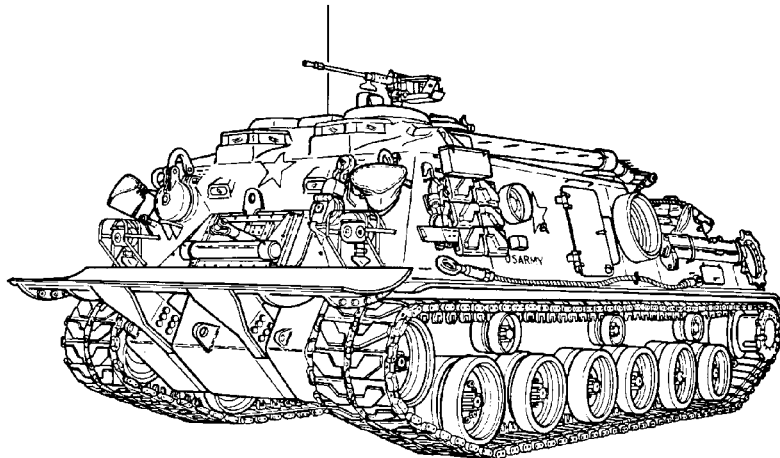


**TM 9-2350-256-34**

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**TECHNICAL MANUAL**  
**DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE MANUAL**  
**FOR**  
**RECOVERY VEHICLE, FULL**  
**TRACKED: MEDIUM, M88A1**  
**NSN 2350-00-122-6826 (EIC AQA)**



**SUPERSEDURE NOTICE** – This manual supersedes TM 9-2350-256-34-1, dated 28 January 1977, and TM 9-2350-256-34-2, dated 16 February 1977, including all changes.

**DISTRIBUTION STATEMENT A** – Approved for public release; distribution is unlimited.

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**HEADQUARTERS, DEPARTMENT OF THE ARMY**

**JULY 2005**





## WARNING SUMMARY

### WARNING



Carbon monoxide poisoning can be deadly.

Carbon monoxide is a colorless, odorless deadly poisonous gas which, when breathed, deprives the body of oxygen and causes suffocation. Exposure to air contaminated with carbon monoxide produces symptoms of headache, dizziness, loss of muscular control, apparent drowsiness, and coma. Permanent brain damage or death can result from severe exposure.

It occurs in the exhaust fumes of fuel-burning heaters and internal combustion engines and becomes dangerously concentrated under conditions of inadequate ventilation. The following precautions must be observed to ensure the safety of personnel whenever the personnel heater, main, or auxiliary engine of any vehicle is operated for maintenance purposes or tactical use.

Do not operate heater or engine of vehicle in an enclosed area unless it is adequately ventilated.

Do not idle engine for long periods without maintaining adequate ventilation in personnel compartments.

Do not drive any vehicle with inspection plates, cover plates, engine compartment doors removed unless necessary for maintenance purposes.

Be alert at all times during vehicle operation for exhaust odors and exposure symptoms. If either are present immediately ventilate personnel compartments. If symptoms persist, remove affected personnel from vehicle and treat as follows: expose to fresh air; keep warm; do not permit physical exercise; if necessary, administer artificial respiration.

The best defense against carbon monoxide poisoning is adequate ventilation.

### WARNING

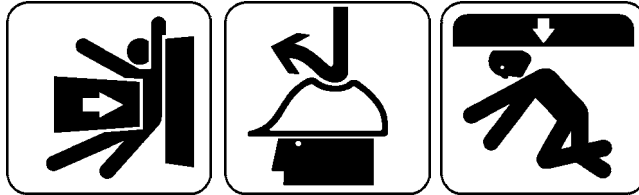


High voltage is used in the operation of some equipment. Serious injury may result if personnel fail to observe safety precautions. Learn the areas containing high voltage in each piece of equipment. Be careful not to contact high voltage connections when installing or operating this equipment. Before working on electrical equipment, harnesses, battery cables or starter cables turn master switch to off position and disconnect battery ground cables.

Observe the warning notes throughout this manual.

## WARNING SUMMARY–Continued

**WARNING**



Do not stand on engine deck while operating the boom.

Do not use a 5-ton wrecker to remove engine deck and powerplant. Use only an M578 Light Recovery Vehicle or another M88A1 Medium Recovery Vehicle to remove the engine deck and powerplant.

The engine deck weighs approximately 1700 lb (771kg), and the powerplant weighs approximately 12,000 lb (5443kg). Use a lifting device with a capacity of at least 15,000 lb (6804kg) to remove engine deck and powerplant.

**WARNING**



Personnel must stay clear of engine and APU exhaust areas during and immediately after engine operations. Contact with these areas can cause severe burns. Smoke generator toxic fumes should not be inhaled. Clear the area of all personnel and keep the vehicle downwind of installation during test.

INSERT LATEST CHANGED PAGES/WORK PACKAGES. DESTROY SUPERSEDED DATA.

**LIST OF EFFECTIVE PAGES/WORK PACKAGES**

**NOTE:** The portion of text affected by the changes is indicated by a vertical line in the outer margins of the page. Changes to illustrations are indicated by miniature pointing hands. Changes to wiring diagrams are indicated by shaded areas.

Dates of issue for original and changed pages/work packages are:

**Original ..0 ..15 July 2005**

**TOTAL NUMBER OF PAGES FOR FRONT AND REAR MATTER IS 28 AND TOTAL NUMBER OF WORK PACKAGES IS 88 CONSISTING OF THE FOLLOWING:**

Page / WP No.	*Change No.	Page / WP No.	*Change No.	Page / WP No.	*Change No.	Page / WP No.	*Change No.
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A.....	0						
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Title .....	0						
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WP 0001 00-0088 00.....	0						
WP 0088 00-12 Blank.....	0						
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DA Form 2028 (2 copies).....	0						
Authentication page.....	0						
MetricConversionChart.....	0						
PIN page .....	0						

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**HEADQUARTERS  
DEPARTMENT OF THE ARMY  
WASHINGTON, D.C., 15 JULY 2005**

**TECHNICAL MANUAL**

**DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE MANUAL**

**FOR**

**RECOVERY VEHICLE MEDIUM, M88A1**

**NSN 2350-00-122-6826**

**(EIC AQA)**

**REPORTING 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 DA Form 2028 (Recommended Changes to Publications and Blank Forms), through the Internet, on the Army Electronic Product Support (AEPS) website. The internet address is <http://aeeps.ria.army.mil>. If you need a password, scroll down and click on "ACCESS REQUEST FORM". The DA Form 2028 is located in the ON-LINE 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, or DA Form 2028 direct to: Technical Publication Information Office, TACOM-RI, 1 Rock Island, IL 61299-7630. The email address is TACOM-TECH-PUBS@ria.army.mil. The fax number is DSN 793-0726 or Commercial (309) 782-0726. A reply will be furnished directly to you.

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## HOW TO USE THIS MANUAL

### MANUAL CONTENT

#### Overview

The front matter in this manual consists of general warnings, title block page, and table of contents.

The information contained in this manual is presented in four chapters. Each chapter is divided into Work Packages (WPs) that cover general information, troubleshooting procedures, maintenance procedures, and other information for specific systems or components. Each WP starts on a right-hand page. Page numbers consist of the WP number followed by a dash and another number. For example, "0014 00-7" means WP 0014 00, page 7.

At the end of this manual are an alphabetical index, schematics, DA Form 2028-2, and a metric conversion chart.

#### Chapters

Chapter 1 provides general information, equipment description, and theory of operation.

Chapter 2 provides the troubleshooting procedures.

Chapter 3 provides maintenance instructions.

Chapter 4 provides supporting information, consisting of references, expendable and durable items list, tool identification list, mandatory replacement parts, and fabricated tools and equipment.

#### Alphabetical Index

An index is located after the last WP in this manual that provides an alphabetical listing of information and components/assemblies contained in this manual.

#### Schematics

There are 22 schematics in the form of foldouts located at the end of this manual. Detailed descriptions of these foldouts are located in WPs 0049 00 and 0050 00.

#### DA Form 2028-2

DA Form 2028-2 is used to report errors and to recommend improvements for the tasks in this manual.

#### Metric Conversion Chart

The metric conversion chart converts English measurements to metric equivalents. Measurements in this manual are provided in both English and metric units.

## HOW TO USE THIS MANUAL—Continued

### Warnings, Cautions, and Notes

You must read and understand this manual BEFORE operating the M88A1.

Throughout this manual you will see WARNING, CAUTION, and NOTE headings. There are good reasons for every one of these notices:

#### **WARNING**

A warning is used to alert the user to hazardous operating and maintenance procedures, practices, or conditions that could result in injury or death. Warnings must be strictly observed.

#### **CAUTION**

A caution is used to alert the user to hazardous operating and maintenance procedures, practices, or conditions that could result in damage to, or destruction of, equipment or mission effectiveness. Cautions must be strictly observed.

#### **NOTE**

A note highlights an essential operating or maintenance procedure, condition, or statement.

Warnings and cautions appear immediately preceding the step to which they pertain. It is important to read and thoroughly understand the warnings and/or cautions before beginning maintenance. Notes may precede or follow the steps to which they pertain, depending on what makes the most sense.

### Initial Setups

Before starting a task, you must obtain all the tools, supplies, and personnel listed in the initial setup. Be sure to read the task before performing the maintenance. If any other tasks are referenced, you must go to the initial setup page for each of those tasks to find out what tools, supplies, and personnel will be needed.

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**INTERMEDIATE MAINTENANCE**  
**RECOVERY VEHICLE, FULL TRACKED: MEDIUM, M88A1**  
**NSN 2350-00-122-6826, EIC AQA**

**GENERAL INFORMATION**

---

**SCOPE**

This technical manual contains instructions for Direct and General Support maintenance for the Recovery Vehicle, Full Tracked: Medium, M88A1 (Figures 1 and 2).

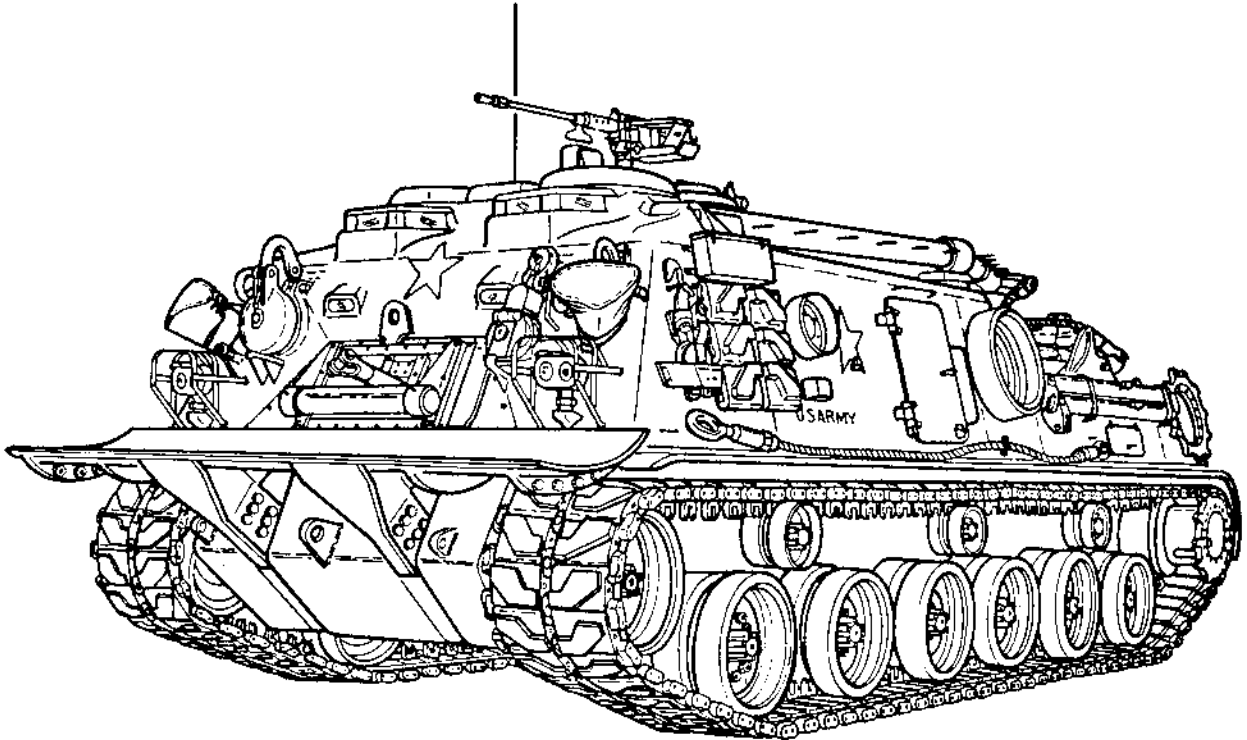


Figure 1. Recovery Vehicle, Full-Track Medium, M88A1—Left-Front View.

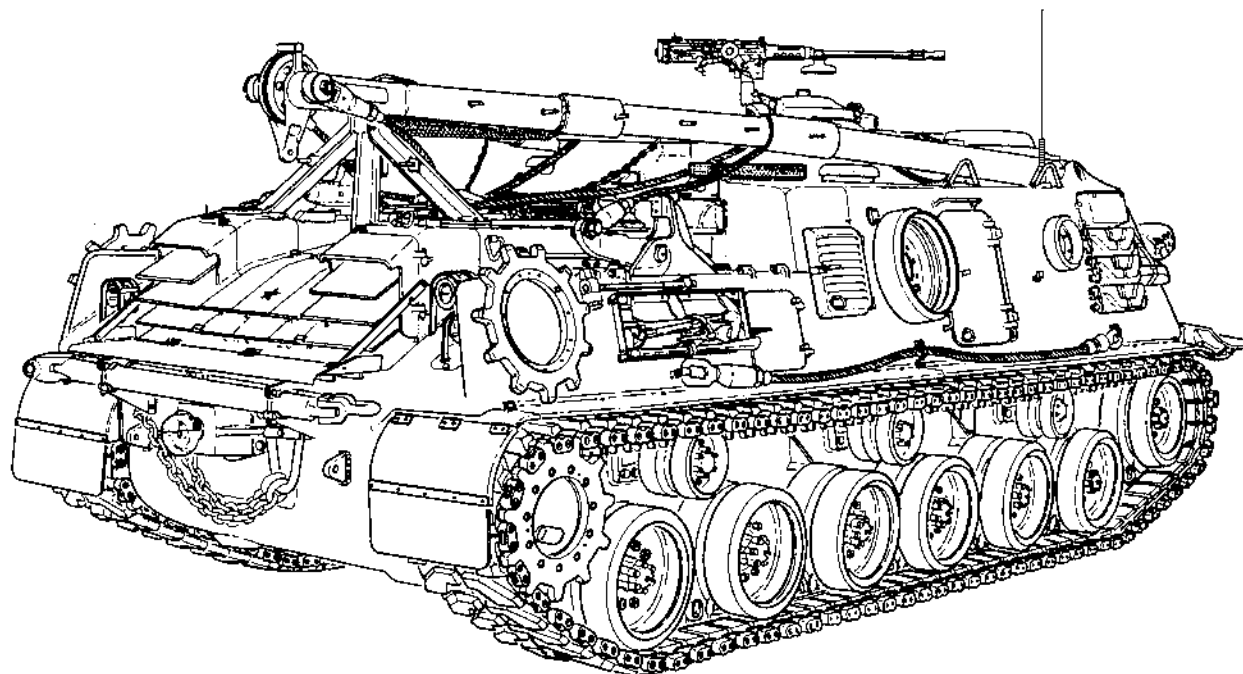


Figure 2. Recovery Vehicle, Full-Tracked: Medium, M88A1—Right-Rear View.

## **MAINTENANCE FORMS, RECORDS, AND REPORTS**

Department of the Army forms and procedures used for equipment maintenance will be those prescribed by (as applicable) DA PAM 738-750, Functional Users Manual for the Army Maintenance Management System (TAMMS); DA PAM 738-751, Functional Users Manual for the Army Maintenance Management System—Aviation (TAMMS-A); or AR 700-138, Army Logistics Readiness and Sustainability.

## **REPORTING EQUIPMENT IMPROVEMENT RECOMMENDATIONS (EIR)**

If your M88A1 needs improvement, let us know. Send us an EIR. You, the user, are the only one who can tell us what you don't like about your equipment. Let us know why you don't like the design or the performance. Put it on an SF 368 (Product Quality Deficiency Report). Mail it to the address specified in DA-PAM 738-750, Functional Users Manual for TAMMS, or as specified by the acquiring activity. We will send you a reply.

## **CORROSION PREVENTION AND CONTROL (CPC)**

CPC of Army materiel is a continuing concern. It is important that any corrosion problems with this item be reported so that the problem can be corrected and improvements can be made to prevent the problem in future items.

While corrosion is typically associated with rusting of metals, it can also include deterioration of other materials, such as rubber and plastic. Unusual cracking, softening, swelling, or breaking of these materials may be a corrosion problem.

If a corrosion problem is identified, it can be reported using SF 368, Product Quality Deficiency Report. Use of key words such as "corrosion," "rust," "deterioration," or "cracking" will ensure that the information is identified as a CPC problem. The form should be submitted to the address specified in DA PAM 738-750, Functional Users Manual for TAMMS.

## **DESTRUCTION OF ARMY MATERIEL TO PREVENT ENEMY USE**

For destruction of Army materiel to prevent enemy use, refer to TM 750-244-6.

## **PREPARATION FOR STORAGE OR SHIPMENT**

Refer to TM 9-2350-256-20 for preparation for storage or shipment.

## LIST OF ABBREVIATIONS / ACRONYMS

Table 1. List of Abbreviations / Acronyms

BII	Basic Issue Items
cm	centimeters
CPC	Corrosion Prevention and Control
dc	direct current
DS	Direct Support
EIR	Equipment Improvement Recommendation
gal	gallons
GS	General Support
in.	inches
kg	kilograms
km/h	kilometers per hour
kPa	kilopascals
lb	pounds
lb-ft	pound-feet
MAC	Maintenance Allocation Chart
mm	millimeters
mph	miles per hour
NATO	North Atlantic Treaty Organization
NSN	National Stock Number
N•m	Newton-meters
P/N	part number
PMCS	Preventive Maintenance Checks and Services
psi	pounds per square inch
RPSTL	Repair Parts and Special Tools List
SC	Supply Catalog
SMR	Source, Maintenance, and Recoverability
TAMMS	The Army Maintenance Management System
TAMMS-A	The Army Maintenance Management System—Aviation
U/M	unit of measure
V	volts
WP	Work Package

END OF WORK PACKAGE





**CHAPTER 1**  
**INTERMEDIATE MAINTENANCE**  
**INTRODUCTORY INFORMATION WITH THEORY OF OPERATION**  
**FOR**  
**RECOVERY VEHICLE, FULL TRACKED: MEDIUM, M88A1**  
**(NSN: 2350-00-122-6826)**



**CHAPTER 1**  
**INTERMEDIATE MAINTENANCE**  
**INTRODUCTORY INFORMATION WITH THEORY OF OPERATION**

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**WORK PACKAGE INDEX**

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Theory of Operation.....	0003 00



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**INTERMEDIATE MAINTENANCE**  
**RECOVERY VEHICLE, FULL TRACKED: MEDIUM, M88A1**  
**NSN 2350-00-122-6826, EIC AQA**  
**DESCRIPTION AND DATA**

---

## **EQUIPMENT CHARACTERISTICS, CAPABILITIES, AND FEATURES**

### **Introduction**

The Recovery Vehicle, Full Tracked: Medium, M88A1 is a medium-armored, full-track-laying, low-silhouette vehicle that performs hoisting, winching, and towing operations for tanks and other vehicles. The vehicle also supports medium and light tank units to effect battlefield recovery. Further detailed descriptions of the individual assemblies and components covered for replacement and/or repair in this manual will be found in pertinent WPs. General operating and maintenance descriptions are found in TM 9-2350-256-10 and TM 9-2350-256-20.

## **LOCATION AND DESCRIPTIONS OF MAJOR COMPONENTS**

### **General**

The general location of major components, assemblies, and auxiliaries is shown on Figure 1.

### **Powerplant**

The powerplant is composed of the Continental Model AVDS-1790-2DR air-cooled, 12-cylinder, diesel engine and the Allison (GM) Model XT-1410-4 cross-drive transmission. The powerplant is removed and installed as a unit. Separation of engine from transmission center section is performed after the powerplant has been removed from the vehicle. The powerplant supplies electrical power through a generator and motive power through the output reduction units.

### **Fuel System**

The fuel system includes liquid fuel (diesel) storage and delivery system. Fuel storage consists of three separate fuel tanks. Fuel is fed to the engine by an electric pump through a system of hoses and valves. Fuel is strained at the tank filler openings as the tanks are filled, and filtered through separate and renewable filter elements as it is fed to the engine. Combustion air is cleaned by two air cleaners and driven into the engine intake manifolds by two turbosuperchargers.

### **Fuel Tanks**

All tanks are of a welded steel construction. The left rear tank contains the filler cap and filter assembly. Fuel level sending units are contained within the right rear and forward tanks. An electric fuel pump is located in the forward fuel tank sump cavity, allowing complete drainage of the tank before tank removal. All tanks are interconnected and shock mounted. Grounding straps are provided to ensure discharge of any static electricity which might accumulate.

### **Fuel Pump**

The electric fuel pump located in the forward fuel tank sump cavity is a centrifugal pusher-type pump designed for submerged operation. It is hermetically sealed and contains a 24-volt dc motor to operate the pump. A strainer is provided as an integral part of the pump assembly for efficient fuel filtering. The fuel pump is shock mounted in a support assembly which suspends the pump in the fuel tank and also provides a housing for fuel and electrical connections.

### **Purge Pump**

The purge pump handle is located on the floor to the left of the driver's position. The purge pump is used to pump air from the fuel lines and to facilitate engine starting in cold weather.

### **Main Engine Generator System**

During periods of main engine operation, the vehicle electrical system derives its power from a 300-ampere, 28-volt dc generator and is driven by the main engine. This generator also serves to charge the vehicle batteries during periods of main engine operation. The vehicle battery system, consists of six 12-volt, 100-ampere-hour batteries connected in a series-parallel to supply 24-volts dc to the electrical system when the generator is not running. A solid state voltage regulator serves to maintain a constant generator output voltage of  $28 \pm 0.7$  volts dc when the generator is powering the electrical system and charging

### **Main Engine Generator System--Continued**

the vehicle batteries. Control of the electrical system is maintained by the driver through a series of instruments and switches mounted on control panels in the driver's area. A system of electrical harnesses interconnects the various components of the vehicle electrical system. Waterproof connections are provided for harnesses and components.

### **Auxiliary Generating System**

The auxiliary generating system consists of a dc voltage generator driven by a diesel engine. A solid-state voltage regulator serves to maintain a constant generator output voltage of  $28 \pm 0.7$  volts dc when the generator is powering the system and charging the batteries. This voltage regulator has an internal current limiting circuit which the APU generator interpole (APU regulator plug pin E) voltage to  $0.48 \pm 0.03$  volt dc. This corresponds to a nominally regulated generator output of 160 amps dc, with a maximum generator output of 180 amps dc.

### **New Dual Voltage Regulator System**

The main and auxiliary engine can be operated together or individually as desired to recharge the vehicle batteries. With the new dual voltage regulator system, during the periods of cold weather starting, the auxiliary engine can now be started and left running to aid the vehicle battery charge condition, while attempting to start the main engine.

### **Harnesses**

The cables and wires carrying the electrical circuits, serving the various components of the electrical system, are assembled into harnesses. These carry the interconnecting splices in protective covering and incorporate various types of terminals. These terminals make positive and secure electrical connections at the various points served by the harness and provide for easy connection and disconnection without splicing or soldering.

### **Transmission and Output Reduction Units**

The Allison Model XT-1410-4 cross-drive transmission is a combined transmission and steering unit. It consists of a basic transmission unit package to which has been added the torque-converter package (front), steering-clutch packages (both sides) and the output-reduction-gear packages (both sides). The output-reduction-gear packages contain the brakes, and together with the sprocket hubs, make up the output reduction units. The outer flange of each output-reduction-gear output shaft assembly carries 10 studs for attaching the sprocket hub. The transmission provides a fluid torque converter connection between engine and final drive and three selective gear ratios forward and one ration in reverse. Repair information is contained in TM 9-2520-215-34.

### **Tracks and Suspension**

The track laying system includes 12 dual road wheels (six on each side) that ride on the two 84-link tracks. Two double sprocket hubs power the tracks. Two compensating idler dual wheels and six track support dual rollers (three on each side) make up the balance of the track laying portion of the track and suspension system. The road wheels are mounted on suspension arms which bear the weight of the vehicle. Torsion bars, anchored to the hull at one end and to each suspension arm at the other, provide spring action for the suspension arms. An adjustable link, between each compensating idler wheel arm and front road wheel arm, provides for adjustment of track tension. Shock absorbers at the first, second and sixth road wheels limit the rate of suspension arm movement at those points. Double volute bumper springs at the first and sixth road wheel arms provide cushioning during maximum road wheel arm travel. Refer to TM 9-2350-256-10 and TM 9-2350-256-20 for replacement and repair instructions.

### **Hull and Cab**

The hull and cab are constructed of cast armor and armor plate welded into a single unit. Armor is distributed to protect the crew and equipment against small-arms fire, medium artillery shell fragments and 20-pound anti-tank mines. Hull bottom armor is equivalent to that of current medium tanks. The hull is equipped with an armored, turret-type cupola that provides a mount for the caliber .50 machinegun. Additional armament stowed in the cab consists of two M16 or M14 rifles, two submachineguns and 10 LAW rockets. Four form-fitting, padded, adjustable seats are provided for the four-person crew. Two removable pedestal stools accommodate two passengers. The two-shot fixed fire extinguisher system may be operated from inside or outside the vehicle. Two portable fire extinguishers are mounted in the crew compartment. Stowage racks for tools and other equipment are located at various points inside the cab. Stowage facilities for track sections, cables, tow bars and various recovery tools and equipment are provided on the outside of the hull and cab. A crew access door is located on each side of the cab. Two escape hatches in the front roof area are provided for the driver and mechanic. One escape hatch at the rear roof area of the cab is

## Hull and Cab—Continued

provided for the rigger. The commander's escape hatch is located in the cupola. Six M17 periscopes provide forward and partial side vision for the driver and mechanic during daylight or night driving. One M17 periscope provides indirect rearward vision for the rigger. Four direct vision blocks, two at front and two at rear of cab, provide vision for driver, mechanic and rigger. Six direct vision blocks in the cupola base afford 360-degree vision for the commander. An AN/WS-2(V)1A passive night viewer may be installed in the driver's hatch when blackout operations are required.

## Miscellaneous Accessories

Items of equipment installed by the manufacturer, depot, or crew are provided in the Components of End Items (COEI) list that can be found in Appendix B of TM 9-2350-256-10.

## EQUIPMENT DATA

### GENERAL

**Table 1. General**

Armament	One caliber .50 Browning machinegun, M2, heavy barrel, flex; one machinegun mount A55ec38 or A88; two caliber 7.62 mm, M14, or 5.56 mm, M16; two caliber .45 submachineguns, M3A1 with equipment; 10 LAW rockets	
Crew	4	
Engine	Diesel, V12, 4-cycle, air cooled model AVDS-1790-2DR	
Transmission	Combination transmission, differential, steer and brake system; model XT-1410-4; gears—3 forward and 1 reverse	
Weight	Gross (vehicle fully loaded with crew, passengers and payload)	112,000 lb (50,803 kg)
	Net (vehicle, no crew or payload)	105,000 lb (47,628 kg)
	Cargo (crew and maximum payload)	7000 lb (3175 kg)

**Table 2. Vehicle**

Dimensions:	
Length	315.5 in. (801 cm)
Width	135 in. (343 cm)
Height	123 in. (312 cm)
Ground clearance	17 in. (43 cm)
Ground pressure	10.9 psi (75 kPa)
Electrical system:	
Battery power	24 V
Generator power	28 ± 0.7 V dc
Batteries	six 12 V
Capacities (refill approximate)	
Fuel tanks	400 gal (1514 L)
Forward tank	252 gal (954 L)
Right rear tank	74 gal (280 L)
Left rear tank	74 gal (280 L)
Main engine crankcase (refill)	16.5 gal (62.5 L)
Transmission	17 gal (64.4 L)

**Table 2. Vehicle—Continued**

Main winch	11 gal (41.6 L)
Hoist winch	3 gal (11.4 L)
Auxiliary Power Unit (APU)	3.5 qt (3.3 L)
Hydraulic system	95 gal (360 L)
Mechanical transmission	1 gal (3.8 L)
Tracks and suspension	
Shoes on each track section	84
Track support rollers (pairs)	6
Roadwheel and arm assemblies (pairs)	12
Suspension	torsion-bar type

**Table 3. Performance**

Vehicle speed (max.)	26 mph (42 km/h)
Fuel consumption	0.7 mpg (0.3 km/L)
Cruising range	300 miles (482 km)
Allowable oil consumption	
Main engine	0.2 gal (0.7 L) per hour
Fording depth (max. without kit)	56 in. (142 cm)
Fording depth (max. with kit)	102 in. (259 cm)
Grade ascending ability (max.)	60 percent
Grade descending ability (max.)	60 percent
Vertical obstacle vehicle will climb (forward direction only)	42 in. (107 cm)
Maximum trench crossing width	103 in. (262 cm)
Turning circle (right or left)	pivot
Boom capacity	50,000 lb (22,680 kg)
Vehicle hoisting capacity	
Spade	12,000 lb (5443 kg)
Spade up (with lockout blocks—4 part line)	40,000 lb (18,144 kg)
Spade down—4 part line	50,000 lb (22,680 kg)
Boom lift height	
8 ft. reach	19 ft (579 cm)
4 ft. reach	25 ft (762 cm)
Hoist winch	
Cable size	0.625 in. dia, 200 ft long (16 mm dia, 61 m long)
Line pull and speed—4 part line	



**Table 3. Performance—Continued**

Bare drum	50,000 lb at 20 fpm (22,680 kg at 6.1 m per minute)
Full drum	30,000 lb at 42 fpm (13,608 kg at 12.8 m per minute)
Main winch	
Cable size	1.25 in. dia, 200 ft long (32 mm dia, 61 m long)
Line pull and speed	
Bare drum	90,000 lb at 20 fpm (40,824 kg at 6.1 m per minute)
Full drum	51,400 lb at 42 fpm (23,315 kg at 12.8 m per minute)
Drawbar pull	90,000 lb (40,824 kg)
Hydraulic wrench	TM 9-5130-338-12&P

**Table 4. Periscope, M17 (7 Included)**

Magnification	1X
Periscope offset	short
Field of view	50 degrees vertical, 150 degrees horizontal

**Table 5. Passive Night Viewer, AN/VVS-2(V)1A (1 Included)**

Field of view	
Width	800 mils (45°)
Height	680 mils (38°)
Depth of field	15 ft (457 cm) to infinity
Focus	fixed

**Table 6. Auxiliary Equipment**

Fire Extinguisher:	
Portable (2 included):	
Type	carbon dioxide
Capacity:	
Volume	218 cu. in. (3572 cc)
Weight	5 lb (2.3 kg)
Weight (fully charged)	15.5 lb (7 kg)
Portable (2 included):	

Table 6. Auxiliary Equipment—Continued

Type	carbon dioxide
Capacity:	
Volume	505 cu. in. (8275 cc)
Weight	10 lb (4.5 kg)
Weight (fully charged)	45 lb (20.4 kg)
Communication equipment:	
Radio set and interphone, consisting of of AN/VRC-44, AN/VRC-46, or AN/VRC-64 with suppressor MX-7778A and interphone AN/VRC-1(V) (4 controls)	
APU:	
Part number	11671436
System battery voltage	24 V dc
System operating voltage	28 ± 0.7 V dc with fully charged batteries (i.e., charging current less than 50 amps)
Cooling air at 200 rpm (in vehicle)	416 cu. ft/min (6817 cc/min)
Height	35 in. (89 cm)
Width	18.75 in. (48 cm)
Length	29.75 in. (76 cm)
Weight	516.5 lb (234.3 kg)
Auxiliary engine:	
Manufacturer	ONAN
Model	DJBMA
Part number	11671394
Type	2 cylinder, 4 cycle, diesel
Cooling system	air cooled by direct-drive centrifugal blower
Bore	3.250 in. (8.2550 cm) dia
Stroke	3.625 in. (9.2075 cm)
Compression ratio	19:1
Horsepower (500 ft [152.4 m] elevation at 115°F [46°C])	10.8 at 2000 rpm
Fuel, diesel	VV-F-800
Oil capacity, including filter	3.5 qt. (3.3 L)
Dry weight (approximate)	310 lb (140.6 kg)
Auxiliary generator:	
Manufacturer	Teledyne Continental Motors
Part number	MS51004-1

**Table 6. Auxiliary Equipment—Continued**

Type	28 V dc, 300 amp, engine accessory
Rated speed	2500/6500 rpm
Overspeed	8000 rpm
Cooling system	direct-driven blower
Weight	94 lb (42.6 kg)
Auxiliary hydraulic pump:	
Manufacturer	Warner-Motive Div. of Borg Warner Corp.
Model	P2-5AH2-1-L
Part number	11671411
Type	fixed displacement (0.58 cu. in. [9.5 cc]/rev)
Rated pressure	2000 psi
Inlet oil pressure	145°F/155°F (63°C/68°C)
Inlet pressure	5 in. Hg (16.84 kPa) vacuum
Delivery at 2000 engine rpm (3000 pump rpm), minimum	6.9 gal (26.1 L) per minute
Weight	4.3 lb (2 kg)

**Table 7. Main Winch and Spade Assembly**

Spade assembly:	
Part number	10862159
Spade actuating cylinders:	
Part number	10867173
Main winch hydraulic motor:	
Part number	11672155
Main winch:	
Part number	8739010
Manufacturer	Pacific Car and Foundry Company
Model	U-90B
Cable size	1.25 in. (32 mm) dia IWRC
Cable length	200 ft (60 m)
Line pull, bare drum	90,000 lb (40,824 kg)

**Table 8. Hoist Winch Assembly**

Hoist winch hydraulic motor:	
Part number	11672155
Hoist winch counterbalance valve:	
Part number	10923500
Hoist winch:	
Part number	8739009
Manufacturer	Pacific Car and Foundry Company
Model	U-35B
Cable size	0.625 in. (16 mm) dia IWRC
Cable length	200 ft (61 m)
Line pull, bare drum (4-part line)	50,000 lb (22,680 kg)

**Table 9. Mechanical Transmission and Main Hydraulic Pump Assembly**

Mechanical transmission:	
Part number	11672155
Type	Single-reduction, herringbone, reducer
Ratio	1.265 to 1
Rating	150 hp (112 kW) @ 1800 rpm input and 1422 rpm output
Main hydraulic pump:	
Part number	7748579
Type	vane fixed-displacement
Output (each section):	
at 1350–1450 rpm and 0 psi (0 kPa)	52 gal (197 L) per minute, maximum
at 1350–1450 rpm and 2000 psi (13,790 kPa)	42 gal (159 L) per minute, minimum
Relief and unloading valve:	
Part number	10867008
Pressure range	0–2000 psi (0–13,790 kPa)

**Table 10. Hoisting Boom Assembly**

Hoisting boom:	
Part number	8676250
Capacity	50,000 lb (22,680 kg)
Maximum lift height (centerline of hook, vehicle level):	
8-foot (244-cm) reach	19 ft (579 cm)

**Table 10. Hoisting Boom Assembly—Continued**

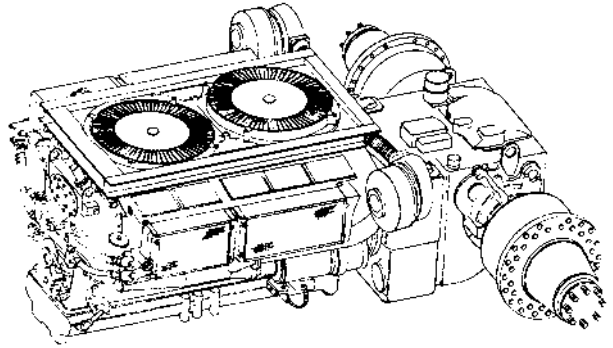
4-foot (122-cm) reach	22 ft (670 cm)
Cylinder (boom and stayline):	
Part number	8743887
Type	single-end rod, double-acting

**Table 11. Control Valves (Hydraulic Subplate Assembly)**

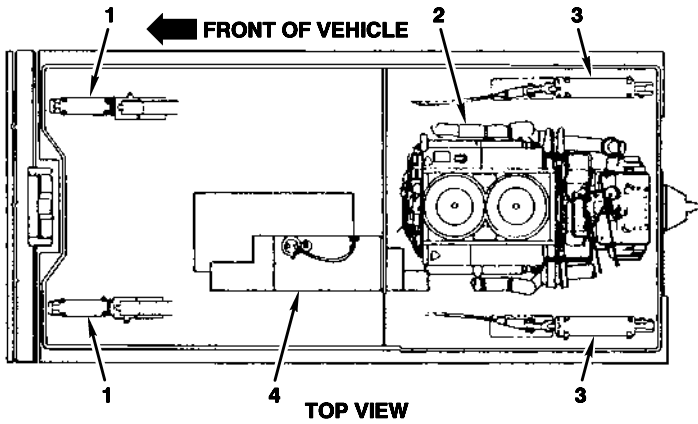
Main winch; hoist winch control valve	
Part number	10866877
Power control valve	
Part number	10866876
System selector control valve	
Part number	10866875
Boom combination control valve	
Part number	8379908-1
APU emergency winch control valve	
Part number	11640359



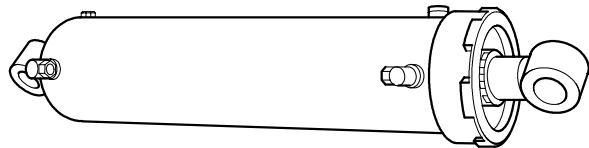
**1. BOOM ACTUATING CYLINDERS.**



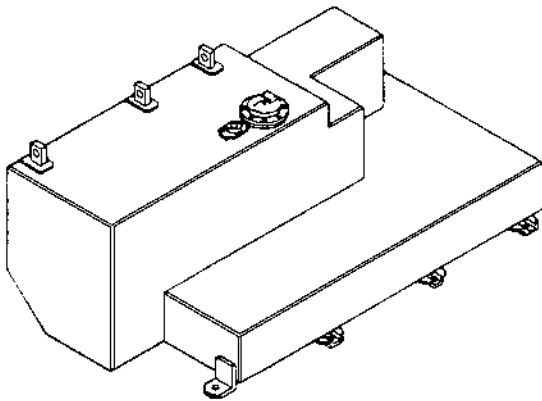
**2. POWERPLANT.**



**TOP VIEW**



**3. BOOM STAYLINE ACTUATING CYLINDERS.**



**4. FORWARD FUEL TANK.**

Figure 1. Location of Major Components, Assemblies, and Auxiliaries (Sheet 1 of 8).

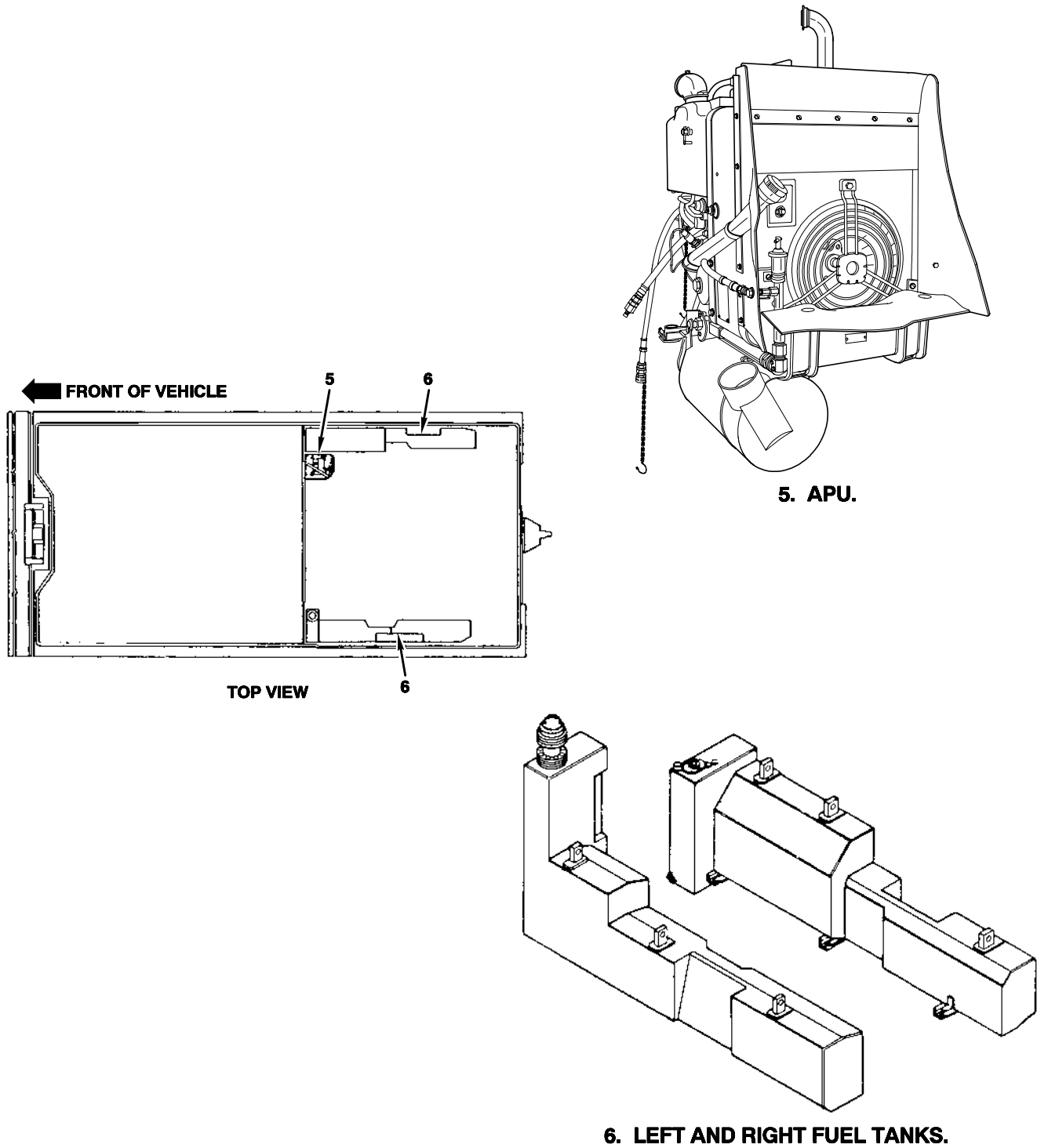
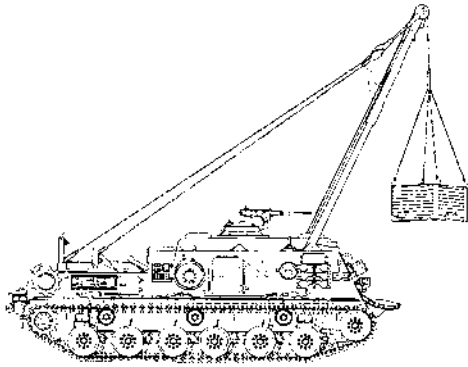
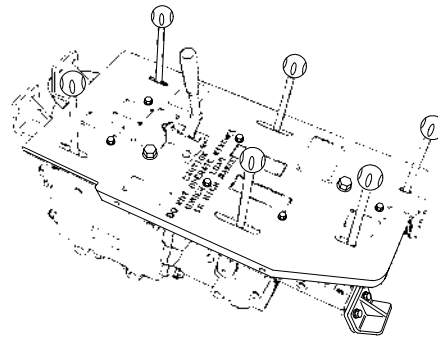


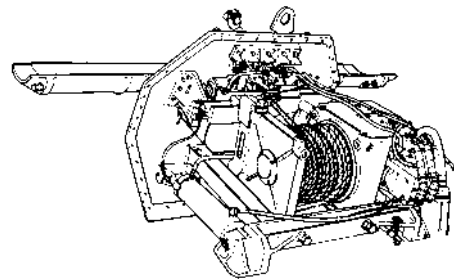
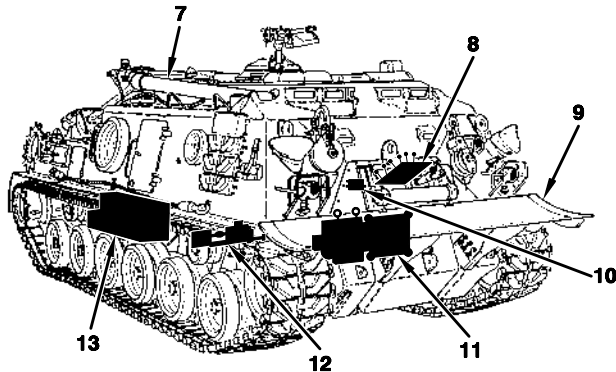
Figure 1. Location of Major Components, Assemblies, and Auxiliaries (Sheet 2 of 8).



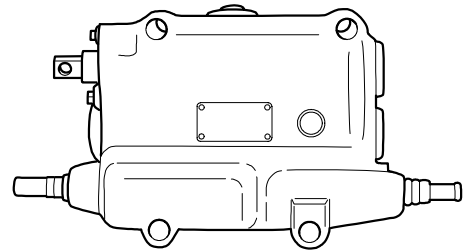
**7. HOISTING BOOM ASSEMBLY.**



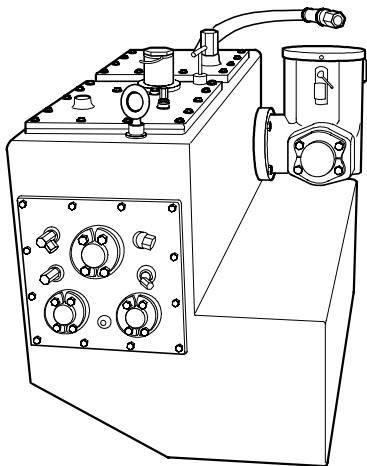
**8. HYDRAULIC SUBPLATE ASSEMBLY.**



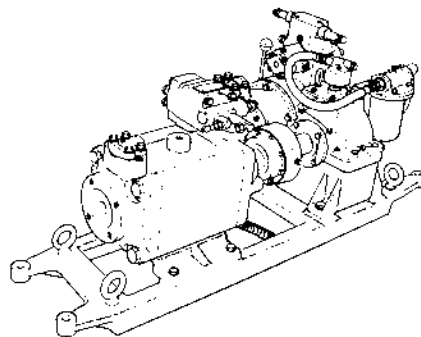
**9. MAIN WINCH AND SPADE ASSEMBLY.**



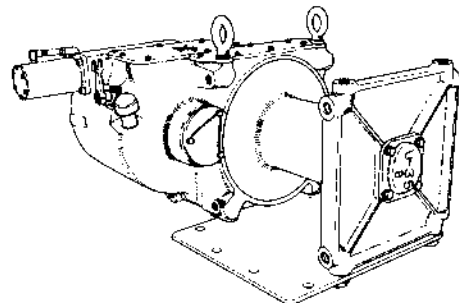
**10. SPADE COMBINATION CONTROL VALVE.**



**13. HYDRAULIC OIL TANK.**



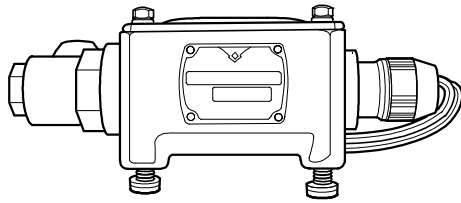
**12. MECHANICAL TRANSMISSION AND MAIN HYDRAULIC PUMP ASSEMBLY.**



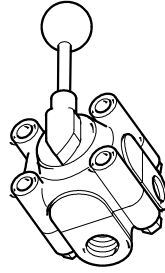
**11. HOIST WINCH ASSEMBLY.**

Figure 1. Location of Major Components, Assemblies, and Auxiliaries (Sheet 3 of 8).

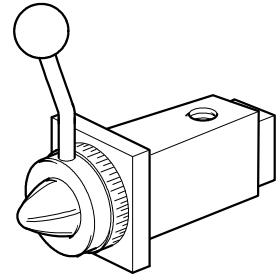




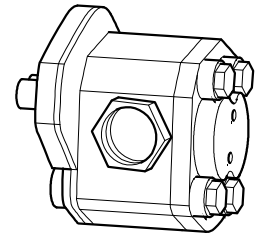
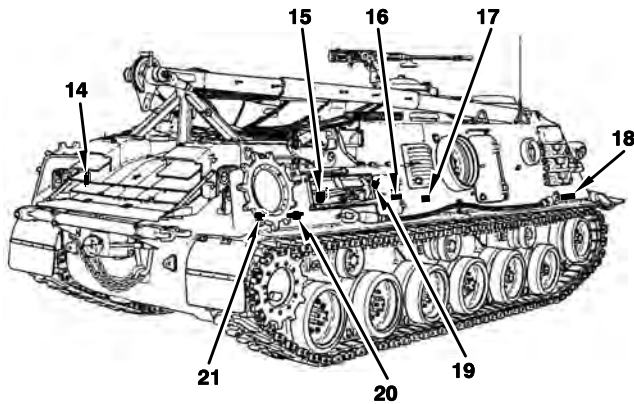
**14. PRESSURE SWITCH ASSEMBLY.**



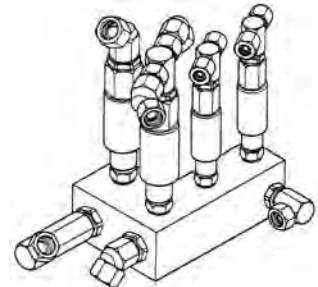
**15. FOUR-WAY SELECTOR VALVE.**



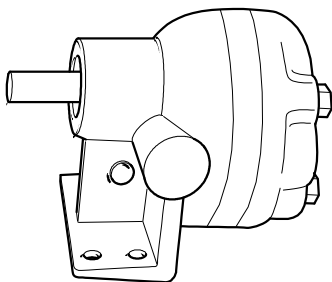
**16. ADJUSTABLE FLOW REGULATOR.**



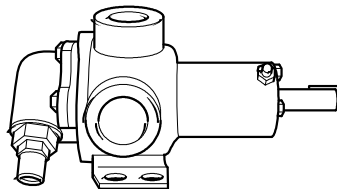
**17. AUXILIARY HYDRAULIC PUMP.**



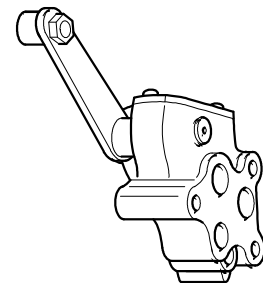
**18. FLOW REGULATOR.**



**21. REFUEL MOTOR.**

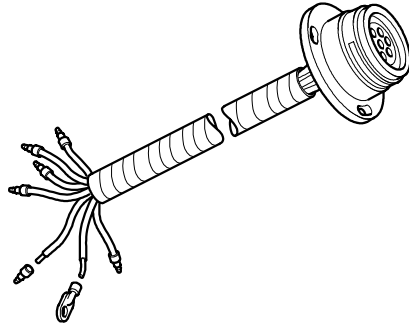


**20. REFUEL PUMP.**

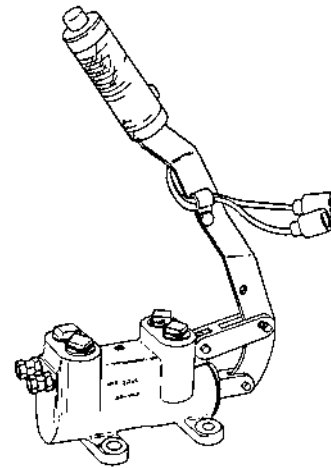
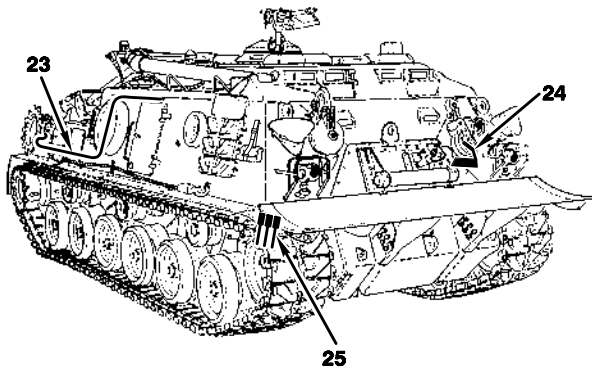


**19. BOOM LIMIT VALVE.**

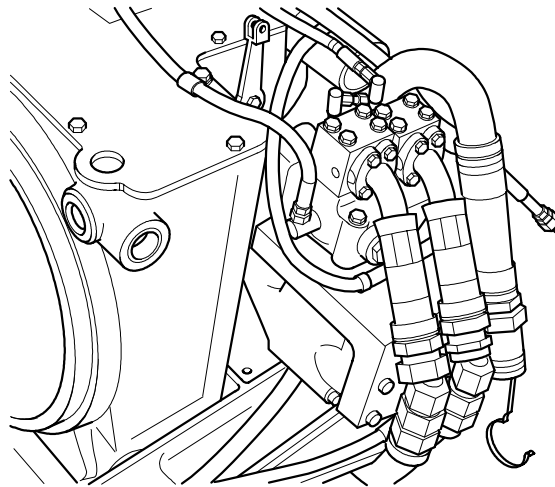
Figure 1. Location of Major Components, Assemblies, and Auxiliaries (Sheet 4 of 8).



**23. HULL WIRING HARNESS.**

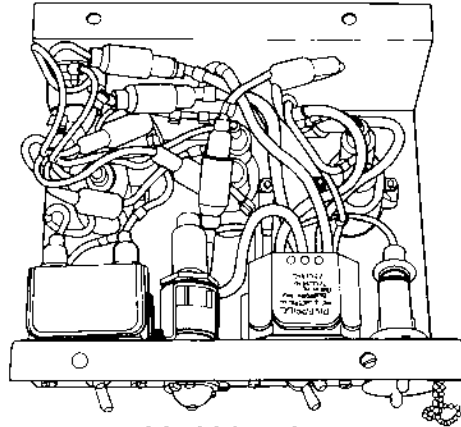


**24. PRIMER PUMP.**

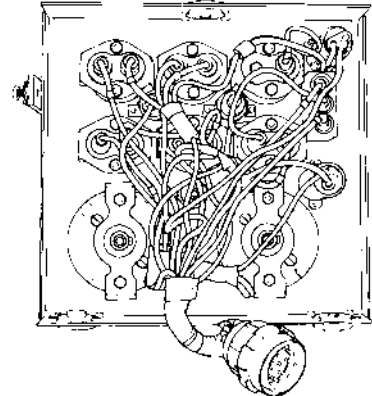


**25. HYDRAULIC LINES.**

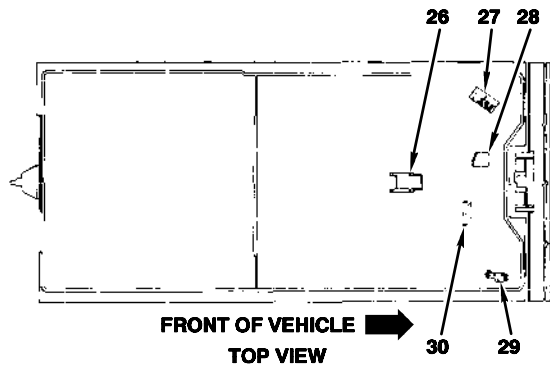
Figure 1. Location of Major Components, Assemblies, and Auxiliaries (Sheet 5 of 8).



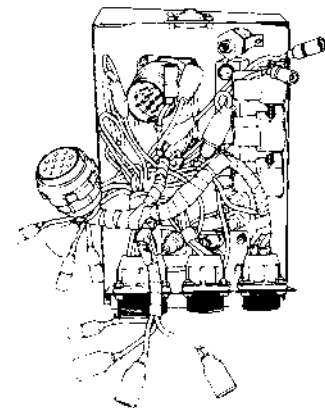
**26. ACCESSORIES PANEL WIRING HARNESS.**



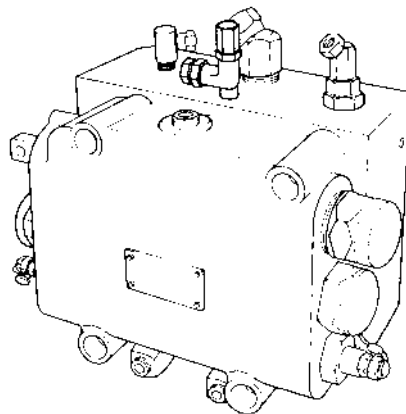
**27. GAGE PANEL WIRING HARNESS.**



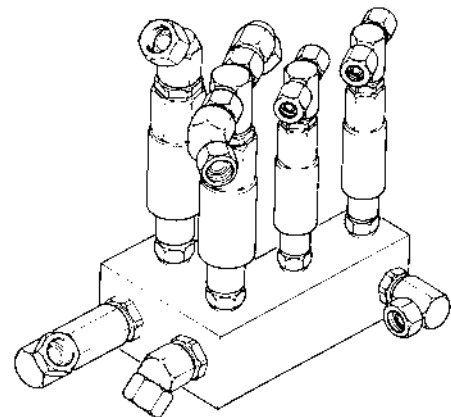
FRONT OF VEHICLE →  
TOP VIEW



**28. MAIN SWITCH PANEL WIRING HARNESS.**

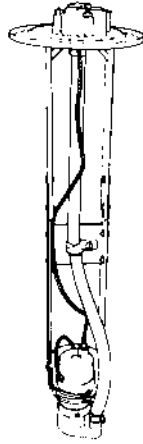


**30. HYDRAULIC CONTROL VALVE (SPADE).**

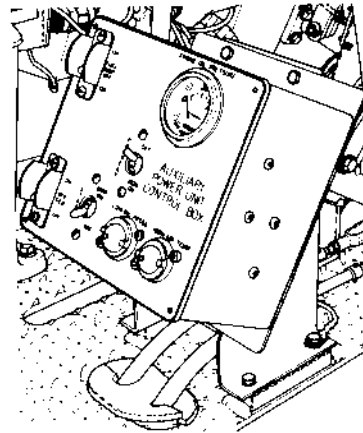


**29. FLOW REGULATING SUBPLATE ASSEMBLY.**

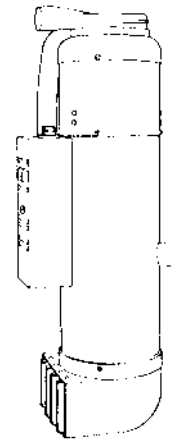
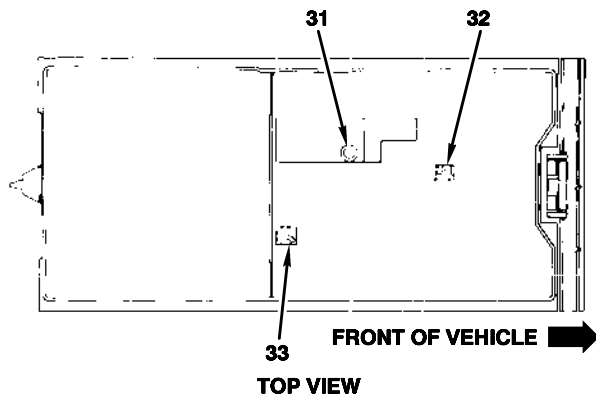
Figure 1. Location of Major Components, Assemblies, and Auxiliaries (Sheet 6 of 8).



**31. FUEL PUMP.**

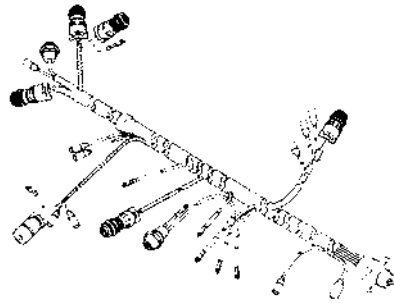


**32. AUXILIARY POWER UNIT CONTROL BOX.**

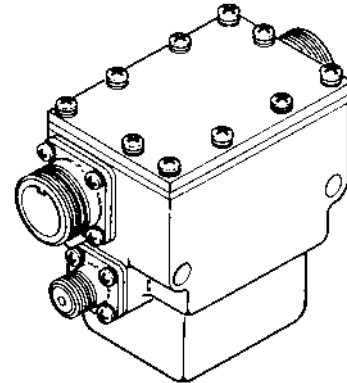


**33. PERSONNEL HEATER.**

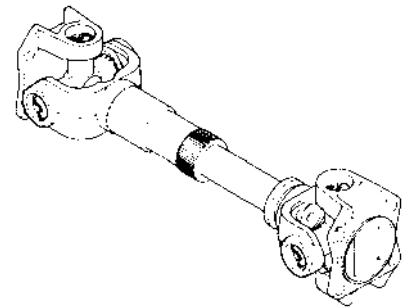
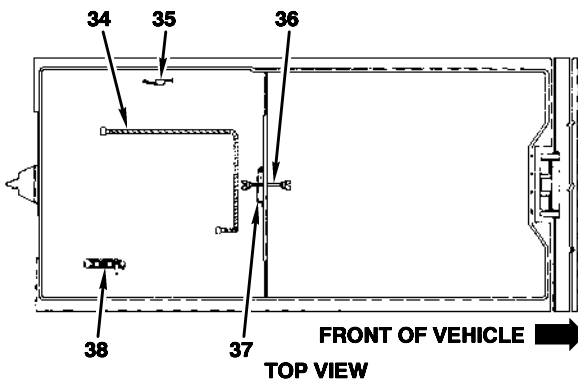
Figure 1. Location of Major Components, Assemblies, and Auxiliaries (Sheet 7 of 8).



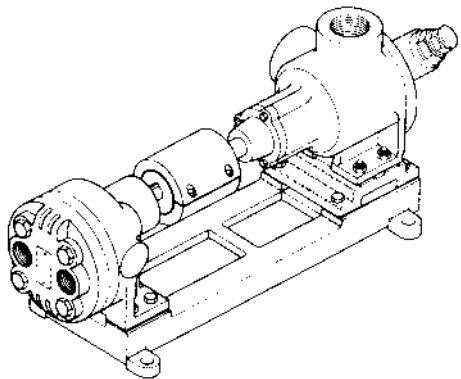
**34. POWERPLANT WIRING HARNESS.**



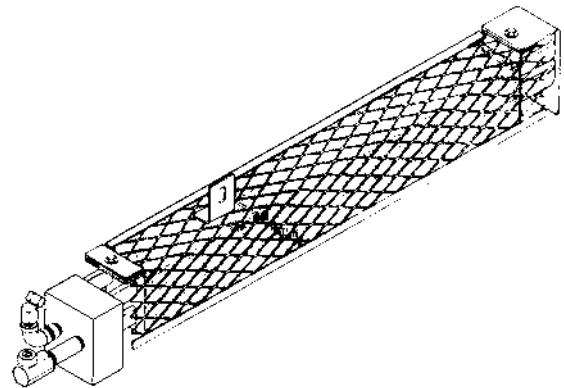
**35. MASTER RELAY.**



**36. MECHANICAL TRANSMISSION POWER TAKEOFF SHAFT.**



**38. FUEL TRANSFER PUMP AND AUXILIARY HYDRAULIC MOTOR.**



**37. MECHANICAL TRANSMISSION OIL COOLER.**

Figure 1. Location of Major Components, Assemblies, and Auxiliaries (Sheet 8 of 8).

**END OF WORK PACKAGE**



**INTERMEDIATE MAINTENANCE**  
**RECOVERY VEHICLE, FULL TRACKED: MEDIUM, M88A1**  
**NSN 2350-00-122-6826, EIC AQA**  
**THEORY OF OPERATION**

### MAIN WINCH AND SPADE ASSEMBLY

The main winch and spade assembly (Figures 1 and 2) is installed on the nosepiece of the vehicle with the winch located in the hull beneath the crew compartment, and the spade externally mounted on the front of the vehicle. The major components of the assembly are a spade; two spade-actuating cylinders; a winch cable; a cable level winder valve; a hydraulic motor; a brake cylinder; a main winch combination control valve; and the main winch, which is equipped with an internal brake.

#### Main Winch

The main winch (Figure 1) is installed in the forward part of the vehicle hull beneath the crew compartment. It is used for heavy-duty winching operations, and has a capacity of 90,000 pounds using a single line.

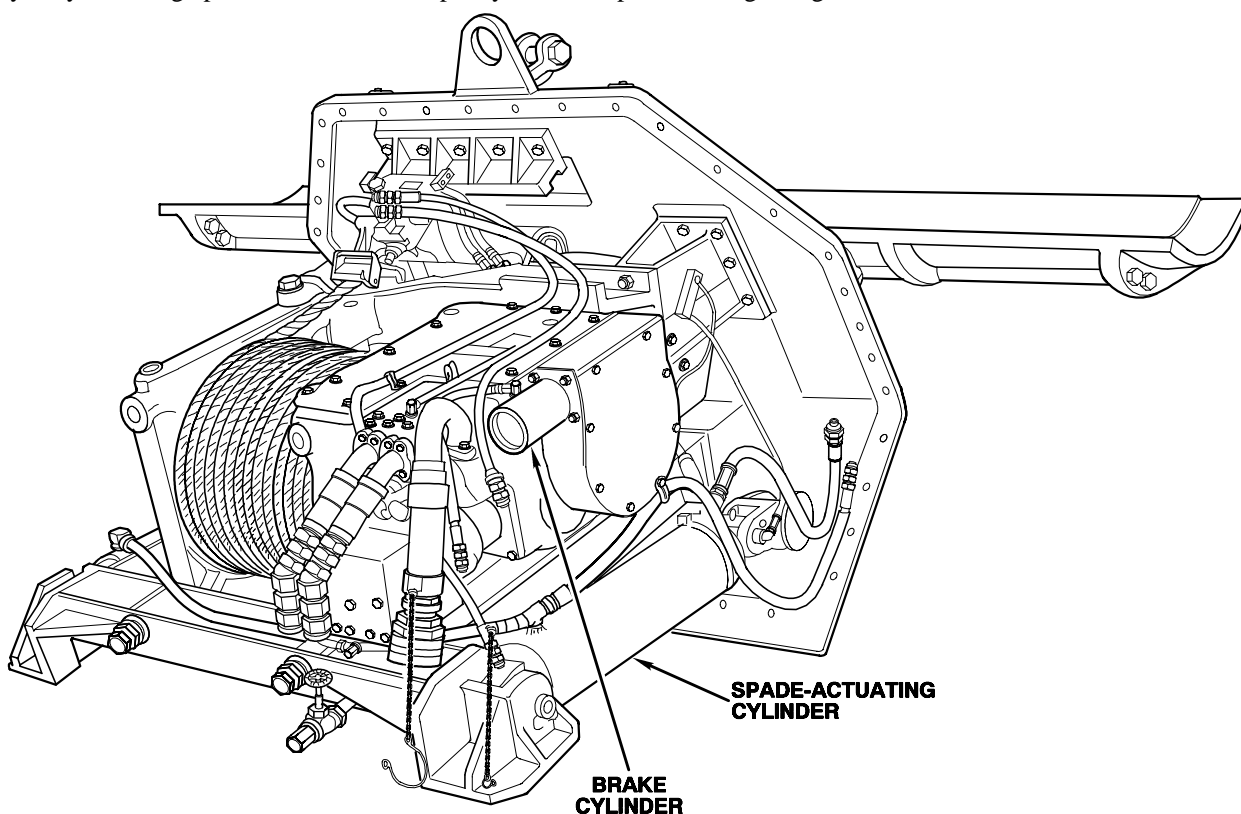


Figure 1. Main Winch and Spade Assembly—Right-Rear View.

#### Spade

The spade (Figure 2) is hydraulically controlled and is externally mounted on the front of the vehicle. It is primarily used to stabilize the vehicle when loads above 12,000 pounds are winched or hoisted. The spade is actuated by two, single-end rods, double-acting hydraulic cylinders. These cylinders retract to raise the spade, and extend to lower it. When the spade control valve is placed in the RAISE position, hydraulic pressure is introduced in front of the cylinder pistons and bled off behind them. The piston rods then retract and actuate the crank arms to raise the spade. When the spade control valve is placed in the LOWER position, hydraulic pressure is introduced behind the pistons and bled off in front of them. The piston rods then extend and actuate the crank arms to lower the spade. Placing the spade control valve in the HOLD position traps all hydraulic fluid in the lines, thus preventing the spade from moving either up or down.

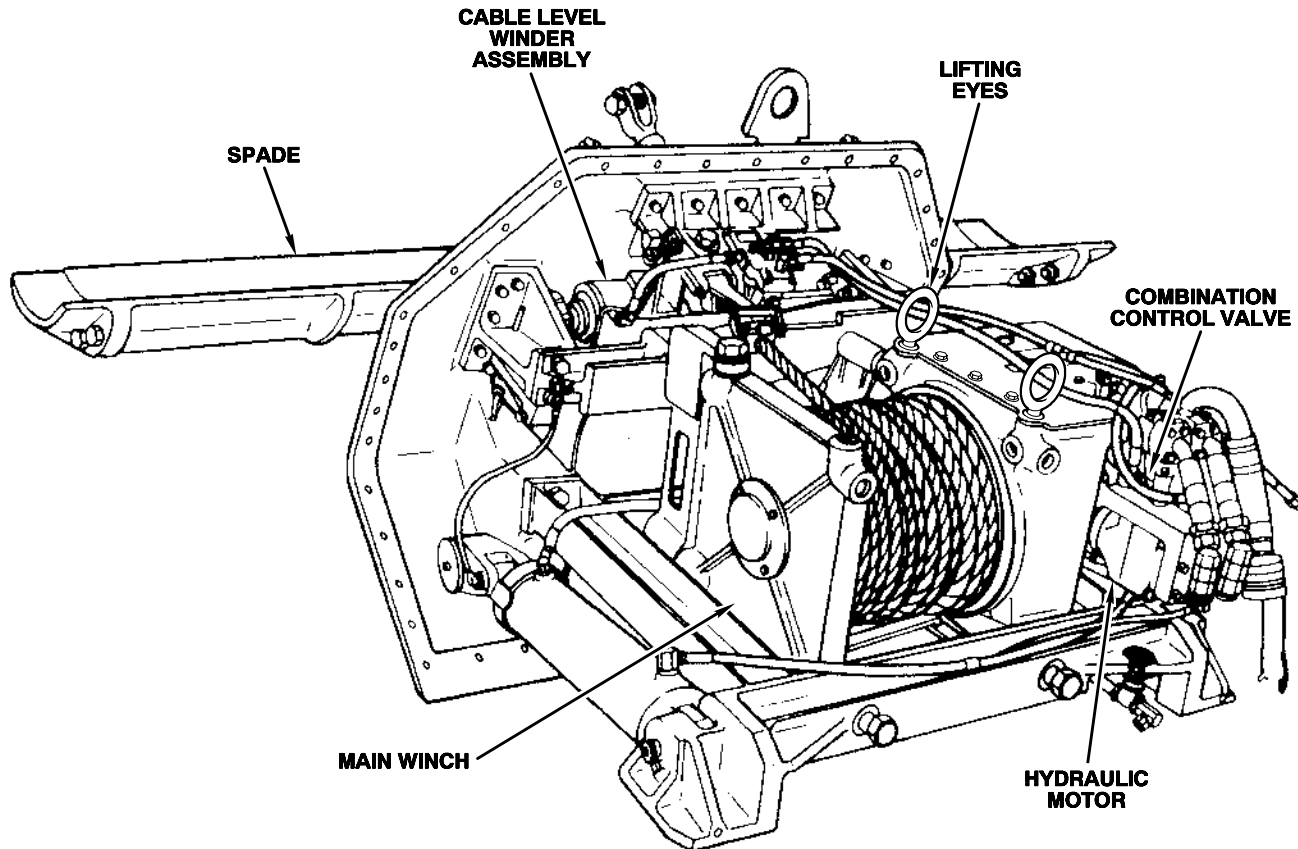


Figure 2. Main Winch and Spade Assembly—Left-Rear View.

### Spade-Actuating Cylinders

The spade is hydraulically actuated by means of two single-end rod, double-acting spade cylinders (Figure 1). These cylinders are located in the hull of the vehicle beneath the crew compartment; one on each side of the main winch.

### Main Winch Combination Control Valve

The main winch combination control valve (Figure 2) is mounted on top of the hydraulic motor manifold. It is a three-position, center open valve, and serves to direct hydraulic flow through the manifold to the hydraulic motor, thus determining the direction of the motor rotation.

### Cable Level Winder Assembly

The cable level winder assembly (Figure 2) is mounted on the inside of the vehicle hull, directly beneath the main winch cable guide plate. The assembly is synchronized with main winch operation and ensures even winding and unwinding of the main winch cable. The cable level winder assembly consists of a traversing cylinder; a stationary, double-end piston rod; a cable level winder valve, and mechanical linkage. As the cable is reeled in, it exerts a force on either the right or the left side of a guide through which it passes. This force is transmitted to a lever which positions the cable level winder valve. The valve then directs hydraulic pressure to either the right or left side of the traversing cylinder, causing it to move and wind the cable evenly.



## Main Winch Hydraulic Motor

The hydraulic motor (Figure 2) is mounted at the rear of the main winch on the underside of the manifold. It is a vane-type, reversible motor which serves to convert hydraulic energy into rotary motion and torque. This torque is then transmitted to the main winch. The hydraulic motor is a reversible, vane-type motor equipped with two identical inlet-outlet ports. Hydraulic pressure induced at either of these inlet/outlet ports is forced through the vanes of the rotor, thus turning the rotor and the shaft which is splined to it. The direction in which the motor rotates (i.e., clockwise or counterclockwise) depends on which inlet/outlet port the hydraulic pressure was introduced, and is controlled by means of the main winch combination control valve mounted on top of the motor manifold.

## Winch Gear Train Operation

When the main winch control valve is in the INHAUL position, the hydraulic motor rotates in the clockwise direction (Figure 3) and drives the winch bevel gear and pinion shaft, causing them to rotate clockwise also. (Gear direction of rotation is determined by viewing the winch from the brake assembly side). The pinion gear is splined to the pinion shaft and thus drives the shaft in the same direction. As the pinion shaft rotates, the geared end of the shaft engages the low speed gear and the pinion gear engages the high speed gear, both of which rotate freely around the brake shaft. Between the high and low speed gears, and splined to the brake shaft is the gear clutch. The external teeth of the gear clutch are meshed with the internal teeth of the gear coupling. This coupling is positioned either left or right in order to couple the gear clutch with either the high or low speed gear, thus causing the brake shaft to rotate in the counterclockwise direction. The splined end of the brake shaft drives the brake drum assembly while the geared end of the shaft meshes with and drives the countershaft gear which is spline-mounted to the countershaft, in the clockwise direction. Also splined to the countershaft is a pinion. The pinion engages the drum gear assembly, thus causing the cable drum to rotate in the counterclockwise or INHAUL direction. Placing the main winch control valve in the PAYOUT position causes the hydraulic motor to rotate in the counterclockwise direction. All gears then rotate in the opposite direction from that described above, and the cable drum rotates in the clockwise or PAYOUT direction.

## Main Winch Brakes

The main winch brake cylinder (Figure 2) is located on the brake housing at the rear of the main winch. Within the cylinder is a piston which is spring loaded to the applied position. The piston exerts force on the brake drum to prevent cable drum movement in the HOLD position. The piston is backed off and the brake released by introducing hydraulic pressure into the brake cylinder. The main winch brake (Figure 3) consists of a circular brake band which makes contact with the brake drum, and a ratchet and pawl assembly which allows the drum to rotate only in the clockwise direction. The brake band is held in its normally applied position by a spring-loaded piston in the brake cylinder. The brake is released by introducing hydraulic fluid into the brake cylinder to overcome the spring force. When the cable is inhauled the brake band is in its normally applied position, and the brake drum, which is not secured to the brake shaft, is held stationary. The two pawls, which are secured directly to the brake shaft, rotate freely in the counterclockwise direction, thus enabling the cable drum to rotate in the counterclockwise or INHAUL direction. When the main winch control valve is placed in the HOLD position, hydraulic motor power is balanced, cable drum rotation ceases, and the brake band remains in its normally applied position. Any weight on the cable is prevented from slipping by the pawls which engage the ratchet teeth on the inside diameter of the drum and prevent cable drum movement. The cable is PAID OUT by introducing hydraulic pressure into the brake cylinder to counteract the piston spring pressure and release the brake band. The entire brake drum assembly is then free to rotate in the clockwise, or PAYOUT direction, even though the pawls within the brake drum remain engaged with the ratchet teeth.

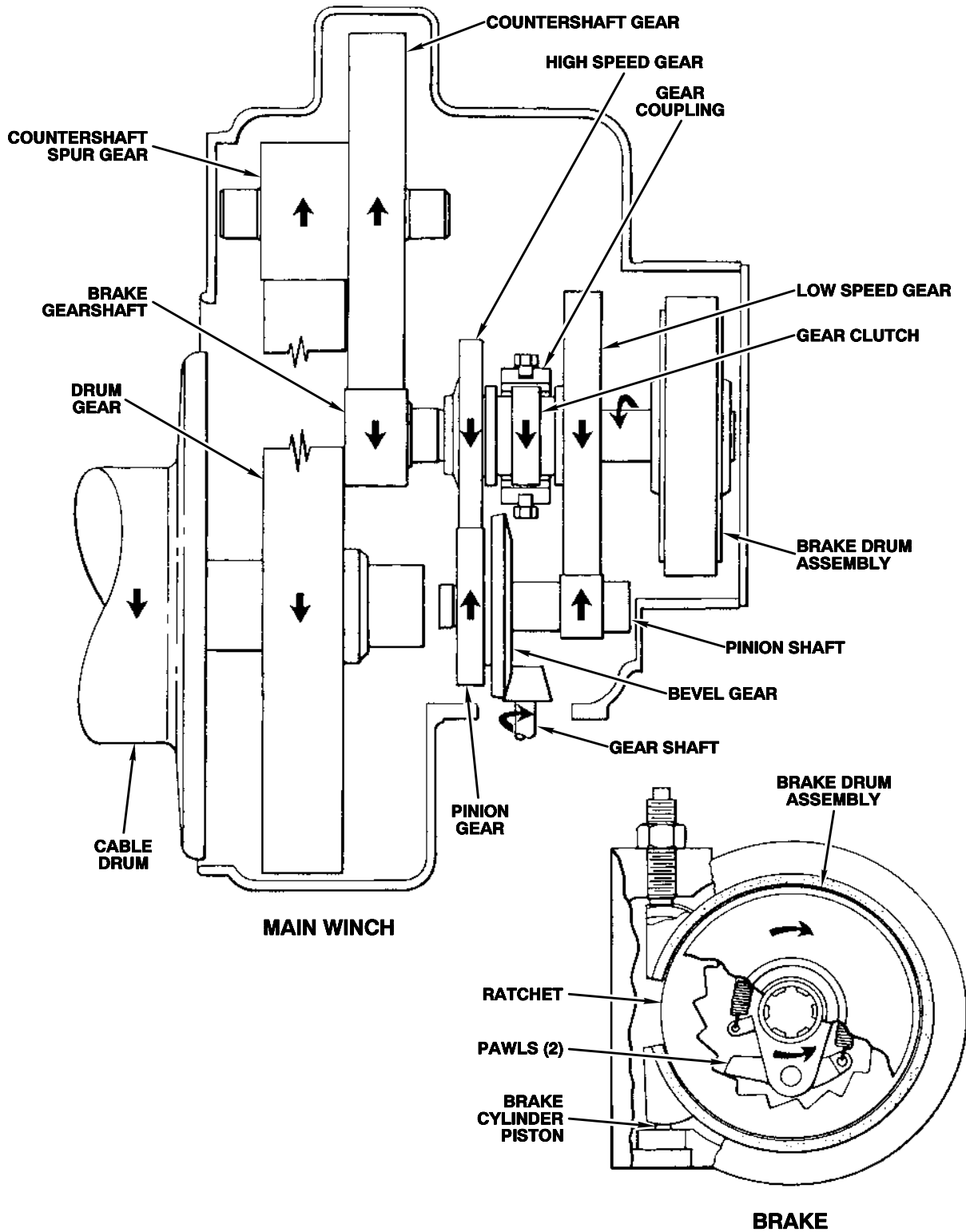


Figure 3. Main Winch Assembly—Cross-Sectional View.

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## HOIST WINCH ASSEMBLY

The hoist winch assembly (Figures 4 and 5) is installed in the hull of the vehicle beneath the crew compartment. It is used for lifting objects and for guiding and hauling the main winch cable. Major components of the assembly are a winch cable, hoist winch combination control valve, counterbalance valve, reversible hydraulic motor, brake cylinder and winch assembly complete with an internal brake.

### Hoist Winch Combination Control Valve

The hoist winch combination control valve (Figure 5) is mounted on the side of the hoist winch counterbalance valve, which is mounted to the hydraulic motor manifold. It is a three-position, balanced-center valve, and serves to direct hydraulic flow through the counterbalance valve and manifold to the hydraulic motor, thus determining the direction of motor rotation.

### Hoist Winch Counterbalance Valve

The hoist winch counterbalance valve (Figure 5) is located between the hoist winch combination control valve and the hydraulic motor manifold. The function of the valve is to prevent a possible overspeed of the hoist winch motor and also prolong the life of the hoist winch brake.

### Hoist Winch Hydraulic Motor

The hydraulic motor (Figure 5) is mounted to the manifold at the rear of the hoist winch. It is a vane-type, reversible motor which serves to convert hydraulic energy into rotary motion and torque. This torque is then transmitted to the hoist winch. Hoist winch hydraulic motor operation is the same as main winch hydraulic motor operation.

### Hoist Winch Gear Train Operation

When the hoist winch control valve is in the RAISE position, the hydraulic motor rotates in the counterclockwise direction (Figure 6) and drives the winch bevel gear and pinion gear, causing them to rotate counterclockwise. (Gear direction of rotation is determined by viewing the hoist winch from the brake assembly side.) The pinion gear is splined to the pinion shaft and thus drives the shaft in the same direction. As the pinion shaft rotates, the geared end of the shaft engages the low speed gear and the pinion gear engages the high speed gear, both of which rotate freely around the brake shaft. Between the high and low speed gears, and splined to the brake shaft, is the gear clutch. The external teeth of the gear clutch are meshed with the internal teeth of the gear coupling. This coupling is positioned either left or right in order to couple the gear clutch with either the high or low speed gear, thus causing the brake shaft to rotate in the clockwise direction. The splined end of the brake shaft drives the brake drum assembly, while the gear end of the shaft meshes with and drives the drum gear in a counterclockwise direction. The drum gear then rotates the cable drum in a counterclockwise direction to raise the winch cable. Placing the hoist winch control valve in the LOWER position causes the hydraulic motor to rotate in a clockwise direction. All gears then rotate in the opposite direction from that described above and the cable drum rotates clockwise to lower the winch cable.

### Hoist Winch Brakes

The hoist winch brake cylinder (Figure 4) is located on the brake housing at the front of the hoist winch. Within the cylinder is a piston which is spring loaded to the applied position. The piston exerts force on the brake drum to prevent drum movement in the HOLD position. The piston is backed off and the brake released by introducing hydraulic pressure into the brake cylinder. The hoist winch brake (Figure 6) consists of a circular brake band which makes contact with the brake drum, and a ratchet and pawl assembly which allows the brake drum to rotate only in the counterclockwise direction. The brake band is held in its normally applied position by a spring-loaded piston in the brake cylinder. The brake is released by introducing hydraulic fluid into the brake cylinder to overcome the spring force. When the cable is raised, the brake band is in its normal applied position and the brake drum which is not secured to the brake shaft, is held stationary. The two pawls, which are secured directly to the brake shaft, rotate freely in a clockwise direction, thus enabling the cable drum to reel in and raise the cable. When the control valve is in the HOLD position, hydraulic motor power is cut off, cable drum rotation ceases and the brake band remains in its normal applied position. Any weight on the cable is held suspended by the pawls which engage the ratchet teeth on the inside diameter of the brake drum and prevent cable drum movement. The cable is lowered by introducing hydraulic pressure into the brake cylinder to counteract the piston spring pressure and release the brake band. The entire brake drum assembly is then free to rotate in a counterclockwise direction even though the pawls within the brake drum are engaged with the ratchet teeth.

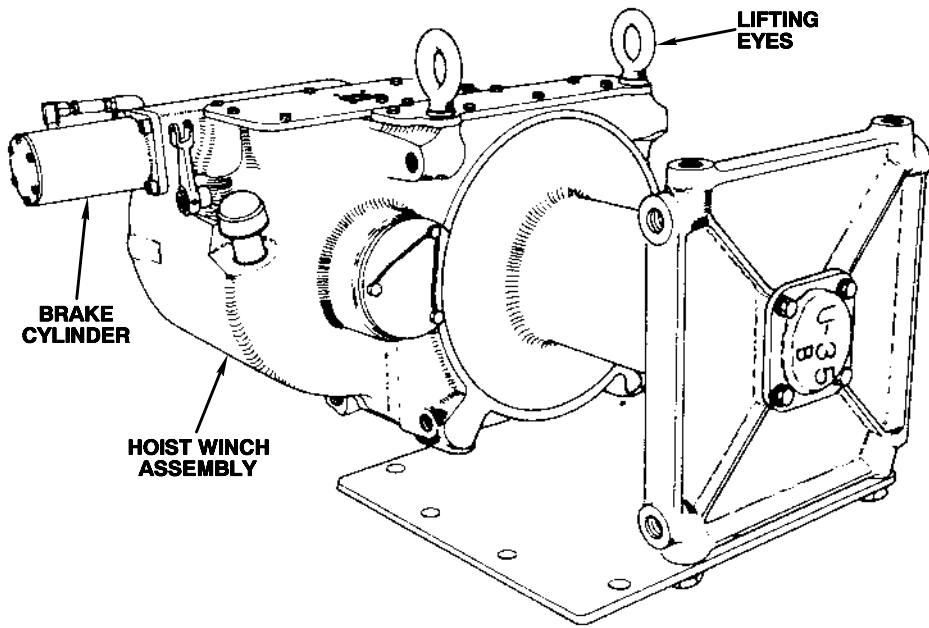


Figure 4. Hoist Winch Assembly—Left-Front View.

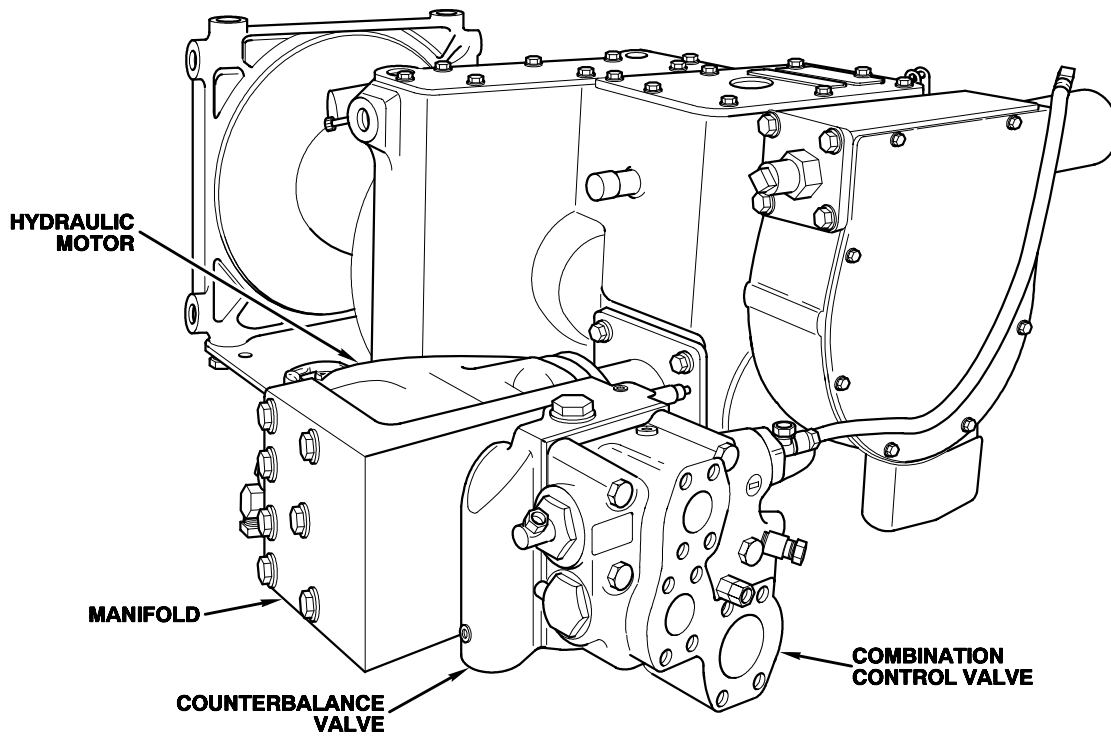


Figure 5. Hoist Winch Assembly—Right-Rear View.

