch (48).

(7) Move HOIST lever (26) to UP position and BOOM lever (27) to DOWN position until boom (43) is fully lowered, and all slack is removed from cable (44).

(8) Close crane control cover (50).

j. Disconnect Remote Control.



(1) Position EMERGENCY STOP switch (41) on crane remote control (35) to OFF.

(2) Position crane POWER switch (37) to OFF.

(3) Remove cable (33) from REMOTE CONTROL HOOK UP receptacle (38).

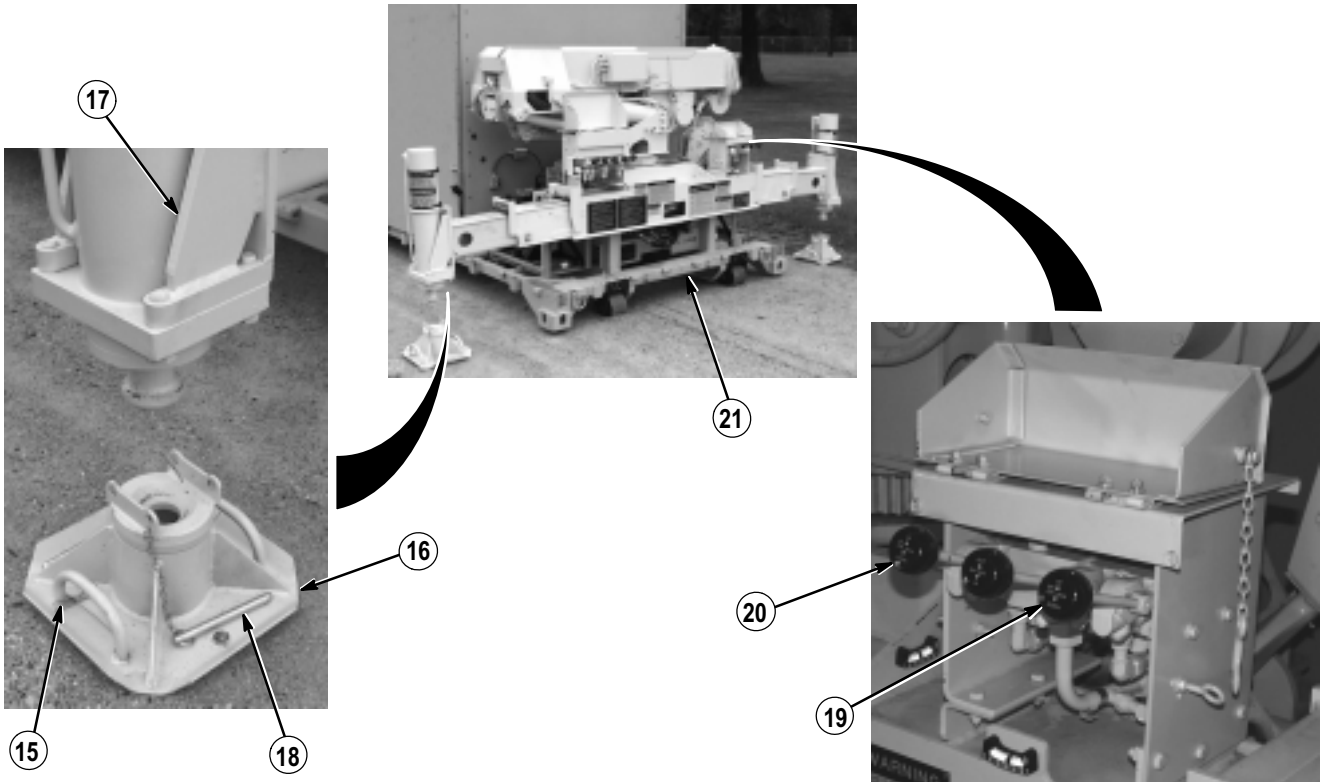
(4) Remove cable (33) from crane remote control (35). Install dust cap.

(5) Remove two hooks (39) from two rings (40), unbuckle and remove remote control strap (34) from operator.

(6) Stow crane remote control (35), remote control strap (34) and cable (33) in stowage box.

2-29. MATERIAL HANDLING CRANE (MHC) OPERATION (CONT).

k. Stow Outriggers and Jack Cylinders.



WARNING

- Keep hands and feet away from outrigger jacks while operating lever to avoid injury.
- Use caution when handling outrigger pads. Sharp edges can injure hands.

NOTE

Left and right outrigger pads are removed/installed the same way. Left side is shown.

(1) Remove retaining pin (18) from outrigger pad (16).

NOTE

Operate LH O/R JACK lever and RH O/R JACK lever at the same time.

(2) Move LH O/R JACK lever (20) and RH O/R JACK lever (19) to UP position until outrigger jack cylinders (17) are fully retracted.

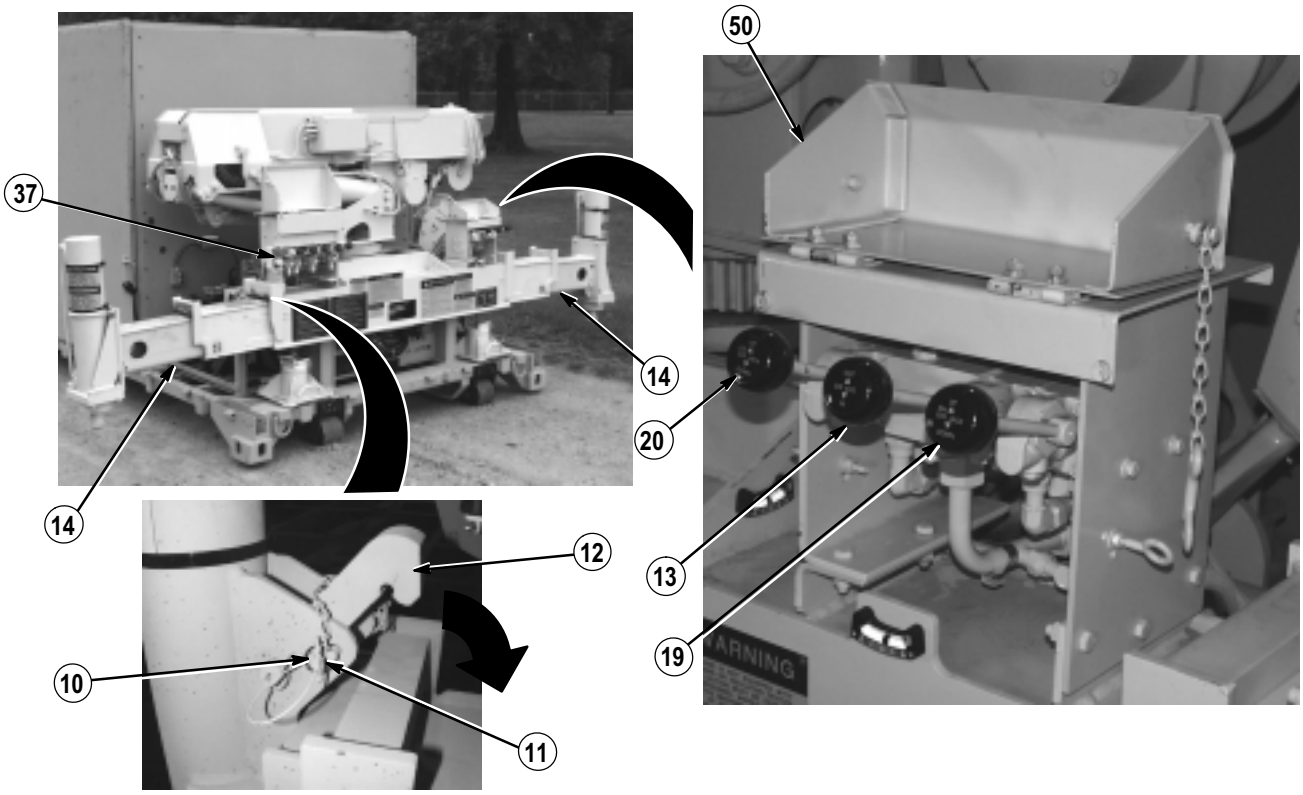
NOTE

Left and right outrigger pads are stowed the same way. Left side is shown.

(3) Install retaining pin (18) in outrigger pad (16).

(4) Stow outrigger pad (16) on stowage posts located on rear of FRS flatrack (21) and install two pins (15).

(5) Repeat Steps (3) and (4) for right outrigger pad.



WARNING

- Keep all personnel clear of system when retracting O/R beams and jacks. The beams can crush hands, and retracting the jacks drops the flatrack back on the ground which could cause injury to personnel.
- Ensure that no tools, parts, personnel or objects are on outriggers before retracting, to prevent personnel injury.

(6) Move O/R EXT lever (13) to IN position until outrigger beams (14) are fully retracted.

NOTE

Ensure chain of pin is looped over top of outrigger latch.

(7) Remove pin (10) and retaining pin (11)and place left outrigger latch (12) in closed position. Install retaining pin and pin.

(8) Repeat Step (7) for right outrigger latch.

(9) Position MAIN POWER switch (37) to OFF.

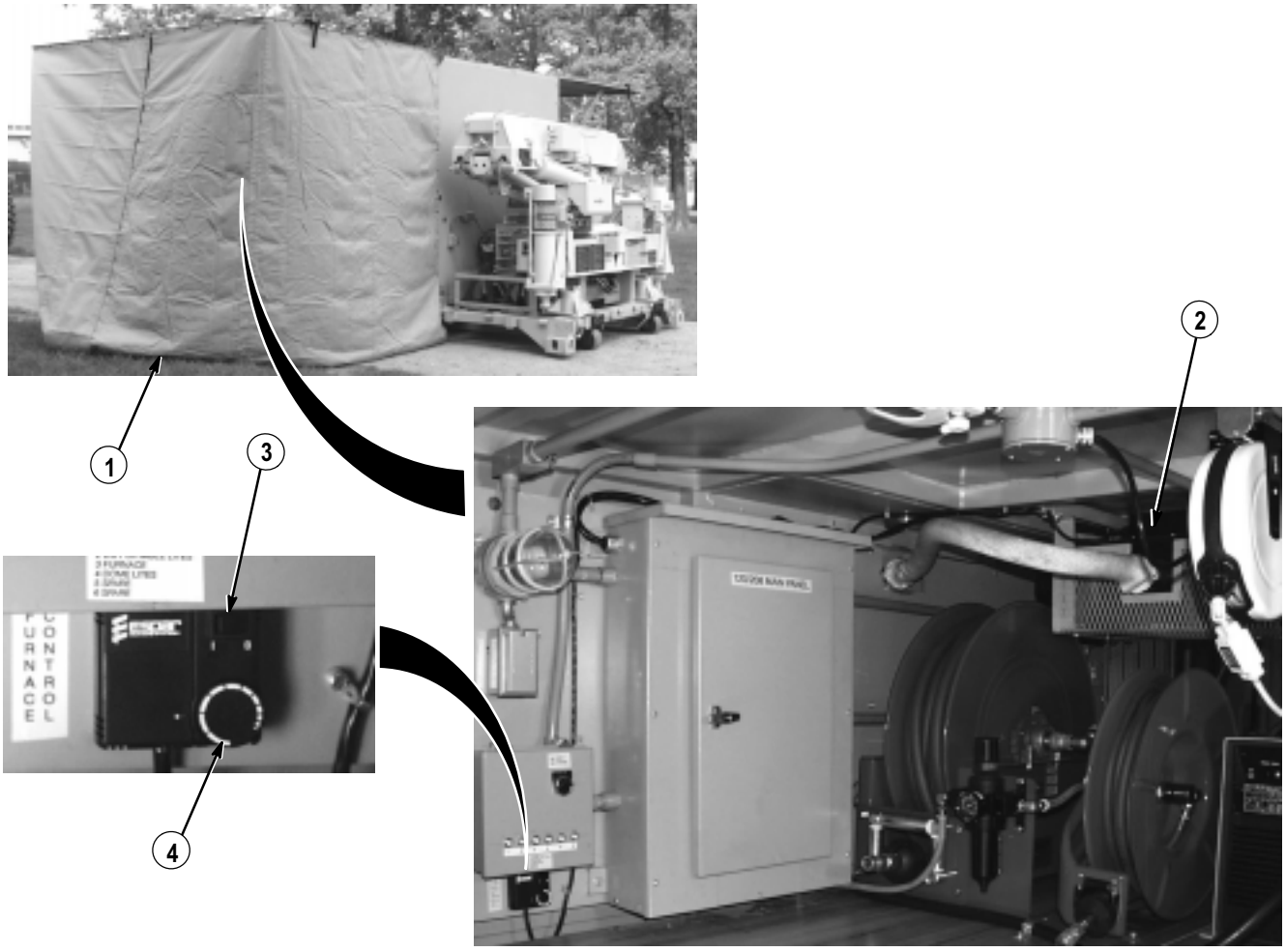
(10) Close outrigger control cover (50).

(11) Stow crane boom light (Para 2-28).

NOTE

Ensure dust cap is installed on remote control hookup.

2-30. SHELTER HEATER OPERATION.



NOTE

24 VOLT DC PANEL power switch must be in the ON position.

(1) Install shelter canvas (1) on shelter

(2) Start generator (Para 2-15).

(3) To start shelter heater (2), depress the switch (3) to the left ( ) position and the red and green lights will illuminate.

(4) Adjust temperature setting by adjusting the temperature control dial (4).

(5) To shutdown shelter heater (2), depress switch to the right (O) position and the red and green lights will go out.

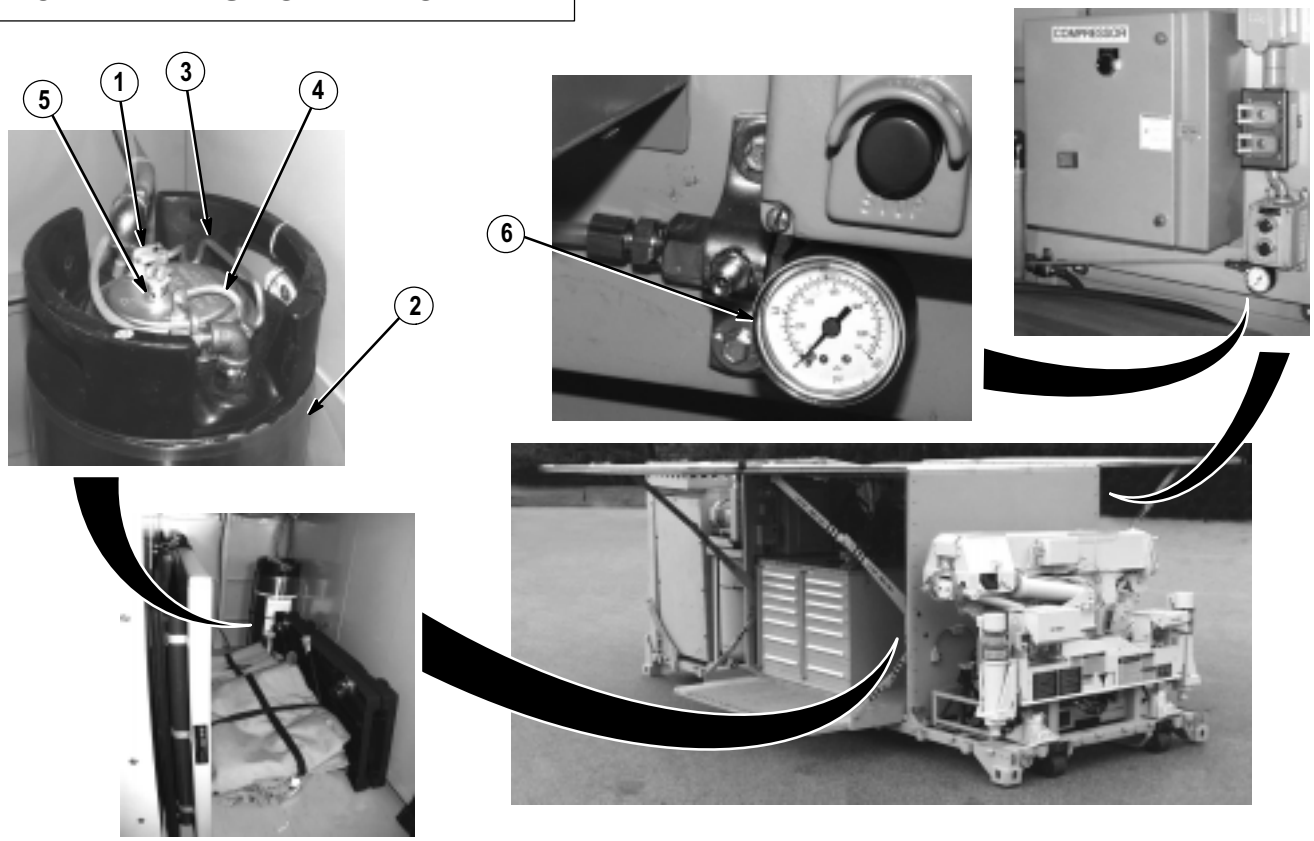
WARNING

Prior to turning off MASTER DISCONNECT switch, allow shelter heater to perform cool down cycle (approx. 3 minutes) until fan stops. Failure to comply may result in a fire causing injury or death to personnel.

(6) Allow the heater fan to stop before shutting down.

(7) Shutdown generator.

2-31. EYE WASH OPERATION.



WARNING

Eye wash is to be refilled and tested by approved medical facility. Consult CHPPM (Center for Health Promotion and Preventive Medicine) for details.

CAUTION

During cold weather partially drain eyewash tank to prevent damage to equipment.

NOTE

Eyewash tank is located inside rear of shelter stowage area. It may be necessary to remove items for easy access.

a. Filling.

(1) Lift up valve (1) on eyewash tank (2) and release air pressure.

(2) Remove access cover (3) by pulling up on release lever (4).

(3) Fill with clean water to the water line marked on eyewash tank (2).

(4) Install access cover (3) and close tightly.

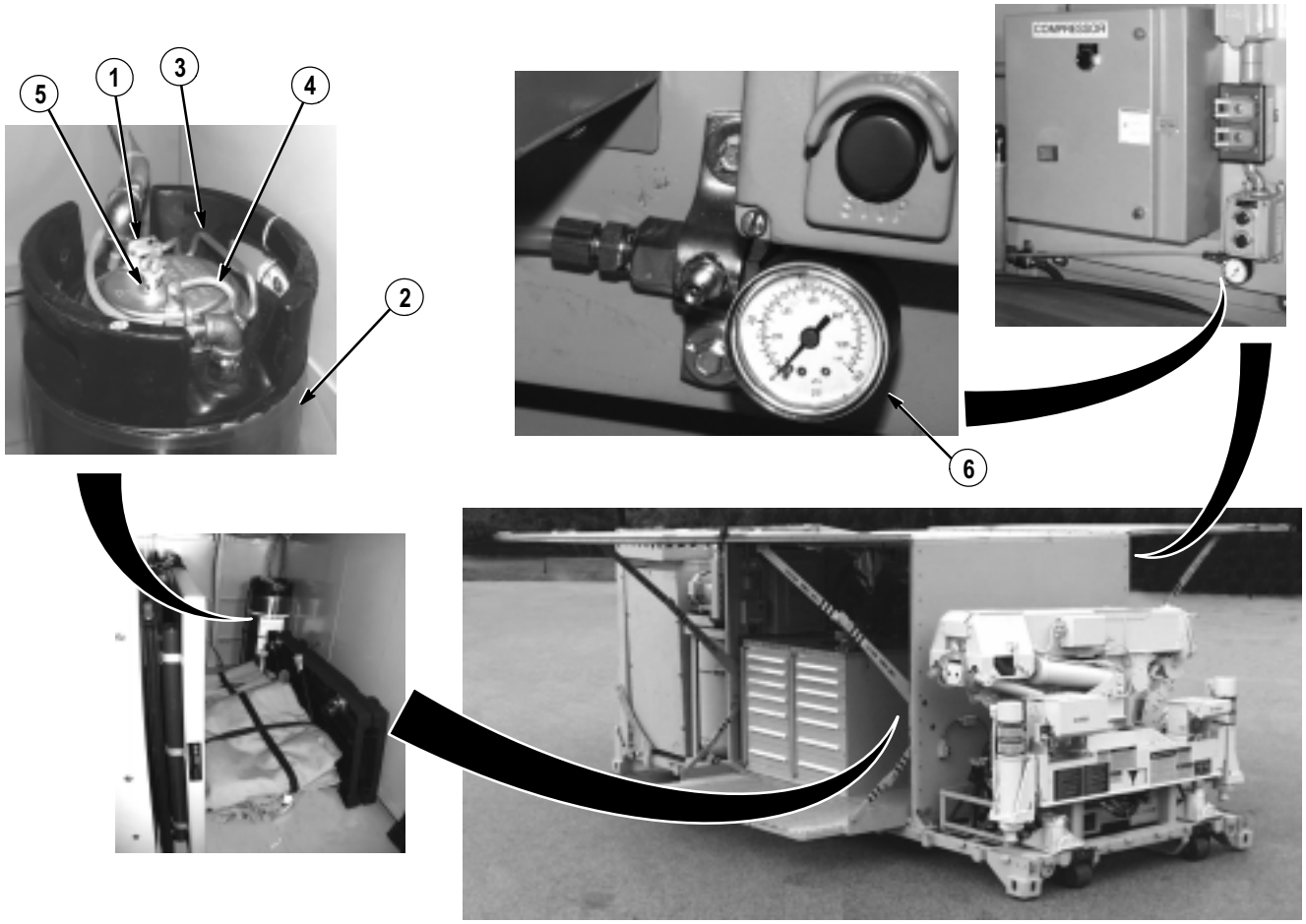
NOTE

Fill with clean compressed air and ensure eyewash tank is full and pressurized to at least 95 psi (655 kPa) (not to exceed 110 psi [758 kPa]).

(5) Fill eyewash tank (2) through air valve (5) and check air pressure gage (6).

2-31. EYE WASH OPERATION (CONT).

b. Draining.



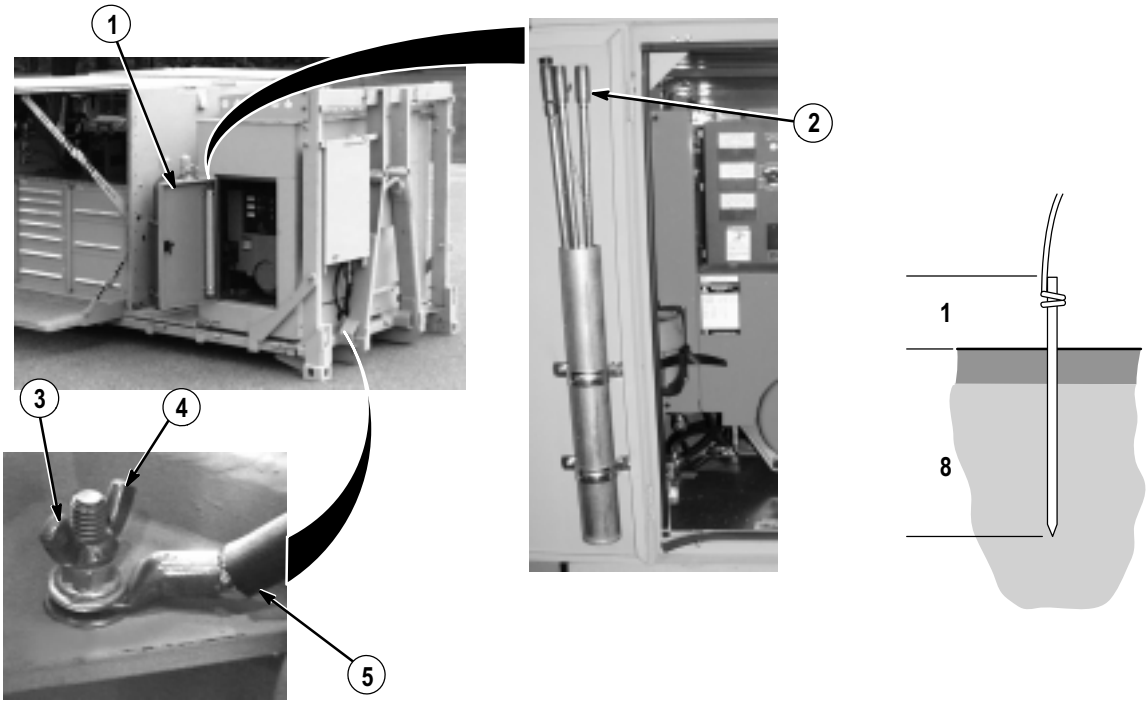
NOTE

Drain and clean the tank at least once a month.

(1) Drain water from eyewash tank (2) using eyewash hose (7).

2-32. GROUNDING PROCEDURE.

a. Grounding Rod Installation.



WARNING

- Electric power generating equipment must be grounded as a safety precaution. Stray electrical current can injure or kill personnel and damage the equipment.
- Ensure MASTER DISCONNECT switch is in the OFF position. Failure to comply may result in serious injury or death to personnel.
- Grounding rod must be driven in ground at least 8 feet. Failure to comply may result in serious injury or death to personnel.

NOTE

- Two piece grounding rod is stowed in tool rack on rear wall inside shelter.

(1) Open generator door (1) and remove three piece grounding rod (2).

NOTE

- It may be necessary to assemble grounding rod as it is being installed into the ground.
- Locate grounding rod close to right front corner of FRS.

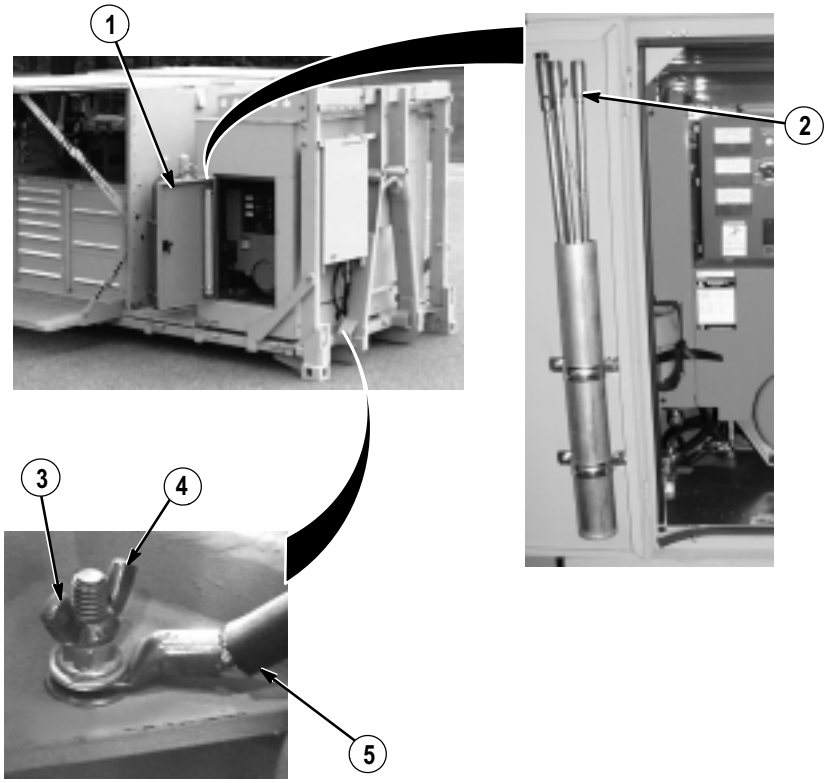
(2) Install grounding rod (2) at least 8 feet into the ground. Grounding rod must be buried below the moisture level.

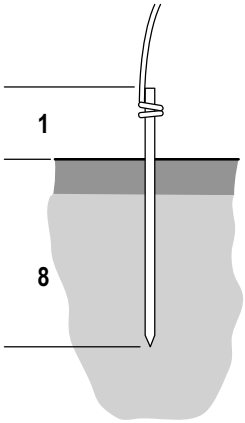
(3) Remove wingnut (3) and attach static cable (4) to grounding terminal (5) on corner of FRS and install wingnut.

(4) If further grounding procedures are necessary, refer to FM 5-424.

2-32. GROUNDING PROCEDURE (CONT).

b. Grounding Rod Removal.





WARNING

- Electric power generating equipment must be grounded as a safety precaution. Stray electrical current can injure or kill personnel and damage the equipment.
- Ensure MASTER DISCONNECT switch is in the OFF position. Failure to comply may result in serious injury or death to personnel.

(1) Remove wingnut (3) and static cable (4) from grounding terminal (5) on corner of FRS and install wingnut.

(2) Remove grounding rod (2) from ground.

NOTE

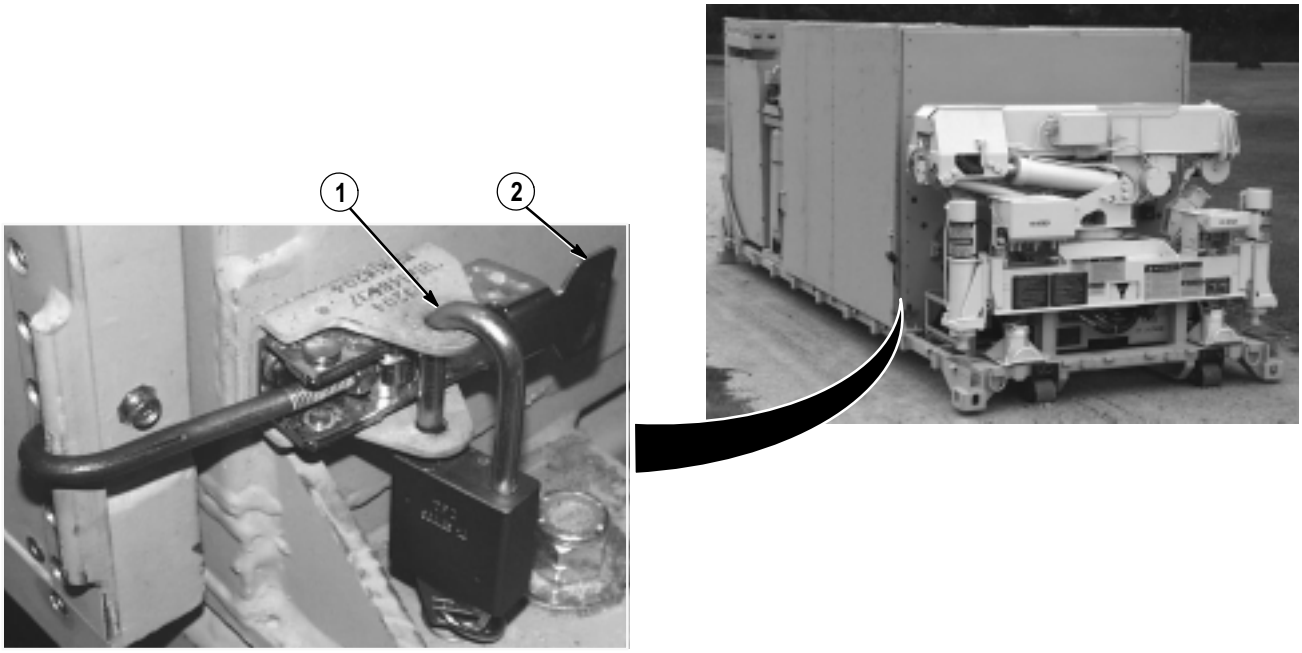
Two piece grounding rod is stowed in tool rack on rear wall inside shelter.

(3) Disassemble and stow grounding rod (2) on generator door (1) and close generator door.

(4) If further grounding procedures are necessary, refer to FM 5-424.

2-33. SHELTER DOOR AND PLATFORM OPERATION.

a. Opening Shelter Doors and Platforms.



WARNING

- Do not attempt to open doors and access platforms while FRS is loaded on vehicle. Failure to comply may result in injury or death to personnel.
- Do not lower/open doors in winds that exceed 30 mph. Failure to comply may result in injury or death to personnel.

NOTE

- The following procedures are identical for both doors. Left side is shown.
- Shelter door has two latches, right side shown.

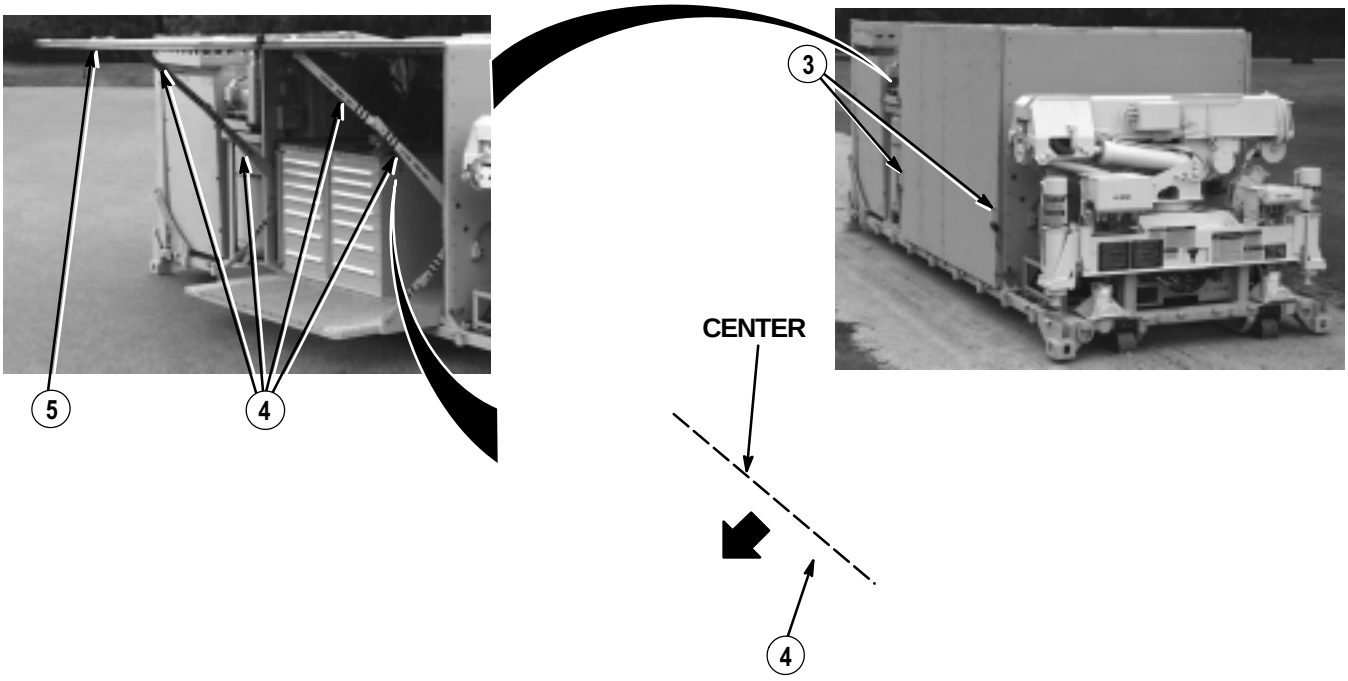
(1) Remove lock (1) from door latch (2).

(2) Release and open door latch (2).

(3) Stow lock (1) on door latch (2).

(4) Repeat Steps (1) through (3) for left door latch.

2-33. SHELTER DOOR AND PLATFORM OPERATION (CONT).



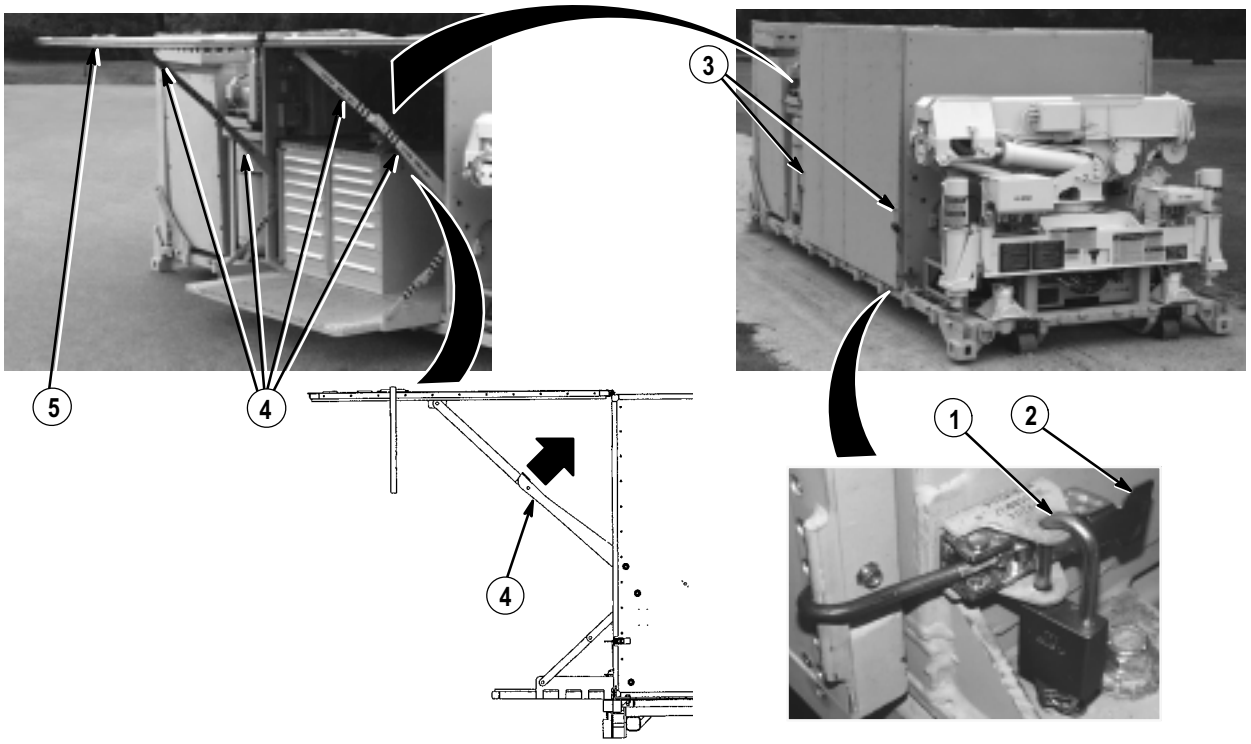
WARNING

- Keep hands clear of pivot points on support arms during door operation. Failure to comply will result in injury to personnel or equipment.
- Sharp corners on door could be present, use caution during door operation. Failure to comply may result in injury to personnel.
- Opening/closing shelter door is a two-person operation. Failure to comply may result in injury to personnel.
- Do not lower/open doors in winds that exceed 30 mph. Failure to comply may result in injury or death to personnel.

(5) With aid of an assistant, pull upward on door handles (3) and step on lower platform until door support arms (4) lock over center in open position and shelter door (5) is open.

(6) Repeat Steps (1) through (5) for right door.

b. Closing Shelter Doors and Platforms.



WARNING

- Keep hands clear of pivot points on support arms during door operation. Failure to comply will result in injury to personnel or equipment.
- Sharp corners on door could be present, use caution during door operation. Failure to comply may result in injury to personnel.
- Opening/closing shelter door is a two-person operation. Failure to comply may result in injury to personnel.
- Do not lower/open doors in winds that exceed 30 mph. Failure to comply may result in injury or death to personnel.
- Keep shelter roof and doors free of accumulated snow, ice, dirt and material buildup. Do not lower doors if buildup is in excess of 1/4 inch thick. Failure to comply may result in injury or death to personnel.

(1) With aid of an assistant, push in and release door support arms (4) and lower shelter door (5).

NOTE

Shelter door has two latches, right side shown.

(2) Remove lock (1) from door latch (2).

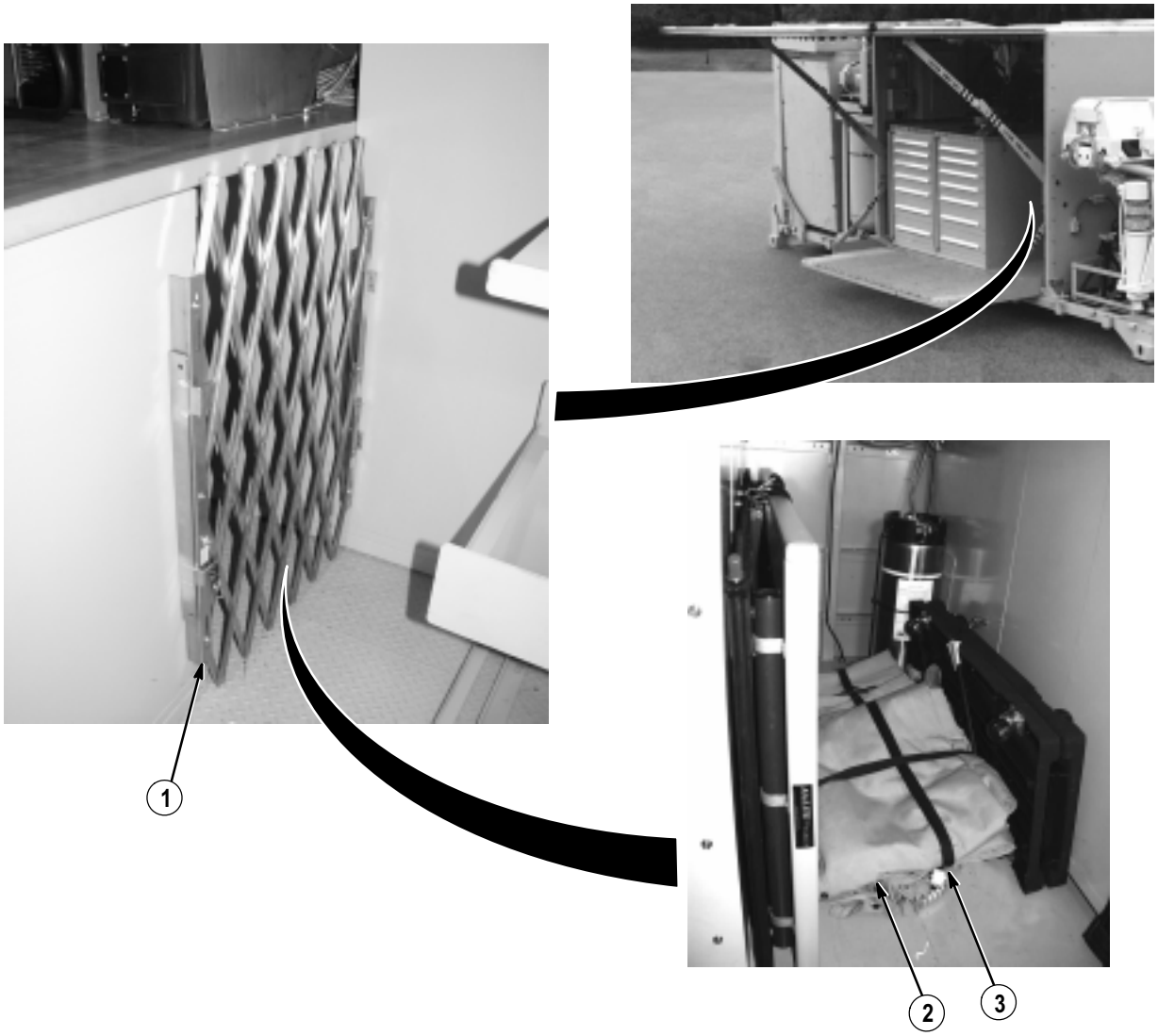
(3) Release and close door latch (2) to secure shelter door (5).

(4) Install lock (1) on door latch (2).

(5) Repeat Steps (1) through (4) for right door.

2-34. CANVAS ENCLOSURE INSTALLATION/REMOVAL.

a. Canvas Enclosure Installation.



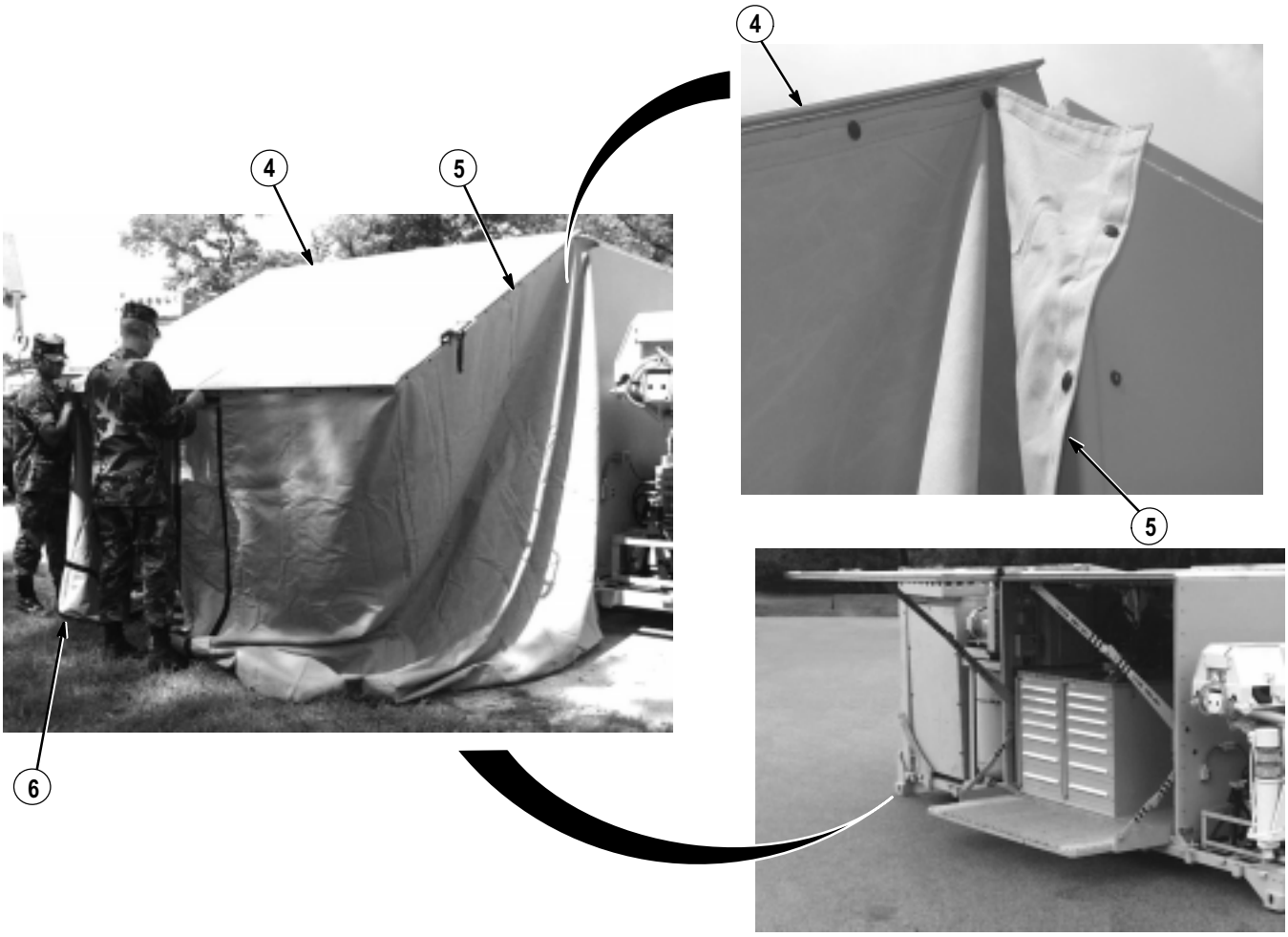
NOTE

The following procedures are identical for both sides of shelter. Left side is shown.

(1) Open storage compartment net (1).

(2) Remove canvas enclosure (2) sections from storage compartment.

(3) Unlatch straps (3) and layout canvas enclosure (2) sections to determine left and right side, two sections for each side.



WARNING

- Opening/closing shelter door is a two person operation. Failure to comply may result in injury to personnel.
- Sharp corners on doors could be present, use caution during door operation. Failure to comply may result in injury to personnel.
- Do not lower doors/roof in winds that exceed 30 mph. Failure to comply may result in injury to personnel.

(4) Lower shelter door (4) and attach right side of canvas (5) first.

(5) Start at top right corner of shelter door (4) and mount right canvas (5) to shelter door.

(6) Start at top left corner of shelter door (4) and mount left canvas (6) to shelter door.

(7) Open shelter door (4) and mount right canvas (5) and left canvas (6) to shelter.

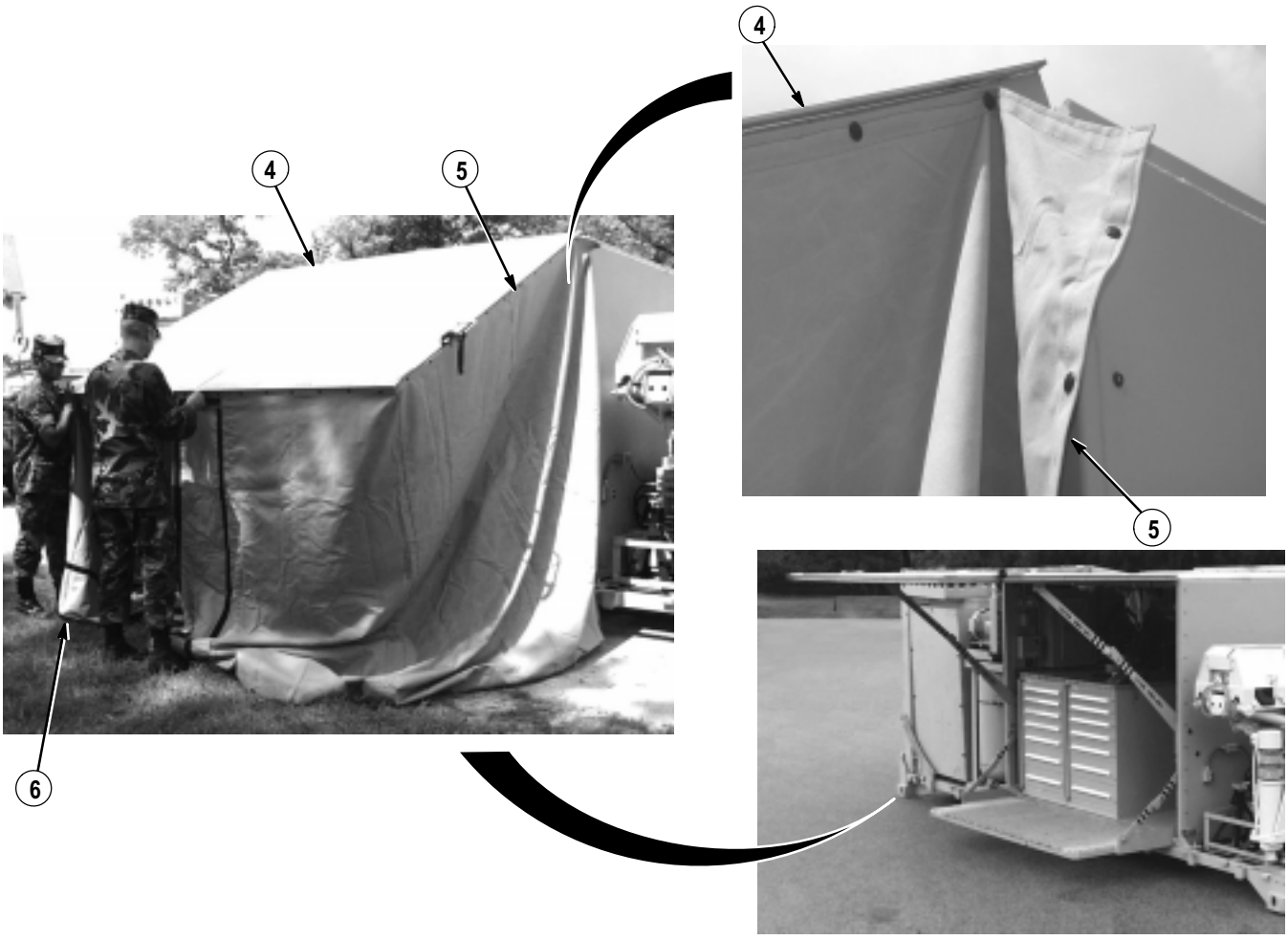
(8) Enclose left side canvas (6) over right side canvas (5).

(9) Install canvas ground anchors as necessary.

(10) Repeat Steps (4) through (9) for right side.

2-34. CANVAS ENCLOSURE INSTALLATION/REMOVAL (CONT).

b. Canvas Enclosure Removal.



WARNING

- Opening/closing shelter door is a two person operation. Failure to comply may result in injury to personnel.
- Sharp corners on doors could be present, use caution during door operation. Failure to comply may result in injury to personnel.
- Do not lower doors/roof in winds that exceed 30 mph. Failure to comply may result in injury to personnel.

NOTE

The following procedures are identical for both sides of shelter. Left side is shown.

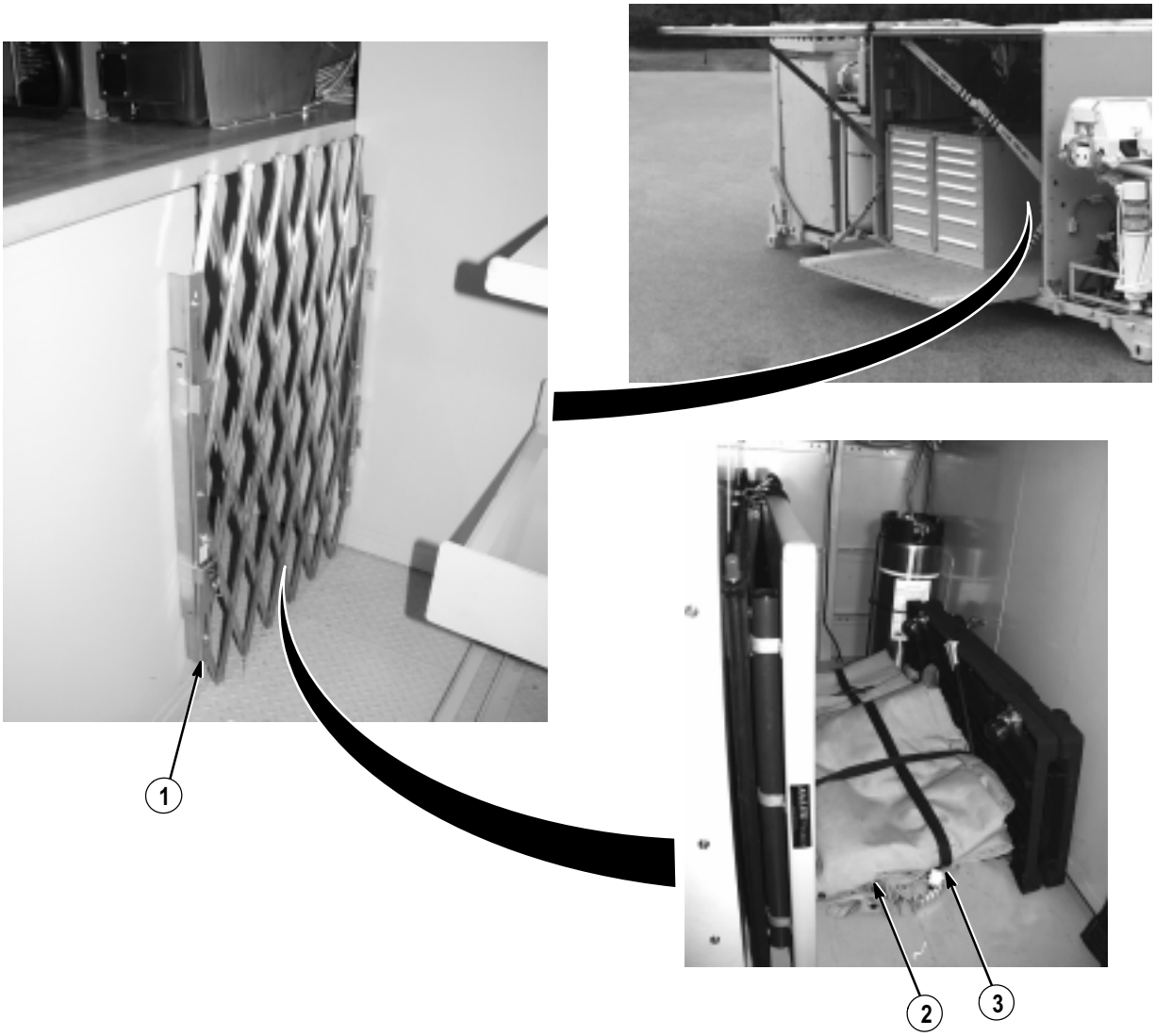
(1) Remove canvas ground anchors.

(2) Detach left side canvas (6) from right side canvas (5).

(3) Lower shelter door (4) and detach left side canvas (6) and right side canvas (5) from shelter.

(4) Remove left canvas (6) and right canvas (5) from shelter door (4).

(5) Open shelter door (4).



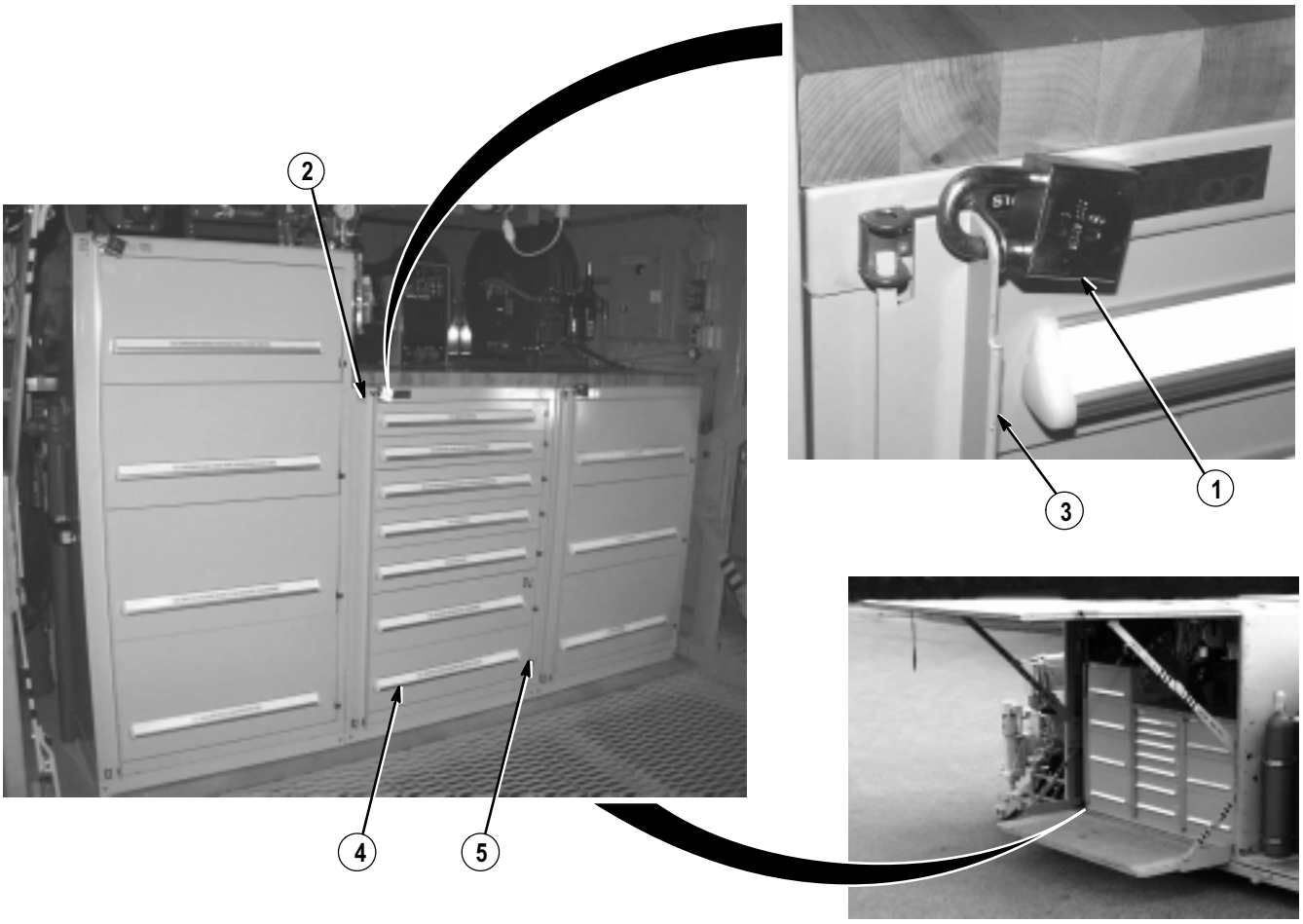
(6) Repeat Steps (1) through (5) for right side.

(7) Fold canvas enclosure (2) sections and secure latch straps (3).

(8) Stow canvas enclosure (2) sections in storage compartment.

(9) Close storage compartment net (1).

2-35. TOOL DRAWER AND CABINET OPERATION.



NOTE

All cabinets operate the same. Welding cabinet shown.

(1) Remove padlock (1) from cabinet (2).

(2) Lift and turn drawer locking bar (3) to the unlock position.

(3) To open drawer (4), push upward on drawer release latch (5) located, on right side of drawer.

(4) Using pulling motion, open drawer (4) to desired position.

(5) To close drawer (4), push upward on drawer release latch (5) located, on right side of drawer.

(6) Lift and turn drawer locking bar (3) to the lock position.

(7) Install padlock (1) on cabinet (2).

Section IV. OPERATION UNDER UNUSUAL CONDITIONS

2-36. OPERATING FORWARD REPAIR SYSTEM (FRS) IN EXTREME HEAT.

CAUTION

- When operating FRS in very hot temperatures of above 100° F (38° C), extra care must be taken to prevent overheating generator (temperatures over 230° F [110° C]). Watch water coolant temperature gage closely.
- Check oil levels often. Generator cooling and lubrication systems support each other. Failure of one system may rapidly cause failure of other system.

NOTE

Air compressor will cause the welder to shut down when air compressor starts. Welder duty cycle is approximately 60% of normal at 120°F.

(1) Let the engine run with no load for about two minutes before shutting down. This will cool the engine faster than quick shutdown and may prevent damage from remaining engine heat.

(2) Check the oil levels often. Oil seals are more likely to leak in extreme hot weather.

(3) Check cooling system often. If any of the following conditions are found, notify Unit Maintenance:

(a) Low coolant level in coolant reservoir or radiator.

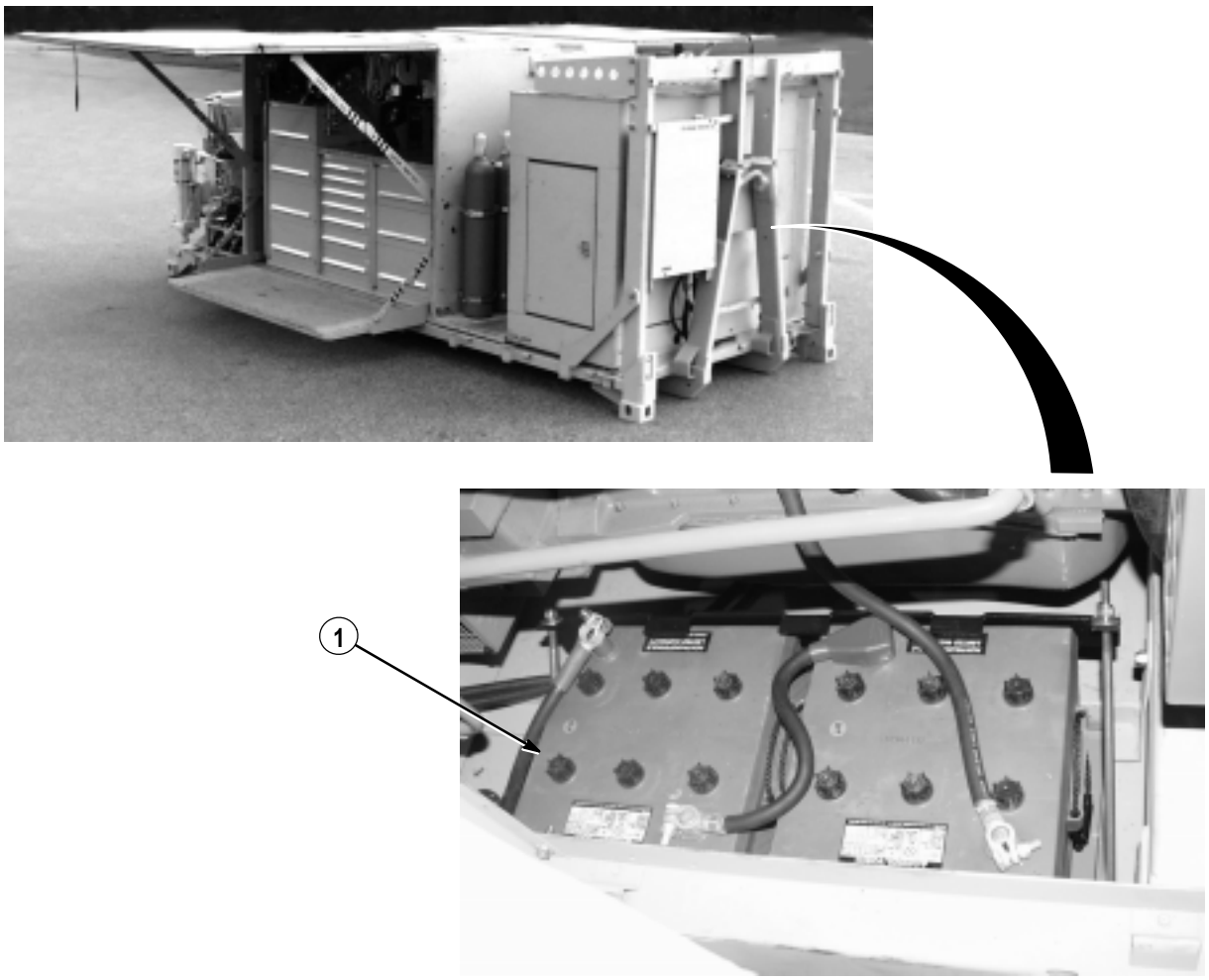
(b) Leaking hose connections which have been tightened but still leak.

(c) Cracked or leaking hoses.

(d) Radiator fins plugged with dust, leaves or insects.

(e) Clear intake duct.

2-36. OPERATING FORWARD REPAIR SYSTEM (FRS) IN EXTREME HEAT (CONT).



NOTE

Batteries do not hold charge well in extreme heat. Battery will be tagged for use in tropical conditions and will have a white circle printed on top. Battery specific gravity must be changed to adjust for heat (TM 9-6140-200-14).

(4) Keep batteries (1) full, but do not overfill.

(5) In hot, damp climates check body and chassis often and notify Unit Maintenance if any of the following are found:

(a) Signs of pitting or paint blistering on metal surfaces.

(b) Signs of mildew, mold or fungus on fabrics or rubber.

2-37. OPERATING FORWARD REPAIR SYSTEM (FRS) IN MUD, SAND, OR SNOW.

NOTE

To determine unstable ground, observe a PLS tire track imprint left in the ground near the FRS. If the tire track imprint depth is greater than 1/8", follow procedures in Para 2-39 "Operating FRS on Unstable or Uneven Ground".

(1) Unload FRS from PLS truck (TM 9-2320-364-10).

CAUTION

Do not direct high pressure water stream at inside shelter, seals, air intake, exhaust outlet, generator or any other component of FRS that could be easily damaged by high pressure water stream.

(2) Scrape off any ice, snow, mud or sand that has accumulated, from the shelter.

(3) For Cold Weather Starting procedures, refer to Para 2-40.

(4) Wash shelter as soon as possible after operation in areas of mud and sand.

2-38. OPERATING FORWARD REPAIR SYSTEM (FRS) IN DESERT ENVIRONMENT.

NOTE

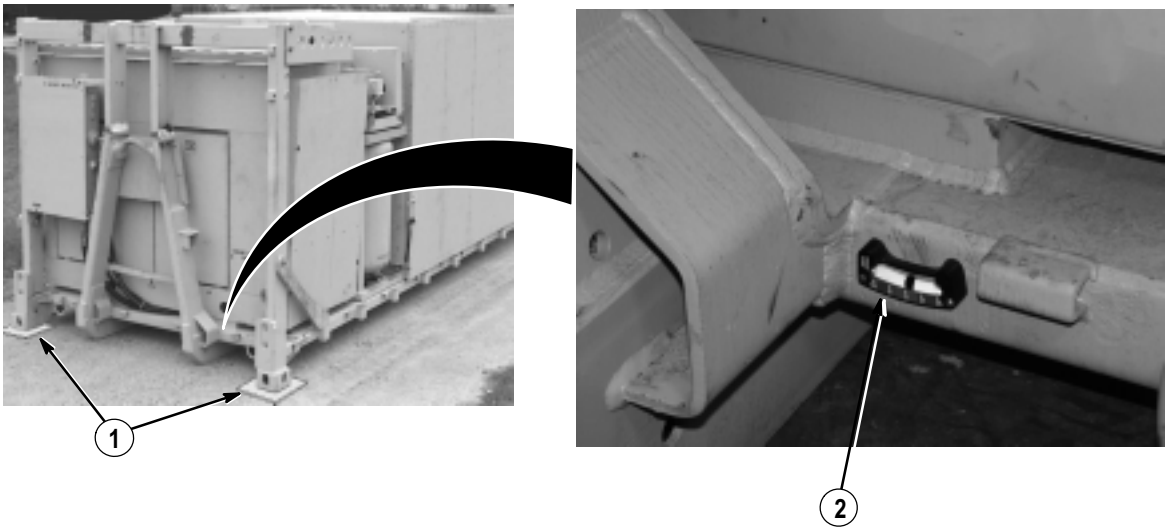
- FM 90-3 contains detailed instructions for living and working in the desert.
- To determine unstable ground, observe a PLS tire track imprint left in the ground near the FRS. If the tire track imprint depth is greater than 1/8", follow procedures in Para 2-39 "Operating FRS on Unstable or Uneven Ground".

(1) Principles for operating in extreme heat and extreme dust, sand, or mud apply to desert environment (Para 2-36 and 2-37).

(2) Temperatures may change as much as 70° F (21° C) between day and night. These changes may damage equipment if FRS is not properly prepared. Due to expansion and contraction of all fluids and air, care should be taken when filling fuel tank and fluid reservoirs to prevent overflow when temperatures change.

2-39. OPERATING FORWARD REPAIR SYSTEM (FRS) ON UNSTABLE OR UNEVEN GROUND.

a. Unstable Ground.



- FRS C-channels of the flatrack must NOT be in contact with the terrain or any object to prevent altering the critical reaction points of the FRS. Failure to comply could result in personnel injury or death.
- FRS cannot be placed on unstable uneven ground greater than 4 degrees. Failure to comply may result in injury or death to personnel and damage to equipment.
- Keep all personnel clear of FRS when operating outriggers. The beams can crush hands and retracting the jacks drops the flatrack back on the ground, which could cause injury to personnel.

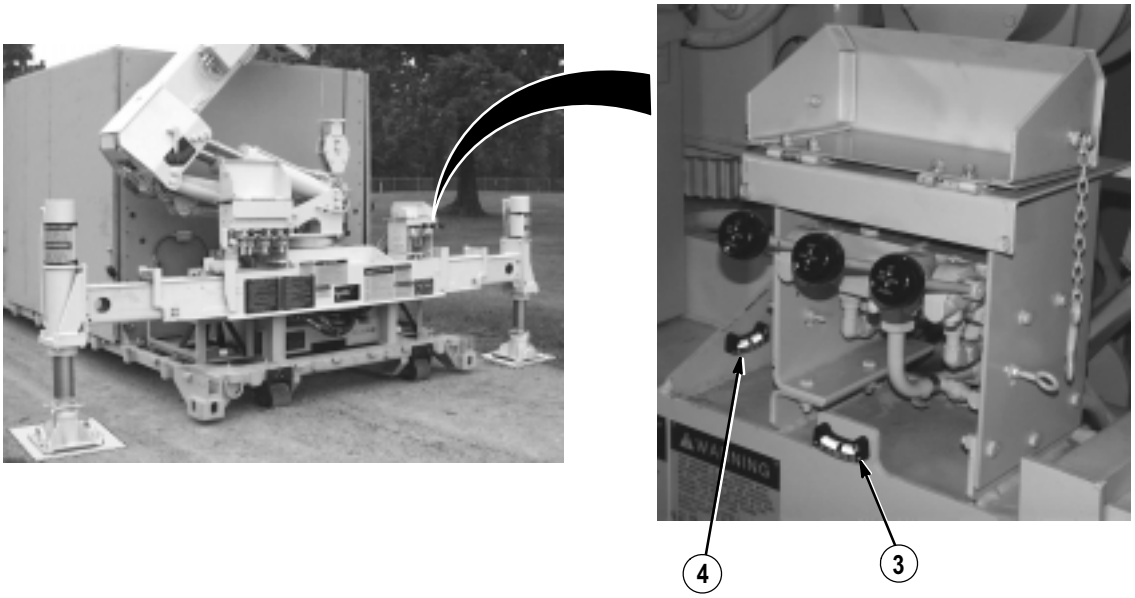
CAUTION

When traversing a load from 90 degrees to 150 degrees on either side, keep the load as low to the ground as possible.

(1) Unload FRS (Para 2-14) before the flatrack ISO corners reach the ground, position one stabilizing platform or suitable device (1) under each of the front ISO corners.

(2) Check front left to right level (2).

2-39. OPERATING FORWARD REPAIR SYSTEM (FRS) ON UNSTABLE OR UNEVEN GROUND (CONT).

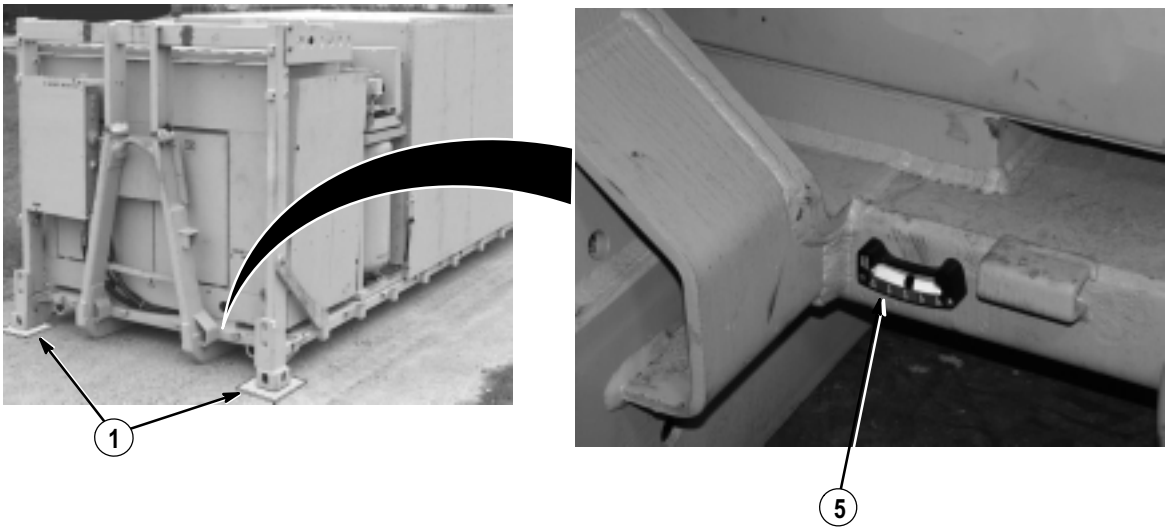


(3) Position one stabilizing platform under each outrigger pad and deploy outrigger and jack cylinders (Para 2-29).

