TM 9-4940-568-20

UNIT MAINTENANCE MANUAL
FOR
FORWARD REPAIR SYSTEM (FRS)

MODEL M7

NSN 4940-01-463-7940

HEADQUARTERS, DEPARTMENT OF THE ARMY
MARCH 2002

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.

WARNING

Do not remove the radiator cap when the engine is hot; steam and hot coolant can escape and burn personnel.

WARNING

Use extreme care when removing the radiator pressure cap. Sudden release of pressure can cause a steam flash which could seriously injure personnel. Slowly loosen cap to the first stop to relieve pressure before removing cap completely. After opening, securely tighten cap.

WARNING

Use a clean, thick waste cloth or like material to remove radiator pressure cap. Avoid using gloves. If hot water soaks through gloves, personnel could be burned.

WARNING

Do not allow personnel to perform maintenance directly under boom or mast. Failure to follow proper procedures could cause serious injury or death.

WARNING

There are extremely dangerous voltage and power levels present inside this unit. Do not attempt to diagnose or repair unless you have had training in power electronics measurement and troubleshooting techniques.

WARNING

Forward Repair System (FRS) weighs 23,680 (10,741 kg). Attach suitable lifting device prior to removal or installation to prevent possible injury to personal.

WARNING

Steam cleaning creates hazardous noise levels and severe burn potential. Eye, skin, and ear protection is required. Failure to comply may result in injury to personnel.

WARNING

ELECTRIC SHOCK can kill.

- Follow all safety precautions.
- Do not touch live electrical parts.
- Turn OFF input power before servicing the machine unless otherwise noted.

WARNING

Solvents used with a spray gun must be used in a spray booth with filter. Face shield must be used by personnel operating spray gun. Failure to comply may result in injury to personnel.

WARNING

On direct contact, uncured silicone sealant irritates eyes. In case of contact, flush eyes with water and seek medical attention. In case of skin contact, wipe off and flush with water.

WARNING

Do not drain engine oil while engine is hot. Severe injury to personnel may result.

WARNING

Ensure engine is cool before performing this task or injury to personnel may result.

WARNING

Compressed air used for cleaning purposes will not exceed 30 psi (207 kPa). Use only with effective chip guarding and personal protective equipment (goggles/shield, gloves, etc.) or injury to personnel may result.

WARNING

Use care when removing or installing retaining rings. Retaining rings are under spring tension and can act as projectiles when released and could cause eye injury.

WARNING

Compressed air used for cleaning purposes will not exceed 30 psi (207 kPa). Use only with effective chip guarding and personal protective equipment (goggles/shield, gloves, etc). Failure to comply may result in injury to personnel.

WARNING

Adhesives, solvents, and sealing compounds can burn easily, can give off harmful vapors, and are harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in well-ventilated area. If adhesive, solvent, or sealing compound gets on skin or clothing, wash immediately with soap and water.

WARNING

Do not remove exhaust system parts while engine is hot. Failure to comply may cause injury to personnel.

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

Starting fluid is toxic and highly flammable. Container is pressurized. NEVER heat container and NEVER discharge starting fluid in confined areas or near open flame. Severe injury to personnel may result.

WARNING

Do not inhale fuel fumes; could cause injury or death.

WARNING

Storage rack weighs approximately 300 lbs (136 kg). Use the aid of an assistant when lifting storage rack to prevent injury to personnel.

WARNING

Allow engine to cool before performing maintenance on muffler, exhaust pipe and exhaust manifold. If necessary, use insulated pads and gloves.

WARNING

Deflector weighs approximately 143 lbs (65 kg). Attach suitable lifting device to prevent possible injury to personnel.

WARNING

Radiator assembly weighs 51 lbs (23 kg). Attach suitable lifting device prior to removal/installation to prevent possible injury to personnel.

WARNING

Ensure radiator is fully supported by lifting device prior to removal of screws in Step (13). Failure to comply may result in severe injury to personnel.

WARNING

Ensure radiator is fully supported by lifting device prior to installation of screws in Step (5) and (6). Failure to comply may result in severe injury to personnel.

WARNING

Coolant is slippery and can cause falls and injury. Clean up spilled coolant immediately.

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

Be careful not to short out battery terminals. Do not smoke or use open flame near batteries. Batteries may explode from a spark. Battery acid is harmful to skin and eyes.

WARNING

Wear safety goggles and acid-proof gloves when battery cover must be removed or when adding electrolyte.

WARNING

Avoid electrolyte contact with skin, eyes, or clothing. If battery electrolyte spills, take immediate action to stop burning effects:

- External: Immediately flush with cold running water to remove all acid.
- Eyes: Flush with cold water for at least 15 minutes. Seek immediate medical attention.
- Internal: Drink large amounts of water or milk. Seek immediate medical attention.
- Clothing or Vehicle: Wash at once with cold water.

WARNING

Injury will result if acid contacts skin or eyes. Wear rubber apron to prevent clothing being damaged.

WARNING

Battery weighs 75 lbs (34 kg). Remove battery only with the aid of an assistant to prevent possible injury to personnel.

WARNING

Battery weighs 75 lbs (34 kg). Install battery only with the aid of an assistant to prevent possible injury to personnel.

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

Do not attempt to repair, cut, or replace any conduit or fixture without first removing all wires to prevent personnel injury or damage to equipment.

WARNING

Air compressor weighs 750 lbs (340 kg). Attach suitable lifting device for removal and properly support air compressor to prevent possible injury to personnel.

WARNING

Air compressor platform weighs 66 lbs (30 kg). Attach suitable lifting device for removal/installation to prevent possible injury to personnel.

WARNING

Air compressor reservoir weighs 254 lbs (115 kg). Use an assistant to help remove air compressor reservoir or possible injury to personnel may result.

WARNING

Hose reel assembly is under pressure. Avoid releasing latching mechanism during removal and installation. Failure to comply could result in injury to personnel.

WARNING

Hose reel assembly is heavy and awkward. Removal and installation of hose reel assembly will require the aid of an assistant to avoid injury to personnel.

WARNING

Hose reel assembly weighs approximately 60 lbs (27 kg). Removal and installation of hose reel assembly will require the aid of an assistant to avoid injury to personnel.

WARNING

Use extreme care when removing drive spring. Spring is under tension and can act as a projectile when released and could cause eye injury.

WARNING

Argon tank valve must be shut off prior to removing regulator. Failure to comply may result in injury or death to personnel.

WARNING

Only apply sealing compound on threads specified in Steps. Failure to comply may result in injury or death to personnel and damage to equipment.

WARNING

Oxygen and propylene valves must be shut off prior to removing regulators. Failure to comply may result in injury or death to personnel.

WARNING

The hydraulic system operates at high pressures. Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in serious injury or death to personnel.

WARNING

Prolonged contact with lubricating oil (MIL-L-2104) may cause a skin rash. Skin and clothing that come into contact with lubricating oil should be thoroughly washed immediately. Saturated clothing should be removed immediately. Areas in which lubricating oil is used should be well-ventilated to keep fumes to a minimum.

WARNING

Hydraulic reservoir and rack weigh 272 lbs (45 kg). Attach suitable lifting device to properly support hydraulic reservoir and rack to prevent possible injury to personnel.

WARNING

Tool cabinets weigh up to 107 lbs (49 kg). Use an assistant when installing tool cabinet on FRS to prevent injury to personnel.

WARNING

Shelter door weighs 220 lbs (100 kgs) and must be supported during door replacement. Use a suitable lifting device of adequate capacity to support door for removal and installation to prevent possible injury to personnel.

WARNING

Shelter platform weighs 268 lbs (122 kg). Use an assistant to help close/open platform or injury to personnel may result.

WARNING

Shelter door weighs 220 lbs (100 kg) and must be securely supported before disassembly to prevent possible injury to personnel.

WARNING

Shelter door weighs 220 lbs (100 kgs) and must be supported during door replacement. Use a suitable lifting device of adequate capacity to support door for removal and installation to prevent possible injury to personnel.

WARNING

Shelter door weighs 220 lbs (100 kgs) and must be supported during door/platform support arm replacement. Use a suitable lifting device of adequate capacity to support door for removal and installation to prevent possible injury to personnel.

WARNING

Platform weighs 268 lbs (122 kg). Use a suitable lifting device of adequate capacity to support platform for removal and installation to prevent possible injury to personnel.

WARNING

Hook arm weighs approximately 50 lbs (22 kg). Use an assistant to help remove hook arm guard or possible injury to personnel may result.

WARNING

Brush guard weighs 444 lbs (201 kg). Attach suitable lifting device for removal and properly support brush guard to prevent any injury to personnel.

WARNING

Brush guard weighs 444 lbs (201 kg). Attach suitable lifting device for installation and properly support brush guard to prevent any injury to personnel.

WARNING

Shelter stowage rack weighs approximately 300 lbs (137 kg). Attach suitable lifting device for removal and properly support shelter stowage rack to prevent possible injury to personnel.

WARNING

Heater assembly may be hot. Ensure heater assembly is cool before performing this task or injury to personnel may result.

WARNING

To prevent personal injury, allow solder joint to cool before handling.

WARNING

To prevent personal injury, never use an open flame to apply heat shrink tubing.

WARNING

To prevent personal injury, allow adhesive to cool before handling.

WARNING

Tip of removal tool is very sharp. Use caution when using tool. Failure to comply may result in injury to personnel.

WARNING

Manual override mode should only be used during crane storage under other than usual conditions ONLY. Failure to comply may cause injury or death to personnel.

WARNING

Cable can become frayed or contain broken wires. Wear heavy leather palmed gloves when handling cable. Frayed or broken wires can injure hands. Failure to comply may result in injury to personnel.

WARNING

Always keep tension on cable when paying cable out from hoist or back onto hoist. Loose cable can mis-spool causing cable and equipment damage.

WARNING

Cable can become frayed or contain broken wires. Wear heavy leather palmed gloves when handling cable. Frayed or broken wires can injure hands. Failure to comply may result in injury to personnel. Never let moving cable slide through hands, even when wearing gloves. A broken wire could pierce through glove and cut hands.

WARNING

Keep your body clear of test spray. Fluid can be injected into the blood stream causing blood poisoning and possible death.

WARNING

Always wear eye protection and protective gloves when performing fuel injector testing to prevent possible injury to personnel.

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:

Original ..... 0 ... 15 March 2002

TOTAL NUMBER OF PAGES IN THIS PUBLICATION IS 799 CONSISTING OF THE FOLLOWING:

Page No.	*Change No.	Page No.	*Change No.	Page No.	*Change No.
Title	0	11-74 Blank	0		
Blank	0	12-1 - 12-4	0		
a - j	0	13-1 - 13-2	0		
A	0	A-1	0		
B Blank	0	A-2 Blank	0		
i - iii	0	B-1 - B-22	0		
iv Blank	0	C-1 - C-4	0		
1-1 - 1-16	0	D-1 - D-5	0		
2-1 - 2-220	0	D-6 Blank	0		
3-1 - 3-70	0	E-1 – E-7	0		
4-1 - 4-43	0	E-8 Blank	0		
4-44 Blank	0	F-1 - F-5	0		
5-1 - 5-64	0	F-6 Blank	0		
6-1 - 6-27	0	G-1 - G-2	0		
6-28 Blank	0	INDEX-1 - INDEX-4	0		
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8-1 - 8-131	0				
8-132 Blank	0				
9-1 - 9-38	0				
10-1 - 10-12	0				
11-1 - 11-73	0				

* Zero In This Column Indicates An Original Page.

TECHNICAL MANUAL **HEADQUARTERS**
DEPARTMENT OF THE ARMY
No. 9-4940-568-20 Washington, D.C. 15 March 2002

UNIT 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, directectly 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.

TABLE OF CONTENTS

HOW TO USE THIS MANUAL

This manual is designed to help maintain the Forward Repair System (FRS). Listed below are some special features included in this manual to help locate and use the needed information:

- A front cover table of contents is provided for quick reference to chapters and sections that will be used often.
- WARNING, CAUTION, and NOTE headings, subject headings, and other essential information are printed in bold type making them easier to see.
- The maintenance tasks describe what must be done to the FRS before starting the task (Equipment Condition), and what must be done to return the system to operating condition after the task is finished (Follow-On Maintenance).
- The Appendices are located at the end of the manual. They contain a reference guide to other manuals, the Maintenance Allocation Chart (MAC), a list of expendable supplies and materials, and other material for maintaining the FRS.
- In addition to text, there are exploded-view illustrations showing how to take a component off and put it back on. Cleaning and inspection procedures are also included as required.
- Chapter 2 of this manual covers Unit level Preventive Maintenance Checks and Services (PMCS) and basic troubleshooting, as well as general maintenance.
- Chapters 3 through 13 of this manual covers Unit level maintenance for the FRS.

Follow these guidelines when using this manual:

- Read all WARNINGS and CAUTIONS before performing any procedure.
- The equipment conditions found in the maintenance procedures are of a general nature and the mechanic may be able to perform only certain steps within a procedure to accomplish the equipment condition.
- 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 chapter provides general information, equipment descriptions and principles of operation for the Forward Repair System (FRS).

a. Type of Manual. Unit Maintenance Instructions, TM 9-4940-568-20.

b. Model Numbers and Equipment Names. 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. DESTRUCTION OF ARMY MATERIAL TO PREVENT ENEMY USE.

Command decision, according to tactical situation, will determine when the destruction of the truck will be accomplished. A destruction plan will be prepared by the using organization unless one has been prepared by a higher authority. For general destruction procedures for this truck, refer to TM 750-244-6, Procedures for Destruction of Tank-Automotive Equipment to Prevent Enemy Use (US Army Tank-Automotive Command).

1-4. 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.

1-5. 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.

1-6. PREPARATION FOR STORAGE AND SHIPMENT.

Refer to Para 2-29 for storage or shipment instructions on the FRS.

1-7. 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 will submit, to the RIA Major Item and Product Assurance managers, an SF 2407. 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.

1-8. LIST OF ABBREVIATIONS/ACRONYMS.

FRS	Forward Repair System
PMCS	Preventive Maintenance Checks and Services
TDC	Top Dead Center

SECTION II. EQUIPMENT DESCRIPTION AND DATA

1-9. EQUIPMENT CHARACTERISTICS, CAPABILITIES AND FEATURES.

Refer to TM 9-4940-568-10 for equipment characteristics, capabilities and features.

1-10. LOCATION AND DESCRIPTION OF MAJOR COMPONENTS.

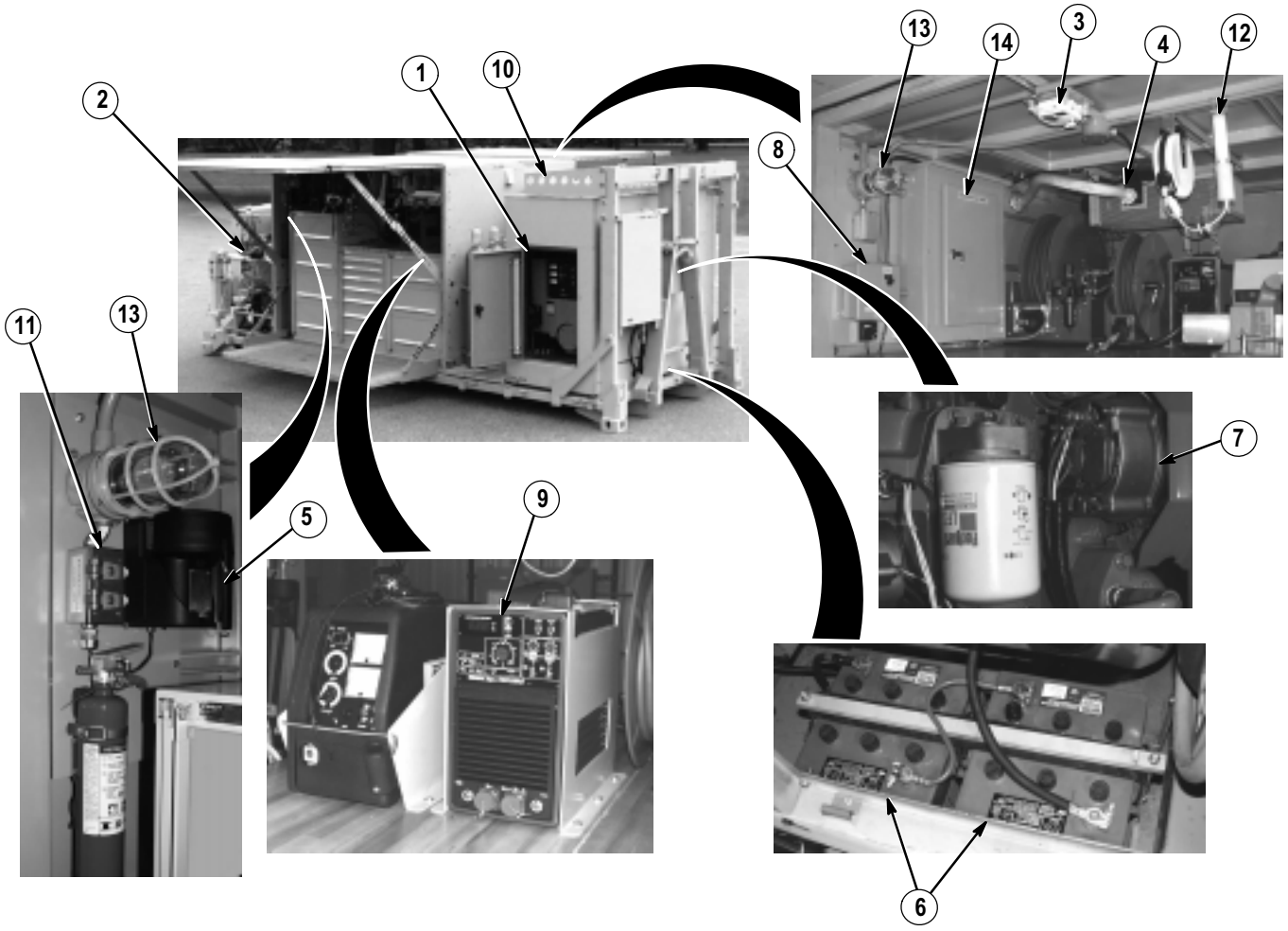
Refer to TM 9-4940-568-10 for location and description of major components.

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.

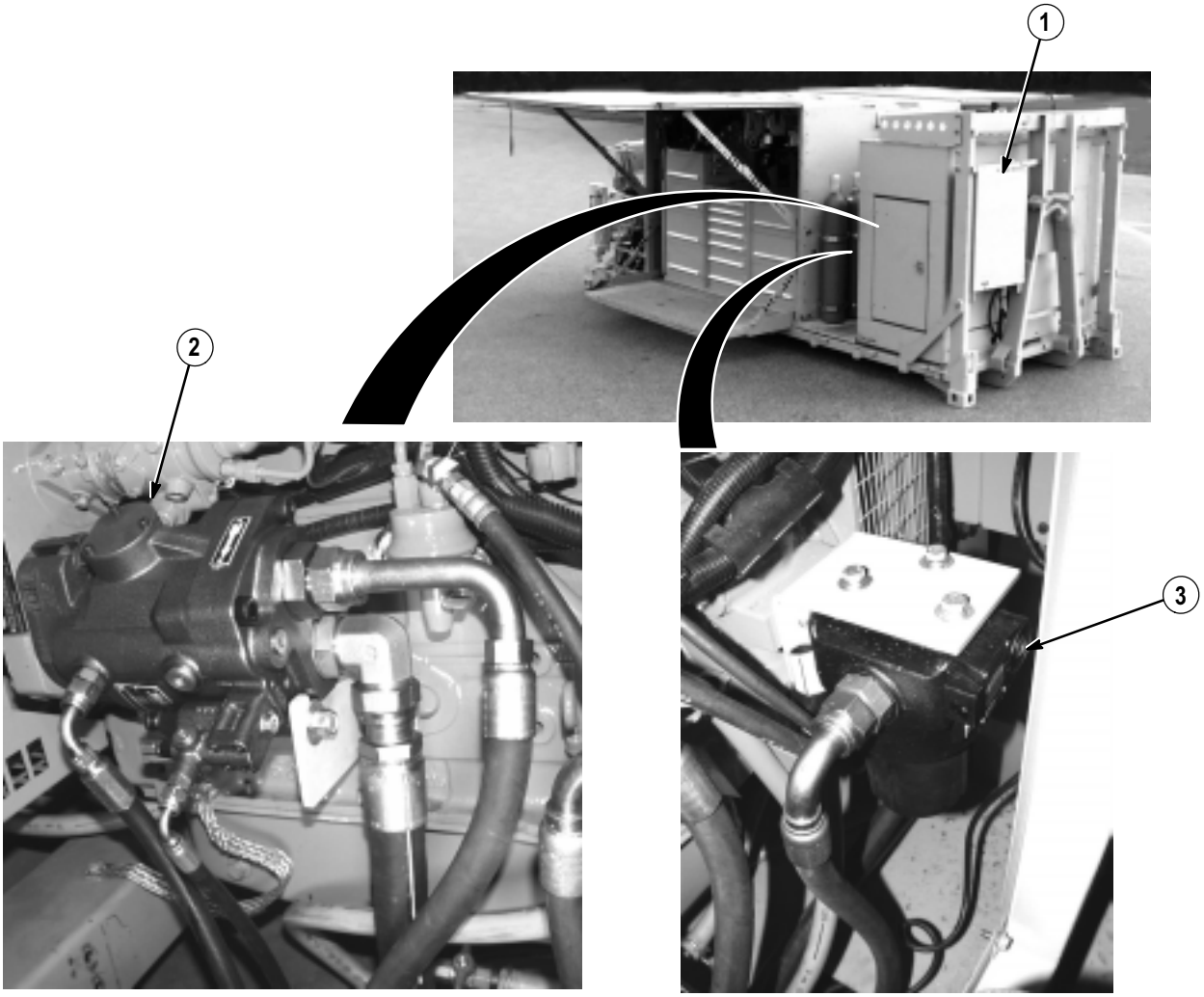
1-12. ELECTRICAL SYSTEM.



The electrical power for the FRS unit is provided by a 35KW Generator Set (1). The electrical system is composed of a 24VDC system and 120/208 AC system. The 24VDC system provides electrical current for the crane (2), domelights (3), heater (4) and portable flashlights (5). Electrical power for the 24VDC 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 24VDC control panel (8) inside shelter of the FRS.

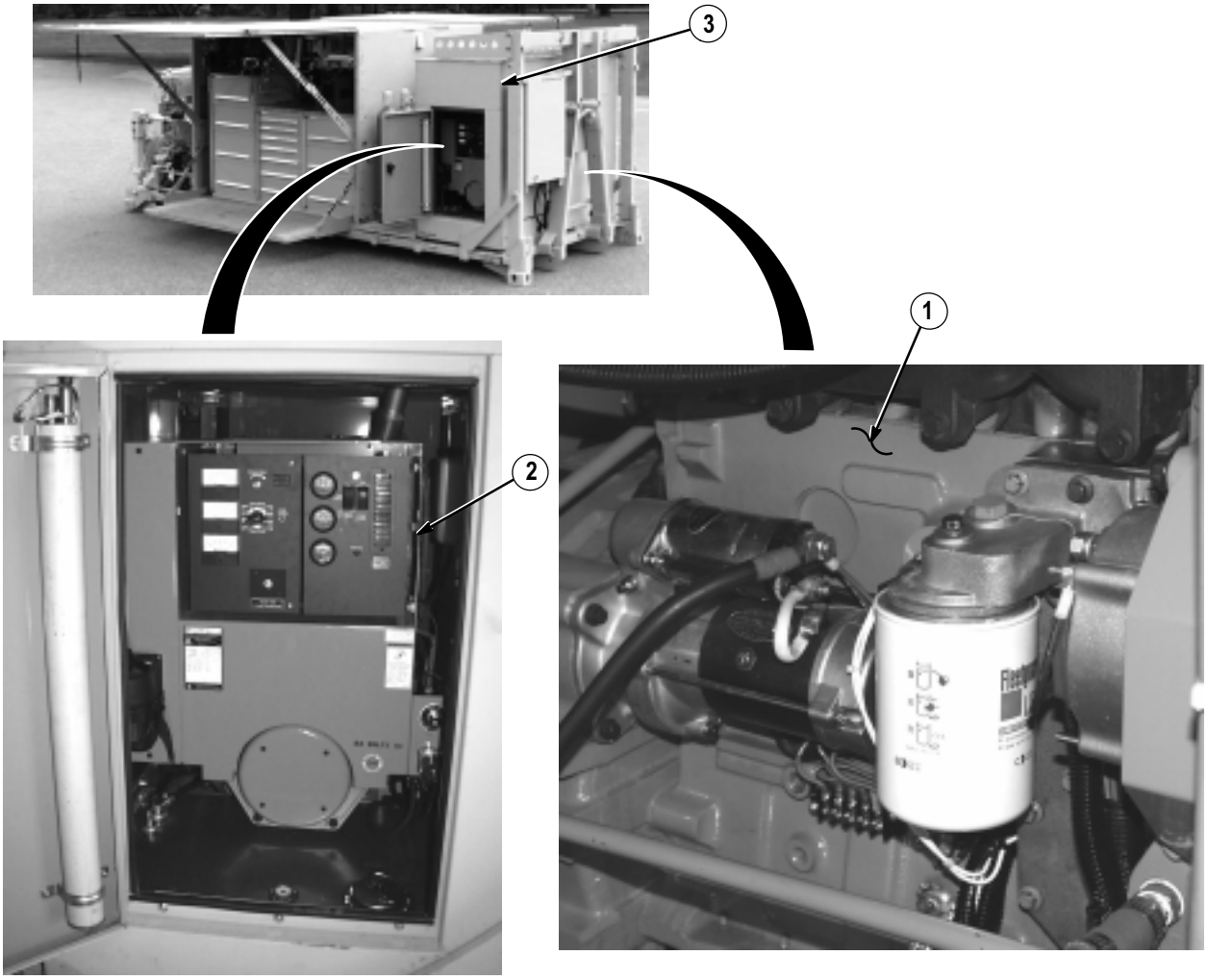
The 120/208 VAC system provides power for the welder (9), air compressor (10), 110 receptacles (11), reel lights (12) and fixed lighting system (13). Electrical power for the 120/208 VAC system is provided by the 35KW generator set which is powered by a 239 cubic inch (3.9L) diesel engine. Circuit breakers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

1-13. HYDRAULIC SYSTEM.



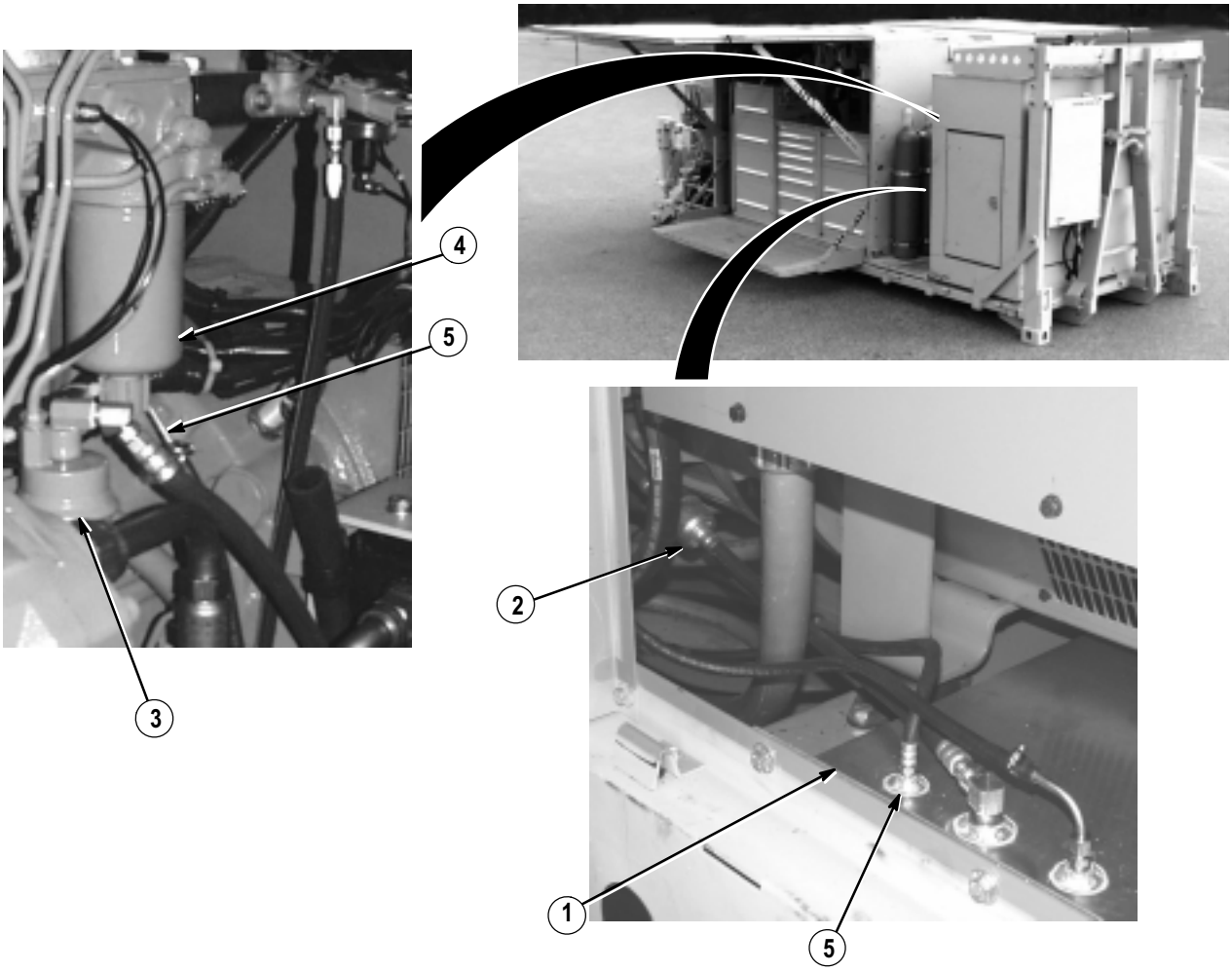
The hydraulic reservoir (1) holds 25 gallons of hydraulic fluid that is used during operation of the crane. Hydraulic fluid is drawn from the hydraulic reservoir to the hydraulic pump (2) through the hydraulic filter (3). The hydraulic pump is mounted on left front side of the engine. It provides hydraulic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

1-14. GENERATOR ENGINE SET.



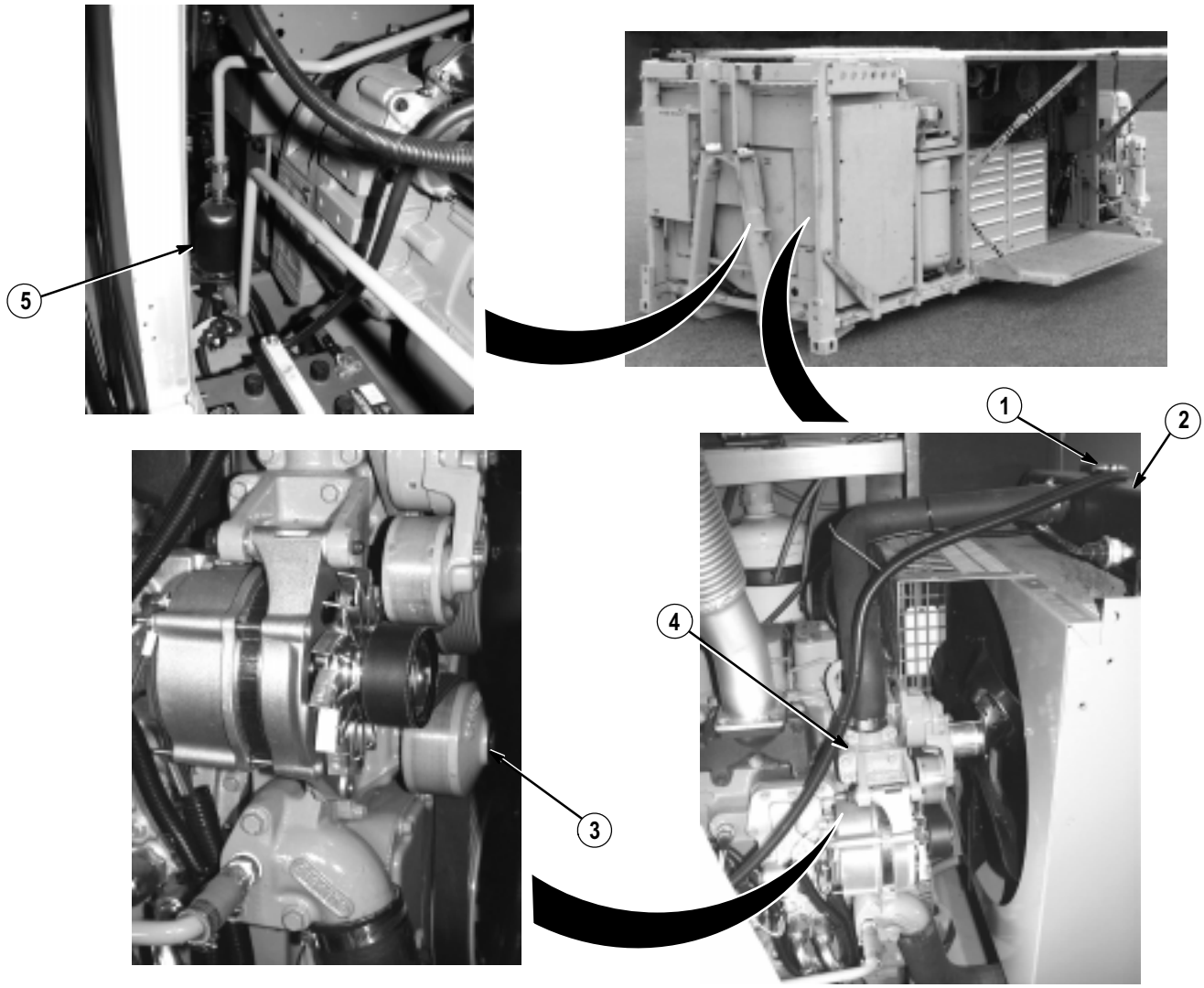
The FRS is equipped with a 4 cylinder, in-line 239 cubic in. (3.9L) diesel powered engine (1), standby generating system, 35KW/44 KVA, continuous standby, 120/208 VAC, 0 three phase (broad range), 60Hz, 1800RPM. The engine controller is unit (2). The engine is mounted in the weather protective housing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



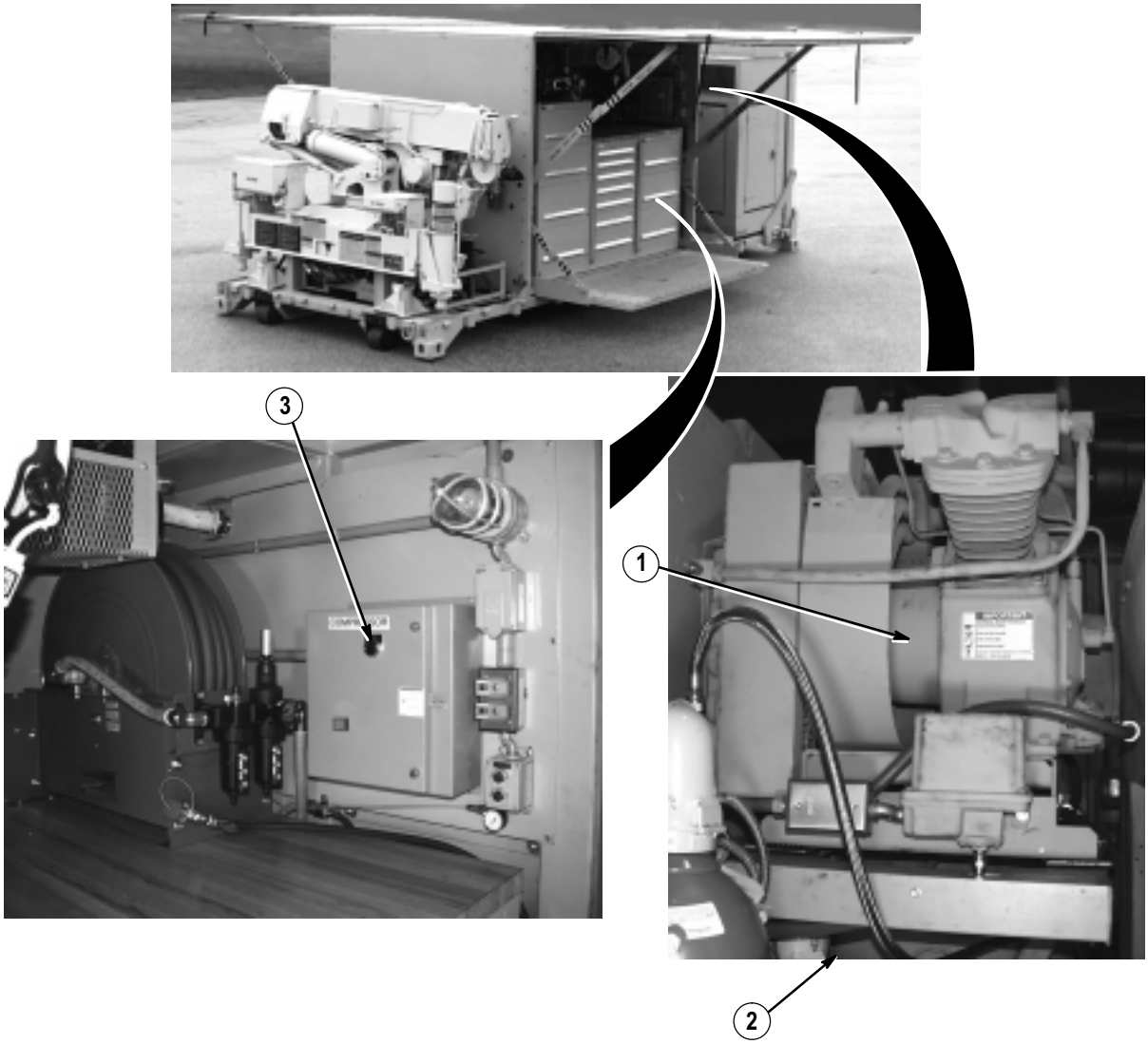
a. Cooling System.

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 degrees 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 Degrees F (–9° C)).

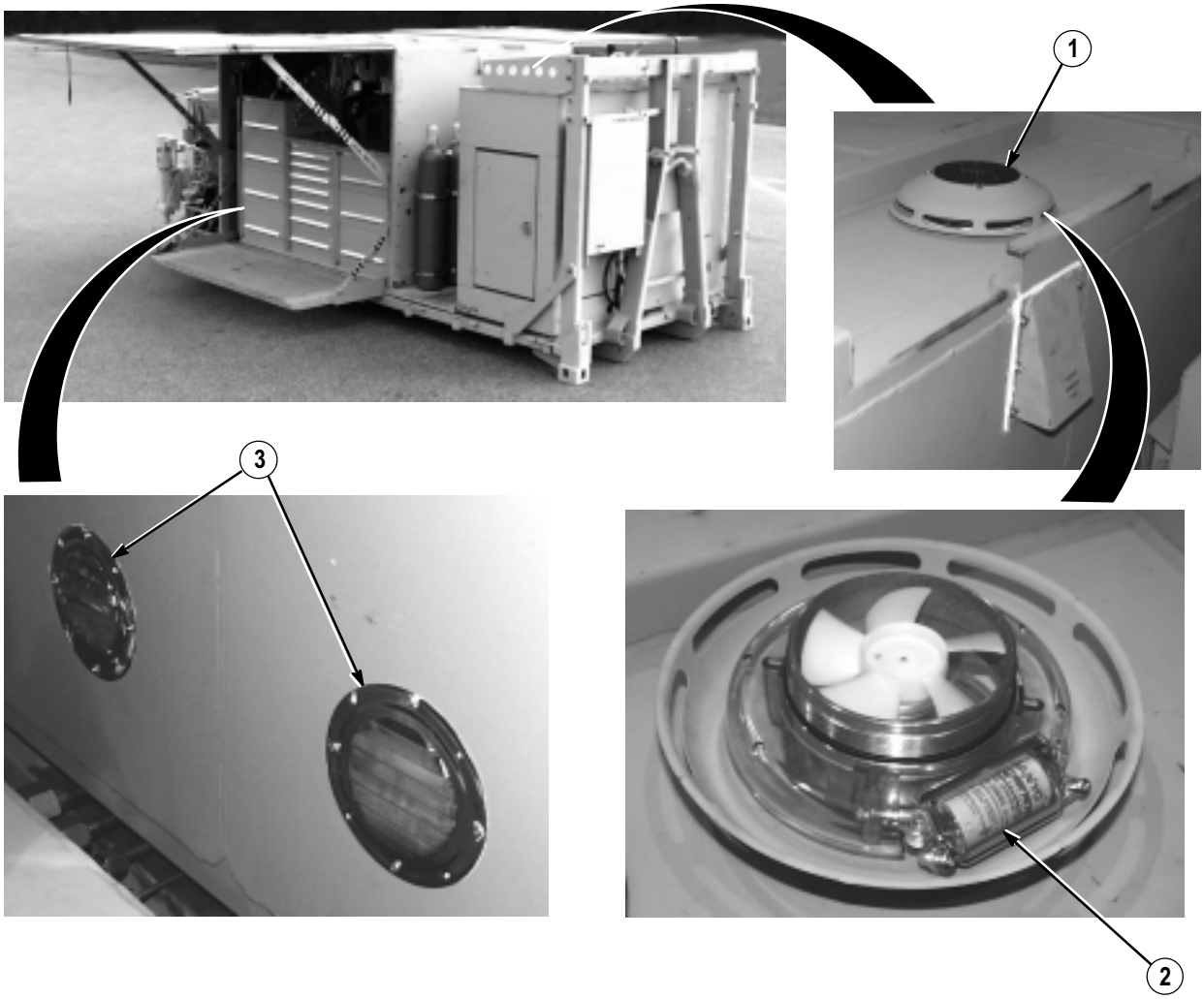
A coolant tank heater (5) is used to keep the engine coolant warm when the engine is shut down. It heats and circulates the coolant within the engine. This reduces startup time and lessens engine wear caused by cold starts. It is electrically operated and thermostatically controlled (ON at 70°F (21°C) and OFF at 100°F (38°C)). Connect the heater to a 110 VAC source of power that will be on during the time the engine is not running.

1-17. AIR COMPRESSOR SYSTEM.



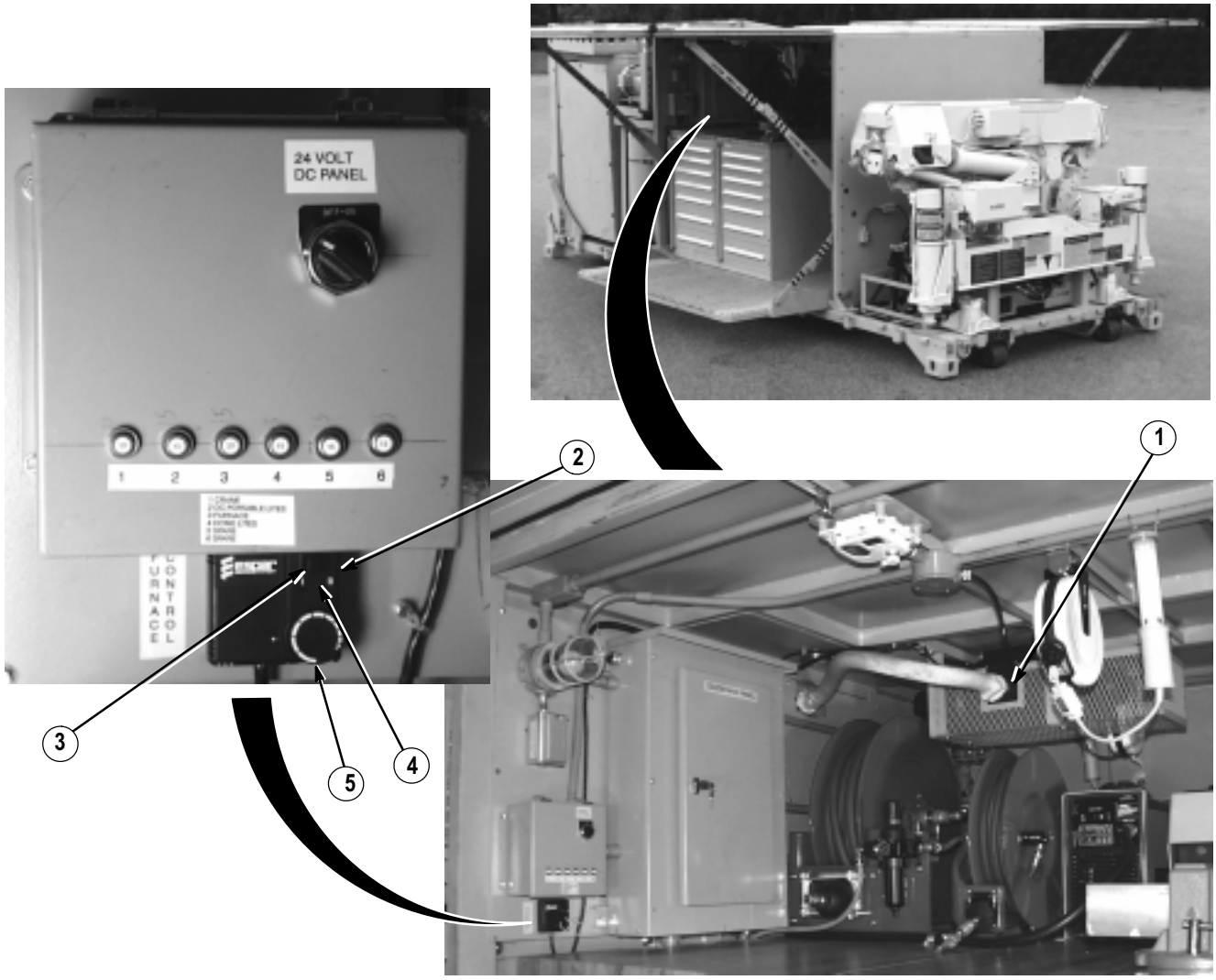
The air compressor system consists of air compressor (1) and a 80 gallon air reservoir (2). It can provide up to 175 psi of regulated compressed air to power pneumatic tools and any other operation. The air compressor is driven by 208 volt three phase electrical motor which can be manually controlled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

1-18. SOLAR AIR VENT.



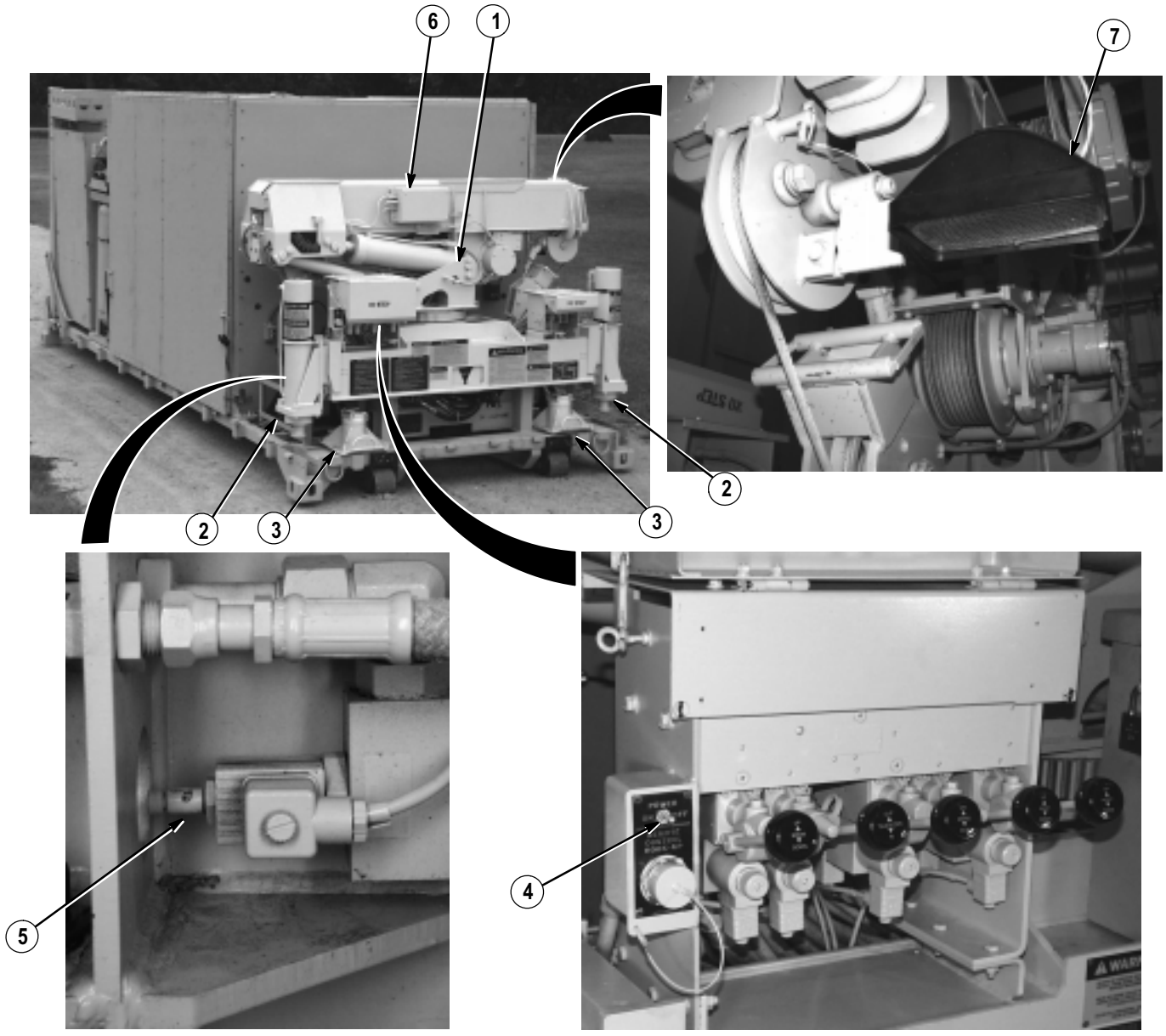
The solar air vent (1) combines solar cell technology with a standard Ni-Cad battery (2) to provide round-the clock ventilation. Air is drawn in two vents (3) on rear wall of shelter and exhausted through solar air vent. The solar air vent is used to equalize the humidity level inside and outside the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

1-19. SHELTER HEATER.



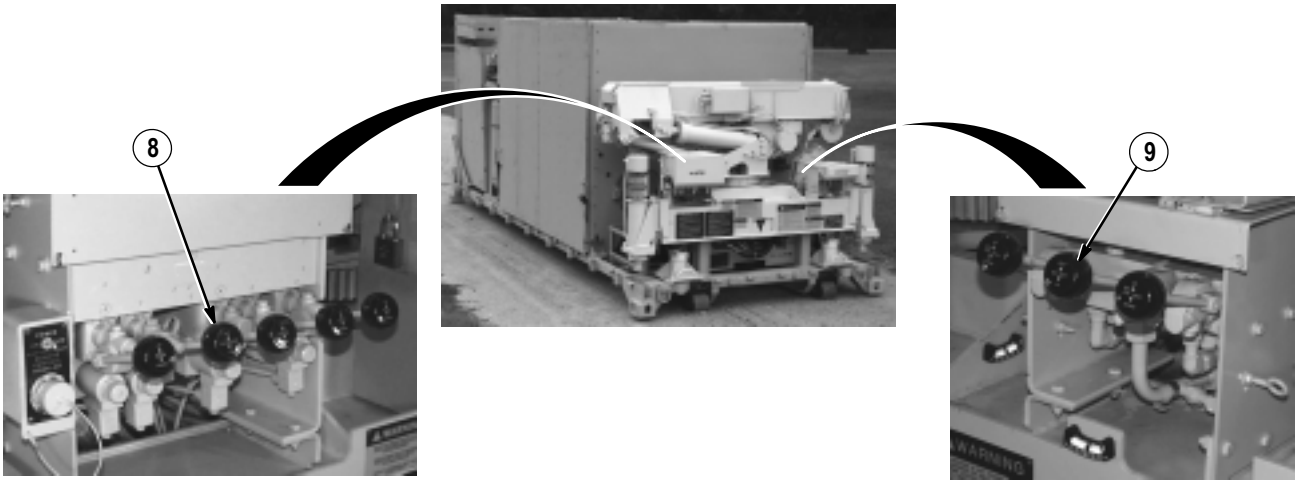
The shelter heater (1) is a diesel-fueled air heater, 24VDC system. Controlled by a thermostat with ON/OFF switch (2), red operating light (3) and green diagnostic light (4). The thermostat control dial (5) has a variable setting of approximately 50° F to approximately 85° F.

1-20. CRANE.

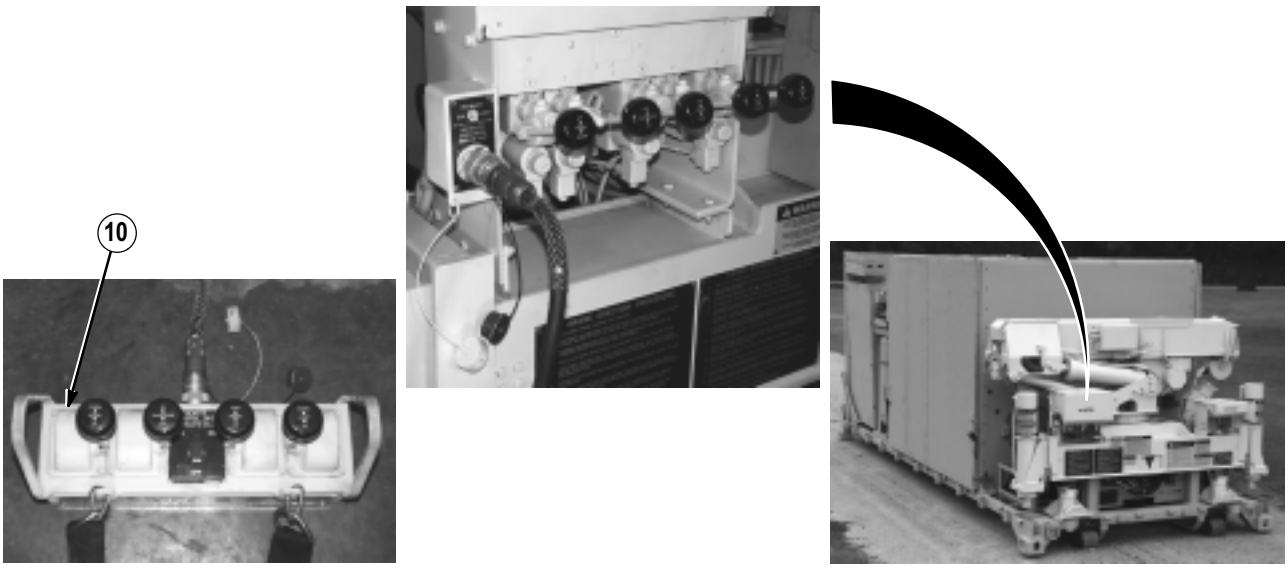


a. Crane. The FRS crane (1) is fully hydraulic and is powered by the FRS hydraulic system. The boom can rotate 300 degrees. The crane is capable of lifting up to 10,000 lbs (4,534 kg) load at a 14 ft (4.3 m). The FRS stability and leveling is accomplished with the left and right side hydraulically operated 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.

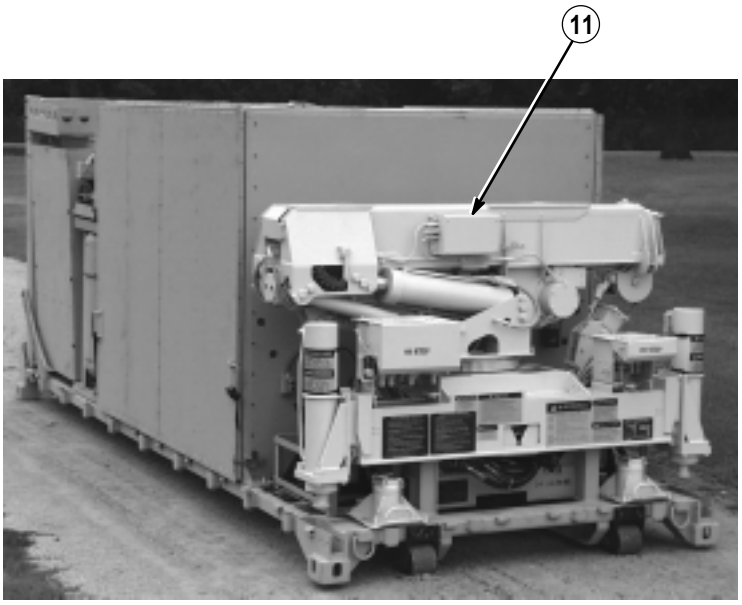
1-20. CRANE (CONT).

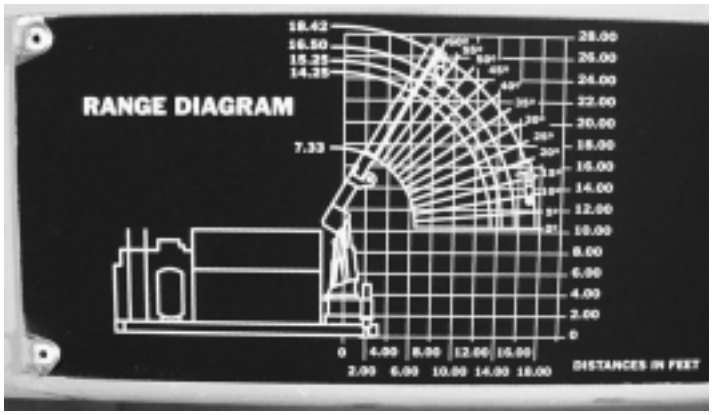


b. Fixed Controls. All crane controls and indicators are located to the rear of the crane. The crane controls (8) are to the left, the outrigger jack controls (9) are to the right and both are accessible to the operator while standing on the ground. Control valves, both crane and outrigger jack, automatically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



c. Remote Controls. The remote control system is designed to operate the spools of the directional control valve. Remote control is proportionally variable. Remote control (10) is provided with an emergency shutdown capability and designed so that when activated, all remote control crane functions cease. The operator can operate the remote control anywhere within 30 ft (9.2 m) of the crane base. The controller has multiple functions to match control levers on the crane controls.



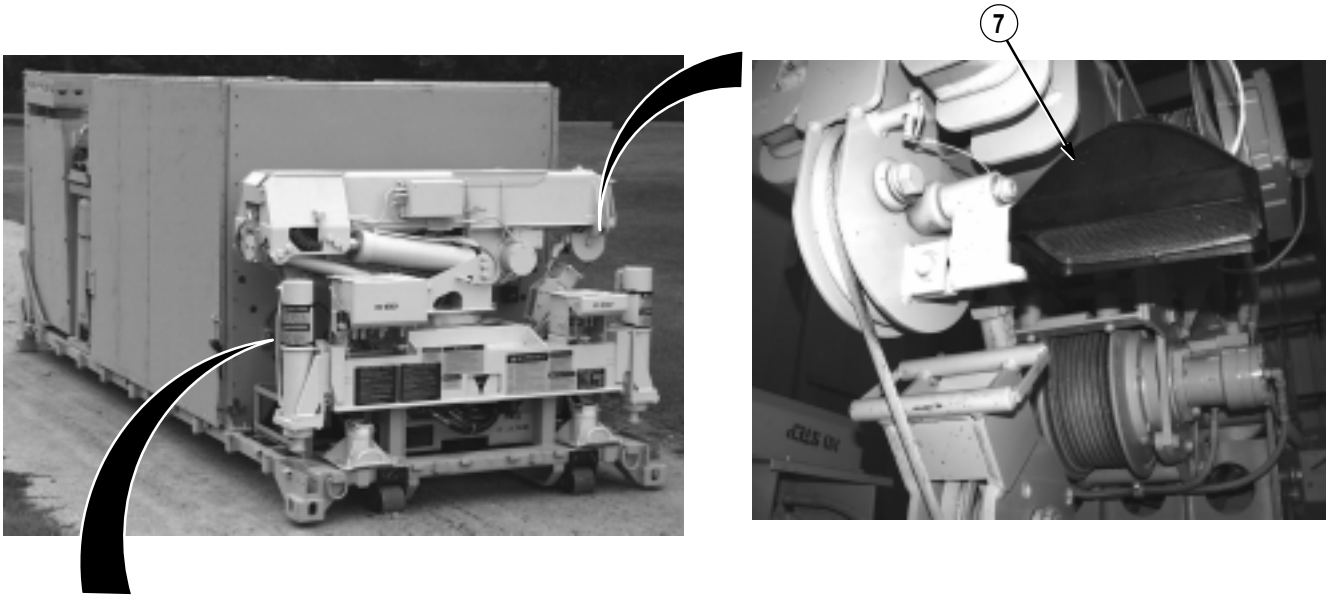


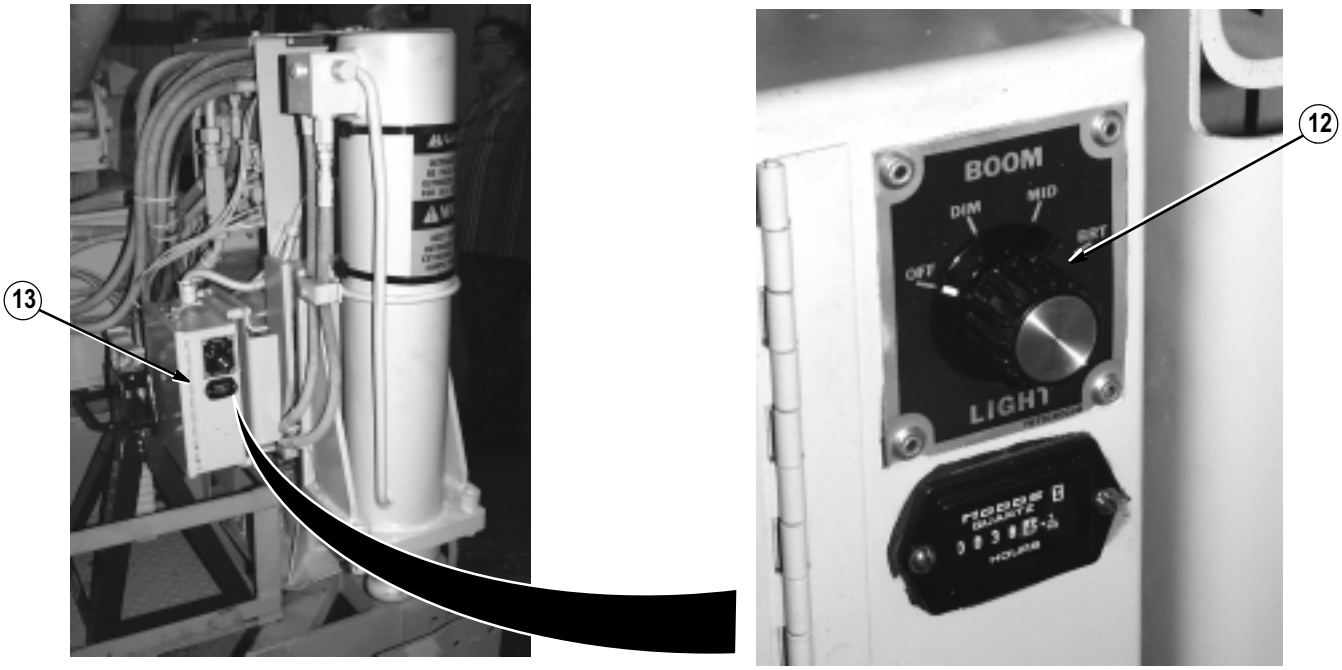
RADIUS (FT)	ON OUTRIGGERS, 300° LIFTING AREA BOOM LENGTH (FT)				
	7.33	14.25	15.25	16.50	18.42
4.00	10500				
7.00	10500				
8.00		10500	10500		
9.00		10500	10500	10000	
10.00		10500	10500	10000	9000
12.00		10000	10000	10000	9000
14.00		10000	10000	9000	8000
15.00			9000	8400	7900
16.00				8000	7500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

CAPACITIES ARE NET HOOK LOADS, IN LBS

d. Overload Shutdown. The crane is provided with an overload shutdown (11) which prevents structural overloading. Two block and overload conditions are sensed through line-pull of the hoist. A preprogrammed 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.

1-20. CRANE (CONT).





e. Boom Light. The 24VDC boom light (7) is powered directly from the FRS unit. As long as the FRS unit has power directed to the crane the light can be utilized even when the crane is not energized. The boom light switch (12) is located on the crane electrical box (13) and can be operated at three switchable intensities (DIM, MID & BRIGHT).

CHAPTER 2

UNIT MAINTENANCE

Section I. REPAIR PARTS; SPECIAL TOOLS; TEST, MEASUREMENT AND DIAGNOSTIC EQUIPMENT (TMDE); AND SUPPORT EQUIPMENT

2-1. COMMON TOOLS AND EQUIPMENT.

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

2-2. SPECIAL TOOLS, TMDE AND SUPPORT EQUIPMENT.

For a listing of special tools, TMDE and support equipment, refer to the Maintenance Allocation Chart (MAC), Appendix B, of this manual and to the Repair Parts and Special Tools List (RPSTL).

2-3. REPAIR PARTS.

Repair parts are listed and illustrated in the Repair Parts and Special Tools List (RPSTL) covering Unit Maintenance for this equipment.

Section II. SERVICE UPON RECEIPT

2-4. UNPACKING AND DEPROCESSING.

a. Unpacking. Upon receipt of a new FRS, the receiving organization must see if it has been properly prepared for service and is in good condition. Inspect all assemblies, subassemblies and accessories to be sure they are in proper working order (TM 9-4940-568-10). Secure, clean and correctly adjust and/or lubricate as needed (Para 2-9 and TM 9-4940-568-10). Check all tools and equipment to be sure every item is accounted for (SC 3990-CL), in good condition, clean and properly mounted or stowed (TM 9-4940-568-10).

b. Deprocessing. Read “Processing and Deprocessing Record of Shipping, Storage and Issue of FRS” tag, (DD Form 1397), and follow all precautions checked. This tag should be attached to the generator control panel access door.

2-5. HAND RECEIPT MANUAL AND INVENTORY OF EQUIPMENT.

When a new FRS is first received by the using organization, it is necessary to inventory the equipment. For detailed procedures, refer to Supply Catalog, SC 3990-CL.

2-6. SERVICE BEFORE OPERATION.

a. General.

(1) Refer to TM 9-4940-568-10 for operating instructions for the FRS.

(2) Upon receipt of a new, used or reconditioned FRS, the receiving organization must see if it has been properly prepared for service and is in good condition (TM 9-4940-568-10). Inspect all assemblies, subassemblies and accessories to be sure they are in proper working order. Secure, clean and correctly adjust and/or lubricate (Para 2-9 and TM 9-4940-568-10) as needed. Check all tools and equipment to be sure every item is there (SC 3990-CL), in good condition, clean and properly mounted or stowed (TM 9-4940-568-10).

(3) Follow general procedures for all services and inspections given in TM 9-4940-568-10.

b. Inspection and Servicing Equipment.

(1) When FRS is received, inspect all items for damage that may have occurred during shipping and unloading operations. Pay close attention to any loose or missing nuts, bolts, screws, access plates, drain plugs, draincocks, oil plugs, assemblies, subassemblies, or components that may be easily lost or broken in transit. Check Basic Issue Items (BII) against checklist to make sure all items are accounted for and are in good condition (TM 9-4940-568-10). Carefully list all discrepancies.

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.

(2) Clean all exterior surfaces coated with rust-preventive compound with drycleaning solvent (Item 38, Appendix C).

(3) Perform the Semiannual (6-month) Preventive Maintenance Checks and Services (PMCS), Table 2-1.

(4) Lubricate specific points shown in Para 2-9 and TM 9-4940-568-10 regardless of interval. Check processing tag for engine oil. If tag states the oil is good for 250 hours of operation and is of the proper grade for local climatic operation, check oil level but do not change oil.

(5) Schedule a semiannual service in accordance with DA Pam 738-750.

2-6. SERVICE BEFORE OPERATION (CONT).

WARNING

- Do not remove the radiator cap when the engine is hot; steam and hot coolant can escape and burn personnel.
- Use extreme care when removing the radiator pressure cap. Sudden release of pressure can cause a steam flash which could seriously injure personnel. Slowly loosen cap to the first stop to relieve pressure before removing cap completely. After opening, securely tighten cap.
- Use a clean, thick waste cloth or like material to remove radiator pressure cap. Avoid using gloves. If hot water soaks through gloves, personnel could be burned.

(6) Check radiator coolant. Check if solution is adequate for expected climatic conditions. Refer to TB 750-651 for preparation of antifreeze solutions. Put tag near filler cap with type of antifreeze and degree of protection written on tag.

c. Special Service Instructions.

(1) FRS Body and Sheet Metal Inspection.

(a) Inspect body and sheet metal for evidence of damage during shipment.

(b) Check doors, latches and hinges on compartments for proper operation.

(c) Check mounting hardware and tighten as necessary.

(2) Generator/Engine Inspection.

(a) Remove any seals, plugs or tape used to seal air inlets and ports on the engine during shipping.

(b) Check crankcase oil level with dipstick.

(c) Examine air cleaner element for dirty or restricted condition.

(d) Inspect engine and cooling hose connections for evidence of leakage.

(e) Clean away any obstruction of cooling air flow to radiator.

(3) Electrical System Inspection.

(a) Inspect battery cable connections and clean and tighten as necessary.

(b) Check generator set panel and shelter lights for burned out lamps, loose connections and dirty or broken lenses.

(c) Ensure alternator is charging properly.

(d) Ensure all electrical equipment functions.

(4) Air System Inspection.

(a) Drain any water from reservoirs.

(b) Inspect air lines and connections for leakage.

(5) Fuel System Inspection.

(a) Check fuel level and replenish, if necessary.

(b) Inspect fuel hoses, tubes, connections and filters for evidence of leakage.

Section III. PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS)

2-7. PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS) INTRODUCTION.

This section contains Unit Maintenance PMCS requirements for the Forward Repair System (FRS). The PMCS tables contain checks and services necessary to ensure the FRS is ready for operation. Using the PMCS tables, perform maintenance at the specified intervals. Perform preventive maintenance checks and services in TM 9-4940-568-10 before doing the Unit preventive maintenance.

2-8. GENERAL MAINTENANCE PROCEDURES.

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.

a. Cleanliness. Dirt, grease, oil and debris only get in the way and may cover up a serious problem. Use drycleaning solvent (Item 38**,** Appendix C) on metal surfaces and soapy water on rubber.

b. Bolts, Nuts and Screws. Check bolts, nuts and screws for obvious looseness, missing, bent or broken condition and tighten or replace as necessary. If they cannot be checked with a tool, look for chipped paint, bare metal or rust around bolt heads.

c. Welds. Look for loose or chipped paint, rust or gaps where parts are welded together. If a bad weld is found, notify the supervisor.

d. Electric Wires and Connectors. Look for cracked or broken insulation, bare wires and loose or broken connectors. Tighten loose connectors and make sure the wires are in good shape.

e. Fluid Hoses, Tubes and Fittings. Look for wear, damage, leaks and make sure clamps and fittings are tight. Wet spots show leaks, but a stain around a fitting or connector may indicate a leak. If connector or fitting is loose, tighten it. If something is broken or worn out, repair or replace per applicable procedure.

f. Fluid Leakage. It is necessary to know how fluid leakage affects the status of fuel, oil, coolant and the hydraulic systems. The following are definitions of the types/classes of leakage necessary to know in order to determine the status of the FRS. Learn, then be familiar with them and REMEMBER - WHEN IN DOUBT, NOTIFY THE SUPERVISOR!

CAUTION

Equipment operation is allowable with minor leakage (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 per applicable procedure.

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

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

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

g. 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.

h. Damage. Damage is defined as any condition that affects safety or would make the FRS unserviceable for mission requirements.

2-9. PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS) TABLES.

a. Do the SEMIANNUAL PREVENTIVE MAINTENANCE (Table 2-1) once every six months.

b. Do the ANNUAL PREVENTIVE MAINTENANCE (Table 2-1) once each year.

c. Do the BIENNIAL PREVENTIVE MAINTENANCE (Table 2-1) once every two years.

d. Always do the PREVENTIVE MAINTENANCE in the same order until it gets to be a habit. Once practiced, it will be easy to spot anything wrong in a hurry. Perform the checks and services listed in Tables 2-1 and 2-2 in the order listed.

e. If something does not work, troubleshoot with instructions in Section IV.

f. If anything looks wrong and is not fixed, write a DA Form 2404/5988-E.

g. When doing preventive maintenance, take along the tools and supplies needed to make all the checks, including a clean rags.

2-9. PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS) TABLES (CONT).

h. The following is a breakdown of the PMCS table:

(1) "Item No." column. Checks and services are numbered in a logical order for moving around the Forward Repair System (FRS). The item number column is used as a source of item numbers for the TM Number Column on DA Form 2404/5988-E, Equipment Inspection and Maintenance Worksheet, for recording results of the PMCS.

(2) "Interval" column. The column identifies when the PMCS should be performed. Lubrication services coincide with the vehicle's Semiannual Preventive Maintenance Service.

(3) "Item To Be Inspected" column. This column identifies the item to be inspected.

(4) "Procedure" column. This column contains all the information required to do the check/inspection. Art is integrated into the column to aid the user in identifying items. Whenever replacement or repair is recommended, reference is made to the applicable maintenance instructions.

(5) "Not Mission Capable If:" column. This column contains a brief statement of the condition (e.g., malfunction, shortage) that would cause the vehicle to be less than fully ready to perform its assigned mission.

NOTE

- If the vehicle must be kept in continuous operation, do only the procedures that can be done without disturbing operation. Make complete checks and services when the vehicle is shut down.
- Oil filters must be serviced/cleaned/changed as applicable, when they are known to be contaminated or clogged and at prescribed intervals.

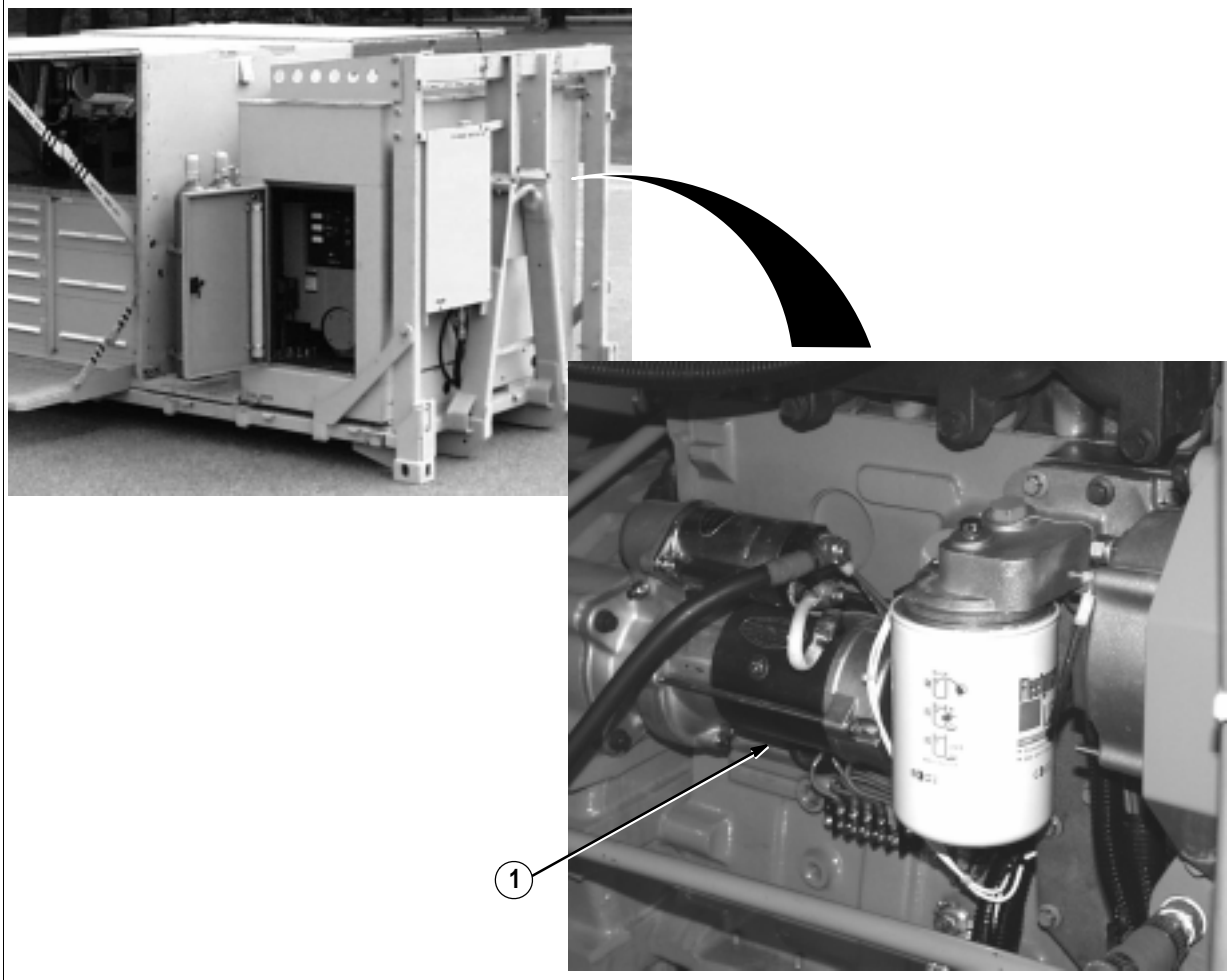
i. For operation of equipment in protracted cold temperatures below -15 degrees F (-26 degrees C), remove lubricants prescribed in lubrication table for temperatures above -15 degrees F (-26 degrees C). Relubricate with lubricants specified in lubrication table for temperatures below -15 degrees F (-26 degrees C). If OEA lubricant is required, see the temperature ranges prescribed in the lubrication table. OEA lubricant is to be used in place of OE/HDO 10 lubricant for all temperature ranges where OE/HDO 10 is specified in the lubrication table.

j. Perform all semiannual inspections in addition to the annual inspections at the time of the annual inspection. Perform all annual and semiannual inspections in addition to the biennial inspections at the time of the biennial inspection.

k. Engine oil/hydraulic oil must be sampled at 100 hours of operation or at 90-day intervals, whichever comes first, as prescribed by DA Pam 738-750. Hard-time intervals will be applied in the event AOAP laboratory support is not available.

Table 2-1. Unit Level Preventive Maintenance Checks and Services (PMCS).

Item No.	Interval	Item to Be Inspected	Procedure	Not Mission Capable If:
			PRIOR TO UNIT PMCS Ensure Operator/Crew has performed PMCS listed in TM 9-4940-568-10. **UNIT PMCS**	
			NOTE • The following will be performed prior to service of the FRS. • Run generator set for 10 minutes or until normal operating temperature is reached.	
1	Semi-Annual	Pre-Service Checks	***a.*** Notice if starter (1) engages smoothly and turns the engine at normal cranking speed.	Starter inoperable or makes excessive noise.



2-9. PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS) TABLES (CONT).

Table 2-1. Unit Level Preventive Maintenance Checks and Services (PMCS) (CONT).

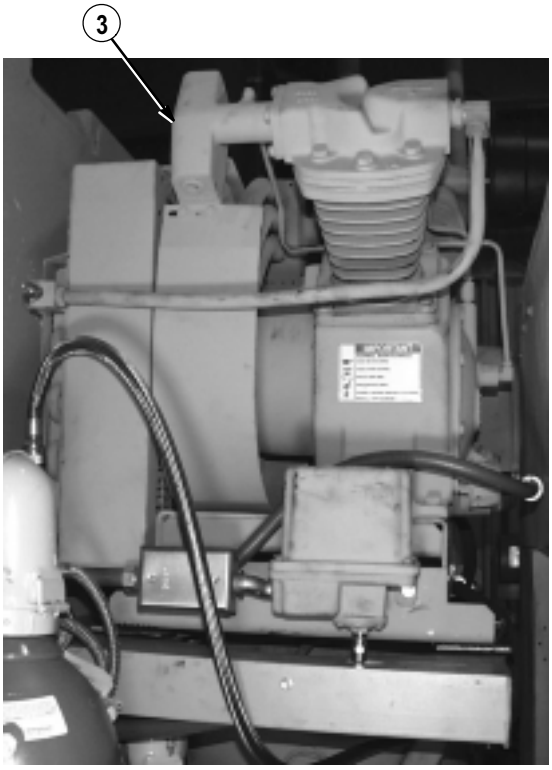
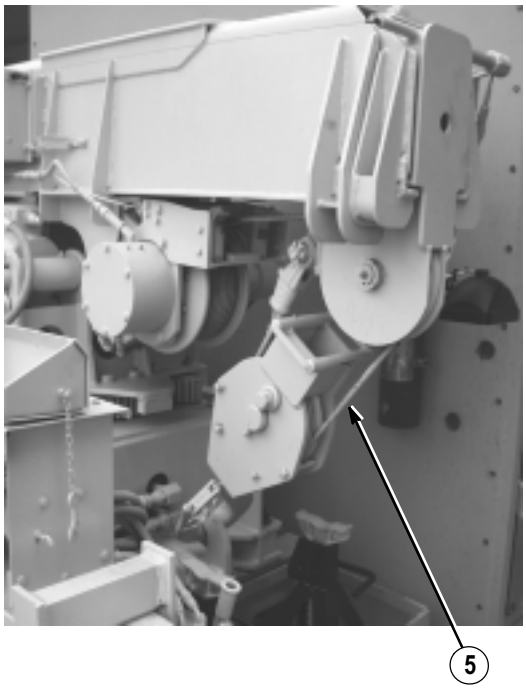
Item No.	Interval	Item to Be Inspected	Procedure	Not Mission Capable If:
			 	
1	Semi-Annual	Pre-Service Checks (cont.)	***b.*** Listen for unusual engine noise. Be alert for excessive vibrating and the smell of burning oil. Check AC voltage gage (2) for proper output. **NOTE** Run air compressor for five minutes or until air reservoir reaches 175 psi (1207 kPa). ***c.*** Notice if air compressor (3) engages smoothly and does not stall generator engine. Listen for air leaks. ***d.*** Listen for belt or motor noise during operation.	Engine knocks, rattles, or smokes excessively. No AC output.

Table 2-1. Unit Level Preventive Maintenance Checks and Services (PMCS) (CONT).

Item No.	Interval	Item to Be Inspected	Procedure	Not Mission Capable If:
			 	
1	Semi-Annual	Pre-Service Checks (cont.)	**NOTE** Put Crane into operation and run for 5 minutes (TM 9-4940-568-10).	
			e. Notice if hydraulic pump (4) engages smoothly and does not stall generator engine.	Hydraulic pump inoperable.
			f. Pay–out hoist winch cable (5) approximately four inches (10.2 cm) and retract cable. Check for excessive leaks on crane.	Hoist inoperable or excessive leaks evident.

2-9. PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS) TABLES (CONT).

Table 2-1. Unit Level Preventive Maintenance Checks and Services (PMCS) (CONT).

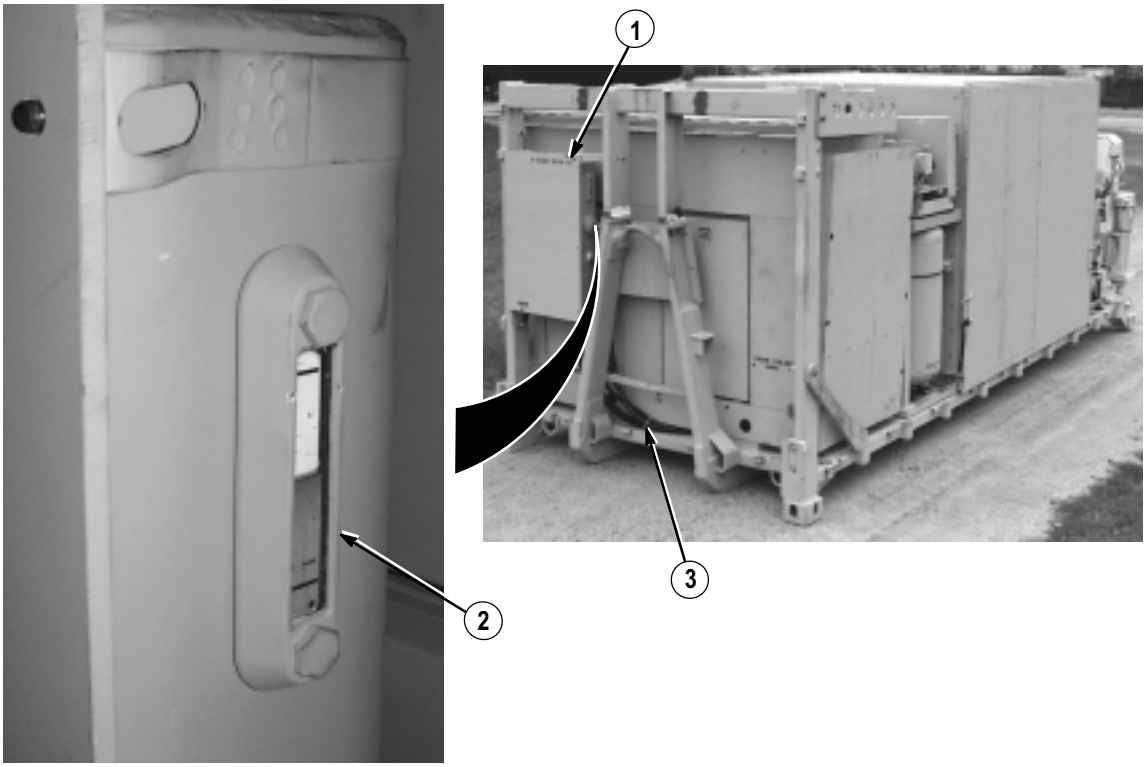
Item No.	Interval	Item to Be Inspected	Procedure	Not Mission Capable If:
				
2	Semi–Annual	Hydraulic Reservoir	***a.*** Check hydraulic reservoir (1) for cracks. leaks, or obvious damage. Replace hydraulic reservoir if necessary (Para 7-6). ***b.*** Check hydraulic oil level at hydraulic reservoir sight glass (2), fill with OE/HDO as required. Refer to Table 2-2. ***c.*** Take sampling of hydraulic oil for AOAP analysis.	Any Class III Leak is found. Faulty oil results from AOAP lab “Do not operate.”
3	Semi–Annual	Hydraulic Hoses and Tubes	Follow routing of all hydraulic hoses and tubes (3). Inspect for loose fittings, chafing, cracks, and leaks.	Loose fitting, cracks or leaks, are found.

Table 2-1. Unit Level Preventive Maintenance Checks and Services (PMCS) (CONT).

Item No.	Interval	Item to Be Inspected	Procedure	Not Mission Capable If:
				
4	Semi–Annual	Air Filter and Air Intake Hose	***a.*** Check air restriction indicator (1) for condition of air filter. Replace air filter as required (Para 8-12). ***b.*** Check air intake hose (2) for proper installation, cracks, breaks, or loose connections that could let unfiltered air into intake system.	Air filter is unserviceable. Hose cracked or unserviceable.

2-9. PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS) TABLES (CONT).

Table 2-1. Unit Level Preventive Maintenance Checks and Services (PMCS) (CONT).

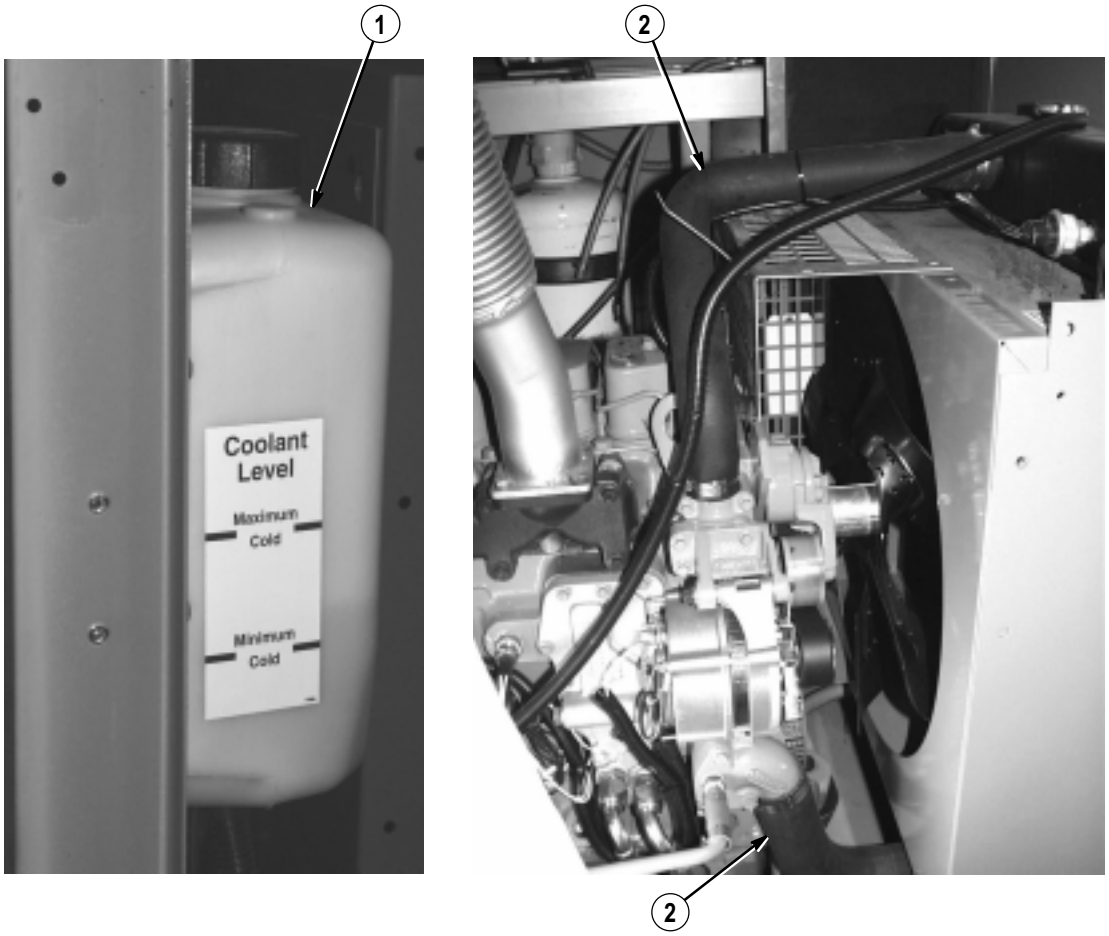
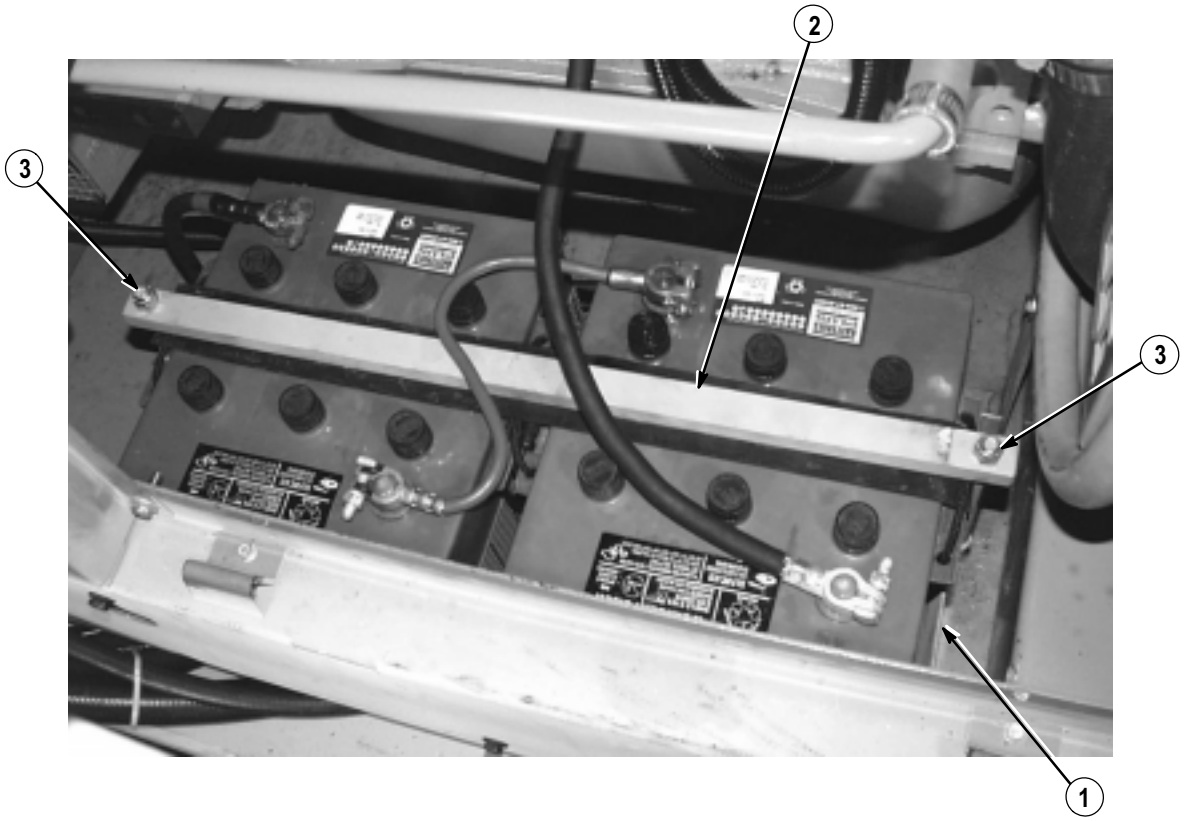
Item No.	Interval	Item to Be Inspected	Procedure	Not Mission Capable If:
				
5	Semi–Annual	Cooling System	***a.*** Check surge tank (1) coolant level and fill as necessary. Refer to Table 2-2. ***b.*** Check condition of coolant. Add or change coolant as necessary. Refer to Table 2-2. ***c.*** Check cooling system hoses (2) and piping for looseness, splits, wear, cracks, and leaks. Tighten loose parts or replace damaged parts.	Any Class III leaks are found.

Table 2-1. Unit Level Preventive Maintenance Checks and Services (PMCS) (CONT).

Item No.	Interval	Item to Be Inspected	Procedure	Not Mission Capable If:
				
6	Semi–Annual	Battery Box	Check battery box (1) for acid spills, debris, and corrosion. Check serviceability of battery hold down (2) and screws (3). **NOTE** If equipped with arctic batteries follow same PMCS procedures for standard batteries.	Hold down is damaged or missing.
7	Semi–Annual	Batteries	Check and record specific gravity of each cell (TM 9-6140-200-14). Check battery cables for fraying, splits, and looseness. Check battery terminals for cracks and serviceability. Remove batteries and clean and service batteries and box. Replace frayed, cracked or damaged parts as needed.	Battery is not within specific gravity level. Cables or terminals are unserviceable.

2-9. PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS) TABLES (CONT).

Table 2-1. Unit Level Preventive Maintenance Checks and Services (PMCS) (CONT).

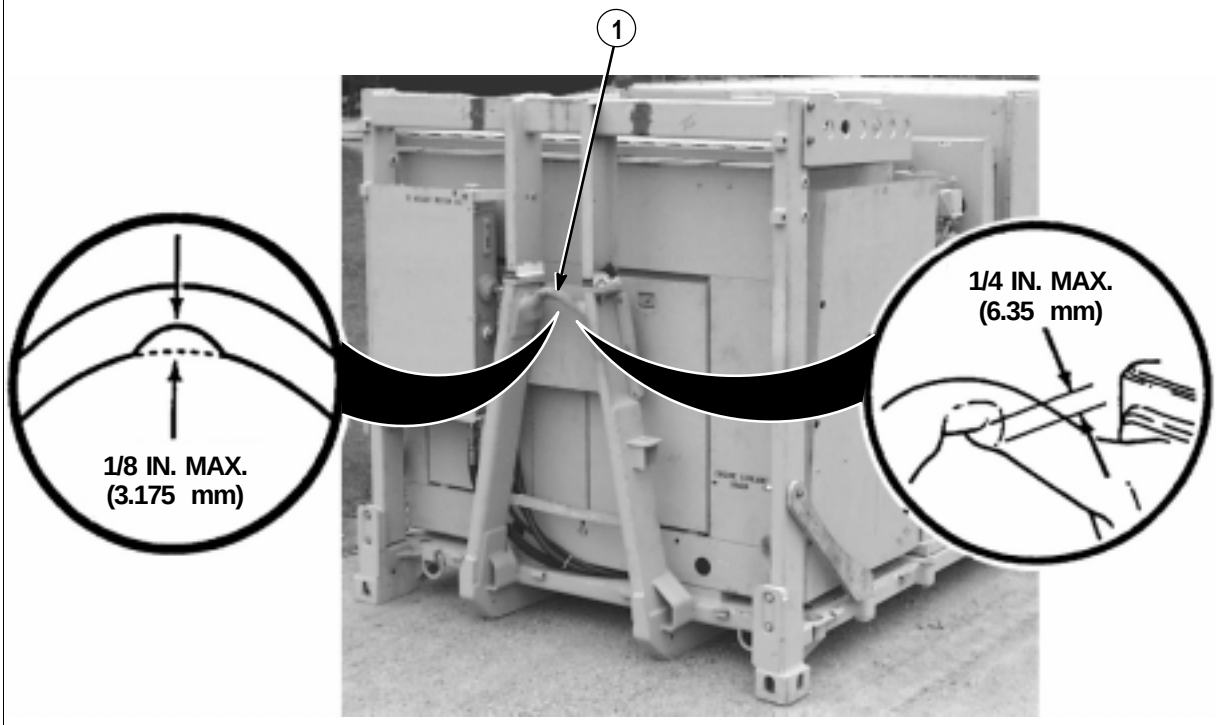
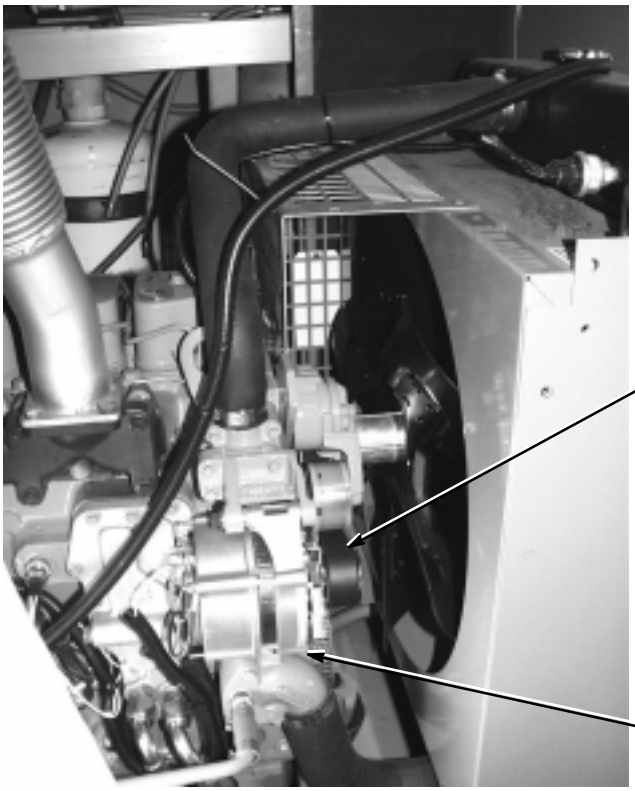
Item No.	Interval	Item to Be Inspected	Procedure	Not Mission Capable If:
				
8	Semi-Annual	Flatrack Weldments	Visually inspect all weldments for cracks and other damage. Report damage to supervisor.	Cracks or broken welds are found that will impair operation.
9	Semi-Annual	Hook Bar	Check hook bar (1) for wear. If wear at lower back side of hook bar is greater than 1/4 in. (6.35 mm) or greater than 1/8 in. (3.175 mm) at bottom of hook bar, notify supervisor.	Wear at lower back side of hook bar is greater than 1/4 in. (6.35 mm) or greater than 1/8 in. (3.175 mm) at bottom of hook bar.

Table 2-1. Unit Level Preventive Maintenance Checks and Services (PMCS) (CONT).

Item No.	Interval	Item to Be Inspected	Procedure	Not Mission Capable If:
				
10	Semi-Annual	Engine Compartment	***a.*** Drain engine oil and change engine oil filter every 250 hrs or semi-annually, whichever comes first (Para 8-2). Refill with OE/HDO as required (Table 2-2).	Any Class III leak is found.
			b. Check engine seals, gaskets and oil lines for evidence of oil leaks. If leaks exist, replace appropriate seal or gasket or tighten line.	Any Class III leak is found.
			c. Check engine wiring for fraying, splits, missing insulation and loose terminal connections. Repair wiring if damaged. Tighten loose connections.	
			d. Check alternator (1) mounting hardware and drive belt (2) for looseness, cracks or damage. Replace damaged mounting hardware or belt. Refer to Para 8-31.	
			e. Check fuel lines and filter for cracked, frayed or loose hoses or lines. Check for evidence of leaks.	Any Class III leak is found.

2-9. PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS) TABLES (CONT).

Table 2-1. Unit Level Preventive Maintenance Checks and Services (PMCS) (CONT).

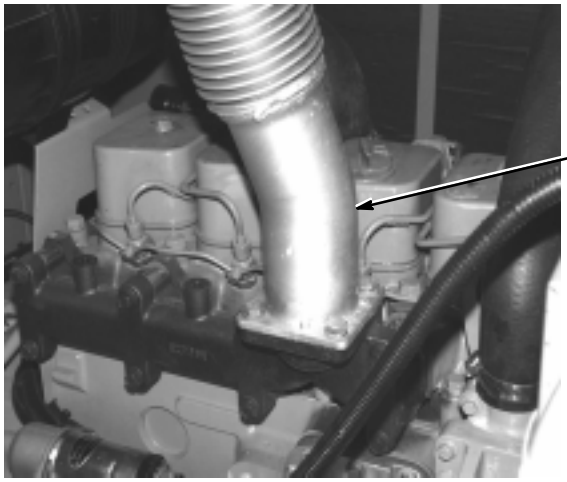
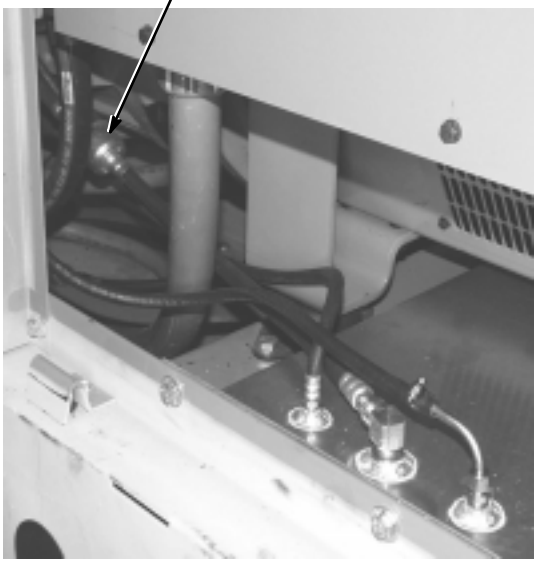
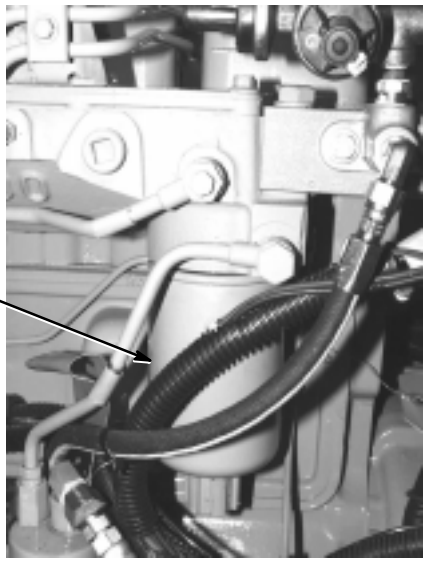
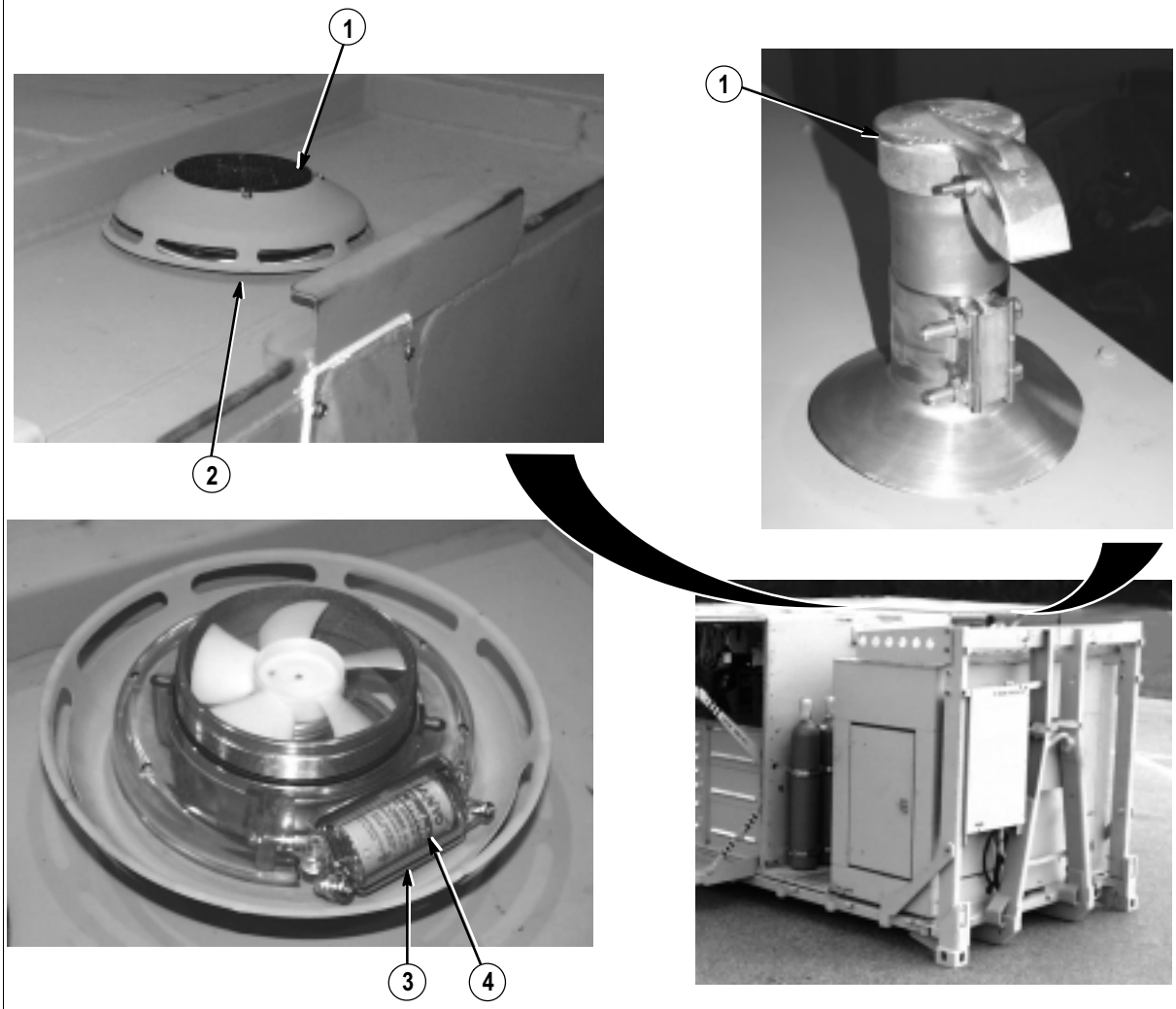
Item No.	Interval	Item to Be Inspected	Procedure	Not Mission Capable If:
				
				
				
10	Semi-Annual	Engine Compartment	***f.*** Check all exhaust pipes (3) and clamps for damage or looseness. Check for evidence of exhaust leaks at connections. Replace damaged exhaust parts. Tighten loose connections (Para 8-23).	
			g. Replace primary (4) and secondary (5) fuel filters every 250 hours or semiannually (Para 8-18 and 8-19).	Any Class III leak is found.

Table 2-1. Unit Level Preventive Maintenance Checks and Services (PMCS) (CONT).

Item No.	Interval	Item to Be Inspected	Procedure	Not Mission Capable If:
				
11	Semi-Annual	Exhaust System	Check rain cap (1) to ensure it operates freely and that it closes off exhaust pipe when the engine is not running. Replace rain cap if missing or damaged (Para 8-23).	
12	Semi-Annual	Solar Vent	***a.*** Clean solar array (1) of solar vent (2) and check for cracks or obvious damage. ***b.*** Clean electrical contacts inside battery case (3). If battery (4) no longer performs at peak performance, replace battery. Refer to Para 12-2.	

2-9. PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS) TABLES (CONT).

Table 2-1. Unit Level Preventive Maintenance Checks and Services (PMCS) (CONT).

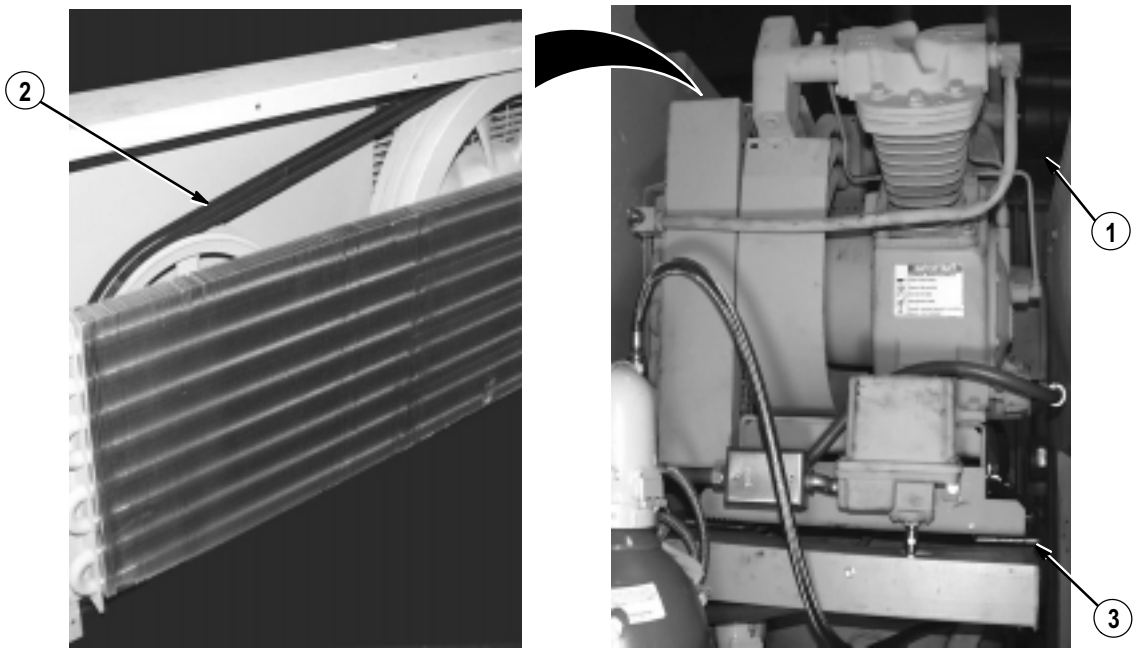
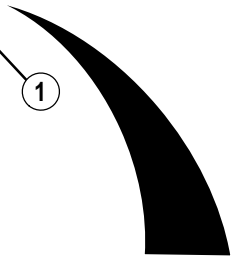
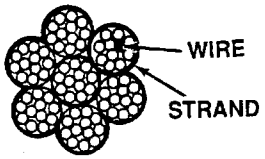
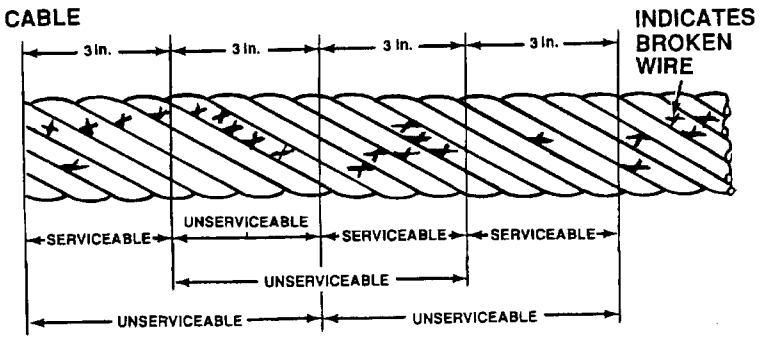
Item No.	Interval	Item to Be Inspected	Procedure	Not Mission Capable If:
				
13	Semi-Annual	Air Compressor	***a.*** Check all lines, hoses and connections for frays, looseness or leaks. Replace damaged hoses and line. Tighten all loose connections. Refer to Para 11-2. ***b.*** Check condition of intake filter (1). Replace filter as required. Refer to Para 11-6. ***c.*** Check air compressor belt (2) for 1/2 in. deflection, cracks, frays or excessive wear. Tighten or replace belt as necessary. Refer to Para 11-3. ***d.*** Check rubber mounts (3) under air compressor for deterioration and looseness. Replace rubber mounts as necessary. Refer to Para 11-2. ***e.*** Drain air compressor crank case oil every 250 hours or semi-annually, whichever comes first (Para 11-9). Refill with OE/HDO as required (Table 2-2).	

Table 2-1. Unit Level Preventive Maintenance Checks and Services (PMCS) (CONT).

Item No.	Interval	Item to Be Inspected	Procedure	Not Mission Capable If:
			   	
14	Semi-Annual	Crane Hoist Cable	Inspect crane hoist cable (1) for weak points in cable and points where greatest stress occurs. ***a.*** Inspect for worn spots. Worn spots will show up as shiny flattened spots on cable strands. ***b.*** Strands must be inspected to determine if one or more wires are broken. ***c.*** Inspect strands. If individual wires are broken next to one another, count broken wires. If six randomly distributed broken wires in one lay (distance in which strands make one complete turn around the cable) or three broken wires in one strand in one lay are found, replace cable (Para 5-5).	***a.*** Outer wires are reduced in diameter by one-fourth. ***b.*** Cable is frayed, kinked, worn or corroded.

2-9. PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS) TABLES (CONT).

Table 2-1. Unit Level Preventive Maintenance Checks and Services (PMCS) (CONT).

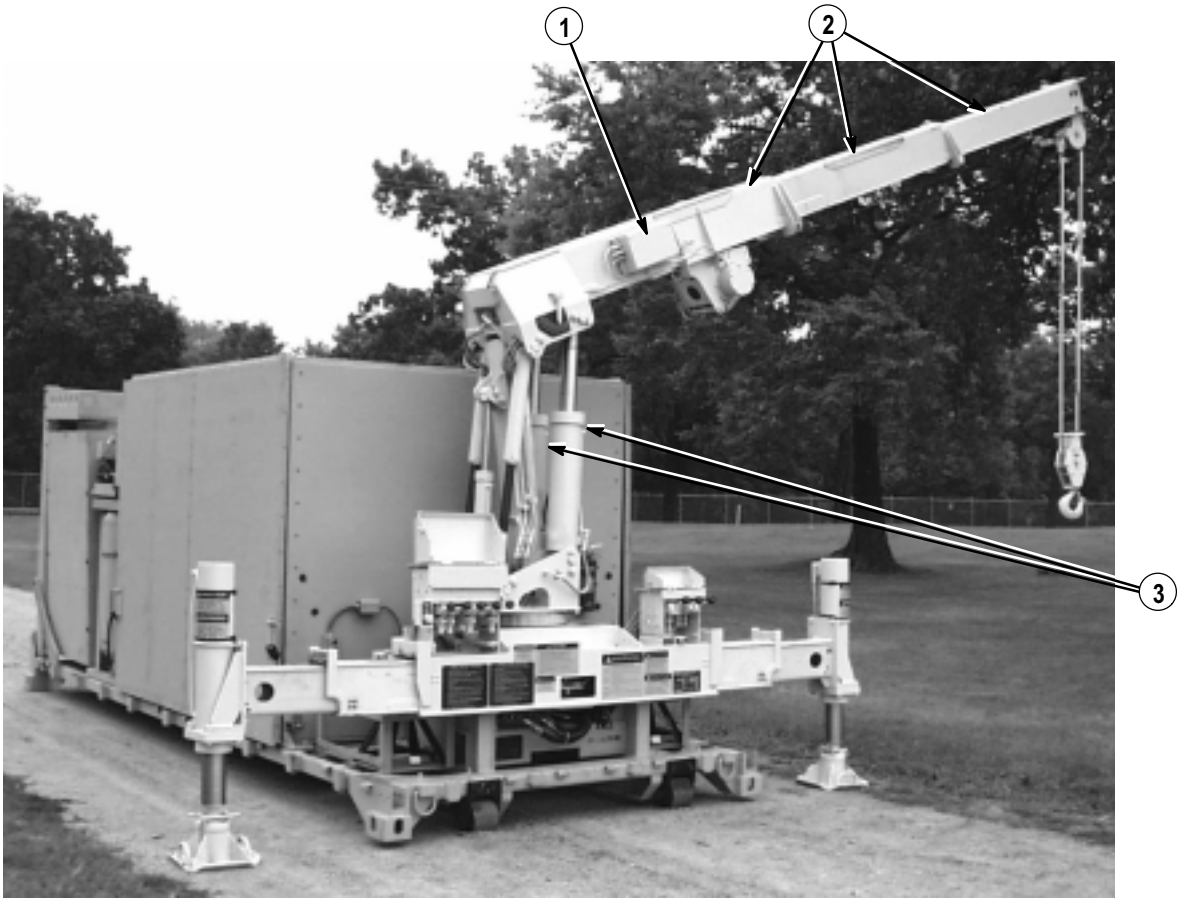
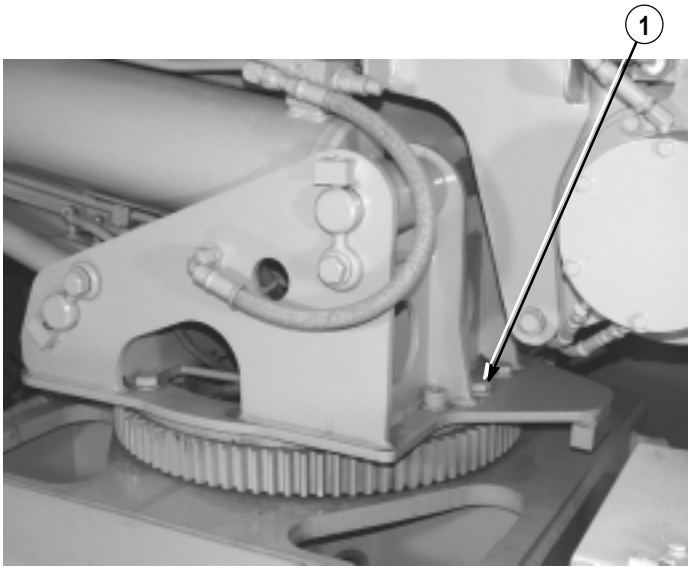
Item No.	Interval	Item to Be Inspected	Procedure	Not Mission Capable If:
				
15	Semi-Annual	Material Handling Crane	***a.*** Raise crane boom (1) and extend boom (2) (TM 9-4940-568-10). Check cylinder piston rods (3) for bends and scoring. ***b.*** Check crane boom (1) for deformation, cracks or broken welds.	Piston rods are scored or bent. Crane boom is deformed, cracked or has broken welds.

Table 2-1. Unit Level Preventive Maintenance Checks and Services (PMCS) (CONT).

Item No.	Interval	Item to Be Inspected	Procedure	Not Mission Capable If:
			 	
			NOTE • If an air-operated grease gun does not purge the fitting, use a hand-operated grease gun. If the part does not purge, remove fitting and clean, install fitting and grease again. If part still does not purge, refer to maintenance task for that component. • When using a grease gun, apply lubricant to the fitting until clean lubricant squeezes out of the part being lubricated.	
16	Semi-Annual	Material Handling Crane	While operating Material Handling Crane (MHC), check that engine maintains 1800 ± 50 rpm during hoisting operation. If engine surges erratically refer to troubleshooting, Section IV.	Engine does not maintain 1800 ± 50 rpms.
17	Semi-Annual	Material Handling Crane	Check torque of inner turntable bearing screws (1). Tighten screws to 370 lb-ft (502 N·m).	Screws are missing.
18	Semi-Annual	Material Handling Crane	Check torque of crane base mount bolts and ensure jam nuts are present.	Any bolt or jam nut is missing.
19	Semi-Annual	Material Handling Crane	Check hydraulic tubes and hoses for splits, cracks, leaks or signs of wear.	Crane tubes or hoses are damaged.

2-9. PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS) TABLES (CONT).

Table 2-1. Unit Level Preventive Maintenance Checks and Services (PMCS) (CONT).

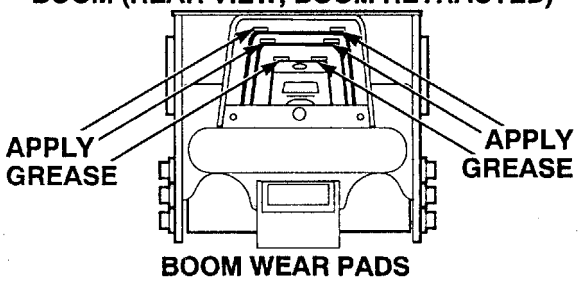
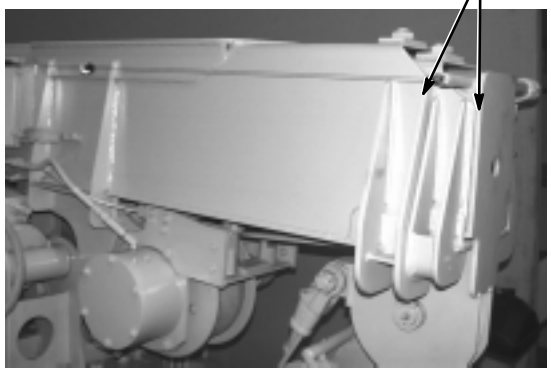
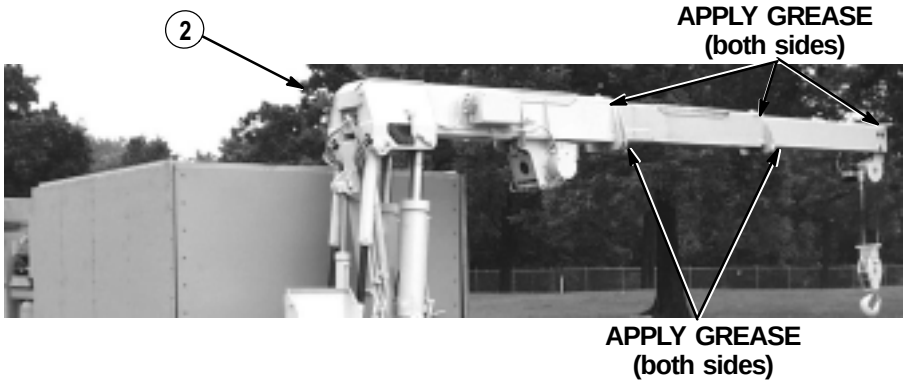
Item No.	Interval	Item to Be Inspected	Procedure	Not Mission Capable If:
			 BOOM (REAR VIEW, BOOM RETRACTED)  	
20	Semi-Annual	Boom Wear Pads	***a.*** Inspect boom wear pads on crane boom (1) for wear. Replace worn pads, notify supervisor. ***b.*** Lubricate boom wear pads with GAA, perform the following procedures: (1) Refer to TM 9-4940-568-10 and shut off FRS. (2) Remove cover (2) at rear of boom. (3) Inject grease in front of each rear (upper) wear pad.	Boom wear pads are worn.

Table 2-1. Unit Level Preventive Maintenance Checks and Services (PMCS) (CONT).

Item No.	Interval	Item to Be Inspected	Procedure	Not Mission Capable If:
20	Semi-Annual	Boom Wear Pads (continued)	 **WARNING** Do not allow personnel to perform maintenance directly under the boom or mast. Failure to follow proper procedures could cause serious injury or death. (4) Refer to TM 9-4940-568-10 and raise crane and extend boom. (5) Apply grease to front (lower) wear pads. (6) Extend and retract boom. If boom chatters or does not smoothly extend/retract, refer to TM 9-4940-568-10, return crane to stowed position and shut off MAIN POWER switch. Repeat Steps (3) through (5). (7) With boom extended, visually inspect that the boom sections undersides are evenly greased along the boom wear pad riding surfaces. If bare spots are present, refer to TM 9-4940-568-10, return crane to stowed position and shut off MAIN POWER switch. Repeat Steps (3) through (6). (8) Install cover plate (2) at rear of boom. (9) If boom continues to chatter or does not smoothly extend/retract, replace wear pads, notify supervisor.	

2-9. PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS) TABLES (CONT).

Table 2-1. Unit Level Preventive Maintenance Checks and Services (PMCS) (CONT).

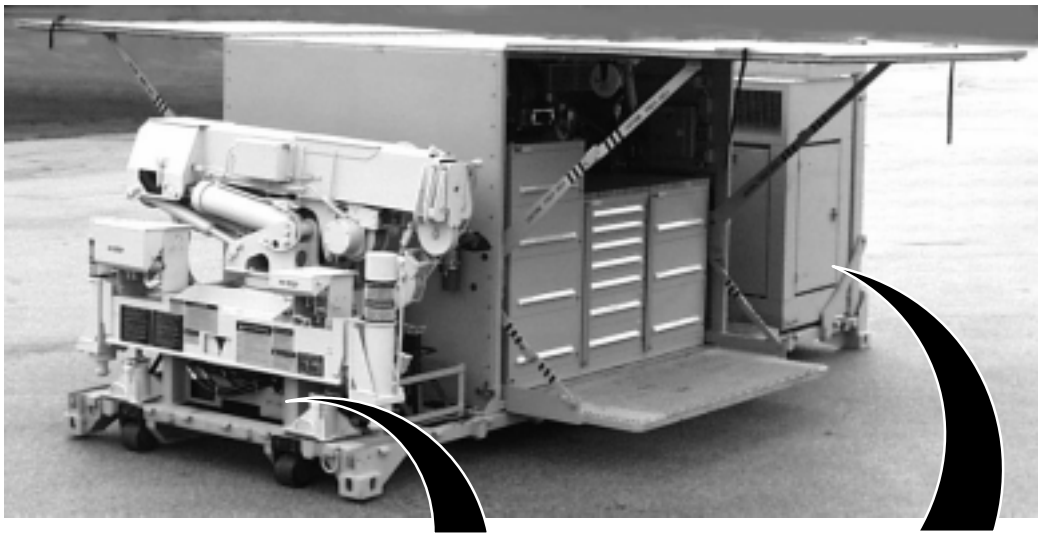
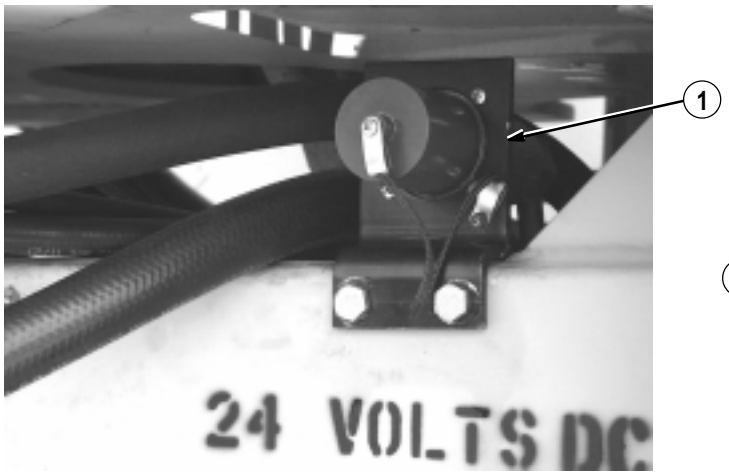
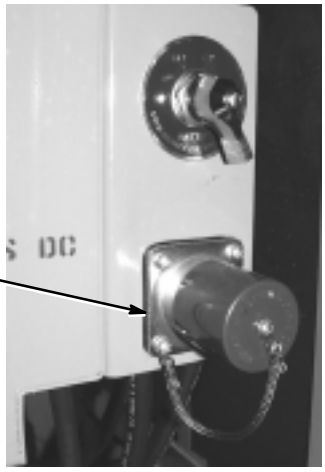
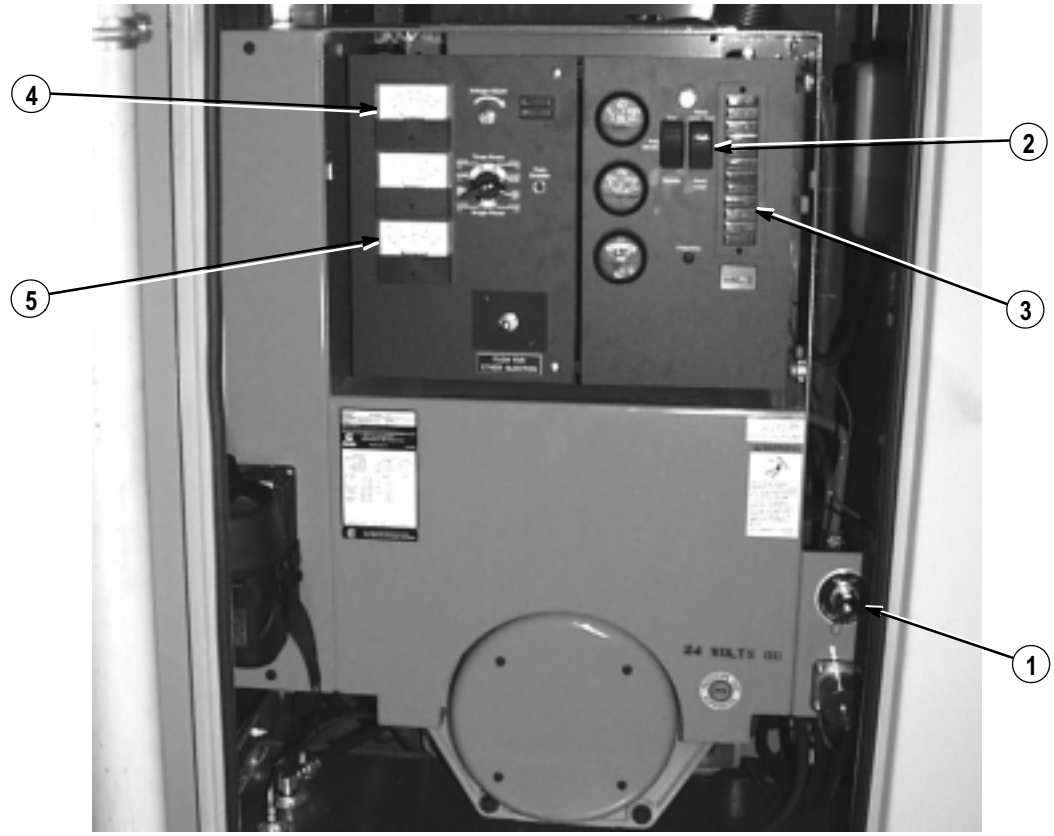
Item No.	Interval	Item to Be Inspected	Procedure	Not Mission Capable If:
			  	
21	Semi-Annual	Slave Receptacle (two each)	Check NATO slave receptacles (1) terminals for damage. Replace if damaged (Para 3-5).	

Table 2-1. Unit Level Preventive Maintenance Checks and Services (PMCS) (CONT).

Item No.	Interval	Item to Be Inspected	Procedure	Not Mission Capable If:
				
22	Semi-Annual	Generator	**a.** Turn MASTER DISCONNECT switch (1) ON and press the LAMP TEST switch (2) to insure that all warning lamps (3) are operational. **b.** Start generator engine (TM 9-4940-568-10). Check there are no warning lamps (3) illuminated. **c.** Ensure AC voltage gage (4) reads between 110-120 volts. Refer to Para 3-15 for adjustment of AC volts. **d.** Ensure Hertz-RPM gage (5) reads 1800 RPM ± 50. Refer to Para 8-16 for adjustment.	After adjustment, voltage gage does not read between 110-120 volts. After adjustment, Hertz/RPM gage does not read 1800 RPM ± 50.

2-9. PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS) TABLES (CONT).

Table 2-1. Unit Level Preventive Maintenance Checks and Services (PMCS) (CONT).

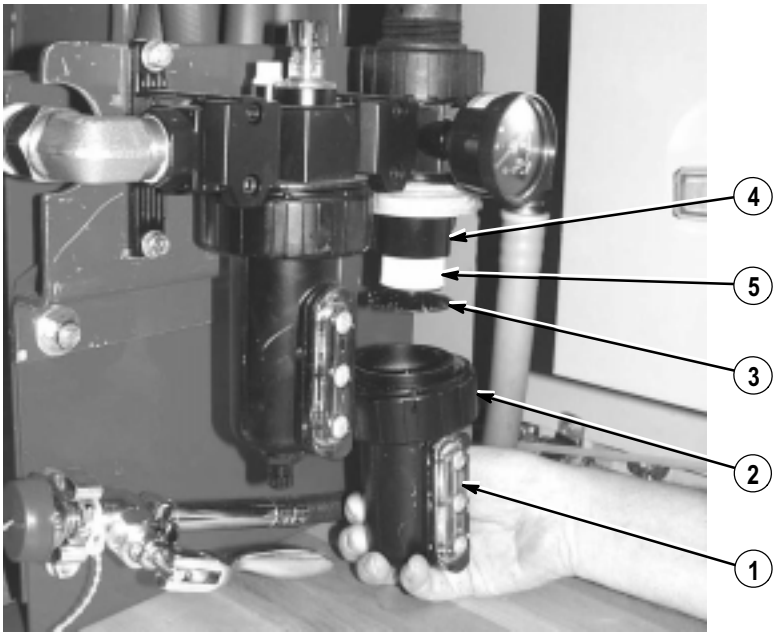
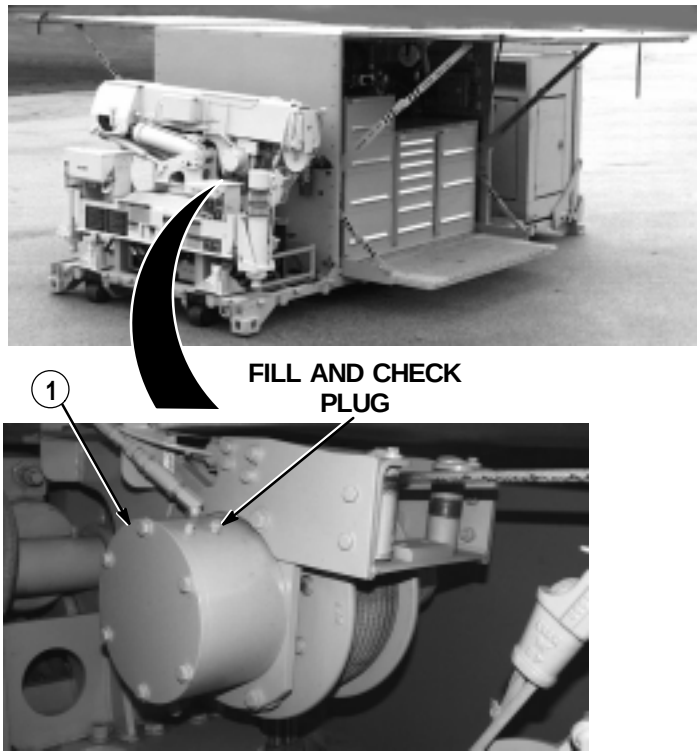
Item No.	Interval	Item to Be Inspected	Procedure	Not Mission Capable If:
				
23	Semi-Annual	Sheet Metal and Frame	**a.** Inspect sheet metal and frame of shelter for evidence of corrosion damage such as surface color change, surface separation, blistered paint, rust, or other evidence of damage.	Damage to frame interferes with operation of FRS.
			b. Check for broken frame welds, cross members or damage to undercarriage.	Frame welds are broken.
			NOTE The following procedures are identical for both air regulator/water separator filters. The right side pneumatic air regulator is shown.	
24	Annual	General/ Pneumatic Air Regulators/ Water Separators	Replace filters. Remove regulator bowl (1) by turning retaining nut (2) counterclockwise. Remove retaining nut (3), filter housing (4) and filter (5). Install in reverse order.	

Table 2-1. Unit Level Preventive Maintenance Checks and Services (PMCS) (CONT).

Item No.	Interval	Item to Be Inspected	Procedure	Not Mission Capable If:
				
			NOTE Per TB 43-0142, cranes must be load tested after extensive repair, modification or if crane has remained idle for one or more years.	
25	Annual	Material Handling-Crane	Notify Direct Support Maintenance if crane meets requirements for load testing.	
26	Annual	Material Handling-Crane	Schedule a turntable bearing inspection. Notify Direct Support Maintenance.	
27	Biennial	Crane Hoist Drum	Check oil level in hoist drum (1) every 250 hours of operation or biennially, whichever comes first. Fill with GO as required. Refer to Table 2-2.	Any Class III leaks are found.

2-9. PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS) TABLES (CONT).

Table 2-1. Unit Level Preventive Maintenance Checks and Services (PMCS) (CONT).

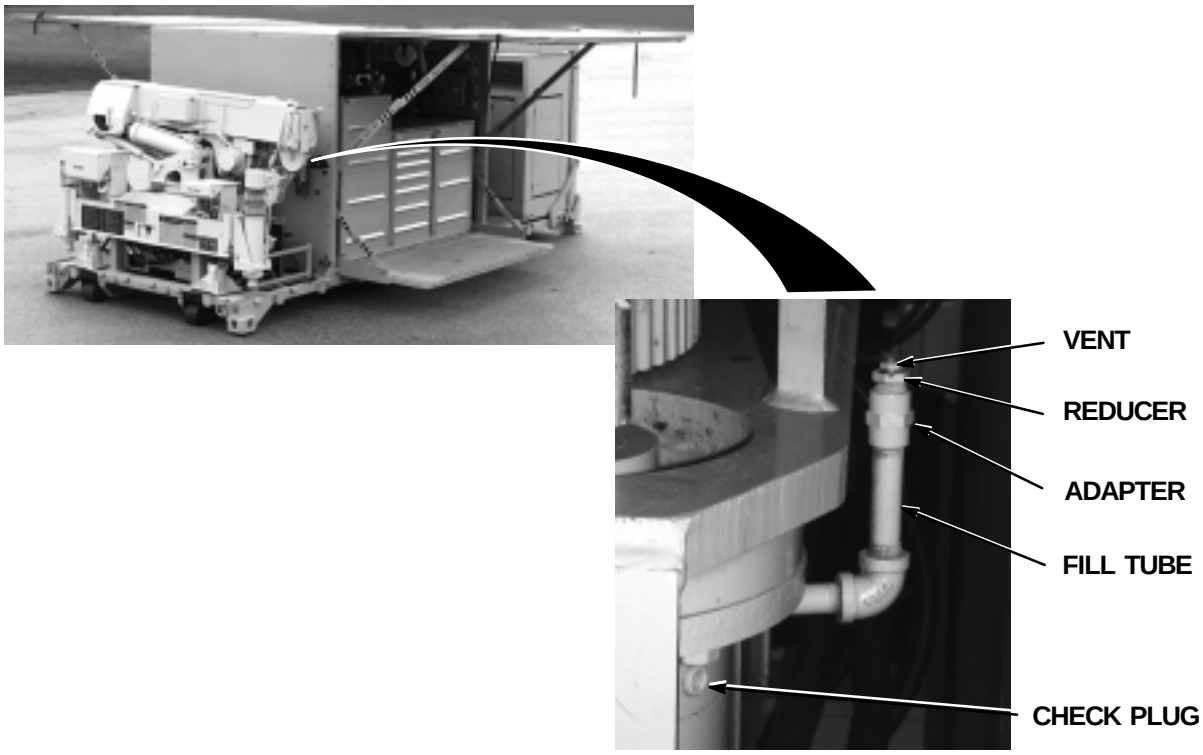
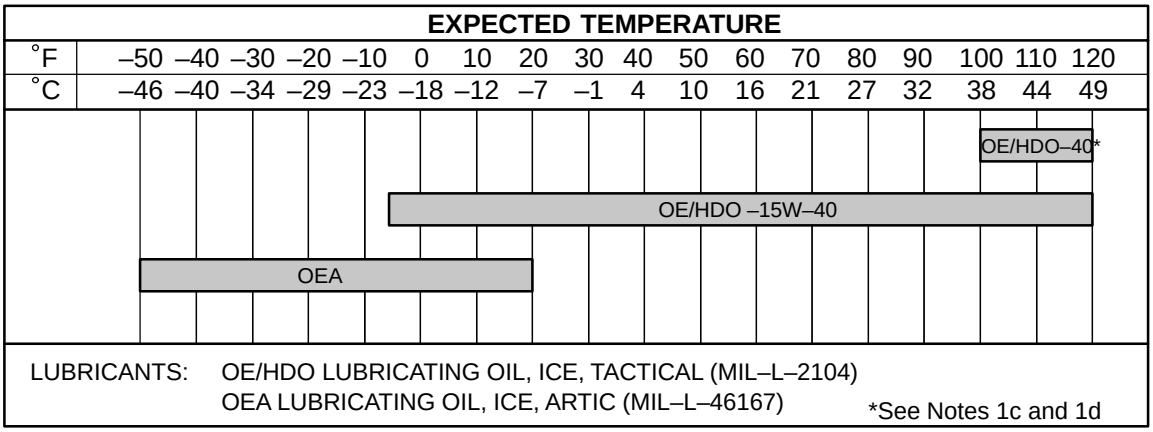
Item No.	Interval	Item to Be Inspected	Procedure	Not Mission Capable If:
				
28	Biennial	Crane Swing Drive Gear Box	To check and fill the swing drive gearbox, perform the following procedures: (1) Remove vent cap at top of filler tube. (2) Remove check plug from gear box. (3) Check that lubricant is visible at bottom of hole of check plug. (4) If required, fill gearbox with lubricant. (5) Replace vent cap. (6) Install check plug. Check oil level in swing drive gearbox every 250 hours of operation or biennially, whichever comes first. Fill with GO as required. Refer to Table 2-2.	Any Class III leaks are found.
29	Biennial	Air Compressor	Install air compressor service kit. Refer to Para 11-4.	

Table 2-2. 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 S – SEMIANNUALLY (6 MONTHS) BI – BIANNUALLY (2 YEARS)	
	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.		
	Crane Hoist	1. pt (0.473 l)	See Chart E.		
	Crane Turntable Gear Box	40 oz (1193.98 G)	See Chart E.		
	Air Lubricant	As required	See Chart F.		

2-9. PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS) TABLES (CONT).

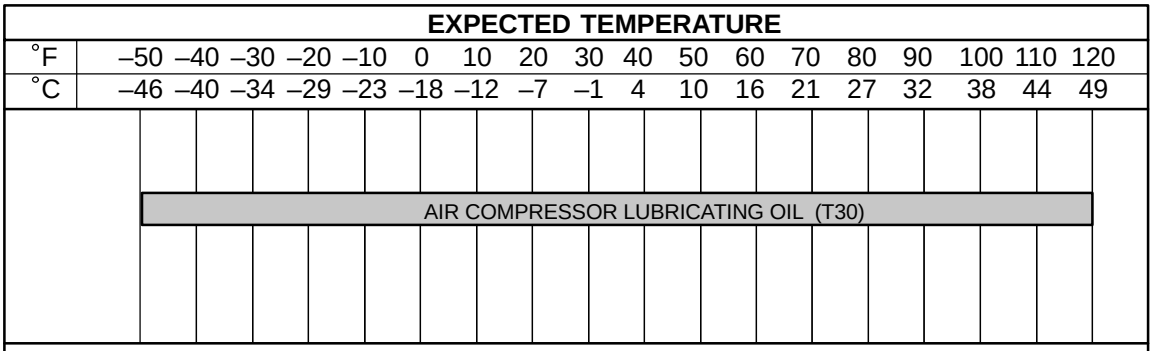
CHART A. ENGINE



LUBRICANTS: OE/HDO LUBRICATING OIL, ICE, TACTICAL (MIL–L–2104)
OEA LUBRICATING OIL, ICE, ARTIC (MIL–L–46167)

*See Notes 1c and 1d

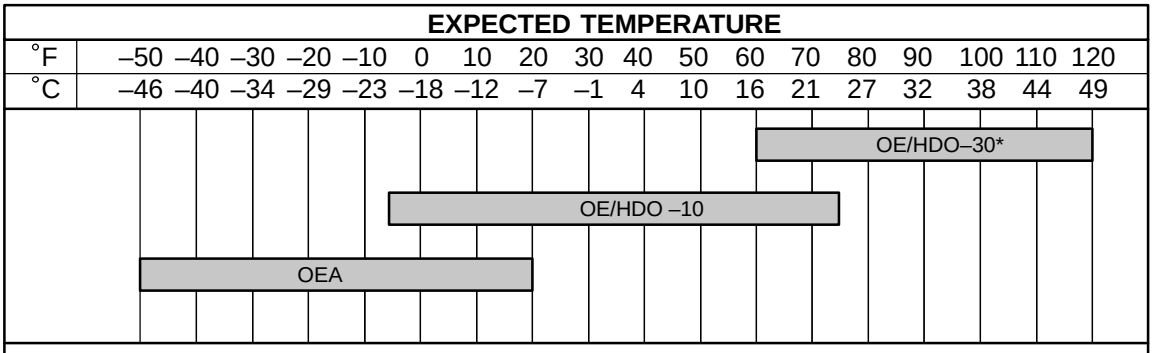
CHART B. AIR COMPRESSOR



LUBRICANTS: OE/HDO LUBRICATING OIL, ICE, TACTICAL (MIL–L–2104)
OEA LUBRICATING OIL, ICE, ARTIC (MIL–L–46167)

*See Notes 1a, 1b and 1e

CHART C. HYDRAULIC RESERVOIR



LUBRICANTS: OE/HDO LUBRICATING OIL, ICE, TACTICAL (MIL–L–2104)
OEA LUBRICATING OIL, ICE, ARTIC (MIL–L–46167)

*See Note 3

CHART D. OIL CAN POINTS

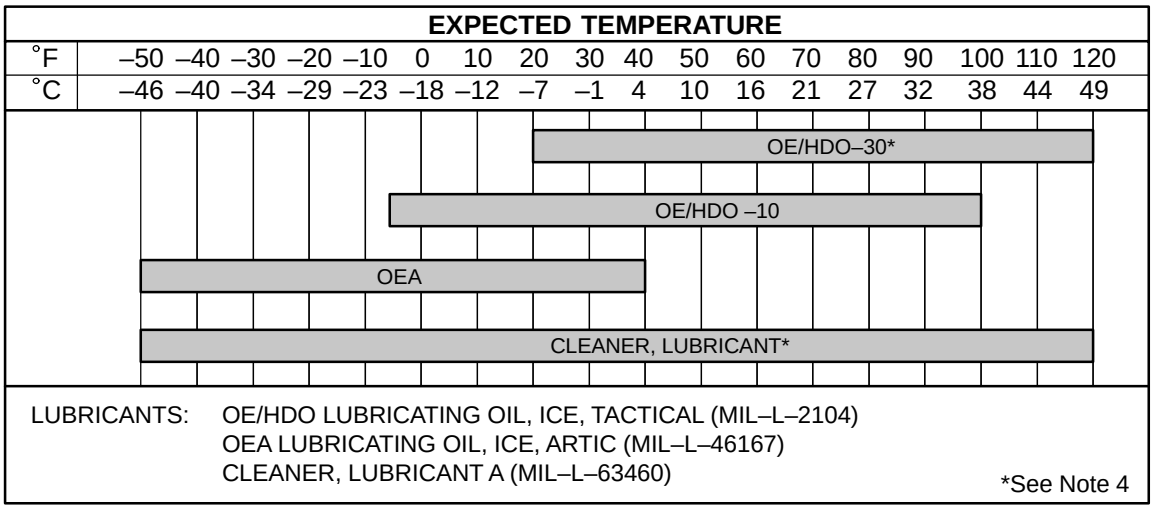


CHART E. CRANE

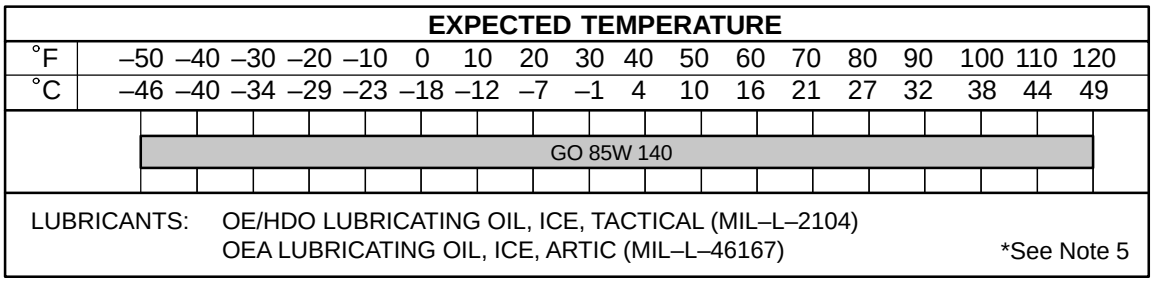
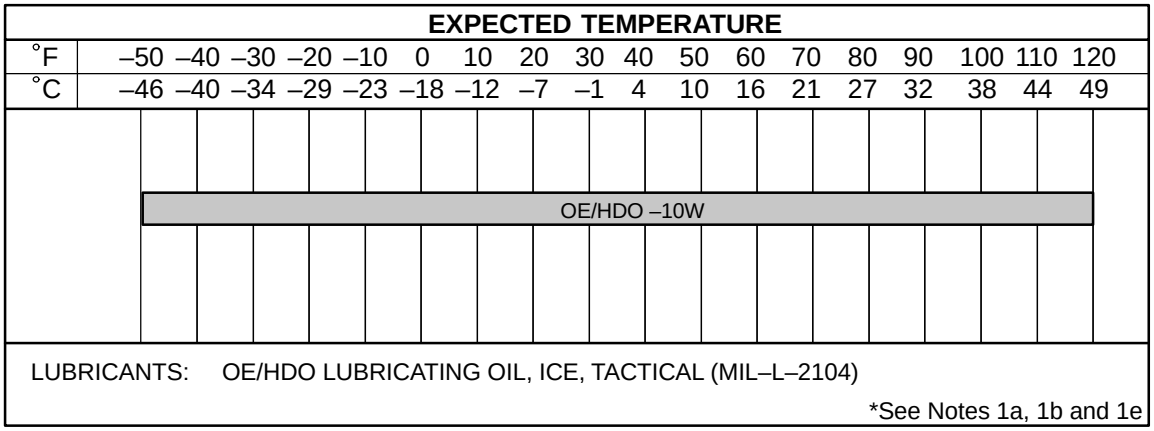


CHART F. AIR LUBRICATOR



Section IV. TROUBLESHOOTING

2-10. TROUBLESHOOTING INTRODUCTION.

a. This section contains information for locating and correcting most of the troubles which may develop on the Forward Repair System-(FRS). Each malfunction for an individual component, unit, or system is followed by a list of tests or inspection which will help to determine corrective actions to take.

b. This manual can not list all malfunctions that may occur, nor all tests or inspections and corrective actions. If a malfunction is not listed or is not corrected by listed corrective actions, notify Direct Support.

c. Table 2-3 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.

Table 2-3. Troubleshooting Fault Index

Table 2-3. Troubleshooting Fault Index (CONT).

Table 2-3. Troubleshooting Fault Index (CONT).

Table 2-3. Troubleshooting Fault Index (CONT).

Table 2-3. Troubleshooting Fault Index (CONT).

2-11. GENERATOR TROUBLESHOOTING.

This paragraph covers Generator Troubleshooting.

Table 2-4. Generator Fault Index

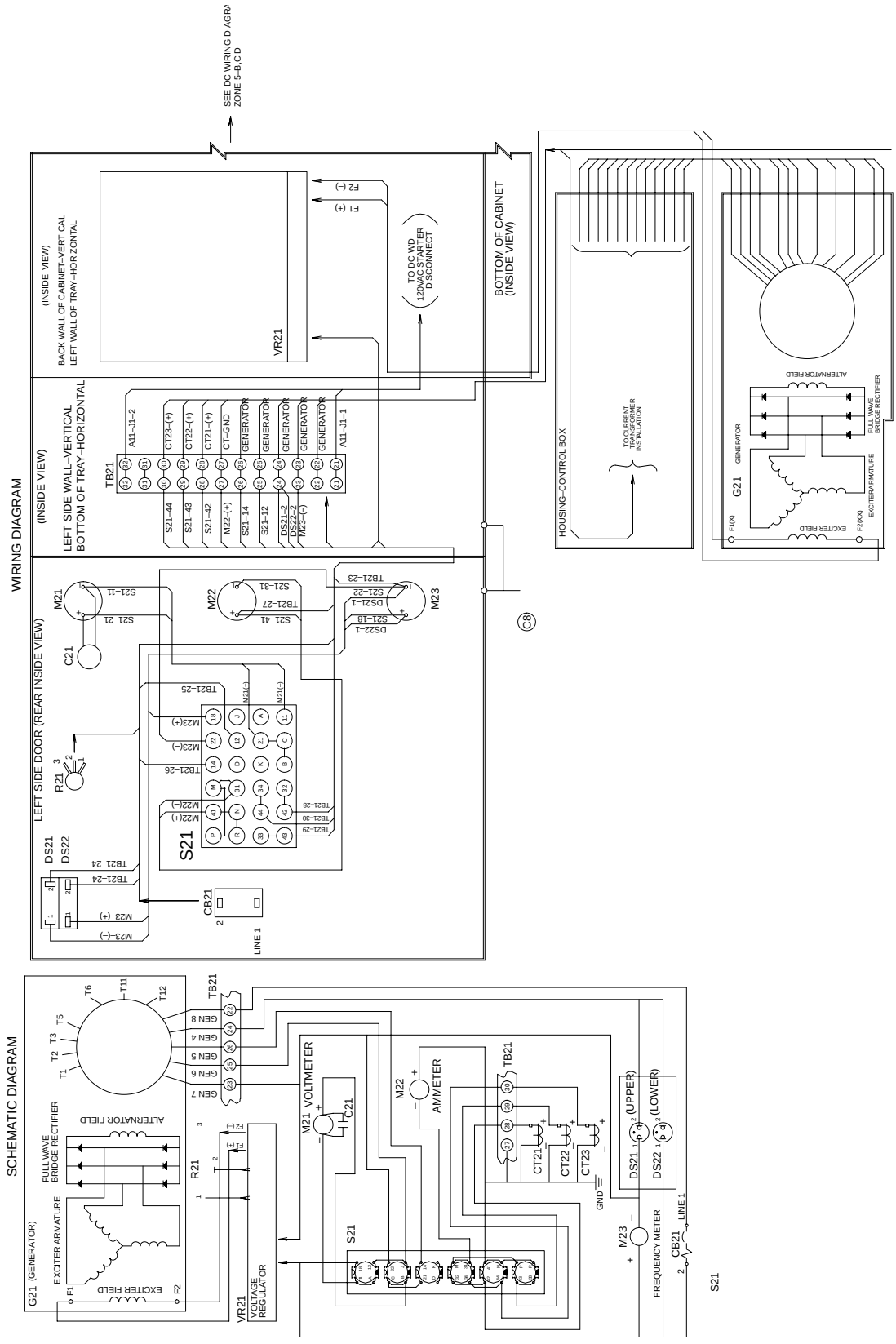
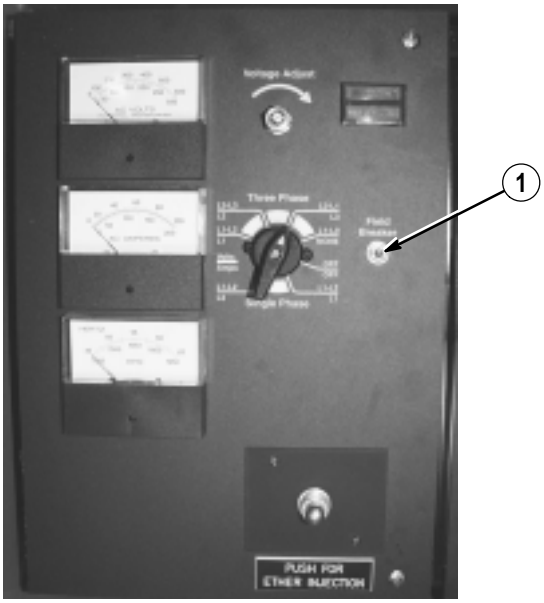


Figure 2-1. Generator VAC Schematic and Wiring Diagram.

Table 2-5. Generator Troubleshooting

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

1. NO OUTPUT VOLTAGE.



The line circuit breaker is OFF.

NOTE

Find out why the circuit breaker was turned OFF, make sure it is safe to reconnect power.

Place the circuit breaker in the ON position.

The line circuit breaker is faulty.

Shut down the set, make sure the power output lines from the set have been disconnected from all other sources of power, attempt to RESET the circuit breaker and throw it ON and check for electrical continuity across each line contact. Replace the circuit breaker if there is measurable resistance across any contact.

Field circuit breaker (1) CB21 has TRIPPED.

RESET the circuit breaker. If it keeps tripping, troubleshoot according to troubleshooting Malfunction 4, Field Circuit Breaker Keeps Tripping.

Field circuit breaker (1) CB21 is faulty.

Shut down the set, attempt to RESET the circuit breaker and disconnect either lead. Replace the circuit breaker if there is measurable resistance across the terminals.

Table 2-5. Generator Troubleshooting (CONT).

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

Check for voltage at Main A/C circuit breaker CB21 input side.

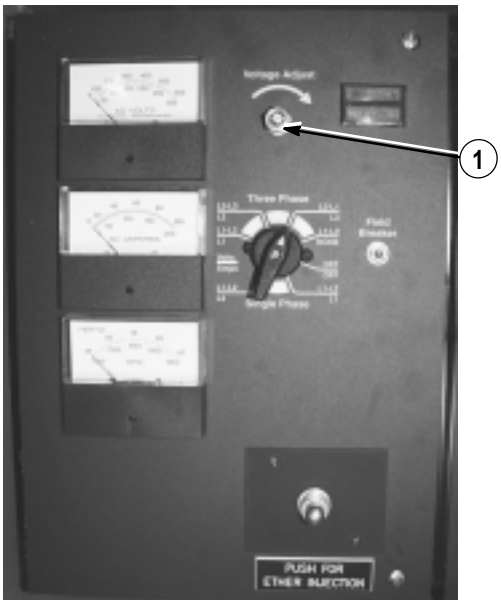
If 120/208 VAC is present replace circuit breaker.

Disconnect voltage regulator VR21 and attach 12 VDC to F1 (positive lead) and F2 (negative lead).

If voltage is present, replace voltage regulator. Notify Direct Support.

If no voltage present, notify Direct Support.

2. OUTPUT VOLTAGE IS TOO HIGH OR TOO LOW.



The voltage has been adjusted improperly.

Adjust output voltage by turning voltage adjustment screw (1).

Improper connections have been made at the generator output terminals.

Shut down the set and reconnect according to the appropriate reconnection diagram. See inside of main power switch panel.

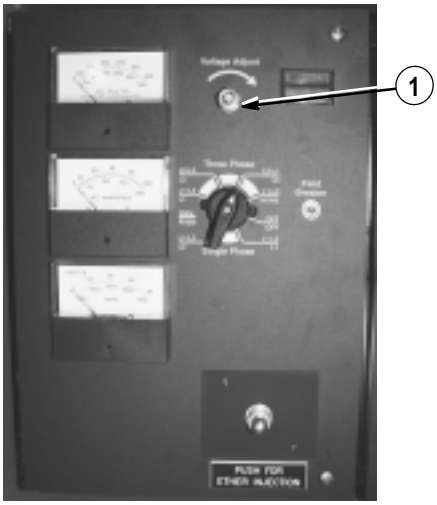
Voltage Regulator VR21 is faulty.

Replace voltage regulator. Notify Direct Support.

Table 2-5. Generator Troubleshooting (CONT).

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

3. OUTPUT VOLTAGE IS UNSTABLE.



The voltage adjusting rheostat (1) on the control panel is faulty.

Unlock the voltage adjusting screw on the front of the control panel and disconnect either lead from the rheostat. Measure resistance between terminals 1 and 2 while turning the adjusting screw fully one way and then the other. Replace the rheostat if it is open at any point, or if resistance does not vary smoothly from zero to approximately 1,500 ohms for sets with the SX460 voltage regulator (shunt excited) or 5,000 ohms for sets with the MX321 voltage regulator (PMG–excited).

Voltage Regulator VR21 is faulty.

Replace voltage regulator. Notify Direct Support.

4. THE FIELD CIRCUIT BREAKER KEEPS TRIPPING.

Voltage Regulator VR21 is faulty.

Replace voltage regulator. Notify Direct Support.

5. THE PHASE CURRENTS ARE UNBALANCED.

The connected loads are distributed unevenly among the phases.

Shut down the set and redistribute the loads as evenly as possible.

Improper connections have been made at the generator output terminals.

Shut down the set and reconnect according to the reconnection diagram. See inside main power switch panel.

A load has a ground fault or short circuit.

Service the faulty equipment as necessary.

2-12. ENGINE TROUBLESHOOTING.

This paragraph covers Engine Troubleshooting.

Table 2-6. Engine Fault Index

Table 2-6. Engine Fault Index (CONT).

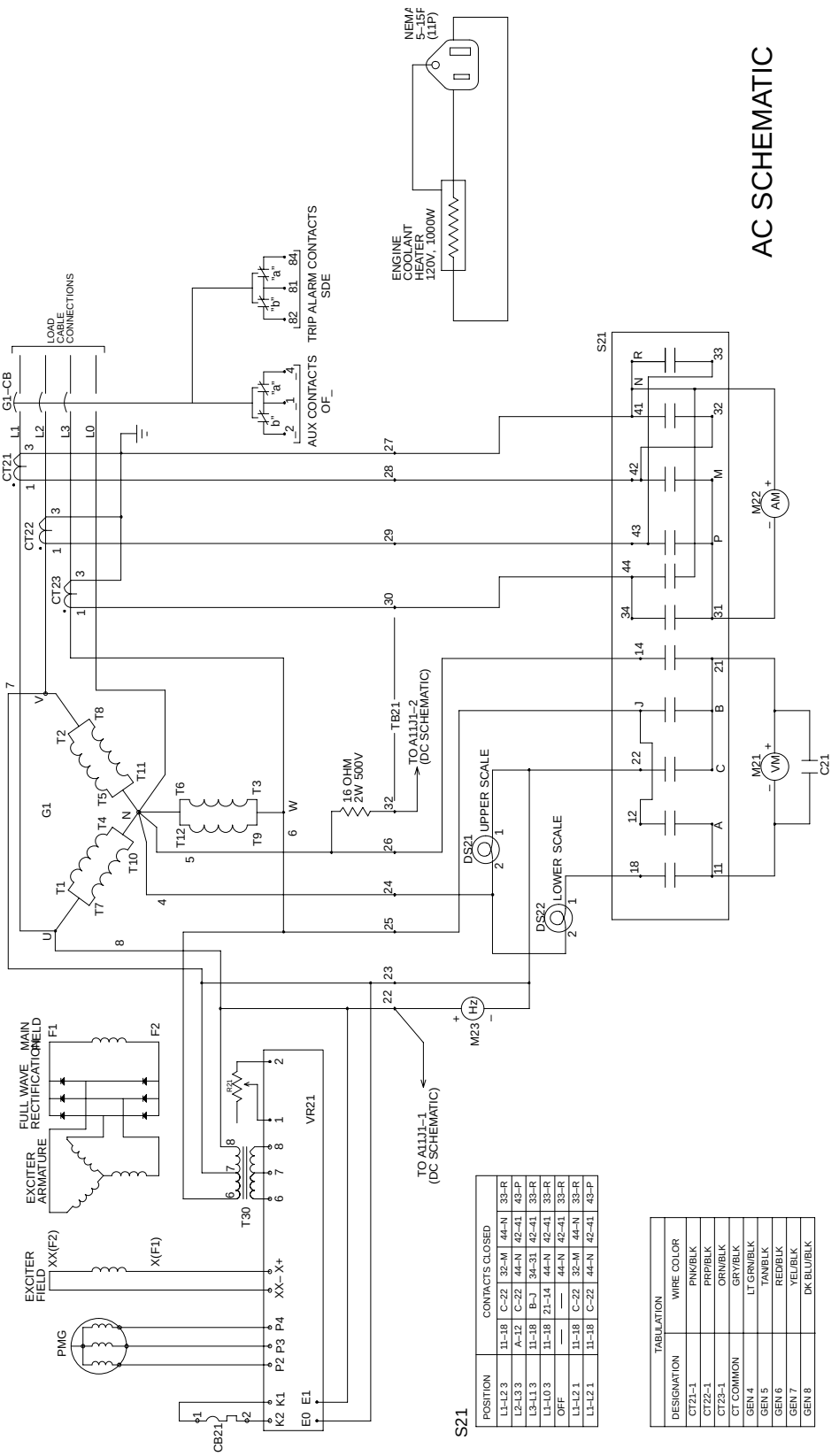
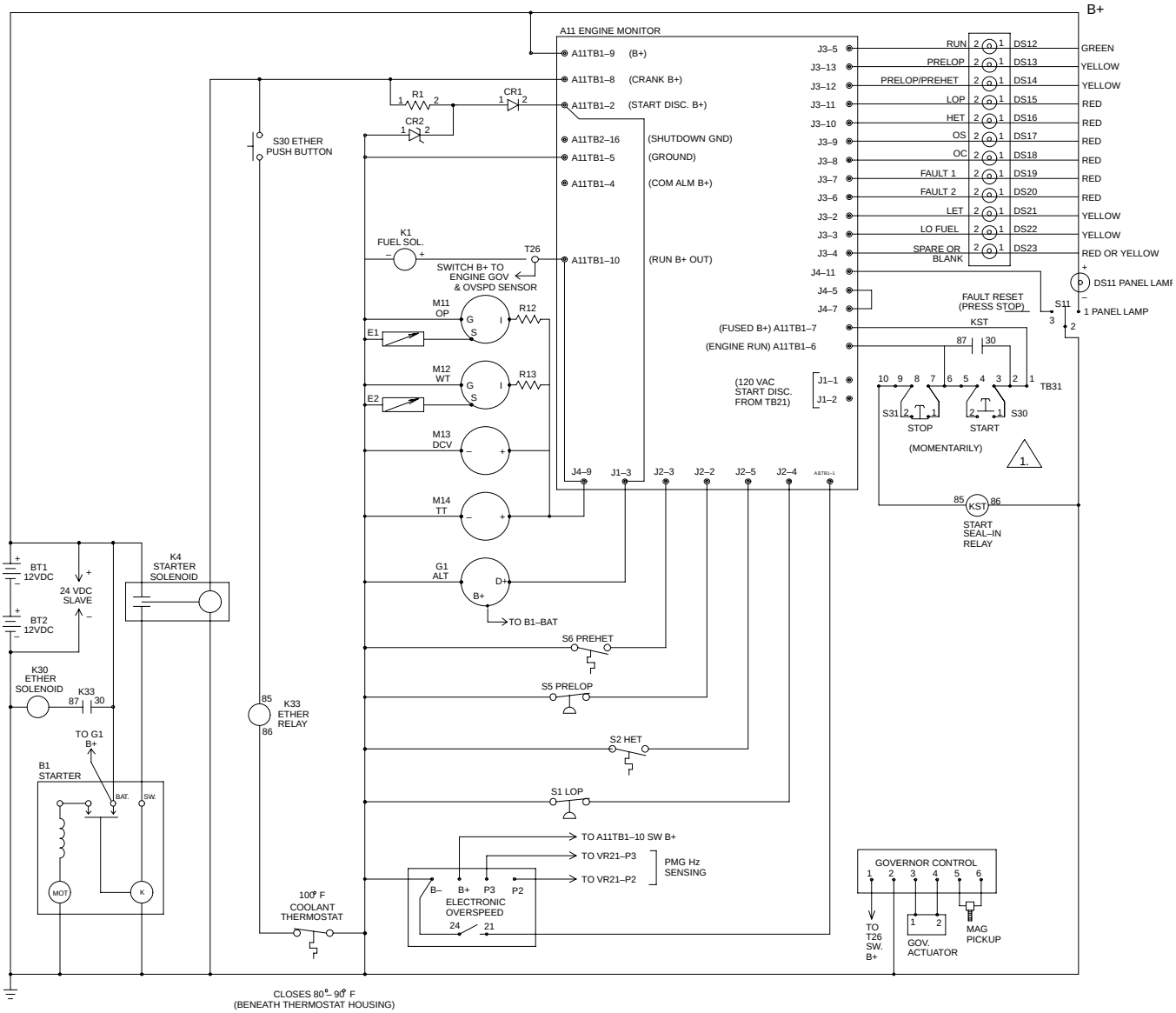


Figure 2-2. Generator Schematic and Wiring Diagram (Sheet 1 of 2).



DC WIRING SCHEMATIC

Figure 2-2. Generator Schematic and Wiring Diagram (Sheet 2 of 2).

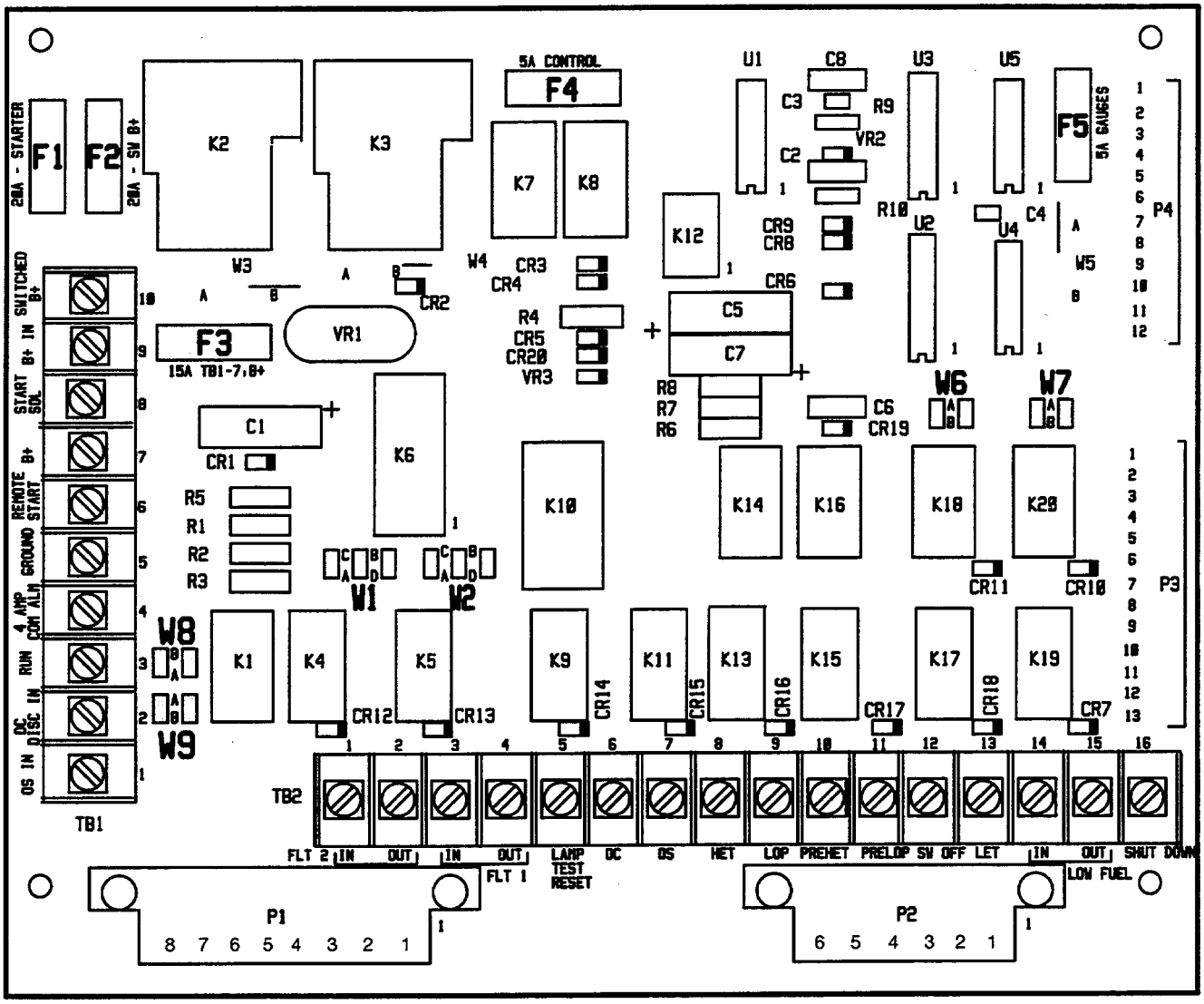


Figure 2-3. Generator Fuses Schematic.

Table 2-7. Engine Troubleshooting

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

1. THE ENGINE DOES NOT CRANK.

Check fuse F1.

Attempt to slave start the engine.

If the engine starts, troubleshoot battery and charging circuit.

Check for 19-24 VDC at A11 card Terminal Board (TB) 1-9.

If no or low voltage is present, troubleshoot wire.

Check for 19-24 VDC at A11 card TB1 terminal 7.

If no voltage is present, notify Direct Support to replace A11 card assembly.

Check for 19-24 VDC at TB31 terminal 1.

If no voltage is present, replace wire.

Close S30 and check for 19-24 VDC at terminal 2.

If no voltage is present, replace starter solenoid terminal (SW).

Check for 19-24 VDC at A11 card TB1 terminal 6.

If no voltage is present, replace wire.

Check for 19-24 VDC at A11 card TB1 terminal 8.

If no voltage is present, notify Direct Support to replace A11 card assembly.

Check for 19-24 VDC at Run-Stop-Remote Switch (S12) terminal 3.

If no voltage is present, replace wire.

Check for 19-24 VDC at S12 terminal 2 with switch in run position.

If no voltage is present, replace Run-Stop-Remote Switch (S12).

Check for 19-24 VDC at A11 card P4J4 terminal 7.

If no voltage is present, replace wire.

Check for 19-24 VDC at A11 card TB1 terminal 8.

If no voltage is present, notify Direct Support to replace A11 card assembly.

Table 2-7. Engine Troubleshooting (CONT).

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

Check for 19-24 VDC at the coil of the K4 relay.

If no voltage is present, replace wire.

If voltage and ground are present, and contacts do not close, replace K4 relay.

Check for 19-24 VDC from battery to input side of the solenoid contacts.

If no voltage is present, replace wire.

Check for 19-24 VDC at starter solenoid coil.

If no voltage is present, replace wire.

If voltage is present, replace starter and solenoid assembly.

2. THE ENGINE DOES NOT CRANK FROM REMOTE START SWITCH.

Check fuse F3.

Check that connections at remote TB are good (located next to main A/C breaker).

Check for 19-24 VDC on wire #20 attached to green button of remote switch.

If no voltage is present, replace wire.

Press green start button and check for voltage at output side.

If no voltage is present, replace switch.

Check that connections of wire are good at remote TB.

Check for voltage at TB31 terminal 9.

If no voltage is present, replace wire #21.

If voltage is present, perform troubleshooting Malfunction 1, Engine Does Not Crank.

Table 2-7. Engine Troubleshooting (CONT).

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

3. THE ENGINE CRANKS BUT DOES NOT START.

Check fuse F2 on A11 card.

Check for 19-24 VDC at A11 card TB1 terminal 10.

If no voltage is present, notify Direct Support to replace A11 card.

Check for 19-24 VDC at engine TB 26 (mounted on right side of engine beneath starter for right terminal).

If no voltage is present, replace wire.

Check for 19-24 VDC at A16 controller B+ terminal.

If no voltage is present, replace wire (marked K1).

Check for 1.5-3 VAC from magnetic pickup while engine is cranking, with fuel pump wiring disconnected.

If no voltage is present, replace magnetic pickup.

Check for 1.5-3 VAC at controller A16 terminals 5 and 6.

If no voltage is present, replace wire.

Check for approximately 5.25 VDC at fuel injection pump.

If no voltage is present, replace wire.

If voltage is present, replace fuel injection pump.

Table 2-7. Engine Troubleshooting (CONT).

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

4. THE ENGINE RUNS UNTIL FAULT SHUTDOWN.

The OVERSPEED lamp comes on and the engine shuts down.

a. Reset the Engine Control Monitor (ECM) (A11 card) by pushing the Run-Stop-Remote switch to Stop. Push the Reset switch to Reset, and restart engine, monitoring engine speed. Readjust the cutout speed if it is lower than specified. Replace the overspeed module (Para 8-16) or the magnetic speed pickup sensor if it cannot be readjusted (Para 8-17).

b. If the set still shuts down due to overspeed, reinstall the magnetic speed pickup sensor to make sure the clearance with the flywheel gear teeth is correct. Replace the speed pickup sensor if output voltage at cranking speed is less than 2.4 VDC as measured at terminals 10 (–) and 11 (–) on the governor.

c. Replace the governor controller if the set still shuts down due to overspeed.

The LO OIL PRESS lamp comes on and the engine shuts down.

a. Check the engine oil level, repair any oil leaks and fill to the proper level. Then reset the ECM by pushing the Run-Stop-Remote switch to Stop, reset switch to Reset and restart the engine.

b. If the engine still shuts down due to low oil pressure, restart the engine and observe oil pressure while cranking the engine. Perform engine oil service (Para 8-2) if oil pressure is less than 14 psi (97 kPa). Replace the low oil pressure cutout switch if oil pressure is greater than 14 psi (97 kPa) (Para 8-39).

Table 2-7. Engine Troubleshooting (CONT).

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

4. THE ENGINE RUNS UNTIL FAULT SHUTDOWN (CONT).

The HI ENG TEMP lamp comes on and the engine shuts down.

a. Check the engine coolant level, repair any coolant leaks and refill as necessary. Then reset the ECM by pushing the Run-Stop-Remote switch to Stop, push Reset switch to Reset and restart engine.

b. If the set shuts down due to high engine temperature, let engine cool, start the engine and observe coolant temperature as the system heats up. If shutdown occurs before the coolant reaches 200° F (93° C), replace the high coolant temperature sensor (Para 8-36). If coolant temperature exceeds 200° F (93° C), clean and service the entire cooling system as required to restore full cooling capacity (Para 8-25).

c. Check low coolant level switch S7 on radiator which is wired in series with High Engine Temperature (HET) switch S2. Wire S7 from engine TB26 goes to S7. The radiator coolant serves as the contact with the switch.

Table 2-7. Engine Troubleshooting (CONT).

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

5. AN AMBER WARNING LAMP IS ON.

The PRE LO OIL PRES lamp comes on while the engine is running.

Shut down the engine if possible or disconnect non-critical loads. (Oil pressure will be less than 20 psi [138 kPa] but greater than 14 psi [97 kPa]). Check engine oil level. If oil level is ok, perform engine oil service (Para 8-2).

The PRE HI ENG TEMP lamp comes on while the engine is running.

Shut down the engine if possible or disconnect non-critical loads. (Engine temperature will be greater than 220° F [104° C] but less than 230° F [110° C].) Check engine coolant level and fill if necessary. Low coolant level switch S7 is wired in series with this circuit.

The LOW ENGINE TEMPERATURE lamp comes on prior to starting the engine.

a. Plug in engine coolant heater (TM 9-4940-568-10), and allow coolant to warm up.

b. If coolant does not warm up, replace engine coolant heater (Para 8-27)

6. THE GREEN RUN LAMP STAYS OFF BUT THE SET RUNS NORMALLY.

The RUN lamp does not light, although the starter has disconnected normally and the engine is running.

a. Press the panel Lamp Test switch and replace the RUN lamp bulb if it does not light.

b. If lamp is good, this indicates that the AC disconnect circuit is not working. Check the AC voltmeter to determine whether or not there is generator output voltage and service as necessary. Refer to Generator Troubleshooting Step 1 No Output Voltage.

c. If there is generator output voltage, check for 120 VAC across pin connectors P1-1 and P1-2 on the A11 card. If there is no voltage, check for loose or missing leads between the connectors and TB21-21 and TB21-32 inside the control box and service as necessary.

d. Notify Direct Support to test generator if there is 120 VAC across pin connectors P1-1 and P1-2 on A11 card but RUN lamp lights during normal operation.

Table 2-7. Engine Troubleshooting (CONT).

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

7. ENGINE WILL NOT CRANK OR CRANKS SLOWLY.

Starting motor spins but will not crank the engine.

Remove the starting motor and check for broken teeth on the ring gear or broken starting motor spring (Para 8-43).

Starting circuit parts or connections loose, broken, damaged or corroded.

Clean, replace or tighten connections and/or parts.

Battery charge low.

Check 19-24 VDC battery voltage.

No voltage to starter solenoid.

Check voltage to solenoid.

Crankshaft rotation restricted.

Bar the engine to check for rotational resistance.

Solenoid or starting motor malfunction.

Replace starting motor (Para 8-43).

Table 2-7. Engine Troubleshooting (CONT).

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

8. ENGINE CRANKS BUT WILL NOT START – NO SMOKE FROM EXHAUST.

Fuel filters plugged with water or other contamination.

Drain fuel/water separator (TM 9-4940-568-10) or replace fuel filters (Para 8-18 and 8-19).

Inspect fuel pump operation.

Refer to Fuel System Priming (TM 9-4940-568-10).

Fuel injection pump not getting fuel or fuel is aerated.

Check fuel flow/bleed fuel system (TM 9-4940-568-10).

Check fuel hoses and lines for restriction. Clear any obstructions or debris.

Maximum inlet restriction to fuel transfer pump must not exceed 100 mm Hg (4 in. Hg).

Air intake or exhaust system plugged.

Visually check; remove the obstruction. Check exhaust system for obstruction.

Check fuse F2 on A11 card.

Check for 19-24 VDC at A11 card TB1 terminal 10.

If no voltage is present, replace A11 card PCB assembly-engine monitor.

Check for 19-24 VDC at engine TB 26 (mounted on right side of engine beneath starter far right terminal).

If no voltage is present, replace wire.

Check for 19-24 VDC at A16 controller B+ terminal.

If no voltage is present, replace wire.

Check for 1.5-3 VAC from magnetic pickup while engine is cranking, with fuel pump wiring disconnected.

If no voltage is present, replace magnetic pickup.

Check for 1.5-3 VAC at controller A16 terminals 5 and 6.

If no voltage is present, replace wire.

Check for approximately 5.25 VDC at fuel injection pump.

If no voltage is present, replace wire.

Table 2-7. Engine Troubleshooting (CONT).

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

9. ENGINE HARD TO START OR WILL NOT START – SMOKE FROM EXHAUST.

Cranking speed too slow (minimum cranking speed = 150 RPM).

Check battery for 19-24 VDC.

Check the battery, starting motor, and look for loose or corroded wiring connections (TM 9-4940-568-10).

Bar the engine to check for internal rotational resistance.

Intake air insufficient.

Inspect or replace filter and check for obstructions to the air supply tube.

Fuel injection pump not getting fuel or fuel is aerated..

Check the flow through the filter and bleed the system. Locate and correct the air source (TM 9-4940-568-10).

Fuel drain back.

Verify fuel return line is plumbed to bottom of fuel tank.

Check fuel hoses and lines for restriction.

Clear any obstructions or debris.

Table 2-7. Engine Troubleshooting (CONT).

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

10. ENGINE STARTS BUT WILL NOT KEEP RUNNING.

Low fuel level.

Check/fill fuel tank (TM 9-4940-568-10).

Intake air or exhaust system restricted.

Visually check for exhaust restriction and inspect the air intake (TM 9-4940-568-10).

Air in the fuel system or the fuel supply is inadequate.

Check fuel flow/bleed fuel system (TM 9-4940-568-10).

Fuel waxing due to extremely cold weather.

Verify by inspecting the fuel filter. Clean the system and use climatized fuel.

Fuel contaminated.

Verify by operating the engine with clean fuel from a temporary supply tank. Drain and flush the fuel supply tank.

Plugged fuel filters.

Check/replace filters (Para 8-18 and 8-19).

11. ENGINE SURGING (SPEED CHANGE)

Fuel level low.

Check/fill fuel tank (TM 9-4940-568-10).

High pressure fuel leak.

Inspect/correct leaks in the high pressure lines and fittings (Para 8-20).

Aerated fuel.

Bleed the fuel system and correct source of the leak (TM 9-4940-568-10).

Table 2-7. Engine Troubleshooting (CONT).

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

12. ENGINE IDLE ROUGH (IRREGULARLY FIRING OR ENGINE SHAKING).

Engine is cold.

Allow engine to warm to operating temperature if engine will not reach operating temperature. Refer to Troubleshooting Malfunction 20 for Coolant Temperature Below Normal.

High pressure fuel leak.

Inspect/correct leaks in the high pressure lines and fittings (Para 8-20).

Air in the fuel system.

Check fuel flow/bleed the fuel system (TM 9-4940-568-10).

Fuel pump malfunctioning.

Check/replace fuel pump (Para 8-21).

Plugged fuel filters.

Replace fuel filters (Para 8-18 and 8-19).

Fuel supply restricted.

Check fuel lines and hoses for restriction. Clear any obstructions or debris.

13. ENGINE RUNS ROUGH OR MISFIRING.

Engine is cold.

Allow engine to warm to operating temperature.

Fuel injection lines leaking.

Inspect/correct leaks in the high pressure lines, fittings and injector sealing washer (Para 8-20).

Air in the fuel or the fuel supply is inadequate.

Check the flow through the filters and bleed the system (TM 9-4940-568-10).

Fuel supply restricted.

Check fuel line for restriction. Replace fuel filters (Para 8-18 and 8-19).

Fuel contaminated.

Verify by operating the engine with clean fuel from a temporary tank.

Table 2-7. Engine Troubleshooting (CONT).

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

14. ENGINE RPM WILL NOT REACH RATED SPEED.

Fuel contaminated.

Verify by operating with clean fuel from a temporary tank.

Fuel supply inadequate.

Check the flow through the filters to locate the source of the restriction (Para 8-18 and 8-19).

Fuel pump malfunctioning.

Check/replace fuel pump (Para 8-21).

15. ENGINE POWER OUTPUT LOW.

Fuel contaminated.

Verify by operating with clean fuel from a temporary tank.

High pressure fuel leak.

Inspect/correct leaks in the high pressure lines, fittings and injector sealing washers (Para 8-20).

Fuel supply restricted

Check fuel lines and hoses for restriction. Clear any obstructions or debris.

Plugged fuel filters.

Replace fuel filters (Para 8-18 and 8-19).

Air in the fuel system.

Bleed the fuel system and check for suction leaks.

Fuel pump malfunctioning.

Check/replace fuel pump (Para 8-21).

Oil level incorrect.

Check/correct oil level (TM 9-4940-568-10).

Table 2-7. Engine Troubleshooting (CONT).

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION
15. ENGINE POWER OUTPUT LOW (CONT).
Intake air inadequate.
Inspect/replace air cleaner element (Para 8-12). Look for other restrictions (TM 9-4940-568-10).
Exhaust restriction.
Check/correct exhaust system for restriction (TM 9-4940-568-10).
Valve clearances incorrect.
Check/adjust valves (Para 8-3).
16. EXHAUST BLACK SMOKE EXCESSIVE.
Intake air restricted.
Inspect/replace air cleaner. Look for other restrictions (Para 8-12).
Exhaust restriction.
Check/correct exhaust system restriction (TM 9-4940-568-10).
Exhaust leak at the air intake manifold.
Check/correct leaks in the air intake manifold gasket. Look for a cracked air intake manifold (Para 8-10).
17. EXHAUST WHITE SMOKE EXCESSIVE.
Coolant temperature too low.
Refer to Troubleshooting Step 20 for “Coolant Temperature Below Normal”.
Lubricating oil level high.
Drain oil to correct level (Para 8-2).

Table 2-7. Engine Troubleshooting (CONT).

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

18. COOLANT TEMPERATURE ABOVE NORMAL (165° F – 195° F) – GRADUAL OVERHEAT.

Coolant level low.

Locate and correct the source of the coolant leak.

Radiator air cooling fins plugged, bent or damaged.

Using compressed air blow debris from fins, straighten cooling fins.

Air flow to the radiator inadequate or restricted.

Check radiator cooling fan (TM 9-4940-568-10).

Engine drive belt loose.

Replace engine drive belt tensioner (Para 8-32).

Engine drive belt missing.

Replace engine drive belt (Para 8-31)

Radiator hose collapsed, restricted or leaking.

Check/replace hose (Para 8-24).

Cooling fan shroud damaged or missing.

Inspect shroud, replace or install.

Radiator cap incorrect or malfunctioning.

Replace radiator cap (Para 8-26).

Over concentration of antifreeze.

Perform cooling system service (Para 8-26).

Table 2-7. Engine Troubleshooting (CONT).

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

18. COOLANT TEMPERATURE ABOVE NORMAL (165° F – 195° F) – GRADUAL OVERHEAT (CONT).

Temperature sending unit or gage malfunctioning.

Replace temperature sending unit (Para 8-34) or gage (Para 8-44).

Thermostat malfunctioning or incorrect.

Check/replace the thermostat (Para 8-33).

Air in the cooling system.

If coolant is aerated, perform cooling system service (Para 8-25).

Water pump malfunctioning.

Check/replace the water pump (Para 8-28).

Cooling passages in radiator, head, head gasket or block plugged.

Flush the system and fill with clean coolant (Para 8-25).

Table 2-7. Engine Troubleshooting (CONT).

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

19. COOLANT TEMPERATURE ABOVE NORMAL (165° F – 195° F) – SUDDEN OVERHEAT.

Coolant level low.

Locate and correct the source of the coolant leak.

Temperature sending unit or gage malfunctioning.

Replace temperature sending unit (Para 8-34) or gage (Para 8-44).

Engine drive belt loose.

Replace engine drive belt tensioner (Para 8-32).

Engine drive belt missing

Replace engine drive belt (Para 8-31).

Radiator hose collapsed, restricted, or leaking.

Check/replace hose (Para 8-24).

Radiator cap incorrect or malfunctioning.

Replace the radiator cap.

Thermostat malfunctioning or incorrect.

Check/replace thermostat (Para 8-33).

Air in the cooling system.

If cooling system is aerated, perform cooling system service (Para 8-25).

Surge tank line from radiator plugged or restricted.

Check for obstruction or debris. Clear any obstruction or debris.

Water pump malfunctioning.

Check/replace the water pump (Para 8-28).

Table 2-7. Engine Troubleshooting (CONT).

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

20. COOLANT TEMPERATURE BELOW NORMAL (165° F – 195° F).

Thermostat inoperable, damaged, contaminated or not sealing.

Check/replace thermostat (Para 8-33).

Temperature sending unit or gage malfunctioning.

Replace temperature sending unit (Para 8-34) or gage (Para 8-44).

Coolant not flowing by temperature sending unit.

Flush the system and fill with clean coolant.

21. LUBRICATING OIL PRESSURE LOW.

Lubricating oil level low.

Check for a severe external oil leak that could reduce the pressure.

Coolant temperature high above 203°F (98°C).

Refer to Troubleshooting Malfunction 18 for Coolant Temperature Above Normal.

Low oil pressure sensor or gage malfunctioning.

Verify the pressure sensor is functioning correctly. Restart generator and verify oil pressure on gage is less than 14 psi when unit shuts down. If oil pressure is normal, replace Low Oil Pressure (LOP) switch (S1) (Para 8-39).

Lubricating oil contaminated.

Perform engine oil service (Para 8-2).

Table 2-7. Engine Troubleshooting (CONT).

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

22. LUBRICATING OIL PRESSURE HIGH.

Engine running too cold.

Refer to troubleshooting Malfunction 20 for Coolant Temperature Below Normal.

Lubricating oil viscosity too thick.

Make sure the correct lubricating oil is being used (TM 9-4940-568-10).

Oil pressure sending unit or gage malfunctioning.

Replace oil pressure sending unit (Para 8-37) or gage (Para 8-44).

23. LUBRICATING OIL CONSUMPTION EXCESSIVE.

External leaks.

Visually inspect for lubricating oil leaks.

Incorrect lubricating oil (specification or viscosity).

Make sure the correct lubricating oil is being used (TM 9-4940-568-10).

Look for reduced viscosity from dilution with fuel. Fuel dilution in lubricating oil can originate from fuel injection pump driveshaft seal or fuel transfer pump.

Lubricating oil contaminated.

Perform engine oil service (Para 8-2).

Table 2-7. Engine Troubleshooting (CONT).

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

24. COOLANT CONTAMINATED.

Coolant rusty, operation without correct mixture of antifreeze and water.

Drain and flush the cooling system. Fill with correct mixture of antifreeze and water (Para 8-25).

Lubricating oil leaks from lubricating oil cooler, head gasket, head and cylinder block.

Notify Direct Support.

25. LUBRICATING OIL CONTAMINATED.

Coolant in the lubricating oil, internal engine component leaks.

Perform engine oil service (Para 8-2).

Fuel pump seal leaking.

Repair or replace fuel pump (Para 8-21).

26. COMPRESSION KNOCKS.

Malfunctioning ether starting aid.

Repair or replace ether starting aid (Para 8-8).

Air in the fuel system.

Bleed the fuel system (TM 9-4940-568-10).

Fuel contaminated.

Verify by operating the engine with clean fuel from a temporary tank.

Engine overloaded.

Verify that engine load rating is not being exceeded.

27. FUEL CONSUMPTION EXCESSIVE.

Fuel leaks.

Check for external leaks and engine lubricating oil dilution.

For fuel dilution, check for internal leaks at the fuel transfer pump and injection pump.

Intake air or exhaust restriction.

Check or replace air filter and exhaust system (Para 8-12 and 8-23).

Table 2-7. Engine Troubleshooting (CONT).

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

28. ENGINE VIBRATION EXCESSIVE.

Engine not running smoothly.

Refer to troubleshooting Malfunction 13 for Engine Runs Rough Or Misfiring.

Fan damaged or malfunctioning.

Check/replace the fan blade (Para 8-30).

Fan hub malfunctioning.

Inspect/replace the fan hub (Para 8-29).

Alternator bearing worn or damaged.

Replace the alternator (Para 8-42).

29. ENGINE NOISES EXCESSIVE.

Drive belt squeal, insufficient tension or abnormally high loading.

Check the tensioner and inspect the drive belt for deterioration. Make sure water pump, tensioner pulley, fan hub and alternator turn freely.

Check for paint/oil or other material on pulleys.

Intake air or exhaust leaks.

Repair/replace components to stop leaks (Para 8-12 and 8-23).

30. ALTERNATOR NOT CHARGING OR INSUFFICIENT CHARGING.

Remove two wires from B+ terminal and connect them together and wrap with electrical tape. Start generator and measure voltage output from B+ terminal.

If voltage is less than 28 VDC, replace alternator (Para 8-42).

2-13. ELECTRICAL SYSTEM TROUBLESHOOTING.

This paragraph covers Electrical System Troubleshooting.

Table 2-8. Electrical System Fault Index

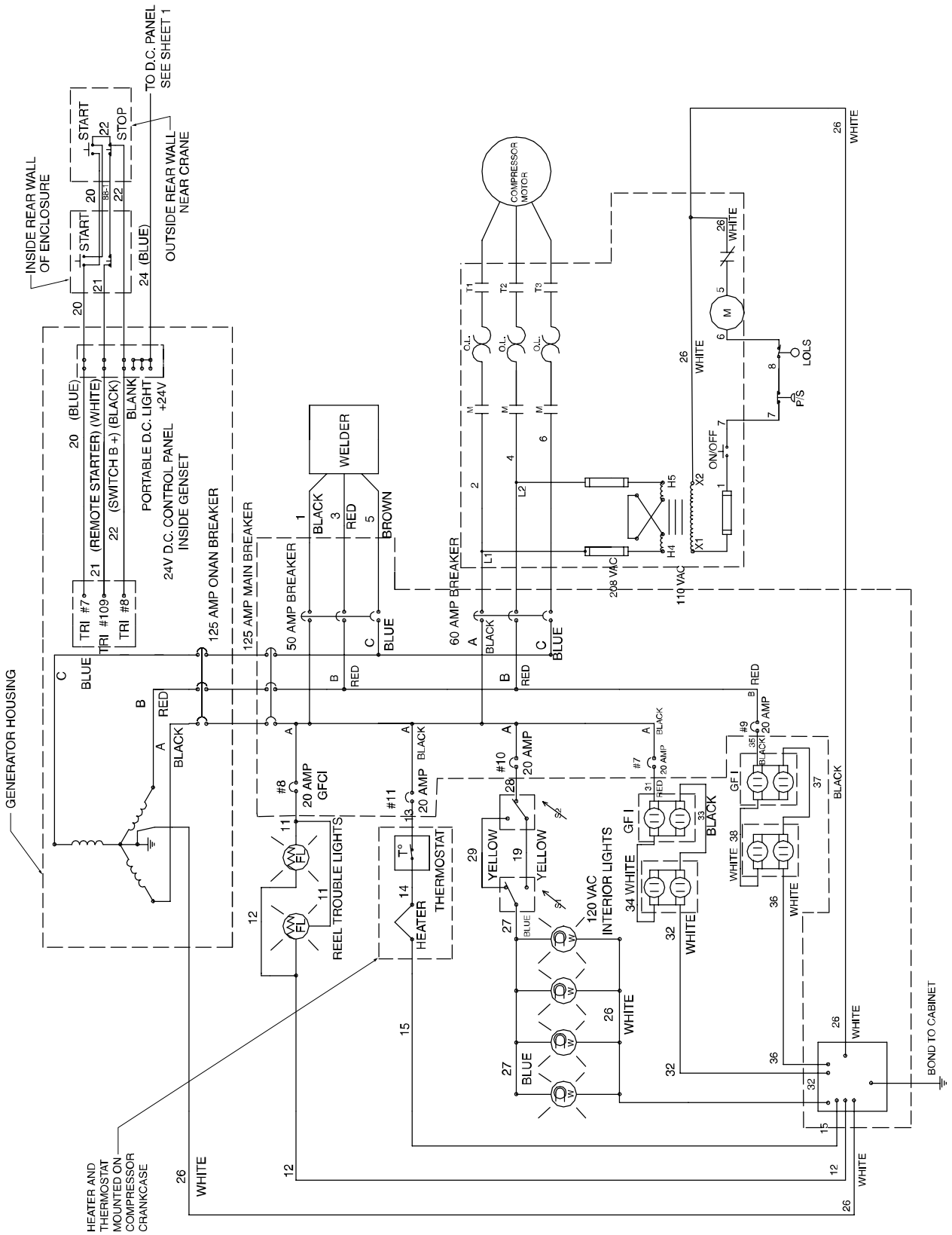


Figure 2-4. 120/208 VAC Circuit Wiring Schematic.

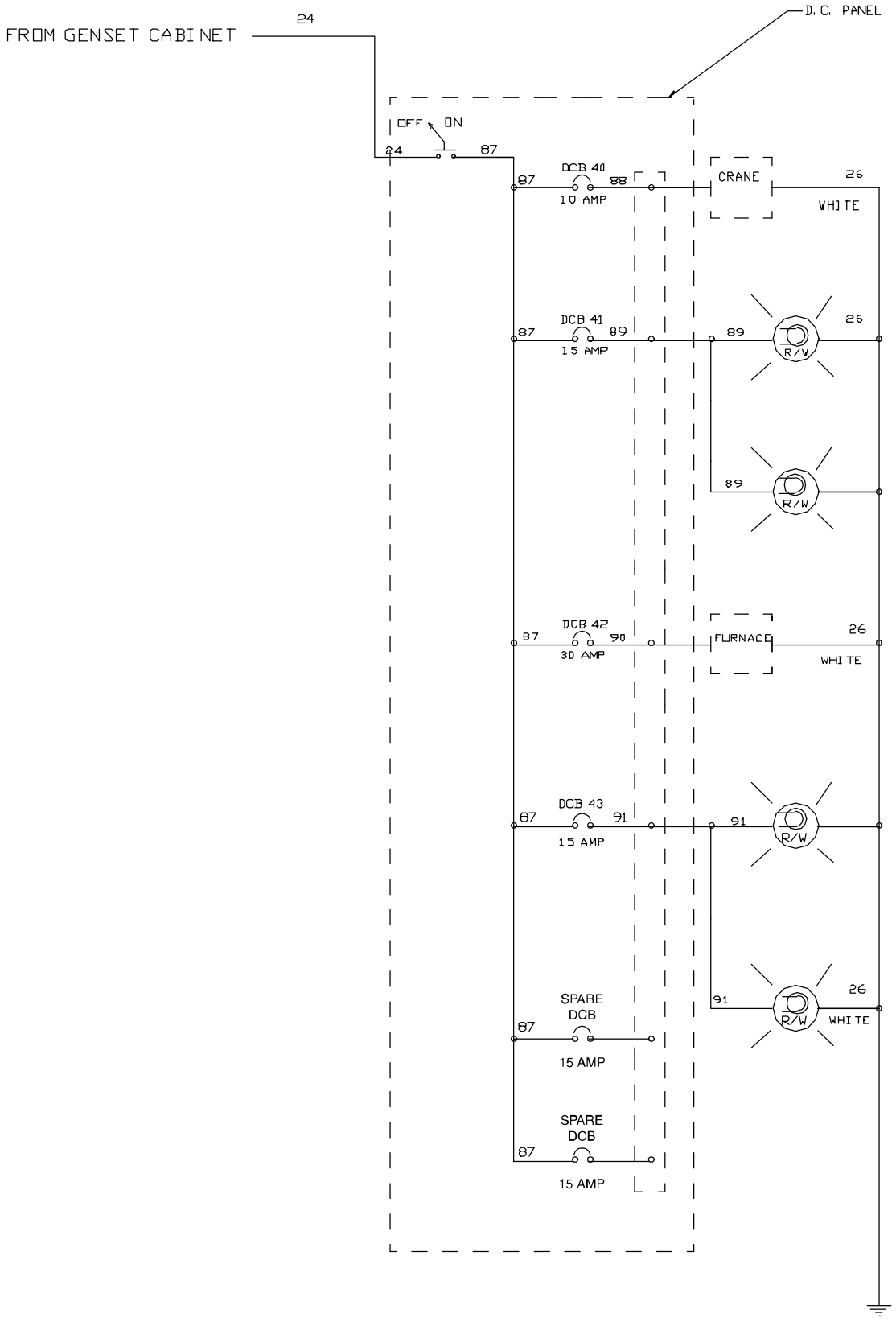
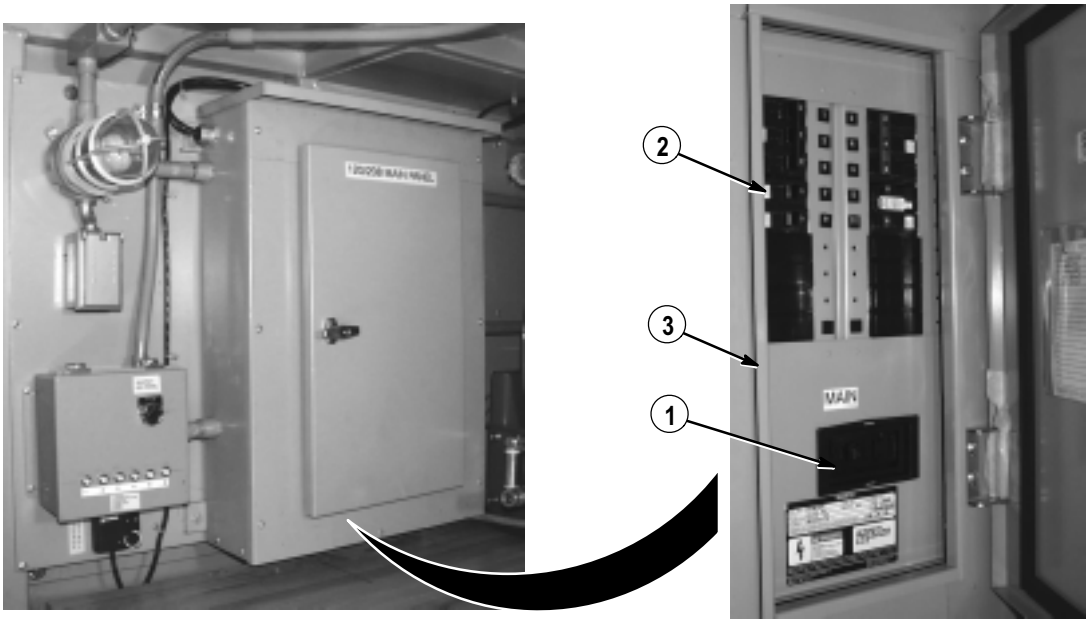


Figure 2-5. 24 VDC Circuit Wiring Schematic.

Table 2-9. Electrical System Troubleshooting

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

1. ONE OR MORE AC RECEPTACLES ARE INOPERABLE.



Start generator (TM 9-4940-568-10). Ensure main AC circuit breaker (1) is ON. Check circuit breaker #7 (2) in 120/208 VAC control panel (3) is not tripped.

Reset circuit breaker #7. If circuit breaker #7 will not reset, go to next test.

Shut down generator (TM 9-4940-568-10). Remove receptacle cover plate and receptacle housing (Para 3-9).

NOTE

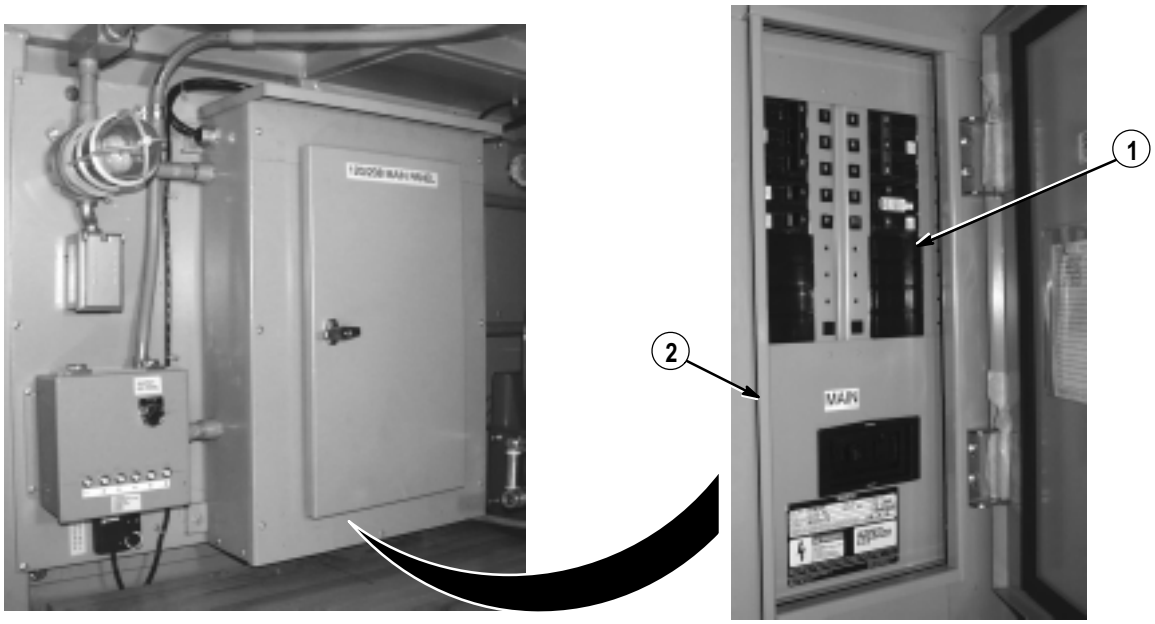
Tag and mark all wires prior to removal. The following must be performed on both receptacles.

- Remove wires from receptacle. Check for continuity across terminals of receptacle. If there is no continuity across terminals, replace receptacle (Para 3-9). If continuity is found on both terminals, go to next step.
- Remove circuit breaker #9 from 120/208 VAC control panel (Para 3-4).
- Remove black wire from terminal and check for continuity on black wire from 120/208 VAC control panel box to black wire at receptacle. If no continuity is found, repair or replace black wire (see schematic Figure 2-4). If continuity is found, Notify Supervisor.

Table 2-9. Electrical System Troubleshooting (CONT).

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

2. ONE OR MORE REEL LIGHTS ARE INOPERABLE.



NOTE

- Ensure FRS 120/208 VAC is functioning properly.
- Ensure FRS generator is started for all voltage checks (TM 9-4940-568-10).

Check circuit breaker #10 (1) inside 120/208 VAC control panel (2) is not tripped. If circuit breaker is not tripped, go to next test.

Reset circuit breaker #10. If circuit breaker #10 will not reset, Notify Supervisor.

NOTE

Ensure multimeter is setup to check AC volts in the correct range.

Check for voltage at AC outlet on reel light cable at light end.

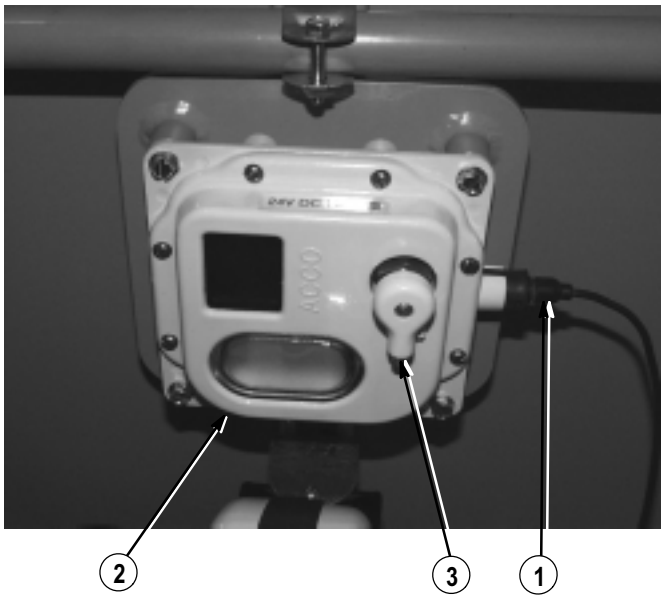
If voltage is present, remove bulb and check for voltage across bulb sockets. If voltage is present across bulb sockets, replace bulb. If no voltage is found, replace reel light (Para 3-12).

If no voltage is found, remove junction box cover and check for voltage on wires 11 and 12. If voltage is present, repair or replace wires 11 and 12 to reel light (see schematic Figure 2-4). Recheck voltage and if no voltage is found, Notify Supervisor.

Table 2-9. Electrical System Troubleshooting (CONT).

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

3. ONE OR MORE DOME LIGHTS ARE INOPERABLE.



NOTE

- Ensure 24 VDC panel switch is in the ON position (TM 9-4940-568-10).
- FRS MASTER DISCONNECT switch is in the ON position (TM 9-4940-568-10).
- Ensure FRS 24 VDC electrical system is functioning properly.

Disconnect wire (1) from dome light (2) and check for voltage between wire plug end and a known good ground.

If voltage is present, remove lense cover and check condition of bulbs (Para 3-11). If bulbs are faulty, replace bulbs. If bulbs are OK, go to next test.

NOTE

Reconnect wire to dome light for the following action.

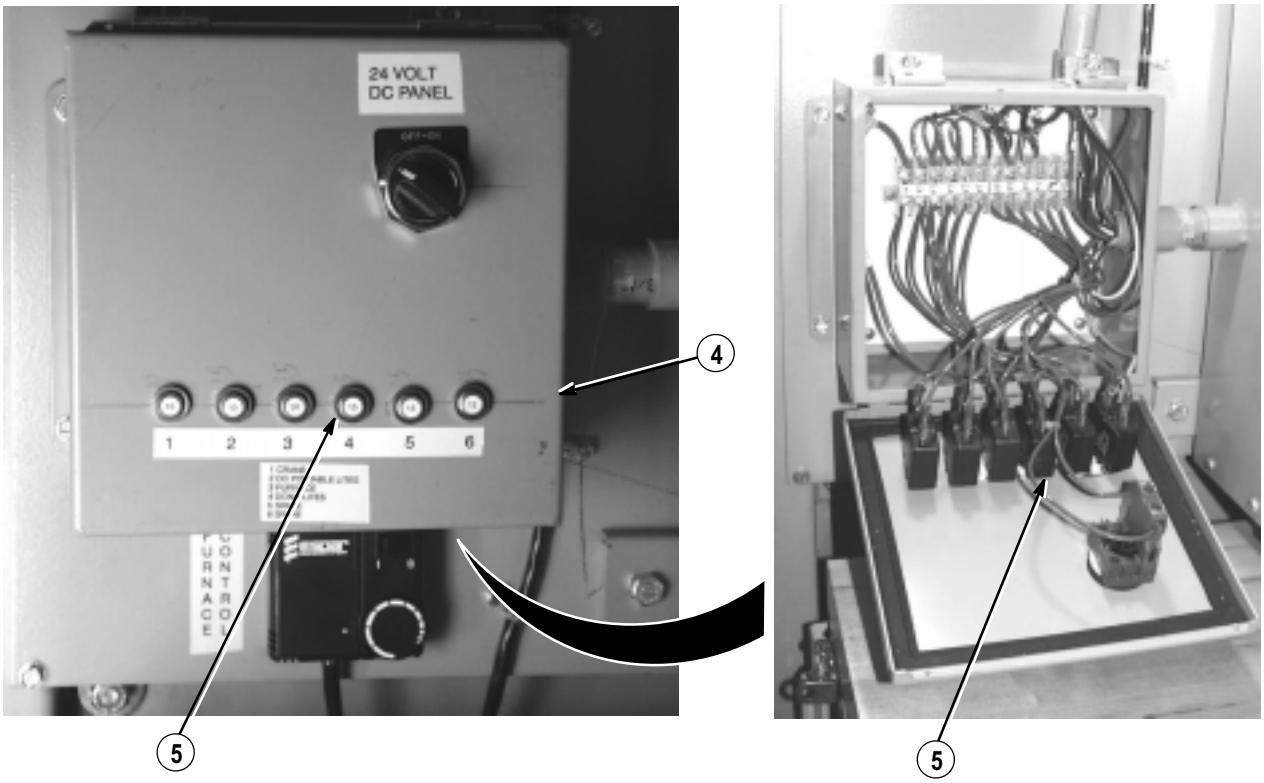
With bulbs removed and dome light selector switch on (3), check for voltage between dome light bulb socket and a known good ground.

If voltage is present, ensure dome light is properly grounded. If voltage is not present, replace dome light (Para 3-11).

Table 2-9. Electrical System Troubleshooting (CONT).

MALFUNCTION TEST OR INSPECTION	CORRECTIVE ACTION

3. ONE OR MORE DOME LIGHTS ARE INOPERABLE (CONT).



Open 24 VDC panel (4) (Para 3-3) and check for voltage between output side of terminal position 91 and known good ground.

If voltage is present, repair or replace wire from terminal position 91 to dome light (see schematic Figure 2-5). If voltage is not present, go to next test.

Check for voltage between output side of circuit breaker #4 (5) and a known good ground.

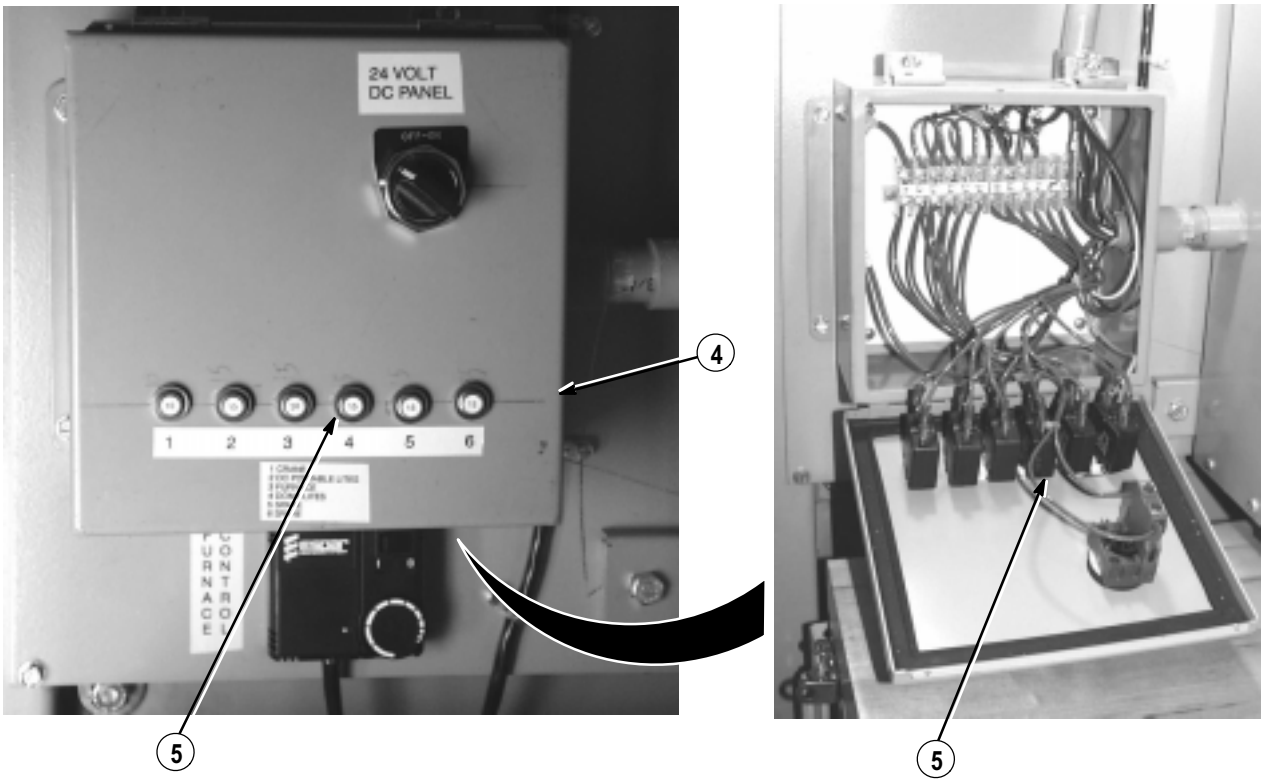
If voltage is present, repair wire between circuit breaker #4 and input side of terminal position 91 (see schematic Figure 2-5). If voltage is not present, go to next test.

Check for voltage between input side of circuit breaker #4 (5) and a known good ground.

If voltage is present, replace circuit breaker #4 (5) (Para 3-3). If voltage is not present, go to next test.

Table 2-9. Electrical System Troubleshooting (CONT).

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION



Check for voltage between 24 VDC panel (4) switch (5) terminal #4 and a known good ground.

If voltage is preset, repair or replace wire between 24 VDC panel switch and circuit breaker #4 (see schematic Figure 2-5). If voltage is not present, go to next test.

Check for voltage between 24 VDC panel (4) switch (5) terminal #3 and known good ground.

If voltage is present, replace 24 VDC panel switch (Para 3-3). If voltage is not present, go to next test.

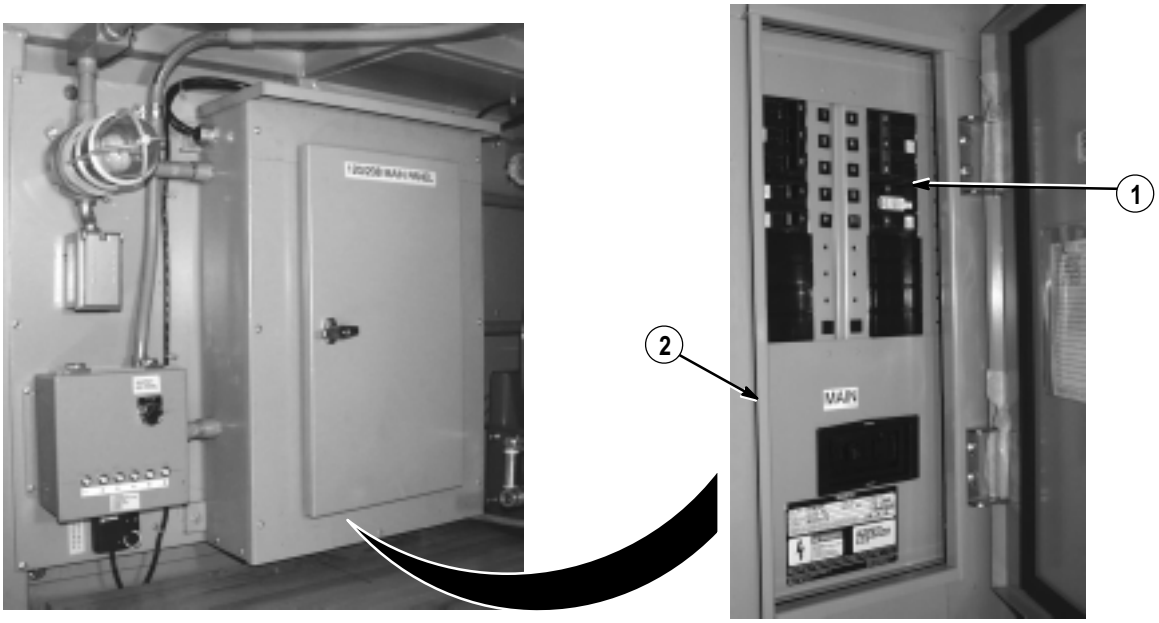
Check for voltage between input side of terminal position #24 and known good ground.

If voltage is present, repair or replace wire between output side of terminal position #24 and 24 VDC panel switch. If voltage is not present, repair or replace wire between generator and input side of terminal position #24 (see schematic Figure 2-5).

Table 2-9. Electrical System Troubleshooting (CONT).

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

4. ONE OR MORE FIXED SHELTER LIGHTS ARE INOPERABLE.



NOTE

- Ensure FRS 120/208 VAC electrical system is functioning properly.
- Ensure FRS generator is started (TM 9-4940-568-10) for all voltage checks.

Check condition of light bulb.

If light bulb is faulty, replace bulb (Para 3-10). If light bulb is good, go to next test.

Check that circuit breaker #8 (1) inside 120/208 main panel (2) is not tripped.

If circuit breaker is not tripped, go to next test. If circuit breaker is tripped, attempt to reset circuit breaker. If circuit breaker will not reset, Notify Supervisor.

Remove fixed light assembly from junction box and check for voltage across terminals.

If voltage is present, replace light fixture socket (Para 3-10). If voltage is not present, install light assembly in junction box and go to next test.

Remove shelter light switch and check for voltage across input terminals of each switch (Para 3-8).

If voltage is present, go to next test. If voltage is not present, Notify Supervisor.

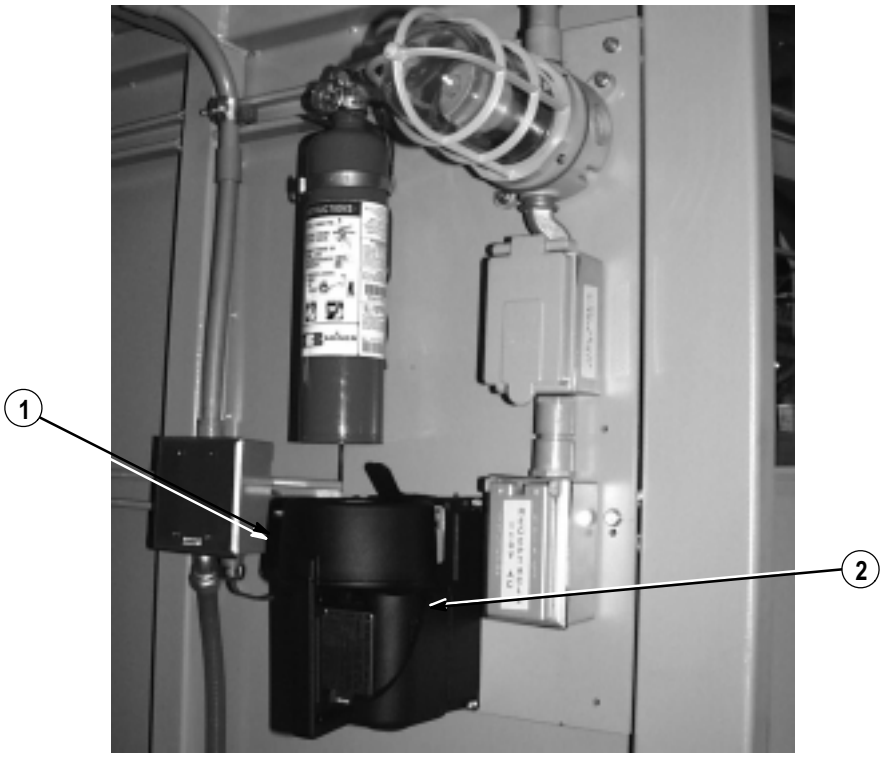
Check for voltage across output terminals of each switch.

If voltage is present, repair or replace wire from switch to shelter switch (see schematic Figure 2-4). If voltage is not present, replace switch (Para 3-8).

Table 2-9. Electrical System Troubleshooting (CONT).

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

5. ONE OR MORE DC RECHARGEABLE HANDLAMPS ARE INOPERABLE.



NOTE

- Ensure FRS 24 VDC electrical system is functioning properly.
- Ensure MASTER DISCONNECT and 24 VDC panel switches are in the ON position for voltage checks (TM 9-4940-568-10).

Check condition of bulb in rechargeable handlamp (1).

If bulb is faulty, replace bulb. If bulb is good, go to next test.

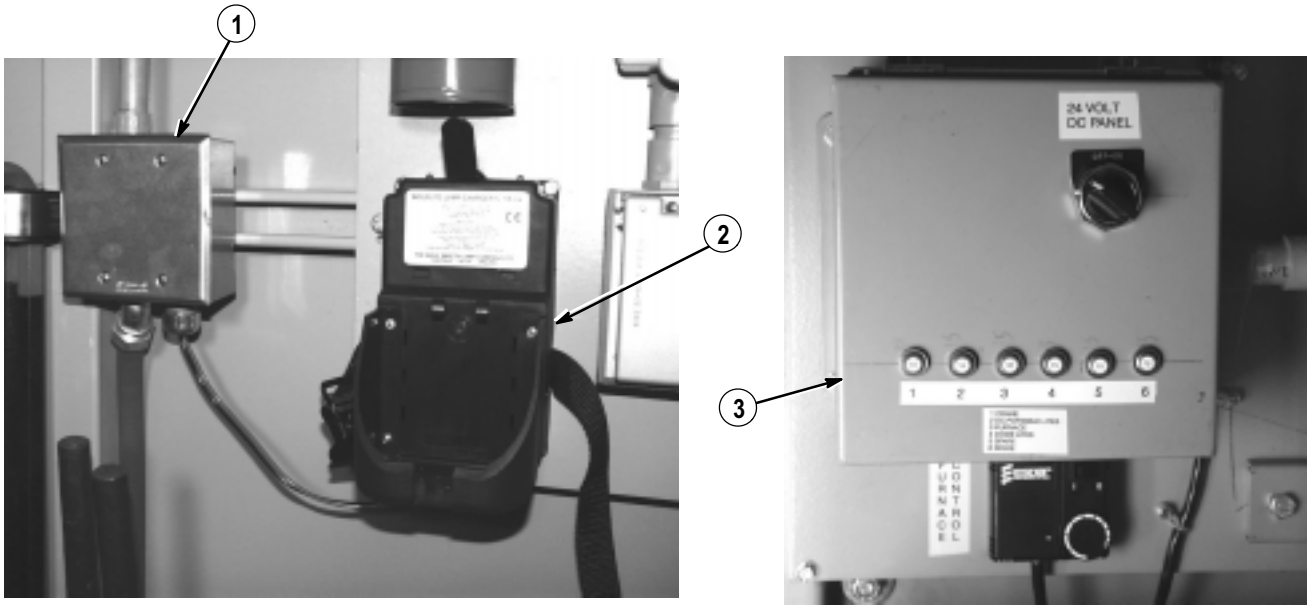
Check condition of fuse inside light casing (2).

If fuse condition is good, replace light. If fuse is faulty, replace fuse.

Table 2-9. Electrical System Troubleshooting (CONT).

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

6. ONE OR MORE DC RECHARGEABLE HANDLAMP CHARGING STATIONS ARE INOPERABLE.



NOTE

- Ensure FRS 24 VDC electrical system is functioning properly.
- Ensure MASTER DISCONNECT and 24 VDC panel switches are in the ON position for voltage checks (TM 9-4940-568-10).

Check for proper ground inside junction box (1) for DC rechargeable handlamp charging station (2).

If proper ground is found, go to next test. If ground cannot be found, repair or replace ground wire from junction box to DC rechargeable handlamp station (see schematic Figure 2-5).

Check for voltage between input wire for rechargeable handlamp charging station (2) and a known good ground.

If voltage is present, replace rechargeable handlamp charging station (Para 3-13). If voltage is not present, go to next test.

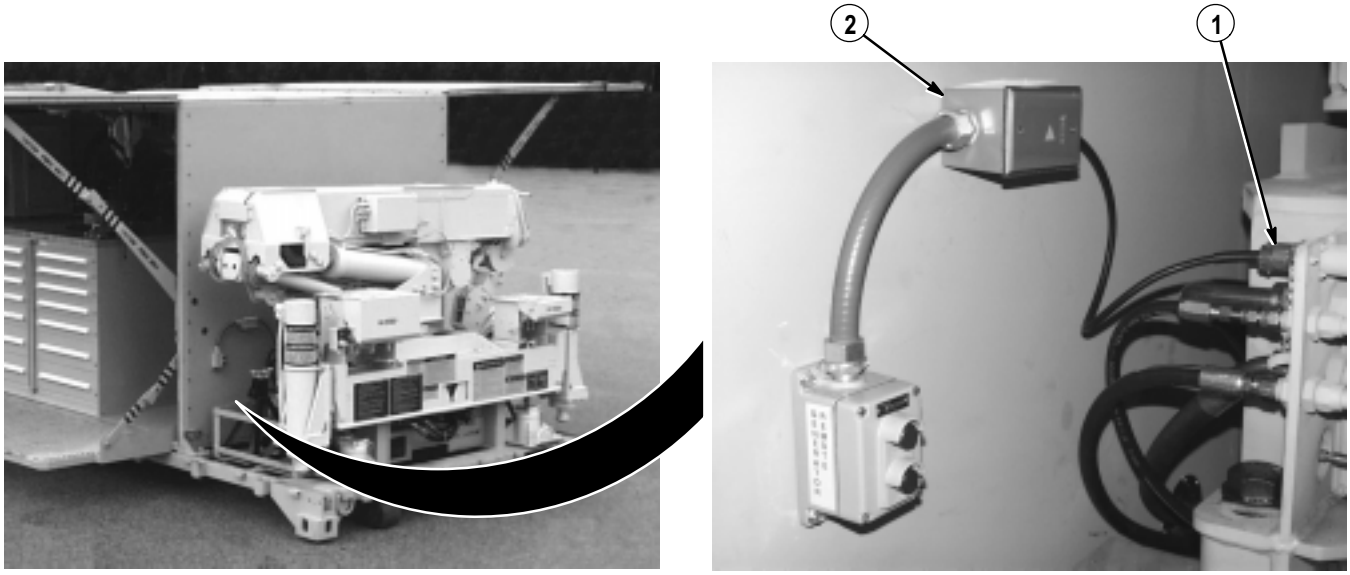
Open 24 VDC panel (3) (Para 3-3) and check for voltage between input terminal position 89 and known good ground.

If voltage is present, repair or replace wire from output terminal position 89 and DC portable light junction box (see schematic Figure 2-5). If voltage is not present, repair or replace 24 VDC input wire to terminal block from generator main circuit breaker panel.

Table 2-9. Electrical System Troubleshooting (CONT).

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

7. NO CRANE POWER FROM SHELTER.



NOTE

- Ensure FRS 24 VDC electrical system is functioning properly.
- Ensure MASTER DISCONNECT and 24 VDC panel switches are in the ON position for voltage checks (TM 9-4940-568-10).

Check for voltage between Pin "A" at crane hydraulic manifold connector (1) and a known good ground.

If voltage is present, refer to crane electrical troubleshooting. If voltage is not present, go to next test.

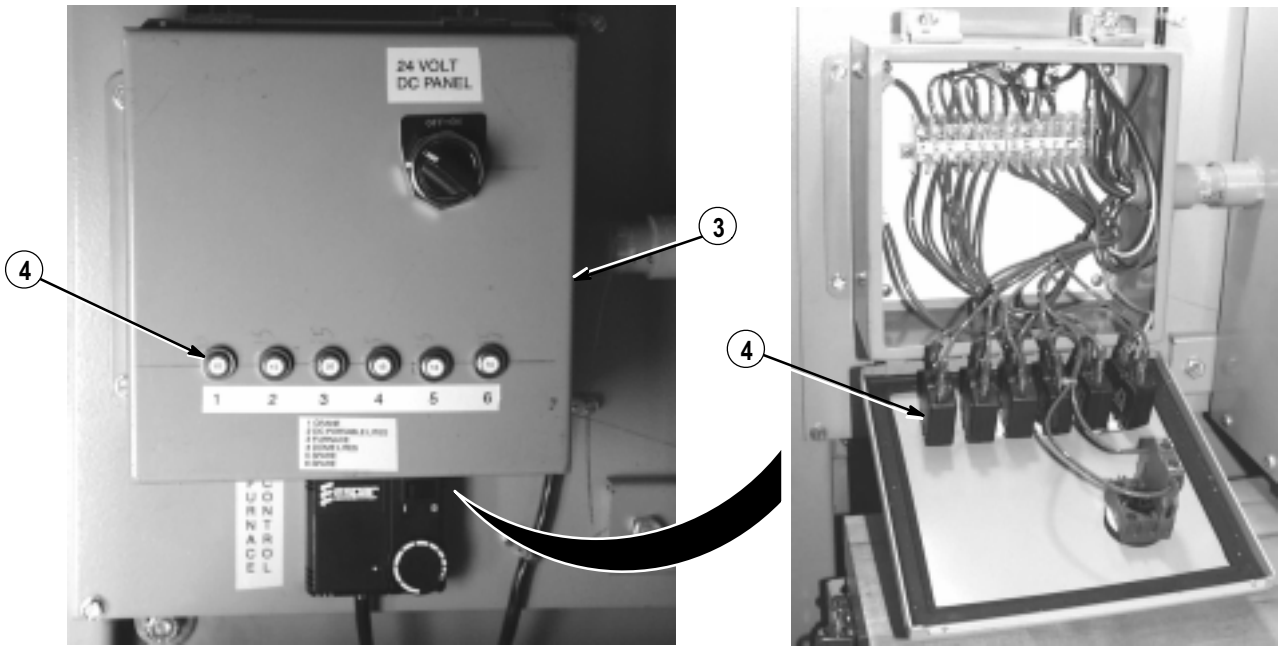
Remove junction box cover (2) on outside rear of shelter and check for voltage between black wire and a known good ground.

If voltage is present, repair or replace power cable between junction box and crane hydraulic manifold connector (Para 3-16). If voltage is not present, go to next test.

Table 2-9. Electrical System Troubleshooting (CONT).

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

7. NO CRANE POWER FROM SHELTER (CONT).



Open 24 VDC panel cover (3) (Para 3-3) and check for voltage on output side of terminal block position 88 and a known good ground.

If voltage is present, repair or replace wire from 24 VDC panel to junction box on outside rear of shelter (see schematic Figure 2-5). If voltage is not present, go to next test.

Check for voltage between output terminal of circuit breaker #1 (4) and a known good ground.

If voltage is present, repair or replace wire from circuit breaker #1 to input side of terminal block position 88 (see schematic Figure 2-5). If voltage is not present, go to next test.

Check for voltage between input terminal of circuit breaker #1 (4) and a known good ground.

If voltage is present, replace circuit breaker #1 (Para 3-3). If voltage is not present, go to next test.

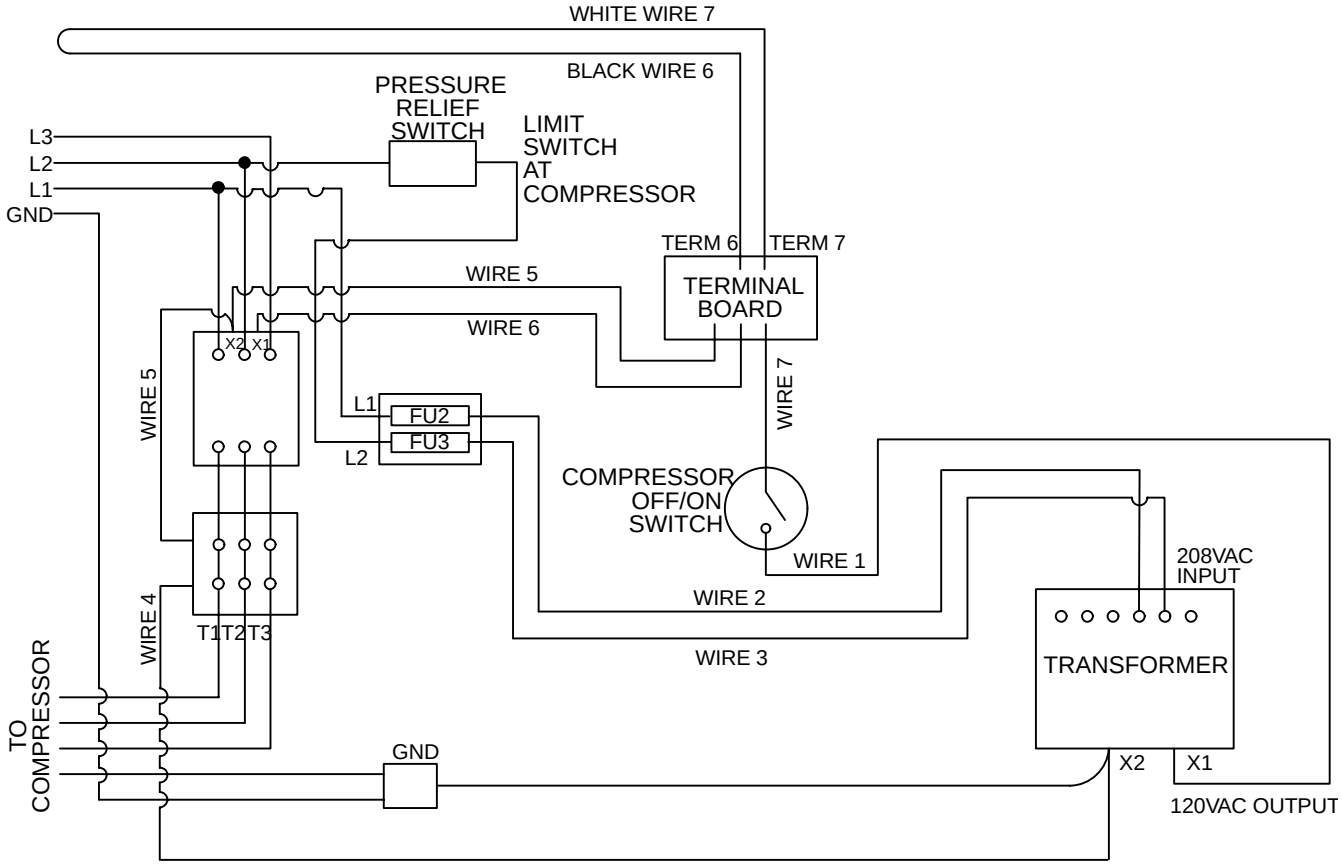
Check for voltage between input terminal block position #24 and a known good ground.

If voltage is present, repair or replace wire from output terminal block position #24 and circuit breaker #1. If voltage is not present, repair or replace 24 VDC power wire from generator main circuit panel (see schematic Figure 2-5).

2-14. AIR COMPRESSOR TROUBLESHOOTING.

This paragraph covers Air Compressor Troubleshooting.

Table 2-10. Air Compressor Fault Index



L1 and L2 provide 208 VAC to a transformer on wires 2 and 3. The transformer drops the voltage to 120 VAC. The hot wire sends 120 VAC to the compressor off/on switch. When the switch is closed, the voltage is sent out to the compressor limit switches and oil level safety switch. It returns on wire 6 to terminal 6 of the compressor terminal board. Wire 6 sends voltage to energize the 3ϕAC relay and sends 208 VAC to the compressor.

Figure 2-6. Air Compressor VAC Schecmatic.

Table 2-11. Air Compressor Troubleshooting

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION
1. OIL IN DISCHARGE AIR.
Clogged intake filter.
Replace intake filter (Para 11-6).
Oil viscosity too low.
Drain and fill with higher viscosity oil (Para 11-9).
Oil level too high.
Drain to correct level (Para 11-9).
Detergent type oil being used.
Change to non-detergent type with rust and oxidation inhibitor.
Oil control ring broken or not seated in, stuck in groove, rough, scratched, or excessive end gap.
Replace air compressor (Para 11-2).
Cylinders or piston rings scratched, worn or scored.
Replace air compressor (Para 11-2).
2. KNOCKS OR RATTLES.
Loose belt wheel or motor pulley or motor with excessive end play in shaft.
Replace air compressor (Para 11-2).
Leaking, broken, or loose valves.
Replace air compressor (Para 11-2).
Leaking, broken or worn inlet unloader parts. Aux. valve dirty, seats worn.
Replace air compressor (Para 11-2).
Worn or scored connecting rod, piston pin or crank pin bearings.
Replace air compressor (Para 11-2).

Table 2-11. Air Compressor Troubleshooting (CONT).

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

2. KNOCKS OR RATTLES (CONT).

Defective ball bearing on crankshaft or on motor shaft. Loose motor fan. Loose bearing spacer on crankshaft.

Replace air compressor (Para 11-2).

Cylinders or piston rings scratched, worn or scored.

Replace air compressor (Para 11-2).

3. AIR DELIVERY HAS DROPPED OFF.

Clogged intake filter/silencer(s).

Replace air compressor (Para 11-2).

Air leaks in piping. (On machine or in outside system.)

Replace air compressor (Para 11-2).

Leaking or maladjusted centrifugal pilot valve, or defective o-ring on pilot valve.

Replace air compressor (Para 11-2).

Leaking, broken, or loose valves.

Replace air compressor (Para 11-2).

Cylinders or piston rings scratched, worn or scored.

Replace air compressor (Para 11-2).

Table 2-11. Air Compressor Troubleshooting (CONT).

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

4. TRIPS MOTOR OVERLOAD OR DRAWS EXCESSIVE CURRENT.

Oil viscosity too high.

Drain and fill with higher viscosity oil (Para 11-9).

Check line voltage, motor terminals for good contact, tight starter connections.

Verify line voltage and check connections.

V-Belt pulled excessively tight.

Loosen belt.

Worn or scored connecting rod, piston pin or crank pin bearings.

Replace air compressor (Para 11-2).

Defective ball bearing on crankshaft or on motor shaft. Loose motor fan. Loose bearing spacer on crankshaft.

Replace air compressor (Para 11-2).

Cylinders or piston rings scratched, worn or scored.

Replace air compressor (Para 11-2).

Table 2-11. Air Compressor Troubleshooting (CONT).

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

5. WATER IN FRAME OR RUSTING IN RESERVOIR.

Detergent type oil being used.

Change to non-detergent type with rust and oxidation inhibitor.

Extremely light duty or located in a damp humid spot.

Drain reservoir often (TM 9-4940-568-10).

6. EXCESSIVE STARTING AND STOPPING (AUTO START).

Air leaks in piping. (On machine or in outside system.)

Replace hoses and tighten fittings.

7. COMPRESSOR RUNS EXCESSIVELY HOT.

Air to fan wheel blocked off.

Remove blockage from fan wheel.

Oil level too low.

Fill to correct level.

8. COMPRESSOR WON'T COME UP TO SPEED.

Check line voltage, motor terminals for good contact, tight starter connections.

Verify line voltage, tighten terminals and connections.

9. LIGHTS FLICKER WHEN COMPRESSOR RUNS.

Check line voltage, motor terminals for good contact, tight starter connections.

Verify line voltage, tighten terminals and connections.

Poor power regulation (unbalanced line).

Repair short in wire (see schematic Figure 2-6).

Table 2-11. Air Compressor Troubleshooting (CONT).

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

10. ABNORMAL PISTON, RING OR CYLINDER WEAR.

Oil level too low.

Fill to correct level.

Detergent type oil being used.

Change to non-detergent type with rust and oxidation inhibitor.

Oil control ring broken or not seated in, stuck in groove, rough, scratched, or excessive end gap.

Replace air compressor (Para 11-2).

Extremely dusty atmosphere.

Need more effective air inlet muffler and cleaner.

11. AIR COMPRESSOR WILL NOT START (NO POWER).

Check to see if air compressor will reset.

Press blue button at air compressor control box.

Open air compressor control box and check for 208 VAC at T1, T2, and T3 with compressor switch on. Check for 208VAC at air compressor motor.

If voltage is present, Notify Supervisor.

If voltage is not present, replace wires (see schematic Figure 2-6).

Check for 208VAC at input side of current reset switch.

If voltage is present, replace current reset switch (Para 3-2).

If voltage is not present, perform next test.

Check for 208VAC at input side of compressor relay from main AC panel.

If voltage is not present, troubleshoot panel.

If voltage is present, perform next test.

Check for 120VAC to fuses FU2 and FU3.

If voltage is not, replace wire as necessary (see schematic Figure 2-6).

If voltage is present, perform next test.

Check for 120VAC from FU2 and FU3.

If voltage is not present, replace fuse as necessary (Para 3-2).

If voltage is present, perform next test.

Table 2-11. Air Compressor Troubleshooting (CONT).

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

11. AIR COMPRESSOR WILL NOT START (NO POWER) (CONT).

Check for 208VAC at input of transformer.

If voltage is not present, replace wires #2 and #3 (see schematic Figure 2-6).

If voltage is present, perform next test.

Check for 120VAC at X1 and X2 terminals of transformer.

If voltage is not present, replace transformer (Para 3-2).

If voltage is present, perform next test.

Check for 120VAC at air compressor ON/OFF switch on wire #1.

If voltage is not present, replace wire #1 (see schematic Figure 2-6).

If voltage is present, perform next test.

Check for voltage at output side of ON/OFF switch where wire #7 is connected.

If voltage is not present, replace switch (Para 3-2).

If voltage is present, perform next test.

Check for 120VAC at terminal board terminal #7.

If voltage is not present, replace wire #7 (see schematic Figure 2-6).

If voltage is present, perform next test.

Check for 120VAC on terminal 6 (voltage returning from compressor limit switches and low compressor oil safety switch).

If no voltage is present, check for voltage going through pressure limit switches. Adjust pressure settings until compressor turns on and off at desired pressures (Para 11-11). If compressor will not start, check wiring through low oil switch or replace switches (Para 11-10).

If voltage is present, perform next test.

Check for 120VAC at X1 terminal (wire #6) on air compressor relay.

If no voltage is present, replace wire #6 (see schematic Figure 2-6).

If 120VAC is present, push manual contact close button in center of relay and compressor should start. If not, replace relay (Para 3-2). If compressor does not start, perform next test.

Disconnect compressor wires at T1, T2, and T3 and reset current sensor and check for 120VAC at T1, T2, and T3.

If no voltage is present, replace current sensor (Para 3-2).

If voltage is present, replace air compressor (Para 11-2).

2-15. HYDRAULIC PUMP TROUBLESHOOTING.

This paragraph covers Hydraulic Pump Troubleshooting.

Table 2-12. Hydraulic Pump Fault Index

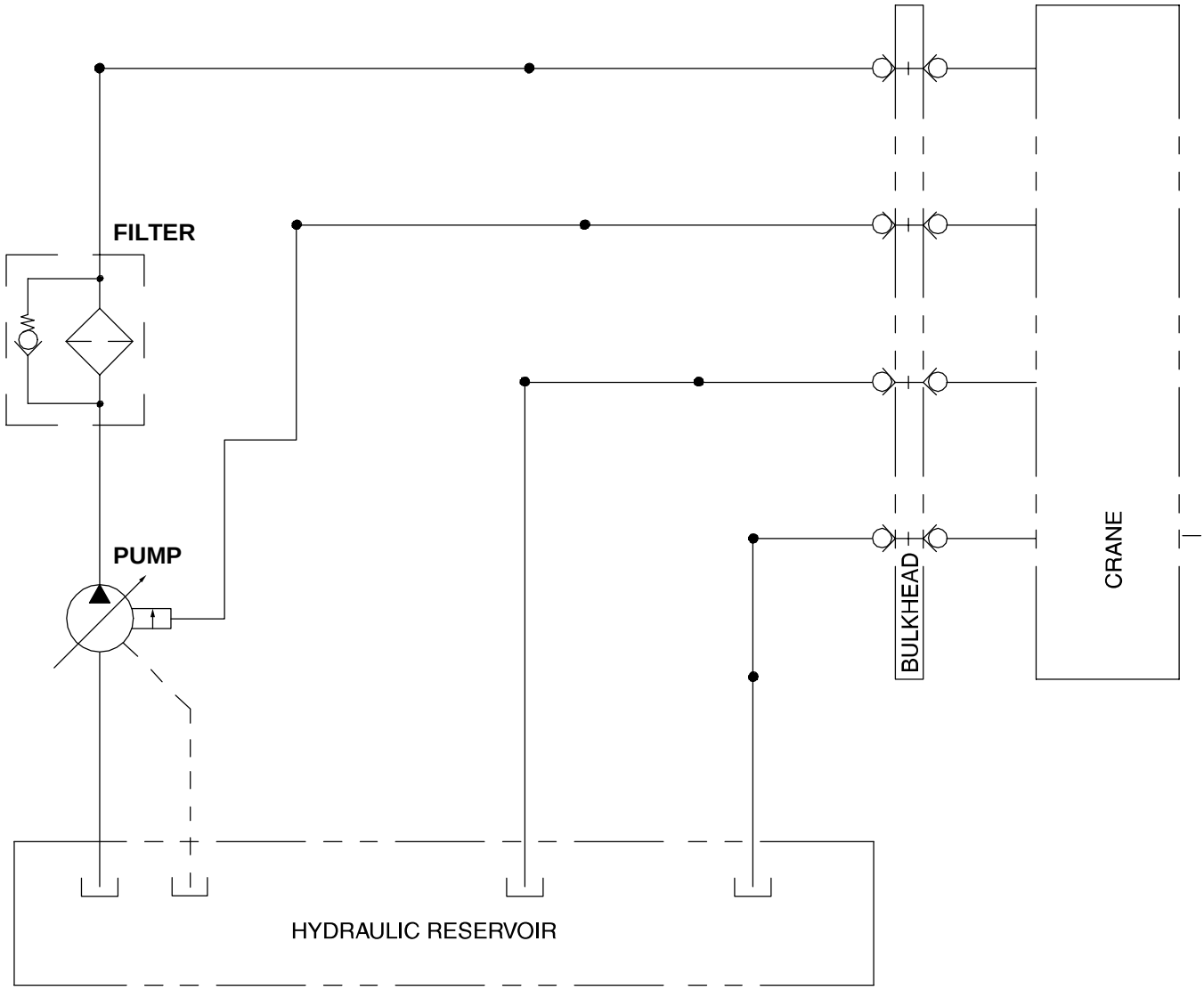


Figure 2-7. Hydraulic Schematic.

Table 2-13. Hydraulic Pump Troubleshooting

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

1. HYDRAULIC PUMP WILL NOT PRIME.

NOTE

Pump should priome within 20 seconds.

Check for proper drive rotation and ensure pump shaft is turning.

If problem persists, Notify Supervisor.

2. HYDRAULIC PUMP PRESSURE LOW.

Check pressure valve adjustment screw is not backed out.

If problem persists, Notify Supervisor.

3. HYDRAULIC PUMP PRODUCES NO FLOW.

Check hydraulic reservoir is full.

If problem persists, Notify Supervisor.

2-16. HEATER SYSTEM TROUBLESHOOTING.

This paragraph covers Heater System Troubleshooting.

Table 2-14. Heater System Fault Index

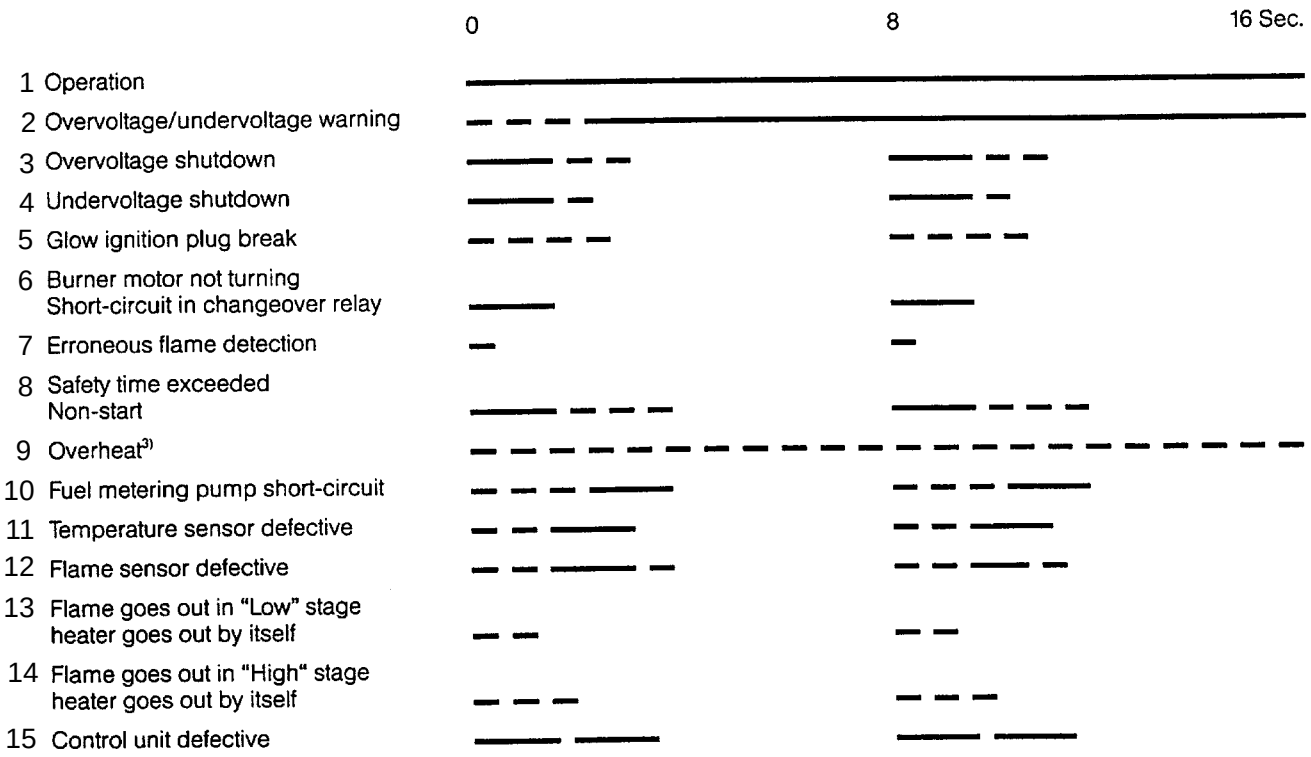


Figure 2-8. Heater Diagnostic Signals.

Table 2-15. Heater System Troubleshooting

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

NOTE

Heater is equipped with built in diagnostics. While pressing the start switch for two to five seconds the green LED light will light accordingly.

1. HEATER WILL NOT START.

Blower fan not turning.

Check 24 VDC circuit breaker (Para 3-3).

Heater only blows cool air.

Check that heater is getting fuel.

2-17. WELDER TROUBLESHOOTING.

This paragraph covers Welder Troubleshooting.

Table 2-16. ARC Welder Fault Index

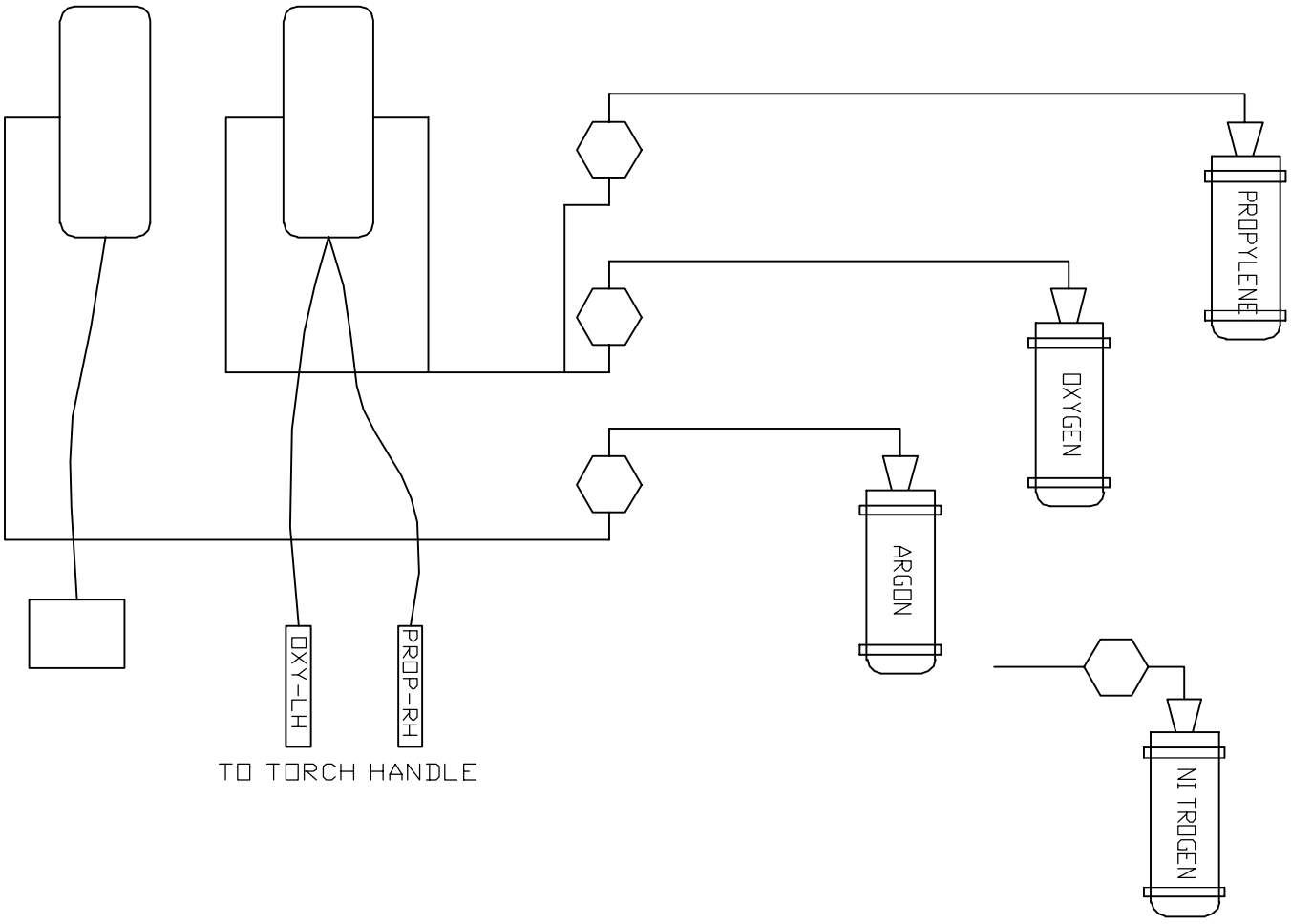


Figure 2-9. ARC Welder Diagram.

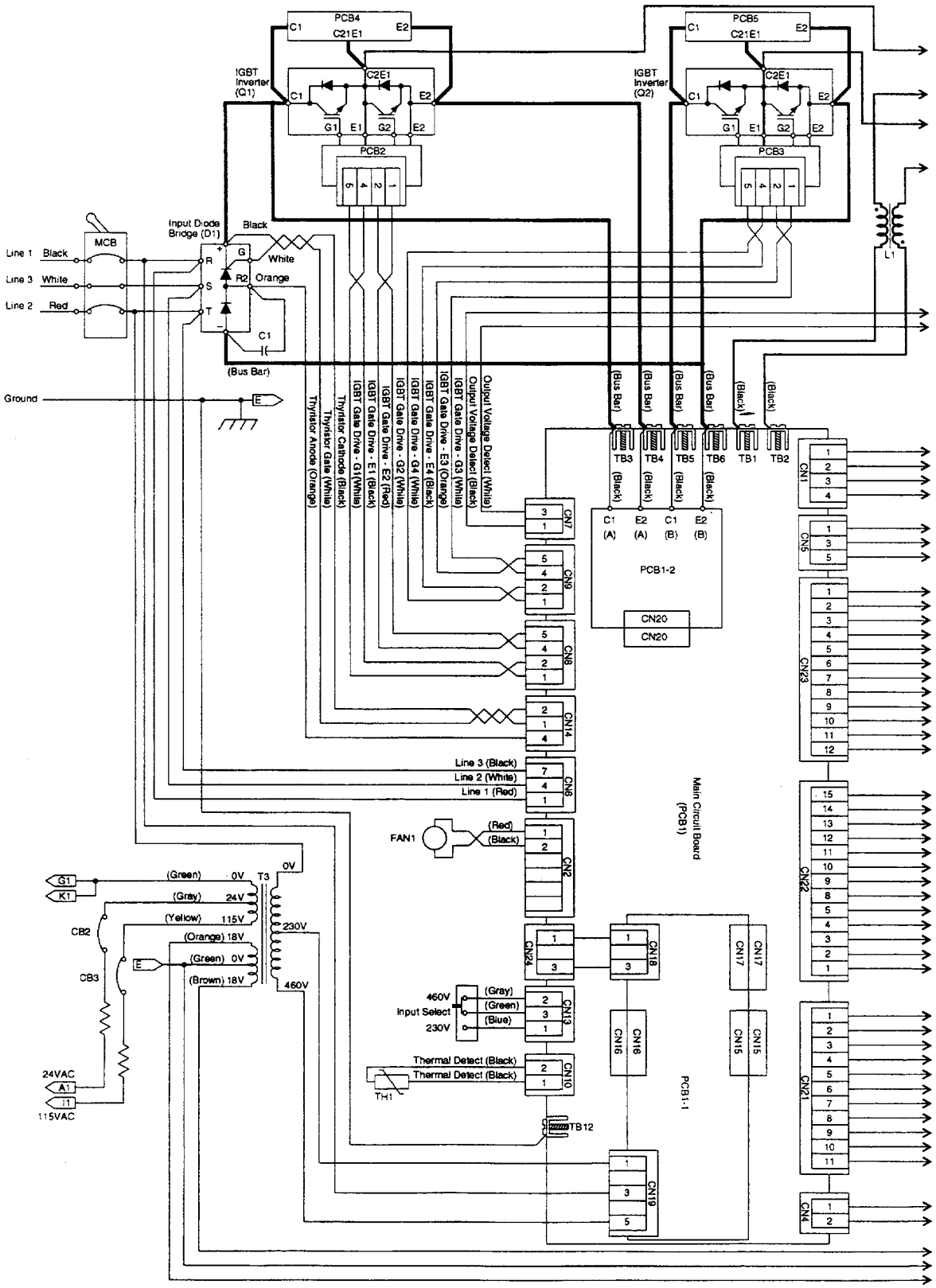


Figure 2-10. ARC Welder Schematic (Sheet 1 of 2).

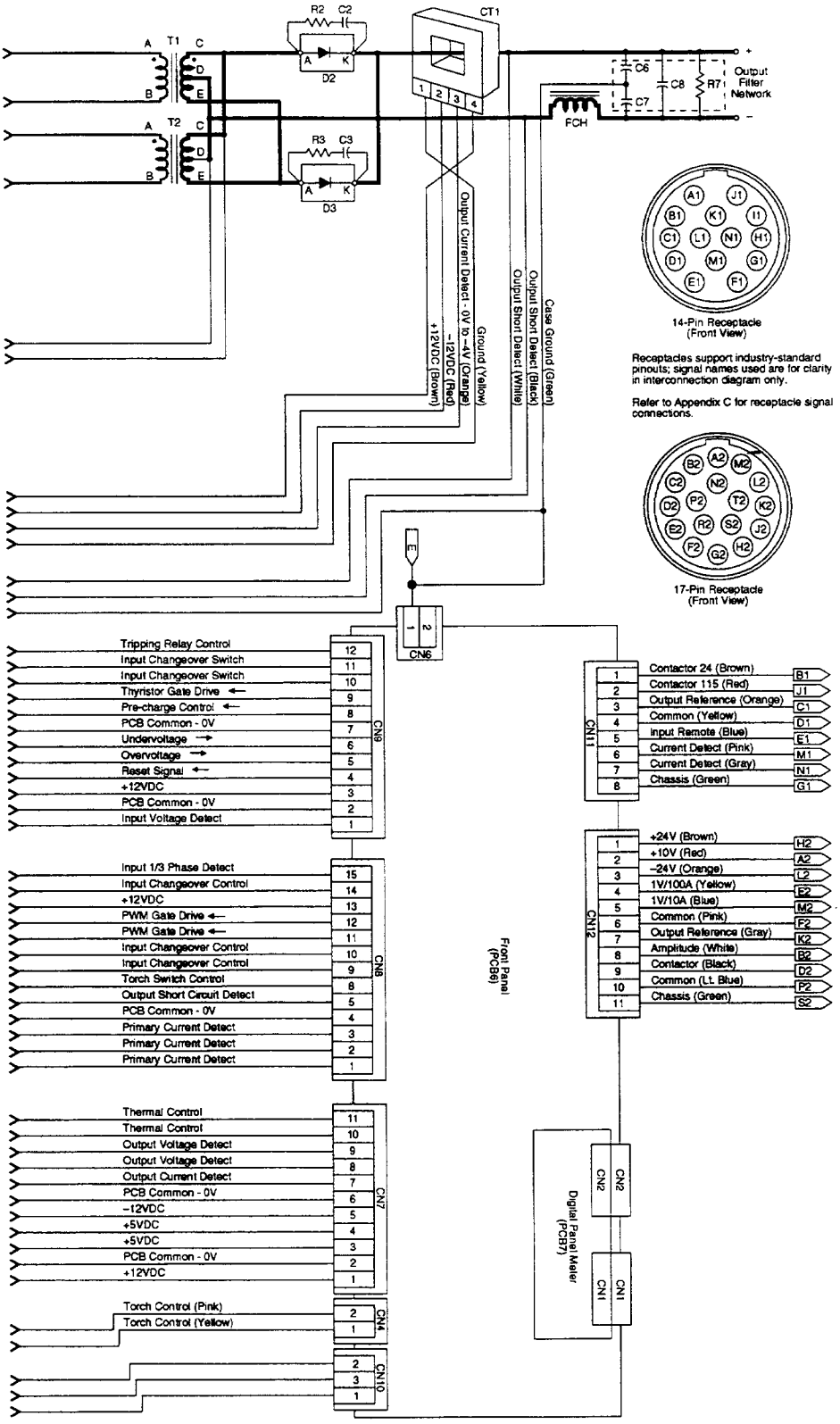


Figure 2-10. ARC Welder Schematic (Sheet 2 of 2).

Table 2-17. ARC Welder Troubleshooting.

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

WARNING

There are extremely dangerous voltage and power levels present inside this unit. Do not attempt to diagnose or repair unless you have had training in power electronics measurement and troubleshooting techniques.

1. NO POWER.

Main power not connected.

Connect main power.

Main power not turned on.

Turn on main power.

MAIN CIRCUIT BREAKER set to OFF position.

Place MAIN CIRCUIT BREAKER to ON position.

INPUT SELECTOR (Easy Link) switch in wrong position.

Place INPUT SELECTOR switch in correct position.

2. POOR WELD.

Wrong polarity.

Set to correct polarity.

Wrong electrode used.

Use correct electrode.

Electrode not properly prepared.

Prepare electrodes using proper instructions.

Incorrect welding amperage setting.

Change to correct amperage setting.

Speed too slow or too fast.

Correct speed setting.

Incorrect switch settings for intended operation.

Change to switch settings used for intended operation.

Poor weld output connection(s).

Fix weld output connection(s).

Table 2-17. ARC Welder Troubleshooting (CONT).

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

3. NO WELD OUTPUT; UNIT IS COMPLETELY INOPERATIVE.

Line disconnect switch is in OFF position.

Place line disconnect switch in ON position.

Line fuse(s) open.

Check and replace line fuse(s).

Improper electrical input connections.

Verify input connections.

MAIN CIRCUIT BREAKER in OFF position

Check and reset MAIN CIRCUIT BREAKER if necessary.

INPUT SELECTOR (Easy Link) switch is set to incorrect position for applied input voltage.

Verify primary source voltage and set INPUT SELECTOR switch to correct setting.

4. WARNING INDICATOR IS ON.

Unit is is thermal shutdown mode.

a. Allow cooling period of approximately five (5) minutes with the power ON. Duty cycle should be reviewed. To reset the WARNING indicator, the power supply must be turned OFF, then ON again.

b. Measure input voltage and verify that it matches the INPUT SELECTOR (Easy Link) switch setting. The length of the input power cable must be considered, as there will be considerable voltage drop along its length.

Table 2-17. ARC Welder Troubleshooting (CONT).

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION
5. ERRATIC OR IMPROPER WELD OUTPUT.
Loose welding cable connections.
Tighten all welding cable connections.
Incorrect welding cable size.
Use proper size and type of cable.
Improper input connections.
Use proper input connections.
Poor electrode condition.
Replace electrode.
If using a wire feeder, ensure that the wire is feeding at a consistent rate.
Adjust wire feeder.
If is GTAW mode, check the condition of the tungsten electrode.
Use the recommended 2% Thoriated tungsten.
In GTAW mode, incorrect argon gas flow.
Verify that argon gas flow is correct.
Incorrectly set PROCESS SELECTOR switch.
Verify the PROCESS SELECTOR switch is set to match the type of welding process being conducted.
Wrong welding polarity.
Verify output torch connections.

Table 2-17. ARC Welder Troubleshooting (CONT).

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

6. GREEN AC POWER INDICATOR OFF; FAN NOT OPERATING.

Input line disconnect switch in OFF position.

Place input line disconnect switch to ON position.

Power supply MAIN CIRCUIT BREAKER (MCB) in OFF position.

Place MCB to ON position.

7. RED WARNING INDICATOR ON; NO WELD OUTPUT.

Thermal sensor TH1 open (thermal shutdown)

Allow the unit to cool for five minutes before turning the power supply ON.

Input voltage fluctuation causing protection circuits to activate.

Monitor input power for spikes and high voltage condition.

8. FRONT PANEL 24V OR 115V CIRCUIT BREAKER(S) TRIPS WHEN REMOTE CONTACTOR POINTS ARE CLOSED OR, WHEN THE AMPERAGE/VOLTAGE SELECTOR IN PANEL POSITION.

Faulty feeder/remote device.

Verify operation of external feeder device and replace if necessary.

9. NO WELD OR OUTPUT; FAN OPERATING; WARNING INDICATOR OFF.

OUTPUT CONTACTOR selector in REMOTE 14 position with no remote contactor connected.

Set OUTPUT CONTACTOR selector to ON position.

Line voltage is too high.

Verify that input voltage matches setting on rear panel INPUT SELECTOR switch.

Table 2-17. ARC Welder Troubleshooting (CONT).

MALFUNCTION TEST OR INSPECTION	CORRECTIVE ACTION
10. LIMITED WELD OUTPUT.	
Poor primary input voltage.	Check primary input voltage is within ±10% of nominal voltage, i.e. 230 VAC ±10%.
11. ERRATIC OR IMPROPER WELD OUTPUT.	
Loose welding cable connections.	Tighten all welding cable connections.
Improper setup.	Check for proper connection of input power.
12. NO 115 VAC OR 24 VAC AT 14-PIN CONNECTOR.	
Front panel circuit breakers are tripped.	Reset front panel circuit breakers.
13. NO WELD OUTPUT; FAN NOT OPERATING; WARNING INDICATOR OFF.	
Line voltage too low.	Verify that input voltage matches setting on rear panel INPUT SELECTOR switch.

Table 2-18. Wire Feeder Welder Fault Index

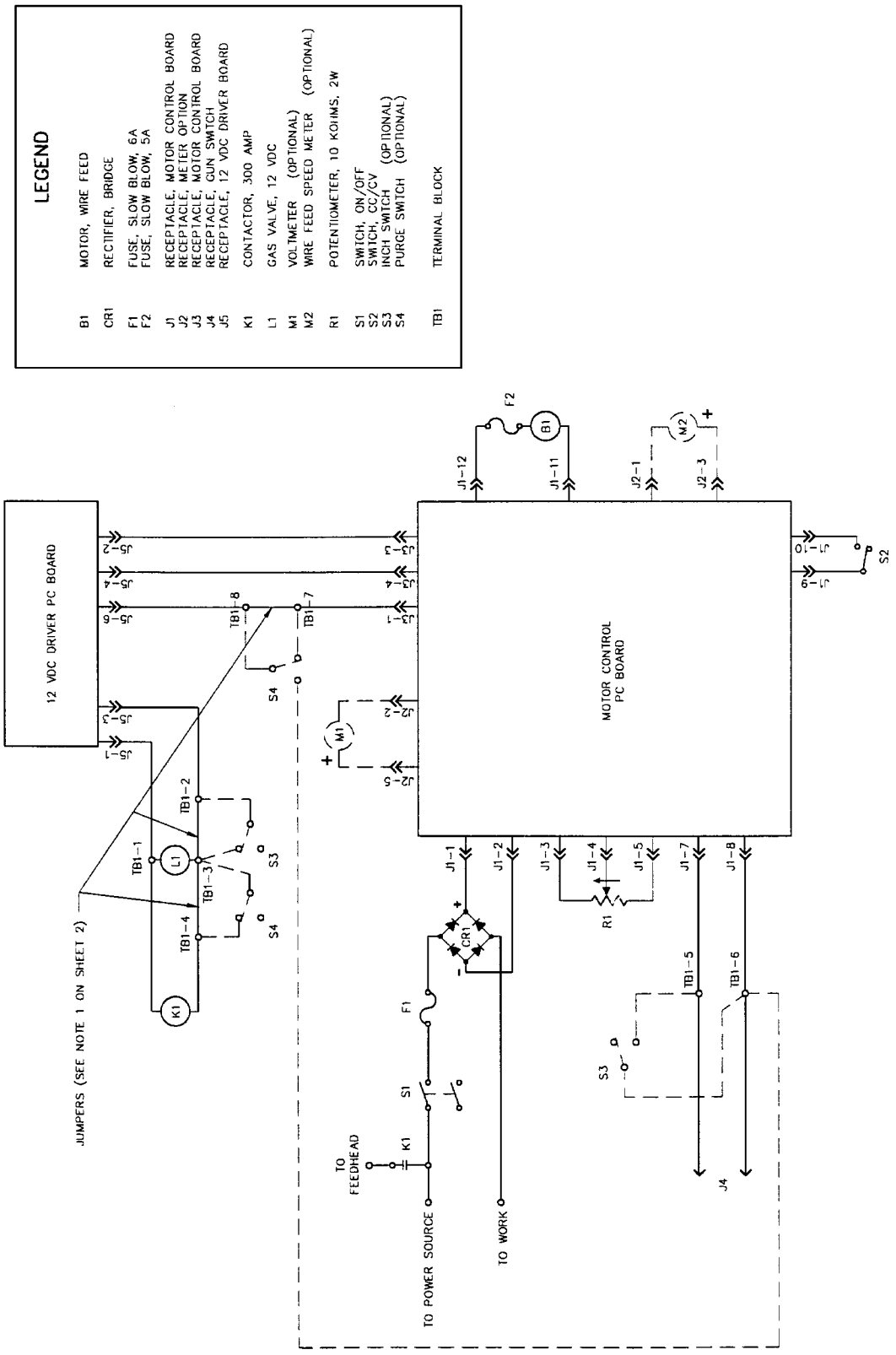


Figure 2-11. Wire Feeder Welder Schematic (Sheet 1 of 2).

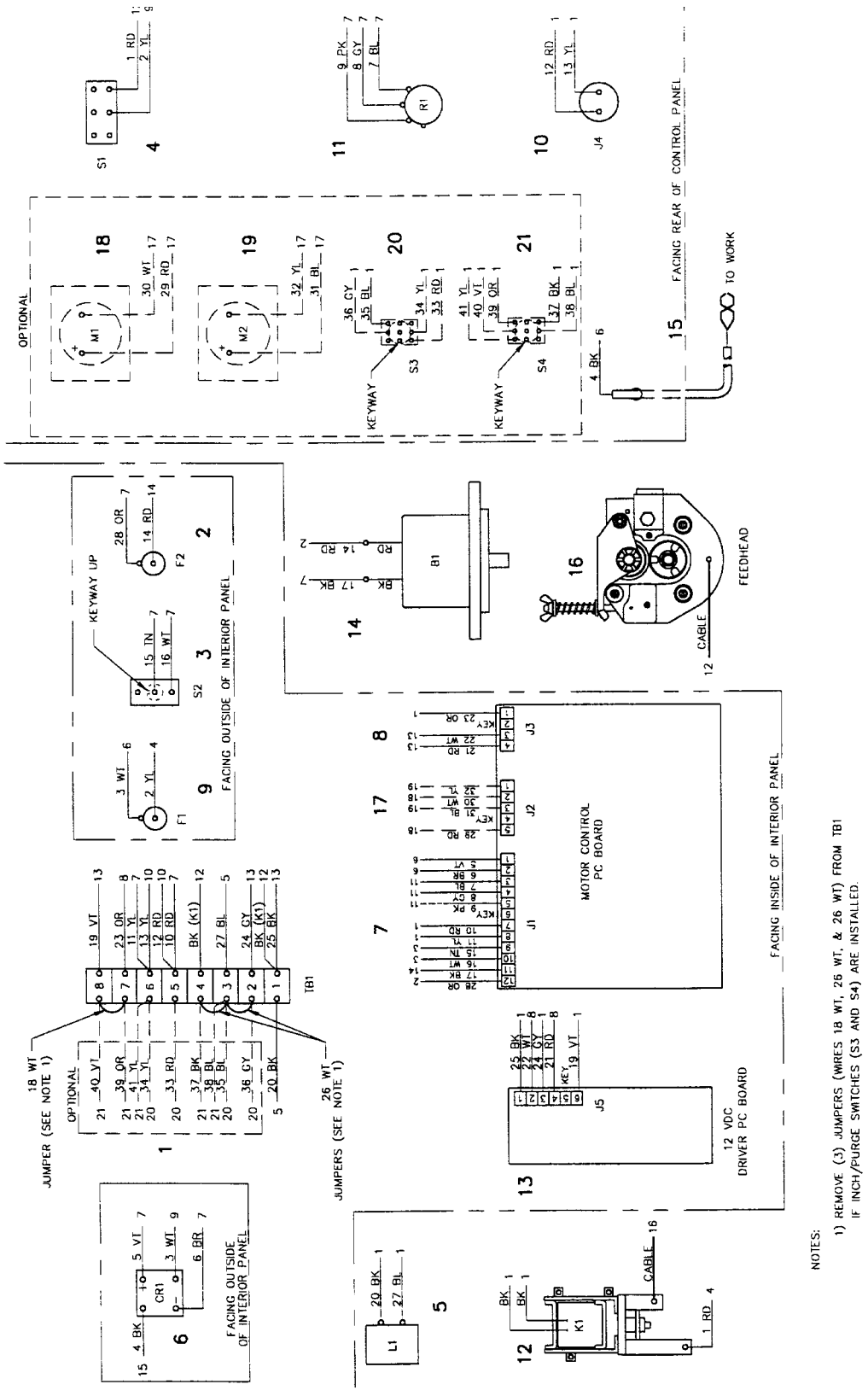


Figure 2-11. Wire Feeder Welder Schematic (Sheet 2 of 2).

Table 2-19. Wire Feeder Welder Troubleshooting.

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

WARNING

ELECTRIC SHOCK can kill.

- Follow all safety precautions.
- Do not touch live electrical parts.
- Turn OFF input power before servicing the machine unless otherwise noted.

CAUTION

Static sensitive devices.

- Use static proof bags.
- Use grounded wrist strap.
- Use qualified personnel when testing or handling device.

1. UNIT IS COMPLETELY INOPERATIVE – NOTHING FUNCTIONS.

Make sure all connections have been made to both the power source and wire feeder.

Verify connections are correct.

Make sure both the power source and wire feeder are turned ON.

Verify position of switch.

Make sure the power source output voltage is less than 140 VDC.

Verify power source voltage.

Check for a damaged power switch (S1).

Replace wire feeder.

Check for a damaged or blown input fuse (F1).

Replace fuse.

Table 2-19. Wire Feeder Welder Troubleshooting (CONT).

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

1. UNIT IS COMPLETELY INOPERATIVE – NOTHING FUNCTIONS (CONT).

With input power supplied to the wire feeder, measure the DC voltage across the (±) and (–) terminals of the bridge rectifier (CR1). The measured voltage should be within 5 volts of the voltage on the output terminals of the power source.

If not, replace wire feeder.

Check plug J1 on the motor control board for loose or faulty connections.

Tighten loose connections if possible or replace wire feeder.

2. WIRE FEED MOTOR OPERATES BUT WIRE DOES NOT FEED OR FEEDS ERRATICALLY.

Incorrect voltage current and/or wire feed speed incorrect.

Correct voltage or wire speed.

Make sure all connections to the wire feeder are tight.

If all connections are tight, replace wire feeder.

Make sure feed rolls are tight.

Replace with new roll.

Check for too little or too much pressure on the feed rolls.

Adjust sping control knob on wire feeder.

Check for correct feed roll size for welding wire being used.

Replace with correct roll size.

Check to see if wire spool tension is too great.

Adjust tension on spool.

Check for restriction in welding gun and/or contact tip.

Remove restriction and clean tip.

Check for correct gun liner and contact tip sizes for welding wire being used.

Replace with correct tip size.

Table 2-19. Wire Feeder Welder Troubleshooting (CONT).

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

3. WIRE WRAPS AROUND THE FEED ROLLS.

Check for too much pressure on the feed rolls.

Adjust sping control knob on wire feeder.

Check alignment of input and output guides.

Adjust alignment of input and output guides.

Check for correct gun liner and contact tip sizes for welding wire being used.

Replace with correct tip size.

4. WIRE DOES NOT FEED WITH GUN SWITCH DEPRESSED.

Check for continuity of the welding gun trigger leads with the trigger depressed.

If no continuity, repair or replace the welding gun.

Check the gun switch receptacle (J4), terminal strip (TB1), motor fuse (F2), wire feed motor (B1), and plug J1 on the motor control p.c. board for loose or faulty connections.

If no loose connection(s) are found, replace wire feeder gun.

Check for damaged or blown motor fuse (F2).

Replace fuse.

Make sure the power source output voltage is less than 140 VDC.

Adjust voltage.

5. WIRE FEED MOTOR CONTINUES TO RUN AFTER GUN SWITCH HAS BEEN RELEASED.

Check for shorted welding gun trigger leads while the gun switch on the welding gun is released.

If shorted, repair or replace the welding gun.

Check for a shorted gun switch receptacle (J4), terminal strip (TB1), or plug J1 on the motor control p.c. board.

If shorted, repair or replace the welding gun.

Table 2-19. Wire Feeder Welder Troubleshooting (CONT).

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

6. NO WIRE FEED SPEED (WFS) CONTROL.

Check for a loose WFS control knob.

Tighten knob.

Check potentiometer (R1) and plug J1 on the motor control p.c. board for loose or faulty connections.

If no loose connection(s) are found, replace wire feeder gun.

With input power supplied to the wire feeder, measure the DC voltage from J1-4 (±) to J2-1 (–) while varying the wire feed speed knob from minimum to maximum, the voltage range should be approximately 0.3 – 0.6 VDC.

If not, replace the wire feeder.

Make sure the power source output voltage is less than 140 VDC.

Adjust voltage.

7. WIRE FEEDS BUT NO GAS FLOWS.

Check to see if the gas cylinder is empty or the valve closed.

Replace cylinder or open valve.

Make sure proper gas flow rate has been set.

Adjust flow rate as needed.

Check for a possible restriction in the gas line or gas valve.

Remove restriction.

Check to see if the welding gun nozzle is plugged.

Remove restriction.

Table 2-19. Wire Feeder Welder Troubleshooting (CONT).

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

8. WIRE FEEDS, CONTACTOR DOES NOT CLOSE, AND WELDING WIRE IS NOT HOT – THERE IS NO ARC.

Check contactor (K1), terminal strip (TB1), and plug J1 on the 12 VDC driver p.c. board for loose or faulty connections.

Check for a damaged or blow fuse on the 12 VDC driver p.c. board.

If this fuse has blown, the contactor or gas valve is most likely shorted and should be checked (and replaced if necessary) before replacing the fuse.

With the contactor (K1) wires disconnected from the terminal strip (TB1), measure the resistance of the contactor coil. The resistance should be between 3 to 10 ohms.

If not, replace the contactor (K1).

Replace the 12 VDC driver p.c. board if necessary.

9. WIRE DOES NOT FEED WITH INCH SWITCH DEPRESSED.

Check inch switch (S3) and terminal strip (TB1) for loose or faulty connections.

Check for defective inch switch (S3).

Make sure the power source output voltage is less than 140 VDC.

10. GAS DOES NOT FLOW WITH PURGE SWITCH DEPRESSED.

Check purge switch (S4) and terminal strip (TB1) for loose or faulty connections.

Check for defective purge switch (S4).

11. METERS DO NOT FUNCTION.

Check meters (M1 and M2) and plug J2 on the motor control p.c. board for loose, faulty, or reversed connections.

2-18. CRANE TROUBLESHOOTING.

This paragraph covers Crane System Troubleshooting. The Crane System Fault Index, Table 2-20, lists faults for the crane system of the Forward Repair System (FRS).

Table 2-20. Crane System Fault Index

Table 2-20. Crane System Fault Index (Continued)

Table 2-21. Crane Troubleshooting

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

NOTE

Complete crane schematics can be found at the back of this manual.

CRANE ELECTRIC- FRS

1. CRANE INOPERATIVE.

NOTE

Unless advised otherwise, the FRS 24V MASTER switch and the crane MAIN POWER switch must be in the ON position for all voltage checks.

Before performing crane troubleshooting procedures, make sure the FRS 24 VDC electrical system is functioning properly.

Test 1. Attempt to move outrigger jack cylinders using crane controls on outrigger control valve bank.

- If outrigger/beams jack cylinders begin to move, problem is with the crane electrical system. Refer to Test 5.
- If outrigger beams/jack cylinders do not move, go to Test 2.

NOTE

Return Manual Override switch to NORMAL position and install manual override guard after Test 2. Notify Supervisor.

Test 2. Cut and remove safety lock seal. Remove two screws, lockwashers, washers and manual override guard from crane. Turn and pullout Hydraulic Pressure Manual Override button and attempt to move outrigger jack cylinders, using crane controls on outrigger control valve bank.

- If outrigger jack cylinders begin to move, the problem is with the crane electrical system, go to Test 5.
- If the outrigger beams/jack cylinders do not move, the problem is with the hydraulic system, go to Test 3.

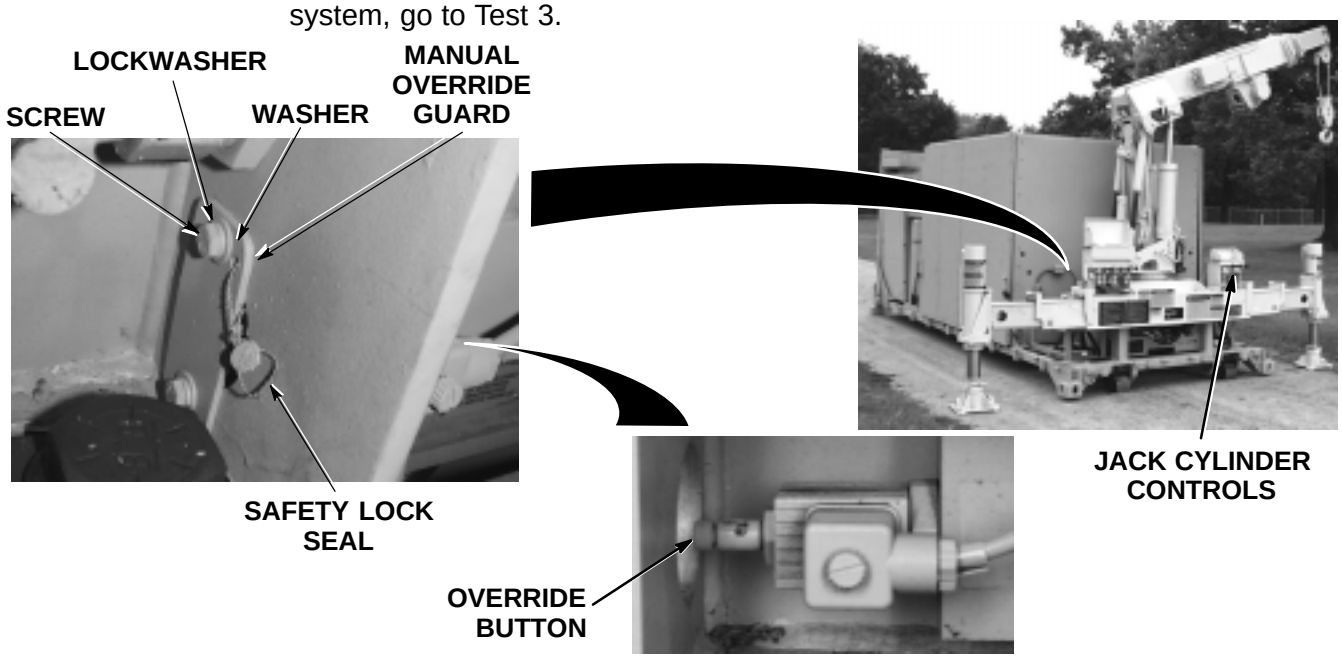


Table 2-21. Crane Troubleshooting (CONT).

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

1. CRANE INOPERATIVE (CONT).

Test 3. Check hydraulic lines, hoses, and fittings for leaks or damage that could restrict flow.