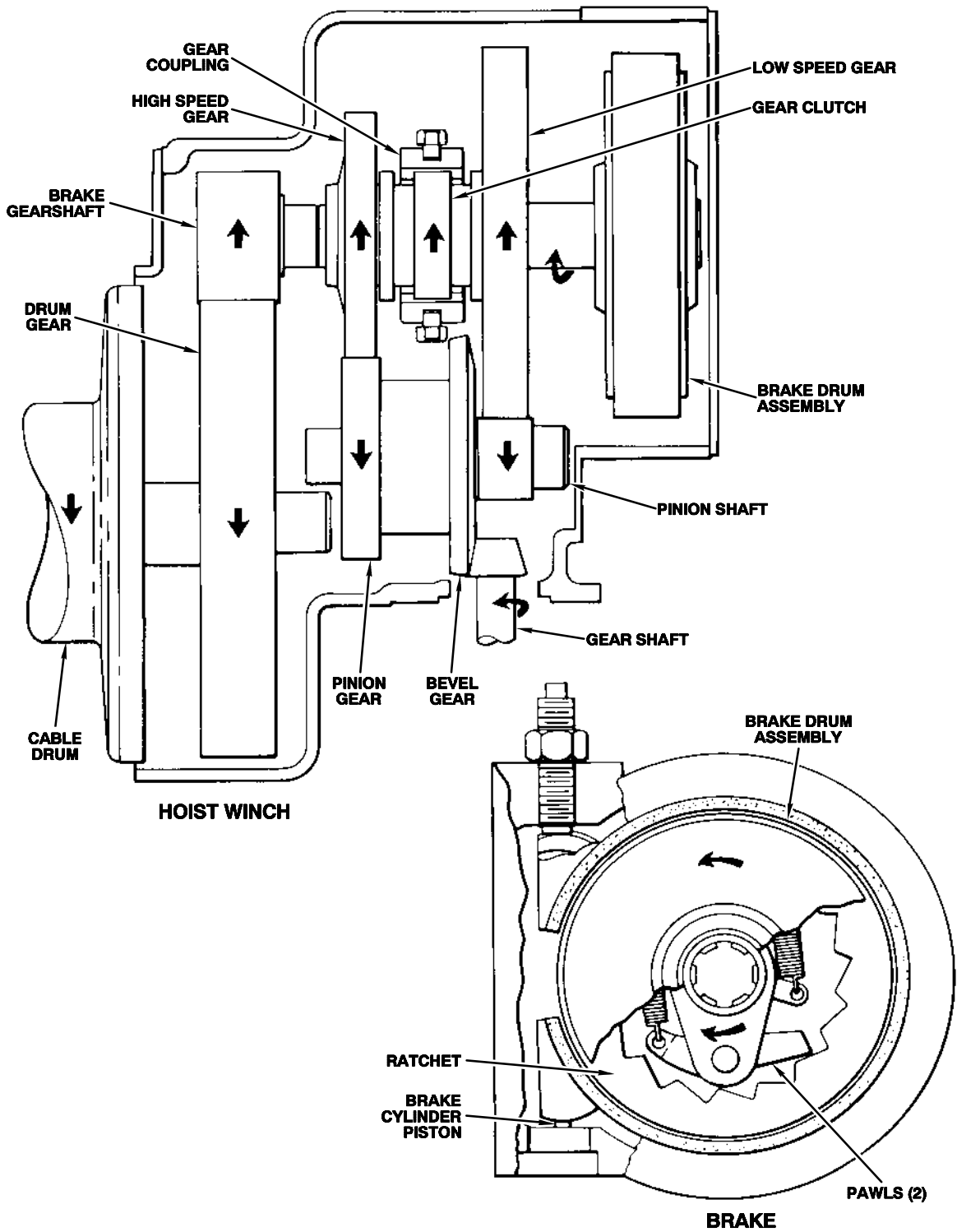


Figure 6. Hoist Winch Assembly—Cross-Sectional View.

## MECHANICAL TRANSMISSION AND MAIN HYDRAULIC PUMP ASSEMBLY

The mechanical transmission and main hydraulic pump assembly (Figures 7 and 8) provide hydraulic pressure for powering the winches, hoisting the boom and spade. It is mounted in the rear of the winch compartment, under the crew compartment. The main engine drives the mechanical transmission in one direction of rotation only, through a propeller shaft and universal joints. The transmission has a single speed reduction and consists of herringbone tooth gears, a lubrication and pressure pump, a high and low pressure valve and a hydraulically operated disk clutch. The transmission housing provides a reservoir for the oil which is used for lubrication and actuation of the disk clutch. The output shaft of the transmission is coupled to the input shaft of the vane-type, fixed-displacement, hydraulic pump. Mounted on top of the pump is a relief and unloading valve, which consists of spring-loaded valves opposed by hydraulic pressure. When the main engine is operating, the input propeller shaft rotates, supplying input power to the transmission gear train and drive to the lubricating pump. When the power control valve is placed in the ON position, hydraulic pressure from the pressure pump is directed to the pressure valve to the clutch cylinder, overcoming the clutch spring force and engaging the clutch disks. With the clutch disks engaged, rotational force is supplied to the output shaft of the transmission, which is coupled to, and drives, the pump shaft. Spline mounted to the drive shaft are two rotors, complete with vanes, which are spring-loaded in the slots of the rotors. These vanes follow the elliptical internal contour of the cam rings. As the vanes move across an inlet in the body, the radius of the cam ring's elliptical contour increases to create a space between the rotor and the cam ring contour. Fluid flows into this space and is trapped between adjacent vanes as they move past the inlet chamber. The fluid is then carried along a path of constant radius to the outlet chamber in the pressure plate. At this point the radius of the cam ring's elliptical contour decreases, forcing the fluid into outlet chambers through pressure plate ports and through outlet ports. Pump output high pressure is directed to the winches and cylinders to operate them.

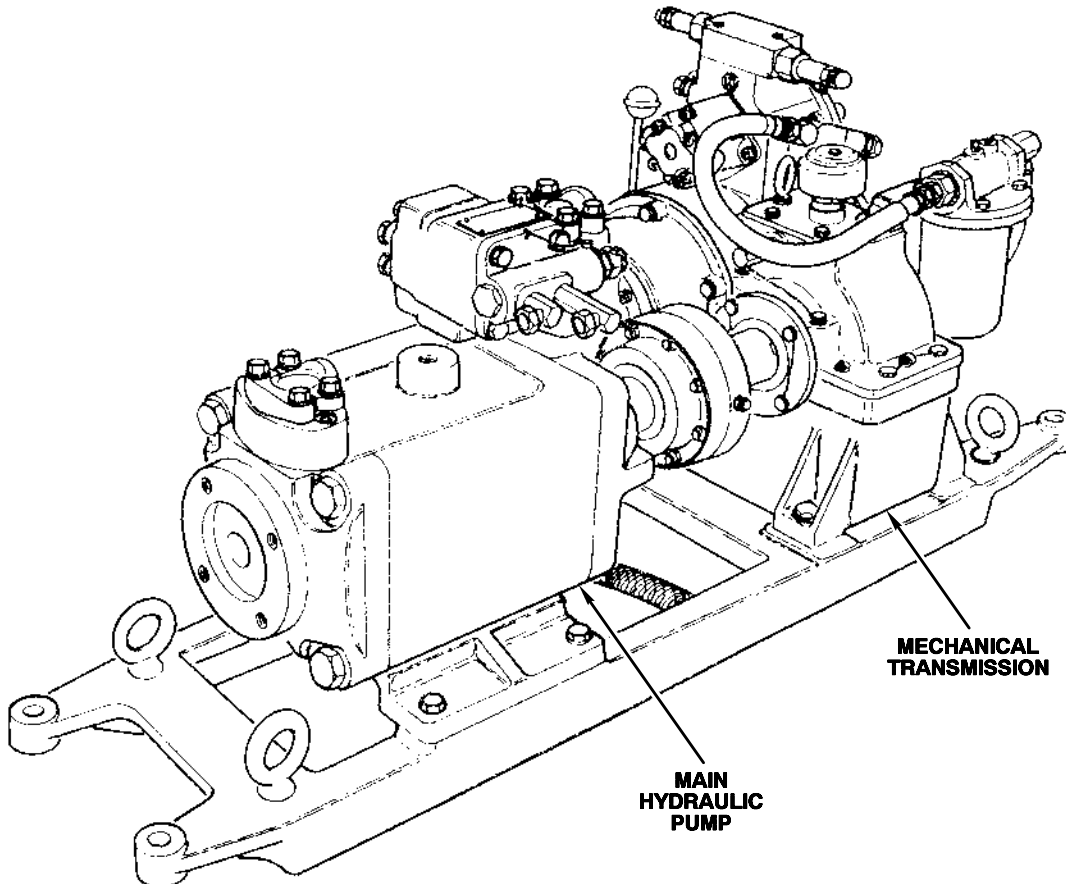


Figure 7. Mechanical Transmission and Main Hydraulic Pump Assembly—Left-Front View.

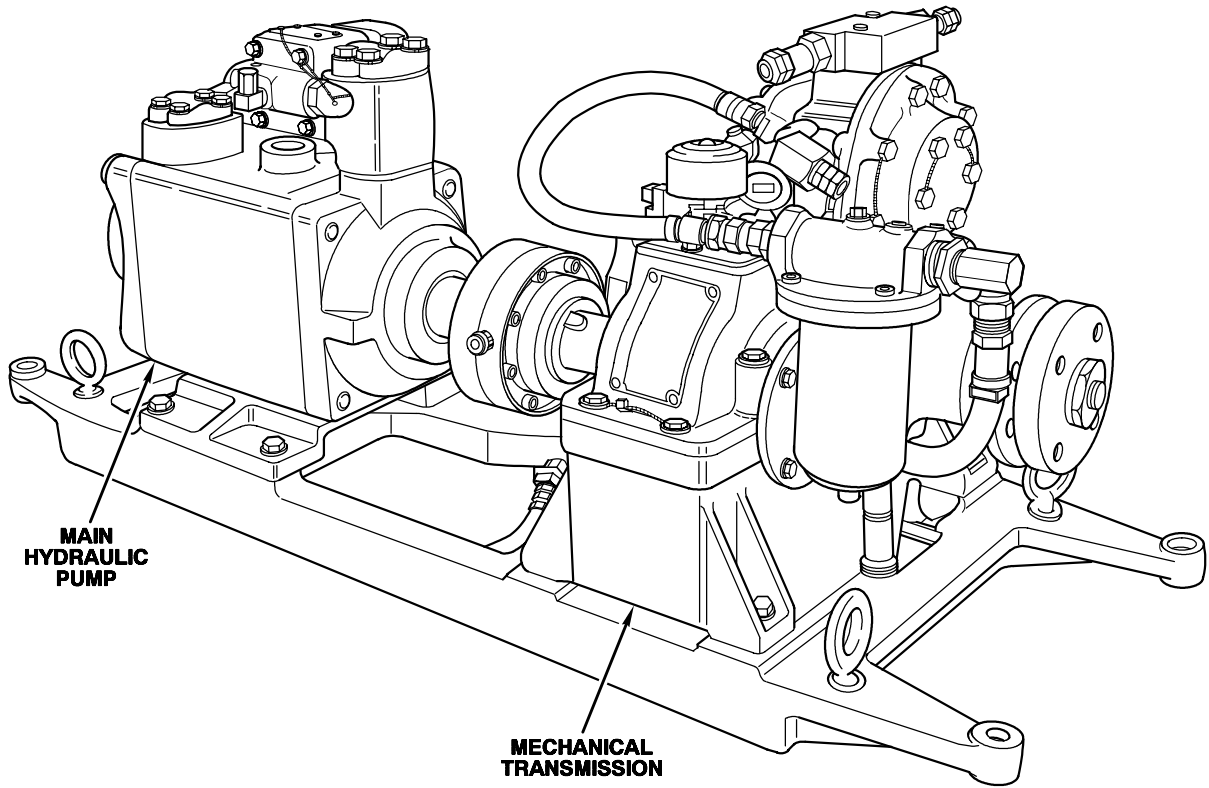


Figure 8. Mechanical Transmission and Main Hydraulic Pump Assembly—Right-Rear View.

## HOISTING BOOM ASSEMBLY

The hoisting boom assembly (Figure 9) consists of a tubular steel A-frame, two boom-actuating cylinders and two stayline cylinders. The A-frame, or boom (Figure 10A), is installed on top of the vehicle hull and is raised or lowered by means of controls within the crew compartment. The boom actuating cylinders (Figure 10B) are located within the vehicle on either side of the crew compartment. They are single-end rod, double-acting hydraulic cylinders which extend to raise the boom and retract to lower it. The two stayline cylinders (Figure 10C) are identical to the boom cylinders and are located at the rear of the vehicle. They work in unison with the boom cylinders to provide four feet of back-and-forth boom travel in the raised position.

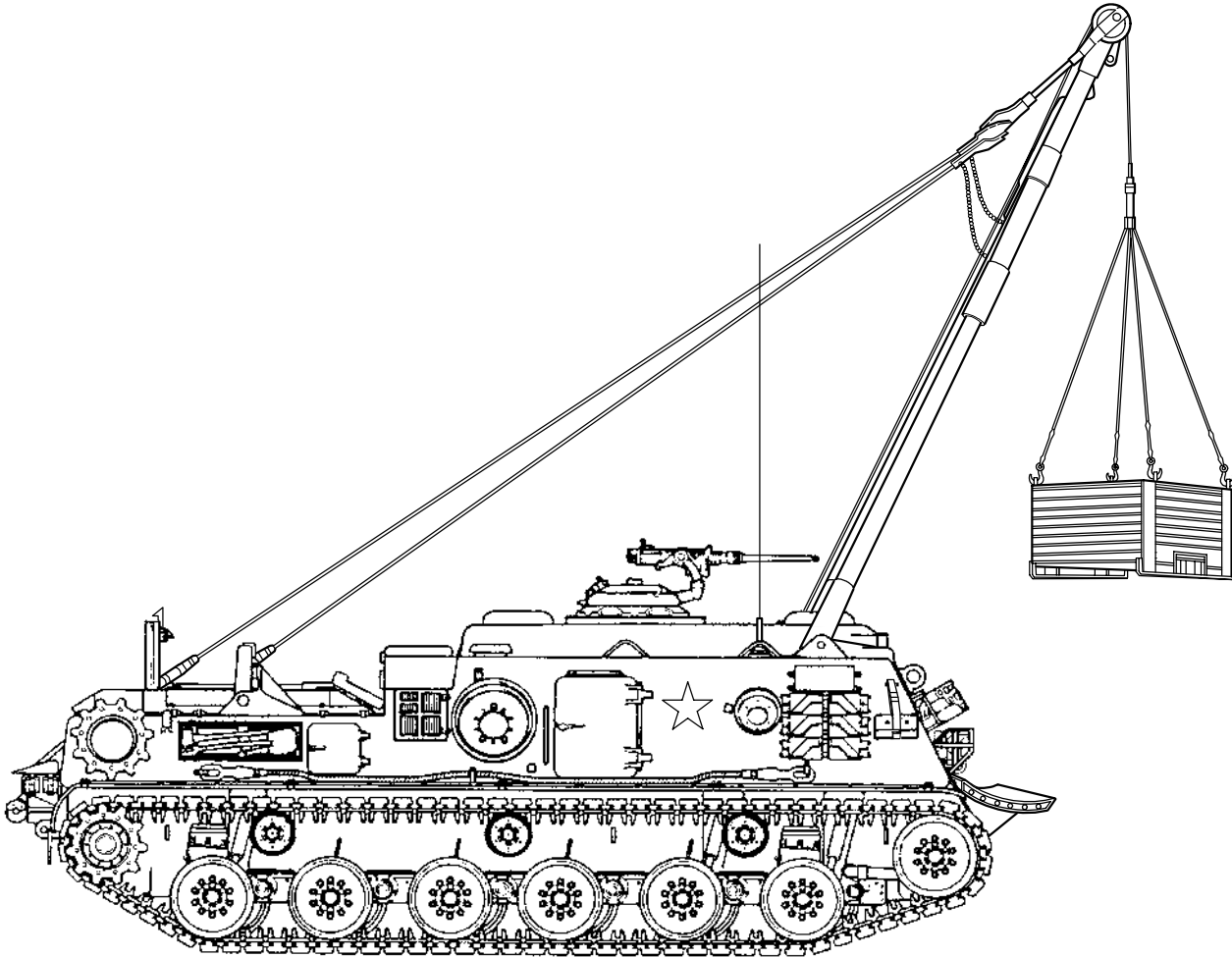


Figure 9. Hoisting Boom Assembly—Right-Rear View.



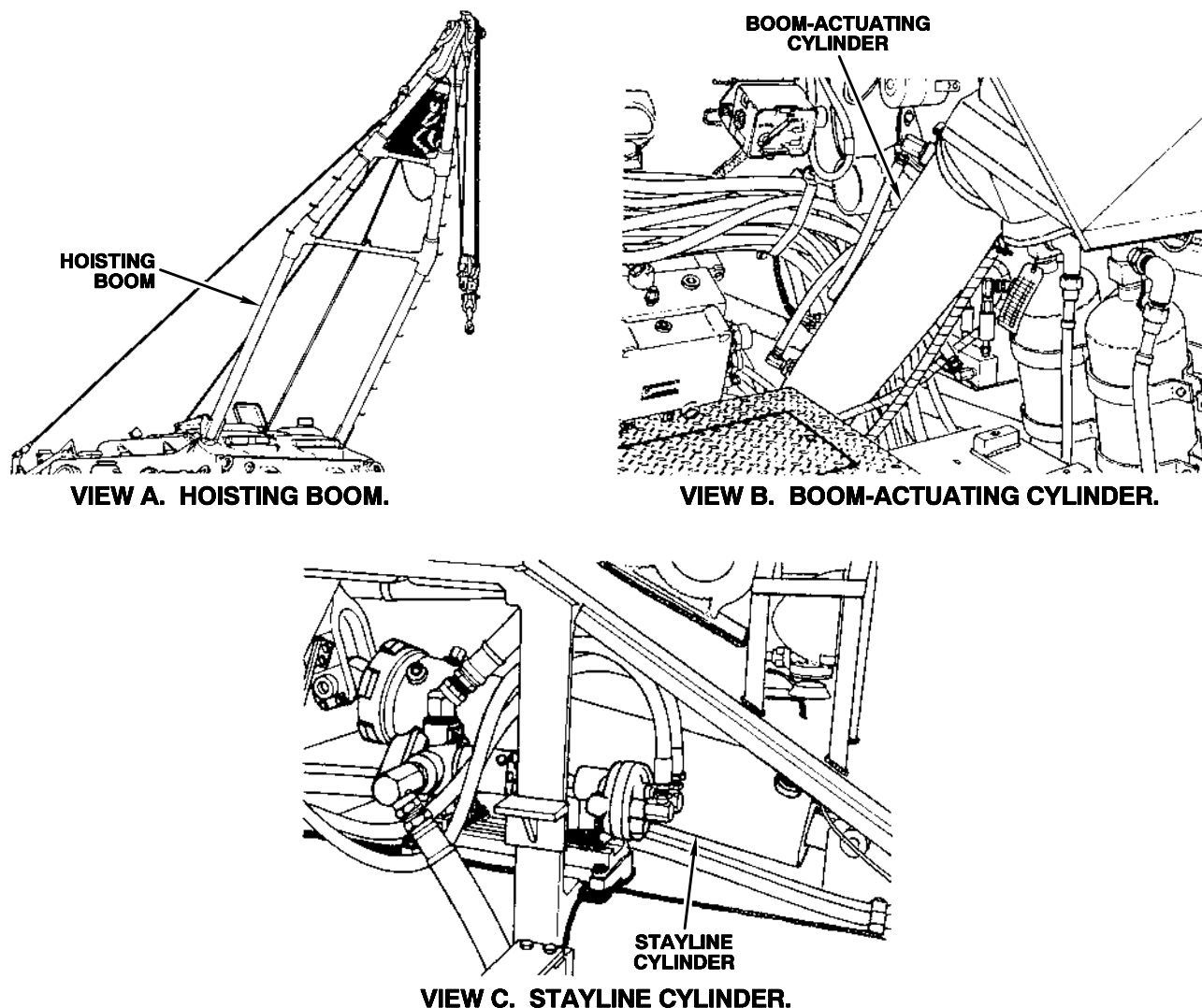


Figure 10. Hoisting Boom Assembly—Installed View.

### Raising The Boom

With the power control valve ON, the boom combination control valve in the FORWARD position and the boom safety valve held in the STOW position, hydraulic pressure is directed to the back of the boom cylinder; thus causing the piston rod to extend, raising the boom. Since no pressure is directed to the stayline cylinders, the crank arms are mechanically moved to their vertical position by the stayline cables, actuating the boom limit valves. Once the boom is raised, release of the boom safety valve allows the valve to return to its normal live position; thus restricting the boom to four feet of movement.

### Lowering The Boom

With the power control valve ON, the boom combination control valve in the RETRACT/STOW position and the boom safety valve held in the STOW position, hydraulic pressure is directed to the rod end of the boom cylinders and bled off the back; thus causing the piston rod to retract and lower the boom. Pressure is also directed to the back end of the stayline cylinders causing the crank arm to retract.

## MAIN HYDRAULIC SYSTEM

The main hydraulic system of the vehicle has three functions: to supply power for control and operation of the boom; to supply power for control and operation of the hoist and main winches and their internal brakes; and to supply power for control and operation of the spade.

### Hydraulic Oil Tank

Hydraulic fluid from the oil tank (Figure 11) is supplied to the hydraulic system, under pressure, by means of the main hydraulic pump, which is driven by the mechanical transmission. Through suction, oil passes from the hydraulic oil tank to the main pump and is pressure-discharged to operate the main hydraulic system.

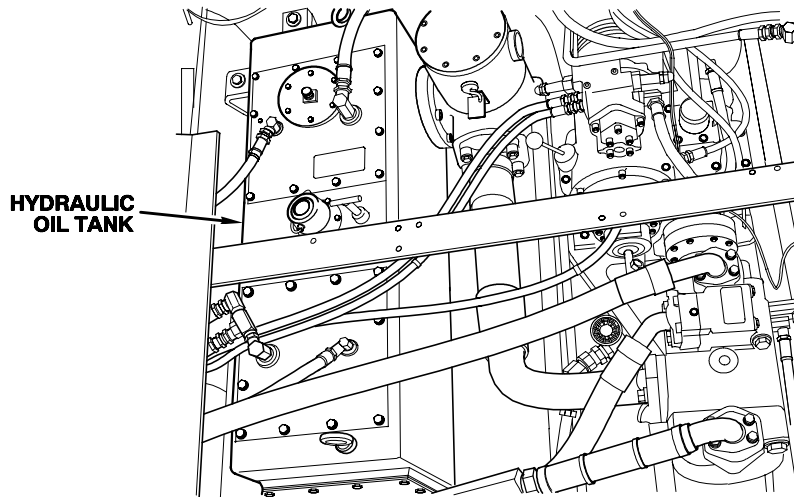


Figure 11. Hydraulic Oil Tank—Installed View.

**Control Valves (Hydraulic Subplate Assembly)**

The hydraulic subplate assembly or main control panel (Figures 12 and 13) is mounted to the right of the driver. Mounted to the subplate are the main winch, hoist winch, boom safety and power control valves; the system selector control valve, the boom combination control valve and the APU emergency control valve. The spade control handle is installed on the subplate and connected to the spade combination control valve by a mechanical linkage. The subplate has numerous ports and passages and serves as a manifold and mount for the operator's hydraulic control valves. Bleed valves are installed in the subplate to provide a means of bleeding portions of the hydraulic system. The subplate itself serves as a manifold and directs the hydraulic oil through numerous passages to inlet or outlet ports of the subplate and the attached control valves.

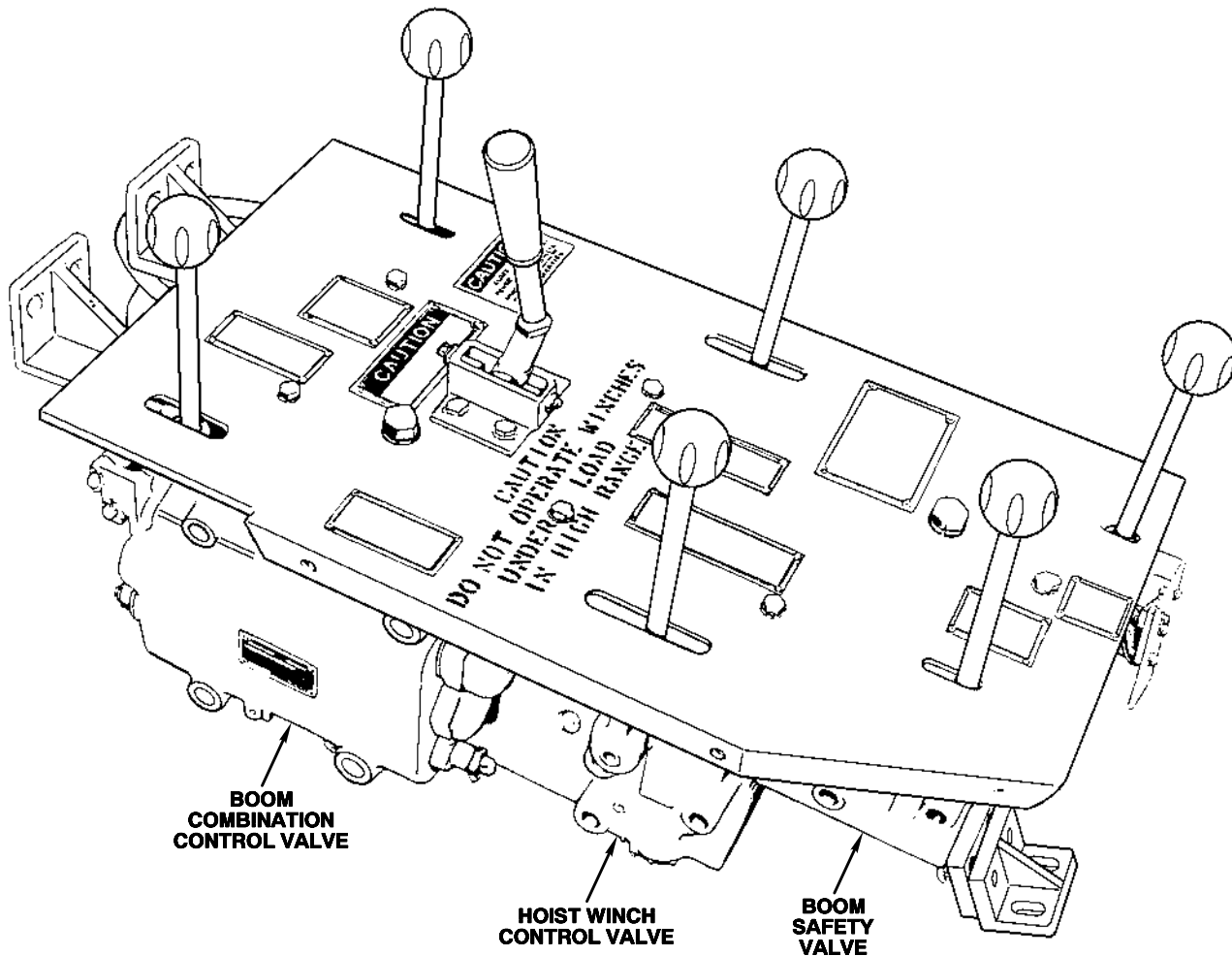


Figure 12. Hydraulic Subplate Assembly—Left-Rear View.

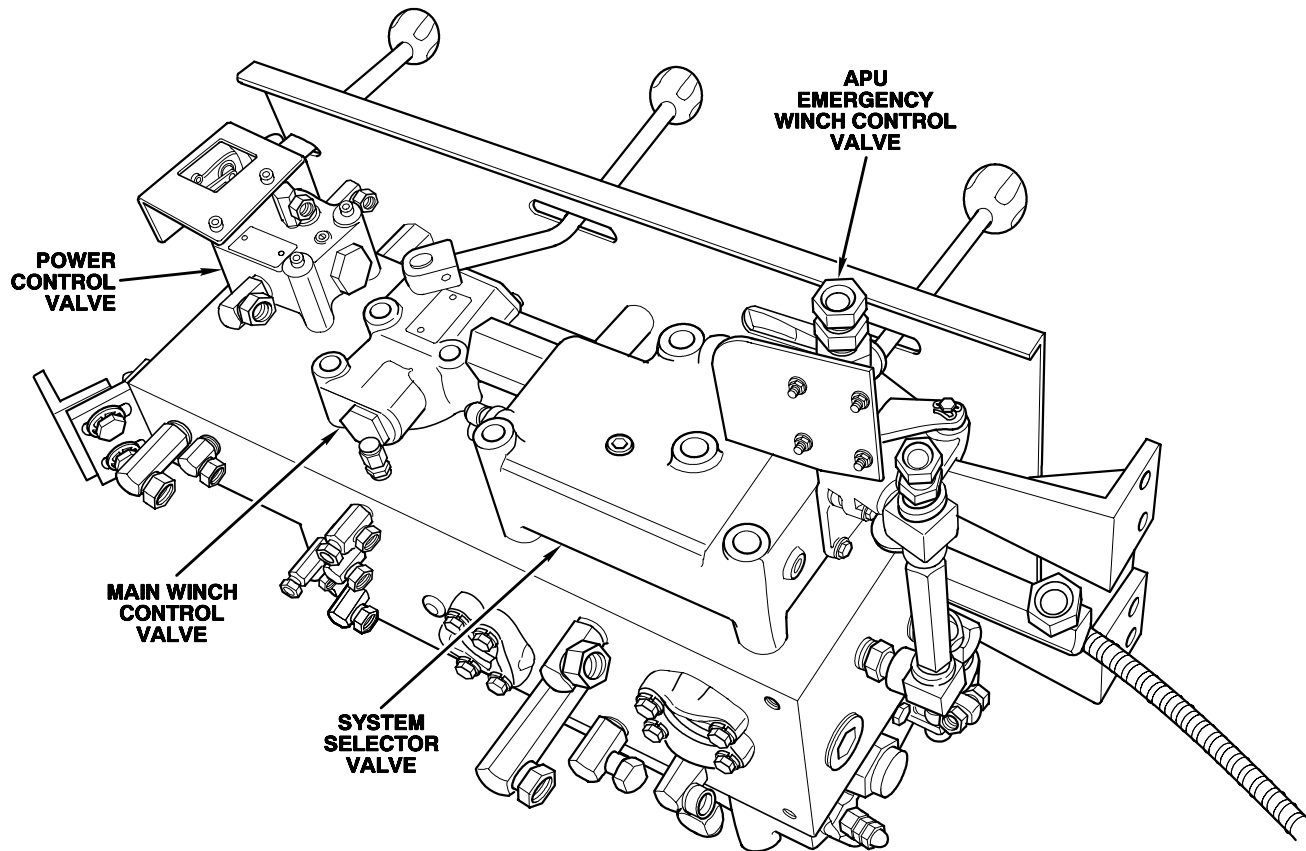


Figure 13. Hydraulic Subplate Assembly—Right-Front View.

### Main and Hoist Control Valves

The main winch control valve (Figure 13) and hoist winch control valve (Figure 12) are manually operated, three-position, open-center, directional control valves and are spring-loaded to the HOLD or centered position. When the valve is in the spring-centered HOLD position, pilot pressure is directed through the valve to the tank return. Also, pressure is bled from the winch combination control valve to the same tank return. Manually placing the valve in the PAYOUT, or LOWER position directs the pilot pressure to the winch combination control valve and the brake cylinder and closes the port opening to the tank return. Moving the valve to the INHAUL, or RAISE position blocks the pilot pressure to the control valve and bleeds the pilot pressure from the winch combination control valve and brake cylinder, through the control valve, to the tank return.

### Boom Combination Control Valve

The boom combination control valve (Figure 12) is a manually operated, three-position, closed-center, directional control valves and are spring-loaded to the HOLD or centered position. This control valve also contains one-way check valves and maximum pressure relief valves. When this control valve is in the spring-centered HOLD position, main pump pressure is blocked and pilot pressure is directed to the tank return. Manually placing the valve in the FORWARD position cuts off pressure and directs main pump pressure through a one-way check valve and a flow restriction to the boom-actuating cylinders. Pressure from the opposite side of the cylinders is directed by the valve to the tank return. If maximum pressure is exceeded, the relief valve opens and bleeds off pressure to the tank return. Placing the valve in the RETRACT/STOW position cuts off pilot pressure and directs main pump pressure through a one-way check valve and a flow restriction to the boom-actuating cylinders and the stayline cylinders. Pressure from the opposite end of the cylinders is ported through the valve to the tank return. The maximum pressure relief valve opens if preset pressure is exceeded.

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### **Boom Safety Control Valve**

The boom safety control valve (Figure 12) is a manually operated, two-position, single-flow path valve, and is spring-loaded to the LIVE or open position. When the valve is in its spring-loaded live position, pilot pressure is directed to the boom limit valves. Manually placing the valve in the STOW position cuts off pilot pressure to the boom limit valves.

### **Power Control Valve**

The power control valve (Figure 12) is a manually operated, two-position, directional flow valve. The valve is held in its selected position by an internal mechanical detent. Manually placing the valve in the ON position allows pump pressure to pass through the valve to the transmission clutch cylinder. Moving the valve to the OFF position blocks the pump pressure and bleeds the oil pressure from the clutch cylinder, through the valve, back to the transmission crankcase return line.

### **System Selector Control Valve**

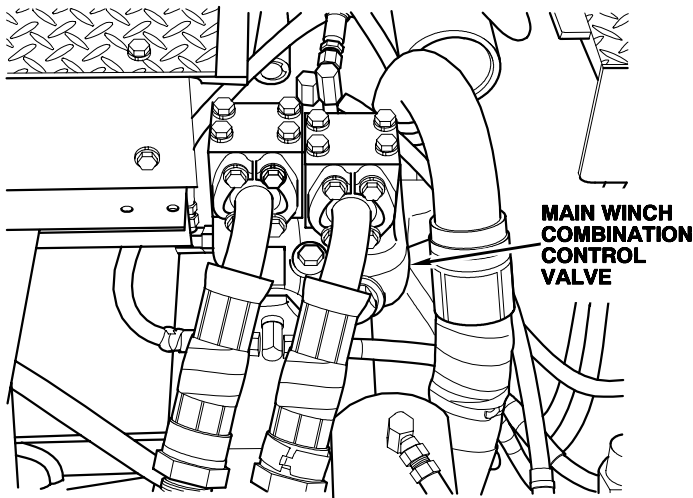
The system selector control valve (Figure 12) is a manually operated, three-position, directional, combination control and relief valve. It is held in its selected position by an internal mechanical detent. When the manual selector control valve is in the center or MAIN position, main hydraulic pump pressure is directed to the spade combination control valve and the boom combination control valve. Pump pressure to the refuel pump motor control valve impact wrench is blocked and any residual pressure from the auxiliary pump is bled to the tank return. Moving the valve to the AUXILIARY position directs auxiliary pump pressure to the spade combination control valve and the boom combination control valve. The port opening from the main pump is closed, and residual pressure from the refuel pump motor control valve and impact wrench line is allowed to flow past the valve to the tank return. Moving the valve to the Auxiliary position directs auxiliary pump pressure to the spade combination control valve and the boom combination control valve. The port opening from the main pump is closed, and residual pressure from the refuel pump motor control valve and impact wrench line is allowed to flow past the valve to the tank return. Placing the valve in the REFUEL position permits the use of main pump pressure and auxiliary pump pressure simultaneously for different operations or the use of just auxiliary pump pressure for refueling or use of the impact wrench. Main pump pressure is directed to the spade and boom combination control valves and auxiliary pump pressure is directed to the refuel pump motor control valve and the impact wrench.

### **APU Emergency Winch Control Valve**

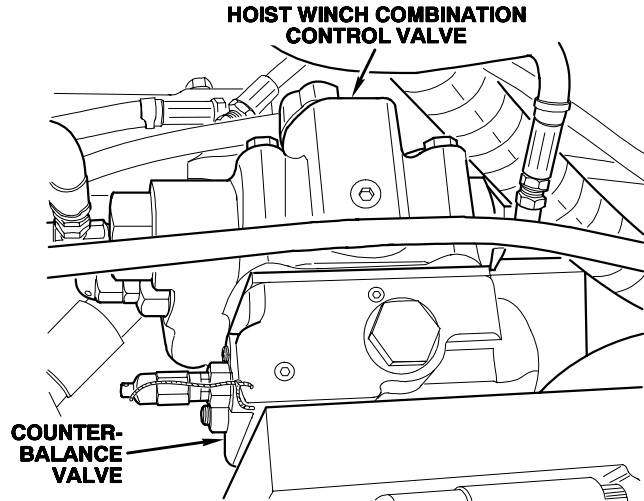
The APU emergency winch control valve (Figure 13) is a manually operated, two-position (open and closed), single-flow path, ball valve. When this valve is in the OPEN position, the auxiliary hydraulic pump directs pressure oil to the hoist winch combination control valve and the main winch combination control valve (for emergency No Load operation of the winch cables). Hydraulic pump pressure is blocked when this valve is in the closed position.

### **Combination Control Valves**

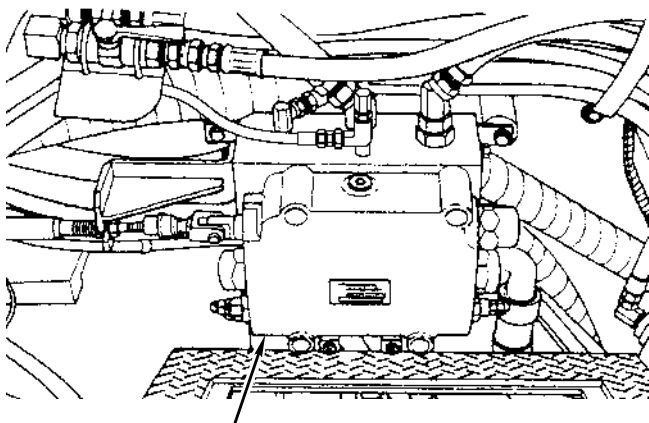
Four combination control valves (Figure 14) are utilized in the main hydraulic system. Two of these valves are manually operated to combine control, check and adjustable relief for boom and spade operation. The boom combination control valve is subplate mounted to the control panel, and the spade control valve is subplate mounted to the cab front wall. The other combination control valves are pilot operated and combine pressure and directional control with adjustable relief for the winches.



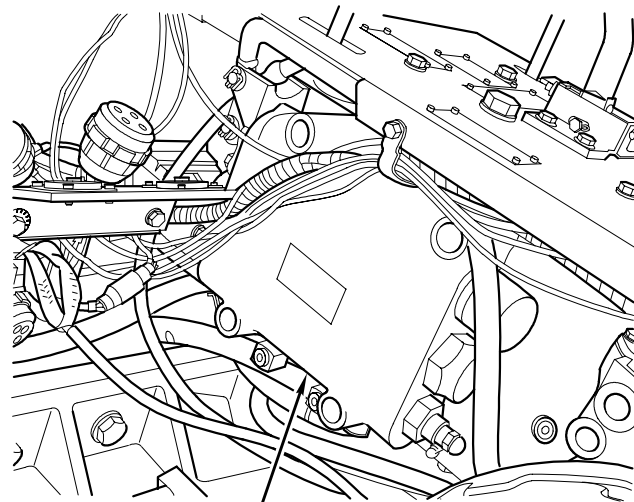
**VIEW A. MAIN WINCH COMBINATION CONTROL VALVE.**



**VIEW B. HOIST WINCH COMBINATION CONTROL VALVE.**



**VIEW C. SPADE COMBINATION CONTROL VALVE.**



**VIEW D. BOOM COMBINATION CONTROL VALVE.**

Figure 14. Combination Control Valves—Installed View.

**Flow Regulators**

Four flow regulators (Figure 15) are installed in the main hydraulic system. They regulate oil flow in one direction, regardless of pressure, and permit unrestricted flow in the opposite direction. The regulators control the speed of raising and lowering the boom.

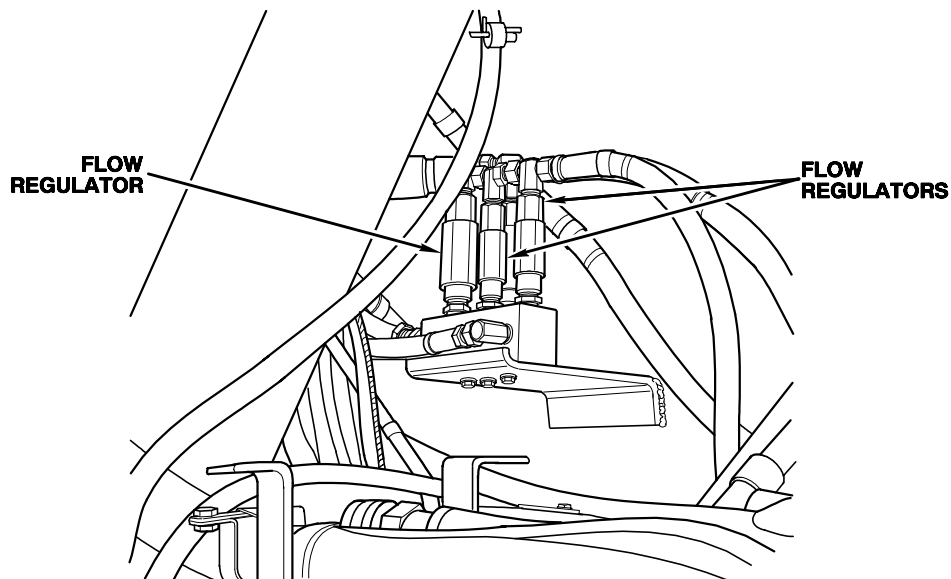


Figure 15. Flow Regulators—Installed View.

### AUXILIARY HYDRAULIC SYSTEM

The auxiliary system of the vehicle has the following functions: to supply power for control and emergency operations of the boom; to supply power for control and emergency operation of the spade and winches; to supply power for operation of refuel pump and impact wrench.

#### Auxiliary Hydraulic Pump

Pressure for the auxiliary hydraulic system is supplied by the auxiliary pump (Figure 16) which is bracket mounted to the auxiliary engine. The auxiliary hydraulic system is engaged by moving the system selector control handle to AUX and by operating the auxiliary engine (refer to TM 9-2350-256-10).

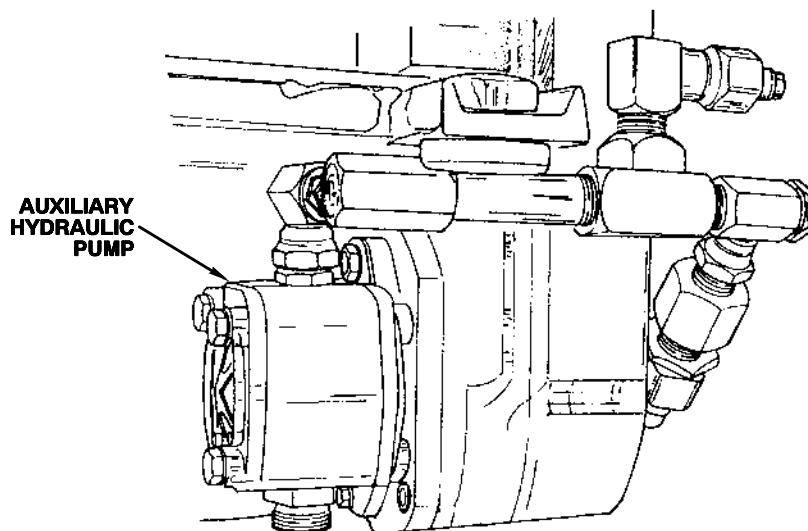


Figure 16. Auxiliary Hydraulic Pump—Installed View.

**Refuel Pump Motor**

A gear-type hydraulic motor (Figure 17) drives the refuel pump when refueling or defueling. Motor rotation is controlled by a four-way selector valve. The refuel pump motor is mounted on the right rear area above the track in the engine compartment, and is coupled to the refuel pump.

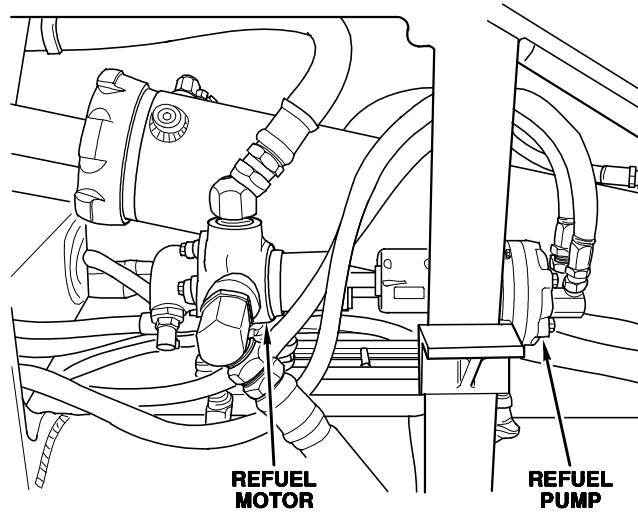


Figure 17. Refuel Motor and Pump Assembly—Installed View.

**Flow Regulator (Adjustable)**

An adjustable flow regulator (Figure 18) is installed in the auxiliary hydraulic system to provide adjustment of flow for operation of the fuel transfer pump or hydraulic impact wrench. A calibrated dial and control handle are provided for variable settings. To operate the regulator; move the handle so that the indicator points to the desired setting. The regulator is mounted on the right rear area above the track in the engine compartment.

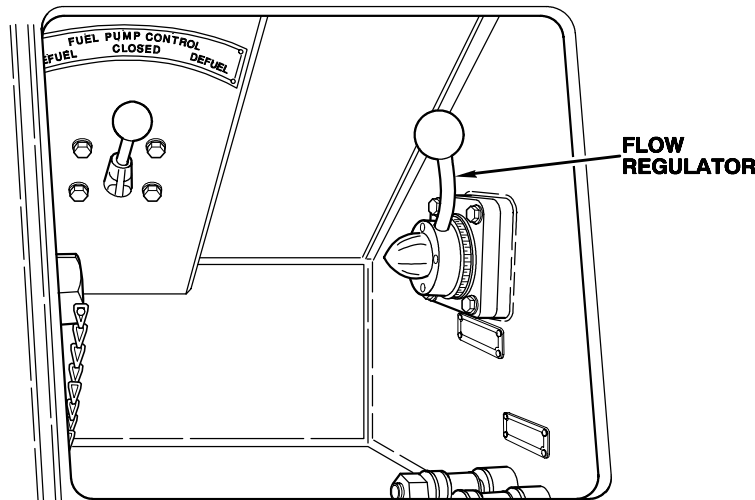


Figure 18. Flow Regulator (Adjustable)—Installed View.



### Four-Way Selector Valve

A three-position, four-way selector valve (Figure 19) is installed in the auxiliary hydraulic system to control the rotation of the refuel pump and motor. The four-way selector valve is mounted on the right rear area above the track in the engine compartment.

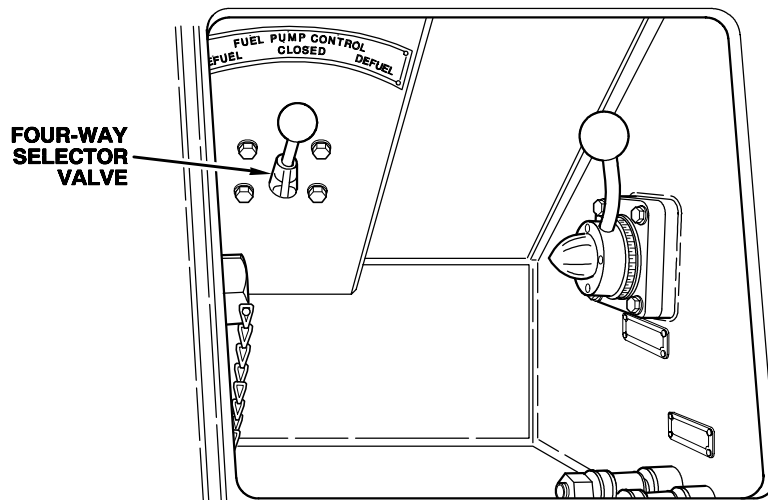
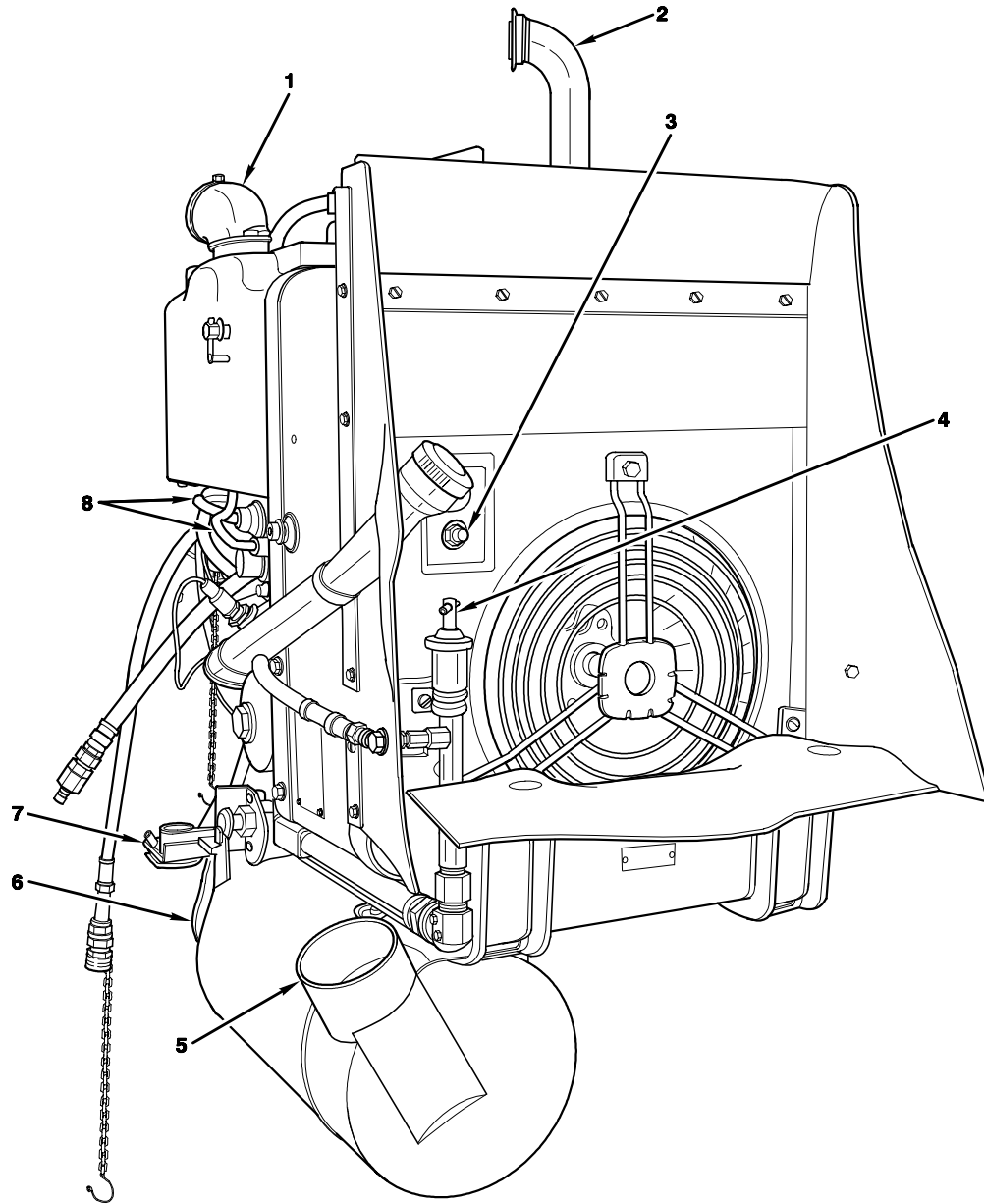


Figure 19. Four-Way Selector Valve—Installed View.

### AUXILIARY POWER UNIT (APU)

The APU (Figure 20) consists of an air cooled diesel engine with a chain case, generator (which is also used as a starter), and hydraulic pump mounted to it. The chain case covers three sprockets and a drive chain. With a support and mounts, the engine, generator/starter and pump form a compact unit which fits into the right forward corner of the vehicle engine compartment. The generator electrical system is designed to supply a maximum of approximately 150 amperes of current at approximately 28 volts dc to charge the vehicle batteries. The pump supplies pressure at  $2000 \pm 50$  psi ( $13,790 \pm 345$  kPa) to the auxiliary hydraulic system.

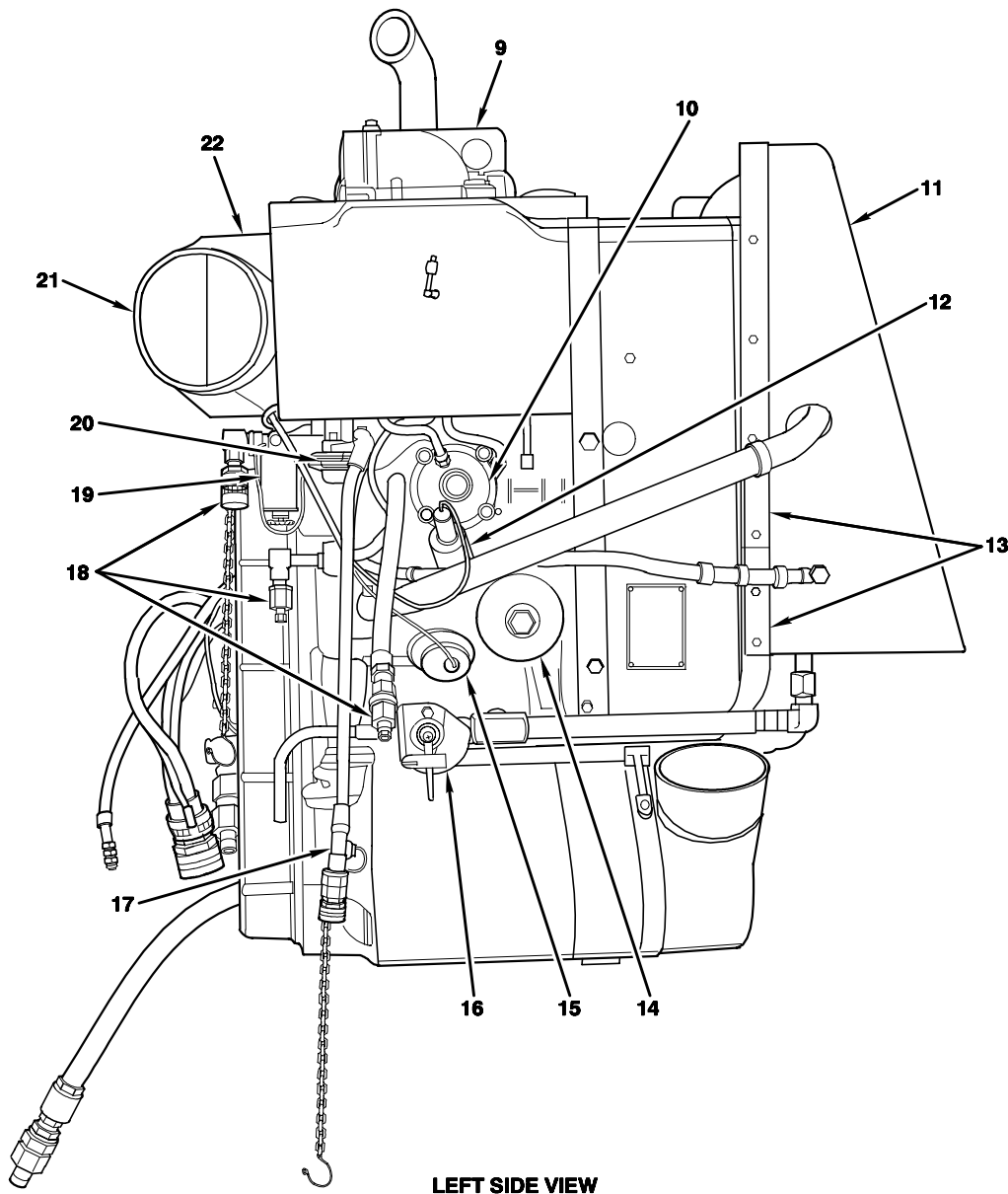


FRONT VIEW

**Legend:**

- |                                    |                                     |
|------------------------------------|-------------------------------------|
| 1. Engine combustion air inlet     | 5. Auxiliary generator cooling duct |
| 2. Exhaust tube                    | 6. Auxiliary generator              |
| 3. Governor speed adjustment screw | 7. Support and mount                |
| 4. Crankcase oil gage rod          | 8. Fuel injection nozzle tubes      |

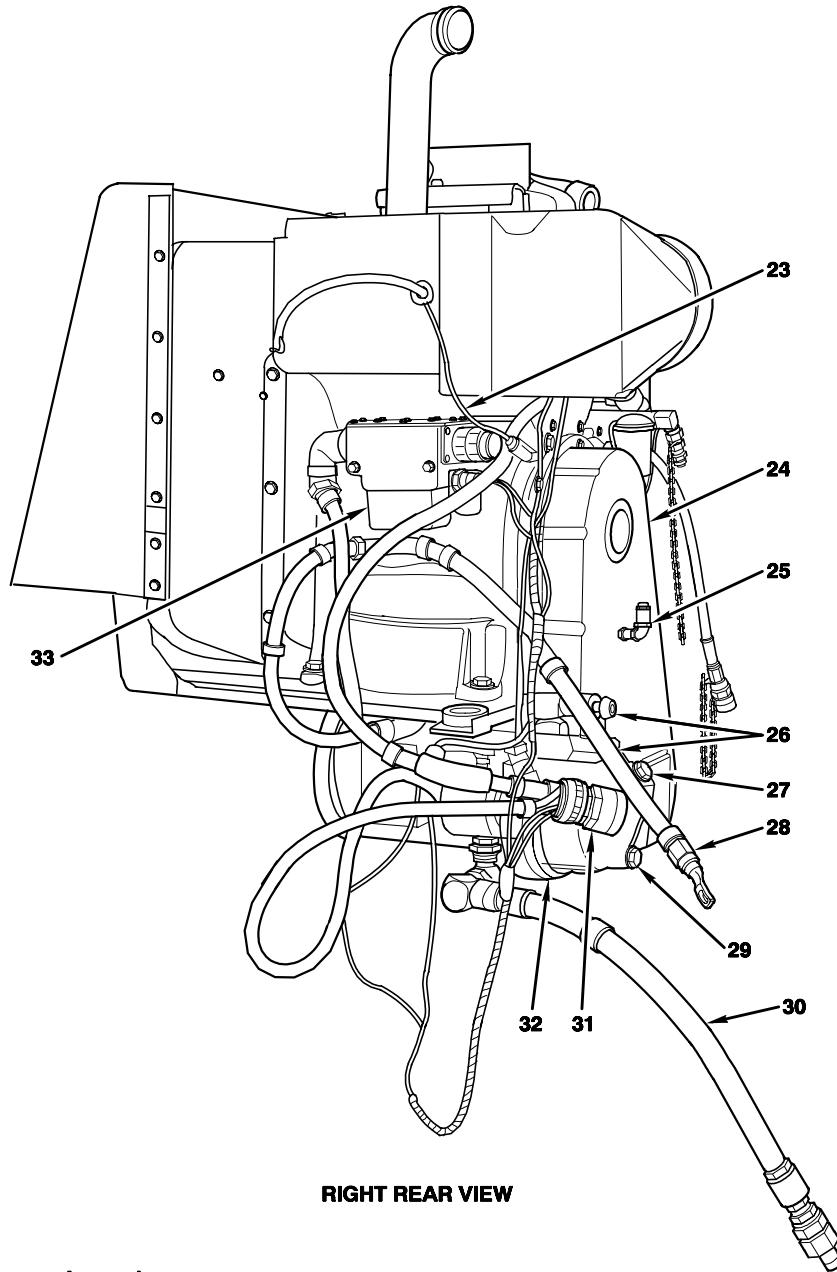
Figure 20. APU (Sheet 1 of 3).



**Legend:**

- |                               |                                    |
|-------------------------------|------------------------------------|
| 9. Lifting eye                | 16. Crankcase oil drain valve      |
| 10. Fuel injection pump       | 17. Fuel line                      |
| 11. Panel                     | 18. Fuel line connections          |
| 12. Oil pressure sending unit | 19. Fuel pump filter bowl          |
| 13. Retainer                  | 20. Fuel transfer pump             |
| 14. Oil filter                | 21. Engine cooling air outlet duct |
| 15. Low oil pressure switch   | 22. Access cover                   |

Figure 20. APU (Sheet 2 of 3).



**RIGHT REAR VIEW**

**Legend:**

- |                                                       |                                    |
|-------------------------------------------------------|------------------------------------|
| 23. Lead to high air temperature warning light switch | 28. Ground cable                   |
| 24. Accessory drive case                              | 29. Accessory drive case oil drain |
| 25. Accessory drive case vent                         | 30. Hydraulic hose                 |
| 26. Hydraulic hose connection                         | 31. Wiring harness                 |
| 27. Accessory drive case oil fill                     | 32. Auxiliary hydraulic pump       |
|                                                       | 33. Starter relay                  |

Figure 20. APU (Sheet 3 of 3).

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## Starting System

The generator, which is coupled to the engine by a drive chain, also serves the dual role as a starter. When the preheat switch is held in the closed (ON) position, and the generator switch is open (OFF), one side of the preheat relay energizing coil on the APU engine is grounded through the preheat switch and a set of APU generator switching relay contacts. This causes the preheat relay contacts to close since the opposite side of the energizing coil is connected directly to the vehicle bus voltage. Power is then supplied through the closed preheat relay contacts to the preheaters, the APU generator/starter field winding, and to one side of the starter switch circuit. When the starter switch is closed, it completes the APU starter relay coil circuit, and bus power is supplied to the APU generator/starter armature circuit through these relay contacts, thus motorizing the generator/starter to start the engine. Therefore both the preheat and starter switches must be closed (ON), and the generator switch must be open (OFF) in order to start the APU. Since the preheat relay energizing coil ground circuit is passed through the set of APU switching relay contacts (as mentioned above), the preheat relay cannot activate if the generator switch is on. The reason for this circuit arrangement is to prevent vehicle bus voltage from being applied to the voltage regulator field through the preheat relay contacts, thus damaging the regulator when the generator switch is on (field circuit from generator to regulator closed) and the preheat switch is activated (bus voltage applies to generator field winding).

## Lubrication

A gear-type pump draws oil from the crankcase and delivers it through a replaceable oil filter to the engine. Normal oil pressure should be 25 psi (172 kPa) or higher under normal operating conditions. An oil pressure switch will activate a low oil pressure warning light on the auxiliary power unit control box of the oil pressure drops below  $14 \pm 2$  psi ( $96.5 \pm 13.8$  kPa). A crankcase drain valve is provided with a handle so that the lubricating oil can be drained without removing the unit from the vehicle.

## Governor

A constant speed governor is set to maintain engine speed at  $2000 \pm 100$  rpm. The governor uses a ball and cup mechanism on the camshaft gear as the sensing device. A yoke resting on the cup connects to an arm and spring mechanism controlling the throttle lever. Any change in engine speed is transmitted from the cup to the yoke and to the throttle. An adjusting screw is provided on the front of the unit to adjust the speed by changing the spring tension.

## Fuel System

The fuel system consists basically of a primary and secondary fuel filter, fuel transfer pump, fuel injection pump and two fuel injection nozzles. The transfer pump operates off the camshaft, drawing fuel from the supply tank and delivering it through the two filters to the injection pump. The injection pump meters and delivers the fuel at high pressure to the nozzles.

## Electrical System

The generator/starter is mounted to the chain case and engine housing and driven by the engine through a roller chain and drive sprocket. The output is controlled automatically by a voltage regulator and current limiting device.

## Hydraulic System

The pump is mounted to the chain case and driven by the engine. It supplies the pressure for the auxiliary hydraulic system. This system powers the refuel pump and impact wrench and also supplies power for emergency operation of the boom, spade and winches.

## END OF WORK PACKAGE



**CHAPTER 2**  
**INTERMEDIATE MAINTENANCE**  
**TROUBLESHOOTING PROCEDURES**  
**FOR**  
**RECOVERY VEHICLE, FULL TRACKED: MEDIUM, M88A1**  
**(NSN: 2350-00-122-6826)**





**CHAPTER 2**  
**INTERMEDIATE MAINTENANCE**  
**TROUBLESHOOTING PROCEDURES**

**WORK PACKAGE INDEX**

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Purge Pump Troubleshooting Procedure.....	0006 00
Electrical System Troubleshooting Procedure.....	0007 00
Main Winch Circuit (Main Hydraulic System) Troubleshooting Procedure.....	0008 00
Hoist Winch Circuit (Main Hydraulic System) Troubleshooting Procedure.....	0009 00
Mechanical Transmission and Main Hydraulic Pump Circuit (Main Hydraulic System) Troubleshooting Procedure.....	0010 00
Spade Circuit (Main Hydraulic System) Troubleshooting Procedure.....	0011 00
Hoisting Boom Circuit (Main Hydraulic System) Troubleshooting Procedure.....	0012 00
Main Winch Circuit (Auxiliary Hydraulic System) Troubleshooting Procedure.....	0013 00
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Hydraulic Impact Wrench (Auxiliary Hydraulic System) Troubleshooting Procedure.....	0017 00
Auxiliary Power Unit (APU) Troubleshooting Procedure.....	0018 00
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**INTERMEDIATE MAINTENANCE**  
**RECOVERY VEHICLE, FULL TRACKED: MEDIUM, M88A1**  
**NSN 2350-00-122-6826, EIC AQA**  
**TROUBLESHOOTING INDEX**

**GENERAL INSTRUCTIONS**

The Troubleshooting Index is the master reference table for locating troubleshooting information. This Index contains a list of various malfunctions which may occur during operation or inspection of the M88A1 and provides a reference to information located within the appropriate Troubleshooting WP. Each Troubleshooting WP provides step-by-step instructions for isolating and correcting malfunctions.

Malfunction/Symptom Troubleshooting Procedure

**FUEL TANKS**

- 1. Fuel leaking from forward fuel tank..... WP 0005 00
- 2. Fuel leaking from right and/or left rear fuel tank..... WP 0005 00

**PURGE PUMP**

- 3. Main engine manifold heaters do not work..... WP 0006 00
- 4. Purge pump difficult to pump or does not pump..... WP 0006 00

**ELECTRICAL SYSTEM**

- 5. Battery-generator indicator reads in yellow or lower red region with main engine running and main generator in system (generator cutout switch closed)..... WP 0007 00
- 6. Battery-generator indicator reads in yellow or lower red region with APU engine running and APU generator switch on (main engine not running)..... WP 0007 00
- 7. Battery-generator indicator reads in bottom of lower red region (no deflection) with master switch on..... WP 0007 00
- 8. All circuits dead except personnel heater, master relay lamp, and slave receptacle..... WP 0007 00
- 9. Infrared system (driver’s periscope) fails to operate..... WP 0007 00

**MAIN WINCH CIRCUIT (MAIN HYDRAULIC SYSTEM)**

- 10. Main winch will not operate..... WP 0008 00
- 11. Main winch pays in and out under no load, but will not pay in or out under load..... WP 0008 00
- 12. Main winch pays in but will not pay out..... WP 0008 00
- 13. Main winch pays out but will not pay in..... WP 0008 00
- 14. Main winch creeps in either direction when in hold position..... WP 0008 00
- 15. Main winch will not hold load..... WP 0008 00
- 16. Insufficient main system oil pressure..... WP 0008 00
- 17. Level winder not operating..... WP 0008 00
- 18. Level winder not operating properly..... WP 0008 00

**HOIST WINCH CIRCUIT (MAIN HYDRAULIC SYSTEM)**

- 19. Hoist winch will not operate..... WP 0009 00
- 20. Hoist winch pays in but will not pay out..... WP 0009 00
- 21. Hoist winch pays out but will not pay in..... WP 0009 00
- 22. Hoist winch creeps in either direction when in hold position..... WP 0009 00
- 23. Hoist winch will not hold load..... WP 0009 00
- 24. Insufficient main system oil pressure..... WP 0009 00

Malfunction/Symptom

Troubleshooting Procedure

**MECHANICAL TRANSMISSION AND MAIN HYDRAULIC PUMP CIRCUIT (MAIN HYDRAULIC SYSTEM)**

- 25. Mechanical transmission fails to operate..... WP 0010 00
- 26. Main hydraulic pump fails to engage..... WP 0010 00
- 27. Mechanical transmission overheating..... WP 0010 00
- 28. Mechanical transmission slipping or chattering..... WP 0010 00
- 29. Mechanical transmission fails to disengage main hydraulic pump..... WP 0010 00
- 30. Main hydraulic pump noisy..... WP 0010 00

**SPADE CIRCUIT (MAIN HYDRAULIC SYSTEM)**

- 31. Spade will not operate..... WP 0011 00
- 32. Spade will not hold with spade combination control valve lever in any position..... WP 0011 00
- 33. Spade will operate only partially..... WP 0011 00

**HOISTING BOOM CIRCUIT (MAIN HYDRAULIC SYSTEM)**

- 34. Boom will not operate..... WP 0012 00
- 35. Boom operates partially..... WP 0012 00
- 36. Boom will not hold in any position..... WP 0012 00
- 37. Boom will not stop automatically after live boom operation..... WP 0012 00
- 38. Boom live operation does not function..... WP 0012 00

**MAIN WINCH CIRCUIT (AUXILIARY HYDRAULIC SYSTEM)**

- 39. Main winch will not operate..... WP 0013 00

**HOIST WINCH CIRCUIT (AUXILIARY HYDRAULIC SYSTEM)**

- 40. Hoist winch will not operate..... WP 0014 00

**SPADE CIRCUIT (AUXILIARY HYDRAULIC SYSTEM)**

- 41. Spade will not operate..... WP 0015 00

**HOISTING BOOM CIRCUIT (AUXILIARY HYDRAULIC SYSTEM)**

- 42. Boom will not operate..... WP 0016 00

**HYDRAULIC IMPACT WRENCH (AUXILIARY HYDRAULIC SYSTEM)**

- 43. Impact wrench does not operate..... WP 0017 00

**AUXILIARY POWER UNIT (APU)**

- 44. Engine fails to crank..... WP 0018 00
- 45. Engine cranks but fails to start..... WP 0018 00
- 46. Engine hard to start..... WP 0018 00
- 47. Engine hard to start in cold weather..... WP 0018 00
- 48. Engine starts but fails to keep running..... WP 0018 00
- 49. Engine overheats..... WP 0018 00
- 50. Engine misfires, lacks power, or emits black smoke..... WP 0018 00
- 51. Engine knocks..... WP 0018 00
- 52. Engine uses excessive oil and emits light blue smoky exhaust..... WP 0018 00
- 53. High air temperature light on APU control box fails to operate properly..... WP 0018 00
- 54. Low oil pressure light in APU control box fails to operate properly..... WP 0018 00
- 55. Oil pressure gage fails to operate..... WP 0018 00
- 56. Battery-generator indicator reads in yellow or lower red region with APU engine running and APU generator switch on..... WP 0018 00

Malfunction/Symptom

Troubleshooting Procedure

**AUXILIARY POWER UNIT (APU)–CONTINUED**

- 57. Battery-generator indicator reads in yellow or lower red region with APU engine running and APU generator switch on with no auxiliary hydraulic pressure..... WP 0018 00
- 58. Engine does not operate at  $2000 \pm 100$  rpm under load conditions..... WP 0018 00

**MECHANICAL TACHOMETER AND SPEEDOMETER**

- 59. Mechanical tachometer or speedometer fails to register..... WP 0019 00

**END OF WORK PACKAGE**



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**INTERMEDIATE MAINTENANCE**  
**RECOVERY VEHICLE, FULL TRACKED: MEDIUM, M88A1**  
**NSN 2350-00-122-6826, EIC AQA**  
**FUEL TANKS TROUBLESHOOTING PROCEDURE**

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**INITIAL SETUP:****Tools and Special Tools**

Tool kit, general mechanic's (item 34, WP 0086 00)

**Materials/Parts**

Cleaning compound (item 5, WP 0085 00)

Detergent (item 6, WP 0085 00)

Methylene chloride (item 10, WP 0085 00)

**References**

TB 750-1047

TM 9-2350-256-20

WP 0027 00

WP 0028 00

WP 0029 00

**Troubleshooting Procedure****Fuel Tanks****Symptom**

Fuel tanks malfunctioning.

**Malfunction**

Fuel leaking from forward fuel tank. Do step 1.

Fuel leaking from right and/or left rear fuel tank. Do steps 2 thru 4.

**CORRECTIVE ACTION**

1. Inspect forward fuel tank for cracks or open seams. Fuel leaking thru a small crack can usually be detected by dust clinging to the wet area.
  - a. If leaking area is accessible without removing the fuel tank:
    - (1) Drain the fuel system (TM 9-2350-256-20).
    - (2) Close fuel valves to left and right rear fuel tanks.
    - (3) Remove the armor cover under the hull to expose the forward fuel tank drain plug. Remove the drain plug.
    - (4) Remove electric intank fuel pump (TM 9-2350-256-20).

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**WARNING**

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Solvents 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 solvent gets on skin or clothing, wash immediately with soap and water.

- (5) Slush tank interior with methylene chloride or cleaning compound as specified in TB 750-1047 to remove residual fuel, dirt, sediment, and other foreign matter. Drain and air dry tank.
- (6) Weld cracked area as required.

**CORRECTIVE ACTION –Continued**

- (7) Close forward fuel tank bypass valve and drain valve. Install drain plug in bottom of tank.
  - (8) Install electric fuel pump (TM 9-2350-256-20).
  - (9) Disconnect the fuel vent hose on top of the forward fuel tank.
  - (10) Connect an air hose and suitable gage to the disconnected vent opening in the forward fuel tank, apply 3–4 psi (21–28 kPa) internal air pressure.
  - (11) Apply soapy water solution, consisting of liquid detergent diluted with 20–40% water, to all exterior surfaces of tank and inspect for air bubble formation.
  - (12) Mark location of any bubble formation, release air pressure, rinse and dry tank, and weld the marked area.
  - (13) Repeat steps (10), (11), and (12) if required.
- b. If leaking area is inaccessible with the fuel tank installed:
- (1) Drain the fuel system (TM 9-2350-256-20).
  - (2) Remove the forward fuel tank from the vehicle (WP 0029 00).
  - (3) Slush tank interior with methylene chloride or cleaning compound as specified in TB 750-1047 to remove residual fuel, dirt, sediment, and other foreign matter. Drain and air dry tank.
  - (4) Inspect tank for any obvious cracks or open seams. Inspect mounting brackets, mounts, and cushions for cracks or breaks. Weld assembly and components as required.
  - (5) Close all openings with temporary plugs or other closures and apply 3–4 psi (21–28 kPa) internal air pressure.
  - (6) Apply soapy water solution, consisting of liquid detergent diluted with 20–40% water, to all exterior surfaces of tank and inspect for air bubble formation.
  - (7) Mark location of any bubble formation, rinse and dry tank, and weld the marked areas.
  - (8) Repeat steps (5), (6), and (7) if required.
  - (9) The electric intake fuel pump and other fittings and accessories may be assembled on the tanks either before or after installation of the tanks in the vehicle (TM 9-2350-256-20).
2. Remove the engine deck (TM 9-2350-256-20). Inspect fuel tank for cracks or open seams. Fuel leaking from a small crack can usually be detected by dust clinging to the wet area.
  3. If the fuel leak cannot be detected or repaired with powerplant installed in the vehicle, remove the fuel tank. For removal of the left rear fuel tank, refer to WP 0027 00. For removal of the right rear fuel tank, refer to WP 0028 00.
  4. If fuel leak cannot be detected or repaired with fuel tank installed in vehicle, remove the powerpack (TM 9-2350-256-20).
    - a. Drain the fuel system (TM 9-2350-256-20).
    - b. Slush tank interior with methylene chloride or cleaning compound as specified in TB 750-1047 to remove residual fuel, dirt, sediment, and other foreign matter. Drain and dry fuel tank.
    - c. Inspect tank for any obvious cracks or open seams. Inspect mounting brackets, mounts, and cushions for cracks and breaks. Weld assembly and components as required.
    - d. Close all openings with temporary plugs or other closures and apply 3–4 psi (21–28 kPa) internal air pressure.
    - e. Apply soapy water solution, consisting of liquid detergent diluted with 20–40% water, to all exterior surfaces of tank and inspect for air bubble formation.



**CORRECTIVE ACTION –Continued**

- f. Mark location of any bubble formation, rinse and dry tank, and weld the marked area.
- g. Repeat steps d, e, and f if required.

**END OF WORK PACKAGE**



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**INTERMEDIATE MAINTENANCE**  
**RECOVERY VEHICLE, FULL TRACKED: MEDIUM, M88A1**  
**NSN 2350-00-122-6826, EIC AQA**  
**PURGE PUMP TROUBLESHOOTING PROCEDURE**

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**INITIAL SETUP:****Tools and Special Tools**

Tool kit, general mechanic's (item 34, WP 0086 00)

**References**

TM 9-2350-256-20  
WP 0031 00

**Materials/Parts**

Cleaning compound (item 5, WP 0085 00)  
Paint thinner (item 18, WP 0085 00)

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**Troubleshooting Procedure****Purge Pump****Symptom**

Purge pump malfunctioning.

**Malfunction**

Main engine manifold heaters do not work. Do step 1.

Purge pump difficult to pump or does not pump. Do step 2.

**CORRECTIVE ACTION**

1. Check manifold heater switch and associated wiring (TM 9-2350-256-20).
  - a. Repair or replace defective components or parts (WP 0031 00).

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**WARNING**

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Solvents 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 solvent gets on skin or clothing, wash immediately with soap and water.

2. Disassemble purge pump (WP 0031 00). Clean all parts in paint thinner or cleaning compound. Inspect all components for cracks, distortion, and/or evidence of excessive wear.
  - a. Replace all defective components.

**END OF WORK PACKAGE**



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**INTERMEDIATE MAINTENANCE**  
**RECOVERY VEHICLE, FULL TRACKED: MEDIUM, M88A1**  
**NSN 2350-00-122-6826, EIC AQA**  
**ELECTRICAL SYSTEM TROUBLESHOOTING PROCEDURE**

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**INITIAL SETUP:****Tools and Special Tools**

Tool kit, general mechanic's (item 34, WP 0086 00)

**References**

TM 9-2350-256-20  
WP 0076 00  
WP 0083 00

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**Troubleshooting Procedure****Electrical System****Symptom**

Electrical system malfunctioning.

**Malfunction**

Battery-generator indicator reads in yellow or lower red region with main engine running and main generator in system (generator cutout switch closed). Do steps 1 and 2.

Battery-generator indicator reads in yellow or lower red region with APU engine running and APU generator switch on (main engine not running). Do steps 3 thru 5.

Battery-generator indicator reads in bottom of lower red region (no deflection) with master switch on. Do step 6.

All circuits dead except personnel heater, master relay lamp, and slave receptacle. Do step 7.

Infrared system (driver's periscope) fails to operate. Do step 8.

**CORRECTIVE ACTION**

1. Check for defective switching relay box.
  - a. Repair or replace switching relay box.
2. Check for defective main generator armature relay.
  - a. Repair or replace main generator armature relay.
3. Check for defective APU generator switch.
  - a. Replace switch, if defective.
4. Check for defective hydraulic pressure switch.
  - a. Adjust or replace pressure switch (WP 0076 00).
5. Check for damaged or defective APU generator (WP 0083 00).
  - a. Replace defective APU generator (WP 0083 00).
6. Check for defective master relay.
  - a. Repair or replace master relay.
7. Check main power bus.
  - a. Repair or replace defective components.

**CORRECTIVE ACTION –Continued**

8. Check for defective high voltage powerpack.
  - a. Replace infrared powerpack, if defective.

**END OF WORK PACKAGE**

**INTERMEDIATE MAINTENANCE**  
**RECOVERY VEHICLE, FULL TRACKED: MEDIUM, M88A1**  
**NSN 2350-00-122-6826, EIC AQA**

**MAIN WINCH CIRCUIT (MAIN HYDRAULIC SYSTEM) TROUBLESHOOTING PROCEDURE**

**INITIAL SETUP:**

**Test Equipment**

Gage (item 9, WP 0086 00)  
 Tester kit, hydraulic pump (item 20, WP 0086 00)

**References (cont.)**

TM 9-2350-256-10  
 TM 9-2350-256-20  
 WP 0051 00

**Tools and Special Tools**

Tool kit, general mechanic's (item 34, WP 0086 00)

WP 0056 00  
 WP 0057 00

**References**

FO-2  
 FO-3

WP 0060 00  
 WP 0063 00  
 WP 0065 00  
 WP 0066 00

**Troubleshooting Procedure**

**Main Winch Circuit (Main Hydraulic System)**

**Symptom**

Main winch circuit (main hydraulic system) malfunctioning.

**Malfunction**

Main winch will not operate. Do steps 1 thru 14.

Main winch pays in and out under no load, but will not pay in or out under load. Do steps 15 thru 21.

Main winch pays in but will not pay out. Do steps 22 thru 24.

Main winch pays out but will not pay in. Do steps 25 and 26.

Main winch creeps in either direction when in hold position. Do step 27.

Main winch will not hold load. Do steps 28 and 29.

Insufficient main system oil pressure. Do steps 30 thru 32.

Level winder not operating. Do steps 33 thru 35.

Level winder not operating properly. Do step 36.

**CORRECTIVE ACTION**

**CAUTION**

Close APU emergency winch control valve for main hydraulic system operation.

1. Attempt operation of hoist winch, boom, and spade.
  - a. If hoist winch, boom, and spade operate, proceed to step 9.

**CORRECTIVE ACTION –Continued**

- b. If hoist winch, boom, and spade do not operate, proceed to step 2.
2. Inspect mechanical transmission drive shaft.
  - a. If not rotating, repair or replace (WP 0066 00).
3. Inspect mechanical transmission for broken or restricted hose.
  - a. Replace mechanical transmission hose (TM 9-2350-256-20).
4. Inspect mechanical transmission output shaft. If not rotating, proceed with mechanical transmission clutch pressure check. Install pressure gage in mechanical transmission clutch pressure hose. For location, refer to TM 9-2350-256-20. With engine operating at 1800 rpm and power control valve lever in ON position, normal operating pressure is  $150 \pm 10$  psi ( $1034 \pm 69$  kPa).
  - a. Remove mechanical transmission and main hydraulic pump assembly (WP 0065 00).
  - b. Replace mechanical transmission (WP 0065 00).
5. Test for defective power control valve. Remove hose no. 66 from valve. With power control valve lever in ON position and mechanical transmission input shaft rotating, oil should flow from the valve port.
  - a. Replace power control valve (WP 0051 00).
6. Inspect main hydraulic pump for broken or damaged shaft coupling.
  - a. Remove mechanical transmission and main hydraulic pump assembly (WP 0065 00).
  - b. Repair or replace shaft coupling (WP 0065 00).

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**WARNING**

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Test components must be capable of withstanding a working pressure of 1950–2050 psi (13,445–14,135 kPa) (step 7 only).

**NOTE**

After performing main hydraulic pump test, return all plumbing to original configuration.

7. Test main hydraulic pump. Remove check valve and tee between hose no. 4A and hose no. 4B. Install main hydraulic pump pressure tester kit between hose no. 4A and hose no. 4B. Install test pressure gage in tee.

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**CAUTION**

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Make sure that the load valve is in full open position before performing test. When performing main hydraulic pump pressure test, do not restrict oil flow beyond operating pressure.

With main engine operating at 1800 rpm, operating pressure should be 1950–2050 psi (13,445–14,135 kPa) when restricting flow using load valve.

After testing, remove hose no. 4B from pump port to no. 1. Remove pilot-operated relief and unloading valve assembly from pump port no. 44. Install hose no. 4B on pump port no. 44.

With main engine operating at 1800 rpm, operating pressure should be 1950–2050 psi (13,445–14,135 kPa) when restricting flow using load valve.

- a. Remove mechanical transmission and main hydraulic pump assembly (WP 0065 00).
- b. Replace main hydraulic pump (WP 0065 00).



**CORRECTIVE ACTION –Continued**

8. Test for improperly adjusted pilot operated relief and unloading valve. Install test gage in valve gage port. With engine operating at 1800 rpm, and spade in stowed position, place spade combination control valve lever in RAISE position and adjust relief valve.
  - a. Adjust relief pressure to 1950–2050 psi (13,445–14,135 kPa). For location of valve gage port and adjusting screw, refer to WP 0065 00.
9. Inspect all hydraulic hoses and connections for visible indication of oil leaks.
  - a. Repair leaks or replace hydraulic hose (TM 9-2350-256-20).
10. Test combination control valve. Install pressure gage in test gage port no. 50 at main winch level winder. Remove hose no. 21A from valve and plug outlet of valve. If no pressure is indicated on gage when operating hydraulic system, it indicates a faulty combination control valve. For location of test gage port, refer to WP 0051 00.
  - a. Replace and adjust combination control valve (WP 0051 00).
  - b. Notify next higher level maintenance activity or major unit commander.
11. Test control valve. Install pressure gage in combination control valve port no. 7. If no pressure is established on gage when actuating control valve, but if pressure is established when removing hose no. 21A from control valve and plugging outlet, it indicates a faulty main winch control valve.
  - a. Replace main winch control valve (WP 0063 00).
12. Test for hydraulic motor failure. Remove hose no. 47 from rear of hydraulic motor. A large volume of oil discharged from port when main winch control valve is engaged indicates a faulty motor.
  - a. Replace hydraulic motor (WP 0065 00).
13. Inspect system selector valve lever for improper position.
  - a. Place system selector valve lever in MAIN position.
14. Mechanical failure of main winch gear train.
  - a. Remove main winch and spade assembly (WP 0051 00).
  - b. Replace main winch (WP 0051 00).
15. Prepare the hydraulic system for operation per TM 9-2350-256-10.
  - a. Verify that the APU emergency winch control valve is in NORMAL OPERATION position (TM 9-2350-256-10).
16. Main winch will be in low gear.
17. Conduct all hydraulic operations in 1800 rpm or governed engine speed.

**NOTE**

TM 9-2350-256-10 states minimum engine speed for winching operations is 1500 rpm.

18. Conduct all hydraulic operation verifications with a hydraulic reservoir temperature of 110–120°F (43–49°C).
19. Verify main hydraulic pressure in accordance with step 8.
20. If hoist winch, boom, and spade operate properly, proceed to steps 9 thru 14.