(4) Check front-to-back level (3) and left-to-right level (4).

(5) If FRS cannot be leveled, system must be moved to more stable ground and repeat Steps (1) through (4).

b. Uneven Ground.



- FRS C-channels of the flatrack must NOT be in contact with the terrain or any object to prevent altering the critical reaction points of the FRS. Failure to comply could result in personnel injury or death.
- FRS cannot be placed on uneven ground greater than 4 degrees. Failure to comply may result in injury or death to personnel and damage to equipment.
- Keep all personnel clear of FRS when operating outriggers. The beams can crush hands and retracting the jacks drops the flatrack back on the ground, which could cause injury to personnel.

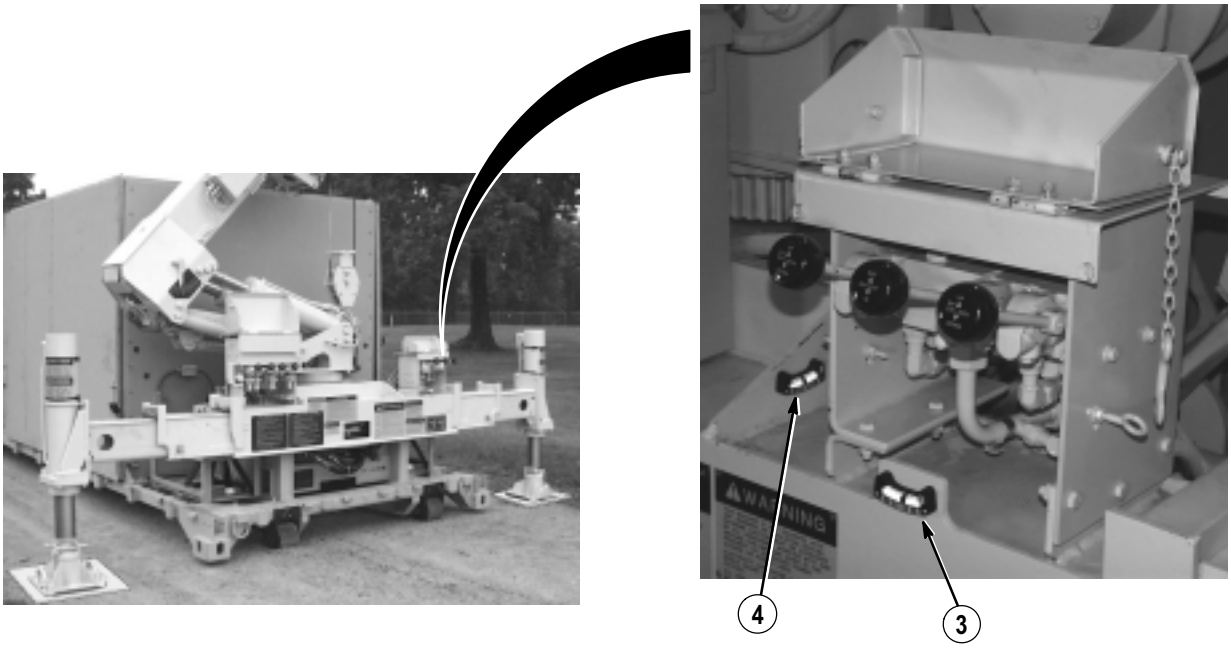
CAUTION

When traversing a load from 90 degrees to 150 degrees on either side, keep the load as low to the ground as possible.

(1) Unload FRS (Para 2-14) before the flatrack ISO corners reach the ground, position one stabilizing platform or suitable device (1) under each of the front ISO corners.

(2) Check front left to right level (2).

2-39. OPERATING FORWARD REPAIR SYSTEM (FRS) ON UNSTABLE OR UNEVEN GROUND (CONT).

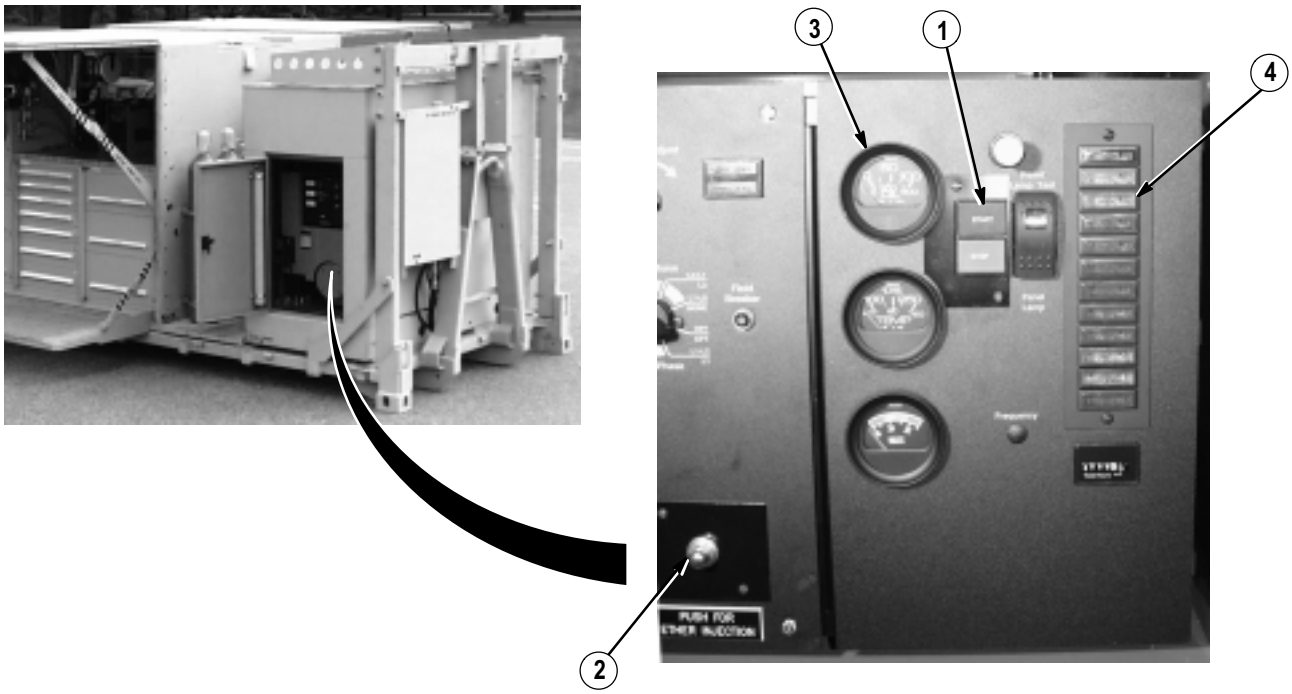


(3) Position one stabilizing platform under each outrigger pad and deploy outrigger and jack cylinders (Para 2-29).

(4) Check front-to-back level (3) and left-to-right level (4).

(5) If FRS cannot be leveled, system must be moved to level ground and repeat Steps (1) through (4).

2-40. OPERATING FORWARD REPAIR SYSTEM (FRS) IN COLD ENVIRONMENT +45° F TO -25° F (+7° C TO –32° C).



CAUTION

- In severe cold, engine coolant can freeze, batteries can freeze and crack, oil and grease may get thick and stiff, eyewash water may freeze, and rubber may crack or break easily.
- If engine fails to start after four tries, refer to troubleshooting.
- Inject starting fluid only while cranking engine and use only for starting.

NOTE

- Before operating FRS in severe cold environment, make sure it has been prepared as described in FM 9-207. Refer to FM 31-70, FM 31-71 and FM 21-305 for additional information on operation in cold environment.

(1) Press engine START/STOP switch START button (1) while pressing ether start switch (2) for no more than 15 seconds. The start sequence is automated, only the ether button is held.

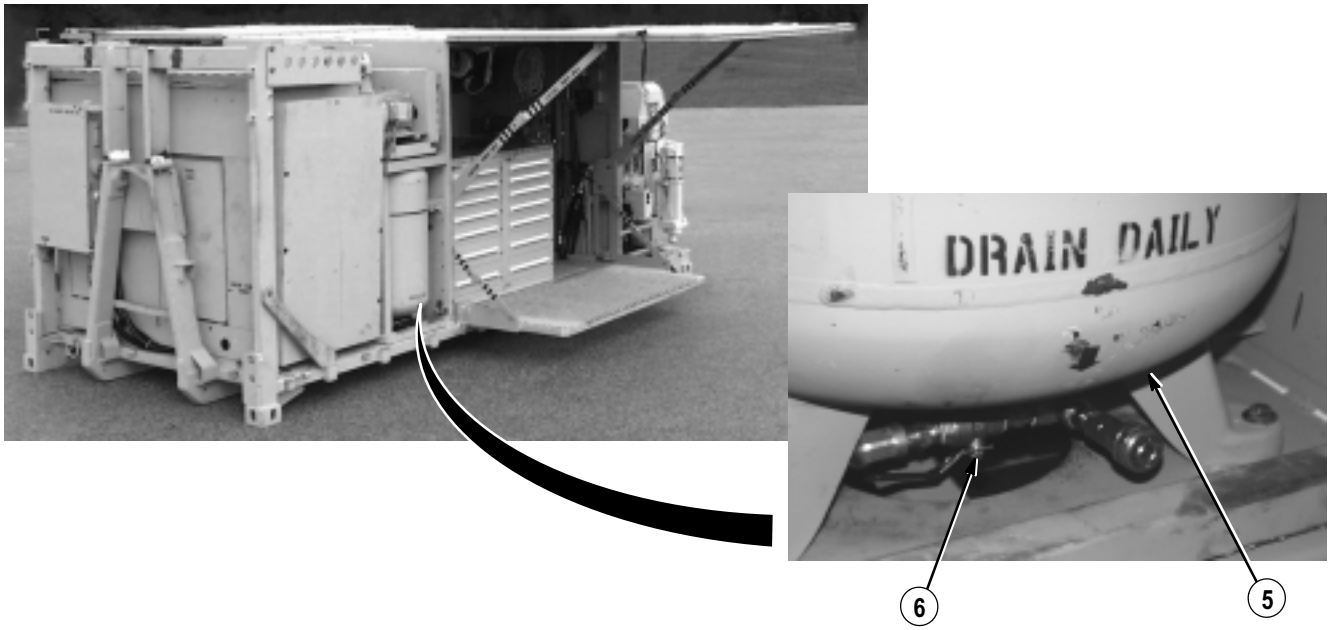
(2) Release engine START/STOP switch START button (1). Oil pressure indicator (3) and oil pressure lamp (4) may light briefly.

NOTE

If engine fails to start, wait 15 seconds before next start attempt to allow starter motor to cool.

(3) If engine fails to start, repeat Steps (1) and (2).

2-40. OPERATING FORWARD REPAIR SYSTEM (FRS) IN COLD ENVIRONMENT +45° F TO -25° F (+7° C TO –32° C) (CONT).



(4) To keep moisture from building up inside air reservoir (5) and freezing, air should be drained from air reservoir after each operation. Turn air reservoir valve (6) and drain air from air reservoir, close valve.

CAUTION

- Park in shelter when possible. Place planks or brush under FRS so it will not freeze in place.
- Keep fuel tank as full as possible during cold operations. Water forms in empty fuel tank as it cools. Water in fuel system could freeze and block fuel system.

(5) Place the FRS on high, dry ground if possible. If high, dry ground is not available, spread out planks or brush to make raised and dry area so the FRS will not freeze in snow, water, ice, or mud.

(6) Place the FRS on level ground so body does not twist.

(7) Keep FRS free of snow and ice. Use broom or applicable material to remove snow and ice from shelter, as soon as possible.

2-41. OPERATING FORWARD REPAIR SYSTEM (FRS) IN EXTREME COLD ENVIRONMENT –26° F TO -50° F (–32° C TO –46° C).

WARNING

Do not touch extremely cold metal (below –26° F [–32° C]). Bare skin may freeze to cold metal and cause injury to personnel.

NOTE

Principles for operating in cold environment apply to extreme cold environment. Refer to Para 2-40 for operating in cold environment.

(1) Before crane is to be operated perform warm-up as follows:

(a) Prepare crane for use (Para 2-29).

(b) Move RH control lever to DOWN position and lower outrigger jack cylinder. Lower the outrigger jack cylinder down to the pad, but do not attach the pad. Fully retract the outrigger jack.

(c) Repeat Step (b) using the LH control lever.

(d) Set up the outrigger jacks (Para 2-29).

CAUTION

Mast must be fully extended or damage to equipment may result.

(e) Raise the crane to operating position using only the manual controls, and holding each respective control fully open in the appropriate direction until the crane function responds (Para 2-29). Perform the following operations (f) through (k) in specified sequence for 10 minutes.

(f) Lower the hook block to ground and raise to 2 ft. (0.61 m) from boom nose.

2-41. OPERATING FORWARD REPAIR SYSTEM (FRS) IN EXTREME COLD ENVIRONMENT –26° F TO -50° F (–32° C TO –46° C) (CONT).

(g) Raise the boom to maximum elevation (45 degrees).

(h) Telescope the boom out fully while operating hoist down to prevent hook block from contacting boom nose.

(i) Fully retract the boom while operating hoist up to keep hook block approximately 2 ft. (0.61 m) from boom nose.

(j) Lower the boom to horizontal.

(k) Rotate the crane fully counterclockwise (180 degrees) and rotate back fully clockwise.

NOTE

Perform Steps (l) and (m) if using remote control.

(l) Connect the remote control (Para 2-29).

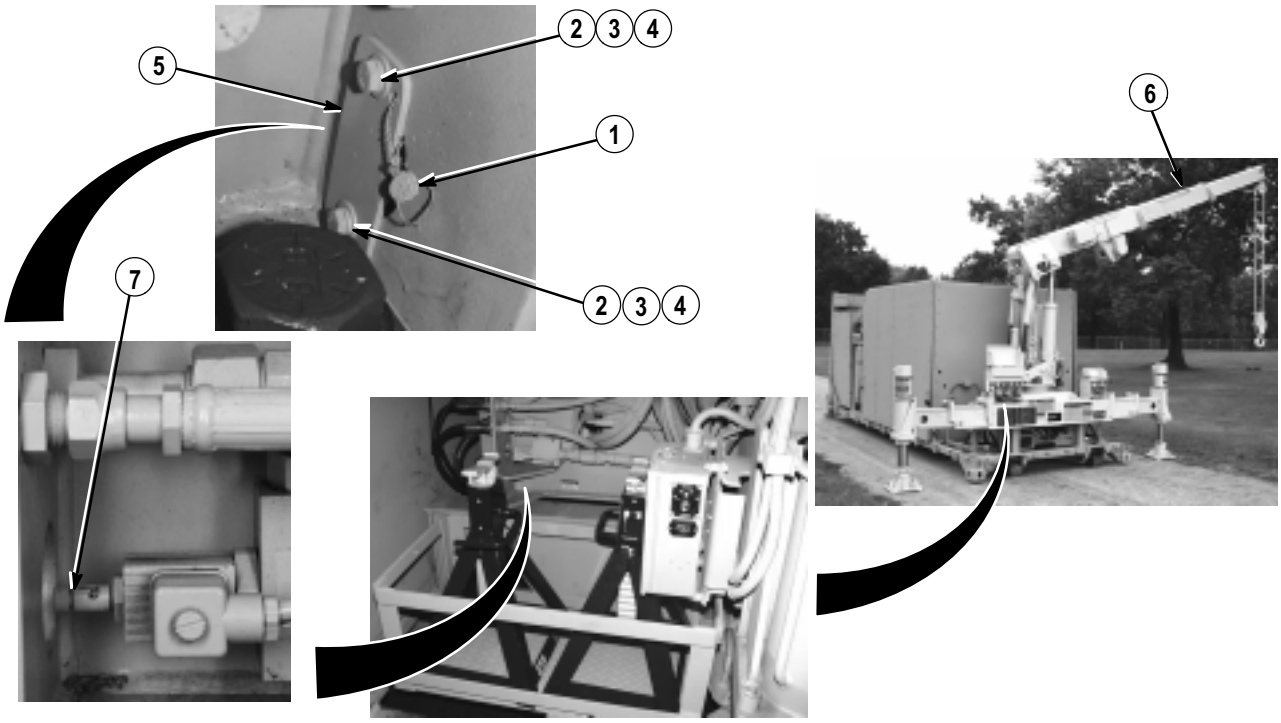
(m) Attempt to operate all crane functions by remote control (Para 2-29), without connecting to load. If any crane function fails to respond, continue to exercise the specific function using the manual control until it responds to the remote control.

(n) Continue with operation of crane (Para 2-29).

(o) When crane operation is completed, disconnect and stow remote control and cable (if used), and shut down crane (Para 2-29).

2-42. FORWARD REPAIR SYSTEM (FRS) EMERGENCY PROCEDURES.

a. Crane Emergency Procedures.



(1) Crane emergency operation with electrical failure:

CAUTION

Do not try to operate any electrical equipment on crane if electrical failure has occurred. Damage to equipment could result.

NOTE

- This procedure will provide emergency hydraulic power to lower crane and load when electrical power has failed.
- Failure of hydraulic system will stop operation of any crane, winch or hydraulic motor. All cranes and winches are equipped with automatic locking mechanisms to hold cranes and winches in position they were in before hydraulics failed.

(a) Cut and remove safety lock seal (1).

(b) Remove two screws (2), lockwashers (3), washers (4) and manual override guard (5) from crane (6).

(c) Press in, twist counterclockwise and pull out MHC MANUAL OVERRIDE valve (7).

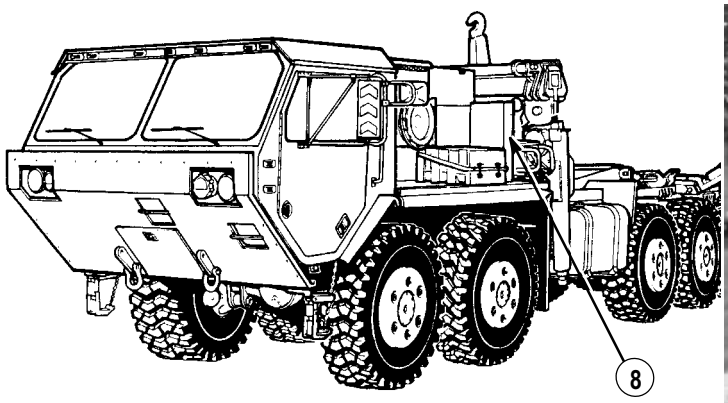
(d) Stow crane (6) in accordance with crane stowage (Para 2-29), using manual controls only.

(e) Press in, twist clockwise and release MHC MANUAL OVERRIDE valve (7).

(f) Notify Unit Maintenance.

2-42. FORWARD REPAIR SYSTEM (FRS) EMERGENCY PROCEDURES (CONT).

b. Forward Repair System (FRS) Crane Auxiliary Slave Hydraulics Operation (Auxiliary [slave] Hydraulics).



CAUTION

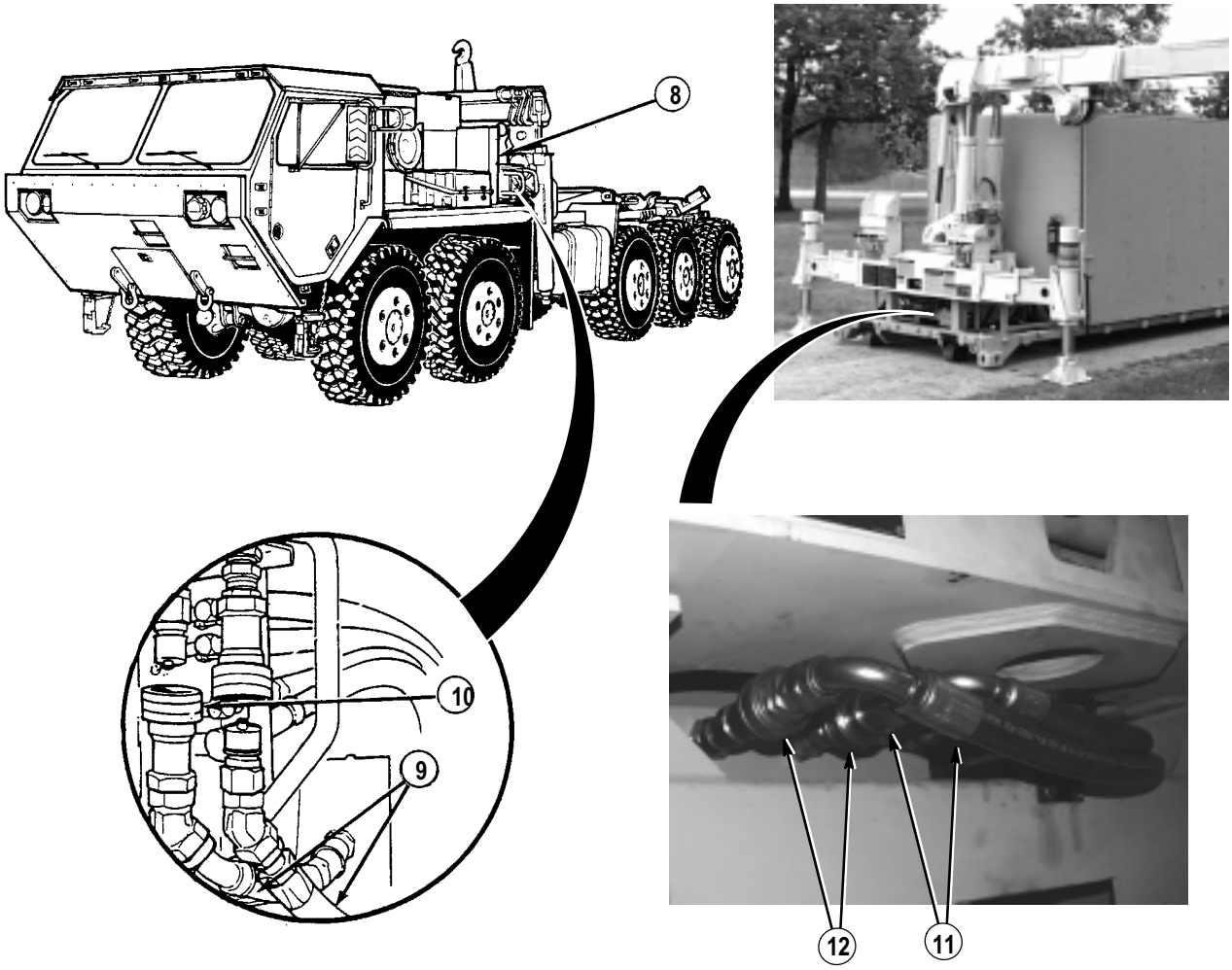
If FRS Crane is disabled and not fully stowed, remove hydraulic reservoir cap from PLS and FRS prior to starting the task to allow excess hydraulic oil to drain. Failure to comply may result in damage to hydraulic reservoir or hydraulic system.

NOTE

- This procedure can only be used if there are no leaks or breaks in the hydraulic system.
- This procedure is used to remove the load and stow the crane on FRS with a failed hydraulic pump or other failure which prevents operation of the hydraulic system.
- Two hoses are required to perform slave hydraulics. The FRS is equipped with a hydraulic slave hose. Remove return hose from PLS truck stowage box.
- If PLS is equipped with a hydraulic reservoir drain hose, position end of hose in a suitable container to catch excess hydraulic oil.

(1) Move truck into position so LHS control box (8) on PLS truck is side by side with FRS.

(2) Shut OFF engine and park truck (TM 9-2320-364-10).



WARNING

Hydraulic fluid is under great pressure. Engines on both PLS truck and FRS must be shut off while disconnecting hydraulic lines, Steps (3) through (8). Failure to do so could cause serious injury or death to personnel.

CAUTION

To prevent hydraulic contamination, keep hydraulic quick disconnects clean or damage to hydraulic system may result.

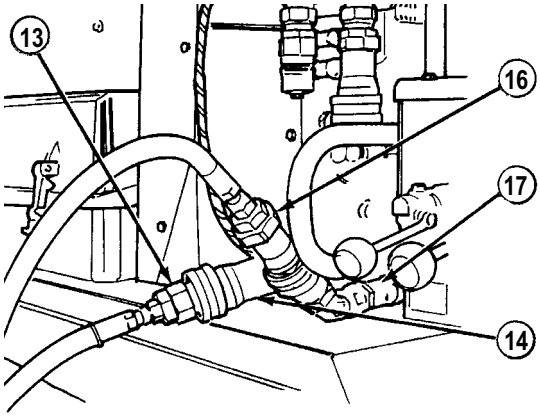
NOTE

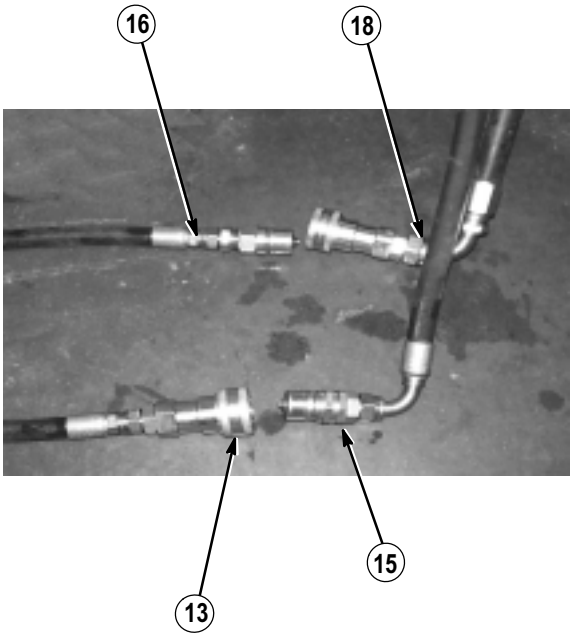
Quick disconnects are located on the back of the LHS control box and back of FRS.

(3) Disconnect hydraulic lines (9) quick disconnects (10) located on the back of the LHS control box (8).

(4) Disconnect hydraulic lines (11) quick disconnects (12) located on the back of the FRS.

2-42. FORWARD REPAIR SYSTEM (FRS) EMERGENCY PROCEDURES (CONT).





NOTE

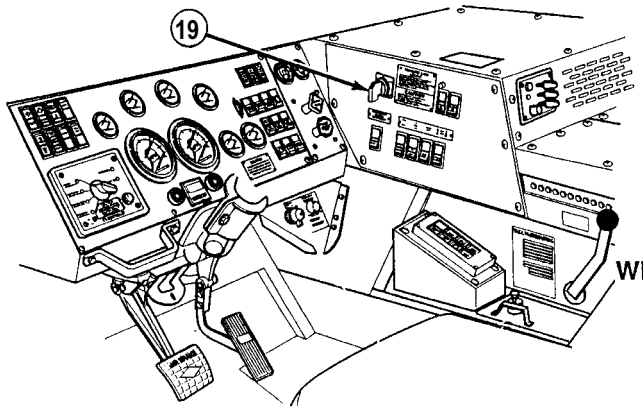
Supply slave hose is equipped with a flow control valve.

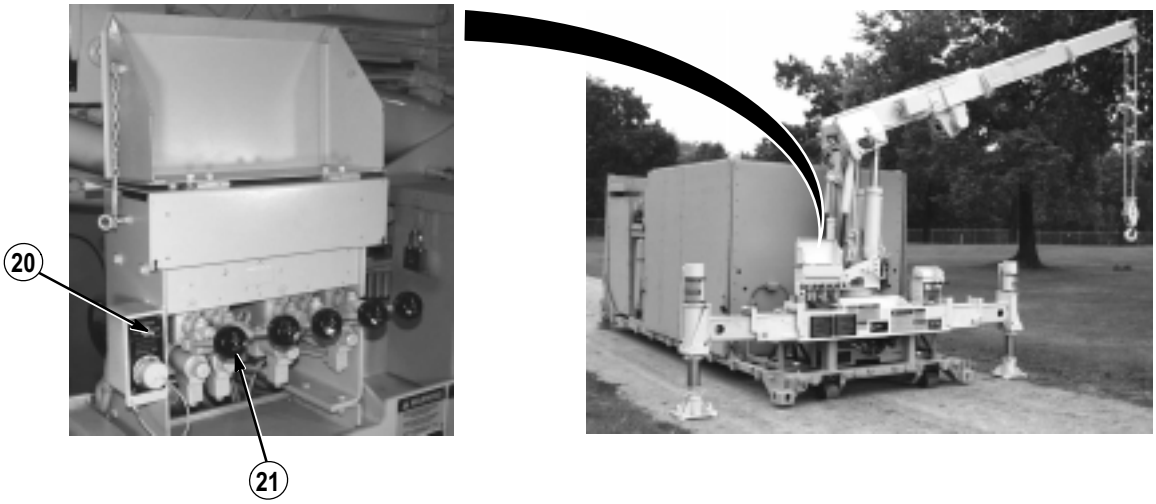
(5) Connect male end of supply slave hose (13) to female end of supply hose (14) on PLS truck.

(6) Connect female end of supply slave hose (13) to male end of supply hose quick disconnect (15) located on FRS.

(7) Connect female end of return slave hose (16) to male end of return hose (17) on PLS truck.

(8) Connect male end of return slave hose (16) to female return hose quick disconnect (18) located on FRS.





CAUTION

PLS truck engine speed must be at idle before using hydraulic selector switch or damage to equipment may result.

(9) Start engine on PLS truck and turn hydraulic selector switch (19) to AUTO position.

(10) If FRS crane has a failure in the hydraulic system but not the electrical system, go to Step (11). If both systems have failed, perform Steps (13) through (15).

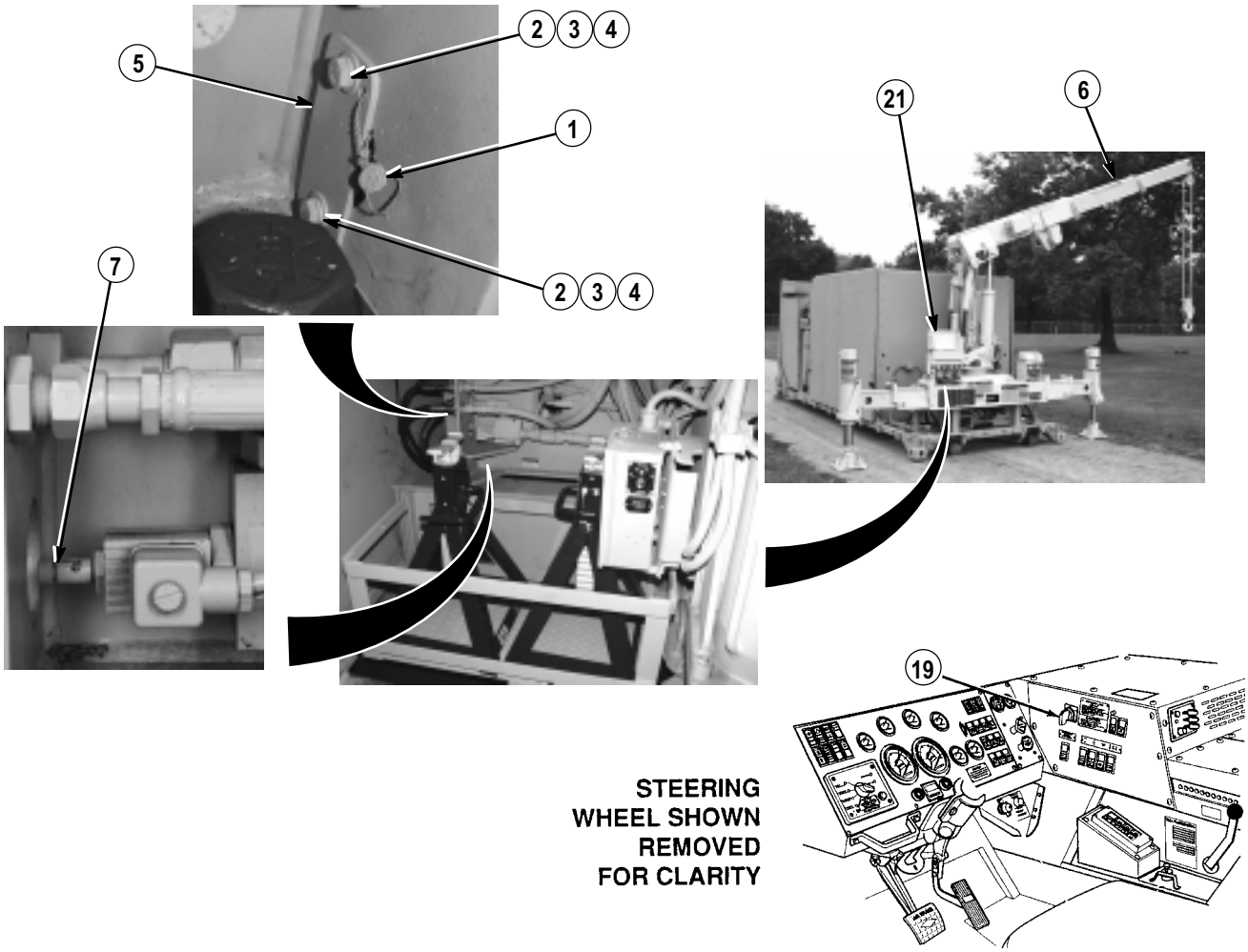
NOTE

Prior to removing load from crane, note position of crane.

(11) On FRS crane turn POWER switch (20) to ON. Operate main controls (21) to remove load from the FRS crane.

(12) On FRS crane turn POWER switch (20) to OFF. Go to Step (16).

2-42. FORWARD REPAIR SYSTEM (FRS) EMERGENCY PROCEDURES (CONT).



NOTE

Button may be stiff and hard to push in.

(13) Press in, twist counterclockwise and pull out MHC MANUAL OVERRIDE valve (7).

(14) Operate main controls (21) to remove load from the FRS crane.

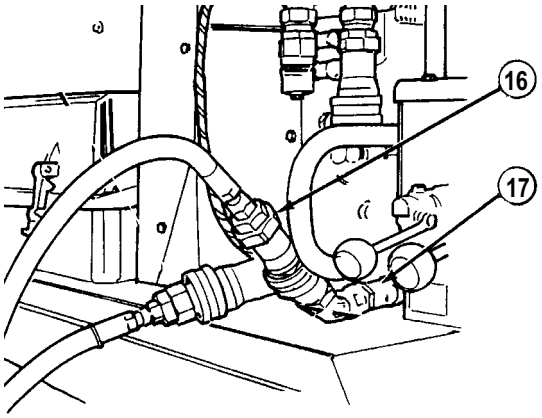
(15) Press in, twist clockwise and release MHC MANUAL OVERRIDE valve (7).

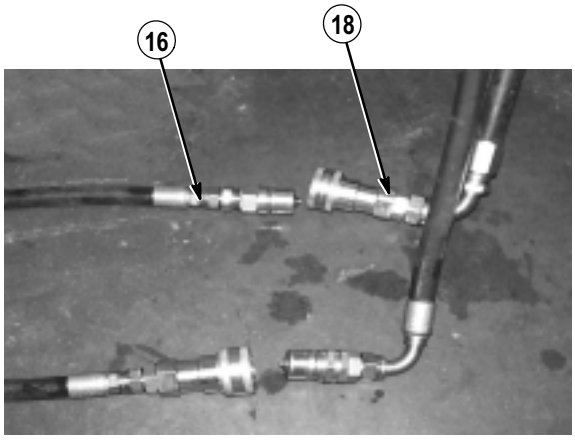
CAUTION

PLS truck engine speed must be at idle before using hydraulic selector switch, or damage to equipment may result.

(16) Turn hydraulic selector switch (19) to OFF position.

(17) Shut off engine on PLS truck.





WARNING

Hydraulic fluid is under great pressure. Engines on both PLS truck and FRS must be shut off while disconnecting hydraulic lines. Failure to do so could cause serious injury or death to personnel.

CAUTION

To prevent hydraulic contamination, keep hydraulic quick disconnects clean or damage to hydraulic system may result.

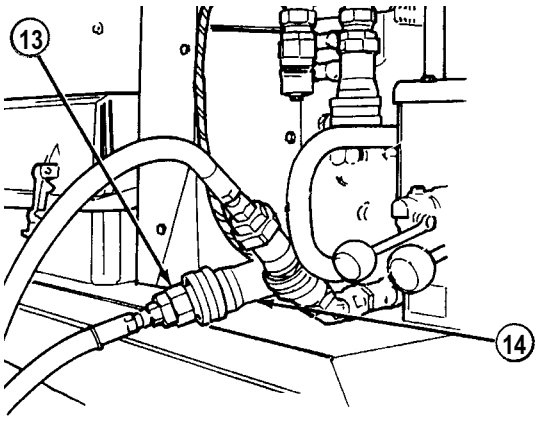
NOTE

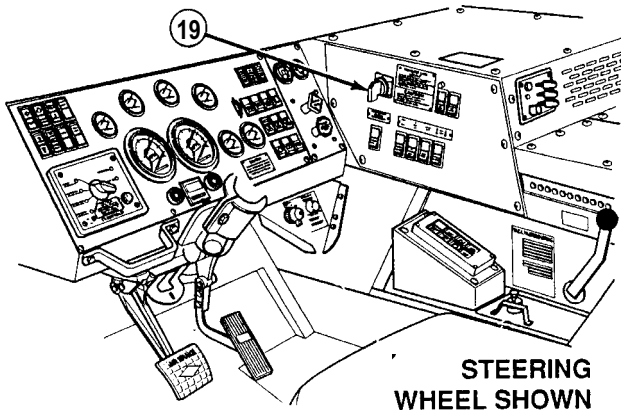
Quick disconnects are located on the back of the LHS control box and back of FRS.

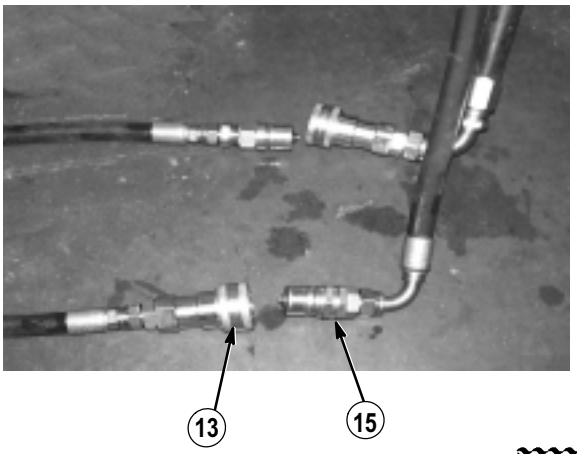
(18) Disconnect female end of return slave hose (16) from male end of return hose (17) on PLS truck.

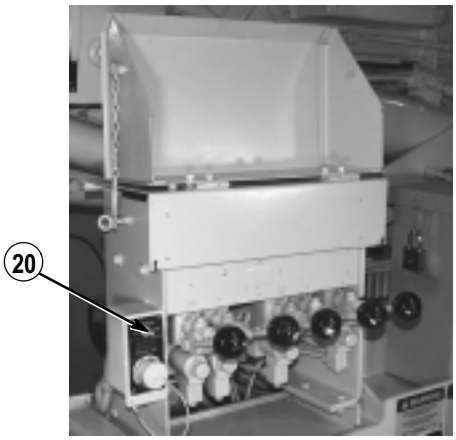
(19) Disconnect male end of return slave hose (16) from female return quick disconnect (18) located on back of FRS crane.

2-42. FORWARD REPAIR SYSTEM (FRS) EMERGENCY PROCEDURES (CONT).









CAUTION

PLS truck engine speed must be at idle before using hydraulic selector switch or damage to equipment may result.

(20) Start engine on PLS truck and turn hydraulic selector switch (19) to AUTO position.

(21) Turn FRS crane selector switch (20) to ON.

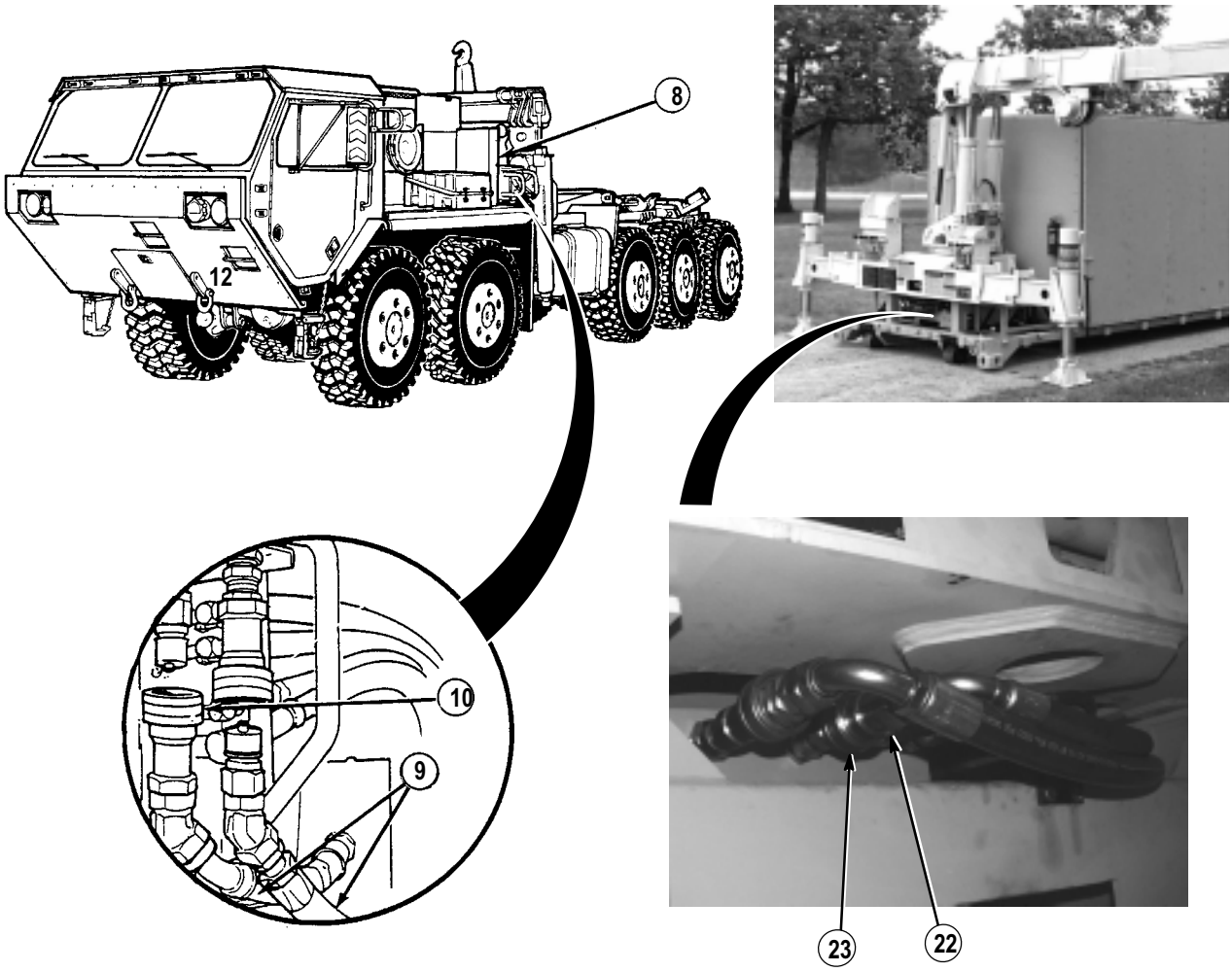
NOTE

- As you retract crane to stowed position, you must observe the FRS sight gage located on hydraulic reservoir to prevent overfilling the reservoir.
- When the hydraulic reservoir has reached the required level, reconnect return lines and continue to stow FRS crane.

(22) Return FRS crane to the stowed position (Para 2-29).

(23) Disconnect male end of supply slave hose (13) from female end of supply hose (14) on PLS truck.

(24) Disconnect female end of supply slave hose (13) from male end of supply quick disconnect (15) located on back of FRS.

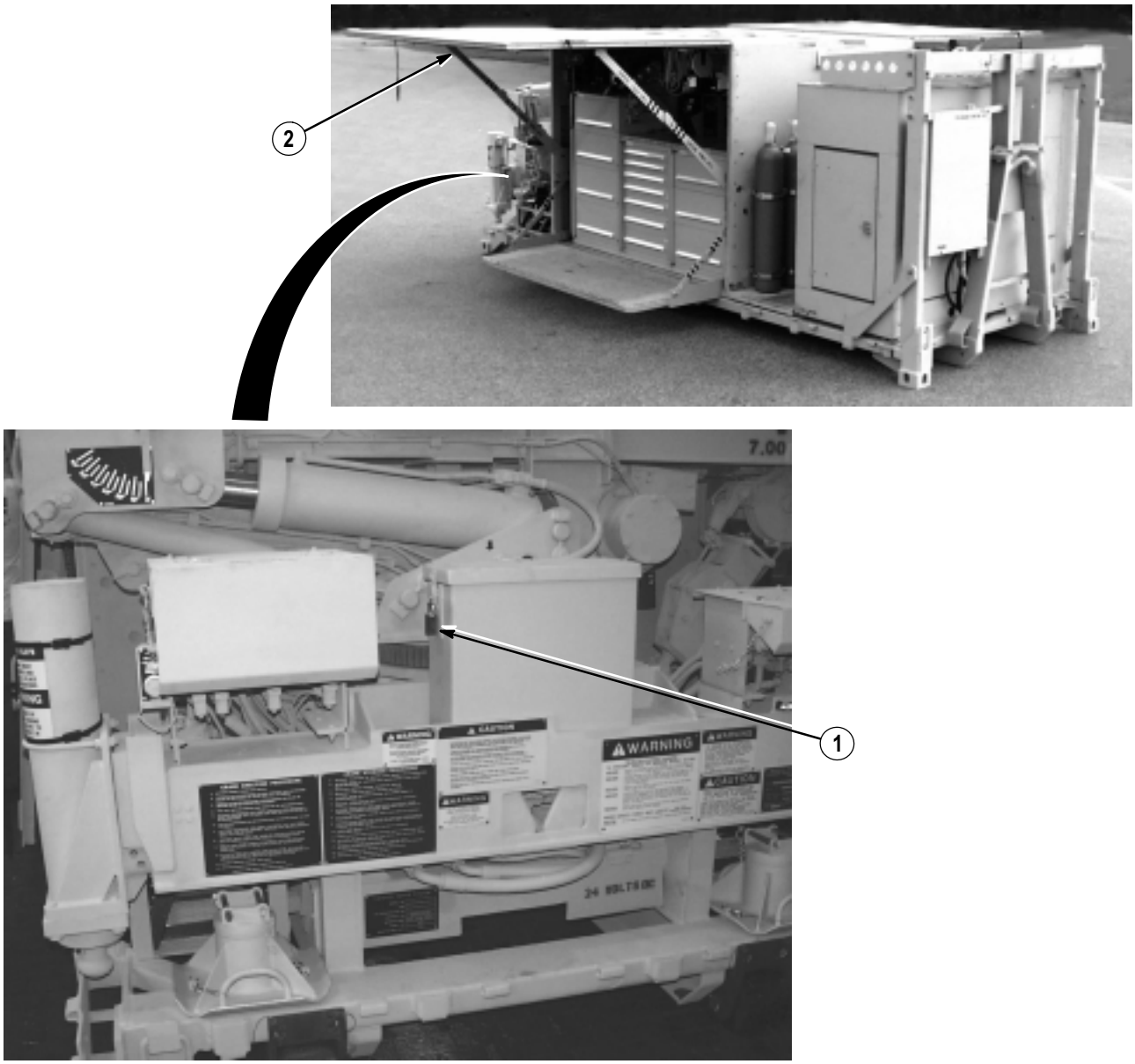


(25) Connect hydraulic lines (9) quick disconnects (10) located on the back of the LHS control box (8).

(26) Connect supply hose quick disconnect (22) to female quick disconnect (23) located on back of the FRS.

(27) When operations are completed, check hydraulic fluid levels in both PLS truck (TM 9-2320-364-10) and FRS (Para 2-11). Fill if necessary.

2-43. SECURE FORWARD REPAIR SYSTEM (FRS).



(1) Lock crane remote stowage box (1).

(2) Lock FRS shelter doors (2). Refer to shelter door assembly and platform operation (Para 2-33).

CHAPTER 3
OPERATOR MAINTENANCE

Section I. LUBRICATION INSTRUCTIONS

3-1. INTRODUCTION.

Refer to Appendix G for lubrication procedures for the Forward Repair System (FRS).

Section II. TROUBLESHOOTING PROCEDURES

3-2. TROUBLESHOOTING INTRODUCTION.

Table 3-1 lists common malfunctions that you may find with your equipment. Perform the tests, inspections and corrective actions in the order they appear in the table. This table cannot list all malfunctions that may occur, all tests or inspections needed to find the fault or all corrective actions needed to correct the fault. If a malfunction is not listed or actions listed do not correct the fault, notify your supervisor.

3-3. TROUBLESHOOTING SYMPTOMS.

To quickly find a troubleshooting procedure, use the Malfunction Index. Table 3-1 contains the operator troubleshooting steps.

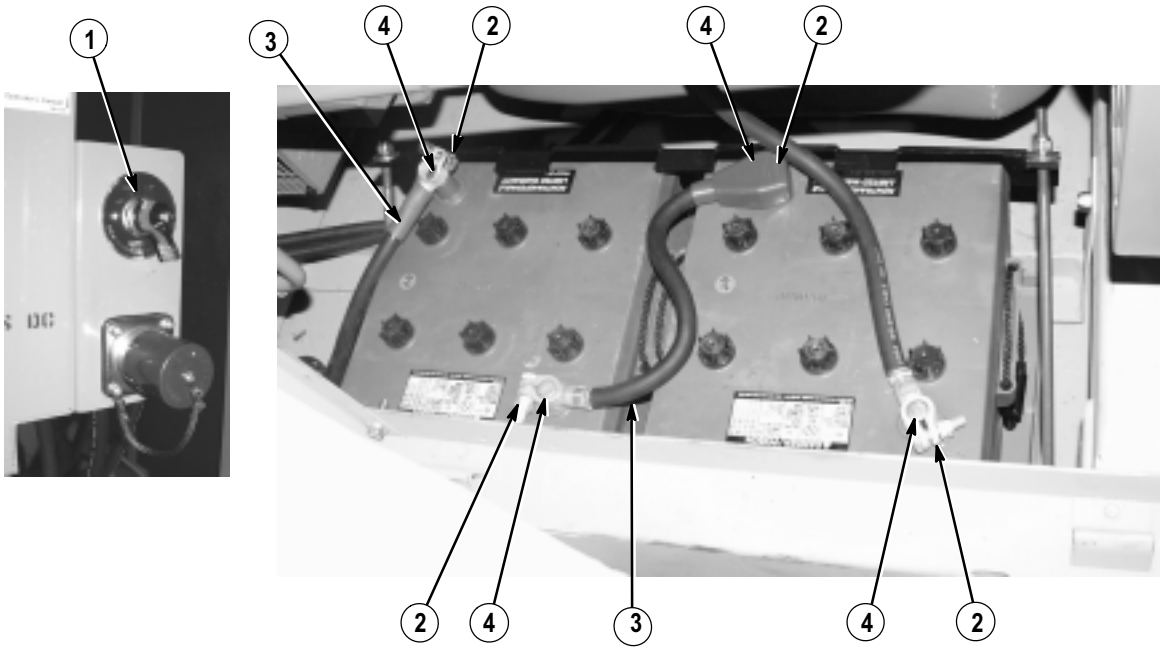
MALFUNCTION INDEX

Table 3-1. Troubleshooting

Malfunction Test or Inspection Corrective Action

GENERATOR

1. ENGINE WILL NOT CRANK OR CRANKS SLOWLY.



WARNING

Lead-acid battery gases can explode. Do not smoke, have open flames, or make sparks around a battery, expecially if caps are off. If a battery is gassing, it can explode and cause injury to personnel.

Step 1. Check that Master Disconnect Switch (1) is in the ON position.

- Position Master Disconnect Switch (1) in ON position.

Step 2. Check for dirty battery cable connections (2) or loose or broken battery cables (3) or posts (4).

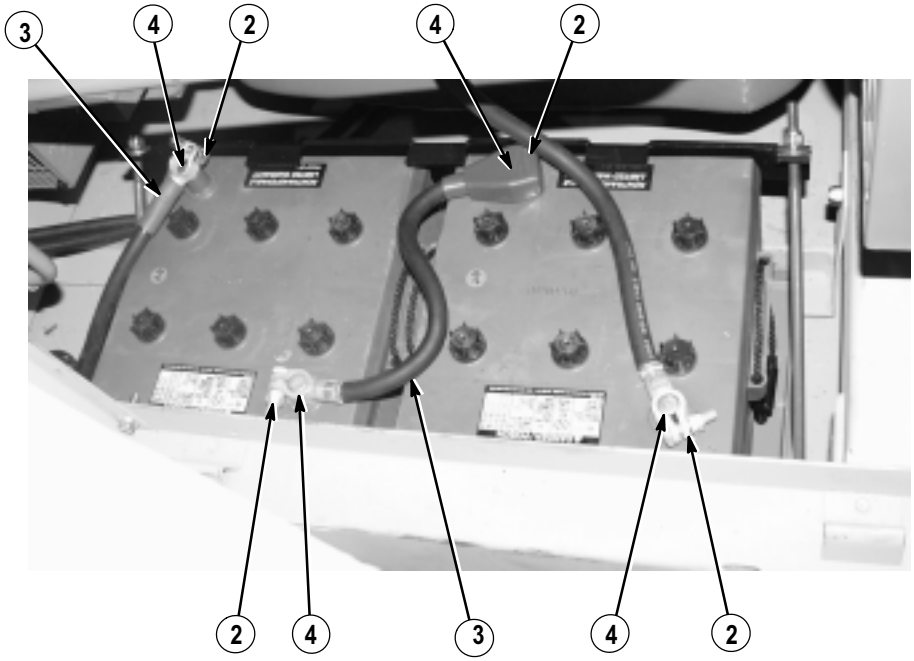
- If battery connections are dirty, or cable or posts are damaged, notify Unit Maintenance.

Table 3-1. Troubleshooting - CONT.

Malfunction Test or Inspection Corrective Action

GENERATOR (CONT)

2. ENGINE CRANKS BUT FAILS TO START.



WARNING

Lead-acid battery gases can explode. Do not smoke, have open flames, or make sparks around a battery, expecially if caps are off. If a battery is gassing, it can explode and cause injury to personnel.

Step 1. Check for dirty battery cable connections (1) or loose or broken battery cables (2) or posts (3).

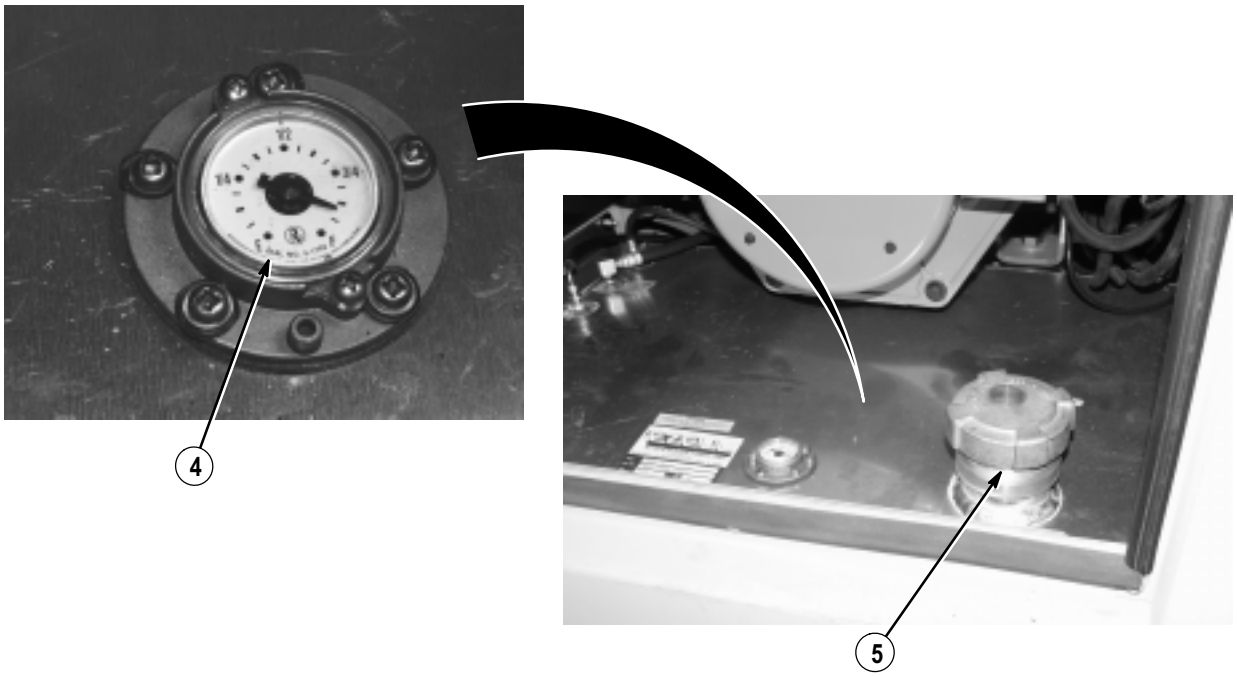
- If battery connections are dirty, or cable or posts are damaged, notify Unit Maintenance.

Table 3-1. Troubleshooting - CONT.

Malfunction Test or Inspection Corrective Action

GENERATOR (CONT)

2. ENGINE CRANKS BUT FAILS TO START (CONT).



Fuel is very flammable and can explode easily. To avoid serious injury or death, keep fuel away from open fire and keep fire extinguisher within easy reach when working with fuel. Do not work on fuel system when engine is hot. Fuel can be ignited by hot engine.

Step 2. Check indication on fuel gage (4).

Step 3. Visually check fuel level in fuel tank (5).

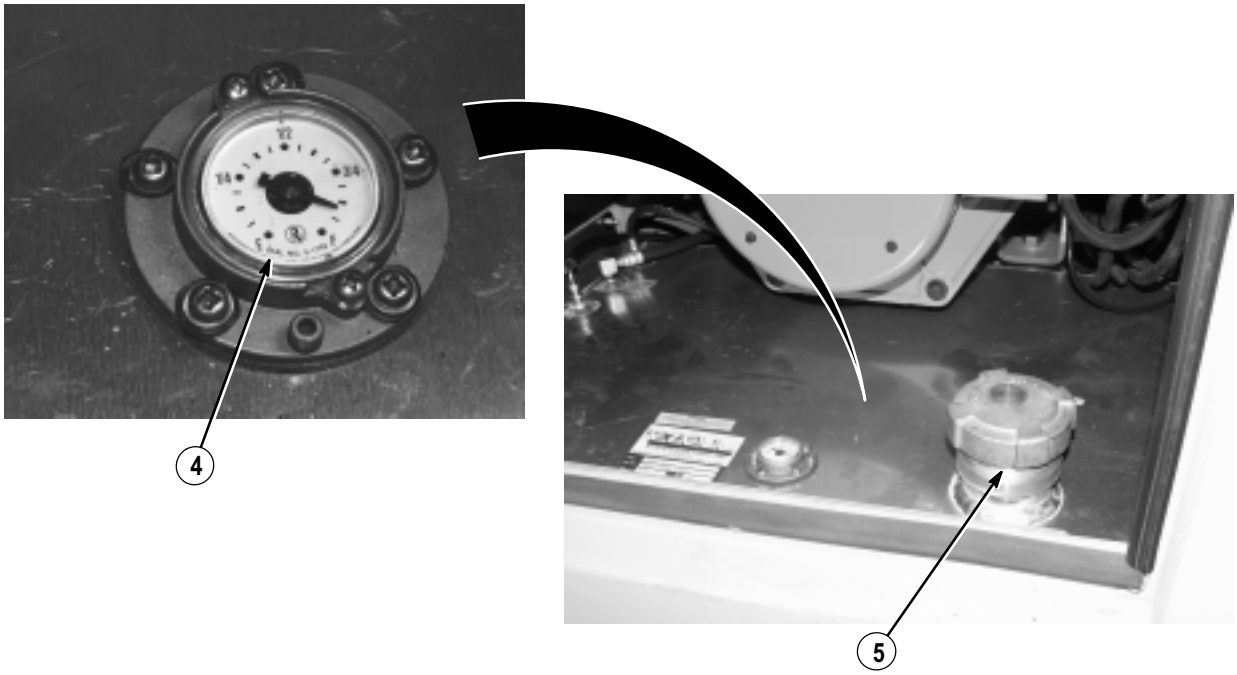
- If fuel tank is empty, add fuel to tank (Para 2-16), prime system (Para 3-4) and try again. If condition persists, notify Unit Maintenance.

Table 3-1. Troubleshooting - CONT.

Malfunction Test or Inspection Corrective Action

GENERATOR (CONT)

3. ENGINE CRANKS BUT FAILS TO START, NO SMOKE FROM EXHAUST.



WARNING

Fuel is very flammable and can explode easily. To avoid serious injury or death, keep fuel away from open fire and keep fire extinguisher within easy reach when working with fuel. Do not work on fuel system when engine is hot. Fuel can be ignited by hot engine.

Step 1. Check indication on fuel gage (1).

Step 2. Visually check fuel level in fuel tank (2).

- If fuel tank is empty, add fuel to tank (Para 2-16), prime system (Para 3-4) and try again. If condition persists, notify Unit Maintenance.

Table 3-1. Troubleshooting - CONT.

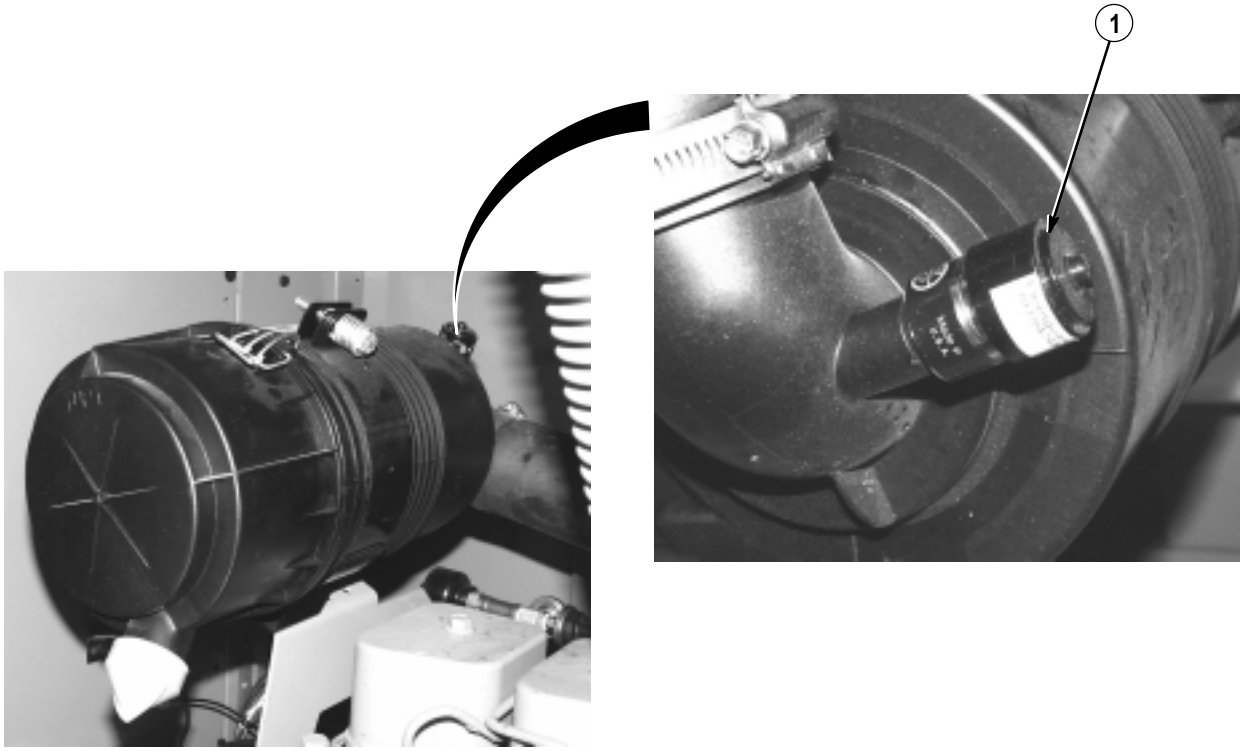
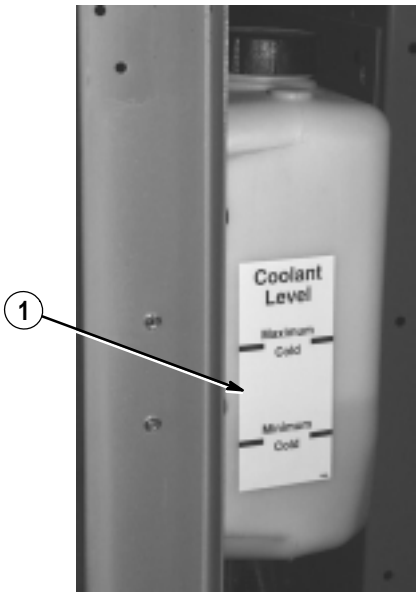
Malfunction Test or Inspection Corrective Action
GENERATOR (CONT)
4. EXCESSIVE BLACK SMOKE FROM EXHAUST.

Step 1. Check air filter restriction indicator (1) for condition of air cleaner element. • If air filter restriction indicator indicates a dirty air cleaner element, notify Unit Maintenance. • If air filter restriction indicator indicates air cleaner element is not dirty, notify Unit Maintenance.

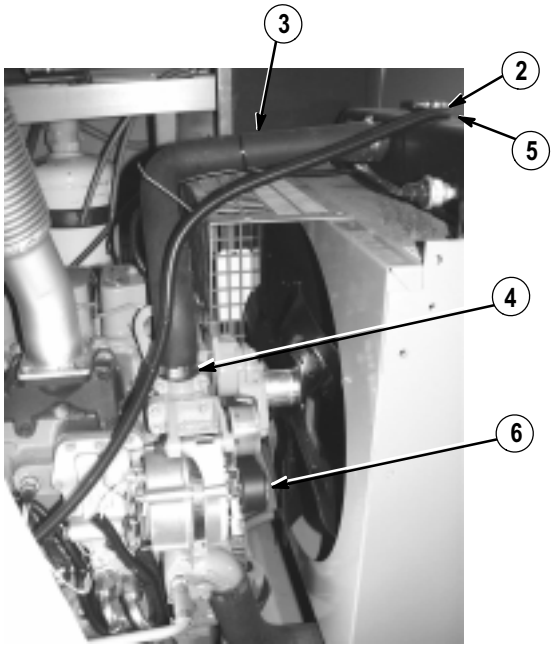
Table 3-1. Troubleshooting - CONT.

Malfunction Test or Inspection Corrective Action

GENERATOR (CONT)

5. COOLANT TEMPERATURE IS ABOVE NORMAL.





WARNING

- Radiator coolant can be extremely hot and cause severe burns.
- Use extreme caution when checking radiator hoses and clamps or injury to personnel may result.

Step 1. Check for proper coolant level (1).

- If coolant is low, fill to correct level (Appendix G).

Step 2. Check for missing or loose radiator cap (2).

Step 3. Check radiator hoses (3) and clamps (4) and radiator (5) for leaks.

- Tighten loose hose clamps.
- If radiator or hoses leak, notify Unit Maintenance.

Step 4. Check drive belt (6) is installed properly and is not worn or missing.

- If fan belt is worn or missing, notify Unit Maintenance.

Table 3-1. Troubleshooting - CONT.

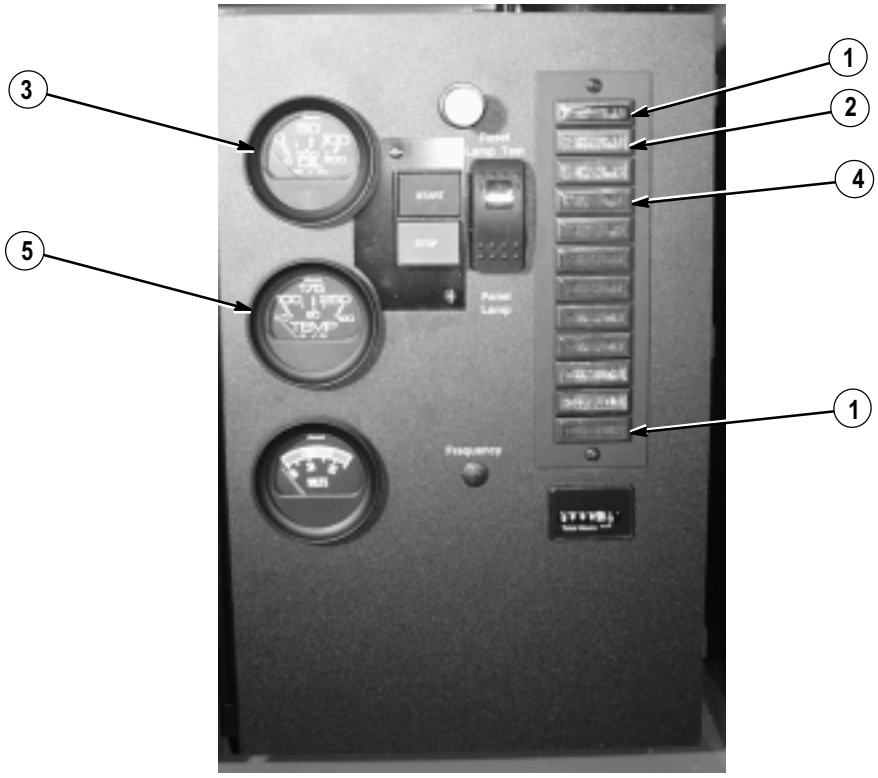
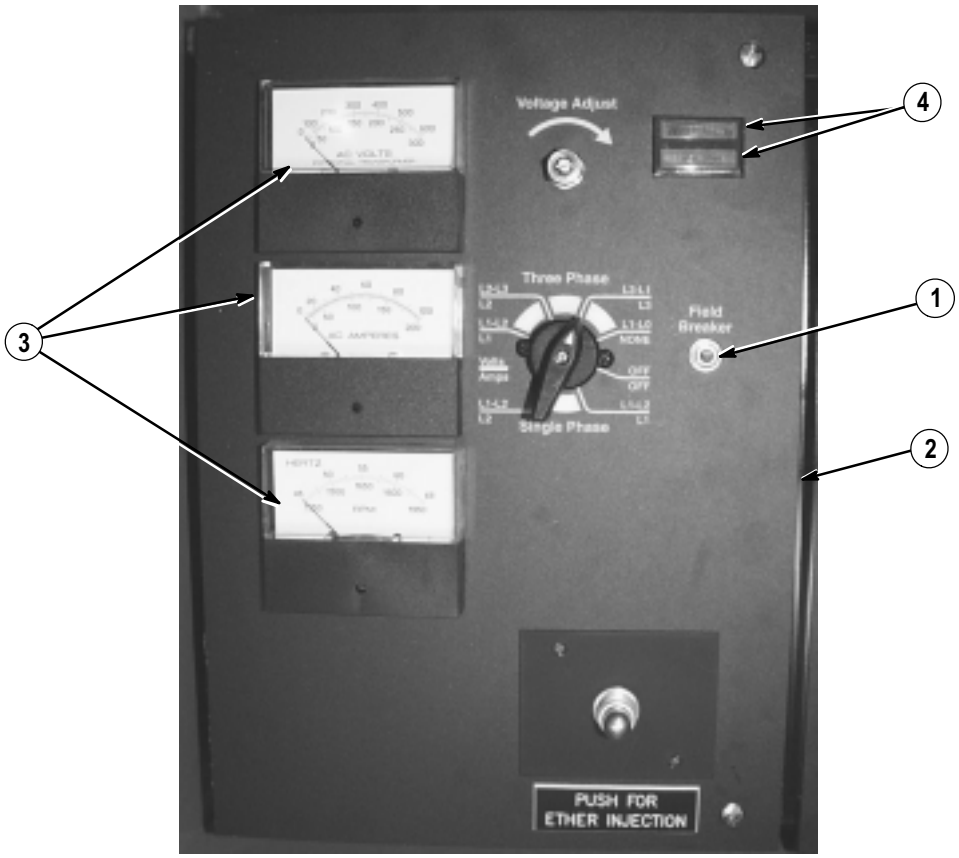
Malfunction Test or Inspection Corrective Action
GENERATOR (CONT) **6. ENGINE CHECK INDICATOR LAMP OR LAMPS ARE ON.**    Step 1. Check indicator lamps (1). Lamps indicate a potential engine failure (low oil pressure, low coolant, coolant overheating) has occurred. • Check gages and shut down engine. Gages should read as follows: Oil pressure 10 psi (69 kPa) at idle; Water Temp gage below 203 degrees F (95 C). • Check engine oil level (Para 2-11) if OIL PRESS gage indicates low reading add oil and recheck gage. If condition still exists, notify Unit Maintenance. • Check coolant level (Para 2-11) if Water Temp gage indicates high reading, add coolant (Appendix G) and recheck gage. If condition still exists, notify Unit Maintenance. Step 2. If LO OIL PRES lamp (2) is on, check engine oil pressure gage (3) and if HI ENG TEMP (4) is on check water temperature gage (5). If both indicate normal, proceed with mission and then notify Unit Maintenance. If either one does not indicate normal, stop engine immediately and notify Unit Maintenance.

Table 3-1. Troubleshooting - CONT.

Malfunction Test or Inspection Corrective Action

GENERATOR (CONT)

7. NO AC OUTPUT VOLTAGE OR VOLTAGE NOT WITHIN SPECIFIED LIMITS 110 - 120.



Step 1. Check if field breaker (1) on AC instrument panel (2) has been tripped.