- If leaking or damaged lines are found, repair or replace lines as needed. Refer to paragraph 7-4 in this manual.
- If no leaks or damage are found, go to Test 4.

Test 4. Replace hydraulic filter element. Refer to paragraph 7-3 in this manual. Start FRS and attempt to move jack cylinders.

- If outrigger jack cylinders operate properly, problem has been corrected.
- If problem remains, Notify Supervisor.

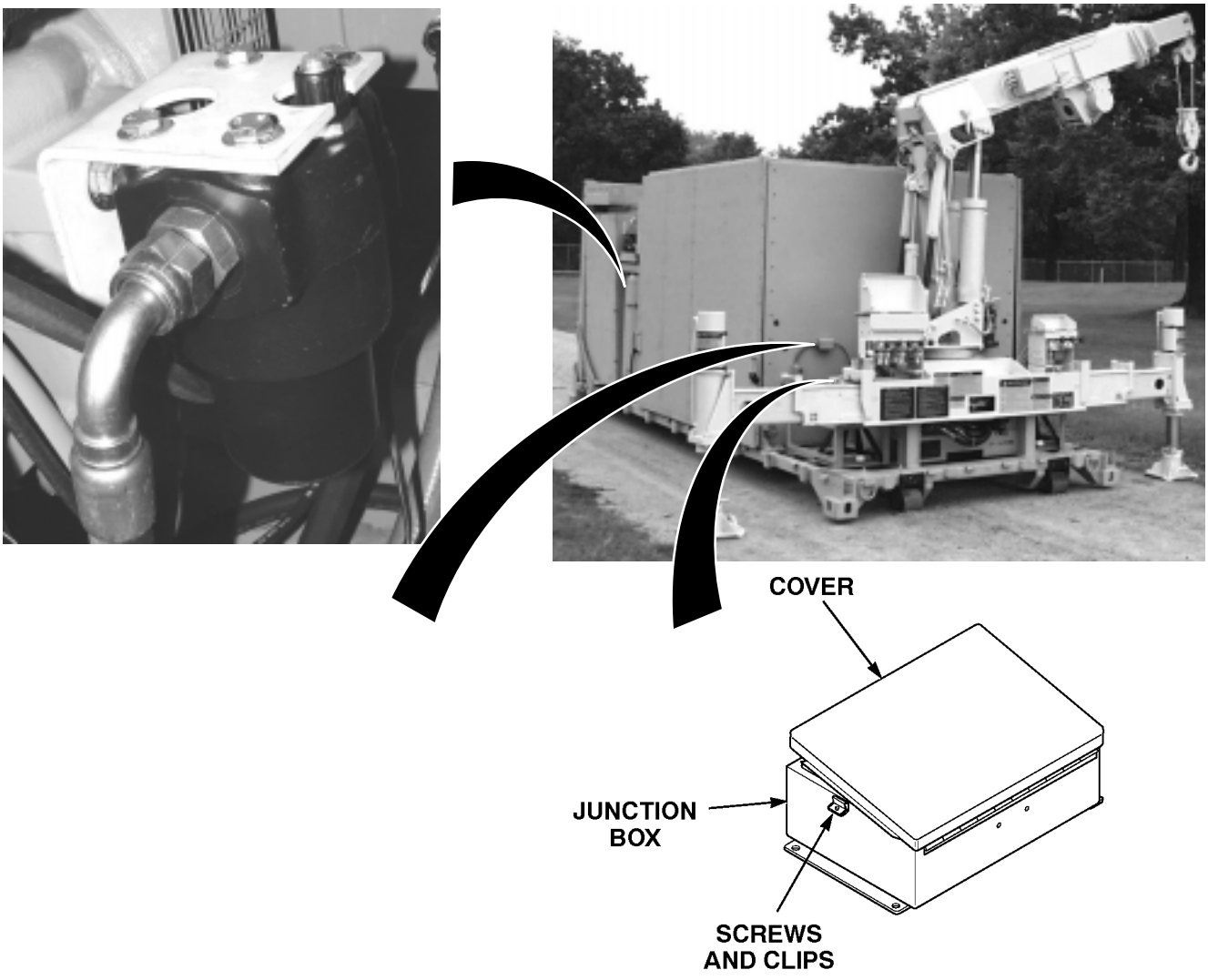


Table 2-21. Crane Troubleshooting (CONT).

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

Test 5. Disconnect FRS to crane connector at hydraulic bulkhead. Check for 24VDC at pin A of connector.

- If 24 volts are present, go to Test 6.
- If 24 volts are not present, the problem is with the FRS electrical system. Refer to troubleshooting paragraph 2-13 in this manual.

NOTE

Reconnect harness at bulkhead.

Test 6. Loosen four screws and clips and open crane junction box cover. Check for 24 volts between junction box terminal strip, position 3, and a good ground.

- If 24 volts are present, go to Test 7.
- If 24 volts are not present, repair or replace white wire in connector from hydraulic bulkhead to junction box terminal strip position 3. Refer to paragraph 3-16 in this manual.

Test 7. Check for 24 volts at crane main power switch (white wire).

- If 24 volts are present, go to Test 8.
- If 24 volts are not present, repair the white wire from the center terminal of the D-5 and D-6 diodes and the main power switch for the crane.

Test 8. Check for 24 volts on the black wire terminal of the crane main power switch.

- If 24 volts are present, go to Test 9.
- If 24 volts are not present, replace crane main power switch.

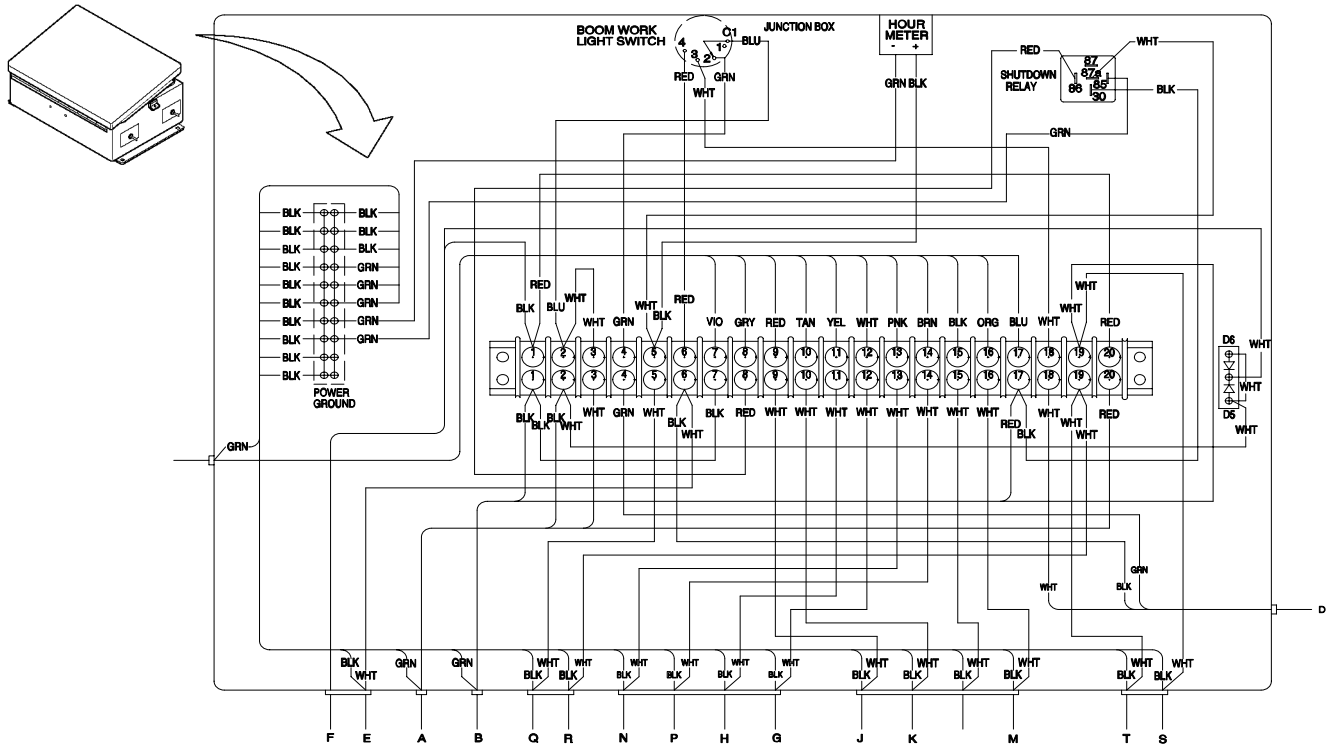


Table 2-21. Crane Troubleshooting (CONT).

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

1. CRANE INOPERATIVE (CONT).

Test 9. Check for 24 volts between junction box terminal strip, position 1, and known good ground.

- If 24 volts are present, go to Test 10.
- If 24 volts are not present, repair or replace black wire between terminal strip, position 1, and crane main power switch.

Test 10. Check for 24 volts at socket A of top harness connector for overload shutdown system.

- If 24 volts are present, go to Test 11.
- If 24 volts are not present, repair or replace harness from junction box to overload shutdown system. Refer to paragraph 5-4 in this manual.

Test 11. Check for 24 volts between junction box,terminal strip, position 17, and known good ground.

- If 24 volts are present, go to Test 12.
- If 24 volts are not present, check for continuity between socket D of overload shutdown system connector and junction box terminal strip, position 17. If no continuity is found, repair or replace harness from junction box to overload shutdown system. Refer to paragraph 5-4 in this manual. If continuity is found, replace overload shutdown system. Refer to paragraph 5-10 in this manual.

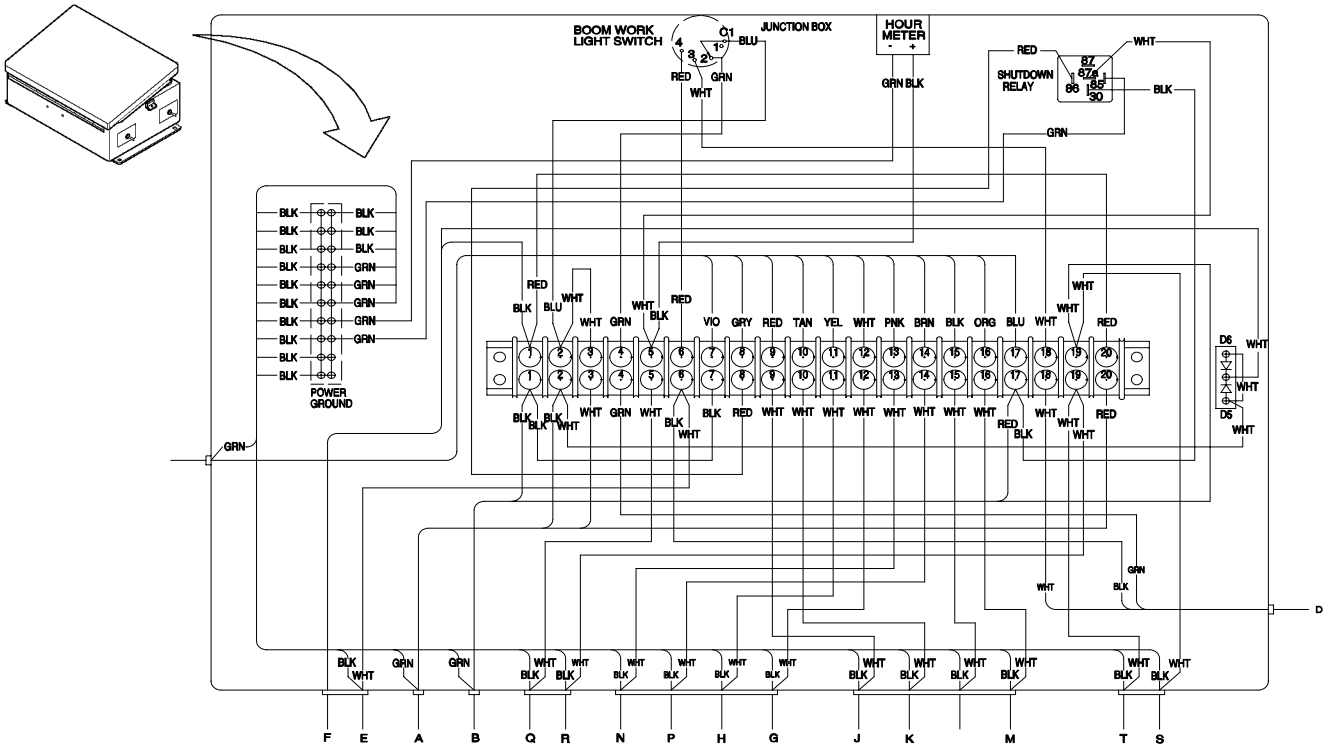


Table 2-21. Crane Troubleshooting (CONT).

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

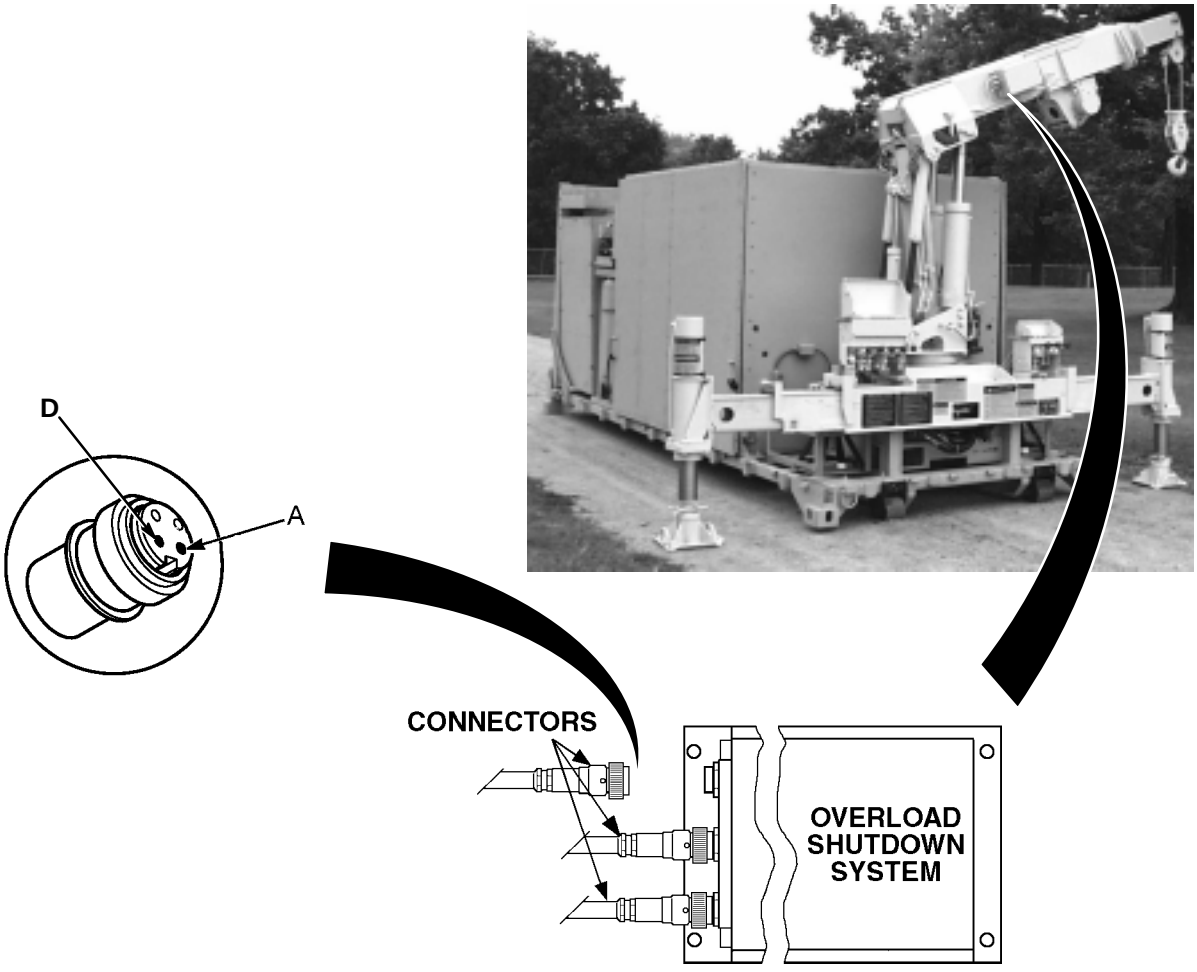


Table 2-21. Crane Troubleshooting (CONT).

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

1. CRANE INOPERATIVE (CONT).

Test 12. Check for 24 volts between shutdown relay (black wire) socket, located in the junction box and a known good ground.

- If 24 volts are present, go to Test 13.
- If 24 volts are not present, repair black wire from terminal strip, position 17, to shutdown relay. Refer to paragraph 3-16 in this manual.

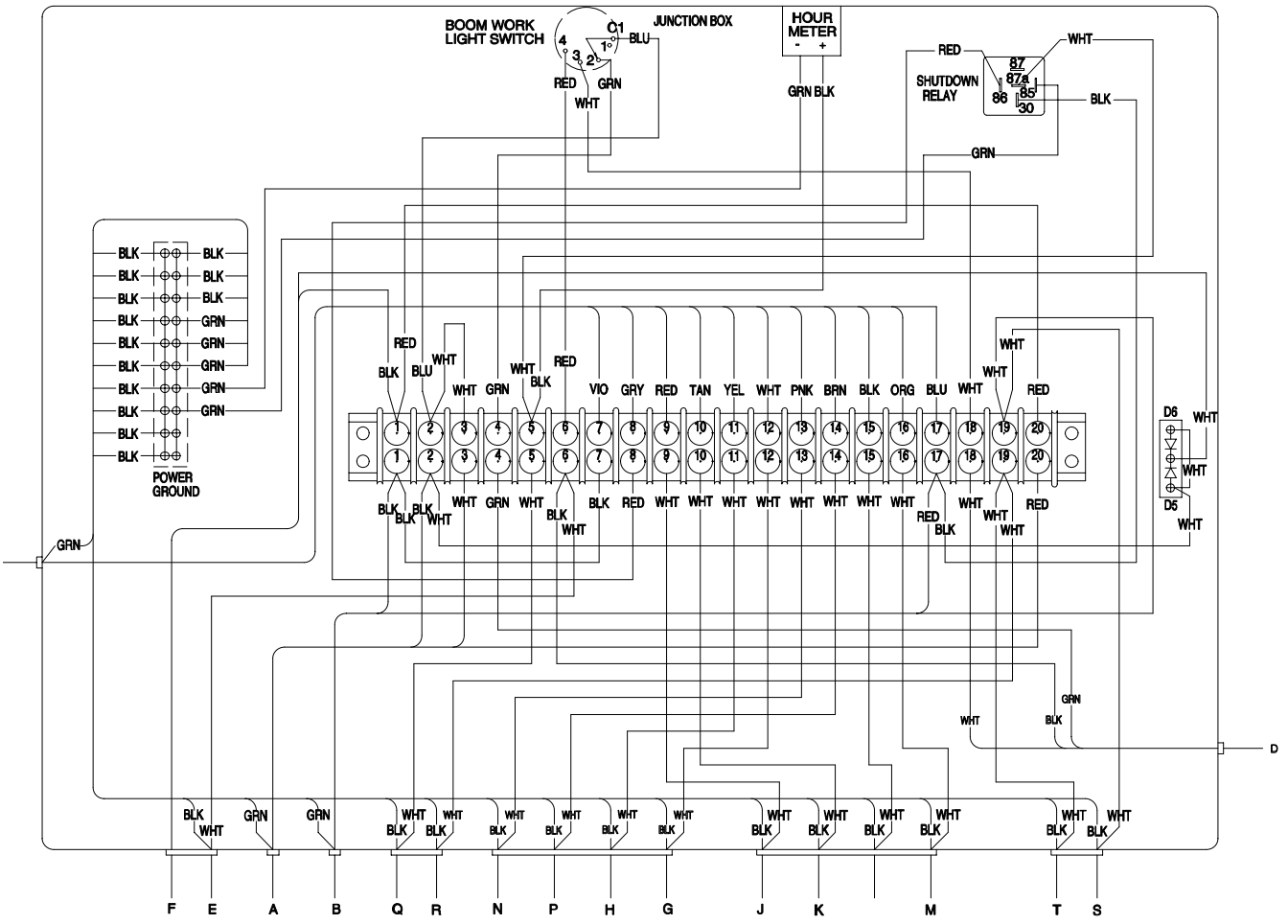
Test 13. Check for continuity between pins 30 and 87a of shutdown relay.

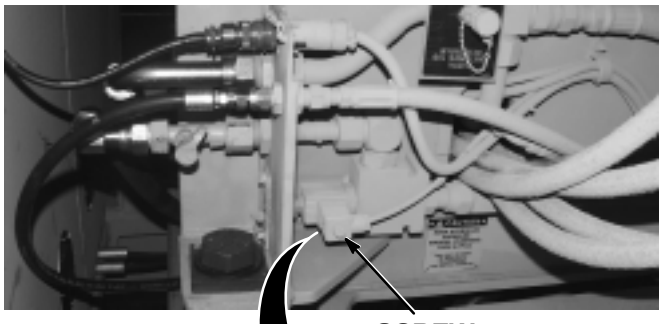
- If no continuity is found, replace shutdown relay. Refer to paragraph 5-4 in this manual.
- If continuity is found, repair white wire from shutdown relay to terminal strip, position 5. Refer to paragraph 3-16 in this manual. Loosen screw and remove connector from manual override valve, check for 24 volts between terminal 1 and known good ground, if no voltage at terminal and ground repair or replace override valve cable assembly. Refer to paragraph 3-16 in this manual.

END OF TEST

Table 2-21. Crane Troubleshooting (CONT).

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION





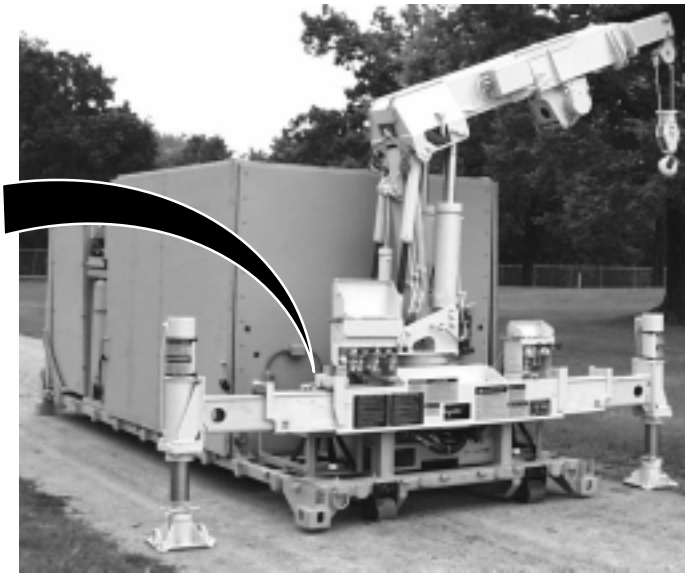


Table 2-21. Crane Troubleshooting (CONT).

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

2. REMOTE CONTROL DOES NOT OPERATE.

NOTE

Before performing crane troubleshooting procedures, make sure the FRS electrical supply system is functioning properly.

Unless advised otherwise, the FRS 24V MASTER switch and the crane MAIN POWER switch must be in the ON position for all voltage checks.

Test 1. Disconnect remote control cable from remote control hook-up connector on crane sub-frame. Check for 24 volts between terminal H and known good ground.

- If 24 volts are not present, no power is getting to the remote control cable. There is an open circuit in the black wire between terminal strip positions 1 and 7, or an open circuit in the violet wire between terminal strip position 7 and the remote control hook-up, terminal H. Refer to paragraph 3-16 in this manual.
- If 24 volts are present, go to Test 2.

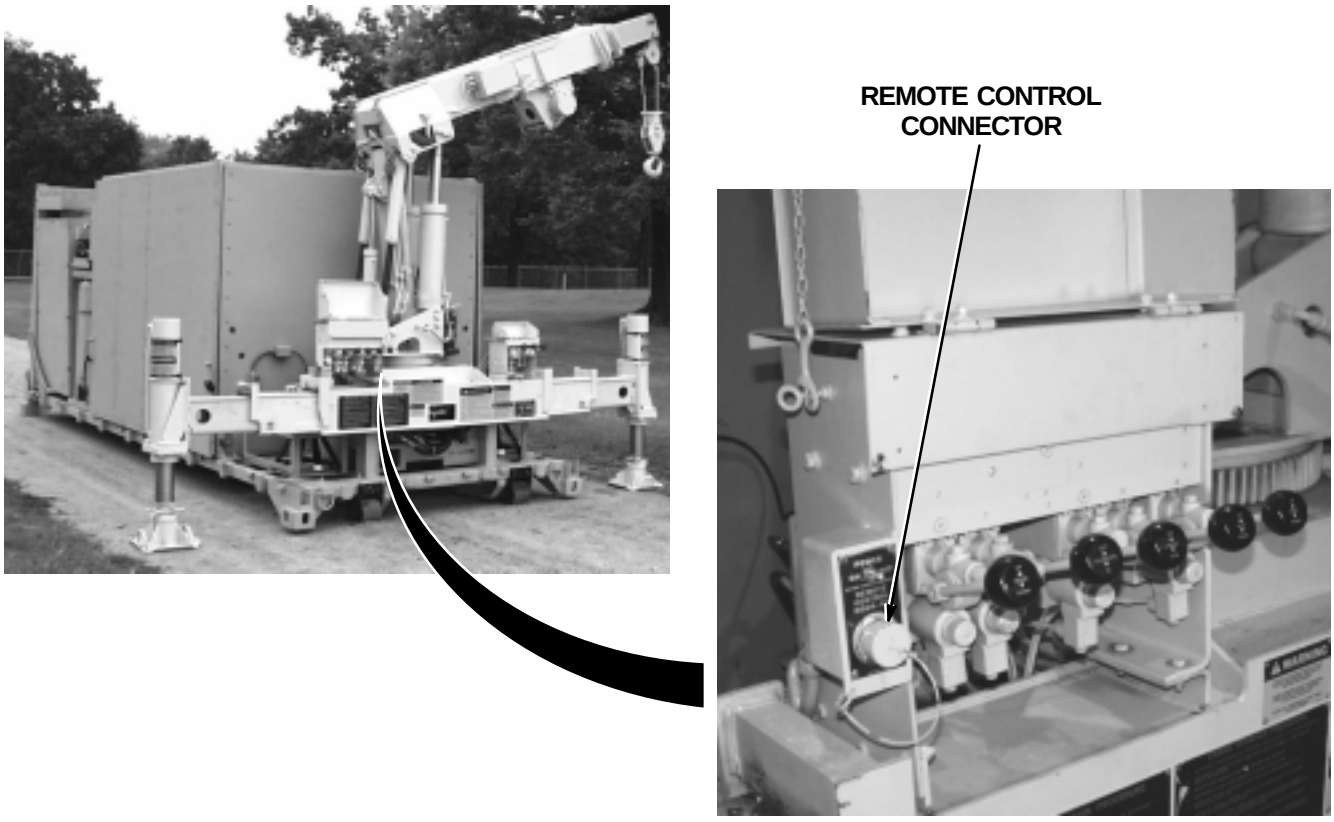


Table 2-21. Crane Troubleshooting (CONT).

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION

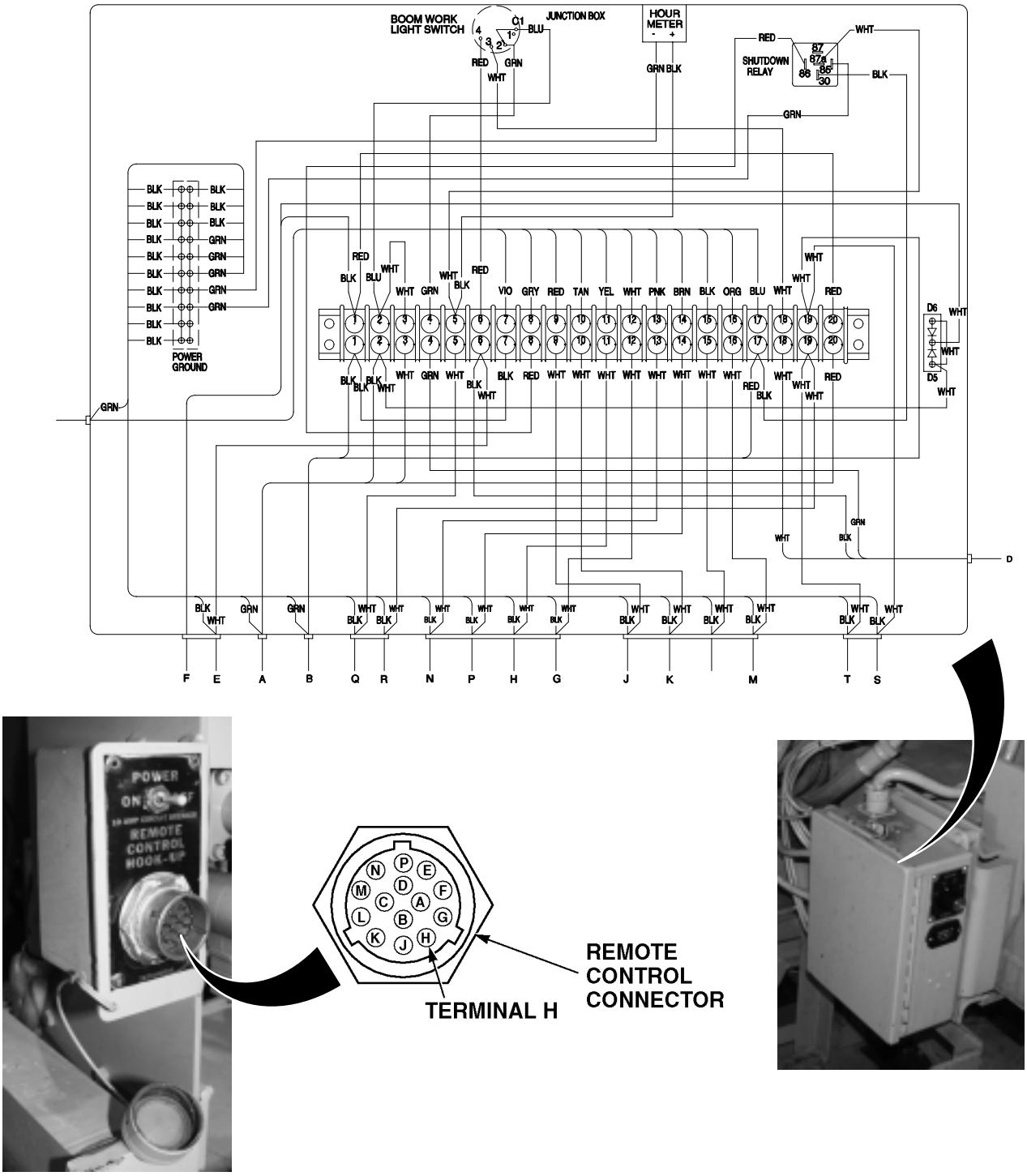


Table 2-21. Crane Troubleshooting (CONT).

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

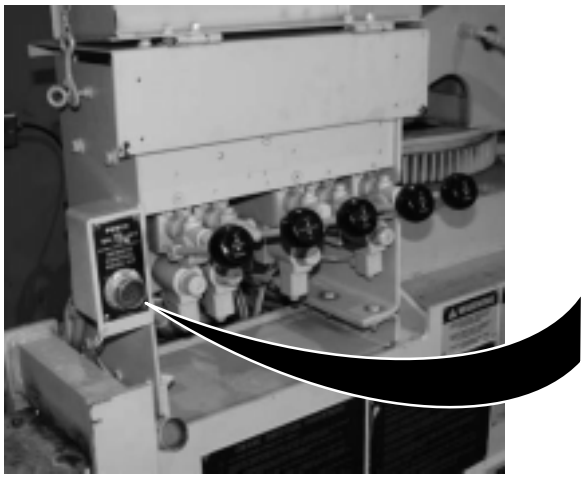
2. REMOTE CONTROL DOES NOT OPERATE (CONT).

Test 2. Check for continuity between remote control hook-up connector, terminal B, and known good ground.

- If continuity is not found, repair green wire between remote control hook-up connector and ground terminal strip in crane junction box. Refer to paragraph 3-16 in this manual.
- If continuity is found, go to Test 3.

Test 3. Disconnect the remote control cable from the remote control unit. Check the cable for continuity between the two cable ends on terminals B and H, one at a time.

- If continuity is not found on either location, replace the remote control cable.
- If continuity is found, reconnect the cable to the remote control unit and the remote control hook-up connector. Then, go to Test 4.



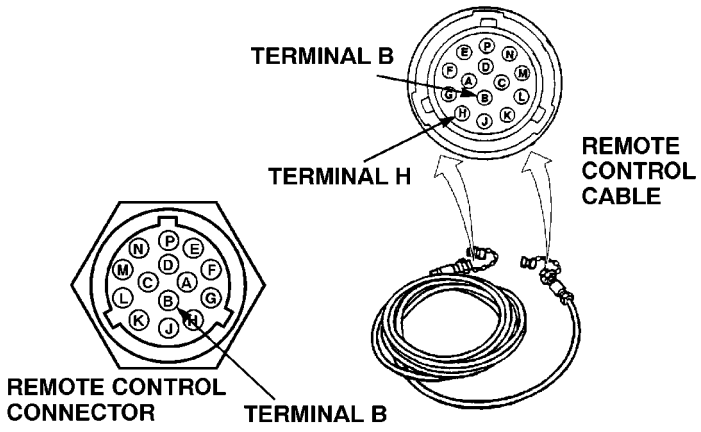


Table 2-21. Crane Troubleshooting (CONT).

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION	

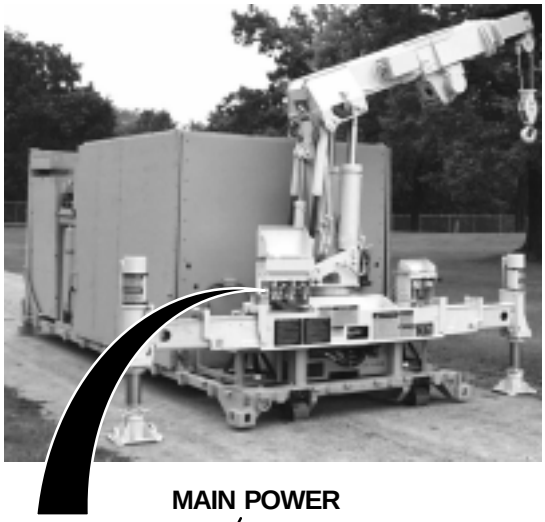
Test 4. Turn MAIN POWER switch to the OFF position. Remove swing controller from remote control unit for access to EMERGENCY STOP switch. Remove EMERGENCY STOP switch from remote control unit, but do not disconnect wires. Refer to paragraph 5-12 in this manual for specific instructions.

CAUTION

Do not allow EMERGENCY STOP switch, swing controller wires, or terminals to contact remote control unit during test. Failure to comply may result in damage to equipment.

Turn MAIN POWER switch to ON position. Check for 24 volts at terminal of wire 4 of EMERGENCY STOP switch.

- If 24 volts are not present, turn MAIN POWER switch OFF and repair wire 4 inside remote control unit between EMERGENCY STOP switch and remote control unit cable connector terminal H.
- If 24 volts are present, go to Test 5.



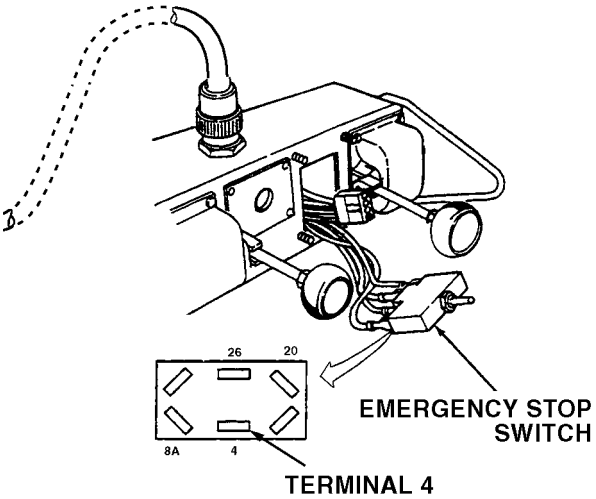


Table 2-21. Crane Troubleshooting (CONT).

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

2. REMOTE CONTROL DOES NOT OPERATE (CONT).

Test 5. Place EMERGENCY STOP switch in ON position. Check for 24 volts at terminal of wire 8A of EMERGENCY STOP switch.

- If 24 volts are not present, EMERGENCY STOP switch is faulty. Refer to paragraph 5-12 in this manual.
- If problem remains, Notify Supervisor.

END OF TEST

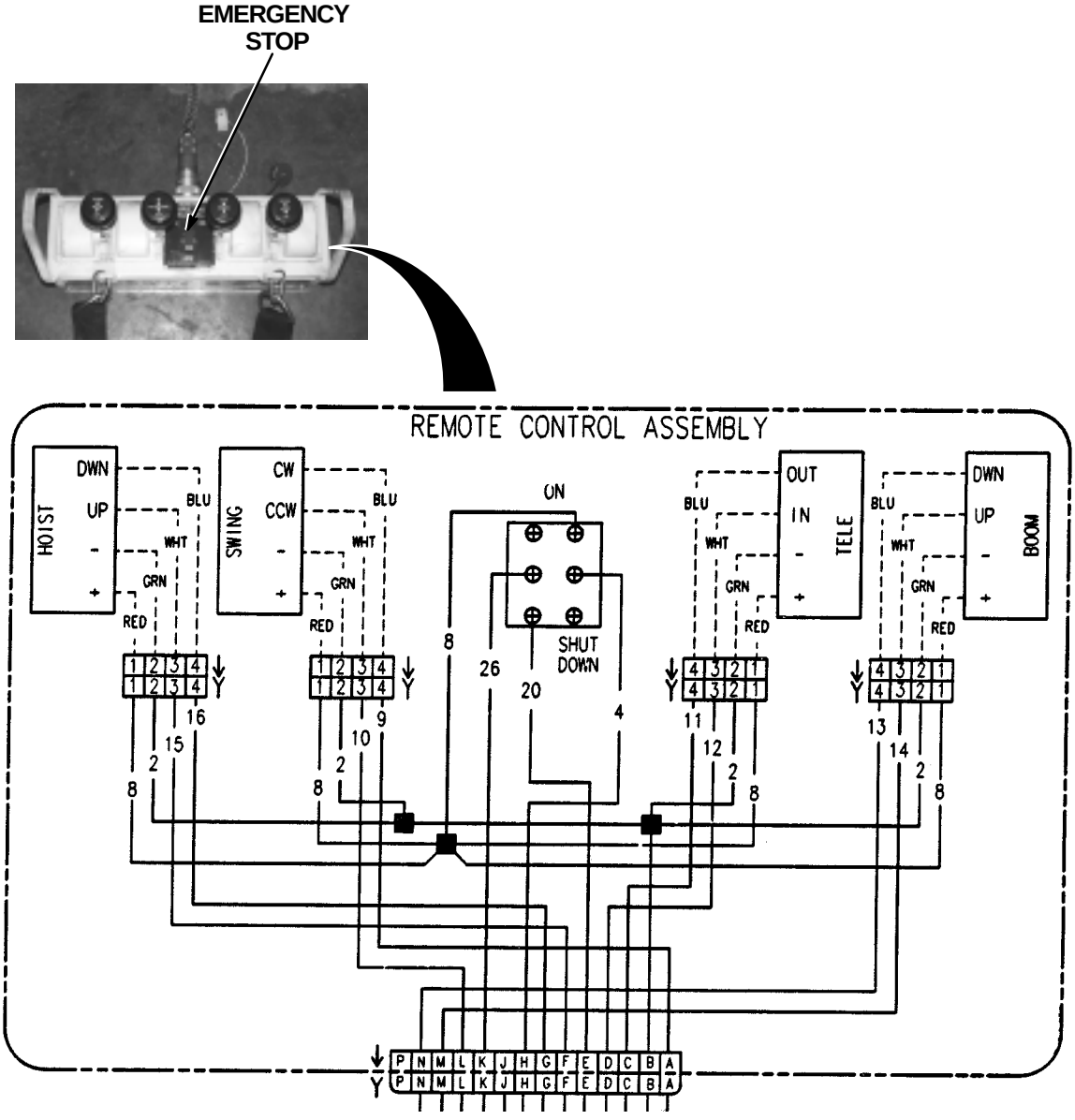


Table 2-21. Crane Troubleshooting (CONT).

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

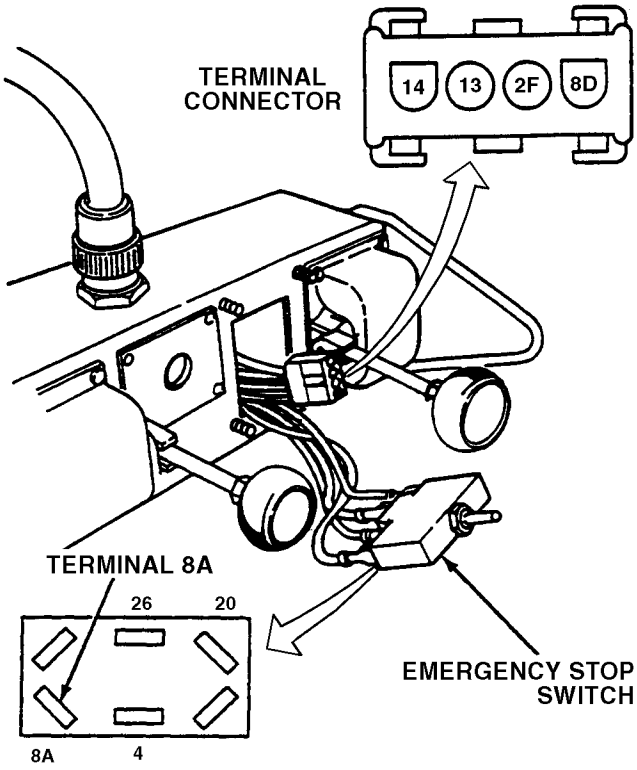


Table 2-21. Crane Troubleshooting (CONT).

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

3. HOIST DOES NOT LOWER WITH REMOTE CONTROL.

NOTE

Before performing crane troubleshooting procedures, make sure the FRS electrical supply system is functioning properly.

Unless advised otherwise, the FRS 24V MASTER switch and the crane MAIN POWER switch must be in the ON position for all voltage checks.

Test 1. Loosen screw and remove connector from hoist DOWN solenoid. Place MAIN POWER and EMERGENCY STOP switches in ON position. Hold remote control unit hoist controller in DOWN position and check for 24 volts between solenoid connector, terminal 1, and known good ground. Connect connector and tighten screw.

- If 24 volts are not present, go to Test 2.
- If 24 volts are present, turn MAIN POWER switch OFF and go to Test 8.

Test 2. Disconnect the remote control cable from the remote control unit and remote control hook-up connector on crane sub-frame. Check the cable for continuity between the two cable ends, terminal G.

- If no continuity is found on terminal G, replace the remote control cable.
- If continuity is found, go to Test 3.

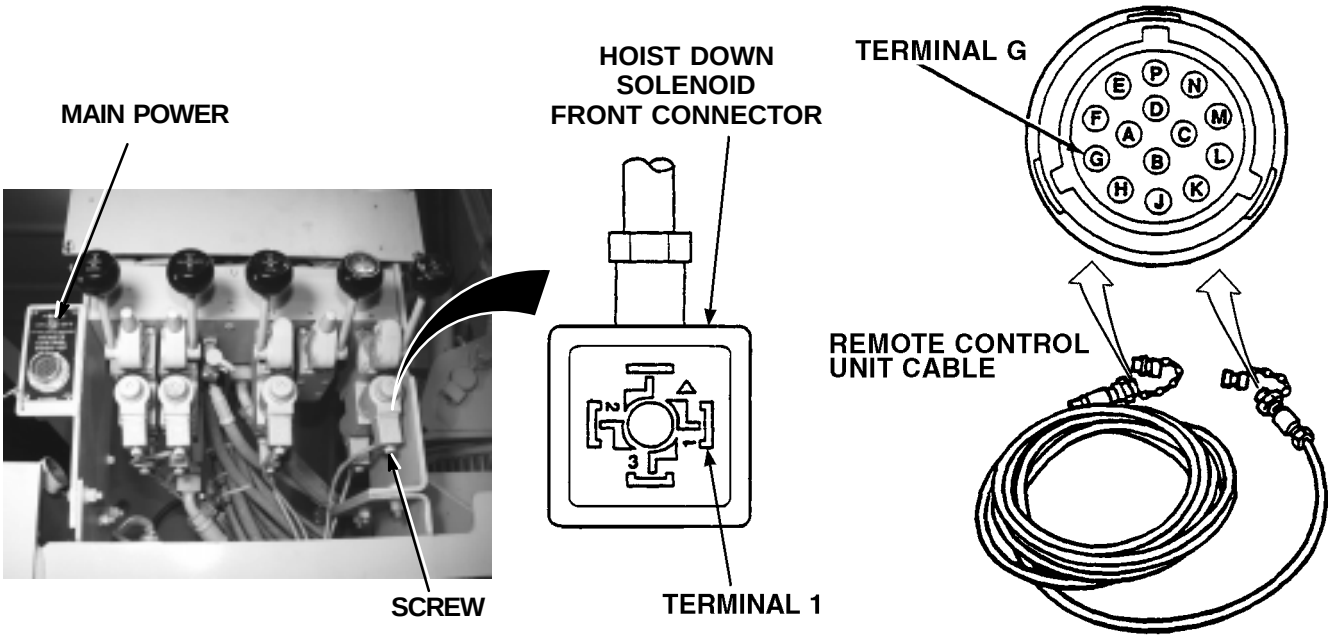


Table 2-21. Crane Troubleshooting (CONT).

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

Test 3. Remove hoist controller from remote control unit. Refer to paragraph 5-12 in this manual. Place EMERGENCY STOP switch in ON position. Check for continuity between the following locations:

	From remote control cable connector pin location:	To controller connector terminal location:
Check 1	H	8E
Check 2	G	16
Check 3	B	2G

- If no continuity is found, repair the wiring within the remote control unit.
- If continuity is found, go to Test 4.

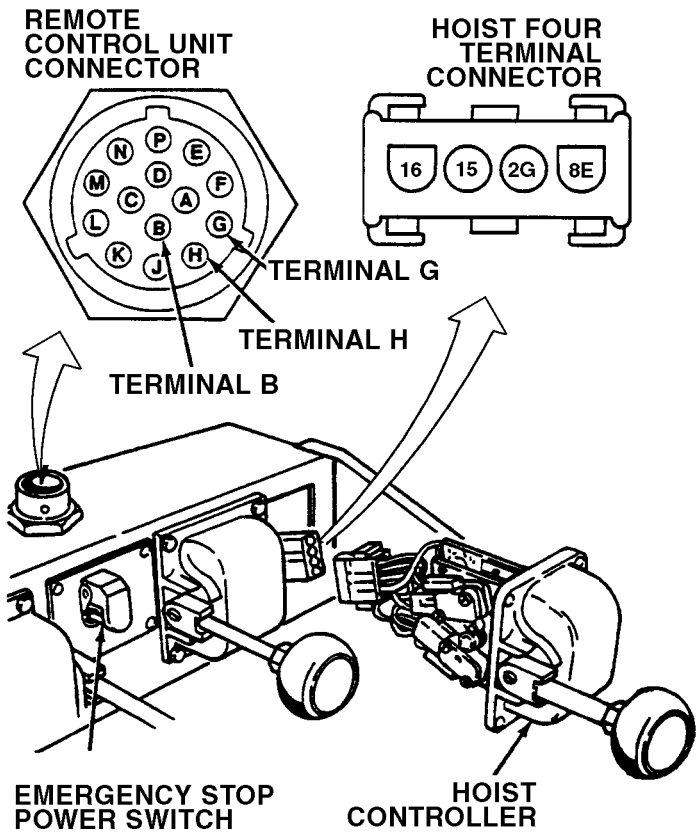


Table 2-21. Crane Troubleshooting (CONT).

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

3. HOIST DOES NOT LOWER WITH REMOTE CONTROL (CONT).

Test 4. Tag and mark connectors on hoist controller switches. Remove the connectors from the two controller switches. Check each switch for continuity between the following switch terminal locations, with the controller lever in the position noted:

	Switch Terminals:	Controller handle position:	Test results:
Check 1	NC to COM	Neutral	Continuity
Check 2	NO to COM	Neutral	No continuity (open)
Check 3	NC to COM	Full UP position	No continuity (open)
Check 4	NO to COM	Full UP position	Continuity

- If the above test results are not obtained, replace switch(es). Refer to paragraph 5-12 in this manual.
- If the above test results are obtained, reinstall the controller switch connectors and go to Test 5.

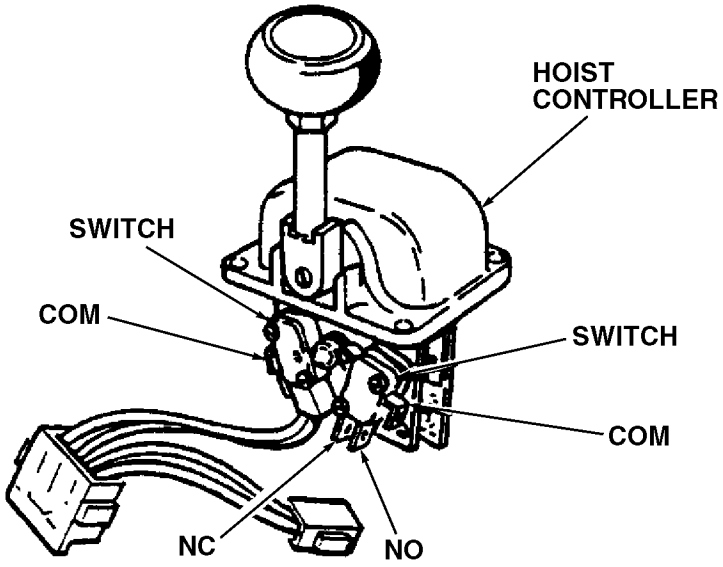
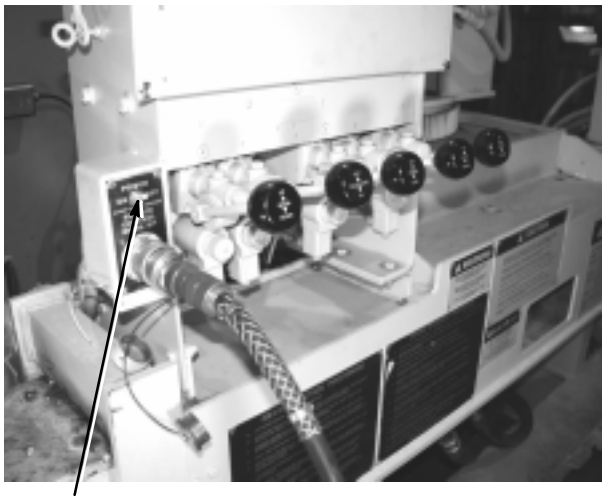
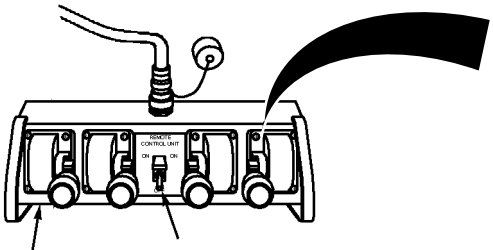


Table 2-21. Crane Troubleshooting (CONT).

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION	
Test 5.	Connect the remote control cable to the remote control unit and remote control hook-up connector on crane sub-frame. Turn MAIN POWER switch to ON position. Check for 24 volts from controller harness, blue wire, with HOIST controller lever in DOWN position, to known good ground. Turn MAIN POWER switch OFF. • If 24 volts are not present, replace controller circuit card. Refer to paragraph 5-12 in this manual. • If 24 volts are present, reassemble remote control unit and go to Test 6.
Test 6.	Loosen four screws and clips and open crane junction box cover. Turn MAIN POWER switch to ON position. Check for 24 volts between terminal strip, position 16, and known good ground with hoist controller held in the DOWN position. Turn MAIN POWER switch to the OFF position. • If 24 volts are not present, repair orange wire between remote control hook-up connector on crane sub-frame and junction box terminal strip. Refer to paragraph 3-16 in this manual. • If 24 volts are present, go to Test 7.



MAIN POWER



REMOTE CONTROL UNIT

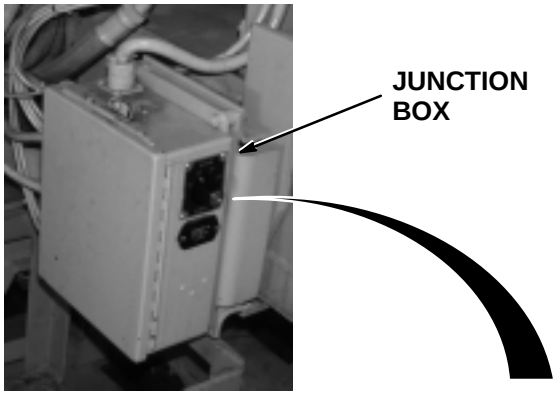
EMERGENCY STOP POWER SWITCH

WHITE WIRE

Table 2-21. Crane Troubleshooting (CONT).

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

3. HOIST DOES NOT LOWER WITH REMOTE CONTROL (CONT).



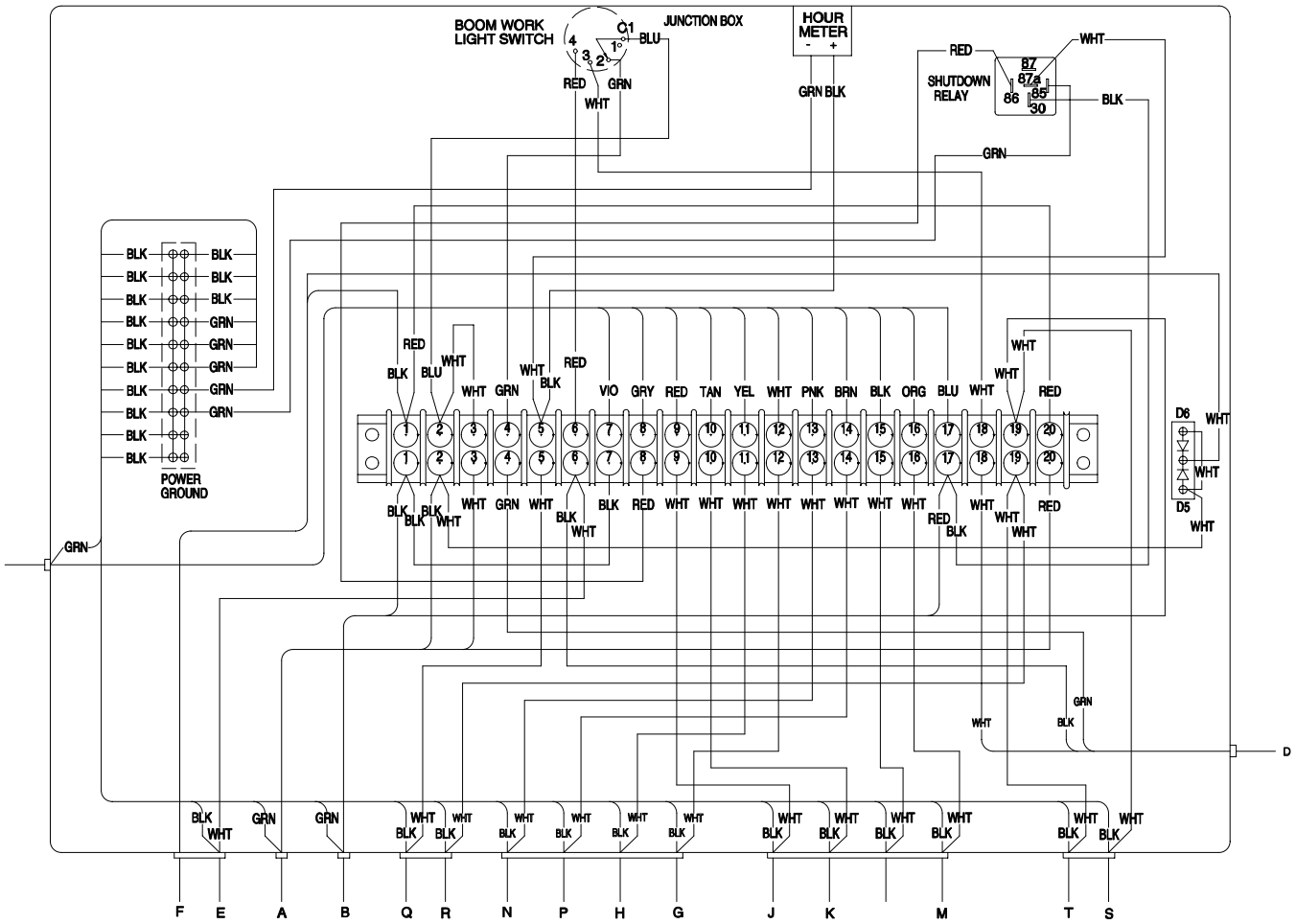


Table 2-21. Crane Troubleshooting (CONT).

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

Test 7. Loosen screw and remove connector hoist DOWN solenoid. Check for continuity between terminal strip, position 16, and hoist DOWN solenoid connector, position 1.

- If no continuity is found, repair white wire between junction box terminal strip, position 16, and hoist DOWN solenoid. Refer to paragraph 3-16 in this manual.
- If continuity is found, go to Test 8.

Test 8. Check for continuity between hoist DOWN solenoid connector, position 2, and known good ground.

- If no continuity is found, repair hoist DOWN solenoid ground circuit.
- If continuity is found, go to Test 9.

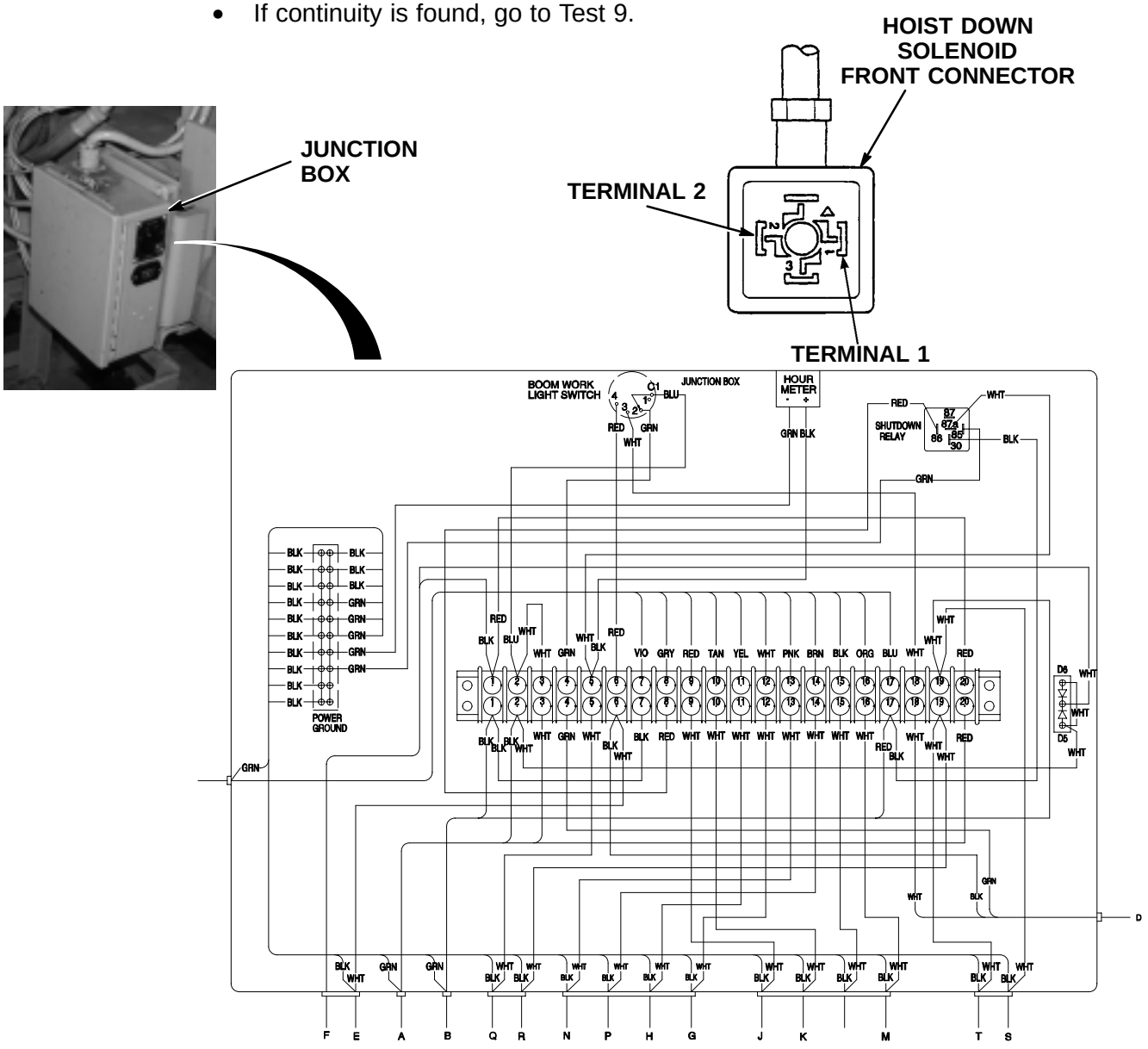


Table 2-21. Crane Troubleshooting (CONT).

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

3. HOIST DOES NOT LOWER WITH REMOTE CONTROL (CONT).

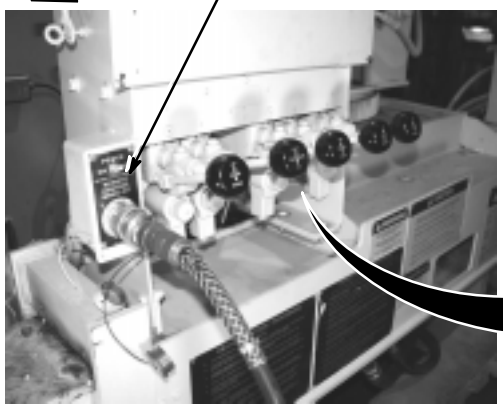
Test 9. Perform a resistance check of solenoid coil. Resistance should be between 23.7 and 26.3 ohms from terminal 1 and terminal 2.

- If coil resistance is not within specification, Notify Supervisor.

END OF TEST

Table 2-21. Crane Troubleshooting (CONT).

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION



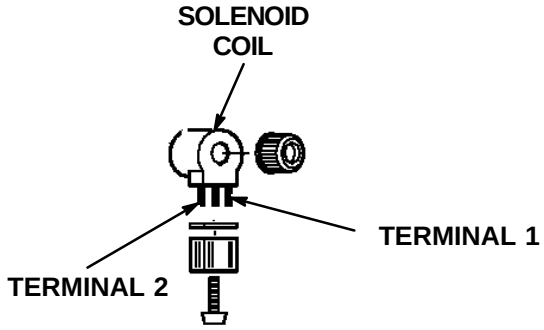


Table 2-21. Crane Troubleshooting (CONT).

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

4. HOIST DOES NOT RAISE WITH REMOTE CONTROL.

NOTE

Before performing crane troubleshooting procedures, make sure the FRS electrical supply system is functioning properly.

Unless advised otherwise, the FRS 24V MASTER switch and the crane MAIN POWER switch must be in the ON position for all voltage checks.

Test 1. Are the boom up and down, and telescope out functions also not working using remote control?

- If none of the above listed functions operate, go to Test 2.
- If boom up/down and telescope out function properly, go to Test 3.

Test 2. Are the boom up and down, and telescope out functions also not working using manual control?

- If none of the above listed functions operate, faulty overload shutdown system, Notify Supervisor.
- If boom up/down and telescope out function properly, faulty lockout solenoid valve, Notify Supervisor.

Test 3. Loosen screw and remove connector from hoist UP solenoid. Place EMERGENCY STOP switch to ON position. Hold remote control unit hoist controller in UP position and check for 24 volts between solenoid connector, terminal 1, and known good ground.

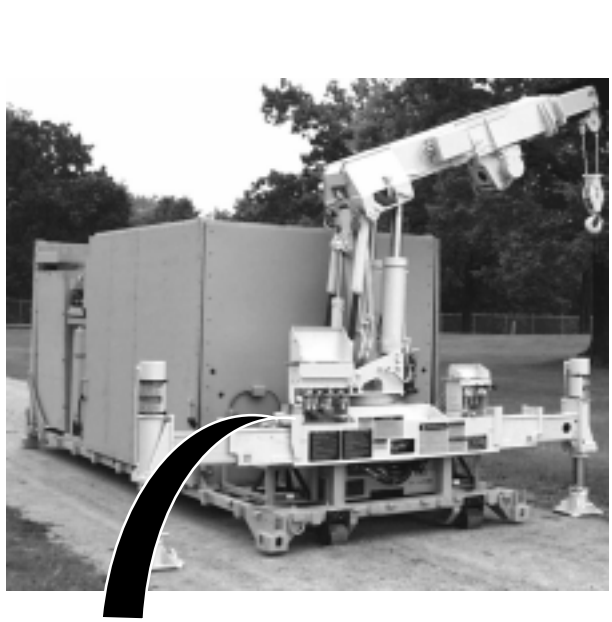
- If 24 volts are not present, go to Test 4.
- If 24 volts are present, turn MAIN POWER switch OFF and go to Test 10.

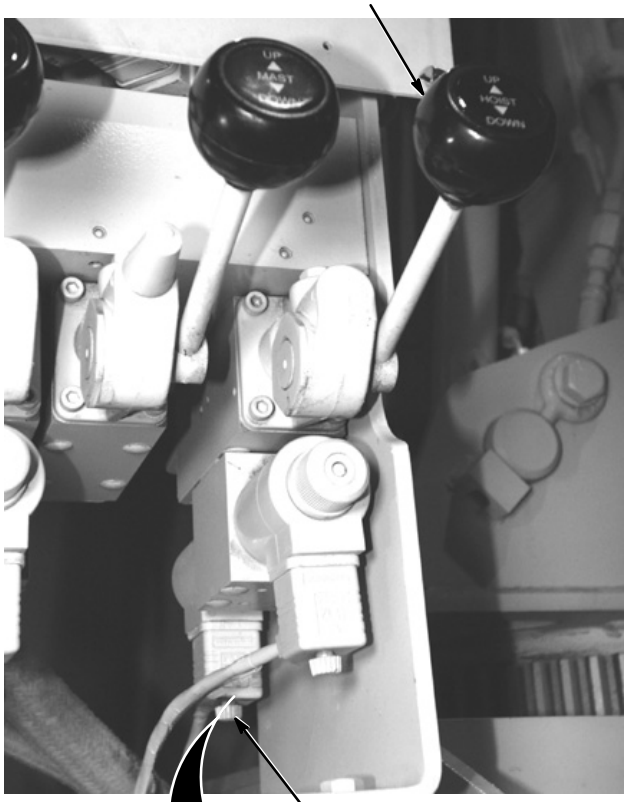
Test 4. Disconnect the remote control cable from the remote control unit and remote control hook-up connector on crane sub-frame. Check the cable for continuity between the two cable ends, terminal F.

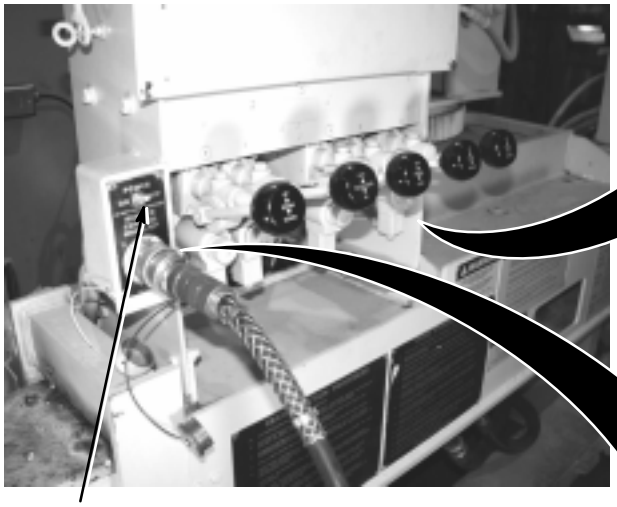
- If no continuity is found on terminal F, replace the remote control cable.
- If continuity is found, go to Test 5.

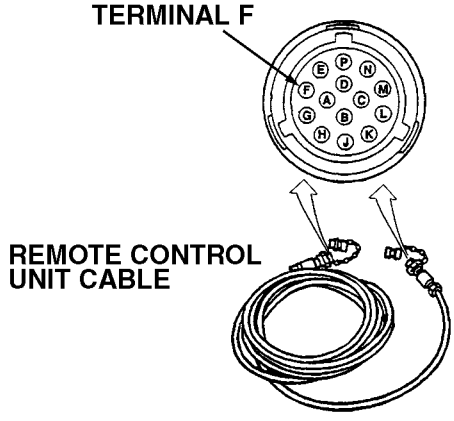
Table 2-21. Crane Troubleshooting (CONT).

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION









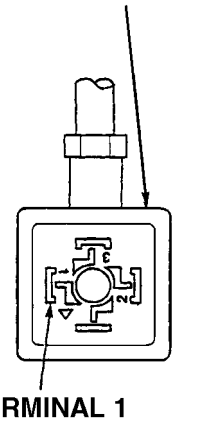


Table 2-21. Crane Troubleshooting (CONT).

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

4. HOIST DOES NOT RAISE WITH REMOTE CONTROL (CONT).

Test 5. Remove hoist controller from remote control unit. Refer to paragraph 5-12 in this manual for specific instructions. Place EMERGENCY STOP switch in ON position. Check for continuity between the following locations:

	From remote control cable connector pin location:	To controller connector terminal location:
Check 1	H	8E
Check 2	F	15
Check 3	B	2G

- If no continuity is found, repair the wiring within the remote control unit. Refer to paragraph 3-16 in this manual.
- If continuity is found, go to Test 6.

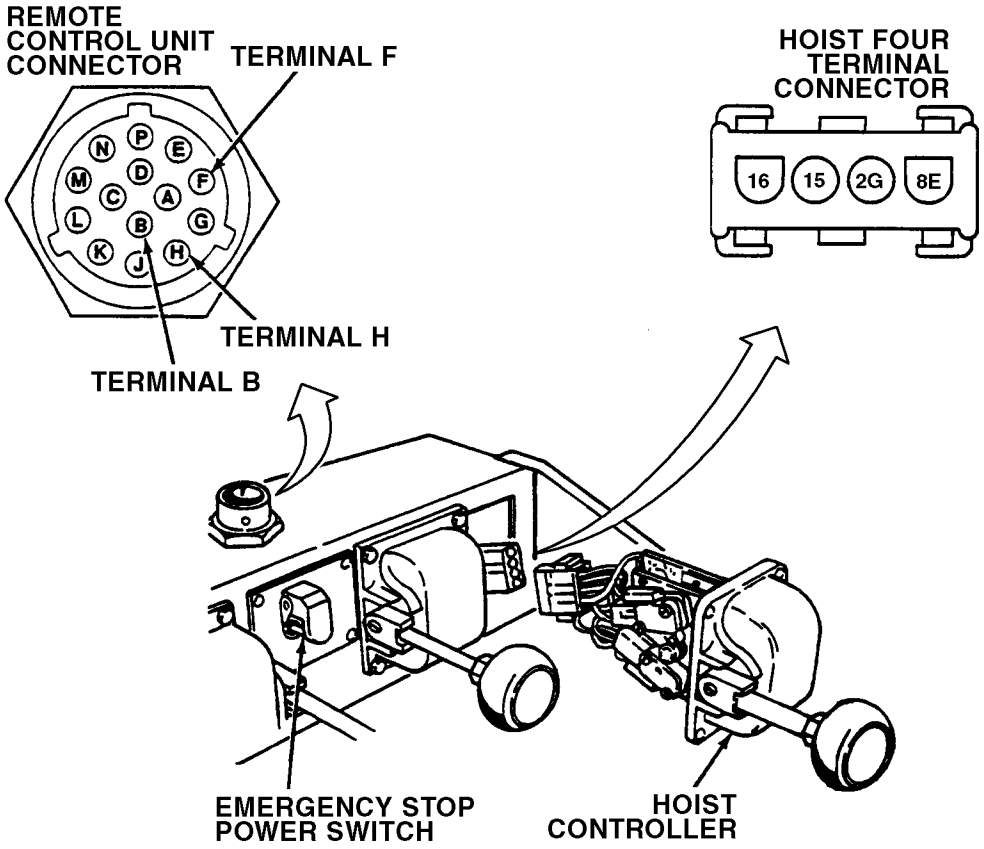


Table 2-21. Crane Troubleshooting (CONT).

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

Test 6. Tag and mark connectors on hoist controller switches. Remove the connectors from the two controller switches. Check each switch for continuity between the following switch terminal locations, with the controller lever in the position noted:

	Switch Terminals:	Controller handle position:	Test results:
Check 1	NC to COM	Neutral	Continuity
Check 2	NO to COM	Neutral	No continuity (open)
Check 3	NC to COM	Full UP position	No continuity (open)
Check 4	NO to COM	Full UP position	Continuity

- If the above test results are not obtained, replace switch(es). Refer to paragraph 5-12 in this manual.
- If the above test results are obtained, reinstall the controller switch connectors and go to Test 7.

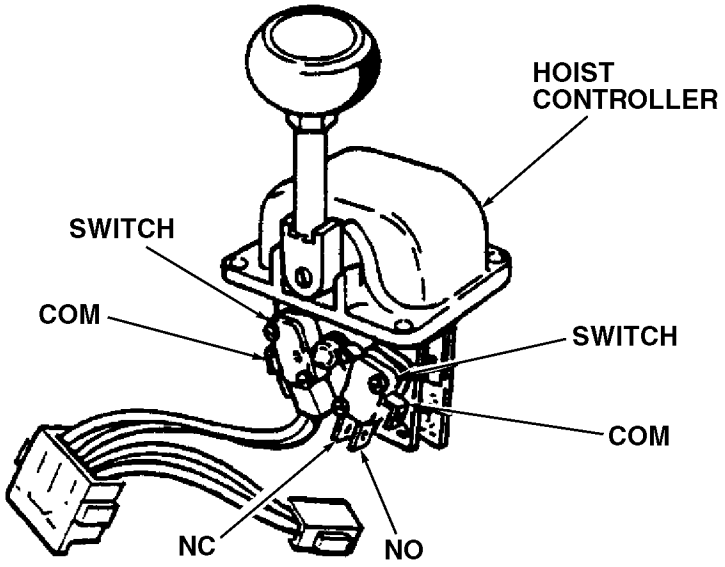


Table 2-21. Crane Troubleshooting (CONT).

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

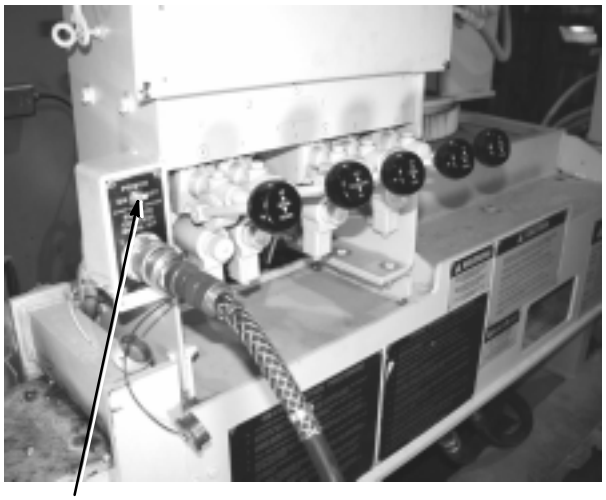
4. HOIST DOES NOT RAISE WITH REMOTE CONTROL (CONT).

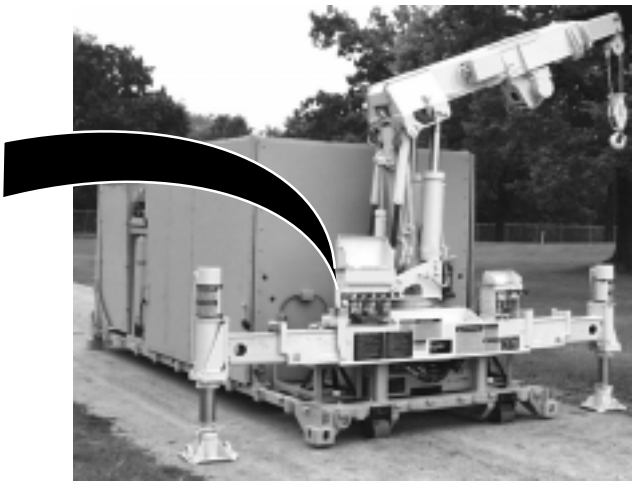
Test 7. Connect the remote control cable to the remote control unit and remote control hook-up connector on crane sub-frame. Turn MAIN POWER switch to ON position. Check for 24 volts from controller harness, white wire, with controller lever in UP position, to known good ground. Turn MAIN POWER switch OFF.

- If 24 volts are not present, replace controller circuit card. Refer to paragraph 5-12 in this manual.
- If 24 volts are present, reassemble remote control unit and go to Test 8.

Test 8. Loosen four screws and clips and open crane junction box cover. Turn MAIN POWER switch and EMERGENCY STOP switch to ON position. Check for 24 volts between terminal strip, position 15, and known good ground with hoist controller held in the UP position. Turn MAIN POWER switch to the OFF position.

- If 24 volts are not present, repair black wire between remote control hook-up connector on crane sub-frame and junction box terminal strip. Refer to paragraph 3-16 in this manual.
- If 24 volts are present, go to Test 9.





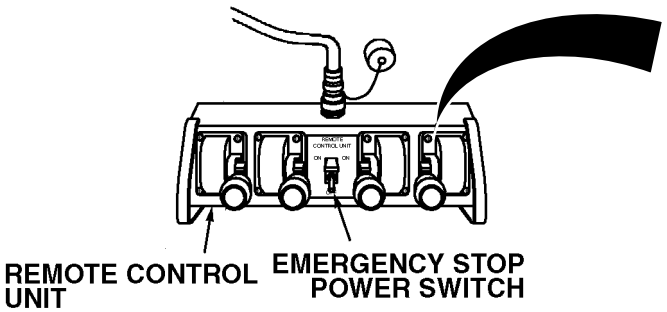
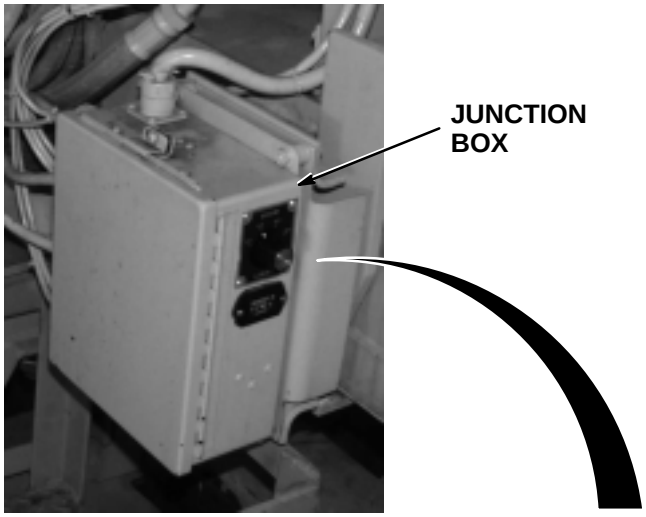


Table 2-21. Crane Troubleshooting (CONT).

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION



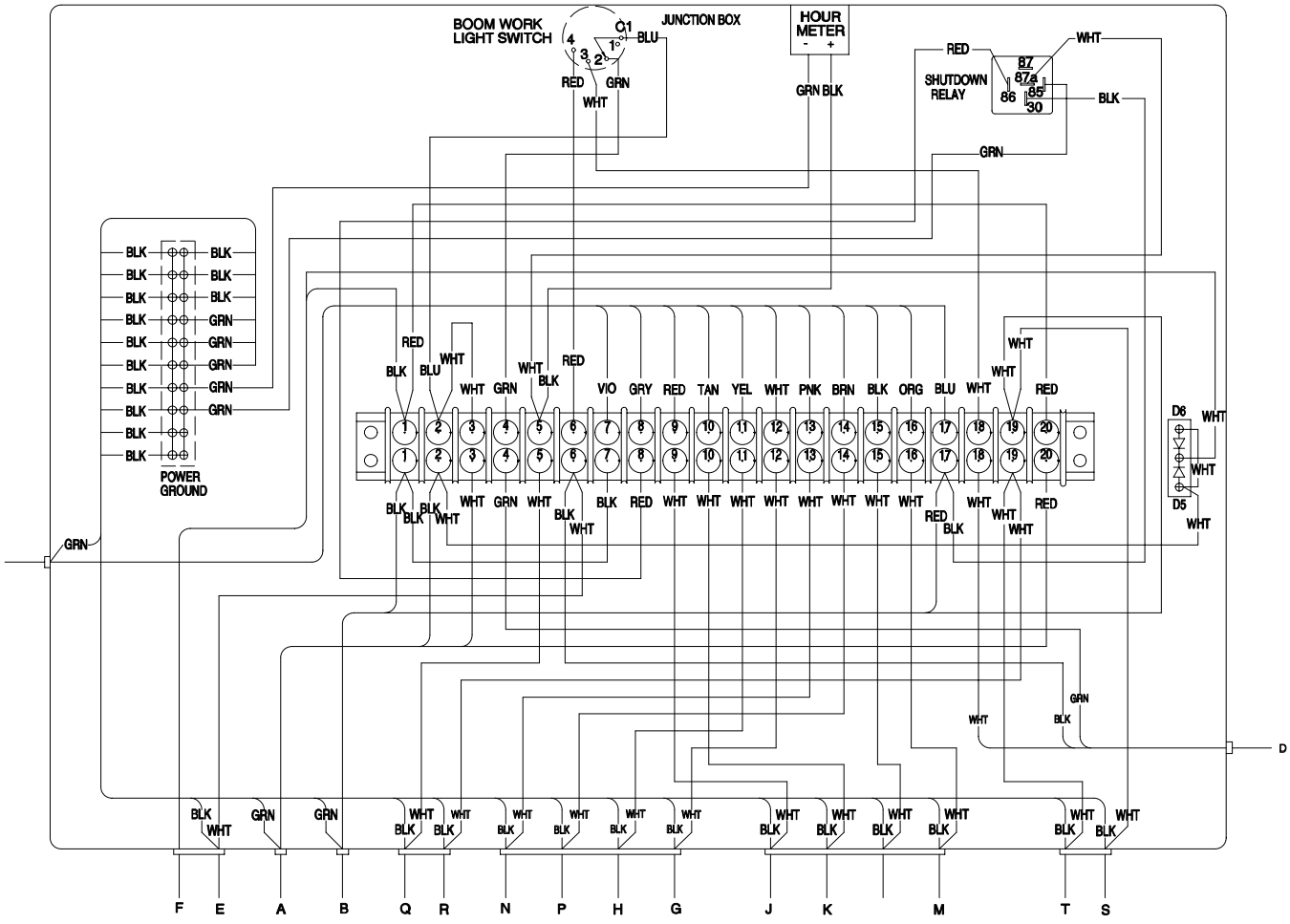


Table 2-21. Crane Troubleshooting (CONT).

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

4. HOIST DOES NOT RAISE WITH REMOTE CONTROL (CONT).

Test 9. Check for continuity between terminal strip, position 15, and hoist UP solenoid connector, terminal 1.

- If no continuity is found, repair white wire between junction box terminal strip, position 15, and hoist UP solenoid. Refer to paragraph 3-16 in this manual.
- If continuity is found, go to Test 10.

Test 10. Check for continuity between hoist UP solenoid connector, terminal 2, and known good ground.

- If no continuity is found, repair hoist UP solenoid ground circuit. Refer to paragraph 3-16 in this manual.
- If continuity is found, go to Test 11.

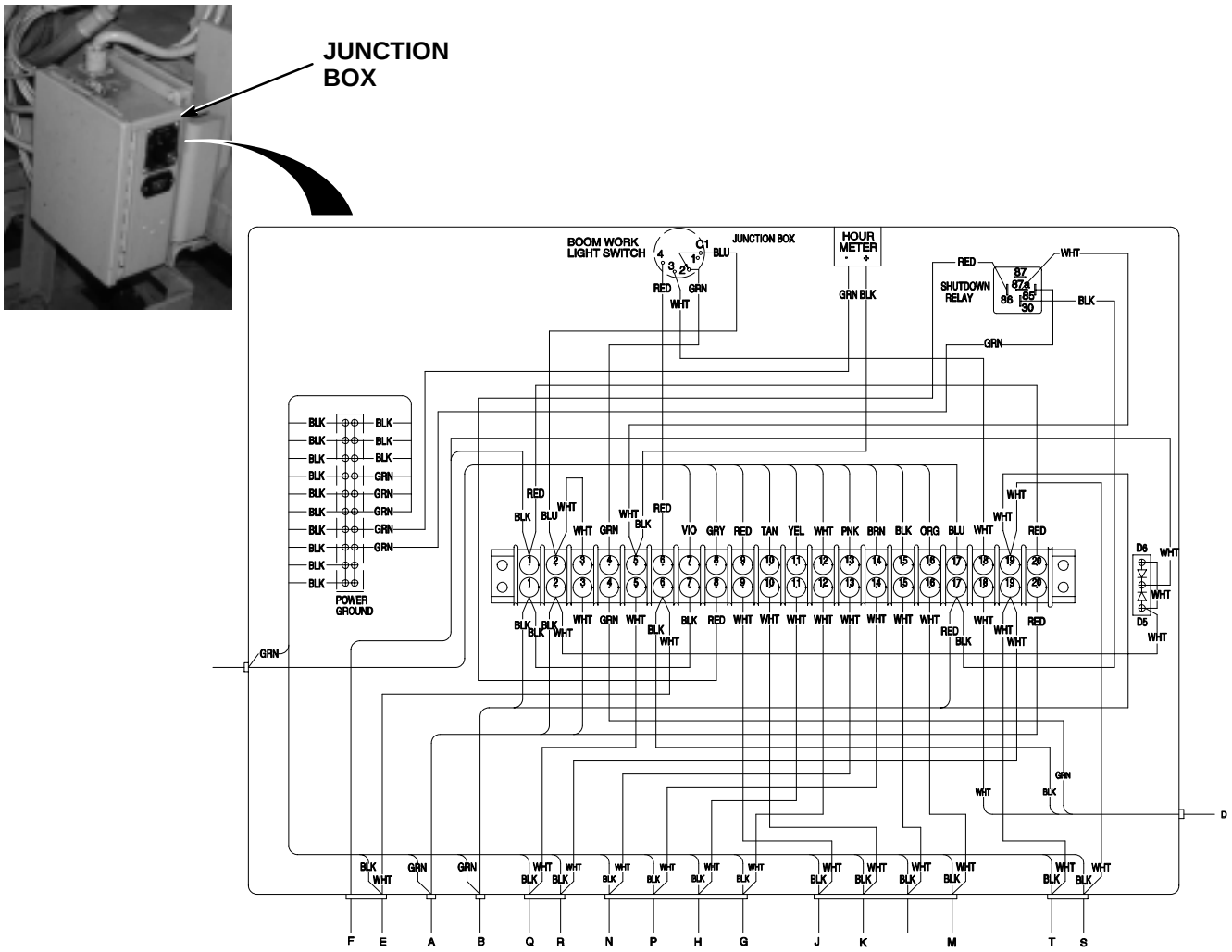


Table 2-21. Crane Troubleshooting (CONT).

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

Test 11. Perform a resistance check of solenoid coil. Resistance should be between 23.7 and 26.3 ohms from terminal 1 and termnial 2.

- If coil resistance is not within specifications, Notify Supervisor.

END OF TEST

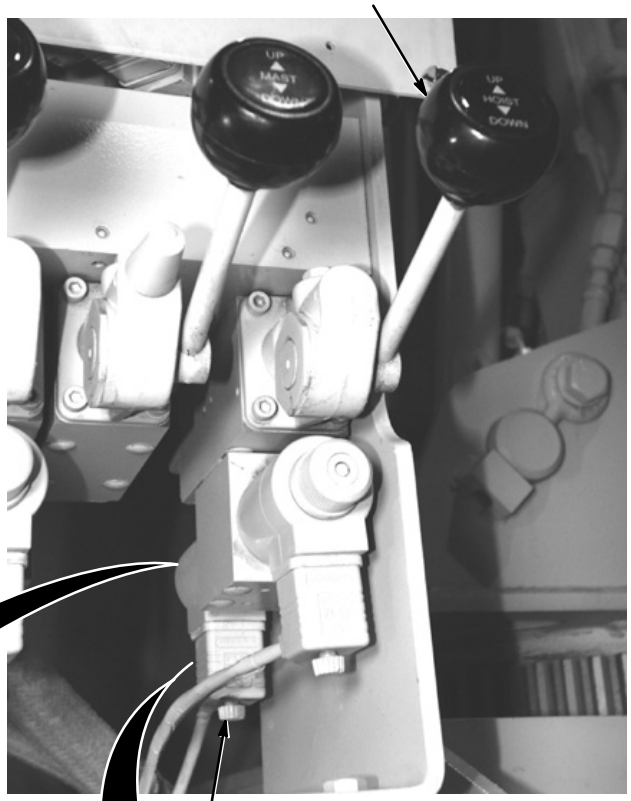


Table 2-21. Crane Troubleshooting (CONT).

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

5. BOOM DOES NOT LOWER WITH REMOTE CONTROL.

NOTE

Before performing crane troubleshooting procedures, make sure the FRS electrical supply system is functioning properly. Insure that Overload Shutdown System (OSS) is functioning properly and lockouts are not engaged.

Unless advised otherwise, the FRS 24V MASTER switch and the crane MAIN POWER switch must be in the ON position for all voltage checks.

Test 1. Are the boom up, hoist up, and telescope out functions also not working using remote control?

- If none of the above listed functions operate, go to Test 2.
- If boom up, hoist up, and telescope out function properly, go to Test 3.

Test 2. Are the boom up, hoist up, and telescope out functions also not working using manual control?

- If none of the above listed functions operate, faulty overload shutdown system, Notify Supervisor.
- If boom up, hoist up, and telescope out function properly, faulty lockout solenoid valve, Notify Supervisor.

Test 3. Loosen screw and remove connector from boom DOWN solenoid. Place EMERGENCY STOP switch in ON position. Hold remote control unit boom controller in DOWN position and check for 24 volts between solenoid connector, terminal 1, and known good ground.

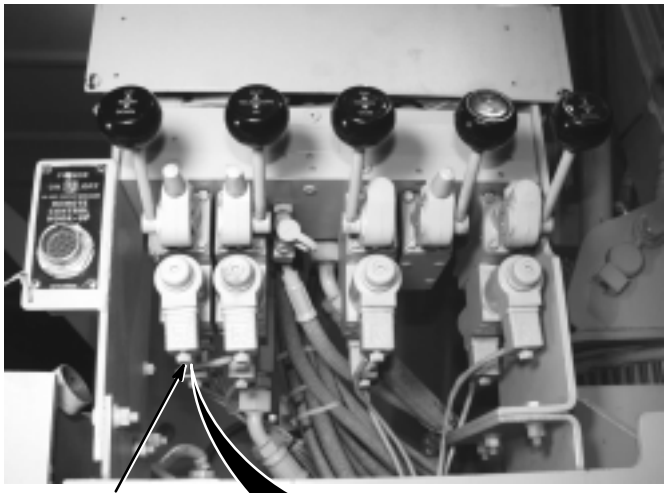
- If 24 volts are present, go to Test 4.
- If 24 volts are not present, turn MAIN POWER switch OFF and go to Test 10.

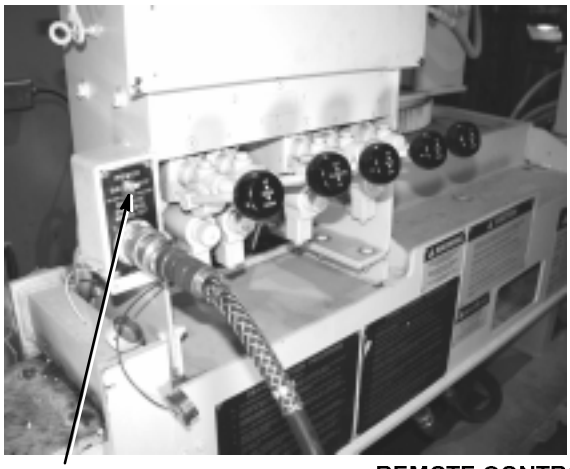
Test 4. Disconnect the remote control cable from the remote control unit and remote control hook-up connector on crane sub-frame. Check the cable for continuity between the two cable ends, terminal M.

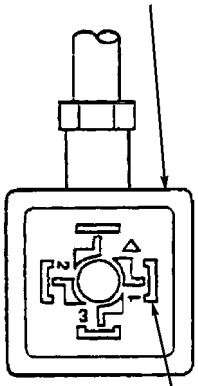
- If no continuity is found on terminal M, replace the remote control cable.
- If continuity is found, go to Test 5.

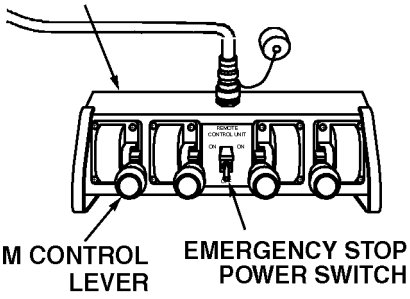
Table 2-21. Crane Troubleshooting (CONT).

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION









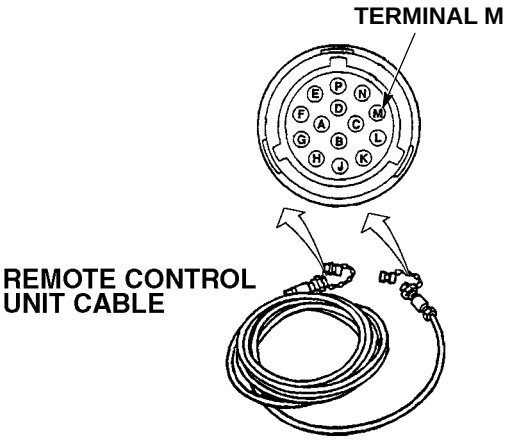


Table 2-21. Crane Troubleshooting (CONT).

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

5. BOOM DOES NOT LOWER WITH REMOTE CONTROL (CONT).

Test 5. Remove boom controller from remote control unit. Refer to paragraph 5-12 in this manual. Place EMERGENCY STOP switch in ON position. Check for continuity between the following locations:

	From remote control cable connector pin location:	To controller connector terminal location:
Check 1	H	8D
Check 2	M	14
Check 3	B	2F

- If no continuity is found, repair the wiring within the remote control unit. Refer to paragraph 3-16 in this manual.
- If continuity is found, go to Test 6.

Test 6. Tag and mark connectors on boom controller switches. Remove the connectors from the two controller switches. Check each switch for continuity between the following switch terminal locations, with the controller lever in the position noted:

	Switch Terminals:	Controller handle position:	Test results:
Check 1	NC to COM	Neutral	Continuity
Check 2	NO to COM	Neutral	No continuity (open)
Check 3	NC to COM	Full UP position	No continuity (open)
Check 4	NO to COM	Full UP position	Continuity

- If the above test results are not obtained, replace switch(es). Refer to paragraph 5-12 in this manual.
- If the above test results are obtained, reinstall the controller switch connectors and go to Test 7.

Table 2-21. Crane Troubleshooting (CONT).

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

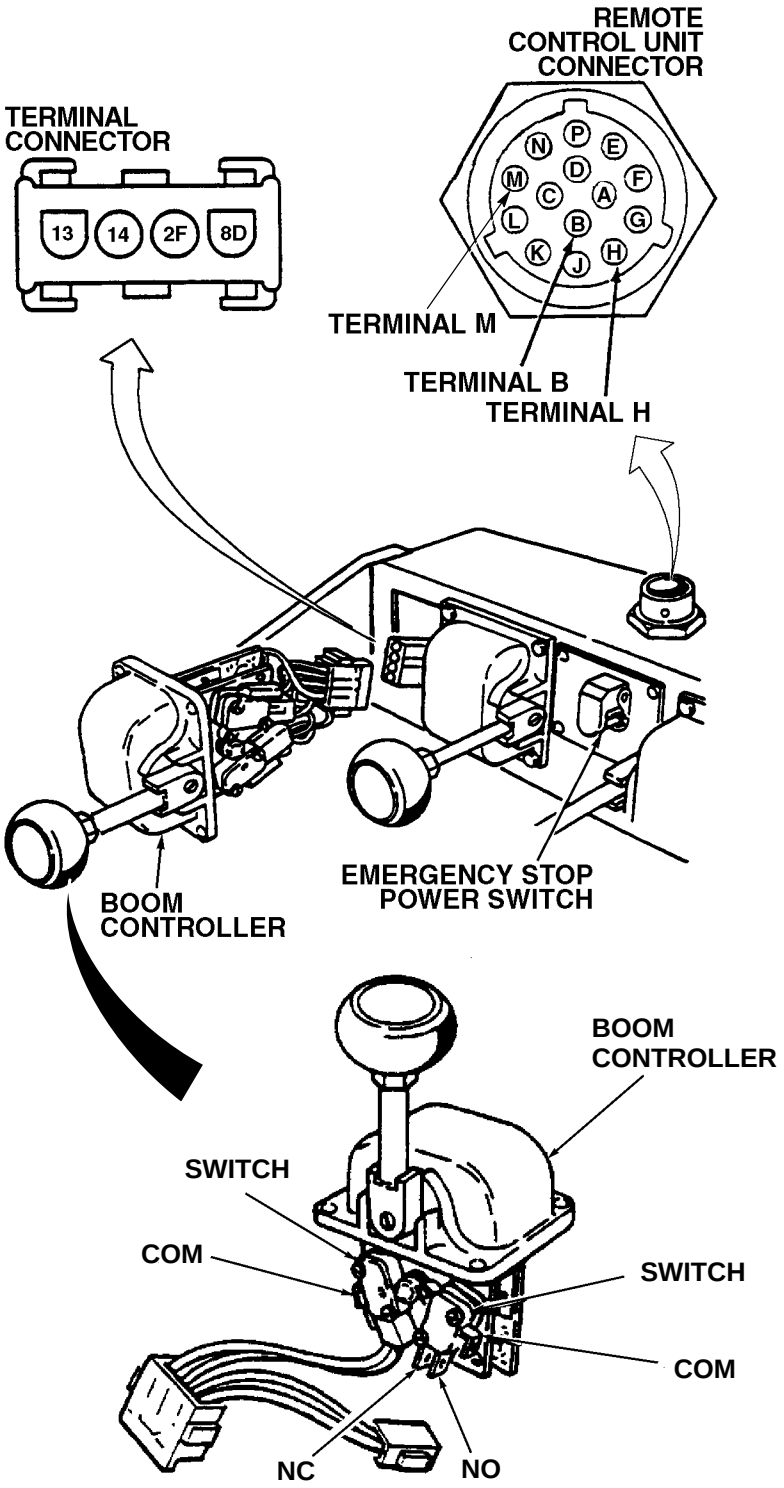


Table 2-21. Crane Troubleshooting (CONT).

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

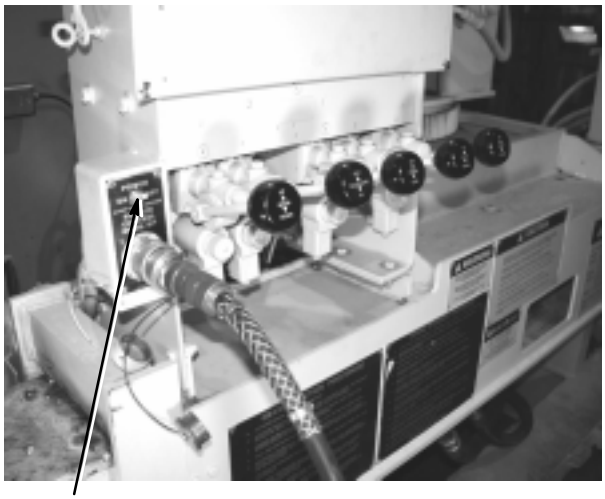
5. BOOM DOES NOT LOWER WITH REMOTE CONTROL (CONT).

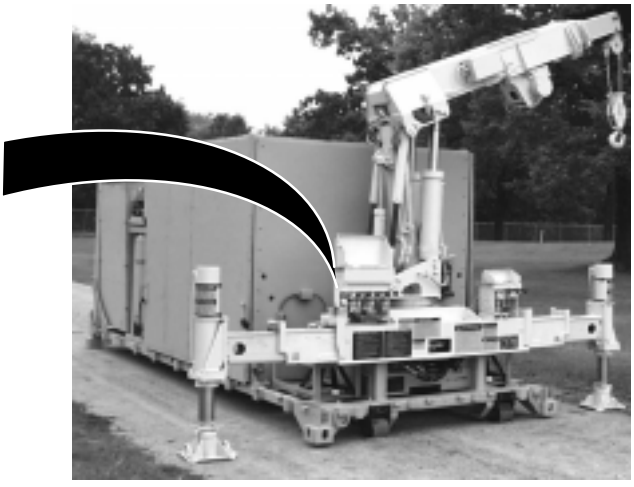
Test 7. Connect the remote control cable to the remote control unit and remote control hook-up connector on crane sub-frame. Turn MAIN POWER switch to ON position. Check for 24 volts from BOOM controller harness, white wire, with BOOM controller lever in DOWN position, to known good ground. Turn MAIN POWER switch OFF.

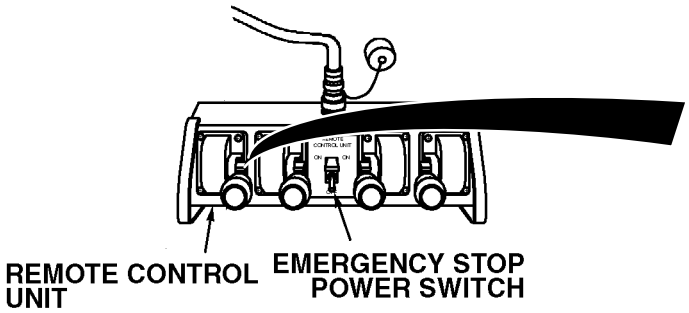
- If 24 volts are not present, replace controller circuit card. Refer to paragraph 5-12 in this manual.
- If 24 volts are present, reassemble remote control unit and go to Test 8.

Test 8. Loosen four screws and clips and open crane junction box cover. Turn MAIN POWER switch to ON position. Check for 24 volts between terminal strip, position 14, and known good ground with boom controller held in the DOWN position. Turn MAIN POWER switch to the OFF position.

- If 24 volts are not present, repair brown wire between remote control hook-up connector on crane sub-frame and junction box terminal strip. Refer to paragraph 3-16 in this manual.
- If 24 volts are present, go to Test 9.





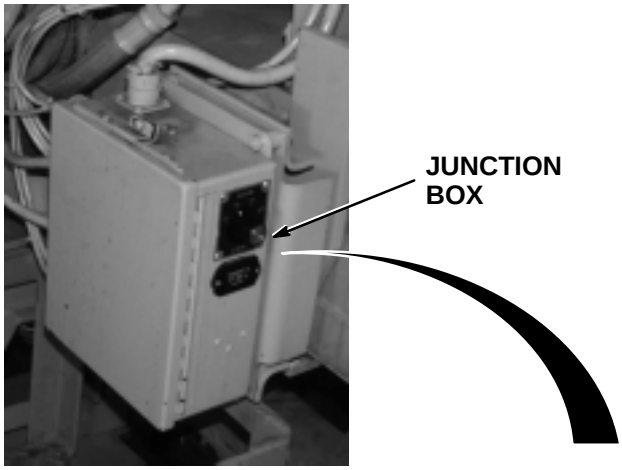


BOOM
CONTROLLER

WHITE WIRE

Table 2-21. Crane Troubleshooting (CONT).

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION



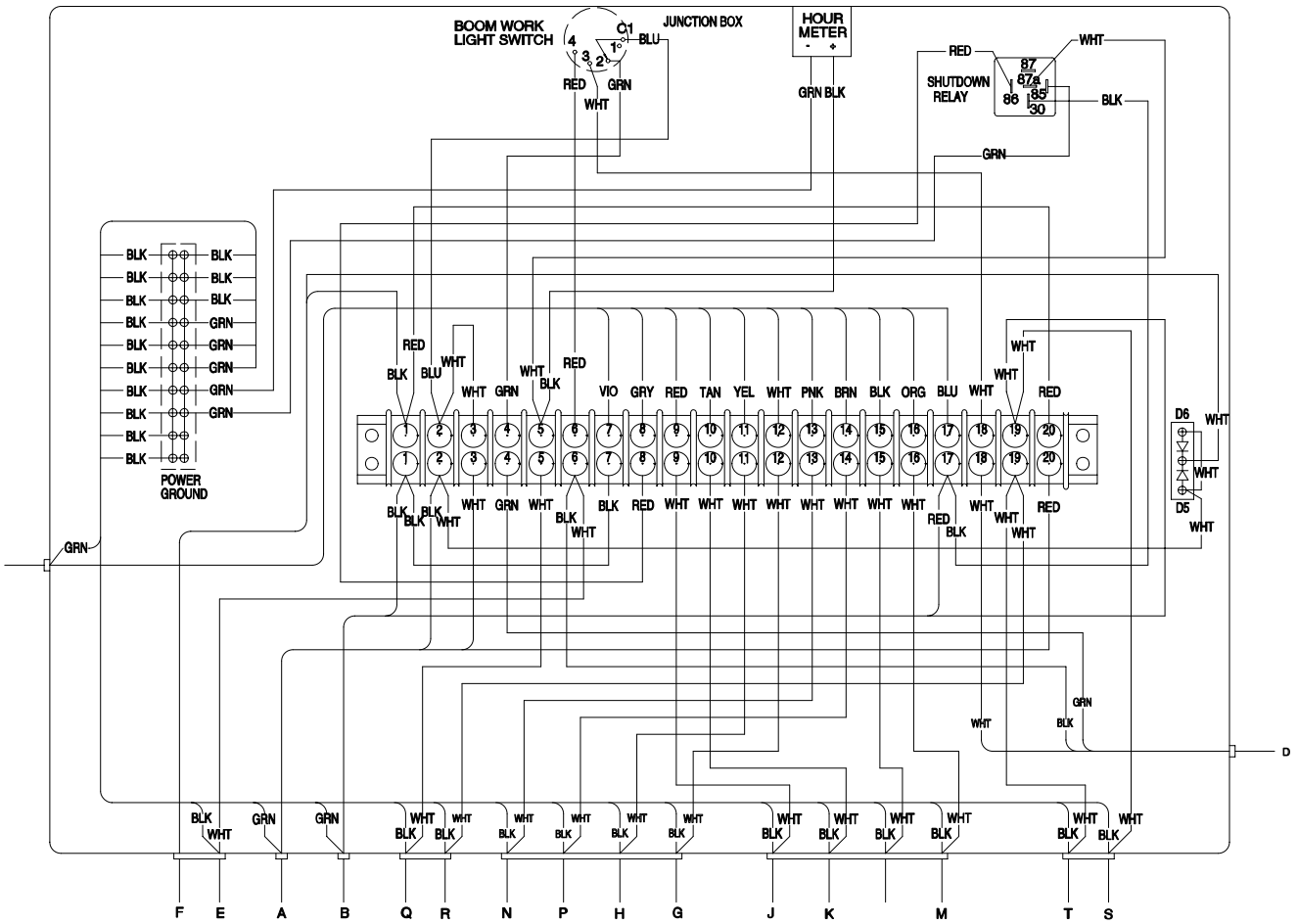


Table 2-21. Crane Troubleshooting (CONT).

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

5. BOOM DOES NOT LOWER WITH REMOTE CONTROL (CONT).

Test 9. Check for continuity between terminal strip, position 14, and boom DOWN solenoid connector, terminal 1.

- If no continuity is found, repair white wire between junction box terminal strip, position 14, and boom DOWN solenoid. Refer to paragraph 3-16 in this manual.
- If continuity is found, go to Test 10.

Test 10. Check for continuity between boom DOWN solenoid connector, terminal 2, and known good ground.

- If no continuity is found , repair boom DOWN solenoid ground circuit. Refer to paragraph 3-16 in this manual.
- If continuity is found, go to Test 11.

Test 11. Perform a resistance check of solenoid coil. Resistance should be between 23.7 and 26.3 ohms from terminal 1 and terminal 2.

- If coil resistance is not within specifications, replace coil. Notify Supervisor.

END OF TEST

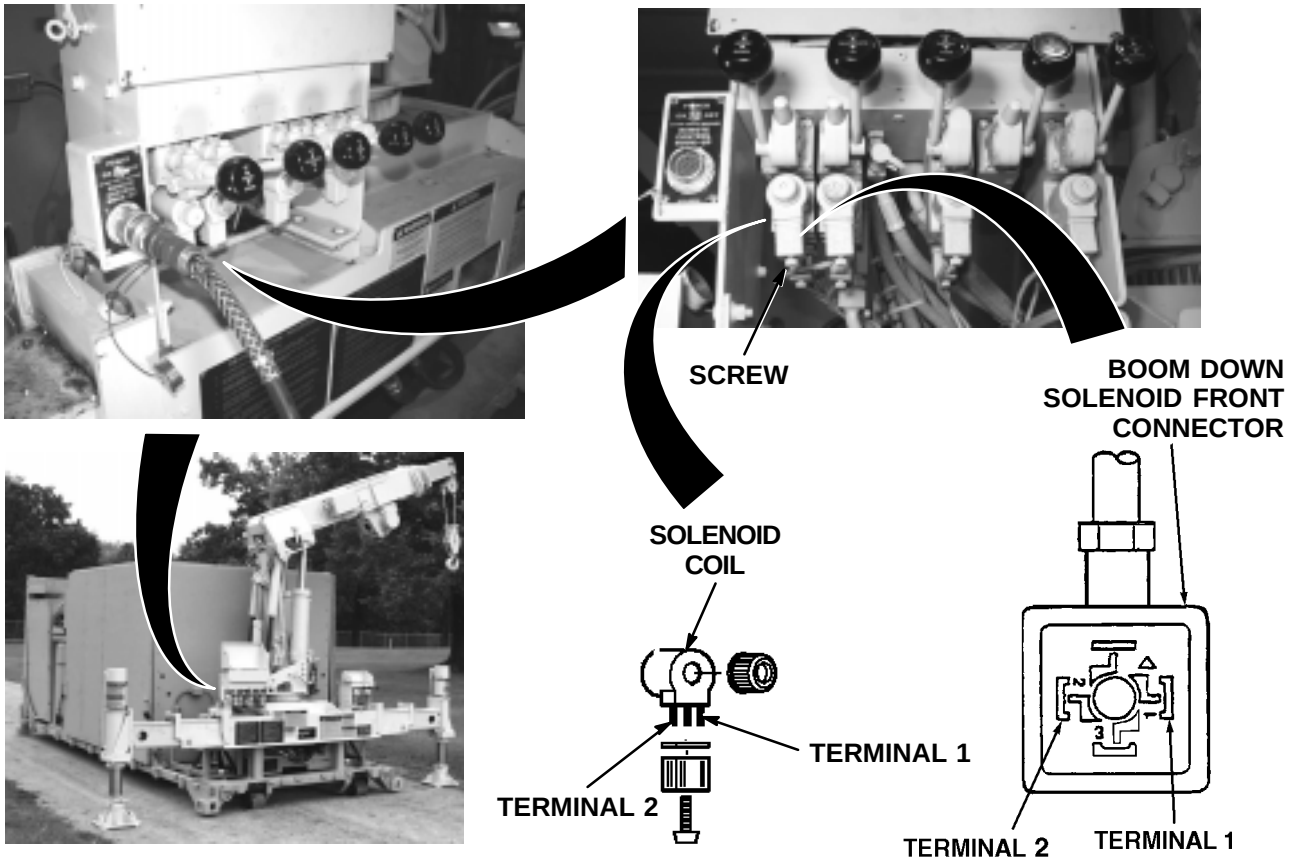
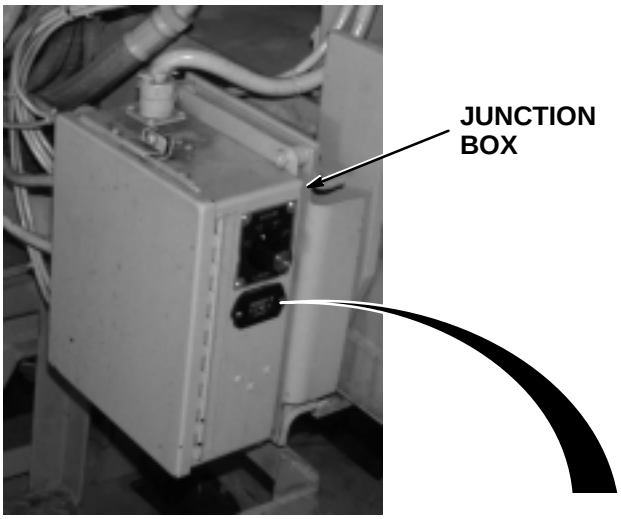


Table 2-21. Crane Troubleshooting (CONT).

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION



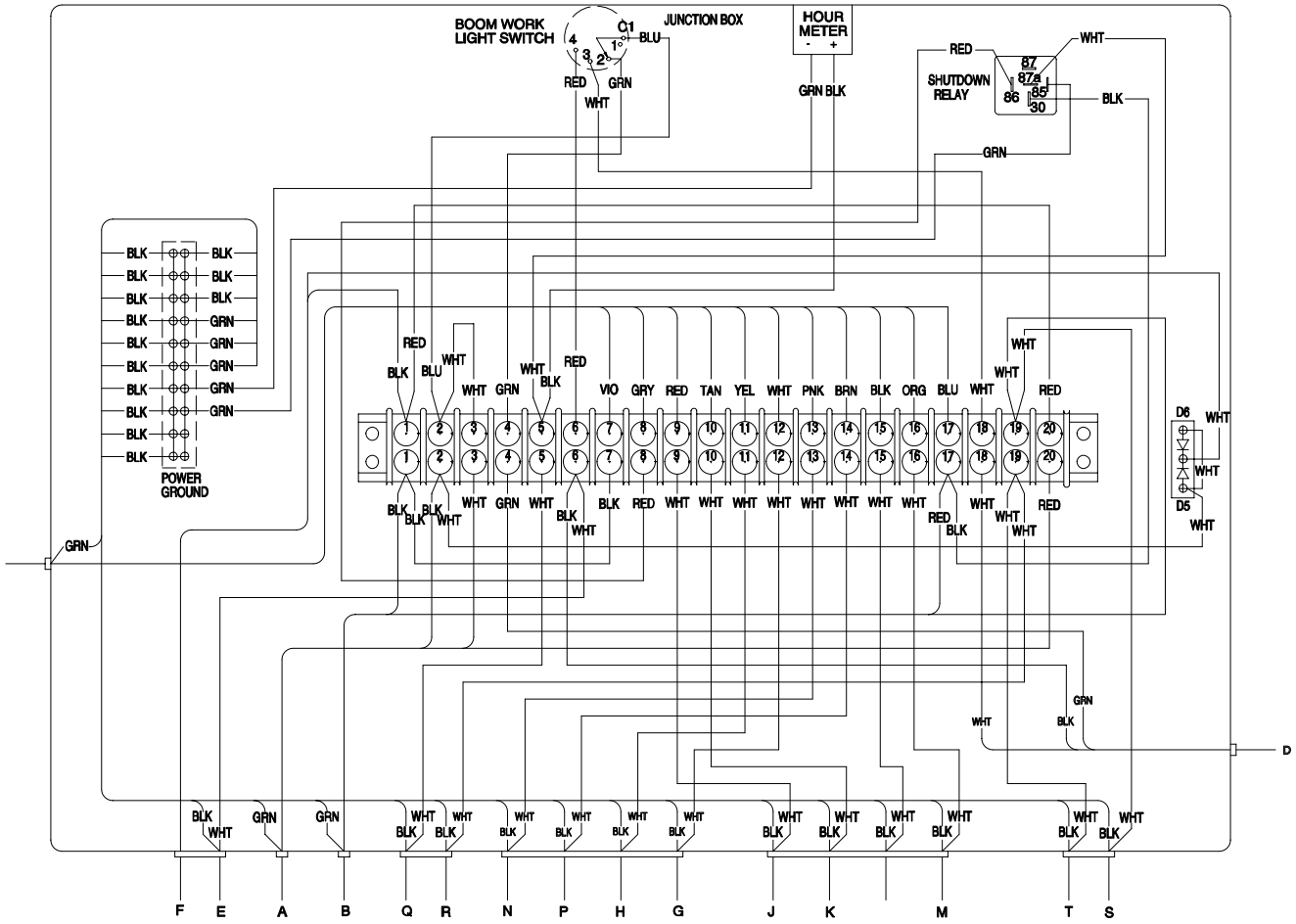


Table 2-21. Crane Troubleshooting (CONT).

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

6. BOOM DOES NOT RAISE WITH REMOTE CONTOL.

NOTE

Before performing crane troubleshooting procedures, make sure the FRS electrical supply system is functioning properly. Insure that Overload Shutdown System (OSS) is functioning properly and lockouts are not engaged.

Unless advised otherwise, the FRS 24V MASTER switch and the crane MAIN POWER switch must be in the ON position for all voltage checks.

Test 1. Are the boom down, hoist up, and telescope out functions also not working using remote control?

- If none of the above listed functions operate, go to Test 2.
- If boom down, hoist up, and telescope out function properly, go to Test 3.

Test 2. Are the boom down, hoist up, and telescope out functions also not working?

- If none of the above listed functions operate, faulty overload shutdown system, Notify Supervisor.
- If boom down, hoist up, and telescope out function properly, faulty lockout solenoid valve, Notify Supervisor.

Test 3. Loosen screw and remove connector from boom UP solenoid. Place EMERGENCY STOP switch in ON position. Hold remote control unit boom controller in UP position and check for 24 volts between solenoid connector, terminal 1, and known good ground.

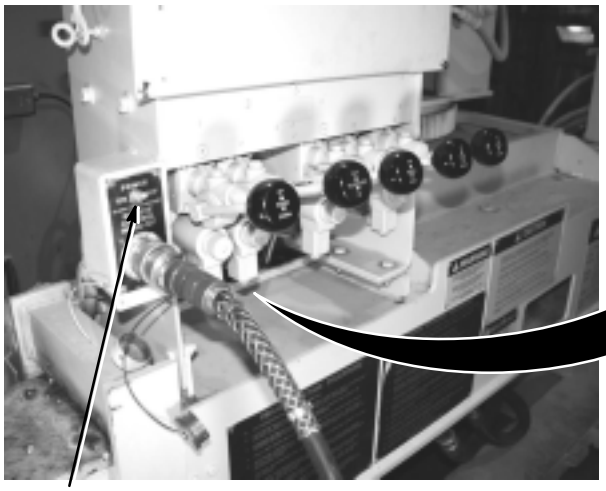
- If 24 volts are not present, go to Test 4.
- If 24 volts are present, turn MAIN POWER switch OFF and go to Test 10.

Test 4. Disconnect the remote control cable from the remote control unit and remote control hook-up connector on crane sub-frame. Check the cable for continuity between the two cable ends, socket N.

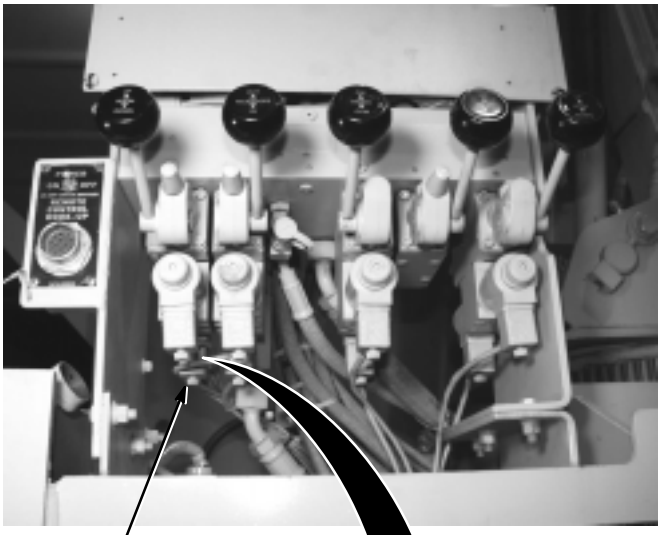
- If no continuity is found on terminal N, replace the remote control cable.
- If continuity is found, go to Test 5.

Table 2-21. Crane Troubleshooting (CONT).

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

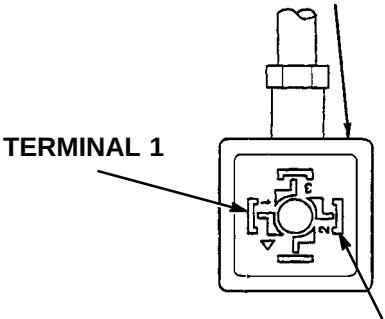


MAIN POWER



SCREW

BOOM UP SOLENOID REAR CONNECTOR



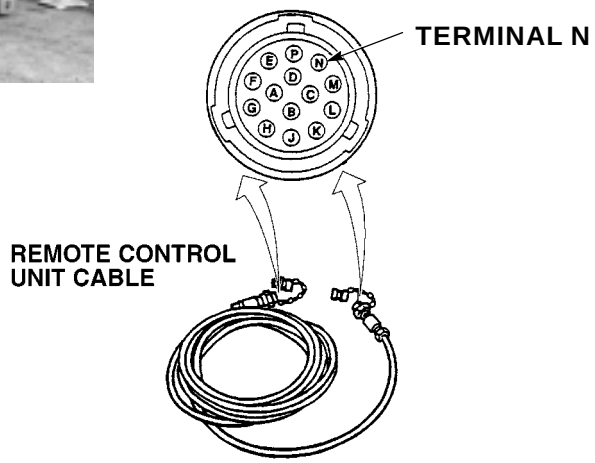


Table 2-21. Crane Troubleshooting (CONT).

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

6. BOOM DOES NOT RAISE WITH REMOTE CONTROL (CONT).

Test 5. Remove boom controller from remote control unit. Refer to paragraph 5-12 in this manual. Place EMERGENCY STOP switch in ON position. Check for continuity between the following locations:

	From remote control cable connector pin location:	To controller connector terminal location:
Check 1	H	8D
Check 2	N	13
Check 3	B	2F

- If no continuity is found, repair the wiring within the remote control unit. Refer to paragraph 3-16 in this manual.
- If continuity is found, go to Test 6.

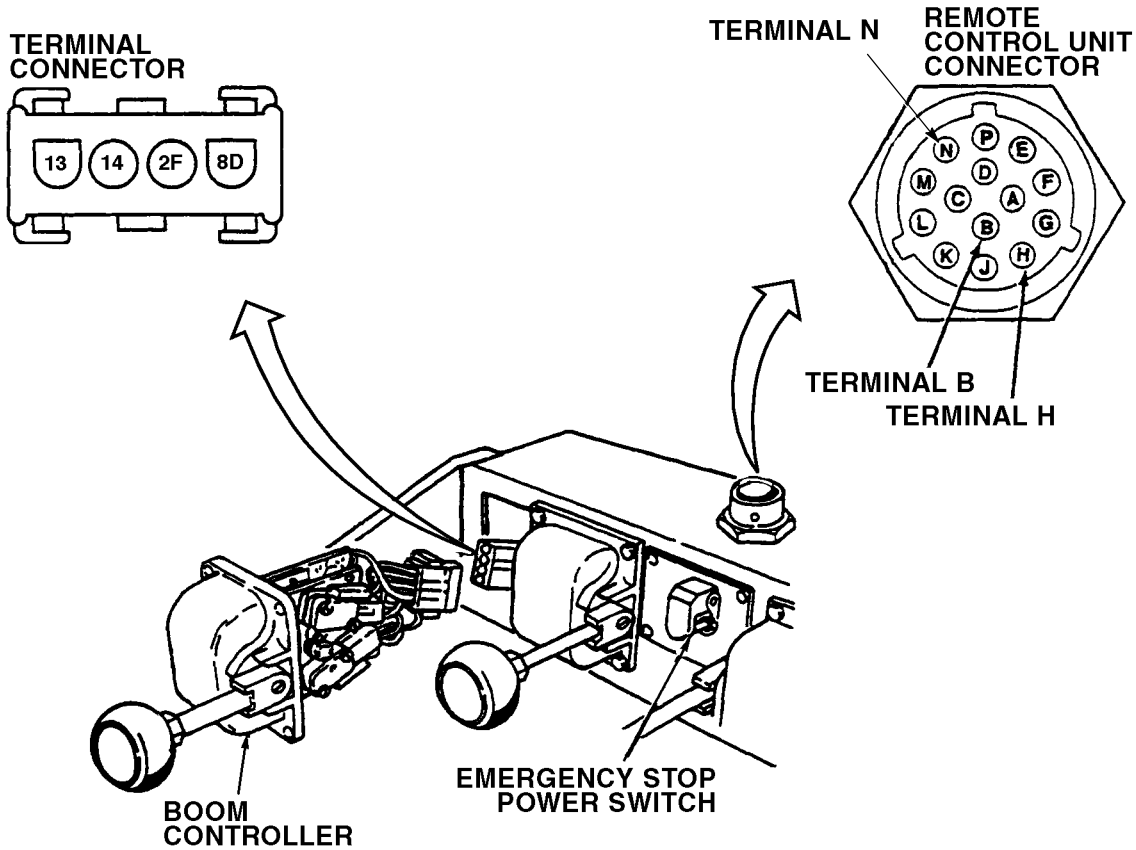


Table 2-21. Crane Troubleshooting (CONT).

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

Test 6. Tag and mark connectors on boom controller switches. Remove the connectors from the two controller switches. Check each switch for continuity between the following switch terminal locations, with the controller lever in the position noted:

	Switch Terminals:	Controller handle position:	Test results:
Check 1	NC to COM	Neutral	Continuity
Check 2	NO to COM	Neutral	No continuity (open)
Check 3	NC to COM	Full UP position	No continuity (open)
Check 4	NO to COM	Full UP position	Continuity

- If the above test results are not obtained, replace switch(es). Refer to paragraph 5-12 in this manual.

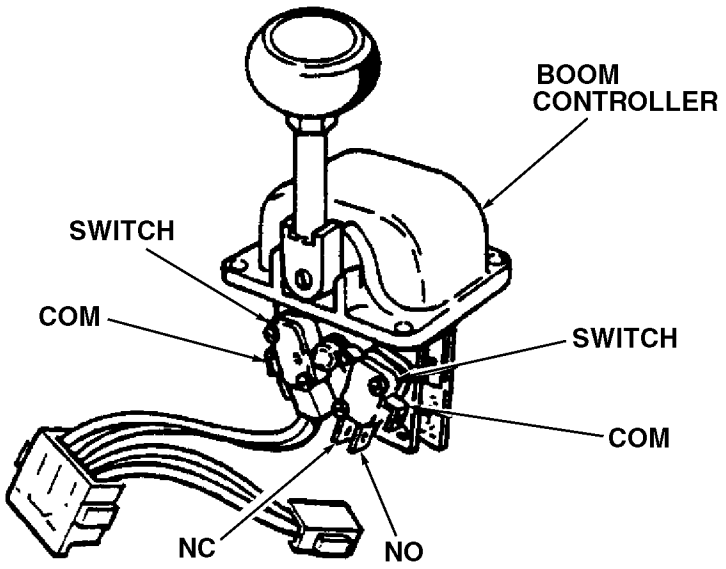


Table 2-21. Crane Troubleshooting (CONT).

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

6. BOOM DOES NOT RAISE WITH REMOTE CONTROL (CONT).

Test 7. Connect the remote control cable to the remote control unit and remote control hook-up connector on crane sub-frame. Turn MAIN POWER switch to ON position. Check for 24 volts from controller harness, blue wire, with BOOM controller lever in UP position, to known good ground. Turn MAIN POWER switch OFF.

- If 24 volts are not present, replace controller circuit card. Refer to paragraph 5-12 in this manual.
- If 24 volts are present, reassemble remote control unit and go to Test 8.

Test 8. Loosen four screws and clips and open crane junction box cover. Turn MAIN POWER switch to ON position. Check for 24 volts between terminal strip, position 13, and known good ground with boom controller held in the UP position. Turn MAIN POWER switch to the OFF position.

- If 24 volts are not present, repair pink wire between remote control hook-up connector on crane sub-frame and junction box terminal strip. Refer to paragraph 3-16 in this manual.
- If 24 volts are present, go to Test 9.

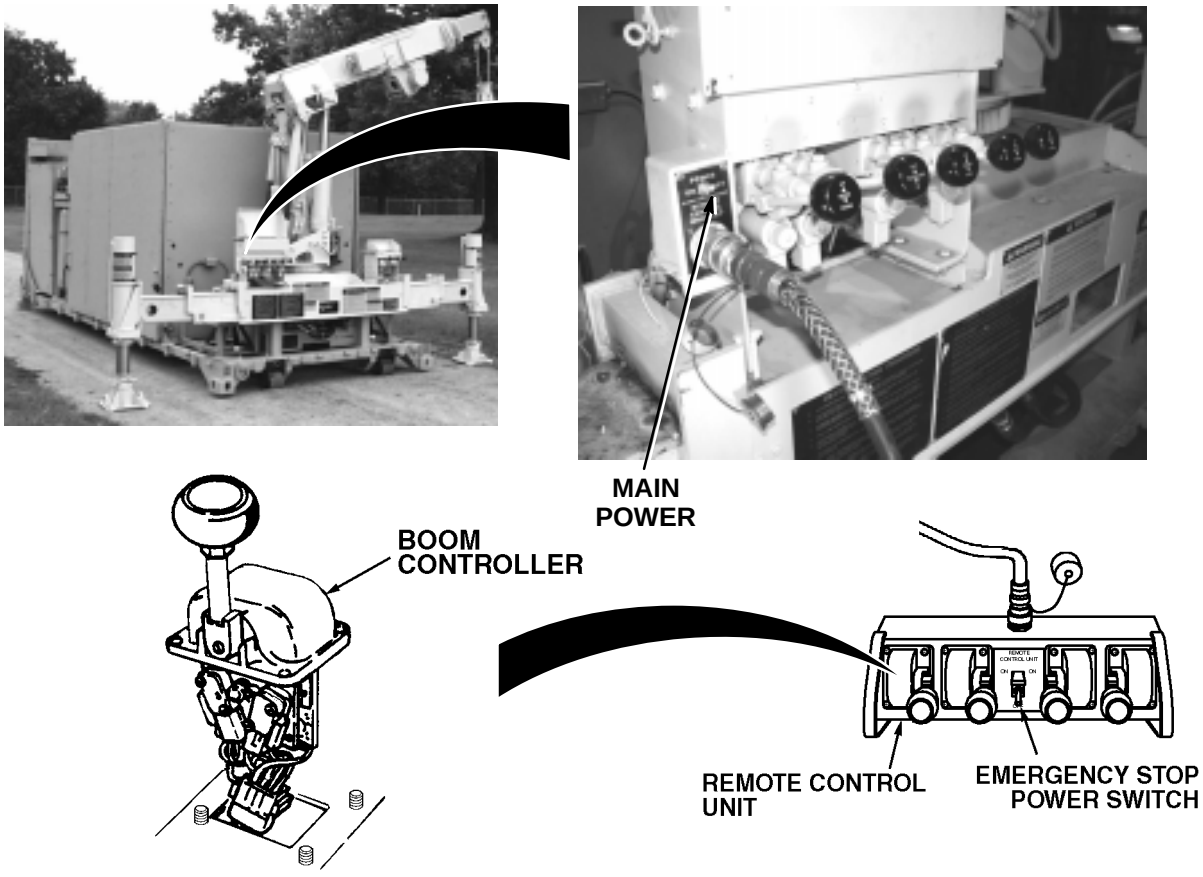
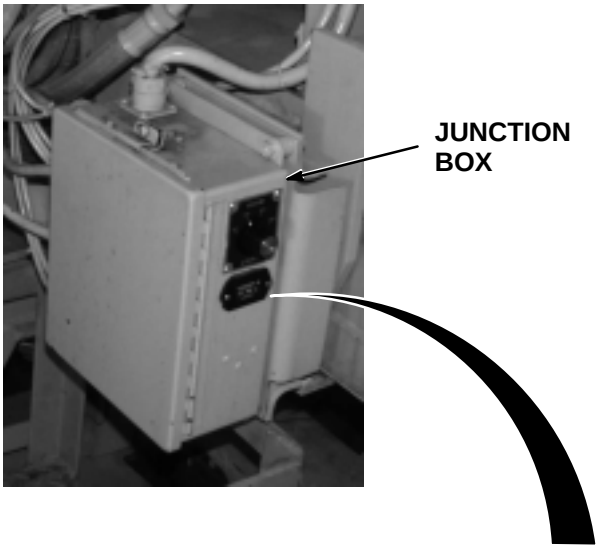


Table 2-21. Crane Troubleshooting (CONT).

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION



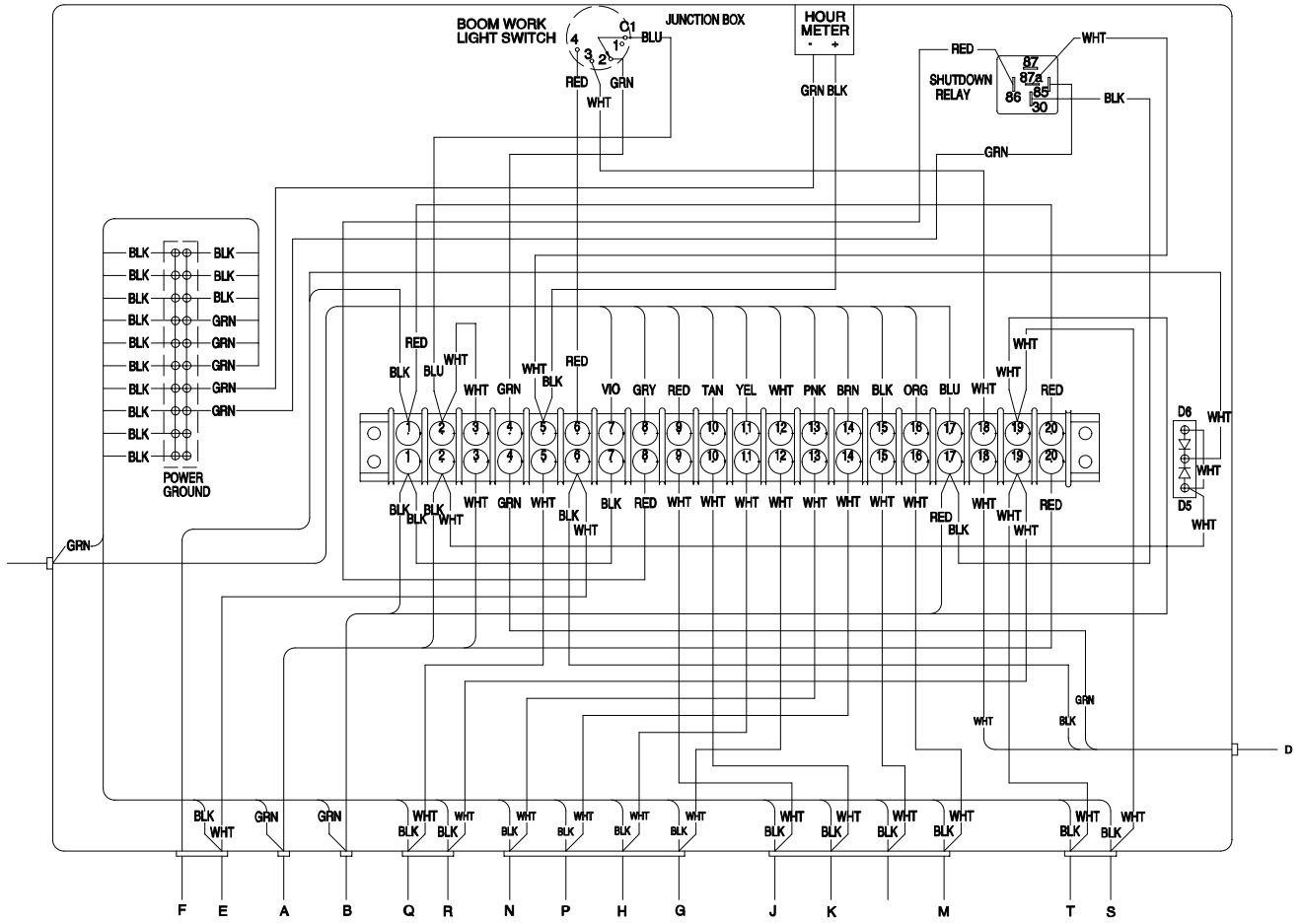


Table 2-21. Crane Troubleshooting (CONT).

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

6. BOOM DOES NOT RAISE WITH REMOTE CONTROL (CONT).

Test 9. Check for continuity between terminal strip, position 13, and boom UP solenoid connector, terminal 1.

- If no continuity is found, repair white wire between junction box terminal strip, position 13, and boom UP solenoid. Refer to paragraph 3-16 in this manual.
- If continuity is found, go to Test 10.

Test 10. Check for continuity between boom UP solenoid connector, terminal 2, and known good ground.

- If no continuity is found, repair boom UP solenoid ground circuit. Refer to paragraph 3-16 in this manual.
- If continuity is found, go to Test 11.

Test 11. Perform a resistance check of solenoid coil. Resistance should be between 23.7 and 26.3 ohms from terminal 1 and terminal 2.

- If coil resistance is not within specifications, Notify Supervisor.

END OF TEST

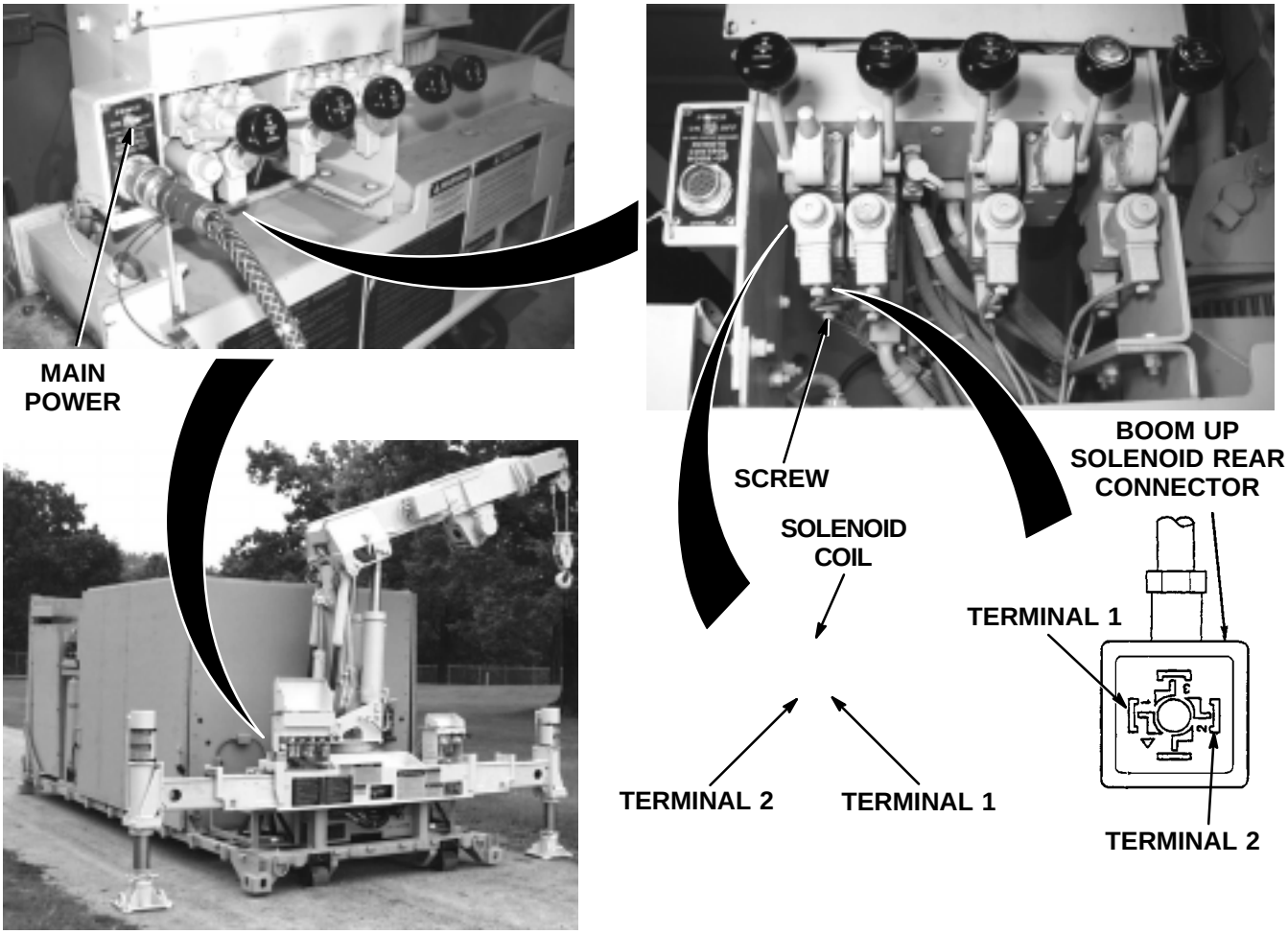
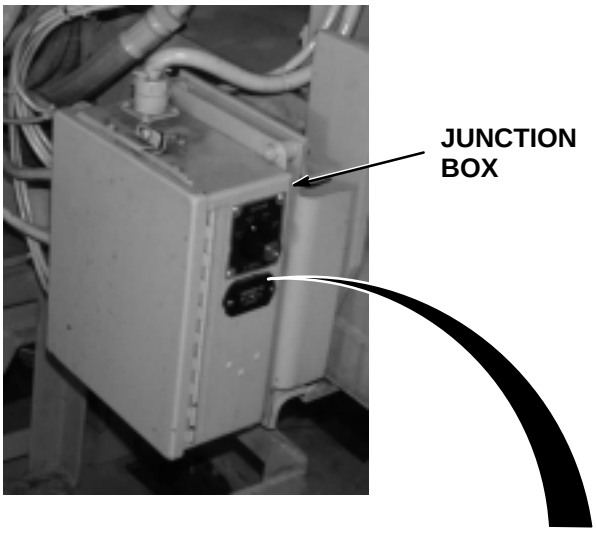


Table 2-21. Crane Troubleshooting (CONT).

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION



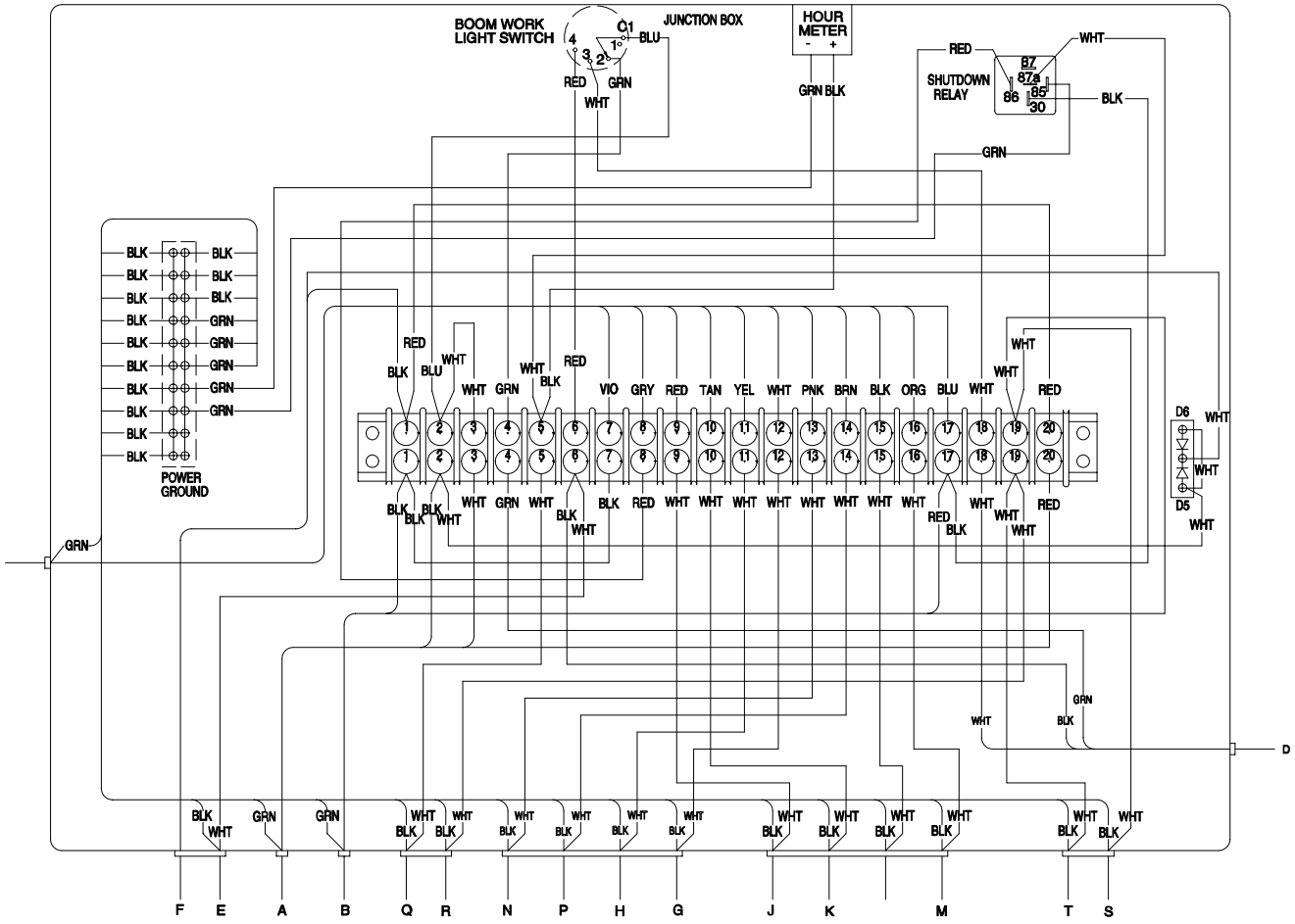


Table 2-21. Crane Troubleshooting (CONT).

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

7. BOOM DOES NOT TELESCOPE IN WITH REMOTE CONTROL.

NOTE

Before performing crane troubleshooting procedures, make sure the FRS electrical supply system is functioning properly.

Unless advised otherwise, the FRS 24V MASTER switch and the crane MAIN POWER switch must be in the ON position for all voltage checks.

Test 1. Loosen screw and remove connector from telescope IN solenoid. Place EMERGENCY STOP switch in ON position. Hold remote control unit telescope controller in IN position and check for 24 volts between solenoid connector, terminal 1, and known good ground.

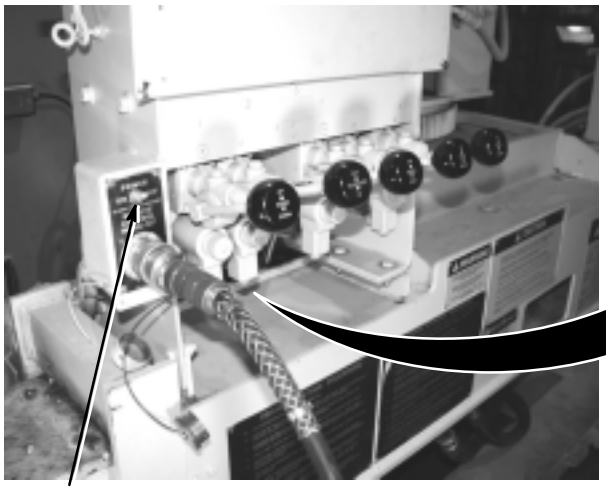
- If 24 volts are not present, go to Test 2.
- If 24 volts are present, turn MAIN POWER switch OFF and go to Test 8.

Test 2. Disconnect the remote control cable from the remote control unit and remote control hook-up connector on crane sub-frame. Check the cable for continuity between the two cable ends, terminal D.

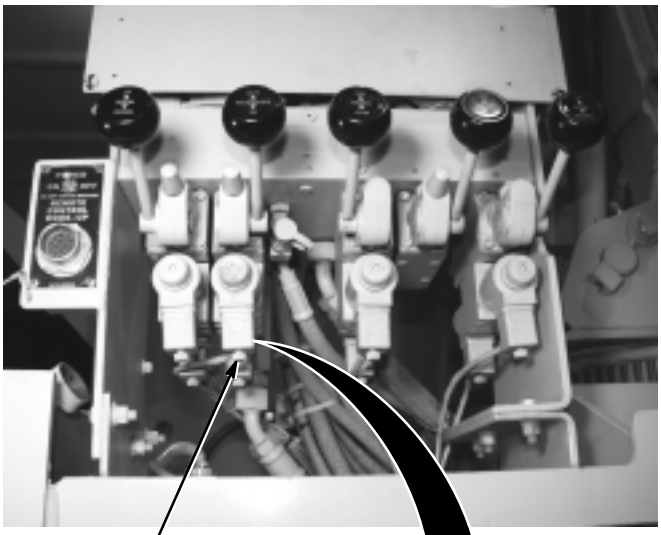
- If no continuity is found on terminal D, replace the remote control cable.
- If continuity is found, go to Test 3.

Table 2-21. Crane Troubleshooting (CONT).

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

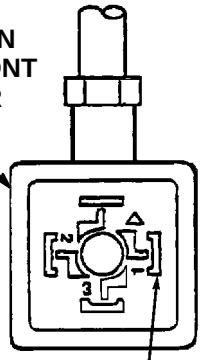


MAIN POWER

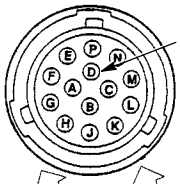


SCREW

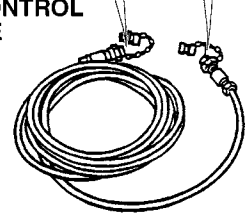
TELESCOPE IN SOLENOID FRONT CONNECTOR



TERMINAL 1



TERMINAL D



REMOTE CONTROL UNIT CABLE

Table 2-21. Crane Troubleshooting (CONT).

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

7. BOOM DOES NOT TELESCOPE IN WITH REMOTE CONTROL (CONT).

Test 3. Remove telescope controller from remote control unit. Refer to paragraph 5-12 in this manual. Place EMERGENCY STOP switch in ON position. Check for continuity between the following locations:

	From remote control cable connector pin location:	To controller connector terminal location:
Check 1	H	8B
Check 2	D	12
Check 3	B	2C

- If no continuity is found, repair the wiring within the remote control unit. Refer to paragraph 3-16 in this manual.
- If continuity is found, go to Test 4.

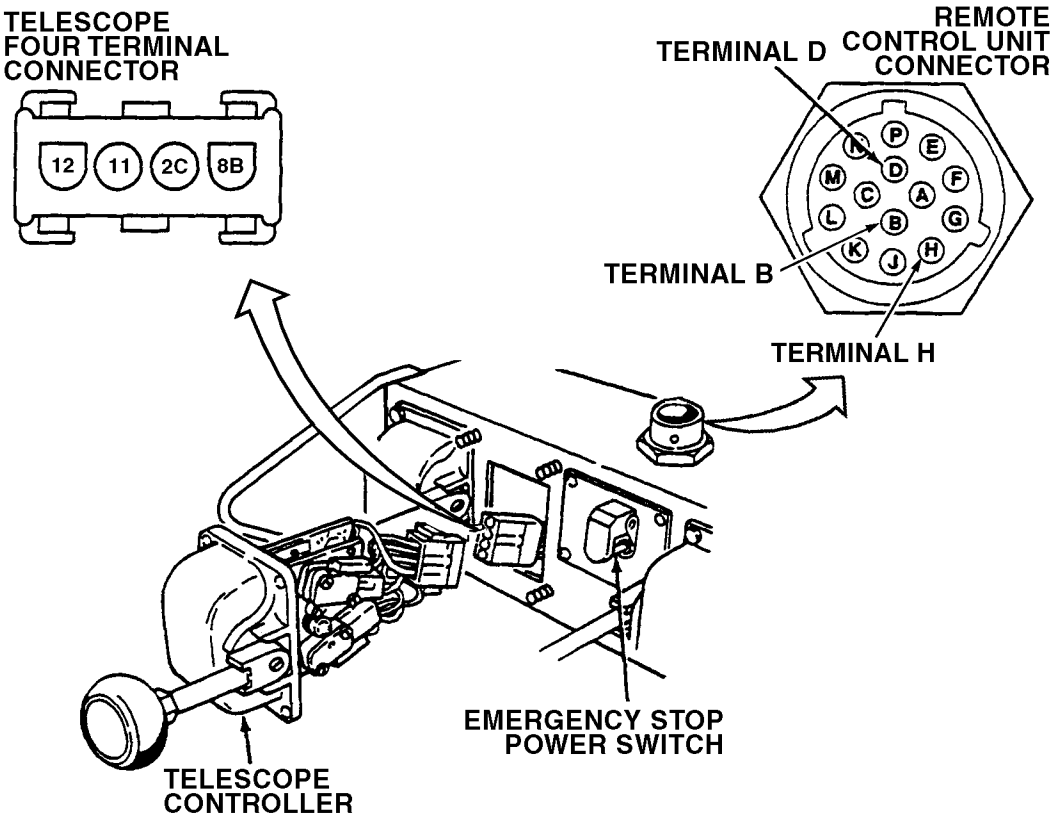


Table 2-21. Crane Troubleshooting (CONT).

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

Test 4. Tag and mark connectors on telescope controller switches. Remove the connectors from the two controller switches. Check each switch for continuity between the following switch terminal locations, with the controller lever in the position noted:

	Switch Terminals:	Controller handle position:	Test results:
Check 1	NC to COM	Neutral	Continuity
Check 2	NO to COM	Neutral	No continuity (open)
Check 3	NC to COM	Full OUT position	No continuity (open)
Check 4	NO to COM	Full OUT position	Continuity

- If the above test results are not obtained, replace switch(es). Refer to paragraph 5-12 in this manual.
- If the above test results are obtained, reinstall the controller switch connectors and go to Test 5.

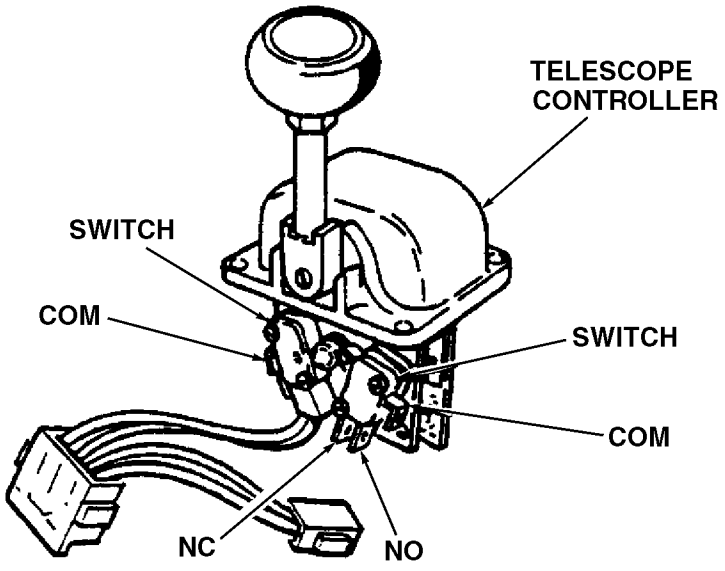


Table 2-21. Crane Troubleshooting (CONT).

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

7. BOOM DOES NOT TELESCOPE IN WITH REMOTE CONTROL (CONT).

Test 5. Connect the remote control cable to the remote control unit and remote control hook-up connector on crane sub-frame. Turn MAIN POWER switch to ON position. Check for 24 volts from controller harness, white wire, with BOOM controller lever in UP position to known good ground. Turn MAIN POWER switch to the OFF position.

- If 24 volts are not present, replace controller circuit card. Refer to paragraph 5-12 in this manual.
- If 24 volts are present, reassemble remote control unit and go to Test 6.

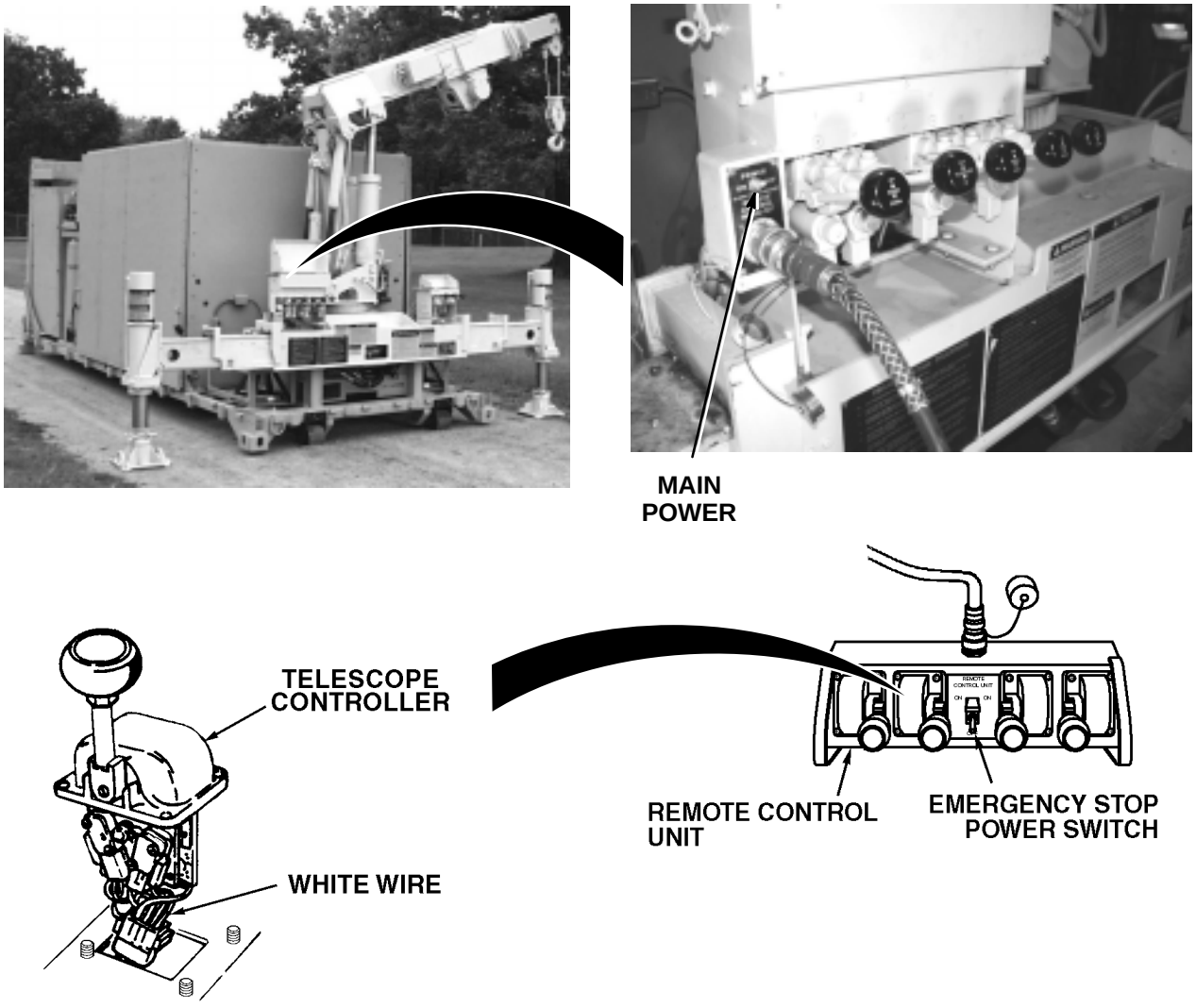
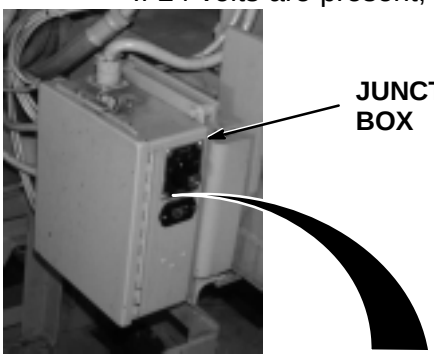


Table 2-21. Crane Troubleshooting (CONT).

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

Test 6. Loosen four screws and clips and open crane junction box cover. Turn MAIN POWER switch to ON position. Check for 24 volts between terminal strip, position 12, and known good ground with telescope controller held in the IN position. Turn MAIN POWER switch to the OFF position.

- If 24 volts are not present, repair white wire between remote control hook-up connector on crane sub-frame and junction box terminal strip. Refer to paragraph 3-16 in this manual.
- If 24 volts are present, go to Test 7.



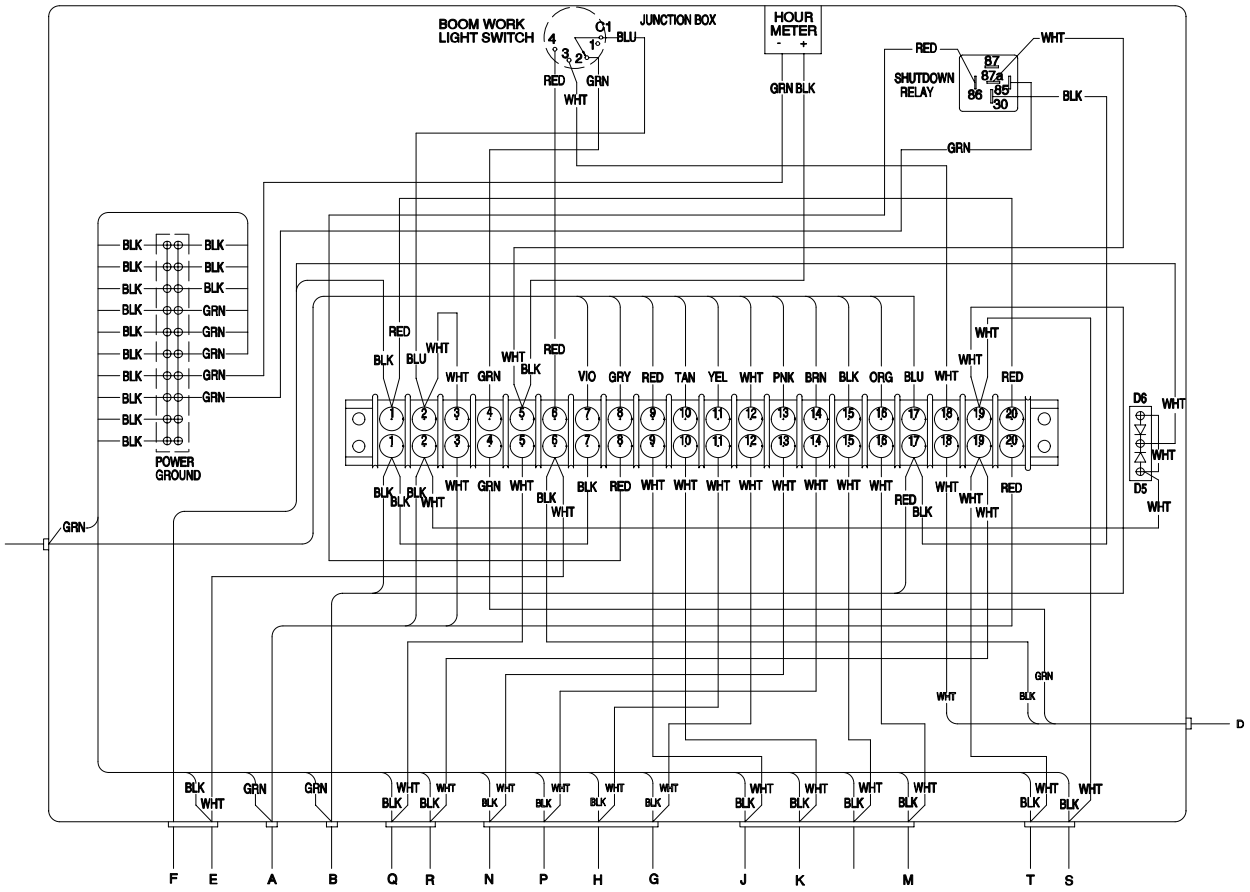


Table 2-21. Crane Troubleshooting (CONT).

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

7. BOOM DOES NOT TELESCOPE IN WITH REMOTE CONTROL (CONT).

Test 7. Check for continuity between terminal strip, position 12, and telescope IN solenoid connector, terminal 2.

- If no continuity is found, repair white wire between junction box terminal strip, position 12, and telescope IN solenoid. Refer to paragraph 3-16 in this manual.
- If continuity is found, go to Test 8.

Test 8. Check for continuity between telescope IN solenoid connector, terminal 2, and known good ground.

- If no continuity is found, repair telescope IN solenoid ground circuit. Refer to paragraph 3-16 in this manual.
- If continuity is found, go to Test 9.

Test 9. Perform a resistance check of solenoid coil. Resistance should be between 23.7 and 26.3 ohms from terminal 1 and terminal 2.

- If coil resistance is not within specifications, Notify Supervisor.

END OF TEST

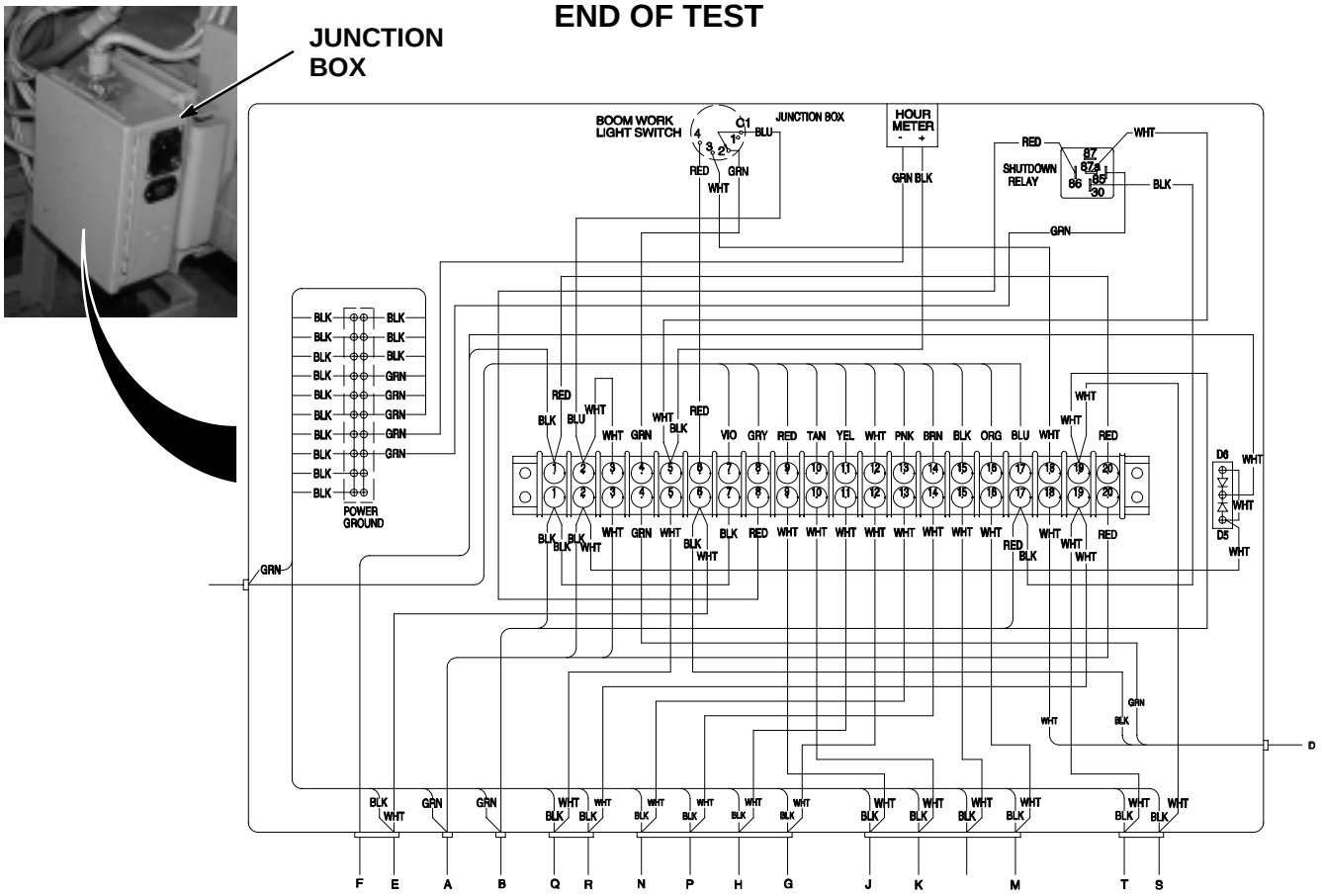


Table 2-21. Crane Troubleshooting (CONT).

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

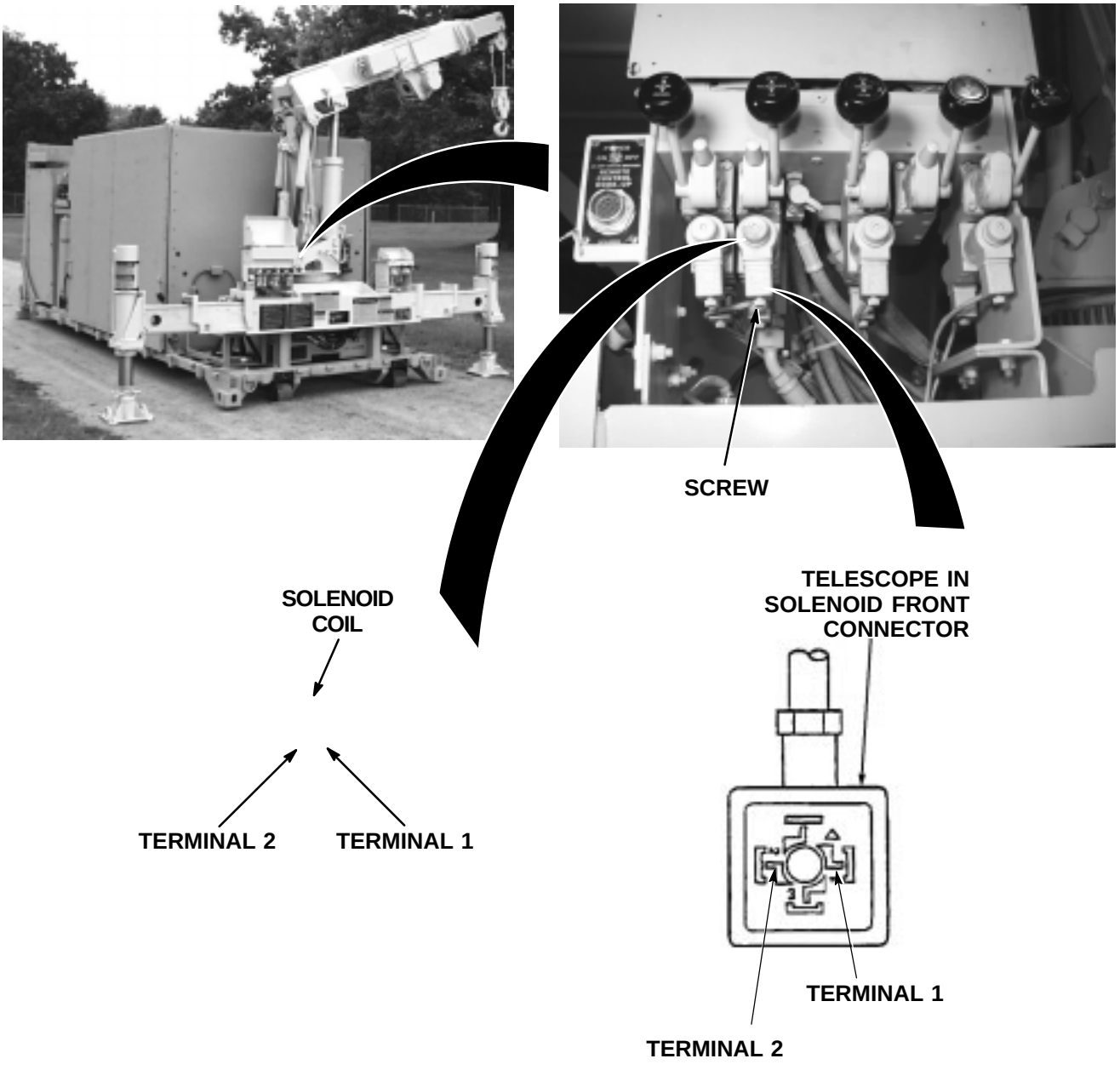


Table 2-21. Crane Troubleshooting (CONT).

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

8. BOOM DOES NOT TELESCOPE OUT WITH REMOTE CONTROL.

NOTE

Before performing crane troubleshooting procedures, make sure the FRS electrical supply system is functioning properly. Insure that Overload Shutdown System (OSS) is functioning properly and lockouts are not engaged.

Unless advised otherwise, the FRS 24V MASTER switch and the crane MAIN POWER switch must be in the ON position for all voltage checks.

Test 1. Are the boom up and down, and hoist up functions also not working using remote control?

- If none of the above listed functions operate, go to Test 2.
- If boom up/down and hoist-up function properly, go to Test 3.

Test 2. Are the boom up and down, and hoist up functions also not working?

- If none of the above listed functions operate, faulty overload shutdown system, Notify Supervisor.
- If boom up/down and hoist-up function properly, faulty lockout solenoid valve, Notify Supervisor.

Test 3. Loosen screw and remove connector from telescope OUT solenoid. Place MAIN POWER and EMERGENCY STOP switches in ON position. Hold remote control unit telescope controller in OUT position and check for 24 volts between solenoid connector, terminal 1, and known good ground.

- If 24 volts are not present, go to Test 4.
- If 24 volts are present, turn MAIN POWER switch OFF and go to Test 10.

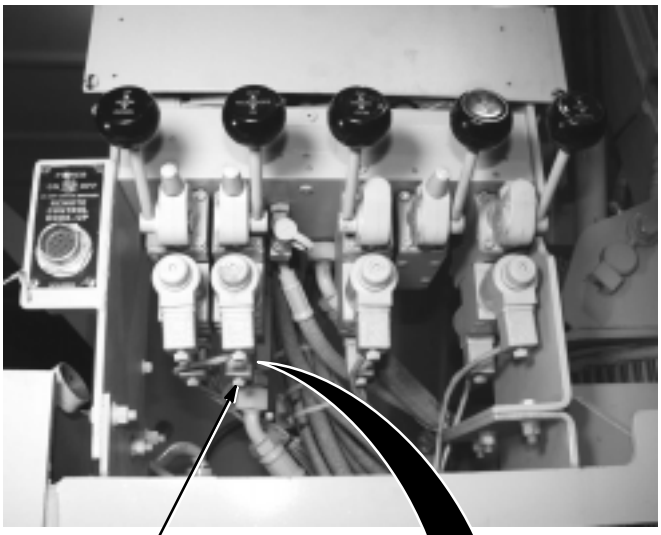
Test 4. Disconnect the remote control cable from the remote control unit and remote control hook-up connector on crane sub-frame. Check the cable for continuity between the two cable ends, terminal C.

- If no continuity is found on terminal C, replace the remote control cable.
- If continuity is found, go to Test 5.

Table 2-21. Crane Troubleshooting (CONT).

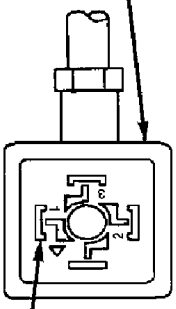
MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION	

MAIN POWER

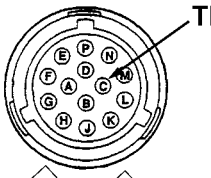


SCREW

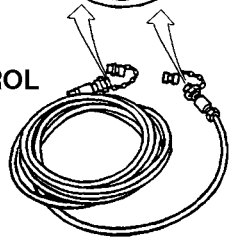
TELESCOPE OUT SOLENOID REAR CONNECTOR



TERMINAL 1



TERMINAL C



REMOTE CONTROL UNIT CABLE

Table 2-21. Crane Troubleshooting (CONT).

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

8. BOOM DOES NOT TELESCOPE OUT WITH REMOTE CONTROL (CONT).

Test 5. Remove telescope controller from remote control unit. Refer to paragraph 5-12 in this manual. Place EMERGENCY STOP switch in ON position. Check for continuity between the following locations:

	From remote control cable connector pin location:	To controller connector terminal location:
Check 1	H	8B
Check 2	C	11
Check 3	B	2C

- If no continuity is found, repair the wiring within the remote control unit. Refer to paragraph 3-16 in this manual.
- If continuity is found, go to Test 6.

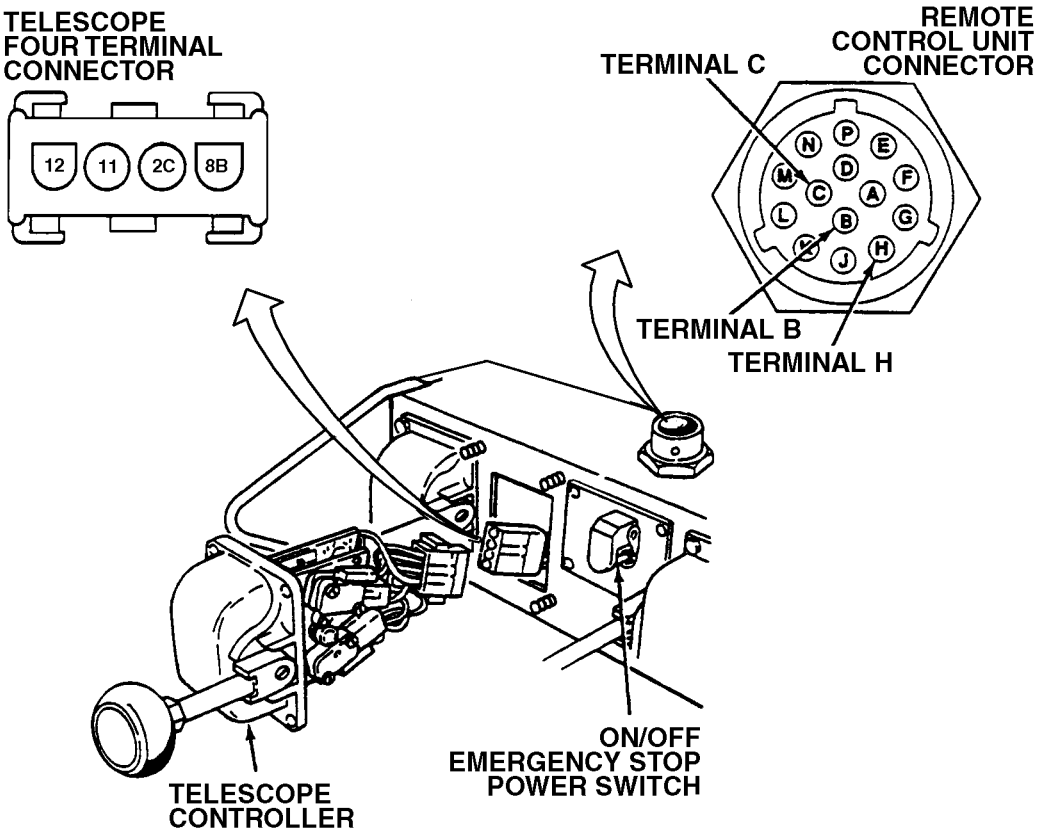


Table 2-21. Crane Troubleshooting (CONT).

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

Test 6. Tag and mark connectors on telescope controller switches. Remove the connectors from the two controller switches. Check each switch for continuity between the following switch terminal locations, with the controller lever in the position noted:

	Switch Terminals:	Controller handle position:	Test results:
Check 1	NC to COM	Neutral	Continuity
Check 2	NO to COM	Neutral	No continuity (open)
Check 3	NC to COM	Full OUT position	No continuity (open)
Check 4	NO to COM	Full OUT position	Continuity

- If the above test results are not obtained, replace switch(es). Refer to paragraph 5-12 in this manual.
- If the above test results are obtained, reinstall the controller switch connectors and go to Test 7.

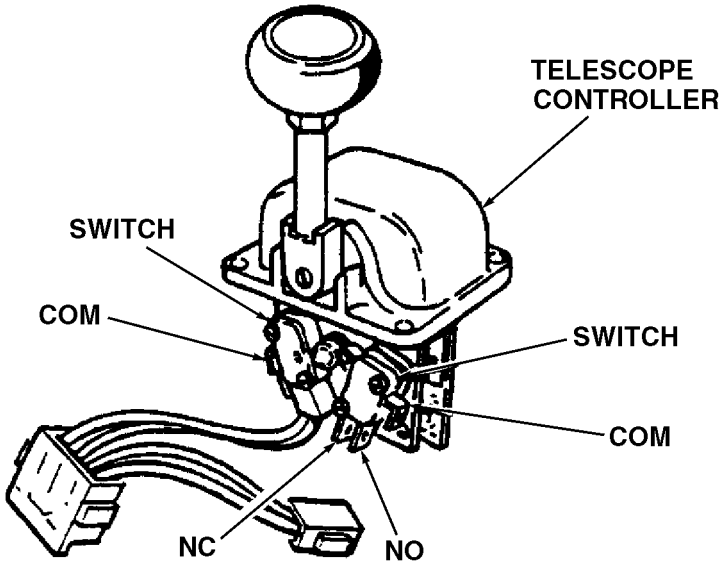


Table 2-21. Crane Troubleshooting (CONT).

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

8. BOOM DOES NOT TELESCOPE OUT WITH REMOTE CONTROL (CONT).

Test 7. Connect the remote control cable to the remote control unit and remote control hook-up connector on crane sub-frame. Turn MAIN POWER switch and EMERGENCY POWER switch to ON position. Check for 24 volts from controller harness, blue wire, with controller in DOWN position to known good ground. Turn MAIN POWER switch OFF.

- If 24 volts are not present, replace controller circuit card. Refer to paragraph 5-12 in this manual.
- If 24 volts are present, reassemble remote control unit and go to Test 8.

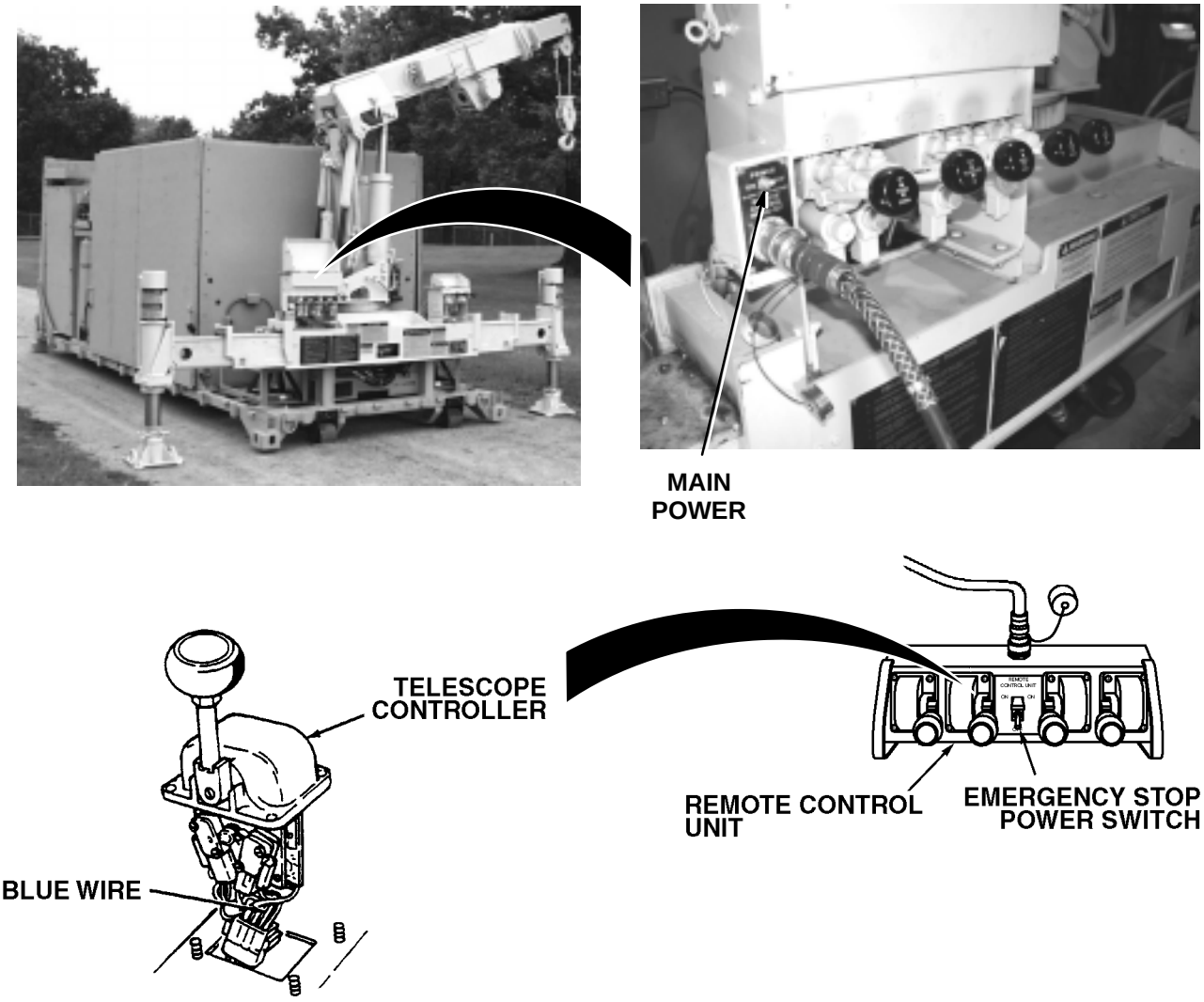
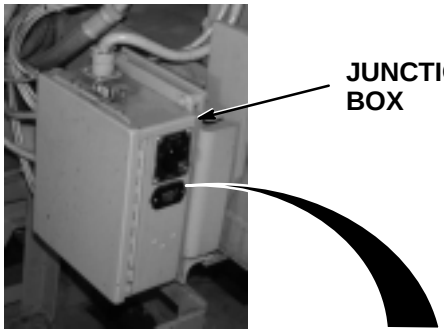


Table 2-21. Crane Troubleshooting (CONT).

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

Test 8. Loosen four screws and clips and open crane junction box cover. Turn MAIN POWER switch and EMERGENCY POWER switch to ON position. Check for 24 volts between terminal strip, position 11, and known good ground with telescope controller held in the OUT position. Turn MAIN POWER switch to the OFF position.

- If 24 volts are not present, repair yellow wire between remote control hook-up connector on crane sub-frame and junction box terminal strip. Refer to paragraph 3-16 in this manual.
- If 24 volts are present, go to Test 9.



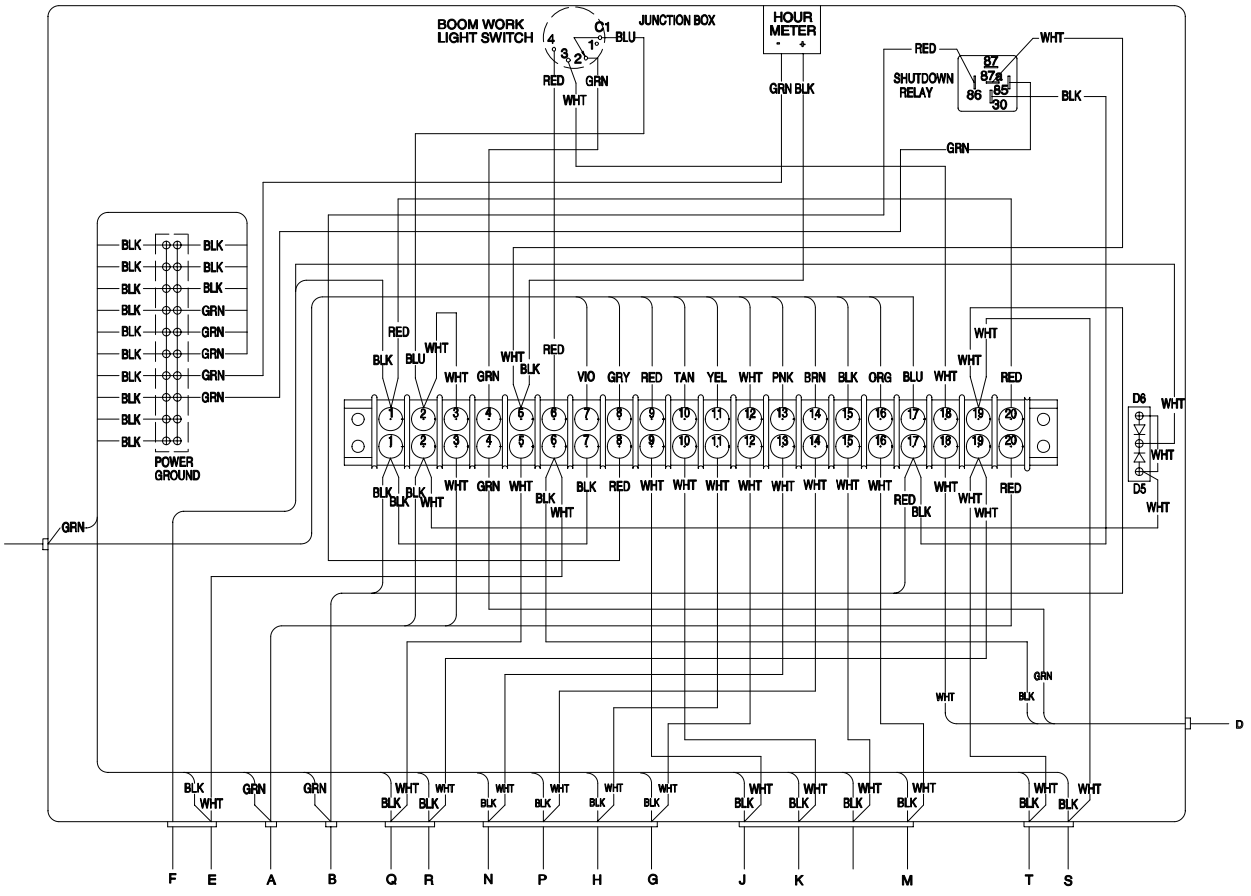


Table 2-21. Crane Troubleshooting (CONT).

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

8. BOOM DOES NOT TELESCOPE OUT WITH REMOTE CONTROL (CONT).

Test 9. Check for continuity between terminal strip, position 11, and telescope OUT solenoid connector, terminal 1.

- If no continuity is found, repair white wire between junction box terminal strip, position 11, and telescope OUT solenoid. Refer to paragraph 3-16 in this manual.
- If continuity is found, go to Test 10.

Test 10. Check for continuity between telescope OUT solenoid connector, terminal 2, and known good ground.

- If no continuity is found, repair telescope OUT solenoid ground circuit. Refer to paragraph 3-16 in this manual.
- If continuity is found, go to Test 11.

Test 11. Perform a resistance check of solenoid coil. Resistance should be 23.7 to 26.3 ohms from terminal 1 and terminal 2.

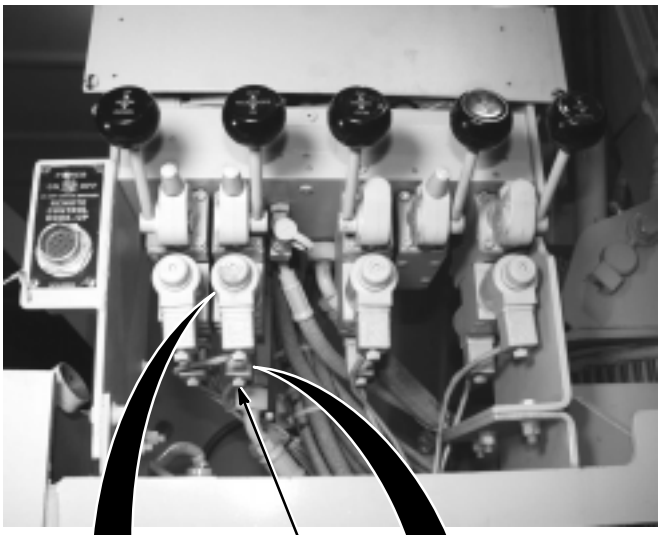
- If coil reistance is not within specifications, Notify Supervisor.

END OF TEST

Table 2-21. Crane Troubleshooting (CONT).

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

MAIN POWER



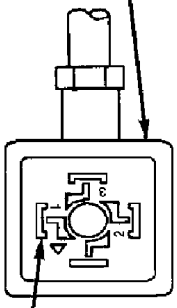
SCREW

TELESCOPE OUT SOLENOID REAR CONNECTOR

SOLENOID COIL

TERMINAL 2

TERMINAL 1



TERMINAL 1

Table 2-21. Crane Troubleshooting (CONT).

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

9. CRANE WILL NOT SWING CLOCKWISE USING REMOTE CONTROL.

NOTE

Before performing crane troubleshooting procedures, make sure the FRS electrical supply system is functioning properly.

Unless advised otherwise, the FRS 24V MASTER switch and the crane MAIN POWER switch must be in the ON position for all voltage checks.

Test 1. Loosen screw and remove connector from swing CW solenoid. Place MAIN POWER and EMERGENCY STOP switches in ON position. Hold remote control unit swing controller in CW position and check for 24 volts between solenoid connector, terminal 1, and known good ground.

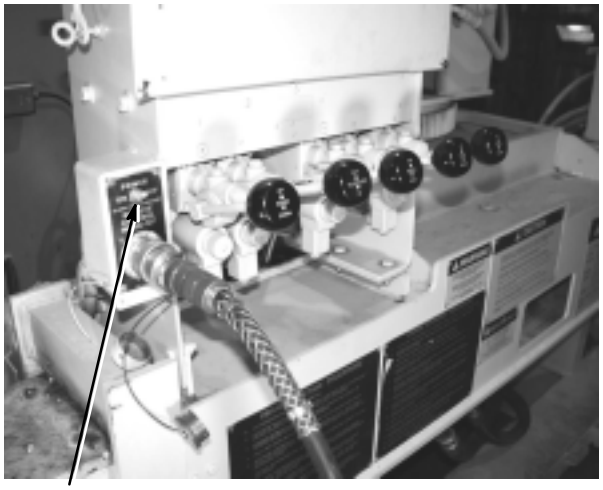
- If 24 volts are not present, go to Test 2.
- If 24 volts are present, turn MAIN POWER switch OFF and go to Test 8.

Test 2. Disconnect the remote control cable from the remote control unit and remote control hook-up connector on crane sub-frame. Check the cable for continuity between the two cable ends, terminal L.

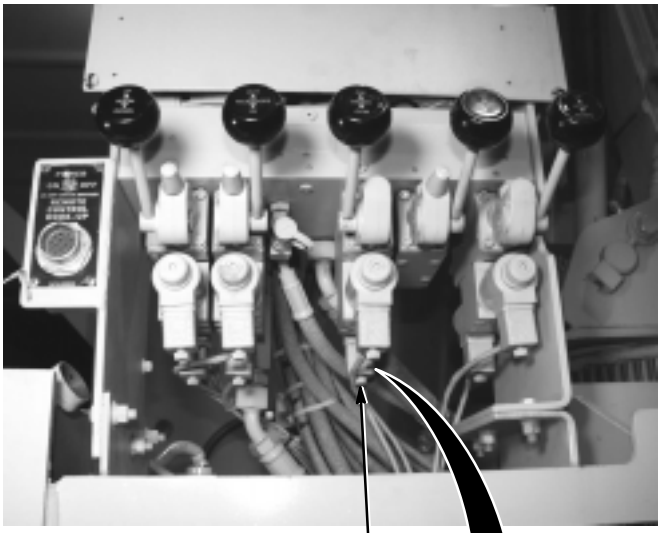
- If no continuity is found on terminal, replace the remote control cable.
- If continuity is found, go to Test 3.

Table 2-21. Crane Troubleshooting (CONT).

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

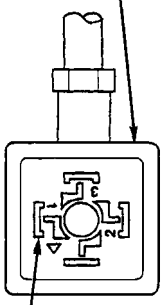


MAIN POWER

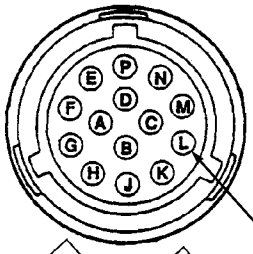


SCREW

SWING CW SOLENOID REAR CONNECTOR



TERMINAL 1



TERMINAL L

REMOTE CONTROL UNIT CABLE

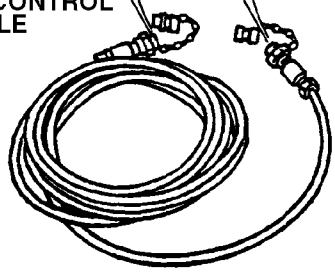


Table 2-21. Crane Troubleshooting (CONT).

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

9. CRANE WILL NOT SWING CLOCKWISE USING REMOTE CONTROL (CONT).

Test 3. Remove swing controller from remote control unit. Refer to paragraph 5-12 in this manual. Place EMERGENCY STOP switch in ON position. Check for continuity between the following locations:

	From remote control cable connector pin location:	To controller connector terminal location:
Check 1	H	8C
Check 2	L	10
Check 3	B	2B

- If no continuity is found, repair the wiring within the remote control unit. Refer to paragraph 3-16 in this manual.
- If continuity is found, go to Test 4.

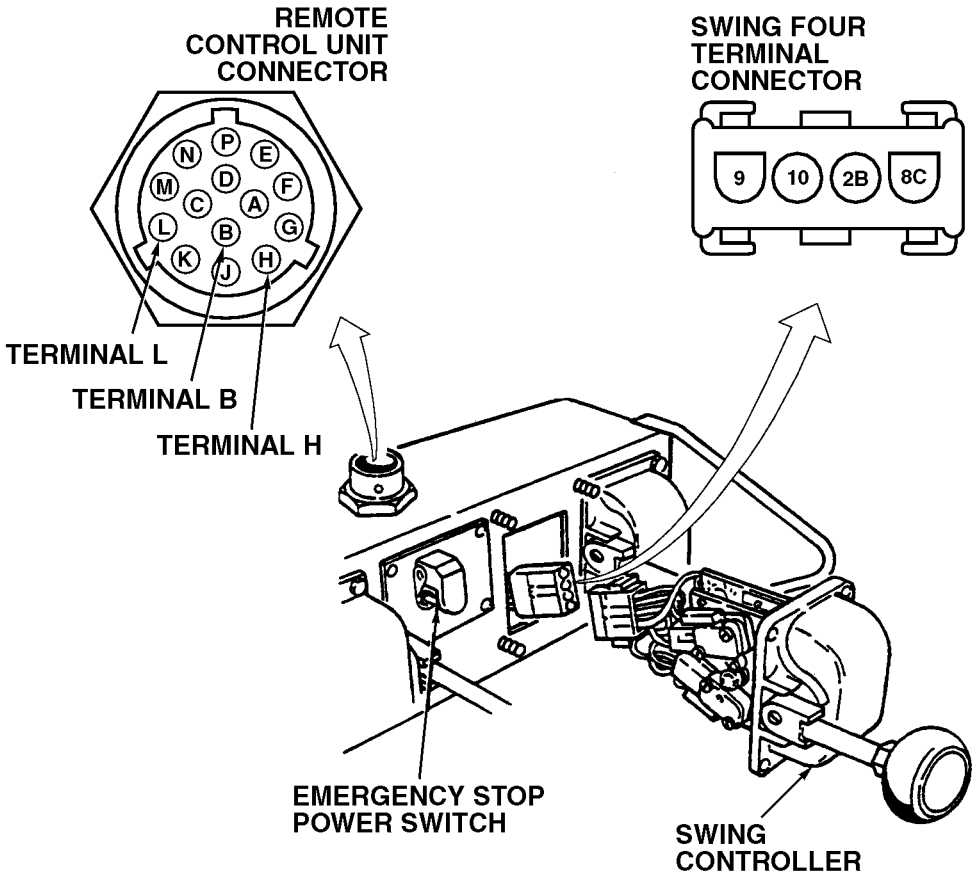


Table 2-21. Crane Troubleshooting (CONT).

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

Test 4. Tag and mark connectors on swing controller switches. Remove the connectors from the two controller switches. Check each switch for continuity between the following switch terminal locations, with the controller lever in the position noted:

	Switch Terminals:	Controller handle position:	Test results:
Check 1	NC to COM	Neutral	Continuity
Check 2	NO to COM	Neutral	No continuity (open)
Check 3	NC to COM	Full CW position	No continuity (open)
Check 4	NO to COM	Full CW position	Continuity

- If the above test results are not obtained, replace switch(es). Refer to paragraph 5-12 in this manual.
- If the above test results are obtained, reinstall the controller switch connectors and go to Test 5.

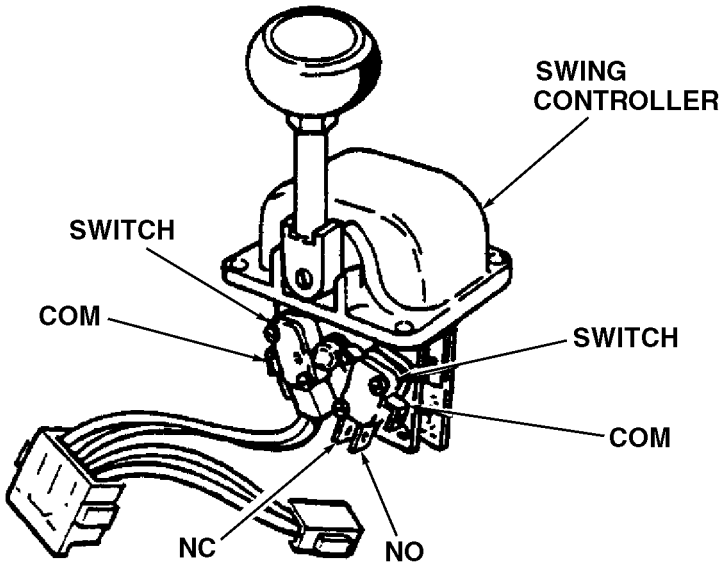


Table 2-21. Crane Troubleshooting (CONT).

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

9. CRANE WILL NOT SWING CLOCKWISE USING REMOTE CONTROL (CONT).

Test 5. Connect the remote control cable to the remote control unit and remote control hook-up connector on crane sub-frame. Turn MAIN POWER switch to ON position. Check for 24 volts from controller harness, white wire, with controller lever to CW position to known good ground. Turn MAIN POWER switch to OFF position.

- If 24 volts are not present, replace controller circuit card. Refer to paragraph 5-12 in this manual.
- If 24 volts are present, reassemble remote control unit and go to Test 6.

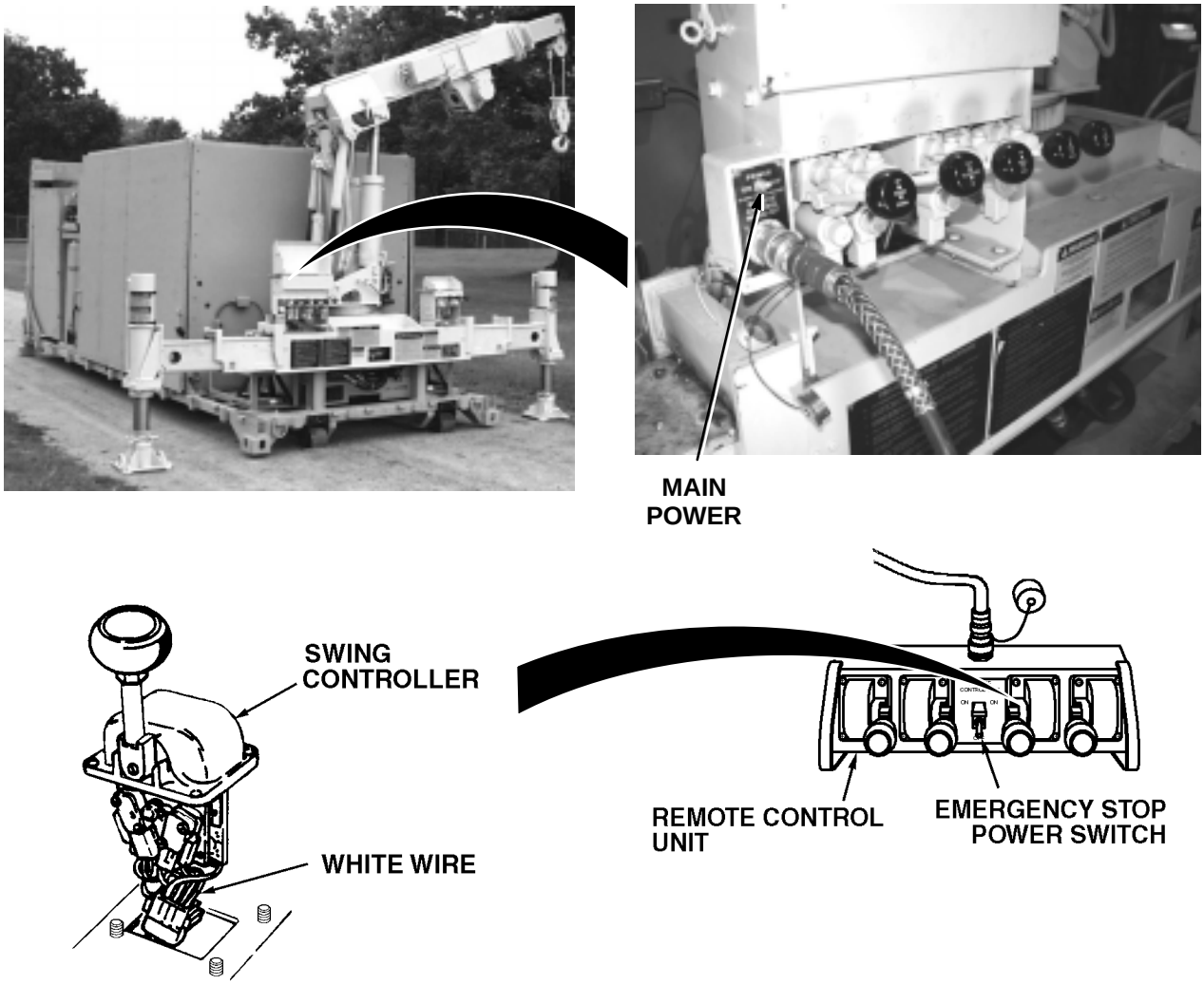
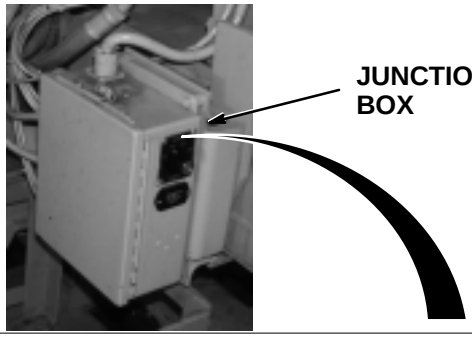


Table 2-21. Crane Troubleshooting (CONT).

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

Test 6. Loosen four screws and clips and open crane junction box cover. Turn MAIN POWER switch to ON position. Check for 24 volts between terminal strip, position 10, and known good ground with swing controller held in the CW position. Turn MAIN POWER switch to OFF position.

- If 24 volts are not present, repair tan wire between remote control hook-up connector on crane sub-frame and junction box terminal strip. Refer to paragraph 3-16 in this manual.
- If 24 volts are present, go to Test 7.



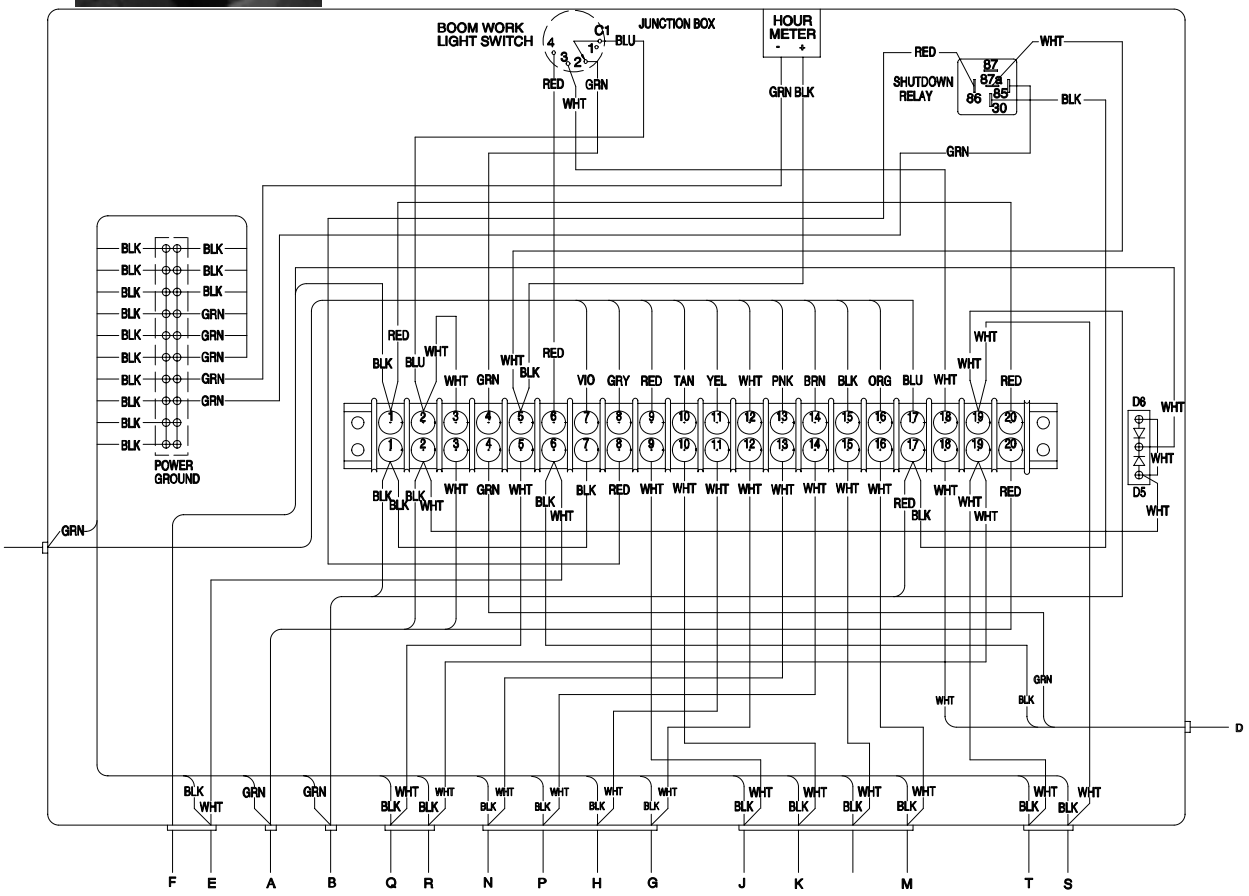


Table 2-21. Crane Troubleshooting (CONT).

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

9. CRANE WILL NOT SWING CLOCKWISE USING REMOTE CONTROL (CONT).

Test 7. Check for continuity between terminal strip, position 10, and swing CW solenoid connector, terminal 1.

- If no continuity is found, repair white wire between junction box terminal strip, position 10, and swing CW solenoid. Refer to paragraph 3-16 in this manual.
- If continuity is found, go to Test 8.

Test 8. Check for continuity between swing CW solenoid connector, terminal 2, and known good ground.

- If no continuity is found, repair swing CW solenoid ground circuit. Refer to paragraph 3-16 in this manual.
- If continuity is found, go to Test 9.

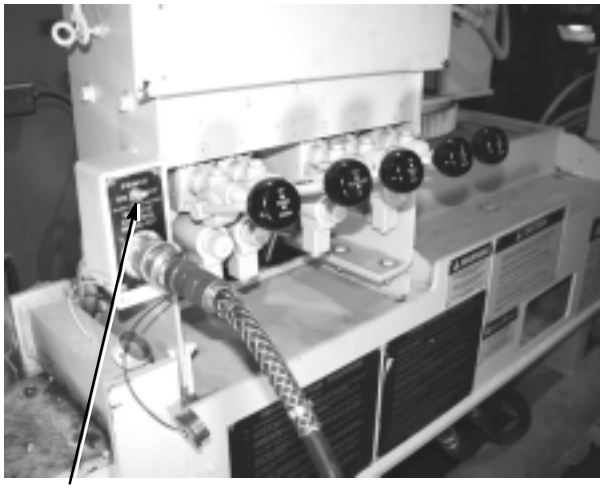
Test 9. Perform a resistance check of solenoid coil. Resistance should be between 23.7 and 26.3 ohms from terminal 1 and terminal 2.

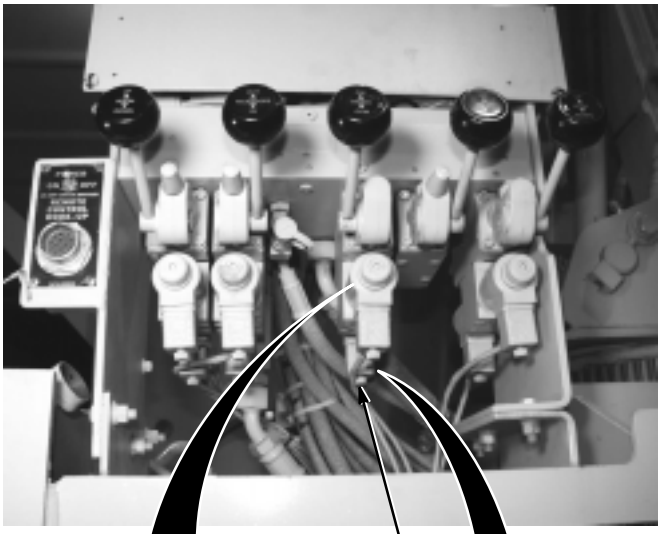
- If coil resistance is not within specifications, Notify Supervisor.

END OF TEST

Table 2-21. Crane Troubleshooting (CONT).

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION





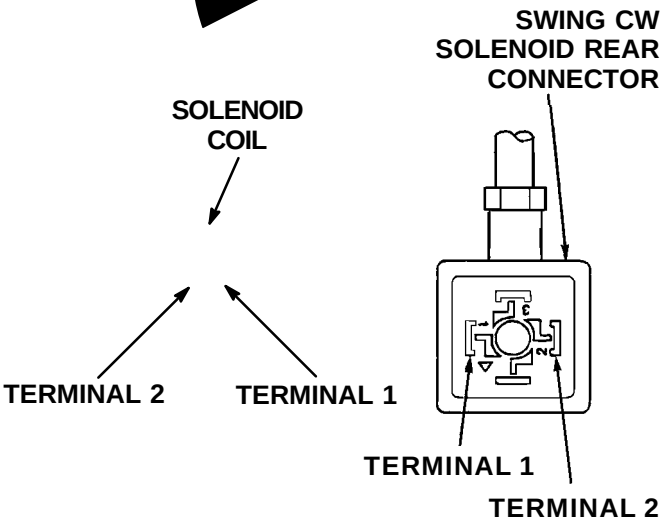


Table 2-21. Crane Troubleshooting (CONT).

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

10. CRANE WILL NOT SWING COUNTERCLOCKWISE USING REMOTE CONTROL.

NOTE

Before performing crane troubleshooting procedures, make sure the FRS electrical supply system is functioning properly.

Unless advised otherwise, the FRS 24V MASTER switch and the crane MAIN POWER switch must be in the ON position for all voltage checks.

Test 1. Loosen screw and remove connector from swing CCW solenoid. Place MAIN POWER and EMERGENCY STOP switches in ON position. Hold remote control unit swing controller in CCW position and check for 24 volts between solenoid connector, terminal 1, and known good ground.

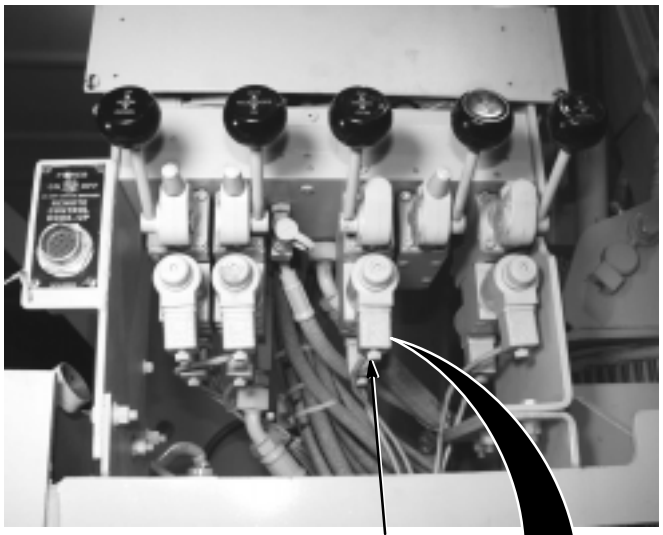
- If 24 volts are not present, go to Test 2.
- If 24 volts are present, turn MAIN POWER switch OFF and go to Test 8.

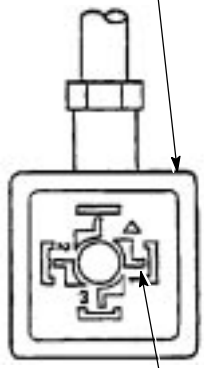
Test 2. Disconnect the remote control cable from the remote control unit and remote control hook-up connector on crane sub-frame. Check the cable for continuity between the two cable ends, terminal A.

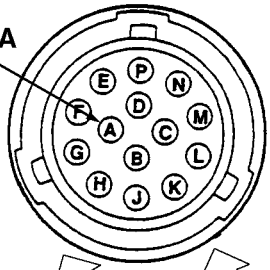
- If no continuity is found on terminal A, replace the remote control cable.
- If continuity is found, go to Test 3.

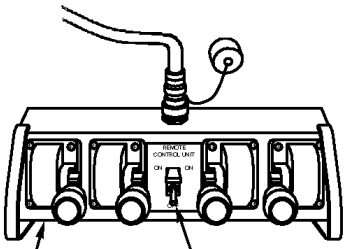
Table 2-21. Crane Troubleshooting (CONT).

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION









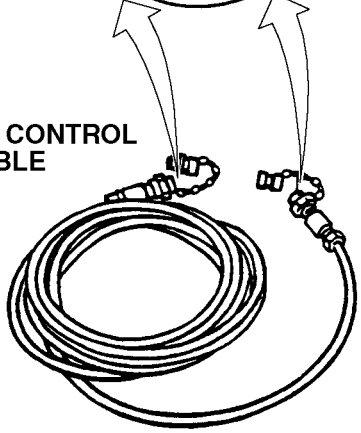


Table 2-21. Crane Troubleshooting (CONT).

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

10. CRANE WILL NOT SWING COUNTERCLOCKWISE USING REMOTE CONTROL (CONT).

Test 3. Remove swing controller from remote control unit. Place EMERGENCY STOP switch in ON position. Check for continuity between the following locations:

	From remote control cable connector pin location:	To controller connector terminal location:
Check 1	H	8C
Check 2	A	9
Check 3	B	2B

- If no continuity is found, repair the wiring within the remote control unit. Refer to paragraph 3-16 in this manual.
- If continuity is found, go to Test 4.

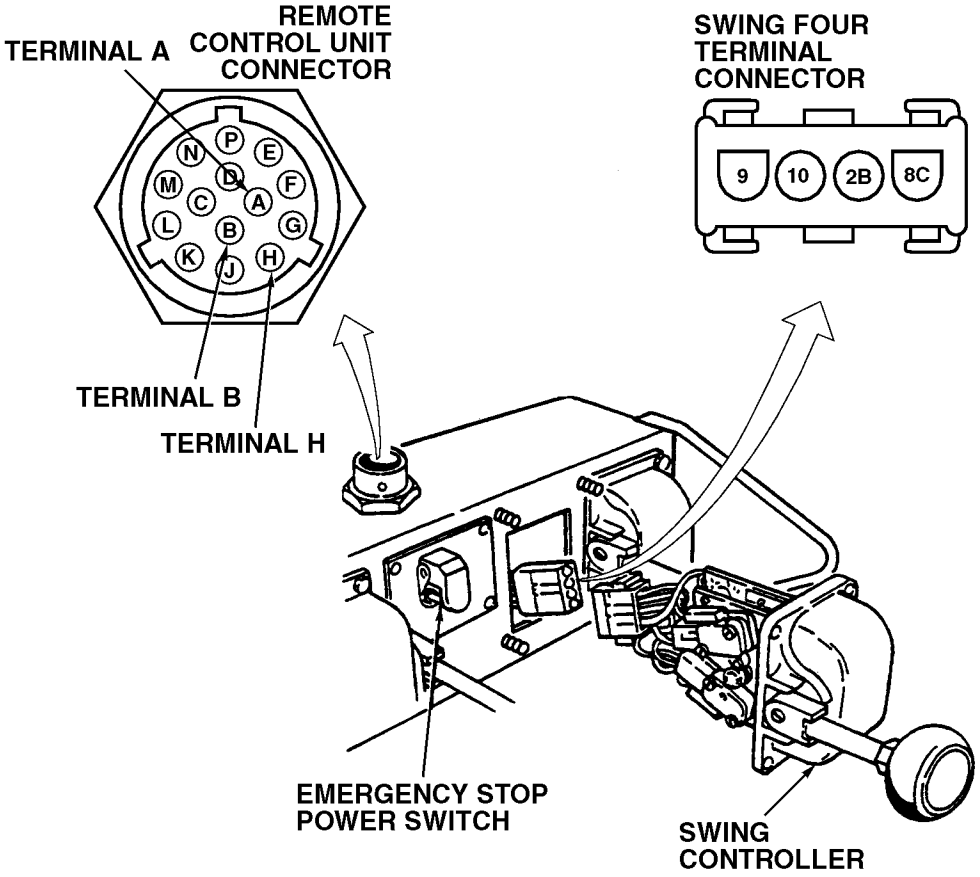


Table 2-21. Crane Troubleshooting (CONT).

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

Test 4. Tag and mark connectors on swing controller switches. Remove the connectors from the two controller switches. Check each switch for continuity between the following switch terminal locations, with the controller lever in the position noted:

	Switch Terminals:	Controller handle position:	Test results:
Check 1	NC to COM	Neutral	Continuity
Check 2	NO to COM	Neutral	No continuity (open)
Check 3	NC to COM	Full CCW position	No continuity (open)
Check 4	NO to COM	Full CCW position	Continuity

- If the above test results are not obtained, replace switch(es). Refer to paragraph 5-12 in this manual.
- If the above test results are obtained, reinstall the controller switch connectors and go to Test 5.

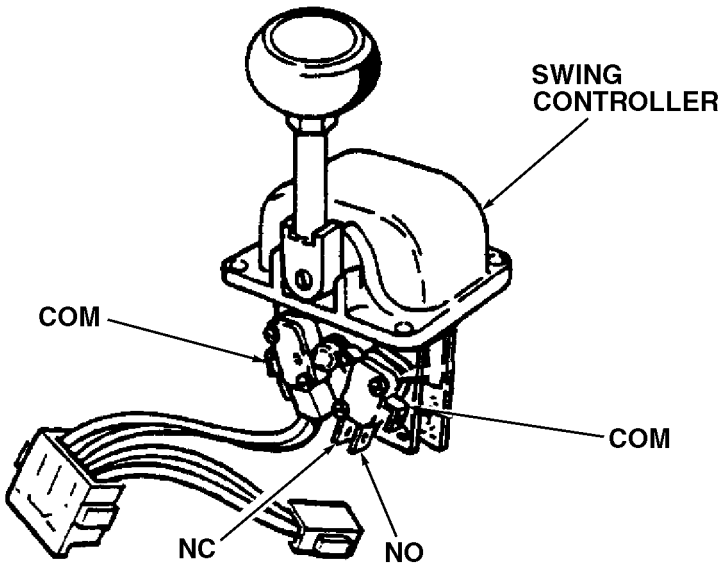


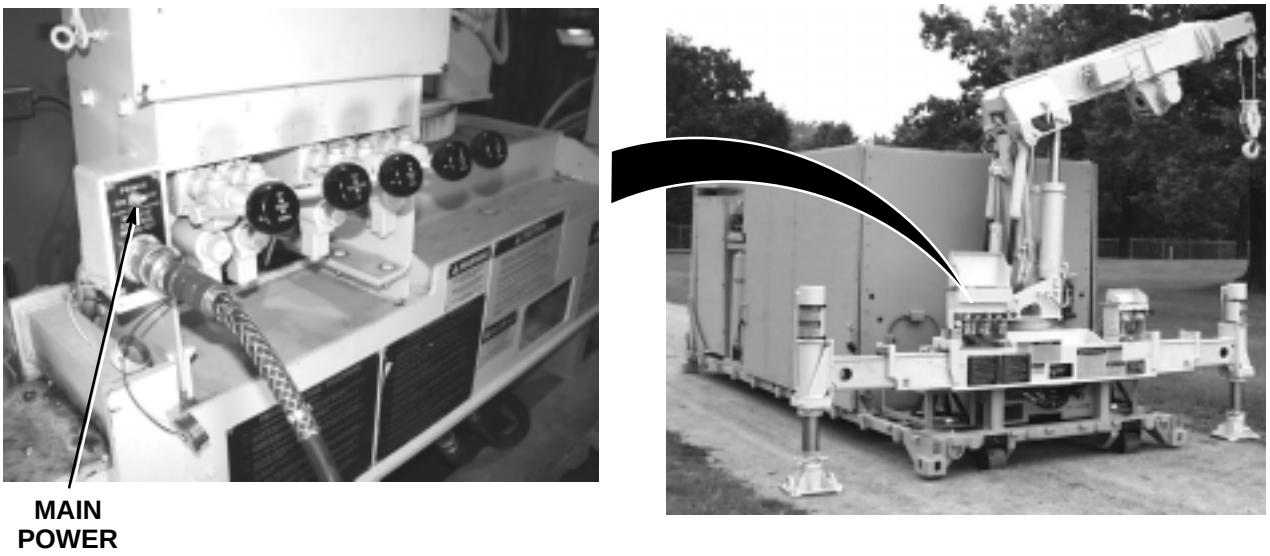
Table 2-21. Crane Troubleshooting (CONT).

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

10. CRANE WILL NOT SWING COUNTERCLOCKWISE USING REMOTE CONTROL (CONT).

Test 5. Connect the remote control cable to the remote control unit and remote control hook-up connector on crane sub-frame. Turn MAIN POWER switch to ON position. Check for 24 volts from controller harness, blue wire, with controller lever in CCW position to known good ground. Turn MAIN POWER switch to OFF position.

- If 24 volts are not present, replace controller circuit card. Refer to paragraph 5-12 in this manual.
- If 24 volts are present, reassemble remote control unit and go to Test 6.



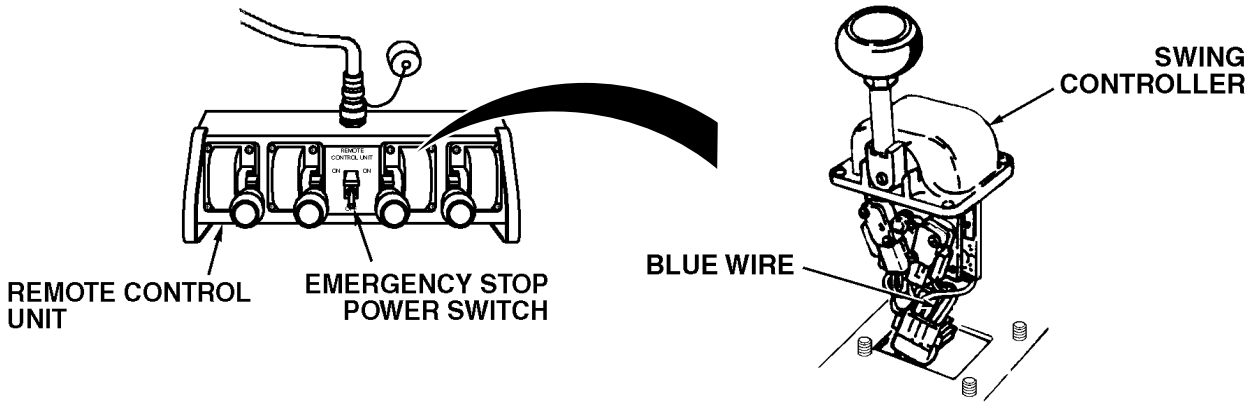
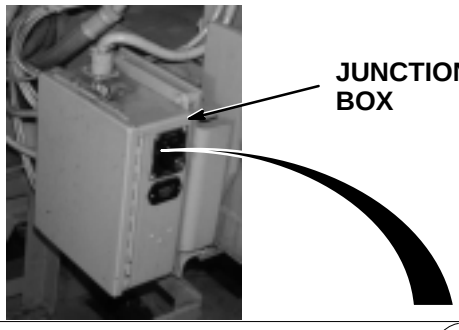


Table 2-21. Crane Troubleshooting (CONT).

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

Test 6. Loosen four screws and clips and open crane junction box cover. Turn MAIN POWER switch to ON position. Check for 24 volts between terminal strip, position 9, and known good ground with swing controller held in the CCW position. Turn MAIN POWER switch to OFF position.

- If 24 volts are not present, repair red wire between remote control hook-up connector on crane sub-frame and junction box terminal strip. Refer to paragraph 3-16 in this manual.
- If 24 volts are present, go to Test 7.



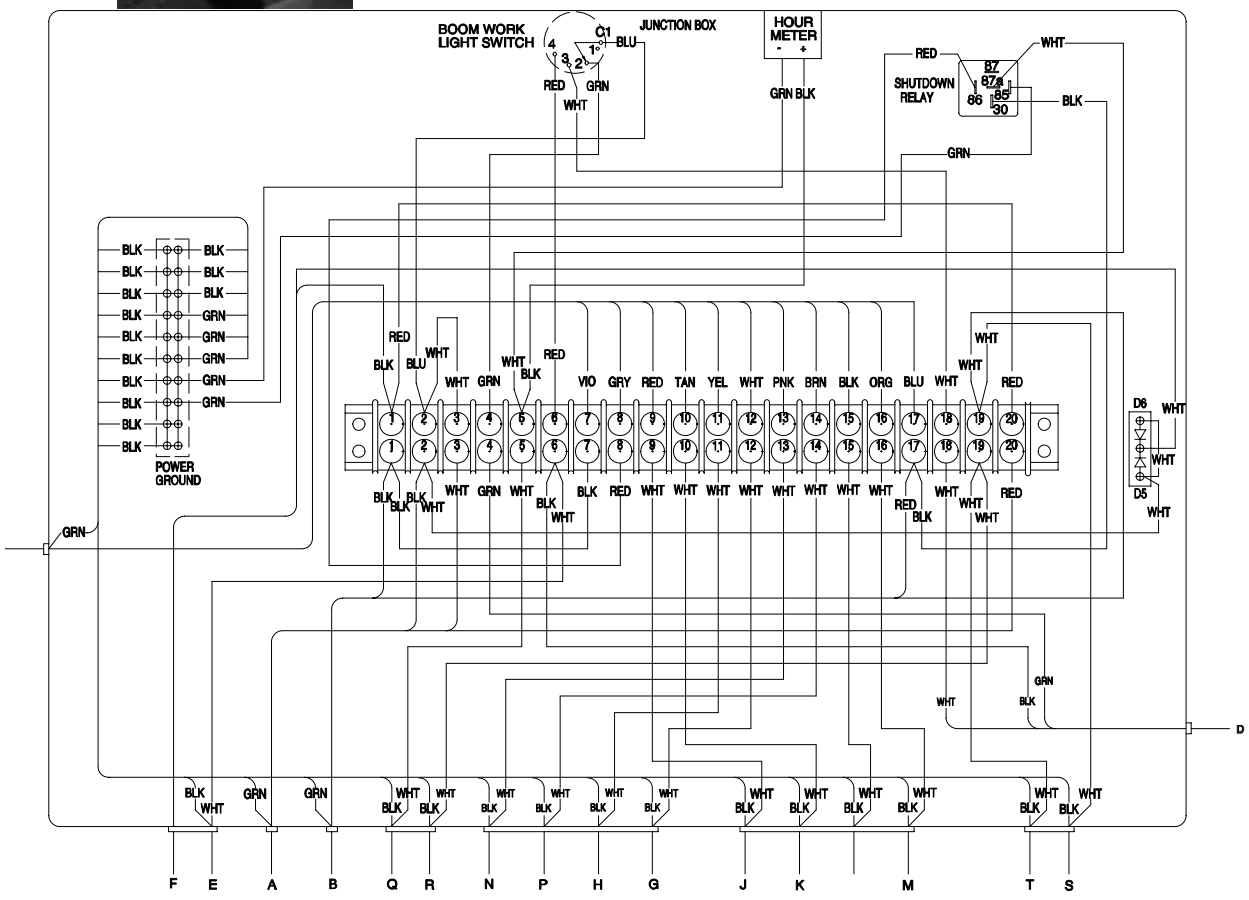


Table 2-21. Crane Troubleshooting (CONT).

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

10. CRANE WILL NOT SWING COUNTERCLOCKWISE USING REMOTE CONTROL (CONT).

Test 7. Check for continuity between terminal strip, position 9, and swing CCW solenoid connector, terminal 1.

- If no continuity is found, repair white wire between junction box terminal strip, position 9, and swing CCW solenoid connector, terminal 1. Refer to paragraph 3-16 in this manual.
- If continuity is found, go to Test 8.

Test 8. Check for continuity between swing CCW solenoid connector, terminal 2, and known good ground.

- If no continuity is found, repair swing CCW solenoid ground circuit. Refer to paragraph 3-16 in this manual.
- If continuity is found, go to Test 9.

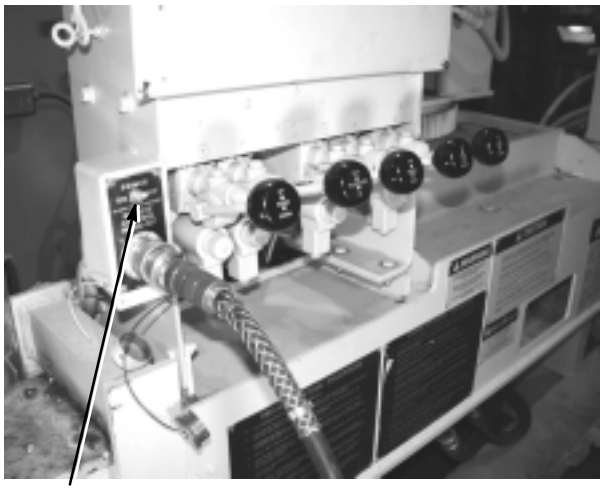
Test 9. Perform resistance check of solenoid coil. Resistance should be between 23.7 and 26.3 ohms from terminal 1 and terminal 2.

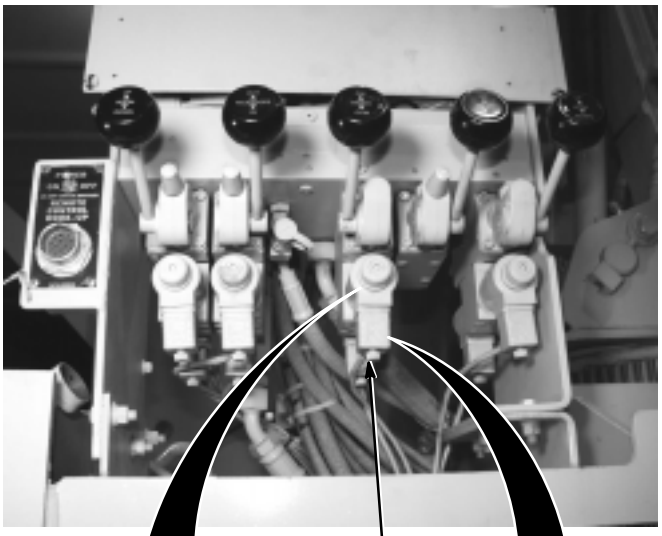
- If coil resistance is not within specifications, Notify Supervisor.

END OF TEST

Table 2-21. Crane Troubleshooting (CONT).

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION





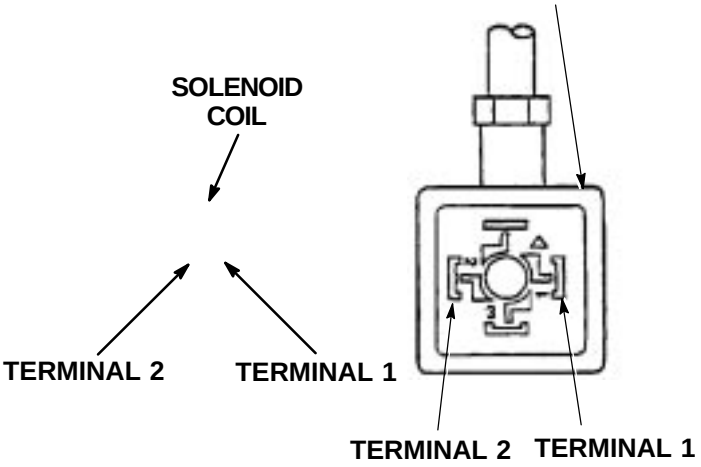


Table 2-21. Crane Troubleshooting (CONT).

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

BOOM LIGHT IS INOPERATIVE

1. BOOM LIGHT DOES NOT WORK.

NOTE

Make sure the FRS 24 VDC electrical system is functioning properly.

Verify that boom light does not work in any of three positions (DIM, MID, and BRT). If light works in one or more positions, go to Malfunction 2.

Test 1. With the boom light switch in the DIM, MID, BRT position, check for voltage at the red wire on boom light.

- If voltage is present, remove black wire from boom light and check continuity from black wire to a known good ground. If continuity is found, replace lamp. If no continuity is found, repair or replace black wire. Refer to paragraph 3-16 in this manual.
- If no voltage is found, go to Test 2.

Test 2. Check for voltage at wire #2 behind access plate on boom light wire spool.

- If voltage is present, repair or replace boom light spool wire #2 from spool to boom light. Refer to paragraph 3-16 in this manual.
- If no voltage is present, go to Test 3.

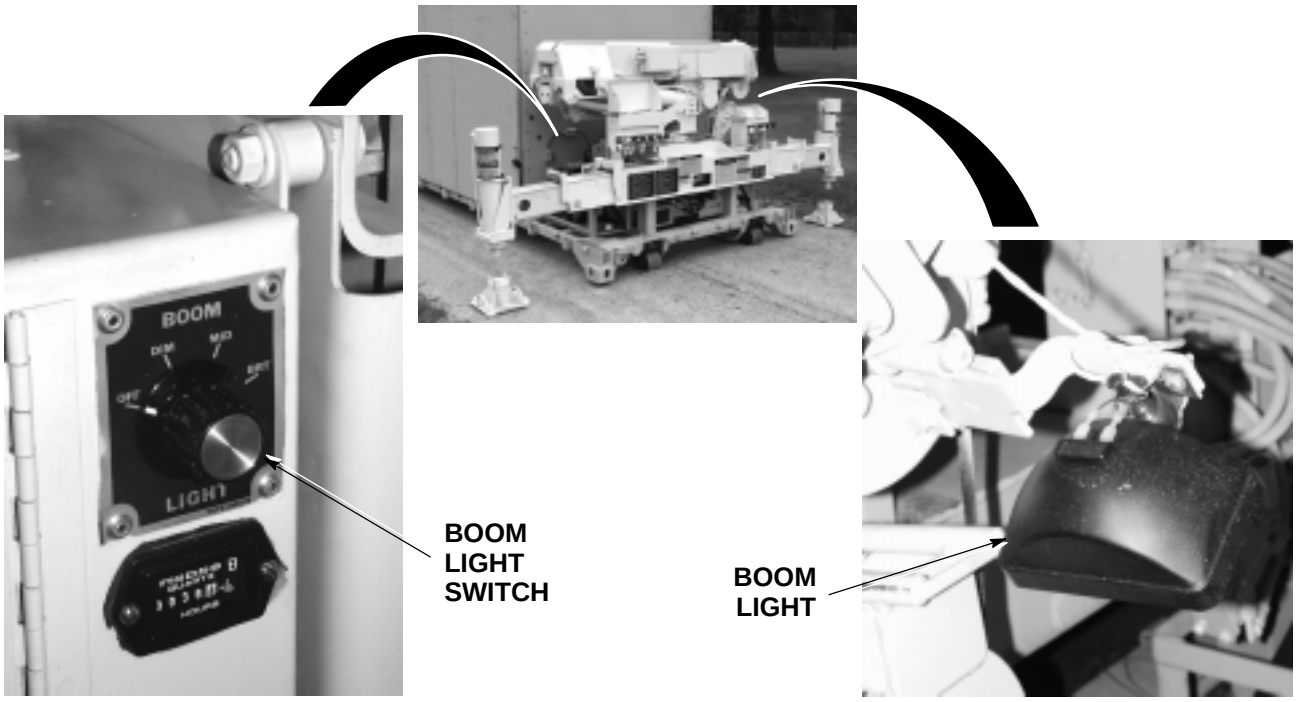


Table 2-21. Crane Troubleshooting (CONT).

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

Test 3. Loosen four screws and clamps and open crane junction box cover and check for voltage between left side of terminal strip position six and a known good ground.

- If voltage is present, repair or replace white wire from terminal strip to boom light wire spool connector behind access plate. Refer to paragraph 3-16 in this manual.
- If no voltage is found, go to Test 4.

Test 4. Check for voltage between right side of terminal strip position 1 and a known good ground.

- If voltage is present, replace switch. Refer to paragraph 5-4 in this manual.
- If no voltage is present, go to Test 5.

Test 5. Disconnect crane main power harness at the crane manifold and check for 24 VDC on pin A.

- If voltage is present, repair or replace harness from crane manifold to crane junction box. Refer to paragraph 5-4 in this manual.
- If no voltage is found, go to troubleshooting FRS 24 VDC electrical system.

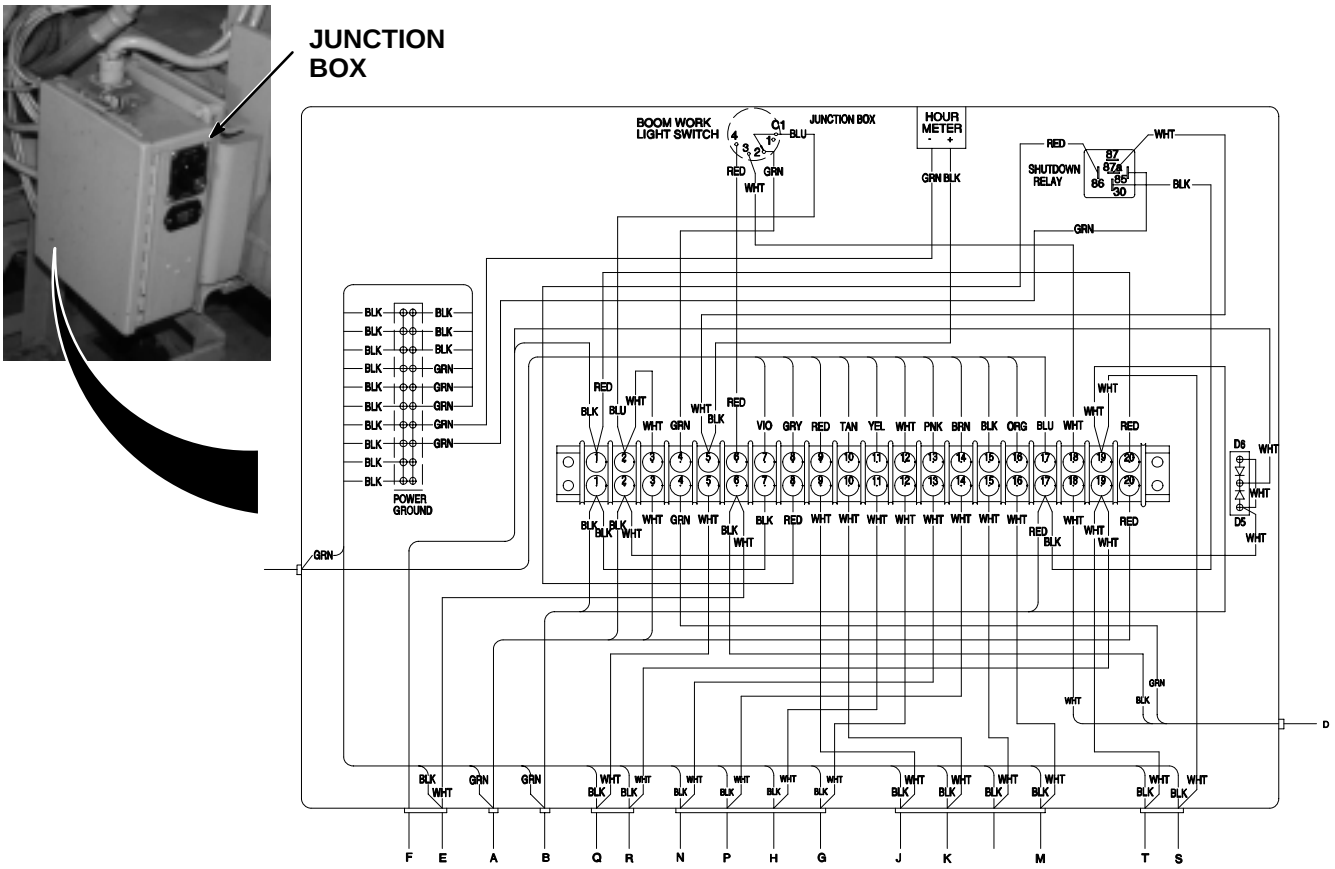


Table 2-21. Crane Troubleshooting (CONT).

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

2. BOOM LIGHT DOES NOT WORK IN THE DIM POSITION.

NOTE

Make sure the FRS 24 VDC electrical system is functioning properly.

Test 1. Loosen four screws and clamps and open crane junction box cover and check for 24 VDC on right side of crane terminal strip position 4 and a known good ground.

- If voltage is present, go to Test 2.
- If no voltage is found, replace boom light switch. Refer to paragraph 5-4 in this manual.

Test 2. Check for voltage on left side of terminal strip position 6 and a known good ground.

- If no voltage is found, replace resistor mounted on back of crane junction box. Refer to paragraph 5-4 in this manual.

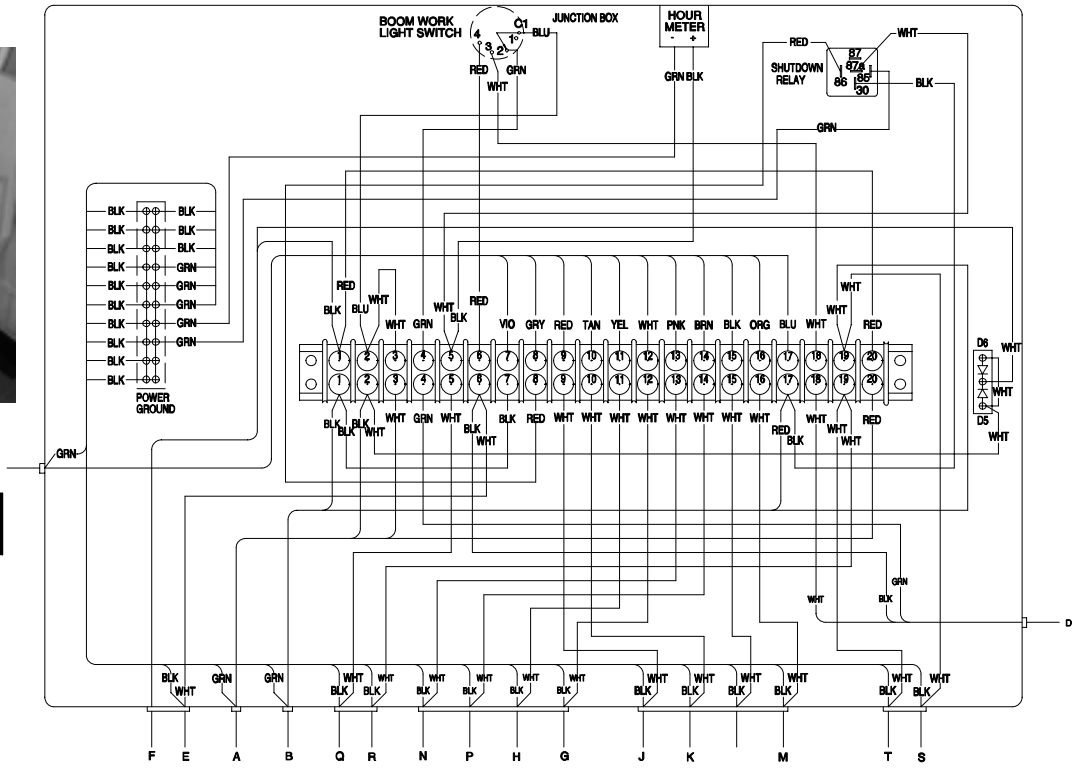


Table 2-21. Crane Troubleshooting (CONT).

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

3. BOOM LIGHT DOES NOT WORK IN THE MID POSITION.

NOTE

Make sure the FRS 24 VDC electrical system is functioning properly.

Test 1. Loosen four screws and clamps and open crane junction box cover and check for 24 VDC on right side of crane terminal strip position 18 and a known good ground.

- If voltage is present, go to Test 2.
- If no voltage is found, replace boom light switch. Refer to paragraph 5-4 in this manual.

Test 2. Check for voltage on left side of terminal strip position 6 and a known good ground.

- If no voltage is found, replace resistor mounted on back of crane junction box. Refer to paragraph 5-14 in this manual.

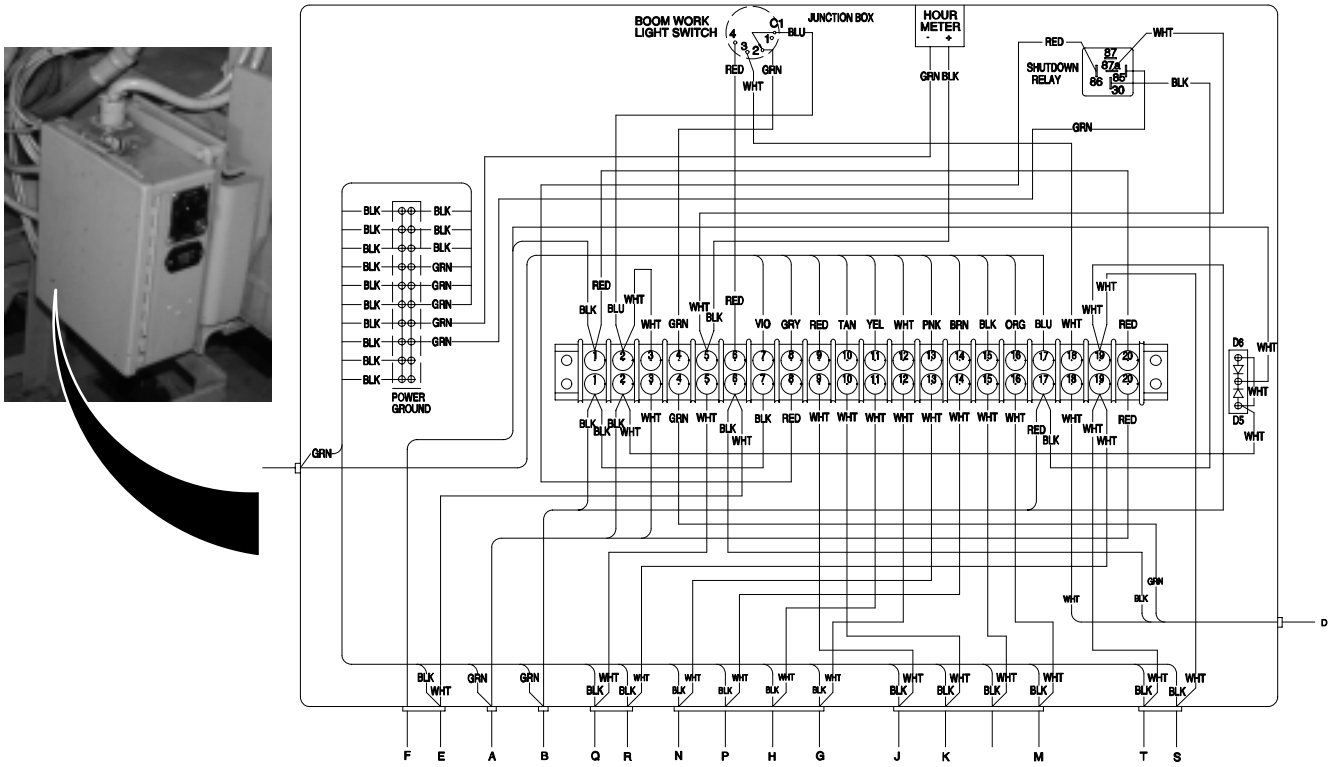


Table 2-21. Crane Troubleshooting (CONT).

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

4. BOOM LIGHT DOES NOT WORK IN THE BRT POSITION.

NOTE

Make sure the FRS 24 VDC electrical system is functioning properly.

Test 1. Loosen four screws and clamps and open crane junction box cover and check for 24 VDC between terminal strip position 6 and a known good ground.

- If no voltage is found, replace boom light switch. Refer to paragraph 5-4 in this manual.

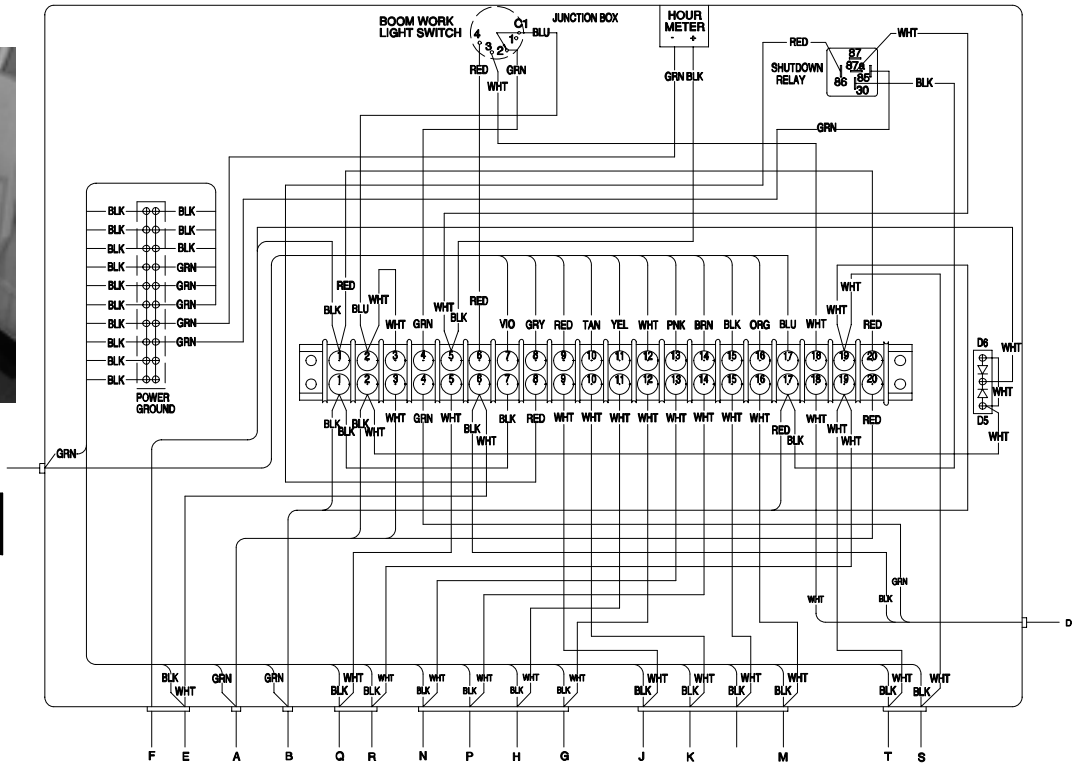


Table 2-21. Crane Troubleshooting (CONT).

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

CRANE HOUR METER IS INOPERATIVE

1. CRANE HOUR METER DOES NOT WORK.

NOTE

Make sure the FRS 24 VDC electrical system is functioning properly.

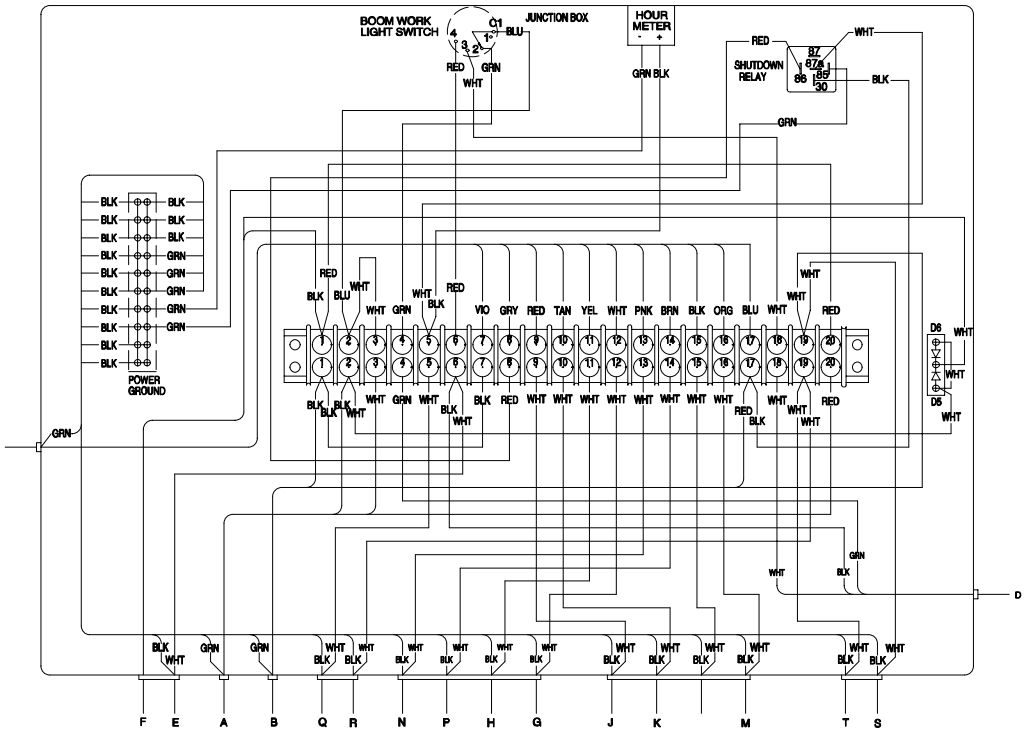
Crane MAIN POWER switch must be in the ON position for hour meter to work.

Test 1. Loosen four screws and clamps and open crane junction box cover. Check for 24 VDC between black wire connector on hour meter and a known good ground.

- If voltage is present, check for continuity between green wire connector on back of hour meter and a known good ground. If continuity is not found, repair or replace green wire from hour meter to power ground terminal strip. If continuity is found, replace hour meter. Refer to paragraph 5-4 in this manual.
- If no voltage is found, go to Test 2.

Test 2. Check for 24 VDC between terminal strip position 5 and a known good ground.

- If voltage is present, repair or replace black wire from terminal strip position 5 and hour meter. Refer to paragraph 3-16 in this manual.
- If no voltage is found, replace overland shutdown relay. Refer to paragraph 5-4 in this manual.



HOUR METER

Table 2-21. Crane Troubleshooting (CONT).

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

CRANE HYDRAULICS- FRS

1. OUTRIGGERS BEAMS/JACK CYLINDERS DO NOT OPERATE.

NOTE

Before performing crane troubleshooting procedures, make sure the FRS electrical supply system is functioning properly.

Unless advised otherwise, the FRS 24V MASTER switch and the crane MAIN POWER switch must be in the ON position for all voltage checks.

Test 1. Cut and remove safety lock seal. Remove two screws, lockwashers, washers and manual override guard from crane. Turn and pull out Hydraulic Pressure Manual Override button and attempt to lower jack cylinders, using crane controls on main control valve bank.

- If outrigger jack cylinders begin to lower, the problem is with the crane electrical system or the hydraulic system shutdown solenoid, go to Malfunction 1, Crane Inoperative, Test 3. If this test eliminates the shutdown system, return override to NORMAL position and install manual override guard. Notify Supervisor.
- If the outrigger jack cylinders do not move, go to Test 2.

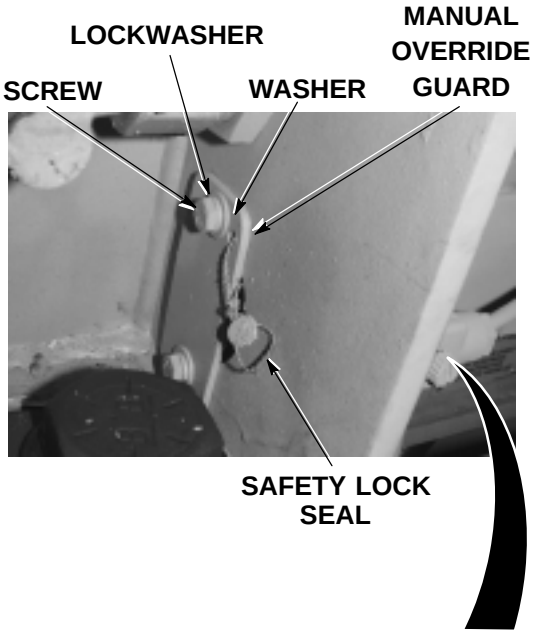
Test 2. Check hydraulic lines, hoses, and fittings for leaks or damage that could restrict flow.

- If leaking or damaged lines are found, repair or replace lines as needed. Refer to paragraph 7-4 in this manual.
- If no leaks or damage are found, Notify Supervisor.

END OF TEST

Table 2-21. Crane Troubleshooting (CONT).

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION



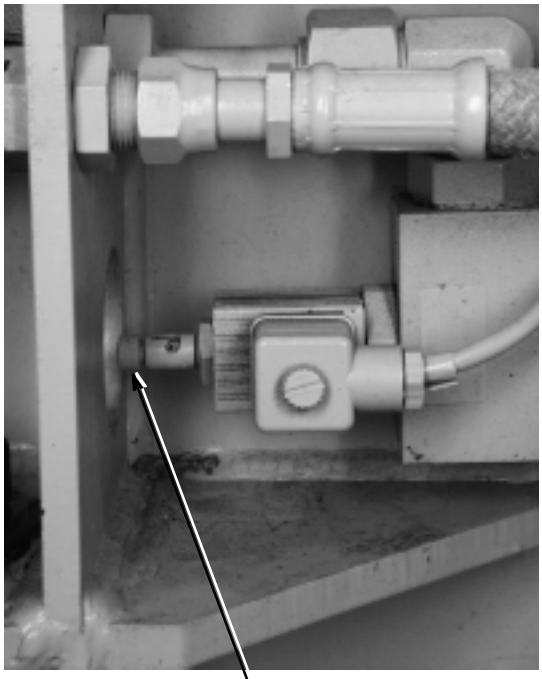


Table 2-21. Crane Troubleshooting (CONT).

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

2. BOOM DOES NOT RAISE OR LOWER.

NOTE

Before performing crane troubleshooting procedures, make sure the FRS electrical supply system is functioning properly.

Unless advised otherwise, the FRS 24V MASTER switch and the crane MAIN POWER switch must be in the ON position for all voltage checks.

Test 1. Are the two hoses and fittings between the BOOM manual control valve and boom hydraulic cylinders free of damage, crimps or leaks?

- If leaks or damaged lines are found, repair as needed. Refer to paragraph 7-4 in this manual.
- If no leaks or damage are found, go to Test 2.

Test 2. Are the three hoses and fittings between the two boom hydraulic cylinders free of damage, crimps or leaks?

- If leaks or damaged lines are found, repair as needed. Refer to paragraph 7-4 in this manual.
- If no leaks or damage are found, Notify Supervisor.

END OF TEST

Table 2-21. Crane Troubleshooting (CONT).

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

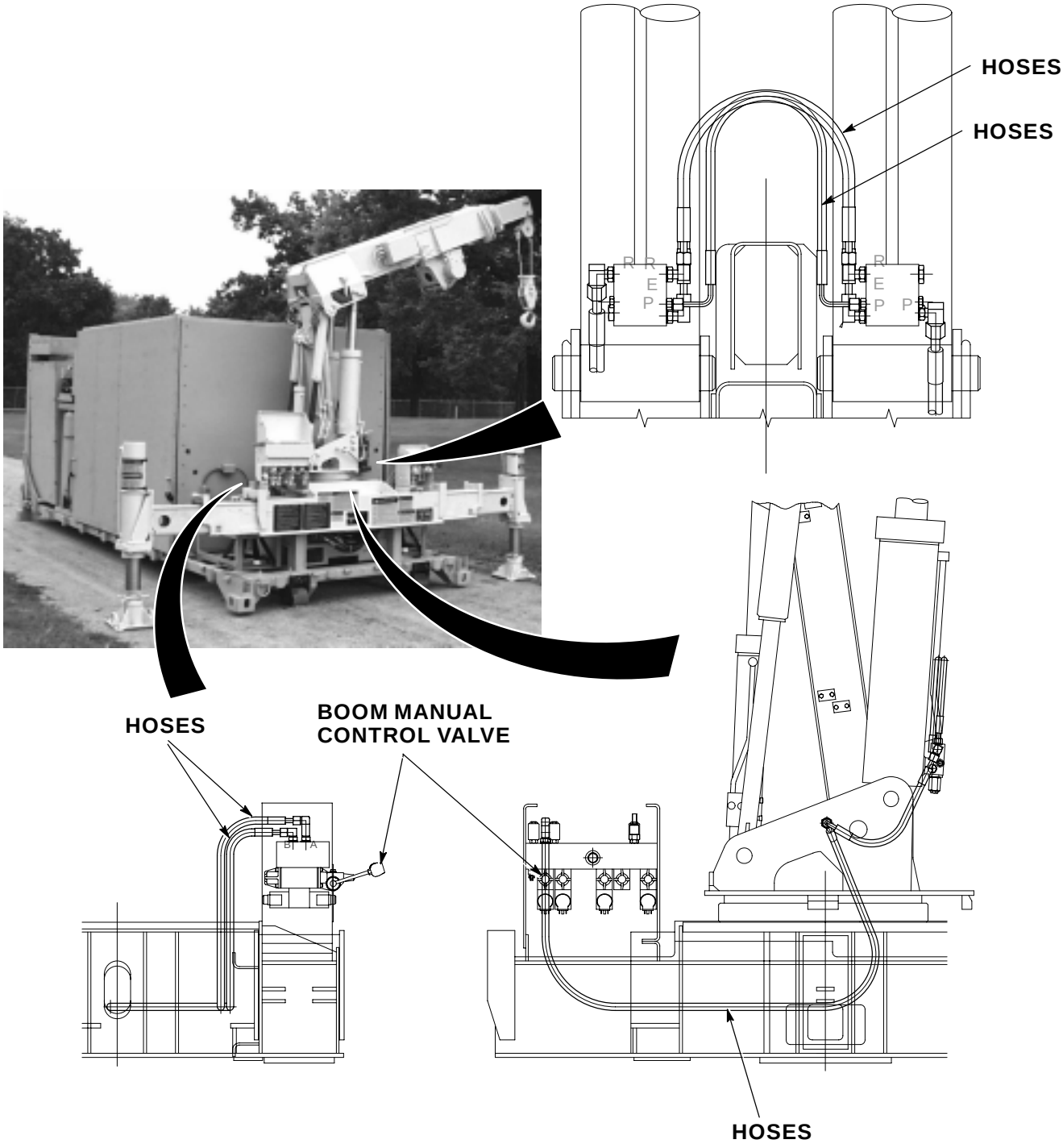


Table 2-21. Crane Troubleshooting (CONT).

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

3. BOOM DOES NOT TELESCOPE.

NOTE

Before performing crane troubleshooting procedures, make sure the FRS electrical supply system is functioning properly.

Unless advised otherwise, the FRS 24V MASTER switch and the crane MAIN POWER switch must be in the ON position for all voltage checks.

This malfunction applies when both the remote control and manual control operations are affected.

Test 1. Are the hoses and fittings between the TELESCOPE manual control valve and telescope hydraulic cylinder free of damage, crimps or leaks?

- If leaks or damaged lines are found, repair as needed. Refer to paragraph 7-4 in this manual.
- If no leaks or damage are found, go to Test 2.

Test 2. Are the three hoses and fittings going to the telescope hydraulic cylinder free of damage, crimps or leaks?

- If leaks or damaged lines are found, repair as needed. Refer to paragraph 7-4 in this manual.
- If no leaks or damage are found, go to Test 3.

Test 3. Attempt to telescope boom out. Check for dry boom wear pads.

- Lubricate dry boom wear pads (TM 9-4940-568-10).
- If boom wear pads are OK, or boom sections cannot be telescoped out, Notify Supervisor.

END OF TEST

Table 2-21. Crane Troubleshooting (CONT).

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

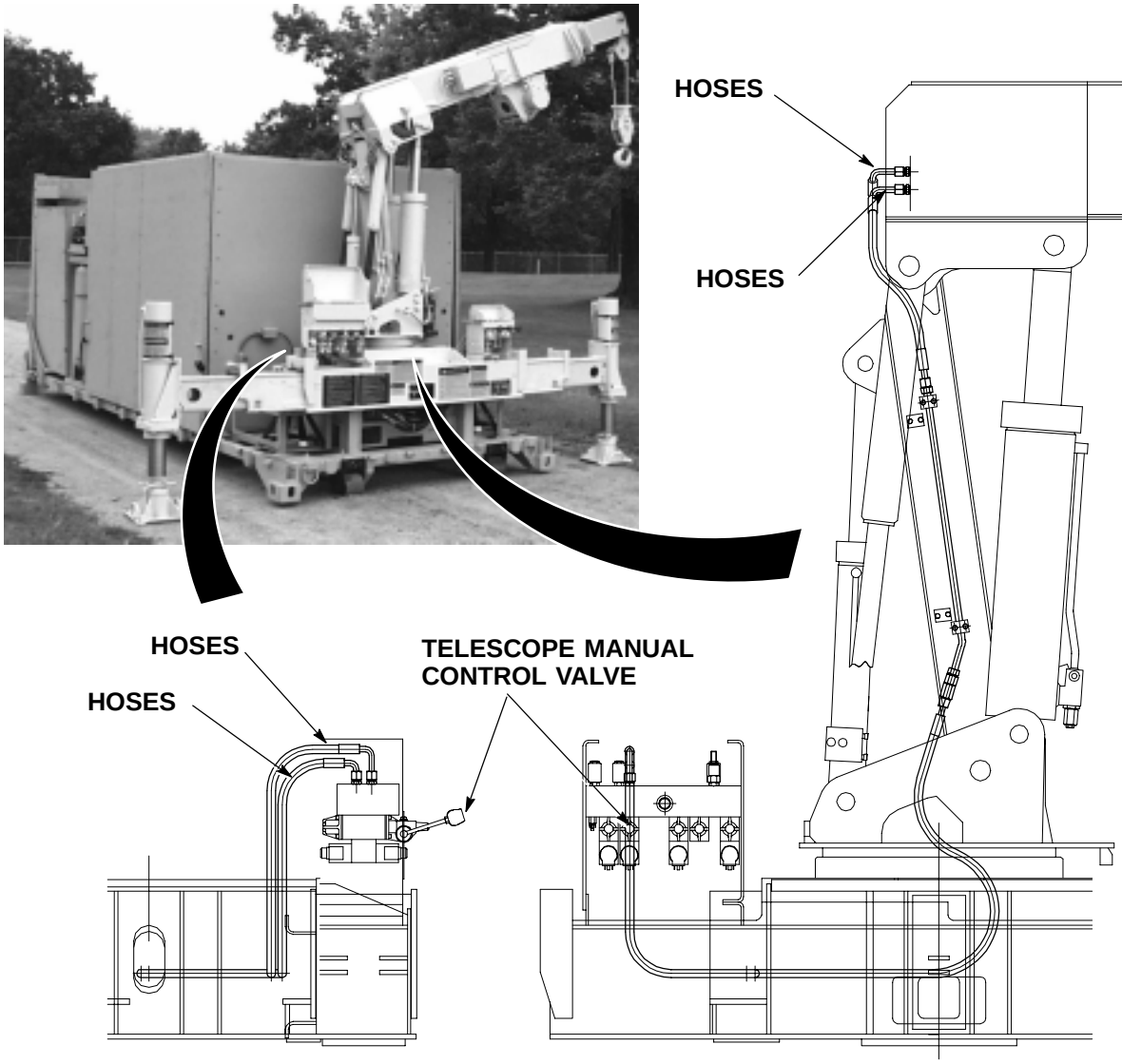


Table 2-21. Crane Troubleshooting (CONT).

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

4. HOIST DOES NOT OPERATE.

NOTE

Before performing crane troubleshooting procedures, make sure the FRS electrical supply system is functioning properly.

Unless advised otherwise, the FRS 24V MASTER switch and the crane MAIN POWER switch must be in the ON position for all voltage checks.

This malfunction applies when both the remote control and manual control operations are affected.

Test 1. Are tubes, hoses and fittings between the HOIST manual control valve and hoist hydraulic motor manifold free of damage, crimps or leaks?

- If leaks or damaged lines are found, repair as needed. Refer to paragraph 7-4 in this manual.
- If no leaks or damage are found, go to Test 2.

Test 2. Are the hoses and fittings between the hoist hydraulic motor manifold and the hoist brake free of damage, crimps or leaks?

- If leaks or damaged lines are found, repair as needed. Refer to paragraph 7-4 in this manual.
- If no leaks or damage are found, go to Test 3.

Test 3. Are the hoses and fittings between the hoist brake and the return drain fitting free of damage, crimps or leaks?

- If leaks or damaged lines are found, repair as needed. Refer to paragraph 7-4 in this manual.
- If no leaks or damage are found, Notify Supervisor.

END OF TEST

Table 2-21. Crane Troubleshooting (CONT).

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

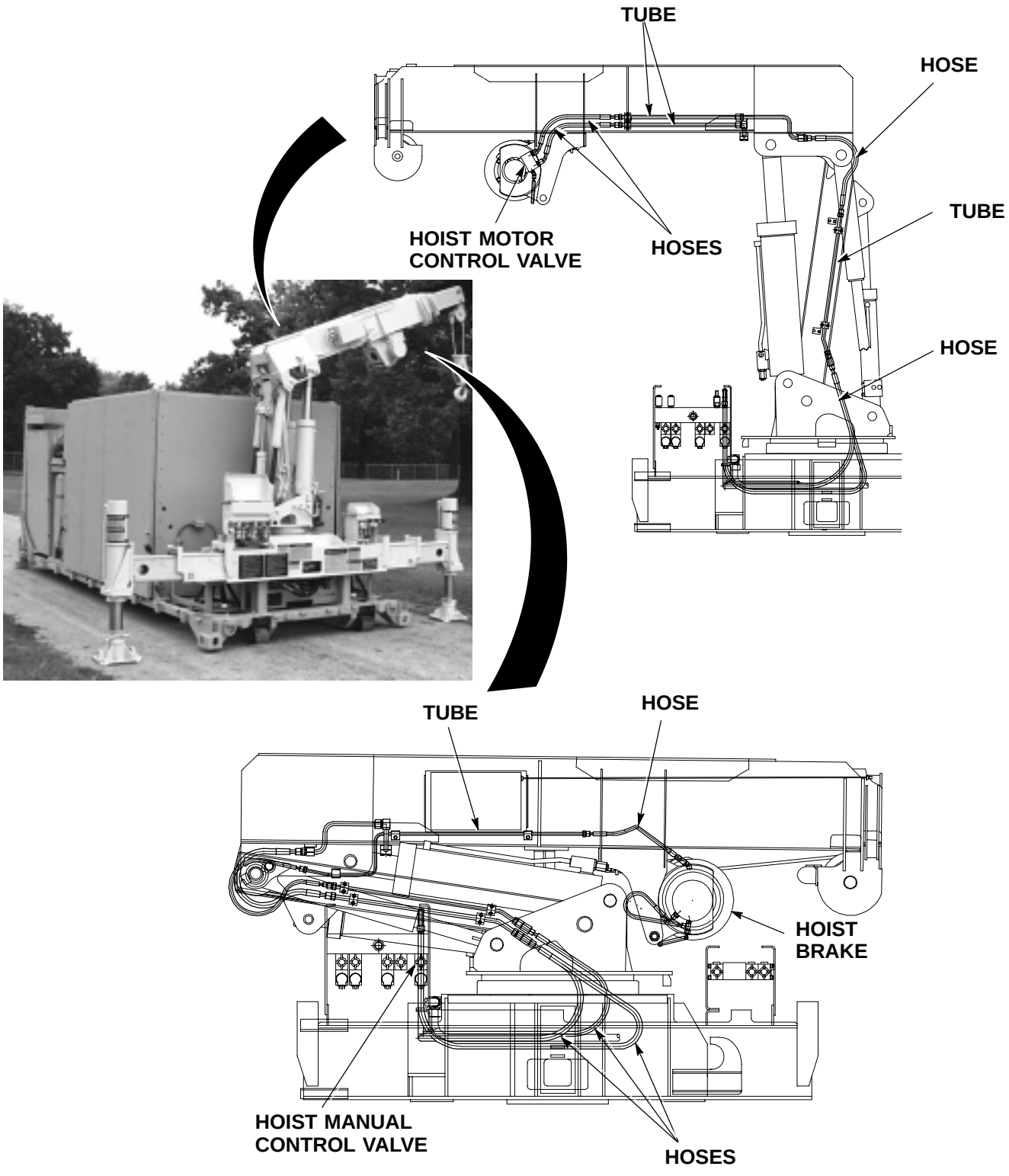


Table 2-21. Crane Troubleshooting (CONT).

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

5. CRANE DOES NOT SWING.

NOTE

Before performing crane troubleshooting procedures, make sure the FRS electrical supply system is functioning properly.

Unless advised otherwise, the FRS 24V MASTER switch and the crane MAIN POWER switch must be in the ON position for all voltage checks.

This malfunction applies when both the remote control and manual control operations are affected.

Test 1. Are tubes, hoses and fittings between the SWING manual control valve and swing hydraulic motor manifold free of damage, crimps or leaks?

- If leaks or damaged lines are found, repair as needed. Refer to paragraph 7-4 in this manual.
- If no leaks or damage are found, go to Test 2.

Test 2. Are the hoses and fittings between the swing hydraulic motor manifold and the swing brake free of damage, crimps or leaks?

- If leaks or damaged lines are found, repair as needed. Refer to paragraph 7-4 in this manual.
- If no leaks or damage are found, go to Test 3.

Test 3. Are the hoses and fittings between the swing hydraulic motor and the drain line tee fitting free of damage, crimps or leaks?

- If leaks or damaged lines are found, repair as needed. Refer to paragraph 7-4 in this manual.
- If no leaks or damage are found, Notify Supervisor.

END OF TEST

Table 2-21. Crane Troubleshooting (CONT).

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

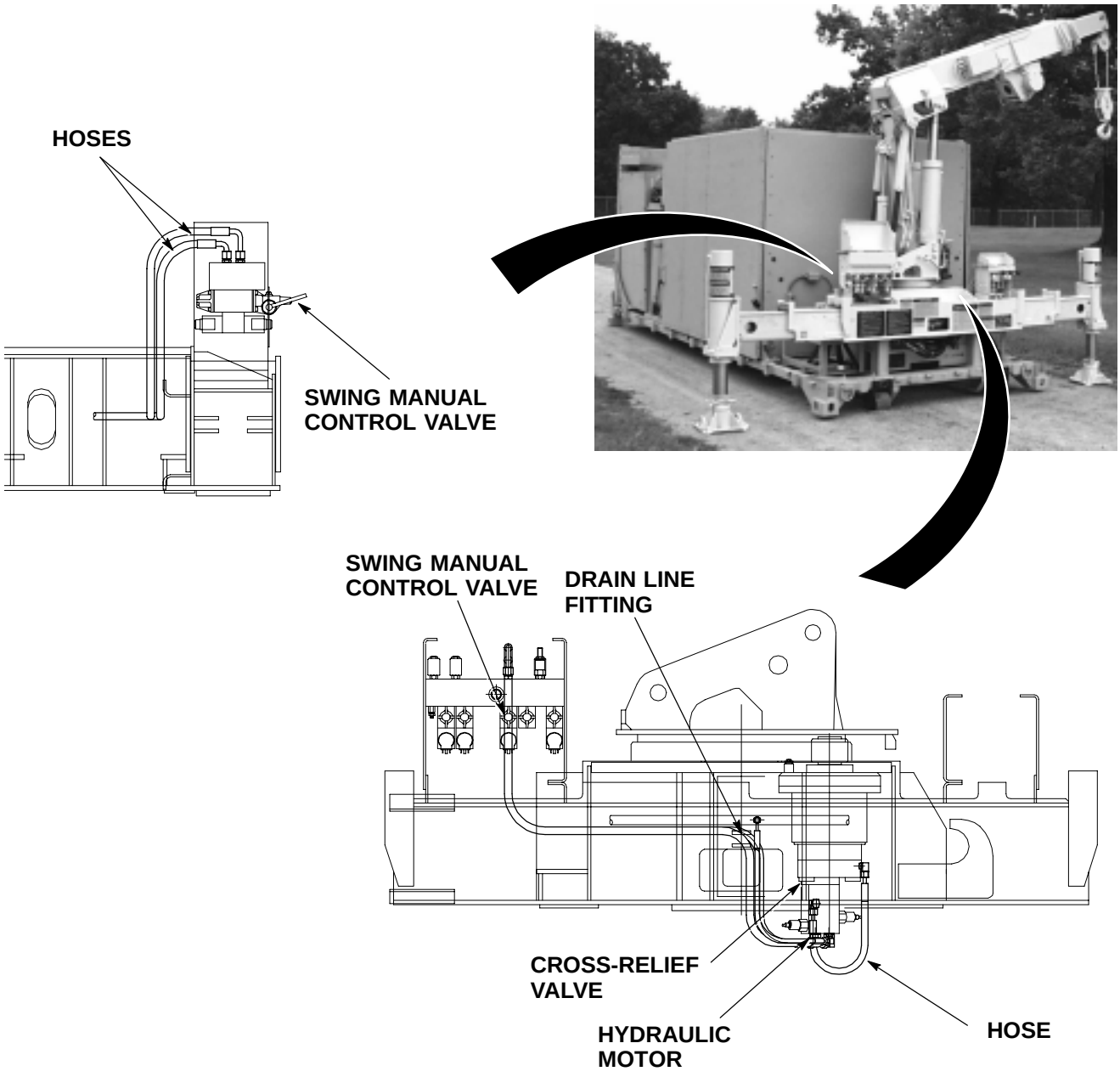


Table 2-21. Crane Troubleshooting (CONT).

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

6. MAST DOES NOT RAISE OR LOWER.

NOTE

Before performing crane troubleshooting procedures, make sure the FRS electrical supply system is functioning properly.

Unless advised otherwise, the FRS 24V MASTER switch and the crane MAIN POWER switch must be in the ON position for all voltage checks.

NOTE

Return Manual Override switch to NORMAL position and install manual override guard after this test, if the valve or its electrical system function properly. Notify Supervisor.

Test 1. Cut and remove safety lock seal. Remove two screws, lockwashers, washers and manual override guard from crane. Turn and pull out Hydraulic Pressure Manual Override button and attempt to raise/lower mast, using crane controls on main control valve bank. Refer to TM 9-4940-568-10.

- If mast begins to raise and/or lower, go to Malfunction 1, Crane Inoperative, Test 3.
- If the mast does not move, go to Test 2.

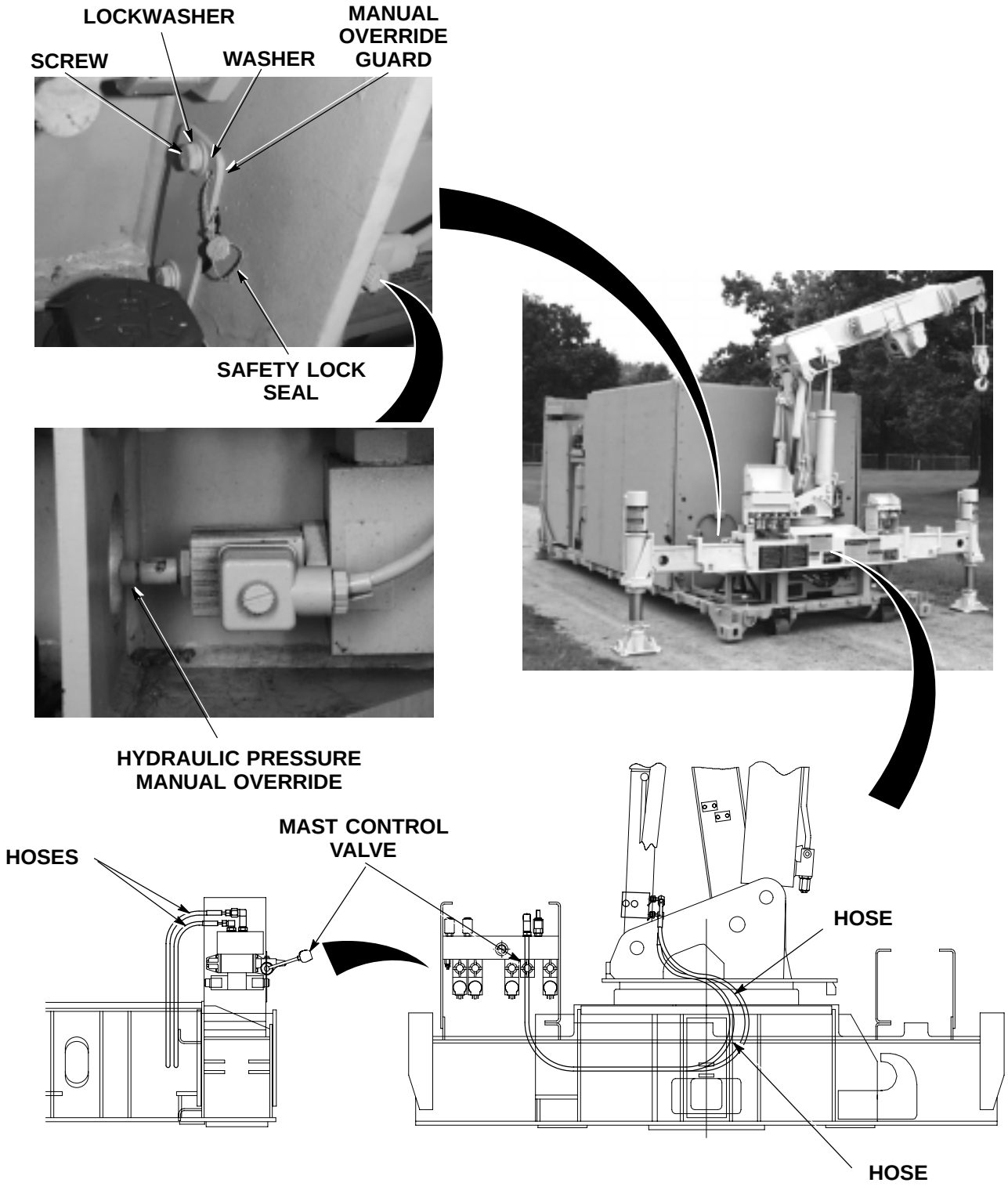
Test 2. Check hydraulic lines, hoses, and fittings for leaks or damage that could restrict flow.

- If leaking or damaged lines are found, repair or replace lines as needed. Refer to paragraph 7-4 in this manual.
- If no leaks or damage are found, Notify Supervisor.

END OF TEST

Table 2-21. Crane Troubleshooting (CONT).

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION



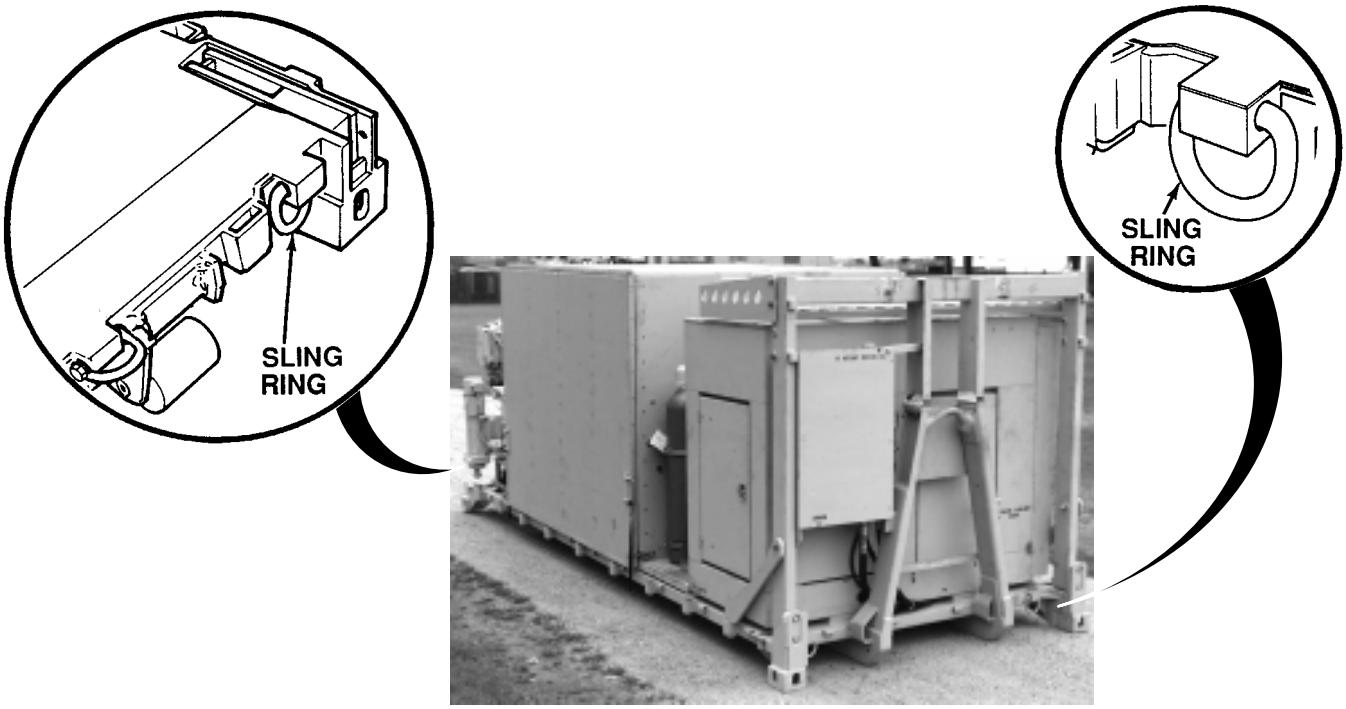
Section V. GENERAL MAINTENANCE INSTRUCTIONS

2-19. GENERAL MAINTENANCE INTRODUCTION.