**NOTE**

This would indicate satisfactory main hydraulic pump operation.

**CORRECTIVE ACTION –Continued**

21. If the problem is still unresolved and system pressure has been verified to be 1950–2050 psi (13,445–14,135 kPa), perform the following:
  - a. Install pressure gage in test port no. 50 at main winch level winder. For location of test gage port, refer to WP 0051 00.
  - b. Adjust main winch (WP 0051 00).
  - c. Verify pressure reading of approximately 1425 psi (9825 kPa). The pressure must be stable.
    - (1) Extremely low pressure (below 1300 psi [8964 kPa]) would be an indication of improper relief valve setting or a faulty combination control valve.
    - (2) Fluctuating and unstable hydraulic pressure is an indication of a faulty combination control valve.
  - d. If fluctuating and unstable hydraulic pressure is experienced, replace the main winch combination control valve.
  - e. If extremely low pressure is experienced (below 1300 psi [8964 kPa]), readjust the main winch pressure to 1400 psi (9653 kPa). The pressure must be stable and without fluctuation. If readjustment cannot be accomplished, replace the main winch combination control valve. Adjustment to the valve is accomplished by cutting the lockwire to the acorn nut, removing the nut, and loosening the locknut. Turn the adjusting screw 1/8 of a turn at a time for adjustment. Turn the screw "in" to increase pressure. (Turning "out" decreases pressure.) The final pressure setting should be verified with the locking nut tightened. Secure the acorn nut with lockwire.

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**WARNING**

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Do not exceed a 1400–1450 psi (9653–9998 kPa) pressure relief setting. Excessive pressure will produce main winch cable pull valves in excess of vehicle specification—bodily injury could occur.

- f. Readjust the brakes for proper function (WP 0057 00).

**NOTE**

The hydraulic pressures stated above are for troubleshooting only and shall not be used as a substitute for load checks to see main winch cable line pull valves.

22. Remove main winch brake cover (WP 0057 00) and check if main winch brake is releasing.
  - a. Adjust brake (WP 0057 00).
23. Remove hydraulic brake cylinder hose no. 29 and inspect for restriction.
  - a. Replace restricted or damaged hose (TM 9-2350-256-20).
24. Remove main winch brake cylinder and test for malfunction (WP 0056 00).
  - a. Replace main winch brake cylinder.
25. Inspect for restricted pilot hose between main winch control valve and combination control valve (refer to FO-3 and trace pilot circuit).
  - a. Replace restricted or damaged pilot hose (TM 9-2350-256-20).
26. Broken free-wheeling ratchet bracket assembly unit in main winch.
  - a. Remove main winch and spade assembly (WP 0051 00).
  - b. Replace main winch (WP 0051 00).

**CORRECTIVE ACTION –Continued**

27. Inspect for restricted pilot hose or main control valve (refer to FO-2 and FO-3 and trace hose and valve for restriction).
  - a. Replace any restricted pilot hose (TM 9-2350-256-20).
  - b. Remove restriction or replace control valve (WP 0051 00).

**NOTE**

In cold weather, oil viscosity increases, causing a retarded flow of oil and possibly causing main winch to creep. Proper warmup will correct.

28. Inspect main winch brake for proper adjustment.
  - a. Adjust main winch brake (WP 0057 00).
29. Remove main winch brake cover and inspect for worn brake lining (WP 0057 00).
30. Test mechanical transmission clutch pressure. Install pressure gage in mechanical transmission clutch pressure hose. For location, refer to TM 9-2350-256-20. With engine operating at 1800 rpm, and power control valve lever in ON position, normal operating pressure is  $150 \pm 10$  psi ( $1034 \pm 69$  kPa).
  - a. Remove mechanical transmission and main hydraulic pump assembly (WP 0065 00).
  - b. Replace mechanical transmission (WP 0065 00).

**WARNING**

Test components must be capable of withstanding a working pressure of 1950–2050 psi (13,445–14,135 kPa) (step 31 only).

**NOTE**

After performing main hydraulic pump test, return all plumbing to original configuration.

31. Test main hydraulic pump. Remove check valve and tee between hose no. 4A and hose no. 4B. Install main hydraulic pump tester kit between hose no. 4A and hose no. 4B. Install test pressure gage in tee.

**CAUTION**

Make sure that the load valve is in full open position before performing test. When performing main hydraulic pump pressure test, do not restrict oil flow beyond operating pressure.

With main engine operating at 1800 rpm, operating pressure should be 1950–2050 psi (13,445–14,135 kPa) when restricting flow using load valve.

After testing, remove hose no. 4B from pump port no. 1. Remove pilot-operated relief and unloading valve assembly from pump port no. 44. Install hose no. 4B on pump port no. 44.

With main engine operating at 1800 rpm, operating pressure should be 1950–2050 psi (13,445–14,135 kPa) when restricting flow using load valve.

- a. Remove mechanical transmission and main hydraulic pump assembly (WP 0065 00).
  - b. Replace main hydraulic pump (WP 0065 00).
32. Inspect system selector valve lever for improper position.
    - a. Place system selector valve lever in MAIN position.

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**CORRECTIVE ACTION –Continued**

33. Inspect hoses and fittings for visible indication of oil leaks. Repair or replace hoses and fittings (WP 0060 00).
34. Inspect level winder valve spool and cylinder rod for leaks.
  - a. Remove main winch and spade assembly (WP 0051 00).
  - b. Replace level winder (refer to WP 0060 00).
35. Inspect level winder control valve actuating mechanism for broken parts.
  - a. Remove control valve actuating mechanism (WP 0060 00).
  - b. Repair control valve actuating mechanism (WP 0060 00).
36. Inspect level winder for improper adjustment (evident by uneven wrap of cable).
  - a. Adjust level winder assembly (WP 0060 00).

**END OF WORK PACKAGE**

**INTERMEDIATE MAINTENANCE  
RECOVERY VEHICLE, FULL TRACKED: MEDIUM, M88A1  
NSN 2350-00-122-6826, EIC AQA**

**HOIST WINCH CIRCUIT (MAIN HYDRAULIC SYSTEM) TROUBLESHOOTING PROCEDURE**

**INITIAL SETUP:**

**Test Equipment**

Gage (item 9, WP 0086 00)  
Tester kit, hydraulic pump ( item 20, WP 0086 00)

**Tools and Special Tools**

Tool kit, general mechanic's (item 34, WP 0086 00)

**References**

FO-4  
FO-5

**References (cont.)**

TM 9-2350-256-20  
WP 0051 00  
WP 0053 00  
WP 0058 00  
WP 0059 00  
WP 0063 00  
WP 0065 00  
WP 0066 00

**Troubleshooting Procedure**

**Hoist Winch Circuit (main Hydraulic System)**

**Symptom**

Hoist winch circuit (main hydraulic system) malfunctioning.

**Malfunction**

Hoist winch will not operate. Do steps 1 thru 14.

Hoist winch pays in but will not pay out. Do steps 15 thru 18.

Hoist winch pays out but will not pay in. Do steps 19 and 20.

Hoist winch creeps in either direction when in hold position. Do step 21.

Hoist winch will not hold load. Do steps 22 thru 24.

Insufficient main system oil pressure. Do steps 25 thru 27.

**CORRECTIVE ACTION**

**CAUTION**

Close APU emergency winch control valve for main hydraulic system operation.

1. Attempt operation of main winch, boom, and spade.
  - a. If main winch, boom, and spade operate, proceed to step 9.
  - b. If main winch, boom, and spade do not operate, proceed to step 2.
2. Inspect mechanical transmission drive shaft.
  - a. If not rotating, repair or replace (WP 0066 00).
3. Inspect mechanical transmission for broken or restricted hose.
  - a. Replace mechanical transmission hose (TM 9-2350-256-20).

**CORRECTIVE ACTION –Continued**

4. Inspect mechanical transmission outfit shaft. If not rotating, proceed with mechanical transmission clutch pressure check. Install pressure gage in mechanical transmission clutch pressure line. For location, refer to TM 9-2350-256-20.  
  
With engine operating at 1800 rpm, and power control valve lever in ON position, normal operating pressure is  $150 \pm 10$  psi ( $1034 \pm 69$  kPa).
  - a. Remove mechanical transmission and main hydraulic pump assembly (WP 0065 00).
  - b. Replace mechanical transmission (WP 0065 00).
5. Test for defective power control valve. Remove hose no. 66 from valve. With power control valve lever in ON position, and mechanical transmission input shaft rotating, oil should flow from valve port.
  - a. Replace power control valve (WP 0053 00).
6. Inspect main hydraulic pump for broken or damaged shaft coupling.
  - a. Remove mechanical transmission and main hydraulic pump assembly (WP 0065 00).
  - b. Repair or replace shaft coupling (WP 0065 00).

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**WARNING**

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Test components must be capable of withstanding a working pressure of 1950–2050 psi (13,445–14,135 kPa) (step 7 only).

**NOTE**

After performing main hydraulic pump test, return all plumbing to original configuration.

7. Test main hydraulic pump. Remove check valve and tee between hose no. 4A and hose no. 4B. Install main hydraulic pump pressure tester kit between hose no. 4A and hose no. 4B. Install test pressure gage in tee.

**CAUTION**

Make sure that the load valve is in full open position before performing test. When performing main hydraulic pump pressure test, do not restrict oil flow beyond operating pressure.

With main engine operating at 1800 rpm, operating pressure should be 1950–2050 psi (13,445–14,135 kPa) when restricting flow using load valve.

After testing, remove hose no. 4B from pump port no. 1. Remove pilot-operated relief and unloading valve assembly from pump port no. 44. Install hose no. 4B on pump port no. 44.

With main engine operating at 1800 rpm, operating pressure should be 1950–2050 psi (13,445–14,135 kPa) when restricting flow using load valve.

- a. Remove mechanical transmission and main hydraulic pump assembly (WP 0065 00).
  - b. Replace main hydraulic pump (WP 0065 00).
8. Test for improperly adjusted pilot operated relief and unloading valve. Install test gage in valve gage port. With engine operating at 1800 rpm and spade in stowed position, place spade combination control valve lever in RAISE position and adjust relief valve.
    - a. Adjust relief pressure to 1950–2050 psi (13,445–14,135 kPa). For location of valve gage port and adjusting screw, refer to WP 0065 00.

**CORRECTIVE ACTION –Continued**

9. Inspect all hydraulic hoses and connections for visible indication of oil leaks.
  - a. Repair leaks or replace hydraulic hose (TM 9-2350-256-20).
10. Test combination control valve. Install pressure gage in valve gage port. Remove hose no. 23A from valve, and plug outlet of valve. If no pressure is indicated on gage when operating hydraulic system, it indicates a faulty combination control valve. For location of test gage port, refer to WP 0053 00.
  - a. Replace and adjust combination valve (WP 0053 00).
11. Test control valve. Install pressure gage in combination control valve port no. 21. If no pressure is established on gage when actuating control valve, but if pressure is established when removing hose no. 23A from control valve and plugging outlet, it indicates a faulty hoist winch control valve.
  - a. Replace hoist winch control valve (WP 0063 00).
12. Test for hydraulic motor failure. Remove hose no. 48 from rear of hydraulic motor. A large volume of oil discharged from port when hoist winch control valve is engaged indicates a faulty motor.
  - a. Replace hydraulic motor (WP 0065 00).
13. Inspect system selector valve lever for improper position.
  - a. Place system selector valve lever in MAIN position.
14. Mechanical failure of hoist winch gear train.
  - a. Remove hoist winch assembly (WP 0053 00).
  - b. Replace hoist winch (WP 0053 00).
15. Remove hoist winch brake cover (WP 0059 00), and check if hoist winch brake is releasing.
  - a. Adjust brake (WP 0058 00).
16. Remove hydraulic brake cylinder hose no. 28 and inspect for restriction.
  - a. Replace restricted or damaged hose (TM 9-2350-256-20).
17. Remove hoist winch brake cylinder and test for malfunction (WP 0058 00).
  - a. Replace hoist winch brake cylinder.
18. Adjust counterbalance valve (WP 0053 00).
  - a. Replace counterbalance valve if defective (WP 0053 00).
19. Inspect for restricted pilot hose between hoist winch control valve and combination control valve (refer to FO-5 and trace pilot circuit).
  - a. Replace restricted or damaged pilot hose (TM 9-2350-256-20).
20. Broken, free-wheeling ratchet brake assembly unit in hoist winch.
  - a. Remove hoist winch assembly (WP 0053 00).
  - b. Replace hoist winch assembly (WP 0053 00).
21. Inspect for restricted pilot hose or hoist winch control valve (refer to FO-4 and FO-5 and trace hose and valve for restriction).
  - a. Replace any restricted pilot hose (TM 9-2350-256-20).
  - b. Remove restriction or replace control valve (WP 0053 00).

**NOTE**

In cold weather, oil viscosity increases, causing a retarded flow of oil and possibly causing winch to creep. Proper warmup will correct.

22. Inspect hoist winch brake for proper adjustment.

**CORRECTIVE ACTION –Continued**

- a. Adjust hoist winch brake (WP 0058 00).
23. Remove hoist winch brake cover and inspect for worn brake lining.
  - a. Replace brake lining (WP 0059 00).
24. Defective counterbalance valve.
  - a. Replace counterbalance valve (WP 0053 00).
25. Test mechanical transmission clutch pressure. Install pressure gage in mechanical transmission clutch pressure hose. For location, refer to TM 9-2350-256-20. With engine operating at 1800 rpm, and power control valve lever in ON position, normal operating pressure is  $150 \pm 10$  psi ( $1034 \pm 69$  kPa).
  - a. Remove mechanical transmission and main hydraulic pump assembly (WP 0065 00).
  - b. Replace mechanical transmission (WP 0065 00).

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**WARNING**

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Test components must be capable of withstanding a working pressure of 1950–2050 psi (13,445–14,135 kPa) (step 26 only).

**NOTE**

After performing main hydraulic pump test, return all plumbing to original configuration.

26. Test main hydraulic pump. Remove check valve and tee between hose no. 4A and hose no. 4B. Install main hydraulic pump pressure tester kit between hose no. 4A and hose no. 4B. Install test pressure gage in tee.

**CAUTION**

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Make sure that the load valve is in full open position before performing test. When performing main hydraulic pump pressure test, do not restrict oil flow beyond operating pressure.

With main engine operating at 1800 rpm, operating pressure should be 1950–2050 psi (13,445–14,135 kPa) when restricting flow using load valve.

After testing, remove hose no. 4B from pump no. 1. Remove pilot-operated relief and unloading valve assembly from pump port no. 44. Install hose no. 4B on pump port no. 44.

With main engine operating at 1800 rpm, operating pressure should be 1950–2050 psi (13,445–14,135 kPa) when restricting flow using load valve.

- a. Remove mechanical transmission and main hydraulic pump assembly (WP 0065 00).
- b. Replace main hydraulic pump (WP 0065 00).
27. Inspect system selector valve for improper position.
  - a. Place system selector valve lever in MAIN position.

**END OF WORK PACKAGE**



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**INTERMEDIATE MAINTENANCE**  
**RECOVERY VEHICLE, FULL TRACKED: MEDIUM, M88A1**  
**NSN 2350-00-122-6826, EIC AQA**

**MECHANICAL TRANSMISSION AND MAIN HYDRAULIC PUMP CIRCUIT (MAIN HYDRAULIC SYSTEM)**  
**TROUBLESHOOTING PROCEDURE**

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**INITIAL SETUP:****Test Equipment**

Gage (item 9, WP 0086 00)  
 Tester kit, hydraulic pump (item 20, WP 0086 00)

**References**

TM 9-2350-256-20  
 WP 0065 00  
 WP 0066 00

**Tools and Special Tools**

Tool kit, general mechanic's (item 34, WP 0086 00)

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**Troubleshooting Procedure****Mechanical transmission and Main Hydraulic Pump Circuit (Main Hydraulic System)****Symptom**

Mechanical transmission and main hydraulic pump circuit (main hydraulic system) malfunctioning.

**Malfunction**

Mechanical transmission fails to operate. Do steps 1 thru 4.

Main hydraulic pump fails to engage. Do steps 5 and 6.

Mechanical transmission overheating. Do steps 7 thru 9.

Mechanical transmission slipping or chattering. Do step 10.

Mechanical transmission fails to disengage main hydraulic pump. Do steps 11 and 12.

Main hydraulic pump noisy. Do steps 13 thru 15.

**CORRECTIVE ACTION**

1. Inspect mechanical transmission drive shaft.
  - a. If not rotating, repair or replace (WP 0066 00).
2. Inspect mechanical transmission for broken or restricted hose.
  - a. Replace mechanical transmission hose (TM 9-2350-256-20).
3. Inspect mechanical transmission output shaft to main hydraulic pump. If not rotating, proceed with mechanical transmission clutch pressure check. Install pressure gage in mechanical transmission clutch pressure line. For location, refer to TM 9-2350-256-20. With engine operating at 1800 rpm and power control valve lever in ON position, normal operating pressure is  $150 \pm 10$  psi ( $1034 \pm 69$  kPa).
  - a. Remove mechanical transmission and main hydraulic pump assembly (WP 0065 00).
  - b. Replace mechanical transmission (WP 0065 00).
4. Test for defective power control valve or restricted hose. Remove hose no. 66 from mechanical transmission. With mechanical transmission drive shaft rotating, and power control valve lever placed in ON position, oil should flow from hose.
  - a. Replace defective power control valve (WP 0065 00).

**CORRECTIVE ACTION –Continued**

- b. Replace restricted or damaged hose (TM 9-2350-256-20).
5. Inspect for broken mechanical transmission and main hydraulic pump shaft coupling.
  - a. Remove mechanical transmission and main hydraulic pump assembly (WP 0065 00).
  - b. Repair or replace shaft coupling (WP 0065 00).
6. Test for low hydraulic pressure to mechanical transmission clutch. Install pressure gage in mechanical transmission clutch pressure hose. For location, refer to TM 9-2350-256-20. With engine operating at 1800 rpm, and power control valve lever in ON position, normal operating pressure should be  $150 \pm 10$  psi ( $1034 \pm 69$  kPa).
  - a. Remove mechanical transmission and main hydraulic pump assembly (WP 0065 00).
  - b. Replace mechanical transmission (WP 0065 00).
7. Inspect mechanical transmission for low oil level.
  - a. Add oil to bring to proper level (TM 9-2350-256-20).
8. Test for faulty mechanical transmission lubrication pump. Remove pipe plug from mechanical transmission test gage port and install pressure gage. For location of test gage port, refer to TM 9-2350-256-20. With engine operating at 1800 rpm, normal operating pressure is 10–15 psi (69–103 kPa).
  - a. Remove mechanical transmission and main hydraulic pump assembly (WP 0065 00).
  - b. Replace mechanical transmission (WP 0065 00).
9. Test for low hydraulic pressure to mechanical transmission clutch. Install pressure gage in mechanical transmission clutch pressure hose. For location, refer to TM 9-2350-256-20. With engine operating at 1800 rpm, and power control valve lever in ON position, normal operating pressure should be  $150 \pm 10$  psi ( $1034 \pm 69$  kPa).
  - a. Remove mechanical transmission and main hydraulic pump assembly (WP 0065 00).
  - b. Replace mechanical transmission (WP 0065 00).
10. Test for low hydraulic pressure to mechanical transmission clutch. Install pressure gage in mechanical transmission clutch pressure hose. For location, refer to TM 9-2350-256-20. With engine operating at 1800 rpm, and power control valve lever in ON position, normal operating pressure should be  $150 \pm 10$  psi ( $1034 \pm 69$  kPa).
  - a. Remove mechanical transmission and main hydraulic pump assembly (WP 0065 00).
  - b. Replace mechanical transmission (WP 0065 00).
11. Test for hydraulic overload. Remove hose no. 66 from mechanical transmission clutch housing. If mechanical transmission disengages with hose removed, it indicates a faulty power control valve.
  - a. Replace power control valve (WP 0065 00).
12. If mechanical transmission does not disengage with hose removed, it indicates a faulty mechanical transmission clutch assembly.
  - a. Remove mechanical transmission and main hydraulic pump assembly (WP 0065 00).
  - b. Replace mechanical transmission (WP 0065 00).
13. Inspect hydraulic reservoir for low oil level.
  - a. Add oil to bring to proper level (TM 9-2350-256-20).

**CORRECTIVE ACTION –Continued**

14. Inspect for collapsed main hydraulic pump suction hose.
  - a. Replace suction hose (TM 9-2350-256-20).

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**WARNING**

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Test components must be capable of withstanding a working pressure of 1950–2050 psi (13,445–14,135 kPa) (step 15 only).

**NOTE**

After performing main hydraulic pump test, return all plumbing to original configuration.

15. Test main hydraulic pump. Remove check valve and tee between hose no. 4A and hose no. 4B. Install main hydraulic pump pressure tester kit between hose no. 4A and hose no. 4B. Install test pressure gage in tee.

**CAUTION**

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Make sure that the load valve is in full open position before performing test. When performing main hydraulic pump pressure test, do not restrict pressure flow beyond operating pressure.

With main engine operating at 1800 rpm, operating pressure should be 1950–2050 psi (13,445–14,135 kPa) when restricting flow using load valve.

After testing, remove hose no. 4B from pump no. 1. Remove pilot-operated relief and unloading valve assembly from pump port no. 44. Install hose no. 4B on pump port no. 44.

With main engine operating at 1800 rpm, operating pressure should be 1950–2050 psi (13,445–14,135 kPa) when restricting flow using load valve.

- a. Remove mechanical transmission and main hydraulic pump assembly (WP 0065 00).
- b. Replace main hydraulic pump (WP 0065 00).

**END OF WORK PACKAGE**



**INTERMEDIATE MAINTENANCE**  
**RECOVERY VEHICLE, FULL TRACKED: MEDIUM, M88A1**  
**NSN 2350-00-122-6826, EIC AQA**

**SPADE CIRCUIT (MAIN HYDRAULIC SYSTEM) TROUBLESHOOTING PROCEDURE**

**INITIAL SETUP:**

**Test Equipment**

Gage (item 9, WP 0086 00)  
 Tester kit, hydraulic pump (item 20, WP 0086 00)

**References**

TM 9-2350-256-20  
 WP 0051 00  
 WP 0065 00  
 WP 0066 00

**Tools and Special Tools**

Tool kit, general mechanic's (item 34, WP 0086 00)

**Troubleshooting Procedure**

**Spade Circuit (Main Hydraulic System)**

**Symptom**

Spade circuit (main hydraulic system) malfunctioning.

**Malfunction**

Spade will not operate. Do steps 1 thru 15.

Spade will not hold with spade combination control valve lever in any position. Do steps 16 thru 19.

Spade will operate only partially. Do steps 20 thru 23.

**CORRECTIVE ACTION**

1. Attempt operation of main winch, hoist winch, and boom.
  - a. If main winch, hoist winch, and boom operate, proceed to step 13.
  - b. If main winch, hoist winch, and boom do not operate, proceed with step 2.
2. Inspect mechanical transmission drive shaft.
  - a. If not rotating, repair or replace (WP 0066 00).
3. Inspect mechanical transmission for broken or restricted hose.
  - a. Replace mechanical transmission hose (TM 9-2350-256-20).
4. Inspect mechanical transmission output shaft. If not rotating, proceed with mechanical transmission clutch pressure check. Install pressure gage in mechanical transmission clutch pressure line. For location, refer to TM 9-2350-256-20. With engine operating at 1800 rpm and power control valve lever in ON position, normal operating pressure is  $150 \pm 10$  psi ( $1034 \pm 69$  kPa).
  - a. Remove mechanical transmission and main hydraulic pump assembly (WP 0065 00).
  - b. Replace mechanical transmission (WP 0065 00).
5. Test for defective power control valve or restricted hose. Remove hose no. 66 from mechanical transmission. With mechanical transmission drive shaft rotating, and power control valve lever placed in ON position, oil should flow from hose.
  - a. Replace defective power control valve (WP 0065 00).
  - b. Replace restricted or damaged hose (TM 9-2350-256-20).

**CORRECTIVE ACTION –Continued**

6. Inspect main hydraulic pump for broken or damaged shaft coupling.
  - a. Remove mechanical transmission and main hydraulic pump assembly (WP 0065 00).
  - b. Repair or replace shaft coupling (WP 0065 00).

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**WARNING**

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Test components must be capable of withstanding a working pressure of 1950–2050 psi (13,445–14,135 kPa) (step 7 only).

**NOTE**

After performing main hydraulic pump test, return all plumbing to original configuration.

7. Test main hydraulic pump. Remove check valve and tee between hose no. 4A and hose no. 4B. Install main hydraulic pump pressure tester kit between hose no. 4A and hose no. 4B. Install test pressure gage in tee.

**CAUTION**

---

Make sure that the load valve is in full open position before performing test. When performing main hydraulic pump pressure test, do not restrict oil flow beyond operating pressure.

With main engine operating at 1800 rpm, operating pressure should be 1950–2050 psi (13,445–14,135 kPa) when restricting flow using load valve.

After testing, remove hose no. 4B from pump port no. 1. Remove pilot-operated relief and unloading valve assembly from pump port no. 44. Install hose no. 4B on pump port no. 44.

With main engine operating at 1800 rpm, operating pressure should be 1950–2050 psi (13,445–14,135 kPa) when restricting flow using load valve.

- a. Remove mechanical transmission and main hydraulic pump assembly (WP 0065 00).
  - b. Replace main hydraulic pump (WP 0065 00).
8. Test for improperly adjusted pilot-operated relief and unloading valve. Install test gage in valve gage port. With engine operating at 1800 rpm, and spade in stowed position, place spade combination control valve lever in RAISE position and adjust relief valve.
    - a. Adjust relief pressure to 1950–2050 psi (13,445–14,135 kPa). For location of valve gage port and adjusting screw, refer to WP 0065 00.
  9. Inspect all hydraulic hoses and connections for visible indication of oil leaks.
    - a. Repair leaks or replace hydraulic hose (TM 9-2350-256-20).
  10. Inspect system selector valve lever for improper position.
    - a. Place system selector valve lever in MAIN position.

**CORRECTIVE ACTION –Continued**

11. Inspect APU emergency winch control valve lever for improper position.
  - a. Place APU emergency winch control valve lever in CLOSED position.

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**WARNING**

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Main winch must be in high range (step 12 only).

12. Test for faulty pilot-operated relief and unloading valve. Attempt operation of boom and winches. If winches operate, but boom and spade fail to operate, it indicates a faulty pilot-operated relief and unloading valve. Shift main winch into high range and inhaul cable completely (clevis contacting front of plate). Continue holding main winch control lever in this position and attempt to operate spade combination control valve lever. Release both levers to neutral and operate spade combination control valve lever.
  - a. If the spade does not function, replace pilot-operated relief and unloading valve (WP 0051 00).
13. Test for spade combination control valve failure. Install pressure gage in pilot operated relief and unloading valve gage port. If, when actuating boom combination control valve lever, operating pressure (1950–2050 psi [13,445–14,135 kPa]) is recorded on pressure gage, but when actuating spade combination control valve lever, no pressure is recorded on gage; it indicates a faulty spade combination control valve. For location of valve gage port, refer to WP 0065 00.
  - a. Replace spade combination control valve (WP 0051 00).
14. Test for restricted or blocked cylinder return hose. Install pressure gage in pilot operated relief and unloading valve gage port. If, when actuating spade combination control valve lever, operating pressure (1950–2050 psi [13,445–14,135 kPa]) is recorded, return hose is restricted or blocked. For location of valve gage port, refer to WP 0065 00.
  - a. Remove any restriction or replace blocked hose (TM 9-2350-256-20).
15. Test for mechanical failure of hydraulic cylinders. Install test gage in pilot-operated relief and unloading valve gage port. If, when actuating the spade combination control valve lever, operating pressure (1950–2050 psi [13,445–14,135 kPa]) is recorded and no return hose is blocked, it indicates mechanical failure of a hydraulic cylinder. For location of valve gage port, refer to WP 0065 00.
  - a. Remove main winch and spade assembly (WP 0051 00).
  - b. Replace spade cylinder (WP 0051 00).
16. Test for spade combination control valve failure. Install pressure gage in pilot operated relief and unloading valve gage port. If, when actuating boom combination control valve lever, operating pressure (1950–2050 psi [13,445–14,135 kPa]) is recorded on pressure gage, but when actuating spade combination control valve lever, no pressure is recorded on gage; it indicates a faulty spade combination control valve. For location of valve gage port, refer to WP 0065 00.
  - a. Replace spade combination control valve (WP 0051 00).
17. Worn spade hydraulic cylinder packings.
  - a. Remove main winch and spade assembly (WP 0051 00).
  - b. Replace spade cylinder (WP 0051 00).
18. Ruptured hydraulic hose.
  - a. Replace hydraulic hose (TM 9-2350-256-20).
19. Damaged spade release valve.
  - a. Replace spade release valve (TM 9-2350-256-20).

**CORRECTIVE ACTION –Continued**

20. Test for improperly adjusted pilot operated relief and unloading valve. Install test gage in valve gage port. With engine operating at 1800 rpm, and spade in stowed position, place spade combination control valve lever in RAISE position and adjust relief valve.
  - a. Adjust relief pressure to 1950–2050 psi (13,445–14,135 kPa). For location of valve gage port and adjusting screw, refer to WP 0065 00.
21. Inspect for loose spade cylinder attaching pins.
  - a. Remove main winch and spade assembly (WP 0051 00).
  - b. Repair or replace attaching pins (WP 0051 00).
22. Inspect for galled spade pivot pins.
  - a. Remove main winch and spade assembly (WP 0051 00).
  - b. Replace spade pivot pins (WP 0051 00).
23. Damaged spade release valve.
  - a. Replace spade release valve (TM 9-2350-256-20).

**END OF WORK PACKAGE**



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**INTERMEDIATE MAINTENANCE**  
**RECOVERY VEHICLE, FULL TRACKED: MEDIUM, M88A1**  
**NSN 2350-00-122-6826, EIC AQA**

**HOISTING BOOM CIRCUIT (MAIN HYDRAULIC SYSTEM) TROUBLESHOOTING PROCEDURE**

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**INITIAL SETUP:****Test Equipment**

Gage (item 9, WP 0086 00)  
 Tester kit, hydraulic pump (item 14, WP 0086 00)

**Tools and Special Tools**

Tool kit, general mechanic's (item 34, WP 0086 00)

**References**

TM 9-2350-256-10

**References (cont.)**

TM 9-2350-256-20  
 WP 0051 00  
 WP 0065 00  
 WP 0066 00  
 WP 0068 00  
 WP 0079 00  
 WP 0082 00

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**Troubleshooting Procedure****Hoisting Boom Circuit (Main Hydraulic System)****Symptom**

Hoisting boom circuit (main hydraulic system) malfunctioning.

**Malfunction**

Boom will not operate. Do steps 1 thru 15.

Boom operates partially. Do steps 16 and 17.

Boom will not hold in any position. Do steps 18 and 19.

Boom will not stop automatically after live boom operation. Do steps 20 and 21.

Boom live operation does not function. Do step 22.

**CORRECTIVE ACTION**

1. Attempt operation of main winch, hoist winch, and spade.
  - a. If main winch, hoist winch, and spade operate, proceed to step 13.
  - b. If main winch, hoist winch, and spade do not operate, proceed with step 2.
2. Inspect mechanical transmission drive shaft.
  - a. If not rotating, repair or replace (WP 0066 00).
3. Inspect mechanical transmission for broken or restricted hoses.
  - a. Replace any broken or restricted hoses (TM 9-2350-256-20).
4. Test for defective power control valve or restricted hose. Remove hose no. 66 from mechanical transmission. With mechanical transmission drive shaft rotating and power control valve lever placed in ON position, oil should flow from hose.
  - a. Replace defective power control valve (WP 0065 00).
  - b. Replace restricted or damaged hose (TM 9-2350-256-20).
5. Inspect mechanical transmission output shaft. If not rotating, proceed with mechanical transmission clutch pressure check. Install pressure gage in mechanical transmission clutch pressure line. For

**CORRECTIVE ACTION –Continued**

location, refer to TM 9-2350-256-20. With engine operating at 1800 rpm and power control valve lever placed in ON position, normal operating pressure is  $150 \pm 10$  psi ( $1034 \pm 69$  kPa).

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**WARNING**

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Test components must be capable of withstanding a working pressure of 1950–2050 psi (13,445–14,135 kPa) (step 6 only).

**NOTE**

After performing main hydraulic pump test, return all plumbing to original configuration.

6. Test main hydraulic pump. Remove check valve and tee between hose no. 4A and hose no. 4B. Install main hydraulic pump pressure tester kit between hose no. 4A and hose no. 4B. Install test pressure gage in tee.

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**CAUTION**

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Make sure that the load valve is in full open position before performing test. When performing main hydraulic pump pressure test, do not restrict oil flow beyond operating pressure.

With main engine operating at 1800 rpm, operating pressure should be 1950–2050 psi (13,445–14,135 kPa) when restricting flow using load valve.

After testing, remove hose no. 4B from pump no. 1. Remove pilot-operated relief and unloading valve assembly from pump port no. 44. Install hose no. 4B on pump port no. 44.

With main engine operating at 1800 rpm, operating pressure should be 1950–2050 psi (13,445–14,135 kPa) when restricting flow using load valve.

- a. Remove mechanical transmission and main hydraulic pump assembly (WP 0065 00).
- b. Replace main hydraulic pump (WP 0065 00).
7. Inspect main hydraulic pump for broken or damaged shaft coupling.
  - a. Remove mechanical transmission and main hydraulic pump assembly (refer to WP 0065 00).
  - b. Repair or replace shaft coupling (WP 0065 00).
8. Test for improperly adjusted pilot operated relief and unloading valve. Install test gage in valve gage port. With engine operating at 1800 rpm and spade in stowed position, place spade combination control valve lever in RAISE position and adjust relief valve.
  - a. Adjust relief pressure to 1950–2050 psi (13,445–14,135 kPa). For location of valve gage port and adjusting screw, refer to WP 0065 00.
9. Inspect all hydraulic hoses and connections for visible indication of oil leaks.
  - a. Repair leaks or replace hydraulic hose (refer to TM 9-2350-256-20).
10. Inspect system selector lever for improper position.
  - a. Place system selector lever in MAIN position.

**CORRECTIVE ACTION –Continued**

11. Inspect APU emergency winch control valve lever for improper position.
  - a. Place APU emergency winch control valve lever in CLOSED position.

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**WARNING**

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Main winch must be in high range (step 12 only).

12. Test for faulty pilot operated relief and unloading valve. Attempt operation of spade and winches. If winches operate, but spade and boom fail to operate, it indicates a faulty pilot operated relief and unloading valve. Shift main winch into high range and inhaul cable completely (clevis contacting front of plate). Continue holding main winch control lever in this position and attempt to operate boom combination control valve lever. Release both levers to neutral and operate boom combination control valve lever.
  - a. If boom does not function, replace pilot operated relief and unloading valve (WP 0051 00).
13. Test for boom combination control valve failure. Install pressure gage in pilot-operated relief and unloading valve gage port. If, when actuating spade combination control valve lever, operating pressure (1950–2050 psi [13,445–14,135 kPa]) is recorded on pressure gage, but when actuating boom combination control valve lever, no pressure is recorded on gage, it indicates a faulty boom combination control valve. For location of valve gage port, refer to WP 0065 00.
  - a. Replace boom combination control valve (WP 0051 00).
14. Test for restricted hydraulic hose or flow regulator. Install pressure gage in pilot operated relief and unloading valve gage port. If, when actuating boom combination control valve lever, operating pressure [1950–2050 psi (13,445–14,135 kPa)] is recorded on pressure gage, it indicates valve is functioning properly. Inspect for restricted hydraulic hose or obstruction in flow regulator. For location of valve gage port, refer to WP 0065 00.
  - a. Replace any restricted hydraulic hose (TM 9-2350-256-20).
  - b. Remove any obstruction or replace flow regulator (WP 0065 00).
15. Inspect for mechanical failure of boom or hydraulic cylinder attaching pins.
  - a. Replace any damaged pins (WP 0068 00).
16. Test for improperly adjusted pilot operated relief and unloading valve. Install test gage in valve port. With engine operating at 1800 rpm, and spade in stowed position, place spade combination control valve lever in RAISE position and adjust relief valve.
  - a. Adjust relief pressure to 1950–2050 psi (13,445–14,135 kPa). For location of valve gage port and adjusting screw, refer to WP 0065 00.
17. Inspect for mechanical binding of boom and cylinder mounting pins.
  - a. Replace any broken or damaged pins (WP 0068 00).
18. Inspect hydraulic hoses and connections for oil leaks.
  - a. Repair leaks or replace hydraulic hose (refer to TM 9-2350-256-20).
19. Test for boom combination control valve failure. Install pressure gage in pilot operated relief and unloading valve gage port. If, when actuating spade combination control valve lever, no pressure is recorded on gage, it indicates a faulty boom combination control valve. For location of valve gage port, refer WP 0065 00.
  - a. Replace boom combination control valve (WP 0079 00).

**CORRECTIVE ACTION –Continued**

20. Inspect boom limit valve for defective or broken actuating arm linkage.
  - a. Repair or replace actuating arm linkage (WP 0082 00).
21. Inspect boom limit valves for proper adjustment.
  - a. Adjust boom limit valves (TM 9-2350-256-20).
22. Inspect boom limit valve actuating shafts for binding.
  - a. Move boom limit valve actuating arm by hand and lubricate shafts. Refer to TM 9-2350-256-10 for lubrication points.

**END OF WORK PACKAGE**

**INTERMEDIATE MAINTENANCE**  
**RECOVERY VEHICLE, FULL TRACKED: MEDIUM, M88A1**  
**NSN 2350-00-122-6826, EIC AQA**

**MAIN WINCH CIRCUIT (AUXILIARY HYDRAULIC SYSTEM) TROUBLESHOOTING PROCEDURE**

**INITIAL SETUP:**

**Test Equipment**

Gage (item 9, WP 0086 00)

**References**

TM 9-2350-256-20

WP 0063 00

WP 0083 00

**Tools and Special Tools**

Tool kit, general mechanic's (item 34, WP 0086 00)

**Troubleshooting Procedure**

**Main Winch Circuit (Auxiliary Hydraulic System)**

**Symptom**

Main winch circuit (auxiliary hydraulic system) malfunctioning.

**Malfunction**

Main winch will not operate.

**CORRECTIVE ACTION**

1. Inspect all hydraulic hoses and connections for visible indication of oil leaks.
  - a. Repair leaks or replace hydraulic hose (TM 9-2350-256-20).
2. Inspect system selector valve lever for improper position.
  - a. Place system selector valve lever in AUX position.
3. Inspect APU emergency winch control valve lever for improper position.
  - a. Place the APU emergency winch control valve lever in OPEN position.

**WARNING**

Test components must be capable of withstanding a working pressure of 1450–1550 psi (9998–10,687 kPa) (step 4 only).

4. Test for broken drive mechanism or faulty auxiliary hydraulic pump. Disconnect auxiliary hydraulic pump discharge hose no. 12. Install suitable gage valve, in conjunction with pressure gage, to outlet of auxiliary hydraulic pump. When restricting oil flow, operating pressure should be 1450–1550 psi (9998–10,687 kPa).

**CAUTION**

When performing auxiliary hydraulic pump pressure test, do not restrict oil flow beyond operating pressure.

Remove APU from vehicle, and replace broken auxiliary hydraulic pump drive mechanism parts, or faulty auxiliary hydraulic pump (WP 0083 00).

**CORRECTIVE ACTION –Continued**

5. Test for faulty or improperly adjusted relief valve within system selector valve gage port. With APU operating, and APU emergency winch control valve lever placed in CLOSED position, place system selector valve lever in AUX position, and adjust relief valve.
  - a. Adjust relief pressure to 1450–1550 psi (9998–10,687 kPa). For location of valve gage port and adjusting screw, refer to WP 0063 00.
  - b. Replace system selector valve if pressure cannot be adjusted to 1450–1550 psi (9998–10,687 kPa) (WP 0063 00).
6. Inspect for faulty check valve in hoses, nos. 4B and 6B. Refer to TM 9-2350-256-20 for hose identification.
  - a. Replace check valve (WP 0063 00).

**NOTE**

Perform following tests using main hydraulic system (step 7 only).

7. Test main winch combination control valve, and control valve. Refer to steps 10 and 11, in MAIN WINCH CIRCUIT (MAIN HYDRAULIC SYSTEM) TROUBLESHOOTING PROCEDURE.

**END OF WORK PACKAGE**

**INTERMEDIATE MAINTENANCE**  
**RECOVERY VEHICLE, FULL TRACKED: MEDIUM, M88A1**  
**NSN 2350-00-122-6826, EIC AQA**

**HOIST WINCH CIRCUIT (AUXILIARY HYDRAULIC SYSTEM) TROUBLESHOOTING PROCEDURE**

**INITIAL SETUP:**

**Test Equipment**

Gage (item 9, WP 0086 00)

**References**

TM 9-2350-256-20

WP 0063 00

WP 0083 00

**Tools and Special Tools**

Tool kit, general mechanic's (item 34, WP 0086 00)

**Troubleshooting Procedure**

**Hoist Winch Circuit (auxiliary Hydraulic System)**

**Symptom**

Hoist winch circuit (auxiliary hydraulic system) malfunctioning.

**Malfunction**

Hoist winch will not operate.

**CORRECTIVE ACTION**

1. Inspect all hydraulic hoses and connections for visible indication of oil leaks.
  - a. Repair leaks or replace hydraulic hose (TM 9-2350-256-20).
2. Inspect system selector valve lever for improper position.
  - a. Place system selector valve lever in AUX position.
3. Inspect APU emergency winch control valve lever for improper position.
  - a. Place the APU emergency winch control valve lever in OPEN position.

**WARNING**

Test components must be capable of withstanding a working pressure of 1450–1550 psi (9998–10,687 kPa) (step 4 only).

4. Test for broken drive mechanism of faulty auxiliary hydraulic pump. Disconnect auxiliary hydraulic pump discharge hose no. 12. Install suitable gate valve, in conjunction with pressure gage, to outlet of auxiliary hydraulic pump. When restricting oil flow, operating pressure should be 1450–1550 psi (9998–10,687 kPa).

**CAUTION**

When performing auxiliary hydraulic pump pressure test, do not restrict oil flow beyond operating pressure.

Remove APU from vehicle, and replace broken auxiliary hydraulic pump drive mechanism parts, or faulty auxiliary hydraulic pump (WP 0083 00).

**CORRECTIVE ACTION –Continued**

5. Test for faulty or improperly adjusted relief valve within system selector valve. Install pressure gage in system selector valve gage port. With APU operating, and APU emergency winch control valve lever placed in CLOSED position, place system selector valve lever in AUX position, and adjust relief valve.
  - a. Adjust relief pressure to 1450–1550 psi (9998–10,687 kPa). For location of valve gage port and adjusting screw, refer to WP 0063 00.
  - b. Replace system selector valve if pressure cannot be adjusted to 1450–1550 psi (9998–10,687 kPa) (WP 0063 00).
6. Inspect for faulty check valve in hoses, nos. 4B and 6B (TM 9-2350-256-20).
  - a. Replace check valve (WP 0063 00).

**NOTE**

Perform following tests using main hydraulic system (step 7 only).

7. Test hoist winch combination control valve and control valve. Refer to first SYMPTOM, steps 10 and 11, in HOIST WINCH CIRCUIT (MAIN HYDRAULIC SYSTEM) TROUBLESHOOTING PROCEDURE.

**END OF WORK PACKAGE**



**INTERMEDIATE MAINTENANCE**  
**RECOVERY VEHICLE, FULL TRACKED: MEDIUM, M88A1**  
**NSN 2350-00-122-6826, EIC AQA**

**SPADE CIRCUIT (AUXILIARY HYDRAULIC SYSTEM) TROUBLESHOOTING PROCEDURE**

**INITIAL SETUP:**

**Test Equipment**

Gage (item 9, WP 0086 00)

**References**

TM 9-2350-256-20

WP 0063 00

WP 0083 00

**Tools and Special Tools**

Tool kit, general mechanic's (item 34, WP 0086 00)

**Troubleshooting Procedure**

**SPADE CIRCUIT (AUXILIARY HYDRAULIC SYSTEM)**

**Symptom**

Spade circuit (auxiliary hydraulic system) malfunctioning.

**Malfunction**

Spade will not operate. Do steps 1 thru 6.

**CORRECTIVE ACTION**

1. Inspect all hydraulic hoses and connections for visible indication of oil leaks.
  - a. Repair leaks or replace hydraulic hose (TM 9-2350-256-20).
2. Inspect system selector valve lever for improper position.
  - a. Place system selector valve lever in AUX position.
3. Inspect APU emergency winch control valve lever for improper position.
  - a. Place the APU emergency winch control valve lever in CLOSED position.

**WARNING**

Test components must be capable of withstanding a working pressure of 1450–1550 psi (9998–10,687 kPa) (step 4 only).

4. Test for broken drive mechanism or faulty auxiliary hydraulic pump. Disconnect auxiliary hydraulic pump discharge hose no. 12. Install suitable gate valve, in conjunction with pressure gage, to outlet of auxiliary hydraulic pump. When restricting oil flow, operating pressure should be 1450–1550 psi (9998–10,687 kPa).

**CAUTION**

When performing auxiliary hydraulic pump pressure test, do not restrict oil flow beyond operating pressure.

Remove APU from vehicle, and replace broken auxiliary hydraulic pump drive mechanism parts, or faulty auxiliary hydraulic pump (WP 0083 00).

**CORRECTIVE ACTION –Continued**

5. Test for faulty or improperly adjusted relief valve within system selector valve. Install pressure gage in system selector valve gage port. With APU operating, and APU emergency winch control valve lever placed in CLOSED position, place system selector valve lever in AUX position, and adjust relief valve.
  - a. Adjust relief pressure to 1450–1550 psi (9998–10,687 kPa). For location of valve gage port and adjusting screw, refer to WP 0063 00.
  - b. Replace system selector valve if pressure cannot be adjusted to 1450–1550 psi (9998–10,687 kPa) (WP 0063 00).

**NOTE**

Perform the following tests using main hydraulic system (step 6 only).

6. Test spade combination control valve, and spade cylinders. Refer to steps 13, 14, and 15, in SPADE CIRCUIT (MAIN HYDRAULIC SYSTEM) TROUBLESHOOTING PROCEDURE.

**END OF WORK PACKAGE**

**INTERMEDIATE MAINTENANCE**  
**RECOVERY VEHICLE, FULL TRACKED: MEDIUM, M88A1**  
**NSN 2350-00-122-6826, EIC AQA**

**HOISTING BOOM CIRCUIT (AUXILIARY HYDRAULIC SYSTEM) TROUBLESHOOTING PROCEDURE**

**INITIAL SETUP:**

**Test Equipment**

Gage (item 9, WP 0086 00)

**References**

TM 9-2350-256-20

WP 0063 00

WP 0083 00

**Tools and Special Tools**

Tool kit, general mechanic's (item 34, WP 0086 00)

**Troubleshooting Procedure**

**Hoisting Boom Circuit (Auxiliary Hydraulic System)**

**Symptom**

Hoisting boom circuit (auxiliary hydraulic system) malfunctioning.

**Malfunction**

Boom will not operate.

**CORRECTIVE ACTION**

1. Inspect all hydraulic hoses and connections for visible indication of oil leaks.
  - a. Repair leaks or replace hydraulic hose (TM 9-2350-256-20).
2. Inspect system selector valve lever for improper position.
  - a. Place system selector valve lever in AUX position.
3. Inspect APU emergency winch control valve lever for improper position.
  - a. Place the APU emergency winch control valve lever in CLOSED position.

**WARNING**

Test components must be capable of withstanding a working pressure of 1450–1550 psi (9998–10,687 kPa) (step 4 only).

4. Test for broken drive mechanism or faulty auxiliary hydraulic pump. Disconnect auxiliary hydraulic pump discharge hose no. 12. Install suitable gate valve, in conjunction with pressure gage, to outlet of auxiliary hydraulic pump. When restricting oil flow, operating pressure should be 1450–1550 psi (9998–10,687 kPa).

**CAUTION**

When performing auxiliary hydraulic pump pressure test, do not restrict oil flow beyond operating pressure.

Remove APU from vehicle, and replace broken auxiliary hydraulic pump drive mechanism parts, or faulty auxiliary hydraulic pump (WP 0083 00).

**CORRECTIVE ACTION –Continued**

5. Test for faulty or improperly adjusted relief valve within system selector valve. Install pressure gage in system selector valve gage port. With APU operating, and APU emergency winch control valve lever placed in CLOSED position, place system selector valve lever in AUX position, and adjust relief valve.
  - a. Adjust relief pressure to 1450–1550 psi (9998–10,687 kPa). For location of valve gage port and adjusting screw, refer to WP 0063 00.
  - b. Replace system selector valve if pressure cannot be adjusted to 1450–1550 psi (9998–10,687 kPa) (WP 0063 00).

**NOTE**

Perform following tests using main hydraulic system (step 6 only).

6. Test boom combination control valve and flow regulators. Inspect for mechanical failure of boom or hydraulic cylinder attaching pins. Refer to steps 13, 14, and 15, in HOISTING BOOM CIRCUIT (MAIN HYDRAULIC SYSTEM) TROUBLESHOOTING PROCEDURE.

**END OF WORK PACKAGE**

**INTERMEDIATE MAINTENANCE**  
**RECOVERY VEHICLE, FULL TRACKED: MEDIUM, M88A1**  
**NSN 2350-00-122-6826, EIC AQA**

**HYDRAULIC IMPACT WRENCH (AUXILIARY HYDRAULIC SYSTEM) TROUBLESHOOTING PROCEDURE**

**INITIAL SETUP:**

**Test Equipment**

Gage (item 9, WP 0086 00)

**References**

TM 9-2350-256-10

TM 9-2350-256-20

**Tools and Special Tools**

Tool kit, general mechanic's (item 34, WP 0086 00)

WP 0063 00

WP 0083 00

**Troubleshooting Procedure**

**Hydraulic Impact Wrench (Auxiliary Hydraulic System)**

**Symptom**

Hydraulic impact wrench (auxiliary hydraulic system) malfunctioning.

**Malfunction**

Impact wrench does not operate.

**CORRECTIVE ACTION**

1. Inspect all hydraulic hoses and connections for visible indication of oil leaks.
  - a. Repair leaks or replace hydraulic hose (TM 9-2350-256-20).
2. Inspect system selector valve lever for improper position.
  - a. Place system selector valve lever in REFUEL position.

**WARNING**

Test components must be capable of withstanding a working pressure of 1450–1550 psi (9998–10,687 kPa) (step 3 only).

3. Test for broken drive mechanism or faulty auxiliary hydraulic pump. Disconnect auxiliary hydraulic pump discharge hose no. 12. Install suitable gate valve, in conjunction with pressure gage, to outlet to auxiliary hydraulic pump. When restricting oil flow, operating pressure should be 1450–1550 psi (9998–10,687 kPa).

**CAUTION**

When performing auxiliary hydraulic pump pressure test, do not restrict oil flow beyond operating pressure.

Remove APU from vehicle, and replace broken auxiliary hydraulic pump drive mechanism parts, or faulty auxiliary hydraulic pump (WP 0083 00).

4. Test for faulty or improperly adjusted relief valve within the system selector valve. Install pressure gage in system selector valve gage port. With APU operating, and APU emergency winch control

**CORRECTIVE ACTION –Continued**

valve lever placed in CLOSED position, place system selector valve lever in AUX position, and adjust relief valve.

- a. Adjust relief pressure to 1450–1550 psi (9998–10,687 kPa). For location of valve gage port and adjusting screw, refer to WP 0063 00.
  - b. Replace system selector valve if pressure cannot be adjusted to 1450–1550 psi (9998–10,687 kPa) (WP 0063 00).
5. Inspect adjustable flow regulator lever for improper setting, or faulty adjustable flow regulator. Refer to TM 9-2350-256-10 for proper setting.
    - a. If adjustable flow regulator lever is properly set, and impact wrench does not operate, replace adjustable flow regulator (WP 0063 00).
  6. Inspect fuel transfer pump control valve lever for improper position.
    - a. Place fuel transfer pump control valve lever in CLOSED position.
  7. Inspect impact wrench for oil leaks or unusual noise.
    - a. If impact wrench leaks oil, or is noisy, replace impact wrench.
    - b. If impact wrench does not leak oil, or is not noisy, and still fails to operate, replace impact wrench.

**END OF WORK PACKAGE**

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**INTERMEDIATE MAINTENANCE**  
**RECOVERY VEHICLE, FULL TRACKED: MEDIUM, M88A1**  
**NSN 2350-00-122-6826, EIC AQA**  
**AUXILIARY POWER UNIT (APU) TROUBLESHOOTING PROCEDURE**

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**INITIAL SETUP:****Test Equipment**

Cable, ground (item 5, WP 0086 00)  
 Cable assembly (item 6, WP 0086 00)  
 Cable assembly (item 7, WP 0086 00)  
 Hose assembly (item 14, WP 0086 00)  
 Hose assembly (item 15, WP 0086 00)  
 Hose assembly (item 16, WP 0086 00)  
 Hose assembly (item 17, WP 0086 00)  
 Hose assembly (item 18, WP 0086 00)

**Tools and Special Tools**

Tool kit, general mechanic's (item 34, WP 0086 00)

**Personnel Required**

Mechanics (3)

**References**

TM 9-2350-256-20  
 TM 9-2815-221-34&P  
 WP 0083 00

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**Troubleshooting Procedure****Auxiliary Power Unit (APU)****Symptom**

APU malfunctioning.

**Malfunction**

Engine fails to crank. Do steps 1 and 2.

Engine cranks but fails to start. Do steps 3 thru 5.

Engine hard to start. Do steps 6 thru 11.

Engine hard to start in cold weather. Do step 12.

Engine starts but fails to keep running. Do steps 13 thru 17.

Engine overheats. Do step 18.

Engine misfires, lacks power, or emits black smoke. Do steps 19 thru 26.

Engine knocks. Do steps 27 thru 32.

Engine uses excessive oil and emits light blue smoky exhaust. Do steps 33 and 34.

High air temperature light on APU control box fails to operate properly. Do step 35.

Low oil pressure light on APU control box fails to operate properly. Do step 35.

Oil pressure gage fails to operate. Do step 35.

Battery-generator indicator reads in yellow or lower red region with APU engine running and APU generator switch on. Do steps 36 thru 38.

Battery-generator indicator reads in yellow or lower red region with APU engine running and APU generator switch on with no auxiliary hydraulic pressure. Do step 39.

Engine does not operate at  $2000 \pm 100$  rpm under load conditions. Do steps 40 thru 47.

### **CORRECTIVE ACTION**

1. Check for defective starting system components and/or associated wiring.
  - a. Repair or replace defective starting system components and/or associated wiring (WP 0033 00, WP 0083 00, and/or TM 9-2815-221-34&P).
2. Attempt to turn engine over using a 5/8 inch, 1/2-inch-square drive socket, extension, and torque wrench set for 70 lb-ft (94.9 N•m), on the flywheel mounting screw, located at the center of the flywheel. If engine turns over, recheck electrical system. If engine fails to turn over, drain oil from APU crankcase. Remove chaincase and drive sprocket (WP 0083 00).
  - a. If engine will not turn over with 70 lb-ft (94.9 N•m) of torque applied to flywheel mounting screw, repair or replace APU engine (WP 0083 00 or TM 9-2815-221-34&P).
  - b. If engine will turn over with 70 lb-ft (94.9 N•m) or less of torque applied to the flywheel mounting screw, inspect generator and hydraulic pump for seizure. Replace defective components.
3. Check fuel shutoff switch, fuel solenoid, and associated wiring.
  - a. Repair or replace defective components (TM 9-2815-221-34&P).
4. Open the bleeder valve on the primary fuel filter to allow all the diesel fuel to drain from the filter. Have an assistant attempt to start the APU. If fuel is pumped from the filter, close the valve.
  - a. If no fuel is pumped from the filter, replace the fuel pump (TM 9-2815-221-34&P).
5. Remove the APU armor cover (TM 9-2350-256-20). Loosen, but do not remove, one of the two high pressure fuel tubes from the fuel injection pump. Have an assistant attempt to start the APU.
  - a. If no fuel is pumped from the loosened fuel tube, replace the fuel injector pump (TM 9-2815-221-34&P).
  - b. If fuel is pumped from the loosened fuel tube, check the fuel injector nozzles (TM 9-2815-221-34&P).
6. Remove APU armor cover (TM 9-2350-256-20).
7. Test fuel injector pump (TM 9-2815-221-34&P).
  - a. Replace fuel injector pump if defective (TM 9-2815-221-34&P).
8. Test fuel injector nozzles (TM 9-2815-221-34&P).
  - a. Replace fuel injector nozzles if defective (TM 9-2815-221-34&P).
9. Check engine timing (TM 9-2815-221-34&P).
  - a. Retime engine (TM 9-2815-221-34&P).
10. Check valve clearance (TM 9-2815-221-34&P).
  - a. Adjust valve clearance (TM 9-2815-221-34&P).
11. Check engine compression (TM 9-2815-221-34&P).
  - a. Replace engine (WP 0083 00).
12. Check for defective preheat components and/or associated wiring.
  - a. Repair or replace defective preheat components and/or associated wiring (TM 9-2350-256-20 and/or TM 9-2815-221-34&P).
13. Remove APU armor cover (TM 9-2350-256-20).



**CORRECTIVE ACTION –Continued**

14. Check fuel pump pressure (TM 9-2815-221-34&P).
  - a. Replace fuel pump (TM 9-2815-221-34&P).
15. Test fuel injector pump (TM 9-2815-221-34&P).
  - a. Replace fuel injector pump if defective (TM 9-2815-221-34&P).
16. Test fuel injector nozzles (TM 9-2815-221-34&P).
  - a. Replace fuel injector nozzles if defective (TM 9-2815-221-34&P).
17. Check valve clearance (TM 9-2815-221-34&P).
  - a. Adjust valves (TM 9-2815-221-34&P).
18. Remove APU from vehicle (WP 0083 00).
  - a. Remove and clean oil cooler (TM 9-2815-221-34&P).
19. Check engine for proper rpm setting (TM 9-2815-221-34&P).
  - a. Adjust rpm setting if required (TM 9-2815-221-34&P).
20. Remove APU armor cover and side panel (TM 9-2350-256-20).
21. Check glow plugs and lead wires.
  - a. Repair or replace defective parts (TM 9-2815-221-34&P).
22. Test fuel injector pump (TM 9-2815-221-34&P).
  - a. Replace fuel injector pump if defective (TM 9-2815-221-34&P).
23. Test fuel injector nozzles (TM 9-2815-221-34&P).
  - a. Replace fuel injector nozzles if defective (TM 9-2815-221-34&P).
24. Check engine timing (TM 9-2815-221-34&P).
  - a. Retime engine if required (TM 9-2815-221-34&P).
25. Check valve clearance (TM 9-2815-221-34&P).
  - a. Adjust valve clearance (TM 9-2815-221-34&P).
26. Check engine compression (TM 9-2815-221-34&P).
  - a. Replace engine (WP 0083 00).
27. Remove APU armor cover (TM 9-2350-256-20).
28. Check engine timing (TM 9-2815-221-34&P).
  - a. Retime engine (TM 9-2815-221-34&P).
29. Check valve clearance (TM 9-2815-221-34&P).
  - a. Adjust valve clearance (TM 9-2815-221-34&P).
30. Test fuel injector pump (TM 9-2815-221-34&P).
  - a. Replace fuel injector pump if defective (TM 9-2815-221-34&P).
31. Test fuel injector nozzles (TM 9-2815-221-34&P).
  - a. Replace fuel injector nozzles if defective (TM 9-2815-221-34&P).
32. If cause of engine knocks cannot be corrected by above steps, replace engine (WP 0083 00).
33. Check air intake system for restrictions.
  - a. Remove all restrictions.
34. Operate APU with hydraulic system selector control lever in the AUX position for 15 minutes.
  - a. If light blue smokey exhaust continues, replace engine (WP 0083 00).

**CORRECTIVE ACTION –Continued**

35. Check for defects in electrical circuit.
  - a. Repair or replace defective components.
36. Check for defective APU generator switch.
  - a. Replace switch, if defective.
37. Check for defective hydraulic pressure switch.
  - a. Adjust or replace pressure switch (WP 0083 00).
38. Check for damaged or defective APU generator (WP 0083 00).
  - a. Replace defective generator (WP 0083 00).
39. Remove APU from vehicle (WP 0083 00). Remove rear chain housing cover from APU (WP 0083 00). Inspect drive chain and gears.
  - a. Replace if defective (TM 9-2815-221-34&P).
40. Check fuel system for air.
  - a. Bleed air from fuel system.
41. Operate APU with hydraulic system selector control lever in AUX position for 15 minutes.
42. Check governor linkage (TM 9-2815-221-34&P).
  - a. Repair, replace, or adjust governor linkage as required (TM 9-2815-221-34&P).
43. Check engine timing (TM 9-2815-221-34&P).
  - a. Retime engine (TM 9-2815-221-34&P).
44. Test fuel injector pump (TM 9-2815-221-34&P).
  - a. Replace fuel injector pump if defective (TM 9-2815-221-34&P).
45. Test fuel injector nozzles (TM 9-2815-221-34&P).
  - a. Replace fuel injector nozzles if defective (TM 9-2815-221-34&P).
46. Check valve clearance (TM 9-2815-221-34&P).
  - a. Adjust valve clearance (TM 9-2815-221-34&P).
47. Check engine compression (TM 9-2815-221-34&P).
  - a. Replace engine (WP 0083 00).

**END OF WORK PACKAGE**

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**INTERMEDIATE MAINTENANCE**  
**RECOVERY VEHICLE, FULL TRACKED: MEDIUM, M88A1**  
**NSN 2350-00-122-6826, EIC AQA**

**MECHANICAL TACHOMETER AND SPEEDOMETER TROUBLESHOOTING PROCEDURE**

---

**INITIAL SETUP:**

**Tools and Special Tools**

Tool kit, general mechanic's (item 34, WP 0086 00)

---

**Troubleshooting Procedure**

**Mechanical Tachometer and Speedometer**

**Symptom**

Mechanical tachometer or speedometer malfunctioning.

**Malfunction**

Mechanical tachometer or speedometer fails to register.

**CORRECTIVE ACTION**

1. Check for flexible shaft ends that might have twisted off.
  - a. Replace flexible shaft assembly if defective.
2. Check 90° drive adapter for stripped threads.
  - a. Repair or replace adapter.

**END OF WORK PACKAGE**



**CHAPTER 3**  
**INTERMEDIATE MAINTENANCE**  
**MAINTENANCE INSTRUCTIONS**  
**FOR**  
**RECOVERY VEHICLE, FULL TRACKED: MEDIUM, M88A1**  
**(NSN: 2350-00-122-6826)**



**CHAPTER 3**  
**INTERMEDIATE MAINTENANCE**  
**MAINTENANCE INSTRUCTIONS**

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**CHAPTER 3**  
**INTERMEDIATE MAINTENANCE**  
**MAINTENANCE INSTRUCTIONS**

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**CHAPTER 3**  
**INTERMEDIATE MAINTENANCE**  
**MAINTENANCE INSTRUCTIONS**

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**WORK PACKAGE INDEX—Continued**

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**INTERMEDIATE MAINTENANCE**  
**RECOVERY VEHICLE, FULL TRACKED: MEDIUM, M88A1**  
**NSN 2350-00-122-6826, EIC AQA**

**PREVENTIVE MAINTENANCE CHECKS AND SERVICES PMCS PROCEDURES INTRODUCTION**

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**GENERAL**

**Introduction**

This WP provides the introduction to PMCS for the M88A1's personnel heater. Refer to WP 0021 00 for the personnel heater PMCS procedures. Refer to TM 9-2350-256-10 and TM 9-2350-256-20 for PMCS for the entire vehicle.

**Reporting Repairs**

All defects that cannot be fixed must be reported on a DA Form 2404, Equipment Inspection and Maintenance Worksheet, immediately after completing PMCS. If a serious problem is found, immediately report it to your supervisor. Remember, record any corrective action taken.

**Specific PMCS Procedures**

The headings for PMCS in WP 0021 00 are defined as follows:

Item No: Provides a logical sequence for PMCS to be performed.

Interval: Specifies the interval at which PMCS is to be performed.

Man-Hours: Specifies the time required to complete PMCS.

Item to be Checked/Serviced: Lists the part of the personnel heater that is to be inspected.

Procedure: Provides the procedure that must be performed to check or service the item.

Equipment Not Available/Ready If: Explains when the personnel heater is nonmission-capable.

**END OF WORK PACKAGE**



**INTERMEDIATE MAINTENANCE**  
**RECOVERY VEHICLE, FULL TRACKED: MEDIUM, M88A1**  
**NSN 2350-00-122-6826, EIC AQA**  
**PERSONNEL HEATER PREVENTIVE MAINTENANCE CHECKS AND SERVICES**

**INITIAL SETUP:****Tools and Special Tools**

Tool kit, general mechanic's (item 34, WP 0086 00)

**Materials/Parts**

Brush, scrub (item 4, WP 0085 00)  
 Cleaning compound (item 5, WP 0085 00)  
 Paint thinner (item 18, WP 0085 00)

**TABLE - 1 PERSONNEL HEATER PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS)**

ITEM NO.	INTERVAL	MAN-HOUR	ITEM TO BE CHECKED OR SERVICED	PROCEDURE	EQUIPMENT NOT READY AVAILABLE
1	Every 100 hours	0.1	Fuel	<b>Check fuel supply.</b>	Low or no fuel.
2	Every 100 hours	0.2	Wires	<b>Inspect wires for worn or broken insulation. Check that all connectors are tight.</b>	Wire insulation worn or broken.
3	Every 100 hours	0.3	Air inlets	<b>Check air inlets for clogging. Remove debris and tighten loose duct connections.</b>	Air inlets clogged or duct connections loose.
4	Every 200 hours (at ambients below 0°F [-17.8°C])	0.2	Igniter	<b>Inspect igniter.</b>	Igniter damaged.
5	Every 400 hours	0.3	Flame detector switch	<b>Remove and clean flame detector switch.</b>	Flame detector switch not clean.
6	Every 400 hours	0.3	Burner	<b>Remove and clean burner to remove deposits and carbon.</b>	Burner not clean.
7	Every 400 hours	0.2	Igniter	<b>Inspect igniter.</b>	Igniter damaged.
8	Every 200 hours (at ambients below 0°F [-17.8°C])	2.0	Personnel heater	<b>Overhaul the heater.</b>	Personnel heater unserviceable.

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ITEM NO.	INTERVAL	MAN- HOUR	ITEM TO BE CHECKED OR SERVICED	PROCEDURE	EQUIPMENT NOT READY AVAILABLE
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**END OF WORK PACKAGE**

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**INTERMEDIATE MAINTENANCE**  
**RECOVERY VEHICLE, FULL TRACKED: MEDIUM, M88A1**  
**NSN 2350-00-122-6826, EIC AQA**

**GENERAL MAINTENANCE**

---

**INITIAL SETUP:****Materials/Parts**

Sealing compound (item 14, WP 0085 00)

**References**

TM 9-2350-256-10

**References (cont.)**

TM 9-2350-256-20

WP 0046 00

WP 0047 00

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**DESCRIPTION**

This WP contains general shop practices and specific methods you must be familiar with to properly maintain the M88A1. You should read and understand these practices and methods before performing any task.

**General**

Before beginning a task, find out how much repair, modification, or replacement is needed to fix the equipment. Sometimes the reason for equipment failure can be seen right away, and complete teardown is not necessary. Disassemble equipment only as far as necessary to repair or replace damaged or broken parts.

**Lubrication**

Refer to TM 9-2350-256-10 and TM 9-2350-256-20 for lubrication instructions.

**Painting and Restenciling Markings**

Refer to TM 9-2350-256-20 for painting and restenciling instructions.

**Lockwire and Sealing Compound**

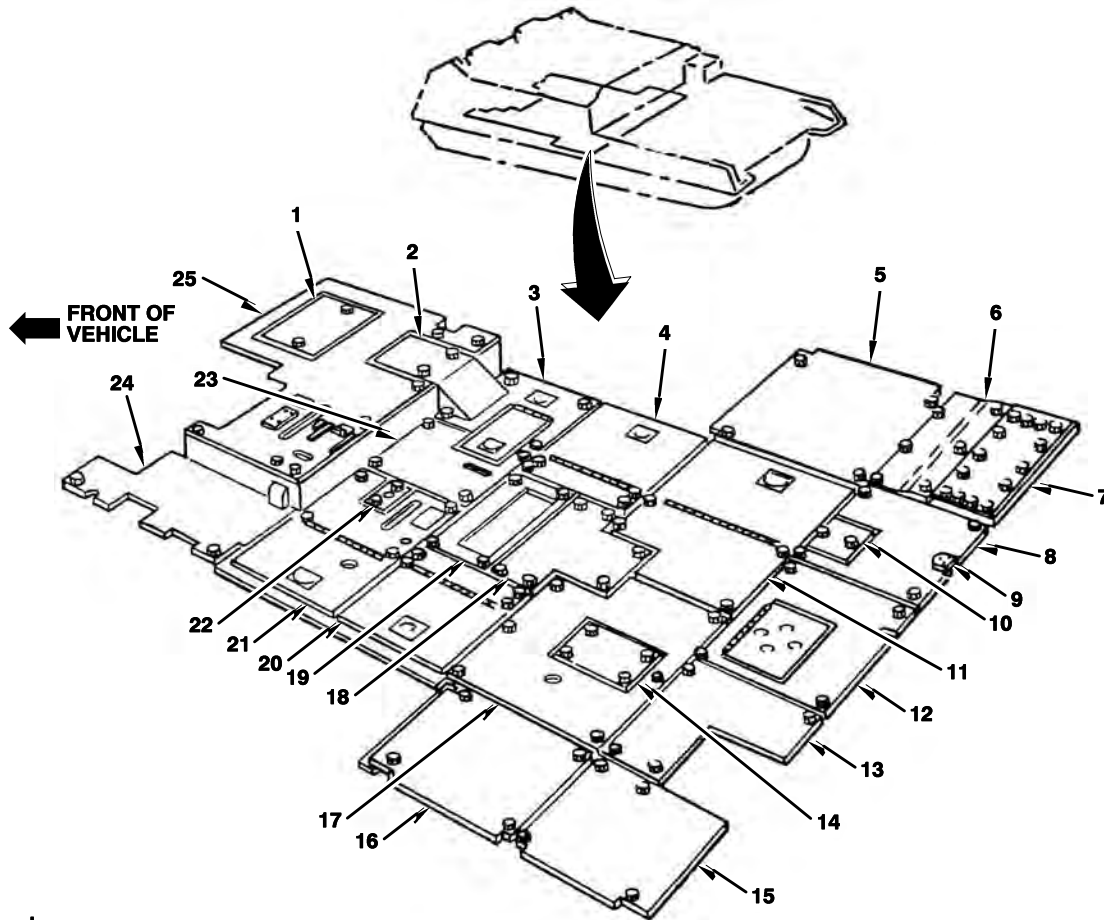
Install lockwire by the double twist method. Apply sealing compound to all pipe threads during installation.

**Torque Values**

Torque data for the specific hardware applications required in various vehicle installations is specified in the applicable sections of this manual.

**Deck Covers, Grilles, Doors, and Cab Subfloor Plates**

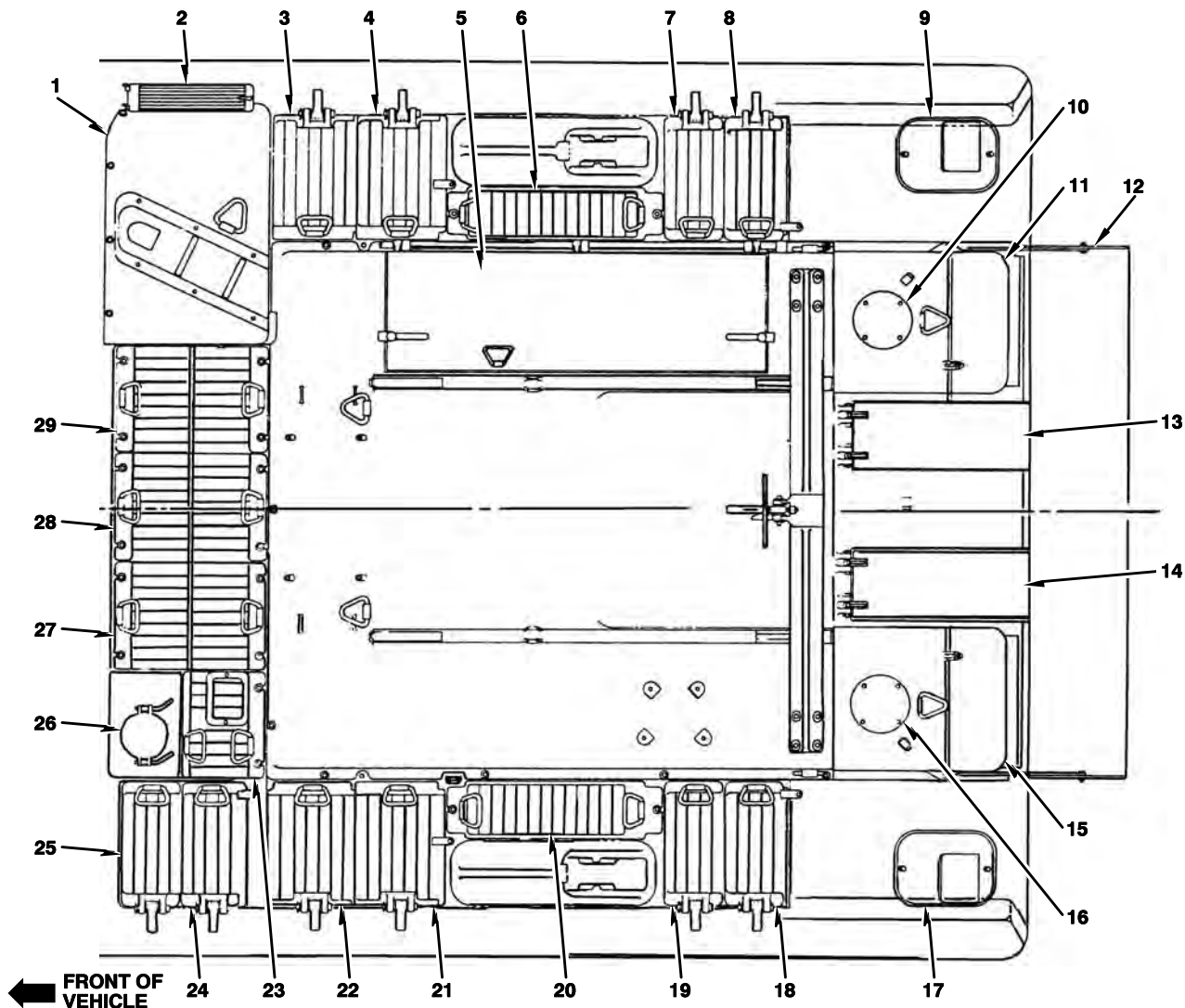
Various deck covers, grilles, doors, and cab subfloor plates must be removed prior to removal of many components. To locate cab subfloor plates, refer to the following illustration with its accompanying legend. Refer to WPs 0046 00 and 0047 00 for removal and installation of subfloor plates #24 and #25. Refer to TM 9-2350-256-20 for removal and installation instructions for all other subfloor plates. To locate deck covers, grilles, and doors, refer to the second and third illustrations below with their accompanying legends.



**Legend:**

- |                                                               |                                                            |
|---------------------------------------------------------------|------------------------------------------------------------|
| 1. Right -front access floor plate                            | 14. Fuel transmitter center left floor access plate        |
| 2. Right-front floor plate rear access                        | 15. Rear left-side floor plate                             |
| 3. Hydraulic valve forward intermediate right floor plate     | 16. Intermediate rear left-side floor plate                |
| 4. U-35 winch center right floor plate                        | 17. Intermediate rear left-center floor plate              |
| 5. Intermediate rear right floor plate                        | 18. Center rear floor plate                                |
| 6. Rear right-side floor plate                                | 19. Center forward floor plate                             |
| 7. Hydraulic connections access cover                         | 20. Intermediate rear left access floor plate              |
| 8. Rear intermediate right floor plate                        | 21. Stowage basket forward intermediate left floor plate   |
| 9. Rear intermediate right access cover                       | 22. Floor and light mount plate                            |
| 10. Rear intermediate right access floor plate                | 23. Hydraulic valve forward intermediate right floor plate |
| 11. Hydraulic line intermediate rear right center floor plate | 24. Left-side front floor plate                            |
| 12. Rear center floor plate                                   | 25. Right-side front floor plate                           |
| 13. Rear left-side intermediate floor plate                   |                                                            |

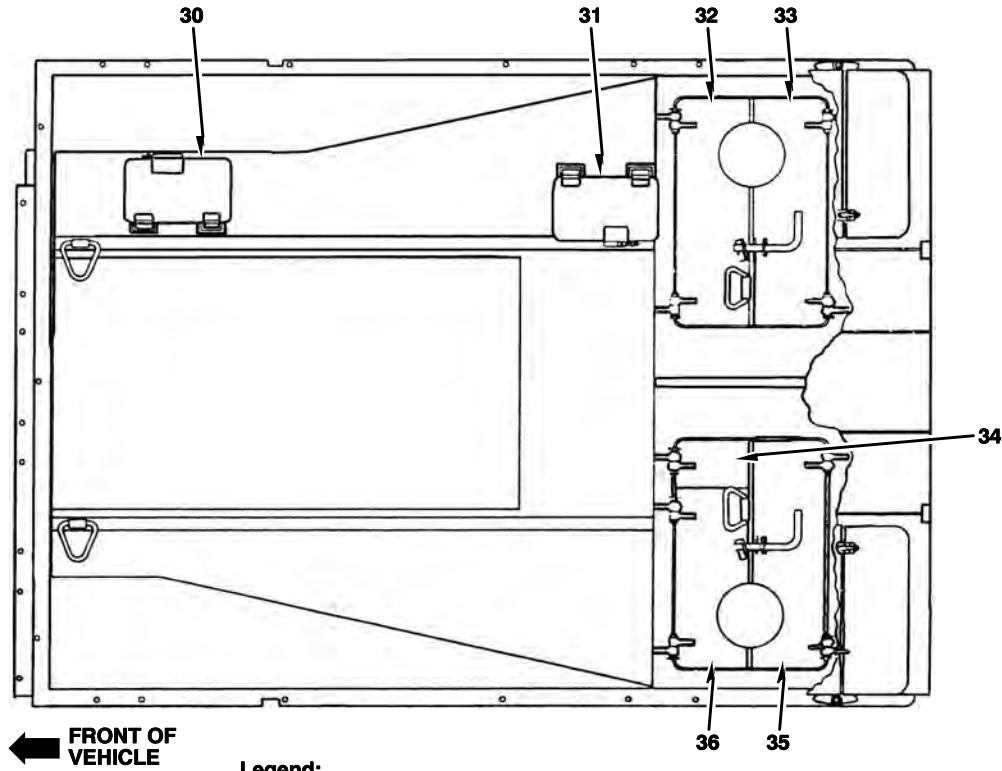




**Legend:**

- |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>1. Auxiliary power unit access cover</li> <li>2. Auxiliary power unit access door</li> <li>3. Right front engine deck air inlet door</li> <li>4. Right front intermediate engine deck air inlet door</li> <li>5. Engine deck right door</li> <li>6. Right intermediate engine deck air inlet grille</li> <li>7. Right rear intermediate engine deck air inlet door</li> <li>8. Right rear engine deck air inlet door</li> <li>9. Right stayline hydraulic cylinder access cover</li> <li>10. Cover, deep water fording exhaust, right</li> <li>11. Engine deck right exhaust door</li> <li>12. Engine exhaust deflector</li> <li>13. Engine deck right center exhaust door</li> <li>14. Engine deck left center exhaust door</li> <li>15. Engine deck left exhaust door</li> </ul> | <ul style="list-style-type: none"> <li>16. Cover, deep water fording exhaust, left</li> <li>17. Left stayline hydraulic cylinder access cover</li> <li>18. Left rear engine deck air inlet door</li> <li>19. Left rear intermediate engine deck air inlet door</li> <li>20. Left intermediate engine deck air inlet grille</li> <li>21. Left intermediate engine deck air inlet door</li> <li>22. Left front intermediate engine deck air inlet door</li> <li>23. Center left front engine deck air inlet grille</li> <li>24. Left front engine deck air inlet door</li> <li>25. Left front, front engine deck air inlet door</li> <li>26. Fuel tank filler neck cover</li> <li>27. Center left front intermediate engine deck air inlet grille</li> <li>28. Center front engine deck air inlet grille</li> <li>29. Center right front engine deck air inlet grille</li> </ul> |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

**DECK COVER**

**Legend:**

- 30. Engine oil check access door
- 31. Engine oil filler tube access door
- 32. Engine deck transmission right front access door
- 33. Engine deck transmission right rear access door
- 34. Engine deck transmission center front access door
- 35. Engine deck transmission left rear access door
- 36. Engine deck transmission left front access door

**DECK BASE****Preparation for Maintenance**

The vehicle should be cleaned as thoroughly inside and out as is advisable for the time available and the operations to be performed. The affected component and the adjacent area should be cleaned in any case.

Remove any items of on-vehicle equipment, armament, or vehicular components that may interfere with efficient operation. Where disconnection of lines will result in loss of fluid, close any shutoff valves that may be in the system and, where possible, have a container available to catch fluid issuing from the lines at the disconnect points. Open hull and engine compartment drain valves to drain off accumulated water, fuel, or oil. If complete disassembly of the vehicle is to be performed, pump out and/or drain fuel tanks. While the component is out of the vehicle, clean the exposed hull or compartment areas thoroughly.

See that all tools required are readily available. Make sure that any spare parts which may be required are available. Provide envelopes, covers, tarpaulins, line plugs, or other material that may be required for protection of the vehicle and exposed components until repairs are made. Provide small parts containers, tags or electric wire and terminal markers, as required.

Provide hoisting or lifting equipment for heavy components and see that supports, benches, or stands are made ready to receive the components when they are removed.

Ensure that sufficient personnel are available for the operation and that they are thoroughly advised of their duties before work is started. Provide all personnel with any protective equipment that may be required, such as safety goggles or lenses, special clothing, safety shoes, rubber apron, and gloves. See that all unassigned personnel are clear of the immediate working area.

Observe all warnings and cautions. Always use power tools carefully.

**END OF WORK PACKAGE**

**INTERMEDIATE MAINTENANCE**  
**RECOVERY VEHICLE, FULL TRACKED: MEDIUM, M88A1**  
**NSN 2350-00-122-6826, EIC AQA**

**POWERPLANT MAINTENANCE**  
**DESCRIPTION, REMOVAL, DISASSEMBLY, CLEANING,**  
**INSPECTION, REPAIR, ASSEMBLY, INSTALLATION**

**INITIAL SETUP:****Tools and Special Tools**

Engine and transmission cart (optional) (Table 1, WP 0088 00)  
 Sling (item 30, WP 0086 00)  
 Tool kit, general mechanic's (item 34, WP 0086 00)

**Materials/Parts (cont.)**

Screws (2) (item 69, WP 0087 00)  
 Screws (2) (item 224, WP 0087 00)  
 Washers (2) (item 229, WP 0087 00)

**Materials/Parts**

Brush, scrub (item 4, WP 0085 00)  
 Cleaning compound (item 5, WP 0085 00)  
 Detergent (item 6, WP 0085 00)  
 Gasket (item 31, WP 0087 00)  
 Lockwashers (26) (item 163, WP 0087 00)  
 Nuts (24) (item 199, WP 0087 00)  
 Nuts, self-locking (2) (item 111, WP 0087 00)

**Personnel Required**

Mechanics (3)

**References**

DA Form 2408-10  
 TM 9-2350-256-20  
 TM 9-2520-215-34  
 TM 9-2815-220-34

**DESCRIPTION**

Refer to TM 9-2815-220-34 for the description and operation of the Continental model AVDS-1790-2DR engine. Refer to TM 9-2520-215-34 for the description and operation of the Allison-GM model XT-1410-4 cross-drive transmission.

**Removal**

1. Remove powerplant in accordance with TM 9-2350-256-20.

**Disassembly****NOTE**

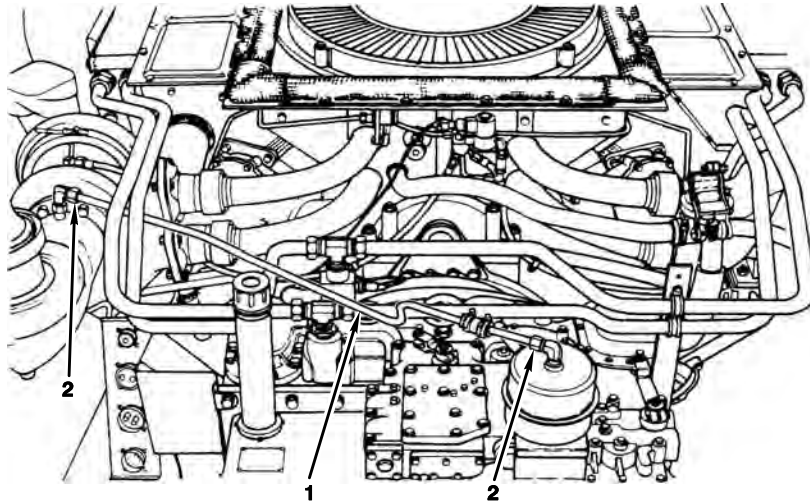
The following procedure contains instructions for separating the main engine from the transmission.

**NOTE**

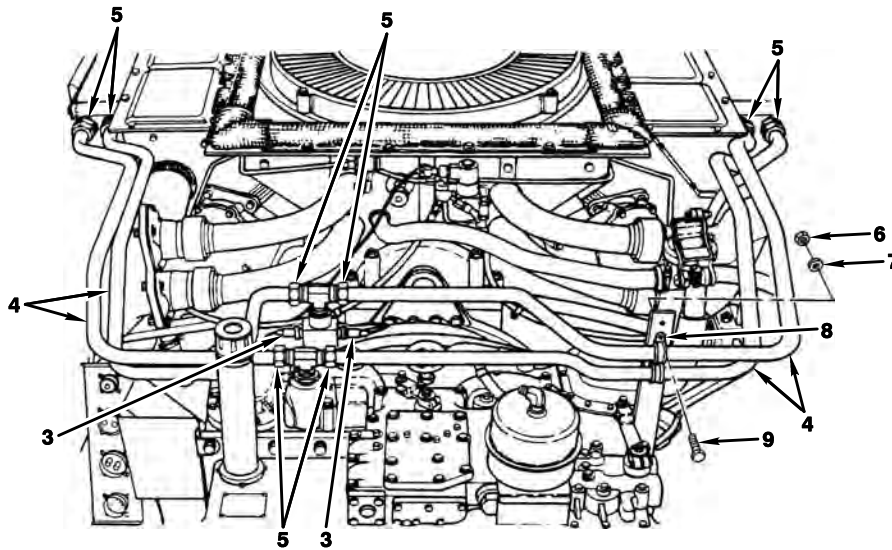
If just the transmission is to be repaired or replaced, it is not necessary to remove the accessory items from the engine.