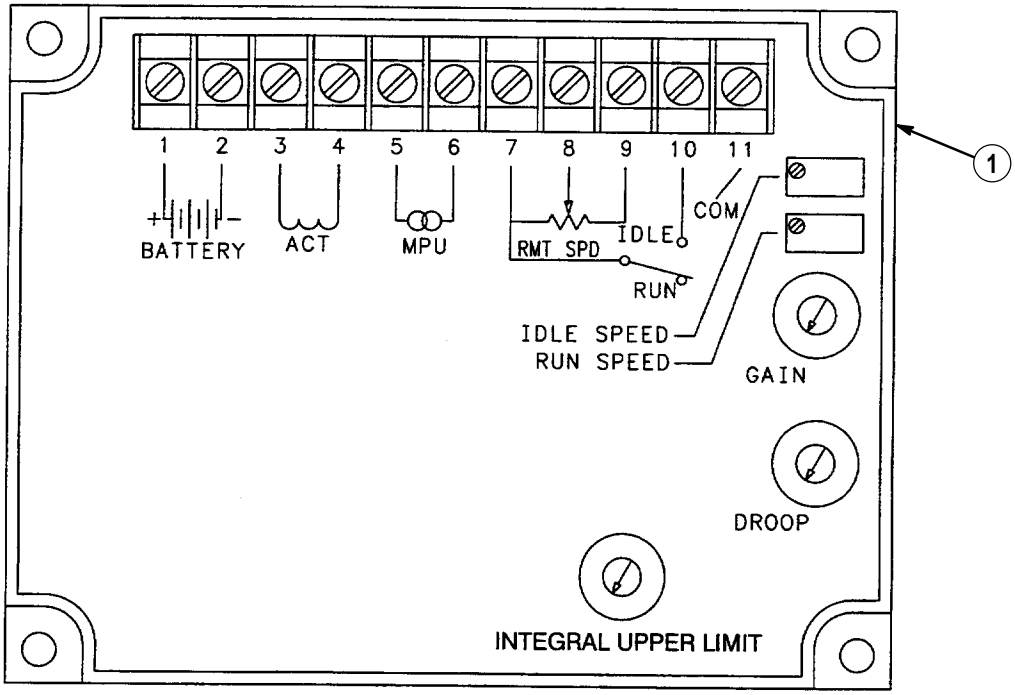
- Reset breaker and try again. If breaker trips again notify Unit Maintenance.

Step 2. Check gages (3) and indicator lamps (4) on AC instrument panel (2) indicate (no voltage, low voltage, high voltage).

- Gages should read as follows:
  AC Voltage 110–120v, AC Ampers 0 - 100 amps and Frequency/RPM 60 Hz at 1800 RPM.
  If any gage does not indicate normal, notify Unit Maintenance.

Table 3-1. Troubleshooting - CONT.

Malfunction Test or Inspection Corrective Action
GENERATOR (CONT)
8. ENGINE HUNTS UPON START-UP.



Step 1. Check for type of fuel being used (Para 2-16).

- Minor adjustment to the governor controller (1) may be required depending upon type of fuel used (Para 3-7a).

Step 2. Check for extreme change in ambient temperature.

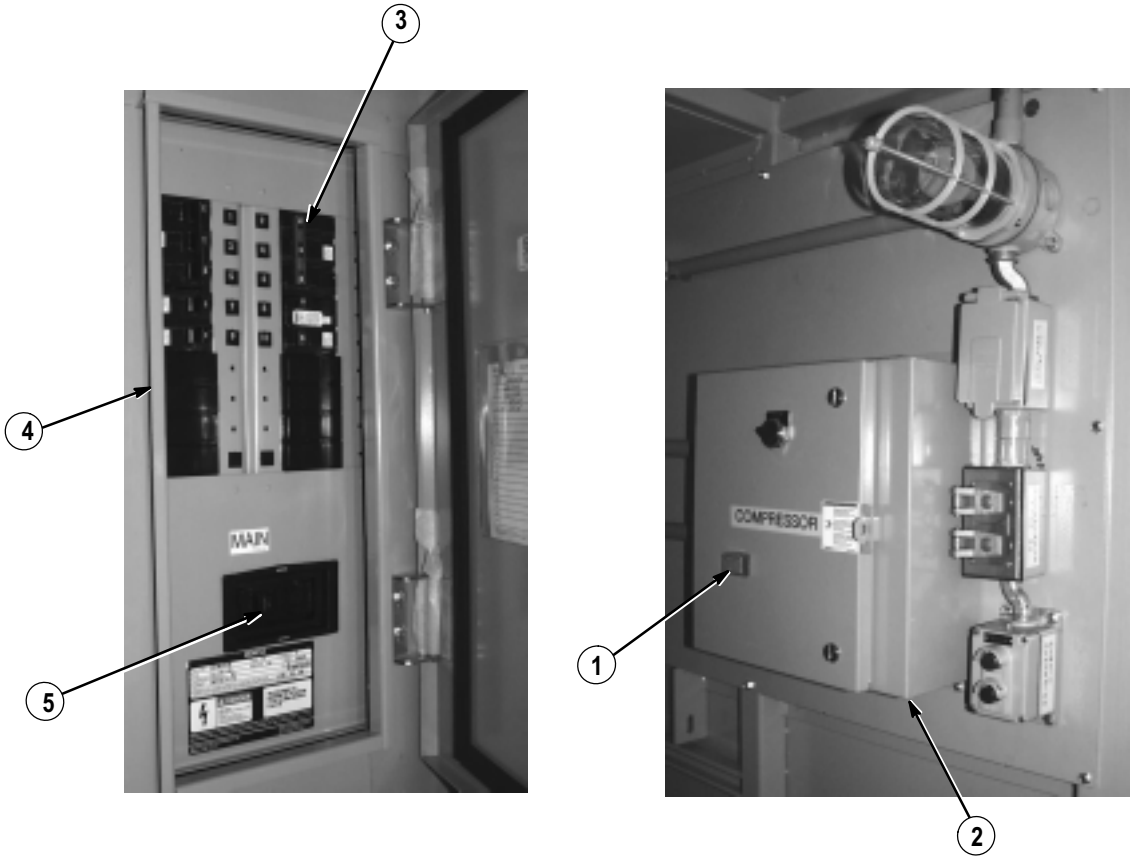
- If operating at extreme temperature conditions adjust governor controller (1) (Para 3-7b).

Table 3-1. Troubleshooting - CONT.

Malfunction Test or Inspection Corrective Action

AIR COMPRESSOR

1. FAILS TO START.



Step 1 Check oil compressor oil level.

Step 2. Press RESET button (1) on Air Compressor Control Box (2).

Step 3. Check if air compressor circuit breaker (3) on 120/208 MAIN PANEL (4) has been tripped.

- Reset breaker and try again. If breaker trips, notify Unit Maintenance.

Step 4. Check if MAIN circuit breaker (5) on 120/208 MAIN PANEL (4) is in ON position.

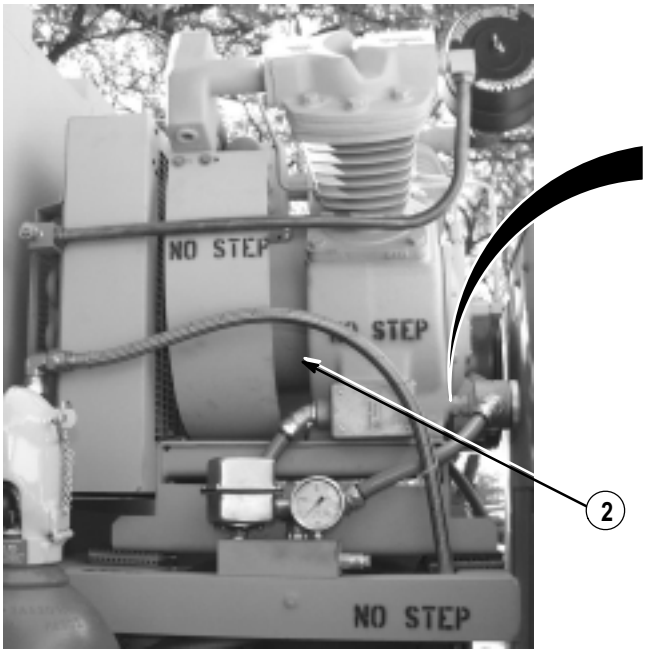
- Position circuit breaker in ON position.
- If problem still exists, notify Unit Maintenance.

Table 3-1. Troubleshooting - CONT.

Malfunction Test or Inspection Corrective Action

AIR COMPRESSOR (CONT)

2. STARTS BUT FAILS TO STAY RUNNING OR SHUTS DOWN DURING NORMAL OPERATION.



Step 1. Check crankcase oil level (1) on air conpressor (2).

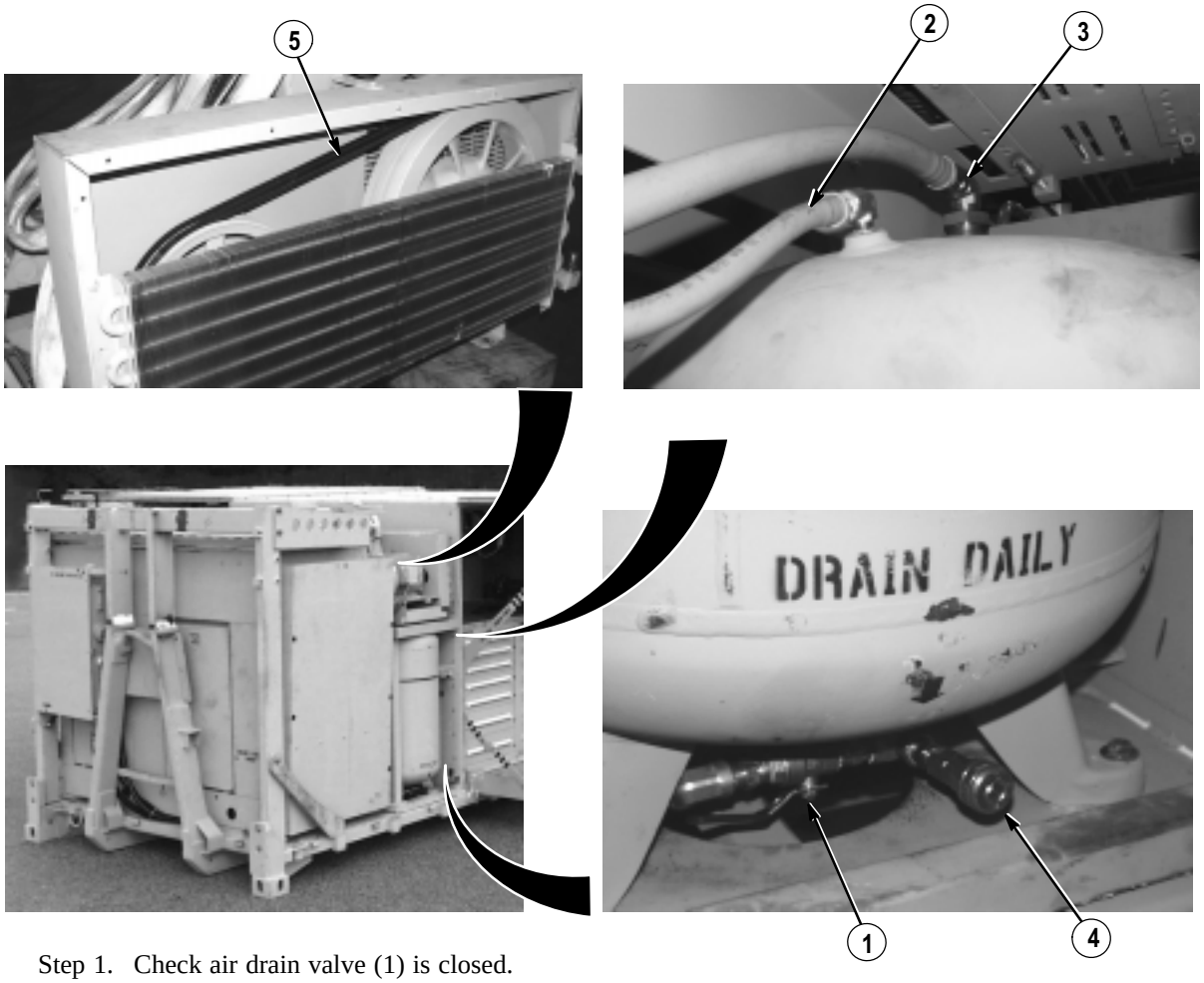
- If oil level is low, add oil (Appendix G).
- If oil level is normal and problem still exists, notify Unit Maintenance.

Table 3-1. Troubleshooting - CONT.

Malfunction Test or Inspection Corrective Action

AIR COMPRESSOR (CONT)

3. FAILS TO BUILD-UP AIR PRESSURE.



Step 1. Check air drain valve (1) is closed.

- Close air drain valve.

Step 2. Listen for leaks at hoses (2), fittings (3) and connectors (4).

- If leaks are found, tighten connectors and fittings.
- If problem still exists, notify Unit Maintenance.

Step 3. Check condition of drivebelt (5).

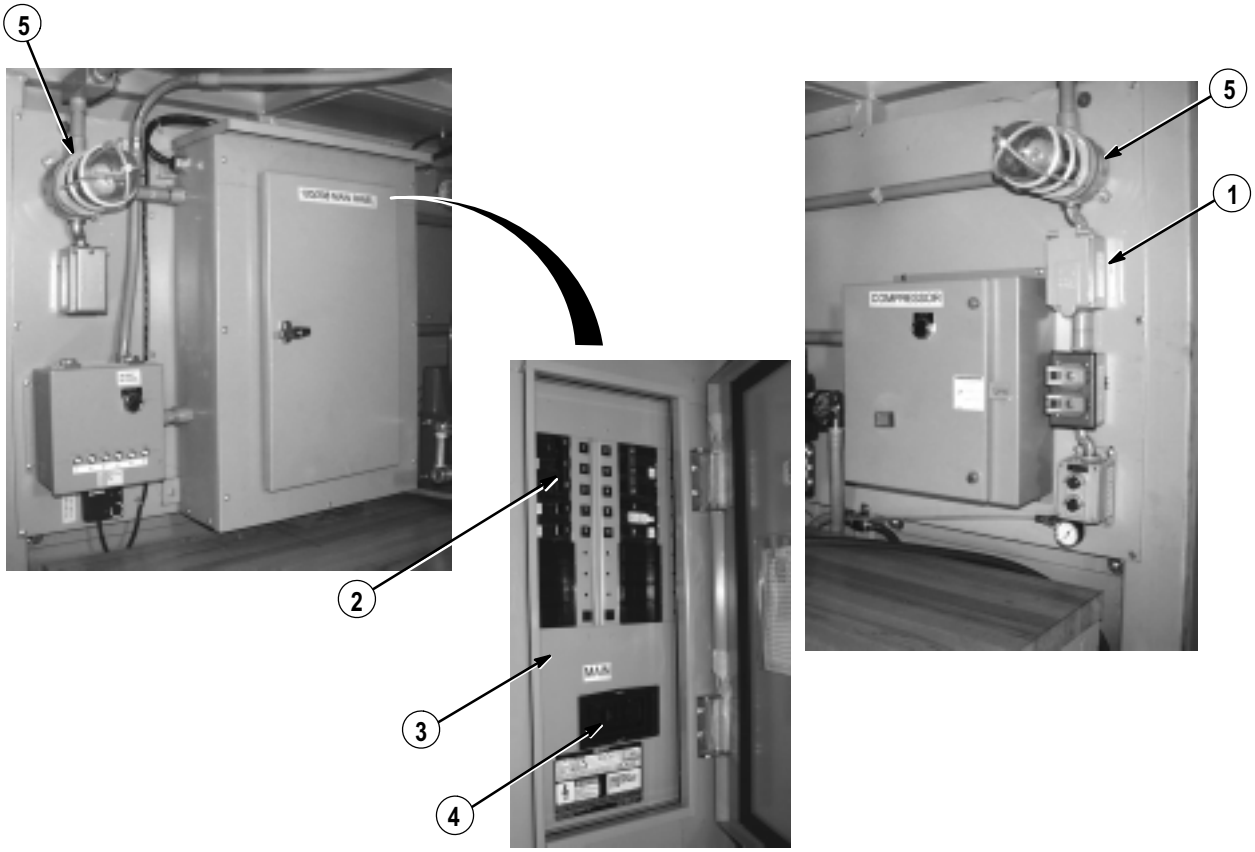
- If drivebelt is worn or damaged, notify Unit Maintenance.

Table 3-1. Troubleshooting - CONT.

Malfunction Test or Inspection Corrective Action

SHELTER INTERIOR ELECTRICAL

1. ONE OR MORE LIGHTING FIXTURES ARE NOT OPERATING PROPERLY.



Step 1. Check lighting system switches (1) are in ON position.

- Position lighting system switch to ON position.

Step 2. Check lighting system circuit breaker No. 10 (2) on 120/208 MAIN PANEL (3) has been tripped.

- Reset breaker and try again, if breaker trips again, notify Unit Maintenance.

Step 3. Check MAIN circuit breaker (4) on 120/208 MAIN PANEL (3) is in ON position.

- Position circuit breaker in ON position.

Step 4. Check all lightbulbs in light fixture (5).

- If a lightbulb doesn't work, check condition of lightbulb. If unserviceable, notify Unit Maintenance.
- If problem still exists, notify Unit Maintenance.

Table 3-1. Troubleshooting - CONT.

Malfunction Test or Inspection Corrective Action

SHELTER INTERIOR ELECTRICAL (CONT)

2. ONE OR BOTH WORKLIGHT FIXTURES ARE NOT OPERATING PROPERLY.

Step 1. Check worklight switch (1) is in ON position.

- Position worklight switch to ON position.

Step 2. Check worklight circuit breaker No. 8 (2) on 120/208 MAIN PANEL (3) has been tripped.

- Reset breaker and try again, if breaker trips again, notify Unit Maintenance.

Step 3. Check MAIN circuit breaker (4) on 120/208 MAIN PANEL (3) is in ON position.

- Position circuit breaker in ON position.

Step 4. Check lightbulb in worklight.

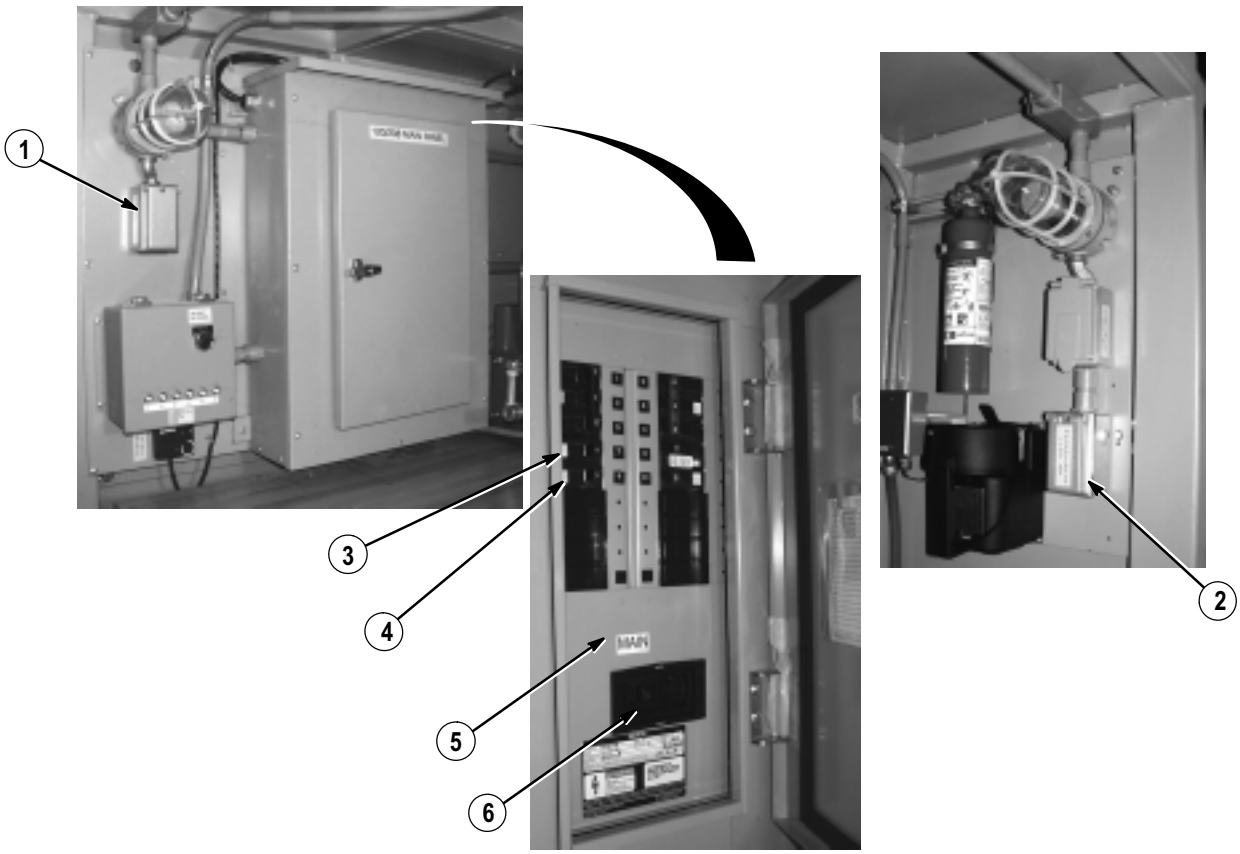
- If a lightbulb doesn't work, check condition of lightbulb. If unserviceable, notify Unit Maintenance.
- If problem still exists, notify Unit Maintenance.

Table 3-1. Troubleshooting - CONT.

Malfunction Test or Inspection Corrective Action

SHELTER INTERIOR ELECTRICAL (CONT)

3. ONE OR MORE RECEPTACLES ARE NOT OPERATING PROPERLY.



Step 1. Check Ground Fault Circuit Interupt (GFCI) circuit breaker on receptacle (1) and (2) have been tripped.

- Reset GFCI breaker(s) and try again, if breaker(s) trips again, notify Unit Maintenance.

Step 2. Check receptical circuit breaker No. 7 (3) and No. 9 (4) on 120/208 MAIN PANEL (5) have been tripped.

- Reset receptacle circuit breaker(s) and try again, if breaker(s) trips again, notify Unit Maintenance.

Step 3. Check MAIN circuit breaker (6) on 120/208 MAIN PANEL (5) is in ON position.

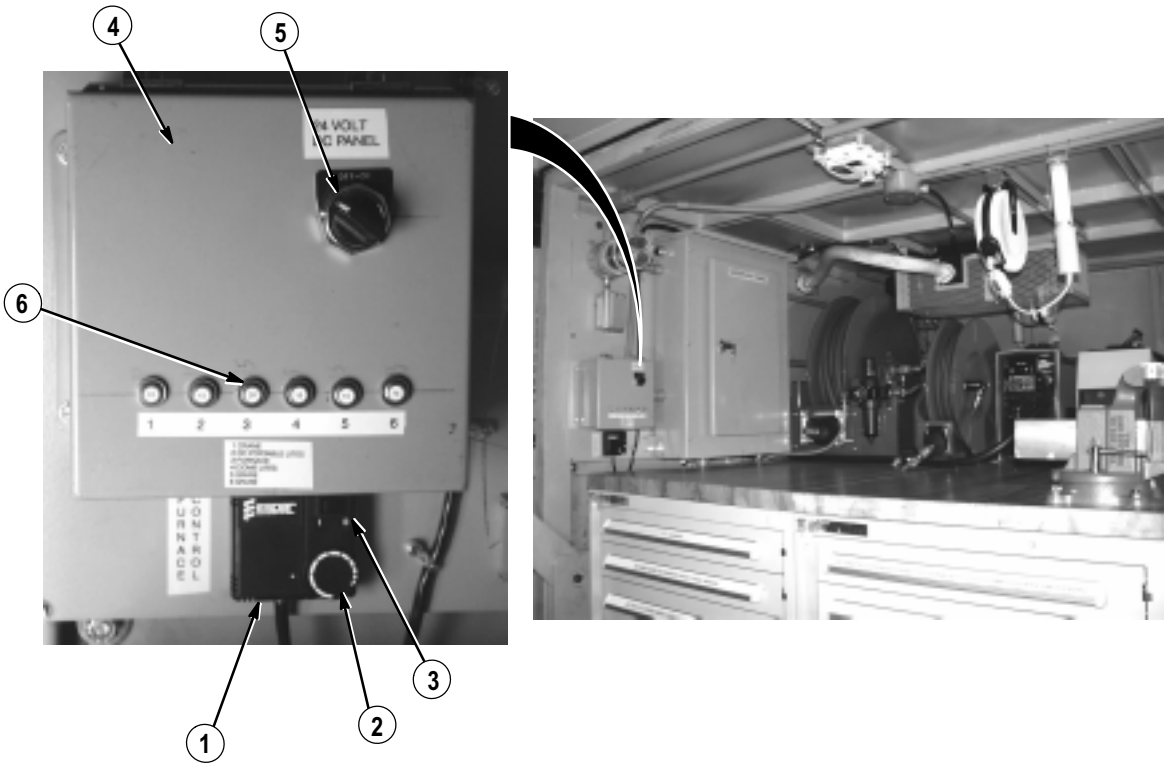
- Position MAIN circuit breaker in ON position.

Table 3-1. Troubleshooting - CONT.

Malfunction Test or Inspection Corrective Action

SHELTER HEATER

1. HEATER FAILS TO START OR DOES NOT STAY RUNNING.



Step 1. Check HEATER thermostat (1) power switch (2) is in ON position and green and red operating light (3) is on.

- Position power switch to ON position.

Step 2. Check 24 VOLT DC PANEL (4) power switch (5) is in ON position.

- Position power switch to ON position.

Step 3. Visually check fuel level in fuel tank.

- If fuel tank is empty, add fuel to tank (Para 2-16).

Step 4. Check HEATER circuit breaker No. 3 (6) on 24 VOLT DC PANEL (4) has been tripped.

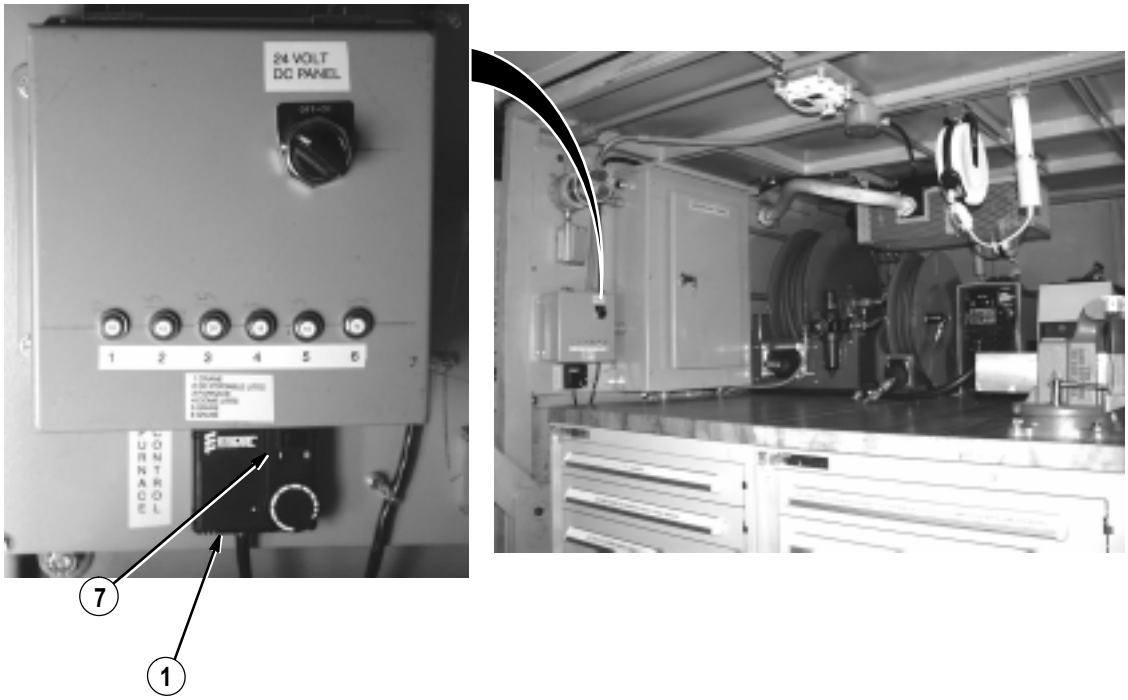
- Reset breaker and try again. If breaker trips, notify Unit Maintenance.

Table 3-1. Troubleshooting - CONT.

Malfunction Test or Inspection Corrective Action

SHELTER HEATER (CONT)

1. HEATER FAILS TO START OR DOES NOT STAY RUNNING (CONT).



Step 5. Check heater thermostat (1) green light (7) for blinking fault code.

- If green light on thermostat is blinking, notify Unit Maintenance.

NOTE

The heater will automatically shutdown if overheating occurs. The thermostat green light will flash on and off to indicate an overheat situation.

Step 6. Check air intake screen and air outlet for obstruction.

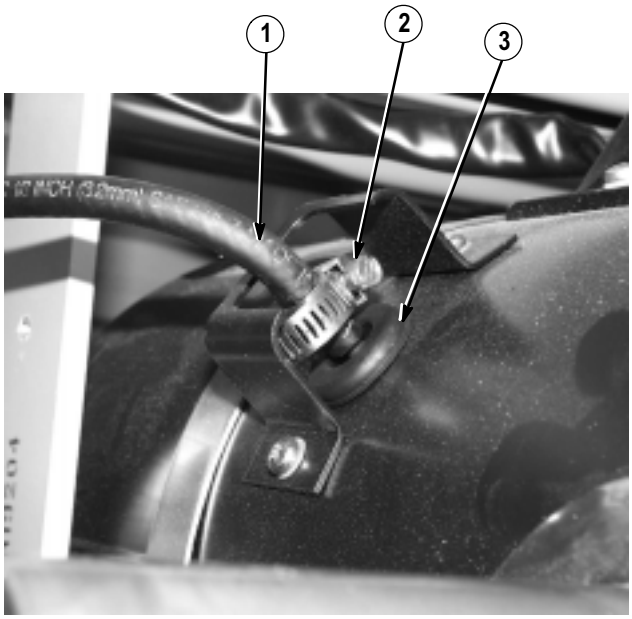
- Clear any obstruction and restart heater.
- If condition persists, notify Unit Maintenance.

Table 3-1. Troubleshooting - CONT.

Malfunction Test or Inspection Corrective Action

SHELTER HEATER (CONT)

1. HEATER FAILS TO START OR DOES NOT STAY RUNNING (CONT).



WARNING

Fuel is very flammable and can explode easily. To avoid serious injury or death, keep fuel away from open fire and keep fire extinguisher within easy reach when working with fuel. Do not work on fuel system when engine is hot. Fuel can be ignited by hot engine.

Step 7. Heater may need to be primed.

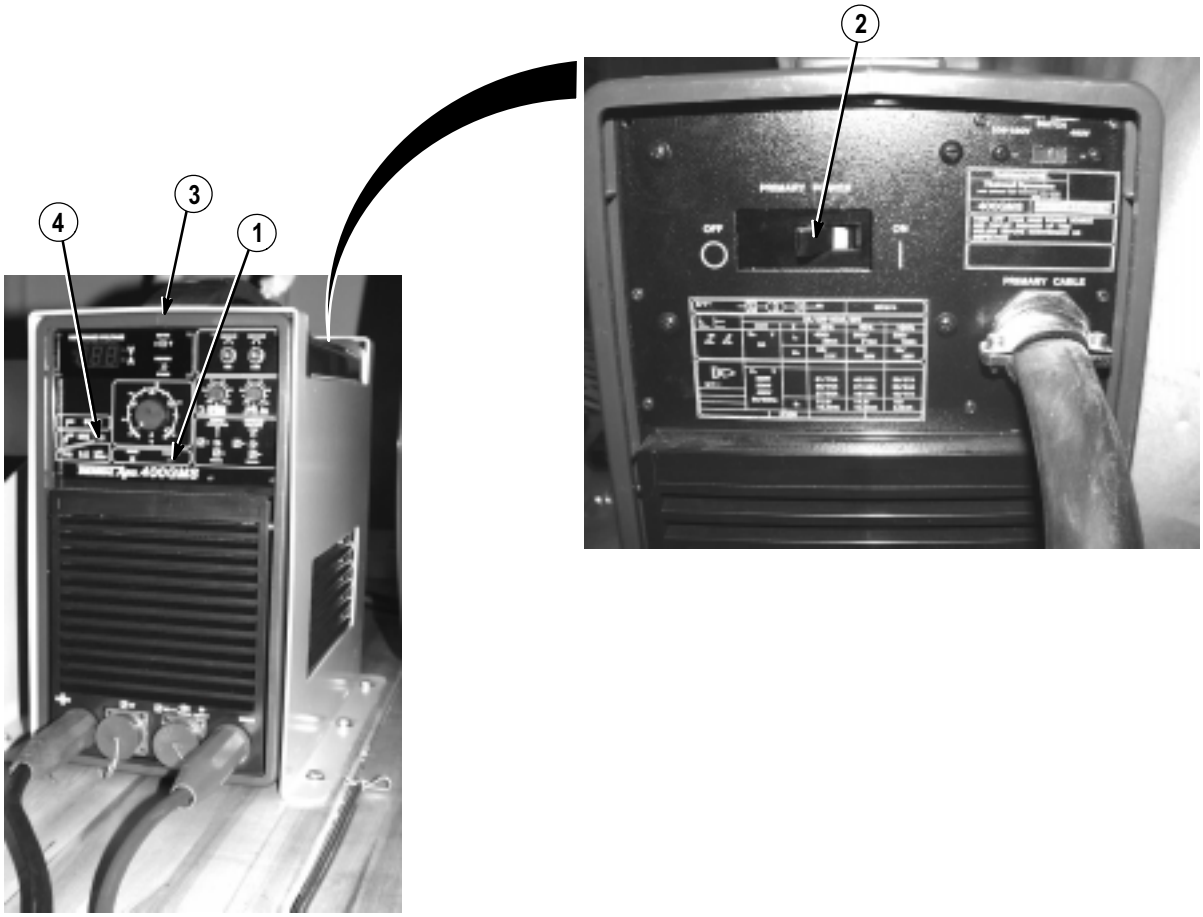
- Place drain pan under hose (1).
- Loosen clamp (2) and remove hose (1) from heater (3).
- Operate heater until entrapped air is bleed (Para 2-30).
- Install hose (1) on heater (3) and tighten clamp (2).
- Operate heater and check for leaks (Para 2-30).
- If condition persists, notify Unit Maintenance.

Table 3-1. Troubleshooting - CONT.

Malfunction Test or Inspection Corrective Action

MIG WELDER

1. MIG WELDER DOES NOT OPERATE.



Step 1. Check if fault system warning light (1) is ON.

- Wait for system to “Boot”.

Step 2. Check power switch (2) on ARC welder (3) is in ON position.

- Position power switch to ON position.

Step 3. Check that process selector switch (4) on ARC welder (3) is in MIG position.

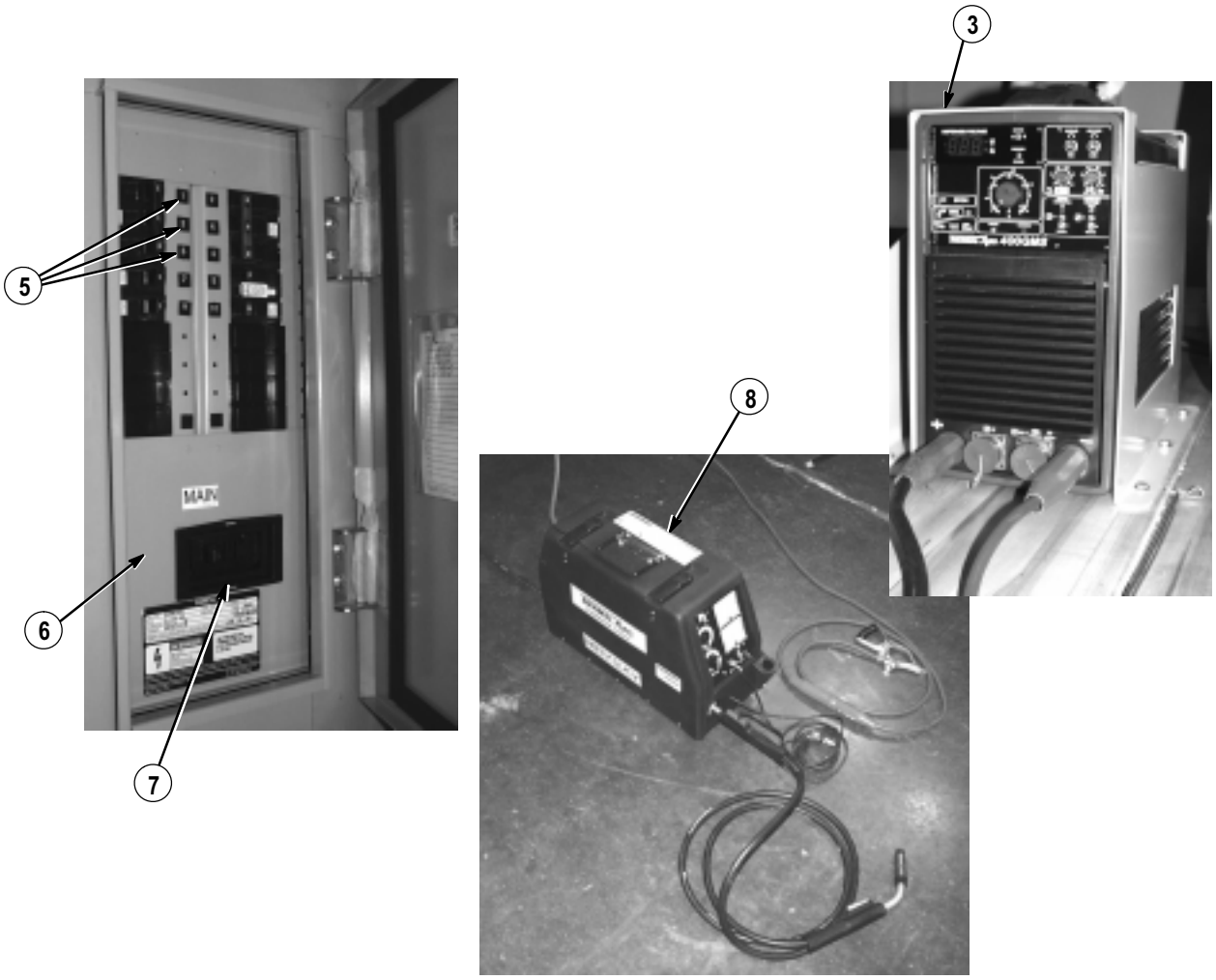
- Position process selector switch to MIG position.

Table 3-1. Troubleshooting - CONT.

Malfunction Test or Inspection Corrective Action

MIG WELDER (CONT)

1. MIG WELDER DOES NOT OPERATE (CONT).



Step 4. Check WELDER circuit breaker No. 1, No. 3, No. 5 (5) on 120/208 MAIN PANEL (6) has been tripped.

- Reset breaker and try again, if breaker trips again, notify Unit Maintenance.

Step 5. Check MAIN circuit breaker (7) on 120/208 MAIN PANEL (6) is in ON position.

- Position circuit breaker in ON position.

Step 6. Check all connections to MIG welder (8) from STICK (SMAW) welder (3).

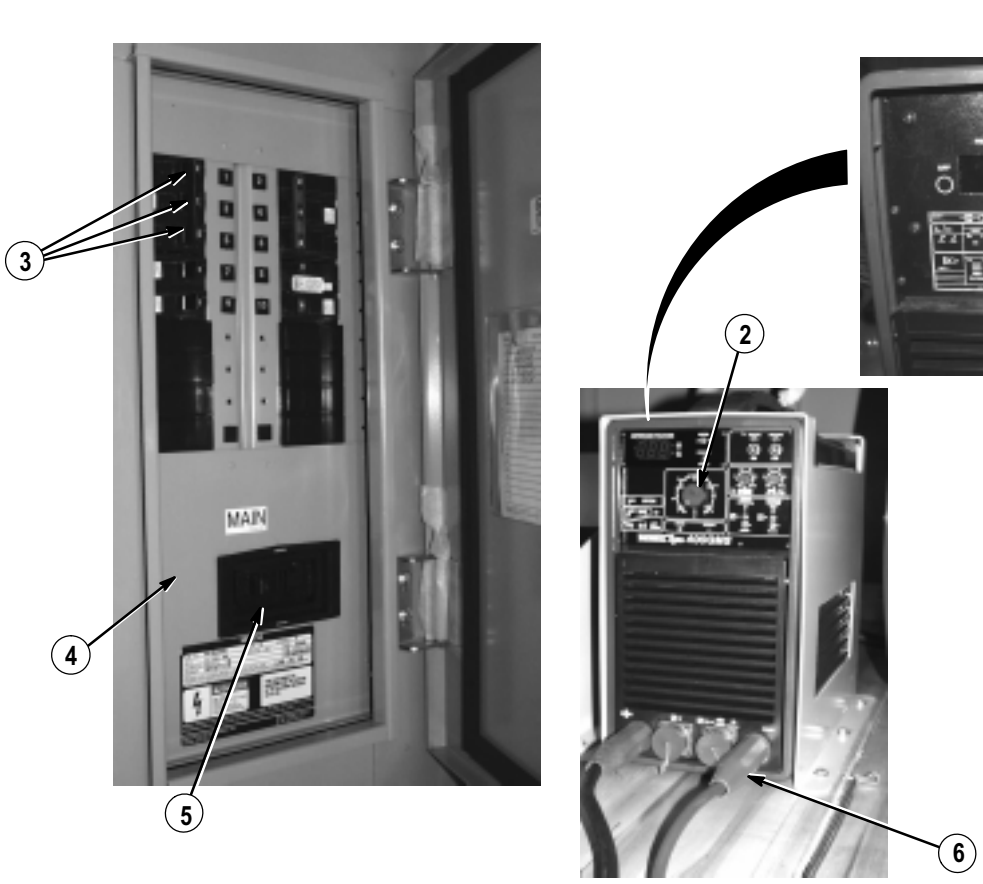
- If connections are secure and MIG welder still does not operate, notify Unit Maintenance.

Table 3-1. Troubleshooting - CONT.

Malfunction Test or Inspection Corrective Action

STICK (SHIELDED METAL ARC WELDING [SMAW]) WELDER

1. STICK (SMAW) WELDER DOES NOT OPERATE.



Step 1. Check power switch (1) on STICK (SMAW) welder is in ON position.

Step 2. Check process selector switch (2) is in proper position.

Step 3. Check WELDER circuit breaker No. 1, No. 3, No. 5 (3) on 120/208 MAIN PANEL (4) has been tripped.

- Reset breaker and try again, if breaker trips again, notify Unit Maintenance.

Step 3. Check main circuit breaker (5) on 120/208 MAIN PANEL (4) is in ON position.

- Position circuit breaker in ON position.

Step 4. Check all connections to STICK (SMAW) welder (6).

- If connections are secure and STICK (SMAW) welder still does not operate, notify Unit Maintenance.

Table 3-1. Troubleshooting - CONT.

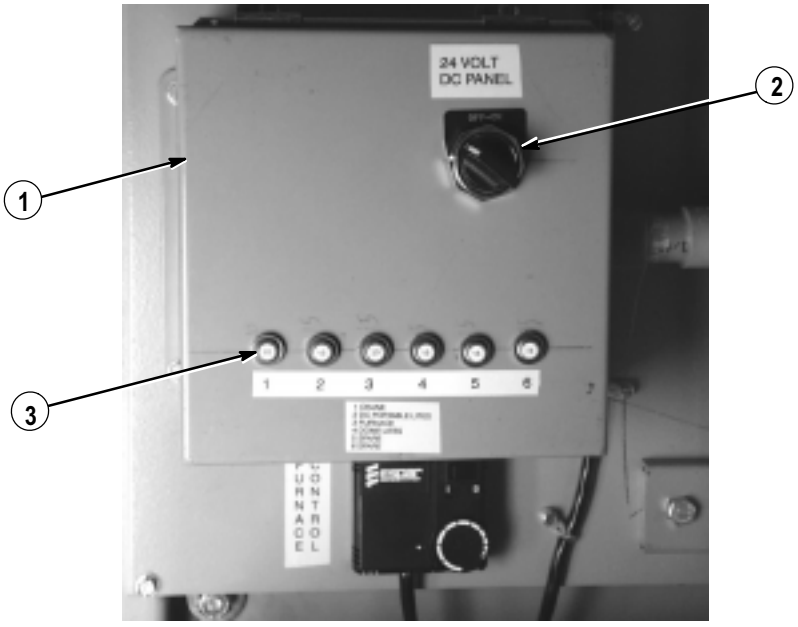
Malfunction Test or Inspection Corrective Action

CRANE

NOTE

- Possible problems that MHC operators may see are:
  1. Slow or abnormal operation.
  2. MHC will not pick up load.
  3. MHC functions do not operate.
- Possible causes of the problems are:
  1. Low hydraulic oil level.
  2. Low engine speed (slow or abnormal operation).
  3. Load too heavy (will not pick up load).
  4. Outrigger jacks are not properly deployed.
- During cold weather operation, MHC functions will be slow until hydraulic oil has warmed up (Para 2-40).
- Report all problems to Unit Maintenance.

1. CRANE DOES NOT OPERATE.



Step 1. Check that 24 VOLT DC PANEL (1) power switch (2) is in the ON position.

- Position power switch to ON position.

Step 2. Check CRANE circuit breaker (3) on 24 VOLT DC PANEL (1) has been tripped.

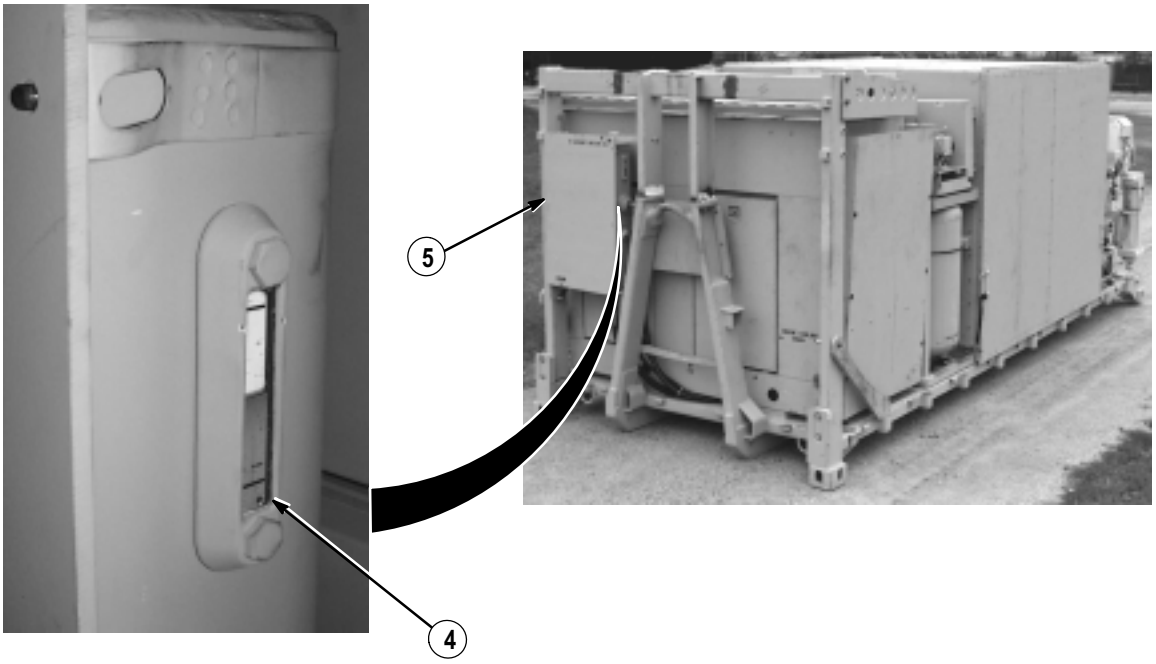
- Reset breaker and try again, if breaker trips, notify Unit Maintenance.

Table 3-1. Troubleshooting - CONT.

Malfunction Test or Inspection Corrective Action

CRANE (CONT)

1. CRANE DOES NOT OPERATE (CONT).



NOTE

On the FRS, the crane must be in the stowed position when checking hydraulic oil level. Hydraulic oil must be at operating temperature.

Step 3. Check the hydraulic oil level in sight glass (4) on hydraulic reservoir (5). Oil level should be between add and full marks.

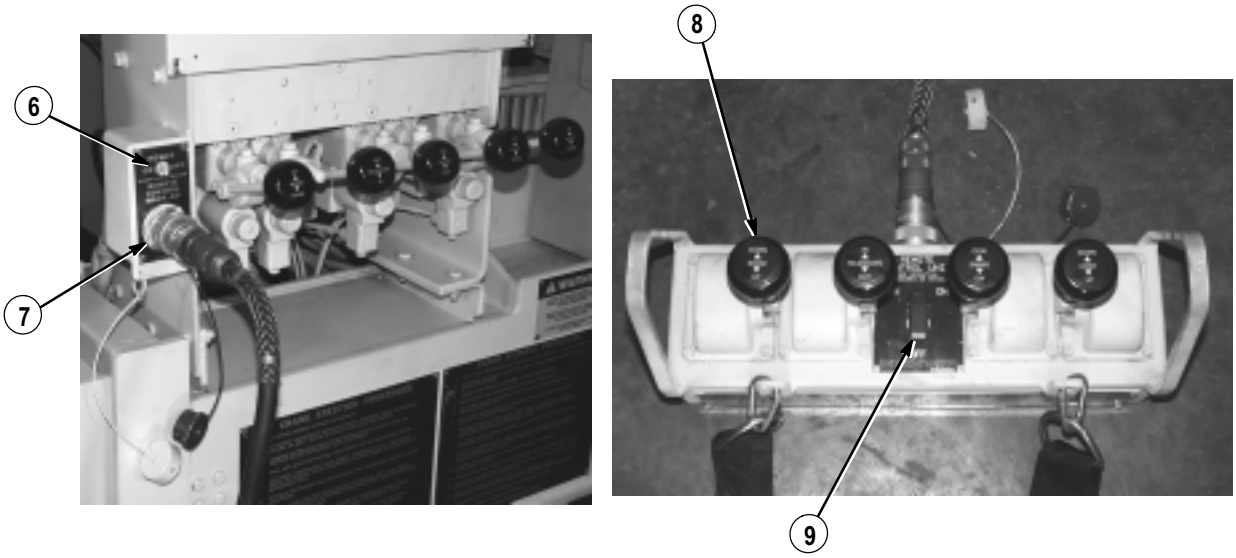
- If oil level is low, add oil (Appendix G).
- If oil level is OK, go to Step 4.

Table 3-1. Troubleshooting - CONT.

Malfunction Test or Inspection Corrective Action

CRANE (CONT)

1. CRANE DOES NOT OPERATE (CONT).



Step 4. Ensure that the MAIN POWER switch (6) at the crane remote control connector panel (7) is in the ON position. This switch functions both as a circuit breaker and switch.

- If the switch is in the OFF position, reset. If the switch trips again, notify Unit Maintenance.
- If the switch is in the ON position, go to Step 5.

Step 5. If the remote control (8) is connected, ensure that the EMERGENCY STOP switch (9) on the crane remote control unit is in the ON position. This switch disables all crane functions when in the OFF position.

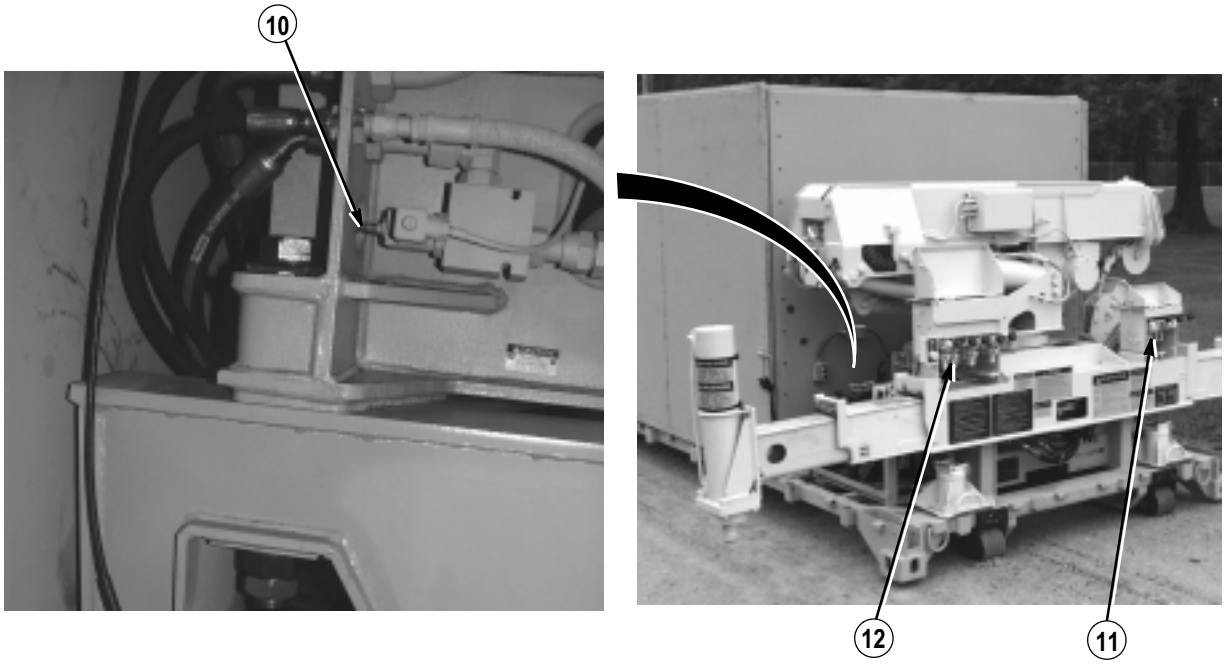
- If the switch is in the OFF position, turn to ON position.
- If the switch is in the ON position, go to Step 6.

Table 3-1. Troubleshooting - CONT.

Malfunction Test or Inspection Corrective Action

CRANE (CONT)

1. CRANE DOES NOT OPERATE (CONT).



NOTE

Button may be stiff and hard to push in.

Step 6. Press in, twist counterclockwise and pull out MHC MANUAL OVERRIDE valve (10) (Para 2-42). Attempt to move outrigger beams/jack cylinders, using crane controls on outrigger control valve bank (11).

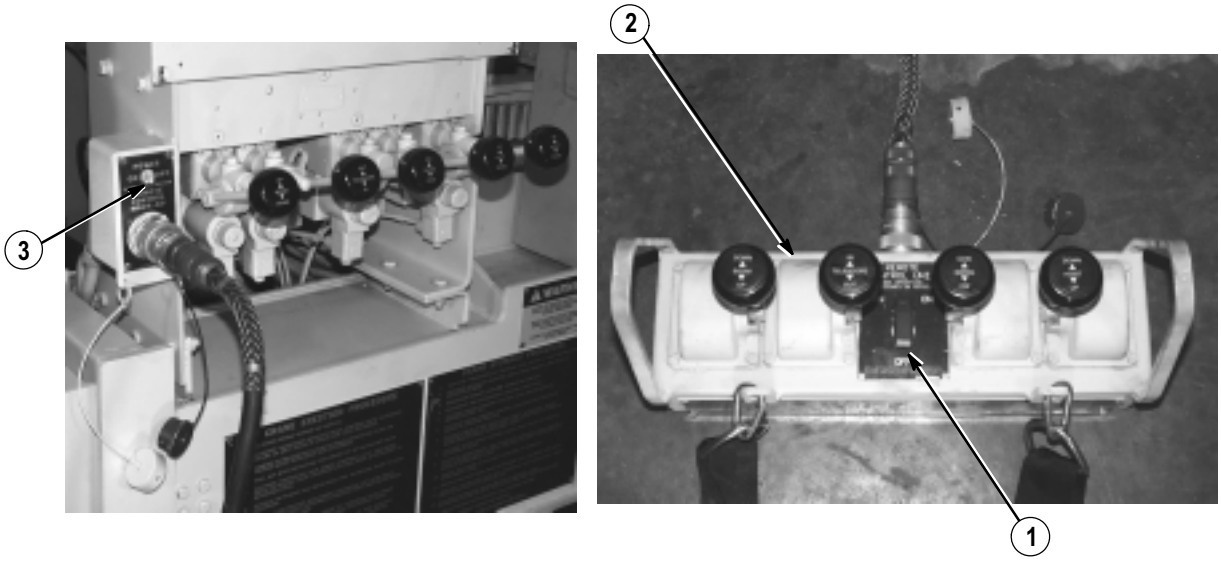
- If outrigger beams/jack cylinders cannot be moved, notify Unit Maintenance.
- If outrigger beams/jack cylinders can be moved, go to Step 7.

Step 7. Check that all crane controls on outrigger valve bank (11) and main control valve bank (12) operate with MHC MANUAL OVERRIDE valve pulled out.

- If all crane controls operate, continue operations using manual controls only and notify Unit Maintenance when mission is completed.

Table 3-1. Troubleshooting - CONT.

Malfunction Test or Inspection Corrective Action
CRANE (CONT)
2. CRANE DOES NOT OPERATE WITH REMOTE CONTROL UNIT.



Step 1. Ensure that the EMERGENCY STOP switch (1) on the crane remote control unit (2) is in the ON position. This switch disables all crane functions when in the OFF position.

- If the switch is in the OFF position, raise cover and move switch to ON position.
- If the switch is in the ON position, go to Step 2.

Step 2. Check electrical connections at the remote control unit (2) and at the crane (3). Inspect connector (both the crane, remote control unit and harness side) for damage; bent, corroded, and unseated pins and sockets.

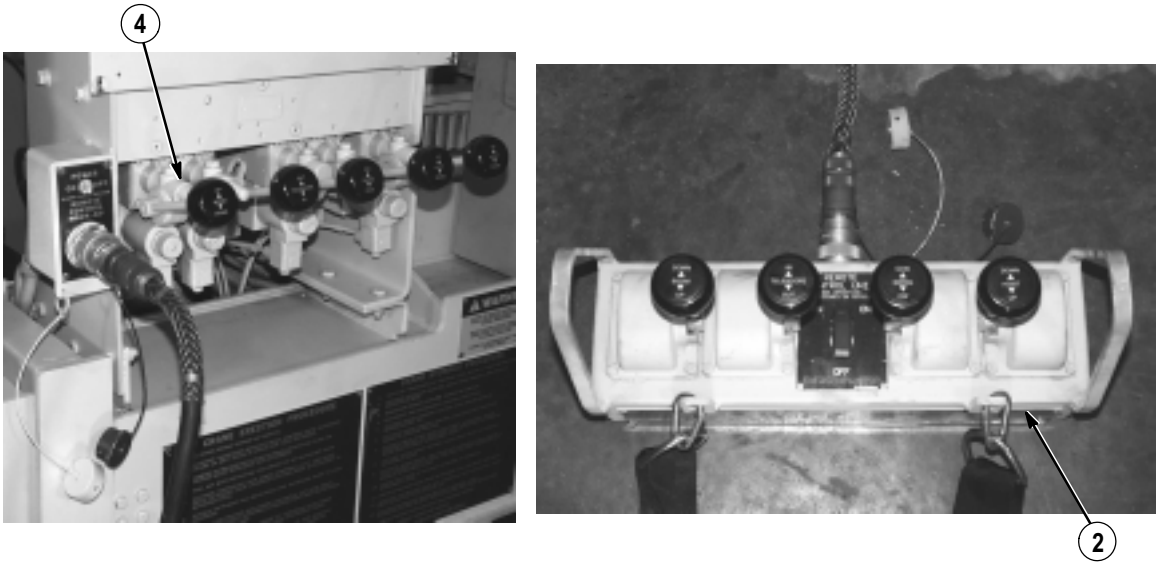
- If damaged connections were found, notify Unit Maintenance.
- If no damage is found, go to Step 3.

Table 3-1. Troubleshooting - CONT.

Malfunction Test or Inspection Corrective Action

CRANE (CONT)

2. CRANE DOES NOT OPERATE WITH REMOTE CONTROL UNIT (CONT).



WARNING

Operator will have limited visibility of load when using the manual controls. Use a ground guide to relay signals to the operator. Boom and load moving out of control cause serious injury or death.

Step 3. Operate the remote control unit (2) and check if the corresponding manual control levers (4) move when the remote control unit is actuated.

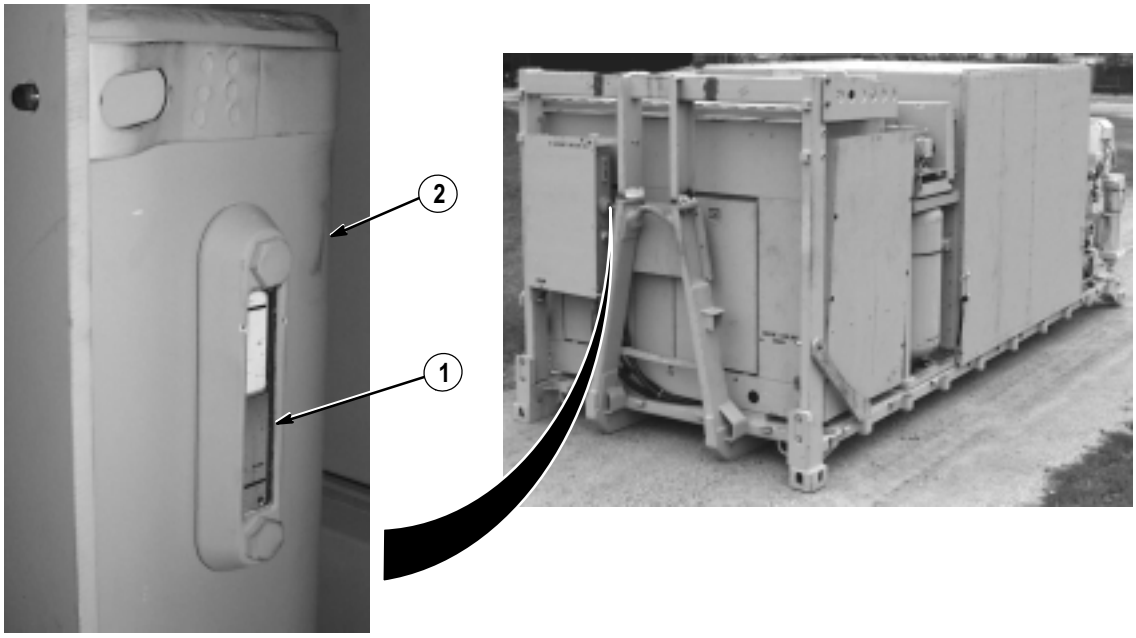
- If levers do not move, operate the crane using manual controls only and notify Unit Maintenance when mission is completed.

Table 3-1. Troubleshooting - CONT.

Malfunction Test or Inspection Corrective Action

CRANE (CONT)

3. BOOM OPERATION ABNORMAL OR DOES NOT TELESCOPE IN OR OUT.



NOTE

On the FRS, the crane must be in the stowed position when checking hydraulic oil level. Hydraulic oil must be at operating temperature.

Step 1. Check the hydraulic oil level in sight glass (1) on hydraulic reservoir (2). Oil level should be between add and full marks.

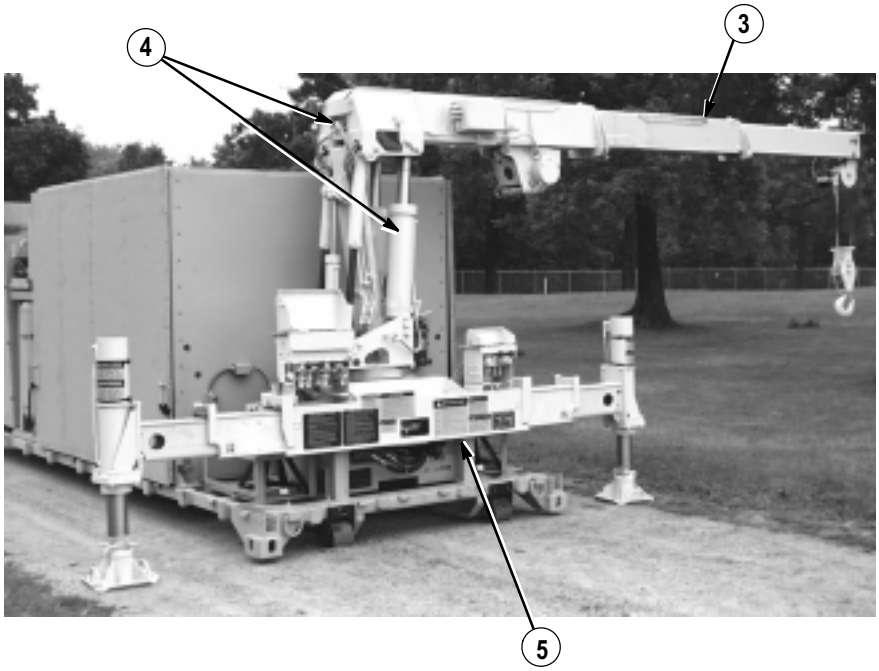
- If oil level is low, add oil (Appendix G).
- If oil level is OK, go to Step 2.

Step 2. Check that load is not over the load limit shown on the range diagram (Para 2-29). The crane overload shutdown system prevents further lifting operations when the crane is overloaded.

- If load is over maximum weight, lower load and reduce load to correct weight.
- If load is OK, go to Step 3.

Table 3-1. Troubleshooting - CONT.

Malfunction Test or Inspection Corrective Action
CRANE (CONT) **3. BOOM OPERATION ABNORMAL OR DOES NOT TELESCOPE IN OR OUT (CONT).**



Step 3. Visually check boom sections (3) for proper lubrication, bends, or other damage.

- If boom sections require lubrication, lubricate in accordance with Appendix G. If damage is present, notify Unit Maintenance.
- If boom sections are OK, go to Step 4.

Step 4. Check for loose or leaking hydraulic connections and damaged hydraulic tubes or hoses.

- Tighten loose connections. If leak does not stop, notify Unit Maintenance.
- If tubes or hoses are damaged or other problems are evident, notify Unit Maintenance.
- If no visual leaks are evident, go to Step 5.

Step 5. Abnormal boom operation may be caused by air in hydraulic cylinders (4). To remove air, first remove load from crane (5). Then raise boom above horizontal and telescope out. Finally, lower boom below horizontal and telescope boom in to purge air from cylinder.

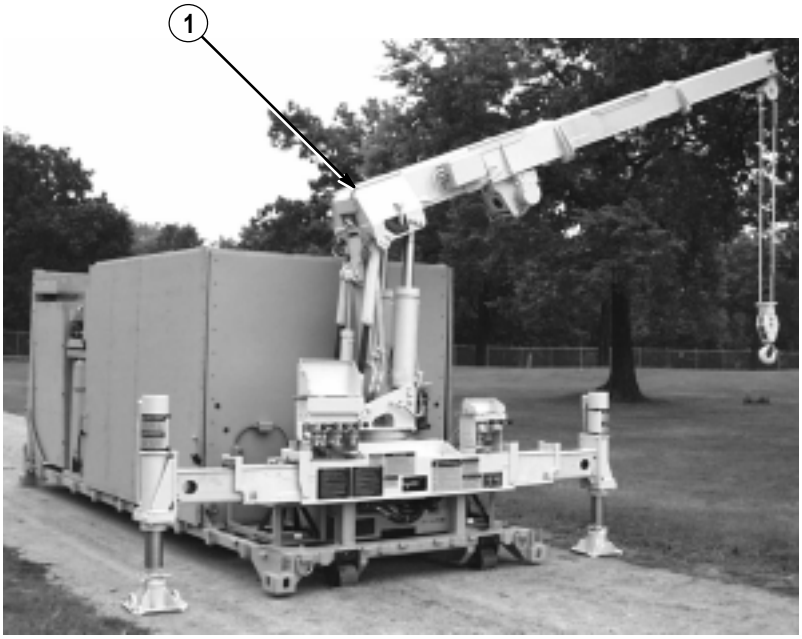
- If problem persists, notify Unit Maintenance.

Table 3-1. Troubleshooting - CONT.

Malfunction Test or Inspection Corrective Action

CRANE (CONT)

4. BOOM DOES NOT RAISE OR LOWER, OR RAISES AND LOWERS SLOWLY.



Step 1. Check outside temperature. If temperature is less than 0° F (-17° C), hydraulic oil may be thick and not flow easily. When operating crane (1) in extremely cold weather, proper warm-up procedures must be followed.

- If operating crane in extremely cold weather, refer to Para 2-41 for specific warm-up instructions.
- If operating crane in other than extreme cold conditions, go to Step 2.

Step 2. Check that load is not over the load limit shown on the range diagram (Para 2-29).

- If load is over maximum weight, lower load and reduce load to correct weight.
- If load is OK, go to Step 3.

Step 3. Check for loose or leaking hydraulic connections and damaged hydraulic tubes or hoses.

- Tighten loose connections. If leak does not stop, notify Unit Maintenance.
- If tubes or hoses are damaged or other problems are evident, notify Unit Maintenance.

Table 3-1. Troubleshooting - CONT.

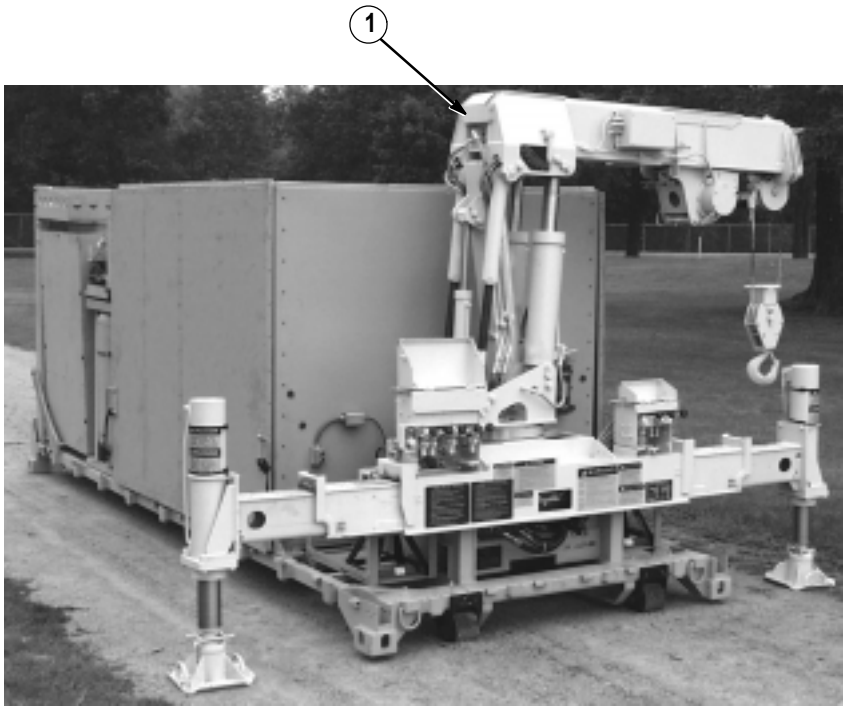
Malfunction Test or Inspection Corrective Action
CRANE (CONT) **5. HOIST OPERATION JERKY, OR DOES NOT LIFT OR LOWER LOAD.**    Step 1. Check outside temperature. If temperature is less than 0° F (-17° C), hydraulic oil may be thick and not flow easily. When operating crane (1) in extremely cold weather, proper warm-up procedures must be followed. • If operating crane in extremely cold weather, refer to Para 2-41 for specific warm-up instructions. • If operating crane in other than extreme cold conditions, go to Step 2. Step 2. Check that load is not over the load limit shown on the range diagram (Para 2-29). • If load is over maximum weight, lower load and reduce load to correct weight. • If load is OK, go to Step 3.

Table 3-1. Troubleshooting - CONT.

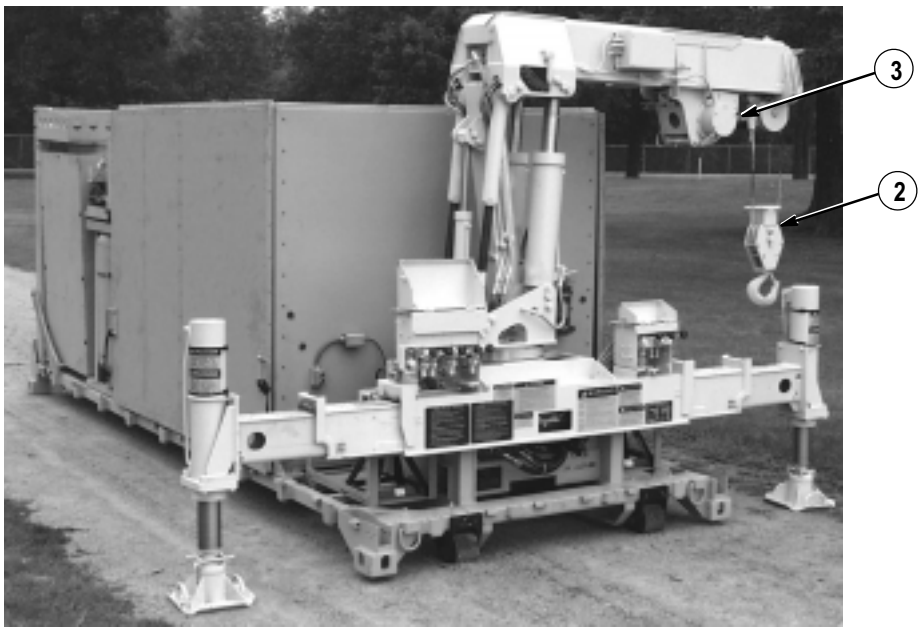
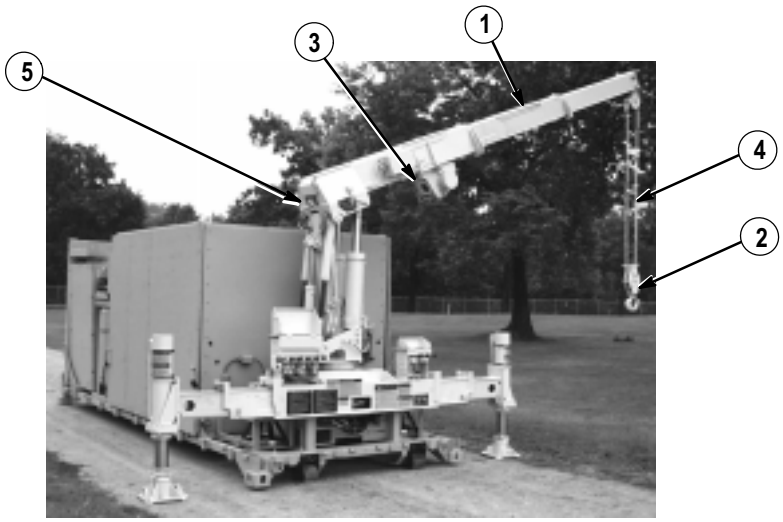
Malfunction Test or Inspection Corrective Action
CRANE (CONT)
5. HOIST OPERATION JERKY, OR DOES NOT LIFT OR LOWER LOAD (CONT).

Step 3. Check if hoist cable (2) is tangled or binding on hoist drum (3). • If hoist cable is tangled or binding, refer to Fault 6, Hoist Does Not Spool Cable Properly. • If hoist cable is OK, go to Step 4.
Step 4. Check for loose or leaking hydraulic connections and damaged hydraulic tubes or hoses. • Tighten loose connections. If leak does not stop, notify Unit Maintenance. • If tubes or hoses are damaged or other problems are evident, notify Unit Maintenance.