This section provides general procedures to be followed for the Unit Maintenance level as specified in the Maintenance Allocation Chart (MAC). When a special procedure is used, the detailed procedure will be in the section covering that component.

2-20. GENERAL MAINTENANCE INSTRUCTIONS.

a. Hoisting Forward Repair System (FRS).



WARNING

Forward Repair System (FRS) weighs 23,680 (10,741 kg). Attach suitable lifting device prior to removal or installation to prevent possible injury to personal.

(1) For other than ordinary operation, Forward Repair System (FRS) must be secured and lifted with a crane or other suitable lifting device. Normally, the FRS is moved onto and off truck or trailer using LHS.

(2) Prepare FRS for loading (TM 9-4940-568-10).

(3) See illustration for view showing sling rings. When lifting a loaded FRS, use appropriate spreader bar and chains to avoid side contact with FRS.

2-21. GENERAL REMOVAL INSTRUCTIONS.

a. Work Required. Remove parts if repair or replacement is required. Do not disassemble a component any further than needed.

b. Preparation. Before removal of any electrical, hydraulic, or air system components, ensure system component is not energized or pressurized. Disconnect battery ground cables, the FRS is equipped with a battery disconnect switch, the switch may be used to disconnect batteries. Before removal of fasteners (nuts, locknuts). Remove any paint on threads to prevent binding of fastener.

c. Identification. To ease assembly and installation, tag and mark shims, connectors, wires and mating ends of lines before disconnecting them. Identify similar parts to ensure correct assembly.

d. Position of Valves. Before removing valve handles, mark or diagram their positions when open and closed. This will help during assembly.

e. Location. Before removing cable ties, cushion clamps, hoses, tubing, wiring etc., note the location, position and routing to ensure correct assembly.

2-22. GENERAL DISASSEMBLY INSTRUCTIONS.

a. Cleanliness. Work area must be as clean as possible to prevent contamination to components.

CAUTION

Self-locking fasteners that are loosened must be replaced, not tightened.

b. Locking Parts. Replace all lockwire, lockwashers, cotter pins and locknuts at time of reassembly.

c. Expendable Parts. All gaskets, packings and seals removed during repair must be discarded and replaced with new parts.

d. Removing Seals. Be sure all traces of oil, gaskets and sealants are removed from components. When possible, use wood or plastic probes and scrapers to prevent damage to machined surfaces.

CAUTION

Do not use tape to close off fuel or oil openings. Sticky surface of tape can mix with fuel and oil and cause engine malfunctions.

e. Parts Protection. To keep dust, dirt, moisture and other objects out of internal parts of systems or components, cap or tape over all open tubes, hoses, air lines, fittings and component openings as soon as part is removed. Wrap all removed parts in clean paper or dip parts in preservation oil.

2-23. GENERAL CLEANING INSTRUCTIONS.

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.
- Never use fuel to clean parts. Fuel is highly flammable. Serious personal injury could result if fuel ignites during cleaning.

a. Cleaning Solvents. Use only approved cleaning solvents to clean parts. Drycleaning solvent P-D-680 (Item 38, Appendix C) is commonly used. Always work in a well-ventilated area.

b. Removing Deposits. Soak parts in drycleaning solvent (Item 38, Appendix C), and wash away deposits by flushing or spraying. When necessary, brush with a soft bristle brush (not wire) moistened in solvent. Use compressed air to dry parts, except bearings, after cleaning. Bearings must drip and air dry.

c. Tools. Do not use wire brushes, abrasive wheels, or compounds to clean parts unless specifically approved in the detailed procedures. Parts may be scratched or altered and may weaken a highly stressed part.

CAUTION

Do not clean lubricant seals, rubber hoses, or electrical components with solvent mixture.

d. Rubber Parts. Do not clean preformed packings or rubber parts in drycleaning solvent. Wipe parts clean with a dry, cleaning cloth (Item 13, Appendix C).

WARNING

Steam cleaning creates hazardous noise levels and severe burn potential. Eye, skin, and ear protection is required. Failure to comply may result in injury to personnel.

e. Exterior Parts. Steam clean all exterior parts thoroughly before removing. This will make inspection and disassembly easier.

WARNING

Solvents used with a spray gun must be used in a spray booth with filter. Face shield must be used by personnel operating spray gun. Failure to comply may result in injury to personnel.

f. Forward Repair System (FRS) Shelter. Use a spray gun and solvent mixture for cleaning exterior of shelter. Allow mixture to remain on item surface for 10 minutes before rinsing. Rinse with hot water under 80 to 120 pounds of pressure, if available. An ordinary garden hose with nozzle may be used if other equipment is not available. Rinse thoroughly.

g. Electrical Parts. Electrical parts, such as coils, junction blocks and switches should not be soaked or sprayed with cleaning solutions. Clean these parts with a cleaning cloth (Item 13, Appendix C) moistened with drycleaning solvent (Item 38, Appendix C).

CAUTION

Do not use soap or alkalies for cleaning FRS interiors.

h. Oil and Fuel Tanks. Pay special attention to all warnings and cautions when working on FRS fuel tank. Oil tanks and fuel tanks should be flushed, using a spray gun and drycleaning solvent. (Item 38, Appendix C).

i. Battery. Exterior surfaces of the electrical system and battery should be cleaned with a weak solution of baking soda and water. Apply solution with a bristle brush to remove corrosion. Pay special attention to all warnings and cautions when working on batteries.

j. Hydraulic System. When cleaning hydraulic system parts use drycleaning solvent P-D-680. Clean and dry parts thoroughly to make sure no residue remains. If a coating preservative is required before assembly, apply a light film of lubricating oil (Item 24, Appendix C). If petroleum-free solvents are not available, use the same hydraulic fluid as used in the FRS system.

2-24. GENERAL INSPECTION INSTRUCTIONS.

a. Cleaning. Clean all parts before inspection. Check for defects such as physical distortion, wear, cracks and pitting.

b. Sealing Surfaces. Inspect all surfaces in contact with gaskets, packings, or seals for nicks and burrs. If any defect is found, remove it before assembly.

c. Tubing, Hoses and Fittings. Inspect all hose surfaces for broken or frayed fabric. Check for breaks caused by sharp kinks or contact with other parts of the FRS. Inspect lines for kinks. Inspect fittings and tubing and mating surfaces and threads for nicks, cracks scratches and other damage. Replace any defective part. After assembly and during initial operation period, check for leaks.

d. Electrical Parts. Inspect all wiring harnesses for broken, chafed, or burned wiring. Inspect all terminal connectors for loose connections and broken parts.

2-24. GENERAL INSPECTION INSTRUCTIONS (CONT).

e. Metal Parts. Visually inspect all castings and weldments for cracks. Parts that carry a great load should receive magnetic particle inspection. Critical non-ferrous parts may be inspected with fluorescent penetrant.

f. Drain Plugs. When removing drain plugs from engine and hydraulic system, check amount of sediment on plugs. Accumulations of grit or fine metal particles may indicate actual or potential component failure. A few fine particles are normal. This inspection helps to determine if there are defective parts prior to internal inspection of the component and to predict degradation of the equipment.

2-25. GENERAL REPAIR INSTRUCTIONS.

a. Screws, Nuts and Fittings. Replace any screw, nut, or fitting with damaged threads. Inspect tapped holes for thread damage. If cross-threading is evident retap the hole for the next oversize screw or stud. If the retapping will weaken the part, or if the cost of the part makes retapping impractical, replace the part. Chasing the threads with proper size tap or die may be adequate.

b. Sheet Metal Repair. Repair minor skin cracks by installing patches.

2-26. GENERAL ASSEMBLY INSTRUCTIONS.

a. Preparation. Remove protective grease coatings from new parts before installation.

b. Preformed Packing Installation. Lubricate all preformed packings with a thin coat of lubricating oil (Item 24, Appendix C) before installing. To install a preformed packing, first clean the groove, then stretch packing and place into position. Place component on flat surface and uniformly press packing into position. Ensure preformed packings are not nicked or torn during assembly.

CAUTION

Use sealing compound sparingly and only on male threads. Do not apply compound on first two threads to avoid contamination of system from compound. Do not apply compound to hose connections or fittings with preformed packings. Damage to equipment may result.

c. Pipe Joints and Fittings. Use sealing compound, sealant, or adhesive as indicated in each maintenance task.

d. Oil Seals. Coat oil seals evenly with oil or grease before installing. Install oil seals with seal lip facing toward lubricant, applying an even force to outer edge of seal. If oil seals are to be installed over keyed or splined shafts, use a guide to prevent sharp edge of keyway or splines from cutting the leather or neoprene seal. Construct guides of very thin gauge sheet metal and shape to the required diameter. Make certain guide edges are not sharp and are bent slightly inward so they do not cut the seal.

WARNING

On direct contact, uncured silicone sealant irritates eyes. In case of contact, flush eyes with water and seek medical attention. In case of skin contact, wipe off and flush with water.

e. Silicone Sealant. Silicone sealant is often used instead of a gasket to seal mating parts. The mating parts must be clean, dry and free of oil or grease for proper adhesion. After silicone sealant has been applied, the mating parts must be assembled immediately. Silicone sealant starts to set-up in 15 minutes and takes 24 hours to completely cure. Excess silicone sealant should be wiped off after assembling the mating parts.

f. Gaskets. Remove all traces of previous gasket and sealant before installing new gasket. Coat both sides of gasket with sealant to provide added sealing.

2-27. GENERAL INSTALLATION INSTRUCTIONS.

a. Preparation. When unpacking items, remove all packing material, barrier paper, tape, plastic bags, protective caps and protective grease coatings. Handle and store removed components carefully.

CAUTION

Use sealing compound sparingly and only on male threads. Do not apply compound on first two threads to avoid contamination of system from compound. Do not apply compound to hose connections or fittings with preformed packings. Damage to equipment may result.

b. Sealing Compounds. Use sealing compounds as required in each maintenance task.

c. Torquing. Tighten bolts, screws, washers, hoses and fittings as required in Appendix E or in each maintenance task.

d. Identification Tags. Put hoses, tubes, lines and electrical wiring in place by matching identification tags and markings on equipment.

e. Hoses, Air Lines and Wiring. After installing hoses, air lines and wiring, ensure that they do not contact moving parts or components edges. Secure in place, out of way with cable ties and cushion clips.

2-28. PREPARATION FOR STORAGE OR SHIPMENT INTRODUCTION.

a. Instructions in this section apply to the FRS to make it available for use upon receipt after shipment. The storage instructions apply to systems being taken out of service for a period up to one year with exercise. If systems are inactive for more than 1 year they will use extended storage procedures.

b. Refer to (AR 750-1) for administrative storage instructions.

c. Refer to (TB 9-2300-422-20) for security procedures.

d. Refer to (TM 38-450) for storage and maintenance of prepositioned material configures to unit sets instructions.

2-29. PREPARATION FOR STORAGE OR SHIPMENT.

a. Perform all Unit Preventive Maintenance Checks and Services (PMCS).

b. Correct all deficiencies noted during inspection if facilities are available. If repairs required are beyond the scope of Unit Maintenance, refer the deficiencies to Direct or General Support Maintenance.

c. Instructions pertaining to Basic Issue Items (BII) and Components of End Items (COEI) storage locations are covered in Appendix B of (TM 9-4940-568-10).

d. Remove rust and corrosion, and scrape any flaked and peeling paint. Dry all surfaces to be painted and coated with preservatives. Refer to (TM 9-247), Materials Used for Cleaning, Preserving, Abrading, and Cementing Ordnance Material and Related Materials including Chemicals.

e. Repaint surface, as required, to prevent against deterioration. Refer to (TM 43-0209) for painting instructions for Field Use, Color, Marking, and Camouflage Painting of Military Vehicles.

2-30. STORAGE MAINTENANCE PROCEDURES.

a. Before placing FRS in storage, perform the following tasks:

(1) Clean the exterior, interior of shelter, generator, and undercarriage.

(2) Conduct a visual inspection of the FRS. Check all lubricant levels. Correct any discrepancies.

(3) Lubricate all oil can points (TM 9-4940-568-10).

(4) Check the coolant level. Test the coolant to ensure that the cooling system is protected against corrosion and temperatures down to –30˚F (–34˚C). Add antifreeze or corrosion inhibitors compatible with ethylene glycol base antifreeze if cooling system is not adequately protected. (TB 750-651).

(5) Ensure the fuel tank contains at least 20 gallons (75.7L) of treated fuel. The fuel should be treated with Biobor J.F. (Item 9, Appendix C) (or equivalent). The addition of 3 teaspoons of Biobor to 20 gallons of fuel will provide adequate protection against fungus growth. When storing FRS in freezing conditions, the addition of 3 ounces (88.7 ml) of isoproply alcohol (Item 6, Appendix C) to 20 gallons of diesel fuel will help prevent fuel line freeze up.

(6) All fuel that is added to the FRS during storage must be treated. While in storage, there must always be at least 20 gallons (75.7L) of treated fuel in the fuel tank.

(7) Check condition of engine air filter. Replace if necessary (Para 8-12).

(8) Check condition of air compressor air filter. Replace if necessary (Para 11-6).

(9) Coat all exposed unpainted surfaces such as crane valve spools, hydraulic cylinders with grease.

CAUTION

Do not allow the baking soda solution to enter the batteries or damage to batteries will result.

(10) Clean batteries and battery cables with a baking soda solution and rinse with fresh water. Add water to battery electrolyte if necessary. Check the specific gravity of the batteries regularly. Keep the batteries fully charged and clean (TM 9-6140-200-14).

(11) Place FRS so there is ample access for inspection, maintenance, and exercising.

(12) Disconnect batteries (TM 9-4940-568-10).

b. While vehicle is in storage, perform the following tasks monthly:

(1) Connect batteries (TM 9-4940-568-10).

(2) If engine is run every 30 days or less, use lubricating oil OE/HDO (Item 25, Appendix C). If engine is not run every 30 days or less, use preservative lubricating oil (Item 26, Appendix C) Grade 2 and change oil filter or warranty will not be maintained.

(3) Conduct visual inspection of the FRS. Check for oil leaks, lubricant levels, battery electrolyte, coolant level. Correct any discrepancies.

(4) Inspect oil can points. Lubricate if necessary (Para 2-11 and TM 9-4940-568-10).

(5) Start engine, and idle for 10 minutes or until the engine water temperature reaches 180°F (82°C).

(6) Shutdown generator (TM 9-4940-568-10).

(7) Disconnect batteries (TM 9-4940-568-10). If batteries are not going to be charged for over 30 days, remove batteries from FRS (Para 3-14) and keep fully charged (TM 9-6150-200-14).

c. While FRS is in storage, perform the following tasks quarterly:

(1) Perform all monthly tasks.

(2) Exercise all ancillary equipment (TM 9-4940-568-10). While operating winches or crane, lubricate wire rope.

d. While FRS is in storage, perform the following tasks yearly:

(1) Perform all quarterly tasks.

(2) Clean the exterior, interior of shelter, engine, and undercarriage. Wash any oil and grease from FRS.

CAUTION

Do not allow the baking soda solution to enter the batteries or damage to batteries will result.

(3) Clean batteries and battery cables with a baking soda solution and rinse with fresh water. Do not allow the baking soda solution to enter the batteries. Add water to battery electrolyte if necessary. Check the specific gravity of the batteries regularly. Keep the batteries fully charged and clean (TM 9-6150-200-14).

(4) Lubricate all oil can points (TM 9-4940-568-20).

(5) Check the coolant level. Test the coolant to ensure that the cooling system is protected against corrosion and temperatures down to –30°F (–34°C). Add antifreeze or corrosion inhibitors compatible with ethylene glycol base antifreeze if cooling system is not adequately protected (TB 750-651).

(6) Change engine oil and oil filter (Para 8-5). Add preservative lubricating oil (Item 26, Appendix C) Grade 2. Change fuel filters (Para 8-19).

2-30. STORAGE MAINTENANCE PROCEDURES (CONT).

e. Extended storage.

CAUTION

When FRS is to remain inactive for more than 12 months, extended storage procedures must be performed to prevent damage due to rust corrosion or organic growth in the fluids.

(1) Completely lubricate oil can points TM 9-4940-568-10.

(2) Engine extended storage.

Change oil and filter (Para 8-5). Add preservative lubricating oil (Item 26, Appendix C), Grade 2.

(3) Crane extended storage.

(a) Coat all unpainted surfaces with Corrosion Preventative Compound (Item 17, Appendix C), or equivalent.

(b) Clean and touch up all paint defects to prevent rusting.

(c) Ensure manual hand pump is fully retracted.

(d) Apply liberal amounts of grease to both manual override buttons.

(e) Unwind hoist cable from drum, clean and lube with recommended lubricant (Brilube or equivalent), rewind on drum.

CAUTION

To avoid over filling, drain oil (equal to amount being added) before installing additive or damage to equipment may result.

(f) Add 2 fl oz (60 ml) VCI-326 (Item 41, Appendix C), (or equivalent) vapor corrosion inhibitor to crane swing drive and .8 fl oz (24 ml) to hoist gearbox.

(g) Operate crane to allow additive to coat all moving parts.

(h) If additional storage time is required, repeat Step (f) at yearly intervals.

(4) Main hydraulic system extended storage.

CAUTION

To avoid over filling, drain oil before installing or damage to equipment may result.

(a) Drain amount of oil from main hydraulic reservoir that is equal to the quantity of additive being added (Para 7-6).

(b) Add 8.5 qts (8L) VCI-326 (Item 41, Appendix C), vapor corrosion inhibitor or equivalent to main hydraulic reservoir.

(c) Operate all ancillary equipment:

Crane - cycle each crane function two cycles.

(d) If additional storage time is required, repeat Steps (a) and (b) at yearly intervals.

(5) Air compressor system extended storage.

CAUTION

To avoid over filling, drain oil before installing additive or damage to equipment may result.

(a) Drain amount of oil from air compressor crankcase that is equal to the quantity of additive being added (Para 11-9).

(b) Add .5 pts VCI-326 (Item 41, Appendix C), vapor corrosion inhibitor or equivalent to air compressor crankcase.

(c) Operate to mix additive. Allow pressure to reach 110 psi.

(d) If additional storage time is required, repeat Steps (a) and (b) at yearly intervals.

(6) Fuel system extended storage.

(a) Drain fuel tank.

(b) Change all fuel filters (Para 8-19).

(c) Ensure the fuel tank contains at least 20 gallons (75.7L) of treated fuel. The fuel should be treated with Biobor JF (Item 9, Appendix C), (or equivalent). The addition of 3 teaspoons of Biobor to 20 gallons of fuel will provide adequate protection against fungus growth. When storing in freezing conditions, the addition of 3 ounces (88.7 ml) of isopropyl alcohol (Item 6, Appendix C), to 20 gallons of diesel fuel will help prevent fuel line freeze up.

(d) Run engine 5 minutes to circulate clean treated fuel throughout the fuel system.

(e) All fuel that is added to the FRS during storage must be treated. While in storage, there must always be at least 20 gallons (75.7L) of treated fuel in FRS fuel tank.

(f) Cap off fuel system.

(7) Battery extended storage.

Remove batteries from FRS (Para 3-14) and keep fully charged (TM 9-6150-200-14).

(8) Check the coolant level (TM 9-4940-568-10). Test the coolant to ensure that the cooling system is protected against corrosion and temperatures down to –30 degrees F (–34 degrees C). Add antifreeze or corrosion inhibitors compatible with ethylene glycol base antifreeze if cooling system is not adequately protected (TB 750-651).

2-30. STORAGE MAINTENANCE PROCEDURES (CONT).

f. When removing vehicle from storage, perform the following tasks:

(1) Install batteries (Para 3-14).

(2) Conduct a visual inspection to the FRS and remove moisture proof tape from engine and fuel system. Check lubricant levels. Correct any discrepancies.

(3) Lubricate oil can points (Para 2-9 and TM 9-4940-568-10).

CHAPTER 3

ELECTRICAL SYSTEM MAINTENANCE

3-1. INTRODUCTION.

This chapter contains maintenance instructions for removing, replacing, repairing, installing and adjusting engine components authorized by the Maintenance Allocation Chart (MAC) at the Unit Maintenance level.

3-2. AIR COMPRESSOR CONTROL BOX REPAIR.

This task covers:

a. Removal
b. Disassembly
c. Cleaning and Inspection
d. Assembly
e. Installation
f. Follow-On Maintenance

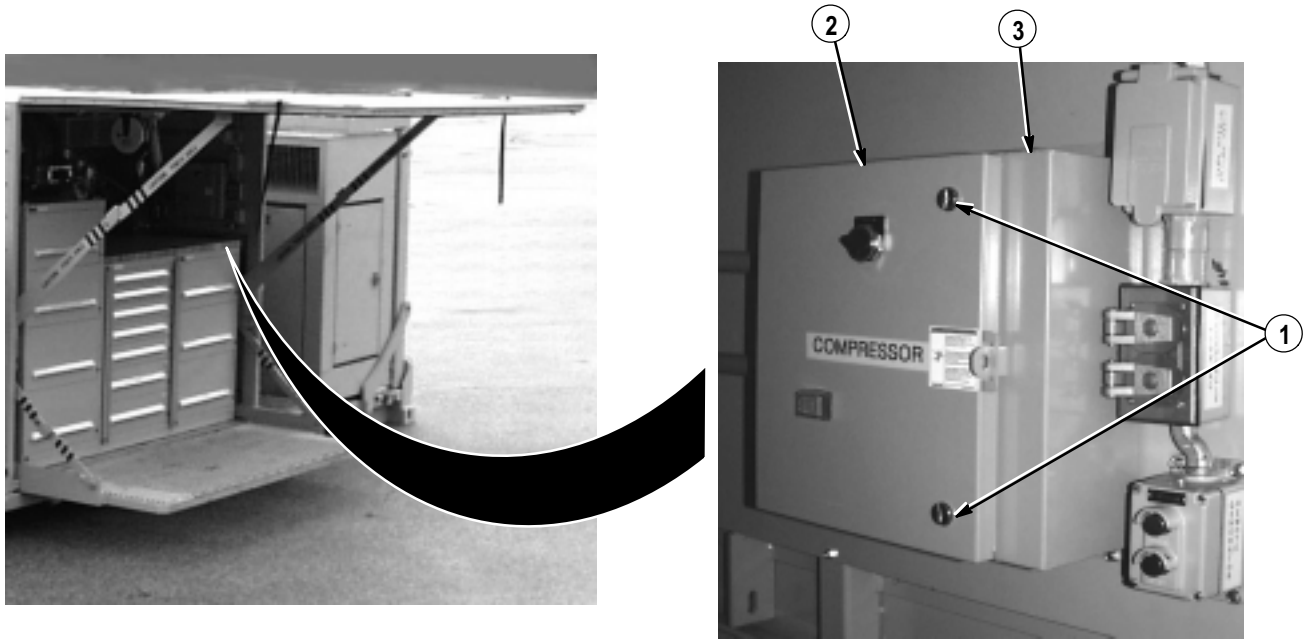
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 30, Appendix G)

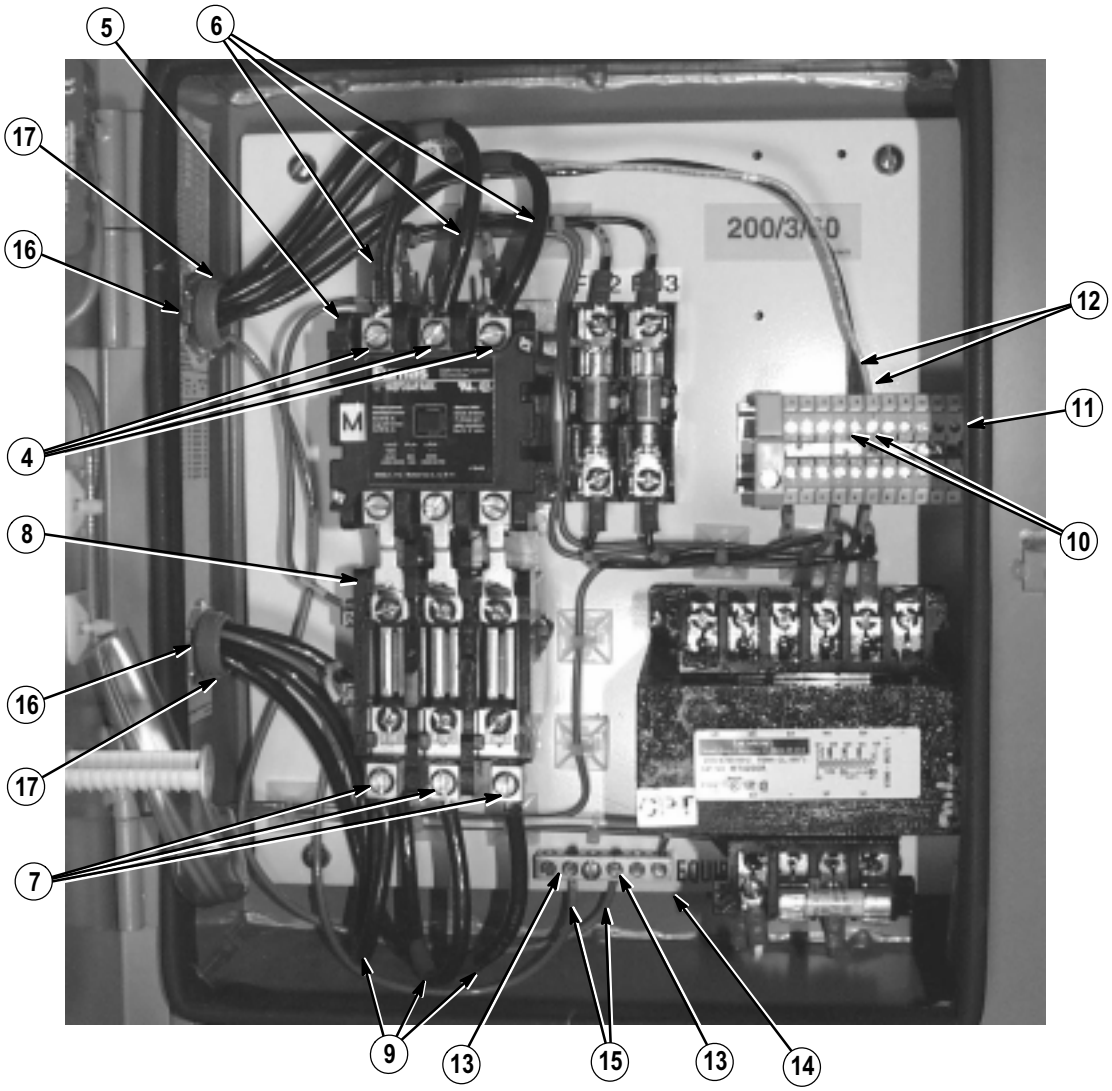
Equipment Condition
FRS unloaded, (TM 9-4940-568-10)
Batteries disconnected, (TM 9-4940-568-10)

Materials/Parts
Cable Ties, (Item 10, Appendix C)
Tags, Identification, (Item 40, Appendix C)

a. Removal.



(1) Turn two screws (1) and open door (2) on control box (3).



NOTE

- Tag and mark all wires prior to removal.
- Remove cable ties as required.

(2) Loosen three screws (4) on relay (5) and remove three wires (6).

(3) Loosen three screws (7) on busbar (8) and remove three wires (9).

(4) Loosen two screws (10) on terminal board (11) and remove two wires (12).

(5) Loosen two screws (13) on ground bar (14) and remove two wires (15).

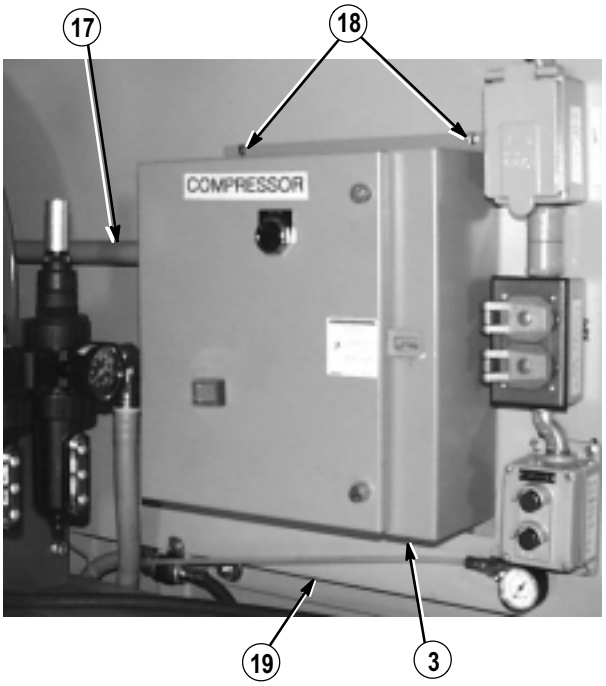
(6) Remove two locknuts (16) from conduit (17).

3-2. AIR COMPRESSOR CONTROL BOX REPAIR (CONT).

NOTE

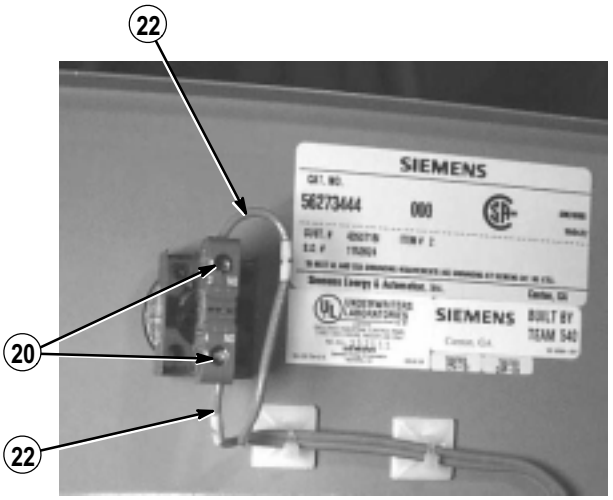
- Support control box upon removal of screws.
- Wires removed will remain with shelter harness conduit.

(7) Remove four screws (18) and control box (3) from shelter wall (19) and conduit (17).

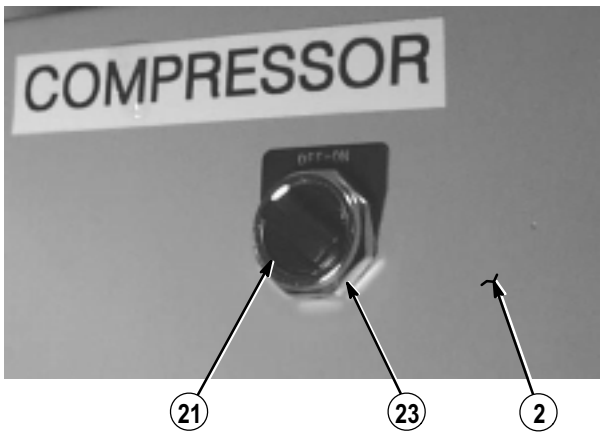


b. Disassembly.

(1) Loosen two screws (20) on ON/OFF switch (21) and remove two wires (22).

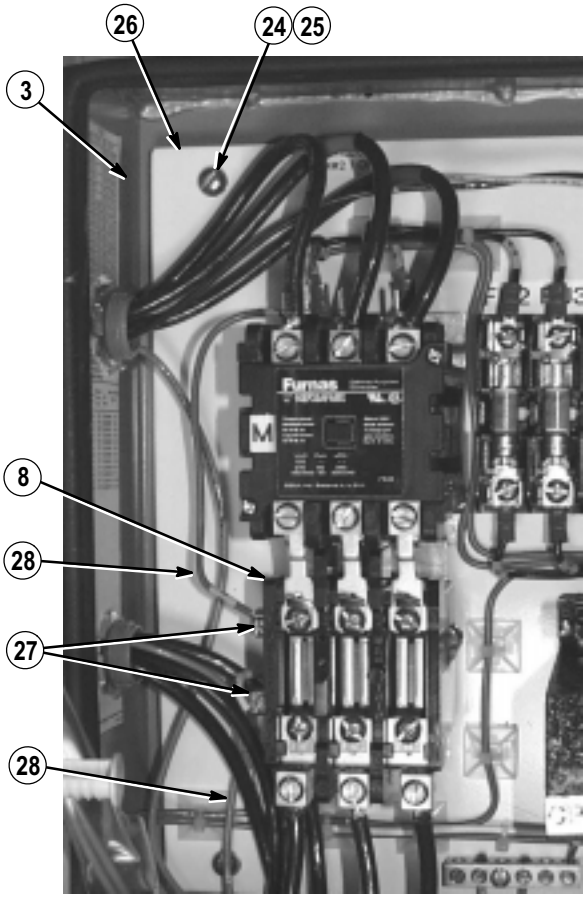


(2) Remove nut (23) and ON/OFF switch (21) from door (2).



(3) Remove four screws (24), nuts (25) and board (26) from control box (3).

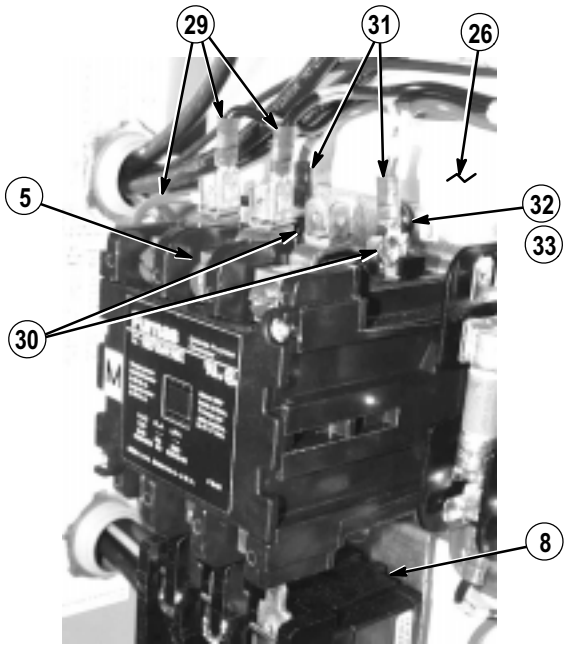
(4) Loosen two screws (27) on busbar (8) and remove two wires (28).



(5) Remove three wires (29) from relay (5).

(6) Loosen two screws (30) on relay (5) and remove two wires (31).

(7) Remove two screws (32), nuts (33), relay (5) and busbar (8) from board (26).



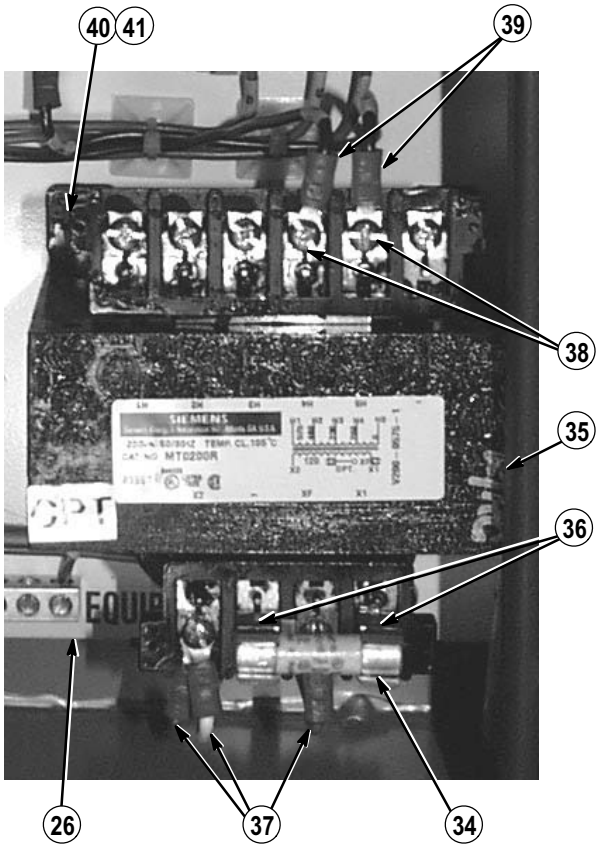
3-2. AIR COMPRESSOR CONTROL BOX REPAIR (CONT).

(8) Remove fuse (34) from transformer (35).

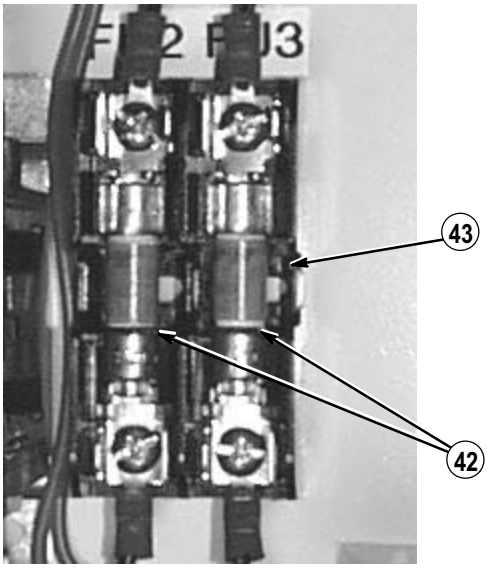
(9) Loosen two screws (36) on transformer (35) and remove three wires (37).

(10) Loosen two screws (38) on transformer (35) and remove two wires (39).

(11) Remove four screws (40), nuts (41) and transformer (35) from board (26).



(12) Remove two fuses (42) from fuse holder (43).



c. Cleaning and Inspection.

(1) Examine all wire ends and connectors for damage (Para 3-16).

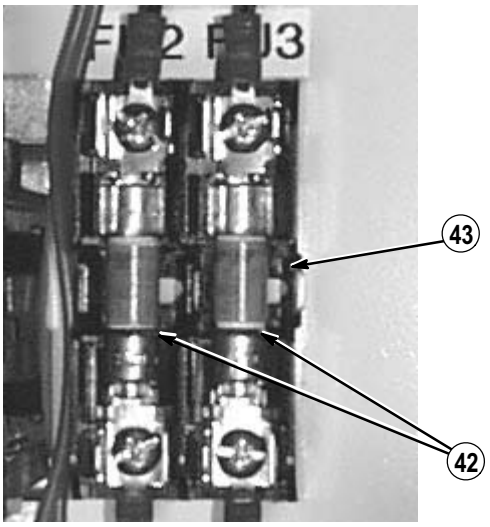
(2) Replace all damaged parts.

d. Assembly.

NOTE

- Install wires in locations as noted prior to removal.
- Install cable ties as required.

(1) Install two fuses (42) in fuse holder (43).

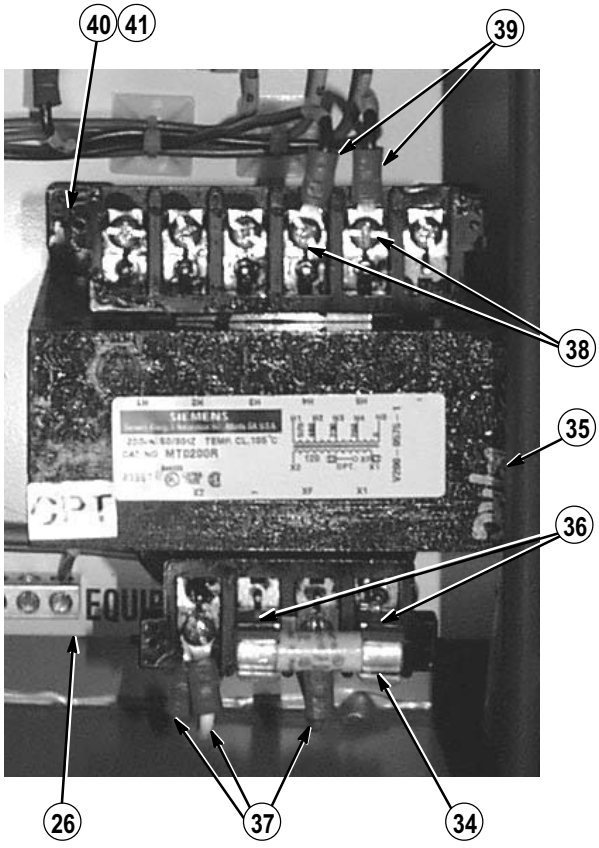


(2) Install transformer (35) on board (26) with four nuts (41) and screws (40).

(3) Position two wires (39) on transformer (35) and tighten two screws (38).

(4) Position three wires (37) on transformer (35) and tighten two screws (36).

(5) Install fuse (34) on transformer (35).

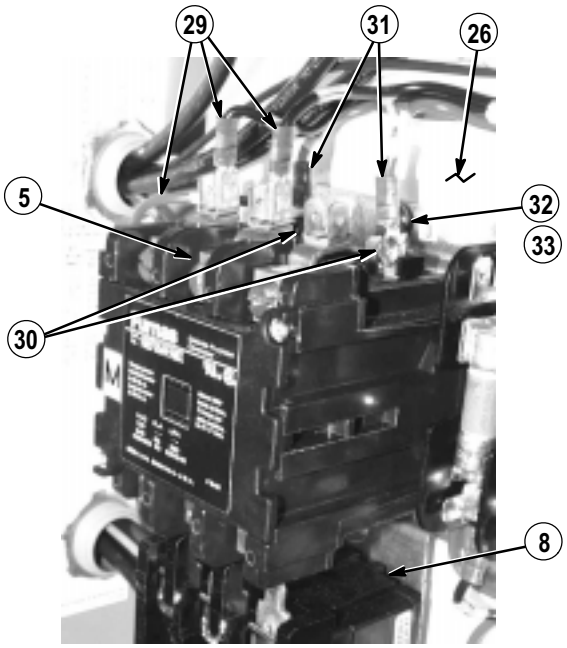


3-2. AIR COMPRESSOR CONTROL BOX REPAIR (CONT).

(6) Install busbar (8) and relay (5) on board (26) with two nuts (33) and screws (32).

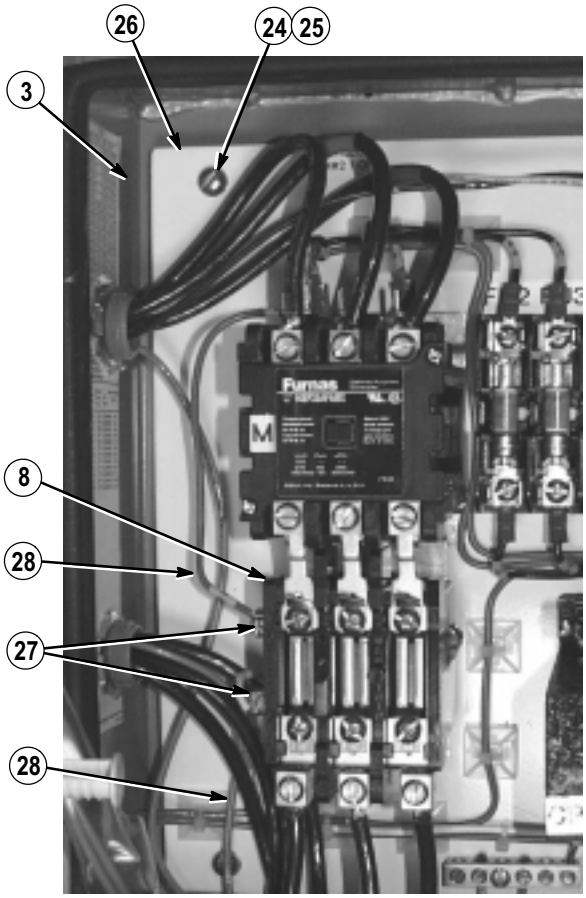
(7) Position two wires (31) on relay (5) and tighten two screws (30).

(8) Install three wires (29) on relay (5).



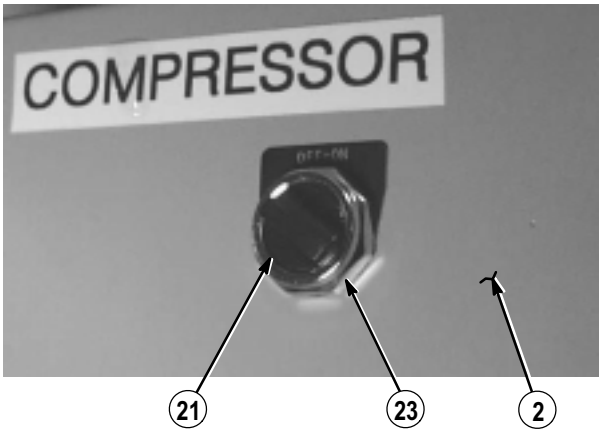
(9) Position two wires (28) on busbar (8) and tighten two screws (27).

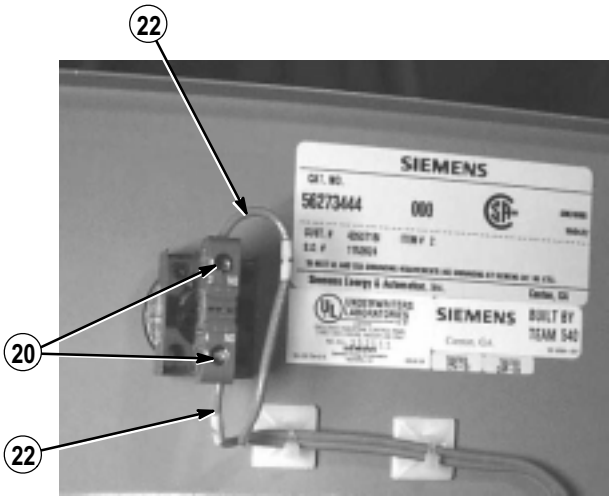
(10) Install board (26) in control box (3) with four nuts (25) and screws (24).



(11) Install ON/OFF switch (21) on door (2) with nut (23).

(12) Position two wires (22) on ON/OFF switch (21) and tighten two screws (20).



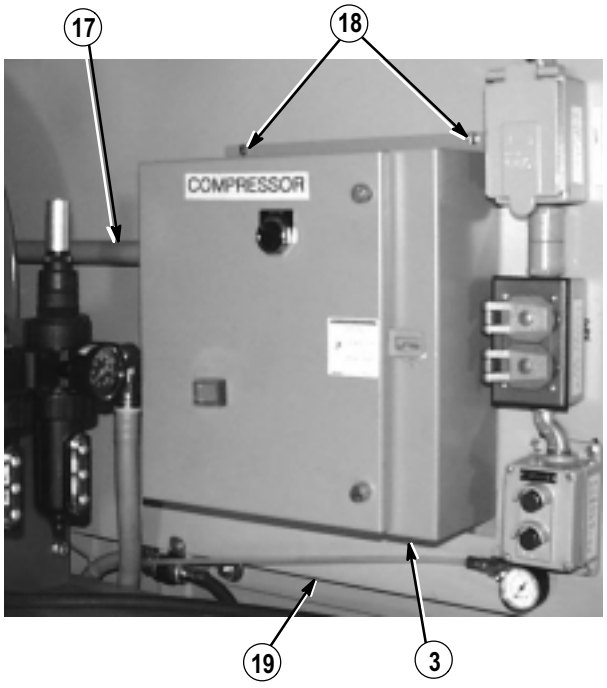


e. Installation.

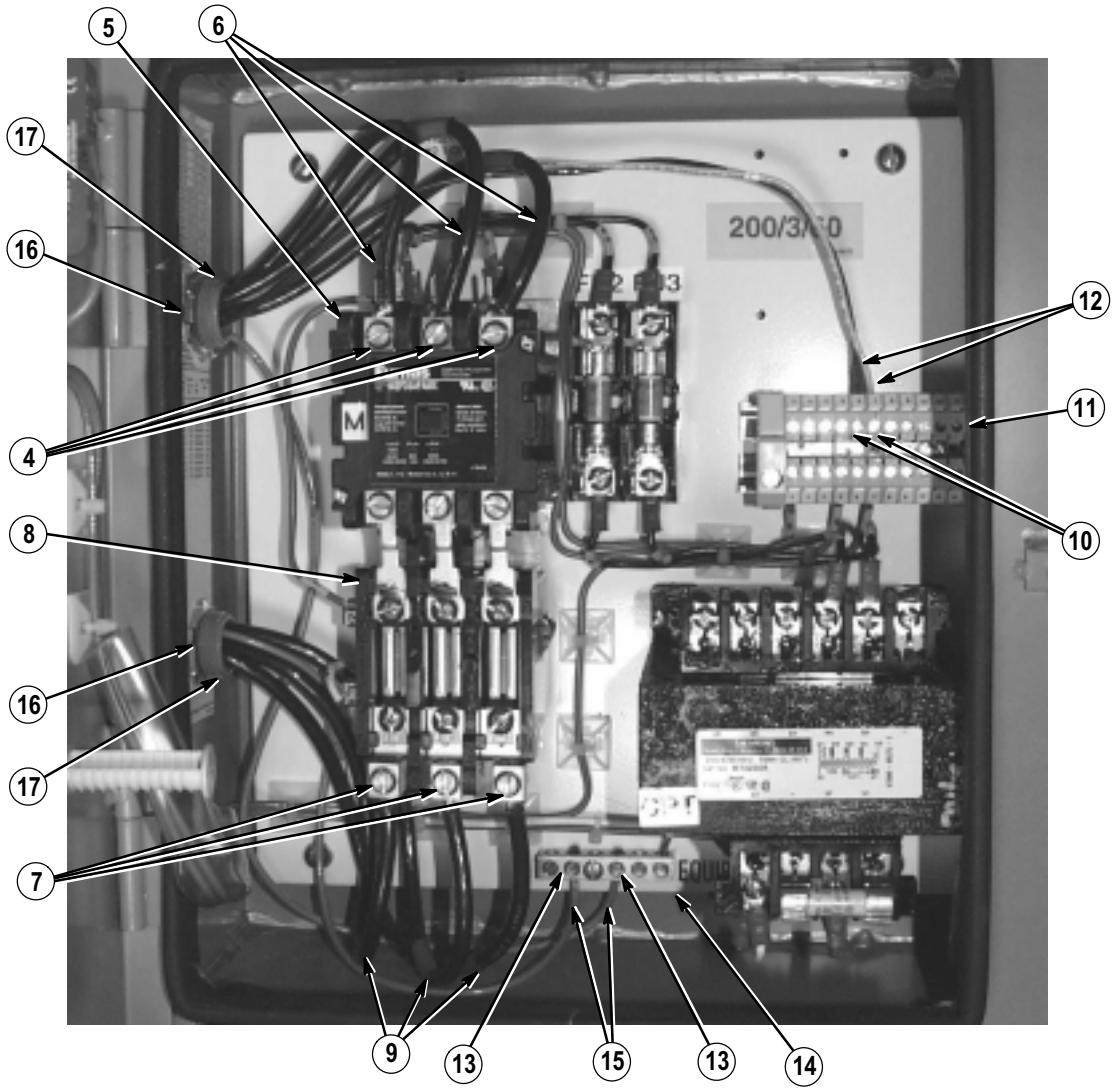
NOTE

Ensure shelter harness conduit wires are positioned through control box conduit holes in side of box.

(1) Position wires and conduit (17) through control box (3) and install control box (3) on shelter wall (19) with four screws (18).



3-2. AIR COMPRESSOR CONTROL BOX REPAIR (CONT).



(2) Install two locknuts (16) on conduit (17).

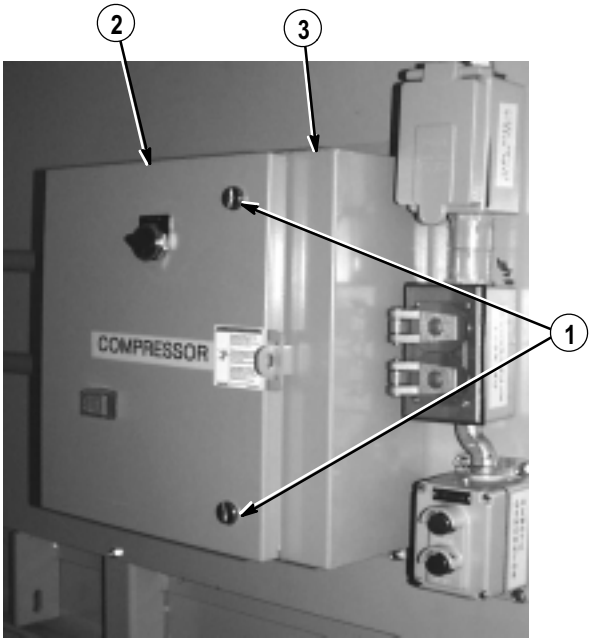
(3) Position two wires (15) on ground bar (14) and tighten two screws (13).

(4) Position two wires (12) on terminal board (11) and tighten two screws (10).

(5) Position three wires (9) on busbar (8) and tighten three screws (7).

(6) Position three wires (6) on relay (5) and tighten three screws (4).

(7) Close door (2) on control box (3) and tighten two screws (1).



f. Follow-On Maintenance:

- Connect batteries, (TM 9-4940-568-10).
- Check operation of air compressor, (TM 9-4940-568-10).

END OF TASK

3-3. 24 VOLT DC PANEL CIRCUIT BREAKER AND ON/OFF SWITCH REPLACEMENT.

This task covers:

a. Removal b. Installation c. Follow-On Maintenance

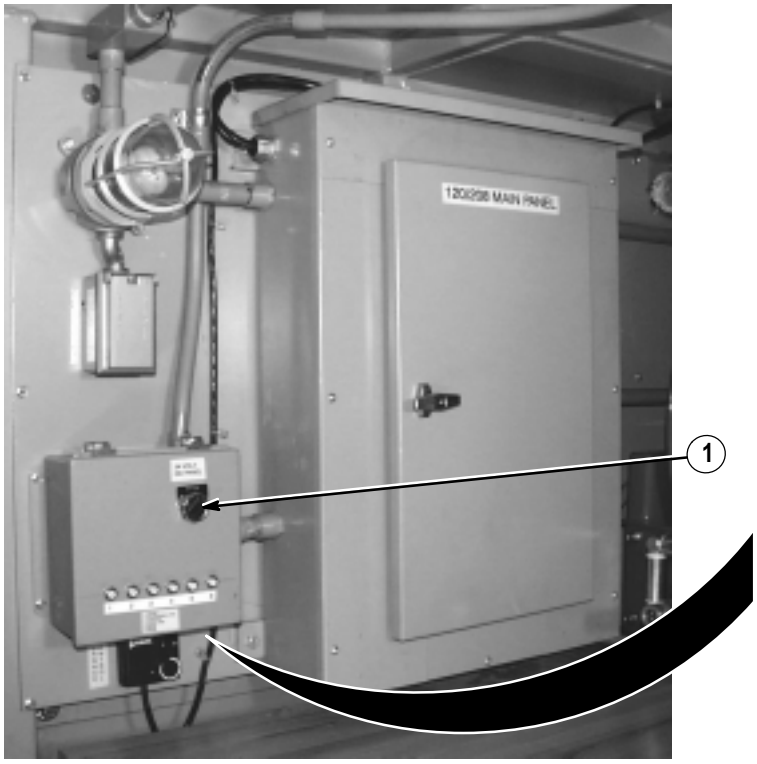
INITIAL SETUP

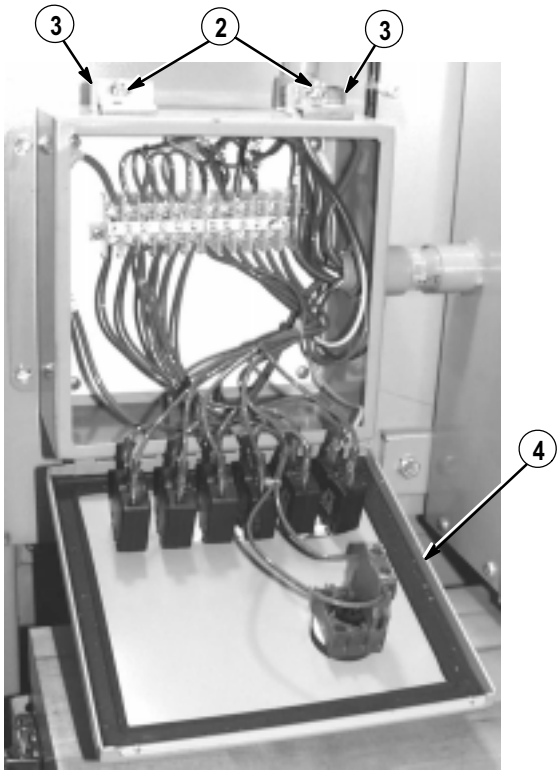
Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 30, Appendix G)

Materials/Parts
Tags, Identification (Item 40, Appendix C)

Equipment Condition
FRS unloaded, (TM 9-4940-568-10)
Batteries disconnected, (TM 9-4940-568-10)

a. Removal.





NOTE

- All six circuit breakers are removed the same way. Crane 10 amp circuit breaker shown.
- Tag and mark all wires prior to removal.

(1) Turn ON/OFF switch (1) to OFF.

(2) Loosen two screws (2) on clamps (3).

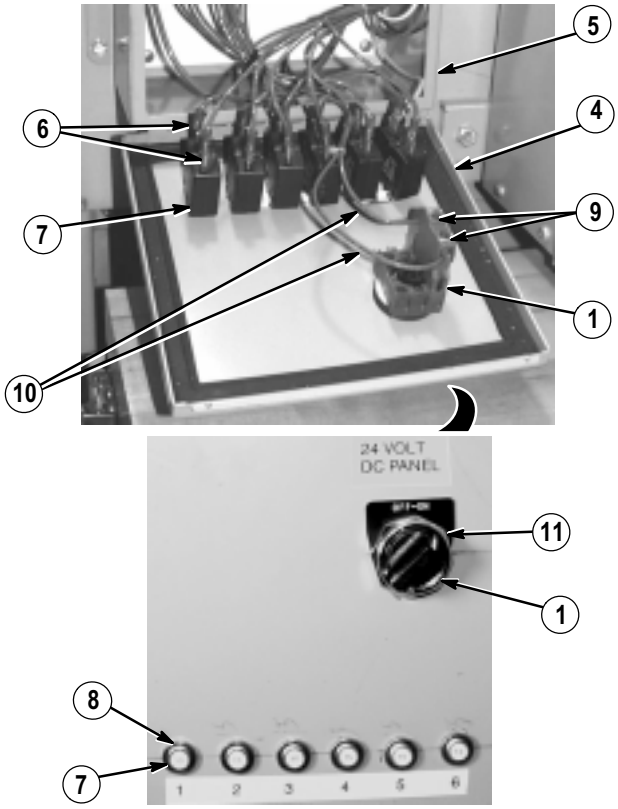
(3) Rotate two clamps (3) and open door (4) on 24 volt DC panel box (5).

(4) Remove two wires (6) from circuit breaker (7).

(5) Remove jam nut (8) and circuit breaker (7) from door (4).

(6) Loosen two screws (9) on ON/OFF switch (1) and remove two wires (10).

(7) Remove nut (11) and ON/OFF switch (1) from door (4).



b. Installation.

NOTE

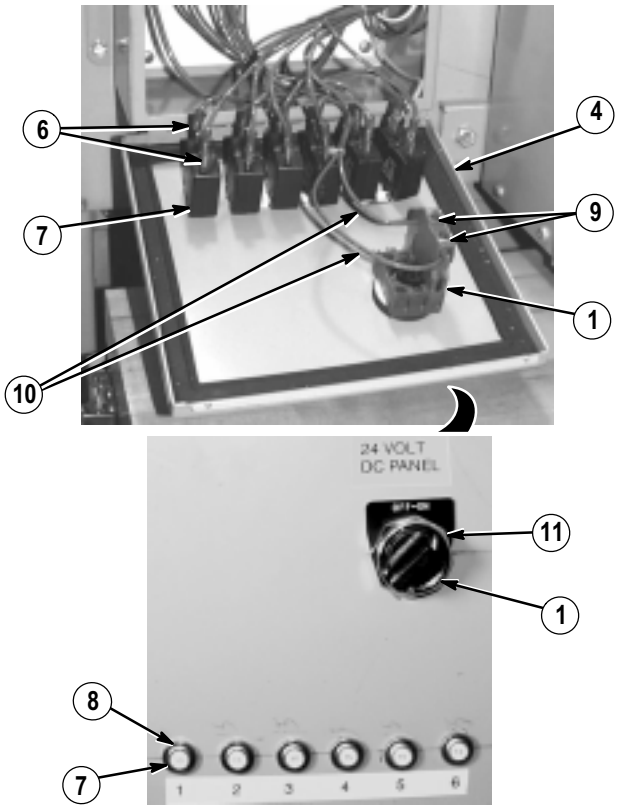
- Install wires in locations as noted prior to removal.
- All six circuit breakers are installed the same way. Crane 10 amp circuit breaker shown.

(1) Install ON/OFF switch (1) on door (4) with nut (11).

(2) Position two wires (10) on ON/OFF switch (1) and tighten screws (9).

(3) Install circuit breaker (7) on door (4) with jam nut (8).

(4) Install two wires (6) on ciruit breaker (7).

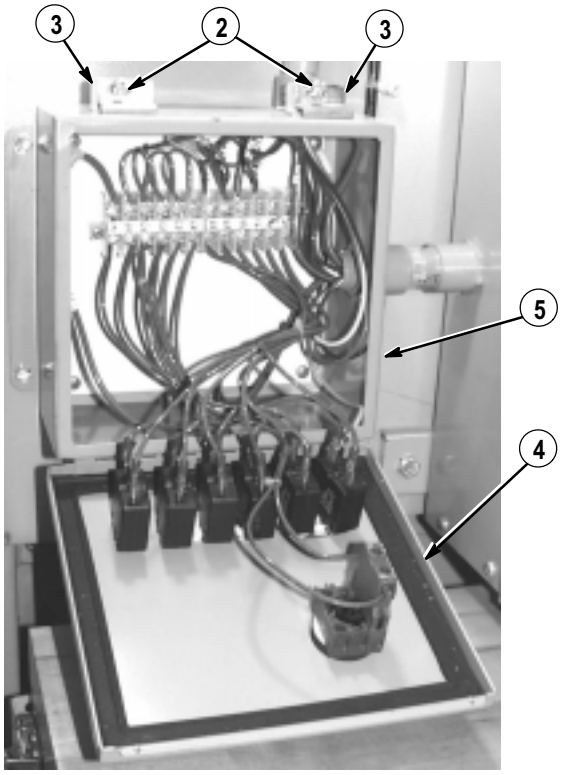


3-3. 24 VOLT DC PANEL CIRCUIT BREAKER AND ON/OFF SWITCH REPLACEMENT (CONT).

(5) Close door (4) on 24 volt DC panel box (5) and rotate two clamps (3).

(6) Tighten two screws (2) on clamps (3).

(7) Turn ON/OFF switch (1) to ON.



c. Follow-On Maintenance:

- Connect batteries, (TM 9-4940-568-10).

END OF TASK

3-4. CIRCUIT BREAKER REPLACEMENT.

This task covers:

a. Removal b. Installation c. Follow-On Maintenance

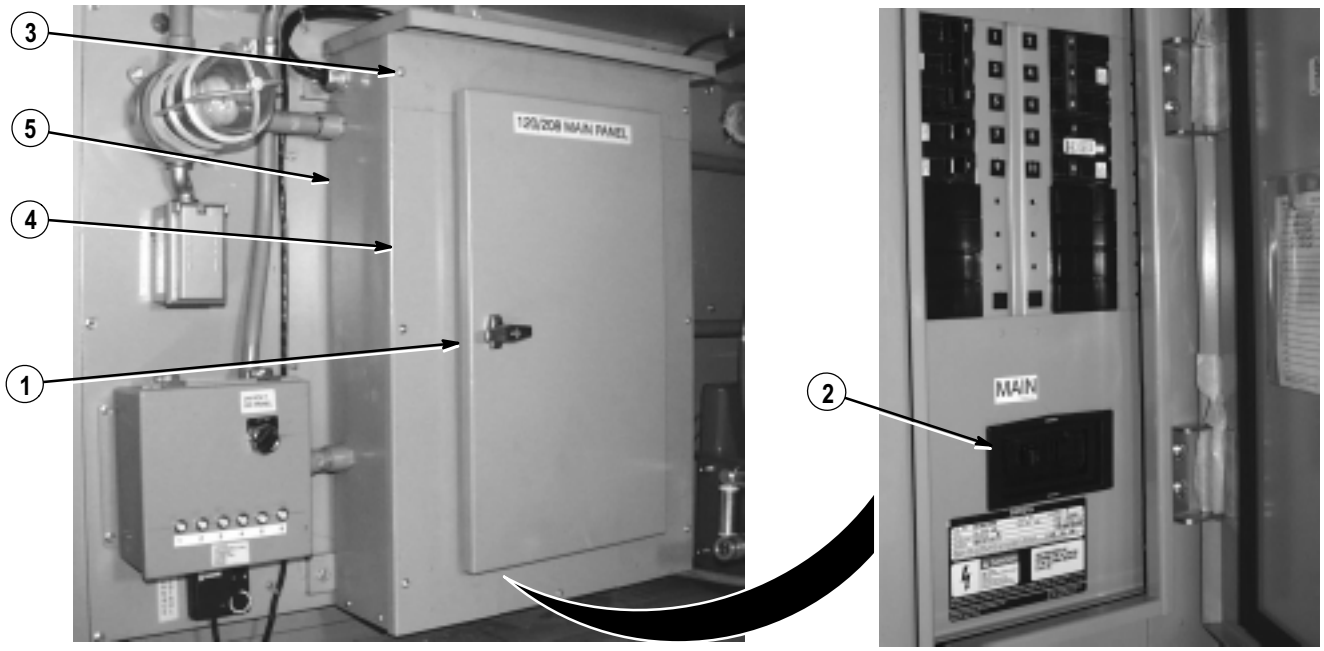
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 30, Appendix G)

Materials/Parts
Tags, Identification (Item 40, Appendix C)

Equipment Condition
FRS unloaded, (TM 9-4940-568-10)
Batteries disconnected, (TM 9-4940-568-10)

a. Removal.



NOTE

All circuit breakers are removed the same way. Types of circuit breakers include the following:

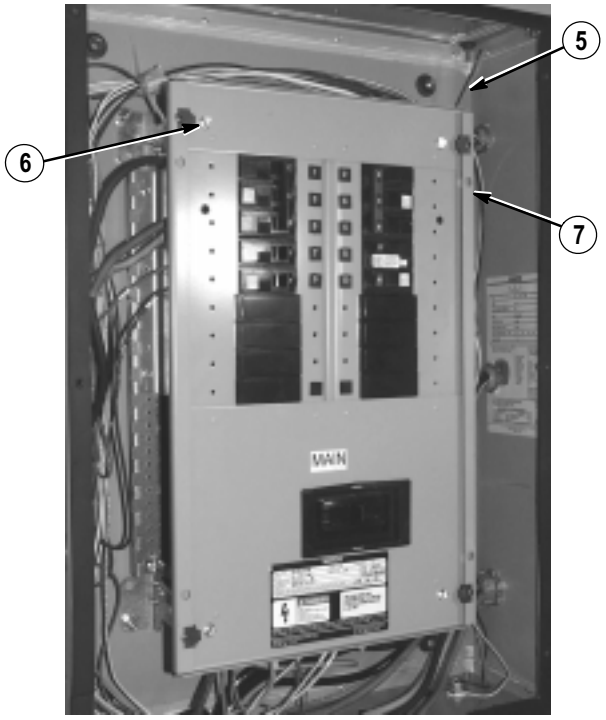
- 20 amp - single pole
- 50 amp - triple throw
- 60 amp - triple throw

(1) Open circuit breaker door (1) and switch main circuit breaker (2) to OFF position.

(2) Remove seven screws (3) and circuit breaker box cover (4) from circuit breaker box (5).

3-4. CIRCUIT BREAKER REPLACEMENT (CONT).

(3) Remove four screws (6) and circuit breaker panel (7) from circuit breaker box (5).

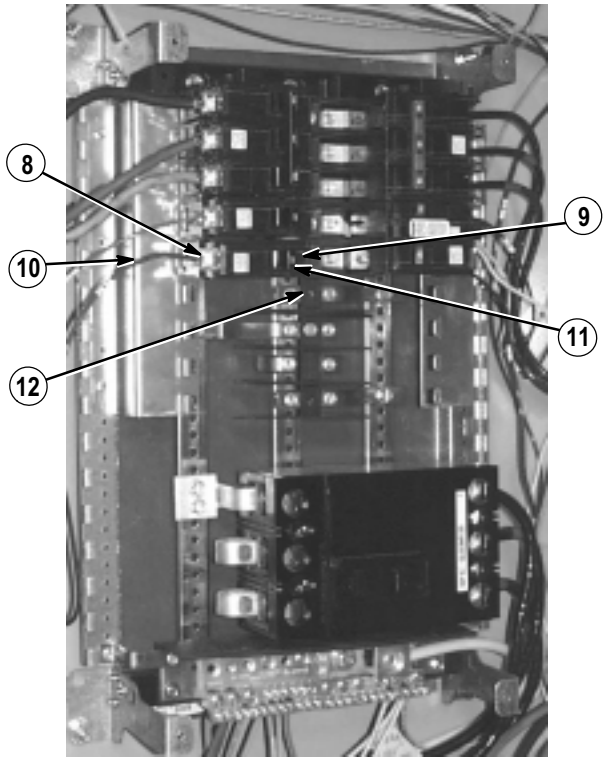


NOTE

- Single pole circuit breaker has one screw and wire, triple throw circuit breaker has three screws and wires.
- Tag and note location of all wires prior to removal.

(4) Loosen screw(s) (8) on circuit breaker (9) and pull out wire(s) (10) from circuit breaker (9).

(5) Remove screw(s) (11) and circuit breaker (9) from bus-bar (12).



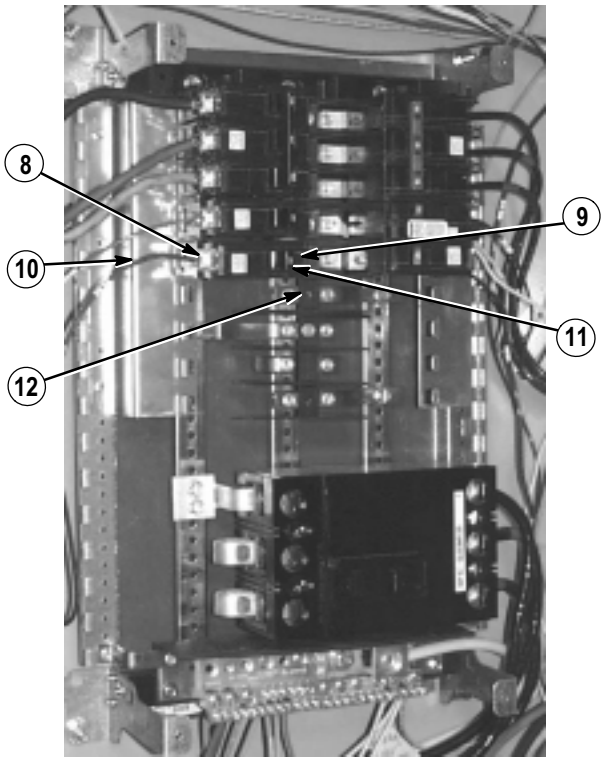
b. Installation.

(1) Install circuit breaker (9) and screw(s) (11) on bus-bar (12).

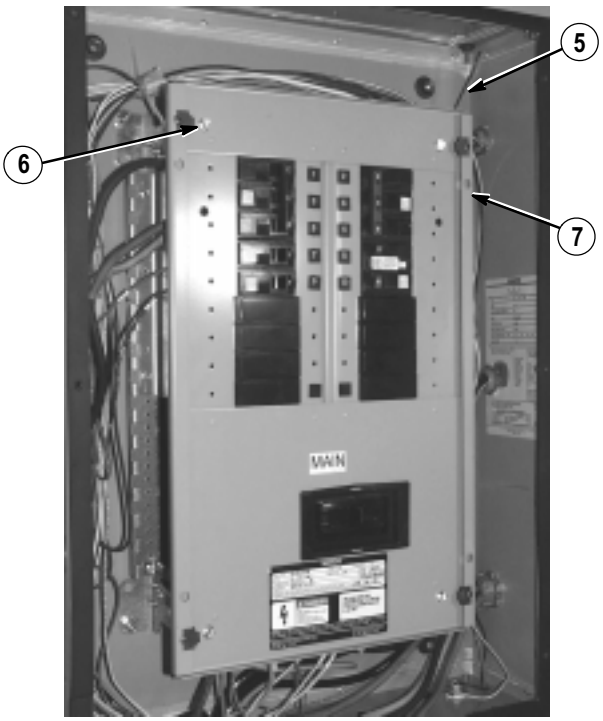
NOTE

Install wires in location as noted prior to removal.

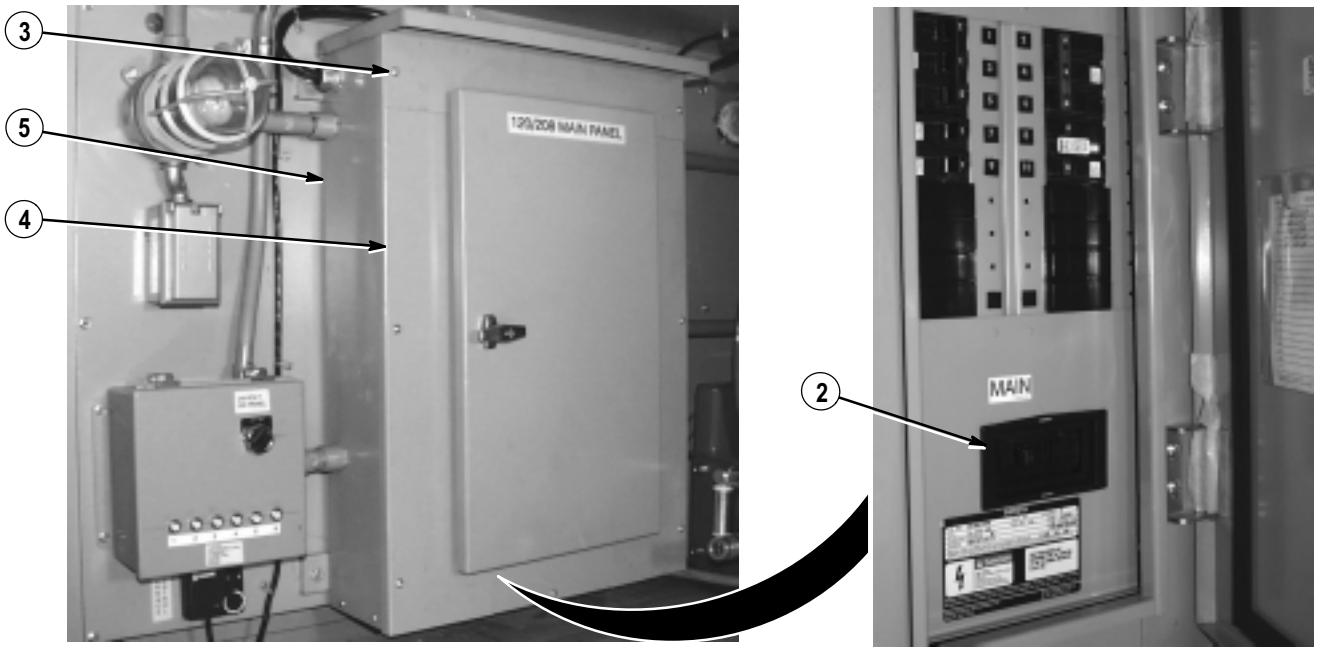
(2) Insert wire(s) (10) in circuit breaker (9) and tighten screw(s) (8).



(3) Install circuit breaker panel (7) and four screws (6) on circuit breaker box (5).



3-4. CIRCUIT BREAKER REPLACEMENT (CONT).



(4) Install circuit breaker box cover (4) and seven screws (3) on circuit breaker box (5).

(5) Switch main circuit breaker (2) to ON position.

c. Follow-On Maintenance:

- Connect batteries, (TM 9-4940-568-10).
- Check for proper operation, (TM 9-4940-568-10).

END OF TASK

3-5. NATO SLAVE RECEPTACLE REPLACEMENT.

This task covers:

a. Removal b. Installation c. Follow-On Maintenance

INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 30, Appendix G)

Materials/Parts
Tags, Identification (Item 40, Appendix C)
Lockwasher (4) (Item 70, Appendix F)

Materials/Parts
Lockwasher (2) (Item 71, Appendix F)
Lockwasher (4) (Item 72, Appendix F)

Equipment Condition
FRS unloaded, (TM 9-4940-568-10)
Batteries disconnected, (TM 9-4940-568-10)

a. Removal.

NOTE

- There are two nato slave receptacles. Both are replaced the same way unless noted other wise.
- Perform Step (1) if removing exterior nato slave receptacle.

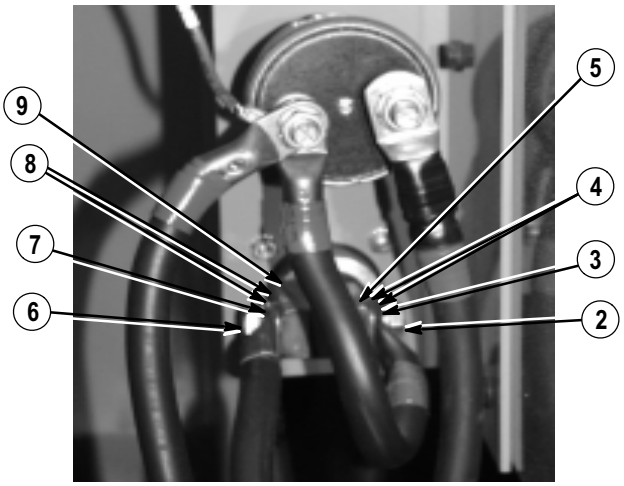
(1) Remove protective cover (1).

NOTE

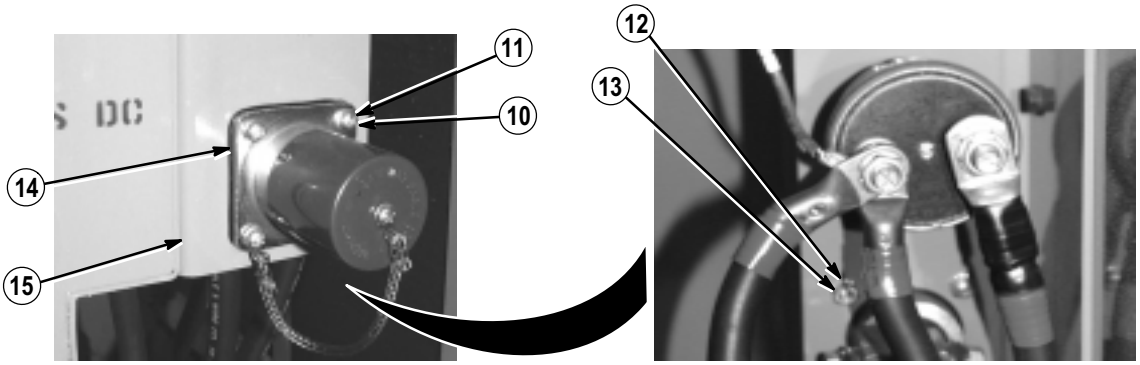
- Tag and mark all wires prior to removal.
- Interior nato slave receptacle shown.

(2) Remove screw (2), lockwasher (3) and two wires (4) from terminal (5). Discard lockwasher.

(3) Remove screw (6), lockwasher (7) and two wires (8) from terminal (9). Discard lockwasher.



3-5. NATO SLAVE RECEPTACLE REPLACEMENT (CONT).

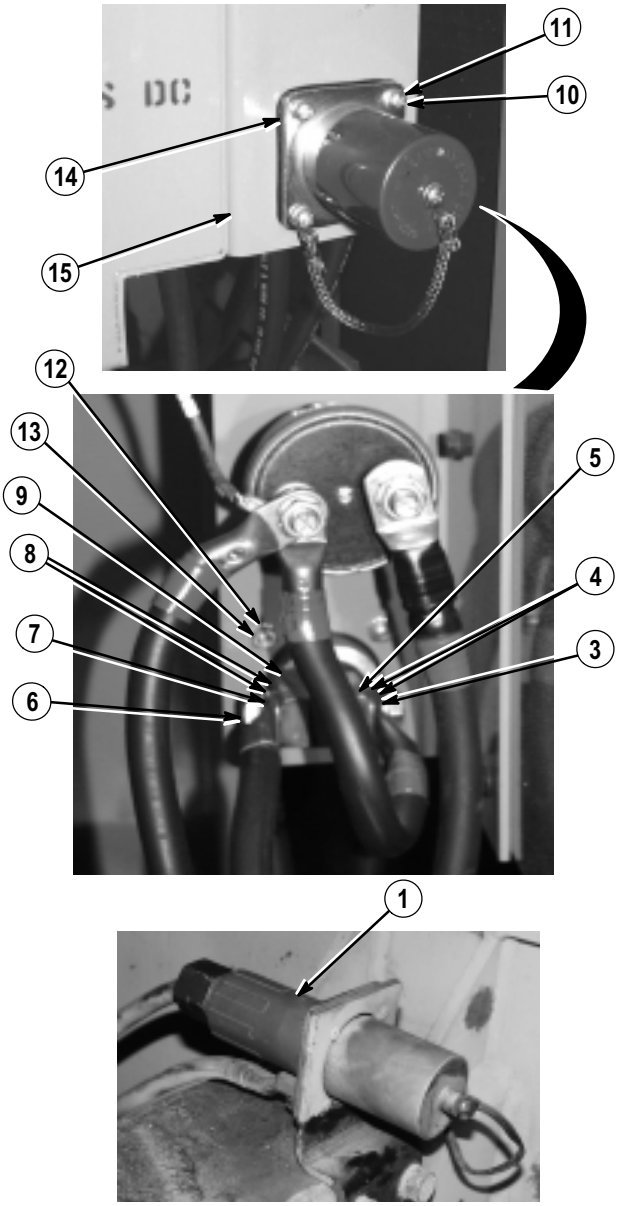


(4) Remove four screws (10), lockwashers (11), lockwashers (12), nuts (13) and slave receptacle (14) from mount bracket (15). Discard lockwashers.

b. Installation.

NOTE

- There are two nato slave receptacles. Both are replaced the same way unless noted other wise.
- Interior nato slave receptacle shown.
- Install wires as noted during removal.



(1) Install slave receptacle (14), four lockwashers (11), screws (10), lockwashers (12) and nuts (13) on mount bracket (15).

(2) Install two wires (8), lockwasher (7) and screw (6) on terminal (9).

(3) Install two wires (4), lockwasher (3) and screw (2) on terminal (5).

NOTE

Perform Step (4) if installing exterior nato slave receptacle.

(4) Install protective cover (1).

c. Follow-On Maintenance:

- Connect batteries, (TM 9-4940-568-10).

END OF TASK

3-6. MASTER DISCONNECT SWITCH REPLACEMENT.

This task covers:

a. Removal b. Installation c. Follow On Maintenance

INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's Automotive (Item 30, Appendix G)

Materials/Parts
Tags, Identification (Item 40, Appendix C)
Lockwasher (2) (Item 80, Appendix F)
Lockwasher (Item 81, Appendix F)
Lockwasher (Item 82, Appendix F)

Equipment Condition
FRS unloaded, (TM 9-4940-568-10)
Batteries disconnected, (TM 9-4940-568-10)

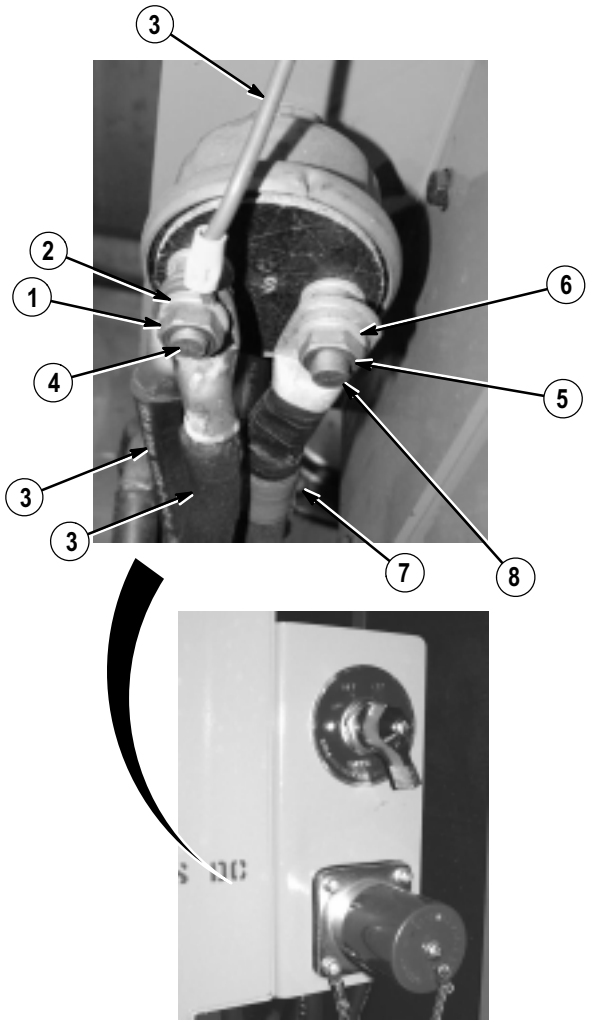
a. Removal.

NOTE

Tag and mark all wires prior to removal.

(1) Remove nut (1), lockwasher (2) and three wires (3) from terminal (4). Discard lockwasher.

(2) Remove nut (5), lockwasher (6) and wire (7) from terminal (8). Discard lockwasher.



3-6. MASTER DISCONNECT SWITCH REPLACEMENT (CONT).

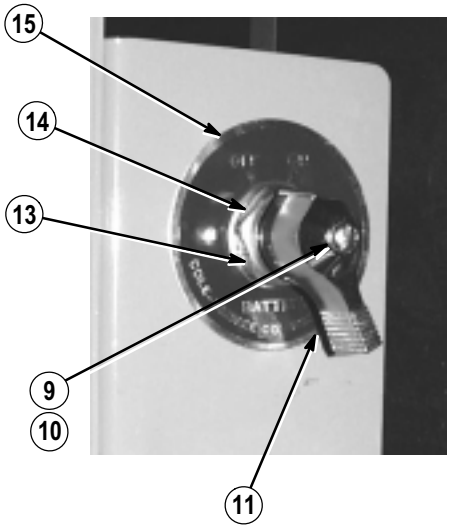
(3) Remove screw (9), lockwasher (10) and switch knob (11) from switch (12). Discard lockwasher.

NOTE

- Note position of switch plate prior to removal.
- Note position of jam nut prior to removal.

(4) Remove nut (13), lockwasher (14), switch plate (15) and switch (12) from bracket (16). Discard lockwasher.

(5) Remove jam nut (17) from switch (12).



b. Installation.

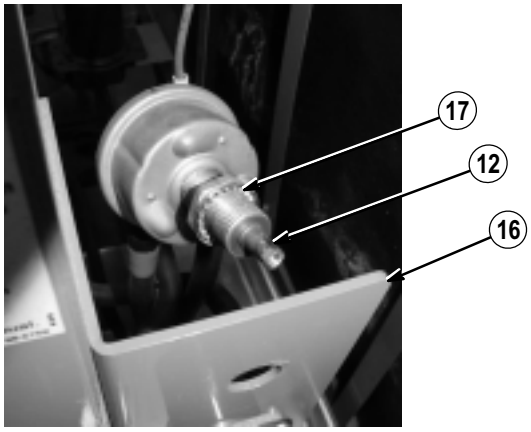
NOTE

Install jam nut and switch plate as noted during removal.

(1) Install jam nut (17) on switch (12).

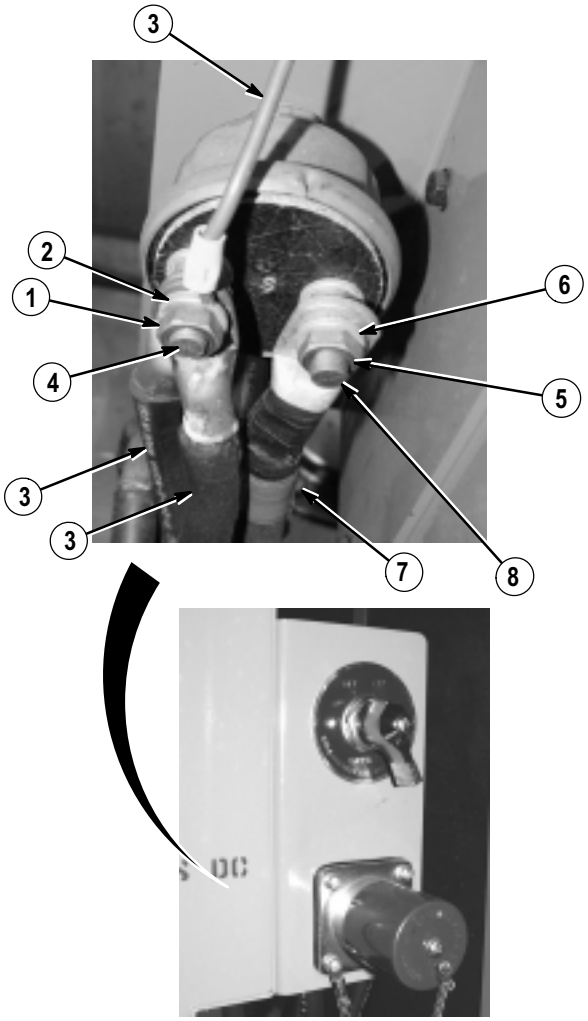
(2) Install switch (12), switch plate (15), lockwasher (14) and nut (13) on bracket (16).

(3) Install knob (11) on switch (12) with lockwasher (10) and screw (9).



(4) Install wire (7) on terminal (8) with lockwasher (6) and nut (5).

(5) Install three wires (3) on terminal (4) with lockwasher (2) and nut (1).



c. Follow-On Maintenance:

- Connect batteries (TM 9-4940-568-10).

END OF TASK

3-7. ELECTRICAL PIPING AND CLAMPS REPLACEMENT.

This task covers:

a. Removal
b. Repair
c. Installation
d. Follow-On Maintenance

INITIAL SETUP

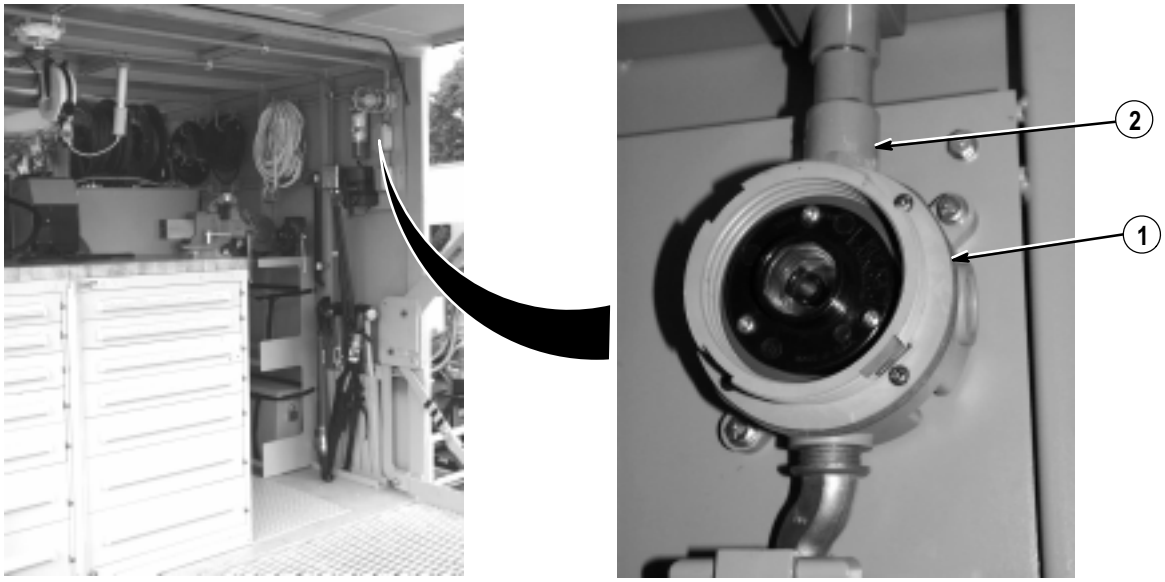
Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 30, Appendix G)

Materials/Parts
Adhesive (Item 1, Appendix C)
Cable Ties (Item 10, Appendix C)
Primer (Item 29, Appendix C)
Tags, Identification (Item 40, Appendix C)

Materials/Parts – Continued
Coupling, Female 1/2 in. (A/R) (Item 2, Appendix F)
Coupling, Female 3/4 in. (Item 3, Appendix F)
Locknut (10) (Item 28, Appendix F)

Equipment Condition
FRS unloaded, (TM 9-4940-568-10)
Batteries disconnected, (TM 9-4940-568-10)

a. Removal.



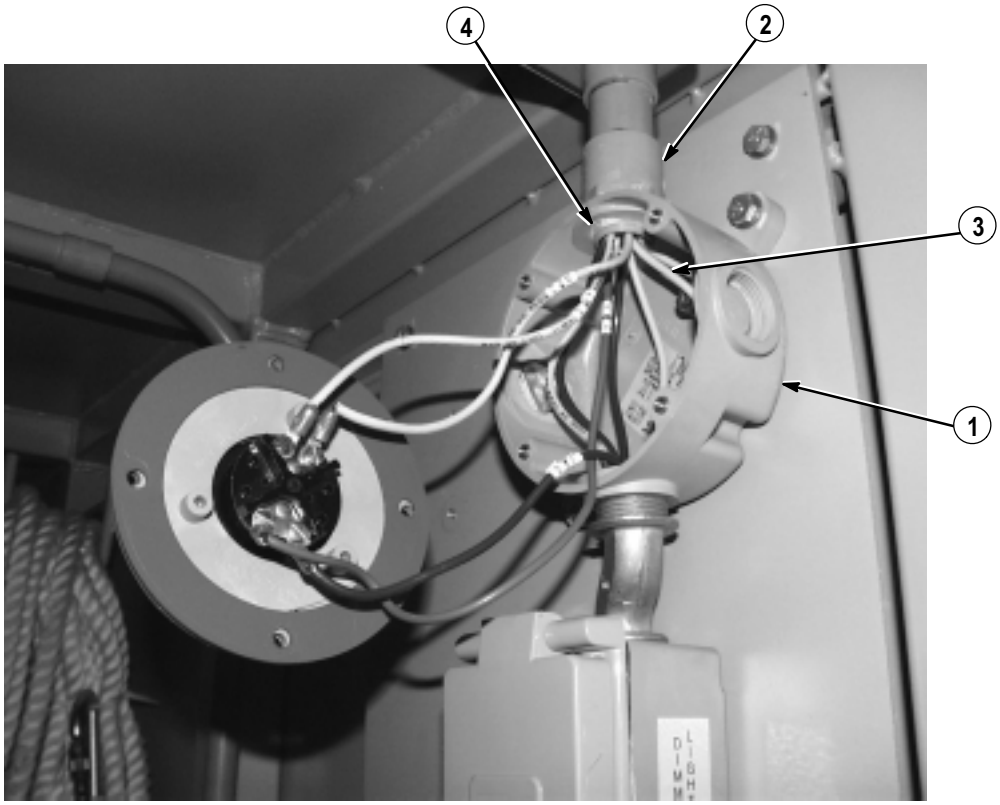
WARNING

Do not attempt to repair, cut, or replace any conduit or fixture without first removing all wires to prevent personnel injury or damage to equipment.

NOTE

- All electric piping is made up of either 3/4 in. or 1/2 in. schedule 40 electrical rigid PVC conduit. Replace or repair using like sizes only.
- Glued joints cannot be separated.
- Remove cable ties as required.

(1) Open junction box (1) located on each end of conduit assembly (2).



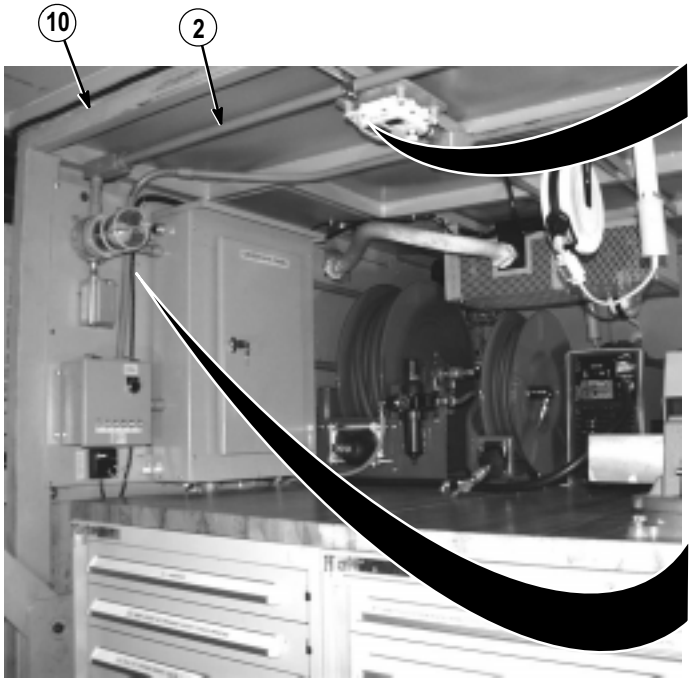
NOTE

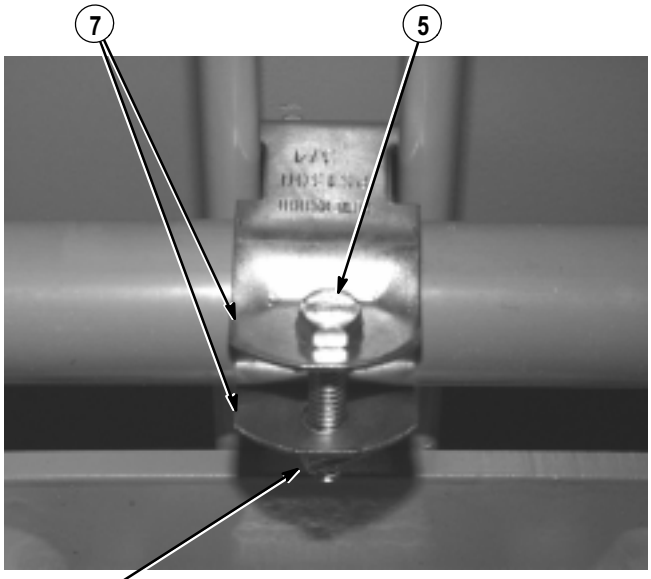
Tag and mark all wire connections prior to removal.

(2) Remove all wire connections and pull wires (3) from conduit assembly (2).

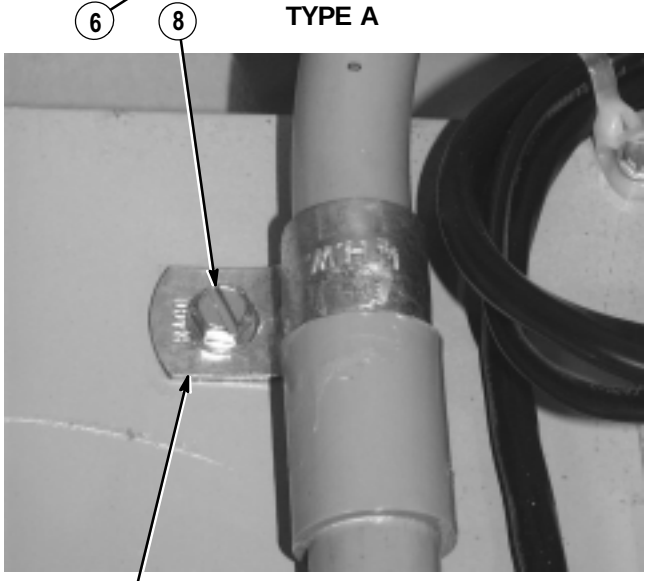
(3) Remove locknuts (4) from inside of junction boxes (1) on both ends of conduit assembly (2).

3-7. ELECTRICAL PIPING AND CLAMPS REPLACEMENT (CONT).





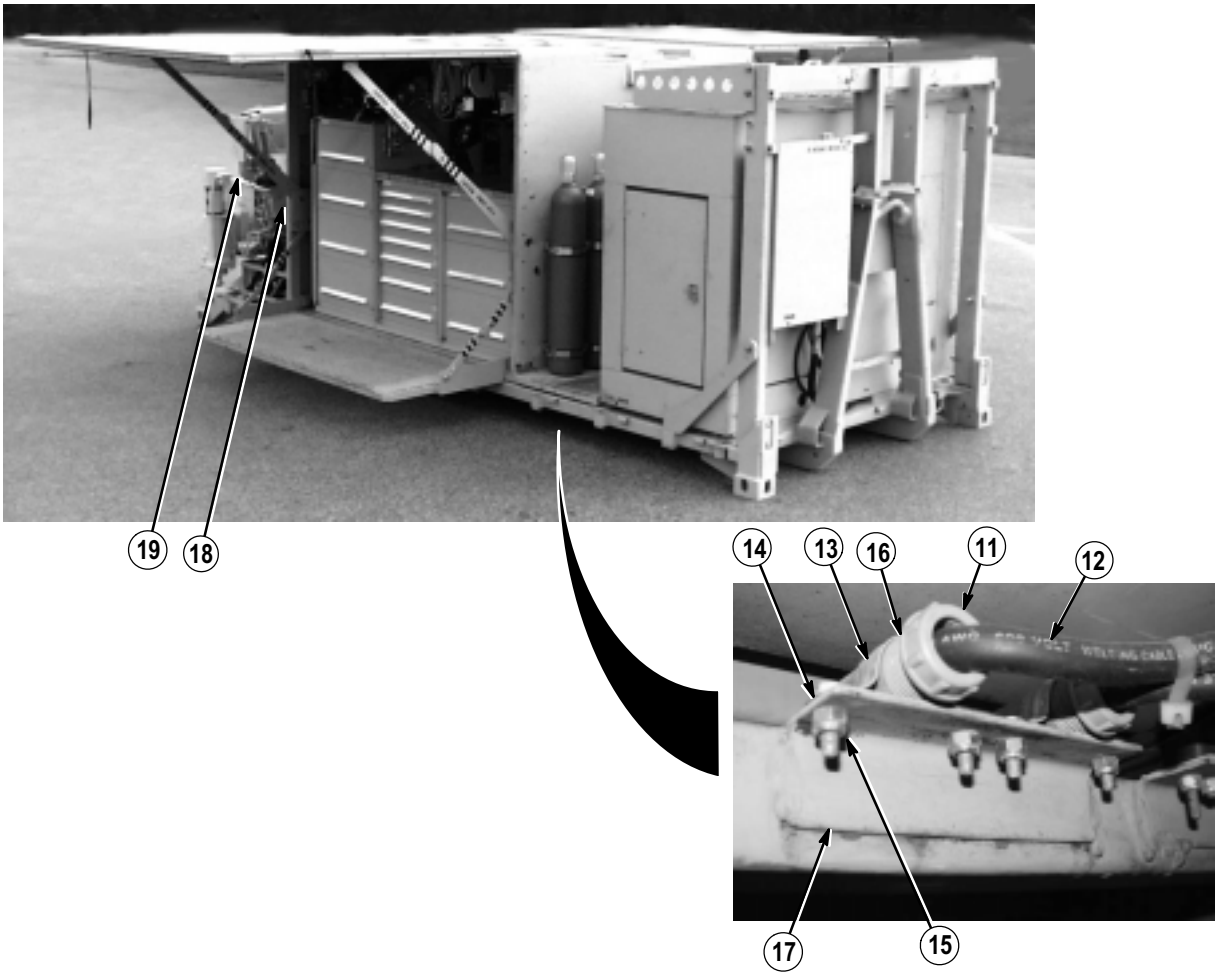
TYPE A



TYPE B

(4) Remove screw (5) and nut (6) from Type A clamp (7) or remove screw (8) and clamp (9) Type B.

(5) Remove conduit assembly (2) from shelter (10).



(6) Remove NATO slave receptacle from rear of FRS (Para 3-5).

(7) Remove wire connectors on end of wire (Para 3-16).

(8) Remove two tube caps (11) and wire (12) from electrical tube (13).

NOTE

Both electrical tubes are removed the same.

(9) Remove two screws (14), locknuts (15), electrical clamp (16), and electrical tube (13) from bracket (17). Discard locknuts.

(10) Repeat Step (9) for four other clamps.

(11) Remove electrical tube (13) from rear of shelter (18) and under crane (19).

3-7. ELECTRICAL PIPING AND CLAMPS REPLACEMENT (CONT).

b. Repair.

NOTE

- Removed components and fixtures are to be replaced with like components and fixtures.
- Female couplers are to be used for mating old and new sections of conduit or fixtures.

(1) Cut out conduit section or fixture needing replacing on conduit assembly.

(2) Apply primer on all surface areas to be connected together.

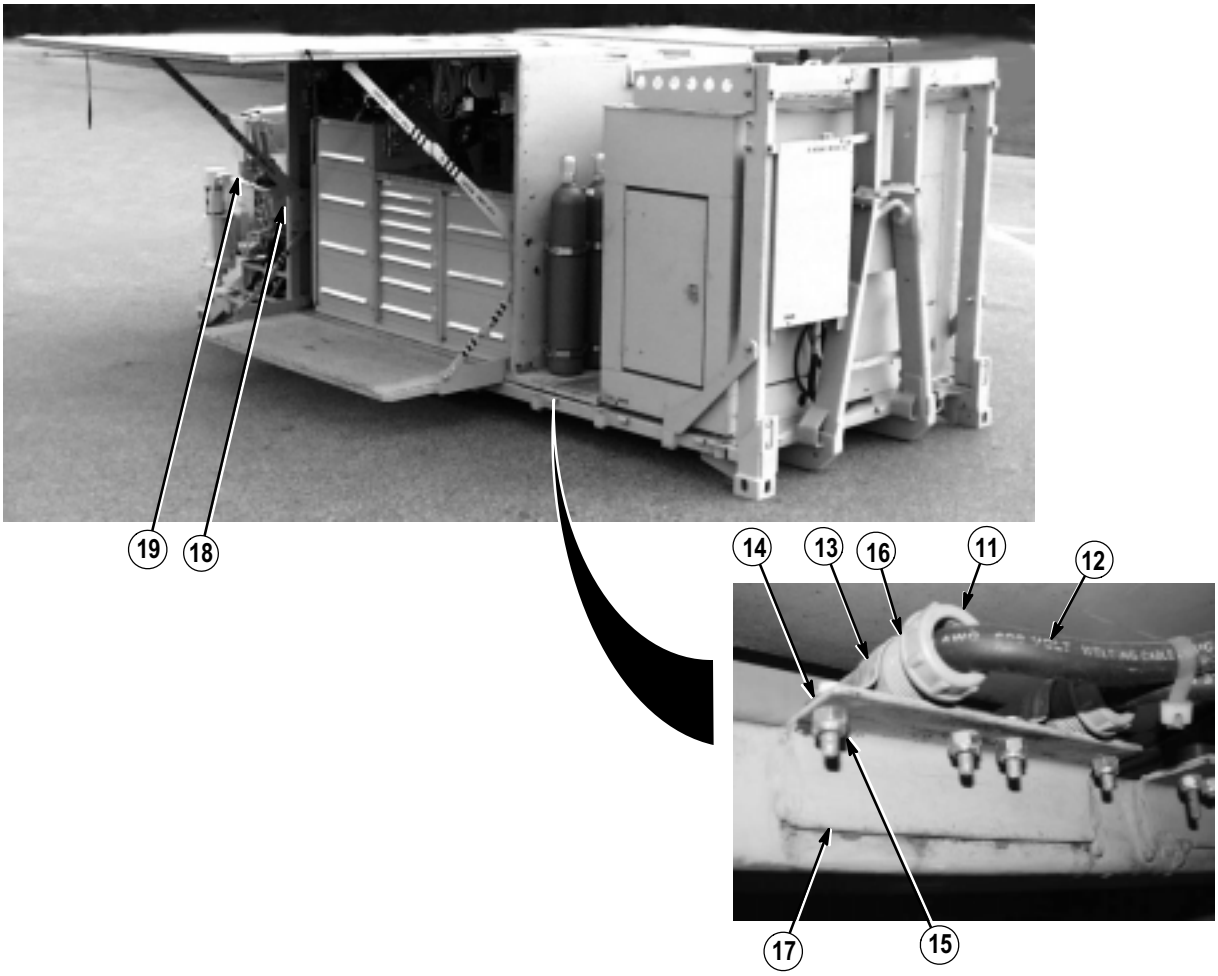
WARNING

Adhesives, solvents, and sealing compounds can burn easily, can give off harmful vapors, and are harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in well-ventilated area. If adhesive, solvent, or sealing compound gets on skin or clothing, wash immediately with soap and water.

(3) Apply adhesive to all primed surface areas to be connected.

(4) Assemble conduit section and/or fixture to conduit assembly.

c. Installation.



NOTE

- Both electrical tubes are installed the same.
- Install cable ties as necessary.

(1) Slide electrical tube (13) under crane (19), and position under rear of shelter (18).

(2) Install electrical tube (13), electrical clamp (16), two screws (14) and locknuts (15) on bracket (17).

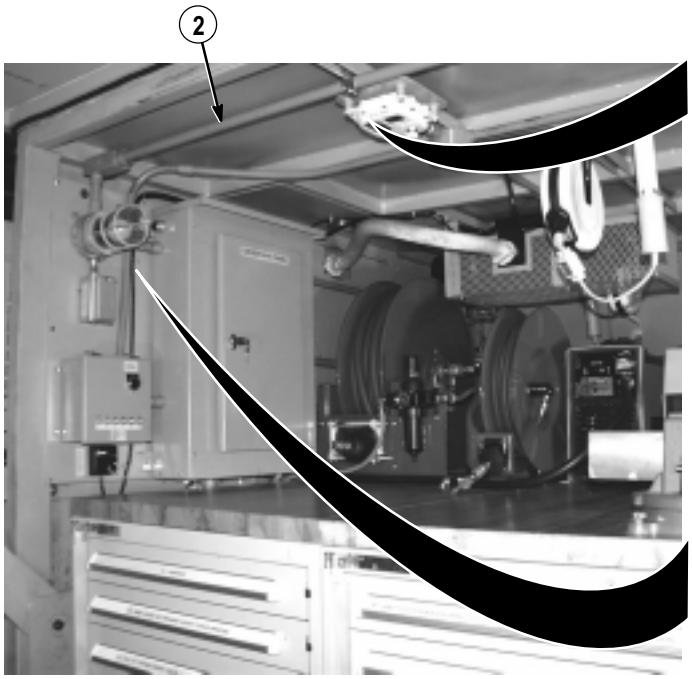
(3) Repeat Step (2) for the four other clamps.

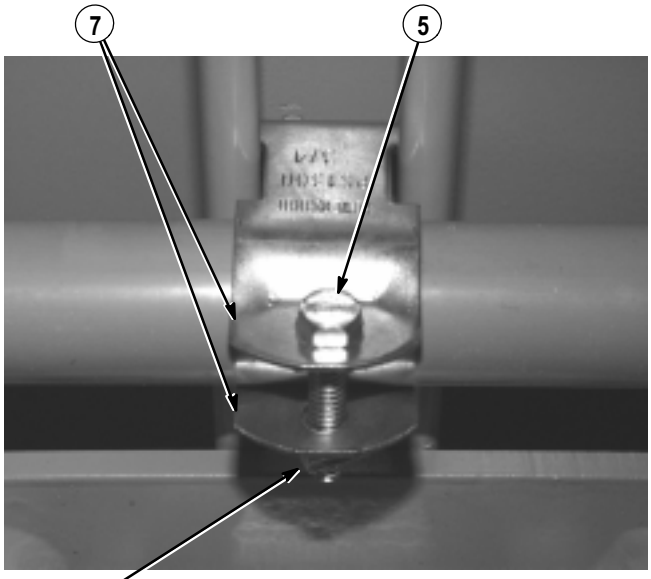
(4) Install two tube caps (11) and wire (12) in electrical tube (13).

(5) Install wire connectors on end of wire (Para 3-16).

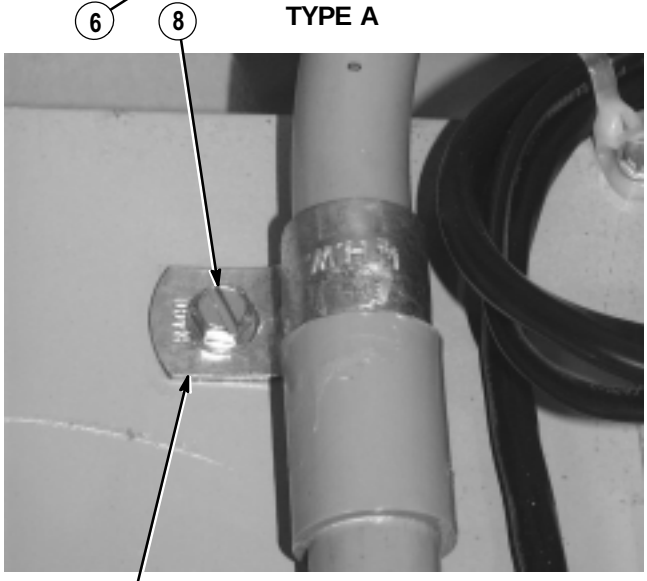
(6) Install NATO slave receptacle on rear of FRS (Para 3-5).

3-7. ELECTRICAL PIPING AND CLAMPS REPLACEMENT (CONT).





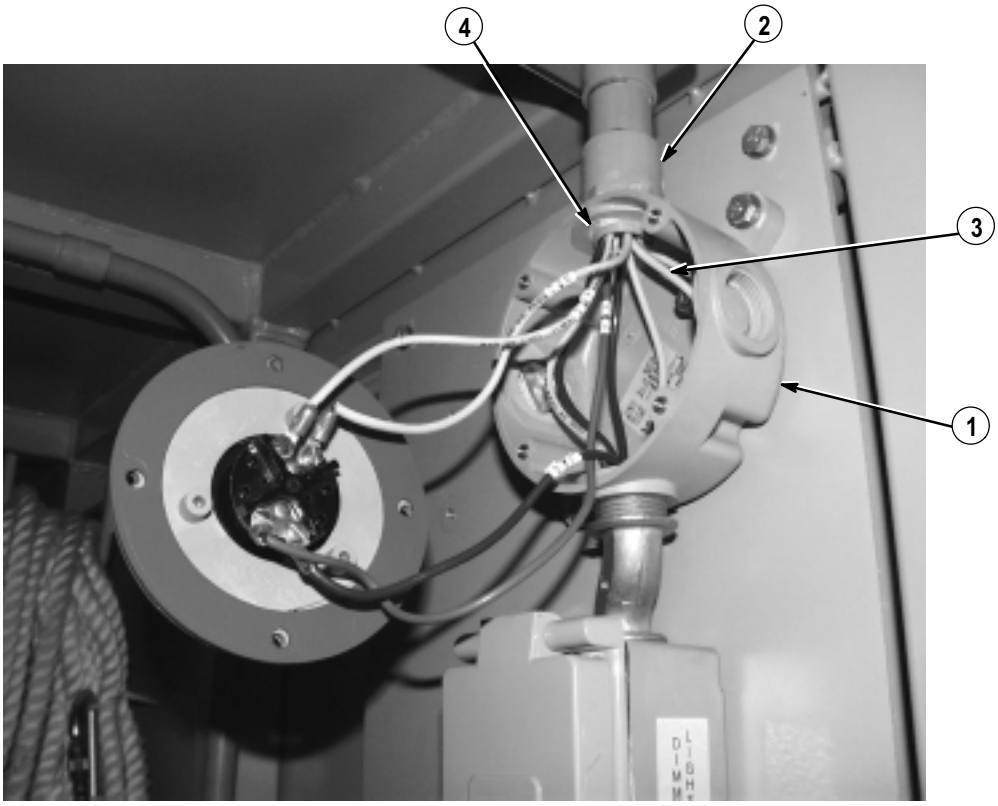
TYPE A



TYPE B

(7) Position conduit assembly (2) in it's proper location.

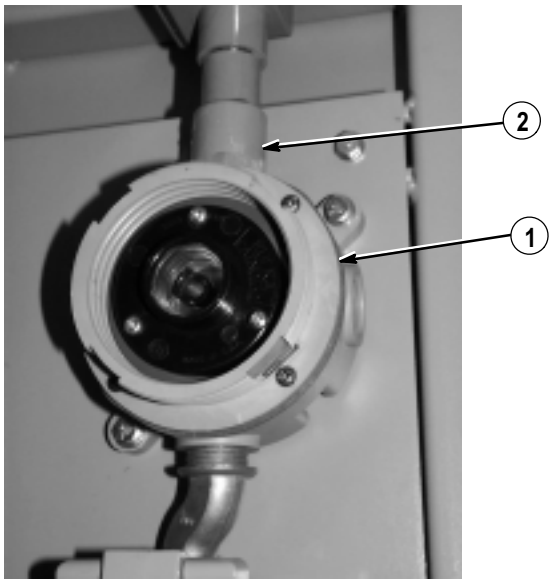
(8) Install screw (5) and nut (6) from Type A clamp (7) or install screw (8) and clamp (9) Type B.



(9) Install locknuts (4) in side of junction boxes (1) on both ends of conduit assembly (2).

(10) Reroute wires (3) through conduit assembly (2) and make connection to wires as marked.

(11) Install covers on each junction box (1).



d. Follow-On Maintenance:

- Connect batteries, (TM 9-4940-568-10).

END OF TASK

3-8. LIGHT SWITCH DIMMER (TOGGLE) REPLACEMENT.

This task covers:

a. Removal b. Installation c. Follow-On Maintenance

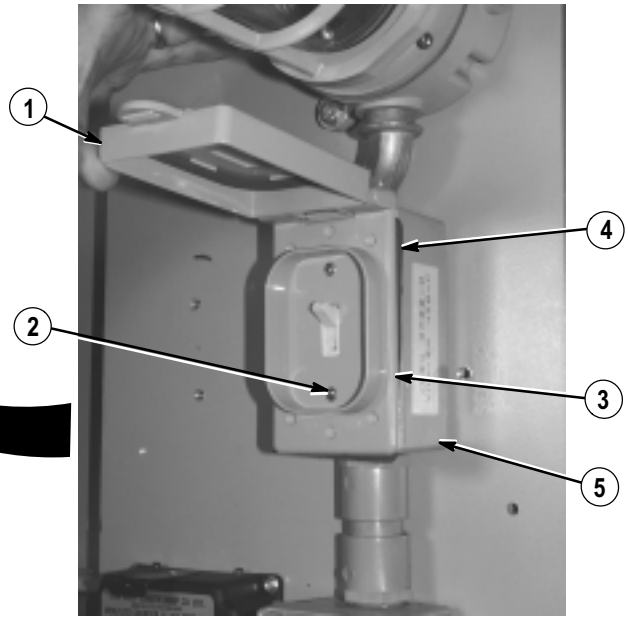
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 30, Appendix G)
Tool Kit, Electric (Item 29, Appendix G)

Materials/Parts
Tags, Identification (Item 40, Appendix C)

Equipment Condition
FRS unloaded, (TM 9-4940-568-10)
Batteries disconnected, (TM 9-4940-568-10)

a. Removal.

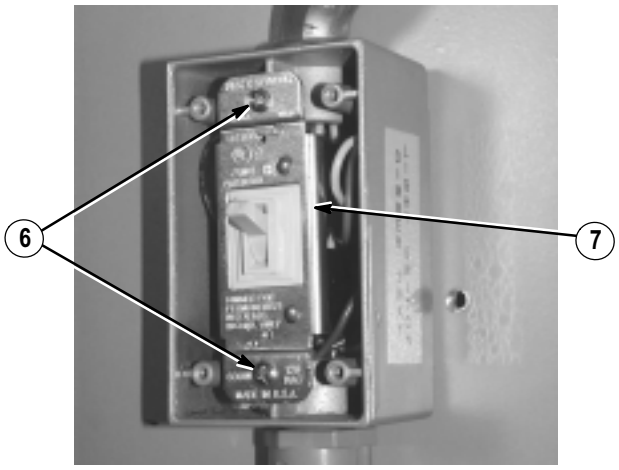


NOTE

There are two light switches, both are removed the same way. Left side is shown.

(1) Lift cover (1) and remove two screws (2), cover plate (3) and gasket (4) from junction box (5).

(2) Remove two screws (6) from light switch (7).



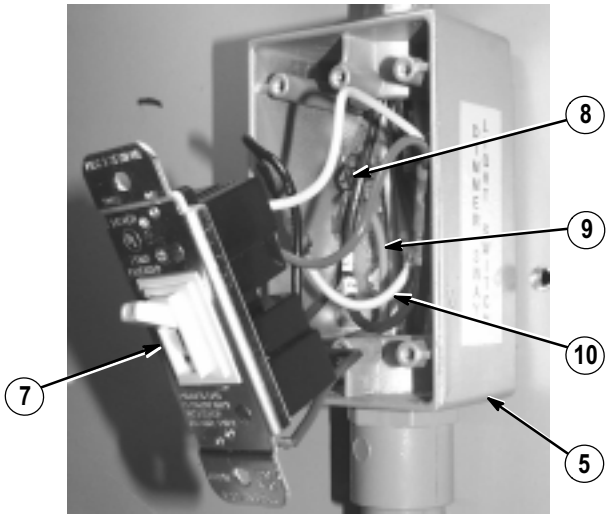
NOTE

Tag and mark all wires prior to removal.

(3) Remove screw (8) and ground wire (9) from junction box (5).

(4) Cut three remaining wires (10) from light switch (7).

(5) Remove light switch (7) from junction box (5).



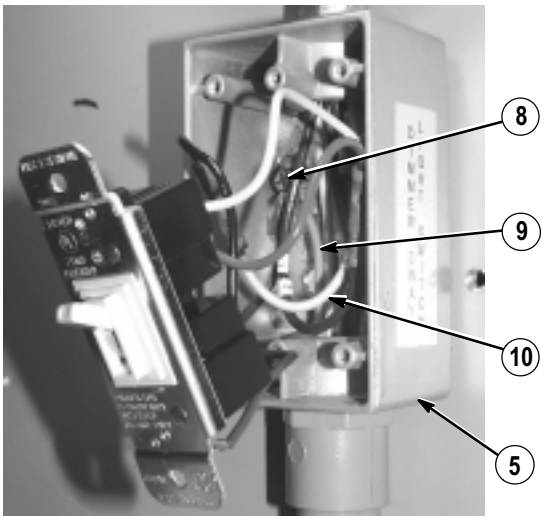
b. Installation.

NOTE

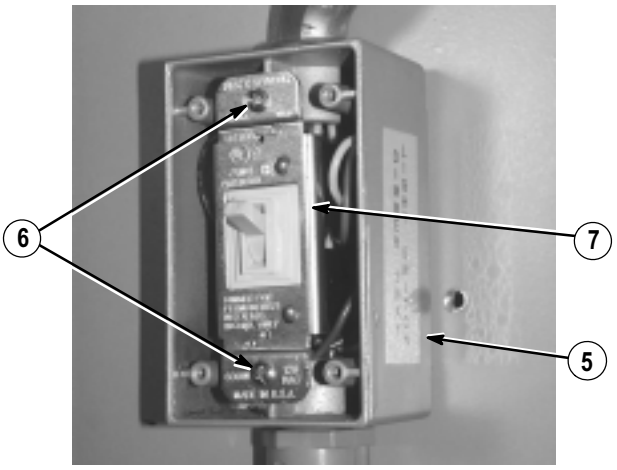
Install wires as noted in removal.

(1) Connect three wires (10) to light switch (7).

(2) Install ground wire (9) to junction box (5) with screw (8).

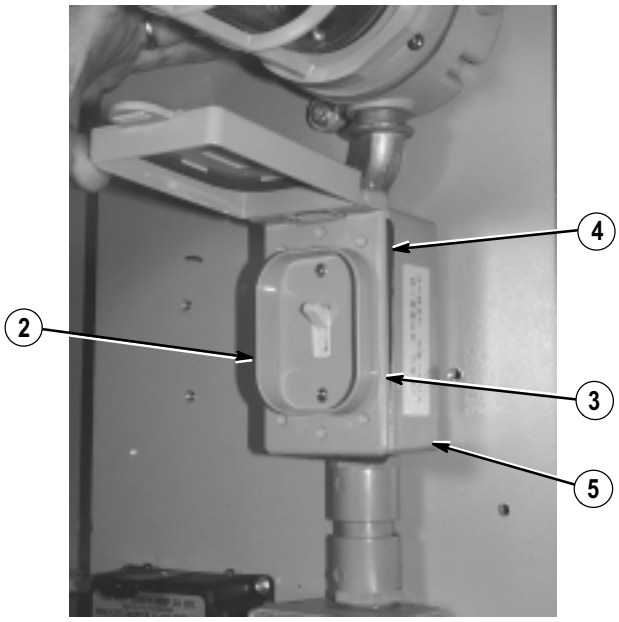


(3) Install light switch (7) with two screws (6) on junction box (5).



3-8. LIGHT SWITCH DIMMER (TOGGLE) REPLACEMENT (CONT).

(4) Install gasket (4), cover plate (3) and two screws (2) on junction box (5).



c. Follow-On Maintenance:

- Connect batteries, (TM 9-4940-568-10).
- Check operation of light switch dimmer.

END OF TASK

3-9. GFCI AND STANDARD 110 VOLT RECEPTACLE REPLACEMENT.

This task covers:

a. Removal b. Installation c. Follow-On Maintenance

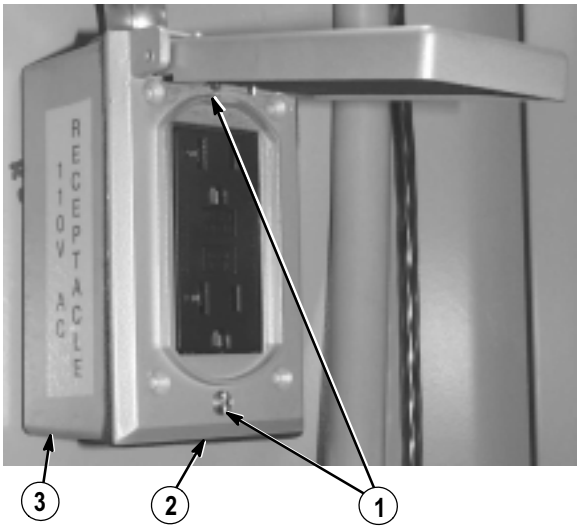
INITIAL SETUP

Tools and Special Tools
Tool Kit, Electrical (Item 29, Appendix G)
Tool Kit, General Mechanic's: Automotive (Item 30, Appendix G)

Materials/Parts
Tags, Identification (Item 40, Appendix C)

Equipment Condition
FRS unloaded, (TM 9-4940-568-10)
Batteries disconnected, (TM 9-4940-568-10)

a. Removal.

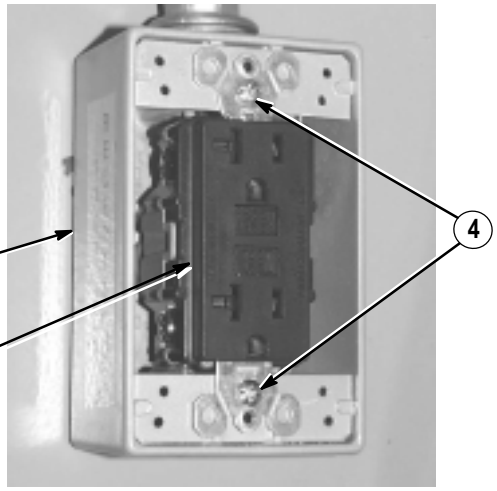


NOTE

- GFCI and standard 110 volt receptacles are replaced the same way except that the GFCI receptacle cover uses two screws and the standard receptacle cover uses four screws for mounting.
- There are two GFCI and two standard receptacles found on the FRS. GFCI shown.

(1) Remove two screws (1) and receptacle cover/gasket (2) from junction box (3).

(2) Remove two screws (4) and receptacle (5) from junction box (3).

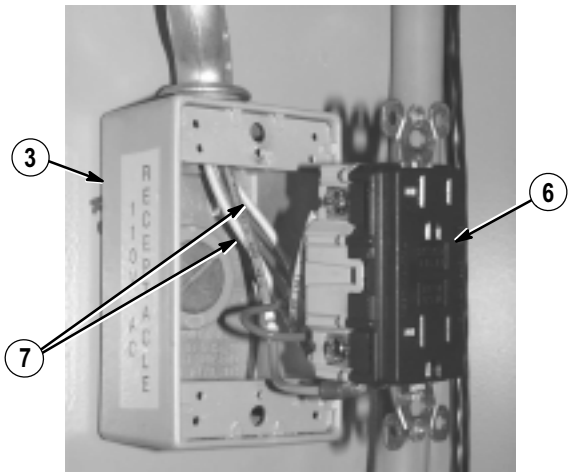


3-9. GFCI AND STANDARD 110 VOLT RECEPTACLE REPLACEMENT (CONT).

NOTE

Tag and mark all wire locations prior to wire removal.

(3) Pull receptacle (6) from junction box (3) and remove wires (7) from receptacle (6).

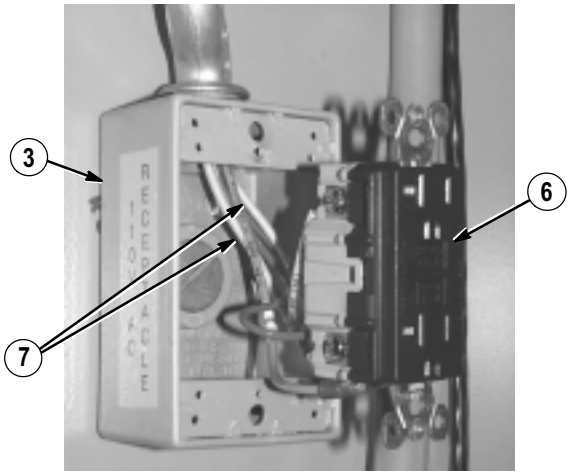


b. Installation.

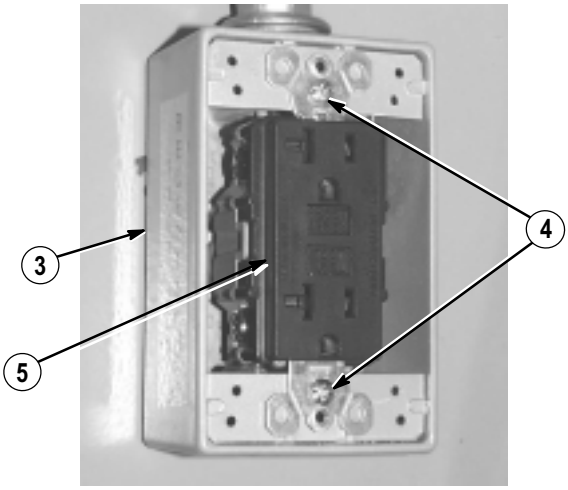
NOTE

Install wires in locations as noted prior to removal.

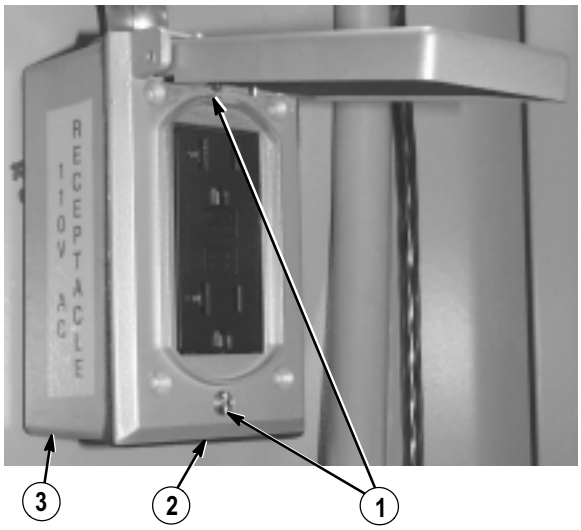
(1) Insert wires (7) into receptacle (6) and place inside junction box (3).



(2) Install receptacle (5) with two screws (4) in junction box (3).



(3) Install receptacle cover/gasket (2) and two screws (1) into junction box (3).



c. Follow-On Maintenance:

- Connect batteries, (TM 9-4940-568-10).
- Start generator and check for proper orientation, (TM 9-4940-568-10).

END OF TASK

3-10. FIXED LIGHT ASSEMBLY REPLACEMENT.

This task covers:

a. Removal b. Installation c. Follow-On Maintenance

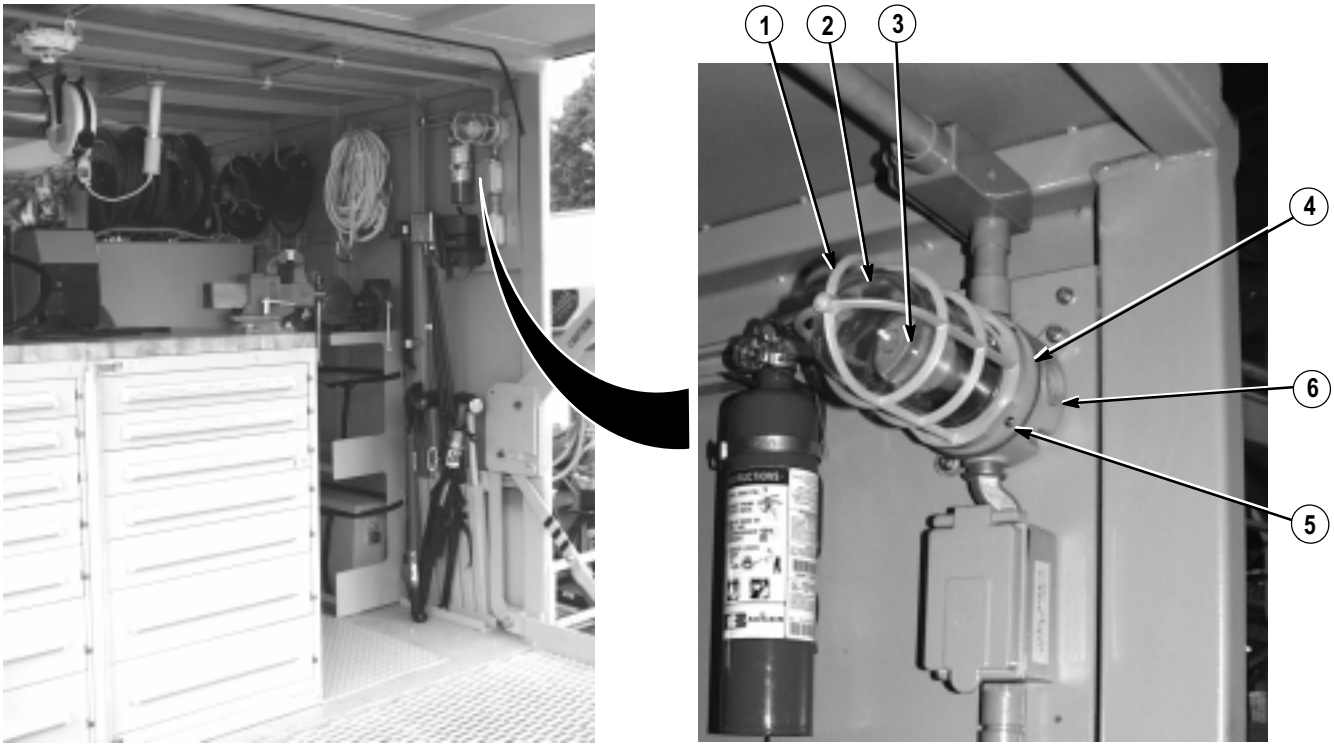
INITIAL SETUP

Tools and Special Tools
Tool Kit , General Mechanic's: Automotive (Item 30, Appendix G)

Materials/Parts
Tags, Identification (Item 40, Appendix C)
Gasket (Item 13, Appendix F)

Equipment Condition
FRS unloaded, (TM 9-4940-568-10)
Batteries disconnected, (TM 9-4940-568-10)

a. Removal.



NOTE

The following procedures are identical for all four fixed light assemblies. Left rear is shown.

(1) Remove light guard (1), glass dome (2) and light bulb (3) from fixed light base (4).

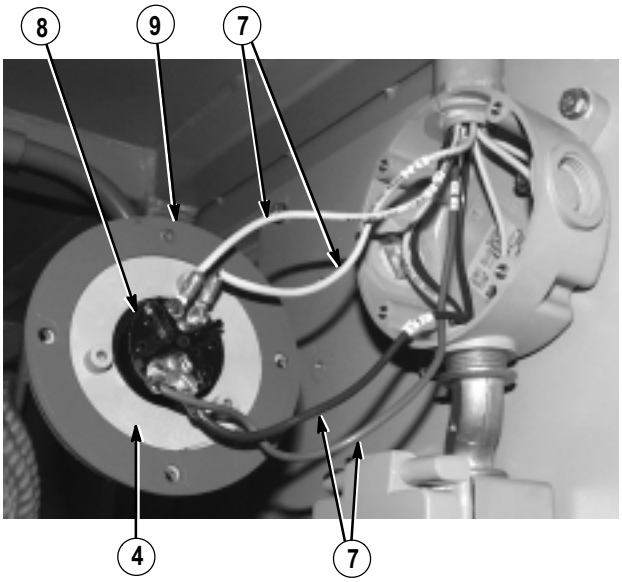
(2) Remove four screws (5) and light base (4) from fixture (6).

NOTE

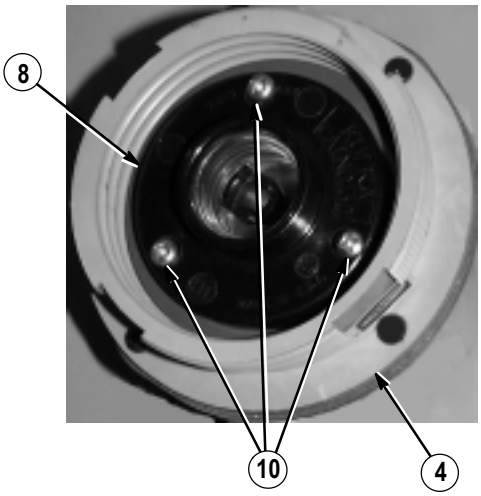
Tag all wires prior to removal.

(3) Disconnect four wire leads (7) from back of light bulb receptacle (8).

(4) Remove gasket (9) from light base (4). Discard gasket.

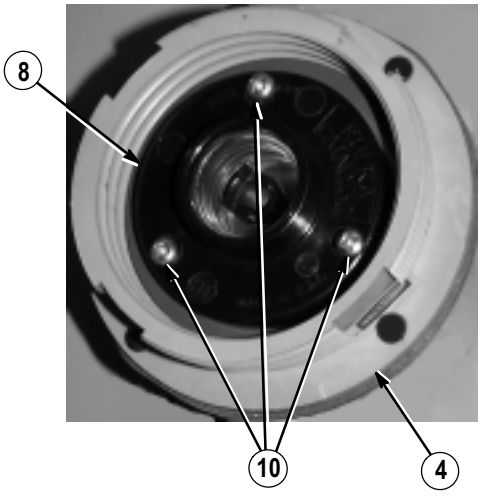


(5) If necessary, remove three screws (10) and light bulb receptacle (8) from light base (4).



b. Installation.

(1) If removed, install light bulb receptacle (8) on light base (4) using three screws (10).



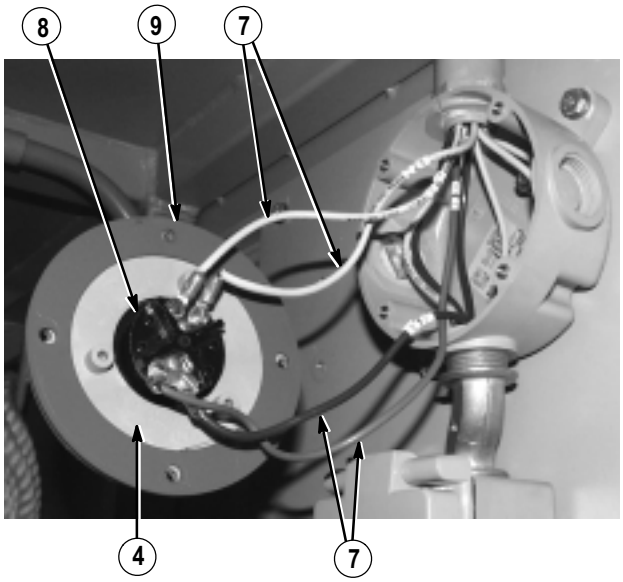
3-10. FIXED LIGHT ASSEMBLY REPLACEMENT (CONT).

(2) Install gasket (9) on light base (4).

NOTE

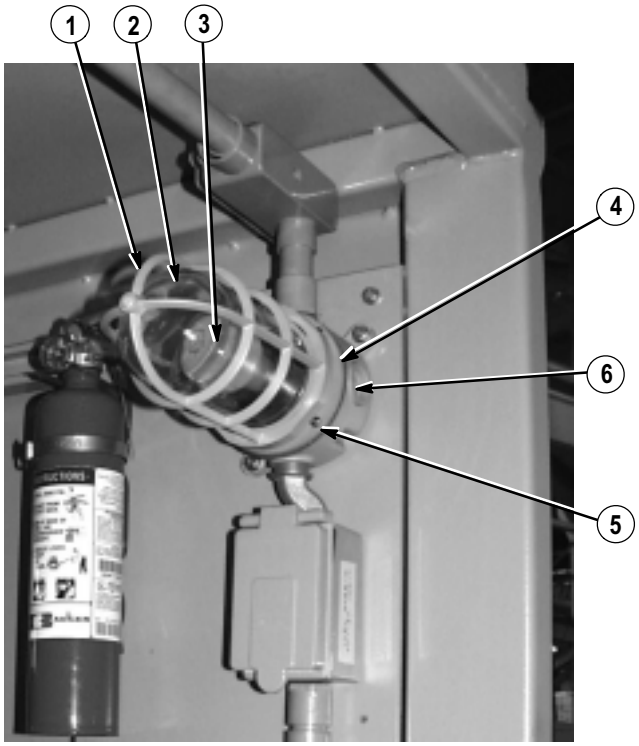
Install wires as noted prior to removal.

(3) Connect four wire leads (7) to back of light bulb receptacle (8).



(4) Install light base (4) on fixture (6) using four screws (5).

(5) Install light bulb (3), glass dome (2) and light guard (1) to fixed light base (4).



c. Follow-On Maintenance:

- Connect batteries, (TM 9-4940-568-10).
- Check lights for proper operation, (TM 9-4940-568-10).

END OF TASK

3-11. DOME LIGHT ASSEMBLY REPLACEMENT.

This task covers:

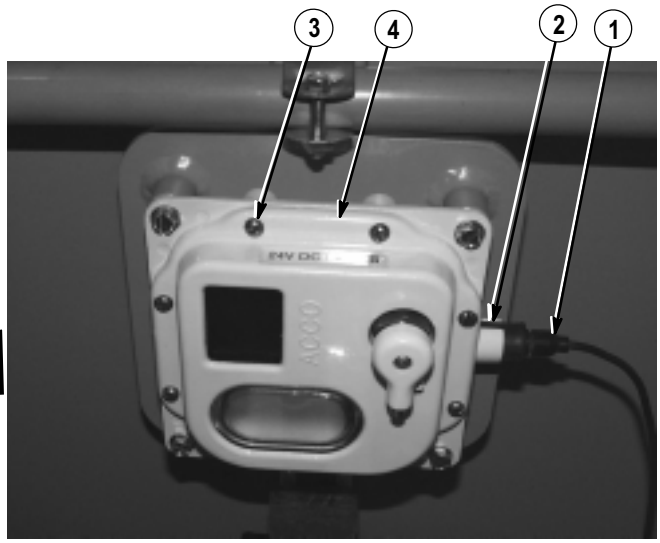
a. Disassembly b. Assembly c. Follow-On Maintenance

INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 30, Appendix G)

Equipment Condition
FRS unloaded, (TM 9-4940-568-10)
Batteries disconnected, (TM 9-4940-568-10)

a. Disassembly.



NOTE

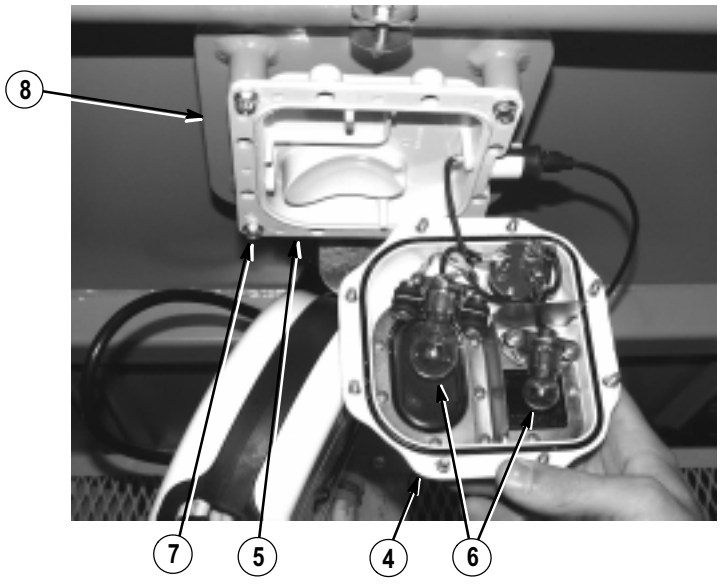
The following procedures are identical for both dome light assemblies. Right side is shown.

(1) Disconnect electrical lead (1) from dome light assembly (2).

(2) Remove eight screws (3) and dome light cover (4) from dome light base (5).

(3) Remove two bulbs (6) from dome light cover (4).

(4) Remove four self–tapping screws (7) and dome light base (5) from bracket (8).

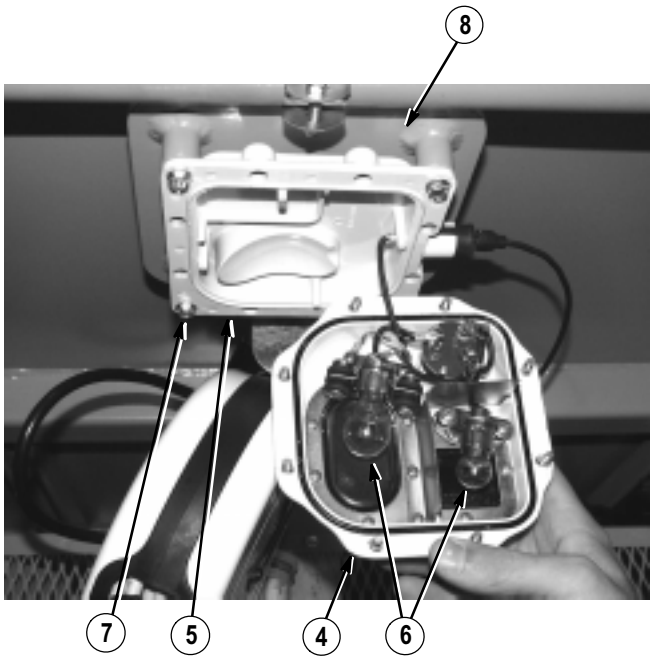


3-11. DOME LIGHT ASSEMBLY REPLACEMENT (CONT).

b. Assembly.

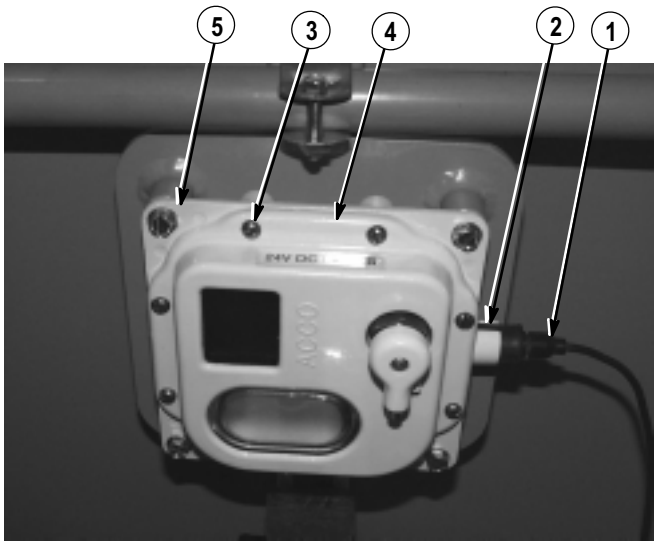
(1) Install four self–tapping screws (7) and dome light base (5) on bracket (8).

(2) Install two bulbs (6) into dome light cover (4).



(3) Install eight screws (3) and dome light cover (4) on dome light base (5).

(4) Connect electrical lead (1) to dome light assembly (2).



c. Follow-On Maintenance:

- Connect batteries, (TM 9-4940-568-10).
- Check for proper operation, (TM 9-4940-568-10).

END OF TASK

3-12. RETRACTABLE WORKLIGHT ASSEMBLY AND LAMP REPLACEMENT.

This task covers:

a. Removal b. Installation c. Follow-On Maintenance

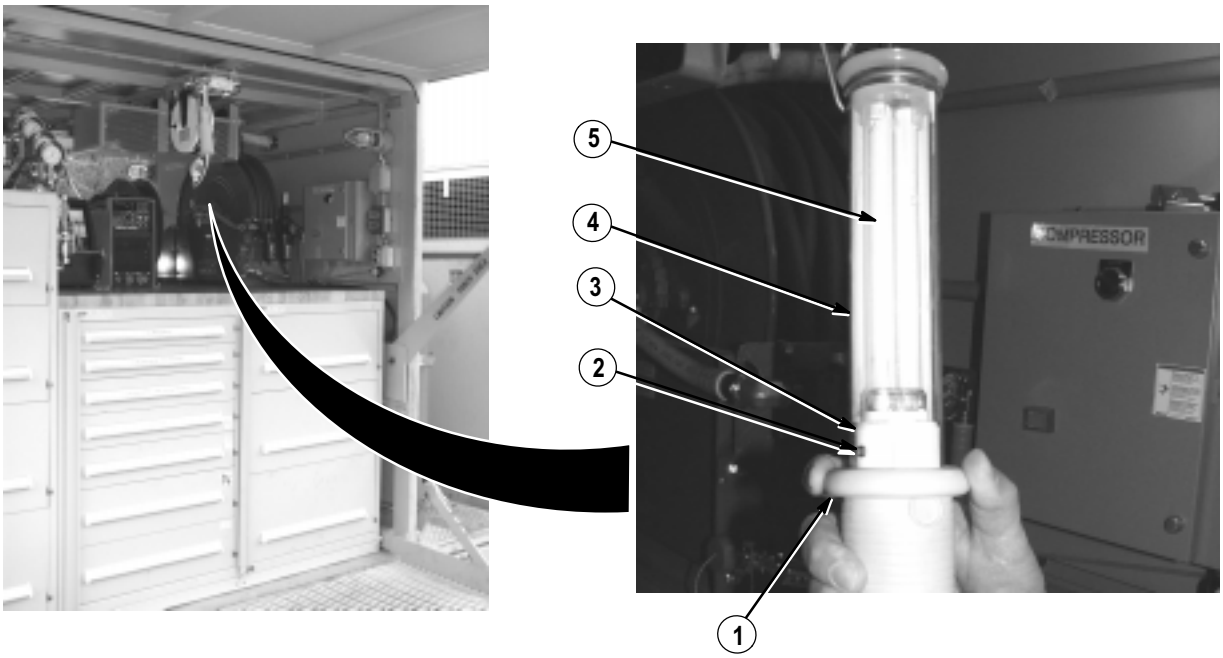
INITIAL SETUP

Tools and Special Tools
Tool Kit , General Mechanic's: Automotive (Item 30, Appendix G)
Tool Kit, Electric (Item 29, Appendix G)

Materials/Parts
Tags, Identification (Item 40, Appendix C)

Equipment Condition
FRS unloaded, (TM 9-4940-568-10)
Batteries disconnected, (TM 9-4940-568-10)

a. Removal.



NOTE

The following procedures are identical for both retractable worklight assemblies. The right side is shown.

(1) Roll back worklight grip (1) and remove two screws (2) from worklight (3).

(2) Remove worklight cover (4) and lamp (5) from worklight (3).

3-12. RETRACTABLE WORKLIGHT ASSEMBLY AND LAMP REPLACEMENT (CONT).

(3) Remove four screws (6) and junction box cover (7) from junction box (8).

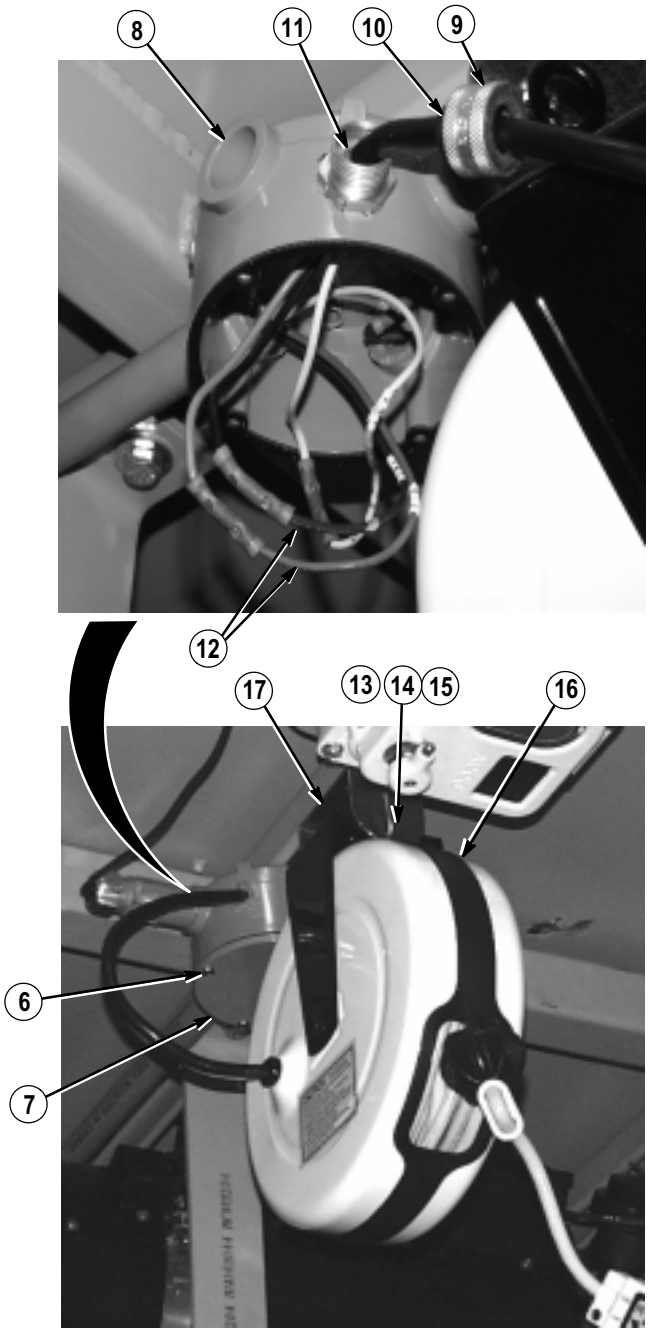
(4) Remove collar (9) and grommet (10) from connector (11).

NOTE

Tag and mark wires prior to removal.

(5) Cut two electrical wires (12) and remove from junction box (8).

(6) Remove nut (13), washer (14), screw (15) and retractable worklight assembly (16) from bracket (17). Retain collar and grommet for use with new worklight assembly.



b. Installation.

(1) Install screw (15), washer (14), nut (13) and retractable worklight assembly (16) to bracket (17).

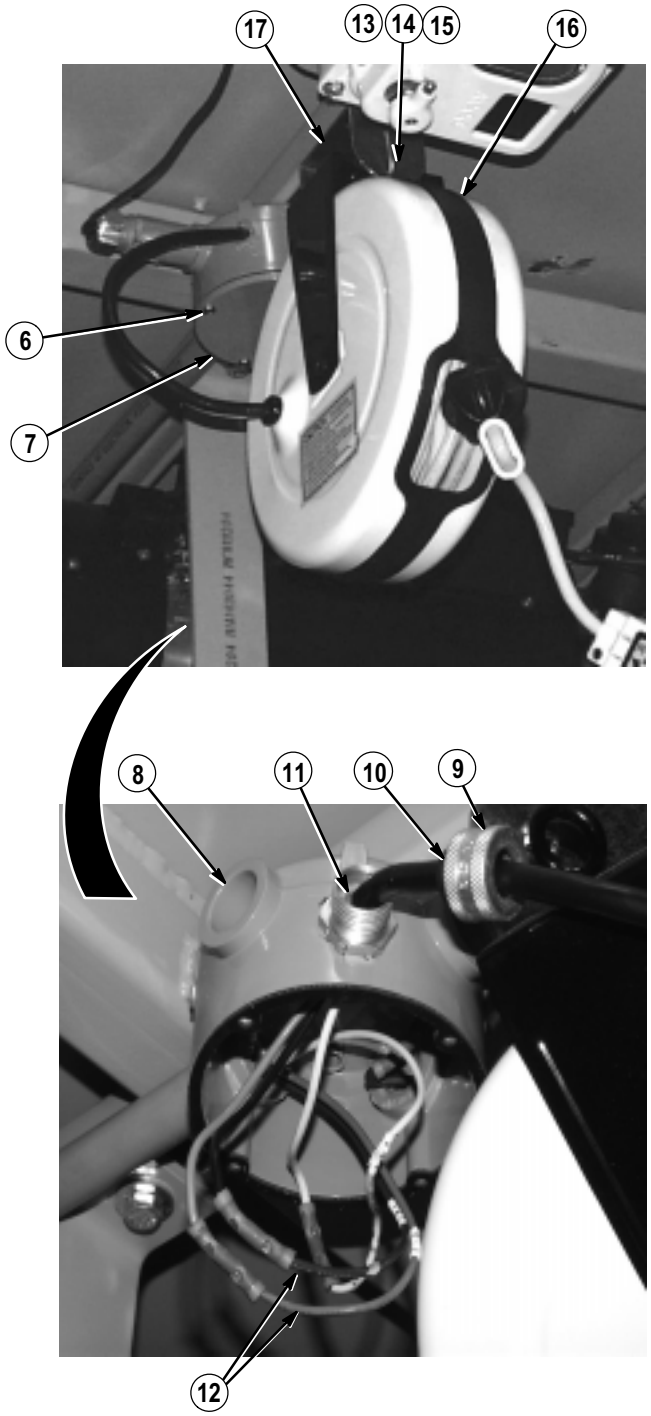
NOTE

Install wires in position noted prior to removal.

(2) Install two electrical wires (12) to junction box (8).

(3) Install grommet (10) and collar (9) onto connector (11).

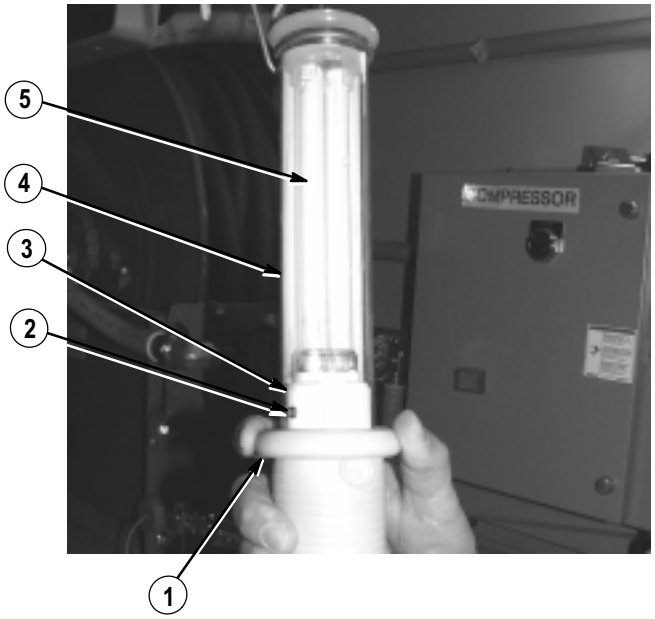
(4) Install four screws (6) and junction box cover (7) on junction box (8).



3-12. RETRACTABLE WORKLIGHT ASSEMBLY AND LAMP REPLACEMENT (CONT).

(5) Install lamp (5) and worklight cover (4) on worklight (3).

(6) Install two screws (2) onto worklight (3) and roll worklight grip (1) into correct position.



c. Follow-On Maintenance:

- Connect batteries, (TM 9-4940-568-10).
- Check worklight for proper operation, (TM 9-4940-568-10).

END OF TASK

3-13. RECHARGEABLE HANDLAMP AND BASE REPAIR.

This task covers:

a. Removal
b. Disassembly
c. Assembly
d. Installation
e. Follow-On Maintenance

INITIAL SETUP

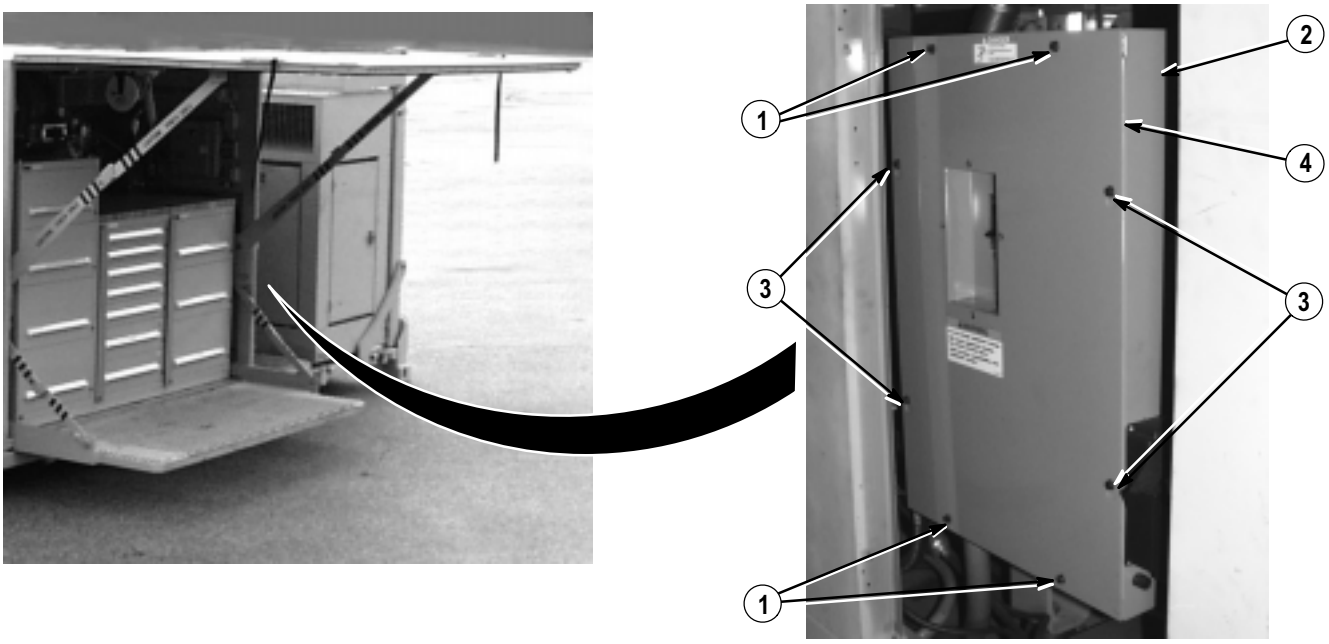
Tools and Special Tools
Tool Kit , General Mechanic's: Automotive (Item 30, Appendix G)
Tool Kit, Electric (Item 29, Appendix G)

Materials/Parts
Tags, Identification (Item 40, Appendix C)
Lockwasher (4) (Item 69, Appendix F)

Materials/Parts
Screw, Self-Tapping (4) (Item 101, Appendix F)

Equipment Condition
FRS unloaded, (TM 9-4940-568-10)
Batteries disconnected, (TM 9-4940-568-10)

a. Removal.



NOTE

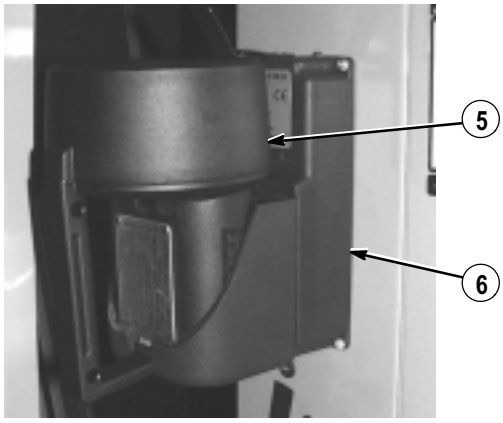
There are three rechargeable handlamps. Follow Steps (1) through (9) for removal of rechargable handlamp located on the generator and Steps (10) through (14) for handlamps located in the shelter.

(1) Remove four screws (1) from generator circuit panel (2).

(2) Loosen four screws (3) and remove panel cover (4) from generator circuit panel (2).

3-13. RECHARGEABLE HANDLAMP AND BASE REPAIR (CONT).

(3) Remove handlamp (5) from lamp charger (6).

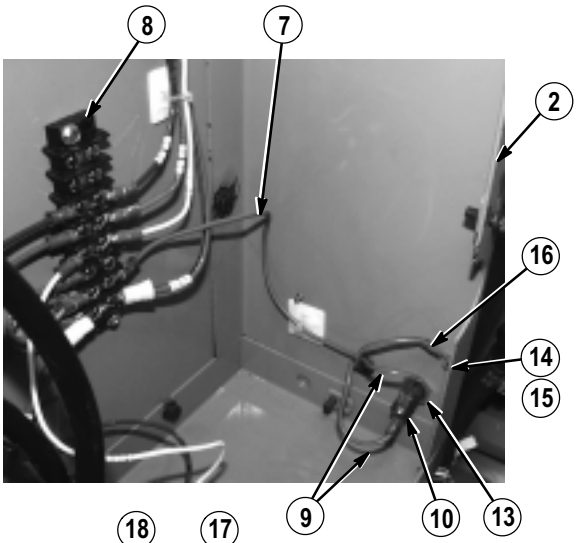


NOTE

Tag and mark all wires and connectors prior to removal.

(4) Disconnect wire (7) from bus bar (8).

(5) Disconnect two wires (9) from back of fuse holder (10).

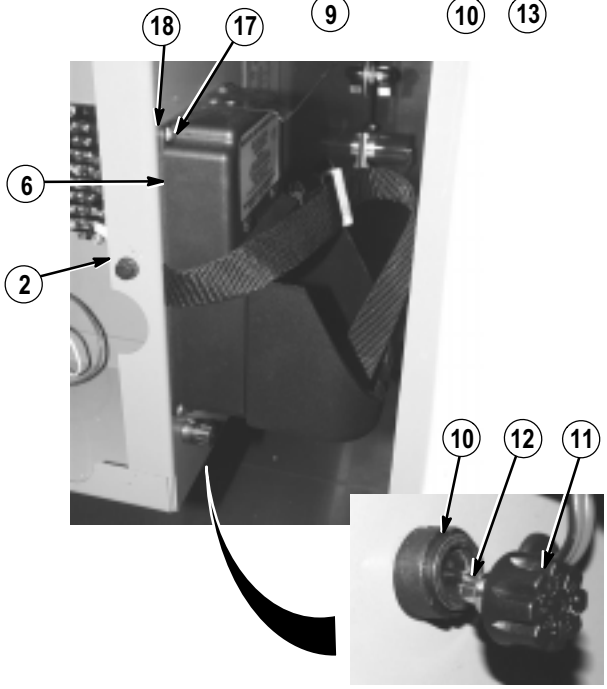


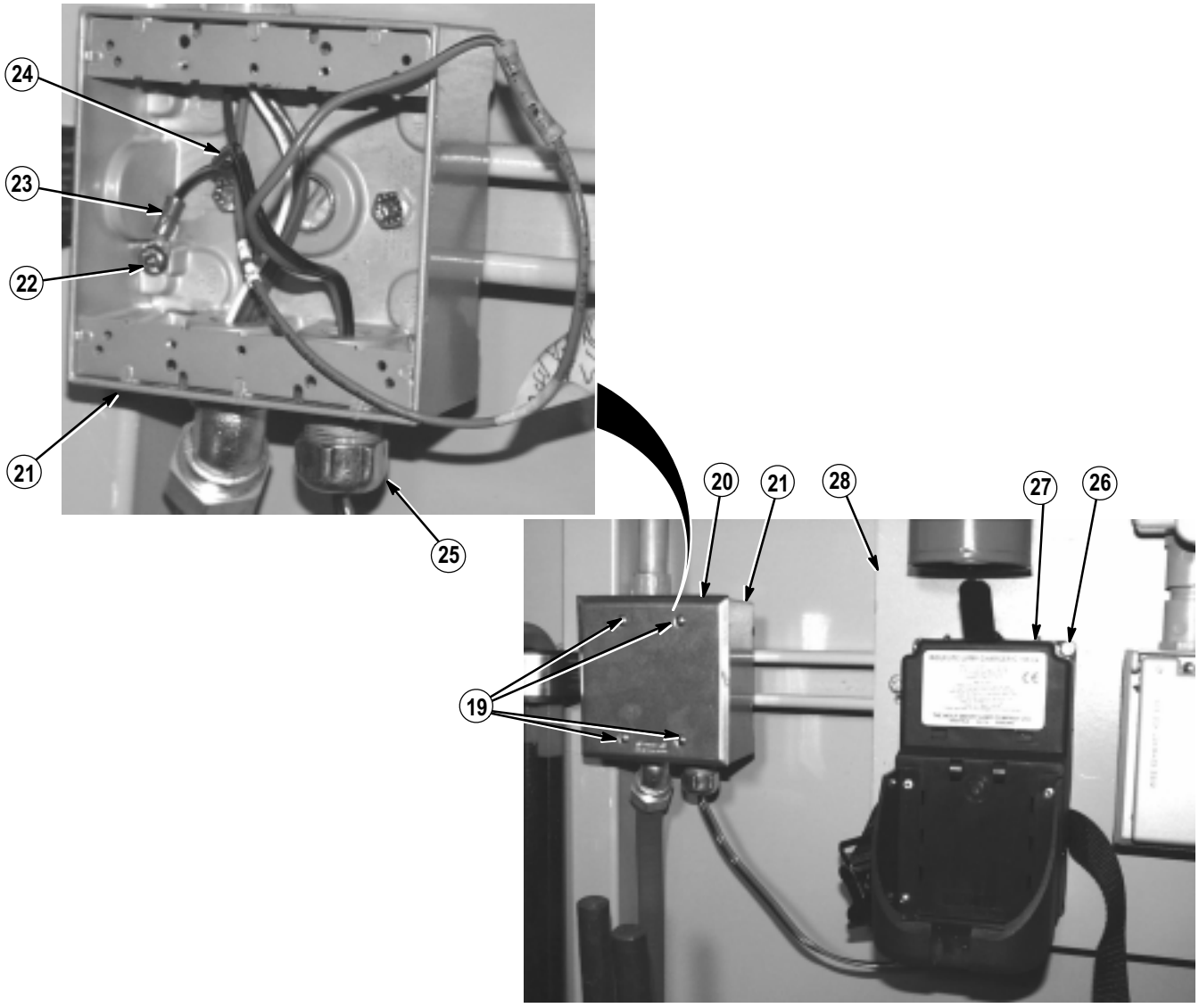
(6) Remove fuse cap (11) and fuse (12) from fuse holder (10).

(7) Remove nut (13) and fuse holder (10) from generator circuit panel (2).

(8) Remove nut (14), washer (15) and ground wire (16) from lower left screw.

(9) Remove four screws (17), lockwashers (18) and lamp charger (6) from generator circuit panel (2). Discard lockwashers.





(10) Remove four screws (19) and cover plate (20) from junction box (21).

(11) Remove screw (22) and ground wire (23) from junction box (21).

(12) Cut wire (24) and remove wire connector.

(13) Remove nut (25) and pull handlamp wires through junction box (21).

(14) Remove four self-tapping screws (26) and lamp charger (27) from shelter panel (28).

3-13. RECHARGEABLE HANDLAMP AND BASE REPAIR (CONT).

b. Disassembly.

(1) Remove lens cap (1).

NOTE

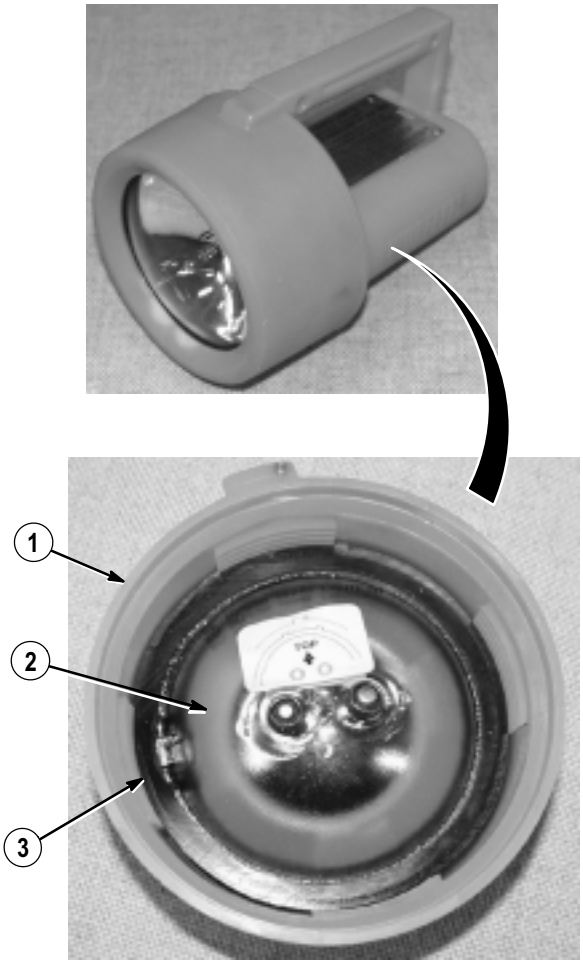
Note position of terminals on bulb before removal.

(2) Remove bulb (2) from lens cap (1).

NOTE

- Note position of rubber seal before removal.
- Note position of molded flange on seal.

(3) Remove rubber seal (3) from lens cap (1).

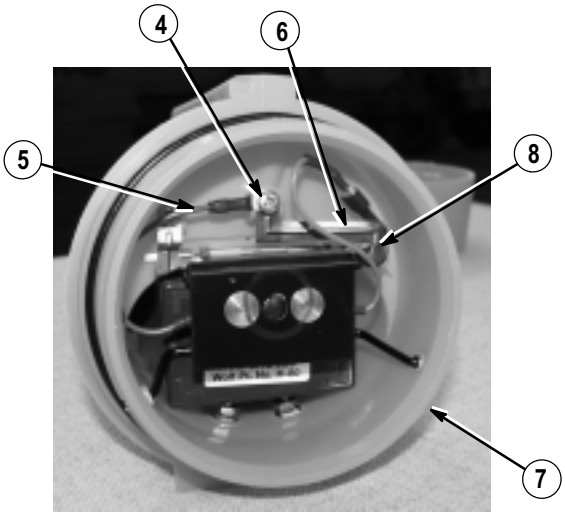


NOTE

Note position of fuse plate before removal.

(4) Remove screw (4), wire (5) and fuse plate (6) from handlamp (7).

(5) Remove fuse (8) from handlamp (7).



c. Assembly.

(1) Position fuse (8) in handlamp (7).

NOTE

Install fuse plate as noted during disassembly.

(2) Install fuse plate (6) and wire (5) with screw (4) on handlamp (7).

NOTE

- Install rubber seal as noted during disassembly.
- Ensure molded flange on rubber seal is in position noted during disassembly.

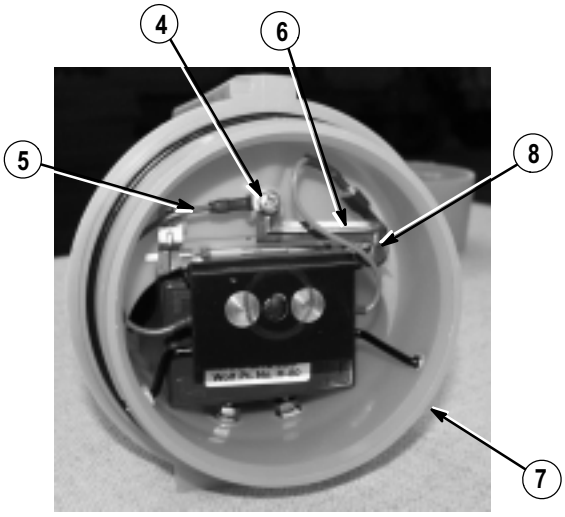
(3) Install rubber seal (3) on lens cap (1).

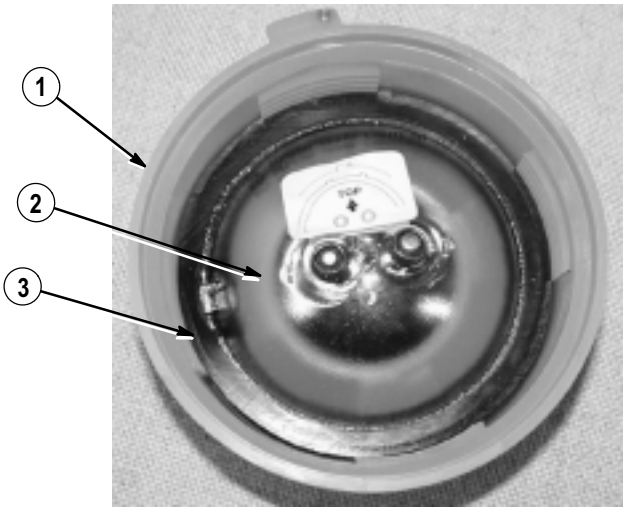
NOTE

Ensure terminals on bulb are in position noted during disassembly.

(4) Install bulb (2) in lens cap (1).

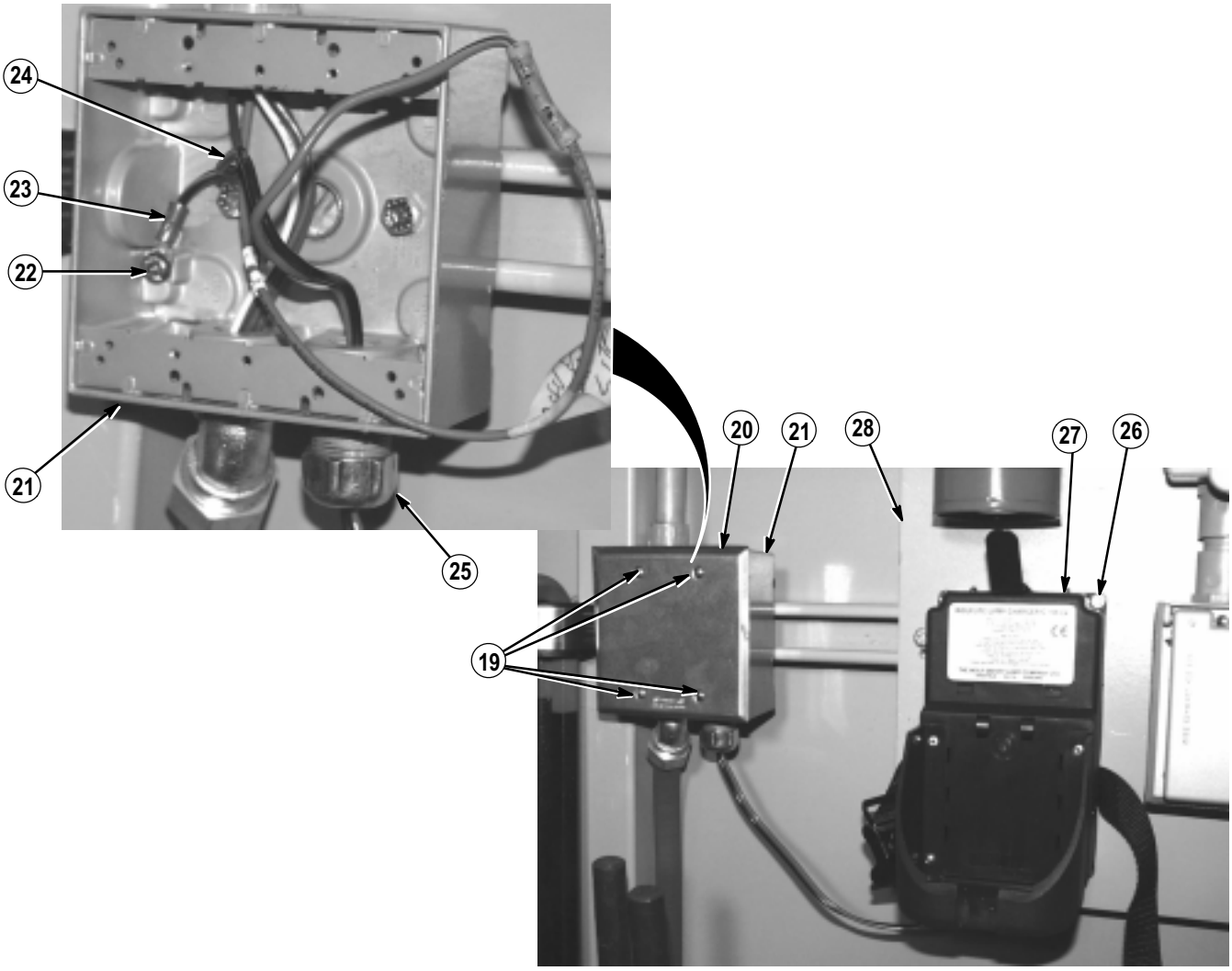
(5) Install lens cap (1) on handlamp (7).





3-13. RECHARGEABLE HANDLAMP AND BASE REPAIR (CONT).

d. Installation.



NOTE

- There are three rechargeable handlamps. Follow Steps (1) through (5) for rechargeable handlamps located in the shelter and Steps (6) through (14) for installation of rechargable handlamp located on the generator.
- If generator is new, mounting holes for handlamp base must be made.
- Install wires in position noted prior to removal.

(1) Install lamp charger (27) with four self-tapping screws (26) on shelter panel (28).

(2) Pull handlamp wires through junction box (21) and install nut (25).

(3) Install wire (24) and wire connector and crimp.

(4) Install screw (22) and ground wire (23) in junction box (21).

(5) Install cover plate (20) on junction box (21) with four screws (19).

(6) Install lamp charger (6) on generator circuit panel (2) with four screws (17) and lockwashers (18).

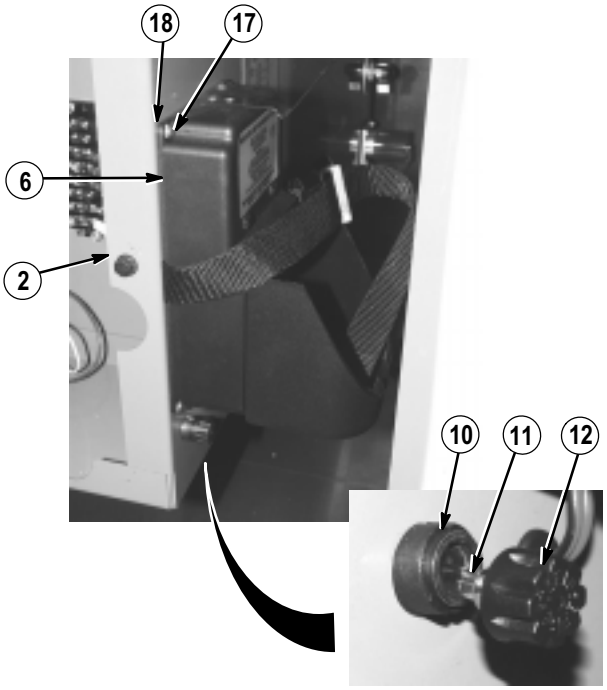
(7) Position ground wire (16) on lower left screw and install washer (15) and nut (14).

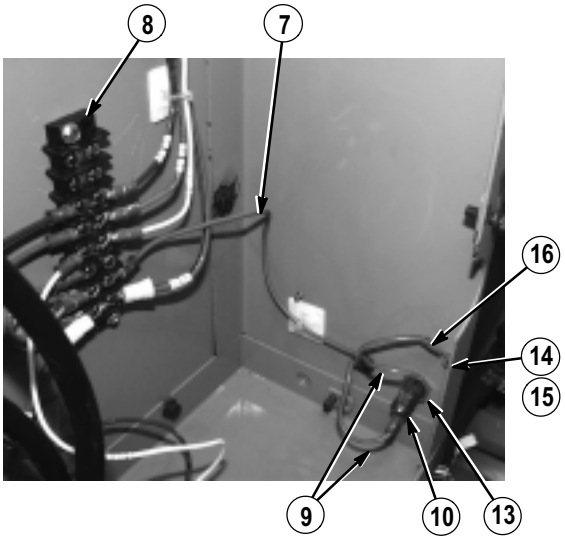
(8) Install fuse holder (10) and nut (13) on generator circuit panel (2).

(9) Install fuse (12) and fuse cap (11) on fuse holder (10).

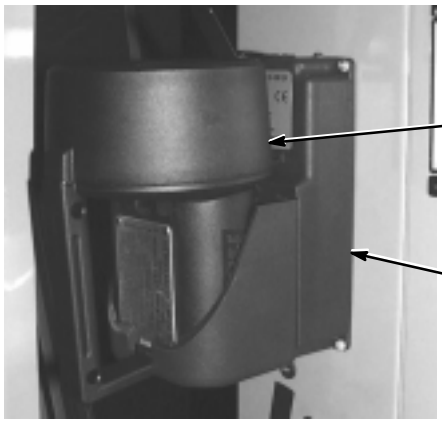
(10) Connect two wires (9) to back of fuse holder (10).

(11) Connect wire (7) to bus bar (8).





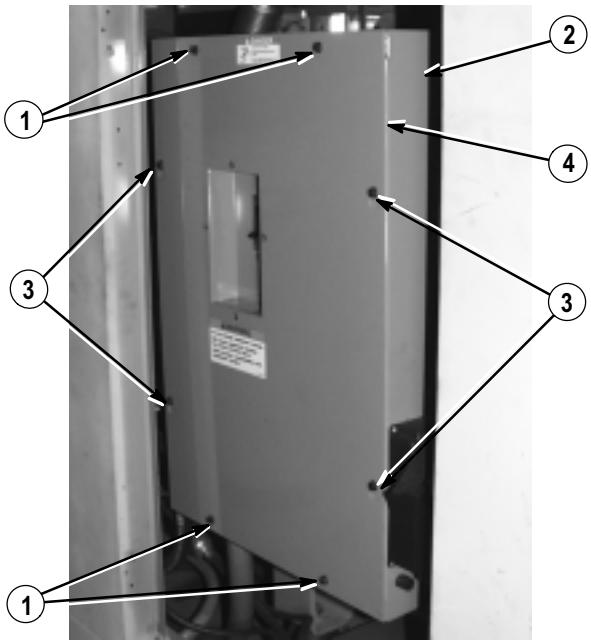
(12) Install handlamp (5) on lamp charger (6).



3-13. RECHARGEABLE HANDLAMP AND BASE REPAIR (CONT).

(13) Position panel cover (4) on generator circuit panel (2) and install four screws (1).

(14) Tighten four screws (3) on generator circuit panel (2).



e. Follow-On Maintenance:

- Connect batteries, (TM 9-4940-568-10).
- Check operation of handlamp, (TM 9-4940-568-10).

END OF TASK

3-14. BATTERY REPLACEMENT.

This task covers:

a. Removal b. Installation c. Follow-On Maintenance

INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 30, Appendix G)
Gloves, Chemical and Oil Protective (Item 13, Appendix G)
Goggles, Industrial (Item 14, Appendix G)

Materials/Parts
Coating Compound, Bituminous (Item 14, Appendix C)
Locknut (2) (Item 36, Appendix F)

Personnel Required
Two

References
TM 9-6140-200-14

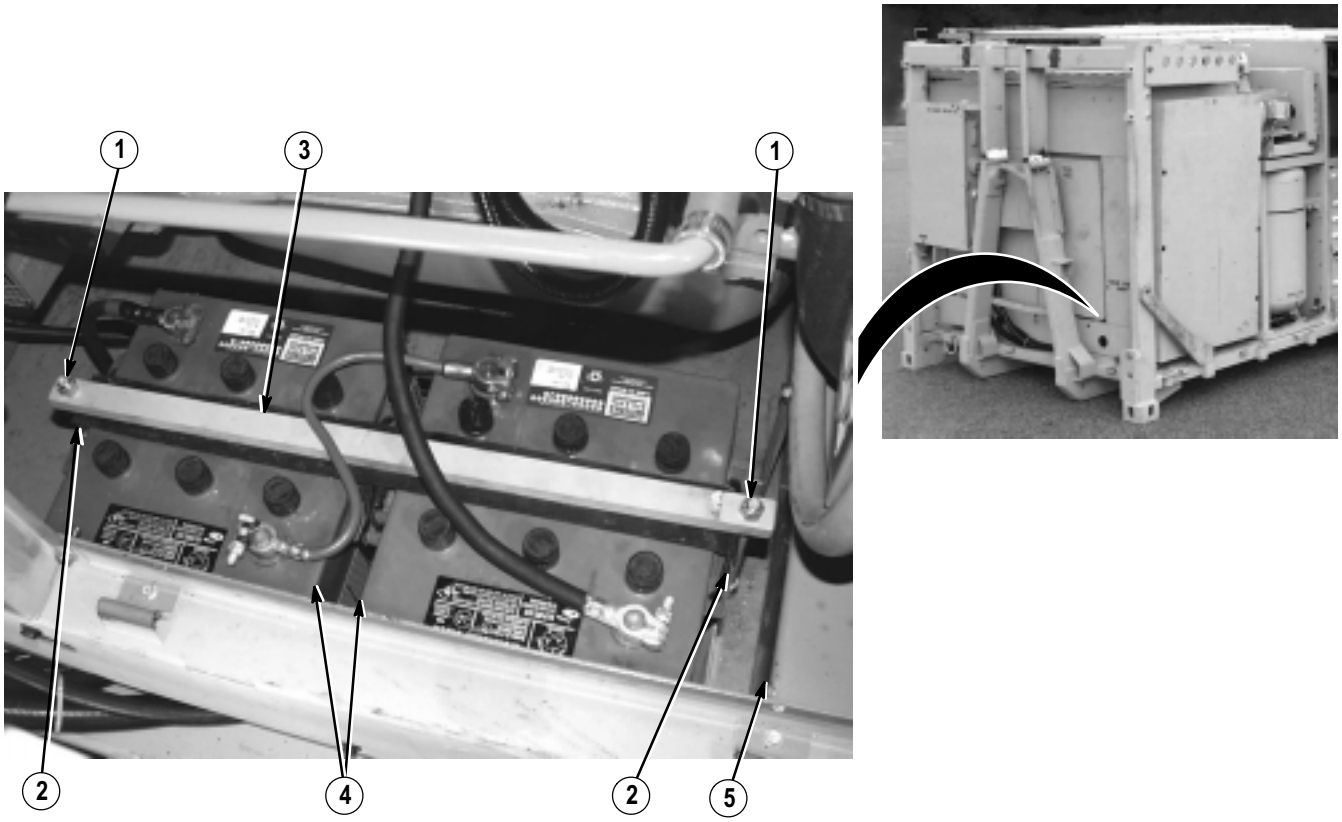
Equipment Condition
FRS unloaded, (TM 9-4940-568-10).
Batteries disconnected, (TM 9-4940-568-10).

WARNING

- Be careful not to short out battery terminals. Do not smoke or use open flame near batteries. Batteries may explode from a spark. Battery acid is harmful to skin and eyes.
- Wear safety goggles and acid-proof gloves when battery cover must be removed or when adding electrolyte.
- Avoid electrolyte contact with skin, eyes, or clothing. If battery electrolyte spills, take immediate action to stop burning effects:
  - External: Immediately flush with cold running water to remove all acid.
  - Eyes: Flush with cold water for at least 15 minutes. Seek immediate medical attention.
  - Internal: Drink large amounts of water or milk. Seek immediate medical attention.
  - Clothing or Vehicle: Wash at once with cold water.
- 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.

3-14. BATTERY REPLACEMENT (CONT).

a. Removal.



(1) Remove two locknuts (1) from battery hold down screws (2). Discard locknuts.

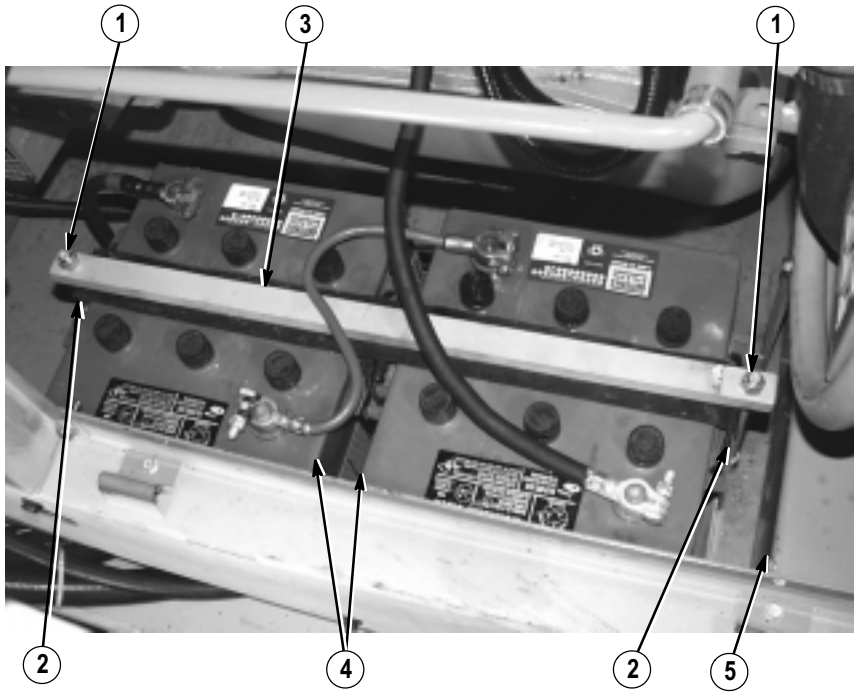
(2) Remove battery hold down (3) from screws (2).

WARNING

Battery weighs 75 lbs (34 kg). Remove battery only with the aid of an assistant to prevent possible injury to personnel.

(3) With aid of an assistant, remove battery or batteries (4) from battery box (5).

b. Installation.



WARNING

Battery weighs 75 lbs (34 kg). Install battery only with the aid of an assistant to prevent possible injury to personnel.

NOTE

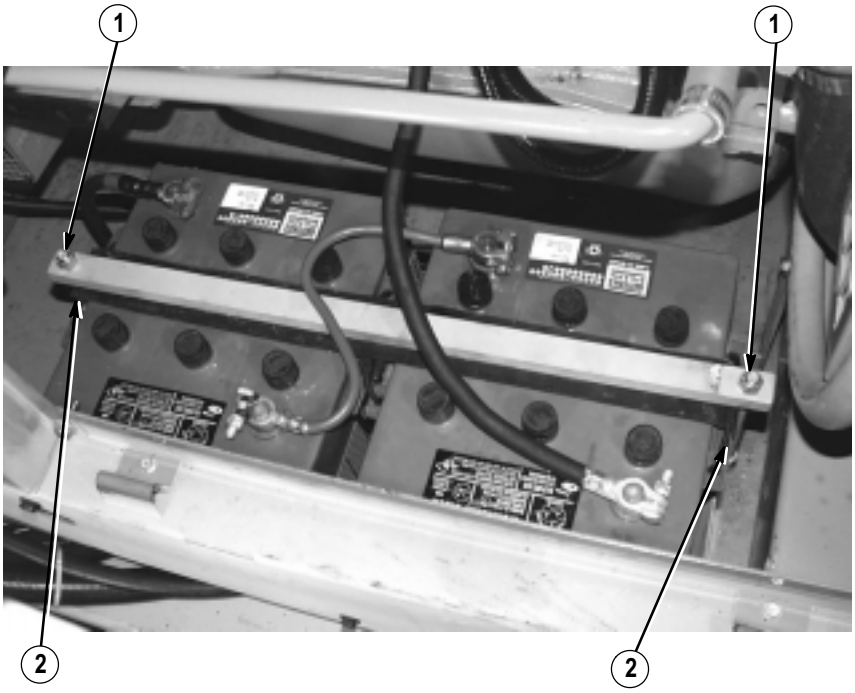
- Use data plate located on left hand noise panel for assistance in battery positioning in Step (1).
- Refer to TM 9-6140-200-14 for more specific details on battery maintenance.

(1) With the aid of an assistant, install battery (4) in battery box (5).

(2) Position battery hold down (3) on screws (2).

(3) Tighten locknut so bottom of locknut (1) is in contact with hold down (3). Then turn locknut (1) down two turns.

3-14. BATTERY REPLACEMENT (CONT).



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) Coat threads of screws (2) and locknuts (1) with bituminous coating compound.

c. Follow-On Maintenance:

- Connect batteries, (TM 9-4940-568-10).

END OF TASK

3-15. AC VOLTAGE ADJUSTMENT.

This task covers:

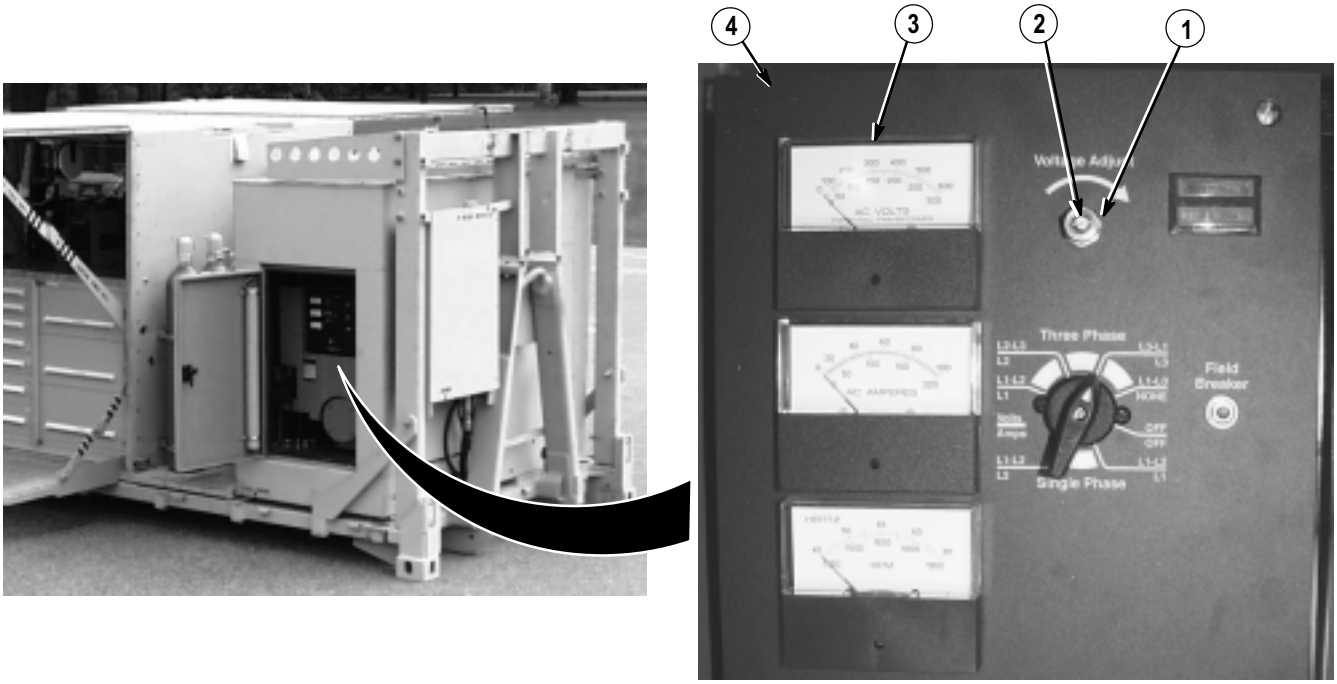
a. Adjustment b. Follow-On Maintenance

INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 30, Appendix G)

Equipment Condition
FRS unloaded, (TM 9-4940-568-10)
Generator started, (TM 9-4940-568-10).

a. Adjustment.



NOTE

The AC voltage may only be adjusted ± 5 percent of the nominal voltage selected on the phase selector switch.

(1) Loosen nut (1) and turn adjustment screw (2) clockwise or counterclockwise to adjust voltage.

(2) Tighten nut (1) while holding adjustment screw (2).

(3) Verify voltage (208V ± 5 percent) by reading AC voltmeter (3) on control panel (4). If voltage cannot be obtained, refer to Para 2-11.

b. Follow-On Maintenance:

- Shut down generator, (TM 9-4940-568-10).

3-16. WIRING HARNESS MAINTENANCE.

This task covers:

a. Solderless Terminal Removal
b. Wire Splicing Using Butt Connectors
c. Wire Splicing Using Solder Method
d. Deutsch Connector (Plug or Receptacle) Repair or Replacement
e. Cannon Connector (Plug or Receptacle) Repair or Replacement
f. Type II Connector Repair or Replacement
g. Hirschman Connector Repair or Replacement

INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 30, Appendix G)
Deutsch Crimping Tool, (Item 5, Appendix G)
Extraction Tool (Item 12, Appendix G)
Terminal Remover, Weatherpac (Item 26, Appendix G)
Weather Pack Crimper (Item 32, Appendix G)

Materials/Parts
Adhesive (Item 4, Appendix C)
Adhesive-Sealant (Item 3, Appendix C)
Alcohol (Item 6, Appendix C)
Heat Shrink Tubing (Item 22, Appendix C)
Solder (Item 36, Appendix C)

Equipment Condition
FRS unloaded, (TM 9-3990-361-10)

a. Solderless Terminal Removal.

CAUTION

Terminals come in different styles and sizes. To prevent equipment damage, be sure to use only the exact replacements. Do not attempt to modify terminal to fit.

(1) Remove old terminal (1) and trim end of wire (2) as needed to make an undamaged end.

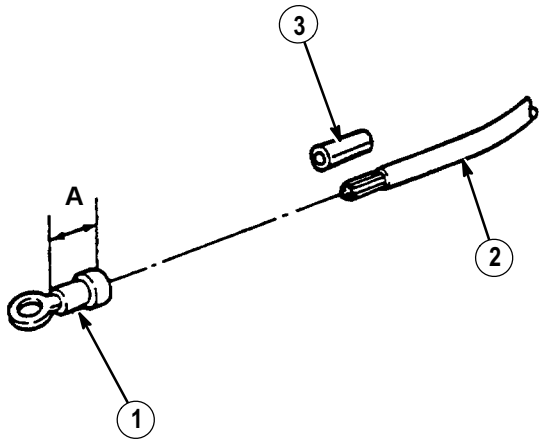
NOTE

If trimming causes wire to become too short, refer to splicing sections (b and c) of this paragraph.

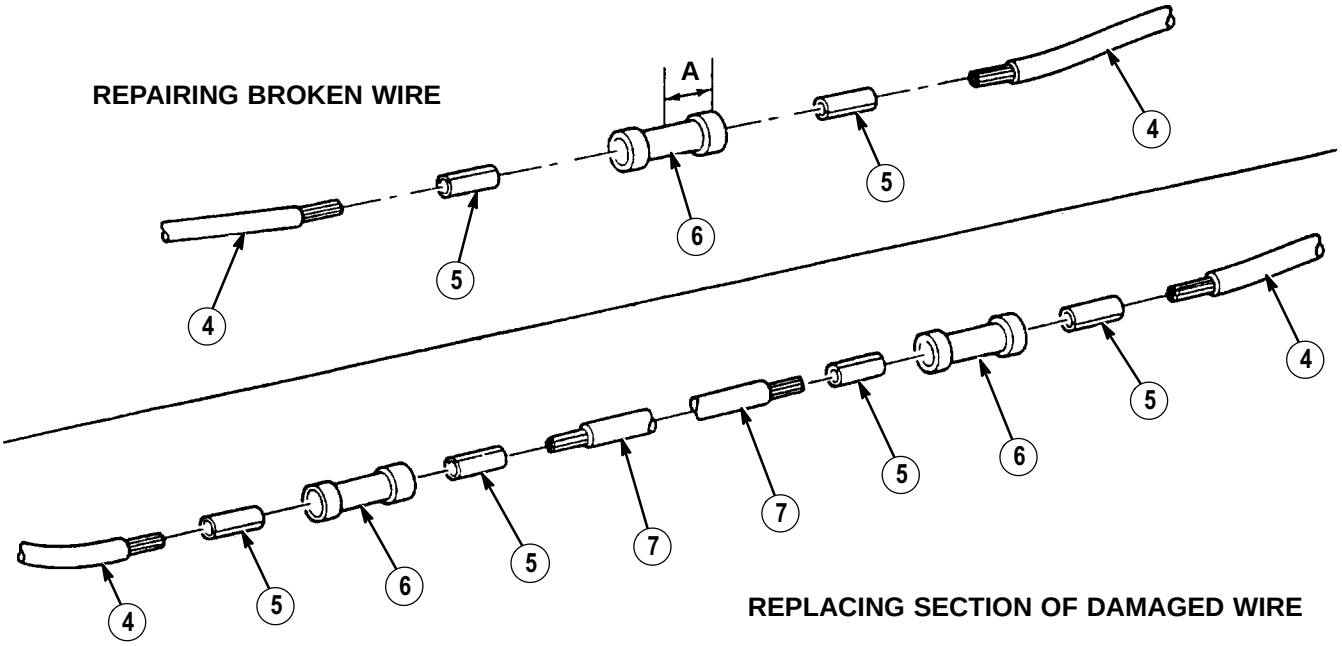
(2) Remove insulation (3) from end of wire (2) equal to the length of dimension A.

(3) Install new terminal (1) over bare end of wire (2). Make sure all strands of wire (2) are inside of terminal (1).

(4) Crimp new terminal (1) firmly in place.



b. Wire Splicing Using Butt Connectors.



NOTE

- Wherever possible, use solder method of wire splicing. Refer to section c of this paragraph.
- If reparing a broken wire perform steps (1) through (4) only. If section of wire is being replaced, perform Steps (5) through (11).

(1) Remove damaged piece of wire (4).

CAUTION

To prevent equipment damage, always use proper gage wire and proper size butt connectors.

(2) Remove insulation (5) from both ends of wire (4) equal to the length of dimension A.

(3) Install butt connector (6) over bare ends of wire (4) and crimp firmly at both ends.

(4) Inspect splice to make sure no bare wire (4) is visible.

(5) If a section of wire (4) is being replaced, install two butt connectors (6), one onto each bare end of wire (4).

(6) Crimp one end of both butt connectors (6) firmly in place over wire (4).

(7) Measure the distance between the two open ends of the two butt connectors (6).

(8) Cut a section of new wire (7) one inch (2.54 cm) longer than the distance measured in step (7).

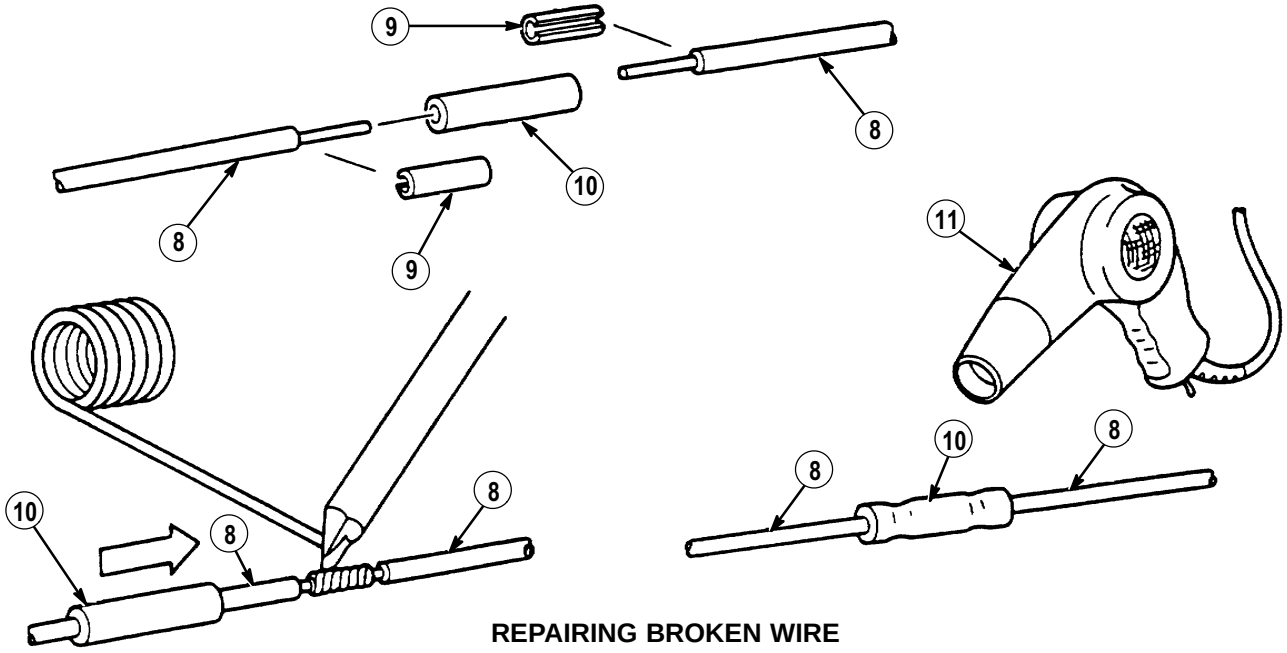
(9) Remove insulation (5) from both ends of new wire (7), equal to dimension A.

(10) Install bare ends of new wire (7) into butt connectors (6) and crimp firmly into place.

(11) Inspect splice and make sure that no bare wire (4 or 7) is visible.

3-16. WIRING HARNESS MAINTENANCE (CONT).

c. Wire Splicing Using Solder Method.



REPAIRING BROKEN WIRE

NOTE

- This method makes a stronger and more permanent repair. Use this method whenever possible.
- If repairing a broken wire, perform Steps (1) thru (7) only. If a section of wire is being replaced, perform Steps (8) thru (13).

(1) If needed, remove broken wire (8).

(2) Remove .75 in. (1.9 cm) of insulation (9) from both ends of wire (8).

(3) Slide a three inch (7.62 cm) piece of proper size heat shrink tubing (10) over one end of wire (8).

(4) Twist the bare ends of wire (8) together and solder. Make sure solder flows evenly onto both ends of wire (8).

WARNING

- To prevent personal injury, allow solder joint to cool before handling.
- To prevent personal injury, never use an open flame to apply heat shrink tubing.

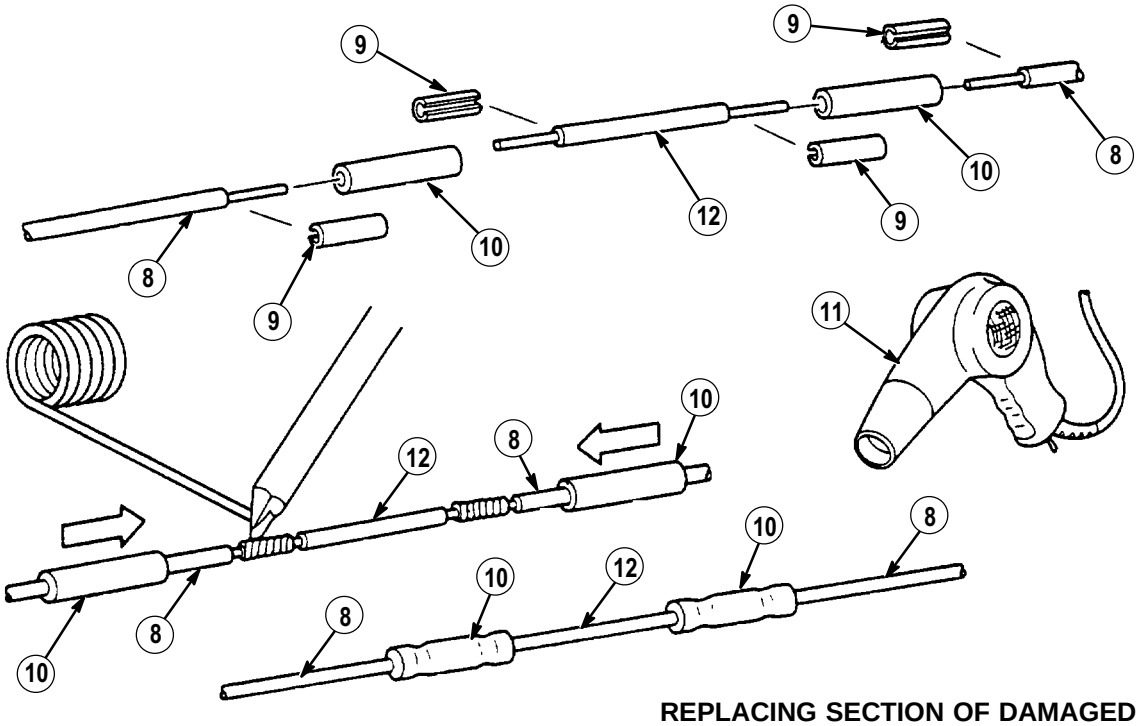
CAUTION

Do not overheat the heat shrink tubing. It will split or melt and have to be replaced.

(5) Slide heat shrink tubing (10) over solder joint.

(6) Make sure solder joint is centered in heat shrink tubing (10).

(7) Heat the heat shrink tubing (10) with a heat gun (11). Allow heat shrink tubing (10) to shrink until tight on solder joint and insulation of wire (8).



REPLACING SECTION OF DAMAGED WIRE

WARNING

To prevent personal injury, allow solder joint to cool before handling.

(8) If replacing a section of wire (8), measure distance between ends of wire (8).

CAUTION

Always use wire of the same gage as the wire being repaired. Use of wire of a smaller gage will cause equipment damage and/or failure.

(9) Cut a section of new wire (12) two inches (5.08 cm) longer than the distance measured in Step (8).

(10) Remove .75 in. (1.9 cm) of insulation (9) from both ends of new wire (12).

(11) Slide two, three inch (7.62 cm) pieces of heat shrink tubing (10) over ends of wire (8).

(12) Twist the bare ends of wires (8) and new wires (12) together and solder. Make sure solder flows evenly onto both wires (8) of each joint.

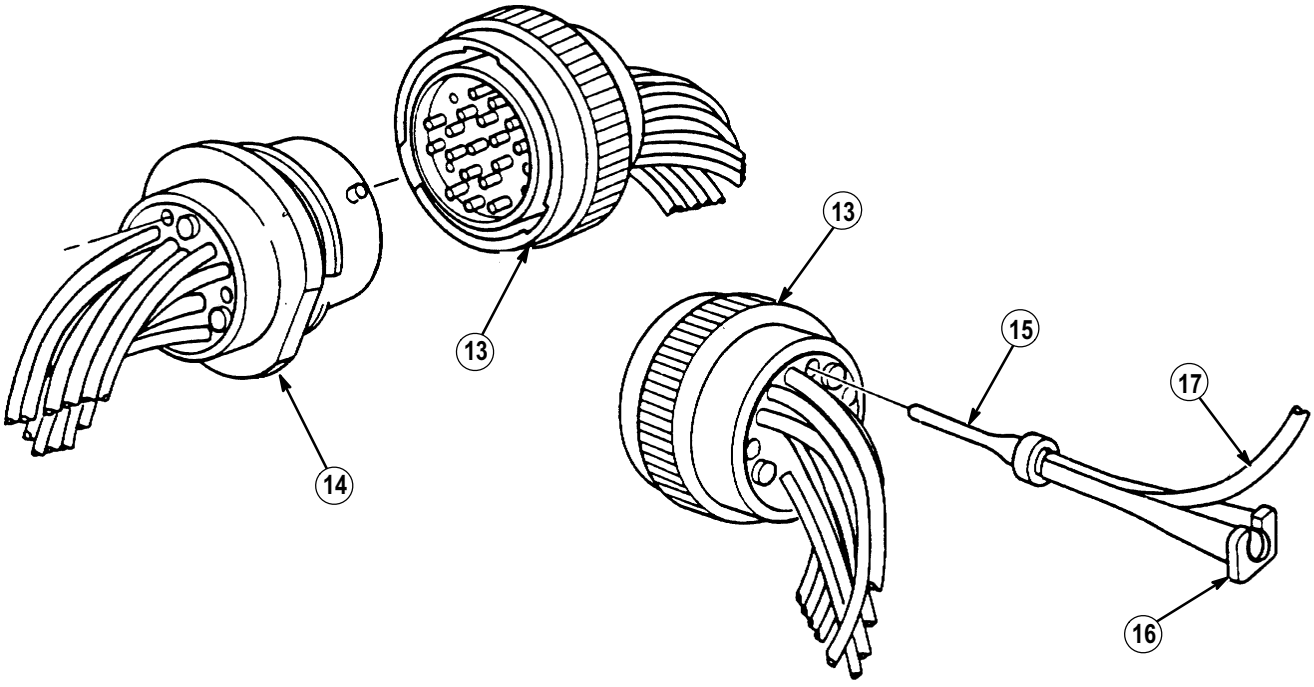
WARNING

To prevent personal injury, allow solder joint to cool before handling.

(13) Repeat Steps (5) thru (7) for both solder joints.

3-16. WIRING HARNESS MAINTENANCE (CONT).

d. Deutsch Connector (Plug or Receptacle) Repair or Replacement.



(1) Disconnect plug (13) from receptacle (14). If needed, remove receptacle (14) from mounting surface.

NOTE

- Some plugs and receptacles may use adhesive to make them more water tight. If a plug or receptacle has adhesive on it and no heat gun is available, go to Step (2). If plug or receptacle had adhesive on it and a heat gun is available, go to Step (3). If plug or receptacle has no adhesive on it, go to Step (4).
- Contact removal from plug or receptacle is the same.

(2) Using a sharp instrument, carefully remove all adhesive from back of plug (13) or receptacle (14) and wire (17).

(3) Using heat gun (11), carefully heat adhesive on back of plug (13) or receptacle (14) until adhesive can be removed.

(4) To remove a contact (15) from plug (13) position rear of plug (13) towards you.

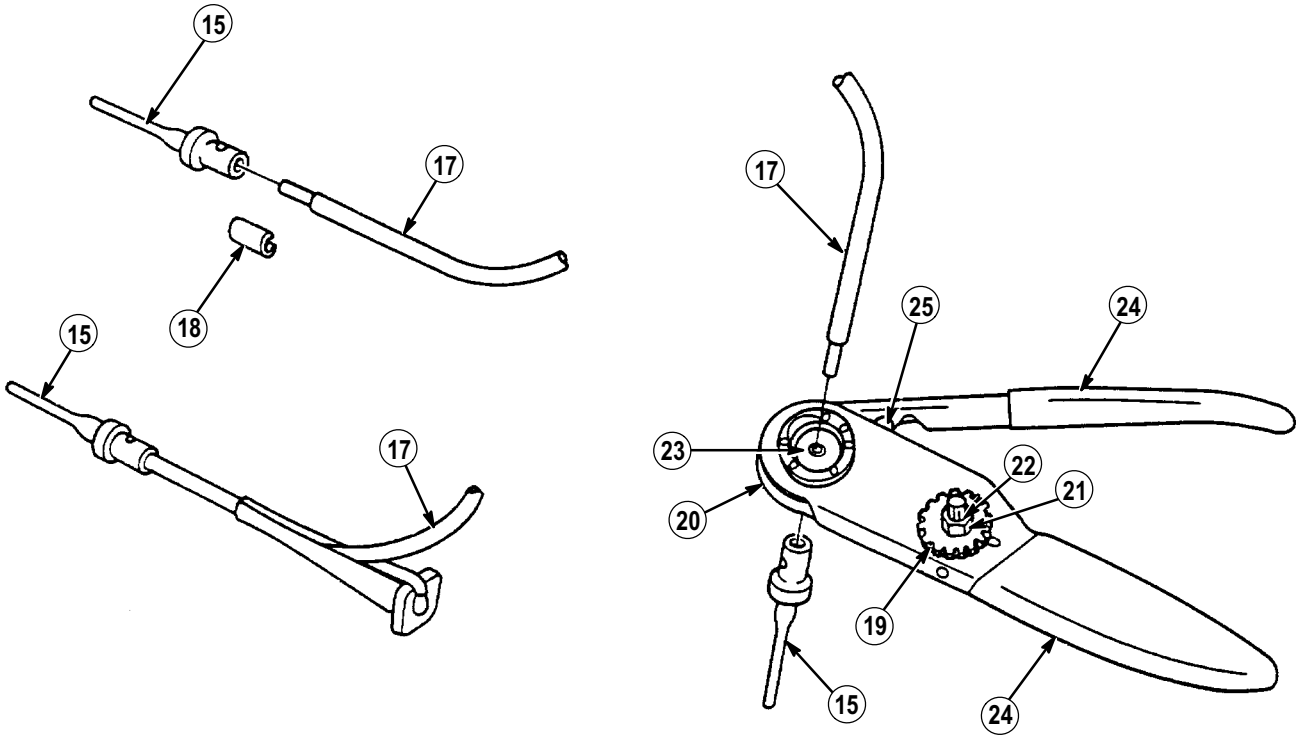
(5) Snap correct size extractor tool (16) over wire (17) being removed.

(6) Slide extractor tool (16) along wire (17) into rear of plug (13) until it engages contact (15) and resistance is felt.

(7) Remove contact (15), extractor tool (16) and wire (17) from plug (13) all at the same time.

(8) If contact (15) is being replaced, cut it from end of wire (17).

(9) If plug (13) or receptacle (14) is being replaced, tag and remove all contacts (15). Refer to Steps (4) thru (7).



(10) To install a new contact (15) remove .25 in. (6.4 mm) of insulation (18) from end of wire (17).

(11) Raise selector knob (19) on crimping tool (20) and rotate until arrow is alined with wire gage being crimped.

(12) Loosen locknut (21) and turn adjusting screw (22) in until it stops.

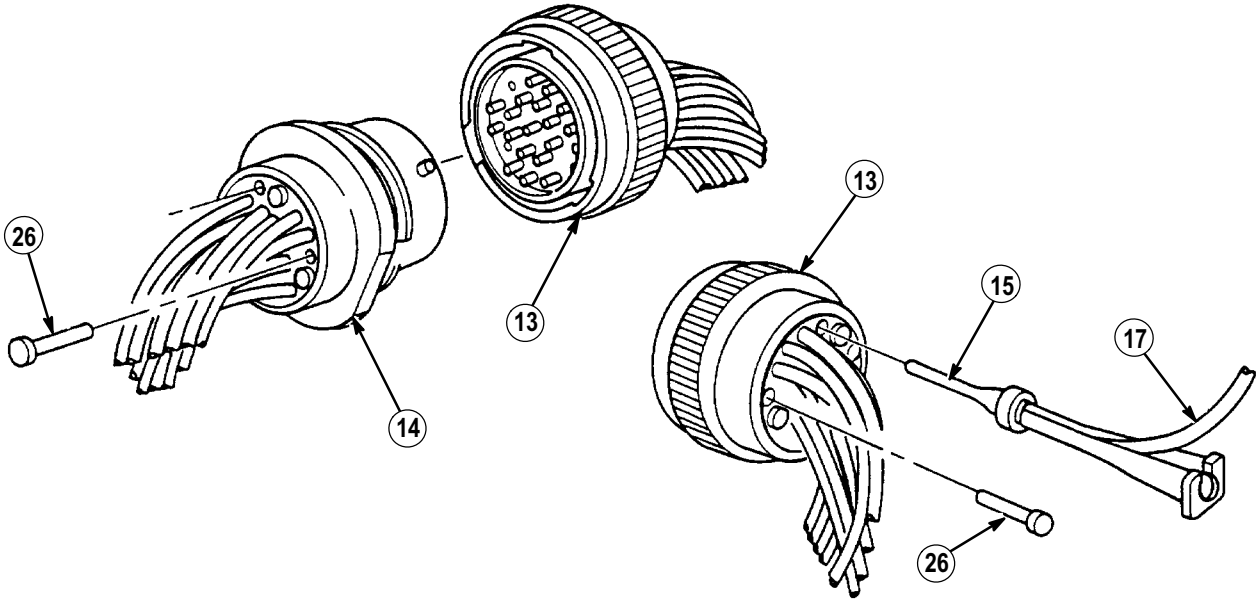
(13) Insert new contact (15) into crimping tool (20) and turn adjusting screw (22) out until contact (15) is flush with cover (23).

(14) Tighten locknut (21) and insert bare end of wire (17) into contact (15).

(15) Make sure contact (15) is centered. Then close handles (24) until one handle (24) touches handle stop (25).

(16) Release handles (24), remove and inspect crimped contacts (15). Make sure all strands of wire (17) are inside contact (15).

3-16. WIRING HARNESS MAINTENANCE (CONT).



NOTE

Crimping tool must be readjusted for each type and/or size contact.

(17) To insert contact(s) (15) into plug (13), position plug (13) with rear toward you.

(18) Insert contact(s) (15) into plug (13) and push until contact (15) stops.

(19) Pull on wire (17) to confirm that contact (15) is locked in place.

(20) Repeat Steps (17) thru (19) as many times as needed until all contacts (15) are installed.

(21) Install sealing plugs (26) into any unused holes in plug (13) and receptacle (14).

NOTE

- If plug and receptacle had adhesive on it and a heat gun is not available, perform Steps (22) and (23) then continue with Step (25).
- If plug receptacle had adhesive on it and a heat gun is available, perform steps (22) and (24) then continue with Step (25).
- If plug and receptacle did not have adhesive on it, go to Step (25).

(22) Clean back of plug (13), receptacle (14) and wires (17) with alcohol and allow to dry.

(23) Apply silicone sealant to seal back of plug (13), receptacle (14) and wires (17). Cover all parts fully.

WARNING

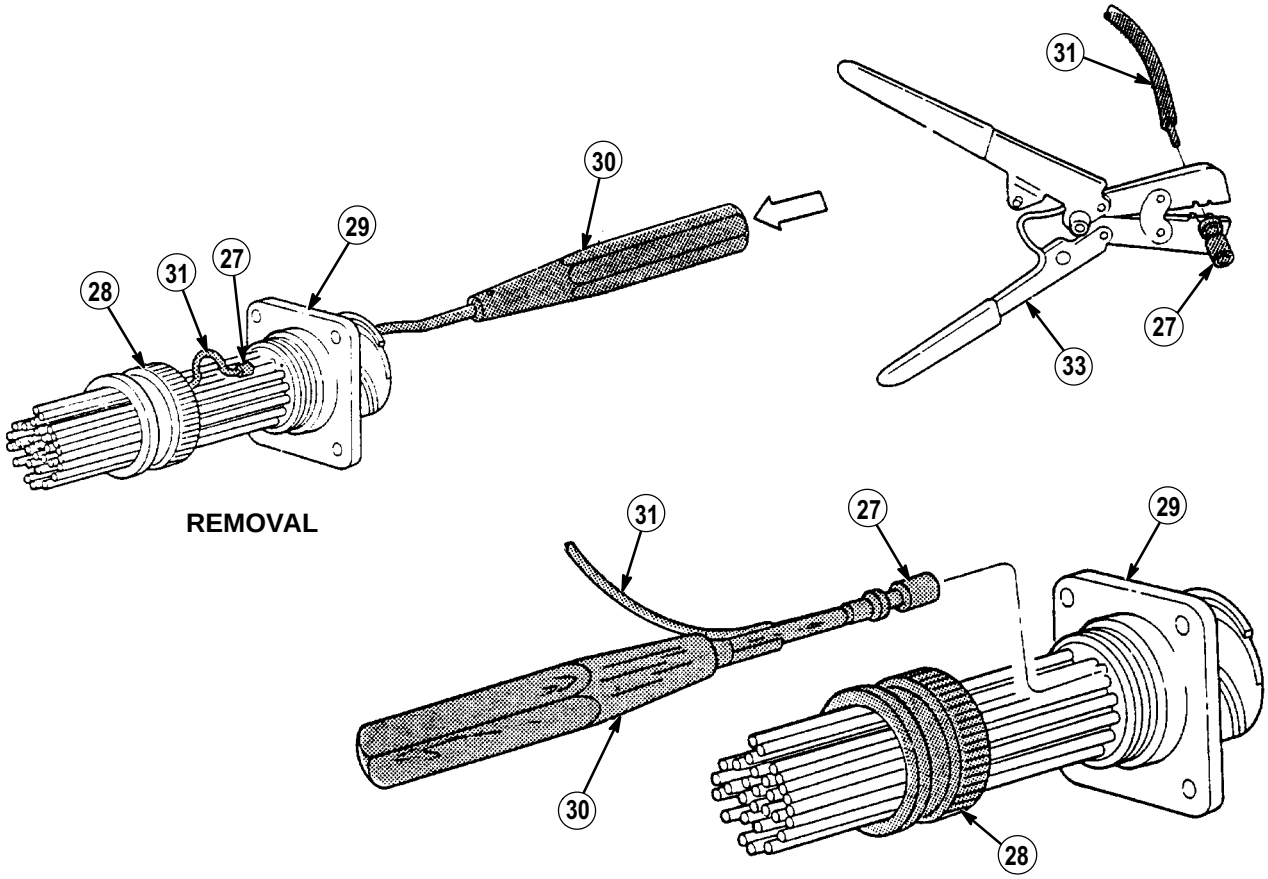
To prevent personal injury, allow adhesive to cool before handling.

(24) Using heat gun (11) apply adhesive to back of plug (13), receptacle (14) and wires (17). Cover all parts fully.

(25) If receptacle (14) was repaired or replaced, install it on mounted surface.

(26) Connect plug (13) to receptacle (14).

e. Cannon Connector (Plug or Receptacle) Repair or Replacement.



(1) To remove contacts (27), separate boot (28) from body (29) and slide out of the way.

(2) Using insertion tool (30), push contact (27) and wire (31) to rear of body (29).

(3) If body (29) is being replaced, tag and remove all contacts (27). Refer to steps (1) and (2) above.

(4) If contact (27) is being replaced, cut it from wire (31).

(5) Remove 1/4 in. (6.3 mm) of insulation (32) from wire (31).

(6) Insert new contact (27) into crimping tool (33).

(7) Install bare end of wire (31) into contact (27) and crimp firmly into place.

(8) Remove wire (31) and contact (27) from crimping tool (33).

(9) To install contact (27), first install boot (28) onto wire (31) if removed.

(10) Install insertion tool (30) onto wire (31) and contact (27).

(11) Using insertion tool (30), install contact (27) and wire (31) into rear of body (29).

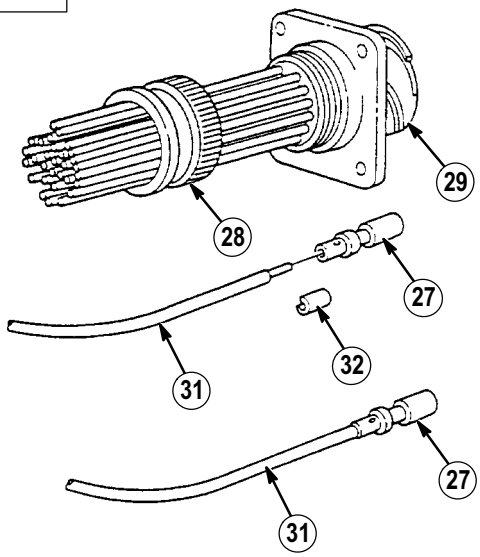
(12) After contact (27) locks in place, remove insertion tool (30).

(13) If body (29) is being replaced, repeat Steps (9) thru (12) until all contacts (27) have been installed.

(14) Slide boot (28) all the way onto body (29).

3-16. WIRING HARNESS MAINTENANCE (CONT).

f. Type II Connector Repair or Replacement.

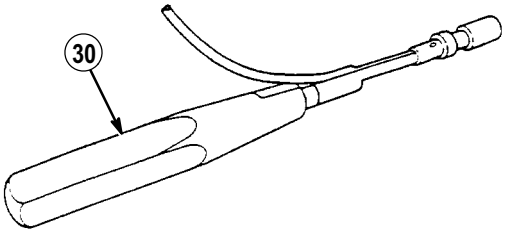


NOTE

- Connector is removed by gently prying up on clip and pulling on connector.
- All Type II connectors are repaired the same way. Number of wires in connector may vary.
- Both halves of the connector are repaired the same way.

(1) Disconnect connector (34).

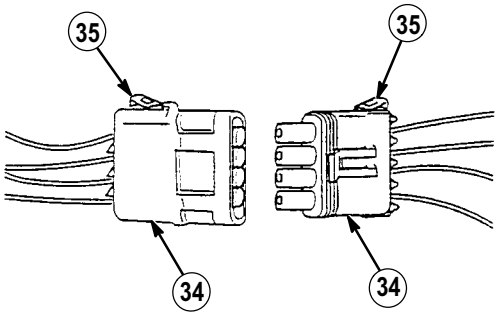
(2) Unlatch and open two secondary locks (35) on connector (34).



WARNING

Tip if removal tool is very sharp. Use caution when using tool. Failure to comply may result in injury to personnel.

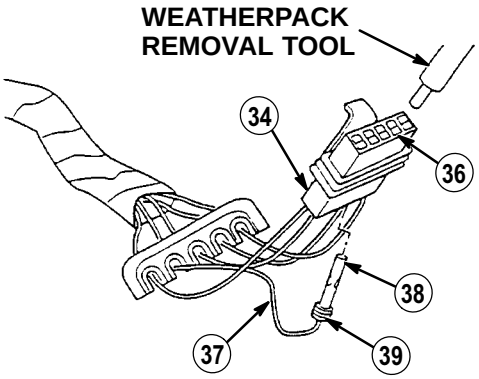
(3) Insert removal tool into cavity (36) on connector (34) until seated.



(4) Pull wire (37) back through connector (34) and remove tool.

NOTE

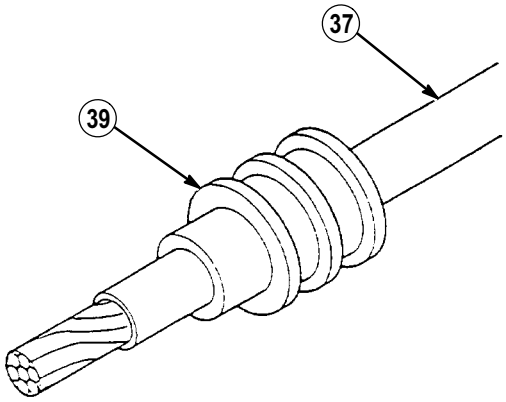
- Perform Step (5) only if old terminal is still attached to wire.
- Make cut directly behind damaged terminal.



(5) Cut terminal (38) and wire seal (39) from wire (37). Discard terminal (38) and seal (39).

(6) Insert wire (37) through new wire seal (39).

(7) Strip end of wire (37) leaving 1/4 in. (6.4 mm) of bare wire.

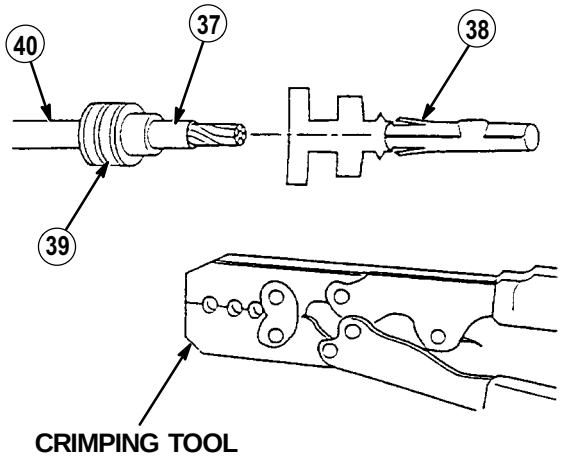


(8) Insert new terminal (38) in locating hole of crimping tool using proper hole according to the gage of wire (37).

(9) Slide seal (39) down to end of insulation (40) on wire (37).

NOTE

Wire and seal should be positioned so larger wings of terminal will crimp around seal and smaller wings will crimp around exposed bare wire.



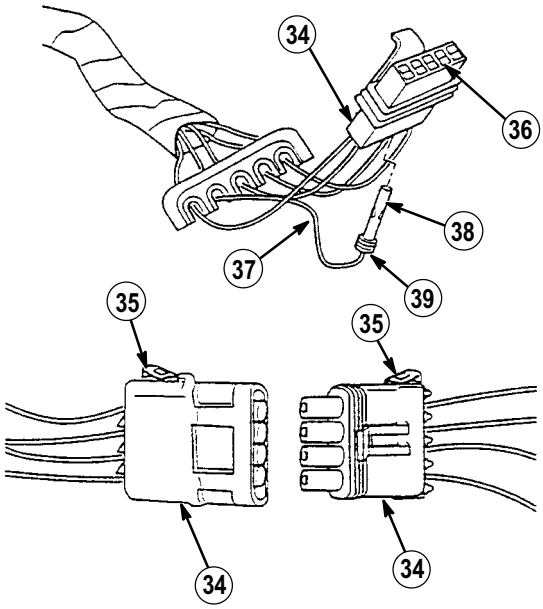
(10) Position wire (37) on terminal (38).

(11) Press handles of crimp tool together until ratchet releases and crimp is complete.

(12) Push new terminal (38) and wire (37) through connector (34) until seated.

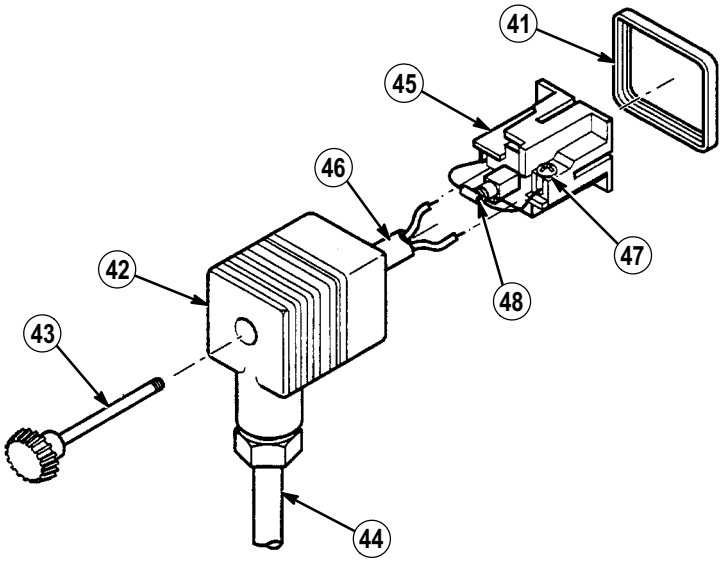
(13) Close two secondary locks (35) on connector (34).

(14) Connect connector (34).



3-16. WIRING HARNESS MAINTENANCE (CONT).

g. Hirschman Connector Repair or Replacement.



(1) If present, remove and discard gasket (41) from connector (42).

(2) Remove screw (43) from connector (42).

(3) Loosen cord grip nut (44).

NOTE

- Note position of insert, diode, and cable ends prior to removal to ensure proper installation.
- Not all connectors will have a diode.

(4) Remove insert (45) and cable (46) from connector (42).

(5) Loosen two screws (47) and remove cable (46) ends and diode (48) from insert (45).

(6) Remove cable (46) from connector (42).

(7) Check diode (48) for continuity in one direction only. Discard diode (48) if no continuity is found, or if continuity is found in both directions (diode has been shorted).

(8) Install cable (46) in connector (42).

NOTE

Diode is installed with stripe on diode facing the screw in the number one terminal.

(9) Install diode (48) and cable (46) ends in insert (45) and tighten two screws (47).

(10) Snap insert (45) into connector (42).

(11) Tighten cord grip nut (44).

(12) Install screw (43) in connector (42).

(13) If removed, install new gasket (41) on connector (42).

END OF TASK

CHAPTER 4

SHELTER MAINTENANCE

4-1. INTRODUCTION.

This chapter contains maintenance instructions for removing, replacing, repairing, installing and adjusting shelter components authorized by the Maintenance Allocation Chart (MAC) at the Unit Maintenance level.

4-2. PLATFORM ASSEMBLY REPLACEMENT.

This task covers:

a. Removal b. Installation c. Follow-On Maintenance

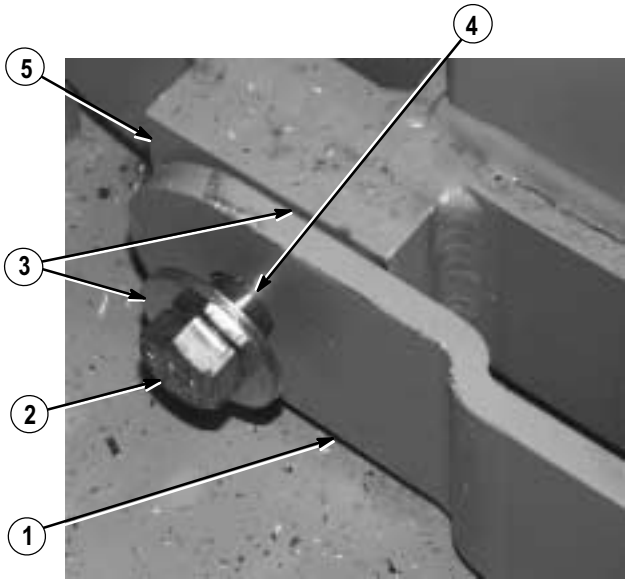
INITIAL SETUP

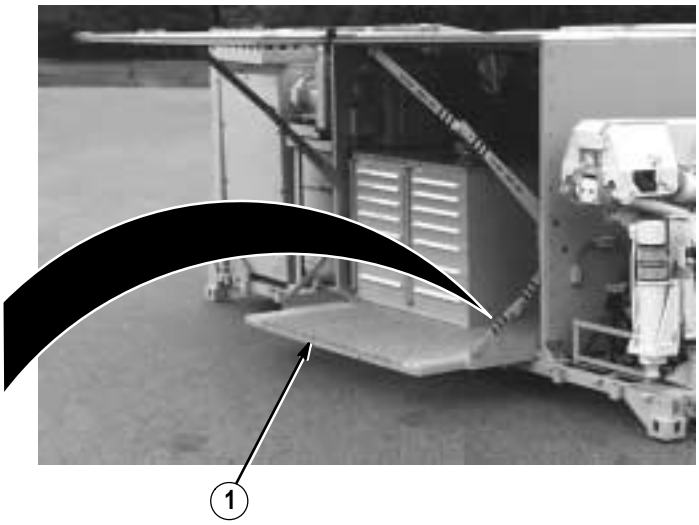
Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 30, Appendix G)
Lifting Device, Minimum Capacity 300 lbs (136 kg)

Personnel Required
Two

Equipment Condition
FRS unloaded, (TM 9-4940-568-10)
Platform support arms removed, (Para 4-3)
Tool cabinets removed (as required), (Para 4-11)

a. Removal.





WARNING

Platform weighs 268 lbs (122 kg). Use a suitable lifting device of adequate capacity to support platform for removal and installation to prevent possible injury to personnel.

NOTE

There are two platform assemblies. Both are removed the same way.

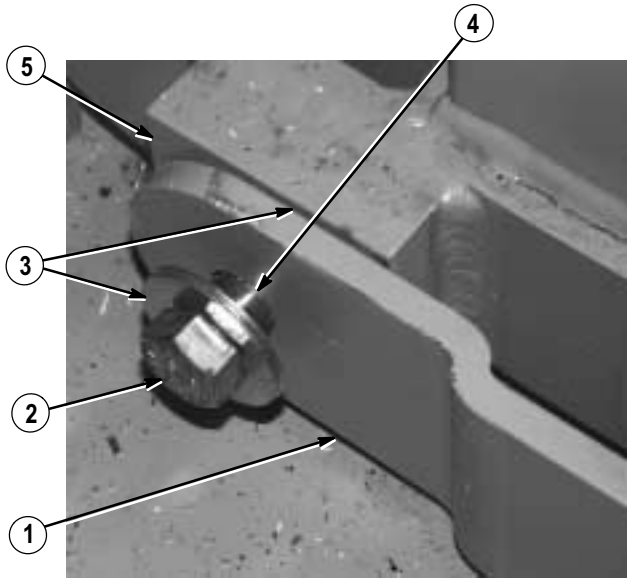
(1) With the aid of an assistant, position lifting device on support platform (1).

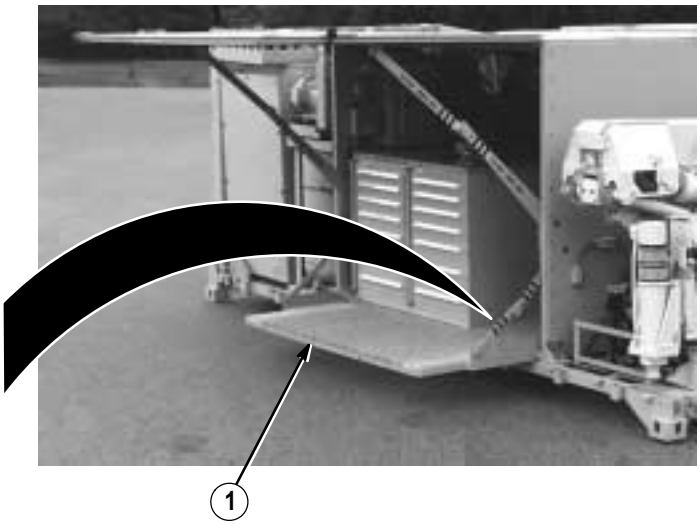
(2) Remove two screws (2), four washers (3) and two sleeves (4) from FRS (5) and platform assembly (1).

(3) With the aid of an assistant, remove platform assembly (1) from FRS (5).

(4) Remove lifting device.

b. Installation.





WARNING

Platform weighs 268 lbs (122 kg). Use a suitable lifting device of adequate capacity to support platform for removal and installation to prevent possible injury to personnel.

NOTE

There are two platform assemblies. Both are installed the same way.

(1) With the aid of an assistant, position lifting device on support platform (1).

(2) With the aid of an assistant, position platform assembly (1) on FRS (5).

(3) Install two sleeves (4), four washers (3) and two screws (2) on platform assembly (1) and FRS (5).

(4) Remove lifting device.

c. Follow-On Maintenance:

- Install tool cabinets, (Para 4-11).
- Install platform support arms, (Para 4-3).

END OF TASK

4-3. DOOR/PLATFORM SUPPORT ARMS REPLACEMENT.

This task covers:

a. Removal
b. Disassembly
c. Cleaning/Inspection
d. Assembly
e. Installation
f. Follow-On Maintenance

INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 30, Appendix G)
Socket Set, 3/8 in. (Item 25, Appendix G)
Wrench, Torque (0 to 60 N·m) (Item 46, Appendix G)
Lifting Device, Minimum Capacity 100 lbs (45 kg)
Wooden Blocks (Appendix D)

Materials/Parts
Grease, GAA (Item 20, Appendix C)
Rags, Wiping (Item 30, Appendix C)

Materials/Parts – Continued
Solvent, Drycleaning (Item 38, Appendix C)
Cotter Pin (12) (Item 93, Appendix F)

Personnel Required
Two

Equipment Condition
FRS unloaded, (TM 9-4940-568-10)
Disconnect batteries, (TM 9-4940-568-10)
Tool cabinet removed (as required), (Para 4-11)

a. Removal.

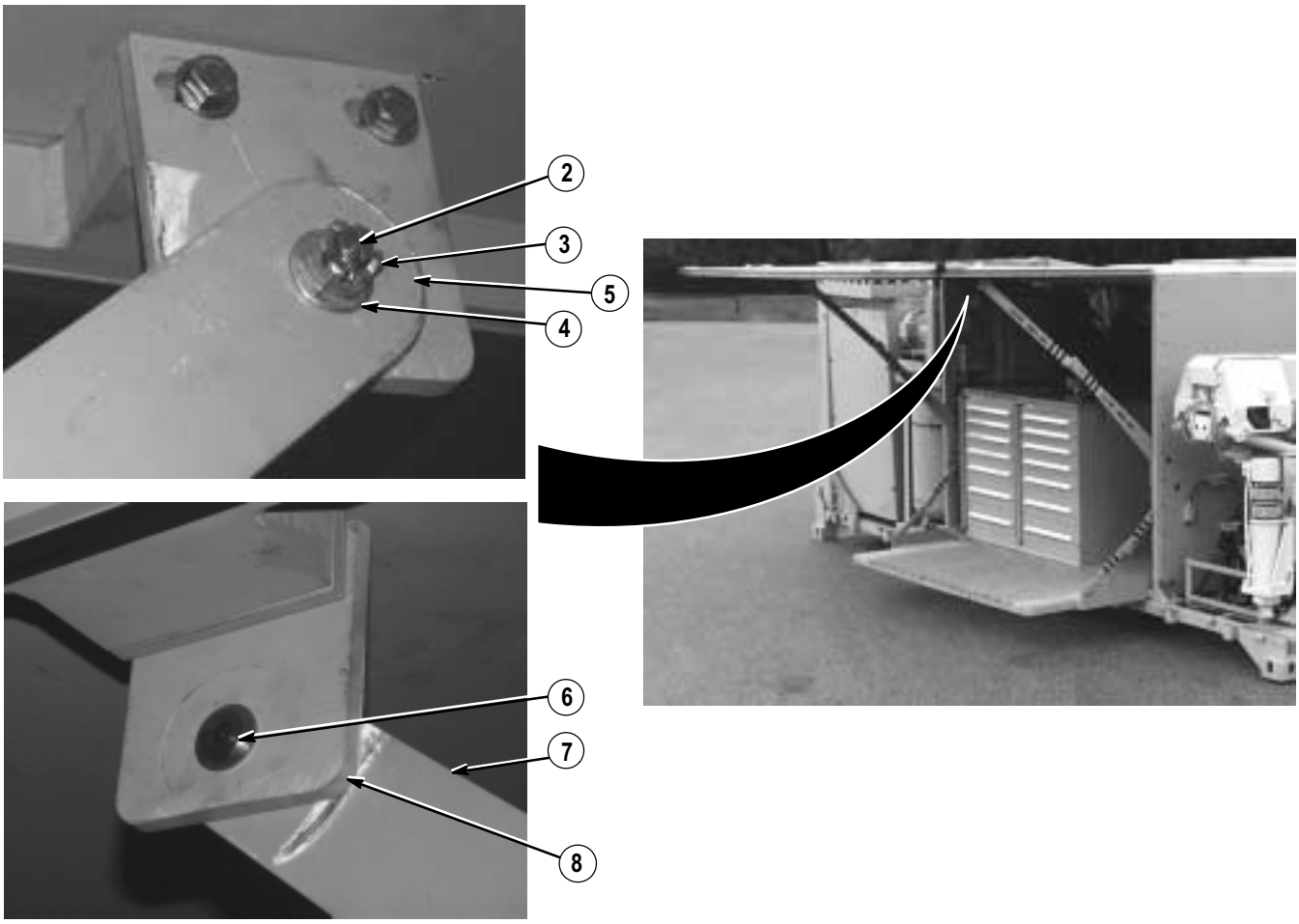
WARNING

Shelter door weighs 220 lbs (100 kg) and must be supported during door/platform support arm replacement. Use a suitable lifting device of adequate capacity to support door for removal and installation to prevent possible injury to personnel.

NOTE

- The following procedures are identical for both shelter doors. Left shelter door shown.
- Place wooden block under platform prior to support arm removal.

(1) With the aid of an assistant, position lifting device in suitable position to support door (1).



NOTE

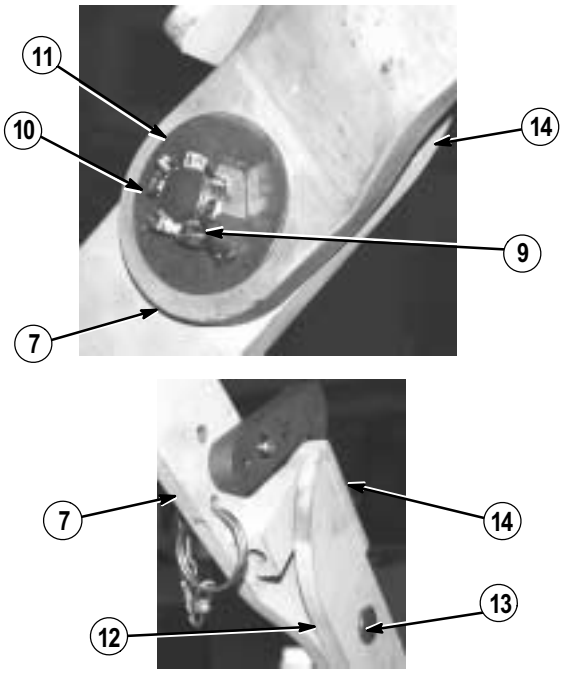
- Door and platform support arms are removed identically. Left door and platform support arms shown.
- Note position of support arms and washers prior to removal.

(2) Remove cotter pin (2), slotted nut (3), washer (4), washer (5) and socket head screw (6) from upper door support arm (7) and plate (8). Discard cotter pin.

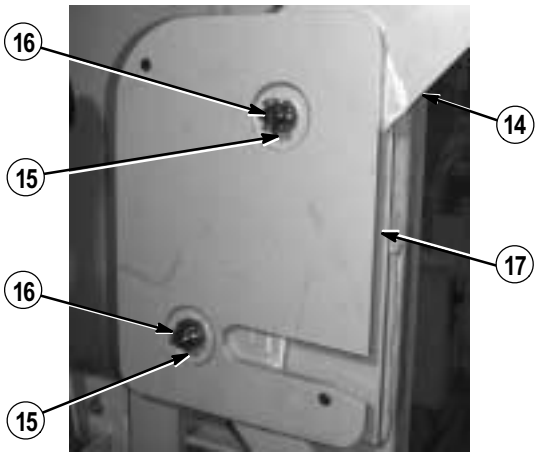
(3) Lower upper door support arm (7).

4-3. DOOR/PLATFORM SUPPORT ARMS REPLACEMENT (CONT).

(4) Support upper door support arm (7) and remove cotter pin (9), slotted nut (10), washer (11), washer (12), socket head screw (13) and upper door support arm from lower support arm (14). Discard cotter pin.

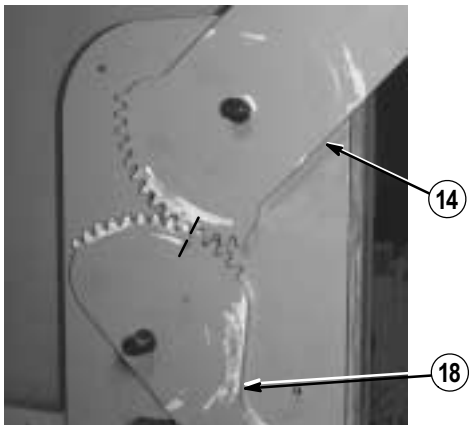


(5) Support lower door support arm (14) and remove two cotter pins (15), nuts (16) and plate (17). Discard cotter pins

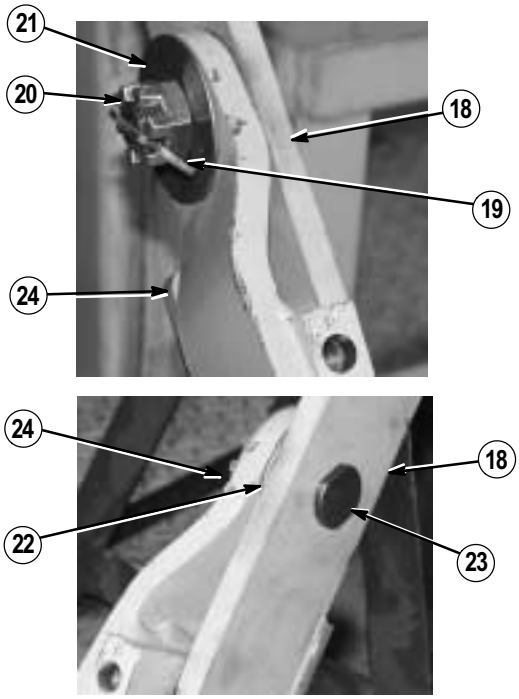


(6) Matchmark lower door support arm (14) and upper platform support arm (18) and remove lower door support arm.

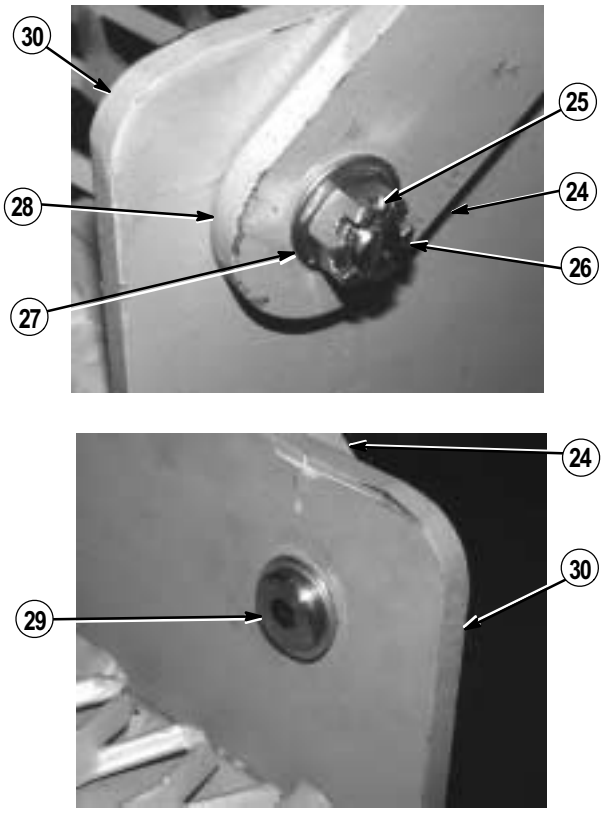
(7) Repeat Steps (2) through (6) for right side door support arms.



(8) Remove cotter pin (19), slotted nut (20), washer (21) and washer (22), socket head screw (23) and upper platform support arm (18) from lower platform support arm (24). Discard cotter pin.



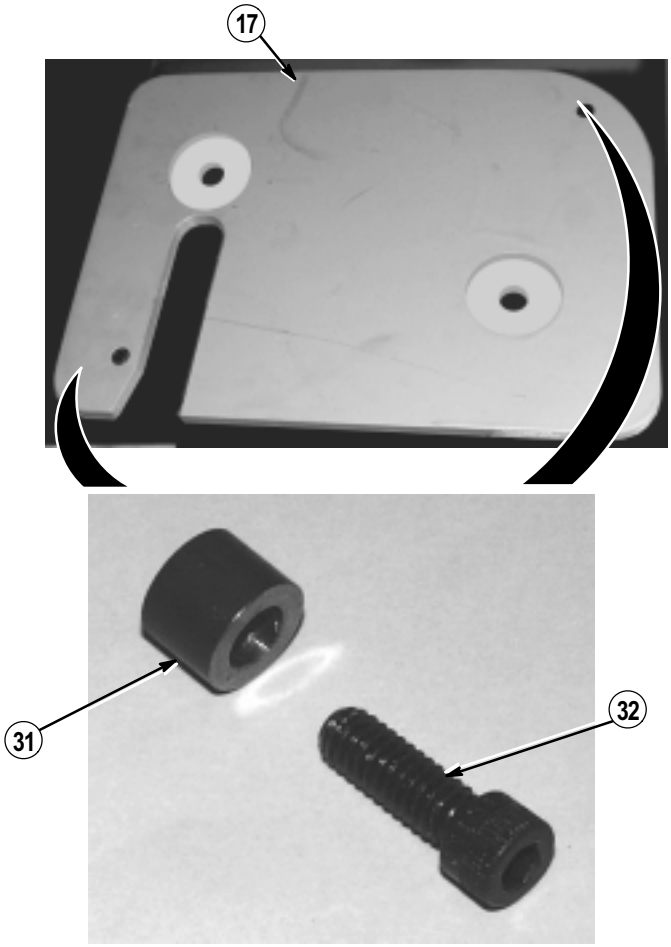
(9) Remove cotter pin (25), slotted nut (26), washer (27) and washer (28), socket head screw (29) and lower platform support arm (24) from platform (30). Discard cotter pin.



4-3. DOOR/PLATFORM SUPPORT ARMS REPLACEMENT (CONT).

(10) Remove two spacers (31) and hex head screws (32) from plate (17).

(11) Repeat Steps (8) through (10) for right side platform support arms.

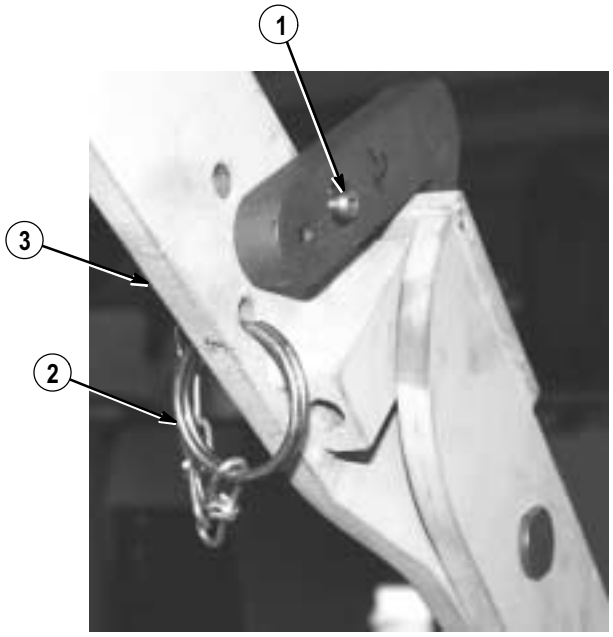


b. Disassembly.

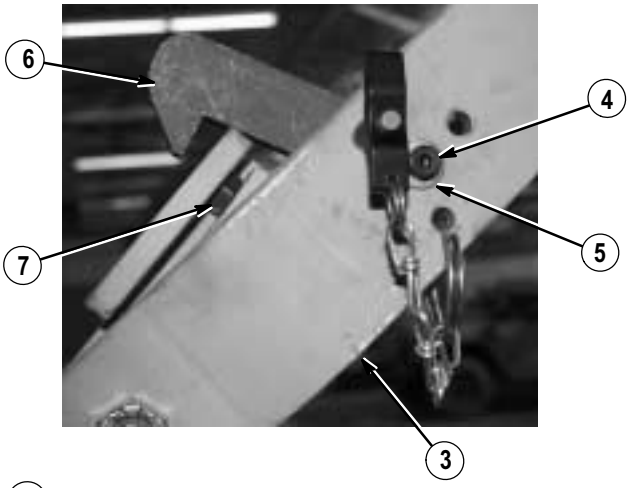
NOTE

- The following procedures are identical for all upper support arms.
- Note position of safety catch prior to removal.

(1) Remove safety catch pin (1) and chain (2) from upper support arm (3).



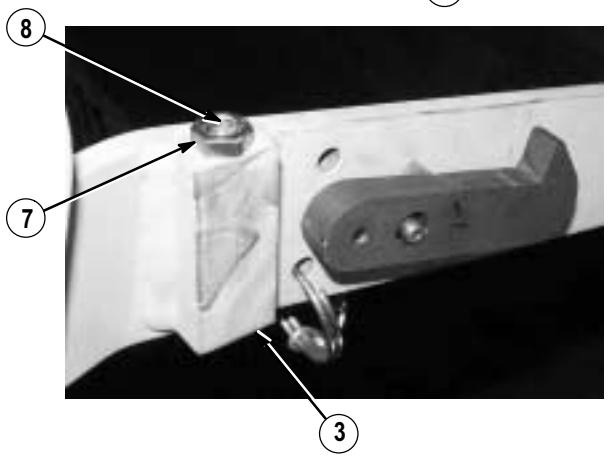
(2) Remove screw (4), washer (5), and safety catch (6) from upper support arm (3).



NOTE

- The following procedures are identical for all upper and lower support arms.
- Note position of setscrew prior to removal.

(3) Remove jam nut (7) and setscrew (8) from upper support arm (3).



c. Cleaning/Inspection.

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.

(1) Clean all parts with drycleaning solvent.

(2) Inspect parts for breaks, cracks, burrs, and sharp edges. Look for unusual signs of wear on the support arm bolt holes and gear teeth.

4-3. DOOR/PLATFORM SUPPORT ARMS REPLACEMENT (CONT).

(3) Replace all damaged parts.

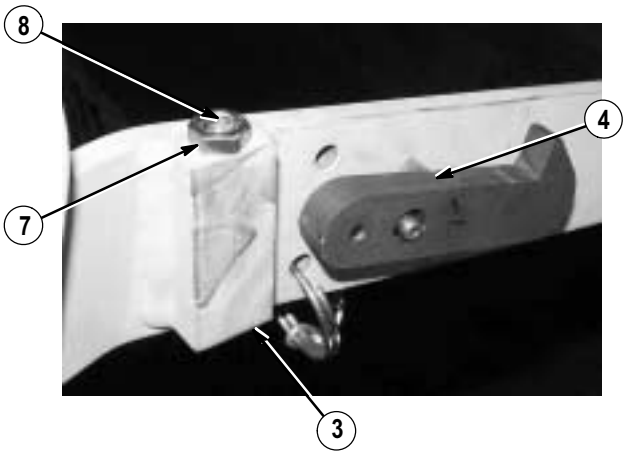
(4) Coat both sides of support arm gear teeth area and matching area on shelter wall and plate with grease.

d. Assembly.

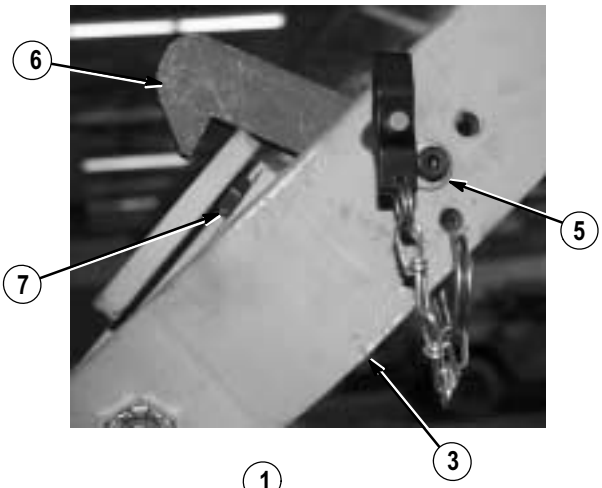
NOTE

- The following procedures are identical for all upper and lower support arms.
- Position setscrews as noted during disassembly.

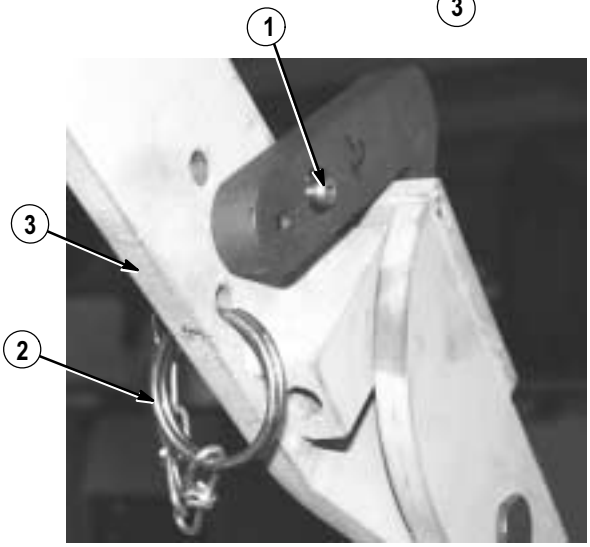
(1) Install setscrew (8) and jam nut (7) on upper support arm (3).



(2) Install safety catch (6), washer (5), and screw (4) on upper support arm (3).



(3) Install chain (2) and safety catch pin (1) on upper support arm (3).

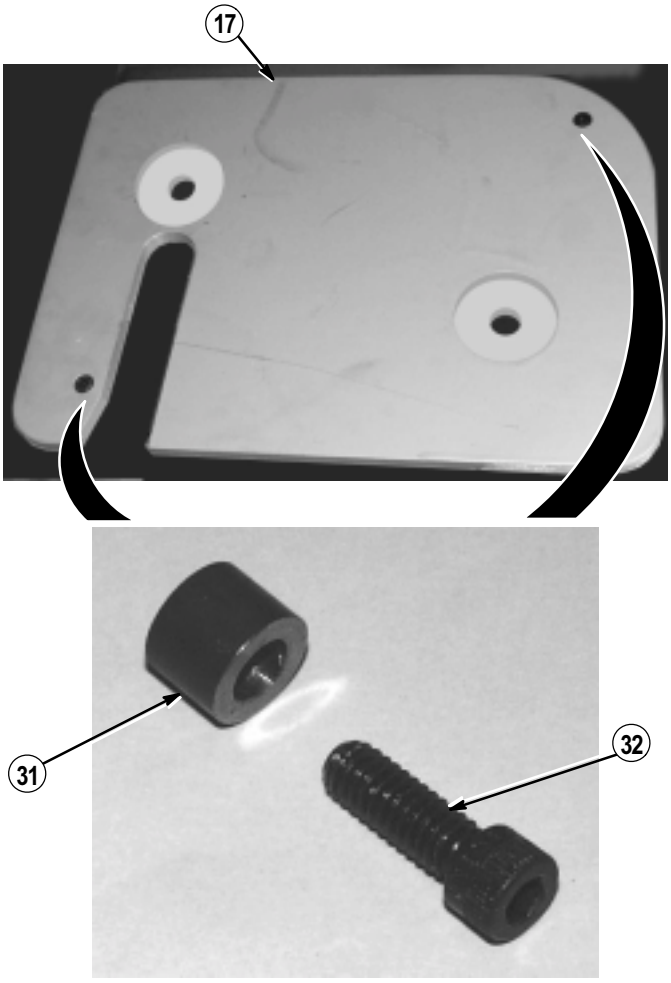


e. Installation.

NOTE

The following procedures are identical for both shelter doors. Left shelter door shown.

(1) Install two hex head screws (32) and spacers (31) on plate (17).

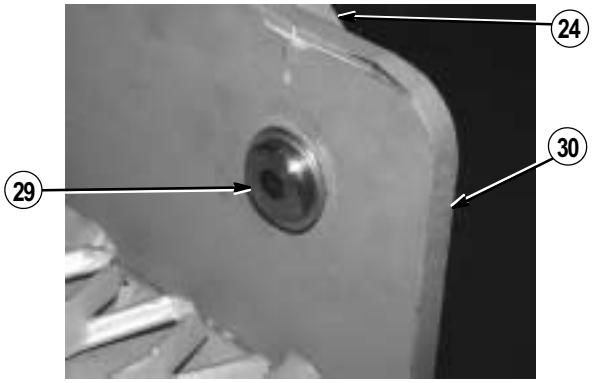


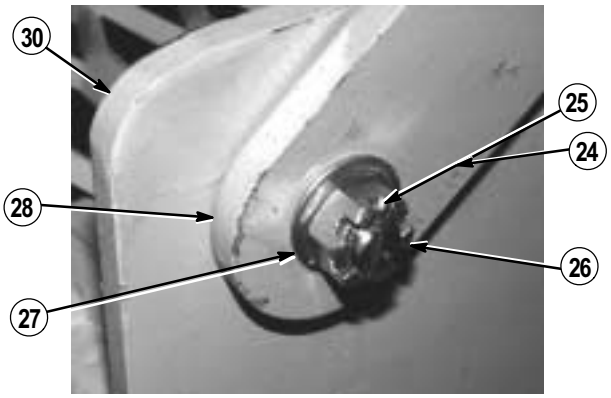
4-3. DOOR/PLATFORM SUPPORT ARMS REPLACEMENT (CONT).

NOTE

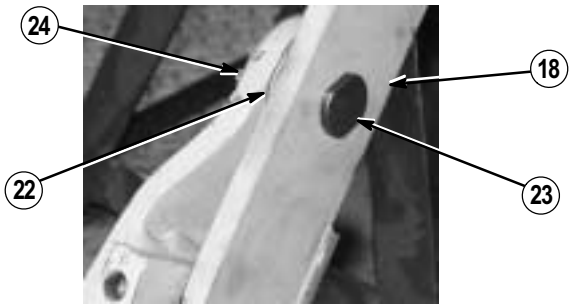
- Door and platform support arms are installed identically. Left door and platform support arms shown.
- Install door and platform support arms and washers as noted during disassembly.

(2) Install lower platform support arm (24) on platform (30) with socket head screw (29), washer (28), washer (27) and slotted nut (26). Tighten slotted nut to 120 lb-in (14 N·m) then back off slotted nut up to 1/16 turn and install cotter pin (25).

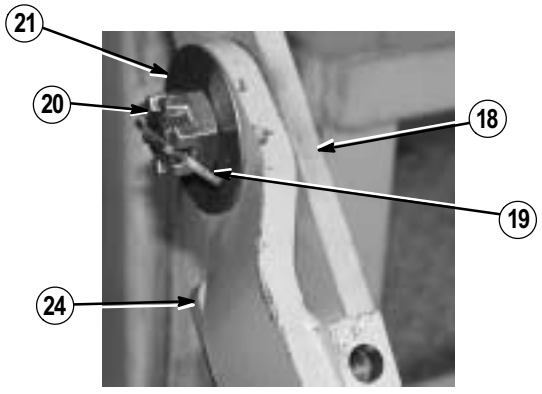




(3) Install upper platform support arm (18) to lower platform support arm (24) with socket head screw (23), washer (22), washer (21) and slotted nut (20). Tighten slotted nut to 120 lb-in (14 N·m) then back off slotted nut up to 1/16 turn and install cotter pin (19).



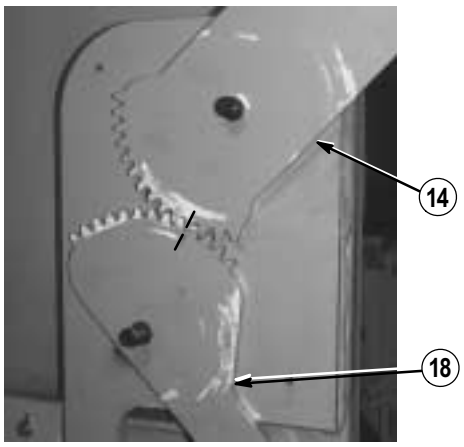
(4) Repeat Steps (2) and (3) for right side platform support arms.



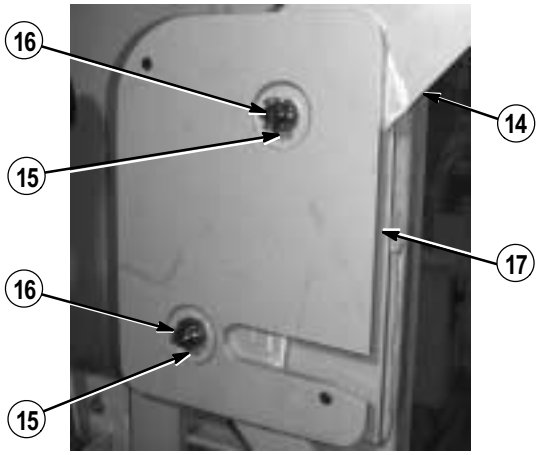
NOTE

If installing a new support arm, transfer mark from old support arm to new support arm.

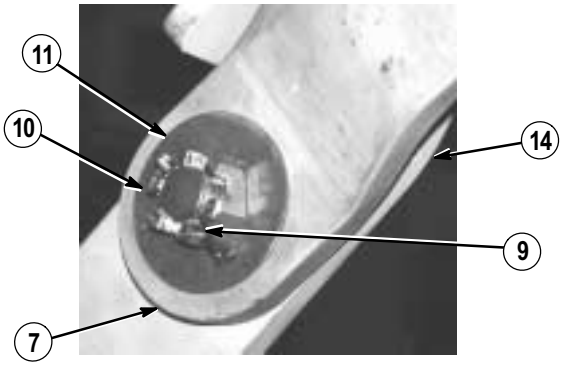
(5) Align matchmarks and install lower door support arm (14) to upper platform support arm (18).



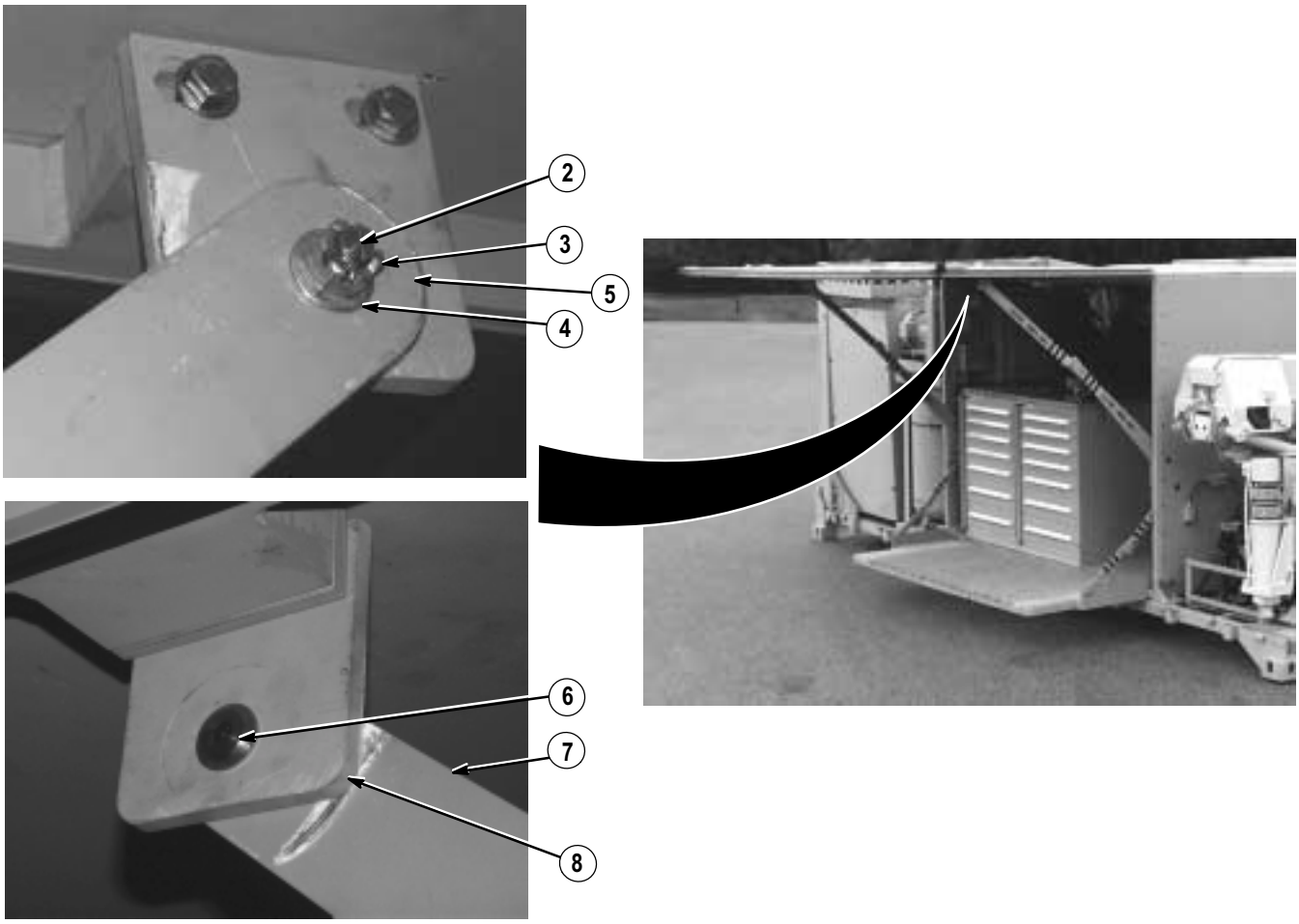
(6) Install plate (17) with two slotted nuts (16) and cotter pins (15).



(7) Install upper door support arm (7) to lower door support arm (14) with socket head screw (13), washer (12), washer (11) and slotted nut (10). Tighten slotted nut to 120 lb-in (14 N·m) then back off slotted nut up to 1/16 turn and install cotter pin (9).



4-3. DOOR/PLATFORM SUPPORT ARMS REPLACEMENT (CONT).



(8) Install upper door support (7) to plate (8) with socket head screw (6), washer (5), washer (4) and slotted nut (3). Tighten slotted nut to 120 lb-in (14 N·m) then back off slotted nut up to 1/16 turn and install cotter pin (2).

(9) Repeat Steps (5) through (8) for right side door support arms.

WARNING

Shelter door weighs 220 lbs (100 kg) and must be supported during door/platform support arms replacement. Use a suitable lifting device of adequate capacity to support door for removal and installation to prevent possible injury to personnel.

(10) Remove lifting device from door (1).

f. Follow-On Maintenance:

- Adjust door, (Para 4-4).
- Lubricate support arms, (TM 9-4940-568-10).

END OF TASK

4-4. DOOR ASSEMBLY REPAIR.

This task covers:

a. Removal
b. Disassembly
c. Cleaning/Inspection
d. Assembly
e. Installation
f. Adjustment

INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 30, Appendix G)
Scale, Tension (Item 23, Appendix G)
Lifting Device, Minimum Capacity 300 lbs (136 kg)
Wooden Blocks (Appendix D)

Materials/Parts
Adhesive (Item 2, Appendix C)
Caulk (Item 11, Appendix C)
Rags, Wiping (Item 30, Appendix C)

Materials/Parts Cont.
Sealing Compound (Item 33, Appendix C)
Solvent, Drycleaning (Item 38, Appendix C)
Cotter Pin (2) (Item 92, Appendix F)
Locknut (10) (Item 33, Appendix F)
Seal (Item 102, Appendix F)

Personnel Required
Two

Equipment Condition
FRS unloaded, (TM 9-4940-568-10)

a. Removal.

WARNING

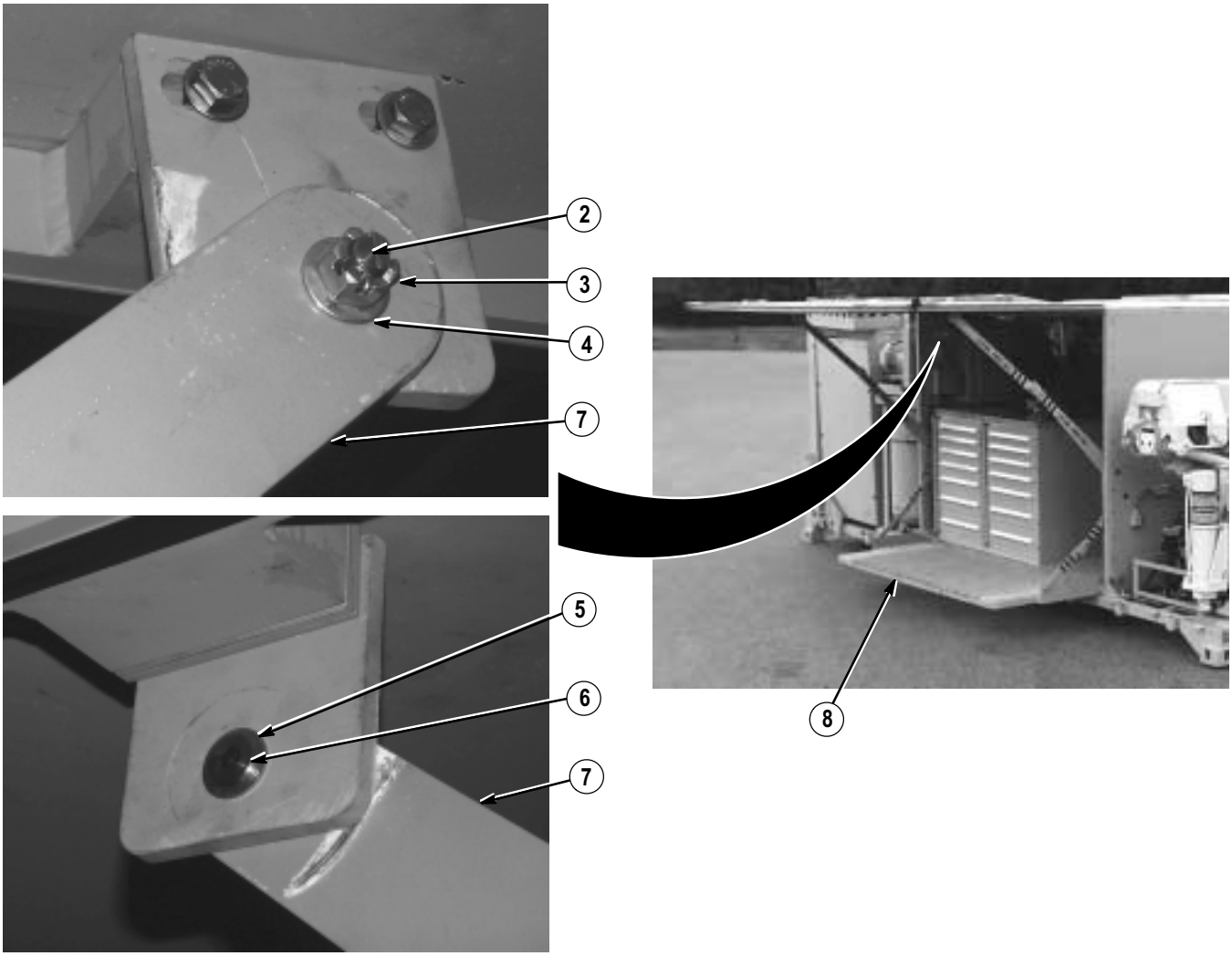
Shelter door weighs 220 lbs (100 kg) and must be supported during door replacement. Use a suitable lifting device of adequate capacity to support door for removal and installation to prevent possible injury to personnel.

NOTE

- The following procedures are identical for both doors. Left side is shown
- Place wooden block under platform prior to support arm removal.

(1) With the aid of an assistant, position lifting device to support door assembly (1).

4-4. DOOR ASSEMBLY REPAIR (CONT).



(2) Remove cotter pin (2), slotted nut (3), washer (4), washer (5) and socket head screw (6) from upper door support arm (7). Discard cotter pin.

(3) Lower upper door support arm (7).

(4) Repeat Steps (2) and (3) for opposite upper door support arm (7).

WARNING

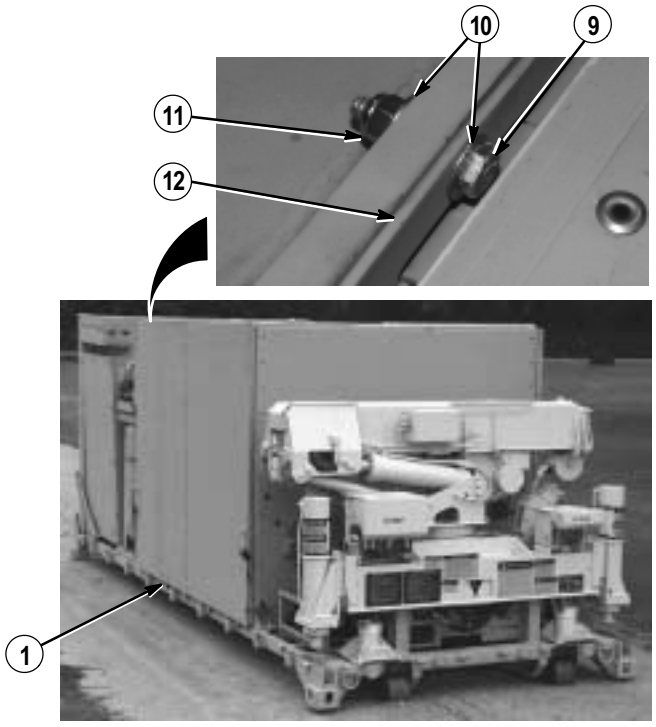
Shelter platform weighs 268 lbs (122 kg). Use an assistant to help close/open platform or injury to personnel may result.

(5) With the aid of assistant, raise shelter platform (8) to closed position.

(6) Lower door assembly (1).

(7) Remove ten screws (9), 20 washers (10), ten locknuts (11) and door assembly (1) from door hinge (12). Discard locknuts.

(8) Remove lifting device from door assembly (1).



b. Disassembly.

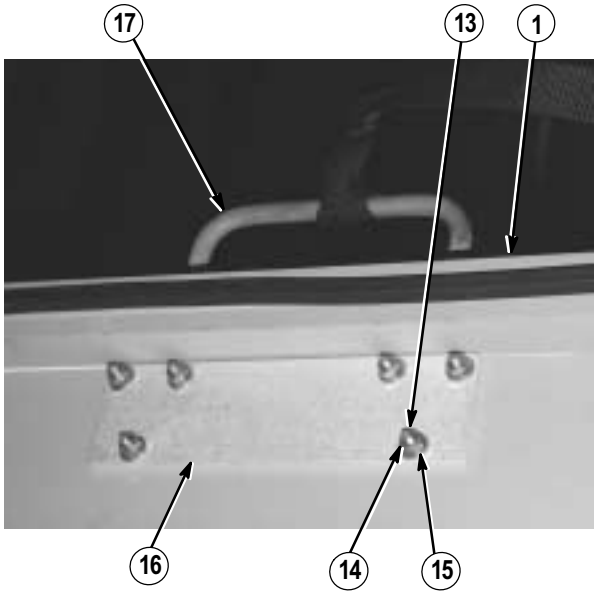
WARNING

Shelter door weighs 220 lbs (100 kg) and must be securely supported before disassembly to prevent possible injury to personnel.