1. Remove all accessory items necessary to work on the engine and transmission (refer to TM 9-2350-256-20).

2. Remove transmission breather tube (1) by loosening one coupling nut (2) at each end.

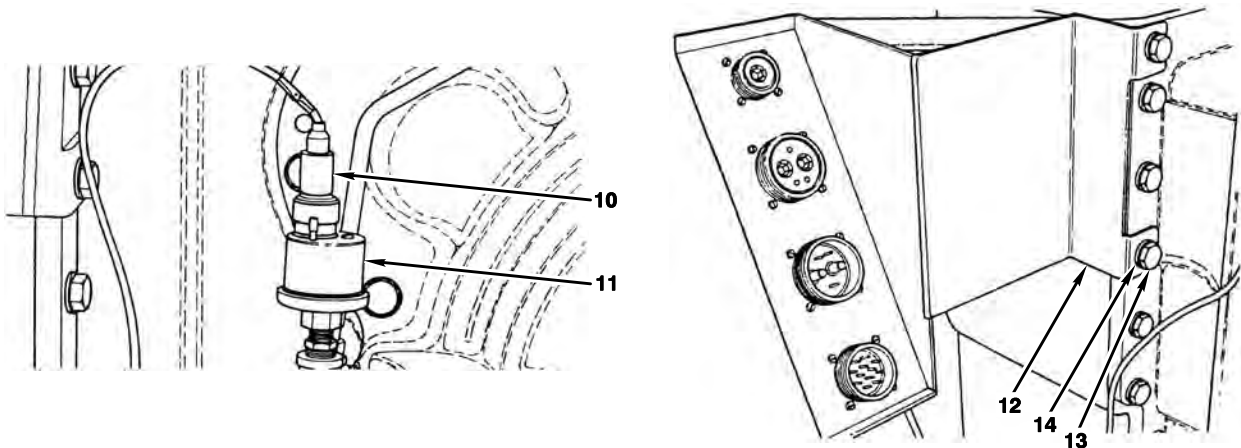


3. Disconnect two wiring harness connectors (3).
4. Remove four transmission oil cooler lines (4) by loosening on each, two nuts (5), and removing two nuts (6), washers (7), loop clamps (8), and screws (9).



5. Disconnect electrical harness connector (10) at transmission oil pressure sending unit (11).

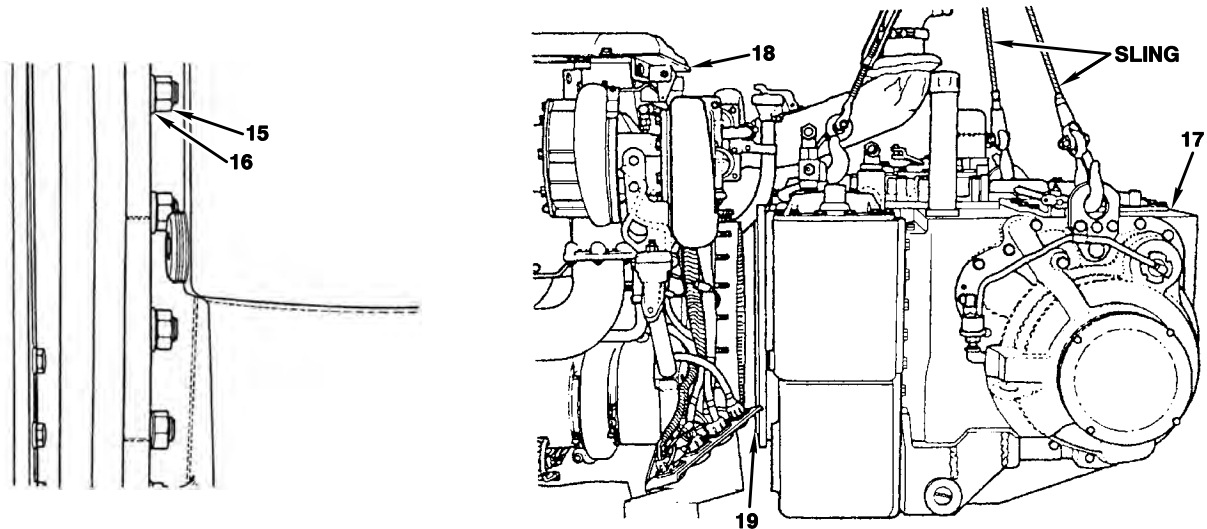
- Remove engine wiring harness bracket (12) by removing two screws (13) and lockwashers (14). Discard lockwashers.



### **CAUTION**

Prior to disconnecting transmission from engine, install lifting sling.

- Disconnect transmission from engine by removing 24 nuts (15) and lockwashers (16). Discard lockwashers.
- Using sling, remove transmission (17) from engine (18).
- Remove and discard gasket (19).



### **Cleaning**

- Wash hoses and harnesses in a mild soap solution, rinse with clean water, and dry with compressed air.

### **WARNING**

Solvents 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 solvent gets on skin or clothing, wash immediately with soap and water.

2. Clean all metal parts with cleaning compound or mineral spirits paint thinner. Use a wire brush where necessary and dry with compressed air.

### **Inspection-Acceptance and Rejection Criteria**

1. Inspect engine, transmission, wiring harness, and all accessories for breaks, leaks, damage, excessive wear, missing parts, or unserviceable condition.

### **Repair or Replacement**

1. Refer to TM 9-2815-220-34 for engine repair or TM 9-2520-215-34 for transmission repair. If the engine or transmission is to be replaced, record the action on DA Form 2408-10, Equipment Component Register.
2. Refer to TM 9-2350-256-20 for instructions on repairing the main engine and transmission accessories removed for powerplant inspection or replacement.

### **Assembly**

#### **NOTE**

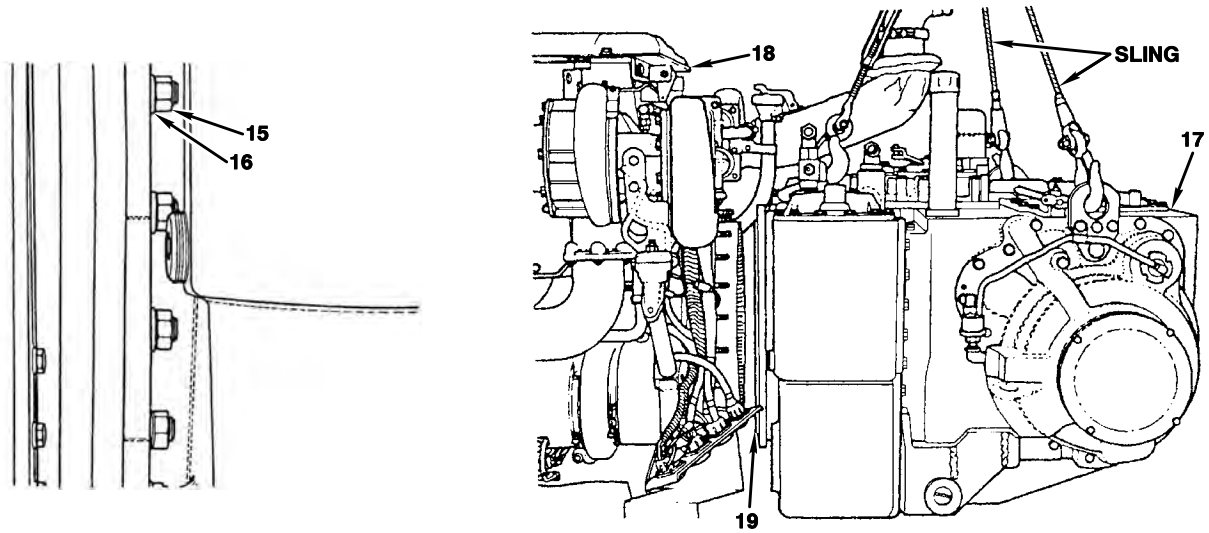
The following procedure contains instructions for connecting the main engine to the transmission.

1. Install sling on transmission (17).
2. Install gasket (19) between transmission (17) and engine (18).

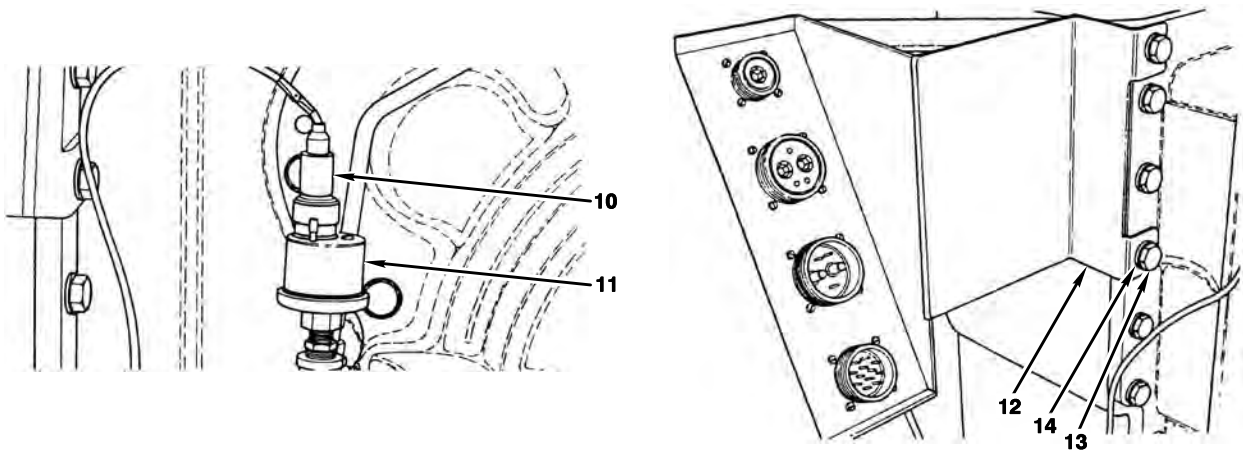
#### **NOTE**

When installing 24 nuts, do not tighten until all nuts have been installed.

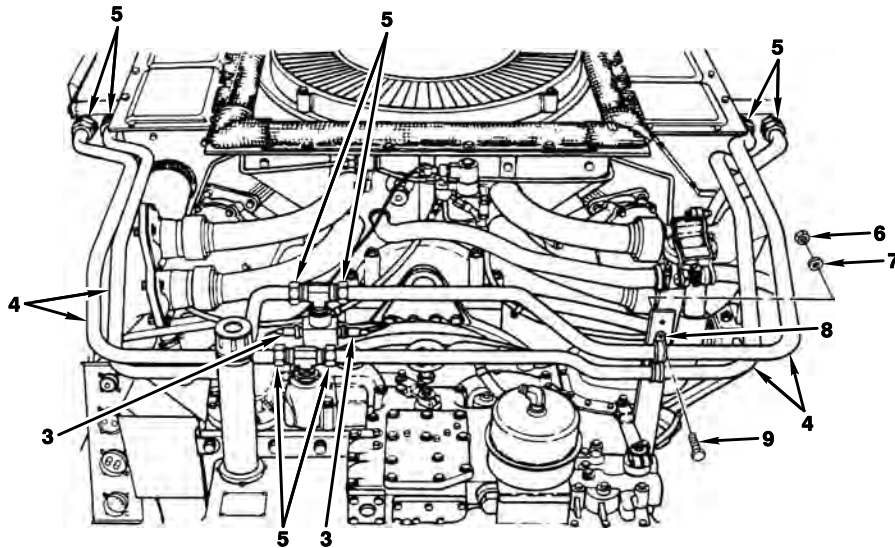
- Secure transmission (17) to engine (18) using 24 lockwashers (16) and nuts (15).



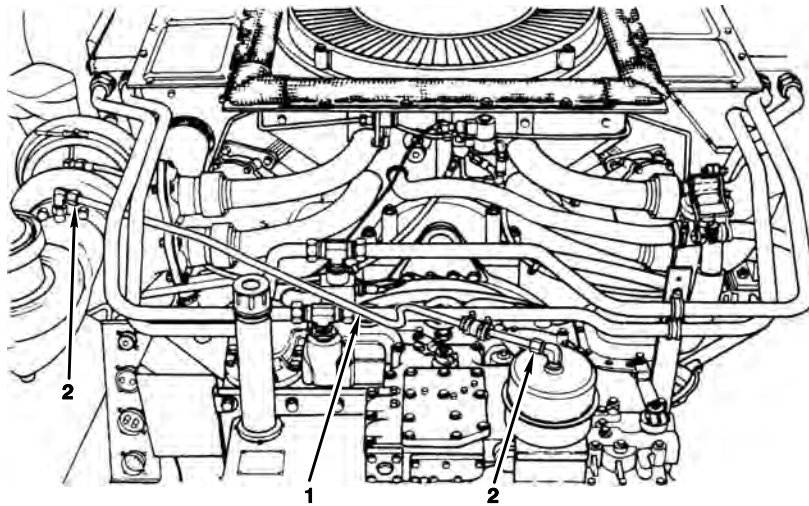
- Install wiring harness bracket (12) with two screws (13) and lockwashers (14).
- Connect electrical harness connector (10) to transmission oil pressure sending unit (11).



6. Install four transmission oil cooler lines (4) by tightening on each, two nuts (5), and securing two of lines to transmission bracket with two screws (9), loop clamps (8), washers (7), and nuts (6).
7. Connect two electrical harness connectors (3).



8. Install transmission breather tube (1) by tightening one coupling nut (2) at each end.



9. Install any accessory items that were removed (refer to TM 9-2350-256-20).

### Installation

1. Install powerplant in accordance with TM 9-2350-256-20.

**END OF WORK PACKAGE**



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**INTERMEDIATE MAINTENANCE**  
**RECOVERY VEHICLE, FULL TRACKED: MEDIUM, M88A1**  
**NSN 2350-00-122-6826, EIC AQA**

**OIL FILTER BYPASS VALVE REPLACEMENT**  
**REMOVAL, INSTALLATION**

---

**INITIAL SETUP:****Tools and Special Tools**

Tool kit, general mechanic's (item 34, WP 0086 00)

**Equipment Condition**

Grille doors removed (TM 9-2350-256-20)

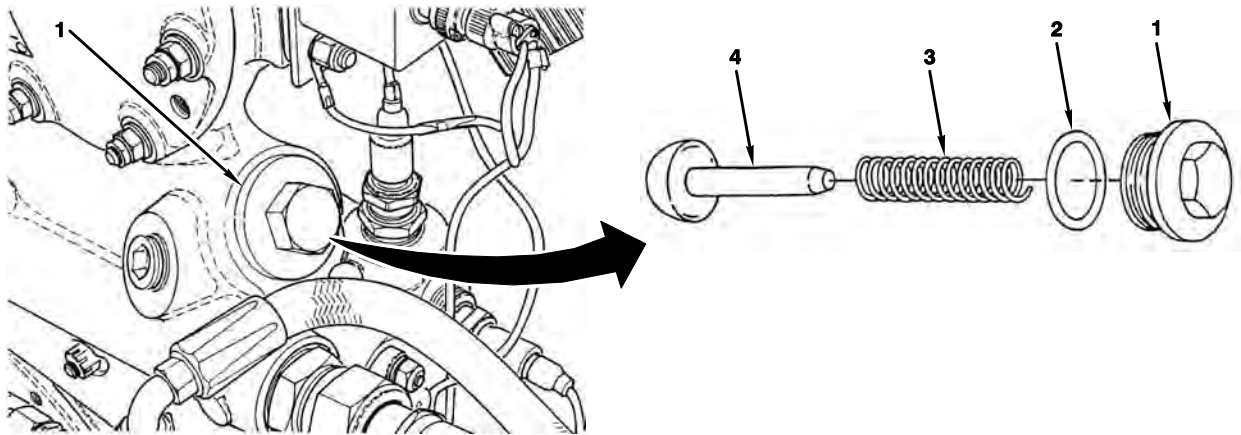
**Materials/Parts**

Gasket (item 177, WP 0087 00)

Spring (item 37, WP 0087 00)

**Removal**

1. Remove oil filter bypass valve plug (1), gasket (2), spring (3), and plunger (4). Discard gasket.

**Installation**

1. Install plunger (4), spring (3), gasket (2), and oil filter bypass valve plug (1).

**END OF WORK PACKAGE**



**INTERMEDIATE MAINTENANCE**  
**RECOVERY VEHICLE, FULL TRACKED: MEDIUM, M88A1**  
**NSN 2350-00-122-6826, EIC AQA**

**OIL PRESSURE REGULATOR VALVE REPLACEMENT**  
**REMOVAL, INSTALLATION**

**INITIAL SETUP:**

**Tools and Special Tools**

Tool kit, general mechanic's (item 34, WP 0086 00)

**Materials/Parts**

Gasket (item 231, WP 0087 00)

Nuts, self-locking (2) (item 109, WP 0087 00)

**Materials/Parts (cont.)**

Spring (item 40, WP 0087 00)

Washers (2) (item 22, WP 0087 00)

**Equipment Condition**

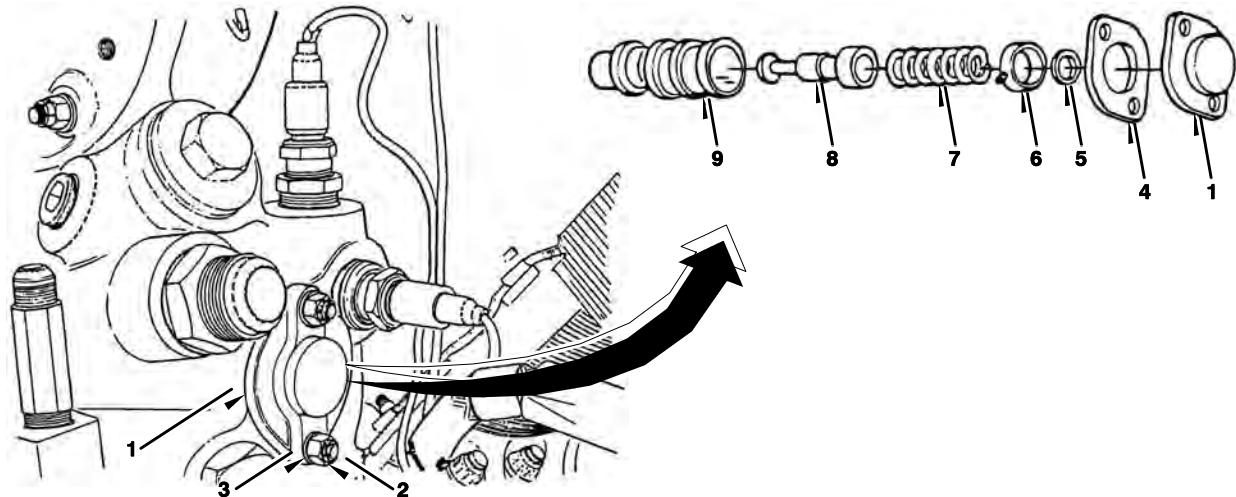
Grille doors removed (TM 9-2350-256-20)

**WARNING**

Oil pressure regulator valve cover (1) is spring loaded. Exercise care when removing it.

**Removal**

1. Remove oil pressure regulator valve cover (1) by removing two self-locking nuts (2) and washers (3). Discard self-locking nuts.
2. Remove gasket (4), washer (5), plate (6), spring (7), plunger (8), and oil pressure sleeve (9). Discard gasket.



**Installation**

1. Install oil pressure sleeve (9), plunger (8), spring (7), plate (6), washer (5), and gasket (4).
2. Install oil pressure regulator valve cover (1) with two self-locking nuts (2) and washers (3).

**END OF WORK PACKAGE**



**INTERMEDIATE MAINTENANCE**  
**RECOVERY VEHICLE, FULL TRACKED: MEDIUM, M88A1**  
**NSN 2350-00-122-6826, EIC AQA**

**ELECTRIC FUEL PUMP MAINTENANCE**  
**DESCRIPTION, REMOVAL, DISASSEMBLY, CLEANING, INSPECTION,**  
**REPAIR, ASSEMBLY, TEST, INSTALLATION**

**INITIAL SETUP:****Test Equipment**

Multimeter (item 23, WP 0086 00)

**Tools and Special Tools**

Tool kit, general mechanic's (item 34, WP 0086 00)

**Materials/Parts**

Cleaning compound (item 5, WP 0085 00)

Detergent (item 6, WP 0085 00)

Fuel (item 7, WP 0085 00)

Clamp, hose (item 180, WP 0087 00)

Lockwashers (4) (item 153, WP 0087 00)

**Materials/Parts (cont.)**

Lockwashers (3) (item 159, WP 0087 00)

Lockwasher (item 232, WP 0087 00)

Nuts (2) (item 170, WP 0087 00)

Nuts (3) (item 200, WP 0087 00)

Nut, hexagon (item 10, WP 0087 00)

Packing (item 17, WP 0087 00)

Screws (2) (item 140, WP 0087 00)

Screws (3) (item 145, WP 0087 00)

**References**

TM 9-2350-256-20

**DESCRIPTION**

The fuel pump is located in the forward fuel tank sump cavity and is a centrifugal pusher-type pump designed for submerged operation. It operates by power from a 24 V dc motor contained in the pump assembly.

**Removal**

**WARNING**

Do not smoke or use open flame when working on fuel system. Explosion may occur, causing severe injury or death.

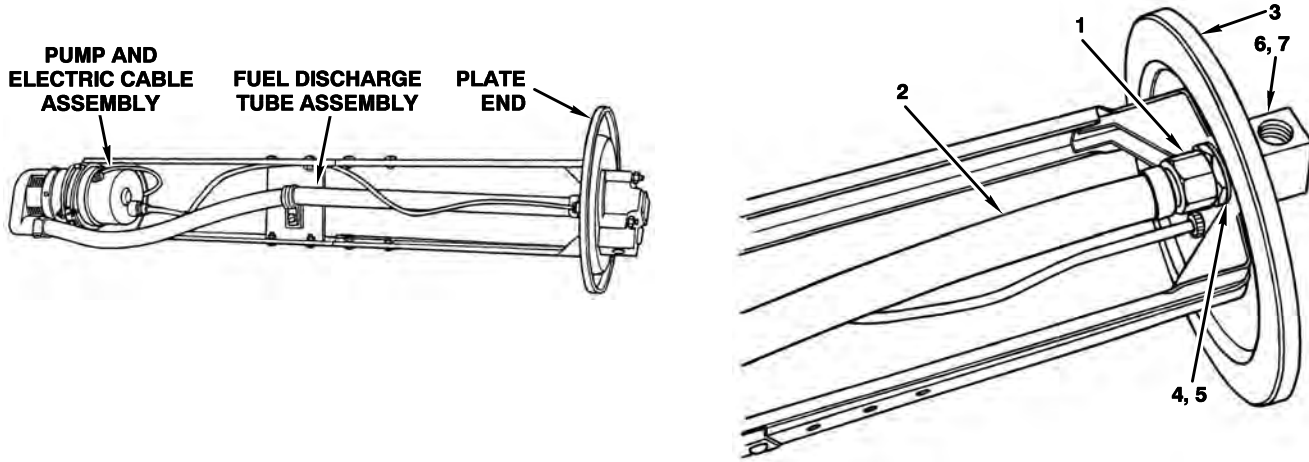
1. Remove fuel pump in accordance with TM 9-2350-256-20.

**Disassembly**

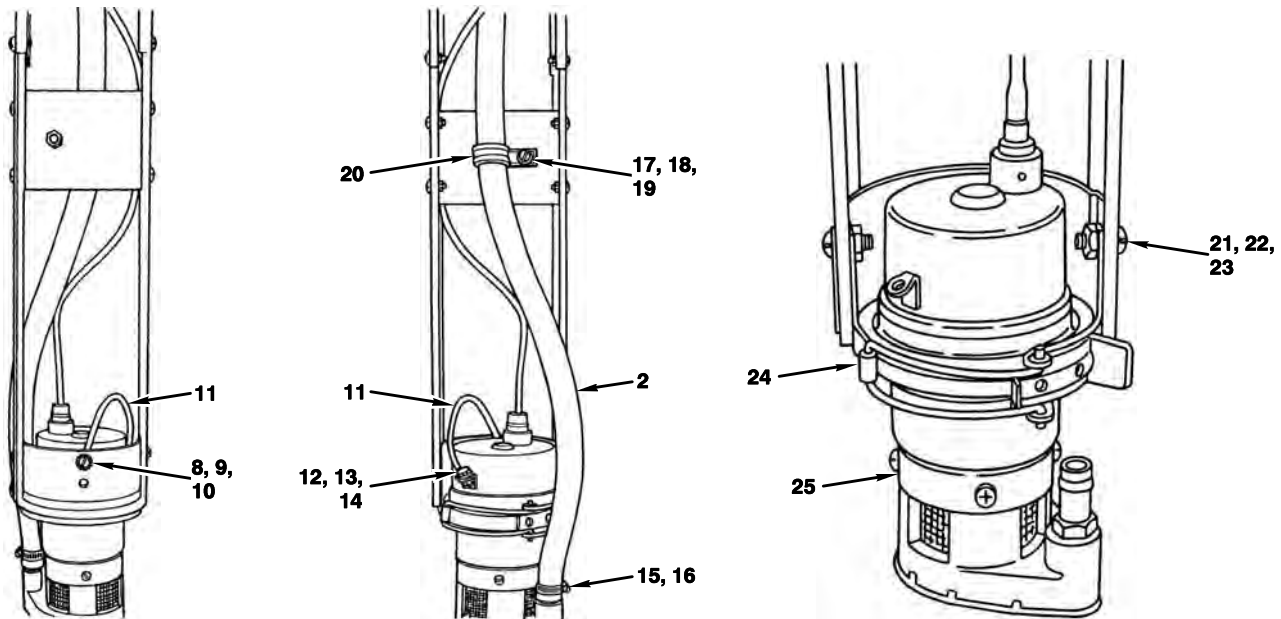
**NOTE**

Refer to TM 9-2350-256-20 for disassembly instructions for the terminal assembly.

1. Back off jamnut (1) and disconnect fuel discharge tube assembly (2) from cover plate (3).
2. Remove hexagon nut (4), lockwasher (5), discharge fitting (6), and packing (7). Discard packing and lockwasher.



3. Remove nut (8), screw (9), two lockwashers (10), and disconnect ground strap (11). Discard lockwashers.
4. Remove nut (12), screw (13), two lockwashers (14), and ground strap (11). Discard lockwashers.
5. Loosen screw (15) of hose clamp (16). Remove nut (17), lockwasher (18), screw (19), strap clamp (20), discharge tube (2), and hose clamp. Discard lockwasher.
6. Remove two nuts (21), lockwashers (22), screws (23), clamp ring assembly (24), and pump and mount assembly (25). Discard lockwashers.



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## Cleaning

### **WARNING**

Solvents 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 solvent gets on skin or clothing, wash immediately with soap and water.

1. After disassembly and before inspection, clean metal parts in clean diesel fuel or cleaning compound. Clean tube in mild soap solution. Carefully blow out and dry each part with compressed air.

### **Inspection-Acceptance and Rejection Criteria**

1. Inspect pump for cracks, distortion, and warpage.
2. Inspect cable for cuts, damage, and continuity.
3. Inspect tube assembly for cracks and other evidence of excessive wear in tube and for damage to swivel end.
4. Check continuity of ground cable and inspect for cuts and other damage.
5. Inspect welded and support parts for cracks, distortion, and breakage.
6. Inspect threaded parts for nicks, cross threading, and excessive wear.
7. Inspect polarizing pin, terminal pin assembly, connector housing, and pin assembly, and fuse block for nicks, cracks, distortion, and other damage that would impair their use.
8. Inspect other terminal assembly components for tears, cracks, hardening, and other damage that would impair their use.

### **Repair or Replacement**

1. Replace pump and electric cable assembly if continuity check of cable shows it to be grounded or if there is any evidence of damage that would impair its use.
2. Repair dents or distortions. Weld cracks and breaks in metal parts where practical. Replace defective parts if badly damaged.
3. Repair threaded parts with a thread chaser if practical or replace defective parts.
4. Replace any other defective parts.

### **Assembly**

1. Install pump and mount assembly (25), clamp ring assembly (24), two screws (23), lockwashers (22), and nuts (21).
2. Connect discharge tube (2) to pump and mount assembly (25). Install hose clamp (16) and tighten screw (15). Install strap clamp (20), screw (19), lockwasher (18), and nut (17).

### **NOTE**

During assembly, place one lockwasher (14) under screw (13) head and one lockwasher against nut (12).

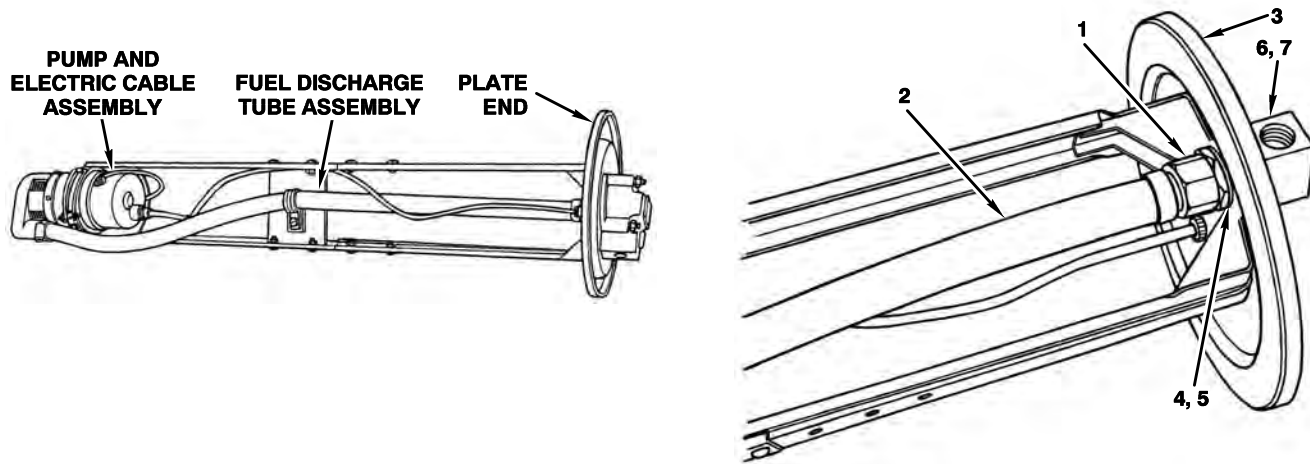
3. Connect ground strap (11) by installing screw (13), two lockwashers (14), and nut (12).

### **NOTE**

During assembly, place one lockwasher (10) under screw (9) head and one lockwasher against nut (8).

4. Install ground strap (11), screw (9), two lockwashers (10), and nut (8).

5. Install packing (7), discharge fitting (6), lockwasher (5), and hexagon nut (4).
6. Install discharge tube (2) to cover plate (3) by tightening jamnut (1).



### NOTE

Refer to TM 9-2350-256-20 for assembly instructions for the terminal assembly.

### Test and Inspection

### WARNING

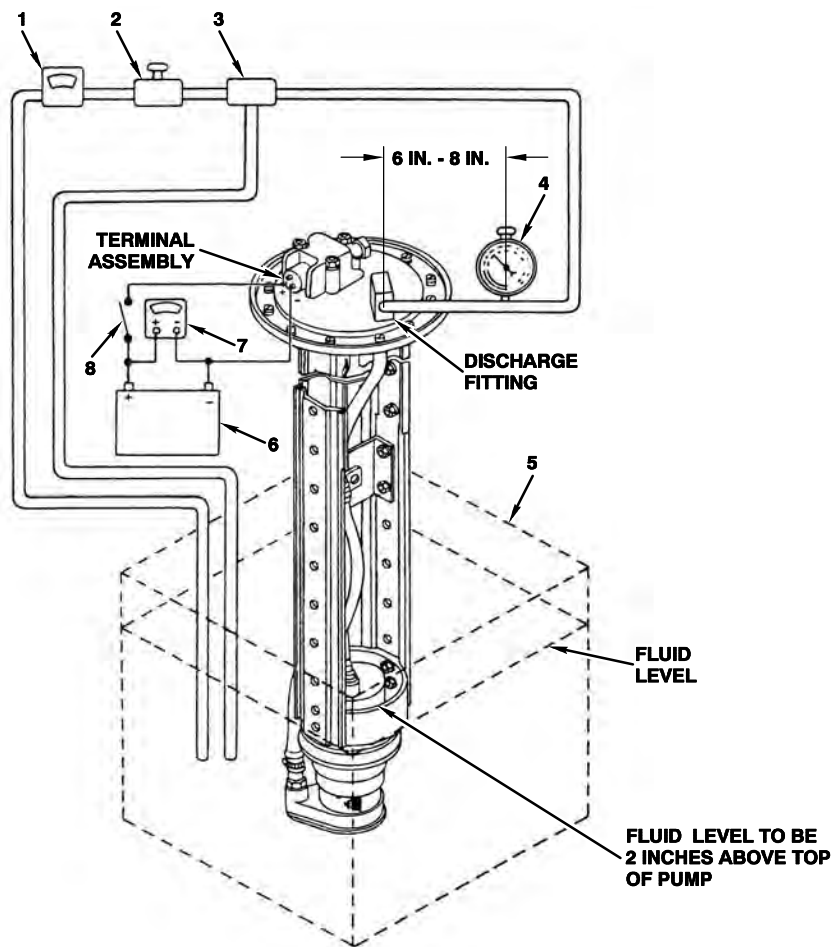
Vapor can explode from electric arc. Do not operate pump by connecting or disconnecting clips. Use a switch (refer to no. 8 on illustration below) in the line.

### NOTE

To determine polarity of the terminal assembly pins, face the pump and mount assembly so that the discharge fitting is to the right and the terminal to the left with the long center (polarizing) pin at the top of the terminal and the screw at the bottom. The positive (hot) pin is on the left side of the terminal and the negative (ground) pin is on the right side.

1. Assemble test equipment to pump with switch (refer to no. 8 on illustration below) open and submerge pump in test fluid (fuel VV-F-800) so that test fluid covers pump by at least 2 in. (51 mm).
2. Adjust power supply for  $27.5 \pm 0.1$  V dc. Close switch (refer to no. 8 on illustration below) and readjust power supply if necessary.
3. Operate pump at  $27.5 \pm V$  dc. Rated flow should be  $220 \pm 9$  gph ( $3.67 \pm 0.15$  gpm) ( $832.8 \pm 34.1$  L/h) at 3.75 psi (25.9 kPa).
4. Repeat step 2 for an  $18 \pm 0.1$  V dc power supply.
5. Operate pump at  $18 \pm V$  dc. Rated flow should be  $80 \pm 3$  gph ( $1.33 \pm 0.05$  gpm) ( $302.8 \pm 11.4$  L/h) at 2.50 psi (17 kPa).





**Legend:**

Equipment required:	Description:
1. Flowmeter	0-10 gph (0-38 l/h) ± 2% of scale reading.
2. Adjustable flow regulator	0-10 psi (0-69 kPa).
3. Relief valve	10 psi (69 kPa).
4. Pressure gage (tap shall be in a 0.5 in. (13 mm) id discharge line, 6-8 in. (15.2-20.3 cm) from pump discharge fitting	0-10 psi (0-69 kPa) ± 2% of scale reading.
5. Reservoir	To suit (fluid level must be minimum of 2 in. (5.1 cm) above pump).
6. Adjustable dc power source	Output capability 0-28 V dc @ 5 amperes.
7. Dc voltmeter	Must measure 17.5-28 V dc to within an accuracy of 0.25%.
8. SPST toggle switch	MS39061-1 (24 V dc, 24 amp).
Test Fluid	Fuel VV-F-800.
Hose, piping, and fittings	To suit.

**Installation**

Install fuel pump in accordance with TM 9-2350-256-20.

**END OF WORK PACKAGE**



**INTERMEDIATE MAINTENANCE**  
**RECOVERY VEHICLE, FULL TRACKED: MEDIUM, M88A1**  
**NSN 2350-00-122-6826, EIC AQA**

**LEFT REAR FUEL TANK MAINTENANCE**  
**DESCRIPTION, REMOVAL, CLEANING, INSPECTION, TESTING, INSTALLATION**

**INITIAL SETUP:****Tools and Special Tools**

Sling (item 30, WP 0086 00)  
 Tool kit, general mechanic's (item 34, WP 0086 00)

**Materials/Parts**

Cleaning compound (item 5, WP 0085 00)  
 Detergent (item 6, WP 0085 00)  
 Methylene chloride (item 10, WP 0085 00)  
 Paint thinner (item 18, WP 0085 00)  
 Lockwashers (6) (item 29, WP 0087 00)  
 Lockwashers (10) (item 43, WP 0087 00)  
 Lockwasher (item 148, WP 0087 00)  
 Lockwashers (12) (item 151, WP 0087 00)  
 Lockwashers (2) (item 157, WP 0087 00)  
 Lockwashers (13) (item 159, WP 0087 00)  
 Lockwashers (11) (item 161, WP 0087 00)  
 Lockwashers (3) (item 163, WP 0087 00)  
 Lockwashers (2) (item 165, WP 0087 00)  
 Lockwashers (3) (item 234, WP 0087 00)  
 Lockwashers (2) (item 243, WP 0087 00)  
 Nuts (3) (item 198, WP 0087 00)  
 Nuts (3) (item 199, WP 0087 00)  
 Nuts (3) (item 233, WP 0087 00)  
 Pins (3) (item 15, WP 0087 00)  
 Pins (2) (item 24, WP 0087 00)  
 Pins, cotter (2) (item 114, WP 0087 00)  
 Pins, cotter (3) (item 117, WP 0087 00)  
 Pin, straight (item 179, WP 0087 00)  
 Screws (12) (item 46, WP 0087 00)

**Materials/Parts (cont.)**

Screw (item 49, WP 0087 00)  
 Screws (2) (item 55, WP 0087 00)  
 Screws (4) (item 56, WP 0087 00)  
 Screws (6) (item 57, WP 0087 00)  
 Screws (6) (item 58, WP 0087 00)  
 Screws (2) (item 77, WP 0087 00)  
 Screws (6) (item 184, WP 0087 00)  
 Screws (3) (item 205, WP 0087 00)  
 Screws (3) (item 207, WP 0087 00)  
 Screws (3) (item 215, WP 0087 00)  
 Screws (3) (item 227, WP 0087 00)  
 Screws (2) (item 242, WP 0087 00)  
 Washers (3) (item 38, WP 0087 00)  
 Washers (3) (item 123, WP 0087 00)

**Personnel Required**

Mechanics (3)

**References**

TB 750-1047  
 TM 9-237

**Equipment Condition**

Tank vents or filler cap opened  
 Fuel drained (TM 9-2350-256-20)  
 Engine deck removed (TM 9-2350-256-20)  
 Powerplant removed (TM 9-2350-256-20)  
 Filler neck removed (TM 9-2350-256-20)

**DESCRIPTION**

The fuel tanks are of a welded steel construction. The left rear tank contains the filler cap and filter assembly. The right and forward tanks contain liquid quantity sending units. The electric fuel pump is housed in the forward tank.

**Removal****WARNING**

Fuel vapor is highly explosive. Use every precaution to prevent striking sparks and to keep open flame away from vehicle when removing fuel tank.

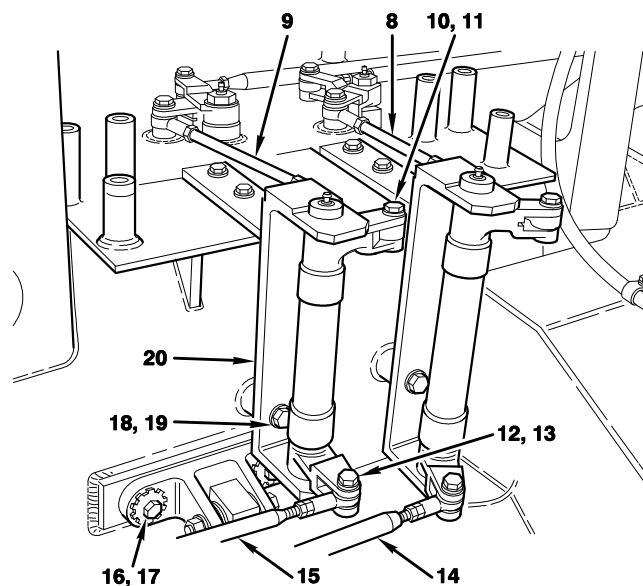
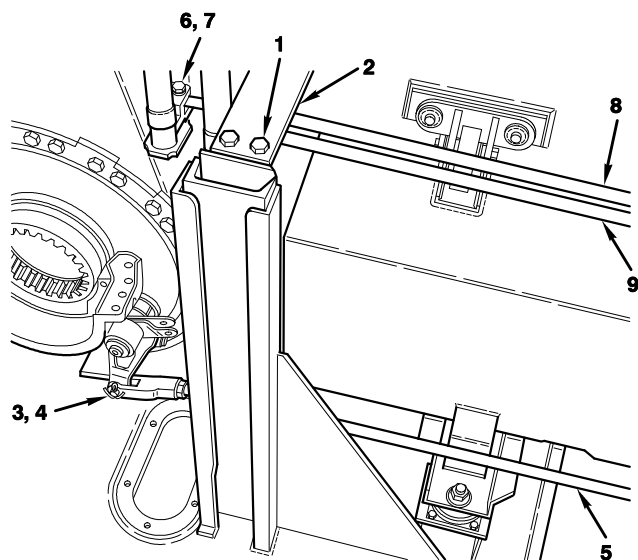
**NOTE**

Perform work outdoors whenever possible.

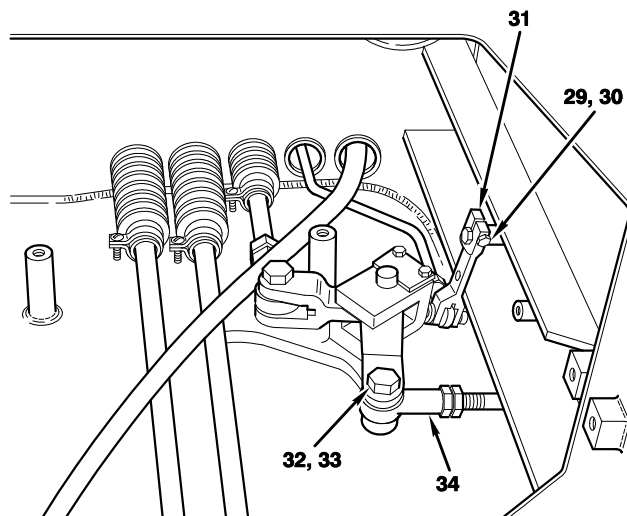
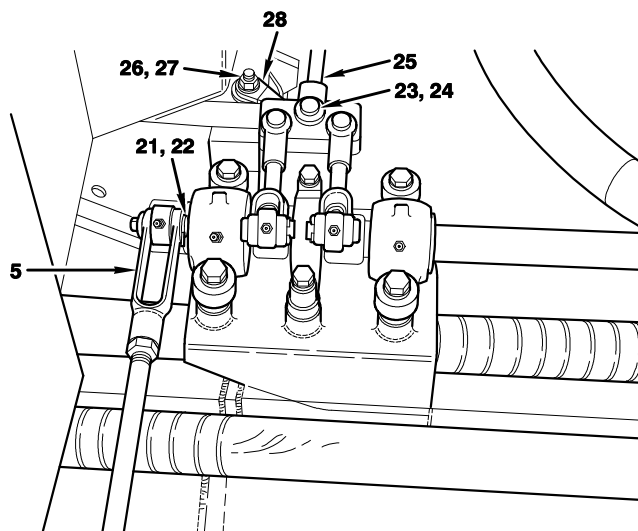
**NOTE**

Fittings and accessories may be removed for ventilation purposes before fuel tank is removed. Refer to TM 9-2350-256-20.

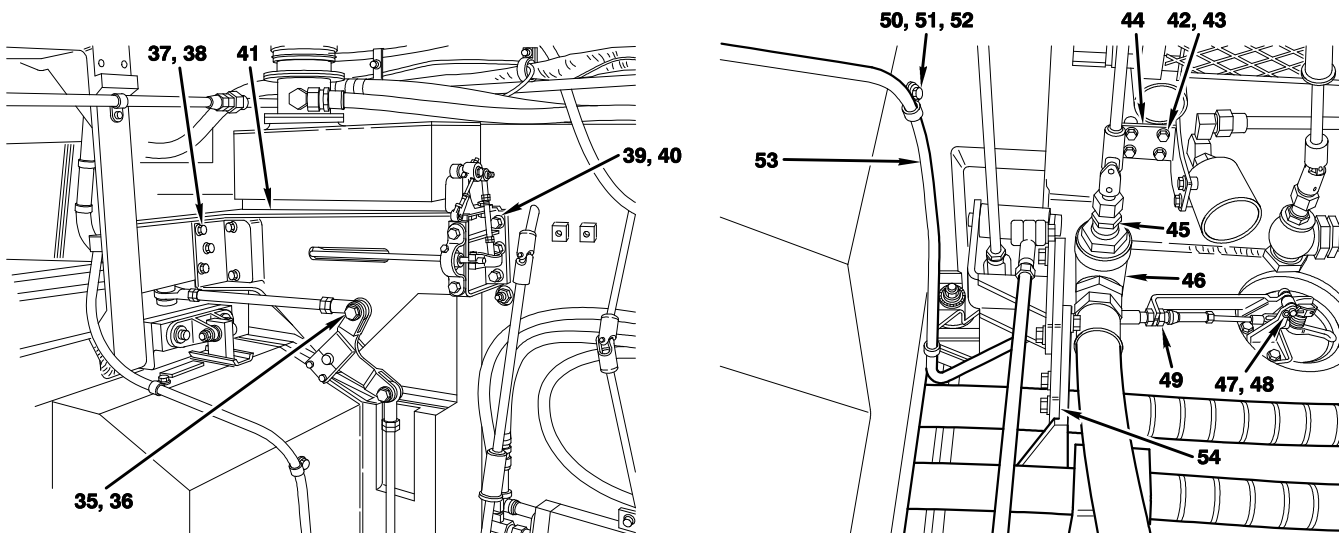
1. Remove four screws (1) and transmission guide rail brace (2).
2. Remove cotter pin (3) and pin (4) and disconnect brake control rod (5). Discard cotter pin.
3. Remove two screws (6) and washers (7) and disconnect steer control rod (8) and shift control rod (9).
4. Remove two screws (10), lockwashers (11), steer control rod (8), and shift control rod (9). Discard lockwashers.
5. Remove two screws (12) and lockwashers (13) and disconnect steer rod (14) and shift rod (15). Discard lockwashers.
6. Remove six screws (16) and lockwashers (17). Discard lockwashers.
7. Remove six screws (18), lockwashers (19), and two control linkage brackets (20). Discard lockwashers.



8. Remove cotter pin (21), pin (22), and brake control rod (5). Discard cotter pin.
9. Remove cotter pin (23) and pin (24) and disconnect brake control rod (25). Discard cotter pin.
10. Remove three nuts (26), lockwashers (27), and ground strap (28). Discard lockwashers.
11. Remove screw (29) and lockwasher (30) and disconnect throttle rod (31). Discard lockwasher.
12. Remove screw (32) and lockwasher (33) and disconnect brake rod (34). Discard lockwasher.



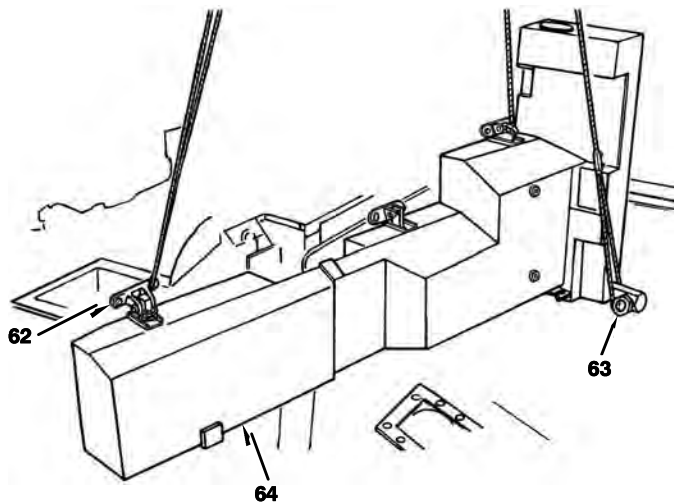
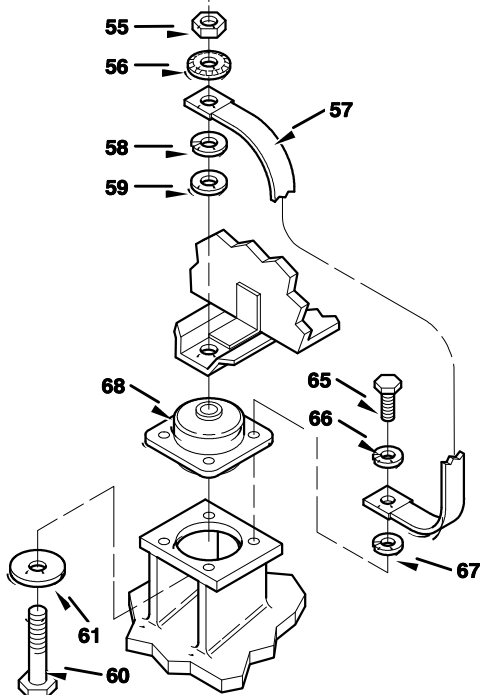
13. Remove screw (35) and lockwasher (36). Discard lockwasher.
14. Remove three screws (37), lockwashers (38), screws (39), lockwashers (40), and support (41) with control linkage attached. Discard lockwashers.
15. Remove six screws (42), lockwashers (43), and bracket (44). Discard lockwashers.
16. Back off nut (45) (hidden) and move valve and fuel line (46) out of way.
17. Remove two cotter pins (47) and pin (48). Discard cotter pins.
18. Loosen two jamnuts (49).
19. Remove two screws (50), lockwashers (51), clamps (52), and stow control cable (53) out of way. Discard lockwashers.
20. Remove bracket (54) with control linkage attached.



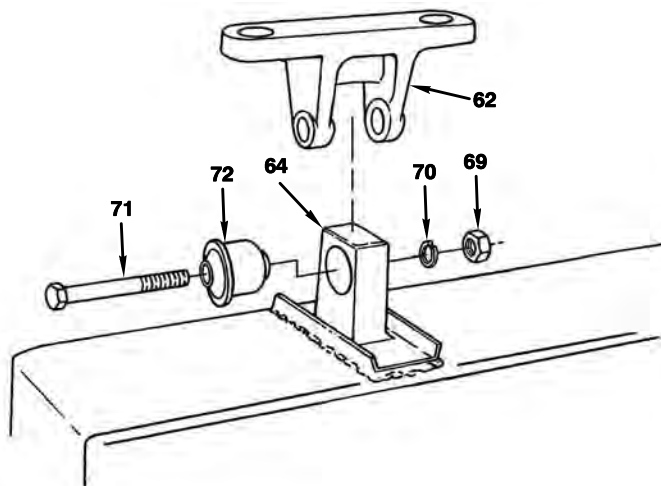
**NOTE**

There are three tank mount locations but only one has a ground strap (57) and two additional lockwashers (58 and 67).

21. Remove three nuts (55), lockwashers (56), disconnect ground strap (57), remove lockwasher (58), three washers (59), bolts (tank mounting) (60), and washers (61). Discard lockwashers.
22. Attach sling to top mount brackets (62) and fuel outlet fitting (63) (for stability) of fuel tank (64). Move fuel tank rearward, swing front away from vehicle wall, and keep level while lifting straight up. Remove fuel tank from vehicle and sling and cable from top mount brackets and fuel outlet fitting.
23. Remove 12 screws (65), lockwashers (66), ground strap (57), lockwasher (67), and 3 tank floor mount cushions (68). Discard lockwashers.



24. Remove three nuts (69), lockwashers (70), screws (71), top mount brackets (62), and mounts (72) from fuel tank (64). Discard lockwashers.



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## Cleaning

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### WARNING

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Solvents 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 solvent gets on skin or clothing, wash immediately with soap and water.

1. When a fuel tank is repaired for leaks, it is necessary to clean, inspect, and test it. Coordinate the following two steps with the inspection and testing procedures which follow this cleaning section. Clean other fuel tank components with cleaning compound or paint thinner and dry with compressed air.
2. Slush fuel tank interior with methylene chloride or cleaning compound as specified in TB 750-1047 to remove residual fuel, dirt, sediment, and foreign matter.
3. Drain and air dry. Reclean magnetic drain plug if necessary.

### Inspection-Acceptance and Rejection Criteria

1. Inspect fuel tank for cleanliness. Repeat above cleaning procedures if necessary.
2. Inspect fuel tank for any obvious cracks or open seams. Inspect mounting brackets, mounts, and cushions for cracks or breaks. Weld fuel tank and components as required (refer to TM 9-237).
3. Inspect fuel tank inlets and outlets for thread damage. Repair with a thread chaser as required.

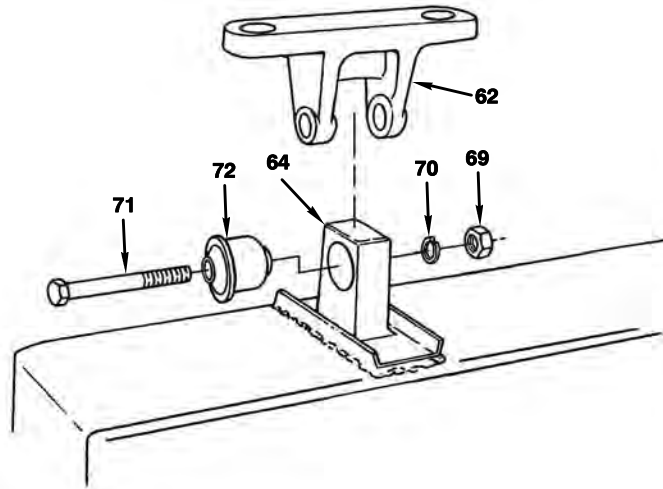
### Testing

1. Close all openings with temporary plugs or other closures and apply 3–4 psi (21–28 kPa) internal air pressure.
2. Apply soapy water solution consisting of liquid detergent diluted with 20–40% water to all exterior surfaces and inspect for air bubble formation.
3. Mark location of any bubble formation, rinse and dry fuel tank, and weld the marked areas (refer to TM 9-237).
4. Repeat steps 1–3.



**Installation**

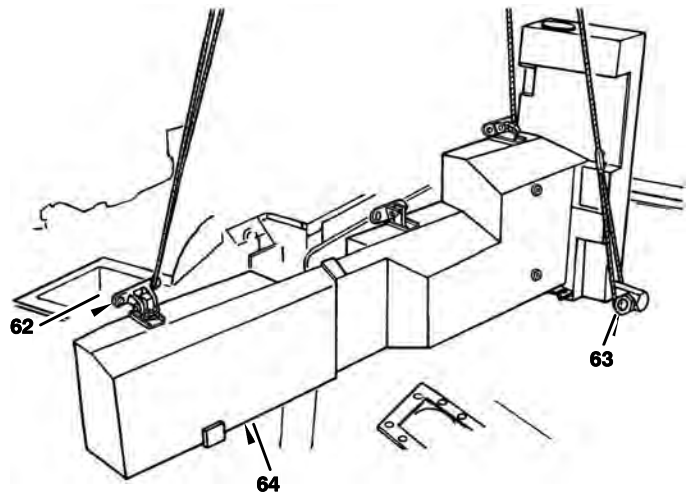
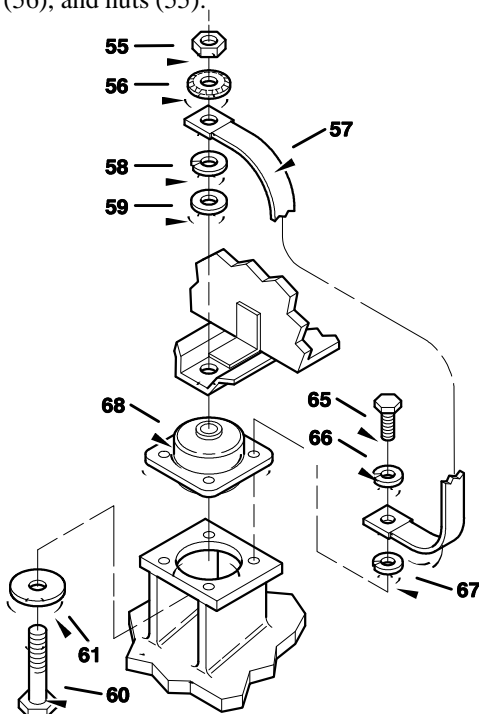
1. Install three mounts (72), top mount brackets (62), screws (71), lockwashers (70), and nuts (69) to fuel tank (64).



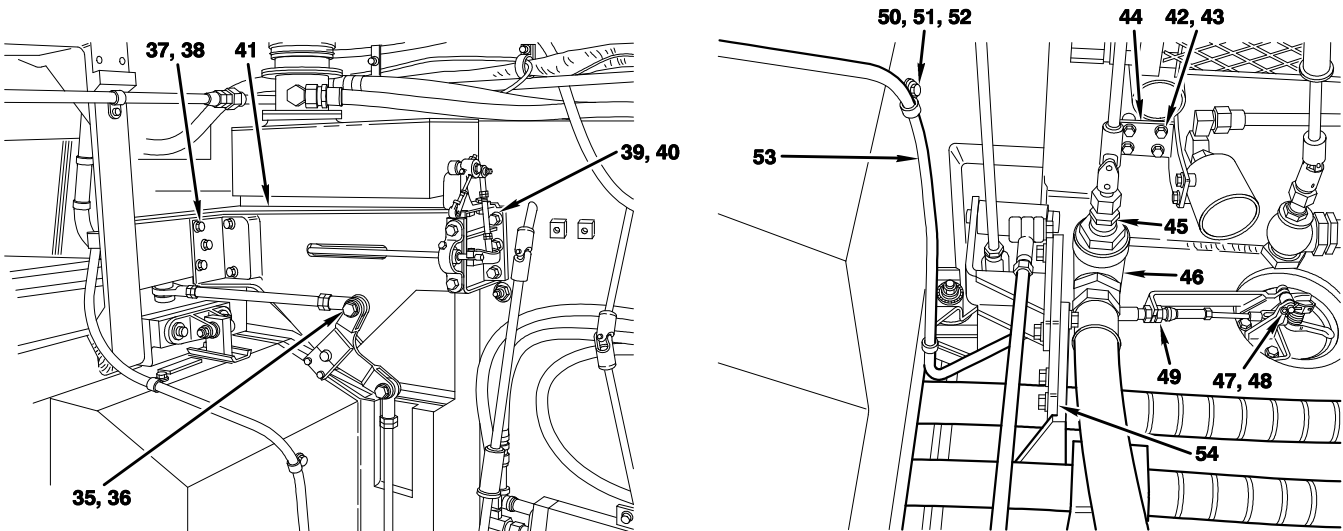
**NOTE**

There are three tank mount locations but only one has a ground strap (57) and two additional lockwashers (58 and 67).

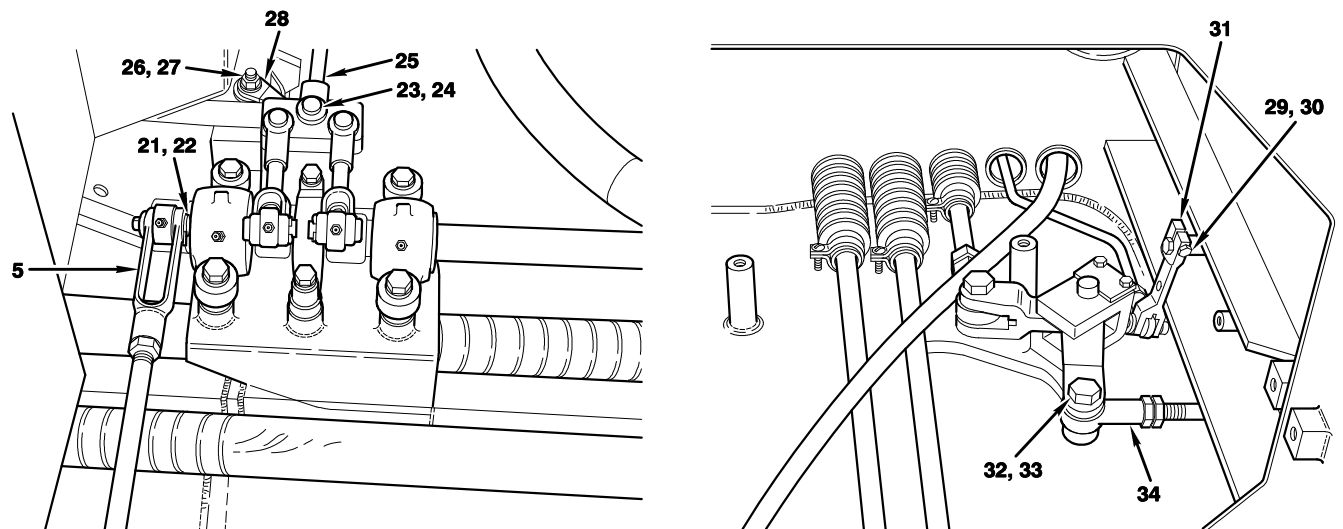
2. Install 3 tank floor mount cushions (68), lockwasher (67), connect ground strap (57), install 12 lockwashers (66), and screws (65).
3. Attach sling to top mount brackets (62) and fuel outlet fitting (63) (for stability). Keep level and lower fuel tank (64), swing front toward vehicle wall, and move forward into position. Remove sling and cable.
4. Install three washers (61), bolts (tank mounting) (60), washers (59), lockwasher (58), ground strap (57), three lockwashers (56), and nuts (55).



5. Install bracket (54) with control linkage attached.
6. Position control cable (53) and install two clamps (52), lockwashers (51), and screws (50).
7. Tighten two jamnuts (49).
8. Install pin (48) and two cotter pins (47).
9. Connect valve and fuel line (46) and tighten nut (45) (hidden).
10. Install bracket (44), six lockwashers (43), and screws (42).
11. Install support (41) with control linkage attached, three lockwashers (40), screws (39), lockwashers (38), and screws (37).
12. Install lockwasher (36) and screw (35).



13. Connect brake rod (34) and install lockwasher (33) and screw (32).
14. Connect throttle (31) and install lockwasher (30) and screw (29).
15. Install ground strap (28), three lockwashers (27), and nuts (26).
16. Connect brake control rod (25) and install pin (24) and cotter pin (23).
17. Install brake control rod (5), pin (22), and cotter pin (21).

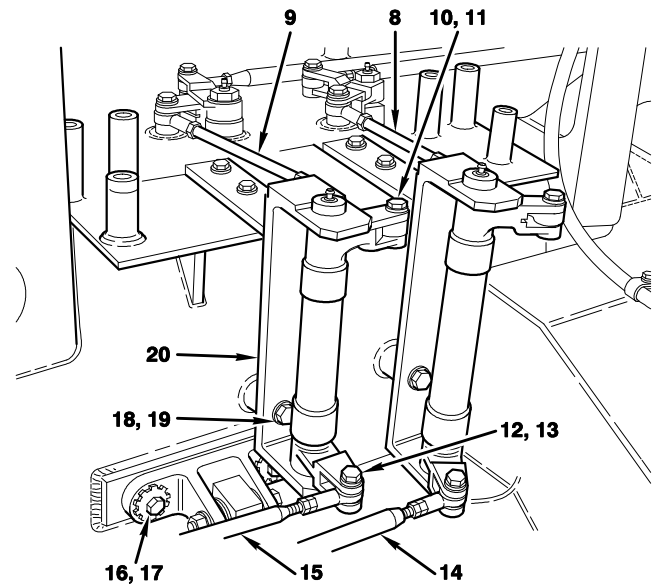
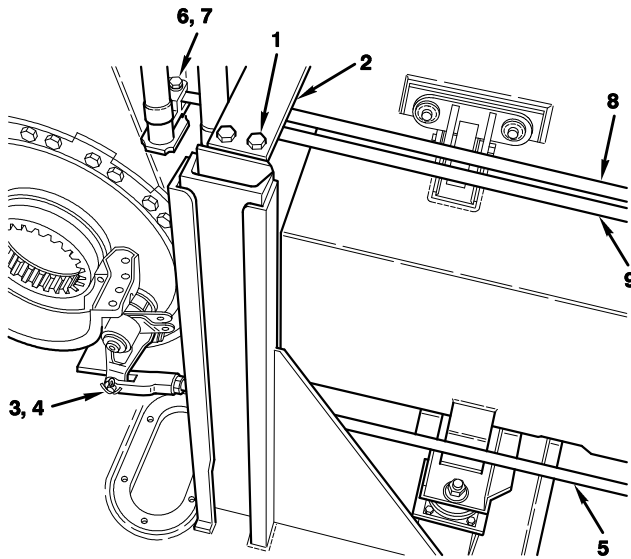


18. Install two control linkage brackets (20), six lockwashers (19), screws (18), washers (17), and screws (16).
19. Connect shift rod (15) and steer rod (14) and install two lockwashers (13) and screws (12).
20. Connect shift control rod (9) and steer control rod (8) and install two lockwashers (11) and screws (10).
21. Install shift control rod (9) and steer control rod (8) and install two washers (7) and screws (6).

**NOTE**

Refer to TM 9-2350-256-20 for alignment of brake control rod.

22. Install brake control rod (5) and install pin (4) and cotter pin (3).
23. Install transmission guide rail brace (2) and four screws (1).



**END OF WORK PACKAGE**



**INTERMEDIATE MAINTENANCE**  
**RECOVERY VEHICLE, FULL TRACKED: MEDIUM, M88A1**  
**NSN 2350-00-122-6826, EIC AQA**

**RIGHT REAR FUEL TANK MAINTENANCE**  
**DESCRIPTION, REMOVAL, CLEANING, INSPECTION, TESTING, INSTALLATION**

**INITIAL SETUP:****Tools and Special Tools**

Sling (item 30, WP 0086 00)  
 Tool kit, general mechanic's (item 34, WP 0086 00)

**Materials/Parts**

Cleaning compound (item 5, WP 0085 00)  
 Detergent (item 6, WP 0085 00)  
 Methylene chloride (item 10, WP 0085 00)  
 Paint thinner (item 18, WP 0085 00)  
 Pins, cotter (2) (item 117, WP 0087 00)  
 Lockwashers (6) (item 29, WP 0087 00)  
 Lockwashers (3) (item 36, WP 0087 00)  
 Lockwashers (2) (item 148, WP 0087 00)  
 Lockwashers (3) (item 151, WP 0087 00)  
 Lockwashers (2) (item 154, WP 0087 00)  
 Lockwashers (3) (item 157, WP 0087 00)  
 Lockwashers (13) (item 159, WP 0087 00)  
 Lockwashers (2) (item 163, WP 0087 00)  
 Nuts (3) (item 198, WP 0087 00)  
 Nuts (3) (item 199, WP 0087 00)  
 Pin (item 15, WP 0087 00)

**Materials/Parts (cont.)**

Pin, spring (item 9, WP 0087 00)  
 Pin, straight (item 179, WP 0087 00)  
 Screws (19) (item 46, WP 0087 00)  
 Screws (6) (item 57, WP 0087 00)  
 Screws (2) (item 74, WP 0087 00)  
 Screws (3) (item 207, WP 0087 00)  
 Screws (3) (item 227, WP 0087 00)  
 Washers (3) (item 38, WP 0087 00)

**Personnel Required**

Mechanics (3)

**References**

TB 750-1047  
 TM 9-237

**Equipment Condition**

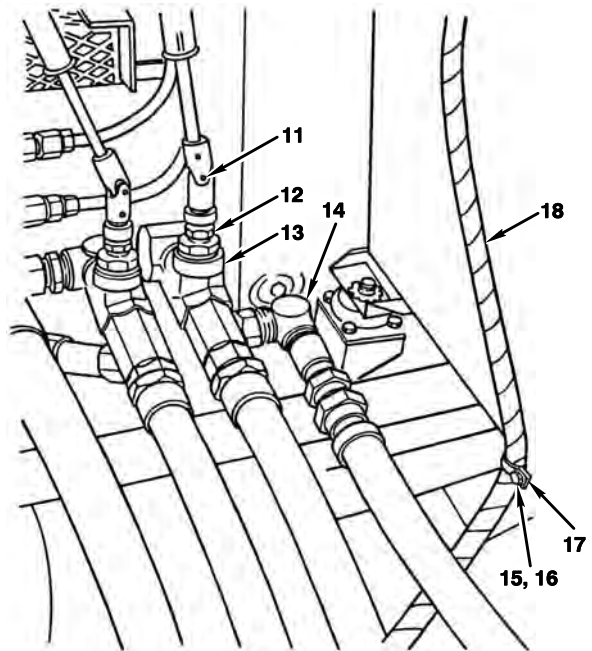
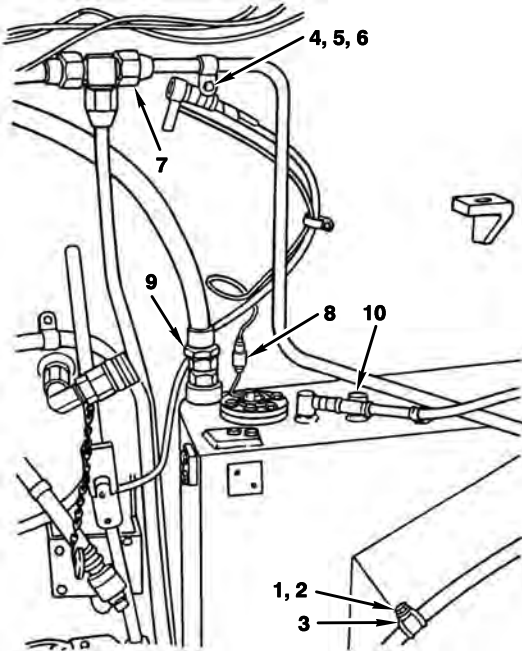
APU removed (WP 0083 00)  
 Fuel level transmitter removed (TM 9-2350-256-20)

**DESCRIPTION**

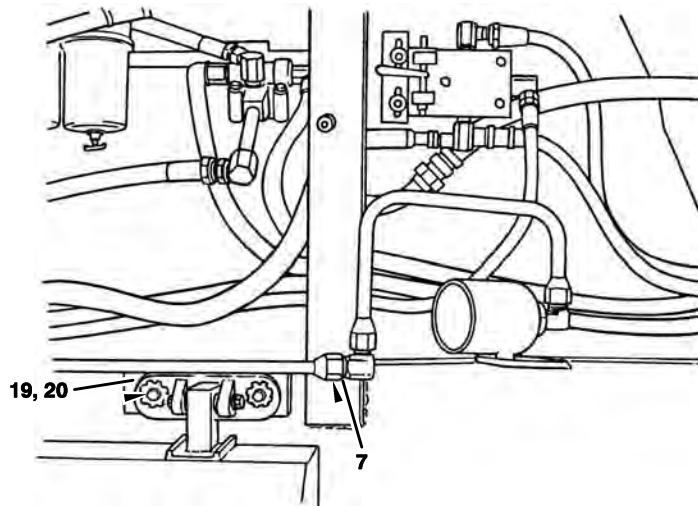
The fuel tanks are of a welded steel construction. The left rear tank contains the filler cap and filter assembly. The right and forward tanks contain liquid quantity sending units. The electric fuel pump is housed in the forward tank.

**Removal**

1. Remove screw (1), lockwasher (2), and clamp (3). Discard lockwasher.
2. Remove screw (4), lockwasher (5), clamp (6), and disconnect fire extinguisher tube (7). Discard lockwasher.
3. Disconnect sending unit lead (8), air vent line (9), and two fuel lines (10).
4. Remove spring pin (11), back off nut (12), disconnect fuel valve and fittings (13), and flex two fuel lines (14) out of way. Discard spring pin.
5. Remove screw (15), lockwasher (16), clamp (17), and flex line (18) down out of way. Discard lockwasher.



6. Remove fire extinguisher tube (7).
7. Remove six screws (19) and lockwashers (20). Discard lockwashers.

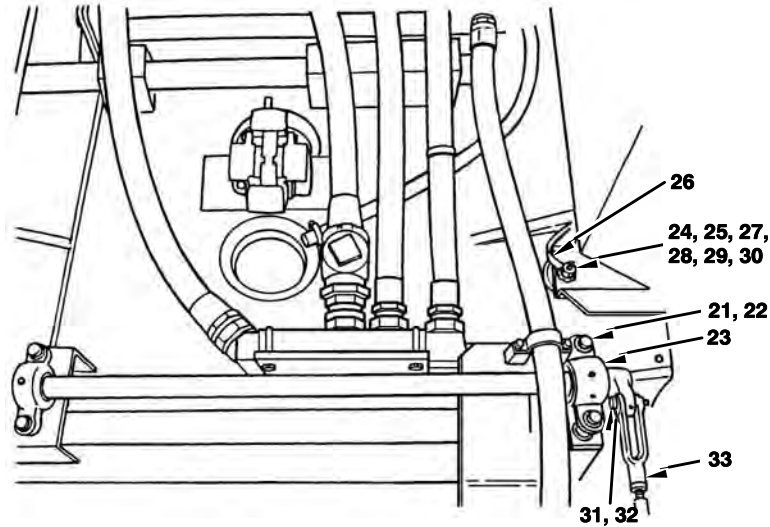


8. Remove two screws (21), lockwashers (22), and clamp (23). Discard lockwashers.

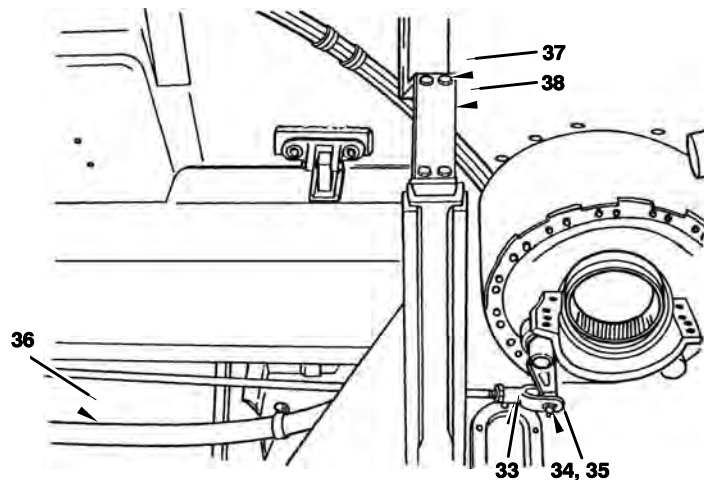
### NOTE

There are three tank mount locations but only one has a ground strap (26) and two additional lockwashers (27 and 43).

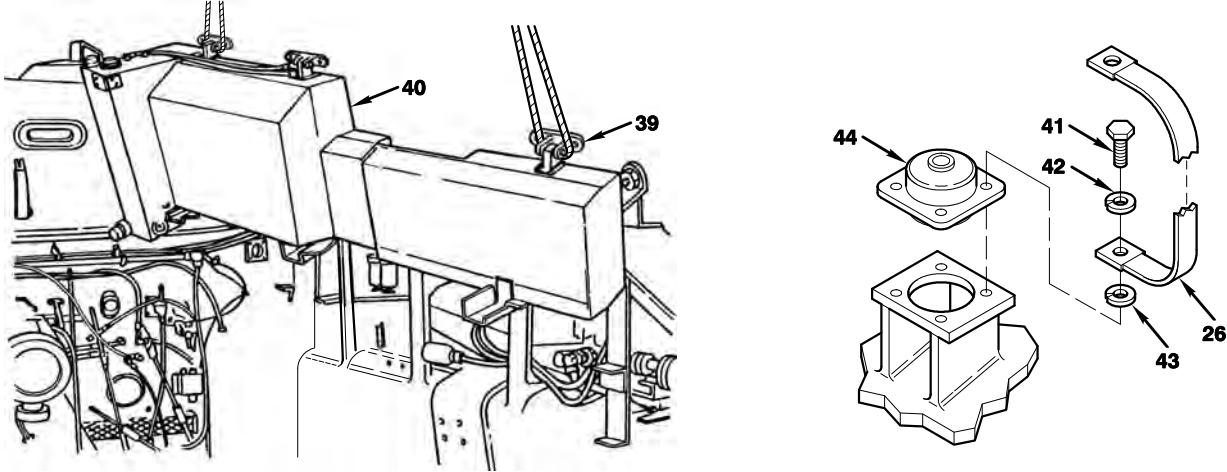
9. Remove three nuts (24), lockwashers (25), disconnect ground strap (26), remove lockwasher (27), three washers (28), bolts (tank mounting) (29), and washers (30). Discard lockwashers.
10. Remove cotter pin (31), pin (32), and disconnect brake control rod (33). Discard cotter pin.



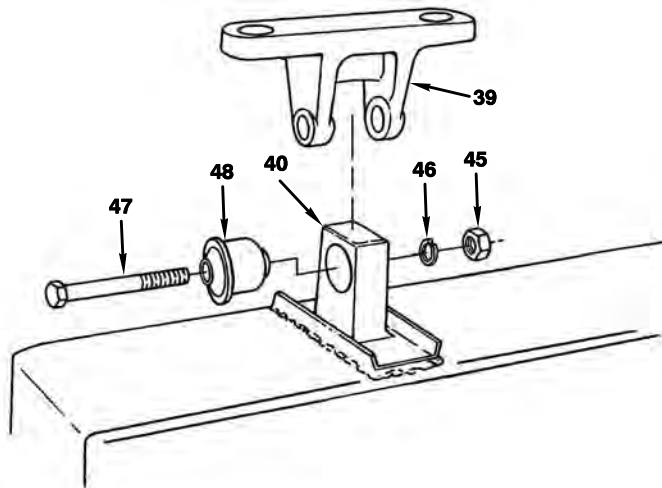
11. Remove cotter pin (34), pin (35), and brake control rod (33). Discard cotter pin.
12. Flex fuel line (36) up and out of way.
13. Remove four screws (37) and transmission guide rail brace (38).



14. Attach sling to top mount brackets (39) of fuel tank (40). Move fuel tank rearward and away from wall, and keep level while lifting straight up. Remove fuel tank from vehicle and sling and cable from top mount brackets.
15. Remove 12 screws (41), lockwashers (42), ground strap (28), lockwasher (43), and 3 tank floor mount cushions (44). Discard lockwashers.



16. Remove three nuts (45), lockwashers (46), screws (47), top mount brackets (39), and mounts (48) from fuel tank (40). Discard lockwashers.



**Cleaning**

**WARNING**

Solvents 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 solvent gets on skin or clothing, wash immediately with soap and water.

1. When a fuel tank is repaired for leaks, it is necessary to clean, inspect, and test it. Coordinate the following two steps with the inspection and testing procedures which follow this cleaning section. Clean other fuel tank components with cleaning compound or paint thinner and dry with compressed air.



2. Slush fuel tank interior with methylene chloride or cleaning compound as specified in TB 750-1047 to remove residual fuel, dirt, sediment, and foreign matter.
3. Drain and air dry. Reclean magnetic drain plug if necessary.

### Inspection-Acceptance and Rejection Criteria

1. Inspect fuel tank for cleanliness. Repeat above cleaning procedures if necessary.
2. Inspect fuel tank for any obvious cracks or open seams. Inspect mounting brackets, mounts, and cushions for cracks or breaks. Weld fuel tank and components as required (refer to TM 9-237).
3. Inspect fuel tank inlets and outlets for thread damage. Repair with a thread chaser as required.

### Testing

1. Close all openings with temporary plugs or other closures and apply 3–4 psi (21–28 kPa) internal air pressure.
2. Apply soapy water solution consisting of liquid detergent diluted with 20–40% water to all exterior surfaces and inspect for air bubble formation.
3. Mark location of any bubble formation, rinse and dry fuel tank, and weld the marked areas (refer to TM 9–237).
4. Repeat steps 1–3.

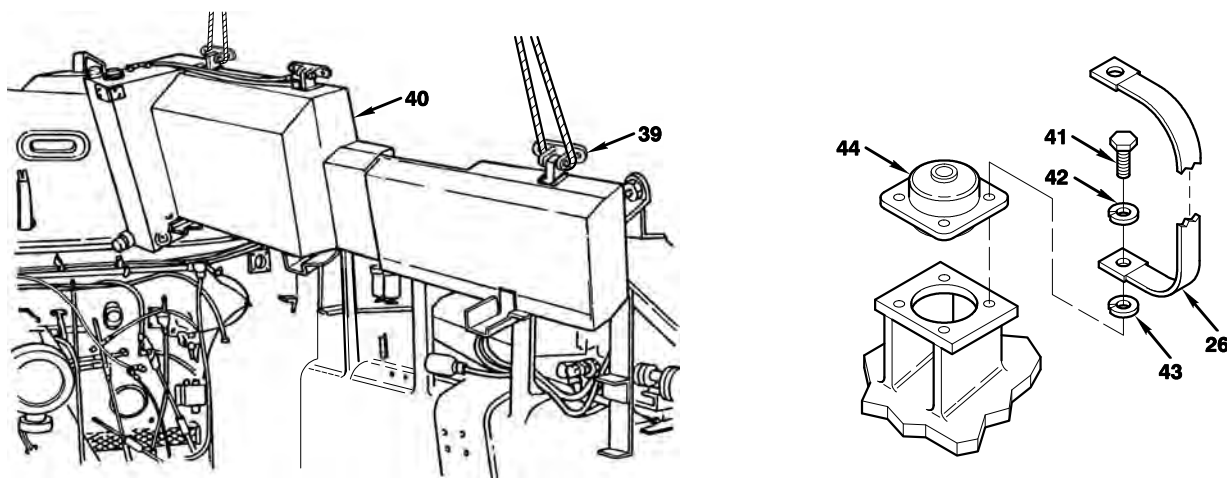
### Installation

1. Install three mounts (48), top mount brackets (39), screws (47), lockwashers (46), and nuts (45) to fuel tank (40).

### NOTE

There are three tank mount locations but only one has a ground strap (26) and two additional lockwashers (43 and 27).

2. Install 3 tank floor mount cushions (44), lockwasher (43), connect ground strap (26), install 12 lockwashers (42), and screws (41).
3. Attach sling to top mount brackets (39) of fuel tank (40). Move fuel tank rearward and away from vehicle wall, and keep level while lifting straight up. Remove fuel tank from vehicle and sling and cable from top mount brackets.

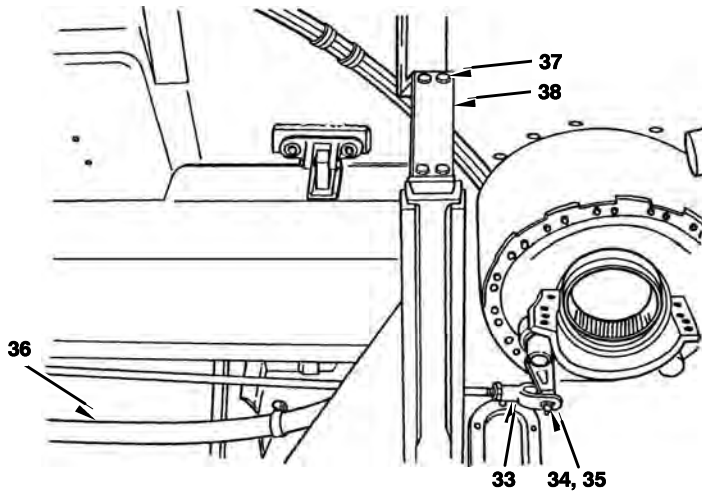


4. Install transmission guide rail brace (38) and four screws (37).
5. Move fuel line (36) into position.

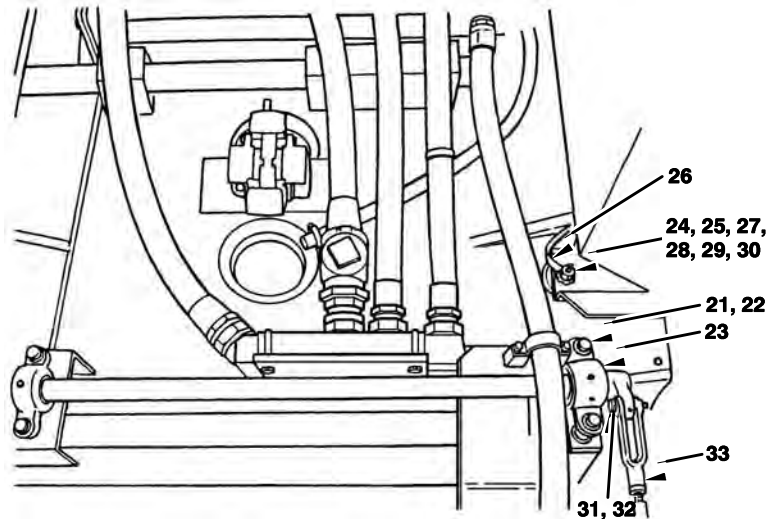
### NOTE

Refer to TM 9-2350-256-20 for alignment of brake control rod.

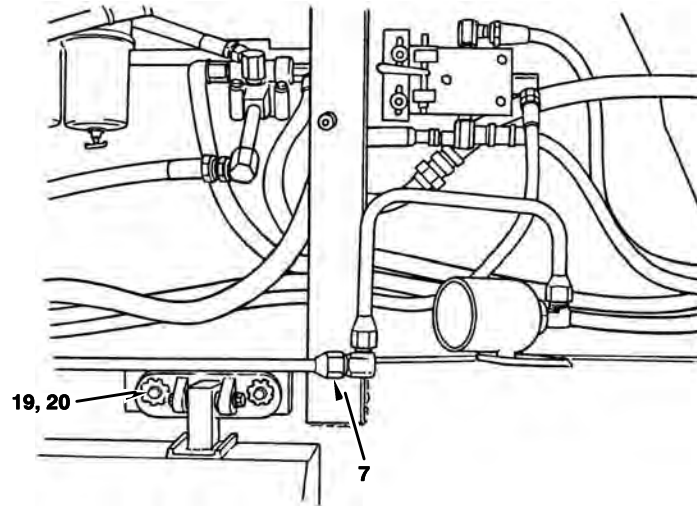
6. Connect brake control rod (33) and install pin (35) and cotter pin (34).



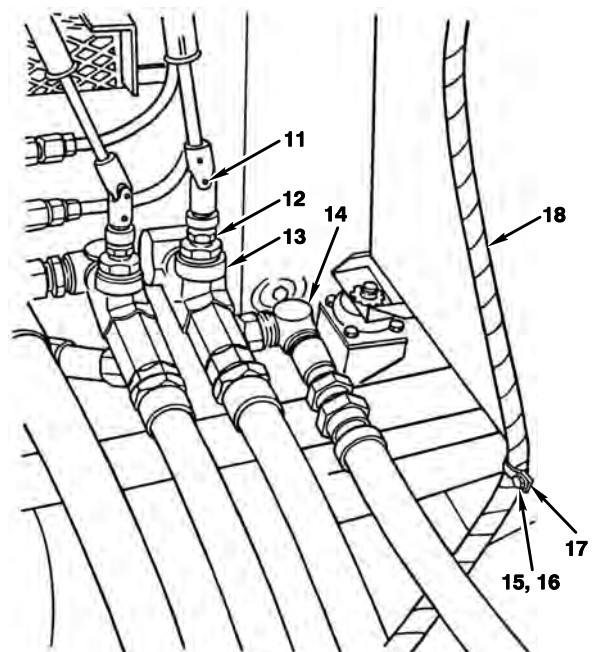
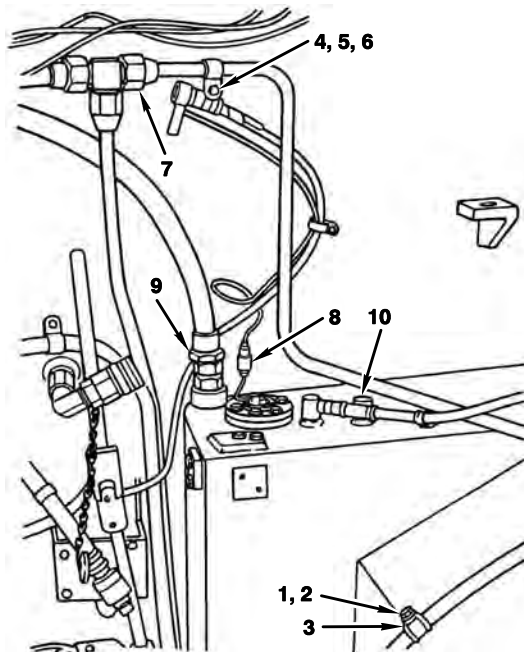
7. Install brake control rod (33), pin (32), and cotter pin (31).
8. Install three washers (30), bolts (tank mounting) (29), washers (28), lockwasher (27), ground strap (26), three lockwashers (25), and nuts (24).
9. Install clamp (23), two lockwashers (22), and screws (21).