Table 3-1. Troubleshooting - CONT.

Malfunction Test or Inspection Corrective Action

CRANE (CONT)

6. HOIST DOES NOT SPOOL CABLE PROPERLY.



WARNING

- Wire rope can become frayed or contain broken wires. Wear heavy leather-palmed work gloves when handling wire rope. Frayed or broken wires can injure hands.
- Never let moving wire rope slide through hands, even when wearing gloves. A broken wire could cut through glove and cut hand.

Step 1. Lower load to the ground as soon as a mis-spooled condition is observed.

Step 2. Raise the boom (1) to the maximum angle, telescope out to maximum length, and lower the hook (2) to just above ground level. At this point there should be approximately five wraps of cable remaining on the drum (3).

Step 3. Inspect the entire length of hoist cable (4) and note any obvious kinks. If kinks are noted, position the crane (5) as necessary to inspect the hoist cable for damaged wires. Refer to hoist cable criteria in PMCS Table (Para 2-11).

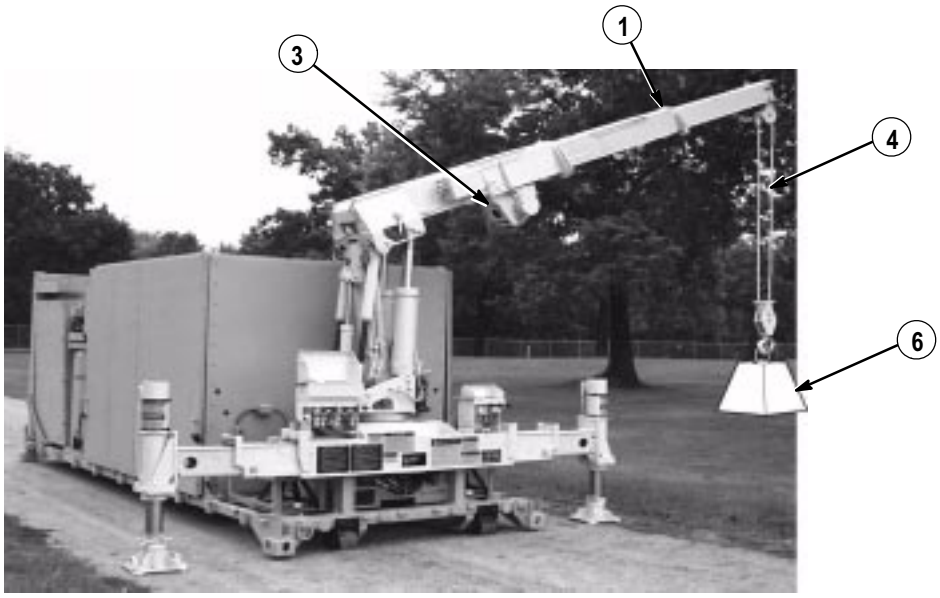
- If cable is still serviceable, return the crane to the position described in Step 2.
- If cable is unserviceable, notify Unit Maintenance.

Table 3-1. Troubleshooting - CONT.

Malfunction Test or Inspection Corrective Action

CRANE (CONT)

6. HOIST DOES NOT SPOOL CABLE PROPERLY (CONT).



WARNING

- Wire rope can become frayed or contain broken wires. Wear heavy leather-palmed work gloves when handling wire rope. Frayed or broken wires can injure hands.
- Never let moving wire rope slide through hands, even when wearing gloves. A broken wire could cut through glove and cut hand.

Step 4. Inspect the cable (4) remaining on the hoist drum (3) for any looseness or gaps between wraps. If gaps exist, lower crane boom (1) to gain access to hoist drum. Using a hammer, gently tap the cable wraps back into close contact.

NOTE

If possible, perform Step 5 without changing the boom length or angle. If necessary, reconfigure the crane as little as possible to attach the load. The load is attached only for the purpose of providing weight to straighten the cable while respooling.

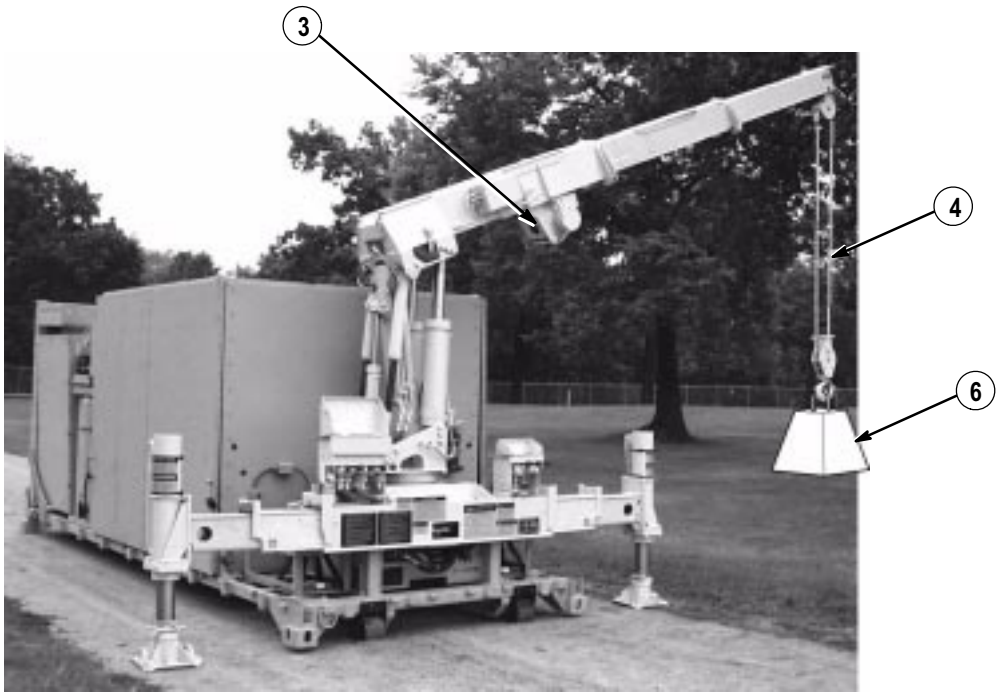
Step 5. Attach a load (6), not exceeding 6500 lbs (2948.4 kg), to crane. Position the load where crane boom (1) can be extended to maximum length and raised to maximum angle. Extend the boom to maximum length and raise to maximum angle.

Table 3-1. Troubleshooting - CONT.

Malfunction Test or Inspection Corrective Action

CRANE (CONT)

6. HOIST DOES NOT SPOOL CABLE PROPERLY (CONT).



WARNING

- Wire rope can become frayed or contain broken wires. Wear heavy leather-palmed work gloves when handling wire rope. Frayed or broken wires can injure hands.
- Never let moving wire rope slide through hands, even when wearing gloves. A broken wire could cut through glove and cut hand.

Step 6. Lift the load (6) slowly to maximum height while observing the cable (4) spooling on hoist drum (3).

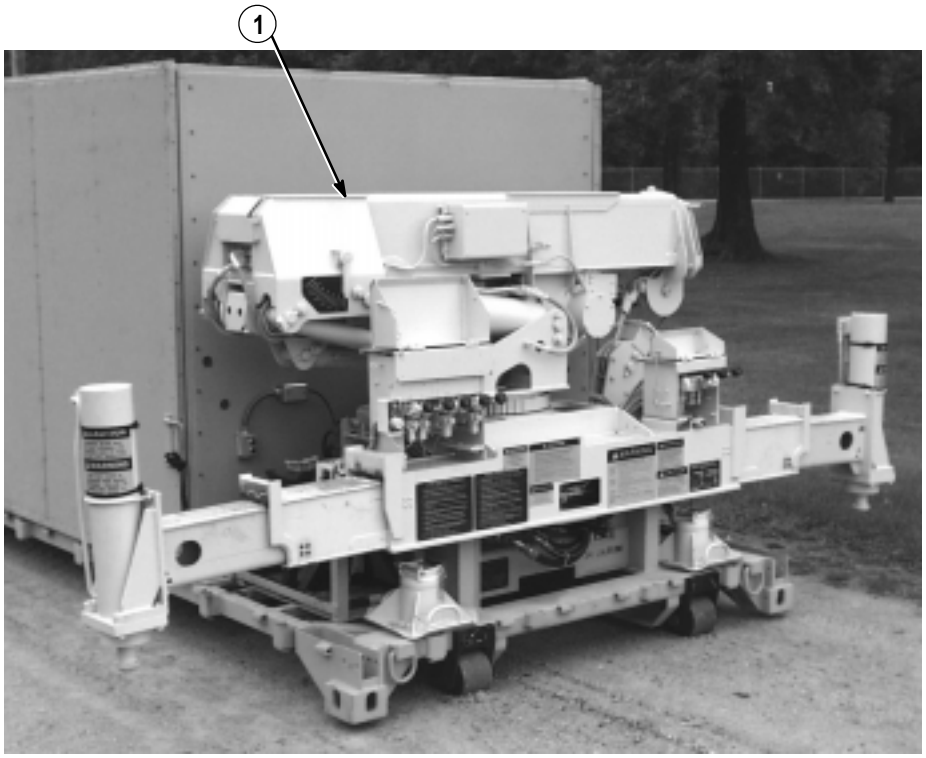
- If mis-spooling occurs, immediately lower the load and repeat up to 12 times. If the cable continues to mis-spool badly, notify Unit Maintenance.
- If cable spools properly, lift the load and lower it 12 times. Then, repeat the process with no load attached. If mis-spooling occurs without a load, notify Unit Maintenance.

Table 3-1. Troubleshooting - CONT.

Malfunction Test or Inspection Corrective Action

CRANE (CONT)

7. MAST, OUTRIGGERS OR STABILIZERS EXTEND OR RETRACT SLOW OR ABNORMAL.



Step 1. Check outside temperature. If temperature is less than 0° F (-17° C), hydraulic oil may be thick and not flow easily. When operating crane (1) in extremely cold weather, proper warm-up procedures must be followed.

- If operating crane in extremely cold weather, refer to Para 2-41 for specific warm-up instructions.
- If operating crane in other than extreme cold conditions, go to Step 2.

Step 2. Check for loose or leaking hydraulic connections and damaged hydraulic tubes or hoses.

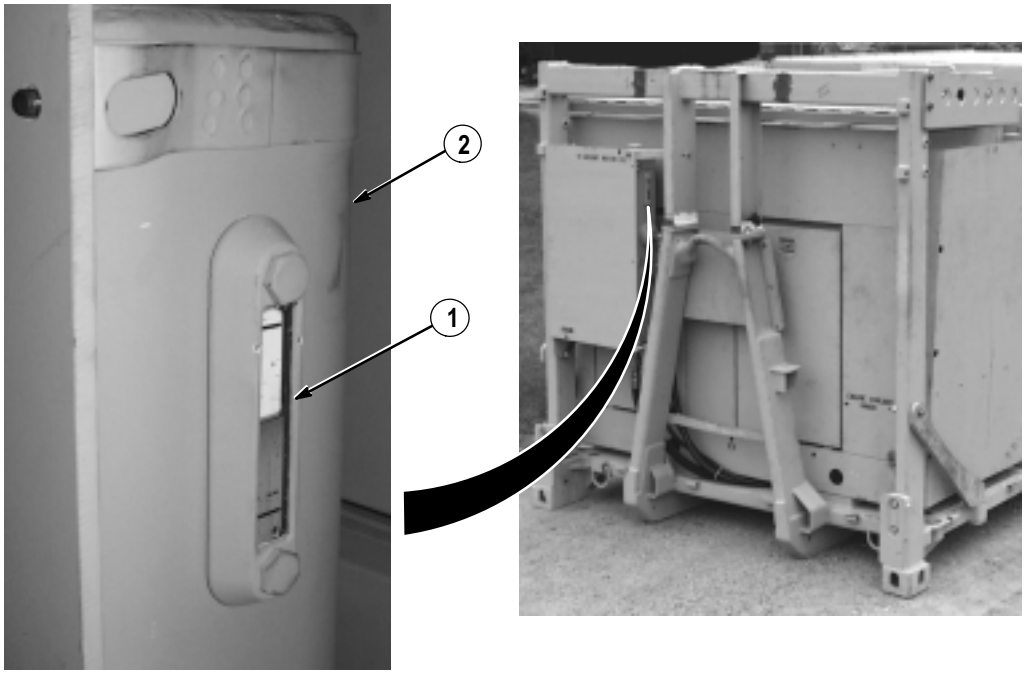
- Tighten loose connections. If leak does not stop, notify Unit Maintenance.
- If tubes or hoses are damaged or other problems are evident, notify Unit Maintenance.

Table 3-1. Troubleshooting - CONT.

Malfunction Test or Inspection Corrective Action

CRANE (CONT)

7. MAST, OUTRIGGERS OR STABILIZERS EXTEND OR RETRACT SLOW OR ABNORMAL (CONT).



NOTE

On the FRS, the crane must be in the stowed position when checking hydraulic oil level. Hydraulic oil must be at operating temperature.

Step 3. Check the hydraulic oil level in sight glass (1) on hydraulic reservoir (2). Oil level should be between add and full marks.

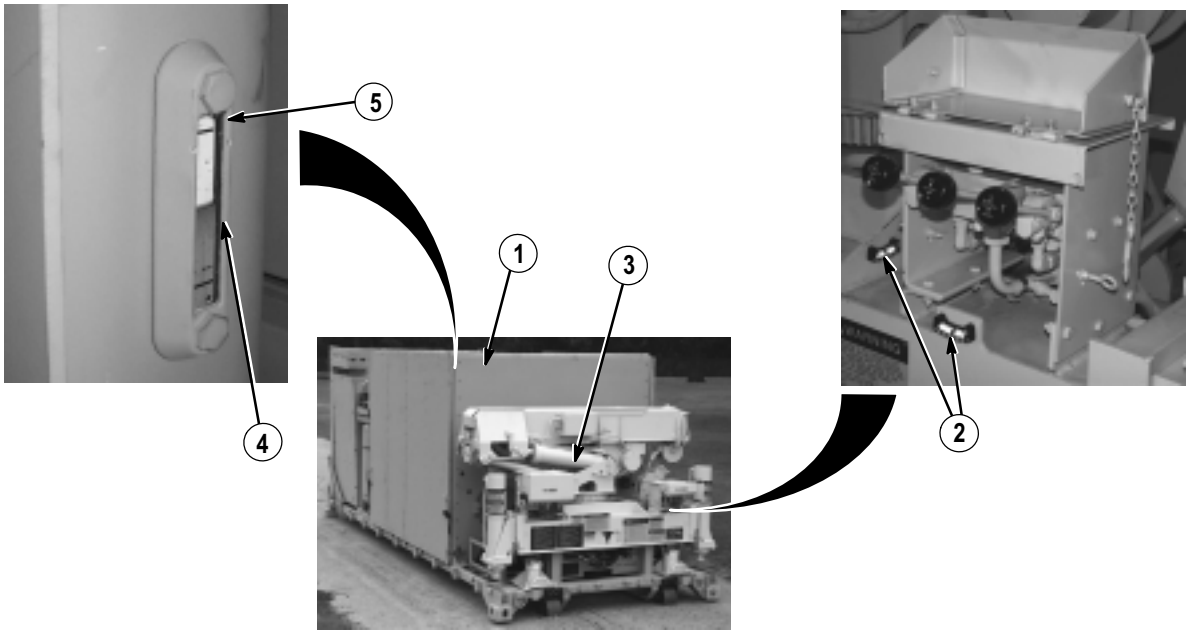
- If oil level is low, add oil (Appendix G).
- If oil level is OK, notify Unit Maintenance.

Table 3-1. Troubleshooting - CONT.

Malfunction Test or Inspection Corrective Action

CRANE (CONT)

8. SWING OPERATION SLOW OR JERKY IN ONE OR BOTH DIRECTIONS, OR DOES NOT SWING IN EITHER DIRECTION.



Step 1. Check if FRS (1) is level (Refer to level gages (2) on crane (3), level bubble should be in green area on both gages.)

NOTE

On the FRS, the crane must be in the stowed position when checking hydraulic oil level. Hydraulic oil must be at operating temperature.

Step 2. Check the hydraulic oil level in sight glass (4) on hydraulic reservoir (5). Oil level should be between add and full marks.

- If oil level is low, add oil (Appendix G).
- If oil level is OK, go to Step 3.

Step 3. Check for loose or leaking hydraulic connections and damaged hydraulic tubes or hoses.

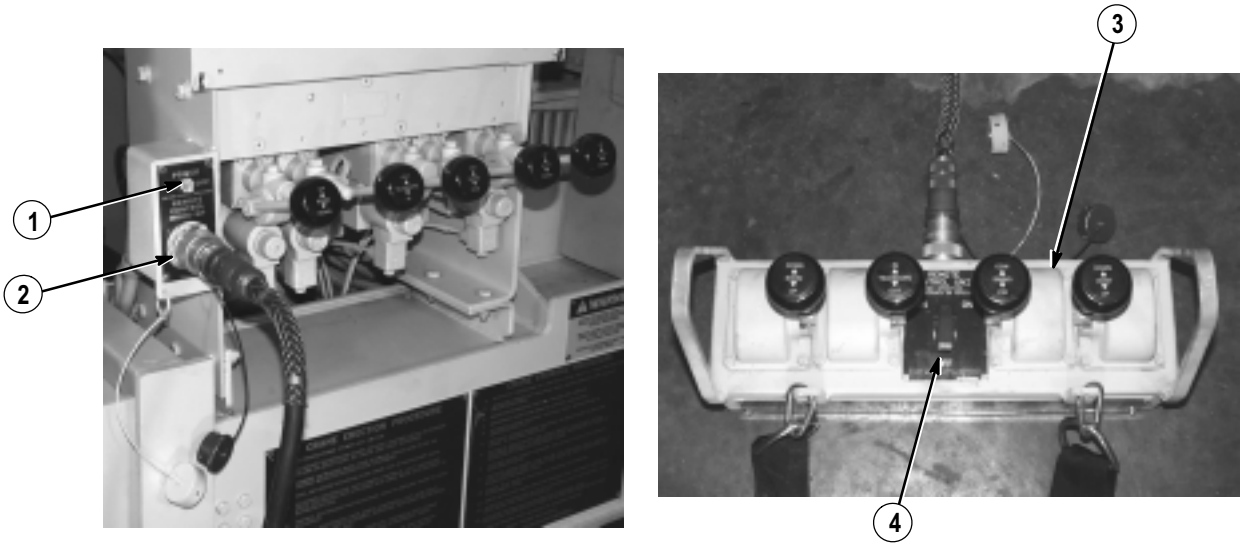
- Tighten loose connections. If leak does not stop, notify Unit Maintenance.
- If tubes or hoses are damaged or other problems are evident, notify Unit Maintenance.

Table 3-1. Troubleshooting - CONT.

Malfunction Test or Inspection Corrective Action

CRANE (CONT)

9. OVERLOAD SHUTDOWN SYSTEM DOES NOT OPERATE PROPERLY.



NOTE

The following tests and inspections should be performed in the event of any of the following:

- Boom up and down, telescope out and hoist up functions are disabled.
- Intermittent cut-out of the above listed functions (with crane unloaded).
- Cut-out of the above listed functions too early or too late (with crane loaded).

Step 1. Ensure that the MAIN POWER switch (1) on the crane junction box (2) is in the ON position. This switch functions both as a circuit breaker and switch.

- If the switch is in the OFF position, reset. If the switch trips again, notify Unit Maintenance.
- If the switch is in the ON position, go to Step 2.

Step 2. If the remote control unit (3) is connected, ensure that the EMERGENCY STOP switch (4) on the crane remote control unit is in the ON position. This switch disables all crane functions when in the OFF position.

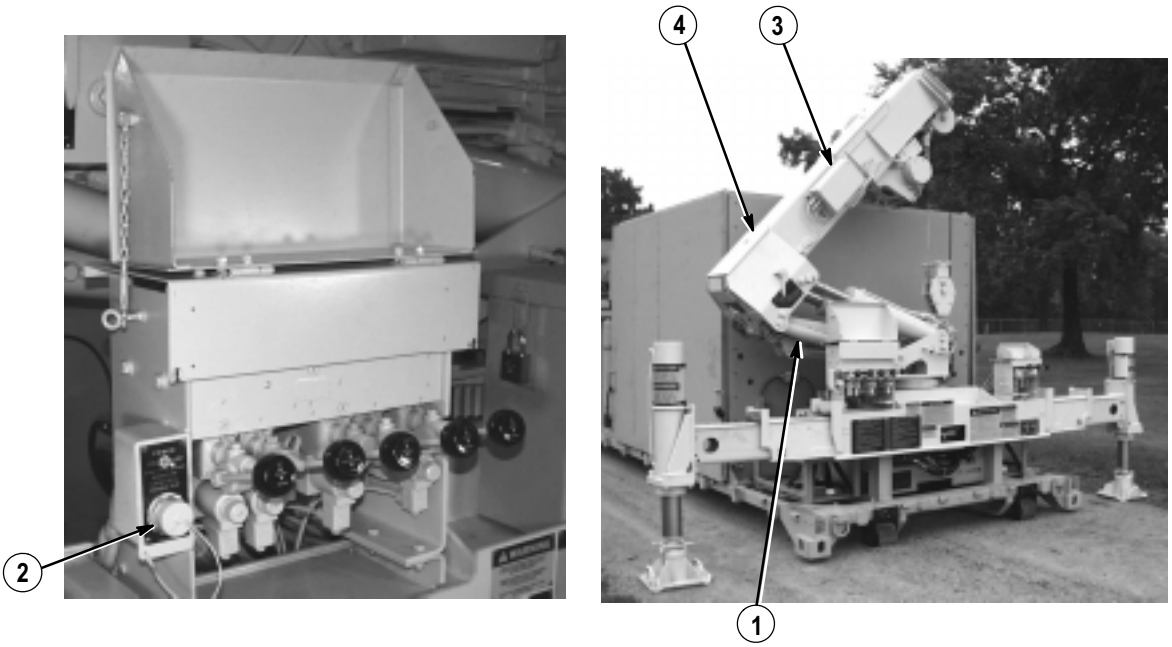
- If the switch is in the OFF position, raise cover and move switch to ON position.
- If the switch is in the ON position, go to Step 3.

Table 3-1. Troubleshooting - CONT.

Malfunction Test or Inspection Corrective Action

CRANE (CONT)

9. OVERLOAD SHUTDOWN SYSTEM DOES NOT OPERATE PROPERLY (CONT).



WARNING

Never attempt crane operations or lifting with crane mast not fully erected. Operating the crane with the crane mast not fully erected even slightly will disrupt the Overload Shutdown System. Failure to comply may result in injury to personnel and damage to equipment.

Step 3. Is the crane mast (1) in the fully erected position?

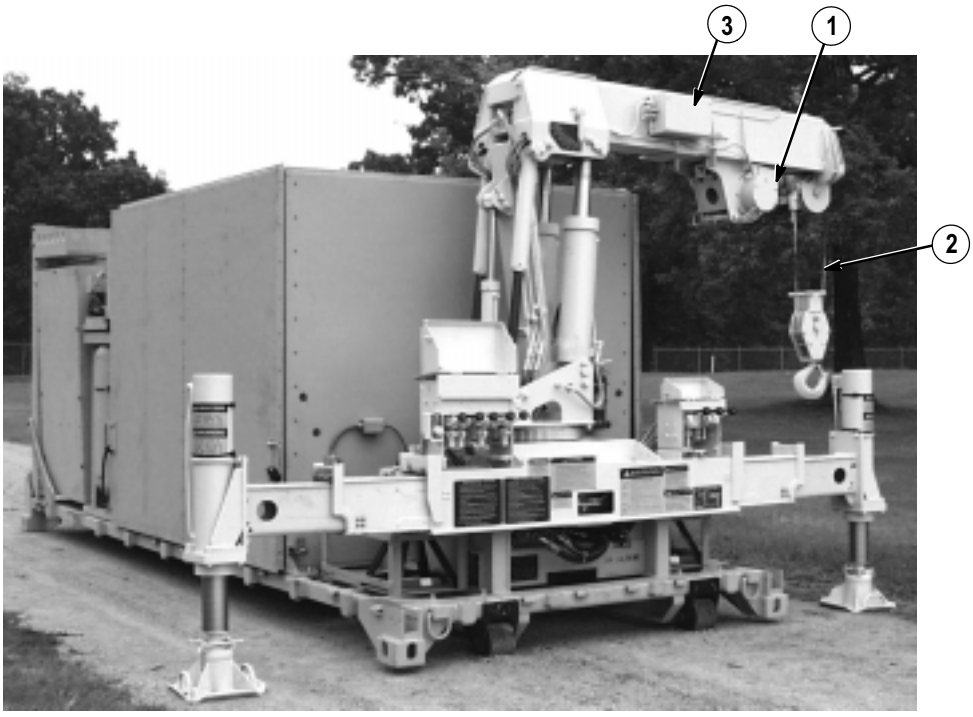
- If the mast is not fully erected, raise mast. Refer to Para 2-29.
- If the mast is fully erected, go to Step 4.

Step 4. Move the MAIN POWER switch (2) to the OFF position. Wait approximately 30 seconds and move the MAIN POWER switch back to the ON position. This action will reset the Overload Shutdown System (3). Wait approximately 30 more seconds for the system to complete a self test and then try to operate the crane (4).

- If the crane operates normally, the problem has been corrected.
- If the problem remains, go to Step 5.

Table 3-1. Troubleshooting - CONT.

Malfunction Test or Inspection Corrective Action
CRANE (CONT) **9. OVERLOAD SHUTDOWN SYSTEM DOES NOT OPERATE PROPERLY (CONT).**



Step 5. Check for proper spooling on hoist drum (1) of the hoist cable (2). It is essential for the correct operation of the Overload Shutdown System (3) to have the hoist cable spooled properly. The Overload Shutdown System cannot accurately determine the amount of extended cable if the cable is not spooled evenly or “birdnested”.

- If the hoist cable is not spooled properly, refer to Fault 6, Hoist Does Not Spool Cable Properly.
- If the hoist cable is OK, notify Unit Maintenance.

Section III. MAINTENANCE PROCEDURES

3-4. FUEL SYSTEM PRIMING.

This task covers:

a. Priming Low Pressure Fuel Lines and Fuel Filter b. Priming High Pressure Fuel Lines

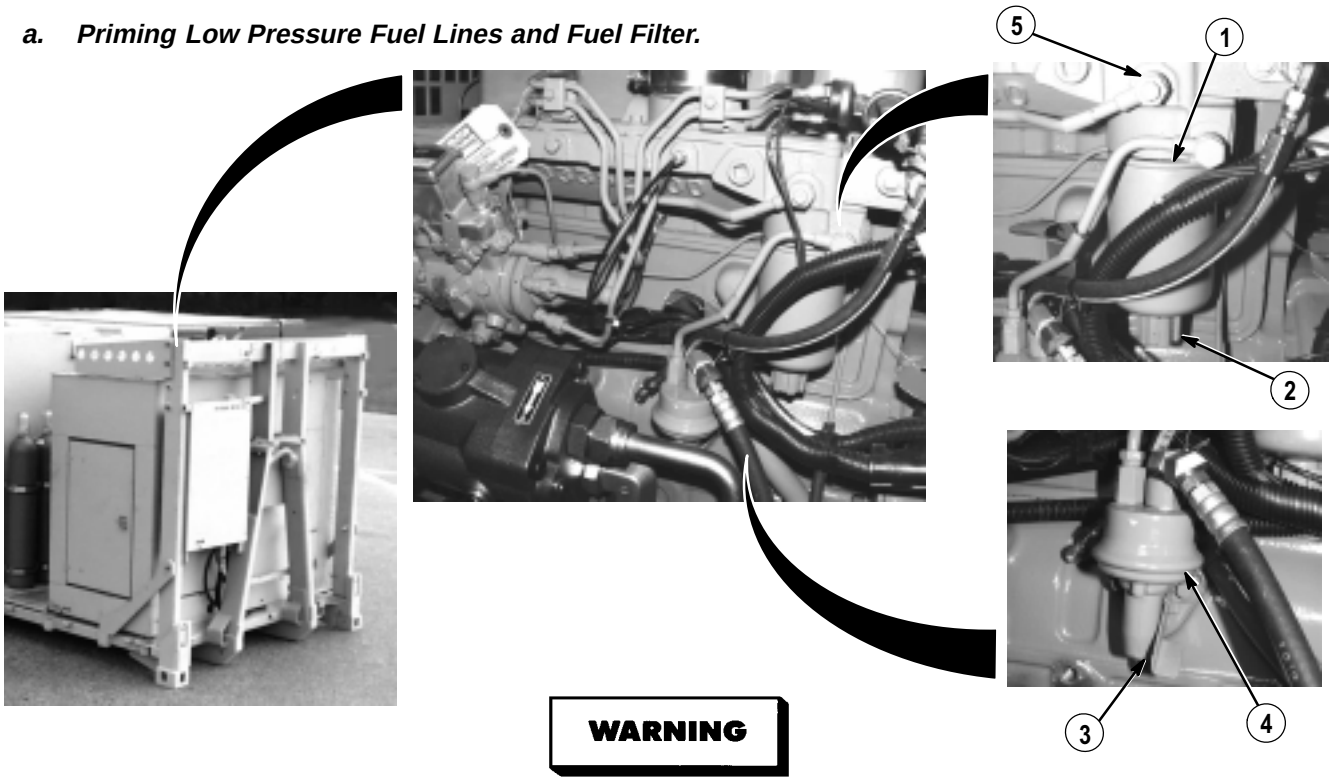
INITIAL SETUP

Tools and Special Tools
Wrench, Combination 1/2 in. (Item 5, Appendix B)
Pan, Drain (Appendix C)

Materials/Parts
Gloves (Appendix C)
Rags, Wiping (Item 15, Appendix D)

Equipment Condition
Engine OFF, (Para 2-15)
Master Disconnect Switch OFF, (Para 2-15)
FRS Unloaded, (Para 2-14)

a. Priming Low Pressure Fuel Lines and Fuel Filter.



WARNING

Fuel is very flammable and can explode easily. To avoid serious injury or death, keep fuel away from open fire and keep fire extinguisher within easy reach when working with fuel. Do not work on fuel system when engine is hot. Fuel can be ignited by hot engine.

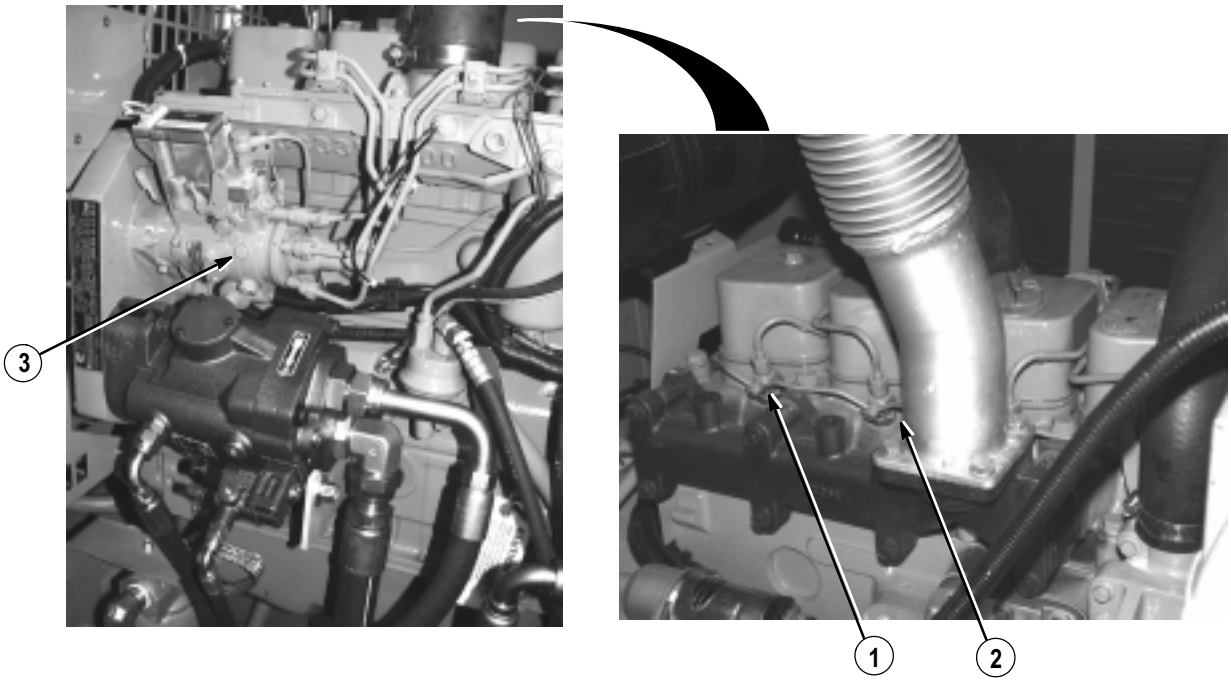
(1) Place drain pan under secondary fuel filter (1).

(2) Open drain (2) on secondary fuel filter (1).

(3) Operate hand lever (3) on fuel transfer pump (4) until fuel flowing from the fitting (5) is free of air.

(4) Tighten drain (2) on secondary fuel filter (1).

b. Priming High Pressure Fuel Lines.



WARNING

- Fuel is very flammable and can explode easily. To avoid serious injury or death, keep fuel away from open fire and keep fire extinguisher within easy reach when working with fuel. Do not work on fuel system when engine is hot. Fuel can be ignited by hot engine.
- Pressure of the fuel in fuel lines is sufficient to penetrate the skin and cause injury to personnel.
- Ensure fuel tank is full of fuel (Para 2-16).

(1) Loosen fitting (1) at injector pump No. 3 line (2).

CAUTION

When using the starting motor to purge the fuel system, do not engage it for more than 30 seconds at a time. Wait two minutes between engagements.

(2) Start generator (Para 2-15).

(3) Allow entrapped air to bleed at four injectors (2), until engine runs smoothly, tighten fittings (1) starting with fitting closest to fuel injection pump (3) and finishing with fitting farthest from fuel injection pump.

3-5. AIR SYSTEM DRAINING.

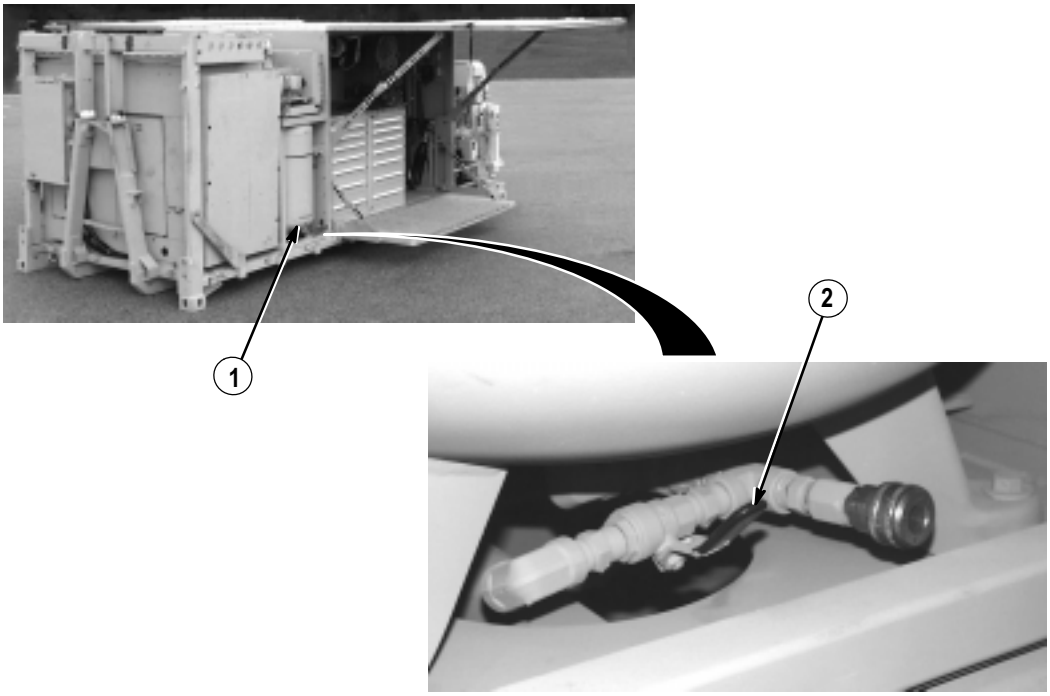
This task covers:

a. Draining

INITIAL SETUP

Equipment Condition
FRS Unloaded, (Para 2-14)
Master Disconnect Switch OFF (Para 2-15)

a. Draining.



CAUTION

- During extreme cold weather (below 32°F [0°C]), air reservoir must be drained at end of operation. Failure to comply may result in damge to equipment.
- Air reservoir must be drained daily to prevent corrosion. Failure to comply may result in damage to equipment.

(1) To drain air from reservoir (1), turn air reservoir drain valve (2) clockwise until air is completely drained from reservoir.

(2) After air is completely drained from reservoir (1), turn air reservoir drain valve (2) counterclockwise until closed.

3-6. BATTERY DISCONNECT/CONNECT.

This task covers:

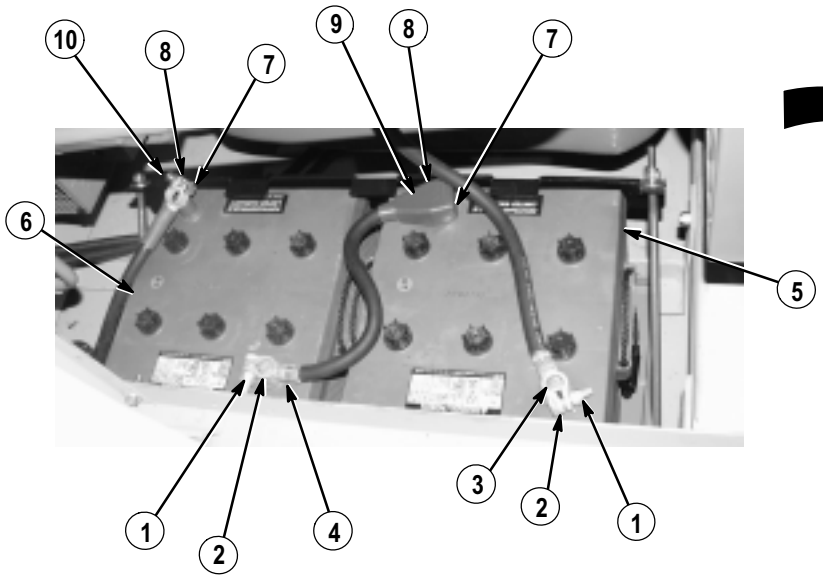
a. Disconnect b. Connect c. Follow-On Maintenance

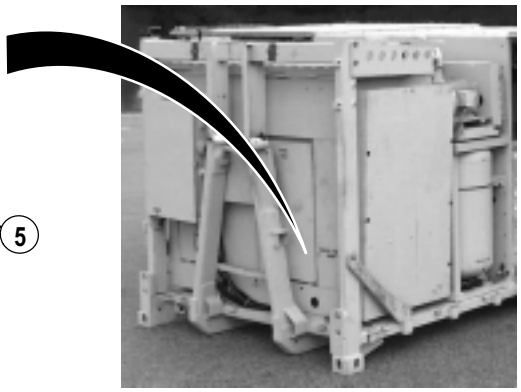
INITIAL SETUP

Tools and Special Tools
Wrench, Combination 1/2 in.
(Item 5, Appendix B)

Equipment Condition
FRS Unloaded, (Para 2-14)
Master Disconnect Switch OFF (Para 2-15)
Remove panel (Para 3-8)

a. Disconnect.





WARNING

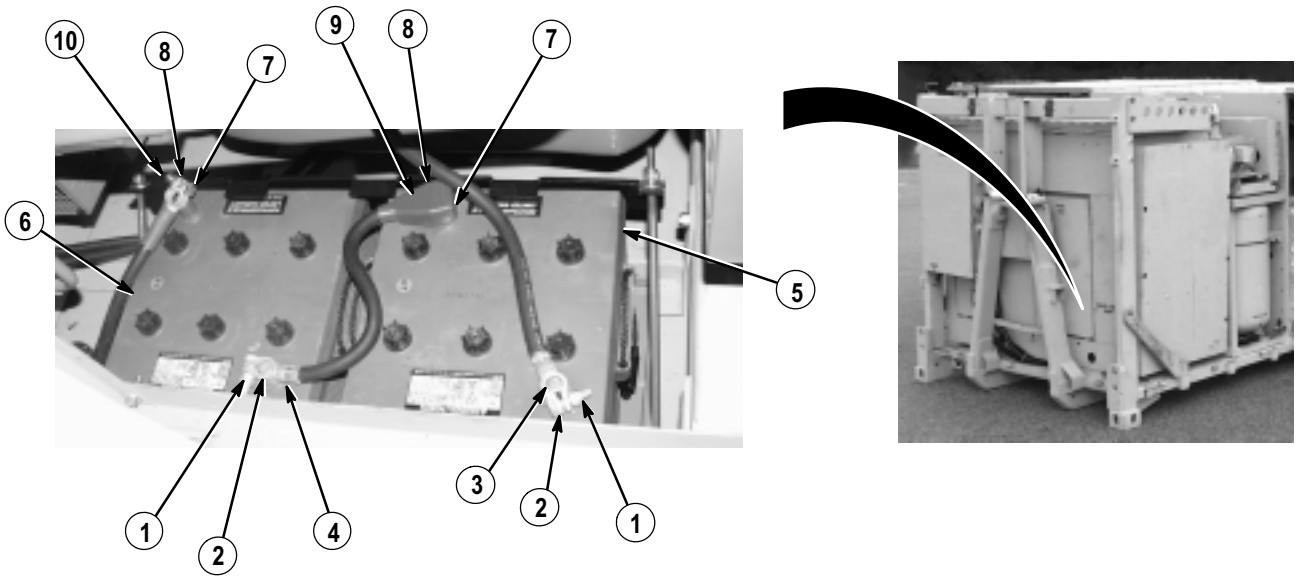
- Upon removal of all wires and cables, ensure no contact is made with battery terminals or other wires and cables. Strap wires and cables away from battery terminals and other wires and cables as required to prevent damage to parts, personal injury, or death.
- Battery acid (electrolyte) is extremely harmful. Always wear safety goggles and rubber gloves, and do not smoke when performing maintenance on batteries. Injury will result if acid contacts skin or eyes. Wear rubber apron to prevent clothing being damaged.
- Remove all jewelry such as rings, ID tags, bracelets, etc. If jewelry or tools contact positive electrical circuits, a direct short may result. Damage to equipment, injury or death to personnel may occur.
- Terminal on battery post (3) must be removed before terminals on posts 4, 9 and 10 are touched or battery damage or personnel injury may occur.

(1) Loosen two nuts (1) and remove two terminals (2) from negative posts (3) and (4) on battery one (5) and battery two (6).

(2) Loosen two nuts (7) and remove two terminals (8) from positive posts (9) and (10) on battery one (5) and battery two (6).

3-6. BATTERY DISCONNECT/CONNECT (CONT).

b. Connect.



NOTE

Install cable ties as required.

(1) Install two terminals (8) on positive posts (9) and (10) on battery one (5) and battery two (6) and tighten two nuts (7).

WARNING

Terminal on battery post (3) must be installed after terminals on posts 4, 9 and 10 are touched or battery damage or personnel injury may occur.

(2) Install terminal (2) on negative post (4) on battery two (6) and tighten nut (1).

(3) Install terminal (2) on negative post (3) on battery one (5) and tighten nut (1).

WARNING

Corrosion inhibitor contains alkali. Do not get in eyes; wear goggles/safety glasses when using. Avoid contact with skin. In case of contact, immediately wash area with soap and water. If eyes are contacted, flush eyes with large amounts of water for at least 15 minutes and get immediate medical attention.

(4) Apply anticorrosion compound to positive posts (9) and (10) and negative posts (3) and (4) and terminals (8) and (2).

c. Follow-On Maintenance

- Install panel (Para 3-8).

END OF TASK

3-7. GOVERNOR CONTROLLER GAIN ADJUSTMENT.

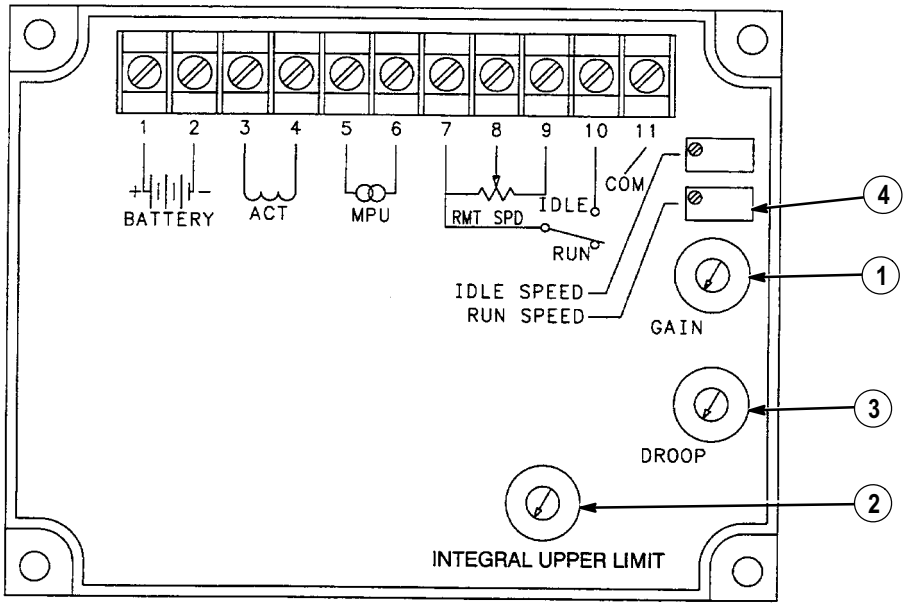
This task covers:

a. Normal Ambient Condition b. Extreme Ambient Condition

INITIAL SETUP

Equipment Condition
FRS Unloaded, (Para 2-14)

a. Normal Ambient Condition.



(1) Electronic Overspeed Module Adjustments: Adjust the governor controller as follows:

(a) The potentiometers (pots) on the controller are adjustable from zero to 100 percent and are marked off in divisions of ten percent. The speed pot has a 20-turn adjustment range. Set the pots initially as follows: GAIN (1) 30 %
INTEGRAL UPPER LIMIT (2) 0% (fully CCW)
DROOP 0% (3) (fully CCW)

(b) If a remote speed pot is used, set it at its midpoint.

(c) Start the set and adjust the RUN SPEED (4) pot to obtain the required output frequency: 60 Hertz (1800 RPM) or 50 Hertz (1500 RPM). Warm up the set under load until it is up to normal operating temperature.

(d) Disconnect the load and turn the GAIN (1) pot to 100 percent or until operation becomes unstable. Then turn the pot counterclockwise until operation again becomes stable.

(e) Interrupt the governor by momentarily removing power from the governor. The engine should recover in 3 to 5 diminishing speed oscillations.

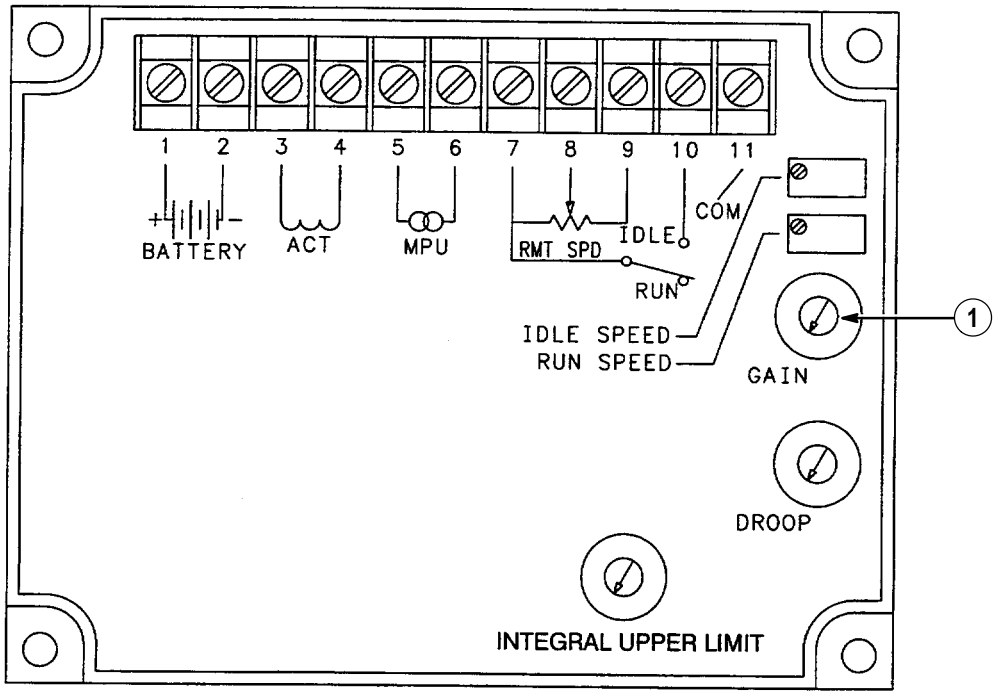
(f) If engine continues to hunt, slightly reduce GAIN (1) setting (turn pot counterclockwise). Repeat Step (e).

(g) After the RUN SPEED (4) and GAIN (1) are adjusted, apply 100% rated load to the generator.

(h) Readjust RUN SPEED (4) if necessary.

3-7. GOVERNOR CONTROLLER GAIN ADJUSTMENT (CONT).

b. Extreme Ambient Condition.



NOTE

- The operating range of the governor controller is from –40°F to + 180° F.
- Adjustment to the GAIN potentiometer will be required when generator set is operated at extreme temperatures.
- Minor adjustment may be required depending upon type of fuel used.

(1) Start engine (Para 2-15).

(2) With the engine at operational temperature, adjust the GAIN potentiometer (1) clockwise until the engine begins to hunt.

(3) With the engine hunting, turn the GAIN potentiometer (1) couterclockwise until stable.

(4) Turn the GAIN potentiometer (1) an additional 5% (1/2 division) counterclockwise to help ensure a stable engine when cold started, or when operated at lower ambients.

NOTE

If prolonged operation at extreme low ambient temperatures perform Step (5).

(5) Adjust GAIN potentiometer (1) counterclockwise as necessary to ensure stable operation.

c. Follow-On Maintenance:

- Start generator and check for proper operation, (Para 2-15).

END OF TASK

3-8. GENERATOR SET PANEL REMOVAL/STOW.

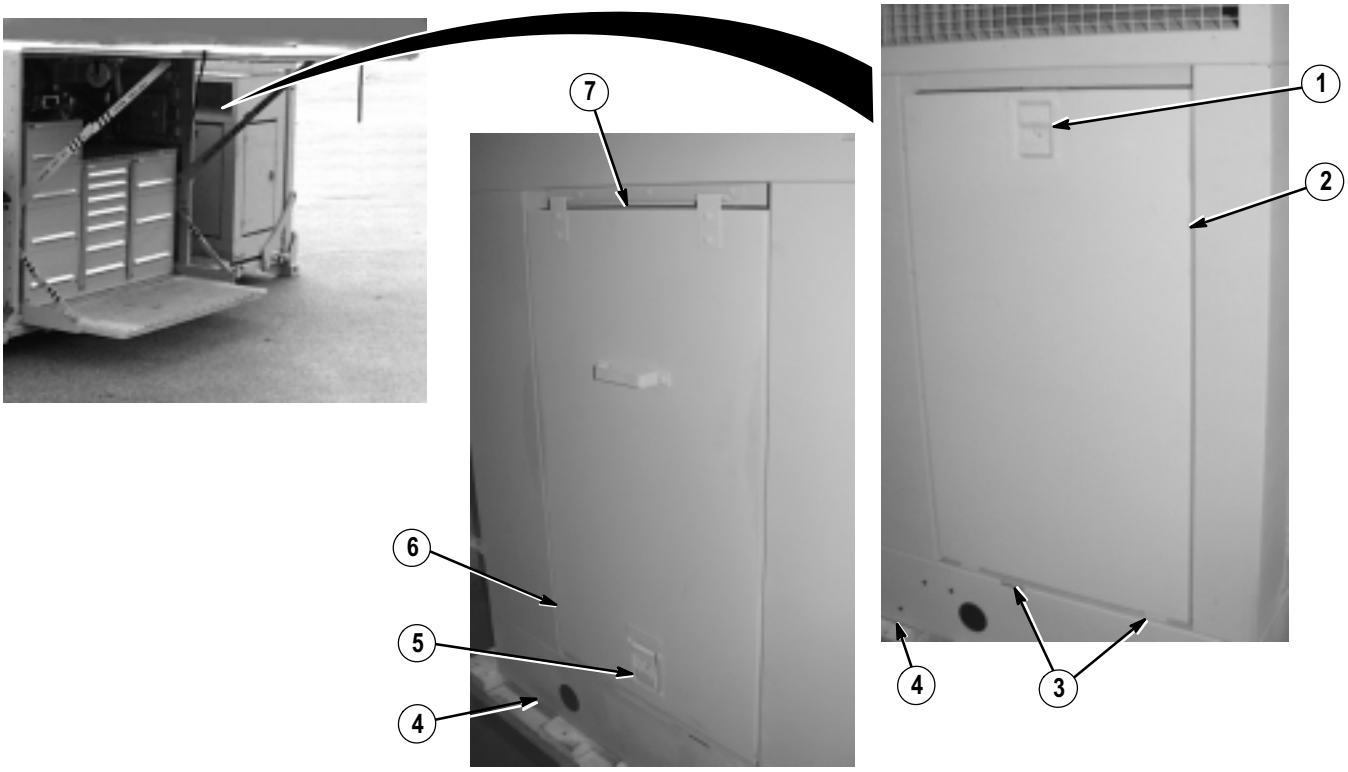
This task covers:

a. Remove Panel b. Stow Panel

INITIAL SETUP

Equipment Condition
FRS Unloaded, (Para 2-14)

a. Remove Panel.



NOTE

- If removing front panel or right rear panel, perform Steps (1) and (2).
- If removing left rear panel, perform Steps (3) and (4).
- If removing front panel from behind hydraulic tank, it may be necessary to move hydraulic tank for clearance. Notify Unit Maintenance.
- Two front panels and right rear panel are removed the same. Right rear panel shown.

(1) Pull out handle (1), lift and remove panel (2) from two lower panel brackets (3) and generator set housing (4).

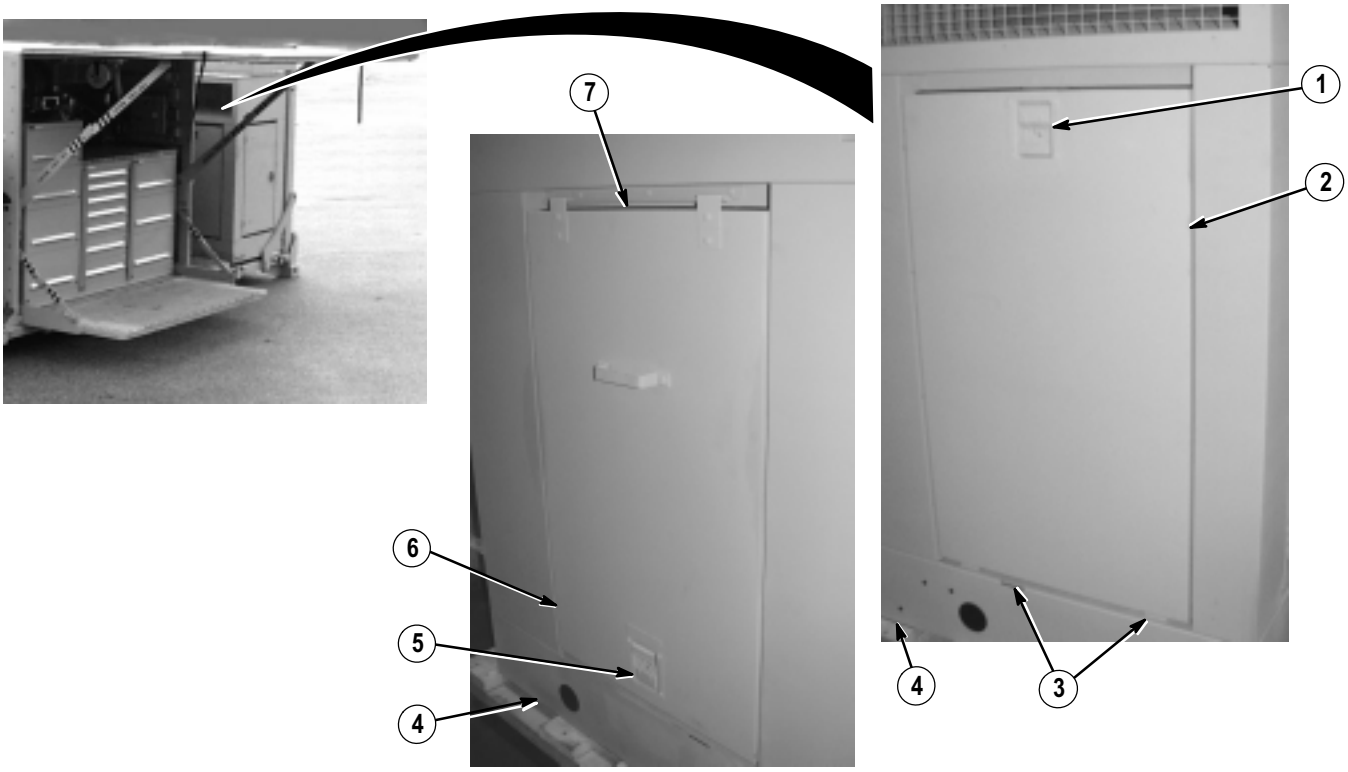
(2) Place panel (2) in a safe location.

(3) Pull out handle (5) and lift panel (6) from upper panel bracket (7) and generator set housing (4).

(4) Place panel (6) in a safe location.

3-8. GENERATOR SET PANEL REMOVAL/STOW (CONT).

b. Stow Panel.



NOTE

- If installing left rear panel, perform Steps (1) and (2).
- If installing front panel or right rear panel, perform Steps (3) and (4).

(1) Position panel (6) on panel bracket (7).

(2) Close panel (6) until handle (5) latches to generator set housing (4).

NOTE

- Two front panels and right rear panel are installed the same. Right rear panel shown.

(3) Position panel (2) on two lower panel brackets (3).

(4) Close panel (2) until handle (1) latches to generator set housing (4).

(5) If hydraulic tank was moved for clearance to panel, notify Unit Maintenance.

APPENDIX A

REFERENCES

A-1. FORMS.

The following forms pertain to this manual. See DA PAM 310-1 for index of blank forms. See DA PAM 738-750, The Army Maintenance Management System (TAMMS), for instructions on the use of maintenance forms pertaining to this manual.

The Army Maintenance Management System (TAMMS) ..... DA PAM 738-750
Equipment Inspection and Maintenance Worksheet ..... DA Form 2404/5988E
Product Quality Deficiency Report ..... SF 368
Recommended Changes to DA Publications and Blank Form ..... DA Form 2028
Recommended Changes to Equipment and Technical Publications ..... DA Form 2028-2
TACOM Major End Item and Product Assurance Managers ..... SF 2407

A-2. TECHNICAL MANUALS.

Maintenance and Repair for Lead-Acid Storage Batteries ..... TM 9-6140-200-14
Operator's Manual for Truck, Tractor, M1074 and M1075 Palletized Load System (PLS) NSN 2320-01-304-2277 and NSN 2320-01-304-2278 ..... TM 9-2320-364-10
Procedures for Destruction of Tank-Automotive Equipment to Prevent Enemy Use ..... TM 750-244-6

A-3. FIELD MANUALS.

Basic Cold Weather Operation Manual ..... FM 31-70
Desert Operations (FM 7-727) ..... FM 90-3
Manual for Wheel Vehicle Driver ..... FM 21-305
Northern Operations ..... FM 31-71
Operation and Maintenance of Ordnance Material in Cold Weather (0 Degrees F to Minus 65 Degrees F) ..... FM 9-207

A-4. MISCELLANEOUS PUBLICATIONS.

Army Acquistion Policy ..... AR 70-1
Hearing Conservation Program ..... TB MED 501
Operator's Circular for Welding Theory and Application ..... TC 9-237
Theatre of Operations Electrical Systems ..... FM 5-424

APPENDIX B

COMPONENTS OF END ITEM (COEI) AND BASIC ISSUE ITEMS (BII) LISTS

Section I. INTRODUCTION

B-1. SCOPE.

This appendix lists COEI and BII for the Forward Repair System (FRS) to help you inventory the items for safe and efficient operation of the equipment.

B-2. GENERAL.

The COEI and BII lists are divided into the following sections:

a. Section II - Components of End Item (COEI). This listing is for information purposes only, and is not authority to requisition replacements. These items are part of the FRS, but they are to be 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 help you find and identify the items.

b. Section III - Basic Issue Items (BII). Section III contains the BII List. These essential items are required to place the FRS in operation. Although shipped separately packaged, BII must be with the FRS during operation and when it is transferred between property accounts. Listing these items is your authority to request/requisition them for replacement based on authorization of the end item by the TOE/MTOE. Illustrations are furnished to help you find and identify the items.

B-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 item called out in the illustration.

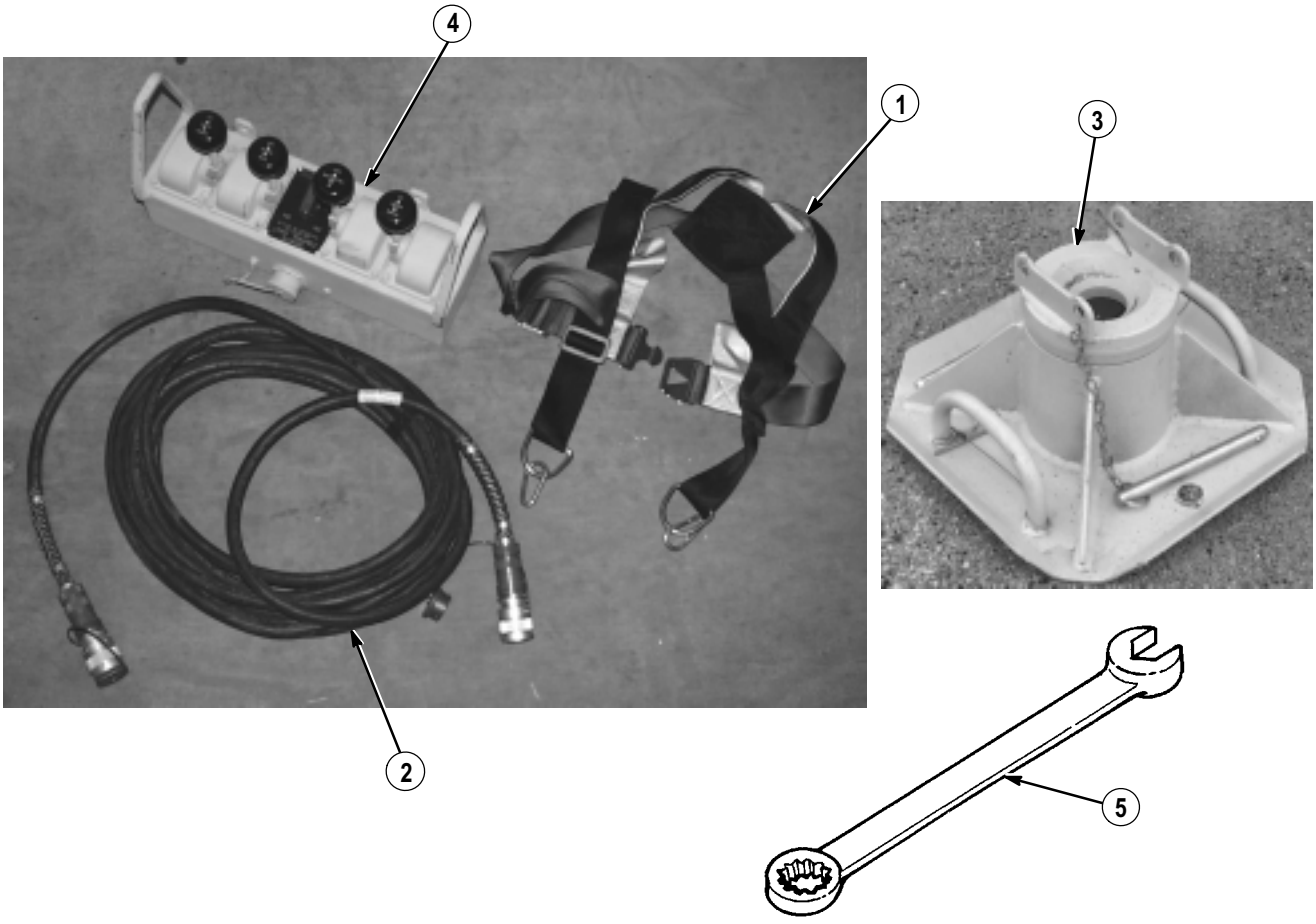
b. Column (2) - National Stock Number (NSN). Indicates the National Stock Number (NSN) assigned to the item and will be used for requisitioning purposes.

c. Column (3) - Description. Indicates the Federal item name, and, if required, a minimum description to identify and locate the item. The last line for each item indicates the Commercial and Government Entity (CAGE) Code in parentheses followed by the part number.

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

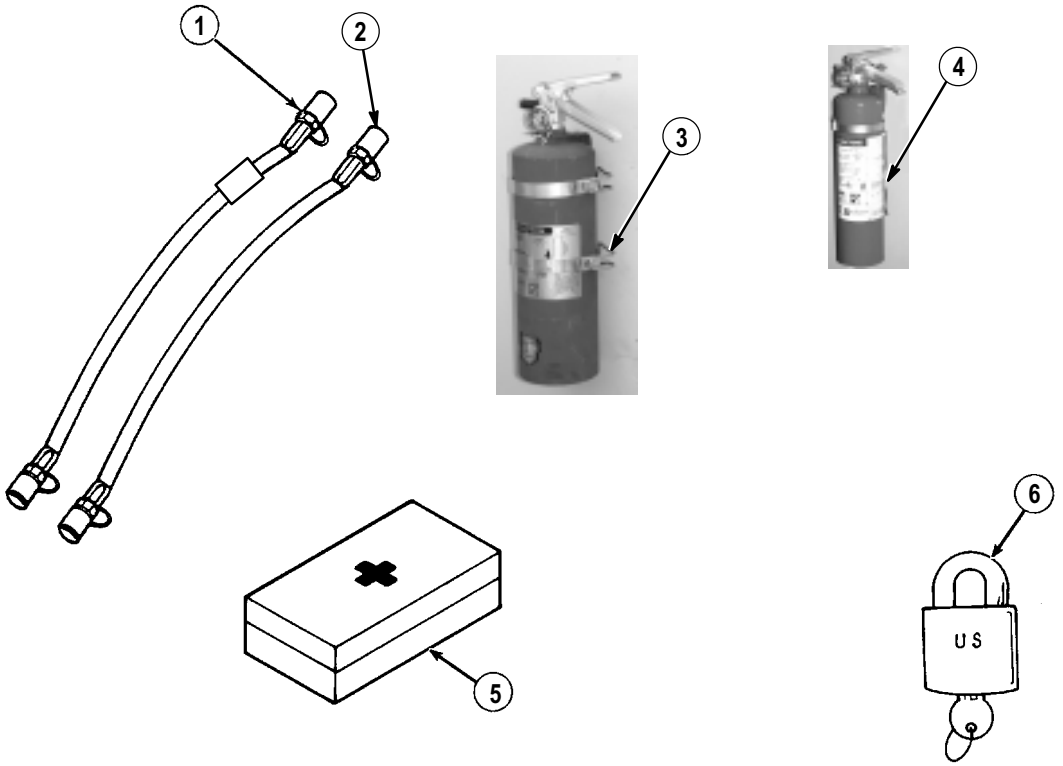
e. Column (5) - Quantity Required (Qty Rqr). Indicates the quantity of the item authorized to be used with/on the equipment.

Section II. COMPONENTS OF END ITEM



(1) Illus Number	(2) National Stock Number	(3) Description CAGE and Part Number	Usable On Code	(4) U/I	(5) Qty Rqr
1	857018714-9	Shoulder Harness Unisex (25795) D809	FRS	EA	1
2	6150-01-387-6357	Cable, Remote Control (12361) 2-195-6-00653	FRS	EA	1
3	2590-01-352-1262	Outrigger Pad Assembly (12361) 2-195-1-00070	FRS	EA	2
4	2540-01-394-7958	Remote Control Box Assembly (12361) 2-195-600661	FRS	EA	1
5	5120-01-300-1367	Wrench, Combination - 1/2 in. (55719) GOEX16	FRS	EA	1

Section III. BASIC ISSUE ITEMS



(1) Illus Number	(2) National Stock Number	(3) Description CAGE and Part Number	Usable On Code	(4) U/I	(5) Qty Rqr
1		Hose Supply Line, Slave RIA 149182-1	FRS	EA	1
2		Hose Return Line, Slave RIA 149182-2	FRS	EA	1
3	4210-00-165-4703	Extinguisher, Fire (5 lb) (DLA)	FRS	EA	1
4	4210-00-965-1105	Extinguisher, Fire (2.5 lb) (RIA)	FRS	EA	2
5	6545-00-922-1200	Kit, First Aid (DLA)	FRS	EA	1
6	5340-00-158-3805	Padlock W/Short Shaft (96906) MS35647-10	FRS	EA	16

APPENDIX C

ADDITIONAL AUTHORIZATION LIST (AAL)

Section I. INTRODUCTION

C-1. SCOPE.

This appendix lists additional items you are authorized for the support of the Forward Repair System (FRS).

C-2. GENERAL.

This list identifies items that do not have to accompany the FRS and that do not have to be turned in with it. These items are all authorized to you by Common Tables of Allowance (CTA), Modification Table of Organization and Equipment (MTOE), Tables of Distribution and Allowances (TDA), or Joint Table of Allowance (JTA).

C-3. EXPLANATION OF LISTING.

National Stock Number (NSN), descriptions and quantities are provided to help you identify and request the additional items you require to support this equipment. The items are listed in alphabetical sequence by item name. If the item you require differs between serial numbers of the same model, effective serial numbers are shown in the last line of the description.

Section II. ADDITIONAL AUTHORIZATION ITEMS LIST

(1) National Stock Number	(2) Description CAGE & Part Number	Usable On Code	(3) U/M	(4) Qty Auth
8415-00-634-4658	Gloves, Leather (90142), 37G2940	FRS	PR	2
4910-00-287-2944	Pan, Drain (81349), MIL-P-45819	FRS	EA	1

APPENDIX D

EXPENDABLE AND DURABLE SUPPLIES AND MATERIALS LIST

Section I. INTRODUCTION

D-1. SCOPE.

This appendix lists all expendable and durable items that you will need to operate and maintain the Forward Repair System (FRS). This listing is for information only and is not authority to requisition the listed items. These items are authorized to you by CTA 50-790 Expendable/Durable Items (except Medical, Class V, Repair Parts and Heraldic Items) or CTA 8-100, Army Medical Department Expendable/Durable

Section II. EXPENDABLE AND DURABLE ITEMS LIST

D-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 item; Dry Cleaning Solvent, (Item 16, Appendix D).

b. Column (2) - Level. This column identifies the lowest level of maintenance that requires the item.

C - Operator/Crew

c. Column (3) - National Stock Number. This is the National Stock Number assigned to the item which you can use to requisition it.

d. Column (4) - Item Name, Description, Commercial and Government Entity Code (CAGEC) and Part Number. This provides the other information you need to identify the item.

e. Column (5) - Unit of Measure. This code shows the physical measurement of an item, such as gallon, dozen, gross, etc.

(1) Item Number	(2) Level	(3) National Stock Number	(4) Description	(5) U/M
1	C		Antifreeze, Arctic Type (MIL-A-11755)	
		6850-00-243-1992	1 gal. can	gal.
		6850-00-174-1806	55 gal. drum	gal.
2	C	6850-00-181-7940	Antifreeze, Permanent, Glycol, Inhibited (MIL-A-46153)	gal.
3	C	7939-00-634-3935	Chips, Soap, (P-S-579)	
4	C	8030-00-903-0931	Corrosion Preventive Compound 1 pt. can	pt.
5	C		Grease, Automotive and Artillery (GAA) (MIL-G-10924)	
		9150-01-197-7789	2.5 oz. tube	oz.
		9150-01-197-7693	14 oz. cartridge	oz.
		9150-01-197-7690	1.75 lb. can	lb.
		9150-01-197-7692	35 lb. can	lb.
		9150-01-197-7691	120 lb. drum	lb.
6	C		Oil, Air Compressor Lubricant	
		9150-01-025-8649	1 qt. can	qt.
7	C		Oil, Fuel, Diesel, DF-1, Winter (VV-F-800)	
		9140-00-286-5286	Bulk	gal.
		9140-00-286-5287	5 gal. drum	gal.
		9140-00-286-5288	55 gal. drum, 16 gage	gal.
		9140-00-286-5289	55 gal. drum, 18 gage	gal.
8	C		Oil, Fuel, Diesel, DF-2, Regular (VV-F-800)	
		9140-00-286-5294	Bulk	gal.
		9140-00-286-5295	5 gal. drum	gal.
		9140-00-286-5296	55 gal. drum, 16 gage	gal.
9	C		Oil, Lubricating, Gear, GO 85/140 (MIL-PRF-2105)	
			5 gal. drum	gal.
10	C		Oil, Lubricating, OEA, ICE, Subzero (MIL-L-46167)	
		9150-00-402-4478	1 qt. can	qt.
		9150-00-402-2372	5 gal. drum	gal.
		9150-00-402-7197	55 gal. drum, 16 gage	gal.

(1) Item Number	(2) Level	(3) National Stock Number	(4) Description	(5) U/M
11	C		Oil, Lubricating, OE/HDO 10 (MIL-L-2104)	
		9150-00-189-6727	1 qt. can	qt.
		9150-00-186-6668	5 gal. drum	gal.
			55 gal. drum, 16 gage	gal.
		9150-00-191-2772	55 gal. drum, 18 gage	gal.
12	C		Oil, Lubricating, OE/HDO 15/40 (SAE 15W-40) (MIL-L-2104)	
		9150-01-178-4725	1 qt. can	qt.
		9150-01-152-4118	5 gal. drum	gal.
		9150-01-152-4119	55 gal. drum	gal.
13	C		Oil, Lubricating, OE/HDO 30 (SAE 30) (MIL-L-2140)	
		9150-00-186-6681	1 qt. can	qt.
		9150-00-188-9858	5 gal. drum	gal.
		9150-00-265-9436	55 gal. drum, 16 gage	gal.
		9150-00-189-6729	55 gal. drum, 18 gage	gal.
14	C		Oil, Lubricating, OE/HDO 40 (MIL-L-2104)	
		9150-00-188-6730	1 qt. can	qt.
		9150-00-188-9865	5 gal. drum	gal.
		9150-00-188-9862	55 gal. drum, 16 gage	gal.
		9150-00-405-2987	bulk	gal.
15	C		Rags, Wiping (A-A-531)	
		7920-00-205-1711	50 lb. bale	
16	C		Solvent, Dry Cleaning, SD (P-D-680)	
		6850-00-664-5685	1 qt. can	qt.
		6850-00-281-1985	1 gal. can	gal.
			(Environmentally Compliant Solvent) (0K209) Breakthrough	
		6850-01-378-0679	5 gallon can	gal.
17	C		Solvent, Biodegradable (MIL-C-87936)	
		6850-01-181-0273	1 qt. can	qt.
		6850-01-184-7453	5 gal. drum	gal.
		6850-01-184-3182	55 gal. drum	gal.