NOTE

There are two handle assemblies and plates for each door assembly.

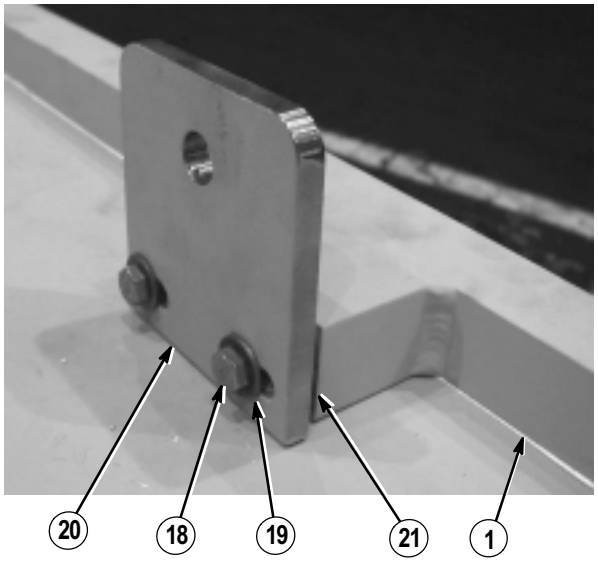
(1) Remove six screws (13), locknuts (14), twelve washers (15), plate (16) and handle assembly (17) from door assembly (1). Discard locknuts.



4-4. DOOR ASSEMBLY REPAIR (CONT).

(2) Remove two screws (18), washers (19), support arm adjustment plate (20) and three shims (21) from door assembly (1).

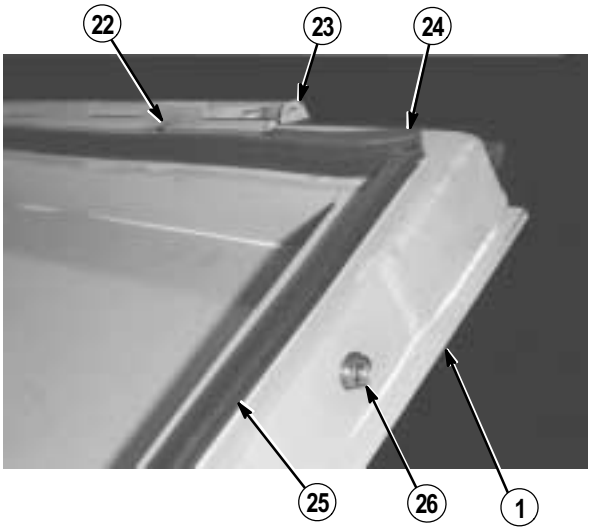
(3) Repeat Steps (1) and (2) for opposite side handle assembly and plate removal.

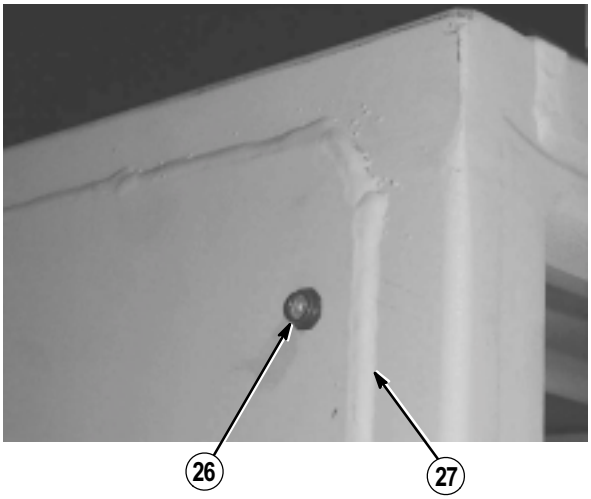


(4) Remove ten screws (22) and hinge (23) from door assembly (1).

(5) Remove and discard seal (24) and weather strip adhesive (25) from door assembly (1).

(6) Remove any damaged screw stud snaps (26) from door assembly (1) or on FRS shell (27) around door assembly opening.





c. Cleaning/Inspection.

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.

(1) Check for worn, defective, or cracked areas on door assembly.

(2) Clean excess adhesive and caulk from door assembly using dry cleaning solvent (Item 38, Appendix C).

d. Assembly.

(1) Install screw stud snaps (26) on door assembly (1) and FRS shelter (27) as necessary.

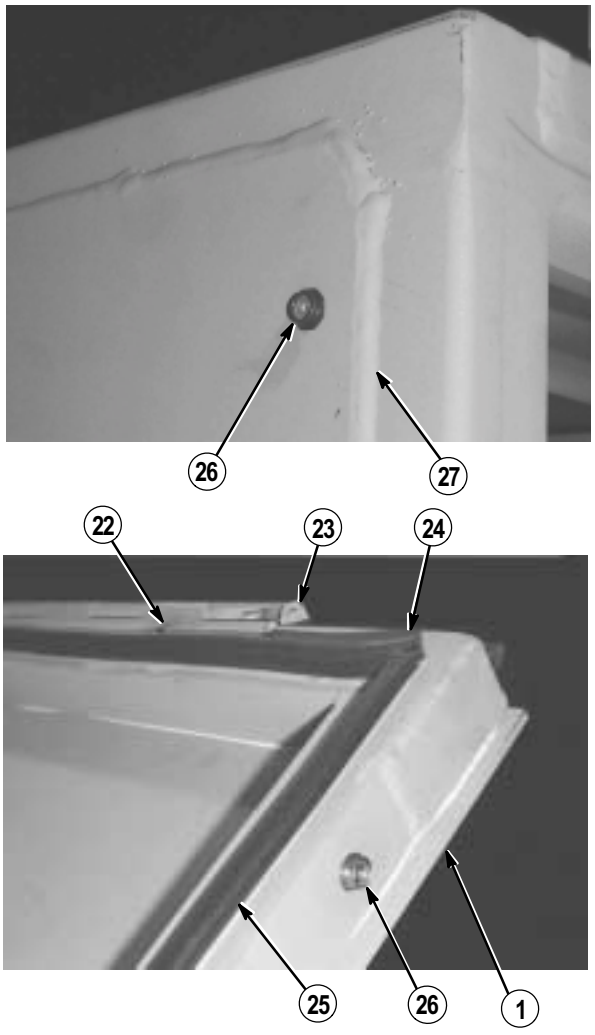
WARNING

Adhesives, solvents and sealing compounds can burn easily, can give off harmful vapors and are harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in well-ventilated area. If adhesive, solvent or sealing compound gets on skin or clothes, wash immediately with soap and water.

(2) Install weather strip adhesive (25) and seal (24) around door assembly (1).

(3) Apply sealing compound to threads of ten screws (22).

(4) Install hinge (23) and ten screws (22) on door assembly (1).



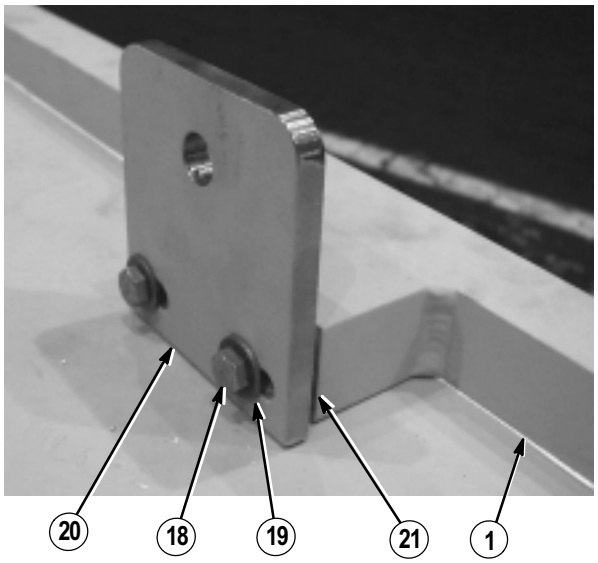
4-4. DOOR ASSEMBLY REPAIR (CONT).

WARNING

Adhesives, solvents and sealing compounds can burn easily, can give off harmful vapors and are harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in well-ventilated area. If adhesive, solvent or sealing compound gets on skin or clothes, wash immediately with soap and water.

(5) Apply sealing compound to threads of two screws (18).

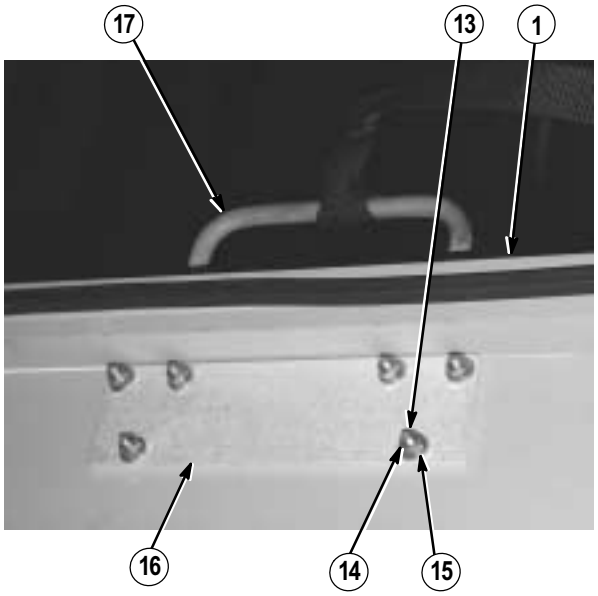
(6) Install three shims (21), support arm adjustment plate (20), two washers (19) and screws (18) on door assembly (1).



(7) Apply caulk to six screws (13) and mating surfaces on plate (16), handle assembly (17) and door assembly (1).

(8) Install handle assembly (17), plate (16), twelve washers (15), six locknuts (14) and screws (13) on door assembly (1).

(9) Repeat Steps (5) through (8) for opposite side support arm adjustment plate (20) and handle assembly (17).



e. Installation.

WARNING

Shelter door weighs 220 lbs (100 kgs) and must be supported during door replacement. Use a suitable lifting device of adequate capacity to support door for removal and installation to prevent possible injury to personnel.

(1) With the aid of an assistant, position lifting device to support door (1).

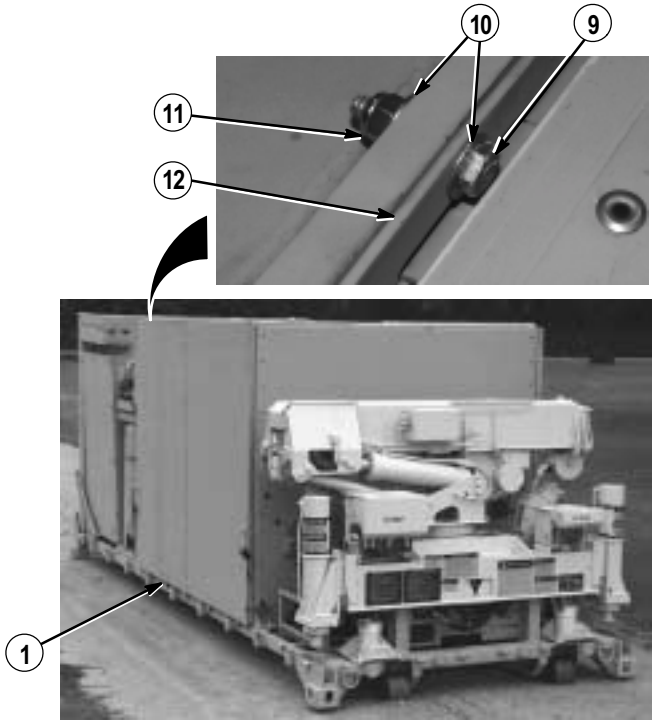
NOTE

Ensure door hinge and door are square with shelter.

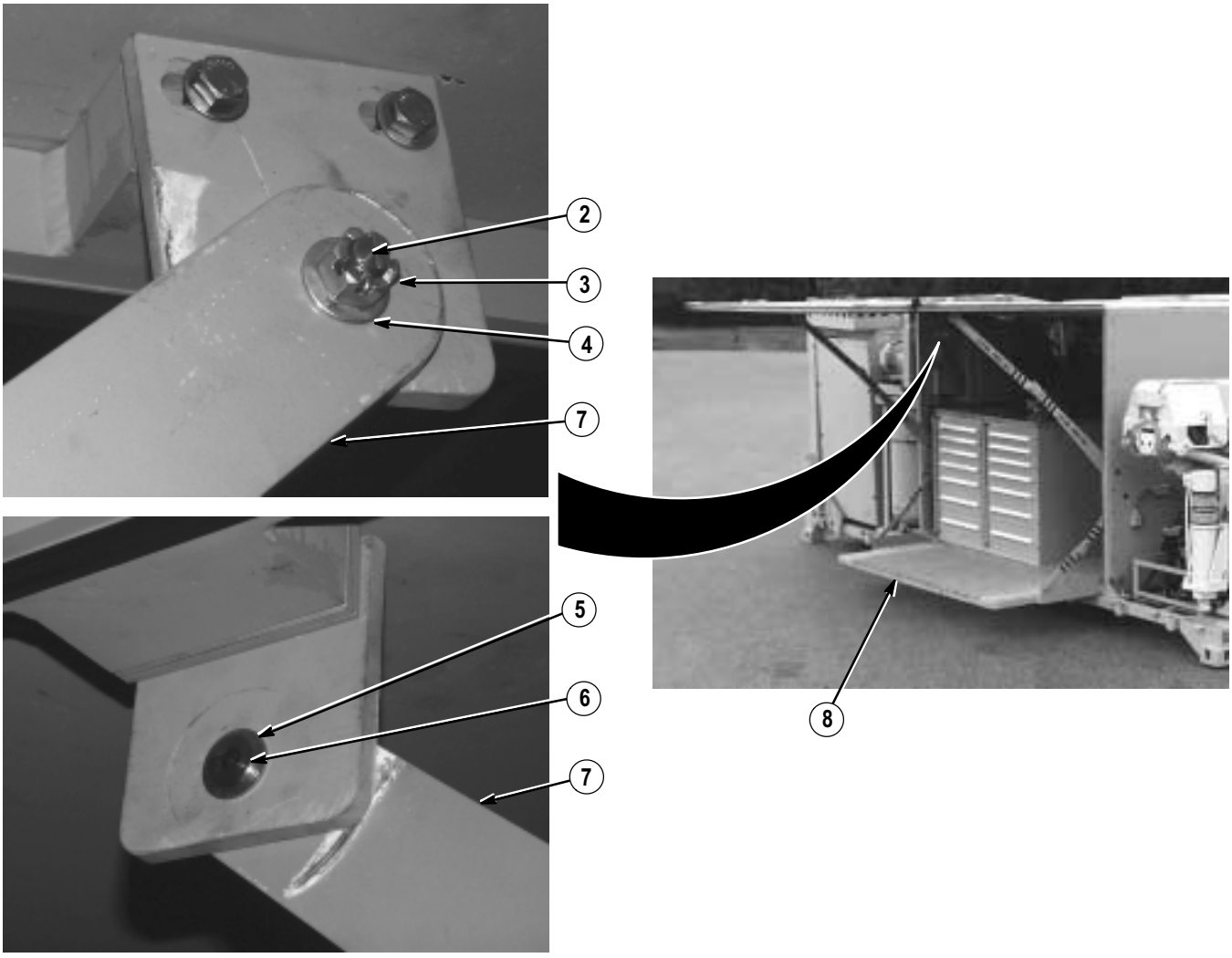
(2) Align door hinge (12) with top of shelter. Ensure hinge is flat across top of shelter.

(3) Install ten bolts (9), 20 washers (10) and ten locknuts (11).

(4) Open shelter door assembly (1).



4-4. DOOR ASSEMBLY REPAIR (CONT).



WARNING

Shelter platform weighs 268 lbs (122 kg). Use an assistant to help close/open platform or injury to personnel may result.

NOTE

Place wooden block under platform prior to support arm assembly.

(5) With the aid of an assistant, lower shelter platform (8).

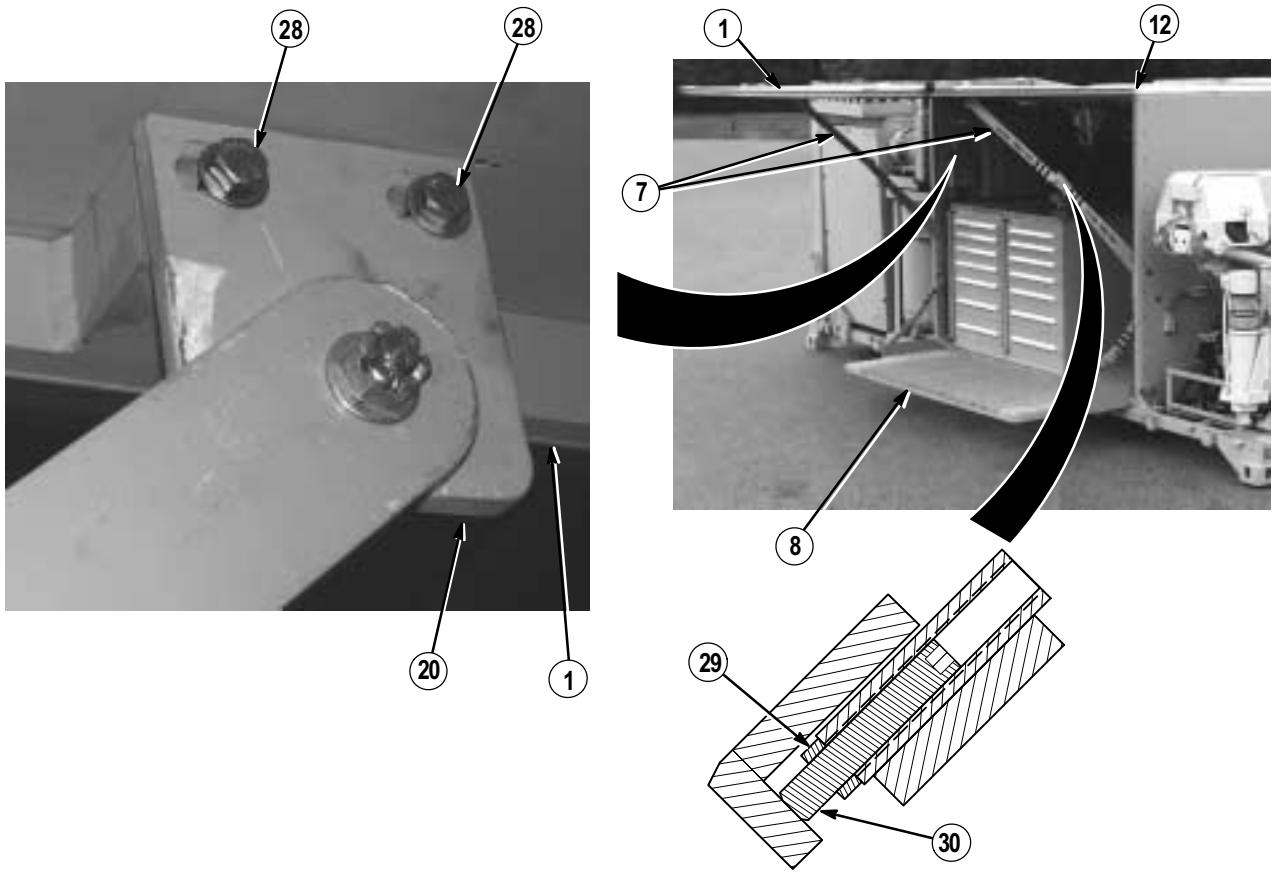
NOTE

Tighten nuts then slightly back off for free support arm movement.

(6) Align upper door support arms (7) and install socket head screw (6), washers (5), washers (4), slotted nuts (3) and cotter pins (2).

(7) Remove lifting device from door (1).

f. Adjustment.



(1) Close door (TM 9-4940-568-10).

(2) Ensure shelter platform (8) is in closed position and not in contact with door assembly (1). Ensure door support arms (7) and door hinge (12) is not binding.

NOTE

If door will not close completely and/or door contacts shelter platform, perform Steps (3) through (6).

(3) Open door assembly slightly, loosen two mount bolts (28) on upper support arm adjustment plate (20) on both sides of door assembly (1).

(4) Close door assembly (1) and ensure platform (8) is in closed position and not in contact with door. Check for proper seal on door.

(5) Open door assembly (1) slightly and tighten two mount bolts (28) on both sides of door assembly (1).

(6) Open and close door assembly (1) and check for binding.

(7) Loosen jam nut (29), adjust setscrew (30), and re-tighten jam nut.

(8) Repeat Step (7) until door will start closing with a combined pull of 30 to 50 lbs (14 to 23 kg) applied at door handles.

END OF TASK

4-5. DOOR LATCH ASSEMBLY REPLACEMENT.

This task covers:

a. Removal b. Installation c. Adjustment

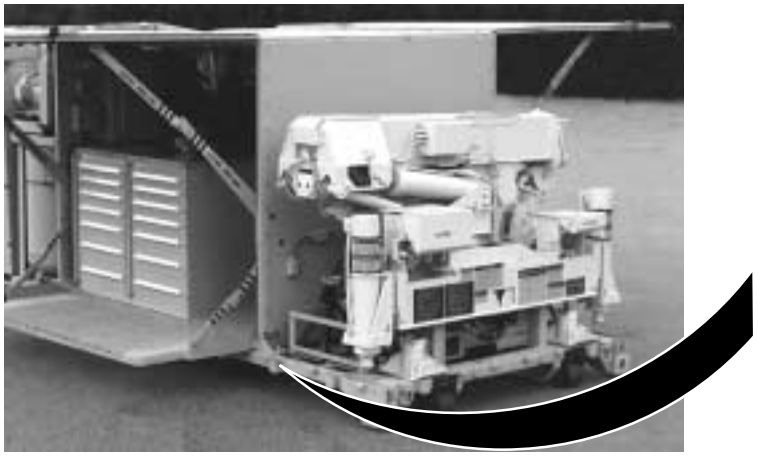
INITIAL SETUP

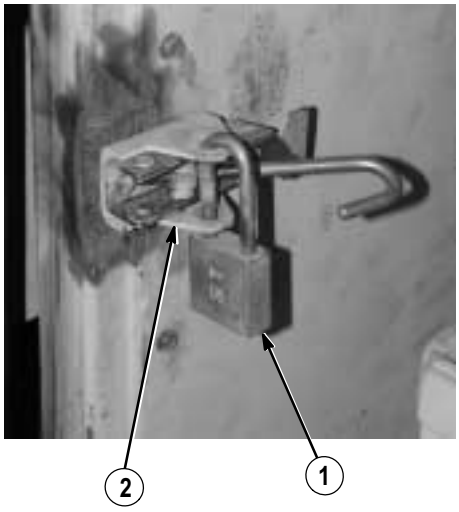
Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 30, Appendix G)

Materials/Parts
Sealing Compound (Item 32, Appendix C)

Equipment Condition
FRS unloaded, (TM 9-4940-568-10)

a. Removal.





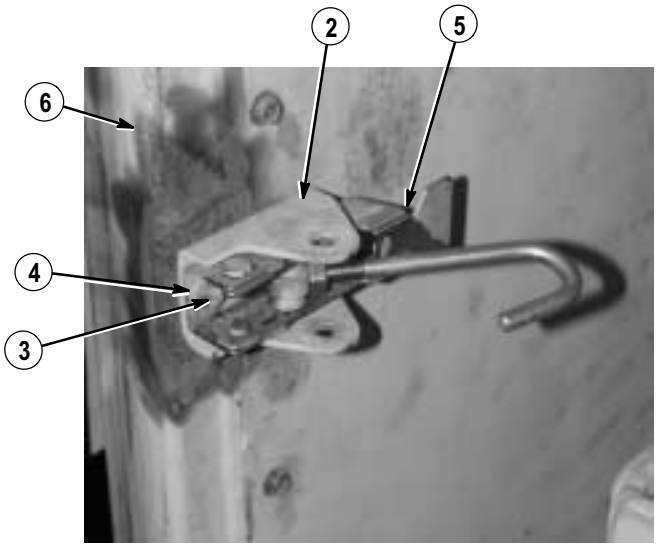
NOTE

There are a total of four door latch assemblies. All door latch assemblies are removed the same way.

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

(2) Remove two screws (3), washers (4), door latch (5) and door latch bracket (2) from shelter (6).

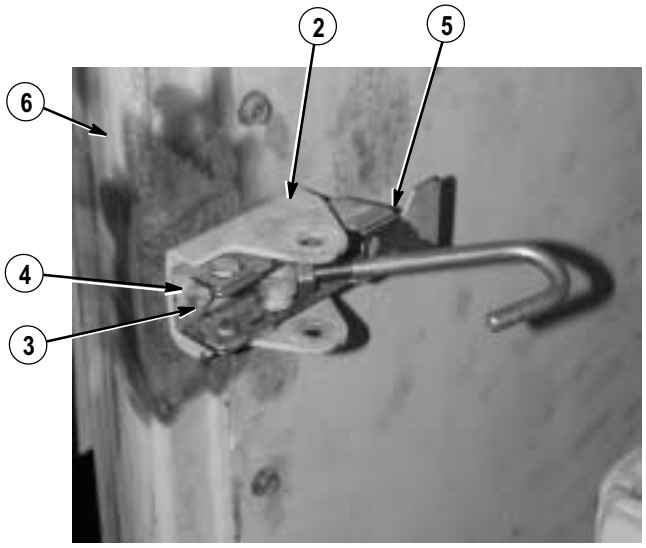
(3) Repeat Steps (1) and (2) for remaining door latch assemblies.



b. Installation.

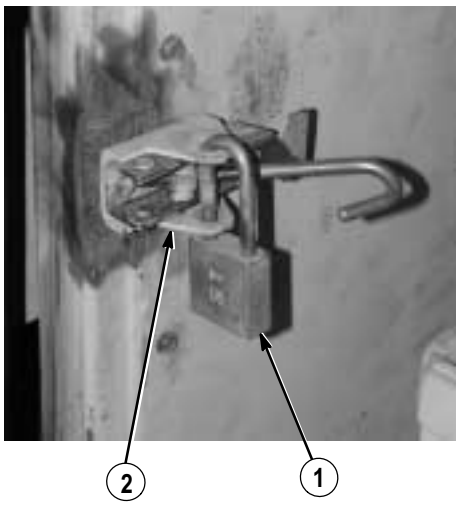
WARNING

Adhesives, solvents, and sealing compounds can burn easily, can give off harmful vapors, and are harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in well-ventilated area. If adhesive, solvent, or sealing compound gets on skin or clothing, wash immediately with soap and water.



(1) Coat threads of two screws (3) with sealing compound.

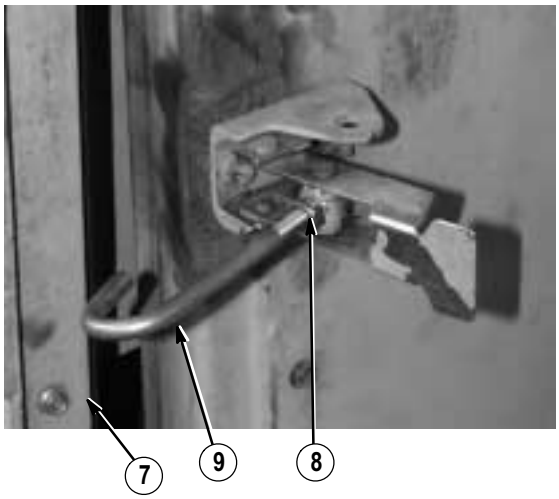
(2) Install door latch bracket (2), door latch (5) on shelter (6) with two washers (4) and screws (3).



(3) Latch shelter door (7) and check for proper seal of door. If proper seal of door is achieved, proceed to Step (4). If proper seal of door is not achieved, perform c. adjustment procedure.

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

c. Adjustment.



(1) Loosen jam nut (8) and turn j-bolt (9) one turn clockwise to tighten or one turn counter clockwise to loosen and close shelter door (7).

(2) Repeat Step (1) until shelter door (7) seals.

(3) Tighten jam nut (8) on j-bolt (9).

END OF TASK

4-6. HOOK ARM GUARD REPLACEMENT.

This task covers:

a. Removal b. Installation

INITIAL SETUP

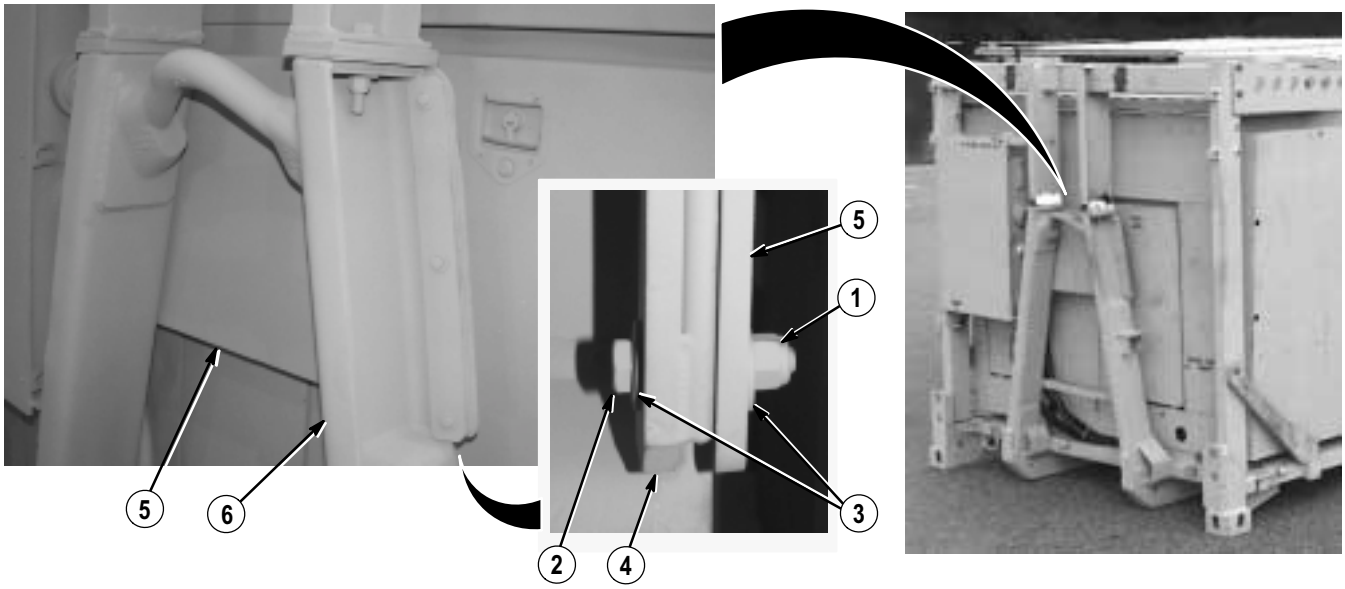
Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 30, Appendix G)

Materials/Parts
Locknut (6) (Item 42, Appendix F)

Personnel Required
Two

Equipment Condition
FRS unloaded, (TM 9-4940-568-10)

a. Removal.



WARNING

Hook arm guard weighs approximately 50 pounds (22 kg). Use an assistant to help remove hook arm guard or possible injury to personnel may result.

(1) Remove six locknuts (1), screws (2), 12 washers (3), two retaining brackets (4) and hook arm guard (5) from brush guard (6). Discard locknuts.

b. Installation.

(1) Install hook arm guard (5), two retaining brackets (4), 12 washers (3), six screws (2) and locknuts (1) on brush guard (6).

END OF TASK

4-7. BRUSH GUARD REPLACEMENT.

This task covers:

a. Removal b. Installation c. Follow-On Maintenance

INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 30, Appendix G)
Lifting Device, Minimum Capacity 500 lbs (227 kg)

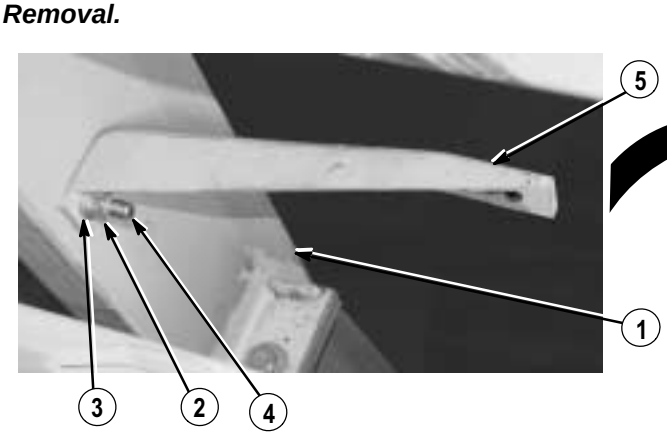
Materials/Parts
Tags, Identification (Item 40, Appendix C)
Locknut (Item 55, Appendix F)
Locknut (2) (Item 38, Appendix F)

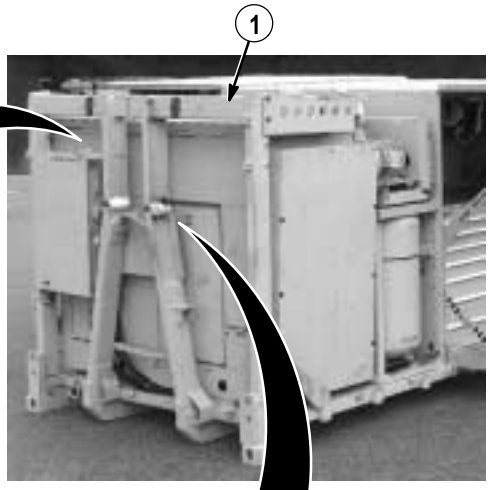
Materials/Parts
Locknut (4) (Item 50, Appendix F)

Personnel Required
Two

Equipment Condition
FRS unloaded, (TM 9-4940-568-10)
Shelter stowage rack removed, (Para 4-9)
Brush guard support arms removed, (Para 4-8)
Hydraulic reservoir removed, (Para 4-3)

a. Removal.





WARNING

Brush guard weighs 444 lbs (201 kg). Attach suitable lifting device for removal and properly support brush guard to prevent any injury to personnel.

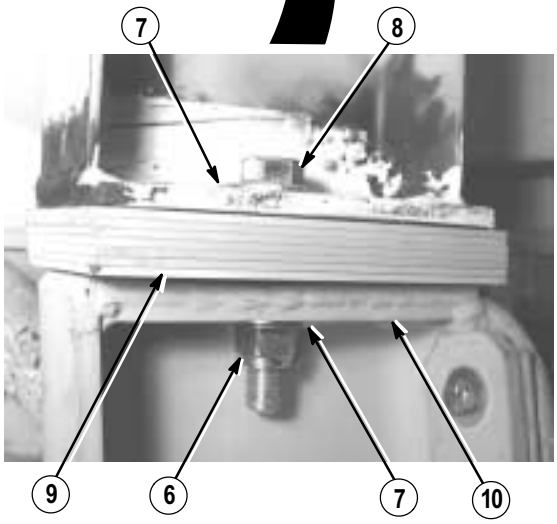
(1) With the aid of an assistant, attach suitable lifting device to brush guard assembly (1).

(2) Remove locknut (2), two washers (3), screw (4) and angle support bracket (5) from brush guard assembly (1).

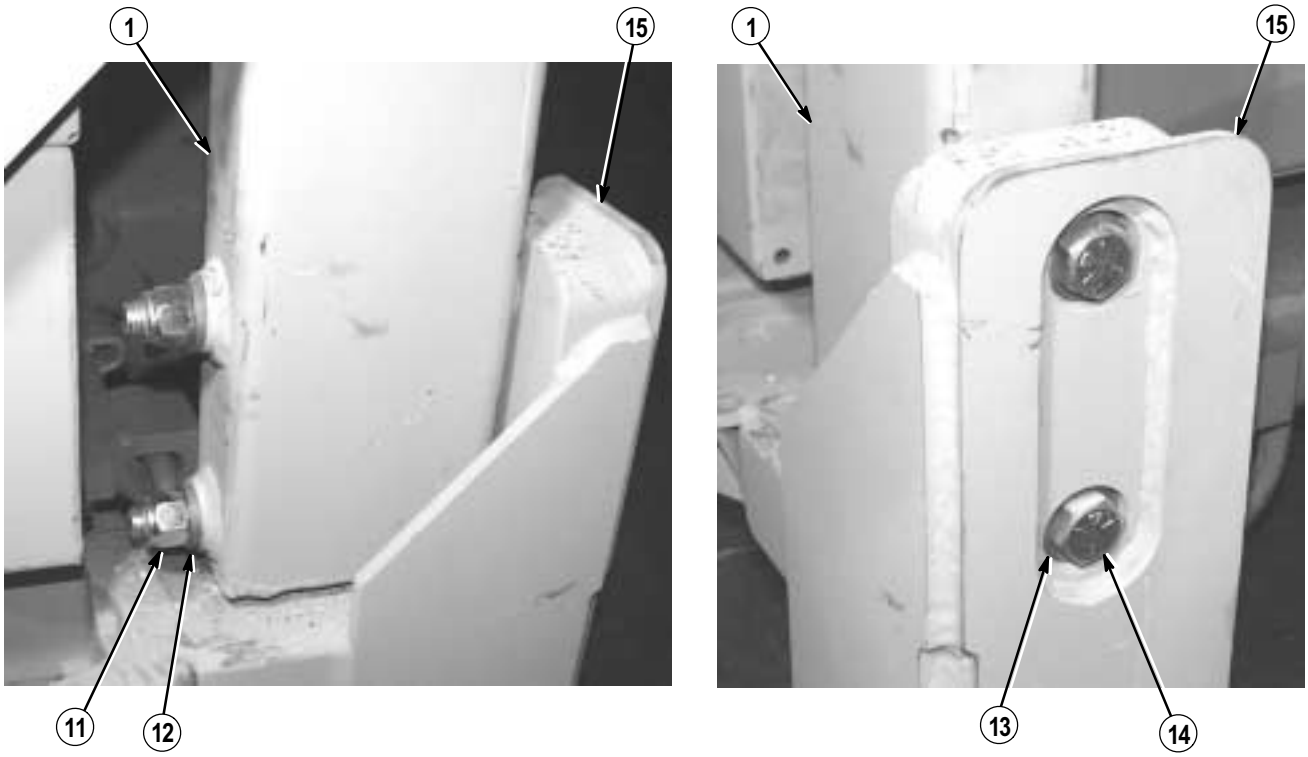
NOTE

Note quantity of shims prior to removal.

(3) Remove two locknuts (6), four washers (7), two screws (8) and shims (9) from bail hook post (10). Discard locknuts.



4-7. BRUSH GUARD REPLACEMENT (CONT).



(4) Remove two locknuts (11), washers (12), washers (13) and screws (14) from flatrack (15) and brush guard assembly (1).

(5) Repeat Step (4) for other side of brush guard assembly (1).

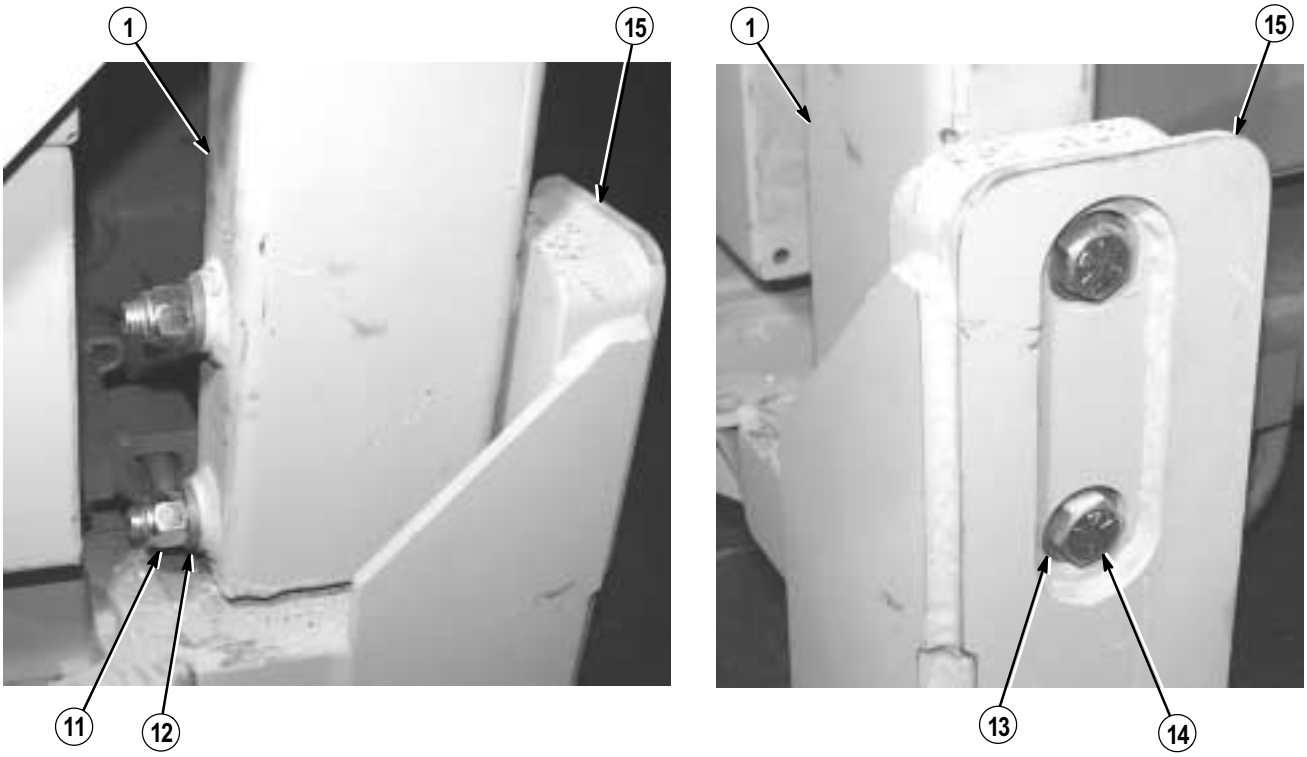
WARNING

Brush guard weighs 444 lbs (201 kg). Attach suitable lifting device for removal and properly support brush guard to prevent any injury to personnel.

(6) With the aid of an assistant, remove brush guard assembly (1) from shelter.

(7) Remove lifting device from brush guard assembly (1).

b. Installation.



WARNING

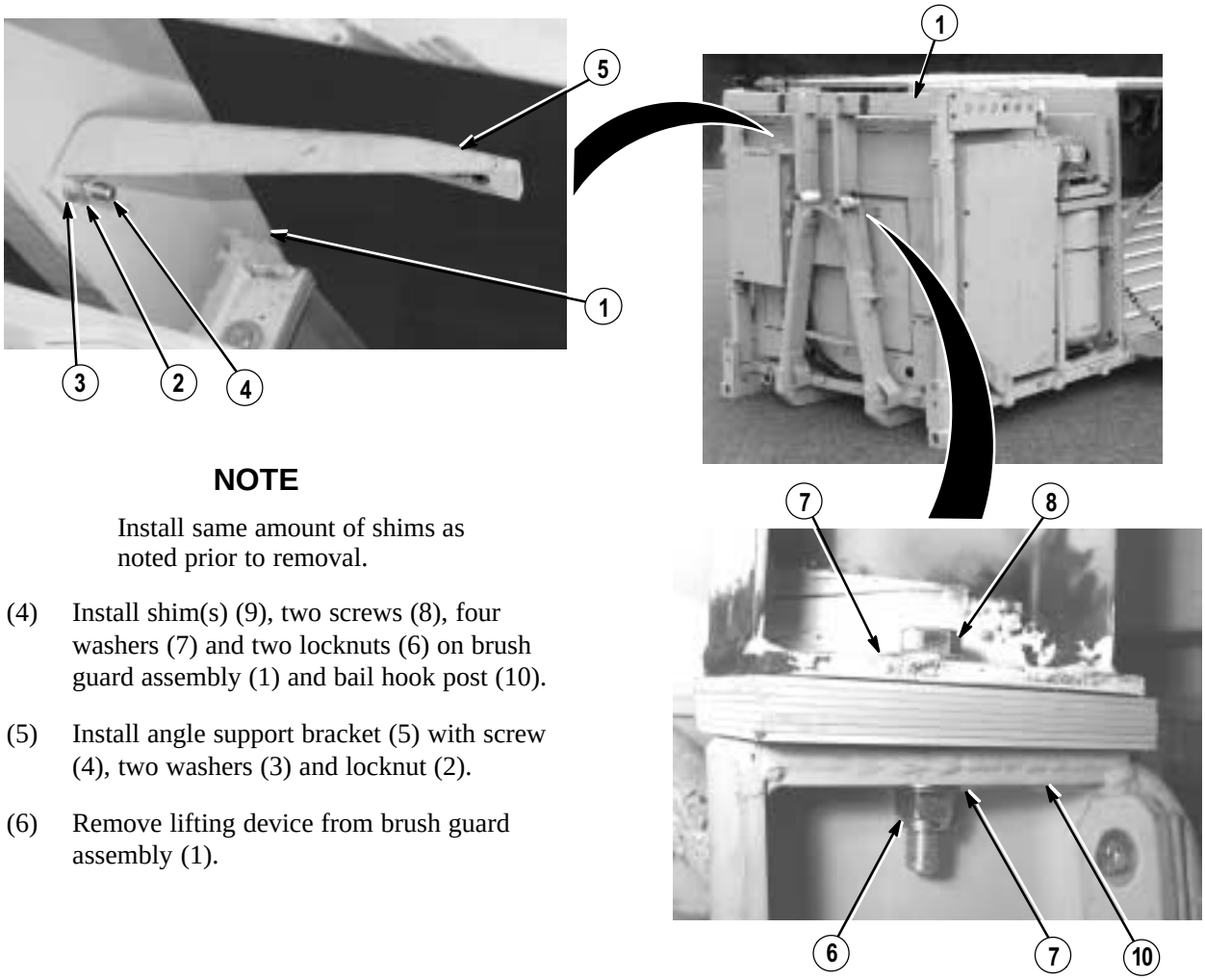
Brush guard weighs 444 lbs (201 kg). Attach suitable lifting device for installation and properly support brush guard to prevent any injury to personnel.

(1) With the aid of an assistant, attach suitable lifting device to brush guard assembly (1).

(2) Install brush guard assembly (1) on flatrack (15) with two screws (14), washers (13), washers (12) and locknuts (11).

(3) Repeat Step (2) for other side of brush guard assembly (1).

4-7. BRUSH GUARD REPLACEMENT (CONT).



NOTE

Install same amount of shims as noted prior to removal.

(4) Install shim(s) (9), two screws (8), four washers (7) and two locknuts (6) on brush guard assembly (1) and bail hook post (10).

(5) Install angle support bracket (5) with screw (4), two washers (3) and locknut (2).

(6) Remove lifting device from brush guard assembly (1).

c. Follow-On Maintenance:

- Install brush guard support arms, (Para 4-8).
- Install shelter stowage rack, (Para 4-9).
- Install hydraulic reservoir, (Para 4-3).

END OF TASK

4-8. BRUSH GUARD SUPPORT ARM REPLACEMENT.

This task covers:

a. Removal b. Installation

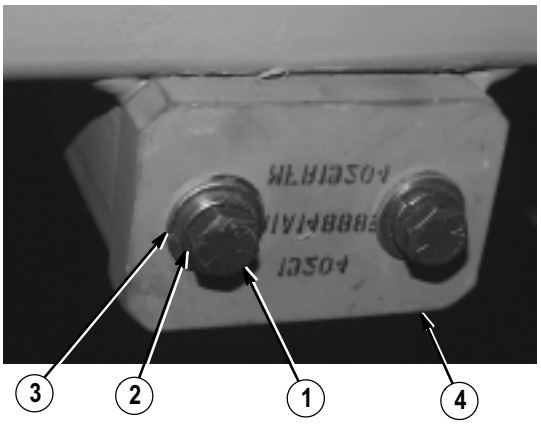
INITIAL SETUP

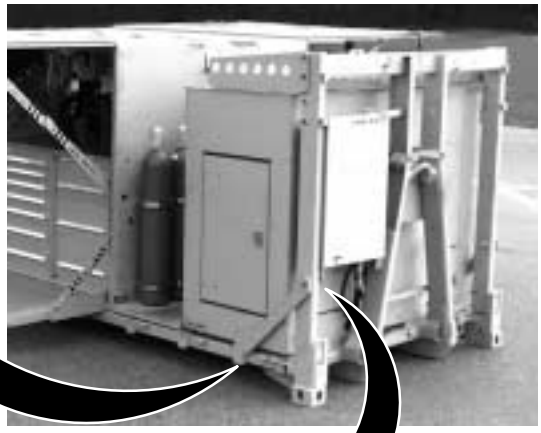
Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 30, Appendix G)

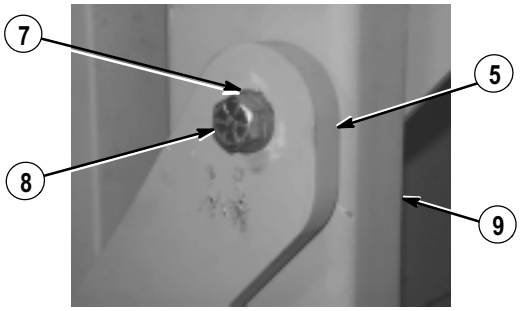
Equipment Condition
FRS unloaded, (TM 9-4940-568-10)

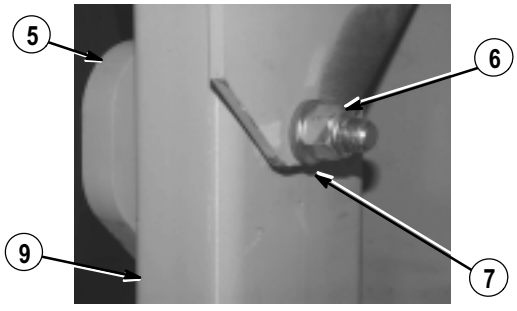
Materials/Parts
Locknut (2) (Item 50, Appendix F)
Lockwasher (4) (Item 67, Appendix F)

a. Removal.









NOTE

Both right hand and left hand support arm removal/installation is the same. Right side shown.

(1) Remove two screws (1), lockwashers (2), washers (3) and plate (4) from support arm (5). Discard lockwashers.

(2) Remove locknut (6), two washers (7) and screw (8) from brush guard (9). Discard locknuts.

(3) Remove support arm (5) from brush guard (9).

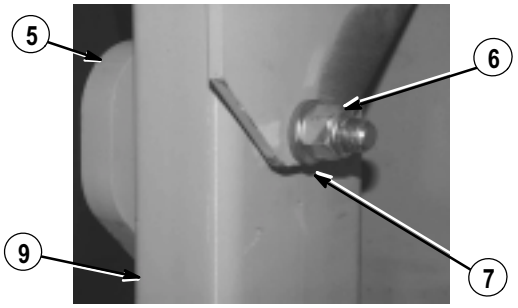
(4) Repeat Steps (1) through (3) for left side.

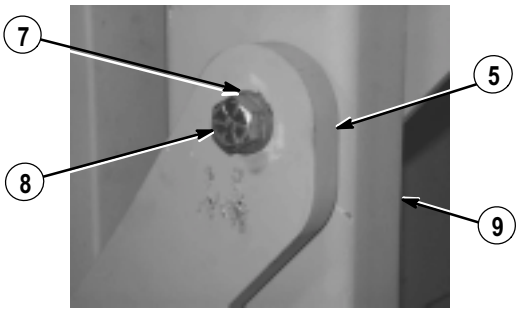
4-7. BRUSH GUARD SUPPORT ARM REPLACEMENT (CONT).

b. Installation.

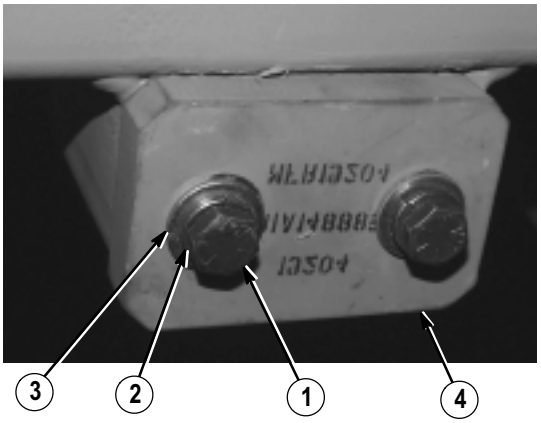
(1) Position support arm (5) on brush guard (9).

(2) Install screw (8), two washers (7) and locknut (6).





(3) Install two screws (1), lockwashers (2), washers (3) and plate (4).



END OF TASK

4-9. SHELTER STOWAGE RACK REPLACEMENT.

This task covers:

a. Removal b. Installation

INITIAL SETUP

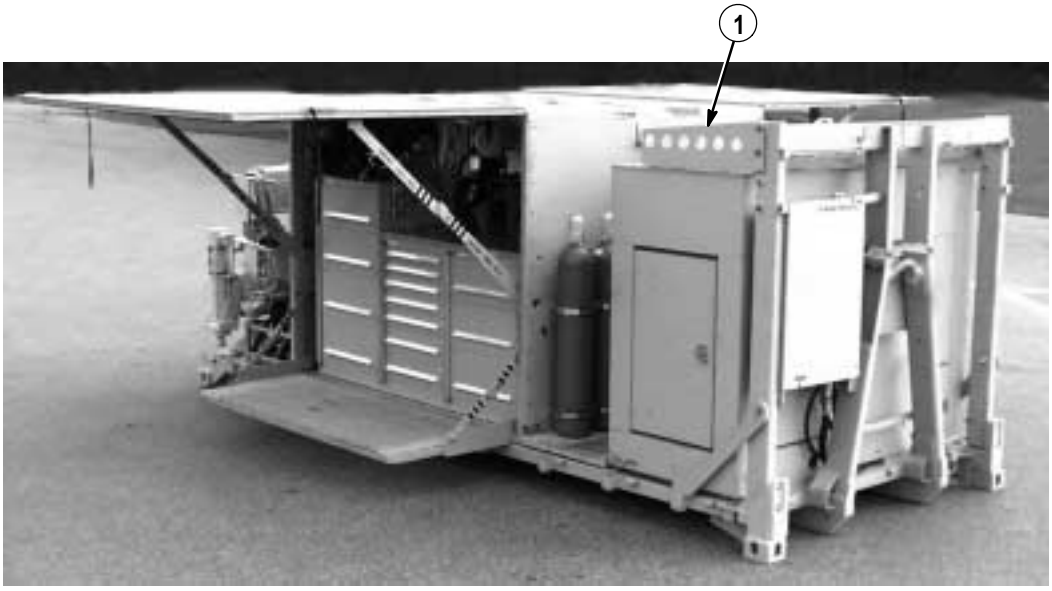
Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 30, Appendix G)
Lifting Device, Minimum Capacity 350 lbs (159 kg)

Materials/Parts
Locknut (4) (Item 40, Appendix F)

Personnel Required
Two

Equipment Condition
FRS unloaded, (TM 9-4940-568-10)

a. Removal.



WARNING

Shelter stowage rack weighs approximately 300 lbs (137 kg). Attach suitable lifting device for removal and properly support shelter stowage rack to prevent injury to personnel.

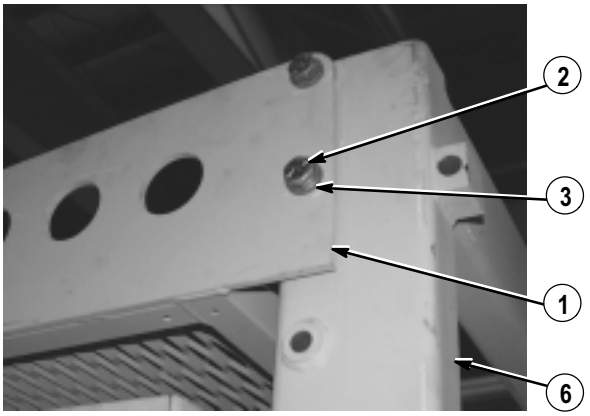
(1) With the aid of an assistant, attach lifting device to shelter stowage rack (1).

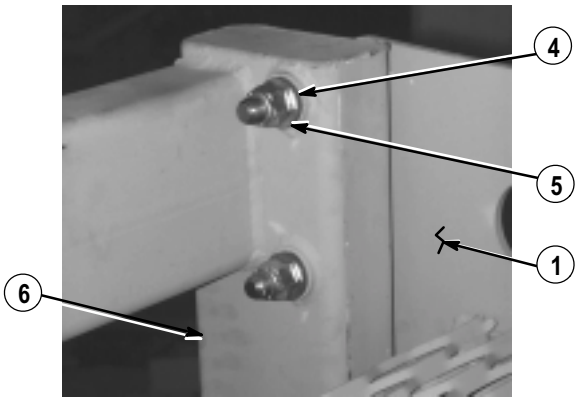
4-7. SHELTER STOWAGE RACK REPLACEMENT (CONT).

(2) Remove four screws (2), washers (3), washers (4) and locknuts (5) from stowage rack (1) and brush guard assembly (6). Discard locknuts.

(3) With the aid of an assistant, remove shelter stowage rack (1) from brush guard assembly (6).

(4) Remove lifting device from shelter stowage rack (1).





b. Installation

WARNING

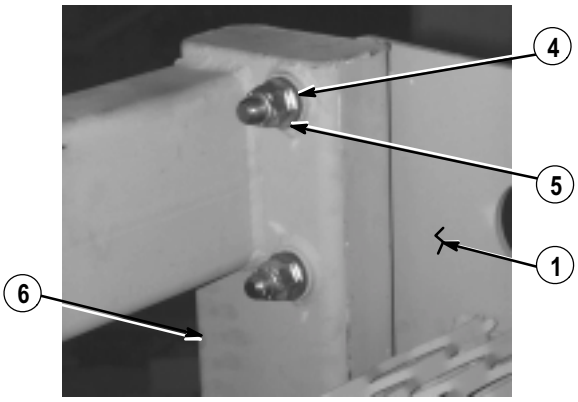
Shelter stowage rack weighs approximately 300 lbs (137 kg). Attach suitable lifting device for removal and properly support shelter stowage rack to prevent injury to personnel.

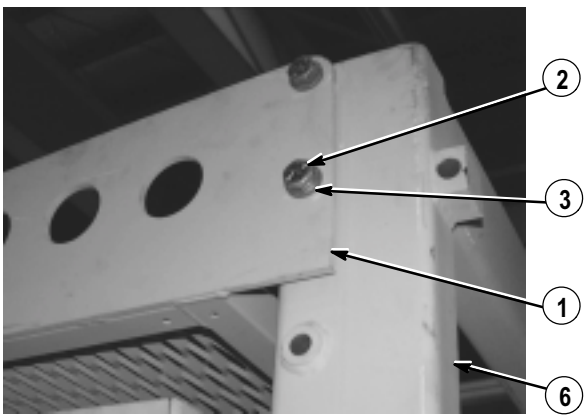
(1) With the aid of an assistant, attach lifting device to shelter stowage rack (1).

(2) With aid of an assistant, position shelter stowage rack (1) on brush guard assembly.

(3) Install shelter stowage rack (1), four screws (2), washers (4), washers (3) and locknuts (5) on brush guard assembly (6).

(4) Remove lifting device from shelter stowage rack (1).





END OF TASK

4-10. JACKSTAND, TRESTLE STORAGE BOX REPLACEMENT.

This task covers:

a. Removal b. Installation

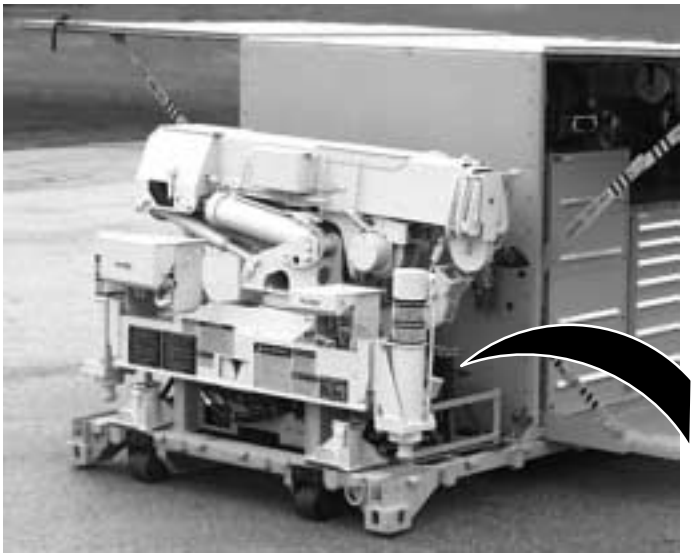
INITIAL SETUP

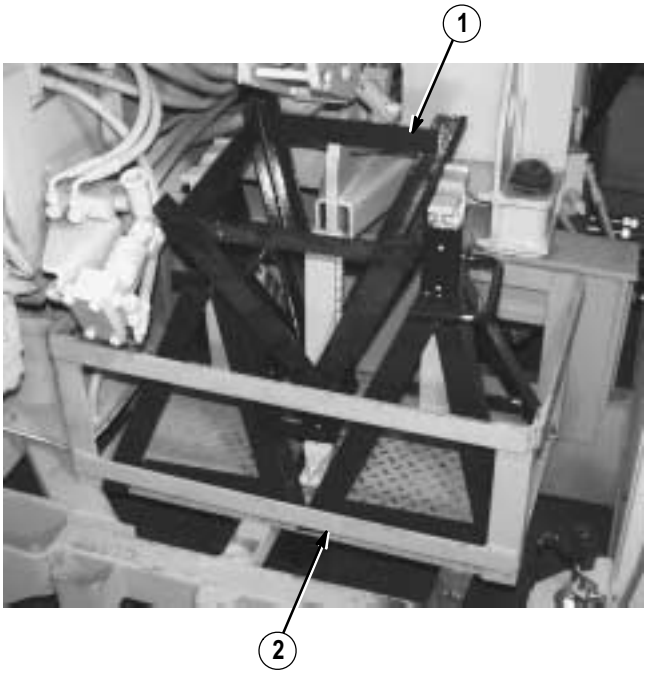
Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 30, Appendix G)

Materials/Parts
Locknuts (4) (Item 48, Appendix F)

Equipment Condition
FRS unloaded, (TM 9-4940-568-10)
Engine OFF, (TM 9–4940–568–10)

a. Removal.





NOTE

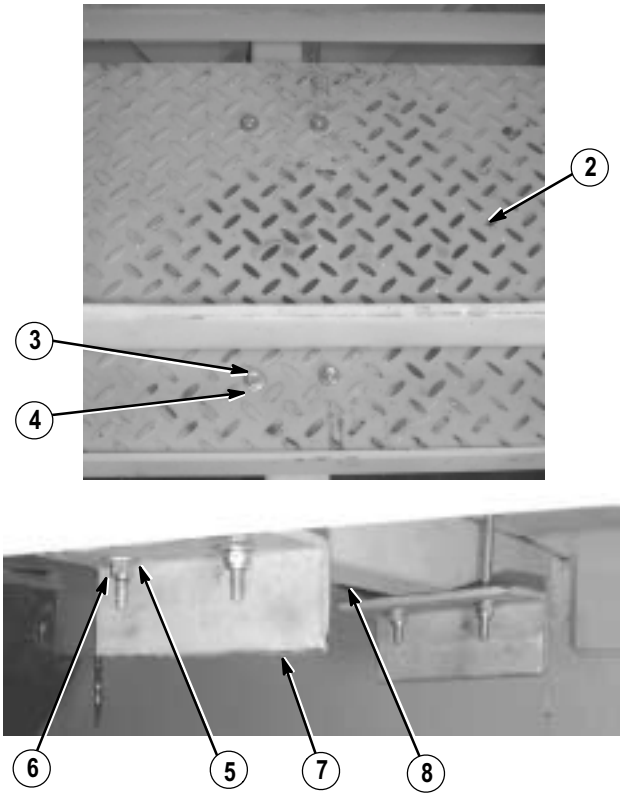
- The following procedures apply to both left and right jackstand trestle storage boxes. Right jackstand trestle storage box shown.
- Note position of jackstand trestle storage box before removal.

(1) Remove three jackstands (1) from storage box (2).

4-10. JACKSTAND, TRESTLE STOWAGE BOX REPLACEMENT (CONT).

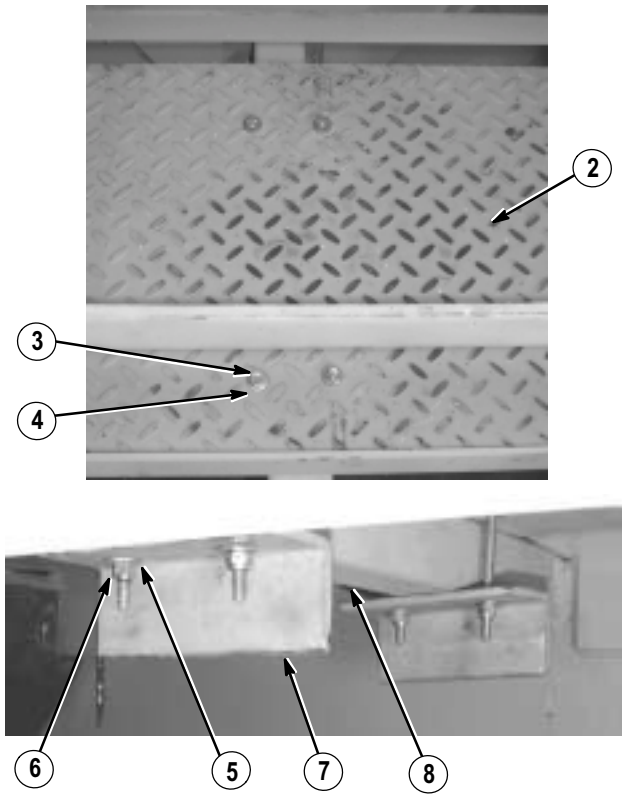
(2) Remove four screws (3), washers (4), washers (5), locknuts (6) and two angle brackets (7) from base of storage box (2). Discard locknuts.

(3) Remove storage box (2) from flatrack (8).

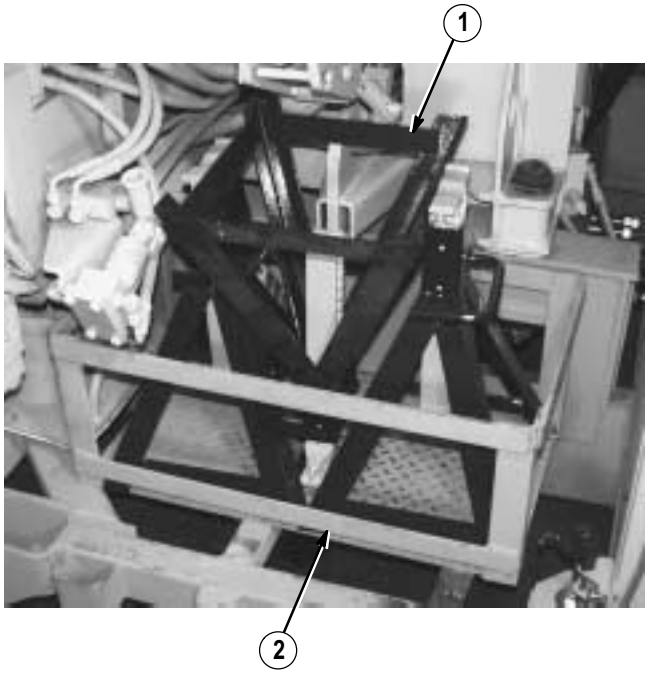


b. Installation.

(1) Install storage box (2) on flatrack (8) with two angle brackets (7), four screws (3), washers (4), washers (5) and locknuts (6).



(2) Install three jackstands (1) in storage box (2).



END OF TASK

4-11. TOOL CABINET REPLACEMENT.

This task covers:

a. Removal b. Installation

INITIAL SETUP

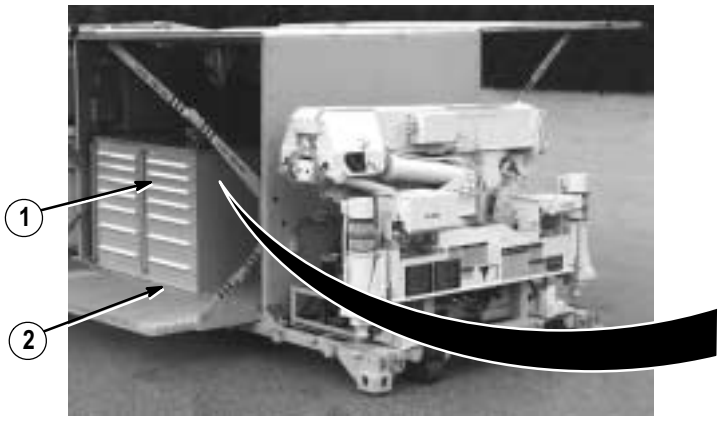
Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 30, Appendix G)
Drill, Electric (Item 7, Appendix G)
Drill Set, Twist (Item 9, Appendix G)

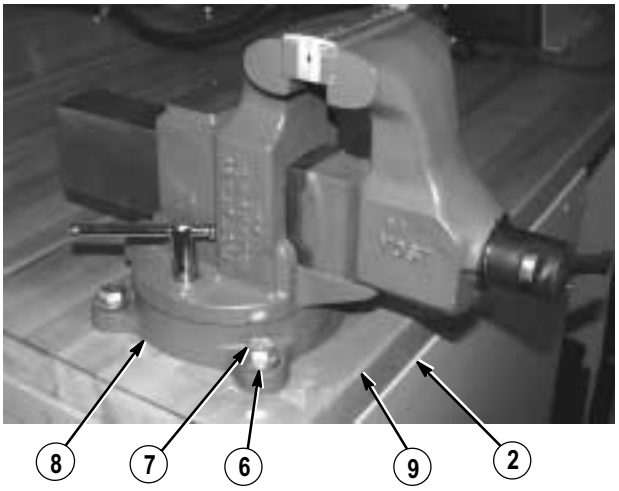
Material/Parts
Locknut (6) (Item 35, Appendix F)
Locknut (3) (Item 54, Appendix F)

Personnel Required
Two

Equipment Condition
FRS unloaded, (TM 9-4940-568-10)

a. Removal.





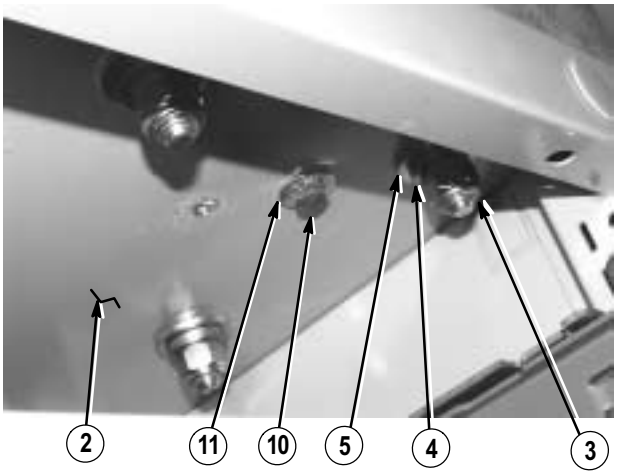
NOTE

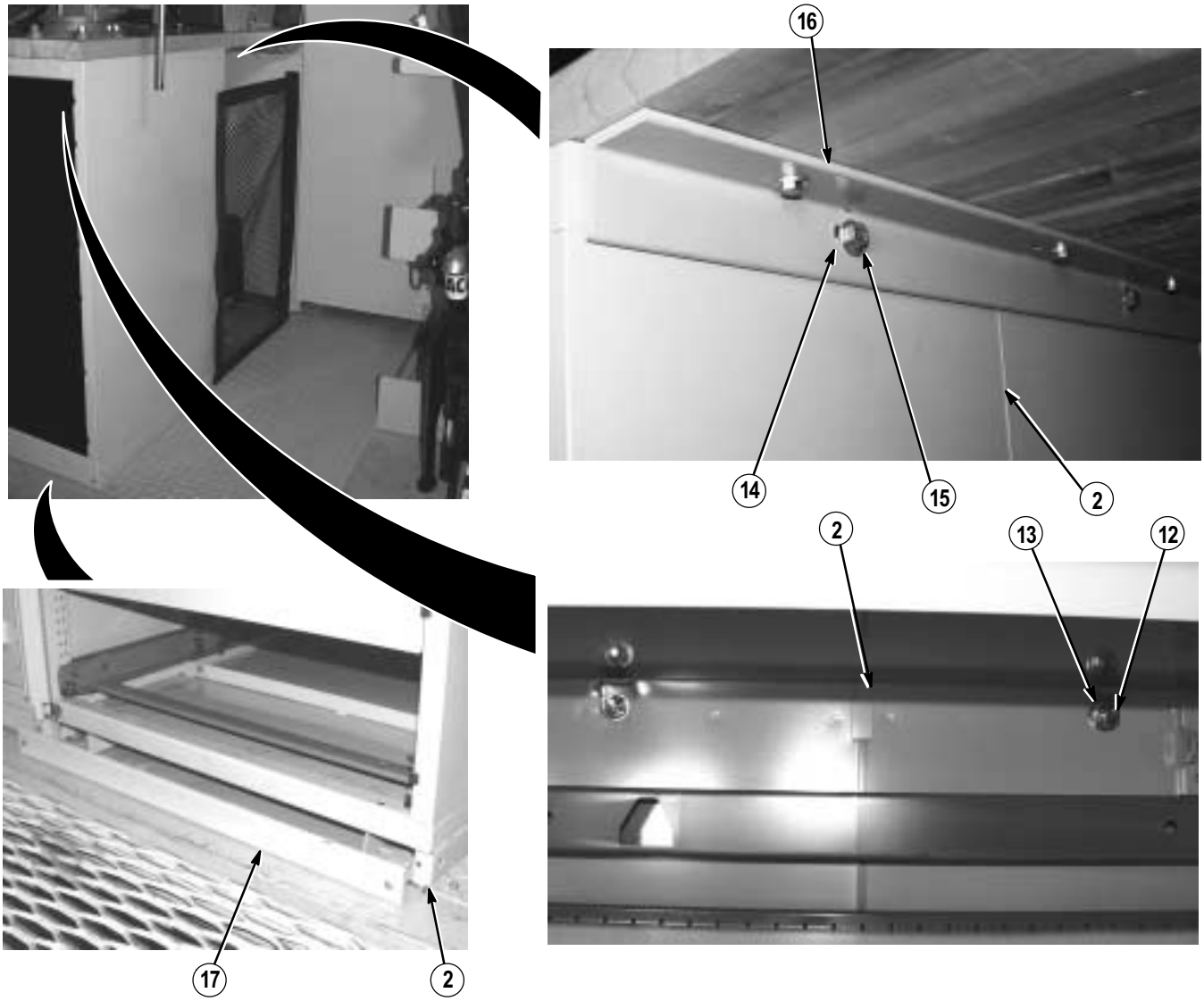
There are five tool cabinets located on the FRS. All five are removed in a similar manner with the exception of items mounted on the working surface above cabinet. Cabinet B is shown.

(1) Remove all drawers (1) from cabinet B (2).

(2) Remove three locknuts (3), washers (4), washers (5), washers (6), screws (7) and vise (8) from wooden top (9) on cabinet B (2). Discard locknuts.

(3) Remove two screws (10) and washers (11) from cabinet B (2) and wooden top (9).





NOTE

Remove items from stowage area behind cabinets as required.

(4) Remove two locknuts (12), washers (13), washers (14) and screws (15) from cabinet B (2) and bracket (16). Discard locknuts.

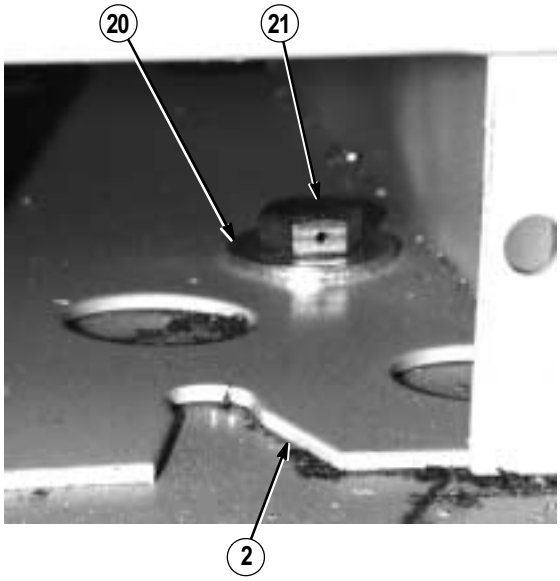
NOTE

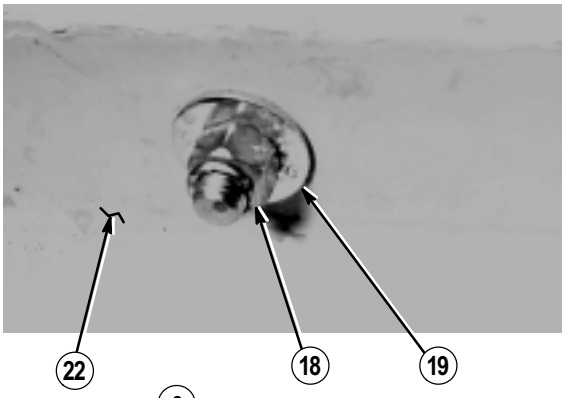
Cover is removed by pulling outward.

(5) Remove cover (17) from bottom front of cabinet B (2).

4-11. TOOL CABINET REPLACEMENT (CONT).

(6) Remove four locknuts (18), washers (19), washers (20) and screws (21) from cabinet B (2) and floor (22). Discard locknuts.

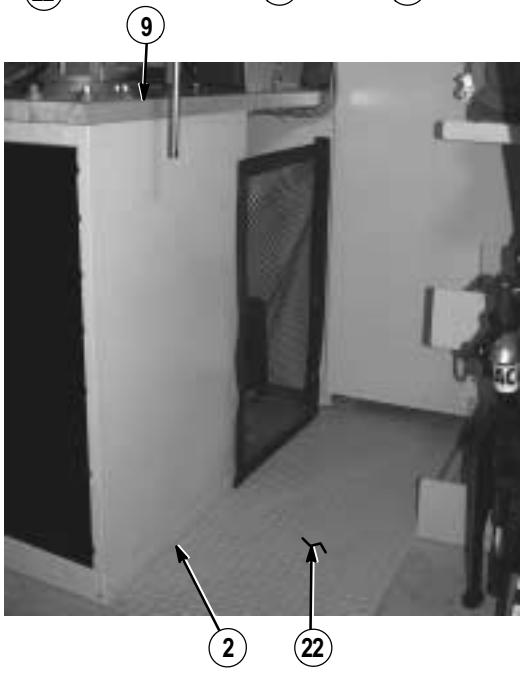




WARNING

Tool cabinets weigh up to 107 lbs (49 kg). Use an assistant when removing tool cabinet from FRS to prevent injury to personnel.

(7) With the aid of an assistant, slide cabinet B (2) out from between wooden top (9) and floor (22) and remove from FRS.



b. Installation.

WARNING

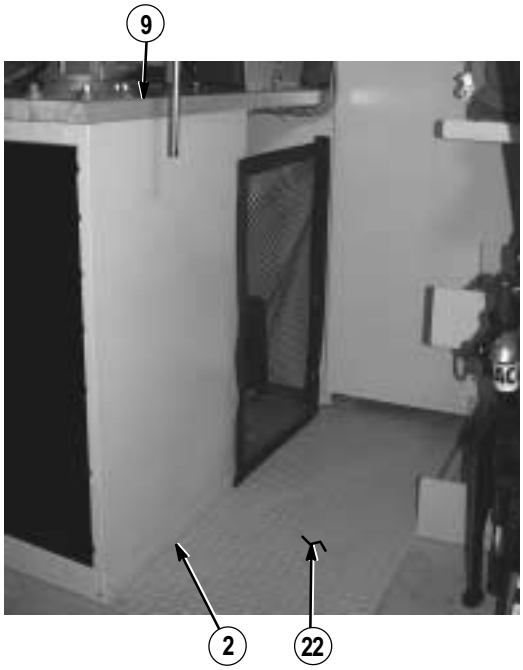
Tool cabinets weigh up to 107 lbs (49 kg). Use an assistant when installing tool cabinet on FRS to prevent injury to personnel.

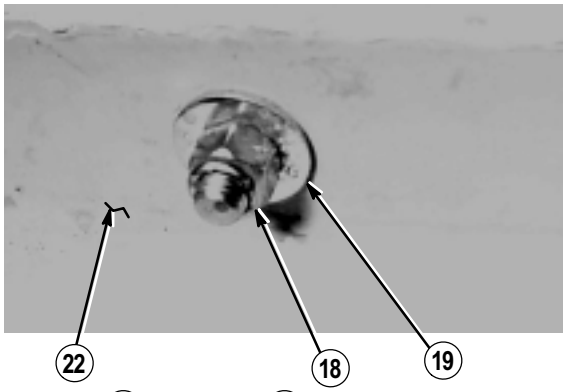
NOTE

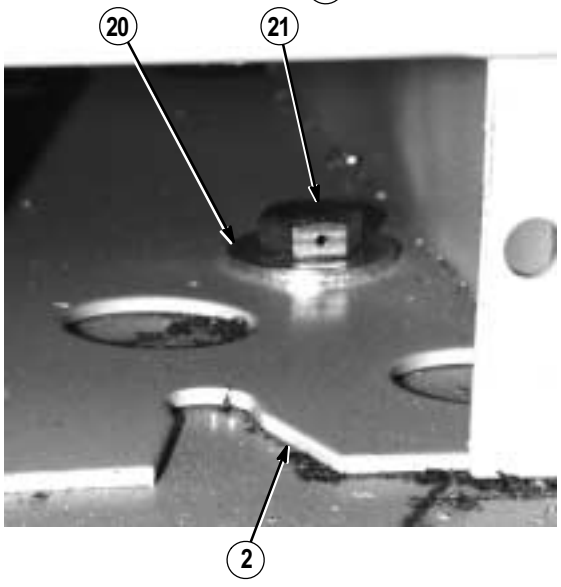
- Ensure all drawers are removed from cabinet being installed.
- There are five tool cabinets located on the FRS. All five are installed in a similar manner with the exception of items mounted on the working surface above cabinet. Cabinet B is shown.

(1) With the aid of an assistant, position cabinet B (2) on FRS between wooden top (9) and floor (22).

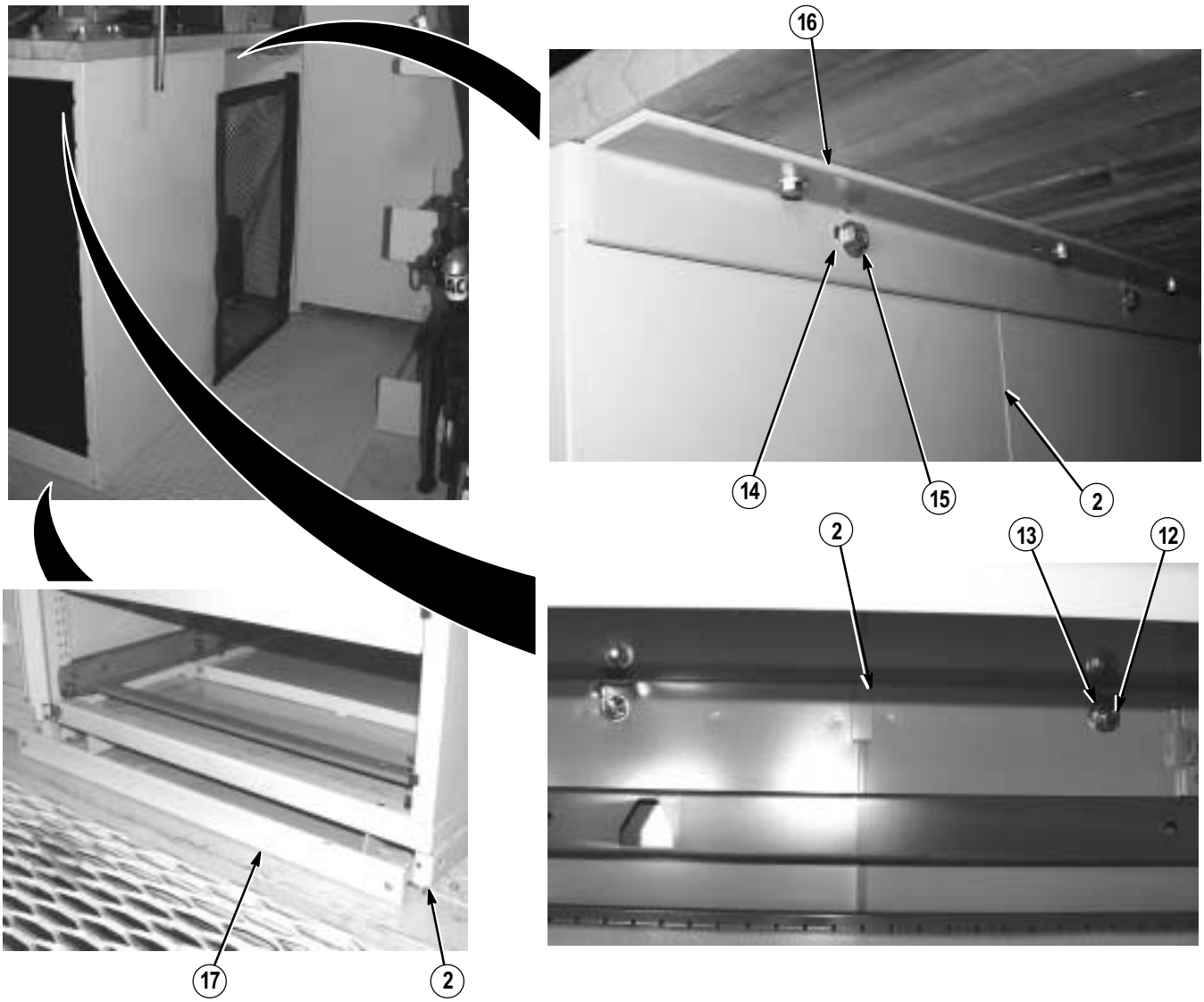
(2) Install cabinet B (2) on floor (22) with four screws (21), washers (20), washers (19) and locknuts (18).







4-11. TOOL CABINET REPLACEMENT (CONT).



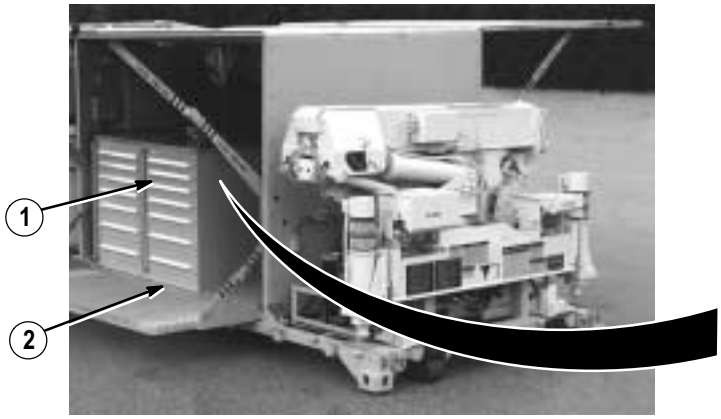
(3) Install cover (17) on bottom front of cabinet B (2).

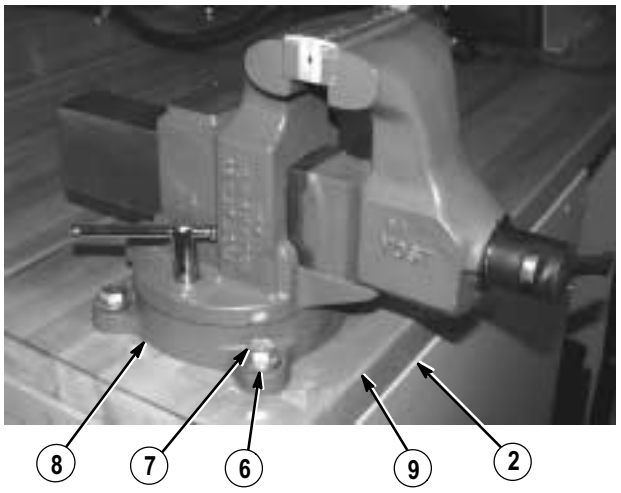
NOTE

- If installing new cabinet, take measurements off old cabinet.
- Perform Step (4) if installing new cabinet.

(4) Record measurements from old cabinet B (2) and drill two 3/8 in. (7.62 cm) holes in new cabinet B (2).

(5) Install cabinet B (2) on bracket (16) with two screws (15), washers (14), washers (13) and locknuts (12).

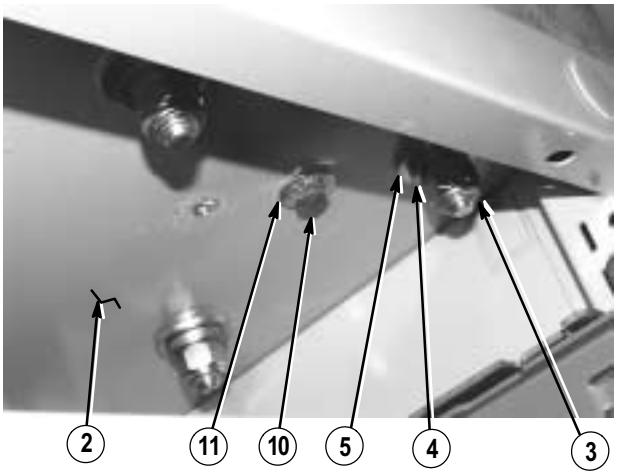




(6) Install two washers (11) and screws (10) in cabinet B (2) and wooden top (9).

(7) Install vise (8) on wooden top (9) and cabinet B (2) with three screws (7), washers (6), washers (5), washers (4) and locknuts (3).

(8) Install drawers (1) in cabinet B (2).



END OF TASK

CHAPTER 5

CRANE MAINTENANCE

5-1. INTRODUCTION.

This chapter contains maintenance instructions for removing, replacing, repairing, installing and adjusting crane components authorized by the Maintenance Allocation Chart (MAC) at the Unit Maintenance level.

5-2. OVERVIEW OF CRANE

This chapter provides information authorized for Unit Maintenance level mechanics. The following sections cover maintenance and replacement procedures for the FRS's crane.

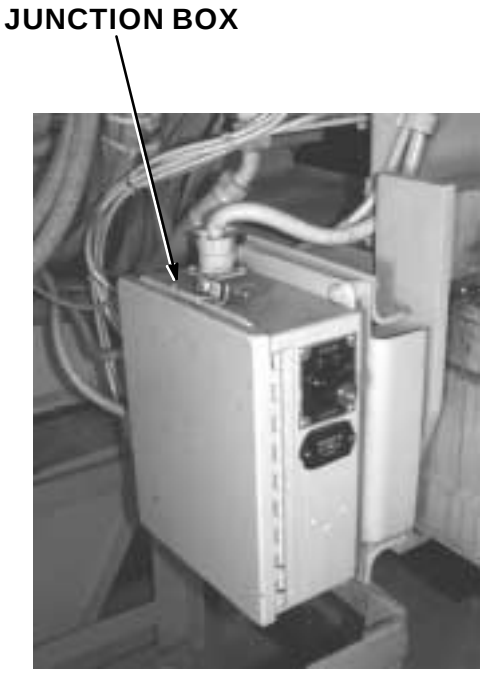
5-3. DESCRIPTION AND DATA

a. General. The FRS crane can be extended to a maximum length of 18 feet. The crane is capable of lifting 10,000 lbs. at 14 feet. Beyond that, the crane is limited to lighter loads by an overload shutdown system. The crane can be rotated 300 degrees. The crane is equipped with remote control functions. In the event of electrical failure, or a hydraulic failure the crane can still be stowed using the manual override valve for the electrical failure or the slave hose for the hydraulic failure.

b. Electrical System. The crane's electrical system operates on 24 volts DC, supplied from FRS 24 VDC system. Electricity provides power for the remote control system. Electricity also controls the overload shutdown system.

(1) JUNCTION BOX. The junction box, located on the crane subframe, receives power (24 volts DC) from the FRS 24 VDC system. The junction box is the center for all of the crane's electrical connections.

(2) OVERLOAD SHUTDOWN SYTEM MICROPROCESSOR. The microprocessor receives information from four sensors to allow a comparison of the actual load and rated load. If the load is over the rated load, the microprocessor will lock out all functions that would increase the load exerted on the crane. These are boom up and down, hoist up, and telescope out. All other functions are not affected by the lockout signal.



5-3. DESCRIPTION AND DATA (Continued)

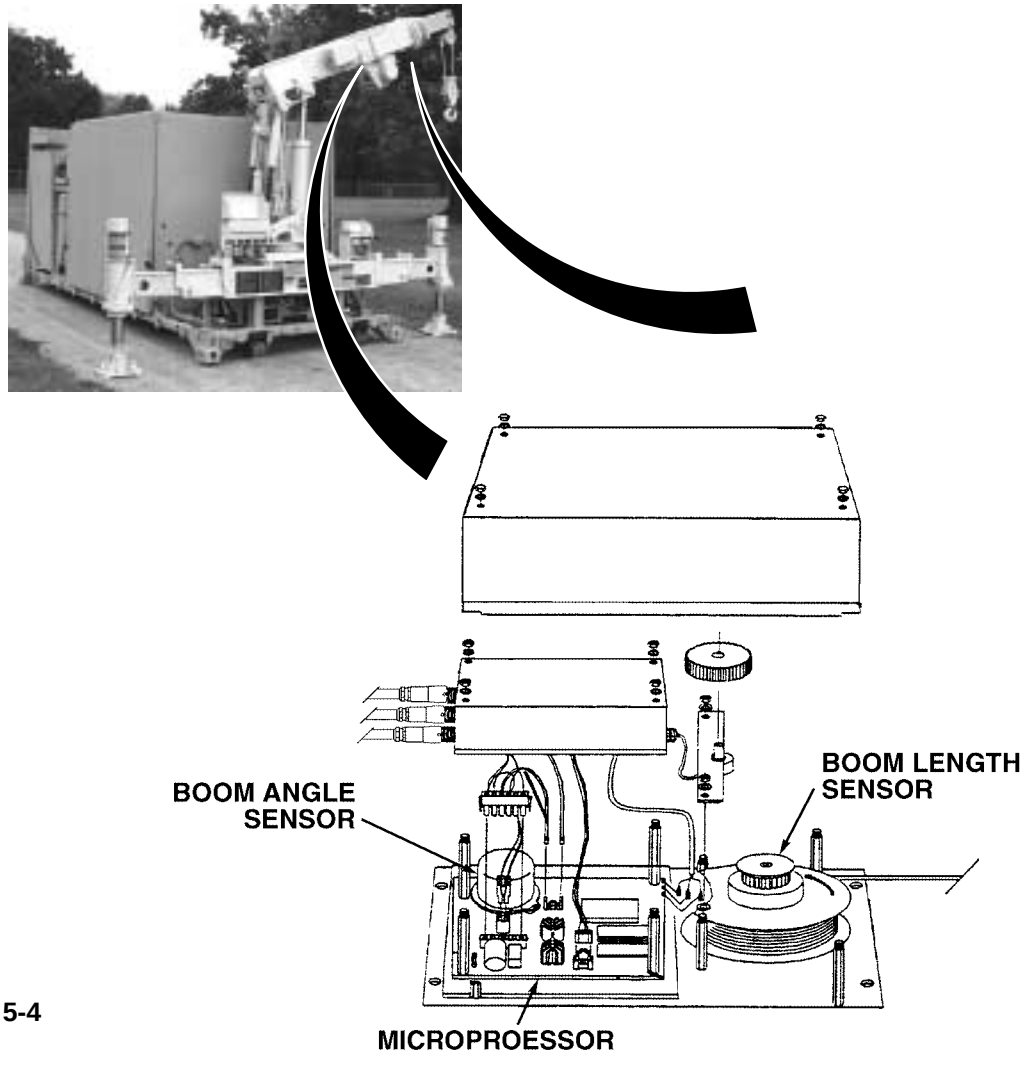
(3) OVERLOAD SHUTDOWN SYSTEM SENSORS.

(a) BOOM LENGTH SENSOR. The boom length sensor is a length potentiometer that measures and sends a signal to the microprocessor on how far the boom is extended.

(b) BOOM ANGLE SENSOR. The boom angle sensor measures and sends a signal to the microprocessor on what angle the boom is at.

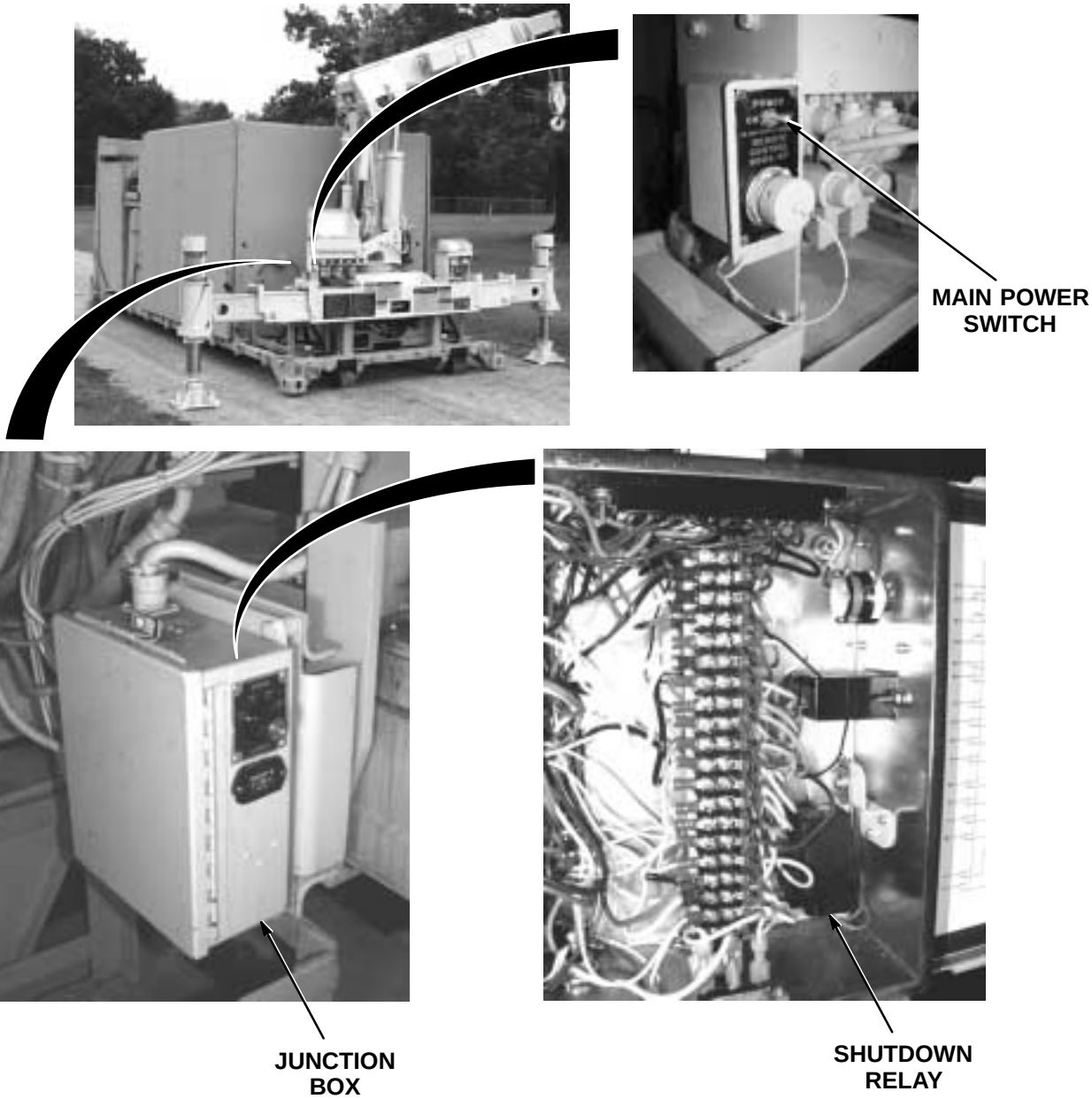
(c) TENSION LOAD CELL. The tension load cell is a strain gage that sends a signal of the load exerted on the hoist at its pivot point. It sends the signal to the microprocessor which uses the information to determine if an overload condition exists. It works in conjunction with the boom length and boom angle sensors to initiate an overload lockout signal.

(d) HOIST LAYER SENSOR. The hoist layer sensor is a proximity switch that sends an ON/OFF signal to the microprocessor indicating the amount of cable that has been spooled off of the hoist. It will cause the microprocessor to use a different calibration factor to determine the actual load exerted on the tension load cell.



(4) MAIN POWER SWITCH. The main power switch allows electrical power from the FRS 24 VDC system to power up the crane's electrical circuits. This switch also serves as a circuit breaker to prevent damage to the crane's electrical system in the event of a short circuit.

(5) SHUTDOWN RELAY. The shutdown relay is located in the junction box and relays a signal from the remote control emergency stop switch to cut power to the manual override valve. This will cause all hydraulic fluid to be blocked from entering the crane's hydraulic system.



5-3. DESCRIPTION AND DATA (Continued)

c. Hydraulic System. The FRS hydrualic pump supplies hydraulic oil to the crane at a flow rate of up to 12 gallons per minute. This flow of hydraulic oil is directed and controlled by several valves on the crane. Opening these valves sends a signal back to FRS variable-displacement hydraulic pump, using the pump to stroke up and deliver to the crane's hydraulic cylinders. Here, hydraulic oil pressure builds until great enough to move the hydraulic cylinders. Relief valves prevent this pressure from becoming too great. The relief valves release extra pressure and send it back to the hydraulic reservoir on the FRS system. Unwanted movement of the crane is prevented by holding valves mounted on the crane's boom.

All hydraulic oil eventually flows back to the FRS hydrualic reservoir through a return line. There, the hydraulic oil is cooled. The hydraulic oil is then drawn into the hydraulic pump, through the filter and begins the cycle again.

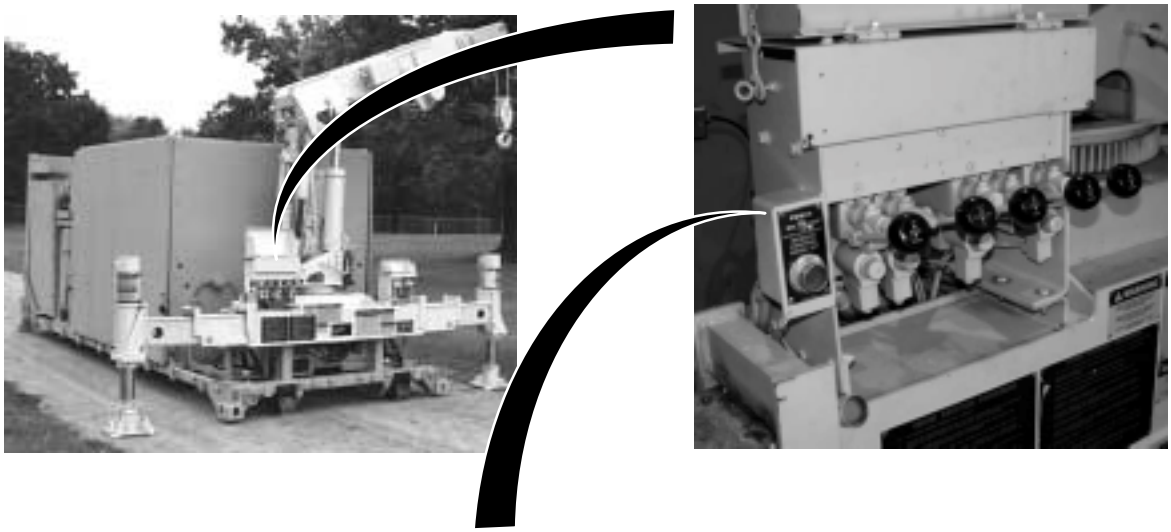
(1) OUTRIGGER EXTENSION CYLINDERS. The two outrigger extension cylinders hydraulically extend or retract the extension beams.

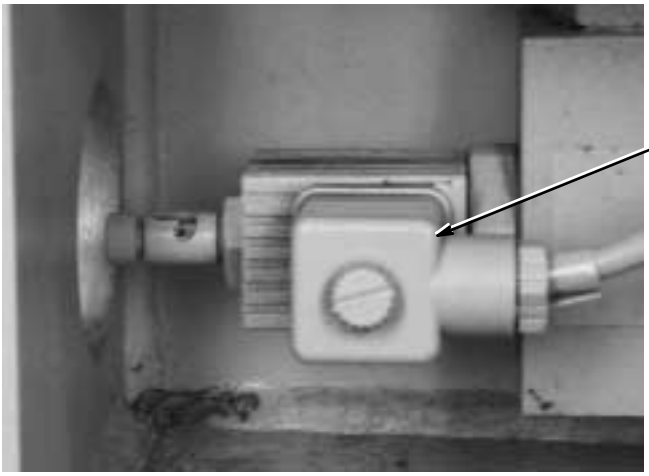
(2) OUTRIGGER JACK CYLINDERS. The two hydraulic jack cylinders are used together with the outrigger beams to give the crane greater stability for handling loads.

WARNING

Manaul override mode should only be used during crane storage under other than usual conditions ONLY. Failure to comply may cause injury or death to personnel.

(4) SYSTEM SHUTDOWN MANUAL OVERRIDE VALVE. The manual override valve is electrically operated by the crane main power switch. It prevents inadvertant operation of the crane by blocking any flow of hydraulic oil to the crane when the main power switch (or the remote control emergency shutdown switch) is OFF. It incorporates a manual override in the event of an electrical failure. In emergency and special circumstances ONLY, turn and pull out the button to supply hydraulic oil to the crane control valves.





MANUAL OVERRIDE VALVE

MANUAL OVERRIDE GUARD SHOWN REMOVED FOR CLARITY

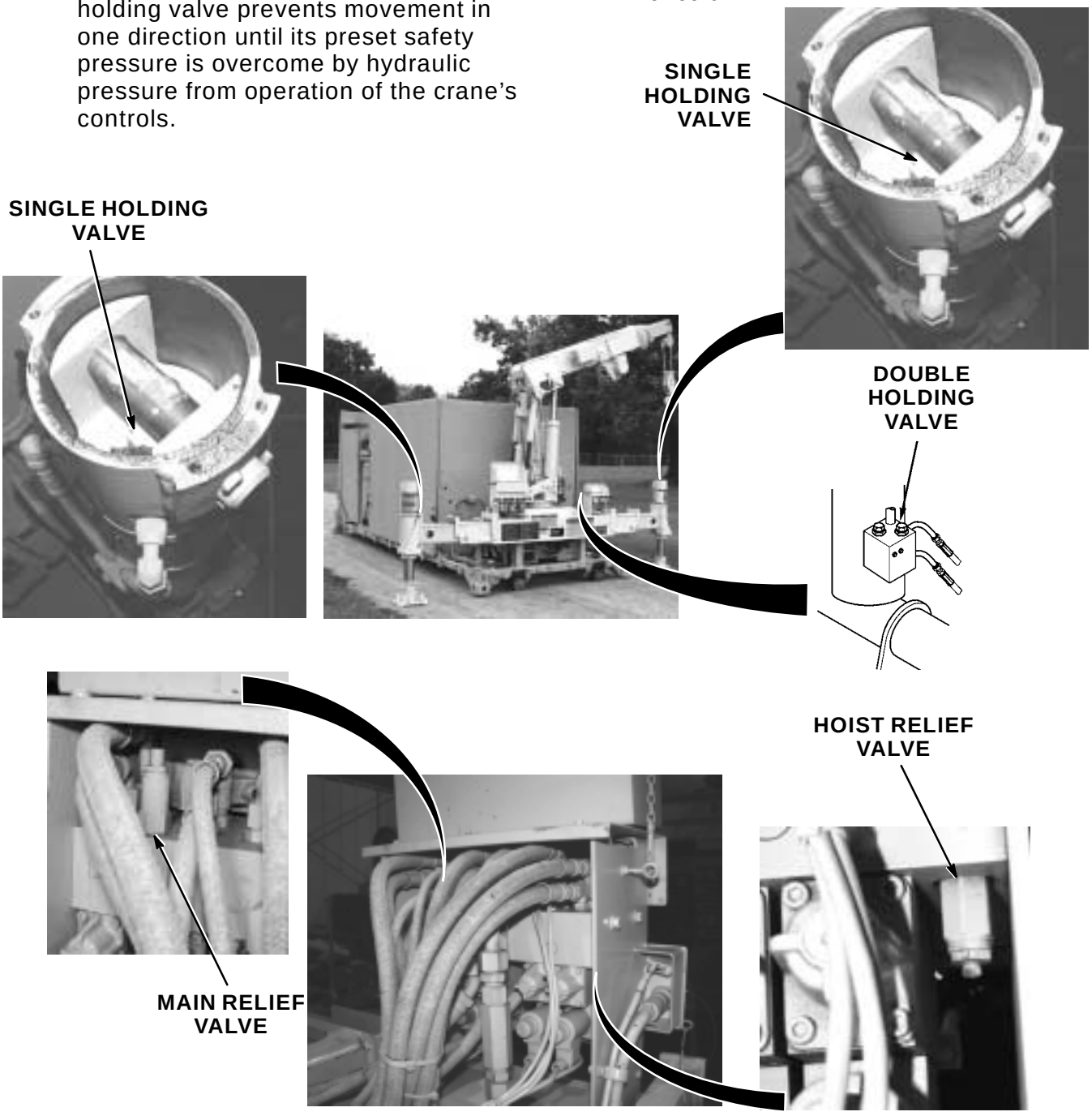
5-3. DESCRIPTION AND DATA (Continued)

(5) DOUBLE HOLDING VALVE. The double holding valve prevents movement of the mast erection cylinder in either direction until its preset safety pressure is overcome by hydraulic pressure from operation of the crane's control in the opposite direction.

(6) SINGLE HOLDING VALVE. The single holding valve prevents movement in one direction until its preset safety pressure is overcome by hydraulic pressure from operation of the crane's controls.

(7) MAIN RELIEF VALVE. The main relief valve protects the crane's components from pressures that might exceed 3,500 psi.

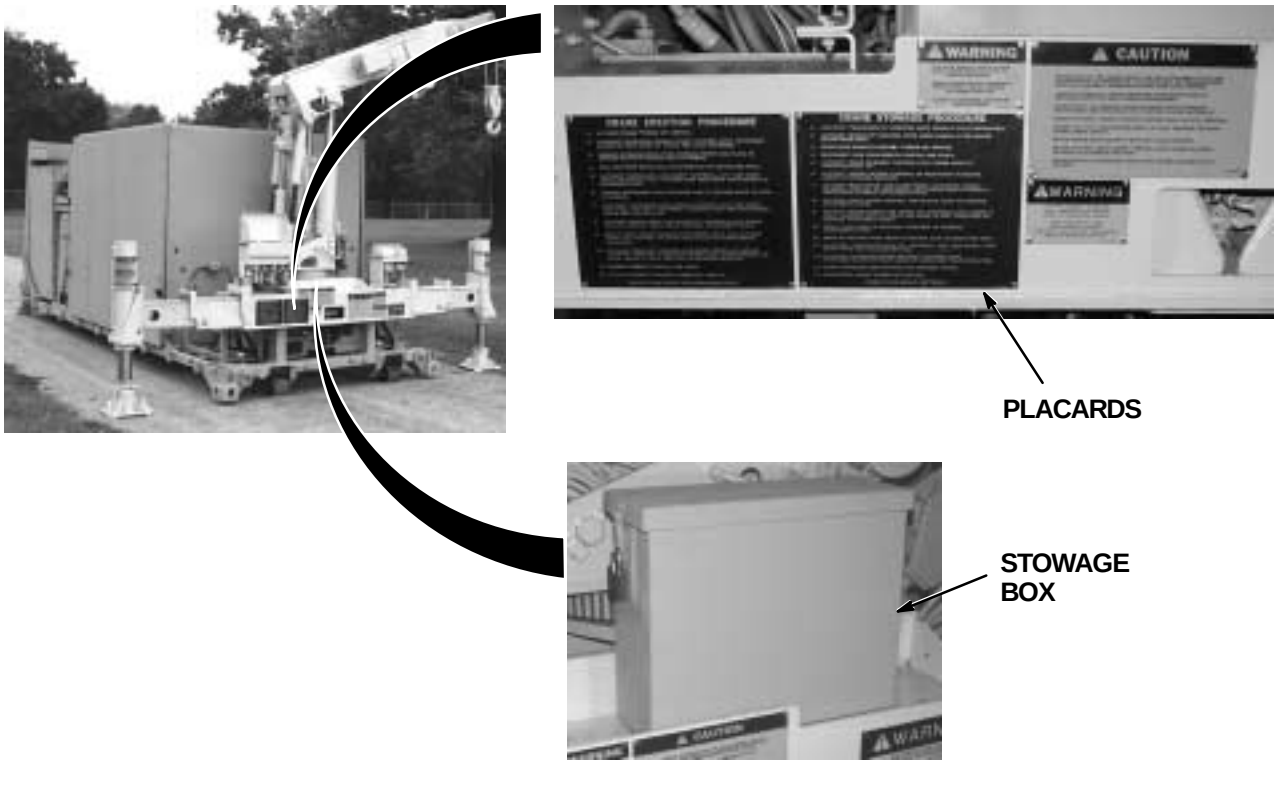
(8) HOIST PRESSURE RELIEF VALVE. The hoist pressure relief valve limits pressure to 2500 psi in the HOIST UP circuit.



d. Accessories. The following items are needed for safe, convenient operation of the crane.

(1) STOWAGE BOX. The stowage box houses the remote control unit, remote control cable, and remote control harness.

(2) PLACARDS. The placards, which are located at prominent positions on the crane, provide instructions and/or warnings.

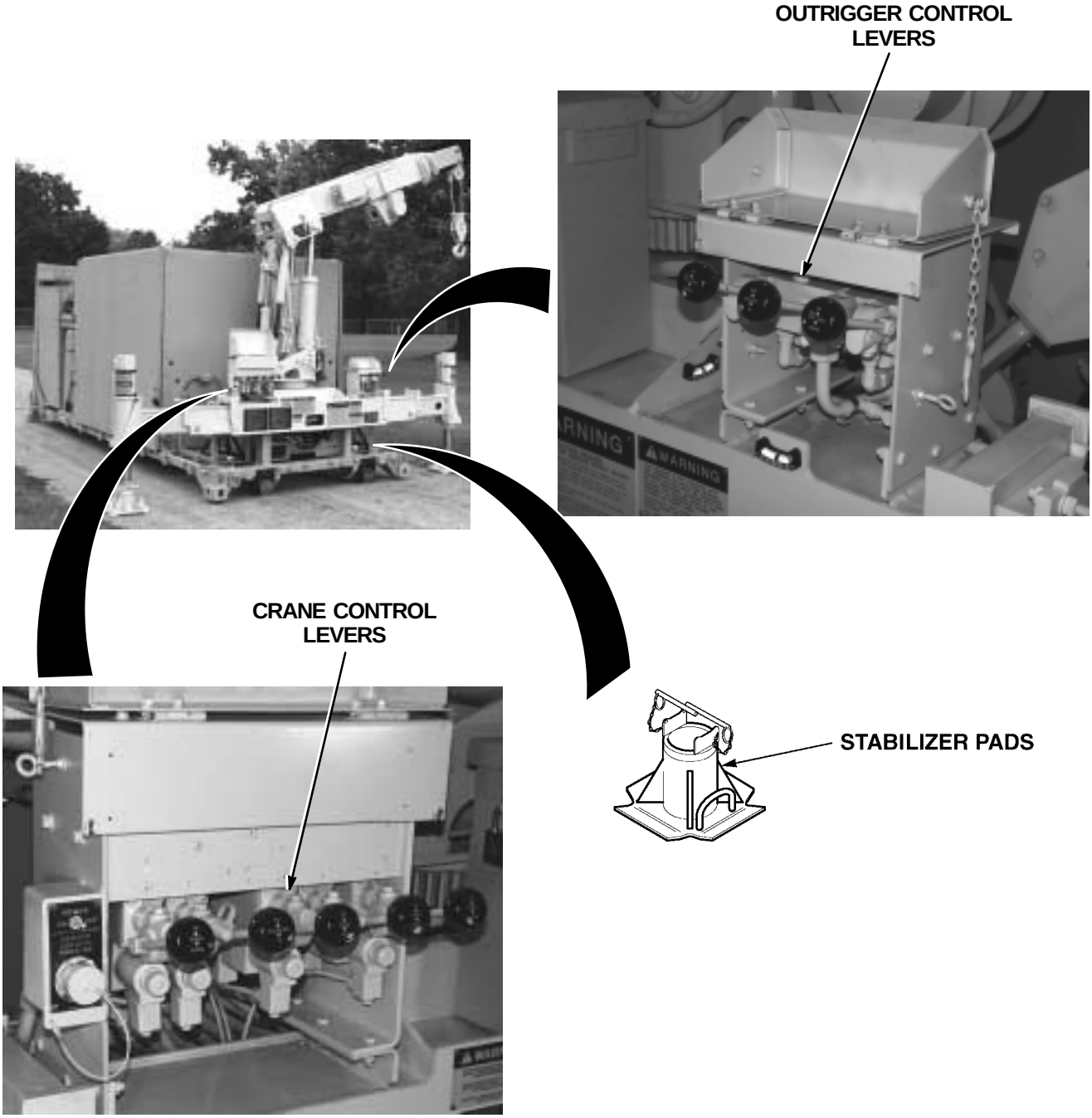


5-3. DESCRIPTION AND DATA (Continued)

(3) OUTRIGGER STABILIZER PADS. The outrigger stabilizer pads provide the base support for the crane while working.

(4) CRANE CONTROL LEVERS. The main levers provide the mechanical linkage for manual operation of the control valves.

(5) OUTRIGGER CONTROL LEVERS. Provide the mechanical linkage for the operation of the outrigger control valves.



5-4. JUNCTION BOX MAINTENANCE

THIS TASK COVERS:
a. Removal and Disassembly
b. Installation

INITIAL SETUP

Tools
Tool Kit, General Mechanic's
(Item 30, Appendix G)

Materials/Parts
Decal (Item 4, Appendix F)
Locknut (2) (Item 26, Appendix F)
Locknut (2) (Item 25, Appendix F)
Lockwasher (16) (Item 59, Appendix F)
Lockwasher (2) (Item 60, Appendix F)
Lockwasher (5) (Item 58, Appendix F)
Preformed packing (3) (Item 86, Appendix F)
Preformed packing (Item 87, Appendix F)
Rivet (17) (Item 97, Appendix F)
Star washer (8) (Item 111, Appendix F)

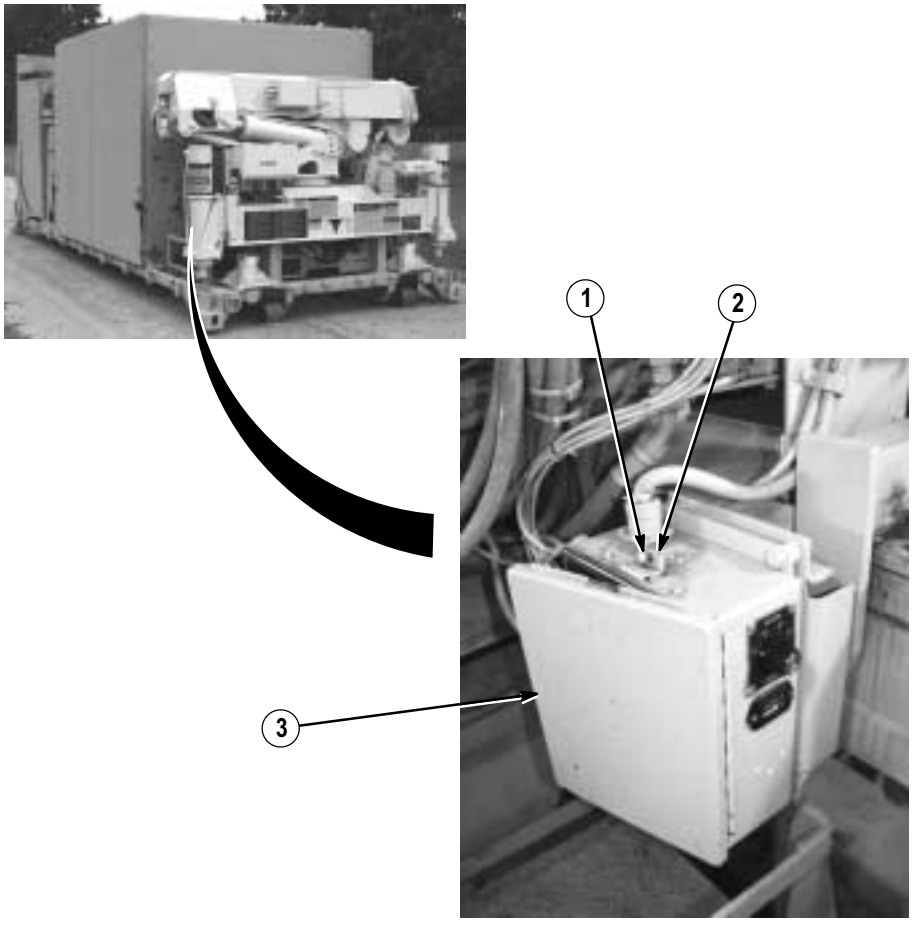
Equipment
Condition
FRS unloaded (TM 9-4940-568-10)

Batteries disconnected
(TM 9-4940-568-10)

General Safety Instructions
To prevent personal injury, make sure batteries are disconnected before working on electrical components.

a. Removal and Disassembly

(1) Loosen four screws (1) and clamps (2) and open cover (3).



5-4. JUNCTION BOX MAINTENANCE (Continued)

NOTE

- Before removing wires, tag and mark with corresponding numbers from illustration and legend.
- All wires are installed on terminal block with a screw. Screw must be removed prior to removal of wires from terminal block.

(2) Remove two black wires (4 and 5) from grounding block (6).

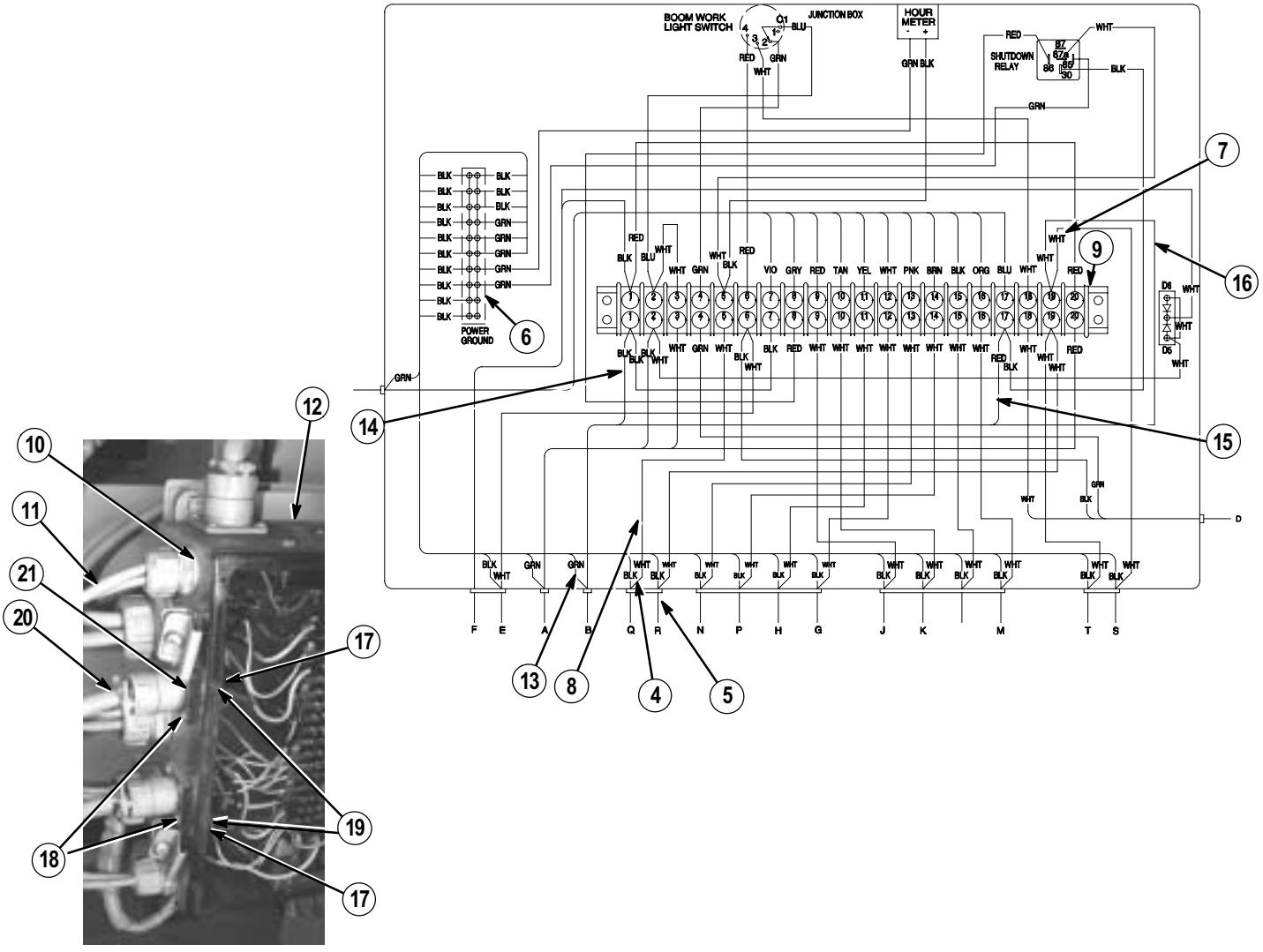
(3) Remove white wire (7) from no. 19 position and white wire (8) from no. 5 position of terminal block (9).

(4) Remove locknut (10) and solenoid cables (11) from junction box (12).

(5) Remove green wire (13) from grounding block (6).

(6) Remove left side black wire (14) from no. 1 position, left side red wire (15) from no. 17 position, and right side white wire (16) from no. 19 position of terminal block (9).

(7) Remove four nuts (17), screws (18), lockwashers (19), OSS cable (20) and preformed packing (21) from junction box (12). Discard lockwashers and performed packing.



(8) Remove green wire (22) from grounding block (6).

(9) Remove left side red wire (23) from no. 20 position, black wire (24) from no. 2 position, and white wire (25) from no. 3 position of terminal block (9).

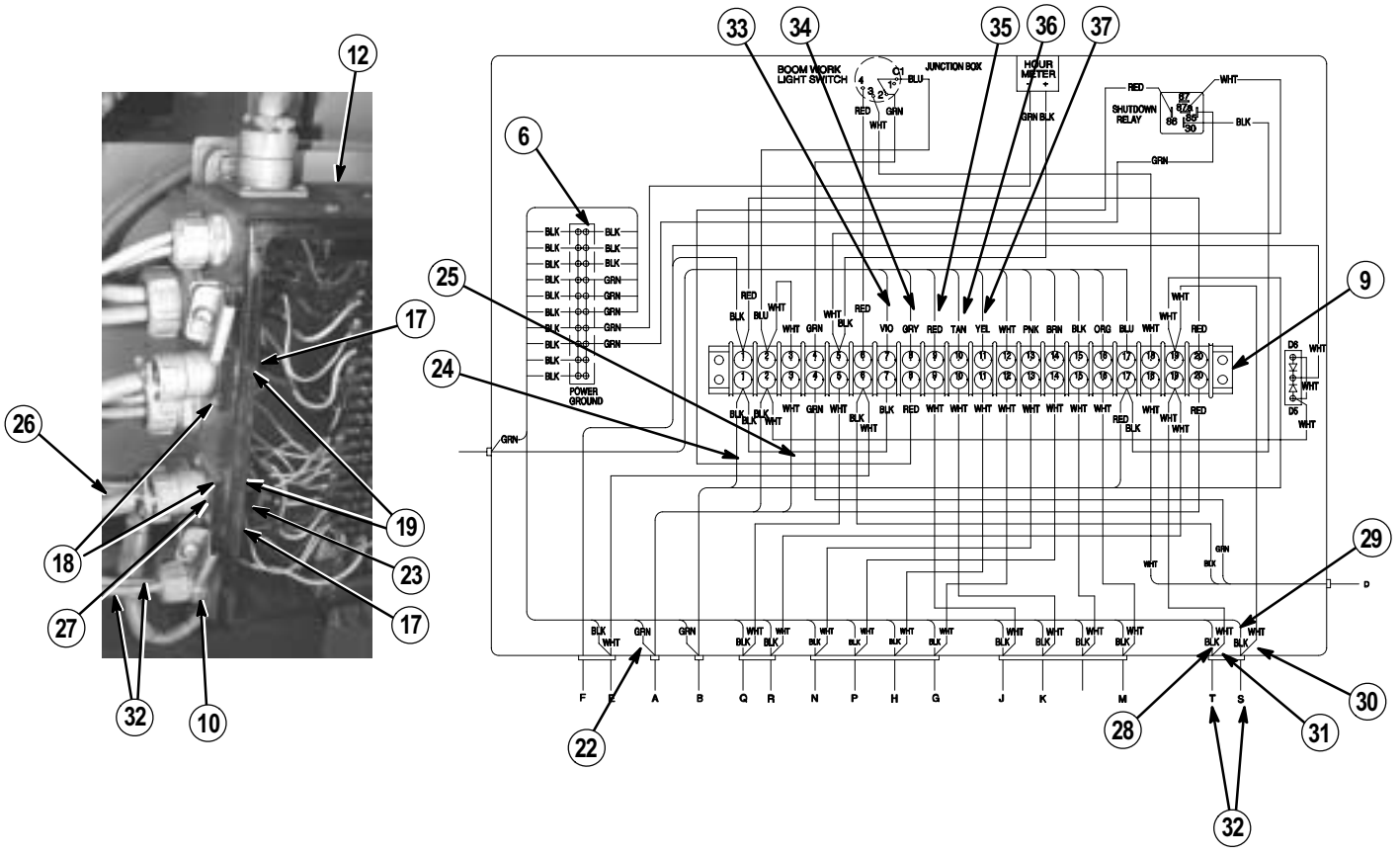
(10) Remove four nuts (17), screws (18), lockwashers (19), main power cable (26) and preformed packing (27) from junction box (12). Discard lockwashers and preformed packing.

(11) Remove two black wires (28 and 29) from grounding block (6).

(12) Remove left side small white wire (30) from no. 19 position and right side white wire (31) from no. 19 position of terminal block (9).

(13) Remove locknut (10) and solenoid cables (32) from junction box (12). Discard locknut.

(14) Remove right side violet wire (33) from no. 7 position, right side grey wire (34) from no. 8 position, right side red wire (35) from no. 9 position, right side tan wire (36) from no. 10 position, and right side yellow wire (37) from no. 11 position of terminal block (9).



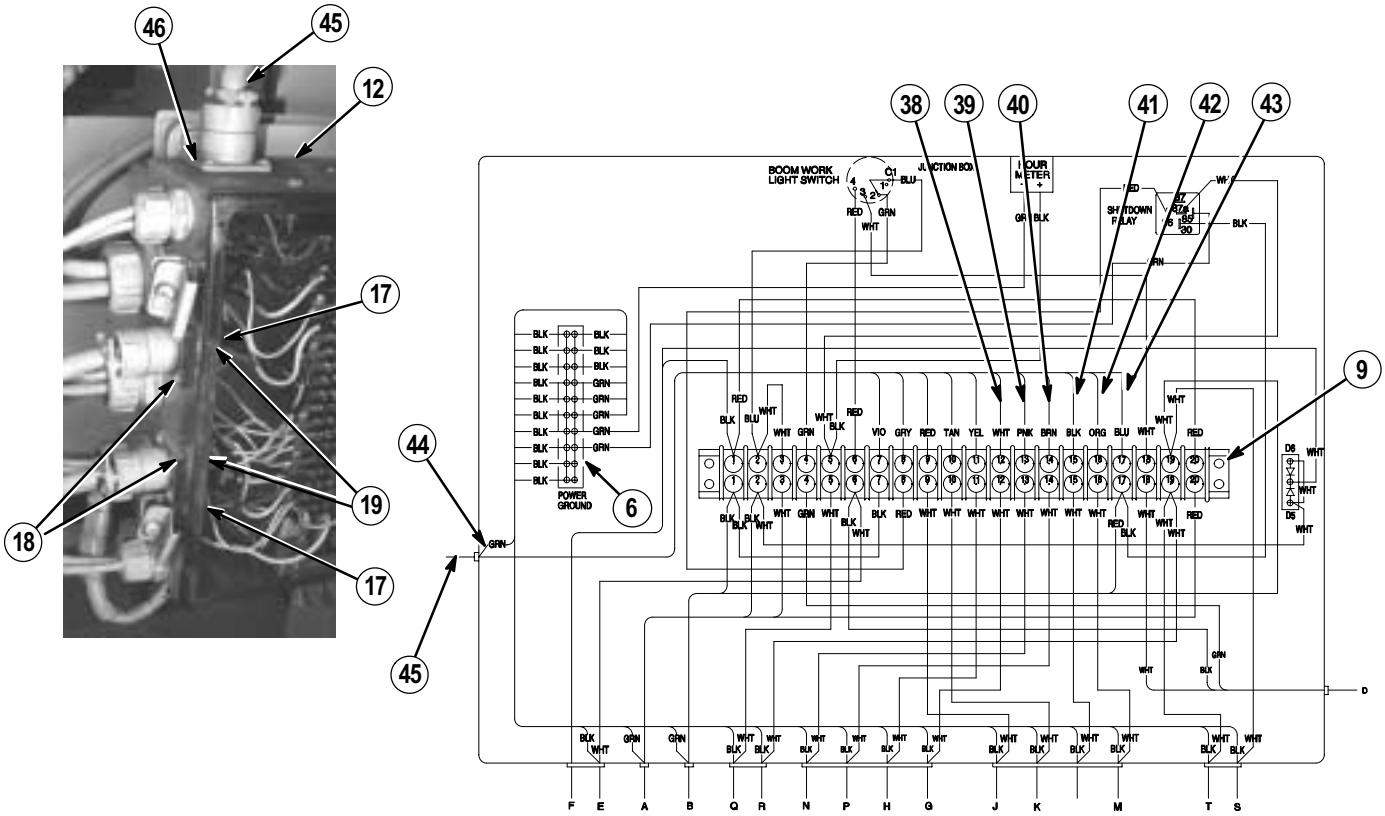
5-4. JUNCTION BOX MAINTENANCE (Continued)

(15) Remove right side white wire (38) from no. 12 position, right side pink wire (39) from no. 13 position, right side brown wire (40) from no. 14 position, right side black wire (41) from no. 15 position, and right side orange wire (42) from no. 16 position of terminal block (9).

(16) Remove right side blue wire (43) from no. 17 position of terminal block (9).

(17) Remove green wire (44) from grounding block (6).

(18) Remove four nuts (17), screws (18), lockwashers (19), remote control cable (45) and preformed packing (46) from junction box (12). Discard lockwashers and preformed packing.



(19) Remove four black wires (47, 48, 49, and 50) from grounding block (6).

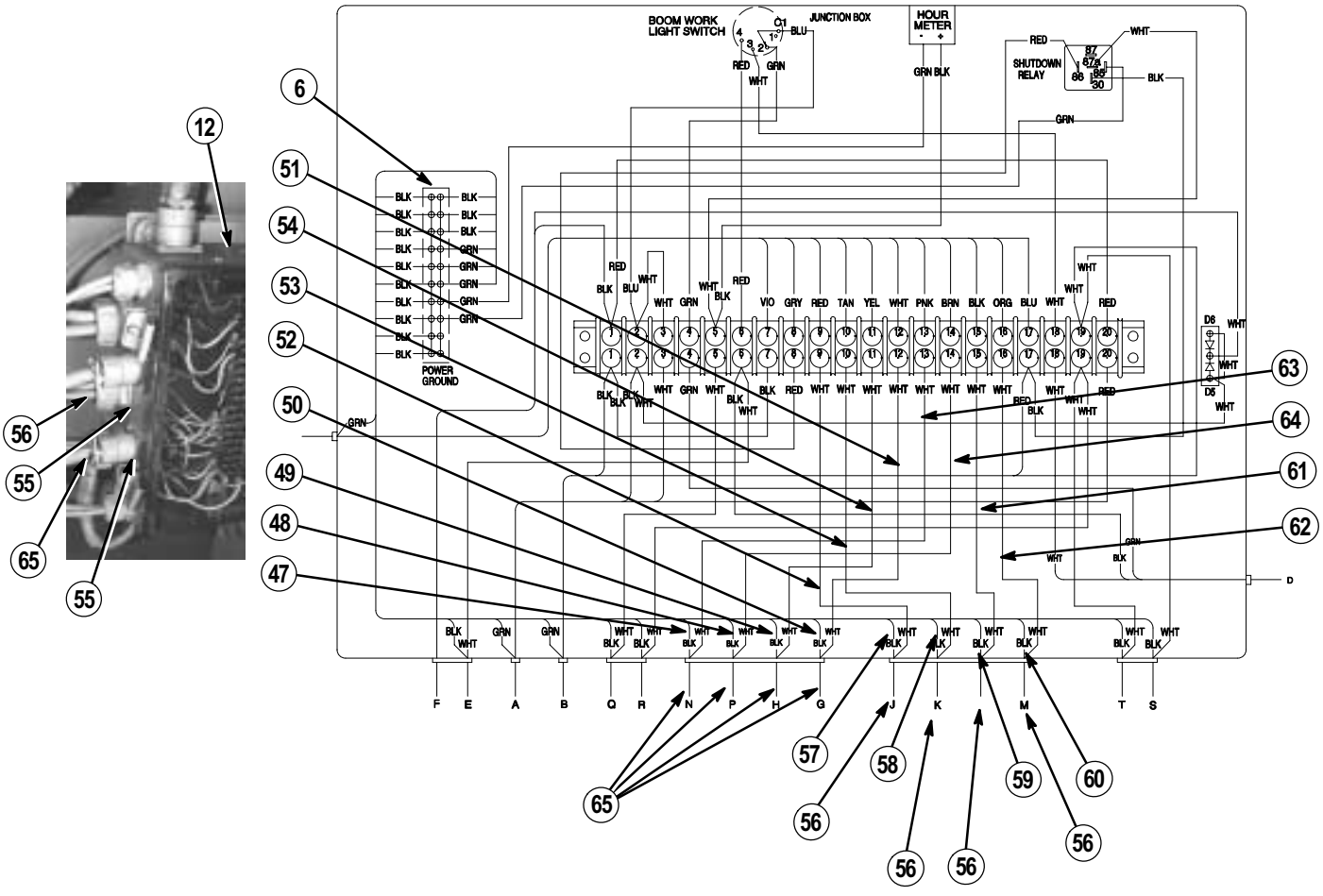
(20) Remove left side white wire (51) from no. 12 position, left side white wire (52) from no. 9 position, left side white wire (53) from no. 10 position, and left side white wire (54) from no. 11 position of terminal block (9).

(21) Remove locknut (55) and solenoid cables (56) from junction box (12). Discard locknut.

(22) Remove four black wires (57, 58, 59, and 60) from grounding block (6).

(23) Remove white wire (61) from no. 15 position, white wire (62) from no. 16 position, white wire (63) from no. 13 position, and white wire (64) from no. 14 position of terminal block (9).

(24) Remove locknut (55) and solenoid cables (65) from junction box (12). Discard locknut.



5-4. JUNCTION BOX MAINTENANCE (Continued)

(25) Remove green wire (66) from grounding block (6).

(26) Remove black wire (67) from no. 5 position of terminal block (9).

(27) Remove two nuts (68), lockwashers (69), washers (70), screws (71) and hour meter (72) from junction box (12). Discard lockwashers.

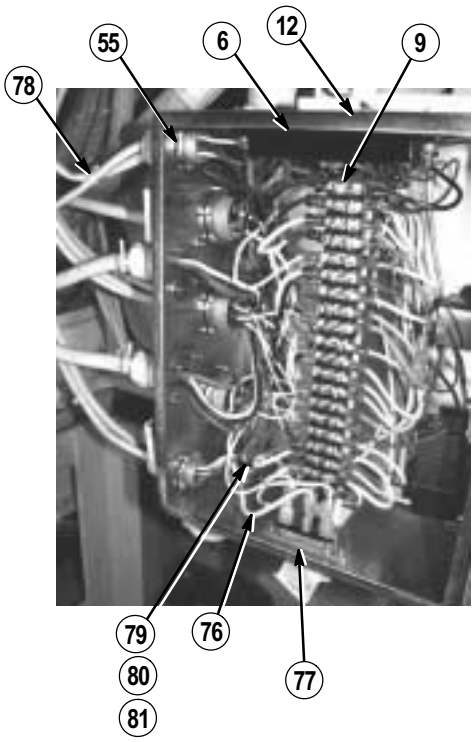
(28) Remove black wire (73) from grounding block (6).

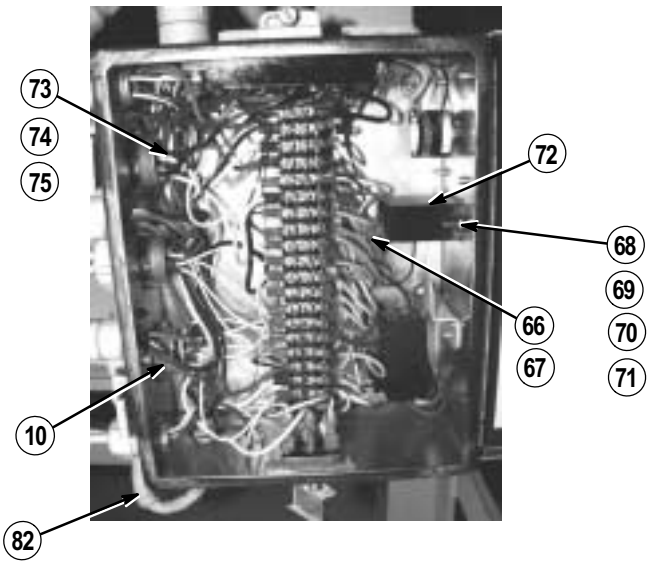
(29) Remove white wire (74) from no. 6 position, black wire (75) from no.1 position of terminal block (9), and white wire (76) on center terminal of diode (77) on inside of junction box (12).

(30) Remove locknut (55) and boom light/power switch cables (78) from junction box (12). Discard locknut.

(31) Remove white wire (79) from no. 18 position, black wire (80) from no. 6 position, and green wire (81) from no. 4 position of terminal block (9).

(32) Remove locknut (10) and resistor cable (82) from junction box (12). Discard locknut.





(33) Remove white wire (83) from no. 2. position of terminal block (9) and diode (77) inside junction box (12).

(34) Remove green wire (84) from grounding block (6).

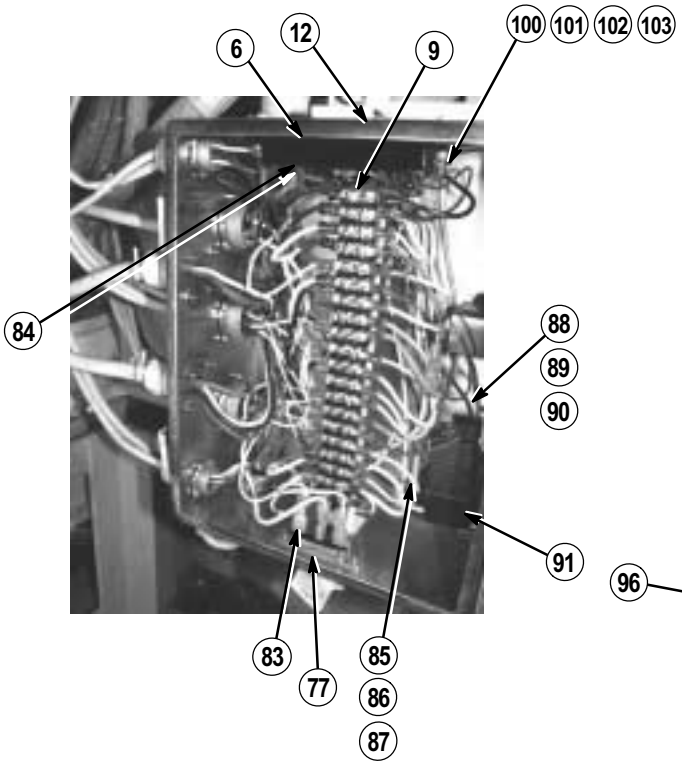
(35) Remove black wire (85) from no. 17 position, white wire (86) from no. 5 position, and red wire (87) from no. 8 position on terminal bock (9).

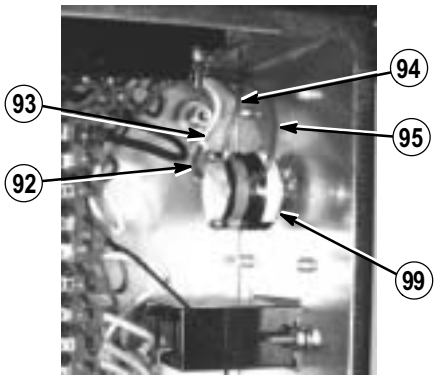
(36) Remove screw (88), lockwasher (89), washer (90) and shutdown relay (91) from junction box (12). Discard lockwasher.

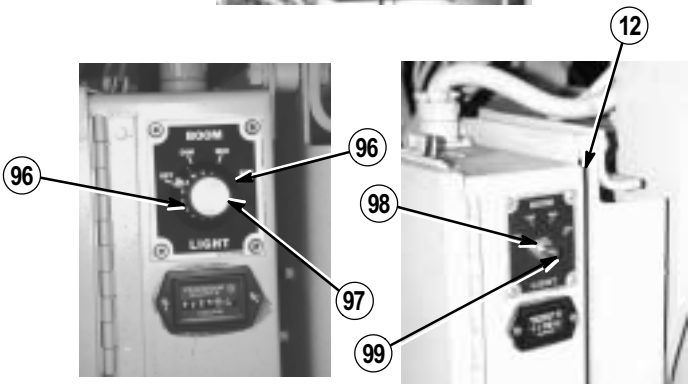
(37) Remove red wire (92) from no. 6 position, white wire (93) from no. 18 position, green wire (94) from no. 4 position, and blue wire (95) from no. 2 position of terminal block (9).

(38) Loosen two screws (96) and remove selector knob (97), nut (98), and boom light switch (99) from junction box (12).

(39) Remove two nuts (100), lockwashers (101), four washers (102), screws (103), and grounding block (6) from junction box (12). Discard lockwashers.







5-4. JUNCTION BOX MAINTENANCE (Continued)

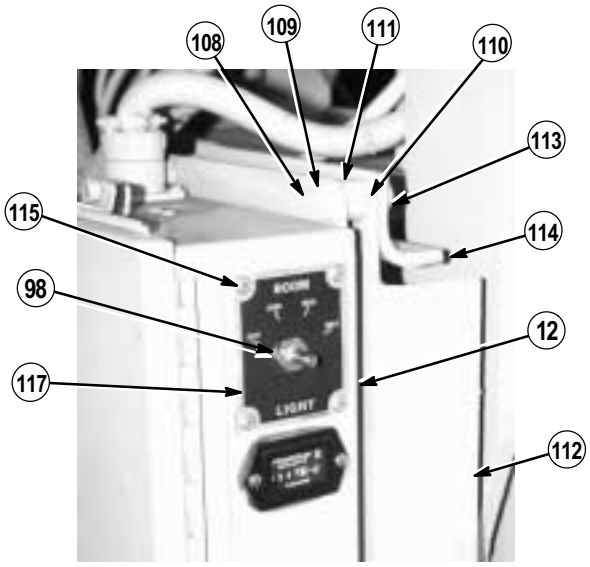
(40) Remove two nuts (104), lockwashers (105), washers (106), screws (107) and terminal block (9) from junction box (12). Discard lockwashers.

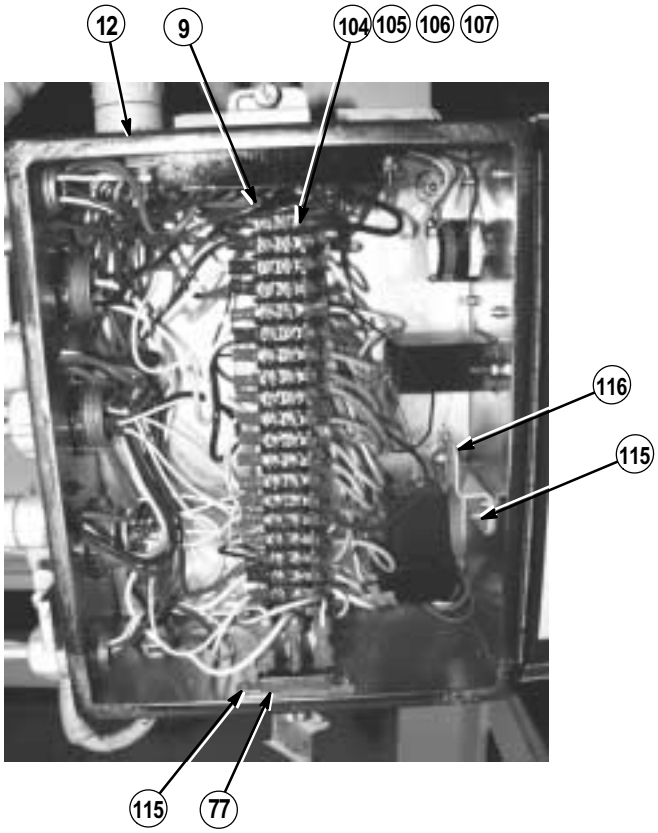
(41) Remove four nuts (108), eight washers (109), junction box (12), star washers (110), four bushings (111), resistor mount plate (112) and four screws (113) from junction box mount bracket (114). Discard star washers.

(42) Remove three rivets (115) and shutdown relay bracket (116) from junction box (12). Discard rivets.

(43) Remove two rivets (115) and diode (77) from junction box (12). Discard rivets.

(44) Remove four rivets (115) and boom light selector plate (117) from junction box (12). Discard rivets.





b. Installation

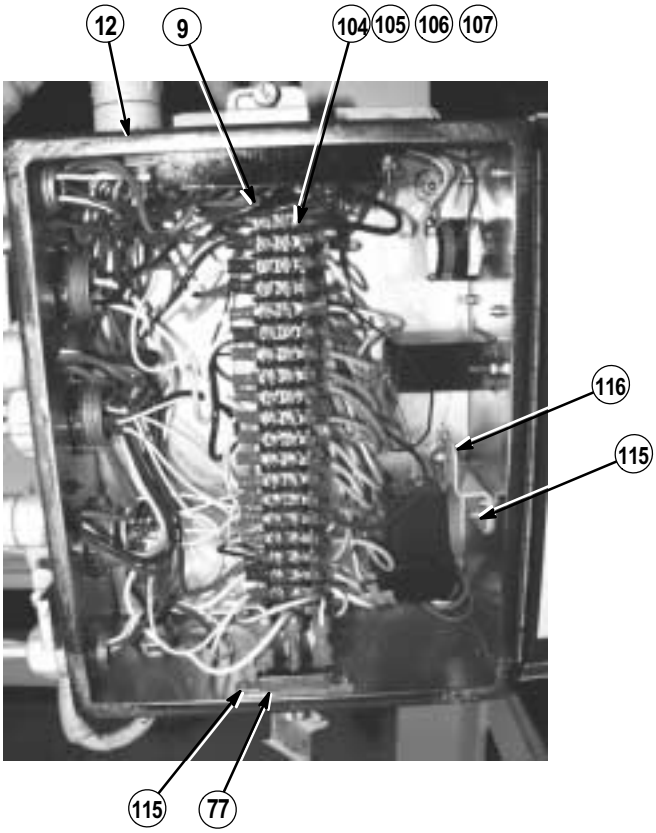
(1) Install boom light selector plate (117) using four rivets (115) on junction box (12).

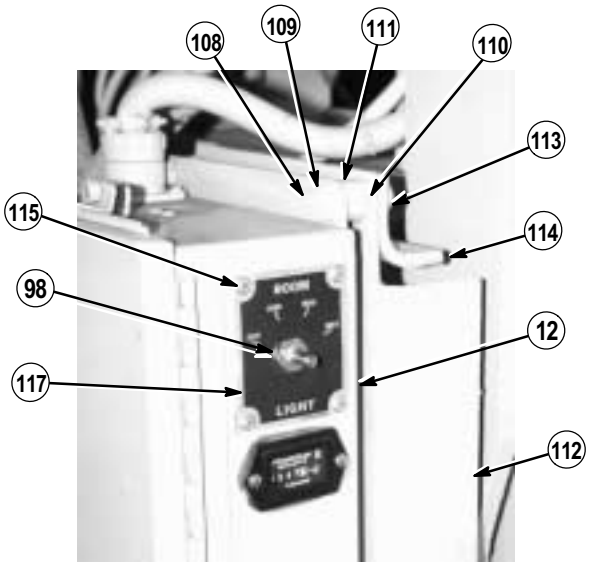
(2) Install diode (77) using two rivets (115) in junction box (12).

(3) Install shutdown relay bracket (116) using three rivets (115) in junction box (12).

(4) Install four screws (113), eight washers (109), resistor mount plate (112), four bushings (111), junction box (12) and four nuts (108) on junction box mount bracket (114).

(5) Install two screws (107), terminal block (9), two washers (106), lockwashers (105) and nuts (104) in junction box (12).





5-4. JUNCTION BOX MAINTENANCE (Continued)

(6) Install two screws (103), grounding block (6), four washers (102), two lockwashers (101), and nuts (100) in junction box (12).

NOTE

Insure boom light switch and selector knob are alined with position on selector plate prior to tightening screws.

(7) Install boom light switch (99), nut (98), selector knob (97) and tighten two screws (96) on junction box (12).

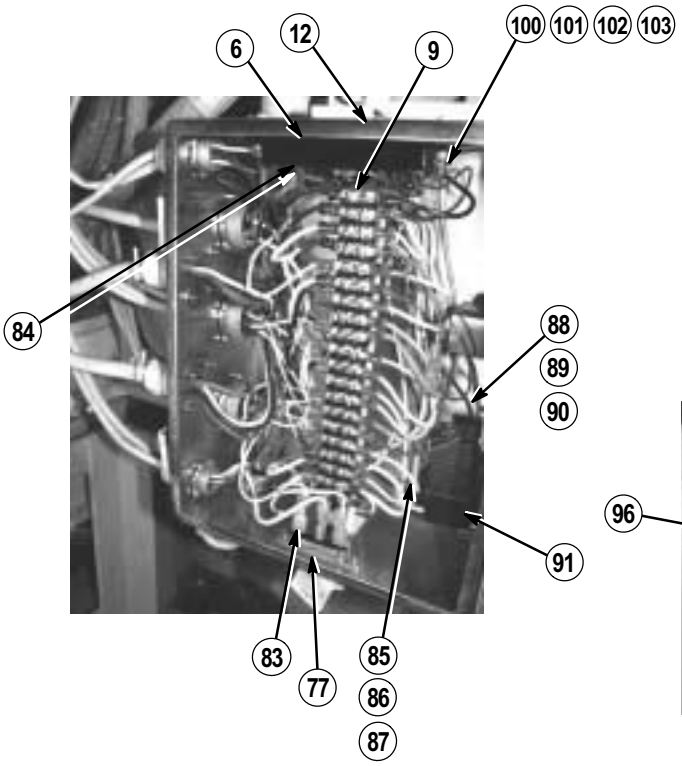
(8) Install red wire (92) on no. 6 position, white wire (93) on no. 18 position, green wire (94) on no. 4 position, and blue wire (95) on no. 2 position of terminal block (9).

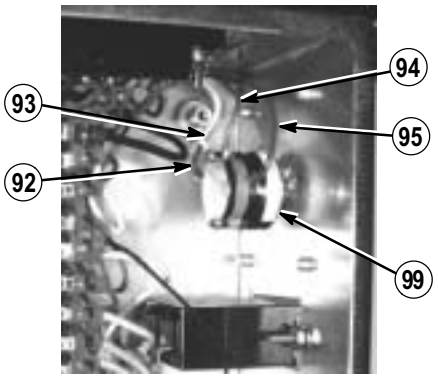
(9) Install shutdown relay (91) in junction box (12) using screw (88), lockwasher (89), and washer (90).

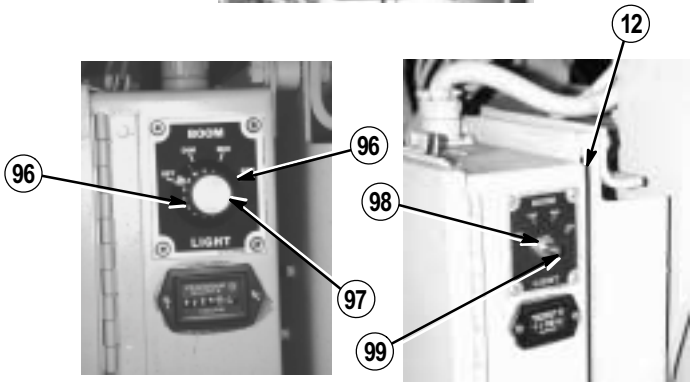
(10) Install black wire (85) on no. 17 position, white wire (86) on no. 5 position, and red wire (87) on no. 8 position on terminal block (9).

(11) Install green wire (84) from grounding block (9).

(12) Install diode (77) inside junction box (12) using rivets and connect white wire (83) to no. 2 position of terminal block (9).







(13) Install resistor cable (82) in junction box (12) with locknut (10).

(14) Install white wire (79) on no. 18 position, black wire (80) on no. 6 position, and green wire (81) on no. 4 position of terminal block (9).

(15) Install boom light/power switch cables (78) in junction box (12) using locknut (55).

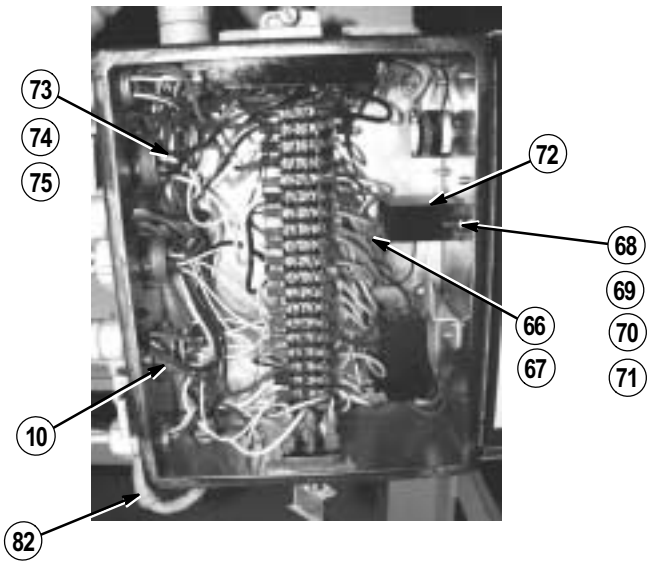
(16) Install white wire (74) on no. 6 position, black wire (75) on no. 1 position of terminal block (9), and white wire (76) on center terminal of diode (77) inside junction box (12).

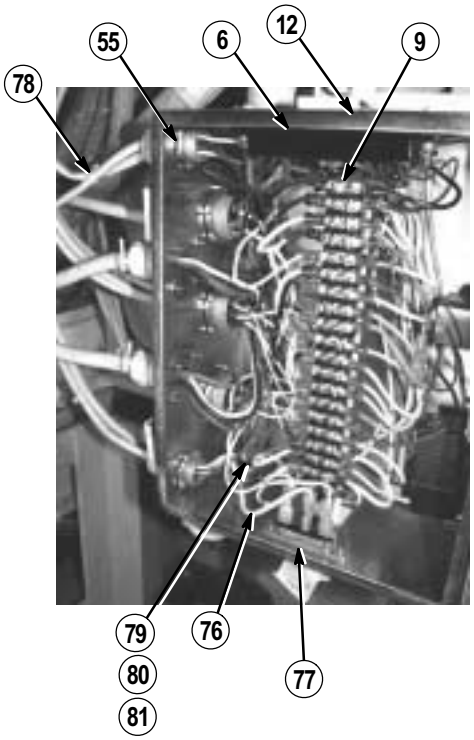
(17) Install black wire (73) in grounding block (6).

(18) Install hour meter (72) in junction box (12) using two screws (71), lockwashers (69), washers (70) and nuts (68).

(19) Install black wire (67) on no. 5 position of terminal block (9).

(20) Install green wire (66) in grounding block (6).





5-4. JUNCTION BOX MAINTENANCE (Continued)

(21) Install solenoid cables (65) in junction box (12) using locknut (55).

NOTE

All wires are installed on terminal block using a screw. Screw must be installed upon installation of wire on terminal block.

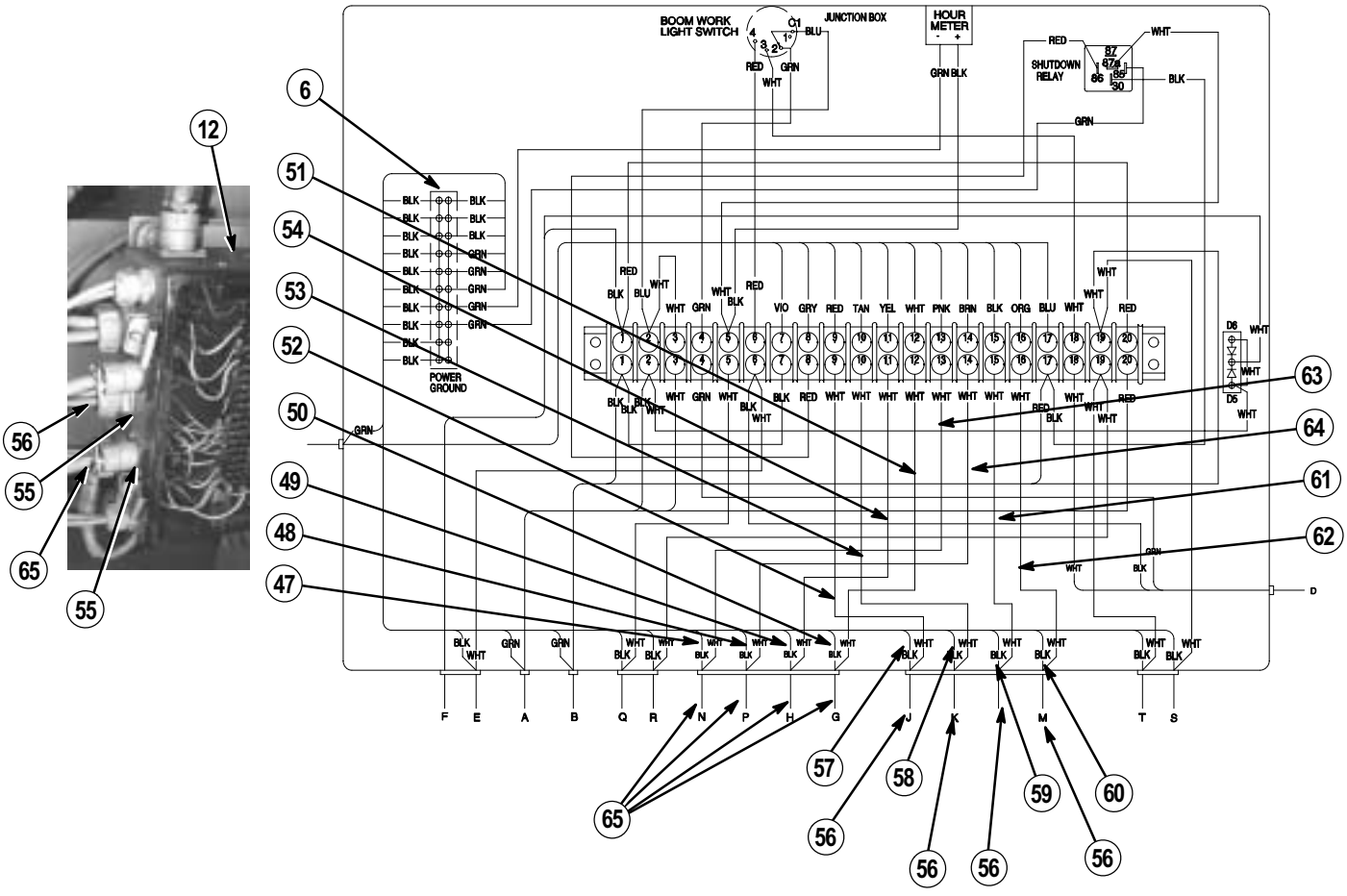
(22) Install white wire (64) on no. 14 position, white wire (63) on no. 13 position, white wire (62) on no. 16 position, and white wire (61) on no. 15 position of terminal block (9).

(23) Install four black wires (57, 58, 59 and 60) on grounding block (6).

(24) Install solenoid cables (56) in junction box (12) using locknut (55).

(25) Install white wire (54) on no. 11 position, white wire (53) on no. 10 position, white wire (52) on no. 9 position, and white wire (51) on no. 12 position of terminal block (9).

(26) Install four black wires (47, 48, 49 and 50) on grounding block (6).

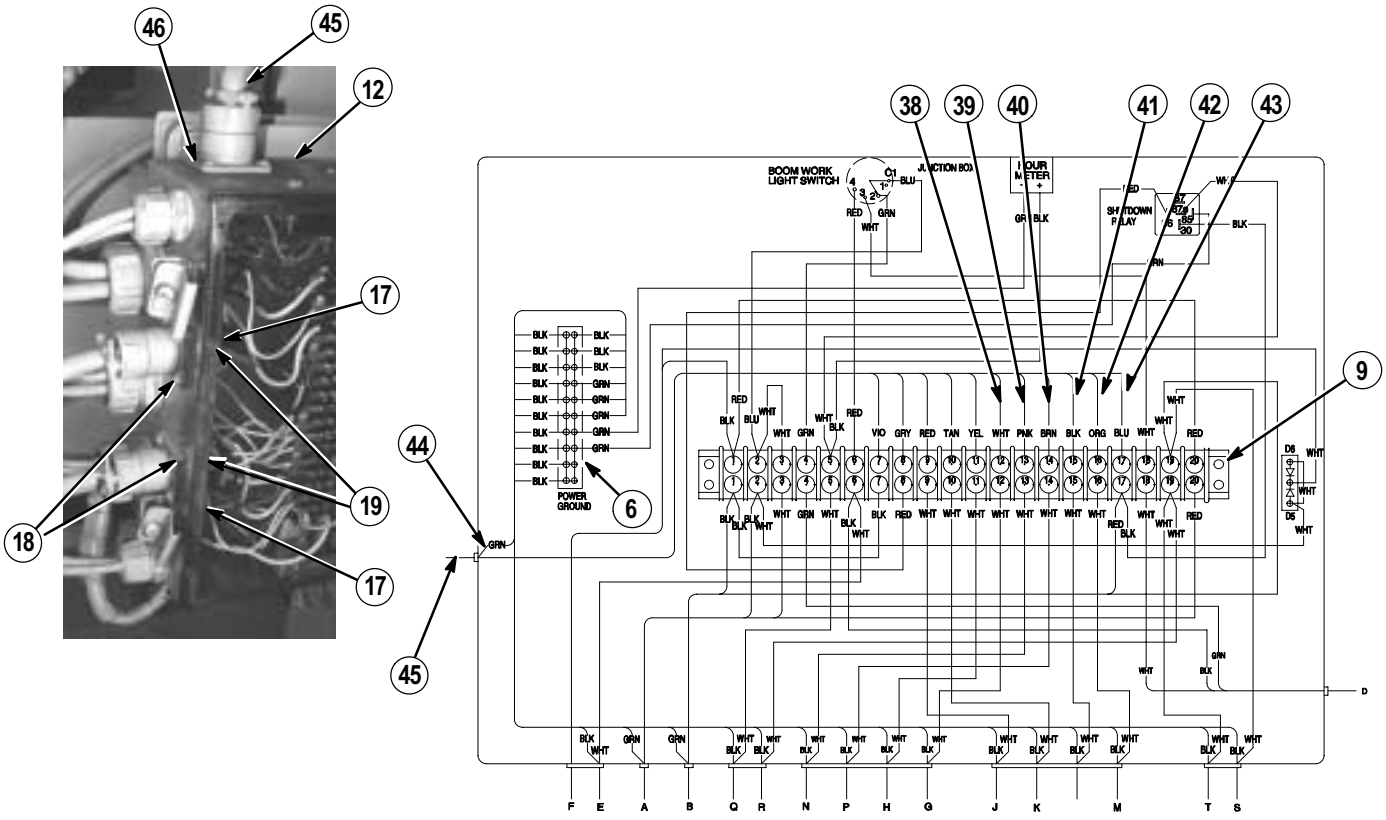


(27) Install remote control cable (45) and preformed packing (46) in junction box (12) using four lockwashers (19), screws (18) and nuts (17).

(28) Install green wire (44) on grounding block (6).

(29) Install blue wire (43) on no. 17 position of terminal block (9).

(30) Install orange wire (42) on no. 16 position, black wire (41) on no. 15 position, brown wire (40) on no. 14 position, pink wire (39) on no. 13 position, and white wire (38) on no. 12 position of terminal block (9).



5-4. JUNCTION BOX MAINTENANCE (Continued)

(31) Install yellow wire (37) in no. 11 position, tan wire (36) in no. 10 position, red wire (35) in no. 9 position, grey wire (34) in no. 8 position, and violet wire (33) in no. 7 position of terminal block (9).

(32) Install solenoid cables (32) in junction box (12) using locknut (10).

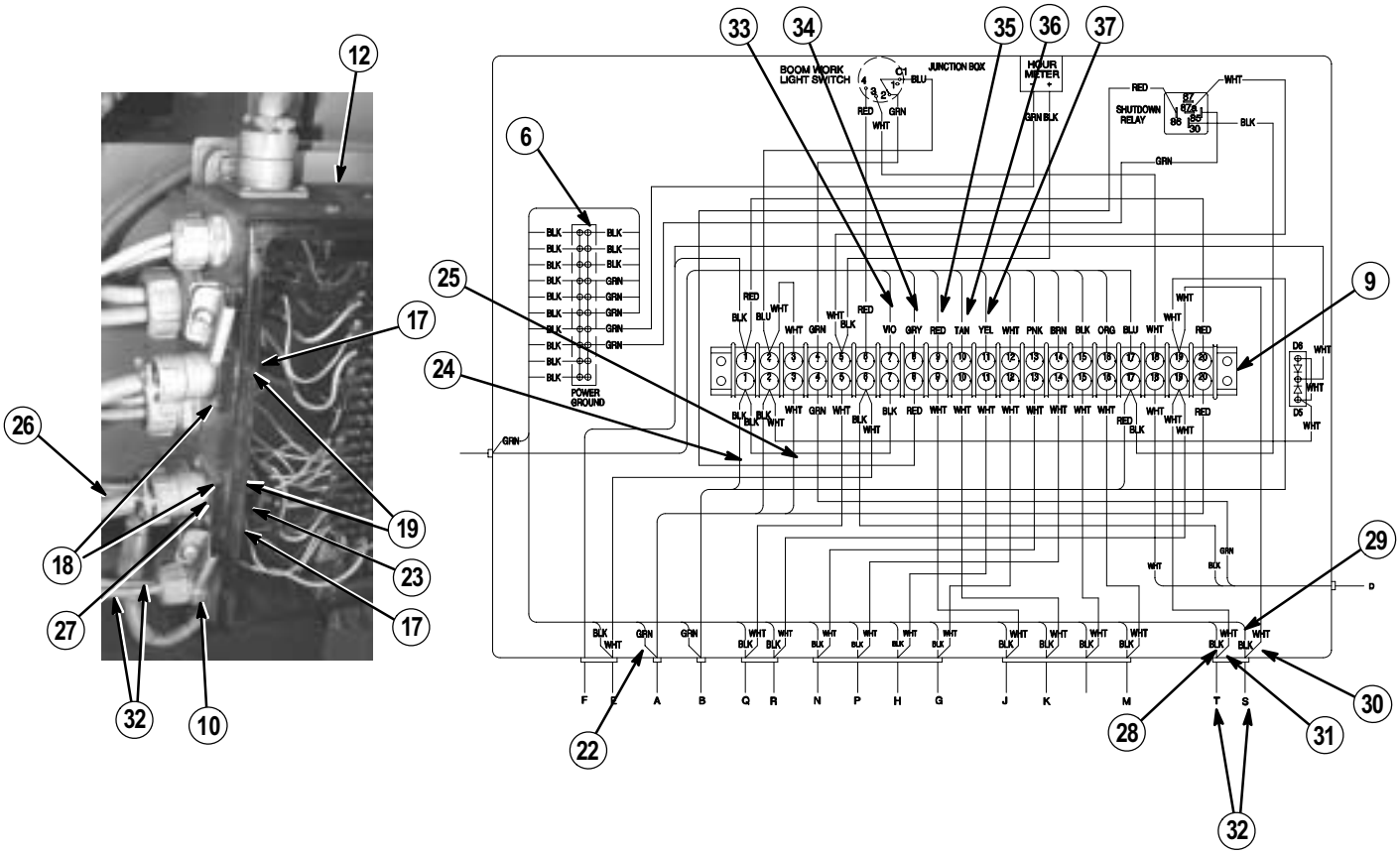
(33) Install white wire (30) in no. 19 position and white wire (31) in no. 19 position of terminal block (9).

(34) Install two black wires (28 and 29) in grounding block (6).

(35) Install main power cable (26) and preformed packing (27) in junction box (12) using four lockwashers (19), screws (18) and nuts (17).

(36) Install white wire (25) in no. 3 position, black wire (24) in no. 2 position, and red wire (23) in no. 4 position on terminal block (9).

(37) Install green wire (22) on grounding block (6).



(38) Install OSS cable (20) and prefomred packing (21) in junction box (12) using four lockwashers (19), screws (18) and nuts (17).

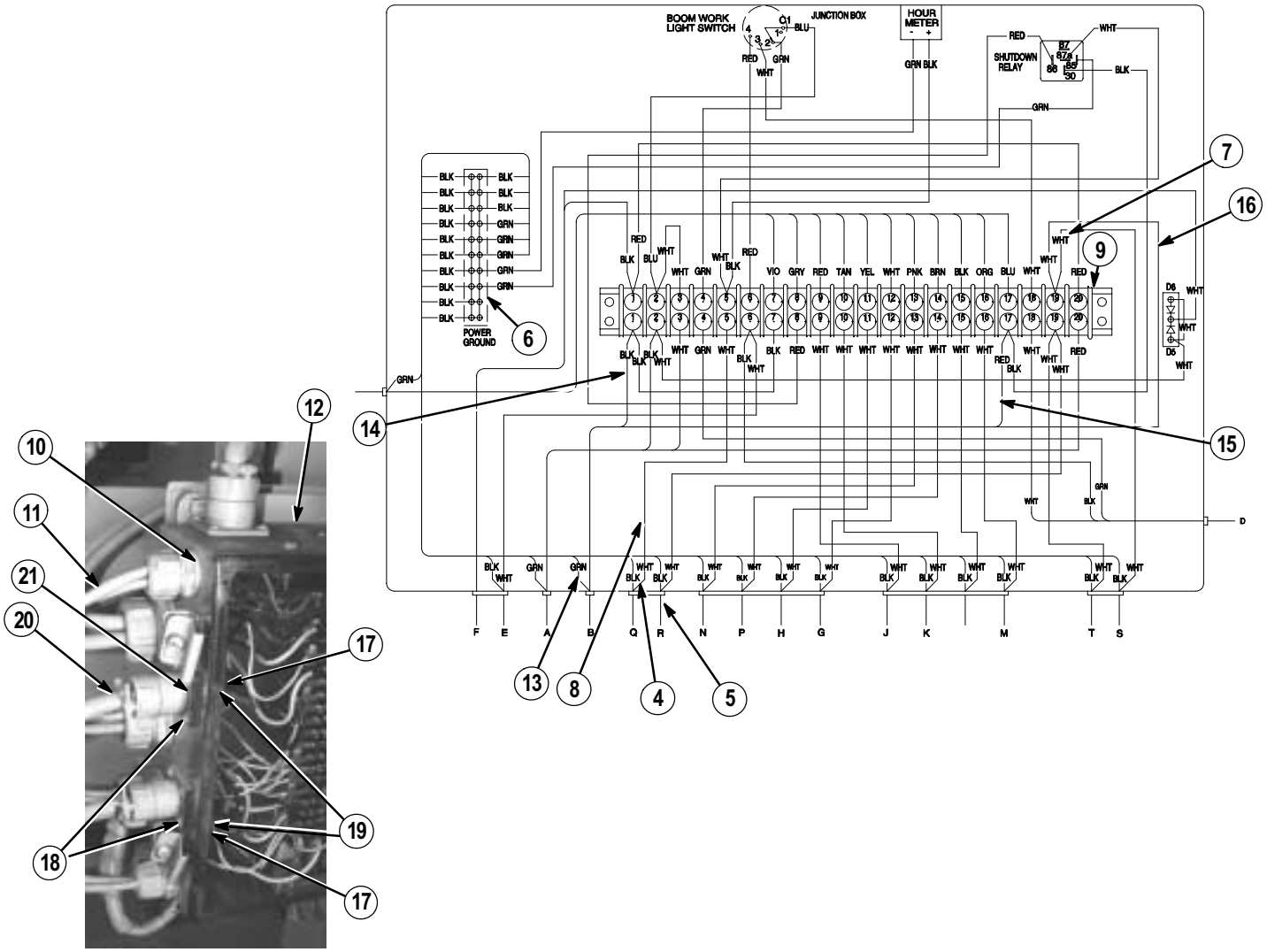
(39) Install white wire (16) in no. 19 position, red wire (15) in no. 17 position, and black wire (14) in no. 1 position of terminal block (9).

(40) Install green wire (13) on grounding block (6).

(41) Install solenoid cables (11) in junction box (12) using locknut (10).

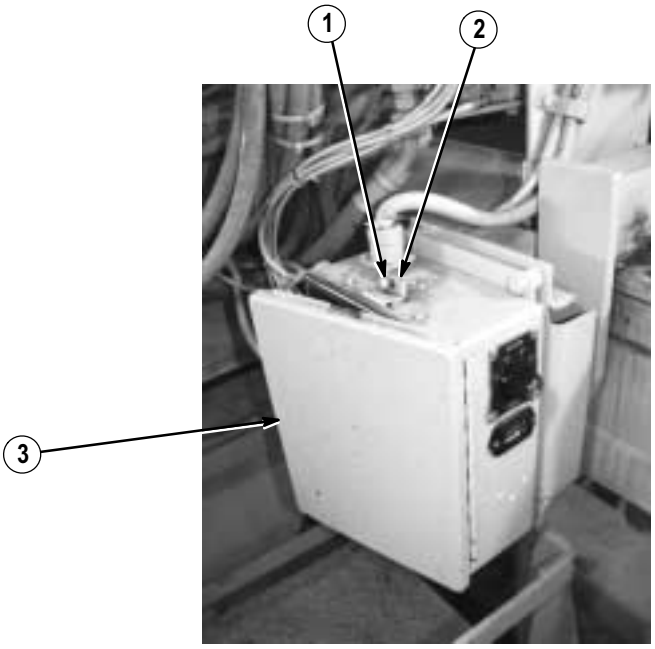
(42) Install white wire (8) in no. 5 position and white wire (7) in no. 19 position of terminal block (9).

(43) Install two black wires (4 and 5) on grounding block (6).



5-4. JUNCTION BOX MAINTENANCE (Continued)

(45) Close cover (3) and tighten four screws (1) and clamps (2).



END OF TASK

Follow-On Maintenance

Connect batteries (TM 9-4940-568-10)

Check crane for proper operation (TM 9-4940-568-10)

5-5. HOIST CABLE REPLACEMENT

THIS TASK COVERS: a. Removal
b. Installation

INITIAL SETUP

Tools
Tool Kit, General Mechanic's
(Item 30, Appendix G)

Equipment
Condition
Boom erected (TM 9-4940-568-10)

Hoist cable fully payed out
(TM 9-4940-568-10)

Hoist block assembly
removed (Para 5-6)

---

a. Removal

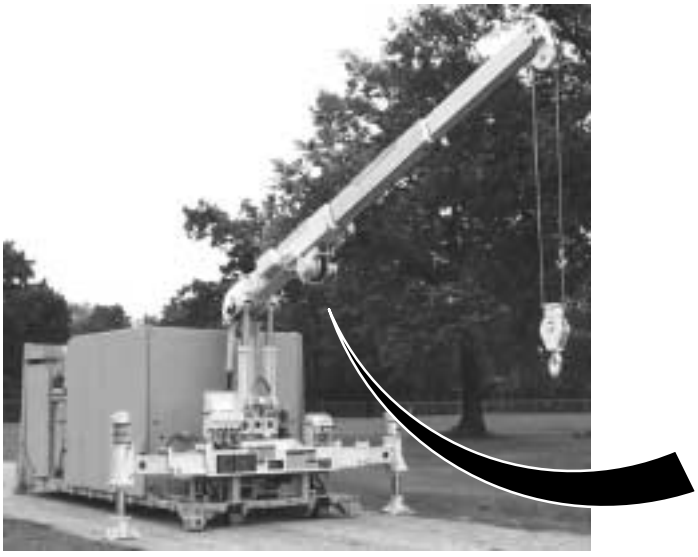
WARNING

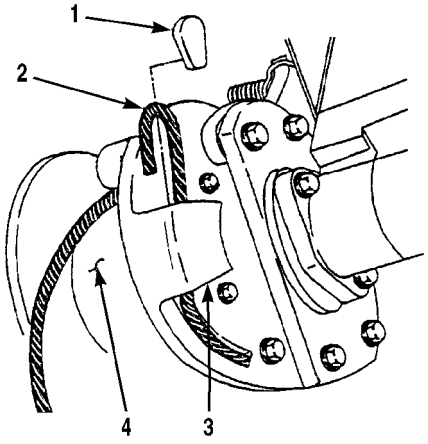
- Cable can become frayed or contain broken wires. Wear heavy leather palmed gloves when handling cable. Frayed or broken wires can injure hands. Failure to comply may result in injury to personnel.
- Always keep tension on cable when paying cable out from hoist or back onto hoist. Loose cable can mis-spool causing cable and equipment damage.

(1) Drive cable wedge (1) and cable (2) out of sleeve (3).

(2) Pull cable (2) from sleeve (3).

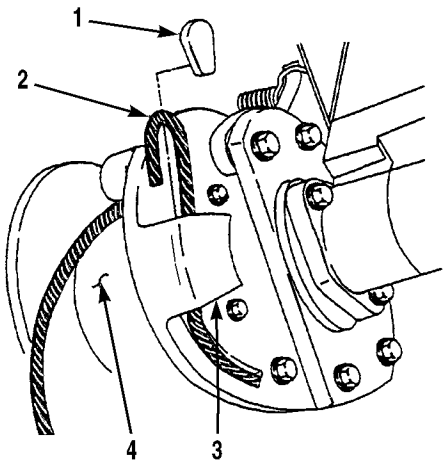
(3) Remove cable (2) from drum (4).





5-5. HOIST CABLE REPLACEMENT (Continued)

b. Installation



(1) Route cable (2) over and around drum (4).

(2) Route cable (2) up through sleeve (3) and back down into sleeve (3), making a loop.

(3) Insert wedge (1) in cable (2) loop and pull cable (2) and wedge (1) into sleeve (3).

(4) Drive wedge (1) and cable (2) into sleeve (3) until fully seated.

(5) Start FRS and turn crane main power switch ON.

NOTE

After one complete layer of cable is on drum, provide tension on cable so that cable spools on tightly. Leave enough cable unspooled to allow installation of hook block.

(6) Install 75 feet of cable (2) onto drum (4) (TM 9-4940-568-10).

END OF TASK

Follow-On Maintenance

Install hook block assembly (Para 5-6)

Stow crane (TM 9-4940-568-10)

5-6. HOOK BLOCK ASSEMBLY MAINTENANCE

THIS TASK COVERS:
a. Removal
b. Disassembly
c. Assembly
d. Installation

INITIAL SETUP

Tools
Tool Kit, General Mechanic's
(Item 30, Appendix G)

Materials/Parts
Grease (Item 21, Appendix C)
Cotter pin (Item 90, Appendix F)
Cotter pin (8) (Item 91, Appendix F)
Cotter pin (Item 92, Appendix F)
Locknut (Item 27, Appendix F)
Lockwasher (Item 65, Appendix F)

Equipment
Condition
FRS unloaded (TM 9-4940-568-10)

Crane erected (TM 9-4940-568-10)

Hoist cable extended until
hook block rests on ground
(TM 9-4940-568-10)

---

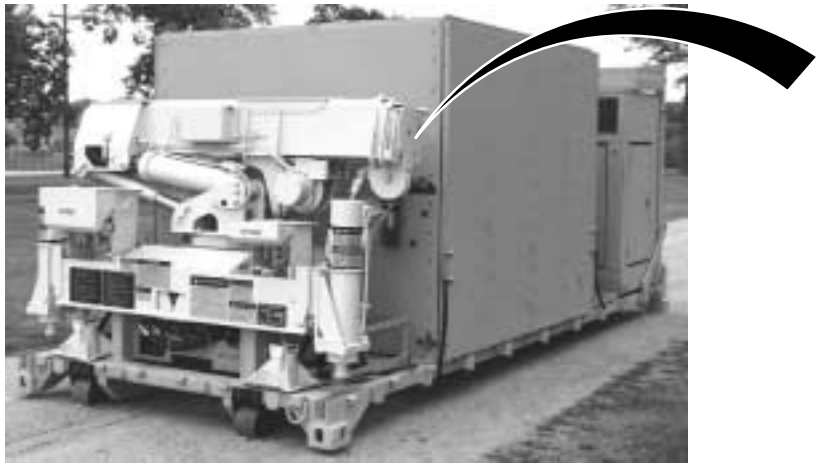
a. Removal

WARNING

Cable can become frayed or contain broken wires. Wear heavy leather palmed gloves when handling cable. Frayed or broken wires can injure hands. Failure to comply may result in injury to personnel.

(1) Remove and discard cotter pin (1) from nut (2).

(2) Remove nut (2), two washers (3), screws (4) and wedge socket (5) from boom (6).



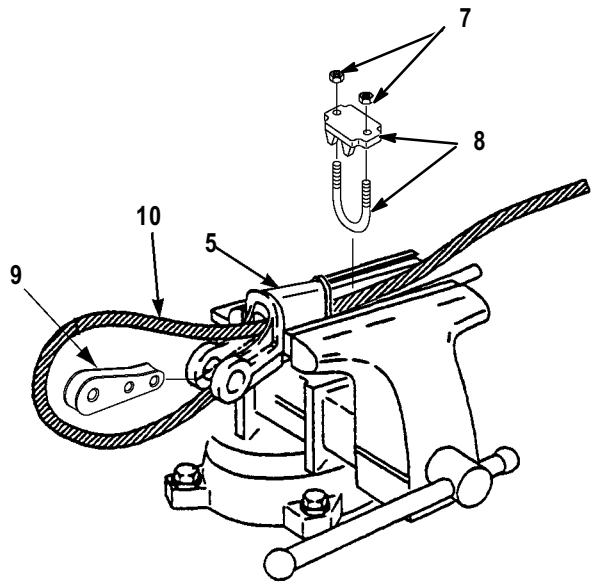
5-6. HOOK BLOCK ASSEMBLY MAINTENANCE (Continued)

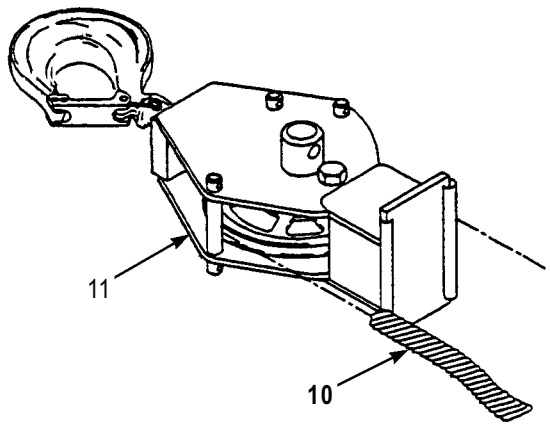
(3) Place wedge socket (5) in vise.

(4) Remove two nuts (7) and wire rope clip (8) from wedge (9).

(5) Remove wedge (9) and cable (10) from wedge socket (5).

(6) Remove hook block (11) from cable (10).





b. Disassembly

(1) Remove and discard eight cotter pins (10) from four straight pins (11).

(2) Remove four straight pins (11) from hook block (9).

(3) Remove lubrication fitting (12) from shouldered shaft (13).

(4) Bend down tabs of key washer (14).

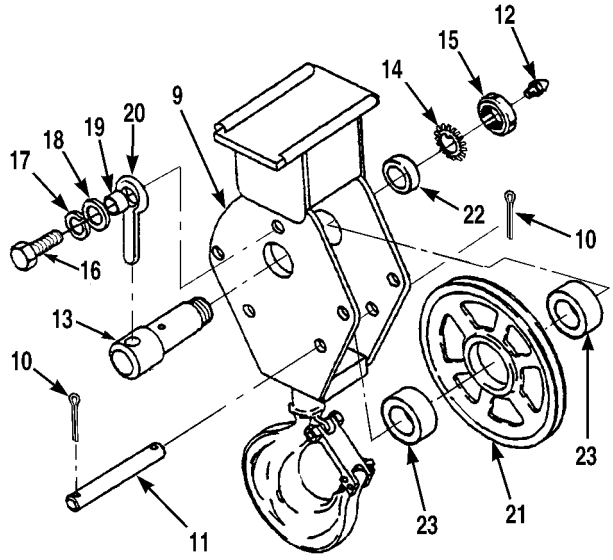
(5) Remove locknut (15) and key washer (14) from hook block (9).

(6) Remove screw (16), lockwasher (17), washer (18) and bushing (19) from hook block (9). Discard lockwasher (17).

(7) Remove eye bolt (20) from shouldered shaft (13) and remove shouldered shaft (13) from hook block (9).

(8) Remove cable pulley (21) and sleeve spacer (22) from hook block (9).

(9) Remove two roller bearings (23) from cable pulley (21).



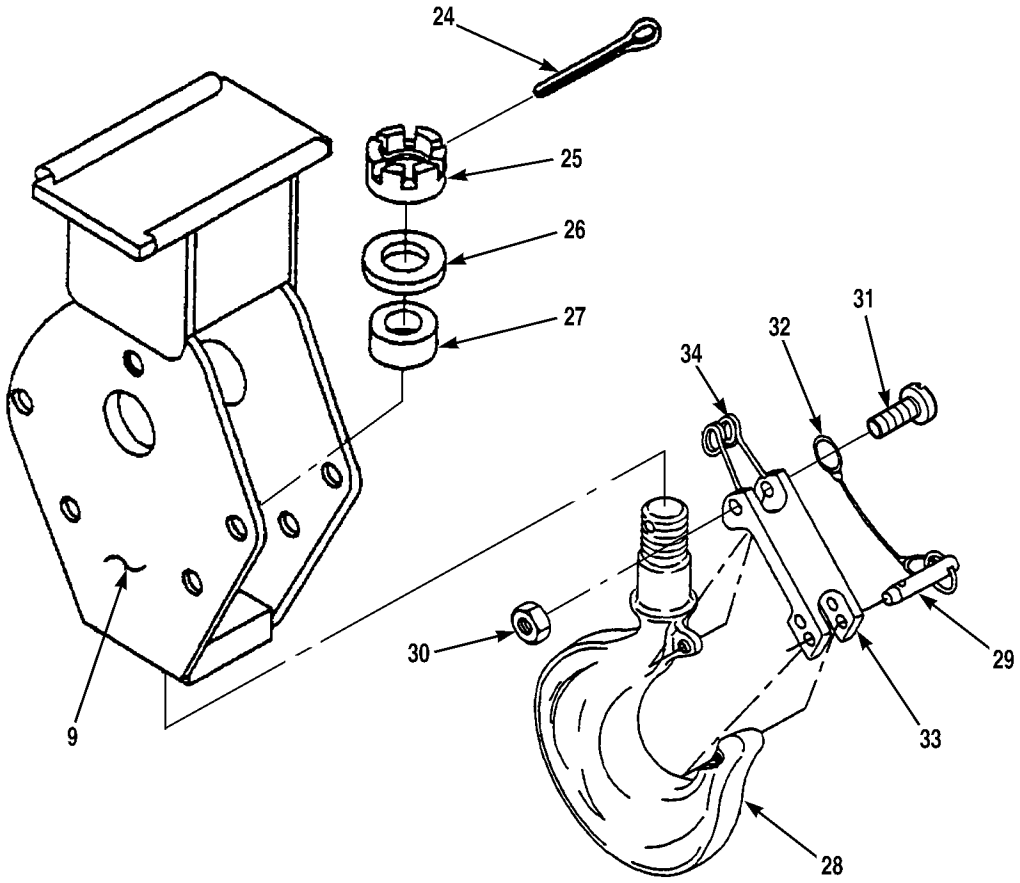
(10) Remove and discard cotter pin (24) from slotted nut (25).

(11) Remove slotted nut (25), washer (26), thrust bearing (27) and swivel hook (28) from hook block (9).

(12) Remove safety pin (29) from swivel hook (28).

(13) Remove locknut (30), screw (31) and lanyard (32) from latch (33). Discard locknut (30).

(14) Remove latch (33) and spring (34) from swivel hook (28).



5-6. HOOK BLOCK ASSEMBLY MAINTENANCE (Continued)

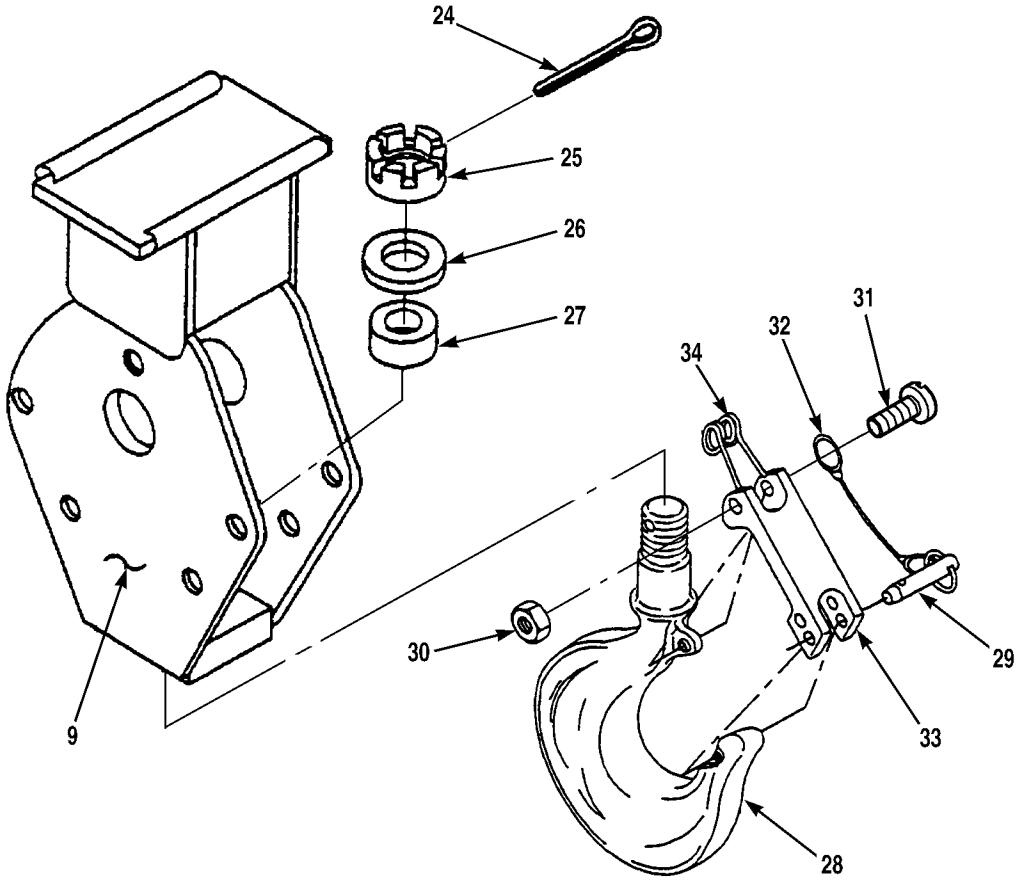
c. Assembly

(1) Install latch (33) on swivel hook (28) with spring (34), lanyard (32), screw (31) and locknut (30).

(2) Install safety pin (29) in latch (33).

(3) Apply a light coat of grease to inner diameter of thrust bearing (27) and install swivel hook (28) on hook block (9) with thrust bearing (27), washer (26) and slotted nut (25).

(4) Install cotter pin (24) in slotted nut (25).



(5) Pack two roller bearings (23) with grease.

(6) Install two roller bearings (23) in cable pulley (21).

(7) Install cable pulley (21) and sleeve bushing (22) in hook block (9) with shouldered shaft (13), key washer (14) and locknut (15). Hand tighten locknut (15).

(8) Bend up tabs of key washer (14) in slots of nut (15).

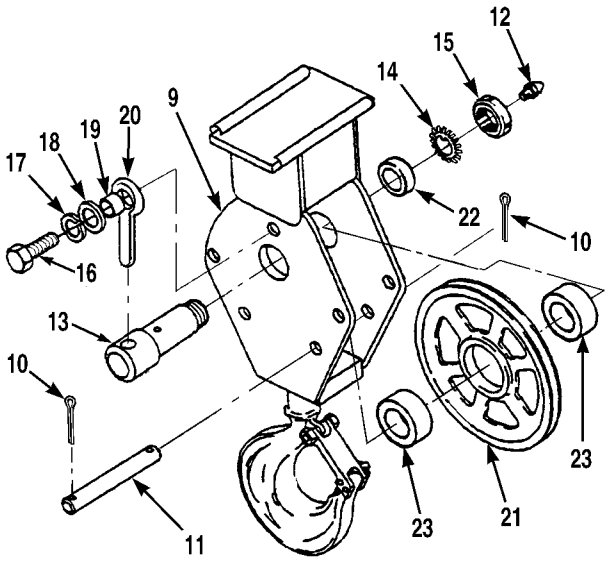
(9) Install lubrication fitting (12) in shouldered shaft (13).

(10) Install eye bolt (20) in shouldered shaft (13).

(11) Install bushing (19), washer (18), lockwasher (17) and screw (16) in hook block (9).

(12) Install four straight shafts (11) in hook block (9).

(13) Install eight cotter pins (10) in four straight shafts (11).



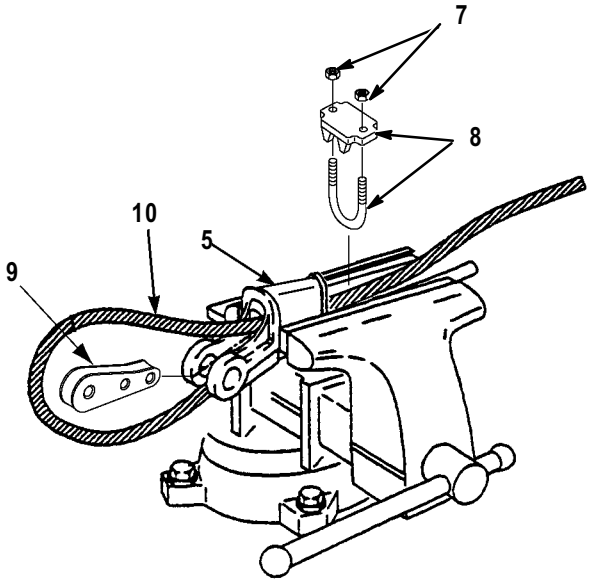
d. Installation

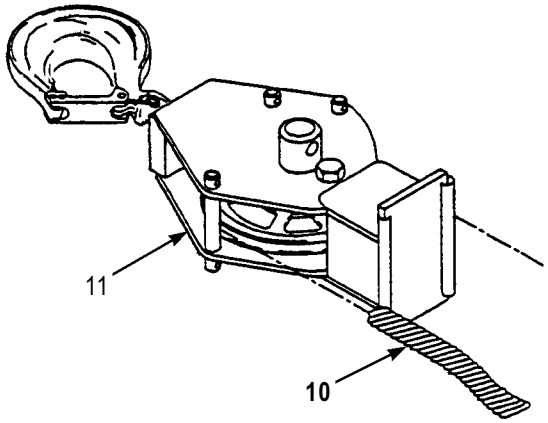
(1) Route cable (10) through hook block sheave (11).

(2) Place wedge socket (5) in vise.

(3) Position cable (10) and wedge (9) in wedge socket (5).

(4) Position wire rope clip (8) and two nuts (7) on wedge (9). Do not tighten.

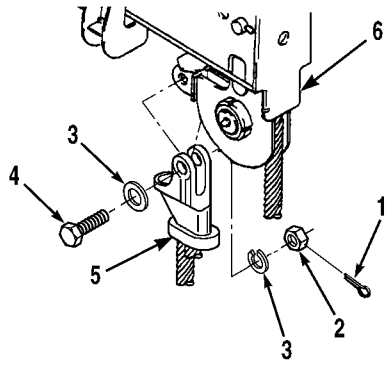




5-6. HOOK BLOCK ASSEMBLY MAINTENANCE (Continued)

(5) Install wedge socket (5) on boom (6) with screw (4), two washers (3) and nut (2).

(6) Install cotter pin (1) in nut (2).

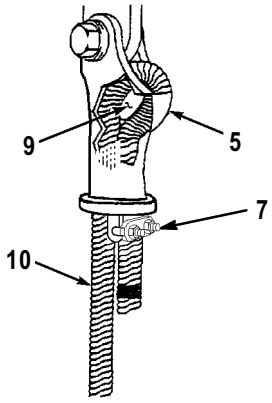


NOTE

Attach suitable weight (250-500 lbs) to hook block to seat cable and wedge in wedge socket.

(7) Seat cable (10) and wedge (9) in wedge socket (5).

(8) Tighten two nuts (7) on wedge (9) in wedge socket (5).



END OF TASK

Follow-On Maintenance

Stow crane
(TM 9-4940-568-10)

Peform load test
(TM 9-4940-568-34).

5-7. BOOM NOSE SHEAVE REPLACEMENT

THIS TASK COVERS: a. Removal
b. Installation

INITIAL SETUP

Tools
Tool Kit, General Mechanic's
(Item 30, Appendix G)

Materials/Parts
Grease (Item 21, Appendix C)
Sealing compound (Item 32, Appendix C)
Lockwasher (Item 65, Appendix F)

Equipment
Condition
FRS unloaded (TM 9-4940-568-10)

Hoist cable extended approximately 10 feet. (TM 9-4940-568-10)

a. Removal

(1) Remove grease fitting (1) from sheave pin (2).

(2) Straighten tab on key washer (3) from detent in nut (4).

(3) Remove nut (4) and key washer (3).

(4) Remove screw (5), lockwasher (6), washer (7) and bushing (8) from sheave pin (9). Discard lockwasher (6).

(5) Remove sheave (10) from sheave pin (2).

NOTE

Support sheave (10) during removal of sheave pin (2). Sheave (10) has two roller bearing assemblies (12) inside hub which may fall out.

(6) Remove sheave pin (2) and sheave (10) from boom (11).

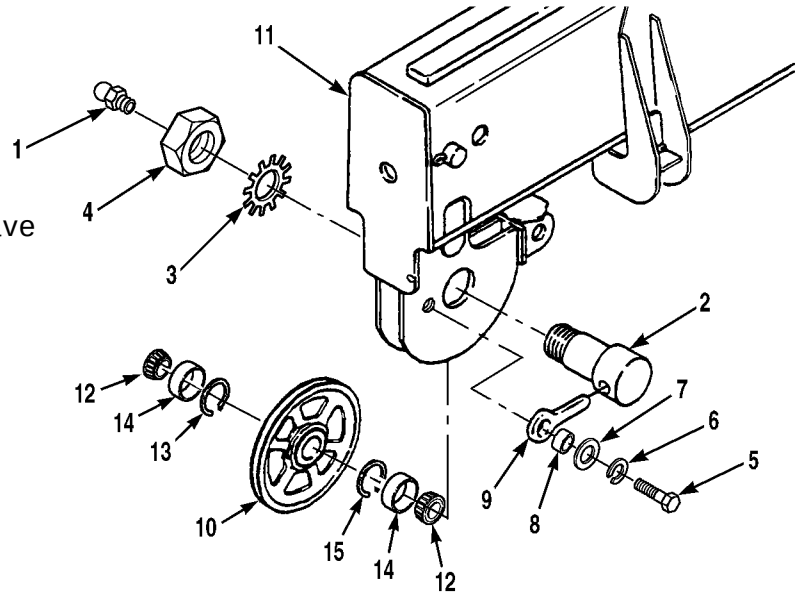
(7) Remove two roller bearing assemblies (12) and bearing spacer (13) from sheave (10).

NOTE

Perform step (8) only if bearing cups (14) are damaged.

(8) Remove two bearing cups (14) and bearing cup spacer (15) from sheave (10).

CABLE AND BOOM LIGHT REMOVED FOR CLARITY



5-7. BOOM NOSE SHEAVE REPLACEMENT (Continued)

b. Installation

(1) If removed, install bearing cup spacer (15) and two bearing cups (14) on sheave (10).

(2) Pack two roller bearing assemblies (12) with grease.

(3) Install bearing spacer (13) and two roller bearing assemblies (12) in sheave (10).

WARNING

Cable can become frayed or contain broken wires. Wear heavy leather palmed gloves when handling cable. Frayed or broken wires can injure hands. Failure to comply may result in injury to personnel. Never let moving cable slide through hands, even when wearing gloves. A broken wire could pierce through glove and cut hands.

(4) Install sheave (10) and sheave pin (2) into boom (11) with cable (16) routed over top of sheave (10) and through groove.

(5) Position lock pin (9) in sheave pin (2).

(6) Position key washer (3) and nut (4) on sheave pin (2).

(7) Apply sealing compound to threads of screw (5).

(8) Install washer (7), lockwasher (6), bushing (8), and screw (5) in sheave pin (2).

(9) Tighten nut (4) until snug.

(10) Bend tang of key washer (3) so that the tang lines up with one of four slots on nut (4).

(11) Install grease fitting (1) in sheave pin (2).

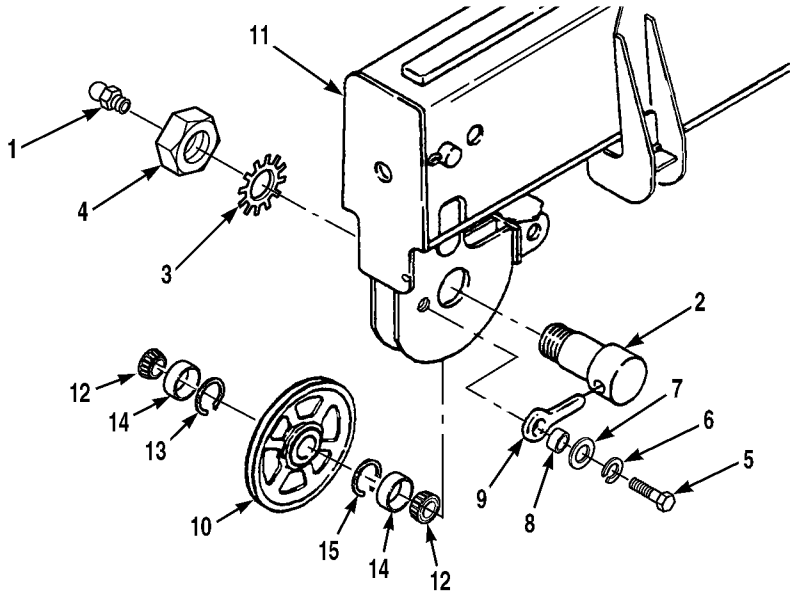
END OF TASK

Follow-On Maintenance

Stow crane
(TM 9-4940-568-10)

Load test crane,
(TM 9-4940-568-34)

CABLE AND BOOM LIGHT REMOVED FOR CLARITY



5-8. POWER CABLE REPLACEMENT

THIS TASK COVERS:
a. Removal
b. Installation

INITIAL SETUP

Tools
Tool Kit, General Mechanic's
(Item 30, Appendix G)

Equipment
Condition
FRS unloaded (TM 9-4940-568-10)

Batteries disconnected
(TM 9-4940-568-10)

General Safety Instructions
To prevent personal injury, make sure batteries are disconnected before working on electrical components.

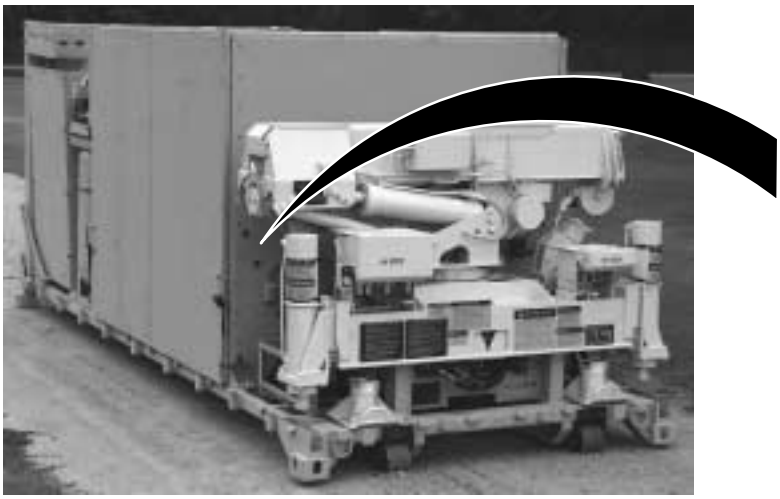
a. Removal

NOTE

Note position of wires and cut as required.

(1) Disconnect power cable connector (1) from hydraulic manifold connector (2).

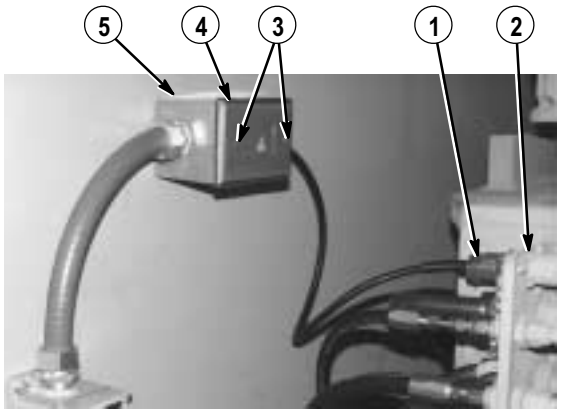
(2) Remove two screws (3) and cover (4) from junction box (5).

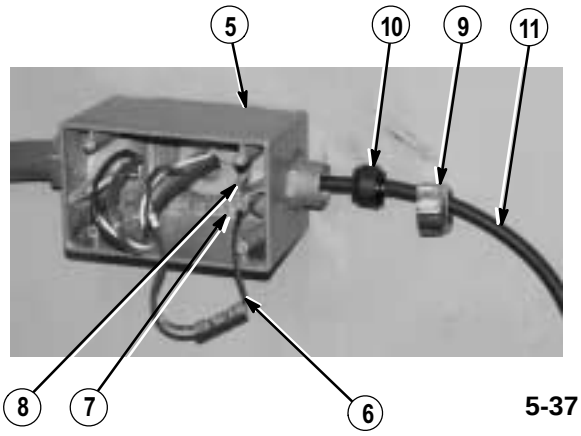


(3) Cut black wire (6) and remove screw (7) and ground wire (8) from junction box (5).

(4) Remove retaining nut (9), grommet (10) and harness (11) from junction box (5).

(5) Remove rubber grommet (10) and retaining nut (9) from harness (11).





5-8. POWER CABLE REPLACEMENT (Continued)

b. Installation

(1) Position retaining nut (9) and rubber grommet (10) on harness (10) and install on junction box (5).

(2) Connect black wire (6) and install screw (7) and ground wire (8) in junction box (5).

(3) Install cover (4) and two screws (3) on junction box (5).

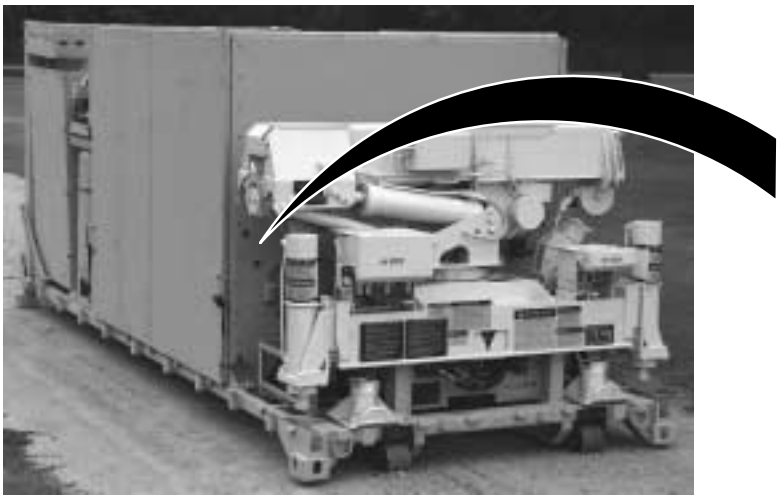
(4) Connect power cable connector (1) to hydraulic manifold connector (2).

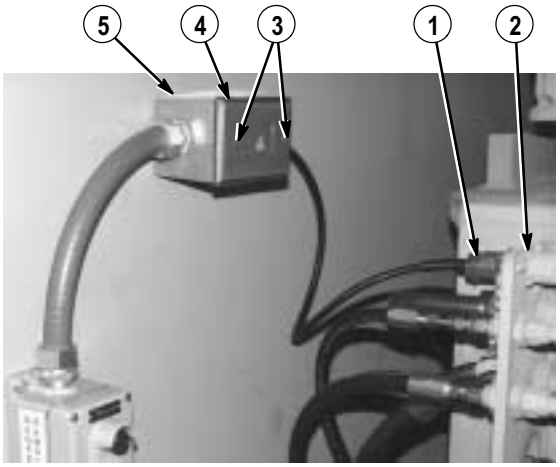
END OF TASK

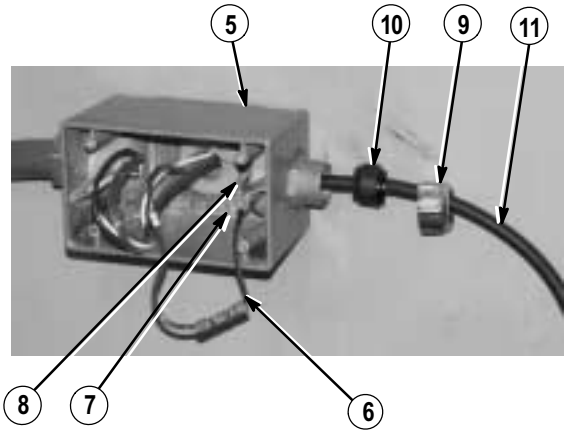
Follow-On Maintenance

Connect batteries (TM 9-4940-568-10)

Deploy outrigger to verify fault is corrected (TM 9-4940-568-10)







5-9. REMOTE CONTROL HARNESS REPLACEMENT

THIS TASK COVERS:
a. Removal
b. Installation

INITIAL SETUP

Tools
Tool Kit, General Mechanic's
(Item 30, Appendix G)

Materials/Parts
Lockwasher (Item 65, Appendix F)

Equipment
Condition
FRS unloaded (TM 9-4940-568-10)

Batteries disconnected
(TM 9-4940-568-10)

Remote control harness removed from junction box (para 5-4).

General Safety Instructions
To prevent personal injury, make sure batteries are disconnected before working on electrical components.

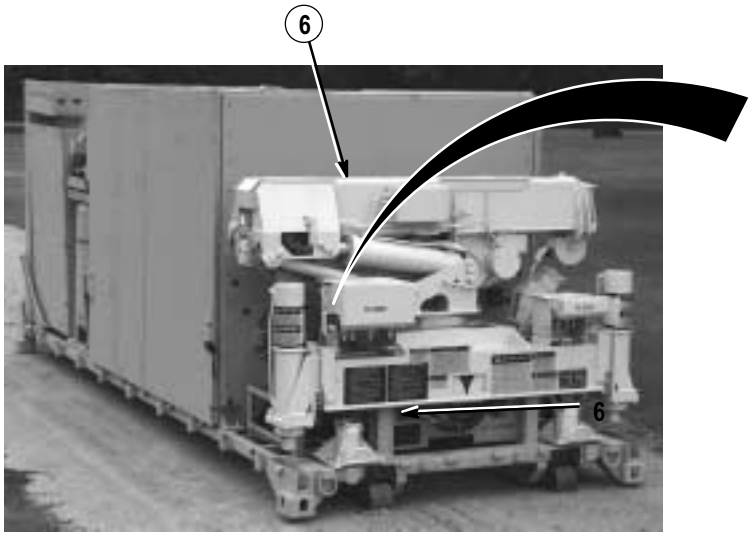
a. Removal

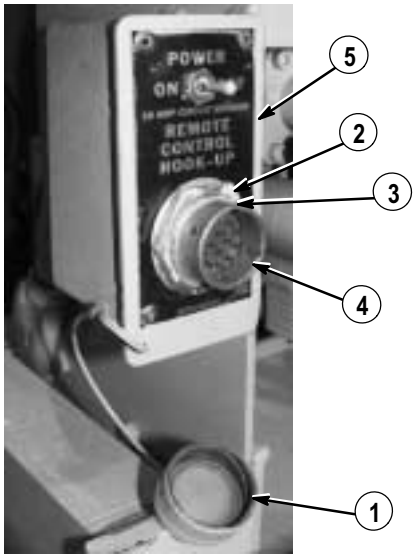
NOTE

- Wire and harness removal from junction box is covered in junction box replacement (para 5-4).
- Cut cable ties as required.
- Remove cushion clamps as required.

(1) Remove dust cap (1), nut (2), lockwasher (3), and remote control harness (4) from bracket (5). Discard lockwasher (3).

(3) Remove remote control harness (4) from crane (6).





5-9. REMOTE CONTROL HARNESS REPLACEMENT (Continued)

b. Installation

NOTE

Install cable ties and cushion clamps as required.

(1) Position remote control harness (4) on crane (6).

(2) Install remote control harness (4) in bracket (5) with lockwasher (3), nut (2) and dust cap (1).

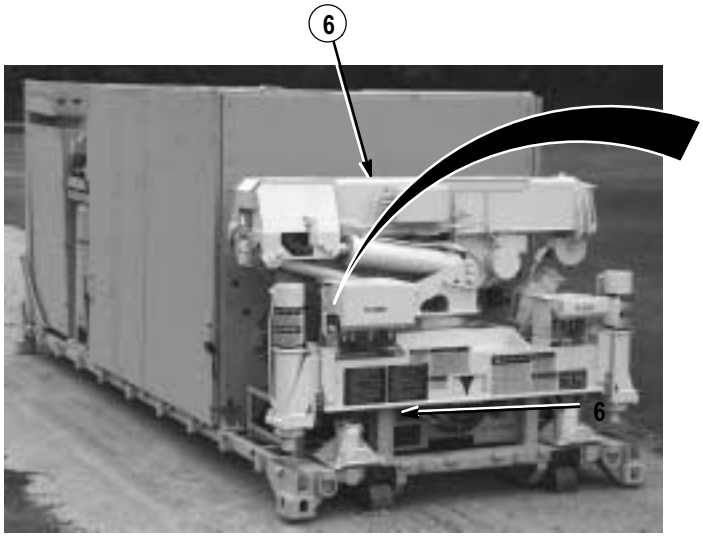
END OF TASK

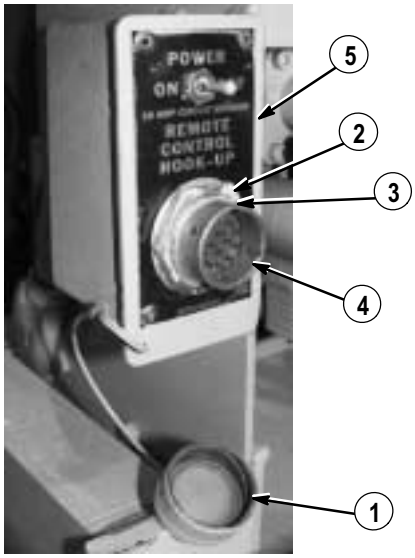
Follow-On Maintenance

Install remote control harness on junction box (para 5-4).

Connect batteries (TM 9-4940-568-10)

Check crane for proper operation (TM 9-4940-568-10)





5-10. OVERLOAD SHUTDOWN CABLE REPLACEMENT

THIS TASK COVERS:
a. Removal
b. Installation

INITIAL SETUP

Tools
Tool Kit, General Mechanic's
(Item 30, Appendix G)

Equipment
Condition
FRS unloaded (TM 9-4940-568-10)

Equipment
Condition (Cont)
Batteries disconnected
(TM 9-4940-568-10)

Overload shutdown cable
removed from junction
box (para 5-4).

General Safety Instructions
To prevent personal injury, make sure batteries are disconnected before working on electrical components.

a. Removal

NOTE

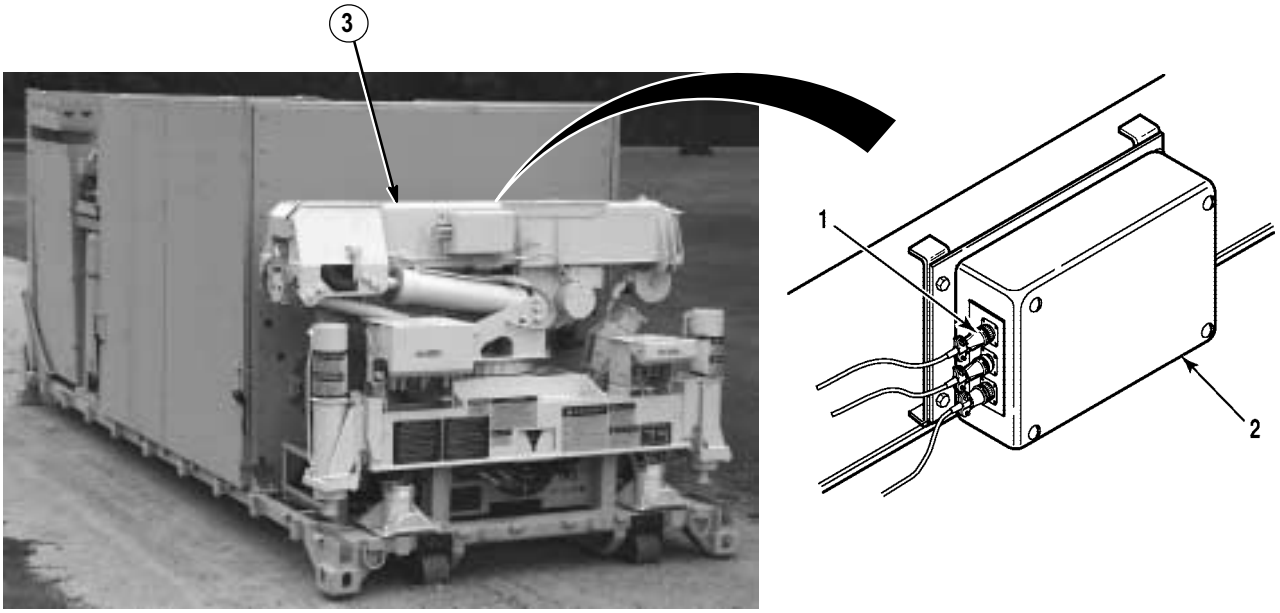
- Cut cable ties as required.
- Remove cushion clamps as required.
- Tag and mark all wires prior to removal.

(1) Disconnect overload shutdown cable (1) from overload shutdown box (2).

NOTE

Note routing of cable before removing.

(2) Remove overload shutdown cable (1) from crane (3).



5-10. OVERLOAD SHUTDOWN CABLE REPLACEMENT (Continued)

b. Installation

Follow-On Maintenance

NOTE

Install cable ties and cushion clamps as required.

(1) Position overload shutdown cable (1) on crane (3).

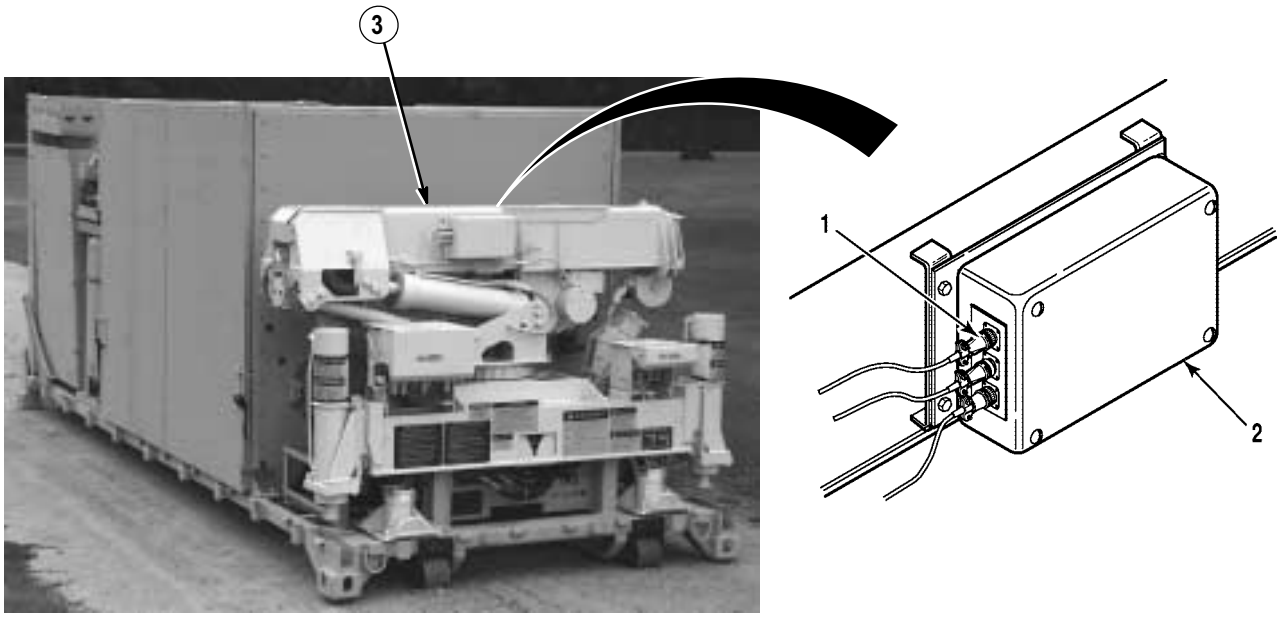
(2) Connect overload shutdown cable (1) to overload shutdown box (2).

Install overload shutdown cable in junction box (para 5-4).

Connect batteries (TM 9-4940-568-10)

Check crane for proper operation (TM 9-4940-568-10)

END OF TASK



5-11. CONTROL SOLENOID CABLE REPLACEMENT

THIS TASK COVERS: a. Removal
b. Installation

INITIAL SETUP

Tools
Tool Kit, General Mechanic's
(Item 30, Appendix G)

Materials/Parts
Lockwasher (4) (Item 61, Appendix F)
Gasket (12) (Item 10, Appendix F)

Equipment
Condition
FRS unloaded (TM 9-4940-568-10)

Batteries disconnected (TM 9-4940-568-10)

Wire and harness removal from junction box is covered in junction box maintenance (para 5-4)

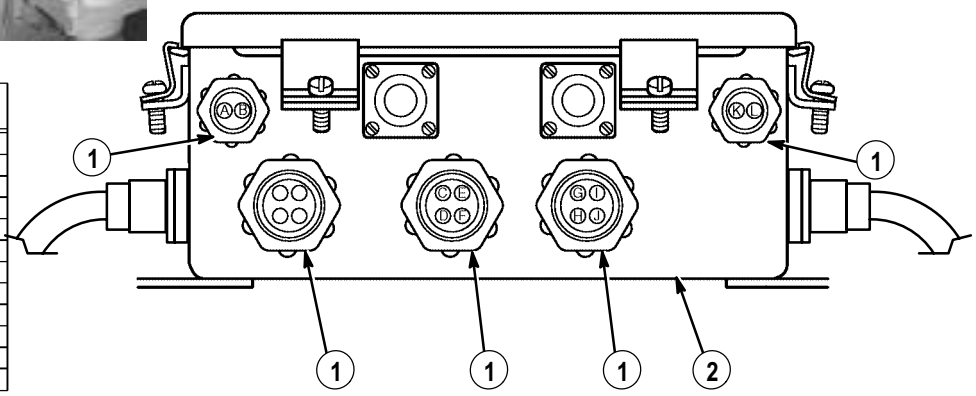
General Safety Instructions
To prevent personal injury, make sure batteries are disconnected before working on electrical components.

a. Removal

NOTE

- Cut cable ties as required.
- Remove cushion clamps as required.
- There are 12 solenoid cables in the junction box. All solenoid cables are removed the same way. Refer to key for functions of solenoid cables.

(1) Remove solenoid cable (1) from junction box (2).



CABLE IDENT.	DESCRIPTION
A	CABLE ASSY - BOOM L/O SOL
B	CABLE ASSY - HYD SYS SOL
C	CABLE ASSY - TELE IN SOL
D	CABLE ASSY - TELE OUT SOL
E	CABLE ASSY - SWING CCW SOL
F	CABLE ASSY - SWING CW SOL
G	CABLE ASSY - HOIST UP SOL
H	CABLE ASSY - BOOM UP SOL
I	CABLE ASSY - HOIST DOWN SOL
J	CABLE ASSY - BOOM DOWN SOL
K	CABLE ASSY - TELE OUT L/O SOL
L	CABLE ASSY - HOIST UP L/O SOL

5-11. CONTROL SOLENOID CABLE REPLACEMENT (Continued)

NOTE

Perform Step (2) if working on FRS overload lockout solenoids. Perform Step (3) if working on FRS crane function solenoids.

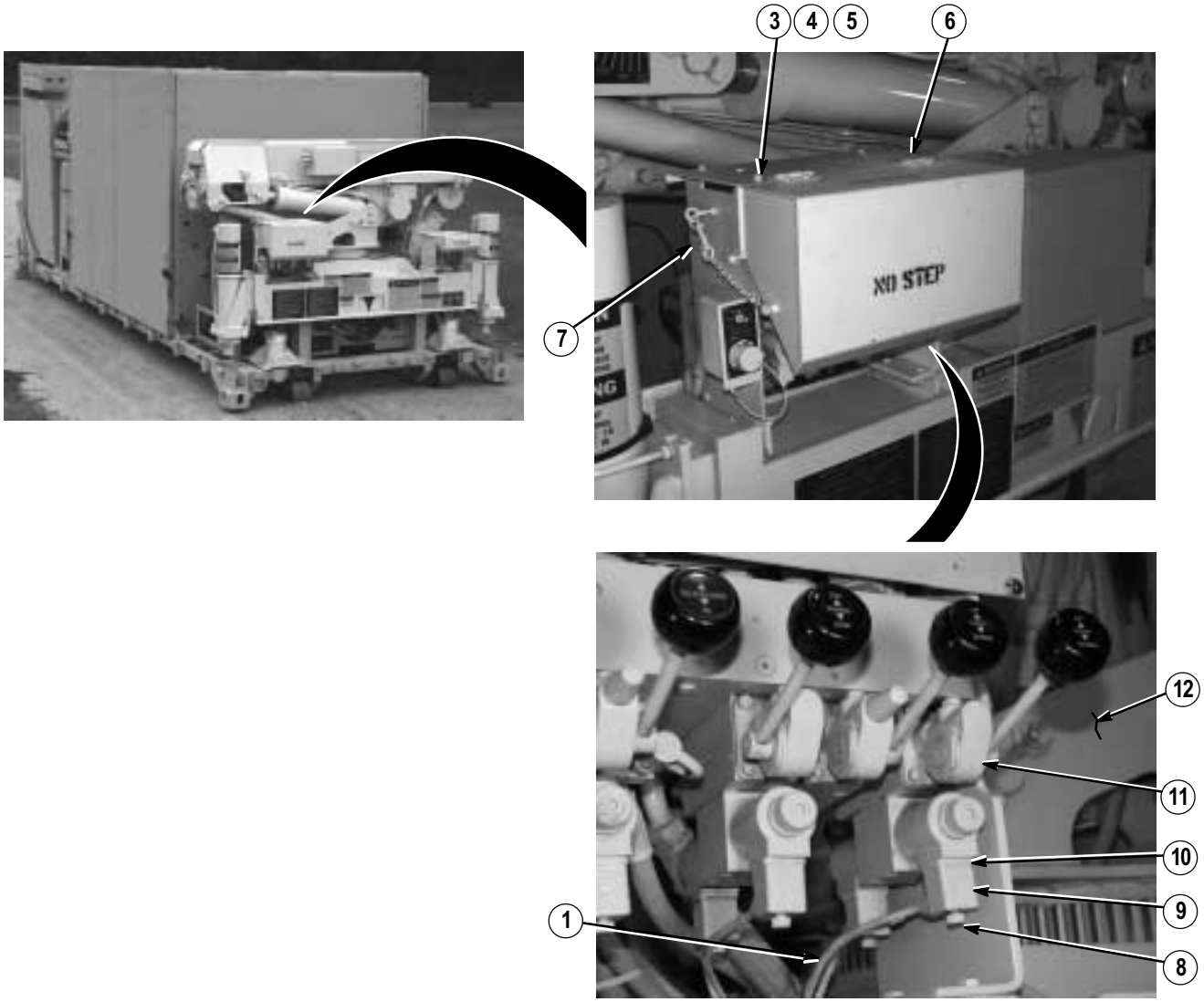
(2) Remove four screws (3), lockwashers (4), washers (5) and cover (6) from bracket (7). Discard lockwashers (4).

NOTE

There are 12 control valves; wiring to all control valve connectors is removed the same way.

(3) Loosen screw (8) and remove connector (9) and gasket (10) from control valve (11). Discard gasket (10).

(4) Remove solenoid cable (1) from crane (12) .



b. Installation

NOTE

Install cable ties and cushion clamps as required.

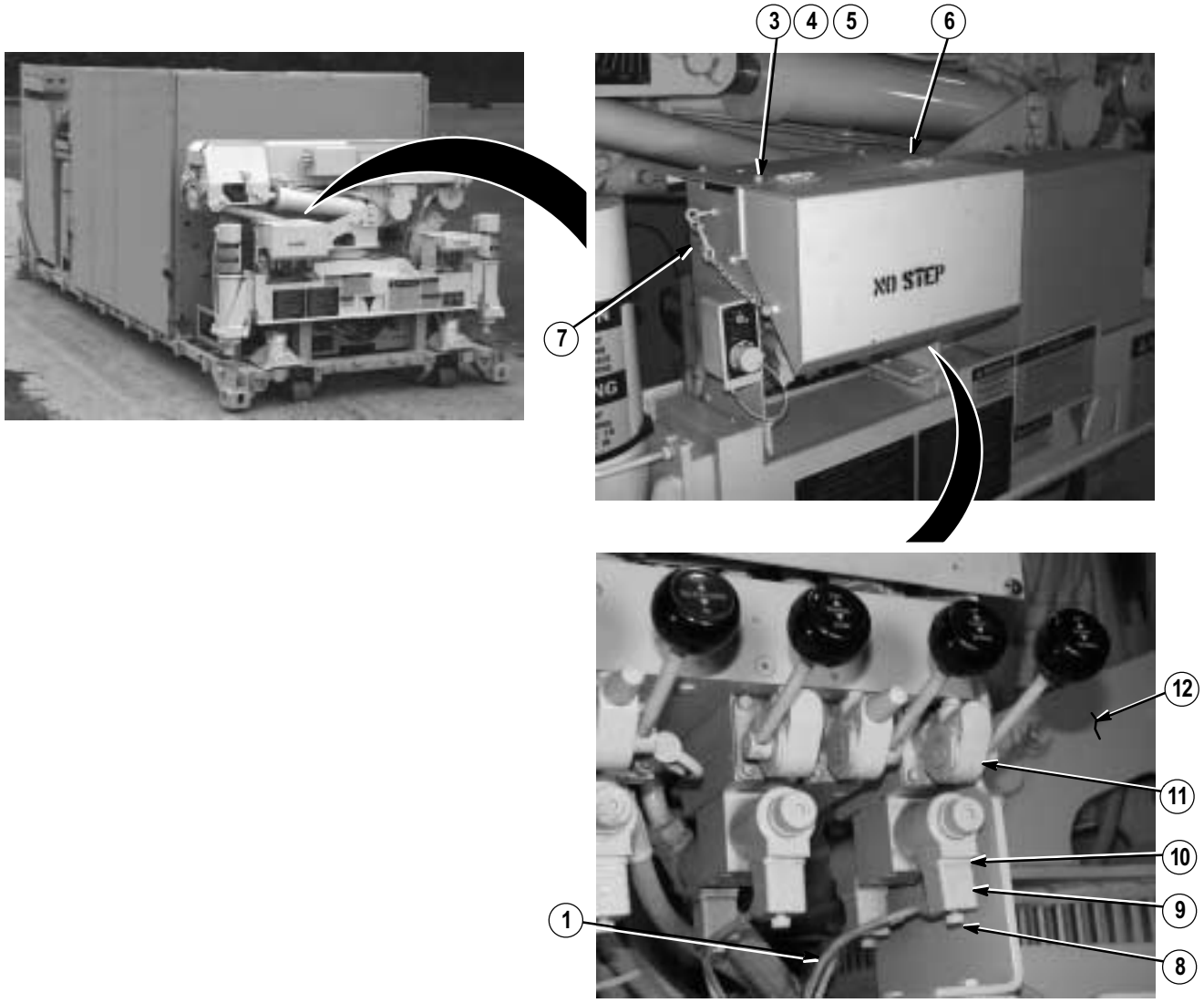
(1) Position solenoid cable (1) on crane (12).

NOTE

- Wires to all control valves are installed the same way.
- Perform Step (2) if working on FRS crane funciton solenoids. Perform Step (3) if working on FRS overload lockout solenoid.

(2) Install gasket (10) and connector (9) and tighten screw (8).

(3) Install cover (6) on bracket (7) with four washers (5), lockwashers (4) and screws (3).



5-11. CONTROL SOLENOID CABLE REPLACEMENT (Continued)

NOTE

Installation of harness and wires in junction box is covered in junction box replacement (para 5-4).

(5) Install solenoid cable (1) in junction box (2).

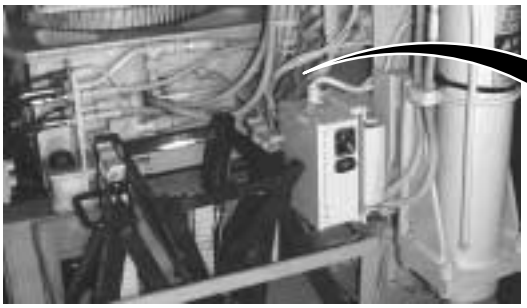
END OF TASK

Follow-On Maintenance

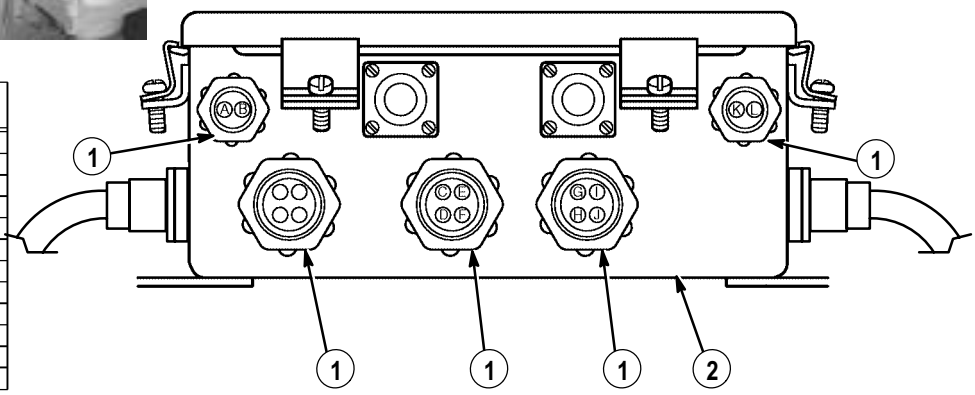
Connect batteries (TM 9-4940-568-10)

Connect solenoid wires to junction box (para 5-4)

Check crane for proper operation (TM 9-4940-568-10)



CABLE IDENT.	DESCRIPTION
A	CABLE ASSY - BOOM L/O SOL
B	CABLE ASSY - HYD SYS SOL
C	CABLE ASSY - TELE IN SOL
D	CABLE ASSY - TELE OUT SOL
E	CABLE ASSY - SWING CCW SOL
F	CABLE ASSY - SWING CW SOL
G	CABLE ASSY - HOIST UP SOL
H	CABLE ASSY - BOOM UP SOL
I	CABLE ASSY - HOIST DOWN SOL
J	CABLE ASSY - BOOM DOWN SOL
K	CABLE ASSY - TELE OUT L/O SOL
L	CABLE ASSY - HOIST UP L/O SOL



5-12. REMOTE CONTROL BOX REPAIR

THIS TASK COVERS: a. Disassembly
b. Assembly

INITIAL SETUP

Tools
Tool Kit, General Mechanic's
(Item 30, Appendix G)

Materials/Parts
Compound, silicone (item 15, Appendix D)

Materials/Parts (Cont)
Sealant, silicone (item 31, Appendix D)
Gasket (Item 11, Appendix F)
Locknut (16) (Item 47, Appendix F)
Lockwasher (Item 57, Appendix F)
Packing, preformed (Item 85, Appendix F)
Washer, plastic (Item 106, Appendix F)
Washer, rubber (Item 107, Appendix F)

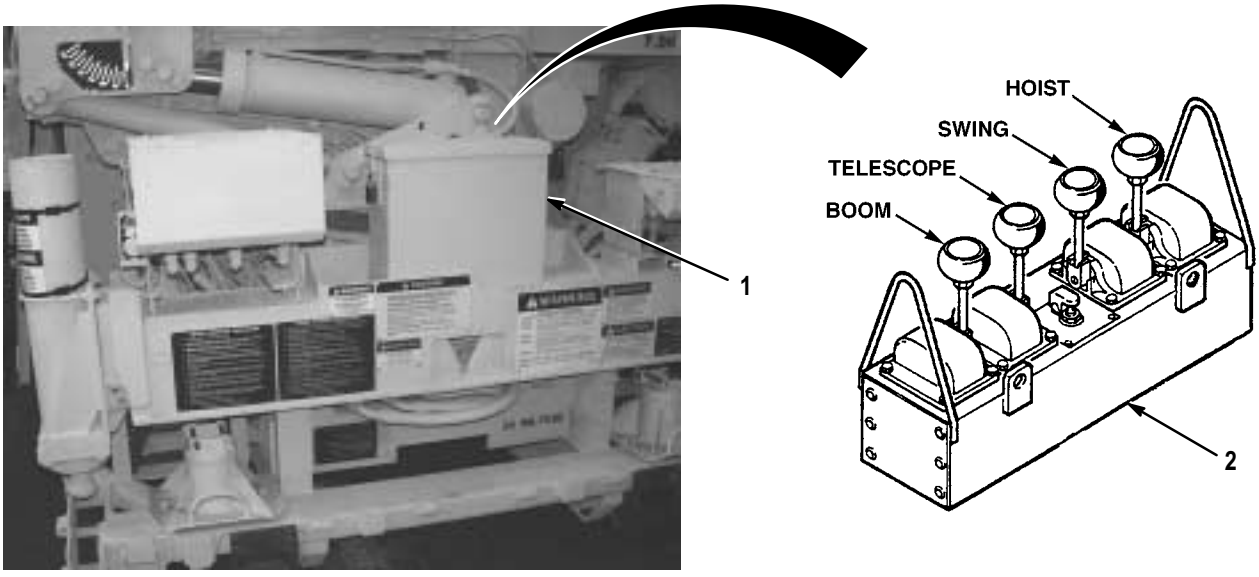
---

a. Disassembly

NOTE

- Tag and mark all connectors, switches, and wires prior to removal.
- All controllers are removed the same way.

(1) Open stowage box (1) and remove remote control box (2) (TM 9-4940-568-10).



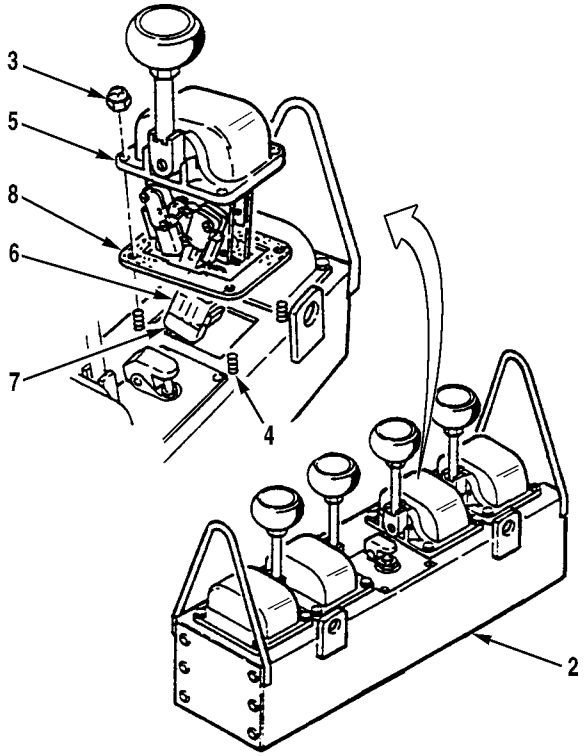
5-12. REMOTE CONTROL BOX REPAIR (Continued)

(2) Remove and discard four locknuts (3) from studs (4).

(3) Lift swing controller (5) away from remote control box (2).

(4) Disconnect swing controller connector (6) from connector (7).

(5) Remove gasket (8) and swing controller (7) from remote control box (2). Discard gasket (8).



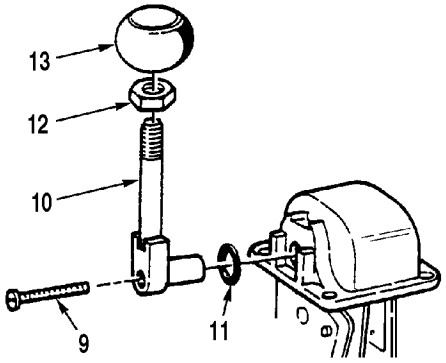
NOTE

Note position of screw (9) and lever assembly (10) prior to removal.

(6) Remove screw (9), lever assembly (10), and preformed packing (11) from swing controller (6). Discard preformed packing.

(7) Loosen nut (12) and remove knob (13) and nut (12) from lever assembly (10).

(8) Repeat Steps (2 thru 7) for telescope controller, hoist controller and boom controller.

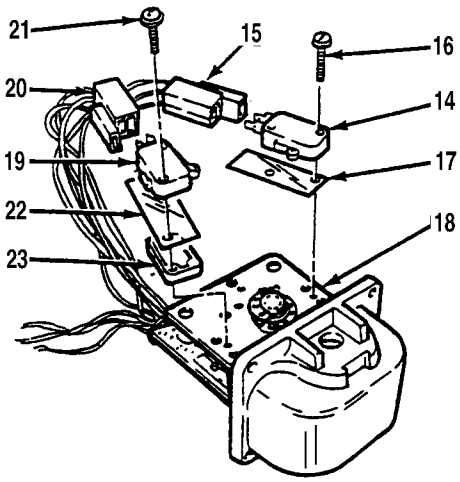


(9) Disconnect switch (14) from connector (15).

(10) Remove two screws (16), switch (14), and insulator (17) from controller (18).

(11) Disconnect switch (19) from connector (20).

(12) Remove two screws (21), switch (19), insulator (22), and spacer (23).



NOTE

Do not remove spacer (28) from circuit card (29) if circuit card (29) is not being replaced.

(13) Remove screws (24 and 25), washers (26), heat sink (27) and spacer (28) from circuit card (29). Discard lockwashers (26).

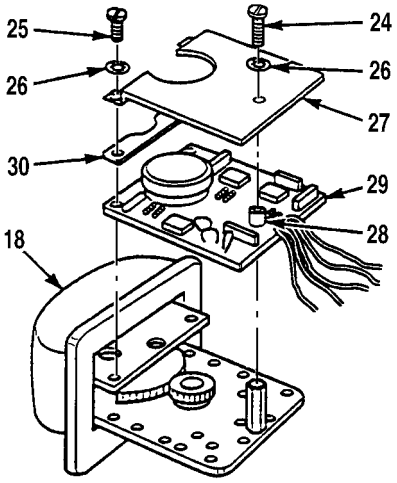
(14) Remove circuit card (29) from controller (18).

NOTE

If circuit card is not being replaced, go to Step (16).

(15) Remove heat sink (30) from circuit card (29).

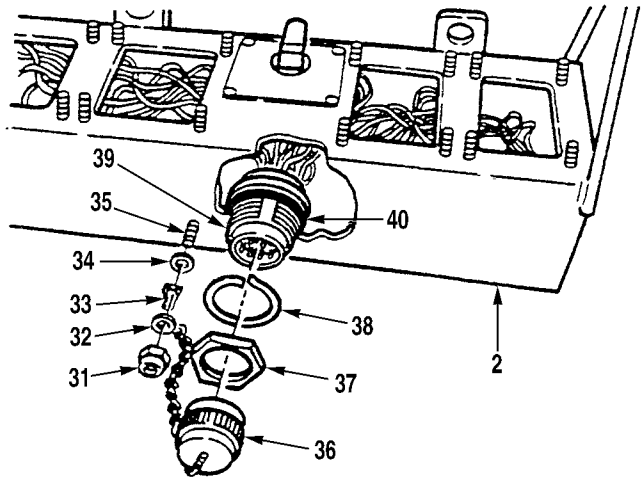
(16) Repeat Steps (9 thru 15) for telescope controller, hoist controller and boom controller.



(17) Remove locknut (31), washer (32), chain (33) and washer (34) from stud (35). Discard locknut (31) and washers (32 and 34).

(18) Remove cap (36) then note position and remove nut (37) and lockwasher (38) from receptacle (39). Discard lockwasher (38).

(19) Push receptacle (39) into remote control box (2) and remove and discard rubber washer (40).

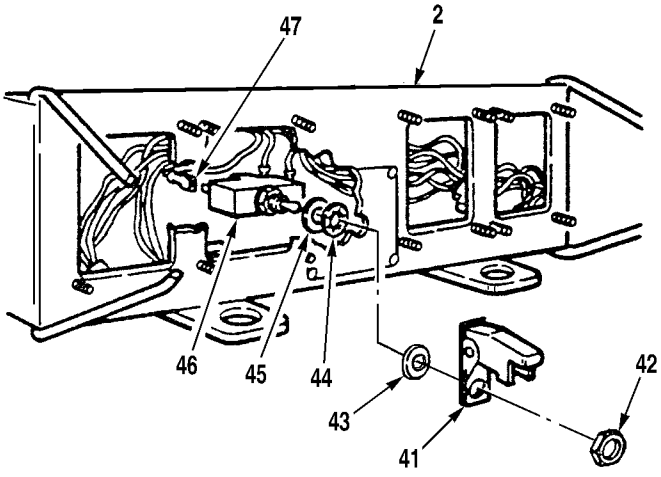


(20) Lift switch guard (41) and mark position.

(21) Remove nut (42), switch guard (41), nylon washer (43), washer (44) and washer (45) from ON/OFF switch (46).

(22) Pull ON/OFF switch (46) out of remote control box (2) through controller hole.

(23) Remove four connectors (47) from ON/OFF switch (46).



5-12. REMOTE CONTROL BOX REPAIR (Continued)

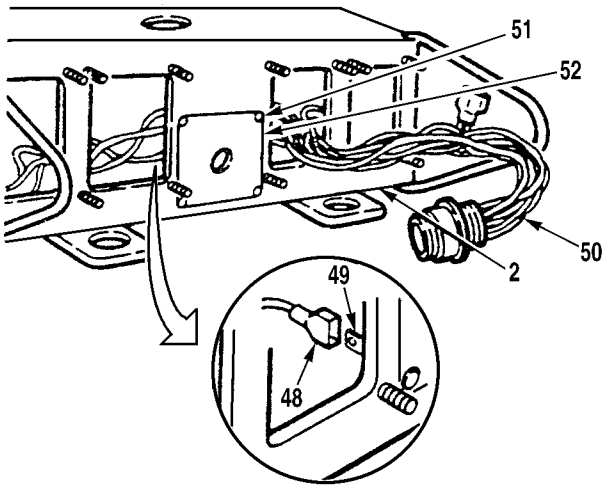
(24) Remove ground wire (48) from ground terminal (49).

(25) Remove wire harness (50) from remote control box (2).

NOTE

Perform Step (26) only if data plate (52) is damaged, or if replacing remote control box.

(26) Drill out and remove four rivets (51), data plate (52), and ground terminal (49) from remote control box (2).



b. Assembly

NOTE

Perform Step (1) only if data plate (52) was removed.

(1) Install data plate (52) and ground terminal (49) on remote control box (2) with four rivets (51).

(2) Apply sealant to four rivets (51) only on inside of remote control box (2).

(3) Position wiring harness (50) in remote control box (2).

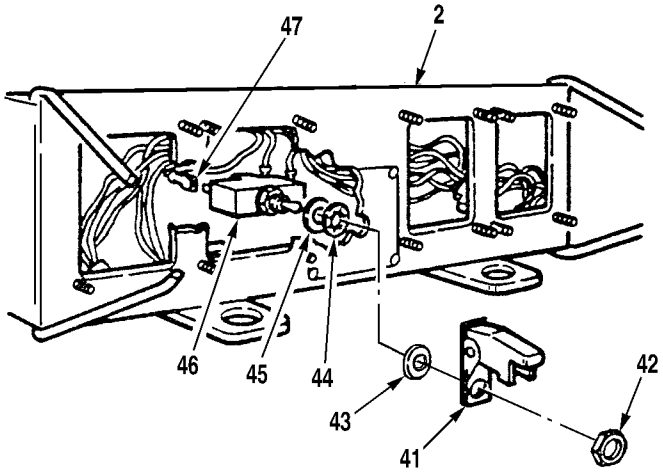
(4) Install ground wire (48) on ground terminal (49).

(5) Install four connectors (47) on ON/OFF switch (46).

NOTE

OFF position of switch points to rubber key of washer.

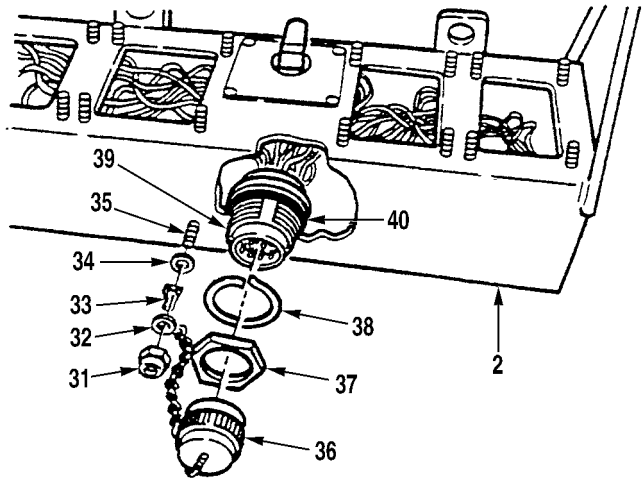
(6) Apply sealant between washer (45) and ON/OFF switch (46) and install ON/OFF switch (46) in remote control box (2) with washer (45), washer (44), nylon washer (43), switch guard (41) and nut (42).



(7) Install rubber washer (40) and receptacle (40) in remote control box (2) with lockwasher (38) and nut (37).

(8) Install cap (36) on receptacle (39).

(9) Install plastic washer (34), chain (33), and plastic washer (32) on stud (35) with locknut (31).



NOTE

If circuit card was not replaced, go to Step (11).

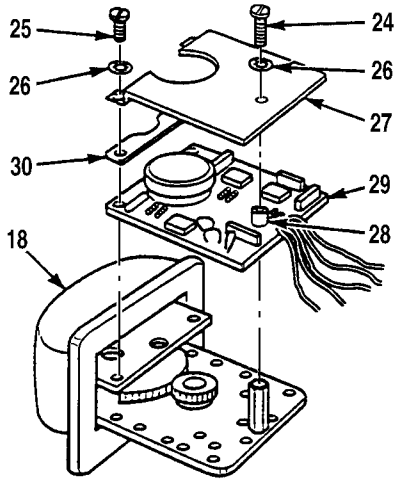
(10) Position heat sink (30) on circuit card (29).

(11) Install circuit card (29) on controller (18).

NOTE

Spacer (28) is installed only if circuit card was replaced.

(12) Install spacer (28) and heat sink (27) on circuit card (29) with three washers (26) and screws (24 and 25).



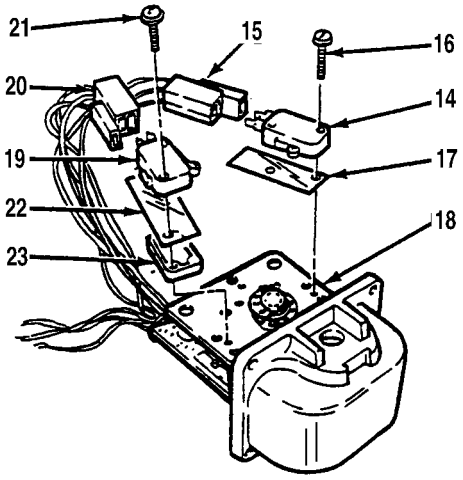
(13) Install spacer (23), insulator (22), and switch (19) on controller (18) with two screws (21).

(14) Connect connector (20) on switch (19).

(15) Install insulator (17) and switch (14) on controller (18) with two screws (16).

(16) Connect connector (15) on switch (14).

(17) Repeat Steps (13 thru 16) for telescope controller, hoist controller, and boom controller.



5-12. REMOTE CONTROL BOX REPAIR (Continued)

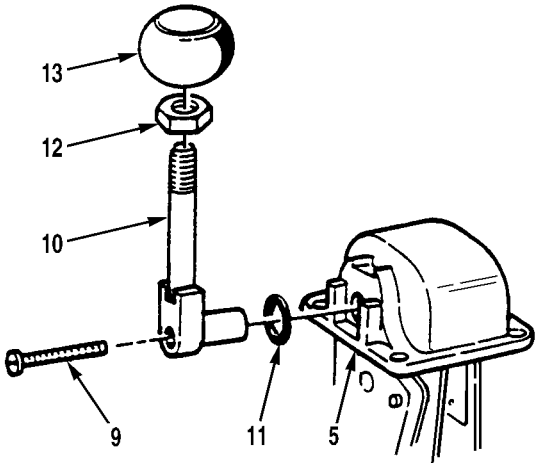
(18) Install nut (12) and knob (13) on lever assembly (10).

(19) Apply silicone compound to shaft of lever assembly (10).

(20) Install preformed packing (11) on lever assembly(10).

(21) Apply sealant to underside of head on screw (9).

(22) Install lever assembly (10) on swing controller (5) with screw (9).



(23) Coat both sides of gasket (8) with sealant and install gasket (8) on swing controller (5).

(24) Connect swing controller connector (6) to connector (7).

(25) Install swing controller connector (6) on studs (4) and remote control box (2) with four locknuts (3).

NOTE

The inner two controllers must be installed before the outer two controllers.

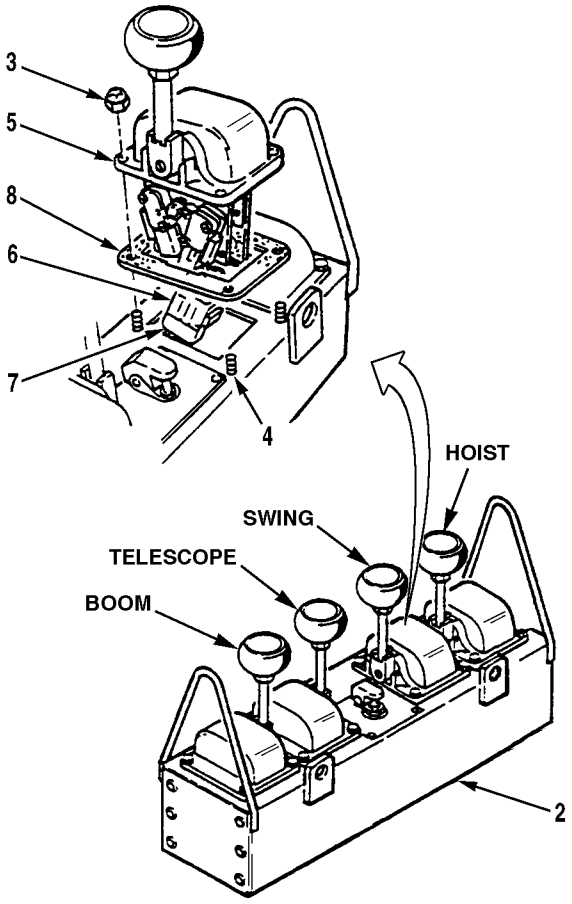
(26) Repeat Steps (18 thru 25) for telescope controller, hoist controller and boom controller in that order.

(27) Stow remote control box (2) in stowage box (TM 9-4940-568-10).

END OF TASK

Follow-On Maintenance

Operate crane to test remote control operation (TM 9-4940-568-10)



5-13. BOOM LIGHT CABLE REPLACEMENT

THIS TASK COVERS:
a. Removal
b. Installation

INITIAL SETUP

Tools
Tool Kit, General Mechanic's
(Item 30, Appendix G)

Equipment
Condition
FRS unloaded (TM 9-4940-568-10)

Batteries disconnected
(TM 9-4940-568-10)

Equipment
Condition (Cont)
Boom light cable disconnected from junction box (para 5-4)

General Safety Instructions
To prevent personal injury, make sure batteries are disconnected before working on electrical components.

a. Removal

NOTE

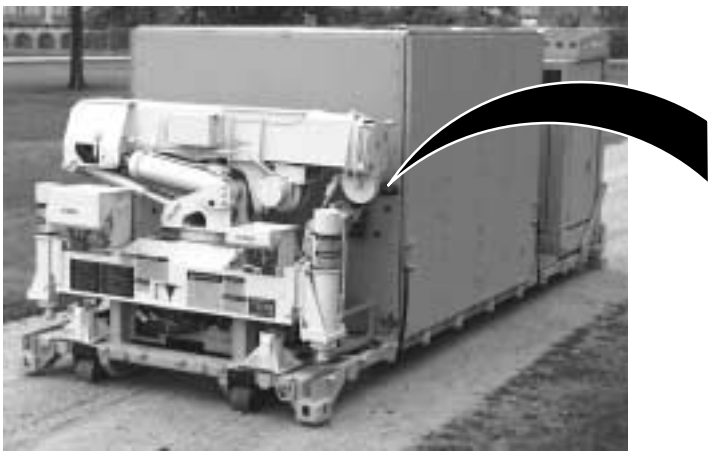
- Cut cable ties as required.
- Remove cushion clamps as required.
- Tag and mark all wires prior to removal.

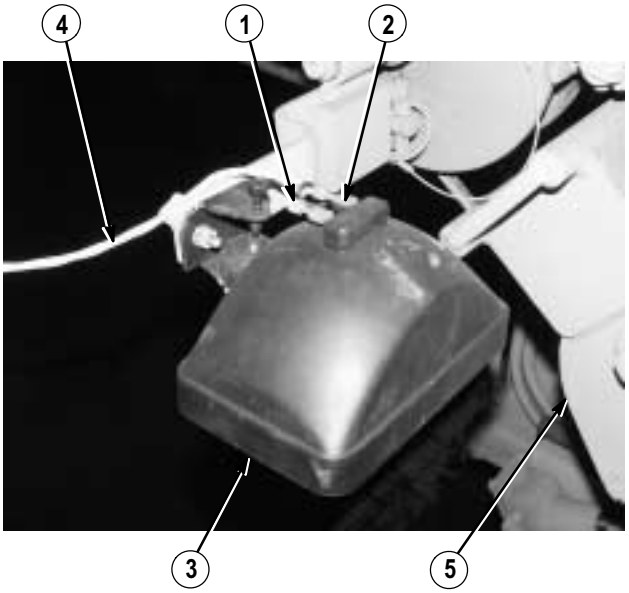
(1) Disconnect black wire (1) and white wire (2) from boom light (3).

NOTE

Note routing of cable prior to removal.

(2) Remove boom light cable (4) from crane (5).





5-13. BOOM LIGHT CABLE REPLACEMENT (Continued)

b. Installation

NOTE

Install cable ties and cushion clamps as required.

(1) Position boom light cable (4) on crane (5).

(2) Connect black wire (1) and white wire (2) to boom light (3).

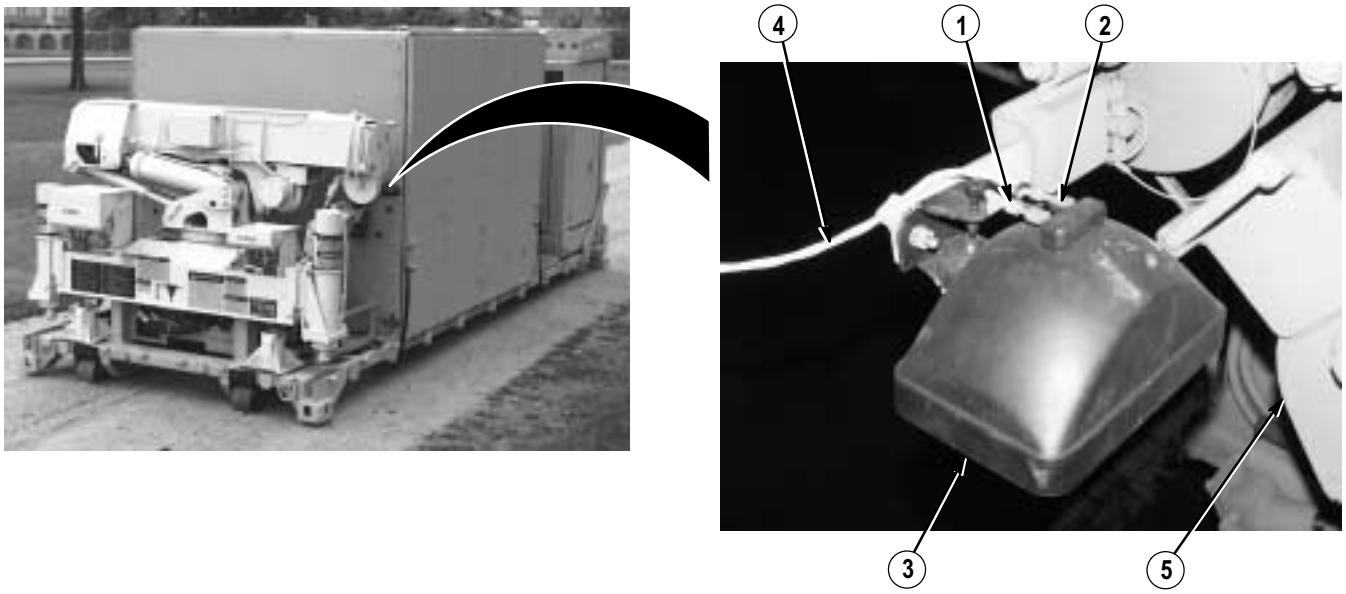
Follow-On Maintenance

Connect batteries (TM 9-4940-568-10)

Connect boom light cable to junction box (para 5-4)

Check boom light for proper operation (TM 9-4940-568-10)

END OF TASK



5-14. BOOM LIGHT RESISTOR REPLACEMENT

THIS TASK COVERS:
a. Removal
b. Installation

INITIAL SETUP

Tools
Tool Kit, General Mechanic's
(Item 30, Appendix G)

Equipment
Condition
FRS unloaded (TM 9-4940-568-10)

Equipment
Condition (Cont)
Batteries disconnected
(TM 9-4940-568-10)

Boom light resistor cable disconnected from junction box (para 5-4).

General Safety Instructions
To prevent personal injury, make sure batteries are disconnected before working on electrical components.

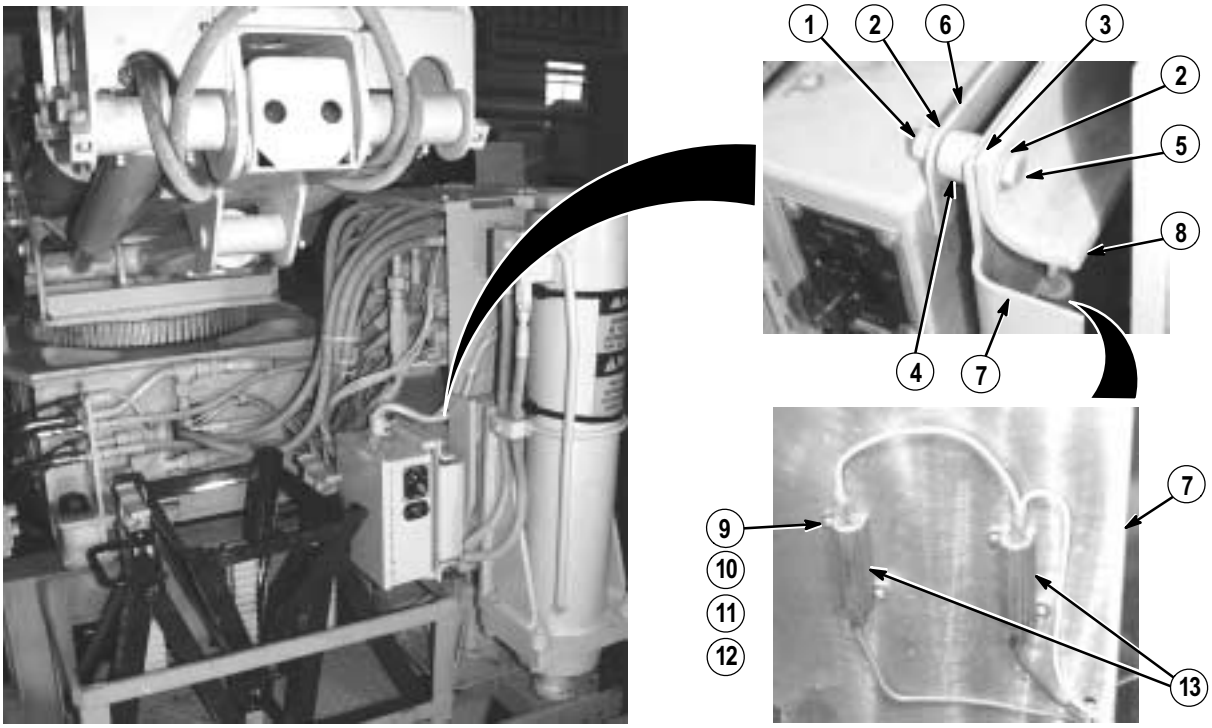
a. Removal

NOTE

Tag and mark all wires prior to removal.

(1) Remove four nuts (1), eight washers (2), star washers (3), four bushings (4), screws (5), junction box (6) and resistor mount plate (7) from junction box mount bracket (8).

(2) Remove four nuts (9), lockwashers (10), washers (11), screws (12) and two resistors (13) from resistor mount plate (7).



5-14. BOOM LIGHT RESISTOR REPLACEMENT (Continued)

b. Installation

(1) Install two resistors (13) on resistor mount plate (7) using four screws (12), washers (11), lockwashers (10) and nuts (9).

(2) Install resistor mount plate (7) and junction box (6) on junction box mount bracket (8) using four screws (5), bushings (4), eight star washers (3), washers (2) and nuts (1).

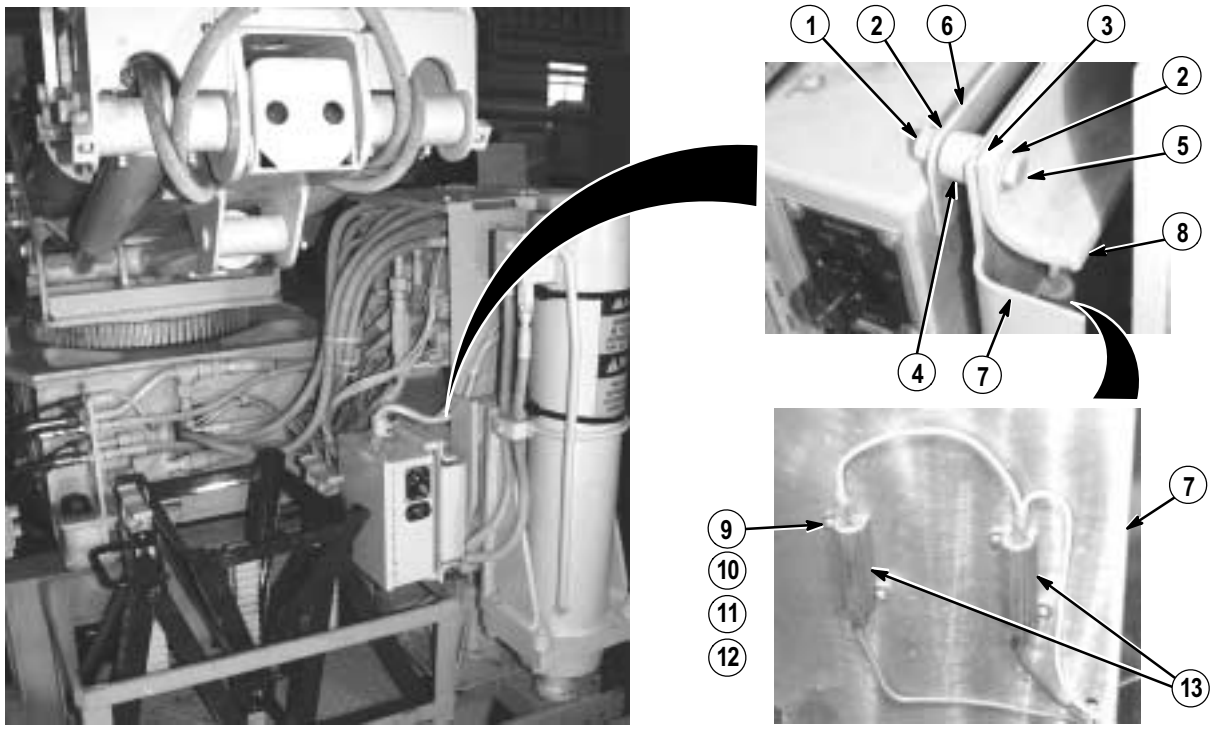
Follow-On Maintenance

Connect batteries (TM 9-4940-568-10)

Connect boom light resistor cable to junction box (para 5-4)

Check operation of boom light (TM 9-4940-568-10)

END OF TASK



5-15. BOOM LIGHT REPLACEMENT

THIS TASK COVERS:
a. Removal
b. Installation

INITIAL SETUP

Tools
Tool Kit, General Mechanic's
(Item 30, Appendix G)

Equipment
Condition
FRS unloaded (TM 9-4940-568-10)

Batteries disconnected
(TM 9-4940-568-10)

General Safety Instructions
To prevent personal injury, make sure batteries are disconnected before working on electrical components.

a. Removal

NOTE

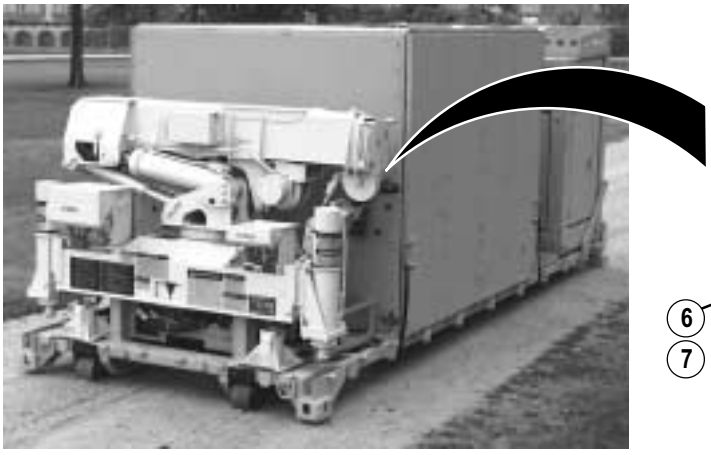
- Tag and mark all wires prior to removal.

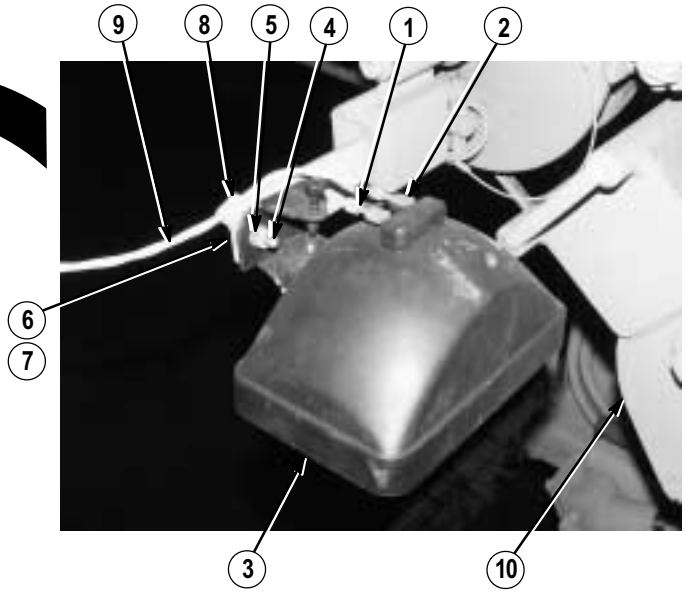
(1) Disconnect black wire (1) and white wire (2) from boom light (3).

NOTE

- Note routing of cable prior to removal.
- Note position of cushion clamp prior to removal.

(2) Remove two nuts (4), lockwashers (5), screws (6), washers (7), one cushion clamp (8), boom light cable (9) and boom light (3) from crane (10).





5-15. BOOM LIGHT REPLACEMENT (Continued)

b. Installation

NOTE

- Install boom light cable as noted prior to removal.
- Install cushion clamp as noted prior to removal.

(1) Position boom light cable (9) in cushion clamp (8).

(2) Position boom light (3) on crane (10) and install boom light cable (9), cushion clamp (8), two washers (7), screws (6), lockwashers (5) and nuts (4).

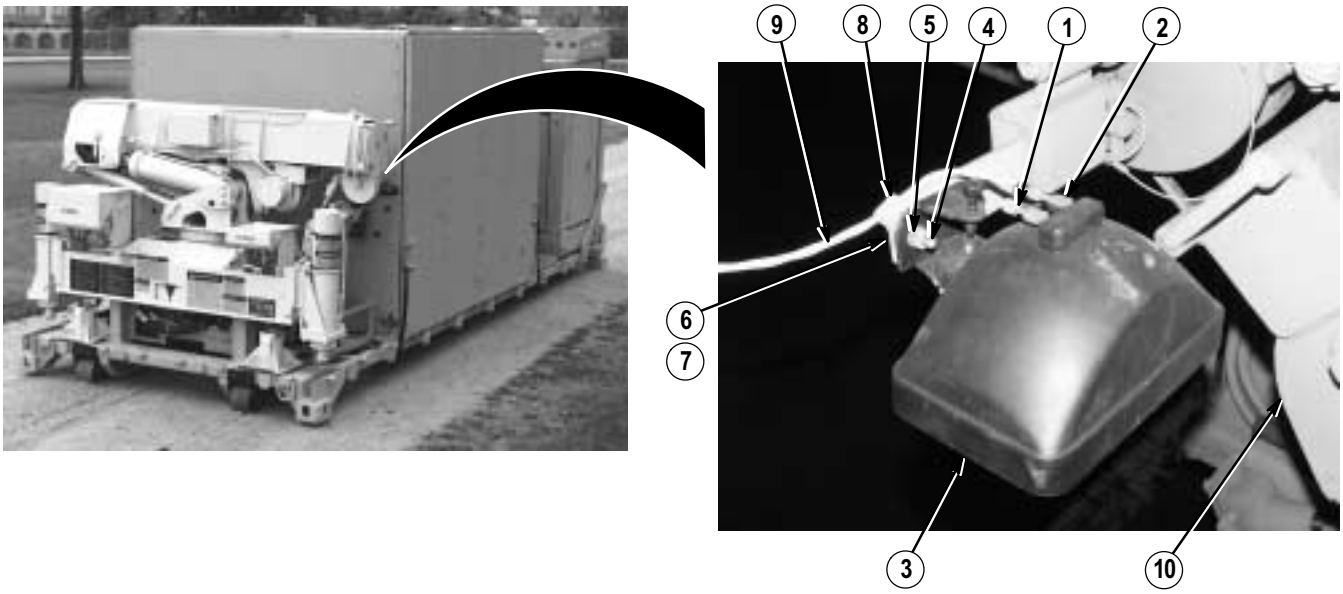
(3) Connect black wire (1) and white wire (2) to boom light (3).

Follow-On Maintenance

Connect batteries (TM 9-4940-568-10)

Check boom light for proper operation (TM 9-4940-568-10)

END OF TASK



5-16. BOOM LIGHT REEL AND GUIDE REPLACEMENT

THIS TASK COVERS:
a. Removal
b. Installation

INITIAL SETUP

Tools
Tool Kit, General Mechanic's
(Item 30, Appendix G)

Equipment
Condition
FRS unloaded (TM 9-4940-568-10)

Batteries disconnected (TM 9-4940-568-10)

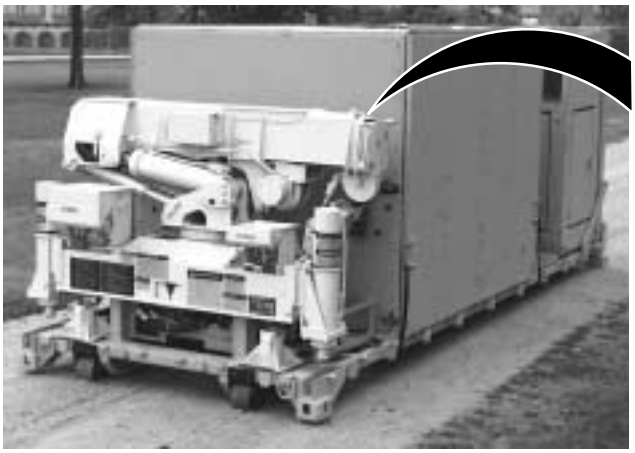
General Safety Instructions
To prevent personal injury, make sure batteries are disconnected before working on electrical components.

a. Removal

NOTE

Tag and mark all wires prior to removal.

(1) Disconnect boom light cable (1) from boom light reel cable (2).

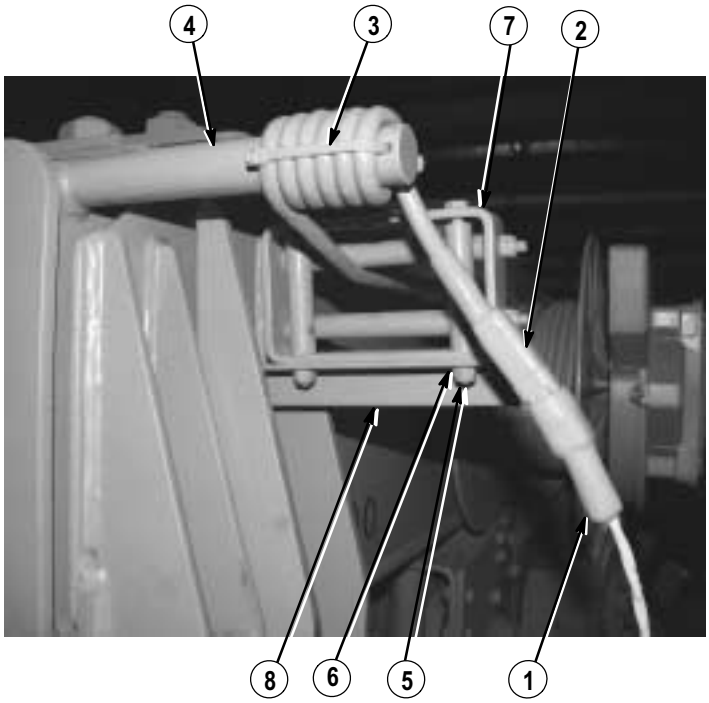


NOTE

Note position of boom light reel cable and cable ties prior to removal.

(2) Remove two cable ties (3) and unwrap boom light reel cable (2) from boom fly mount (4).

(3) Remove two nuts (5), washers (6) and guide (7) from boom (8).



5-15. BOOM LIGHT REEL AND GUIDE REPLACEMENT (Continued)

(4) Disconnect boom light reel cable (9) from boom light power cable (10).

(5) Remove nut (11), washer (12), clamp (13) and boom light reel cable (9) from boom (8).

(6) Remove four nuts (14), washers (15), bolts (16) and boom light reel assembly (17) from boom (8).

b. Installation

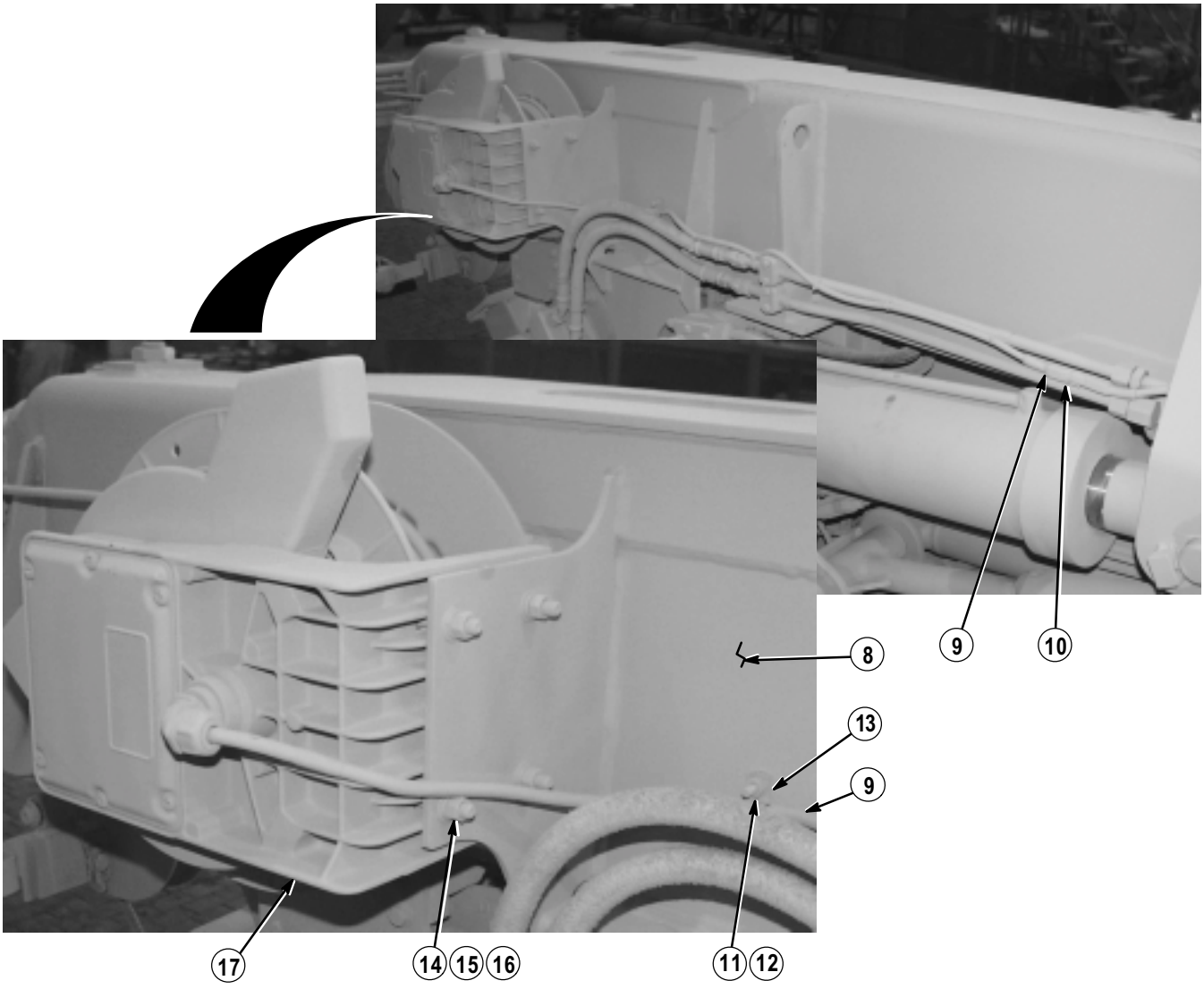
NOTE

Install cable ties as necessary.

(1) Install boom light reel assembly (17) on boom (8) using four bolts (16), washers (15) and nuts (14).

(2) Connect boom light power cable (10) to boom light reel cable (9).

(3) Install boom light reel cable (9) and clamp (13) on boom (8) using washer (12) and nut (11).



(4) To pretension cable reel, perform the following steps:

(a) Wrap all boom light reel cable (2) onto drum (18) of boom light reel assembly (17).

(b) Pull boom light reel cable (2) out one full rotation of drum (18) and secure drum.

(c) Wrap the boom light reel cable (2) that was pulled out back onto the drum (18). This sets the pretension one turn.

(d) Repeat steps b and c to place a total of 12 pretension turns on boom light reel assembly (17).

(e) Pull cable out completely to ensure enough spring revolutions remain for operating.

NOTE

Install boom light reel cable and cable ties as noted during removal.

(5) Install guide (7) on boom (8) using two washers (6) and nuts (5).

(6) Wrap boom light reel cable (2) in a clockwise direction (five times) on the boom fly mount (4) and secure with two cable ties (3).