10. Install six lockwashers (20) and screws (19).
11. Connect fire extinguisher tube (7).



12. Move line (18) into position and install clamp (17), lockwasher (16), and screw (15).
13. Move fuel valve and fittings (13) and two fuel lines (14) into position, tighten nut (12), install spring pin (11).
14. Connect two fuel lines (10), air vent line (9), and sending unit lead (8).
15. Install fire extinguisher tube (7), clamp (6), lockwasher (5), and screw (4).
16. Install clamp (3), lockwasher (2), and screw (1).



**END OF WORK PACKAGE**



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**INTERMEDIATE MAINTENANCE**  
**RECOVERY VEHICLE, FULL TRACKED: MEDIUM, M88A1**  
**NSN 2350-00-122-6826, EIC AQA**

**FORWARD FUEL TANK MAINTENANCE**  
**DESCRIPTION, REMOVAL, CLEANING, INSPECTION, TESTING, INSTALLATION**

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**INITIAL SETUP:****Tools and Special Tools**

Tool kit, general mechanic's (item 34, WP 0086 00)

**Materials/Parts**

Cleaning compound (item 5, WP 0085 00)  
 Detergent (item 6, WP 0085 00)  
 Methylene chloride (item 10, WP 0085 00)  
 Paint thinner (item 18, WP 0085 00)  
 Lockwashers (6) (item 29, WP 0087 00)  
 Lockwashers (8) (item 36, WP 0087 00)  
 Lockwasher (item 148, WP 0087 00)  
 Lockwashers (4) (item 151, WP 0087 00)  
 Lockwasher (item 157, WP 0087 00)  
 Lockwashers (16) (item 159, WP 0087 00)  
 Lockwashers (3) (item 166, WP 0087 00)  
 Nuts (4) (item 198, WP 0087 00)  
 Nuts (8) (item 199, WP 0087 00)  
 Screws (6) (item 57, WP 0087 00)  
 Screws (8) (item 207, WP 0087 00)  
 Screws (16) (item 209, WP 0087 00)  
 Screws (3) (item 221, WP 0087 00)  
 Screws (4) (item 227, WP 0087 00)  
 Washers (4) (item 38, WP 0087 00)  
 Washers (4) (item 123, WP 0087 00)

**Personnel Required**

Mechanics (3)

**References**

TB 750-1047  
 TM 9-237  
 WP 0022 00

**Equipment Condition**

Commander's and rigger's seats removed (TM 9-2350-256-20)  
 Hoist winch cable chute removed (TM 9-2350-256-20)  
 Drain valve controls and control lever bracket removed (TM 9-2350-256-20)  
 Subfloor plates 5, 6, 8, 10, 11, 12, 13, 14, 17, 18, 20, 21, 22, and 23 removed (TM 9-2350-256-20)  
 Main winch and spade assembly removed (WP 0051 00)  
 Hoist winch assembly removed (WP 0053 00)  
 Mechanical transmission and hydraulic pump assembly removed (WP 0065 00)  
 Mechanical transmission power takeoff drive shaft disconnected at main engine and shaft entirely removed (WP 0066 00)  
 APU control box and bracket, and shift and throttle control components mounted on floor plates removed (TM 9-2350-256-20)  
 Any stowage racks and boxes interfering with removal of fuel tank removed (TM 9-2350-256-20)  
 Transmitter and electric fuel pump removed (TM 9-2350-256-20)

**DESCRIPTION**

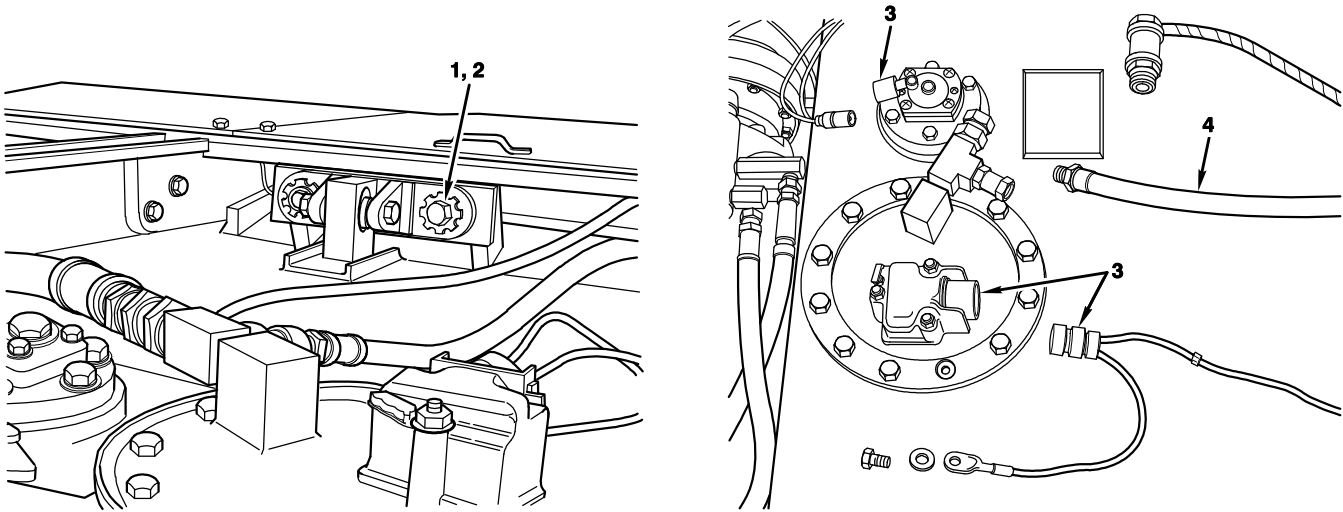
The fuel tanks are of a welded steel construction. The left rear tank contains the filler cap and filter assembly. The right and forward tanks contain liquid quantity sending units. The electric fuel pump is housed in the forward tank.

**NOTE**

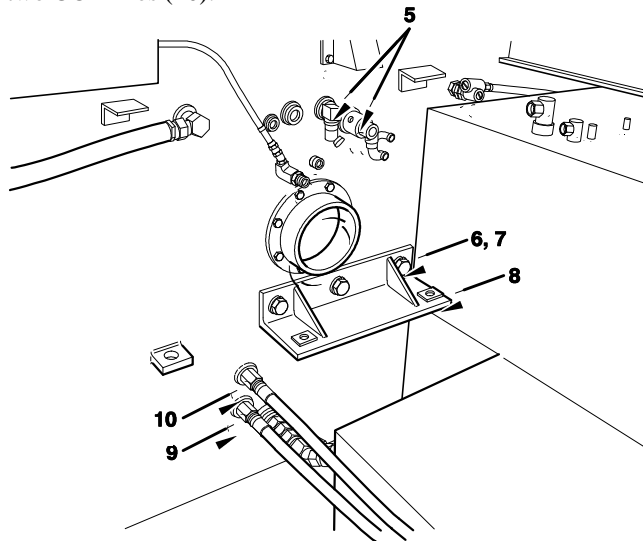
The fuel tank may be stripped of all fittings, fuel pump, and sending unit, while installed, for ventilation purposes (refer to TM 9-2350-256-20).

**Removal**

1. Support rear (lower) end of hydraulic control panel (subplate) by opening operator's and mechanic's hatches and looping a chain through hatches. Secure chain to lower end of panel to support it. Remove attaching bolts at rear support bracket and remove subfloor plate 1 (WP 0022 00).
2. Remove six screws (1) and lockwashers (2). Discard lockwashers.
3. Disconnect three leads (3).
4. Disconnect two fuel lines (4).



5. Remove fittings (5).
6. Remove three screws (6), lockwashers (7), and mechanical transmission bracket (8). Discard lockwashers.
7. Disconnect fuel line (9) and two CO2 lines (10).

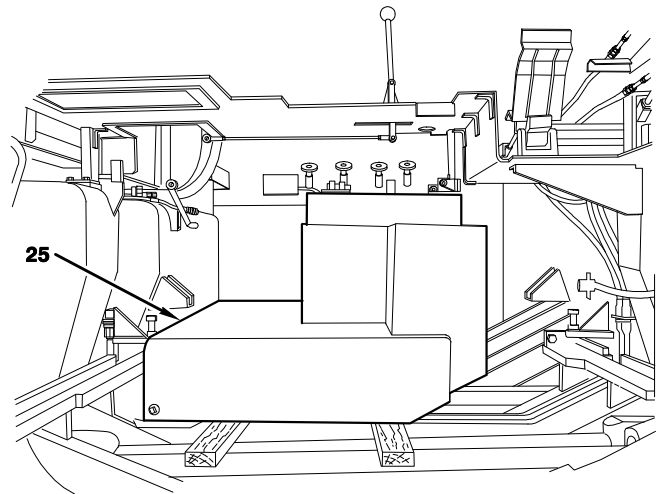
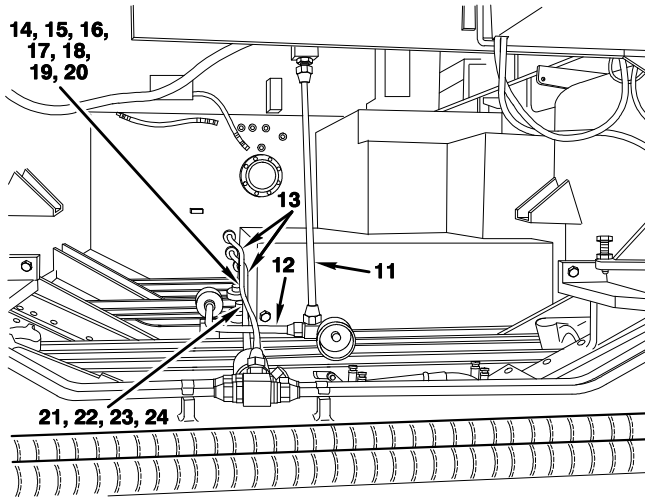


8. Disconnect CO2 line (11) and two CO2 lines (12).
9. Remove two CO2 lines (13).

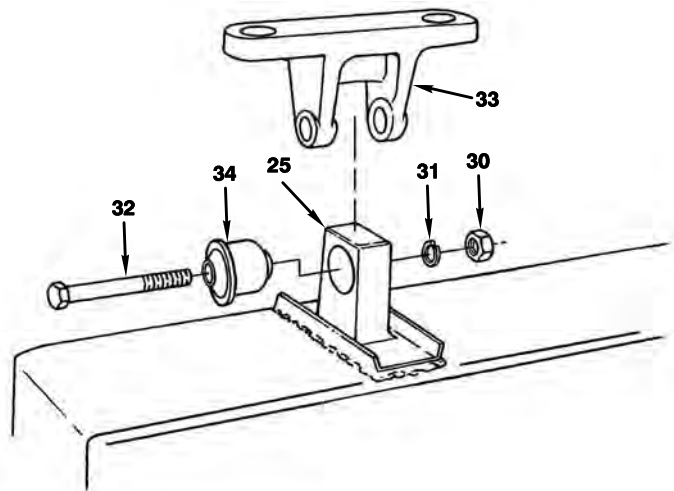
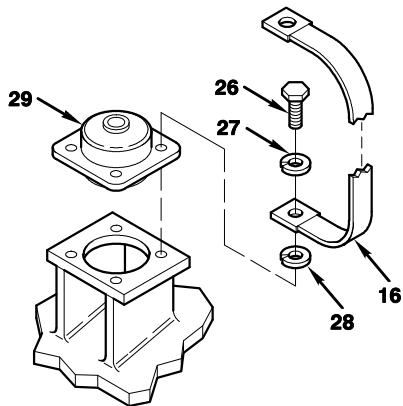
**NOTE**

There are eight tank mount locations but only one has a ground strap (16) and two additional lockwashers (17 and 28).

10. Remove four nuts (14), lockwashers (15), disconnect ground strap (16), remove lockwasher (17), four washers (18), bolts (19), and washers (20). Discard lockwashers.
11. Remove four nuts (21), lockwashers (22), screws (23), and mount cushions (24). Discard lockwashers.
12. Move fuel tank (25) from wall onto 2x4 skids and slide out of spade opening.



13. Remove 16 screws (26), lockwashers (27), ground strap (16), lockwasher (28), and 4 tank floor mount cushions (29). Discard lockwashers.
14. Remove four nuts (30), lockwashers (31), screws (32), top mount brackets (33), and mounts (34) from fuel tank (25). Discard lockwashers.



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## Cleaning

### **WARNING**

Solvents 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 solvent gets on skin or clothing, wash immediately with soap and water.

### **NOTE**

Unscrew the magnetic drain plug from the bottom of the fuel tank, clean it of all particles, inspect for thread damage, and replace on fuel tank prior to cleaning fuel tank.

1. When a fuel tank is repaired for leaks, it is necessary to clean, inspect, and test it. Coordinate the following two steps with the inspection and testing procedures which follow this cleaning section. Clean other fuel tank components with cleaning compound or paint thinner and dry with compressed air.
2. Slush fuel tank interior with methylene chloride or cleaning compound as specified in TB 750-1047 to remove residual fuel, dirt, sediment, and foreign matter.
3. Drain and air dry. Reclean magnetic drain plug if necessary.

### **Inspection-Acceptance and Rejection Criteria**

1. Inspect fuel tank for cleanliness. Repeat above cleaning procedures if necessary.
2. Inspect fuel tank for any obvious cracks or open seams. Inspect mounting brackets, mounts, and cushions for cracks or breaks. Weld fuel tank and components as required (refer to TM 9-237).
3. Inspect fuel tank inlets and outlets for thread damage. Repair with a thread chaser as required.

### **Testing**

1. Close all openings with temporary plugs or other closures and apply 3–4 psi (21–28 kPa) internal air pressure.
2. Apply soapy water solution consisting of liquid detergent diluted with 20–40% water to all exterior surfaces and inspect for air bubble formation.
3. Mark location of any bubble formation, rinse and dry fuel tank, and weld the marked areas (refer to TM 9-237).
4. Repeat steps 1–3.



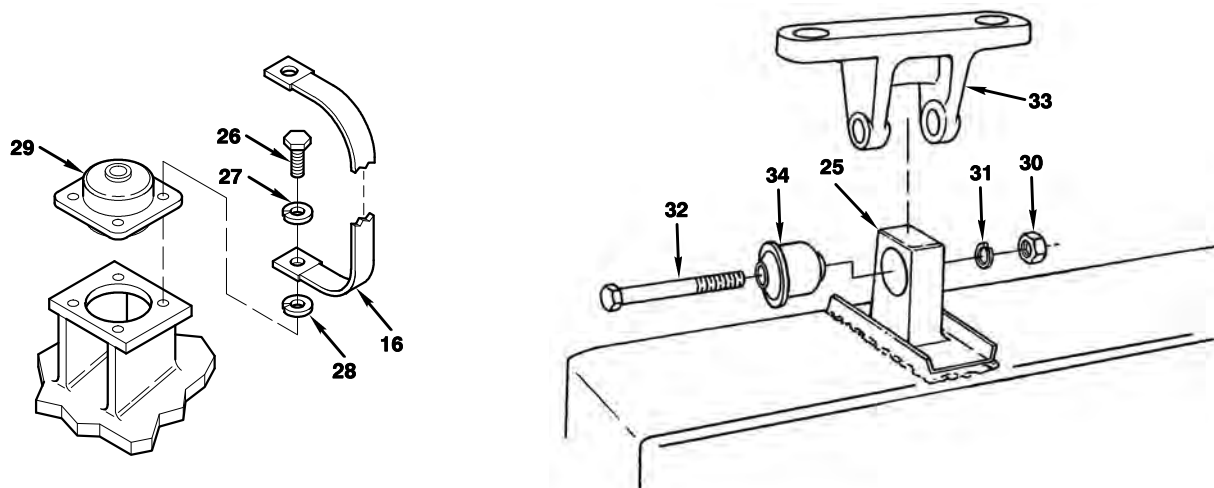
## Installation

1. Install four mounts (34), top mount brackets (33), screws (32), lockwashers (31), and nuts (30) to fuel tank (25).

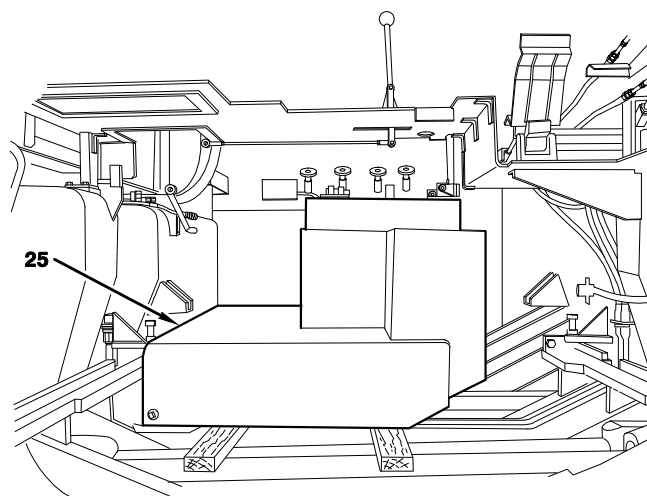
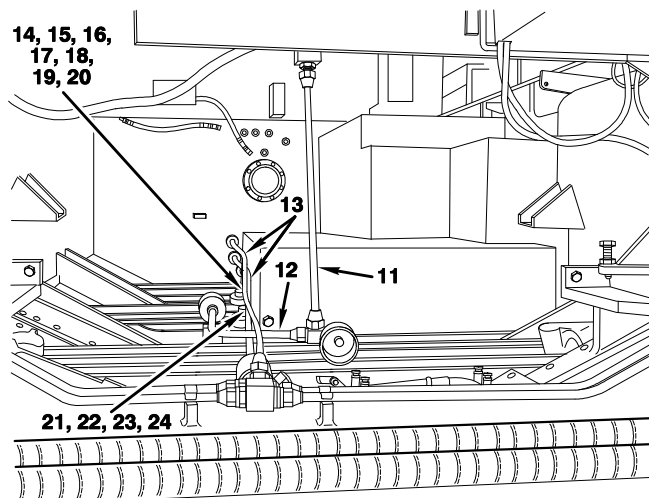
### NOTE

There are eight tank mount locations but only one has a ground strap (16) and two additional lockwashers (28 and 17).

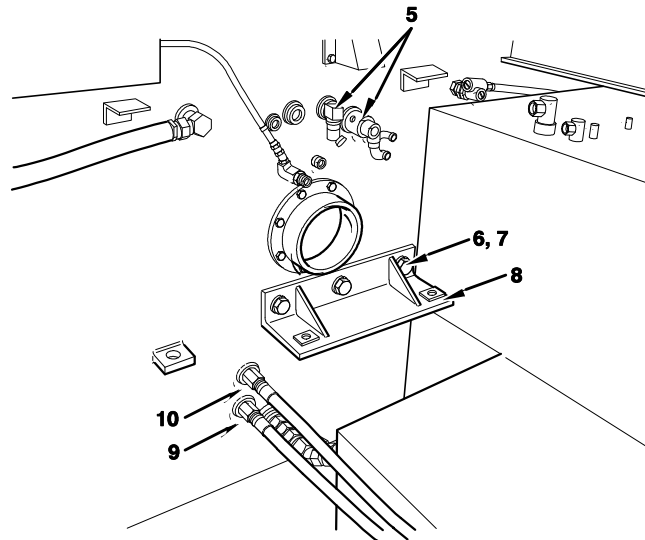
2. Install 4 tank floor mount cushions (29), lockwasher (28), connect ground strap (16), install 16 lockwashers (27), and screws (26).



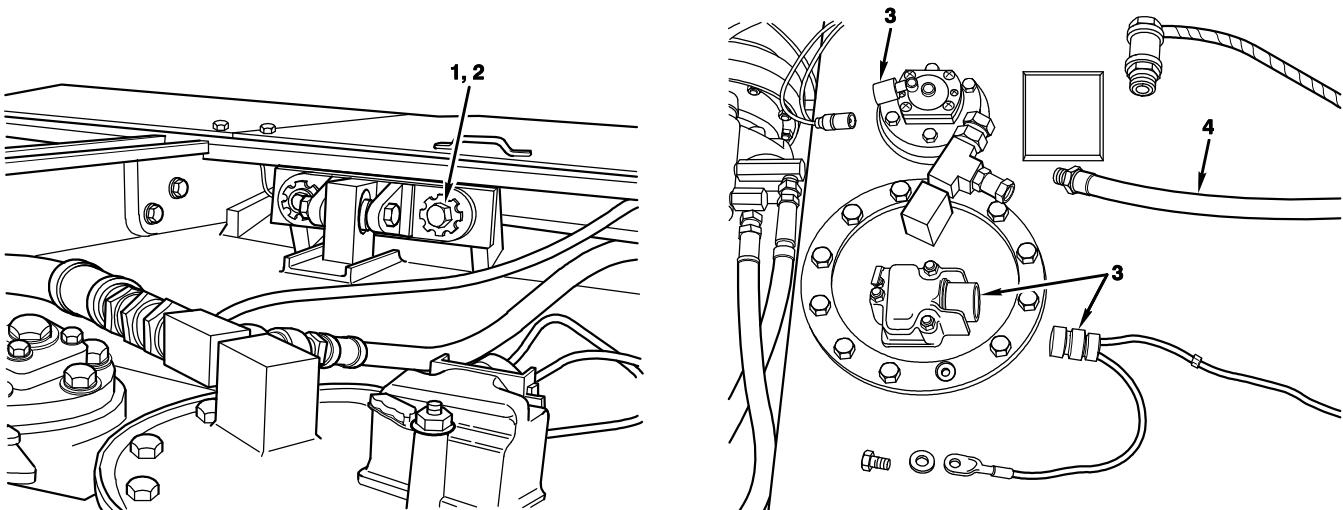
3. Move fuel tank (25) through spade opening onto 2x5 skids and slide into position.
4. Install four mount cushions (24), screws (23), lockwashers (22), and nuts (21).
5. Install four washers (20), bolts (tank mounting) (19), washers (18), lockwasher (17), ground strap (16), four lockwashers (15), and nuts (14).
6. Install two CO2 lines (13).
7. Connect two CO2 lines (12) and CO2 line (11).



8. Connect two CO2 lines (10) and fuel line (9).
9. Install mechanical transmission bracket (8), three lockwashers (7), and screws (6).
10. Install fittings (5).



11. Connect two fuel lines (4).
12. Connect three leads (3).
13. Install six lockwashers (2) and screws (1).



**END OF WORK PACKAGE**

**INTERMEDIATE MAINTENANCE**  
**RECOVERY VEHICLE, FULL TRACKED: MEDIUM, M88A1**  
**NSN 2350-00-122-6826, EIC AQA**

**FUEL TRANSFER PUMP AND AUXILIARY HYDRAULIC MOTOR MAINTENANCE**  
**REMOVAL, DISASSEMBLY, ASSEMBLY, INSTALLATION**

**INITIAL SETUP:**

**Tools and Special Tools**

Tool kit, general mechanic's (item 34, WP 0086 00)

**Materials/Parts**

Lockwashers (8) (item 160, WP 0087 00)  
 Lockwashers (4) (item 161, WP 0087 00)  
 Nuts (4) (item 201, WP 0087 00)  
 Screws (4) (item 210, WP 0087 00)

**Materials/Parts (cont.)**

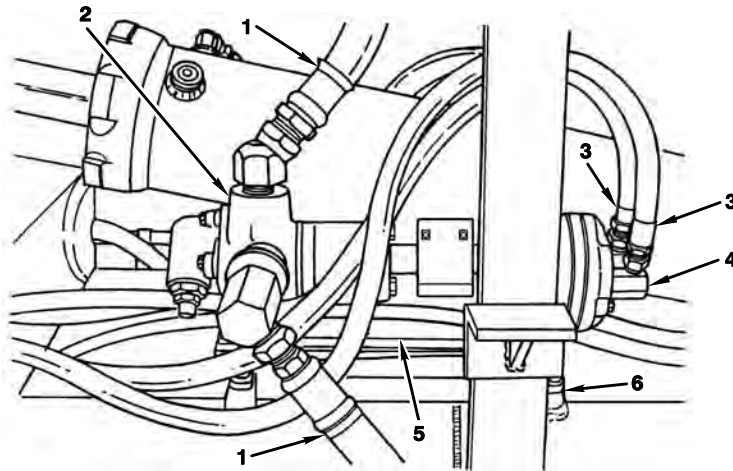
Screws (4) (item 211, WP 0087 00)  
 Screws (4) (item 214, WP 0087 00)  
 Setscrews (2) (item 235, WP 0087 00)

**Equipment Condition**

Deck doors 7 and 8 opened (WP 0022 00)  
 Engine deck removed (TM 9-2350-256-20)

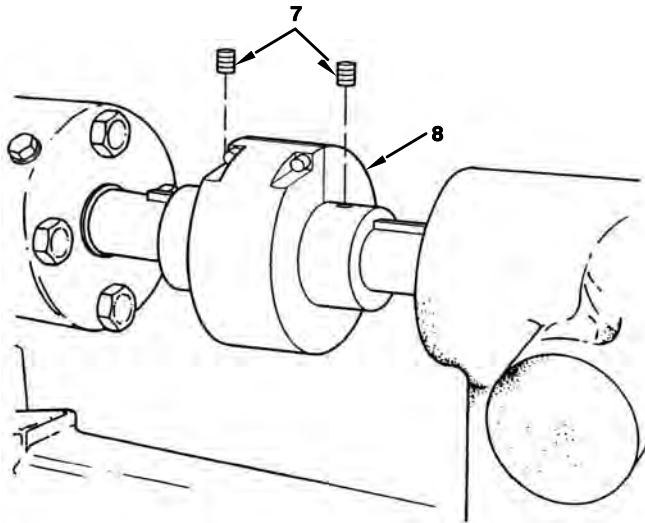
**Removal**

1. Disconnect two fuel lines (1) from fuel transfer pump (2) and two hydraulic lines (3) from auxiliary hydraulic motor (4).
2. Remove fuel transfer pump and auxiliary hydraulic motor assembly (5) and shims (6).

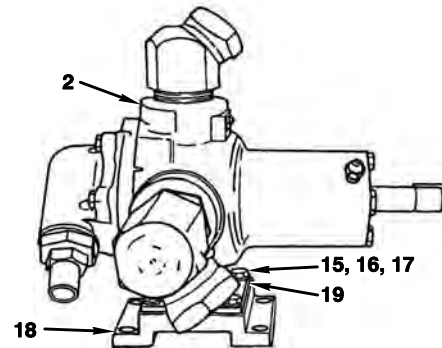
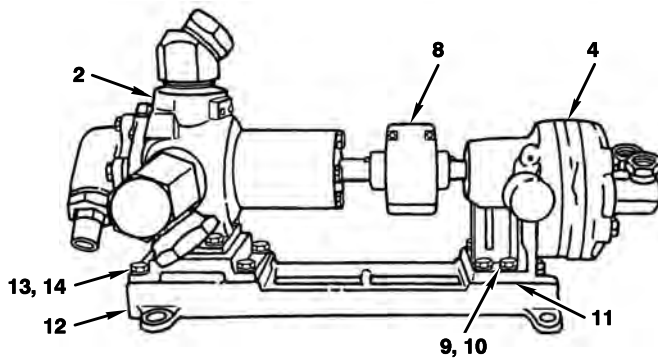


## Disassembly

1. Remove two setscrews (7) from coupling assembly (8).



2. Remove four screws (9), lockwashers (10), auxiliary hydraulic motor (4), and shims (11) from base (12). Discard lockwashers.
3. Remove coupling assembly (8).
4. Remove four screws (13), lockwashers (14), and fuel transfer pump (2) from base (12). Discard lockwashers.
5. Remove four nuts (15), lockwashers (16), screws (17), adapter (18), and shim (19) from fuel transfer pump (2). Discard lockwashers.



## Assembly

1. Install shim (19), adapter (18), four screws (17), lockwashers (16), and nuts (15) to fuel transfer pump (2).
2. Install fuel transfer pump (2), four lockwashers (14), and screws (13) to base (12).
3. Install coupling assembly (8).

## NOTE

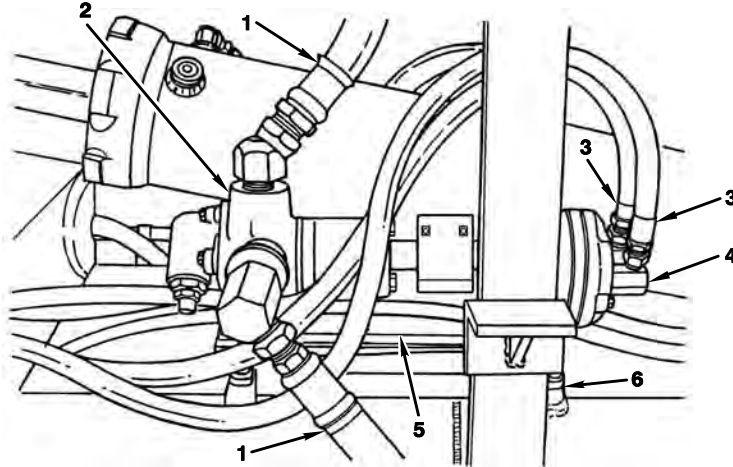
Install sufficient shims (11) between base (12) and auxiliary hydraulic motor (4) to ensure sprocket alignment.

4. Install shims (11), auxiliary hydraulic motor (4), four lockwashers (10), and screws (9) to base (12).
5. Install two setscrews (7) to coupling assembly (8).

**Installation****NOTE**

Install sufficient shims (6) between base and mounting pads to ensure that all four feet set squarely on pads.

1. Install shims (6) and fuel transfer pump and auxiliary hydraulic motor assembly (5).
2. Connect two hydraulic lines (3) to auxiliary hydraulic motor (4) and two fuel lines (1) to fuel transfer pump (2).

**END OF WORK PACKAGE**



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**INTERMEDIATE MAINTENANCE**  
**RECOVERY VEHICLE, FULL TRACKED: MEDIUM, M88A1**  
**NSN 2350-00-122-6826, EIC AQA**

**PURGE PUMP MAINTENANCE**  
**DESCRIPTION, REMOVAL, DISASSEMBLY, CLEANING, INSPECTION,**  
**REPAIR, ASSEMBLY, INSTALLATION, TESTING**

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**INITIAL SETUP:****Tools and Special Tools**

Tool kit, general mechanic's (item 34, WP 0086 00)

**Materials/Parts**

Cleaning compound (item 5, WP 0085 00)

Paint thinner (item 18, WP 0085 00)

Lockwasher (item 154, WP 0087 00)

Lockwire (as required) item 106, WP 0087 00)

**Materials/Parts (cont.)**

Packings (2) (item 129, WP 0087 00)

Packing (item 130, WP 0087 00)

Screw (item 203, WP 0087 00)

**References**

TM 9-2350-256-20

WP 0022 00

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**DESCRIPTION**

The purge pump is used to pump air from the fuel lines and to operate the engine manifold heaters for cold weather starting.

**Removal**

1. Remove purge pump in accordance with TM 9-2350-256-20.

Disassembly

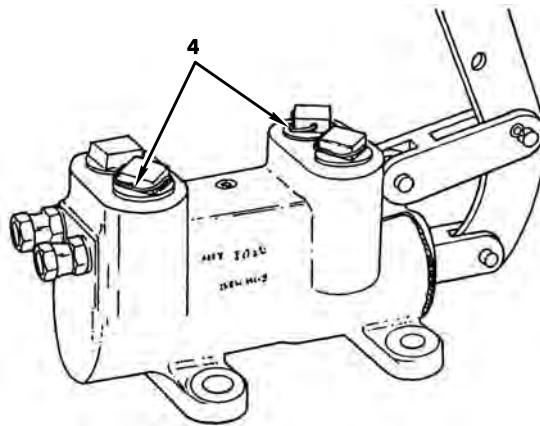
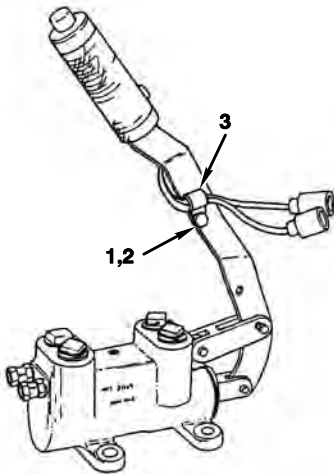
**CAUTION**

Be careful not to damage switch leads when removing handle.

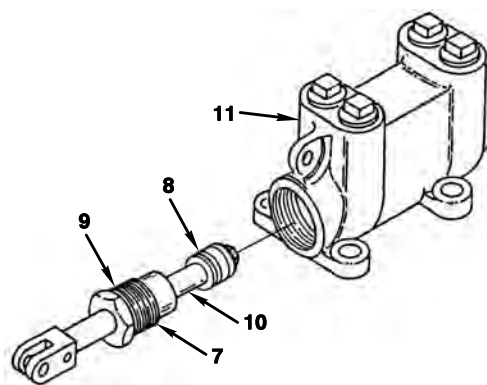
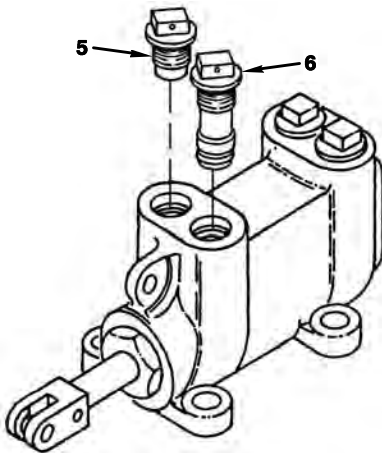
**NOTE**

Refer to TM 9-2350-256-20 for instructions on further disassembly of the purge pump.

1. Remove screw (1), lockwasher (2), and clamp (3). Discard lockwasher.



2. Cut two lockwires (4) and remove two outlet valves (5) and inlet valves (6). Discard lockwires.
3. Unscrew gland (7) and remove packing (8), two packings (9), and piston and rod assembly (10) from pump housing (11). Discard packings.





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## Cleaning

### **WARNING**

Solvents 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 solvent gets on skin or clothing, wash immediately with soap and water.

1. Clean dirt and other foreign matter from all metal parts in cleaning compound or paint thinner. Dry with compressed air.
2. Clean dirt from ferrules on switch leads if necessary.

## Inspection-Acceptance and Rejection Criteria

1. Inspect switch leads for cuts or other damage.
2. Check switch for electrical continuity and switching action.
3. Inspect threaded parts for stripping, cross threading, and other evidence of excessive wear.
4. Inspect all components for cracks, distortion, and other evidence of excessive wear.

## Repair or Replacement

1. Replace all defective components.

## Assembly

### **CAUTION**

Be careful not to damage switch leads when installing handle.

### **NOTE**

Refer to TM 9-2350-256-20 for instructions on further assembly of the purge pump.

1. Install two packings (9) and packing (8) on piston and rod assembly (10) and install piston and rod assembly by screwing gland (7) into pump housing (11).

### **NOTE**

Refer to WP 0022 00 for instructions on installing lockwire.

2. Install two inlet valves (6), outlet valves (5), and lockwires (4).
3. Install clamp (3), lockwasher (2), and screw (1).

## Installation

1. Install purge pump in accordance with TM 9-2350-256-20.

## Testing

1. Test purge pump by using normal operating procedures as described in TM 9-2350-256-20.

## END OF WORK PACKAGE



**INTERMEDIATE MAINTENANCE**  
**RECOVERY VEHICLE, FULL TRACKED: MEDIUM, M88A1**  
**NSN 2350-00-122-6826, EIC AQA**  
**ENGINE COOLING FANS MAINTENANCE**  
**DESCRIPTION, REMOVAL, DISASSEMBLY, ASSEMBLY, INSTALLATION**

**INITIAL SETUP:****Tools and Special Tools**

Tool kit, general mechanic's (item 34, WP 0086 00)

**Materials/Parts**

Bolts (32) (item 41, WP 0087 00)

Nuts (32) (item 175, WP 0087 00)

**Materials/Parts (cont.)**

Pins, cotter (32) (item 113, WP 0087 00)

Washers (32) (item 21, WP 0087 00)

**References**

TM 9-2350-256-20

**DESCRIPTION**

The engine cooling fans are attached to hubs and are mounted on shafts that are driven by the engine-driven fan drive clutch assembly. The hub and fan assemblies are balanced, but each assembly can be replaced without affecting the balance of the complete unit. Both hub and fan assemblies are interchangeable.

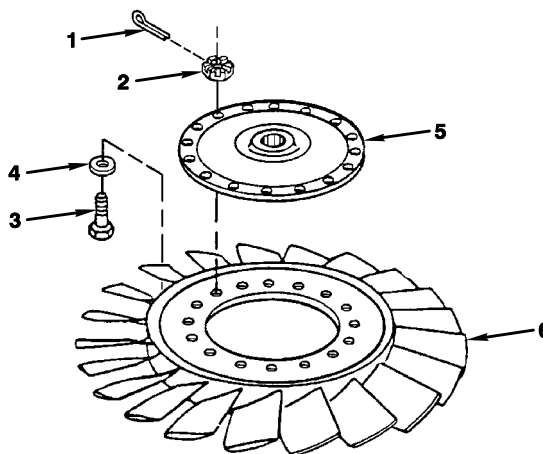
**Removal**

1. Remove engine cooling fans in accordance with TM 9-2350-256-20.

**Disassembly****NOTE**

Both the forward and rear cooling fans are disassembled the same way. This procedure covers one cooling fan.

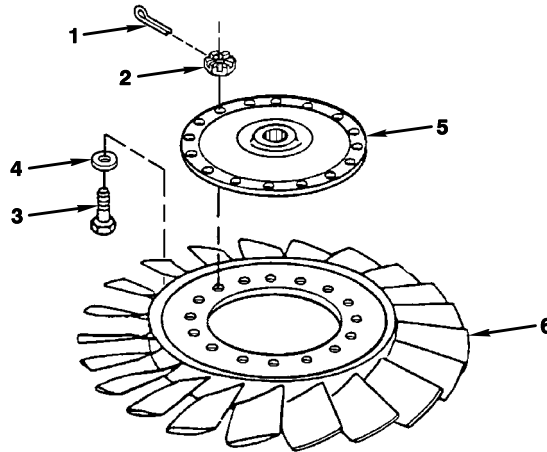
1. Remove 16 cotter pins (1), nuts (2), bolts (3), washers (4), hub body (5), and fan impeller (6). Discard cotter pins.



**Assembly****NOTE**

Both the forward and rear cooling fans are assembled the same way. This procedure covers one cooling fan.

1. Install fan impeller (6), hub body (5), 16 washers (4), bolts (3), nuts (2), and cotter pins (1).

**Installation**

1. Install engine cooling fans in accordance with TM 9-2350-256-20.

**END OF WORK PACKAGE**

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**INTERMEDIATE MAINTENANCE**  
**RECOVERY VEHICLE, FULL TRACKED: MEDIUM, M88A1**  
**NSN 2350-00-122-6826, EIC AQA**  
**WIRING HARNESS GENERAL MAINTENANCE**  
**REMOVAL, DISASSEMBLY, INSPECTION, REPAIR, ASSEMBLY, INSTALLATION, TEST**

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**INITIAL SETUP:****Test Equipment**

Multimeter (item 23, WP 0086 00)

**Tools and Special Tools**

Soldering gun (item 32, WP 0086 00)  
 Tool kit, electrical (item 33, WP 0086 00)  
 Tool kit, general mechanic's (item 34, WP 0086 00)

**Materials/Parts**

Brush, scrub (item 4, WP 0085 00)  
 Marker tags (item 9, WP 0085 00)  
 Rod (item 12, WP 0085 00)  
 Solder (item 15, WP 0085 00)  
 Tape, insulation, electrical (item 17, WP 0085 00)

**References**

TB SIG 222  
 WP 0034 00  
 WP 0035 00  
 WP 0036 00  
 WP 0037 00  
 WP 0038 00

**Equipment Condition**

Master switch off  
 Battery ground cables disconnected (TM 9-2350-256-20)

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**WARNING**

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Certain precautions must be observed when removing electrical components. Accidental contact of metal tools between battery or starter cables and the frame of the vehicle causes a direct short circuit resulting in arcing and instant heating of the tool to red hot. This can cause painful burns on the hands and serious damage to tools, vehicle components and batteries. Moreover the overloaded battery may explode, spraying hot acid and sharp fragments over the surrounding area. The correct procedure when removing electrical equipment, harnesses, leads, or cables is to first turn off the master switch and then disconnect the battery ground cables. Protect the ground cables from accidental contact with the battery terminals. When the work has been completed, connect the battery ground cables last.

**CAUTION**

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When removing harnesses, leads, and cables, check circuit number markers. If any are missing, illegible, or damaged to the extent that they might come off, tag cables with correct circuit numbers (refer to the vehicle wiring diagram in TM 9-2350-256-20) prior to disconnecting them.

**Removal**

1. Refer to WPs 0034 00 thru 0038 00 and TM 9-2350-256-20 for removal instructions of wiring harnesses. The circuit number of each cable is shown on a metal band attached to the junction of terminal end of each cable. Refer to TM 9-2350-256-20 for a listing of the circuit numbers assigned to the vehicle and for the vehicle wiring diagram.

**Disassembly**

1. Unwrap or cut tape which binds the wires or cables to the old harness.

2. Lay out the old harness with all the splices exposed, so that it can be used as a model for building the new harness.
3. Tag or otherwise identify all wires or cables.
4. Remove all cable connectors.

### Inspection-Acceptance and Rejection Criteria

1. Shell and terminal assemblies:
  - a. Inspect for cracks, tears, cuts, chips, and gouges.
  - b. Inspect for condition of material and discard parts showing any sign of hardening.
2. Plug and receptacle assemblies:
  - a. Inspect for cracks, dents, bent inserts, cross threading, and damage that would impair their serviceability.

### Repair or Replacement

1. General. Before repairing a harness, clean thoroughly of dirt and other accumulations with a brush and clean water. Dry and perform the following inspection procedures:
  - a. Inspect harness for frayed areas.
  - b. Inspect individual leads for cuts and other evidence of excessive wear and for missing, damaged, and illegible circuit number and part number markers.
  - c. Inspect all cable connectors as described in INSPECTION paragraph above.

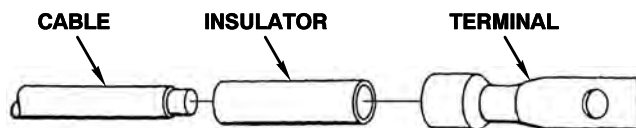
#### NOTE

Do not distort skirts of terminal when crimping to cable.

#### NOTE

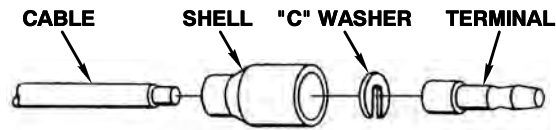
In plug and receptacle assemblies, plug all spare grommet holes with rod.

2. Procedure:
  - a. Replace frayed wiring.
  - b. Remove defective leads and replace, reusing cable connectors (refer to "c" below) where possible. Use spare harness leads, if present, as replacement or cut a new length of cable of proper gage and assemble into the harness (refer to ASSEMBLY paragraph below).
  - c. Remove damaged and defective connectors and install new connector parts as follows:
    - (1) Terminal-type cable connector:
      - (a) Strip cable insulation equal to depth of terminal well.
      - (b) Slide insulator over cable.
      - (c) Insert cable into terminal well, and crimp.
      - (d) Slide insulator over crimped end of terminal.



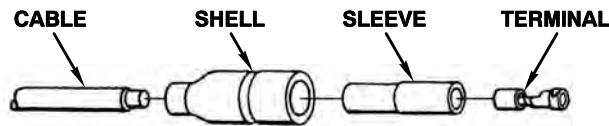
(2) Male cable connector:

- (a) Strip cable insulation equal to depth of terminal well.
- (b) Slide shell over cable.
- (c) Insert cable into terminal well, and crimp.
- (d) Place C-washer over cable at crimped junction and slide shell over C-washer and terminal.



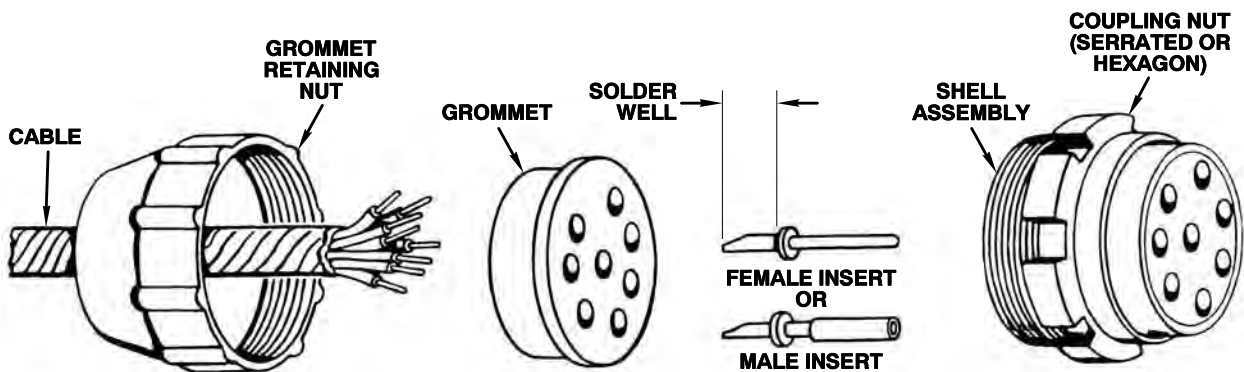
(3) Female cable connector (with sleeve):

- (a) Strip cable insulation equal to depth of terminal well.
- (b) Slide shell and sleeve over cable.
- (c) Insert cable into terminal well, and crimp.
- (d) Slide shell and sleeve over terminal.

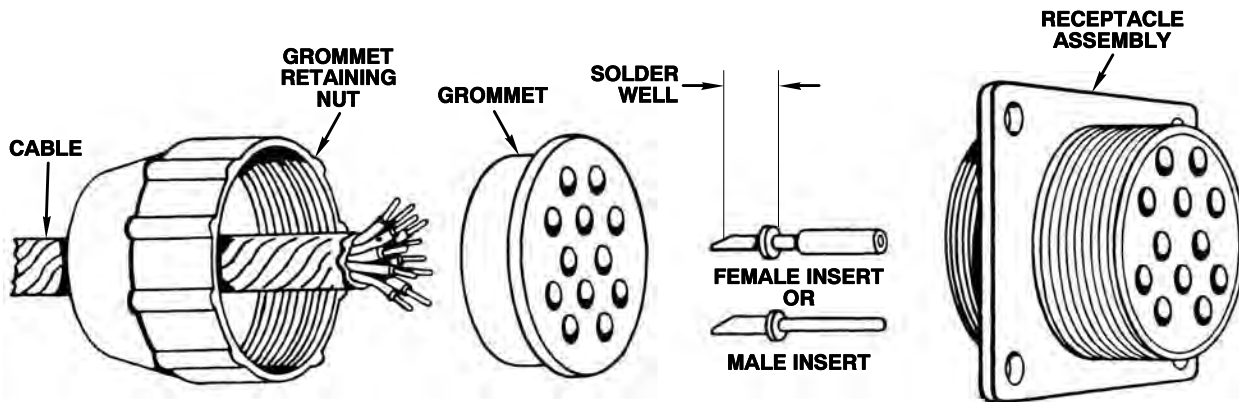


(4) Plug assembly:

- (a) Strip cable insulation equal to depth of solder wells of inserts.
- (b) Pass cable ends through grommet retaining nut, grommet, and coupling nut; insert into solder wells of inserts and solder (refer to TB SIG 222).
- (c) Slide grommet over inserts and press into shell assembly until seated.
- (d) Thread grommet retaining nut to shell assembly until seated.



- (5) Receptacle assembly:
- Strip cable insulation equal to depth of solder wells of inserts.
  - Pass cable ends through grommet retaining nut, and grommet; insert into solder wells of inserts and solder (refer to TB SIG 222).
  - Slide grommet over inserts and press into shell assembly until seated.
  - Thread grommet retaining nut to shell assembly until seated.



### Assembly

- General. Continuity checks are performed during the fabrication procedure. The following step provides procedural instructions for step-by-step assembly and for splicing and wrapping. Refer to REPAIR paragraph above for instructions for assembly of connectors to cables.
- Procedure:
  - Using the pattern of the old harness, cut new cable to the required lengths and complete all splices. Spliced cable must be adequately insulated and the insulation must be sealed to the insulation of each cable. Wrap with  $\frac{3}{4}$ -in. black plastic sheet tape-type insulation or use heat-shrinkable promolded covers when available.
  - Make a continuity check of each cable and splice, using a multimeter.
  - Assemble connectors to cables as identified in DISASSEMBLY paragraph above.
  - Make another continuity check between opposite ends of cables through the appropriate connector pins.
  - Wrap splices and wrap cables into harness bundle with plastic electrical insulation tape. Bind cables together with one-half overlapping turns in the same manner that the old harness was wrapped.
  - Locate and attach the required circuit number and part number markers using the old harness as a pattern.

### Installation

- Refer to WPs 0034 00 thru 0038 00 and TM 9-2350-256-20 for installation instructions of wiring harnesses. The circuit number of each cable is shown on a metal band attached to the junction of terminal end of each cable. Refer to TM 9-2350-256-20 for a listing of the circuit numbers assigned to the vehicle and for the vehicle wiring diagram.

### Test and Inspection

- The test of a wiring harness is performed during assembly.

### END OF WORK PACKAGE



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**INTERMEDIATE MAINTENANCE**  
**RECOVERY VEHICLE, FULL TRACKED: MEDIUM, M88A1**  
**NSN 2350-00-122-6826, EIC AQA**

**POWERPLANT WIRING HARNESS MAINTENANCE**  
**REMOVAL, REPAIR, INSTALLATION**

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**INITIAL SETUP:****Test Equipment**

Multimeter (item 23, WP 0086 00)

**Tools and Special Tools**

Soldering gun (item 32, WP 0086 00)  
 Tool kit, electrical (item 33, WP 0086 00)  
 Tool kit, general mechanic's (item 34, WP 0086 00)

**Materials/Parts**

Marker tags (item 9, WP 0085 00)  
 Solder (item 15, WP 0085 00)  
 Tape, insulation, electrical (item 17, WP 0085 00)  
 Lockwashers (4) (item 146, WP 0087 00)  
 Lockwashers (4) (item 147, WP 0087 00)  
 Lockwasher (item 149, WP 0087 00)  
 Lockwashers (26) (item 154, WP 0087 00)  
 Lockwashers (3) (item 182, WP 0087 00)

**Materials/Parts (cont.)**

Nuts (4) (item 171, WP 0087 00)  
 Nuts (4) (item 173, WP 0087 00)  
 Screw (item 20, WP 0087 00)  
 Screw (item 50, WP 0087 00)  
 Screws (4) (item 141, WP 0087 00)  
 Screws (4) (item 144, WP 0087 00)  
 Screws (24) (item 186, WP 0087 00)  
 Screw (item 215, WP 0087 00)

**References**

WP 0033 00

**Equipment Condition**

Engine deck assembly removed (TM 9-2350-256-20)  
 Master switch off  
 Battery ground cables disconnected (TM 9-2350-256-20)

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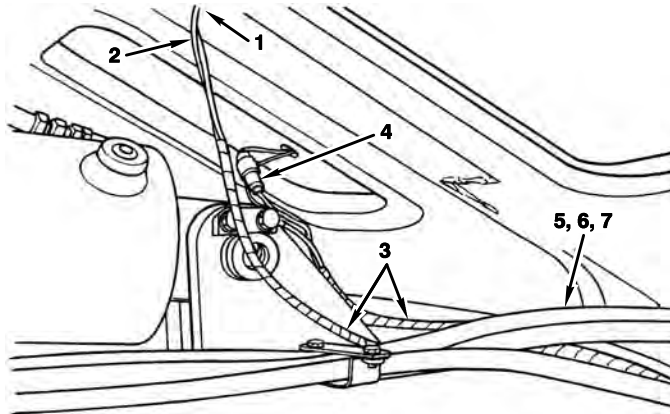
**Removal****NOTE**

Remove interfering components as required for access.

**NOTE**

Perform the following steps at right rear—engine compartment.

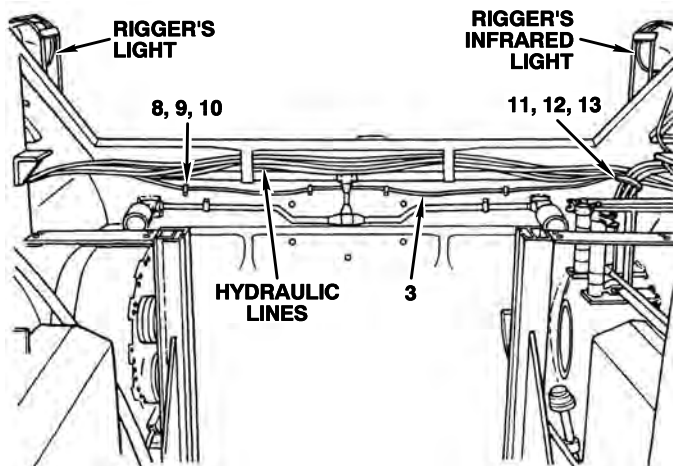
1. Remove grommet (hidden) (1) to pull connectors through hole and disconnect two leads (2) of wiring harness (3) to rigger's light.
2. Disconnect two leads (4) to B.O. marker.
3. Remove screw (5), washer (6), and clamp (hidden) (7).



**NOTE**

Perform the following steps at rear—engine compartment.

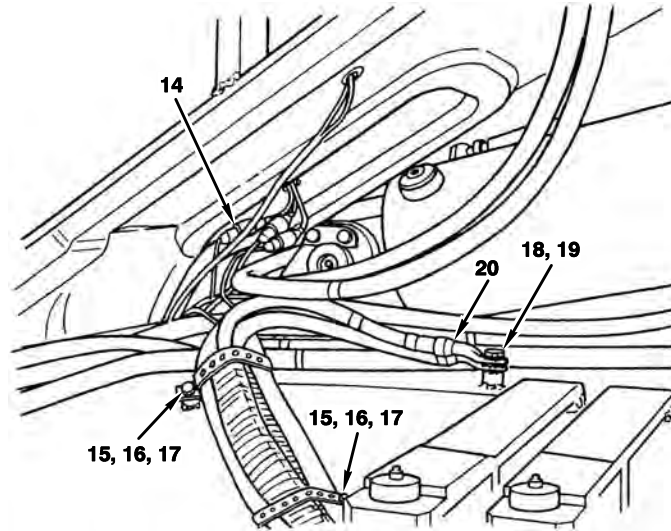
4. Remove four screws (8), washers (9), and clamps (10) from wiring harness (3).
5. Remove screw (11), washer (12), and clamp (hidden) (13).



**NOTE**

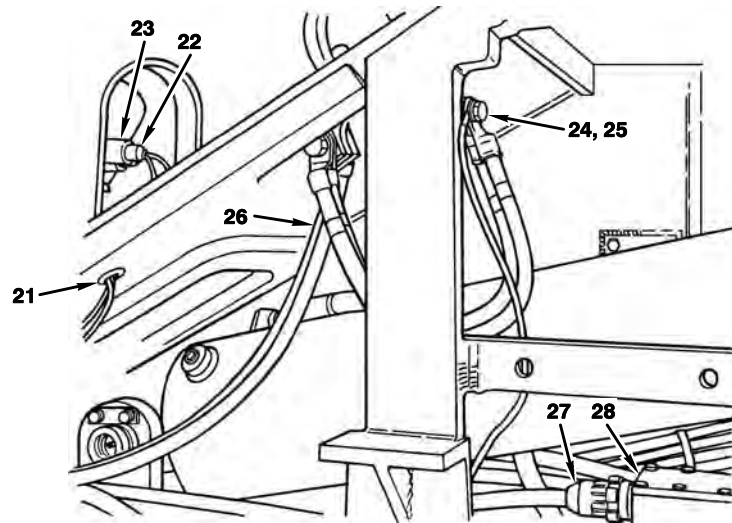
Perform the following steps at left rear—engine compartment.

6. Disconnect three leads (14) to taillight.
7. Remove two screws (15), washers (16), and clamps (17).
8. Remove screw (18), three lockwashers (19), and disconnect two ground cables (20). Discard lockwashers.

**NOTE**

Perform the following steps at left rear—engine compartment.

9. Remove grommet (21) to pull connectors through hole and disconnect two leads (22) to rigger's infrared light (23).
10. Remove screw (24) and three lockwashers (25). Discard lockwashers.
11. Disconnect two harness leads (26) to slave receptacle.
12. Disconnect cable (27) at main engine generator armature relay (28).



**NOTE**

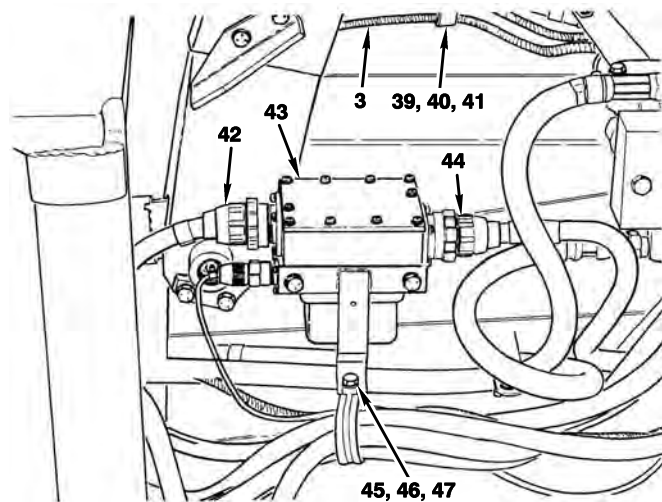
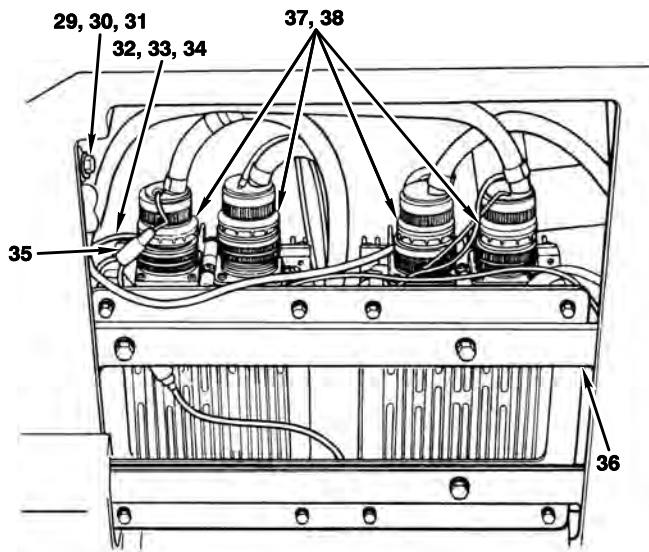
Perform the following steps at left side rear—engine compartment.

13. Remove screw (29), four washers (30), and disconnect lead (31).
14. Remove screw (32), washer (33), and disconnect lead (34).
15. Disconnect connector (35).
16. Disconnect two connectors (hidden) (36).
17. Disconnect four cables (37) from voltage regulators (38).

**NOTE**

Perform the following steps at left side center—engine compartment.

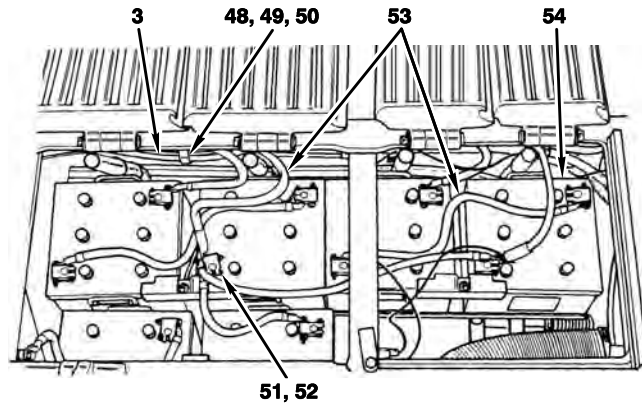
18. Remove three screws (39), washers (40), and clamps (41) from wiring harness (3).
19. Disconnect four cables (42) from master relay (43).
20. Disconnect cable (44) from master relay (43).
21. Remove screw (45), washer (46), and clamp (47).



**NOTE**

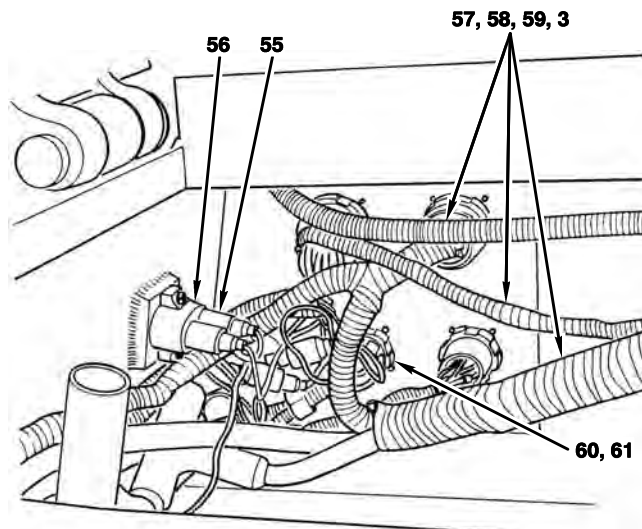
Perform the following steps at left side front—engine compartment.

22. Remove three screws (48), washers (49), and clamps (50) from wiring harness (3).
23. Remove two screws (51) and nuts (52) and disconnect two cables (53) from batteries (54).

**NOTE**

Perform the following steps at left side front corner—engine compartment.

24. Disconnect two leads (55) from circuit breaker (56).
25. Remove screws (57), washers (58), and clamps (59) from wiring harness (3).
26. Disconnect four harnesses (60) from bulkhead receptacles (61).

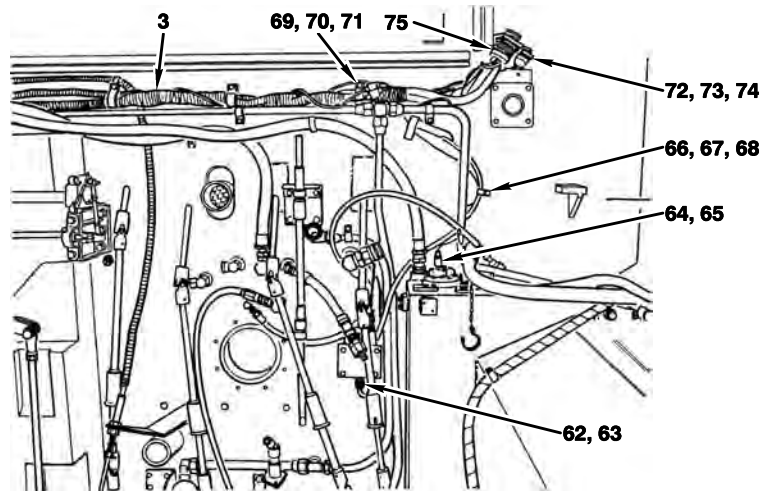


**BATTERIES SHOWN REMOVED FOR CLARITY.**

**NOTE**

Perform the following steps at right front corner—engine compartment.

27. Disconnect lead (62) to pressure switch (63).
28. Disconnect lead (64) to transmitter (65).
29. Remove screw (66), washer (67), and clamp (68).
30. Remove four screws (69), washers (70), and clamps (71).
31. Remove eight nuts (72), lockwashers (73), and screws (74). Discard lockwashers.
32. Disconnect two APU wiring harnesses (75).
33. Remove wiring harness (3).

**Repair or Replacement**

1. Repair wiring harness as required in accordance with WP 0033 00.
2. Replace missing or defective grommets as required.

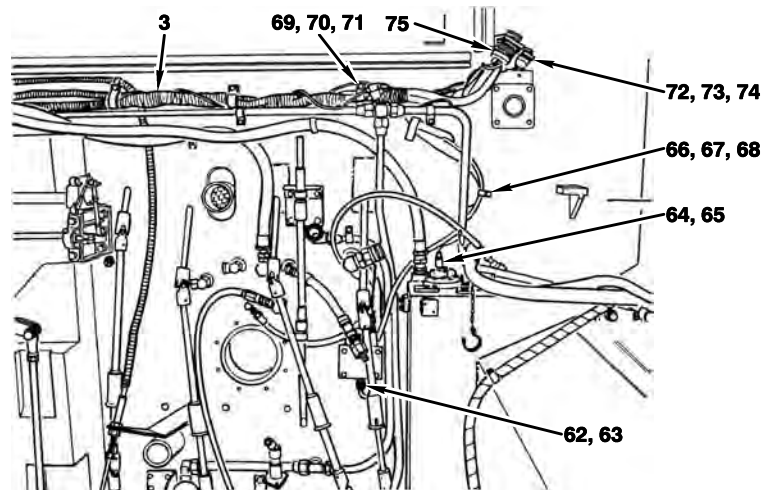


## Installation

### NOTE

Perform the following steps at right front corner—engine compartment.

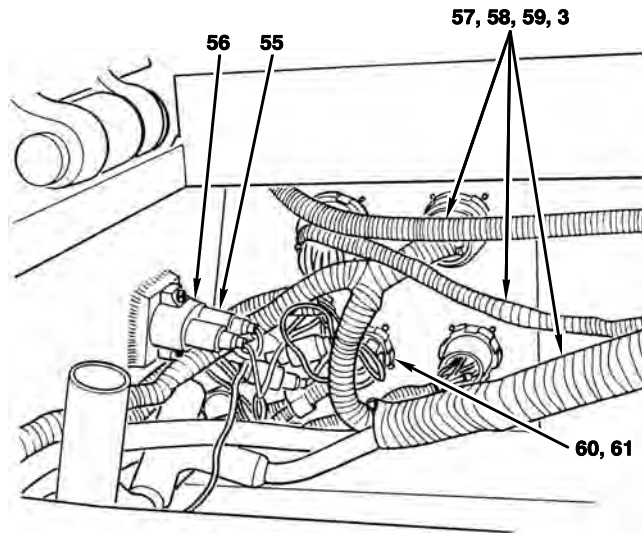
1. Place wiring harness (3) into position.
2. Connect two APU wiring harnesses (75).
3. Install eight screws (74), lockwashers (73), and nuts (72).
4. Install four clamps (71), washers (70), and screws (69).
5. Install clamp (68), washer (67), and screw (66).
6. Connect lead (64) to transmitter (65).
7. Connect lead (62) to pressure switch (63).



**NOTE**

Perform the following steps at left side front corner—engine compartment.

8. Connect four harnesses (60) to bulkhead receptacles (61).
9. Install clamps (59), washers (58), and screws (57) to wiring harness (3).
10. Connect two leads (55) to circuit breaker (56).

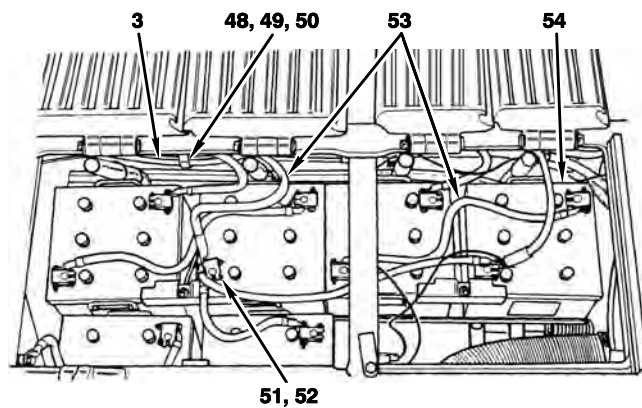


**BATTERIES SHOWN REMOVED FOR CLARITY.**

**NOTE**

Perform the following steps at left side front—engine compartment.

11. Connect two cables (53) to batteries (54) and install two screws (51) and nuts (52).
12. Install three clamps (50), washers (49), and screws (48) to harness (3).





**NOTE**

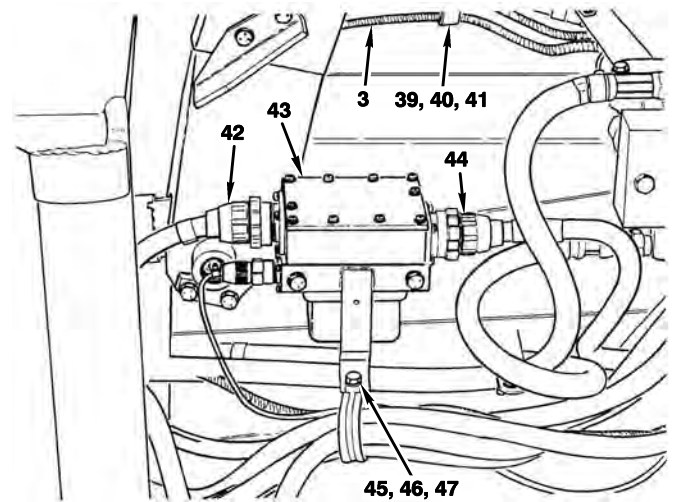
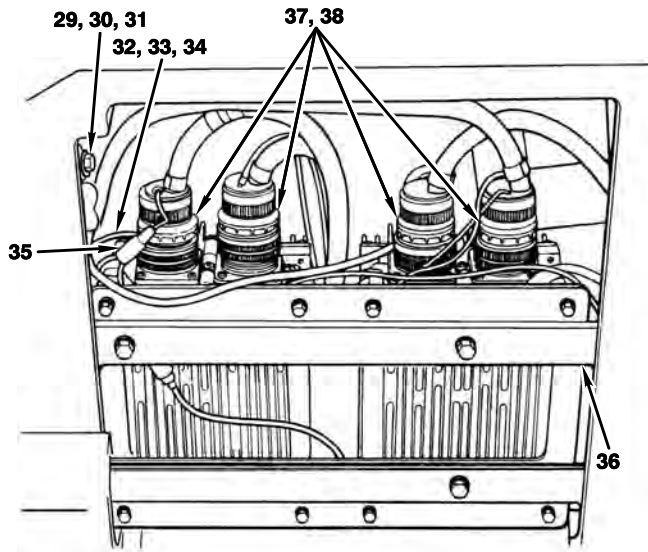
Perform the following steps at left side center—engine compartment.

13. Install clamp (47), washer (46), and screw (45).
14. Connect cable (44) to master relay (43).
15. Connect four cables (42) to master relay (43).
16. Install three clamps (41), washers (40), and screws (39) to wiring harness (3).

**NOTE**

Perform the following steps at left side rear—engine compartment.

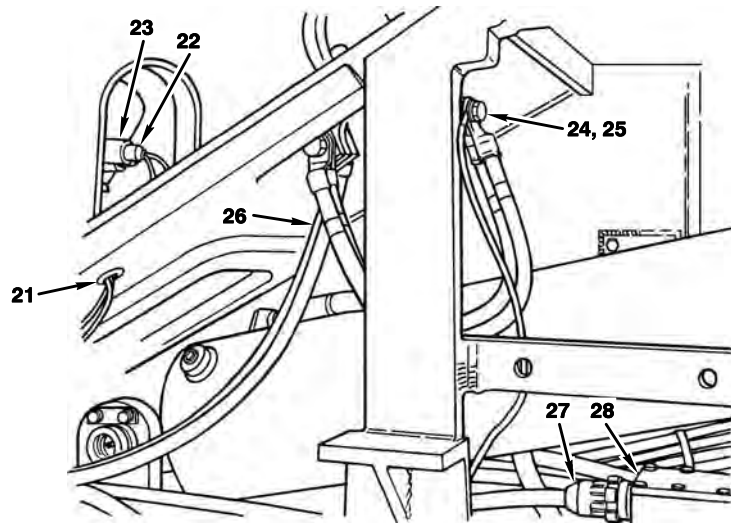
17. Connect four cables (37) to voltage regulators (38).
18. Connect two connectors (hidden) (36).
19. Connect connector (35).
20. Connect lead (34) by installing washer (33) and screw (32).
21. Connect lead (31) by installing four washers (30) and screw (29).



**NOTE**

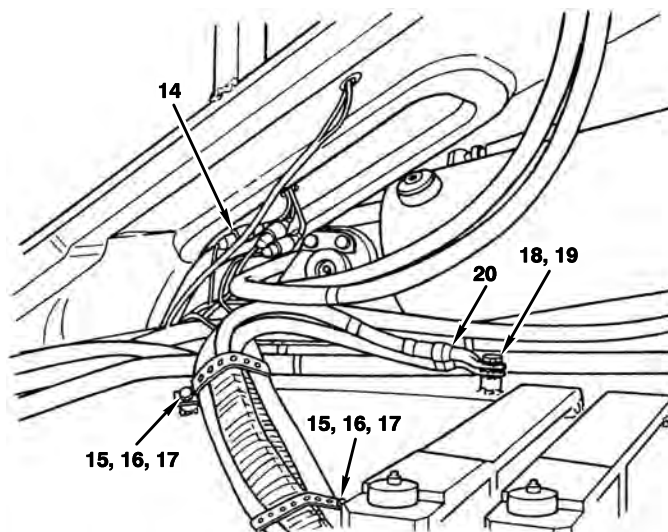
Perform the following steps at left rear—engine compartment.

22. Connect cable (27) to main engine generator armature relay (28).
23. Connect two harness leads (26) to slave receptacle.
24. Install three lockwashers (25) and screw (24).
25. Connect two leads (22) to rigger's infrared light (23) and install grommet (21).

**NOTE**

Perform the following steps at left rear—engine compartment.

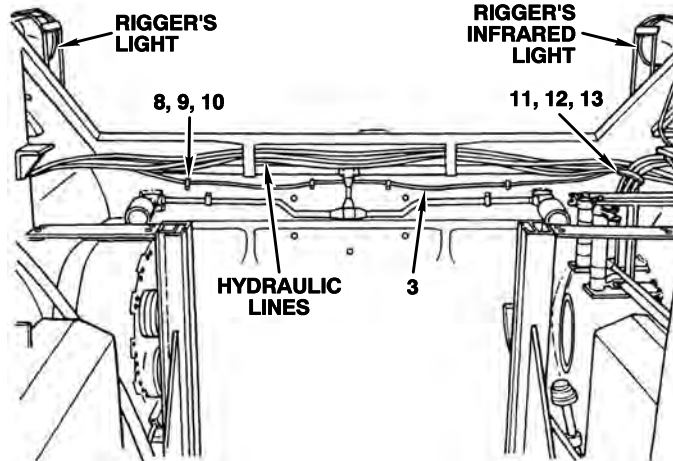
26. Connect two ground cables (20) by installing three lockwashers (19) and screw (18).
27. Install two clamps (17), washers (16), and screws (15).
28. Connect three leads (14) to taillight.



**NOTE**

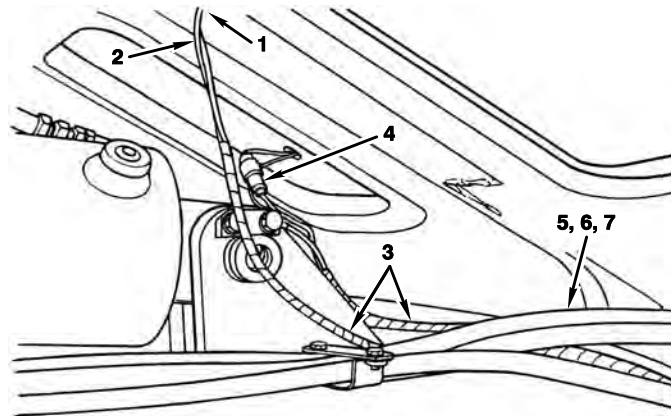
Perform the following steps at left rear—engine compartment.

29. Install clamp (hidden) (13), washer (12), and screw (11).
30. Install four clamps (10), washers (9), and screws (8) to wiring harness (3).

**NOTE**

Perform the following steps at right rear—engine compartment.

31. Install clamp (hidden) (7), washer (6), and screw (5).
32. Connect two leads (4) to B.O. marker.
33. Connect two leads (2) of wiring harness (3) to rigger's light and install grommet (hidden) (1).



**END OF WORK PACKAGE**



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**INTERMEDIATE MAINTENANCE**  
**RECOVERY VEHICLE, FULL TRACKED: MEDIUM, M88A1**  
**NSN 2350-00-122-6826, EIC AQA**

**MAIN LIGHTING, B.O. SELECTOR, AND STARTER SWITCHES WIRING HARNESSSES MAINTENANCE**  
**REMOVAL, REPAIR, INSTALLATION**

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**INITIAL SETUP:****Test Equipment**

Multimeter (item 23, WP 0086 00)

**Tools and Special Tools**

Soldering gun (item 32, WP 0086 00)  
Tool kit, electrical (item 33, WP 0086 00)  
Tool kit, general mechanic's (item 34, WP 0086 00)

**Materials/Parts**

Marker tags (item 9, WP 0085 00)  
Solder (item 15, WP 0085 00)  
Tape, insulation, electrical (item 16, WP 0085 00)

**Materials/Parts (cont.)**

Nuts, self-locking (12) (item 44, WP 0087 00)  
Screws (12) (item 142, WP 0087 00)

**References**

WP 0033 00

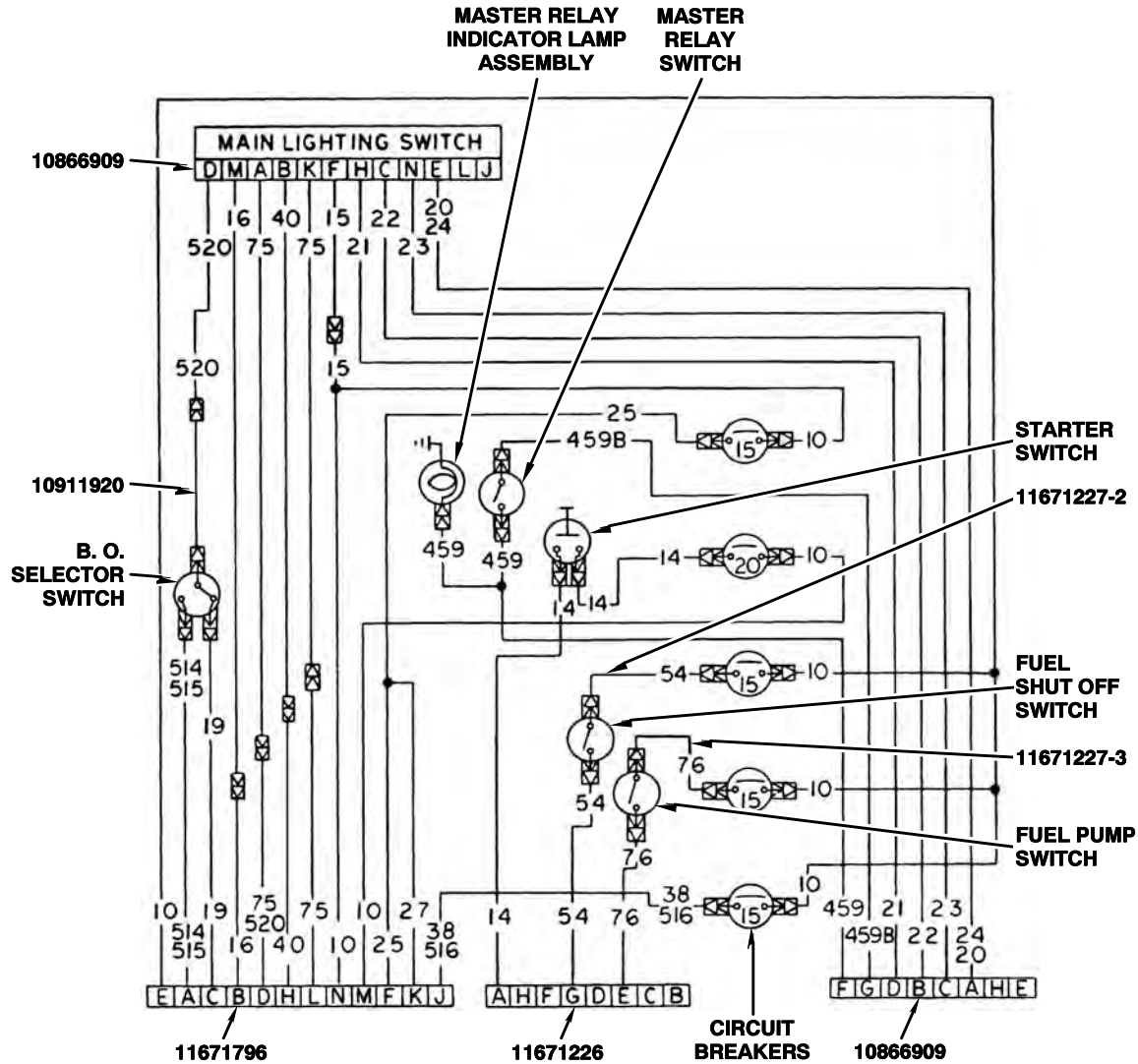
**Equipment Condition**

Master switch off  
Battery ground cables disconnected (TM 9-2350-256-20)  
Main switch panel removed (TM 9-2350-256-20)

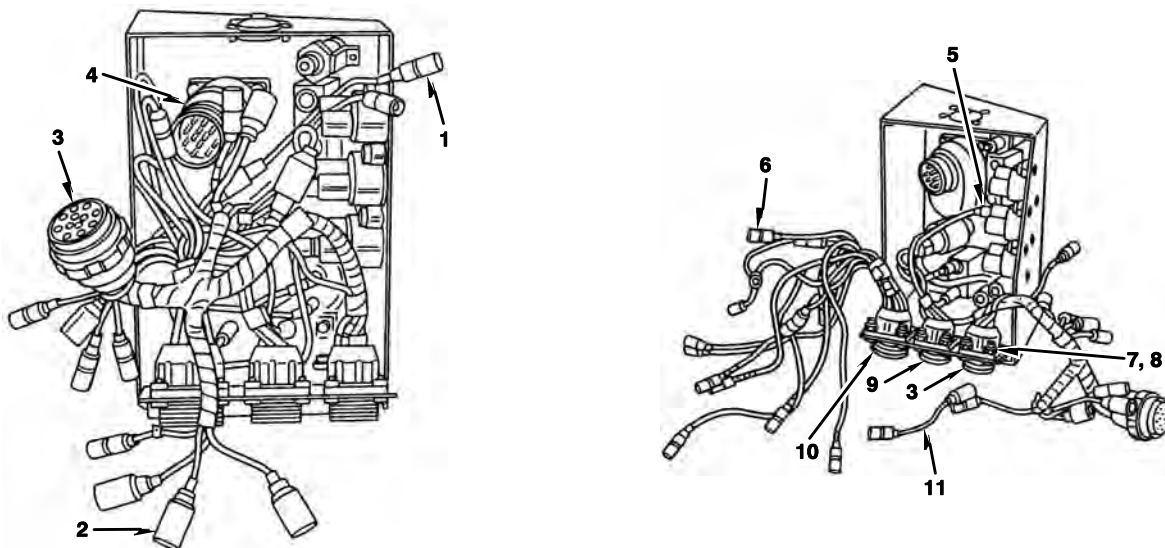
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**Removal**

1. The main switch panel wiring diagram is provided below:



2. Remove three leads (no. 520 connecting no. 520 from light switch panel connector to blackout selector, no. 54 from fuel shutoff switch to circuit breaker, and no. 76 from fuel pump switch to circuit breaker).
3. Disconnect two leads (1) and eight leads (2).
4. Disconnect main lighting switch and master relay wiring harness (3) from main lighting switch (4).
5. Disconnect 5 leads (5) and 13 leads (6).
6. Remove 12 self-locking nuts (7), screws (8), and 3 wiring harnesses (3, 9, and 10). Discard self-locking nuts.
7. Remove lead (11).

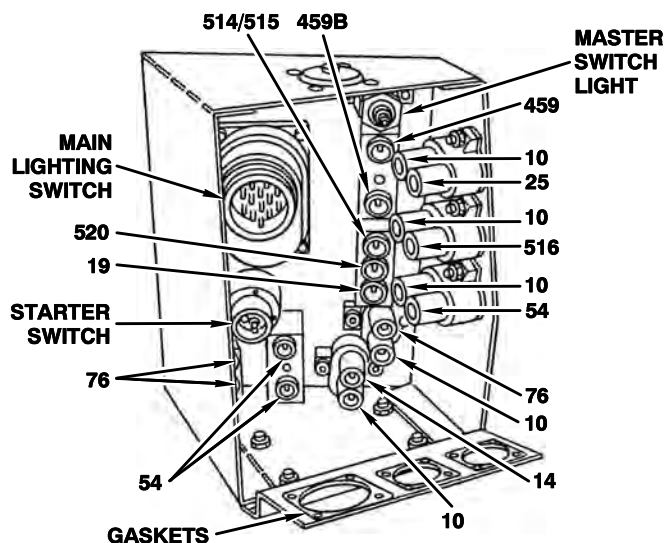


### Repair or Replacement

1. Repair wiring harnesses as required in accordance with WP 0033 00.

### Installation

1. The rear view of the main switch panel is provided below. Be careful to match circuit number markers to the correct receptacles:



2. Install lead (11).
3. Connect 3 wiring harnesses (10, 9, and 3) and install 12 screws (8) and self-locking nuts (7).
4. Install 13 leads (6) and 5 leads (5).
5. Connect wiring harness (3) to main lighting switch (4).
6. Install eight leads (2) and two leads (1).
7. Install three leads (no. 520 connecting no. 520 from light switch panel connector to blackout selector, no. 54 from fuel shutoff switch to circuit breaker, and no. 76 from fuel pump switch to circuit breaker).

### END OF WORK PACKAGE





**INTERMEDIATE MAINTENANCE**  
**RECOVERY VEHICLE, FULL TRACKED: MEDIUM, M88A1**  
**NSN 2350-00-122-6826, EIC AQA**

**BILGE PUMP CIRCUIT BREAKER TO SWITCH PANEL LEAD ASSEMBLY MAINTENANCE**  
**REMOVAL, REPAIR, INSTALLATION**

**INITIAL SETUP:****Test Equipment**

Multimeter (item 23, WP 0086 00)

**Tools and Special Tools**

Soldering gun (item 32, WP 0086 00)  
 Tool kit, electrical (item 33, WP 0086 00)  
 Tool kit, general mechanic's (item 34, WP 0086 00)

**Materials/Parts**

Marker tags (item 9, WP 0085 00)

**Materials/Parts (cont.)**

Solder (item 15, WP 0085 00)  
 Tape, insulation, electrical (item 17, WP 0085 00)

**References**

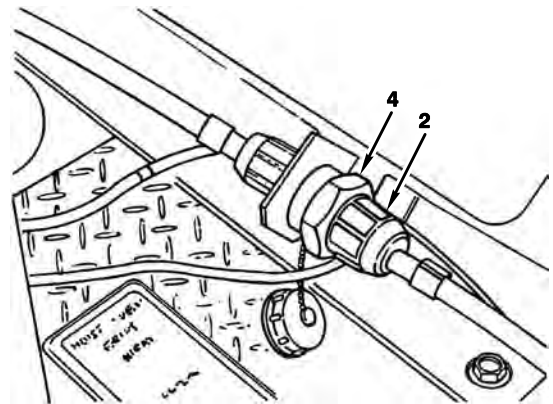
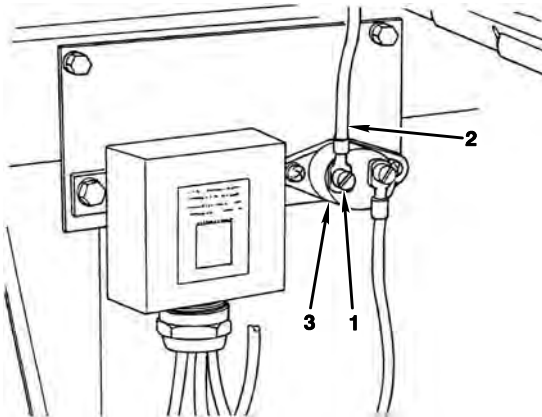
WP 0033 00

**Equipment Condition**

Master switch off  
 Battery ground cables disconnected (TM 9-2350-256-20)

**Removal**

1. Remove screw (1) and disconnect bilge pump circuit breaker to switch panel lead assembly (2) from relay (3).
2. Disconnect connector (4) and remove lead assembly (2).