APPENDIX E

STOWAGE AND SIGN GUIDE (FOR COEI, BII, AND APPLICABLE AAL ITEMS)

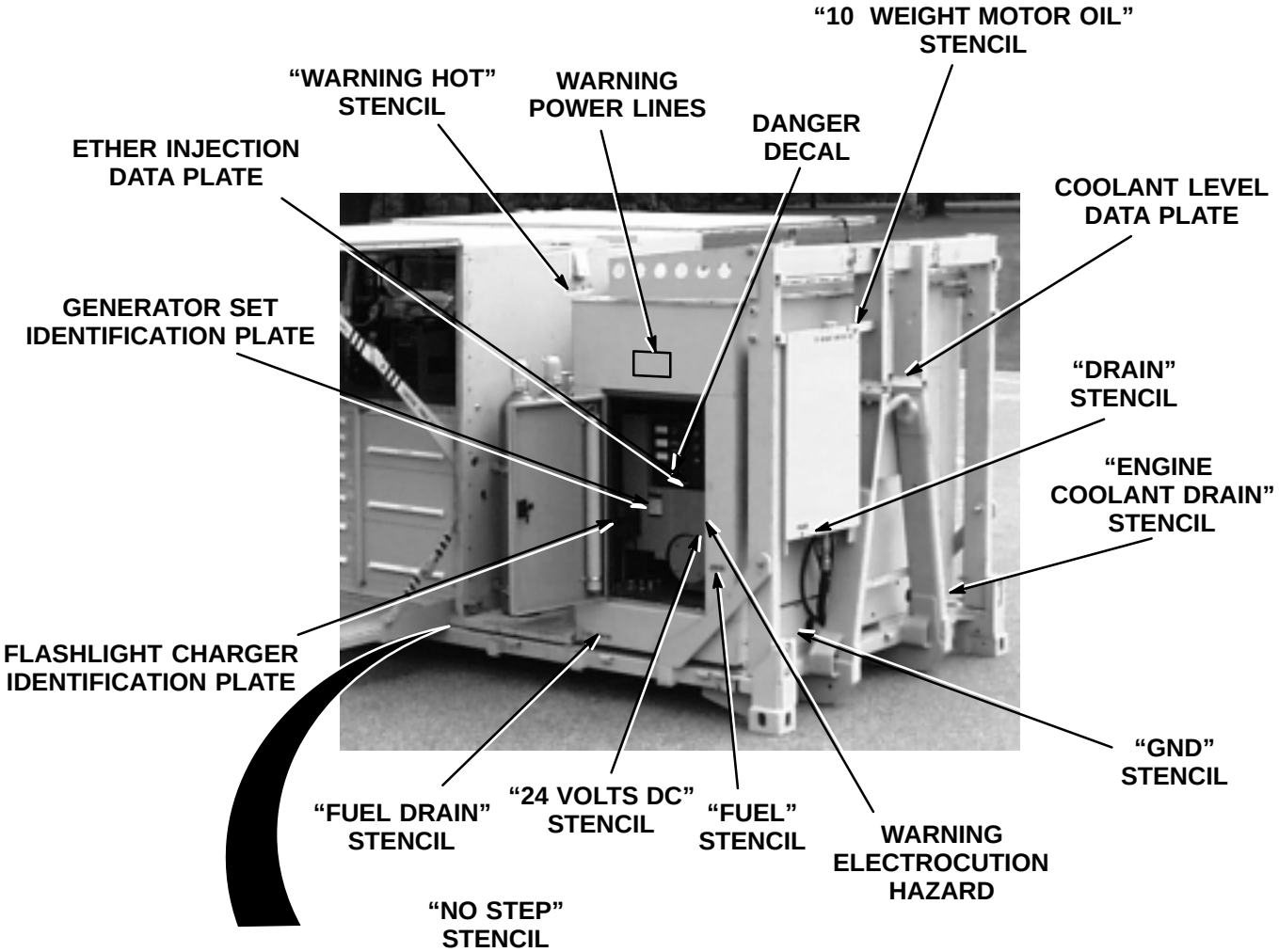
Section I. INTRODUCTION

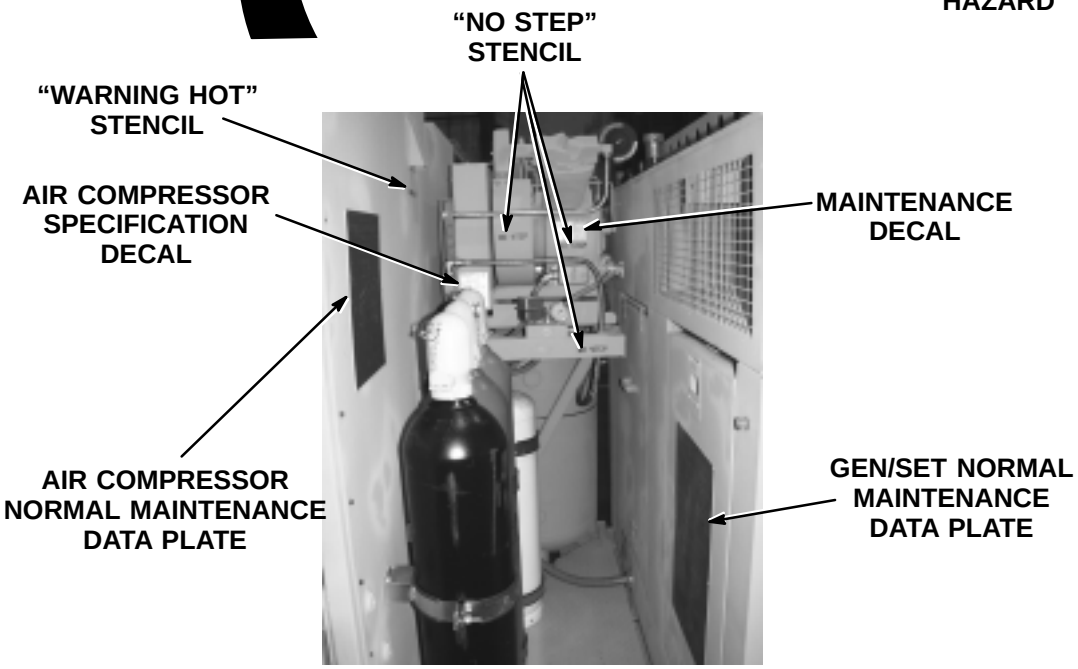
E-1. SCOPE.

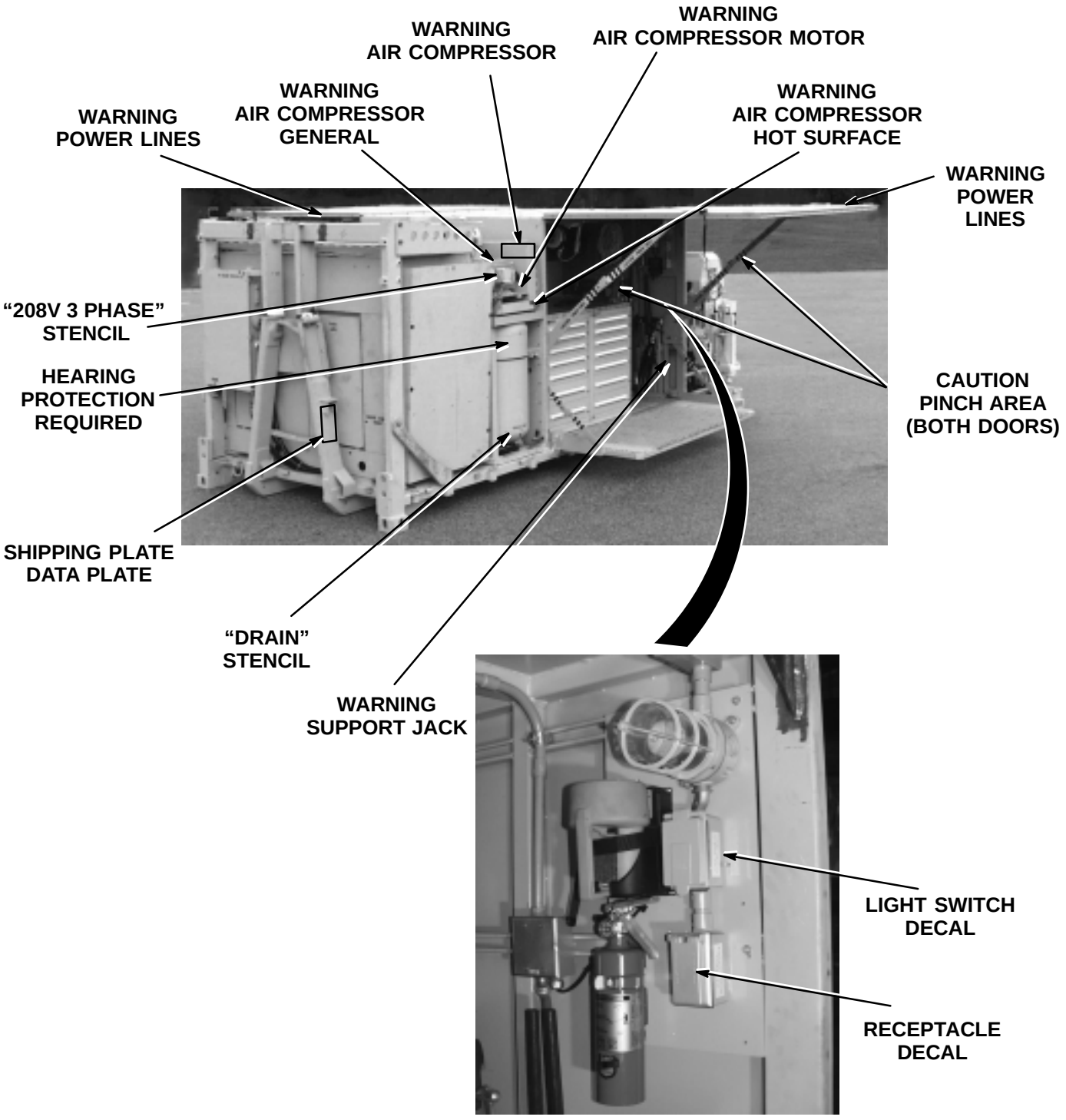
This appendix shows locations for data plates, decals and stencils that are required to be in place on the Forward Repair System (FRS).

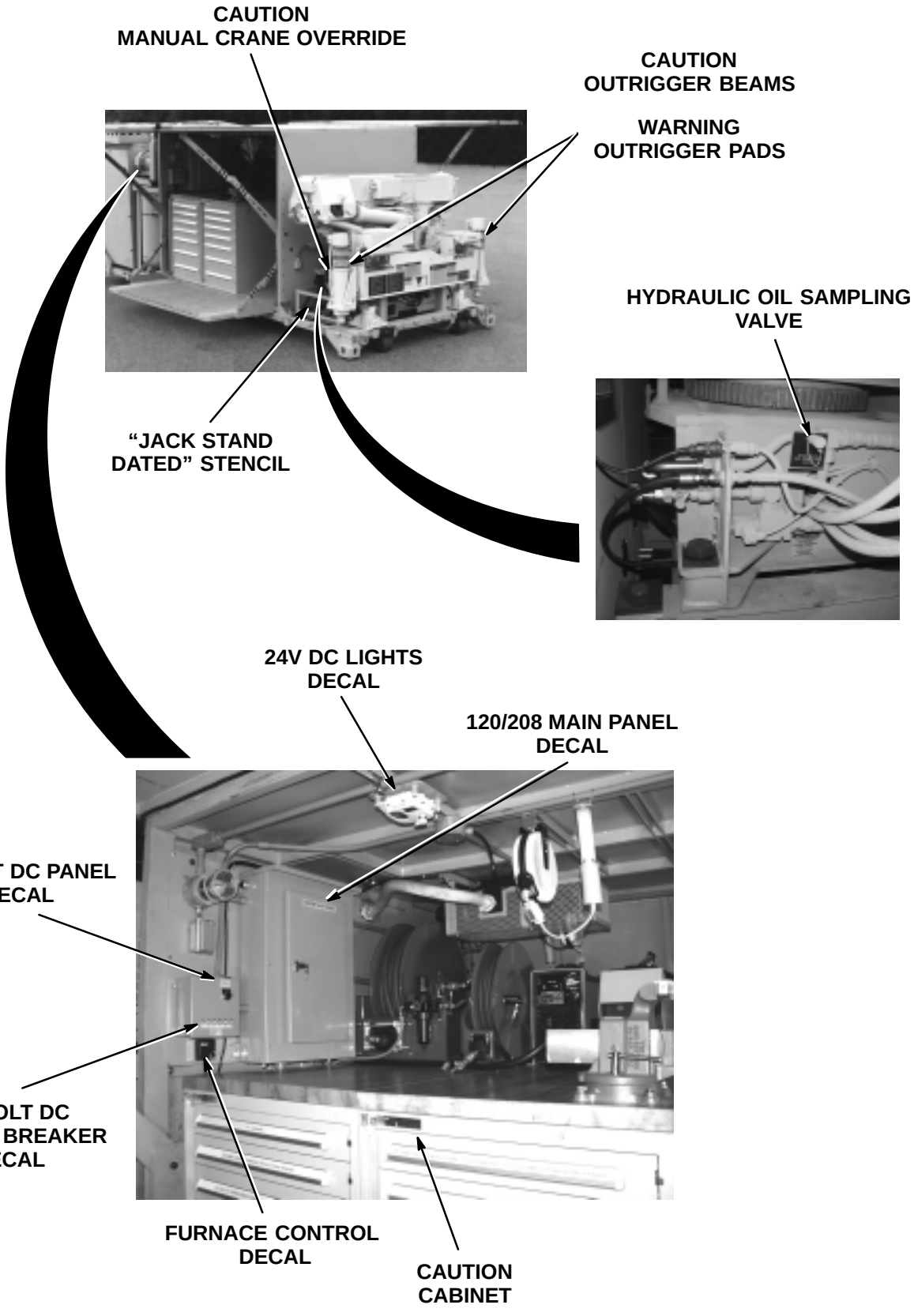
E-2. GENERAL.

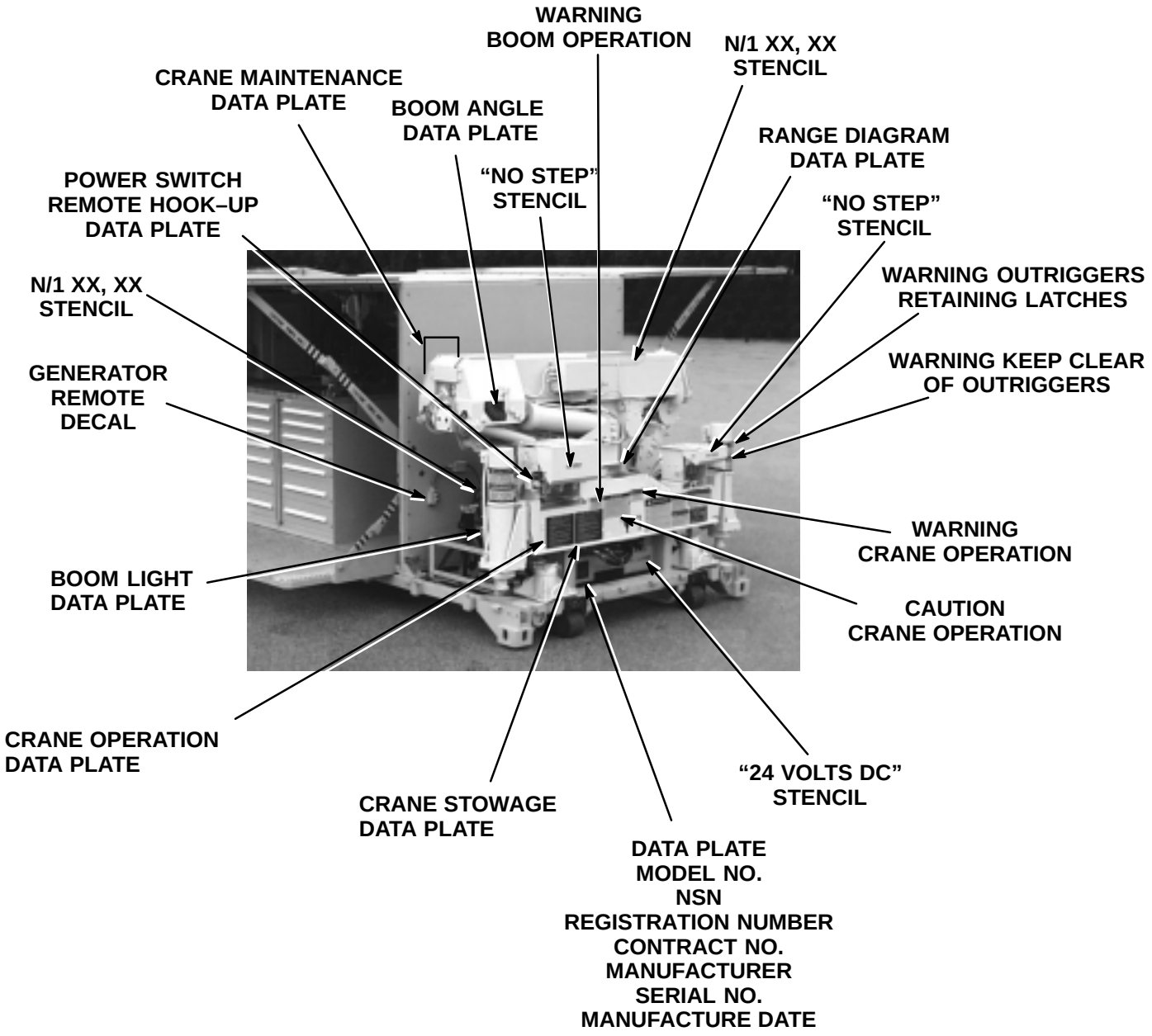
The figures on the next pages show the location of metal signs, decals and stencils used on the FRS. Most of these signs and stencils contain cautions or information needed to operate the FRS safely.

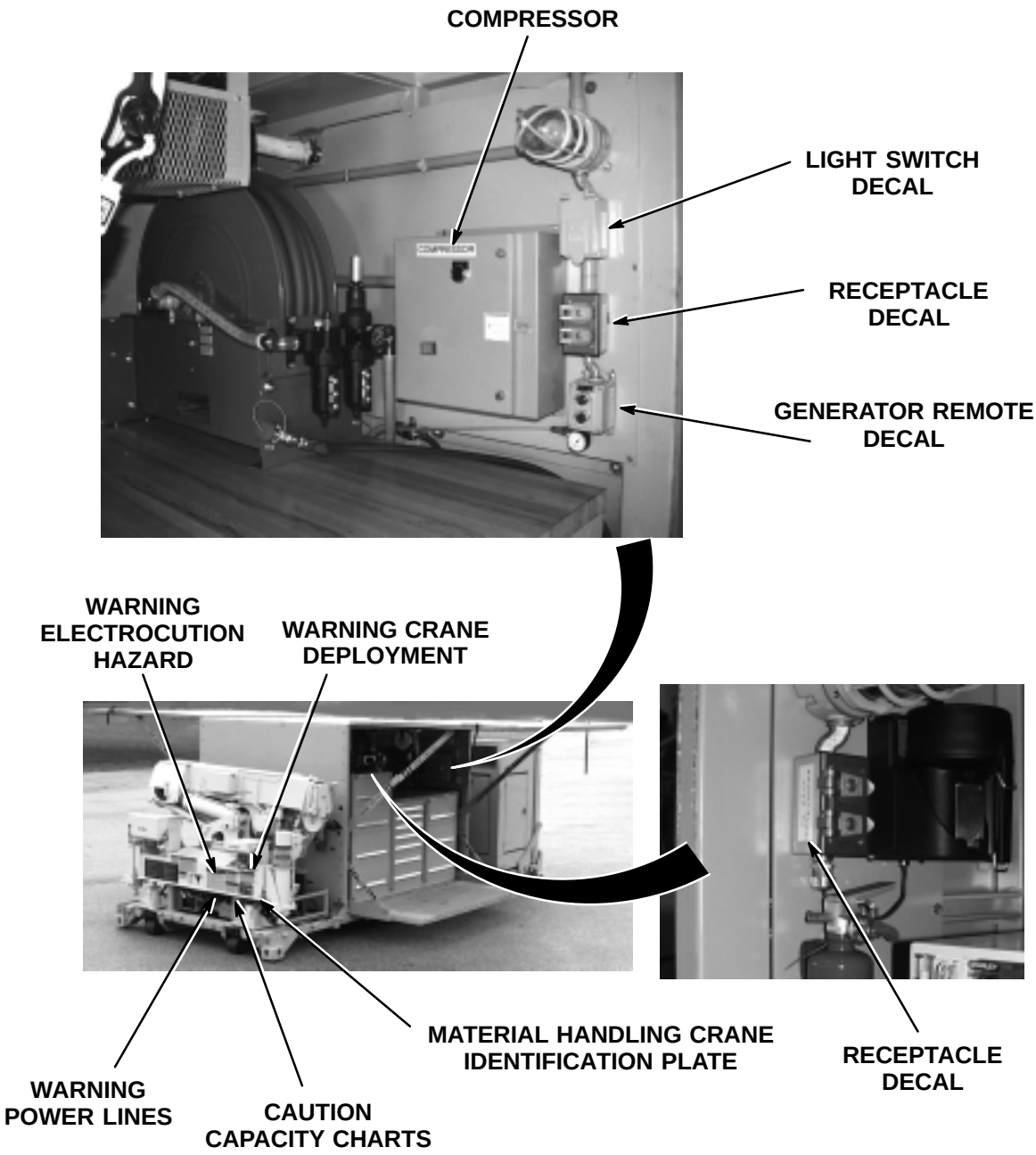

"10 WEIGHT MOTOR OIL" STENCIL
"WARNING HOT" STENCIL
WARNING POWER LINES
DANGER DECAL
ETHER INJECTION DATA PLATE
COOLANT LEVEL DATA PLATE
GENERATOR SET IDENTIFICATION PLATE
"DRAIN" STENCIL
"ENGINE COOLANT DRAIN" STENCIL
FLASHLIGHT CHARGER IDENTIFICATION PLATE
"GND" STENCIL
"FUEL DRAIN" STENCIL
"24 VOLTS DC" STENCIL
"FUEL" STENCIL
WARNING ELECTROCUTION HAZARD

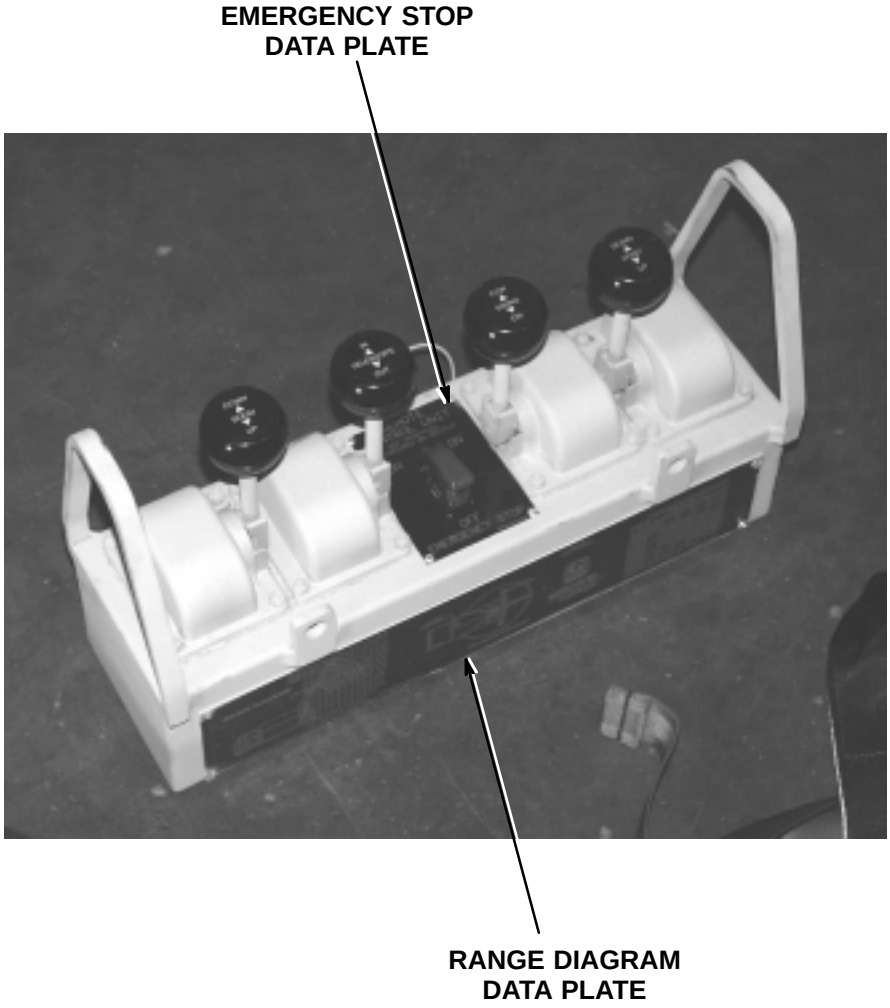

"NO STEP" STENCIL
"WARNING HOT" STENCIL
AIR COMPRESSOR SPECIFICATION DECAL
MAINTENANCE DECAL
AIR COMPRESSOR NORMAL MAINTENANCE DATA PLATE
GEN/SET NORMAL MAINTENANCE DATA PLATE


WARNING
AIR COMPRESSOR
WARNING
AIR COMPRESSOR MOTOR
WARNING
AIR COMPRESSOR
GENERAL
WARNING
POWER LINES
WARNING
AIR COMPRESSOR
HOT SURFACE
WARNING
POWER
LINES
"208V 3 PHASE"
STENCIL
HEARING
PROTECTION
REQUIRED
CAUTION
PINCH AREA
(BOTH DOORS)
SHIPPING PLATE
DATA PLATE
"DRAIN"
STENCIL
WARNING
SUPPORT JACK
LIGHT SWITCH
DECAL
RECEPTACLE
DECAL


CAUTION
MANUAL CRANE OVERRIDE
CAUTION
OUTRIGGER BEAMS
WARNING
OUTRIGGER PADS
HYDRAULIC OIL SAMPLING
VALVE
"JACK STAND
DATED" STENCIL
24V DC LIGHTS
DECAL
120/208 MAIN PANEL
DECAL
24 VOLT DC PANEL
DECAL
24 VOLT DC
CIRCUIT BREAKER
DECAL
FURNACE CONTROL
DECAL
CAUTION
CABINET


WARNING
BOOM OPERATION
N/1 XX, XX
STENCIL
CRANE MAINTENANCE
DATA PLATE
BOOM ANGLE
DATA PLATE
RANGE DIAGRAM
DATA PLATE
POWER SWITCH
REMOTE HOOK–UP
DATA PLATE
"NO STEP"
STENCIL
"NO STEP"
STENCIL
WARNING OUTRIGGERS
RETAINING LATCHES
N/1 XX, XX
STENCIL
GENERATOR
REMOTE
DECAL
WARNING KEEP CLEAR
OF OUTRIGGERS
WARNING
CRANE OPERATION
BOOM LIGHT
DATA PLATE
CAUTION
CRANE OPERATION
CRANE OPERATION
DATA PLATE
"24 VOLTS DC"
STENCIL
CRANE STOWAGE
DATA PLATE
DATA PLATE
MODEL NO.
NSN
REGISTRATION NUMBER
CONTRACT NO.
MANUFACTURER
SERIAL NO.
MANUFACTURE DATE


COMPRESSOR
LIGHT SWITCH DECAL
RECEPTACLE DECAL
GENERATOR REMOTE DECAL
WARNING ELECTROCUTION HAZARD
WARNING CRANE DEPLOYMENT
MATERIAL HANDLING CRANE IDENTIFICATION PLATE
RECEPTACLE DECAL
WARNING POWER LINES
CAUTION CAPACITY CHARTS


EMERGENCY STOP
DATA PLATE
RANGE DIAGRAM
DATA PLATE

APPENDIX F

FRS LOAD PLAN

Section I. INTRODUCTION

F-1. SCOPE.

This appendix identifies, shows the location, and briefly describes all tools and equipment contained in or on the FRS. All tools and equipment are also listed alphabetically for ease in locating them. The two tables included in this appendix are:

Table F-1. List Of Tools And Equipment By Location On FRS

Table F-2. Alphabetical List Of Tools And Equipment

F-2. EXPLANATION OF COLUMNS IN TABLES F-1 AND F-2.

a. Column 1, Item #. Used to identify item in illustration.

b. Column 2, Item Description. Brief description of tool or piece of equipment to help identify it.

c. Column 3, NSN/Part Number. National Stock Number if available, if not the part number stenciled or etched on the tool or piece of equipment.

d. Column 4, Qty. Quantity found on FRS.

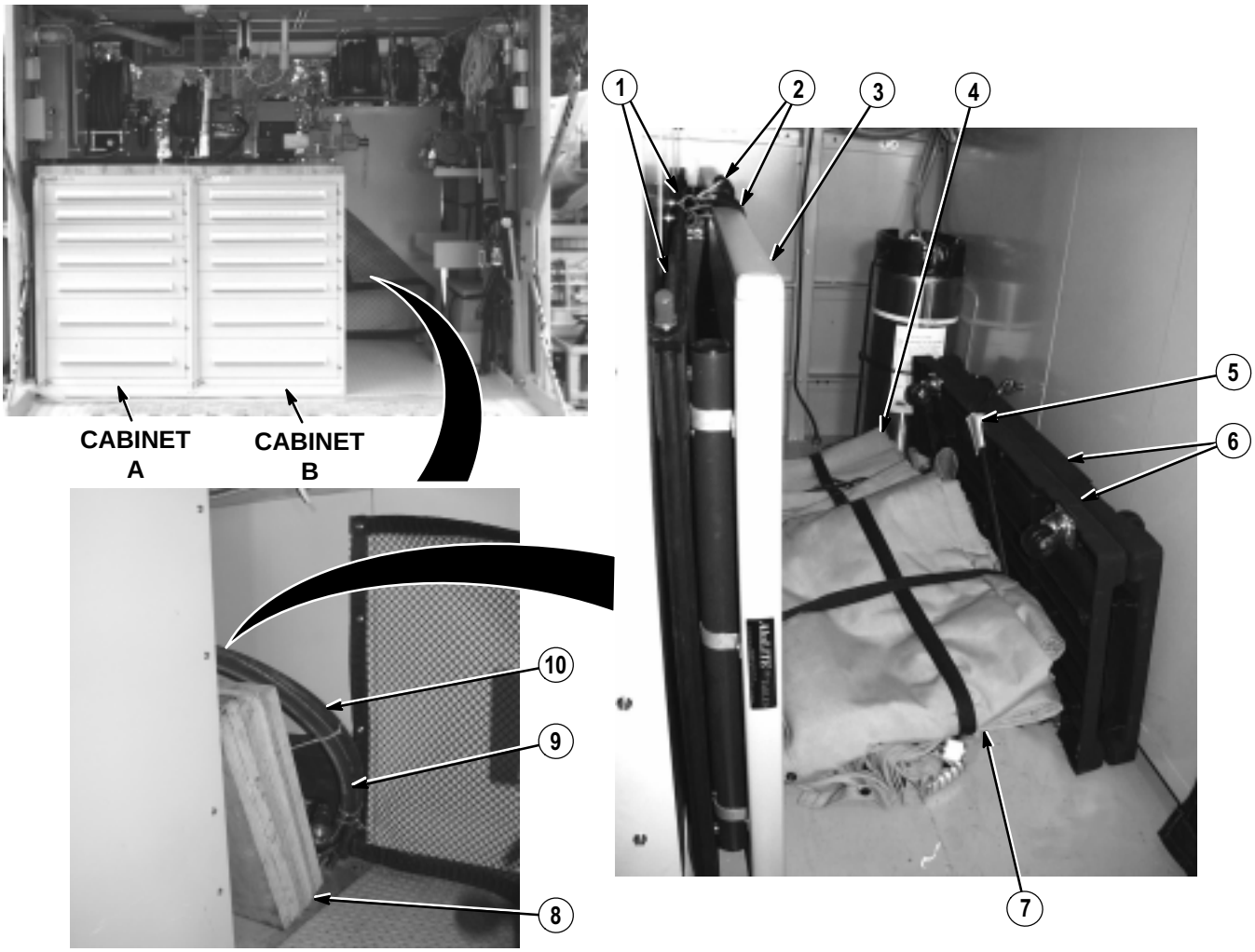
e. Column 5, UI. Unit of Issue.

f. Column 6, Location. Two letter codes are used to identify where the item is located on FRS. Each two letter code corresponds to an illustration in Table F-1 that identifies the part. This column is only included in Table F-2 (Alphabetical List of Tools). The two letter codes and their definitions are as follows:

1. BS	Bulk Storage	7. RW	Rear Wall
2. CM	Counter Mount	8. A –	Cabinet A Drawers 2 thru 7
3. CLM	Ceiling Mount	9 B –	Cabinet B Drawers 1 thru 7
4. FV	Front View	10. C –	Cabinet C Drawer 3
5. FW	Front Wall	11. D –	Cabinet D Drawers 1 thru 7
6. RV	Rear View	12. E –	Cabinet E Drawers 1 thru 4

Section II. FORWARD REPAIR SYSTEM (FRS) EQUIPMENT LOADING PLAN

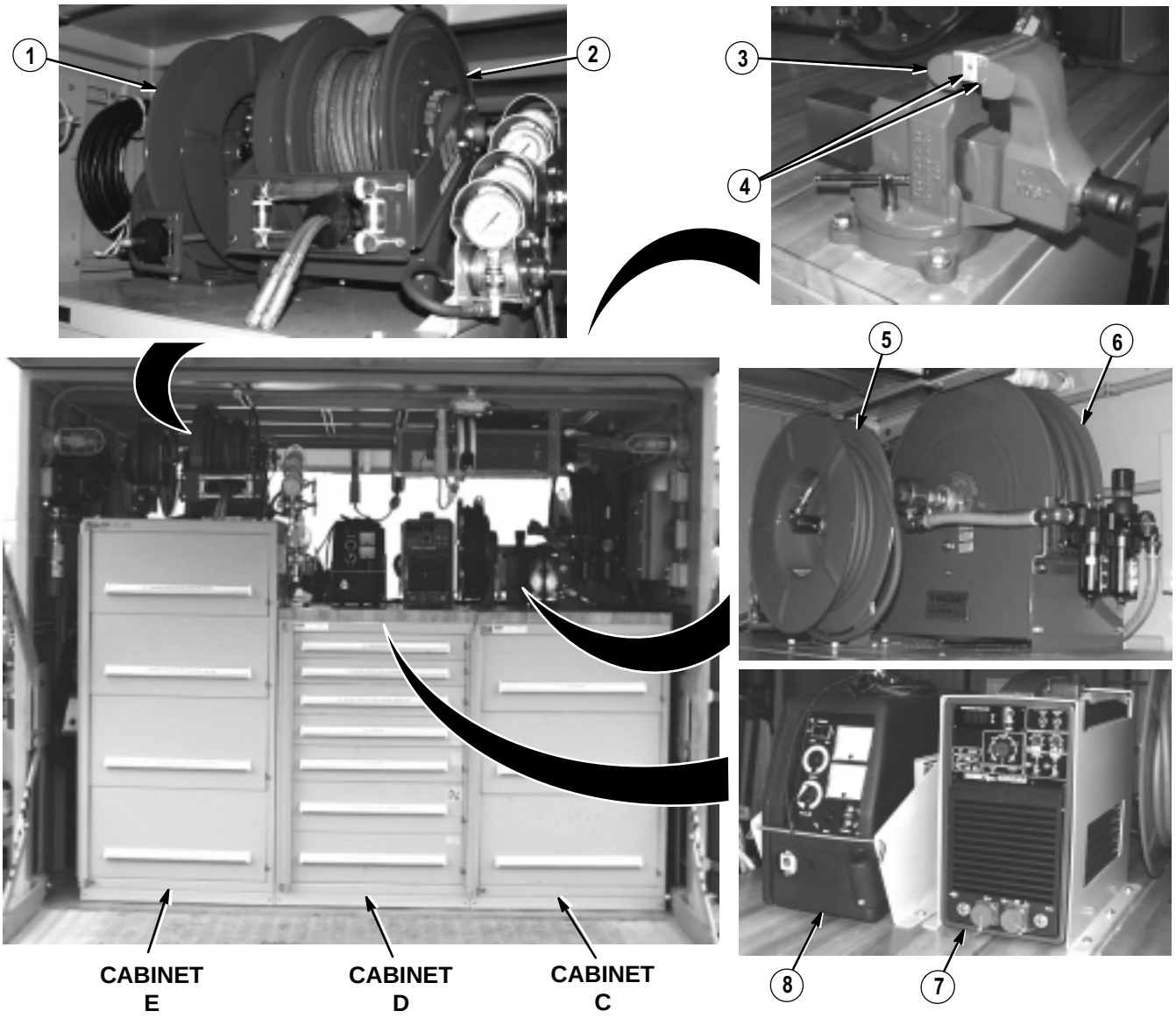
Table F-1. List of Tools and Equipment By Location On FRS



FRS BULK STORAGE (BS)

Item #	Item Description	NSN/Part Number	Qty	UI
1	BAG, AIR LIFTING, KPI–44	30978888190	2	EA
2	STRAPS, RUBBER, TIE-DOWN 21”	5340-00-X99-7113	2	EA
3	TABLE, FOLDING, ALULITE W/ROMAN II LEGS	3052	1	EA
4	TARP LEFT SIDE	RIA148878	2	EA
5	STRAPS, RUBBER, TIE-DOWN 15”	5340-00-X99-7112	1	EA
6	CREEPER	257954WM29	2	EA
7	TARP RIGHT SIDE	RIA148879	2	EA
8	CRIB BLOCKING	RIA149431	7	EA
9	SLAVE HOSE SUPPLY LINE	RIA149182-1	1	EA
10	SLAVE HOSE RETURN LINE	RIA149182-2	1	EA

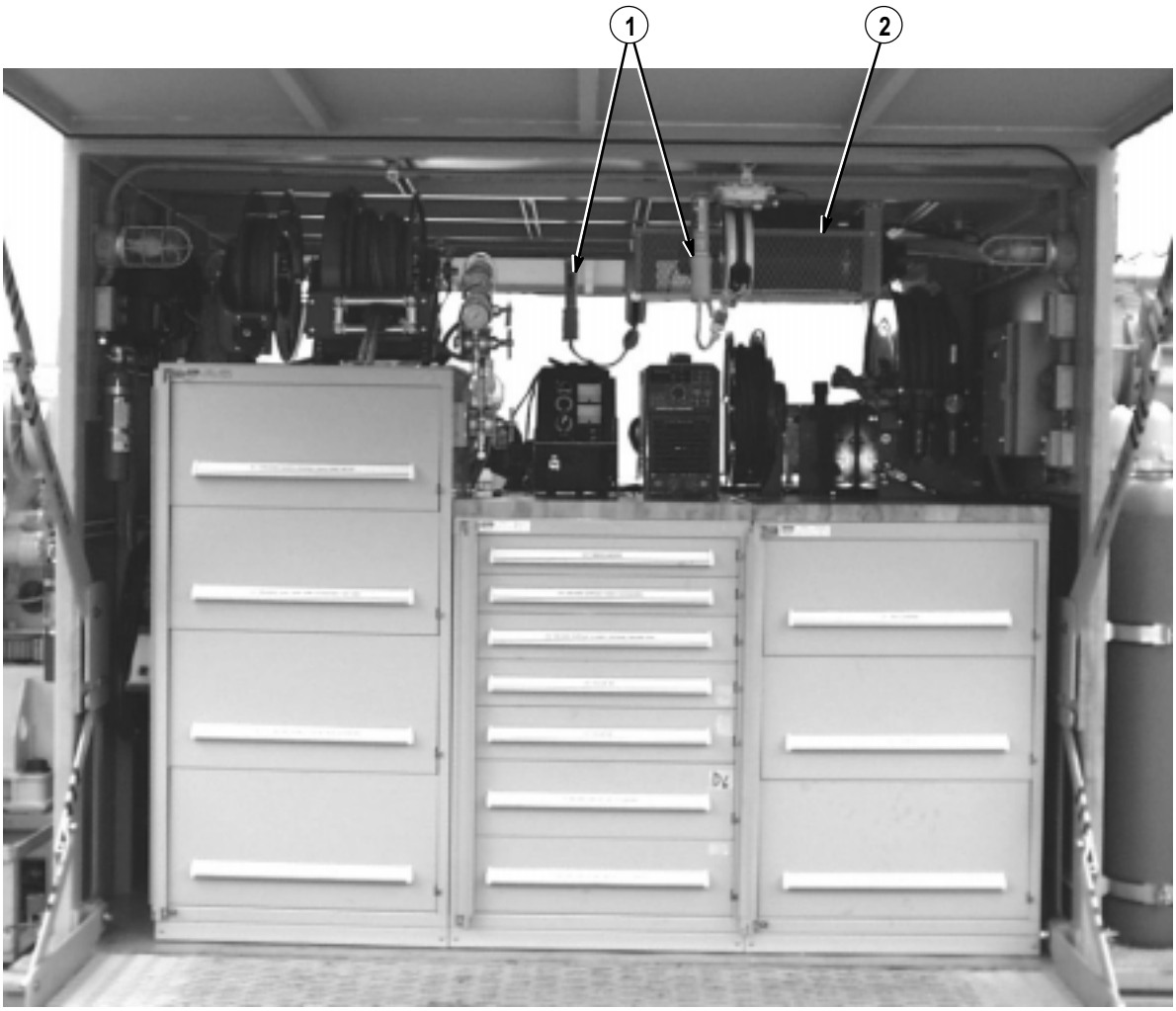
Table F-1. List Of Tools And Equipment By Location On FRS – Continued



FRS COUNTER MOUNT (CM)

Item #	Item Description	NSN/Part Number	Qty	UI
1	ARGON HOSE REEL	4930-01-311-2882	1	EA
2	HOSE REEL, DUAL OXY/ACTYL W/O HOSE	52173S36106LT	1	EA
3	VISE, MACHINIST'S SWVL BASE, 4" JAW	5120-00-293-1439	1	EA
4	CAPS, VISE JAW	5120-00-221-1506	1	PG
5	HOSE REEL, AIR LINE, SPR. RET., 3/8"	521737670 OLP	1	EA
6	HOSE REEL, AIR LINE, SPR. RET., 3/4"	52173D9375 OLP	1	EA
7	WELDER, 400GMS	3431-00-X99-8023	1	EA
8	WELDER, WIRE FEED	3431-00-X99-8025	1	EA

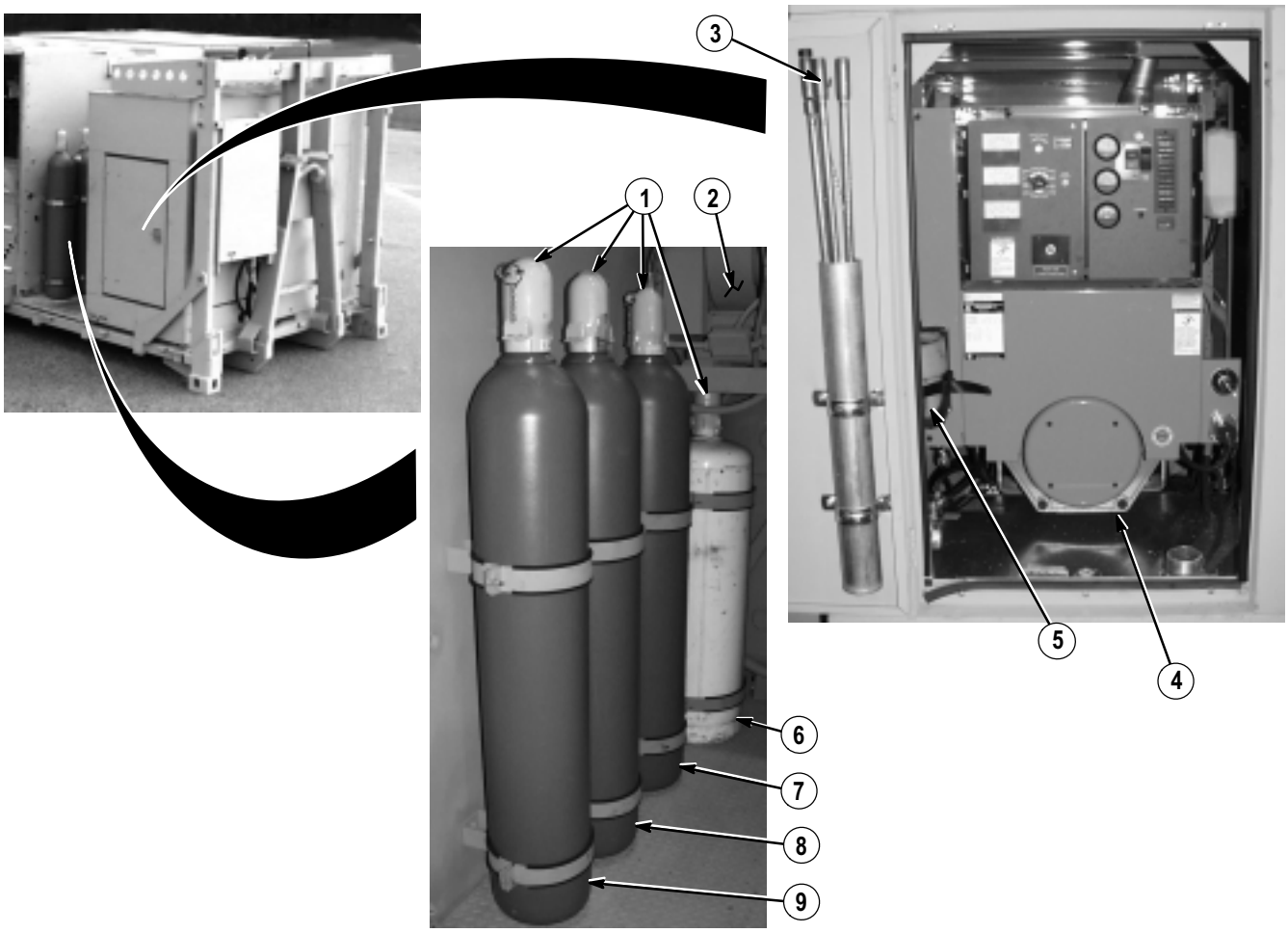
Table F-1. List Of Tools And Equipment By Location On FRS – Continued



FRS CEILING MOUNT (CLM)

Item #	Item Description	NSN/Part Number	Qty	UI
1	LIGHT, TROUBLE, FLUORESCENT, 50 FT	6230-00-X99-7109	2	EA
2	AIR HEATER	38453D8LC-24V	1	EA

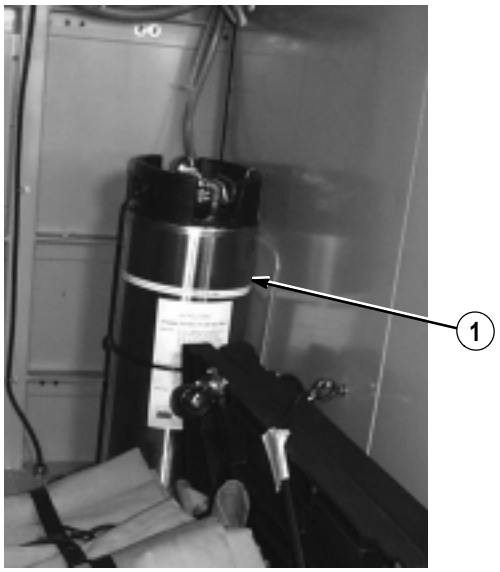
Table F-1. List Of Tools And Equipment By Location On FRS – Continued

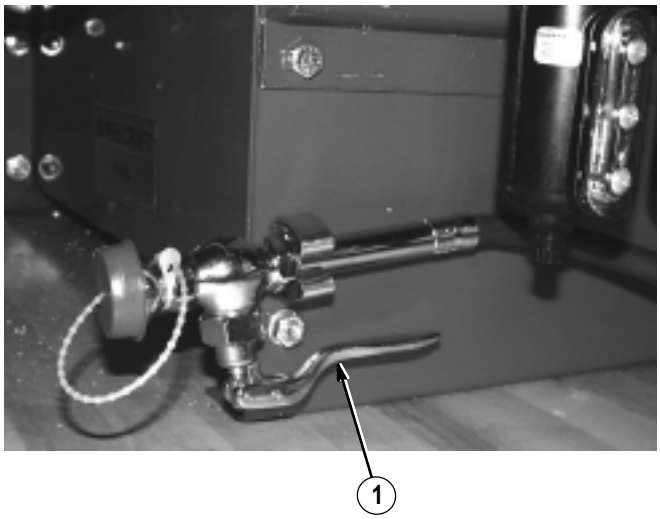


FRS FRONT VIEW (FV)

Item #	Item Description	NSN/Part Number	Qty	UI
1	SAFETY CAPS	5340-01-396-3951	4	EA
2	AIR COMPRESSOR AND RECEIVER	3W2937100X15	1	EA
3	ROD ASSEMBLY, GROUND INSIDE GEN SET	5975-00-897-3791	1	EA
4	GENERATOR SET	6115-00-X99-5156	1	EA
5	LIGHT, WOLF	6230-00-X99-5117	1	EA
6	TANK, PROPYLENE	6830-00-X99-7120	1	EA
7	TANK, OXYGEN	6830-00-X99-7119	1	EA
8	TANK, ARGON	6830-00-X99-7118	1	EA
9	TANK, NITROGEN	6830-00-X99-7121	1	EA

Table F-1. List Of Tools And Equipment By Location On FRS – Continued

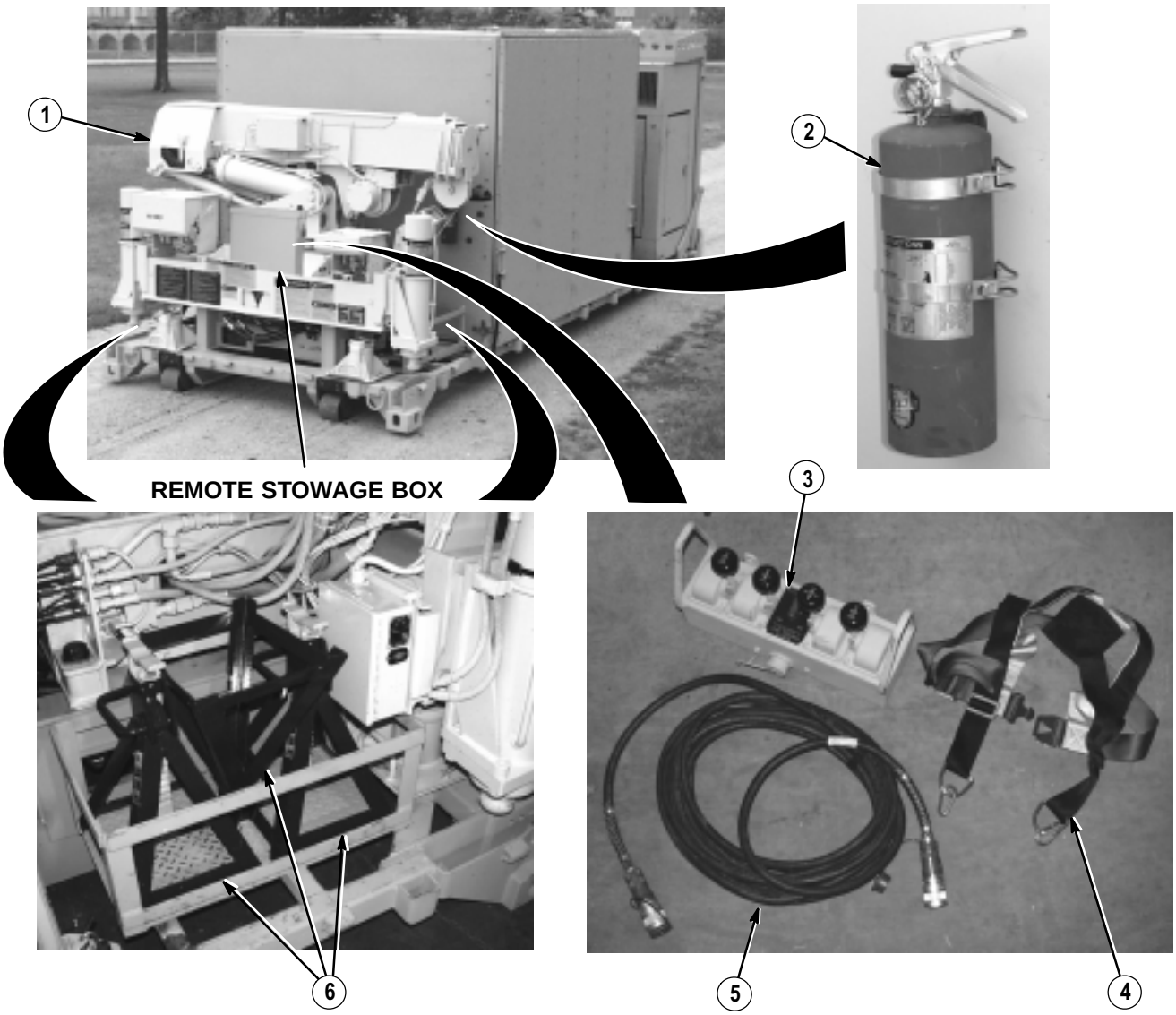




FRS FRONT WALL (FW)

Item #	Item Description	NSN/Part Number	Qty	UI
1	FOUNTAIN, EYE AND FACE WASH	4240-00-551-3134	1	EA

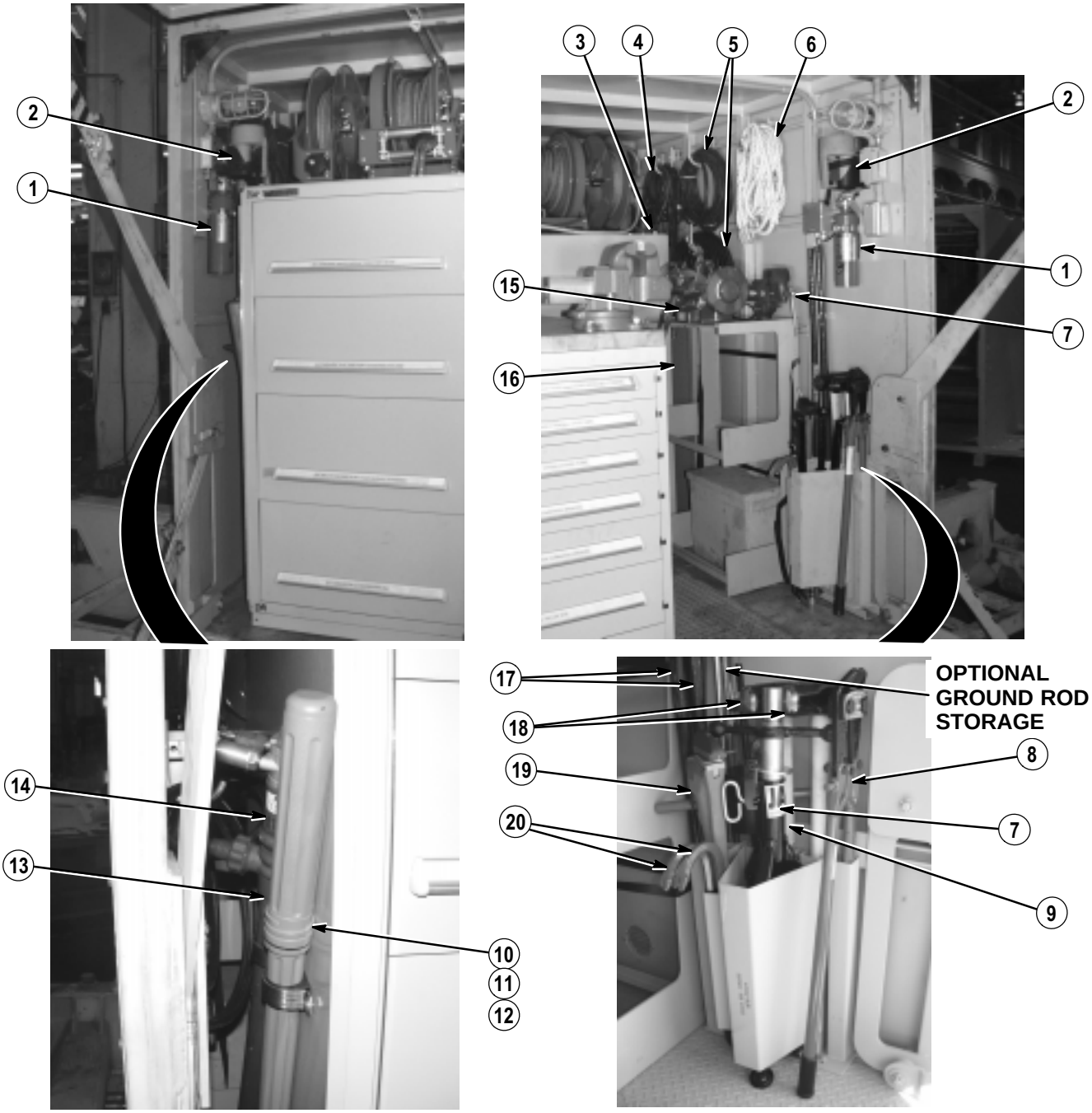
Table F-1. List Of Tools And Equipment By Location On FRS – Continued



FRS REAR VIEW (RV)

Item #	Item Description	NSN/Part Number	Qty	UI
1	CRANE, LVS MK17A1	3950-00-X99-8101	1	EA
2	FIRE EXTINGUISHER 5 LB.	4210-00-165-4703	1	EA
3	REMOTE CONTROL ASSEMBLY	2-195-6-10000	1	EA
4	STRAP, REMOTE CONTROL	D809	1	EA
5	CABLE	2-195-6-00653	1	EA
6	TRESTLE, 7 TON	3950-00-251-8013	6	EA

Table F-1. List Of Tools And Equipment By Location On FRS – Continued



FRS REAR WALL (RW)

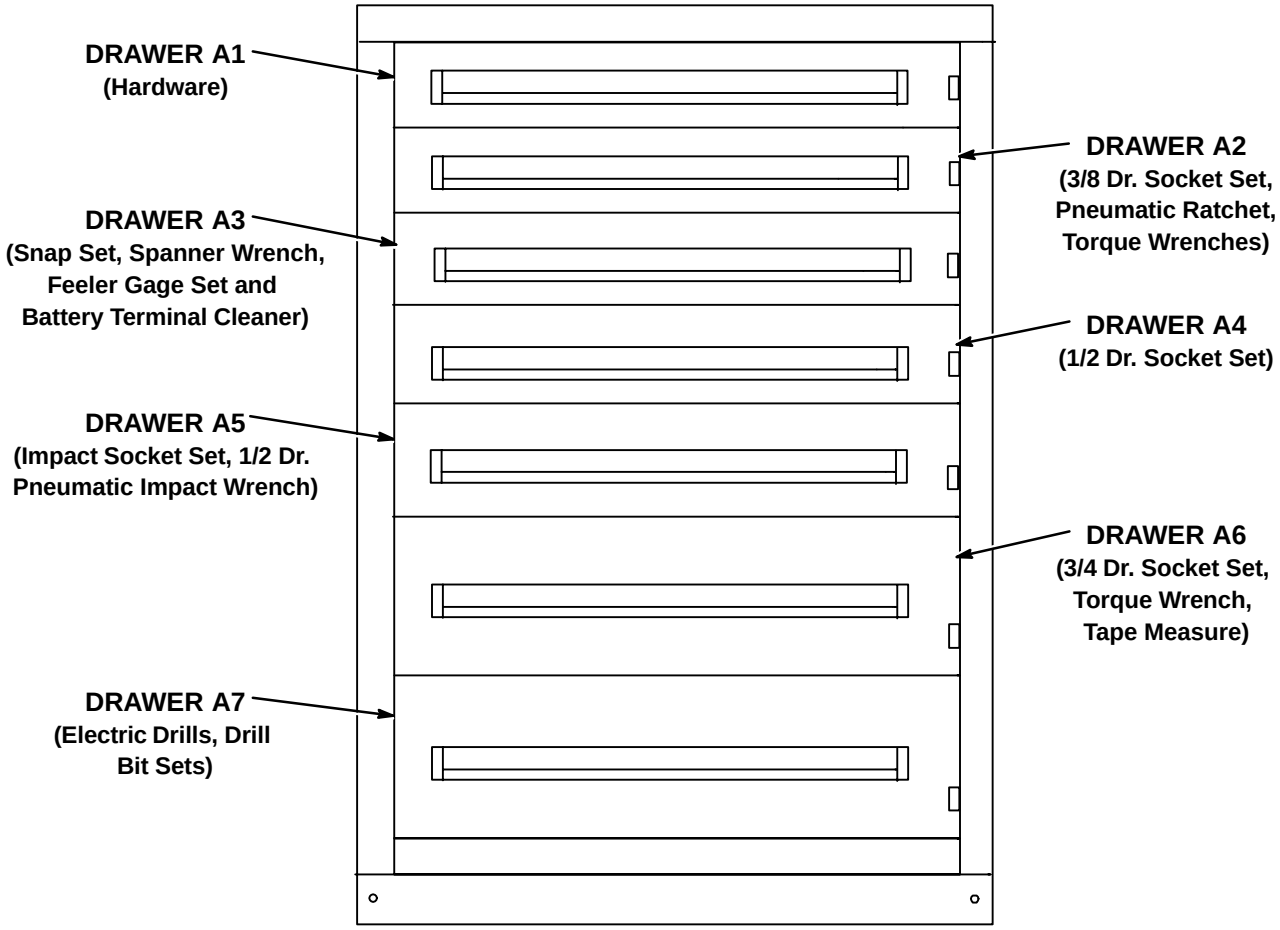
Item #	Item Description	NSN/Part Number	Qty	UI
1	FIRE EXTINGUISHERS W/ BRACKET, 2.5 LB	4210-00-965-1105	2	EA
2	LIGHT, WOLF	6230-00-X99-5117	2	EA
3	CABLE, WELDING ASSY, W/2 FTGS, 45 FT RED LDP-70	6150-00-X99-7105	1	EA

Table F-1. List Of Tools And Equipment By Location On FRS – Continued

FRS REAR WALL (RW) – Continued

Item #	Item Description	NSN/Part Number	Qty	UI
4	CABLE, WELDING ASSY, W/2 FTGS, 45 FT BLACK LDP-50	6150-00-X99-7106	1	EA
5	CORD, ELECTRICAL POWER, 50', ALL	6150-00-682-3460	2	EA
6	LANYARD ASSY, 1/2" D. NYLON W/D RINGS	257955M534	2	EA
7	LIFT-A-JACK W/3" MULTI-PURPOSE VISE	3950-00-X99-7710	1	EA
8	CUTTERS, BOLT	5110-00-224-7057	1	EA
9	SLIDE HAMMER, GROUND, ROD	5120-01-013-1676	1	EA
10	BRAZING ROD HOLDER	3439-00-X99-8028	1	EA
11	BRAZING ROD, 1/8"	3439-00-X99-8020	1	PK
12	BRAZING ROD, 3/16"	0015FC-80	1	PK
13	PUMP ATTACHMENT, AIR MOTOR	TBD	1	EA
14	PUMP, AIR MOTOR	TBD	1	EA
15	GRINDING MACHINE, UTILITY	3415-00-517-7754	1	EA
16	TORQUE WRENCH, 3/4" DRIVE, 90-600 FT-LBS.	5120-01-400-0319	1	EA
17	BAR, WRECKING, GOOSE NECK, 24"	1CV0555–124	2	EA
18	HAMMER, SLEDGE, 8 LBS (Fiberglass handle)	5120-01-428-5175	2	EA
19	WRENCH, PIPE, ADJUSTABLE, 36"	5120-01-399-8985	1	EA
20	CROWBAR, PINCH, HEAVY DUTY, 59" INCH	5120-00-224-1390	2	EA

Table F-1. List Of Tools And Equipment By Location On FRS – Continued

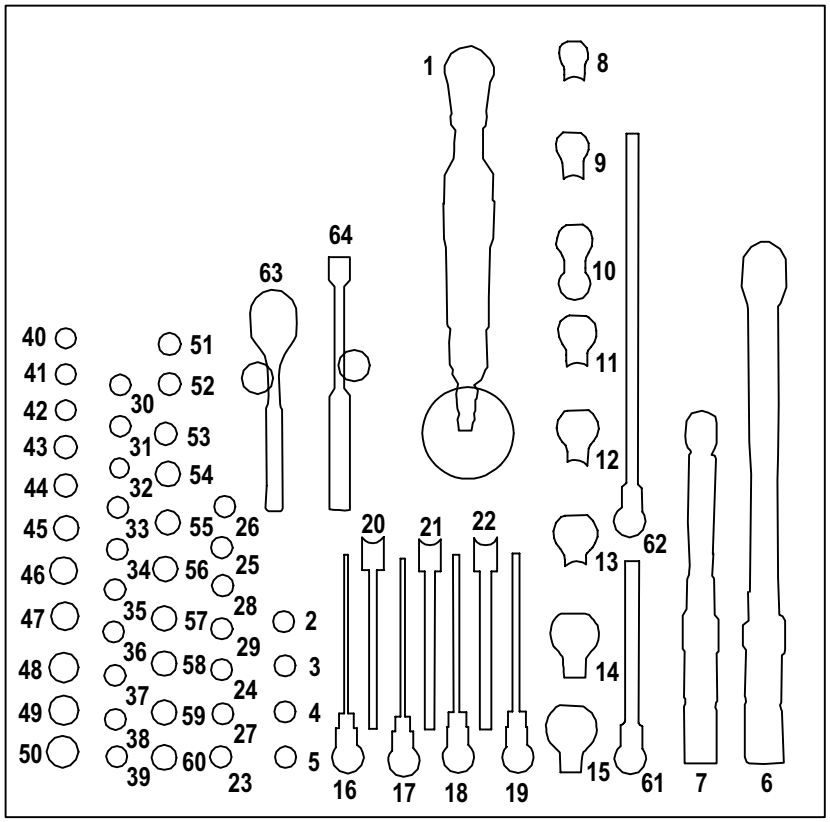


CABINET A

DRAWER A1

Item #	Item Description	NSN/Part Number	Qty	UI
	Drawer will be used for storage of fasteners.			