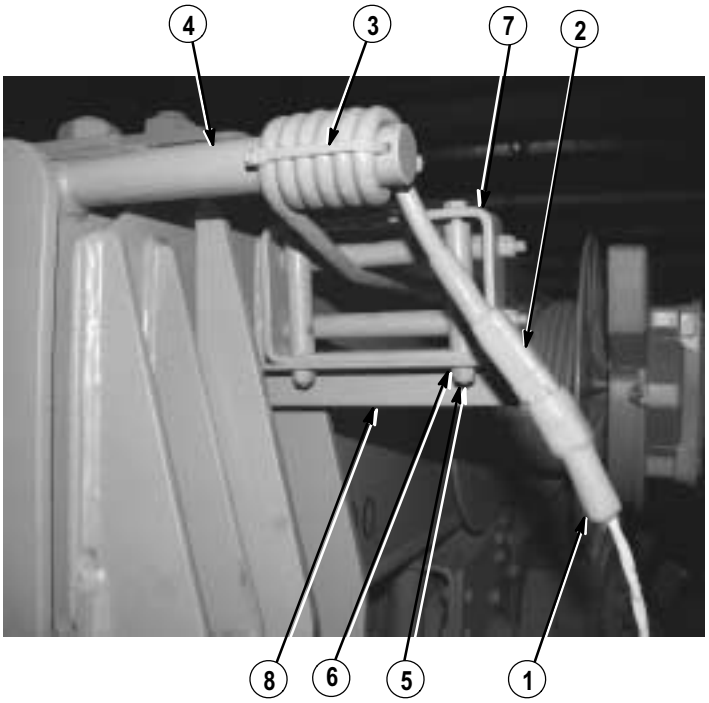
(7) Connect boom light reel cable (2) to boom light cable (1).

NOTE

Follow-On Maintenance

Check for proper boom light reel and boom light operation (TM 9-4940-568-10)

END OF TASK



5-17. CRANE REMOTE CONTROL STORAGE BOX REPLACEMENT.

This task covers:

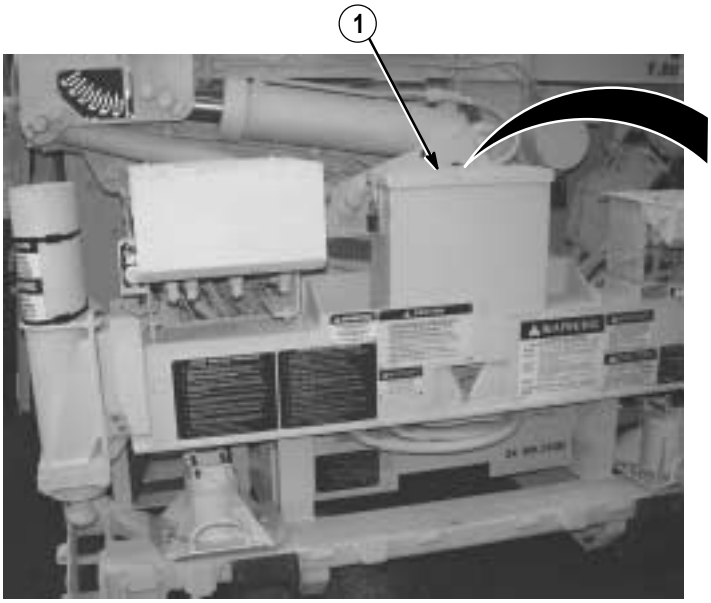
a. Removal b. Installation c. Follow-On Maintenance

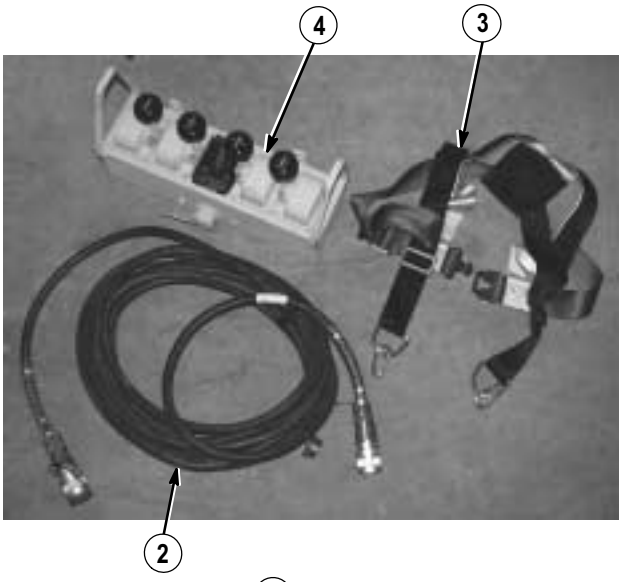
INITIAL SETUP

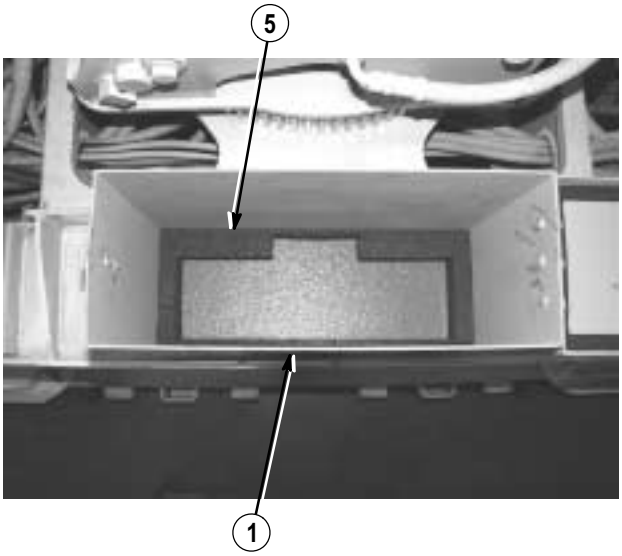
Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 30, Appendix G)

Equipment Condition
FRS unloaded, (TM 9-4940-568-10)

a. Removal.







(1) Open crane remote control stowage box (1).

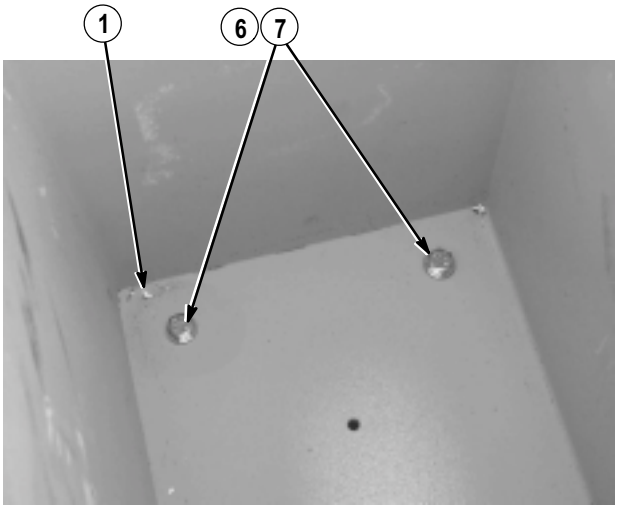
(2) Remove cable (2), remote control strap (3) and crane remote control (4) from crane remote control stowage box (1).

(3) Remove padding (5) from crane remote control stowage box (1).

NOTE

Note position of crane remote control stowage box prior to removal.

(4) Remove four screws (6), washers (7) and crane remote control stowage box (1) from crane.

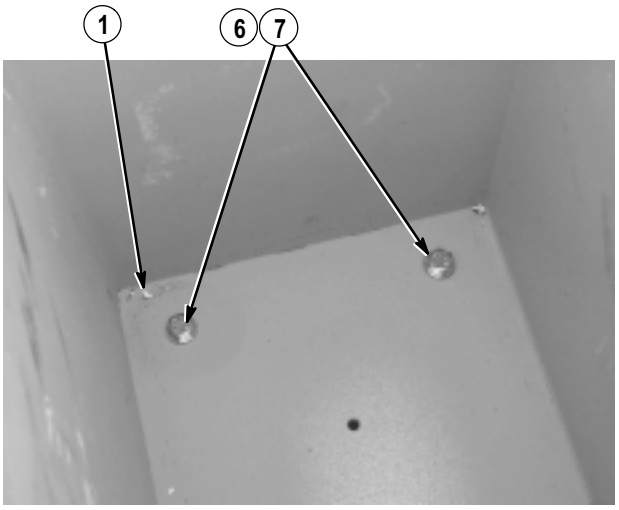


b. Installation.

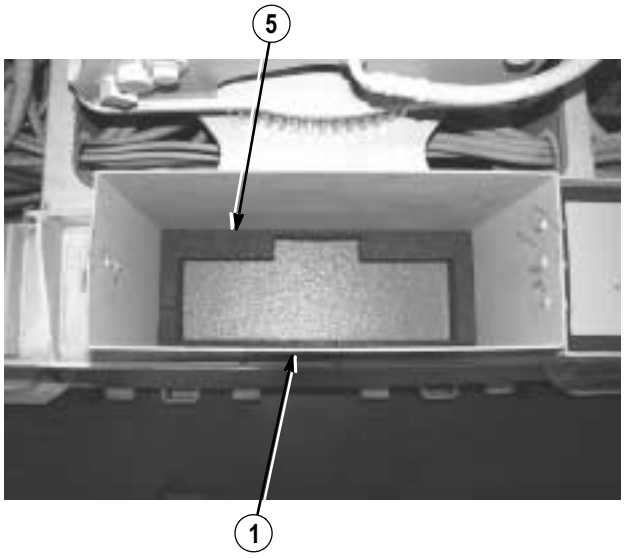
NOTE

Position crane remote control stowage box as noted during removal.

(1) Install crane remote control stowage box (1), four washers (7) and screws (6) on crane.

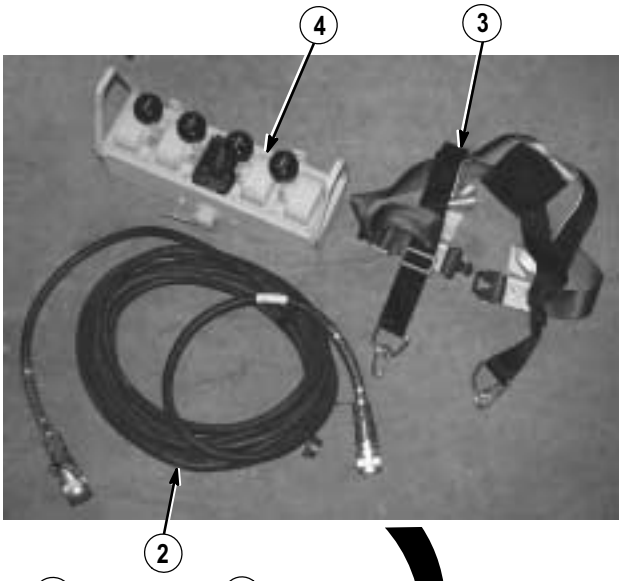


(2) Install padding (5) in crane remote control stowage box (1).

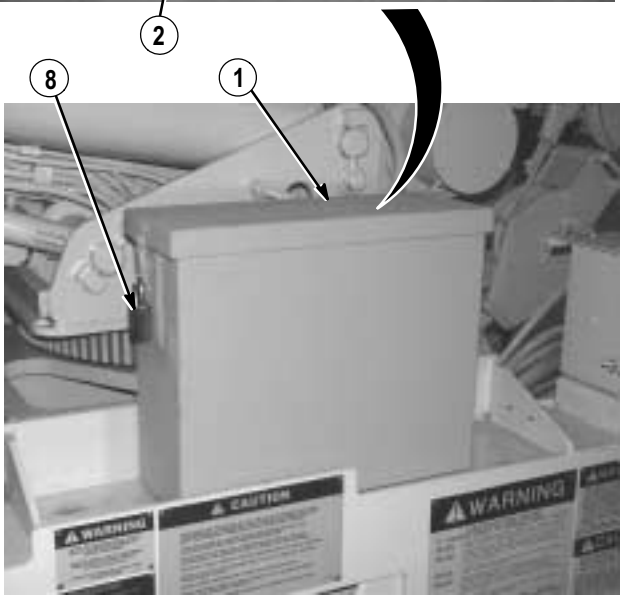


5-17. CRANE REMOTE CONTROL STORAGE BOX REPLACEMENT (CONT).

(3) Position crane remote control (4), remote control strap (3) and cable (2) in crane remote control stowage box (1).



(4) Close crane remote control stowage box (1) and install lock (8).



c. Follow-On Maintenance:

- Connect batteries, (TM 9-4940-568-10).

END OF TASK

CHAPTER 6

SHELTER ACCESSORY ITEMS MAINTENANCE

6-1. INTRODUCTION.

This chapter contains maintenance instructions for removing, replacing, repairing, installing and adjusting shelter accesory items authorized by the Maintenance Allocation Chart (MAC) at the Unit Maintenance level.

6-2. HEATER ASSEMBLY AND HEATER VENT REPAIR.

This task covers:

a. Removal
b. Disassembly
c. Assembly
d. Installation
e. Follow-On Maintenance

INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 30, Appendix G)
Pan, Drain (Item 20, Appendix G)

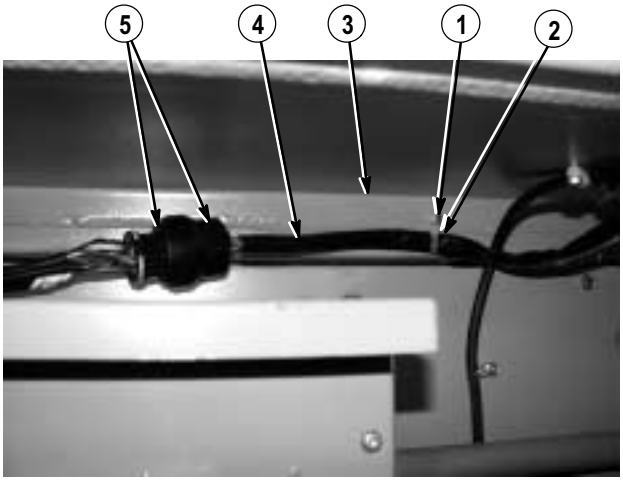
Materials/Parts
Cable Ties (Item 10, Appendix C)
Tags, Identification (Item 40, Appendix C)
Gasket (Item 6, Appendix F)
Gasket (Item 5, Appendix F)
Retaining Ring (Item 94, Appendix F)

Materials/Parts - Continued
Lockwasher (8) (Item 77, Appendix F)
Screw, Self-Tapping (A/R) (Item 100, Appendix F)

Personnel Required
Two

Equipment Condition
FRS unloaded, (TM 9-4940-568-10)
Batteries disconnected, (TM 9-4940-568-10)

a. Removal.



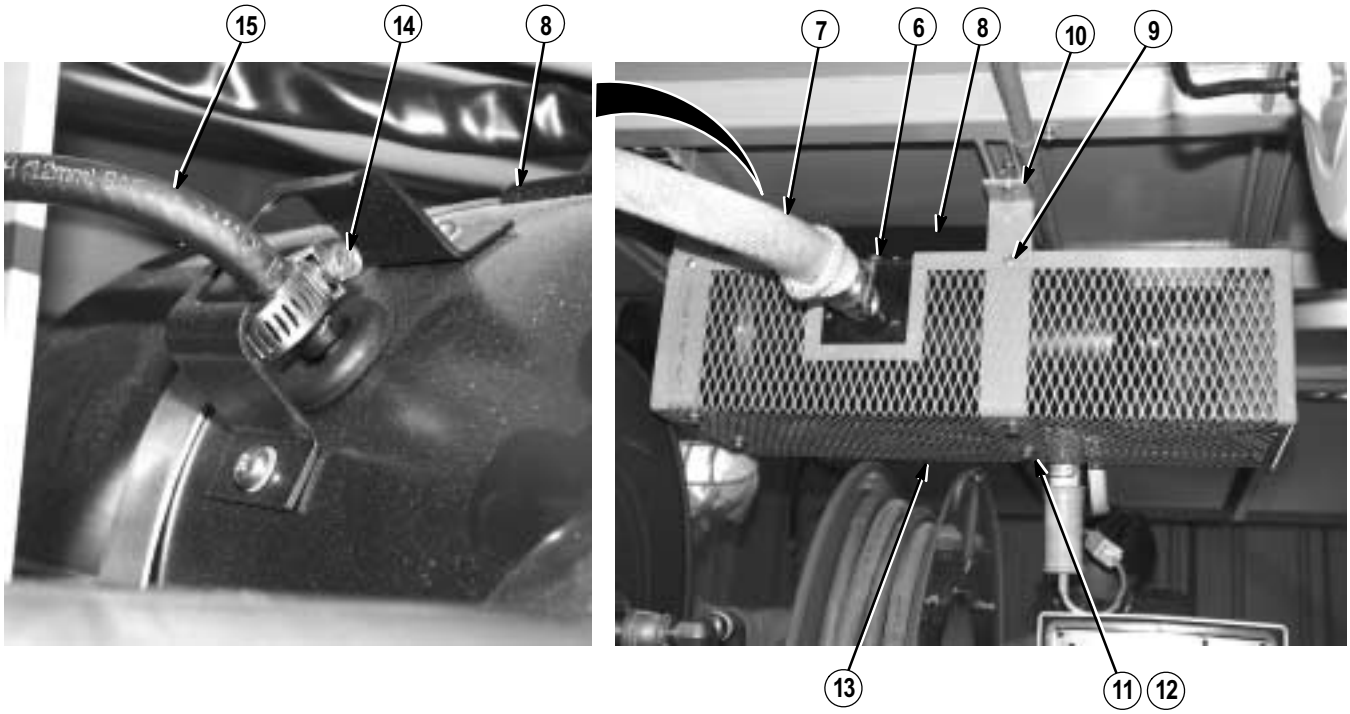
WARNING

Heater assembly may be hot. Ensure heater assembly is cool before performing this task or injury to personnel may result.

NOTE

- Tag and mark all hoses and connectors prior to removal.
- Remove cable ties as required to remove wires and fuel hoses.
- Place drain pan under fuel hose as necessary.

(1) Remove two self-tapping screws (1) and clamps (2) from shelter (3) and power line (4). Discard self-tapping screws.
(2) Disconnect connector (5).



(3) Loosen exhaust tube clamp (6) on exhaust tube (7).

(4) Remove exhaust tube (7) from heater (8).

(5) Remove four self-tapping screws (9) from heater mounting brackets (10). Discard self-tapping screws.

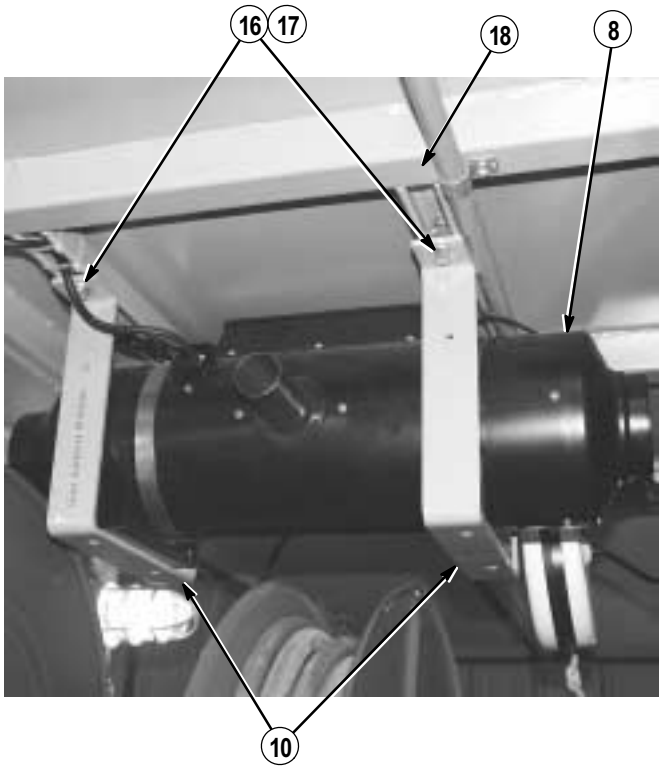
(6) Remove four screws (11), washers (12) and cage vent (13) from heater mounting brackets (10).

(7) Loosen fuel line clamp (14) on fuel line (15).

(8) Remove fuel line (15) from heater (10).

6-2. HEATER ASSEMBLY AND HEATER VENT REPAIR (CONT).

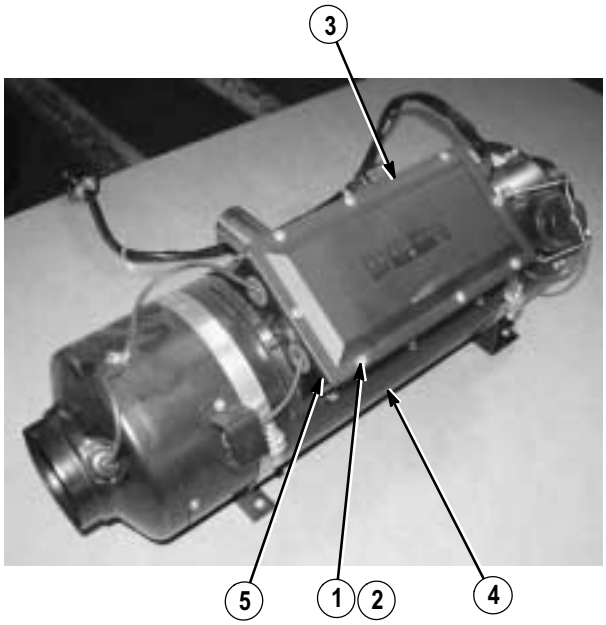
(9) With the aid of an assistant, remove four screws (16), washers (17), two hanging brackets (10) and heater (8) from shelter (18).



b. Disassembly.

(1) Remove eight screws (1), washers (2) and cover (3) from outer casing (4).

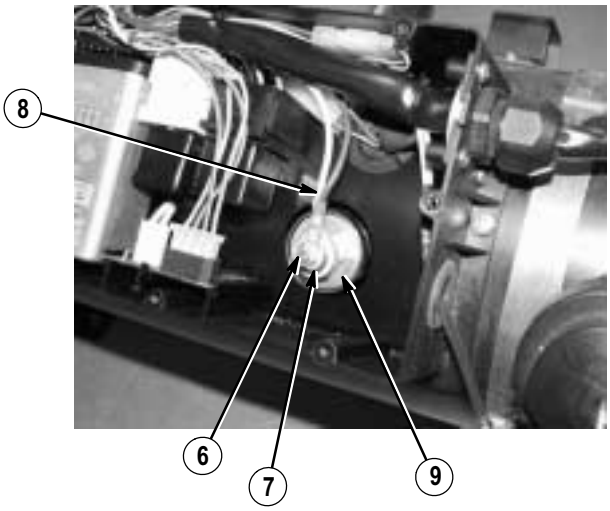
(2) Remove gasket (5) from cover (3). Discard gasket.



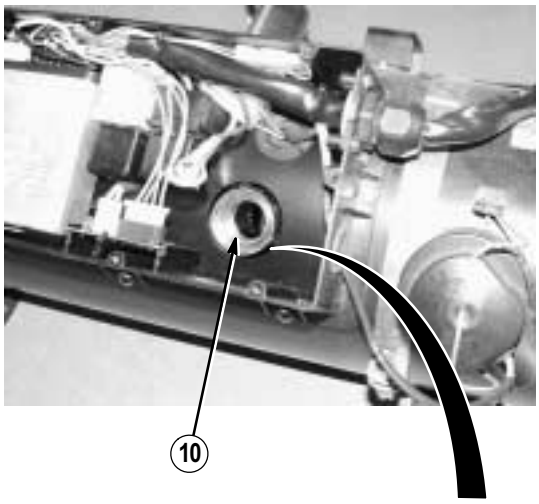
NOTE

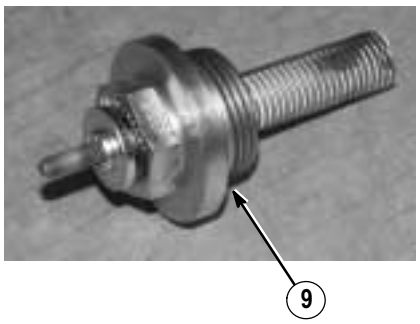
Tag and mark all wires prior to removal.

(3) Remove nut (6), washer (7), and wire terminal assembly (8) from glow plug (9).



(4) Remove glow plug (9) from heat exchanger (10).





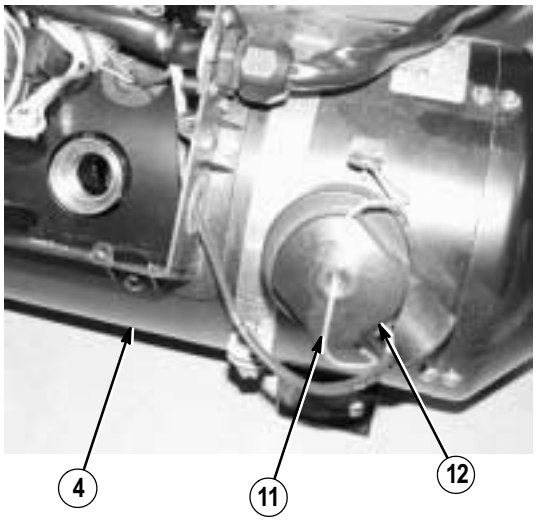
6-2. HEATER ASSEMBLY AND HEATER VENT REPAIR (CONT).

WARNING

Use care when removing or installing retaining rings. Retaining rings are under spring tension and can act as projectiles when released and could cause eye injury.

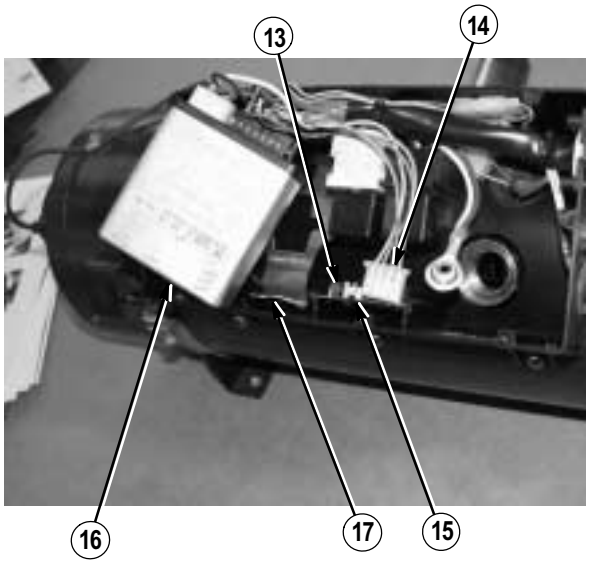
(5) Remove retaining clip (11) from solenoid (12).

(6) Remove solenoid (12) from outer casing (4).

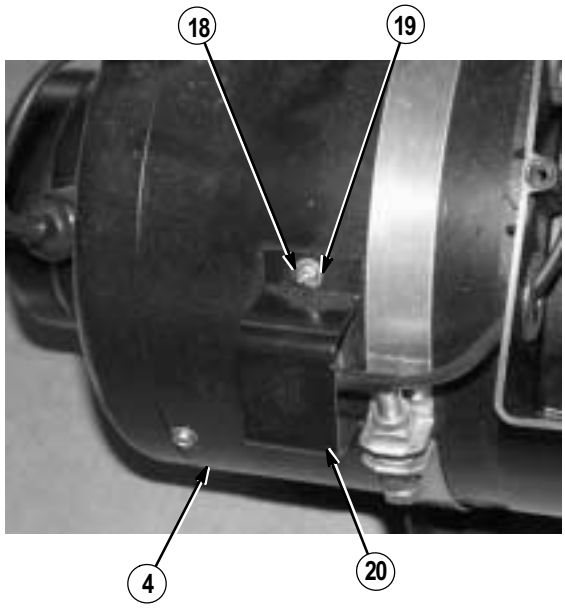


(7) Remove terminals (13) and (14) from circuit board (15).

(8) Remove control valve (16) from valve mounting bracket (17).

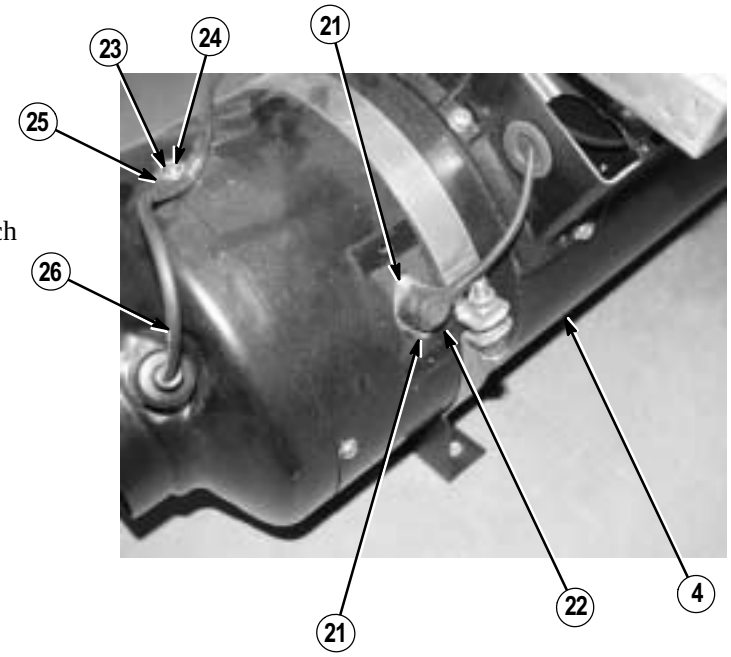


(9) Remove two screws (18), washers (19), and guard (20) from outer casing (4).



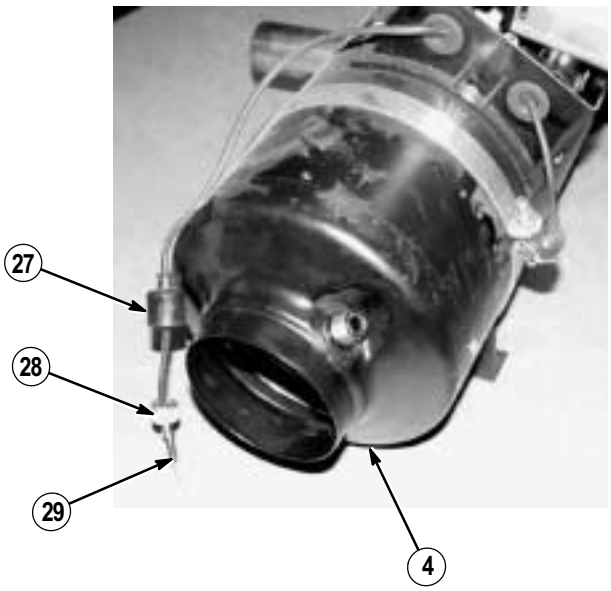
(10) Remove two screws (21) and thermal cutout switch (22) from outer casing (4).

(11) Remove screw (23), lockwasher (24), clamp (25) and temperature limiter switch wire (26) from outer casing (4).



6-2. HEATER ASSEMBLY AND HEATER VENT REPAIR (CONT).

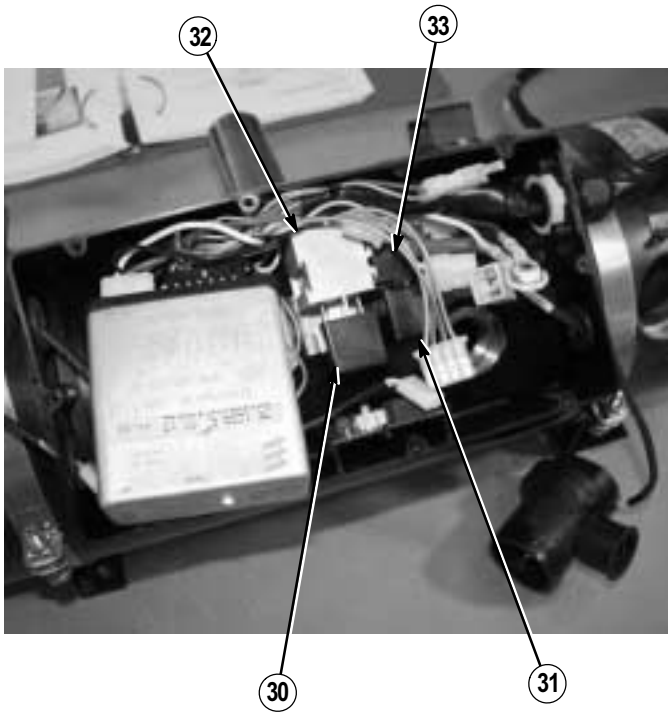
(12) Lift rubber boot (27), unscrew retaining nut (28), and remove temperature limiter (29) from outer casing (4).

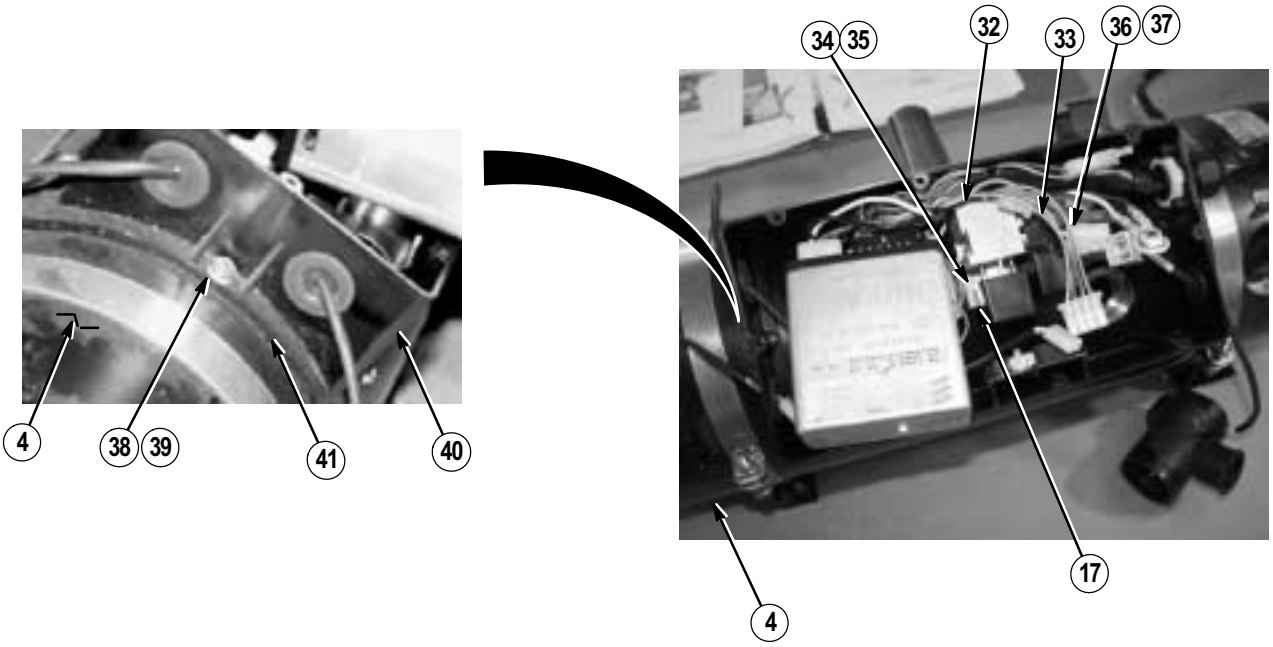


NOTE

Tag and mark solenoids and solenoid connectors prior to removal.

(13) Remove solenoids (30) and (31) from solenoid connectors (32) and (33).





NOTE

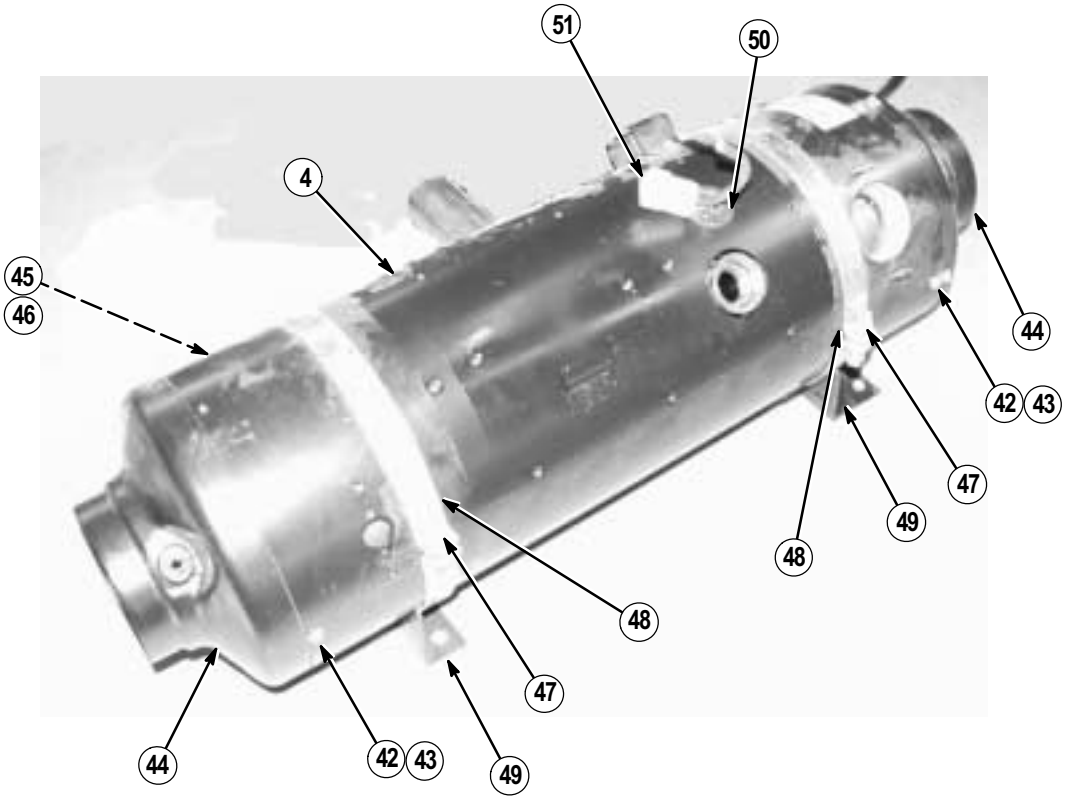
Tag and mark solenoid connectors prior to removal.

(14) Remove screw (34), washer (35), solenoid connector (32) and valve mounting bracket (17) from outer casing (4).

(15) Remove screw (36), washer (37) and solenoid connector (33) from outer casing (4).

(16) Remove eight screws (38), washers (39), housing (40), and gasket (41) from outer casing (4). Discard gasket.

6-2. HEATER ASSEMBLY AND HEATER VENT REPAIR (CONT).

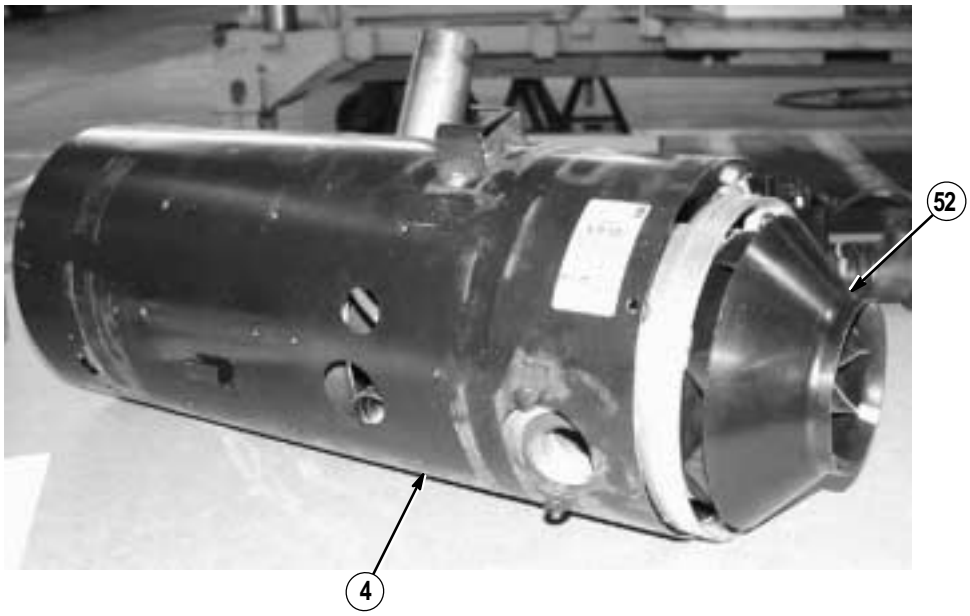


(17) Remove seven screws (42), lockwashers (43), and two end reducing caps (44) from outer casing (4). Discard lockwashers.

(18) Remove four screws (45) and four washers (46) from outer casing (4).

(19) Remove two screws (47), two straps (48) and two brackets (49) from outer casing (4).

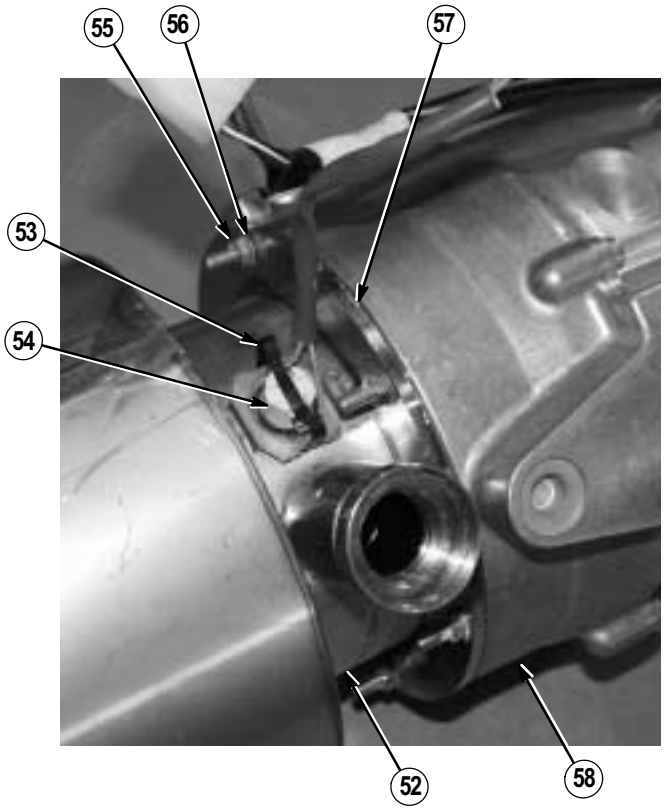
(20) Remove rubber grommet (50) from outer casing (4). Position two wires (51) to the inside of outer casing (4).



(21) Remove heat exchanger (52) with blower attached from outer casing (4).

(22) Remove retaining clip (53) and flame sensor (54) from heat exchanger (52).

(23) Remove six nuts (55), washers (56), gasket (57), and blower (58) from heat exchanger (52). Discard gasket.



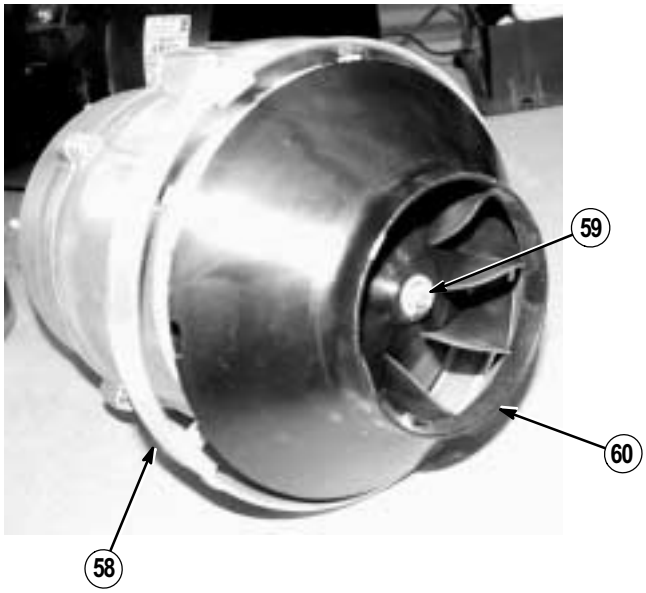
6-2. HEATER ASSEMBLY AND HEATER VENT REPAIR (CONT).

WARNING

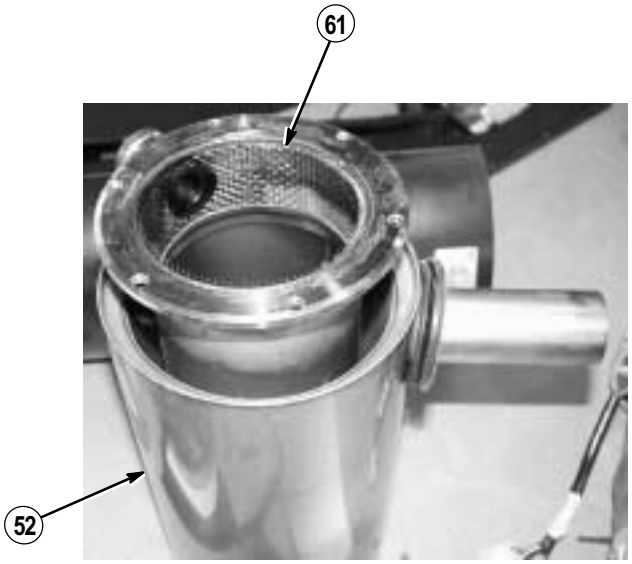
Use care when removing or installing retaining rings. Retaining rings are under spring tension and can act as projectiles when released and could cause eye injury.

(24) Remove retaining ring (59) from blower impeller (60). Discard retaining ring.

(25) Remove blower impeller (60) from blower (58).

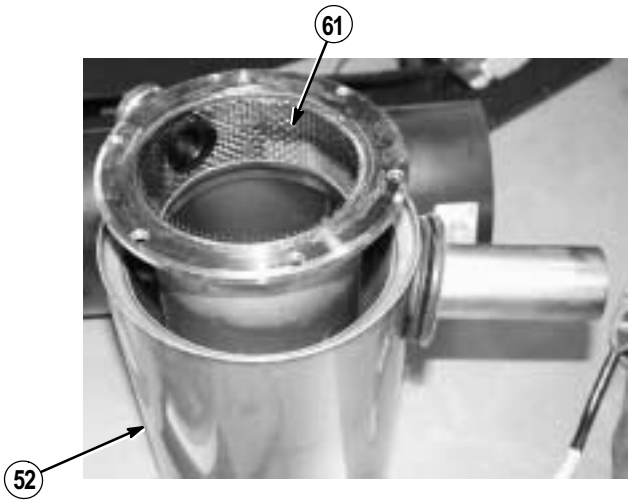


(26) Remove combustion chamber lining (61) from heat exchanger (52).



c. Assembly.

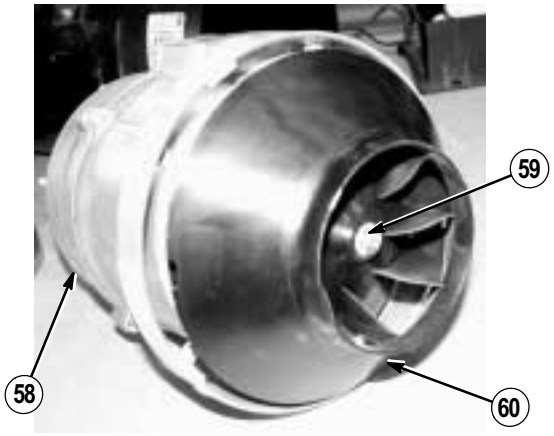
(1) Install combustion chamber lining (61) in heat exchanger (52).



WARNING

Use care when removing or installing retaining rings. Retaining rings are under spring tension and can act as projectiles when released and could cause eye injury.

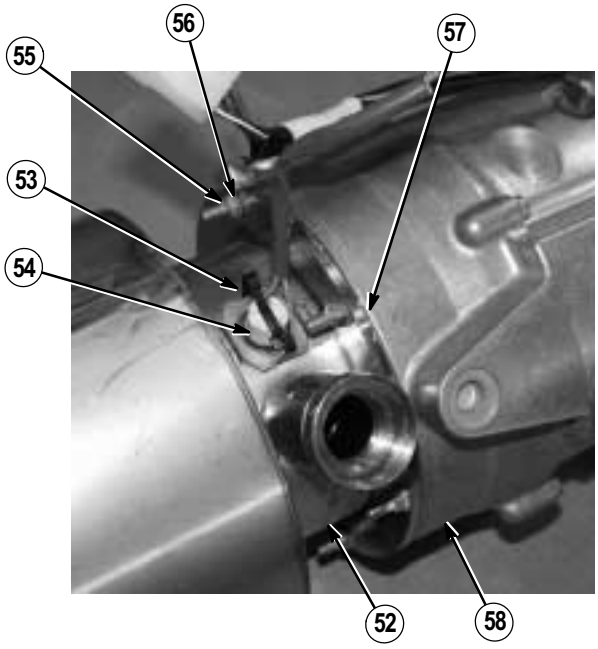
(2) Install blower impeller (60) on blower (58), and secure with retaining ring (59).



(3) Install gasket (57) on blower (58).

(4) Install blower (58) on heat exchanger (52) with six washers (56) and nuts (55).

(5) Install flame sensor (54) in heat exchanger (52) with retaining clip (53).



6-2. HEATER ASSEMBLY AND HEATER VENT REPLACEMENT (CONT).

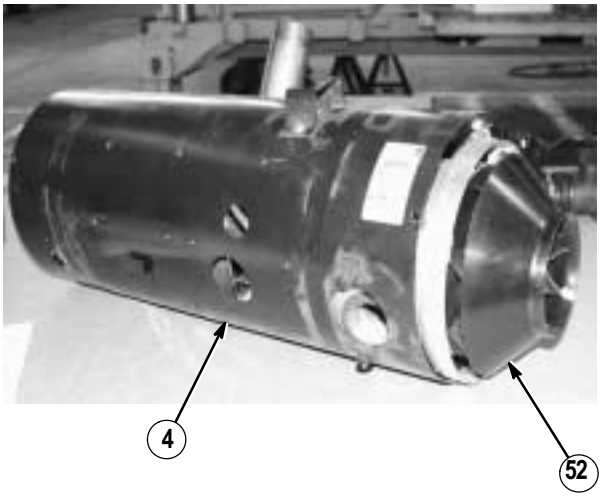
(6) Position two wires (51) to the outside of outer casing (4). Install rubber grommet (50) on outer casing (4).

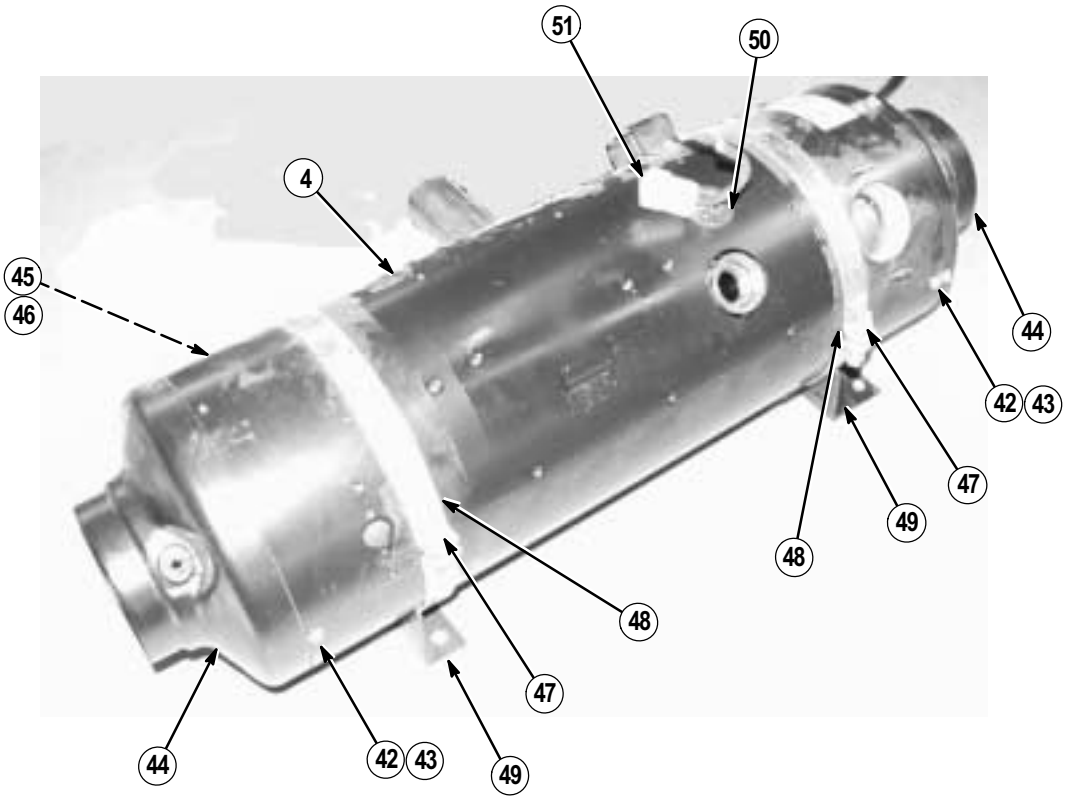
(7) Install assembled heat exchanger (52) in outer casing (4).

(8) Install two brackets (49) on outer casing (4) with four washers (46) and screws (45).

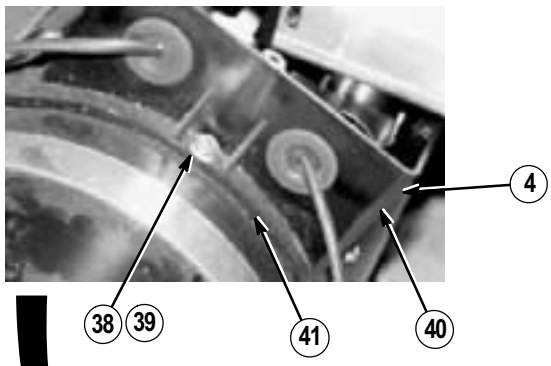
(9) Install two straps (48) on outer casing (4) with two screws (47).

(10) Install the two end reducing caps (44) on outer casing (4) with seven lockwashers (43) and screws (42).





(11) Install gasket (41) and housing (40) on outer casing (4) with eight washers (39) and screws (38).

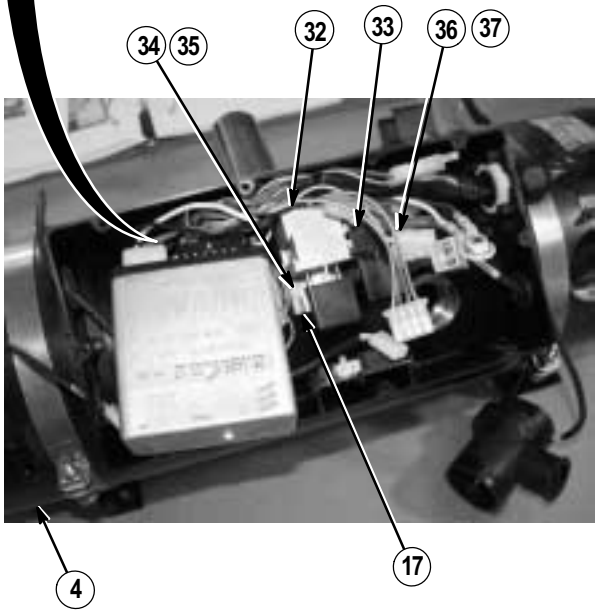


NOTE

Install solenoid connectors as noted prior to removal.

(12) Install solenoid connector (33) on outer casing (4) with washer (37) and screw (36).

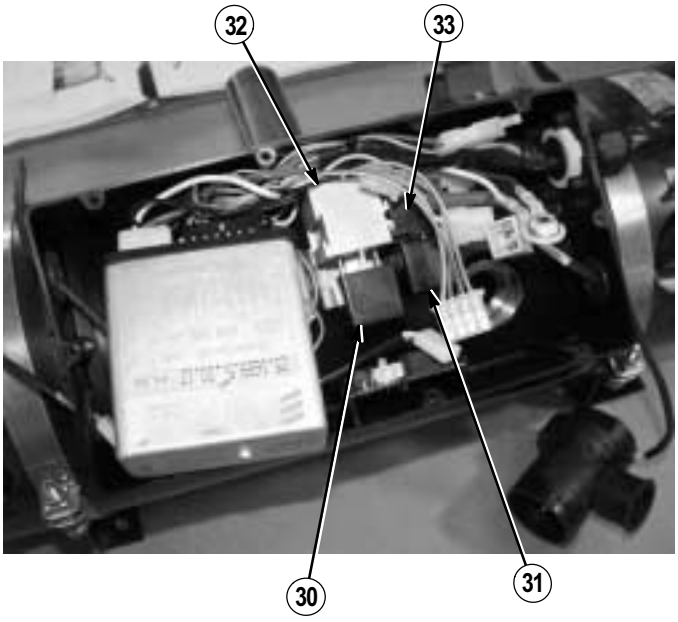
(13) Install valve mounting bracket (17) and solenoid connector (32) on outer casing (4) with washer (35) and screw (34).



NOTE

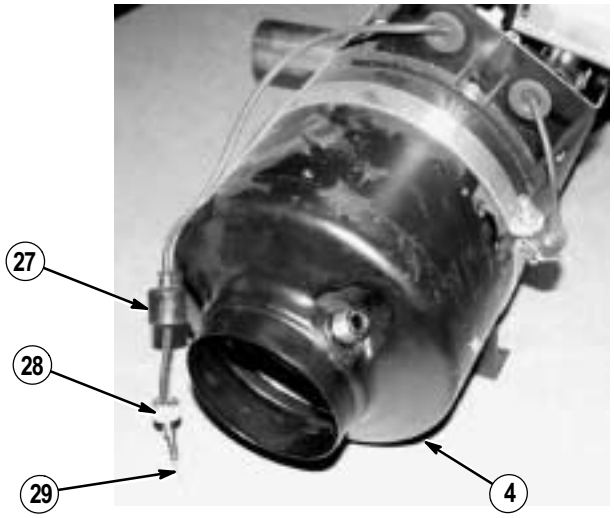
Install solenoids and solenoid connectors as noted prior to removal.

(14) Install solenoids (30) and (31) in solenoid connector (32) and (33).



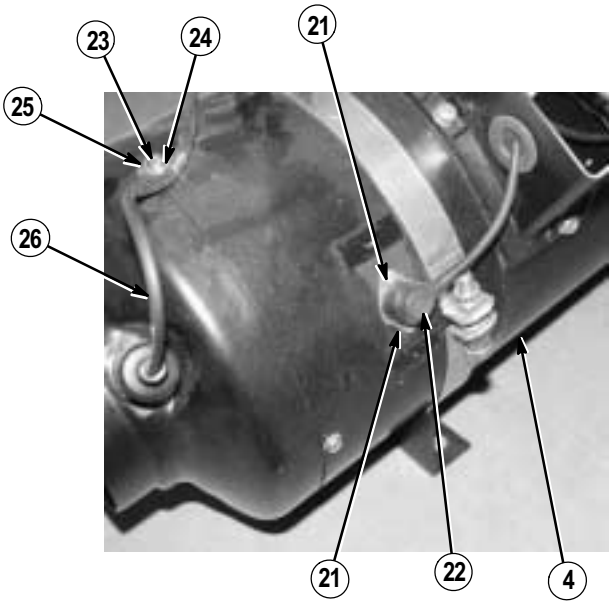
6-2. HEATER ASSEMBLY AND HEATER VENT REPAIR (CONT).

(15) Position temperature limiter (29) onto outer casing (4). Tighten retaining nut (28) and position rubber boot (27) over temperature limiter (29).

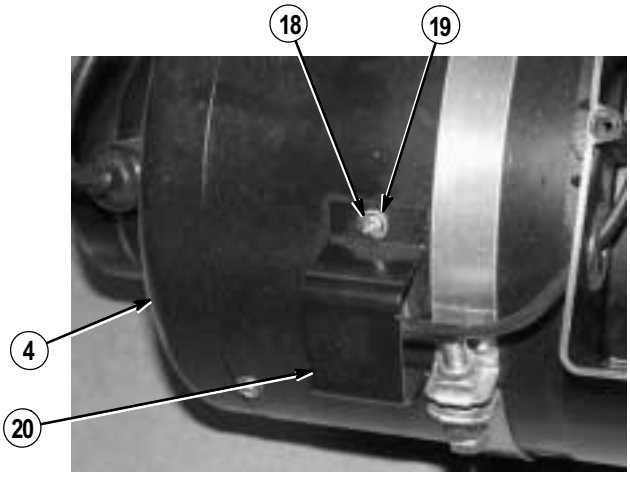


(16) Install temperature limiter switch wire (26) on outer casing (4) with clamp (25), lockwasher (24) and screw (23).

(17) Install thermal cutout switch (22) on outer casing (4) with two screws (21).

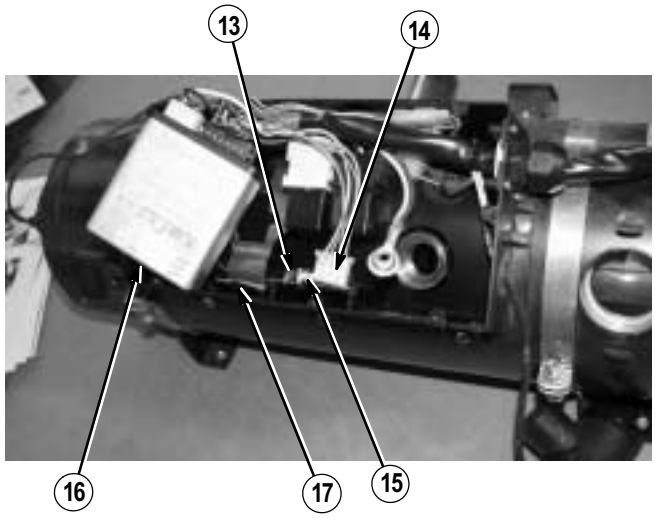


(18) Install guard (20) on outer casing (4) with two washers (19) and two screws (18).



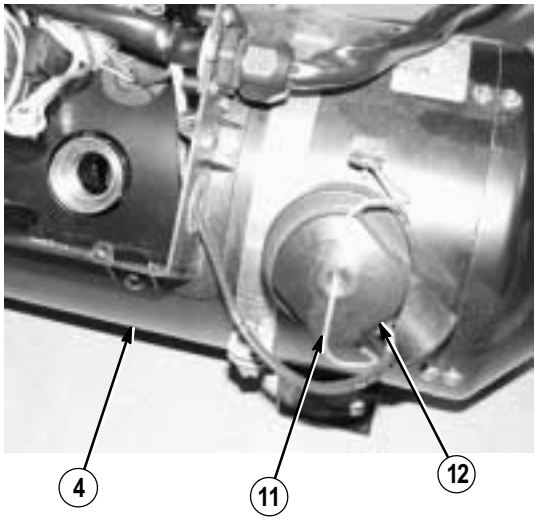
(19) Install control valve (16) on valve mounting bracket (17).

(20) Install terminals (14) and (13) on circuit board (15).



(21) Install solenoid (12) on outer casing (4) and secure with retaining clip (11).

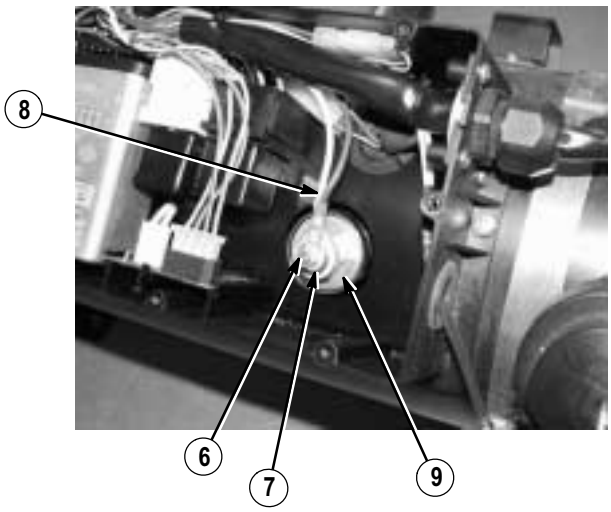
(22) Install glow plug (9) in heat exchanger (10).



NOTE

Install all wires as noted prior to removal.

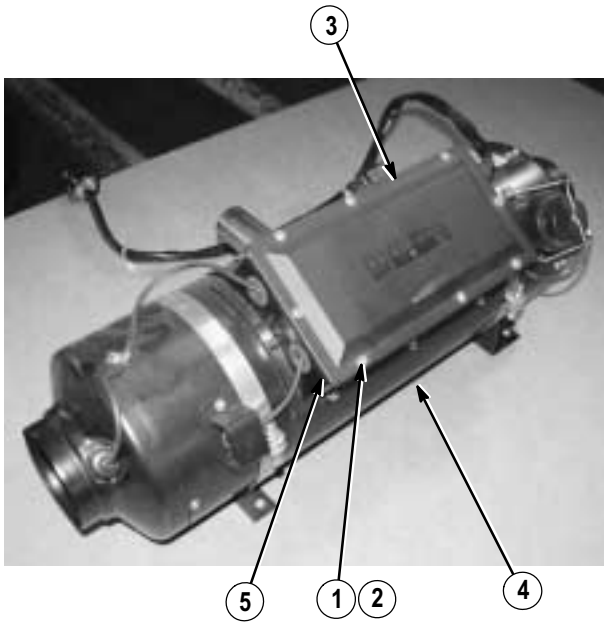
(23) Install wire terminal assembly (8) onto glow plug (9) with washer (7) and nut (6).



6-2. HEATER ASSEMBLY AND HEATER VENT REPAIR (CONT).

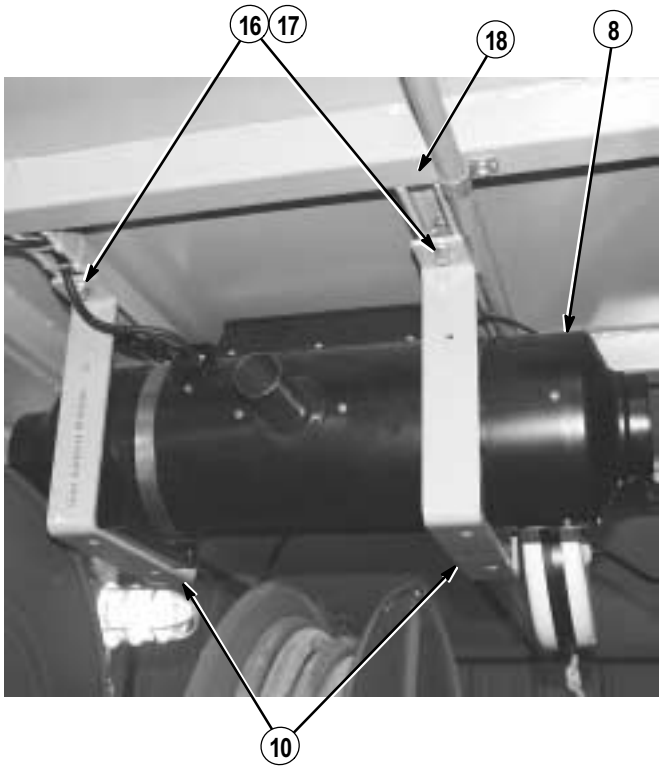
(24) Install gasket (5) on cover (3).

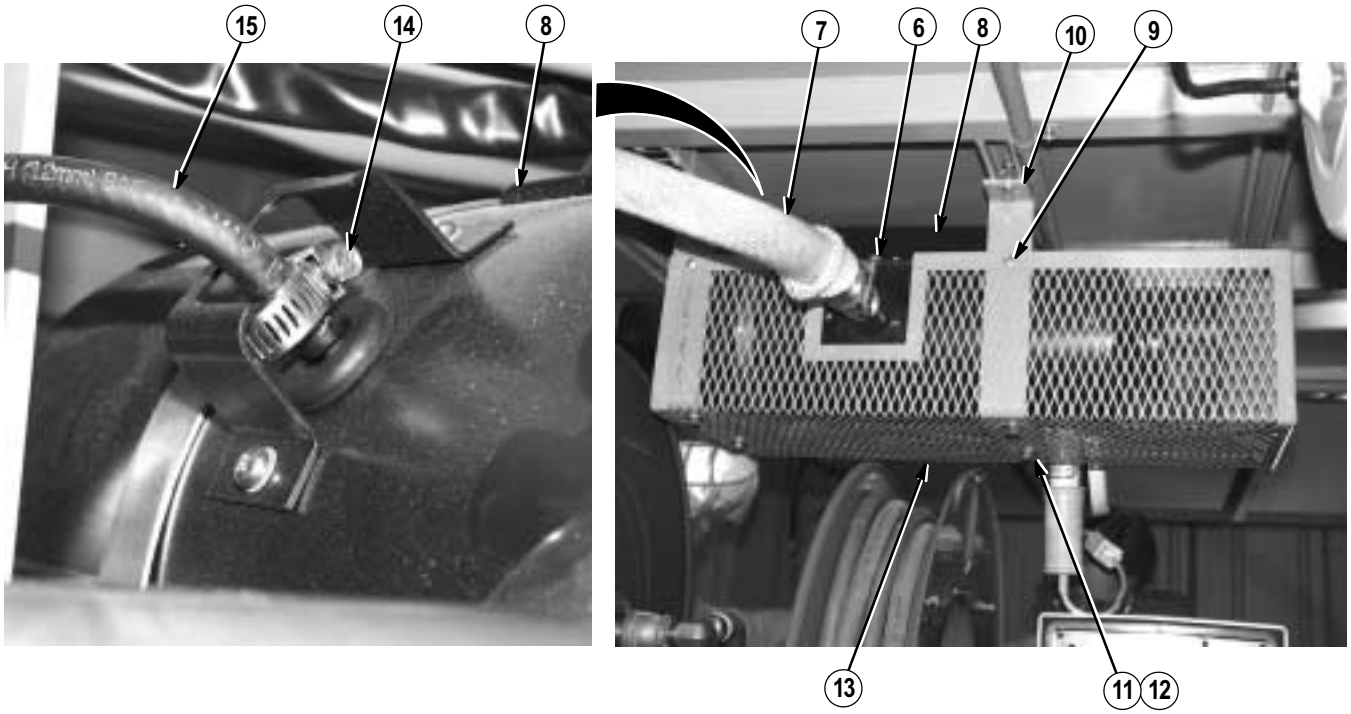
(25) Install cover (3) on outer casing (4) with eight washers (2) and screws (1).



d. Installation.

(1) With the aid of an assistant, install heater (8), two heater mounting brackets (10), four washers (17) and screws (16) on shelter (18).





(2) Install fuel line (15) on heater (8).

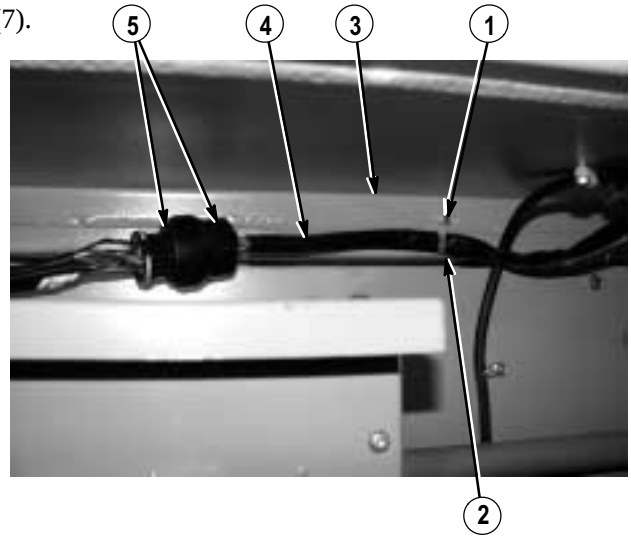
(3) Tighten fuel line clamp (14) on fuel line (15).

(4) Install cage vent (13), four washers (12) and screws (11) on heater mounting brackets (10).

(5) Install four self-tapping screws (9) on heater mounting brackets (10).

(6) Position exhaust tube (7) on heater (8).

(7) Tighten exhaust tube clamp (6) on exhaust tube (7).



(8) Connect connector parts (5).

(9) Install powerline (4) with two clamps (2) and self-tapping screws (1).

e. Follow-On Maintenance:

- Connect batteries, (TM 9-4940-568-10).
- Check operation of heater, (TM 9-4940-568-10).

END OF TASK

6-3. EYE WASH TANK AND BRACKET REPLACEMENT.

This task covers:

a. Removal b. Installation c. Follow-On Maintenance

INITIAL SETUP

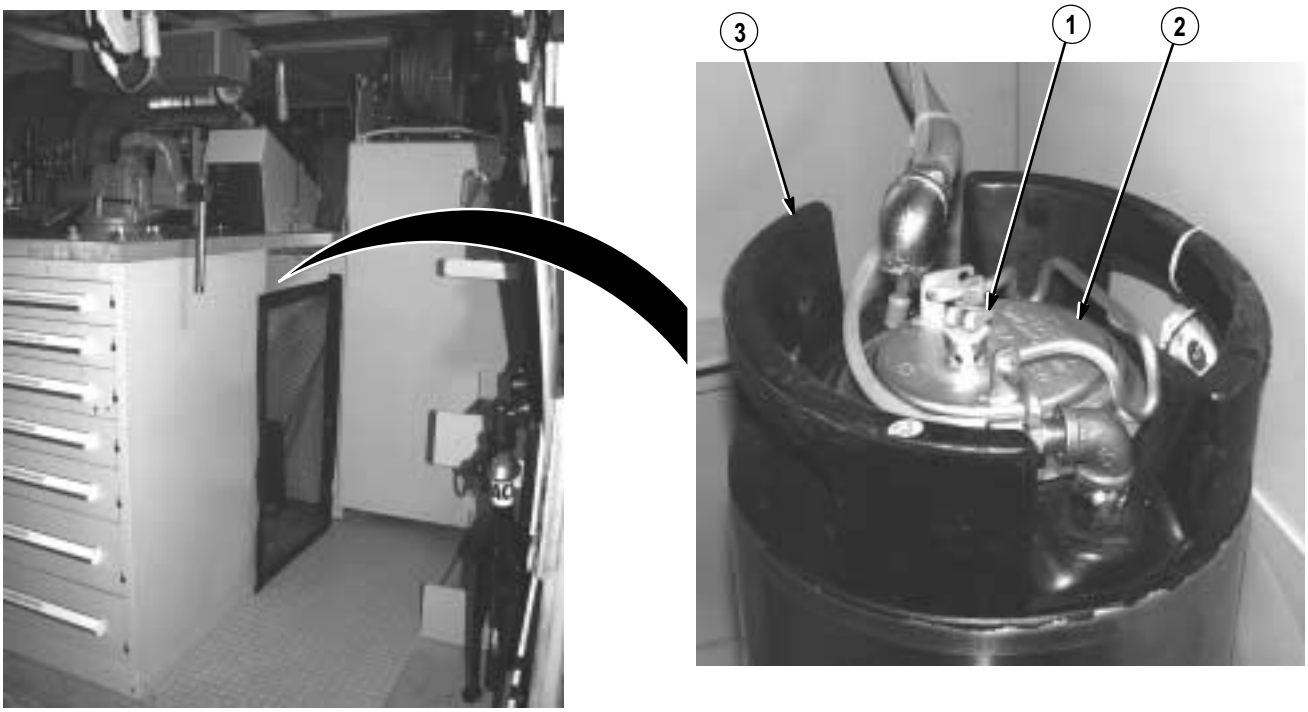
Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 30, Appendix G)

Materials/Parts
Cable Ties (Item 10, Appendix C)
Sealing Compound (Item 32, Appendix C)
Tags, Identification (Item 40, Appendix C)

Materials/Parts – Continued
Locknut (2) (Item 29, Appendix F)
Lockwasher (Item 74, Appendix F)

Equipment Condition
FRS unloaded, (TM 9-4940-568-10)

a. Removal.



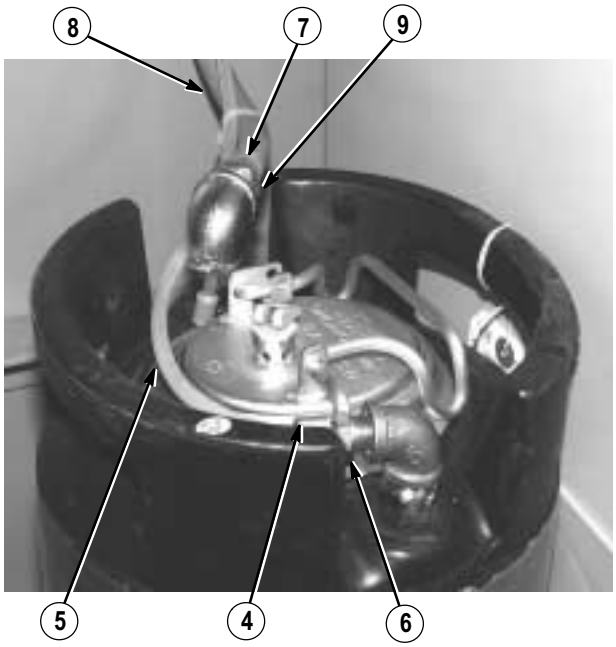
NOTE

- Remove items from stowage area behind cabinets as required.
- Note location and position of fittings, elbows, adapters, and hoses prior to removal.
- Remove cable ties as required.

(1) Lift pressure relief valve (1) on eye wash tank cover (2) to release pressure in eye wash tank (3).

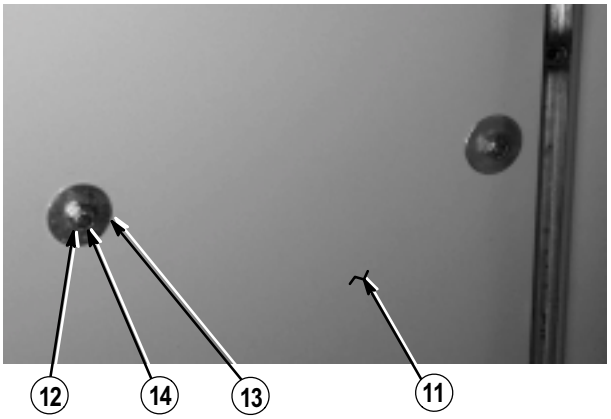
(2) Remove nut (4) and hose (5) from fitting (6).

(3) Loosen clamp (7) on hose (8) and remove hose from fitting (9).



(4) Remove drawer C2 (10) from cabinet C (11).

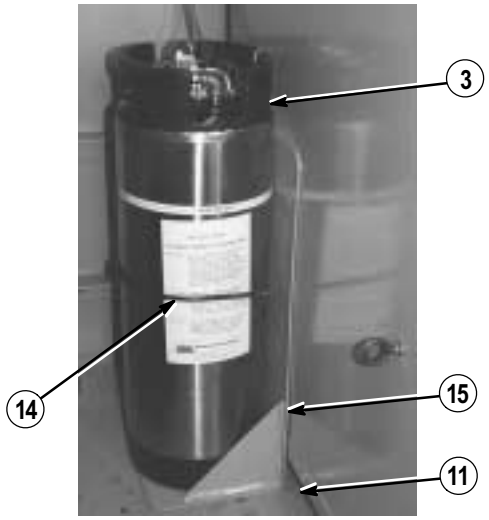
(5) Remove two locknuts (12) and washers (13) from U-bolt (14) and cabinet C (11). Discard locknuts.



6-3. EYE WASH TANK AND BRACKET REPLACEMENT (CONT).

(6) Remove U-bolt (14) and eye wash tank (3) from bracket (15).

(7) Remove bracket (15) from cabinet C (11).



(8) Remove fitting (6) from elbow (16).

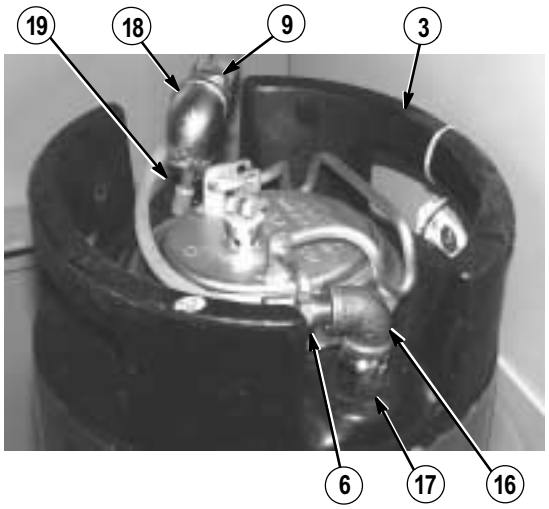
(9) Remove elbow (16) from fitting (17).

(10) Remove fitting (17) from eye wash tank (3).

(11) Remove fitting (9) from elbow (18).

(12) Remove elbow (18) from fitting (19).

(13) Remove fitting (19) from eye wash tank (3).



(14) Remove nut (20) and hose (5) from fitting (21).

(15) Remove hose (5) from FRS.

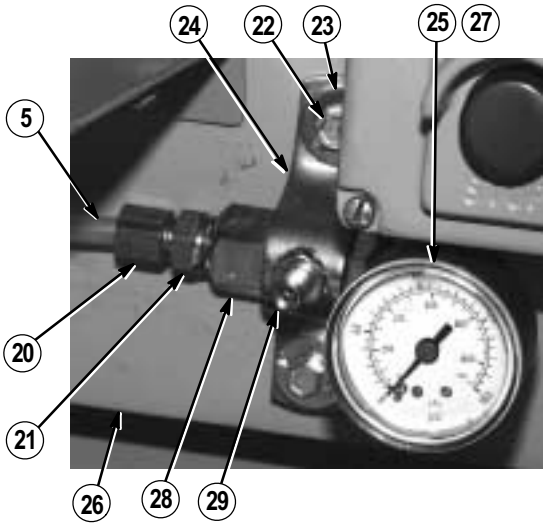
(16) Remove two screws (22), washers (23), bracket (24), gage (25) from shelter wall (26).

(17) Remove gage (25) from elbow (27).

(18) Remove elbow (27) from adapter (28).

(19) Remove fitting (21) from adapter (28).

(20) Remove air valve (29) from adapter (28).

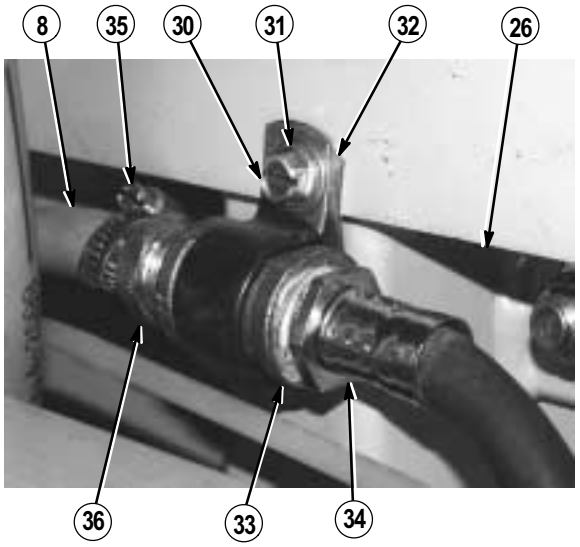


(21) Remove screw (30), washer (31) and cushion clip (32) from sleeve (33) and shelter wall (26).

(22) Remove hose (34) from sleeve (33).

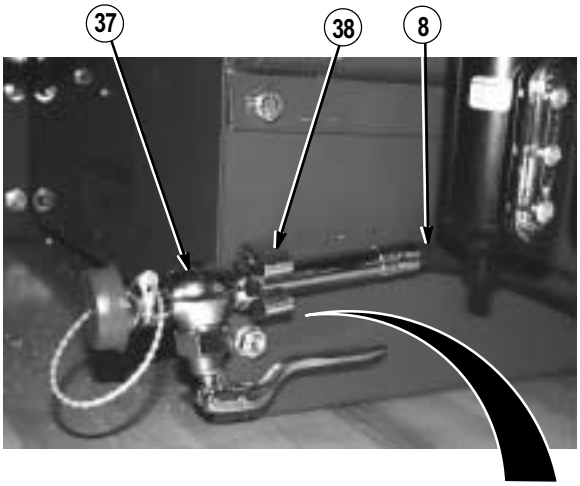
(23) Loosen clamp (35) and remove hose (8) from fitting (36).

(24) Remove fitting (36) from sleeve (33).

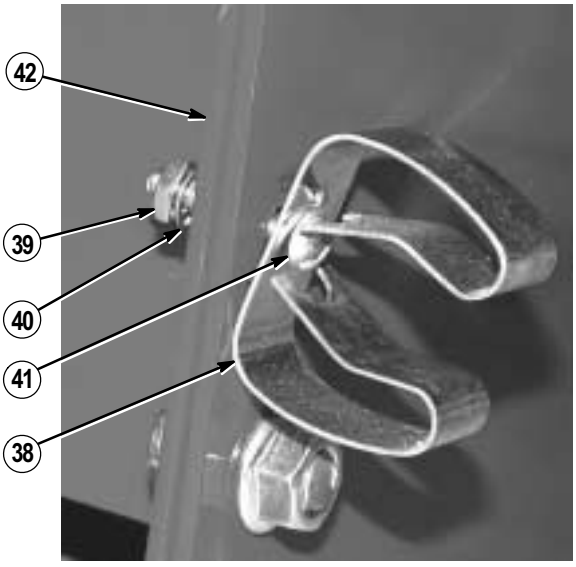


(25) Remove nozzle (37) from clip (38).

(26) Remove hose (8) from FRS.

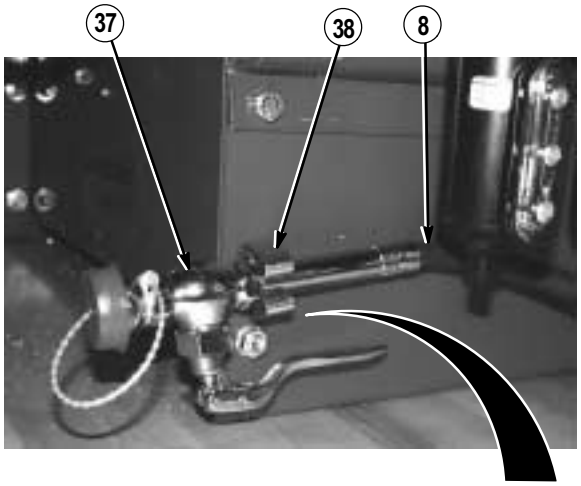


(27) Remove nut (39), lockwasher (40), screw (41) and clip (38) from hose reel (42). Discard lockwasher.



6-3. EYE WASH TANK AND BRACKET REPLACEMENT (CONT).

b. Installation.



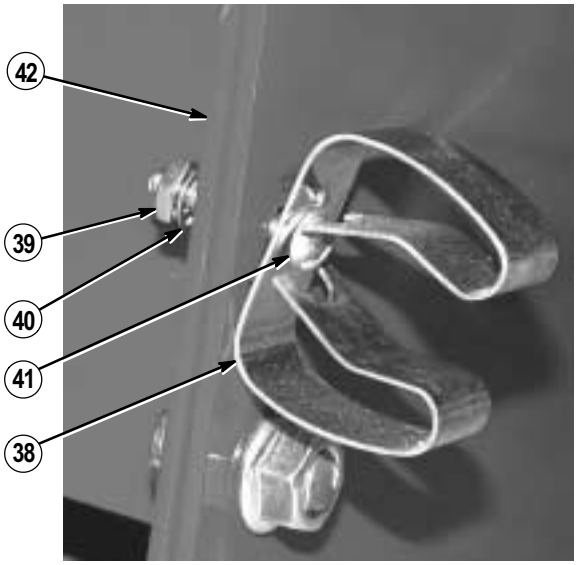
NOTE

- Install cable ties as required.
- Install fittings, elbows, adapters, and hoses as notes prior to removal.

(1) Install clip (38) on hose reel (42) with screw (41), lockwasher (40) and nut (39).

(2) Position hose (8) in FRS.

(3) Install nozzle (37) on clip (38).



WARNING

Adhesives, solvents and sealing compounds can burn easily, can give off harmful vapors and are harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in well-ventilated area. If adhesive, solvent or sealing compound gets on skin or clothes, wash immediately with soap and water.

(4) Apply sealing compound to threads of fitting (36).

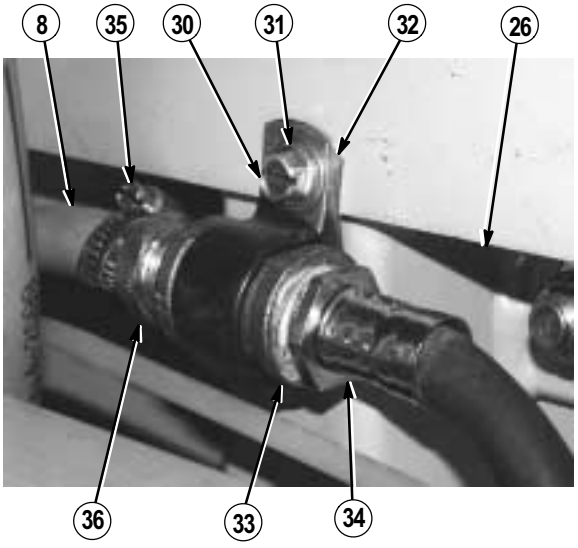
(5) Install fitting (36) on sleeve (33).

(6) Position hose (8) on fitting (36) and tighten clamp (35).

(7) Apply sealing compound to threads of hose (34).

(8) Install hose (34) on sleeve (33).

(9) Install sleeve (33) on shelter wall (26) with cushion clip (32), washer (31) and screw (30).



WARNING

Adhesives, solvents and sealing compounds can burn easily, can give off harmful vapors and are harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in well-ventilated area. If adhesive, solvent or sealing compound gets on skin or clothes, wash immediately with soap and water.

(10) Apply sealing compound to threads of air valve (29), fitting (21), elbow (27) and gage (25).

(11) Install air valve (29) on adapter (28).

(12) Install fitting (21) on adapter (28).

(13) Install elbow (27) on adapter (28).

(14) Install gage (25) on elbow (27).

(15) Install adapter (5) and gage (25) on shelter wall (26) with bracket (24), two washers (23) and screws (22).

(16) Position hose (8) in FRS.

(17) Position hose (5) on fitting (21) and tighten nut (20).

(18) Apply sealing compound to threads of fitting (19), fitting (9), fitting (17) and fitting (6).

(19) Install fitting (19) on eye wash tank (3).

(20) Install elbow (18) on fitting (19).

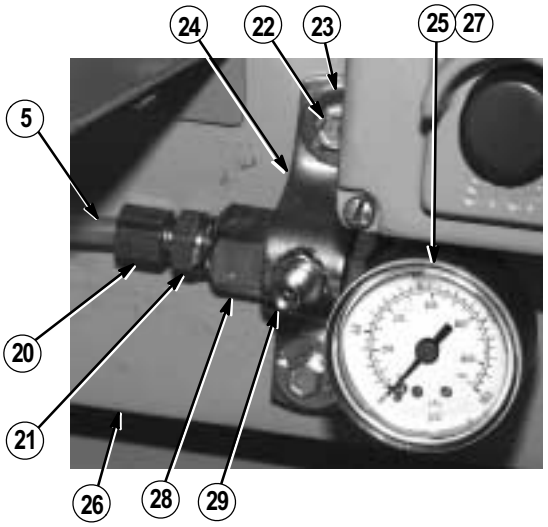
(21) Install fitting (17) on eye wash tank (3).

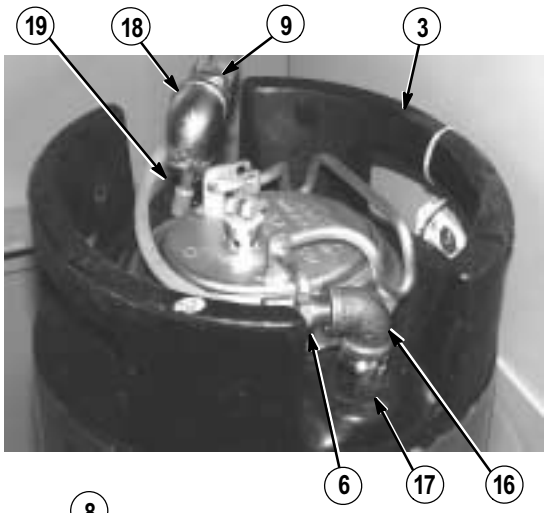
(22) Install elbow (16) on fitting (17).

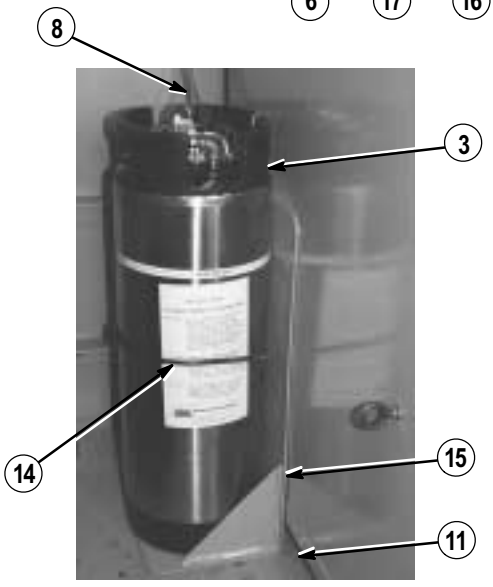
(23) Install fitting (6) on elbow (16).

(24) Position bracket (15) on cabinet C (11).

(25) Position eye wash tank (3) and U-bolt (14) on bracket (15).



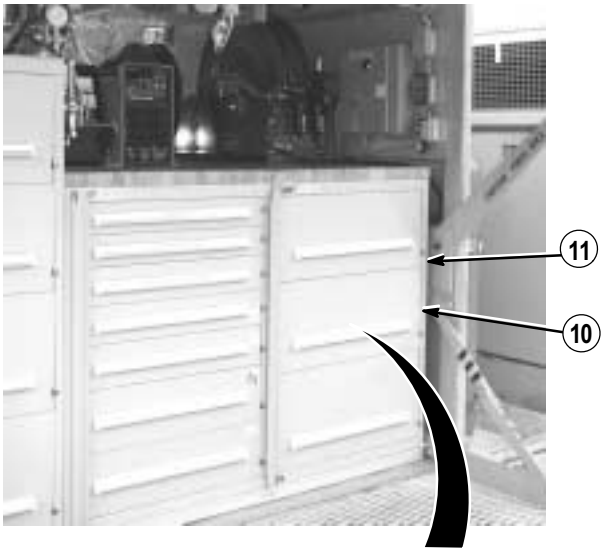


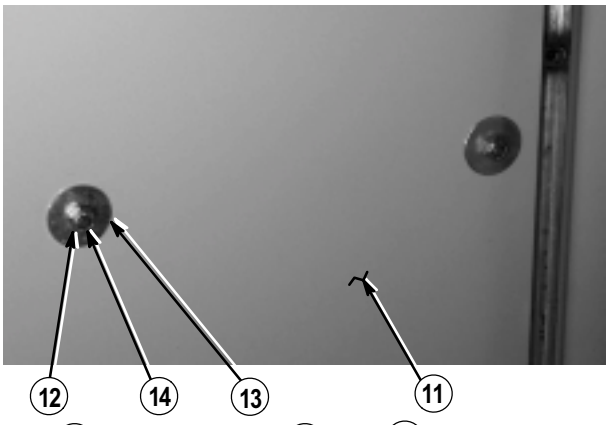


6-3. EYE WASH TANK AND BRACKET REPLACEMENT (CONT).

(26) Install two washers (13) and locknuts (12) on U-bolt (14) and cabinet C (11).

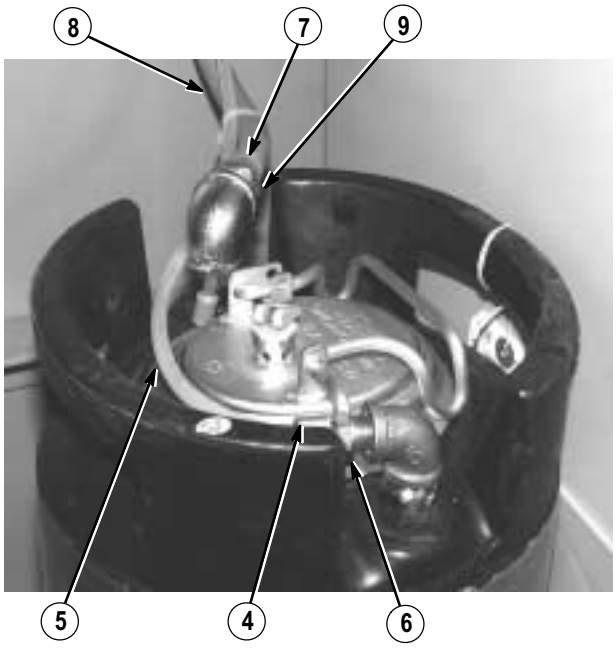
(27) Install drawer C2 (10) in cabinet C (11).



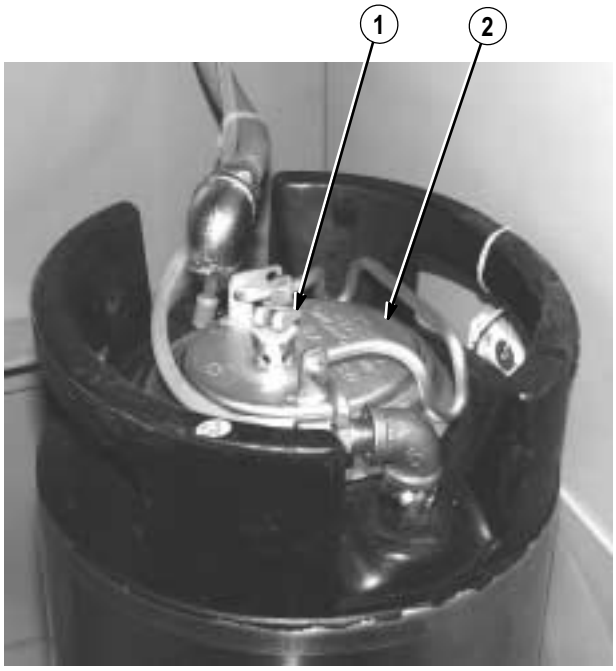


(28) Position hose (8) on fitting (9) and tighten clamp (7).

(29) Position hose (5) on fitting (6) and tighten nut (4).



(30) Close pressure relief valve (1) on eye wash tank cover (2).



c. Follow-On Maintenance:

- Check operation of eye wash, (TM 9-4940-568-10).

END OF TASK

CHAPTER 7

HYDRAULIC SYSTEM MAINTENANCE

7-1. INTRODUCTION.

This chapter contains maintenance instructions for removing, replacing, repairing, installing and adjusting hydraulic system components authorized by the Maintenance Allocation Chart (MAC) at the Unit Maintenance level.

7-2. HYDRAULIC SERVICE.

This task covers:

a. Drain b. Fill

INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 30, Appendix G)
Dispensing Pump (Item 6, Appendix G)
Drum, Storage (Item 10, Appendix G)
Hose, Drain (Item 16, Appendix G)
Pan, Drain (2) (Item 20, Appendix G)

Materials/Parts
Sealing Compound (Item 32, Appendix C)

Equipment Condition
FRS unloaded, (TM 9-4940-568-10)
Batteries disconnected, (TM 9-4940-568-10)

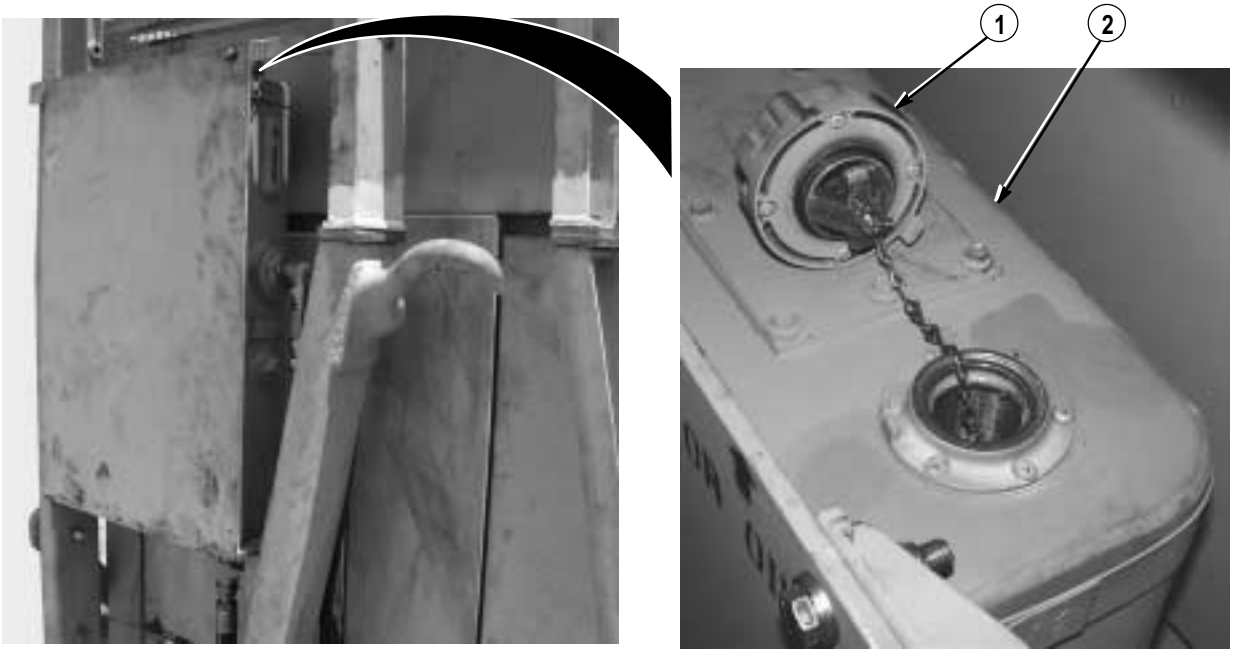
a. Drain.

WARNING

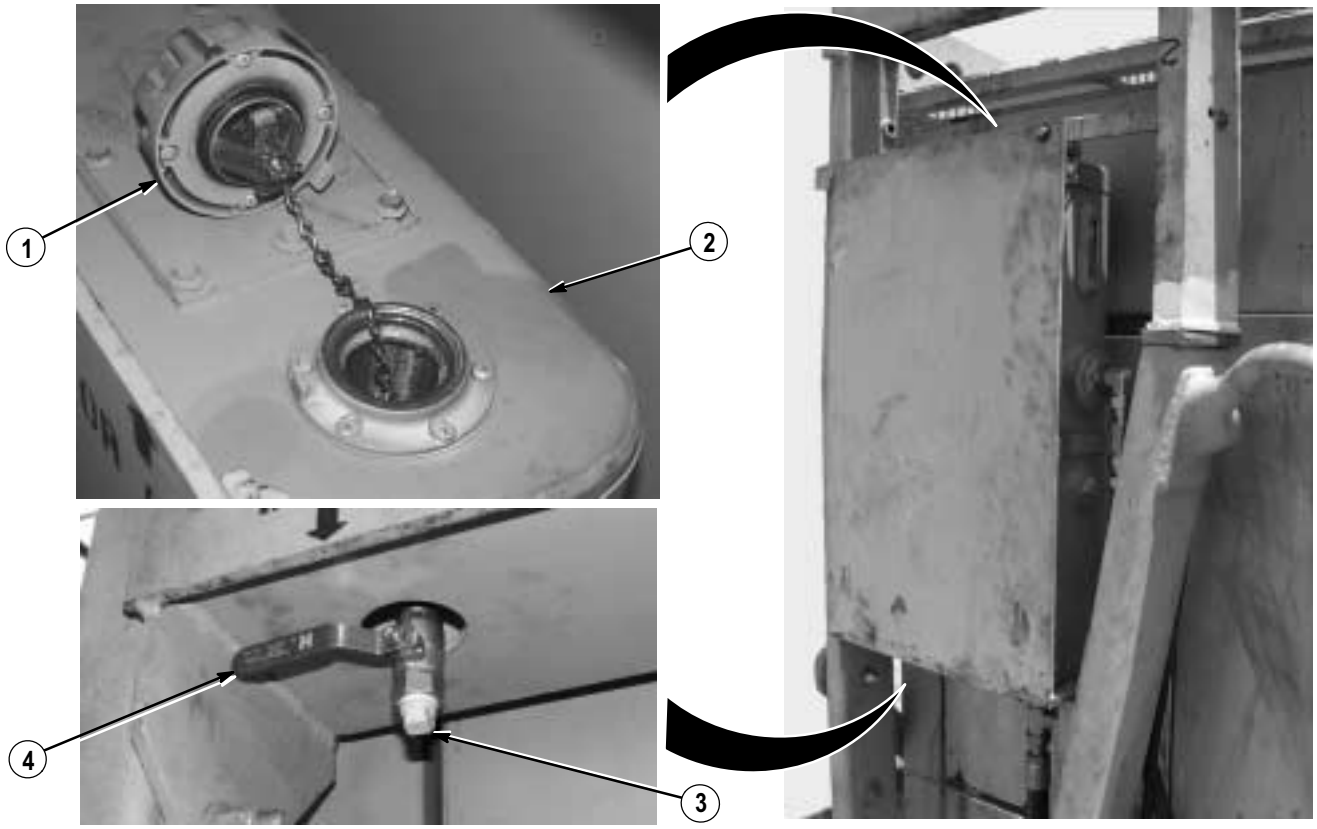
Prolonged contact with lubricating oil (MIL-L-2104) may cause a skin rash. Skin and clothing that come in contact with lubricating oil should be thoroughly washed immediately. Saturated clothing should be removed immediately. Areas in which lubricating oil is used should be well-ventilated to keep fumes to a minimum.

CAUTION

Clean area before removing filler breather to keep foreign matter out of hydraulic reservoir and to prevent damage.



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



NOTE

Hydraulic reservoir capacity is 25 gallons.

(2) Position suitable drain pan under hydraulic reservoir (2), remove drain plug (3) and open drain valve (4). Drain hydraulic reservoir.

(3) Close drain valve (4) and install drain plug (3).

b. Fill.

WARNING

Adhesives, solvents, and sealing compounds can burn easily, can give off harmful vapors, and are harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in well-ventilated area. If adhesive, solvent, or sealing compound gets on skin or clothing, wash immediately with soap and water.

(1) Apply sealing compound to threads of drain plug (3).

(2) Ensure drain valve (4) is closed and install drain plug (3) on drain valve.

(3) Fill hydraulic reservoir (2) (Para 2-9, Table 2-2).

(4) Install hydraulic reservoir filler breather cap (1) on hydraulic reservoir (2).

END OF TASK

7-3. HYDRAULIC FILTER AND FILTER HEAD REPLACEMENT.

This task covers:

a. Removal b. Installation c. Follow-On Maintenance

INITIAL SETUP

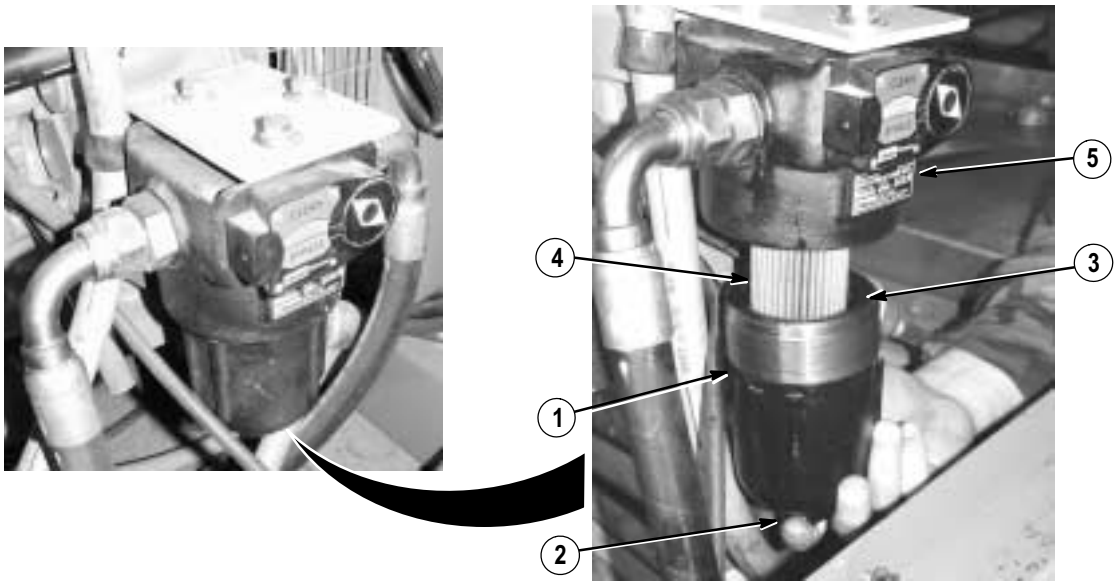
Tools and Special Tools
Tool Kit, General Mechanic's (Item 30, Appendix G)
Pan, Drain (Item 20, Appendix G)
Wrench, Combination 1-3/8 (Item 38, Appendix G)
Wrench, Combination 1-1/2 (Item 39, Appendix G)

Materials/Parts
Oil, Lubricating (Item 24, Appendix C)
Lockwasher (3) (Item 78, Appendix F)

Materials/Parts – Continued
Lockwasher (4) (Item 79, Appendix F)
Packing, Preformed (Item 88, Appendix F)
Packing, Preformed (Item 89, Appendix F)

Equipment Condition
FRS unloaded, (TM 9-4940-568-10)
Batteries disconnected, (TM 9-4940-568-10)

a. Removal.



WARNING

The hydraulic system operates at high pressures. Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in serious injury or death to personnel.

(1) Position drain pan under hydraulic filter housing (1).

(2) Open drain valve (2) and drain hydraulic filter housing (1).

(3) Remove hydraulic filter housing (1), preformed packing (3) and filter (4) from hydraulic filter head (5). Discard preformed packing.

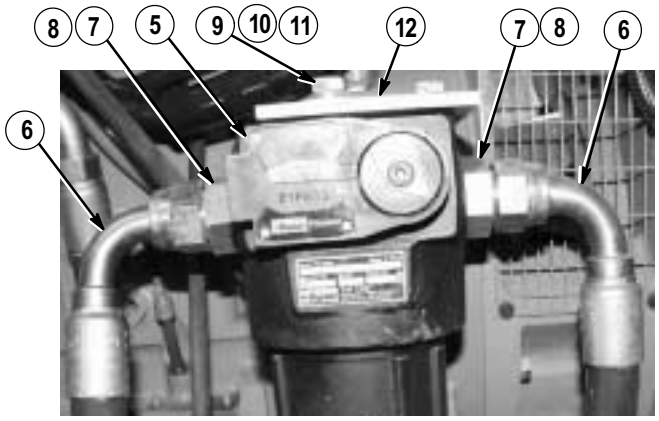
NOTE

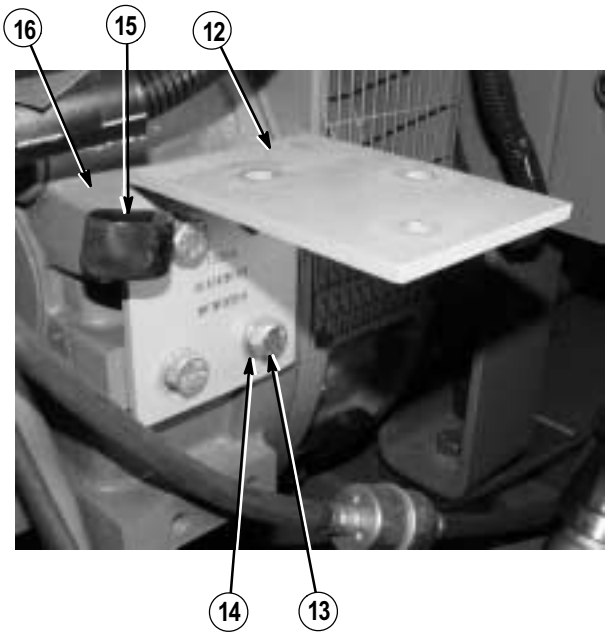
Note location and position of hoses prior to removal.

(4) Remove two hydraulic hoses (6), fittings (7) and preformed packings (8) from hydraulic filter head (5). Discard preformed packings.

(5) Remove three screws (9), lockwashers (10), washers (11), and hydraulic filter head (5) from bracket (12). Discard lockwashers.

(6) Remove four screws (13), lockwashers (14), cushioned clamp (15) and bracket (12) from flywheel housing (16). Discard lockwashers.





b. Installation.

(1) Install bracket (12) and cushioned clamp (15) on flywheel housing (16) and secure with four lockwashers (14) and screws (13).

(2) Install hydraulic filter head (5), three washers (11), new lockwashers (10), and screws (9) on bracket (12).

NOTE

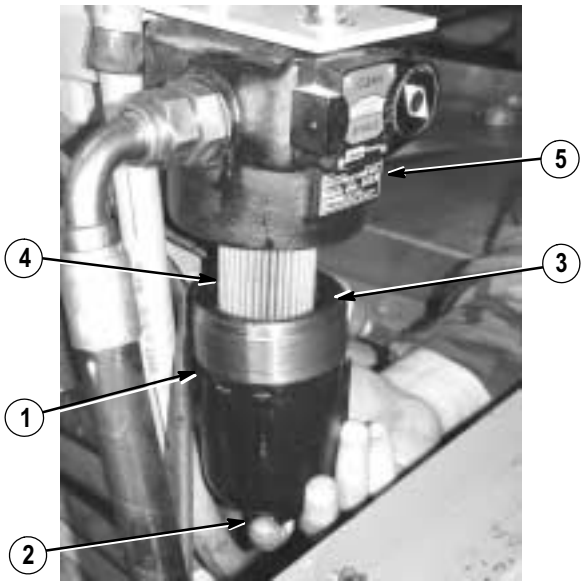
Install hydraulic hoses in location and position noted during removal.

(3) Apply oil to preformed packings (8).

(4) Install two preformed packings (8), fittings (7) and hydraulic hoses (6) on hydraulic filter head (5).

(5) Close drain valve (2).

(6) Install filter (4), preformed packing (3) and hydraulic filter housing (1) on hydraulic fitter head (5).



c. Follow-On Maintenance:

- Fill hydraulic reservoir, (Para 7-6).
- Connect batteries, (TM 9-4940-568-10).
- Start generator and check for leaks, (TM 9-4940-568-10).

END OF TASK

7-4. HYDRAULIC HOSES AND TUBES REPLACEMENT.

This task covers:

a. Hose And Tube Locations b. Follow-On Maintenance

INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 30, Appendix G)
Cap and Plug Set (Item 3, Appendix G)
Pan, Drain (2) (Item 20, Appendix G)

Materials/Parts
Cable Ties (Item 10, Appendix C)
Tags, Identification (Item 40, Appendix C)

Equipment Condition
FRS unloaded, (TM 9-4940-568-10)
Crane stowed, (TM 9-4940-568-10)
Hydraulic reservoir drained, (Para 7-6)
Batteries disconnected, (TM 9-4940-568-10)

a. Hose And Tube Locations.

WARNING

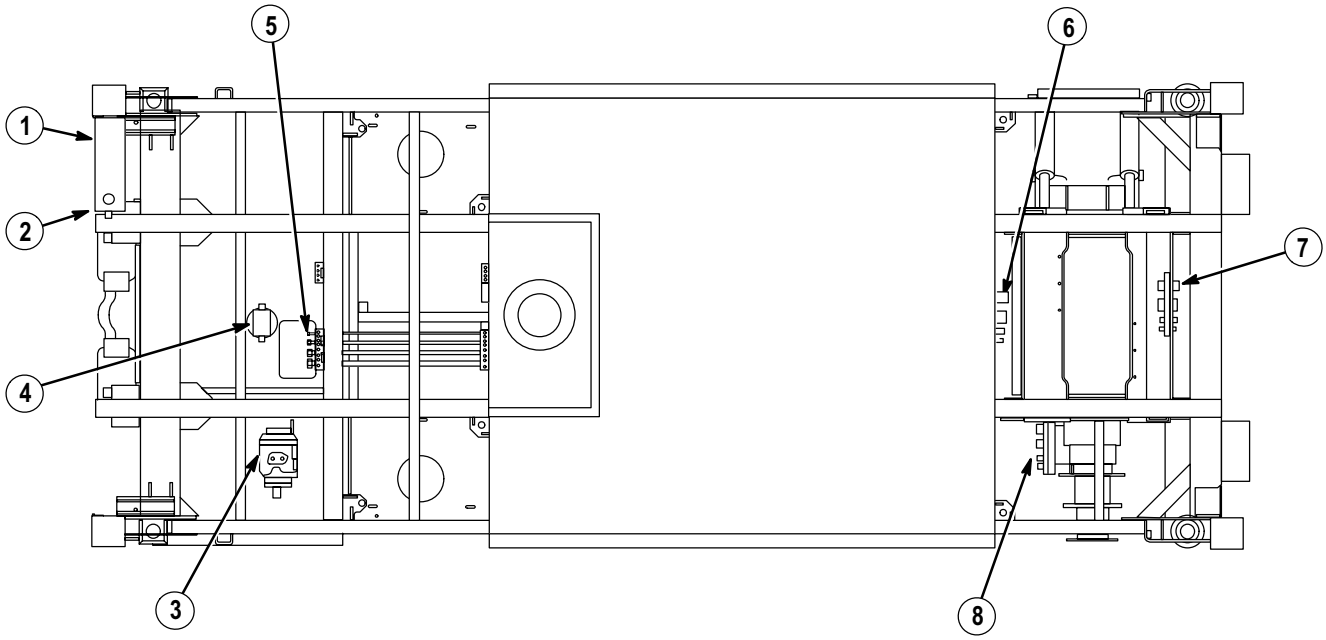
Prolonged contact with lubricating oil (MIL-L-2104) may cause a skin rash. Skin and clothing that come in contact with lubricating oil should be thoroughly washed immediately. Saturated clothing should be removed immediately. Areas in which lubricating oil is used should be well-ventilated to keep fumes to a minimum.

CAUTION

Equipment may be damaged by foreign matter if hoses, tubes and connectors are not plugged and capped when removed.

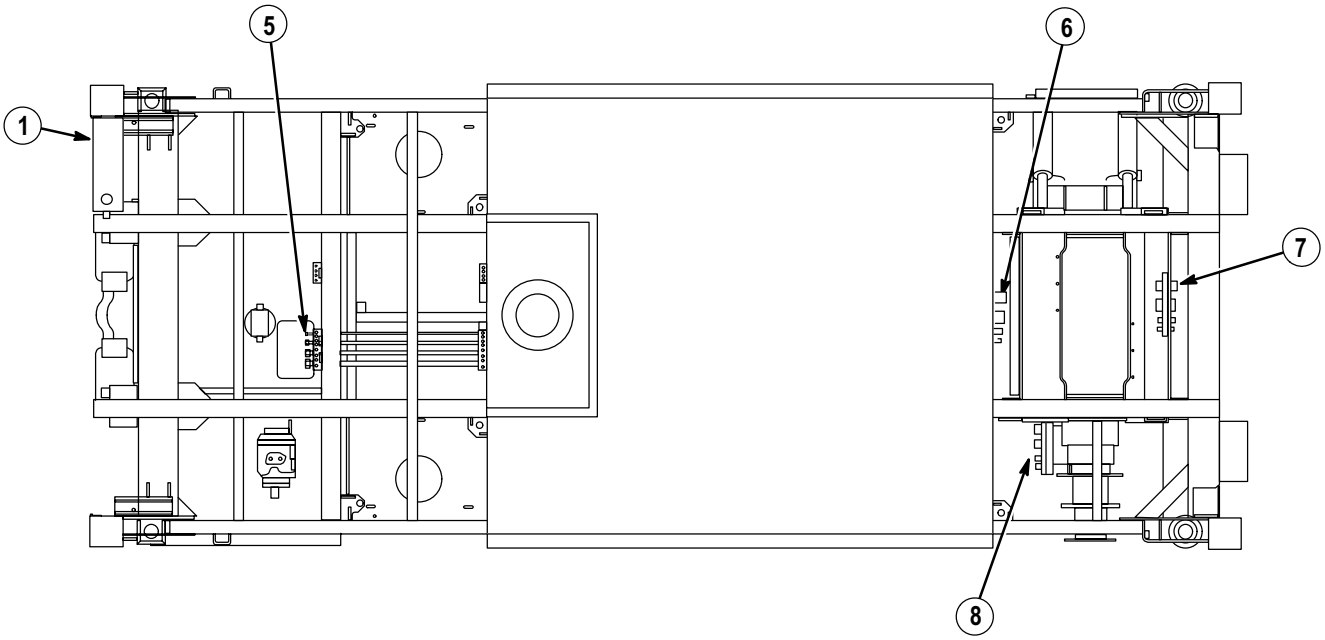
NOTE

- This procedure shows the location of hydraulic hoses on the shelter. It will never be necessary to remove all hydraulic hoses at one time.
- As items are removed, cap and plug all hoses, tubes and connectors.
- Tag and mark all hoses, pipes and tubes before removal.
- Inspect all hoses, lines and fittings for cracks, bends, nicks, dents, stripping threads and cuts. Replace all damaged parts.
- Remove and replace cable ties as required.
- Remove clamps and support brackets as required.



Hose Number	From	To
F881JCJ620202092	Hydraulic reservoir bottom (1)	Hydraulic pump bottom rear (3)
F772J1J916121246	Hydraulic pump top rear (3)	Hydraulic filter left side (4)
F772J9J912121231	Hydraulic filter right side (4)	Tube shelter front right (5)
RIA148972	Hydraulic hose filter (5)	Hydraulic hose bulkhead (6)
F772JCJC12131233	Tube shelter rear middle left (6)	Bulkhead inside middle right (7)
F772J9J712121284	Bulkhead outside middle left (7)	Crane manifold (pressure port) (8)
F421J9J116161684	Crane manifold (return line) (8)	Bulkhead outside left (7)
F421JCJC16161634	Bulkhead inside right (7)	Tube shelter rear left (6)
RIA148971	Hydraulic hose from bulkhead (6)	Hydraulic hose tank (5)
F421JCJC16161691	Tube shelter front right (5)	Hydraulic tank top right (2)
F301J9JC04040471	Crane manifold (load sensing port) (8)	Bulkhead outside right (7)
F301JCJC04040432	Bulkhead inside left (7)	Tube shelter rear right (6)
RIA148974	Hydraulic hose from bulkhead (6)	Hydraulic hose hydraulic pump (5)
F301J9J9040404425	Tube shelter front left (5)	Hydraulic pump bottom side (3)
F421J9J9080808114	Hydraulic pump side top (3)	Hydraulic reservoir top right (2)

7-4. HYDRAULIC HOSES AND TUBES REPLACEMENT (CONT).



Hose Number	From	To
F881JCJ908121265	Hydraulic tank-bottom right (1)	Tube shelter front middle left (5)
RIA148973	Hydraulic hose from hydraulic tank (5)	Hydraulic hose bulkhead (6)
F881JCJC08081233	Tube shelter rear middle right (6)	Bulkhead inside middle left (7)
F421J9JC08080875	Bulkhead outside middle right (7)	Crane manifold (hand pump port) (8)

b. Follow-On Maintenance:

- Fill hydraulic reservoir, (Para 7-6).
- Connect batteries, (TM 9-4940-568-10).
- Operate crane, (TM 9-4940-568-10).
- Check for leaks.

END OF TASK

7-5. HYDRAULIC QUICK-DISCONNECT FITTINGS REPLACEMENT.

This task covers:

a. Removal b. Installation c. Follow-On Maintenance

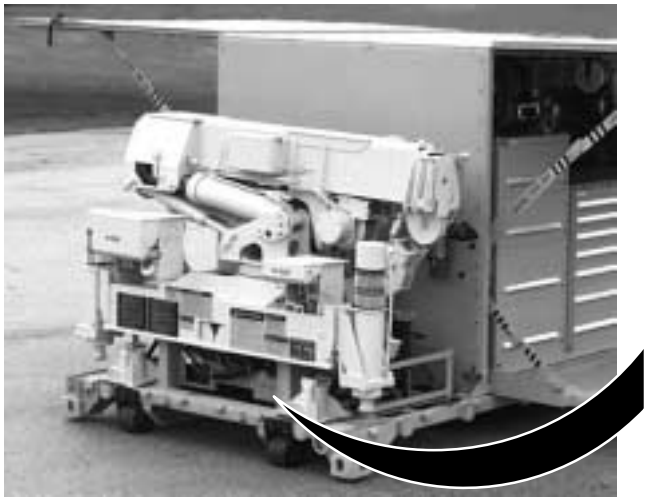
INITIAL SETUP

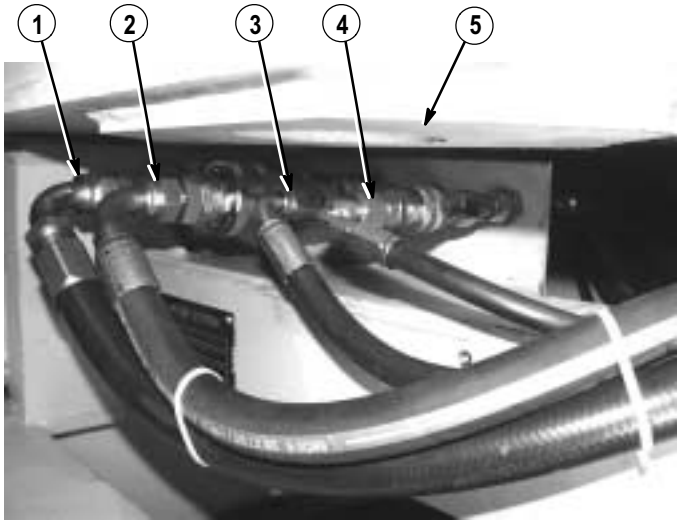
Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 30, Appendix G)
Pan, Drain (2) (Item 20, Appendix G)

Materials/Parts
Tags, Identification (Item 40, Appendix C)

Equipment Condition
FRS unloaded, (TM 9-4940-568-10)
Batteries disconnected, (TM 9-4940-568-10)
Hydraulic reservoir drained, (Para 7-6)

a. Removal.





WARNING

- Prolonged contact with lubricating oil (MIL-L-2104) may cause a skin rash. Skin and clothing that come in contact with lubricating oil should be thoroughly washed immediately. Saturated clothing should be removed immediately. Areas in which lubricating oil is used should be well-ventilated to keep fumes to a minimum.
- The hydraulic system operates at high pressures. Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in serious injury or death to personnel.

NOTE

Tag and mark all hoses and fittings prior to removal.

(1) Position drain pan under hydraulic quick-disconnect fittings.

(2) Disconnect return hose (1), pressure hose (2), bypass hose (3) and variable displacement hose (4) from crane (5).

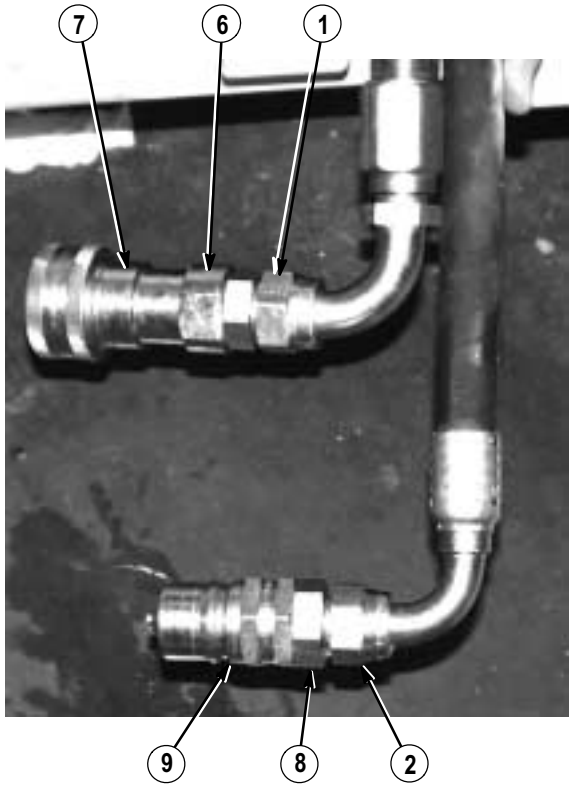
7-5. HYDRAULIC QUICK-DISCONNECT FITTINGS REPLACEMENT (CONT).

(3) Remove fitting (6) from return hose (1).

(4) Remove female quick-disconnect (7) from fitting (6).

(5) Remove fitting (8) from pressure hose (2).

(6) Remove male quick-disconnect (9) from fitting (8).



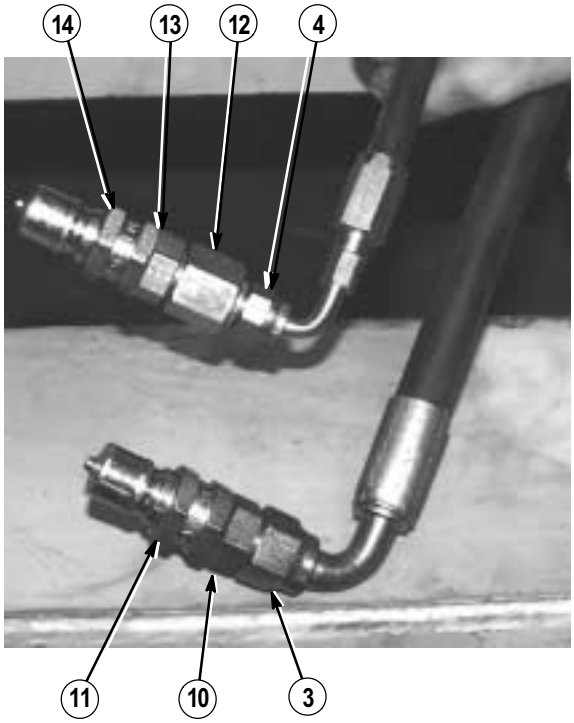
(7) Remove fitting (10) from bypass hose (3).

(8) Remove male quick-disconnect (11) from fitting (10).

(9) Remove reducer (12) from variable displacement hose (4).

(10) Remove fitting (13) from reducer (12).

(11) Remove male quick-disconnect (14) from fitting (13).

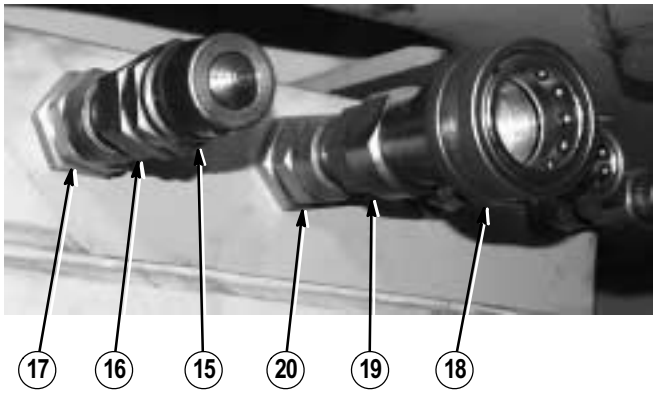


(12) Remove male quick-disconnect (15) from adapter (16).

(13) Remove adapter (16) from fitting (17).

(14) Remove female quick-disconnect (18) from adapter (19).

(15) Remove adapter (19) from fitting (20).

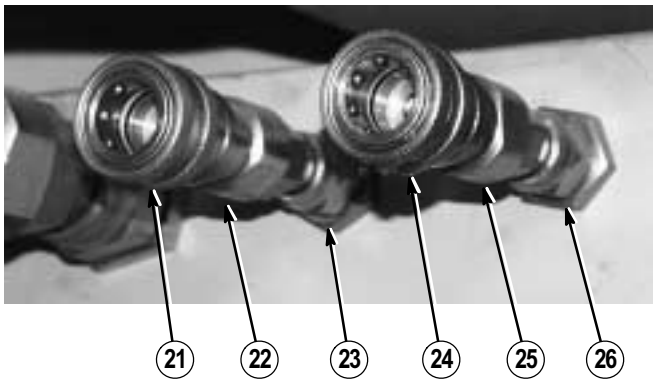


(16) Remove female quick-disconnect (21) from adapter (22).

(17) Remove adapter (22) from fitting (23).

(18) Remove female quick-disconnect (24) from adapter (25).

(19) Remove adapter (25) from fitting (26).



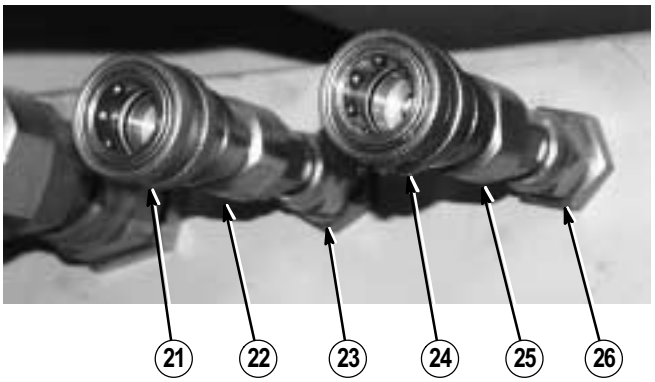
b. Installation.

(1) Install adapter (25) on fitting (26).

(2) Install female quick-disconnect (24) on adapter (25).

(3) Install adapter (22) on fitting (23).

(4) Install female quick-disconnect (21) on adapter (22).

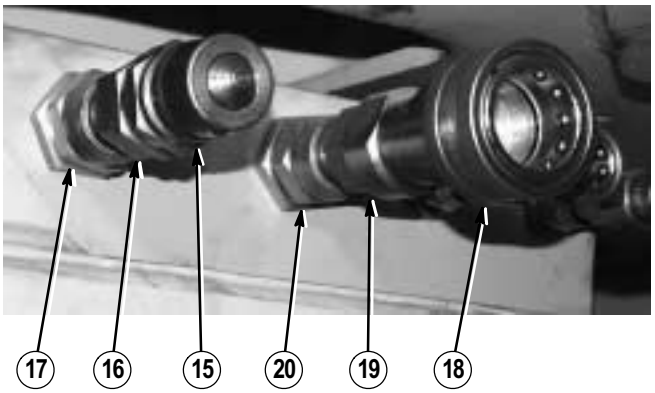


(5) Install adapter (19) on fitting (20).

(6) Install female quick-disconnect (18) on adapter (19).

(7) Install adapter (16) on fitting (17).

(8) Install male quick-disconnect (15) on adapter (16).



7-5. HYDRAULIC QUICK-DISCONNECT FITTINGS REPLACEMENT (CONT).

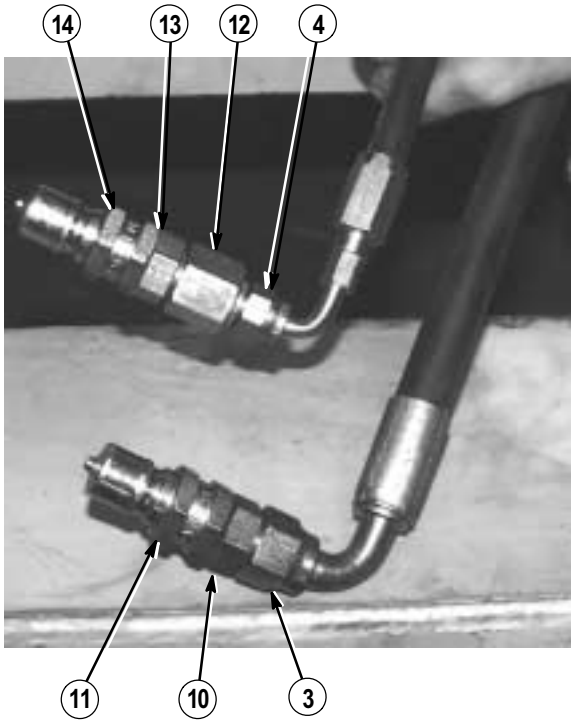
(9) Install male quick-disconnect (14) on fitting (13).

(10) Install fitting (13) on reducer (12).

(11) Install reducer (12) on variable displacement hose (4).

(12) Install male quick-disconnect (11) on fitting (10).

(13) Install fitting (10) on bypass hose (3).

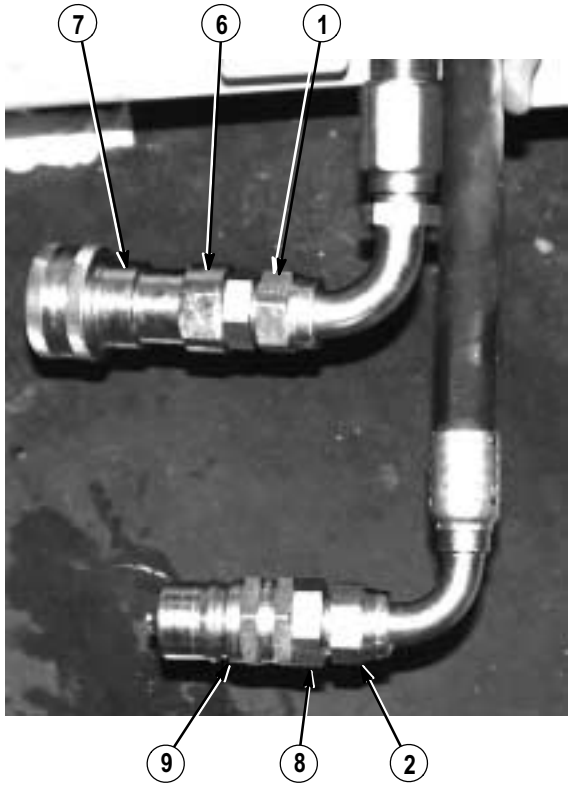


(14) Install male quick-disconnect (9) on fitting (8).

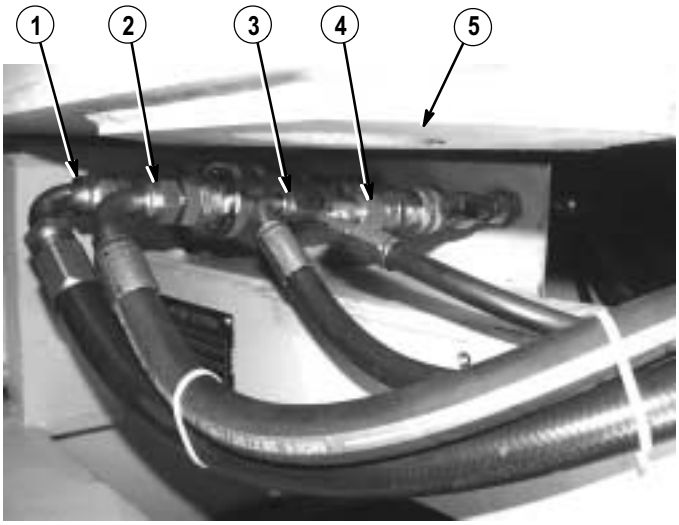
(15) Install fitting (8) on pressure hose (2).

(16) Install female quick-disconnect (7) on fitting (6).

(17) Install fitting (6) on return hose (1).



(18) Connect variable displacement hose (4), bypass hose (3), pressure hose (2) and return hose (1) on crane (5).



c. Follow-On Maintenance:

- Fill hydraulic reservoir, (Para 7-6).
- Connect batteries, (TM 9-4940-568-10).
- Operate crane, (TM 9-4940-568-10).
- Check for leaks.

END OF TASK

7-6. HYDRAULIC RESERVOIR REPLACEMENT.

This task covers:

a. Removal b. Installation c. Follow-On Maintenance

INITIAL SETUP

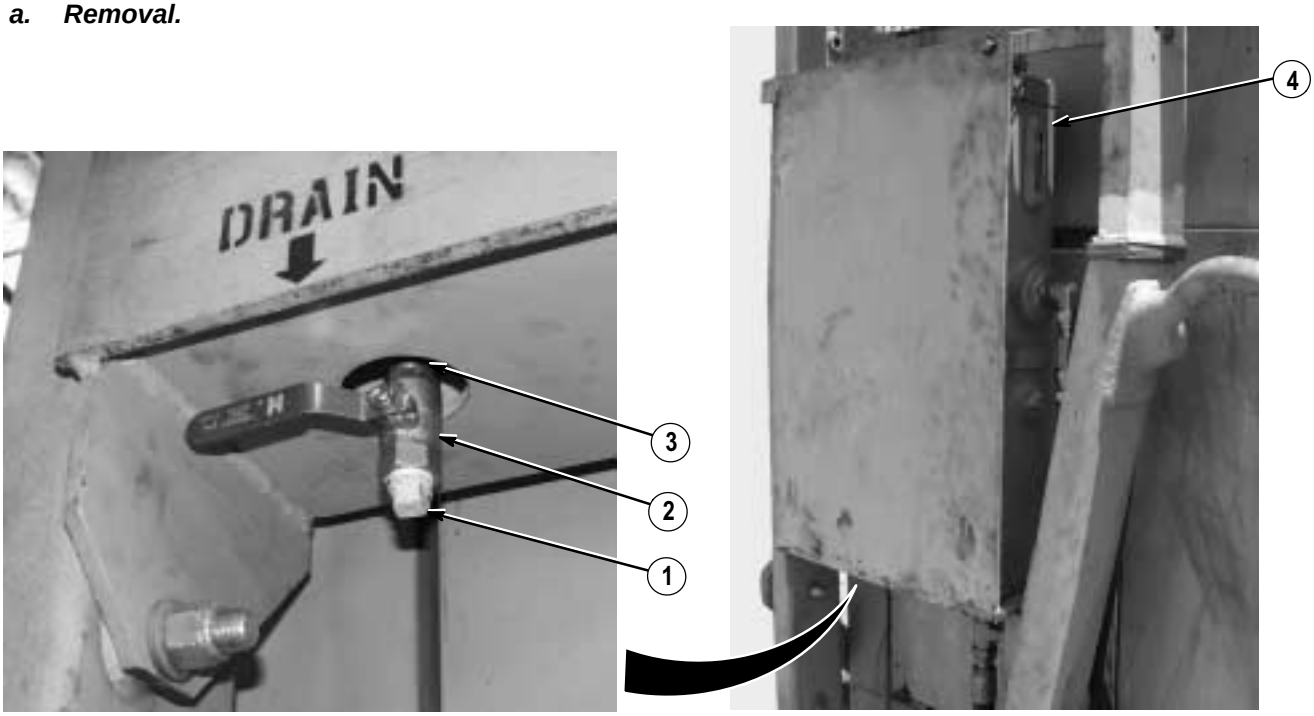
Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 30, Appendix G)
Cap and Plug Set, (Item 3, Appendix G)
Lifting Device, Minimum Capacity 300 lbs (136 kg)
Wooden Blocks (2) (Appendix D)

Materials/Parts
Sealing Compound (Item 32, Appendix C)
Locknut (6) (Item 42, Appendix F)
Locknut (Item 44, Appendix F)

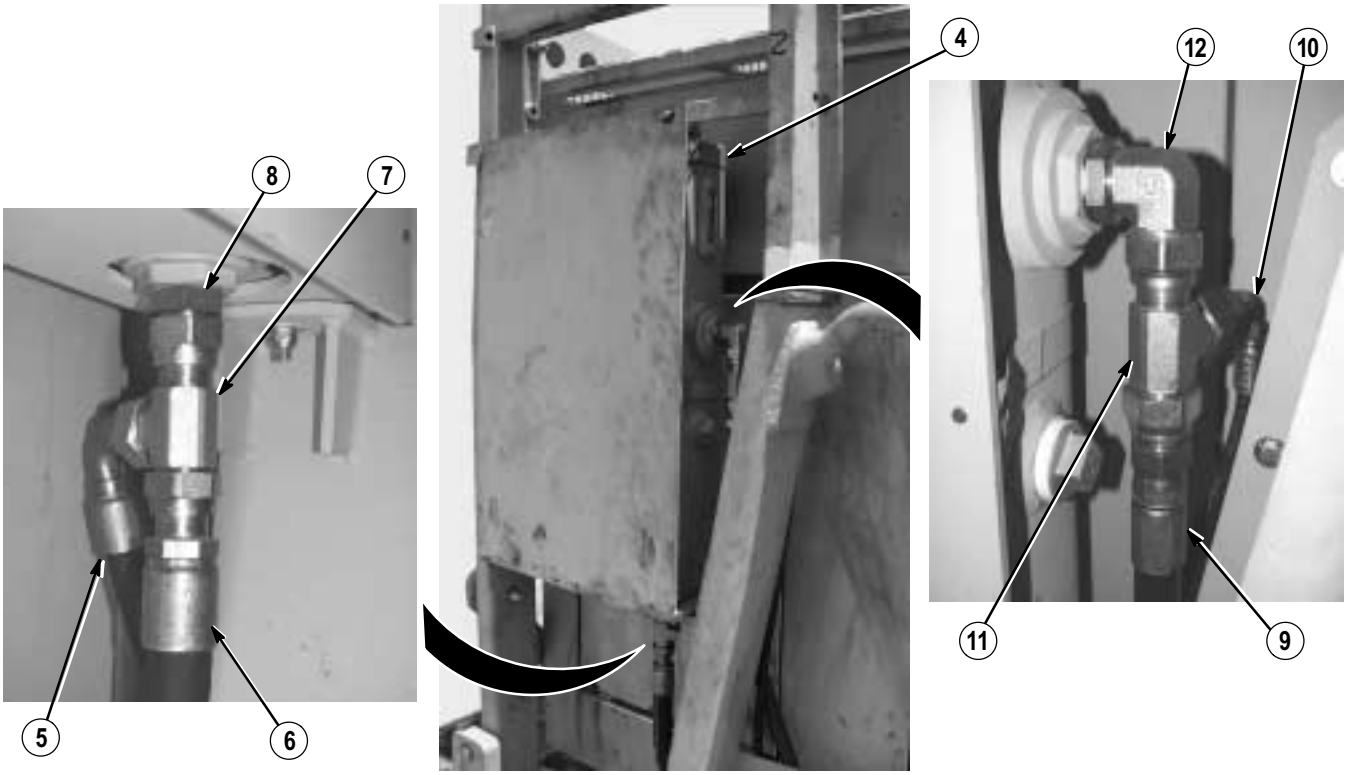
Personnel Required
Two

Equipment Condition
FRS unloaded, (TM 9-4940-568-10)
Batteries disconnected, (TM 9-4940-568-10)
Hydraulic reservoir drained, (Para 7-2)

a. Removal.



(1) Remove drain plug (1), drain valve (2) and adapter (3) from hydraulic reservoir (4).



WARNING

- Hydraulic reservoir and rack weigh 272 lbs (124 kg). Attach suitable lifting device and properly support hydraulic reservoir and rack to prevent possible injury to personnel.
- Prolonged contact with lubricating oil (MIL-L-2104) may cause a skin rash. Skin and clothing that come into contact with lubricating oil should be thoroughly washed immediately. Saturated clothing should be removed immediately. Areas in which lubricating oil is used should be well-ventilated to keep fumes to a minimum.

CAUTION

Clean area before removing any hydraulic lines or fittings. After removal, cap or plug all lines and fittings to keep foreign materials out of hydraulic system, preventing damage to equipment.

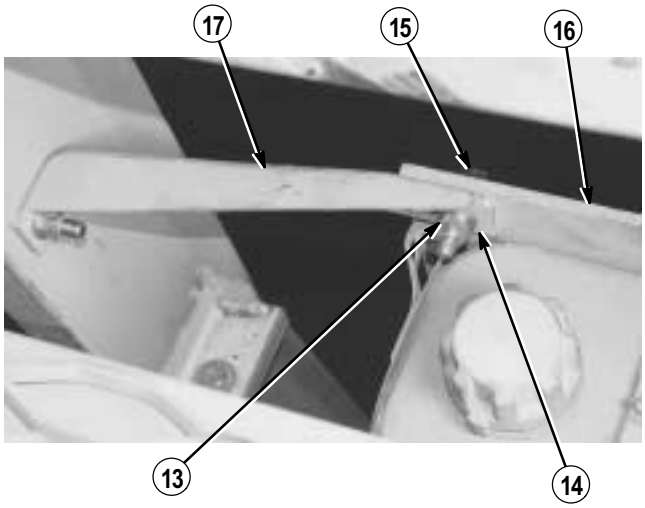
(2) Remove two hoses (5) and (6), tee-fitting (7) and straight fitting (8) from hydraulic reservoir (4).

(3) Remove two hoses (9) and (10), tee-fitting (11) and elbow fitting (12) from hydraulic reservoir (4).

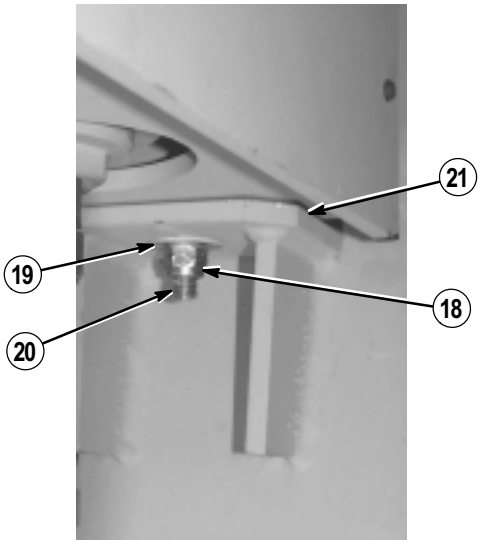
(4) With the aid of an assistant, place lifting device in suitable position to support hydraulic reservoir (4).

7-6. HYDRAULIC RESERVOIR REPLACEMENT (CONT).

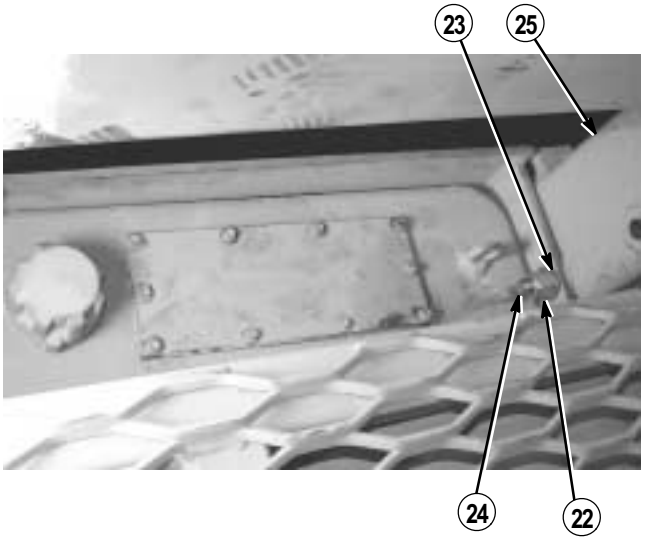
(5) Remove locknut (13), two washers (14) and screw (15) from hydraulic reservoir rack (16) and support arm (17). Discard locknut.



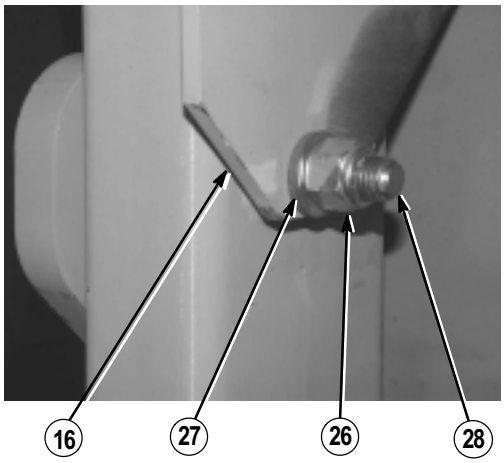
(6) Remove locknut (18), two washers (19) and screw (20) from lower left-side mounting bracket (21). Discard locknut.



(7) Remove locknut (22), two washers (23) and screw (24) from upper right-side brushguard frame member (25). Discard locknut.



(8) Remove locknut (26), two washers (27), screw (28) and reservoir with rack (16). Lower reservoir and rack, support on wooden blocks, and remove lifting device. Discard locknut.



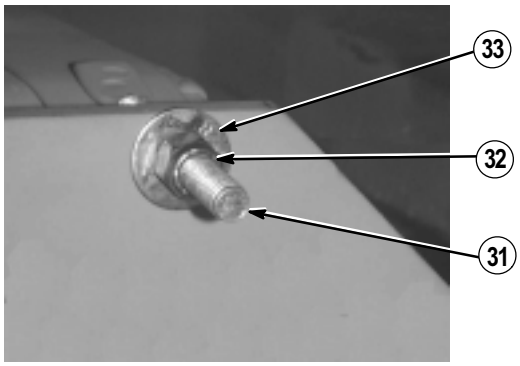
(9) Remove three socket-head screws (29) and washers (30) from three retaining straps (31).

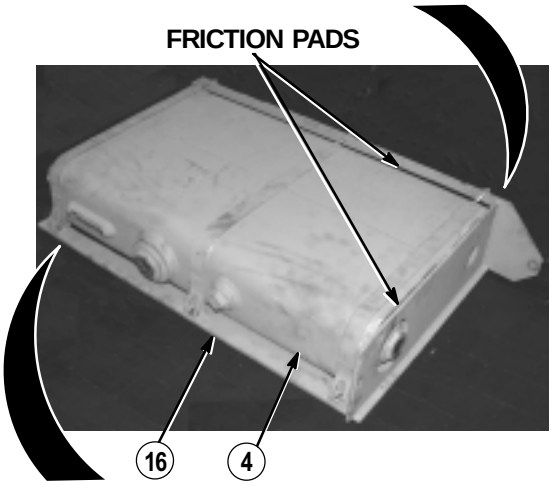
(10) Remove three locknuts (32), washers (33) and retaining straps (31) from hydraulic reservoir (4) to rack (16). Discard locknuts

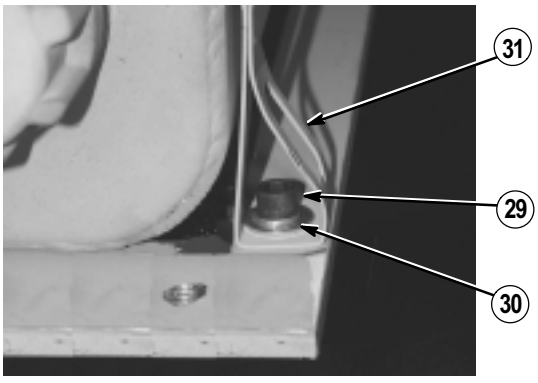
NOTE

Retain two friction pads for installation of new reservoir.

(11) With the aid of an assistant, lift hydraulic reservoir (4) from rack (16).







7-6. HYDRAULIC RESERVOIR REPLACEMENT (CONT).

b. Installation.

WARNING

- Hydraulic reservoir and rack weigh 272 lbs (124 kg). Attach suitable lifting device and properly support hydraulic reservoir and rack to prevent possible injury to personnel.

CAUTION

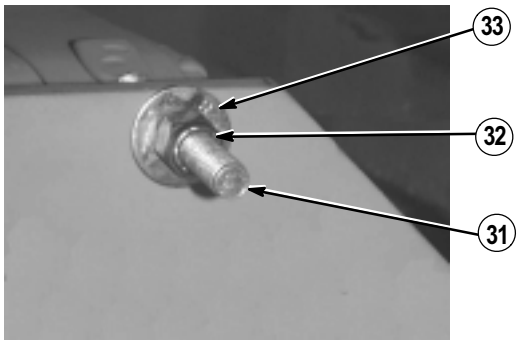
Clean area before removing any hydraulic lines or fittings. After removal, cap or plug all lines and fittings to keep foreign materials out of hydraulic system, preventing damage to equipment.

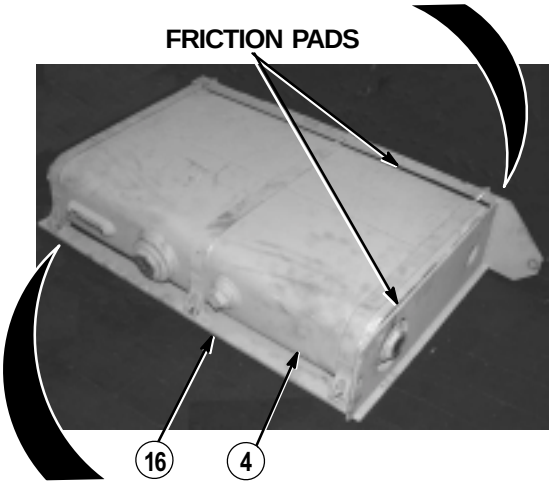
(1) Attach lifting device and with the aid of an assistant, position hydraulic reservoir (4) onto rack (16). Reuse two friction pads with new reservoir.

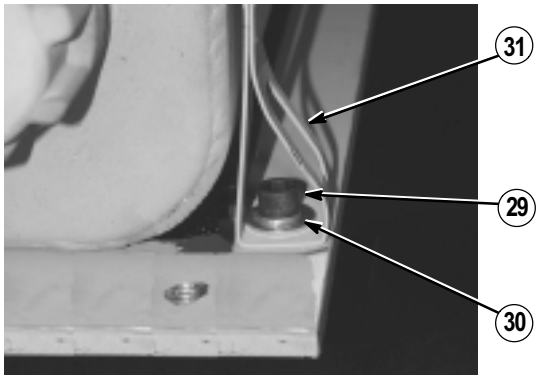
(2) Secure hydraulic reservoir (4) to rack (16) with three retaining straps (31), washers (33) and locknuts (32).

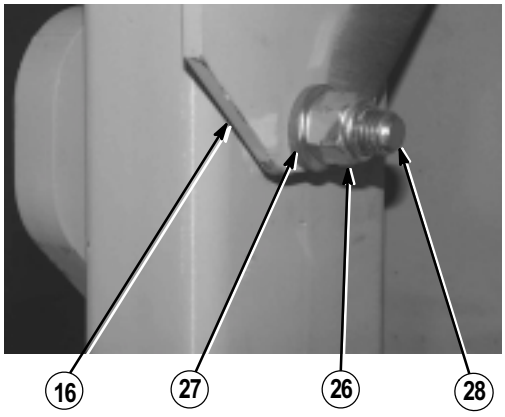
(3) Install three socket-head screws (29) and washers (30) on retaining straps (31).

(4) Attach lifting device, raise hydraulic reservoir (4) and rack (16) off of wooden blocks and attach bolt (28), two washers (27) and locknut (26) to hydraulic reservoir and rack.

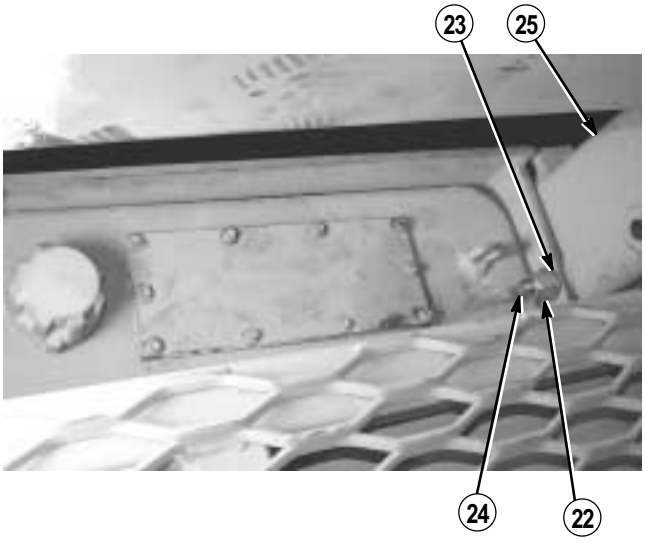




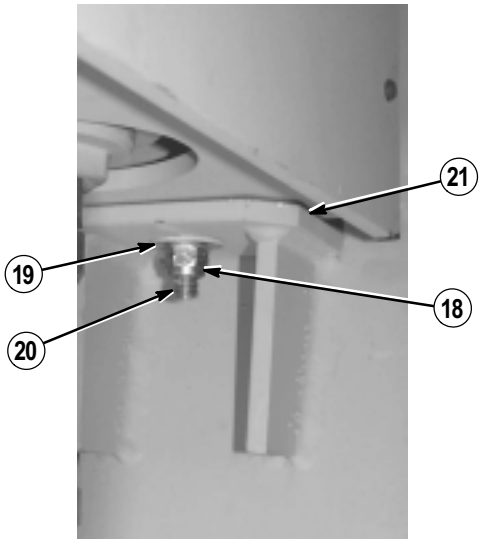




(5) Attach locknut (22), two washers (23) and bolt (24) to upper right-side brushguard frame mount (25).

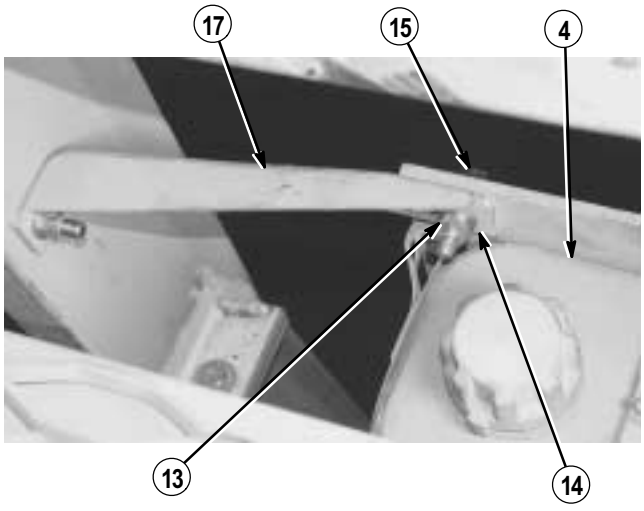


(6) Attach locknut (18), two washers (19) and bolt (20) to lower left-side mounting bracket (21).

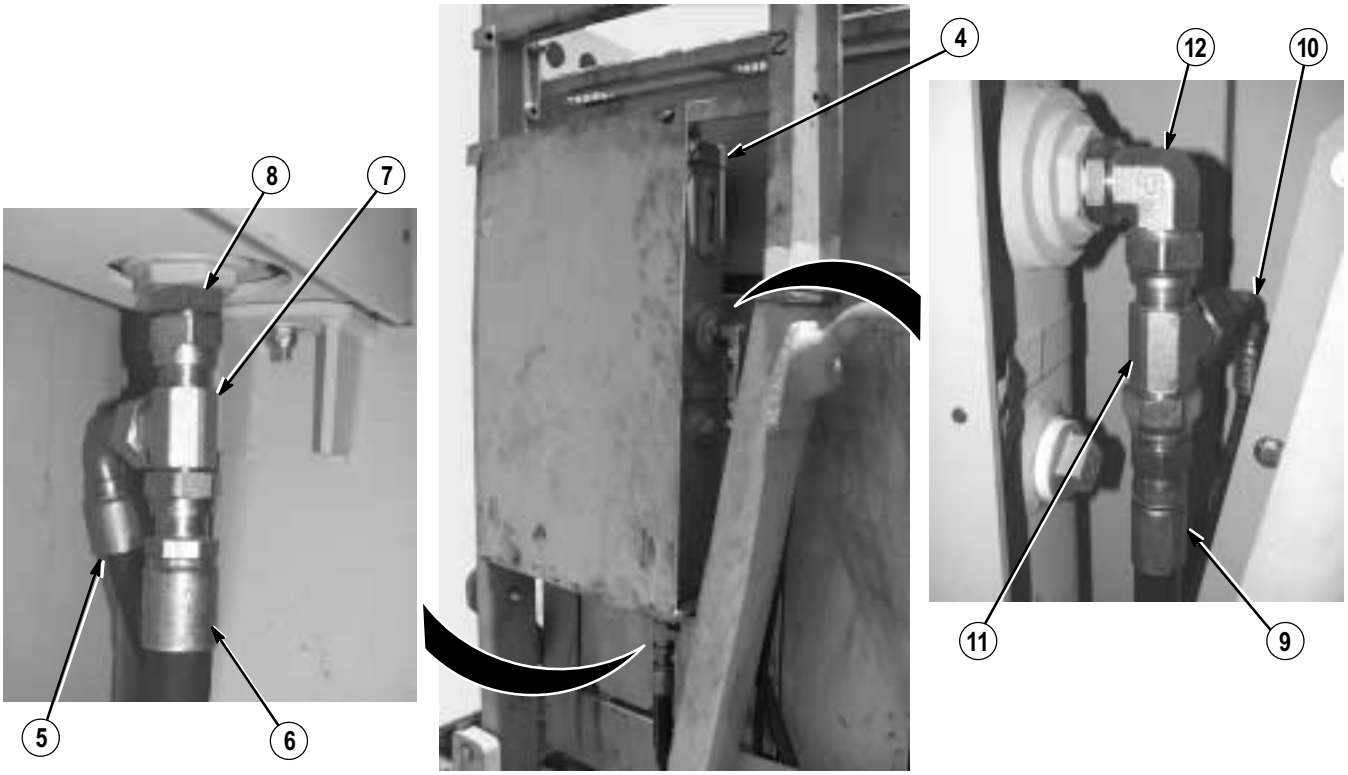


(7) Attach hydraulic reservoir (4) to support arm (17) using locknut (13), two washers (14) and bolt (15).

(8) Remove lifting device.



7-6. HYDRAULIC RESERVOIR REPLACEMENT (CONT).



WARNING

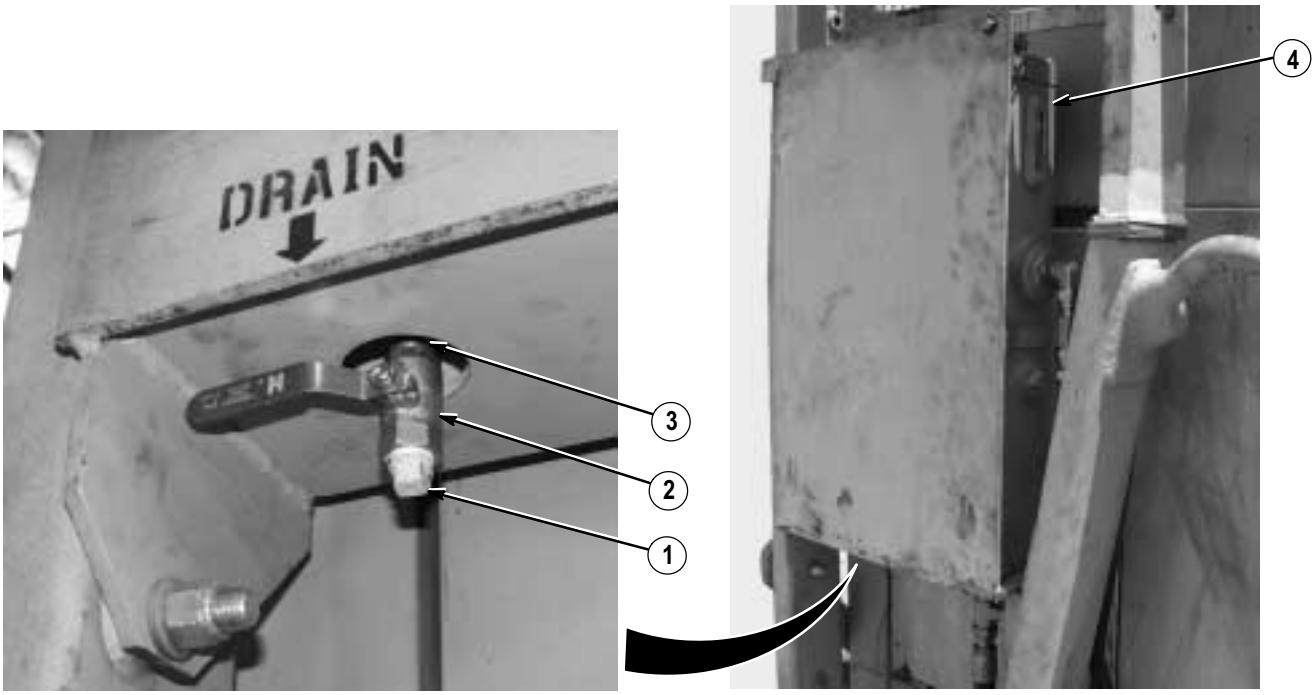
Adhesives, solvents, and sealing compounds can burn easily, can give off harmful vapors, and are harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in well-ventilated area. If adhesive, solvent, or sealing compound gets on skin or clothing, wash immediately with soap and water.

(9) Apply sealing compound to threads of elbow fitting (12) and straight fitting (8)

(10) Attach two hoses (9) and (10), tee-fitting (11) and elbow fitting (12) to hydraulic reservoir (4).

(11) Attach two hoses (5) and (6), tee-fitting (7) and straight fitting (8) to hydraulic reservoir (4).

(12) Fill hydraulic reservoir (4) (refer to Para 7-6a.).



WARNING

Adhesives, solvents, and sealing compounds can burn easily, can give off harmful vapors, and are harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in well-ventilated area. If adhesive, solvent, or sealing compound gets on skin or clothing, wash immediately with soap and water.

(13) Apply sealing compound to threads of drain plug (1).

(14) Install adapter (3), drain valve (2) and drain plug (1) on hydraulic reservoir (4).

c. Follow-On-Maintenance:

- Fill hydraulic reservoir, (Para 7-2).
- Connect batteries, (TM 9-4940-568-10).
- Start generator and check for leaks, (TM 9-4940-568-10).

END OF TASK

CHAPTER 8

GENERATOR AND ENGINE MAINTENANCE

8-1. INTRODUCTION.

This chapter contains maintenance instructions for removing, replacing, repairing, installing and adjusting generator and engine components authorized by the Maintenance Allocation Chart (MAC) at the Unit Maintenance level.

8-2. ENGINE OIL SERVICE.

This task covers:

a. Drain b. Fill c. Follow-On Maintenance

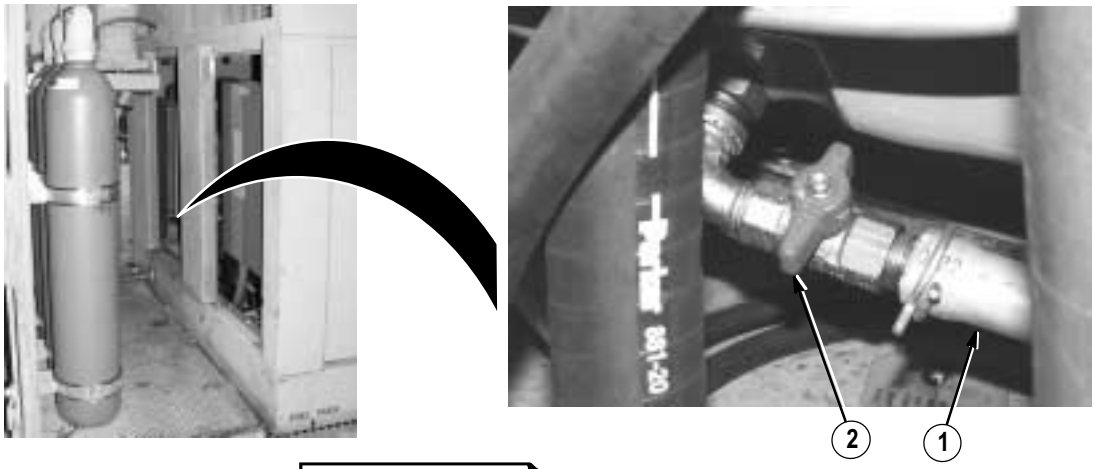
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 30, Appendix G)
Pan, Drain (Item 20, Appendix G)

Equipment Condition
FRS unloaded, (TM 9-4940-568-10)
Engine off, (TM 9-4940-568-10)
Rear left panel removed (TM 9-4940-568-10)

Materials/Parts
Lubricating Oil, Engine (Item 25, Appendix C)
Rags, Wiping (Item 30, Appendix C)

a. Drain.



WARNING

Do not drain engine oil while engine is hot. Severe injury to personnel may result.

(1) Position drain pan under oil pan drain hose (1).

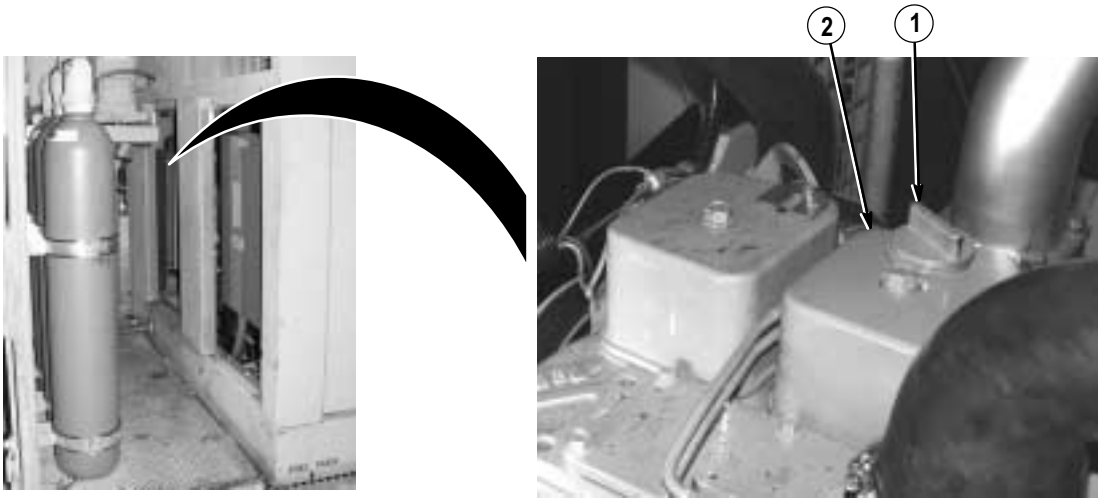
NOTE

Engine oil capacity is 12 qts (11 l).

(2) Open oil drain valve (2) and completely drain all engine oil.

(3) Close oil drain valve (2) and stow oil pan drain hose (1).

b. Fill.



CAUTION

Ensure engine oil drain valve is closed and engine is completely drained of oil. Failure to comply may result in damage to equipment.

(1) Remove engine fill cap (1) from engine valve cover (2).

(2) Fill engine with oil in accordance with Lubrication Table 2-2, Para 2-9.

(3) Install engine fill cap (1) in engine valve cover (2).

c. Follow-On Maintenance:

- Start and run engine for three minutes, (TM 9-4940-568-10).
- Check for oil leaks, (TM 9-4940-568-10).
- Shut OFF engine and allow oil to drain for 20 minutes, (TM 9-4940-568-10).
- Check engine oil level and add engine oil as needed, (TM 9-4940-568-10).
- Install rear left panel, (TM 9-4940-568-10).

END OF TASK

8-3. ENGINE ROCKER ARM, PUSH ROD, COVER AND GASKET REPLACEMENT.

This task covers:

a. Removal
b. Disassembly
c. Cleaning/Inspection
d. Assembly
e. Installation
f. Follow-On Maintenance

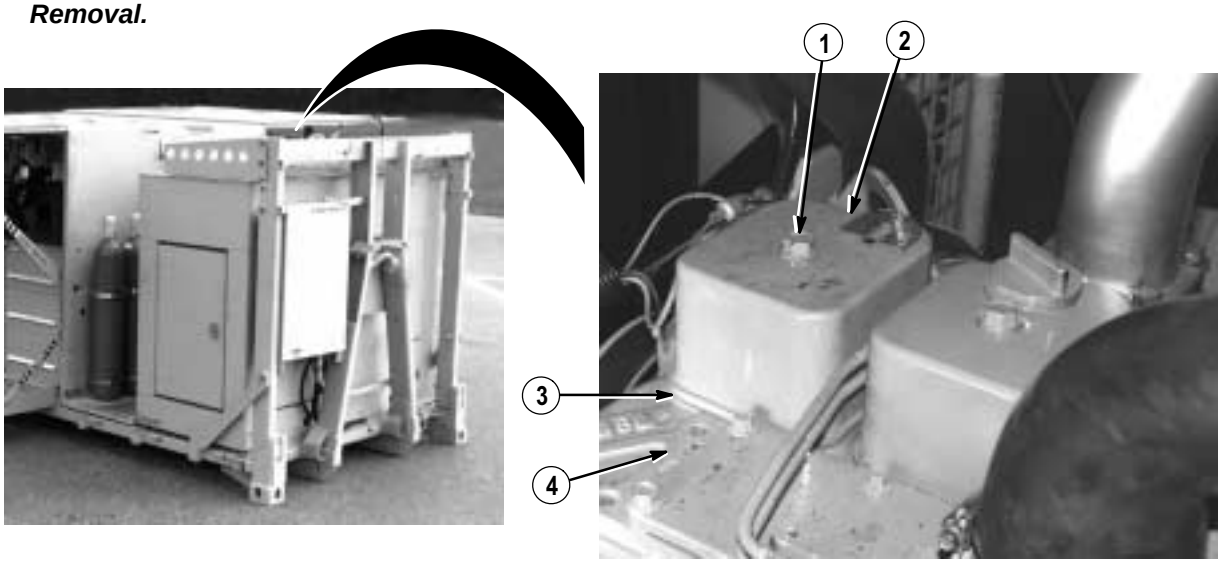
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 30, Appendix G)
Engine Turnover Tool (Item 11, Appendix G)
Socket Set, 3/8 in. (Item 25, Appendix G)
Wrench, Torque (0 to 60 N·m) (Item 46, Appendix G)

Materials/Parts
Gasket (Item 9, Appendix F)

Equipment Condition
FRS unloaded, (TM 9-4940-568-10)
Batteries disconnected, (TM 9-4940-568-10)
Rear panel removed, (TM 9-4940-568-10)

a. Removal.



WARNING

Ensure engine is cool before performing this task or injury to personnel may result.

NOTE

This procedure applies to all eight rocker arms. Exhaust rocker arm shown.

(1) Remove screw (1), rocker arm cover (2) and gasket (3) from cylinder head (4). Discard gasket.

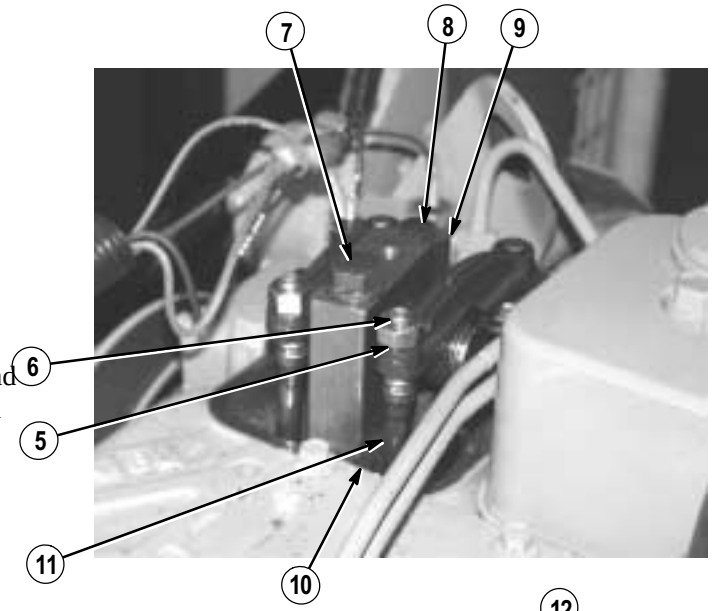
WARNING

Use care when removing or installing retaining rings. Retaining rings are under spring tension and could cause severe eye injury.

(2) Loosen two jam nuts (5) and loosen adjusting screws (6) until they stop

(3) Remove long screw (7), short screw (8) and rocker arm assembly (9) from engine head (10).

(4) Remove two push rods (11) from engine head (10).



b. Disassembly.

WARNING

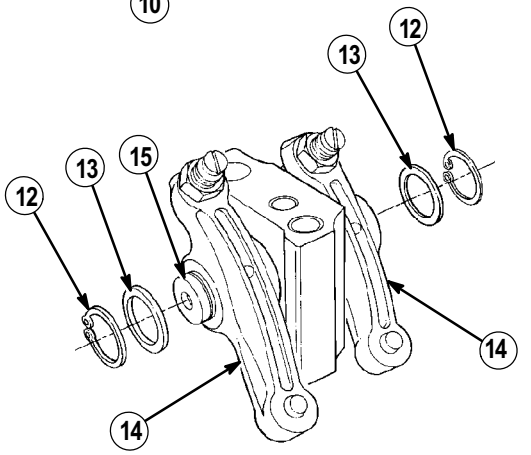
Use care when removing or installing retaining rings. Retaining rings are under spring tension and could cause severe eye injury.

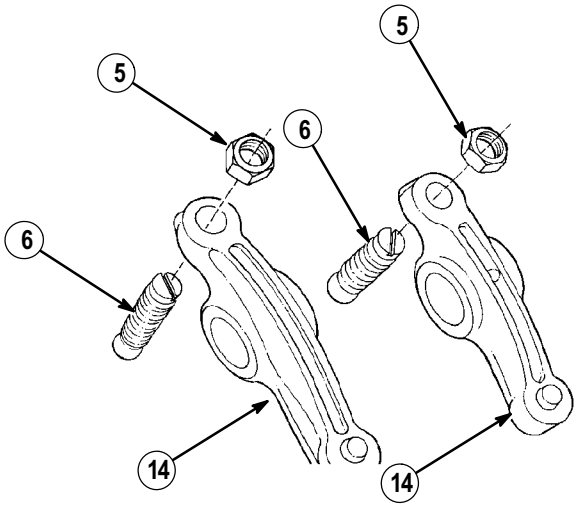
NOTE

Note position of intake and exhaust rocker arm levers proir to removal.

(1) Remove two retaining rings (12), thrust washers (13) and rocker levers (14) from rocker lever shaft (15).

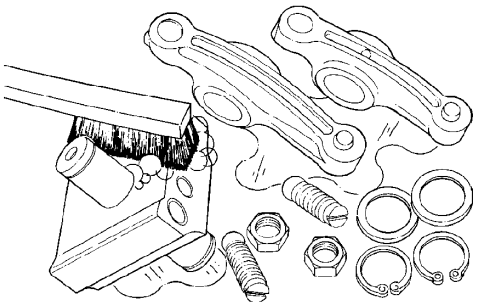
(2) Remove two jam nuts (5) and adjusting screws (6) from rocker levers (14).





8-3. ENGINE ROCKER ARM, COVER AND GASKET REPLACEMENT (CONT).

c. Cleaning/Inspection.



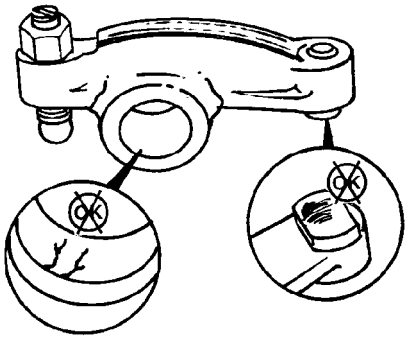
(1) Clean all parts in a strong solution of laundry detergent in hot water.

WARNING

Compressed air used for cleaning purposes will not exceed 30 psi (207 kPa). Use only with effective chip guarding and personal protective equipment (goggles/shield, gloves, etc). Failure to comply may result in injury to personnel.

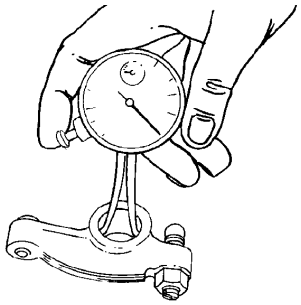
NOTE

Pedestals are made from powdered metal and will continue to show wetness after they have been cleaned and dried.

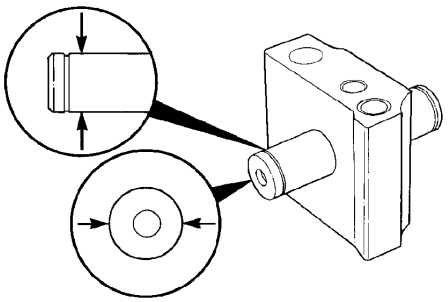


(2) Rinse all parts with clean hot water and dry with compressed air.

(3) Inspect for cracks and excessive wear in the bore and contact surface of the rocker levers.



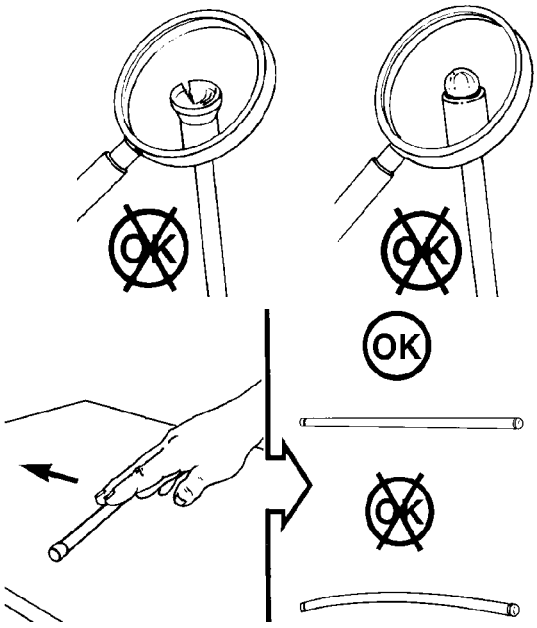
(4) Measure rocker lever bore. Diameter (Maximum): 0.75 in. (19.05 mm).



(5) Inspect rocker lever pedestal and rocker lever shaft. Measure rocker lever shaft: Diameter (Minimum): 0.746 in. (18.94 mm).

(6) Inspect pushrod ball and socket for signs of scoring. Check for cracks where the ball and the socket are pressed in the tube.

(7) Check push rods for roundness and staightness.



d. Assembly.

(1) Install two adjusting screws (6) and jam nuts (5) on rocker levers (14). Do not tighten.

(2) Lubricate rocker lever shaft (15) with lubricating oil.

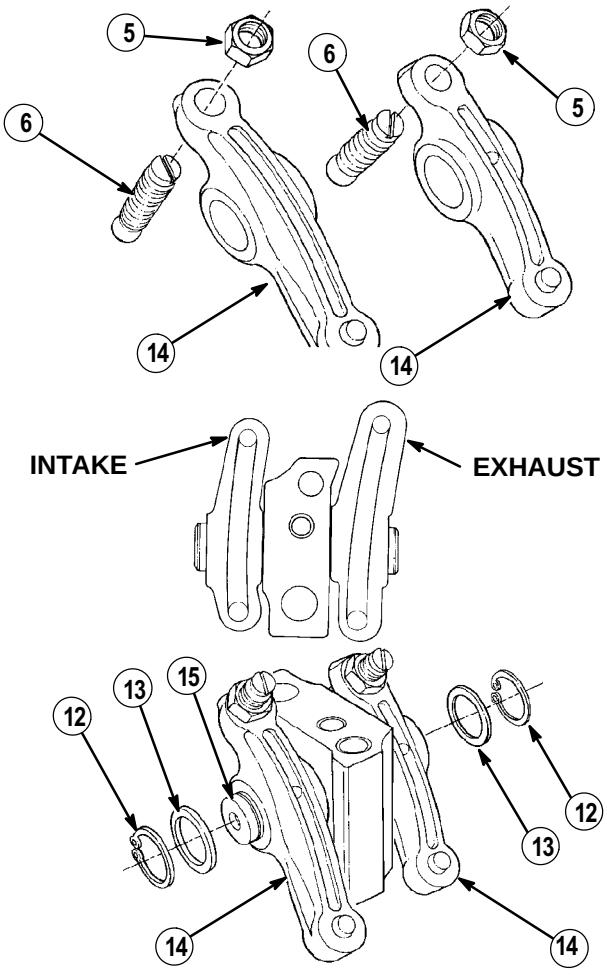
WARNING

Use care when removing or installing retaining rings. Retaining rings are under spring tension and could cause severe eye injury.

NOTE

Position intake and exhaust rocker arm levers noted during disassembly.

(3) Install two rocker levers (14) on rocker lever shaft (15) with two thrust washers (13) and retaining rings (12).



8-3. ENGINE ROCKER ARM, COVER AND GASKET REPLACEMENT (CONT).

e. Installation.

CAUTION

To prevent damage to the engine or pin, disengage the pin after locating Top Dead Center (TDC).

(1) Remove cover from engine (16).

(2) Install engine turnover tool (17) on engine (16).

NOTE

When engine timing pin engages hole in camshaft gear, cylinder number one is at TDC on the compression stroke.

(3) Using engine turnover tool (17), turn engine slowly while pressing the engine timing pin (18) and locate TDC for cylinder Number 1.

(4) Lubricate push rod sockets on engine head (10) with lubricating oil.

(5) Install two push rods (11) in push rod sockets on engine head (10).

(6) Ensure rocker lever adjusting screws (6) are completely backed out.

(7) Lubricate threads and underheads of long screw (7) and short screw (8).

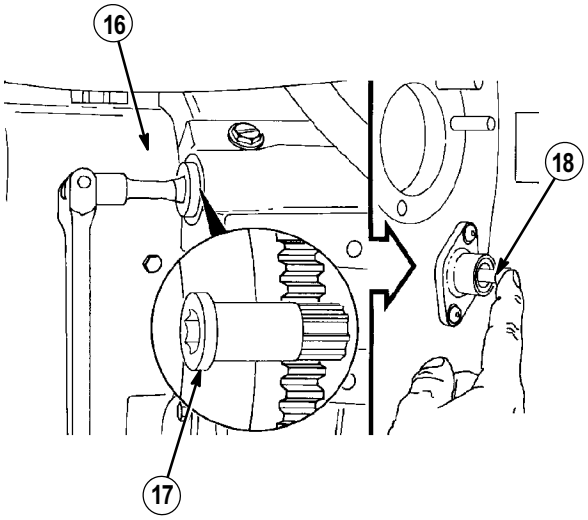
NOTE

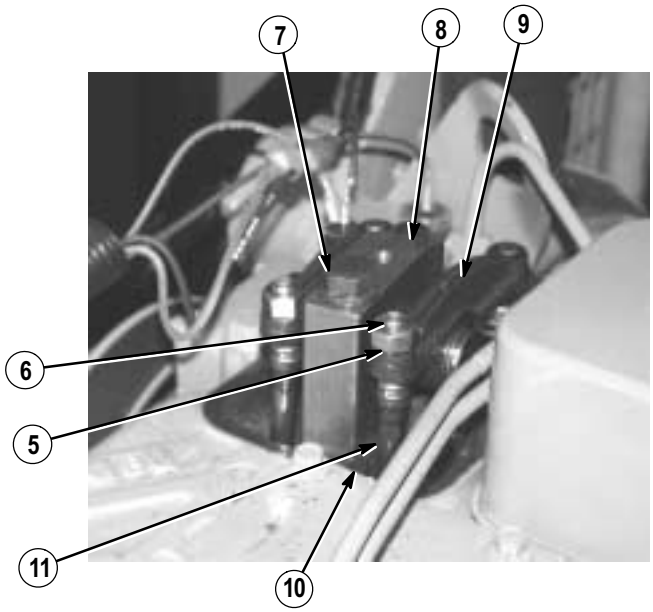
Ensure dowl ring on bottom of pedestal aligns with dowl bore on engine head.

(8) Install rocker arm assembly (9) on engine head (10) with long screw (7) and short screw (8). Tighten long screw to 66 lb-ft (90 N·m).

(9) Tighten long screw (7) to 90 lb-ft (120 N·m). Rotate long screw an additional 90°.

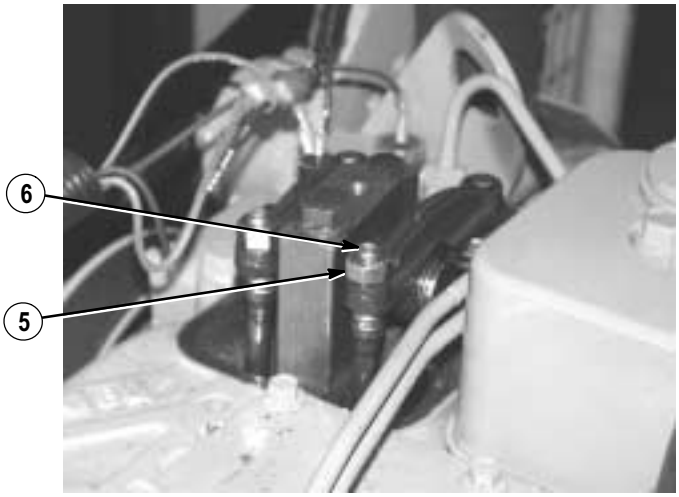
(10) Tighten short scerw (8) to 18 lb-ft (24 N·m).





NOTE

- Intake valve clearance .010 in. (0.254 mm).
- Exhaust valve clearance .020 in. (0.508 mm).
- Valve adjustment may only be done on cool engine (140°F) (60°C).
- The clearance is correct when some resistance is “felt” when the feeler gauge is placed between the valve stem and the rocker arm.

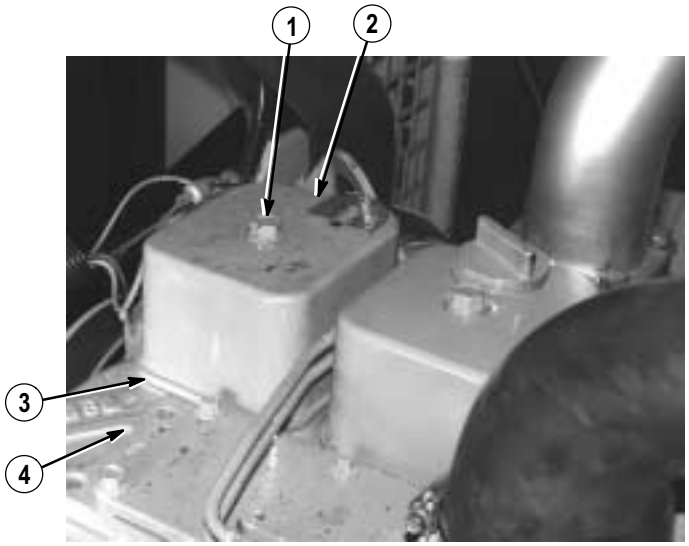


(11) Tighten tappet adjustment screw (6) until proper clearance is obtained.

(12) While keeping tappet adjustment screw (6) at the correct clearance tighten jamnut (5) to 18 lb-ft (24 N·m).

NOTE

- If more than one rocker arm is replaced, repeat Steps (4) through (12).
- The engine crankshaft must be rotated 360° for each rocker arm installed.



(13) Install gasket (3), rocker arm cover (2) and screw (1) on cylinder head (4). Tighten screw to 18 lb-ft (24 N·m).

f. Follow-On Maintenance:

- Install rear panel, (TM 9-4940-568-10).
- Start generator and listen for unusual noise and leaks, (TM 9-4940-568-10).
- Connect batteries, (TM 9-4940-568-10).

END OF TASK

8-4. ENGINE OIL PAN/GASKET REPLACEMENT.

This task covers:

a. Removal
b. Cleaning/Inspection
c. Installation
d. Follow-On Maintenance

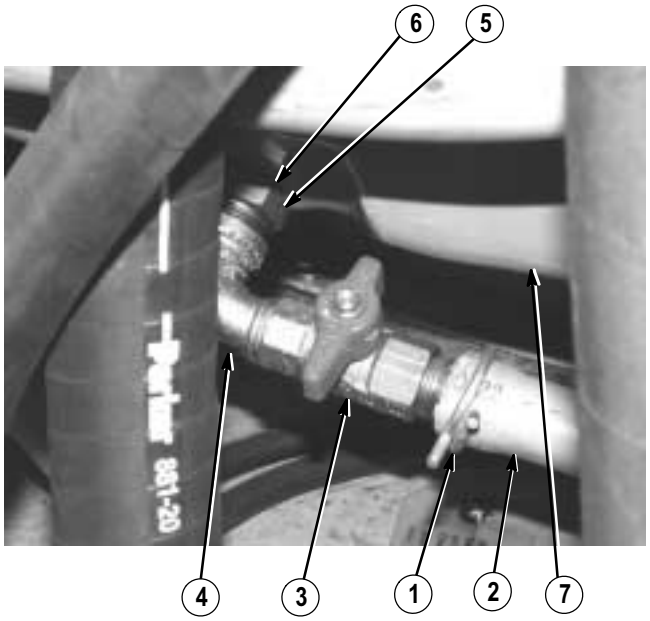
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 30, Appendix G)
Pan, Drain (Item 20, Appendix G)
Removal Tool, Oil Filter (Item 22, Appendix G)
Socket Set, 3/8 in. (Item 25, Appendix G)
Wrench, Torque (0 to 60 N·m) (Item 46, Appendix G)

Materials/Parts
Lubricating Oil, Engine (Item 25, Appendix C)
Gasket, Oil Drain (Item 19, Appendix F)
Gasket, Oil Pan Engine (Item 21, Appendix F)
Gasket, Oil Suction Tube (Item 22, Appendix F)
Lockwasher (Item 66, Appendix F)

Equipment Condition
FRS unloaded, (TM 9-4940-568-10)
Batteries removed, (Para 3-14)
Engine oil drained, (Para 8-5)

a. Removal.



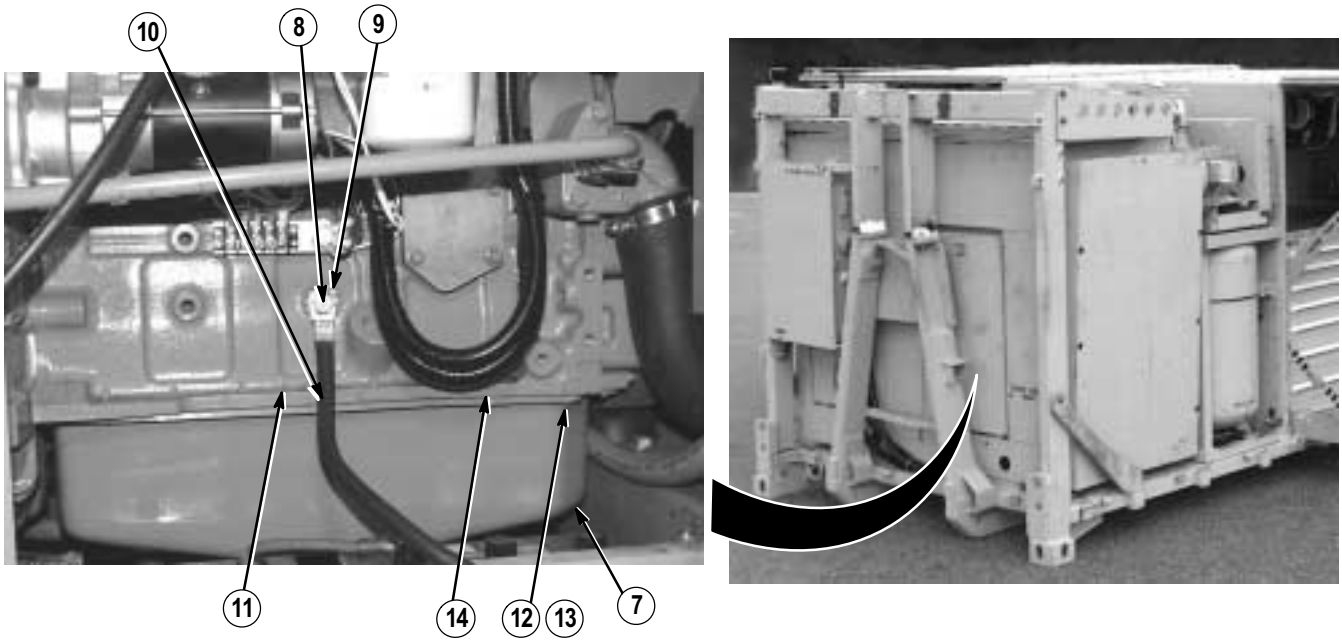
WARNING

Ensure engine is cool before performing this task or injury to personnel may result.

(1) Remove hose clamp (1) and drain hose (2) from drain valve (3).

(2) Remove drain valve (3) and elbow (4) from adapter (5).

(3) Remove adapter (5) and gasket (6) from engine oil pan (7). Discard gasket.

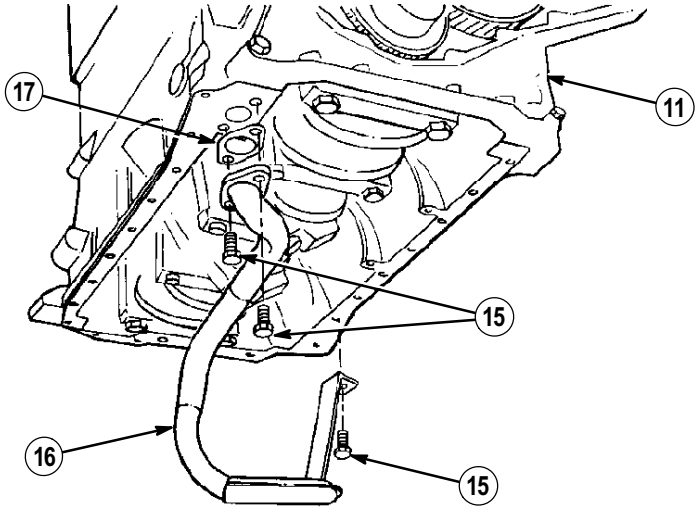


(4) Remove screw (8), lockwasher (9) and battery ground cable (10) from engine block (11). Discard lockwasher.

NOTE

Note location of screws prior to removal.

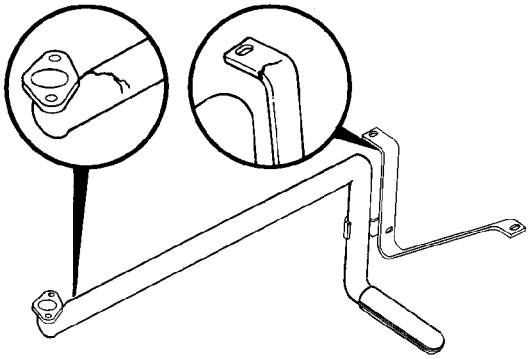
(5) Remove 25 screws (12), two screws (13), engine oil pan (7) and gasket (14). Discard gasket.

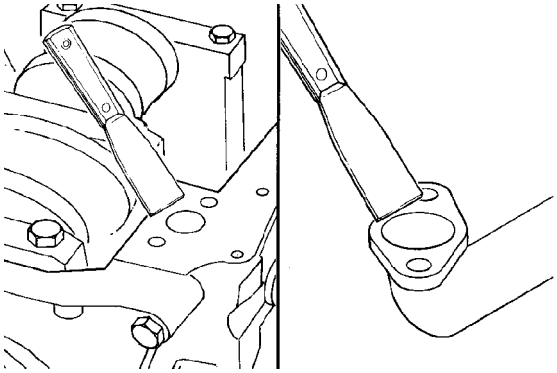


(6) Remove three screws (15), lubricating oil suction tube (16), and gasket (17) from engine block (11). Discard gasket.

8-4. ENGINE OIL PAN/GASKET REPLACEMENT (CONT).

b. Cleaning/Inspection.

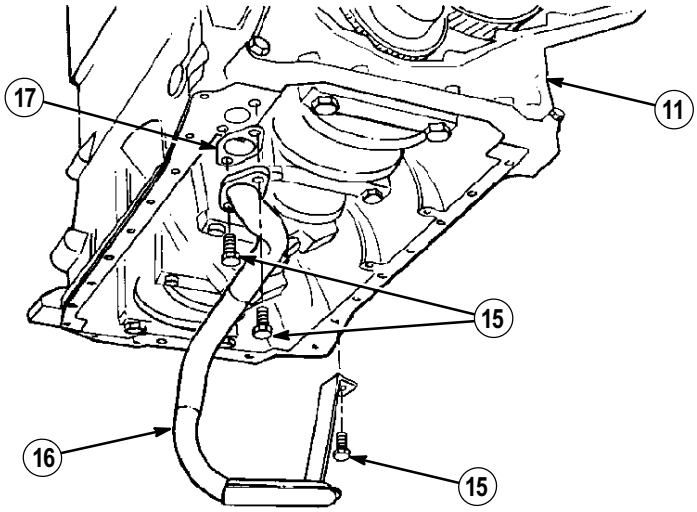




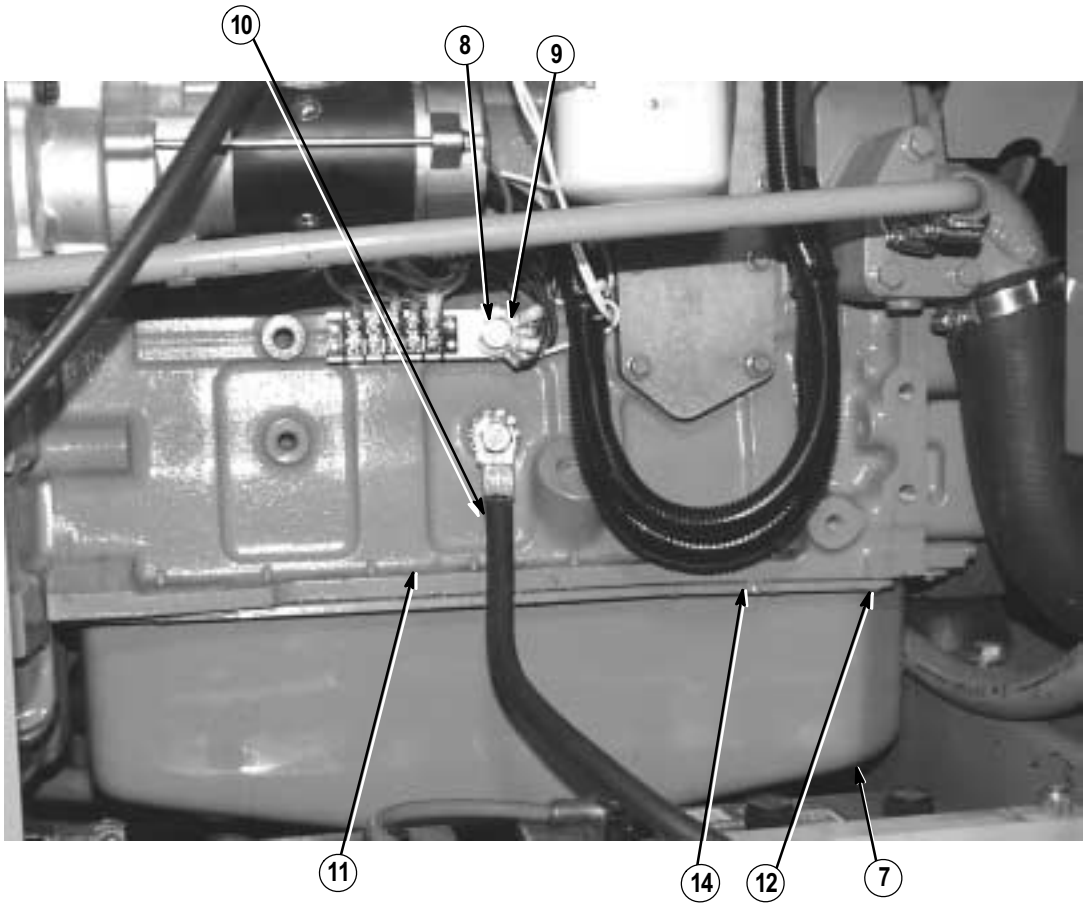
(1) Inspect the suction tube for cracks.

(2) Clean the gasket surfaces.

c. Installation.



(1) Install gasket (17), lubricating oil suction tube (16), and three screws (15) onto engine block (11). Torque screws to 18 lb-ft (24 N·m).



NOTE

Do not tighten engine oil pan screws until all 27 screws are installed.

(2) Place gasket (14) on engine oil pan (7).

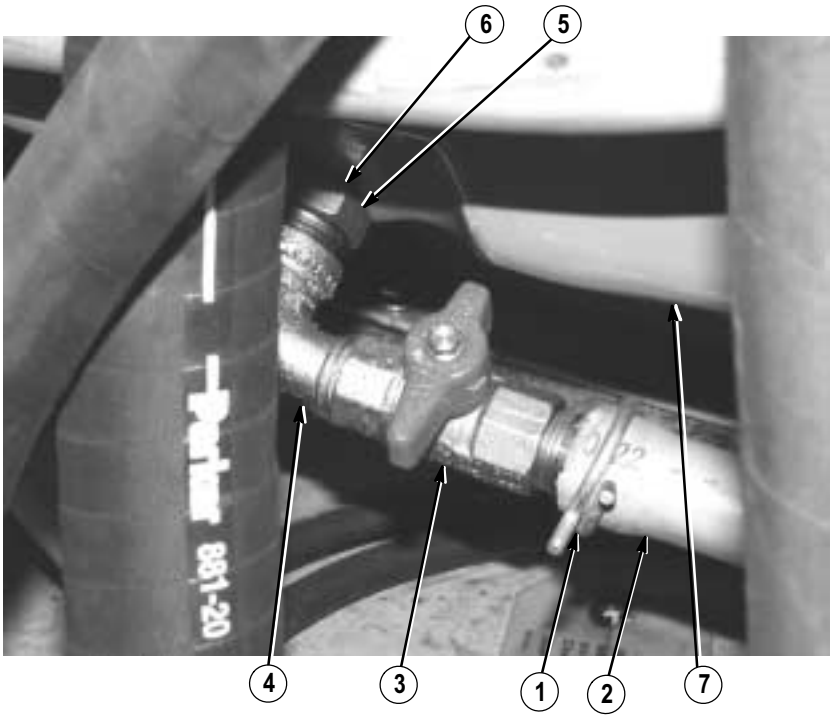
NOTE

Install screws in Step (3) as noted prior to removal

(3) Install engine oil pan (7), 25 screws (12) and two screws (13) on engine block (11). Torque 27 screws to 18 lb–ft (24 N·m).

(4) Install screw (8), lockwasher (9) and battery ground cable (10) on engine block (11).

8-4. ENGINE OIL PAN/GASKET REPLACEMENT (CONT).



(5) Install gasket (6) and adapter (5) on engine oil pan (7).

(6) Install hose clamp (1) and drain hose (2) on drain valve (3).

(7) Install elbow (4) and drain valve (3) on adapter (5).

d. Follow-On Maintenance:

- Fill engine with oil, (Para 8-5).
- Install batteries, (Para 3-14).
- Start generator and check for leaks, (TM 9-4940-568-10).

END OF TASK

8-5. ENGINE OIL FILTER REPLACEMENT.

This task covers:

a. Removal b. Installation c. Follow-On Maintenance

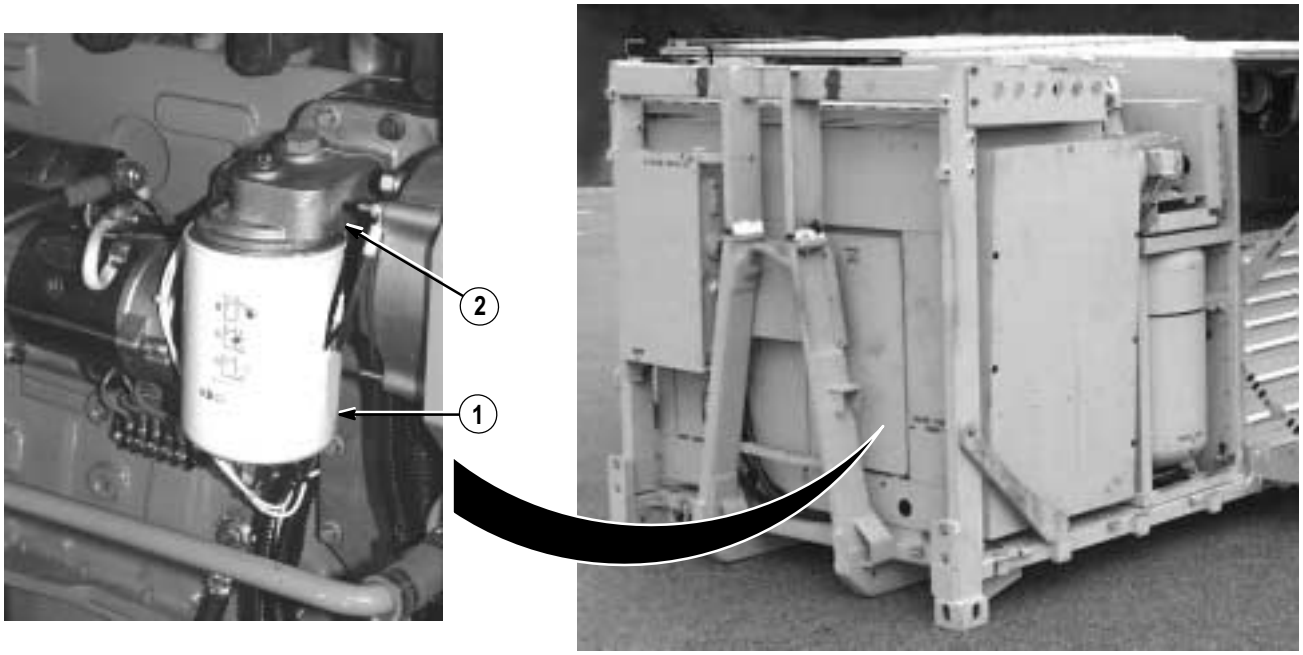
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 30, Appendix G)
Pan, Drain (Item 20, Appendix G)
Removal Tool, Oil Filter (Item 22, Appendix G)

Materials/Parts
Lubricating Oil, Engine (Item 25, Appendix C)
Rags, Wiping (Item 30, Appendix C)

Equipment Condition
FRS unloaded, (TM 9-4940-568-10)
Engine OFF, (TM 9-4940-568-10)
Front panel removed, (TM 9-4940-568-10)

a. Removal.



WARNING

Ensure engine is cool before performing this task or injury to personnel may result.

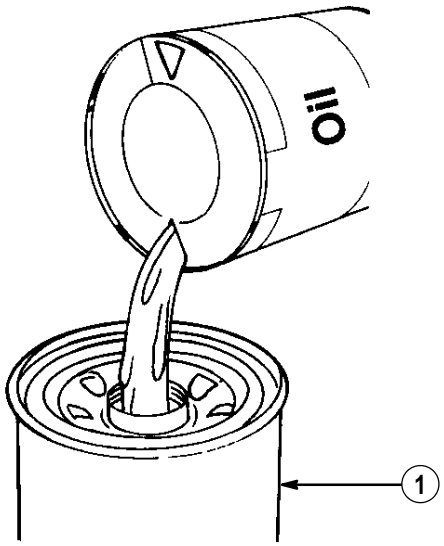
(1) Position drain pan under engine oil filter (1).

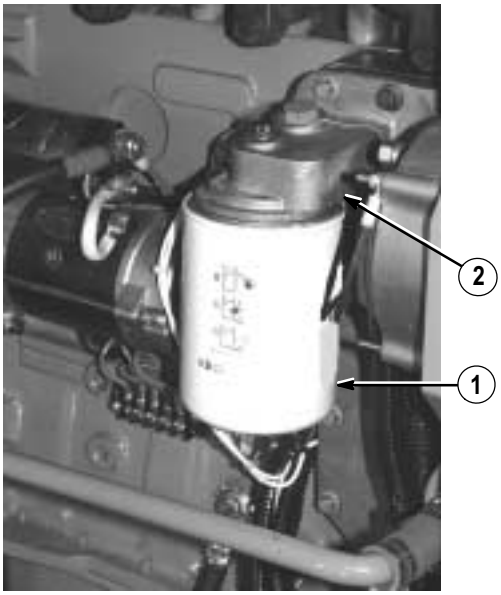
(2) Using oil filter removal tool, loosen engine oil filter (1) by turning counterclockwise.

(3) Remove engine oil filter (1) from filter head (2). Discard oil filter.

8-5. ENGINE OIL AND OIL FILTER REPLACEMENT (CONT).

b. Installation.





(1) Lubricate oil filter seal with clean engine oil.

(2) Fill engine oil filter (1) 2/3 full with clean engine oil.

(3) Install engine oil filter (1) on filter head (2).

CAUTION

Do not use oil filter removal tool to tighten engine oil filter or possible damage to filter and filter head may result.

(4) By hand, tighten engine oil filter (1) until it makes contact with filter head (2).

(5) By hand, tighten engine oil filter (1) 2/3 turn after contact with filter head (2).

c. Follow-On Maintenance:

- Start and run generator for three minutes, (TM 9-4940-568-10).
- Check for oil leaks, (TM 9-4940-568-10).
- Shut OFF generator for at least 10 minutes, (TM 9-4940-568-10).
- Check oil level and add engine oil as needed, (TM 9-4940-568-10).
- Install front panel, (TM 9-4940-568-10).

END OF TASK

8-6. ENGINE OIL FILTER HEAD AND GASKET REPLACEMENT.

This task covers:

a. Removal
b. Disassembly
c. Cleaning/Inspection
d. Assembly
e. Installation
f. Follow On Maintenance

INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 30, Appendix G)
Compressor Unit, Air (Item 4, Appendix G)
Gloves, Chemical Oil Protective (Item 13, Appendix G)
Goggles, Industrial (Item 14, Appendix G)
Gun, Air Blow (Item 15, Appendix G)

Materials/Parts
Solvent, Dry Cleaning (Item 38, Appendix C)
Gasket (Item 8, Appendix F)
Gasket, Oil Filter Head (Item 20, Appendix F)

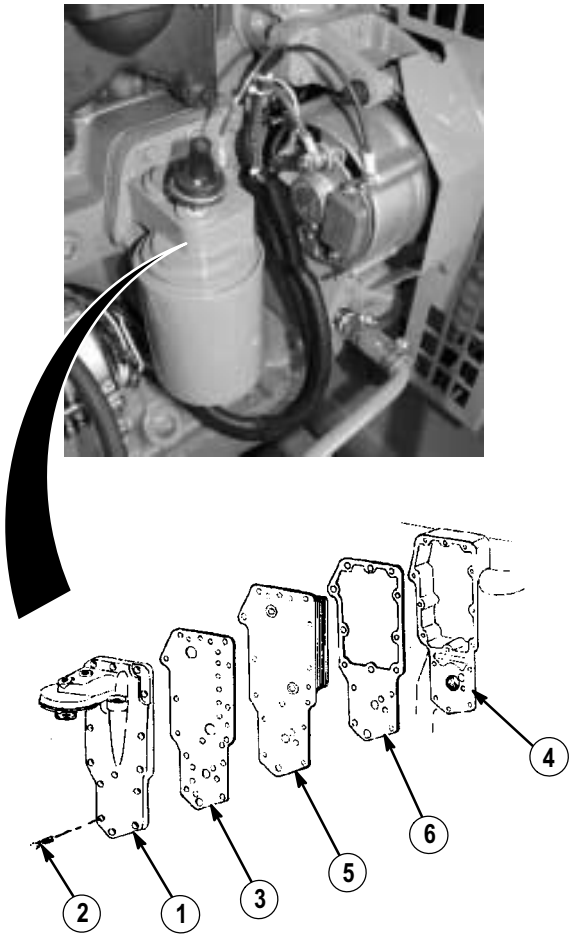
Equipment Condition
Engine oil filter removed, (Para 8-5)
Coolant drained, (Para 8-25)
Oil pressure sending unit removed, (Para 8-37)

a. Removal.

(1) Clean area around the oil filter head (1).

(2) Remove 14 screws (2), oil filter head (1) and oil filter head gasket (3) from engine (4). Discard oil filter head gasket.

(3) Remove oil transfer connection (5) and gasket (6) from engine (4). Discard gasket.

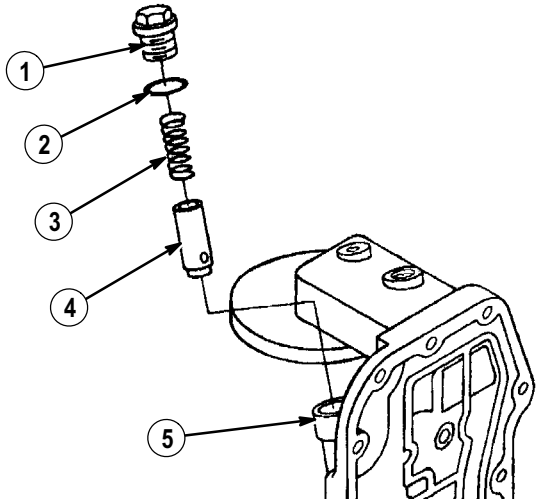


8-6. ENGINE OIL FILTER HEAD AND GASKET REPLACEMENT (CONT).

b. Disassembly.

(1) Clean area around plug (1).

(2) Remove plug (1), preformed packing (2), spring (3) and plunger (4) from oil filter head (5). Discard preformed packing.



c. Cleaning/Inspection.

WARNING

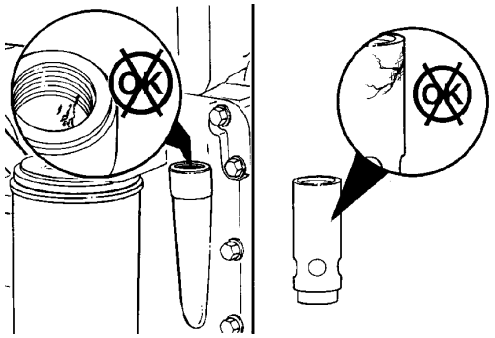
- Drycleaning Solvent (P-D-680) is TOXIC and flammable. Wear protective goggles, face shield, and gloves; use only in a well-ventilated area; avoid contact with skin, eyes, and clothes, and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent. The flashpoint for Type II 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.

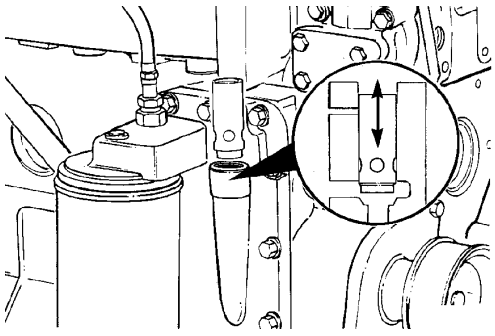
(1) Clean all sealing surfaces.

(2) Clean all parts with drycleaning solvent.

WARNING

Compressed air used for cleaning purposes will not exceed 30 psi (207 kPa). Use only with effective chip guarding and personal protective equipment (goggles/shield, gloves, etc.) or injury to personnel may result.





(3) Dry all parts with compressed air.

(4) Check plunger, spring and bore for cracks. Polished areas on plunger and bore are acceptable.

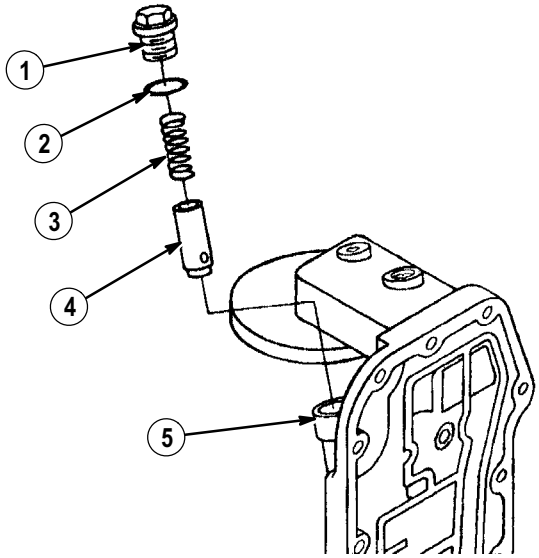
(5) Verify plunger moves freely in bore.

d. Assembly.

(1) Install plunger (4) in bore of oil filter head (5).

(2) Install preformed packing (2) on plug (1) and lubricate with clean engine oil.

(3) Install spring (3), preformed packing (2) and plug (1) on oil filter head (5). Tighten plug to 60 ft-lb (80 N·m).



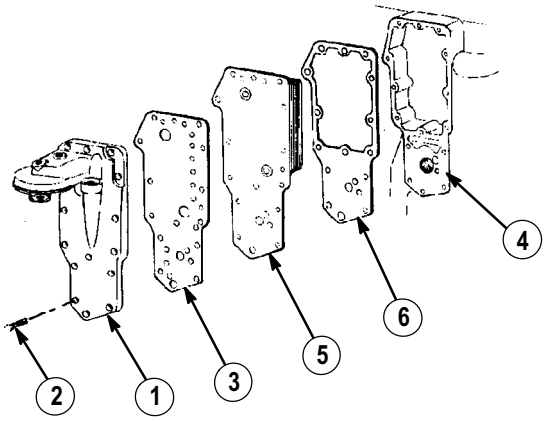
e. Installation.

NOTE

If using a new oil transfer connection, ensure plugs are removed.

(1) Position gasket (6) and oil transfer connection (5) on engine (4).

(2) Install oil filter head gasket (3) and oil filter head (1) on engine (4) with 14 screws (2). Tighten screws to 18 ft-lb (24 N·m).



f. Follow-On Maintenance:

- Install oil pressure sending unit, (Para 8-37).
- Install engine oil filter, (Para 8-5).
- Fill coolant, (Para 8-25).
- Start generator set and check for leaks (TM 9-4940-568-10).

END OF TASK

8-7. REMOTE START SWITCH (GENERATOR) REPLACEMENT.

This task covers:

a. Removal b. Installation c. Follow-On Maintenance

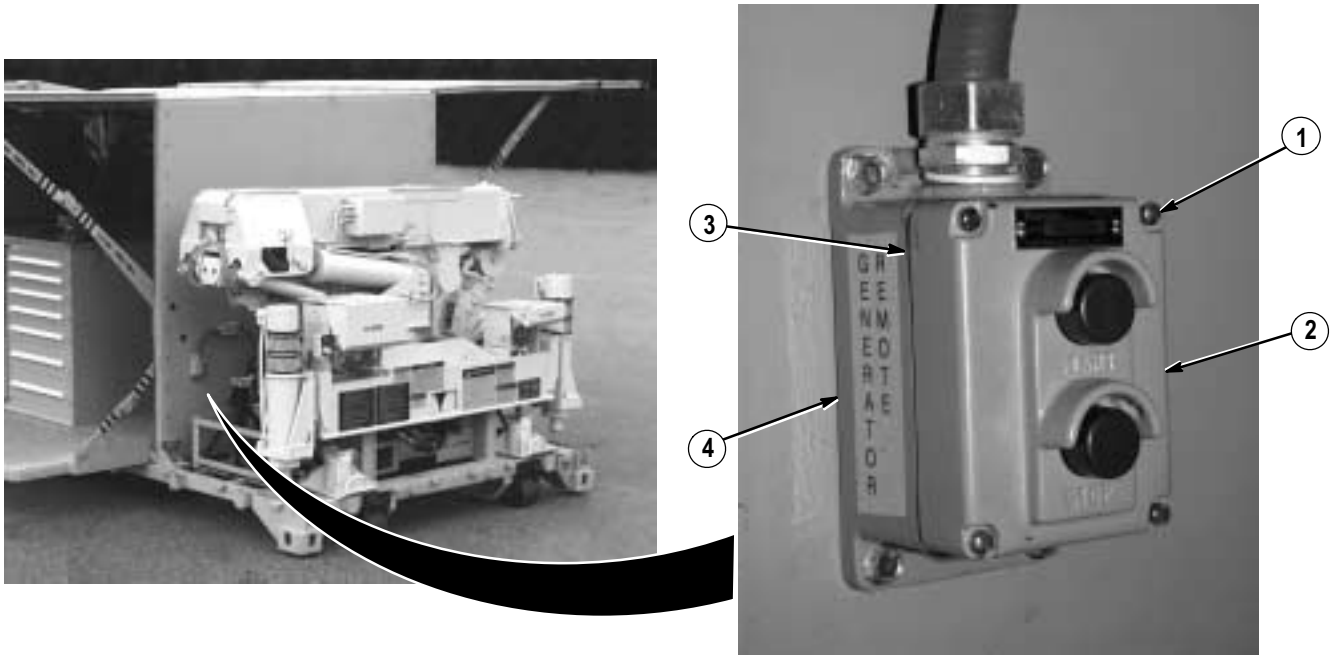
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 30, Appendix G)
Tool Kit, Electric (Item 29, Appendix G)

Materials/Parts
Tags, Identification (Item 40, Appendix C)
Gasket (Item 14, Appendix F)
Lockwasher (2) (Item 83, Appendix F)

Equipment Condition
FRS unloaded, (TM 9-4940-568-10)
Batteries disconnected, (TM 9-4940-568-10)

a. Removal.

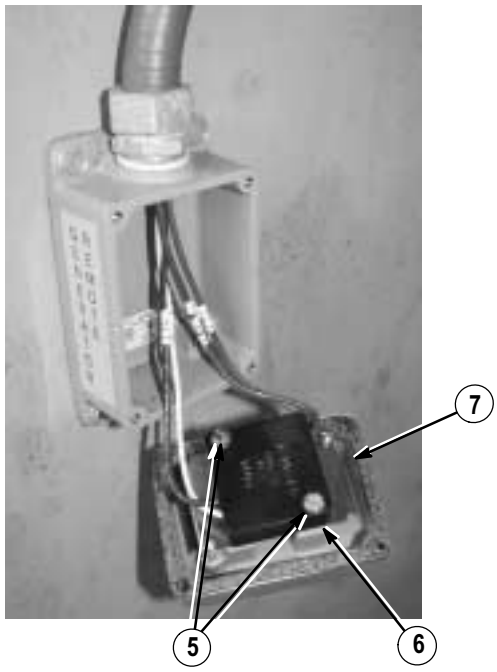


NOTE

There are two remote start switches. Both are replaced the same way. Outside left rear shelter switch is shown.

(1) Remove four screws (1), remote start switch cover plate (2) and gasket (3) from remote start switch housing (4).

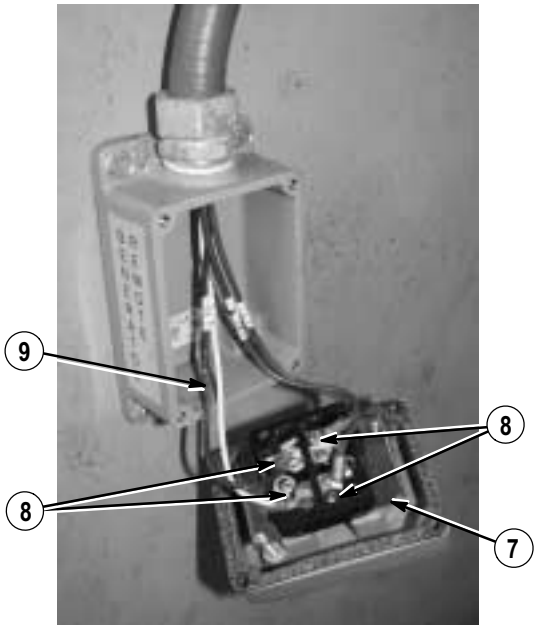
(2) Remove two screws (5) and cover (6) from remote start switch (7).



NOTE

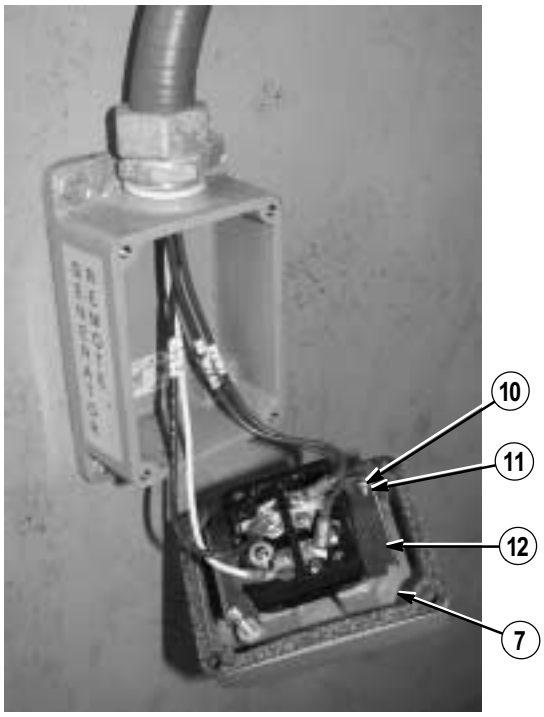
Tag and mark all wires prior to removal.

(3) Remove four screws (8) and wires (9) from remote start switch (7).



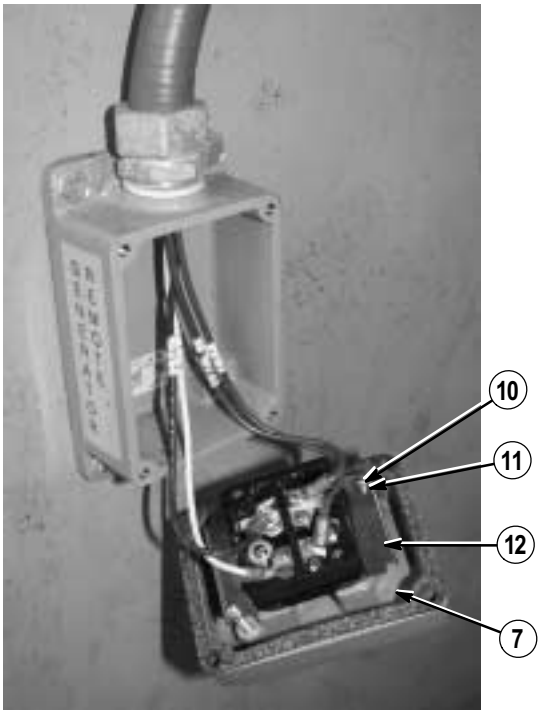
8-7. REMOTE START SWITCH (GENERATOR) REPLACEMENT (CONT).

(4) Remove two screws (10), lockwashers (11) and brackets (12) from remote start switch (7). Discard lockwashers.

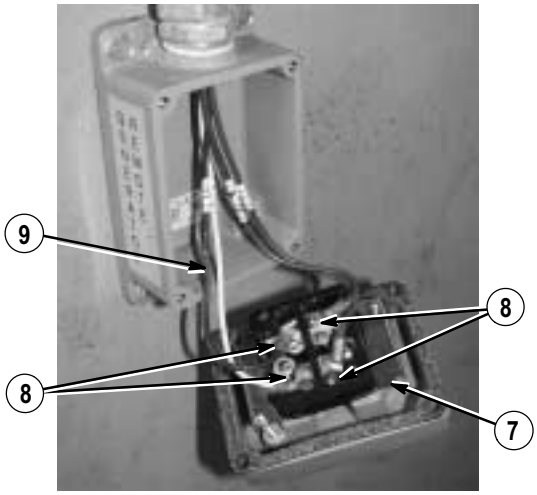


b. Installation.

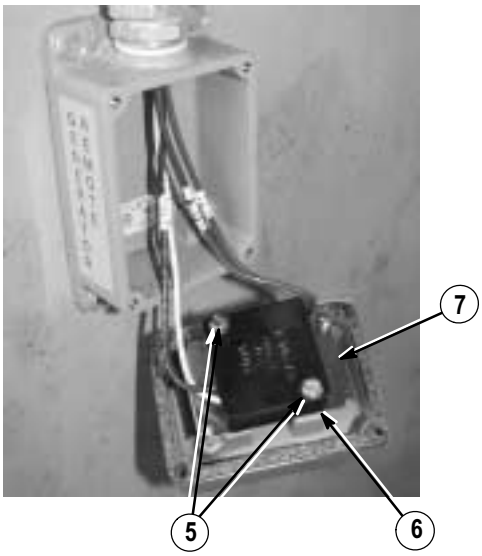
(1) Install two brackets (12), lockwashers (11) and screws (10) on remote start switch (7).



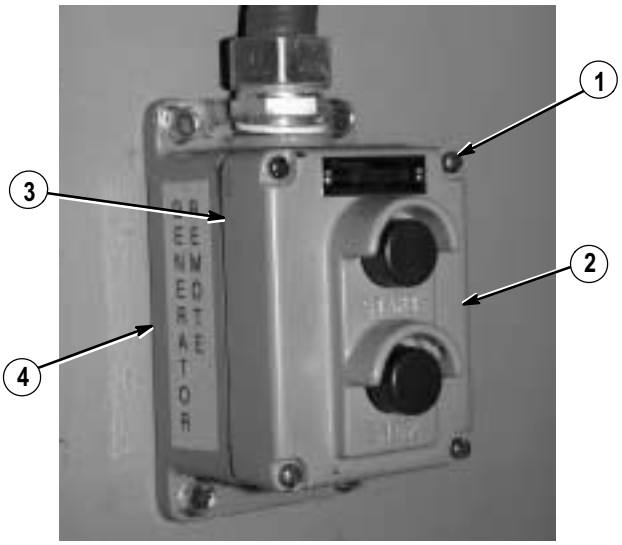
(2) Install wires (9) on remote start switch (7), with four screws (8).



(3) Install cover (6) on remote start switch (7) with two screws (5).



(4) Install four screws (1), remote start switch cover plate (2) and gasket (3) on remote start switch housing (4).



c. Follow-On Maintenance:

- Connect batteries, (TM 9-4940-568-10).
- Start generator from remote start switch, (TM 9-4940-568-10).

END OF TASK

8-8. ETHER STARTING AID REPLACEMENT.

This task covers:

a. Removal b. Installation c. Follow-On Maintenance

INITIAL SETUP

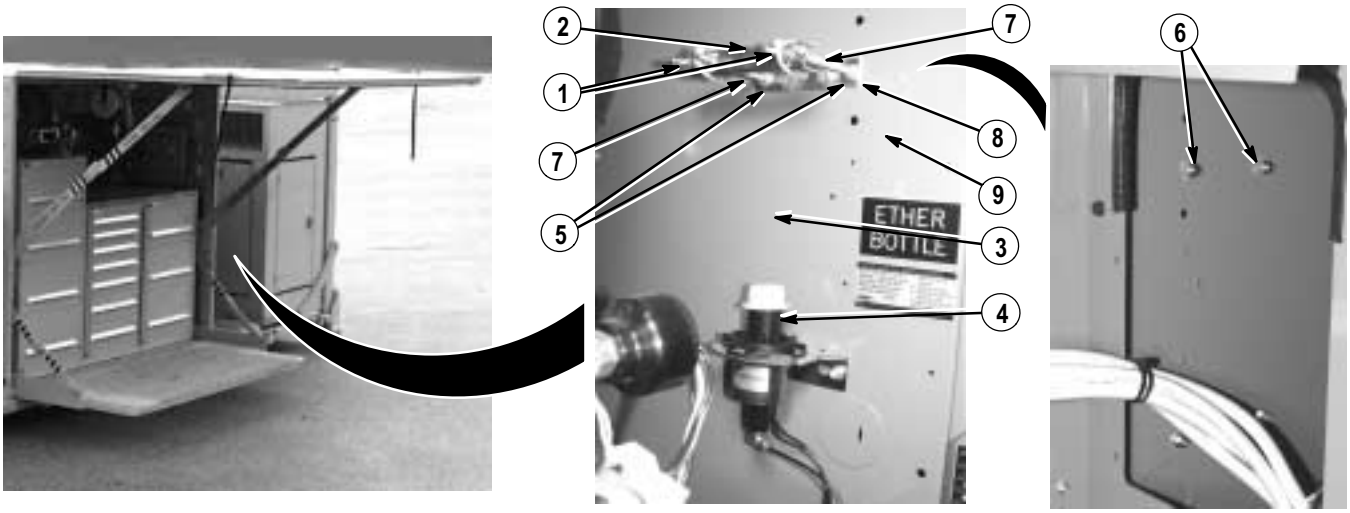
Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 30, Appendix G)
Tool Kit, Electrical (Item 29, Appendix G)

Materials/Parts
Cable Ties (Item 10, Appendix C)

Materials/Parts – Continued
Sealing Compound (Item 34, Appendix C)
Tags, Identification (Item 40, Appendix C)

Equipment Condition
FRS unloaded, (TM 9-4940-568-10)
Batteries disconnected, (TM 9-4940-568-10)
Remove rear panel, (TM 9-4940-568-10)

a. Removal.



WARNING

Starting fluid is toxic and highly flammable. Container is pressurized. NEVER heat container and NEVER discharge starting fluid in confined areas or near open flame. Severe injury to personnel may result.

NOTE

Remove cable ties as necessary.

(1) Remove generator circuit breaker panel as outlined in Engine Electronic Overspeed Module Replacement (Para 8-16).

(2) Remove two wingnuts (1) and clamp (2).

(3) Remove ether supply cylinder (3) by turning counterclockwise from solenoid valve (4).

(4) Remove two nuts (5), nuts (6), studs (7) and bracket (8) from generator panel (9).

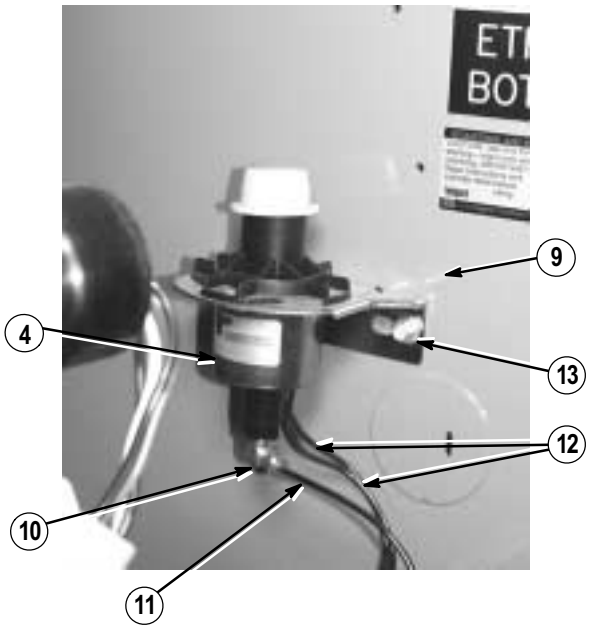
NOTE

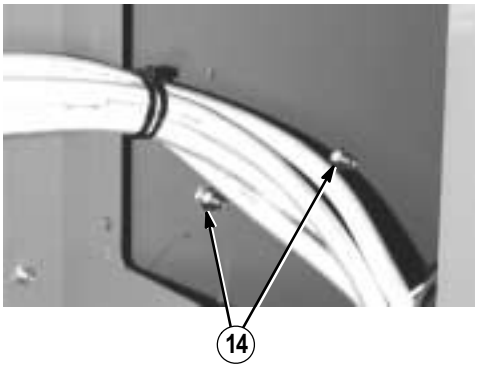
Tag and mark all wires prior to removal.

(5) Remove fitting (10) and ether tube (11) from solenoid valve (4).

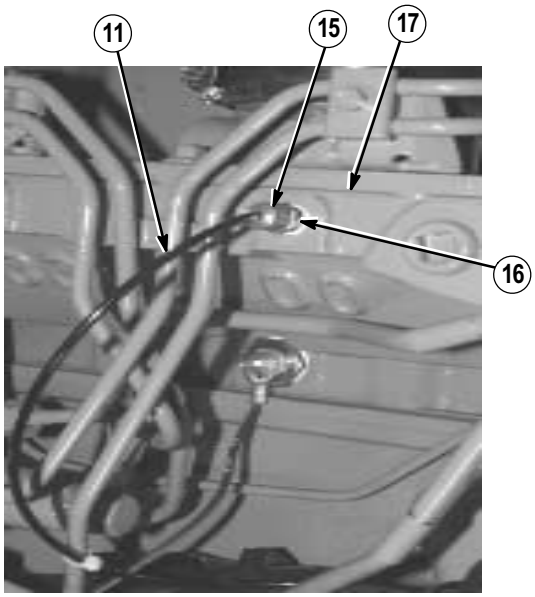
(6) Cut two wires (12) from solenoid valve (4).

(7) Remove two screws (13), nuts (14) and solenoid valve (4) from generator panel (9).



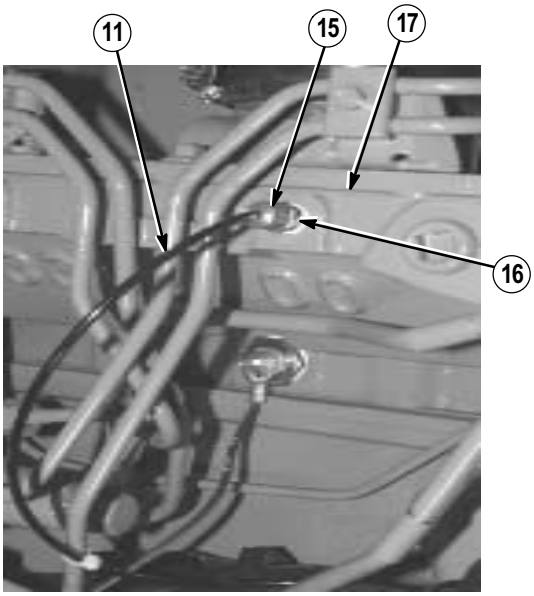


(8) Remove nut (15), ether tube (11) and atomizer (16) from engine cylinder head (17).



8-8. ETHER START AID ASSEMBLY REPLACEMENT (CONT).

b. Installation.



WARNING

Adhesives, solvents, and sealing compounds can burn easily, can give off harmful vapors, and are harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in well-ventilated area. If adhesive, solvent, or sealing compound gets on skin or clothing, wash immediately with soap and water.

NOTE

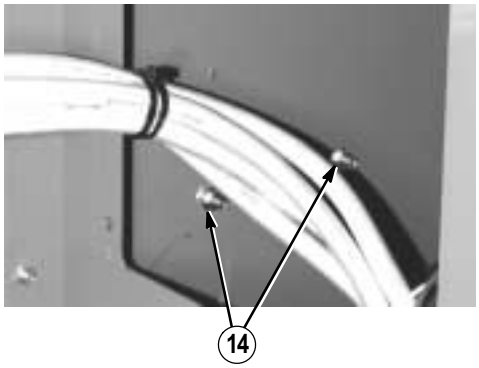
Install cable ties as necessary.

(1) Apply sealing compound to threads of atomizer (16).

NOTE

Atomizer opening at end of fitting must point straight up when installed in cylinder head.

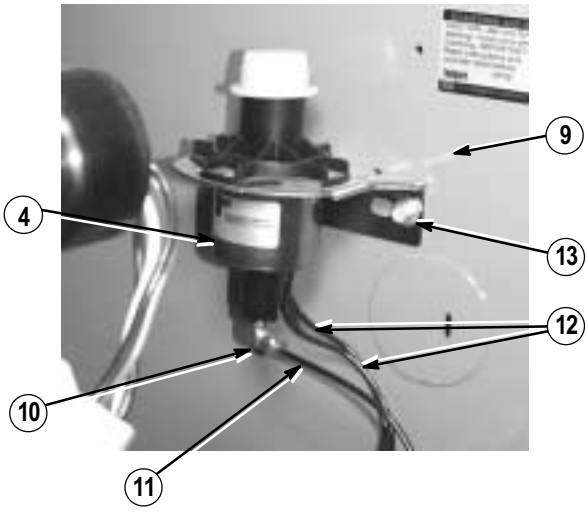
(2) Install atomizer (16), ether tube (11) and nut (15) on engine cylinder head (17).



(3) Install solenoid valve (4) on generator panel (9) using two screws (13) and nuts (14).

(4) Connect two wires (12) and crimp to solenoid valve (4).

(5) Install fitting (10) and ether tube (11) to solenoid valve (4).

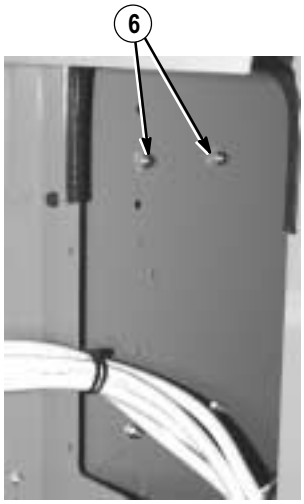


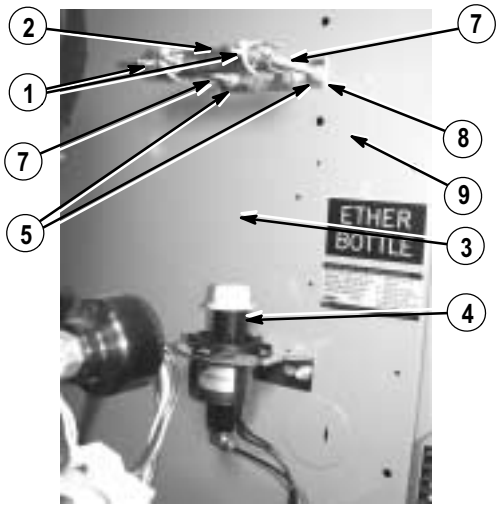
(6) Install bracket (8), two studs (7), nuts (6), and nuts (5) on generator panel (9).

(7) Position ether supply cylinder (3) on solenoid valve (4) and turn clockwise to tighten.

(8) Install clamp (2) and two wing nuts (1).

(9) Install generator circuit breaker panel as outlined in Engine Electronic Overspeed Module Replacement (Para 8-16).





c. Follow-On Maintenance:

- Connect batteries, (TM 9-4940-568-10).
- Install rear panel (TM 9-4940-568-10).

END OF TASK

8-9. ETHER START AID SWITCH REPLACEMENT.

This task covers:

a. Removal b. Installation c. Follow-On Maintenance

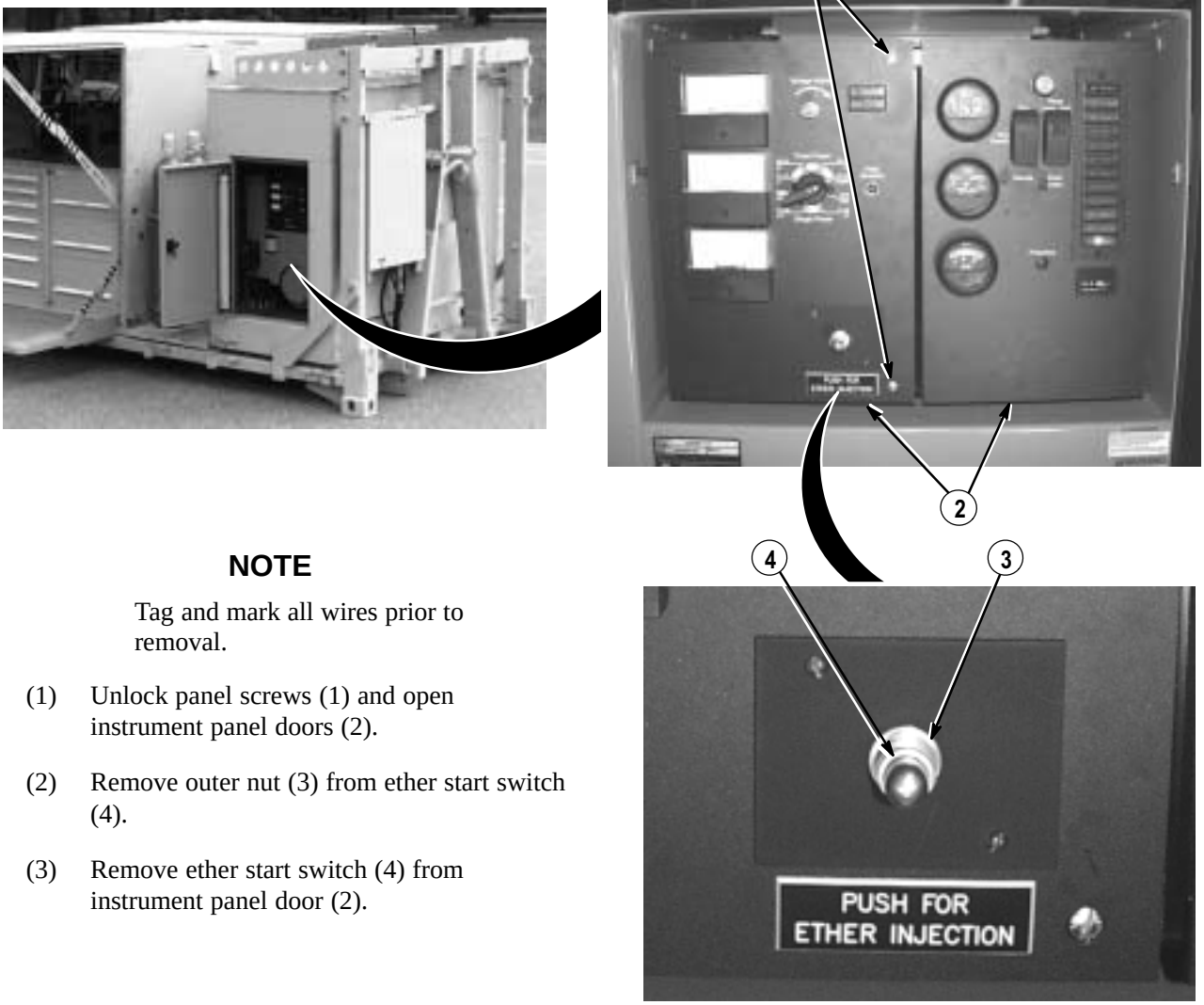
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 30, Appendix G)

Materials/Parts
Tags, Identification (Item 40, Appendix C)

Equipment Condition
FRS unloaded, (TM 9-4940-568-10)
Batteries disconnected, (TM 9-4940-568-10)

a. Removal.



NOTE

Tag and mark all wires prior to removal.

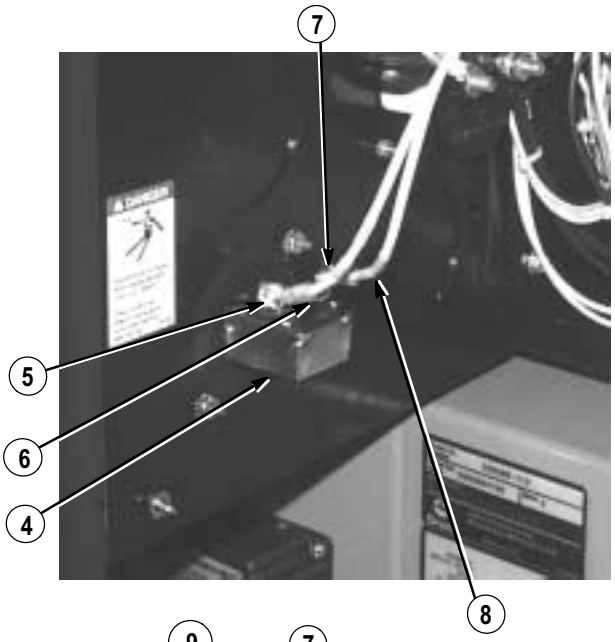
(1) Unlock panel screws (1) and open instrument panel doors (2).

(2) Remove outer nut (3) from ether start switch (4).

(3) Remove ether start switch (4) from instrument panel door (2).

(4) Loosen screw (5) and remove wire (6) from ether start switch (4).

(5) Loosen screw (7) and remove wire (8) from ether start switch (4).



b. Installation.

(1) Install jam nut (9) against ether start switch (4).

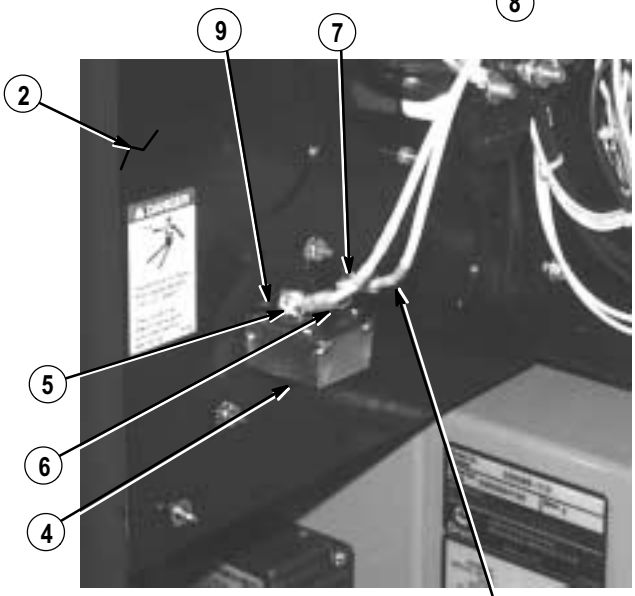
(2) Position ether start switch (4) in instrument panel door (2).

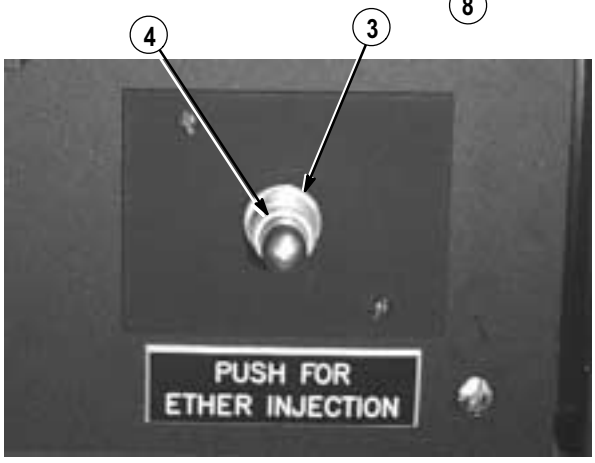
(3) Install outer nut (3) on ether start switch (4).

(4) Tighten outer nut (3) until nut is tight against instument panel (2).

(5) Install wire (8) and tighten screw (7) on ether start switch (4).

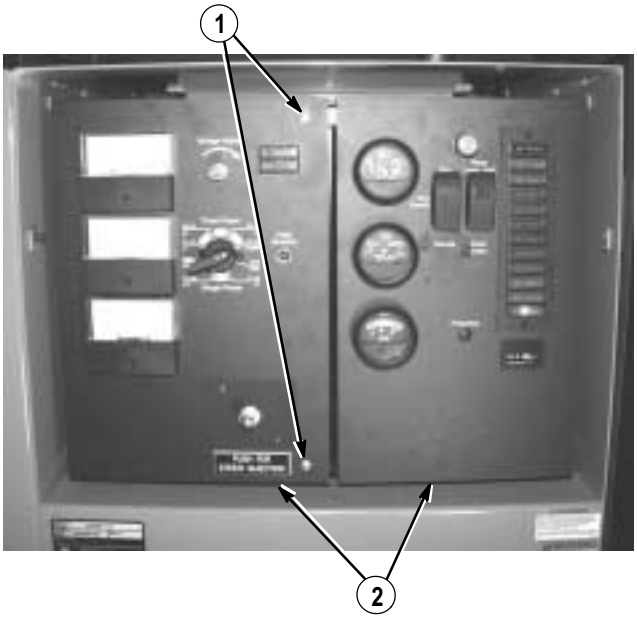
(6) Install wire (6) and tighten screw (5) on ether start switch (4).





8-9. ETHER START AID SWITCH REPLACEMENT (CONT).

(7) Close instrument panel doors (2) and lock panel screws (1).



c. Follow-On Maintenance:

- Connect batteries (TM 9-4940-568-10).

END OF TASK

8-10. ENGINE AIR INTAKE MANIFOLD REPLACEMENT.

This task covers:

a. Removal b. Installation c. Follow-On Maintenance

INITIAL SETUP

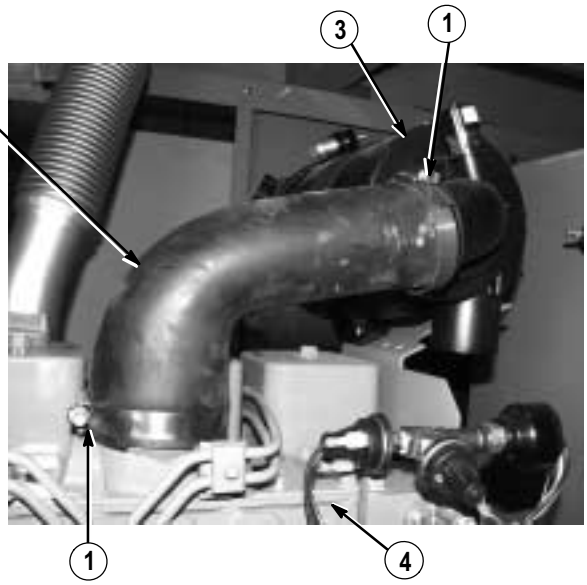
Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 30, Appendix G)
Socket Set , 3/8 in. (Item 25, Appendix G)
Wrench Torque (0 to 60 N·m) (Item 46, Appendix G)

Materials/Parts
Sealing Compound (Item 34, Appendix C)

Materials/Parts – Continued
Gasket, Air Intake Manifold (Item 15, Appendix F)

Equipment Condition
FRS unloaded, (TM 9-4940-568-10)
Batteries disconnected, (TM 9-4940-568-10)
Fuel injector lines removed (high pressure), (Para 8-20)

a. Removal.

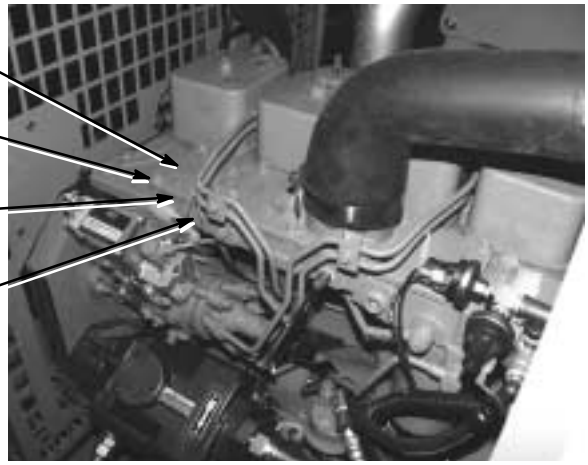


WARNING

Ensure engine is cool before performing this task or injury to personnel may result.

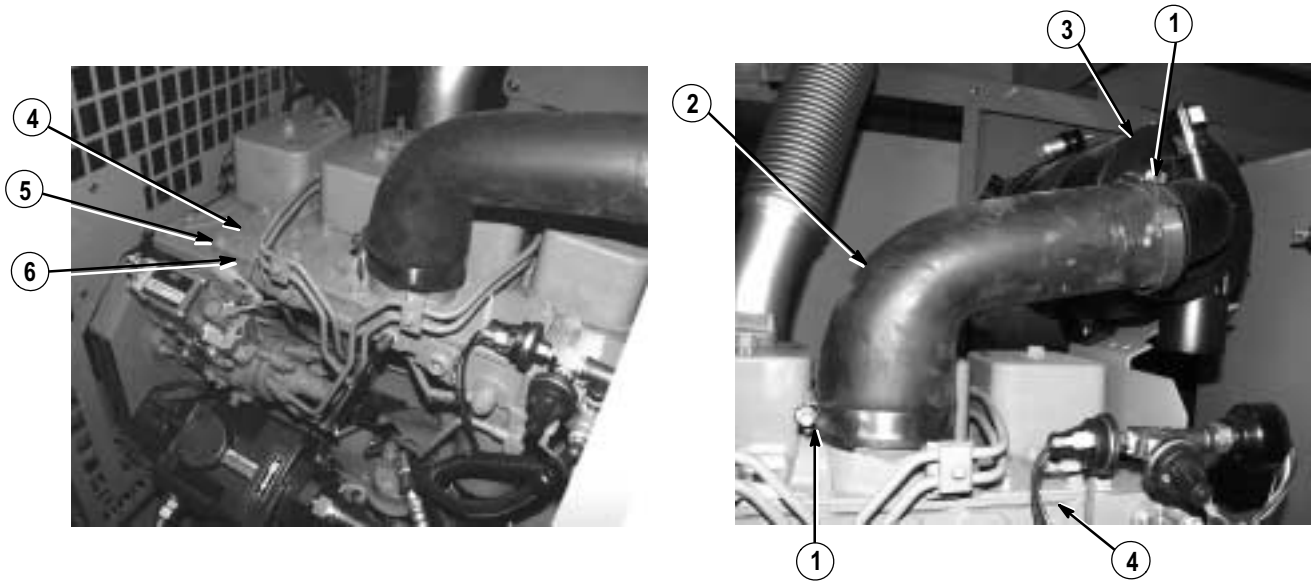
(1) Loosen two clamps (1) and remove air cleaner elbow (2) from air cleaner (3) and air intake manifold (4).

(2) Remove eight screws (5), gasket (6) and air intake manifold (4) from engine (7). Discard gasket.



8-10. ENGINE AIR INTAKE MANIFOLD REPLACEMENT (CONT).

b. Installation.



WARNING

Adhesives, solvents and sealing compounds can burn easily, can give off harmful vapors, and are harmful to the skin and clothing. To avoid injury or death, keep away from open fire and use in well–ventilated area. If adhesive, solvent or sealing compound gets on skin or clothing, wash immediately with soap and water.

(1) Apply sealing compound to threads of eight screws (5).

(2) Install air intake manifold (4) and gasket (6) with eight screws (5). Tighten screws to 18 lb-ft (24 N·m).

(3) Install air cleaner elbow (2) on air intake manifold (4) and air cleaner (3) and tighten two clamps (1).

c. Follow-On Maintenance:

- Install fuel injector lines (high pressure), (Para 8-20).
- Connect batteries, (TM 9-4940-568-10).

END OF TASK

8-11. ENGINE EXHAUST MANIFOLD REPLACEMENT.

This task covers:

a. Removal b. Installation c. Follow-On Maintenance

INITIAL SETUP

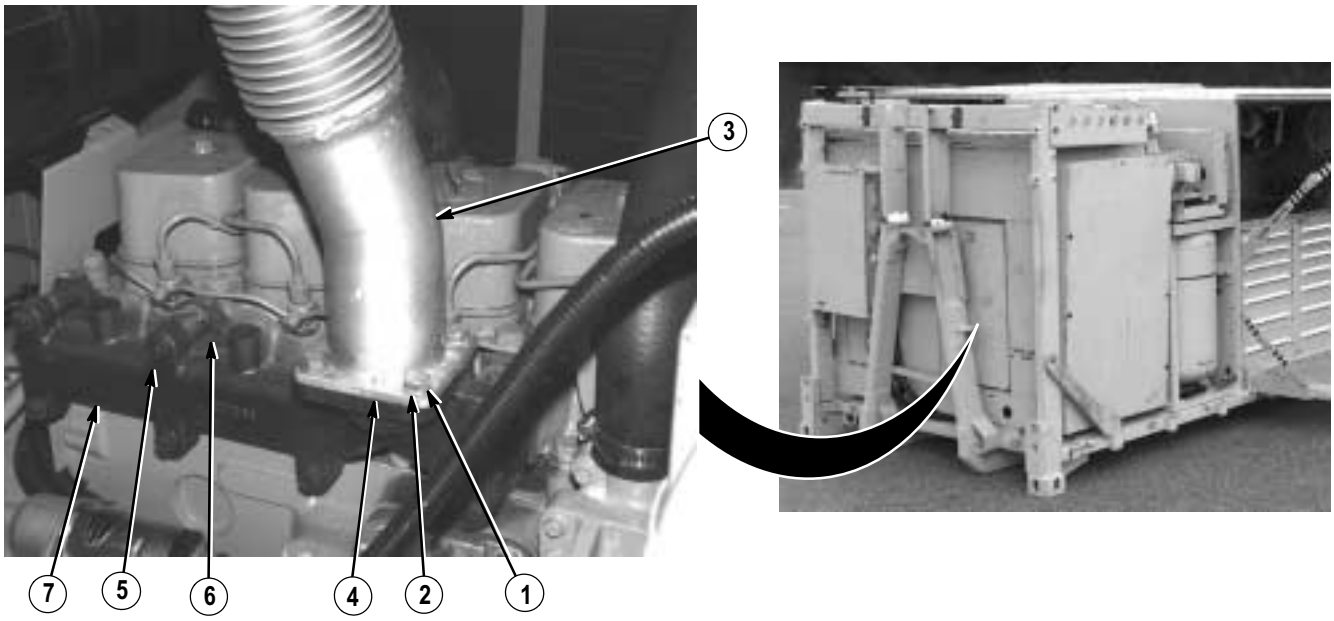
Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 30, Appendix G)
Wrench, Torque (0-175 lb-ft [0-237 N·m]) (Item 44, Appendix G)

Materials/Parts
Anti-Seize Compound (Item 8, Appendix C)
Gasket, Exhaust (Item 16, Appendix F)

Materials/Parts - Continued
Gasket, Manifold (4) (Item 18, Appendix F)
Lockwasher (4) (Item 62, Appendix F)

Equipment Condition
FRS unloaded, (TM 9-4940-568-10)
Batteries disconnected, (TM 9-4940-568-10)

a. Removal.



WARNING

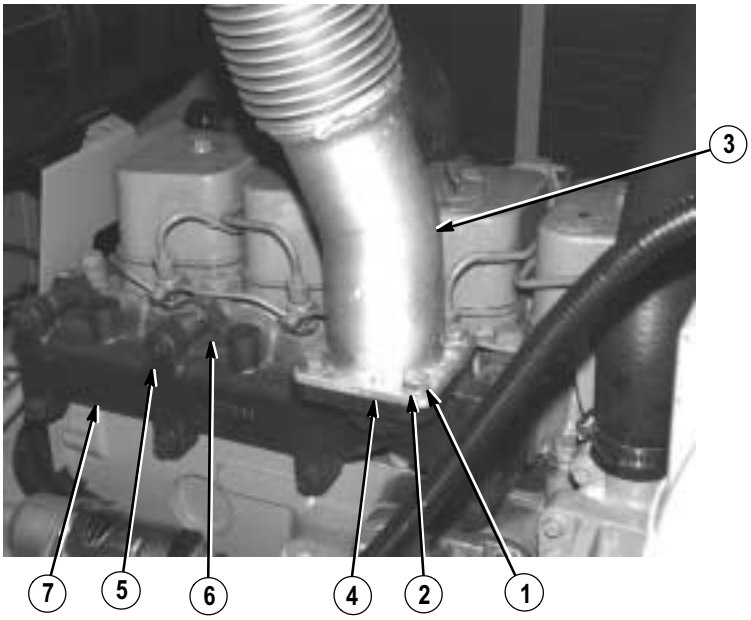
Do not remove exhaust system parts while engine is hot. Failure to comply may cause injury to personnel.

(1) Remove four screws (1), lockwashers (2), exhaust pipe (3) and exhaust gasket (4). Discard lockwashers and gasket.

(2) Remove eight screws (5), four manifold gaskets (6) and exhaust manifold (7). Discard gaskets.

8-11. ENGINE EXHAUST MANIFOLD REPLACEMENT (CONT).

b. Installation.



WARNING

Adhesives, solvents and sealing compounds can burn easily, can give off harmful vapors, and are harmful to the skin and clothing. To avoid injury or death, keep away from open fire and use in well–ventilated area. If adhesive, solvent or sealing compound gets on skin or clothing, wash immediately with soap and water.

(1) Apply anti-seize compound to threads of screws (5).

(2) Install four manifold gaskets (6) and exhaust manifold (5) using eight screws (5). Tighten screws to 32 lb-ft (43 N·m).

(3) Install four screws (1), washers (2) and exhaust gasket (4) on exhaust pipe (3).

c. Follow-On Maintenance:

- Connect batteries, (TM 9-4940-568-10).
- Start generator and check for leaks, (TM 9-4940-568-10).

END OF TASK

8-12. ENGINE AIR FILTER REPLACEMENT.

This task covers:

a. Removal b. Installation c. Follow-On Maintenance

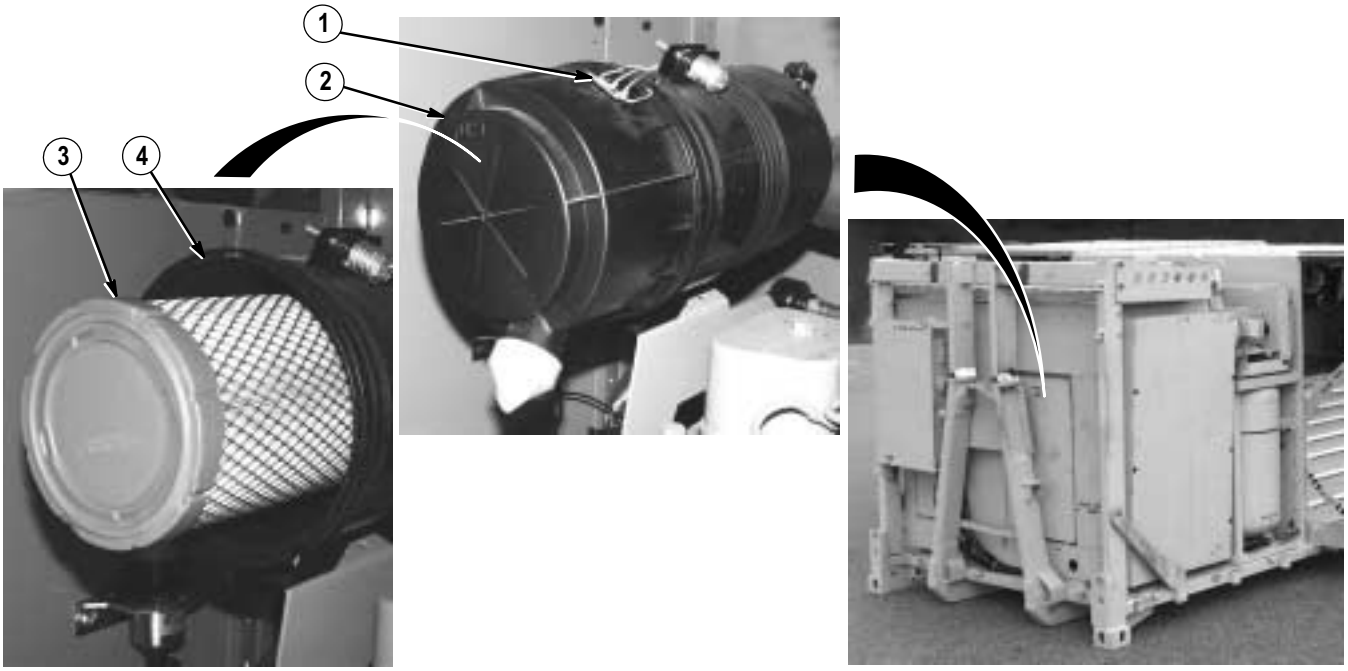
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 30, Appendix G)

Materials/Parts
Rags, Wiping (Item 30, Appendix C)

Equipment Condition
FRS unloaded, (TM 9-4940-568-10)
Engine OFF, (TM 9-4940-568-10)
Front panel removed, (TM 9-4940-568-10)

a. Removal.



WARNING

Ensure engine is cool before performing this task or injury to personnel may result.

(1) Release two retaining clips (1) and remove air cleaner cover (2).

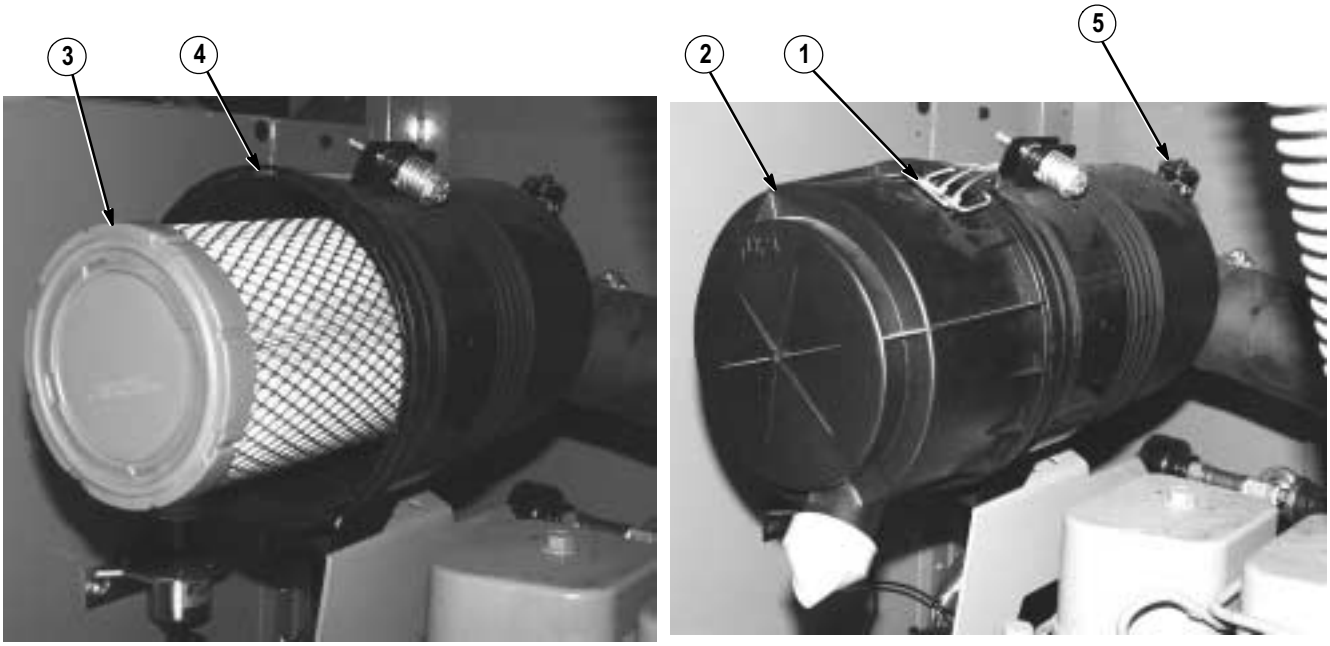
NOTE

There may be some initial resistance when removing the filter. Gently move the end of filter up and down and side-to-side or twist to break the seal.

(2) Slowly remove the air filter (3) to reduce amount of dust dislodged.

(3) Wipe out the interior of the air cleaner housing (4) and cover with a clean, damp cloth. Make sure that all dust is removed from all interior surfaces of the air cleaner housing.

8-12. ENGINE AIR FILTER REPLACEMENT (CONT).



b. Installation.

CAUTION

The seal area is on the inside of the open end of the filter. The sealing area will stretch slightly and adjust itself over the outlet tube. To complete the seal, apply pressure at the outer rim of the filter, not the flexible center. No cover pressure is required to hold the seal. Failure to comply may result in damage to parts.

(1) Install air filter (3) into air cleaner housing (4).

(2) Install air cleaner cover (2) and secure with two retaining clips (1).

NOTE

If installing a new air filter, perform Step (3) to reset service indicator.

(3) Push on top of service indicator (5) to reset.

c. Follow-On Maintenance.

- Start engine and check air seal on canister, (TM 9-4940-568-10).
- Install front panel, (TM 9-4940-568-10).

END OF TASK

8-13. ENGINE AIR CLEANER AND BRACKET REPLACEMENT.

This task covers:

a. Removal b. Installation c. Follow On Maintenance

INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 30, Appendix G)

Materials/Parts
Lockwasher (2) (Item 64, Appendix F)

Equipment Condition
FRS unloaded, (TM 9-4940-568-10)
Batteries disconnected, (TM 9-4940-568-10)
Rear panel(s) removed, (TM 9-4940-568-10)
Air filter removed, (Para 8-12)

a. Removal.

(1) Remove two hose clamps (1) and air cleaner elbow (2) from air inlet manifold (3) and air cleaner (4).

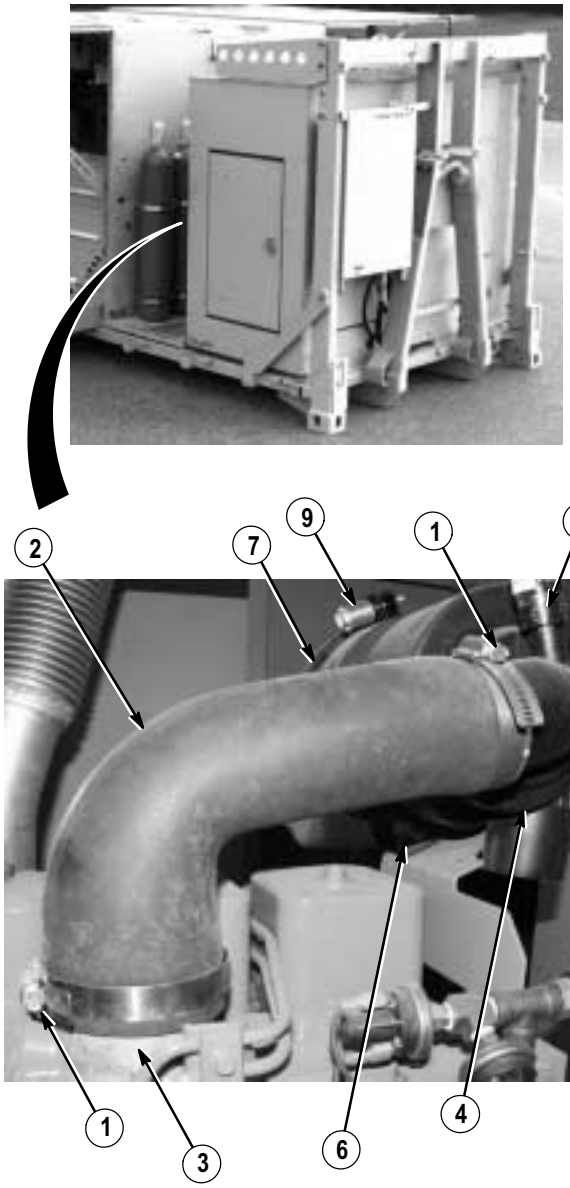
(2) Remove service indicator (5) from air cleaner (4).

(3) Remove two screws (6) and air cleaner band (7), with air cleaner (4) still installed, from mounting bracket (8).

NOTE

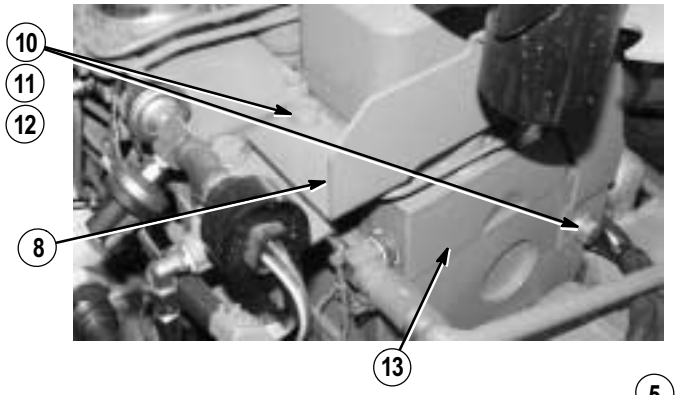
Note position of air cleaner prior to removal.

(4) Loosen screw (9) and remove air cleaner (4) from air cleaner band (7). Retighten screw (9) back on air cleaner band (7).



8-13. ENGINE AIR CLEANER AND BRACKET REPLACEMENT (CONT).

(5) Remove two screws (10), lockwashers (11), washers (12), and mounting bracket (8) from engine (13). Discard lockwashers.



b. Installation.

(1) Install mounting bracket (8) on engine (13) with washers (12), lockwashers (11) and two screws (10).

NOTE

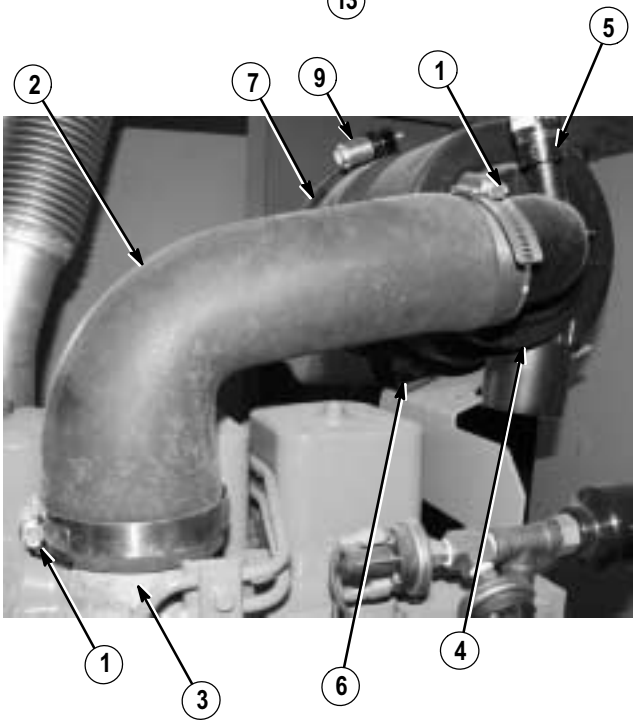
Install air cleaner in position noted during removal.

(2) Loosen screw (9) and install air cleaner (4) on air cleaner band (7).

(3) Install assembled air cleaner (4) and air cleaner band (7) on mounting bracket (8) with two screws (6).

(4) Install service indicator (5) on air cleaner (4).

(5) Install air inlet manifold (3), air cleaner elbow (2) and two hose clamps (1) on air cleaner (4).



c. Follow On Maintenance.

- Install air filter, (Para 8-12).
- Connect batteries, (TM 9-4940-568-10).
- Install rear panel(s), (TM 9-4940-568-10).

END OF TASK

8-14. FUEL TANK VENT REPLACEMENT.

This task covers:

a. Removal b. Installation c. Follow-On Maintenance

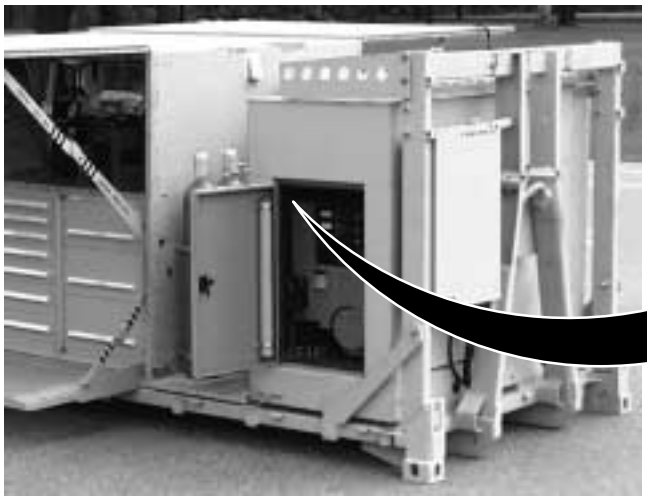
INITIAL SETUP

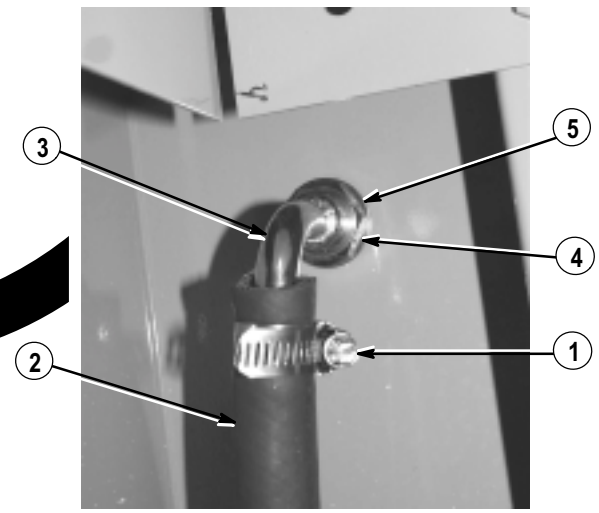
Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 30, Appendix G)

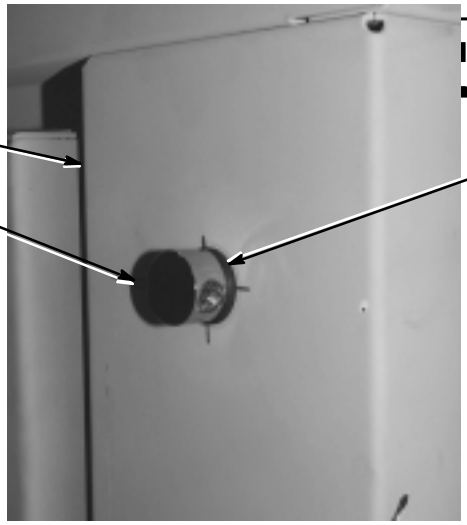
Materials/Parts
Washer, Rubber (Item 108, Appendix F)

Equipment Condition
FRS unloaded, (TM 9-4940-568-10)
Remove rear panel, (TM 9-4940-568-10)

a. Removal.







Do not inhale fuel fumes; could cause injury or death to personnel.

(1) Loosen hose clamp (1) and remove upper vent hose (2) from fuel tank vent (3).

(2) Remove jam nut (4) and washer (5) from fuel tank vent (3).

(3) Remove fuel tank vent (3) and rubber washer (6) from generator housing (7). Discard rubber washer.

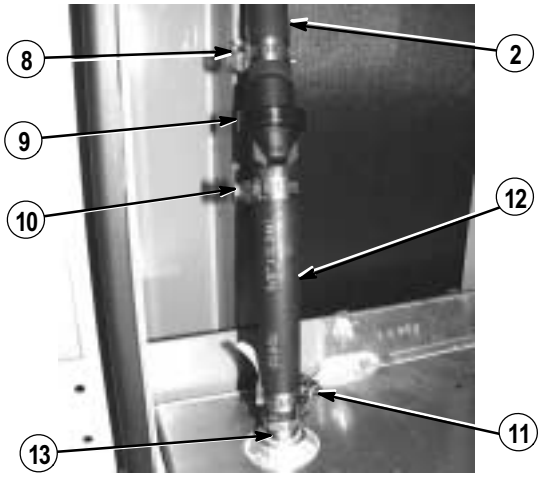
8-14. FUEL TANK VENT REPLACEMENT (CONT).

(4) Loosen hose clamp (8) and remove upper vent hose (2) from check valve (9).

NOTE

Note position of check valve prior to removal.

(5) Loosen hose clamp (10) and (11) and remove check valve (9) and lower vent hose (12) from adapter (13).



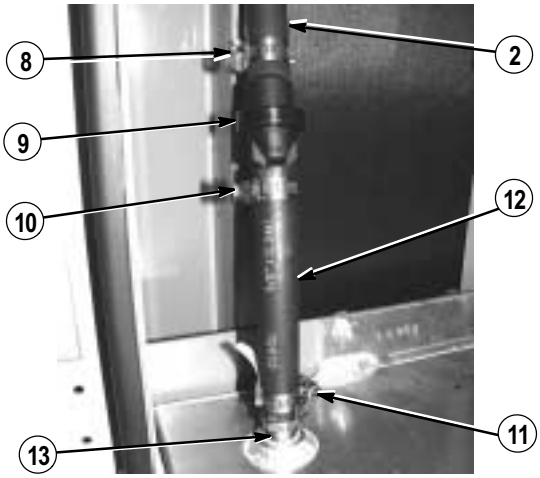
b. Installation.

NOTE

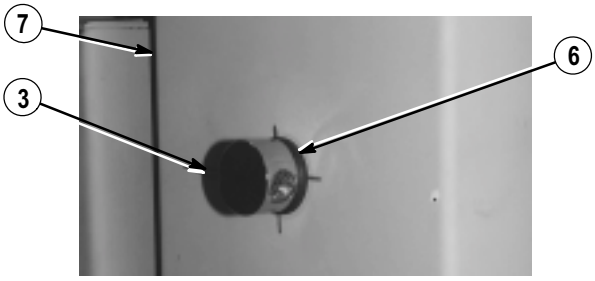
Position check valve as noted prior to removal.

(1) Install lower vent hose (12) and check valve (9) on adapter (13) and tighten hose clamps (11) and (10).