**Repair or Replacement**

1. Repair lead assembly as required in accordance with WP 0033 00.

**Installation**

1. Connect connector (4) of lead assembly (2).
2. Install lead assembly (2) and screw (1) to relay (3).

**END OF WORK PACKAGE**



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**INTERMEDIATE MAINTENANCE**  
**RECOVERY VEHICLE, FULL TRACKED: MEDIUM, M88A1**  
**NSN 2350-00-122-6826, EIC AQA**  
**EMERGENCY FLASHER CIRCUIT WIRING HARNESS MAINTENANCE**  
**REMOVAL, REPAIR, INSTALLATION**

---

**INITIAL SETUP:****Test Equipment**

Multimeter (item 23, WP 0086 00)

**Tools and Special Tools**

Soldering gun (item 32, WP 0086 00)  
 Tool kit, electrical (item 33, WP 0086 00)  
 Tool kit, general mechanic's (item 34, WP 0086 00)

**Materials/Parts**

Marker tags (item 9, WP 0085 00)

**Materials/Parts (cont.)**

Solder (item 15, WP 0085 00)  
 Tape, insulation, electrical (item 17, WP 0085 00)

**References**

WP 0033 00

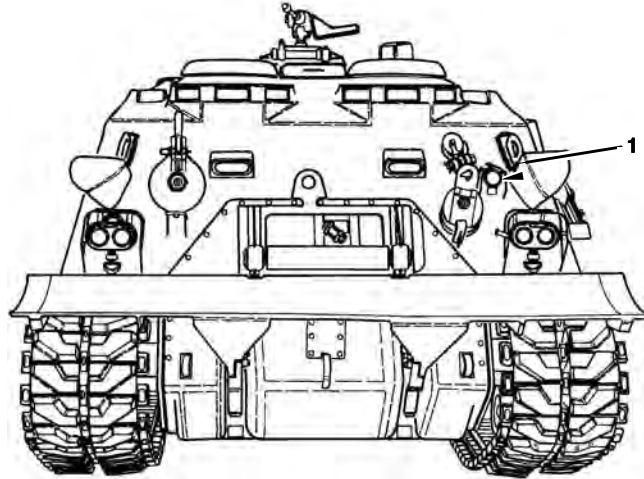
**Equipment Condition**

Master switch off  
 Battery ground cables disconnected (TM 9-2350-256-20)

---

**Removal**

1. Disconnect emergency flasher circuit (no. 325) wiring harness from left front red flasher indicator lamp (1). Remove shell, washer, and ferrule from cable (refer to WP 0033 00) so that cable can slide through narrow opening.

**NOTE**

Remove interfering components as required for access.

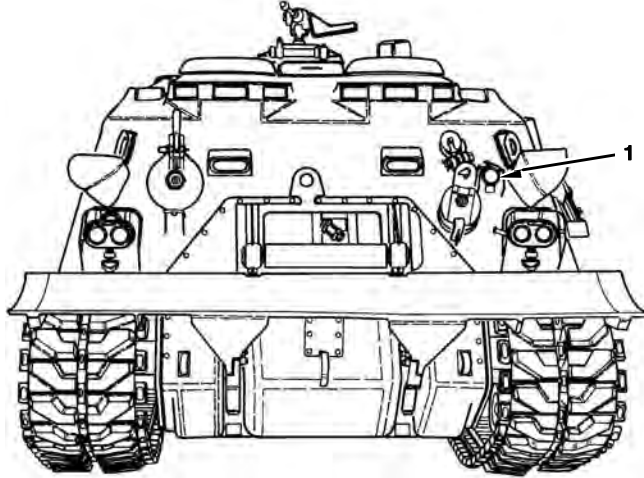
2. Disconnect cable connectors, loosen or remove any cable clamps, and remove wiring harness.

**Repair or Replacement**

1. Repair wiring harness as required in accordance with WP 0033 00.
2. Replace missing or defective grommets as required.

**Installation**

1. Connect wiring harness, tighten or install any cable clamps, and connect cable connectors.
2. Thread cable through to left front red flasher indicator lamp (1) without connector installed. Install shell, washer, and ferrule onto cable (refer to WP 0033 00). Install wiring harness to left front red flasher indicator lamp.

**END OF WORK PACKAGE**

**INTERMEDIATE MAINTENANCE  
RECOVERY VEHICLE, FULL TRACKED: MEDIUM, M88A1  
NSN 2350-00-122-6826, EIC AQA**

**ACCESSORIES PANEL WIRING HARNESS AND LEAD MAINTENANCE  
REMOVAL, REPAIR, INSTALLATION**

**INITIAL SETUP:**

**Test Equipment**

Multimeter (item 23, WP 0086 00)

**Tools and Special Tools**

Soldering gun (item 32, WP 0086 00)  
Tool kit, electrical (item 33, WP 0086 00)  
Tool kit, general mechanic's (item 34, WP 0086 00)

**Materials/Parts**

Marker tags (item 9, WP 0085 00)  
Solder (item 15, WP 0085 00)  
Tape, insulation, electrical (item 17, WP 0085 00)

**Materials/Parts (cont.)**

Lockwashers (4) (item 153, WP 0087 00)  
Nuts (4) (item 170, WP 0087 00)  
Screws (4) (item 140, WP 0087 00)

**References**

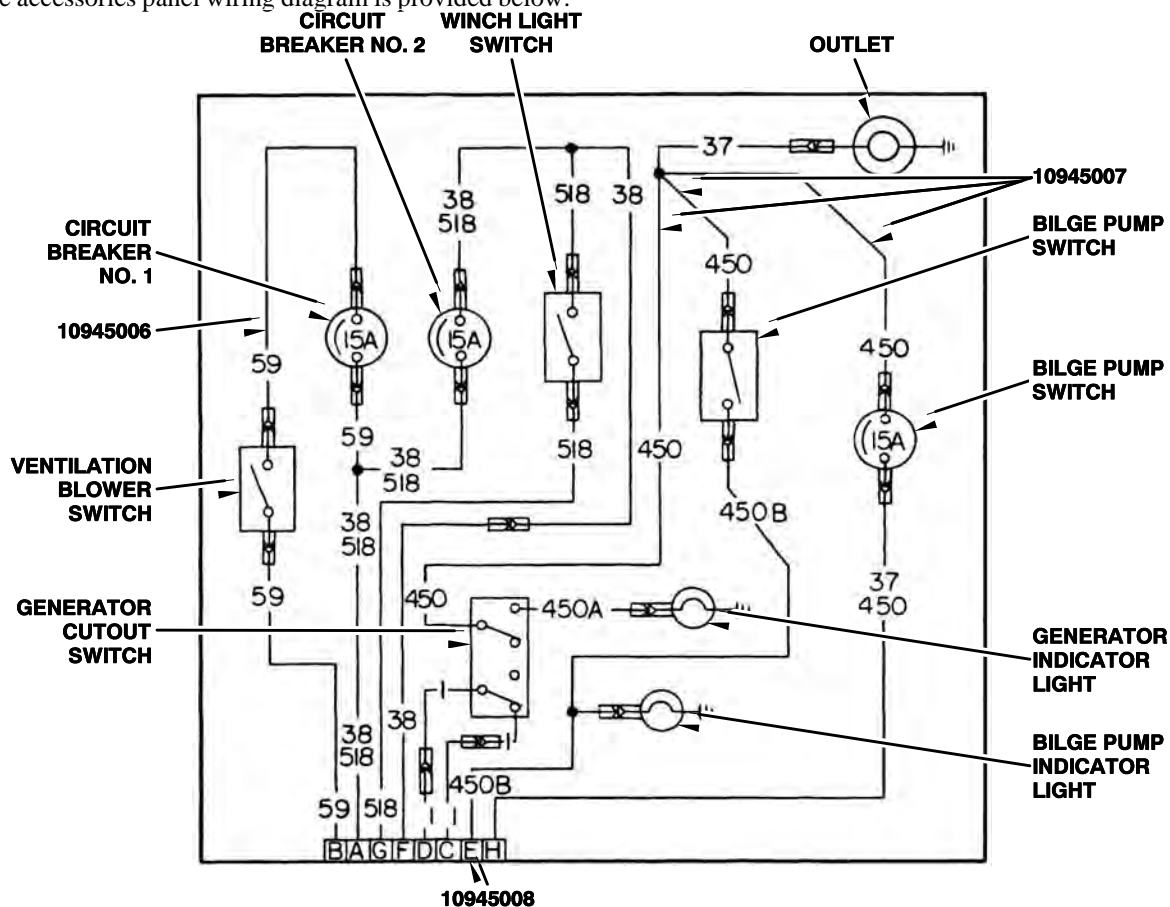
WP 0033 00

**Equipment Condition**

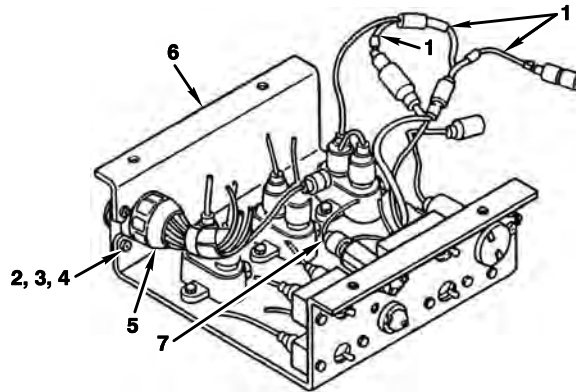
Master switch off  
Battery ground cables disconnected (TM 9-2350-256-20)  
Accessories panel removed (TM 9-2350-256-20)

**Removal**

- The accessories panel wiring diagram is provided below:



2. Disconnect 11 connectors (1).
3. Remove four nuts (2), screws (3), lockwashers (4), and wiring harness (5) from accessories panel (6). Discard lockwashers.
4. Remove lead (7).

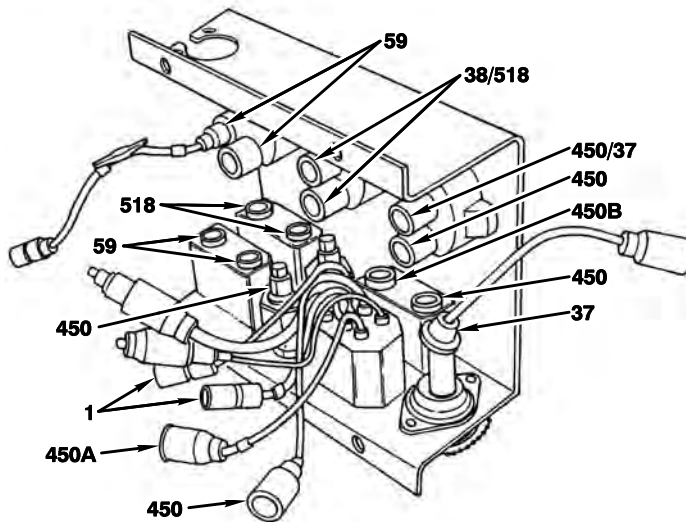


**Repair or Replacement**

1. Repair wiring harness and lead as required in accordance with WP 0033 00.

**Installation**

1. The rear view of the accessories panel is provided below. Be careful to match circuit numbers to the correct receptacles:



**NOTE**

The unidentified plugged leads are not used.

2. Install lead (7).
3. Connect wiring harness (5) to accessories panel (6) by installing four lockwashers (4), screws (3), and nuts (2).
4. Install 11 connectors (1).

**END OF WORK PACKAGE**

**INTERMEDIATE MAINTENANCE**  
**RECOVERY VEHICLE, FULL TRACKED: MEDIUM, M88A1**  
**NSN 2350-00-122-6826, EIC AQA**

**TRANSMISSION LOCKUP CONTROL (THROTTLE) LINKAGE ROD ASSEMBLY MAINTENANCE**  
**REMOVAL, DISASSEMBLY, CLEANING, INSPECTION, REPAIR, ASSEMBLY, INSTALLATION**

**INITIAL SETUP:****Tools and Special Tools**

Tool kit, general mechanic's (item 34, WP 0086 00)

**References**

TM 9-2350-256-20

**Materials/Parts**

Brush, scrub (item 4, WP 0085 00)

Cleaning compound (item 5, WP 0085 00)

Paint thinner (item 18, WP 0085 00)

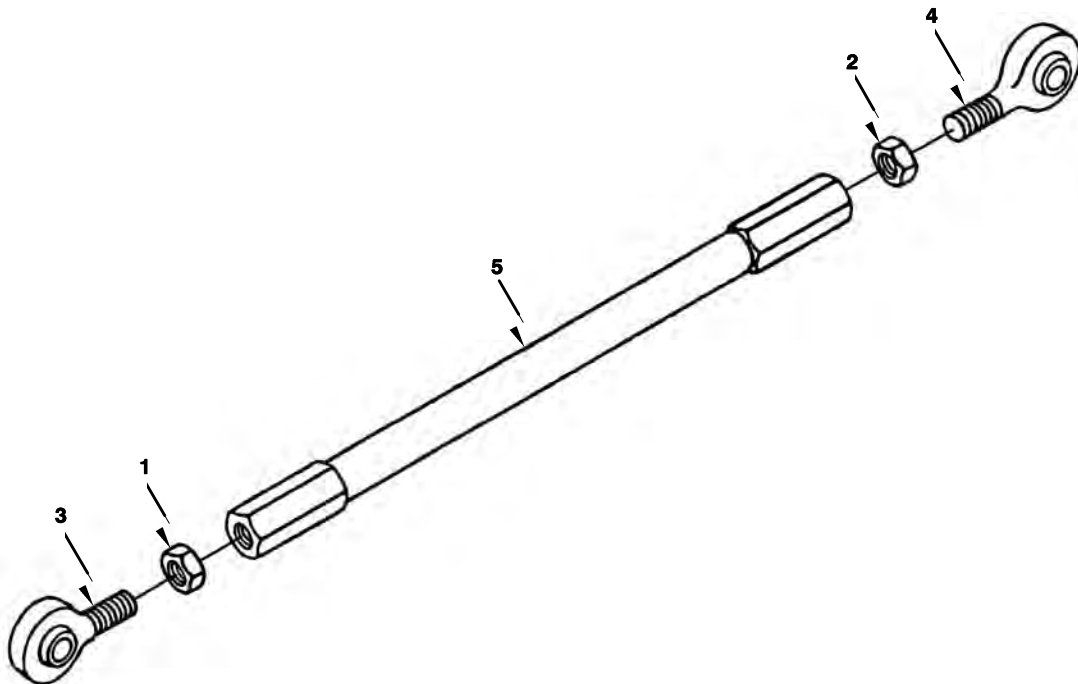
**Removal**

1. Remove transmission lockup control (throttle) linkage rod assembly in accordance with TM 9-2350-256-20.

**Disassembly****NOTE**

Bearing (4) has left-hand threads.

1. Loosen jamnuts (1 and 2) and remove bearings (3 and 4) from rod (5).
2. Remove jamnuts (1 and 2) from bearings (3 and 4).



## Cleaning

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### WARNING

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Solvents 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 solvent gets on skin or clothing, wash immediately with soap and water.

1. Clean all metal parts with cleaning compound or paint thinner. Use a wire brush where necessary and dry with compressed air.

### Inspection-Acceptance and Rejection Criteria

1. Check rod and bearings for cracks or distortion.
2. Check threaded parts for cross-threading, nicks, or excessive wear.

### Repair or Replacement

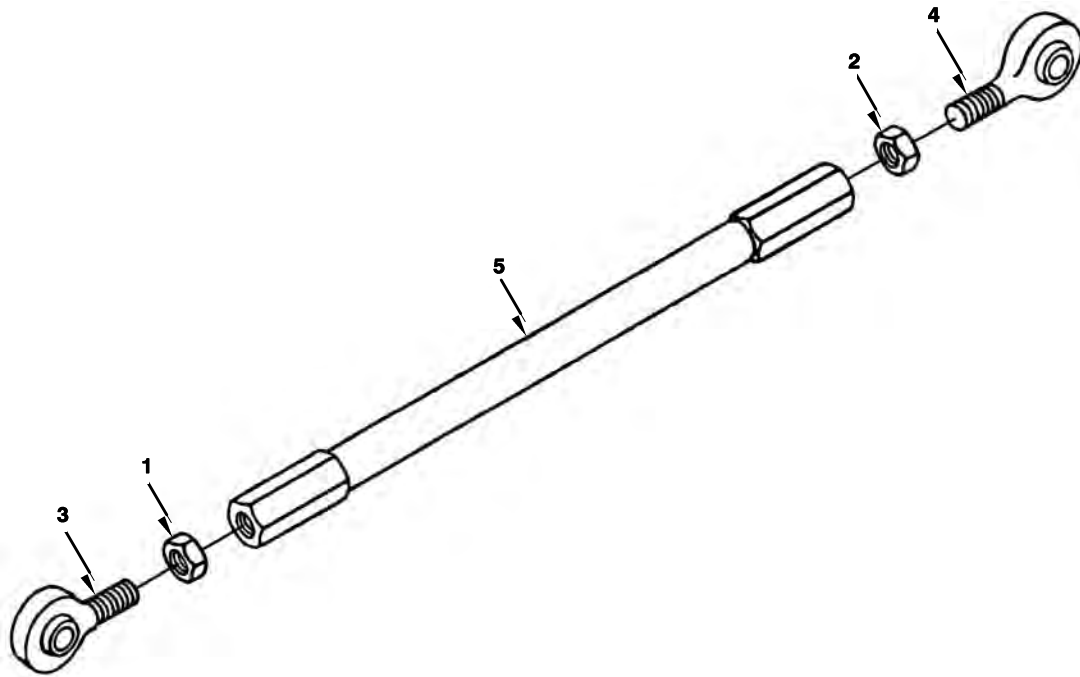
1. Replace all defective parts. If rod or either bearing is defective, replace entire assembly.



**Assembly****NOTE**

Bearing (4) has left-hand threads.

1. Install jamnuts (1 and 2) onto bearings (3 and 4).
2. Install bearings (3 and 4) onto rod (5) and tighten jamnuts (1 and 2).

**Installation**

1. Install transmission lockup control (throttle) linkage rod assembly in accordance with TM 9-2350-256-20.

**END OF WORK PACKAGE**



**INTERMEDIATE MAINTENANCE**  
**RECOVERY VEHICLE, FULL TRACKED: MEDIUM, M88A1**  
**NSN 2350-00-122-6826, EIC AQA**

**TRANSMISSION OIL BREATHER TUBE ASSEMBLY MAINTENANCE**  
**REMOVAL, DISASSEMBLY, CLEANING, INSPECTION, REPAIR, ASSEMBLY, INSTALLATION**

**INITIAL SETUP:**

**Tools and Special Tools**

Tool kit, general mechanic's (item 34, WP 0086 00)

**Materials/Parts**

Brush, scrub (item 4, WP 0085 00)

Cleaning compound (item 5, WP 0085 00)

**Materials/Parts (cont.)**

Detergent (item 6, WP 0085 00)

Clamps (2) (item 236, WP 0087 00)

**References**

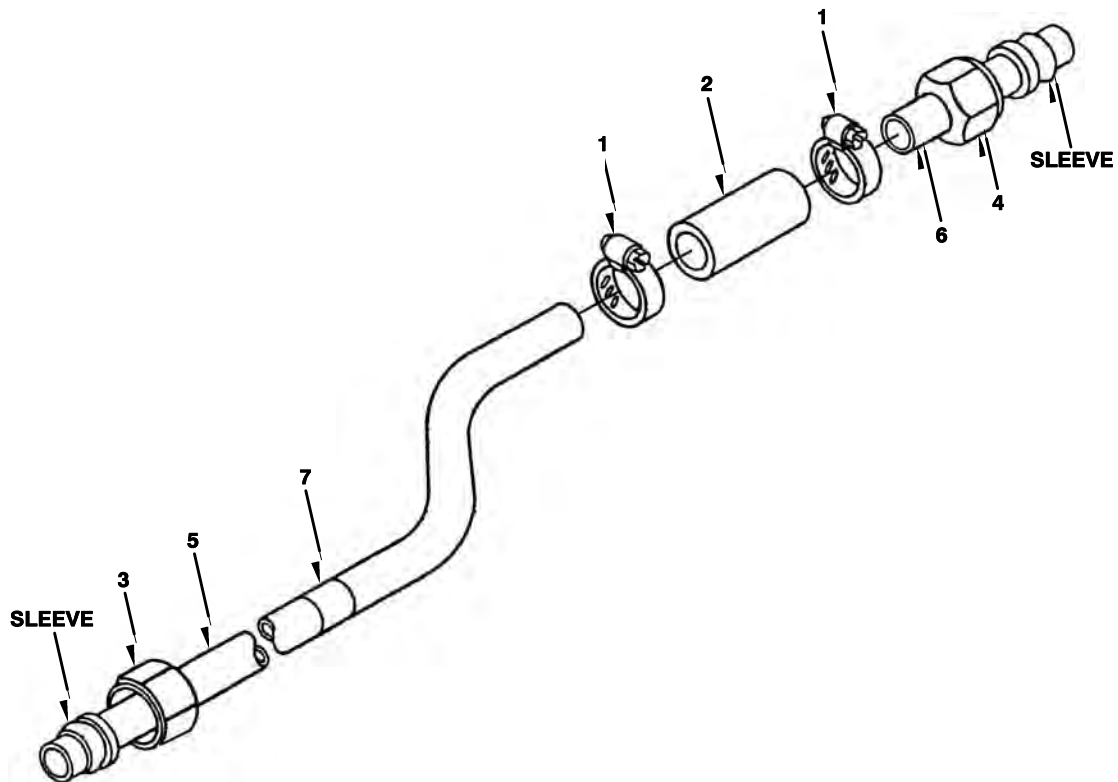
WP 0023 00

**Removal**

1. Remove transmission oil breather tube assembly in accordance with WP 0023 00.

**Disassembly**

1. Remove two clamps (1) and hose (2).
2. Back nuts (3 and 4) off tubes (5 and 6) at hose (2) ends.
3. Remove marker (7).



**Cleaning**

1. Wash hose in a mild detergent solution, rinse with clean water, and dry with compressed air.

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**WARNING**

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Solvents 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 solvent gets on skin or clothing, wash immediately with soap and water.

2. Clean all metal parts with cleaning compound or paint thinner. Use a wire brush where necessary and dry with compressed air.

**Inspection-Acceptance and Rejection Criteria**

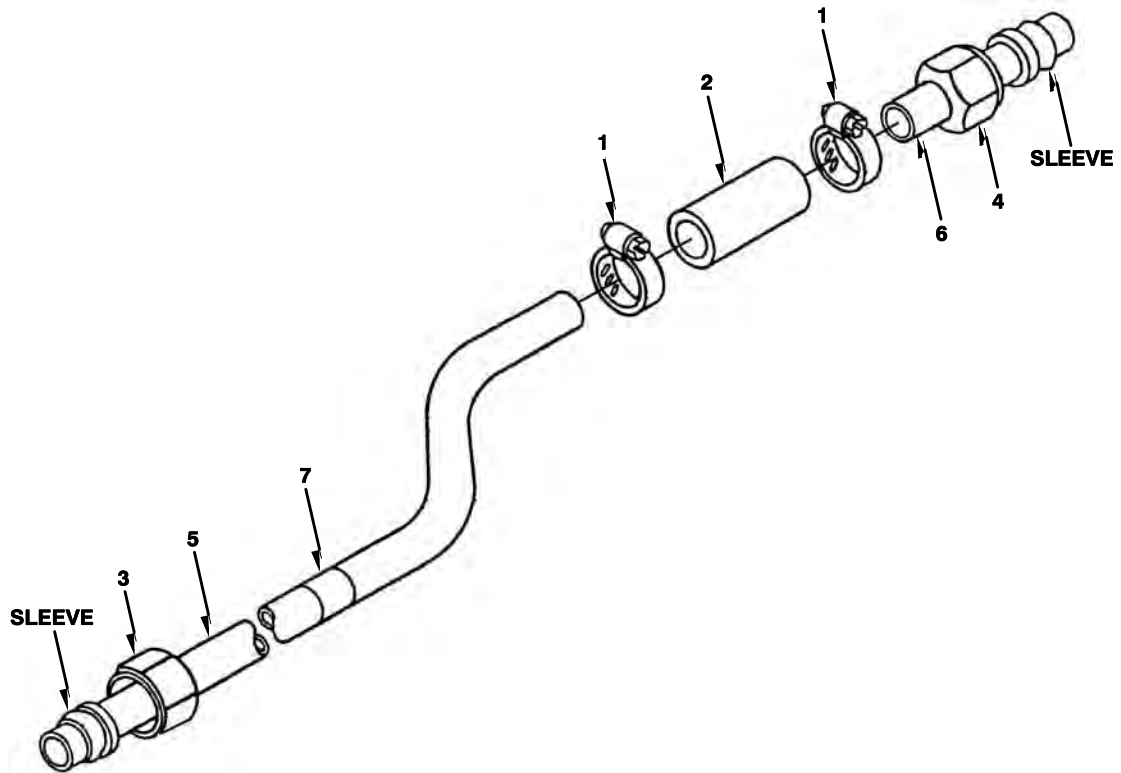
1. Check that leading edge of each sleeve is at least 1/8 in. (3.2 mm) from end of tube and close to or touching tube.
2. Check that back of each sleeve is in contact with tube.
3. Inspect sleeves for evidence of wear and distortion.
4. Inspect hose for fraying, cracks, or excessive wear.

**Repair or Replacement**

1. Replace all defective parts. If either sleeve is defective, replace entire assembly.

**Assembly**

1. Install marker (7).
2. Slide nuts (3 and 4) on tubes (5 and 6) at hose (2) ends leaving nuts backed off.
3. Install hose (2) and two clamps (1).

**Installation**

1. Install transmission oil breather tube assembly in accordance with WP 0023 00.

**END OF WORK PACKAGE**



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**INTERMEDIATE MAINTENANCE**  
**RECOVERY VEHICLE, FULL TRACKED: MEDIUM, M88A1**  
**NSN 2350-00-122-6826, EIC AQA**

**TRANSMISSION OIL FILTERS MAINTENANCE**  
**DESCRIPTION, REMOVAL, DISASSEMBLY, ASSEMBLY, INSTALLATION**

---

**INITIAL SETUP:****Tools and Special Tools**

Tool kit, general mechanic's (item 34, WP 0086 00)

**Materials/Parts**

Gaskets (2) (item 1, WP 0087 00)

Lockwashers (24) (item 161, WP 0087 00)

**Materials/Parts (cont.)**

Screws (24) (item 54, WP 0087 00)

Snap rings (2) (item 93, WP 0087 00)

**References**

TM 9-2350-256-20

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**DESCRIPTION**

Located on each side of the top of the converter housing are identical two-element filter assemblies. The right-side assembly filters all the oil pumped by the input-pressure oil pump that is located immediately below the filter cavity in the converter housing. The left-side assembly filters all oil returning from the torque converter before distribution to the lubrication system.

Each filter assembly consists of a head assembly and two element assemblies. Each head assembly consists of a head, relief valve, two springs, a valve seat, and a snap ring. Each filter element is replaceable as a unit.

The filter assemblies are bolted vertically into the converter housing cavities. Oil to be filtered is pumped into the cavities surrounding the filters. The filter elements are hollow disks of fine mesh wire screen. Oil flows into the elements and into the perforated tube on which the elements are stacked. Foreign matter in the oil collects on the outer surfaces of the filter elements. Filtered oil flows up the perforated tubes, through the filter heads, and into the converter housing. Should the filter packs become clogged, pressure in the filter cavities will rise until the relief valves open. When the relief valves open, oil flows directly into the hydraulic system.

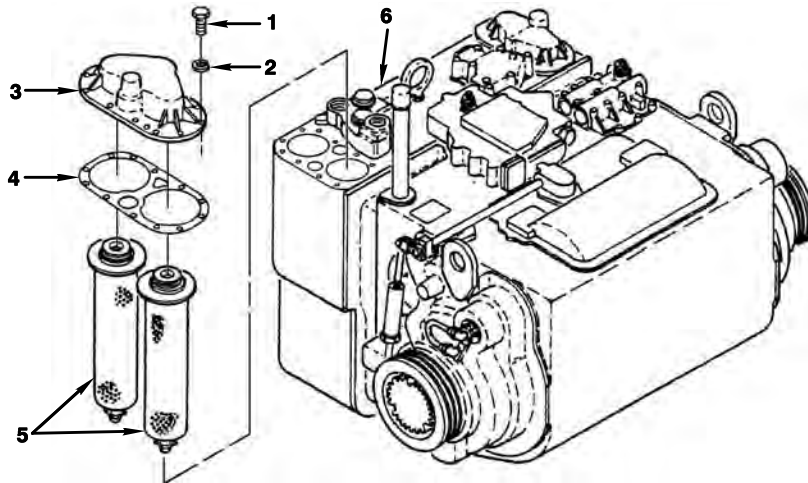
**Removal**

1. Remove transmission oil filters in accordance with TM 9-2350-256-20.

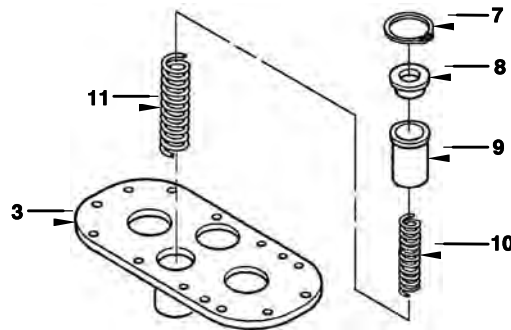
**Disassembly****NOTE**

Both transmission oil filters are disassembled the same way. This procedure covers one transmission oil filter.

1. Remove 12 screws (1), lockwashers (2), head assembly (3), gasket (4), and oil filter cartridge (5) from transmission subassembly (torque converter) (6). Discard lockwashers and gasket.



2. Remove snap ring (7), valve seat (8), relief valve (9), inner compression ring (10), and outer compression ring (11) from head assembly (3). Discard snap ring.



## Assembly

### NOTE

Both transmission oil filters are assembled the same way. This procedure covers one transmission oil filter.

1. Install outer compression ring (11), inner compression ring (10), relief valve (9), valve seat (8), and snap ring (7) to head assembly (3).
2. Install oil filter cartridge (5), gasket (4), head assembly (3), 12 lockwashers (2), and screws (1) to transmission subassembly (torque converter) (6).

## Installation

1. Install transmission oil filter in accordance with TM 9-2350-256-20.

## END OF WORK PACKAGE



**INTERMEDIATE MAINTENANCE**  
**RECOVERY VEHICLE, FULL TRACKED: MEDIUM, M88A1**  
**NSN 2350-00-122-6826, EIC AQA**

**SUSPENSION SYSTEMS MAINTENANCE**  
**REMOVAL, DISASSEMBLY, ASSEMBLY, INSTALLATION**

**INITIAL SETUP:**

**Tools and Special Tools**

Adapters (2) (item 2, WP 0086 00)  
 Fixtures (2) (item 8, WP 0086 00)  
 Impact wrench, hydraulic (item 19, WP 0086 00)  
 Tool kit, general mechanic's (item 34, WP 0086 00)  
 Wrench (item 37, WP 0086 00)

**Materials/Parts**

Cotter pin (item 16, WP 0087 00)

**References**

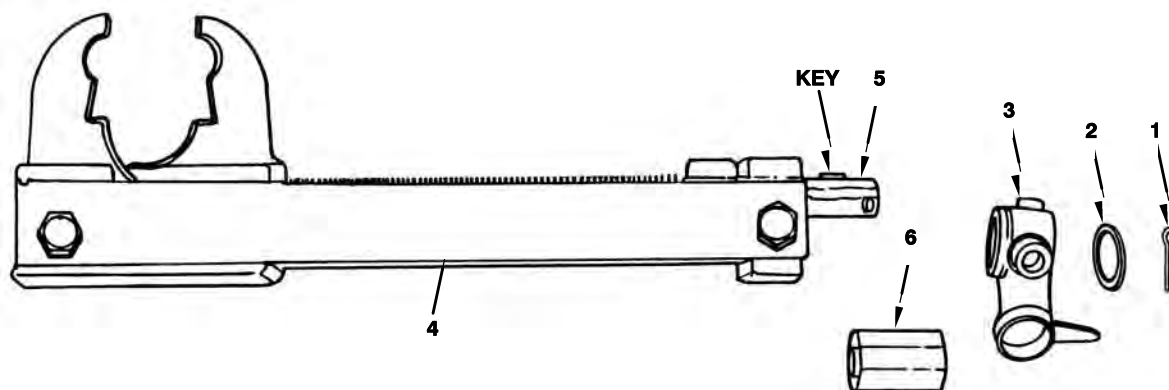
TM 9-2350-256-10  
 TM 9-2350-256-20

**Removal**

1. Refer to TM 9-2350-256-10 for removal of the tracks. To facilitate the removal of the tracks, disassemble the track fixture as shown in DISASSEMBLY below. Use the hydraulic impact wrench with the track fixture and impact wrench adapter to separate the tracks. Refer to TM 9-2350-256-10 for operating instructions on the hydraulic impact wrench.
2. Refer to TM 9-2350-256-20 for removal of hub and sprocket assemblies, compensating idler assemblies, road wheels and hubs, torsion bars, road wheel arms, torsion bar anchors, road wheel arm housings, shock absorbers, bumper springs, track support roller assemblies, and output reduction drives.

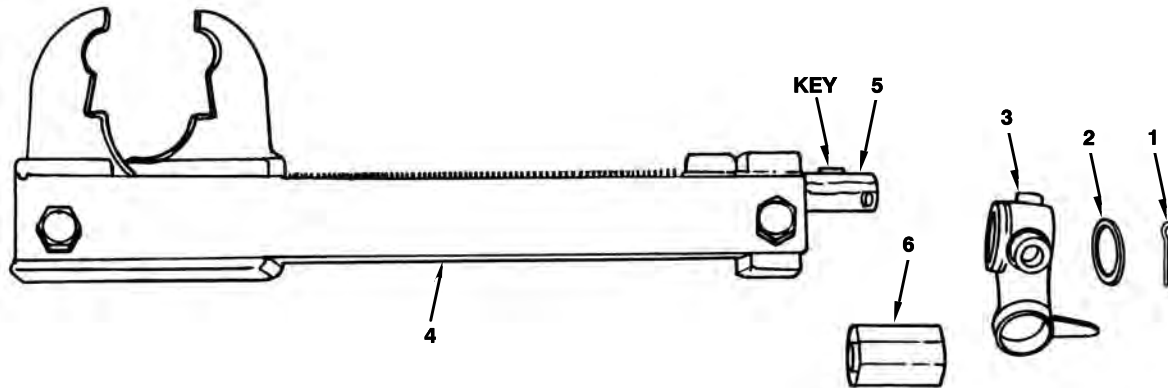
**Disassembly**

1. Remove cotter pin (1), washer (2), and ratchet (3) from track fixture (4). Do not remove key from shaft end (5). Discard cotter pin.
2. Install impact wrench adapter (6) on shaft end (5) and tighten set screw on adapter.



**Assembly**

1. Loosen set screw on impact wrench adapter (6) and remove adapter from shaft end (5).
2. Install ratchet (3), washer (2), and cotter pin (1) to track fixture (4).

**Installation**

1. Refer to TM 9-2350-256-10 for installation of the tracks. To facilitate the installation of the tracks, disassemble the track fixture as shown in DISASSEMBLY above. Use the hydraulic impact wrench with the track fixture and impact wrench adapter to connect the tracks. Refer to TM 9-2350-256-10 for operating instructions on the hydraulic impact wrench.
2. Refer to TM 9-2350-256-20 for installation of hub and sprocket assemblies, compensating idler assemblies, road wheels and hubs, torsion bars, road wheel arms, torsion bar anchors, road wheel arm housings, shock absorbers, bumper springs, track support roller assemblies, and output reduction drives.

**END OF WORK PACKAGE**

**INTERMEDIATE MAINTENANCE**  
**RECOVERY VEHICLE, FULL TRACKED: MEDIUM, M88A1**  
**NSN 2350-00-122-6826, EIC AQA**

**RUBBER SEALING STRIPS ON ACETYLENE COMPARTMENT DOOR MAINTENANCE**  
**REMOVAL, CLEANING, INSTALLATION**

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**INITIAL SETUP:****Tools and Special Tools**

Tool kit, general mechanic's (item 34, WP 0086 00)

**Materials/Parts**

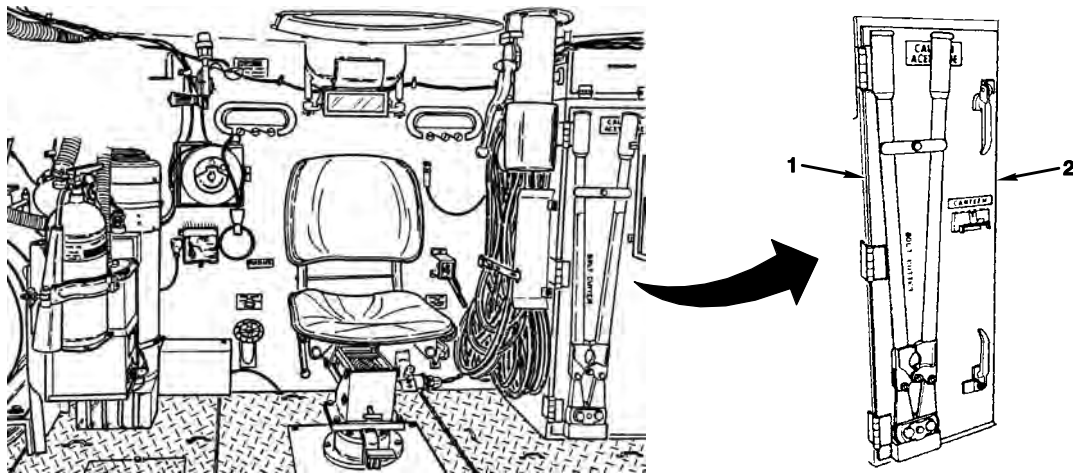
Adhesive (item 3, WP 0085 00)

Brush, scrub (item 4, WP 0086 00)

---

**Removal**

1. Remove sealing strips (1) from acetylene compartment door (2) and discard.

**Cleaning**

1. Clean area thoroughly by scraping off old adhesive and then removing dirt, grease, and other foreign matter with a wire brush.

**Installation**

1. Apply fresh adhesive and wait until adhesive becomes slightly tacky.
2. Press new sealing strips (1) firmly into place to acetylene compartment door (2) and clean any excess adhesive from surface of sealing strip.
3. Allow adhesive to thoroughly dry before closing acetylene compartment door (2).

**END OF WORK PACKAGE**



**INTERMEDIATE MAINTENANCE**  
**RECOVERY VEHICLE, FULL TRACKED: MEDIUM, M88A1**  
**NSN 2350-00-122-6826, EIC AQA**

**VISION CUPOLA PADDING ASSEMBLY MAINTENANCE**  
**REMOVAL, DISASSEMBLY, CLEANING, INSPECTION, ASSEMBLY, INSTALLATION**

**INITIAL SETUP:**

**Tools and Special Tools**

- Brush, scrub (item 3, WP 0086 00)
- Tool kit, general mechanic's (item 34, WP 0086 00)

**Materials/Parts (cont.)**

- Rubber sheet (item 13, WP 0085 00)
- Paint thinner (item 18, WP 0085 00)

**Materials/Parts**

- Adhesive (item 3, WP 0085 00)
- Cleaning compound (item 5, WP 0085 00)

**References**

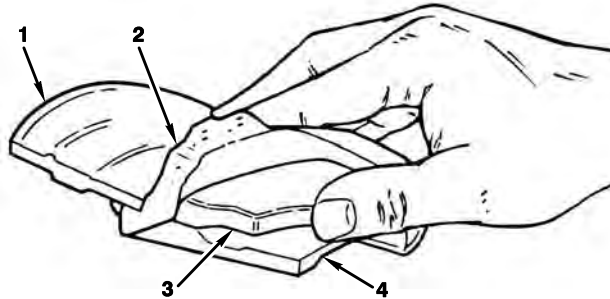
- TM 9-2350-256-20

**Removal**

1. Remove vision cupola in accordance with TM 9-2350-256-20.

**Disassembly**

1. Strip latex coating (1), interply (2), and crash pad (3) from support (4).



**Cleaning**

**WARNING**

Solvents 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 solvent gets on skin or clothing, wash immediately with soap and water.

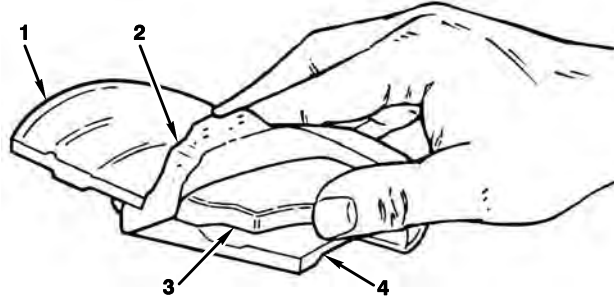
1. Scrape dirt and adhesive from support and clean with a wire brush. Clean with cleaning compound or paint thinner and dry.

**Inspection-Acceptance and Rejection Criteria**

1. Inspect support for cracks, distortion, breakage, or other damage that would impair its use. If defective, replace entire padding assembly.

**Assembly**

1. Cement crash pad (3) to support (4) and interply (2) to back of support with adhesive.
2. Cement rubber sheet (1) to obtain a smooth skin 0.015-in. (0.38-mm) thick of synthetic rubber, except a 4-1/8-in. (10.48-cm) area on back of support (4).

**Installation**

1. Install vision cupola in accordance with TM 9-2350-256-20.

**END OF WORK PACKAGE**

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**INTERMEDIATE MAINTENANCE**  
**RECOVERY VEHICLE, FULL TRACKED: MEDIUM, M88A1**  
**NSN 2350-00-122-6826, EIC AQA**  
**ROCKET AMMUNITION STORAGE BOX PADS MAINTENANCE**  
**REMOVAL, CLEANING, INSTALLATION**

---

**INITIAL SETUP:****Tools and Special Tools**

Tool kit, general mechanic's (item 34, WP 0086 00)

**Materials/Parts**

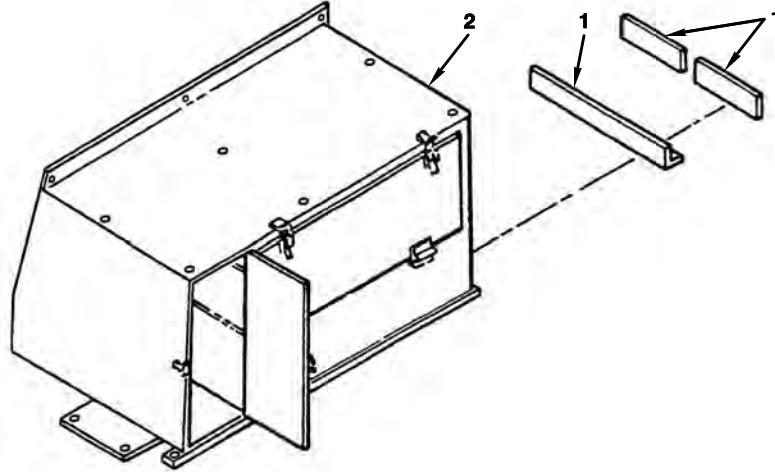
Adhesive (item 3, WP 0085 00)

Brush, scrub (item 4, WP 0086 00)

---

**Removal**

1. Remove pads (1) from rocket ammunition storage box (2) and discard.

**Cleaning**

1. Clean area thoroughly by scraping off old adhesive and then removing dirt, grease, and other foreign matter with a wire brush.

**Installation**

1. Cut new pads (1) to proper size from sheets.
2. Apply fresh adhesive and wait until adhesive becomes slightly tacky.
3. Press new pads (1) firmly into place to rocket ammunition storage box (2) and clean any excess adhesive from surface of pads.
4. Allow adhesive to thoroughly dry before closing rocket ammunition storage box (2).

**END OF WORK PACKAGE**





**INTERMEDIATE MAINTENANCE**  
**RECOVERY VEHICLE, FULL TRACKED: MEDIUM, M88A1**  
**NSN 2350-00-122-6826, EIC AQA**

**RIGHT-SIDE FRONT FLOOR PLATE REPLACEMENT**  
**REMOVAL, INSTALLATION**

**INITIAL SETUP:****Tools and Special Tools**

Tool kit, general mechanic's (item 34, WP 0086 00)

**Materials/Parts**

Lockwashers (7) (item 156, WP 0087 00)

Screws (7) (item 53, WP 0087 00)

**Personnel Required**

Mechanics (2)

**Equipment Condition**

Hydraulic control panel (subplate) assembly removed (WP 0063 00)

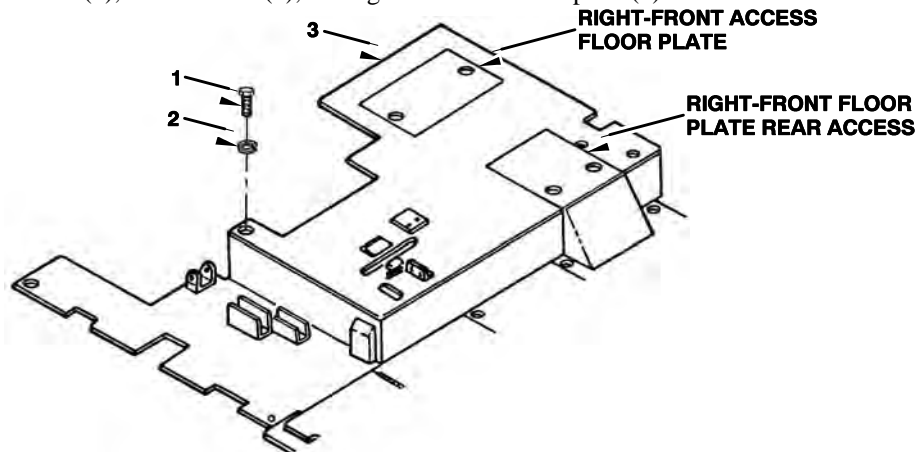
Right-front access floor plate and right-front floor plate rear access removed (TM 9-2350-256-20)

APU control box removed (TM 9-2350-256-20)

Shifting controls and linkage removed (TM 9-2350-256-20)

**Removal**

1. Remove seven screws (1), lockwashers (2), and right-side front floor plate (3). Discard lockwashers.

**Installation**

1. Install right-side front floor plate (3), seven lockwashers (2), and screws (1).

**END OF WORK PACKAGE**



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**INTERMEDIATE MAINTENANCE**  
**RECOVERY VEHICLE, FULL TRACKED: MEDIUM, M88A1**  
**NSN 2350-00-122-6826, EIC AQA**

**LEFT-SIDE FRONT FLOOR PLATE REPLACEMENT**  
**REMOVAL, INSTALLATION**

---

**INITIAL SETUP:****Tools and Special Tools**

Tool kit, general mechanic's (item 34, WP 0086 00)

**Personnel Required**

Mechanics (2)

**Materials/Parts**

Lockwashers (2) (item 156, WP 0087 00)

Screws (2) (item 53, WP 0087 00)

**Equipment Condition**

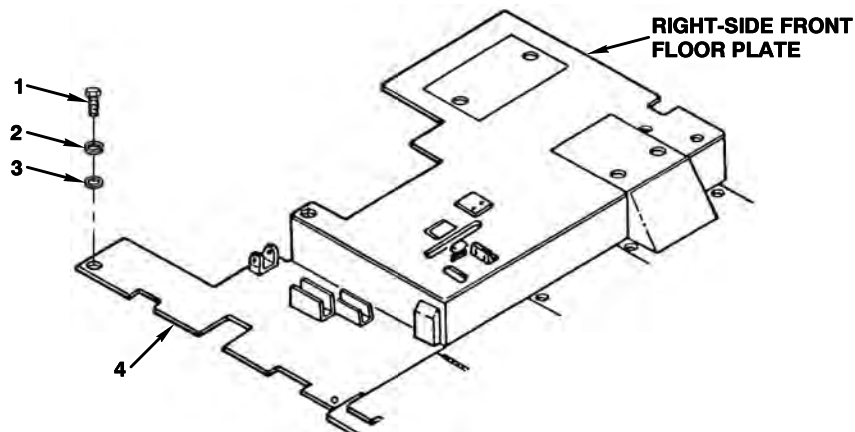
Wiring harness from dimmer switch disconnected

Right-side front floor plate removed (WP 0046 00)

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**Removal**

1. Remove two screws (1), lockwashers (2), washers (3), and left-side front floor plate (4). Discard lockwashers.

**Installation**

1. Install left-side front floor plate (4), two washers (3), lockwashers (2), and screws (1).

**END OF WORK PACKAGE**



**INTERMEDIATE MAINTENANCE**  
**RECOVERY VEHICLE, FULL TRACKED: MEDIUM, M88A1**  
**NSN 2350-00-122-6826, EIC AQA**

**PORTABLE FIRE EXTINGUISHER STOWAGE BOXES AND BRACKETS MAINTENANCE**  
**REMOVAL, DISASSEMBLY, REPAIR, ASSEMBLY, INSTALLATION**

**INITIAL SETUP:**

**Tools and Special Tools**

Tool kit, general mechanic's (item 34, WP 0086 00)

**Materials/Parts**

Cotter pins (2) (item 114, WP 0087 00)  
 Lockwashers (2) (item 160, WP 0087 00)  
 Lockwashers (2) (item 161, WP 0087 00)  
 Nuts (4) (item 197, WP 0087 00)

**Materials/Parts (cont.)**

Nuts (2) (item 201, WP 0087 00)  
 Pins, straight (2) (item 30, WP 0087 00)  
 Rivets (4) (item 176, WP 0087 00)

**References**

TM 9-2350-256-20

**Removal**

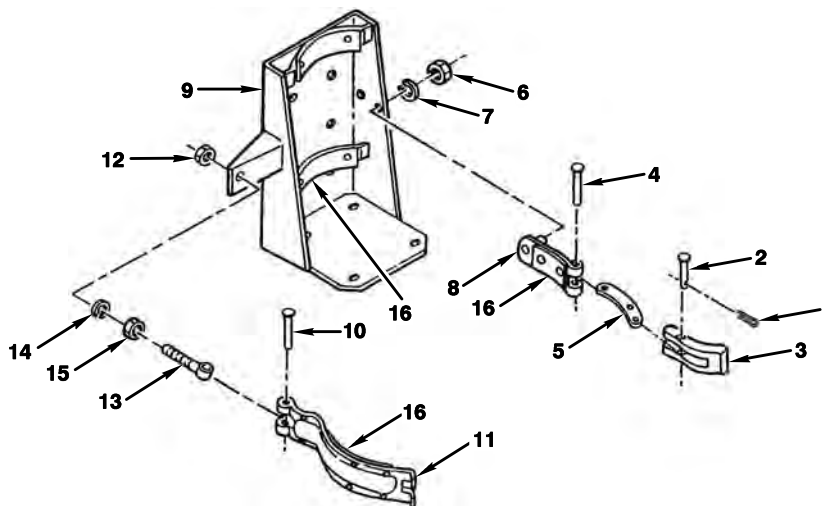
1. Remove portable fire extinguisher stowage boxes and brackets in accordance with TM 9-2350-256-20.

**NOTE**

There are two portable fire extinguisher stowage boxes and brackets. This procedure covers one.

**Disassembly**

1. Remove cotter pin (1), straight pin (2), rod end clevis (3), rivet (4), connecting link (5), nut (6), lockwasher (7), and retaining strap (8) from mounting bracket (9). Discard cotter pin, rivet, and lockwasher.
2. Remove rivet (10), fixed arm assembly (11), nut (12), rod connector (13), lockwasher (14), and nut (15) from mounting bracket (9). Discard rivet and lockwasher.

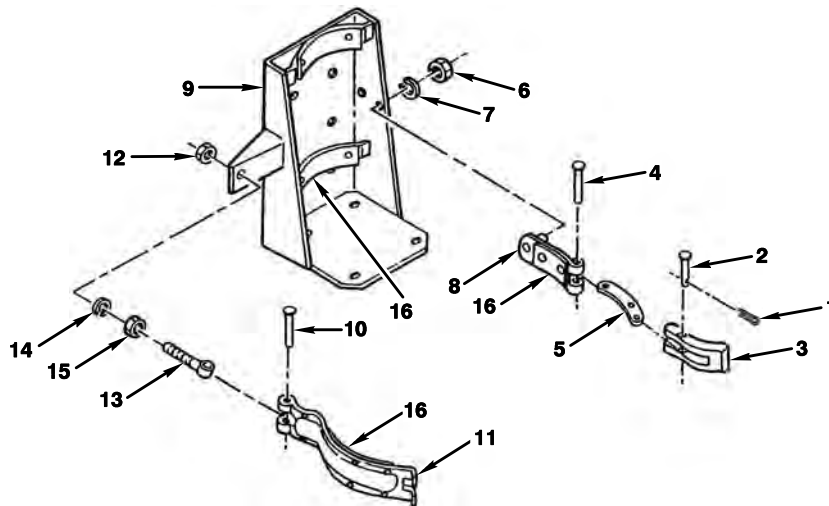


**Repair or Replacement**

**NOTE**

There are two portable fire extinguisher stowage boxes and brackets. This procedure covers one.

1. Remove old linings (16) from retaining strap (8), mounting bracket (9), and fixed arm assembly (11).
2. Use old linings (16) as patterns and cut new linings to the same sizes.
3. Position linings (16) on retaining strap (8), mounting bracket (9), and fixed arm assembly (11).



4. Set the rivet tangs below the lining surface so that the surface is smooth. Peen over properly to hold securely in place.

### Assembly

### NOTE

There are two portable fire extinguisher storage boxes and brackets. This procedure covers one.

1. Install nut (15), lockwasher (14), rod connector (13), nut (12), fixed arm assembly (11), and rivet (10) to mounting bracket (9).
2. Install retaining strap (8), lockwasher (7), nut (6), connecting link (5), rivet (4), rod end clevis (3), straight pin (2), and cotter pin (1) to mounting bracket (9).

### Installation

1. Install portable fire extinguisher storage boxes and brackets in accordance with TM 9-2350-256-20.

**END OF WORK PACKAGE**

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**INTERMEDIATE MAINTENANCE**  
**RECOVERY VEHICLE, FULL TRACKED: MEDIUM, M88A1**  
**NSN 2350-00-122-6826, EIC AQA**  
**MAIN HYDRAULIC SYSTEM MAINTENANCE**

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**INITIAL SETUP:****References**

TM 9-2350-256-10

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**GENERAL**

The main hydraulic system powers and controls the main winch, hoist winch, hoisting boom, and spade. The main winch and hoist winch are driven by vane-type hydraulic motors, and the hoisting boom and spade are actuated by hydraulic cylinders. Hydraulic fluid, under pressure for operating the hydraulic motors and hydraulic cylinders, is provided through a closed power circuit by a fixed-displacement, vane-type, double pump driven by a mechanical transmission (power takeoff) from the main engine. The hydraulic pump draws its fluid from the hydraulic oil tank, and pump output is controlled by engine speed. The operation of the hydraulic motors and the hydraulic cylinders is controlled through the control circuit. Each winch hydraulic motor is provided with a pilot-operated, spring centered, directional combination control valve which directs the fluid in the power circuit to the winch being operated. These directional control valves are remotely controlled by manually operated hydraulic control valves, which direct control pressure to them. The directional combination control valves for the spade and boom cylinders are manually controlled. Any internal leakage through the hydraulic motors, cylinders, or valves is returned to the hydraulic oil tank by tank return. Description of operation of the basic circuits in the main hydraulic system will be found below. Schematic diagrams of the main hydraulic system idling, and the hydraulic system operating the main winch, hoist winch, hoisting boom, and spade are shown in Foldouts FO-1 thru FO-9.

**NOTE**

Refer to TM 9-2350-256-10 for operating instructions for the winches, power takeoff, and hoist system.

**Main Hydraulic System—Idling (Figure FO-1)**

With the main engine operating at system idling speed, the power control valve is placed in the ON position, directing mechanical transmission pump pressure to the clutch (port no. 228), thus engaging the clutch which permits the mechanical transmission to drive the main hydraulic pump. The pump draws filtered fluid from the hydraulic oil tank (port no. 69) and discharges it through two outlet ports (port nos. 1 and 44) under pressure. The pump discharge pressure is directed to the relief and unloading valve (port no. 2) and the hoist winch combination control valve (port no. 27). Pump discharge pressure passes through the relief and unloading valve (port no. 3), through the hydraulic subplate (port nos. 136 and 125) of the main hydraulic control panel, and to the system selector valve (port no. 45) which is placed in the MAIN position. The pump pressure is then directed to, and blocked at the spade and boom combination control valves (port no. 33), as they are in their normal spring-centered HOLD position. Differential pressure across the pilot pressure valve, in the main relief valve, forces the valve open to allow a parallel flow (port no. 4) of pump discharge pressure to be directed to the hoist winch combination control valve (port no. 22). Differential pressure across the pilot pressure valve, in the hoist winch combination control valve, forces the valve open, directing the pump pressure (port no. 20) to the main winch combination control valve (port nos. 12 and 13) where the action duplicates the hoist winch combination control valve and the hydraulic fluid is returned to the oil tank (port no. 11). Hydraulic pressure is directed to both sides of the winch motors (port nos. 17 and 18) by the spring-centered directional control valve in the winch combination control valves.

**Main Winch—Payout (Figure FO-2)**

With the main winch control valve placed in the PAYOUT position, the pilot pressure (port nos. 15 and 16) tends to equal pump discharge pressure and is directed to both ends of the pilot-operated directional control valve (port nos. 8 and 10) in the main winch combination control valve. The ends of the directional control valve differ in size, the larger end at port no. 10 and the hydraulic differential across the valve causes it to move, directing the flow of pump pressure to one side of the main winch motor

(port no. 18), causing the motor to drive the main winch in the PAYOUT direction. The pilot pressure is also directed to the main winch brake cylinder to disengage the winch brake. Pump discharge pressure (port no. 52) is also directed to the level winder valve (port no. 50) which controls the direction of movement of the cable level winder.

### **Main Winch—Inhaul (Figure FO-3)**

With the main winch control valve placed in the INHAUL position, the hydraulic pressure at the large area end of the pilot-operated directional control valve in the main winch combination control valve is directed to the tank return (port no. 10). The pilot pressure is directed to one end (port no. 8) of the pilot-operated directional control valve, positioning the valve to direct pump pressure to one side of the main winch motor (port no. 17) and causing the motor to drive the main winch in the INHAUL direction. The hydraulic pressure in the brake cylinder is ported to tank return, causing the brake cylinder springs to engage the brake; and the brake ratchet and pawls are available for instant braking. Pump pressure is also being directed to the level winder valve (port no. 50).

### **Hoist Winch—Lower (Figure FO-4)**

With the hoist winch control valve placed in the LOWER position, pilot pressure is directed to both ends of the pilot-operated directional control valve (port nos. 19 and 24) in the hoist winch combination control valve. The differential across the directional control valve, due to the difference in size, positions the valve directing pump pressure (port no. 57) to one side of the hoist winch motor (port no. 17). The hoist winch motor then drives the hoist winch in the LOWER direction. Pilot pressure is directed to the hoist winch brake cylinder, overcoming the spring force, causing the brake band to expand, and allowing the brake drum to rotate.

### **Hoist Winch—Raise (Figure FO-5)**

With the hoist winch control valve placed in the RAISE position, the hydraulic pressure at the large end (port no. 19) of the pilot-operated directional control valve in the hoist winch combination control valve is directed to tank return. The pilot pressure is directed to one end of the pilot-operated directional control valve (port no. 24), positioning the valve to direct pump pressure to one side of the hoist winch motor (port no. 18) and causing the motor to drive the hoist winch in the RAISE position. The brake cylinder pressure is directed to tank return, allowing the brake cylinder springs to compress the brake band around the winch brake drum, and providing instant braking through the brake drum ratchet and pawls.

### **Hoisting Boom—Forward (Figure FO-6)**

With the manually operated directional control valve, in the boom combination control valve, placed in the FORWARD position and at the same time placing the boom safety valve in the STOW position, pilot pressure is blocked at both valves (port nos. 31 and 39). Pump discharge pressure (port no. 34) is directed to the boom cylinders, extending the piston rod and raising the boom. The stayline cylinder pistons are retracted mechanically into the stayline cylinders by the crankarms and the fluid behind the piston is forced out to tank return (port no. 62).

### **Hoisting Boom—Retract/Stow (Figure FO-7)**

With the manually operated directional control valve, in the boom combination control valve, placed in the RETRACT/STOW position, and at the same time placing the boom safety valve in the STOW position, pilot pressure is blocked at both valves (port nos. 31 and 39). Pump discharge pressure is directed to one end of the boom (port no. 61) and stayline cylinders (port no. 62), the opposite cylinder ends are ported to tank return (port nos. 61 and 62), causing boom cylinders to retract and the stayline cylinders to extend.

### **Spade—Raise (Figure FO-9)**

With the manually operated directional control valve, in the spade combination control valve, placed in the RAISE position, pilot pressure is blocked at the valve (port no. 30). Pump discharge pressure is directed to one end of the spade cylinders (port no. 59), and the opposite end (port no. 60) is ported to the tank return, causing the cylinder rod to retract and raising the spade.



**Spade—Lower (Figure FO-10)**

With the manually operated directional control valve, in the LOWER position, pilot pressure is blocked at the valve (port no. 30). Pump discharge pressure is directed to one end of the cylinders (port no. 60) and the opposite end (port no. 59) is ported to the tank return, extending the cylinder rod causing the spade to lower.

**END OF WORK PACKAGE**



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**INTERMEDIATE MAINTENANCE**  
**RECOVERY VEHICLE, FULL TRACKED: MEDIUM, M88A1**  
**NSN 2350-00-122-6826, EIC AQA**  
**AUXILIARY HYDRAULIC SYSTEM MAINTENANCE**

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**INITIAL SETUP:****References**TM 9-2350-256-10

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**GENERAL**

The auxiliary hydraulic system powers and controls the hoisting boom, spade, main winch, and hoist winch when the main engine is inoperative. The auxiliary hydraulic system also powers and controls the refuel-defuel pump and the hydraulic impact wrench. The auxiliary system power is supplied by a fixed-displacement, gear-type hydraulic pump which draws fluid from the hydraulic oil tank and is driven by the APU. The auxiliary hydraulic pump output is determined by the governed speed of the power unit engine. Any internal leakage through the hydraulic cylinders or valves is returned to the hydraulic oil tank by the tank return circuit. The operation of the hoisting boom, spade, main winch, and hoist winch is controlled by the same control valves as used in the main hydraulic system. The operation of the refuel-defuel system is controlled by a manually operated four-way selector valve and an adjustable flow regulator. Description of operation of the basic circuits in the auxiliary hydraulic system will be found below. Schematic diagrams of the auxiliary hydraulic system idling, the main winch inhaul and payout, the hoist winch raise and lower, the hoisting boom raise and lower, the spade raise and lower, the refuel-defuel pump, and the impact wrench are shown in Foldouts FO-10 thru FO-20.

**NOTE**

Refer to TM 9-2350-256-10 for operating instructions for the boom, winches, spade, refuel-defuel, and impact wrench system.

**Auxiliary Hydraulic System—Idling (Figure FO-11)**

With the APU operating, the system selector valve in the MAIN position, and the APU emergency winch control valve in the CLOSED position, oil is drawn from the hydraulic reservoir (port no. 243) into the pump (port no. 63), and the pump discharges low pressure oil (port no. 64) to the system selector valve (port no. 48) and returns to the reservoir (port no. 236). The above valve lever positions are used when the APU generator is being used to charge the batteries.

**Main Winch—Inhaul (Figure FO-12)**

With the system selector valve in the AUXILIARY position, and the APU emergency winch control valve in the OPEN position, hydraulic pressure is directed to the main winch combination control valve (port nos. 12 and 13), and returns to the reservoir (port no. 237). With the main winch control valve placed in the INHAUL position, the hydraulic pressure at the large area end of the pilot-operated directional control valve, in the main winch combination valve, is directed to tank return (port no. 10). The pilot pressure is directed to one end (port no. 8) of the pilot-operated directional control valve, positioning the valve to direct pump pressure to one side of the main winch motor (port no. 17) and causing the motor to drive the main winch in the INHAUL direction. The hydraulic pressure in the brake cylinder is ported to tank return, causing the brake cylinder springs to engage the brake, and the brake ratchet and pawls are available for instant braking. Pump pressure is also being directed to the level winder valve (port no. 50) which controls the movement of the cable level winder.

**Main Winch—Payout (Figure FO-13)**

With the system selector valve in the AUXILIARY position, and the APU emergency winch control valve in the OPEN position, hydraulic pressure is directed to the main winch combination control valve (port nos. 12 and 13) and returns to the reservoir (port no. 237). With the main winch control valve placed in the PAYOUT position, the pilot pressure (port nos. 15 and 16) tends to equal pump discharge pressure and is directed to both ends of the pilot-operated directional control valve (port nos. 8 and 10) in the main winch combination control valve. The ends of the directional control valve differ in size, the larger end at port

no. 10 and the hydraulic differential across the valve causes it to move, directing the flow of pump pressure to one side of the main winch motor (port no. 18), causing the motor to drive the main winch in the PAYOUT direction. The pilot pressure is also directed to the main winch brake cylinder to disengage the winch brake. Pump discharge pressure is also directed to the level winder valve (port no. 50) which controls the direction of movement of the cable level winder.

#### **Hoist Winch—Raise (Figure FO-14)**

With the system selector valve in the AUXILIARY position, and the APU emergency winch control valve in the OPEN position, hydraulic pressure is directed to the hoist winch combination control valve (port nos. 22 and 27), and returns through the main combination control valve to the reservoir (port no. 237). With the hoist winch control valve placed in the RAISE position, the hydraulic pressure at the large end (port no. 19) of the pilot-operated directional control valve in the hoist winch combination control valve is directed to one end of the pilot-operated directional control valve (port no. 24), positioning the valve to direct pump pressure to one side of the hoist winch motor (port no. 18) and causing the motor to drive the hoist winch in the RAISE direction. The brake cylinder hydraulic pressure is directed to tank return, allowing the brake cylinder springs to compress the brake band around the winch brake drum, and providing instant braking through the brake drum ratchet and pawls.

#### **Hoist Winch—Lower (Figure FO-15)**

With the system selector valve in the AUXILIARY position, and the APU emergency winch control valve in the OPEN position, hydraulic pressure is directed to the hoist winch combination control valve (port nos. 22 and 27), and returns through the main winch combination control valve to the reservoir (port no. 237). With the hoist winch control valve placed in the LOWER position, pilot pressure is directed to both ends of the pilot-operated directional control valve (port nos. 19 and 24) in the hoist winch combination control valve. The differential across the directional control valve, due to the difference in size, positions the valve directing the pump pressure to one side of the hoist winch motor (port no. 17). The hoist winch motor then drives the hoist winch in the LOWER direction. Pilot pressure is directed to the hoist winch brake cylinder, overcoming the spring force, causing the brake band to expand, and allowing the brake drum to rotate.

#### **Hoisting Boom—Forward (Figure FO-16)**

With the APU emergency winch control valve in the CLOSED position, and the system selector valve in the AUXILIARY position, the pressure is directed to the boom combination control valve and the spade combination control valve (port no. 33) and is blocked. The oil then flows over the relief valve in the system selector valve and returns to the reservoir (port no. 236). With the boom combination control valve placed in the FORWARD position, and at the same time placing the boom safety valve in the STOW position, pump discharge pressure is directed to the boom cylinders. The pump pressure, directed to one end of the cylinder (port no. 62) with the other end (port no. 61) ported to the tank return, causes the piston rod to extend, raising the boom. The stayline cylinder pistons are retracted mechanically into the cylinders by the crankarms and the fluid behind the pistons is forced out of the cylinders (port no. 62) to the tank return.

#### **Hoisting Boom—Retract/Stow (Figure FO-17)**

With the APU emergency winch control valve in the CLOSED position, and the system selector valve in the AUXILIARY position, the pressure is directed to the boom combination control valve and the spade combination control valve (port no. 33) and is blocked. The oil then flows over the relief valve in the system selector valve and returns to the reservoir (port no. 236). With the boom combination control valve placed in the STOW position, pump discharge pressure is directed to the boom cylinders (port no. 61) and stayline cylinders (port no. 62). The pump pressure, directed to one end of the cylinder while the opposite end is ported to the tank return, causes the boom cylinders to retract and the stayline cylinders to extend.

#### **Spade—Raise (Figure FO-19)**

With the APU emergency winch control valve in the CLOSED position, and the system selector valve in the AUXILIARY position, the pressure is directed to the spade combination control valve and the boom combination control valve (port no. 33) and is blocked. The oil then flows over the relief valve in the system selector valve and returns to the reservoir (port no. 236). With the spade combination control valve placed in the RAISE position, pump pressure is directed to the rod end of the spade cylinder (port no. 59). The back end of the cylinder is ported to tank return, (port no. 235). The differential across the piston causes the rod to retract, raising the spade.

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**Spade—Lower (Figure FO-20)**

With the APU emergency winch control valve in the CLOSED position, and the system selector valve in the AUXILIARY position, the pressure is directed to the spade combination control valve and the boom combination control valve (port no. 33) is blocked. The oil then flows over the relief valve in the system selector valve and returns to the reservoir (port no. 236). With the spade combination control valve placed in the LOWER position, pump pressure is directed to the back end of the spade cylinder (port no. 60). The opposite end is ported to the tank return (port no. 235). The differential across the piston causes the rod to extend, lowering the spade.

**Refuel (Figure FO-21)**

With the APU emergency winch control valve in the CLOSED position, the impact wrench disconnected, and the system selector valve placed in the REFUEL position, pump pressure is directed to the adjustable flow regulator (port IN) and the four-way selector valve. The flow of the hydraulic pressure to the pressure side of the four-way selector valve can be varied by the adjustable flow regulator. Placing the four-way selector valve in the REFUEL position, directs the auxiliary pump pressure to the gear-type refuel pump motor (port no. 65), which is coupled to and drives the refuel pump. The hydraulic oil (port no. 66) returns to the tank after passing through the refuel pump motor. Placing the four-way selector valve in the DEFUEL position causes the opposite motor and pump rotation.

**Impact Wrench (Figure FO-22)**

With the impact wrench hoses connected, the APU emergency winch control valve in the CLOSED position, and the system selector valve in the REFUEL position, the hydraulic pressure is directed to the adjustable flow regulator and is blocked at the four-way selector valve, which is in the closed position. Pressure is then directed through the impact wrench and returns to the reservoir (port no. 245).

**END OF WORK PACKAGE**



**INTERMEDIATE MAINTENANCE**  
**RECOVERY VEHICLE, FULL TRACKED: MEDIUM, M88A1**  
**NSN 2350-00-122-6826, EIC AQA**

**MAIN WINCH AND SPADE ASSEMBLY MAINTENANCE**  
**DESCRIPTION, REMOVAL, DISASSEMBLY, CLEANING, INSPECTION,**  
**ASSEMBLY, INSTALLATION, ADJUSTMENT, TESTING**

**INITIAL SETUP:****Test Equipment**

Gage, pressure (item 9, WP 0086 00)

**Tools and Special Tools**

Adapter (item 1, WP 0086 00)  
 Guide (item 12, WP 0086 00)  
 Handle (item 13, WP 0086 00)  
 Impact wrench, hydraulic (item 19, WP 0086 00)  
 Lifting eyes (2) (item 21, WP 0086 00)  
 Puller (item 24, WP 0086 00)  
 Sling (item 30, WP 0086 00)  
 Tool kit, general mechanic's (item 34, WP 0086 00)

**Materials/Parts**

Sealing compound (item 14, WP 0085 00)  
 Tape, antiseizing (item 16, WP 0085 00)  
 Bolts (12) (item 83, WP 0087 00)  
 Gasket (item 7, WP 0087 00)  
 Locknuts (4) (item 174, WP 0087 00)  
 Lockwashers (4) (item 161, WP 0087 00)  
 Lockwashers (2) (item 156, WP 0087 00)  
 Lockwashers (32) (item 168, WP 0087 00)  
 Lockwashers (52) (item 169, WP 0087 00)  
 Lockwashers (17) (item 163, WP 0087 00)  
 Lockwashers (27) (item 166, WP 0087 00)  
 Lockwashers (8) (item 162, WP 0087 00)  
 Nuts, self-locking (32) (item 85, WP 0087 00)  
 Packing (item 137, WP 0087 00)  
 Packings (2) (item 132, WP 0087 00)  
 Packings (2) (item 133, WP 0087 00)  
 Packings (2) (item 134, WP 0087 00)  
 Pins (2) (item 26, WP 0087 00)  
 Pins (4) (item 89, WP 0087 00)  
 Pins, cotter (2) (item 115, WP 0087 00)

**Materials/Parts (cont.)**

Pin, straight (item 192, WP 0087 00)  
 Screws (2) (item 55, WP 0087 00)  
 Screws (8) (item 65, WP 0087 00)  
 Screws (7) (item 70, WP 0087 00)  
 Screws (12) (item 71, WP 0087 00)  
 Screws (4) (item 72, WP 0087 00)  
 Screws (3) (item 76, WP 0087 00)  
 Screws (21) (item 79, WP 0087 00)  
 Screws (19) (item 80, WP 0087 00)  
 Screws (31) (item 81, WP 0087 00)  
 Screws (8) (item 82, WP 0087 00)  
 Screws (4) (item 97, WP 0087 00)  
 Screws (2) (item 100, WP 0087 00)  
 Screws (2) (item 184, WP 0087 00)  
 Screws (4) (item 206, WP 0087 00)  
 Screws (8) (item 216, WP 0087 00)  
 Screws (16) (item 217, WP 0087 00)  
 Screws (8) (item 218, WP 0087 00)  
 Screw (item 219, WP 0087 00)  
 Screws (20) (item 223, WP 0087 00)  
 Screws (2) (item 225, WP 0087 00)  
 Screws, lock (4) (item 5, WP 0087 00)  
 Seals (2) (item 240, WP 0087 00)  
 Seals (2) (item 241, WP 0087 00)  
 Washers (6) (item 124, WP 0087 00)

**Personnel Required**

Mechanics (3)

**Equipment Condition**

Subfloor plates 1, 2, and 3 removed (TM 9-2350-256-20)  
 Doors of subfloor plates 4 and 21 opened (WP 0022 00)  
 Main winch cable removed (TM 9-2350-256-20)

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**DESCRIPTION**

The main winch has an inhaul capacity of 90,000 lb (40,824 kg) maximum, using a single-part line on bare drum (3 to 5 wraps minimum of cable on bare drum and not to exceed the first layer).

**NOTE**

**LOAD TEST REQUIREMENT**—Load testing of main winch is mandatory, prior to use, under any of the following requirements: (1) When new. (2) Following any repairs, disassembly and assembly, adjustments, or parts replacement, of main winch. (3) When modifications are made that could affect the strength or lifting capabilities of the vehicle.

Load testing will be accomplished by support maintenance activities.

Refer to the TESTING section below for the detailed step-by-step procedure.

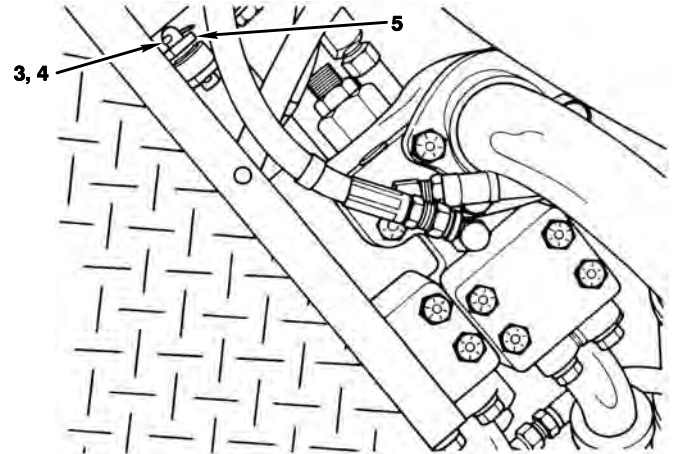
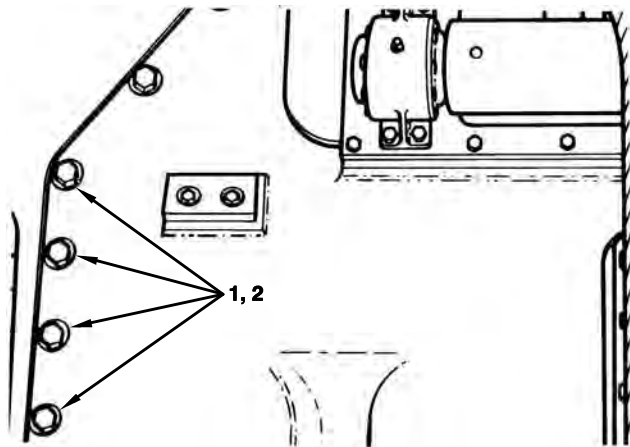
**NOTE**

If your vehicle has main winch assembly 8739010-11 or 8739010-1, send winch assembly to depot maintenance for removal of anti-chatter kit.

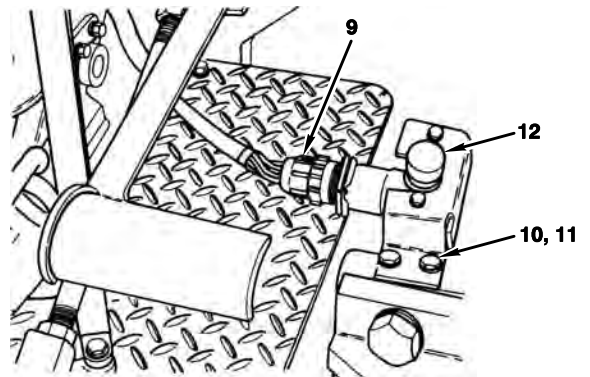
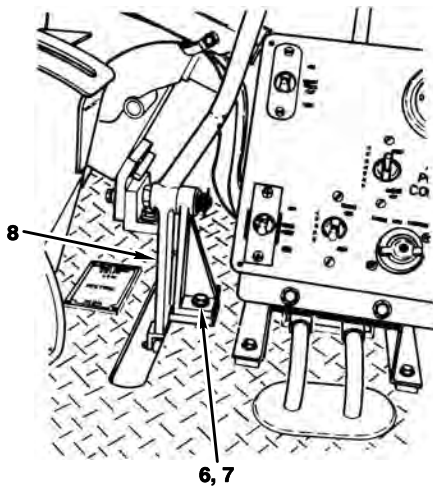


**Removal**

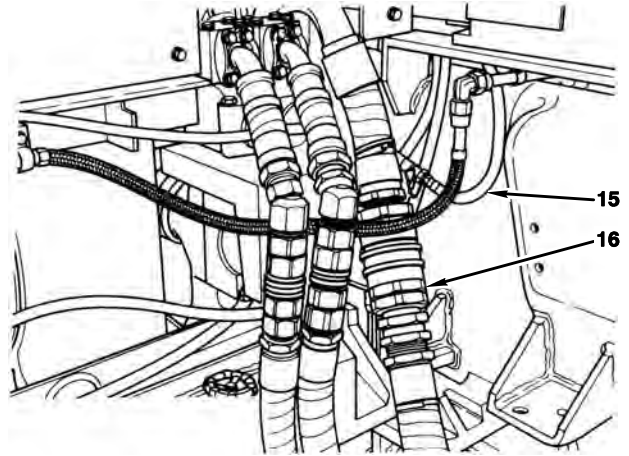
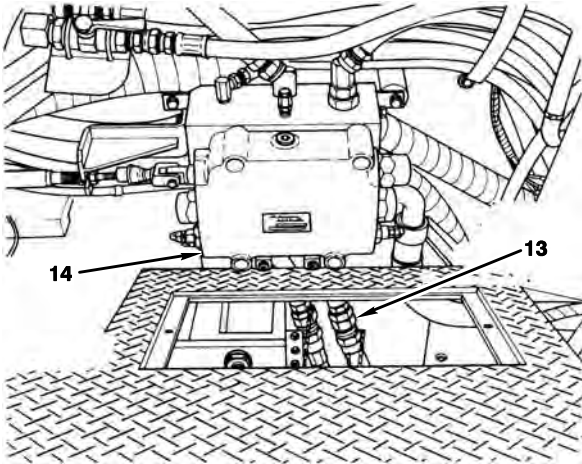
1. Lower spade and remove eight screws (1) and lockwashers (2) (four each side of front plate). Discard lockwashers.
2. Remove cotter pin (3) and straight pin (4) and disconnect winch shift rod (5). Discard cotter pin.



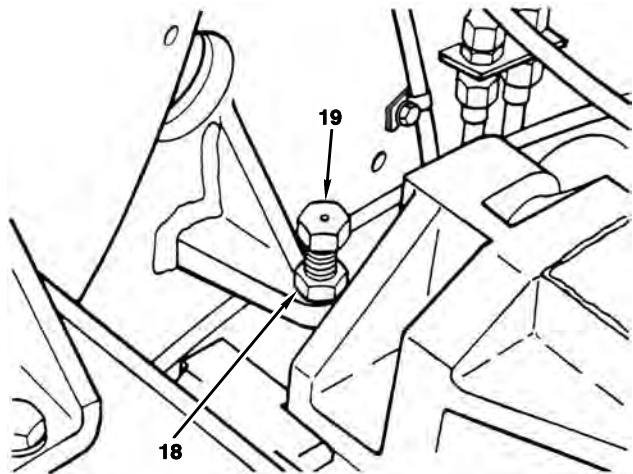
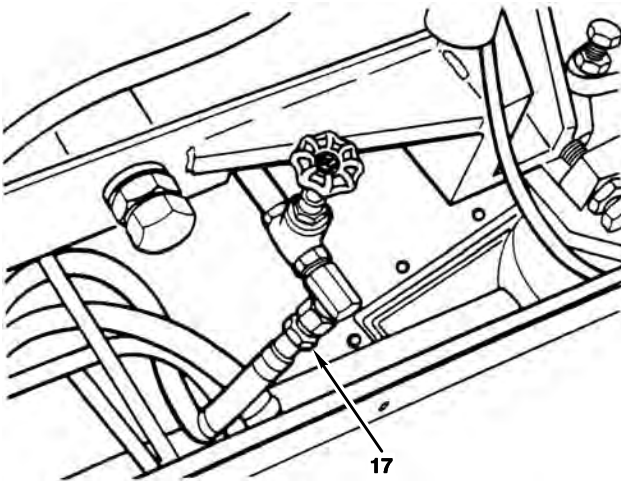
3. Remove two screws (6), lockwashers (7), and winch shift lever with attached shift rod (8). Discard lockwashers.
4. Disconnect electrical cable (9).
5. Remove two screws (10), lockwashers (11), and dimmer switch with attached bracket (12). Discard lockwashers.



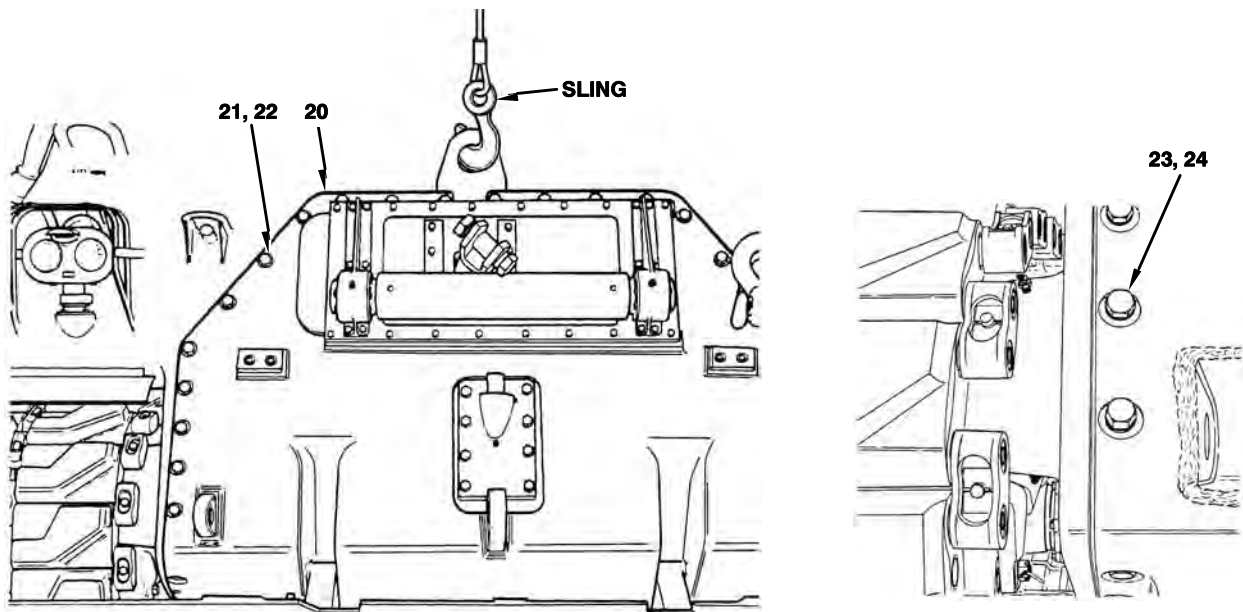
6. Disconnect two hydraulic lines (13) from spade control valve (14).
7. Disconnect six small hydraulic lines (15) and three large hydraulic lines (16).



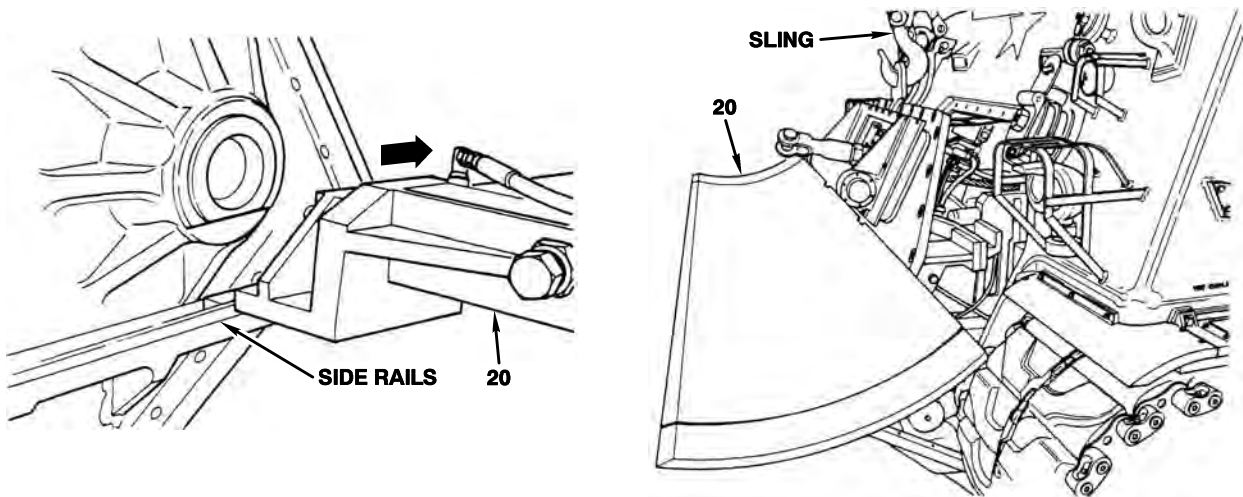
8. Disconnect drain line (17).
9. Loosen four locknuts (18) and lock screws (19) (two each side).