Table F-1. List Of Tools And Equipment By Location On FRS – Continued



DRAWER A2

Item #	Item Description	NSN/Part Number	Qty	UI
1	RATCHET, AIR, 3/8” DRIVE	MODEL 111	1	EA
2	BIT, HEX, 6MM, 3/8” DR	5120-01-399-9807	1	EA
3	BIT, HEX, 7MM, 3/8” DR	5120-01-399-9805	1	EA
4	BIT, HEX, 8MM, 3/8” DR	5120-01-399-9819	1	EA
5	BIT, HEX, 10MM, 3/8” DR	5120-01-399-9817	1	EA
6	WRENCH, TORQUE, 20-100 FT-LB, 3/8” DR	5120-01-400-0237	1	EA
7	WRENCH, TORQUE, 40-200 IN-LB, 3/8” DR	5120-01-400-0233	1	EA
8	CROWFOOT, FL. NUT, 12 PT, 5/8”, 3/8” DR	5120-01-428-4954	1	EA
9	CROWFOOT, FL. NUT, 12 PT, 11/16”, 3/8” DR	5120-01-428-4957	1	EA
10	CROWFOOT, FL. NUT, 12 PT, 3/4”, 3/8” DR	5120-01-428-4986	1	EA
11	CROWFOOT, FL. NUT, 12 PT, 13/16”, 3/8” DR	5120-01-428-5002	1	EA
12	CROWFOOT, FL. NUT, 12 PT, 7/8”, 3/8” DR	5120-01-428-5007	1	EA

Table F-1. List Of Tools And Equipment By Location On FRS – Continued

DRAWER A2 – Continued

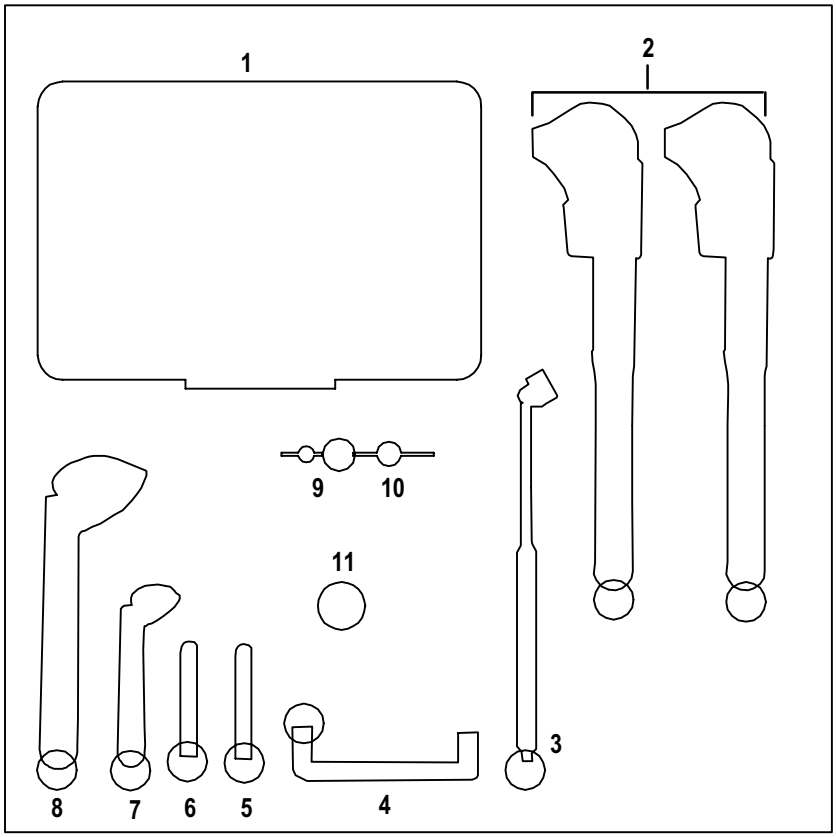
Item #	Item Description	NSN/Part Number	Qty	UI
13	CROWFOOT, FL. NUT, 12 PT, 15/16”, 3/8” DR	5120-01-428-4966	1	EA
14	CROWFOOT, FL. NUT, 12 PT, 1”, 3/8” DR	5120-01-428-4993	1	EA
15	CROWFOOT, FL. NUT, 12 PT, 1 1/16”, 3/8” DR	5120-01-428-4997	1	EA
16	BIT, HEX, EXTRA LONG, 1/8”, 3/8” DR	5120-01-399-9787	1	EA
17	BIT, HEX, EXTRA LONG, 5/32”, 3/8” DR	5120-01-399-9799	1	EA
18	BIT, HEX, EXTRA LONG, 3/16”, 3/8” DR	5120-01-399-9796	1	EA
19	BIT, HEX, EXTRA LONG, 7/32”, 3/8” DR	5120-01-399-9806	1	EA
20	BIT, HEX, EXTRA LONG, 1/4”, 3/8” DR	1CV0549901/4XL	1	EA
21	BIT, HEX, EXTRA LONG, 5/16”, 3/8” DR	5120-01-399-9809	1	EA
22	BIT, HEX, EXTRA LONG, 3/8”, 3/8” DR	5120-01-399-9812	1	EA
23	BIT, HEX, 1/8”, 3/8” DR	5120-01-399-9977	1	EA
24	BIT, HEX, 5/32”, 3/8” DR	5120-01-399-9979	1	EA
25	BIT, HEX, 3/16”, 3/8” DR	5120-01-399-9978	1	EA
26	BIT, HEX, 7/32”, 3/8” DR	5120-01-399-9981	1	EA
27	BIT, HEX, 1/4”, 3/8” DR	5120-01-399-9980	1	EA
28	BIT, HEX, 5/16”, 3/8” DR	5120-01-399-9982	1	EA
29	BIT, HEX, 3/8”, 3/8” DR	5120-01-399-9784	1	EA
30	BIT, TORX, T10, 3/8” DRIVE	5120-01-399-9779	1	EA
31	BIT, TORX, T15, 3/8” DRIVE	5120-01-399-9776	1	EA
32	BIT, TORX, T20, 3/8” DRIVE	5120-01-399-9778	1	EA
33	BIT, TORX, T25, 3/8” DRIVE	5120-01-399-9781	1	EA
34	BIT, TORX, T27, 3/8” DRIVE	5120-01-399-9789	1	EA
35	BIT, TORX, T30, 3/8” DRIVE	5120-01-399-9786	1	EA
36	BIT, TORX, T40, 3/8” DRIVE	5120-01-399-9795	1	EA
37	BIT, TORX, T45, 3/8” DRIVE	5120-01-399-9791	1	EA
38	BIT, TORX, T50, 3/8” DRIVE	5120-01-399-9793	1	EA
39	BIT, TORX, T55, 3/8” DRIVE	5120-01-399-9800	1	EA
40	SOCKET, DEEP, 9 MM, 12 PT, 3/8 DRIVE	5120-01-399-9886	1	EA
41	SOCKET, DEEP, 10 MM, 12 PT, 3/8 DRIVE	5120-01-399-9598	1	EA
42	SOCKET, DEEP, 11 MM, 12 PT, 3/8 DRIVE	5120-01-399-9599	1	EA
43	SOCKET, DEEP, 12 MM, 12 PT, 3/8 DRIVE	5120-01-399-9603	1	EA

Table F-1. List Of Tools And Equipment By Location On FRS – Continued

DRAWER A2 – Continued

Item #	Item Description	NSN/Part Number	Qty	UI
44	SOCKET, DEEP, 13 MM, 12 PT, 3/8 DRIVE	5120-01-399-9604	1	EA
45	SOCKET, DEEP, 14 MM, 12 PT, 3/8 DRIVE	5120-01-399-9602	1	EA
46	SOCKET, DEEP, 15 MM, 12 PT, 3/8 DRIVE	5120-01-399-9607	1	EA
47	SOCKET, DEEP, 16 MM, 12 PT, 3/8 DRIVE	5120-01-399-9605	1	EA
48	SOCKET, DEEP, 17 MM, 12 PT, 3/8 DRIVE	5120-01-399-9606	1	EA
49	SOCKET, DEEP, 18 MM, 12 PT, 3/8 DRIVE	5120-01-399-9610	1	EA
50	SOCKET, DEEP, 19 MM, 12 PT, 3/8 DRIVE	5120-01-399-9608	1	EA
51	SOCKET UNIVERSAL, 12 PT, 3/8” 3/8 DR	5120-01-399-9740	1	EA
52	SOCKET UNIVERSAL, 12 PT, 7/16” 3/8 DRIVE	5120-01-399-9741	1	EA
53	SOCKET UNIVERSAL, 12 PT, 1/2” 3/8 DRIVE	5120-01-399-9744	1	EA
54	SOCKET UNIVERSAL, 12 PT, 9/16” 3/8 DRIVE	5120-01-399-9742	1	EA
55	SOCKET UNIVERSAL, 12 PT, 5/8” 3/8 DRIVE	5120-01-399-9745	1	EA
56	SOCKET UNIVERSAL, 12 PT, 11/16” 3/8	5120-01-399-9746	1	EA
57	SOCKET UNIVERSAL, 12 PT, 3/4” 3/8 DRIVE	5120-01-399-9751	1	EA
58	SOCKET UNIVERSAL, 12 PT, 13/16” 3/8 DR	5120-01-428-4716	1	EA
59	SOCKET UNIVERSAL, 12 PT, 7/8” 3/8 DR	5120-01-428-4735	1	EA
60	SOCKET UNIVERSAL, 12 PT, 15/16” 3/8 DR	5120-01-428-4718	1	EA
61	EXTENSION, 3/4” DRIVE, 6” L	5130-01-400-0118	1	EA
62	EXTENSION, 3/4” DRIVE, 12” L	1CV057178P	1	EA
63	RATCHET, STD L, 3/8” DR, 7” L	5120-01-400-0227	1	EA
64	BREAKER BAR HINGE HANDLE 3/8” DR 8 1/2” LONG	5120-01-399-9609	1	EA

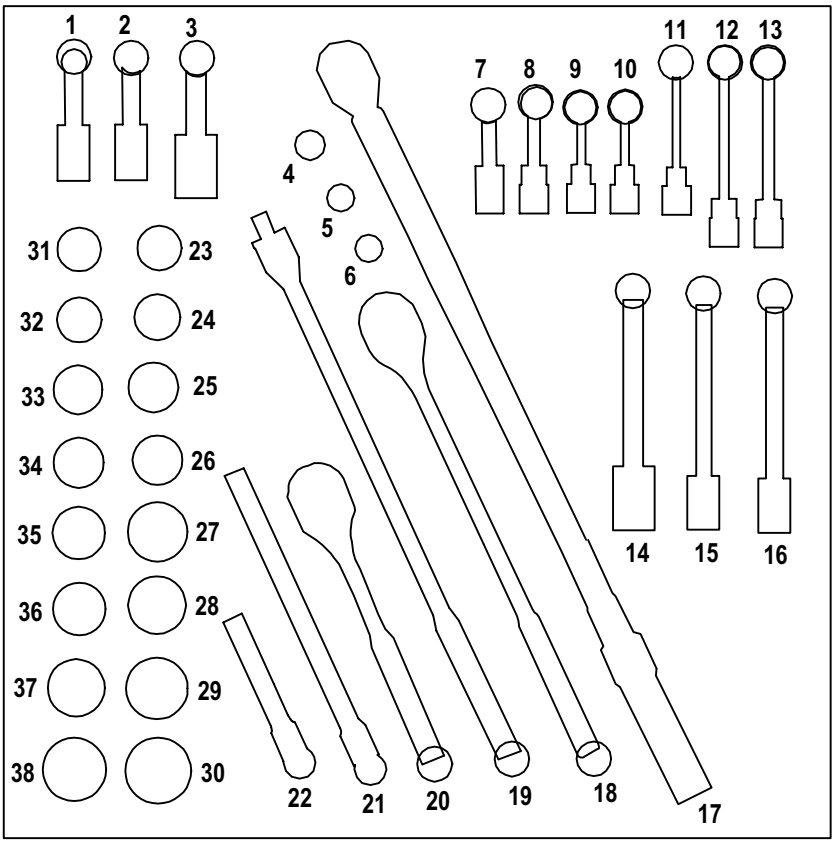
Table F-1. List Of Tools And Equipment By Location On FRS – Continued



DRAWER A3

Item #	Item Description	NSN/Part Number	Qty	UI
1	PLIERS KIT, RETAINING RING, 1/4” TO 3-1/2”	5120-01-428-5103	1	EA
2	WRENCH, ADJUSTABLE, 0 TO 3-5/8 JAW	5120-00-264-3793	2	EA
3	GAGE, AIR PRESSURE	4910-00-204-3170	1	EA
4	WRENCH, OFFSET 3/4	GIT6192	1	EA
5	GAGE, FEELER, METRIC	5120-01-399-9332	1	EA
6	GAGE, FEELER, STD	5120-01-399-9319	1	EA
7	WRENCH, SPANNER, 3/4”-2”	5120-01-399-8959	1	EA
8	WRENCH, SPANNER, 2”-4-3/4”	5120-01-399-8970	1	EA
9	REPAIR TOOL, TIRE VALVE, LARGE TIRES	5120-00-529-2727	1	EA
10	REPAIR TOOL, TIRE VALVE, STD TIRES	76377S445	1	EA
11	CLEANER, BATTERY POST	5120-01-400-1200	1	EA

Table F-1. List Of Tools And Equipment By Location On FRS – Continued



DRAWER A4

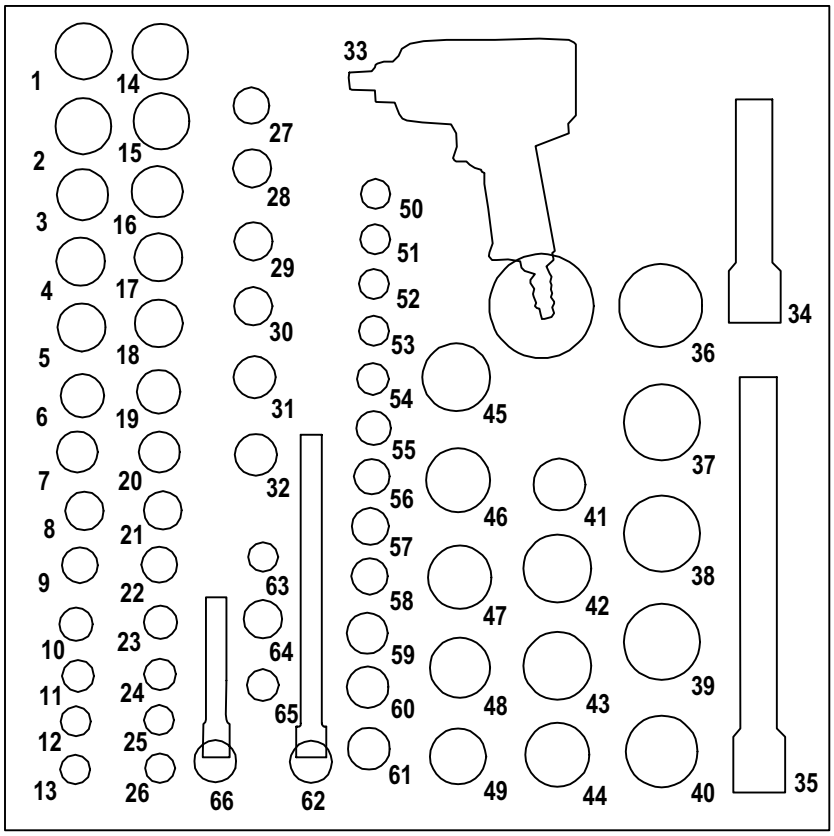
Item #	Item Description	NSN/Part Number	Qty	UI
1	BIT, HEX, 1/2”, 1/2” DR	5120-01-399-9830	1	EA
2	BIT, HEX, 9/16”, 1/2” DR	5120-01-399-9829	1	EA
3	BIT, HEX, 5/8”, 1/2” DR	5120-01-399-9831	1	EA
4	UNIVERSAL JOINT, 1/2” DR	5120-01-399-9658	1	EA
5	EXTENSION, 1/2” DR, 2 1/2” LONG	5120-01-399-9663	1	EA
6	ADAPTER, 1/2” F X 3/8”M	5120-01-399-9665	1	EA
7	BIT, HEX, 7/16”, 1/2” DR	5120-01-399-9828	1	EA
8	BIT, HEX, 3/8”, 1/2” DR	5120-01-399-9827	1	EA
9	BIT, HEX, 1/4”, 1/2” DR	5120-01-399-9824	1	EA
10	BIT, HEX, 5/16”, 1/2” DR	5120-01-399-9825	1	EA
11	BIT, HEX, EXTRA LONG, 1/4”, 1/2” DR	5120-01-399-9832	1	EA
12	BIT, HEX, EXTRA LONG, 5/16”, 1/2” DR	5120-01-399-9833	1	EA
13	BIT, HEX, EXTRA LONG, 3/8”, 1/2” DR	5120-01-399-9835	1	EA

Table F-1. List Of Tools And Equipment By Location On FRS – Continued

DRAWER A4 – Continued

Item #	Item Description	NSN/Part Number	Qty	UI
14	BIT, HEX, EXTRA LONG, 5/8”, 1/2” DR	5120-01-399-9838	1	EA
15	BIT, HEX, EXTRA LONG, 1/2”, 1/2” DR	5120-01-399-9834	1	EA
16	BIT, HEX, EXTRA LONG, 9/16”, 1/2” DR	5120-01-399-9837	1	EA
17	TORQUE WRENCH .50-250 FT-LB, 1/2” DR	5120-01-400-0239	1	EA
18	RATCHET, LONG HANDLE, 1/2” DR, 15” LONG	5120-01-400-0231	1	EA
19	BREAKER BAR, 1/2” DR, 18 5/8” LONG	1CV055468	1	EA
20	RATCHET, OPEN HEAD, 1/2” DR, 10 1/2” LNG	5120-01-400-0229	1	EA
21	EXTENSION, 1/2” DR, 10” LONG	5120-01-399-9662	1	EA
22	EXTENSION, 1/2” DR, 5” LONG	5120-01-399-9661	1	EA
23	SOCKET, DEEP WELL, 12 PT, 1”, 1/2 DR	5120-01-428-4673	1	EA
24	SOCKET, DEEP WELL, 12 PT, 1 1/16” 1/2 DR	5120-01-428-4699	1	EA
25	SOCKET, DEEP WELL, 12 PT, 1 1/8” 1/2 DR	5120-01-428-4684	1	EA
26	SOCKET, DEEP WELL, 12 PT, 1 1/4” 1/2 DR	5120-01-428-4680	1	EA
27	SOCKET, DEEP WELL, 12 PT, 1 5/16” 1/2 DR	5120-01-428-4705	1	EA
28	SOCKET, DEEP WELL, 12 PT, 1 3/8” 1/2 DR	5120-01-428-4688	1	EA
29	SOCKET, DEEP WELL, 12 PT, 1 7/16” 1/2 DR	5120-01-428-4686	1	EA
30	SOCKET, DEEP WELL, 12 PT, 1 1/2” 1/2 DR	5120-01-428-4711	1	EA
31	SOCKET, STANDARD, 12PT, 1-1/16”, 1/2 DR	5120-01-428-4771	1	EA
32	SOCKET, STANDARD, 12 PT, 1-1/8”, 1/2”	5120-01-428-4759	1	EA
33	SOCKET, UNIVERSAL, 12 PT, 1 3/16” 1/2 DR	5120-01-428-4781	1	EA
34	SOCKET, UNIVERSAL, 12 PT, 1 1/4” 1/2 DR	5120-01-428-4778	1	EA
35	SOCKET, STANDARD, 12 PT, 1 5/16”, 1/2	5120-01-428-4768	1	EA
36	SOCKET, UNIVERSAL, 12 PT, 1 3/8” 1/2 DR	5120-01-428-4788	1	EA
37	SOCKET, UNIVERSAL, 12 PT, 1 7/16” 1/2 DR	5120-01-428-4786	1	EA
38	SOCKET, STANDARD, 12 PT, 1-1/2”, 1/2”	5120-01-428-4782	1	EA

Table F-1. List Of Tools And Equipment By Location On FRS – Continued



DRAWER A5

Item #	Item Description	NSN/Part Number	Qty	UI
1	SOCKET, IMPACT, STD, 6 PT, 1-1/4”, 1/2” DR	5130-01-400-0067	1	EA
2	SOCKET, IMPACT, STD, 6 PT, 1 3/16”, 1/2” DR	5130-01-400-0065	1	EA
3	SOCKET, IMPACT, STD, 6 PT, 1-1/8”, 1/2” DR	5130-01-400-0061	1	EA
4	SOCKET, IMPACT, STD, 6 PT, 1 1/16”, 1/2” DR	1CV057434H	1	EA
5	SOCKET, IMPACT, STD, 6 PT, 1”, 1/2” DR	1CV057432H	1	EA
6	SOCKET, IMPACT, STD, 6 PT, 15/16”, 1/2” DR	5120-00-912-5444	1	EA
7	SOCKET, IMPACT, STD, 6 PT, 7/8”, 1/2” DR	1CV057428H	1	EA
8	SOCKET, IMPACT, STD, 6 PT, 13/16”, 1/2” DR	5120-00-912-5451	1	EA
9	SOCKET, IMPACT, STD, 6 PT, 3/4”, 1/2” DR	1CV057424H	1	EA
10	SOCKET, IMPACT, STD, 6 PT, 11/16”, 1/2” DR	1CV057422H	1	EA
11	SOCKET, IMPACT, STD, 6 PT, 5/8”, 1/2” DR	1CV057420H	1	EA
12	SOCKET, IMPACT, STD, 6 PT, 9/16”, 1/2” DR	7418H	1	EA
13	SOCKET, IMPACT, STD, 6 PT, 1/2”, 1/2” DR	1CV057416H	1	EA

Table F-1. List Of Tools And Equipment By Location On FRS – Continued

DRAWER A5 – Continued

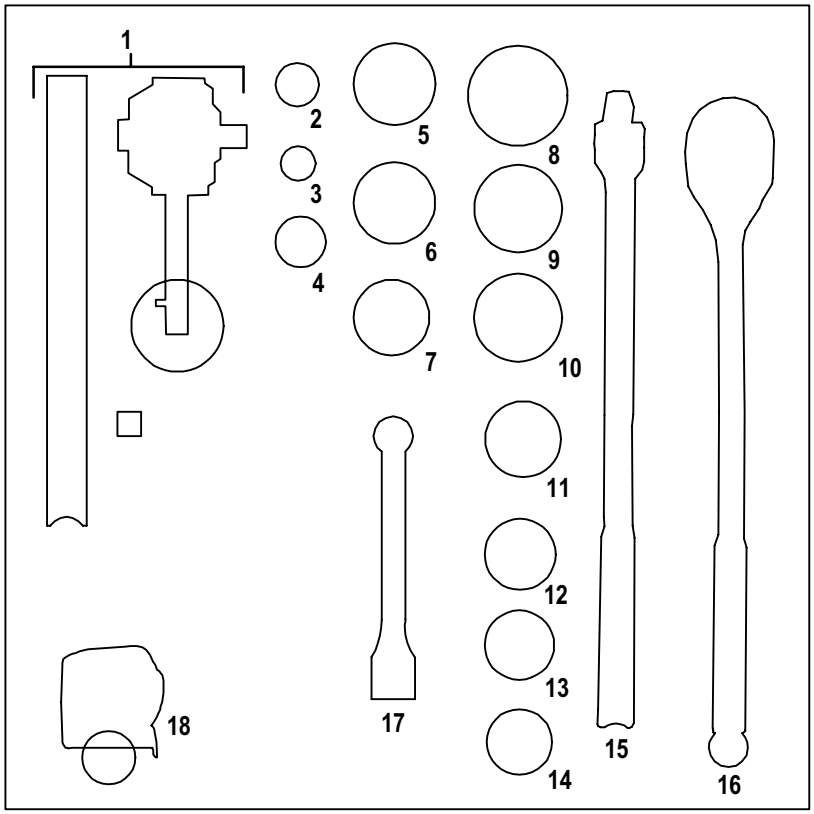
Item #	Item Description	NSN/Part Number	Qty	UI
14	SOCKET, IMPACT, DEEP, 6PT, 1 1/4”, 1/2” DR	1CV057340H	1	EA
15	SOCKET, IMPACT, DEEP, 6PT, 1 3/16”, 1/2” DR	1CV057338H	1	EA
16	SOCKET, IMPACT, DEEP, 6PT, 1-1/8”, 1/2” DR	5130-01-400-0286	1	EA
17	SOCKET, IMPACT, DEEP, 6PT, 1 1/16”, 1/2” DR	1CV057334H	1	EA
18	SOCKET, IMPACT, DEEP, 6PT, 1”, 1/2” DR	5130-01-364-7060	1	EA
19	SOCKET, IMPACT, DEEP, 6PT, 15/16”, 1/2” DR	1CV057330H	1	EA
20	SOCKET, IMPACT, DEEP, 6PT, 7/8”, 1/2” DR	1CV057328H	1	EA
21	SOCKET, IMPACT, DEEP, 6PT, 13/16”, 1/2” DR	5130-01-400-0107	1	EA
22	SOCKET, IMPACT, DEEP, 6PT, 3/4”, 1/2” DR	1CV057324H	1	EA
23	SOCKET, IMPACT, DEEP, 6PT, 11/16”, 1/2” DR	1CV057322H	1	EA
24	SOCKET, IMPACT, DEEP, 6PT, 5/8”, 1/2” DR	5130-01-400-0099	1	EA
25	SOCKET, IMPACT, DEEP, 6PT, 9/16”, 1/2” DR	1CV057318H	1	EA
26	SOCKET, IMPACT, DEEP, 6PT, 1/2”, 1/2” DR	1CV057316H	1	EA
27	SOCKET, IMPACT DR, UNIV., 6PT, 1/2”, 1/2” D	5130-01-400-0121	1	EA
28	SOCKET, IMPACT, UNIV., 6PT, 9/16, 1/2” DR	5130-01-400-0126	1	EA
29	SOCKET, IMPACT, UNIV., 6PT, 5/8”, 1/2” DR	5130-01-400-0128	1	EA
30	SOCKET, IMPACT, UNIV., 6PT, 11/16”, 1/2” DR	5130-01-400-0132	1	EA
31	SOCKET, IMPACT, UNIV., 6PT, 3/4”, 1/2” DR	5130-01-400-0133	1	EA
32	SOCKET, IMPACT, UNIV., 6PT, 13/16”, 1/2” DR	5130-01-400-0137	1	EA
33	WRENCH, IMPACT, 1/2” SQ DR.	65832131	1	EA
34	EXTENSION IMPACT 7” L, 3/4” DR	5130-01-400-0127	1	EA
35	EXTENSION IMPACT 13” L, 3/4” DR	5130-01-400-0129	1	EA
36	SOCKETS, STD, IMPACT, 6 PT, 1 3/4”, 3/4” DR	5130-01-400-0153	1	EA
37	SOCKETS, STD, IMPACT, 6 PT, 1 5/8”, 3/4” DR	5130-01-400-0149	1	EA
38	SOCKETS, STD, IMPACT, 6 PT, 1 9/16”, 3/4” DR	5130-01-400-0145	1	EA
39	SOCKETS, STD, IMPACT, 6 PT, 1 1/2”, 3/4” DR	5130-01-400-0144	1	EA
40	SOCKETS, STD, IMPACT, 6 PT, 1 7/16”, 3/4” DR	5130-01-400-0140	1	EA
41	SOCKET IMPACT 6 PT 15/16”, 3/4” DR	5130-01-400-0151	1	EA
42	SOCKETS, STD, IMPACT, 6 PT, 1 3/8”, 3/4” DR	5130-01-400-0138	1	EA
43	SOCKETS, STD, IMPACT, 6 PT, 1 5/16”, 3/4” DR	5130-01-400-0135	1	EA
44	SOCKETS, STD, IMPACT, 6 PT, 1 1/4”, 3/4” DR	5130-01-400-0161	1	EA
45	SOCKETS, DEEP, THIN WALL, 6PT, 1 1/2”, 3/4”	5130-01-400-0283	1	EA
46	SOCKETS, DEEP, THIN WALL, 6PT, 1 7/16”, 3/4”	5130-01-400-0281	1	EA

Table F-1. List Of Tools And Equipment By Location On FRS – Continued

DRAWER A5 – Continued

Item #	Item Description	NSN/Part Number	Qty	UI
47	SOCKETS, DEEP, THIN WALL, 6PT, 1 3/8”, 3/4”	5130-01-400-0276	1	EA
48	SOCKETS, DEEP, THIN WALL, 6PT, 1 5/16”, 3/4”	5130-01-400-0272	1	EA
49	SOCKETS, DEEP, THIN WALL, 6PT, 1 1/4”, 3/4” DR	5130-01-400-0268	1	EA
50	SOCKETS, STD, METRIC, 6PT, 13MM, 1/2” DR	5130-01-045-8552	1	EA
51	SOCKETS, STD, METRIC, 6PT, 14MM, 1/2” DR	1CV057414H	1	EA
52	SOCKETS, STD, METRIC, 6PT, 15MM, 1/2” DR	1CV057415H	1	EA
53	SOCKETS, STD, METRIC, 6PT, 16MM, 1/2” DR	1CV057416H	1	EA
54	SOCKETS, STD, METRIC, 6PT, 17MM, 1/2” DR	1CV057417H	1	EA
55	SOCKETS, STD, METRIC, 6PT, 18MM, 1/2” DR	1CV057418H	1	EA
56	SOCKETS, STD, METRIC, 6PT, 19MM, 1/2” DR	1CV057419H	1	EA
57	SOCKETS, STD, METRIC, 6PT, 20MM, 1/2” DR	1CV057420H	1	EA
58	SOCKETS, STD, METRIC, 6PT, 21MM, 1/2” DR	1CV057421H	1	EA
59	SOCKETS, STD, METRIC, 6PT, 22MM, 1/2” DR	1CV057422H	1	EA
60	SOCKETS, STD, METRIC, 6PT, 23MM, 1/2” DR	1CV057423H	1	EA
61	SOCKETS, STD, METRIC, 6PT, 24MM, 1/2” DR	1CV057424H	1	EA
62	EXTENSION, 1/2” D., 10” L	1CV057183-00	1	EA
63	EXTENSION, 1/2” D., 2” L	5130-01-400-0108	1	EA
64	UNIVERSAL JOINT 1/2” D	5130-01-400-0136	1	EA
65	UNIVERSAL JOINT, 3/8” DRIVE	5130-01-400-0114	1	EA
66	EXTENSION, 1/2” D., 5” L	5120-00-243-7326	1	EA

Table F-1. List Of Tools And Equipment By Location On FRS – Continued



DRAWER A6

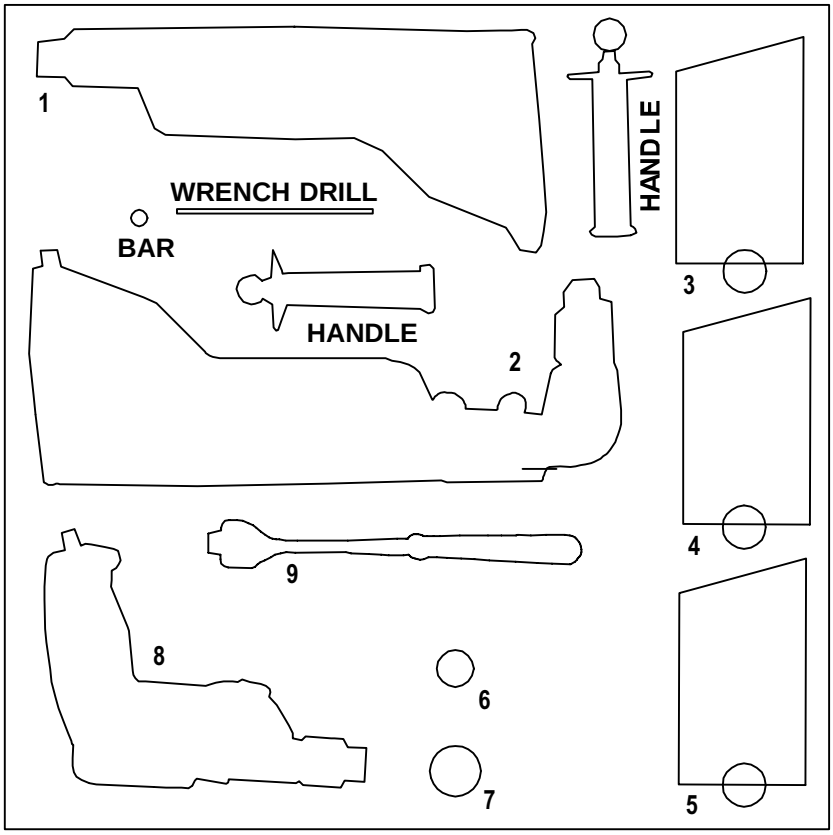
Item #	Item Description	NSN/Part Number	Qty	UI
1	TORQUE MULTIPLYER, 1200 FT-LB (3 PC)	5120-01-399-9054	1	EA
2	EXTENSION, 3/4 DR, 4” LONG	5120-01-399-9736	1	EA
3	ADAPTER, 3/4” F-1/2” M	5120-01-399-9756	1	EA
4	UNIVERSAL JOINT, 3/4” DR	5120-01-399-9735	1	EA
5	SOCKET, STD LGN, 1 7/8, 12PT, 3/4” DR	5120-01-399-9699	1	EA
6	SOCKET, STD LGN, 1 13/16, 12PT, 3/4” DR	5120-01-399-9695	1	EA
7	SOCKET, STD LGN, 1 3/4, 12PT, 3/4” DR	5120-01-399-9698	1	EA
8	SOCKET, STD LGN, 2 1/4, 12PT, 3/4” DR	5120-01-399-9714	1	EA
9	SOCKET, STD LGN, 2 1/16, 12PT, 3/4” DR	5120-01-399-9704	1	EA
10	SOCKET, STD LGN, 2, 12PT, 3/4” DR	5120-01-399-9707	1	EA
11	SOCKET, STD LGN, 1 11/16, 12PT, 3/4” DR	5120-01-399-9689	1	EA
12	SOCKET, STD LGN, 1 5/8, 12PT, 3/4” DR	5120-01-399-9692	1	EA

Table F-1. List Of Tools And Equipment By Location On FRS – Continued

DRAWER A6 – Continued

Item #	Item Description	NSN/Part Number	Qty	UI
13	SOCKET, STD LGN, 1 9/16, 12PT, 3/4” DR	5120-01-399-9684	1	EA
14	SOCKET, STD LGN, 1 1/2, 12PT, 3/4” DR	5120-01-399-9686	1	EA
15	BREAKER BAR, 3/4” DR, 20” LONG	5120-01-358-3171	1	EA
16	RATCHET, 3/4” DR, 20” LONG	5120-01-400-0266	1	EA
17	EXTENSION, 3/4” DR, 8” LONG	5120-01-399-9747	1	EA
18	TAPE MEASURE, 25 FT	5120-01-428-5470	1	EA

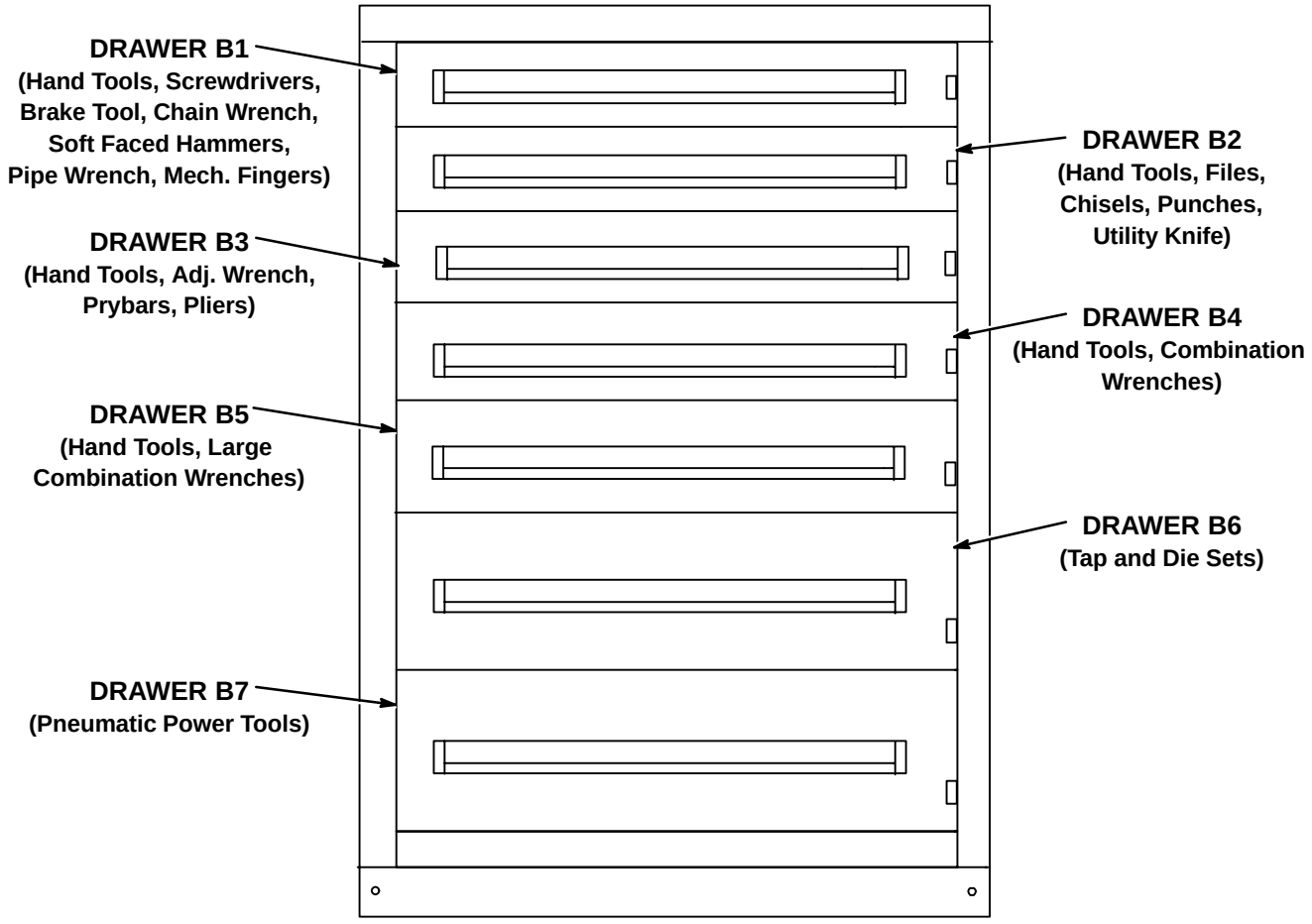
Table F-1. List Of Tools And Equipment By Location On FRS – Continued



DRAWER A7

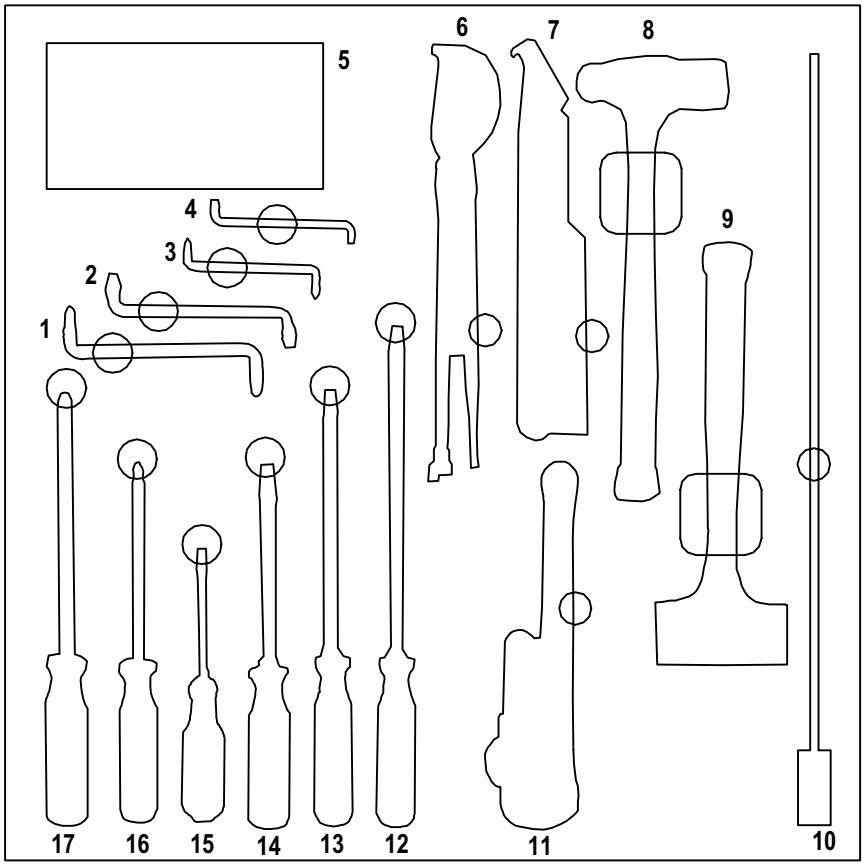
Item #	Item Description	NSN/Part Number	Qty	UI
1	DRILL, HAND, VSR, ELEC, 1/2”	609337554	1	EA
2	DRILL, RIGHT ANGLE, ELEC, 1/2”	5130-01-180-7933	1	EA
3	DRILL BIT SET, METRIC 1MM-13MM X 0.55MM (25 PIECES)	5133-01-052-3580	1	SE
4	DRILL BIT SET, ALPHA A-Z	257951V710	1	SE
5	DRILL SET STANDARD 1/16” 1/2”	257951U200	1	SE
6	BRUSH, WIRE, ROTARY, SOLID	5130-00-263-0235	1	EA
7	BRUSH, WIRE, ROTARY, FLARE	5130-00-293-2409	1	EA
8	DRILL, HAND, VSR, ELECT, 3/8”	5130-01-396-6314	1	EA
9	WHEEL, ABRASIVE, W/CUTTERS	5130-00-223-9952	1	EA

Table F-1. List Of Tools And Equipment By Location On FRS – Continued



CABINET B

Table F-1. List Of Tools And Equipment By Location On FRS – Continued



DRAWER B1

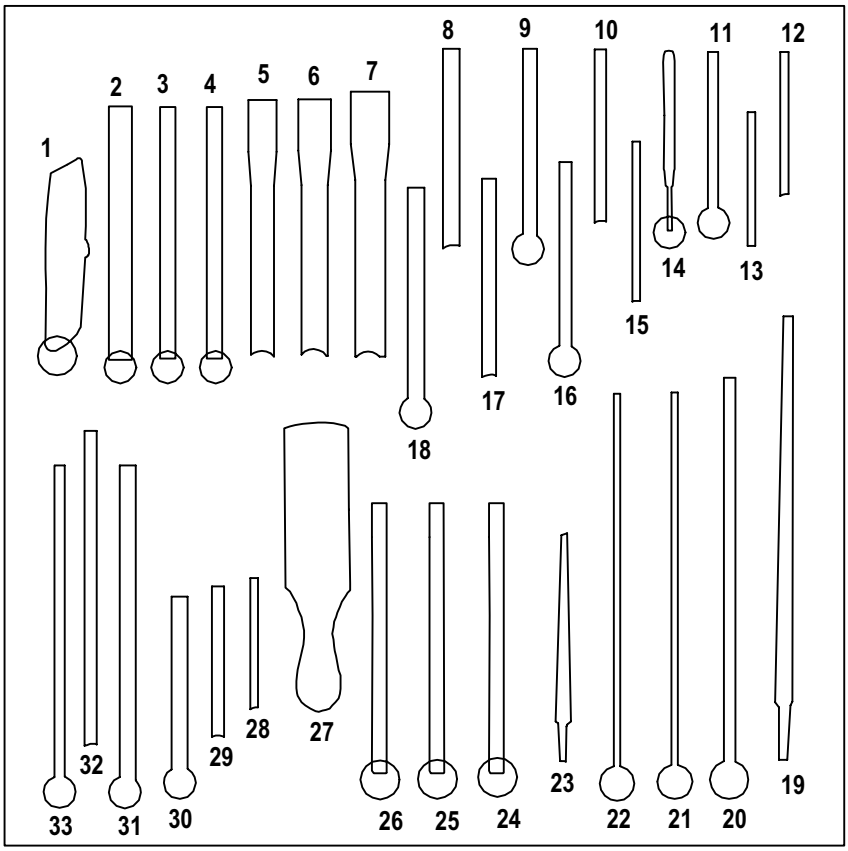
Item #	Item Description	NSN/Part Number	Qty	UI
1	SCREWDRIVER, OFFSET, PHIL. TIP, 3 & 4	5120-01-399-9188	1	EA
2	SCREWDRIVER, OFFSET, STANDARD TIP	5120-01-399-9181	1	EA
3	SCREWDRIVER, OFFSET, PHIL. TIP, 1 & 2	5120-01-399-9182	1	EA
4	SCREWDRIVER, OFFSET, STANDARD TIP	5120-01-399-9183	1	EA
5	SCREWDRIVER BIT SET, MAGNETIC, 28 PC	1CV0561929	1	EA
6	PLIERS, BRAKE REPAIR, 12-7/8 LNG	5120-01-400-1201	1	EA
7	WRENCH, UNIVERSAL CHAIN	1CV05801	1	EA
8	HAMMER, BALL PEEN, 32 OZ, 14 LNG	76377CBH32-O	1	EA
9	HAMMER, DEAD BLOW, 42 OZ, 14” LNG	5120-01-399-5746	1	EA
10	TOOL, PICK UP, CLAW-TYPE, FLEXIBLE 23 1/2” LONG	5120-01-399-9296	1	EA
11	WRENCH, PIPE, ADJUSTABLE, 12”	5120-01-399-8981	1	EA
12	100 PLUS SQ SHNK STD SCREWDRIVER	66-170	1	EA

Table F-1. List Of Tools And Equipment By Location On FRS – Continued

DRAWER B1 – Continued

Item #	Item Description	NSN/Part Number	Qty	UI
13	100 PLUS 3 POINT PHILLIPS SCREWDRIVER	66-178	1	EA
14	100 PLUS 4 POINT PHILLIPS SCREWDRIVER	66-176	1	EA
15	SCREWDRIVER, STANDARD, 1/4”	66-090	1	EA
16	100 PLUS SQ SHNK STD SCREWDRIVER 8	64-103	1	EA
17	100 PLUS SQ SHNK STD SCREWDRIVER 10	64-104	1	EA

Table F-1. List Of Tools And Equipment By Location On FRS – Continued



DRAWER B2

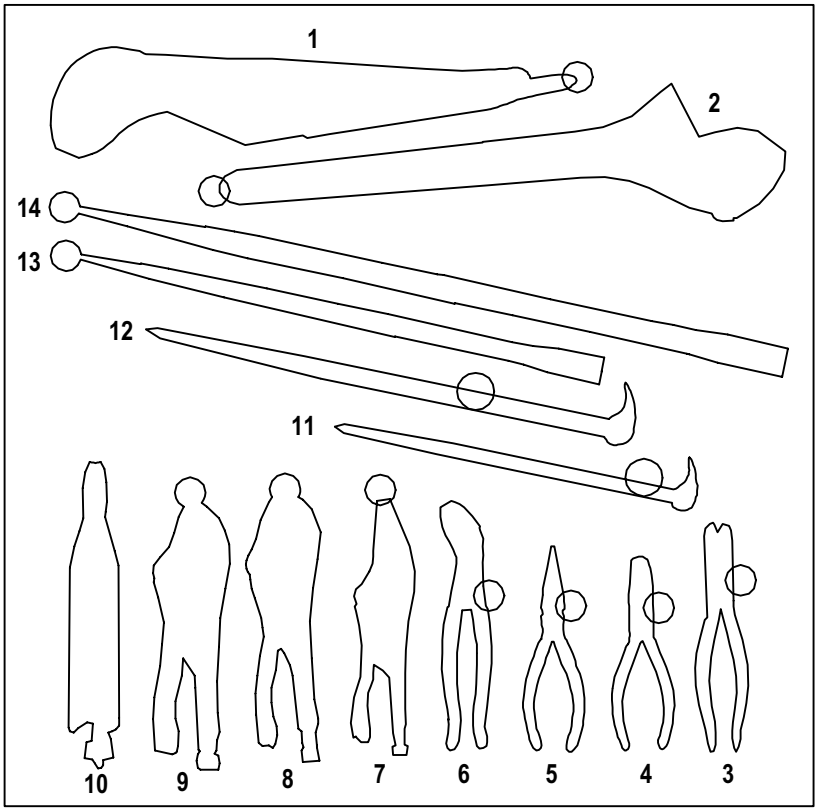
Item #	Item Description	NSN/Part Number	Qty	UI
1	KNIFE, UTILITY	5110-01-428-5547	1	EA
2	PUNCH, DRIVE PIN, BRASS, 3/8” DIA PT	1CV05BD8	1	EA
3	PUNCH, DRIVE PIN, BRASS, 1/4” DIA PT	1CV05BD6	1	EA
4	PUNCH, DRIFT PIN, BRASS, 1/2” DIA PT	1CV0549920	1	EA
5	CHISEL, COLD, 7/8” CUT	5110-01-406-7201	1	EA
6	CHISEL, COLD, 1” CUT	1CV0586A718X8	1	EA
7	CHISEL, COLD, 1 3/16” CUT	1CV0586A1X8	1	EA
8	PUNCH, STARTING, 1/4” DIA PT	5110-01-399-9940	1	EA
9	PUNCH, STARTING, 7/32” DIA PT	5110-01-399-9402	1	EA
10	PUNCH, STARTING, 3/16” DIA PT	5110-01-399-9400	1	EA
11	PUNCH, STARTING, 1/8” DIA PT	5110-01-399-9399	1	EA
12	PUNCH, STARTING, 3/32” DIA PT	5110-01-399-9397	1	EA

Table F-1. List Of Tools And Equipment By Location On FRS – Continued

DRAWER B2 – Continued

Item #	Item Description	NSN/Part Number	Qty	UI
13	PUNCH, DRIVE PIN, 3/32” DIA PT	5110-01-399-9937	1	EA
14	PUNCH, DRIVE PIN, 5/32” DIA PT	5110-01-399-9947	1	EA
15	PUNCH, DRIVE PIN, 1/8” DIA PT	5110-01-399-9945	1	EA
16	PUNCH, DRIVE PIN, 3/16” DIA PT	5110-01-399-9942	1	EA
17	PUNCH, DRIVE PIN, 7/32” DIA PT	5110-01-399-9948	1	EA
18	PUNCH, DRIVE PIN, 1/4” DIA PT	5110-01-399-9949	1	EA
19	FILE, HAND, ROUND, 1/2” DIA, 12” L	5110-00-234-6557	1	EA
20	FILE, HAND, HALF ROUND, 10” L	5110-00-249-2858	1	EA
21	FILE, HAND, FLAT, 10” L	5110-00-234-6537	1	EA
22	FILE, HAND, PILLAR TYPE, 10” L	5110-00-239-6889	1	EA
23	FILE, HAND, TRI SQUARE, 6” L	5110-00-241-9160	1	EA
24	THREAD RESTORER, METRIC THREADS	5110-01-431-0299	1	EA
25	THREAD RESTORER, STANDARD THREADS	5110-01-431-0309	1	EA
26	THREAD RESTORER, STANDARD THREADS	5110-01-431-0286	1	EA
27	BRUSH, FILE CLEANER	7920-00-224-7987	1	EA
28	PUNCH, CENTER 1/4”	5110-01-399-9953	1	EA
29	PUNCH, CENTER 3/8”	5110-01-399-9951	1	EA
30	PUNCH, CENTER 1/2”	5110-01-399-9955	1	EA
31	PUNCH, DRIFT, 1/4” DIA PT	5110-01-399-9395	1	EA
32	PUNCH, DRIFT, 3/16” DIA PT	5110-01-399-9392	1	EA
33	PUNCH, DRIFT, 1/8” DIA PT	5110-01-399-9391	1	EA

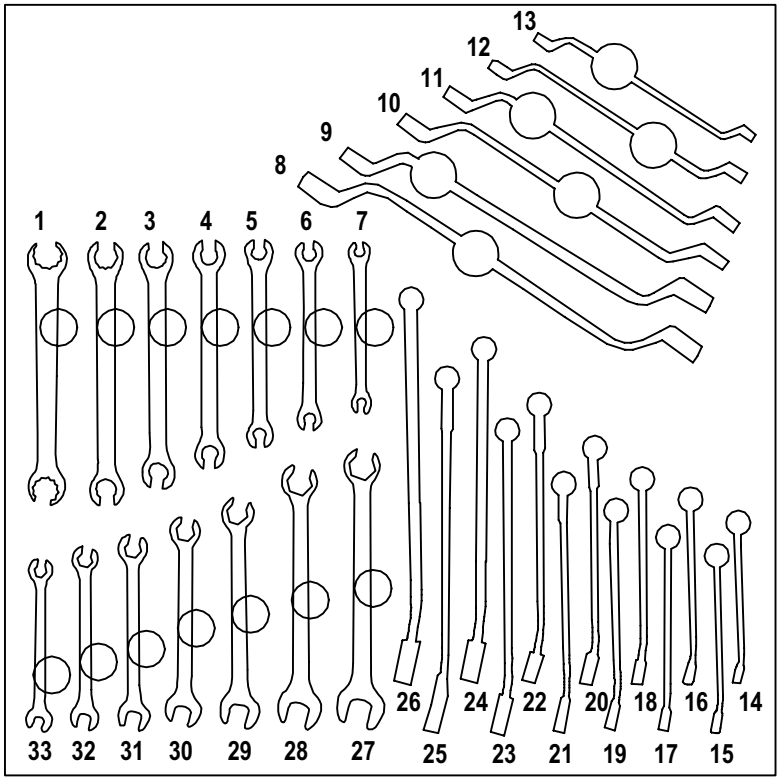
Table F-1. List Of Tools And Equipment By Location On FRS – Continued



DRAWER B3

Item #	Item Description	NSN/Part Number	Qty	UI
1	PLIERS, 4-1/16”, SLIP JOINT	5120-01-399-9259	1	EA
2	WRENCH, ADJUSTABLE, AUTO LOCKING 18”	5120-01-399-9869	1	EA
3	BATTERY TERMINAL SPREADER & REAMER	5120-01-399-9240	1	EA
4	PLIERS, 78 DEG, BENT NOSE	5120-01-399-9227	1	EA
5	PLIERS, 6 5/8” HEAVY DUTY LONG NOSE	5120-01-399-9167	1	EA
6	PLIERS, BATTERY TERMINAL	5120-01-431-0225	1	EA
7	VISE GRIP, LONG NOSE, 9”	5120-01-399-9233	1	EA
8	VISE GRIP, 10”, STRAIGHT JAW	5120-01-400-0314	1	EA
9	VISE GRIP, 10” CURVED W/CUTTER	5120-01-399-9226	1	EA
10	WIRE TWISTER, AUTO RETURN	5120-01-431-1957	1	EA
	BAR SET, PRY 4 PC (Includes the following:)	1CV052100	1	EA
11	BAR, PRY	2126	1	EA
12	BAR, PRY	2130	1	EA
13	BAR, PRY	2120	1	EA
14	BAR, PRY	2124	1	EA

Table F-1. List Of Tools And Equipment By Location On FRS – Continued



DRAWER B4

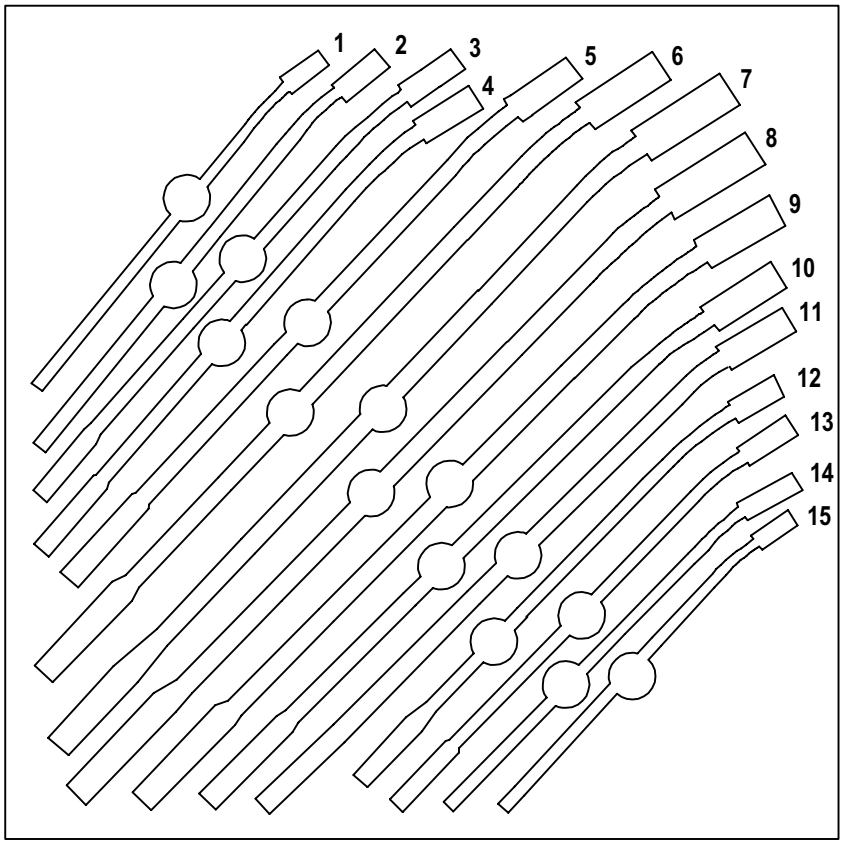
Item #	Item Description	NSN/Part Number	Qty	UI
1	WRENCH, FL NUT, DBL END, 12 PT, 19 X 21 MM	1CV053719MT	1	EA
2	WRENCH, FL NUT, DBL END, 12 PT, 16 X 18 MM	1CV053716MT	1	EA
3	WRENCH, FL NUT, DBL END, 12 PT, 15 X 17 MM	1CV053715MT	1	EA
4	WRENCH, FL NUT, DBL END, 12 PT, 13 X 14 MM	1CV053713MT	1	EA
5	WRENCH, FL NUT, DBL END, 12 PT, 10 X 12 MM	1CV053710MT	1	EA
6	WRENCH, FL NUT, DBL END, 12 PT, 9 X 11 MM	1CV053709MT	1	EA
7	WRENCH, FL NUT, DBL END, 12 PT, 7 X 8 MM	1CV053707MT	1	EA
8	WRENCH, DEEP OFFSET BOX, 12 P, 3/4”-7/8”	5120-01-399-8913	1	EA
9	WRENCH, DEEP OFFSET BOX, 12 P, 15/16”-1”	5120-01-399-8914	1	EA
10	WRENCH, DEEP OFFSET BOX, 12 P, 11/16”-13/16”	5120-01-399-8916	1	EA
11	WRENCH, DEEP OFFSET BOX, 12 P, 5/8”-11/16”	5120-01-399-8915	1	EA
12	WRENCH, DEEP OFFSET BOX, 12 P, 1/2”-9/16”	5120-01-399-8910	1	EA
13	WRENCH, DEEP OFFSET BOX, 12 P, 3/8”-7/16”	5120-01-399-8909	1	EA

Table F-1. List Of Tools And Equipment By Location On FRS – Continued

DRAWER B4 – Continued

Item #	Item Description	NSN/Part Number	Qty	UI
14	WRENCH, C-BOX, OPEN END, 12 P, 1/4”	5120-00-288-9997	1	EA
15	WRENCH, C-BOX, OPEN END, 12 P, 5/16”	1CV051210	1	EA
16	WRENCH, C-BOX, OPEN END, 12 PT, 11/32”	1CV051211	1	EA
17	WRENCH, C-BOX, OPEN END, 12 PT, 3/8”	5120-00-228-9504	1	EA
18	WRENCH, C-BOX, OPEN END, 12 P, 7/16”	5120-00-228-9505	1	EA
19	WRENCH, C-BOX, OPEN END, 12 P, 1/2”	5120-00-228-9506	1	EA
20	WRENCH, C-BOX, OPEN END, 12 P, 9/16”	5120-00-228-9507	1	EA
21	WRENCH, C-BOX, OPEN END, 12 P, 5/8”	5120-00-228-9508	1	EA
22	WRENCH, C-BOX, OPEN END, 12 P, 11/16”	5120-00-228-9509	1	EA
23	WRENCH, C-BOX, OPEN END, 12 P, 3/4”	5120-00-228-9510	1	EA
24	WRENCH, C-BOX, OPEN END, 12 P, 13/16”	5120-00-228-9511	1	EA
25	WRENCH, C-BOX, OPEN END, 12 P, 7/8”	1CV051228	1	EA
26	WRENCH, C-BOX, OPEN END, 12 P, 15/16”	1CV051230	1	EA
27	WRENCH, COMB FL NUT, OPN END, 12 PT, 3/4”	1CV053757T	1	EA
28	WRENCH, COMB FL NUT, OPN END, 12PT, 11/16”	1CV053756T	1	EA
29	WRENCH, COMB FL NUT, OPN END, 12PT, 5/8”	1CV053755T	1	EA
30	WRENCH, COMB FL NUT, OPN END, 12PT, 9/16”	1CV053754T	1	EA
31	WRENCH, COMB FL NUT, OPN END, 12PT, 1/2”	1CV053753T	1	EA
32	WRENCH, COMB FL NUT, OPN END, 12PT, 7/16”	1CV053752T	1	EA
33	WRENCH, COMB FL NUT, OPN END, 12PT, 3/8”	1CV053751T	1	EA

Table F-1. List Of Tools And Equipment By Location On FRS – Continued



DRAWER B5

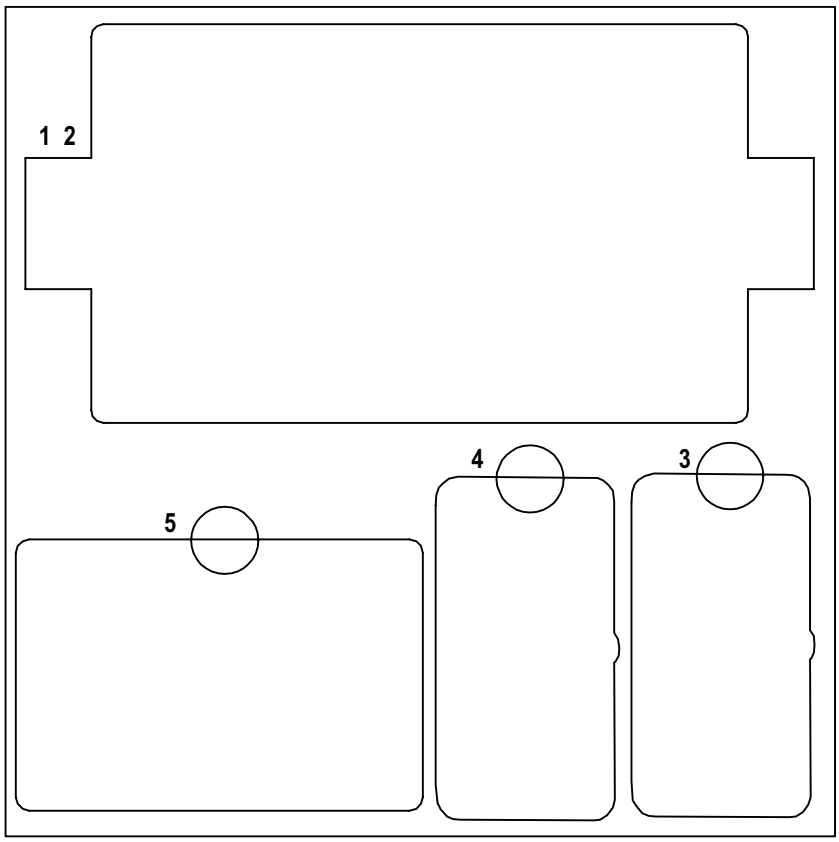
Item #	Item Description	NSN/Part Number	Qty	UI
1	WRENCH, C-BOX, OPEN END, 12 PT, 1-1/16”	5120-00-228-9515	1	EA
2	WRENCH, C-BOX, OPEN END, 12 PT, 1-1/4”	1CV051240	1	EA
3	WRENCH, C-BOX, OPEN END, 12 PT, 1-7/16”	5120-01-399-8790	1	EA
4	WRENCH, C-BOX, OPEN END, 12 P, 1-1/2”	5120-01-399-8798	1	EA
5	WRENCH, C-BOX, OPEN END, 12 PT, 1-5/8”	5120-01-399-8801	1	EA
6	WRENCH, C-BOX, OPEN END, 12 P, 1-7/8”	5120-01-399-8806	1	EA
7	WRENCH, C-BOX, OPEN END, 12 P, 2-1/16”	1CV051266	1	EA
8	WRENCH, C-BOX, OPEN END, 12 PT, 2-1/8”	1CV051268	1	EA
9	WRENCH, C-BOX, OPEN END, 12 P, 2”	5120-01-399-8813	1	EA
10	WRENCH, C-BOX, OPEN END, 12 PT, 1-3/4”	5120-01-399-8808	1	EA
11	WRENCH, C-BOX, OPEN END, 12 P, 1-11/16”	5120-01-399-8795	1	EA

Table F-1. List Of Tools And Equipment By Location On FRS – Continued

DRAWER B5 – Continued

Item #	Item Description	NSN/Part Number	Qty	UI
12	WRENCH, C-BOX, OPEN END, 12 PT, 1-3/8”	5120-01-399-8793	1	EA
13	WRENCH, C-BOX, OPEN END, 12 P, 1-5/16”	5120-01-399-8786	1	EA
14	WRENCH, C-BOX, OPEN END, 12 P, 1-1/8”	5120-00-228-9516	1	EA
15	WRENCH, C-BOX, OPEN END, 12 PT, 1”	1CV051232	1	EA

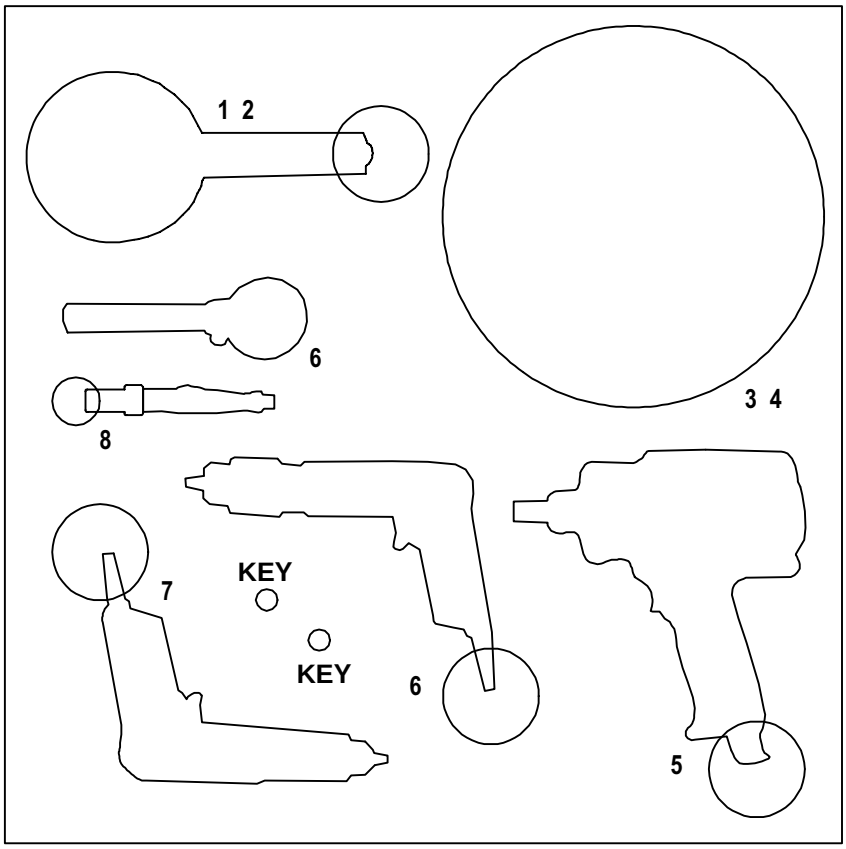
Table F-1. List Of Tools And Equipment By Location On FRS – Continued



DRAWER B6

Item #	Item Description	NSN/Part Number	Qty	UI
1	TAP & DIE SET, 25 PC, 9/16” /1”	5136-01-431-0367	1	EA
2	TAP & DIE SET, 25 PC, 14 MM/24 MM	5136-01-431-0373	1	EA
3	TAP & DIE SET, 41 PC, 4-40” NC/ 1/2-20” NF	5136-01-415-4208	1	EA
4	TAP & DIE SET, 41 PC, 3 MM/12 MM	5136-01-431-0372	1	EA
5	EXTRACTOR SET, SCREW 1/8”-1”	5120-01-400-2740	1	EA

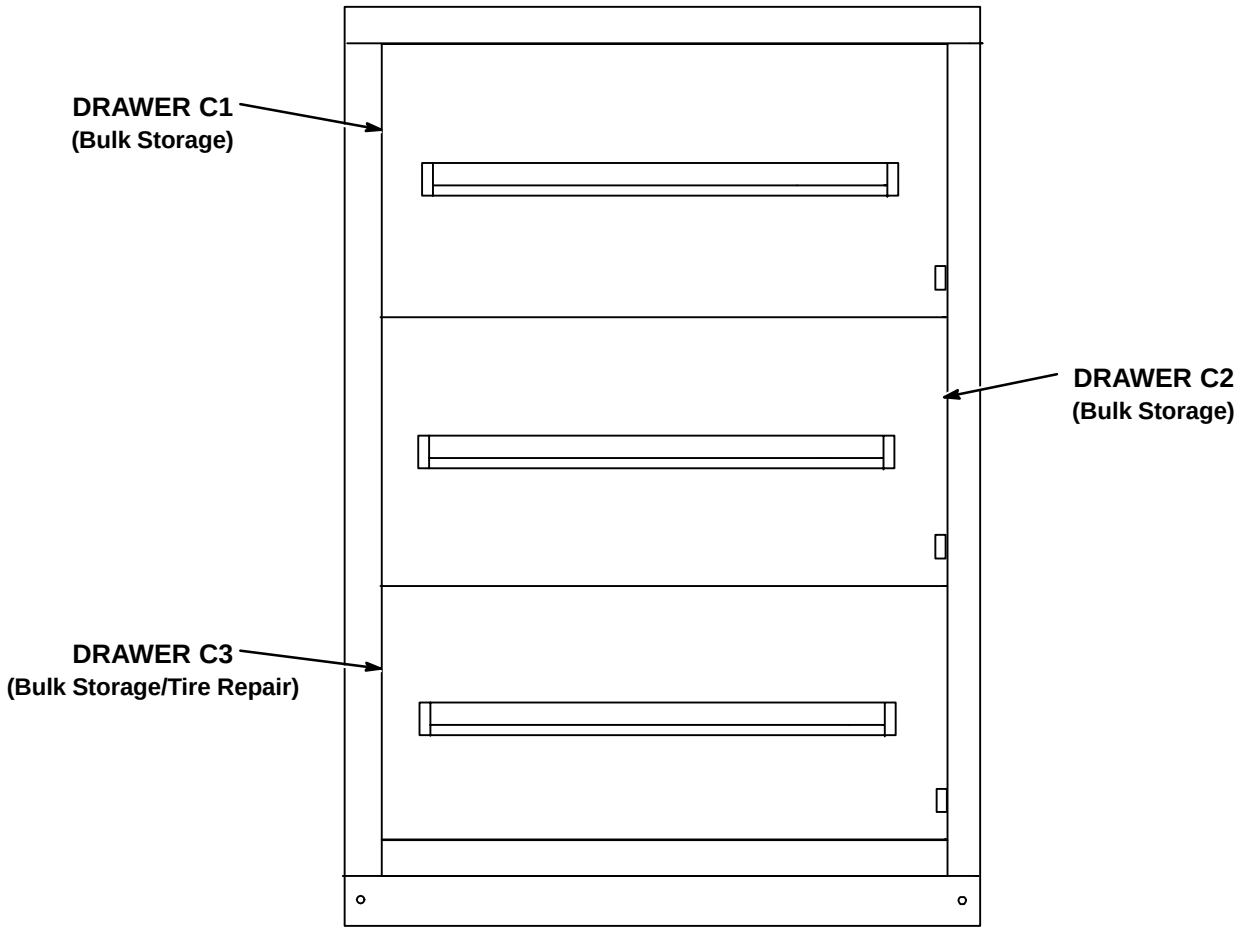
Table F-1. List Of Tools And Equipment By Location On FRS – Continued



DRAWER B7

Item #	Item Description	NSN/Part Number	Qty	UI
1	GRINDER, ANGLE, 5” AND WRENCHES	47805HA120RP105	1	EA
2	GRINDING WHEELS	3460-00-X99-5051	1	EA
3	GAGE, TIRE PRESSURE, 20 TO 120 PSI	4910-01-298-5479	1	EA
4	WHIP AIR HOSE 3/8”, 12’ LONG ASSY	801 16-5BP H4FP-6-144.00	1	EA
5	WRENCH, IMPACT, 3/4” SQ DRIVE	478052925P1	1	EA
6	DRILL, 900 RPM, PNEU, 1/2” AND HANDLE	478057ANST8	1	EA
7	DRILL, 3200 RPM, PNEU, 3/8”	478057AMST6	1	EA
8	AIR GUN, 9.5 CFM @ 100 PSI, W/HOSE	4940-00-333-5541	1	EA

Table F-1. List Of Tools And Equipment By Location On FRS – Continued



CABINET C

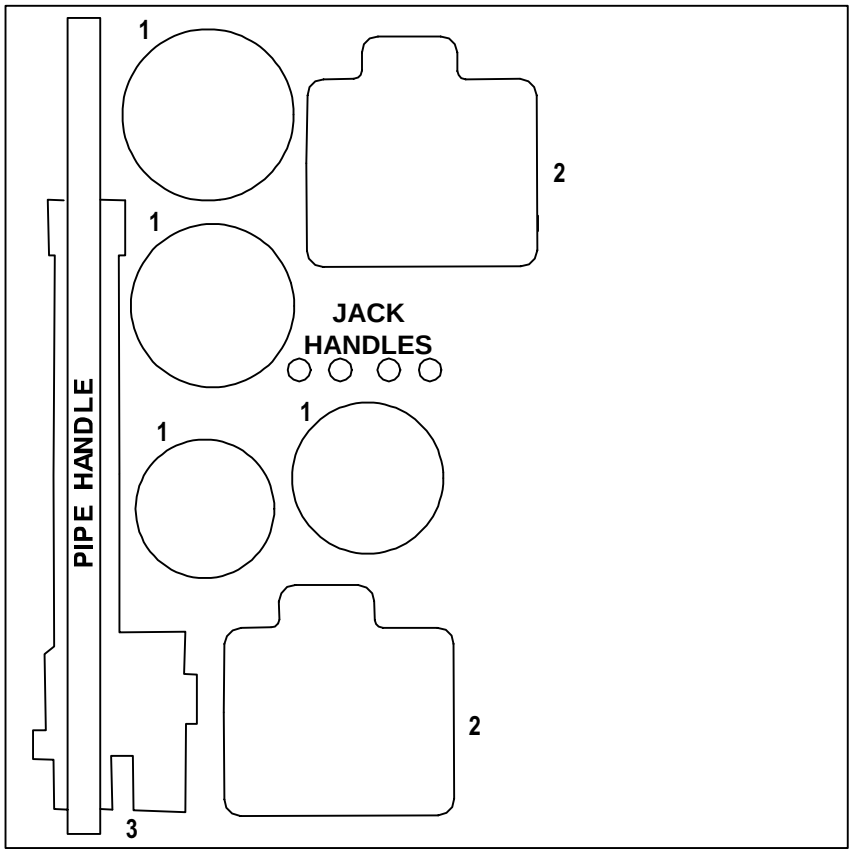
DRAWER C1

Item #	Item Description	NSN/Part Number	Qty	UI
	Bulk storage.			

DRAWER C2

Item #	Item Description	NSN/Part Number	Qty	UI
	Bulk storage.			