(2) Install upper vent hose (2) on check valve (9) and tighten hose clamp (8).

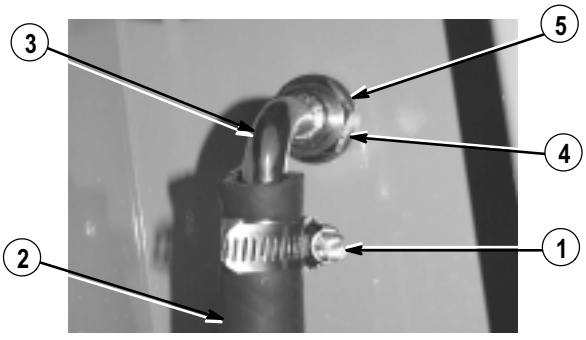


(3) Install rubber washer (6) and fuel tank vent (3) on generator housing (7).



(4) Install jam nut (4) and washer (5) on fuel tank vent (3).

(5) Install upper vent hose (2) on fuel tank vent (3) and tighten hose clamp (1).



c. Follow-On Maintenance:

- Connect batteries, (TM 9-4940-568-10).
- Install rear panel, (TM 9-4940-568-10).

END OF TASK

8-15. FUEL TANK GAGE REPLACEMENT.

This task covers:

a. Removal b. Installation

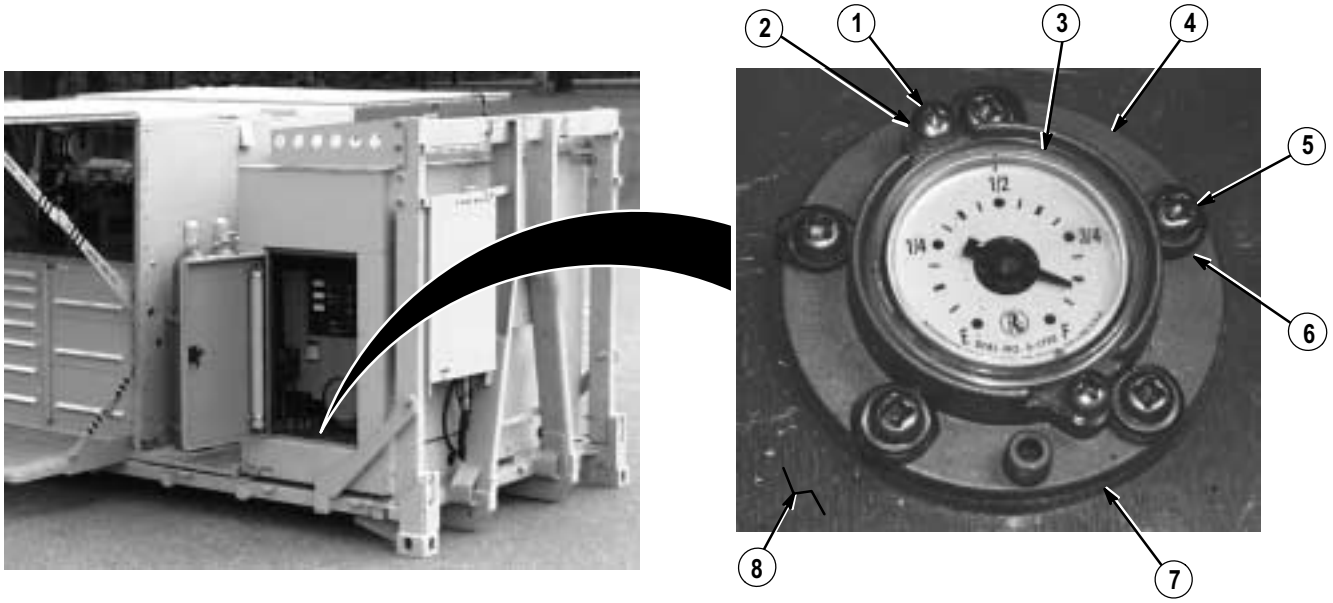
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 30, Appendix G)

Materials/Parts
Gasket (Item 12, Appendix F)
Washer, Rubber (5) (Item 109, Appendix F)

Equipment Condition
FRS unloaded, (TM 9-4940-568-10)

a. Removal.



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.

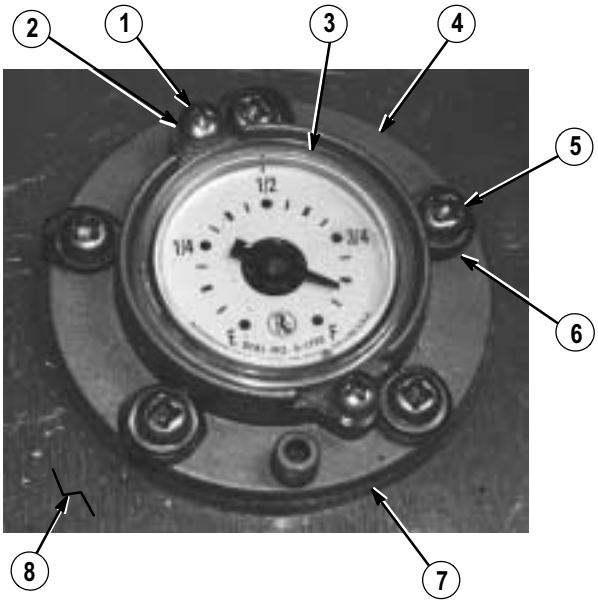
(1) Remove two screws (1) and washers (2) from fuel tank gage (3).

(2) Remove fuel tank gage (3) from fuel tank sending unit (4).

(3) Remove five screws (5), rubber washers (6), fuel tank sending unit (4) and gasket (7) from fuel tank (8). Discard rubber washers and gasket.

8-15. FUEL TANK GAGE REPLACEMENT (CONT).

b. Installation.



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) Install gasket (7) and fuel tank sending unit (4) on fuel tank (8) with five rubber washers (6) and screws (5).

(2) Install fuel tank gage (3) on fuel tank sending unit (4) using two washers (2) and screws (1).

END OF TASK

8-16. ENGINE ELECTRONIC OVERSPEED MODULE REPLACEMENT.

This task covers:

a. Removal
b. Installation
c. Adjustment
d. Follow-On Maintenance

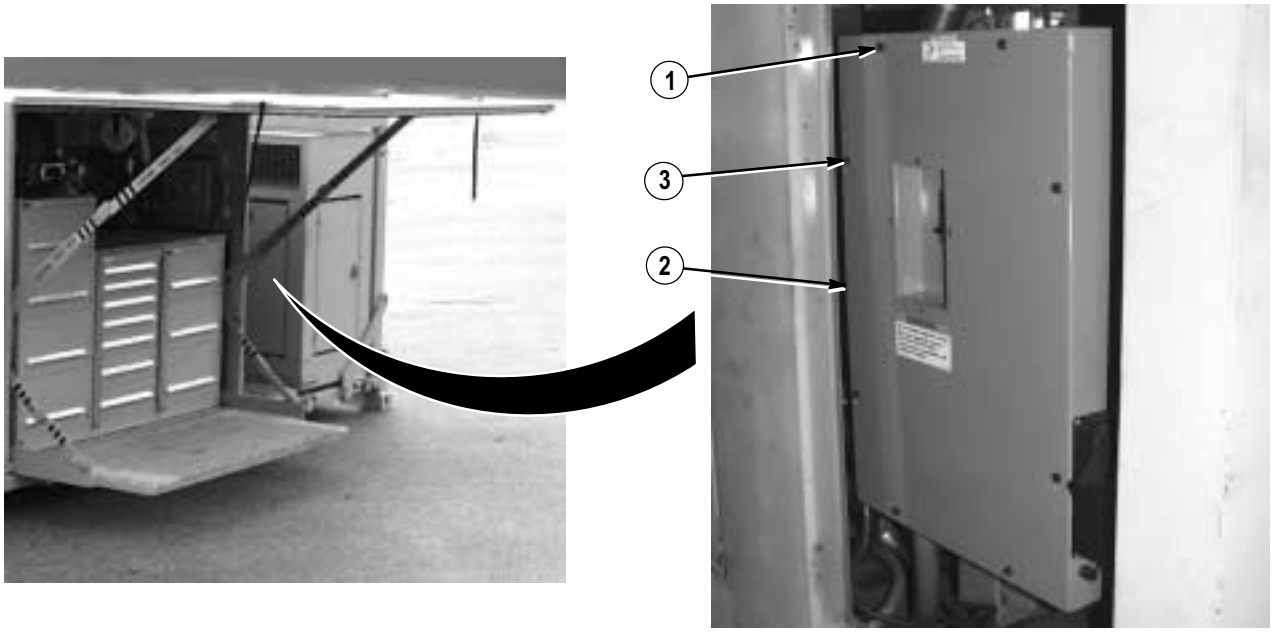
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 30, Appendix G)

Material/Parts
Tag, Identification (Item 40, Appendix C)
Locknut (4) (Item 56, Appendix F)

Equipment Condition
FRS unloaded, (TM 9-4940-568-10)
Batteries disconnected, (TM 9-4940-568-10)
Rear panel removed, (TM 9-4940-568-10)

a. Removal.



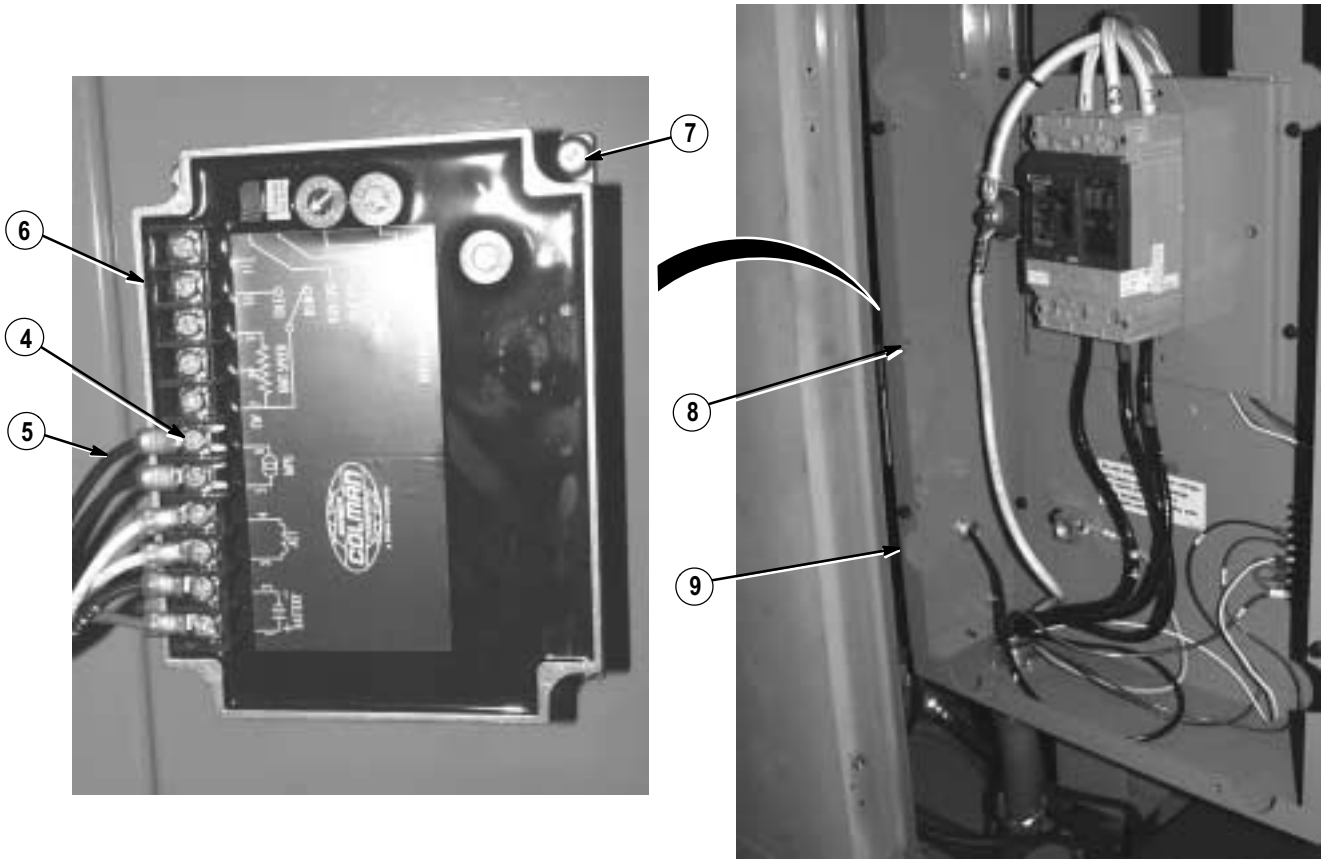
WARNING

Ensure engine is cool before performing this task or injury to personnel may result.

(1) Remove four screws (1) from generator panel (2).

(2) Loosen four screws (3) and remove panel (2).

8-16. ENGINE ELECTRONIC OVERSPEED MODULE REPLACEMENT (CONT).



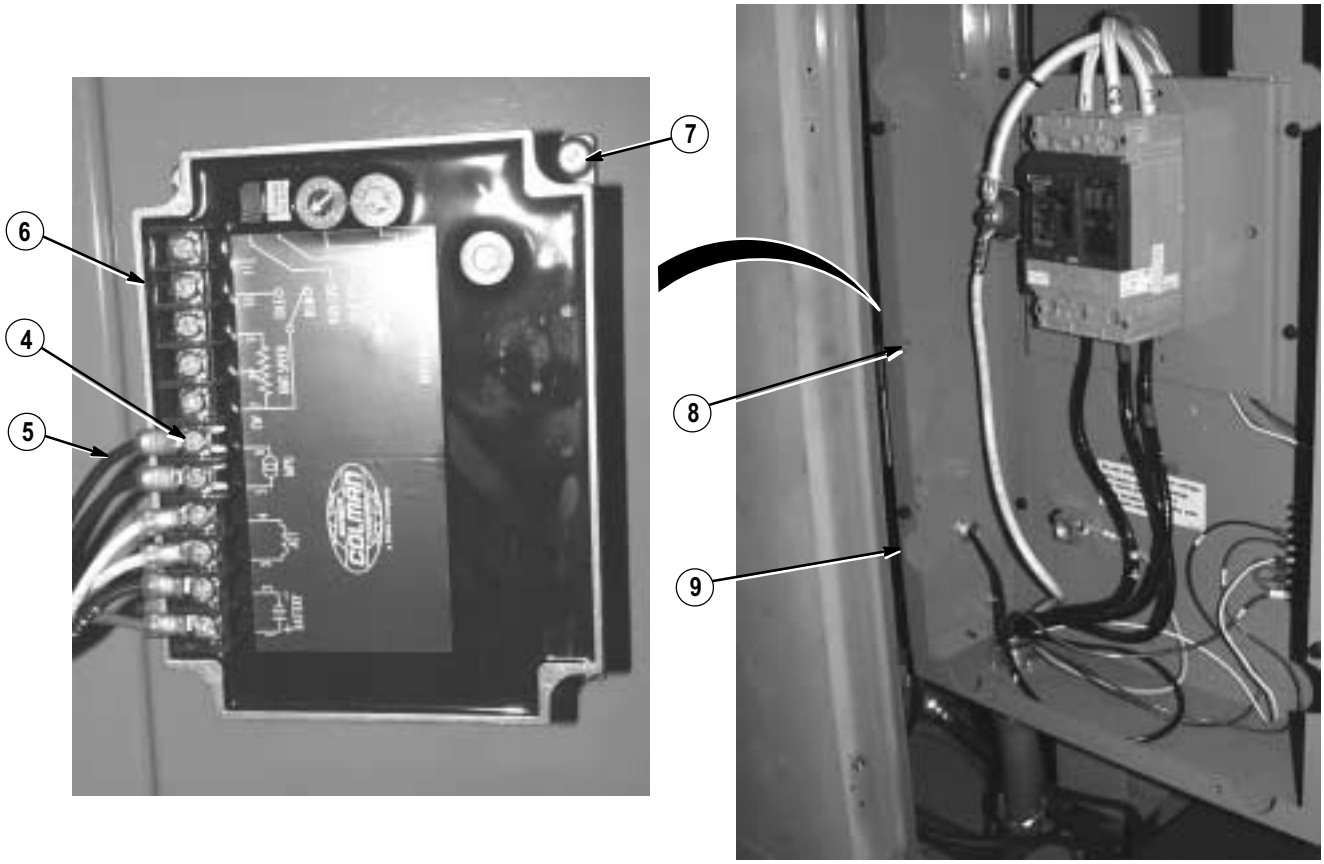
NOTE

Tag and mark wires prior to removal.

(3) Loosen six screws (4) and remove wires (5) from module (6).

(4) Remove four screws (7), locknuts (8) and module (6) from generator back panel (9). Discard locknuts.

b. Installation.



(1) Install module (6) on generator back panel (9) with four screws (7) and locknuts (8).

NOTE

Install wires in position as noted prior to removal.

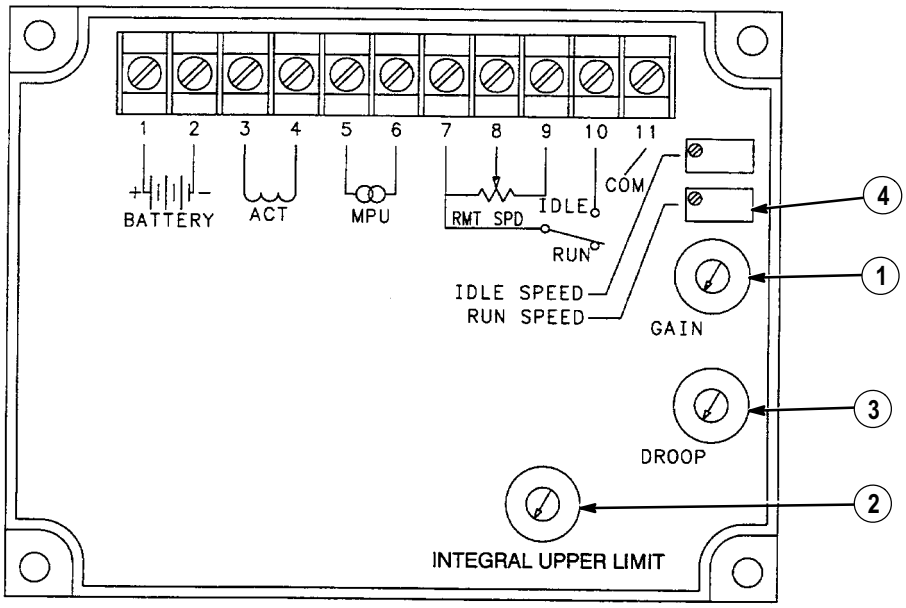
(2) Install six wires (5) on module (6) and tighten six screws (4).

(3) Install panel cover (2) and tighten four screws (3).

(4) Install four screws (1) on generator panel (2).

8-16. ENGINE ELECTRONIC OVERSPEED MODULE REPLACEMENT (CONT).

c. Adjustment.



(1) Electronic Overspeed Module Adjustments: If necessary, insure module is wired according to the illustration and install the magnetic speed pickup sensor (Para 8-17). Then 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.

d. Follow-On Maintenance:

- Connect batteries, (TM 9-4940-568-10).
- Start generator and check for proper operation, (TM 9-4940-568-10).
- Install rear panel, (TM 9-4940-568-10).

END OF TASK

8-17. MAGNETIC SPEED PICKUP SENSOR REPLACEMENT.

This task covers:

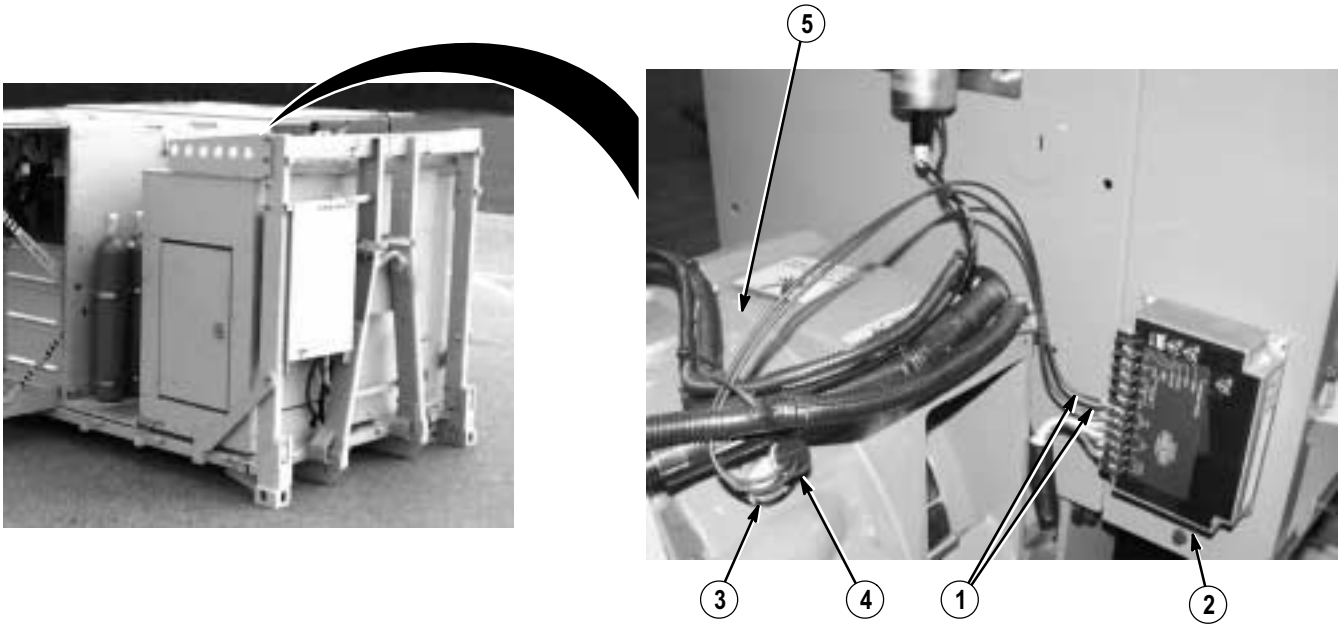
a. Removal b. Installation c. Follow-On Maintenance

INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 30, Appendix G)
Engine Turnover Tool (Item 11, Appendix G)

Equipment Condition
FRS unloaded, (TM 9-4940-568-10)
Batteries disconnected, (TM 9-4940-568-10)
Rear left panel removed, (TM 9-4940-568-10)

a. Removal.



NOTE

Tag and mark all wires prior to removal.

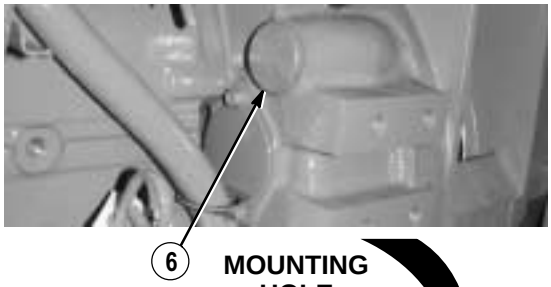
(1) Remove two wires (1) from electronic overspeed module (2).

(2) Loosen jamnut (3) and remove magnetic pickup (4) from engine (5).

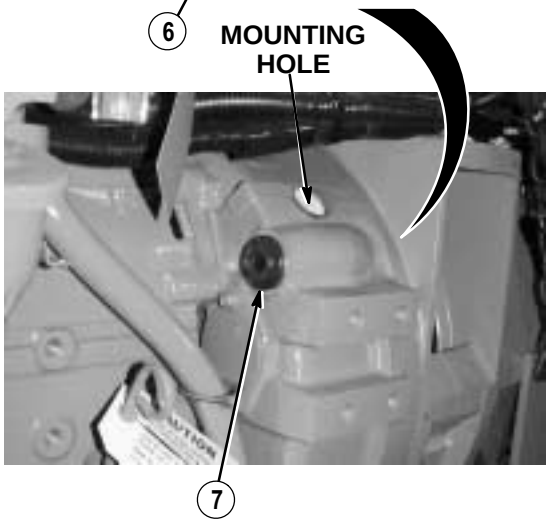
8-17. MAGNETIC SPEED PICKUP SENSOR REPLACEMENT (CONT).

b. Installation.

(1) Remove cover (6) and install engine turnover tool (7).



(2) Bar engine until a gear tooth on the flywheel lines up in center of the mounting hole.



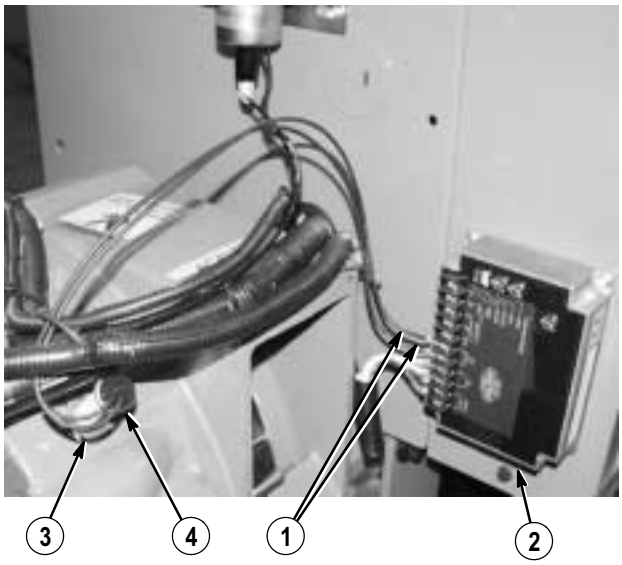
(3) Thread the magnetic pickup (4) in gently until it just touches the gear tooth.

(4) Back magnetic pickup (4) out one quarter turn and tighten jamnut (3).

NOTE

Install wires as noted during removal.

(5) Install two wires (1) on electronic overspeed module (2).



c. Follow-On Maintenance:

- Connect batteries, (TM 9-4940-568-10).
- Start generator and check for leaks, (TM 9-4940-568-10).

END OF TASK

8-18. PRIMARY (IN-LINE) FUEL FILTER REPLACEMENT.

This task covers:

a. Removal b. Installation c. Follow-On Maintenance

INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 30, Appendix G)

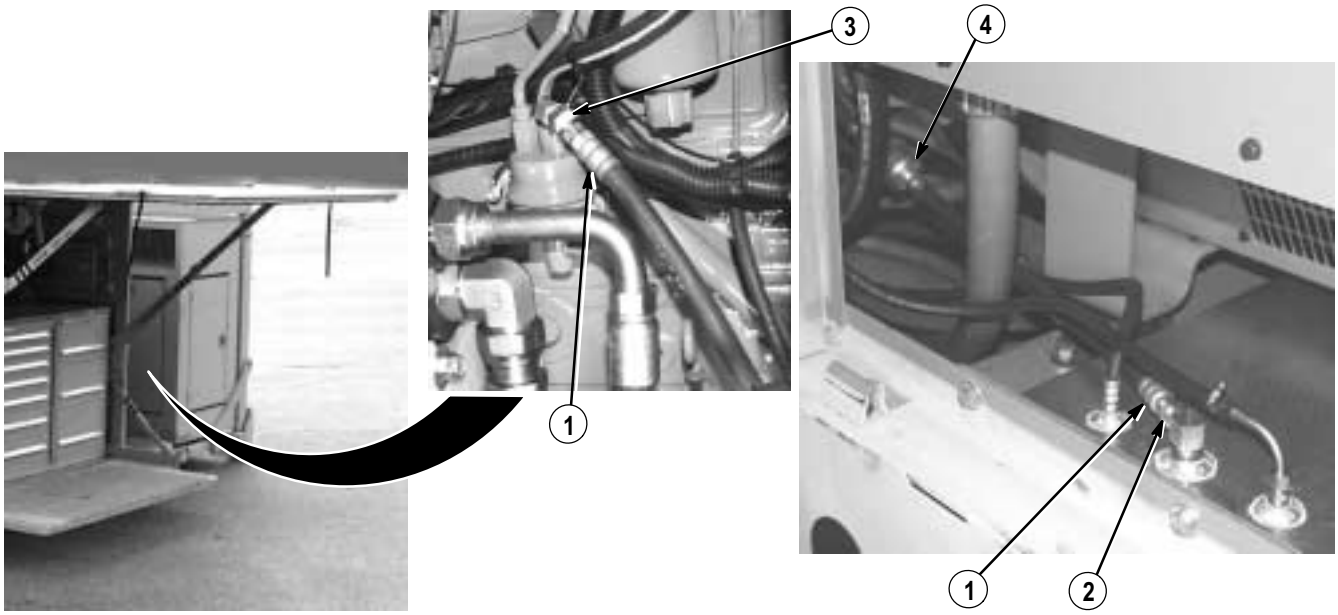
Materials/Parts
Sealing Compound (Item 32, Appendix C)

Equipment Condition
FRS unloaded, (TM 9-4940-568-10)
Batteries disconnected, (TM 9-4940-568-10)
Remove rear panels, (TM 9-4940-568-10)

a. Removal.

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.



NOTE

Note position of fuel filter prior to removal.

(1) Remove hose (1) from fitting (2).

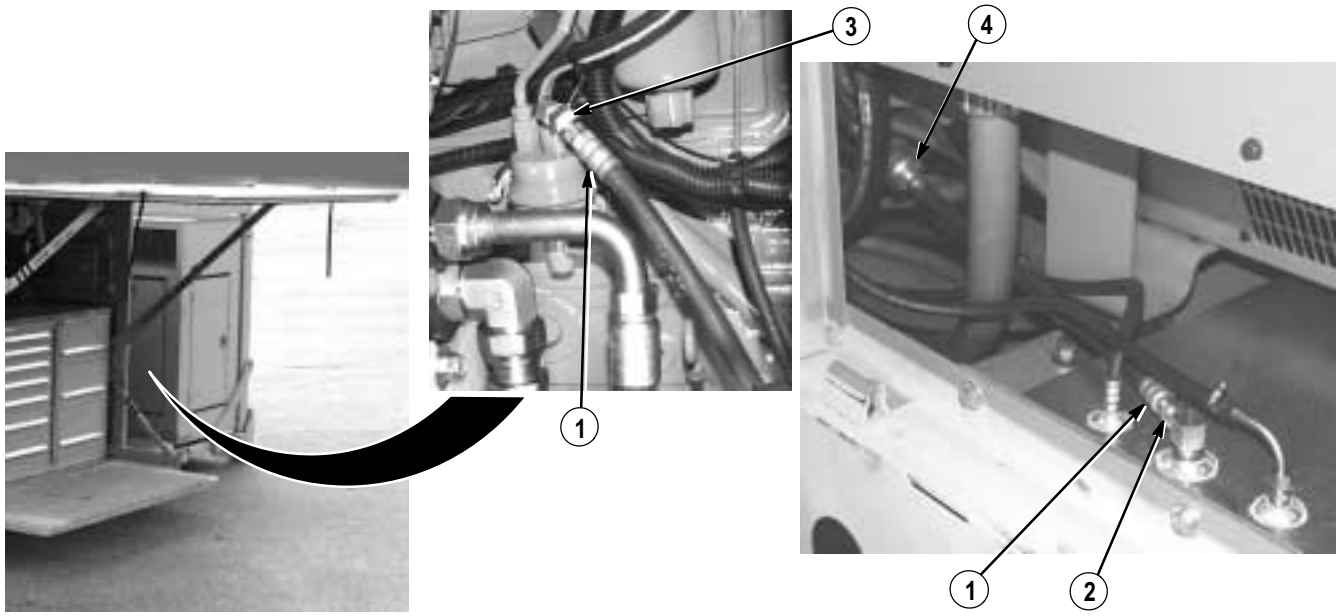
NOTE

Threaded end of hose does not swivel.

(2) Remove hose (1) from reducer (3).
(3) Discard filter (4).

8-18. PRIMARY (IN-LINE) FUEL FILTER REPLACEMENT (CONT).

b. Installation.



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.
- Adhesives, solvents and sealing compounds can burn easily, can give off harmful vapors, and are harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in well–ventilated area. If adhesive, solvent or sealing compound gets on skin or clothing, wash immediately with soap and water.

NOTE

Install fuel filter in position noted in removal.

(1) Apply sealing compound to threads on ends of hose (1).

(2) Position fuel filter (4) so arrow is pointing toward fuel pump.

(3) Install hose (1) on reducer (3).

(4) Install hose (1) on fitting (2).

c. Follow-On Maintenance:

- Connect batteries, (TM 9-4940-568-10)
- Start generator and check for leaks, (TM 9-4940-568-10).
- Install rear panels (TM 9-4940-568-10).

END OF TASK

8-19. SECONDARY FUEL FILTER REPLACEMENT.

This task covers:

a. Removal b. Installation c. Follow-On Maintenance

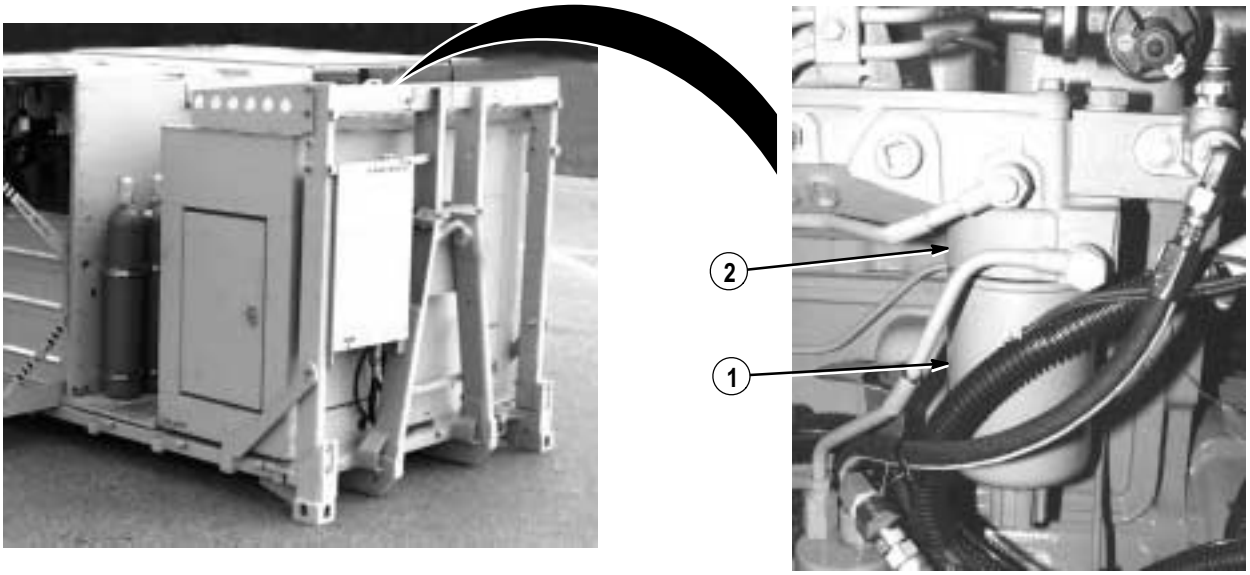
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 30, Appendix G)
Pan, Drain (Item 20, Appendix G)

Material/Parts
Fuel, Diesel Regular (Item 19, Appendix C)
Oil, Engine Lubricating (Item 24, Appendix C)

Equipment Condition
FRS unloaded, (TM 9-4940-568-10)
Batteries disconnected, (TM 9-4940-568-10)
Remove rear panel, (TM 9-4940-568-10)

a. Removal.



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.

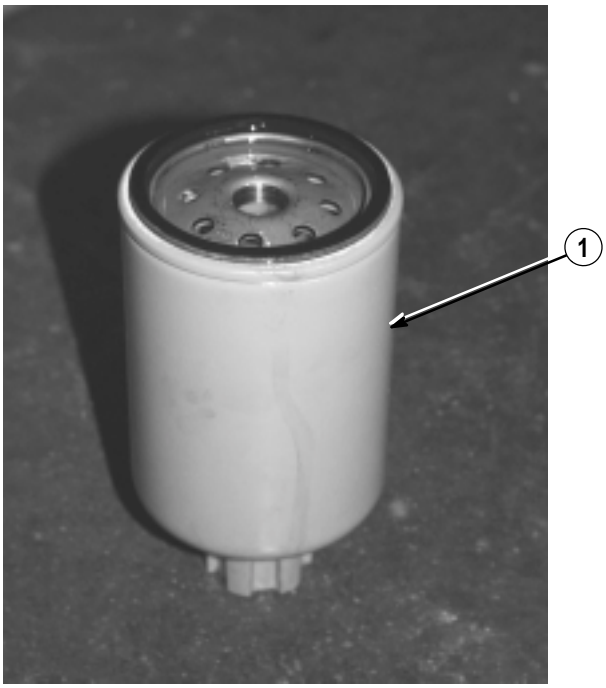
NOTE

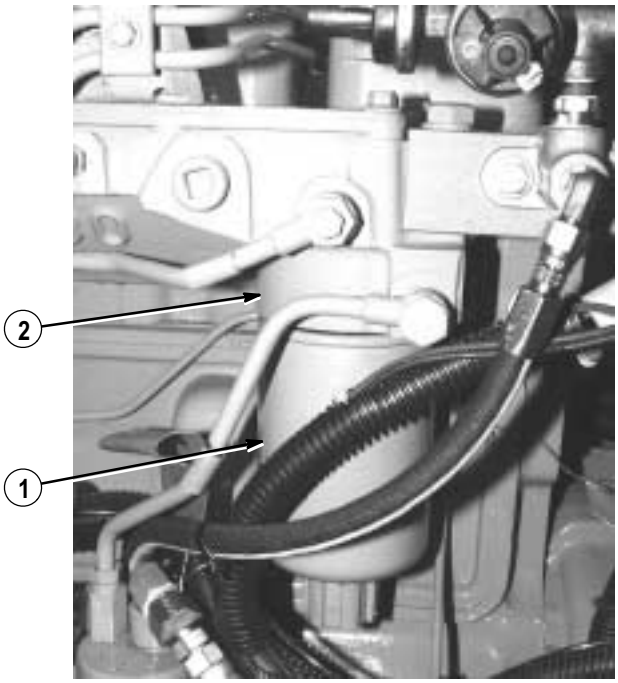
Position drain pan under fuel lines to catch excess fuel.

Remove fuel filter (1) from fuel filter head assembly (2). Discard filter.

8-19. SECONDARY FUEL FILTER REPLACEMENT (CONT).

b. Installation.





NOTE

Lubricate fuel filter seal lightly with lubricating oil.

(1) Fill fuel filter (1) with fuel.

(2) Install fuel filter (1) on fuel filter head assembly (2).

(3) By hand, tighten fuel filter (1) until fuel filter makes contact with filter head (2).

(4) By hand, tighten fuel filter (1) 2/3 turn on filter head (2).

c. Follow-On Maintenance:

- Connect batteries, (TM 9-4940-568-10).
- Start generator and check for leaks, (TM 9-4940-568-10).

END OF TASK

8-20. FUEL INJECTION LINES REPLACEMENT.

This task covers:

a. High Pressure Fuel Lines
b. Low Pressure Fuel Line
c. Injection Pump Supply Line
d. Fuel Drain Lines
e. Follow-On Maintenance

INITIAL SETUP

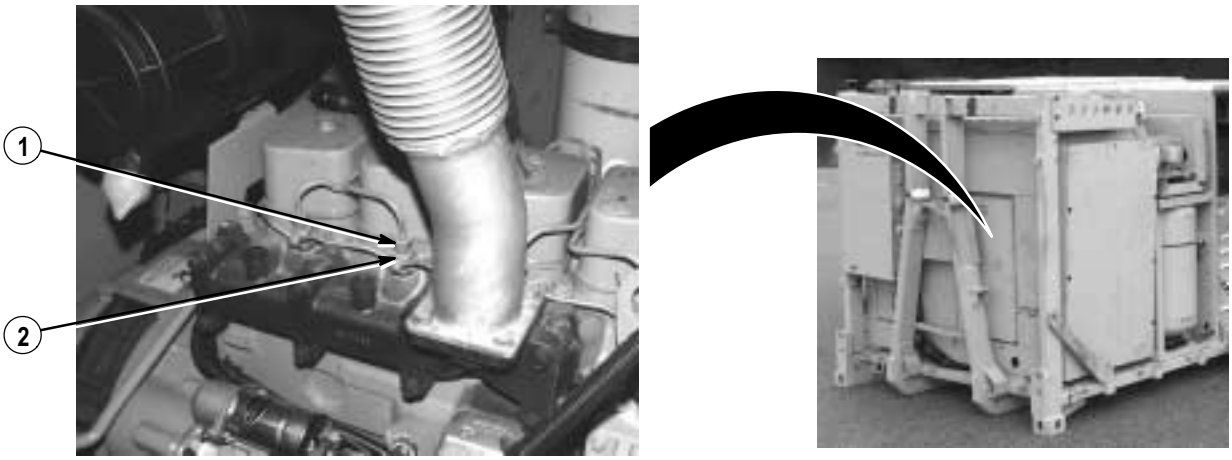
Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 30, Appendix G)
Pan, Drain (Item 20, Appendix G)

Material/Parts
Tags, Identification (Item 40, Appendix C)

Material/Parts – Continued
Seal, Banjo (A/R) (Item 103, Appendix F)
Sealing Washer (A/R) (Item 110, Appendix F)

Equipment Condition
FRS unloaded, (TM 9-4940-568-10)
Batteries disconnected, (TM 9-4940-568-10)

a. 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.

NOTE

- Tag and mark fuel lines prior to removal.
- Position drain pan under hoses to catch excess fuel.
- There are four high pressure fuel lines. They are removed the same way.

(1) Removal.

(a) Disconnect fuel line (1) from injector (2).

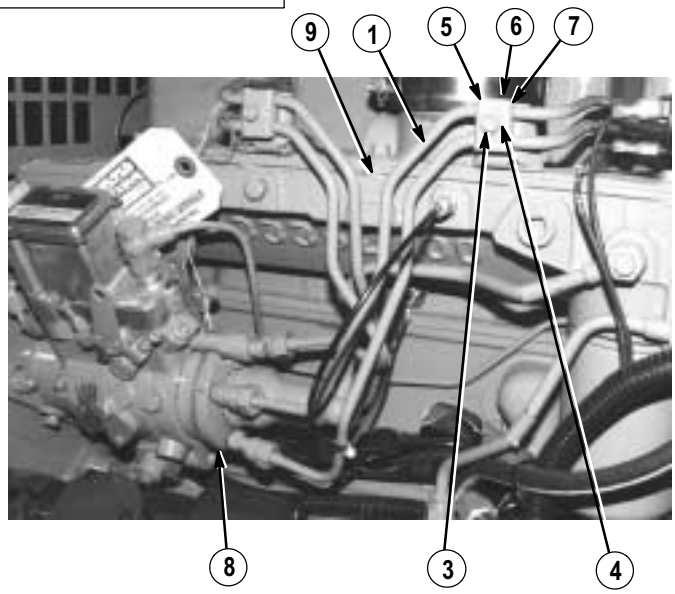
8-20. FUEL INJECTION LINES REPLACEMENT (CONT).

(b) Remove screw (3), washer (4), plate (5) and two clamps (6) from fuel lines (1) and bracket (7).

(c) Disconnect fuel line (1) from fuel injector pump (8).

(d) Remove fuel line (1) from engine (9).

(e) Repeat Steps (a) through (e) or remaining fuel lines.



(2) Installation.

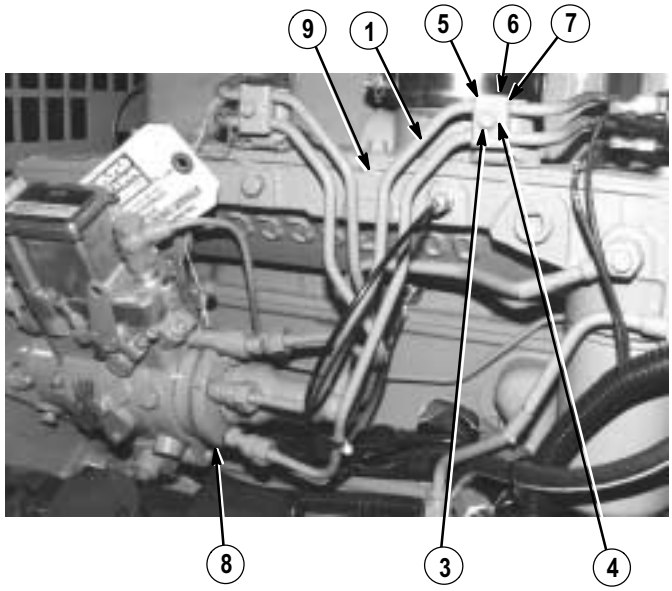
NOTE

Install fuel lines in position as noted prior to removal.

(a) Position fuel line (1) on engine (9).

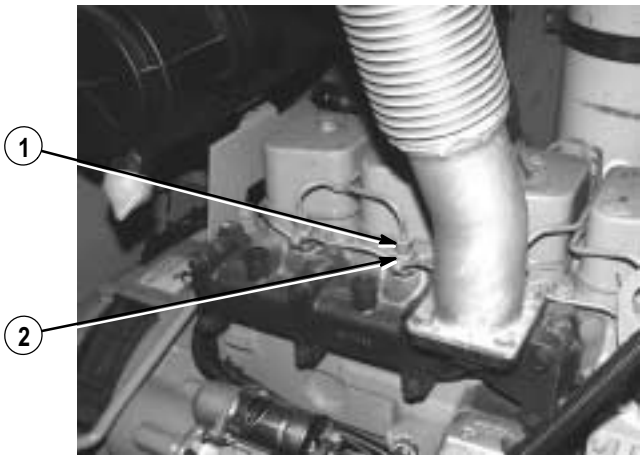
(b) Connect fuel line (1) on fuel injector pump (8).

(c) Install fuel lines (1) on bracket (7) with two clamps (6), plate (5), washer (4) and screw (3).

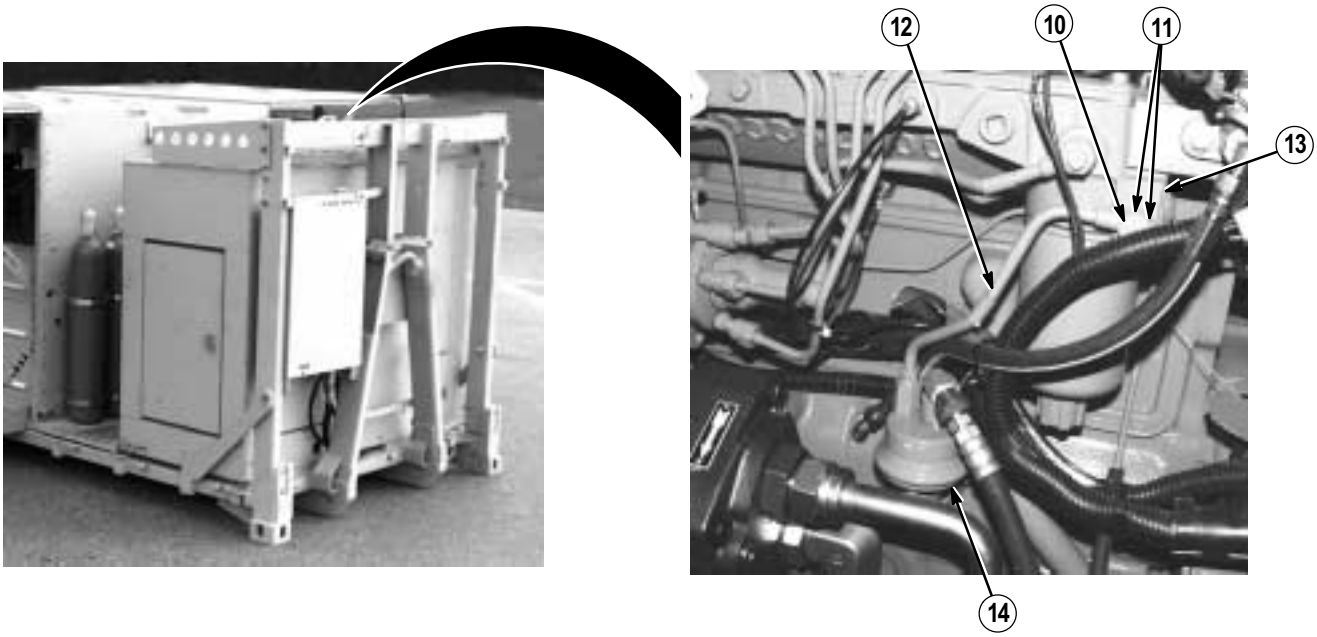


(d) Connect fuel line (1) on injector (2).

(e) Repeat Steps (a) through (e) for remaining fuel lines.



b. Low Pressure Fuel Line.



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.

NOTE

- Tag and mark fuel lines prior to removal.
- Position drain pan under hoses to catch excess fuel.

(1) Removal.

(a) Remove banjo connector screw (10), two sealing washers (11) and fuel line (12) from fuel filter head (13). Discard sealing washers.

(b) Disconnect fuel line (12) and remove from fuel pump (14).

(2) Installation.

NOTE

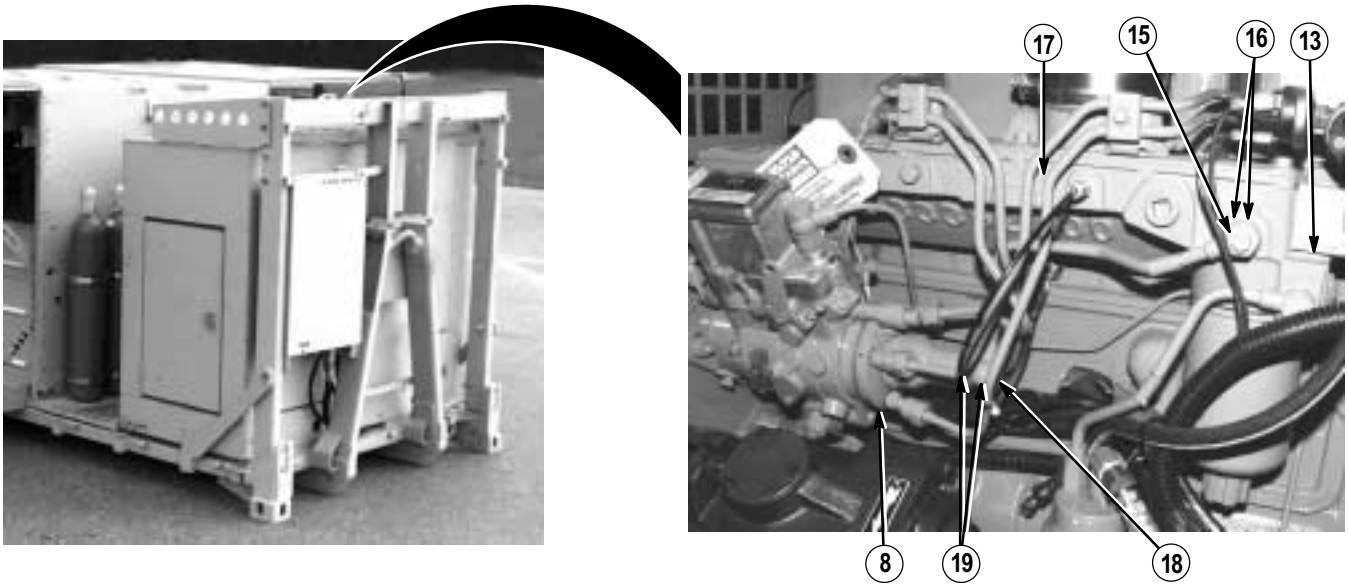
Install fuel line in position as noted prior to removal.

(a) Install fuel line (12) on fuel pump (14).

(b) Install fuel line (12) on fuel filter head (13) with two sealing washers (11) and banjo connector screw (10).

8-20. FUEL INJECTION LINES REPLACEMENT (CONT).

c. Injection Pump Supply Line.



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.

NOTE

- Tag and mark fuel lines prior to removal.
- Position drain pan under hoses to catch excess fuel.

(1) Removal.

(a) Remove banjo connector screw (15), two sealing washers (16) and fuel line (17) from fuel filter head (13). Discard sealing washers.

(b) Remove banjo connector screw (18), two sealing washers (19) and fuel line (17) from fuel injector pump (8). Discard sealing washers.

(2) Installation.

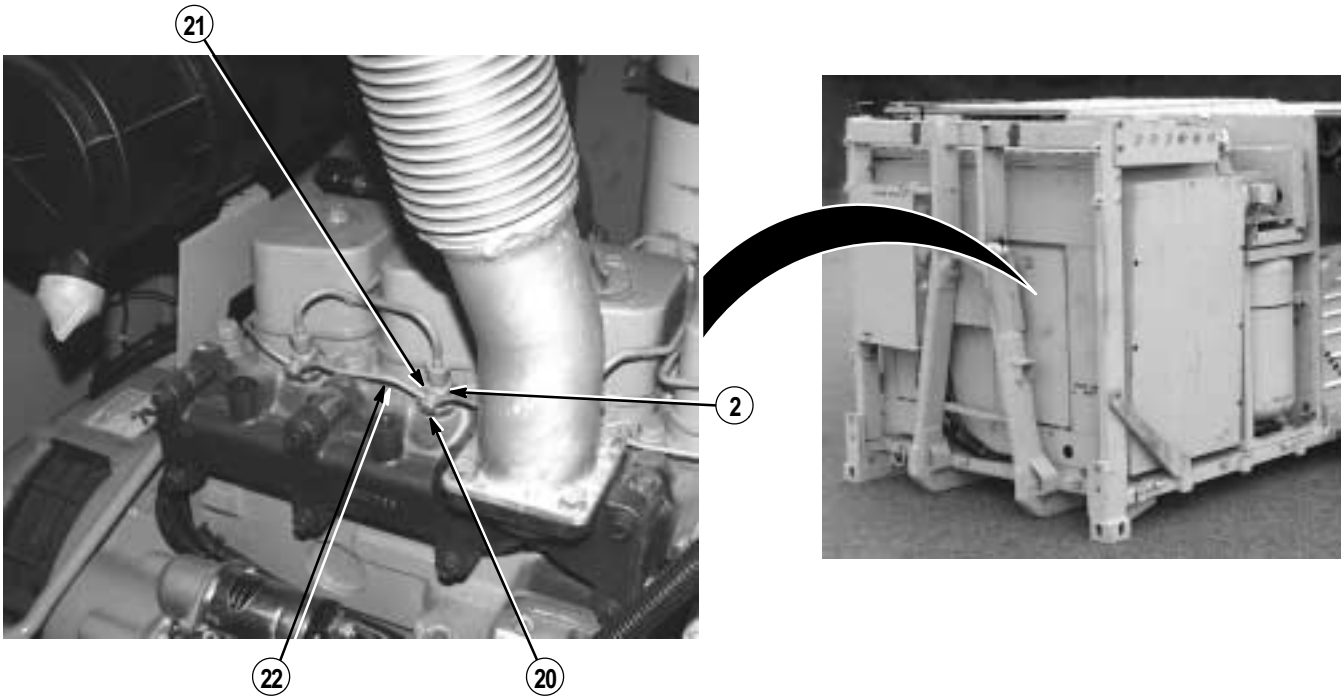
NOTE

Install fuel line in position as noted prior to removal.

(a) Install fuel line (17) on fuel injector pump (8) with two sealing washers (19) and banjo connector screw (18).

(b) Install fuel line (17) on fuel filter head (13) with two sealing washers (16) and banjo connector screw (15).

d. Fuel Drain 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.

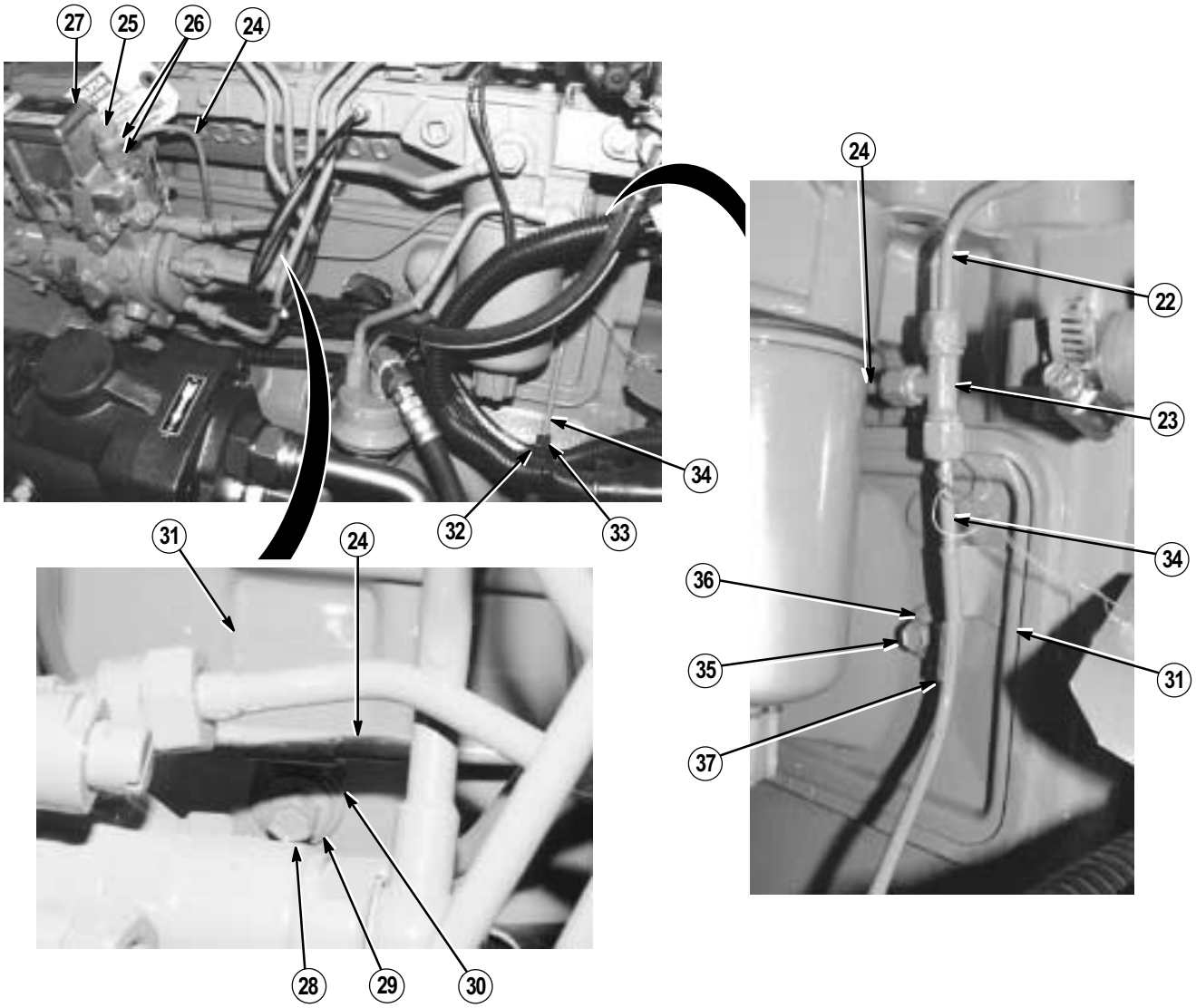
NOTE

- Tag and mark fuel lines prior to removal.
- Position drain pan under hoses to catch excess fuel.

(1) Removal.

(a) Remove four banjo connector screws (20), banjo seals (21) and fuel line (22) from four fuel injectors (2). Discard banjo seals.

8-20. FUEL INJECTION LINES REPLACEMENT (CONT).



(b) Disconnect fuel line (22) and remove from tee (23).

(c) Disconnect fuel line (24) from tee (23).

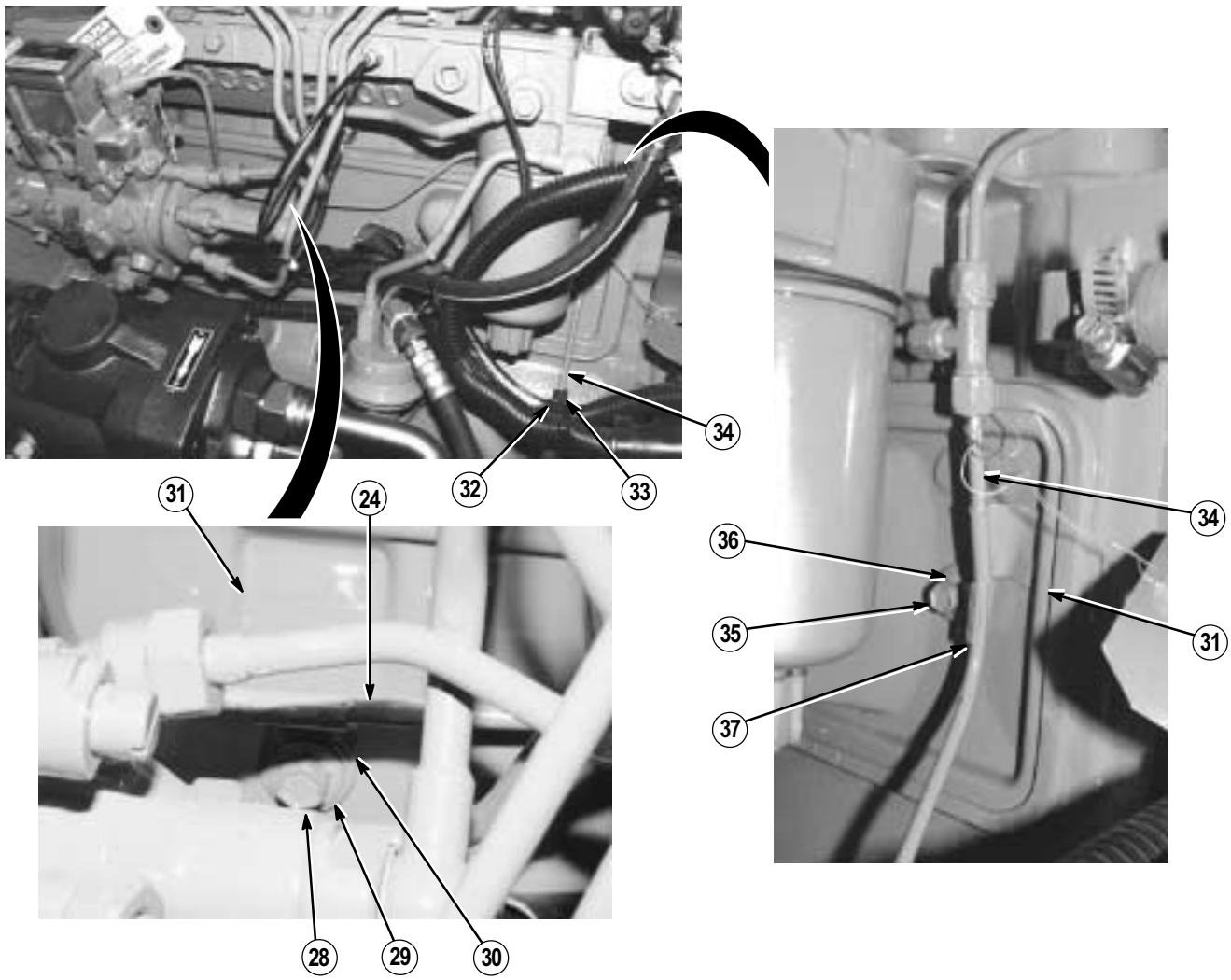
(d) Remove banjo connector screw (25), two sealing washers (26) and fuel line (24) from electronic fuel shutoff valve (27). Discard sealing washers.

(e) Remove screw (28), washer (29), clamp (30) and fuel line (24) from engine (31).

(f) Loosen clamp (32) and remove hose (33) from fuel line (34).

(g) Remove fuel line (34) from tee (23).

(h) Remove screw (35), washer (36), clamp (37) and fuel line (34) from engine (31).



(2) Installation.

NOTE

Install fuel line in position as noted prior to removal.

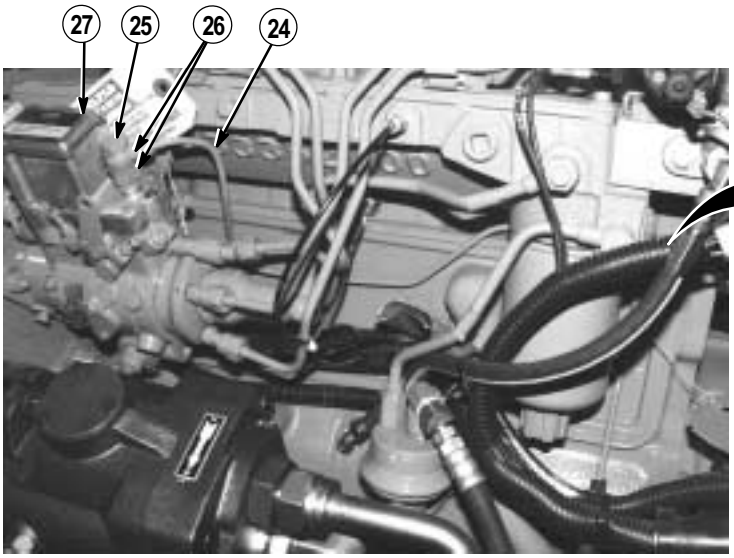
(a) Install fuel line (34) on engine (31) with clamp (37), washer (36) and screw (35).

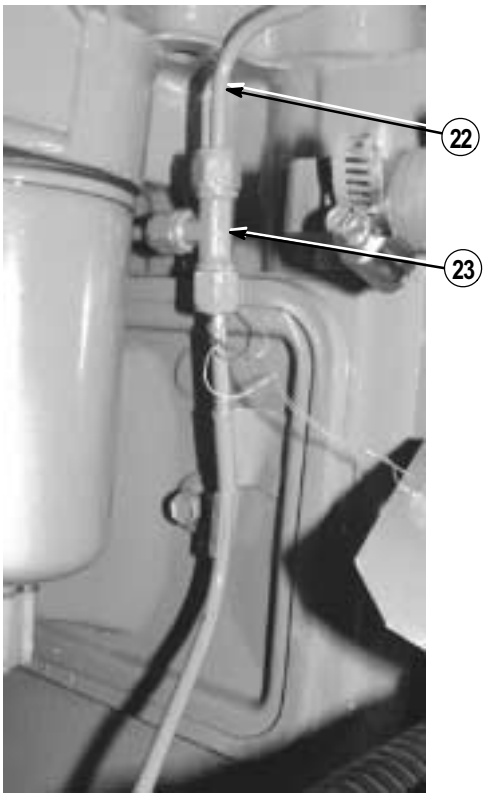
(b) Install fuel line (34) on tee (23).

(c) Install hose (33) on fuel line (34) and tighten clamp (32).

(d) Install fuel line (24) on engine (31) with clamp (30), washer (29) and screw (28). Tighten clamp.

8-20. FUEL INJECTION LINES REPLACEMENT (CONT).



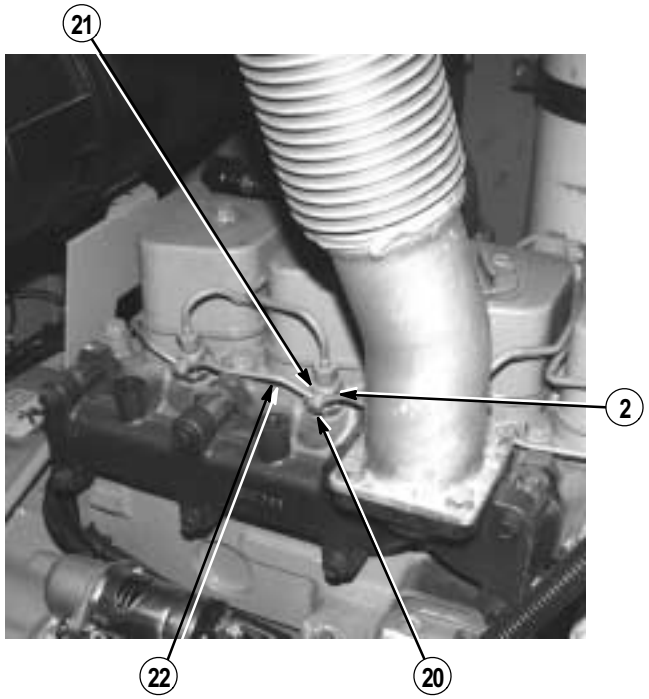


(e) Install fuel line (24) on electronic fuel shutoff valve (27) with two sealing washers (26) and banjo connector screw (25).

(f) Install fuel line (24) on tee (23).

(g) Install fuel line (22) on tee (23).

(h) Install fuel lines (22) on four fuel injectors (2) with banjo seals (21) and banjo connector screws (20).



e. Follow On Maintenance:

- Connect batteries, (TM 9-4940-568-10).
- Prime fuel system and check for leaks, (TM 9-4940-568-10).

END OF TASK

8-21. FUEL PUMP REPLACEMENT.

This task covers:

a. Removal b. Installation c. Follow-On Maintenance

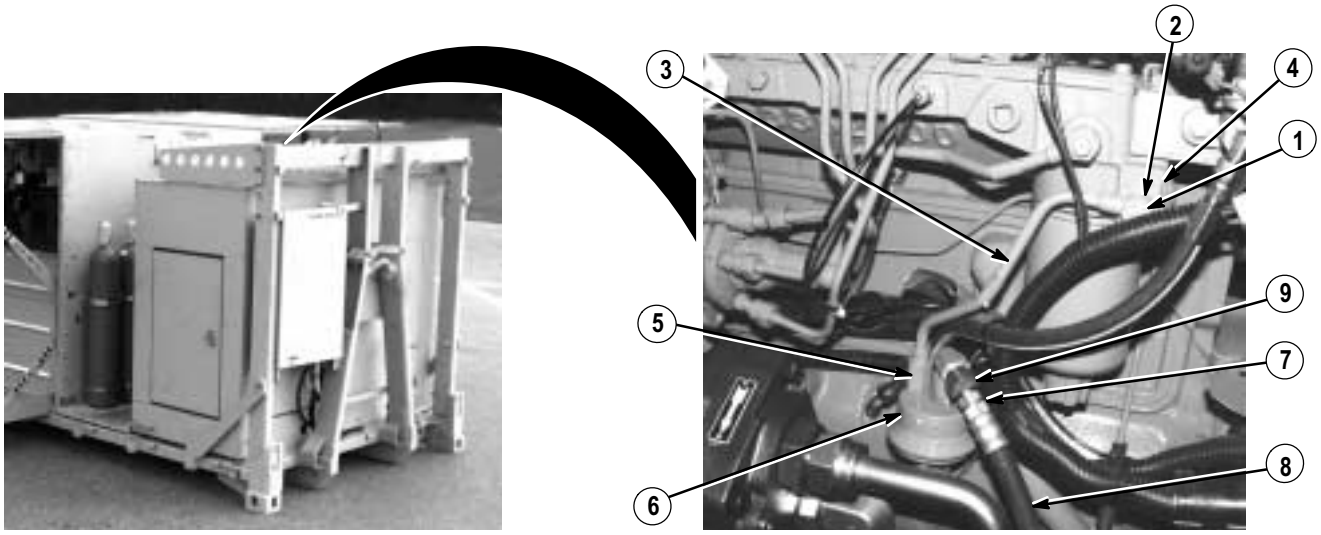
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 30, Appendix G)
Pan, Drain (Item 20, Appendix G)
Socket Set, 3/8 in. (Item 25, Appendix G)
Wrench, Torque (0 to 60 N·m) (Item 46, Appendix G)

Material/Parts
Sealing Compound (Item 34, Appendix C)
Gasket, Fuel Pump (Item 17, Appendix F)
Washer, Sealing (2) (Item 110, Appendix F)

Equipment Condition
FRS unloaded, (TM 9-4940-568-10)
Batteries disconnected, (TM 9-4940-568-10)
Remove rear panel, (TM 4940-568-10)

a. Removal.



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.

NOTE

Position drain pan under fuel lines to catch excess fuel.

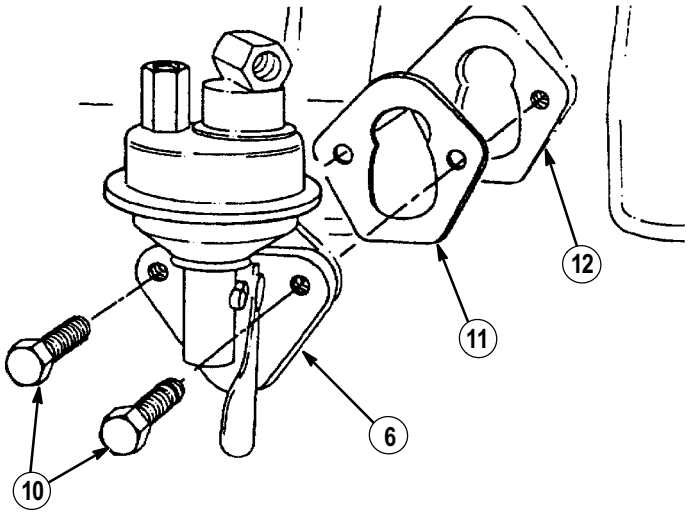
(1) Remove banjo screw (1) and two sealing washers (2) from fuel line (3) on fuel filter housing (4). Discard sealing washers

(2) Loosen fitting (5) and remove line (3) from fuel pump (6).

(3) Loosen fitting (7) and remove hose (8) and elbow (9) from fuel pump (6).

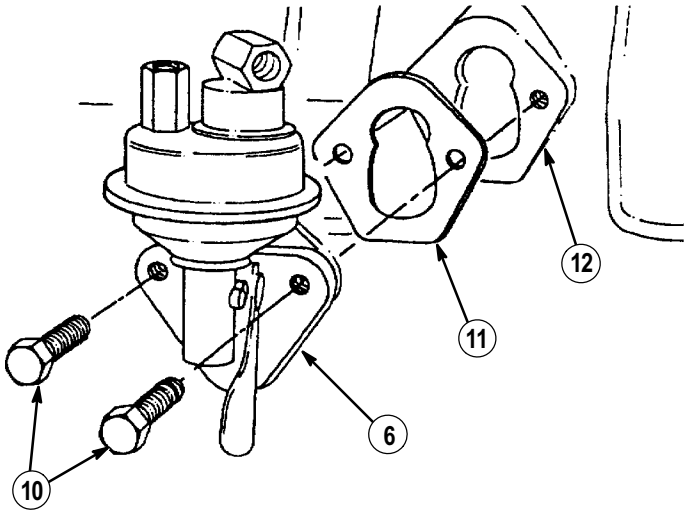
8-21. FUEL PUMP REPLACEMENT (CONT).

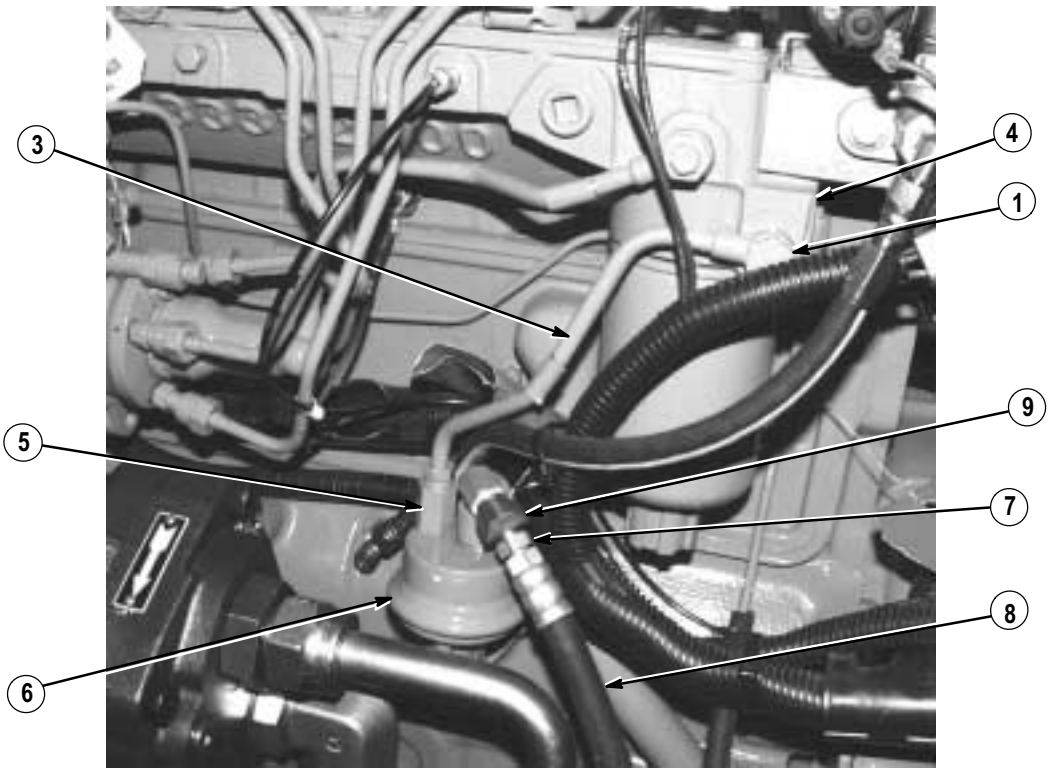
(4) Remove two screws (10), fuel pump (6) and gasket (11) from engine (12). Discard gasket.



b. Installation.

(1) Install gasket (11), fuel pump (6) and two screws (10) on engine (12). Tighten screws to 18 lb-ft (24 N·m).





WARNING

Adhesives, solvents and sealing compounds can burn easily, can give off harmful vapors and are harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in well-ventilated area. If adhesive, solvent or sealing compound gets on skin or clothes, wash immediately with soap and water.

(2) Coat threads of fitting (7) and elbow (9) with sealing compound.

(3) Install elbow (9) and tighten fitting (7) on hose (8) for fuel pump (6).

(4) Coat threads of fitting (5) with sealing compound.

(5) Install line (3) on fuel pump (6) and tighten fitting (5).

(6) Install banjo screw (1), two sealing washers and fuel line (3) on fuel filter housing (4).

8-21. FUEL PUMP REPLACEMENT (CONT).

c. Follow-On Maintenance:

- Prime fuel system, (TM 9-4940-568-10).
- Connect batteries, (TM 9-4940-568-10).
- Start generator and check for leaks, (TM 9-4940-568-10).
- Install rear panel, (TM 9-4940-568-10).

END OF TASK

8-22. FUEL HOSES AND FITTINGS REPLACEMENT.

This task covers:

a. Fuel Pump Supply Hose (w/Filter)
b. Fuel Return Hose
c. Heater Supply Hose
d. Follow-On Maintenance

INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 30, Appendix G)
Cap and Plug Set (Item 3, Appendix G)
Pan, Drain (Item 20, Appendix G)

Materials/Parts
Cable Ties (Item 10, Appendix C)

Materials/Parts - Continued
Sealing Compound (Item 32, Appendix C)
Tags, Identification (Item 40, Appendix C)

Equipment Condition
FRS unloaded, (TM 9-4940-568-10)
Batteries disconnected, (TM 9-4940-568-10)
Remove rear panel, (TM 9-4940-568-10)

CAUTION

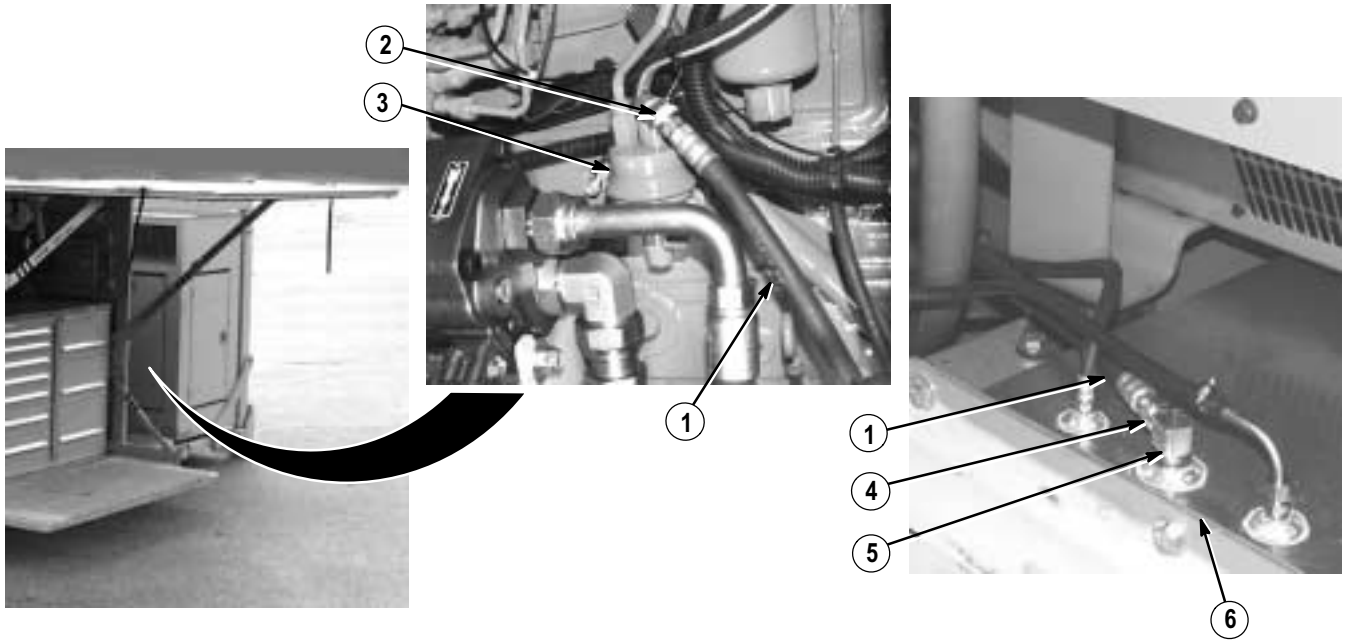
Equipment may be damaged by foreign matter if hoses, tubes and connectors are not plugged and capped when removed.

NOTE

- Note location and position of hoses, reducers, elbows and fittings prior to removal.
- Remove cable ties as required.
- Cap hoses, fittings, and connections upon removal.
- Position drain pan under hose to catch excess fuel.

8-22. FUEL HOSES AND FITTINGS REPLACEMENT (CONT).

a. Fuel Pump Supply Hose (With Filter).



(1) Removal.

(a) Remove hose (1) from fitting (2).

(b) Remove fitting (2) from fuel pump (3).

NOTE

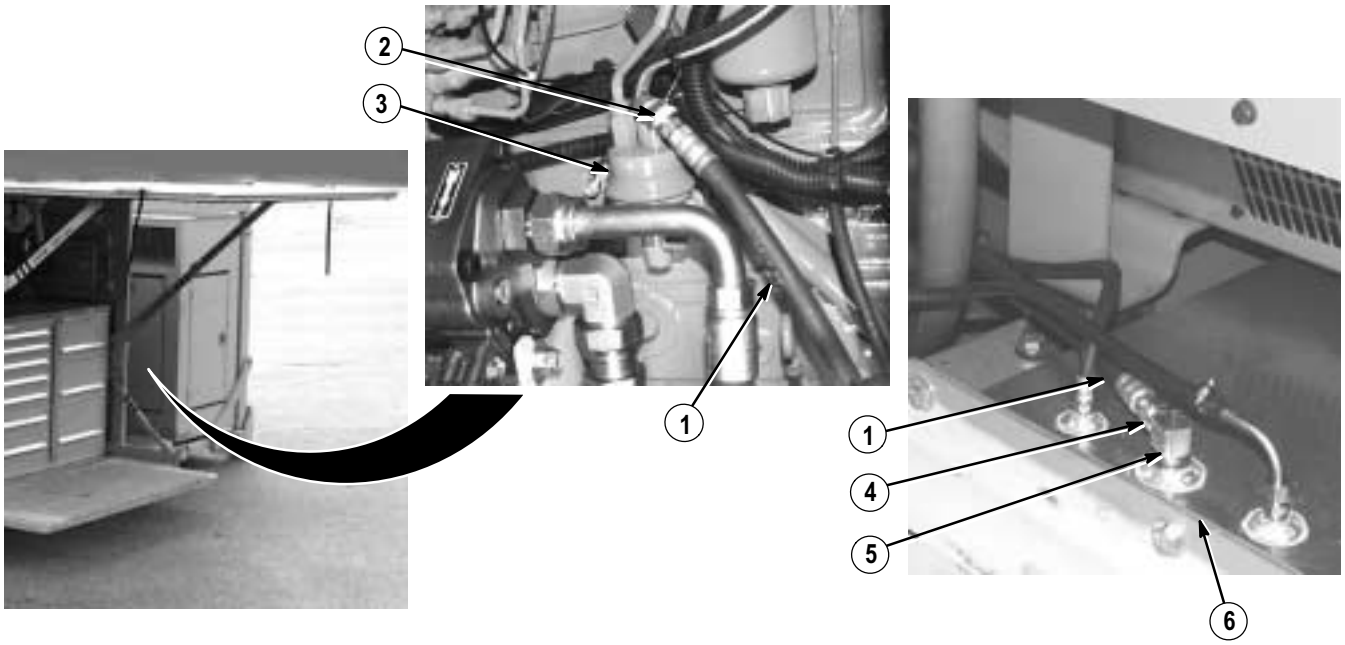
Threaded end of hose does not swivel.

(c) Remove hose (1) from reducer (4).

(d) Remove reducer (4) from elbow (5).

(e) Remove elbow (5) from fuel tank (6).

(2) Installation.



WARNING

Adhesives, solvents and sealing compounds can burn easily, can give off harmful vapors, and are harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in well–ventilated area. If adhesive, solvent or sealing compound gets on skin or clothing, wash immediately with soap and water.

NOTE

Install hoses, fittings, elbows and reducers in locations as noted prior to removal.

(a) Apply sealing compound to threads of elbow (5), reducer (4), fitting (2) and hose (1).

(b) Install elbow (5) on fuel tank (6).

(c) Install reducer (4) on elbow (5).

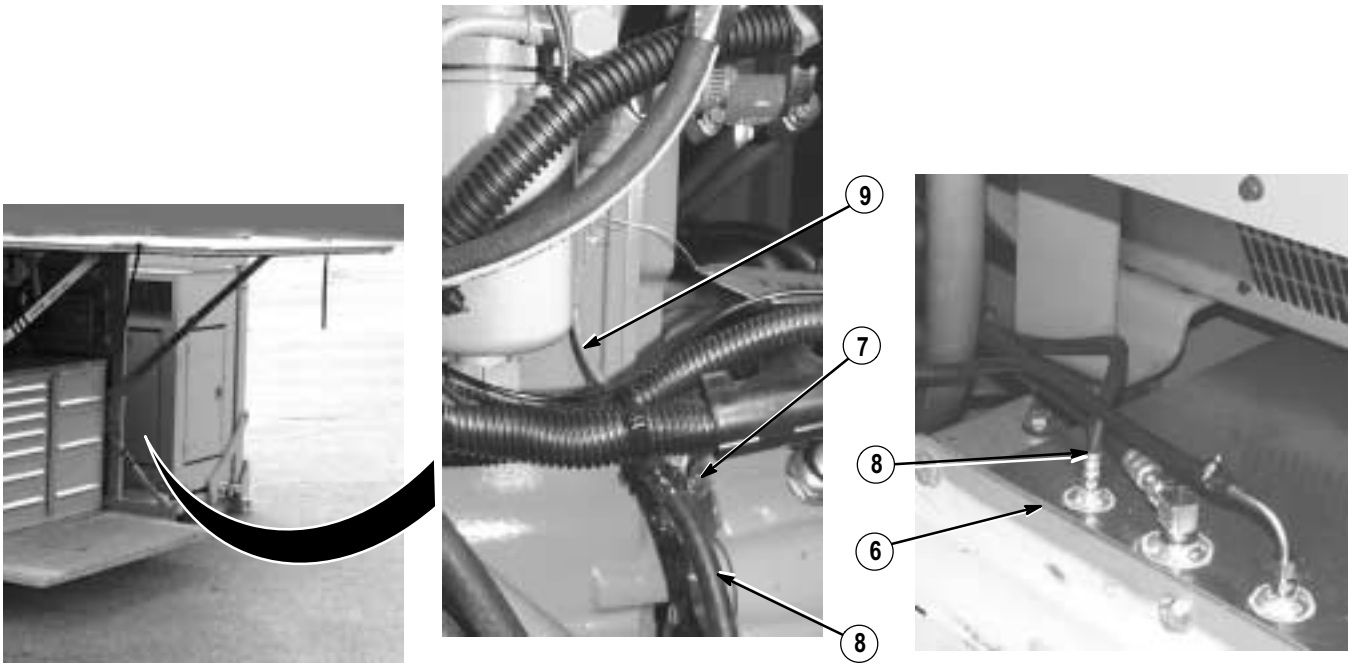
(d) Install hose (1) on reducer (4).

(e) Install fitting (2) on fuel pump (3).

(f) Install hose (1) on fitting (2).

8-22. FUEL HOSES AND FITTINGS REPLACEMENT (CONT).

b. Fuel Return Hose.



(1) Removal.

(a) Loosen clamp (7) and remove hose (8) from fuel return line (9).

NOTE

Threaded end of hose does not swivel.

(b) Remove hose (8) from fuel tank (6).

(2) Installation.

WARNING

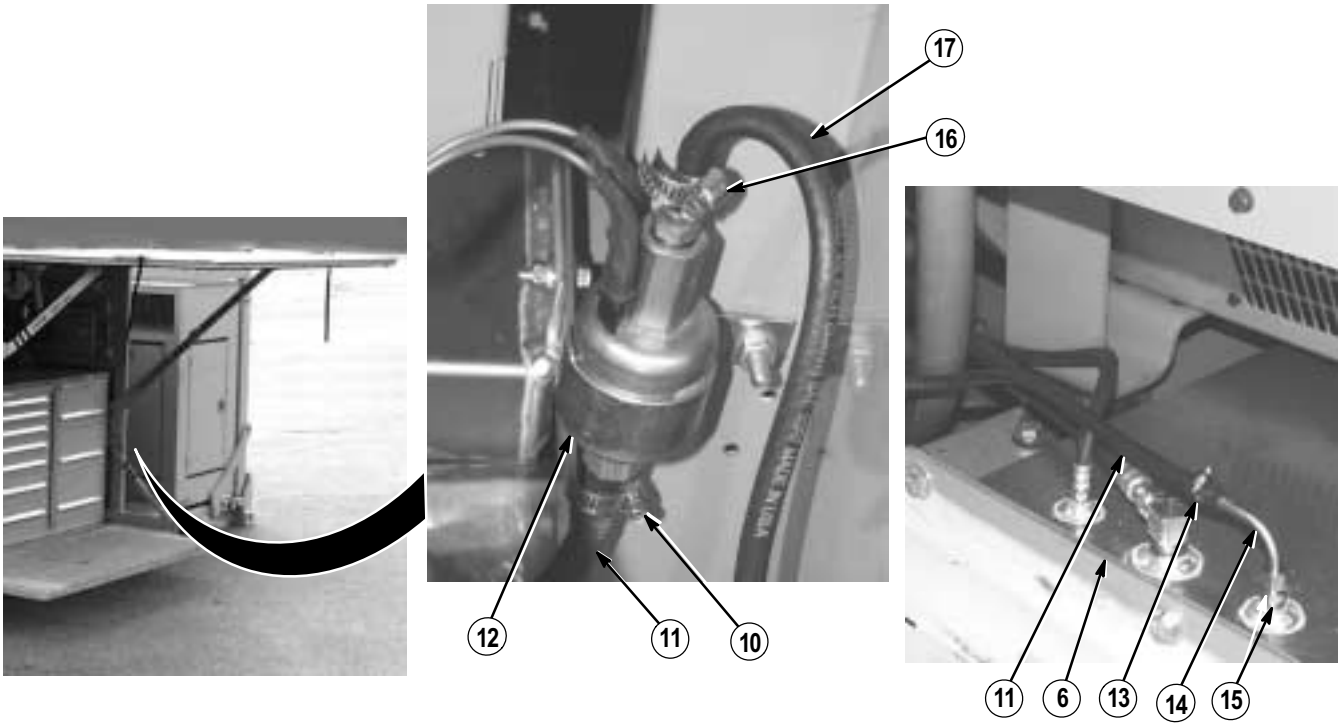
Adhesives, solvents and sealing compounds can burn easily, can give off harmful vapors, and are harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in well–ventilated area. If adhesive, solvent or sealing compound gets on skin or clothing, wash immediately with soap and water.

(a) Apply sealing compound to threads of hose (8).

(b) Install hose (8) on fuel tank (6).

(c) Install hose (8) on fuel return line (9) and tighten clamp (7).

c. Heater Supply Hose.



(1) Removal.

(a) Loosen clamp (10) and remove hose (11) from electric fuel pump (12).

(b) Loosen clamp (13) and remove hose (11) from tube (14).

(c) Remove tube (14) from fitting (15).

(d) Remove fitting (15) from fuel tank (6).

NOTE

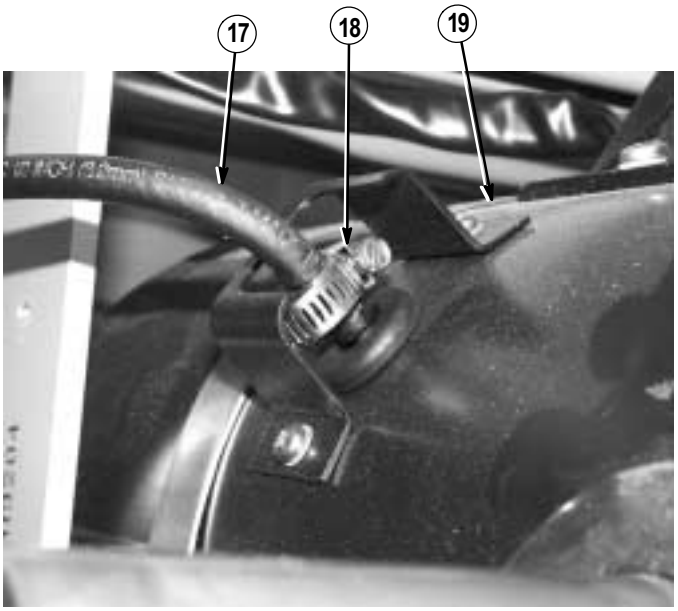
Heater supply hose routes from generator housing through bottom of shelter to heater. Note routing prior to removal.

(e) Loosen clamp (16) and remove hose (17) from electric fuel pump (12).

8-22. FUEL HOSES AND FITTINGS REPLACEMENT (CONT).

(f) Loosen clamp (18) and remove hose (17) from heater (19).

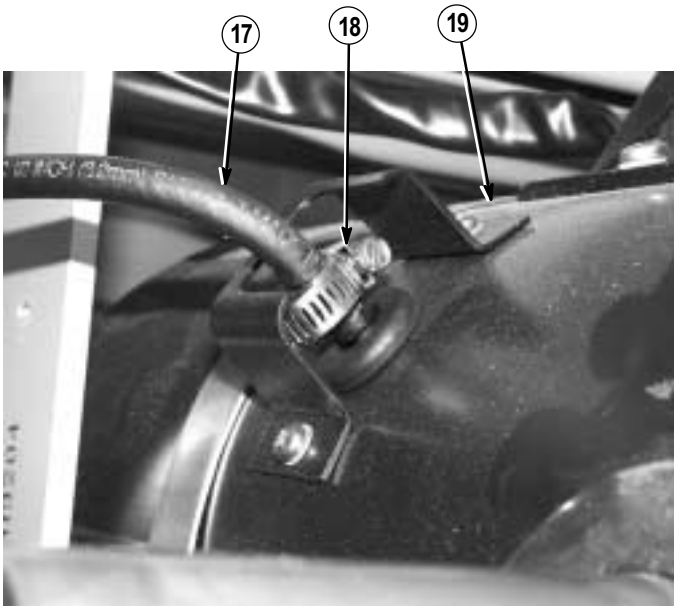
(g) Remove hose (17) from shelter.

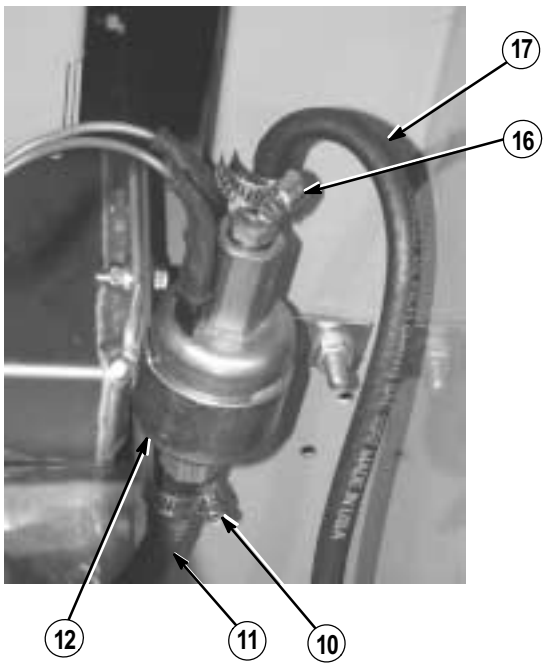


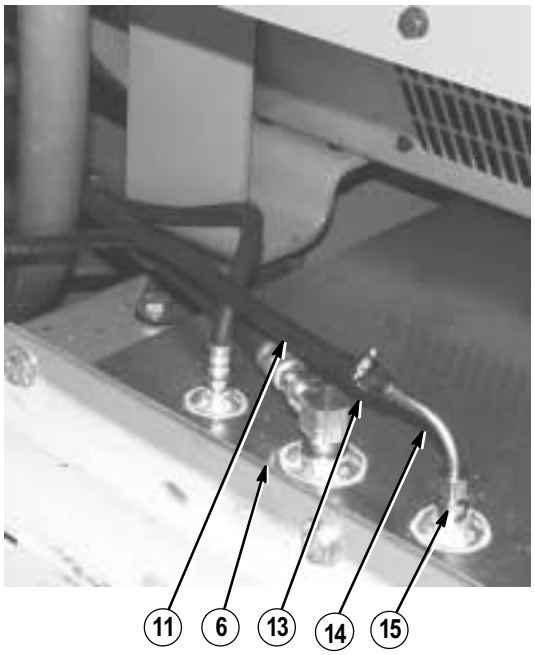
(2) Installation.

(a) Position hose (17) in shelter.

(b) Install hose (17) on heater (19) and tighten clamp (18).







(c) Install hose (17) on electric fuel pump (12) and tighten clamp (16).

WARNING

Adhesives, solvents and sealing compounds can burn easily, can give off harmful vapors, and are harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in well–ventilated area. If adhesive, solvent or sealing compound gets on skin or clothing, wash immediately with soap and water.

(d) Apply sealing compound to threads of fitting (15).

(e) Install fitting (15) in fuel tank (6).

(f) Install tube (14) on fitting (15).

(g) Install hose (11) on tube (14) and tighten clamp (13).

(h) Install hose (11) on electric fuel pump (12) and tighten clamp (10).

d. Follow–On–Maintenance:

- Connect batteries, (TM 9-4940-568-10).
- Prime fuel system, (TM 9-4940-568-10).
- Start generator and check for leaks, (TM 9-4940-568-10).

END OF TASK

8-23. EXHAUST SYSTEM REPLACEMENT.

This task covers:

a. Removal b. Installation c. Follow-On Maintenance

INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 30, Appendix G)
Lifting Device (Minimum capacity 300 lbs [136 kg])

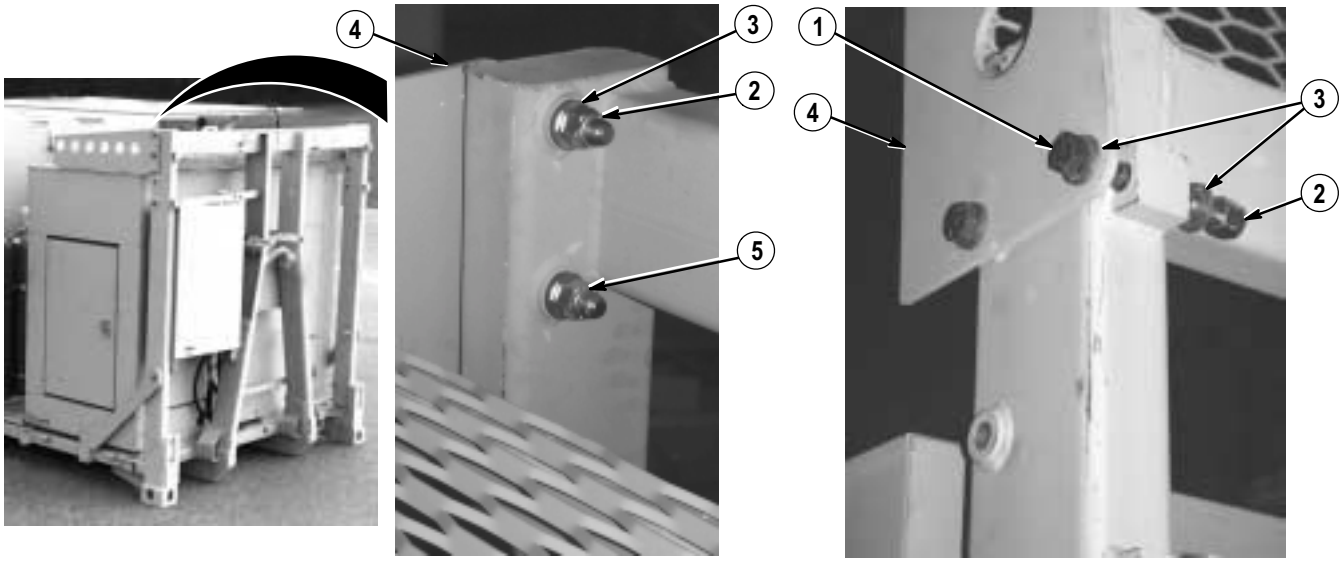
Materials/Parts
Gasket (Item 16, Appendix F)
Locknut (4) (Item 44, Appendix F)

Materials/Parts – Continued
Lockwasher (4) (Item 62, Appendix F)
Rivet (4) (Item 98, Appendix F)

Personnel Required
Two

Equipment Condition
FRS unloaded, (TM 9-4940-568-10)
Batteries disconnected, (TM 9-4940-568-10)
Remove air compressor filter, (Para 11-6)
Remove brush guard support arm, (Para 4-8)

a. Removal.



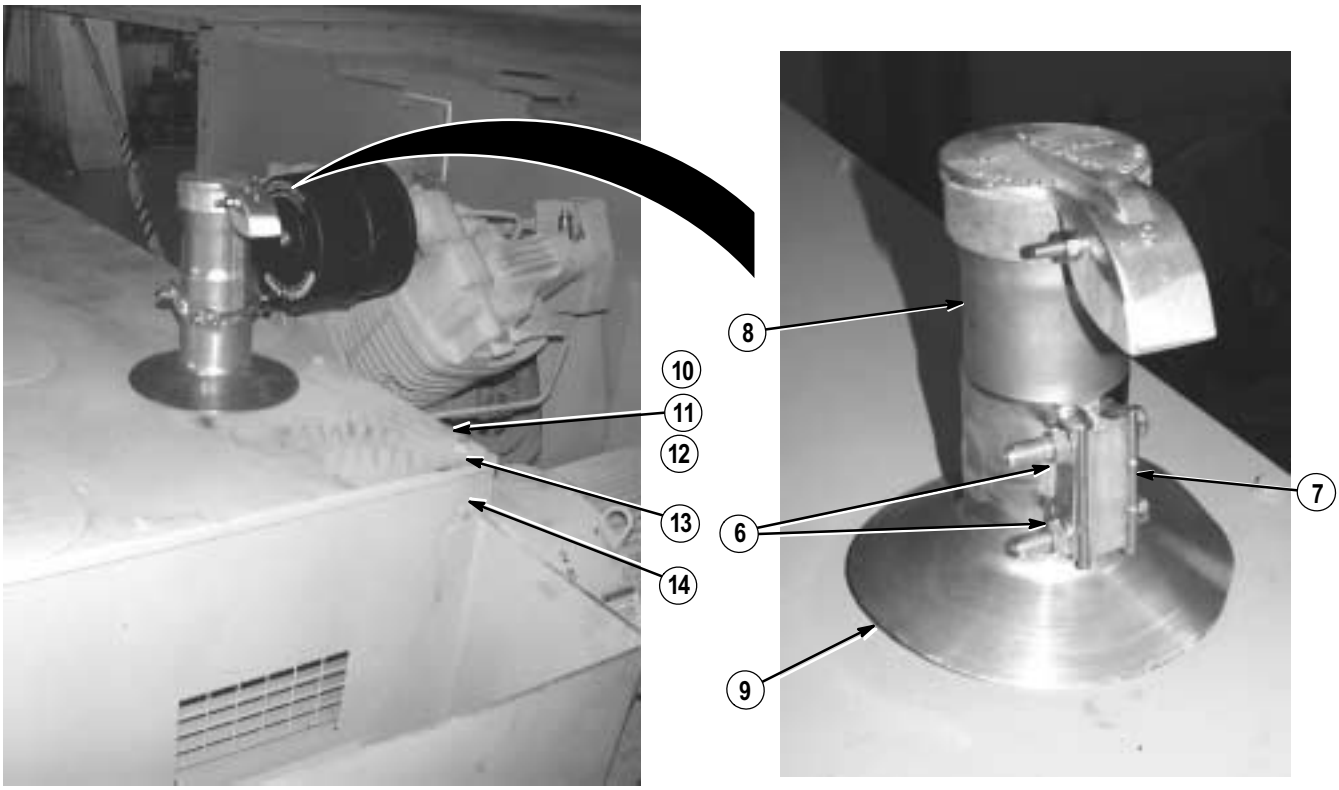
WARNING

Storage rack weighs approximately 300 lbs (136 kg). Use the aid of an assistant when lifting storage rack to prevent injury to personnel.

(1) Remove two top screws (1), locknuts (2) and four washers (3) from storage rack (4). Retain locknuts

(2) Loosen two bottom locknuts (5) on storage rack (4).

(3) With the aid of an assistant, pivot storage rack (4) up and position two screws (1), washers (3) and locknuts (2) (removed from top hole) in storage rack to lock in upright position.



WARNING

Allow engine to cool before performing maintenance on muffler, exhaust pipe and exhaust manifold. If necessary, use insulated pads and gloves.

CAUTION

To prevent damage to the equipment, do not step on generator top panel.

(4) Loosen two nuts (6) on clamp (7) and remove exhaust rain cap (8), clamp and muffler flange (9).

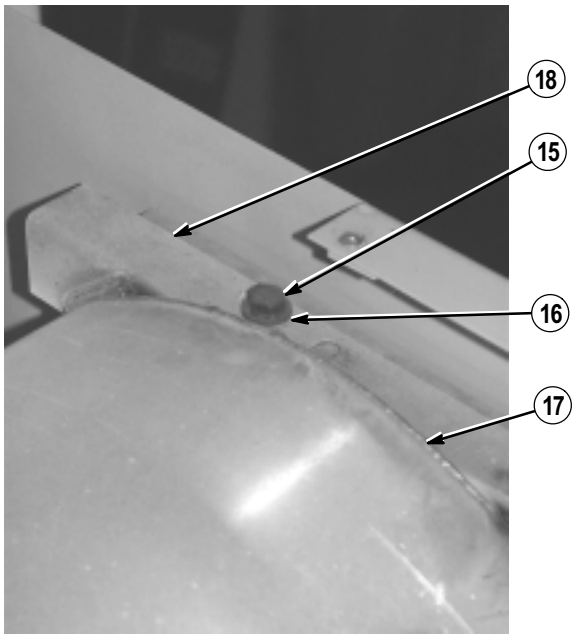
(5) Remove 13 screws (10), washers (11) and plastic washers (12) from top panel (13) of generator enclosure (14).

NOTE

Perform the following step only with the aid of an assistant.

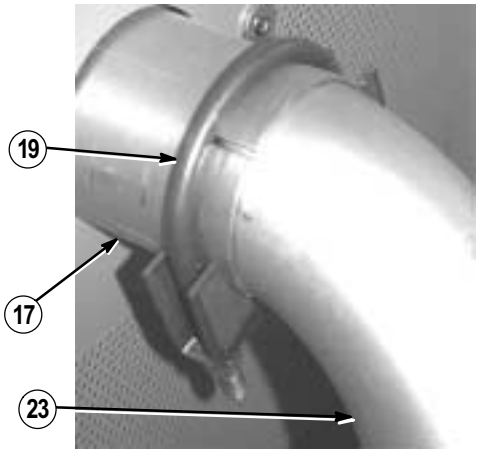
(6) Remove top panel (13).

8-23. EXHAUST SYSTEM REPLACEMENT (CONT).



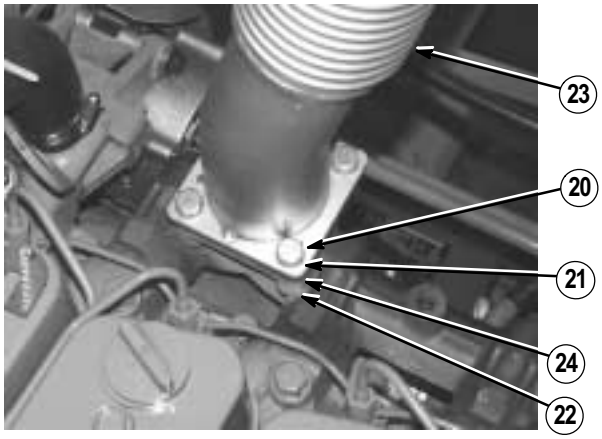
(7) Remove two screws (15) and washers (16) from muffler (17) and muffler brackets (18).

(8) Loosen muffler clamp (19) on muffler (17).



(9) Remove four screws (20) and lockwashers (21) from exhaust manifold (22). Discard lockwashers.

(10) Remove exhaust pipe (23) and gasket (24) from muffler (17) and exhaust manifold (22). Discard gasket



WARNING

Deflector weighs approximately 143 lbs (65 kg). Attach suitable lifting device to prevent possible injury to personnel.

(11) With the aid of an assistant, attach lifting device to deflector (25).

(12) Loosen four screws (26) and remove two screws (27), washers (28) and remove deflector (25) from generator enclosure (14).

(13) Remove lifting device from deflector (25).

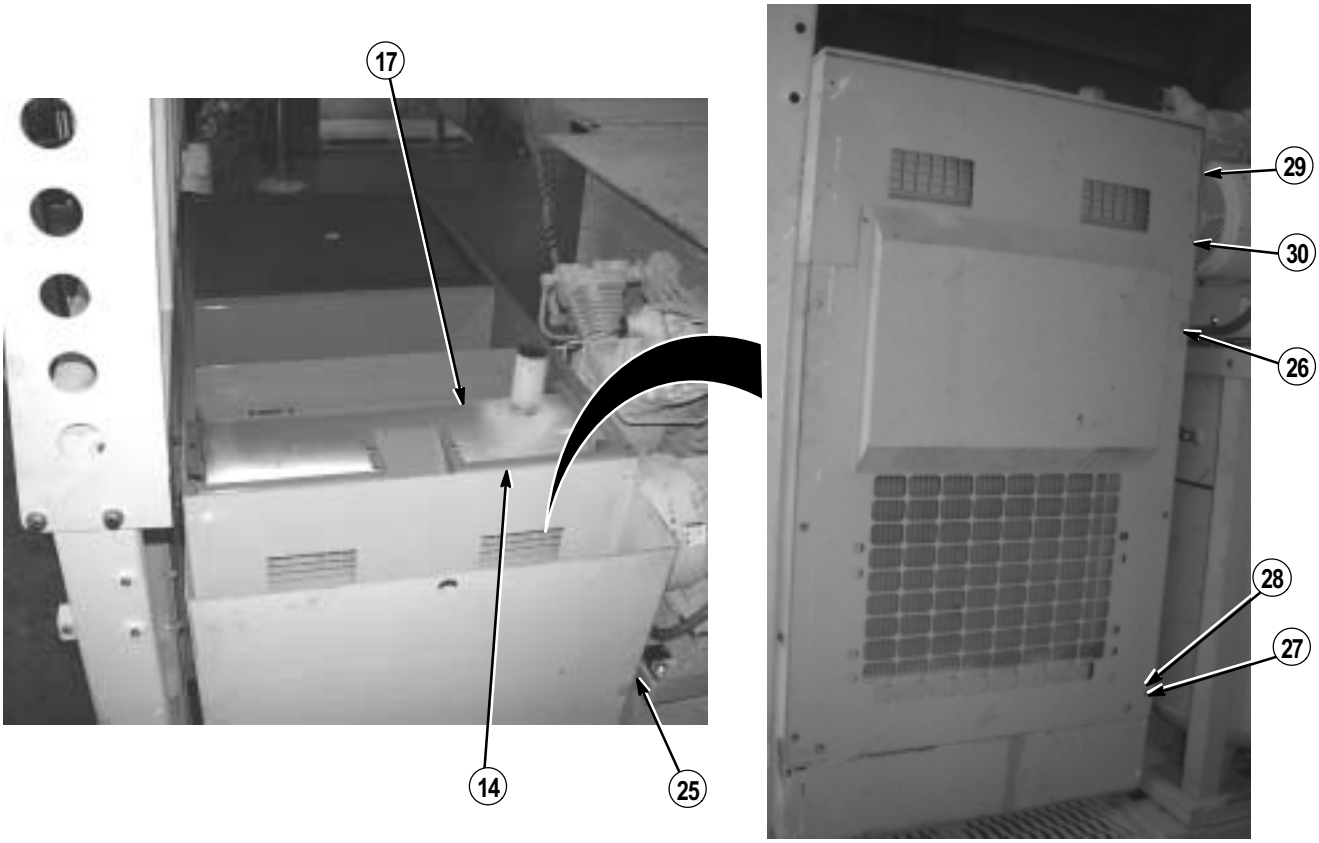
(14) Drill out four rivets (29) from generator enclosure left panel (30).

(15) Remove generator enclosure left panel (30) from generator enclosure (14).

(16) With the aid of an assistant, remove muffler (17) from generator enclosure (14).

8-23. EXHAUST SYSTEM REPLACEMENT (CONT).

b. Installation.



(1) With the aid of an assistant, position muffler (17) in generator enclosure (14).

(2) Install generator enclosure left panel (30) on generator enclosure (14).

(3) Install four rivets (29) on generator enclosure left panel (30).

WARNING

Deflector weighs approximately 143 lbs (65 kg). Attach suitable lifting device to prevent possible injury to personnel.

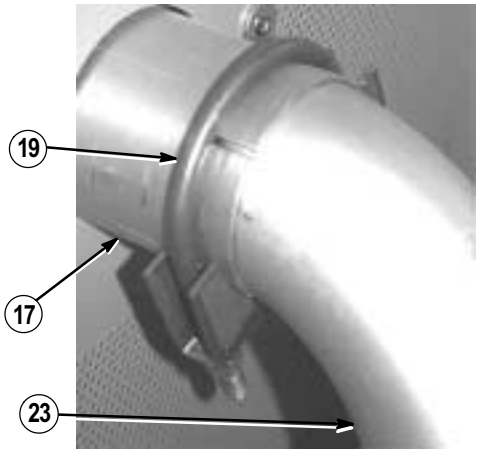
(4) Attach lifting device to deflector (25).

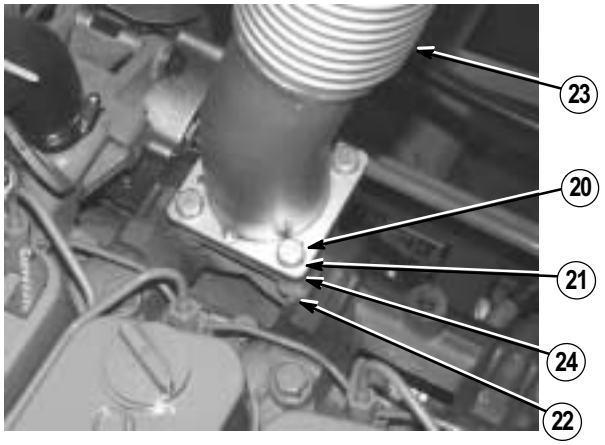
(5) With the aid of an assistant, position deflector (25) on generator enclosure (14) and install two washers (28), screws (27) and tighten four screws (26).

(6) Position exhaust pipe (23) and gasket (24) on muffler (17) and exhaust manifold (22).

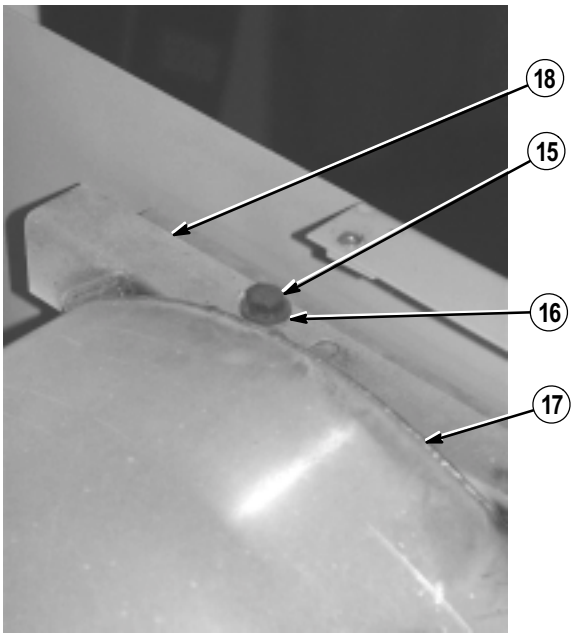
(7) Install four screws (20) and lockwashers (21) to exhaust manifold (22).

(8) Tighten muffler clamp (19) on mufller (17).

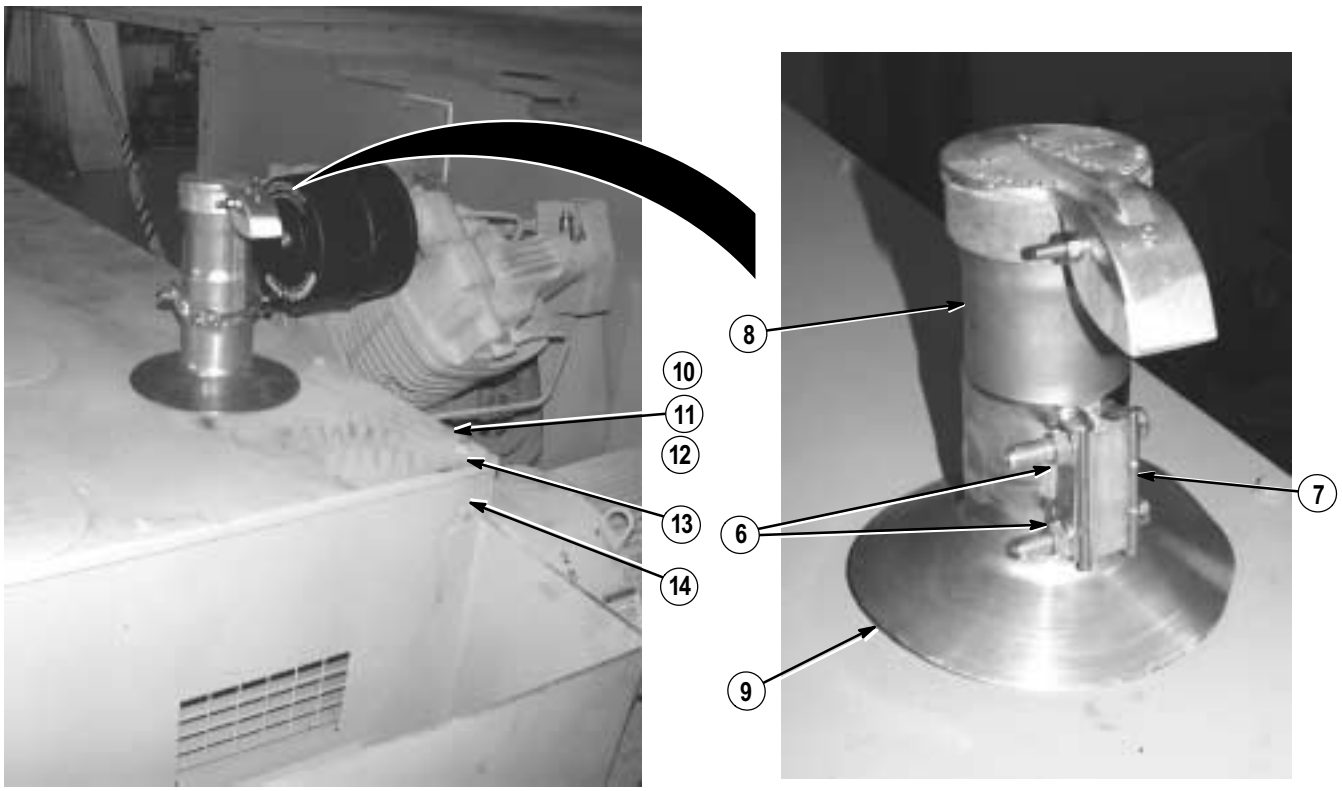




(9) Install two screws (15) and washers (16) on muffler (17) and muffler brackets (18).



8-23. EXHAUST SYSTEM REPLACEMENT (CONT).



CAUTION

To prevent damage to the equipment, do not step on generator top panel.

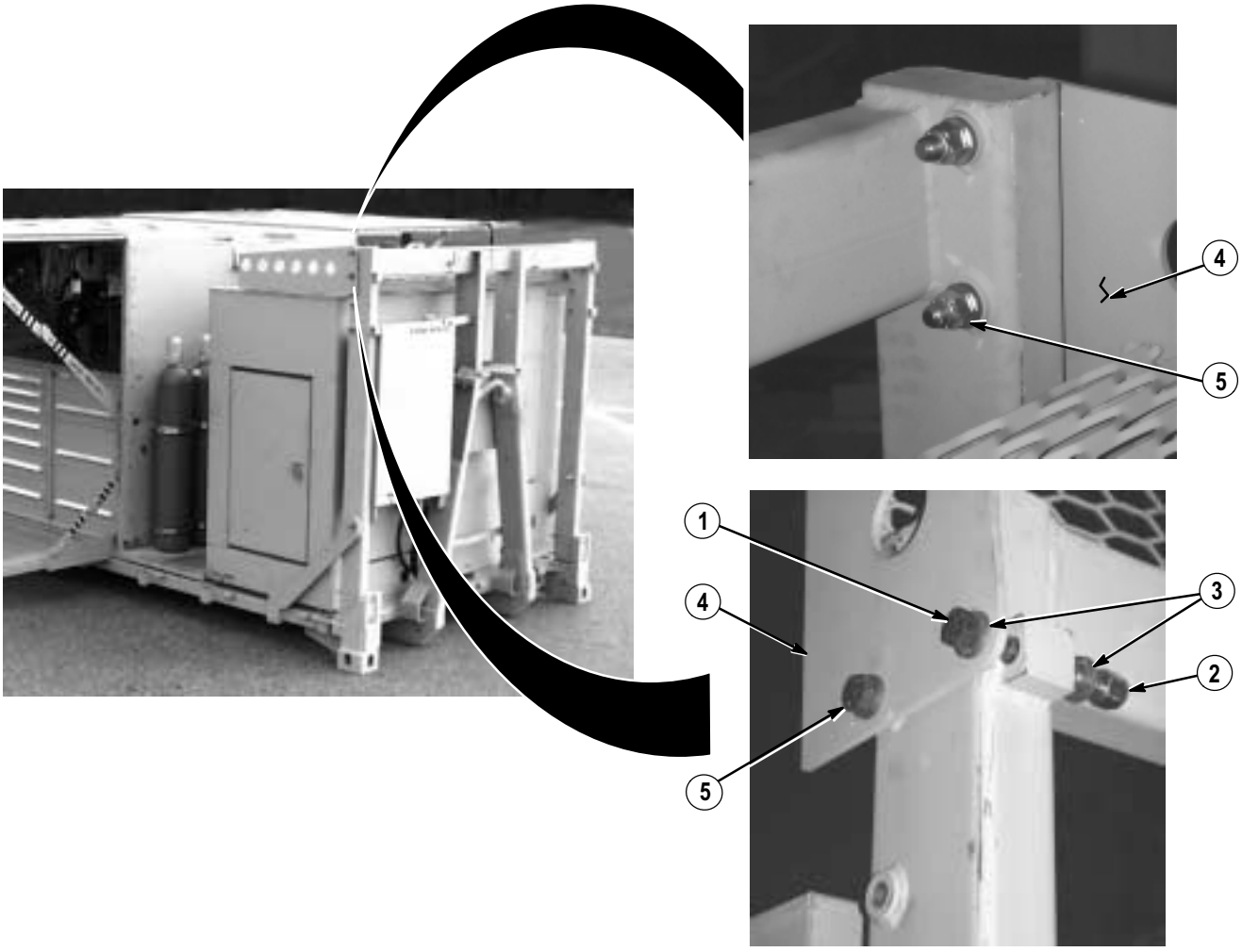
NOTE

Perform the following step only with the aid of an assistant.

(10) Install top panel (13) on generator enclosure (14).

(11) Install 13 screws (10), washers (11) and plastic washers (12) to top panel (13) of generator enclosure (14).

(12) Install muffler flange (9), clamp (7) and exhaust rain cap (8) and tighten two nuts (6).



WARNING

Storage rack weighs approximately 300 lbs (136 kg). Use the aid of an assistant when lifting storage rack to prevent injury to personnel.

(13) Remove two screws (1), locknuts (2) and four washers (3) to unlock storage rack (4) and with aid of an assistant pivot storage rack down. Discard locknuts

(14) Install two screws (1), locknuts (2) and four washers (3) to secure storage rack (4).

(15) Remove two bottom locknuts (5) on storage rack (4). Discard locknuts

(16) Install two bottom locknuts (5) on storage rack (4).

c. Follow-On Maintenance:

- Install brush guard support arm, (Para 4-8).
- Install air compressor filter, (Para 11-6).
- Start generator and check for leaks, (TM 9-4940-568-10).

END OF TASK

8-24. RADIATOR REPLACEMENT.

This task covers:

a. Removal b. Installation c. Follow-On Maintenance

INITIAL SETUP

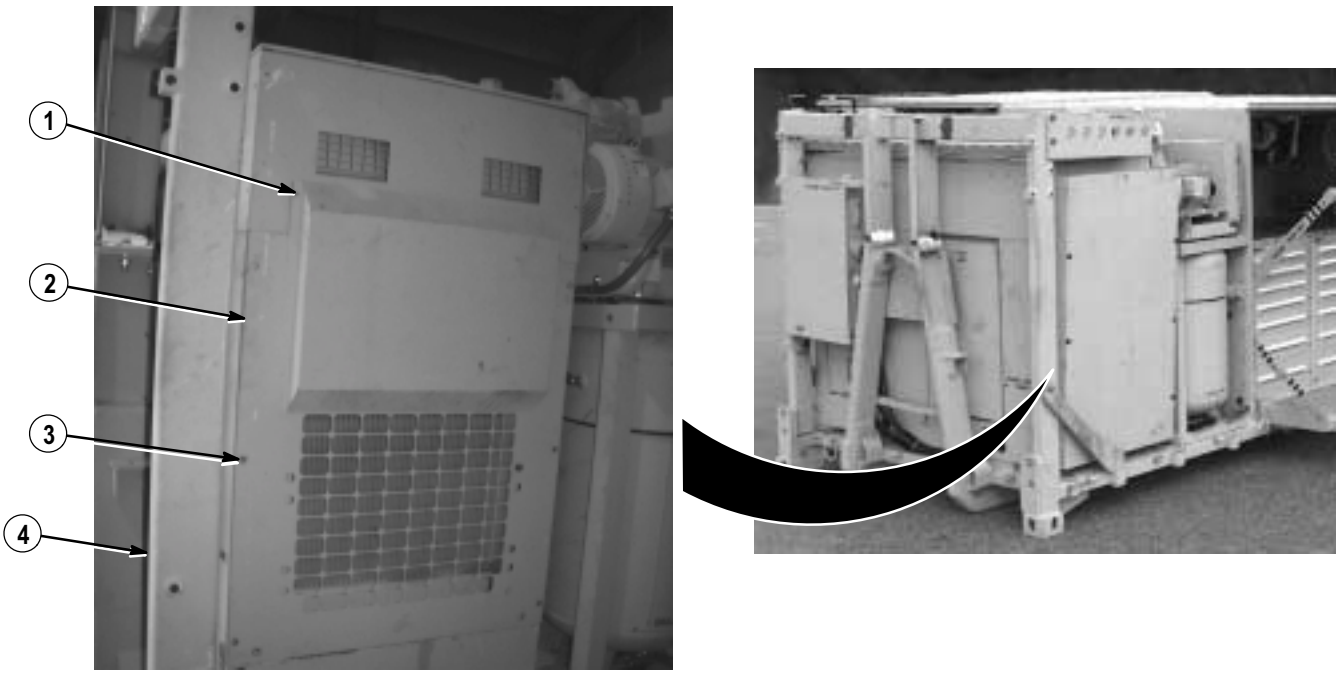
Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 30, Appendix G)
Drill, Electric (Item 8, Appendix G)
Drill Set, Twist (Item 9, Appendix G)
Lifting Device, Minimum Capacity 100 lbs [45 kg])

Material/Parts
Sealing Compound (Item 32, Appendix C)
Tags, Identification (Item 40, Appendix C)
Rivet (2) (Item 98, Appendix F)

Personnel Required
Two

Equipment Condition
FRS unloaded, (TM 9-4940-568-10)
Batteries disconnected, (TM 9-4940-568-10)
Radiator drained, (Para 8-26)

a. Removal.

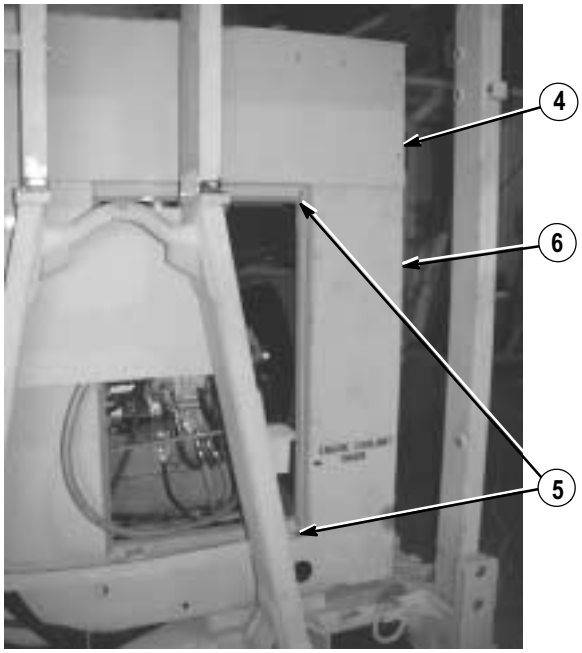


(1) Remove deflector as outlined in Exhaust System Replacement (Para 8-23).

(2) Drill out two rivets (1) from generator left panel (2).

(3) Remove four screws (3) and generator left panel (2) from generator enclosure (4).

(4) Remove three screws (5) and front left panel (6) of generator enclosure (4).



NOTE

It may be necessary to tap low coolant level sensor with a soft faced hammer to loosen.

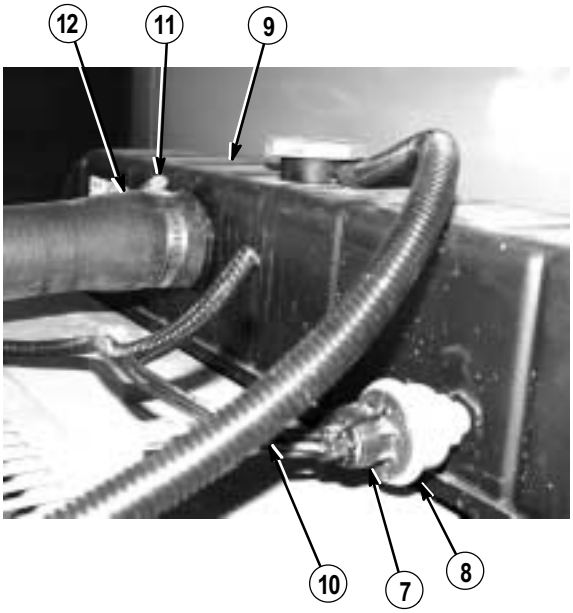
(5) Disconnect connector (7) from low coolant level sensor (8).

(6) Remove low coolant level sensor (8) from radiator (9).

(7) Disconnect surge tank hose (10) from radiator (9).

WARNING

Radiator assembly weighs 51 lbs (23 kg). Attach suitable lifting device prior to removal/installation to prevent possible injury to personnel.



NOTE

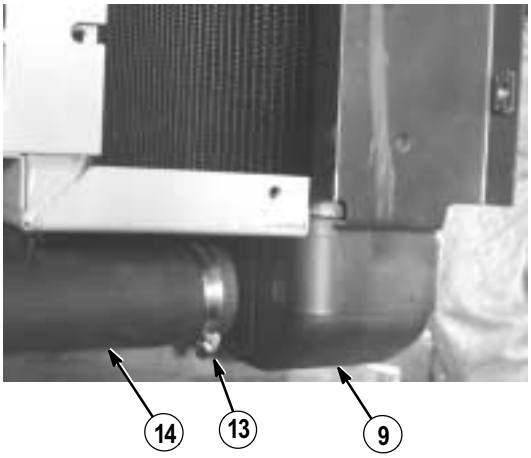
Note and record position of hose clamps prior to removal.

(8) Attach lifting device to radiator (9).

(9) Loosen clamp (11) and remove upper hose (12) from radiator (9).

8-24. RADIATOR REPLACEMENT (CONT).

(10) Loosen clamp (13) and remove lower hose (14) from radiator (9).



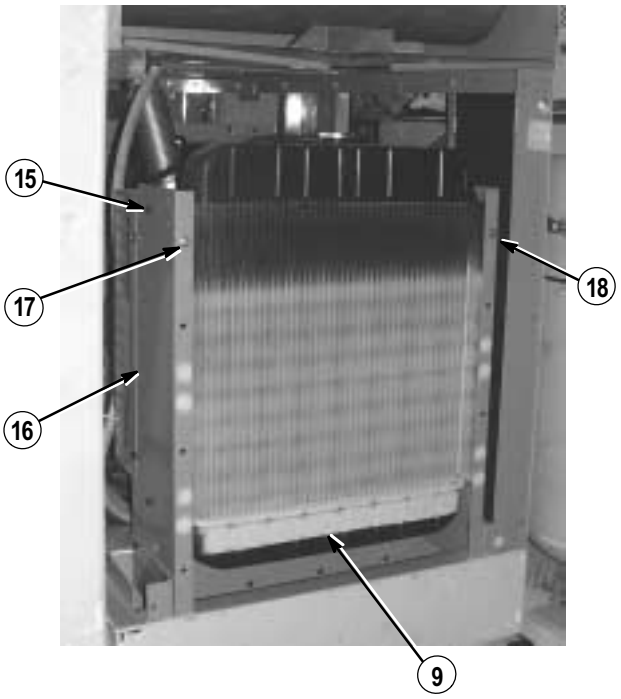
(11) Remove four screws (15) from right side radiator panel (16).

(12) Remove three screws (17) from left side of radiator (9).

WARNING

Ensure radiator is fully supported by lifting device prior to removal of screws in Step (13). Failure to comply may result in severe injury to personnel.

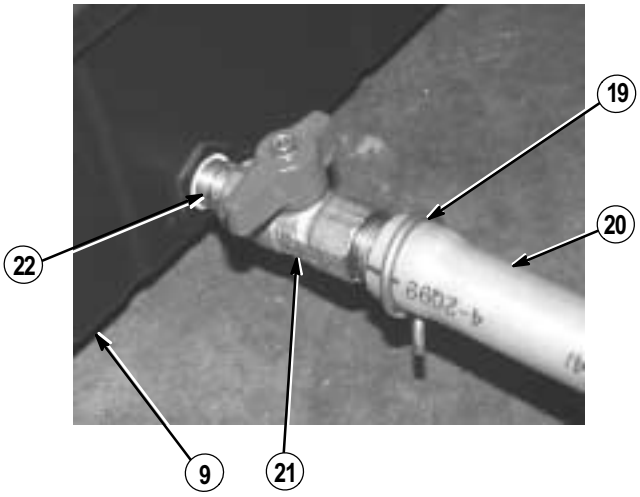
(13) With aid of an assistant, remove three screws (18) from right side of radiator (9) and remove radiator from generator enclosure (4).



(14) Remove hose clamp (19) and hose (20) from drain valve (21).

(15) Remove drain valve (21) and hose adapter (22) from radiator (9).

(16) Remove lifting device from radiator (9).

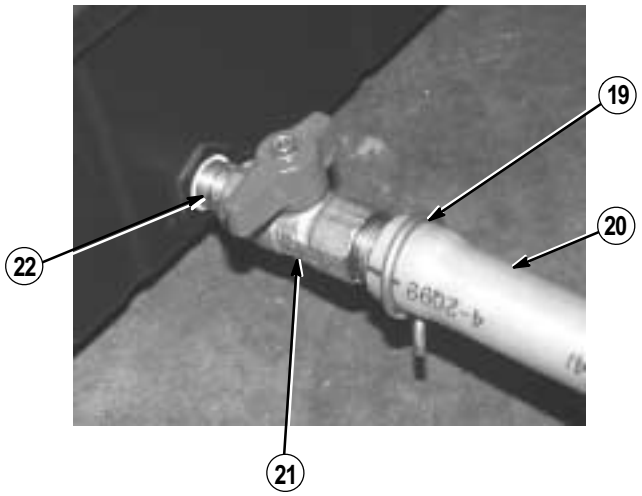


b. Installation.

WARNING

Radiator assembly weighs 51 lbs (23 kg). Attach suitable lifting device prior to removal/installation to prevent possible injury to personnel.

(1) Attach lifting device to radiator (9).



WARNING

Adhesives, solvents and sealing compounds can burn easily, can give off harmful vapors and are harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in well–ventilated area. If adhesive, solvent or sealing compound gets on skin or clothing, wash immediately with soap and water.

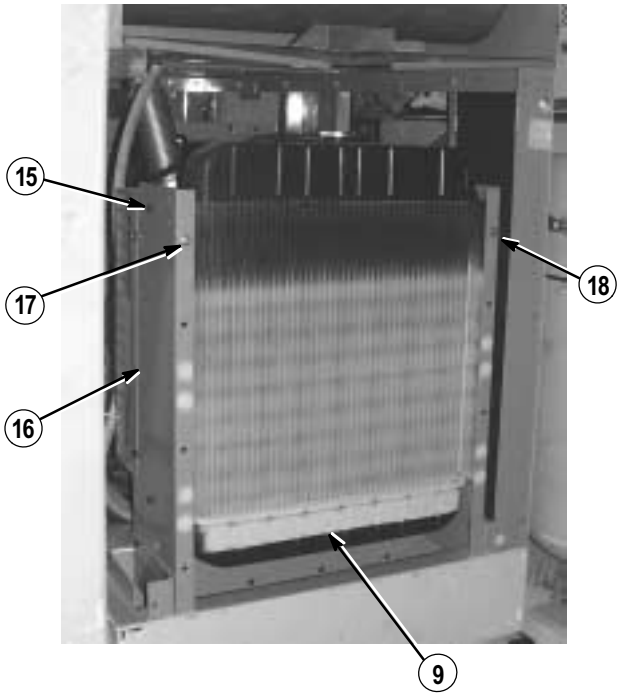
(2) Apply sealing compound to threads of drain valve (21) and hose adapter (22).

(3) Install hose adapter (22) and drain valve (21) on radiator (9).

(4) Install hose (20) and hose clamp (19) on drain valve (21).

WARNING

Ensure radiator is fully supported by lifting device prior to installation of screws in Step (5) and (6). Failure to comply may result in severe injury to personnel.



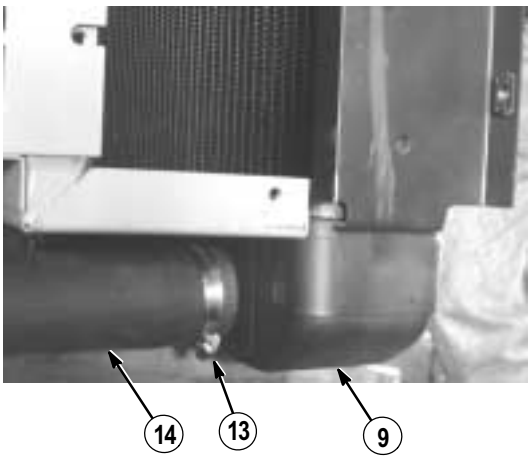
(5) With aid of an assistant, install radiator (9) with three screws (18) on right side of radiator (9).

(6) Install three screws (17) on left side of radiator (9).

(7) Install right side radiator panel (16) with four screws (15).

8-24. RADIATOR REPLACEMENT (CONT).

(8) Install lower hose (14) on radiator (9) and tighten clamp (13).

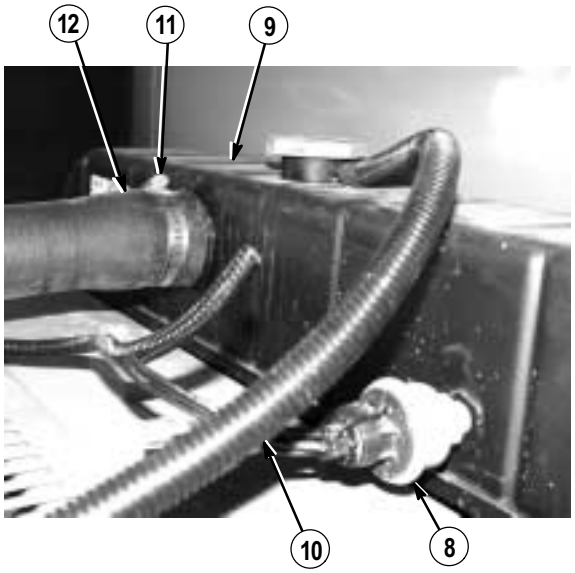


(9) Install upper hose (12) on radiator (9) and tighten clamp (11).

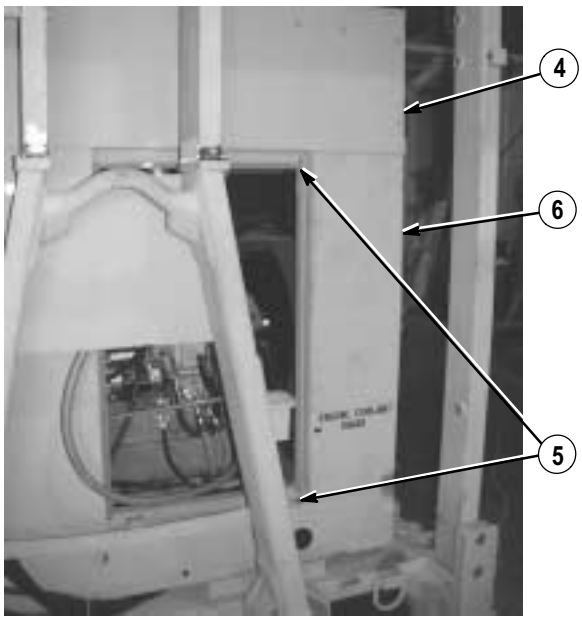
(10) Connect surge tank hose (10) to radiator (9).

(11) Install low coolant level sensor (8) on radiator (9).

(12) Connect connector (7) on low coolant level sensor (8).



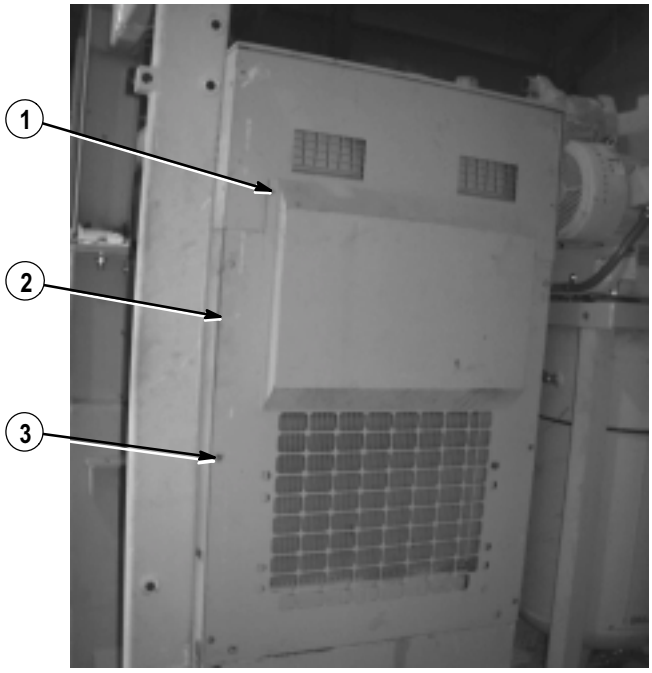
(13) Install front left panel of generator (6) on generator enclosure (4) and secure with three screws (5).



(14) Install generator left panel (2) on generator enclosure (4) with four screws (3).

(15) Install two rivets (1) on generator panel (2).

(16) Install deflector as outlined in Exhaust System Radiator, (Para 8-23).



c. Follow-On Maintenance:

- Fill radiator, (Para 8-26).
- Connect batteries, (TM 9-4940-568-10).
- Start generator and check for leaks, (TM 9-4940-568-10).

END OF TASK

8-25. COOLING SYSTEM SERVICE.

This task covers:

a. Drain b. Fill c. Follow-On Maintenance

INITIAL SETUP

Tools and Special Tools
Tool Kit, General, Mechanic's: Automotive (Item 30, Appendix G)
Pan, Drain (Item 20, Appendix G)

Material/Parts
Antifreeze (Item 7, Appendix C)

Equipment Condition
FRS unloaded, (TM 9-4940-568-10)
Remove front panel, (TM 9-4940-568-10)

a. Drain.

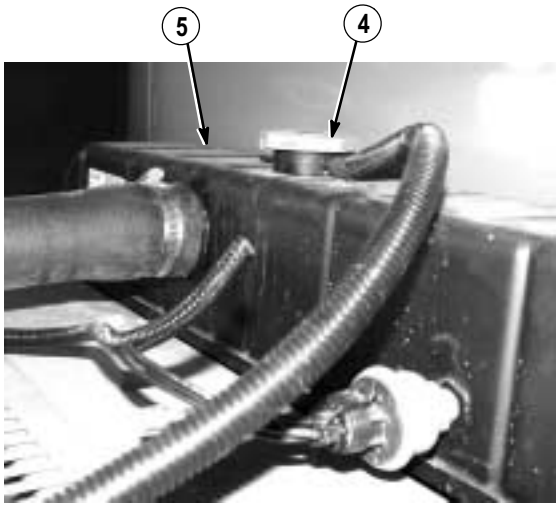
(1) Raise stowage rack as outlined in Exhaust System Replacement (Para 8-23).

(2) Remove two bolts (1) and top panel (2) from generator enclosure (3).

WARNING

Ensure engine is cool before performing this task or injury to personnel may result.

(3) Remove radiator cap (4) from radiator (5).



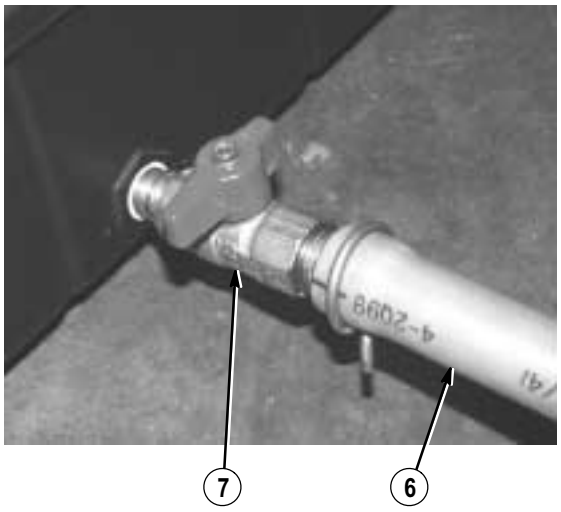
(4) Position end of drain hose (6) in drain pan.

NOTE

Cooling system capacity is 26 quarts.

(5) Open drain valve (7) and drain coolant.

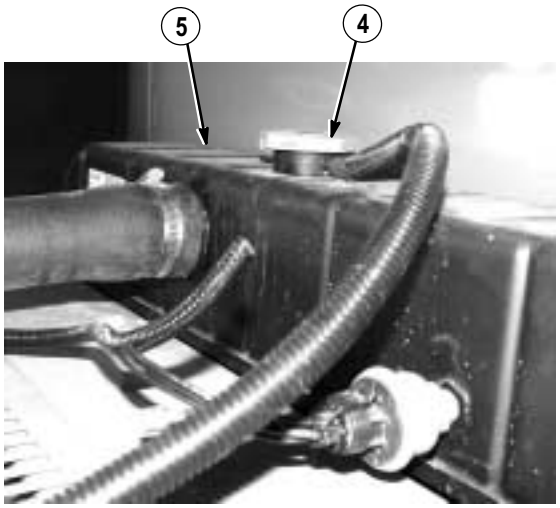
(6) After coolant stops draining, close drain valve (7).



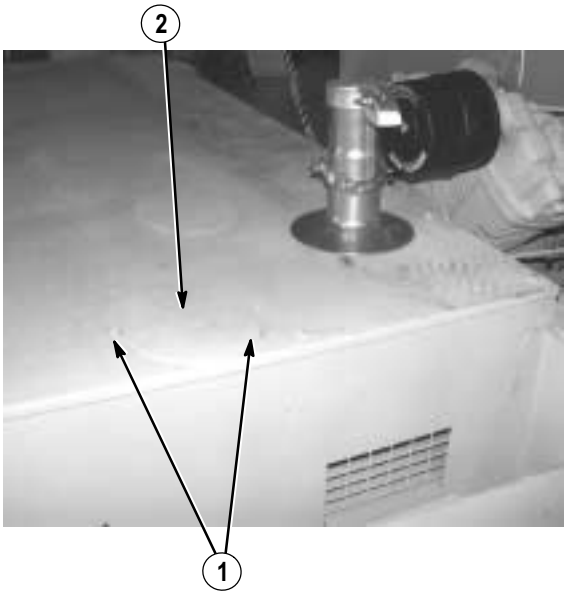
b. Fill.

(1) Fill radiator (5) with coolant until full.

(2) Install radiator cap (4) on radiator (5).



(3) Install top panel (2) and two bolts (1) on generator enclosure (3).



8-25. COOLING SYSTEM SERVICE (CONT).

(4) Fill surge tank (8) until coolant level is between maximum and minimum.

NOTE

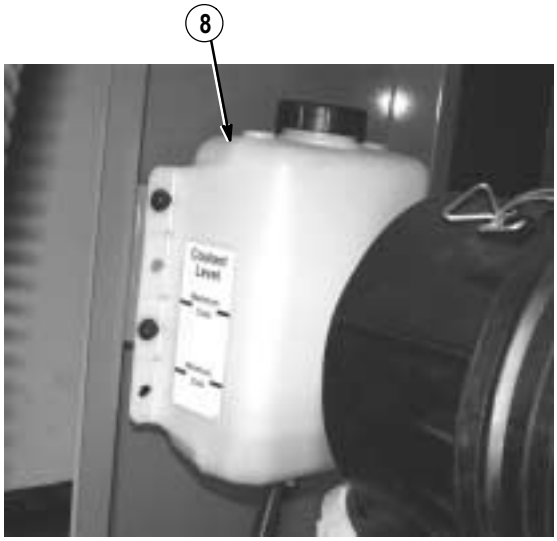
While engine is running check for leaks.

(5) Start generator (TM 9-4940-568-10). Run until operating temperature is reached.

(6) Shut down generator.

(7) Check radiator coolant level in surge tank (8). Add coolant as required.

(8) Lower stowage rack as outlined in Exhaust System Replacement (Para 8-23).



c. Follow-On Maintenance:

- Install front panel (TM 9-4940-568-10).

END OF TASK

8-26. COOLANT SURGE TANK REPLACEMENT.

This task covers:

a. Removal b. Installation c. Follow-on Maintenance

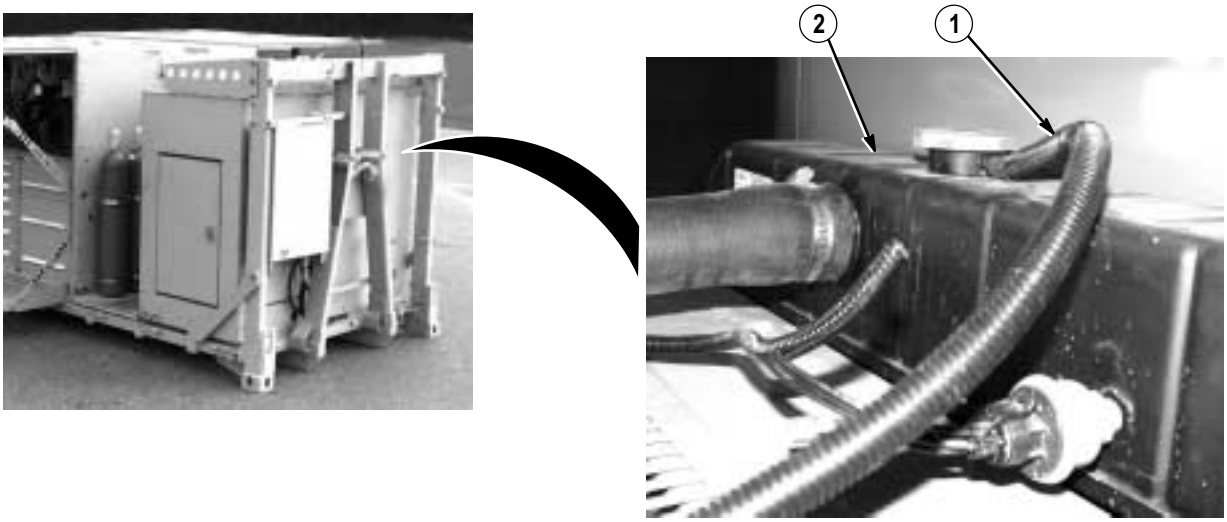
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 30, Appendix G)
Pan, Drain (Item 20, Appendix G)

Material/Parts
Cable Ties (Item 10, Appendix C)

Equipment Condition
FRS unloaded, (TM 9-4940-568-10)
Remove front panel, (TM 9-4940-568-10)

a. Removal.



WARNING

Coolant is slippery and can cause falls and injury. Clean up spilled coolant immediately.

NOTE

- Note location of hose and hose ties before removal.
- Remove cable ties as necessary.
- Place drain pan under surge tank to catch excess coolant.

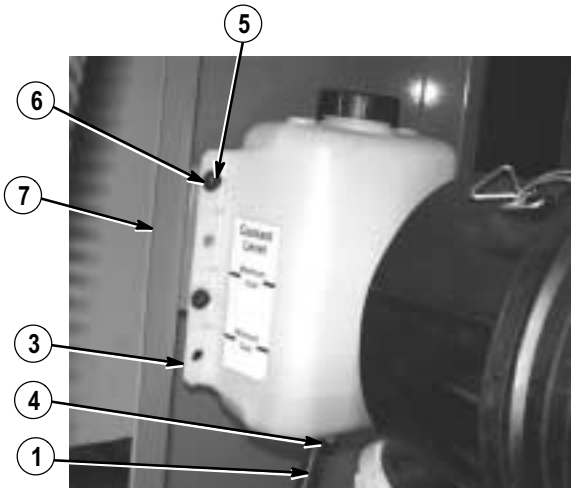
(1) Remove surge tank hose (1) from radiator (2).

8-26. COOLANT SURGE TANK REPLACEMENT (CONT).

(2) Place surge tank hose (1) in drain pan and drain coolant from surge tank (3) into drain pan.

(3) Loosen hose clamp (4) and remove hose (1) from surge tank (3).

(4) Remove four screws (5), washers (6) and surge tank (3) from generator enclosure (7).



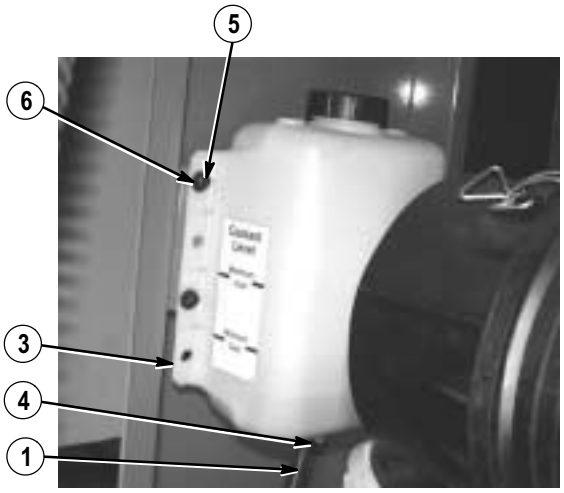
b. Installation.

NOTE

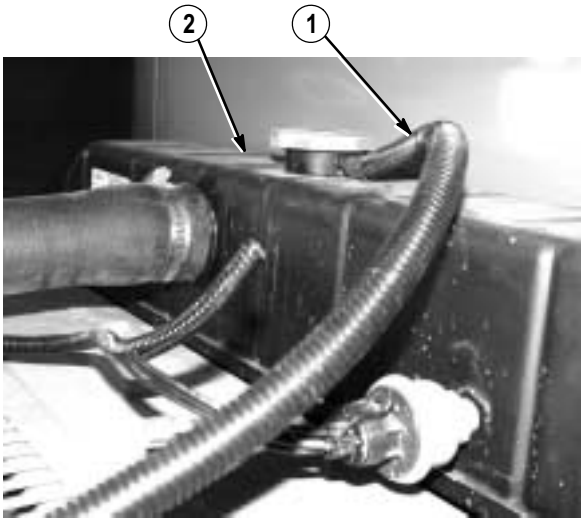
Position cable ties and hose as noted during removal.

(1) Install surge tank (3) using four washers (6) and screws (5).

(2) Install hose (1) on surge tank (3) and tighten hose clamp (4).



(3) Install surge tank hose (1) on radiator (2).



c. Follow-On Maintenance:

- Fill with coolant until level is between maximum and minimum on surge tank.
- Install front panel, (TM 9-4940-568-10).

END OF TASK

8-27. ENGINE COOLANT HEATER REPLACEMENT.

This task covers:

a. Removal b. Installation c. Follow On Maintenance

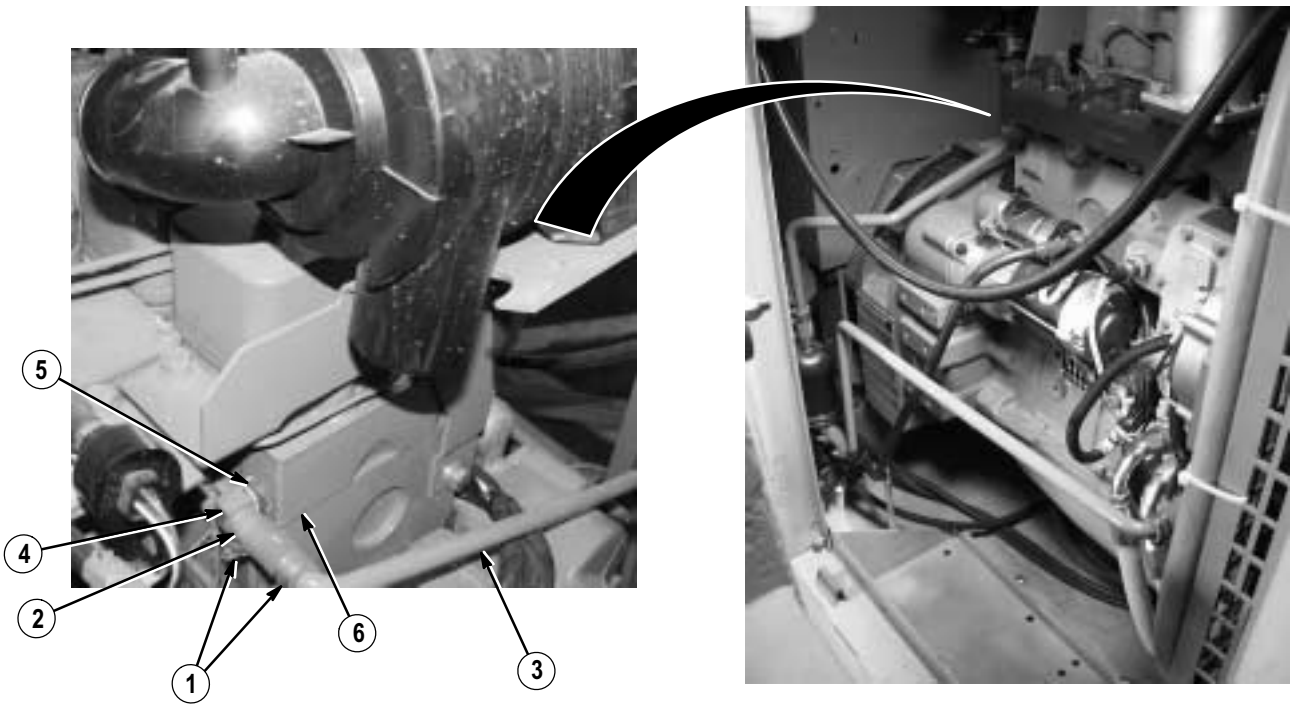
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 30, Appendix G)
Pan, Drain (Item 20, Appendix G)

Materials/Parts
Sealing Compound (Item 32, Appendix C)

Equipment Condition
FRS unloaded, (TM 9-4940-568-10)
Batteries disconnected, (TM 9-4940-568-10)
Radiator drained, (Para 8-25)
Rear panel removed, (TM 9-4940-568-10)

a. Removal.

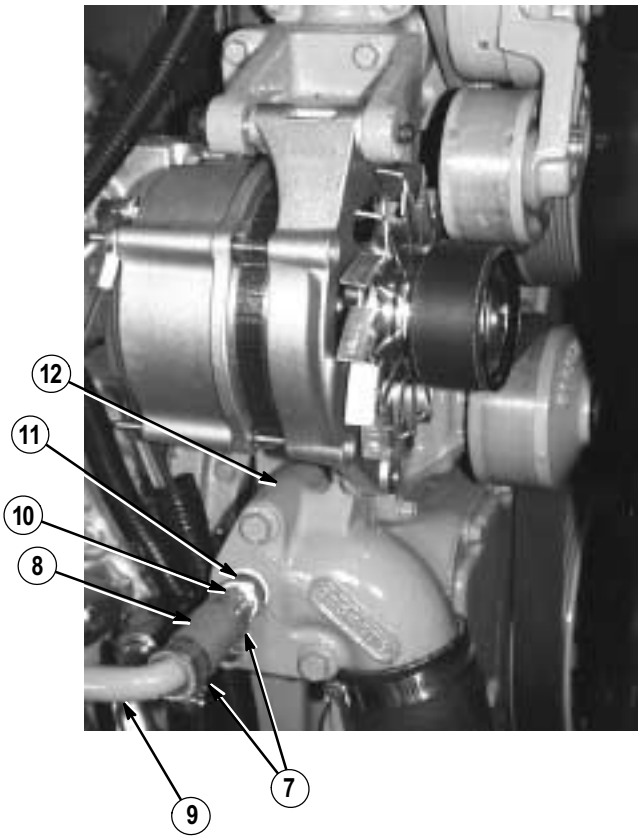


(1) Loosen two hose clamps (1) and remove hose (2) from water heater tube (3) and hose elbow (4).

(2) Remove hose elbow (4) and reducer (5) from engine block (6).

(3) Loosen two hose clamps (7) and remove hose (8) from water heater tube (9) and hose connector (10).

(4) Remove hose connector (10) and reducer (11) from water inlet connection (12).

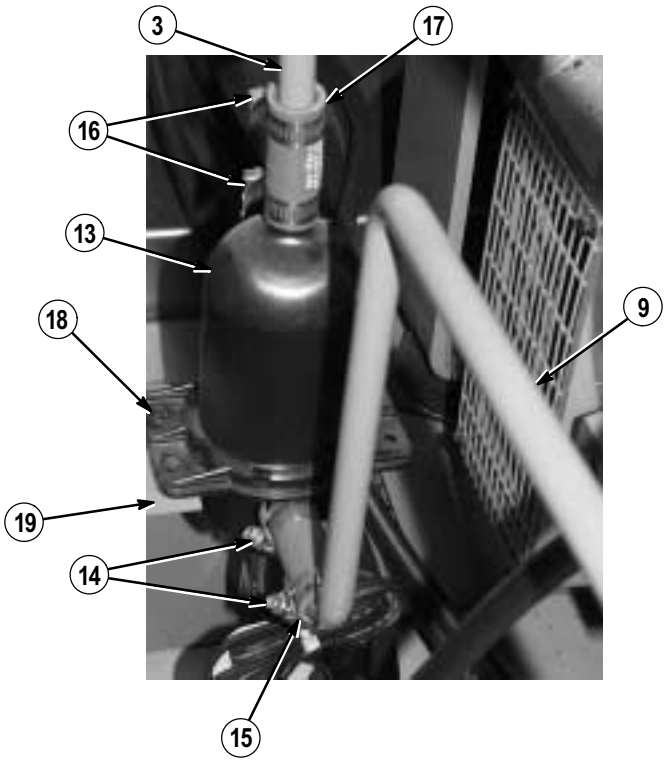


(5) Position drain pan under engine water heater (13).

(6) Loosen two hose clamps (14) and remove hose (15) and water heater tube (9) from engine water heater (13).

(7) Loosen two hose clamps (16) and remove hose (17) and water heater tube (3) from engine water heater (13).

(8) Remove two screws (18) and engine water heater (13) from bracket (19).



8-27. ENGINE COOLANT HEATER REPLACEMENT (CONT).

b. Installation.

(1) Install engine water heater (13) on bracket (19) with two screws (18).

(2) Install water heater tube (3) and hose (17) on engine water heater (13) and tighten two hose clamps (16).

(3) Install water heater tube (9) and hose (15) on engine water heater (13) and tighten two hose clamps (14)

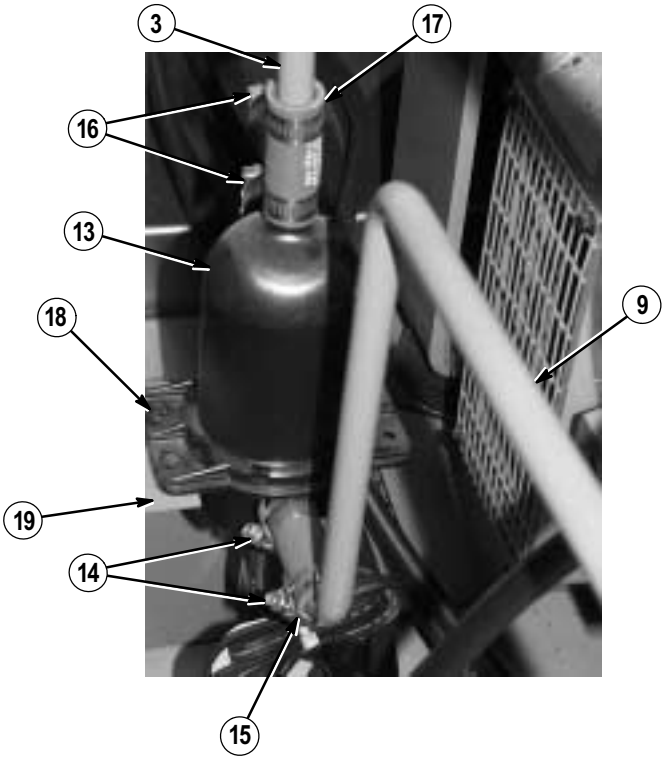
WARNING

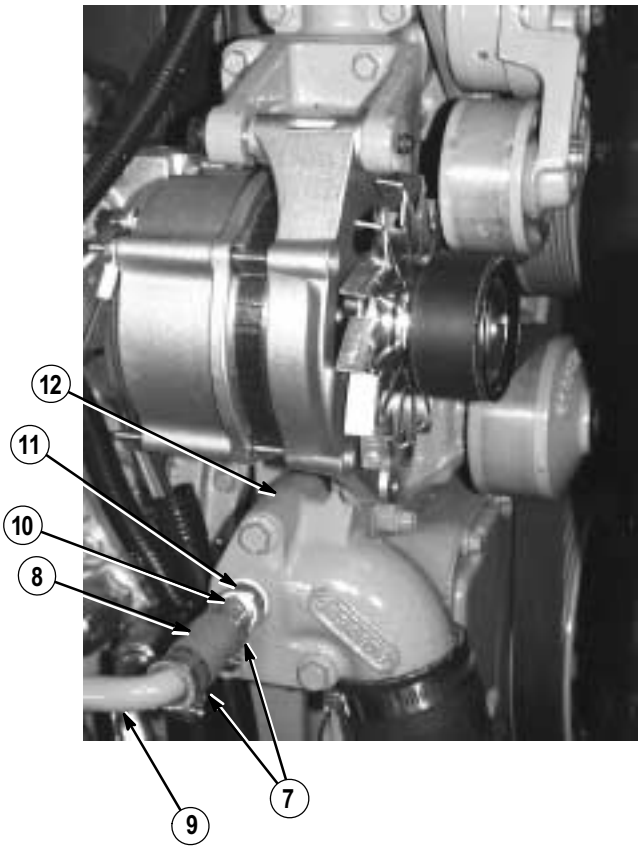
Adhesives, solvents, and sealing compounds can burn easily, can give off harmful vapors, and are harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in well-ventilated area. If adhesive, solvent, or sealing compound gets on skin or clothing, wash immediately with soap and water.

(4) Coat threads of reducer (11) and hose connector (10) with sealing compound.

(5) Install reducer (11) and hose connector (10) on water inlet connector (12).

(6) Install hose (8) and two hose clamps (7) on hose connector (10) and water heater tube (9).





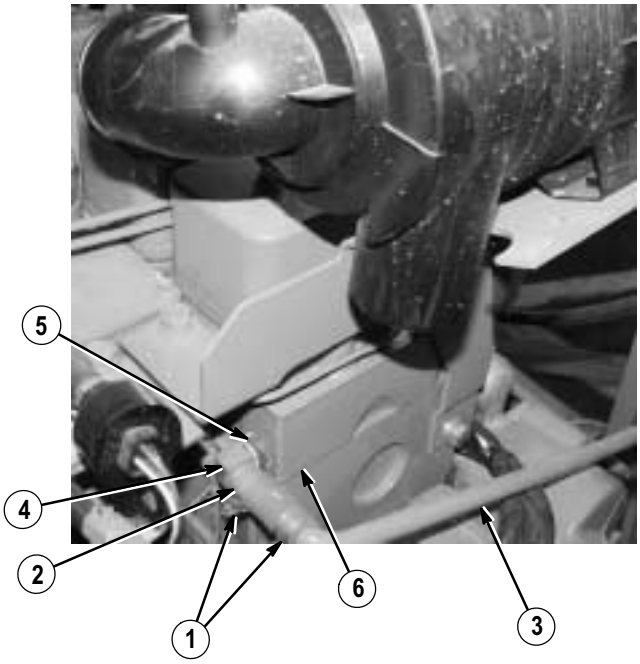
WARNING

Adhesives, solvents, and sealing compounds can burn easily, can give off harmful vapors, and are harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in well-ventilated area. If adhesive, solvent, or sealing compound gets on skin or clothing, wash immediately with soap and water.

(7) Coat threads of reducer (5) and hose elbow (4) with sealing compound.

(8) Install reducer (5) and hose elbow (4) onto engine block (6).

(9) Install hose (2) on hose elbow (4) and water heater tube (3) and tighten two hose clamps (1)



c. Follow-On Maintenance:

- Fill radiator, (Para 8-25).
- Connect batteries, (TM 9-4940-568-10).
- Start engine and check for leaks, (TM 9-4940-568-10).
- Install rear panel, (TM 9-4940-568-10).

END OF TASK

8-28. ENGINE WATER PUMP REPLACEMENT.

This task covers:

a. Removal b. Installation c. Follow-On Maintenance

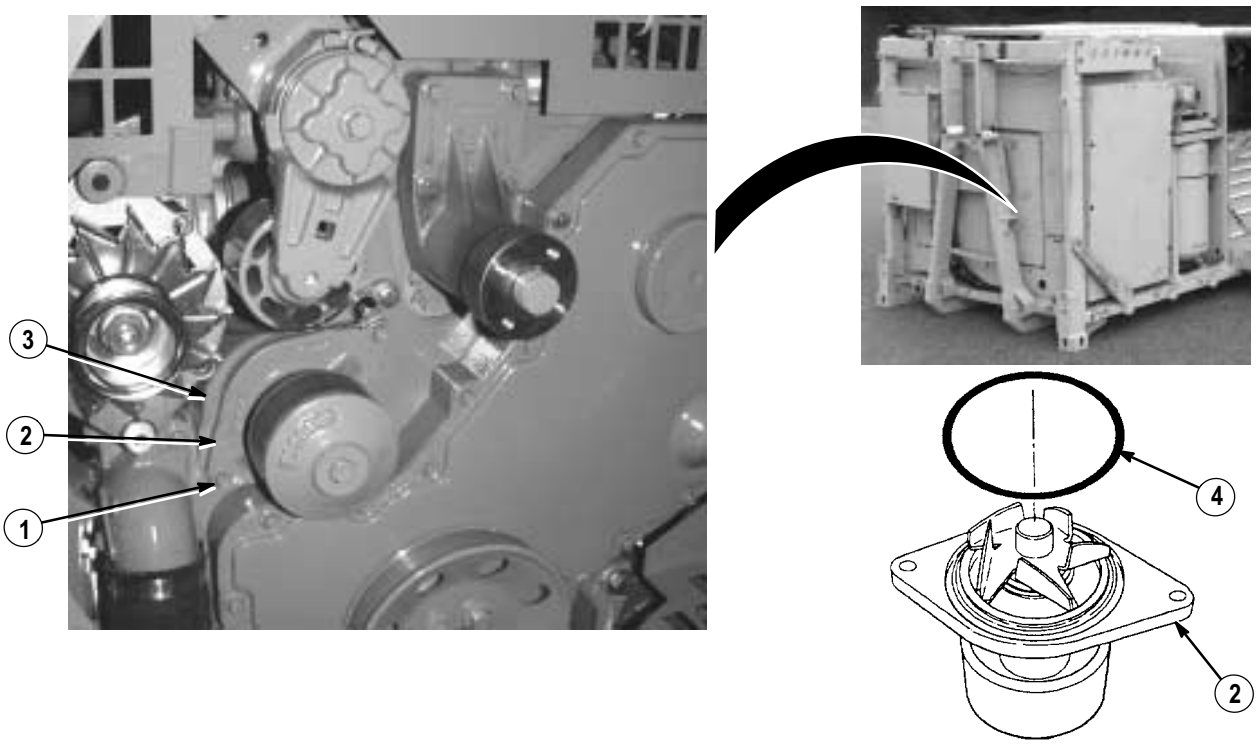
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 30, Appendix G)
Pan, Drain (Item 20, Appendix G)
Socket Set, 3/8 in. (Item 25, Appendix G)
Wrench, Torque (0 to 60 N·m) (Item 46, Appendix G)

Materials/Parts
Packing, Preformed (Item 84, Appendix F)

Equipment Condition
FRS unloaded, (TM 9-4940-568-10)
Batteries disconnected, (TM 9-4940-568-10)
Cooling system drained, (Para 8-25)
Remove fan assembly, (Para 8-30)
Engine drive belt removed, (Para 8-31)

a. Removal.



WARNING

Ensure engine is cool before performing this task or injury to personnel may result.

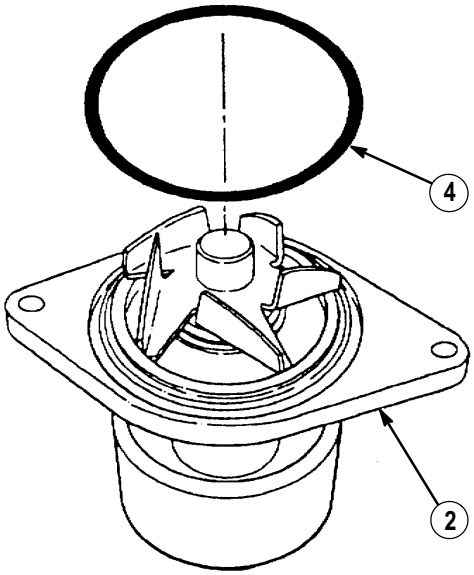
NOTE

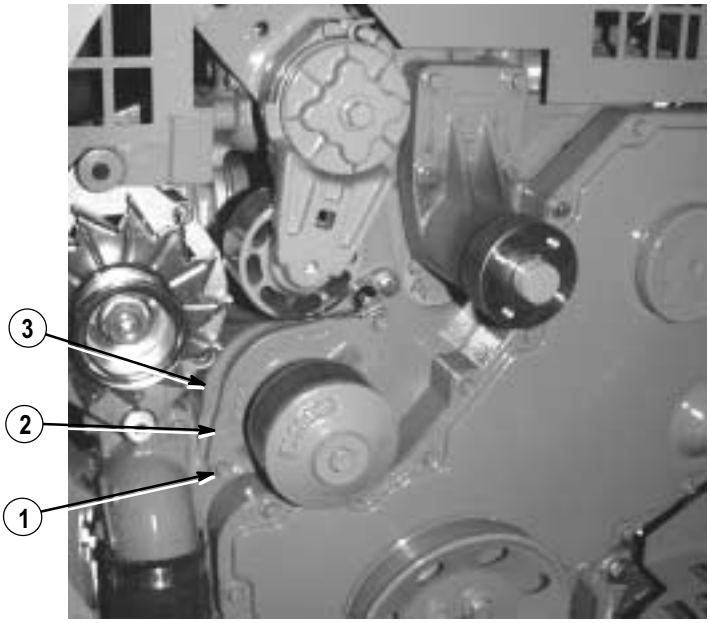
Position drain pan under water pump to catch excess coolant.

(1) Remove two screws (1) and water pump (2) from engine (3).

(2) Remove preformed packing (4) from groove on inside of water pump (2) housing.

b. Installation.





(1) Install preformed packing (4) in groove on inside of water pump (2) housing.

(2) Install water pump (2) on engine (3) using two screws (1). Tighten screws to 18 lb-ft (24 N·m).

c. Follow-On Maintenance:

- Install engine drive belt, (Para 8-31).
- Install fan assembly, (Para 8-30).
- Cooling system filled, (Para 8-25).
- Connect batteries, (TM 9-4940-568-10).
- Start generator and check for leaks, (TM 9-4940-568-10).

END OF TASK

8-29. ENGINE FAN HUB REPLACEMENT.

This task covers:

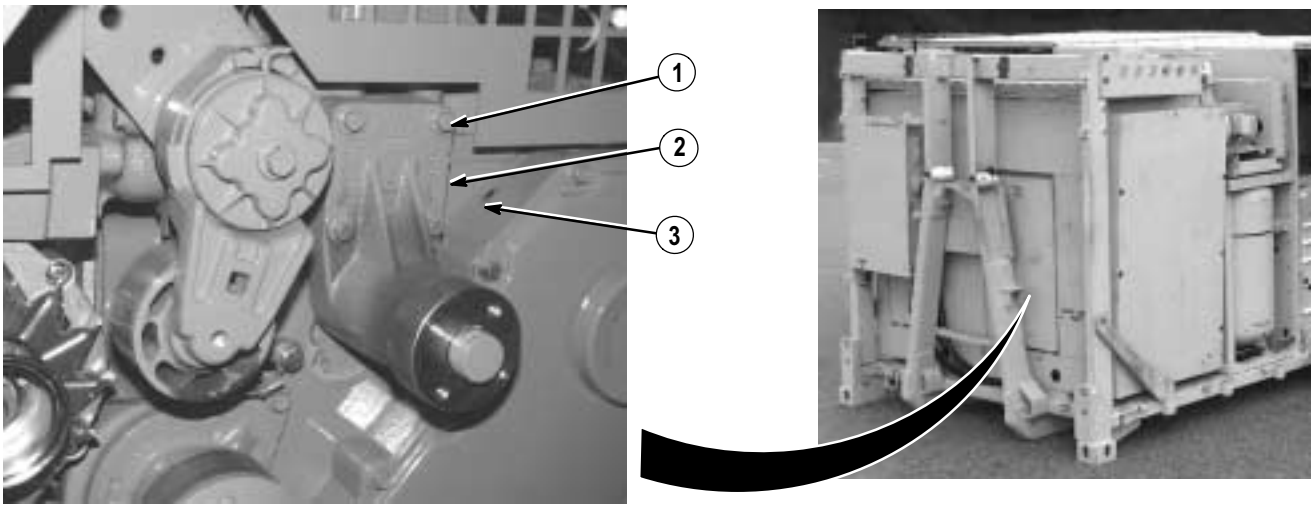
a. Removal b. Installation c. Follow-On Maintenance

INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 30, Appendix G)
Socket Set, 3/8 in. (Item 25, Appendix G)
Wrench, Torque (0 to 60 N·m) (Item 46, Appendix G)

Equipment Condition
FRS unloaded, (TM 9-4940-568-10)
Batteries disconnected, (TM 9-4940-568-10)
Engine drive belt removed, (Para 8-31)
Fan blade removed, (Para 8-30)

a. Removal.



WARNING

Ensure engine is cool before performing this task or injury to personnel may result.

Remove four screws (1) and fan hub (2) from engine (3).

b. Installation.

Install fan hub (2) and four screws (1) on engine (3). Tighten screws to 18 lb-ft (24 N·m).

c. Follow-On Maintenance:

- Install engine drive belt, (Para 8-31).
- Install fan blade, (Para 8-30).
- Connect batteries, (TM 9-4940-568-10).
- Start generator check operation, (TM 9-4940-568-10).

END OF TASK

8-30. ENGINE FAN BLADE REPLACEMENT.

This task covers:

a. Removal b. Installation c. Follow-On Maintenance

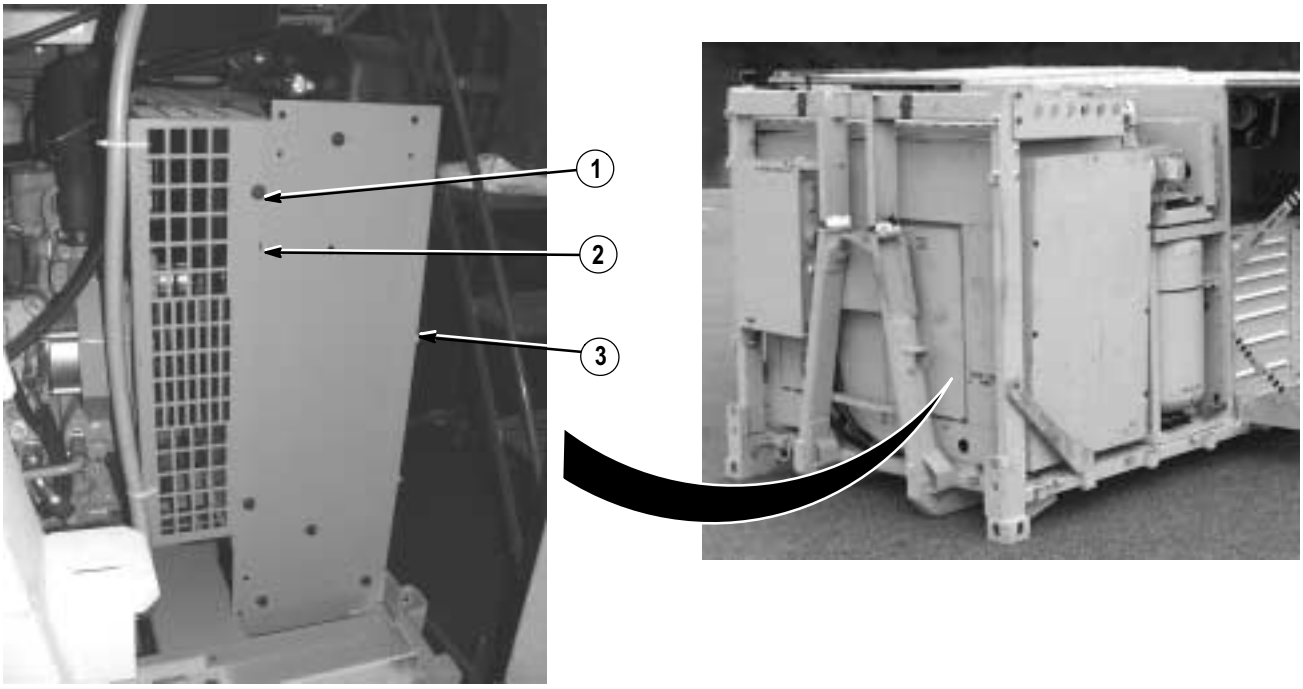
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 30, Appendix G)
Socket Set, 3/8 in. (Item 25, Appendix G)
Wrench, Torque (0 to 60 N·m) (Item 46, Appendix G)

Materials/Parts
Cable Ties (Item 10, Appendix C)
Tags, Identification (Item 40, Appendix C)

Equipment Condition
FRS unloaded, (TM 9-4940-568-10)
Batteries disconnected, (TM 9-4940-568-10)

a. Removal.



WARNING

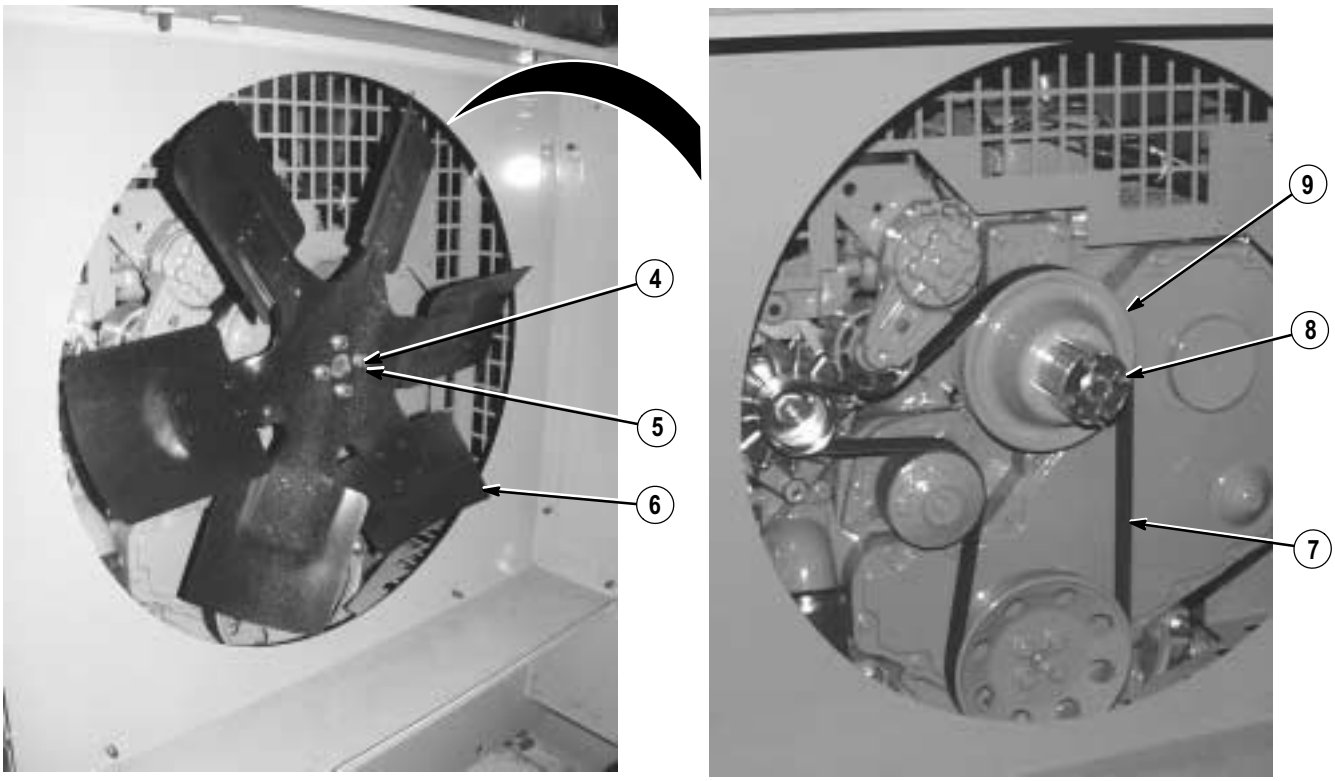
Ensure engine is cool before performing this task or injury to personnel may result.

NOTE

- Note location of ties prior to removal.
- Remove cable ties as required.

(1) Remove five screws (1) and fan shroud (2) from fan housing (3).

8-30. ENGINE FAN BLADE REPLACEMENT (CONT).



CAUTION

Use caution to prevent damage to radiator.

NOTE

Note location of fan blades prior to removal.

(2) Remove four screws (4) and washers (5) and remove fan (6).

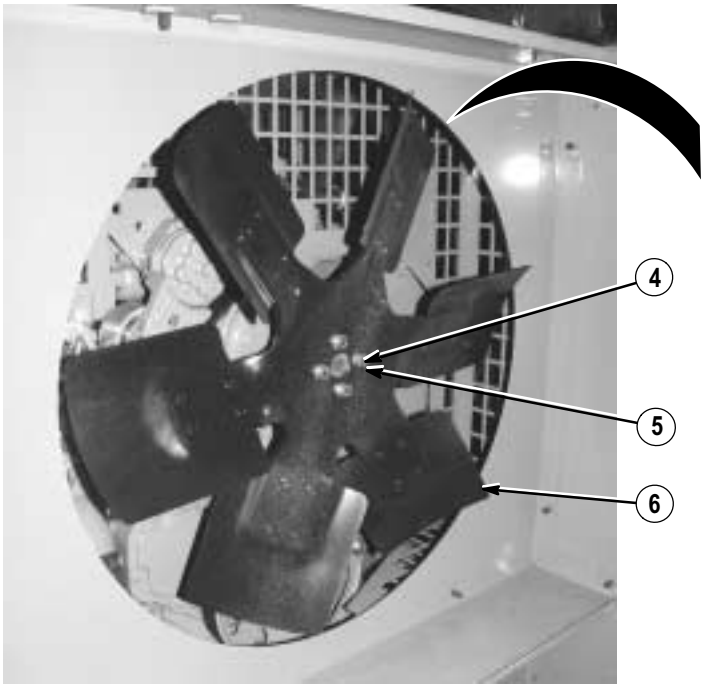
NOTE

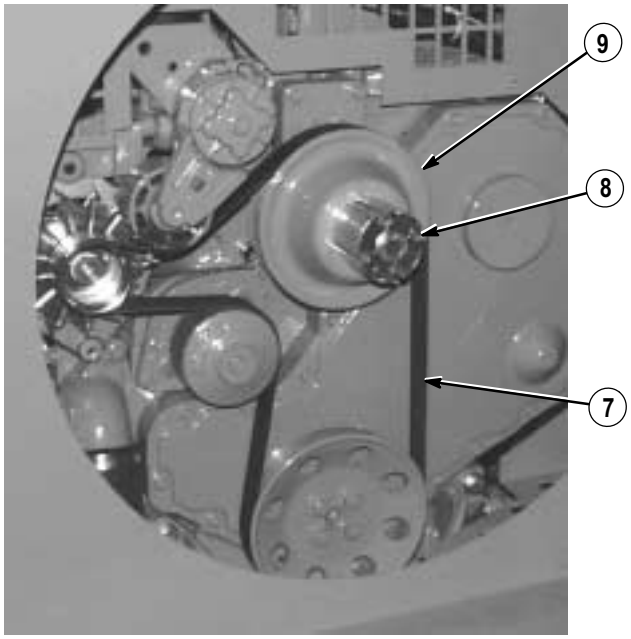
If necessary for pulley removal, perform Steps (3) and (4).

(3) Remove engine drive belt (7) (Para 8-31).

(4) Remove spacer (8) and pulley (9).

b. Installation.





NOTE

- Install cable ties as required.
- If pulley was removed, perform Steps (1) and (2).

(1) Using care to align holes, install spacer (8) and pulley (9).

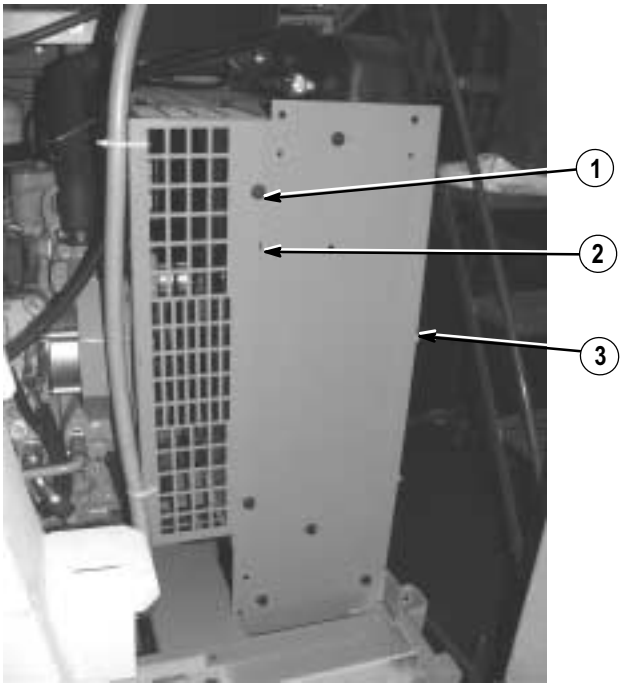
(2) Install engine accessory drive belt (7) (Para 8-31).

CAUTION

Use caution to prevent damage to radiator.

(3) Install fan (6) with four screws (4) and washers (5).

(4) Install fan shroud (2) on fan housing (3) with five screws (1). Tighten screws to 18 lb-ft (24 N·m).



c. Follow-On Maintenance:

- Connect batteries, (TM 9-4940-568-10).
- Start engine and check operation of fan, (TM 9-4940-568-10).

END OF TASK

8-31. ENGINE FAN/ALTERNATOR BELT REPLACEMENT.

This task covers:

a. Removal b. Installation c. Follow-On Maintenance

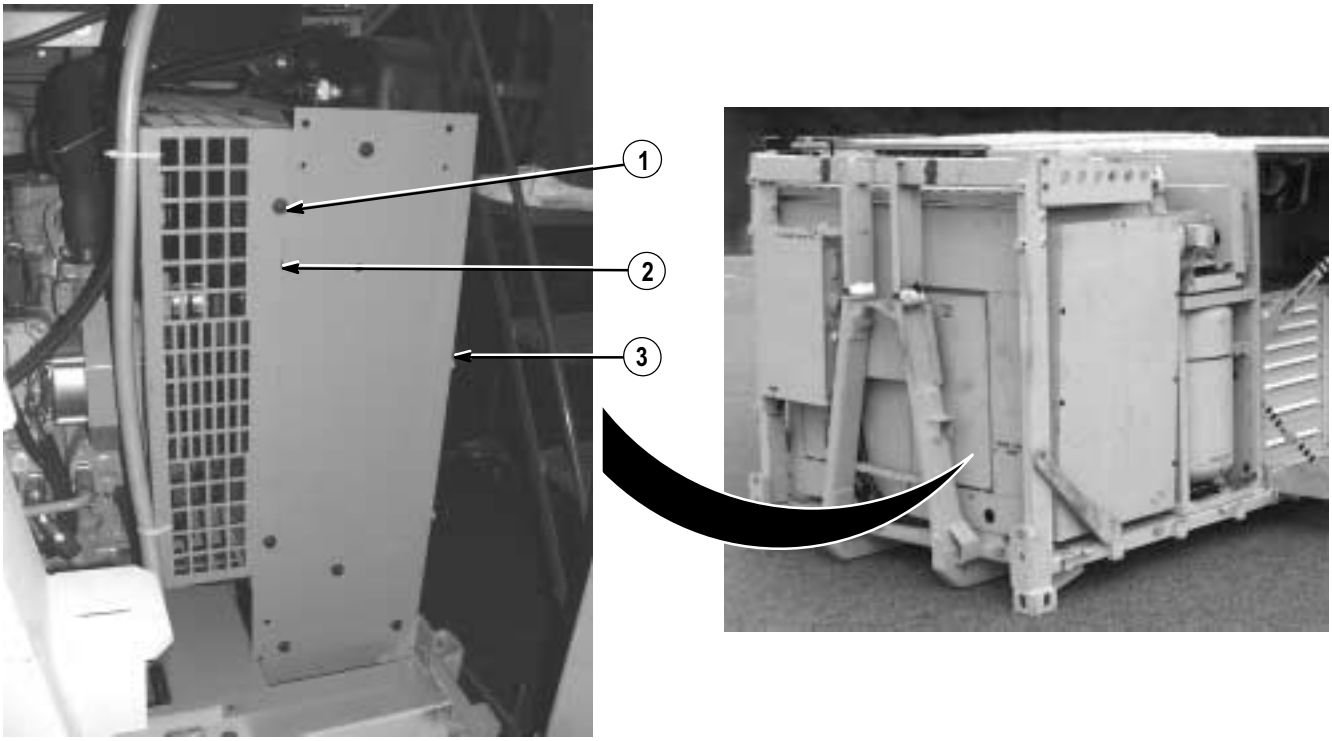
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 30, Appendix G)

Equipment Condition
FRS unloaded, (TM 9-4940-568-10)
Disconnect batteries, (TM 9-4940-568-10)

Materials/Parts
Cable Ties (Item 10, Appendix C)

a. Removal.



WARNING

Ensure engine is cool before performing this task or injury to personnel may result.

NOTE

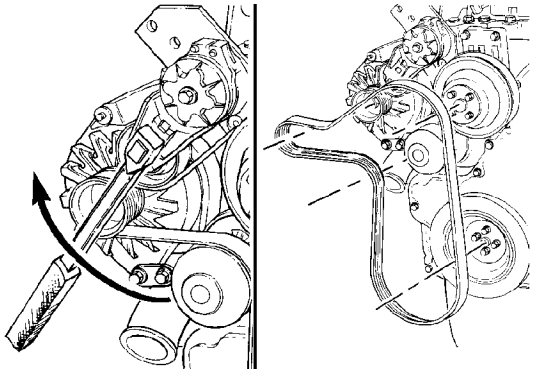
- Note location of cable ties prior to removal.
- Remove cable ties as required.

(1) Remove five screws (1) and fan shroud (2) from fan housing (3).

NOTE

Note routing of engine drive belt prior to removal.

(2) Release belt tension by releasing pressure to belt tensioner (4) and remove engine drive belt (5) from pulleys (6).

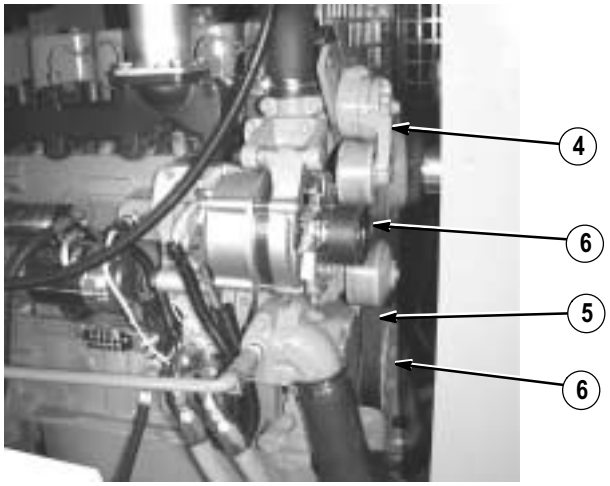


b. Installation.

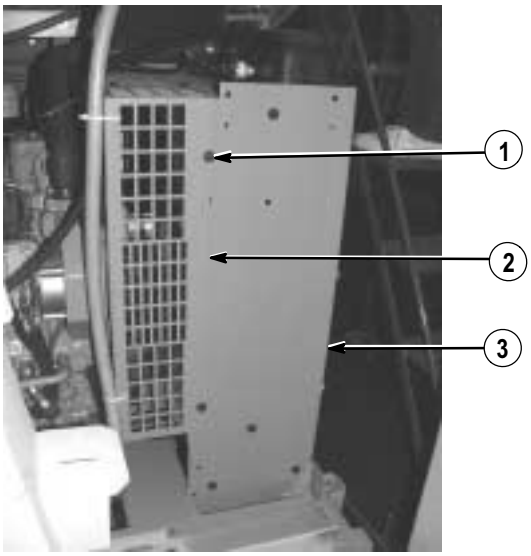
NOTE

- Ensure belt is alined with grooves in pulleys prior to releasing pressure on belt tensioner.
- Install cable ties as required.

(1) Install engine drive belt (5) on pulleys (6) while applying pressure to belt tensioner (4).



(2) Install fan shroud (2) on fan housing (3) with five screws (1).



c. Follow-On Maintenance:

- Connect batteries, (TM 9-4940-568-10).

END OF TASK

8-32. ENGINE DRIVE BELT TENSIONER REPLACEMENT.

This task covers:

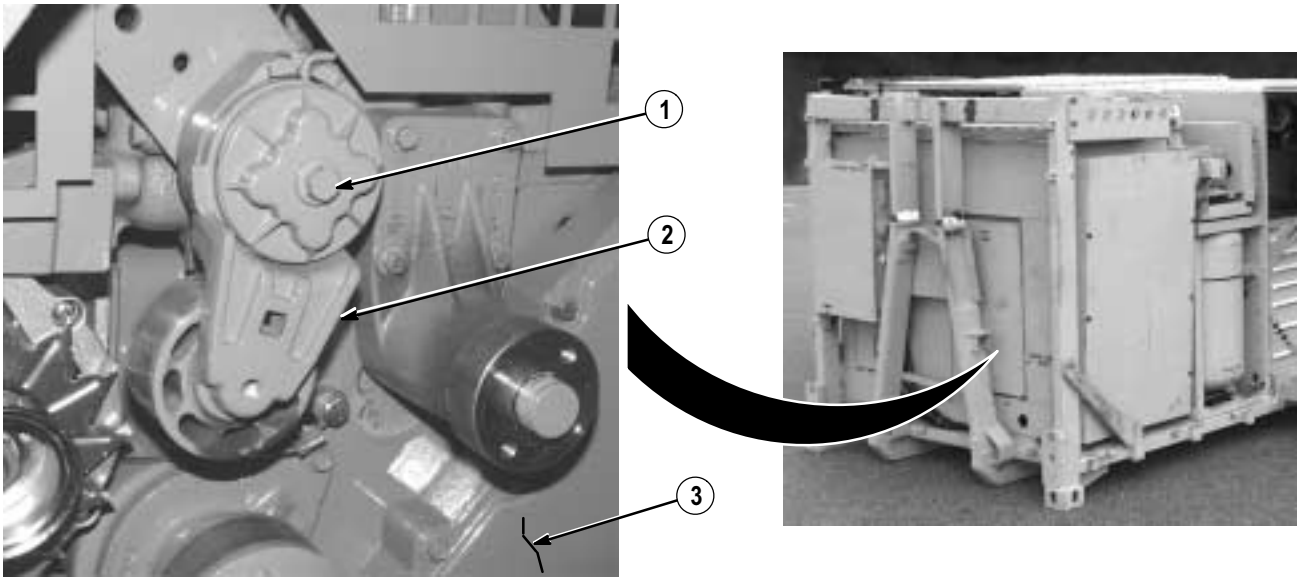
a. Removal b. Installation c. Follow-On Maintenance

INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 30, Appendix G)
Socket Set, 3/8 in. (Item 25, Appendix G)
Wrench, Torque (0 to 60 N·m) (Item 46, Appendix G)

Equipment Condition
FRS unloaded, (TM 9-4940-568-10)
Batteries disconnected, (TM 9-4940-568-10)
Engine drive belt removed, (Para 8-31)

a. Removal.



Remove screw (1) and remove belt tensioner (2) from engine (3).

b. Installation.

Install belt tensioner (2) and screw (1) on engine (3). Tighten screw to 32 lb-ft (43 N·m).

c. Follow-On Maintenance:

- Install engine drive belt, (Para 8-31).
- Connect batteries, (TM 9-4940-568-10).
- Start generator and check belt operation, (TM 9-4940-568-10).

END OF TASK

8-33. ENGINE THERMOSTAT AND FRONT LIFTING BRACKET REPLACEMENT.

This task covers:

a. Removal b. Installation c. Follow-On Maintenance

INITIAL SETUP

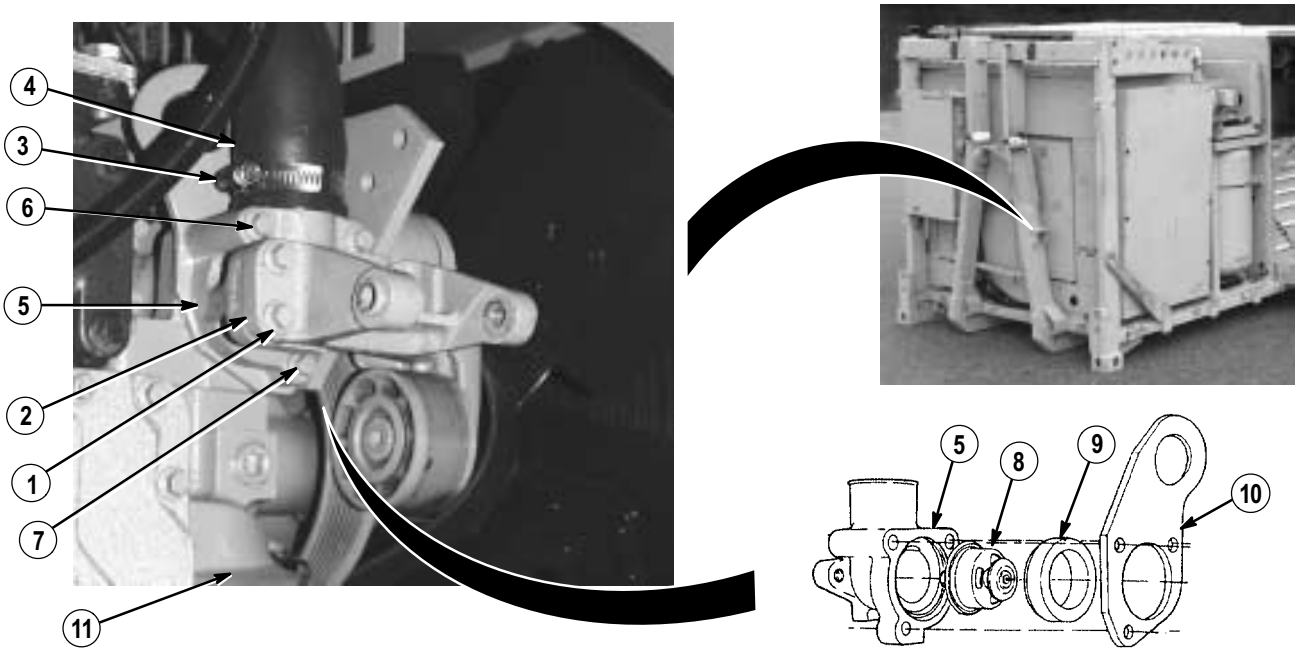
Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 30, Appendix G)
Socket Set, 3/8 in. (Item 25, Appendix G)
Wrench, Torque (0 to 60 N·m) (Item 46, Appendix G)

Materials/Parts
Tags, Identification (Item 40, Appendix C)

Materials/Parts – Continued
Seal, Coolant Thermostat (Item 104, Appendix F)

Equipment Condition
FRS unloaded, (TM 9-4940-568-10)
Batteries disconnected, (TM 9-4940-568-10)
Alternator removed, (Para 8-42)
Cooling system drained, (Para 8-25)

a. Removal.



WARNING

Ensure engine is cool before performing this task or injury to personnel may result.

(1) Remove three screws (1) from upper alternator mount bracket (2).

(2) Loosen hose clamp (3) and remove radiator hose (4) from thermostat housing (5).

NOTE

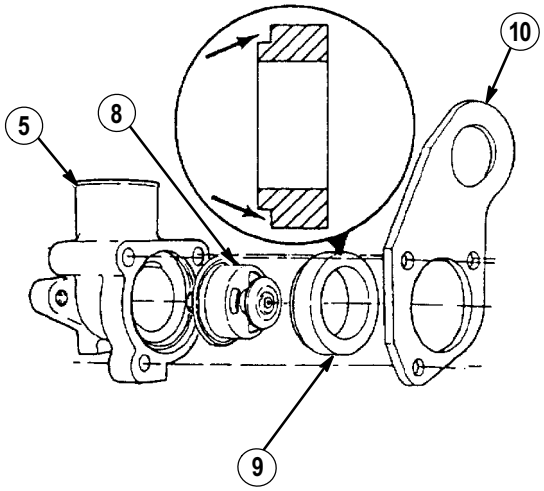
Tag and mark location of screws prior to removal.

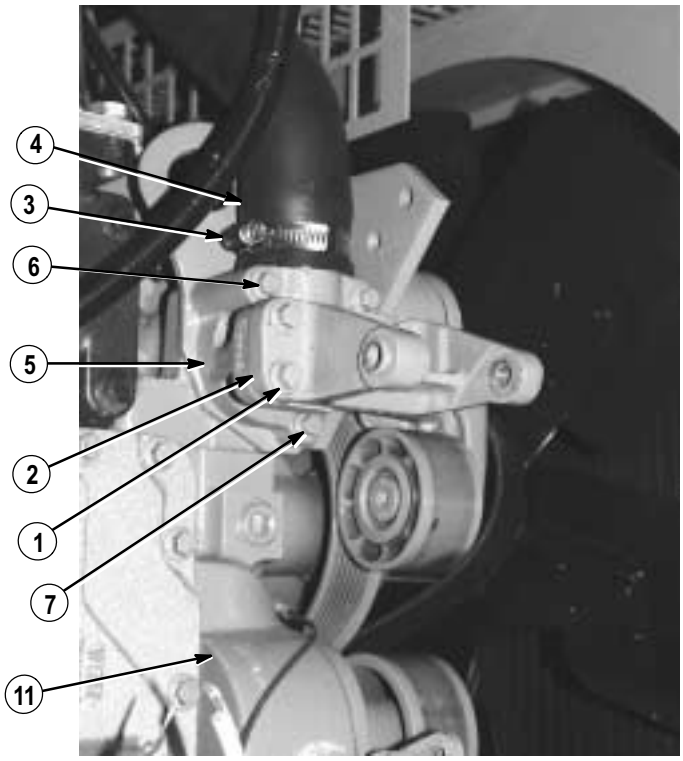
(3) Remove two screws (6) and one screw (7) from thermostat housing (5).

(4) Remove thermostat housing (5), thermostat (8), seal (9) and lifting bracket (10) from engine (11). Discard seal.

8-33. ENGINE THERMOSTAT AND FRONT LIFTING BRACKET REPLACEMENT (CONT).

b. Installation.





(1) Position lifting bracket (10), seal (9), thermostat (8) and thermostat housing (5) on engine (11).

NOTE

Align tang on thermostat with notch in housing.

(2) Install thermostat housing (5) using two screws (6) and screw (7). Tighten screws to 18 lb-ft (24 N·m).

(3) Install radiator hose (4) on thermostat housing (5) and tighten hose clamp (3).

(4) Install upper alternator mount bracket (2) using three capscrews (1). Tighten screws to 18 lb-ft (24 N·m).

c. Follow-On Maintenance:

- Install alternator, (Para 8-42).
- Cooling system filled, (Para 8-25).
- Connect batteries, (TM 9-4940-568-10).
- Start generator and check for leaks, (TM 9-4940-568-10).

END OF TASK

8-34. COOLANT TEMPERATURE SENDING UNIT REPLACEMENT.

This task covers:

a. Removal b. Installation c. Follow-On Maintenance

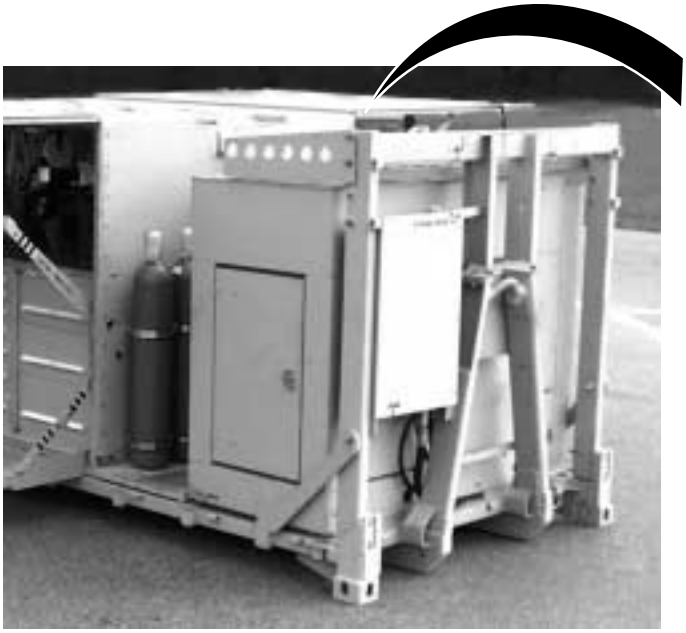
INITIAL SETUP

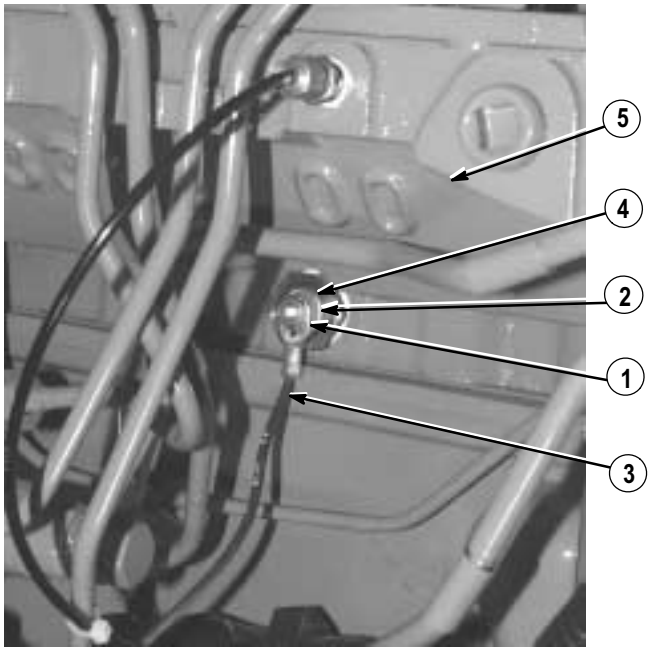
Tools and Special Tools
Tool Kit, General Mechanic's: Automotive
(Item 30, Appendix G)

Materials/Parts
Sealing Compound, (Loctite 567)
(Item 32, Appendix C)

Equipment Condition
FRS unloaded, (TM 9-4940-568-10)
Batteries disconnected, (TM 9-4940-568-10)
Cooling system drained, (Para 8-25)
Remove rear panel, (TM 9-4940-568-10)

a. Removal.





WARNING

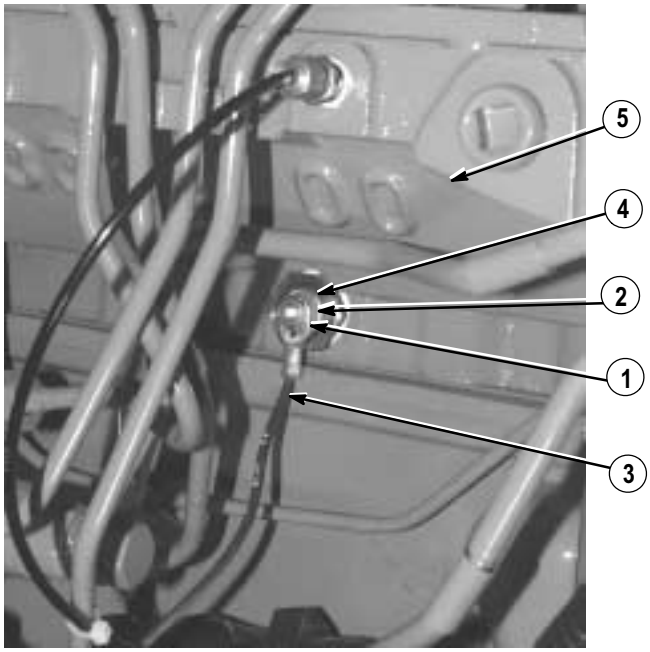
Ensure engine is cool before performing this task or injury to personnel may result.

(1) Remove nut (1), washer (2), wire (3) from coolant temperature sending unit (4).

(2) Remove coolant temperature sending unit (4) from engine (5).

8-34. COOLANT TEMPERATURE SENDING UNIT REPLACEMENT (CONT).

b. Installation.



WARNING

Adhesives, solvents, and sealing compounds can burn easily, can give off harmful vapors, and are harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in well-ventilated area. If adhesive, solvent or sealing compound gets on skin or clothing, wash immediately with soap and water.

(1) Apply sealing compound to coolant temperature sending unit (4).

(2) Install coolant temperature sending unit (4) on engine (5).

(3) Install wire (3), washer (2) and nut (1) on coolant temperature sending unit (4).

c. Follow-On Maintenance:

- Fill cooling system, (Para 8-25)
- Connect batteries, (TM 9-4940-568-10).
- Start generator and check for leaks, (TM 9-4940-568-10).

END OF TASK

8-35. PRE-HIGH COOLANT TEMPERATURE SENSOR REPLACEMENT.

This task covers:

a. Removal b. Installation c. Follow-On Maintenance

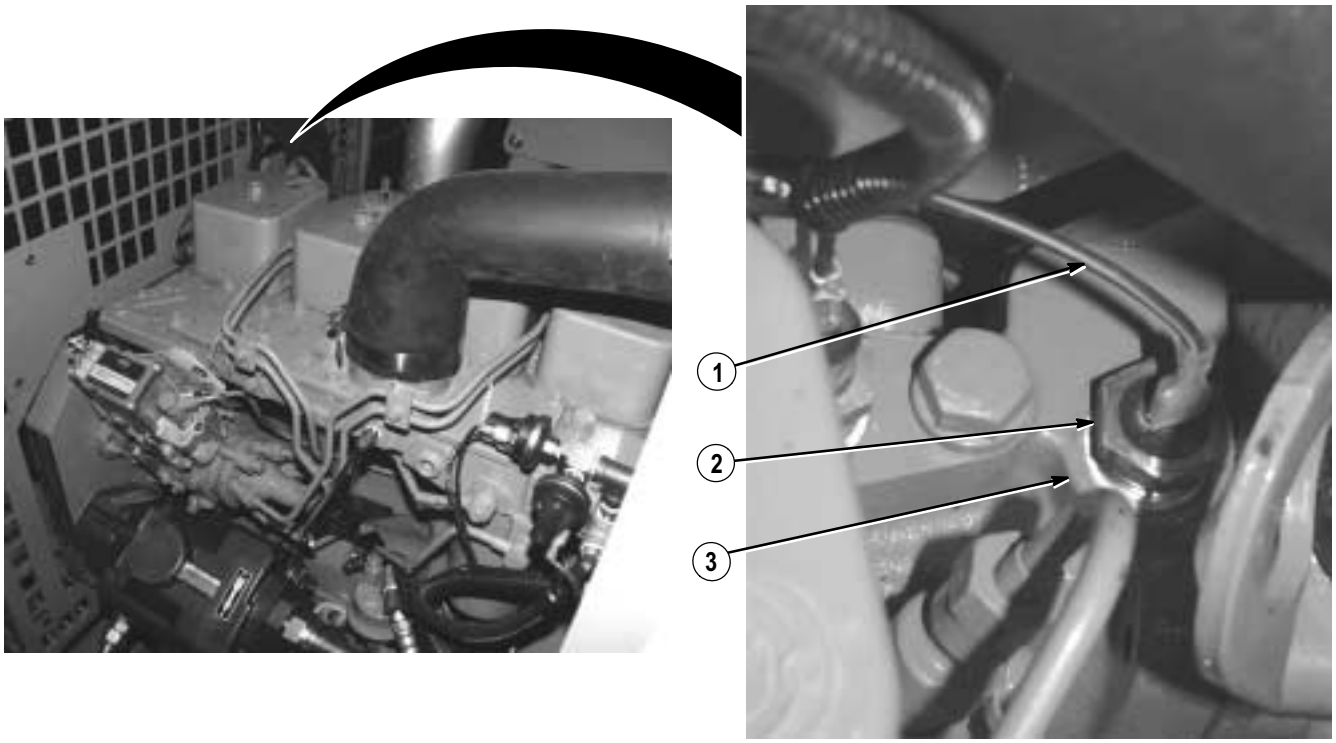
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive
(Item 30, Appendix G)

Materials/Parts
Sealing Compound, (Loctite 567)
(Item 32, Appendix C)

Equipment Condition
FRS unloaded, (TM 9-4940-568-10)
Batteries disconnected, (TM 9-4940-568-10)
Cooling system drained, (Para 8-25)
Remove rear panel, (TM 9-4940-568-10)

a. Removal.



WARNING

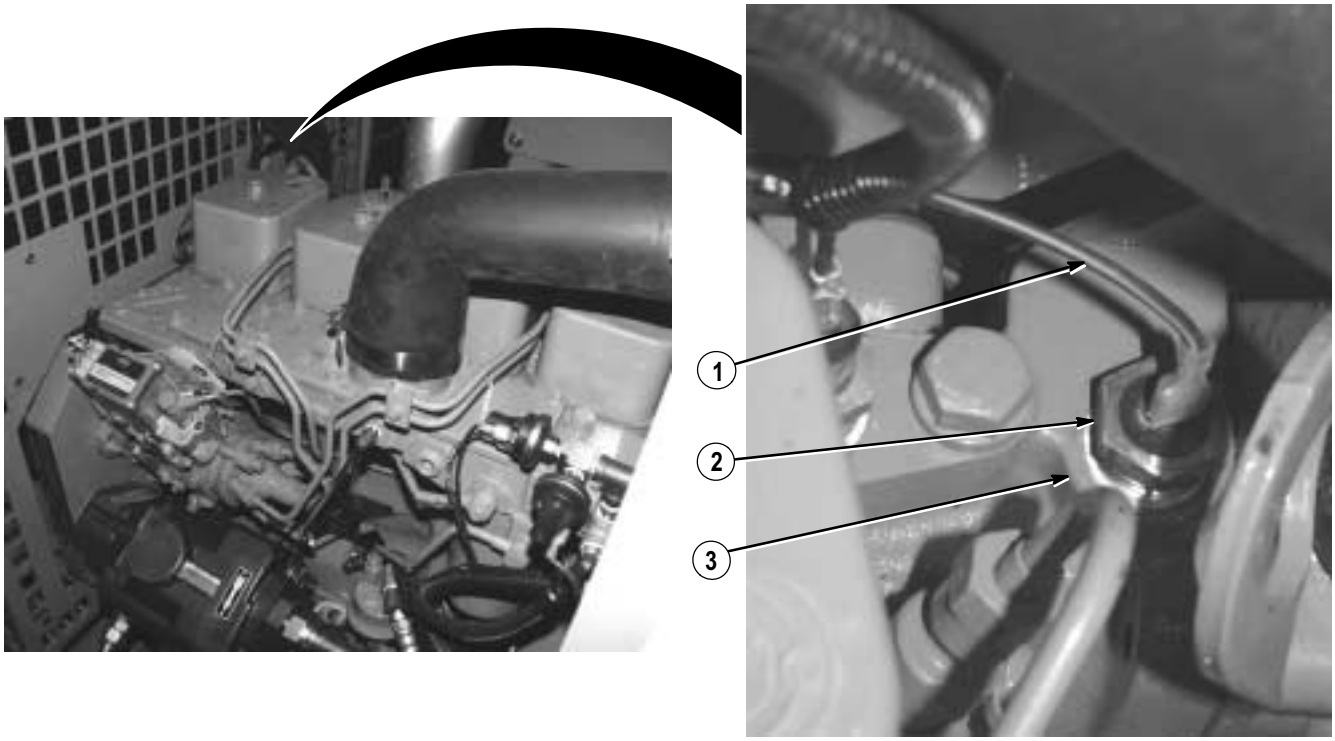
Ensure engine is cool before performing this task or injury to personnel may result.

(1) Remove wire (1) from pre-high coolant temperature sensor (2).

(2) Remove pre-high coolant temperature sensor (2) from engine (3) .

8-35. PRE-HIGH COOLANT TEMPERATURE SENSOR REPLACEMENT (CONT).

b. Installation.



WARNING

Adhesives, solvents, and sealing compounds can burn easily, can give off harmful vapors, and are harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in well-ventilated area. If adhesive, solvent or sealing compound gets on skin or clothing, wash immediately with soap and water.

(1) Apply sealing compound to pre-high coolant temperature sensor (2).

(2) Install pre-high coolant temperature sensor (2) and wire (1) on engine (3).

(3) Install wire (1) on pre-high coolant temperature sensor (2).

c. Follow-On Maintenance:

- Fill cooling system, (Para 8-25).
- Connect batteries, (TM 9-4940-568-10).
- Start generator and check for leaks, (TM 9-4940-568-10).

END OF TASK

8-36. HIGH COOLANT TEMPERATURE SENSOR REPLACEMENT.

This task covers:

a. Removal b. Installation c. Follow-On Maintenance

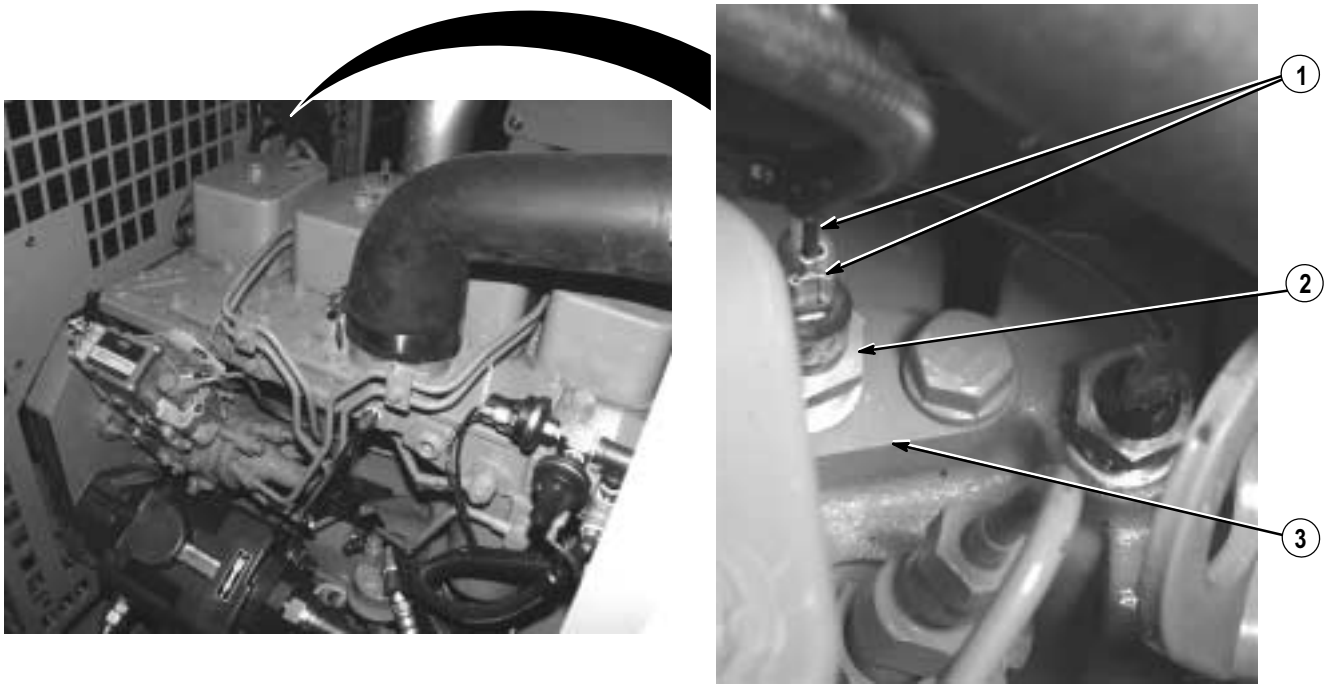
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 30, Appendix G)

Materials/Parts
Sealing Compound, (Loctite 567) (Item 32, Appendix C)
Tags, Identification (Item 40, Appendix C)

Equipment Condition
FRS unloaded, (TM 9-4940-568-10)
Batteries disconnected, (TM 9-4940-568-10)
Cooling system drained, (Para 8-25)
Remove rear panel, (TM 9-4940-568-10)

a. Removal.



WARNING

Ensure engine is cool before performing this task or injury to personnel may result.

NOTE

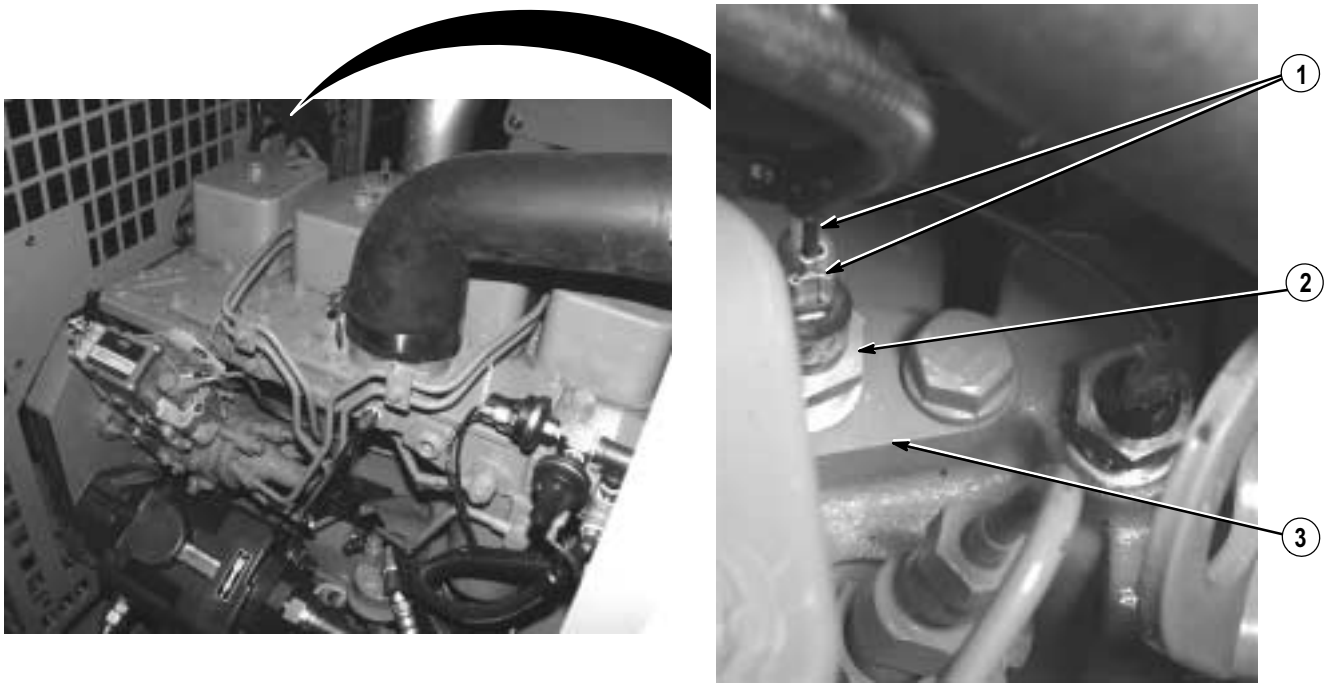
Tag and mark all wires and connectors prior to removal.

(1) Remove two wires (1) from high coolant temperature sensor (2).

(2) Remove high coolant temperature sensor (2) from engine (3).

8-36. HIGH COOLANT TEMPERATURE SENSOR REPLACEMENT (CONT).

b. Installation.



WARNING

Adhesives, solvents, and sealing compounds can burn easily, can give off harmful vapors, and are harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in well-ventilated area. If adhesive, solvent or sealing compound gets on skin or clothing, wash immediately with soap and water.

(1) Apply sealing compound to high coolant temperature sensor (2).

(2) Install high coolant temperature sensor (2) on engine (3).

(3) Connect two wires (1) on high coolant temperature sensor (2).

c. Follow-On Maintenance:

- Fill cooling system, (Para 8-25).
- Connect batteries, (TM 9-4940-568-10).
- Start generator and check for leaks, (TM 9-4940-568-10).
- Install rear panel, (TM 9-4940-568-10).

END OF TASK

8-37. OIL PRESSURE SENDING UNIT REPLACEMENT.

This task covers:

a. Removal b. Installation c. Follow-On Maintenance

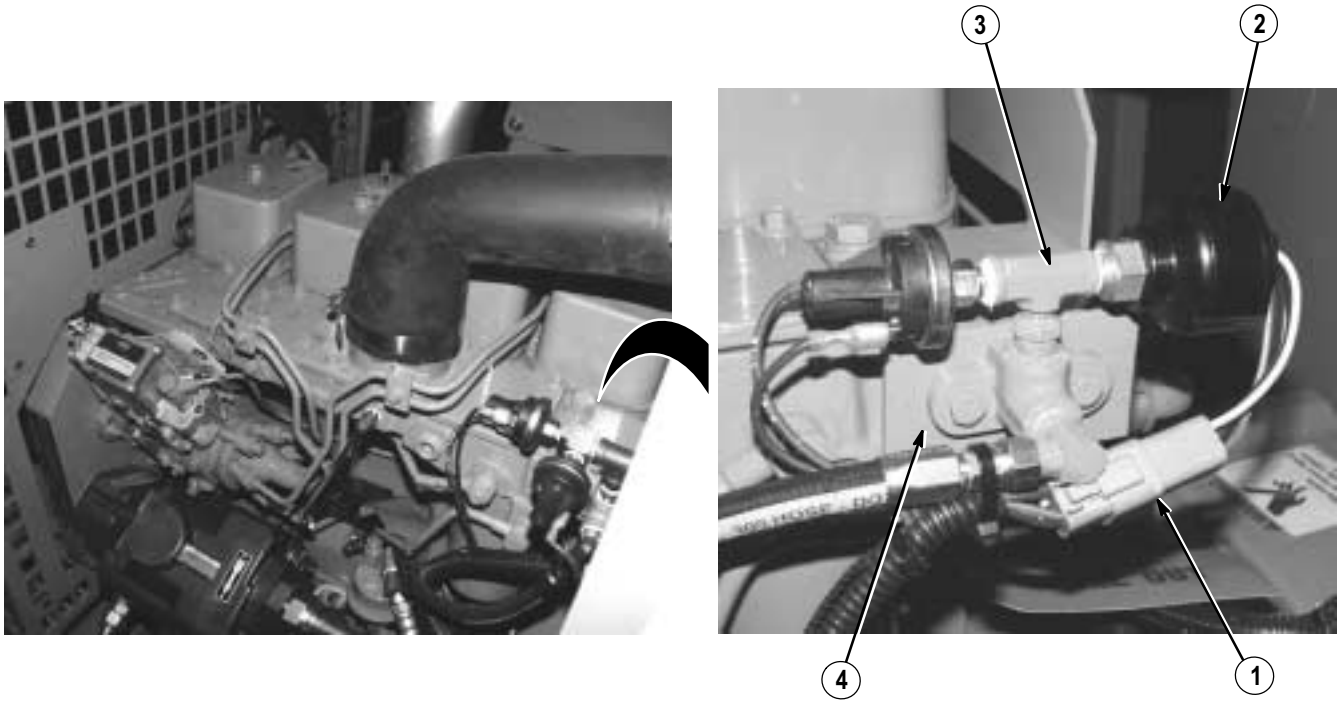
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 30, Appendix G)

Materials/Parts
Sealing Compound (Item 32, Appendix C)

Equipment Condition
FRS unloaded, (TM 9-4940-568-10)
Batteries disconnected, (TM 9-4940-568-10)
Remove rear panel, (TM 9-4940-568-10)

a. Removal.

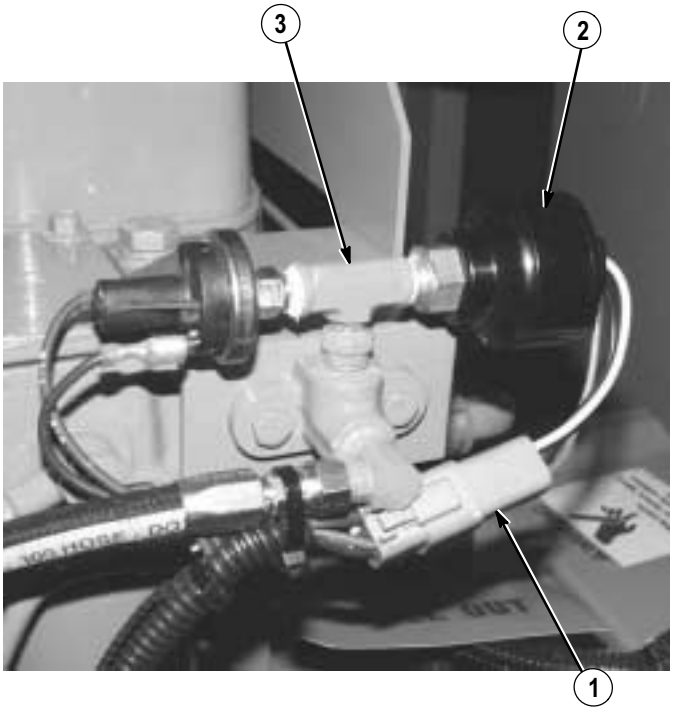


(1) Disconnect connector (1) from oil pressure sending unit (2).

(2) Remove oil pressure sending unit (2) from tee fitting (3) on engine (4).

8-37. OIL PRESSURE SENDING UNIT REPLACEMENT (CONT).

b. Installation.



WARNING

Adhesives, solvents, and sealing compounds can burn easily, can give off harmful vapors, and are harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in well-ventilated area. If adhesive, solvent, or sealing compound gets on skin or clothing, wash immediately with soap and water.

(1) Apply sealing compound to threads of oil pressure sending unit (2).

(2) Install oil pressure sending unit (2) in tee fitting (3).

(3) Connect wire connector (1) to oil pressure sending unit (2).

c. Follow-On Maintenance:

- Connect batteries, (TM 9-4940-568-10).
- Start generator and check operation of oil pressure gage, (TM 9-4940-568-10).
- Install rear panel, (TM 9-4940-568-10).

END OF TASK

8-38. PRE-LOW OIL PRESSURE SENSOR REPLACEMENT.

This task covers:

a. Removal b. Installation c. Follow-On Maintenance

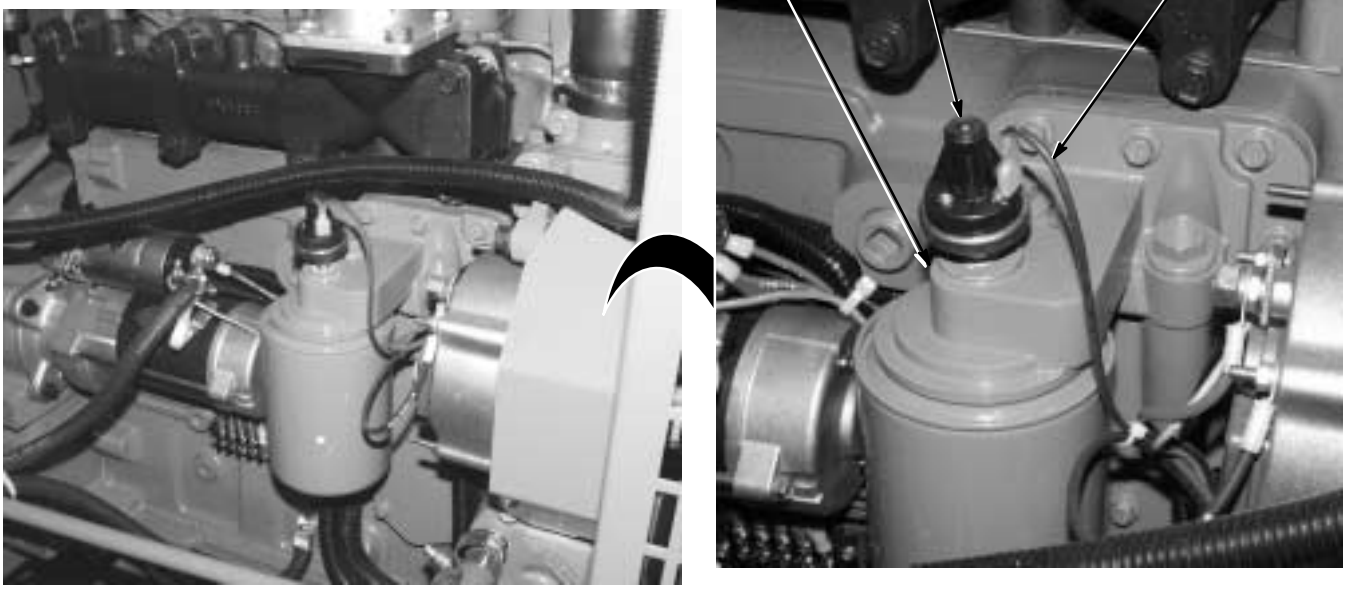
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 30, Appendix G)

Materials/Parts
Sealing Compound (Item 32, Appendix C)
Tags, Identification (Item 40, Appendix C)

Equipment Condition
FRS unloaded, (TM 9-4940-568-10)
Batteries disconnected, (TM 9-4940-568-10).

a. Removal.



WARNING

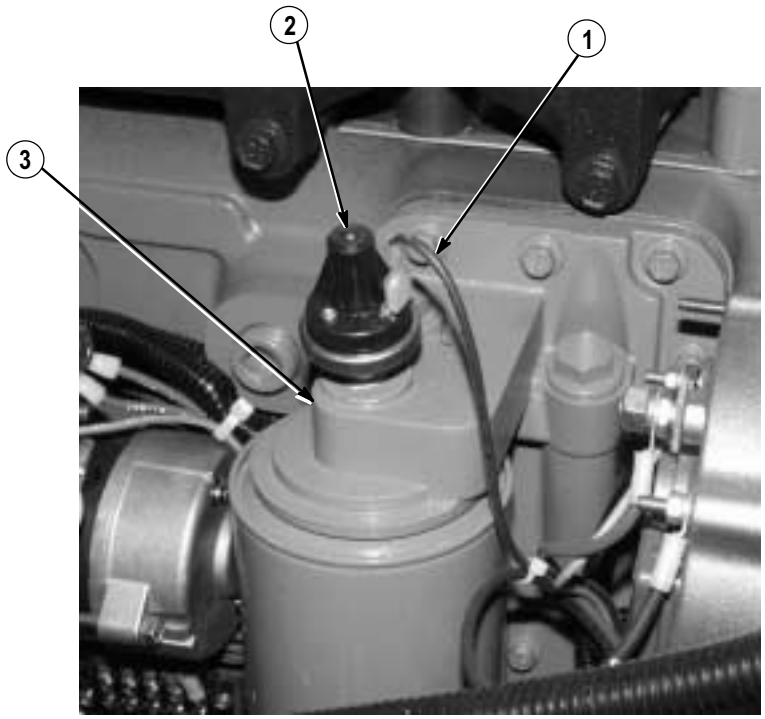
Ensure engine is cool before performing this task or injury to personnel may result.

(1) Remove wire (1) from pre-low oil pressure sensor (2).

(2) Remove pre-low oil pressure sensor (2) from oil filter head (3).

8-38. PRE-LOW OIL PRESSURE SENSOR REPLACEMENT (CONT).

b. Installation.



WARNING

Adhesives, solvents, and sealing compounds can burn easily, can give off harmful vapors, and are harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in well-ventilated area. If adhesive, solvent, or sealing compound gets on skin or clothing, wash immediately with soap and water.

(1) Apply sealing compound to threads of pre-low oil pressure sensor (2).

(2) Install pre-low oil pressure sensor (2) on oil filter head (3).

(3) Install wire (1) as noted prior to removal of pre-low oil pressure sensor (2).

c. Follow-On Maintenance:

- Connect batteries, (TM 9-4940-568-10).
- Start generator and check for leaks, (TM 9-4940-568-10).

END OF TASK

8-39. LOW OIL PRESSURE SENSOR REPLACEMENT.

This task covers:

a. Removal b. Installation c. Follow-On Maintenance

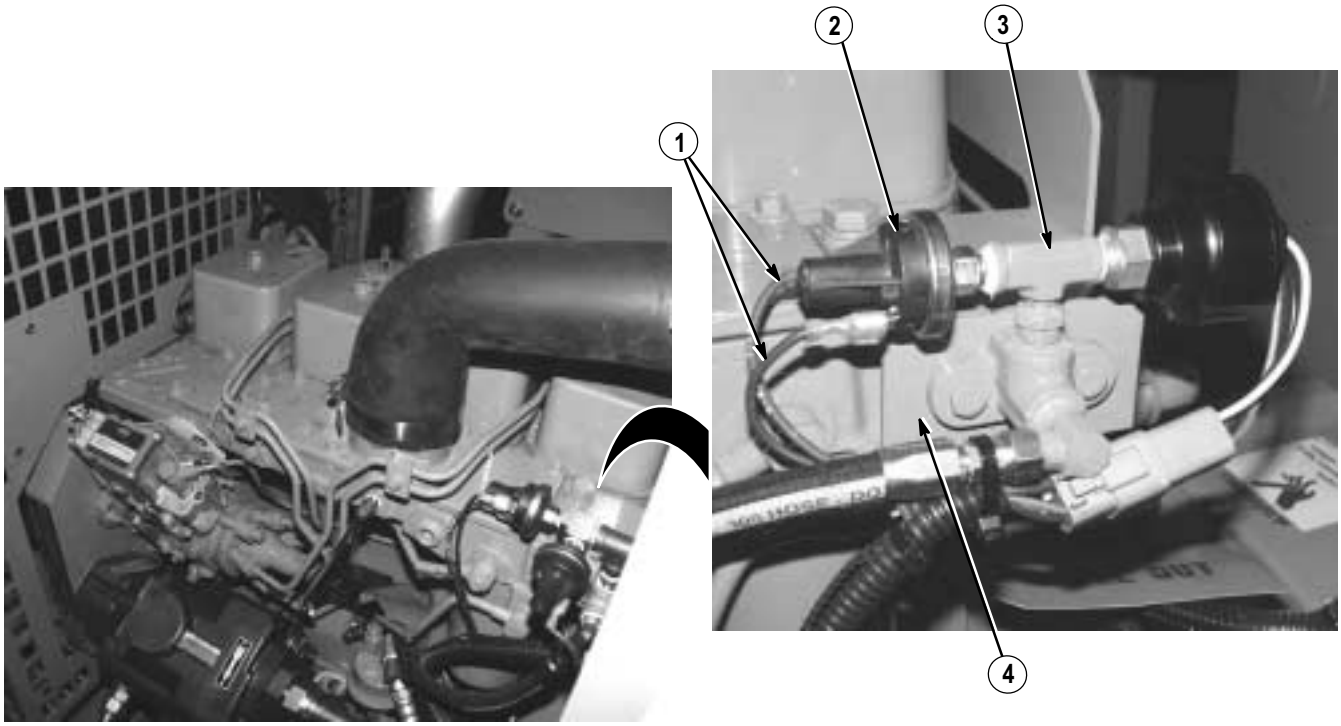
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 30, Appendix G)

Materials/Parts
Sealing Compound (Item 32, Appendix C)
Tags, Identification (Item 40, Appendix C)

Equipment Condition
FRS unloaded, (TM 9-4940-568-10)
Batteries disconnected, (TM 9-4940-568-10).
Remove rear panel, (TM 9-4940-568-10).

a. Removal.



NOTE

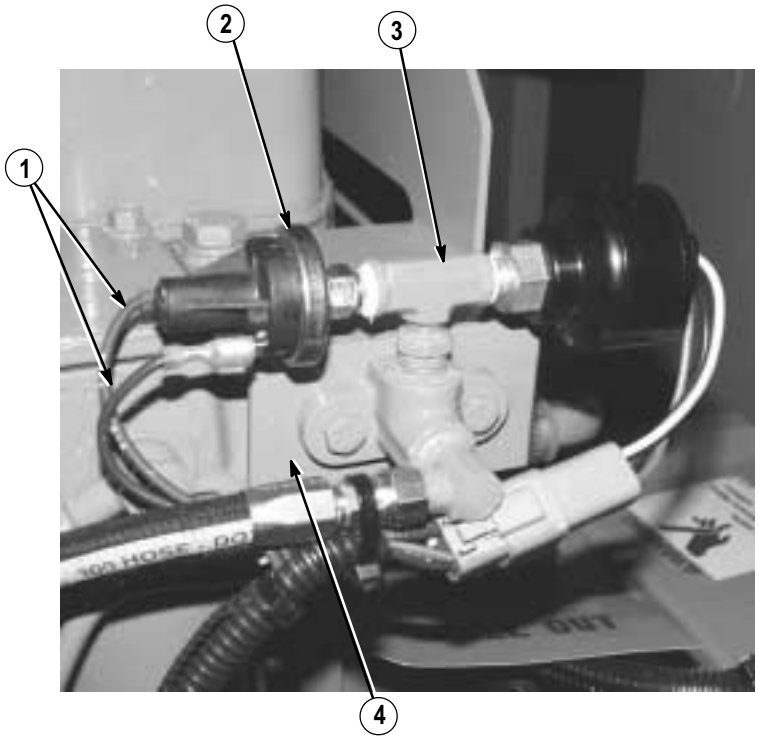
Tag and mark all wires prior to removal.

(1) Remove two wires (1) from low oil pressure sensor (2).

(2) Remove low oil pressure sensor (2) from tee fitting (3) on engine (4).

8-39. LOW OIL PRESSURE SENSOR REPLACEMENT (CONT).

b. Installation.



WARNING

Adhesives, solvents, and sealing compounds can burn easily, can give off harmful vapors, and are harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in well-ventilated area. If adhesive, solvent, or sealing compound gets on skin or clothing, wash immediately with soap and water.

(1) Apply sealing compound to threads of low oil pressure sensor (2).

(2) Install low oil pressure sensor (2) in tee fitting (3).

(3) Install two wires (1) on low oil pressure sensor (2) as noted in removal.

c. Follow-On Maintenance:

- Connect batteries, (TM 9-4940-568-10).
- Start generator and check for leaks, (TM 9-4940-568-10).
- Install rear panel, (TM 9-4940-568-10).

END OF TASK

8-40. LOW ENGINE TEMPERATURE SENSOR REPLACEMENT.

This task covers:

a. Removal b. Installation c. Follow-On Maintenance

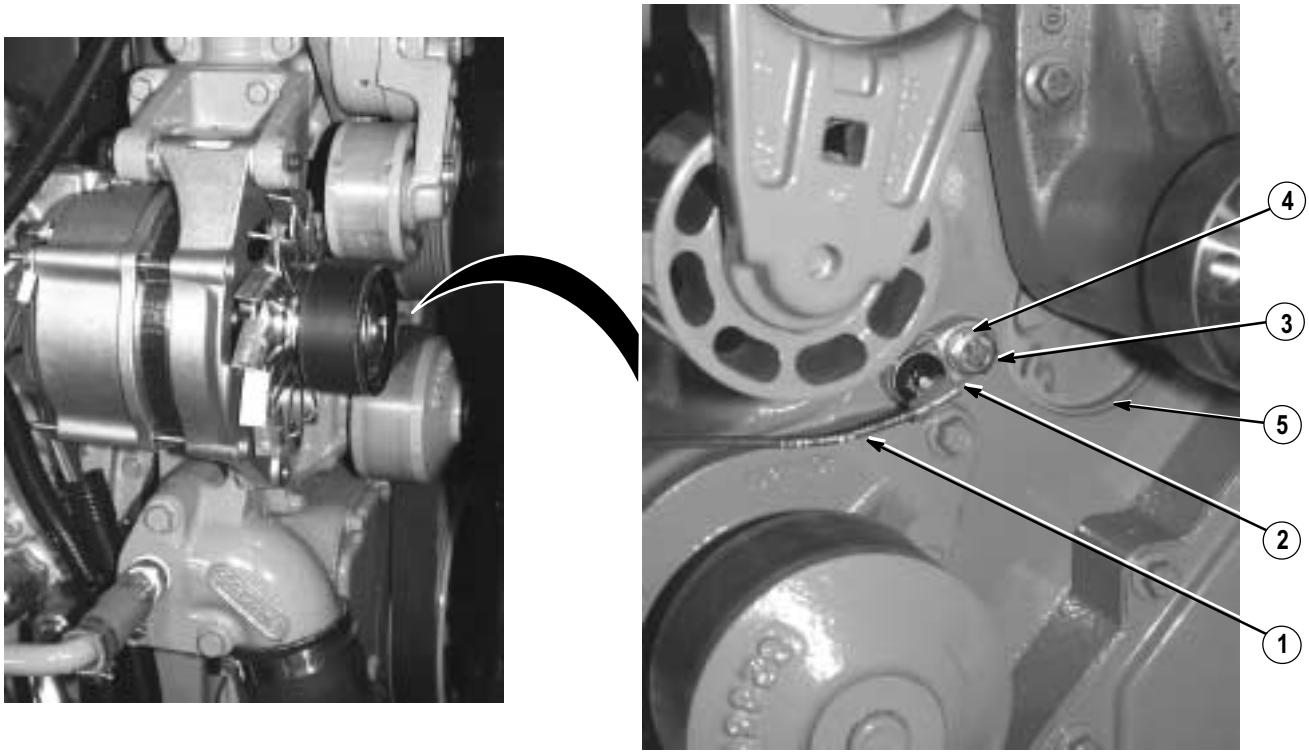
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 30, Appendix G)

Materials/Parts
Lockwasher (Item 73, Appendix F)

Equipment Condition
FRS unloaded, (TM 9-4940-568-10)
Batteries disconnected, (TM 9-4940-568-10).

a. Removal.



WARNING

Ensure engine is cool before performing this task or injury to personnel may result.

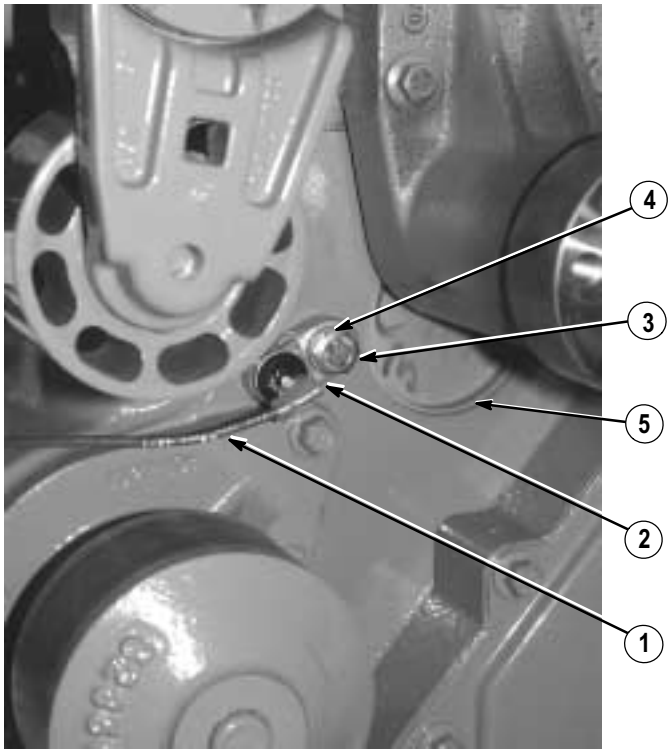
(1) Remove fan shroud as outlined in Engine Drive Belt Replacement (Para 8-31).

(2) Remove wire (1) from low engine temperature sensor (2).

(3) Remove screw (3), lockwasher (4) and low engine temperature sensor (2) from engine (5). Discard lockwasher.

8-40. LOW ENGINE TEMPERATURE SENSOR REPLACEMENT (CONT).

b. Installation.



(1) Install low engine temperature sensor (2) with screw (3) and lockwasher (4) on engine (5).

(2) Install wire (1) on low engine temperature sensor (2).

(3) Install fan shroud as outlined in Engine Drive Belt Replacement, (Para 8-31).

c. Follow-On Maintenance:

- Connect batteries, (TM 9-4940-568-10).

END OF TASK

8-41. ETHER START SENSOR REPLACEMENT.

This task covers:

a. Removal b. Installation c. Follow-On Maintenance

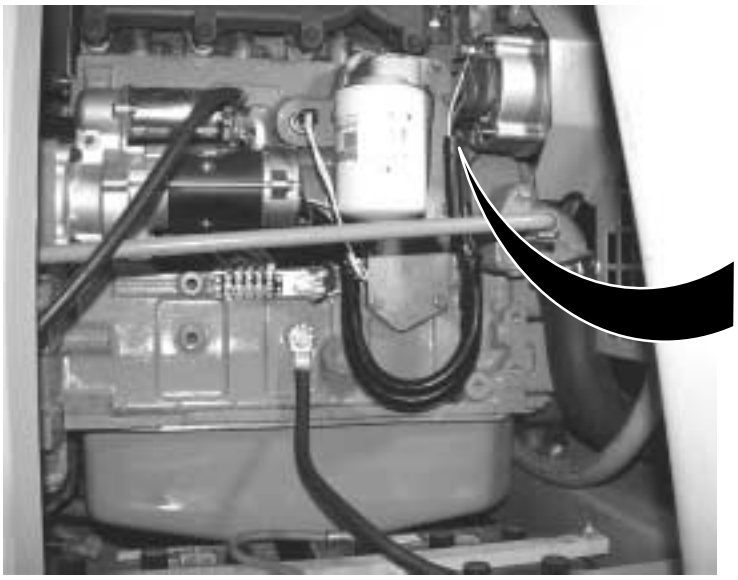
INITIAL SETUP

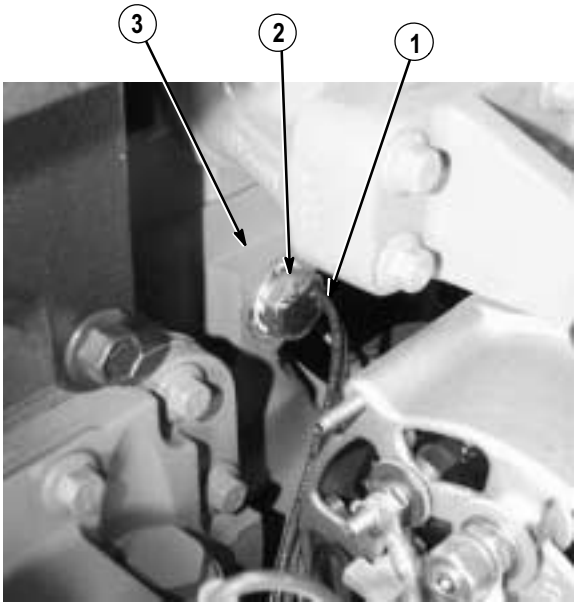
Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 30, Appendix G)

Materials/Parts
Sealing Compound (Item 32, Appendix C)

Equipment Condition
FRS unloaded, (TM 9-4940-568-10)
Batteries disconnected, (TM 9-4940-568-10).
Cooling system drained, (Para 8-2)

a. Removal.





WARNING

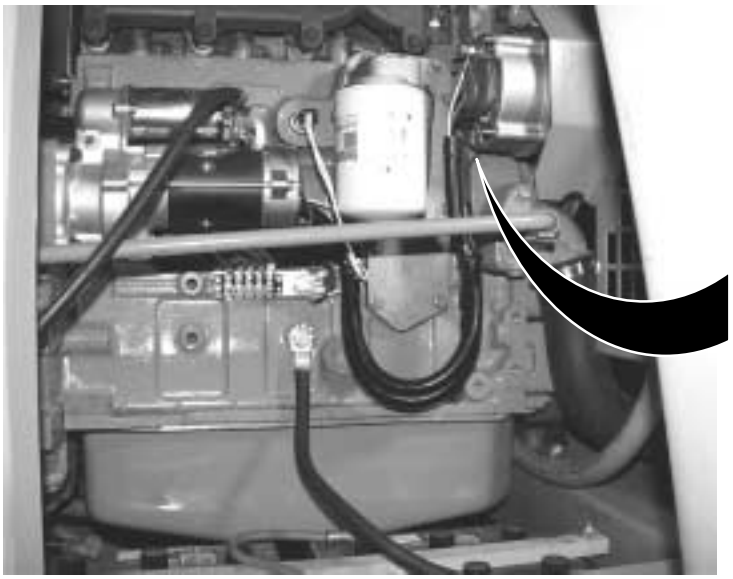
Ensure engine is cool before performing this task or injury to personnel may result.

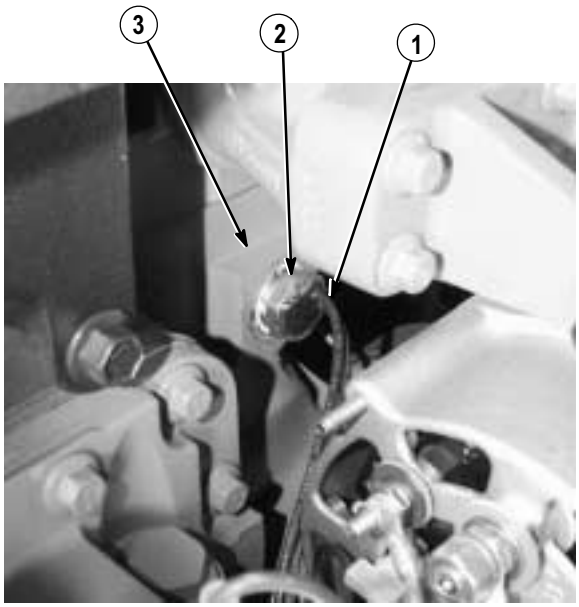
(1) Unplug wire connector (1) from ether start sensor (2).

(2) Remove ether start sensor (2) from engine (3).

8-41. ETHER START SENSOR REPLACEMENT (CONT).

b. Installation.





WARNING

Adhesives, solvents, and sealing compounds can burn easily, can give off harmful vapors, and are harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in well-ventilated area. If adhesive, solvent or sealing compound gets on skin or clothing, wash immediately with soap and water.

(1) Apply sealing compound to ether start sensor (2).

(2) Install ether start sensor (2) in engine (3).

(3) Plug wire connector (1) into ether start sensor (2).

c. Follow-On Maintenance:

- Connect batteries, (TM 9-4940-568-10).
- Fill cooling system, (Para 8-2).
- Start generator and check for leaks, (TM 9-4940-568-10).

END OF TASK

8-42. ALTERNATOR REPLACEMENT.

This task covers:

a. Removal b. Installation c. Follow-On Maintenance

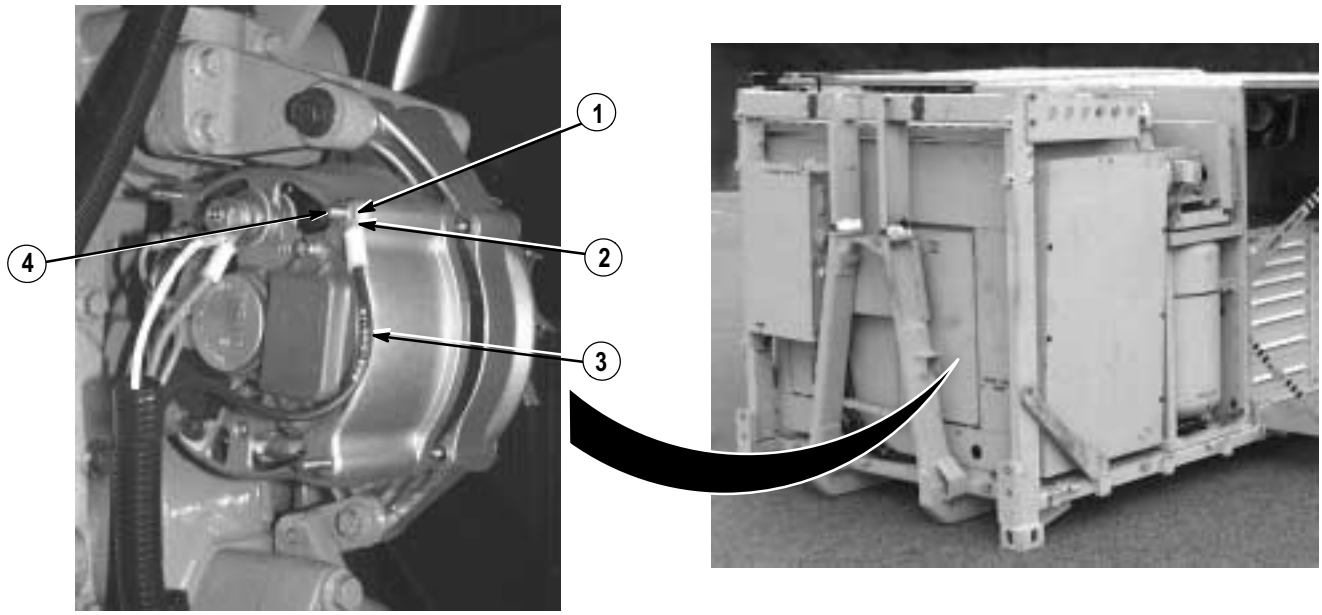
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 30, Appendix G)
Socket Set, 3/8 in. (Item 25, Appendix G)
Wrench, Torque (0 to 60 N·m) (Item 46, Appendix G)

Materials/Parts
Tags, Identification (Item 40, Appendix C)
Lockwasher (Item 63, Appendix F)

Equipment Condition
FRS unloaded, (TM 9-4940-568-10)
Engine drive belt removed, (Para 8-31)

a. Removal.



NOTE

Tag and mark all wires and connectors prior to removal.

(1) Remove nut (1), washer (2) and black wire (3) from terminal one (4).

8-42. ALTERNATOR REPLACEMENT (CONT).

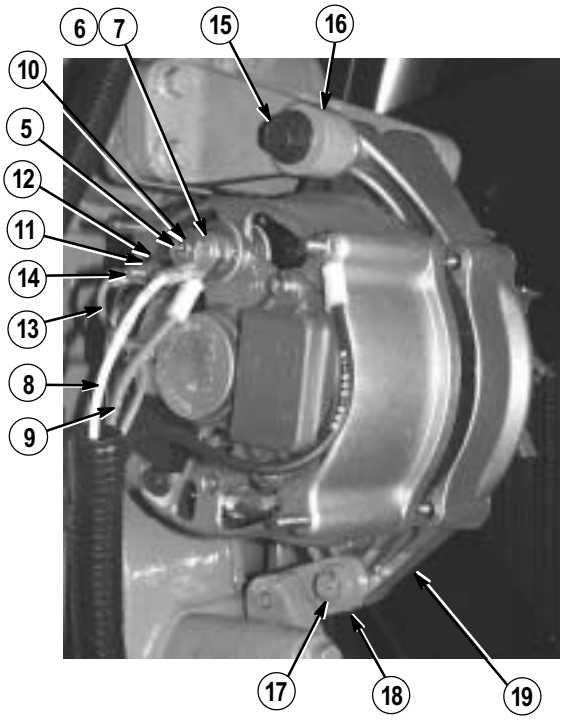
(2) Remove nut (5), washer (6), lockwasher (7), white wire (8) and red wire (9) from terminal (10). Discard lockwasher.

(3) Remove nut (11), washer (12) and gray wire (13) from terminal (14).

(4) Remove top screw (15) from upper alternator bracket (16).

(5) Remove bottom screw (17) from bottom alternator bracket (18).

(6) Remove alternator (19) from alternator bracket (18).



b. Installation.

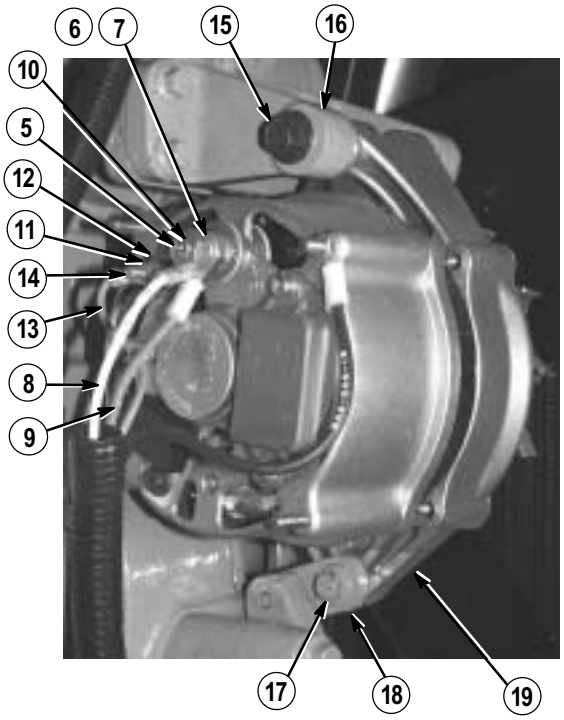
(1) Position alternator (19) and bottom screw (17) on bottom alternator bracket (18).

(2) Install top screw (15) on upper alternator bracket (16). Tighten screw to 32 lb-ft (43 N·m).

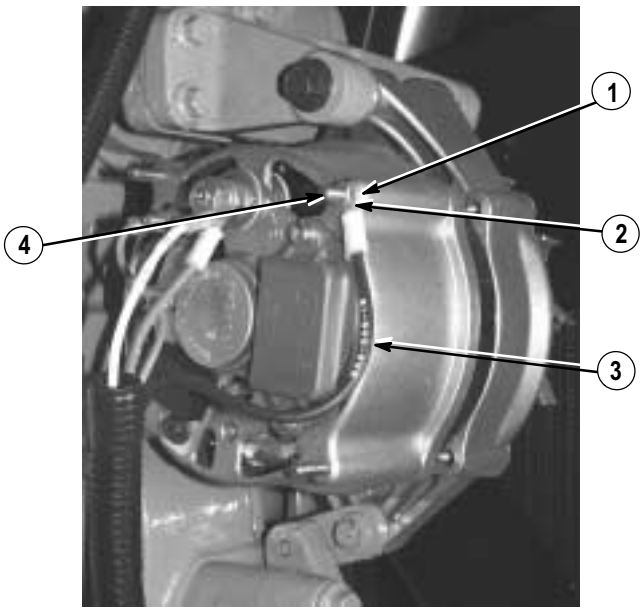
(3) Tighten bottom screw (17) to 18 lb-ft (24 N·m).

(4) Install gray wire (13), washer (12) and nut (11) on terminal (14).

(5) Install red wire (9), white wire (8), washer (6), lockwasher (7) and nut (5) on terminal (10).



(6) Install black wire (3), washer (2) and nut (1) on terminal one (4).



c. Follow-On Maintenance:

- Install engine drive belt, (Para 8-31).
- Start generator, (TM 9-4940-568-10).

END OF TASK

8-43. STARTER REPLACEMENT.

This task covers:

a. Removal b. Installation c. Follow-On Maintenance

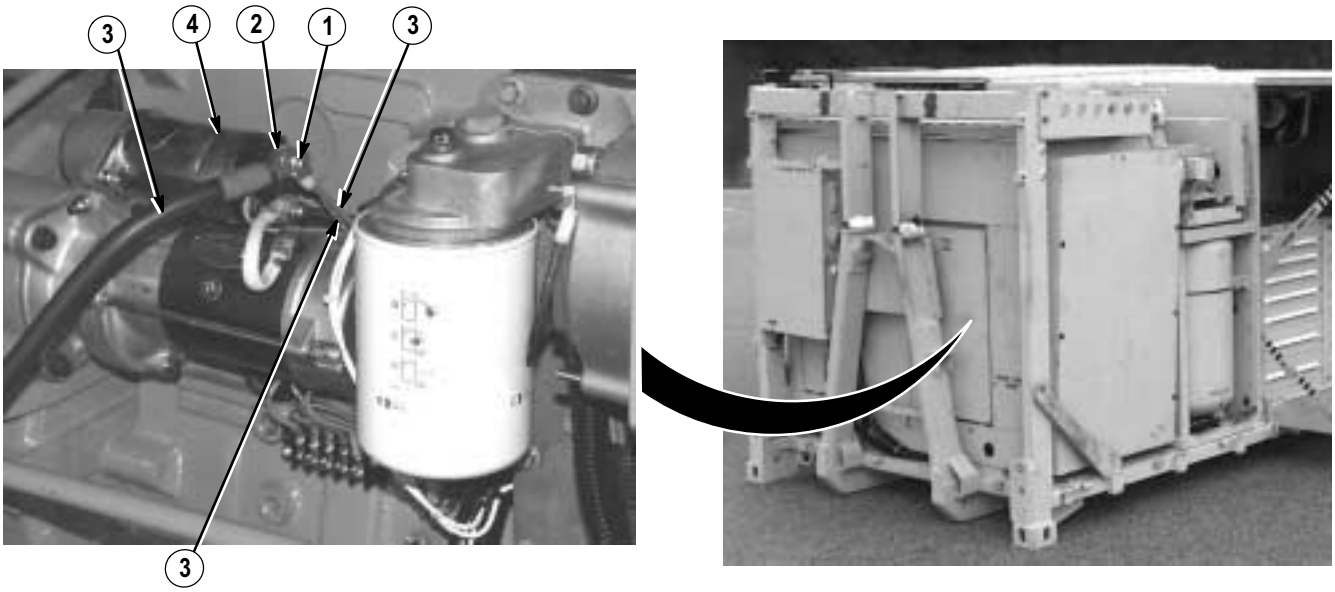
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 30, Appendix G)
Socket Set, 3/8 in. (Item 25, Appendix G)
Wrench, Torque (0 to 60 N·m) (Item 46, Appendix G)

Materials/Parts
Cable Ties (Item 10, Appendix C)
Tags, Identification (Item 40, Appendix C)
Lockwasher (Item 68, Appendix F)

Equipment Condition
FRS unloaded, (TM 9-4940-568-10)
Batteries disconnected, (TM 9-4940-568-10)

a. Removal.



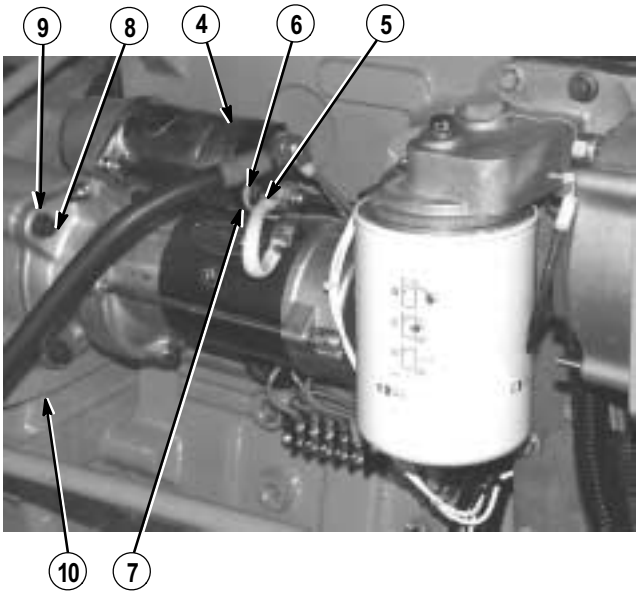
NOTE

Tag and note location of all wires and connectors prior to removal.

(1) Remove nut (1), lockwasher (2) and three wires (3) off solenoid (4). Discard lockwasher.

(2) Remove nut (5), washer (6) and wire (7) from solenoid (4).

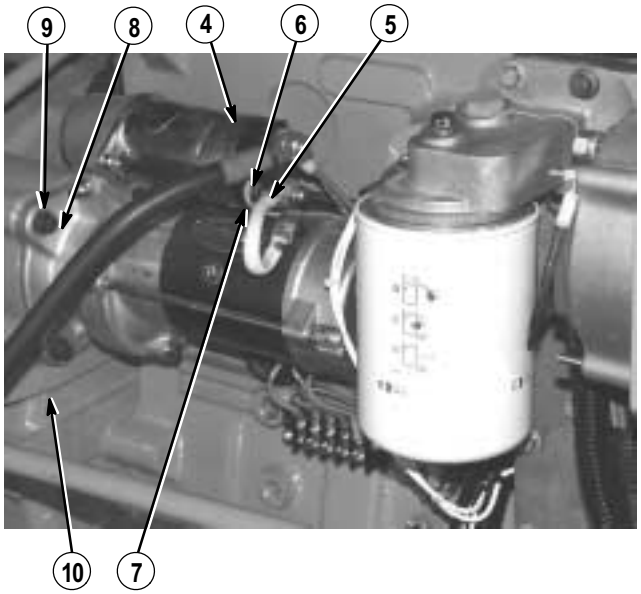
(3) Remove three screws (8) and starter (9) from engine (10).



b. Installation.

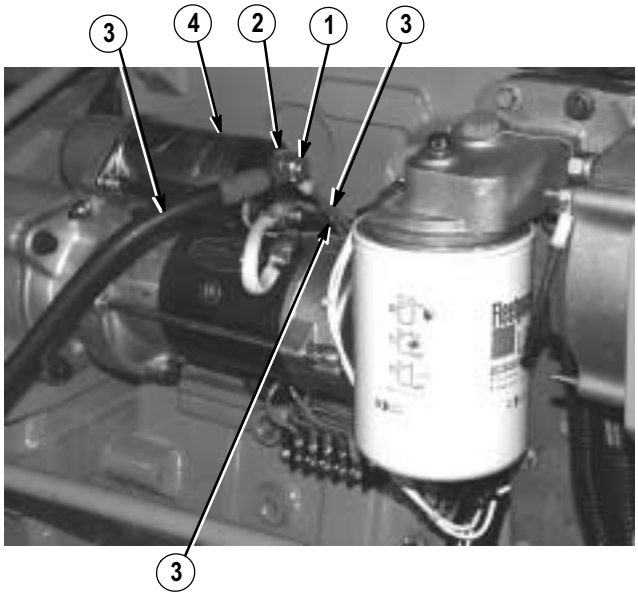
(1) Install starter (9) on engine (10) with three screws (8). Tighten screws to 32 lb–ft (43 N·m).

(2) Install wire (7), washer (6) and nut (5) on solenoid (4).



8-43. STARTER REPLACEMENT (CONT).

(3) Install three wires (3), lockwasher (2) and nut (1) on solenoid (4).



c. Follow-On Maintenance:

- Connect batteries (TM 9-4940-568-10).
- Check starter operation.

END OF TASK

8-44. GENERATOR METER REPLACEMENT.

This task covers:

a. Removal b. Installation c. Follow-On Maintenance

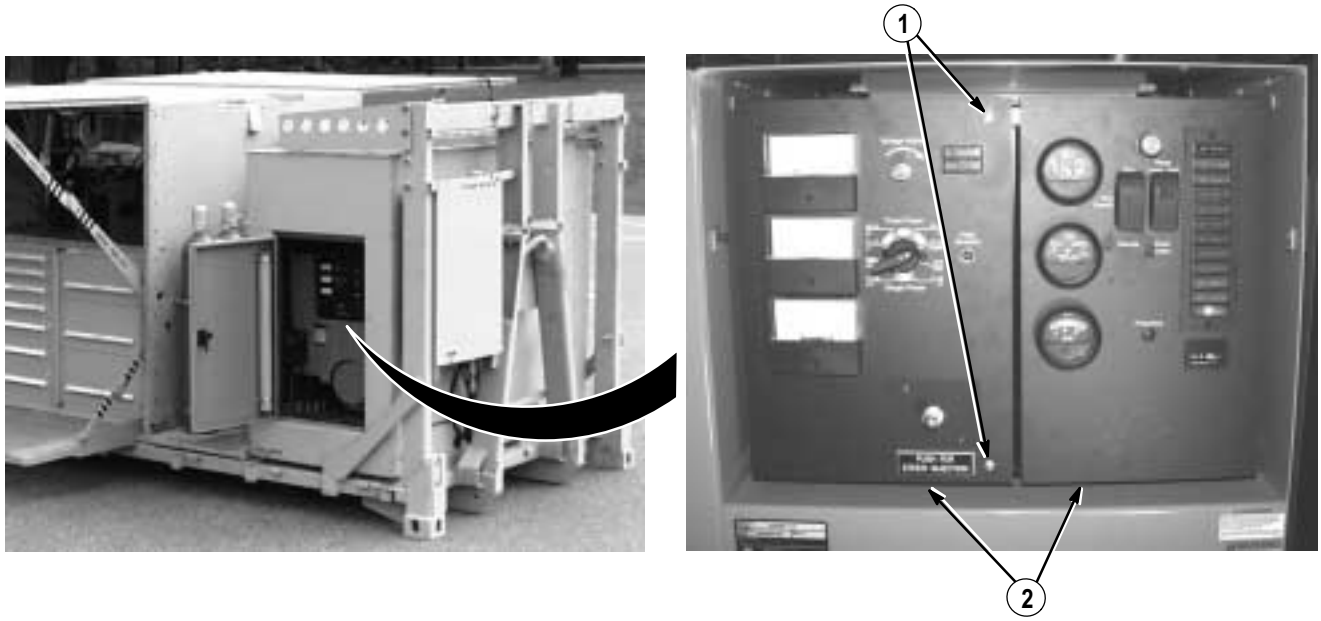
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 30, Appendix G)

Materials/Parts
Tags, Identification (Item 40, Appendix C)

Equipment Condition
FRS unloaded, (TM 9-4940-568-10)
Batteries disconnected, (TM 9-4940-568-10)

a. Removal.



NOTE

- There are three electrical gages. They are all removed the same way.
- Note location, tag, and mark all wires prior to removal.

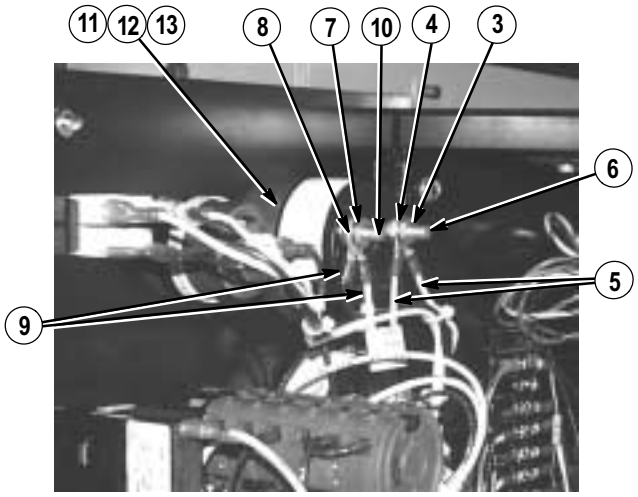
(1) Unlock panel screws (1) and open instrument panel doors (2).

8-44. GENERATOR METER REPLACEMENT (CONT).

(2) Remove nut (3), washer (4), and two wires (5) from terminal (6).

(3) Remove nut (7), washer (8), and two wires (9) from terminal (10).

(4) Remove two nuts (11) and washers (12) from electric gage mount posts (13).



(5) Remove gage (14) from instrument panel door (2).

b. Installation.

(1) Install gage (14) into instrument panel door (2).

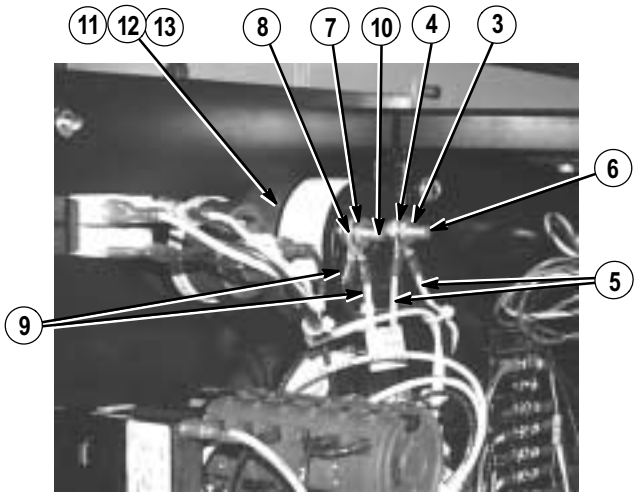
(2) Install two washers (12) and nuts (11) on electric gage mount posts (13).

NOTE

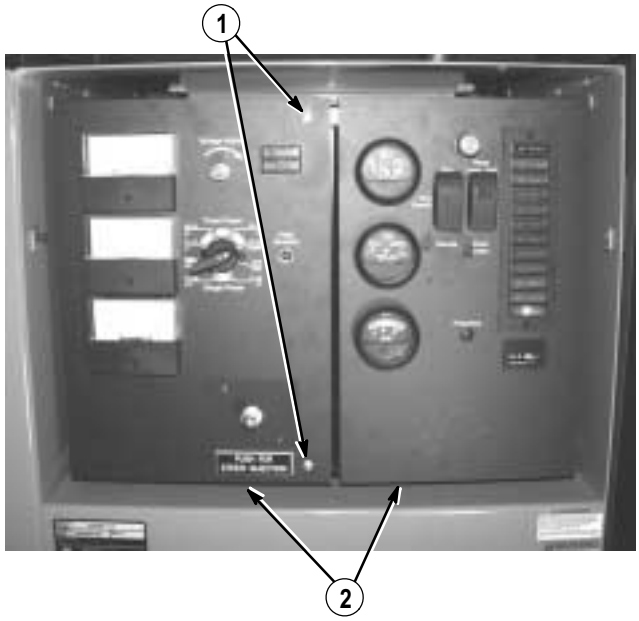
Install wires as noted prior to removal.

(3) Install two wires (9), washer (8), and nut (7) on terminal (10).

(4) Installl two wires (5), washer (4), and nut (3) on terminal (6).



(5) Close instrument panel doors (2) and lock panel screws (1).



c. Follow-On Maintenance:

- Connect batteries, (TM 9-4940-568-10).
- Start generator and check operation of electric gage, (TM 9-4940-568-10).

END OF TASK

CHAPTER 9

GAS, AIR AND VACUUM MAINTENANCE

9-1. INTRODUCTION.

This chapter contains maintenance instructions for removing, replacing, repairing, installing and adjusting gas, air and vacuum components authorized by the Maintenance Allocation Chart (MAC) at the Unit Maintenance level.

9-2. ARGON HOSE REEL AND BRACKET REPLACEMENT.

This task covers:

a. Removal
b. Disassembly
c. Cleaning/Inspection
d. Assembly
e. Installation

INITIAL SETUP

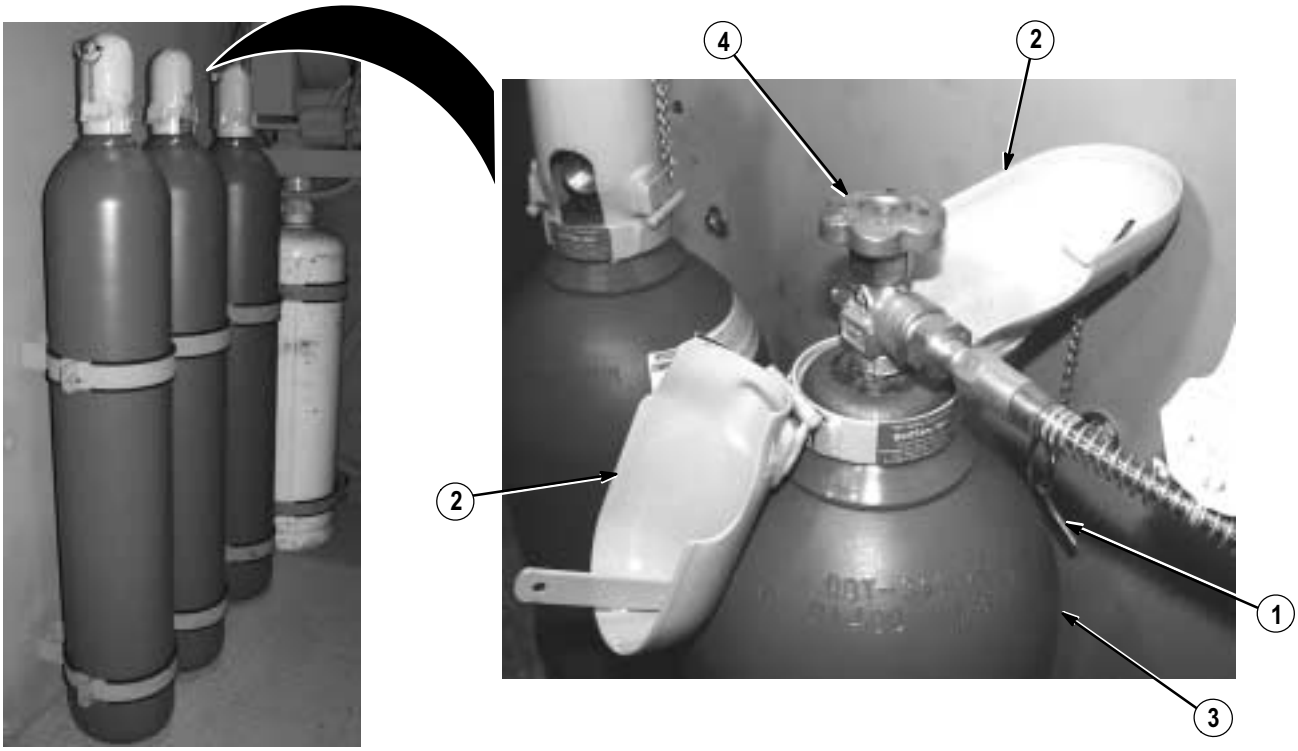
Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 30, Appendix G)
Socket Set, 3/8 in. (Item 25, Appendix G)

Materials/Parts
Cable Ties (Item 10, Appendix C)
Cloth, Cleaning (Item 13, Appendix C)
Sealing Compound (567) (Item 32, Appendix C)
Soap Solution (Item 37, Appendix C)
Solvent, Drycleaning (Item 38, Appendix C)
Tags, Identification (Item 40, Appendix C)

Materials/Parts - Continued
Gasket (Item 7, Appendix F)
Locknut (4) (Item 35, Appendix F)
Locknut (4) (Item 29, Appendix F)
Locknut (4) (Item 49, Appendix F)
Locknut (6) (Item 24, Appendix F)
Snap Ring (Item 96, Appendix F)

Equipment Condition
FRS unloaded, (TM 9-4940-568-10)

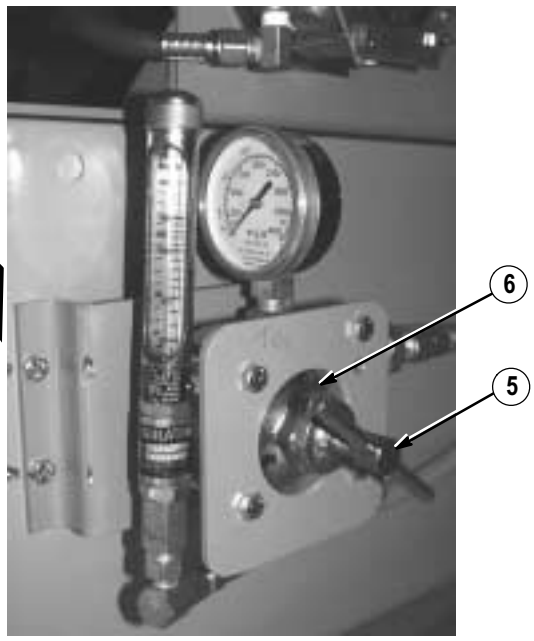
a. Removal.