10. Install two lifting eyes, attach sling, and take up weight of winch and spade assembly (20).
11. Remove 23 screws (21) and lockwashers (22). Discard lockwashers.
12. Remove 21 screws (23) and lockwashers (24). Discard lockwashers.



13. Pull main winch and spade assembly (20) outward to remove. Guide main winch and spade assembly along side rails, ensuring even clearance.

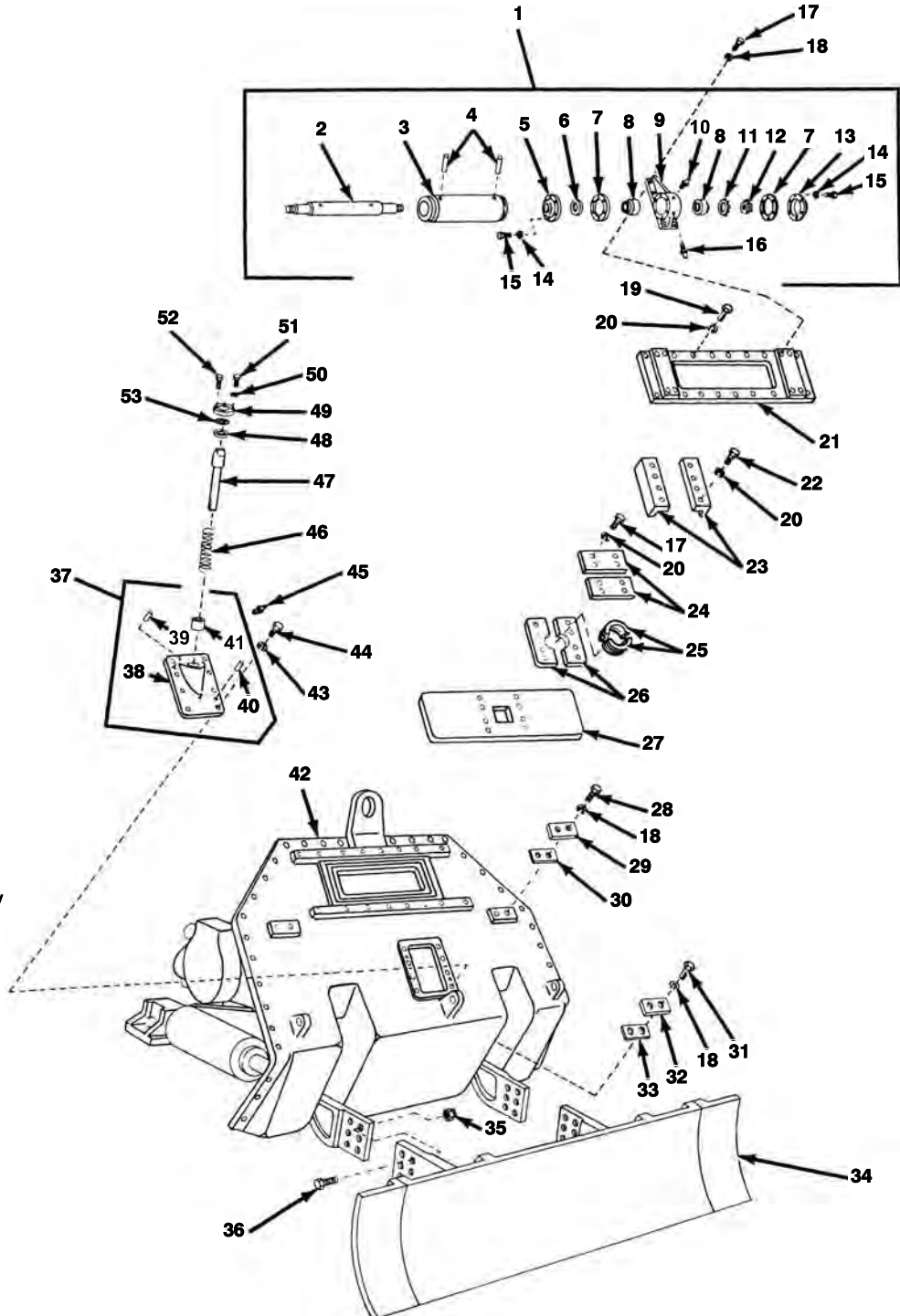


### Disassembly

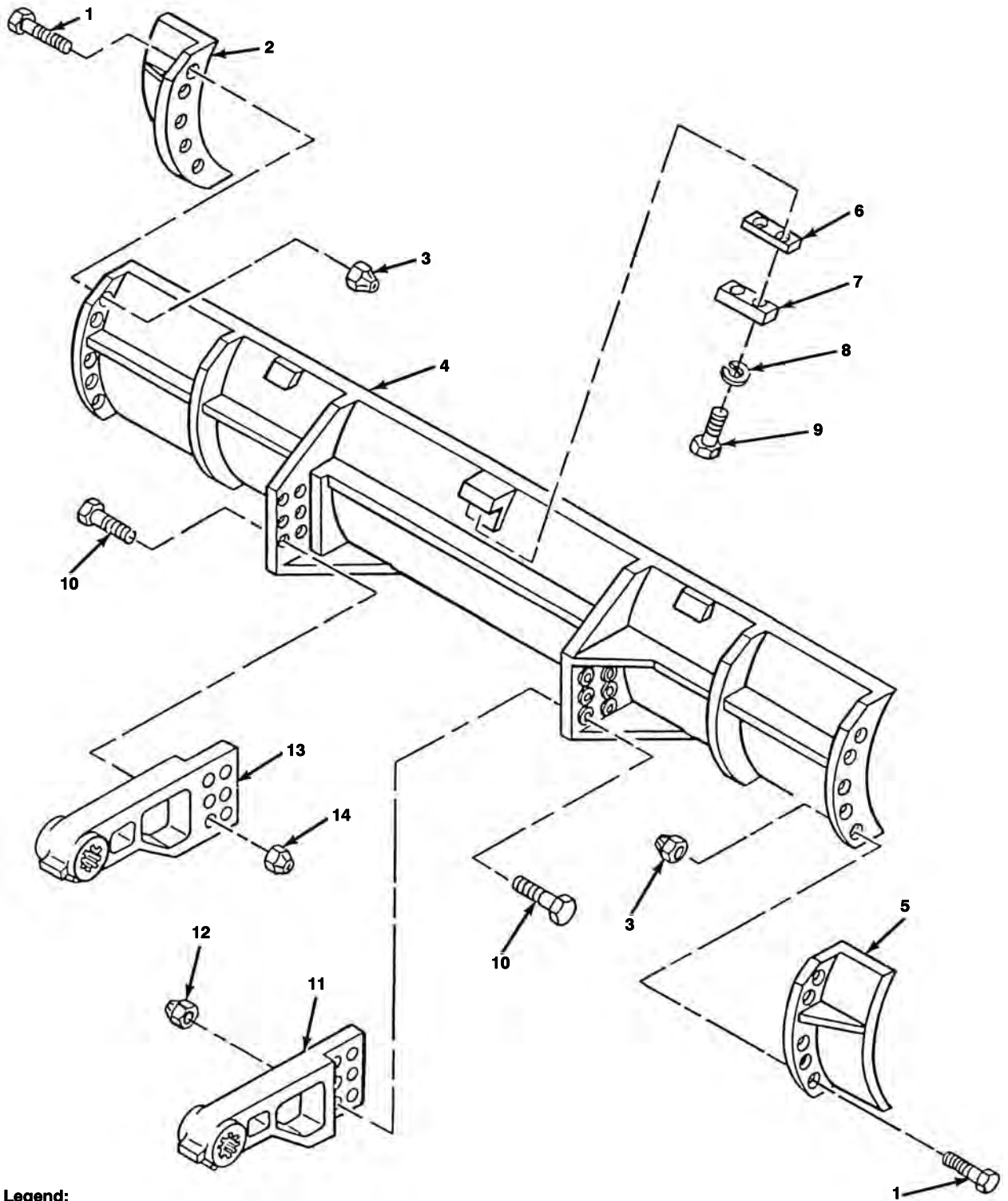
1. The following six illustrations, with accompanying legends, serve to identify all subassemblies and attaching parts. The step-by-step disassembly procedure is provided after these six illustrations:

**Legend:**

1. Cable roller assembly
2. Roller shaft
3. Roller
4. Pin
5. Retainer
6. Seal
7. Gasket
8. Roller bearing
9. Roller bracket
10. Lubrication fitting
11. Key washer
12. Round nut
13. Bearing cover
14. Lockwasher
15. Screw
16. Lubricant pressure relief valve
17. Screw
18. Lockwasher
19. Screw
20. Lockwasher
21. Frame
22. Screw
23. Guide
24. Retainer
25. Half bushing
26. Cover
27. Cable guide plate
28. Screw
29. Top spade stop block
30. Shim
31. Screw
32. Lower spade stop block
33. Shim
34. Spade
35. Locknut
36. Screw
37. Spade latch housing assembly
38. Spade latch housing
39. Pin
40. Pin
41. Sleeve bushing
42. Cover assembly
43. Lockwasher
44. Screw
45. Lubrication fitting
46. Spring
47. Retainer plunger
48. Wiper rod
49. Retainer
50. Lockwasher
51. Screw
52. Screw
53. O-ring



**SPADE, COVER ASSEMBLY, AND ATTACHING PARTS.**



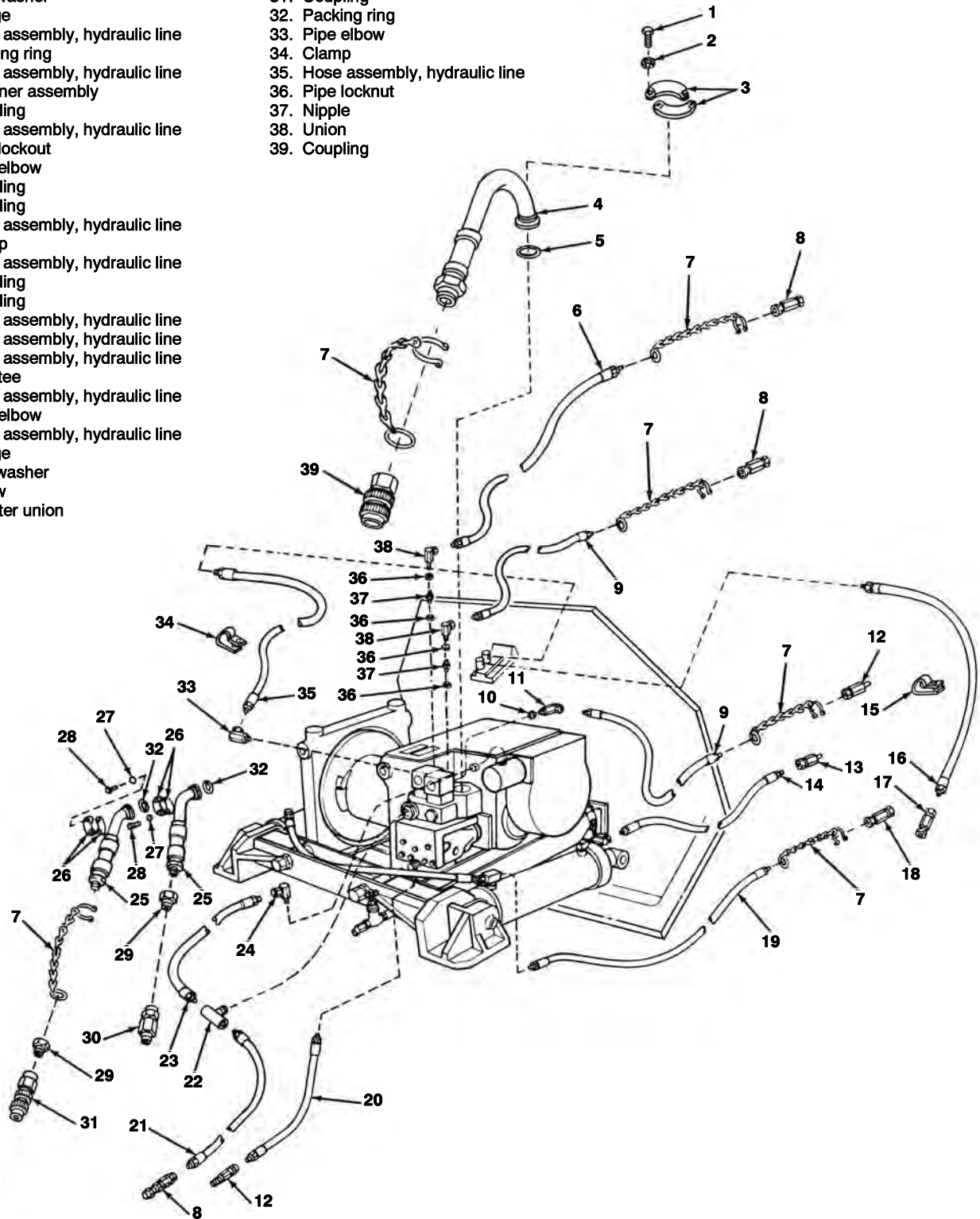
**Legend:**

- |                    |                    |                          |                          |
|--------------------|--------------------|--------------------------|--------------------------|
| 1. Screw           | 5. Spade extension | 9. Screw                 | 13. Remote control lever |
| 2. Spade extension | 6. Shim            | 10. Screw                | 14. Self-locking nut     |
| 3. Locknut         | 7. Striker plate   | 11. Remote control lever |                          |
| 4. Spade           | 8. Lockwasher      | 12. Self-locking nut     |                          |

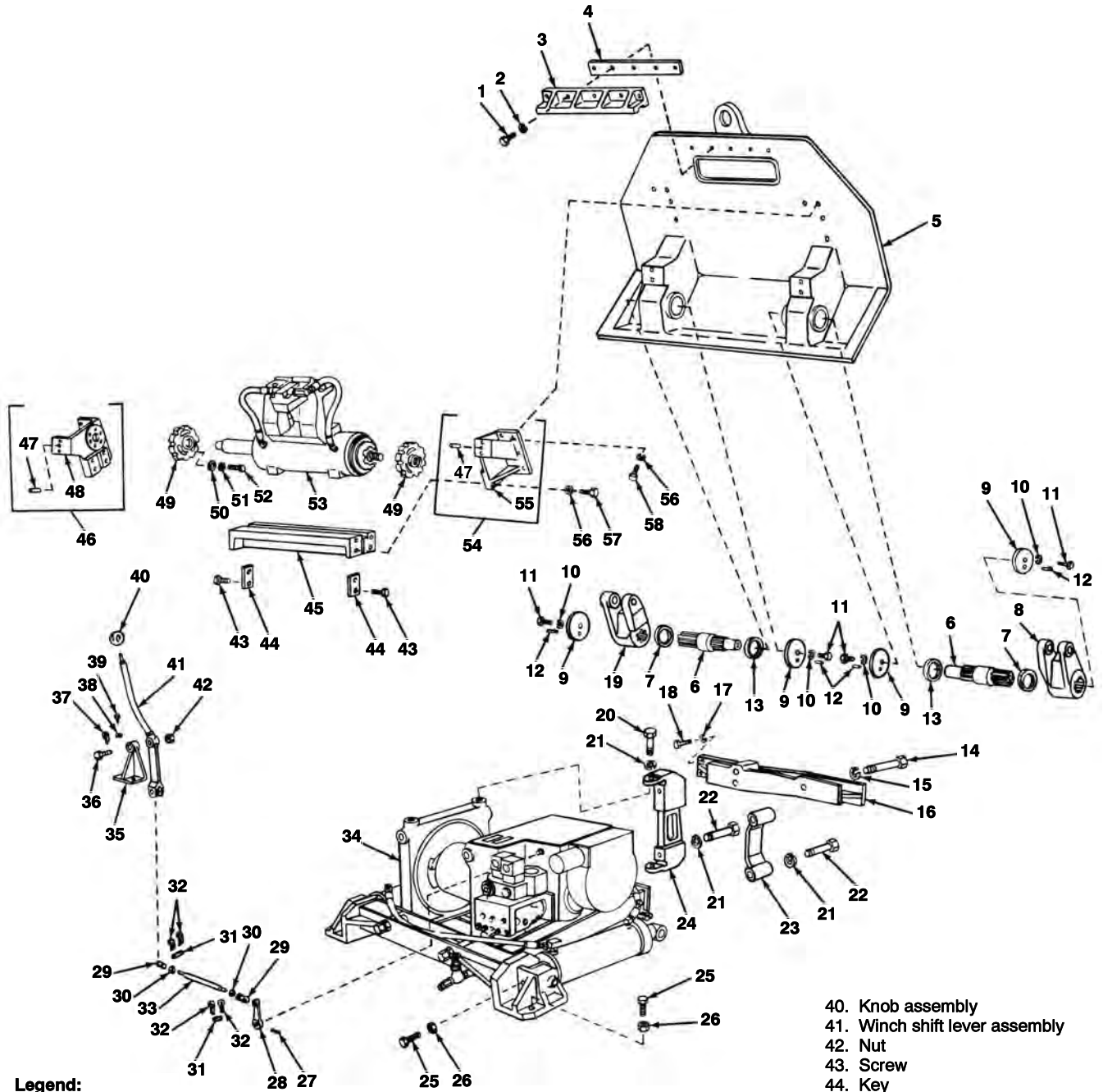
**SPADE, EXPLODED VIEW.**

**Legend:**

- |                                   |                                   |
|-----------------------------------|-----------------------------------|
| 1. Screw                          | 30. Coupling                      |
| 2. Lockwasher                     | 31. Coupling                      |
| 3. Flange                         | 32. Packing ring                  |
| 4. Hose assembly, hydraulic line  | 33. Pipe elbow                    |
| 5. Packing ring                   | 34. Clamp                         |
| 6. Hose assembly, hydraulic line  | 35. Hose assembly, hydraulic line |
| 7. Retainer assembly              | 36. Pipe locknut                  |
| 8. Coupling                       | 37. Nipple                        |
| 9. Hose assembly, hydraulic line  | 38. Union                         |
| 10. Pipe lockout                  | 39. Coupling                      |
| 11. Pipe elbow                    |                                   |
| 12. Coupling                      |                                   |
| 13. Coupling                      |                                   |
| 14. Hose assembly, hydraulic line |                                   |
| 15. Clamp                         |                                   |
| 16. Hose assembly, hydraulic line |                                   |
| 17. Coupling                      |                                   |
| 18. Coupling                      |                                   |
| 19. Hose assembly, hydraulic line |                                   |
| 20. Hose assembly, hydraulic line |                                   |
| 21. Hose assembly, hydraulic line |                                   |
| 22. Pipe tee                      |                                   |
| 23. Hose assembly, hydraulic line |                                   |
| 24. Pipe elbow                    |                                   |
| 25. Hose assembly, hydraulic line |                                   |
| 26. Flange                        |                                   |
| 27. Lockwasher                    |                                   |
| 28. Screw                         |                                   |
| 29. Adapter union                 |                                   |



**MAIN WINCH AND HYDRAULIC LINES.**



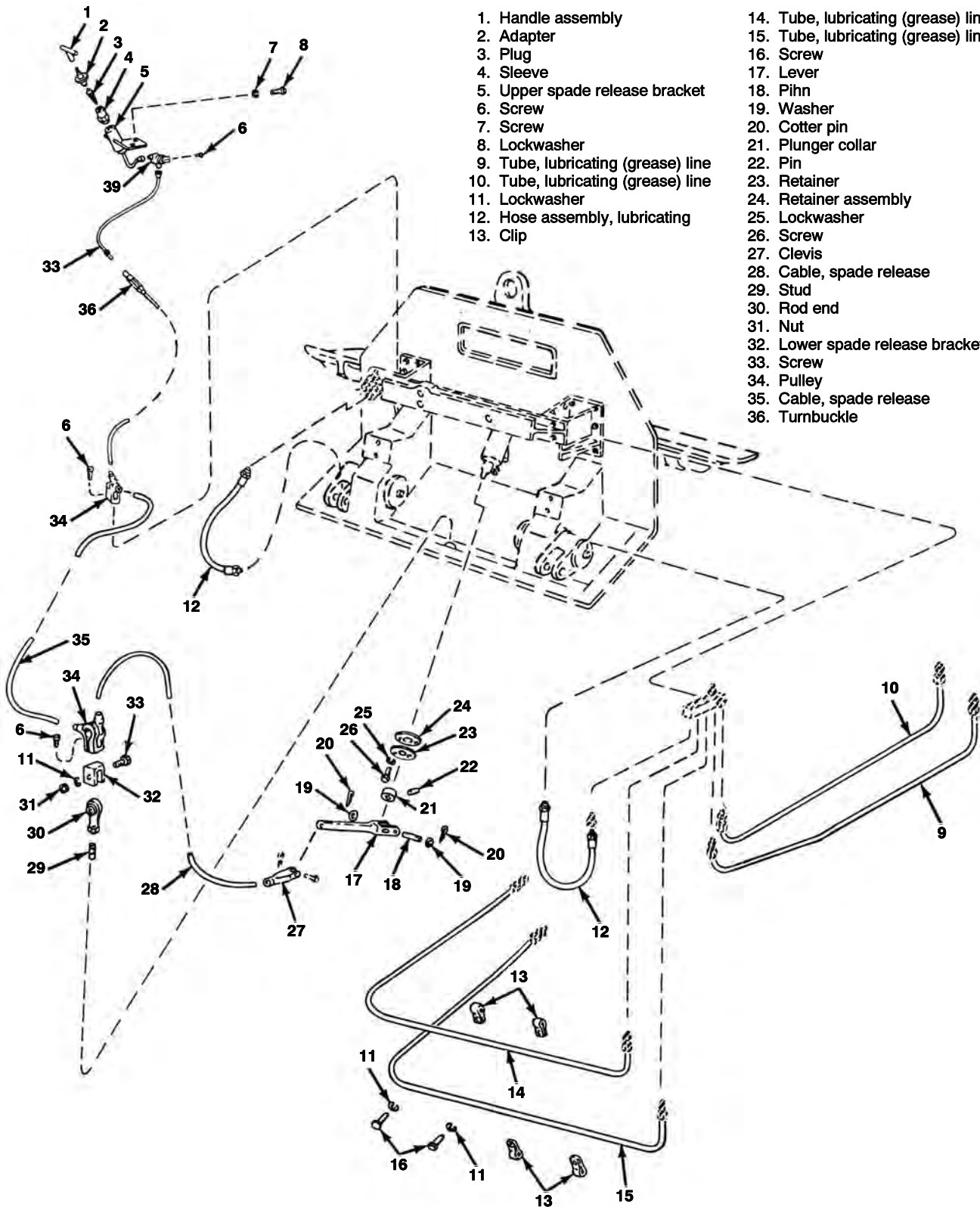
**Legend:**

- |                   |                |                       |                                |
|-------------------|----------------|-----------------------|--------------------------------|
| 1. Screw          | 14. Screw      | 27. Spring pin        | 40. Knob assembly              |
| 2. Lockwasher     | 15. Lockwasher | 28. Winch shift lever | 41. Winch shift lever assembly |
| 3. Guide          | 16. Support    | 29. Plain bearing     | 42. Nut                        |
| 4. Shim           | 17. Lockwasher | 30. Nut               | 43. Screw                      |
| 5. Cover assembly | 18. Screw      | 31. Straight pin      | 44. Key                        |
| 6. Link arm shaft | 19. Link arm   | 32. Cotter pin        | 45. Bottom level winder guide  |
| 7. Seal           | 20. Screw      | 33. Winch shift rod   | 46. Support assembly           |
| 8. Link arm       | 21. Lockwasher | 34. Winch assembly    | 47. Pin                        |
| 9. Plate          | 22. Screw      | 35. Bracket           | 48. Support                    |
| 10. Lockwasher    | 23. Spacer     | 36. Bolt              | 49. Flange                     |
| 11. Screw         | 24. Spacer     | 37. Pin               | 50. Washer                     |
| 12. Dowel pin     | 25. Screw      | 38. Lockwasher        | 51. Lockwasher                 |
| 13. Seal          | 26. Nut        | 39. Screw             | 52. Screw                      |
|                   |                |                       | 53. Level winder assembly      |
|                   |                |                       | 54. Support assembly           |
|                   |                |                       | 55. Support                    |
|                   |                |                       | 56. Lockwasher                 |
|                   |                |                       | 57. Screw                      |
|                   |                |                       | 58. Screw                      |

**MAIN WINCH, COVER, LEVEL WINDER, AND ATTACHING PARTS.**

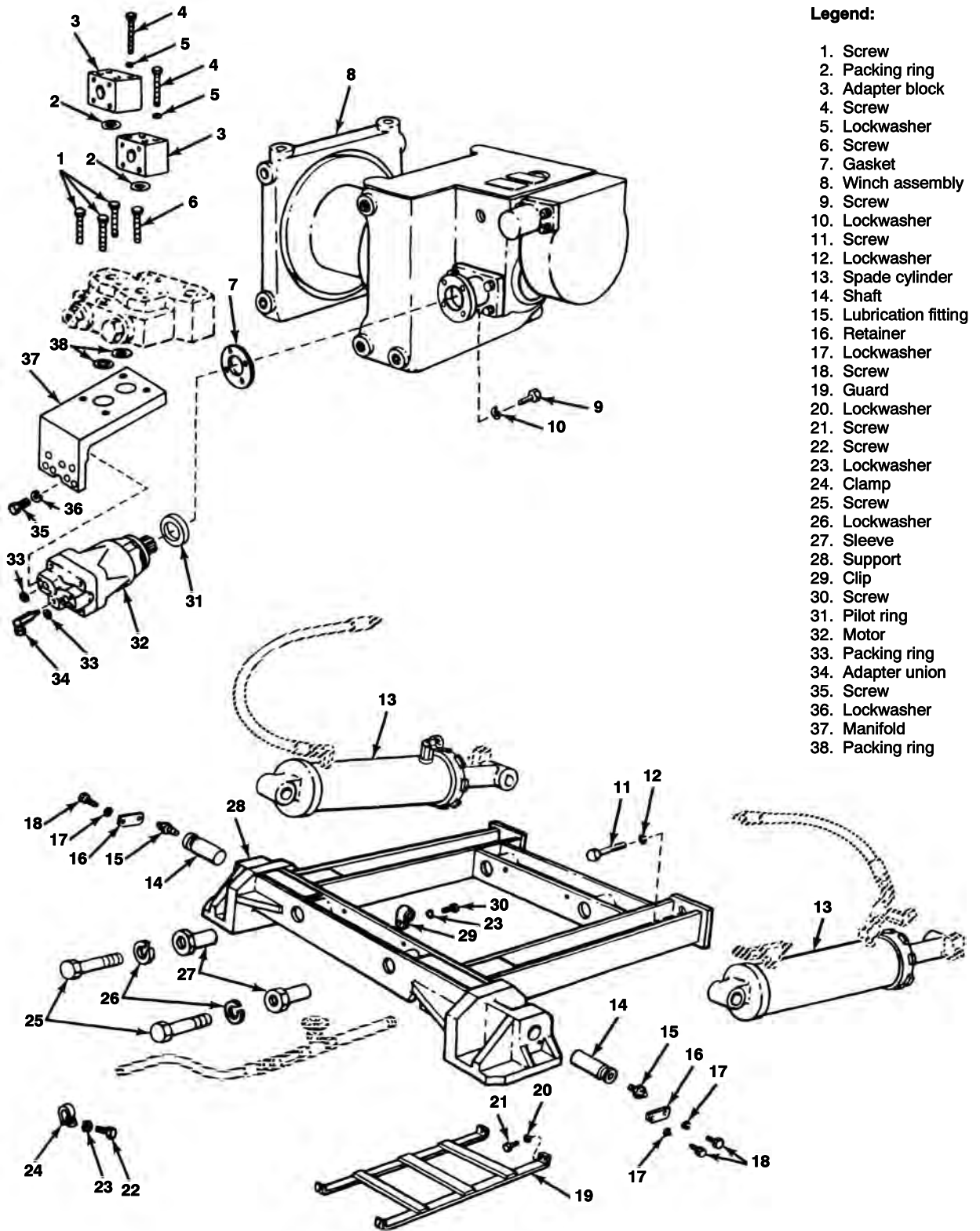
**Legend:**

- |                                     |                                     |
|-------------------------------------|-------------------------------------|
| 1. Handle assembly                  | 14. Tube, lubricating (grease) line |
| 2. Adapter                          | 15. Tube, lubricating (grease) line |
| 3. Plug                             | 16. Screw                           |
| 4. Sleeve                           | 17. Lever                           |
| 5. Upper spade release bracket      | 18. Pin                             |
| 6. Screw                            | 19. Washer                          |
| 7. Screw                            | 20. Cotter pin                      |
| 8. Lockwasher                       | 21. Plunger collar                  |
| 9. Tube, lubricating (grease) line  | 22. Pin                             |
| 10. Tube, lubricating (grease) line | 23. Retainer                        |
| 11. Lockwasher                      | 24. Retainer assembly               |
| 12. Hose assembly, lubricating      | 25. Lockwasher                      |
| 13. Clip                            | 26. Screw                           |
|                                     | 27. Clevis                          |
|                                     | 28. Cable, spade release            |
|                                     | 29. Stud                            |
|                                     | 30. Rod end                         |
|                                     | 31. Nut                             |
|                                     | 32. Lower spade release bracket     |
|                                     | 33. Screw                           |
|                                     | 34. Pulley                          |
|                                     | 35. Cable, spade release            |
|                                     | 36. Turnbuckle                      |



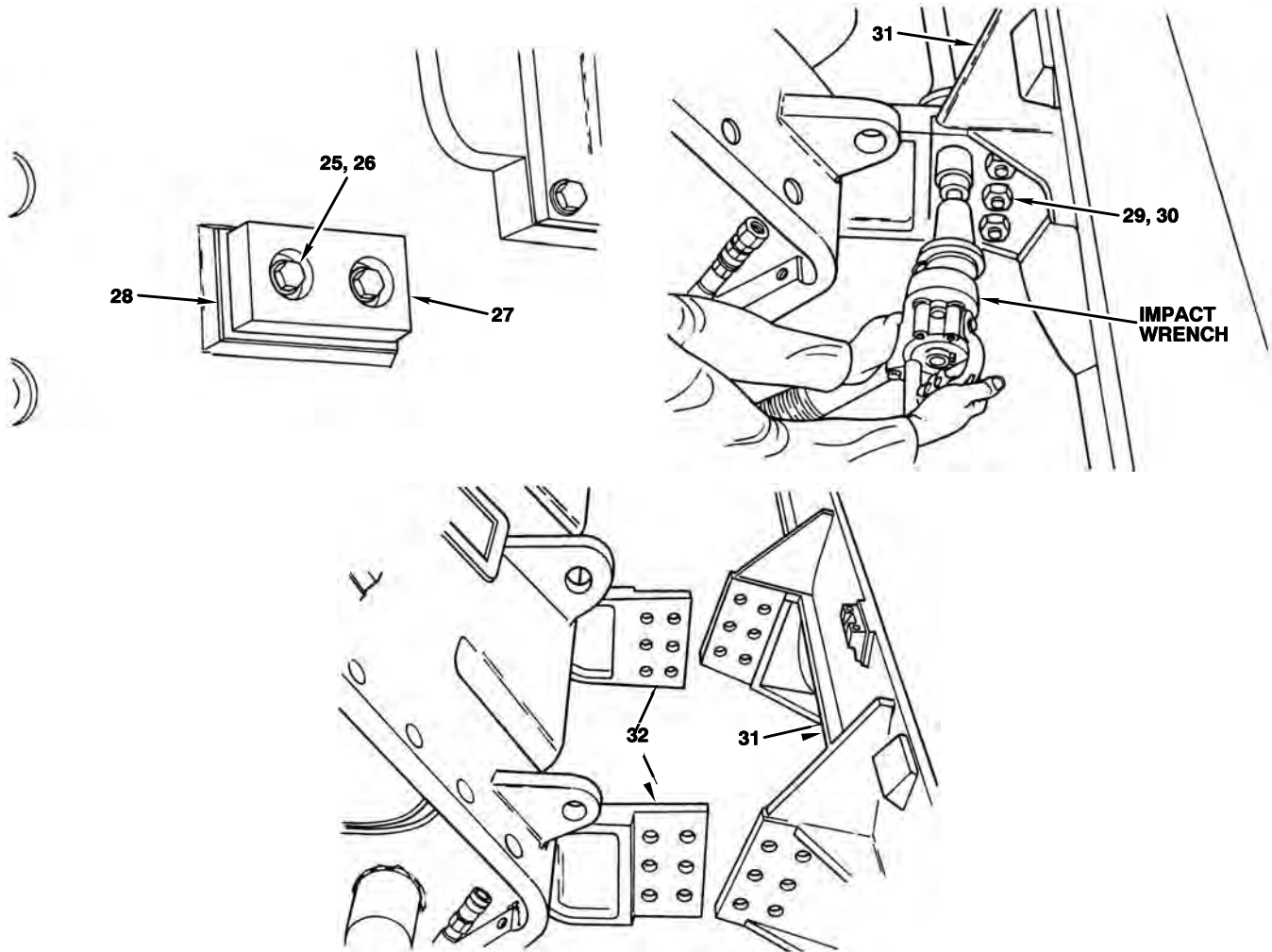
**COVER ASSEMBLY AND LUBRICATING LINES, MECHANICAL SPADE RELEASE.**



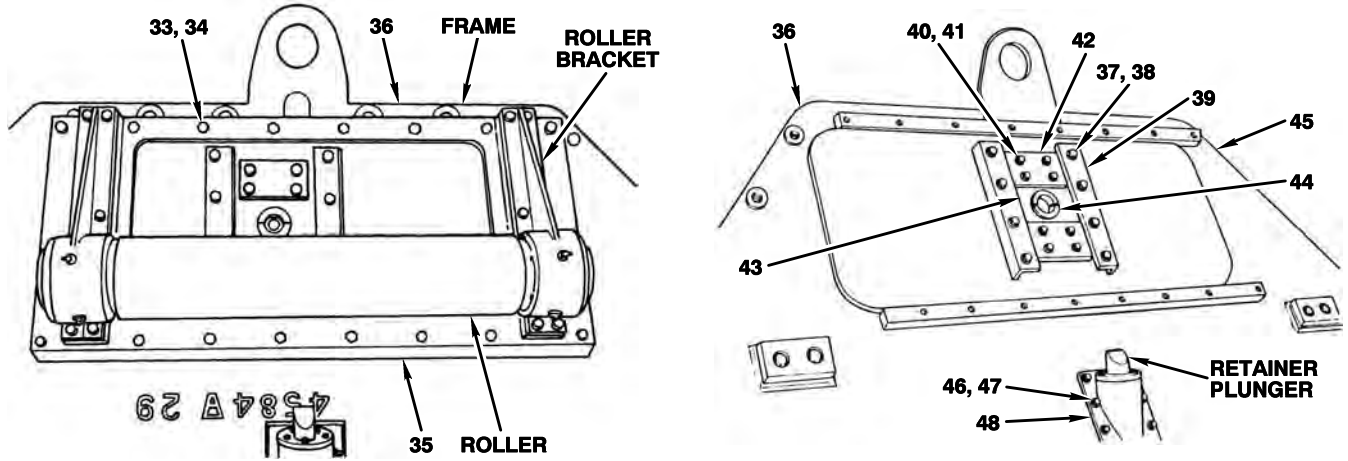


**MAIN WINCH AND SPADE ASSEMBLIES, MOTOR, AND ATTACHING PARTS.**

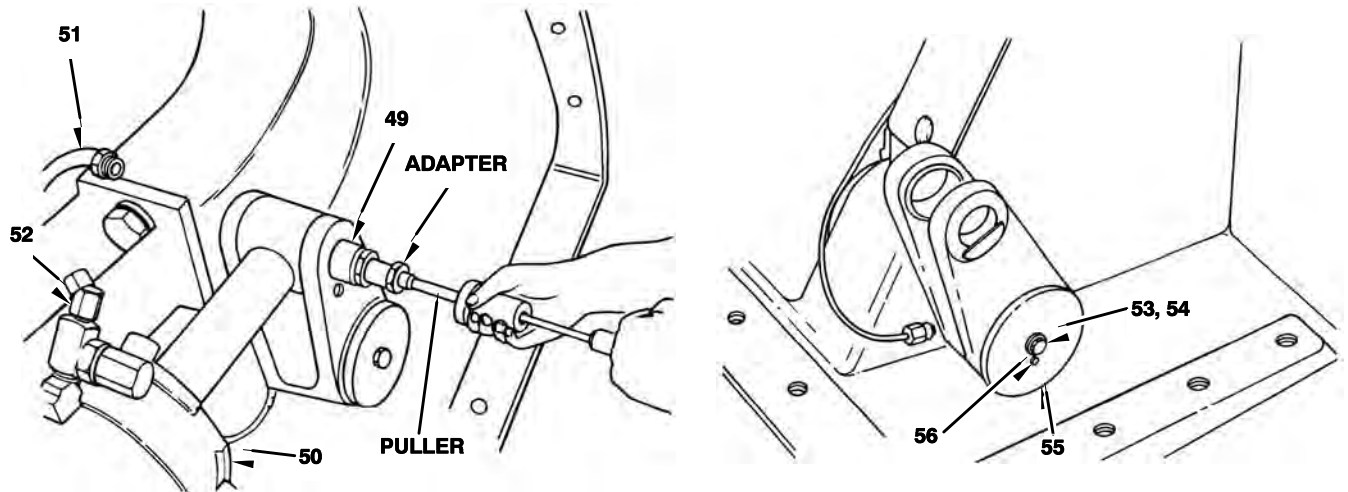
2. Remove two screws (25), lockwashers (26), spade stop block (27), and shim (28). Discard lockwashers.
3. Using impact wrench, remove 12 locknuts (29), bolts (30), and spade (31) from spade arms (32). Discard locknuts.



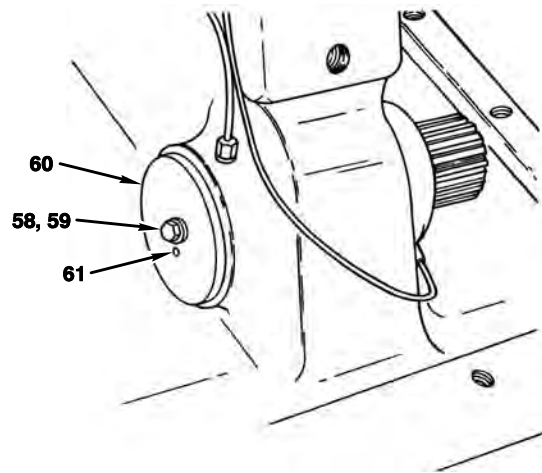
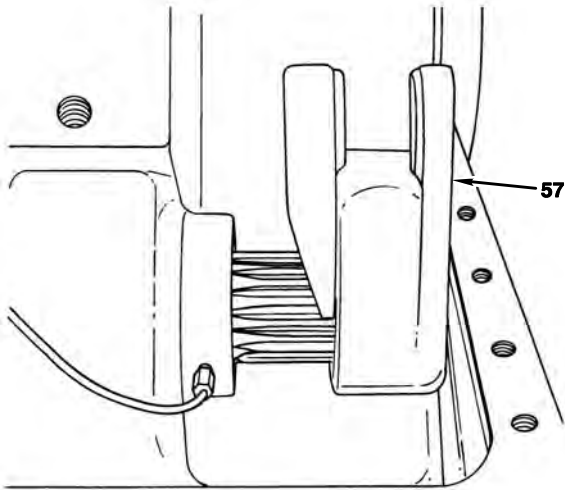
4. Remove 16 screws (33), lockwashers (34), and cable roller assembly (35) from cover assembly (36). Discard lockwashers.
5. Remove eight screws (37), lockwashers (38), two guides (39), eight screws (40), lockwashers (41), two retainers (42), covers (43), half bushings (44), and cable guide plate (45) from cover assembly (36). Discard lockwashers.
6. Remove eight screws (46), lockwashers (47), and spring latch housing assembly (48). Discard lockwashers.



7. Using adapter and puller, remove pivot pin (49) from end of spade actuating cylinder (50).
8. Disconnect hoses (51) and remove fittings (52) and spade actuating cylinder (50).
9. Remove screw (53), lockwasher (54), outer plate (55), and pin (56). Discard lockwasher.



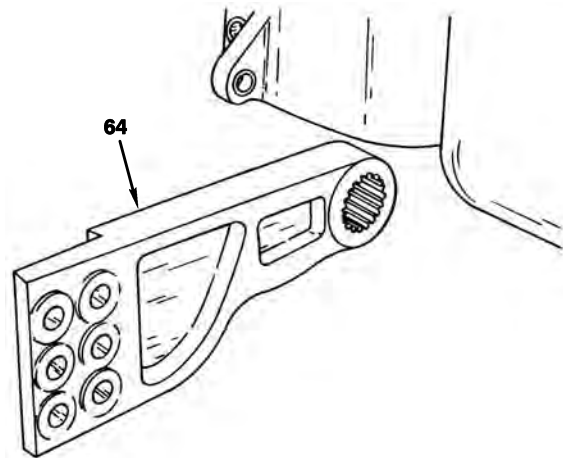
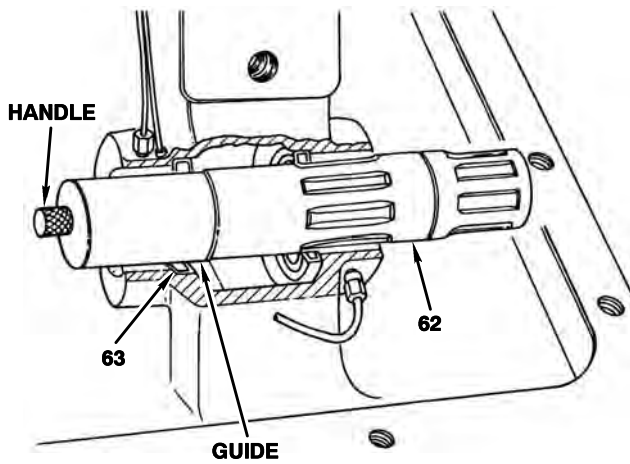
10. Remove link arm (57).
11. Remove screw (58), lockwasher (59), inner plate (60), and pin (61). Discard lockwasher.



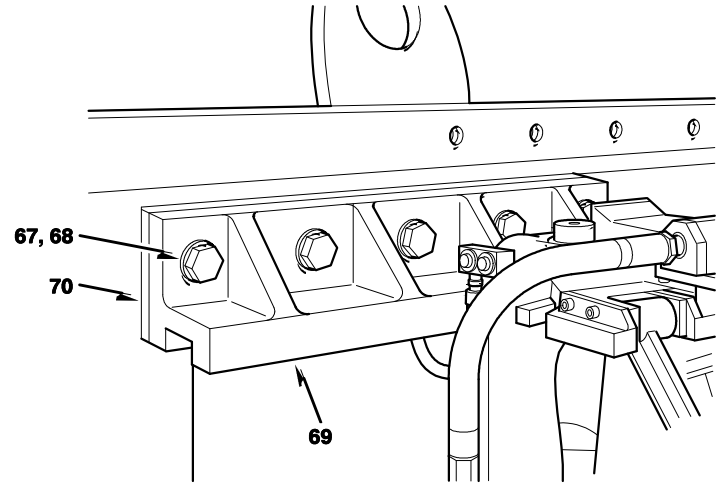
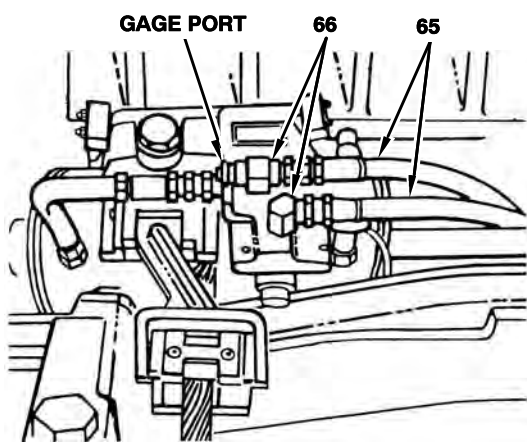
**NOTE**

Support spade arm (64) while removing shaft (62).

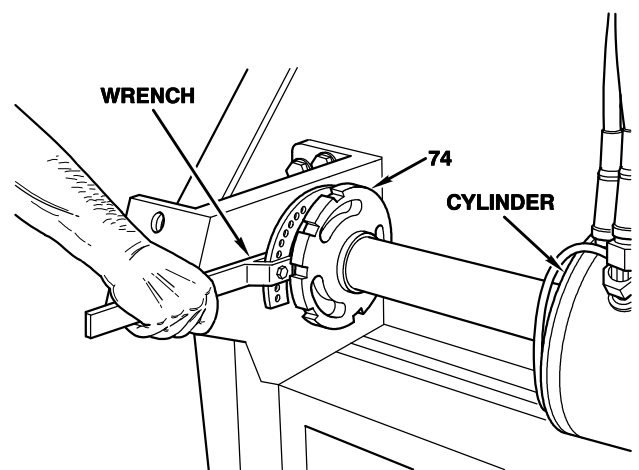
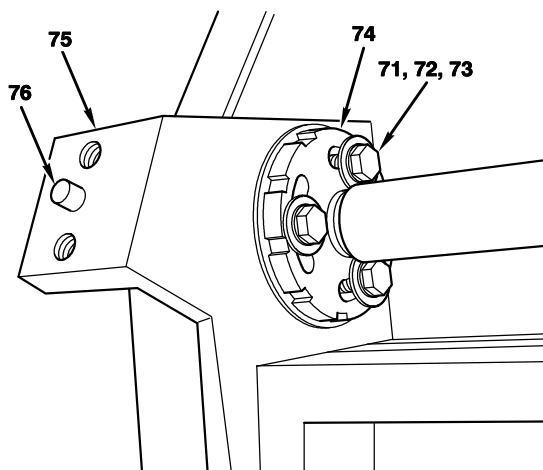
12. Use handle and guide to remove shaft (62) and remove two seals (63). Discard seals.
13. Remove spade arm (64).



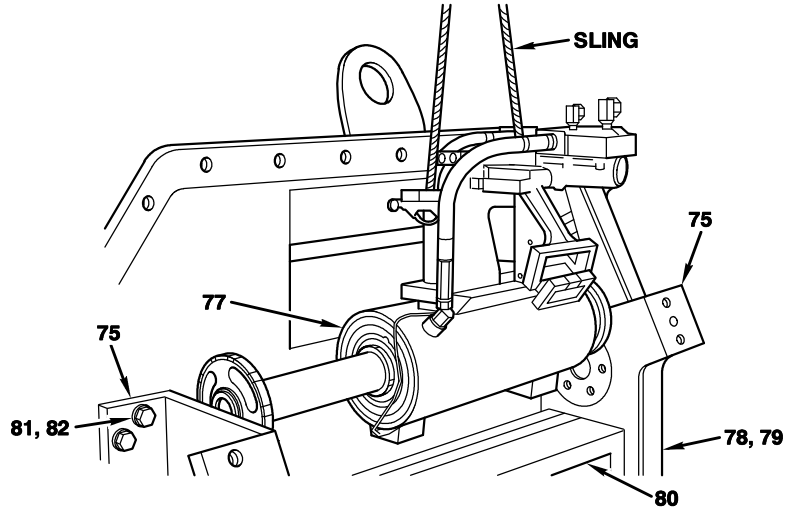
14. Repeat steps 7 thru 12 for other side.
15. Disconnect hydraulic lines (65) from fittings (66).
16. Remove five screws (67), lockwashers (68), level winder assembly top guide (69), and shim (70). Discard lockwashers.



17. Remove three screws (71), lockwashers (72), washers (73) securing flange nut (74) to support assembly (75). Using wrench, remove flange nut from support assembly. Discard lockwashers.
18. Remove pin (76).



19. Repeat steps 16 and 17 for other side.
20. Using sling, remove cable level winder assembly (77).
21. Remove four screws (hidden) (78), two keys (hidden) (79), and bottom level winder guide (80).
22. Remove eight screws (81), lockwashers (82), and two support assemblies (75). Discard lockwashers.



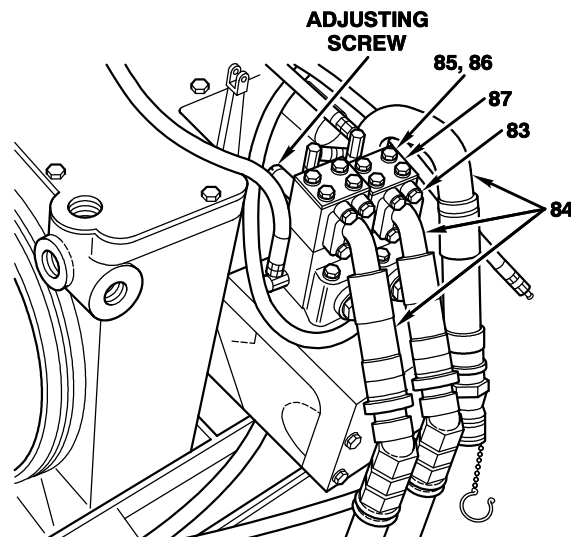
### NOTE

For removing the spade lock pin, main winch frame, and lubrication lines, refer to the illustrations at the beginning of this section.

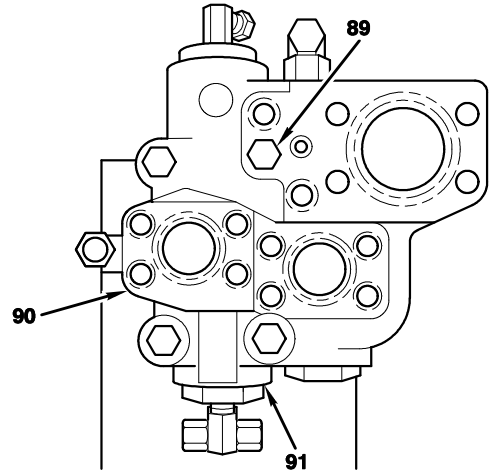
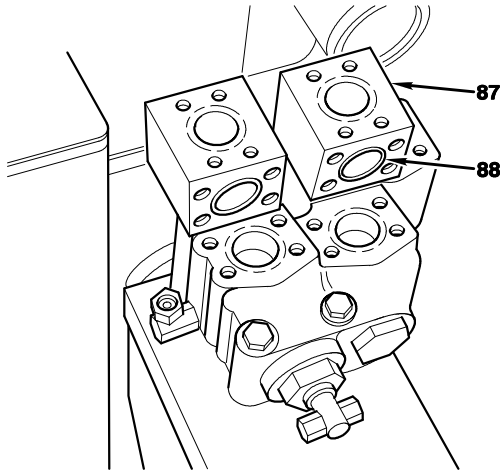
### NOTE

Steps 23 thru 29 pertain to disassembly of the main winch into subassemblies.

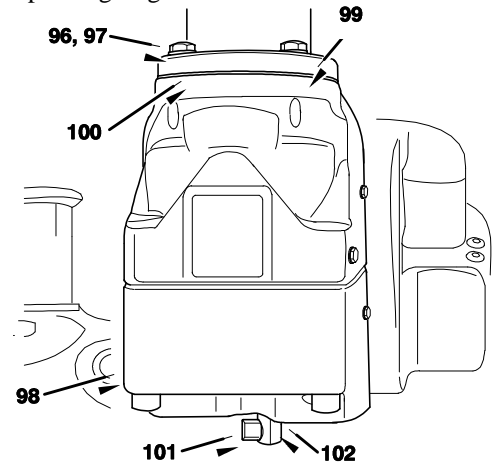
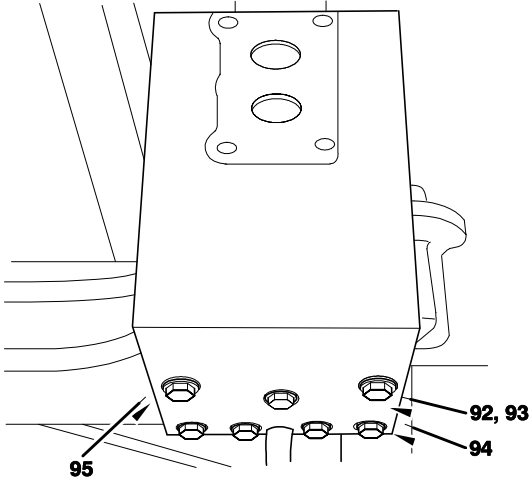
23. Remove 12 screws (83) and disconnect hose assemblies (84).
24. Remove eight screws (85), lockwashers (86), and two adapter blocks (87). Discard lockwashers.



25. Remove two packings (88) from adapter blocks (87). Discard packing rings.
26. Remove four screws (89), combination control valve (90), and two packings (hidden) (91). Discard packing rings.



27. Remove seven screws (92), lockwashers (93), manifold (94), and two packings (hidden) (95). Discard lockwashers and packing rings.
28. Remove four screws (96), lockwashers (97), motor (98), gasket (99), and pilot ring (hidden) (100). Discard lockwashers and gasket.
29. Remove adapter union (101) and packing (102) from motor (98). Discard packing ring.



**NOTE**

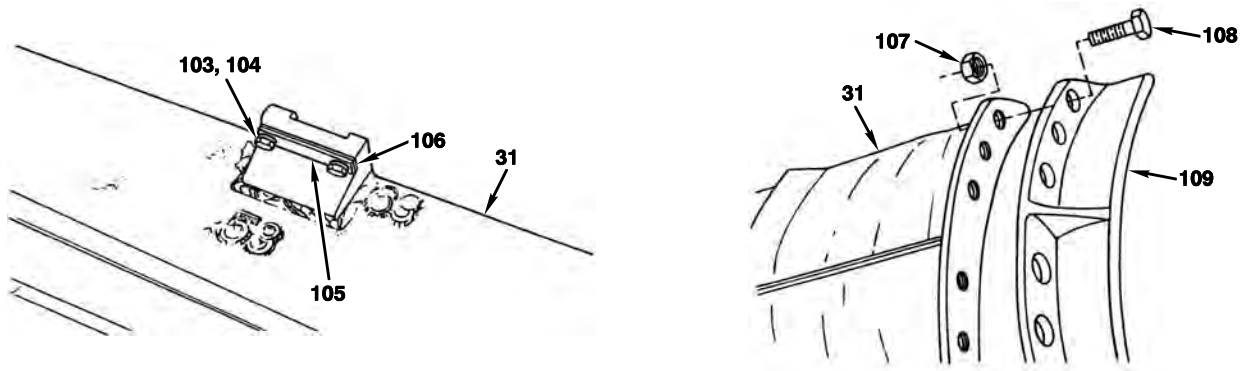
Steps 30 and 31 pertain to disassembly of the spade (31).

30. Remove two screws (103), lockwashers (104), striker plate (105), and shim (106) from spade (31). Discard lockwashers.

**NOTE**

The left and right spade extensions (109) are removed in the same manner, but are not interchangeable.

31. Remove 10 self-locking nuts (107), screws (108), and two spade extensions (109) from spade (31). Discard self-locking nuts.

**Cleaning**

1. Scrape accumulated mud and dirt from the spade. Wash with hose and water or steam-clean. Scrape off chipped and peeled paint.

**Inspection-Acceptance and Rejection Criteria**

1. Inspect spade for nicks, dents, burrs, and distortion. Remove nicks and burrs with a rough file. Straighten distorted edges and hammer out dents.
2. Check welds for cracks and defects. Repair damaged welded joints by welding. Paint all areas where bare metal has been exposed due to filing, hammering, or peeling.

**Assembly****NOTE**

Steps 1 and 2 pertain to assembly of the spade (31).

**NOTE**

The left and right spade extensions (109) are installed in the same manner, but are not interchangeable.

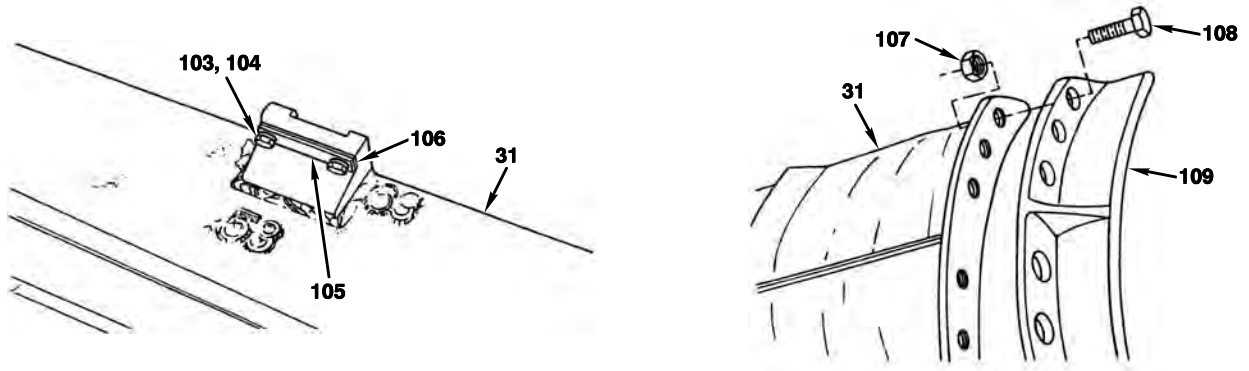


1. Install two spade extensions (109), 10 screws (108), and self-locking nuts (107) to spade (31).

**NOTE**

Shim striker plate (105) as required during spade (31) installation.

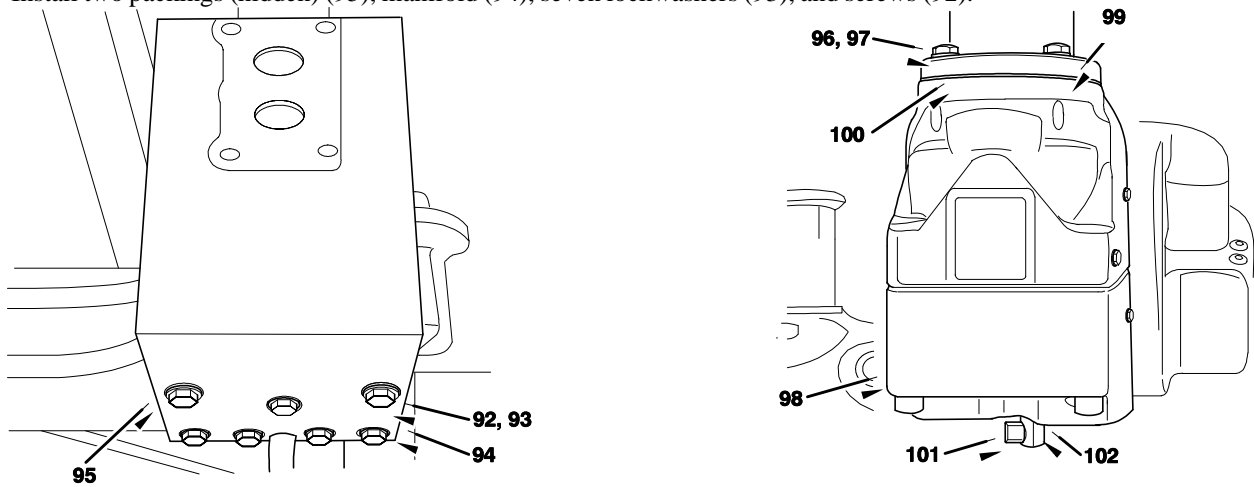
2. Install shim (106), striker plate (105), two lockwashers (104), and screws (103) to spade (31).



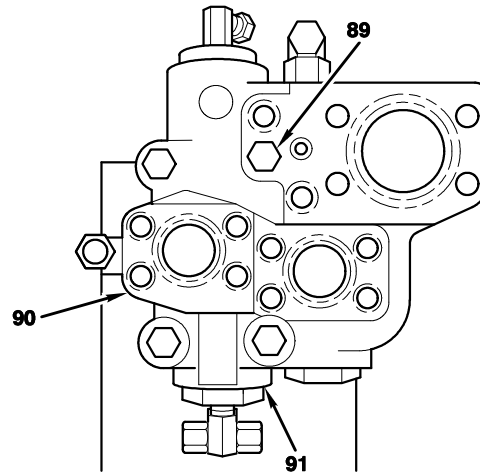
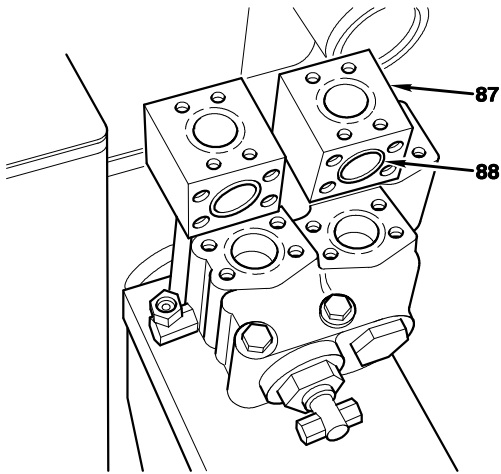
**NOTE**

Steps 3 thru 9 pertain to assembly of the main winch from subassemblies.

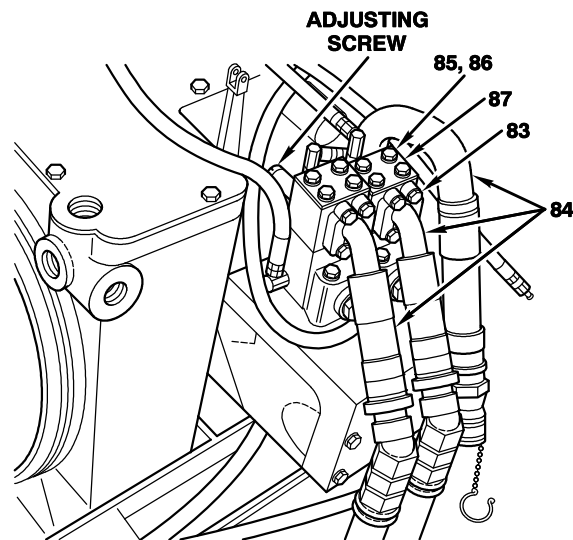
3. Install packing (102) and adapter union (101) to motor (98).
4. Install pilot ring (hidden) (100), gasket (99), motor (98), four lockwashers (97), and screws (96).
5. Install two packings (hidden) (95), manifold (94), seven lockwashers (93), and screws (92).



6. Install two packings (hidden) (91), combination control valve (90), and four screws (89). If combination control valve was manufactured by NY Air Brake Co., torque screws to 45 lb-ft (61 N•m).
7. Install two packings (88) to adapter blocks (87).



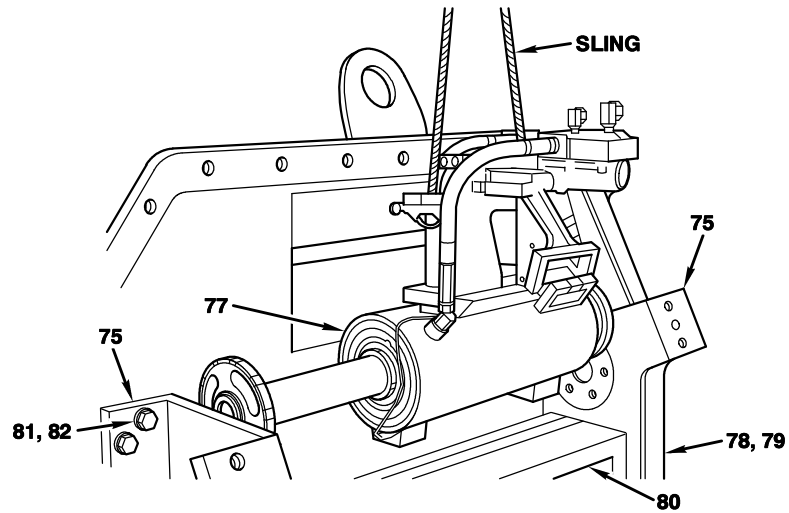
8. Install two adapter blocks (87), eight lockwashers (86), and screws (85).
9. Connect hose assemblies (84) and install 12 screws (83).



**NOTE**

For installing the spade lock pin, main winch frame, and lubrication lines, refer to the illustrations at the beginning of this section.

10. Install two support assemblies (75), eight lockwashers (82), and screws (81).
11. Install bottom level winder guide (80), two keys (hidden) (79), and four screws (hidden) (78).
12. Using sling, install cable level winder assembly (77).

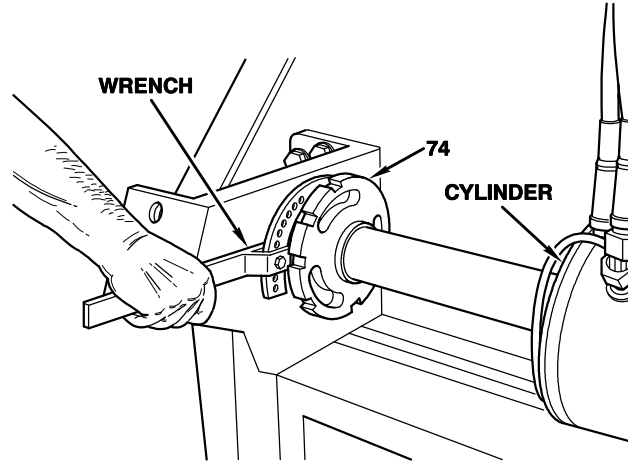
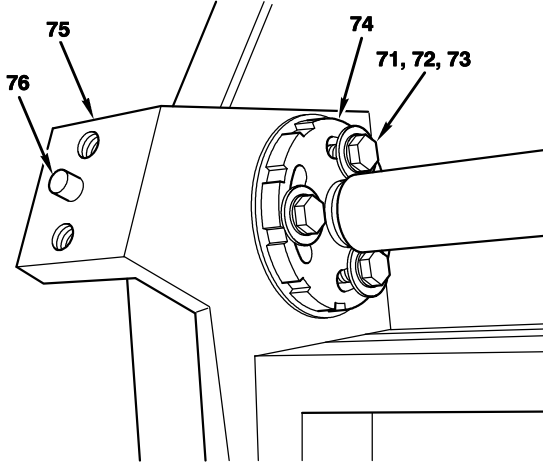


13. Install pin (76).

**NOTE**

Cylinder of cable level winder assembly must be centered on piston when securing flange nuts (74).

14. Using wrench, secure flange nut (74) to support assembly (75) using three washers (73), lockwashers (72), and screws (71).

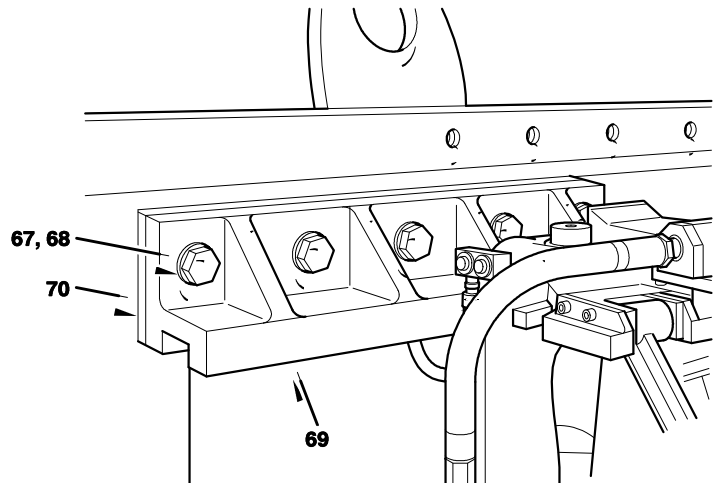
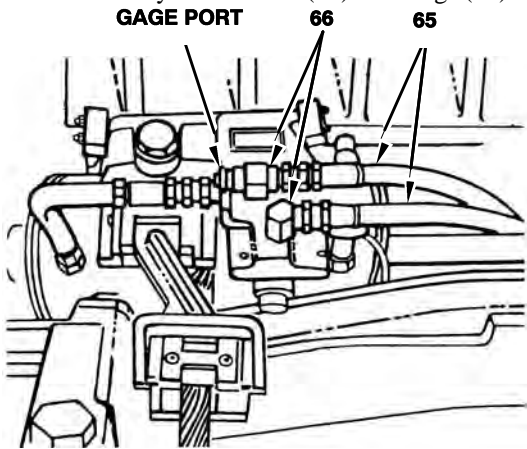


15. Repeat steps 13 and 14 for other side.

**NOTE**

Shim level winder assembly top guide (69) as required to prevent binding of cable level winder assembly (71).

16. Install shim (70), level winder assembly top guide (69), five lockwashers (68), and screws (67).
17. Connect hydraulic lines (65) to fittings (66).

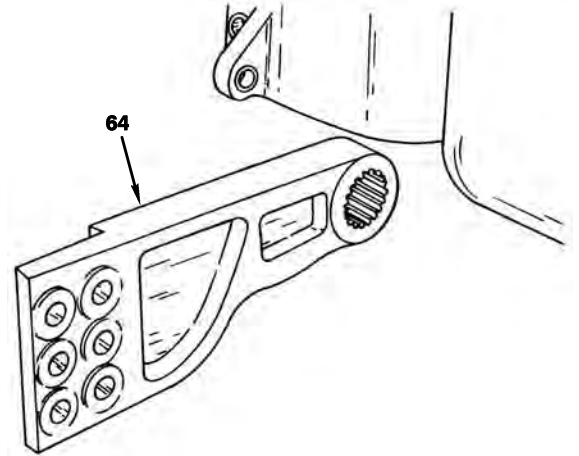
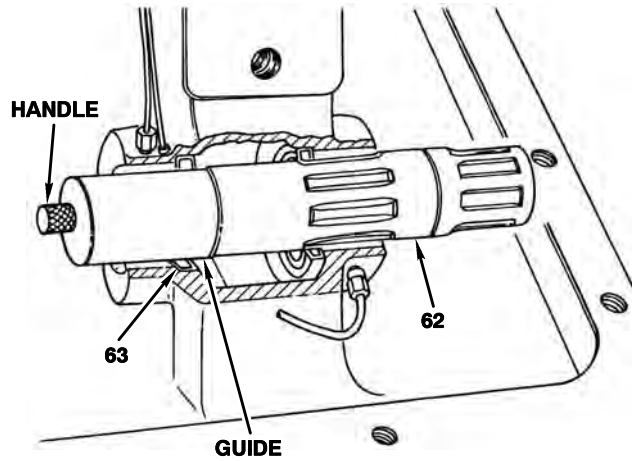


18. Install spade arm (64).

**NOTE**

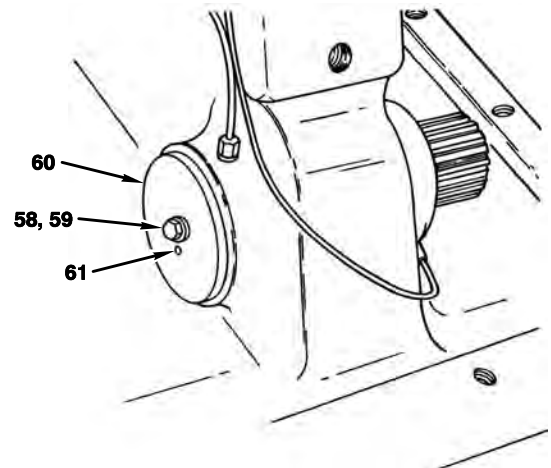
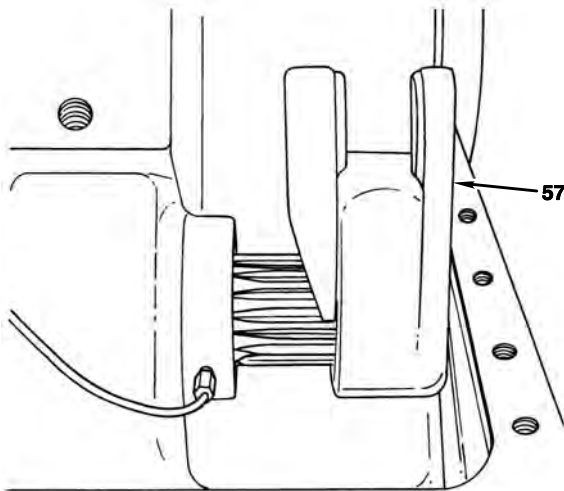
Support spade arm (64) while installing shaft (62).

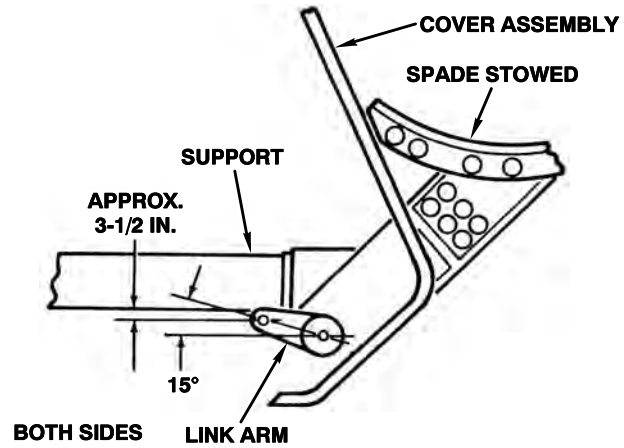
19. Install two seals (63) and using handle and guide, install shaft (62).



20. Install pin (61), inner plate (60), lockwasher (59), and screw (58).

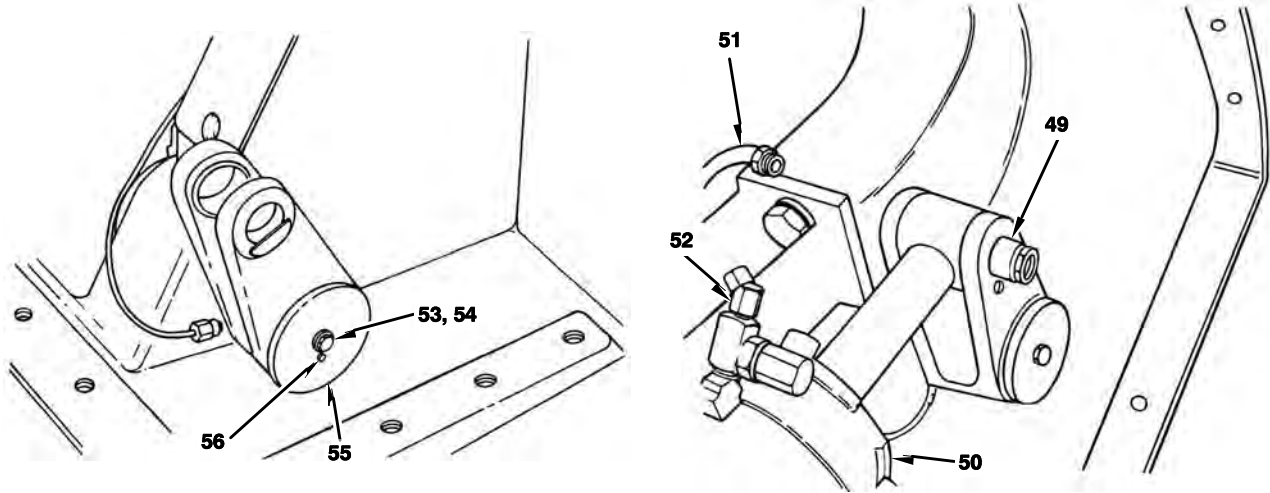
21. Install link arm (57).



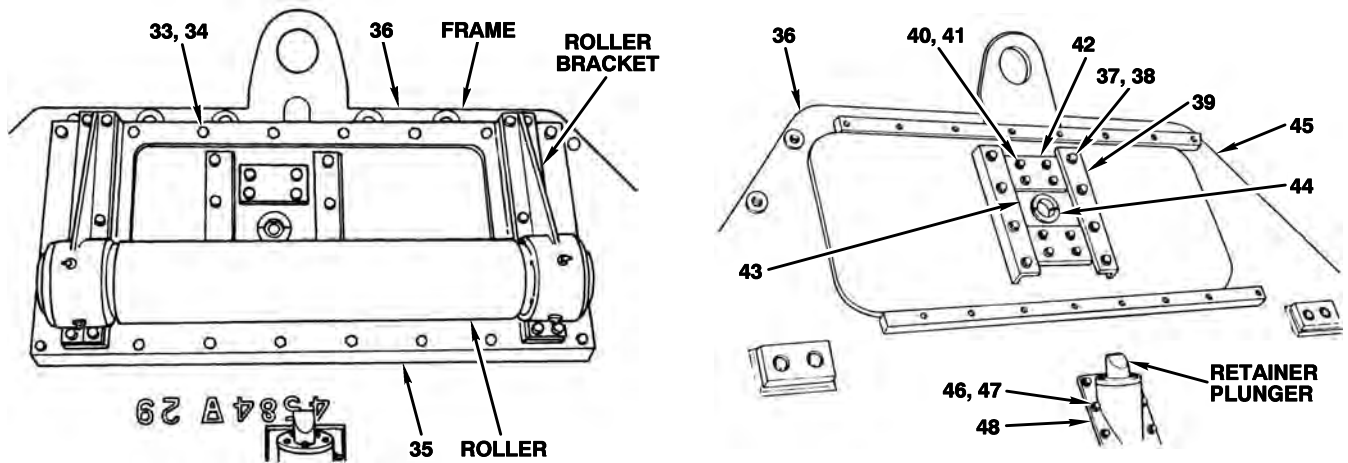
**NOTE**

The link arm is indexed correctly (refer to illustration above) on the shaft when the spade is in the stowed position and the hole for the pivot pin for each spade cylinder is 3-1/2 in. (8.89 cm) below the bottom of the winch support.

22. Install pin (56), outer plate (55), lockwasher (54), and screw (53).
23. Install spade actuating cylinder (50) and fittings (52) and connect hoses (51).
24. Using wood block and hammer, install pivot pin (49) to end of spade actuating cylinder (50).



25. Repeat steps 18 thru 24 for other side.
26. Install spring latch housing assembly (48), eight lockwashers (47), and screws (46).
27. Install cable guide plate (45), two half bushings (44), covers (43), retainers (42), eight lockwashers (41), screws (40), two guides (39), eight lockwashers (38), and screws (37) to cover assembly (36).
28. Install cable roller assembly (35), 16 lockwashers (34), and screws (33) to cover assembly (36).

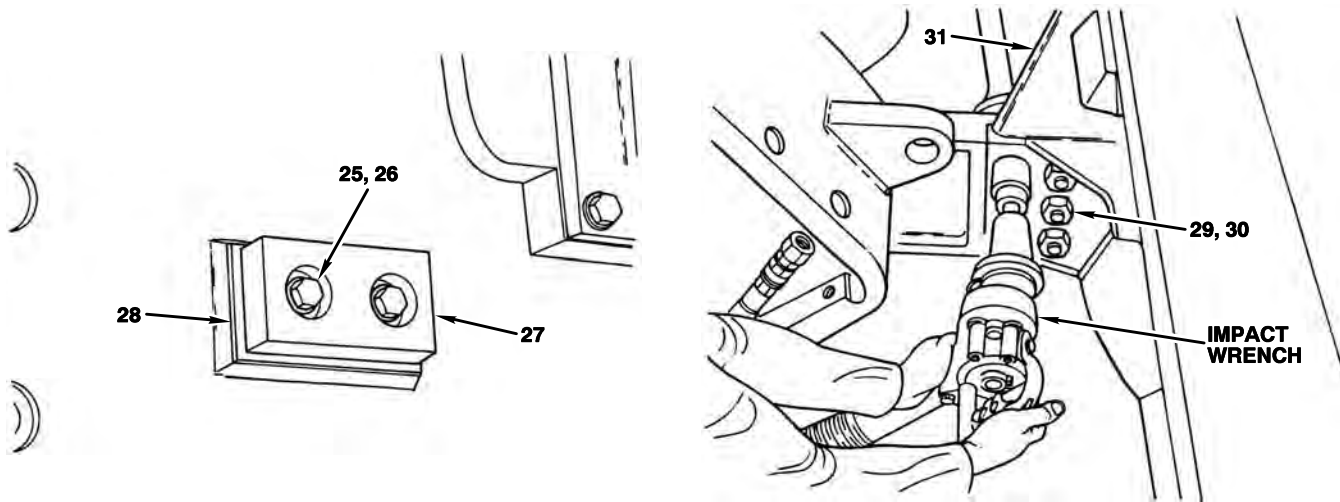
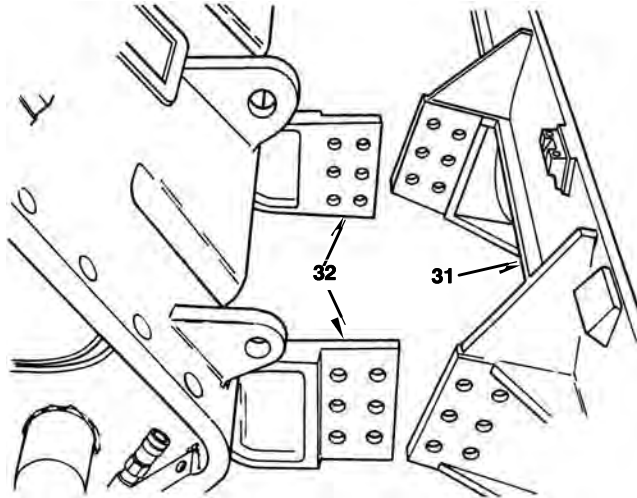


29. Position spade (31) to spade arms (32) and using impact wrench, install 12 bolts (30) and locknuts (29).

**NOTE**

Shim spade stop block (27) as required.

30. Install shim (28), spade stop block (27), two lockwashers (26), and screws (25).



31. Lubricate winch in accordance with TM 9-2350-256-20.

**Installation**

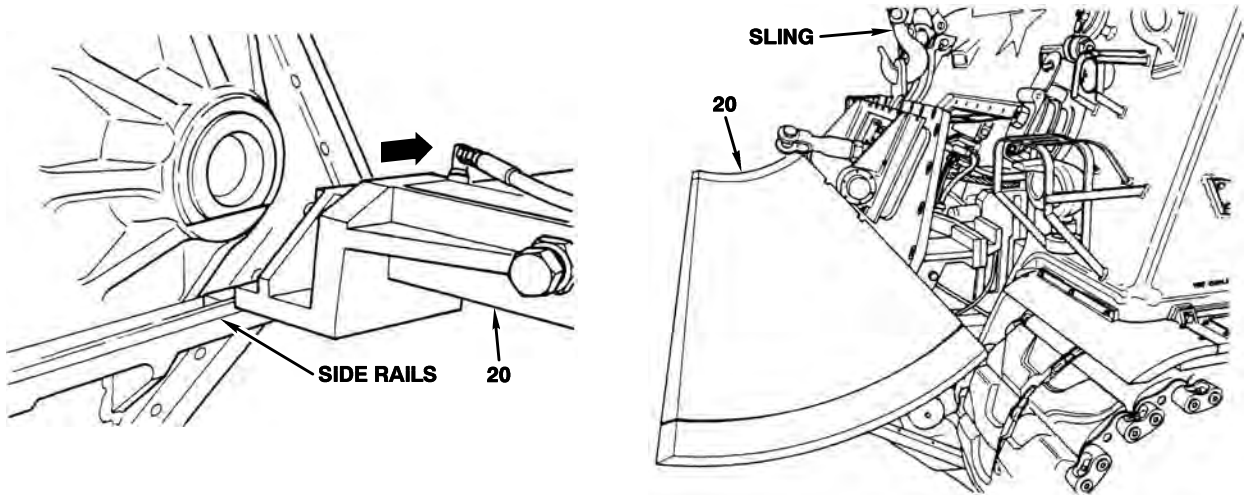
**NOTE**

Coat mating surfaces with sealant tape.

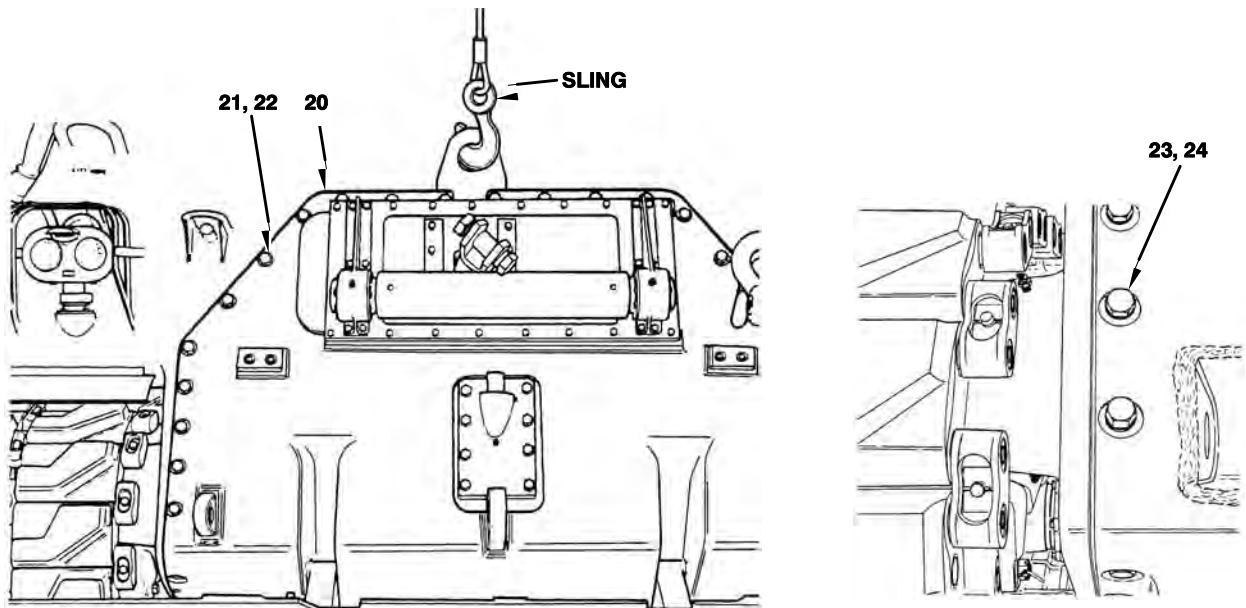
1. Attach lifting sling to two lifting eyes.



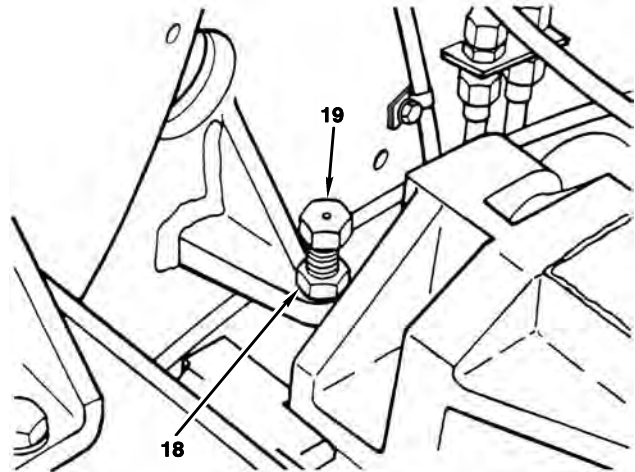
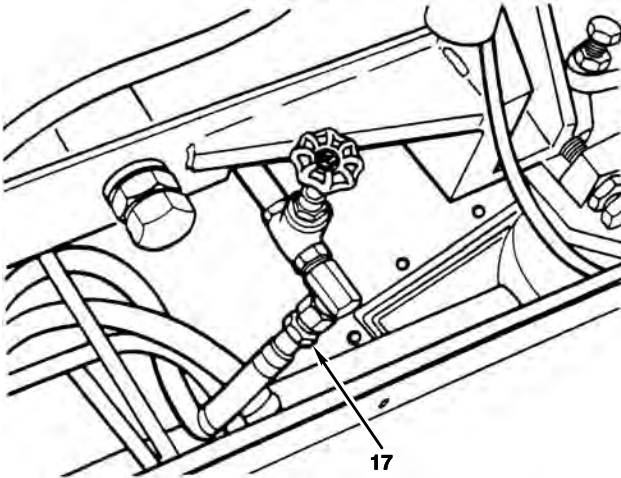
- Slide main winch and spade assembly (20) into position. Guide main winch and spade assembly along side rails, ensuring even clearance.