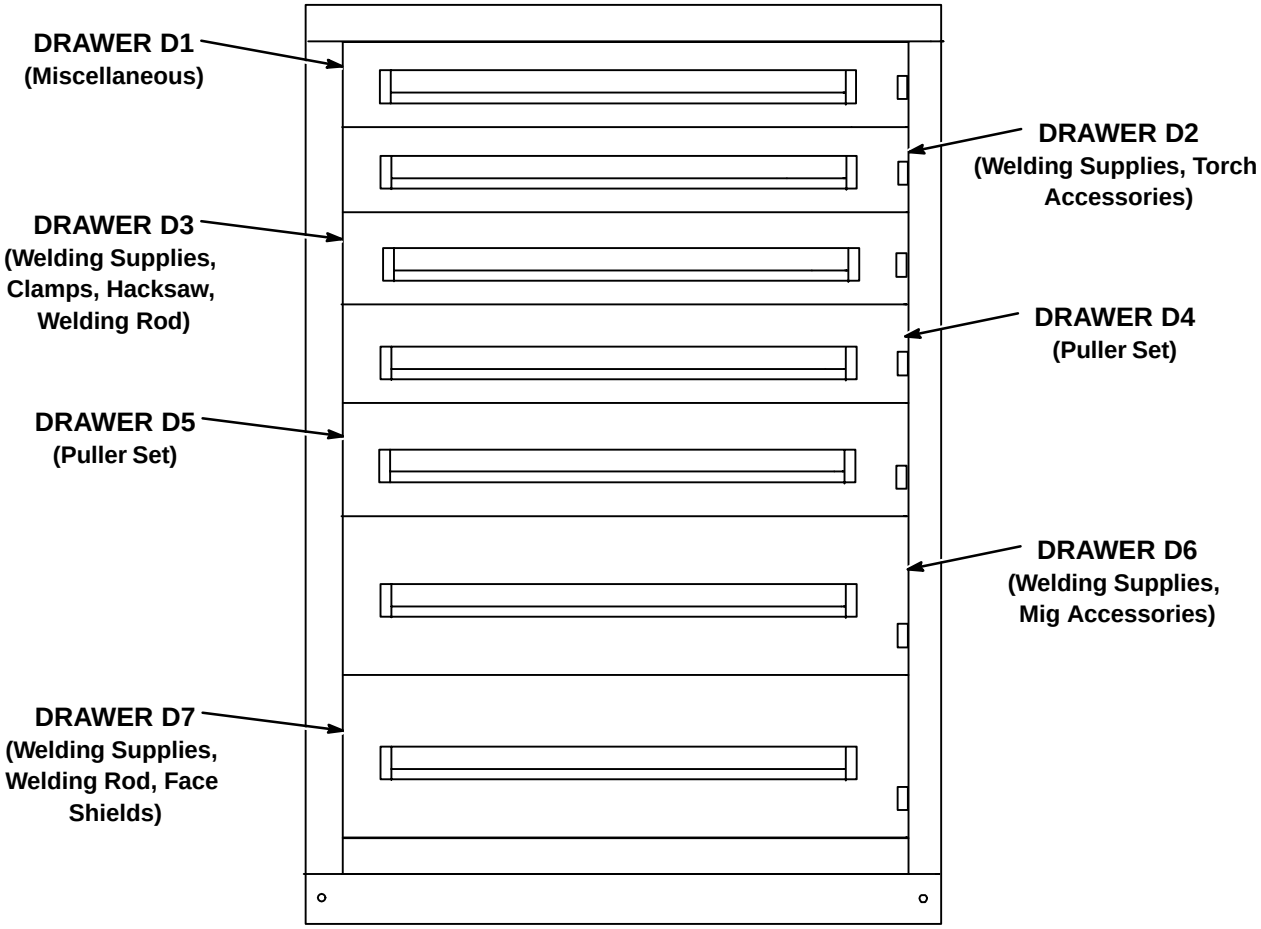
Table F-1. List Of Tools And Equipment By Location On FRS – Continued



DRAWER C3

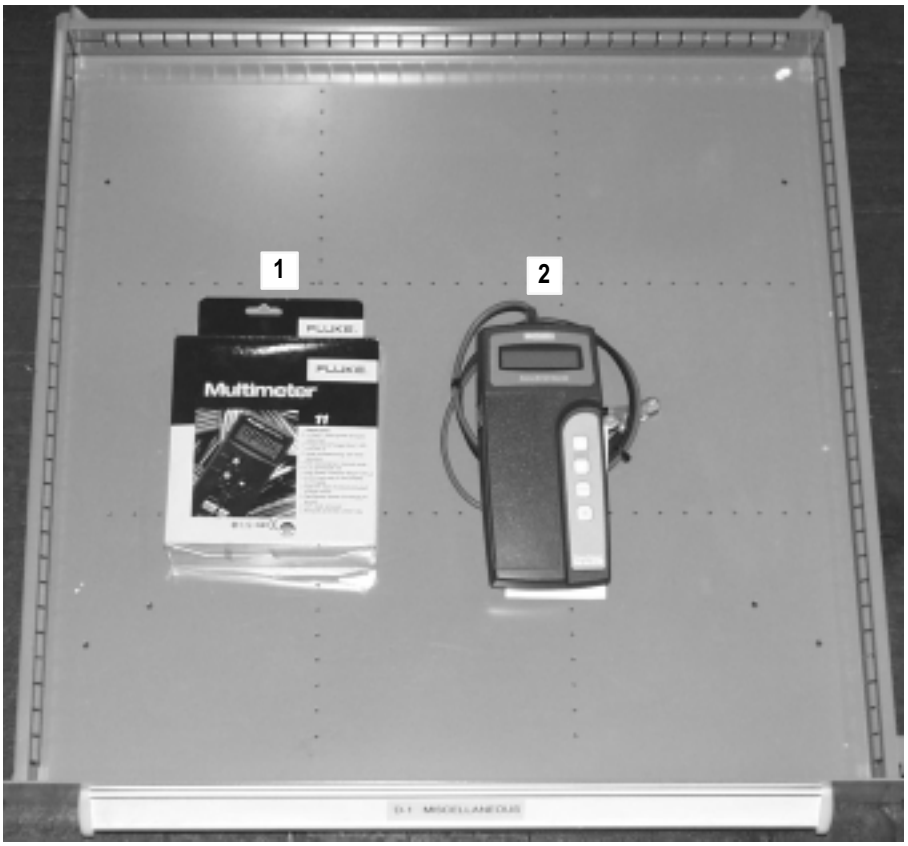
Item #	Item Description	NSN/Part Number	Qty	UI
1	SOCKET SET, WHEEL, BEARING KIT	5120-00-169-4586	1	SE
2	JACK KIT, HYD HAND, 20 TON CAP	5120-00-188-1788	2	EA
3	WRENCH, WHEEL, STUD NUT GEARED, SOC,	5120-00-378-4411	1	EA

Table F-1. List Of Tools And Equipment By Location On FRS – Continued



CABINET D

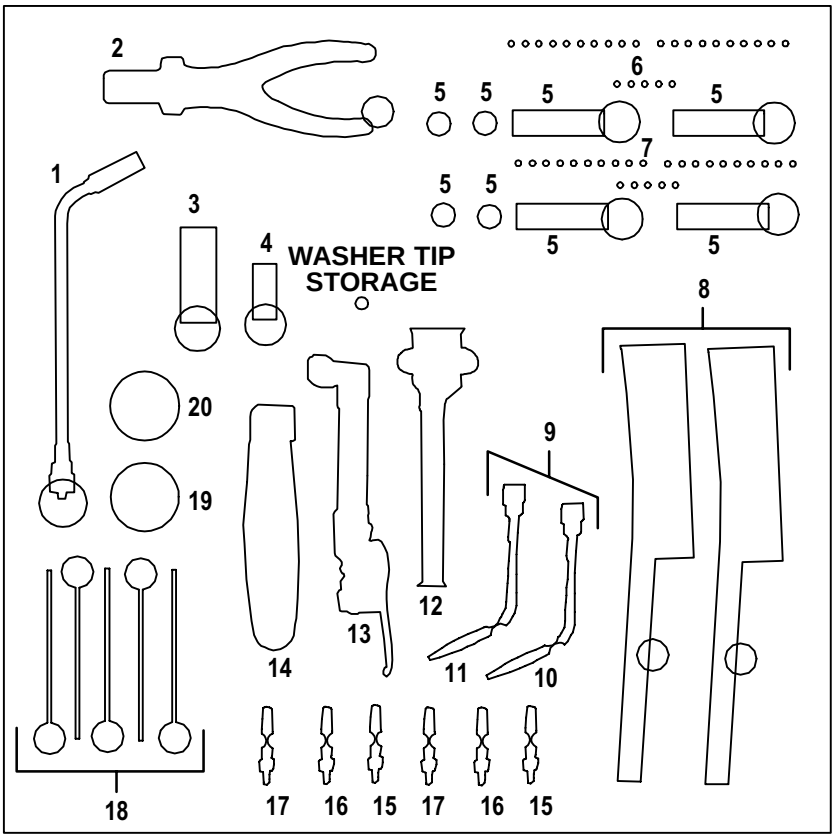
Table F-1. List Of Tools And Equipment By Location On FRS – Continued



DRAWER D1

Item #	Item Description	NSN/Part Number	Qty	UI
1	MULTIMETER, DIGITAL	6625-01-363-5825	1	EA
2	BATTERY ANALYZER AND BATTERY TERMINAL CONNECTORS	6625-01-454-0821	1	EA

Table F-1. List Of Tools And Equipment By Location On FRS – Continued



DRAWER D2

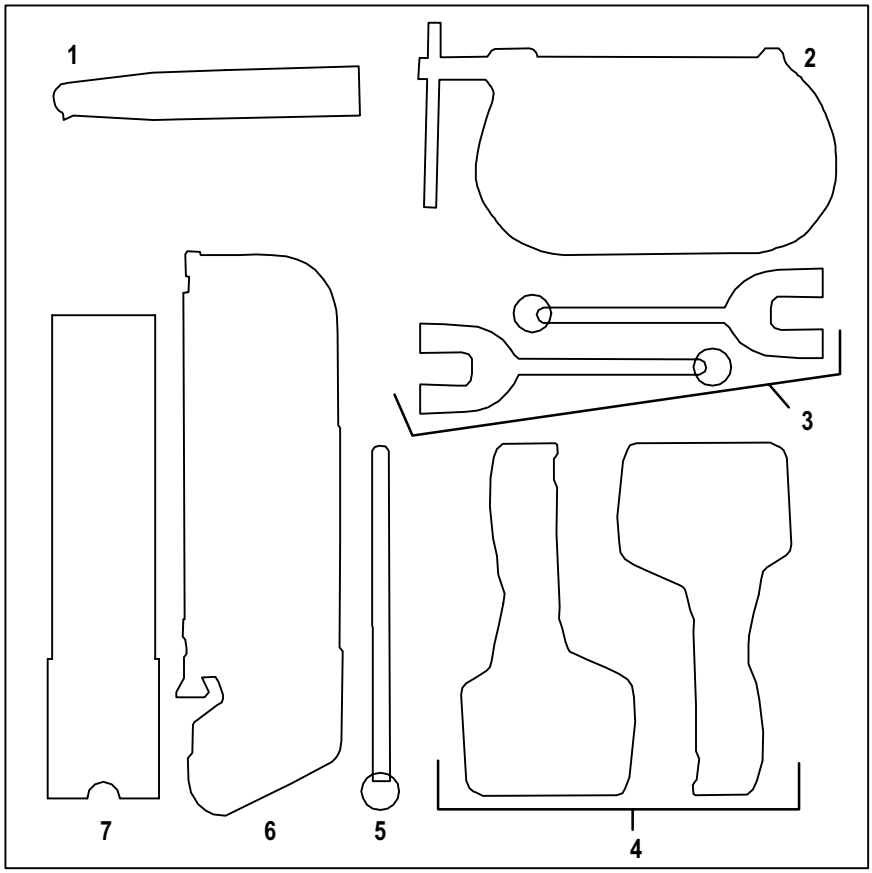
Item #	Item Description	NSN/Part Number	Qty	UI
1	MULTI-FLAME HEATING NOZZLE	3433-01-023-5601	1	EA
2	WELPER HAND TOOL	5120-00-X99-5064	1	EA
3	STANDARD TIP CLEANER	3439-00-383-3634	1	EA
4	FLINT	5120-00-X99-5053	1	EA
5	CUTTING TIPS/HOLDER	3433-00-X99-7434	4	EA
6	TIPS, CONTACT, .035	403-1-35	25	EA
7	TIPS, CONTACT, .045	403-1-45	25	EA
8	BRUSH, WIRE, HAND	5120-00-X99-7093	2	EA
9	14 UNI NOZZLE	0234-0094	2	EA
10	TIP, GAS WELDING	63026D311-0485	1	EA
11	TIP, GAS WELDING	63026D311-0483	1	EA
12	TORCH HANDLE	5110-00-391-1220	1	EA

Table F-1. List Of Tools And Equipment By Location On FRS – Continued

DRAWER D2 – Continued

Item #	Item Description	NSN/Part Number	Qty	UI
13	CUTTING ATTACHMENT	5110-00-391-1219	1	EA
14	FLINT TIP FRICTION LIGHTER	5120-00-X99-7092	1	EA
15	TIP, CUTTING	3433-01-423-5708	2	EA
16	TIP, CUTTING	3433-01-423-5701	2	EA
17	TIP, CUTTING	3433-01-423-5702	2	EA
18	SOAPSTONE	5110-00-223-6708	5	EA
19	SOLDER, ACID CORE	3439-00-184-8960	1	SL
20	SOLDER, ROSIN CORE	3439-01-074-9983	1	SL

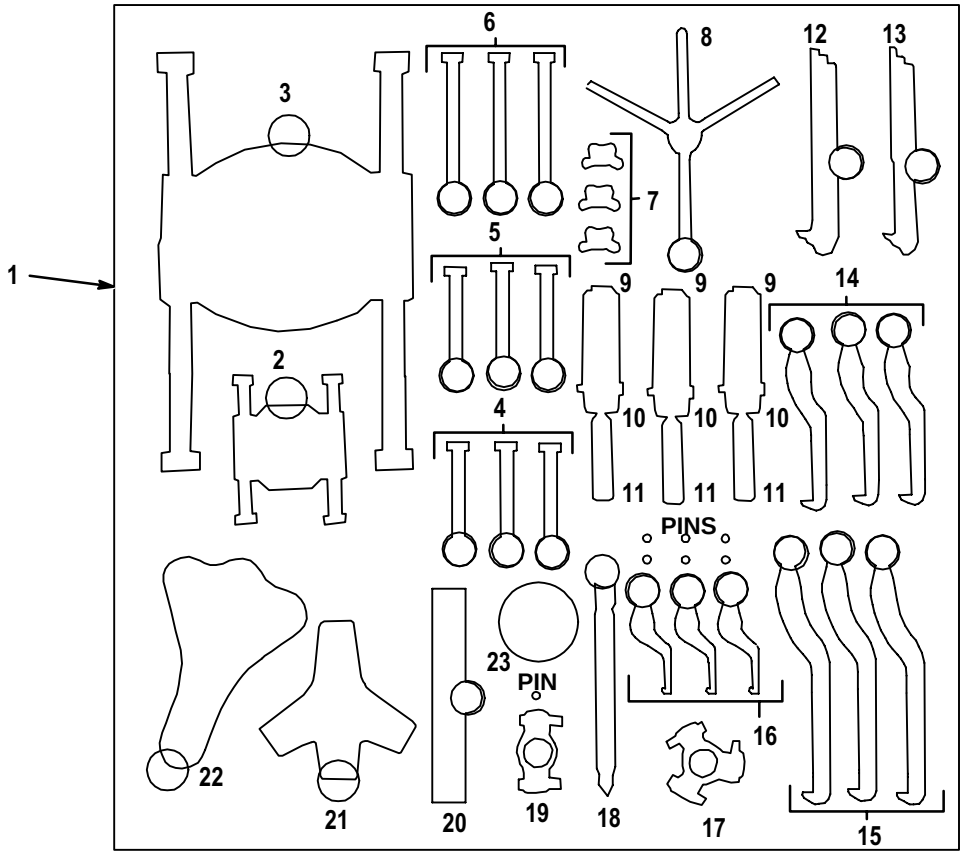
Table F-1. List Of Tools And Equipment By Location On FRS – Continued



DRAWER D3

Item #	Item Description	NSN/Part Number	Qty	UI
1	TESTER, ELECTROLYTE AND ANTIFREEZE	6630-00-105-1418	1	EA
2	C-CLAMPS, DEEP THROAT	5120-01-399-9451	2	EA
3	CLAMP, VISE-GRIP, WELDING, 9”	5120-01-399-9464	2	EA
4	CLAMP, VISE-GRIP	5120-01-399-9465	4	EA
5	BLADES, HACKSAW	5110-01-430-5934	1	BD
6	HACKSAW	5110-01-428-5396	1	EA
7	HOLDER, WELD ROD	3490-01-401-5339	1	EA

Table F-1. List Of Tools And Equipment By Location On FRS – Continued



DRAWER D4

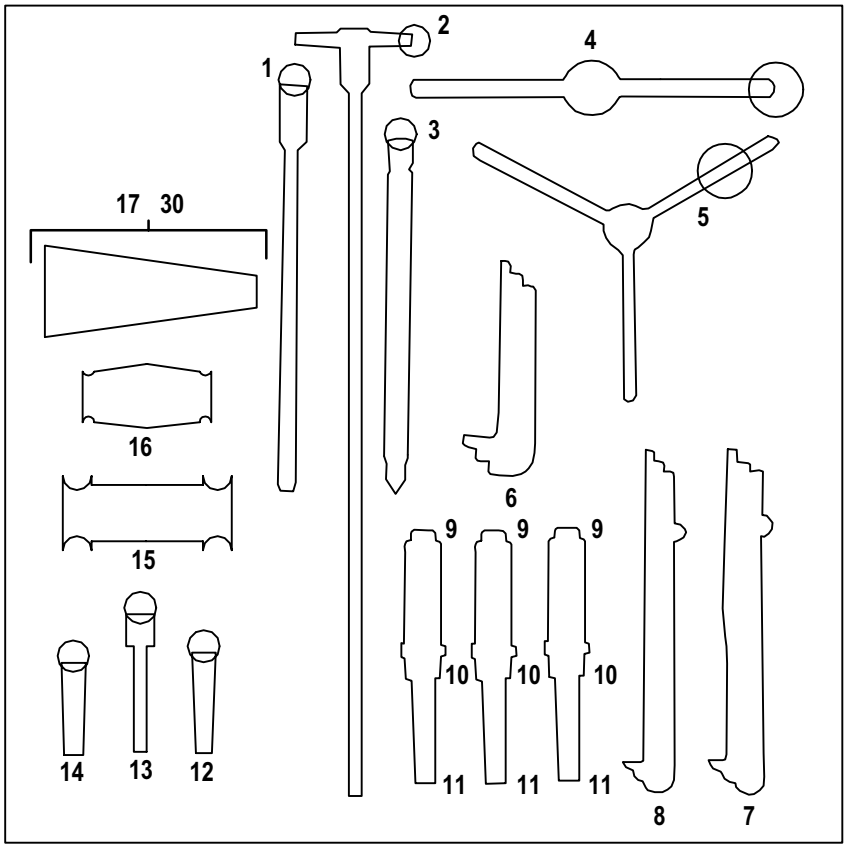
Item #	Item Description	NSN/Part Number	Qty	UI
1	MASTER PULLER SET W/O BOX	5180-00-X00-7040	1	SET
2	BEARING SEPARATOR, 2 3/8” CAPACITY	4331	1	EA
3	BEARING SEPARATOR, 6” CAPACITY	4333A	1	EA
4	SCREW, CAP, 3/8-16” X 3”	4028	3	EA
5	SCREW, CAP, 3/8-24 X 3”	4005C	3	EA
6	SCREW, CAP, 3/8-16 X 4”	4205E	3	EA
7	CLIPS	4225B	3	EA
8	CROSSARM, 2 WAY/3 WAY	4208CA	1	EA
9	JAW BLOCK	4209JB	3	EA
10	JAW, PIVOT PIN	4056PN	3	EA
11	REVERSIBLE JAW, 4 1/2” REACH	4210RJ	3	EA
12	JAW, DUAL REACH	4026A	3	EA

Table F-1. List Of Tools And Equipment By Location On FRS – Continued

DRAWER D4 – Continued

Item #	Item Description	NSN/Part Number	Qty	UI
13	JAW, LONG, NARROW	4027	3	EA
14	JAW, REVERSIBLE, 4” REACH	4056-4	3	EA
15	JAW, REVERSIBLE, 6” REACH	4056-6	3	EA
16	JAW, INSIDE, 2” REACH	4056-2	3	EA
17	YOKE, 3 WAY	4225B	1	EA
18	SCREW, FORCING	4205S	1	EA
19	YOKE, 2 WAY	4250B	1	EA
20	CROSSARM, SLOTTED, 2 WAY	4206SC	1	EA
21	CROSSARM, SLOTTED, 2 WAY/3 WAY	4205B	1	EA
22	AXLE FLANGE	4277B	1	EA
23	NUT, ADJUSTING, REVERSIBLE	4250N	1	EA

Table F-1. List Of Tools And Equipment By Location On FRS – Continued



DRAWER D5

Item #	Item Description	NSN/Part Number	Qty	UI
1	ROD, SHORT, SLIDE	4275R	1	EA
2	ROD, T-HANDLE SLIDE	4260R	1	EA
3	SCREW, FORCING	4225S	1	EA
4	CROSSARM, 2 WAY	4226CA	1	EA
5	CROSSARM, 3 WAY	4227CA	1	EA
6	JAW, CAP SCREW	4018	3	EA
7	JAW, LONG, NARROW	4017	3	EA
8	JAW, DUAL-REACH	4016	3	EA
	JAW SPRING, 10 TON (Includes the following:)	4011S	3	EA
9	JAW BLOCK	4229JB	3	EA
10	JAW, PIVOT PIN	4056PN	3	EA
11	REVERSIBLE JAW	4230RJ	3	EA
12	BLIND BEARING PULLER	4280-S-1	1	EA

Table F-1. List Of Tools And Equipment By Location On FRS – Continued

DRAWER D5 – Continued

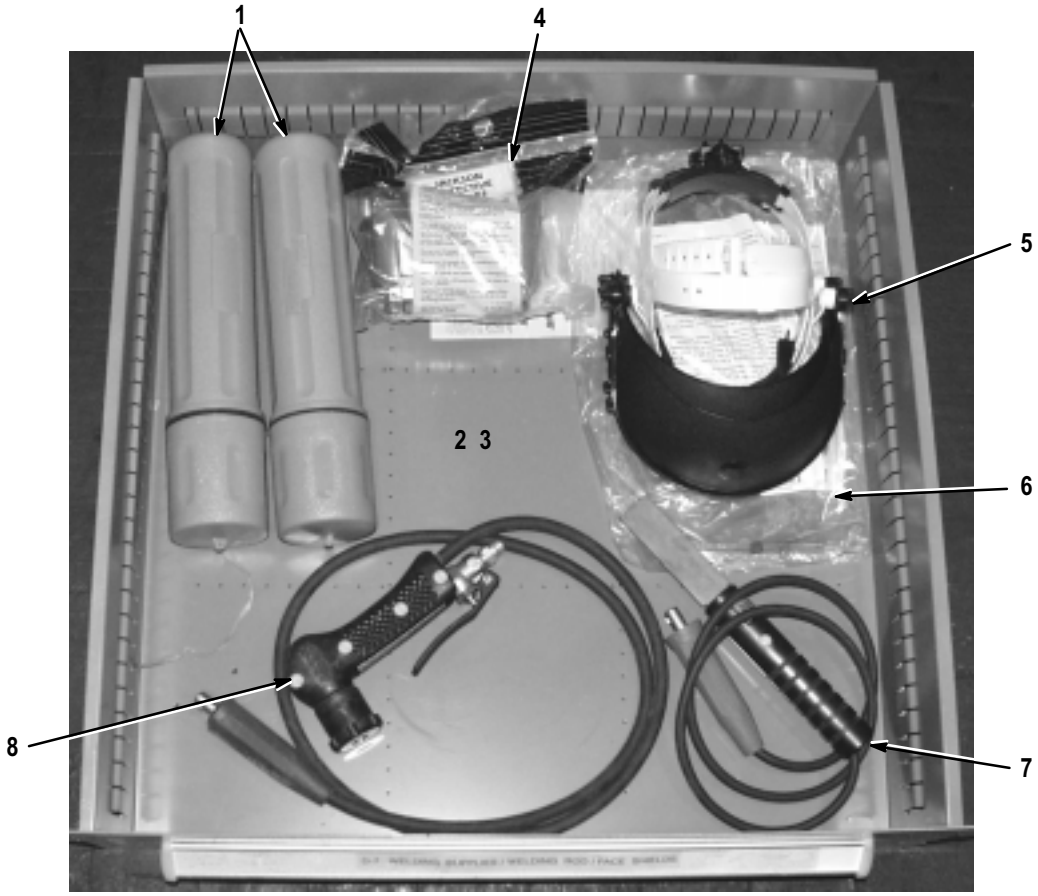
Item #	Item Description	NSN/Part Number	Qty	UI
13	PIN	4280-S-2	1	EA
14	JAW, INSIDE HOOK	4256S	1	EA
15	HAMMER, 5 LB. SLIDE	4055H	1	EA
16	HAMMER, 2 1/2 LB. SLIDE	4260H	1	EA
	STEP PLATE ADAPTER SET (Includes the following:)	4040	1	EA
17	STEP PLATE, 2 3/8 BORE	4040-14	1	EA
18	STEP PLATE, 2 1/4 BORE	4040-13	1	EA
19	STEP PLATE, 2 1/8 BORE	4040-12	1	EA
20	STEP PLATE, BORE	4040-11	1	EA
21	STEP PLATE, BORE	4040-10	1	EA
22	STEP PLATE, BORE	4040-9	1	EA
23	STEP PLATE, BORE	4040-8	1	EA
24	STEP PLATE, BORE	4040-7	1	EA
25	STEP PLATE, BORE	4040-6	1	EA
26	STEP PLATE, BORE	4040-5	1	EA
27	STEP PLATE, BORE	4040-4	1	EA
28	STEP PLATE, BORE	4040-3	1	EA
29	STEP PLATE, BORE	4040-2	1	EA
30	STEP PLATE, BORE	4040-1	1	EA

Table F-1. List Of Tools And Equipment By Location On FRS – Continued

DRAWER D6

Item #	Item Description	NSN/Part Number	Qty	UI
1	APRON, WELDERS	564GR-40	2	EA
2	GLOVES, WELDER	8415-00-X99-7094	2	EA
3	CONDUIT LINER, .035 WIRE, 15’ AL.	3433-00-X99-7098	1	EA
4	CONDUIT LINER, .045 WIRE, 15’ STEEL	3433-00-X99-7441	1	EA
5	CABLE ASSY, GROUND, 5 FT LONG LDP-50	6150-00-X99-7108	1	EA
6	CABLE ASSY, STINGER, 5 FT LONG LDP-70	6150-00-X99-7107	1	EA
7	MIG GUN, STEEL	2515-45	1	EA
8	MIG GUN, ALUMINUM	2510-35-9	1	EA
9	WIRE STEEL, .045	3439-00-X99-7099	1	EA
10	SHIELD, TORCH, LEATHER	8415-00-X99-7517	1	EA
11	WIRE, ALUMINUM, .035	3439-00-X99-7102	1	EA

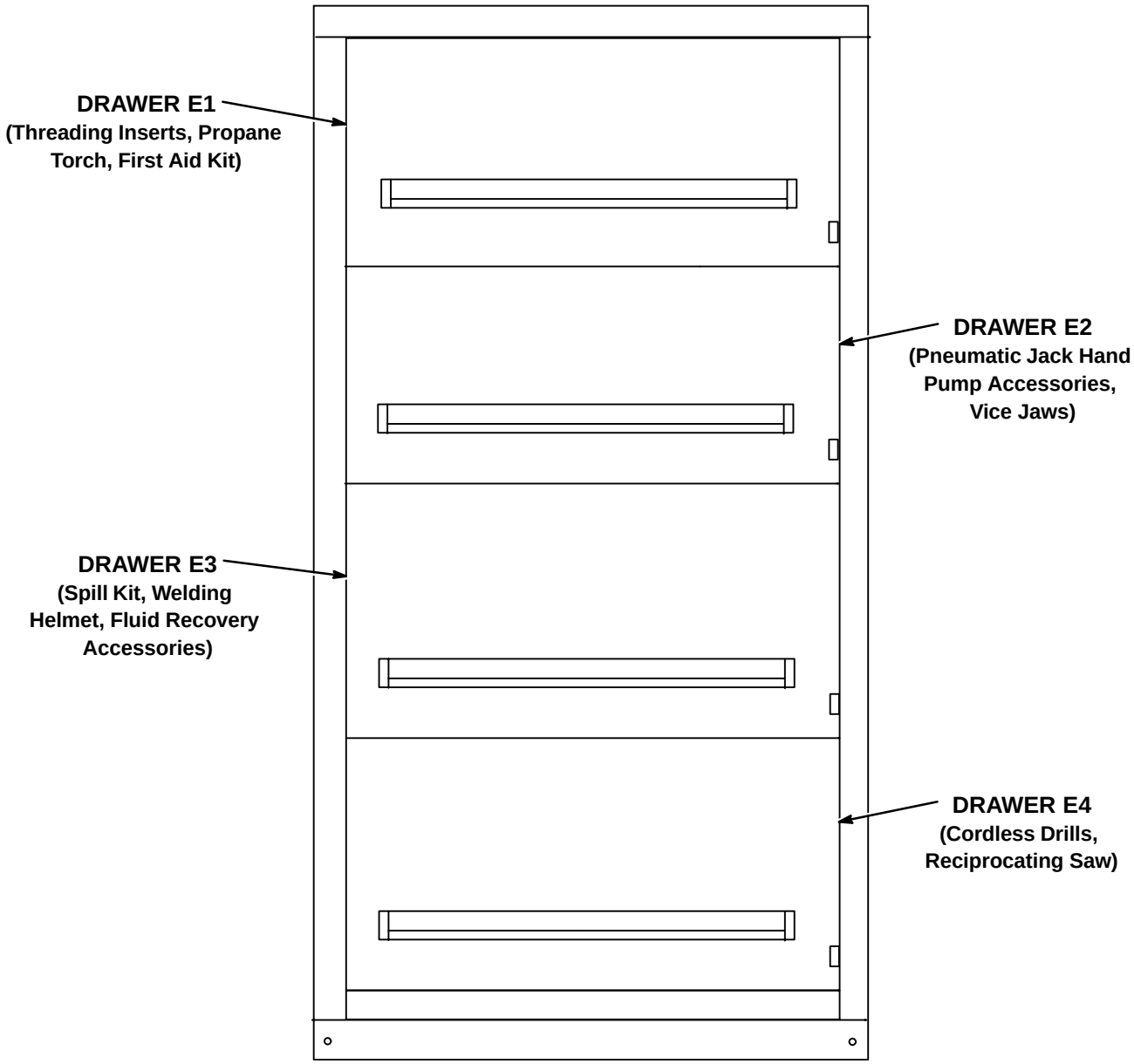
Table F-1. List Of Tools And Equipment By Location On FRS – Continued



DRAWER D7

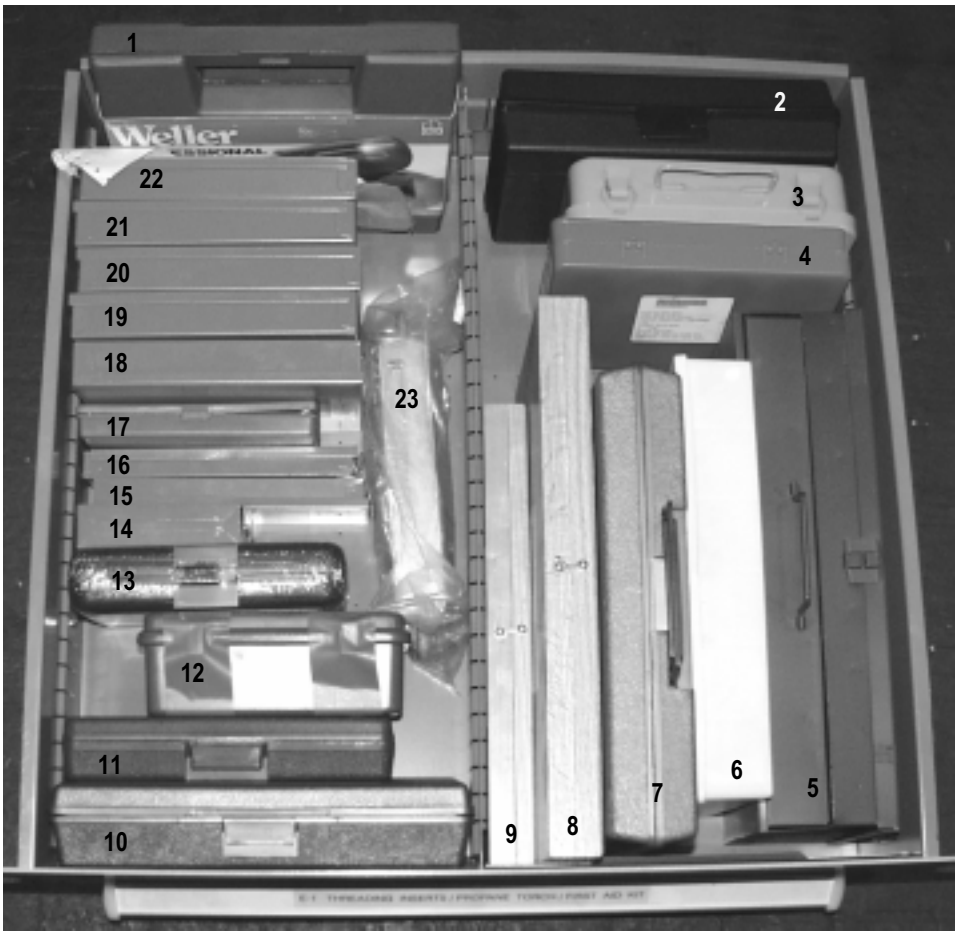
Item #	Item Description	NSN/Part Number	Qty	UI
1	HOLDER, WELD ROD	3490-01-401-5339	2	EA
2	CUTTING RODS, EXOTHERMIC TORCH, 3/8 X	3421-00-X99-7124	1	EA
3	CUTTING RODS, EXOTHERMIC TORCH, 1/4 X	3421-00-X99-7125	1	EA
4	GOGGLES, INDUSTRIAL	749360746-0515	2	EA
5	HEADGEAR 170S	0742-0020	2	EA
6	CLEAR VISOR 915-60	0754-0215	2	EA
7	CABLE ASSY, EXOTHERMIC, 5 FT LONG	6150-00-X99-7117	1	EA
8	CABLE ASSY, EXOTHERMIC, 5 FT LONG	6150-00-X99-7116	1	EA

Table F-1. List Of Tools And Equipment By Location On FRS – Continued



CABINET E

Table F-1. List Of Tools And Equipment By Location On FRS – Continued



DRAWER E1

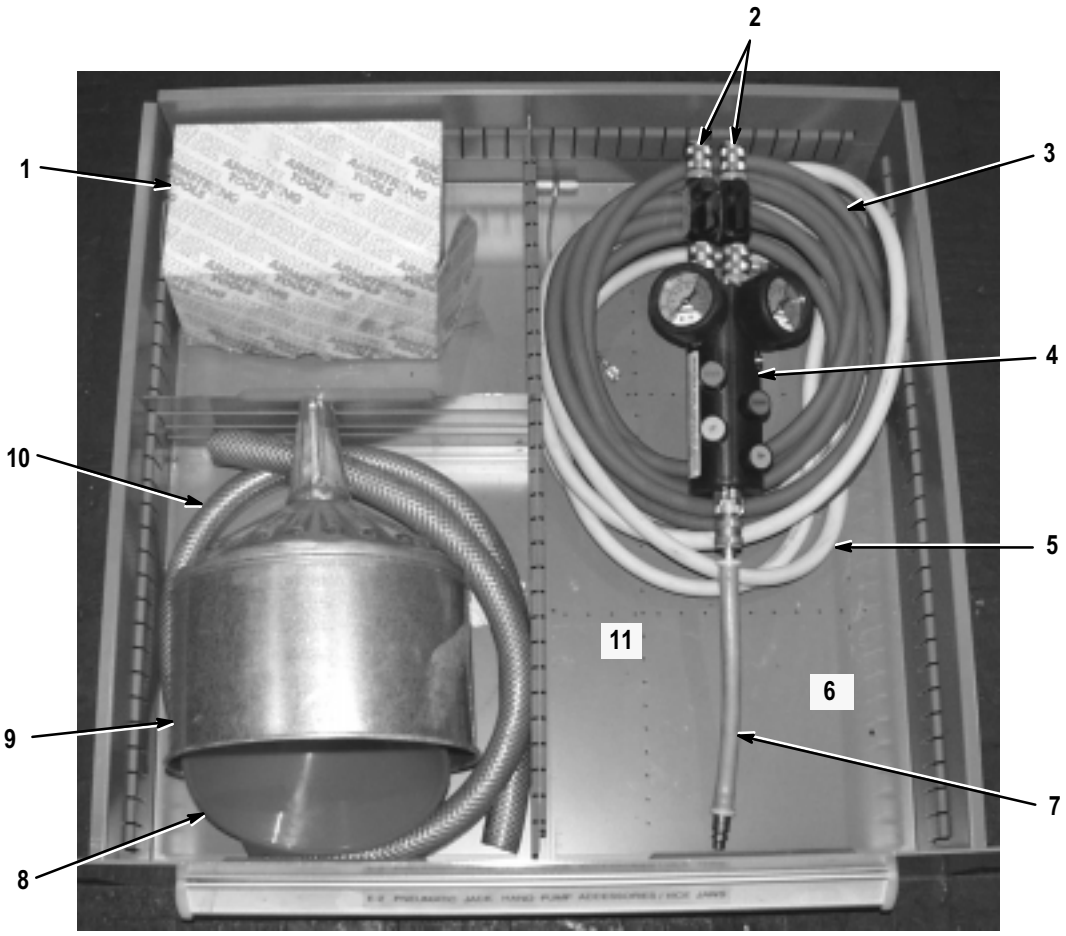
Item #	Item Description	NSN/Part Number	Qty	UI
1	SOLDERING GUN, 3-WIRE	3439-00-808-0528	1	EA
2	SOLDERING TORCH, KIT	3439-00-542-0531	1	EA
3	TOOL KIT, BLIND RIVET	5180-01-201-4978	1	EA
4	PACKING, ASSORTED, PREFORMED	5330-00-966-8657	1	EA
5	TOOL KIT, ELECTRICAL CONTACT	5180-00-876-9366	1	EA
6	TERMINAL KIT	5940-00-525-0907	1	EA
7	THREAD INSERT, KIT, COIL	5120-01-113-1544	1	EA
8	DIE SET, RETHREADING	5136-01-321-6790	1	EA
9	SPLIT RING, THREAD REPAIR	5136-01-355-3035	1	EA
10	FLARING AND CUTTING KIT	5180-00-596-1038	1	EA
11	PUNCH SET, GASKET	5110-00-449-7313	1	EA

Table F-1. List Of Tools And Equipment By Location On FRS – Continued

DRAWER E1 – Continued

Item #	Item Description	NSN/Part Number	Qty	UI
12	FIRST AID KIT, GENERAL PURPOSE	6545-00-922-1200	1	EA
13	THREAD INSERT, SCREW, 1/2-13 UNC	5180-00-051-5024	1	EA
14	REFACING TOOL, TUBE FITTING	5110-00-595-9279	1	EA
15	THREAD INSERT, SCREW, 1/4-28 UNC	5180-00-935-0736	1	EA
16	THREAD INSERT, SCREW, 1/4-20 UNC	5180-00-935-0732	1	EA
17	TUBE FLARING, METRIC	5120-01-335-1606	1	EA
18	THREAD INSERT, SCREW, 3/8-16 UNC	5180-00-935-0734	1	EA
19	THREAD INSERT, SCREW, 5/16-18 UNC	5180-00-935-0733	1	EA
20	THREAD INSERT, SCREW, 5/16-24 UNC	5180-00-935-0737	1	EA
21	THREAD INSERT, SCREW, 1/2-20 UNC	5180-00-054-7505	1	EA
22	THREAD INSERT, SCREW, 3/8-24 UNC	5180-00-935-0738	1	EA
23	SCALE, DIAL, INDICATING	6670-00-254-4634	1	EA

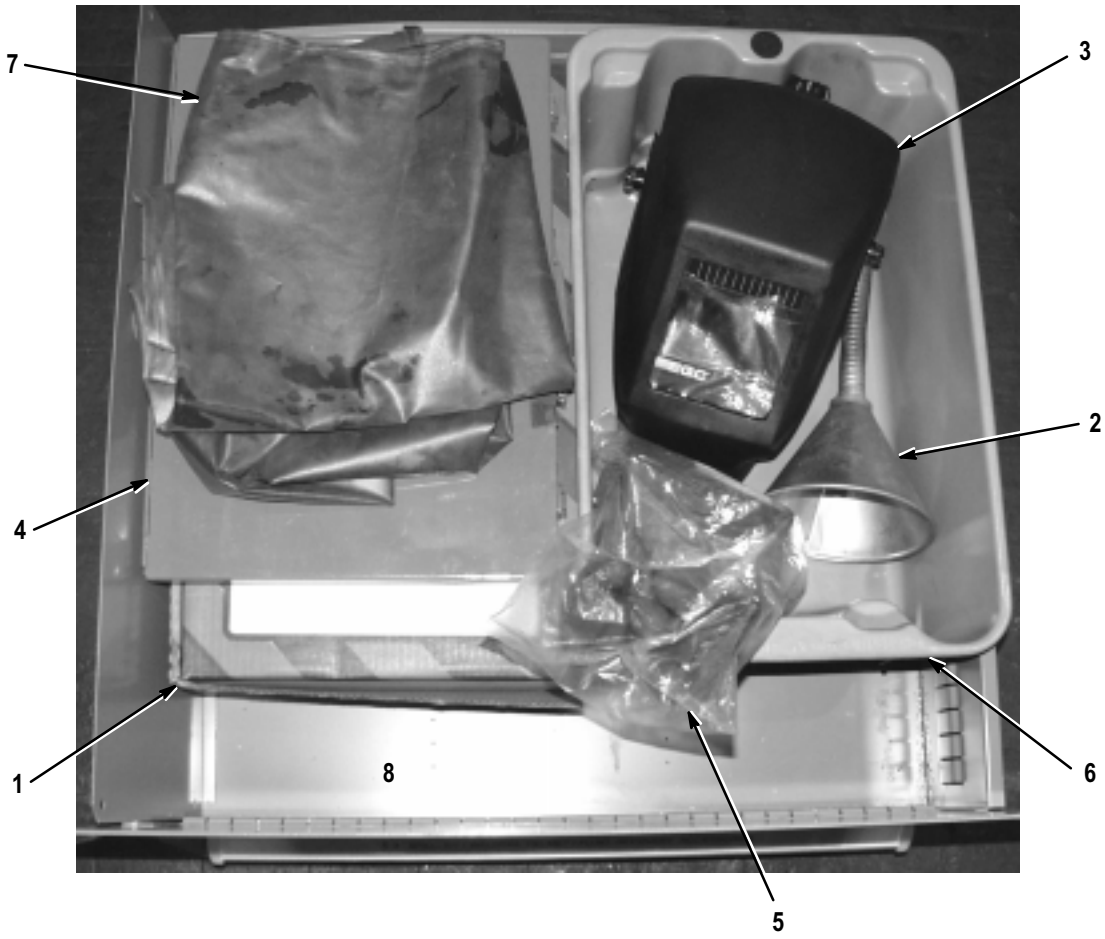
Table F-1. List Of Tools And Equipment By Location On FRS – Continued



DRAWER E2

Item #	Item Description	NSN/Part Number	Qty	UI
1	CHAIN VISE, PIPE	5120-01-180-0670	1	EA
2	VALVE, RELIEF, INLINE	30978890490	2	EA
3	HOSE, AIR, RED, 16 FT	30978890516	1	EA
4	CONTROLLER, DUAL, W/16 FT BLK HOSE	30978890900	1	EA
5	HOSE, AIR, YELLOW, 16 FT	30978890515	1	EA
6	DRILL SHARPENER	58656DRX500SP	1	EA
7	AIR WHIP	804-H5EP-H9-CPX	1	EA
8	FUNNEL, RIGID SPOUT, 2 QT CAP	7240-00-404-9795	1	EA
9	FUNNEL, RIGID SPOUT, 2 GAL CAP	7240-00-244-1206	1	EA
10	DISPENSING PUMP, AIR PRESSURE (Hose only)	4930-01-392-8645	1	EA
11	NITROGEN HOSE, 50 FT	302-5020	1	EA

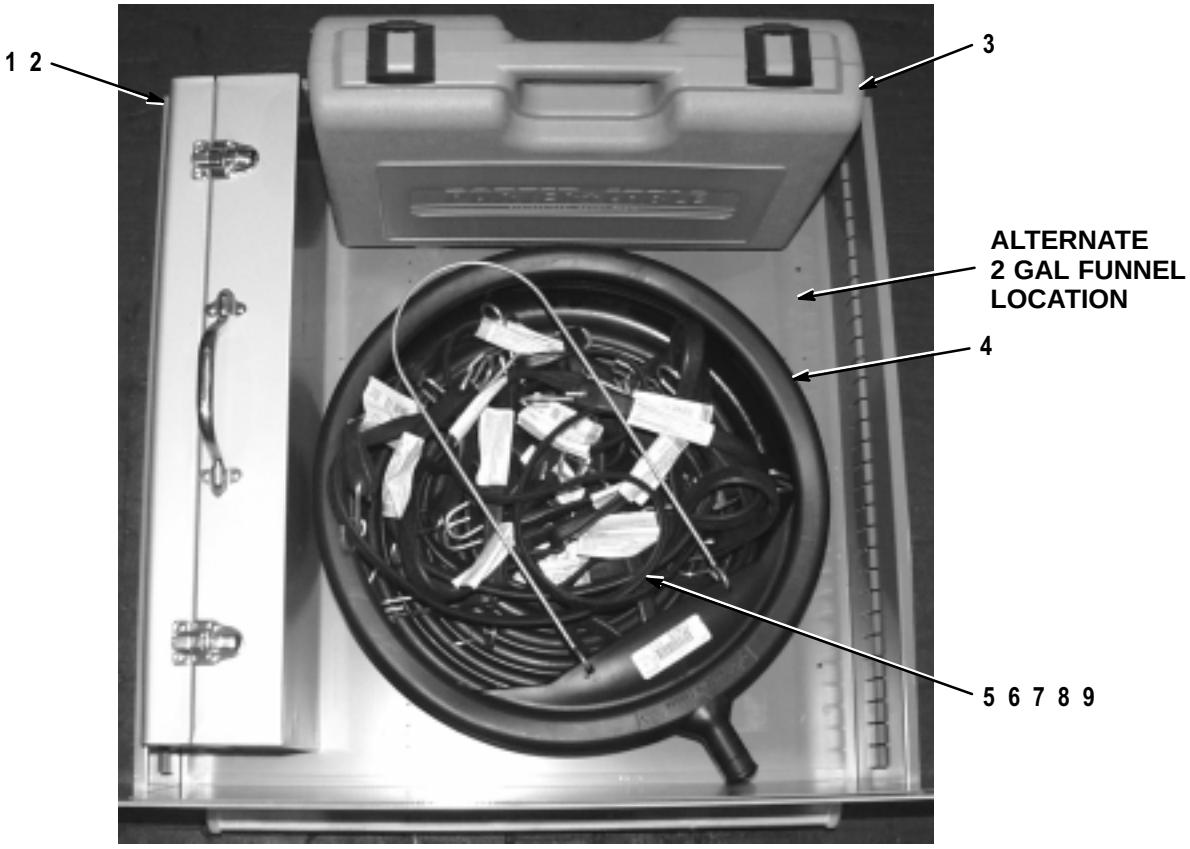
Table F-1. List Of Tools And Equipment By Location On FRS – Continued



DRAWER E3

Item #	Item Description	NSN/Part Number	Qty	UI
1	ENVIRONMENTAL SUPPORT	4235-01-399-2495	1	EA
2	FUNNEL, FLEXIBLE SPOUT, 1 QT CAP	7240-00-559-7364	1	EA
3	HELMET, QEC MASTER WELDING	749360744-0753	1	EA
4	ADAPTER KIT, GREASE GUN	4930-01-178-8848	1	EA
5	GLOVES, RUBBER: MEN	8415-00-266-8675	1	EA
6	BOX TOTE, PLASTIC, 20.5L X 12.6W X 8H	3990-01-056-2990	1	EA
7	APRON, RUBBER COATED, BLACK	8415-00-082-6108	1	EA
8	GUN, GREASE	YA732	1	EA

Table F-1. List Of Tools And Equipment By Location On FRS – Continued



DRAWER E4

Item #	Item Description	NSN/Part Number	Qty	UI
1	SAW ALL, VARIABLE SPEED	5120-01-139-9674	1	EA
2	ALL PURPOSE BLADES	6093312421-5	1	EA
3	DRILL CORDLESS, 12 V, 1/2”	609339862	1	EA
4	PAN, DRAIN, 5 GAL CAP	257956Y810	1	EA
5	STRAPS, RUBBER, TIE-DOWN 9”	5340-00-X99-7111	4	EA
6	STRAPS, RUBBER, TIE-DOWN 15”	5340-00-X99-7112	5	EA
7	STRAPS, RUBBER, TIE-DOWN 21”	5340-00-X99-7113	6	EA
8	STRAPS, RUBBER, TIE-DOWN 31”	5340-00-X99-7114	4	EA
9	STRAPS, RUBBER, TIE-DOWN 41”	5340-00-X99-7115	4	EA

Table F-2. Alphabetical List of Tools and Equipment

Item	Item Description	NSN/Part Number	Qty	UI	Location
1	ADAPTER, 1/2” F X 3/8”M	5120-01-399-9665	1	EA	A4
2	ADAPTER, 3/4” F-1/2” M	5120-01-399-9756	1	EA	A6
3	ADAPTER KIT, GREASE GUN	4930-01-178-8848	1	EA	E3
4	AIR COMPRESSOR AND RECEIVER	3W2937100X15	1	EA	FV
5	AIR GUN, 9.5 CFM @ 100 PSI, W/HOSE	4940-00-333-5541	1	EA	B7
6	AIR HEATER	38453D8LC-24V	1	EA	CLM
7	AIR WHIP, 12”	804-H5EP-H9C PX 12.00	1	EA	E2
8	ALL PURPOSE BLADES	6093312421-5	1	EA	E4
9	APRON, RUBBER COATED, BLACK	8415-00-082-6108	1	EA	E3
10	APRON, WELDERS	564GR-40	2	EA	D6
11	ARGON HOSE REEL	4930-01-311-2882	1	EA	CM
12	AXLE FLANGE	4277B	1	EA	D4
13	BAG, AIR LIFTING, KPI–44	30978888190	2	EA	BS
14	BAR SET, PRY 4 PC	1CV052100	1	EA	B3
15	BAR, WRECKING, GOOSE NECK, 24”	1CV0555–124	2	EA	RW
16	BATTERY ANALYZER AND BATTERY TERMINAL CONNECTORS	6625-01-454-0821	1	EA	D1
17	BATTERY TERMINAL SPREADER & REAMER	5120-01-399-9240	1	EA	B3
18	BEARING SEPARATOR, 6” CAPACITY	4333A	1	EA	D4
19	BEARING SEPARATOR, 2 3/8” CAPACITY	4331	1	EA	D4
20	BIT, HEX, 6MM, 3/8” DR.	5120-01-399-9807	1	EA	A2
21	BIT, HEX, 7MM, 3/8” DR.	5120-01-399-9805	1	EA	A2
22	BIT, HEX, 8MM, 3/8” DR.	5120-01-399-9819	1	EA	A2
23	BIT, HEX, 10MM, 3/8” DR.	5120-01-399-9817	1	EA	A2
24	BIT, HEX, 1/8”, 3/8” DR.	5120-01-399-9977	1	EA	A2
25	BIT, HEX, 5/32”, 3/8” DR.	5120-01-399-9979	1	EA	A2
26	BIT, HEX, 3/16”, 3/8” DR.	5120-01-399-9978	1	EA	A2
27	BIT, HEX, 7/32”, 3/8” DR.	5120-01-399-9981	1	EA	A2
28	BIT, HEX, 1/4”, 3/8” DR.	5120-01-399-9980	1	EA	A2
29	BIT, HEX, 5/16”, 3/8” DR.	5120-01-399-9982	1	EA	A2
30	BIT, HEX, 3/8”, 3/8” DR.	5120-01-399-9784	1	EA	A2
31	BIT, HEX, 1/4”, 1/2” DR	5120-01-399-9824	1	EA	A4

Table F-2. Alphabetical List of Tools and Equipment – Continued

Item	Item Description	NSN/Part Number	Qty	UI	Location
32	BIT, HEX, 5/16”, 1/2” DR	5120-01-399-9825	1	EA	A4
33	BIT, HEX, 3/8”, 1/2” DR	5120-01-399-9827	1	EA	A4
34	BIT, HEX, 7/16”, 1/2” DR	5120-01-399-9828	1	EA	A4
35	BIT, HEX, 1/2”, 1/2” DR	5120-01-399-9830	1	EA	A4
36	BIT, HEX, 9/16”, 1/2” DR	5120-01-399-9829	1	EA	A4
37	BIT, HEX, 5/8”, 1/2” DR	5120-01-399-9831	1	EA	A4
38	BIT, HEX, EXTRA LONG, 1/8”, 3/8” DR.	5120-01-399-9787	1	EA	A2
39	BIT, HEX, EXTRA LONG, 5/32”, 3/8” DR.	5120-01-399-9799	1	EA	A2
40	BIT, HEX, EXTRA LONG, 3/16”, 3/8” DR.	5120-01-399-9796	1	EA	A2
41	BIT, HEX, EXTRA LONG, 7/32”, 3/8” DR.	5120-01-399-9806	1	EA	A2
42	BIT, HEX, EXTRA LONG, 1/4”, 3/8” DR.	1CV0549901/4XL	1	EA	A2
43	BIT, HEX, EXTRA LONG, 5/16”, 3/8” DR.	5120-01-399-9809	1	EA	A2
44	BIT, HEX, EXTRA LONG, 3/8”, 3/8” DR.	5120-01-399-9812	1	EA	A2
45	BIT, HEX, EXTRA LONG, 1/4”, 1/2” DR	5120-01-399-9832	1	EA	A4
46	BIT, HEX, EXTRA LONG, 5/16”, 1/2” DR	5120-01-399-9833	1	EA	A4
47	BIT, HEX, EXTRA LONG, 3/8”, 1/2” DR	5120-01-399-9835	1	EA	A4
48	BIT, HEX, EXTRA LONG, 1/2”, 1/2” DR	5120-01-399-9834	1	EA	A4
49	BIT, HEX, EXTRA LONG, 9/16”, 1/2” DR	5120-01-399-9837	1	EA	A4
50	BIT, HEX, EXTRA LONG, 5/8”, 1/2” DR	5120-01-399-9838	1	EA	A4
51	BIT, TORX, T10, 3/8” DRIVE	5120-01-399-9779	1	EA	A2
52	BIT, TORX, T15, 3/8” DRIVE	5120-01-399-9776	1	EA	A2
53	BIT, TORX, T20, 3/8” DRIVE	5120-01-399-9778	1	EA	A2
54	BIT, TORX, T25, 3/8” DRIVE	5120-01-399-9781	1	EA	A2
55	BIT, TORX, T27, 3/8” DRIVE	5120-01-399-9789	1	EA	A2
56	BIT, TORX, T30, 3/8” DRIVE	5120-01-399-9786	1	EA	A2
57	BIT, TORX, T40, 3/8” DRIVE	5120-01-399-9795	1	EA	A2
58	BIT, TORX, T45, 3/8” DRIVE	5120-01-399-9791	1	EA	A2
59	BIT, TORX, T50, 3/8” DRIVE	5120-01-399-9793	1	EA	A2
60	BIT, TORX, T55, 3/8” DRIVE	5120-01-399-9800	1	EA	A2
61	BLADES, HACKSAW	5110-01-430-5934	1	BD	D3
62	BLIND BEARING PULLER	4280-S-1	1	EA	D5
63	BOX TOTE, PLASTIC, 20.5L X 12.6W X 8H	3990-01-056-2990	1	EA	E3

Table F-2. Alphabetical List of Tools and Equipment – Continued

Item	Item Description	NSN/Part Number	Qty	UI	Location
64	BRAZING ROD HOLDER	3439-00-X99-8028	1	EA	RW
65	BRAZING ROD, 1/8”	3439-00-X99-8020	1	PK	RW
66	BRAZING ROD, 3/16”	0015FC-80	1	PK	RW
67	BREAKER BAR HINGE HANDLE 3/8” DR 8 1/2” LONG	5120-01-399-9609	1	EA	A2
68	BREAKER BAR, 1/2” DR, 18 5/8” LONG	1CV055468	1	EA	A4
69	BREAKER BAR, 3/4” DR, 20” LONG	5120-01-358-3171	1	EA	A6
70	BRUSH, FILE CLEANER	7920-00-224-7987	1	EA	B2
71	BRUSH, WIRE, HAND	5120-00-X99-7093	2	EA	D2
72	BRUSH, WIRE, ROTARY, FLARE	5130-00-293-2409	1	EA	A7
73	BRUSH, WIRE, ROTARY, SOLID	5130-00-263-0235	1	EA	A7
74	CABLE	2-195-6-00653	1	EA	RV
75	CABLE ASSY, EXOTHERMIC, 5 FT LONG LDP-50 END	6150-00-X99-7117	1	EA	D7
76	CABLE ASSY, EXOTHERMIC, 5 FT LONG LDP-70 END	6150-00-X99-7116	1	EA	D7
77	CABLE ASSY, GROUND, 5 FT LONG LDP-50	6150-00-X99-7108	1	EA	D6
78	CABLE ASSY, STINGER, 5 FT LONG LDP-70	6150-00-X99-7107	1	EA	D6
79	CABLE, WELDING ASSY, W/2 FTGS, 45 FT BLACK LDP-50	6150-00-X99-7106	1	EA	RW
80	CABLE, WELDING ASSY, W/2 FTGS, 45 FT RED LDP-70	6150-00-X99-7105	1	EA	RW
81	CAPS, VISE JAW	5120-00-221-1506	1	PG	CM
82	C-CLAMPS, DEEP THROAT	5120-01-399-9451	2	EA	D3
83	CHAIN VISE, PIPE	5120-01-180-0670	1	EA	E2
84	CHISEL, COLD, 7/8” CUT	5110-01-406-7201	1	EA	B2
85	CHISEL, COLD, 1” CUT	1CV0586A718X8	1	EA	B2
86	CHISEL, COLD, 1 3/16” CUT	1CV0586A1X8	1	EA	B2
87	CLAMP, VISE-GRIP	5120-01-399-9465	4	EA	D3
88	CLAMP, VISE-GRIP, WELDING, 9”	5120-01-399-9464	2	EA	D3
89	CLEANER, BATTERY POST	5120-01-400-1200	1	EA	A3
90	CLEAR VISOR 915-60	0754-0215	2	EA	D7
91	CLIPS	4225B	3	EA	D4
92	CONDUIT LINER, .035 WIRE, 15’ AL.	3433-00-X99-7098	1	EA	D6
93	CONDUIT LINER, .045 WIRE, 15’ STEEL	3433-00-X97-7441	1	EA	D6

Table F-2. Alphabetical List of Tools and Equipment – Continued

Item	Item Description	NSN/Part Number	Qty	UI	Location
94	CONTROLLER, DUAL, W/16 FT BLK HOSE	30978890900	1	EA	E2
95	CORD, ELECTRICAL POWER, 50', ALL	6150-00-682-3460	2	EA	RW
96	CRANE, LVS MK17A1	3950-00-X99-8101	1	EA	RV
97	CREEPER	257954WM29	2	EA	BS
98	CRIB BLOCKING	RIA149431	7	EA	BS
99	CROSSARM, 2 WAY	4226CA	1	EA	D5
100	CROSSARM, 2 WAY/3 WAY	4208CA	1	EA	D4
101	CROSSARM, 3 WAY	4227CA	1	EA	D5
102	CROSSARM, SLOTTED, 2 WAY	4206SC	1	EA	D4
103	CROSSARM, SLOTTED, 2 WAY/3 WAY	4205B	1	EA	D4
104	CROWBAR, PINCH, HEAVY DUTY, 59" INCH	5120-00-224-1390	2	EA	RW
105	CROWFOOT, FL. NUT, 12 PT, 5/8", 3/8" DR.	5120-01-428-4954	1	EA	A2
106	CROWFOOT, FL. NUT, 12 PT, 11/16", 3/8" DR.	5120-01-428-4957	1	EA	A2
107	CROWFOOT, FL. NUT, 12 PT, 3/4", 3/8" DR.	5120-01-428-4986	1	EA	A2
108	CROWFOOT, FL. NUT, 12 PT, 13/16", 3/8" DR.	5120-01-428-5002	1	EA	A2
109	CROWFOOT, FL. NUT, 12 PT, 7/8", 3/8" DR.	5120-01-428-5007	1	EA	A2
110	CROWFOOT, FL. NUT, 12 PT, 15/16", 3/8" DR.	5120-01-428-4966	1	EA	A2
111	CROWFOOT, FL. NUT, 12 PT, 1", 3/8" DR.	5120-01-428-4993	1	EA	A2
112	CROWFOOT, FL. NUT, 12 PT, 1 1/16", 3/8" DR.	5120-01-428-4997	1	EA	A2
113	CUTTERS, BOLT	5110-00-224-7057	1	EA	RW
114	CUTTING ATTACHMENT	5110-00-391-1219	1	EA	D2
115	CUTTING RODS, EXOTHERMIC TORCH, 1/4 X	3421-00-X99-7125	1	EA	D7
116	CUTTING RODS, EXOTHERMIC TORCH, 3/8 X	3421-00-X99-7124	1	EA	D7
117	CUTTING TIPS/HOLDER	3433-00-X99-7434	4	EA	D2
118	DIE SET, RETHREADING	5136-01-321-6790	1	EA	E1
119	DISPENSING PUMP, AIR PRESSURE (Hose only)	4930-01-392-8645	1	EA	E2
120	DRILL BIT SET, ALPHA A-Z	257951V710	1	SE	A7
121	DRILL BIT SET, METRIC 1MM-13MM X 0.55MM (25 PIECES)	5133-01-052-3580	1	SE	A7
122	DRILL CORDLESS, 12 V, 1/2"	609339862	1	EA	E4
123	DRILL, HAND, VSR, ELECT, 3/8"	5130-01-396-6314	1	EA	A7

Table F-2. Alphabetical List of Tools and Equipment – Continued

Item	Item Description	NSN/Part Number	Qty	UI	Location
124	DRILL, HAND, VSR, ELEC, 1/2”	609337554	1	EA	A7
125	DRILL, RIGHT ANGLE, ELEC, 1/2”	5130-01-180-7933	1	EA	A7
126	DRILL, 900 RPM, PNEU, 1/2” AND HANDLE	478057ANST8	1	EA	B7
127	DRILL, 3200 RPM, PNEU, 3/8”	478057AMST6	1	EA	B7
128	DRILL SET STANDARD 1/16” 1/2”	257951U200	1	SE	A7
129	DRILL SHARPENER	58656DRX500SP	1	EA	E2
130	ENVIRONMENTAL SUPPORT	4235-01-399-2495	1	EA	E3
131	EXTENSION, 1/2” D., 2” L	5130-01-400-0108	1	EA	A5
132	EXTENSION, 1/2” D., 5” L	5120-00-243-7326	1	EA	A5
133	EXTENSION, 1/2” D., 10” L	1CV057183-00	1	EA	A5
134	EXTENSION, 1/2” DR, 2 1/2” LONG	5120-01-399-9663	1	EA	A4
135	EXTENSION, 1/2” DR, 5” LONG	5120-01-399-9661	1	EA	A4
136	EXTENSION, 1/2” DR, 10” LONG	5120-01-399-9662	1	EA	A4
137	EXTENSION, 3/4 DR, 4” LONG	5120-01-399-9736	1	EA	A6
138	EXTENSION, 3/4” DRIVE, 6” L	5130-01-400-0118	1	EA	A2
139	EXTENSION, 3/4” DR, 8” LONG	5120-01-399-9747	1	EA	A6
140	EXTENSION, 3/4” DRIVE, 12” L	1CV057178P	1	EA	A2
141	EXTENSION IMPACT 7” L, 3/4” DR	5130-01-400-0127	1	EA	A5
142	EXTENSION, IMPACT, 7” L, 3/4” DRIVE	07567	1	EA	A2
143	EXTENSION IMPACT 13” L, 3/4” DR	5130-01-400-0129	1	EA	A5
144	EXTENSION, IMPACT, 13” L, 3/4” DRIVE,	07569	1	EA	A2
145	EXTRACTOR SET, SCREW 1/8”-1”	5120-01-400-2740	1	EA	B6
146	FILE, HAND, FLAT, 10” L	5110-00-234-6537	1	EA	B2
147	FILE, HAND, HALF ROUND, 10” L	5110-00-249-2858	1	EA	B2
148	FILE, HAND, PILLAR TYPE, 10” L	5110-00-239-6889	1	EA	B2
149	FILE, HAND, ROUND, 1/2” DIA, 12” L	5110-00-234-6557	1	EA	B2
150	FILE, HAND, TRI SQUARE, 6” L	5110-00-241-9160	1	EA	B2
151	FIRE EXTINGUISHER 5 LB.	4210-00-165-4703	1	EA	RV
152	FIRE EXTINGUISHERS W/ BRACKET, 2.5 LB	4210-00-965-1105	2	EA	RW
153	FIRST AID KIT, GENERAL PURPOSE	6545-00-922-1200	1	EA	E1
154	FLARING AND CUTTING KIT	5180-00-596-1038	1	EA	E1

Table F-2. Alphabetical List of Tools and Equipment – Continued

Item	Item Description	NSN/Part Number	Qty	UI	Location
155	FLINT	5120-00-X99-5053	1	EA	D2
156	FLINT TIP FRICTION LIGHTER	5120-00-X99-7092	1	EA	D2
157	FOUNTAIN, EYE AND FACE WASH	4240-00-551-3134	1	EA	FW
158	FUNNEL, FLEXIBLE SPOUT, 1 QT CAP	7240-00-559-7364	1	EA	E3
159	FUNNEL, RIGID SPOUT, 2 QT CAP	7240-00-404-9795	1	EA	E2
160	FUNNEL, RIGID SPOUT, 2 GAL CAP	7240-00-244-1206	1	EA	E2
161	GAGE, AIR PRESSURE	4910-00-204-3170	1	EA	A3
162	GAGE, FEELER, METRIC	5120-01-399-9332	1	EA	A3
163	GAGE, FEELER, STD	5120-01-399-9319	1	EA	A3
164	GAGE, TIRE PRESSURE, 20 TO 120 PSI	4910-01-298-5479	1	EA	B7
165	GENERATOR SET	6115-00-X99-5156	1	EA	FV
166	GLOVES, RUBBER: MEN	8415-00-266-8675	1	EA	E3
167	GLOVES, WELDER	8415-00-X99-7094	2	EA	D6
168	GOGGLES, INDUSTRIAL	749360746-0515	2	EA	D7
169	GRINDER, ANGLE, 5” AND WRENCHES	47805HA120RP105	1	EA	B7
170	GRINDING MACHINE, UTILITY	3415-00-517-7754	1	EA	RW
171	GRINDING WHEELS	3460-00-X99-5051	1	EA	B7
172	GUN, GREASE	YA732	1	EA	E3
173	HACKSAW	5110-01-428-5396	1	EA	D3
174	HAMMER, BALL PEEN, 32 OZ, 14 LNG	76377CBH32-O	1	EA	B1
175	HAMMER, SLEDGE, 8 LBS (Fiberglass handle)	5120-01-428-5175	2	EA	RW
176	HAMMER, 2 1/2 LB. SLIDE	4260H	1	EA	D5
177	HAMMER, 5 LB. SLIDE	4055H	1	EA	D5
178	HAMMER, DEAD BLOW, 42 OZ, 14” LNG	5120-01-399-5746	1	EA	B1
179	HEADGEAR 170S	0742-0020	2	EA	D7
180	HELMET, QEC MASTER WELDING	749360744-0753	1	EA	E3
181	HOLDER, WELD ROD	3490-01-401-5339	1	EA	D3
182	HOLDER, WELD ROD	3490-01-401-5339	2	EA	D7
183	HOSE, AIR, RED, 16 FT	30978890516	1	EA	E2
184	HOSE, AIR, YELLOW, 16 FT	30978890515	1	EA	E2

Table F-2. Alphabetical List of Tools and Equipment – Continued

Item	Item Description	NSN/Part Number	Qty	UI	Location
185	HOSE REEL, AIR LINE, SPR. RET., 3/8”	521737670 OLP	1	EA	CM
186	HOSE REEL, AIR LINE, SPR. RET., 3/4”	52173D9375 OLP	1	EA	CM
187	HOSE REEL, DUAL OXY/ACTYL W/O HOSE	52173S36106LT	1	EA	CM
188	HOSE SUPPLY LINE, SLAVE	RIA149182-1	1	EA	BS
189	HOSE SUPPLY LINE, SLAVE	RIA149182-2	1	EA	BS
190	JACK KIT, HYD HAND, 20 TON CAP	5120-00-188-1788	2	EA	C3
191	JAW BLOCK	4209JB	3	EA	D4
192	JAW BLOCK	4229JB	3	EA	D5
193	JAW, CAP SCREW	4018	3	EA	D5
194	JAW, DUAL-REACH	4016	3	EA	D5
195	JAW, DUAL REACH	4026A	3	EA	D4
196	JAW, INSIDE HOOK	4256S	1	EA	D5
197	JAW, INSIDE, 2” REACH	4056-2	3	EA	D4
198	JAW, LONG, NARROW	4017	3	EA	D5
199	JAW, LONG, NARROW	4027	3	EA	D4
200	JAW, PIVOT PIN	4056PN	3	EA	D4
201	JAW, PIVOT PIN	4056PN	3	EA	D5
202	JAW, REVERSIBLE, 4” REACH	4056-4	3	EA	D4
203	JAW, REVERSIBLE, 6” REACH	4056-6	3	EA	D4
204	KNIFE, UTILITY	5110-01-428-5547	1	EA	B2
205	LANYARD ASSY, 1/2” D. NYLON W/D RINGS	257955M534	2	EA	RW
206	LIFT-A-JACK W/3” MULTI-PURPOSE VISE	3950-00-X99-7710	1	EA	RW
207	LIGHT, TROUBLE, FLUORESCENT, 50 FT	6230-00-X99-7109	2	EA	CLM
208	LIGHT, WOLF	6230-00-X99-5117	1	EA	FV
209	LIGHT, WOLF	6230-00-X99-5117	2	EA	RW
210	MASTER PULLER SET W/O BOX	5180-00-X00-7040	1	SET	D4
211	MIG GUN, ALUMINUM	2510-35-9	1	EA	D6
212	MIG GUN, STEEL	2515-45	1	EA	D6
213	MULTI-FLAME HEATING NOZZLE	3433-01-023-5601	1	EA	D2
214	MULTIMETER, DIGITAL	6625-01-363-5825	1	EA	D1
215	NITROGEN HOSE, 50 FT	302-5020	1	EA	E2
216	NUT, ADJUSTING, REVERSIBLE	4250N	1	EA	D4
217	PACKING, ASSORTED, PREFORMED	5330-00-966-8657	1	EA	E1
218	PAN, DRAIN, 5 GAL CAP	257956Y810	1	EA	E4

Table F-2. Alphabetical List of Tools and Equipment – Continued

Item	Item Description	NSN/Part Number	Qty	UI	Location
219	PIN	4280-S-2	1	EA	D5
220	PLIERS, BATTERY TERMINAL	5120-01-431-0225	1	EA	B2
221	PLIERS, 78 DEG, BENT NOSE	5120-01-399-9227	1	EA	B2
222	PLIERS, BRAKE REPAIR, 12-7/8 LNG	5120-01-400-1201	1	EA	B1
223	PLIERS, 6 5/8” HEAVY DUTY LONG NOSE	5120-01-399-9167	1	EA	B2
224	PLIERS, 4-1/16”, SLIP JOINT	5120-01-399-9259	1	EA	B2
225	PLIERS KIT, RETAINING RING, 1/4” TO 3-1/2”	5120-01-428-5103	1	EA	A3
226	100 PLUS 3 POINT PHILLIPS SCREWDRIVER	66-178	1	EA	B1
227	100 PLUS 4 POINT PHILLIPS SCREWDRIVER	66-176	1	EA	B1
228	100 PLUS SQ SHNK STD SCREWDRIVER	66-170	1	EA	B1
229	100 PLUS SQ SHNK STD SCREWDRIVER 8	64-103	1	EA	B1
230	100 PLUS SQ SHNK STD SCREWDRIVER 10	64-104	1	EA	B1
231	PUMP, AIR MOTOR	TBD	1	EA	RW
232	PUMP, DRUM, ATTACHMENT	TBD	1	EA	RW
233	PUNCH, CENTER 1/4”	5110-01-399-9953	1	EA	B2
234	PUNCH, CENTER 3/8”	5110-01-399-9951	1	EA	B2
235	PUNCH, CENTER 1/2”	5110-01-399-9955	1	EA	B2
236	PUNCH, DRIFT, 1/8” DIA PT	5110-01-399-9391	1	EA	B2
237	PUNCH, DRIFT, 3/16” DIA PT	5110-01-399-9392	1	EA	B2
238	PUNCH, DRIFT, 1/4” DIA PT	5110-01-399-9395	1	EA	B2
239	PUNCH, DRIVE PIN, BRASS, 1/4” DIA PT	1CV05BD6	1	EA	B2
240	PUNCH, DRIVE PIN, BRASS, 3/8” DIA PT	1CV05BD8	1	EA	B2
241	PUNCH, DRIFT PIN, BRASS, 1/2” DIA PT	1CV0549920	1	EA	B2
242	PUNCH, DRIVE PIN, 3/32” DIA PT	5110-01-399-9937	1	EA	B2
243	PUNCH, DRIVE PIN, 7/32” DIA PT	5110-01-399-9948	1	EA	B2
244	PUNCH, DRIVE PIN, 1/8” DIA PT	5110-01-399-9945	1	EA	B2
245	PUNCH, DRIVE PIN, 5/32” DIA PT	5110-01-399-9947	1	EA	B2
246	PUNCH, DRIVE PIN, 3/16” DIA PT	5110-01-399-9942	1	EA	B2
247	PUNCH, DRIVE PIN, 1/4” DIA PT	5110-01-399-9949	1	EA	B2
248	PUNCH, STARTING, 3/32” DIA PT	5110-01-399-9397	1	EA	B2
249	PUNCH, STARTING, 1/8” DIA PT	5110-01-399-9399	1	EA	B2

Table F-2. Alphabetical List of Tools and Equipment – Continued

Item	Item Description	NSN/Part Number	Qty	UI	Location
250	PUNCH, STARTING, 3/16” DIA PT	5110-01-399-9400	1	EA	B2
251	PUNCH, STARTING, 7/32” DIA PT	5110-01-399-9402	1	EA	B2
252	PUNCH, STARTING, 1/4” DIA PT	5110-01-399-9940	1	EA	B2
253	PUNCH SET, GASKET	5110-00-449-7313	1	EA	E1
254	RATCHET, AIR, 3/8” DRIVE	MODEL 111	1	EA	A2
255	RATCHET, 3/4” DR, 20” LONG	5120-01-400-0266	1	EA	A6
256	RATCHET, LONG HANDLE, 1/2” DR, 15” LONG	5120-01-400-0231	1	EA	A4
257	RATCHET, OPEN HEAD, 1/2” DR, 10 1/2” LNG	5120-01-400-0229	1	EA	A4
258	RATCHET, STD L, 3/8” DR, 7” L	5120-01-400-0227	1	EA	A2
259	REFACING TOOL, TUBE FITTING	5110-00-595-9279	1	EA	E1
260	REMOTE CONTROL ASSEMBLY	2-195-6-10000	1	EA	RV
261	REPAIR TOOL, TIRE VALVE, LARGE TIRES	5120-00-529-2727	1	EA	A3
262	REPAIR TOOL, TIRE VALVE, STD TIRES	76377S445	1	EA	A3
263	REVERSIBLE JAW, 4 1/2” REACH	4210RJ	3	EA	D4
264	REVERSIBLE JAW	4230RJ	3	EA	D5
265	ROD ASSEMBLY, GROUND INSIDE GEN SET	5975-00-897-3791	1	EA	FV
266	ROD, SHORT, SLIDE	4275R	1	EA	D5
267	ROD, T-HANDLE SLIDE	4260R	1	EA	D5
268	SAFETY CAPS	5340-01-396-3951	4	EA	FV
269	SAW ALL, VARIABLE SPEED	5120-01-139-9674	1	EA	E4
270	SCALE, DIAL, INDICATING	6670-00-254-4634	1	EA	E1
271	SCREW, CAP, 3/8-16” X 3”	4028	3	EA	D4
272	SCREW, CAP, 3/8-16 X 4”	4205E	3	EA	D4
273	SCREW, CAP, 3/8-24 X 3”	4005C	3	EA	D4
274	SCREW, FORCING	4205S	1	EA	D4
275	SCREW, FORCING	4225S	1	EA	D5
276	SCREWDRIVER BIT SET, MAGNETIC, 28 PC	1CV0561929	1	EA	B1
277	SCREWDRIVER, OFFSET, PHIL. TIP, 1 & 2	5120-01-399-9182	1	EA	B1
278	SCREWDRIVER, OFFSET, PHIL. TIP, 3 & 4	5120-01-399-9188	1	EA	B1

Table F-2. Alphabetical List of Tools and Equipment – Continued

Item	Item Description	NSN/Part Number	Qty	UI	Location
279	SCREWDRIVER, OFFSET, STANDARD TIP	5120-01-399-9181	1	EA	B1
280	SCREWDRIVER, OFFSET, STANDARD TIP	5120-01-399-9183	1	EA	B1
281	SCREWDRIVER, STANDARD, 1/4”	66-090	1	EA	B1
282	SHIELD, TORCH, LEATHER	8415-00-X99-7517	1	EA	D6
283	SLIDE HAMMER, GROUND, ROD	5120-01-013-1676	1	EA	RW
284	SOAPSTONE	5110-00-223-6708	5	EA	D2
285	SOCKET, DEEP, 9 MM, 12 PT, 3/8 DRIVE	5120-01-399-9886	1	EA	A2
286	SOCKET, DEEP, 10 MM, 12 PT, 3/8 DRIVE	5120-01-399-9598	1	EA	A2
287	SOCKET, DEEP, 11 MM, 12 PT, 3/8 DRIVE	5120-01-399-9599	1	EA	A2
288	SOCKET, DEEP, 12 MM, 12 PT, 3/8 DRIVE	5120-01-399-9603	1	EA	A2
289	SOCKET, DEEP, 13 MM, 12 PT, 3/8 DRIVE	5120-01-399-9604	1	EA	A2
290	SOCKET, DEEP, 14 MM, 12 PT, 3/8 DRIVE	5120-01-399-9602	1	EA	A2
291	SOCKET, DEEP, 15 MM, 12 PT, 3/8 DRIVE	5120-01-399-9607	1	EA	A2
292	SOCKET, DEEP, 16 MM, 12 PT, 3/8 DRIVE	5120-01-399-9605	1	EA	A2
293	SOCKET, DEEP, 17 MM, 12 PT, 3/8 DRIVE	5120-01-399-9606	1	EA	A2
294	SOCKET, DEEP, 18 MM, 12 PT, 3/8 DRIVE	5120-01-399-9610	1	EA	A2
295	SOCKET, DEEP, 19 MM, 12 PT, 3/8 DRIVE	5120-01-399-9608	1	EA	A2
296	SOCKET, DEEP WELL, 12 PT, 1”, 1/2 DR	5120-01-428-4673	1	EA	A4
297	SOCKET, DEEP WELL, 12 PT, 1 1/16” 1/2 DR	5120-01-428-4699	1	EA	A4
298	SOCKET, DEEP WELL, 12 PT, 1 1/8” 1/2 DR	5120-01-428-4684	1	EA	A4
299	SOCKET, DEEP WELL, 12 PT, 1 1/4” 1/2 DR	5120-01-428-4680	1	EA	A4
300	SOCKET, DEEP WELL, 12 PT, 1 5/16” 1/2 DR	5120-01-428-4705	1	EA	A4
301	SOCKET, DEEP WELL, 12 PT, 1 3/8” 1/2 DR	5120-01-428-4688	1	EA	A4
302	SOCKET, DEEP WELL, 12 PT, 1 7/16” 1/2 DR	5120-01-428-4686	1	EA	A4
303	SOCKET, DEEP WELL, 12 PT, 1 1/2” 1/2 DR	5120-01-428-4711	1	EA	A4
304	SOCKET IMPACT 6 PT 15/16”, 3/4” DR	5130-01-400-0151	1	EA	A5
305	SOCKET, IMPACT, DEEP, 6PT, 1/2”, 1/2” DR	1CV057316H	1	EA	A5
306	SOCKET, IMPACT, DEEP, 6PT, 9/16”, 1/2” DR	1CV057318H	1	EA	A5
307	SOCKET, IMPACT, DEEP, 6PT, 5/8”, 1/2” DR	5130-01-400-0099	1	EA	A5
308	SOCKET, IMPACT, DEEP, 6PT, 11/16”, 1/2” DR	1CV057322H	1	EA	A5
309	SOCKET, IMPACT, DEEP, 6PT, 3/4”, 1/2” DR	1CV057324H	1	EA	A5
310	SOCKET, IMPACT, DEEP, 6PT, 13/16”, 1/2” DR	5130-01-400-0107	1	EA	A5