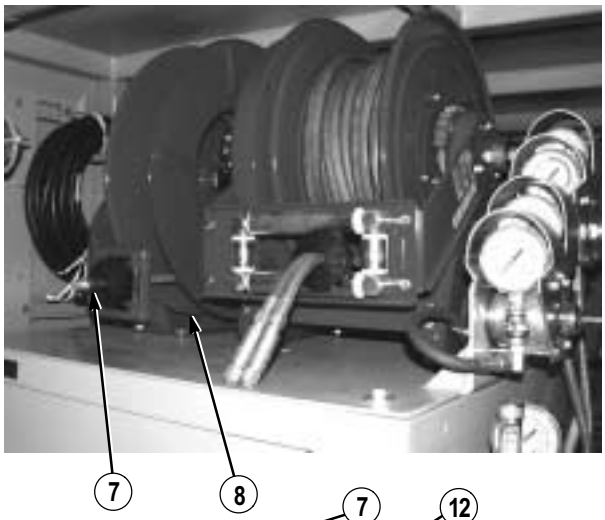
NOTE

Remove cable ties as required.

(1) Remove pin (1) and open safety cap (2) on argon tank (3).
(2) Close valve (4) on argon tank (3).



(3) Turn handle (5) on argon regulator (6) clockwise to ensure valve is closed and excess argon is bled from hose (7).

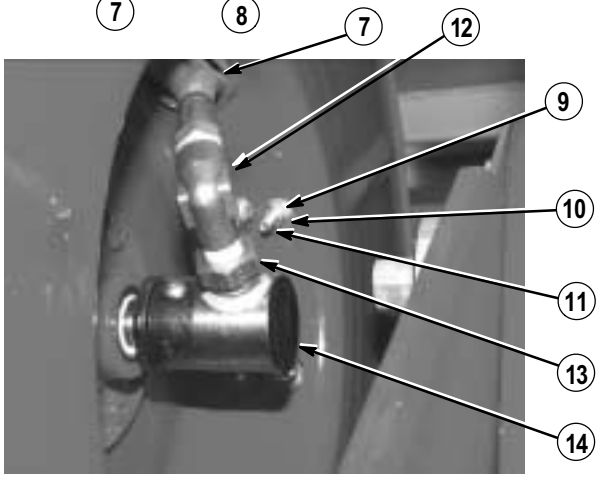


Hose reel assembly is under pressure. Avoid releasing latching mechanism during removal and installation. Failure to comply could result in injury to personnel.

(4) Layout entire length of hose (7) from hose reel assembly (8).

(5) Remove four locknuts (9), washers (10) and two clamps (11) from hose reel assembly (8). Discard locknuts.

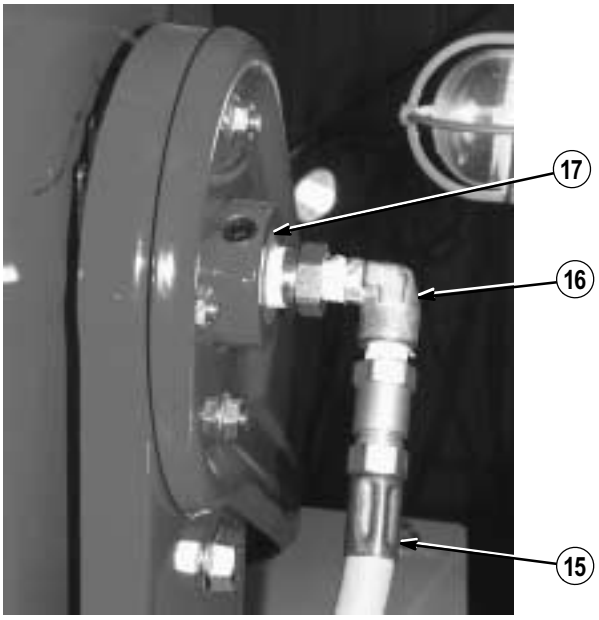
(6) Remove hose (7), elbow fitting (12) and adapter (13) from swivel assembly (14).



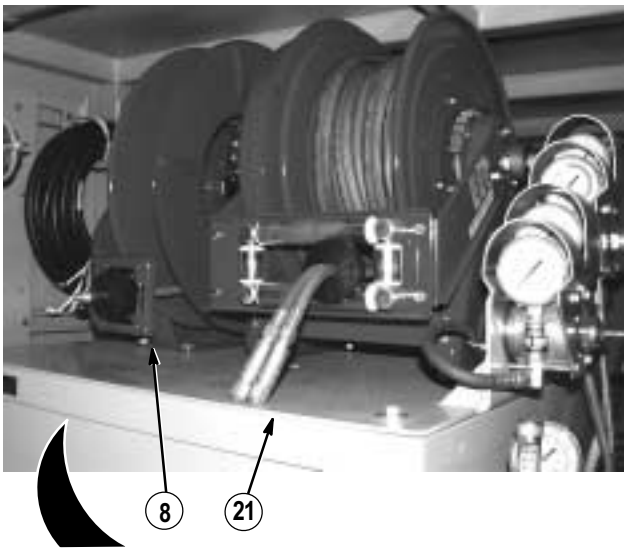
9-2. ARGON HOSE REEL AND BRACKET REPLACEMENT (CONT).

(7) Remove hose (15) from elbow fitting (16).

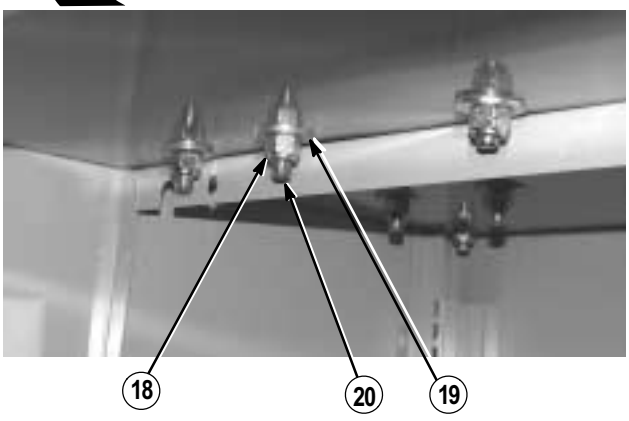
(8) Remove elbow fitting (16) from hose reel inlet port (17).



(9) Remove tool drawer E–1 on right side of shelter to gain access to hose reel mounting hardware.

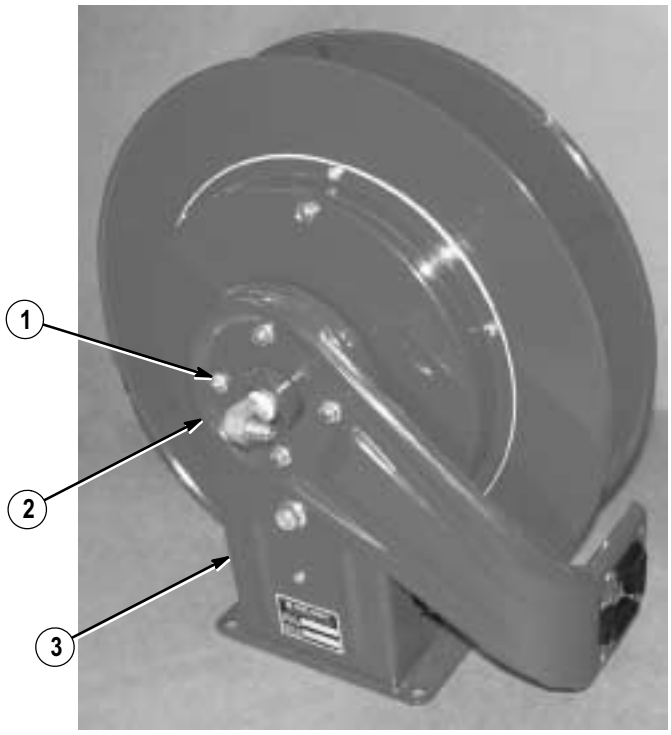


(10) Remove four locknuts (18), washers (19), screws (20) and hose reel assembly (8) from top of tool cabinet (21).



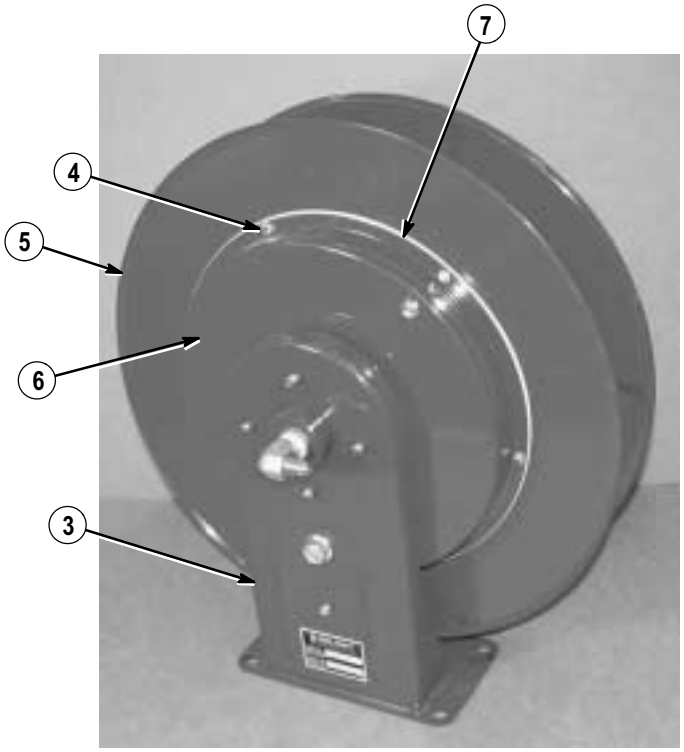
b. Disassembly.

(1) Remove four locknuts (1) and guide arm with rollers (2) from hose reel base (3). Discard locknuts.

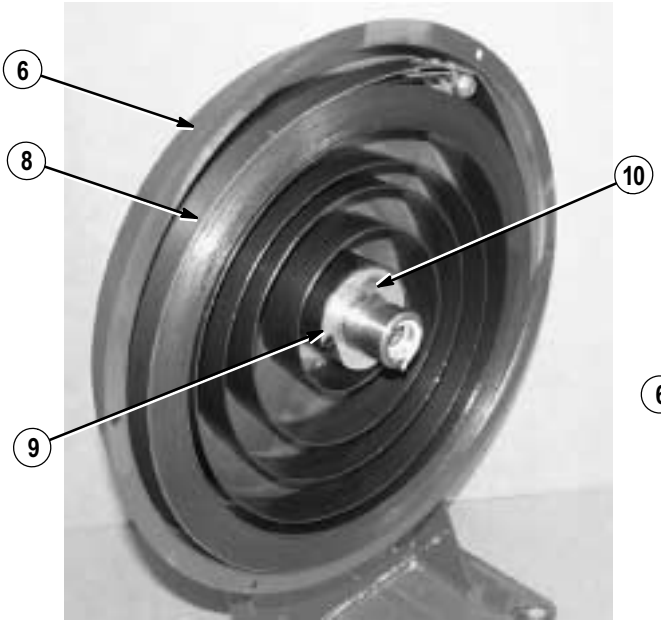


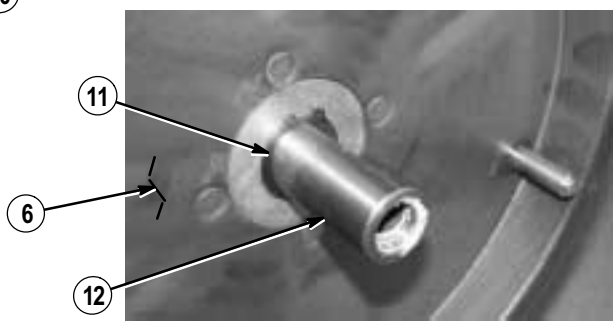
(2) Remove six locknuts (4) and sheave assembly (5) from spring case (6). Discard locknuts.

(3) Remove gasket (7) from sheave assembly (5). Discard gasket.



9-2. ARGON HOSE REEL AND BRACKET REPLACEMENT (CONT).





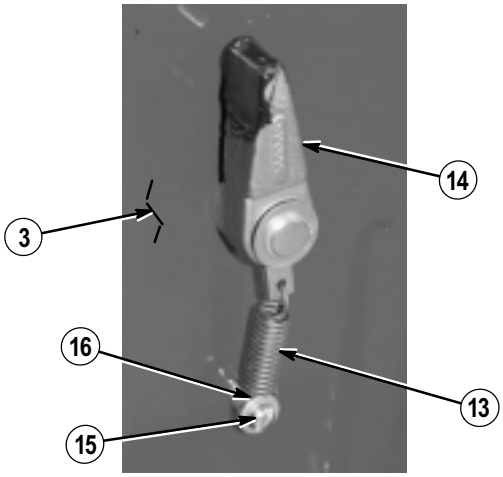
WARNING

Use extreme care when removing drive spring. Spring is under tension and can act as a projectile when released and could cause eye injury.

NOTE

Note position of drive spring, prior to removal.

(4) Remove drive spring (8), spring arbor (9) and spring arbor key (10) from spring case (6).



WARNING

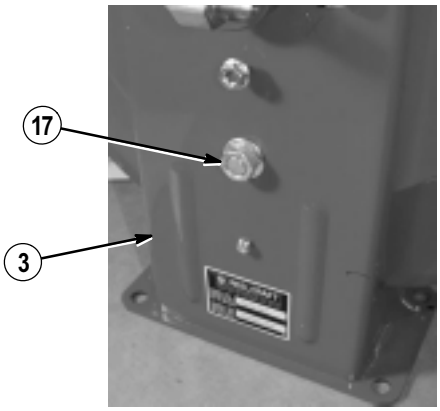
Use care when removing or installing retaining rings. Retaining rings are under spring tension and can act as projectiles when released and could cause eye injury.

(5) Remove snap ring (11) and spring case (6) from main shaft (12). Discard snap ring.

(6) Remove spring (13) from latch pawl (14).

(7) Remove screw (15), washer (16) and spring (13) from hose reel base (3).

(8) Remove hex nut (17) and latch pawl (14) from hose reel base (3).



c. Cleaning/Inspection.

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.

(1) Clean and inspect drive spring, spring case, latch pawl, spring, and guide arm rollers per the information below.

(2) Cleaning all parts with dry cleaning solvent (Item 38, Appendix C) and clean lint-free cloth (Item 13, Appendix C) and air dry.

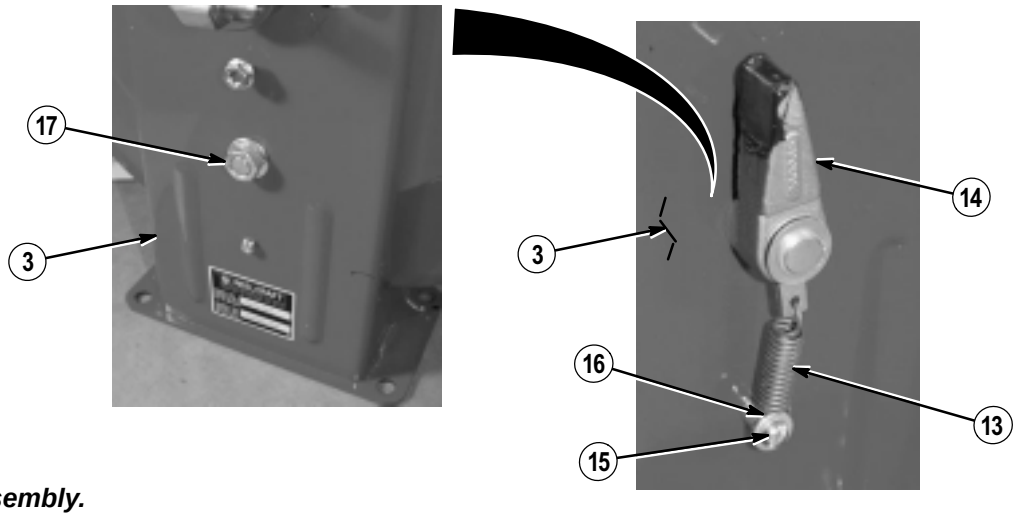
(3) Inspect all parts for damage that would impair operation.

(4) Inspect sheeve assembly and latch pawl for roughness or gouging.

(5) Inspect drive spring, spring arbor and spring arbor key for cracks and freedom of movement.

(6) Discard all damaged parts.

9-2. ARGON HOSE REEL AND BRACKET REPLACEMENT (CONT).



d. Assembly.

NOTE

Prior to assembly, coat latch pawl with grease.

(1) Install latch pawl (14) on hose reel base (3) and secure with hex nut (17).

(2) Install spring (13), washer (16) and screw (15) on hose reel base (3).

(3) Install spring (13) on latch pawl (14).

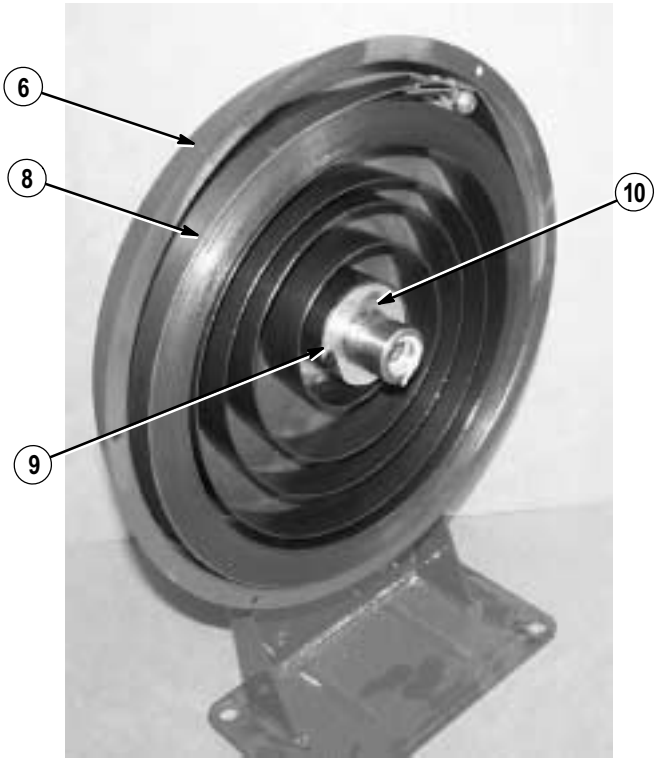
WARNING

Use care when removing or installing retaining rings. Retaining rings are under spring tension and can act as projectiles when released and could cause eye injury.

NOTE

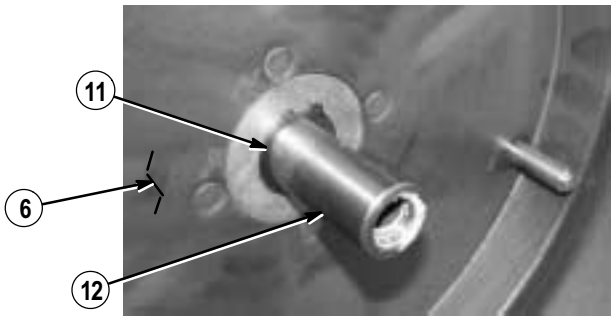
Prior to assembly, coat main shaft with grease.

(4) Install main shaft (12) on spring case (6) with snap ring (11).



WARNING

Use extreme care when removing drive spring. Spring is under tension and can act as a projectile when released and could cause eye injury.

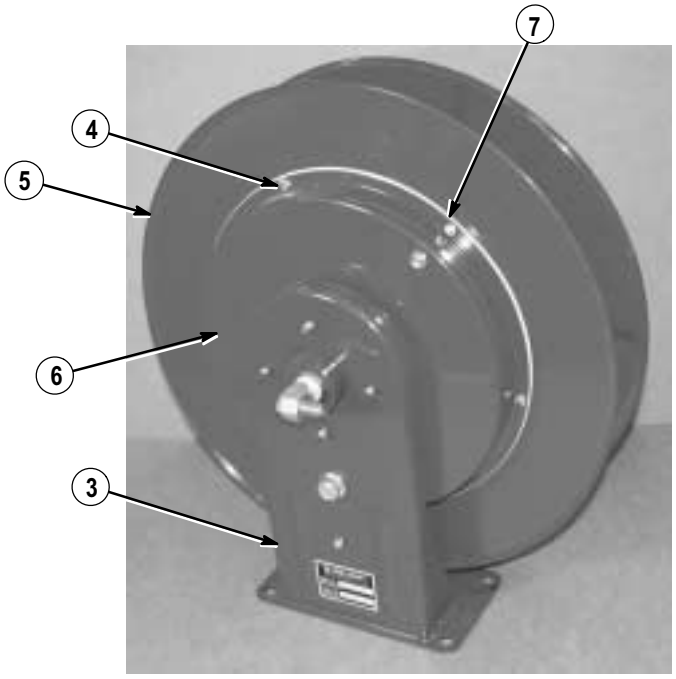


NOTE

- Prior to assembly, coat spring arbor with grease.
- Install drive spring into same position noted during disassembly.

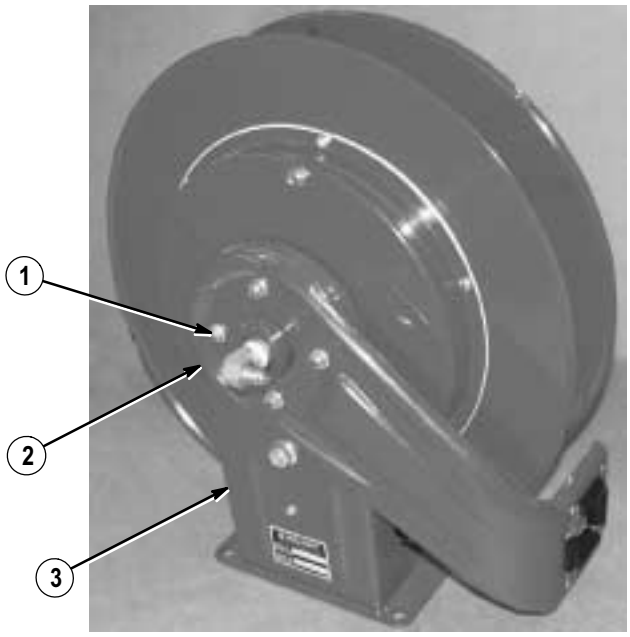
(5) Install spring arbor key (10), spring arbor (9) and drive spring (8) on spring case (6).

(6) Install gasket (7) and sheave assembly (5) on spring case (6) with six new locknuts (4).



9-2. ARGON HOSE REEL AND BRACKET REPLACEMENT (CONT).

(7) Install guide arm with rollers (2) on hose reel base (3) with four new locknuts (1).

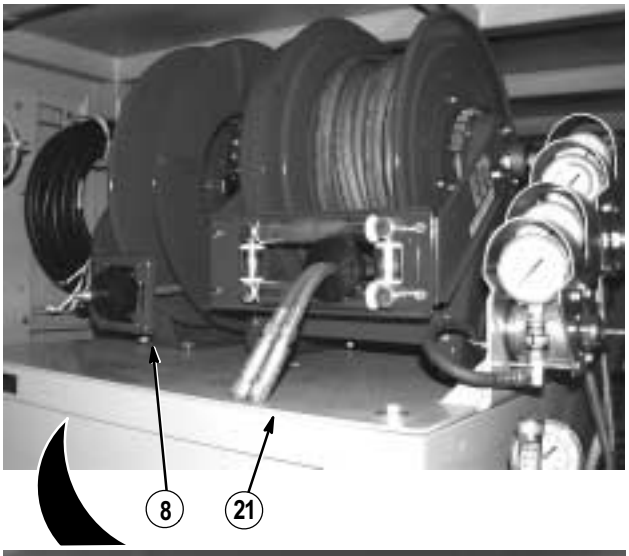


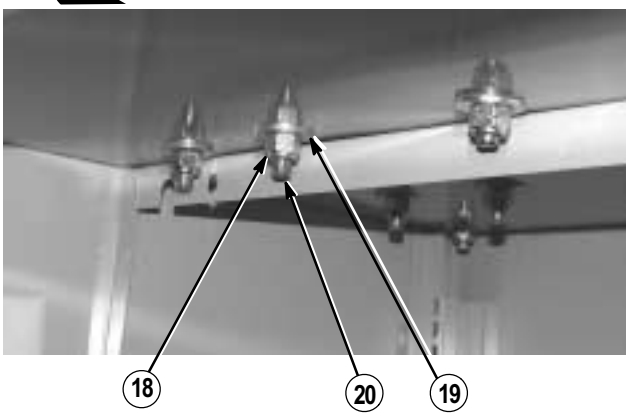
e. Installation.

NOTE

Install cable ties as required.

(1) Install hose reel assembly (8) on tool cabinet (21) with four screws (20), washers (19) and locknuts (18).



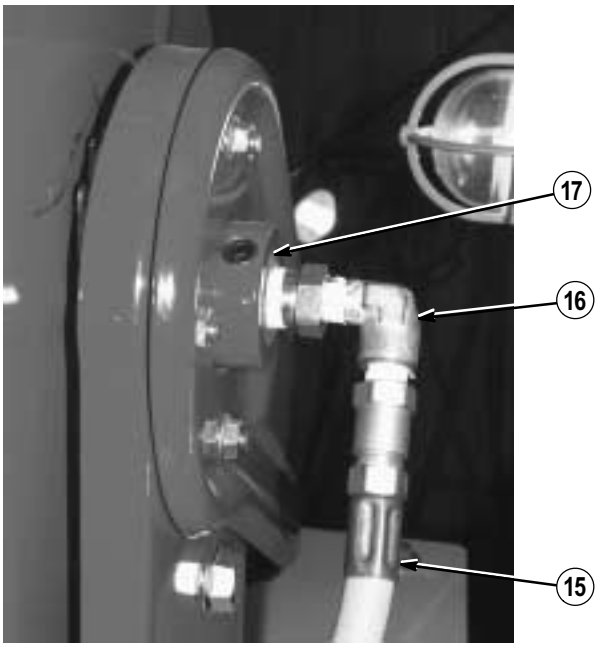


WARNING

Adhesives, solvents, and sealing compounds can burn easily, can give off harmful vapors, and are harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in well-ventilated area. If adhesive, solvent, or sealing compound gets on skin or clothing, wash immediately with soap and water.

(2) Coat threads with sealant and install elbow fitting (16) in hose reel inlet port (17).

(3) Coat threads with sealant and install hose (15) on elbow fitting (16).



9-2. ARGON HOSE REEL AND BRACKET REPLACEMENT (CONT).

(4) Coat threads of adapter (13) and elbow (12) and install in swivel assembly (14).

WARNING

Hose reel assembly is under tension. Avoid releasing latching mechanism during removal and installation. Failure to comply could result in injury to personnel.

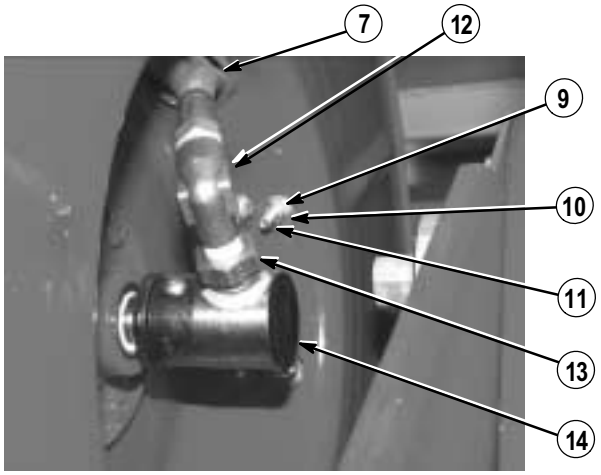
NOTE

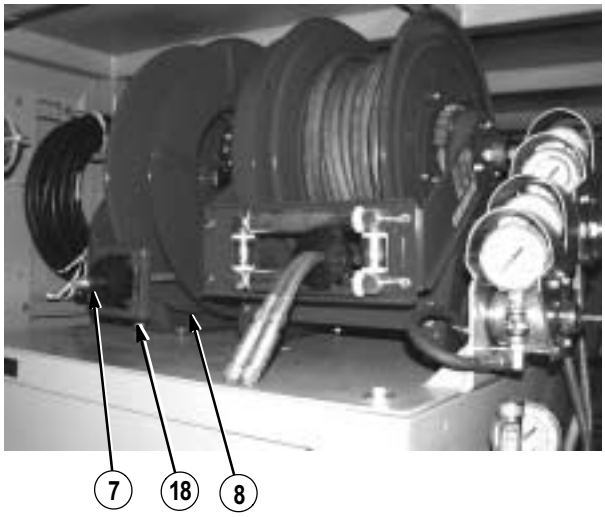
Prior to output hose installation, it is necessary to preload the hose reel assembly. Perform Step (5) to preload the hose reel assembly.

(5) Manually turn the hose reel (8) until spring is tight, back off three turns, and then latch.

(6) Apply sealant to threads and route hose (7) through guide arm bracket (18) and hose reel slot and install on elbow fitting (12).

(7) Install two clamps (11), four washers (10), and locknuts (9) on hose reel assembly (8).





(8) Ensure valve (4) on argon tank is closed and attach MIG welder (TM 9-4940-568-10).

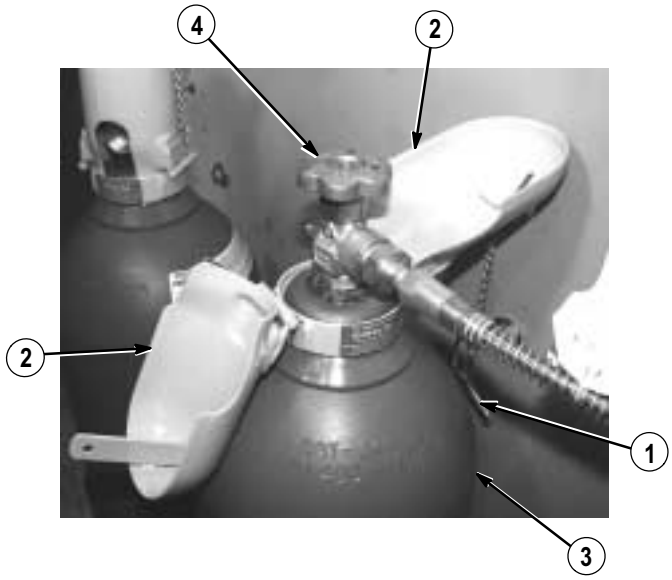
(9) Open valve (4) on argon tank (3) and turn handle (5) on argon regulator (6) to charge hoses and hose reel assembly. Using soap solution, check for leaks.

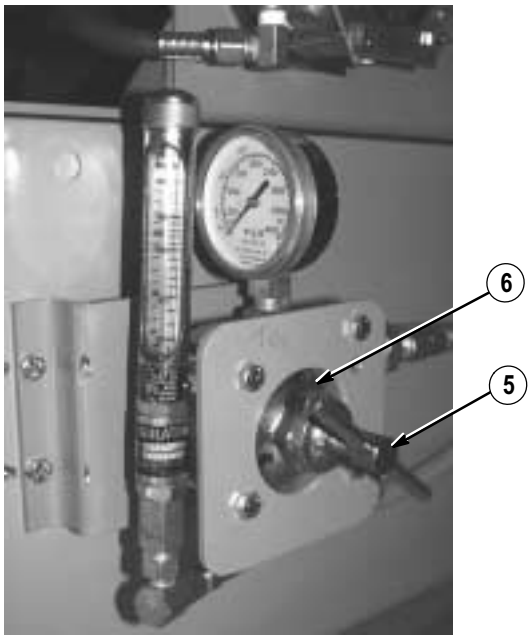
(10) Turn handle (5) on argon regulator (6) to close.

(11) Close valve (4) on argon tank (3).

(12) Close safety cap (2) on argon tank (3) and install pin (1).

(13) Disconnect MIG welder (TM 9-4940-568-10).





END OF TASK

9-3. DUAL OXY/PROPYL HOSE REEL AND BRACKET REPLACEMENT.

This task covers:

a. Removal
b. Disassembly
c. Cleaning/Inspection
d. Assembly
e. Installation

INITIAL SETUP

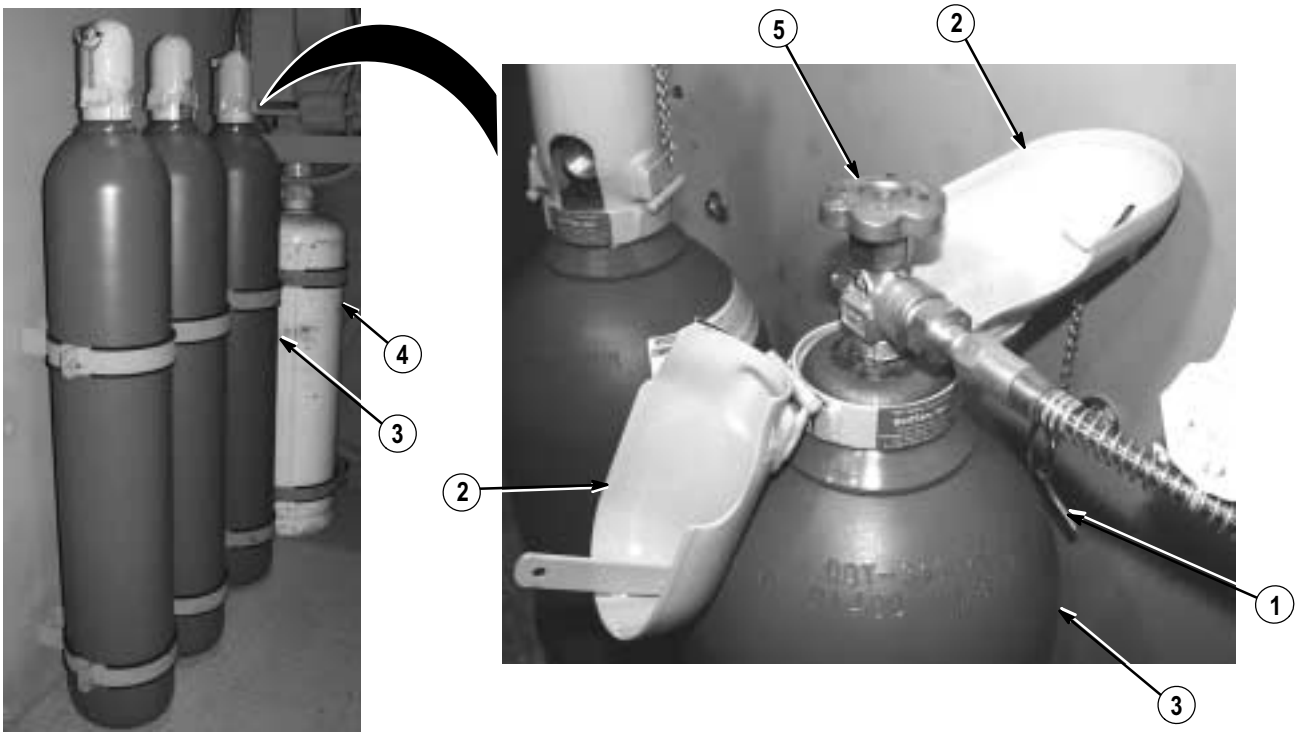
Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 30, Appendix G)

Materials/Parts
Cable Ties (Item 10, Appendix C)
Cloth, Cleaning (Item 13, Appendix C)
Grease, Automotive and Artillery (GAA) (Item 20, Appendix C)
Oil, Lubricating (Item 26, Appendix C)
Sealing Compound (Item 32, Appendix C)

Materials/Parts - Continued
Soap Solution (Item 37, Appendix C)
Solvent, Drycleaning (Item 38, Appendix C)
Tags, Identification (Item 40, Appendix C)
Locknut (4) (Item 35, Appendix F)
Locknut (4) (Item 41, Appendix F)
Snap Ring (4) (Item 96, Appendix F)

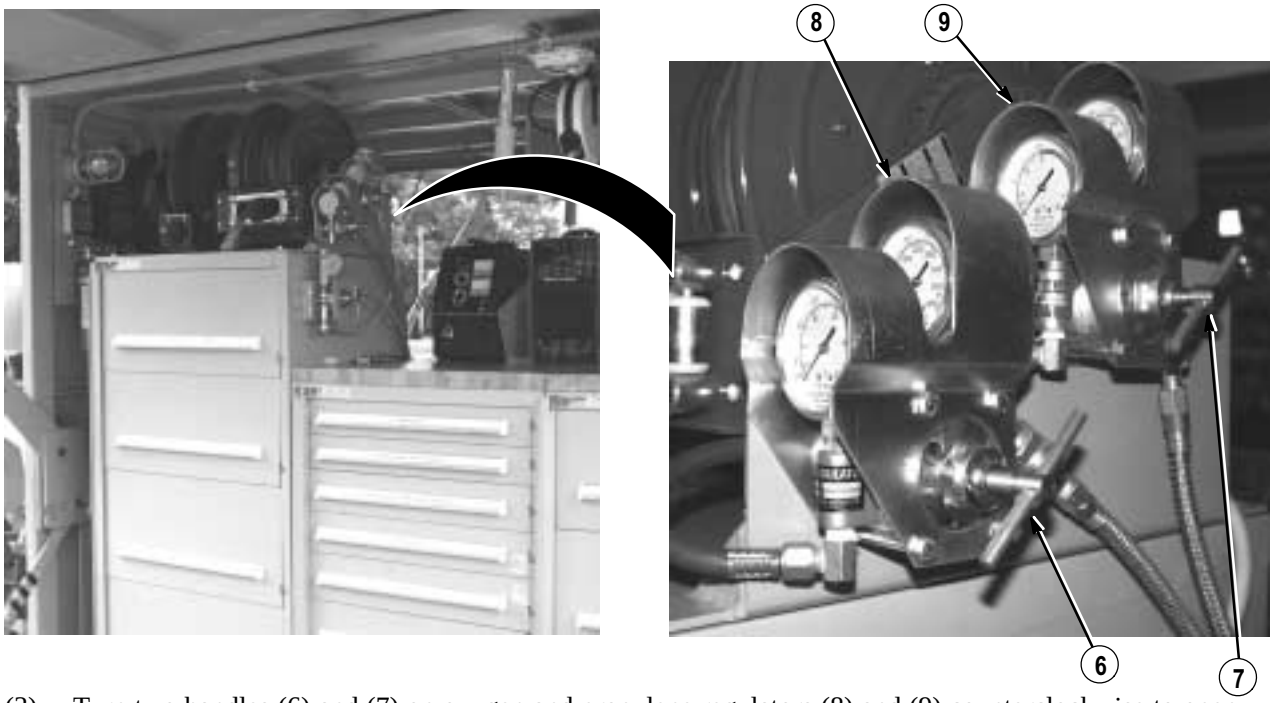
Equipment Condition
FRS unloaded, (TM 9-4940-568-10)

a. Removal.



(1) Remove pin (1) and open safety cap (2) on oxygen tank (3) or propylene tank (4).

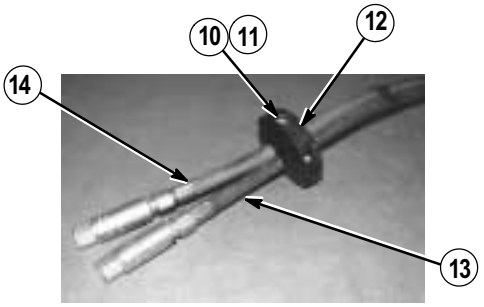
(2) Close valve (5) on oxygen tank (3) or propylene tank (4).



(3) Turn two handles (6) and (7) on oxygen and propylene regulators (8) and (9) counterclockwise to open valves and bleed excess oxygen and propylene from system. Turn handles clockwise to close.

WARNING

Hose reel assembly is under pressure. Avoid releasing latching mechanism during removal and installation. Failure to comply could result in injury to personnel.



(4) Remove two screws (10), nuts (11) and hose bumper assembly (12) from hoses (13) and (14).

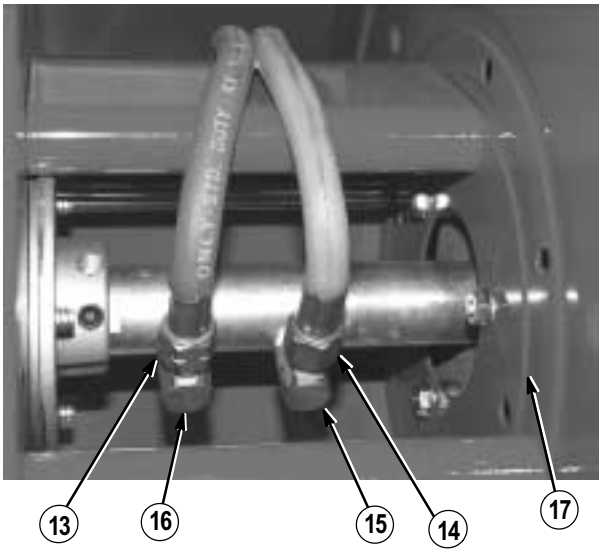
(5) Layout entire length of hoses (13) and (14) until hose fittings (15) and (16) are accessible.

NOTE

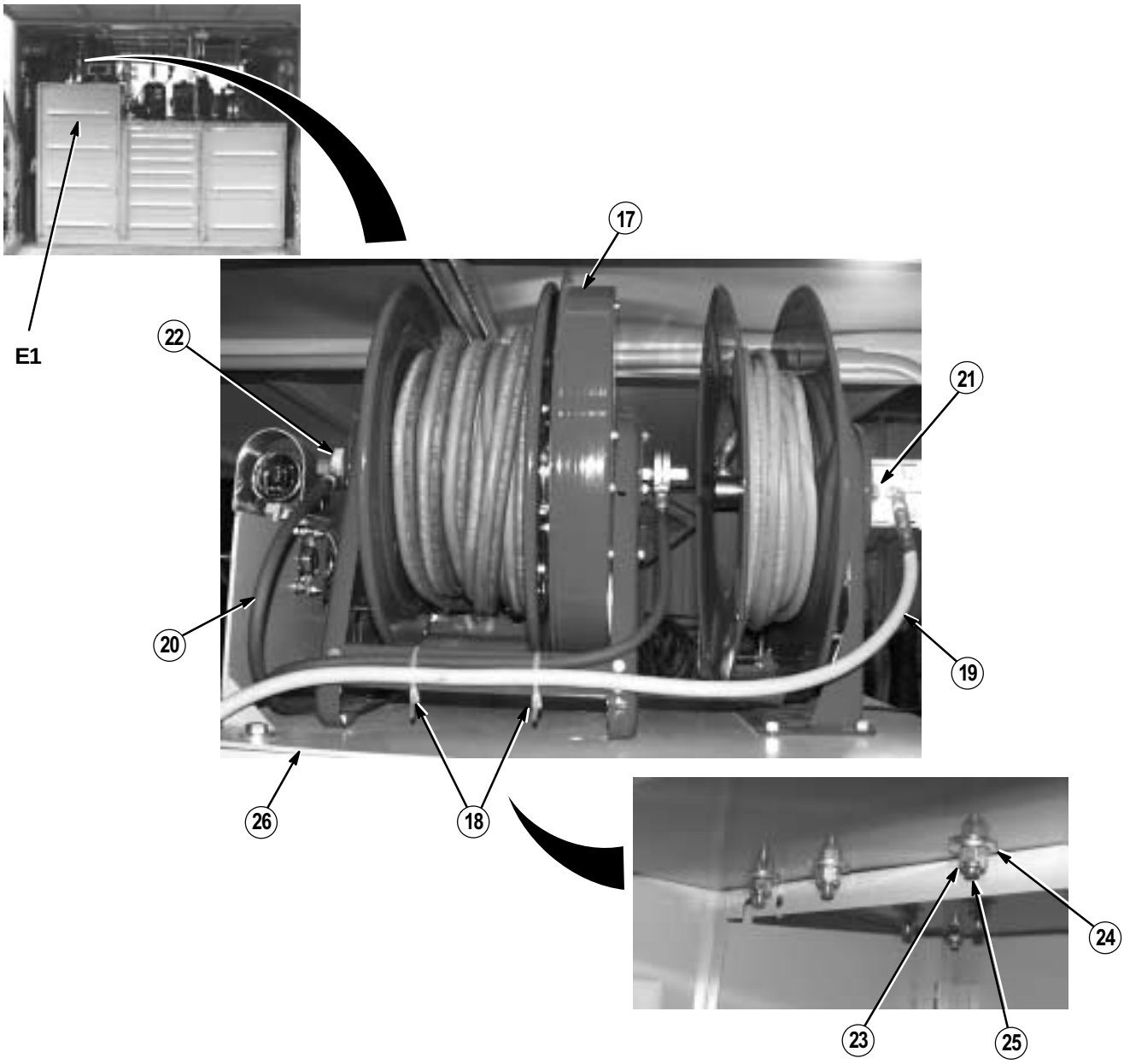
Note location of hoses prior to removal.

(6) Remove two hoses (13) and (14) from two hose fittings (15) and (16) from hose reel assembly (17).

(7) Slowly unwind hose reel assembly (17) to remove spring tension.



9-3. DUAL OXY/PROPYL HOSE REEL AND BRACKET REPLACEMENT (CONT).



NOTE

Note location of cable ties prior to removal.

(8) Cut and remove two cable ties (18) from two hoses (19) and (20).

(9) Remove two hoses (19) and (20) from swivel assemblies (21) and (22).

(10) Remove tool drawer E–1 on right side of shelter to gain access to hose reel mounting hardware (TM 9-4940-568-10).

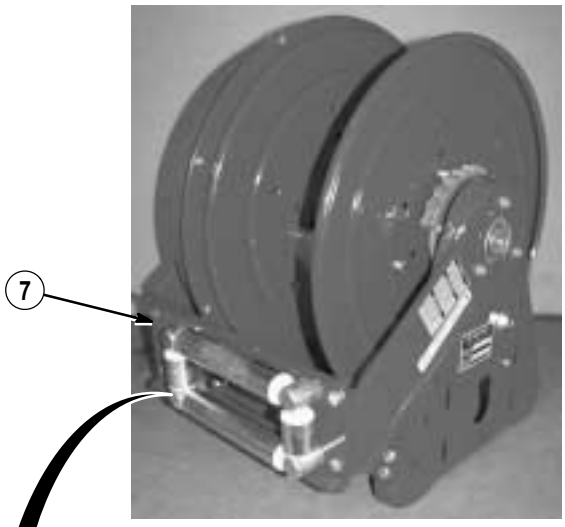
NOTE

Note location of hose reel assembly prior to removal.

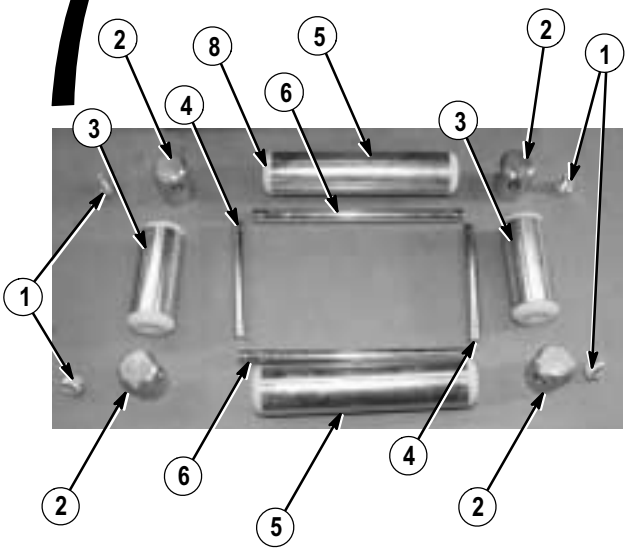
(11) Remove four locknuts (23), washers (24), screws (25) and hose reel assembly (17) from top of tool cabinet (26). Discard locknuts.

b. Disassembly.

(1) Remove four screws (1), roller posts (2), two roller tube-short (3), roller pin-short (4), roller tube-long (5), and roller pin-long (6) from roller plate (7).

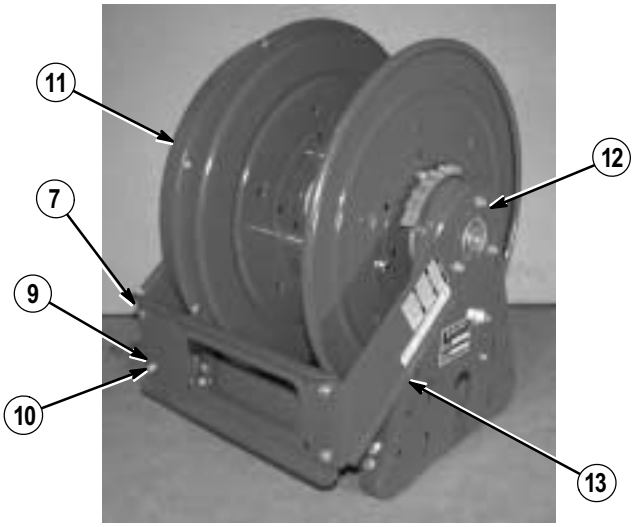


(2) Remove eight roller bushings (8) from two roller tube-short (3) and roller tube-long (5).

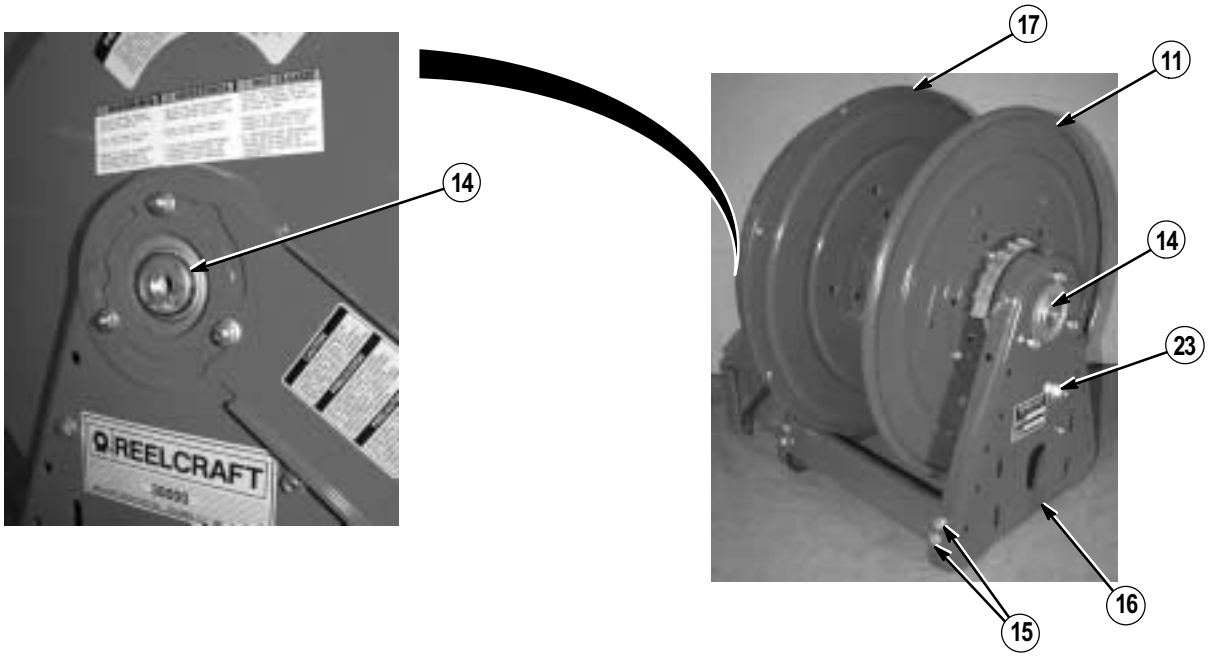


(3) Remove four screws (9), locknuts (10), and roller plate (7) from hose reel assembly (11). Discard locknuts.

(4) Loosen three screws (12) and remove right guide arm (13) from hose reel assembly (11).



9-3. DUAL OXY/PROPYL HOSE REEL AND BRACKET REPLACEMENT (CONT).



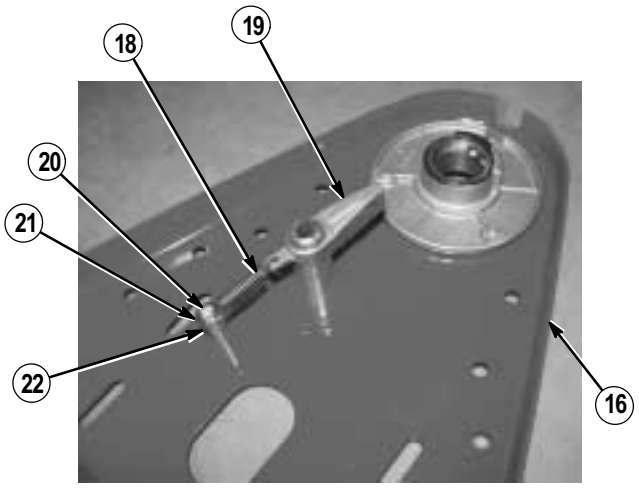
WARNING

Use care when removing or installing retaining rings. Retaining rings are under spring tension and can act as projectiles when released and could cause eye injury.

(5) Remove and discard two snap rings (14) from hose reel assembly (11).

(6) Support hose reel assembly (11), then remove four screws (15) and right side frame (16) from hose reel assembly (11).

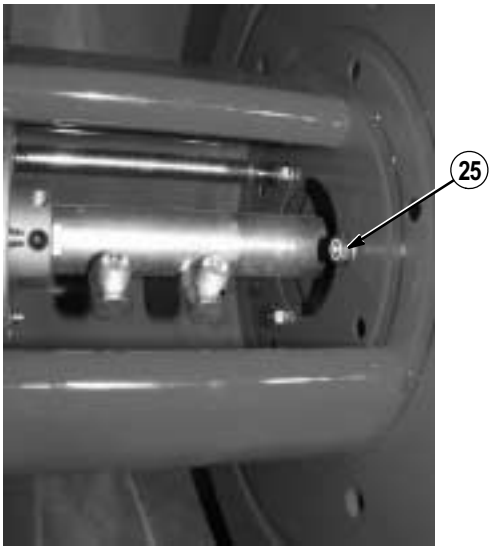
(7) Remove hose reel assembly (11) from spring and case assembly (17).

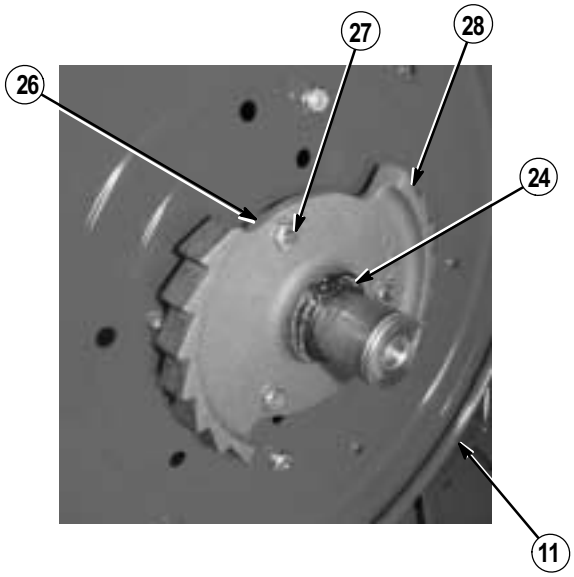


(8) Remove latch spring (18) from latch pawl (19).

(9) Remove screw (20), washer (21) and latch spring (18) from spacer (22).

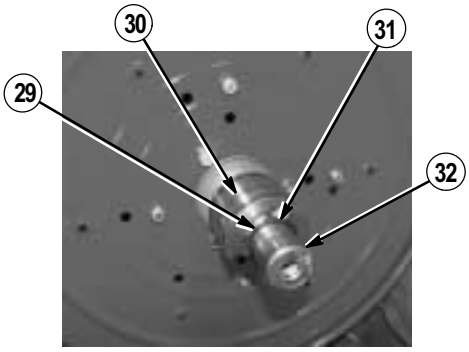
(10) Remove nut (23) and latch pawl (19) from right side frame (16).





WARNING

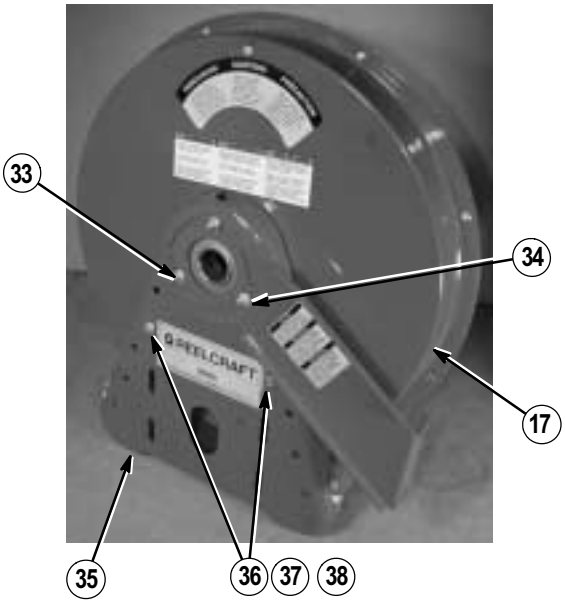
Use care when removing or installing retaining rings. Retaining rings are under spring tension and can act as projectiles when released and could cause eye injury.



(11) Remove snap ring (24) from hose reel assembly (11). Discard snap ring.

(12) Remove three nuts (25), spacers (26), screws (27) and latch ratchet (28) from hose reel assembly (11).

(13) Remove snap ring (29), spring arbor (30), and spring arbor key (31) from center shaft (32). Discard snap ring.



(14) Remove three nuts (33) and left guide arm (34) from left side frame (35).

(15) Remove two nuts (36), spacers (37), three spacers (38) and spring case assembly (17) from left side frame (35).

9-3. DUAL OXY/PROPYL HOSE REEL AND BRACKET REPLACEMENT (CONT).

c. Cleaning/Inspection.

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.

(1) Cleaning all parts with dry cleaning solvent (Item 38, Appendix C) and clean lint-free cloth (Item 13, Appendix C) and air dry.

(2) Inspect all parts for damage that would impair operation.

(3) Inspect rollers, latch pawl and latch rachet for roughness or gouging.

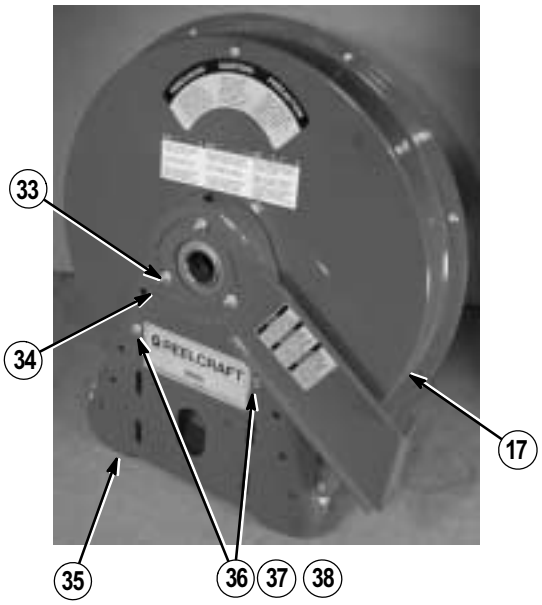
(4) Inspect spring and case assembly for cracks and freedom of movement.

(5) Discard all damaged parts.

d. Assembly.

(1) Install spring case assembly (17) on left side frame (35) and secure with three spacers (38), two spacers (37) and nuts (36).

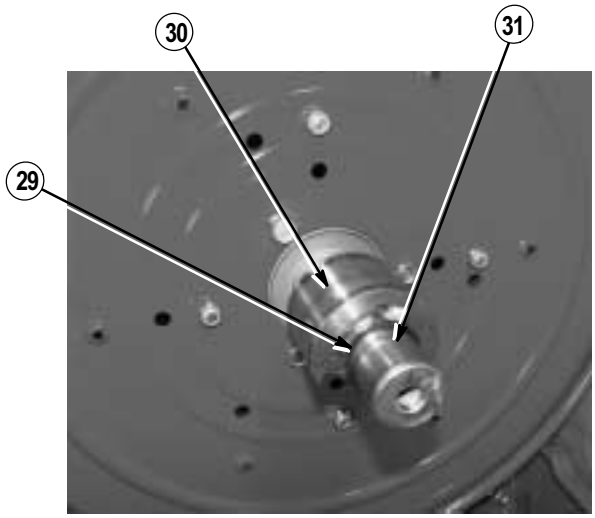
(2) Install left guide arm (34) on left side frame (35) and secure with three nuts (33).



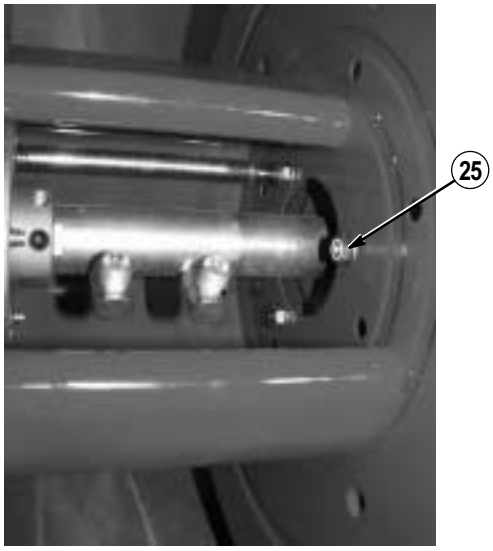
NOTE

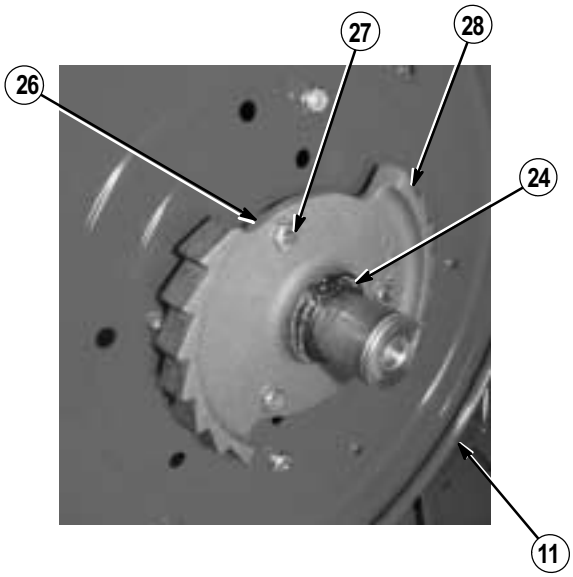
Prior to assembly, coat center shaft and spring arbor with grease.

(3) Install spring arbor key (31), spring arbor (30) and snap ring (29) onto center shaft (32).



9-3. DUAL OXY/PROPYL HOSE REEL AND BRACKET REPLACEMENT (CONT).





(4) Install latch ratchet (28) on hose reel assembly (11) with three screws (27), spacers (26) and nuts (25).

WARNING

Use care when removing or installing retaining rings. Retaining rings are under spring tension and can act as projectiles when released and could cause eye injury.

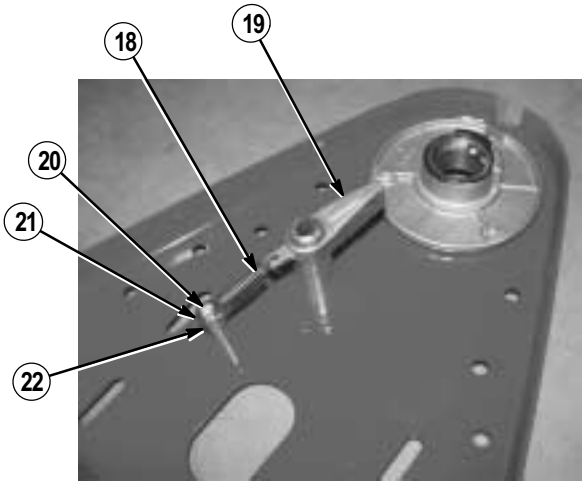
(5) Install snap ring (24) on hose reel assembly (11).

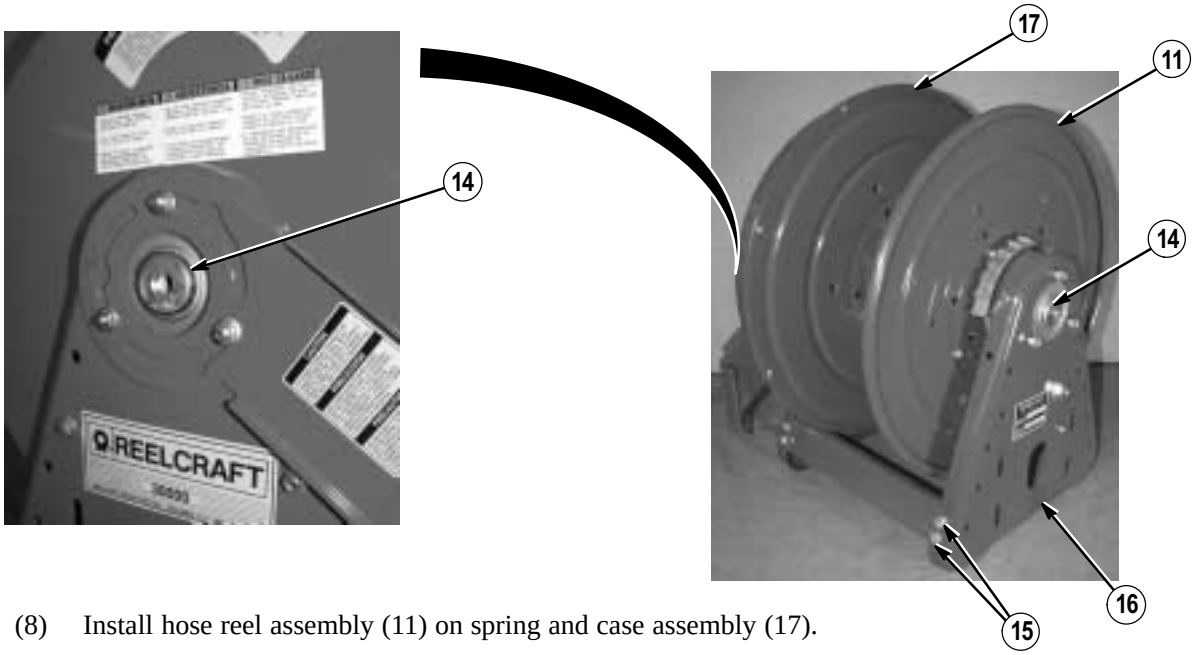
NOTE

Prior to assembly, coat latch pawl with grease.

(6) Install latch pawl (19) on right side frame (16) with nut (23).

(7) Install spacer (22), washer (21), screw (20) and spring (18) on latch pawl (19).





(8) Install hose reel assembly (11) on spring and case assembly (17).

(9) Install right side frame (16) onto hose reel assembly (11) with four screws (15).

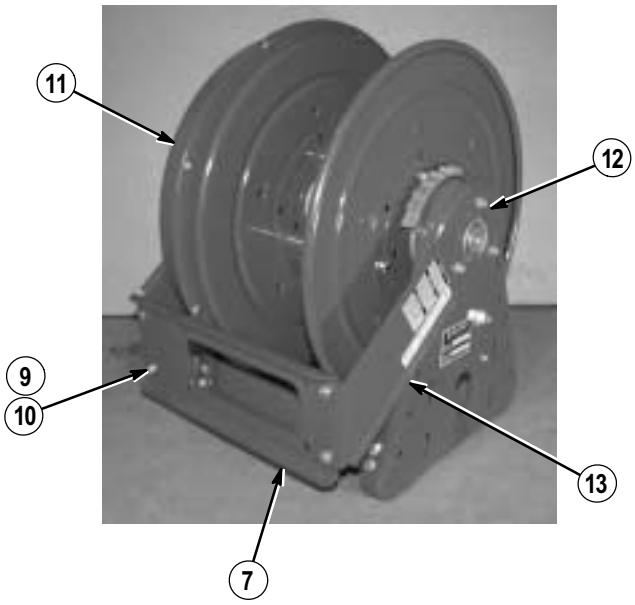
WARNING

Use care when removing or installing retaining rings. Retaining rings are under spring tension and can act as projectiles when released and could cause eye injury.

(10) Install two snap rings (14) on hose reel assembly (11).

(11) Install right guide arm (13) on right side frame (16), and secure with three screws (12).

(12) Install roller plate (7) on hose reel assembly (11), and secure with four locknuts (10) and screws (9).



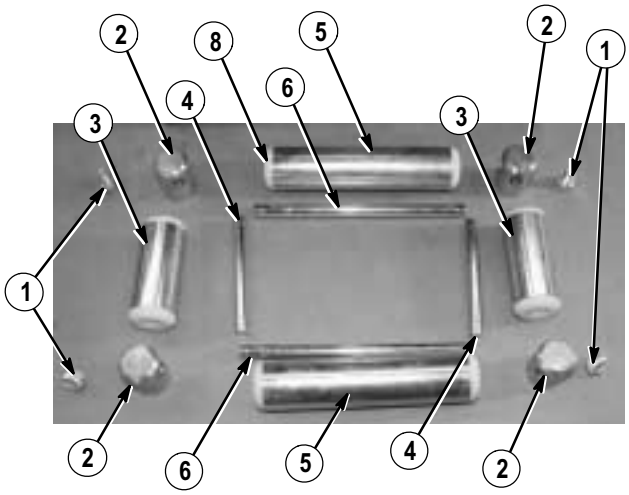
9-3. DUAL OXY/PROPYL HOSE REEL AND BRACKET REPLACEMENT (CONT).

(13) Install eight roller bushings (8) on two roller tube-longs (5) and roller tube-shorts (3).

NOTE

Oil roller pin-shorts and roller pin -longs.

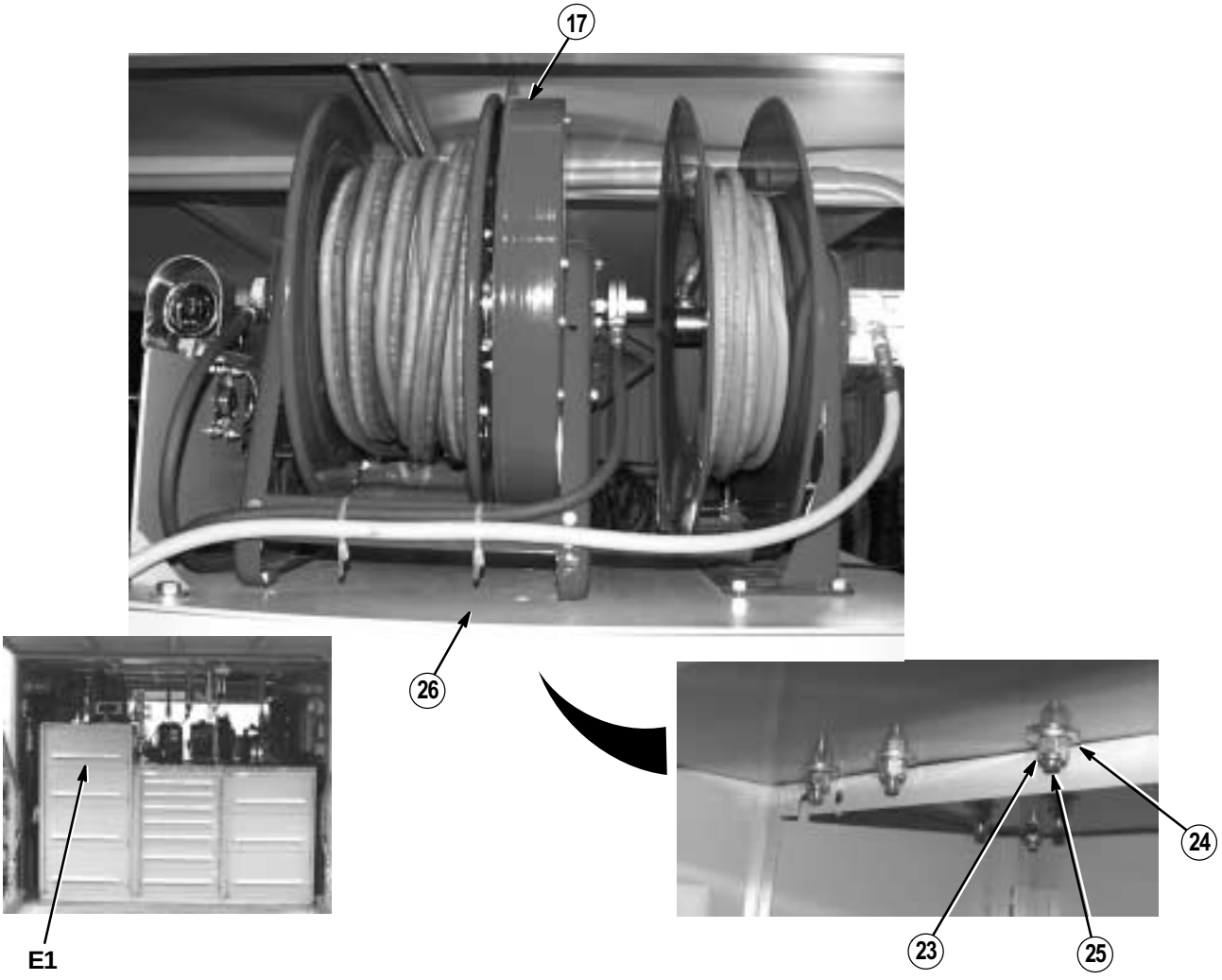
(14) Install two roller pin-long (6), roller tube-long (5), roller pin-short (4), roller tube-short (3), roller posts (2) with four screws (1).

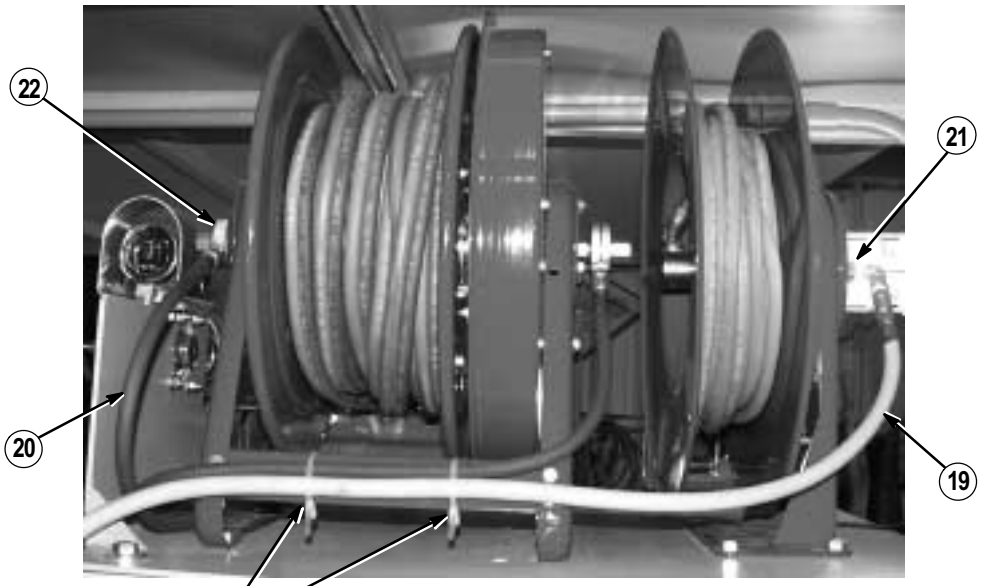


e. Installation.

(1) Install hose reel assembly (17) onto tool cabinet (26) with four screws (25), washers (24) and locknuts (23).

(2) Install tool drawer E1 on right side of shelter (TM 9-4940-568-10).





WARNING

Adhesives, solvents, and sealing compounds can burn easily, can give off harmful vapors, and are harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in well-ventilated area. If adhesive, solvent, or sealing compound gets on skin or clothing, wash immediately with soap and water.

(3) Apply sealing compound to threads of two hoses (19) and (20).

(4) Install two hoses (19) and (20) on swivel assemblies (21) and (22), as noted during removal.

NOTE

Install cable ties as noted prior to removal.

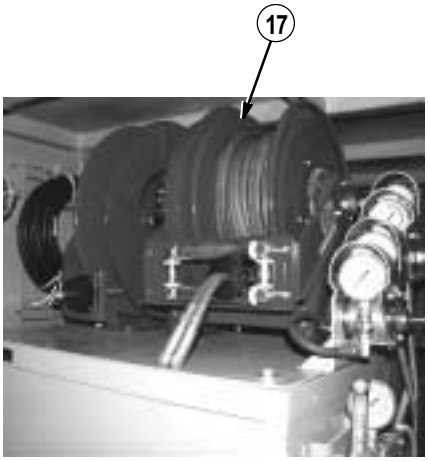
(5) Install two cable ties (18) on hoses (19) and (20).

WARNING

Hose reel assembly is under pressure. Avoid releasing latching mechanism during removal and installation. Failure to comply could result in injury to personnel.

NOTE

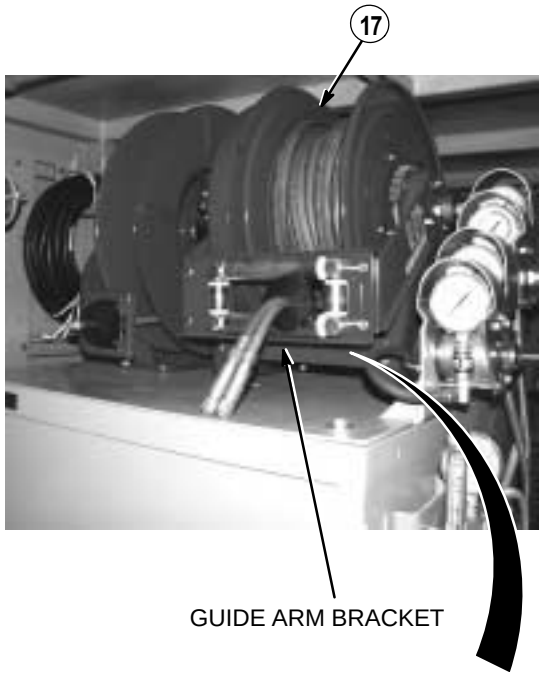
Prior to output hose installation, it is necessary to preload the hose reel assembly. Perform the following step to preload the hose reel assembly.



(6) Manually turn hose reel assembly (17) until spring is tight, back off three turns, and then latch.

9-3. DUAL OXY/PROPYL HOSE REEL AND BRACKET REPLACEMENT (CONT).

(7) Apply sealant to threads, route two hoses (13) and (14) through guide arm bracket and install on two fittings (15) and (16).



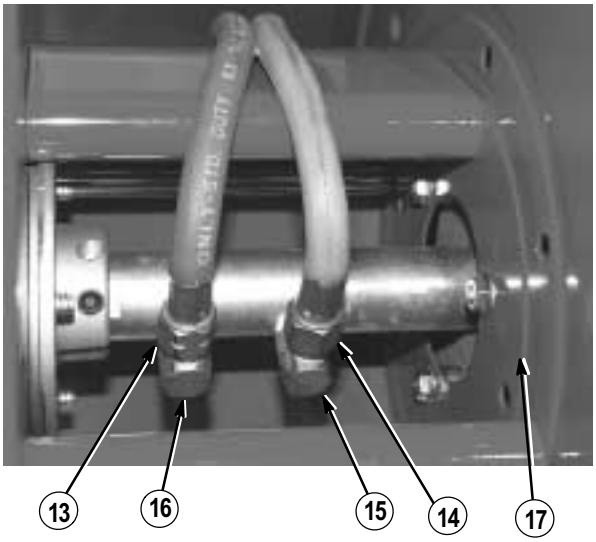
WARNING

Hose reel assembly is under pressure. Avoid releasing latching mechanism during removal and installation. Failure to comply could result in injury to personnel.

NOTE

Install hoses in location noted during removal.

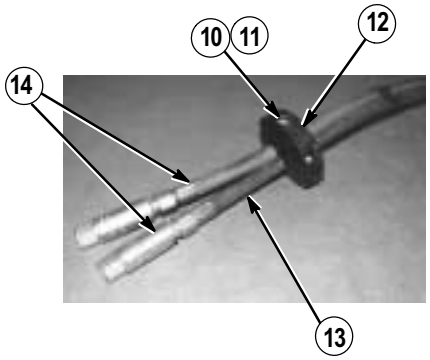
(8) Retract hose (13) on hose reel assembly (17).



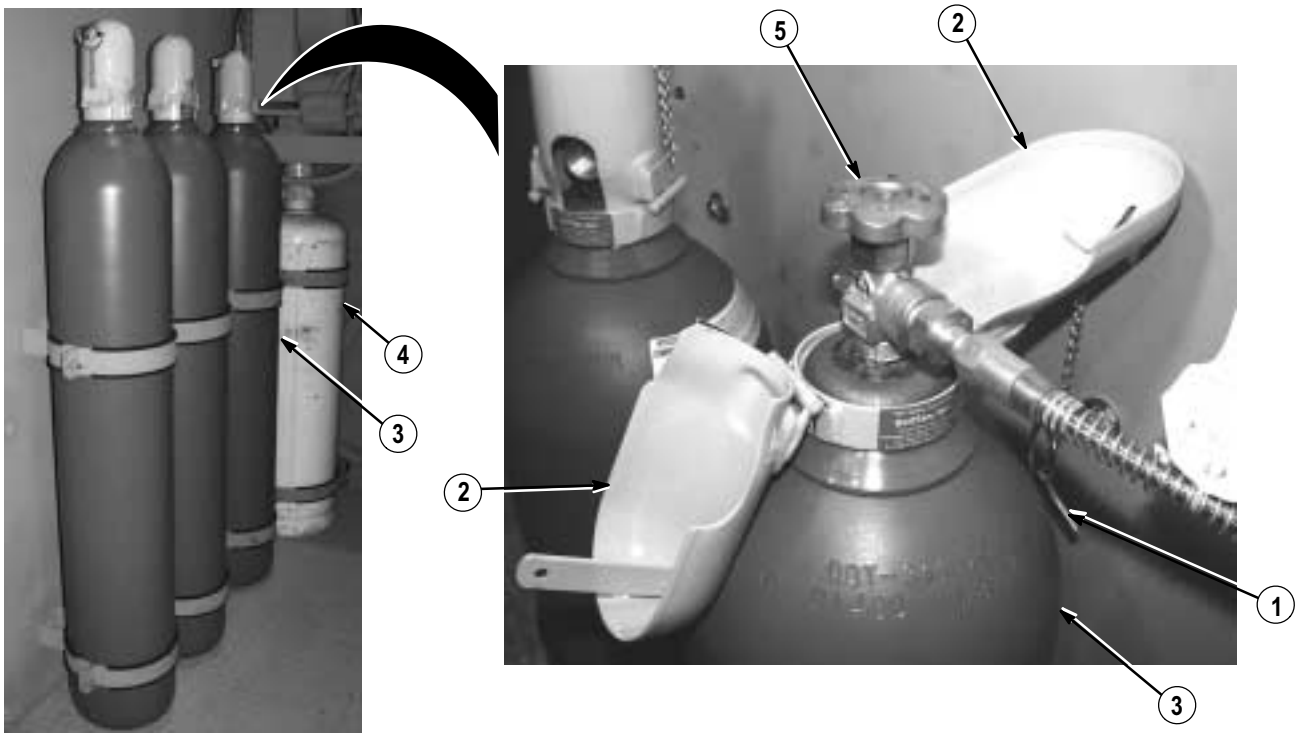
NOTE

Position hose bumper assembly as noted during removal.

(9) Install hose bumper assembly (12), two screws (10) and nuts (11) on hoses (13) and (14).



(10) Ensure cutting torch is off and install on hose (TM 9-4940-568-10).



(11) Open valve (5) on oxygen tank (3) or propylene tank (4).

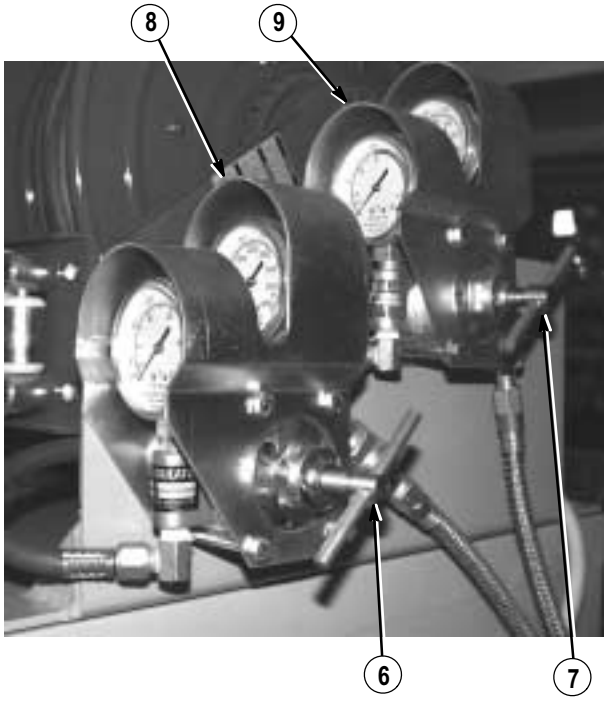
(12) Turn two handles (6) and (7) on oxygen and propylene regulators (8) and (9) counterclockwise to charge hoses and hose reel assembly. Using soap solution, check for leaks.

(13) Close valve (5) on oxygen tank (3) and propylene tank (4).

(14) Close safety cap (2) on oxygen tank (3) or propylene tank (4).

(15) Turn two handles (6) and (7) on oxygen and propylene regulators (8) and (9) clockwise to close.

(16) Disconnect cutting torch (TM 9-4940-568-10).



END OF TASK

9-4. ARGON REGULATOR REPLACEMENT.

This task covers:

a. Removal b. Installation c. Follow-On Maintenance

INITIAL SETUP

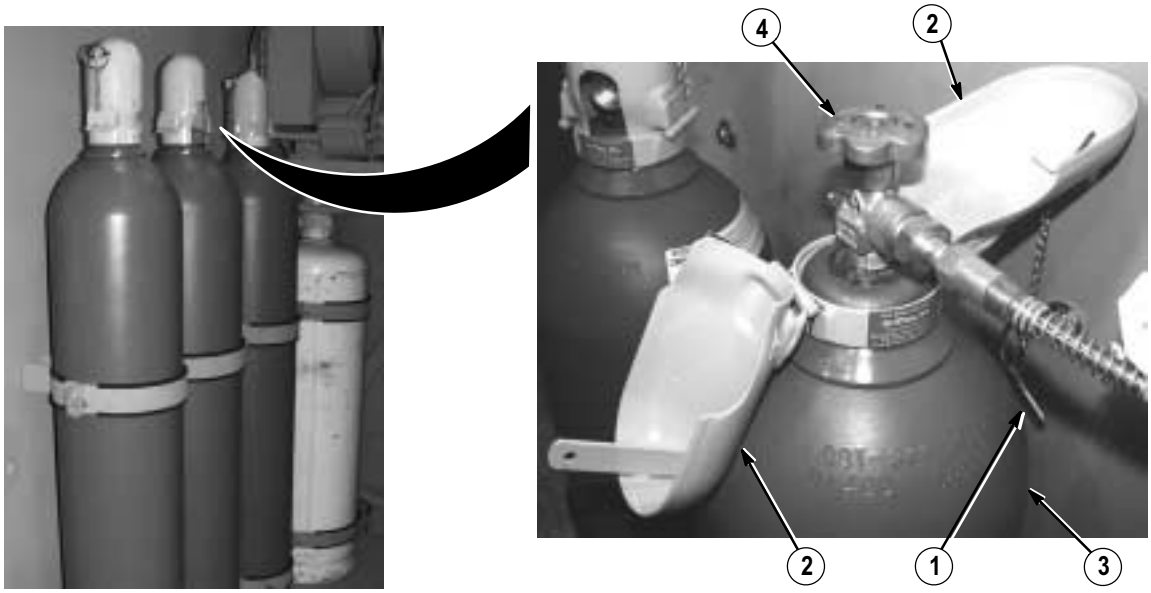
Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 30, Appendix G)
Wrench, Combination 1-1/8 in. (Item 35, Appendix G)

Materials/Parts
Sealing Compound, (Loctite 567) (Item 32, Appendix C)
Soap Solution (Item 37, Appendix C)

Materials/Parts – Continued
Tags, Identification (Item 40, Appendix C)
Locknut (8) (Item 30, Appendix F)

Equipment Condition
FRS unloaded, (TM 9-4940-568-10)
Master disconnect switch OFF, (TM 9-4940-568-10).

a. Removal.



WARNING

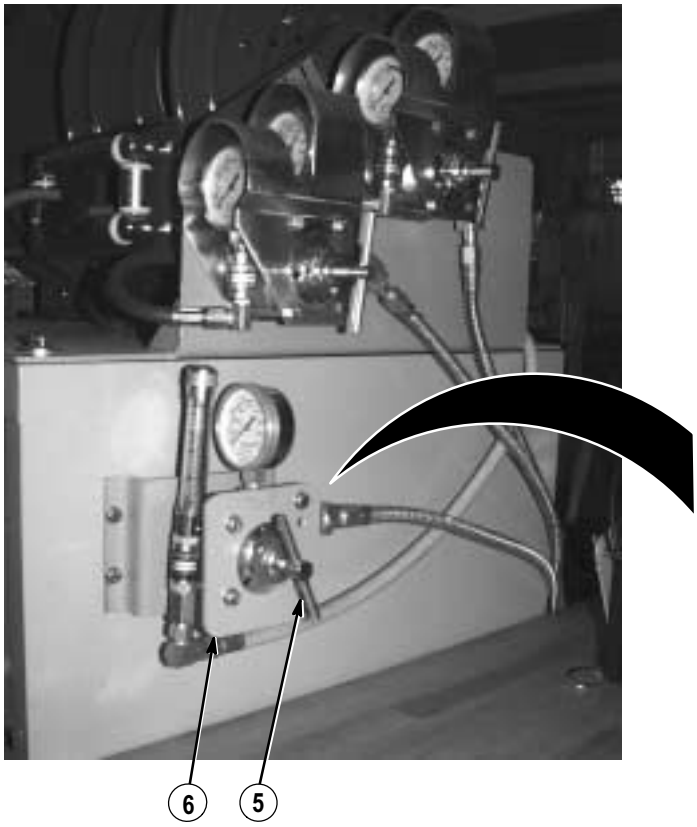
Argon tank valve must be shut off prior to removing regulator. Failure to comply may result in injury or death to personnel.

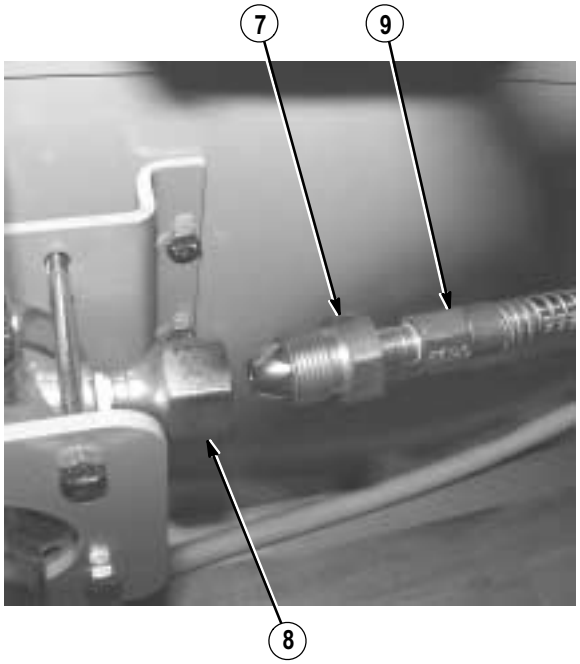
NOTE

Note location and position of hoses, fittings, elbows, and adapters prior to removal.

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

(2) Shut off valve (4) on argon tank (3).





(3) Open valve (5) on argon regulator (6).

(4) Remove adapter (7) from fitting (8).

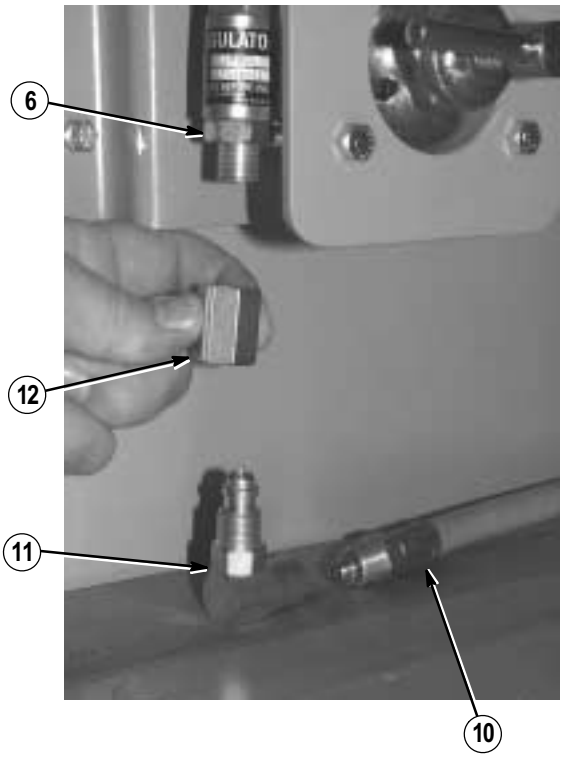
(5) Remove adapter (7) from hose (9).

(6) Remove fitting (8) from argon regulator (6).

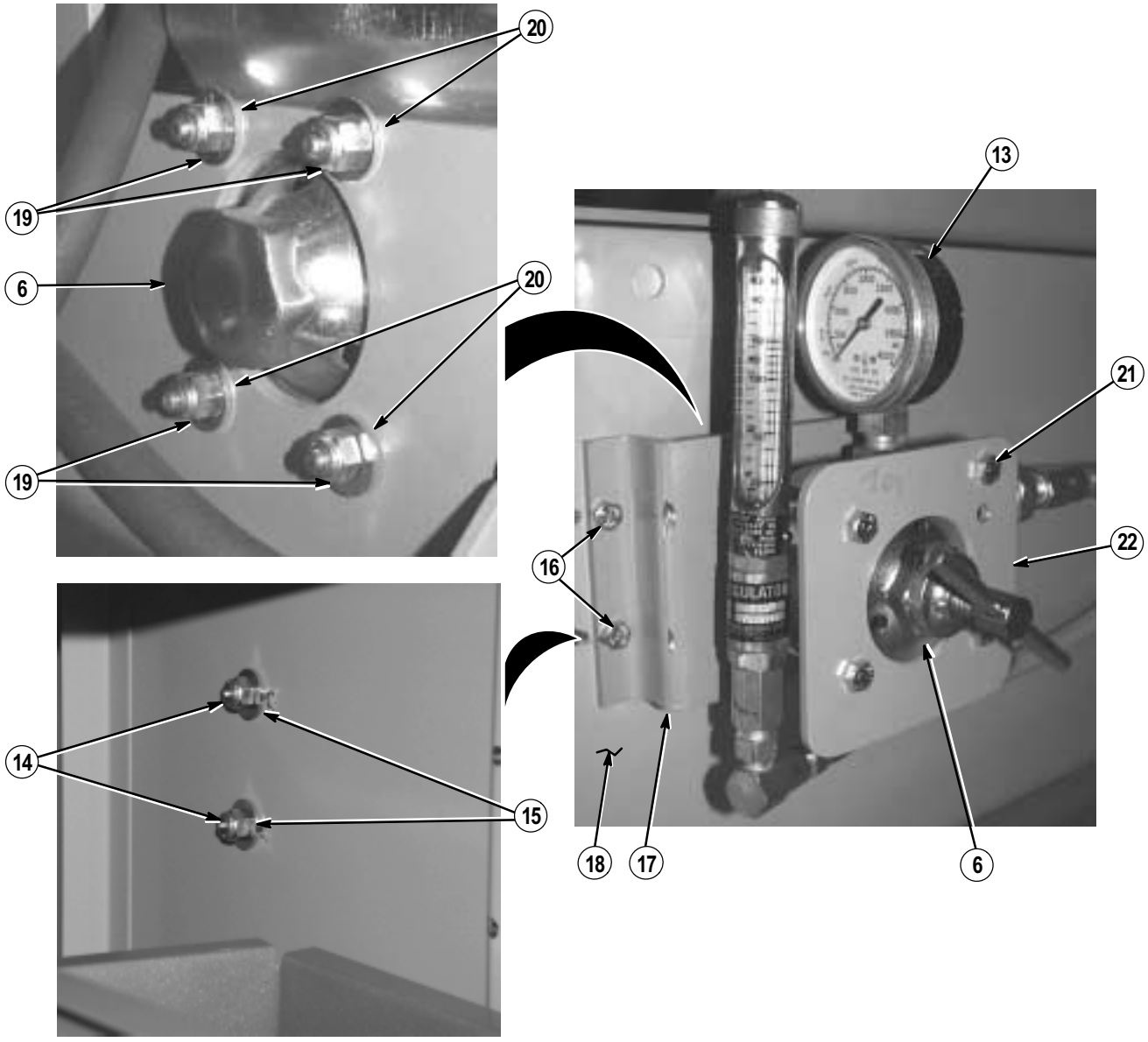
(7) Remove hose (10) from elbow (11).

(8) Remove elbow (11) from sleeve (12).

(9) Remove sleeve (12) from argon regulator (6).



9-4. ARGON REGULATOR REPLACEMENT (CONT).

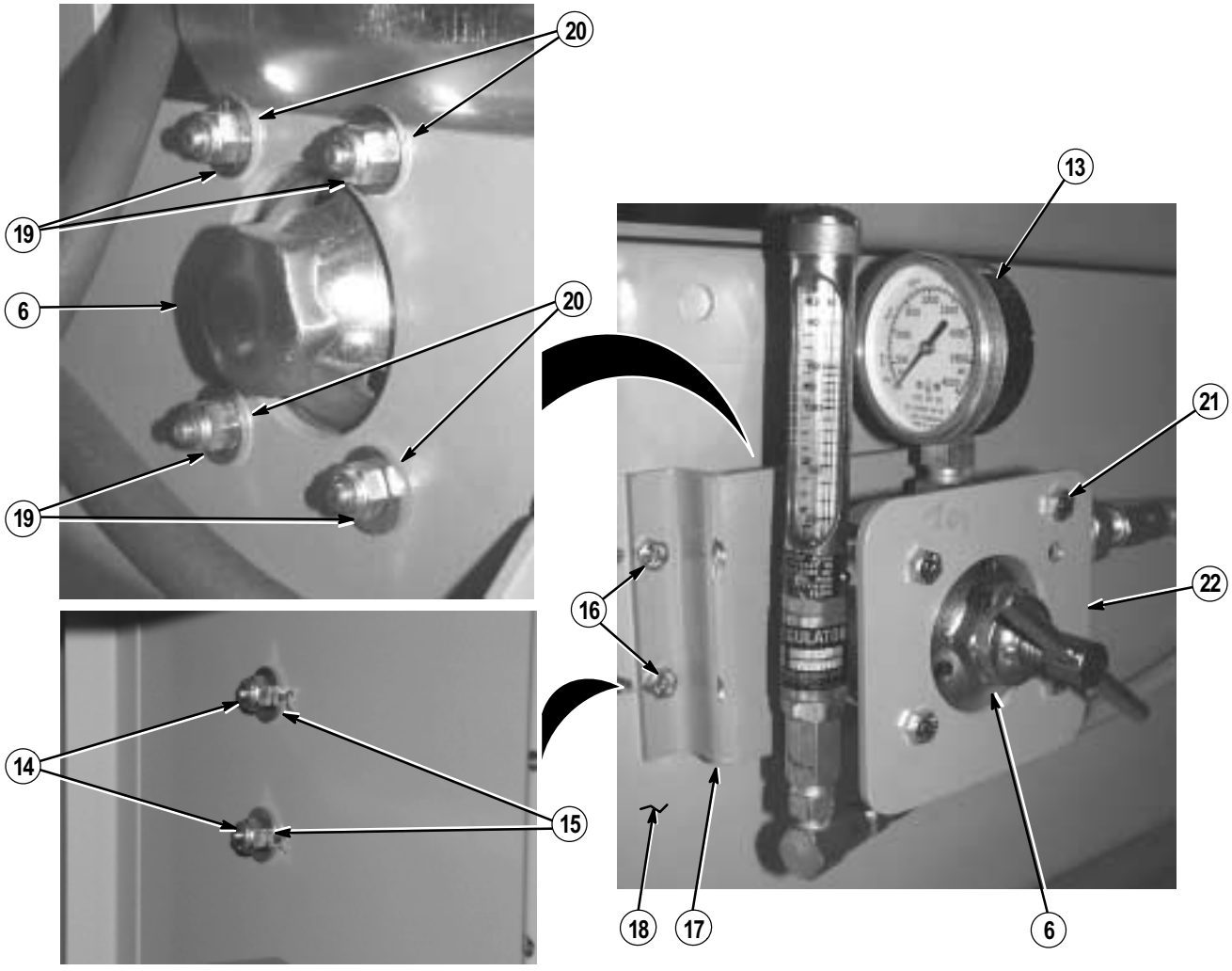


(10) Remove pressure gage (13) from argon regulator (6).

(11) Open drawer E1 and remove four locknuts (14) , washers (15), screws (16) and bracket (17) from cabinet (18). Discard locknuts.

(12) Remove four locknuts (19), washers (20), screws (21), plate (22) and argon regulator (6) from bracket (17). Discard locknuts.

b. Installation.



NOTE

Install hoses, fittings, elbows, and adapters as noted prior to removal.

(1) Install argon regulator (6) on bracket (17) with plate (22), four screws (21), washers (20) and locknuts (19).

(2) Open drawer E1 and install bracket (17) on cabinet (18) with four screws (16), washers (15) and locknuts (14).

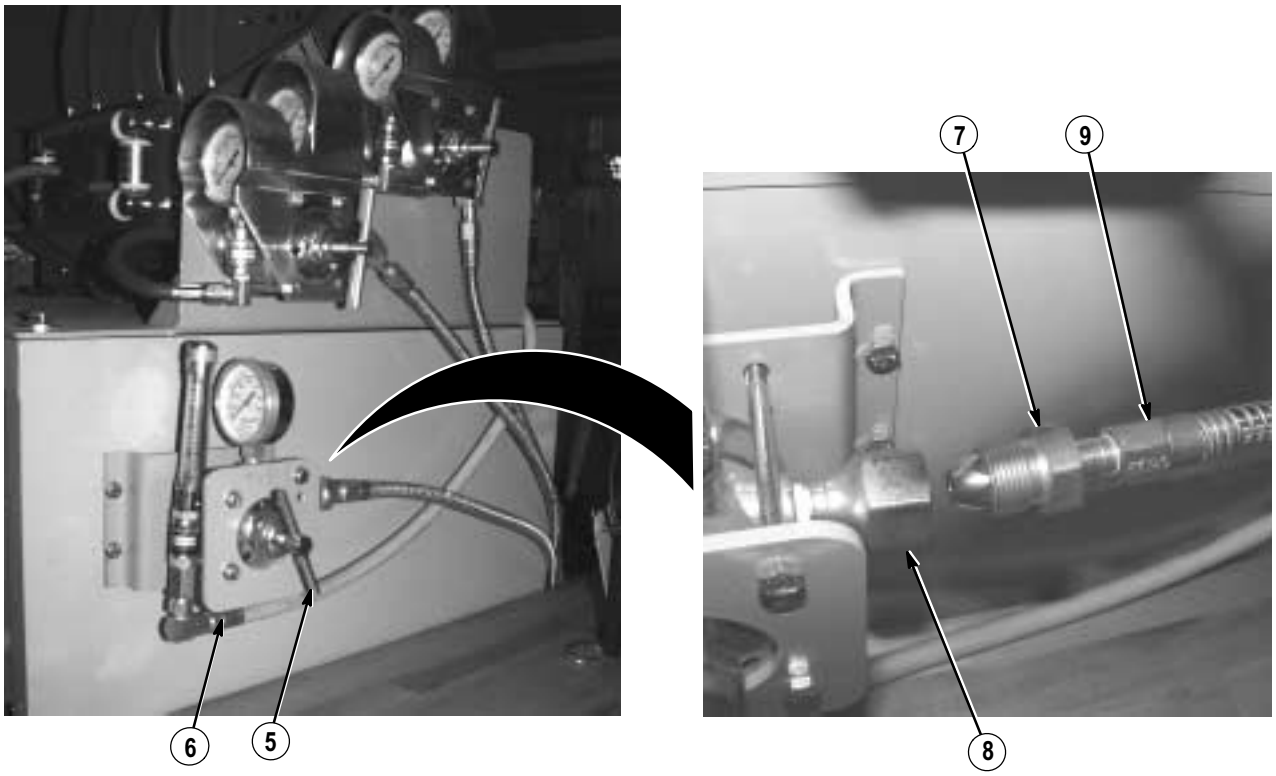
WARNING

- Adhesives, solvents and sealing compounds can burn easily, can give off harmful vapors, and are harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in a well-ventilated area. If adhesive, solvent, or sealing compound gets on skin or clothing, wash immediately with soap and water.
- Only apply sealing compound on threads specified in Steps. Failure to comply may result in injury or death to personnel and damage to equipment.

(3) Apply sealing compound to threads of pressure gage (13).

(4) Install pressure gage (13) on argon regulator (6).

9-4. ARGON REGULATOR REPLACEMENT (CONT).



(5) Install sleeve (12) on argon regulator (6).

(6) Install elbow (11) on sleeve (12).

(7) Install hose (10) on elbow (11).

WARNING

Adhesives, solvents, and sealing compounds can burn easily, can give off harmful vapors, and are harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in well-ventilated area. If adhesive, solvent, or sealing compound gets on skin or clothing, wash immediately with soap and water.

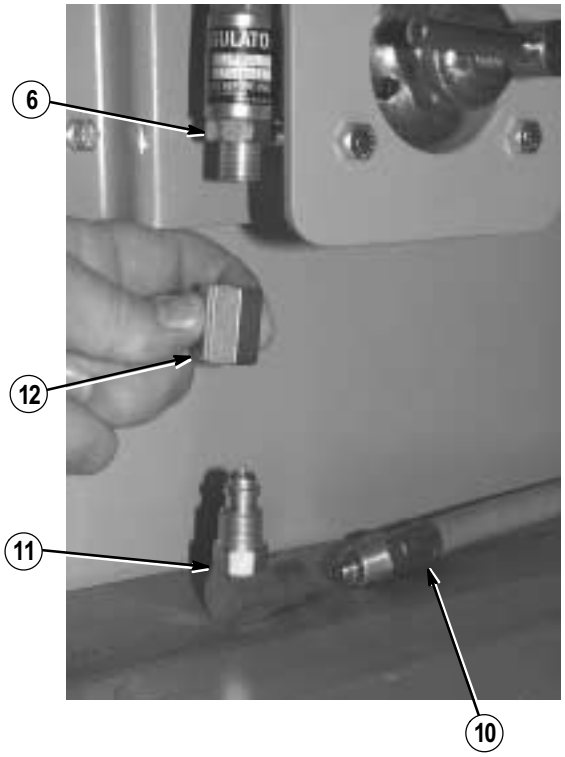
(8) Apply sealing compound to threads of fitting (8).

(9) Install fitting (8) on argon regulator (6).

(10) Apply sealing compound to hose end of adapter (7).

(11) Install adapter (7) on hose (9).

(12) Install adapter (7) on fitting (8).



(13) Ensure valve (4) and argon tank is closed and attach MIG welder (TM 9-4940-568-10).

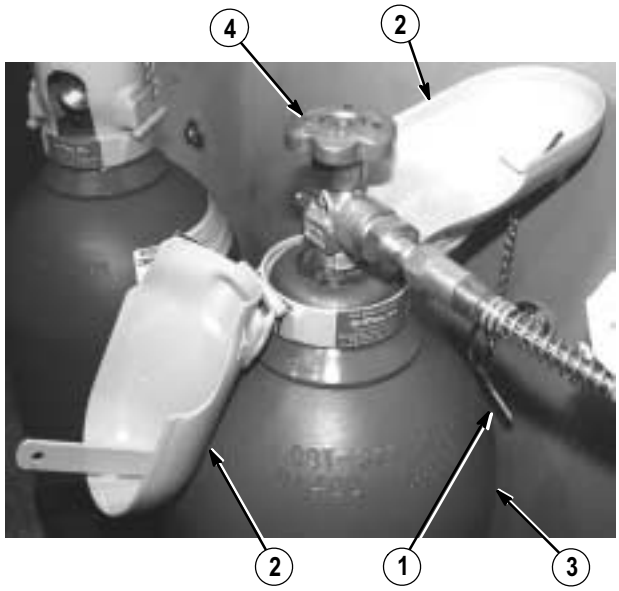
(14) Open valve (4) on argon tank (3) and valve (5) on argon regulator (6) to charge hoses (10) and hose reel assembly. Using soap solution, check for leaks.

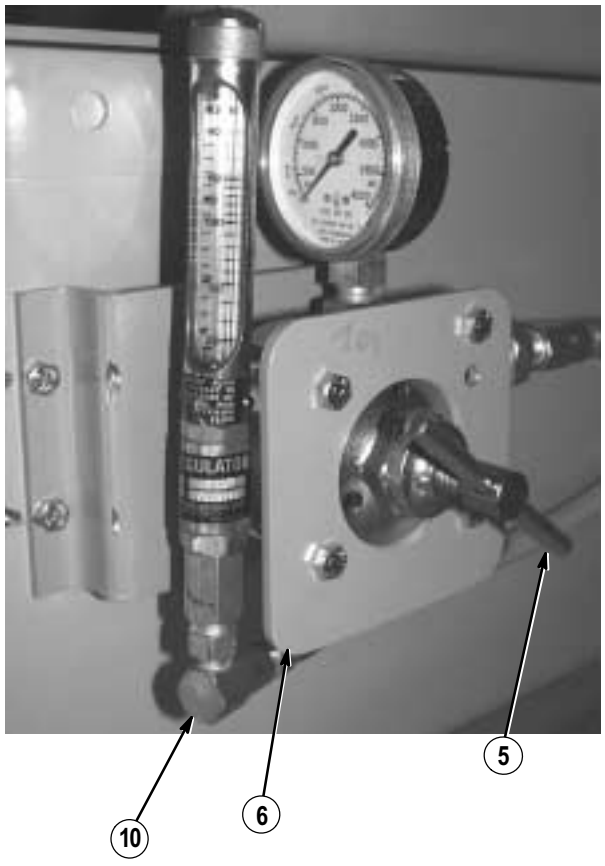
(15) Close valve (5) on argon regulator (6).

(16) Close valve (4) on argon tank (3).

(17) Close safety cap (2) on argon tank (3) and install pin (1).

(18) Disconnect MIG welder (TM 9-4940-568-10).





c. Follow-On Maintenance:

- Check operation of argon regulator, (TM 9-4940-568-10).

END OF TASK

9-5. OXYGEN AND PROPYLENE REGULATOR REPLACEMENT.

This task covers:

a. Removal b. Installation c. Follow-On Maintenance

INITIAL SETUP

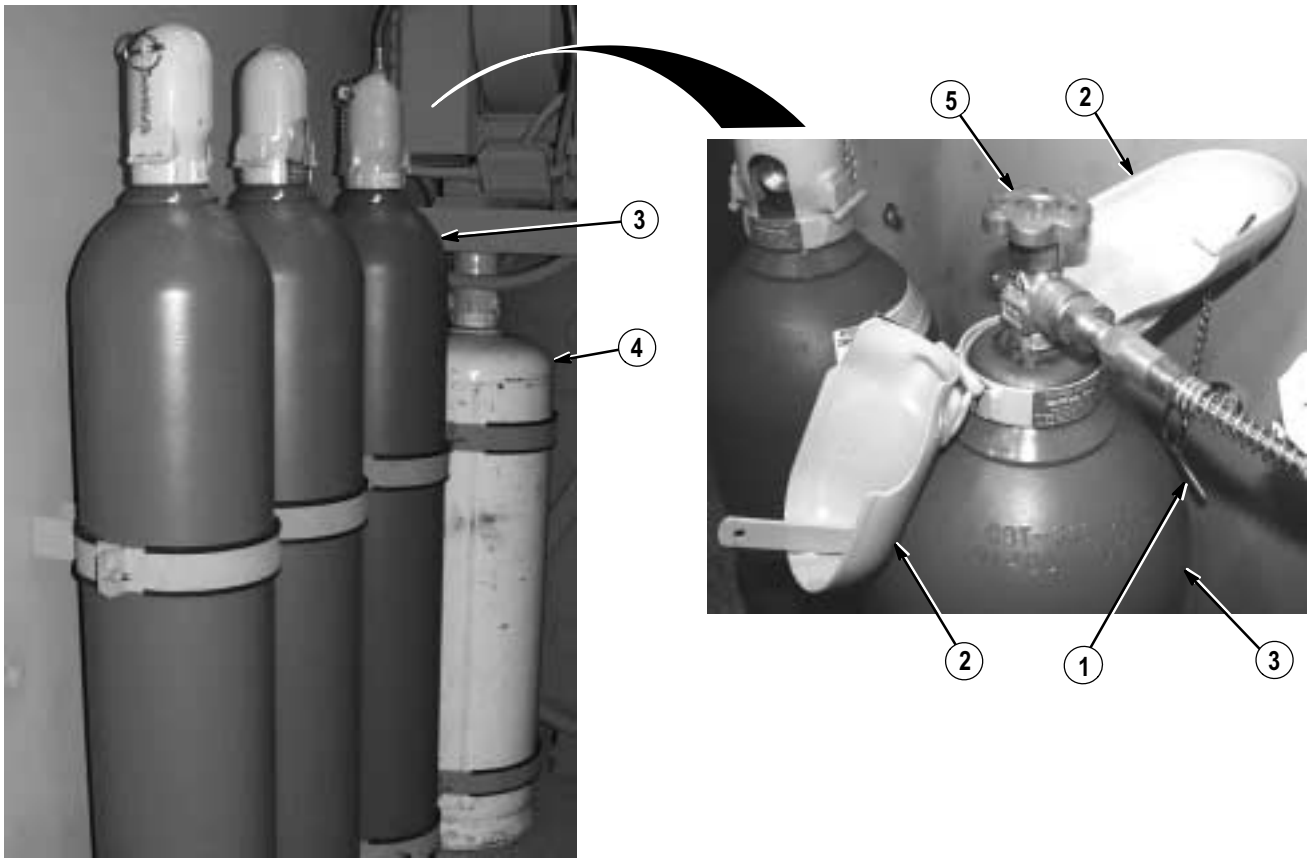
Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 30, Appendix G)
Wrench, Combination 1-1/8 in. (Item 35, Appendix G)

Materials/Parts
Sealing Compound, (Item 32, Appendix C)
Soap Solution (Item 37, Appendix C)
Tags, Identification (Item 40, Appendix C)

Materials/Parts - Continued
Locknut (8) (Item 23, Appendix F)

Equipment Condition
FRS unloaded, (TM 9-4940-568-10)
Master disconnect switch OFF, (TM 9-4940-568-10).

a. Removal.



WARNING

Oxygen and propylene valves must be shut off prior to removing regulators. Failure to comply may result in injury or death to personnel.

NOTE

- Both oxygen and propylene regulators are removed the same way. Oxygen regulator is shown.
- Oxygen connectors have right hand threads.
- Propylene connectors have left hand threads.
- Note position and location of hoses, adapters, reducers, and gages prior to removal.

(1) Remove pin (1) and open safety cap (2) on oxygen tank (3) or propylene tank (4).

(2) Close valve (5) on oxygen tank (3) or propylene tank (4).

9-5. OXYGEN AND PROPYLENE GAS REGULATOR REPLACEMENT (CONT).

(3) Open valve (6) on oxygen regulator (7).

(4) Remove adapter (8) from reducer (9).

(5) Remove adapter (8) from hose (10).

(6) Remove reducer (9) from elbow (11).

(7) Remove elbow (11) from oxygen regulator (7).

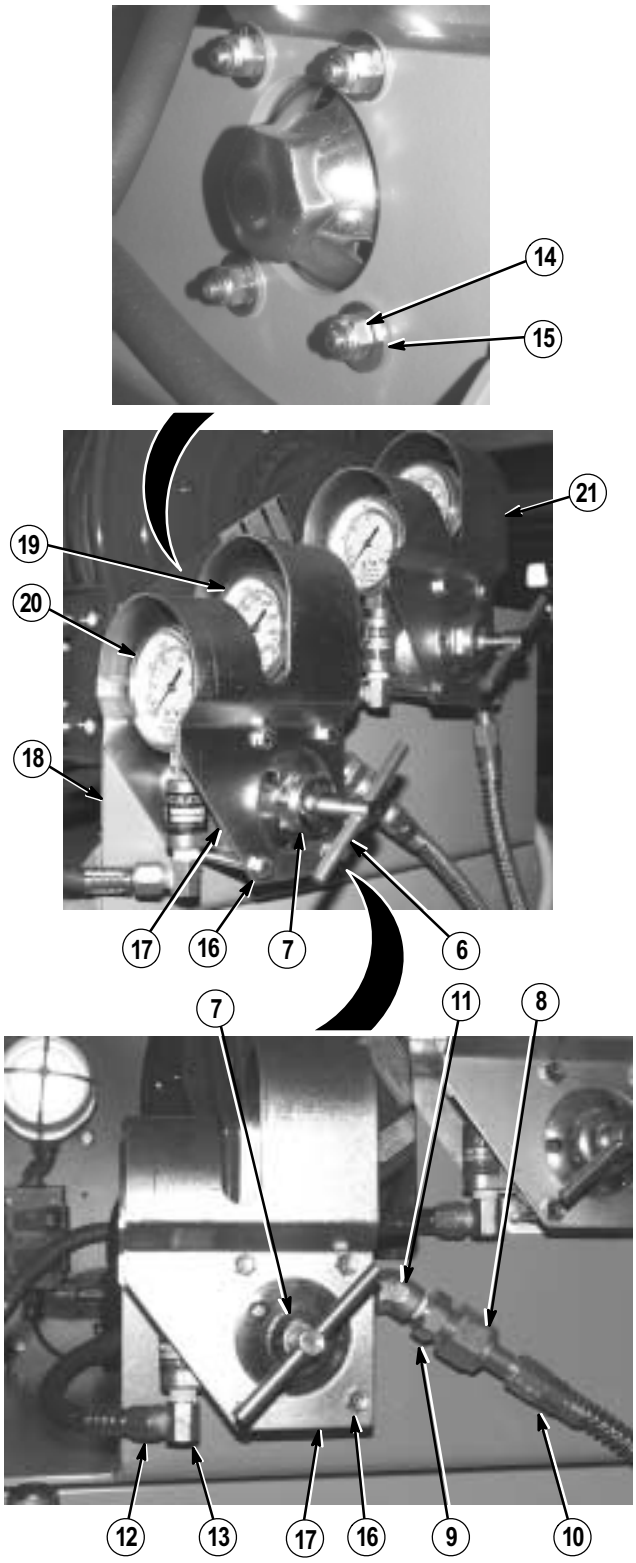
(8) Remove hose (12) from elbow (13).

(9) Remove elbow (13) from oxygen regulator (7).

(10) Remove four locknuts (14), washers (15), screws (16), guard (17) and oxygen regulator (7) from bracket (18). Discard locknuts.

(11) Remove high pressure gage (19) and low pressure gage (20) from oxygen regulator (7).

(12) Repeat Steps (1) through (11) for propylene regulator (21).



b. Installation.

WARNING

- Adhesives, solvents and sealing compounds can burn easily, can give off harmful vapors, and are harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in a well-ventilated area. If adhesive, solvent, or sealing compound gets on skin or clothing, wash immediately with soap and water.
- Only apply sealing compound on threads specified in Steps. Failure to comply may result in injury or death to personnel and damage to equipment.

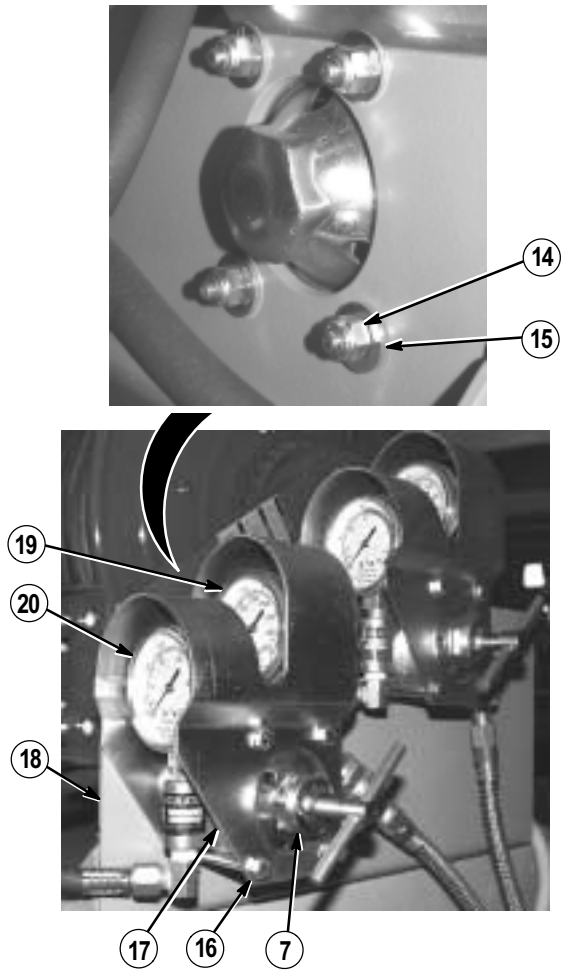
NOTE

- Install hoses, reducers, adapters, and gages as noted prior to removal.
- Both oxygen and propylene regulators are installed the same way. Oxygen regulator is shown.
- Oxygen connectors have right hand threads.
- Propylene connectors have left hand threads.

(1) Apply sealing compound to threads of low pressure gage (20) and high pressure gage (19).

(2) Install low pressure gage (20) and high pressure gage (19) on oxygen regulator (7).

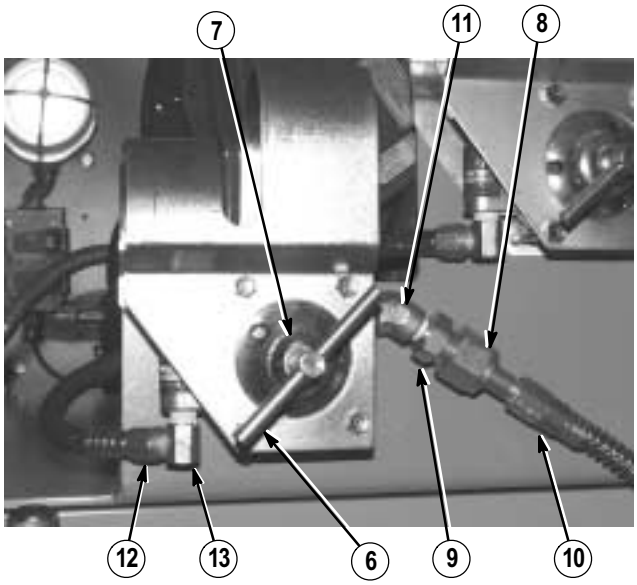
(3) Install oxygen regulator (7) and guard (17) on bracket (18) with four screws (16), washers (15) and locknuts (14).



9-5. OXYGEN AND PROPYLENE GAS REGULATOR REPLACEMENT (CONT).

WARNING

Adhesives, solvents, and sealing compounds can burn easily, can give off harmful vapors, and are harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in well-ventilated area. If adhesive, solvent, or sealing compound gets on skin or clothing, wash immediately with soap and water.



(4) Apply sealing compound to threads of oxygen regulator end of elbow (13).

(5) Install elbow (13) on oxygen regulator (7).

(6) Install hose (12) on elbow (13).

(7) Apply sealing compound to threads of elbow (11).

(8) Install elbow (11) on oxygen regulator (7).

(9) Apply sealing compound to elbow end of reducer (9).

(10) Install reducer (9) on elbow (11).

(11) Apply sealing compound to threads of adapter (8).

(12) Install adapter (8) on hose (10).

(13) Install adapter (8) on reducer (9).

(14) Ensure cutting torch is in off position and install on hose (TM 9-4940-568-10).

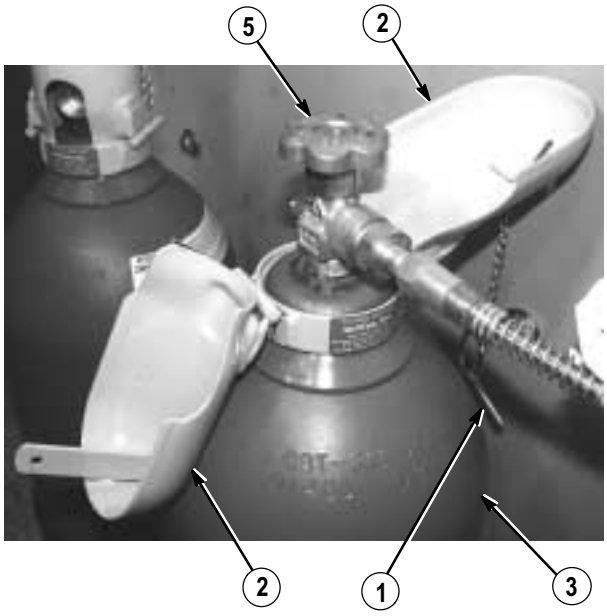
(15) Open valve (5) on oxygen tank (3) and valve (6) on oxygen regulator (7) to charge hoses (10) and hose reel assembly. Using soap solution, check for leaks.

(16) Close valve (5) on oxygen tank (3).

(17) Close safety cap (2) on oxygen tank (3) and install pin (1).

(18) Disconnect cutting torch (TM 9-4940-568-10).

(19) Repeat Steps (1) through (16) for propylene regulator.



c. Follow-On Maintenance:

- Check operation of oxygen and propylene regulators, (TM 9-4940-568-10).

END OF TASK

CHAPTER 10

WELDING MAINTENANCE

10-1. INTRODUCTION.

This chapter contains maintenance instructions for removing, replacing, repairing, installing and adjusting welding components authorized by the Maintenance Allocation Chart (MAC) at the Unit Maintenance level.

10-2. ARC WELDER AND BRACKET REPLACEMENT.

This task covers:

a. Removal b. Installation c. Follow-On Maintenance

INITIAL SETUP

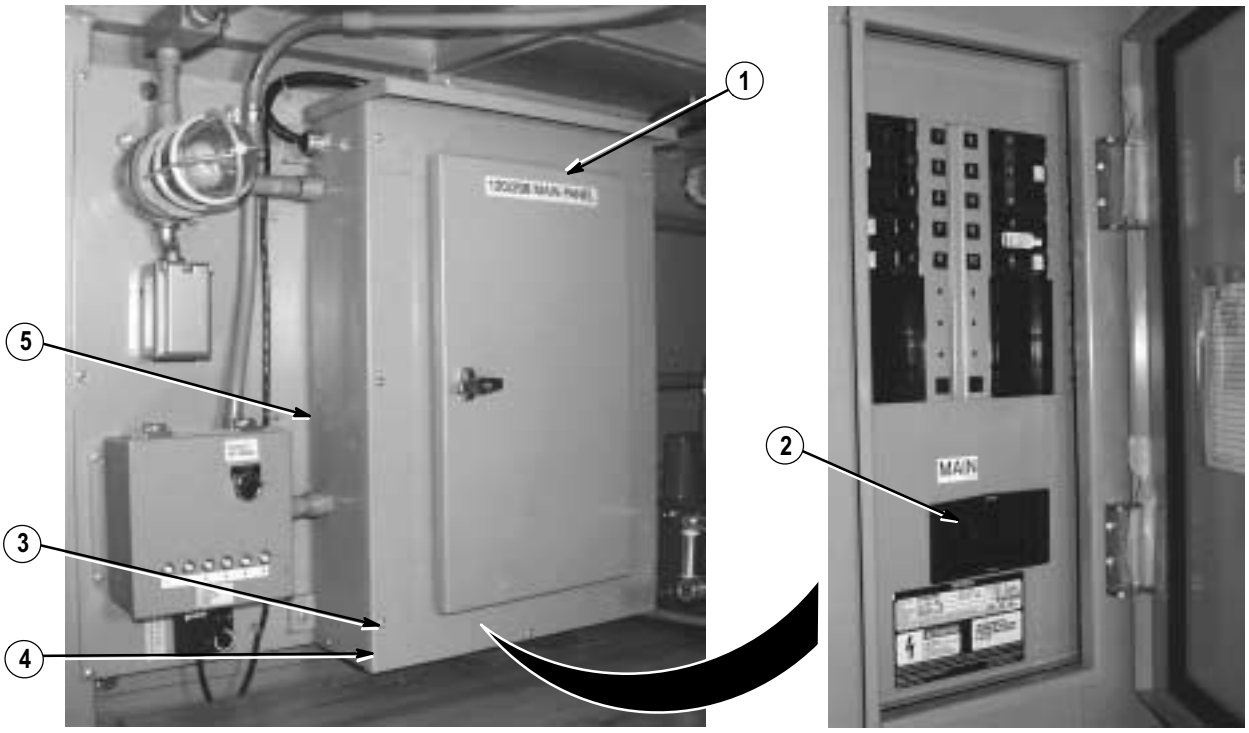
Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 30, Appendix G)

Materials/Parts
Cable Ties (Item 10, Appendix C)
Tags, Identification (Item 40, Appendix C)

Materials/Parts - Continued
Locknut (6) (Item 30, Appendix F)

Equipment Condition
FRS unloaded, (TM 9-4940-568-10)
Batteries disconnected, (TM 9-4940-568-10)

a. Removal.



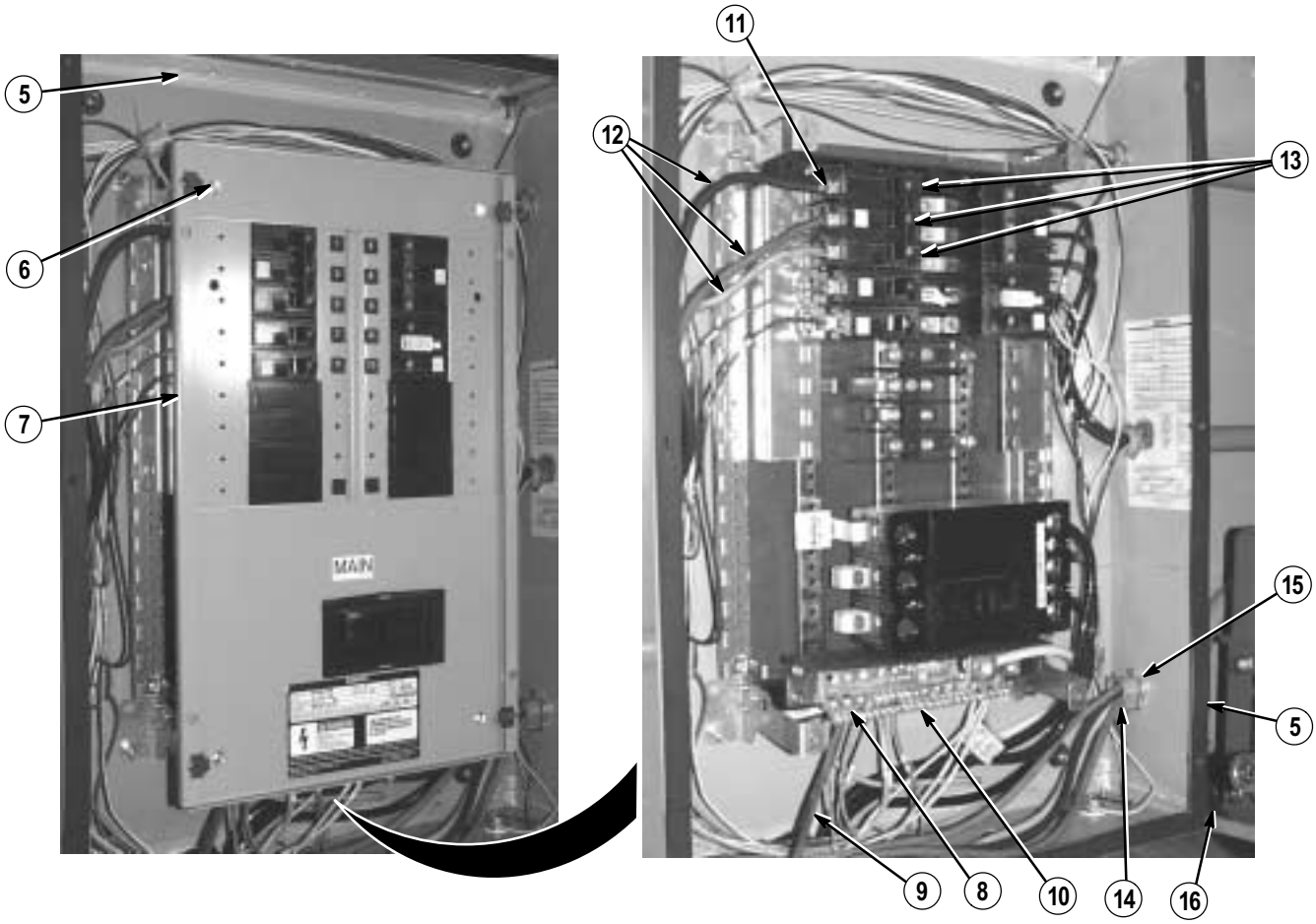
NOTE

Remove cable ties as required.

(1) Open circuit breaker box door (1).

(2) Switch main circuit breaker (2) to OFF position.

(3) Remove seven screws (3) and circuit breaker cover (4) from circuit breaker box (5).



(4) Remove four screws (6) and circuit breaker panel (7) from circuit breaker box (5).

NOTE

Tag and note location of all wires prior to removal.

(5) Loosen screw (8) and remove ground wire (9) from ground bar (10).

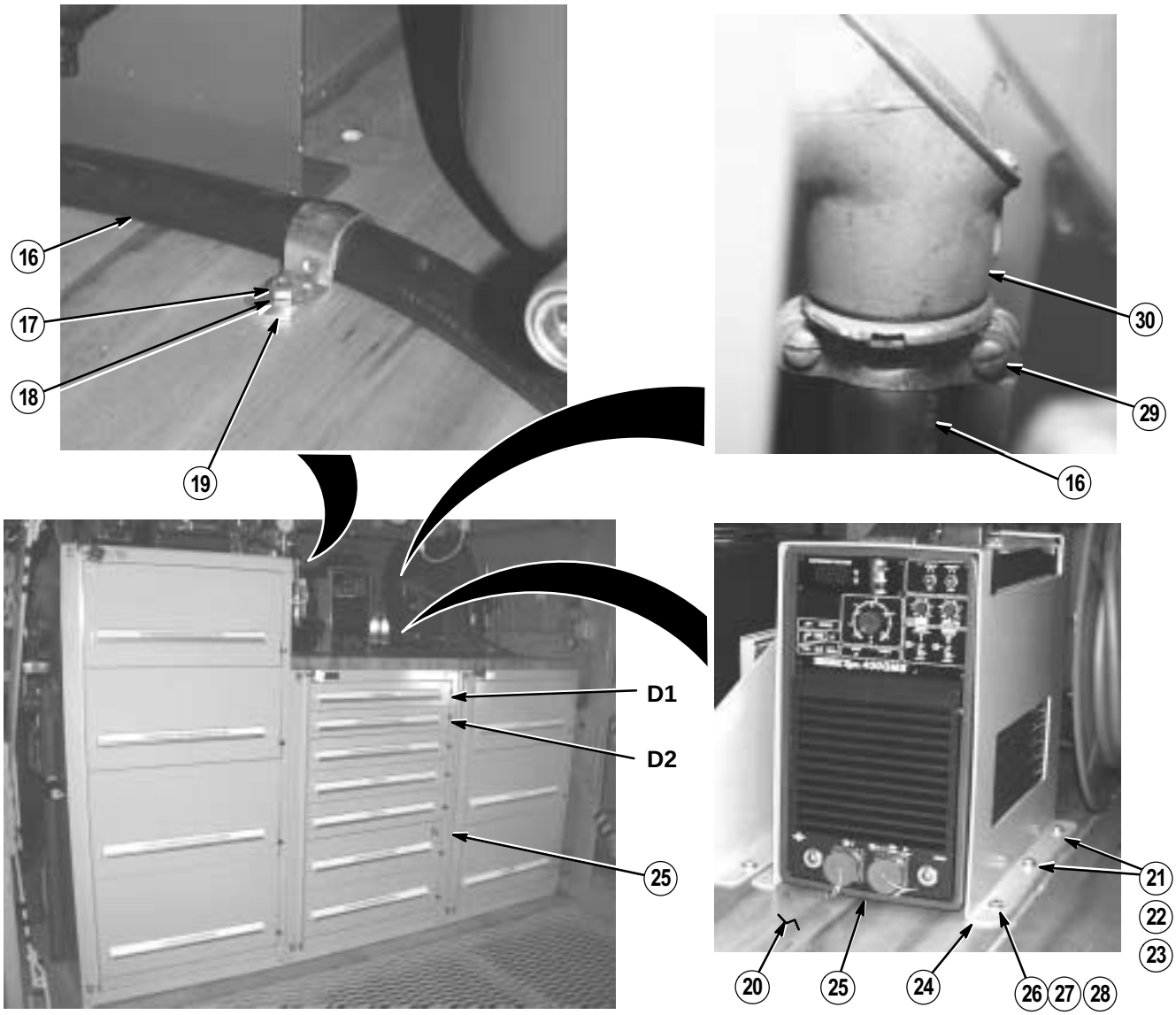
(6) Loosen three screws (11) and remove wires (12) from circuit breakers (13).

NOTE

Retain retaining nut and locknut for installation.

(7) Remove retaining nut (14), locknut (15) and primary cable (16) from circuit breaker box (5).

10-2. ARC WELDER AND BRACKET REPLACEMENT (CONT).



(8) Remove screw (17), washer (18) and clamp (19) from primary cable (16) to counter top (20).

(9) Remove four locknuts (21), eight washers (22) and four screws (23) from arc welder bracket (24). Discard locknuts.

(10) Remove two drawers (D1 and D2) from right side, center cabinet (25).

(11) Remove two locknuts (26), four washers (27), two screws (28) and arc welder bracket (24). Discard locknuts.

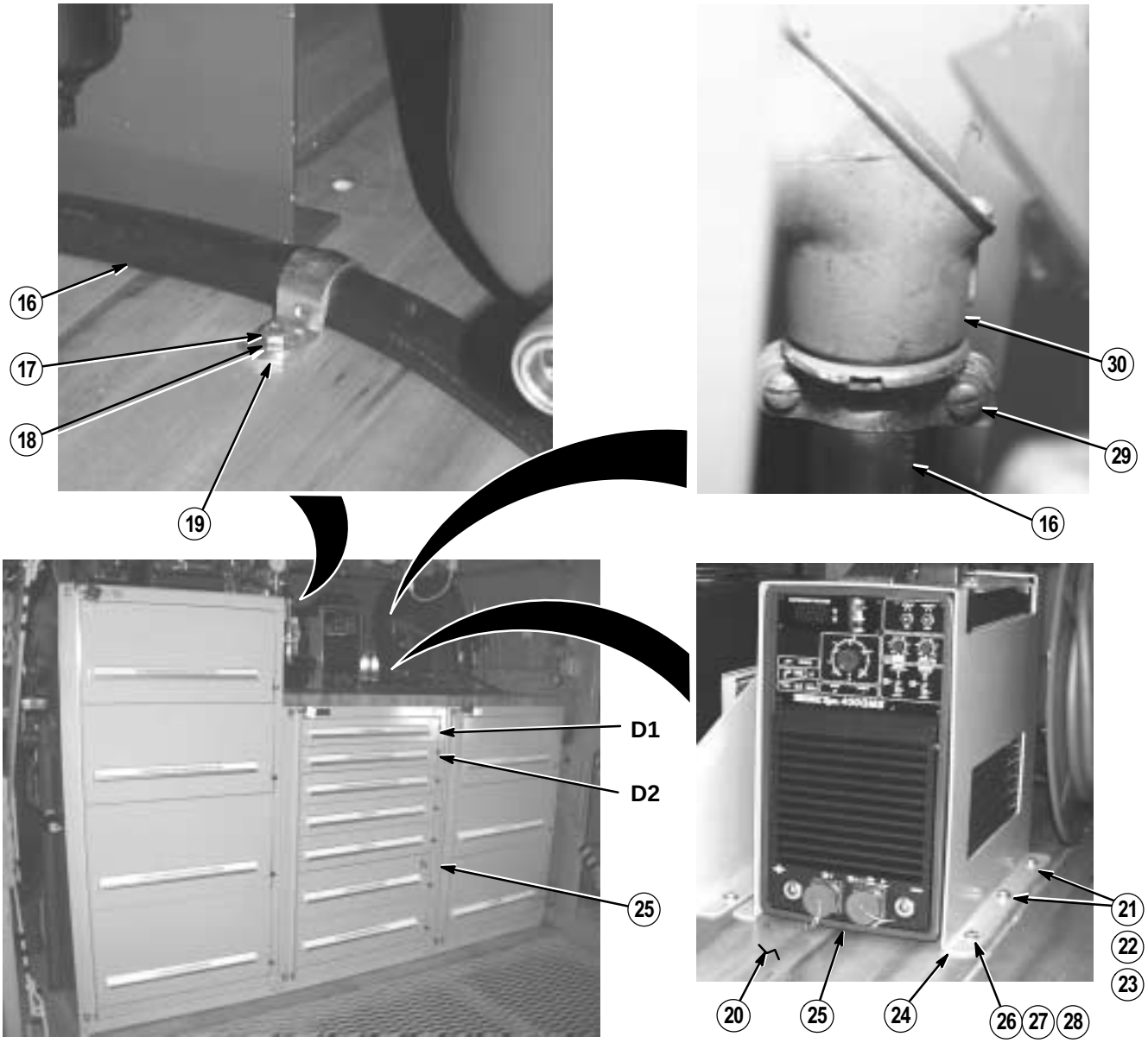
(12) Remove arc welder (25) from counter top (20).

NOTE

Retain elbow clamp for installation.

(13) Remove two screws (29) and elbow clamp (30) from primary cable (16).

b. Installation.



(1) Attach elbow clamp (30) and two screws (29) to primary cable (16).

(2) Position arc welder (25) on counter top (20).

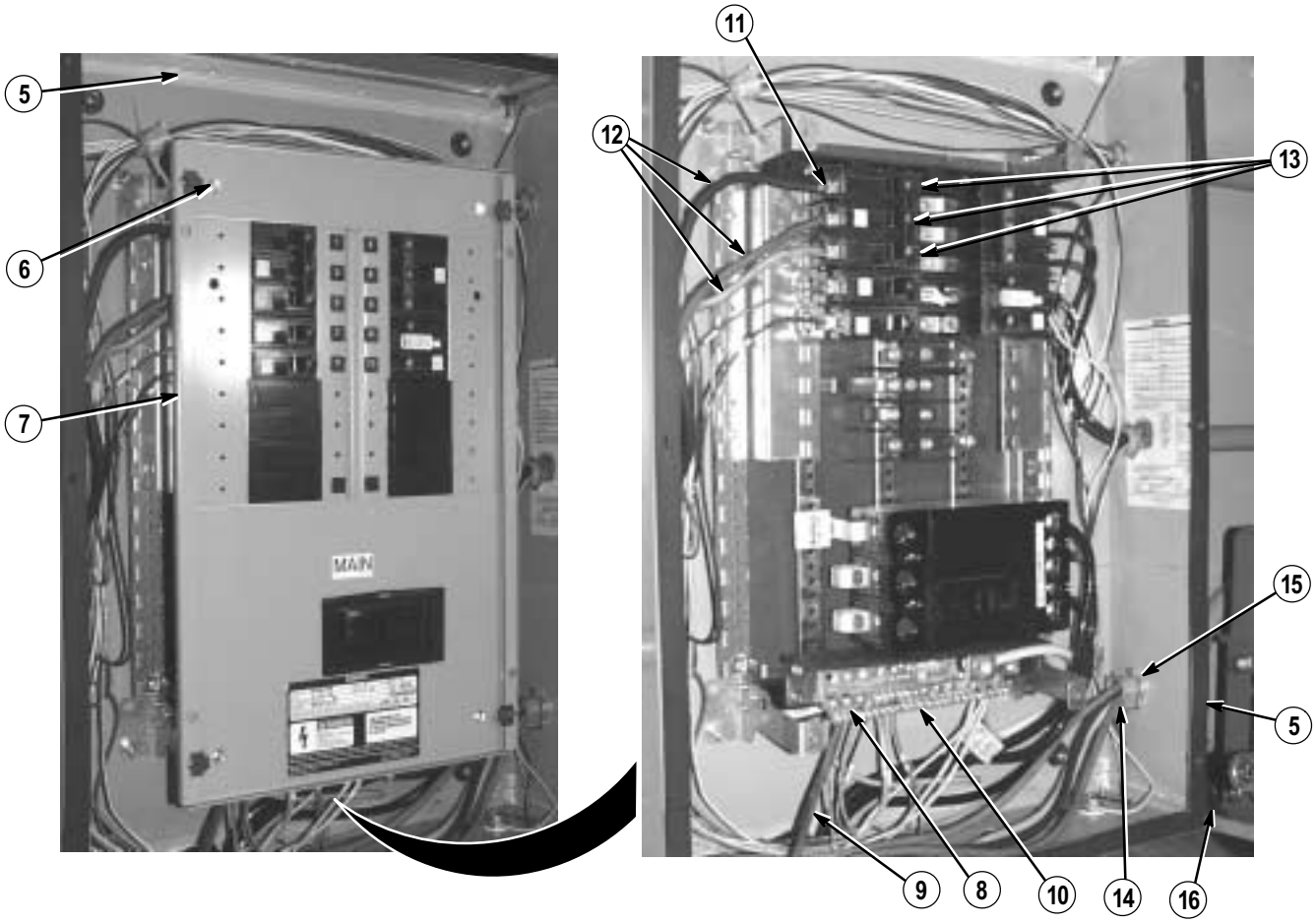
(3) Install arc welder bracket (24) with two screws (28), four washers (27) and two locknuts (26).

(4) Install two drawers (D1 and D2) in right side, center cabinet (25).

(5) Install four screws (23), eight washers (22) and four locknuts (21) on arc welder bracket (24).

(6) Install primary cable (16) to counter top (20) with clamp (19), washer (18) and screw (17).

10-2. ARC WELDER AND BRACKET REPLACEMENT (CONT).

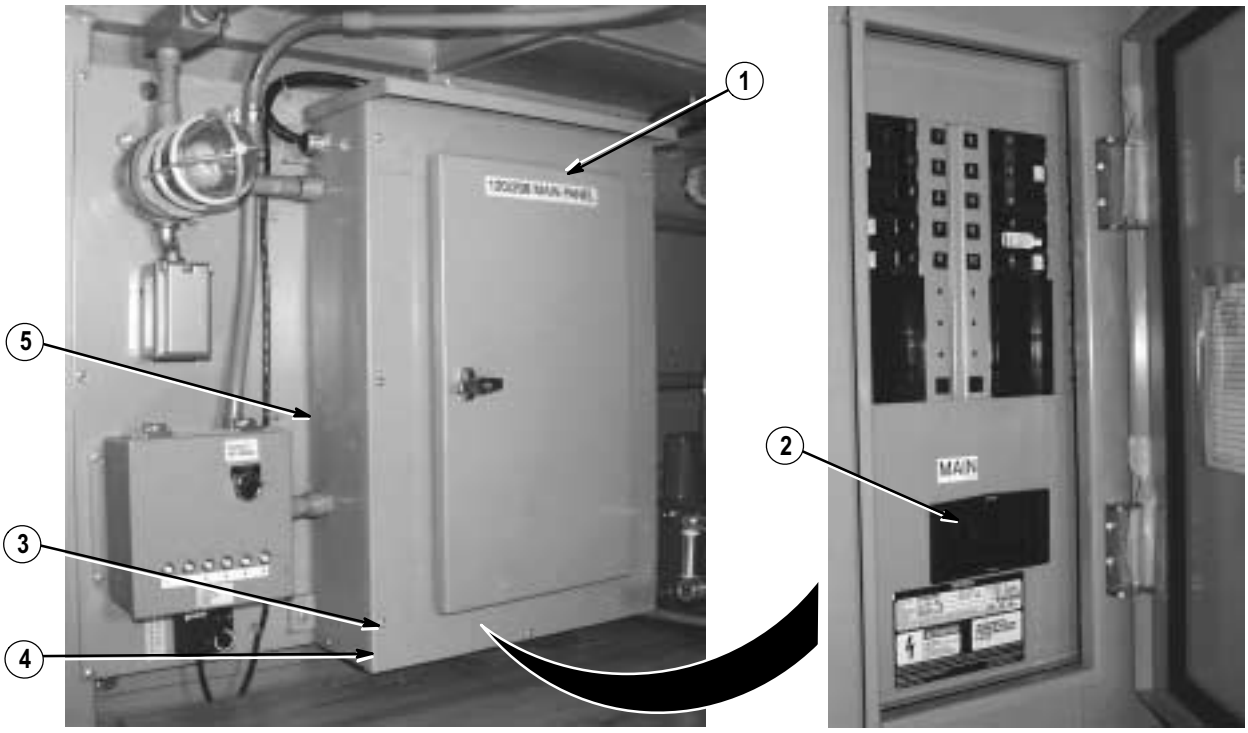


(7) Install retaining nut (14), locknut (15) and primary cable (16) to circuit breaker box (5).

(8) Position three wires (12) on circuit breakers (13) and tighten screws (11).

(9) Position ground wire (9) on ground bar (10) and tighten screw (8).

(10) Install circuit breaker panel (7) on circuit breaker box (5) with four screws (6).



(11) Install circuit breaker cover (4) on circuit breaker box (5) with seven screws (3).

(12) Switch main circuit breaker (2) to ON position.

(13) Close circuit breaker box door (1).

c. Follow-On Maintenance:

- Connect batteries, (TM 9-4940-568-10).
- Check operation of ARC welder (TM 9-4940-568-10).

END OF TASK

10-3. WIRE FEED (MIG) WELDER AND BRACKET REPLACEMENT.

This task covers:

a. Removal b. Installation

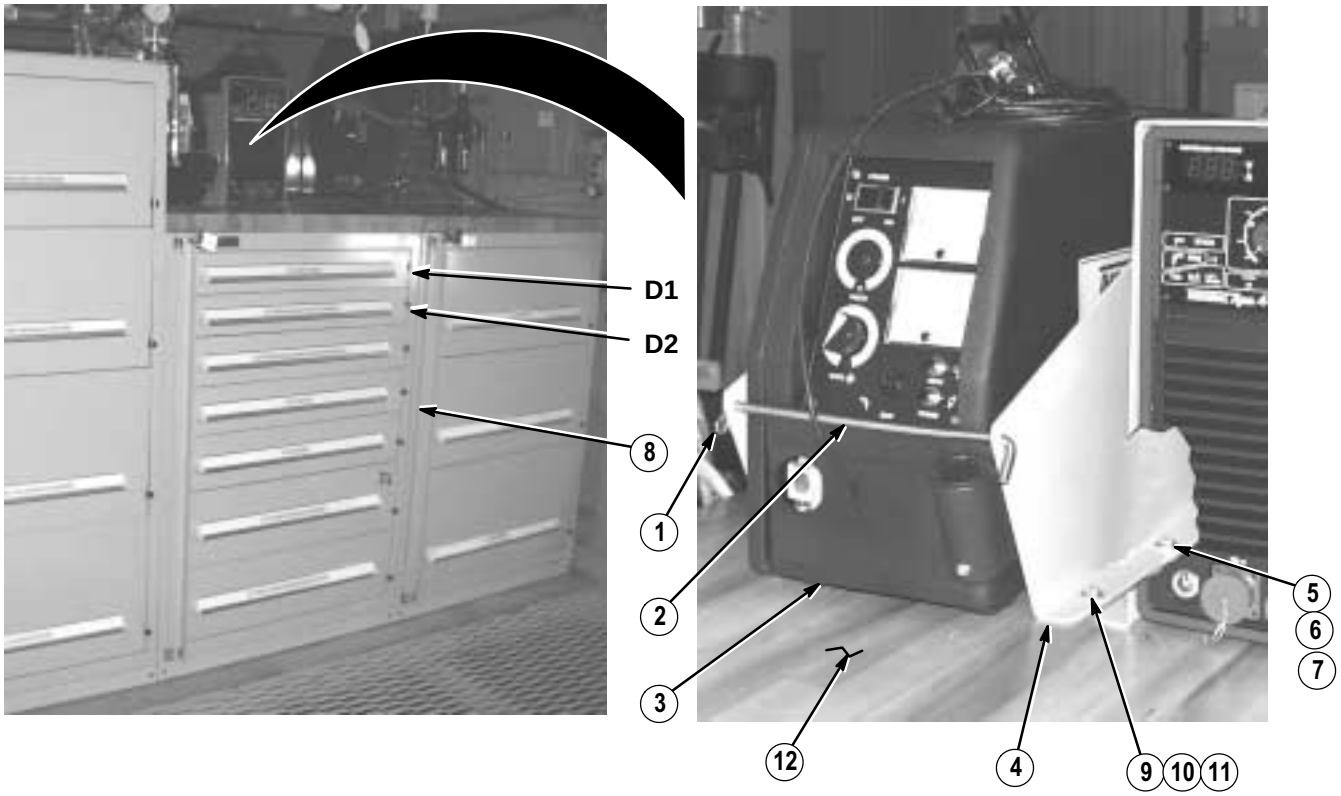
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 30, Appendix G)

Equipment Condition
FRS unloaded, (TM 9-4940-568-10)

Materials/Parts
Locknut (6) (Item 30, Appendix F)

a. Removal.



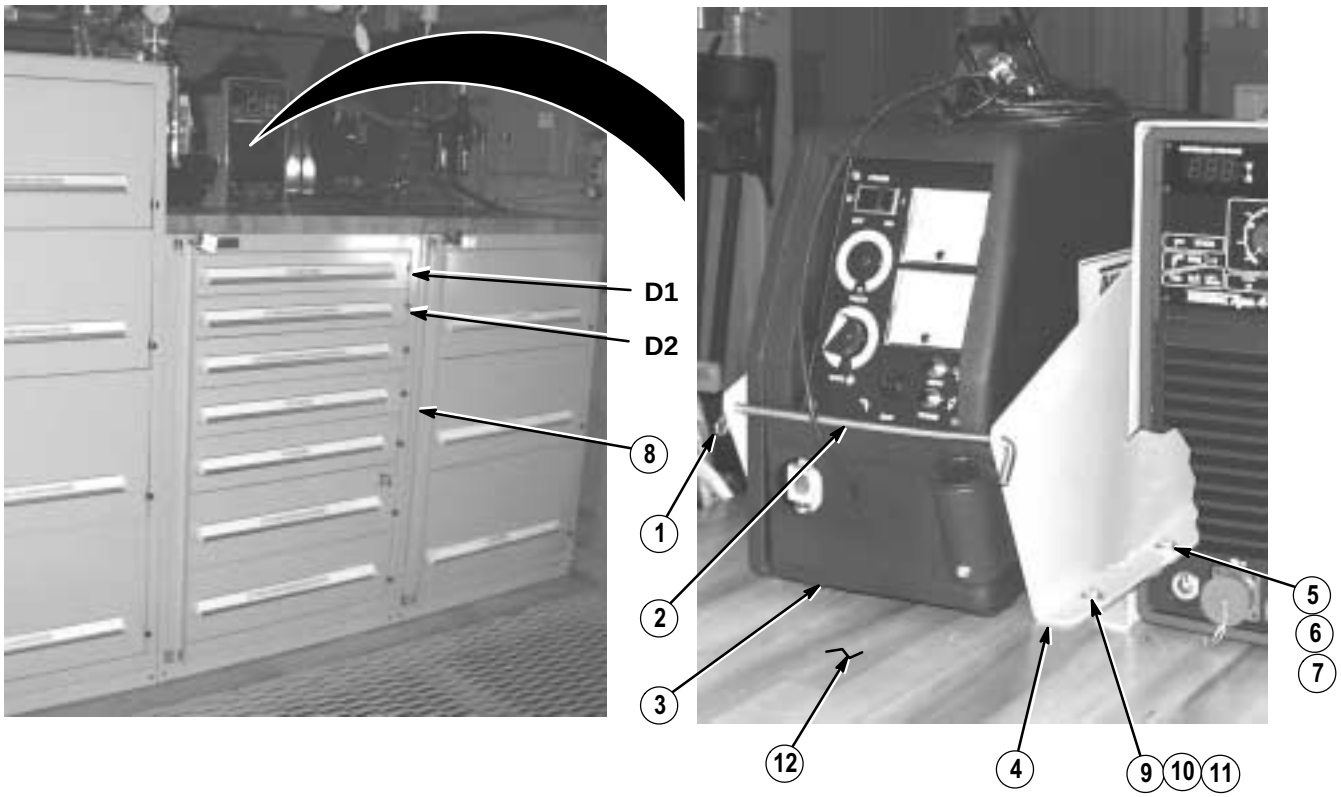
(1) Remove retaining clip (1), retaining rod (2) and wire feed welder (3) from wire feed welder bracket (4).

(2) Remove four locknuts (5), eight washers (6), four screws (7) and wire feed welder bracket (4). Discard locknuts.

(3) Remove two drawers (D1 and D2) from right side, center cabinet (8).

(4) Remove two locknuts (9), four washers (10), two screws (11) and wire feed welder bracket (4) from counter top (12). Discard locknuts.

b. Installation.



(1) Install wire feed welder bracket (4), two screws (11), four washers (10) and two locknuts (9) on counter top (12).

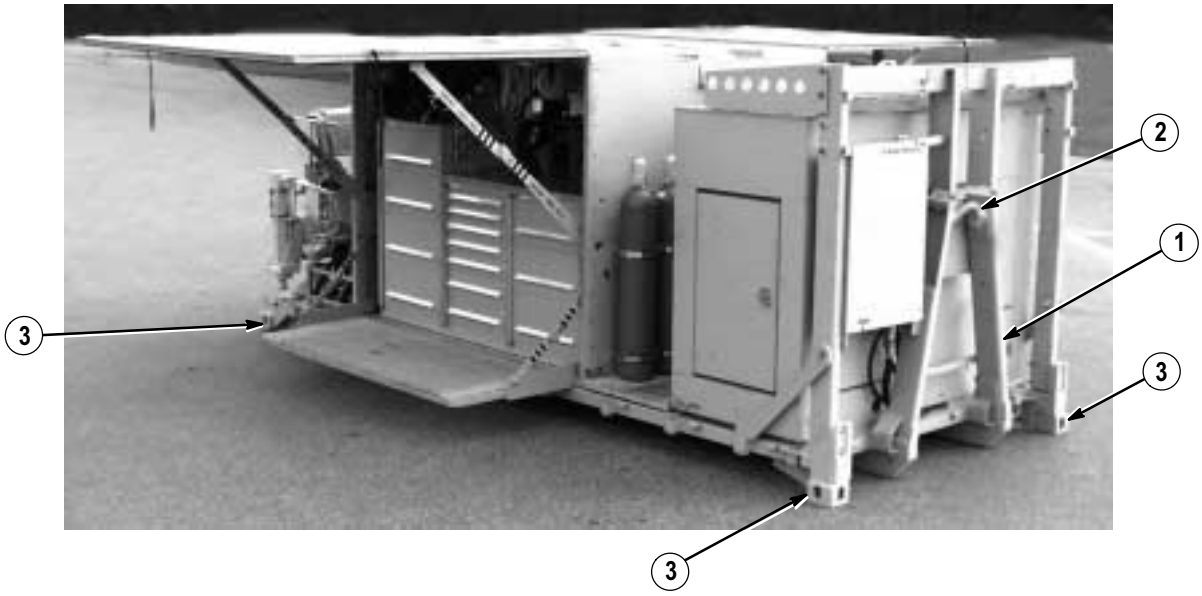
(2) Install two drawers (D1 and D2) into right side, center cabinet (8).

(3) Install four screws (7), eight washers (6) and four locknuts (5) onto wire feed welder bracket (4).

(4) Position wire feed welder (3) and install retaining rod (2) and retaining clip (1), in wire feed welder bracket (4).

END OF TASK

10-4. FRS GENERAL WELDING MAINTENANCE.



NOTE

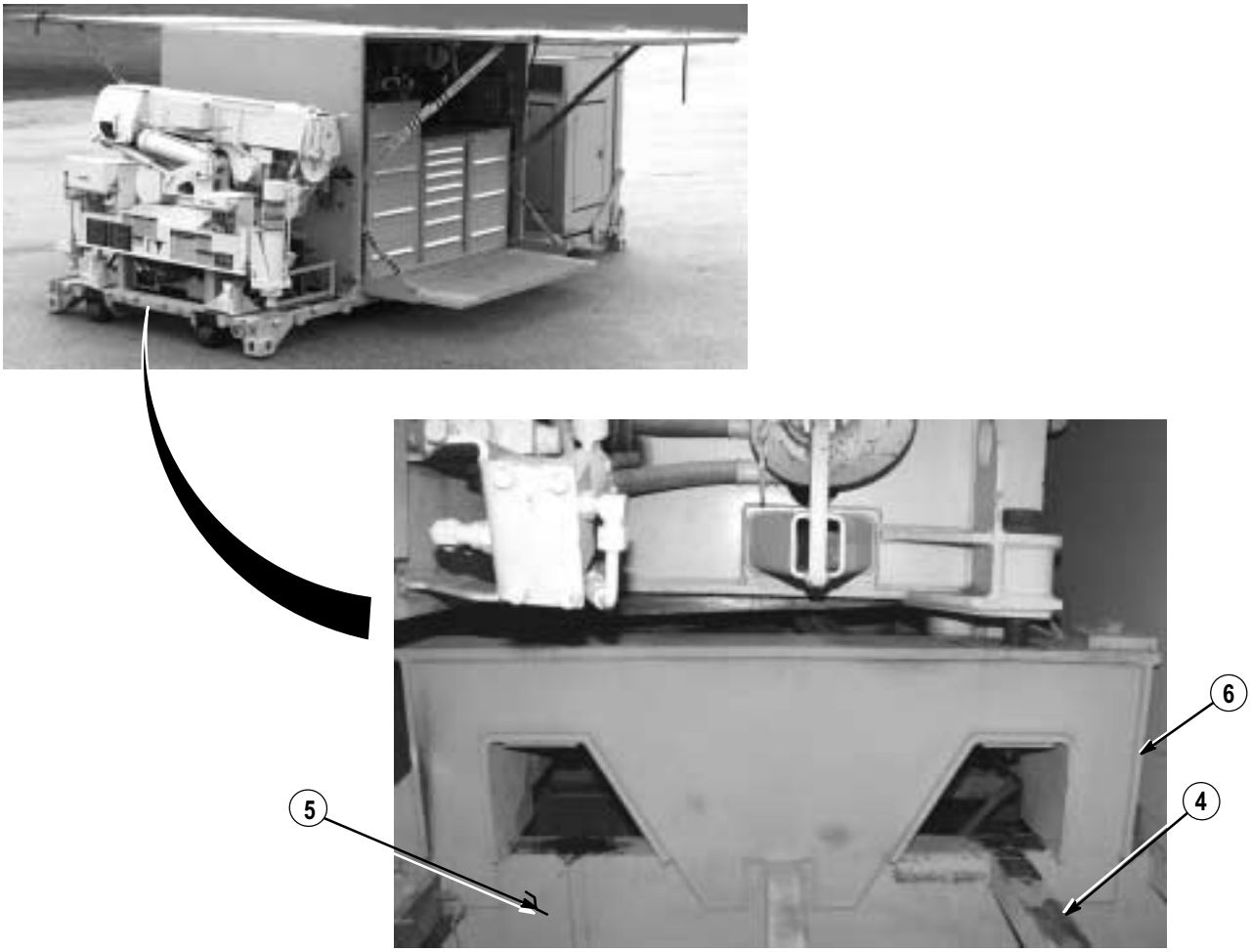
When weldment cracks are discovered, it is recommended that they be repaired at the next service interval, or as noted to prevent the length of the crack from increasing and to minimize repair. The following inspection procedures are to be considered as guidelines only. Any cracks discovered during inspections considered more significant, especially from a safety stand point, should be referred to the supervisor for weld repair decisions. This would include cracks identified in any main structural areas (A-Frame, main rail flanges and crane frame base) and cracks that have opened and could lengthen rapidly during loading/unloading operations.

a. Weldment Points. Thoroughly inspect all weldments for cracks, chips or other damage. Areas include the front and rear corner fittings, FRS flatrack crossmembers and the hookbar. Inspect welds for acceptable crack length limits using the following guidelines.

(1) *A-Frame Interface (1).* This area includes the A-Frame channel to main rail interface, the top and outboard wrapper plates, and the front wrapper plate and gussets. Solid welds in this area are necessary to ensure safe loading and unloading of the FRS flatrack. A crack should be repaired before it has reached 2 in. (5 cm). The combined length of multiple cracks at any one location should not exceed 4 in. (10 cm).

(2) *Hookbar (2).* These welds are located at the base of the hookbar casting on the A-Frame of the FRS flatrack. These welds secure the hookbar to the structure and are subjected to a significant portion of the total load during loading and unloading operations. Cracks should be repaired prior to reaching 1 in. (2 cm) in length. The combined length of multiple cracks at this location should not exceed 1 1/2 in. (4 cm).

(3) *Corner Fitting and Adjacent Structure (3).* The corner fittings of the FRS flatrack are used for transportation. They may be used to secure the FRS flatrack to a trailer or bribbing for the crane. Due to the high loads that these fittings can see in a transport mode, the crack should be repaired before reaching 1/2 in. (1 cm) in length. The combined length of multiple cracks at any one location should not exceed 1/2 in. (1 cm). This applies to cracks present in the adjoining structure also.



(4) *Crossmembers (4).* These welds are located at the junction of the crossmember and the main rails. A crack should be repaired before it has reached 2 in. (5 cm) at one location. The total length of all cracks on a single crossmember should not exceed 2 in. (5 cm). When cracks are present on several crossmembers, action should be taken to repair it at the next service. If a crossmember is completely missing, repairs should be made prior to use.

(5) *Main Rails (5).* The main rails provide a major portion of the load carrying capacity of the flatrack. They support a portion of the load while loaded on the truck and trailer. Cracks between the main rail and the pinning boss and the main rail and the fork pocket should be repaired before reaching one in. (2 cm). Cracks at other locations on the main rails should be repaired before reaching 1/2 in. (1 cm).

(6) *Crane Frame Base (6).* The crane frame base supports the crane and transfers the load capacity from the crane to the main rails. Repair cracks present on crane frame base or between crane frame base and main rails prior to use.

10-4. FRS GENERAL WELDING MAINTENANCE (CONT).

WARNING

CARC paint contains isocyanate (HDI) which is highly irritating to skin and respiratory system. High concentrations of HDI can produce symptoms of itching and reddening of skin, a burning sensation in throat and nose and watering of the eyes. In extreme concentrations, HDI can cause cough, shortness of breath, pain during respiration, increased sputum production, and chest tightness. The following precautions must be taken whenever using CARC paint:

- ALWAYS use air line respirators when using CARC paint unless air sampling shows exposure to be below standards. Use chemical cartridge respirator if air sampling is below standards.
- DO NOT let skin or eyes come in contact with CARC paint. Always wear protective equipment (gloves, ventilation mask, safety goggles, etc.).
- DO NOT use CARC paint without adequate ventilation.
- NEVER weld or cut CARC-coated materials.
- DO NOT grind or sand painted equipment without high-efficiency air purifying respirators in use.
- BE AWARE of CARC paint exposure symptoms; symptoms can occur a few days after initial exposure. Seek medical help immediately if symptoms are detected.

CAUTION

Do not weld the FRS flatrack while on trailer or truck or damage to equipment may result.

b. Flatrack Welding. Welding on the FRS flatrack must be performed off the trailer or truck. Different areas of the FRS flatrack require different weld electrodes. Use the following guidelines to determine the correct weld.

(1) *Hookbar*. Two different welding methods can be used to repair the hookbar.

NOTE

Use minimum preheat and maintain the interpass temperature of 300 degrees F (136 degrees C).

(a) *ER110S-1 Gas Metal Arc Welding (GMAW)*. This method requires the use of a wire feed welder with argon and oxygen shielding gas and ER110S-1 welding wire.

(b) *E11018-M Submerged Metal Arc Welding (SMAW)*. This process utilizes a E11018-M stick electrode and an arc welder.

(2) *Remaining FRS Flatrack Welds*. Welding wire ER80S-D2 is used to repair welds on the majority of the flatrack with the exception of the hookbar. Welding with ER80S-D2 weld wire requires a wire feed welder and carbon dioxide shielding gas.

CHAPTER 11

PNEUMATIC SYSTEM MAINTENANCE

11-1. INTRODUCTION.

This chapter contains maintenance instructions for removing, replacing, repairing, installing and adjusting pneumatic components authorized by the Maintenance Allocation Chart (MAC) at the Unit Maintenance level.

11-2. AIR COMPRESSOR AND PLATFORM REPLACEMENT.

This task covers:

a. Removal b. Installation c. Follow-On Maintenance

INITIAL SETUP

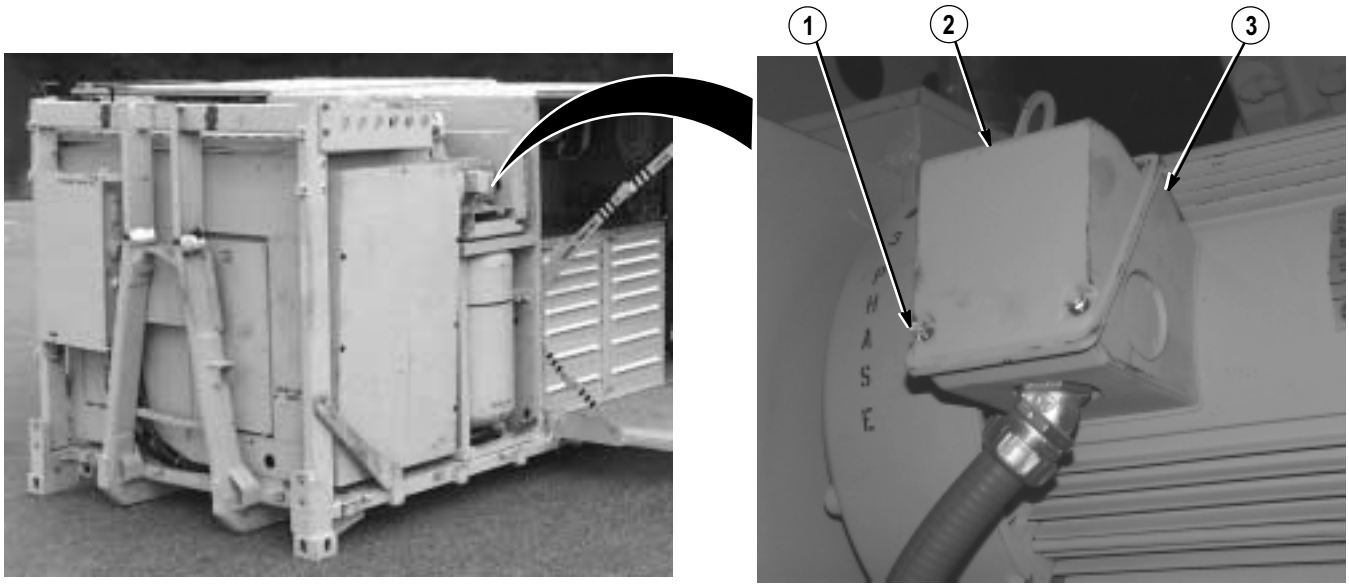
Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 30, Appendix G)
(Item 46, Appendix G)
Lifting Device, Minimum Capacity 800 lbs (363 kg)

Materials/Parts
Tags, Identification (Item 40, Appendix C)
Tape, Electrical (Item 39, Appendix C)
Locknut (2) (Item 43, Appendix F)
Locknut (3) (Item 51, Appendix F)
Locknut (3) (Item 42, Appendix F)
Locknut (4) (Item 37, Appendix F)
Locknut (4) (Item 39, Appendix F)

Personnel Requied
Two

Equipment Condition
FRS unloaded, (TM 9-4940-568-10)
Air filter removed, (Para 11-6)
Air reservoir drained, (TM 9-4940-568-10)
Batteries disconnected, (TM 9-4940-568-10)
Low oil level switch removed, (Para 11-5)
Air compressor pressure switch removed, (Para 11-10)
Air compressor gage removed, (Para 11-7)

a. Removal.



(1) Remove four screws (1) and wire junction box cover (2) from wire junction box (3).

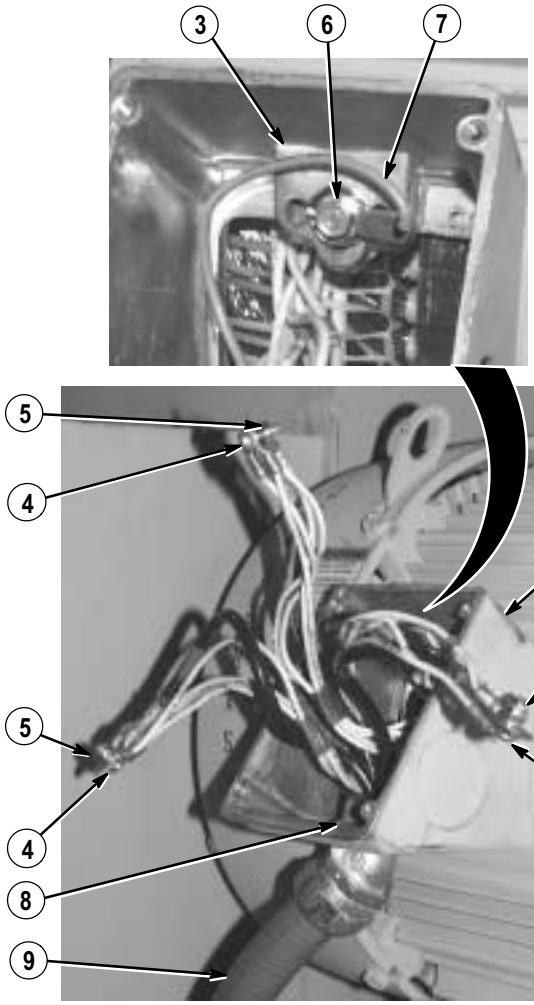
NOTE

Tag and mark all wires prior to removal.

(2) Remove three screws (4) and locknuts (5) from wire junctions. Discard locknuts.

(3) Remove screw (6) and ground wire (7) from wire junction box (3).

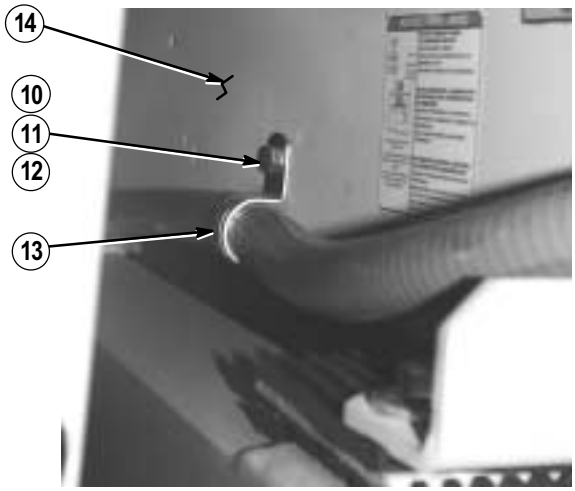
(4) Remove nut (8) and harness (9) from wire junction box (3).



NOTE

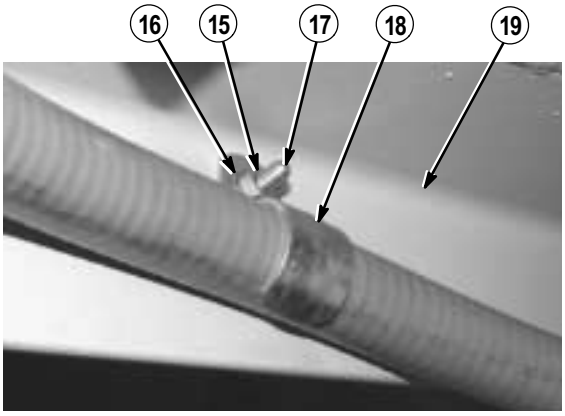
Note location of clamps prior to removal.

(5) Remove nut (10), washer (11), screw (12) and clamp (13) from air compressor mount bracket (14).

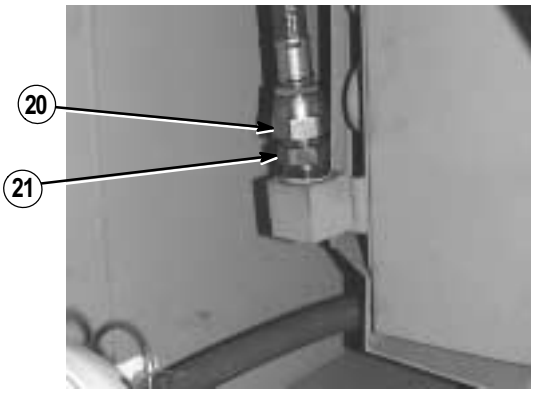


11-2. AIR COMPRESSOR AND PLATFORM REPLACEMENT (CONT).

(6) Remove nut (15), washer (16), screw (17) and clamp (18) from air compressor platform (19).



(7) Remove main air line (20) from fitting (21).



WARNING

Air compressor weighs 750 lbs (340 kg). Attach suitable lifting device for removal and properly support air compressor to prevent possible injury to personnel.

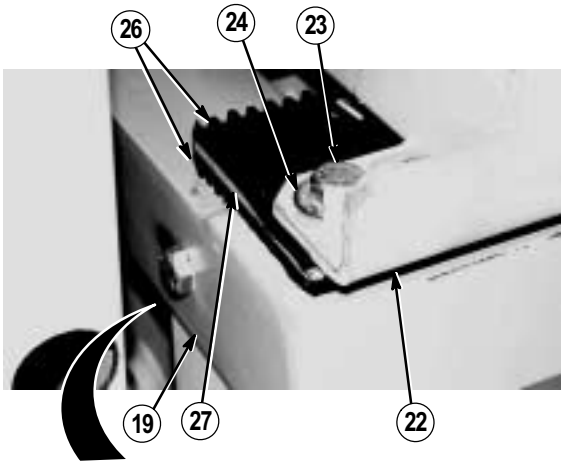
(8) Attach lifting device to air compressor (22).

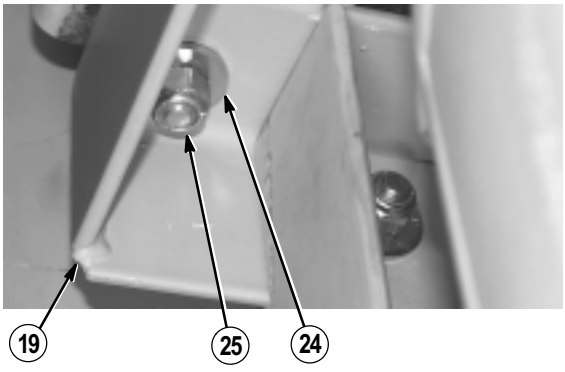
(9) With the aid of an assistant, remove four screws (23), eight washers (24), four locknuts (25) and air compressor (22) from air compressor platform (19).

NOTE

Note position of pads and spacers prior to removal.

(10) Remove eight pads (26) and four spacers (27) from air compressor platform (19).

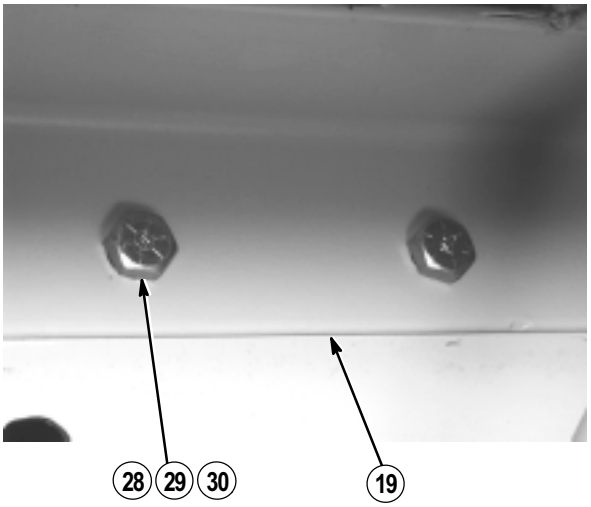




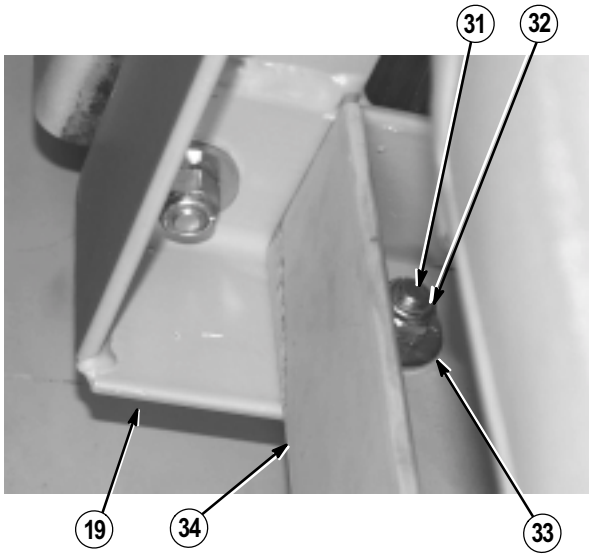
WARNING

Air compressor platform weighs 66 lbs (30 kg). Attach suitable lifting device for removal/installation to prevent possible injury to personnel.

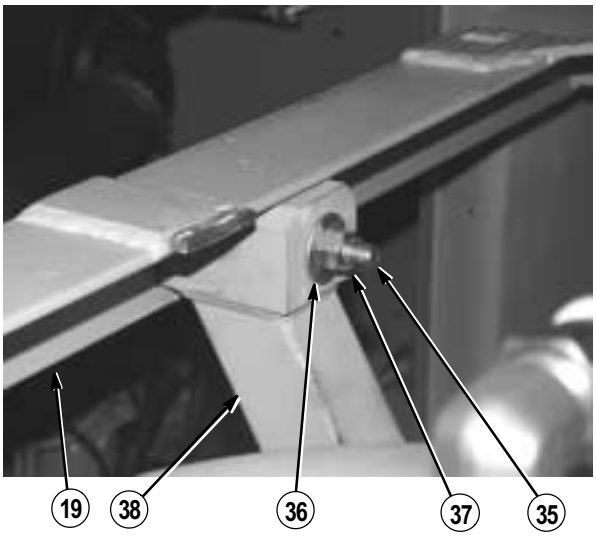
(11) Remove four screws (28), washers (29) and locknuts (30) from air compressor platform (19) on shelter wall. Discard locknuts.



(12) Remove screw (31), washer (32) and locknut (33) from air compressor platform (19) and front support bracket (34). Discard locknut.

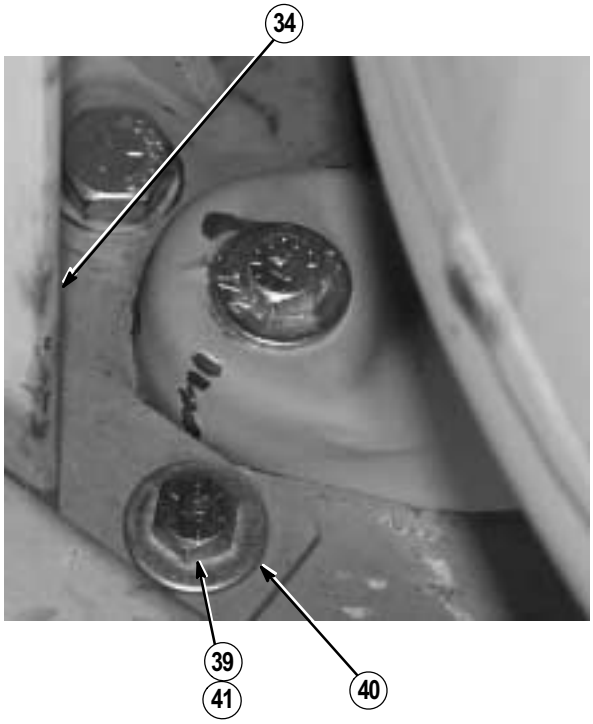


(13) Remove screw (35), two washers (36), locknut (37) and air compressor platform (19) from rear support bracket (38). Discard locknut.

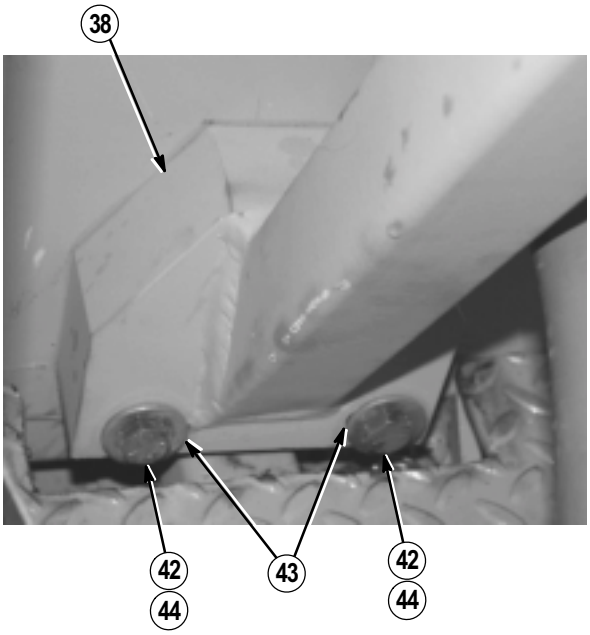


11-2. AIR COMPRESSOR AND PLATFORM REPLACEMENT (CONT).

(14) Remove screw (39), two washers (40), locknut (41) and front support bracket (34) from floor. Discard locknut.

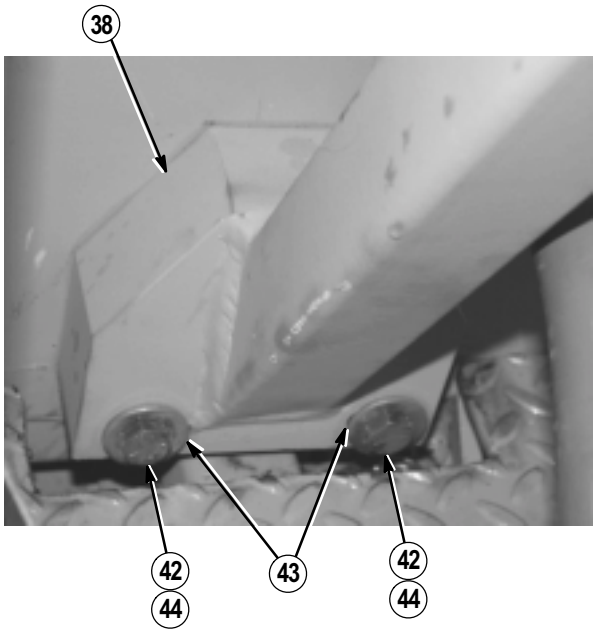


(15) Remove two screws (42), four washers (43), two locknuts (44) and rear support bracket (38) from shelter wall. Discard locknuts.

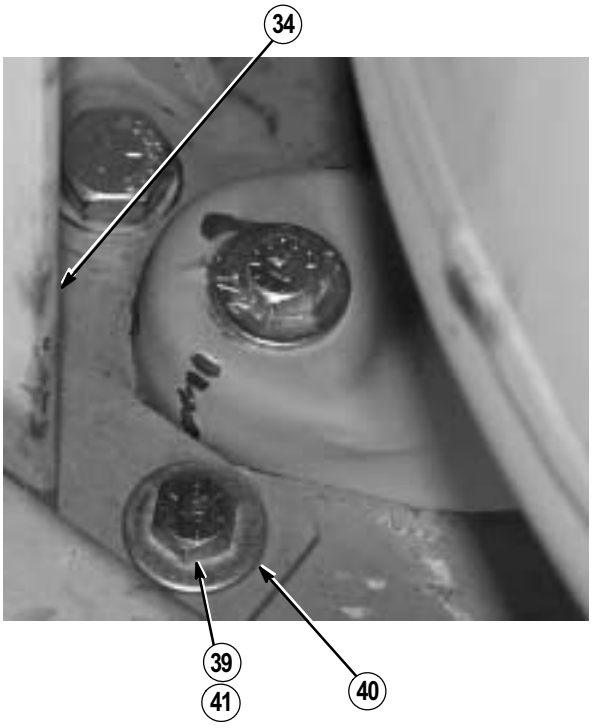


b. Installation.

(1) Install rear support bracket (38) on shelter wall with two screws (42), four washers (43) and two locknuts (44).

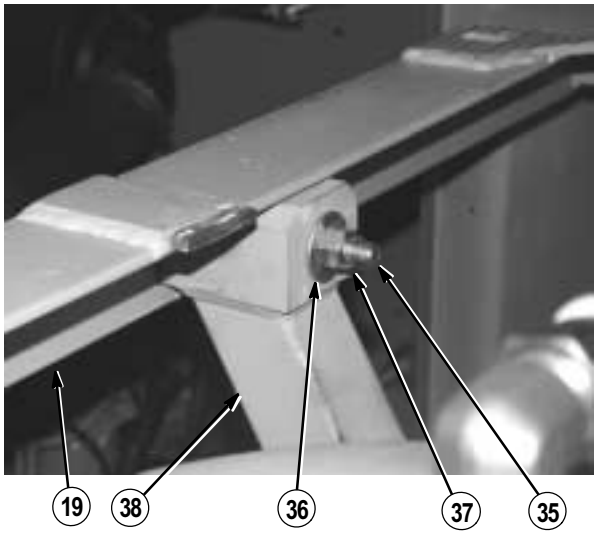


(2) Install front support bracket (34), screw (39), two washers (40) and locknut (41) to floor.

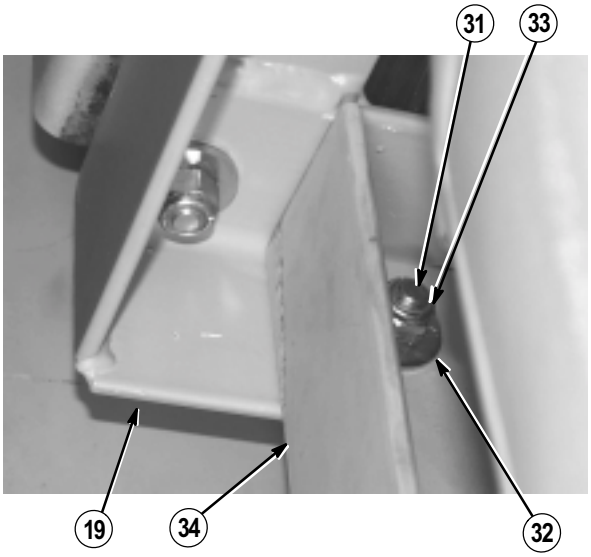


11-2. AIR COMPRESSOR AND PLATFORM REPLACEMENT (CONT).

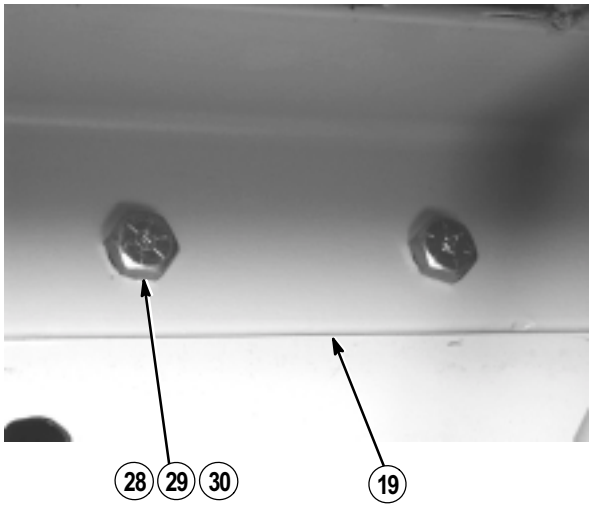
(3) Install air compressor platform (19) on rear support bracket (38) with screw (35), two washers (36) and locknut (37).



(4) Install screw (31), washer (32) and locknut (33) for air compressor platform (19) on front support bracket (34).



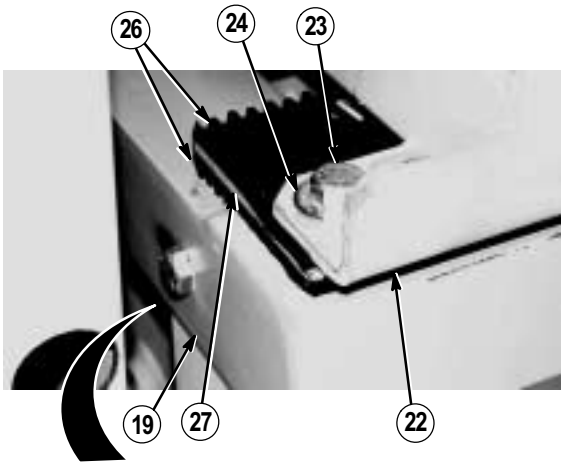
(5) Install four screws (28), washers (29) and locknuts (30) on air compressor platform (19) to shelter wall.



NOTE

Position pads and spacers as noted during removal.

(6) Position eight pads (26) and four spacers (27) on air compressor platform (19).

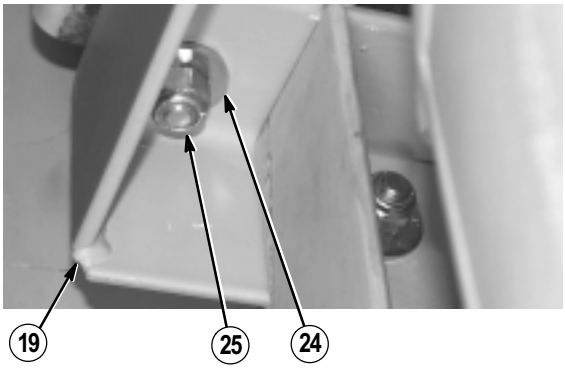


WARNING

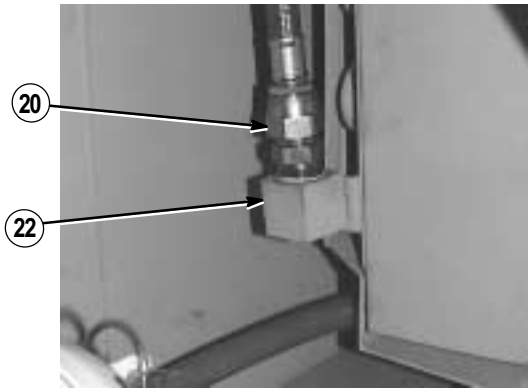
Air compressor weighs 750 lbs (340 kg). Attach suitable lifting device for removal and properly support air compressor to prevent possible injury to personnel.

(7) Attach a suitable lifting device to air compressor (22).

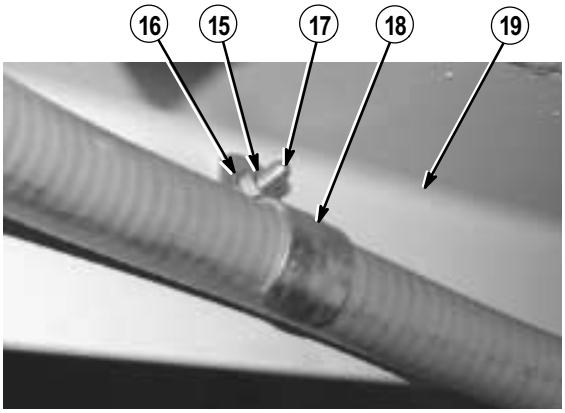
(8) With the aid of an assistant, install air compressor (22) on air compressor platform (19) with four screws (23), eight washers (24) and four locknuts (25).



(9) Install main air line (20) on air compressor (22).

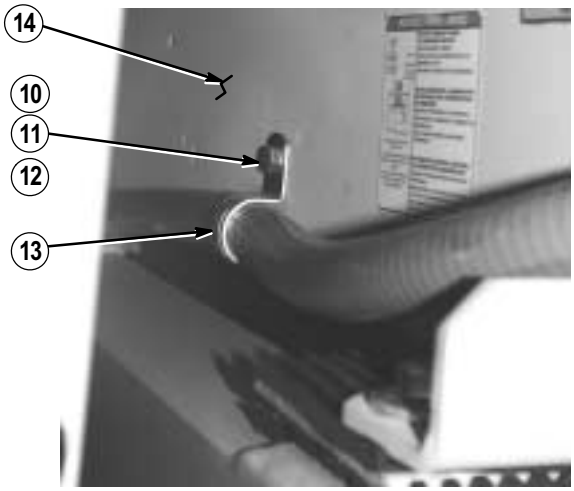


(10) Install clamp (18), screw (17), washer (16) and nut (15) on air compressor platform (19).



11-2. AIR COMPRESSOR AND PLATFORM REPLACEMENT (CONT).

(11) Install clamp (13), screw (12), washer (11) and nut (10) on air compressor bracket (14).



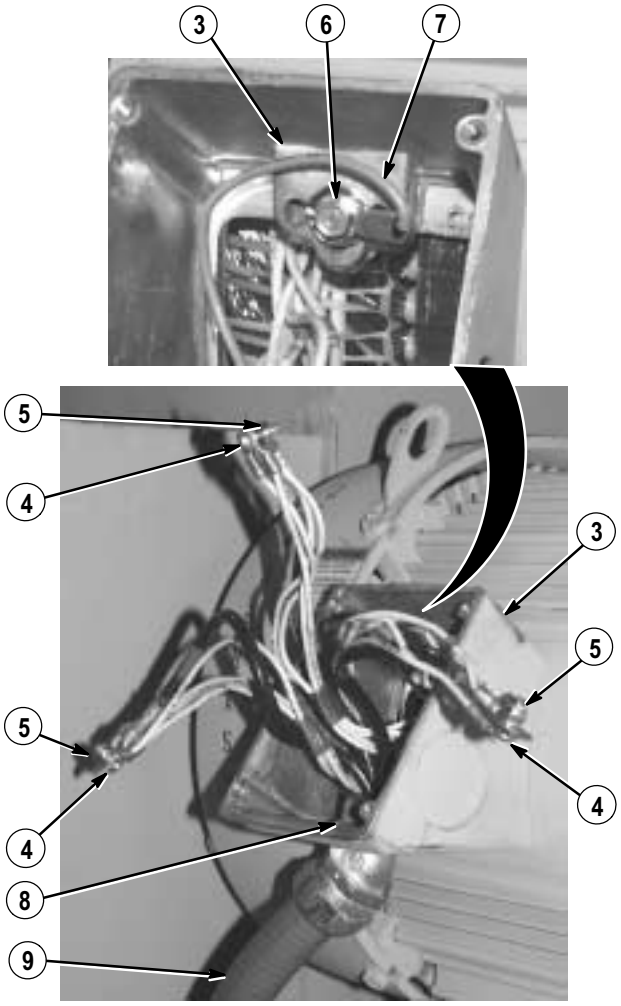
(12) Install harness (9) through junction box (3) and tighten nut (8).

(13) Install ground wire (7) and screw (6) on wire junction box (3).

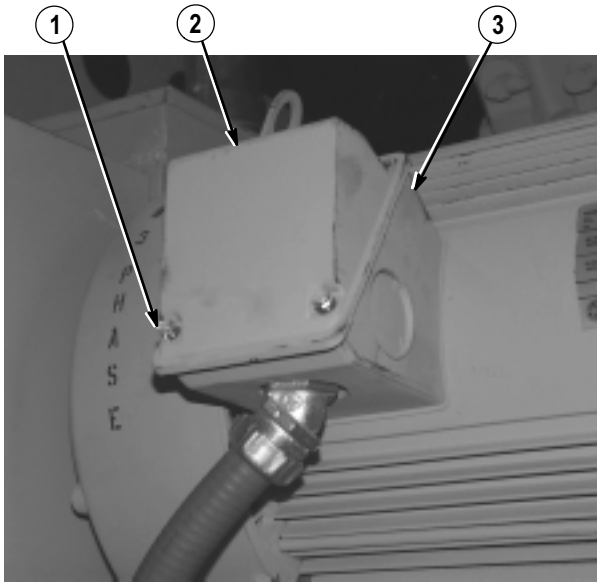
NOTE

Install wires as noted prior to removal.

(14) Connect wire junctions with three screws (4) and locknuts (5).



(15) Install wire junction box cover (2) with four self-tapping screws (1) on wire junction box (3).



c. Follow-On Maintenance:

(1) Install air filter, (TM 9-4940-568-10).

(2) Install oil level switch, (Para 11-5).

(3) Install air compressor pressure switch, (Para 11-10).

(4) Install air compressor pressure gage, (Para 11-7).

(5) Connect batteries, (TM 9-4940-568-10).

(6) Start generator and air compressor and check for proper operation, (TM 9-4940-568-10).

END OF TASK

11-3. AIR COMPRESSOR BELT REPLACEMENT.

This task covers:

a. Removal b. Installation c. Follow-On Maintenance

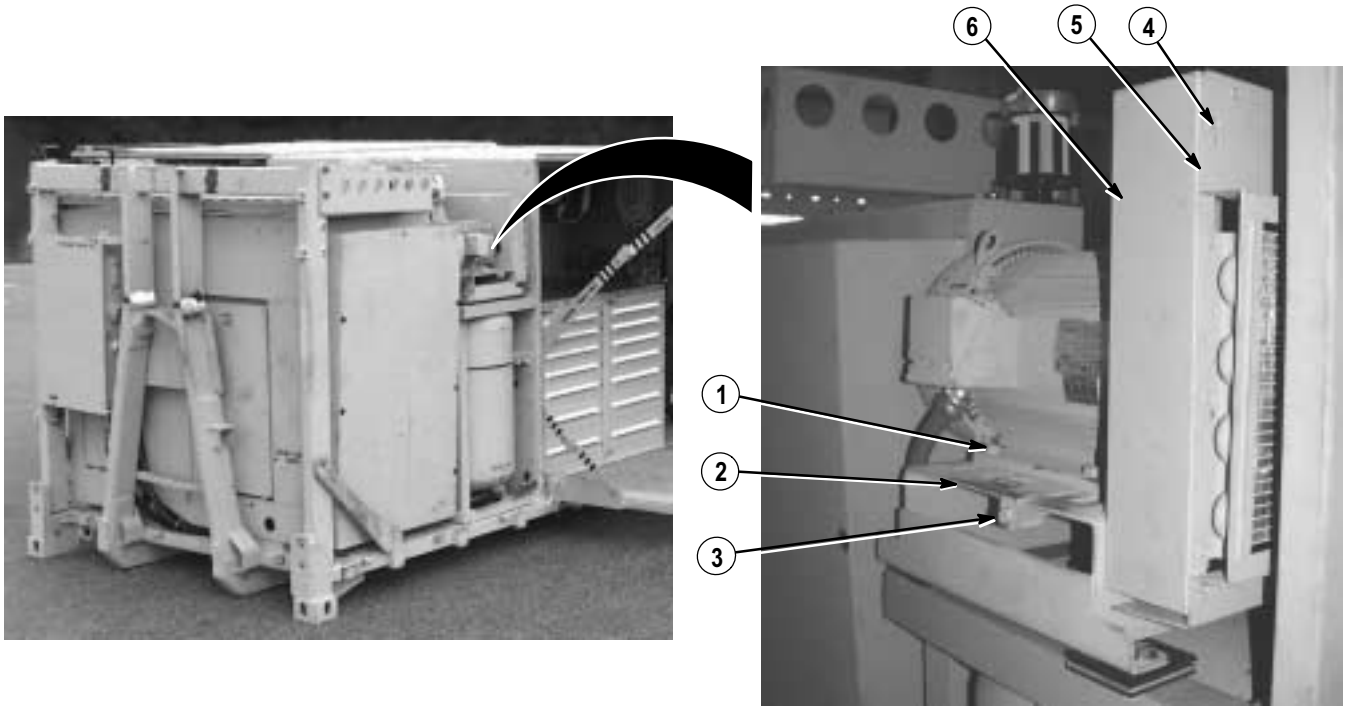
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 30, Appendix G)
Socket Set, 3/8 in. (Item 25, Appendix G)

Materials/Parts
Rags, Wiping (Item 30, Appendix C)
Screw, Self-Tapping (7) (Item 99, Appendix F)

Equipment Condition
FRS unloaded, (TM 9-4940-568-10)
Disconnect batteries, (TM 9-4940-568-10)

a. Removal.



(1) Loosen four screws (1) from air compressor frame (2).

(2) Loosen belt tensioner (3) on air compressor frame (2).

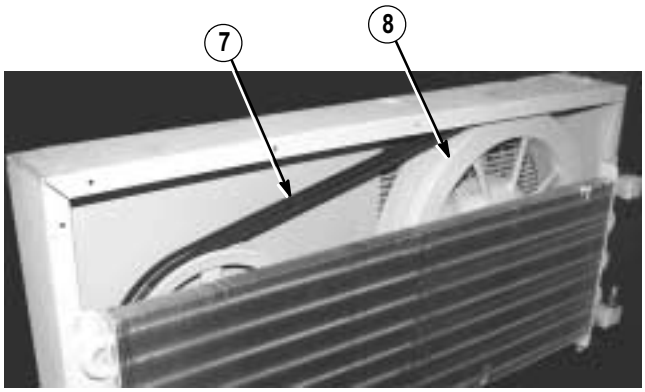
(3) Remove seven self-tapping screws (4) from beltguard cover (5). Discard self-tapping screws.

CAUTION

Excercise care to avoid damaging fins.

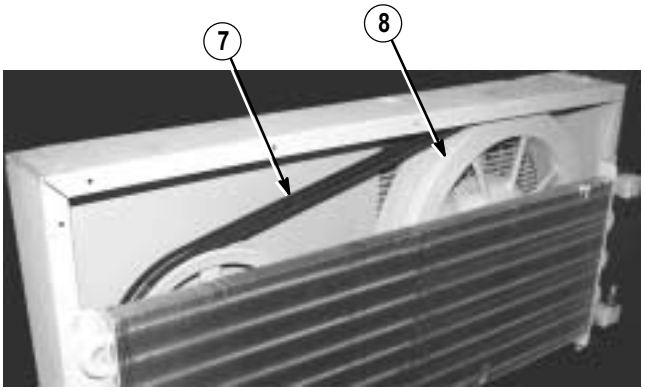
(4) Remove beltguard cover (5) from beltguard shroud (6).

(5) Remove two belts (7) from pulleys (8).



b. Installation.

(1) Position two belts (7) on pulleys (8).



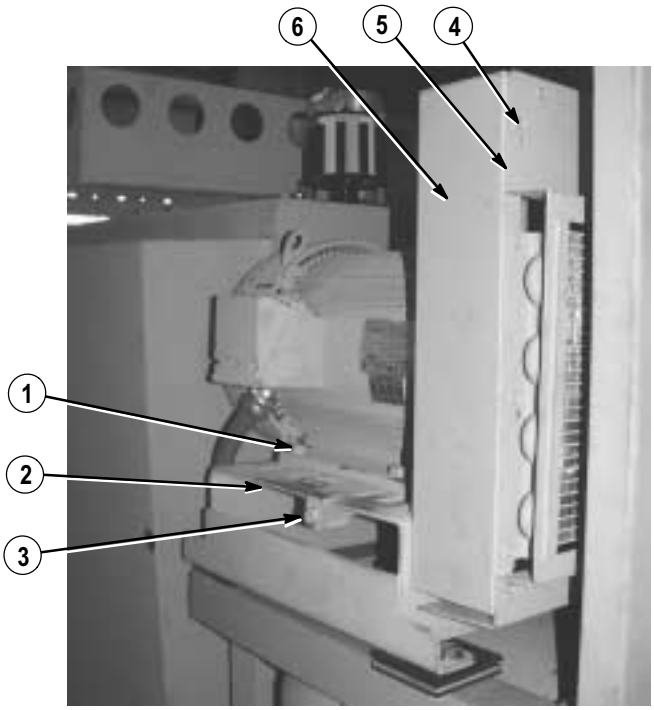
NOTE

Belts are properly adjusted when there is 1/2 in. of deflection when measured between pulleys.

(2) Turn belt tensioner (3) and adjust tension of belt to provide a 1/2 in. of deflection.

(3) Tighten four screws (1) on air compressor frame (2).

(4) Install cover (5) and secure with seven new self-tapping screws (4) on beltguard shroud (6).



c. Follow-On Maintenance:

- Connect batteries, (TM 9-4940-568-10).
- Start generator, (TM 9-4940-568-10).
- Start compressor and check belt operation, (TM 9-4940-568-10).
- Shut off generator and recheck belt tension, (TM 9-4940-568-10).

END OF TASK

11-4. AIR COMPRESSOR SERVICE KIT.

This task covers:

a. Removal b. Installation c. Follow-On Maintenance

INITIAL SETUP

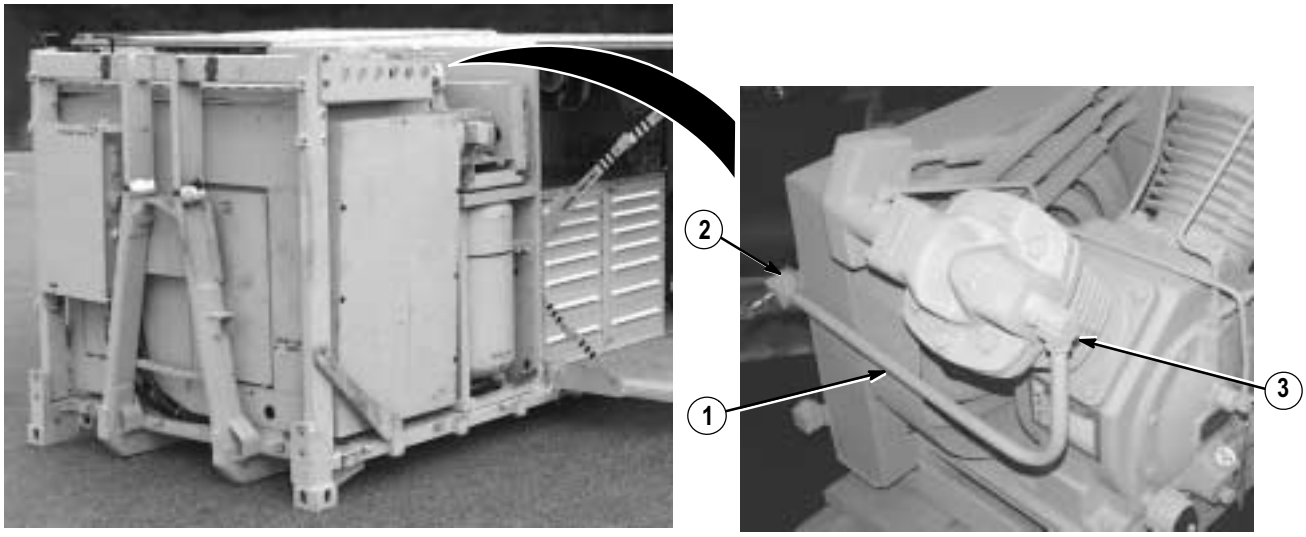
Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 30, Appendix G)
Wrench, Torque (0 To 300 lb-ft [0–407 N·m]) (Item 45, Appendix G)

Materials/Parts
Tags, Identification (Item 40, Appendix C)
Tape, Electrical (Item 39, Appendix C)
Air Compressor Maintenance Kit (Item 1, Appendix F)

Personnel Required
Two

Equipment Condition
FRS unloaded, (TM 9-4940-568-10)
Air filter removed, (Para 11-6)
Air reservoir drained, (TM 9-4940-568-10)
Batteries disconnected, (TM 9-4940-568-10)

a. Removal.



NOTE

- Tag and mark all tubes prior to removal.
- Note position of tubes prior to removal.

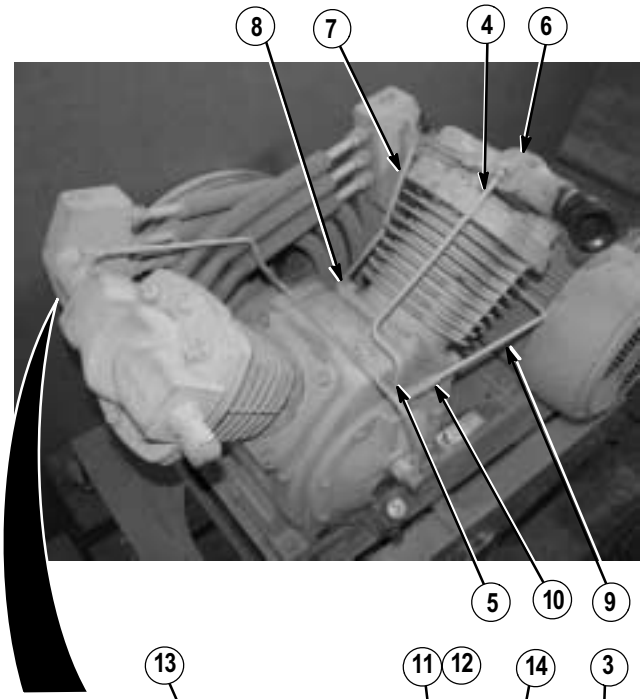
(1) Remove tube assembly (1) from aftercooler coil (2).

(2) Remove tube assembly (1) from high pressure airhead (3).

(3) Remove end cover tube assembly (4) from tube connector (5) and low pressure airhead (6).

(4) Remove breather tube assembly (7) from connector (8) and low pressure airhead (6).

(5) Remove check valve tube assembly (9) from tube connector (10) and low pressure airhead (6).

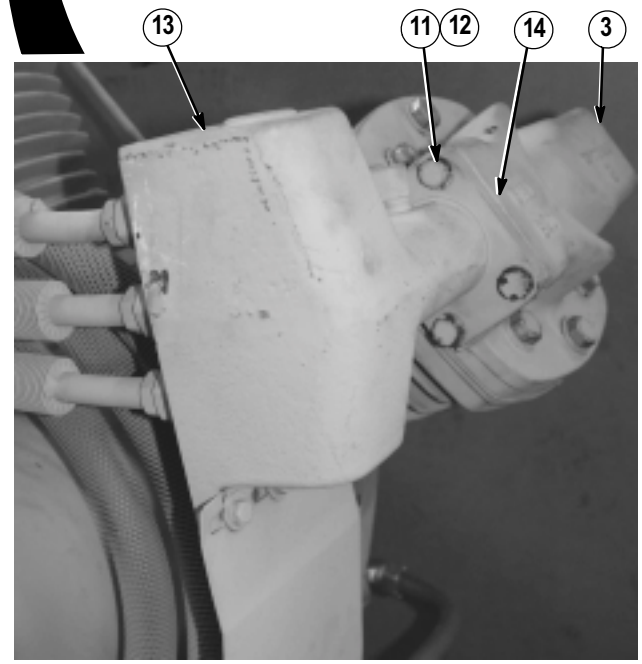


NOTE

High pressure intercooler manifold and low pressure intercooler manifold are removed the same. High pressure intercooler manifold shown.

(6) Remove four screws (11), lockwashers (12), high pressure intercooler manifold (13), gasket (14), from high pressure airhead (3). Discard lockwashers and gasket.

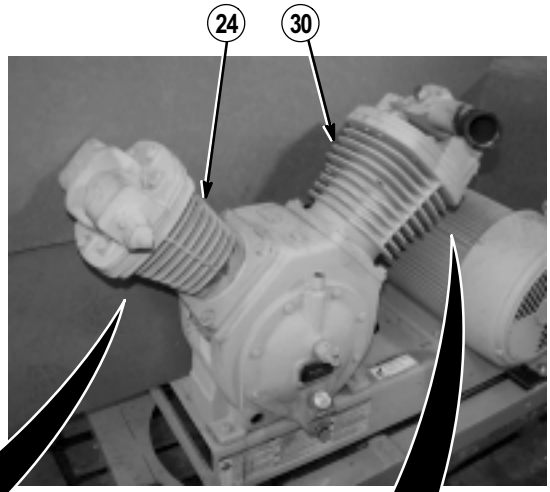
(7) Repeat Step (6) for low pressure intercooler manifold.

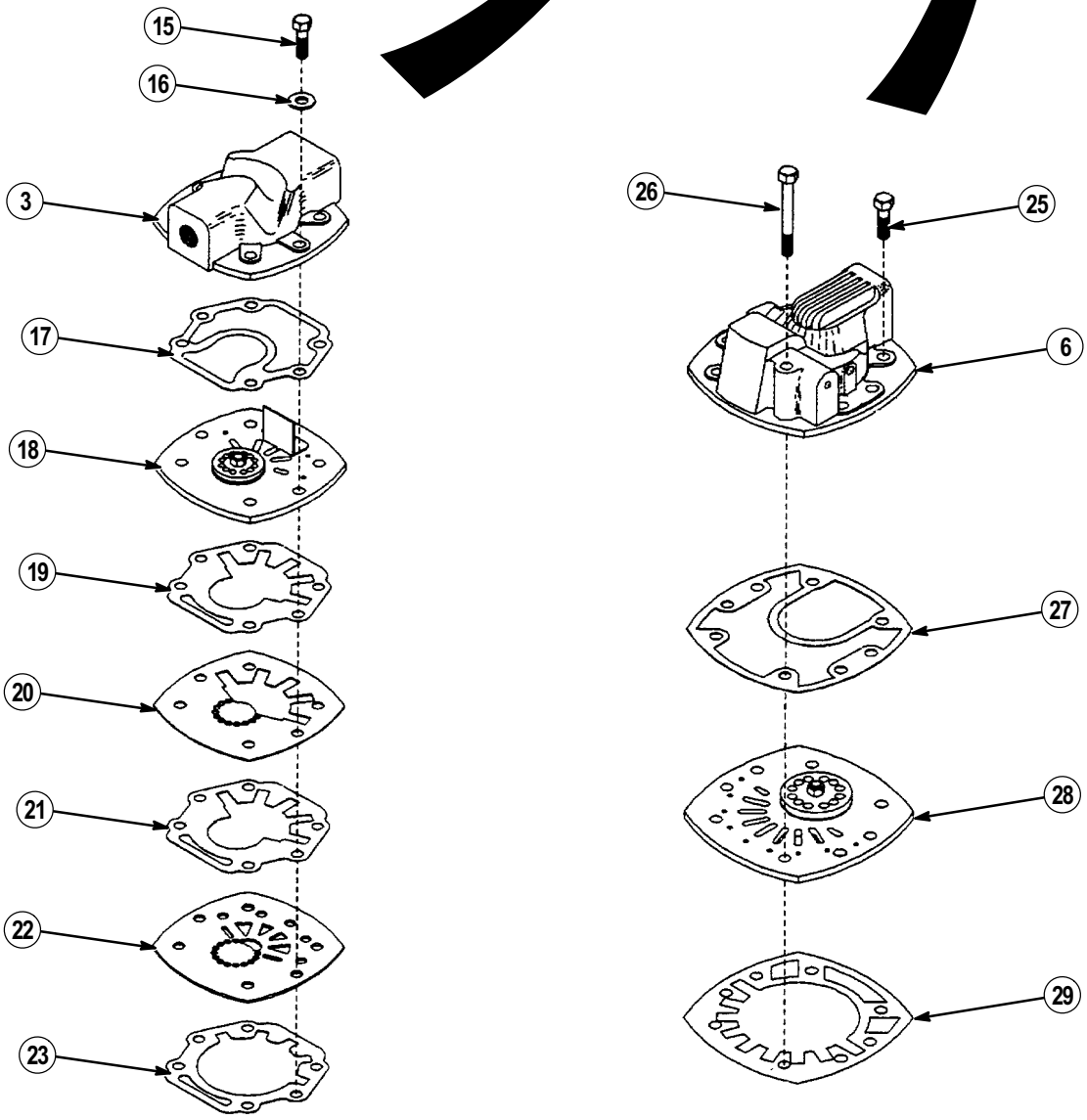


11-4. AIR COMPRESSOR SERVICE KIT (CONT).

(8) Remove six screws (15), washer (16), high pressure airhead (3), airhead gasket (17), plate assembly (18), plate gasket (19), spacer plate (20), plate gasket (21), disc plate (22), and valve plate gasket (23) from high pressure air cylinder (24). Discard gaskets.

(9) Remove five screws (25), screw (26), low pressure airhead (6), airhead gasket (27), valve plate assembly (28) and valve plate assembly (29) from low pressure air cylinder (30). Discard gaskets.

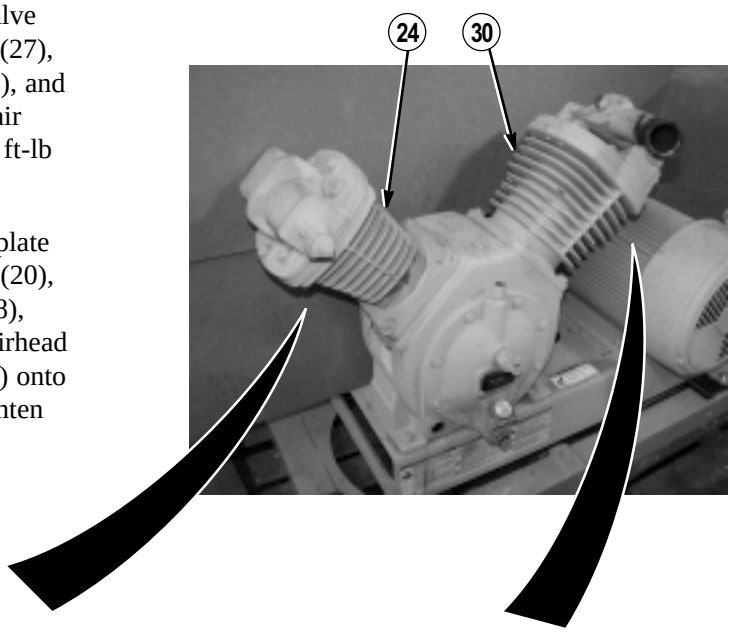


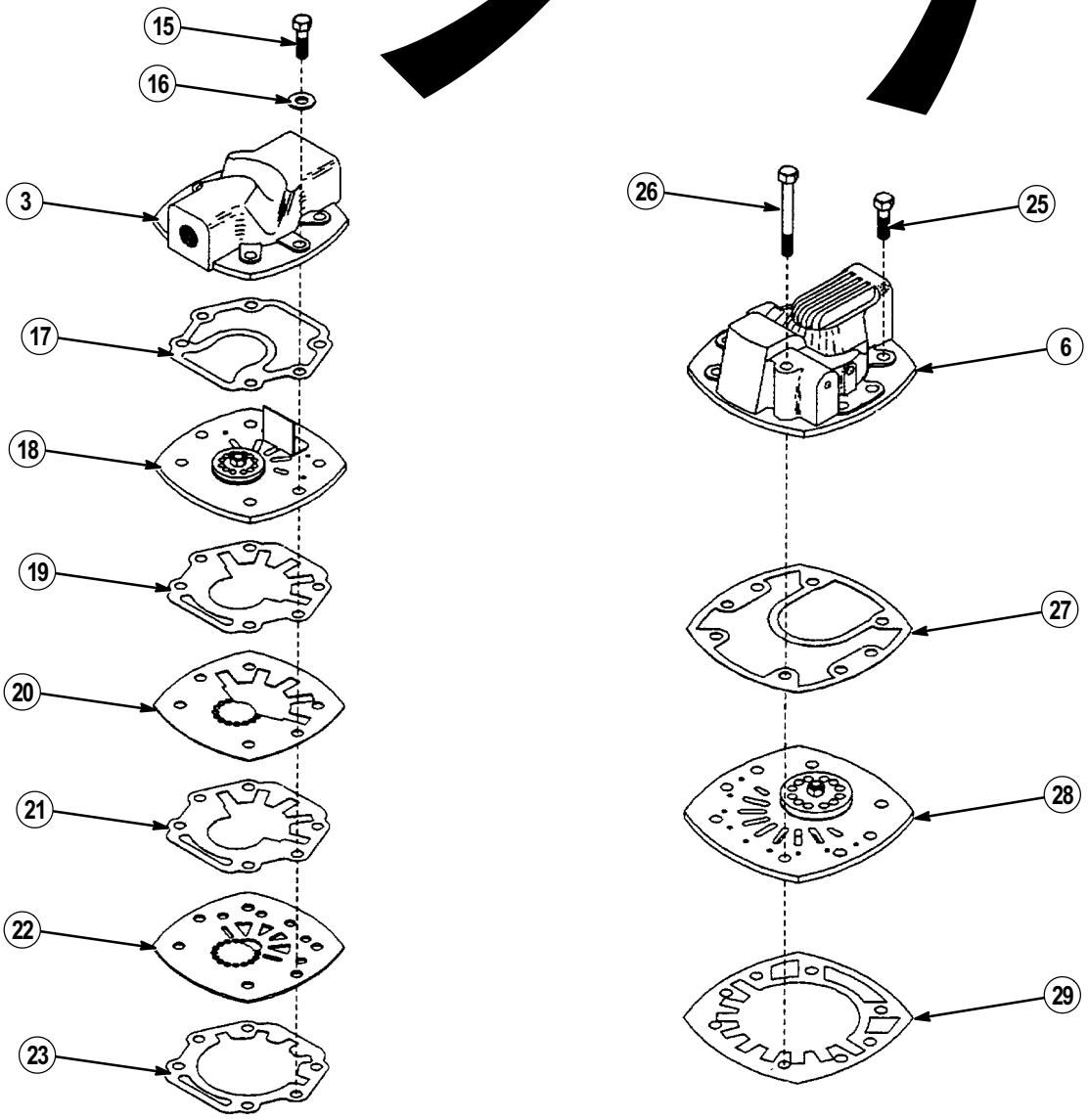


b. Installation.

(1) Install valve plate assembly (29), valve plate assembly (28), airhead gasket (27), low air pressure head (6), screw (26), and five screws (25) onto low pressure air cylinder (30). Tighten screws to 75 ft-lb (102 N·m).

(2) Install valve plate gasket (23), disc plate (22), plate gasket (21), spacer plate (20), plate gasket (19), plate assembly (18), airhead gasket (17), high pressure airhead (3), washer (16), and six screws (15) onto high pressure air cylinder (24). Tighten screws to 203 ft-lb (275 N·m).





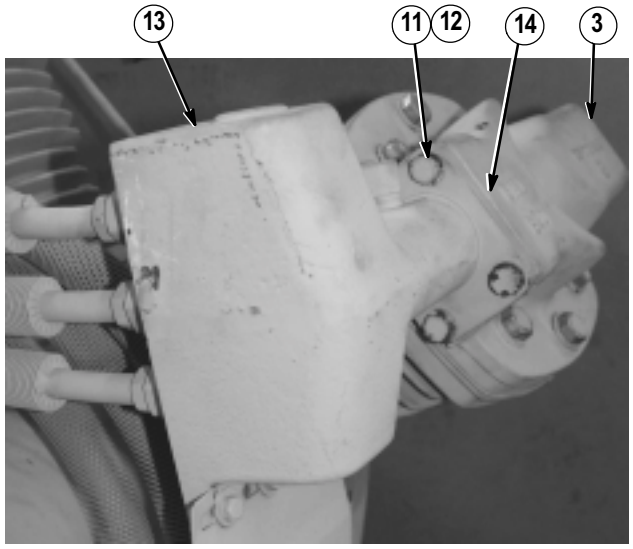
11-4. AIR COMPRESSOR SERVICE KIT (CONT).

NOTE

High pressure intercooler manifold and low pressure intercooler manifold are installed the same. High pressure intercooler manifold shown.

(3) Install gasket (14) and high pressure intercooler manifold (13) on high pressure airhead (3) with four lockwashers (12) and screws (11).

(4) Repeat Step (3) for low pressure intercooler manifold.



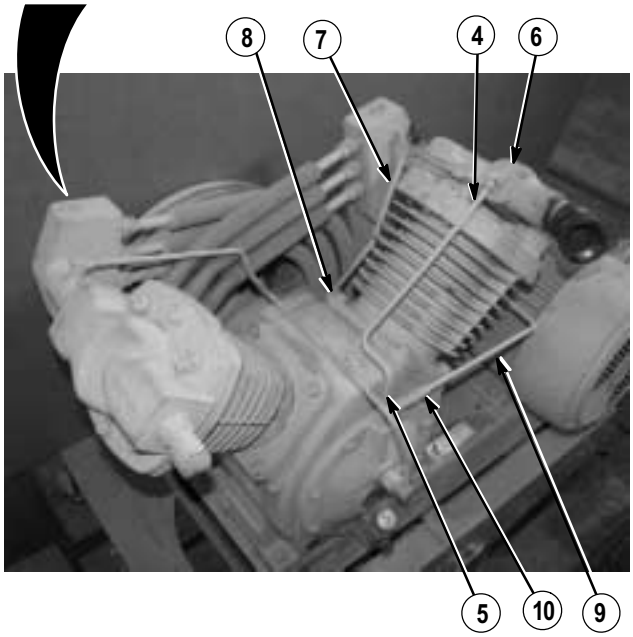
NOTE

Position tubes as noted during removal.

(5) Install check valve tube assembly (9) on tube connector (10) and low pressure airhead (6).

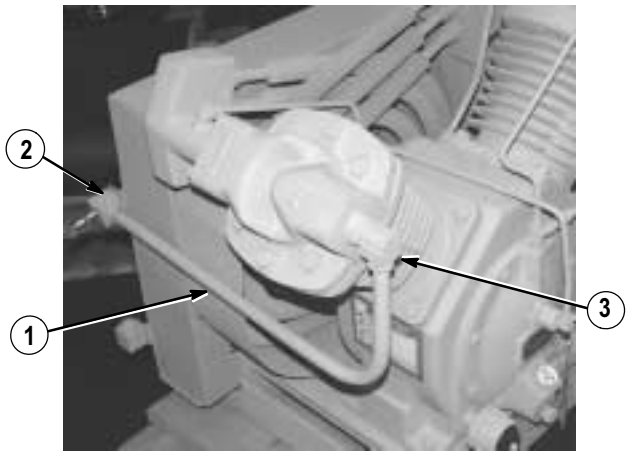
(6) Install breather tube assembly (7) on connector (8) and low pressure airhead (6).

(7) Install end cover tube assembly (4) on tube connector (5) and low pressure airhead (6).



(8) Install tube assembly (1) on aftercooler coil (2).

(9) Install tube assembly (1) on high pressure airhead (3).



c. Follow-On Maintenance:

- Air filter installed, (Para 11-6).
- Connect batteries, (TM 9-4940-568-10).
- Start air compressor and check for leaks, (TM 9-4940-568-10).

11-5. AIR COMPRESSOR OIL LEVEL SWITCH REPLACEMENT.

This task covers:

a. Removal b. Installation c. Follow-On Maintenance

INITIAL SETUP

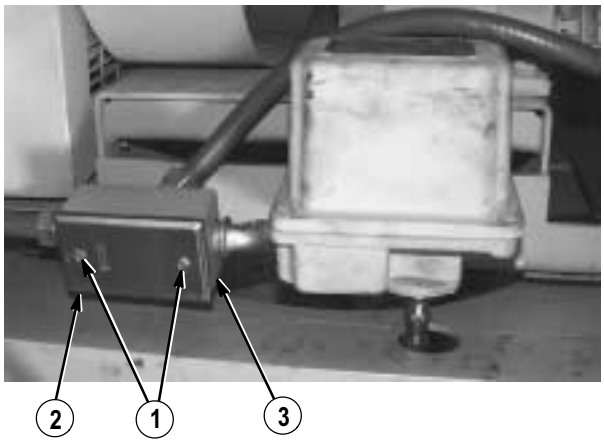
Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 30, Appendix G)
Tool Kit, Electric (Item 29, Appendix G)
Wrench, Combination 1 1/16 in. (Item 34, Appendix G)

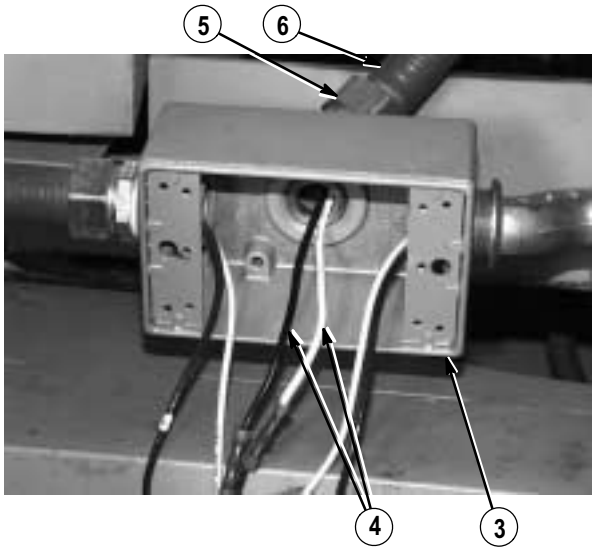
Materials/Parts
Lubricating Oil, Air Compressor (Item 23, Appendix C)

Materials/Parts – Continued
Tags, Identification (Item 40, Appendix C)

Equipment Condition
FRS unloaded, (TM 9-4940-568-10)
Batteries disconnected (TM 9-4940-568-10)
Air compressor crankcase drained (Para 11-9)

a. Removal.





NOTE

Tag and mark all wires prior to removal.

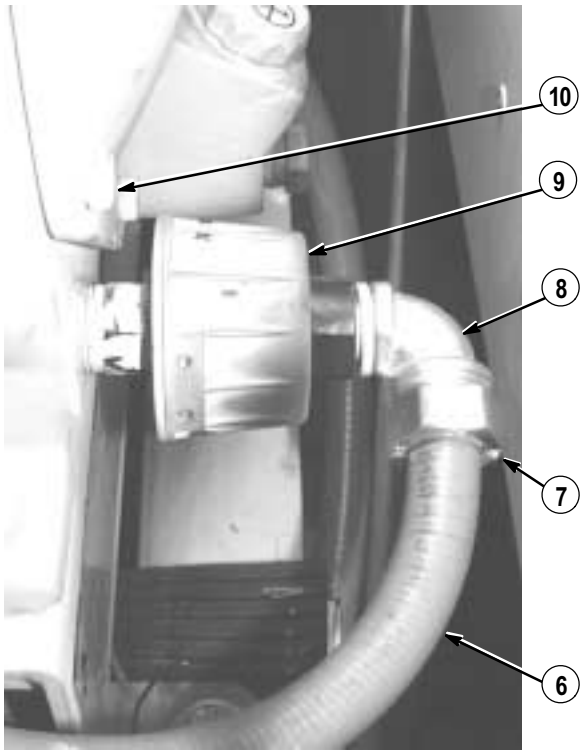
(1) Remove two screws (1) and access plate (2) from junction box (3).

(2) Cut wires (4), loosen nut (5) and remove wiring harness (6) from junction box (3).

11-5. AIR COMPRESSOR OIL LEVEL SWITCH REPLACEMENT (CONT).

(3) Loosen nut (7) and remove wiring harness (6) and elbow (8) from air compressor oil level switch (9).

(4) Remove air compressor oil level switch (9) from air compressor (10).

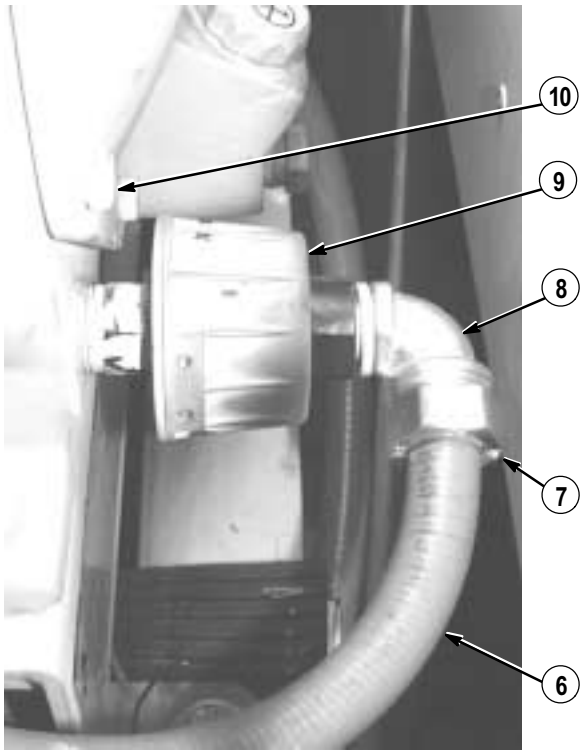


b. Installation.

(1) Install air compressor oil level switch (9) in air compressor (10).

(2) Route wires through elbow (8) and wiring harness (6).

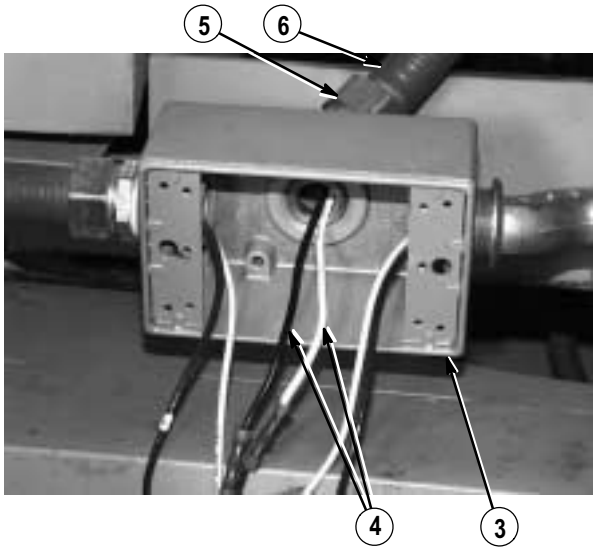
(3) Install elbow (8) in air compressor oil level switch (9) and tighten nut (7).



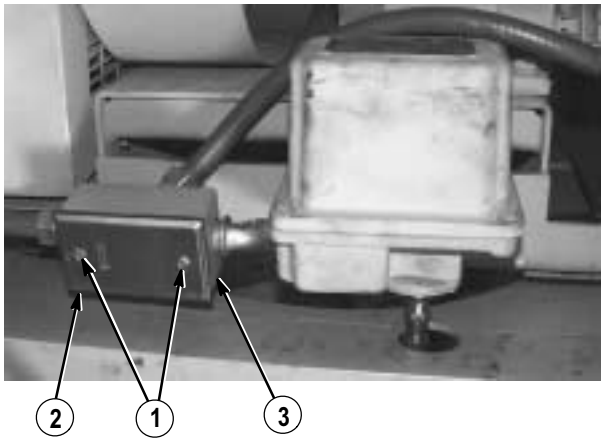
NOTE

Install wires as noted prior to removal.

(4) Route wiring harness (6) through junction box (3) and tighten nut (5). Connect wires (4).



(5) Install access plate (2) with two screws (1) on junction box (3).



c. Follow-On Maintenance:

- Fill air compressor crankcase with oil, (Para 11-9).
- Connect batteries, (TM 9-4940-568-10).
- Start generator, (TM 9-4940-568-10).
- Start air compressor and check operation, (TM 9-4940-568-10).

END OF TASK

11-6. AIR COMPRESSOR AIR FILTER REPLACEMENT.

This task covers:

a. Removal b. Installation

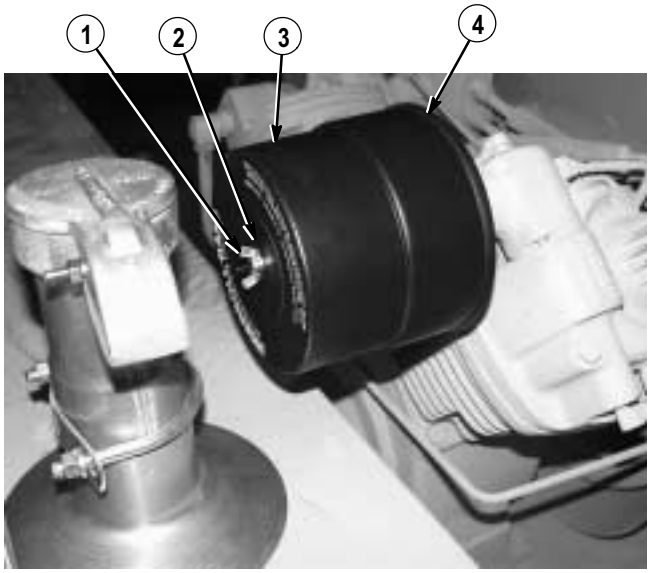
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 30, Appendix G)

Equipment Condition
FRS unloaded, (TM 9-4940-568-10)

Materials/Parts
Rags, Wiping (Item 30, Appendix C)

a. Removal.



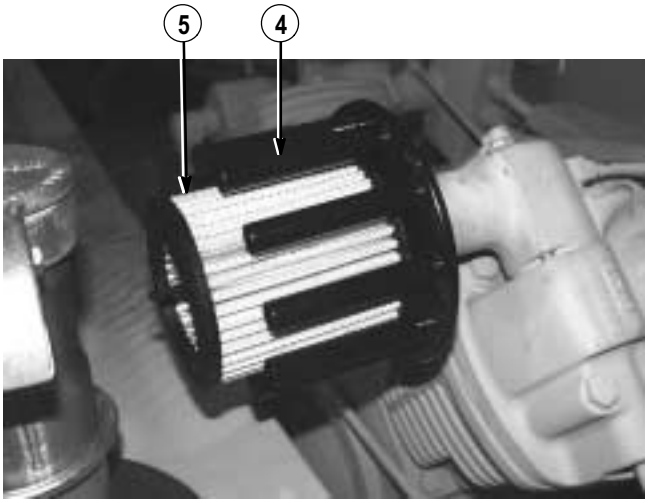
WARNING

Ensure engine is cool before performing this task or injury to personnel may result.

(1) Remove wing nut (1), plastic washer (2) and air filter cover (3) from air filter base (4).

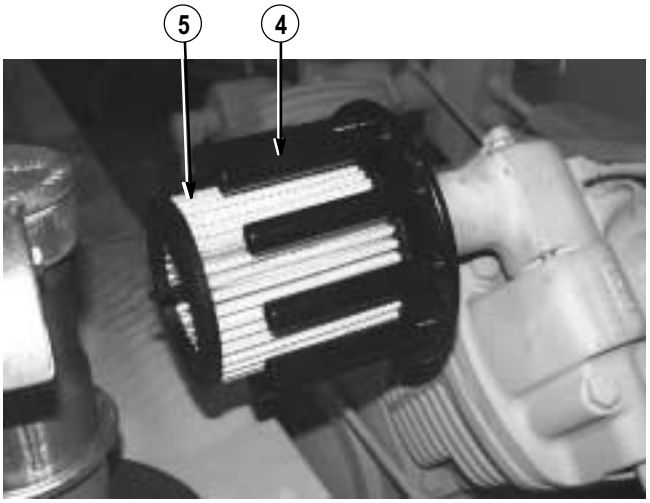
(2) Remove air filter (5) from air filter base (4).

(3) Wipe inside of air filter base (4) with damp cloth to remove contaminants.

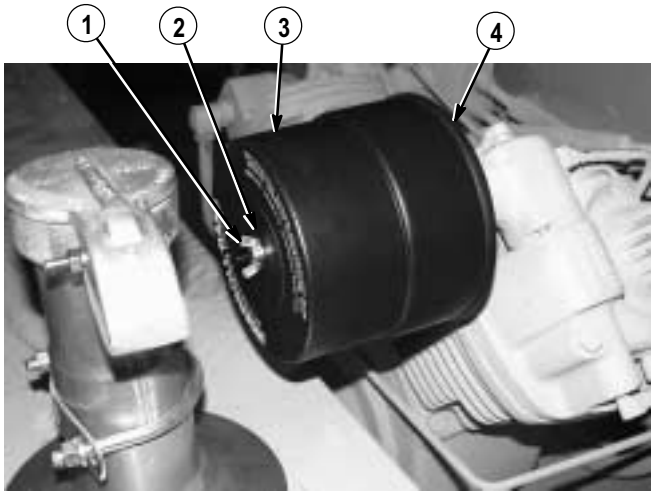


b. Installation.

(1) Install air filter (5) on air filter base (4).



(2) Install air filter cover (3), plastic washer (2) and wing nut (1) on air filter base (4).



END OF TASK

11-7. AIR COMPRESSOR GAGE REMOVAL.

This task covers:

a. Removal b. Installation c. Follow-On Maintenance

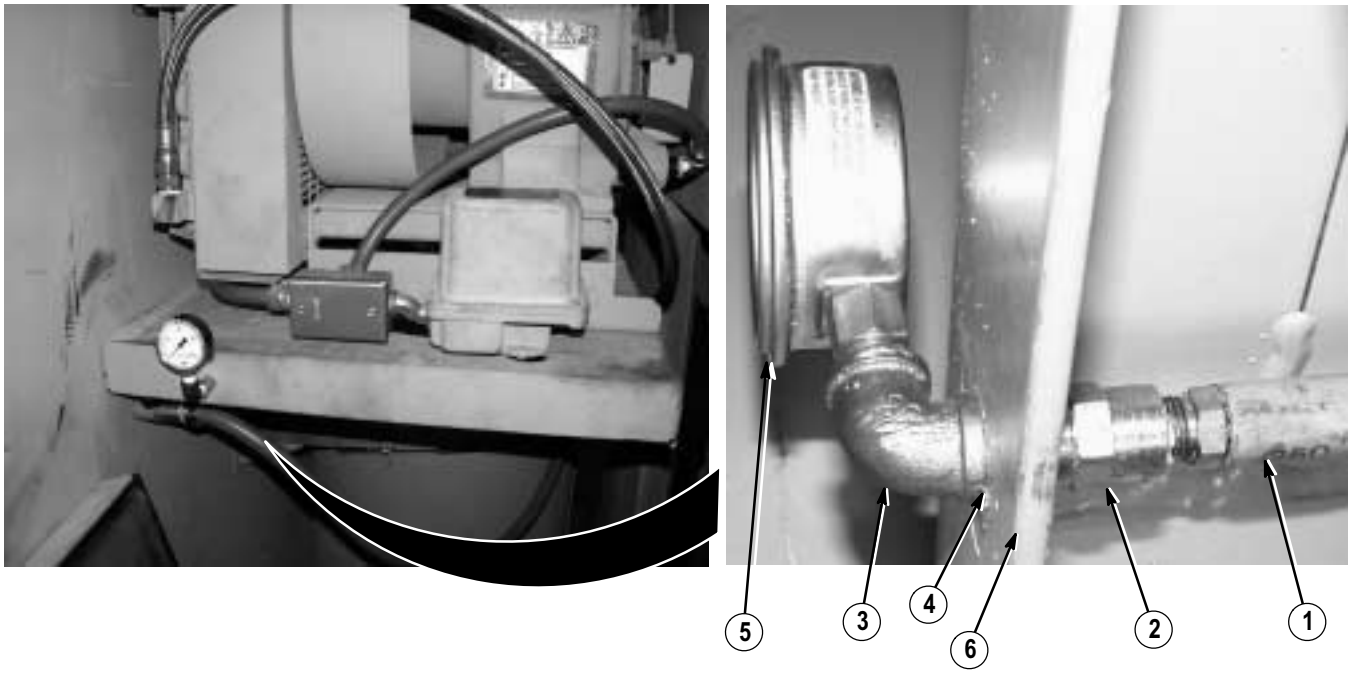
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 30, Appendix G)

Materials/Parts
Sealing Compound (Item 32, Appendix C)

Equipment Condition
FRS unloaded, (TM 9-4940-568-10)
Air compressor reservoir drained, (TM 9-4940-568-10)

a. Removal.

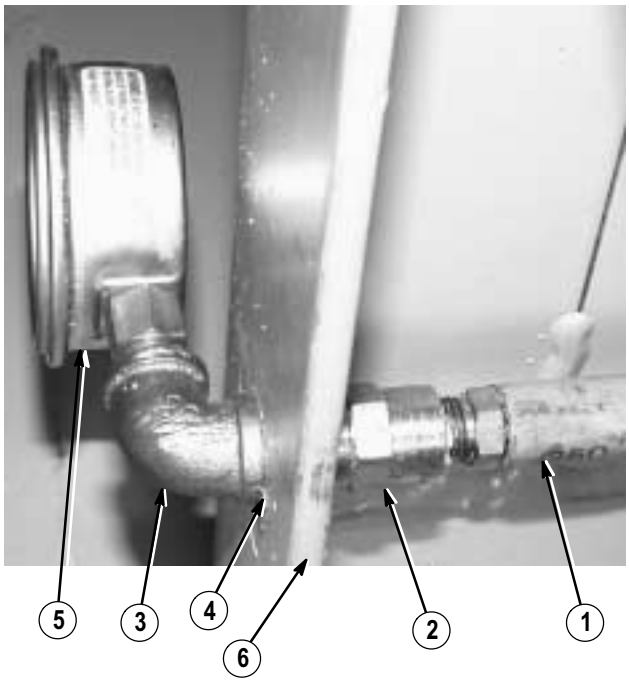


(1) Remove hose (1) from union (2).

(2) Remove elbow (3), nipple (4) and air compressor gage (5) from union (2) and air compressor platform (6).

(3) Remove elbow (3) from air compressor gage (5).

b. Installation.



WARNING

Adhesives, solvents, and sealing compounds can burn easily, can give off harmful vapors, and are harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in well-ventilated area. If adhesive, solvent, or sealing compound gets on skin or clothing, wash immediately with soap and water.

(1) Apply sealing compound to threads of gage (5), nipple (4) and hose (1).

(2) Install elbow (3) on air compressor gage (5).

(3) Install air compressor gage (5), elbow (3), nipple (4) and union (2) to air compressor platform (6)

(4) Install hose (1) on union (2).

c. Follow-On Maintenance:

- Start generator, (TM 9-4940-568-10).
- Start compressor and check operation of gage, (TM 9-4940-568-10).

END OF TASK

11-8. AIR COMPRESSOR HEATER AND THERMOSTAT REPLACEMENT.

This task covers:

a. Removal b. Installation c. Follow-On Maintenance

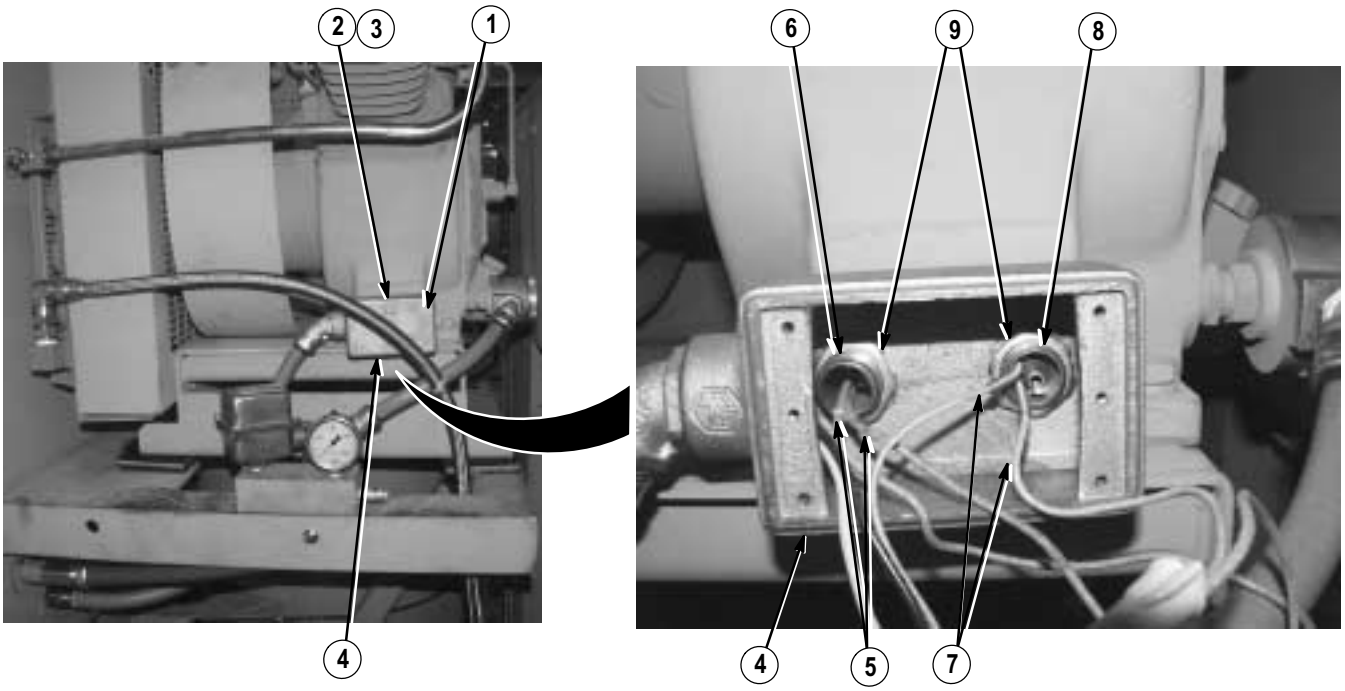
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 30, Appendix G)

Materials/Parts
Sealing Compound (Item 32, Appendix C)
Tags, Identification (Item 40, Appendix C)

Equipment Condition
FRS unloaded, (TM 9-4940-568-10)
Batteries disconnected, (TM 9-4940-568-10)
Air compressor crankcase drained, (Para 11-9)

a. Removal.



NOTE

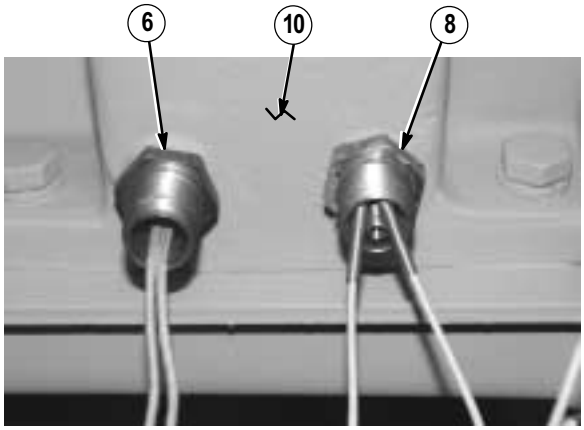
Tag and mark all wires prior to removal.

(1) Remove four screws (1), cover (2) and gasket (3) from junction box (4).

(2) Disconnect two wires (5) from heater (6) and two wires (7) from thermostat (8).

(3) Remove two nuts (9) and junction box (4) from heater (6) and thermostat (8).

(4) Remove heater (6) and thermostat (8) from air compressor (10).



b. Installation.

WARNING

Adhesives, solvents, and sealing compounds can burn easily, can give off harmful vapors, and are harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in well-ventilated area. If adhesive, solvent, or sealing compound gets on skin or clothing, wash immediately with soap and water.

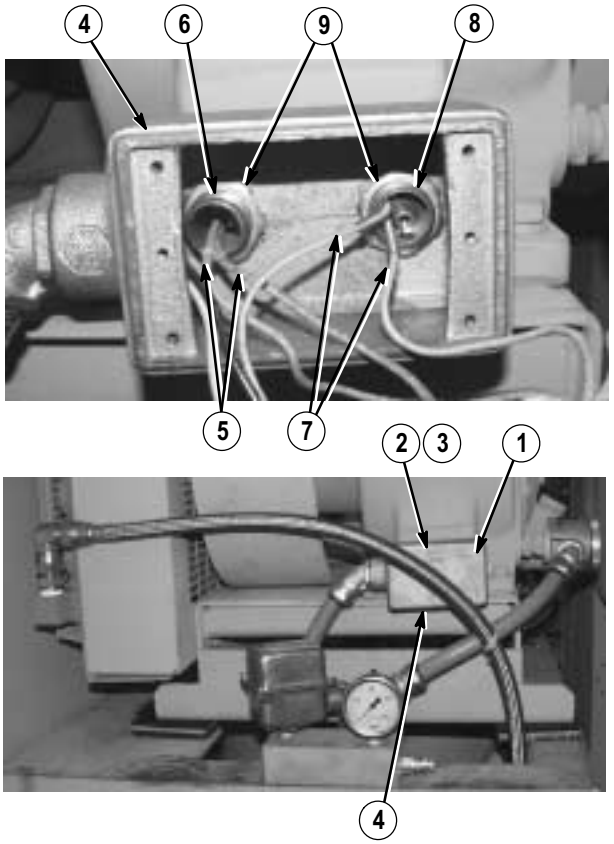
(1) Apply sealing compound to threads of thermostat (8) and heater (6).

(2) Install thermostat (8) and heater (6) on air compressor (10).

(3) Install junction box (4) to thermostat (8) and heater (6) with two nuts (9).

(4) Connect two wires (7) from thermostat (8) and two wires (5) from heater (6) as noted during removal.

(5) Install gasket (3) and cover (2) on junction box (4) with four screws (1).



c. Follow-On Maintenance:

- Fill air compressor crankcase with oil, (Para 11-9).
- Connect batteries, (TM 9-4940-568-10).
- Start generator, (TM 9-4940-568-10).
- Start air compressor and check operation, (TM 9-4940-568-10).

END OF TASK

11-9. AIR COMPRESSOR CRANKCASE OIL DRAIN/FILL.

This task covers:

a. Drain b. Fill c. Follow-On Maintenance

INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 30, Appendix G)
Pan, Drain (Item 20, Appendix G)

Materials/Parts
Oil, Air Compressor Lubricating (Item 23, Appendix C)
Rags, Wiping (Item 30, Appendix C)

Equipment Condition
FRS unloaded, (TM 9-4940-568-10)

a. Drain.

NOTE

- Position drain pan under drain plug to catch oil.
- Air compressor oil capacity is approximately four quarts or 3.8 liters.

(1) Remove drain plug (1) from air compressor crankcase (2) and let oil drain.

(2) Install drain plug (1) in air compressor crankcase (2).

b. Fill.

(1) Remove oil level dipstick (3) and add oil until level reaches bottom thread of dipstick hole.

(2) Install oil level dipstick (3) in air compressor crankcase (2).

c. Follow-On Maintenance:

- Start generator, (TM 9-4940-568-10).
- Start air compressor and check operation, (TM 9-4940-568-10).

END OF TASK

11-10. AIR COMPRESSOR PRESSURE SWITCH REPLACEMENT.

This task covers:

a. Removal
b. Disassembly
c. Assembly
d. Installation
e. Follow-On Maintenance

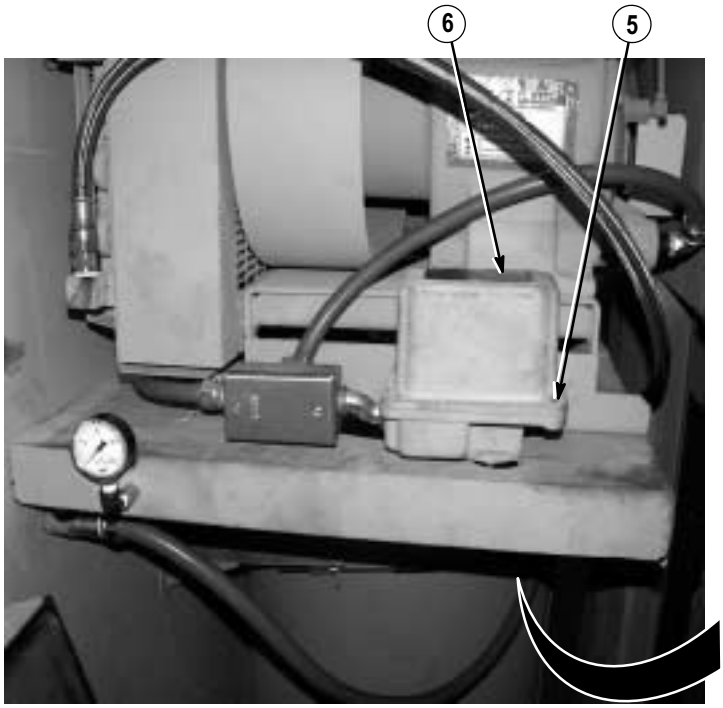
INITIAL SETUP

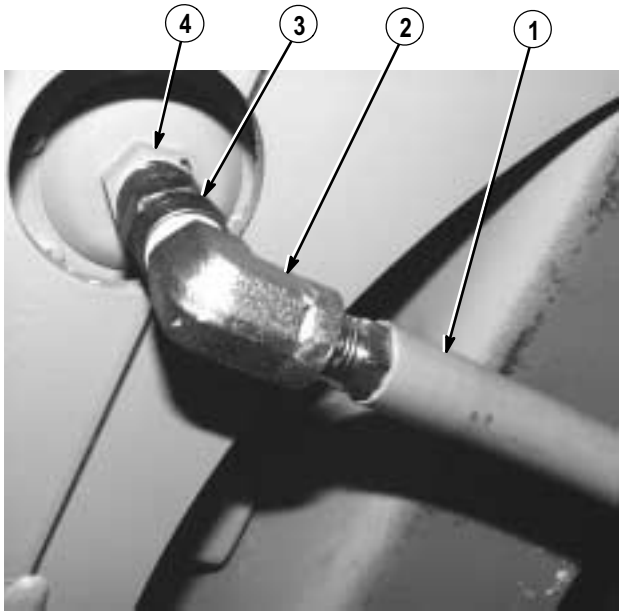
Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 30, Appendix G)
Tool Kit, Electric (Item 29, Appendix G)

Materials/Parts
Tags, Identification (Item 40, Appendix C)
Locknut (2) (Item 52, Appendix F)

Equipment Condition
FRS unloaded, (TM 9-4940-568-10)
Batteries disconnected, (TM 9-4940-568-10)
Air reservoir drained, (TM 9-4940-568-10)

a. Removal.





NOTE

Note position of elbow prior to disassembly.

(1) Remove hose (1) from elbow (2).

(2) Remove elbow (2) and adapter (3) from pressure switch (4).

(3) Remove four screws (5) and cover (6) from pressure switch (4).

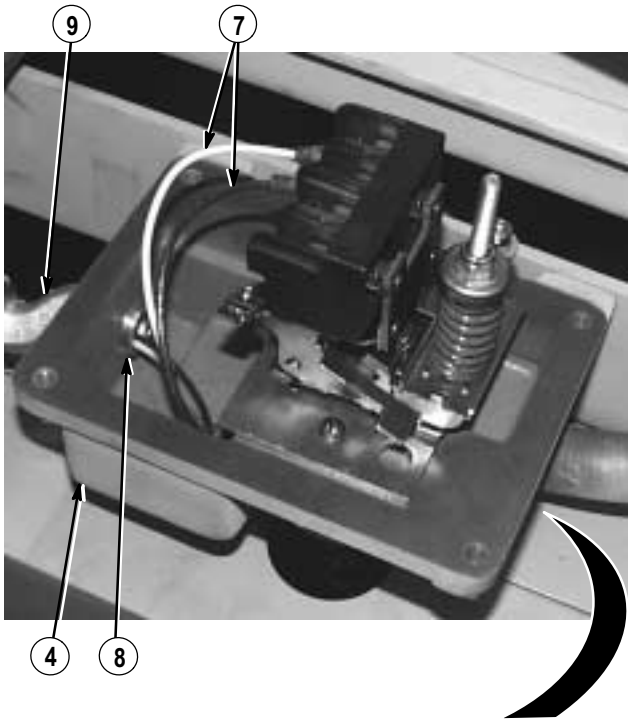
11-10. AIR COMPRESSOR PRESSURE SWITCH REPLACEMENT (CONT).

NOTE

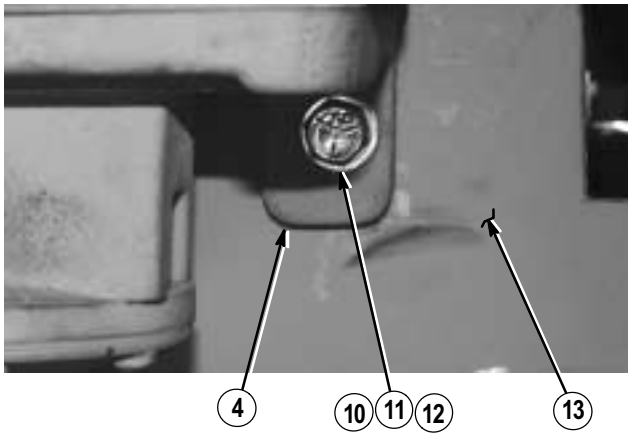
Tag and mark all wires prior to removal.

(4) Disconnect two wires (7) from pressure switch (4).

(5) Remove nut (8) from pressure switch (4) and electrical offset (9).



(6) Remove two screws (10), four washers (11) and two locknuts (12) and pressure switch (4) from air compressor bracket (13). Discard locknuts.



b. Disassembly.

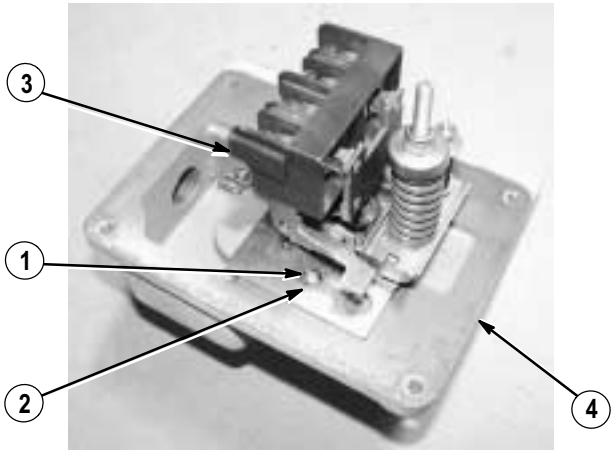
(1) Remove three screws (1), lockwashers (2), and switch mechanism (3) from lower enclosure (4). Discard lockwashers.

NOTE

Note position of diaphragm prior to removal.

(2) Remove six screws (5), lockwashers (6), diaphragm cover (7) and diaphragm (8) from lower enclosure (4). Discard lockwashers.

(3) Remove diaphragm rod (9) from lower enclosure (4).



c. Assembly.

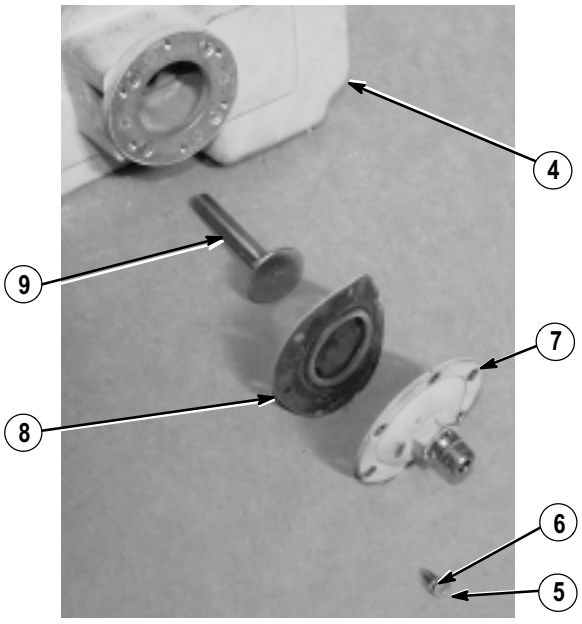
(1) Install diaphragm rod (9) onto lower enclosure (4).

NOTE

Install diaphragm in location and position noted during disassembly.

(2) Install diaphragm (8) and diaphragm cover (7) on lower enclosure (4) with six lockwashers (6) and screws (5).

(3) Install switch mechanism (3) onto lower enclosure (4) with three lockwashers (2) and screws (1).



11-10. AIR COMPRESSOR PRESSURE SWITCH REPLACEMENT (CONT).

d. Installation.

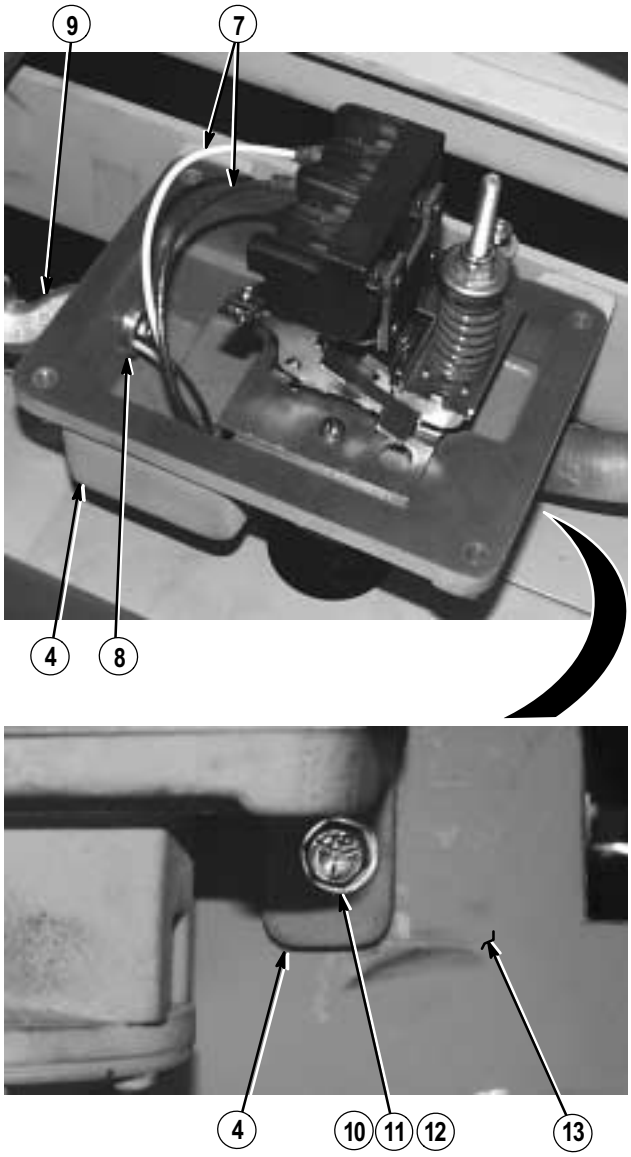
(1) Install pressure switch (4) on air compressor bracket (13) with two screws (10), four washers (11) and two locknuts (12).

(2) Install nut (8) on pressure switch (4) and electrical offset (9).

NOTE

Install wires in location as noted prior to removal.

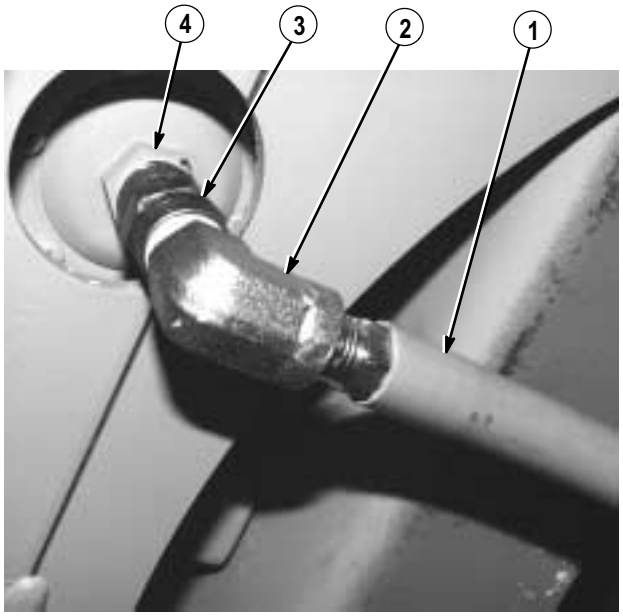
(3) Install two wires (7) on pressure switch (4).



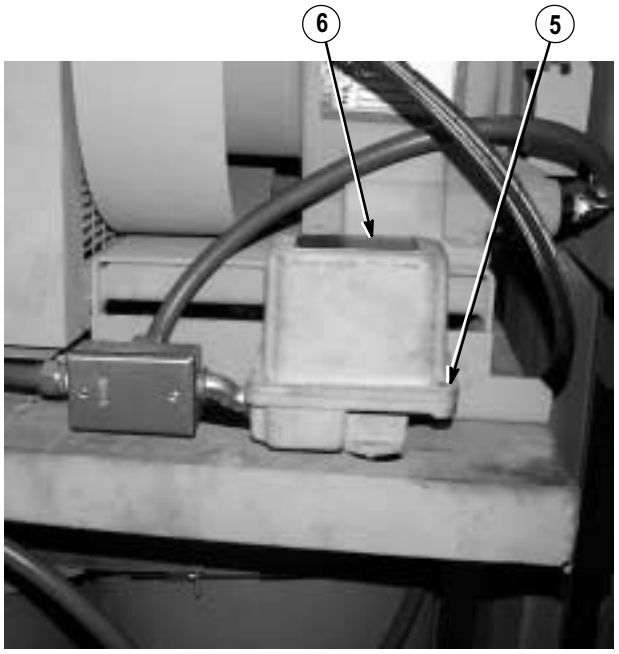
(4) Install hose (1), elbow (2) and adapter (3) on bottom of pressure switch (4) in location noted in removal.

(5) Connect batteries (TM 9-4940-568-10).

(6) Adjust air compressor pressure switch (Para 11-11)



(7) Install cover (6) with four screws (5).



e. Follow-On Maintenance:

- Start air compressor and check for leaks, (TM 9-4940-568-10).

END OF TASK

11-11. AIR COMPRESSOR PRESSURE SWITCH ADJUSTMENT.

This task covers:

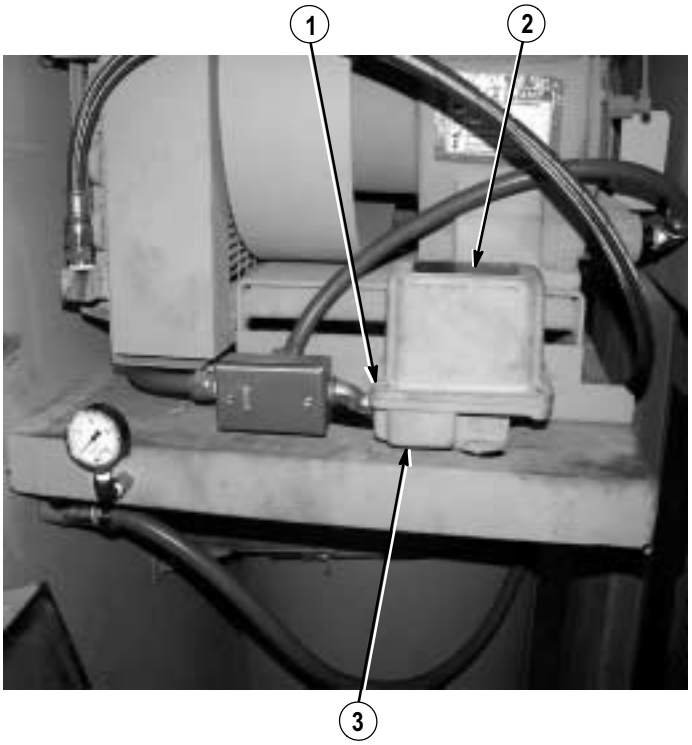
a. Adjustment b. Follow-On Maintenance

INITIAL SETUP

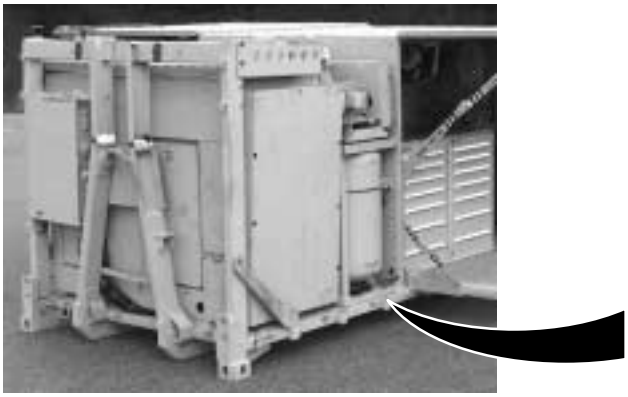
Tools and Special Tools
Tool Kit, General Mechanic's: Automotive
(Item 30, Appendix G)

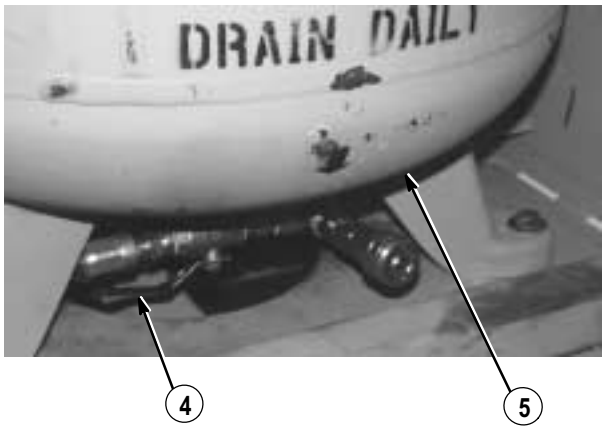
Equipment Condition
FRS unloaded, (TM 9-4940-568-10)
Air reservoir drained, (TM 9-4940-568-10)

a. Adjustment.



(1) Remove four screws (1) and cover (2) from air compressor pressure switch (3).





NOTE

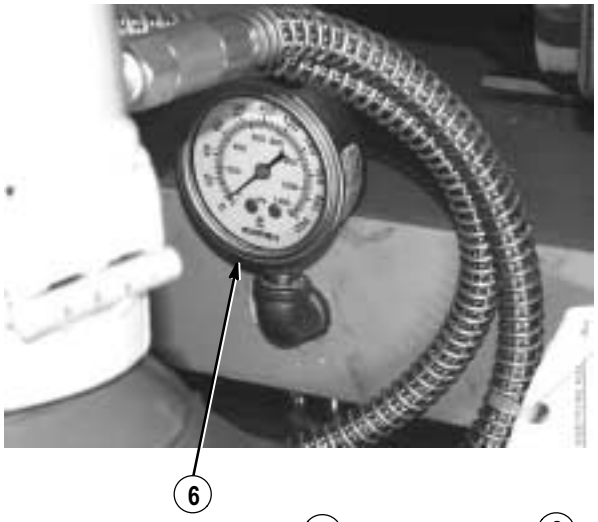
The following adjustment changes both high and low operating points. Turning range spring nut clockwise will increase the setting.

(2) Open air valve (4) on air reservoir (5).

(3) Start generator (TM 9-4940-568-10).

(4) Start air compressor (TM 9-4940-568-10).

(5) While observing air gage (6), adjust range spring nut (7), until air compressor cuts off at 175 lbs (1206 kPa).



NOTE

Turn differential spring nut clockwise to increase the pressure difference between high and low operating points.

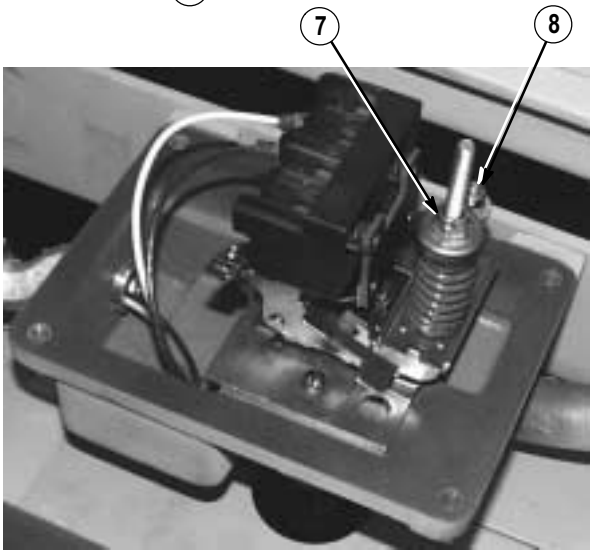
(6) While observing air gage (6) adjust differential spring nut (8), until air compressor restarts at 110 psi (758 kPa).

(7) Repeat Steps (5) and (6) until desired readings are achieved.

(8) Close air valve (4) on air reservoir (5).

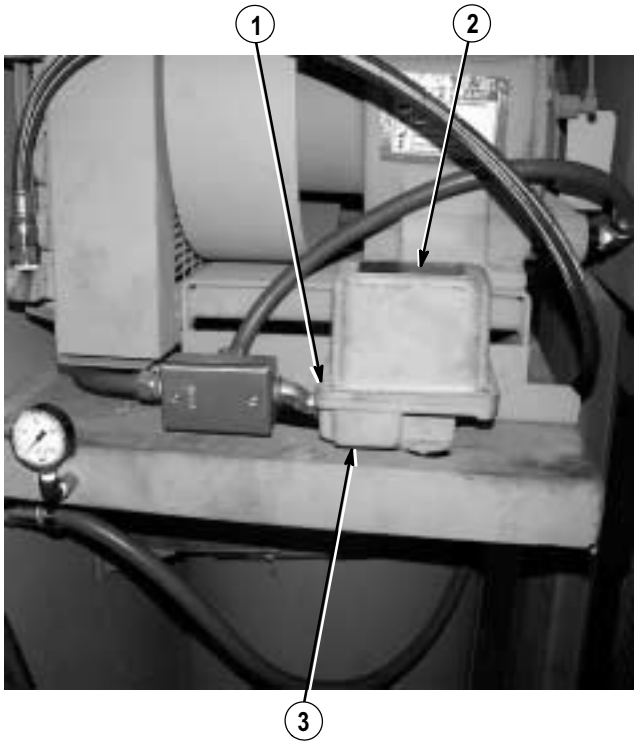
(9) Shut off air compressor.

(10) Shut off generator.



11-11. AIR COMPRESSOR PRESSURE SWITCH ADJUSTMENT (CONT).

(11) Install cover (2) on air compressor pressure switch (3) with four screws (1).



b. Follow-On Maintenance:

- Start air compressor and check for leaks, (TM 9-4940-568-10).

END OF TASK

11-12. PNEUMATIC HOSE REEL AND 3/8" HOSE REPAIR.

This task covers:

a. Removal
b. Disassembly
c. Cleaning/Inspection
d. Assembly
e. Installation
f. Follow-On Maintenance

INITIAL SETUP

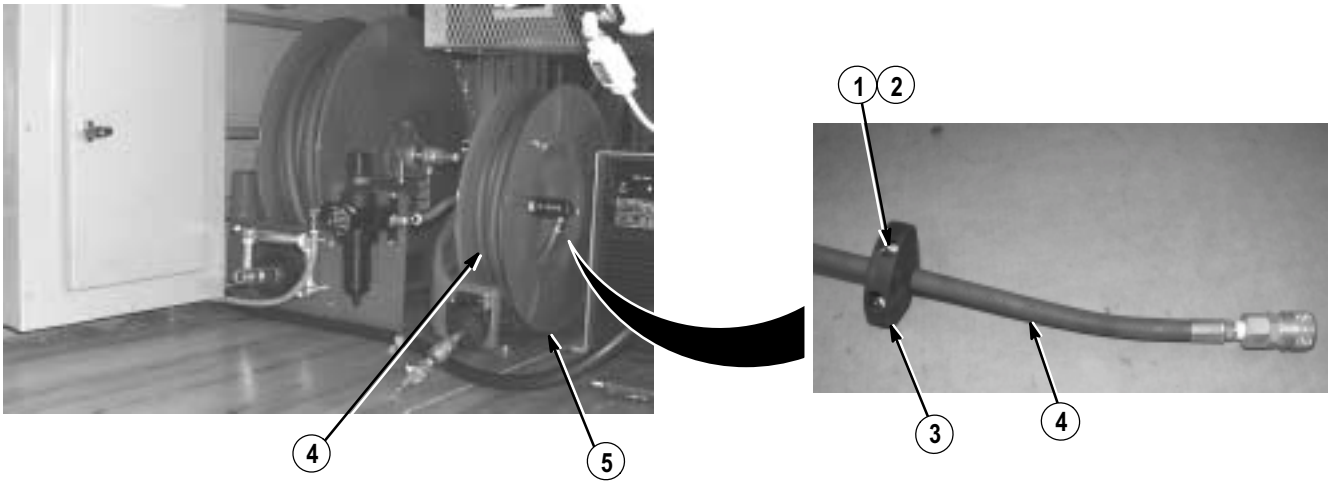
Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 30, Appendix G)

Materials/Parts
Cloth, Cleaning (Item 13, Appendix C)
Grease, Automotive and Artillery (GAA) (Item 20, Appendix C)
Sealing Compound (567) (Item 32, Appendix C)
Solvent, Drycleaning (Item 38, Appendix C)

Materials/Parts - Continued
Gasket (Item 7, Appendix F)
Locknut (4) (Item 35, Appendix F)
Locknut (4) (Item 29, Appendix F)
Locknut (4) (Item 49, Appendix F)
Locknut (6) (Item 24, Appendix F)
Snap Ring (Item 96, Appendix F)

Equipment Condition
FRS unloaded, (TM 9-4940-568-10)
Air reservoir drained, (TM 9-4940-568-10)

a. Removal.



WARNING

Hose reel assembly is under pressure. Avoid releasing latching mechanism during removal and installation. Failure to comply could result in injury to personnel.

(1) Remove two screws (1), nuts (2) and hose bumper assembly (3) from hose (4).

(2) Payout entire length of hose (4) from hose reel assembly (5).

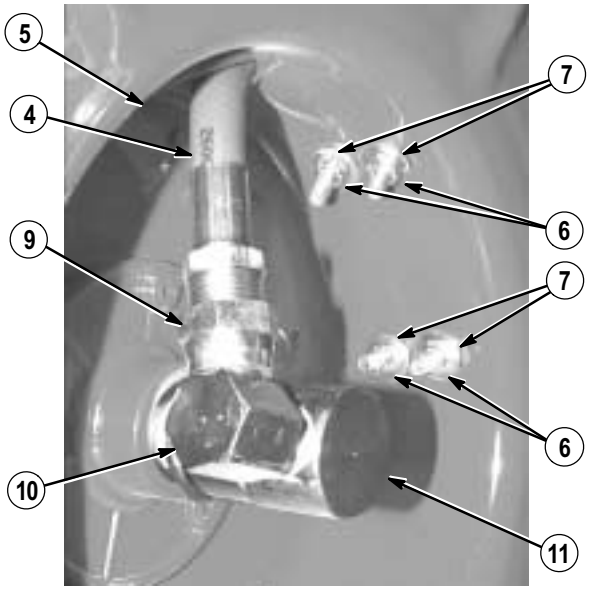
11-12. PNEUMATIC HOSE REEL AND 3/8” HOSE REPAIR (CONT).

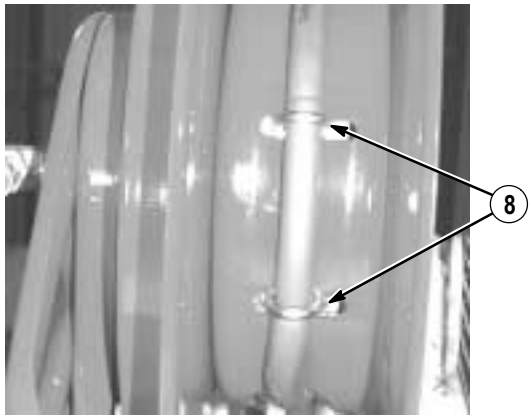
(3) Remove four locknuts (6), washers (7) and two u-bolts (8) from hose reel assembly (5). Discard locknuts.

(4) Loosen nut (9) and remove hose (4) from hose reel assembly (5).

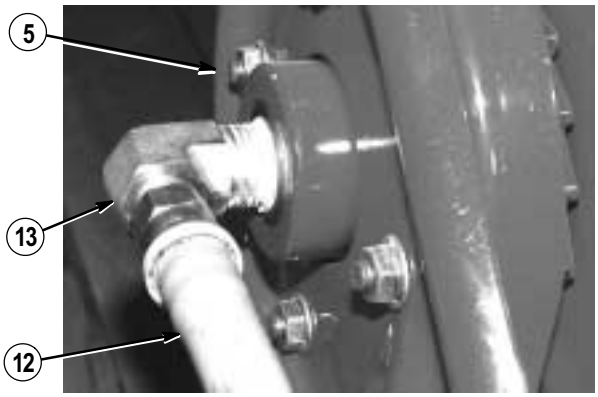
(5) Slowly unwind hose reel assembly (5) to remove spring tension.

(6) Remove hose fitting (10) and adapter (11) from hose reel assembly (5).

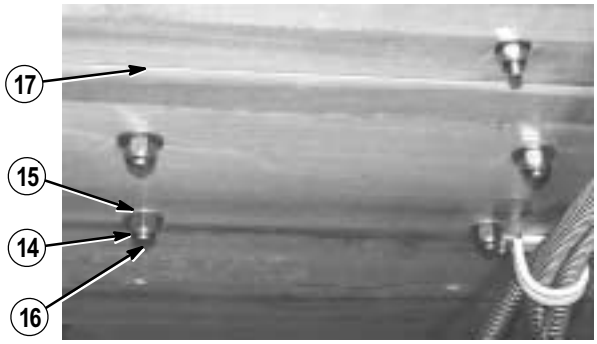




(7) Remove hose (12) and fitting (13) from hose reel assembly (5).