Table F-2. Alphabetical List of Tools and Equipment – Continued

Item	*Item Description*	*NSN/Part Number*	*Qty*	*UI*	*Location*
311	SOCKET, IMPACT, DEEP, 6PT, 7/8”, 1/2” DR	1CV057328H	1	EA	A5
312	SOCKET, IMPACT, DEEP, 6PT, 15/16”, 1/2” DR	1CV057330H	1	EA	A5
313	SOCKET, IMPACT, DEEP, 6PT, 1-1/8”, 1/2” DR	5130-01-400-0286	1	EA	A5
314	SOCKET, IMPACT, DEEP, 6PT, 1”, 1/2” DR	5130-01-364-7060	1	EA	A5
315	SOCKET, IMPACT, DEEP, 6PT, 1 1/16”, 1/2” DR	1CV057334H	1	EA	A5
316	SOCKET, IMPACT, DEEP, 6PT, 1 3/16”, 1/2” DR	1CV057338H	1	EA	A5
317	SOCKET, IMPACT, DEEP, 6PT, 1 1/4”, 1/2” DR	1CV057340H	1	EA	A5
318	SOCKET, IMPACT DR, UNIV., 6PT, 1/2”, 1/2” D	5130-01-400-0121	1	EA	A5
319	SOCKET, IMPACT, STD, 6 PT, 1/2”, 1/2” DR	1CV057416H	1	EA	A5
320	SOCKET, IMPACT, STD, 6 PT, 9/16”, 1/2” DR	7418H	1	EA	A5
321	SOCKET, IMPACT, STD, 6 PT, 5/8”, 1/2” DR	1CV057420H	1	EA	A5
322	SOCKET, IMPACT, STD, 6 PT, 11/16”, 1/2” DR	1CV057422H	1	EA	A5
323	SOCKET, IMPACT, STD, 6 PT, 3/4”, 1/2” DR	1CV057424H	1	EA	A5
324	SOCKET, IMPACT, STD, 6 PT, 13/16”, 1/2” DR	5120-00-912-5451	1	EA	A5
325	SOCKET, IMPACT, STD, 6 PT, 7/8”, 1/2” DR	1CV057428H	1	EA	A5
326	SOCKET, IMPACT, STD, 6 PT, 15/16”, 1/2” DR	5120-00-912-5444	1	EA	A5
327	SOCKET, IMPACT, STD, 6 PT, 1”, 1/2” DR	1CV057432H	1	EA	A5
328	SOCKET, IMPACT, STD, 6 PT, 1 1/16”, 1/2” DR	1CV057434H	1	EA	A5
329	SOCKET, IMPACT, STD, 6 PT, 1-1/8”, 1/2” DR	5130-01-400-0061	1	EA	A5
330	SOCKET, IMPACT, STD, 6 PT, 1 3/16”, 1/2” DR	5130-01-400-0065	1	EA	A5
331	SOCKET, IMPACT, STD, 6 PT, 1-1/4”, 1/2” DR	5130-01-400-0067	1	EA	A5
332	SOCKET, IMPACT, UNIV., 6PT, 9/16, 1/2” DR	5130-01-400-0126	1	EA	A5
333	SOCKET, IMPACT, UNIV., 6PT, 5/8”, 1/2” DR	5130-01-400-0128	1	EA	A5
334	SOCKET, IMPACT, UNIV., 6PT, 11/16”, 1/2” DR	5130-01-400-0132	1	EA	A5
335	SOCKET, IMPACT, UNIV., 6PT, 3/4”, 1/2” DR	5130-01-400-0133	1	EA	A5
336	SOCKET, IMPACT, UNIV., 6PT, 13/16”, 1/2” DR	5130-01-400-0137	1	EA	A5
337	SOCKET SET, WHEEL, BEARING KIT	5120-00-169-4586	1	SE	C3

Table F-2. Alphabetical List of Tools and Equipment – Continued

Item	Item Description	NSN/Part Number	Qty	UI	Location
338	SOCKET, STANDARD, 12 PT, 1-1/16”, 1/2 DR	5120-01-428-4771	1	EA	A4
339	SOCKET, STANDARD, 12 PT, 1-1/8”, 1/2”	5120-01-428-4759	1	EA	A4
340	SOCKET, STANDARD, 12 PT, 1 5/16”, 1/2	5120-01-428-4768	1	EA	A4
341	SOCKET, STANDARD, 12 PT, 1-1/2”, 1/2”	5120-01-428-4782	1	EA	A4
342	SOCKET, STD LGN, 1 1/2, 12PT, 3/4” DR	5120-01-399-9686	1	EA	A6
343	SOCKET, STD LGN, 1 9/16, 12PT, 3/4” DR	5120-01-399-9684	1	EA	A6
344	SOCKET, STD LGN, 1 5/8, 12PT, 3/4” DR	5120-01-399-9692	1	EA	A6
345	SOCKET, STD LGN, 1 11/16, 12PT, 3/4” DR	5120-01-399-9689	1	EA	A6
346	SOCKET, STD LGN, 1 3/4, 12PT, 3/4” DR	5120-01-399-9698	1	EA	A6
347	SOCKET, STD LGN, 1 13/16, 12PT, 3/4” DR	5120-01-399-9695	1	EA	A6
348	SOCKET, STD LGN, 1 7/8, 12PT, 3/4” DR	5120-01-399-9699	1	EA	A6
349	SOCKET, STD LGN, 2, 12PT, 3/4” DR	5120-01-399-9707	1	EA	A6
350	SOCKET, STD LGN, 2 1/16, 12PT, 3/4” DR	5120-01-399-9704	1	EA	A6
351	SOCKET, STD LGN, 2 1/4, 12PT, 3/4” DR	5120-01-399-9714	1	EA	A6
352	SOCKET UNIVERSAL, 12 PT, 13/16” 3/8 DR	5120-01-428-4716	1	EA	A2
353	SOCKET UNIVERSAL, 12 PT, 15/16” 3/8 DR	5120-01-428-4718	1	EA	A2
354	SOCKET UNIVERSAL, 12 PT, 3/8” 3/8 DR	5120-01-399-9740	1	EA	A2
355	SOCKET UNIVERSAL, 12 PT, 7/16” 3/8 DRIVE	5120-01-399-9741	1	EA	A2
356	SOCKET UNIVERSAL, 12 PT, 1/2” 3/8 DRIVE	5120-01-399-9744	1	EA	A2
357	SOCKET UNIVERSAL, 12 PT, 9/16” 3/8 DRIVE	5120-01-399-9742	1	EA	A2
358	SOCKET UNIVERSAL, 12 PT, 5/8” 3/8 DRIVE	5120-01-399-9745	1	EA	A2
359	SOCKET UNIVERSAL, 12 PT, 11/16” 3/8	5120-01-399-9746	1	EA	A2
360	SOCKET UNIVERSAL, 12 PT, 3/4” 3/8 DRIVE	5120-01-399-9751	1	EA	A2
361	SOCKET UNIVERSAL, 12 PT, 7/8” 3/8 DR	5120-01-428-4735	1	EA	A2
362	SOCKET, UNIVERSAL, 12 PT, 1 3/16” 1/2 DR	5120-01-428-4781	1	EA	A4
363	SOCKET, UNIVERSAL, 12 PT, 1 1/4” 1/2 DR	5120-01-428-4778	1	EA	A4
364	SOCKET, UNIVERSAL, 12 PT, 1 3/8” 1/2 DR	5120-01-428-4788	1	EA	A4
365	SOCKET, UNIVERSAL, 12 PT, 1 7/16” 1/2 DR	5120-01-428-4786	1	EA	A4
366	SOCKETS, DEEP, THIN WALL, 6PT, 1 1/4”, 3/4” DR	5130-01-400-0268	1	EA	A5
367	SOCKETS, DEEP, THIN WALL, 6PT, 1 5/16”, 3/4”	5130-01-400-0272	1	EA	A5

Table F-2. Alphabetical List of Tools and Equipment – Continued

Item	Item Description	NSN/Part Number	Qty	UI	Location
368	SOCKETS, DEEP, THIN WALL, 6PT, 1 3/8”, 3/4”	5130-01-400-0276	1	EA	A5
369	SOCKETS, DEEP, THIN WALL, 6PT, 1 7/16”, 3/4”	5130-01-400-0281	1	EA	A5
370	SOCKETS, DEEP, THIN WALL, 6PT, 1 1/2”, 3/4”	5130-01-400-0283	1	EA	A5
371	SOCKETS, STD, IMPACT, 6 PT, 1 1/4”, 3/4” DR	5130-01-400-0161	1	EA	A5
372	SOCKETS, STD, IMPACT, 6 PT, 1 5/16”, 3/4” DR	5130-01-400-0135	1	EA	A5
373	SOCKETS, STD, IMPACT, 6 PT, 1 3/8”, 3/4” DR	5130-01-400-0138	1	EA	A5
374	SOCKETS, STD, IMPACT, 6 PT, 1 7/16”, 3/4” DR	5130-01-400-0140	1	EA	A5
375	SOCKETS, STD, IMPACT, 6 PT, 1 1/2”, 3/4” DR	5130-01-400-0144	1	EA	A5
376	SOCKETS, STD, IMPACT, 6 PT, 1 9/16”, 3/4” DR	5130-01-400-0145	1	EA	A5
377	SOCKETS, STD, IMPACT, 6 PT, 1 5/8”, 3/4” DR	5130-01-400-0149	1	EA	A5
378	SOCKETS, STD, IMPACT, 6 PT, 1 3/4”, 3/4” DR	5130-01-400-0153	1	EA	A5
379	SOCKETS, STD, METRIC, 6PT, 13MM, 1/2” DR	5130-01-045-8552	1	EA	A5
380	SOCKETS, STD, METRIC, 6PT, 14MM, 1/2” DR	1CV057414H	1	EA	A5
381	SOCKETS, STD, METRIC, 6PT, 15MM, 1/2” DR	1CV057415H	1	EA	A5
382	SOCKETS, STD, METRIC, 6PT, 16MM, 1/2” DR	1CV057416H	1	EA	A5
383	SOCKETS, STD, METRIC, 6PT, 17MM, 1/2” DR	1CV057417H	1	EA	A5
384	SOCKETS, STD, METRIC, 6PT, 18MM, 1/2” DR	1CV057418H	1	EA	A5
385	SOCKETS, STD, METRIC, 6PT, 19MM, 1/2” DR	1CV057419H	1	EA	A5
386	SOCKETS, STD, METRIC, 6PT, 20MM, 1/2” DR	1CV057420H	1	EA	A5
387	SOCKETS, STD, METRIC, 6PT, 21MM, 1/2” DR	1CV057421H	1	EA	A5

Table F-2. Alphabetical List of Tools and Equipment – Continued

Item	Item Description	NSN/Part Number	Qty	UI	Location
388	SOCKETS, STD, METRIC, 6PT, 22MM, 1/2” DR	1CV057422H	1	EA	A5
389	SOCKETS, STD, METRIC, 6PT, 23MM, 1/2” DR	1CV057423H	1	EA	A5
390	SOCKETS, STD, METRIC, 6PT, 24MM, 1/2” DR	1CV057424H	1	EA	A5
391	SOLDER, ACID CORE	3439-00-184-8960	1	SL	D2
392	SOLDER, ROSIN CORE	3439-01-074-9983	1	SL	D2
393	SOLDERING GUN, 3-WIRE	3439-00-808-0528	1	EA	E1
394	SOLDERING TORCH, KIT	3439-00-542-0531	1	EA	E1
395	SPLIT RING, THREAD REPAIR	5136-01-355-3035	1	EA	E1
396	STANDARD TIP CLEANER	3439-00-383-3634	1	EA	D2
397	STEP PLATE ADAPTER SET	4040	1	EA	D4
398	STOWAGE BOX, REMOTE	RIA149140	1	EA	RV
399	STRAP, REMOTE CONTROL	D809	1	EA	RV
400	STRAPS, RUBBER, TIE-DOWN 9”	5340-00-X99-7111	4	EA	E4
401	STRAPS, RUBBER, TIE-DOWN 15”	5340-00-X99-7112	1	EA	BS
402	STRAPS, RUBBER, TIE-DOWN 15”	5340-00-X99-7112	5	EA	E4
403	STRAPS, RUBBER, TIE-DOWN 21”	5340-00-X99-7113	6	EA	BS
404	STRAPS, RUBBER, TIE-DOWN 21”	5340-00-X99-7113	6	EA	E4
405	STRAPS, RUBBER, TIE-DOWN 31”	5340-00-X99-7114	4	EA	E4
406	STRAPS, RUBBER, TIE-DOWN 41”	5340-00-X99-7115	4	EA	E4
407	TABLE, FOLDING, ALULITE W/ROMAN II LEGS	3052	1	EA	BS
408	TANK, ARGON	6830-00-X99-7118	1	EA	FV
409	TANK, NITROGEN	6830-00-X99-7121	1	EA	FV
410	TANK, OXYGEN	6830-00-X99-7119	1	EA	FV
411	TANK, PROPYLENE	6830-00-X99-7120	1	EA	FV
412	TAP & DIE SET, 25 PC, 9/16” /1”	5136-01-431-0367	1	EA	B6
413	TAP & DIE SET, 25 PC, 14 MM/24 MM	5136-01-431-0373	1	EA	B6
414	TAP & DIE SET, 41 PC, 3 MM/12 MM	5136-01-431-0372	1	EA	B6
415	TAP & DIE SET, 41 PC, 4-40” NC/ 1/2-20” NF	5136-01-415-4208	1	EA	B6
416	TAPE MEASURE, 25 FT	5120-01-428-5470	1	EA	A6

Table F-2. Alphabetical List of Tools and Equipment – Continued

Item	Item Description	NSN/Part Number	Qty	UI	Location
417	TARP LEFT SIDE	RIA148878	2	EA	BS
418	TARP RIGHT SIDE	RIA148879	2	EA	BS
419	TERMINAL KIT	5940-00-525-0907	1	EA	E1
420	TESTER, ELECTROLYTE AND ANTIFREEZE	6630-00-105-1418	1	EA	D3
421	THREAD INSERT, KIT, COIL	5120-01-113-1544	1	EA	E1
422	THREAD INSERT, SCREW, 1/4-20 UNC	5180-00-935-0732	1	EA	E1
423	THREAD INSERT, SCREW, 1/4-28 UNC	5180-00-935-0736	1	EA	E1
424	THREAD INSERT, SCREW, 5/16-18 UNC	5180-00-935-0733	1	EA	E1
425	THREAD INSERT, SCREW, 5/16-24 UNC	5180-00-935-0737	1	EA	E1
426	THREAD INSERT, SCREW, 3/8-16 UNC	5180-00-935-0734	1	EA	E1
427	THREAD INSERT, SCREW, 3/8-24 UNC	5180-00-935-0738	1	EA	E1
428	THREAD INSERT, SCREW, 1/2-13 UNC	5180-00-051-5024	1	EA	E1
429	THREAD INSERT, SCREW, 1/2-20 UNC	5180-00-054-7505	1	EA	E1
430	THREAD RESTORER, METRIC THREADS	5110-01-431-0299	1	EA	B2
431	THREAD RESTORER, STANDARD THREADS	5110-01-431-0286	1	EA	B2
432	THREAD RESTORER, STANDARD THREADS	5110-01-431-0309	1	EA	B2
433	TIP, CUTTING	3433-01-423-5701	2	EA	D2
434	TIP, CUTTING	3433-01-423-5702	2	EA	D2
435	TIP, CUTTING	3433-01-423-5708	2	EA	D2
436	TIP, GAS WELDING	63026D311-0483	1	EA	D2
437	TIP, GAS WELDING	63026D311-0485	1	EA	D2
438	TIPS, CONTACT, .035	403-1-35	25	EA	D2
439	TIPS, CONTACT, .045	403-1-45	25	EA	D2
440	TOOL KIT, BLIND RIVET	5180-01-201-4978	1	EA	E1
441	TOOL KIT, ELECTRICAL CONTACT	5180-00-876-9366	1	EA	E1
442	TOOL, PICK UP, CLAW-TYPE, FLEXIBLE 23 1/2” LONG	5120-01-399-9296	1	EA	B1
443	TORCH HANDLE	5110-00-391-1220	1	EA	D2
444	TORQUE MULTIPLYER, 1200 FT-LB (3 PC)	5120-01-399-9054	1	EA	A6
445	TORQUE WRENCH, 3/4” DRIVE, 90-600 FT-LBS.	5120-01-400-0319	1	EA	RW

Table F-2. Alphabetical List of Tools and Equipment – Continued

Item	Item Description	NSN/Part Number	Qty	UI	Location
446	TORQUE WRENCH .50-250 FT-LB, 1/2” DR	5120-01-400-0239	1	EA	A4
447	TRESTLE, 7 TON	3950-00-251-8013	6	EA	RV
448	TUBE FLARING, METRIC	5120-01-335-1606	1	EA	E1
449	14 UNI NOZZLE	0234-0094	2	EA	D2
450	UNIVERSAL JOINT, 1/2” DR	5120-01-399-9658	1	EA	A4
451	UNIVERSAL JOINT 1/2” D.	5130-01-400-0136	1	EA	A5
452	UNIVERSAL JOINT, 3/8” DRIVE	5130-01-400-0114	1	EA	A5
453	UNIVERSAL JOINT, 3/4” DR	5120-01-399-9735	1	EA	A6
454	VALVE, RELIEF, INLINE	30978890490	2	EA	E2
455	VISE GRIP, LONG NOSE, 9”	5120-01-399-9233	1	EA	B3
456	VISE GRIP, 10” CURVED W/CUTTER	5120-01-399-9226	1	EA	B3
457	VISE GRIP, 10”, STRAIGHT JAW	5120-01-400-0314	1	EA	B3
458	VISE, MACHINIST’S SWVL BASE, 4” JAW	5120-00-293-1439	1	EA	CM
459	WELPER HAND TOOL	5120-00-X99-5064	1	EA	D2
460	WELDER, 400GMS	3431-00-X99-8023	1	EA	CM
461	WELDER, WIRE FEED	3431-00-X99-8025	1	EA	CM
462	WHEEL, ABRASIVE, W/CUTTERS	5130-00-223-9952	1	EA	A7
463	WHIP AIR HOSE 3/8”, 12’ LONG ASSY	801 16-5BP H4FP-6-144.00	1	EA	B7
464	WIRE, ALUMINUM, .035	3439-00-X99-7102	1	EA	D6
465	WIRE STEEL, .045	3439-00-X99-7099	1	EA	D6
466	WIRE TWISTER, AUTO RETURN	5120-01-431-1957	1	EA	B3
467	WRENCH, ADJUSTABLE, AUTO LOCKING 18”	5120-01-399-9869	1	EA	B3
468	WRENCH, ADJUSTABLE, 0 TO 3-5/8 JAW	5120-00-264-3793	2	EA	A3
469	WRENCH, C-BOX, OPEN END, 12 P, 1/4”	5120-00-288-9997	1	EA	B4
470	WRENCH, C-BOX, OPEN END, 12 P, 5/16”	1CV051210	1	EA	B4
471	WRENCH, C-BOX, OPEN END, 12 PT, 11/32”	1CV051211	1	EA	B4
472	WRENCH, C-BOX, OPEN END, 12 PT, 3/8”	5120-00-228-9504	1	EA	B4
473	WRENCH, C-BOX, OPEN END, 12 P, 7/16”	5120-00-228-9505	1	EA	B4
474	WRENCH, C-BOX, OPEN END, 12 P, 1/2”	5120-00-228-9506	1	EA	B4
475	WRENCH, C-BOX, OPEN END, 12 P, 9/16”	5120-00-228-9507	1	EA	B4
476	WRENCH, C-BOX, OPEN END, 12 P, 5/8”	5120-00-228-9508	1	EA	B4

Table F-2. Alphabetical List of Tools and Equipment – Continued

Item	Item Description	NSN/Part Number	Qty	UI	Location
477	WRENCH, C-BOX, OPEN END, 12 P, 11/16”	5120-00-228-9509	1	EA	B4
478	WRENCH, C-BOX, OPEN END, 12 P, 3/4”	5120-00-228-9510	1	EA	B4
479	WRENCH, C-BOX, OPEN END, 12 P, 13/16”	5120-00-228-9511	1	EA	B4
480	WRENCH, C-BOX, OPEN END, 12 P, 7/8”	1CV051228	1	EA	B4
481	WRENCH, C-BOX, OPEN END, 12 P, 15/16”	1CV051230	1	EA	B4
482	WRENCH, C-BOX, OPEN END, 12 PT, 1”	1CV051232	1	EA	B5
483	WRENCH, C-BOX, OPEN END, 12 PT, 1-1/16”	5120-00-228-9515	1	EA	B5
484	WRENCH, C-BOX, OPEN END, 12 P, 1-1/8”	5120-00-228-9516	1	EA	B5
485	WRENCH, C-BOX, OPEN END, 12 PT, 1-1/4”	1CV051240	1	EA	B5
486	WRENCH, C-BOX, OPEN END, 12 P, 1-5/16”	5120-01-399-8786	1	EA	B5
487	WRENCH, C-BOX, OPEN END, 12 PT, 1-3/8”	5120-01-399-8793	1	EA	B5
488	WRENCH, C-BOX, OPEN END, 12 PT, 1-7/16”	5120-01-399-8790	1	EA	B5
489	WRENCH, C-BOX, OPEN END, 12 P, 1-1/2”	5120-01-399-8798	1	EA	B5
490	WRENCH, C-BOX, OPEN END, 12 PT, 1-5/8”	5120-01-399-8801	1	EA	B5
491	WRENCH, C-BOX, OPEN END, 12 P, 1-11/16”	5120-01-399-8795	1	EA	B5
492	WRENCH, C-BOX, OPEN END, 12 PT, 1-3/4”	5120-01-399-8808	1	EA	B5
493	WRENCH, C-BOX, OPEN END, 12 P, 1-7/8”	5120-01-399-8806	1	EA	B5
494	WRENCH, C-BOX, OPEN END, 12 P, 2”	5120-01-399-8813	1	EA	B5
495	WRENCH, C-BOX, OPEN END, 12 P, 2-1/16”	1CV051266	1	EA	B5
496	WRENCH, C-BOX, OPEN END, 12 PT, 2-1/8”	1CV051268	1	EA	B5
497	WRENCH, COMB FL NUT, OPN END, 12PT, 3/8”	1CV053751T	1	EA	B4
498	WRENCH, COMB FL NUT, OPN END, 12PT, 7/16”	1CV053752T	1	EA	B4
499	WRENCH, COMB FL NUT, OPN END, 12PT, 1/2”	1CV053753T	1	EA	B4
500	WRENCH, COMB FL NUT, OPN END, 12PT, 9/16”	1CV053754T	1	EA	B4
501	WRENCH, COMB FL NUT, OPN END, 12PT, 5/8”	1CV053755T	1	EA	B4
502	WRENCH, COMB FL NUT, OPN END, 12PT, 11/16”	1CV053756T	1	EA	B4

Table F-2. Alphabetical List of Tools and Equipment – Continued

Item	*Item Description*	*NSN/Part Number*	*Qty*	*UI*	*Location*
503	WRENCH, COMB FL NUT, OPN END, 12 PT, 3/4”	1CV053757T	1	EA	B4
504	WRENCH, DEEP OFFSET BOX, 12 P, 15/16”-1”	5120-01-399-8914	1	EA	B4
505	WRENCH, DEEP OFFSET BOX, 12 P, 3/8”-7/16”	5120-01-399-8909	1	EA	B4
506	WRENCH, DEEP OFFSET BOX, 12 P, 1/2”-9/16”	5120-01-399-8910	1	EA	B4
507	WRENCH, DEEP OFFSET BOX, 12 P, 5/8”-11/16”	5120-01-399-8915	1	EA	B4
508	WRENCH, DEEP OFFSET BOX, 12 P, 11/16”-13/16”	5120-01-399-8916	1	EA	B4
509	WRENCH, DEEP OFFSET BOX, 12 P, 3/4”-7/8”	5120-01-399-8913	1	EA	B4
510	WRENCH, FL NUT, DBL END, 12 PT, 7 X 8 MM	1CV053707MT	1	EA	B4
511	WRENCH, FL NUT, DBL END, 12 PT, 9 X 11 MM	1CV053709MT	1	EA	B4
512	WRENCH, FL NUT, DBL END, 12 PT, 10 X 12 MM	1CV053710MT	1	EA	B4
513	WRENCH, FL NUT, DBL END, 12 PT, 13 X 14 MM	1CV053713MT	1	EA	B4
514	WRENCH, FL NUT, DBL END, 12 PT, 15 X 17 MM	1CV053715MT	1	EA	B4
515	WRENCH, FL NUT, DBL END, 12 PT, 16 X 18 MM	1CV053716MT	1	EA	B4
516	WRENCH, FL NUT, DBL END, 12 PT, 19 X 21 MM	1CV053719MT	1	EA	B4
517	WRENCH, IMPACT, 1/2” SQ DR.	65832131	1	EA	A5
518	WRENCH, IMPACT, 3/4” SQ DRIVE	478052925P1	1	EA	B7
519	WRENCH, OFFSET 3/4	GIT 6192	1	EA	A3
520	WRENCH, PIPE, ADJUSTABLE, 12”	5120-01-399-8981	1	EA	B1
521	WRENCH, PIPE, ADJUSTABLE, 36”	5120-01-399-8985	1	EA	RW
522	WRENCH, SPANNER, 3/4”-2”	5120-01-399-8959	1	EA	A3
523	WRENCH, SPANNER, 2”-4-3/4”	5120-01-399-8970	1	EA	A3
524	WRENCH, TORQUE, 20-100 FT-LB, 3/8” DR.	5120-01-400-0237	1	EA	A2

Table F-2. Alphabetical List of Tools and Equipment – Continued

Item	*Item Description*	*NSN/Part Number*	*Qty*	*UI*	*Location*
525	WRENCH, TORQUE, 40-200 IN-LB, 3/8” DR.	5120-01-400-0233	1	EA	A2
526	WRENCH, UNIVERSAL CHAIN	1CV05801	1	EA	B1
527	WRENCH, WHEEL, STUD NUT GEARED, SOC,	5120-00-378-4411	1	EA	C3
528	YOKE, 2 WAY	4250B	1	EA	D4
529	YOKE, 3 WAY	4225B	1	EA	D4

APPENDIX G

LUBRICATION INSTRUCTIONS

Section I. INTRODUCTION

G-1. SCOPE.

This appendix gives lubrication requirements for the Forward Repair System (FRS) which are the responsibility of the operator/crew.

G-2. GENERAL LUBRICATION REQUIREMENTS.

a. Maintaining Lubricant Levels. Lubricant levels must be checked as specified in the PMCS (Chapter 2, Section 2) and Lubrication Table. Steps must be taken to replenish and maintain lubricant levels.

WARNING

- Drycleaning Solvent (P-D-680) is TOXIC and flammable. Wear protective goggles, face shield, and gloves; use only in a well-ventilated area; avoid contact with skin, eyes, and clothes, and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent. The flashpoint for Type II Drycleaning Solvent is 140 degrees F (60 degrees C) and Type III Drycleaning Solvent is 200 degrees F (93 degrees C). Failure to do so may result in injury or death to personnel.
- If personnel become dizzy while using cleaning solvent, immediately get fresh air and medical help. If solvent contacts skin or clothes, flush with cold water. If solvent contacts eyes, immediately flush eyes with water and get immediate medical attention.

b. Cleaning Fittings Before Lubrication. Clean parts with Dry Cleaning Solvent P-D-680 or equivalent. Dry before lubricating. Dotted arrow points indicate lubrication on both sides of the equipment.

c. Lubrication After Fording. If fording operation occurs, lubricate all fittings below fording depth.

d. Lubrication After High-Pressure Washing. After a thorough washing, lubricate all grease fittings and oil can points outside and underneath FRS.

e. Localized Views. A reference to the appropriate localized view is given after most lubrication entries. Localized views begin on page G-11.

G-3. LUBRICATION INTERVALS.

a. Service Interval Under Normal Conditions. Service intervals listed are for normal operation in moderate temperatures, humidity, and atmospheric conditions. Hard time intervals may be shortened if your lubricants are contaminated or if you are operating the equipment under adverse conditions, including longer-than-usual operating hours. Hard time intervals may be extended during periods of low activity, though adequate preservation precautions must be taken. Perform semi-annual service intervals every six months.

b. Service Interval Under Unusual Conditions. Increase frequency of lubricating service when operating under abnormal conditions such as high or low temperatures. Such operation can diminsh lubricant's protective qualities. More frequent lubricating service intervals are necessary to maintain FRS readiness when operating under abnormal conditions.

c. Hard Time Intervals. Intervals shown in this appendix are based on hours and calendar times. An example of hours and calendar intervals is 3/S, in which 3 HRS stands for three hours, and S stands for semiannually (every six months). The lubrication for the FRS is to be performed at whichever interval occurs first. For equipment under manufacturer's warranty, hard time oil service intervals shall be followed.

G-4. LUBRICATION FOR OPERATION UNDER EXTREME TEMPERATURES.

a. Changes in Lubricant Grades. Lubricant grades change with weather conditions. Refer to Lubrication Table for lubricant grade changes.

b. Arctic Conditions. Refer to FM 9-207, Operation and Maintenance of Ordinance Material in cold weather (0 degrees F to –65 degrees F) (–18 degrees C to –54 degrees C), or the Lubrication Table.

G-5. CORROSION CONTROL.

Refer to Para 1-3 for appropriate corrosion control procedures.

Section II. LUBRICATION TABLE KEY

Table G-1. Lubricants

Lubrication Oil, Internal Combustion Engine (ICE), Tactical, OE/HDO (MIL-L-2104) or Lubricating Oil, ICE, Arctic, OEA (MIL-L-46167)	Component	Approximate Capacity	Expected Temperatures	Intervals	For arctic operation, refer to FM 9-207.
	Engine	12 qt (11 l)	See Chart A.	D – DAILY M – MONTHLY AR – AS REQUIRED HRS – HOURS BI – BIANNUALLY (2 YEARS) S – SEMIANNUALLY (6 MONTHS)	
	Air Compressor	4 qt (3.8 l)	See Chart B.		
	Hydraulic Reservoir	100 qt (95 l)	See Chart C.		
	Oil Can Points	As required	See Chart D.		
	Air Lubricant	As required	See Chart E.		

Section II. LUBRICATION TABLE KEY (CONT).

Table G-2. Other Fluids

Fluid	Capacity	Temperature	
Drycleaning Solvent, SD-II, (P-D-680)	As Required	All Temperatures	For arctic operation, refer to FM 9-207.
Antifreeze, Ethylene Glycol (MIL-A-46153)	22 qt (21 l)*	Above -50 degrees F (-46 degrees C)	
Antifreeze, Arctic-Type (MIL-A-11755)	22 qt (21 l)*	Use when extended periods of -46 degrees F (-40 degrees C) or below are encountered.	

* Cooling System Capacity

Table G-3. Grease; Automotive and Artillery (GAA) (MIL-L-10924)

The following components are lubricated with GAA as required at all temperatures.

Crane (Fittings) (Wear Pads) (Plates)	For arctic operation, refer to FM 9-207.
Shelter Doors (Gears)	

Table G-4. Antiseize Compound (MIL-A-907)

The following components are lubricated with antiseize compound as required at all temperatures.

Crane Tension Link
Shelter Doors (Support Arms)

Section II. LUBRICATION TABLE KEY (CONT).

CHART A. ENGINE

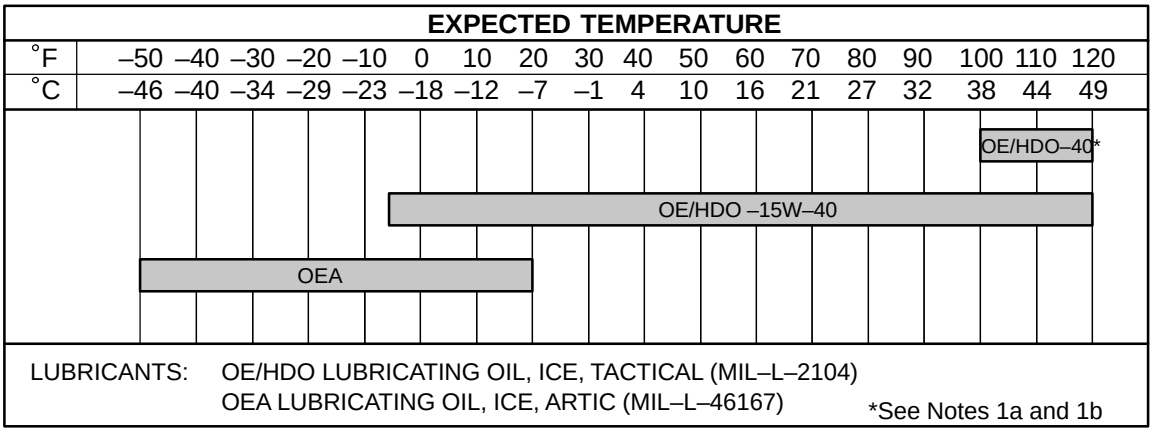


CHART B. AIR COMPRESSOR

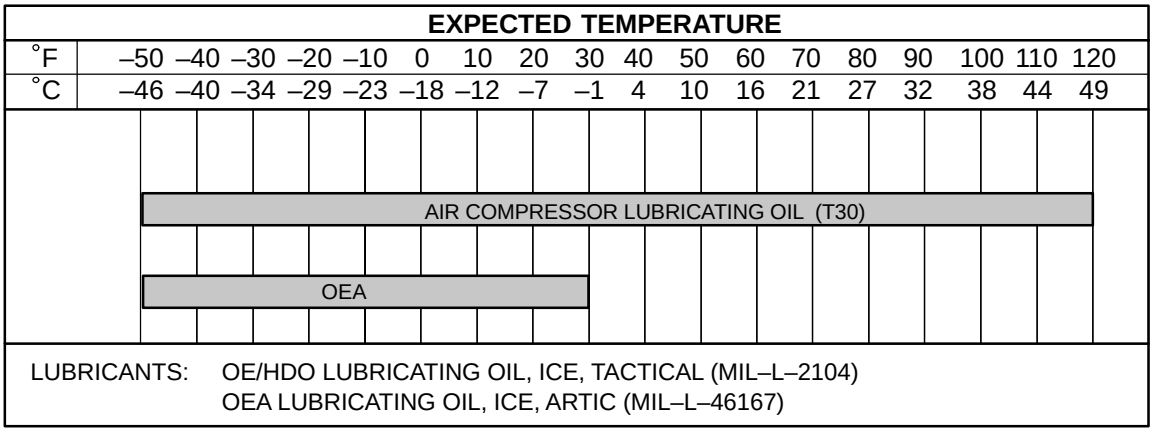
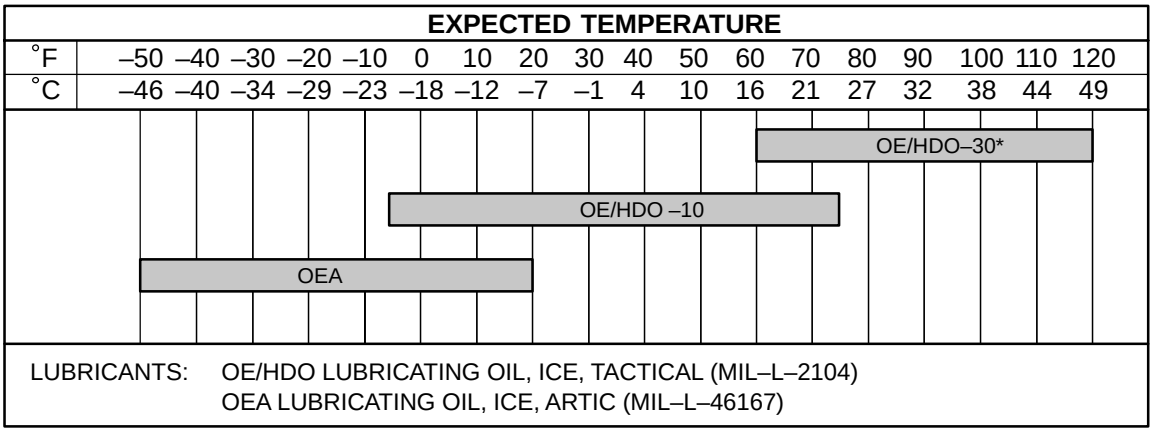


CHART C. HYDRAULIC RESERVOIR



Section II. LUBRICATION TABLE KEY (CONT).

CHART D. OIL CAN POINTS

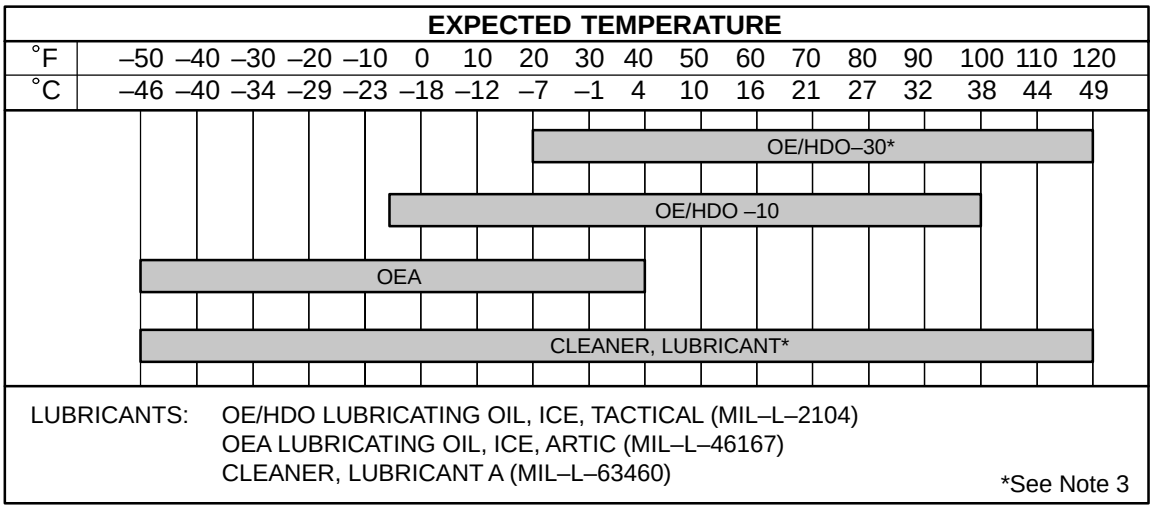
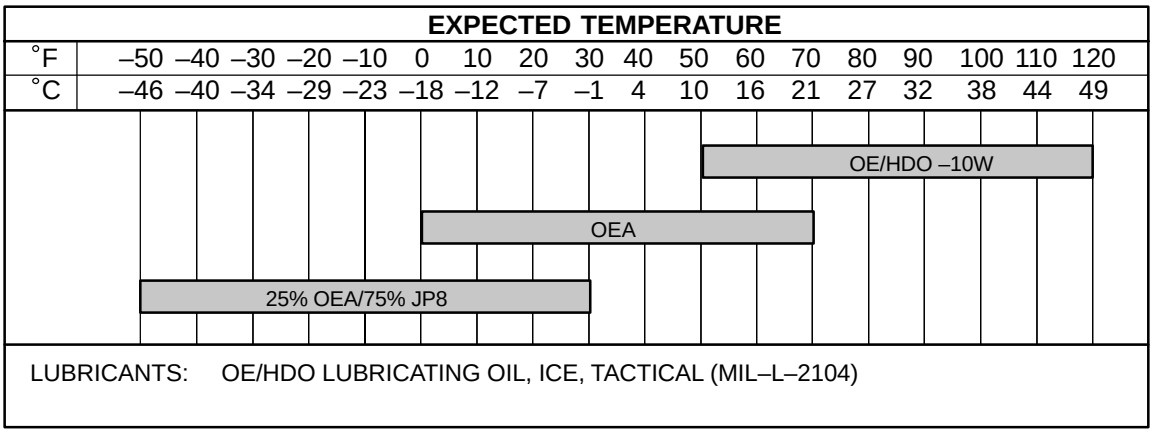


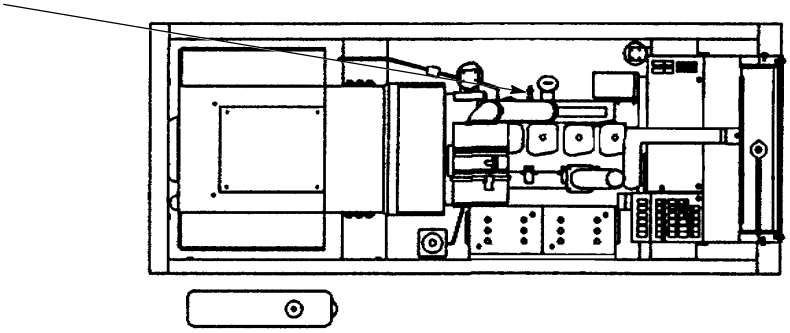
CHART F. AIR LUBRICATOR



Section III. LUBRICATION POINTS

Engine Oil Level

Check oil at dipstick.
(See Note 1a and View 1.)
Fill at filler cap.
See View 1.) OE/HDO D/10HRS

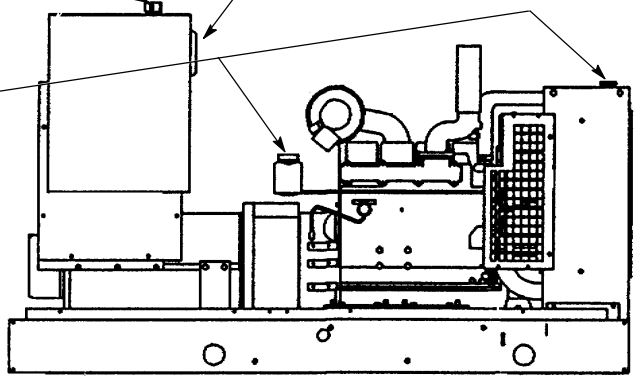


Hydraulic Oil Level

Check fluid level at sight gage
and fill. (See View 2.) OE/HDO D/10HRS

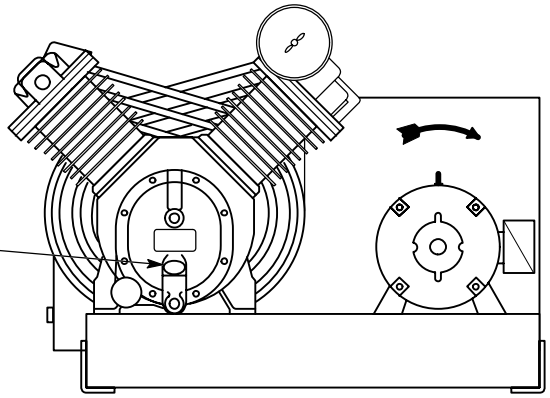
Engine Coolant Level

Check level and fill.
(See View 3.) T30 D/10HRS



Compressor Oil Level

Check level and fill.
(See View 4.) D/10 HRS



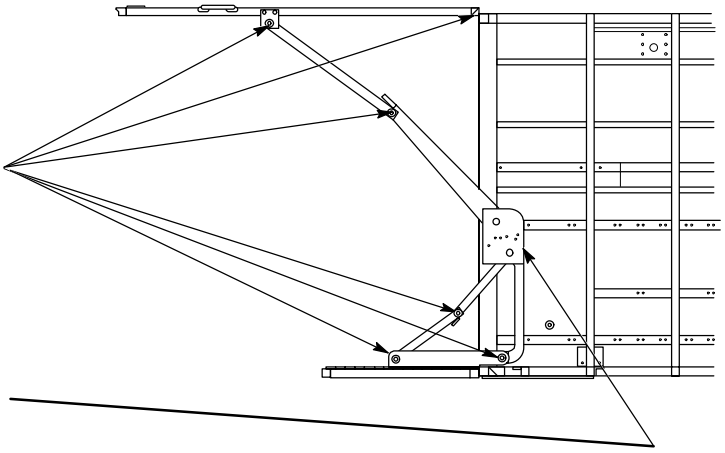
Section III. LUBRICATION POINTS (CONT).

Shelter Door

Lubricate (See Note 3 and View 5.) Antiseize AR

Shelter Door Gears

Coat sides and teeth lightly with grease. (See Notes 2a, 2d and View 6) GAA AR



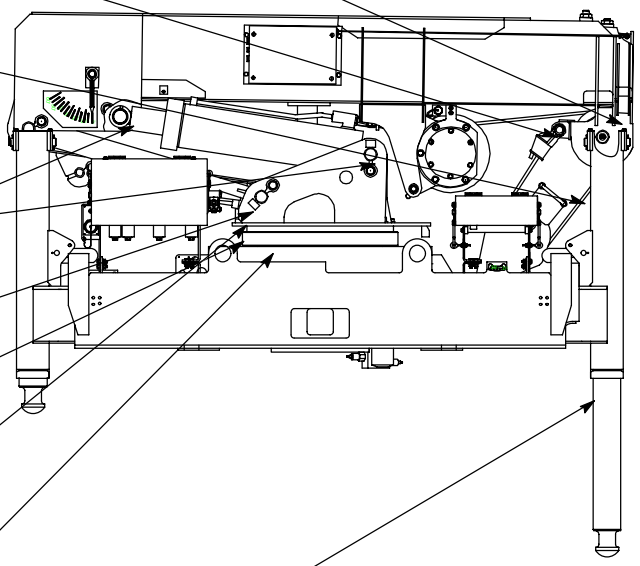
Air Lubricator

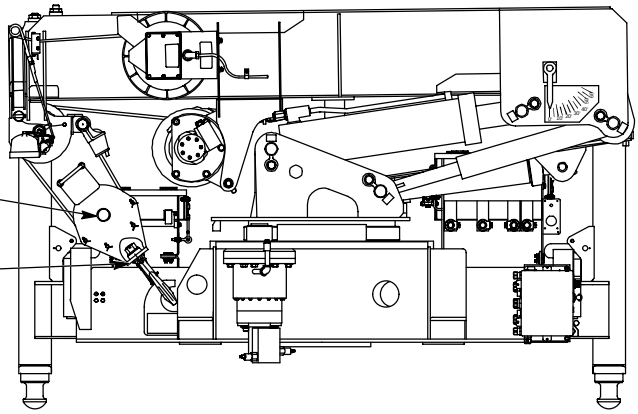
Check level and fill. (See View 7)

OE/HDO-10W AR

Section III. LUBRICATION POINTS (CONT).

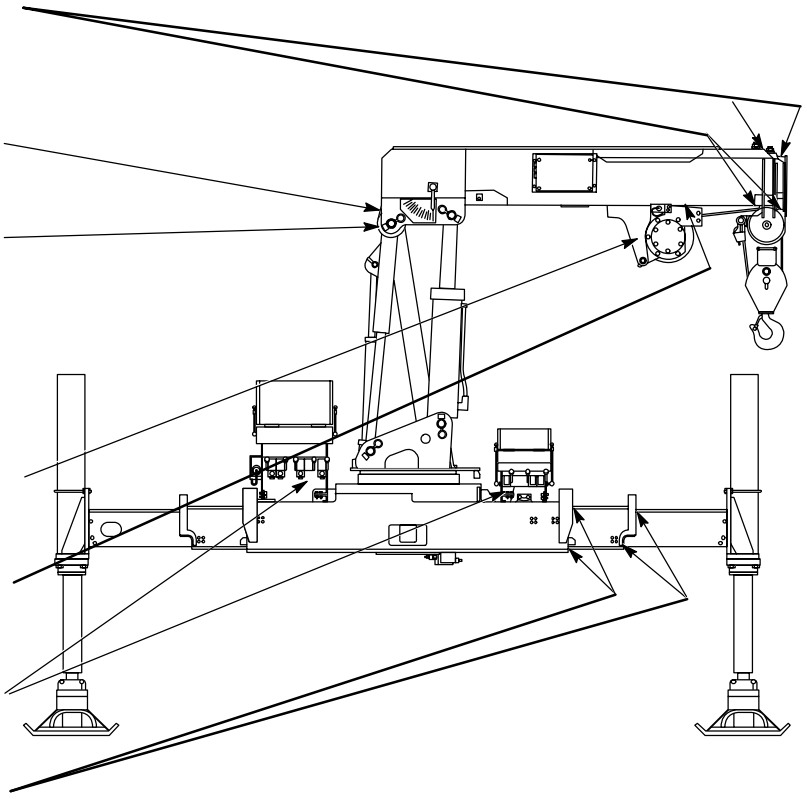
	LUBRICANT • INTERVAL
Boom Nose Sheave	
Lubricate. (1 fitting) (See Note 2a and View 15.)	GAA M/50HRS
Hoist Cable Clevis	
Lubricate with oil can. (See Note 2a and View 15.)	OE/HDO AR
Hoist Cable	
Clean and lubricate. (See View 8.) (Crane extended) (Requires assistant)	OE/HDO AR
Lift Cylinder	
Lubricate. (8 fittings) (See Note 2a and View 9.)	Antiseize M/50HRS
Tension Link	
Lubricate. (8 fittings) (See Note 2a and View 10.)	GAA M/50HRS
Lubricate link. (See Note 2a and View 10.)	Antiseize M/50HRS
Rotation Gear and Pinion Teeth	
Coat teeth of rotation gear lightly with grease. (See Notes 2a, 2c and View 8.)	GAA M/50HRS
Turntable Bearing	
Lubricate. (4 Swing Bearing) (See Note 2a and View 11.)	GAA M/50HRS
Jack Cylinder Barrels	
Lubricate. (See Note 2a) and View 12.)	Antiseize M/50HRS
Hook Block Sheave	
Lubricate. (1 fitting) (See Note 2a and View 8.)	GAA M/50HRS
Hook Assembly Bearing	
Lubricate with oil can. (See Note 2a and View 8.)	OE/HDO AR



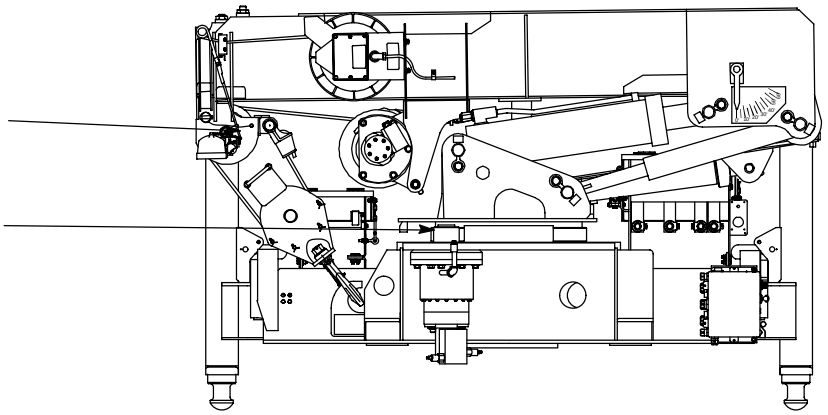


Section III. LUBRICATION POINTS (CONT).

	LUBRICANT	INTERVAL
Boom Wear Pads		
Clean top and bottom sliding surfaces of boom wear pads and lubricate by coating with grease. (Crane extended)	GAA	M/50HRS
Mast		
Lubricate. (4 fittings) (See Note 2a and View 13.)	GAA	M/50HRS
Mast Cylinder		
Lubricate. (6 fittings) (Crane extended.) (See Note 2a and View 14.)	GAA	M/50HRS
Hoist Gear Box		
Check and fill. (See Note 2e and View 8.)	GO	BI/250HRS
Hoist Cable Guide Rollers		
Lubricate with oil can. (See Note 2a and View 15.)	OE/HDO	M/50HRS
Crane Control Valve Levers		
Lubricate with oil can. (See Note 2a and View 10.)	OE/HDO	M/50HRS
Top, Bottom and Side Outrigger Plate		
Clean and Lubricate. (See Note 2a and View 16.)	GAA	M/50HRS



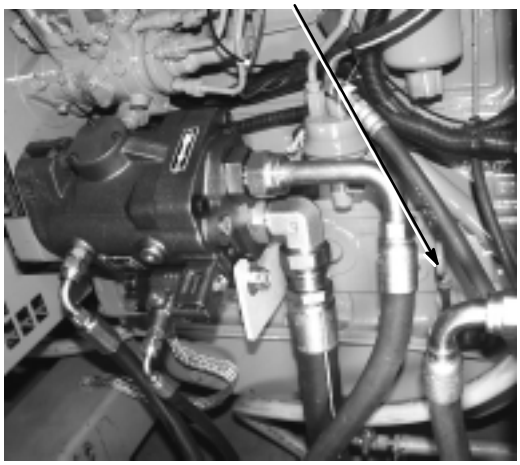
Boom Light		
Lubricate with oil can. (See Note 2a and View 17.)	OE/HDO	M/50HRS
Turntable Gearbox		
Check plug and fill. (See Note 2f and View 18.)	GO	BI/250HRS



LOCALIZED LUBRICATION VIEW POINTS.

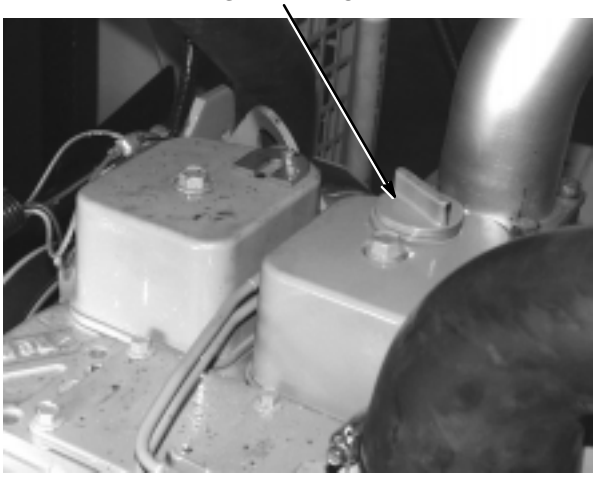
1

ENGINE DIPSTICK



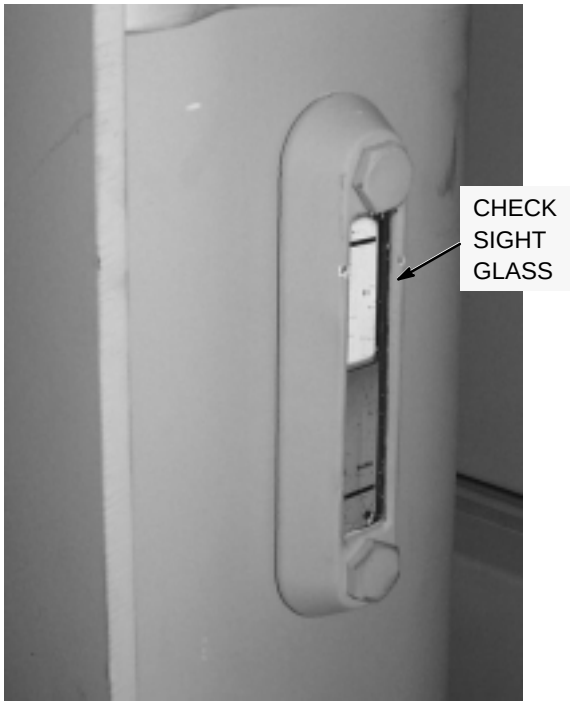
ENGINE CRANKCASE

ENGINE FILL CAP



ENGINE CRANKCASE

2



HYDRAULIC RESERVOIR

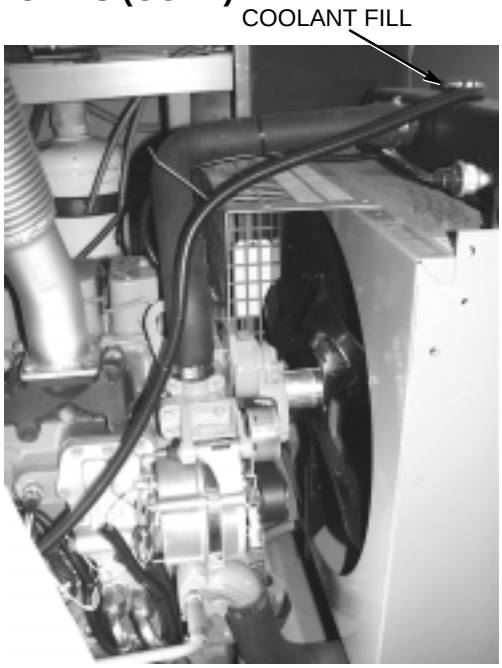
FILL

HYDRAULIC RESERVOIR

LOCALIZED LUBRICATION VIEW POINTS (CONT).

3

COOLING SYSTEM

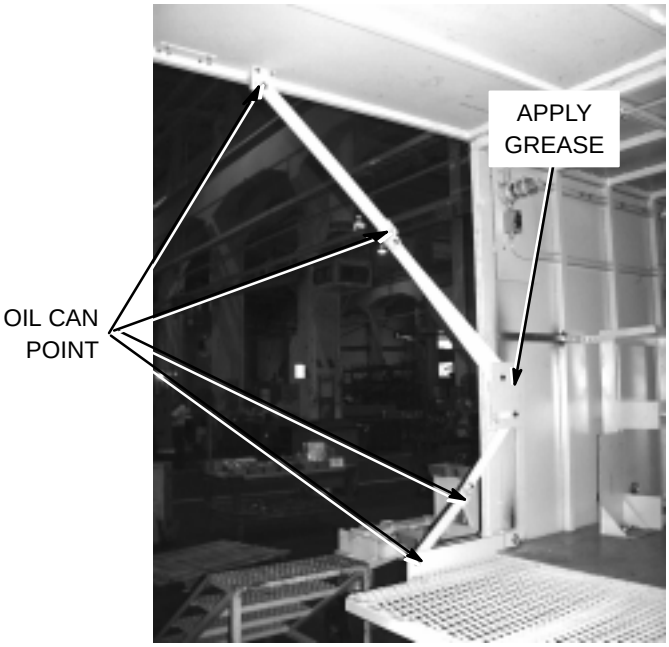


COOLING SYSTEM

4

AIR COMPRESSOR

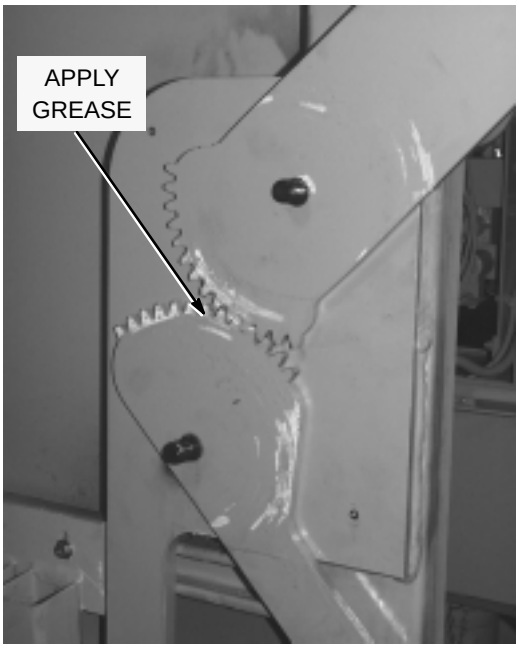
5



SHELTER DOOR

LOCALIZED LUBRICATION VIEW POINTS (CONT).

6

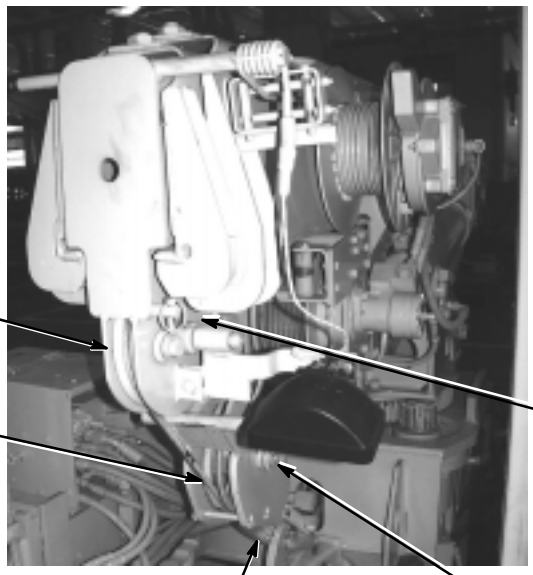


SHELTER DOOR GEARS

7

AIR LUBRICATOR

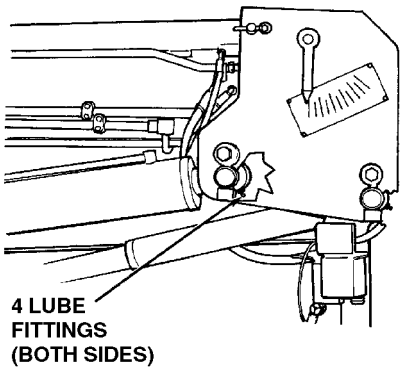
8



HOOK BLOCK SHEAVE, HOOK ASSEMBLY BEARING AND HOIST CABLE

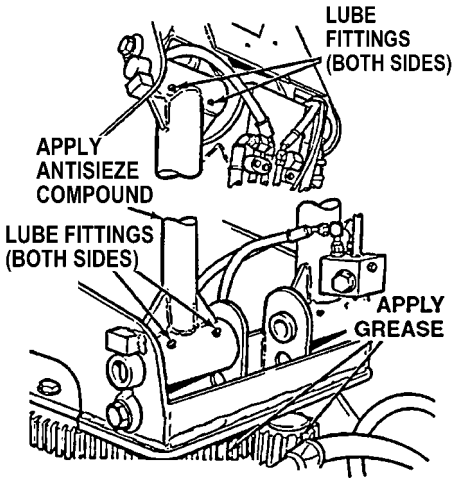
LOCALIZED LUBRICATION VIEW POINTS (CONT).

9



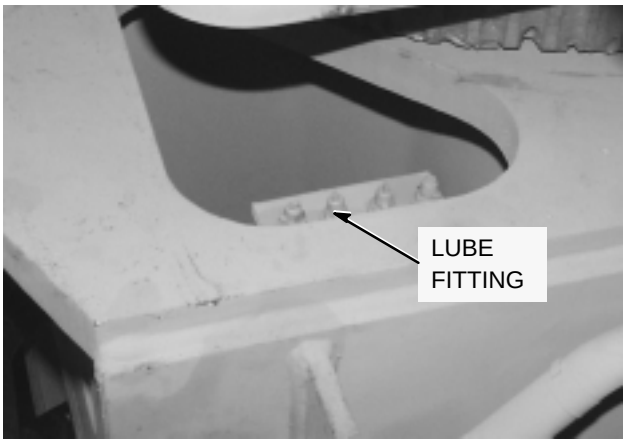
LIFT CYLINDER

10



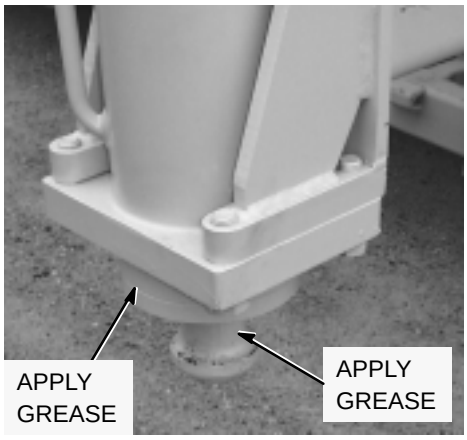
TENSION LINK,
ROTATION GEAR
AND PINION TEETH

11



TURNTABLE BEARING

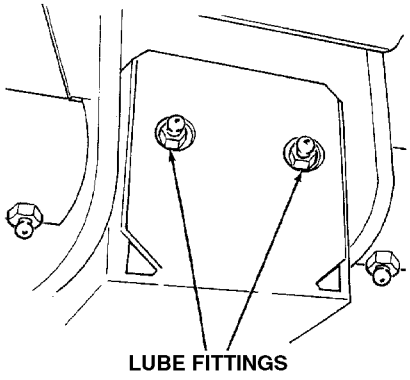
12



JACK CYLINDER BARRELS

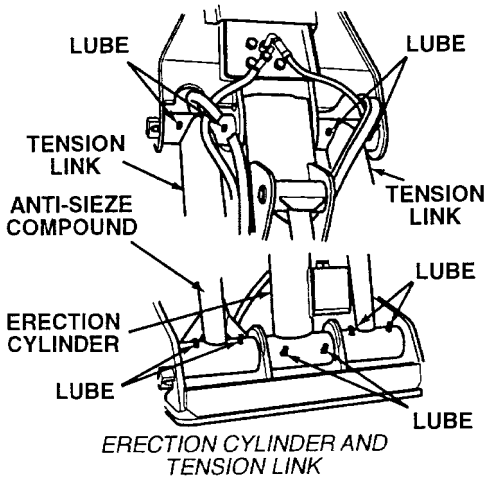
LOCALIZED LUBRICATION VIEW POINTS (CONT).

13



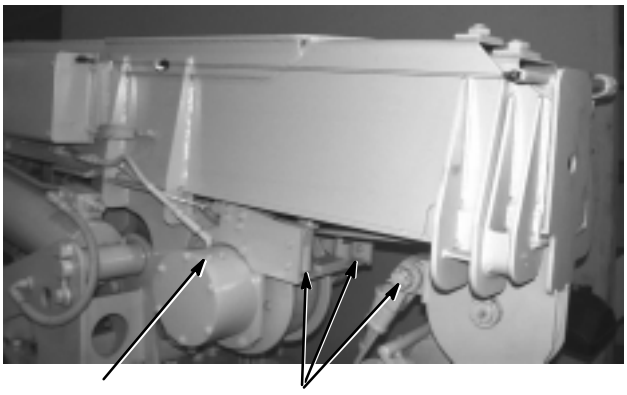
MAST (STOWED)

14



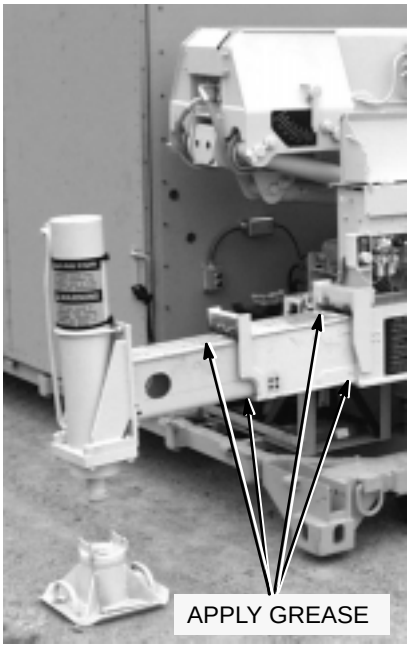
MAST CYLINDER

15



HOIST CABLE GUIDE ROLLERS, BOOM NOSE SHEAVE AND HOIST CABLE CLEVIS

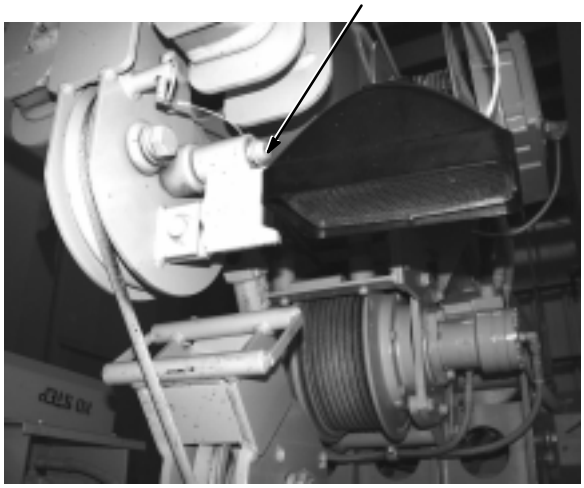
16



TOP, BOTTOM AND SIDE OUTRIGGER PLATE

LOCALIZED LUBRICATION VIEW POINTS (CONT).

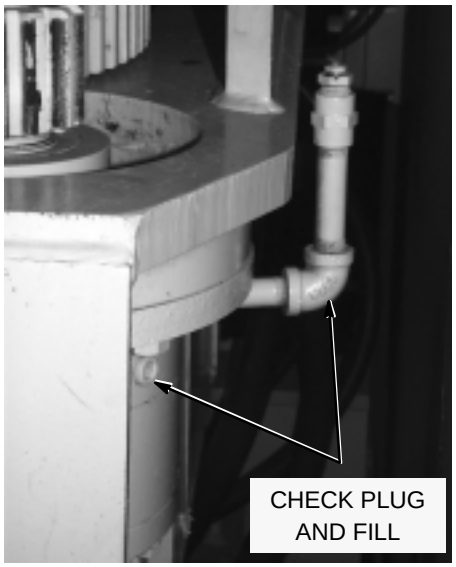
17



APPLY GREASE

BOOM LIGHT

18



TURNTABLE GEARBOX

NOTES

1. ENGINE.

a. Cold Oil Check. Keep engine oil level as close as possible to the dipstick high mark without overfilling.

b. Crankcase. Check oil level with FRS on level ground and the engine off and cool. Do not overfill crankcase.

2. MATERIAL HANDLING CRANE (MHC).

a. The 50 hour interval is based on actual MHC operating hours. The hours can be tracked by the operator and recorded in the logbook. The MHC should be lubricated on a monthly or 50 actual operating hour interval, whichever comes first. Crane must be fully unstowed to properly lubricate.

b. Use oil can sparingly. A single oil can application at each oil can point is required.

c. Lubricate boom wear pads and exposed rotation gears more often when cranes are operated in sandy or dusty conditions.

d. Remove safety pin from hook. Lubricate safety pin and reinstall in hook.

e. The 250 hour interval is based on actual crane operating hours. The hours can be tracked by the operator and recorded in the logbook or the hour-meter on the crane. The crane should be lubricated on a semiannual or 250 actual operating hour interval, whichever comes first.

f. The 150 hour interval is based on annual or 150 actual operating. Fill with oil until oil level reaches bottom of check plug hole.

3. OIL CAN POINTS.

Lubricate doors, side panels, locks and pivot points every 250 hrs or Semiannually. Lubricate more often if usage is high.

INDEX

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W

By Order of the Secretary of the Army:

ERIC K. SHINSEKI
General, United States Army
Chief of Staff

Official:

JOEL B. HUDSON
Administrative Assistant to the
Secretary of the Army
0030710

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THE METRIC SYSTEM AND EQUIVALENTS

LINEAR MEASURE
1 Centimeter=10 Millimeters=0.01 Meters=0.3937 Inches
1 Meter=100 Centimeters=1000 Millimeters=39.37 Inches
1 Kilometer=1000 Meters=0.621 Miles

WEIGHTS
1 Gram=0.001 Kilograms=1000 Milligrams=0.035 Ounces
1 Kilogram=1000 Grams=2.2 Lb
1 Metric Ton=1000 Kilograms=1 Megagram=1.1 Short Tons

LIQUID MEASURE
1 Milliliter=0.001 Liters=0.0338 Fluid Ounces
1 Liter=1000 Milliliters=33.82 Fluid Ounces

SQUARE MEASURE
1 Sq Centimeter=100 Sq Millimeters=0.155 Sq Inches
1 Sq Meter=10,000 Sq Centimeters=10.76 Sq Feet
1 Sq Kilometer=1,000,000 Sq Meters=0.386 Sq Miles

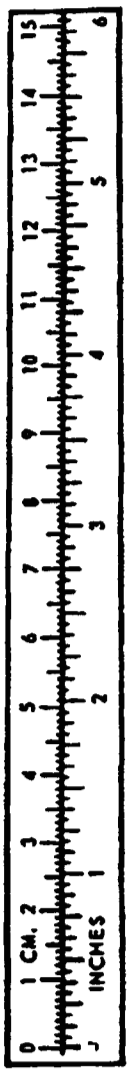
CUBIC MEASURE
1 Cu Centimeter=1000 Cu Millimeters=0.06 Cu Inches
1 Cu Meter=1,000,000 Cu Centimeters=35.31 Cu Feet

TEMPERATURE
5/9 (°F − 32) = °C
212° Fahrenheit is equivalent to 100° Celsius
90° Fahrenheit is equivalent to 32.2° Celsius
32° Fahrenheit is equivalent to 0° Celsius
9/5 C° + 32 = F°

APPROXIMATE CONVERSION FACTORS

TO CHANGE	TO	MULTIPLY BY
Inches	Centimeters	2.540
Feet	Meters	0.305
Yards	Meters	0.914
Miles	Kilometers	1.609
Square Inches	Square Centimeters	6.451
Square Feet	Square Meters	0.093
Square Yards	Square Meters	0.836
Square Miles	Square Kilometers	2.590
Acres	Square Hectometers	0.405
Cubic Feet	Cubic Meters	0.028
Cubic Yards	Cubic Meters	0.765
Fluid Ounces	Milliliters	29.573
Pints	Liters	0.473
Quarts	Liters	0.946
Gallons	Liters	3.785
Ounces	Grams	28.349
Pounds	Kilograms	0.454
Short Tons	Metric Tons	0.907
Pound-Feet	Newton-Meters	1.356
Pounds/Sq Inch	Kilopascals	6.895
Miles per Gallon	Kilometers per Liter	0.425
Miles per Hour	Kilometers per Hour	1.609

TO CHANGE	TO	MULTIPLY BY
Centimeters	Inches	0.394
Meters	Feet	3.280
Meters	Yards	1.094
Kilometers	Miles	0.621
Sq Centimeters	Square Inches	0.155
Square Meters	Square Feet	10.764
Square Meters	Square Yards	1.196
Square Kilometers	Square Miles	0.386
Sq Hectometers	Acres	2.471
Cubic Meters	Cubic Feet	35.315
Cubic Meters	Cubic Yards	1.308
Milliliters	Fluid Ounces	0.034
Liters	Pints	2.113
Liters	Quarts	1.057
Liters	Gallons	0.264
Grams	Ounces	0.035
Kilograms	Pounds	2.205
Metric Tons	Short Tons	1.102
Newton-Meters	Pound-Feet	0.738
Kilopascals	Pounds per Sq Inch	0.145
Km per Liter	Miles per Gallon	2.354
Km per Hour	Miles per Hour	0.621



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