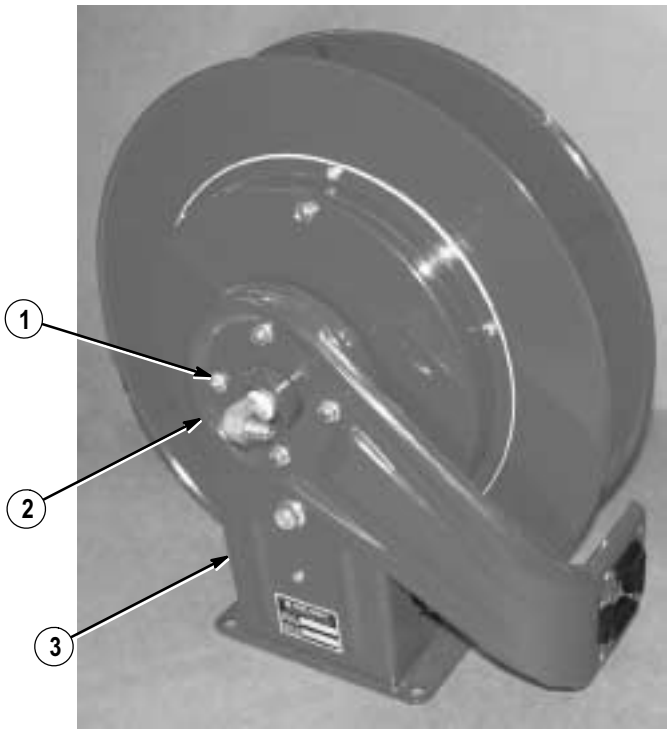
(8) Remove four locknuts (14), washers (15), screws (16) and hose reel assembly (5) from tool cabinet (17). Discard locknuts.



11-12. PNEUMATIC HOSE REEL AND 3/8” HOSE REPAIR CONT).

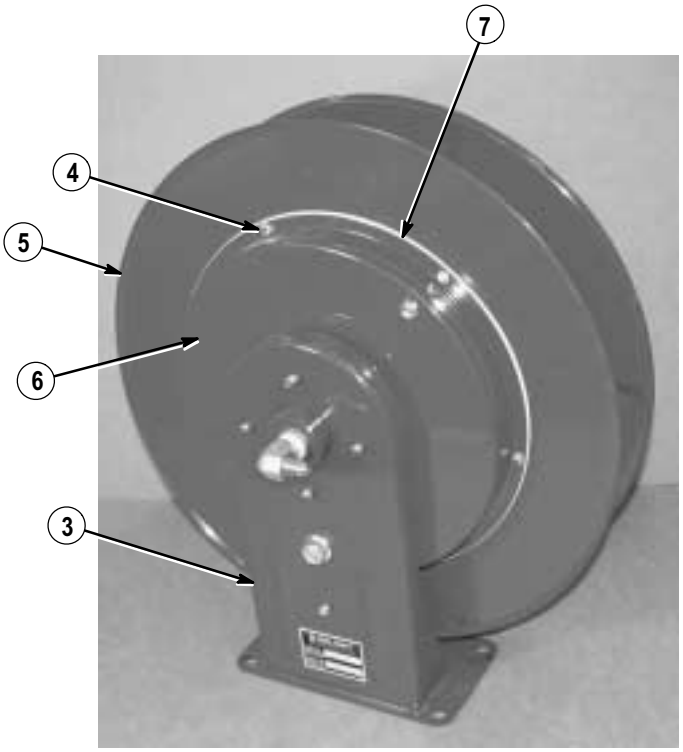
b. Disassembly.

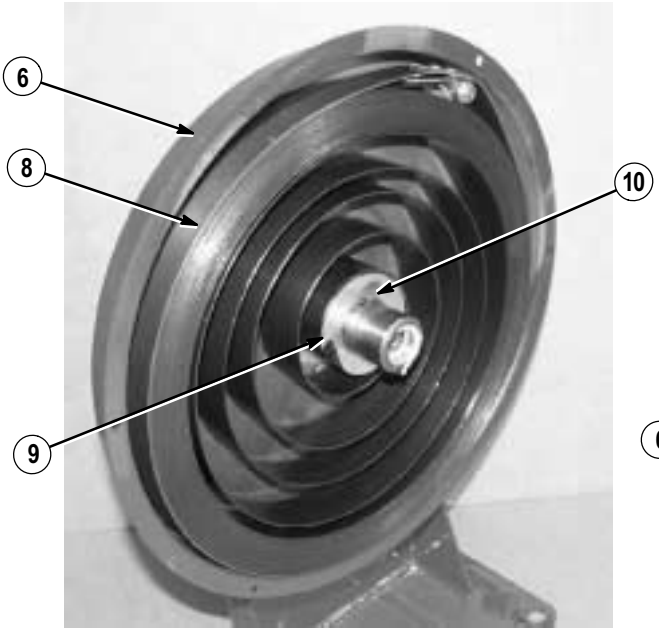
(1) Remove four locknuts (1) and guide arm with rollers (2) from hose reel base (3). Discard locknuts.

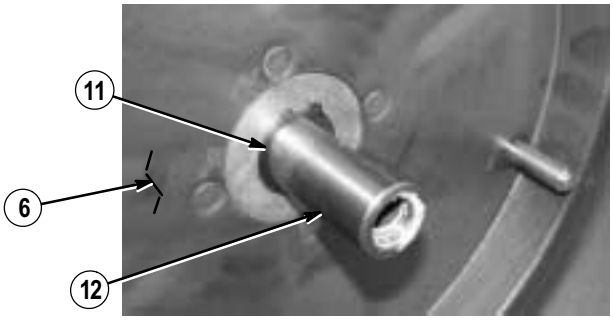


(2) Remove six locknuts (4) and sheave assembly (5) from spring case (6). Discard locknuts.

(3) Remove gasket (7) from sheave assembly (5). Discard gasket.







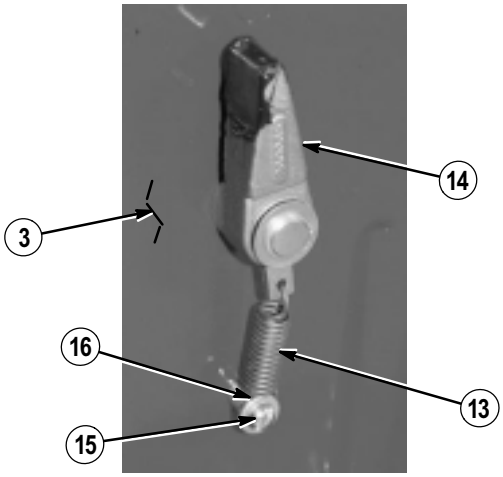
WARNING

Use extreme care when removing drive spring. Spring is under tension and can act as a projectile when released and could cause eye injury.

NOTE

Note position of drive spring, prior to removal.

(4) Remove drive spring (8), spring arbor (9) and spring arbor key (10) from spring case (6).



WARNING

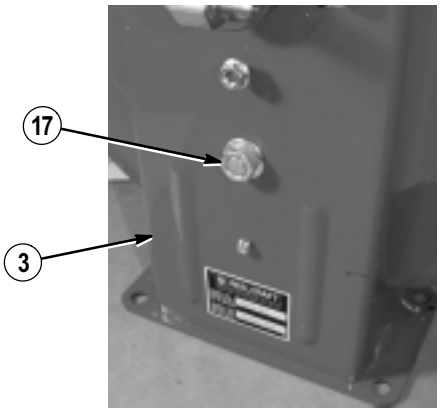
Use care when removing or installing retaining rings. Retaining rings are under spring tension and can act as projectiles when released and could cause eye injury.

(5) Remove snap ring (11) and spring case (6) from main shaft (12). Discard snap ring.

(6) Remove spring (13) from latch pawl (14).

(7) Remove screw (15), washer (16) and spring (13) from hose reel base (3).

(8) Remove hex nut (17) and latch pawl (14) from hose reel base (3).



11-12. PNEUMATIC HOSE REEL AND 3/8” HOSE REPAIR (CONT).

c. Cleaning/Inspection.

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.

(1) Clean and inspect drive spring, spring case, latch pawl, spring, and guide arm rollers per the information below.

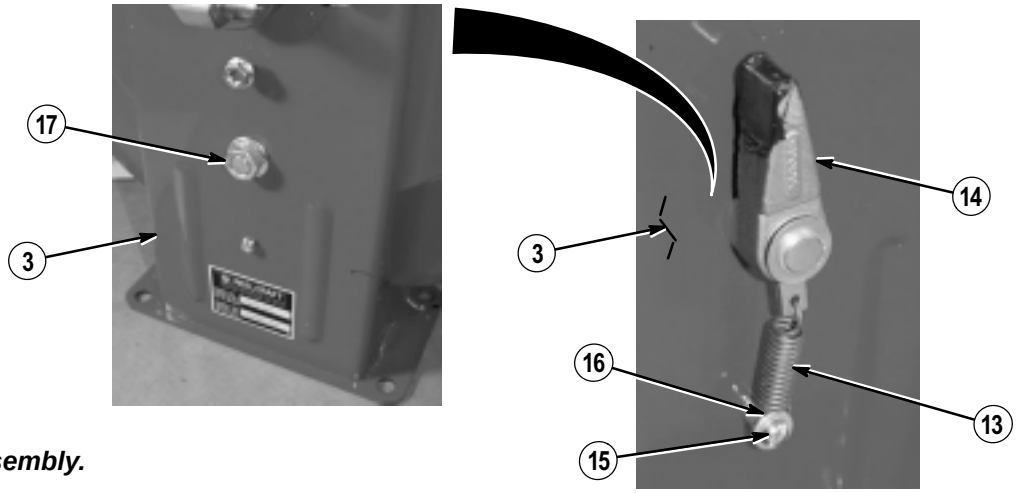
(2) Cleaning all parts with dry cleaning solvent (Item 38, Appendix C) and clean lint-free cloth (Item 13, Appendix C) and air dry.

(3) Inspect all parts for damage that would impair operation.

(4) Inspect sheeve assembly and latch pawl for roughness or gouging.

(5) Inspect drive spring, spring arbor and spring arbor key for cracks and freedom of movement.

(6) Discard all damaged parts.



d. Assembly.

NOTE

Prior to assembly, coat latch pawl with grease.

(1) Install latch pawl (14) on hose reel base (3), and secure with hex nut (17).

(2) Install spring (13), washer (16) and screw (15) on hose reel base (3).

(3) Install spring (13) on latch pawl (14).

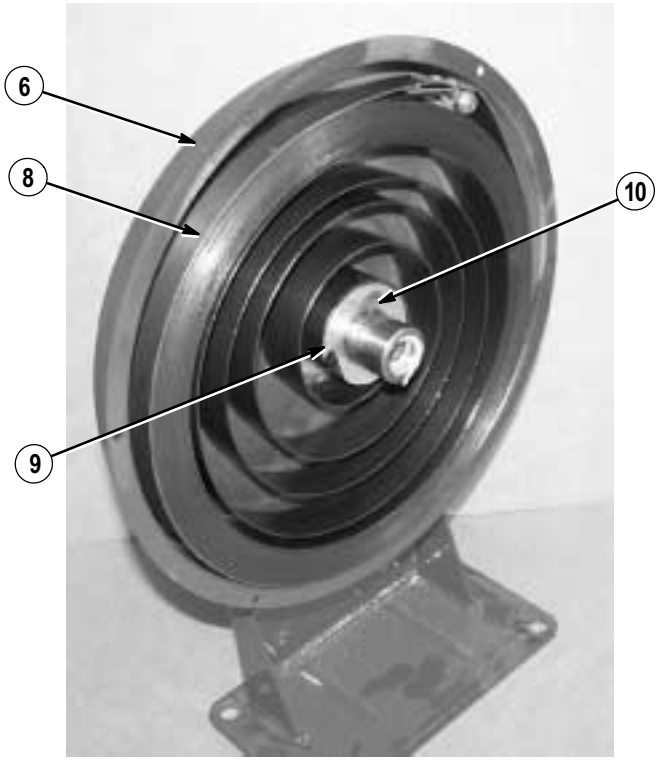
WARNING

Use care when removing or installing retaining rings. Retaining rings are under spring tension and can act as projectiles when released and could cause eye injury.

NOTE

Prior to assembly, coat main shaft with grease.

(4) Install main shaft (12) on spring case (6), with snap ring (11).



11-12. PNEUMATIC HOSE REEL AND 3/8” HOSE REPAIR (CONT).

WARNING

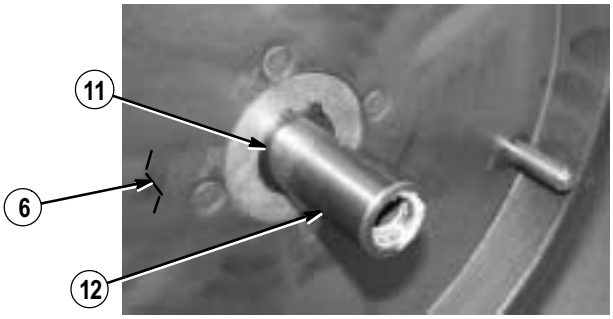
Use extreme care when removing drive spring. Spring is under tension and can act as a projectile when released and could cause eye injury.

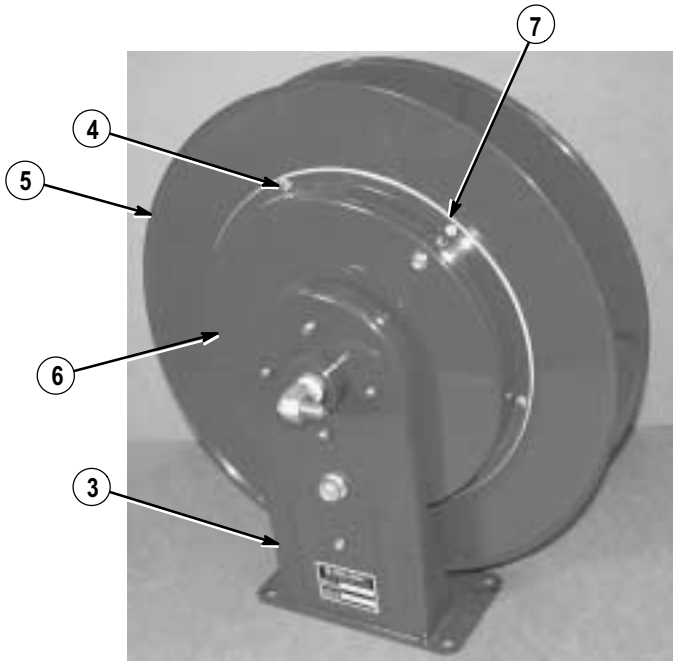
NOTE

- Prior to assembly, coat spring arbor with grease.
- Install drive spring into same position noted during disassembly.

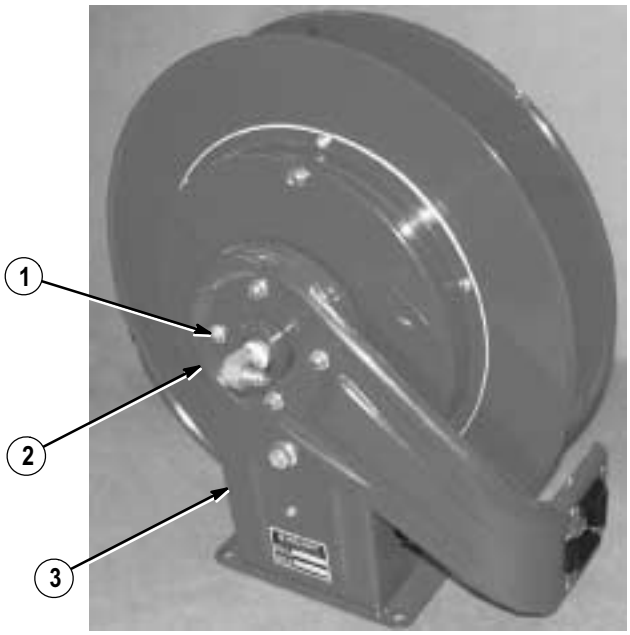
(5) Install spring arbor key (10), spring arbor (9) and drive spring (8) on spring case (6).

(6) Install gasket (7) and sheave assembly (5) on spring case (6) with six locknuts (4).



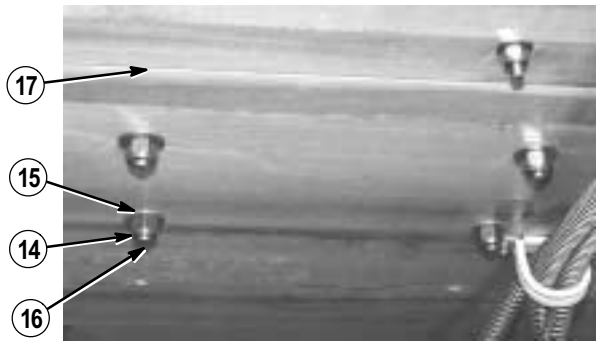


(7) Install guide arm with rollers (2) on hose reel base (3) with four new locknuts (1).



e. Installation

(1) Install hose reel assembly (5) on tool cabinet (17) with four screws (16), washers (15) and locknuts (14).

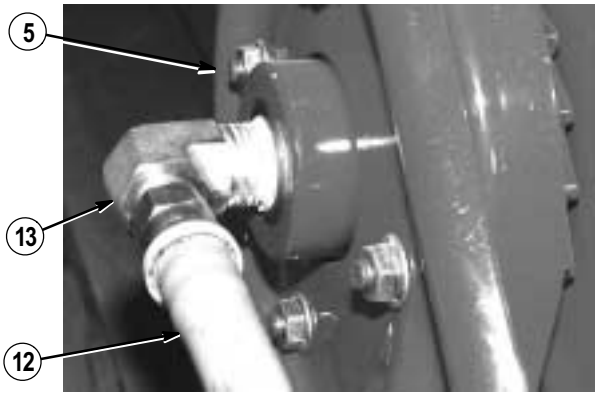


WARNING

Adhesives, solvents and sealing compounds can burn easily, can give off harmful vapors and are harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in well-ventilated area. If adhesive, solvent or sealing compound gets on skin or clothes, wash immediately with soap and water.

(2) Coat threads of fitting (13) with sealing compound.

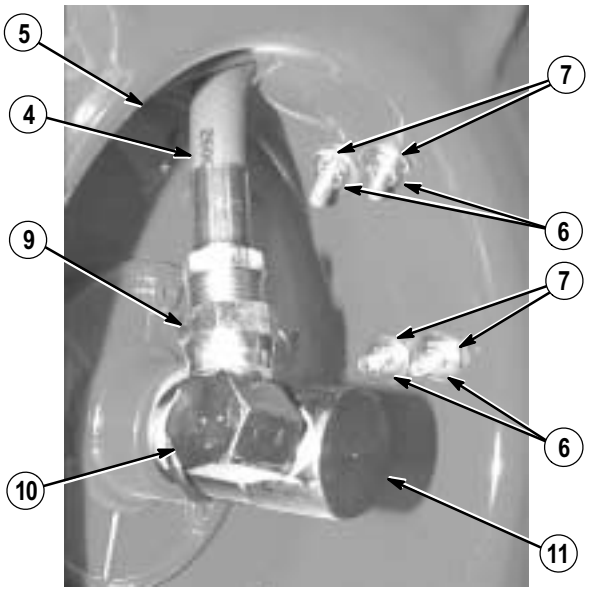
(3) Install fitting (13) and hose (12) on hose reel assembly (5).



11-12. PNEUMATIC HOSE REEL AND 3/8” HOSE REPAIR (CONT).

(4) Coat threads of adapter (11) with sealing compound.

(5) Install adapter (11) and hose fitting (10) on hose reel assembly (5).



WARNING

Hose reel assembly is under pressure. Avoid releasing latching mechanism during removal and installation. Failure to comply could result in injury to personnel.

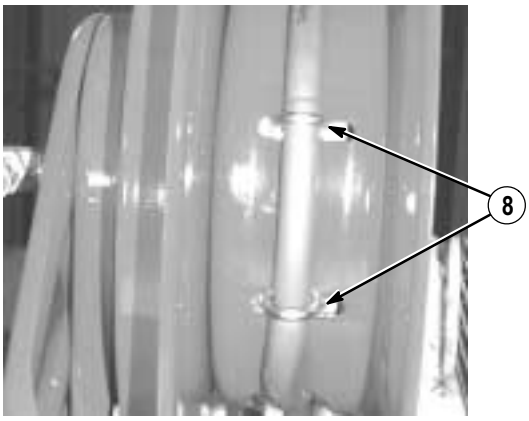
NOTE

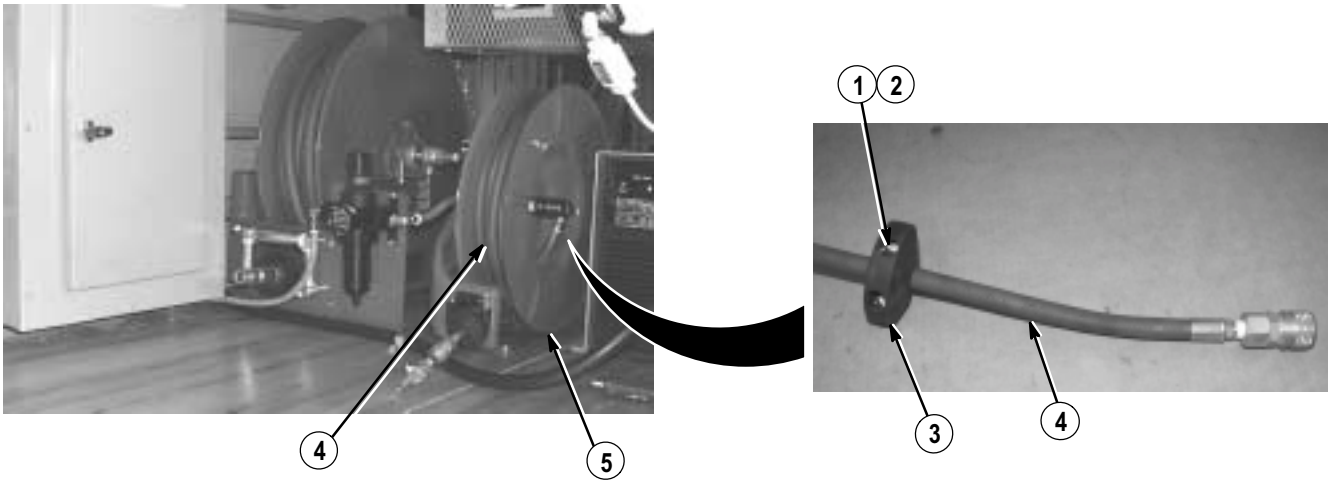
Prior to hose installation it is necessary to preload the hose reel assembly. Perform Step (6) to preload the hose reel assembly.

(6) Manually turn hose reel (5) until spring is tight, back off three turns, and then latch.

(7) Route hose (4) through hose reel assembly (5) and tighten nut (9).

(8) Install two u-bolts (8), four washers (7) and locknuts (6) on hose reel assembly (5).





CAUTION

When adding wraps of hose, be careful not to exceed the winding mechanism's spring capacity. Adjust enough wraps of hose to achieve the desired tension. Damage to the winding mechanism will result if spring is over-tensioned.

NOTE

If necessary, adjust spring tension on reel by adding or removing wraps of hose from spool, one wrap at a time, until desired tension is obtained. Add wraps to increase tension and remove wraps to decrese tension.

(9) Retract hose (4) on hose reel assembly (5).

NOTE

Install hose bumper assembly as noted during disassembly.

(10) Install hose bumper assembly (3), two screws (1) and nuts (2) on hose (4).

f. Follow-On Maintenance:

- Start generator, (TM 9-4940-568-10).
- Start air compressor and check for leaks, (TM 9-4940-568-10).

END OF TASK

11-13. PNEUMATIC HOSE REEL AND 3/4" HOSE REPAIR.

This task covers:

a. Removal
b. Disassembly
c. Cleaning/Inspection
d. Assembly
e. Installation
f. Follow-On Maintenance

INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 30, Appendix G)
Socket Set, 3/8 in. (Item 25, Appendix G)
Wrench, Combination, 1-1/4 in. (Item 36, Appendix G)
Wrench, Combination, 1-1/2 in. (Item 39, Appendix G)
Wrench, Pipe 1 1/2 in. (Item 43, Appendix G)

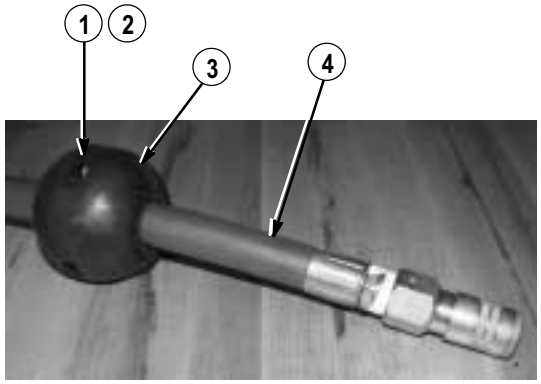
Materials/Parts
Cloth, Cleaning (Item 13, Appendix C)
Grease, Automotive and Artillery (GAA) (Item 20, Appendix C)
Sealing Compound (Item 32, Appendix C)
Solvent, Drycleaning (Item 38, Appendix C)

Materials/Parts – Continued
Locknut (4) (Item 30, Appendix F)
Locknut (4) (Item 35, Appendix F)
Locknut (4) (Item 46, Appendix F)
Lockwasher (Item 74, Appendix F)
Ring, Snap (4) (Item 95, Appendix F)

Personnel Required
Two

Equipment Condition
FRS unloaded, (TM 9-4940-568-10)
Air system drained, (TM 9-4940-568-10)

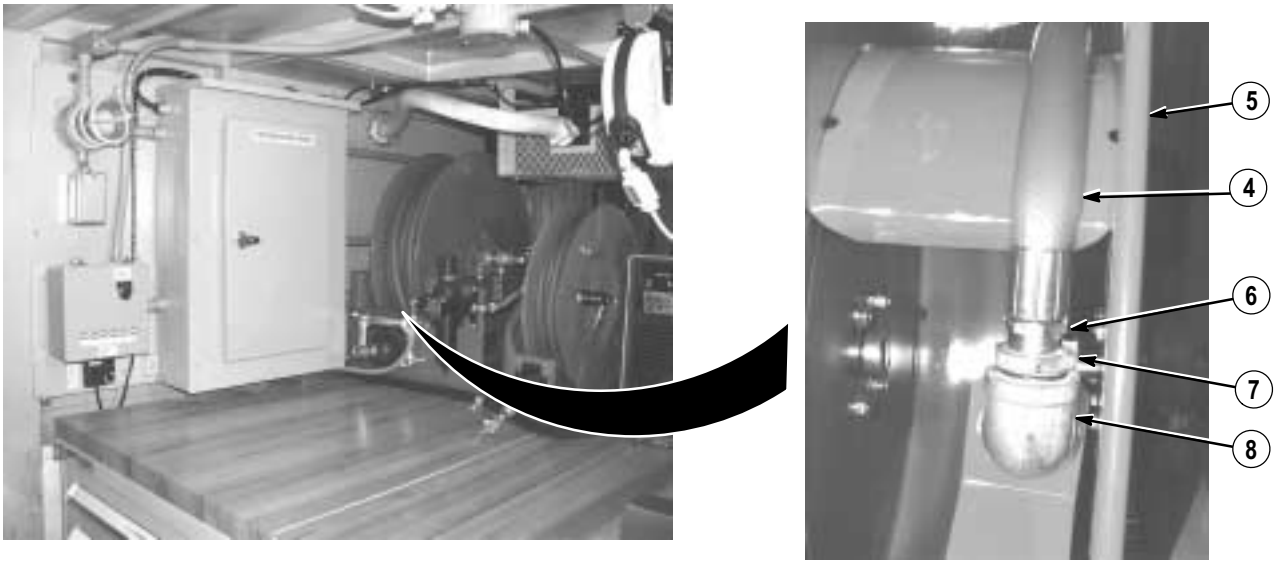
a. Removal.



WARNING

Hose reel assembly is under pressure. Avoid releasing latching mechanism during removal and installation. Failure to comply could result in injury to personnel.

(1) Remove two screws (1), nuts (2), and hose bumper assembly (3) from hose (4).



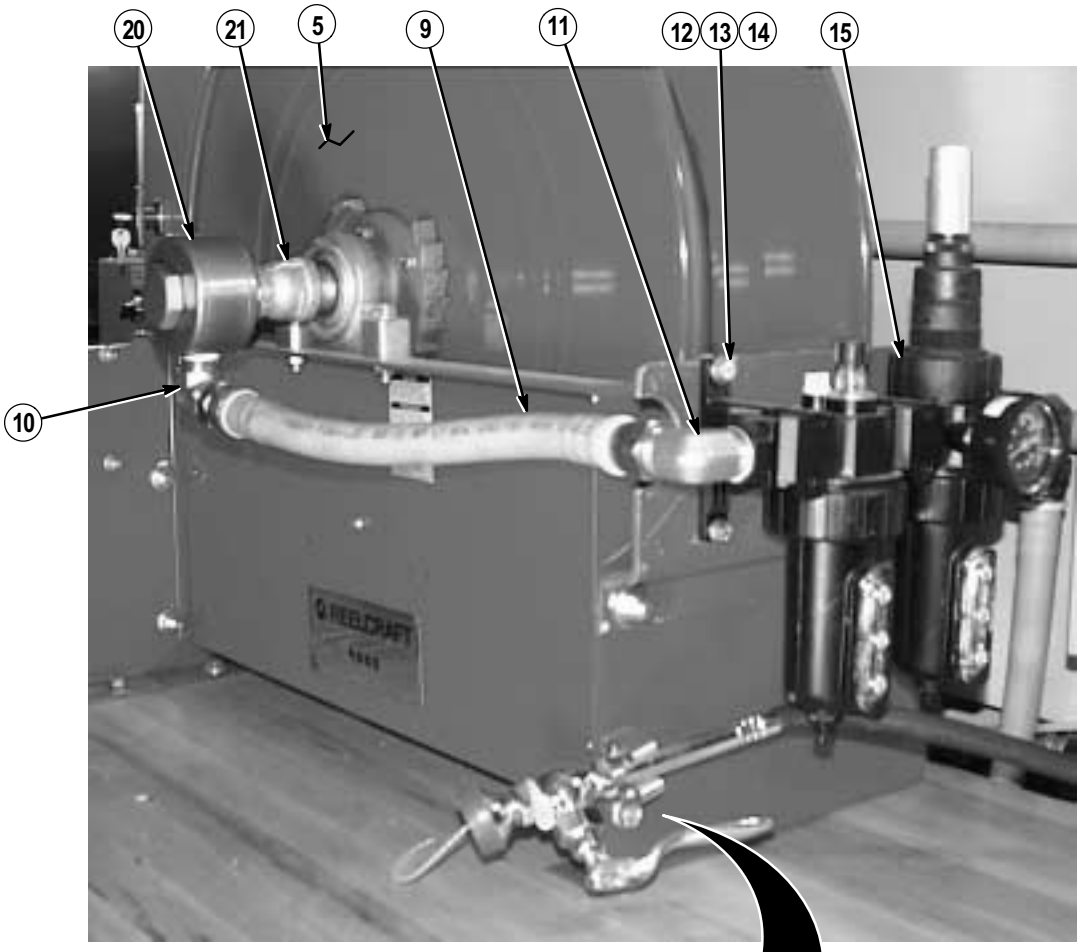
(2) Payout entire length of hose (4) from hose reel assembly (5).

(3) Loosen fitting (6) and remove hose (4).

(4) Slowly unwind hose reel assembly (5) to remove spring tension.

(5) Remove adapters (7) and elbow (8) from hose reel assembly (5).

11-13. PNEUMATIC HOSE REEL AND 3/4” HOSE REPAIR (CONT).

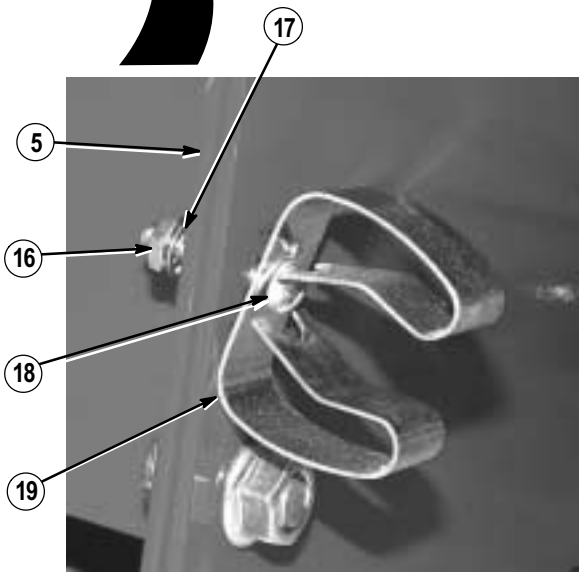


(6) Remove inlet hose (9) from hose reel adapter elbow (10) and regulator/water separator elbow (11).

(7) Remove four locknuts (12), eight washers (13) and four screws (14) from regulator/water separator (15). Discard locknuts.

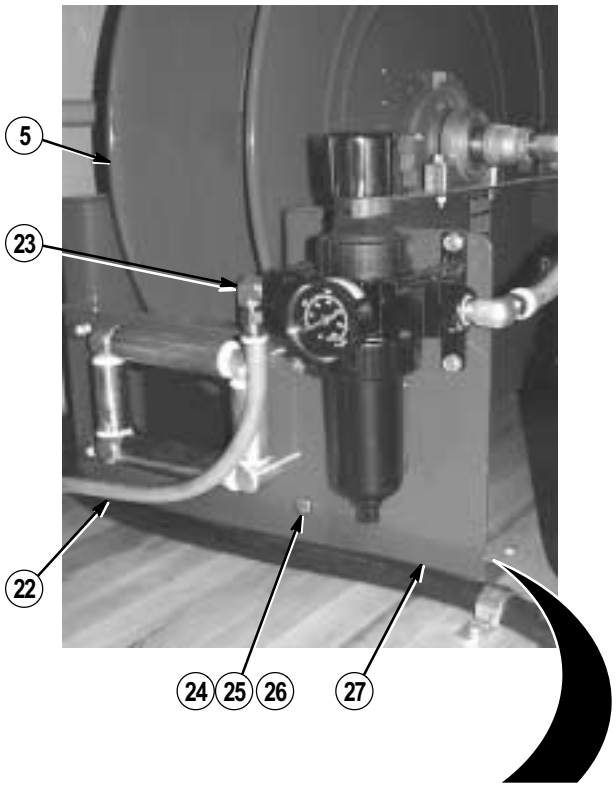
(8) Remove nut (16), lockwasher (17), screw (18) and eye wash nozzle mount (19) from hose reel assembly (5). Discard lockwasher.

(9) Remove hose reel adapter (20) and union (21) from hose reel assembly (5).



(10) Remove hose (22) from regulator elbow (23).

(11) Remove four nuts (24), washers (25), screws (26) and regulator mount plate (27) from hose reel assembly (5).



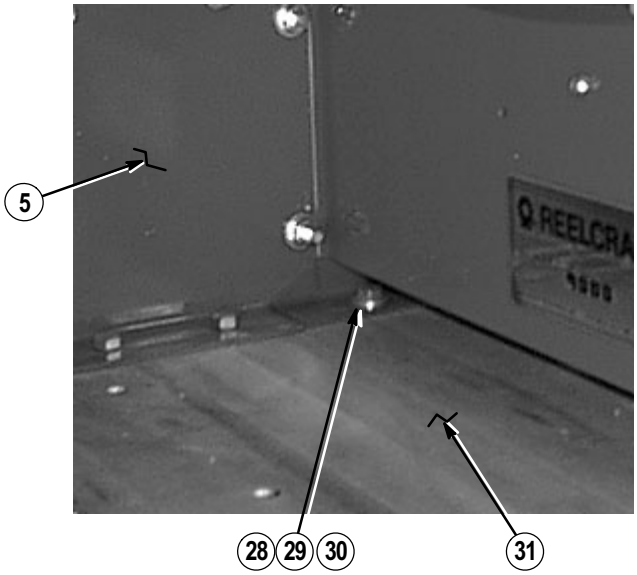
WARNING

Hose reel assembly is heavy and awkward. Removal and installation of hose reel assembly will require the aid of an assistant to avoid injury to personnel.

NOTE

The right front bulk stowage drawer must be removed (TM 9-4940-568-10) to remove two mount bolts.

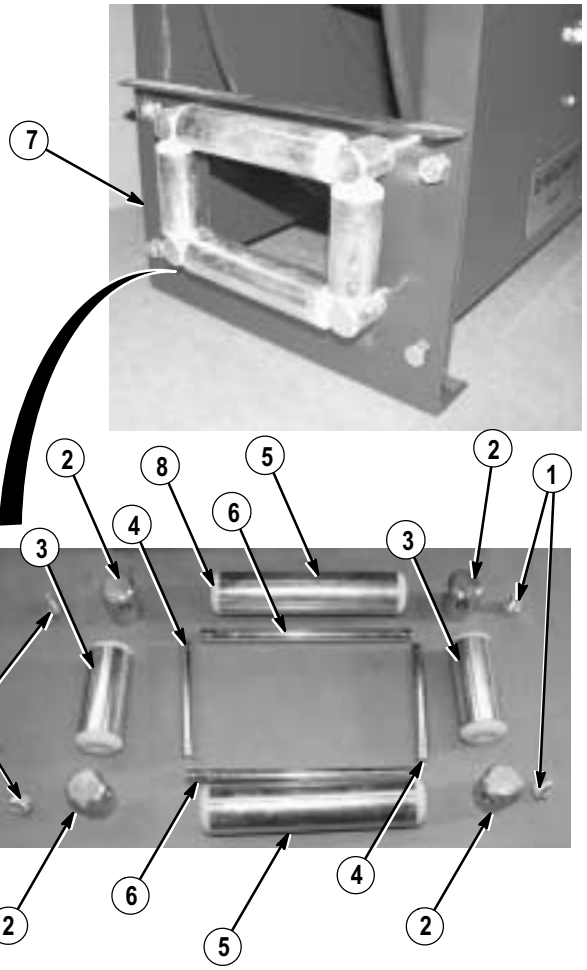
(12) With the aid of an assistant, remove four locknuts (28), eight washers (29), four screws (30) and hose reel assembly (5) from tool cabinet counter top (31). Discard locknuts.



11-13. PNEUMATIC HOSE REEL AND 3/4” HOSE REPAIR (CONT).

b. Disassembly.

(1) Remove four screws (1), roller posts (2), two roller tube-shorts (3), roller pin-shorts (4), roller tube-longs (5) and roller pin-long (6) from roller plate (7).



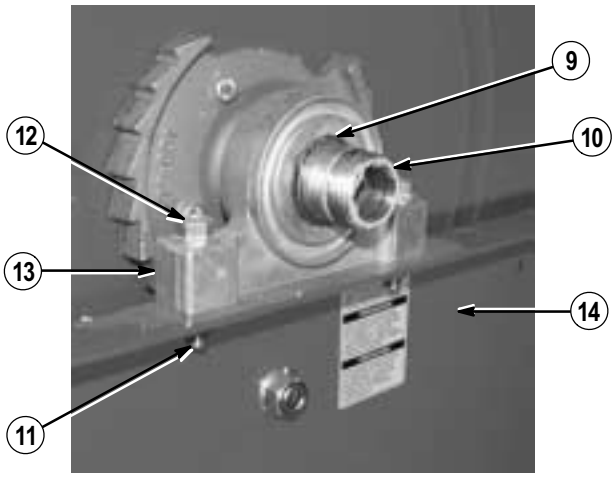
(2) Remove eight roller bushings (8) from two roller tube-shorts (3) and roller tube-longs (5).

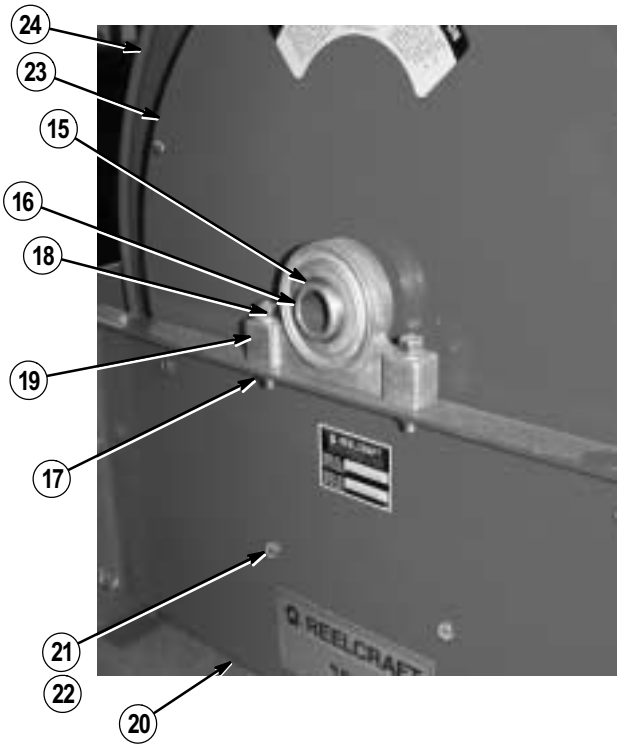
WARNING

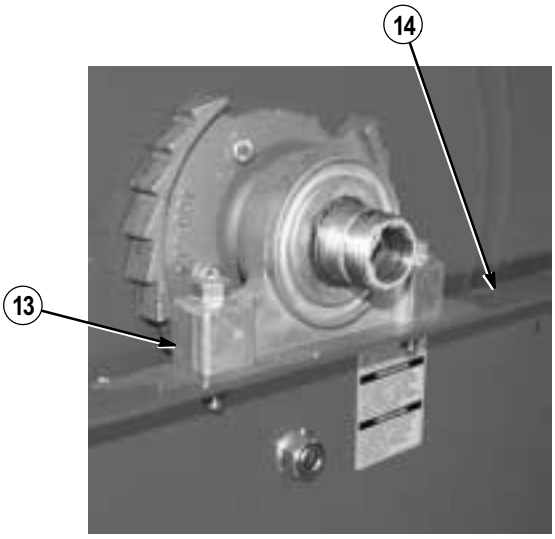
Use care when removing or installing retaining rings. Retaining rings are under spring tension and can act as projectiles when released and could cause eye injury.

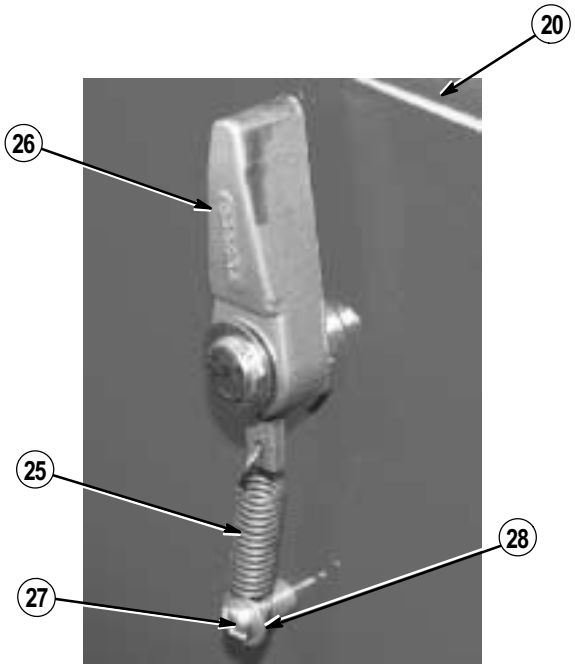
(3) Remove snap ring (9) from inlet tube (10). Discard snap ring.

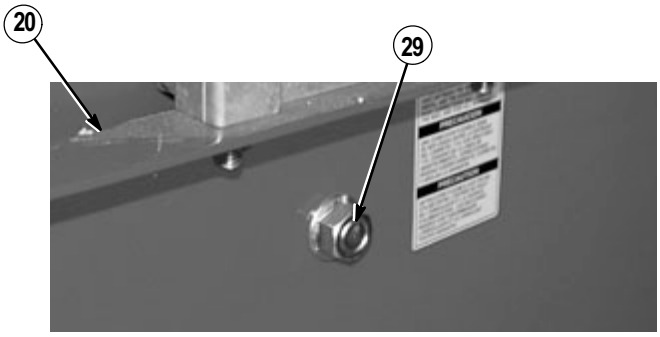
(4) Remove two locknuts (11) and screws (12) from pillow block (13) and side frame (14). Discard locknuts.











(5) Remove snap ring (15) from support shaft (16). Discard snap ring.

(6) Remove two locknuts (17) and screws (18) from pillow block (19) and side frame (20). Discard locknuts.

(7) Remove four nuts (21) and screws (22) from side frame (20) and spring and case assembly (23).

(8) Remove pillow block (13), pillow block (19) and sheave assembly (24) from side frame (14) and side frame (20).

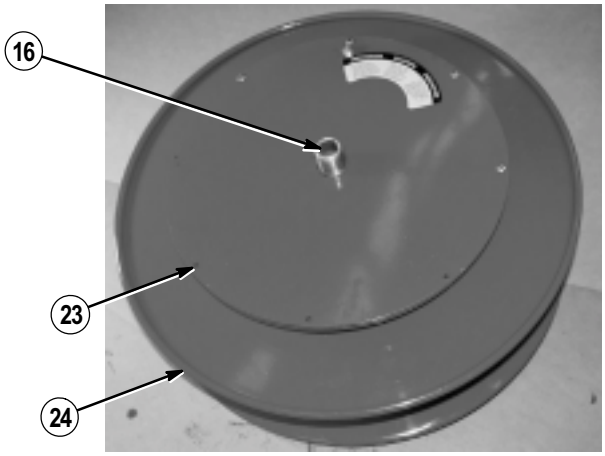
(9) Remove spring (25) from latch pawl (26).

(10) Remove screw (27), washer (28), and spring (25) from side frame (20).

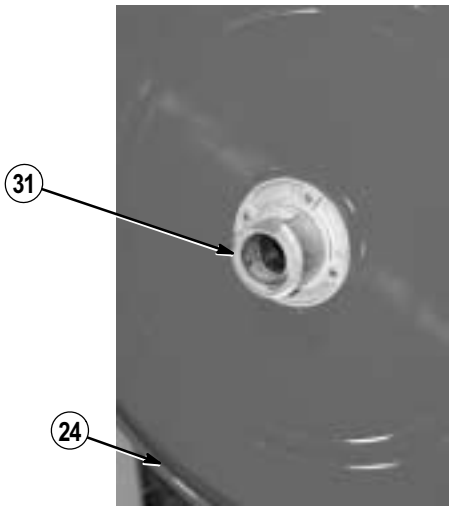
(11) Remove nut (29) and latch pawl (26) from side frame (20).

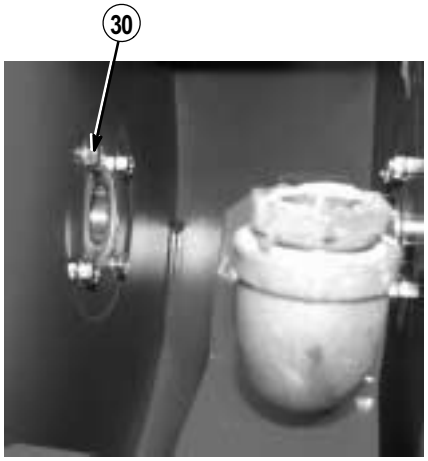
11-13. PNEUMATIC HOSE REEL AND 3/4” HOSE REPAIR (CONT).

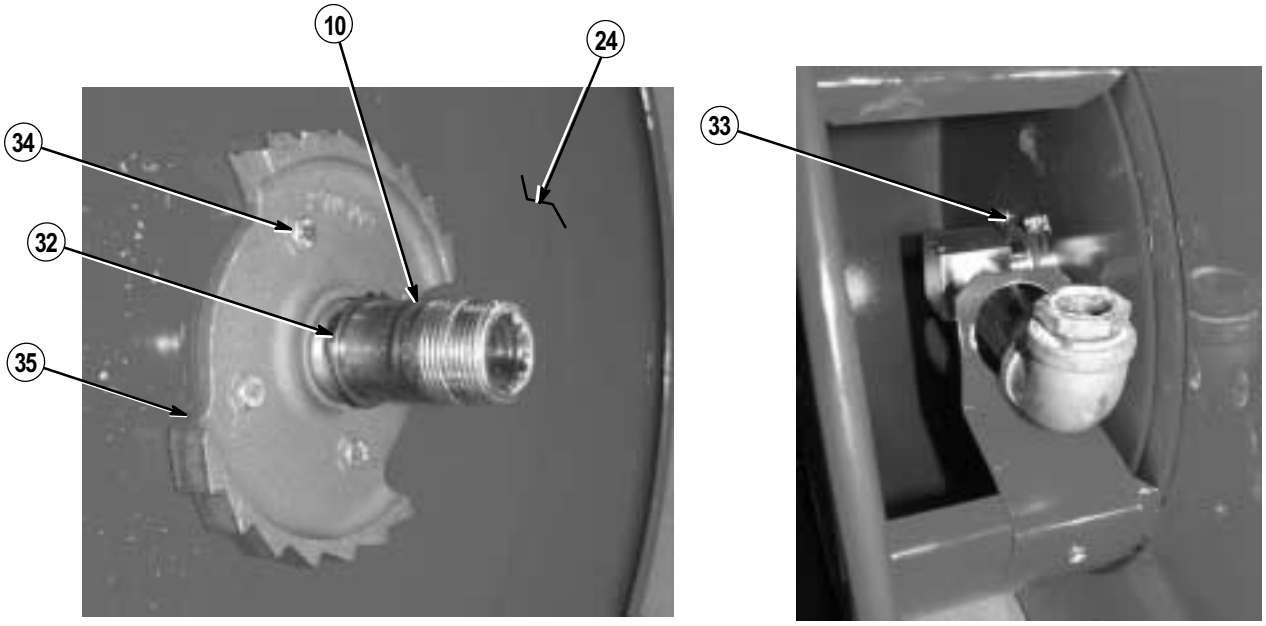
(12) Remove support shaft (16) and spring and case assembly (23) from sheave assembly (24).



(13) Remove four screws (30) and spring arbor (31) from sheave assembly (24).







(14) Remove two snap rings (32) from inlet tube (10). Discard snap rings.

(15) Remove four nuts (33), screws (34), latch rachet hub (35), and inlet tube (10) from sheave assembly (24).

11-13. PNEUMATIC HOSE REEL AND 3/4” HOSE REPAIR (CONT).

c. Cleaning/Inspection.

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.

(1) Cleaning all parts with dry cleaning solvent (Item 38, Appendix C) and clean lint-free cloth (Item 13, Appendix C) and air dry.

(2) Inspect all parts for damage that would impair operation.

(3) Inspect rollers, latch pawl and latch ratchet hub for roughness or gouging.

(4) Inspect spring and case assembly for cracks and freedom of movement.

(5) Discard all damaged parts.

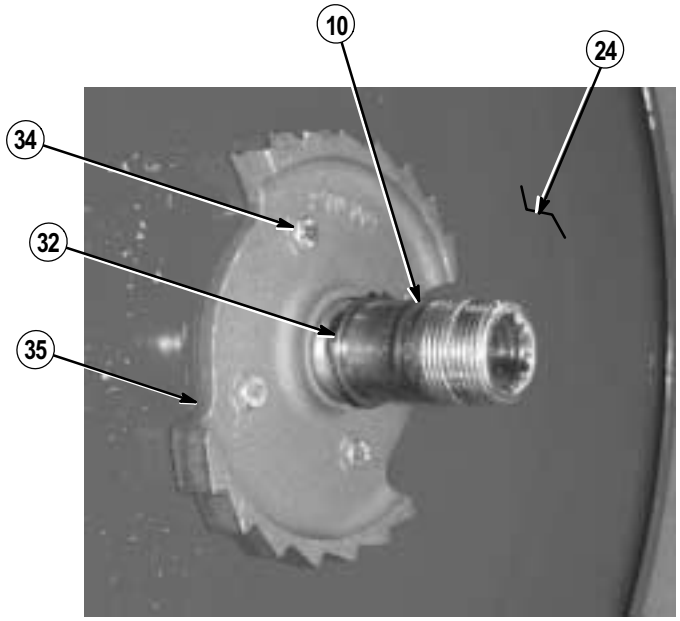
d. Assembly.

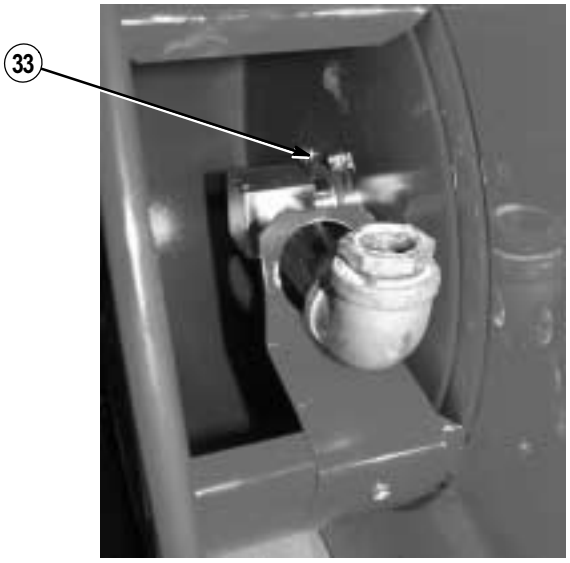
NOTE

Prior to assembly, coat latch ratchet hub with grease.

(1) Install inlet tube (10) and latch rachet hub (35) onto sheave assembly (24), and secure with four screws (34) and nuts (33).

(2) Install two snap rings (32) on inlet tube (10).



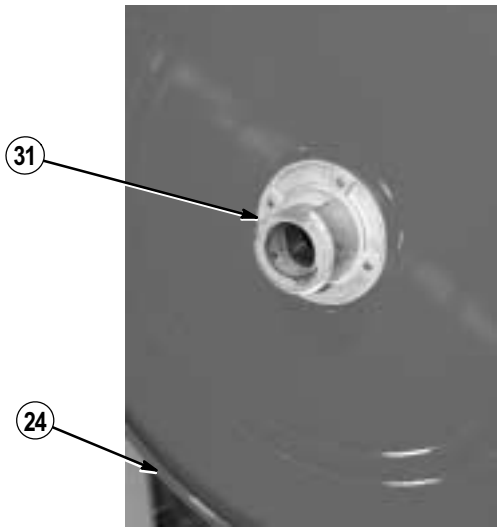


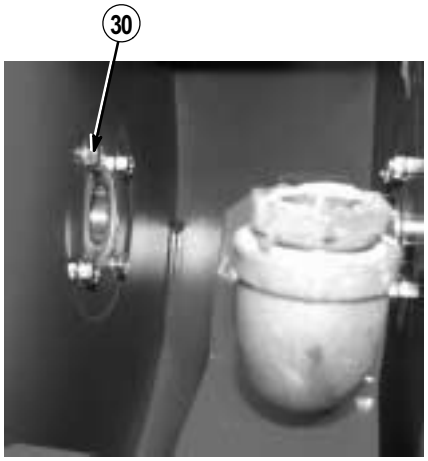
11-13. PNEUMATIC HOSE REEL AND 3/4” HOSE REPAIR (CONT).

NOTE

Prior to assembly, coat spring arbor with grease.

(3) Install spring arbor (31) on sheave assembly (24), and secure with four screws (30).

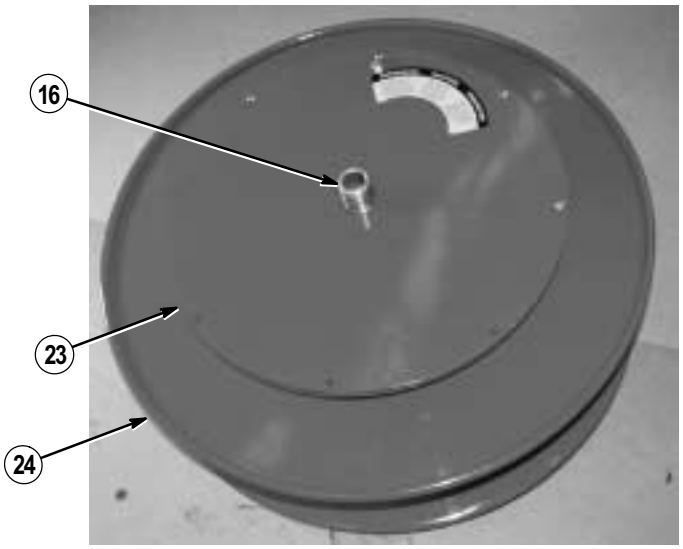




NOTE

Prior to assembly, coat support shaft with grease.

(4) Install spring and case assembly (23) and support shaft (16) on sheave assembly (24).



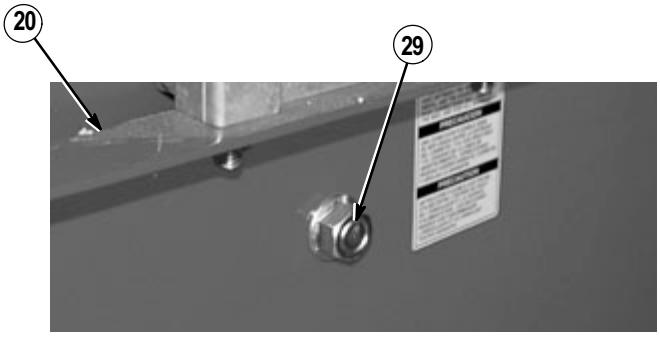
NOTE

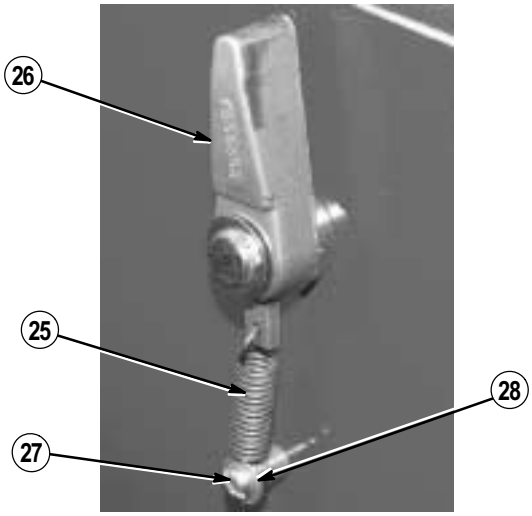
Prior to assembly, coat latch pawl with grease.

(5) Install latch pawl (26) on side frame (20), and secure with nut (29).

(6) Install spring (25), washer (28), and screw (27) on side frame (20).

(7) Install spring (25) on latch pawl (26).





NOTE

Prior to assembly, coat pillow blocks with grease.

(8) Install sheave assembly (24) and two pillow blocks (19) on side frame (20).

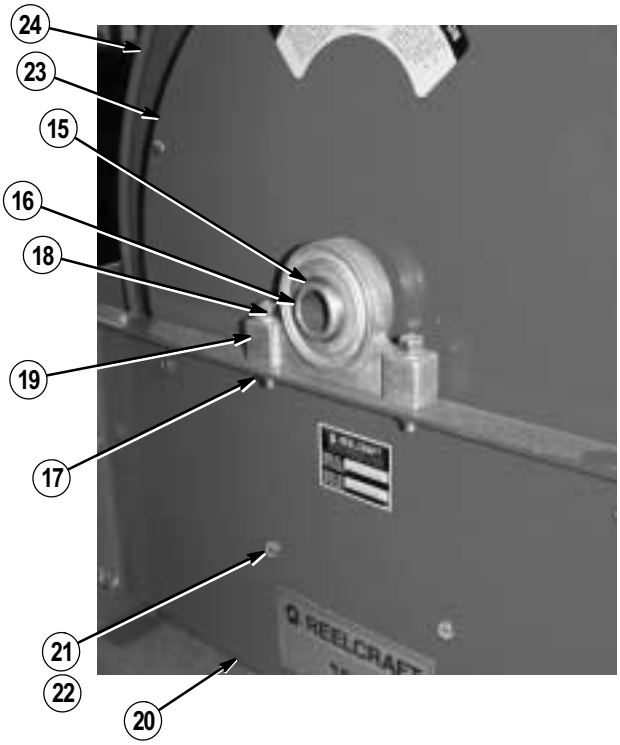
(9) Install four screws (22) and nuts (21) on side frame (20) and spring and case assembly (23).

(10) Install two pillow blocks (19) on side frame (20), with four screws (18) and four locknuts (17).

NOTE

Prior to assembly, coat support shaft with grease.

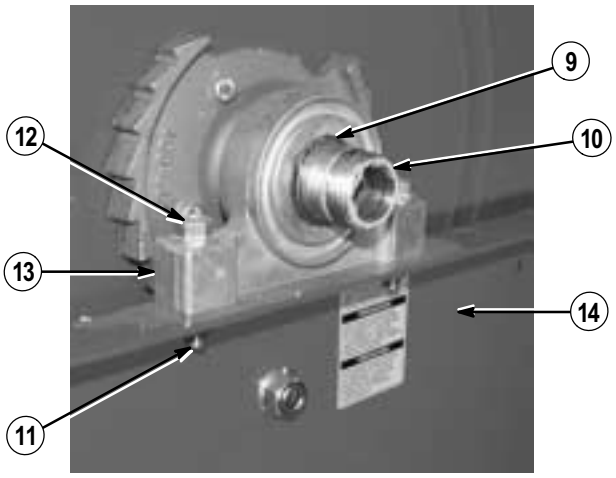
(11) Install snap ring (15) on support shaft (16).



11-13. PNEUMATIC HOSE REEL AND 3/4” HOSE REPAIR (CONT).

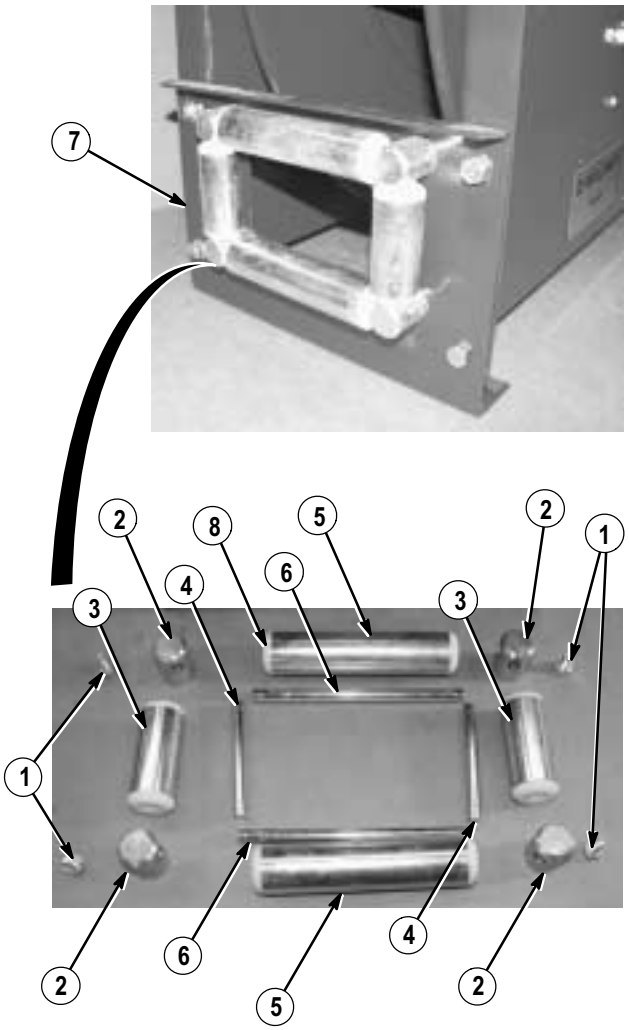
(12) Install two screws (12), locknuts (11) and pillow block (13) on side frame (14).

(13) Install new snap ring (9) on inlet tube (10).



(14) Install eight roller bushings (8) on two roller tube-longs (5) and roller tube-shorts (3).

(15) Install two roller pin-longs (6), roller tube-longs (5), roller pin-shorts (4), roller tube-shorts (3), and four roller posts (2), and screws (1) on roller plate (7).



e. Installation.

WARNING

Hose reel assembly weighs approximately 60 lbs (27 kg). Removal and installation of hose reel assembly will require the aid of an assistant to avoid injury to personnel.

(1) With the aid of an assistant, install the hose reel assembly (5) on tool cabinet counter top (31) with four screws (30), eight washers (29) and four locknuts (28).

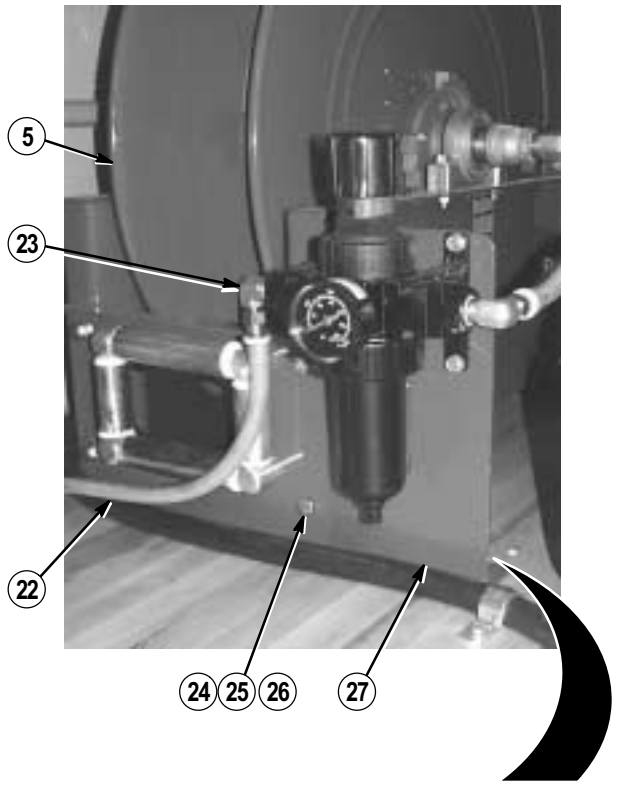
(2) Install regulator mount plate (27), four screws (26), four washers (25) and four nuts (24) on hose reel assembly (5).

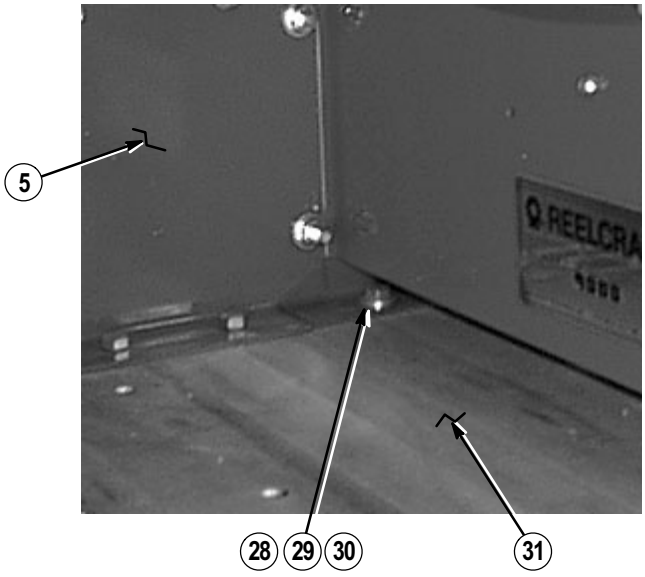
WARNING

Adhesives, solvents and sealing compounds can burn easily, can give off harmful vapors and are harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in well-ventilated area. If adhesive, solvent or sealing compound gets on skin or clothes, wash immediately with soap and water.

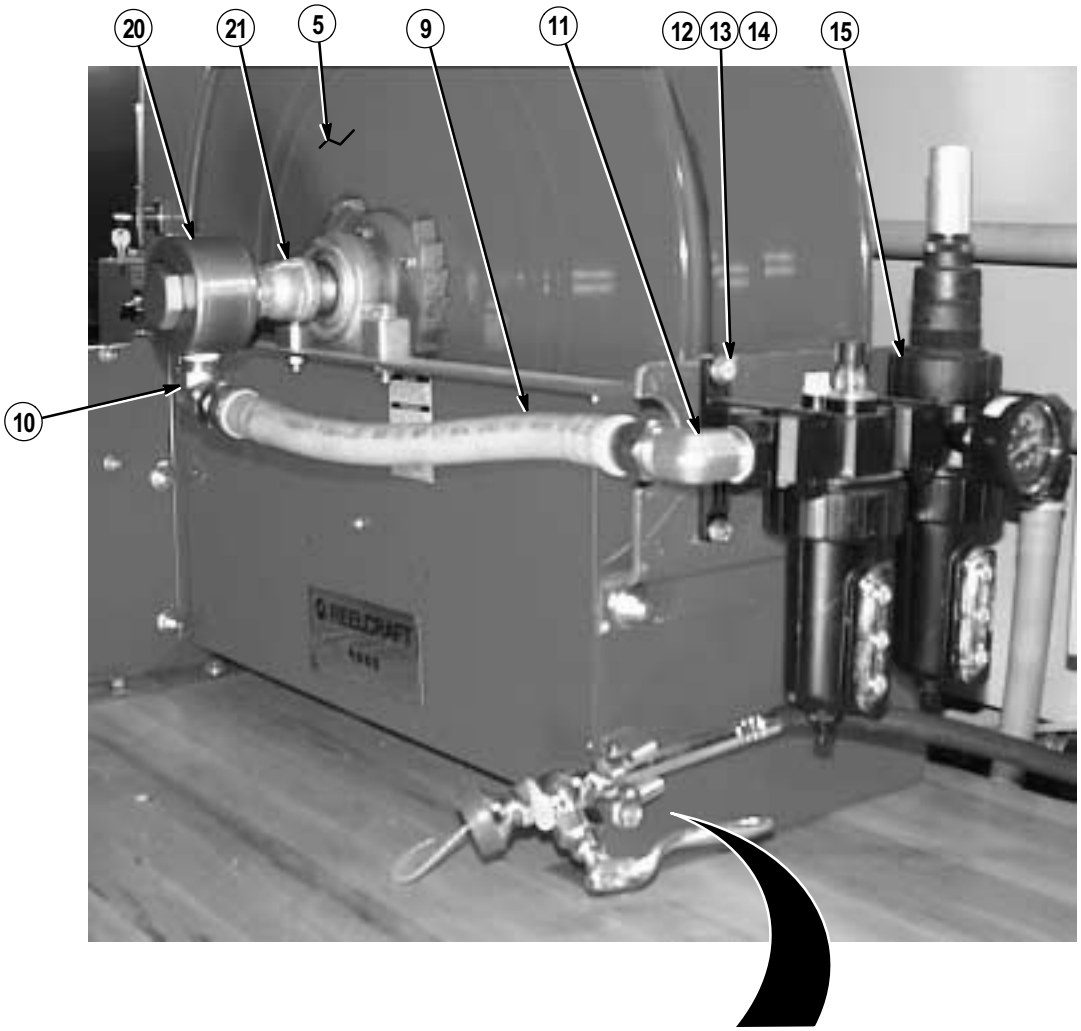
(3) Coat threads of regulator elbow (23) with sealing compound.

(4) Install hose (22) on regulator elbow (23).





11-13. PNEUMATIC HOSE REEL AND 3/4” HOSE REPAIR (CONT).



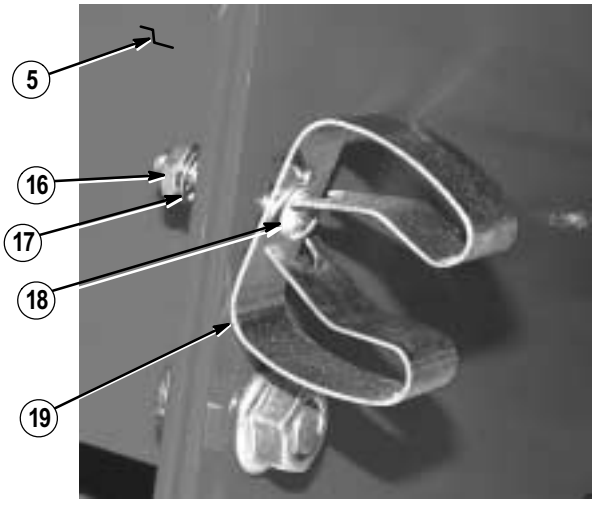
(5) Coat threads of hose reel adapter (20) and union (21) with sealing compound.

(6) Install union (21) and hose reel adapter (20) on hose reel assembly (5).

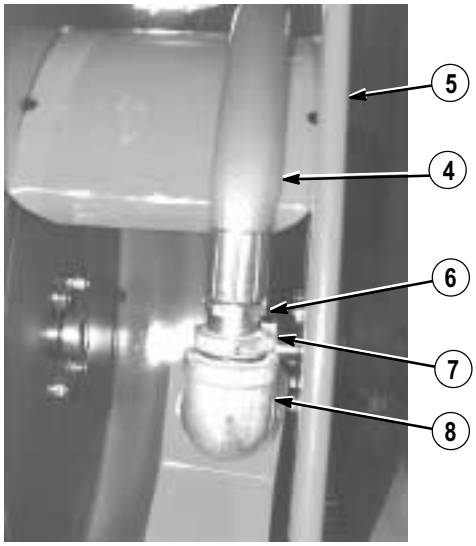
(7) Install eye wash nozzle mount (19), screw (18), lockwasher (17) and nut (16) on hose reel assembly (5).

(8) Install regulator/water separator (15) with four screws (14), eight washers (13) and four locknuts (12).

(9) Connect inlet hose (9) on hose reel adapter elbow (10) and regulator/water separator elbow (11).



(10) Install elbow (8) and adapter (7) on hose reel assembly (5).



WARNING

Hose reel assembly is under pressure. Avoid releasing latching mechanism during removal and installation. Failure to comply could result in injury to personnel.

NOTE

Prior to hose installation it is necessary to preload the hose reel assembly. Perform Step (11) to preload the hose reel assembly.

(11) Manually turn hose reel assembly (5) until spring is tight, back off three turns, and then latch.

(12) Route hose (4) through hose reel assembly (5) and tighten fitting (6).

CAUTION

When adding wraps of hose, be careful not to exceed the winding mechanisms spring capacity. Adjust enough wraps of hose to achieve the desired tension. Damage to the winding mechanism will result if spring is over-tensioned.

NOTE

If necessary, adjust spring tension on reel by adding or removing wraps of hose from spool, one wrap at a time, until desired tension is obtained. Add wraps to increase tension. Remove wraps to decrease tension.

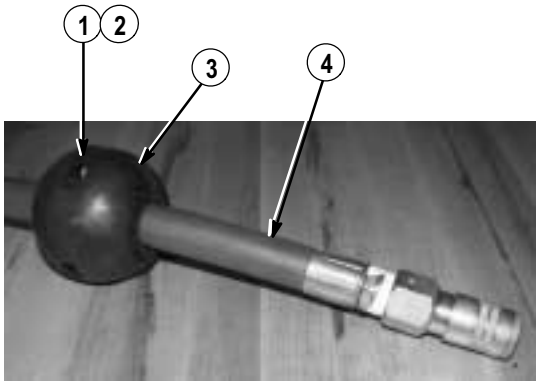
(13) Retract hose (4) on hose reel assembly (5).

11-13. PNEUMATIC HOSE REEL AND 3/4” HOSE REPAIR (CONT).

NOTE

Install hose bumper assembly as noted during disassembly.

(14) Install hose bumper assembly (3), two screws (1), and nuts (2) on hose (4).



f. Follow-On Maintenance:

- Start generator, (TM 9-4940-568-10).
- Start air compressor and check for leaks, (TM 9-4940-568-10).

END OF TASK

11-14. AIR COMPRESSOR RESERVOIR AND BRACKET REPLACEMENT.

This task covers:

a. Removal b. Installation c. Follow-On Maintenance

INITIAL SETUP

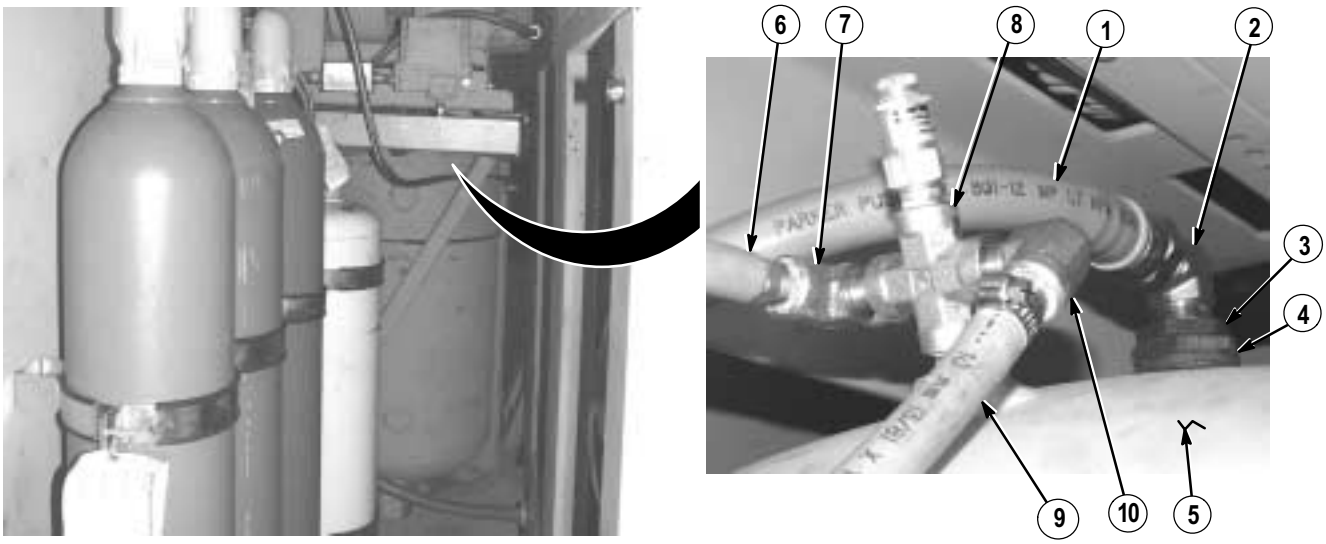
Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 30, Appendix G)
Vise, Machinist's (Item 31, Appendix G)
Wrench, Adjustable 0-3 5/8 in. (Item 33, Appendix G)
Wrench, Combination 1-1/4 in. (Item 36, Appendix G)
Lifting Device, Minimum Capacity 300 lbs (136 kg)

Materials/Parts
Tags, Identification (Item 40, Appendix C)
Sealing Compound (567) (Item 32, Appendix C)
Locknut (2) (Item 32, Appendix F)
Locknut (3) (Item 42, Appendix F)
Locknut (4) (Item 34, Appendix F)

Personnel Required
Two

Equipment Condition
FRS unloaded, (TM 9-4940-568-10)
Air compressor and platform removed, (Para 11-2)

a. Removal.



NOTE

- Tag and mark air lines before removing.
- Note position of air lines and fittings prior to removal.

(1) Disconnect outlet airline (1) from elbow (2).

(2) Remove elbow (2), adapter (3) and adapter (4) from top of air reservoir (5).

(3) Remove air line (6) and elbow (7) from tee adaapter (8).

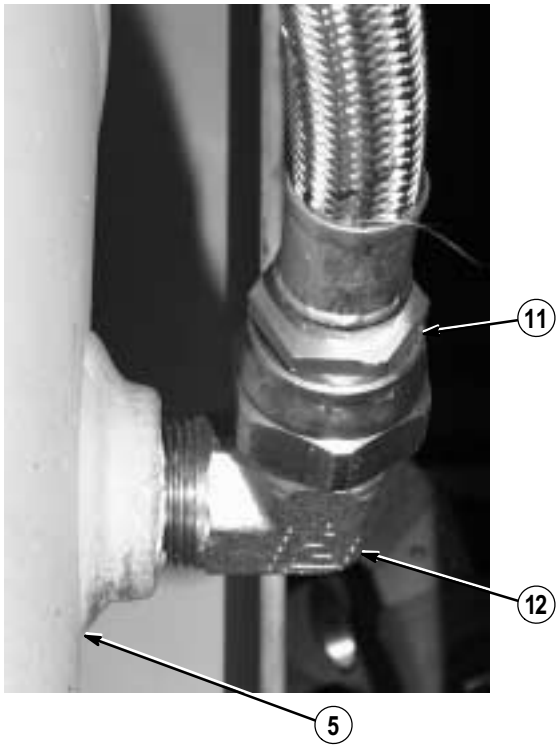
(4) Loosen clamp and remove air line (9) and elbow (10) from tee adapter (8).

(5) Remove tee adapter (8) from top of air reservoir (5).

11-14. AIR COMPRESSOR RESERVOIR AND BRACKET REPLACEMENT (CONT).

(6) Remove air line (11) from elbow (12).

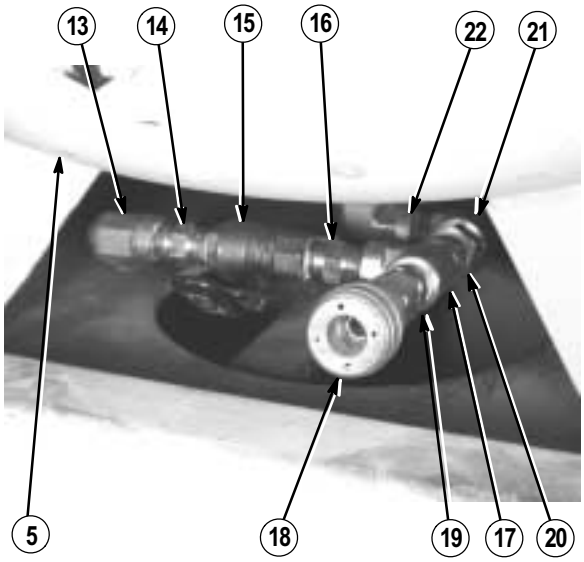
(7) Remove elbow (12) from side of air reservoir (5).



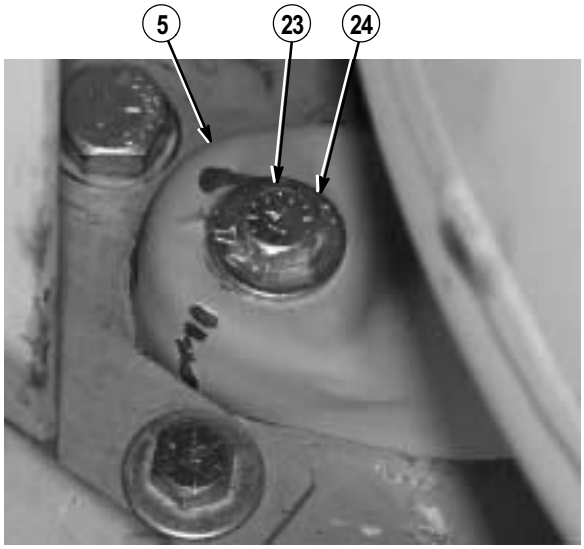
(8) Remove elbow (13), male fitting (14), valve (15) and male fitting (16) from tee fitting (17).

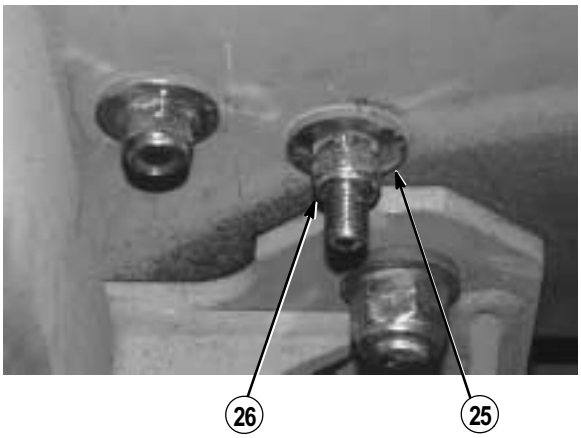
(9) Remove quick disconnect (18), male fitting (19), tee fitting (17) and male fitting (20) from elbow (21).

(10) Remove elbow (21) and elbow (22) from air reservoir (5).

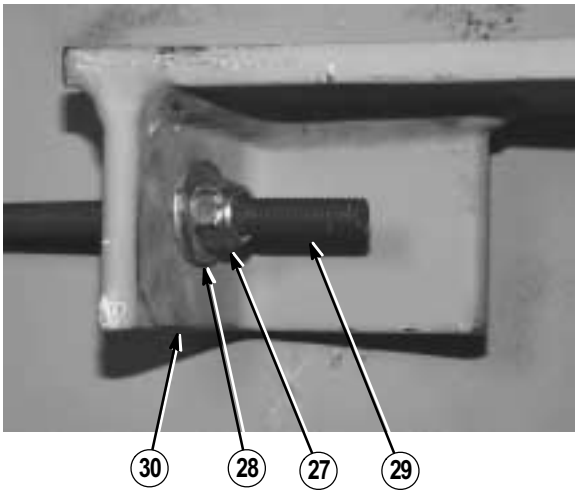


(11) Remove three screws (23), washers (24), washers (25) and locknuts (26) from legs of air reservoir (5). Discard locknuts.



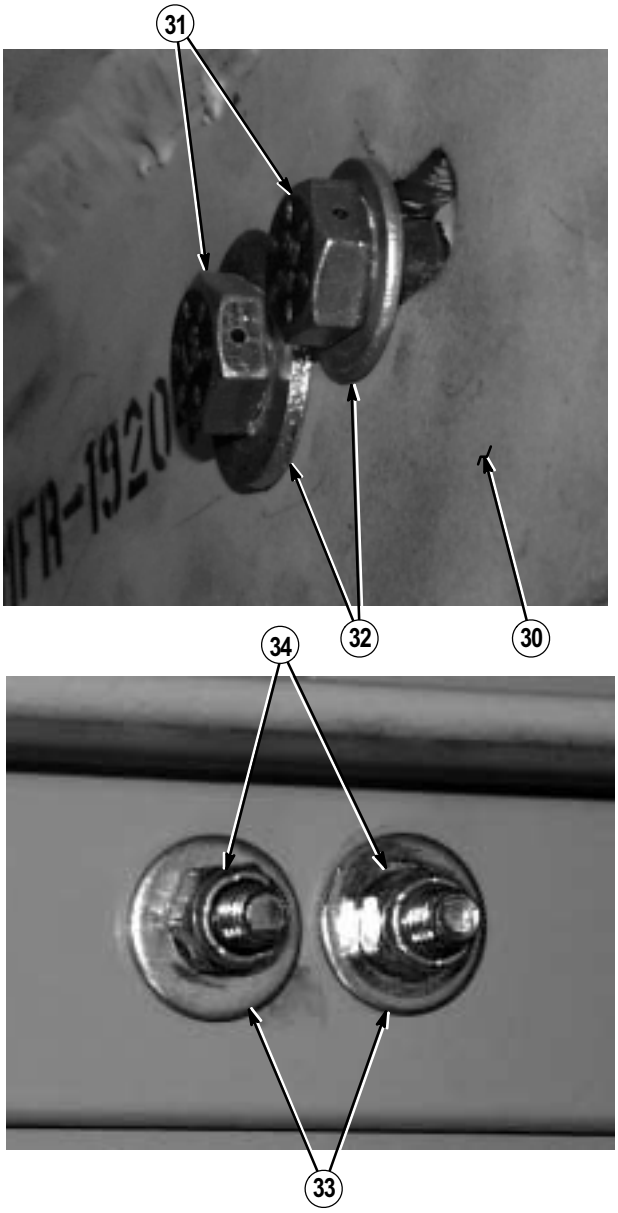


(12) Remove two locknuts (27), washers (28) and retaining U-bolt (29) from air reservoir bracket (30). Discard locknuts.



11-14. AIR COMPRESSOR RESERVOIR AND BRACKET REPLACEMENT (CONT).

(13) Remove four screws (31), washers (32), washers (33), locknuts (34) and air reservoir bracket (30) on wall of shelter. Discard locknuts.



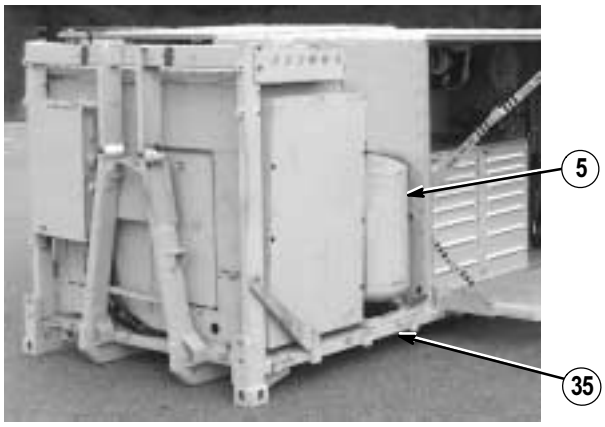
WARNING

Air compressor reservoir weighs 254 lbs (115 kg). Use an assistant to help remove air compressor reservoir or possible injury to personnel may result.

NOTE

Note position of air reservoir prior to removal.

(14) With the aid of an assistant, remove air reservoir (5) from flatrack (35).



b. Installation.

WARNING

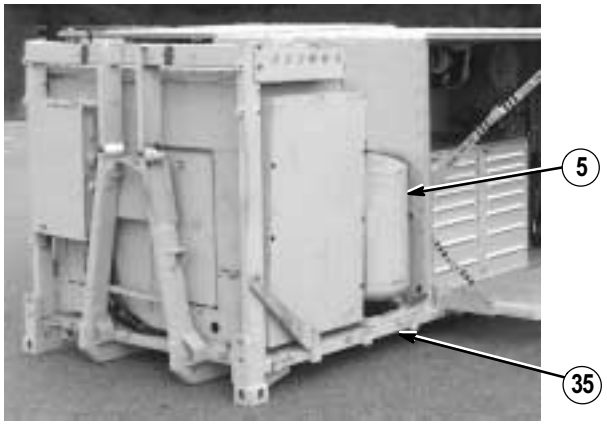
Air compressor reservoir weighs 254 lbs (115 kg). Use an assistant to help remove air compressor reservoir or possible injury to personnel may result.

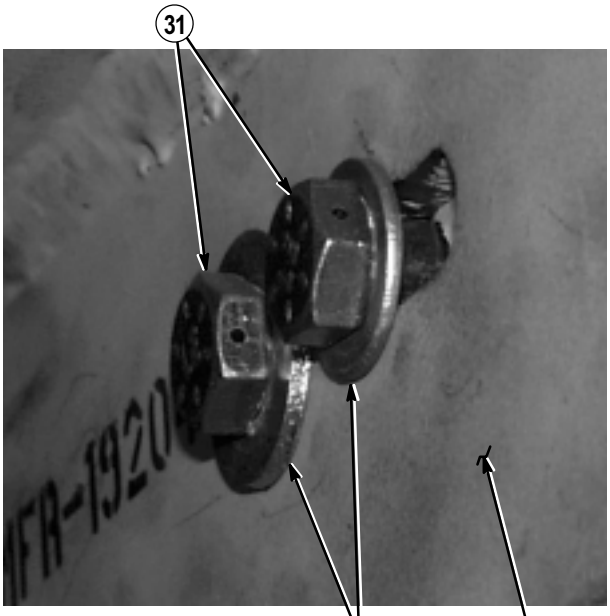
NOTE

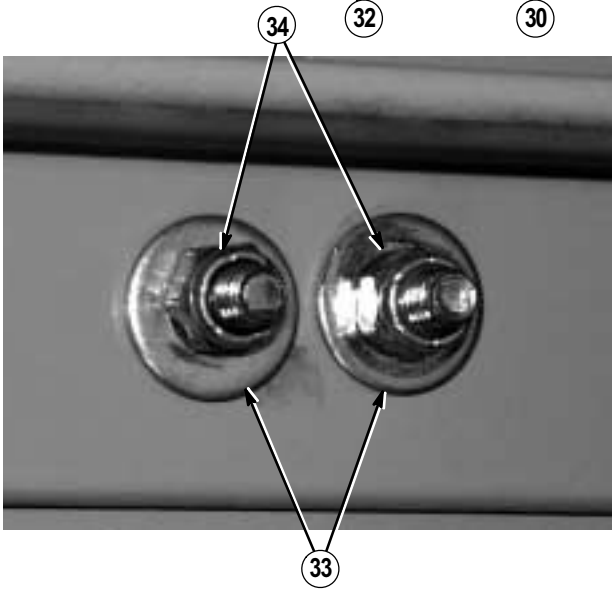
Note position of air reservoir prior to removal.

(1) With aid from an assistant, install air reservoir (5) on flatrack (35).

(2) Install air reservoir bracket (30) with four screws (31), washers (32), washers (33) and locknuts (34) on wall of shelter.

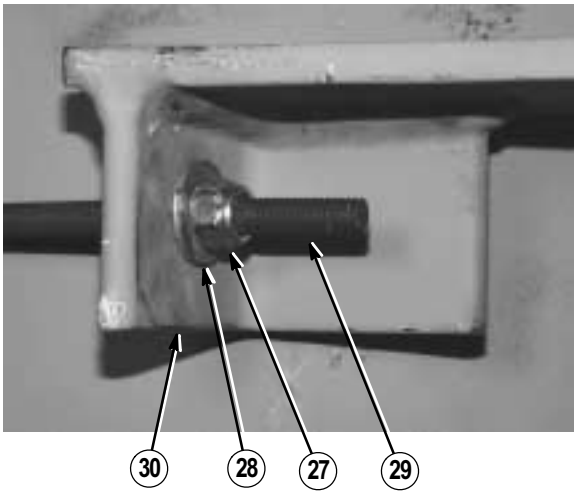




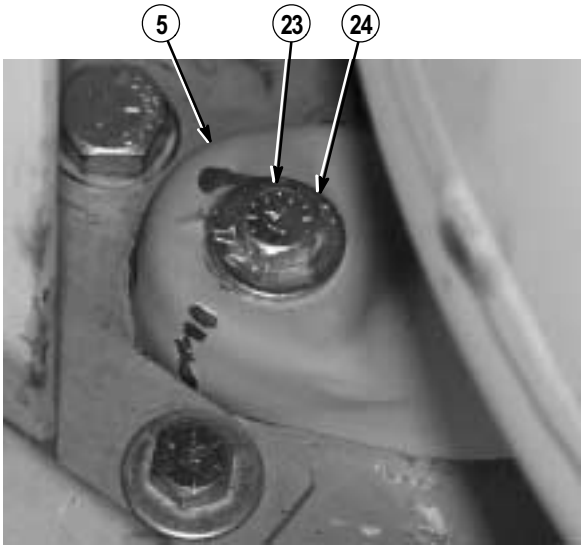


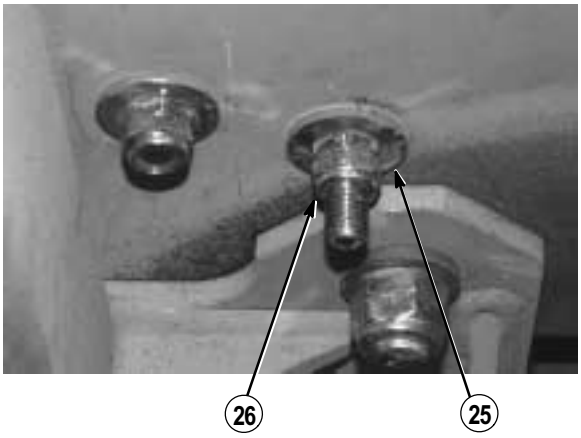
11-14. AIR COMPRESSOR RESERVOIR AND BRACKET REPLACEMENT (CONT).

(3) Install retaining U-bolt (29), two washers (28) and locknuts (27) on air reservoir bracket (30).



(4) Install three screws (23), washers (24), washers (25) and locknuts (26) in legs of air reservoir (5).





WARNING

Adhesives, solvents, and sealing compounds can burn easily, can give off harmful vapors, and are harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in well-ventilated area. If adhesive, solvent, or sealing compound gets on skin or clothing, wash immediately with soap and water.

NOTE

Position valve, fittings and elbows as noted prior to removal.

(5) Apply sealing compound to threads of elbow (22) and elbow (21).

(6) Install elbow (22) and elbow (21) on air reservoir (5).

(7) Apply sealing compound to threads of elbow (21), male fitting (20), tee fitting (17), male fitting (19) and quick disconnect (18).

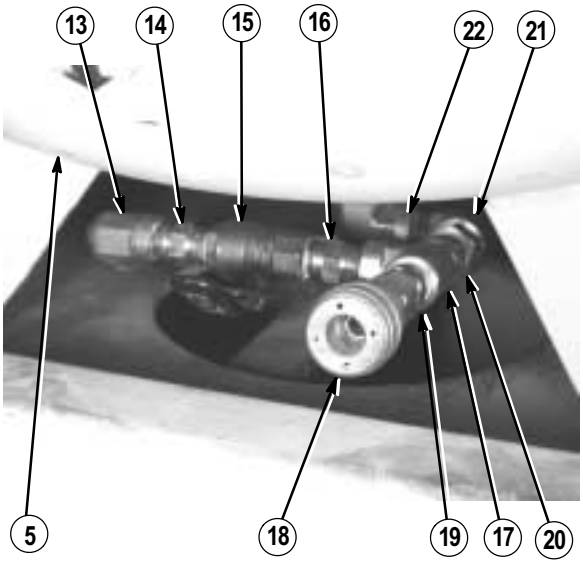
(8) Install male fitting (20), tee fitting (17), male fitting (19) and quick disconnect (18) on elbow (21).

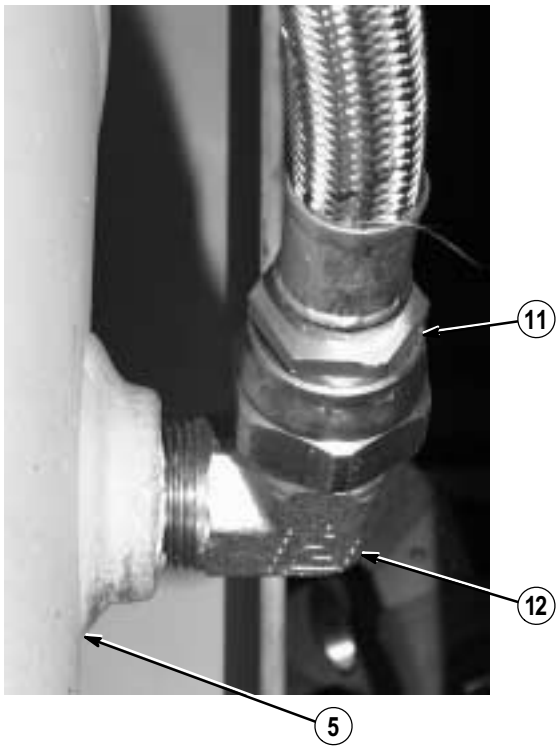
(9) Apply sealing compound to threads of male fitting (16), valve (15), male fitting (14) and elbow (13).

(10) Install male fitting (16), valve (15), male fitting (14) and elbow (13) on tee fitting (17).

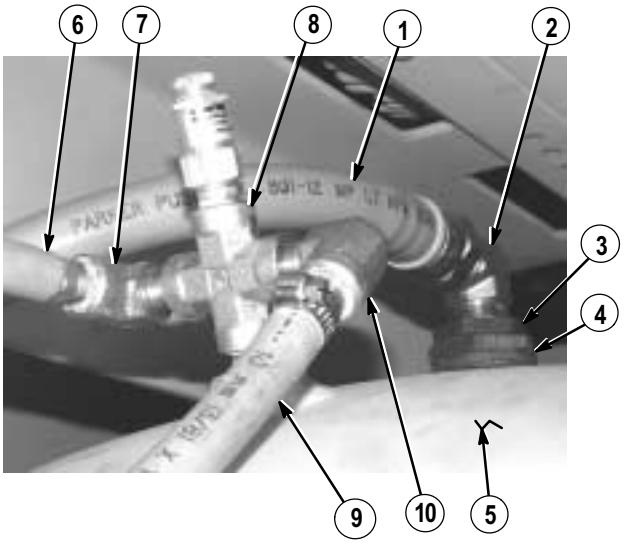
(11) Apply sealing compound to threads of elbow (12).

(12) Install elbow (12) and air line (11) on side of of air reservoir (5).





11-14. AIR COMPRESSOR RESERVOIR AND BRACKET REPLACEMENT (CONT).



WARNING

Adhesives, solvents, and sealing compounds can burn easily, can give off harmful vapors, and are harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in well-ventilated area. If adhesive, solvent, or sealing compound gets on skin or clothing, wash immediately with soap and water.

(13) Apply sealing compound to threads of tee adapter (8).

(14) Install tee adapter (8) to top of air reservoir (5).

(15) Apply sealing compound to threads of elbow (10) and elbow (7).

(16) Install elbow (10) and air line (9) on tee adapter (8). Tighten clamp.

(17) Install elbow (7) and air line (6) on tee adapter (8). Tighten clamp.

(18) Apply sealing compound to threads of adapter (4), adapter (3) and elbow (2).

(19) Install adapter (4), adapter (3) and elbow (2) to top of air reservoir (5).

(20) Connect outlet airline (1) to elbow (2).

c. Follow-On Maintenance:

- Install air compressor, (Para 11-2).
- Start air compressor and check for leaks, (TM 9-4940-568-10).

END OF TASK

11-15. AIR REGULATORS/WATER SEPARATORS/AIR LUBRICATORS REPLACEMENT.

This task covers:

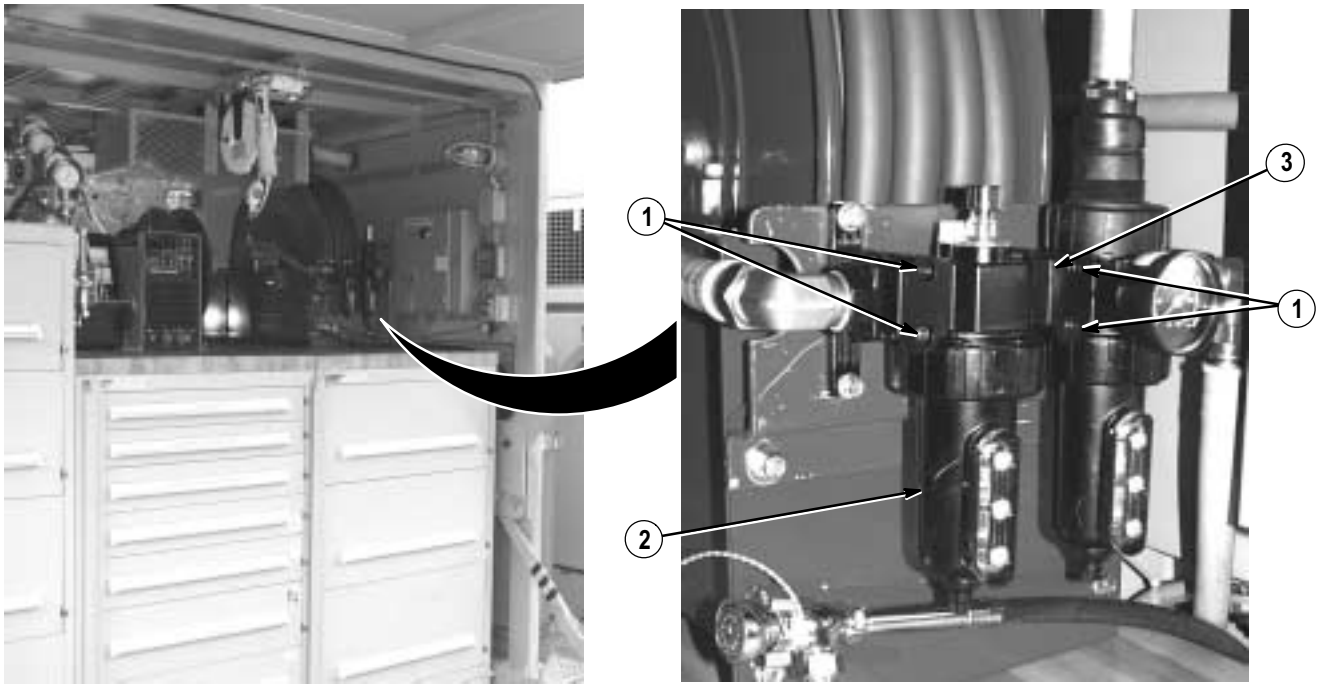
a. Removal b. Installation c. Follow-On Maintenance

INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 30, Appendix G)

Equipment Condition
FRS unloaded, (TM 9-4940-568-10)
Air compressor air tank drained, (TM 9-4940-568-10)

a. Removal.



NOTE

The following procedures are identical for both air regulators and air lubricators. The right-side pneumatic air regulator and lubricator are shown.

(1) Remove four socket head screws (1) and air lubricator (2) from bracket (3).

b. Installation.

(1) Install air lubricator (2) with four socket head screws (1) on bracket (3).

c. Follow-On Maintenance:

- Start air compressor and check for leaks.
- Fill air lubricator (TM 9-4940-568-10)

END OF TASK

CHAPTER 12

FAN AND BLOWER MAINTENANCE

12-1. INTRODUCTION.

This chapter contains maintenance instructions for removing, replacing, repairing, installing and adjusting fan and blower components authorized by the Maintenance Allocation Chart (MAC) at the Unit Maintenance level.

12-2. SOLAR VENT AND BATTERY REPLACEMENT.

This task covers:

a. Removal b. Clean and Inspect c. Installation

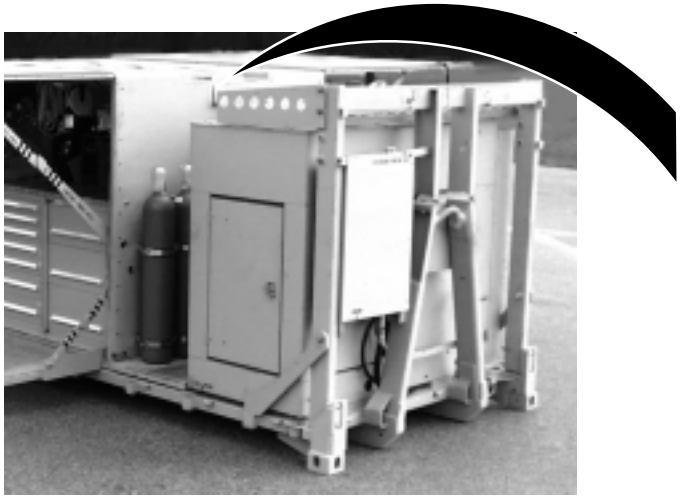
INITIAL SETUP

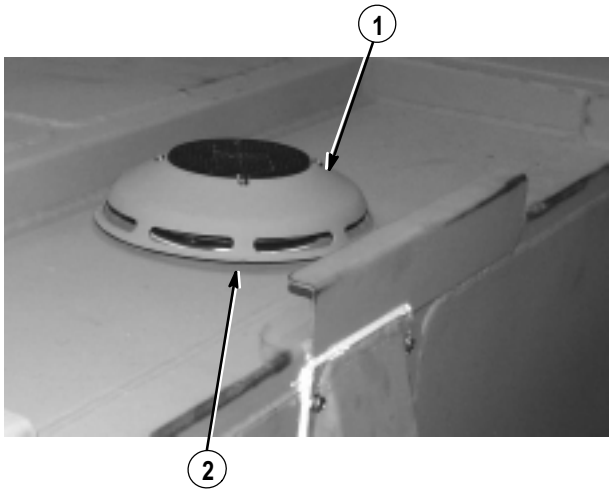
Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 30, Appendix G)

Material/Parts
Adhesive (Item 3, Appendix C)
Locknut (4) (Item 45, Appendix F)

Equipment Condition
FRS unloaded, (TM 9-4940-568-10)

a. Removal.



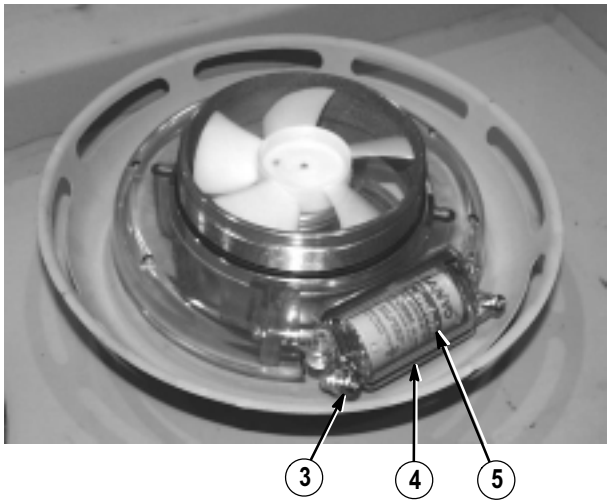


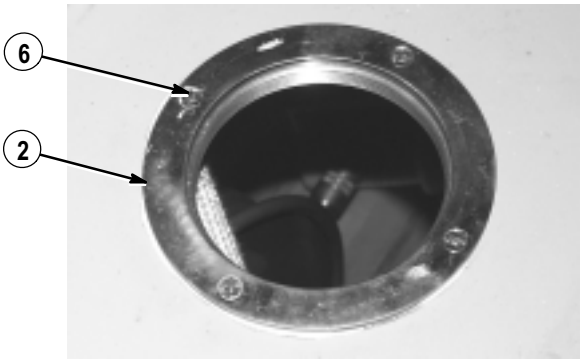
(1) Turn cover assembly (1) counterclockwise and remove from collar (2).

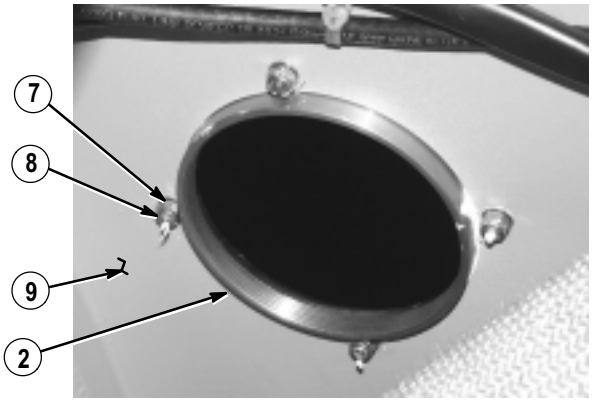
NOTE

If replacing battery, perform Step (2).

(2) Remove two screws (3), battery case cover (4) and Ni–Cad battery (5).







(3) Remove four screws (6), washers (7) and locknuts (8) from collar (2). Discard locknuts.

(4) Remove collar (2) from shelter (9).

b. Clean and Inspect.

(1) Clean surface around circumference of vent hole to insure proper sealing.

c. Installation.

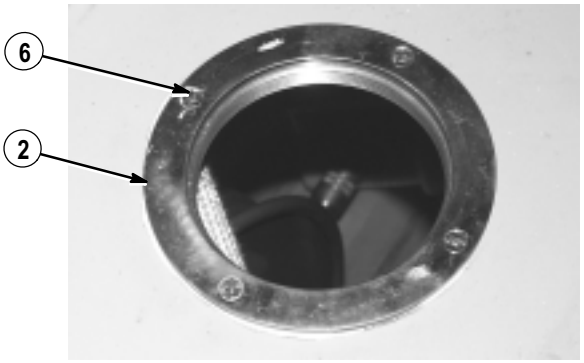
WARNING

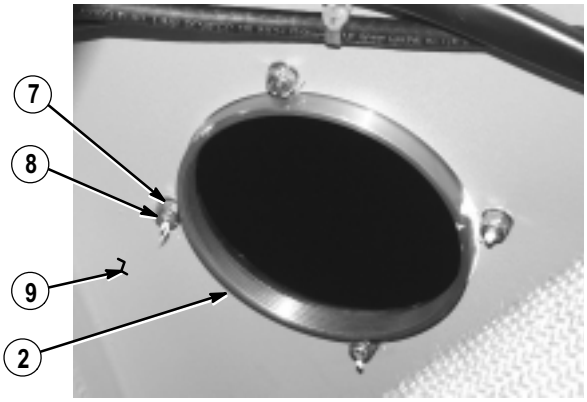
Adhesives, solvents, and sealing compounds can burn easily, can give off harmful vapors, and are harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in well-ventilated area. If adhesive, solvent, or sealing compound gets on skin or clothing, wash immediately with soap and water.

(1) Apply adhesive on underside of flange on collar (2).

(2) Position collar (2) in hole of shelter (9) aligning holes from shelter and collar (2).

(3) Install four screws (6), washers (7) and locknuts (8) on collar (2) and shelter (9).



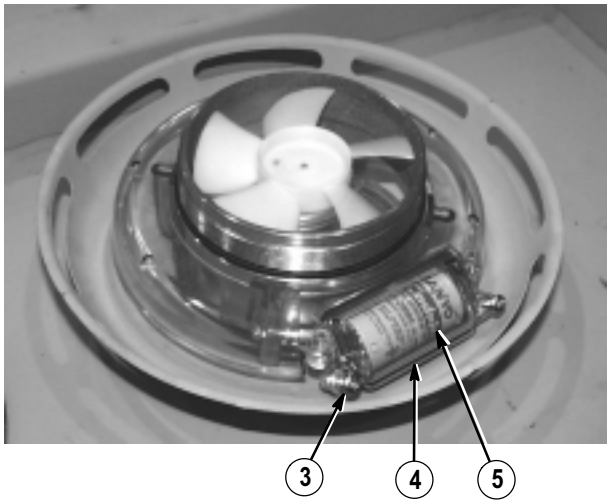


12-2. SOLAR VENT AND BATTERY REPLACEMENT (CONT).

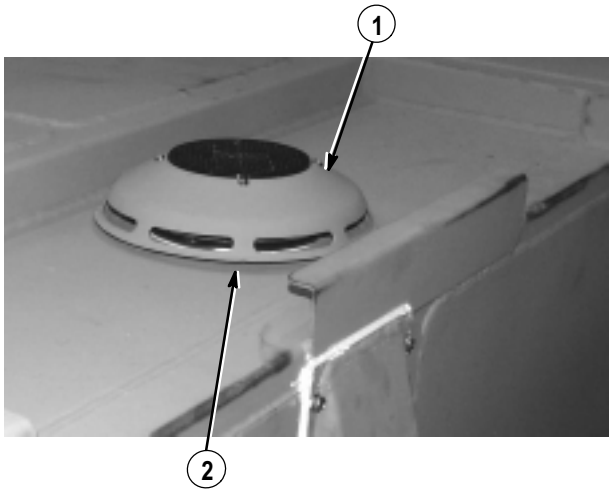
NOTE

- If replacing battery, perform Step (4).
- Ensure electrical contacts inside the battery case are clean.
- When reclosing the battery case, ensure the gasket is in place to prevent water from causing battery corrosion.

(4) Install Ni–Cad battery (5), battery case cover (4) and two screws (3).



(5) Install cover assembly (1) on deck plate (2) by turning clockwise.



END OF TASK

CHAPTER 13

FIRE FIGHTING EQUIPMENT MAINTENANCE

13-1. INTRODUCTION.

This chapter contains maintenance instructions for removing, replacing, repairing, installing and adjusting fire fighting equipment components authorized by the Maintenance Allocation Chart (MAC) at the Unit Maintenance level.

13-2. FIRE EXTINGUISHER AND BRACKET REPLACEMENT.

This task covers:

a. Removal b. Installation

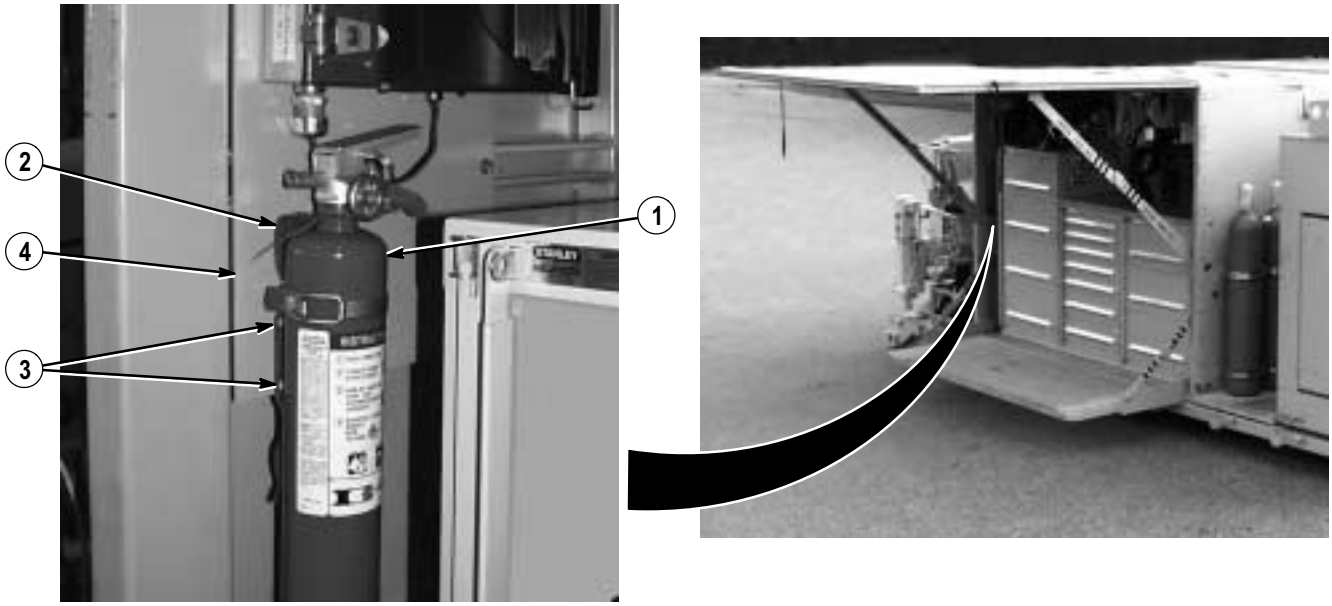
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 30, Appendix G)

Equipment Condition
FRS unloaded, (TM 9-4940-568-10)

Materials/Parts
Screw, Self-Tapping (2) (Item 99, Appendix F)

a. Removal.



NOTE

The following procedures apply to both interior and exterior fire extinguishers. Interior fire extinguisher shown.

(1) Remove fire extinguisher (1) from fire extinguisher mount (2).

(2) Remove two self-tapping screws (3) and fire extinguisher mount (2) from shelter wall (4). Discard self-tapping screws.

b. Installation.

(1) Install fire extingusher mount (2) to shelter wall (4) with two screws (3).

(2) Install fire extinguisher (1) on fire extinguisher mount (2).

END OF TASK

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
Processing and Deprocessing Record for Shipment, Storage and Issue of Vehicles and Spare Engines ..... DD FORM 1397
TACOM Major End Item and Product Assurance Managers ..... SF 2407

A-2. FIELD MANUALS.

Operation and Maintenance of Ordnance Material in Cold Weather (0 Degrees F to Minus 65 Degrees F) ..... FM 9-207

A-3. TECHNICAL MANUALS.

Procedures for Destruction of Tank-Automotive Equipment to Prevent Enemy Use ..... TM 750-244-6
Materials Used for Cleaning, Preserving, Abrading, and Cementing Ordinance Material and Related Materials Including Chemicals ..... TM 9-247
Operator's Maintenance Manual for Forward Repair System (FRS) Model M7 NSN 4940-01-463-7940 ..... TM 9-4940-568-10
Maintenance and Repair for Lead-Acid Storage Batteries ..... TM 9-6140-200-14

A-4. MISCELLANEOUS PUBLICATIONS.

Army Materiel Maintenance Policy and Retail Maintenance Operations ..... AR 750-1
..... SC 3990-CL
Hearing Conservation Program ..... TB MED 501
..... TM 38-450
Safety Inspection and Testing of Lifting Devices ..... TB 43-0142
Color, Marking and Camouflage Painting of Military Vehicles, Construction Equipment, and Materials Handling Equipment ..... TB 43-0209
Use of Antifreeze Solutions, Antifreeze Extender, Cleaning Compounds and Test Kit in Engine Cooling Systems ..... TB 750-651
Security of Tactical Wheeled Vehicles ..... TB 9-2300-422-20

APPENDIX B

MAINTENANCE ALLOCATION CHART (MAC)

Section I. INTRODUCTION

B-1. GENERAL.

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

b. The Maintenance Allocation Chart (MAC) in Section II designates overall authority and responsibility for the performance of maintenance functions on the identified end item or component. The application of the maintenance functions to the end item or component will be consistent with the capacities and capabilities of the designated maintenance levels.

c. Section III lists the tools and test equipment required for each maintenance function as referenced from Section II.

d. Section IV lists remarks (identified by an alphabetic code in Column 6 of the MAC) to provide a ready reference to the definition of the remark.

B-2. MAINTENANCE FUNCTIONS.

Maintenance functions will be limited to and defined as follows:

a. Inspect. To determine the serviceability of an item by comparing its physical, mechanical, and/or electrical characteristics with established standards through examination (e.g., by sight, sound, or feel).

b. Test. To verify serviceability by measuring the mechanical, pneumatic, hydraulic, or electrical characteristics of an item and comparing those characteristics with prescribed standards.

c. Service. Operations required periodically to keep an item in proper operating condition, i.e., to clean (includes decontaminate, when required), to preserve, to drain, to paint, or to replenish fuel, lubricants, chemical fluids, or gases.

d. Adjust. To maintain or regulate, within prescribed limits, by bringing into proper or exact position, or by setting the operating characteristics to specified parameters.

e. Align. To adjust specified variable elements of an item to bring about optimum or desired performance.

f. Calibrate. To determine and cause corrections to be made or to be adjusted on instruments or test, measuring, and diagnostic equipments used in precision measurement. Consists of comparisons of two instruments, one of which is a certified standard of known accuracy, to detect and adjust any discrepancy in the accuracy of the instrument being compared.

g. Remove/Install. To remove and install the same item when required to perform service or other maintenance functions. Install may be the act of emplacing, seating, or fixing into position a spare, repair part, or module (component or assembly) in a manner to allow the proper functioning of an equipment or system.

h. Replace. To remove an unserviceable item and install a serviceable counterpart in its place. "Replace" is authorized by the MAC and is shown as the 3rd position code of the SMR code.

i. Repair. The application of maintenance services, including fault location/troubleshooting, removal/installation, and disassembly/assembly procedures, and maintenance actions to identify troubles and restore serviceability to an item by correcting specific damage, fault, malfunction, or failure in a part, subassembly, module (component or assembly), end item, or system.

(1) Service includes inspection, testing, service, adjustment, alinement, calibration and/or replacement.

(2) Fault locate/troubleshooting is the process of investigating and detecting the cause of equipment malfunctioning; the act of isolating a fault within a system or Unit Under Test (UUT).

(3) Disassemble/Assemble encompasses the step-by-step taking apart (or breakdown) of a spare/functional group coded item to the level of its least componency identified as maintenance significant (i.e., assigned an SMR code) for the category of maintenance under consideration.

(4) Actions include welding, grinding, riveting, straightening, facing, remachining and/or resurfacing.

j. Overhaul. The maintenance effort (service/action) prescribed to restore an item to a completely serviceable/operational condition as required by maintenance standards in appropriate technical publications (i.e., DMWR). Overhaul is normally the highest degree of maintenance performed by the Army. Overhaul does not normally return an item to like new condition.

k. Rebuild. Consists of those services/actions necessary for the restoration of unserviceable equipment to a like new condition in accordance with original manufacturing standards. Rebuild is the highest degree of material maintenance applied to Army equipment. The rebuild operation includes the act of returning to zero those age measurements (hours/miles, etc.) considered in classifying Army equipment/components.

B-3. EXPLANATION OF COLUMNS IN SECTION II.

a. Column 1, Group Number. Column 1 lists functional group code numbers, the purpose of which is to identify maintenance significant components, assemblies, subassemblies, and modules with the next higher assembly. End item group number shall be "OO."

b. Column 2, Component/Assembly. Column 2 contains the names of components, assemblies, subassemblies, and modules for which maintenance is authorized.

c. Column 3, Maintenance Function. Column 3 lists the functions to be performed on the item listed in Column 2.

d. Column 4, Maintenance Level. Column 4 specifies, by the listing of a work time figure in the appropriate subcolumn(s), the level of maintenance authorized to perform the function listed in Column 3. This figure represents the active time required to perform that maintenance function at the indicated level of maintenance. If the number or complexity of the tasks within the listed maintenance function vary at different maintenance levels, appropriate work time figures will be shown for each level. The work time figure represents the average time required to restore an item (assembly, subassembly, component, module, end item, or system) to a serviceable condition under typical field operating conditions. This time includes preparation time (including any necessary disassembly/assembly time), troubleshooting/fault location time, and quality assurance/quality control time in addition to the time required to perform the specific tasks identified for the maintenance functions authorized in the maintenance allocation chart. The symbol designations for the various maintenance levels are as follows:

C	Operator or Crew	H	General Support
O	Unit Maintenance	D	Depot Maintenance
F	Direct Support Maintenance		

***** Asterisk indicates level of maintenance authorized to complete this function. No time is established.

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

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

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

a. Column 1, Reference Code. The tool and test equipment reference code correlates with a code used in the MAC, Section II, Column 5.

b. Column 2, Maintenance Level. The lowest category of maintenance authorized to use the tool or test equipment.

c. Column 3, Nomenclature. Name or identification of the tool or test equipment.

d. Column 4, National Stock Number. The national stock number of the tool or test equipment.

e. Column 5, Tool Number. The manufacturers part number.

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

a. Column 1, Reference Code. An alphabetic code listed in the sixth column of the MAC and first column of the Remarks section to identify remarks made to the MAC.

b. Column 2, Remarks. The complete text of the remarks made to the MAC.

Section II. MAINTENANCE ALLOCATION CHART

(1)	(2)	(3)	(4) Maintenance Level					(5)	(6)
			Unit		Direct Support	General Support	Depot		
Group Number	Component/Assembly	Maintenance Function	C	O	F	H	D	Tools and Equipment	Remarks
06	**ELECTRICAL SYSTEM**								
0607	Instrument or Engine Control Panel:								
	Generator Control Box	Inspect Repair	0.1	 1.0				 1	
	120/208 Volt AC Main Panel	Inspect Repair	0.1	 1.0				 1	
	Air Compressor Control Box	Inspect Replace Repair	0.1	 1.0 0.5				 1 1	
	24 Volt DC Main Panel	Inspect Repair	0.1	 0.5				 1	
0608	Miscellaneous Items:								
	Electrical Piping And Clamps	Inspect Replace	0.1	 2.0				 1	
	GFCI/Standard 110-V Receptacle	Replace		0.5				1,2	
	Light Switch	Inspect Replace	0.1	 0.5				 1,2	
	Nato Slave Receptacle	Inspect Replace	0.5	 1.0				 1	
	Master Disconnect Switch	Inspect Replace	0.5	 0.5				 1	
0609	Lights:								
	Dome Light	Inspect Replace Repair	0.1	 0.5 0.5				 1 1	
	Fixed Light	Inspect Replace Repair	0.1	 0.5 0.5				 1 1	
	Rechargable Handlamp	Inspect Replace Repair	0.1	 0.5 0.5				 1,2 1,2	
	Retractable Light	Inspect Replace	0.1	 1.0				 1,2	

Section II. MAINTENANCE ALLOCATION CHART (CONT).

(1)	(2)	(3)	(4) Maintenance Level					(5)	(6)
			Unit		Direct Support	General Support	Depot		
Group Number	Component/Assembly	Maintenance Function	C	O	F	H	D	Tools and Equipment	Remarks
0612	Batteries, Storage:								
	Battery	Inspect	0.1						
		Replace		1.0				1	
18	**SHELTER AND RACK**								
1812	Special Purpose Bodies:								
	Bottle Bracket	Replace		0.5				1	
	Brush Guard Support Arm	Inspect	0.1						
		Replace		2.5				1	
	Door Assembly	Inspect	0.1						
		Replace		0.5				1	
		Repair		4.0				1	
		Adjust		0.3				1,49	
	Door Latch	Inspect	0.1						
		Replace		1.0				1	
		Adjust		0.1				1	
	Door Support Arms	Inspect	0.1						
		Replace		3.0				1,50,80	
	Fire Extinguisher Bracket	Inspect	0.1						
		Replace		0.5				1	
	Hook Arm Guard	Inspect	0.1						
		Replace		0.5				1	
	Jackstand Storage Box	Inspect	0.1						
		Replace		1.0				1	
	Air Compressor Platform Assembly	Inspect	0.1						
		Replace		1.5				1	
	Shelter Stowage Rack	Inspect	0.1						
		Replace		1.0				1	
	Tool Cabinet	Replace		1.5				1,20,21	
	Miscellaneous Shelter Components	Replace		2.0				1	

Section II. MAINTENANCE ALLOCATION CHART (CONT).

(1)	(2)	(3)	(4) Maintenance Level					(5)	(6)
			Unit		Direct	General			
Group Number	Component/Assembly	Maintenance Function	C	O	Support F	Support H	Depot D	Tools and Equipment	Remarks
20	**CRANE**								
2001	Hoist, Capstan, Windlass, Crane or Winch Assembly:								
	Crane	Inspect	0.1						
		Service		0.5					
		Test			1.0			45	
		Adjust			0.5			5,6,13,32,	
		Replace			5.0			37,40,42,	
								45,51,52,	
								59,71,77,	
								78,74,82,	
		Repair			2.0			83,	
								5,6,13,32,	
								37,40,42,	
								45,51,52,	
								59,71,74,	
								77,78,82,	
								83,	
	Junction Box	Replace		1.0				1	
		Repair		4.0				1	
	Hoist Cable	Replace		1.0				1	
	Hook Block Assembly	Replace		0.5				1	
		Repair		0.5				1	
	Boom Nose Sheave	Replace		1.0				1	
	Power Cable	Replace		0.2				1	
	Overload Shutdown Cable	Replace		0.5				1	
		Adjust		1.0					
	Electric Solenoid Cable	Replace		0.5				1	
	Remote Control Box	Replace		0.3				1	
		Repair		1.0				1,3,4	
	Remote Control Storage Box	Replace		0.3				1	
	Boom Light Cable	Replace		0.2				1	
	Boom Light Resistor	Replace		0.5					
	Boom Light	Replace		0.2					

Section II. MAINTENANCE ALLOCATION CHART (CONT).

(1)	(2)	(3)	(4) Maintenance Level					(5)	(6)
			Unit		Direct Support	General Support	Depot		
Group Number	Component/Assembly	Maintenance Function	C	O	F	H	D	Tools and Equipment	Remarks
2001	Hoist, Capstan, Windlass, Crane or Winch Assembly (CONT.):								
	Boom Light Reel and Guide	Inspect Replace	0.1	0.5					
	Three Function Manual Control Valve Mounting Bracket	Replace			1.0				
	Swing Drive Orbit Motor	Replace Repair			2.0	1.0			
	Swing Drive Brake	Replace Repair			2.0	1.0			
	Swing Drive Assembly	Replace Repair			2.0	1.0			
	Boom, Mid Section and Telescopic Cylinder	Replace Repair Adjust			7.0	0.8 0.5			
	Boom, Fly Section	Replace Adjust			4.0 0.5				
	Boom, Base Section	Replace			7.0				
	Lift Cylinder	Replace Repair			3.0	0.9			
	Erection Cylinder	Replace Repair			3.0	0.9			
	Tension Link	Replace			2.0				
	Mast	Replace			6.0				
	Cable Follower	Replace Repair			0.7 0.6				
	Proximity Sensor	Replace			0.5				

Section II. MAINTENANCE ALLOCATION CHART (CONT).

(1)	(2)	(3)	(4) Maintenance Level					(5)	(6)
			Unit		Direct Support	General Support	Depot	Tools and	
Group Number	Component/Assembly	Maintenance Function	C	O	F	H	D	Equipment	Remarks
2001	Hoist, Capstan, Windlass, Crane or Winch Assembly (CONT.):								
	Hoist Hydraulic Motor	Replace Repair			1.0	 2.0			
	Oil Filled Disk Brake Assembly	Replace Repair			1.0	 2.0			
	Gear Set	Replace Repair			1.0	 2.0			
	Hoist Assembly	Inspect Service Replace	0.1 0.3		 1.4				
	Overload Shutdown	Replace			1.0				
	Tension Load Cell	Replace			0.5				
	Turntable Bearing	Replace Inspect			4.0 2.0				
	Turntable	Replace			7.0				
	Five Function Control Valve Mounting Bracket	Replace			1.0				
	Cross-Relief Valve	Replace Repair			1.0	 1.0			
	Manual Control Two-Way Solenoid Valve	Replace Repair			1.0	 1.0			
	Five Function Control Valve	Replace Repair			0.1	 0.5			
	Three Function Manual Control Valve	Replace Repair			0.1	 0.5			

Section II. MAINTENANCE ALLOCATION CHART (CONT).

(1)	(2)	(3)	(4) Maintenance Level					(5)	(6)
			Unit		Direct Support	General Support	Depot		
Group Number	Component/Assembly	Maintenance Function	C	O	F	H	D	Tools and Equipment	Remarks
2001	Hoist, Capstan, Windlass, Crane or Winch Assembly (CONT.):								
	Hoist, Boom, Telescope, Swing Crane Electric Solenoid	Replace Repair			0.2	 1.0			
	Crane Control Valves	Replace Repair			0.2	 1.0			
	Hoist Motor Control Valve	Replace				0.5			
	Hoist Motor Holding Valve	Replace				0.5			
	Boom Assembly	Replace				5.0			
	Hoist Hydraulic Pressure	Adjust				0.5			
	Main Hydraulic Pressure	Adjust				0.5			
	Crane Tubing	Replace				1.0			
	Crane Hoses	Replace				1.0			
	Outrigger Cylinder Holding Valve	Replace				0.5			
	Boom Lift Holding Valve	Replace				0.5			
	Bulldozer Tripod, Main Frame, Jack and Mounting:								
	Outrigger Extension Cylinder	Replace Repair			3.0	 4.0			
	Jack Cylinder	Replace Repair			2.0	 3.0			
	Outrigger Beam	Replace			2.0				

Section II. MAINTENANCE ALLOCATION CHART (CONT).

(1)	(2)	(3)	(4) Maintenance Level					(5)	(6)
			Unit		Direct Support	General Support	Depot		
Group Number	Component/Assembly	Maintenance Function	C	O	F	H	D	Tools and Equipment	Remarks
22	**ACCESSORY ITEMS**								
2202	Accessory Items:								
	Eye Wash Fountain	Inspect Replace	0.1	 1.5				 1	
	Heater Assembly And Vent	Inspect Replace Repair	0.1	 1.5 2.0				 1,42 1,42	
24	**HYDRAULIC AND FLUID SYSTEMS**								
2401	Hydraulic Pump:								
	Hydraulic Pump	Inspect Replace Repair Adjust	0.1		 2.0 3.0 1.0			 5,42,50,75 76,80, 5,42,50,75 76,80, 5,59	
2403	Hydraulic Controls and/or Manual Controls:								
	Hydraulic Quick Disconnect	Inspect Replace	0.1	 1.5				 1,42	
2406	Hydraulic Lines and Fittings:								
	Hydraulic Filter	Inspect Replace	0.1	 1.0				 1,42,72,73	
	Hydraulic Tubes, Clamps and Hoses	Inspect Replace		0.1	 2.0			 1,13,42	
	Hydraulic Conduit	Replace		0.1				1	
2408	Liquid Tanks or Reservoirs:								
	Hydraulic Reservoir	Inspect Service Replace	0.1	 1.0 2.0				 1 1,13	

Section II. MAINTENANCE ALLOCATION CHART (CONT).

(1)	(2)	(3)	(4) Maintenance Level					(5)	(6)
			Unit		Direct Support	General Support	Depot		
Group Number	Component/Assembly	Maintenance Function	C	O	F	H	D	Tools and Equipment	Remarks
29	**AUXILIARY GENERATORS AND ENGINE AND CONTROLS (Special Purpose)**								
2901	Generator and Engine Assembly								
	Engine Generator Assembly	Inspect	0.1						
		Test		0.5				39,50,65, 80	
		Service		1.5					
		Replace			3.5			5,13,34,42, 51,71,72, 76,82	
		Repair				8.0		5,13,42,51, 71,72,76, 82	
	Generator Housing	Inspect			0.5				
		Replace			4.0			5,13	
	Generator Set Chassis and Engine Mount	Inspect			0.5				
		Replace			4.0			5,13,23,50, 80,82	
2910	Engine Assembly								
	Engine Assembly	Inspect	0.1	0.5					
		Test		1.0					
		Service		1.0				1	
		Adjust			2.0			5,23	
		Replace			4.0			5,23,37,82	
		Repair		1.5	8.5			5,23,37,82	
	Ground Rod Stowage Cylinder	Replace		0.5				1	
2911	Crankcase, Cylinder Sleeve, Cylinder Head and Block:								
	Block	Replace				12.0		5,14,20,30 33,48,54, 57	
		Repair				8.0		5,14,20,30 33,48,54, 57	

Section II. MAINTENANCE ALLOCATION CHART (CONT).

(1)	(2)	(3)	(4) Maintenance Level					(5)	(6)
			Unit		Direct	General			
Group Number	Component/Assembly	Maintenance Function	C	O	Support F	Support H	Depot D	Tools and Equipment	Remarks
2911	Crankcase, Cylinder Sleeve, Cylinder Head and Block: (CONT)								
	Cylinder Head	Replace Repair			3.5	6.0		5,3 5,3,11,14, 30,31,35, 41,44,46, 48,63,81	
2912	Crankshaft:								
	Crankshaft	Replace				4.5		5,46 5,11,36, 46,63	
	Crankshaft Front Seal Crankshaft Rear Seal	Replace			3.5 3.5			5,41,44 5,63	
2913	Flywheel Assembly:								
	Flywheel	Replace			4.0			5,14,30,31 35,81 5,14,30,31 35,81	
2914	Piston, Connecting Rods:								
	Pistons	Replace				6.0		5,14,15,19 23,26,27, 28,30,38, 43,61,62, 66 5,14,15,19 23,26,27, 28,30,38, 43,61,62, 66	

Section II. MAINTENANCE ALLOCATION CHART (CONT).

(1)	(2)	(3)	(4) Maintenance Level					(5)	(6)
			Unit		Direct Support	General Support	Depot		
Group Number	Component/Assembly	Maintenance Function	C	O	F	H	D	Tools and Equipment	Remarks
2915	Valves, Camshaft, and Timing System:								
	Rocker Arm	Replace		2.0				1,23,50,80	
	Camshaft and Camshaft Gear	Replace				6.5		5,18,14,22 23,27,30, 63	
	Push Rod Cover	Replace			0.5			5,14,30,35 50,80	
2916	Engine Lubrication System:								
	Oil Filter	Replace		0.1				1, 4, 42	
	Oil Filter Head	Replace		1.0				1, 4, 42	
	Oil Pan/Gasket	Replace		2.0				1, 3	
	Lubricating Oil Pump	Inspect Replace		1.0 4.0				 5,14,30, 50,80	
2917	Special Starting Devices:								
	Ether Start	Inspect Replace	0.1	 0.5				 1, 7	
	Ether Switch	Replace		0.1				1	
	Remote Start Switch	Inspect Replace	0.1	 0.5				 1, 7	
2918	Manifolds:								
	Air Intake Manifold	Replace		2.0				1,50,80	
	Exhaust Manifold	Replace		3.0				1,81	

Section II. MAINTENANCE ALLOCATION CHART (CONT).

(1)	(2)	(3)	(4) Maintenance Level					(5)	(6)
			Unit		Direct	General			
Group Number	Component/Assembly	Maintenance Function	C	O	Support F	Support H	Depot D	Tools and Equipment	Remarks
2919	Driving Mechanisims:								
	Engine Drive Belt	Inspect	0.1						
		Replace		1.0				1	
	Engine Drive Belt Tensioner	Replace		2.5				1,50,80	
	Front Gear Cover	Replace			6.0			5,81	
	Timing Pin	Replace			1.0			5,23,50,80	
2933	Engine Air Cleaner:								
	Air Cleaner and Bracket	Replace		1.0				1	
	Air Filter	Inspect	0.1						
		Replace		0.3				1	
2935	Engine Fuel Tank:								
	Fuel Tank Gage	Inspect	0.1						
		Replace		1.0				1	
	Fuel Tank and Cap	Inspect	0.1	3.0					
		Replace		1.5				5,18,19,21 22,42	
2937	Engine Fuel Filter:								
	Fuel Filter	Replace		0.5				1,42	
	In-line Fuel Filter	Replace		0.5				1	
2938	Engine Priming System, Lines, and Pumps:								
	Fuel Hose	Inspect	0.1					1,13,42	
		Replace		0.5					
	Fuel Injector	Inspect		0.5					
		Replace		2.0				1,4,50,80	
		Repair		0.5				1,4,50,80 10	
		Test		0.5				60	

Section II. MAINTENANCE ALLOCATION CHART (CONT).

(1)	(2)	(3)	(4) Maintenance Level					(5)	(6)
			Unit		Direct Support	General Support	Depot		
Group Number	Component/Assembly	Maintenance Function	C	O	F	H	D	Tools and Equipment	Remarks
2938	Engine Priming System, Lines, and Pumps (CONT):								
	Fuel Injector Lines	Inspect Replace	0.1	 1.5				 1,4,42	
	Fuel Injector Pump	Inspect Adjust Replace		0.5	 0.3 2.0			 1,23,50,80 5,3,23,47, 50,80,81	
	Fuel Shut Off Valve	Replace			1.0			5,50,80	
	Fuel Pump	Replace		1.0				1,42,50,80	
2941	Engine Muffler, Exhaust, and Tail Pipes:								
	Exhaust System	Inspect Replace	0.1	0.1 3.0				 1	
2951	Engine Radiator, Shell, Core, and Expansion Tank:								
	Coolant Surge Tank	Inspect Service Replace	0.1	 0.5 0.5				 1,42	
	Radiator	Inspect Service Replace	0.1	 1.0 2.5				 1,19,21 1,19,21	
2953	Engine Cooling System Lines:								
	Coolant Tank Heater	Replace		0.5				1,42	
2954	Engine Water Pump:								
	Engine Water Pump	Replace		2.5				1,4,50,80	
2955	Engine Fan, Fan Drives, Fan Belts, Fan:								
	Engine Fan Blade	Inspect Replace	0.1	 2.5				1,4,50,80	
	Engine Fan Hub	Replace		0.5				1,4	

Section II. MAINTENANCE ALLOCATION CHART (CONT).

(1)	(2)	(3)	(4) Maintenance Level					(5)	(6)
			Unit		Direct	General			
Group Number	Component/Assembly	Maintenance Function	C	O	Support F	Support H	Depot D	Tools and Equipment	Remarks
2960	Sending Units:								
	Coolant Temperature Sending Unit	Replace		0.5				1	
	Engine Electronic Overspeed Module	Replace Adjust		0.5 0.5				1 1	
	Engine Thermostat and Lifting Bracket	Replace		2.0				1,4,50,80	
	Ether Start Sensor	Replace		1.0				1	
	High Coolant Temperature Sensor	Replace		0.5				1	
	Low Engine Temperature Sensor	Replace		0.5				1	
	Low Oil Pressure Sensor	Replace		0.5				1	
	Oil Pressure Sending Unit	Replace		0.5				1	
	Pre-High Coolant Temperature Sensor	Replace		0.5				1	
	Pre-Low Oil Pressure Sensor	Replace		0.5				1	
2961	Generator:								
	Generator	Test Replace Repair			2.0 6.0	 12.0		 5,13,23,50 80,82 5,13,23 50,80,82	
	Alternator	Test Replace		0.3 1.0				 1,4,50,80	
	Generator Control Panel (AC)	Replace Repair		0.1 1.0				1 1	
	Generator Control Panel (DC)	Replace Repair		0.1 1.5				1 1	

Section II. MAINTENANCE ALLOCATION CHART (CONT).

(1)	(2)	(3)	(4) Maintenance Level					(5)	(6)
			Unit		Direct Support	General Support	Depot		
Group Number	Component/Assembly	Maintenance Function	C	O	F	H	D	Tools and Equipment	Remarks
2963	Starter, Solenoids, Circuit Breakers, Wiring, and Switches:								
	Starter	Test Replace Repair		0.3 0.5	 4.0			1,4,50,80 1,4,50,80 1,4,50,80	
2967	Instrument Panel								
	Meter Replacement	Replace		0.5				1	
2968	Switches, Circuit Breakers, and Fuses:								
	Generator Electronic Circuit Card (ECC)	Replace		1.0				1	
43	**GAS SYSTEMS**								
4316	Assembled Hose, Fittings, Lines, Breathers, Filters and Traps:								
	Hose Reel, Argon	Inspect Replace Repair Adjust	0.1	 1.5 1.0 0.2				 1,50 1,50	
	Hose Reel, Oxygen, Propylene	Inspect Replace Repair Adjust	0.1	 1.5 1.0 0.2				 1 1	
4317	Control Valves:								
	Argon Regulator and Guard	Replace		1.0				1,69	
	Oxygen/Propylene Regulators	Replace		1.0				1,69	
44	**WELDING EQUIPMENT**								
4400	Major Assemblage:								
	Arc Welder/Bracket	Inspect Replace	0.1	 1.0				 1	
	Wire Feeder/Bracket	Inspect Replace	0.1	 1.0				 1	

Section II. MAINTENANCE ALLOCATION CHART (CONT).

(1)	(2)	(3)	(4) Maintenance Level					(5)	(6)
			Unit		Direct Support	General Support	Depot		
Group Number	Component/Assembly	Maintenance Function	C	O	F	H	D	Tools and Equipment	Remarks
50	**PNEUMATIC EQUIPMENT**								
5000	Air Compressor Assembly:								
	Air Compressor Assembly	Inspect Replace Repair	0.1	0.1 5.0		8.0		1 5,31,43 68,74,82	
	Air Compressor Reservoir/Bracket	Inspect Replace	0.1	 7.0				 1,64,67,70	
5006	Lubrication System:								
	Air Compressor Oil Level Switch	Replace		2.0				1,2,68	
	Air Compressor Crankcase Oil	Drain Fill		0.5 0.5				1,42	
5007	Compressor Drive:								
	Air Compressor Drive Belt	Inspect Adjust Replace		0.1 0.5 1.0				 1,50 1,50	
5009	Unloader System Components:								
	Air Compressor Air Filter	Inspect Replace		0.1 0.1				 1	
5012	Throttling Devices:								
	Air Compressor Gage	Inspect Replace	0.1	 0.5				 1	
	Air Compressor Pressure Switch	Adjust Replace Repair		0.5 1.5 1.0				 1,2 1,2	

Section II. MAINTENANCE ALLOCATION CHART (CONT).

(1)	(2)	(3)	(4) Maintenance Level					(5)	(6)
			Unit		Direct Support	General Support	Depot		
Group Number	Component/Assembly	Maintenance Function	C	O	F	H	D	Tools and Equipment	Remarks
5015	Air Discharge System:								
	Pneumatic Hose Reel/Hose 3/4”	Inspect	0.1						
		Replace		3.0				1,50,70,7379	
		Repair		1.0				1,50,70,7379	
		Adjust		0.2					
	Pneumatic Hose Reel/Hose 3/8”	Inspect	0.1						
		Repair		3.0				1	
		Replace		1.0				1	
		Adjust		0.2					
	Air Regulator/Water Separator/Air Lubricator	Inspect	0.1						
		Replace		1.0				1	
		Service	0.1						
64	**VENTILATING FANS**								
6401	Ventilating Fan Assembly:								
	Solar Vent	Inspect	0.1						
		Replace		0.5				1	

Section III. TOOL AND TEST EQUIPMENT REQUIREMENTS

Table B-1. Tool and Test Equipment Requirements

Tool or Test Equipment Ref Code	Maintenance Category	Nomenclature	National/ NATO Stock Number	Tool Number
1	O	TOOL KIT, General Mechanic's: Automotive	5180-00-177-7033	SC 5180-90-N26
2	O	TOOL KIT, Electric	5180-00-876-9336	SC 4910-95-A72-HR
3	O	SHOP EQUIPMENT, Automotive Maintenance and Repair: Common No. 1	4910-00-754-0654	SC 4910-95-A74
4	O	SHOP EQUIPMENT, Automotive Maintenance and Repair: Common No. 2	4910-00-754-0650	SC 4910-95-A78-HR
5	F	TOOL KIT, General Mechanic's	5180-00-699-5273	SC 5180-90-CL-N05
6	F	SHOP EQUIPMENT, Automotive Maintenance and Repair: Field Maintenance, Basic	4910-00-754-0705	SC 4910-95-A31
7	F	SHOP EQUIPMENT, Fuel and Electrical System, Engine: Field Maintenance, Basic	4940-00-754-0714	SC 4940-95-B20-HR
8	F	SHOP EQUIPMENT, Automotive Maintenance and Repair: Field Maintenance, Supp. 2	4910-00-754-0707	SC 4910-95-A63
9	H	BRUSH, Bore, Injector	TBD	TBD
10	O	BRUSH, Injector Cleaning	7920-01-381-6132	3822509
11	H	BRUSH, Nylon	7920-00-685-3980	7920-00-685-3980
12	H	CAMSHAFT BUSHING TOOL	5120-01-389-8449	3823509
13	O	CAP AND PLUG SET	5340-00-450-5718	10935405
14	F	COMPRESSOR, Air Unit	4130-00-752-9633	MIL-C-13874
15	H	COMPRESSOR, Ring, 75-125mm (3-5 in.)	TBD	TBD
16	H	COMPRESSOR, Spring, Valve	5120-01-297-2347	J7455-A
17	O	CRIMPING TOOL (Deutsch)	5120-00-165-3912	M22520/1-01
18	F	DISPENSING PUMP	4930-00-287-8293	FEDXXD370
19	O	DRILL, Electric, Portable, 1/4 in.	5130-00-889-8993	SC 4910-95-A31
20	O	DRILL, Electric, Portable	5130-00-293-1849	WD00661
21	O	DRILL SET, Twist	5133-00-293-0983	GGG-D-751
22	O	DRUM, Storage 57 Gal	8110-00-082-2626	MIL-D6054

Table B-1. Tool and Test Equipment Requirements (Cont).

Tool or Test Equipment Ref Code	Maintenance Category	Nomenclature	National/ NATO Stock Number	Tool Number
23	F	ENGINE TURNOVER TOOL	5120-01-285-5193	3824591
24	O	EXTRACTION TOOL (Deutsch)	5120-01-158-4707	114010
25	H	GAGE, Depth, Micrometer	5210-00-619-4045	GGG-C-105
26	F	GAGE, Feeler	5210-01-131-8151	2070A70
27	F	GAGE SET, Telescoping	5210-00-473-9350	559-590
28	H	GRINDER, Die	TBD	TBD
29	H	GRINDING WHEEL	3460-00-529-2105	SC 4910-95-A31
30	F	GUN, Air Blow	4940-00-333-5541	GGG-G-770
31	O	HAMMER, Hand, Soft Plastic	5120-01-065-9037	3-HD
32	F	HANDLE, Tubular	TBD	54555A82
33	H	HONING UNIT, Cylindrical	5130-00-991-0699	MIL-C-82609
34	F	HOOKS, LIFTING	4030-01-478-1098	3784T24
35	F	INDICATOR, Dial	5210-00-794-9178	SC 4910-95-A31
36	H	INDICATOR, Dial, Set W/Magnetic Base	5120-00-402-9619	J7872
37	F	JACKSTAND, Trestle	4910-00-251-8013	306
38	H	MICROMETER, Outside, Caliper, Set	5210-00-554-7134	GGG-C-105
39	F	MULTIMETER	6625-00-999-6282	ANURM105C
40	F	MULTIPLIER, Torque	5120-01-348-9484	YA393
41	F	OIL SEAL INSTALLER, Front Crankshaft	5120-01-476-1516	38242298
42	O	PAN, DRAIN 6 Gal	4910-01-476-1516	MIL-P-45819
43	H	PLIERS, Retaining Ring	5120-00-595-9552	S6800
44	F	PRESS, Arbor, Hand Operated	3444-00-163-4338	MIL-P-80261
45	F	PROTRACTOR, Magnetic	5210-01-415-0075	2150A25
46	F	PULLER Kit, Universal	5180-00-423-1596	1677
47	F	PULLER, Mechanical	5720-01-389-5917	3823276
48	F	SANDER, Portable Disc Electric	5130-00-596-9728	OOS90
49	O	SCALE, Tension	4910-00-779-6832	J8129
50	O	SOCKET SET, 3/8 in.	5120-01-117-3876	SC4910-95-A72-HR
51	F	SOCKET SET, 3/4 in.	5120-00-204-1999	GGG-W-641
52	F	SOCKET SET, 2 in. – 1 in. Drive	5120-00-081-2309	SC 4910-95-A31
53	H	SOFT WIRE WHEEL	TBD	TBD
54	H	STEAM CLEANER	7910-01-157-8272	PRO 12-5
55	H	STONE, 15 Degree	4940-00-473-6437	SC 4910-95-A31

Table B-1. Tool and Test Equipment Requirements (Cont).

Tool or Test Equipment Ref Code	Maintenance Category	Nomenclature	National/ NATO Stock Number	Tool Number
56	H	STONE, 60 Degree	4910-00-540-4679	SC 4910-95-A31
57	F	STRAIGHT EDGE	4920-00-442-1030	11-1480
58	H	TAPPET KIT	TBD	3822513
59	F	TESTER, Hydraulic Oil Flow Pressure	TBD	PDS1-400-05-10
60	O	TESTER, Injector	TBD	TBD
61	H	TOOL, Oil Ring Expander	TBD	TBD
62	H	TOOL, Piston Ring Expander	5120-01-387-8935	3823137
63	H	TOOL, Wear Sleeve Installation	4920-01-476-0297	3824078
64	O	VISE, Machinist's	5120-00-293-1439	504M2
65	F	WHEATSTONE BRIDGE	TBD	TBD
66	H	WHEEL, Steel Wire	TBD	TBD
67	O	WRENCH, Adjustable 0 3 5/8 in.	5120-00-264-3793	2117080
68	O	WRENCH, Combination 1 1/16 in.	5120-00-228-9515	1234
69	O	WRENCH, Combination 1 1/8 in.	5120-00-228-9516	1172
70	O	WRENCH, Combination 1 1/4 in.	5120-00-228-9517	1173
71	O	WRENCH, Combination 1 5/16 in.	5120-01-399-8786	1242
72	O	WRENCH, Combination 1 3/8 in.	5120-01-367-0103	1176A
73	O	WRENCH, Combination 1 1/2 in.	5120-01-399-8798	1248
74	O	WRENCH, Combination 1 11/16 in.	5120-01-399-8795	1254
75	O	WRENCH, Combination 1 5/8 in.	5120-01-399-8801	1252
76	O	WRENCH, Combination 1 7/8 in.	5120-01-399-8806	1260
77	O	WRENCH, Combination 2 in.	5120-01-399-8813	1264
78	F	WRENCH, Offset 2 in.	TBD	TBD
79	O	WRENCH, Pipe	5120-00-277-1461	41W664
80	O	WRENCH, Torque, 3/8 in. Drive (0-60 N·m)	5120-01-112-9531	SC 4910-95-A72-HR
81	O	WRENCH, Torque (0 to 175 lb-ft [0–237 N·m])	5120-01-396-5751	1753LDF
82	O	WRENCH, Torque (0 to 300 lb-ft [0–407 N·m])	5120-00-555-1523	5120-00-555-1523
83	O	WRENCH, Torque (0 to 600 lb-ft [0 to 814 N·m])	5120-01-355-1797	TE602LA

APPENDIX C

EXPENDABLE SUPPLIES AND MATERIALS LIST

Section I. INTRODUCTION

C-1. SCOPE.

This appendix lists expendable supplies and materials you will need to operate and maintain the Forward Repair System (FRS). These items are authorized to you by CTA50-970, Expendable Items (Except Medical, Class V, Repair parts and Heraldic Items) or CTA8-100, Army Medical Department Expendable/Durable Items.

C-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 task box to identify the material (e.g., “Cloth, Cleaning, Item 13, Appendix C”).

b. Column (2) - Level. This is the maintenance level approved to use the item listed.

c. Column (3) - National Stock Number. This is the National Stock Number assigned to the item; use it to request or requisition the item.

d. Column (4) - Description. Indicates the Federal item name and, if required, a description to identify the item. The last line for each item indicates the Commercial and Government Entity (CAGE) code in parentheses followed by the part number.

e. Column (5) - Unit of Measure. Indicates the measure used in performing the actual maintenance function. This measure is expressed by a two-character alphabetical abbreviation (e.g., ea, in. or pr). If the unit of measure differs from the unit of issue, requisition the lowest unit of issue that will satisfy your requirements.

Section II. EXPENDABLE SUPPLIES AND MATERIALS LIST

(1) Item No.	(2) Level	(3) National Stock Number	(4) Description	(5) U/M
1	O	8040-01-307-0504	Adhesive (53472) 30834 16 oz can, brush top	oz
2	O	TBD	Adhesive (TBD) RIA149187	TBD
3	O		Adhesive (71984) RTV 732 Clear	
		8040-00-701-9546	5 oz kit	oz
		8040-01-010-8758	12 oz kit	oz
			(80244) MIL-A-46106 Group 1, Type 1	
		8040-01-331-7469	3 oz tube	oz
		8040-01-331-7475	12 oz cartridge	oz
4	O	TBD	Adhesive, Jetmelt (45152) 1502520	TBD
5	O	TBD	Adhesive Sealant (45152) 24758FX	oz
6	O		Alcohol, Isopropyl (53390) 7618-19-4	
		6810-01-075-5546	40 oz bottle	oz
7	O		Antifreeze (81349) MIL-A-46153	
		6850-00-181-7929	1 gallon bottle	gl
		6850-00-181-7940	55 gallon drum	gl
8	O		Antiseize Compound, High Temperature (81349) MIL-A-907	
		8030-00-597-5367	2-1/2 lb can	lb
9	O		Biocide, Fuel Preservative (OU7J1) Biobar J.F.	
		6840-00-300-6373	1 quart	qt
		6840-01-173-6940	5 gallon	gl
10	O		Cable Ties (96906) MS3367-3	
		5975-01-273-8133	12 inches long, 100 per package	hd
11	O	TBD	Caulk (RIA 148771)	TBD
12	O		Cleaner, Lubricant A (81349) MIL-L-63460	
		9150-01-079-6124	4 oz bottle, w/extender tube	oz
13	O		Cloth, Cleaning (81349) MIL-C-85043	
		7920-00-165-7195	Type 1 - 10 lb box	lb
		7920-00-044-9281	Type 2 - 10 lb box	lb
14	O		Coating Compound, Bituminous, Solvent Type (70842) 765-1505	
		8030-00-546-8621	21 oz aerosol can	oz

Section II. EXPENDABLE SUPPLIES AND MATERIALS LIST (CONT)

(1) Item No.	(2) Level	(3) National Stock Number	(4) Description	(5) U/M
15	O		Compound Silicone (72984) DCIII	
		6850-00-294-0860	5 oz tube	oz
16	O	TBD	Compound, Valve Lapping	TBD
17	O		Corrosion Preventive Compound (81349) MIL-C-11796	
		8030-00-231-2353	5 lb	lb
		8030-00-285-1570	35 lb	lb
18	O		Crocus Cloth	
		5350-00-221-0872	(81348) P-C-458	sh
19	O	9140-00-286-5294	Fuel, Diesel Regular Bulk	gl
20	O		Grease, Automotive and Artillery (70878) 5542P (81349) MIL-G-10924	
		9150-01-197-7688	2.25 oz tube	oz
		9150-01-197-7690	1.75 lb can	lb
		9150-00-197-7689	6.5 lb can	lb
21	O		Grease, Lithium Lubriplate	
		TBD	(07748) 5555	oz
22	O		Heatshrink, Tubing	
		5970-01-161-8031	(TBD)	TBD
23	O		Lubricating Oil, Air Compressor T30 (TBD)	
		9150-01-025-8649	1 quart can	qt
24	O		Lubricating Oil, Engine OE/HDO 30 (81349) MIL-L-2104	
		9250-00-186-6681	1 quart can	qt
		9150-00-188-9858	5 gallon can	gl
		9150-00-189-6729	55 gallon drum	gl
25	O		Lubricating Oil, Engine OE/HDO 15W/40 (81349) MIL-L-2104	
		9150-01-152-4117	1 quart can	qt
		9150-01-178-4725	12 quart box	qt
		9150-01-152-4118	5 gallon can	gl
		9150-01-152-4119	55 gallon drum	gl
26	O		Lubricating Oil, Preservative (15W40) (Engine) (81349) MIL-L-21260C	
		9150-01-293-7696	5 gallon	gl
		9150-01-293-2792	55 gallon	gl
27	O	TBD	Oil	TBD
28	O	TBD	Paper, 400-grit	TBD
29	O		Primer	oz
		7930-01-259-0802	(53472) 30795	

Section II. EXPENDABLE SUPPLIES AND MATERIALS LIST (CONT)

(1) Item No.	(2) Level	(3) National Stock Number	(4) Description	(5) U/M
30	O		Rags, Wiping (58536) A-A-531	
		7920-00-205-1711	50 pound bale	lb
31	O		Sealant, Ultra Blue 587	
		TBD	(TBD)	TBD
32	O		Sealing Compound (05972) Loctite #567	
		8030-01-054-0740	50 ml bottle	ml
		8030-00-204-9149	250 ml tube (05972) Loctite #567-47	ml
		8030-01-166-0675	50 ml tube	ml
33	O		Sealing Compound (05972) Loctite #271 (80244) MIL-S-46163 Type 1 Grade K	
		8030-00-148-9833	10 ml bottle	ml
		8030-01-158-6070	50 ml bottle	ml
34	O		Sealing Compound (05972) Loctite #242 (80244) MIL-S-46163A Type 2 Grade N	
		8030-01-104-5392	10 ml bottle	ml
		8030-01-014-5869	50 ml bottle	ml
		8030-01-025-1692	250 ml bottle	ml
35	O	TBD	Soap	TBD
36	F	TBD	Solder 96/4	roll
37	O		Solution, Soap (81349) MIL-W-15000 Class C	
		6810-00-252-1345	1 quart bottle	qt
38	O		Solvent, Drycleaning (58536) A-A-711 (81348) P-D-680	
		6850-00-664-5685	1 quart can	qt
		6850-00-264-9038	5 gallon can (Environmentally Compliant Solvent) (0K209) Breakthrough	gl
		6850-01-378-0679	5 gallon can	gl
39	O		Tape, Electrical	
		5970-00-547-0966	(19207) BISEALTYPE3	ea
40	O		Tag, Identification (16956) 12-105	
		9905-00-720-3577	white	ea
41	O		Vapor Corrosion Inhibitor (44695) VCI 326 (81349) MIL-P-46002B	
		TBD	1 pint	pt

APPENDIX D

ILLUSTRATED LIST OF MANUFACTURED ITEMS

Section I. INTRODUCTION

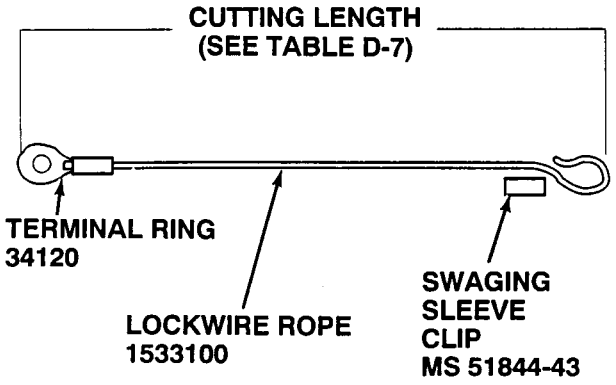
D-1. SCOPE.

This appendix includes complete instructions for manufacturing or fabricating authorized items locally. All bulk materials needed to manufacture an item are listed by part number or specification number in a tabular list with an illustration, as needed.

Section II. MANUFACTURED ITEMS

D-2. LOCKWIRE ROPE FABRICATION.

The lockwire length is shown in Table D-1. Crimped button stop caps are used to attach the lockwire to other components. Each application requires two swaging sleeve clips.



NOTES:

1. OBTAIN ALL COMPONENTS REQUIRED TO FABRICATE LOCKWIRE.
2. USE A FINE TOOTHED HACKSAW OR SUITABLE CUTTING DEVICE, AND CUT LOCKWIRE TO LENGTH REQUIRED.
3. SLIDE WIRE THROUGH HOLE IN COMPONENT, UNTIL LOCKWIRE COMES THROUGH OTHER SIDE.
4. SLIDE CAP ONTO LOCKWIRE, UNTIL CAP BOTTOMS AGAINST COMPONENT AND WIRE COMES THROUGH CAP.
5. CRIMP CAP TO LOCKWIRE.
6. SLIDE OPPOSITE END OF WIRE THROUGH ASSEMBLY, AND SLIDE OTHER CAP OVER END OF WIRE.
7. SLIDE WIRE THROUGH HOLE IN COMPONENT, UNTIL LOCKWIRE COMES THROUGH OTHER SIDE.
8. SLIDE CAP ONTO LOCKWIRE, UNTIL CAP BOTTOMS AGAINST COMPONENT AND WIRE COMES THROUGH CAP.
9. CRIMP CAP TO LOCKWIRE.

The following wire rope is cut from bulk stock. Refer to Table D-1 for cutting lengths.

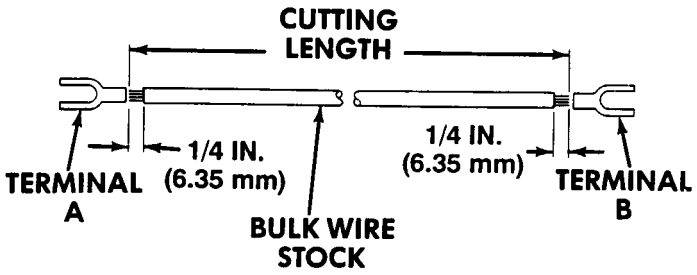
Table D-1. Lockwire Rope

Lockwire Rope Part Number	Lockwire Rope Part Number	Cutoff Length	
		Inches	cm
1533100-010	1533100	10	25
1533100-015	1533100	15	38
1533100-020	1533100	20	51
1533100-024	1533100	24	61

D-3. WIRE AND WIRE ASSEMBLIES FABRICATION.

Fabricate from bulk wire stock listed in Table D-2. Use wire cutters to cut wire to required length, then strip ends of wire ¼ in. (6.35 mm). Crimp the required lugs or terminals onto wire ends.

Table D-2. Wire And Wire Assemblies

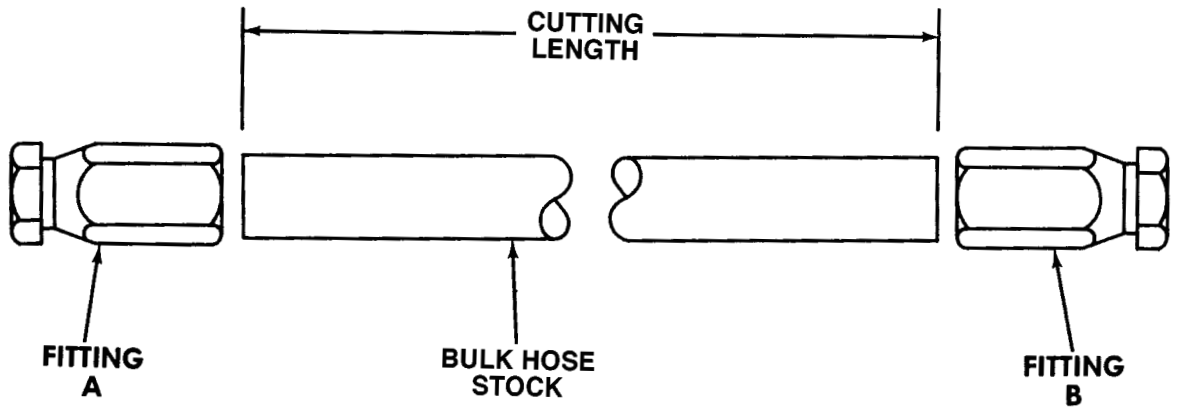


Wire/Assembly Part Number	Bulk Wire Part Number	Cutoff Length	
		Inches	cm
1884540W-012	121782A	12	31
1947560W-012	121782A	12	31
1959390W-012	121782A	12	31
1969600W-012	121782A	12	31
1977300W-010	4127FX	10	25
1974580-013	R-64951	13	33
1974590-005	R-64951	5	13
1978470W-005	R-64951	5	13

D-4. HOSES AND TUBES.

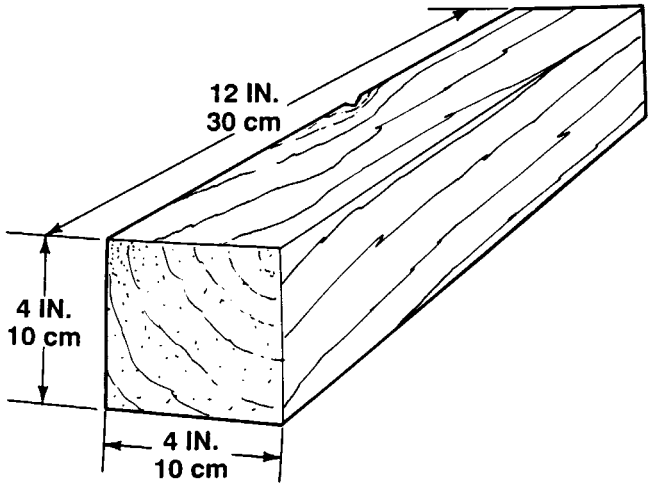
Fabricate hoses and tubes from bulk hose or tube stock listed in Table D-3. Use a fine toothed hacksaw or suitable cutting device and cut hose/tube to desired length. Place fitting A in vise and screw hose/tube counterclockwise until hose/tube bottoms out in fitting. Back off ¼ turn. Repeat for fitting B.

Table D-3. Hoses and Tubes



Hose/Tube Part Number	Bulk Hose Part Number	Cutoff Length	
		Inches	cm

D-5. WOODEN BLOCKS.



a. Fabricate from MML751 lumber stock.

b. Using saw and standard planing machine, cut stock to size required in Table D-4.

Table D-4. Wooden Blocks

Para Number	Finished Dimensions of Block In. (cm)
7-6	4 by 4 by 12 in. (10 by 10 by 30 cm)
4-4	4 by 4 by 12 in. (10 by 10 by 30 cm)
4-3	4 by 4 by 12 in. (10 by 10 by 30 cm)
5-3	4 by 4 by 12 in. (10 by 10 by 30 cm)

APPENDIX E

TORQUE LIMITS

E-1. SCOPE.

This section provides general torque limits for the screws, hoses and fittings used on the truck. Special torque limits are listed in the maintenance procedures for applicable components. The general torque limits given in this appendix shall be used when specific torque limits are not indicated in the maintenance procedure. These general torque limits cannot be applied to screws that retain rubber components. The rubber components will be damaged before the torque limit is reached. If a special torque limit is not given in the maintenance instructions, tighten the screw or nut until it touches the metal bracket then tighten it one more turn.

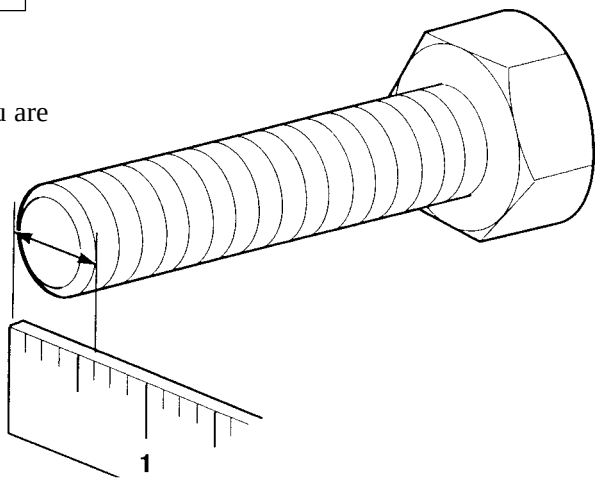
E-2. TORQUE LIMITS.

Table E-1 lists the torque limits for wet flange nuts. Table E-2 lists the torque limits for wet socket head capscrews. Table E-3 lists dry torque limits for capscrews. Dry torque limits are used on screws that do not have high pressure lubricants applied to the threads. Table E-4 lists wet torque limits for capscrews. Wet torque limits are used on screws that have high pressure lubricants applied to the threads. Table E-5 lists the torque limits for SAE 37 degree flare hose connections. Table E-6 lists the torque limits for SAE 45 degree flare hose connections. Table E-7 lists the torque limits for ORS preformed packing face seal hose connections. Table E-8 lists the torque limits for NPSM swivel connections.

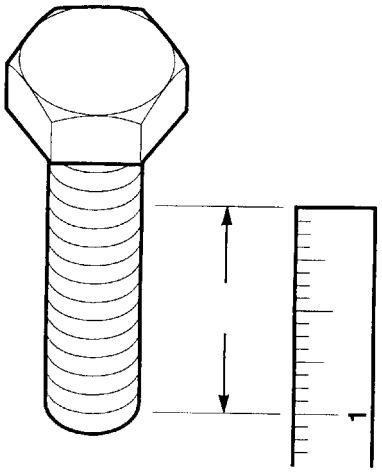
E-3. HOW TO USE TORQUE TABLE.

a. Screws and Nuts.

(1) Measure the diameter of the screw you are installing with a ruler.



E-3. HOW TO USE TORQUE TABLE (CONT).



(2) Measure out one inch with a ruler and count the number of threads per inch.

(3) Under the heading SIZE, look down the left hand column until you find the diameter of the screw you are installing (there will usually be two lines beginning with the same size).

(4) In the second column under SIZE, find the number of threads per inch that matches the number of threads per inch you counted in Step 2. (Not required for metric screws).

(5) To find the grade screw you are installing, match the markings on the head to the correct picture of CAPSCREW HEAD MARKINGS on the torque table.

(6) Look down the column under the picture you found in Step 5. until you find the torque limit (lb-ft or N·m) for the diameter and threads per inch of the screw you are installing.

(7) Use wet torque values.

CAPSCREW HEAD MARKINGS

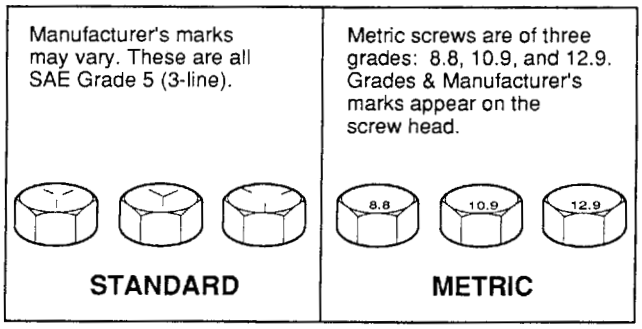


Table E-1. Torque Limits For Wet Flange Nuts

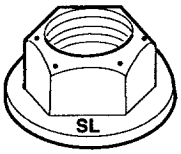
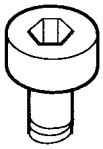
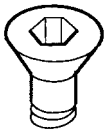
SPIRALOCK FLANGE NUT MARKINGS GRADE 8	DIAMETER		THREADS PER INCH	TORQUE	
	IN.	MM		LB-FT	N·m
	1/4	6.35	20	15	20
	5/16	7.94	18	25	34
	3/8	9.65	16	45	61
	1/2	12.70	13	110	149
	5/8	15.87	11	210	285
	3/4	19.05	10	375	508

Table E-2. Torque Limits For Wet Socket Head Cap Screws

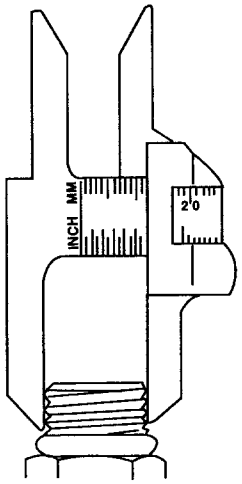
SOC HEAD/12 PT.  SOC FLAT HEAD 	TORQUE IN FT. LBS. (CAP SCREWS) LUBED		
	SIZE	SOC HD OR 12 PT	SOC FLAT HD
	.10-24	5	2.5
	.25-20	12	6
	.31-18	25	12
	.38-16	44	22
	.50-13	70	36
	.56-12	106	53
	.62-11	212	106
	.75-10	375	187
	1.00-8	781	

b. Hoses and Fittings.

NOTE

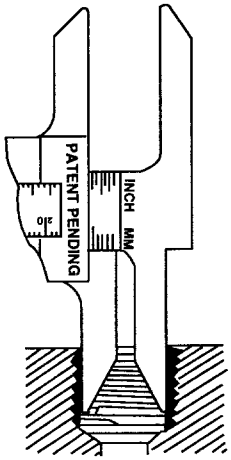
Most fluid piping system sizes are measured by dash numbers. These are universally used abbreviations for the size of the component expressed as the numerator of the fraction with the denominator always being 16. For example, a -04 port is 4/16 or 1/4-inch. Dash numbers are usually nominal (in name only) and are abbreviations that make ordering of components easier.

(1) Measure the I.D./O.D. diameter with a caliper as shown.



O.D.
(MALE THREADS)

(2) Under the heading MALE THREAD O.D. and FEMALE THREAD I.D., match the measurements with the row in table to determine proper torque.



I.D.
(FEMALE THREADS)

(3) To find the sealing surface angle, use a protractor and measure the sealing surface parallel to the center line of the fitting.

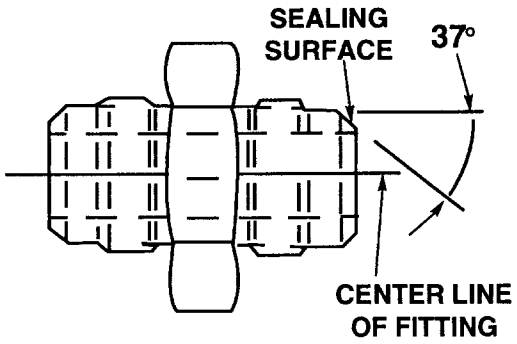
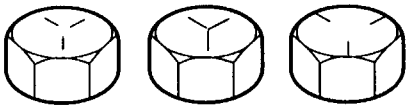
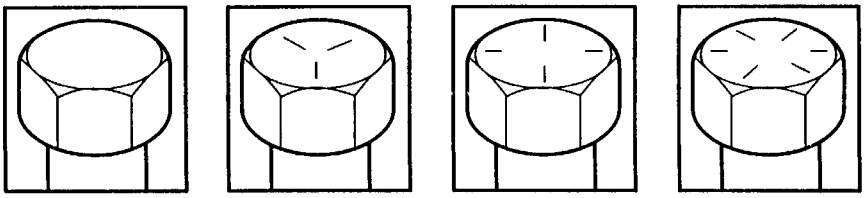


Table E-3. Torque Limits For Dry Fasteners

CAPSCREW HEAD MARKINGS



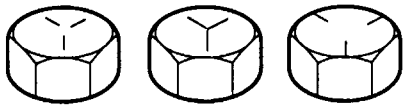
Manufacturer's marks may vary.
These are all SAE Grade 5 (3-line).



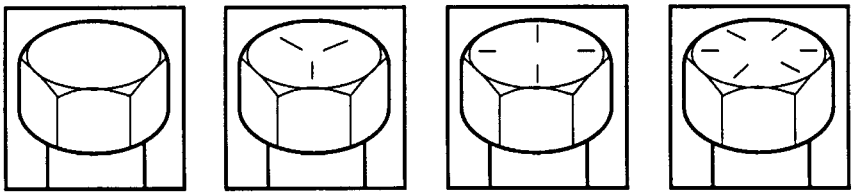
SIZE			TORQUE							
			SAE GRADE NO. 2		SAE GRADE NO. 5		SAE GRADE NO. 6 or 7		SAE GRADE NO. 8	
DIA. INCHES	THREADS PER INCH	MILLIMETERS	POUNDS FEET	NEWTON METERS	POUNDS FEET	NEWTON METERS	POUNDS FEET	NEWTON METERS	POUNDS FEET	NEWTON METERS
1/4	20	6.35	5	7	8	11	10	14	12	16
1/4	28	6.35	6	9	10	14	12	16	14	19
5/16	18	7.94	11	15	17	23	21	28	25	34
5/16	24	7.94	12	16	19	26	24	33	25	34
3/8	16	9.53	20	27	30	41	40	54	45	61
3/8	24	9.53	23	31	35	47	45	61	50	68
7/16	14	11.11	30	41	50	68	60	81	70	95
7/16	20		35	47	55	75	70	95	80	108
1/2	13	12.70	50	68	75	102	95	129	110	149
1/2	20		55	75	90	122	100	136	120	163
9/16	12	14.29	65	88	110	149	135	183	150	203
9/16	18		75	102	120	163	150	203	170	231
5/8	11	15.88	90	122	150	203	190	258	220	298
5/8	18		100	136	180	244	210	285	240	325
3/4	10	19.05	160	217	260	353	320	434	380	515
3/4	16		180	244	300	407	360	488	420	569
7/8	9	22.23	140	190	400	542	520	705	600	814
7/8	14		155	210	440	597	580	786	660	895
1	8	25.40	220	298	580	786	800	1085	900	1220
1	12		240	325	640	868	860	1166	1000	1356
1-1/8	7	25.58	300	407	800	1085	1120	1519	1280	1736
1-1/8	12		340	461	880	1193	1260	1709	1440	1953
1-1/4	7	31.75	420	597	1120	1519	1580	2142	1820	2468
1-1/4	12		460	624	1240	1681	1760	2387	2000	2712
1-3/8	6	34.93	560	759	1460	1980	2080	2820	2380	3227
1-3/8	12		640	868	1680	2278	2380	3227	2720	3688
1-1/2	6	38.10	740	1003	1940	2631	2780	3770	3160	4285
1-1/2	12		840	1139	2200	2983	3100	4204	3560	4827

Table E-4. Torque Limits For Wet Fasteners

CAPSCREW HEAD MARKINGS

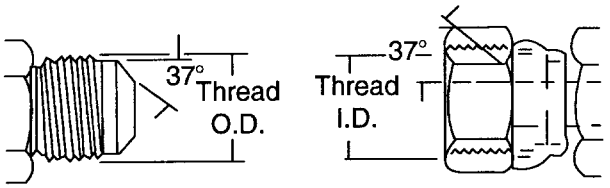


Manufacturer's marks may vary.
These are all SAE Grade 5 (3-line).



SIZE			TORQUE							
			SAE GRADE NO. 2		SAE GRADE NO. 5		SAE GRADE NO. 6 or 7		SAE GRADE NO. 8	
DIA. INCHES	THREADS PER INCH	MILLIMETERS	POUNDS FEET	NEWTON METERS	POUNDS FEET	NEWTON METERS	POUNDS FEET	NEWTON METERS	POUNDS FEET	NEWTON METERS
1/4	20	6.35	4	6	6	8	8	11	9	12
1/4	28	6.35	5	7	7	9	9	12	10	14
5/16	18	7.94	8	11	13	18	16	22	18	24
5/16	24	7.94	9	12	14	19	18	24	20	27
3/8	16	9.53	15	20	23	31	30	41	35	47
3/8	24	9.53	17	23	25	34	30	41	35	47
7/16	14	11.11	24	33	35	47	45	61	55	75
7/16	20		25	34	40	54	50	68	60	81
1/2	13	12.70	35	47	55	75	70	95	80	108
1/2	20		40	54	65	88	80	108	90	122
9/16	12	14.29	50	68	80	108	100	136	110	149
9/16	18		55	75	90	122	110	149	130	176
5/8	11	15.88	70	95	110	149	140	190	170	231
5/8	18		80	108	130	176	160	217	180	244
3/4	10	19.05	120	163	200	271	240	325	280	380
3/4	16		140	190	220	298	280	380	320	434
7/8	9	22.23	110	149	300	407	400	542	460	624
7/8	14		120	163	320	434	440	597	500	678
1	8	25.40	160	217	440	597	600	814	680	922
1	12		170	231	480	651	660	895	740	1003
1-1/8	7	25.58	220	298	600	814	840	1139	960	1320
1-1/8	12		260	353	660	895	940	1275	1080	1464
1-1/4	7	31.75	320	434	840	1139	1100	1492	1360	1844
1-1/4	12		360	488	920	1248	1320	1790	1500	2034
1-3/8	6	34.93	420	570	1100	1492	1560	2115	1780	2414
1-3/8	12		460	624	1260	1709	1780	2414	2040	2776
1-1/2	6	38.10	560	760	1460	1980	2080	2820	2360	3200
1-1/2	12		620	841	1640	2224	2320	3146	2660	3607

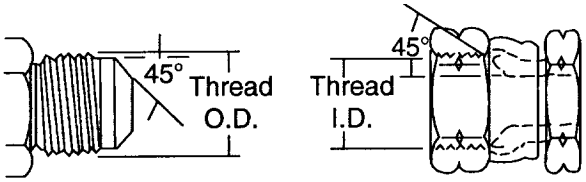
Table E-5. Torque Limits For 37 Degree Flare Hose Connections



Male Half **Female Half**

INCH SIZE	DASH NO.	THREAD SIZE	TORQUE LB.FT.	TORQUE N·m
1/4	04	7/16-20	11-12	15-16
3/8	06	9/16-18	18-21	24-28
1/2	08	3/4-16	36-39	49-53
5/8	10	7/8-14	57-62	77-84
3/4	12	1 1/16-12	79-87	107-118
7/8	14	1 3/16-12	83-91	113-123
1	16	1 5/16-12	108-113	146-153
1 1/4	20	1 5/8-12	127-133	172-180
1 1/2	24	1 7/8-12	158-167	214-224
2	32	2 1/2-12	245-258	332-350

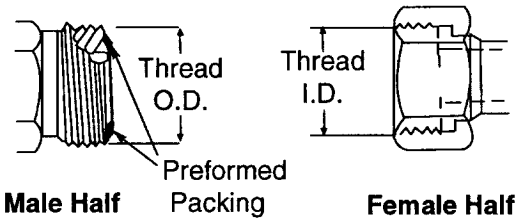
Table E-6. Torque Limits For 45 Degree Flare Hose Connections



Male Half **Female Half**

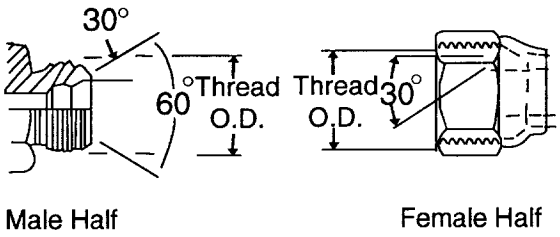
INCH SIZE	DASH NO.	THREAD SIZE	TORQUE LB.FT.	TORQUE N·m
1/4	04	7/16-20	8-9	11-12
3/8	06	5/8-18	18-20	24-27
1/2	08	3/4-16	36-38	49-51
5/8	10	7/8-14	52-54	70-73
3/4	12	1 1/16-14	71-74	97-100

Table E-7. Torque Limits For ORS Preformed Packing Face Seal Hose Connections



INCH SIZE	DASH NO.	THREAD SIZE	TORQUE LB.FT.	TORQUE N·m
1/4	04	9/16-18	10-12	14-16
3/8	06	11/16-16	18-20	24-27
1/2	08	13/16-16	32-35	43-47
5/8	10	1-14	46-50	62-68
3/4	12	1 3/16-12	65-70	88-95
1	16	1 7/16-12	108-113	146-153
1 1/4	20	1 11/16-12	127-133	172-180
1 1/2	24	2-12	158-167	214-226

Table E-8. Torque Limits For NPSM Swivel Connections



INCH SIZE	DASH NO.	THREAD SIZE	TORQUE LB.FT.	TORQUE N·m
1/8	02	1/8-27	3-4	4-5
1/4	04	1/4-18	10-11	14-15
3/8	06	3/8-18	16-18	22-24
1/2	08	1/2-14	25-27	34-37
3/4	12	3/4-14	46-48	62-65
1	16	1-1 1/2	80-83	108-113
1 1/4	20	1 1/4-11/2	130-134	176-182
1 1/2	24	1 1/2-11/2	160-164	217-222
2	32	2-11/2	170-174	231-240

APPENDIX F

MANDATORY REPLACEMENT PARTS

Section I. INTRODUCTION

F-1. SCOPE.

This appendix lists all mandatory replacement parts required for performance of Unit Support Maintenance of the Forward REpair System (FRS). It authorizes the requisitioning, issue, and disposition of consumable repair parts. All consumable repair parts listed in the maintenance tasks are listed here for ease of reference.

F-2. EXPLANATION OF COLUMNS (SECTION II).

a. Column (1) - Replacement Part Reference Code. This number is assigned to the entry in the listing and is referenced in the narrative task box to identify the part e.g., Gasket (Item 8, Appendix F).

b. Column (2) - Nomenclature. Indicates the federal item name and, if required, a description to identify the item.

c. Column (3) - Part Number. This is the vendor number assigned to the item.

d. Column (4) - National Stock Number. This is the National Stock Number assigned to the item; use it to request or requisition the item.

Section II. MANDATORY REPLACEMENT PARTS LIST

(1) Index No.	(2) Nomenclature	(3) Part Number	(4) National Stock Number
1	Air Compressor Maintenance Kit	38485124	TBD
2	Coupling, Female 1/2”	TBD	TBD
3	Coupling, Female 3/4”	TBD	TBD
4	Decal	7-376-100165	TBD
5	Gasket	25 1731 01 00 04	TBD
6	Gasket	25 1751 01 00 05	TBD
7	Gasket	260069	TBD
8	Gasket	3929791	5330-01-453-7147
9	Gasket	3929795	5330-01-453-7148
10	Gasket	731740-002	TBD
11	Gasket	A/281	TBD
12	Gasket	TBD	TBD
13	Gasket	TBD	TBD
14	Gasket	TBD	TBD
15	Gasket, Air Intake Manifold	3931605	TBD
16	Gasket, Exhaust	154-2708	TBD
17	Gasket, Fuel Pump	3931059	5330-01-467-2130
18	Gasket, Manifold	J905443	5330-01-218-1201
19	Gasket, Oil Drain	C0102H4700	5330-01-212-3361
20	Gasket, Oil Filter Head	3942915	TBD
21	Gasket, Oil Pan Engine	3931602	5330-01-305-9414
22	Gasket, Oil Suction Tube	3931349	TBD
23	Locknut	12Z200-201	5310-00-262-6379
24	Locknut	300011	3510-01-333-3754
25	Locknut	7-659-000047	TBD
26	Locknut	7-659-000205	TBD
27	Locknut	7-660-081600	TBD
28	Locknut	M45913/1-1CG5Z	TBD
29	Locknut	M45913/-4CG5C	5310-00-088-1251
30	Locknut	M45913/1-4CG8Z	TBD
31	Locknut	M45913/1-4CG8Z	TBD
32	Locknut	M45913/1-4CGS3	5310-00-929-1807

Section II. MANDATORY REPLACEMENT PARTS LIST (CONT)

(1) Index No.	(2) Nomenclature	(3) Part Number	(4) National Stock Number
33	Locknut	M45913/1-4CS3	5310-00-929-1809
34	Locknut	M45913/1-5CG5Z	5310-00-814-0673
35	Locknut	M45913/1-6CG5Z	5310-00-087-4652
36	Locknut	M45913/1-6CG8Z	TBD
37	Locknut	M45913/1-8CG5Z	5310-00-595-7421
38	Locknut	M45913/1-9CG5C	TBD
39	Locknut	M45913/1/9FG5Z	TBD
40	Locknut	M45913/1-12CG5Z	TBD
41	Locknut	MS17828-5C	5310-00-409-3710
42	Locknut	MS17829-8C	5310-00-595-7421
43	Locknut	MS17830-9C	5310-00-455-0393
44	Locknut	MS17830-12C	5310-00-241-6609
45	Locknut	MS21083C3	5310-00-926-1835
46	Locknut	MS35690-604	5310-00-655-6544
47	Locknut	MS51922-1	5310-00-088-1231
48	Locknut	MS51943-5	5310-01-249-0904
49	Locknut	MS51943-33	5310-00-814-0673
50	Locknut	NUT 1	TBD
51	Locknut	TBD	TBD
52	Locknut	TBD	TBD
53	Locknut	TBD	TBD
54	Locknut	TBD	TBD
55	Locknut	TBD	TBD
56	Locknut	TBD	TBD
57	Lockwasher	114021	5310-01-081-0798
58	Lockwasher	7-950-060050	TBD
59	Lockwasher	7-950-060350	TBD
60	Lockwasher	7-950-080050	TBD
61	Lockwasher	7-950-140050	TBD
62	Lockwasher	850-2010	TBD
63	Lockwasher	C0850200800	5310-01-321-4088
64	Lockwasher	C0850201200	5310-01-212-3389
65	Lockwasher	MS35338-51	TBD

Section II. MANDATORY REPLACEMENT PARTS LIST (CONT)

(1) Index No.	(2) Nomenclature	(3) Part Number	(4) National Stock Number
66	Lockwasher	MS35335-65	5310-00-655-6151
67	Lockwasher	MS51848-12	5310-00-688-2195
68	Lockwasher	TBD	TBD
69	Lockwasher	TBD	TBD
70	Lockwasher	TBD	TBD
71	Lockwasher	TBD	TBD
72	Lockwasher	TBD	TBD
73	Lockwasher	TBD	TBD
74	Lockwasher	TBD	TBD
75	Lockwasher	TBD	TBD
76	Lockwasher	TBD	TBD
77	Lockwasher	TBD	TBD
78	Lockwasher	TBD	TBD
79	Lockwasher	TBD	TBD
80	Lockwasher	TBD	TBD
81	Lockwasher	TBD	TBD
82	Lockwasher	TBD	TBD
83	Lockwasher	TBD	TBD
84	Packing, Preformed	3906698	5330-01-297-6308
85	Packing, Preformed	A-103	5331-01-214-1912
86	Packing, Preformed	MS9068-021	TBD
87	Packing, Preformed	MS9068-025	TBD
88	Packing, Preformed	TBD	TBD
89	Packing, Preformed	TBD	TBD
90	Pin, Cotter	7-690-143210	3515-01-466-4933
91	Pin, Cotter	7-690-081610	5315-10-466-4903
92	Pin, Cotter	7-690-103210	5315-10-466-4919
93	Pin, Cotter	MS24665-355	TBD
94	Ring, Retaining	17122005	TBD
95	Ring, Snap	S140-31	TBD
96	Ring, Snap	300007	TBD
97	Rivet	7-760-000027	TBD
98	Rivet (1/8”)	818-0237-01	TBD

Section II. MANDATORY REPLACEMENT PARTS LIST (CONT)

(1) Index No.	(2) Nomenclature	(3) Part Number	(4) National Stock Number
99	Screw, Self-Tapping	32187056	TBD
100	Screw, Self-Tapping	TBD	TBD
101	Screw, Self-Tapping	TBD	TBD
102	Seal	RIA 148899	TBD
103	Seal, Banjo Fitting	3903380	5330-01-195-5268
104	Seal, Coolant Thermostat	J923331	5330-01-190-1904
105	Seal, Copper	3923261	5330-01-379-8396
106	Washer, Plastic	16FW008032	5310-00-988-8820
107	Washer, Rubber	2-325-N300-90	TBD
108	Washer, Rubber	TBD	TBD
109	Washer, Rubber	TBD	TBD
110	Washer, Sealing	3918191	5310-01-467-6420
111	Washer, Star	7-950-00047	TBD

APPENDIX G

TOOL IDENTIFICATION LIST

Section I. INTRODUCTION

G-1. SCOPE.

This appendix lists all of the tools needed to repair the Forward Repair System (FRS).

G-2. GENERAL.

This appendix is a list of tools, both common and special, test equipment and tool kits used at unit level to repair the truck. This list is arranged alphabetically and shows the nomenclature, part number (P/N), National Stock Number (NSN) and references when applicable. The index number corresponds to the index number found in the task box of maintenance procedures.

Section II. COMMON TOOLS, TEST EQUIPMENT AND TOOL KITS

Item No.	Description	Part No.	NSN	Reference
1	Brush, Injector Cleaning	3822509	7920-01-381-6132	
2	Bracket, Lifting	3908118	TBD	
3	Cap and Plug Set	10935405	5340-00-450-5718	
4	Compressor Unit, Air	MIL-C-13874	4130-00-752-9633	SC 4910-95-A72-HR
5	Crimping Tool (Deutsch)	HDT-48-00	5120-00-165-3912	
6	Dispensing Pump	FEDXXD370	4930-00-287-8293	SC 4910-95-A72-HR
7	Drill, Electric, Portable	WD00661	5130-00-293-1849	SC 4910-95-A74
8	Drill, Electric, Portable, 1/4 in.	1070	5130-00-889-8993	SC 4910-95-A31
9	Drill Set, Twist	GGG-D-751	5133-00-293-0983	SC 4910-95-A74
10	Drum, Storage 57 Gal	MIL-D-6054	8110-00-082-2626	
11	Engine Turnover Tool	3824591	5120-01-285-5193	
12	Extraction Tool (Deutsch)	114010	5120-01-158-4707	
13	Gloves, Chemical Oil Protective	ZZ-G-381	8415-00-641-4601	SC 4910-95-A74
14	Goggles, Industrial	GGG-G-13	4140-00-269-7912	SC 4910-95-A74
15	Gun, Air Blow	GGG-G-770	4940-00-333-5541	SC 4910-95-A72-HR
16	Hose, Drain	ZZ-H-461	4720-00-356-8557	SC 4910-95-A74
17	Jackstand, Trestle	306	4910-00-251-8013	SC 4910-95-A74
18	Multiplier, Torque	YA393	5120-01-348-9484	
19	Protractor, Magnetic	2150A251	5210-00-415-0075	
20	Pan, Drain 6 Gal	TBD	4910-00-287-2944	MIL-P-45819
21	Puller, Mechanical	3823276	5720-01-389-5917	
22	Removal Tool, Oil Filter	2304	5120-00-865-0933	SC 4910-95-A72-HR
23	Scale, Tension	J8129	4910-00-779-6832	

Section II. COMMON TOOLS, TEST EQUIPMENT AND TOOL KITS (CONT)

Item No.	Description	Part No.	NSN	Reference
24	Socket Set, 3/4 In.	GGG-W-641	5120-00-204-1999	SC 4910-95-A72-HR
25	Socket Set, 3/8 In.	221FSMY	5120-01-117-3876	SC 4910-95-A72-HR
26	Terminal Remover, Weatherpac	J36400-5	5120-01-374-8969	
27	Tester, Hydraulic Oil Flow Pressure	PDS1-400-05-10	TBD	
28	Testor, Injector	TBD	4910-00-225-8641	SC 4940-95-B20
29	Tool Kit, Electric	7550526	5180-00-876-9336	SC 4910-95-A72-HR
30	Tool Kit, General Mechanic's: Automotive		5180-00-177-7033	SC 5180-90-N26
31	Vise, Machinist's	504M2	5120-00-293-1439	SC 4910-95-A74
32	Weatherpac Crimper	J38852	5120-01-374-8936	
33	Wrench, Adjustable 0 3 5/8 in.	C715	5120-00-264-3793	
34	Wrench, Combination 1 1/16 in.	1234	5120-00-228-9515	SC 4910-95-A74
35	Wrench, Combination 1 1/8 in.	1172	5120-00-228-9516	SC 4910-95-A74
36	Wrench, Combination 1 1/4 in.	1173	5120-00-228-9517	SC 4910-95-A74
37	Wrench, Combination 1 5/16 in.	1174	5120-00-228-9518	SC 4910-95-A74
38	Wrench, Combination 1 3/8 in.	1176A	5120-00-228-9519	SC 4910-95-A74
39	Wrench, Combination 1 1/2 in.	1178	5120-00-277-8834	SC 4910-95-A74
40	Wrench, Combination 1 5/8 in.	1180	5120-01-016-7144	
41	Wrench, Combination 1 11/16 in.	A-A-1351	5120-01-184-8566	
42	Wrench, Combination 1 7/8 in.	1260	5120-00-020-8632	
43	Wrench, Pipe	41W664	5120-00-277-1461	SC 4910-95-A74
44	Wrench, Torque (0 To 175 lb-ft [0–237 N·m])	1753LDF	5120-00-640-6364	SC 4910-95-A74
45	Wrench, Torque (0 To 300 lb-ft [0–407 N·m])	6134A	5120-00-555-1523	SC 4910-95-A72-HR
46	Wrench, Torque, 3/8 In. Drive (0 To 60 N·m)	TESI60	5120-01-112-9531	SC 4910-95-A72-HR
47	Wrench, Torque (0 To 600 lb-ft [0 To 814 N·m])	6020A	5120-01-140-0319	

INDEX

Subject, Para

Subject, Para

Subject, Para

E (Cont)

F

G

Subject, Para

G (Cont)

H

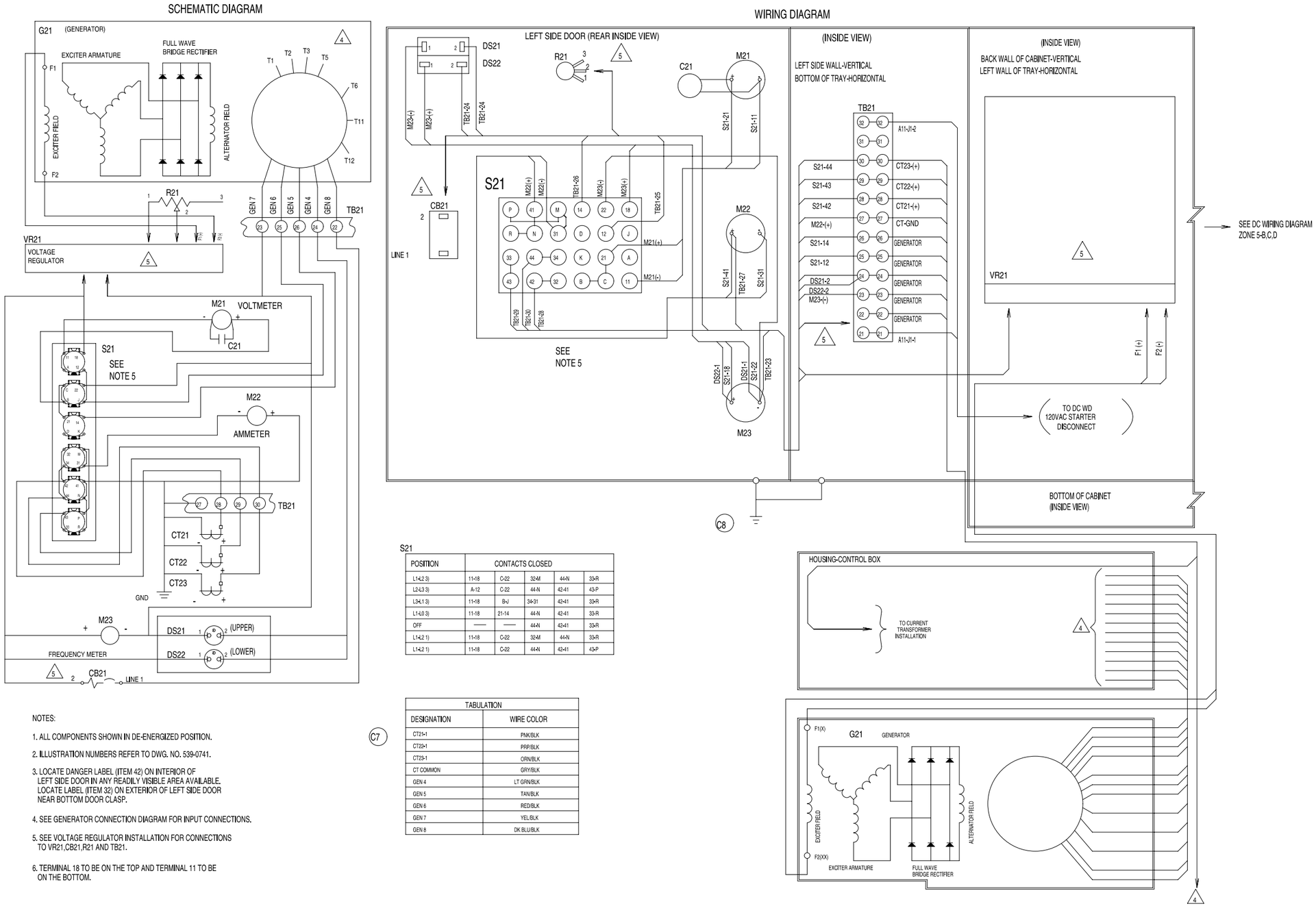
I

Subject, Para

W

SCHEMATICS

The following section contain the schematics which are the same in TM 9-4940-568-20 and TM 9-4940-568-34.



S21

POSITION	CONTACTS CLOSED				
L1-L2 3)	11-18	C-22	32-M	44-N	33-R
L2-L3 3)	A-12	C-22	44-N	42-41	43-P
L3-L1 3)	11-18	B-J	34-31	42-41	33-R
L1-L0 3)	11-18	21-14	44-N	42-41	33-R
OFF	——	——	44-N	42-41	33-R
L1-L2 1)	11-18	C-22	32-M	44-N	33-R
L1-L2 1)	11-18	C-22	44-N	42-41	43-P

NOTES:

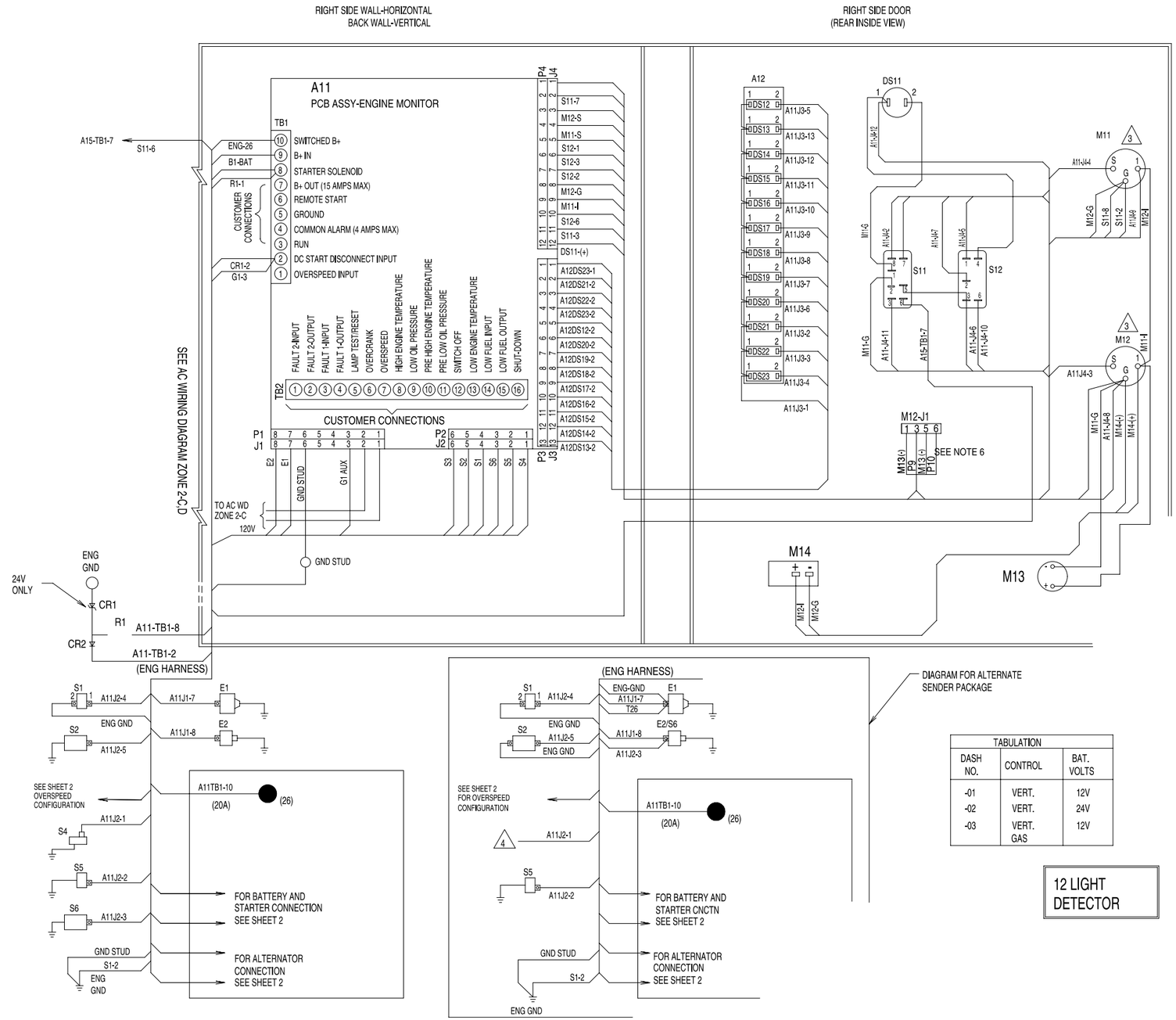
1. ALL COMPONENTS SHOWN IN DE-ENERGIZED POSITION.
2. ILLUSTRATION NUMBERS REFER TO DWG. NO. 539-0741.
3. LOCATE DANGER LABEL (ITEM 42) ON INTERIOR OF LEFT SIDE DOOR IN ANY READILY VISIBLE AREA AVAILABLE. LOCATE LABEL (ITEM 32) ON EXTERIOR OF LEFT SIDE DOOR NEAR BOTTOM DOOR CLASP.
4. SEE GENERATOR CONNECTION DIAGRAM FOR INPUT CONNECTIONS.
5. SEE VOLTAGE REGULATOR INSTALLATION FOR CONNECTIONS TO VR21,CB21,R21 AND TB21.
6. TERMINAL 18 TO BE ON THE TOP AND TERMINAL 11 TO BE ON THE BOTTOM.

C7

TABULATION	
DESIGNATION	WIRE COLOR
CT21-1	PNK/BLK
CT22-1	PPR/BLK
CT23-1	ORN/BLK
CT COMMON	GRY/BLK
GEN 4	LT GRN/BLK
GEN 5	TAN/BLK
GEN 6	RED/BLK
GEN 7	YEL/BLK
GEN 8	DK BLU/BLK

GENERATOR SET CONTROL BOX (AC) WIRING SCHEMATIC

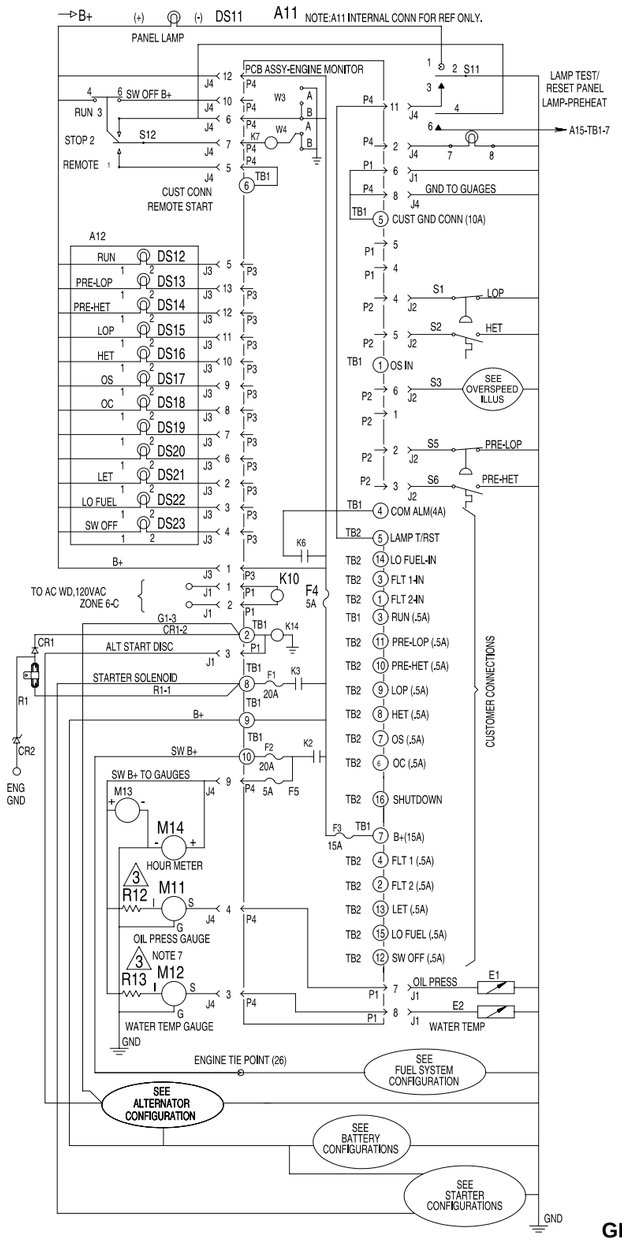
FIGURE FO-1. ELECTRICAL SYSTEM SCHEMATIC
FOLDOUT 1 OF 19
FP– 1 /FP– 2 BLANK



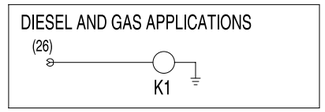
GENERATOR SET CONTROL BOX INDICATOR LAMP (DC) WIRING SCHEMATIC (1 OF 2)

FIGURE FO-1. ELECTRICAL SYSTEM SCHEMATIC
FOLDOUT 2 OF 19
FP– 3 /FP– 4 BLANK

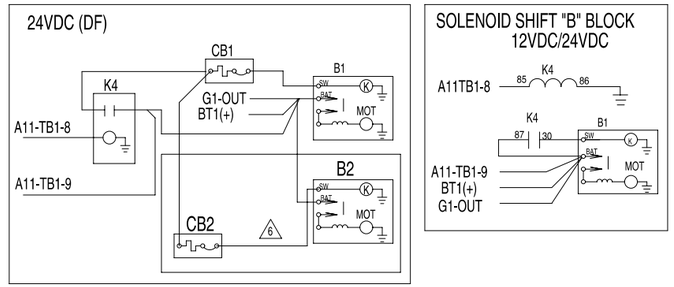
SCHEMATIC DIAGRAM



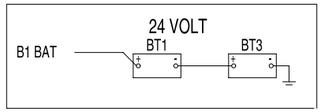
IGNITION FUEL SYSTEMS CONFIGURATIONS

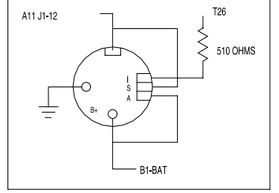


STARTER CONFIGURATIONS

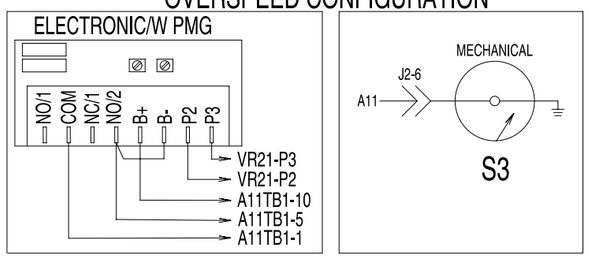


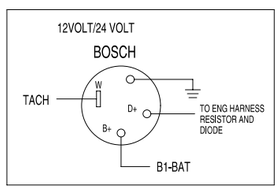
BATTERY CONFIGURATIONS



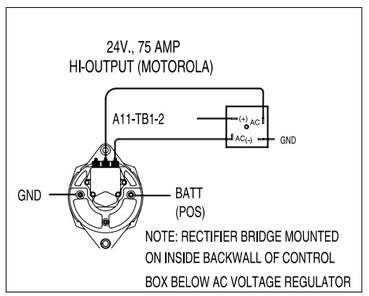


OVERSPEED CONFIGURATION



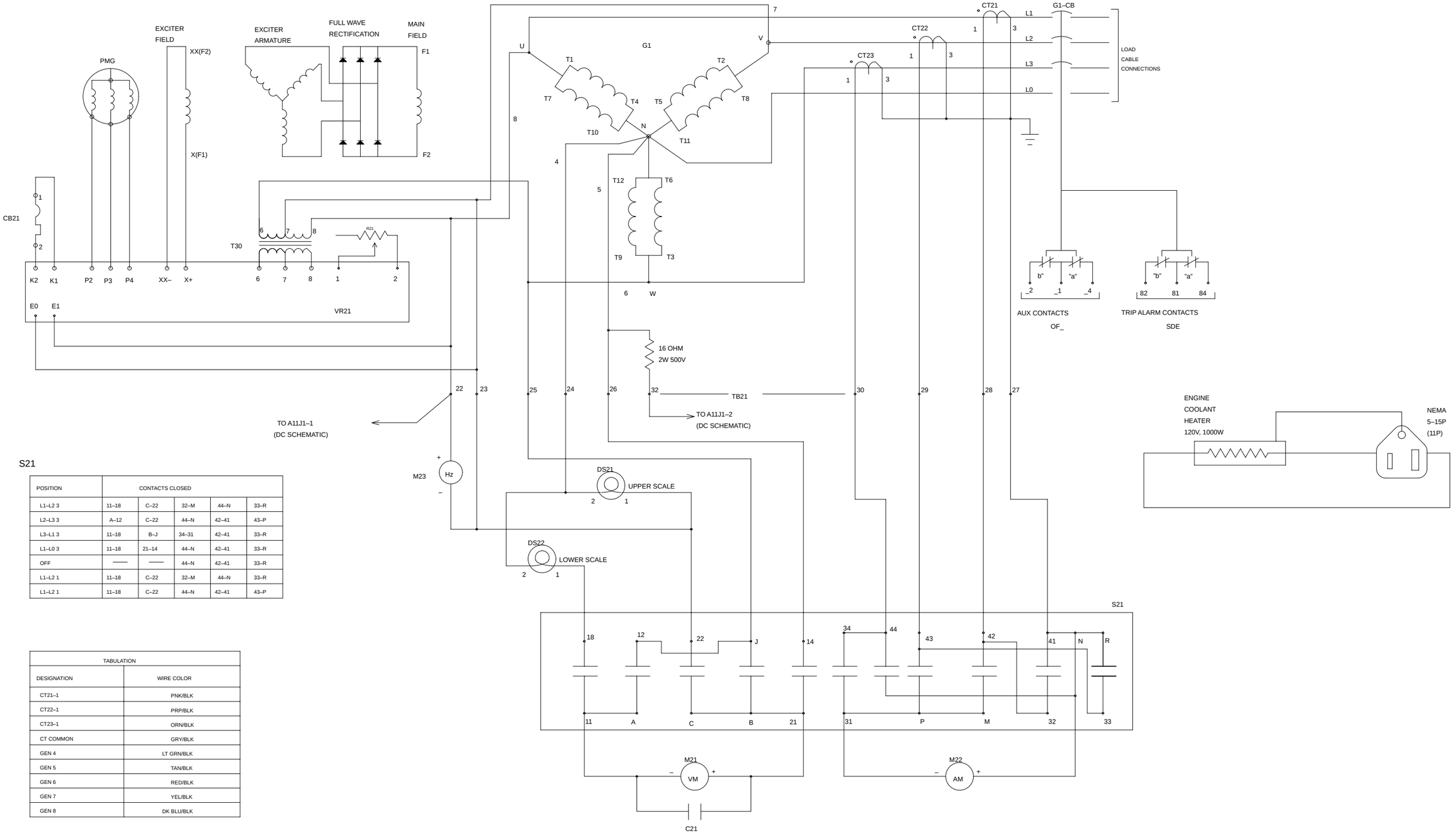


ALTERNATOR CONFIGURATIONS



GENERATOR SET CONTROL BOX INDICATOR LAMP (DC) WIRING SCHEMATIC (2 OF 2)

FIGURE FO-1. ELECTRICAL SYSTEM SCHEMATIC
FOLDOUT 3 OF 19
FP– 5 /FP– 6 BLANK



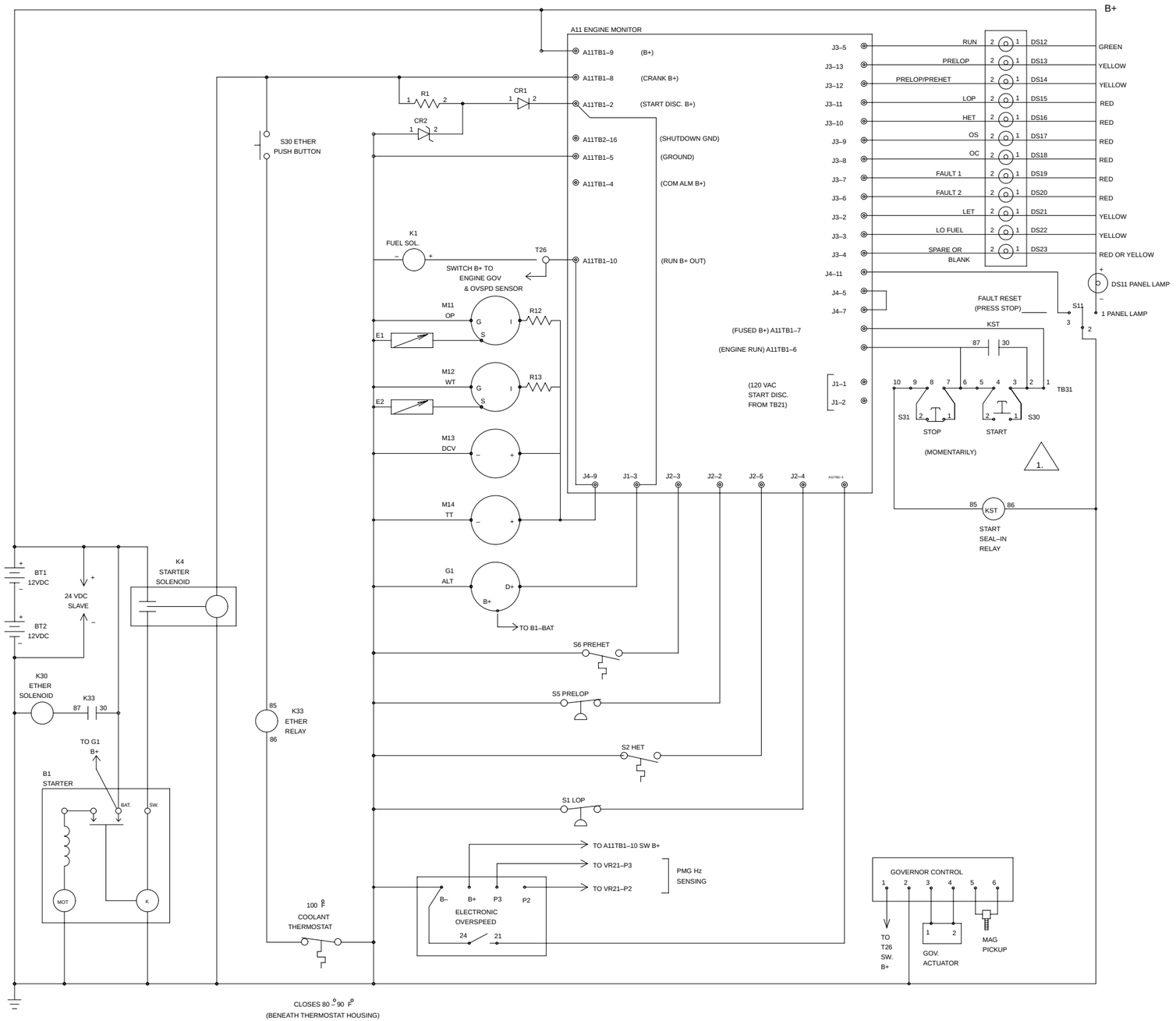
S21

POSITION	CONTACTS CLOSED				
L1–L2 3	11–18	C–22	32–M	44–N	33–R
L2–L3 3	A–12	C–22	44–N	42–41	43–P
L3–L1 3	11–18	B–J	34–31	42–41	33–R
L1–L0 3	11–18	21–14	44–N	42–41	33–R
OFF	——	——	44–N	42–41	33–R
L1–L2 1	11–18	C–22	32–M	44–N	33–R
L1–L2 1	11–18	C–22	44–N	42–41	43–P

TABULATION	
DESIGNATION	WIRE COLOR
CT21–1	PNK/BLK
CT22–1	PRP/BLK
CT23–1	ORN/BLK
CT COMMON	GRY/BLK
GEN 4	LT GRN/BLK
GEN 5	TAN/BLK
GEN 6	RED/BLK
GEN 7	YEL/BLK
GEN 8	DK BLU/BLK

GENERATOR SET (AC) WIRING SCHEMATIC

FIGURE FO-1. ELECTRICAL SYSTEM SCHEMATIC
FOLDOUT 4 OF 19
FP– 7 /FP– 8 BLANK

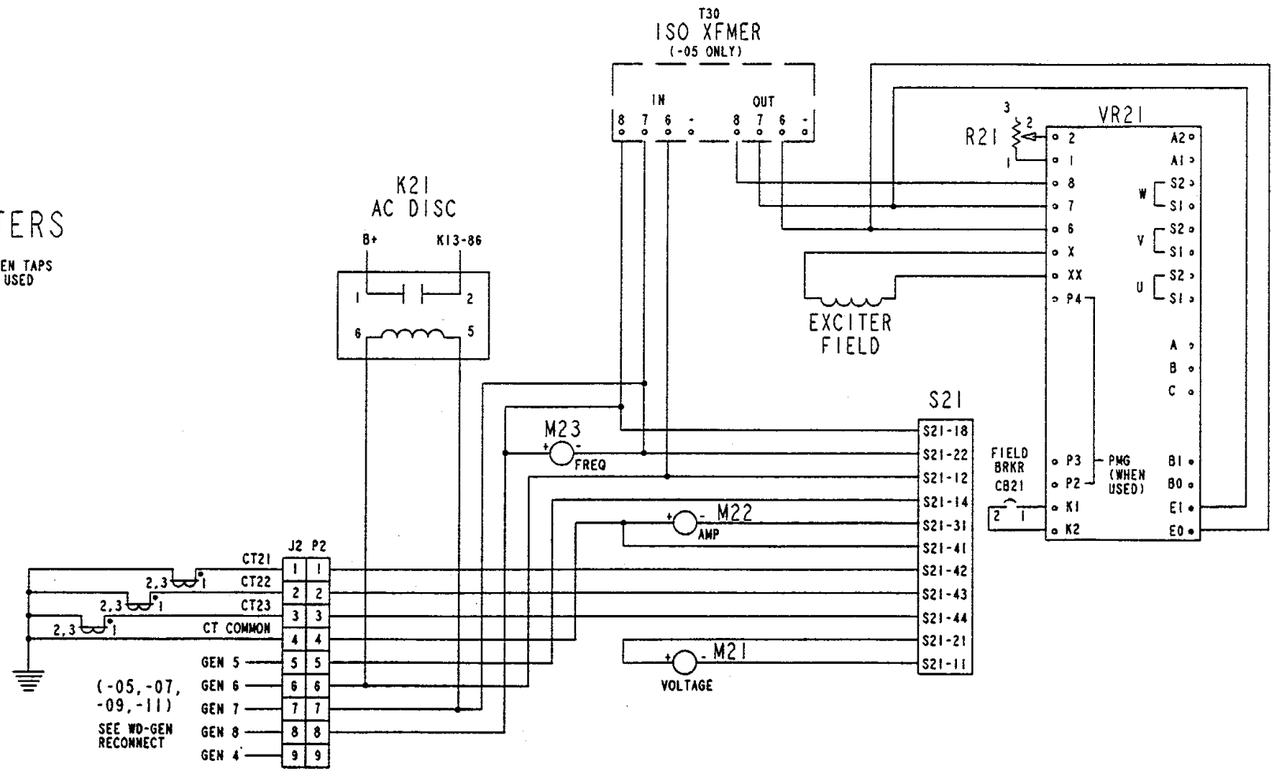


GENERATOR SET (DC) WIRING SCHEMATIC

FIGURE FO-1. ELECTRICAL SYSTEM SCHEMATIC
FOLDOUT 5 OF 19
FP– 9 /FP– 10 BLANK

METERS

600V GEN TAPS
NOT USED



SCHEMATIC-MX321 & SX421 REGULATOR

S21 JUMPERS

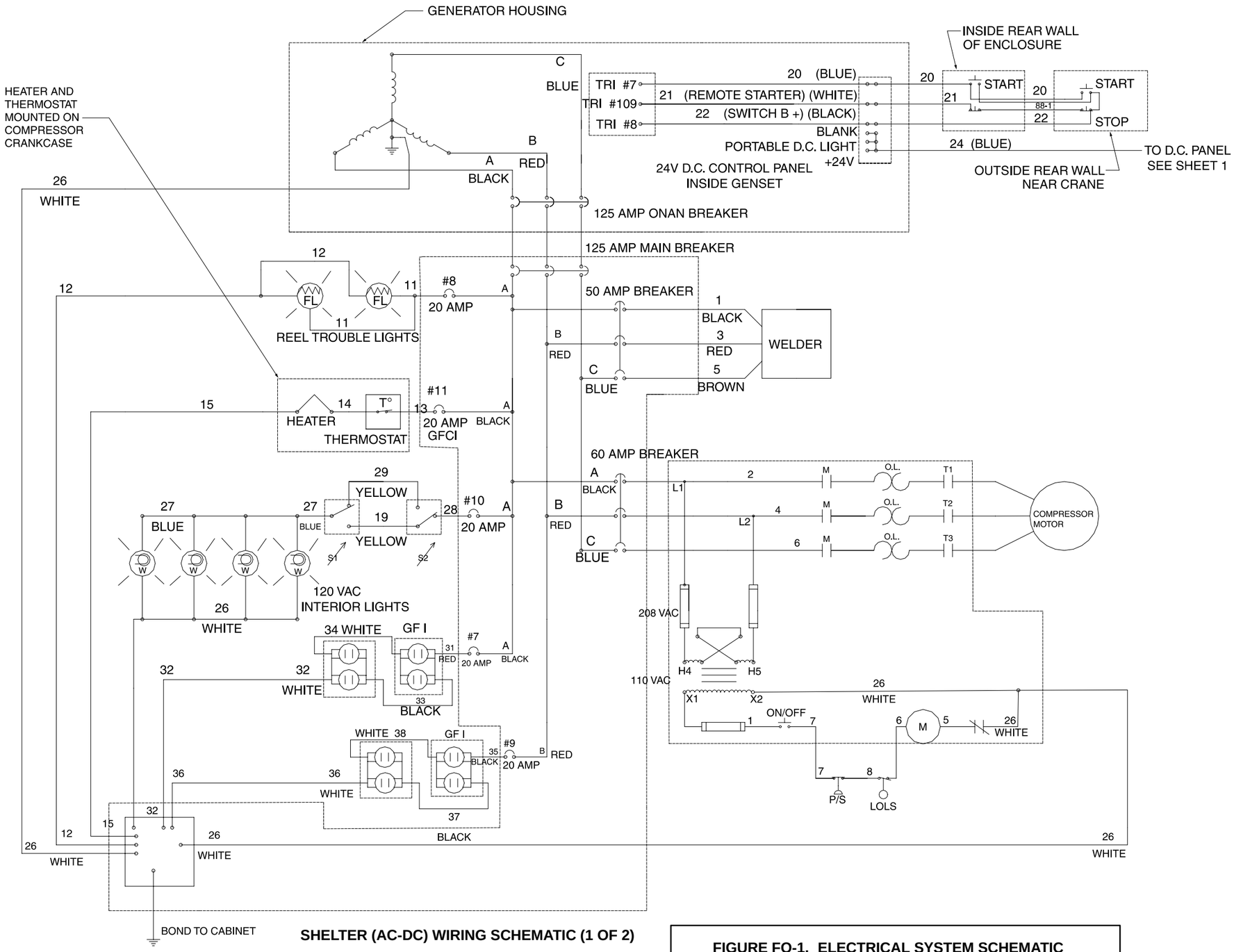
EXTERNAL	INTERNAL
M-P	N-41
34-44	M-31
C-21	A-11
32-42	B-C
12-J	33-43
N-R	

S21 SWITCH LOGIC

	18-11	22-C	14-21	M-32	41-42	P-43	12-A	J-B	31-34	N-44	R-33
L1-L2 3Ø	X	X		X						X	X
L2-L3 3Ø		X			X	X	X			X	
L3-L1 3Ø	X				X			X	X		X
L1-L0 3Ø	X		X		X					X	X
OFF					X					X	X
L1-L2 1ØA	X	X		X						X	X
L1-L2 1ØB	X	X			X	X				X	

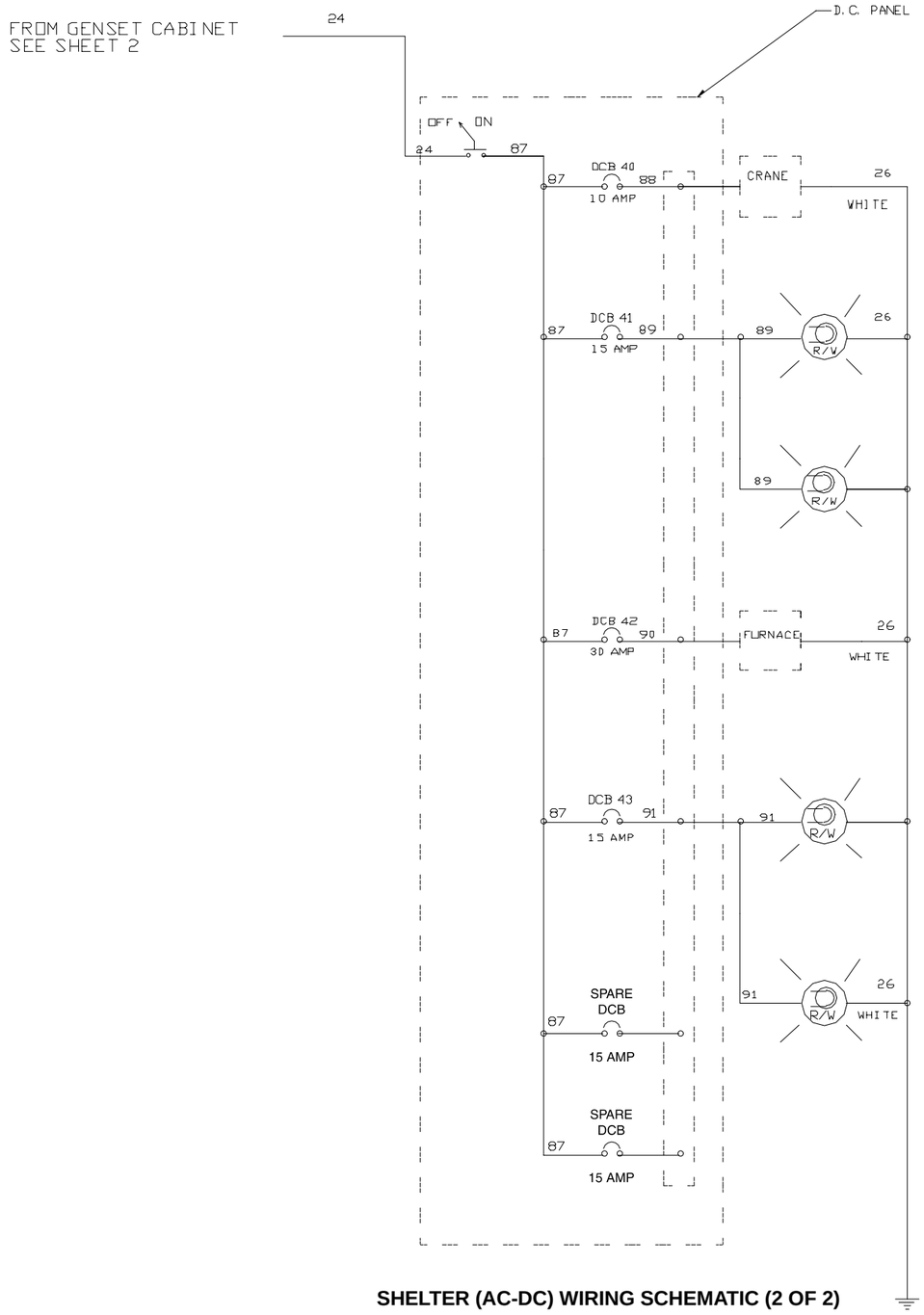
GENERATOR SET VOLTAGE REGULATOR WIRING SCHEMATIC

FIGURE FO-1. ELECTRICAL SYSTEM SCHEMATIC
FOLDOUT 6 OF 19
FP– 11 /FP– 12 BLANK



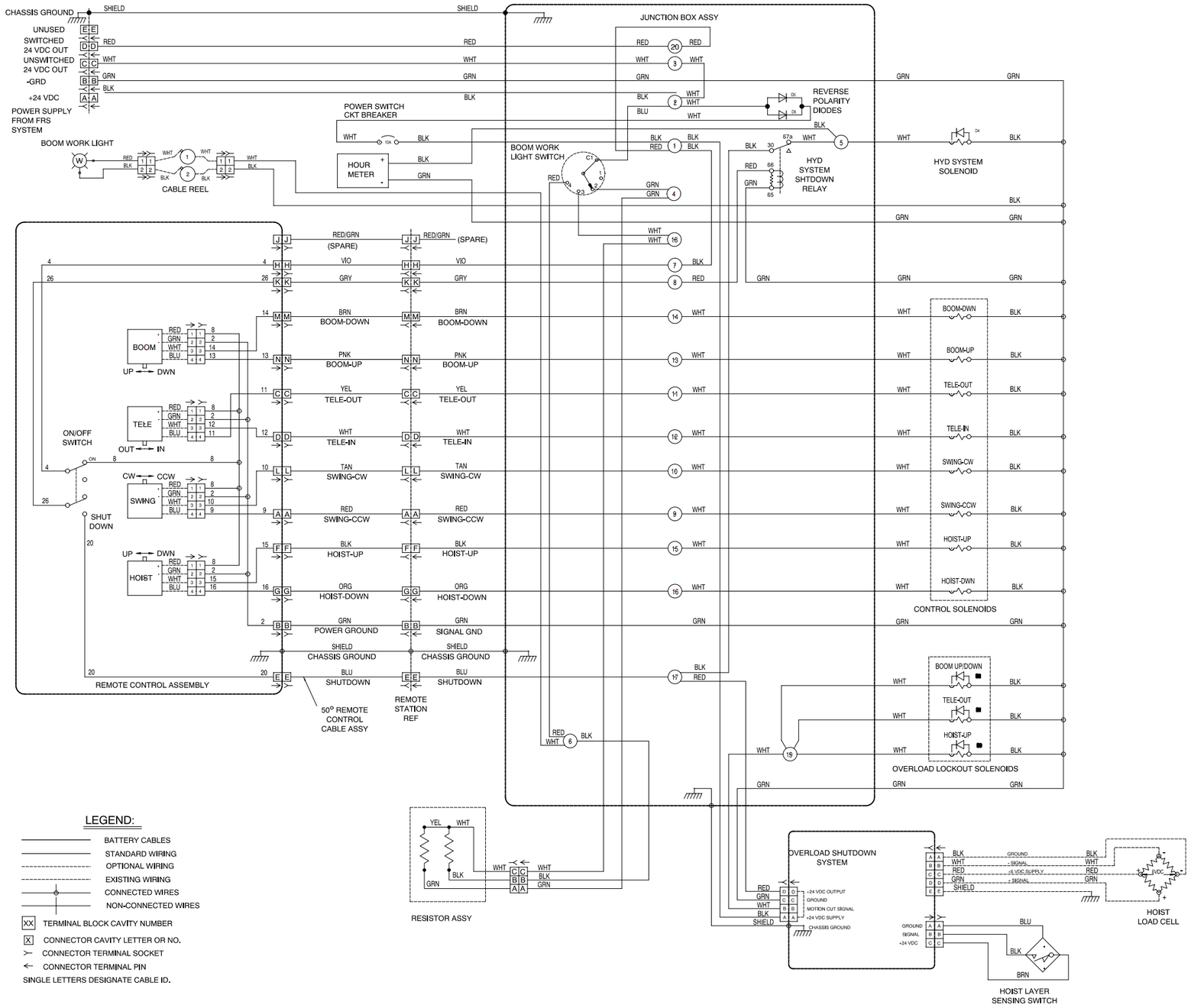
SHELTER (AC-DC) WIRING SCHEMATIC (1 OF 2)

FIGURE FO-1. ELECTRICAL SYSTEM SCHEMATIC
FOLDOUT 7 OF 19
FP– 13 /FP– 14 BLANK



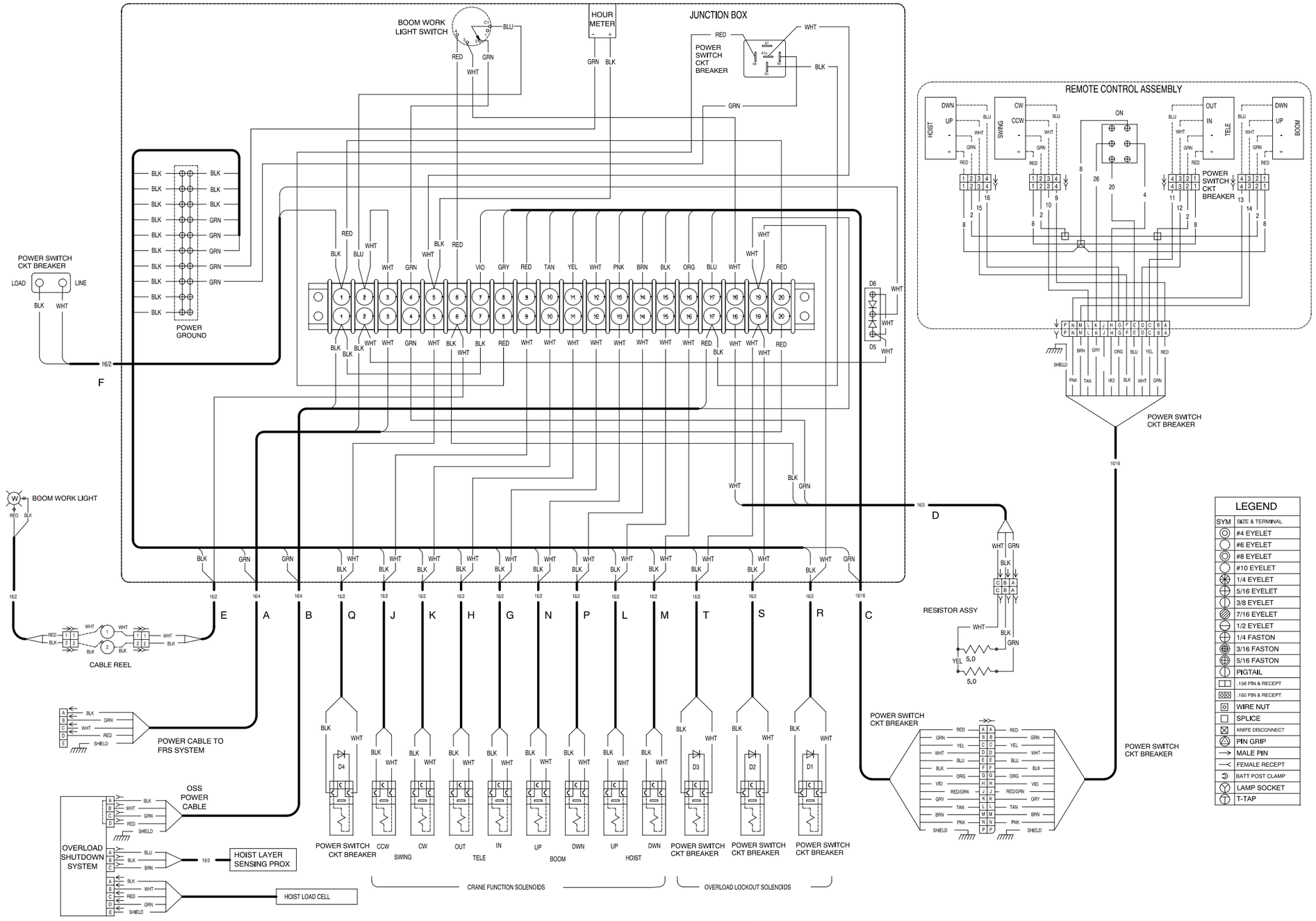
SHELTER (AC-DC) WIRING SCHEMATIC (2 OF 2)

FIGURE FO-1. ELECTRICAL SYSTEM SCHEMATIC
FOLDOUT 8 OF 19



CRANE ELECTRICAL WIRING SCHEMATIC (1 OF 3)

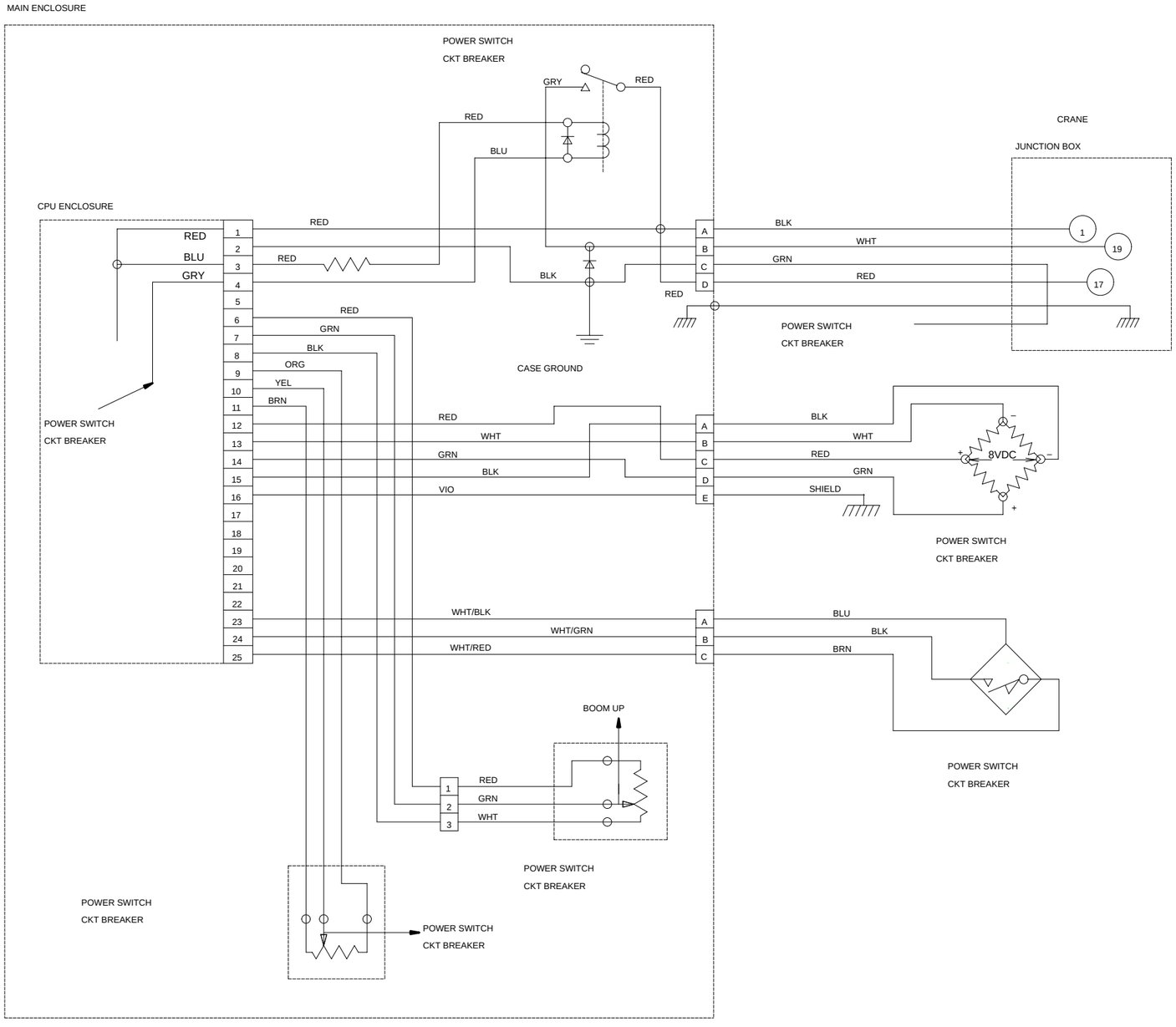
FIGURE FO-1. ELECTRICAL SYSTEM SCHEMATIC
FOLDOUT 9 OF 19
FP– 17 /FP– 18 BLANK



LEGEND	
SYM	SIZE & TERMINAL
	#4 EYELET
	#6 EYELET
	#8 EYELET
	#10 EYELET
	1/4 EYELET
	5/16 EYELET
	3/8 EYELET
	7/16 EYELET
	1/2 EYELET
	1/4 FASTON
	3/16 FASTON
	5/16 FASTON
	PIGTAIL
	.156 PIN & RECEPT
	.160 PIN & RECEPT
	WIRE NUT
	SPLICE
	KNIFE DISCONNECT
	PIN GRIP
	MALE PIN
	FEMALE RECEPT
	BATT POST CLAMP
	LAMP SOCKET
	T-TAP

CRANE ELECTRICAL WIRING SCHEMATIC (2 OF 3)

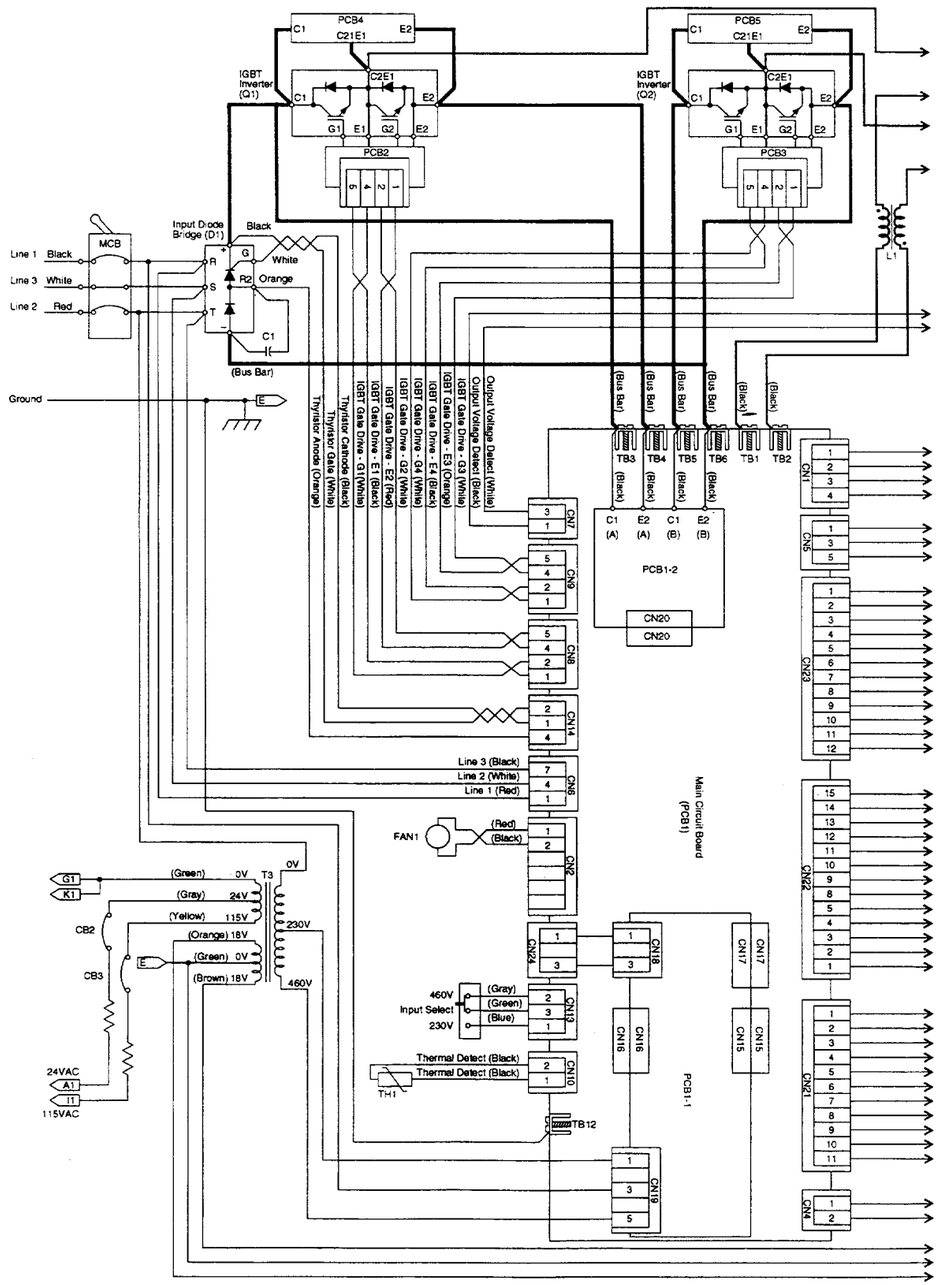
FIGURE FO-1. ELECTRICAL SYSTEM SCHEMATIC
FOLDOUT 10 OF 19
FP– 19 /FP– 20 BLANK



CPU CONNECTOR PIN DESIGNATIONS	
PIN	DESIGNATION
1	24 VDC POWER INPUT FROM CRANE AND VEHICLE
2	GROUND TO CRANE AND VEHICLE
3	24 VDC OUTPUT, UNSWITCHED, TO MOTION CUT RELAY COIL
4	GROUND FROM MOTION CUT RELAY COIL, SWITCHED IN CPU
5	
6	POWER TO BOOM ANGLE POTENTIOMETER (8.0 VDC)
7	BOOM ANGLE POTENTIOMETER OUTPUT SIGNAL
8	BOOM ANGLE POTENTIOMETER GROUND
9	POWER TO BOOM LENGTH POTENTIOMETER (8.0 VDC)
10	BOOM LENGTH POTENTIOMETER OUTPUT SIGNAL
11	BOOM LENGTH POTENTIOMETER GROUND
12	POWER TO HOIST LOAD CELL (8.0 VDC)
13	HOIST LOAD CELL OUTPUT SIGNAL, –VE
14	HOIST LOAD CELL OUTPUT SIGNAL, +VE
15	HOIST LOAD CELL GROUND
16	HOIST LOAD CELL SHIELD (GROUND)
17	
18	
19	
20	
21	
22	
23	HOIST LAYER SENSING SWITCH GROUND
24	HOIST LAYER SENSING SWITCH OUTPUT SIGNAL
25	POWER TO HOIST LAYER SENSING SWITCH (24 VDC)

CRANE ELECTRICAL WIRING SCHEMATIC (3 OF 3)

FIGURE FO-1. ELECTRICAL SYSTEM SCHEMATIC
FOLDOUT 11 OF 19
FP– 21 /FP– 22 BLANK



STICK WELDER WIRING SCHEMATIC

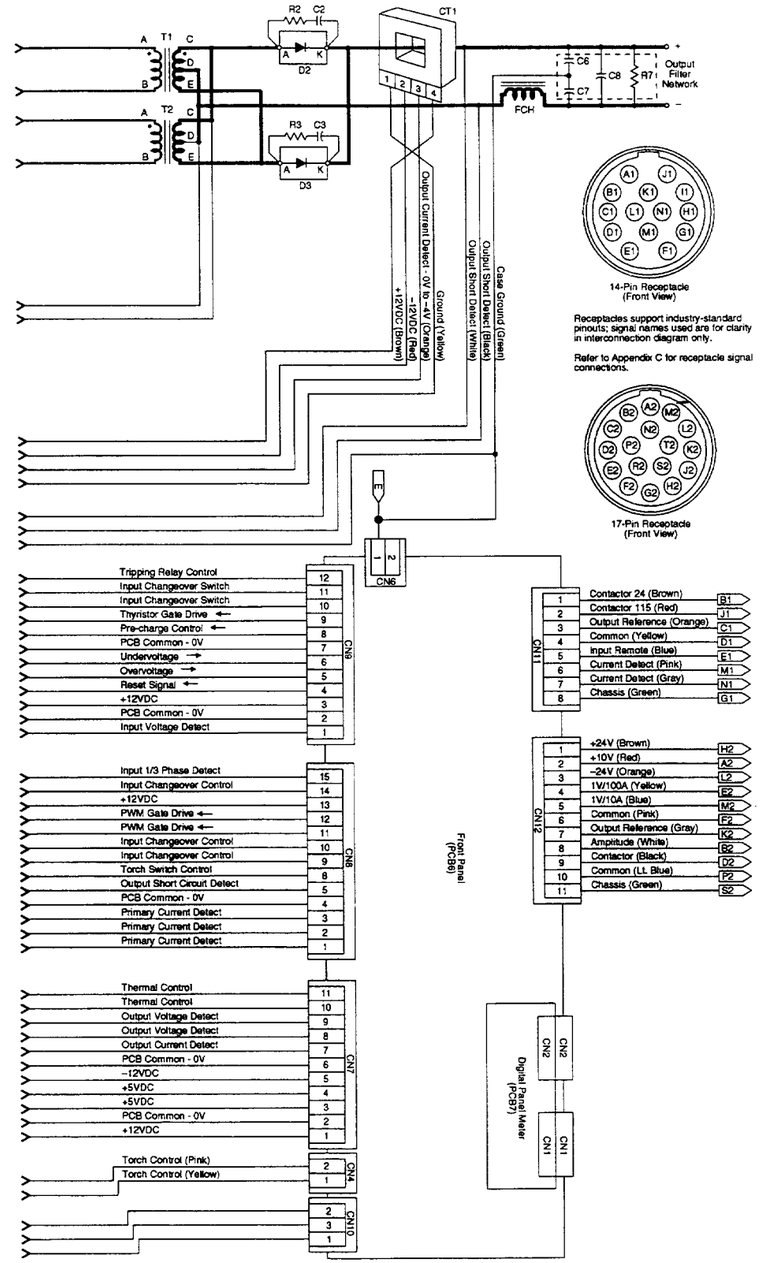
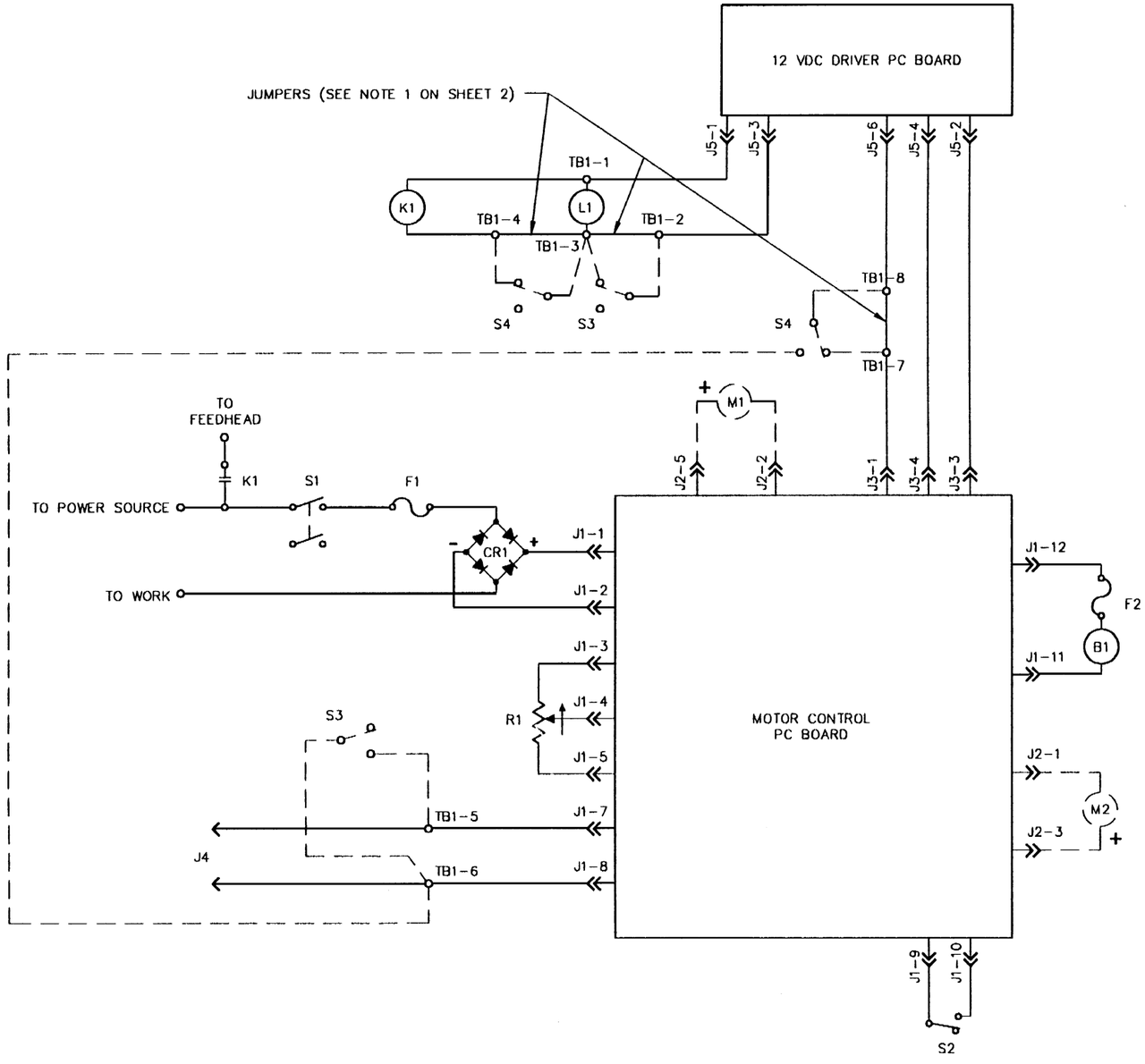


FIGURE FO-1. ELECTRICAL SYSTEM SCHEMATIC
FOLDOUT 12 OF 19
FP– 23 /FP– 24 BLANK

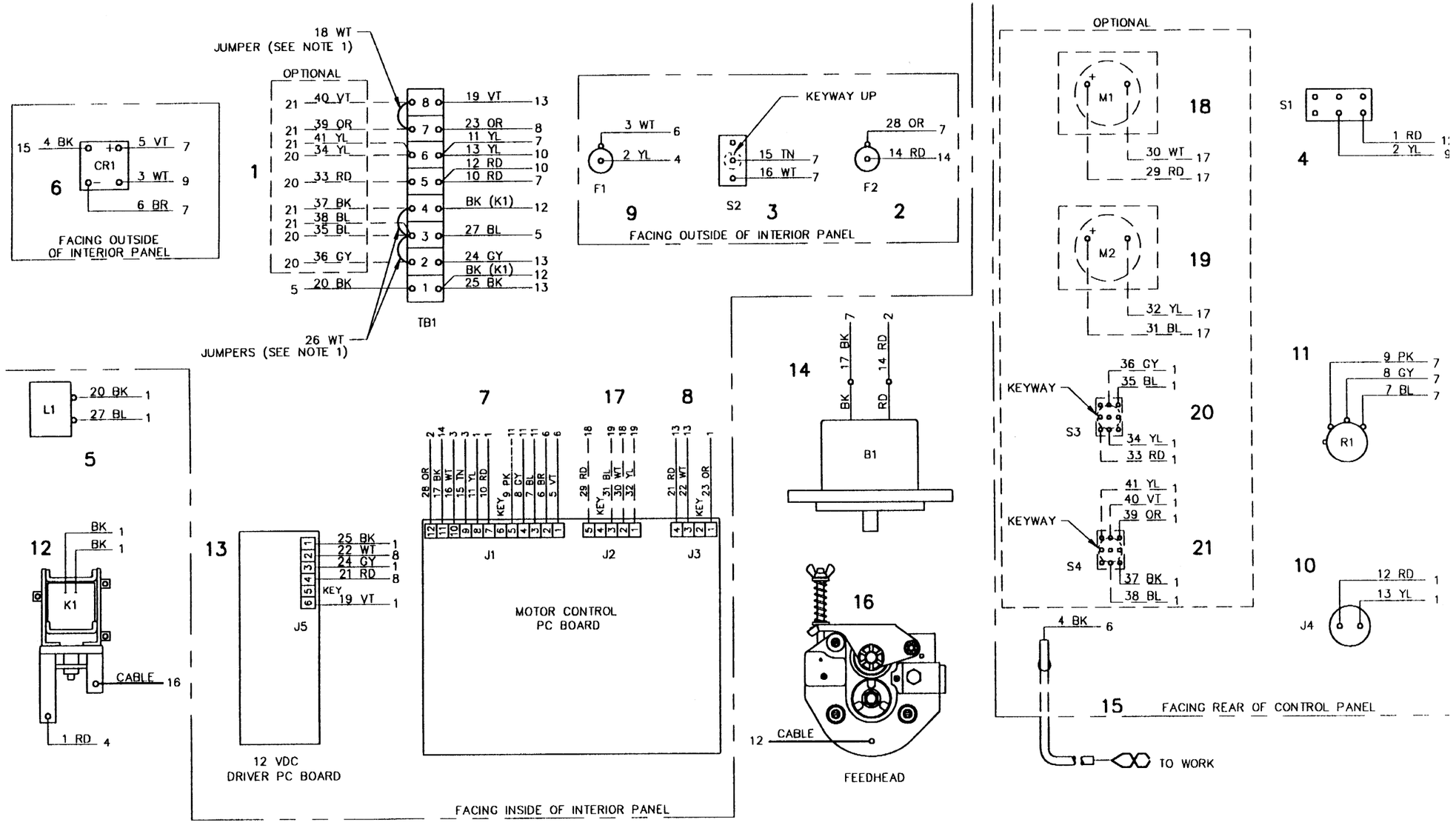


LEGEND

B1	MOTOR, WIRE FEED
CR1	RECTIFIER, BRIDGE
F1	FUSE, SLOW BLOW, 6A
F2	FUSE, SLOW BLOW, 5A
J1	RECEPTACLE, MOTOR CONTROL BOARD
J2	RECEPTACLE, METER OPTION
J3	RECEPTACLE, MOTOR CONTROL BOARD
J4	RECEPTACLE, GUN SWITCH
J5	RECEPTACLE, 12 VDC DRIVER BOARD
K1	CONTACTOR, 300 AMP
L1	GAS VALVE, 12 VDC
M1	VOLTMETER (OPTIONAL)
M2	WIRE FEED SPEED METER (OPTIONAL)
R1	POTENTIOMETER, 10 KOHMS, 2W
S1	SWITCH, ON/OFF
S2	SWITCH, CC/CV
S3	INCH SWITCH (OPTIONAL)
S4	PURGE SWITCH (OPTIONAL)
TB1	TERMINAL BLOCK

WIRE FEED MIG WELDER WIRING SCHEMATIC (1 OF 2)

FIGURE FO-1. ELECTRICAL SYSTEM SCHEMATIC
FOLDOUT 13 OF 19
FP– 25 /FP– 26 BLANK

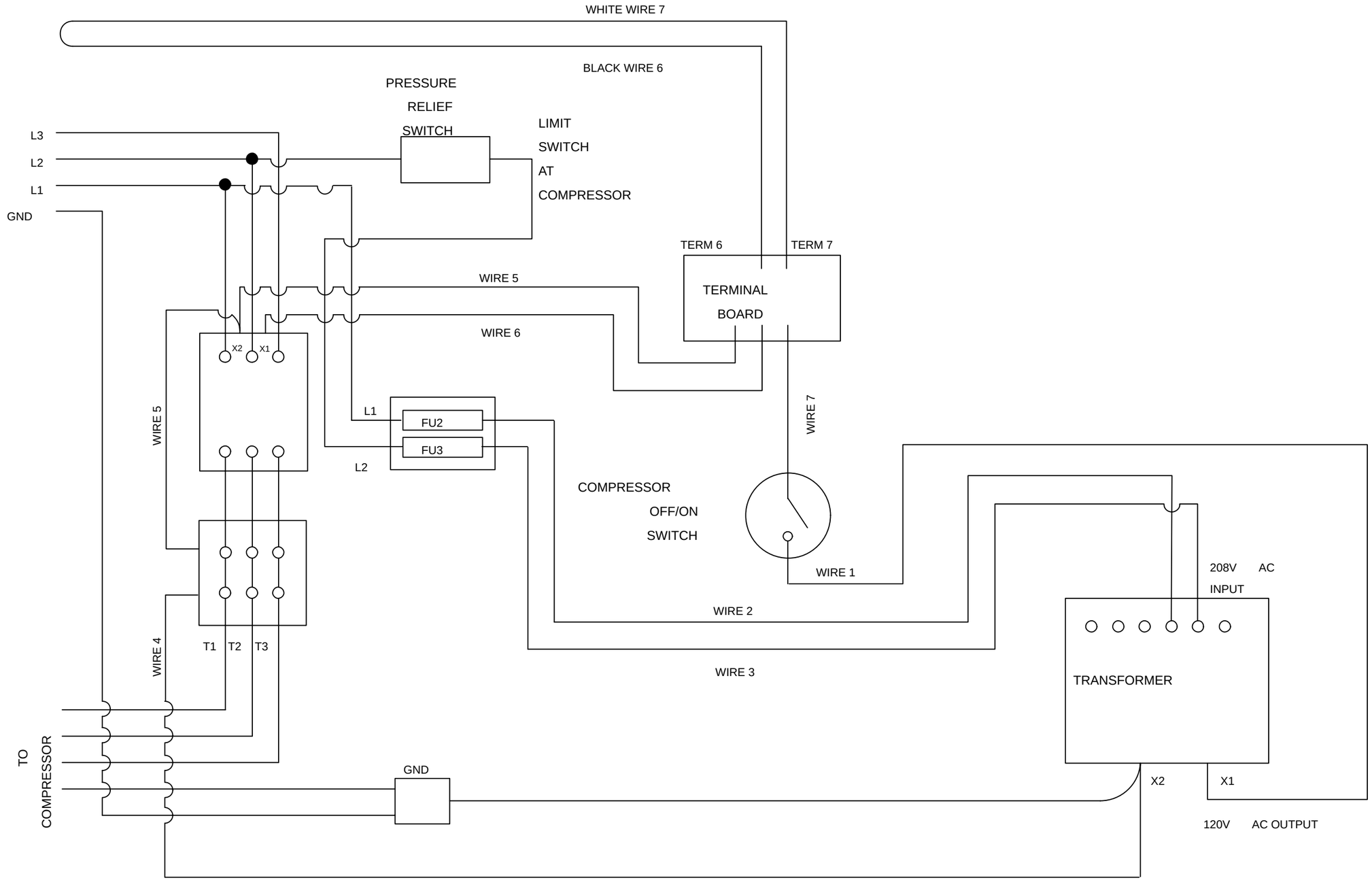


NOTES:

1) REMOVE (3) JUMPERS (WIRES 18 WT, 26 WT, & 26 WT) FROM TB1 IF INCH/PURGE SWITCHES (S3 AND S4) ARE INSTALLED.

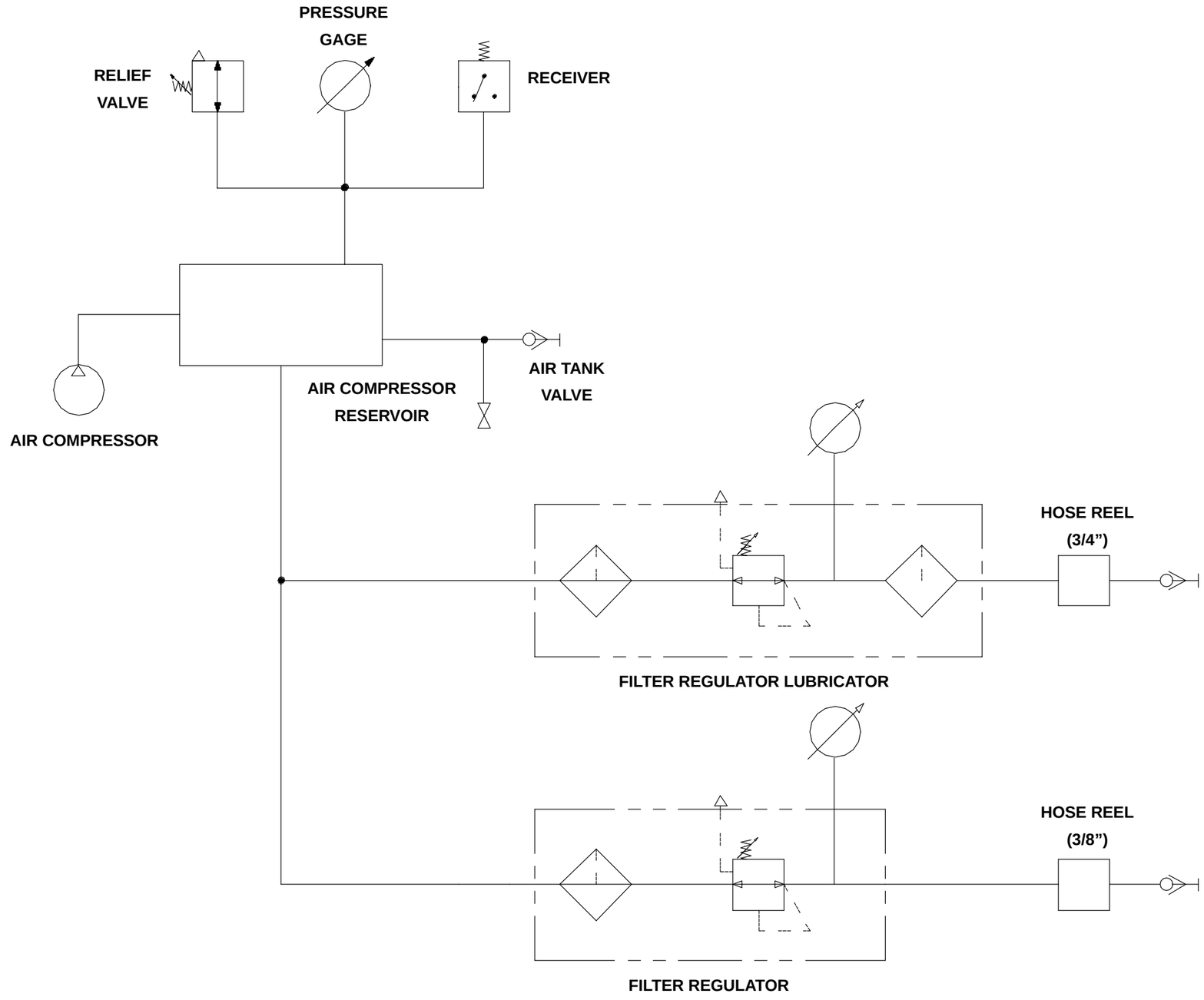
WIRE FEED MIG WELDER WIRING SCHEMATIC (2 OF 2)

FIGURE FO-1. ELECTRICAL SYSTEM SCHEMATIC
FOLDOUT 14 OF 19
FP– 27 /FP– 28 BLANK



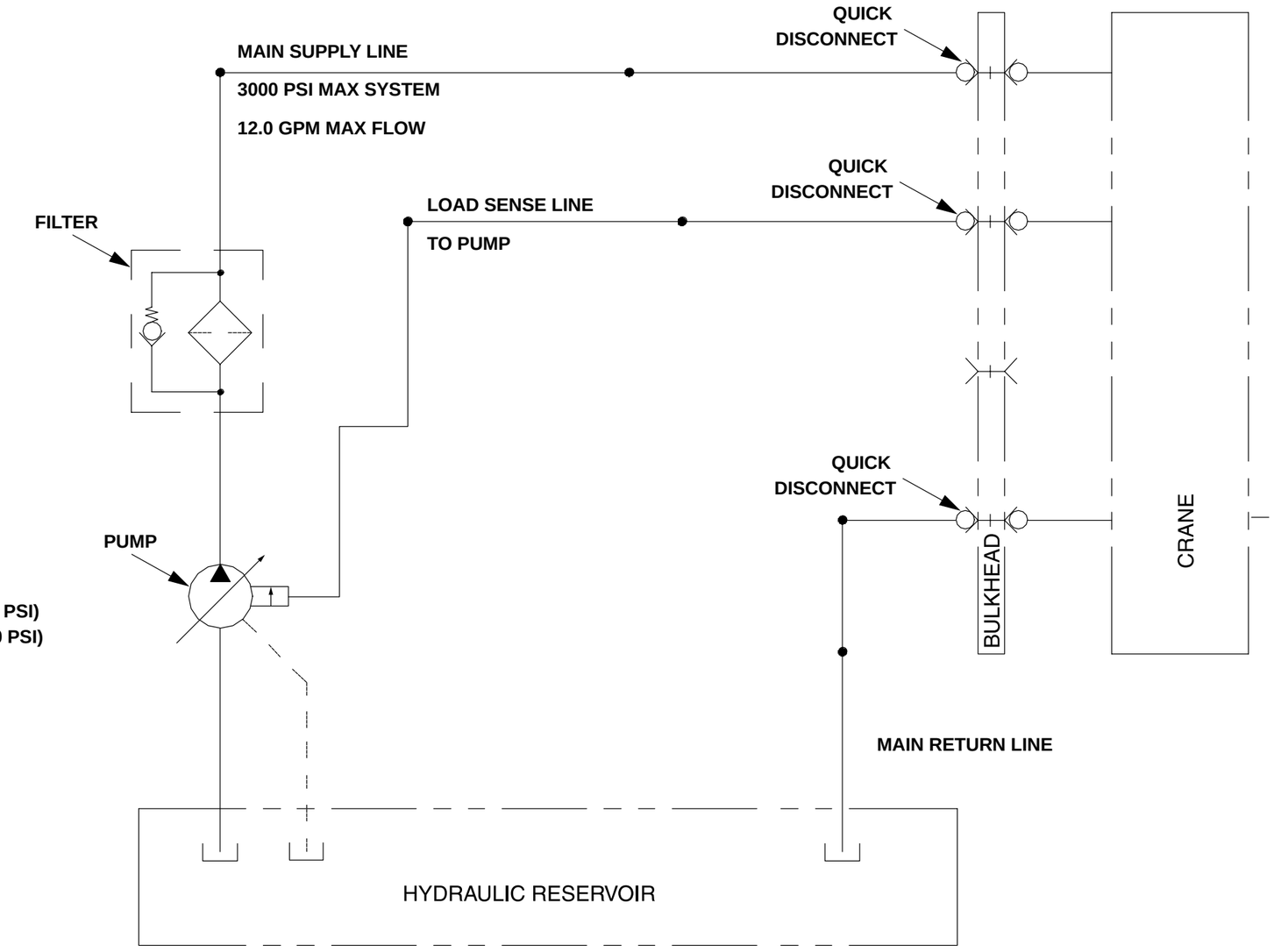
AIR COMMPRESSOR WIRING SCHEMATIC

FIGURE FO-1. ELECTRICAL SYSTEM SCHEMATIC
FOLDOUT 15 OF 19
FP– 29 /FP– 30 BLANK



AIR COMPRESSOR HOSE SCHEMATIC

FIGURE FO-2. AIR COMPRESSOR HOSE SCHEMATIC
FOLDOUT 16 OF 19
FP– 31 /FP– 32 BLANK

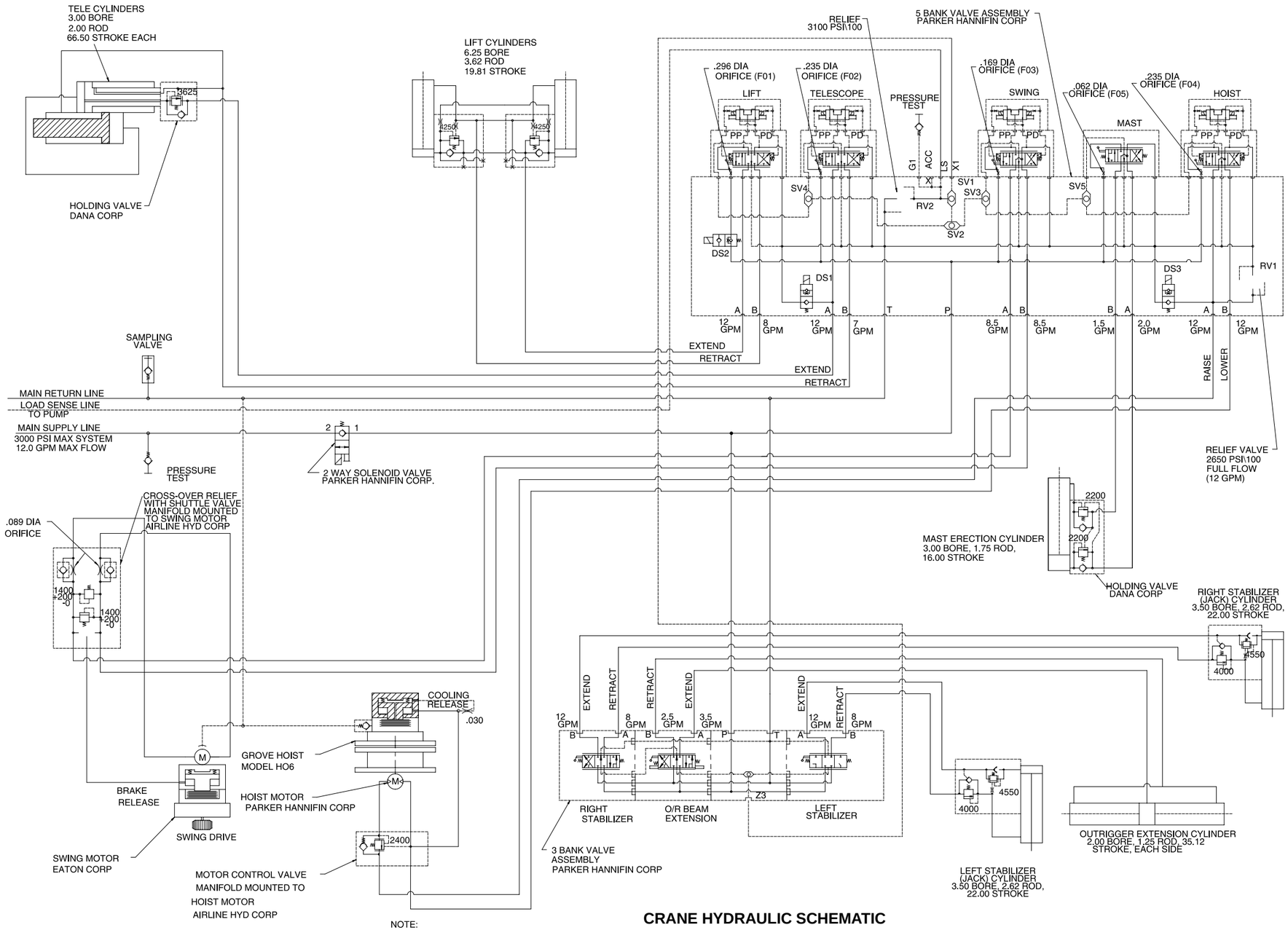


NOTE:
VERIFY HYDRAULIC PRESSURE SETTINGS UNDER THE FOLLOWING CONDITIONS:

1. **LOADSENSE PUMP STAND–BY PRESSURE: 325 PSI (\10 PSI)**
2. **LOADSENSE PUMP LIMITING PRESSURE: 3500 PSI (\100 PSI)**
3. **HYDRAULIC OIL TEMPERATURE: 140 (\10PSI)**

FRS HYDRAULIC SCHEMATIC

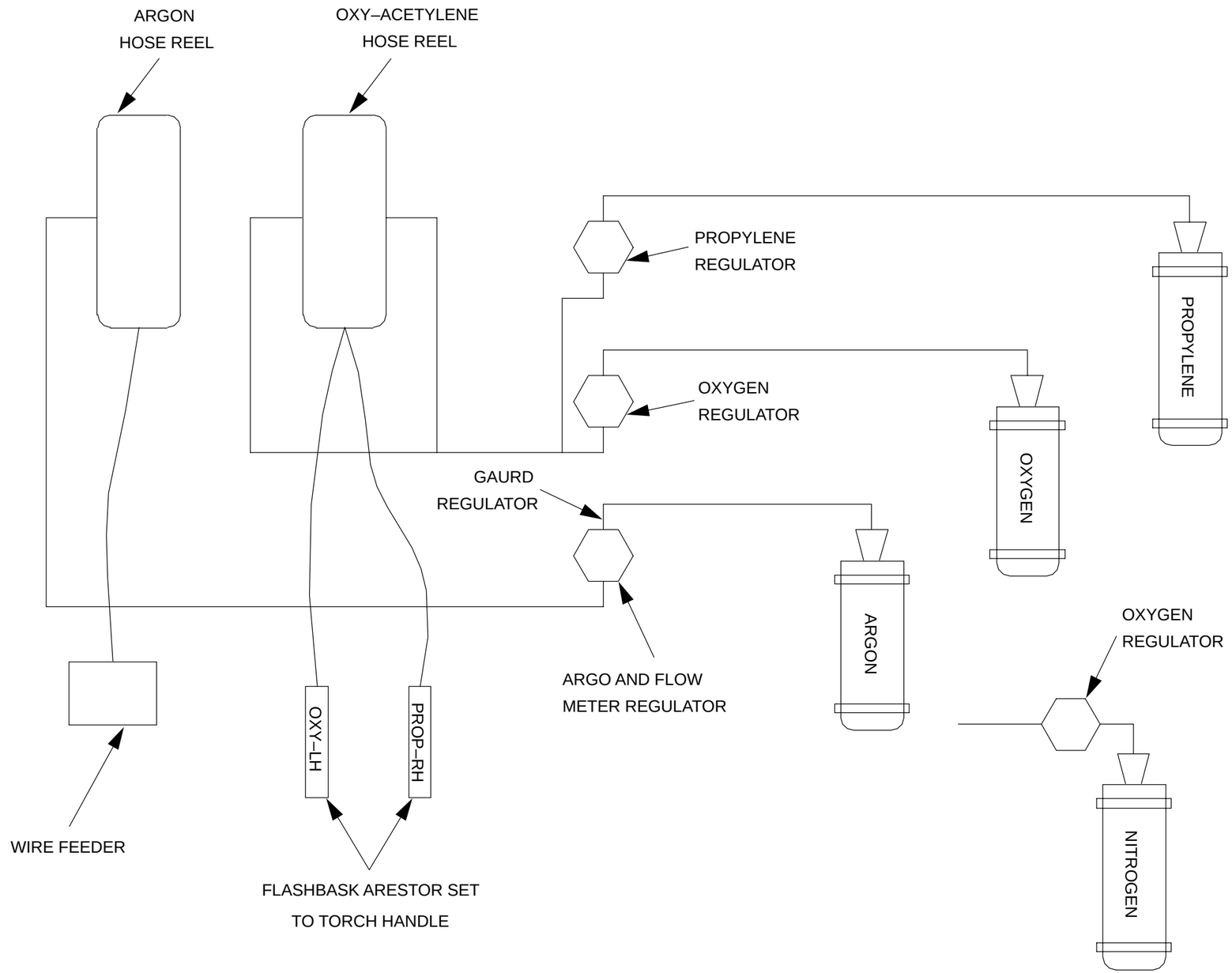
FIGURE FO-3. HYDRAULIC SYSTEM SCHEMATIC
FOLDOUT 17 OF 19



CRANE HYDRAULIC SCHEMATIC

NOTE:
VERIFY HYDRAULIC PRESSURE SETTINGS
UNDER THE FOLLOWING CONDITIONS:
1. LOADSENSE PUMP STAND-BY PRESSURE:325 PSI(\10PSI)
2. LOADSENSE PUMP LIMITING PRESSURE:3500 PSI(\100PSI)
3. HYDRAULIC OIL TEMPERATURE: 140˚F (\10˚F)

FIGURE FO-3. HYDRAULIC SYSTEM SCHEMATIC
FOLDOUT 18 OF 19



WELDING HOSE SCHEMATIC

FIGURE FO-4. WELDING HOSE SCHEMATIC
FOLDOUT 19 OF 19
FP– 37 /FP– 38 BLANK

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
0030711

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TO: *(Forward to proponent of publication or form) (Include ZIP Code)*	**FROM:** *(Activity and location) (Include ZIP Code)*	

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** Reference to line numbers within the paragraph or subparagraph.*

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PUBLICATION NUMBER	DATE	TITLE

PAGE NO.	COLM NO.	LINE NO.	NATIONAL STOCK NUMBER	REFERENCE NO.	FIGURE NO.	ITEM NO.	TOTAL NO. OF MAJOR ITEMS SUPPORTED	RECOMMENDED ACTION

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PAGE NO.	COLM NO.	LINE NO.	NATIONAL STOCK NUMBER	REFERENCE NO.	FIGURE NO.	ITEM NO.	TOTAL NO. OF MAJOR ITEMS SUPPORTED	RECOMMENDED ACTION

PART III - REMARKS *(Any general remarks or recommendations, or suggestions for improvement of publications and blank forms. Additional blank sheets may be used if more space is needed.)*

TYPED NAME, GRADE OR TITLE	TELEPHONE EXCHANGE/AUTOVON, PLUS EXTENSION	SIGNATURE

RECOMMENDED CHANGES TO PUBLICATIONS AND BLANK FORMS For use of this form, see AR 25-30; the proponent agency is OAASA	Use Part II *(reverse)* for Repair Parts and Special Tool Lists (RPSTL) and Supply Catalogs/Supply Manuals (SC/SM).	DATE
TO: *(Forward to proponent of publication or form) (Include ZIP Code)*	**FROM:** *(Activity and location) (Include ZIP Code)*	

PART I - ALL PUBLICATIONS (EXCEPT RPSTL AND SC/SM) AND BLANK FORMS

PUBLICATION/FORM NUMBER	DATE	TITLE

ITEM	PAGE	PARA-*	LINE	FIGURE NO.	TABLE	RECOMMENDED CHANGES AND REASON

** Reference to line numbers within the paragraph or subparagraph.*

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TO: *(Forward direct to addressee listed in publication)*	FROM: *(Activity and location) (Include ZIP Code)*	DATE

PART II - REPAIR PARTS AND SPECIAL TOOL LISTS AND SUPPLY CATALOGS/SUPPLY MANUALS

PUBLICATION NUMBER	DATE	TITLE

PAGE NO.	COLM NO.	LINE NO.	NATIONAL STOCK NUMBER	REFERENCE NO.	FIGURE NO.	ITEM NO.	TOTAL NO. OF MAJOR ITEMS SUPPORTED	RECOMMENDED ACTION

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TYPED NAME, GRADE OR TITLE	TELEPHONE EXCHANGE/AUTOVON, PLUS EXTENSION	SIGNATURE

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

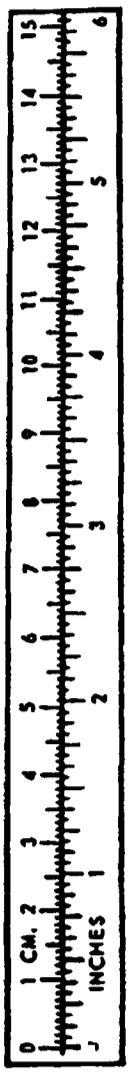
CUBIC MEASURE
1 Cu Centimeter=1000 Cu Millimeters=0.06 Cu Inches
1 Cu Meter=1,000,000 Cu Centimeters=35.31 Cu Feet

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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