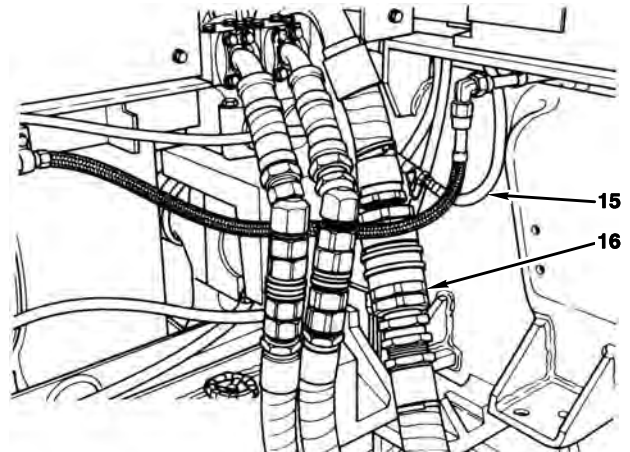
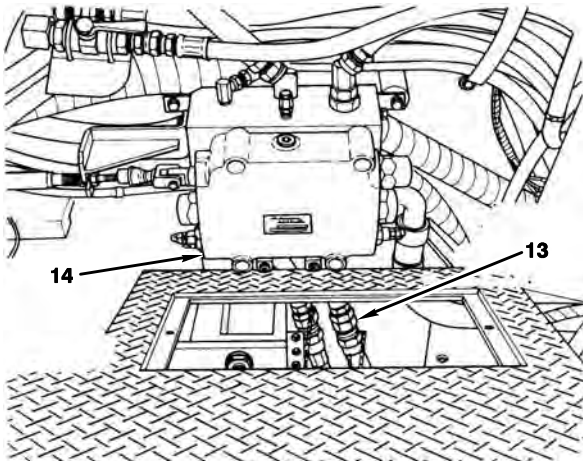
- Install 21 lockwashers (24) and screws (23). Apply sealer under each screw head and on all threads. Torque screws to 300–400 lb-ft (407–542 N•m).
- Install 23 lockwashers (22) and screws (21). Apply sealer under each screw head and on all threads. Torque screws to 300–340 lb-ft (407–461 N•m).



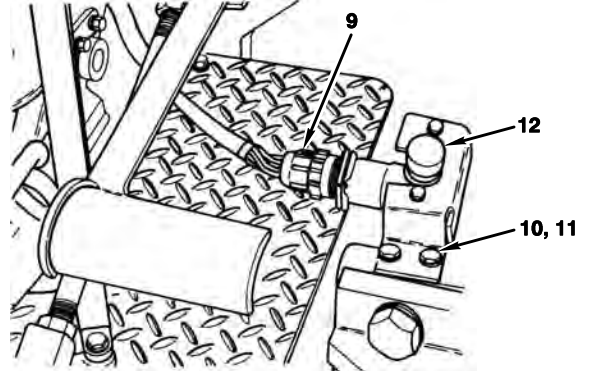
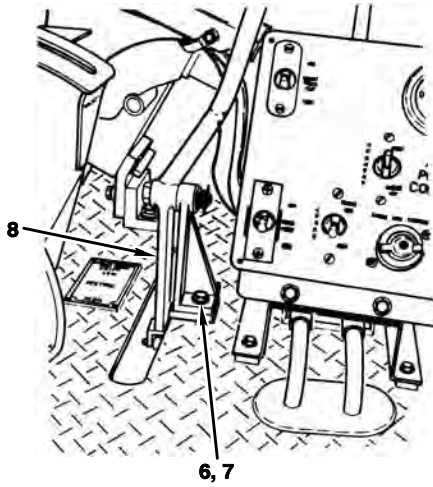
5. Tighten four lock screws (19) and locknuts (18) (two each side). After nosepiece is tight, torque screws to 100–125 lb-ft (136–169 N•m).
6. Connect drain line (17).



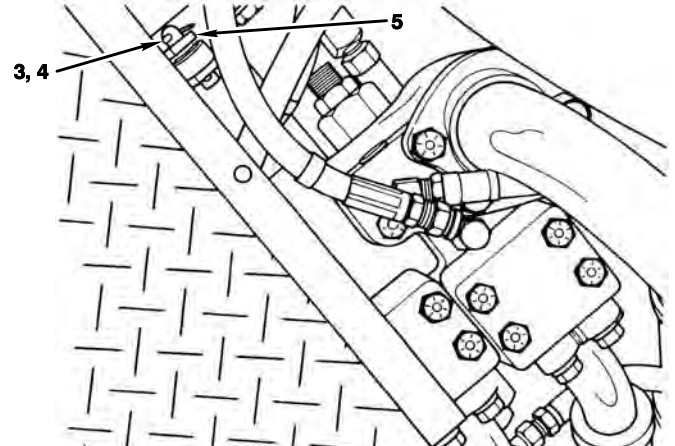
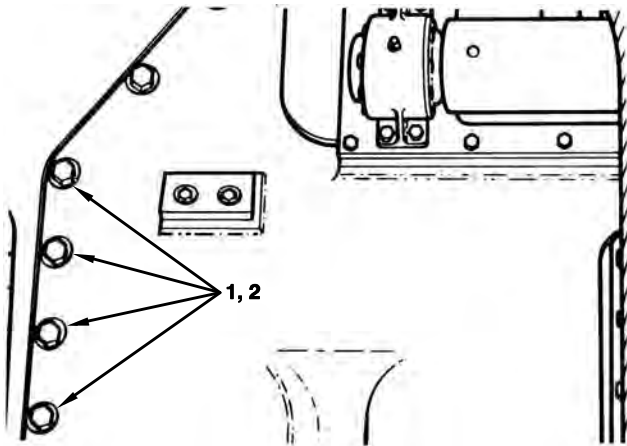
7. Connect three large hydraulic lines (16) and six small hydraulic lines (15).
8. Connect two hydraulic lines (13) to spade control valve (14).



9. Install dimmer switch with attached bracket (12), two lockwashers (11), and screws (10).
10. Connect electrical cable (9).
11. Install winch shift lever with attached shift rod (8), two lockwashers (7), and screws (6).



12. Connect winch shift rod (5) and install straight pin (4) and cotter pin (3).
13. Lower spade and install eight lockwashers (2) and screws (1) (four each side of front plate).



## Adjustment

### WARNING

The main winch combination control valve must be adjusted by the following ADJUSTMENT procedures in this section and TESTING procedures in the next section so that the main winch will have a capacity as specified in the DESCRIPTION above.

### WARNING

Test components (pressure gages, hoses, and fitting) must be capable of withstanding a working pressure of 1950–2050 psi (13,445–14,135 kPa).

### NOTE

VEHICLE PREPARATION—Perform steps 1 thru 4 for vehicle preparation.

1. Install pressure gage in level winder gage port (110).

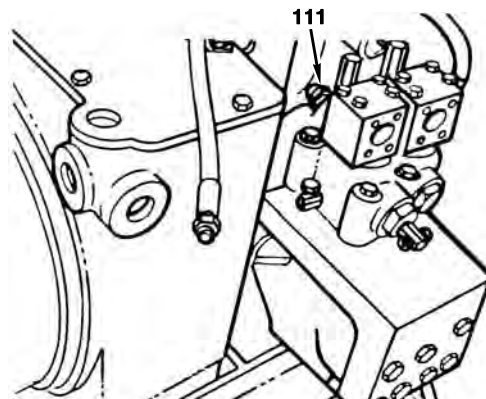
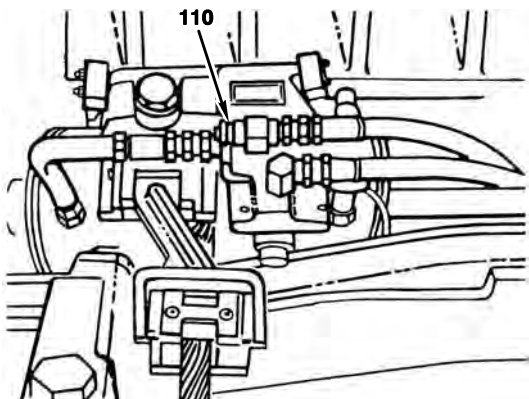
### NOTE

Do not adjust brake if anchoring cable.

2. Place load on winch. Use load cell if available and anchor.

If a load cell is unavailable, attach winch cable to an anchoring device or adjust winch brake full tight. Refer to WP 0056 00 for brake adjustment procedure.

3. If using anchor or winch brake, use adjusting screw (111) on main winch combination control valve to reduce pressure as far as possible. Turning in counterclockwise direction will decrease pressure.



4. Set engine speed at 1600–1800 rpm.

### NOTE

MAIN WINCH COMBINATION CONTROL VALVE ADJUSTMENT—Perform steps 5 thru 10 to adjust the main winch combination control valve to achieve winching requirements.

### NOTE

This adjustment must be performed with the hydraulic reservoir oil temperature at 100°F–130°F (38°C–54°C).

5. If using load cell, adjust relief pressure to achieve desired pull by turning adjusting screw (111) on main winch combination control valve. Turning in clockwise direction will increase pressure:
  - 88,000–92,000 lb (39,917–41,731 kg) pull with cable off nose roller.
  - 83,000–87,000 lb (37,649–39,463 kg) pull with cable over nose roller.
6. If using load cell, activate winch to INHAUL in low gear. If using anchor, activate winch to INHAUL. If using winch brake, activate winch to pay out.
7. If using anchor or winch brake, adjust relief pressure to original value recorded in Vehicle Log Book.
8. Verify setting with locking nut in locked position, and record new setting in Vehicle Log Book.
9. Disconnect pressure gage. Disconnect load cell or anchor, or readjust winch brake as necessary.
10. Verify pay out and inhaul.

### NOTE

If adjustment procedure was done using load cell, no further load test is required. If adjustment was made using anchor or brakes, proceed with the load test that follows.

## Testing

### NOTE

LOAD TEST—Perform steps 1 thru 3 for the load test of the main winch.

### NOTE

The following load test must be performed with the hydraulic reservoir oil temperature at 100°F–130°F (38°C–54°C).

1. Verify winching capability by attaching winch cable to a vehicle with the towed vehicle transmission in neutral.
2. Winch vehicle must be at least 10 ft (3.05 m).
3. If vehicle fails to pass the load test, repeat the above ADJUSTMENT and TESTING procedures.

## END OF WORK PACKAGE



**INTERMEDIATE MAINTENANCE**  
**RECOVERY VEHICLE, FULL TRACKED: MEDIUM, M88A1**  
**NSN 2350-00-122-6826, EIC AQA**

**MAIN WINCH MOTOR REPLACEMENT  
REMOVAL, INSTALLATION**

**INITIAL SETUP:****Tools and Special Tools**

Tool kit, general mechanic's (item 34, WP 0086 00)

**Materials/Parts**

Gasket (item 7, WP 0087 00)  
Lockwashers (8) (item 162, WP 0087 00)  
Lockwashers (11) (item 163, WP 0087 00)  
Packings (2) (item 132, WP 0087 00)  
Packings (2) (item 133, WP 0087 00)  
Packings (2) (item 134, WP 0087 00)

**Materials/Parts (cont.)**

Packing (item 137, WP 0087 00)  
Screws (7) (item 70, WP 0087 00)  
Screws (4) (item 71, WP 0087 00)  
Screws (3) (item 76, WP 0087 00)  
Screws (8) (item 216, WP 0087 00)  
Screw (item 219, WP 0087 00)

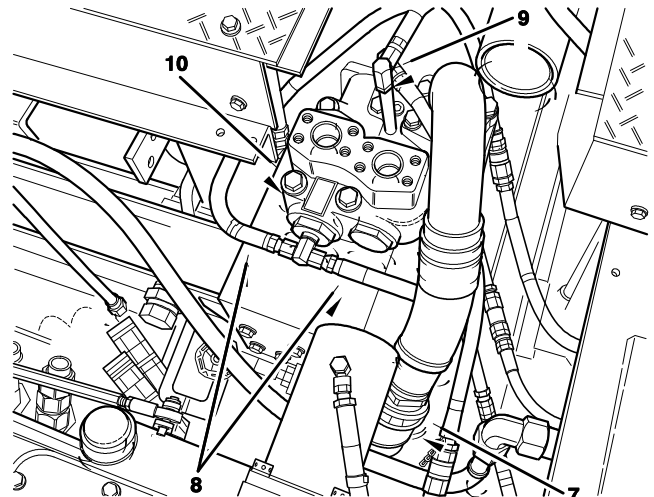
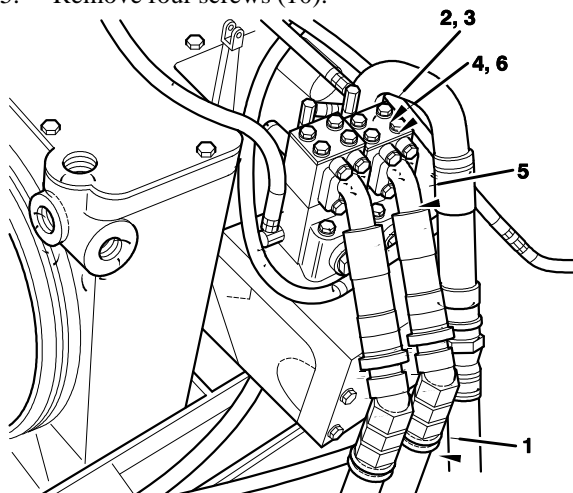
**Equipment Condition**

Subfloor plates 2, 3, and 23 removed (TM 9-2350-256-20)

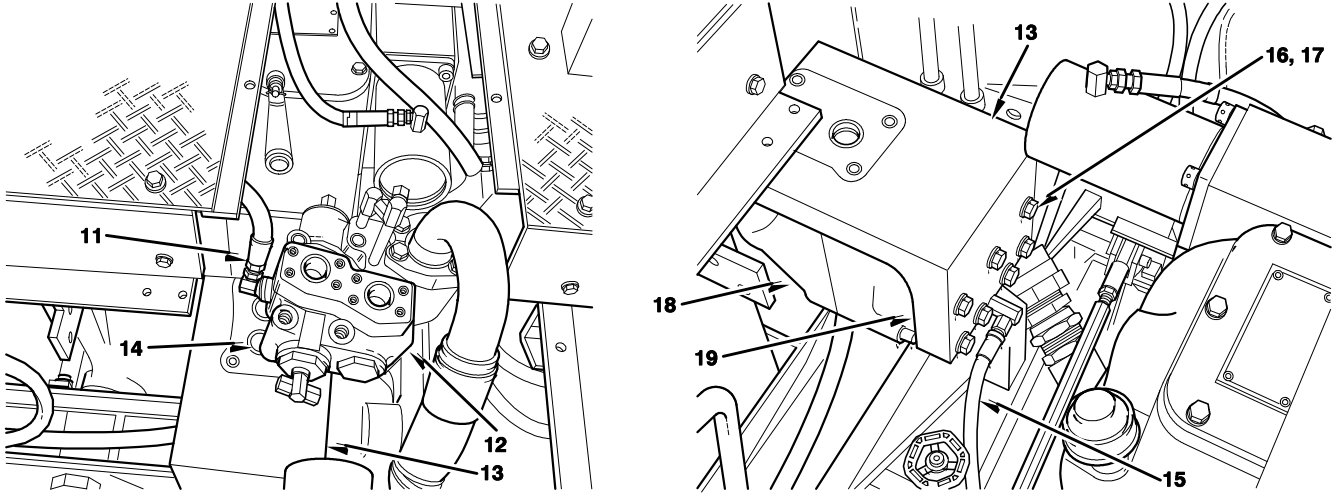
**Removal****NOTE**

Use Hydraulic Motor Kit 11672160 on retrofitted vehicles when replacing a motor which is not a Dennison Model No. M4E-185-3N00-B101-M40712.

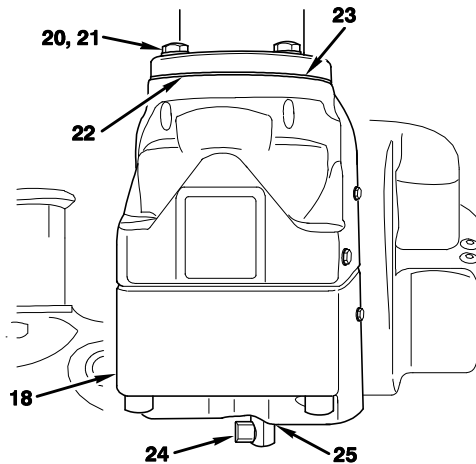
1. Disconnect two hydraulic lines (1).
2. Remove eight screws (2), lockwashers (3), and two adapter blocks (4) with hydraulic lines (5) attached. Discard lockwashers.
3. Remove two recessed packings (hidden) (6) and discard.
4. Disconnect hydraulic line (7), two hydraulic lines (8), and three hydraulic lines (9).
5. Remove four screws (10).



6. Disconnect hydraulic line (11) and remove combination valve (12) with large hose attached from manifold (13).
7. Remove and discard two packings (recessed in valve) (14).
8. Disconnect drain line (15).
9. Remove seven screws (16), lockwashers (17), and manifold (13) from main winch motor (18). Discard lockwashers.
10. Remove and discard two packings (hidden) (19).



11. Remove four screws (20), lockwashers (21), main winch motor (18), gasket (22), and pilot ring (hidden) (23). Discard lockwashers and gasket.
12. Remove adapter union (24) and packing (25) from main winch motor (18). Discard packing ring.

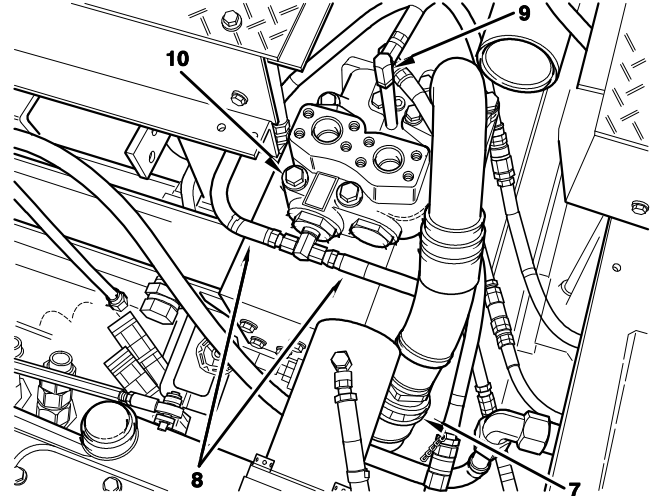
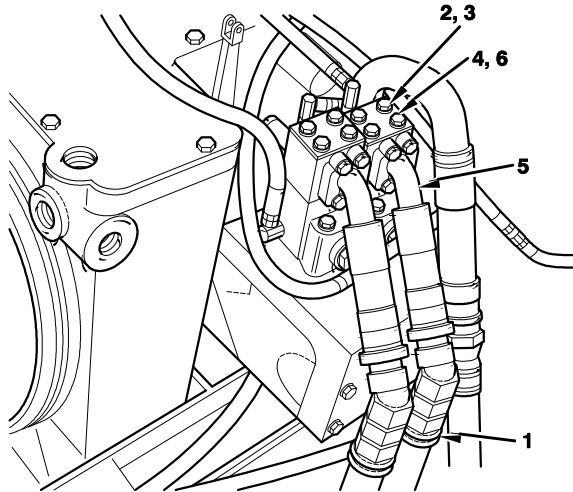


**Installation**

1. Install packing (25) and adapter union (24) to main winch motor (18).
2. Install pilot ring (hidden) (23), gasket (22), main winch motor (18), four lockwashers (21), and screws (20).
3. Install two packings (hidden) (19).
4. Install manifold (13), seven lockwashers (17), and screws (16) to main winch motor (18).
5. Connect drain line (15).
6. Install two packings (recessed in valve) (14).
7. Install combination valve (12) with large hose attached to manifold (13) and connect hydraulic line (11).
8. Install four screws (10).



9. Connect three hydraulic lines (9), two hydraulic lines (8), and hydraulic line (7).
10. Install two recessed packings (hidden) (6).
11. Install two adapter blocks (4) with hydraulic lines (5) attached, eight lockwashers (3), and screws (2).
12. Connect two hydraulic lines (1).



**END OF WORK PACKAGE**



**INTERMEDIATE MAINTENANCE**  
**RECOVERY VEHICLE, FULL TRACKED: MEDIUM, M88A1**  
**NSN 2350-00-122-6826, EIC AQA**

**HOIST WINCH ASSEMBLY MAINTENANCE**  
**DESCRIPTION, REMOVAL, DISASSEMBLY, ASSEMBLY, INSTALLATION, ADJUSTMENT, TESTING**

**INITIAL SETUP:****Test Equipment**

Gage (item 9, WP 0086 00)

**Tools and Special Tools**

Lifting eyes (2) (item 22, WP 0086 00)  
 Sling (item 30, WP 0086 00)  
 Tool kit, general mechanic's (item 34, WP 0086 00)

**Materials/Parts**

Bolts (2) (item 59, WP 0087 00)  
 Bolt (item 75, WP 0087 00)  
 Gasket (item 7, WP 0087 00)  
 Lockwashers (10) (item 161, WP 0087 00)  
 Lockwashers (16) (item 162, WP 0087 00)  
 Lockwashers (17) (item 163, WP 0087 00)  
 Lockwashers (12) (item 166, WP 0087 00)  
 Lockwashers (2) (item 167, WP 0087 00)  
 Nuts (2) (item 202, WP 0087 00)  
 Nut, self-locking (item 110, WP 0087 00)  
 Packings (2) (item 132, WP 0087 00)  
 Packings (4) (item 133, WP 0087 00)  
 Packings (2) (item 134, WP 0087 00)  
 Pin, cotter (item 115, WP 0087 00)  
 Pin, straight (item 192, WP 0087 00)  
 Screws (2) (item 57, WP 0087 00)  
 Screws (6) (item 58, WP 0087 00)  
 Screws (7) (item 70, WP 0087 00)

**Materials/Parts (cont.)**

Screws (4) (item 71, WP 0087 00)  
 Screws (4) (item 74, WP 0087 00)  
 Screws (3) (item 76, WP 0087 00)  
 Screws (12) (item 80, WP 0087 00)  
 Screws (4) (item 96, WP 0087 00)  
 Screws (16) (item 103, WP 0087 00)  
 Screws (2) (item 205, WP 0087 00)  
 Screws (2) (item 219, WP 0087 00)  
 Screws (2) (item 222, WP 0087 00)

**Personnel Required**

Mechanics (3)

**References**

WP 0058 00  
 WP 0062 00

**Equipment Condition**

Hoist winch cable removed (TM 9-2350-256-20)  
 Cupola and cupola plate removed (TM 9-2350-256-20)  
 Commander's seat removed (TM 9-2350-256-20)  
 Hoist winch cable chute removed (TM 9-2350-256-20)  
 Cupola and cupola plate assembly, oddment trays, boxes, racks, or baskets removed, as required for clearance and to prevent damage (TM 9-2350-256-20)  
 Subfloor plates 3, 4, 11, 17, 18, 19, 20, 21, and 23 removed (TM 9-2350-256-20)

**DESCRIPTION**

The hoist winch assembly has a vertical lifting capacity of 30,000 lb (13,608 kg) full drum, and 50,000 lb (22,680 kg) bare drum, using a four-part line (3 to 5 wraps minimum of cable on a bare drum). The hoist winch assembly consists of a hydraulic motor, combination control valve, counterbalance valve, winch cable, brake cylinder, and the hoist winch. The hoist winch assembly is installed in the hull of the vehicle beneath the crew compartment.

**NOTE**

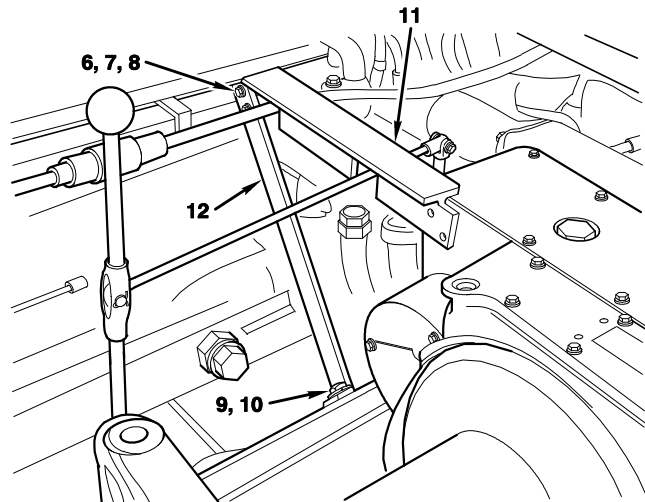
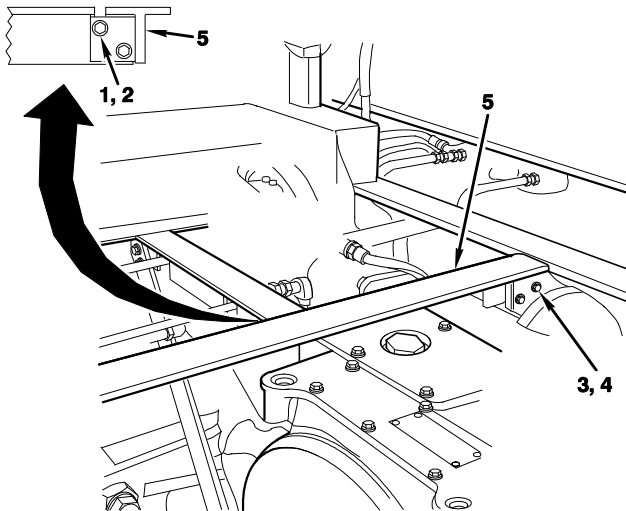
**LOAD TEST REQUIREMENT**—Load testing of hoist winch is mandatory, prior to use, under any of the following requirements: (1) When new. (2) Following any repairs, disassembly and assembly, adjustments, or parts replacement, of hoist winch. (3) When modifications are made that could affect the strength or lifting capabilities of the vehicle.

Load testing will be accomplished by support maintenance activities.

Refer to the TESTING section below for the detailed step-by-step procedure.

## Removal

1. Remove two screws (1), lockwashers (2), four screws (3), lockwashers (4), and cross support (5). Discard lockwashers.
2. Remove two nuts (6), lockwashers (7), bolts (8), screws (9), lockwashers (10), support bar (11), and support bar brace (12). Discard lockwashers.



3. Remove clamp and fire extinguisher tube (13) in accordance with TM 9-2350-256-20.
4. Remove cotter pin (14), pin (15), self-locking nut (16), bolt (17), and shift rod (18) and lever (19) together as a unit. Discard cotter pin and self-locking nut.

## WARNING

Keep drain valve (20) closed.

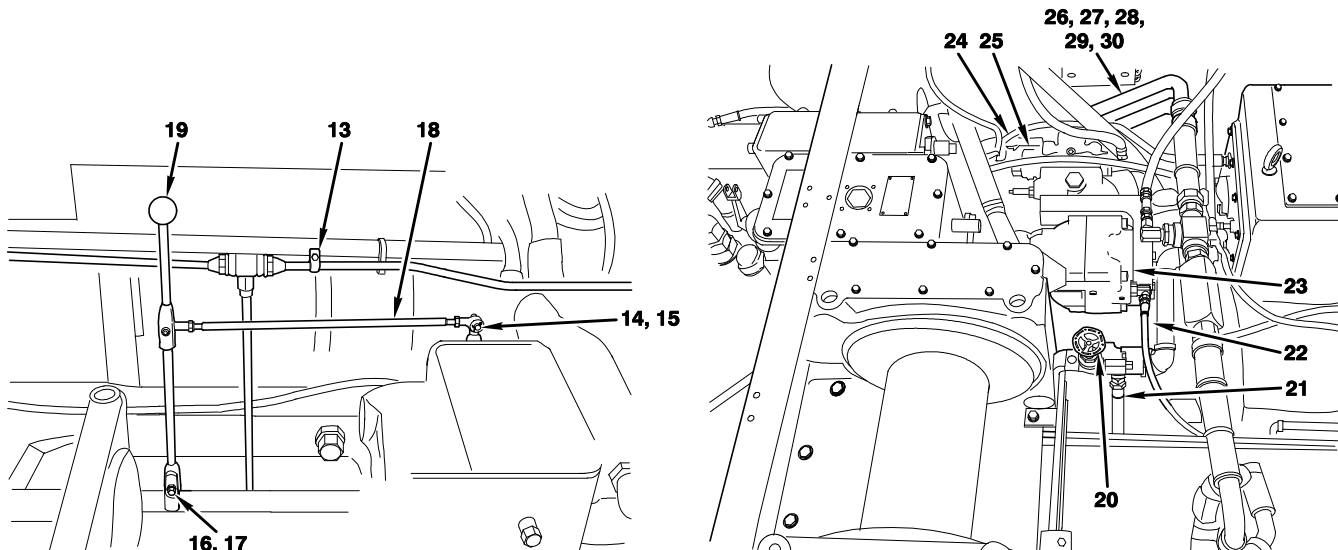
5. Disconnect drain line (21) from drain valve (20).
6. Disconnect hydraulic line (22) from motor (23).
7. Disconnect four hydraulic lines (24) from combination control valve (25).

## NOTE

The flange-type hydraulic hoses (29), attaching hardware (26, 27, and 28), and packings (30) are hidden between combination control valve (25) and vehicle wall.

8. Remove eight screws (26), lockwashers (27), four flanges (28), and disconnect two flange-type hydraulic hoses (29). Discard lockwashers.

9. Remove and discard two packings (hidden) (30).

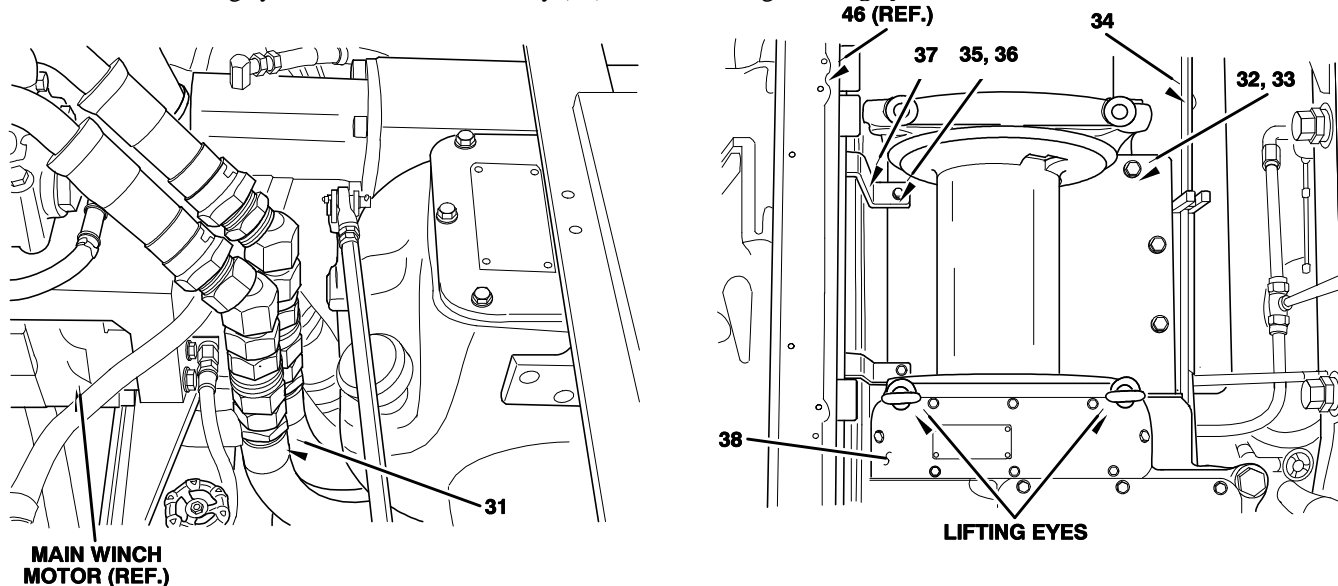


10. Disconnect two hydraulic lines (31).

11. Remove four screws (32) and lockwashers (33) from front support (34). Discard lockwashers.

12. Remove two screws (35) and lockwashers (36) from cable guard (37). Discard lockwashers.

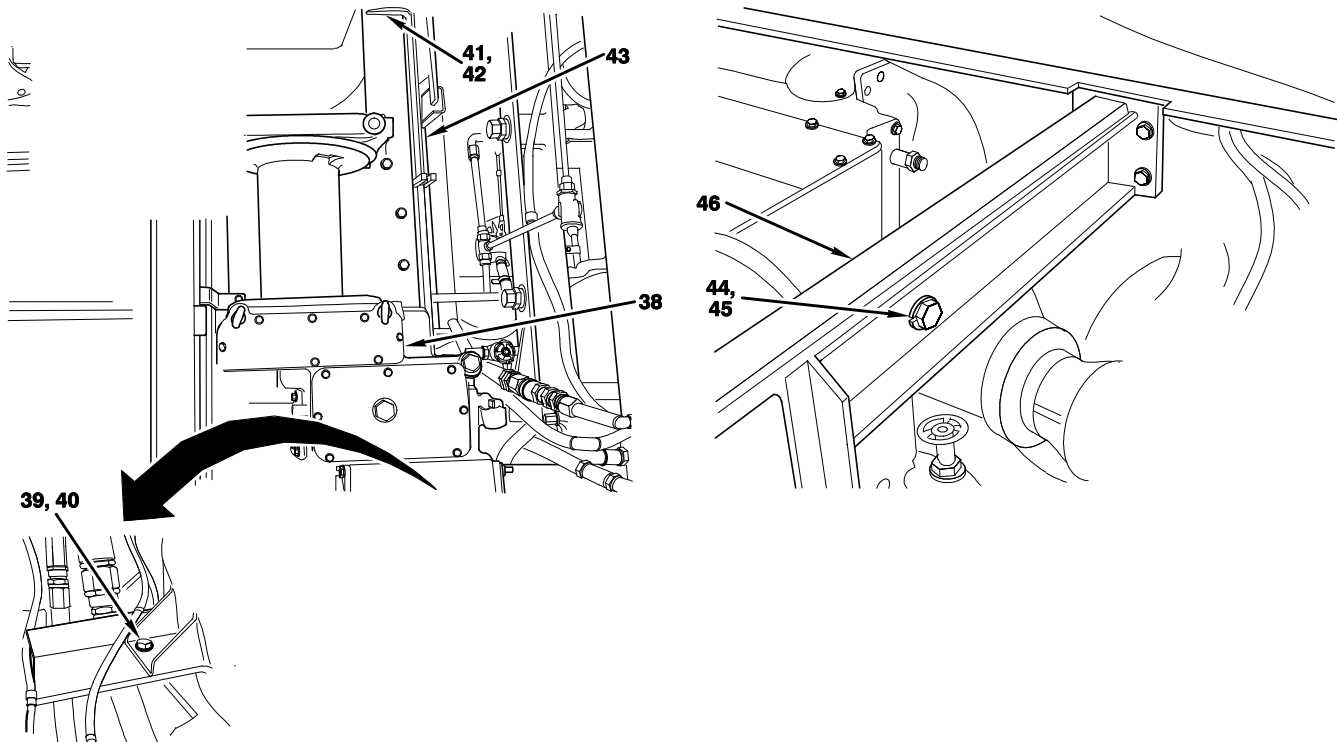
13. Install two lifting eyes to hoist winch assembly (38) and attach sling to lifting eyes.



**NOTE**

There are two methods of removing the hoist winch assembly (38) from this point: steps 14 thru 17 or steps 18 thru 23.

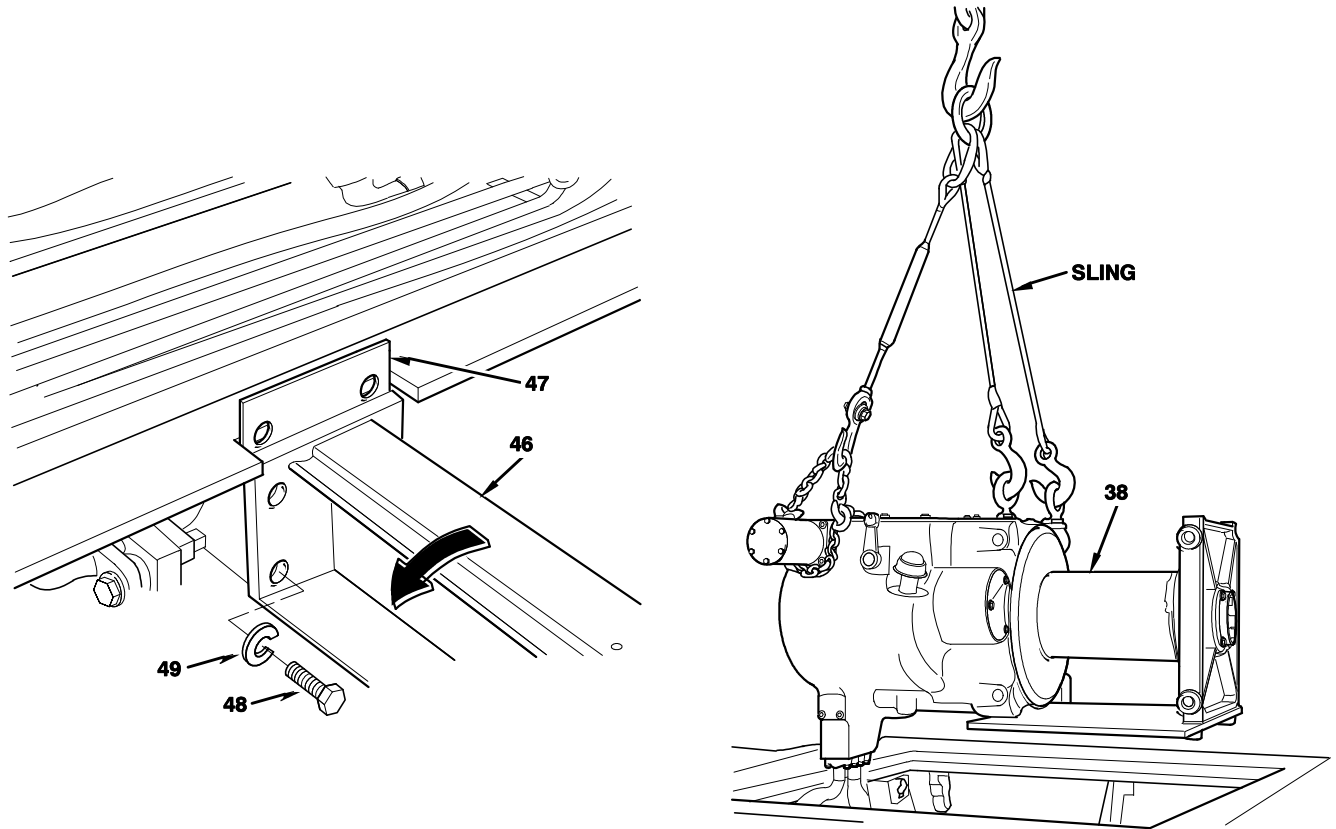
14. Using sling, support weight of hoist winch assembly (38) and remove two screws (39), lockwashers (40), screws (hidden) (41), lockwashers (hidden) (42), and let front support (43) down for clearance. Discard lockwashers.
15. Continue to support weight of hoist winch assembly (38) with sling and remove two screws (44) and lockwashers (45) from cross support beam (46). Discard lockwashers.
16. Move hoist winch assembly (38) forward to clear cross support beam (46) and raise hoist winch assembly.
17. Remove hoist winch assembly (38) thru cupola plate opening.

**NOTE**

Steps 18 thru 23 is the alternate method of removing the hoist winch assembly (38).

18. Using sling, support weight of hoist winch assembly (38) and remove two screws (44) and lockwashers (45) from cross support beam (46). Discard lockwashers.
19. Remove two screws securing mechanical transmission and main hydraulic pump assembly to cross support beam (46).
20. Raise and block mechanical transmission and main hydraulic pump assembly to clear cross support beam (46).
21. Mark shims (47) and cross support beam (46) so they may be installed in the same place from which they were removed to prevent misalignment of winch and mechanical transmission mounting holes. Remove eight screws (48), lockwashers (49), and shims. Discard lockwashers.
22. Tip cross support beam (46) to clear from under mechanical transmission support and lift cross support beam out of way.

23. Remove hoist winch assembly (38) straight up thru cupola plate opening.

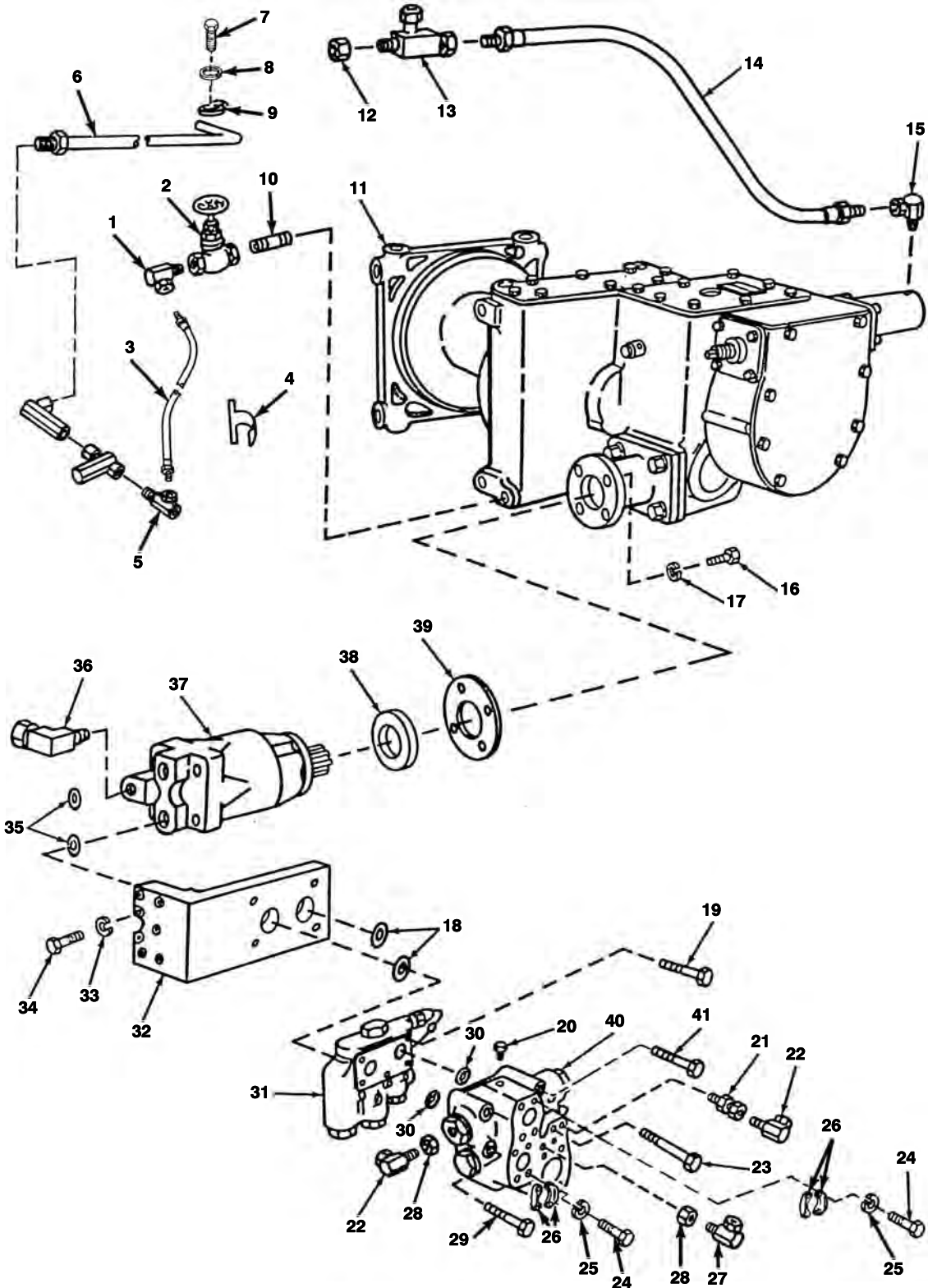


### Disassembly

1. The following illustration, with accompanying legend, serves to identify all subassemblies and attaching parts. The step-by-step disassembly procedure is provided after this illustration:

**Legend:**

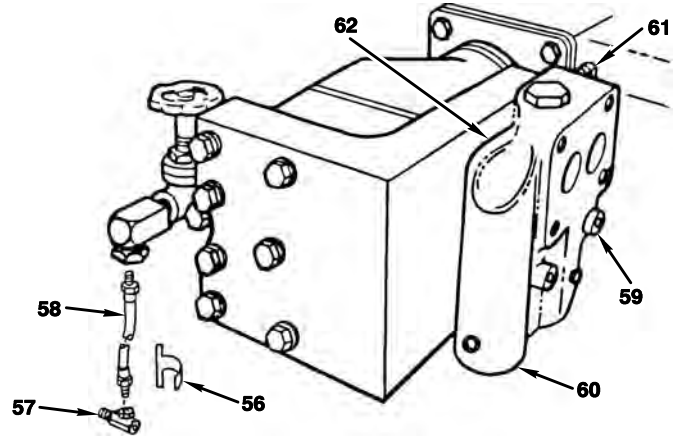
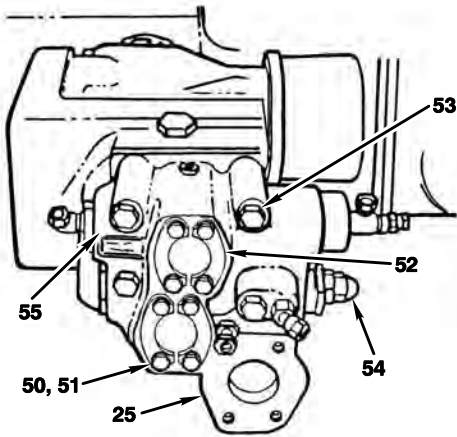
1. Adapter union
2. Gate valve
3. Hose assembly
4. Band marker
5. Elbow
6. Hose assembly
7. Screw
8. Lockwasher
9. Strap
10. Nipple
11. Winch assembly
12. Locknut
13. Pipe tee
14. Hose assembly, hydraulic line
15. Adapter union
16. Screw
17. Lockwasher
18. Packing ring
19. Screw
20. Magnetic plug
21. Union
22. Adapter union
23. Screw
24. Screw
25. Washer
26. Flange
27. Adapter union
28. Seal nut
29. Screw
30. Packing
31. Counterbalance valve
32. Manifold
33. Lockwasher
34. Screw
35. Packing ring
36. Adapter union
37. Motor
38. Ring
39. Gasket
40. Combination control valve
41. Screw



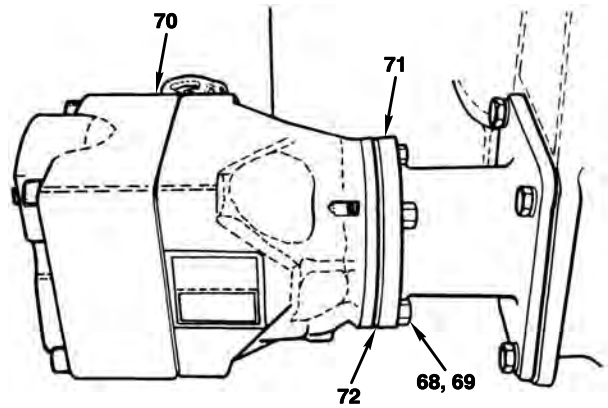
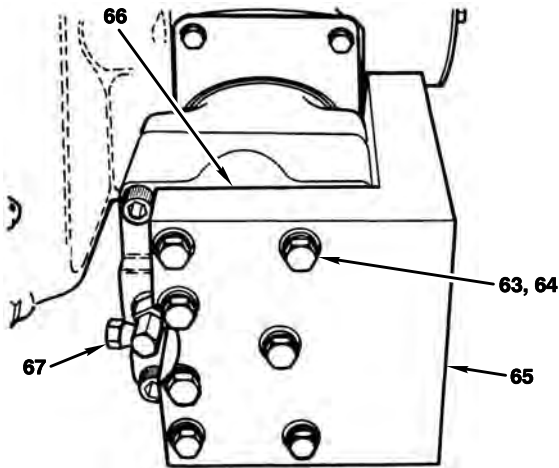
**HOIST WINCH ASSEMBLY, PARTIAL EXPLODED VIEW.**



2. Remove eight screws (50), lockwashers (51), and four flanges (52). Discard lockwashers.
3. Remove four screws (53) and combination control valve (25). Do not remove adjusting screw (54).
4. Remove and discard two packings (hidden) (55).
5. Remove band marker (56), elbow (57), and hose assembly (58).
6. Remove four screws (59) and counterbalance valve (60). Do not remove adjusting screw (61).
7. Remove and discard two packings (hidden) (62).



8. Remove seven screws (63), lockwashers (64), and manifold (65). Discard lockwashers.
9. Remove and discard two packings (hidden) (66).
10. Remove adapter union (67).
11. Remove four screws (68), lockwashers (69), motor (70), pilot ring (hidden) (71), and gasket (72). Discard lockwashers and gasket.

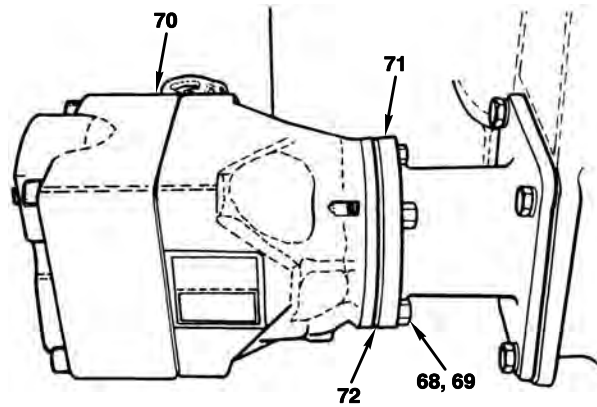
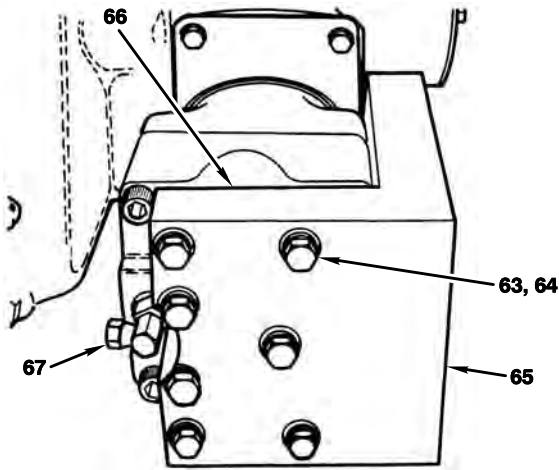


Assembly

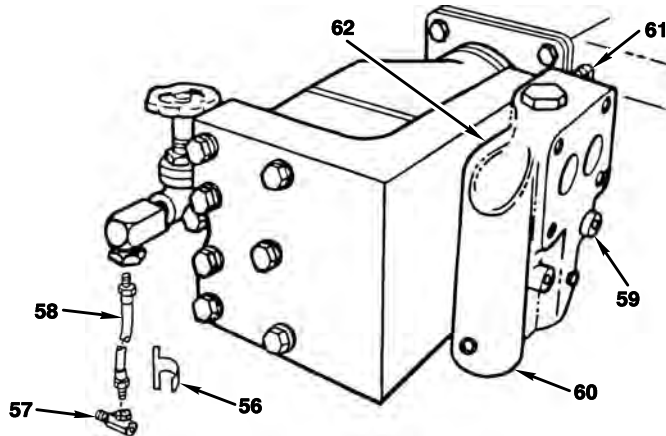
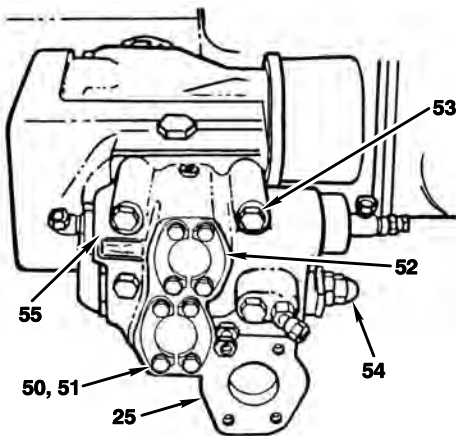
**NOTE**

Use hydraulic motor kit 11672161 on retrofitted vehicles when replacing a motor that is not a Dennison model no. M4E-185-3N00-B101-M40712.

1. Install gasket (72), pilot ring (hidden) (71), motor (70), four lockwashers (69), and screws (68).
2. Install adapter union (67).
3. Install two packings (hidden) (66).
4. Install manifold (65), seven lockwashers (64), and screws (63).



5. Install two packings (hidden) (62).
6. Install counterbalance valve (60) and four screws (59). Torque screws to 55 lb-ft (74.6 N•m).
7. Install hose assembly (58), elbow (57), and band marker (56).
8. Install two packings (hidden) (55).
9. Install combination control valve (25) and four screws (53). Torque screws to 45 lb-ft (61.0 N•m) (applicable only to combination control valve manufactured by Hydreco).
10. Install four flanges (52), eight lockwashers (51), and screws (50).



## Installation

1. Install two lifting eyes to hoist winch assembly (38) and attach sling to lifting eyes.

### NOTE

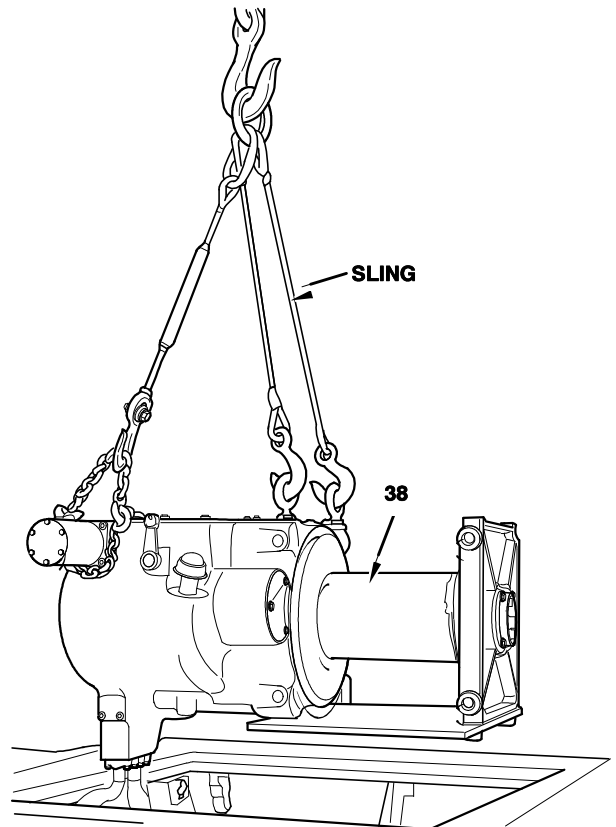
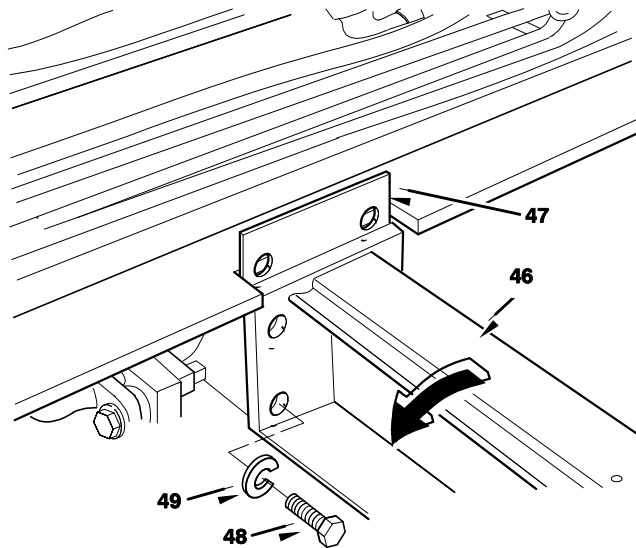
There are two methods of moving and securing the hoist winch assembly (38) into position: steps 2 thru 7 or steps 8 thru 10 (depending on how removed).

2. Using sling, lower hoist winch assembly (38) straight down thru cupola plate opening into position. Continue to support weight of hoist winch assembly with sling.
3. Move cross support beam (46) into position.

### NOTE

Ensure marks made on shims (47) and cross support beam (46) match to ensure alignment of winch and mechanical transmission mounting holes.

4. Install shims (47), eight lockwashers (49), and screws (48).

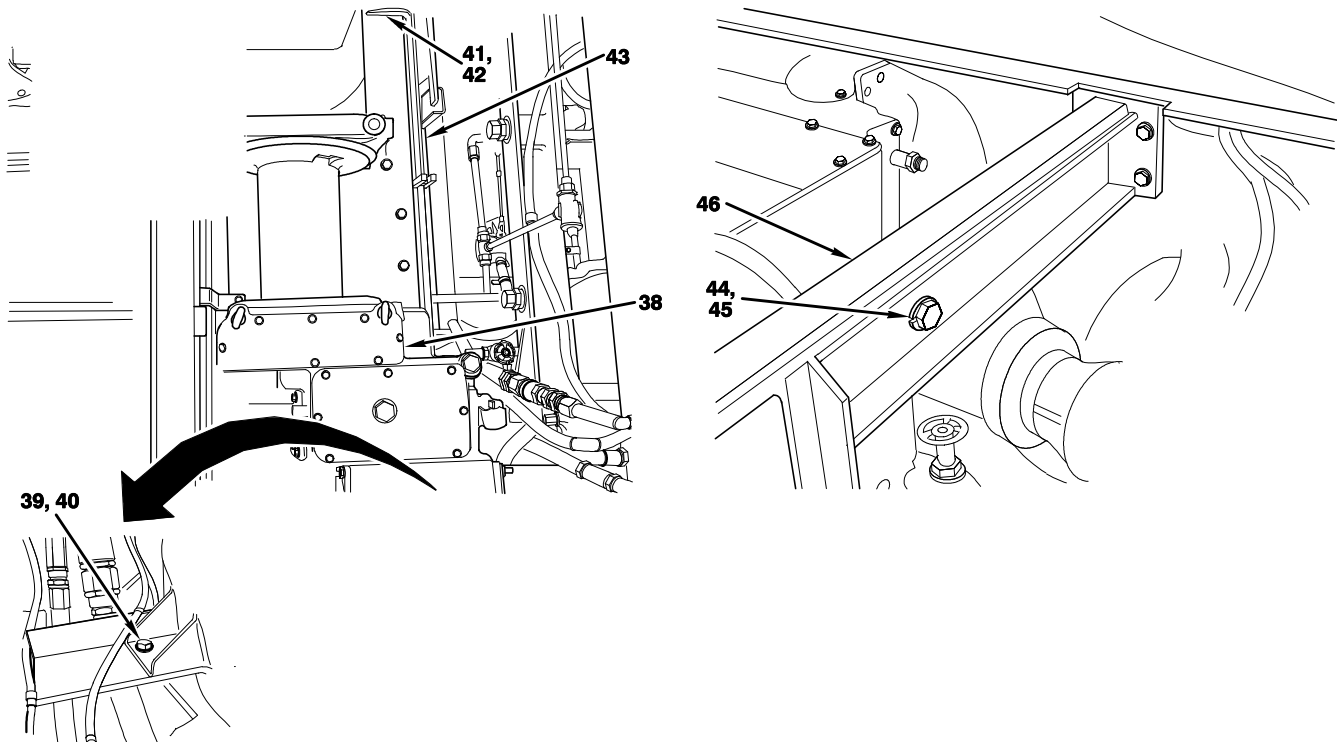


5. Remove block supporting mechanical transmission and main hydraulic pump assembly and move back into position.
6. Install two screws securing mechanical transmission and main hydraulic pump assembly to cross support beam (46).
7. Install two lockwashers (45) and screws (44) securing hoist winch assembly (38) to cross support beam (46).

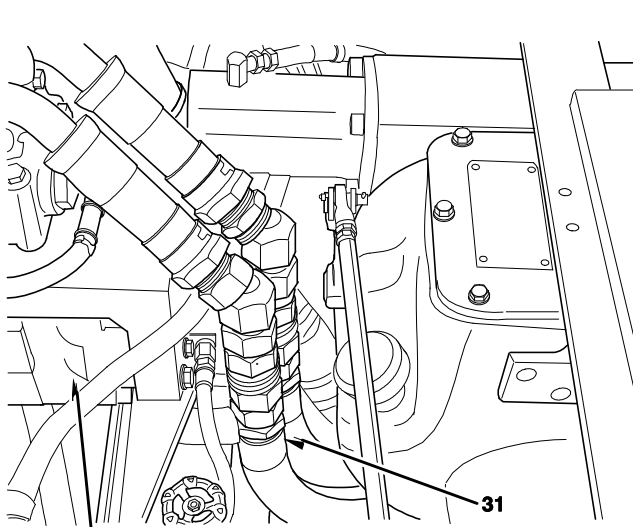
**NOTE**

Steps 8 thru 10 is the alternate method of moving and securing the hoist winch assembly (38) into position.

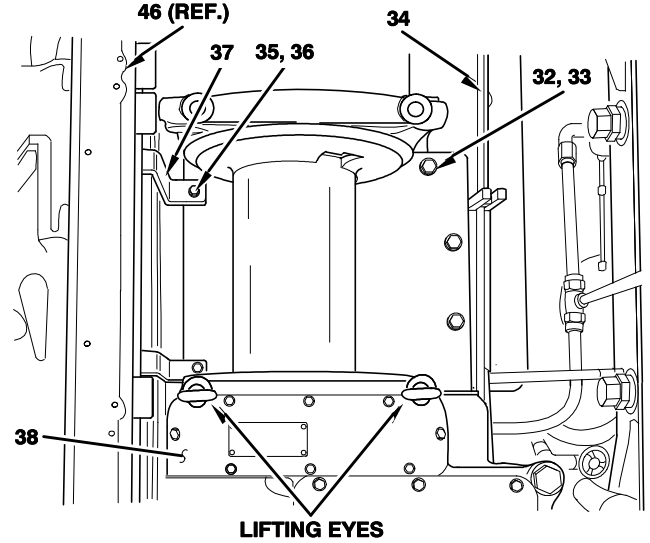
8. Move hoist winch assembly (38) rearward to clear cross support beam (46) and then lower hoist winch assembly into position. Continue to support weight of hoist winch assembly with sling.
9. Install two lockwashers (45) and screws (44) securing hoist winch assembly (38) to cross support beam (46).
10. Lift front support (43) into position and install two lockwashers (hidden) (42), screws (hidden) (41), lockwashers (40), and screws (39).



11. Remove sling and two lifting eyes from hoist winch assembly (38).
12. Install two lockwashers (36) and screws (35) to cable guard (37).
13. Install four lockwashers (33) and screws (32) to front support (34).
14. Connect two hydraulic lines (31).



**MAIN WINCH  
MOTOR (REF.)**



**NOTE**

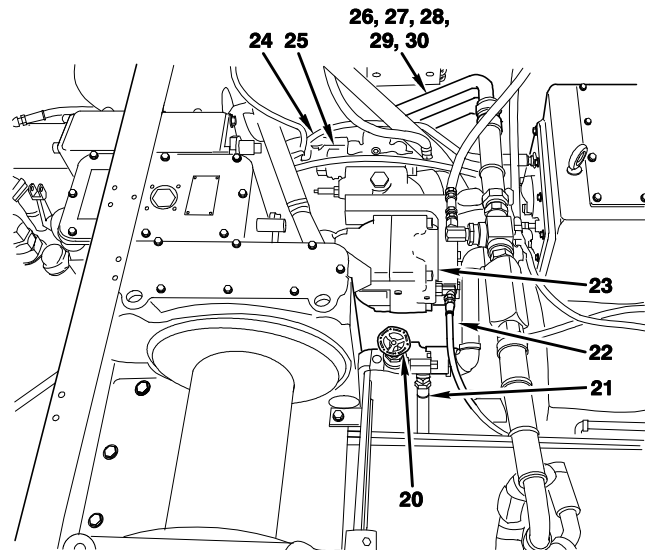
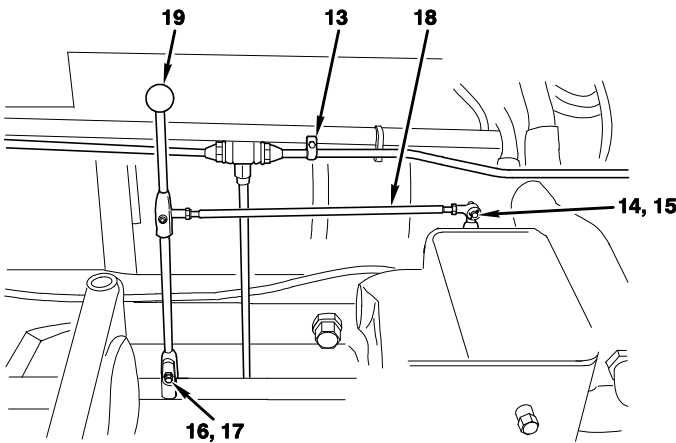
The flange-type hydraulic hoses (29), attaching hardware (28, 27, and 26), and packings (30) are hidden between combination control valve (25) and vehicle wall.

15. Install two packings (30).
16. Connect two flange-type hydraulic hoses (29), four flanges (28), eight lockwashers (27), and screws (26).
17. Connect four hydraulic lines (24) to combination control valve (25).
18. Connect hydraulic line (22) to motor (23).

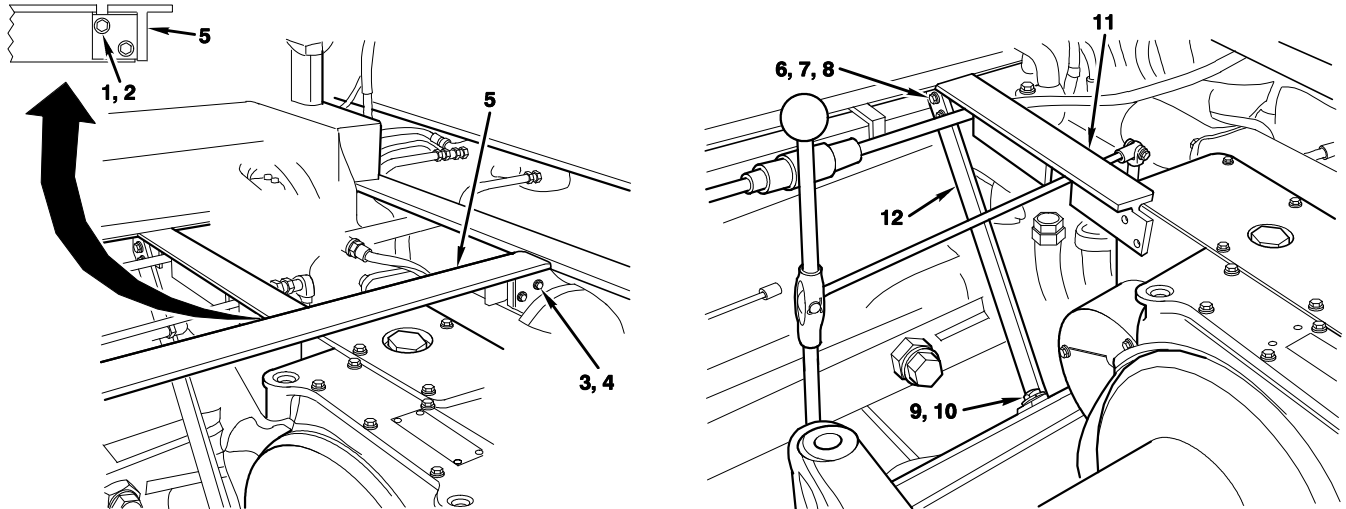
**WARNING**

Keep drain valve (20) closed.

19. Connect drain line (21) to drain valve (20).
20. Install shift rod (18) and lever (19) together as a unit, bolt (17), self-locking nut (16), pin (15), and cotter pin (14).
21. Install clamp and fire extinguisher tube (13) in accordance with TM 9-2350-256-20.



22. Install support bar brace (12), support bar (11), two lockwashers (10), screws (9), bolts (8), lockwashers (7), and nuts (6).
23. Install cross support (5), four lockwashers (4), screws (3), two lockwashers (2), and screws (1).



### Adjustment

### WARNING

The hoist winch combination control valve is adjusted by the vehicle manufacturer. Should verification or adjustment be required, the hoist winch combination control valve must be adjusted by the following ADJUSTMENT procedures in this section and TESTING procedures in the next section so that the hoist will have a capacity as specified in the DESCRIPTION above.

### WARNING

Test components (pressure gages, hoses, and fitting) must be capable of withstanding a working pressure of 1950–2050 psi (13,445–14,135 kPa).

### NOTE

For bare drum verification of hoist winch combination control valve, a test cable may be fabricated not to exceed 110 ft (33.53 m) in length, using fabrication instructions in WP 0062 00.

### NOTE

VEHICLE PREPARATION—Perform steps 1 thru 4 for vehicle preparation.

1. Install pressure gage in gage port (73) of hoist winch combination control valve (25).

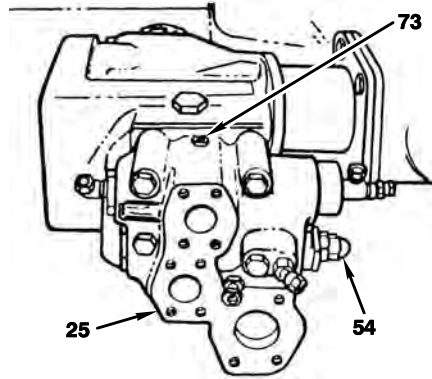
### NOTE

If using anchor, do not adjust brake.

2. Place load on winch. Use calibrated weights or load cell if available. Load cell must be anchored.

If a load cell or weights are unavailable, attach cable to an anchor or adjust winch brake full tight. Refer to WP 0058 00 for brake adjustment procedure.

3. If using anchor or winch brake, use adjusting screw (54) on hoist winch combination control valve (25) to reduce pressure as far as possible. Turning in counterclockwise direction will decrease pressure.



4. Set engine speed at 1600–1800 rpm.

### NOTE

HOIST WINCH COMBINATION CONTROL VALVE ADJUSTMENT—Perform steps 5 thru 10 to adjust the hoist winch combination control valve to achieve hoisting requirements.

### NOTE

This adjustment must be performed with the hydraulic reservoir oil temperature at 100°F–130°F (38°C–54°C).

5. If using calibrated weights or load cell, use adjusting screw (54) on hoist winch combination control valve (25) to achieve maximum lift of 50,000–55,000 lb (22,680–24,948 kg). Turning in clockwise direction will increase pressure.
6. Activate winch to raise in low gear.

### CAUTION

Do not exceed 1000 psi (6895 kPa) relief pressure.

7. If using anchor or winch brake, adjust relief pressure to original value recorded in Vehicle Log Book.
8. Verify setting with locking nut in locked position, and record new setting in Vehicle Log Book.
9. Disconnect pressure gage. Disconnect weights, load cell, or anchor, or readjust winch brake as necessary.

### NOTE

If smooth lowering capability is not obtained, adjust counterbalance valve (60). Refer to step 4 under TESTING below for adjustment procedure.



10. Verify smoothness of lowering capability.

### NOTE

If adjustment procedure was done using calibrated weights or load cell, no further load test is required. If relief valve was set with anchor or brake, proceed with the load test that follows.

### Testing

### NOTE

LOAD TEST—Perform steps 1 thru 3 for the load test of the hoist winch.

### NOTE

The following load test must be performed with the hydraulic reservoir oil temperature at 100°F–130°F (38°C–54°C).

1. Verify lifting capability by rigging a four-part line and raising and lowering a load of at least 25,000 lb (11,340 kg). The rear of an M88A1, a medium tank, or equivalent may be used.

### NOTE

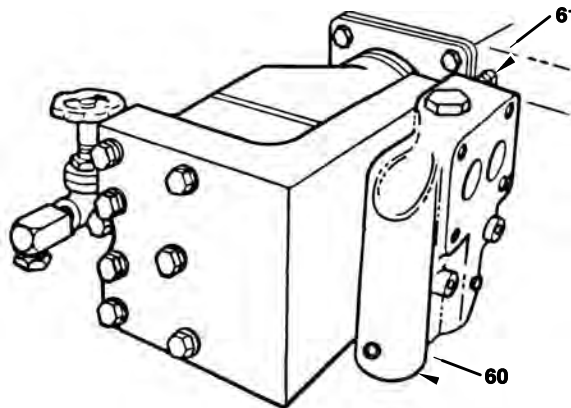
If smooth lowering capability is not obtained, adjust counterbalance valve (60). Refer to step 4 below for adjustment procedure.

2. Verify smoothness of lowering capability.
3. If vehicle fails to pass the load test, repeat the above ADJUSTMENT procedures.

### NOTE

COUNTERBALANCE VALVE ADJUSTMENT—Perform step 4 to adjust the counterbalance valve (60).

4. With engine operating at 1600 to 1800 rpm and HOIST WINCH operating lever in LOWER position, adjust counterbalance valve (60) by turning adjusting screw (61) until hoist winch provides a smooth lowering capability.



**END OF WORK PACKAGE**



**INTERMEDIATE MAINTENANCE**  
**RECOVERY VEHICLE, FULL TRACKED: MEDIUM, M88A1**  
**NSN 2350-00-122-6826, EIC AQA**  
**HOIST WINCH MOTOR REPLACEMENT**  
**REMOVAL, INSTALLATION**

**INITIAL SETUP:****Tools and Special Tools**

Tool kit, general mechanic's (item 34, WP 0086 00)

**References**

WP 0053 00

**Materials/Parts**

Gasket (item 7, WP 0087 00)  
 Lockwashers (11) (item 163, WP 0087 00)  
 Packings (2) (item 134, WP 0087 00)  
 Screws (7) (item 70, WP 0087 00)  
 Screws (4) (item 71, WP 0087 00)

**Equipment Condition**

Hoist winch counterbalance valve removed (WP 0055 00)

**NOTE**

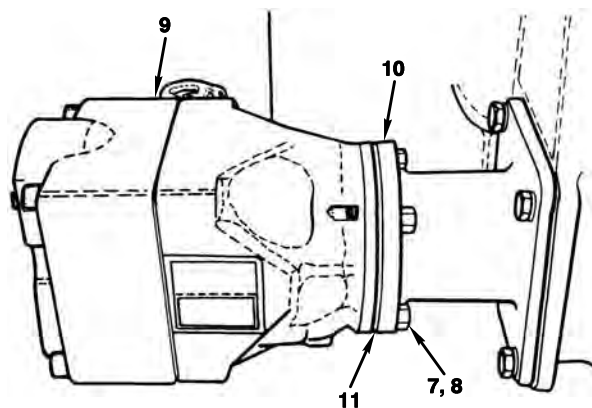
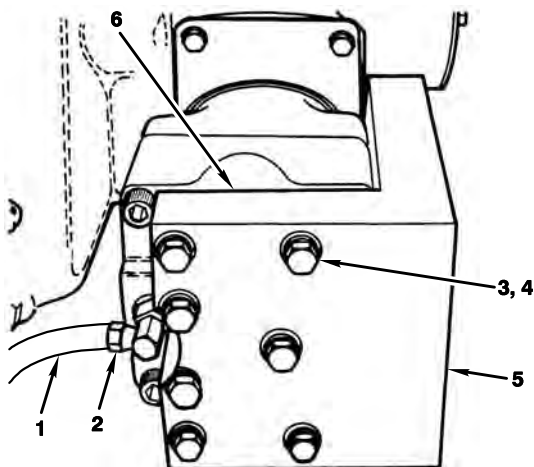
**LOAD TEST REQUIREMENT**—Load testing of hoist winch is mandatory, prior to use, following replacement of the hoist winch motor.

Load testing will be accomplished by support maintenance activities.

Refer to the TESTING section in WP 0053 00 for the detailed step-by-step procedure.

**Removal**

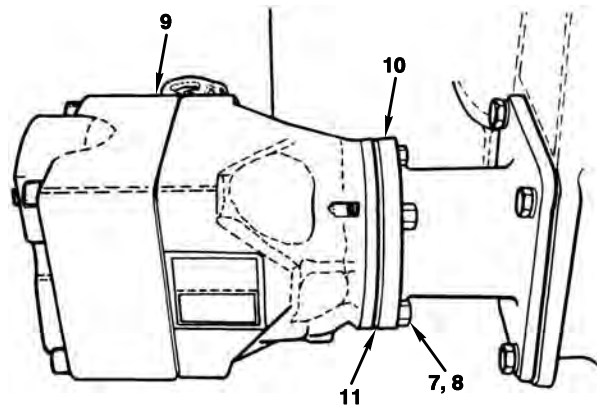
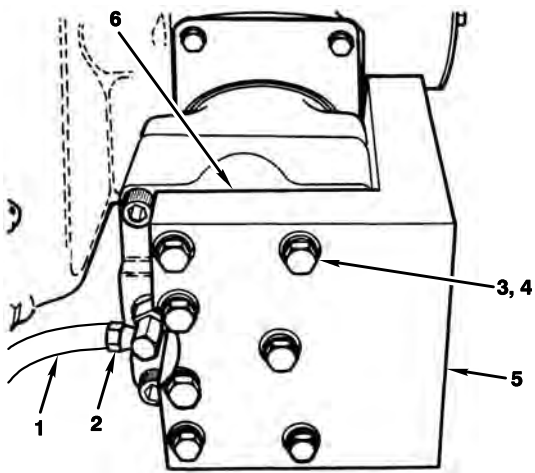
1. Disconnect hydraulic line (1) from adapter union (2).
2. Remove seven screws (3), lockwashers (4), and manifold (5). Discard lockwashers.
3. Remove and discard two packings (hidden) (6).
4. Remove adapter union (2).
5. Remove four screws (7), lockwashers (8), motor (9), pilot ring (hidden) (10), and gasket (11). Discard lockwashers and gasket.



**Installation****NOTE**

Use hydraulic motor kit 11672161 on retrofitted vehicles when replacing a motor that is not a Dennison model no. M4E-185-3N00-B101-M40712.

1. Install gasket (11), pilot ring (hidden) (10), motor (9), four lockwashers (8), and screws (7).
2. Install adapter union (2).
3. Install two packings (hidden) (6).
4. Install manifold (5), seven lockwashers (4), and screws (3).
5. Connect hydraulic line (1) to adapter union (2).

**END OF WORK PACKAGE**

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**INTERMEDIATE MAINTENANCE**  
**RECOVERY VEHICLE, FULL TRACKED: MEDIUM, M88A1**  
**NSN 2350-00-122-6826, EIC AQA**  
**HOIST WINCH COUNTERBALANCE VALVE REPLACEMENT**  
**REMOVAL, INSTALLATION**

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**INITIAL SETUP:****Tools and Special Tools**

Tool kit, general mechanic's (item 34, WP 0086 00)

**Materials/Parts**

Lockwashers (8) (item 162, WP 0087 00)

Packings (2) (item 132, WP 0087 00)

Packings (4) (item 133, WP 0087 00)

Screws (3) (item 76, WP 0087 00)

Screws (4) (item 96, WP 0087 00)

**Materials/Parts (cont.)**

Screws (8) (item 103, WP 0087 00)

Screw (item 219, WP 0087 00)

**References**

WP 0053 00

**Equipment Condition**

Subfloor plates 4 and 11 removed (TM 9-2350-256-20)

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**NOTE**

**LOAD TEST REQUIREMENT**—Load testing of hoist winch is mandatory, prior to use, following replacement of the hoist winch counterbalance valve.

Load testing will be accomplished by support maintenance activities.

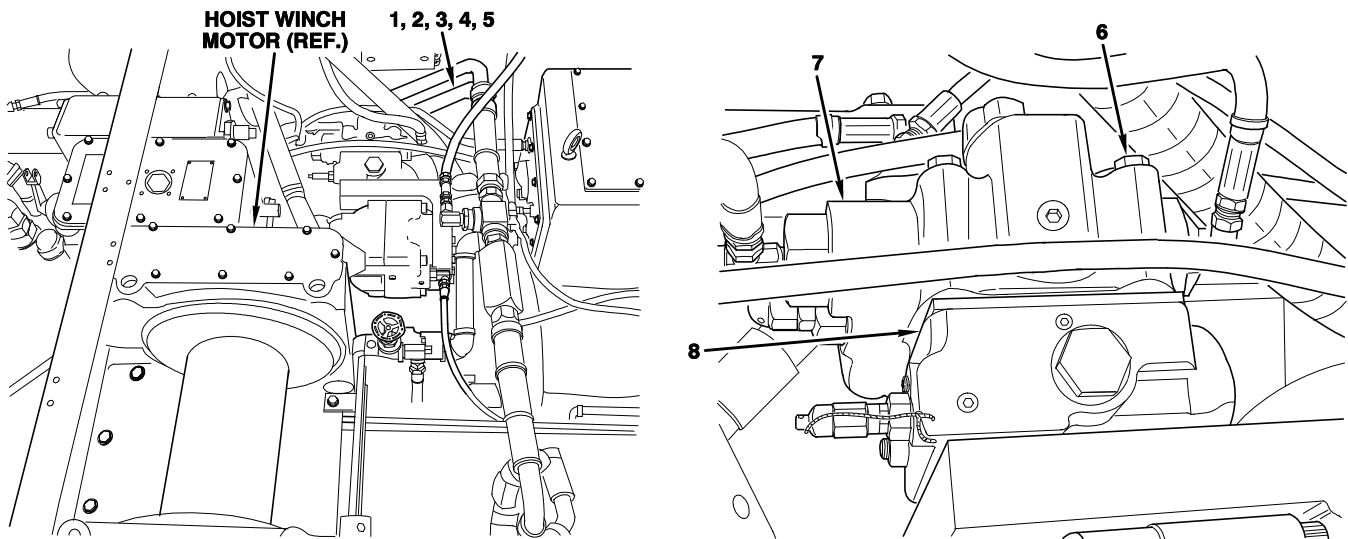
Refer to the **TESTING** section in WP 0053 00 for the detailed step-by-step procedure.

Removal

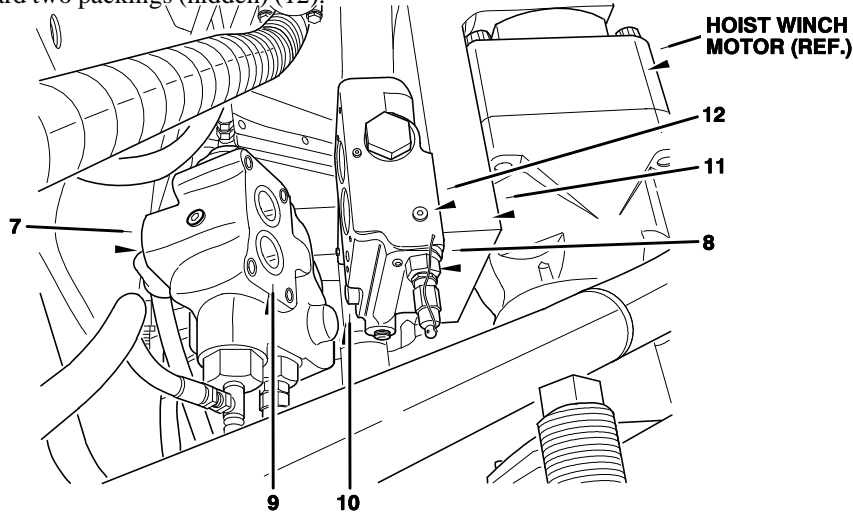
**NOTE**

The flange-type hydraulic hoses (4), attaching hardware (1, 2, and 3), and packings (5) are hidden between combination control valve (7) and vehicle wall.

1. Remove eight screws (1), lockwashers (2), four flanges (3), and disconnect two flange-type hydraulic hoses (4). Discard lockwashers.
2. Remove and discard two packings (5).
3. Remove four screws (6) and combination control valve (7) (with four hydraulic lines attached) from counterbalance valve (8). Place combination control valve on floor of vehicle.



4. Remove and discard two packings (9) from combination control valve (7).
5. Remove four screws (10) and counterbalance valve (8) from manifold (11).
6. Remove and discard two packings (hidden) (12).



**Installation**

1. Install two packings (hidden) (12).
2. Install counterbalance valve (8) and four screws (10) to manifold (11). Torque screws to 55 lb-ft (74.6 N•m).
3. Install two packings (9) to combination control valve (7).
4. Install combination control valve (7) (with four hydraulic lines attached) to counterbalance valve (8) and four screws (6). Torque screws to 45 lb-ft (61.0 N•m) (applicable only to combination control valve manufactured by Hydreco).
5. Install two packings (5).
6. Connect two flange-type hydraulic hoses (4) and install four flanges (3), eight lockwashers (2), and screws (1).

**END OF WORK PACKAGE**





**INTERMEDIATE MAINTENANCE**  
**RECOVERY VEHICLE, FULL TRACKED: MEDIUM, M88A1**  
**NSN 2350-00-122-6826, EIC AQA**

**MAIN WINCH BRAKE CYLINDER MAINTENANCE**  
**REMOVAL, TESTING, INSTALLATION, ADJUSTMENT**

**INITIAL SETUP:**

**Test Equipment**

Gage (item 9, WP 0086 00)

**Materials/Parts**

Screws (4) (item 101, WP 0087 00)

**Tools and Special Tools**

Tool kit, general mechanic's (item 34, WP 0086 00)

**Equipment Condition**

Subfloor plates 1 and 2 removed (TM 9-2350-256-20)

**WARNING**

Brake adjusting screw (2) must be loosened prior to removal of brake cylinder (5). Use care in removing brake cylinder.

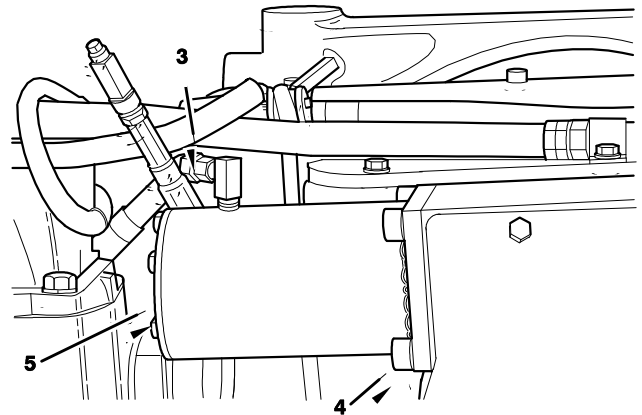
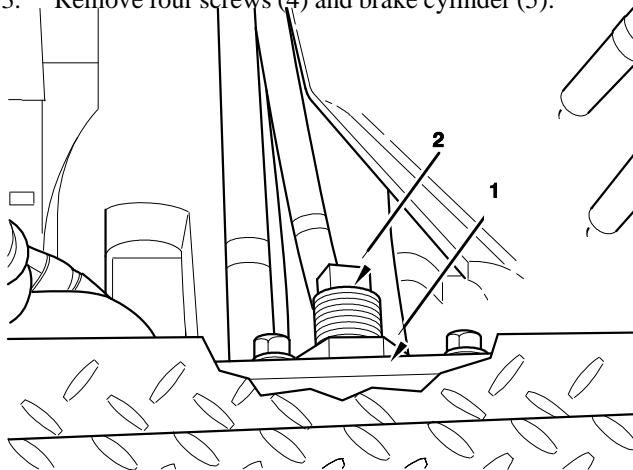
**Removal**

1. Loosen locknut (1) and adjusting screw (2).
2. Disconnect hose (3).

**WARNING**

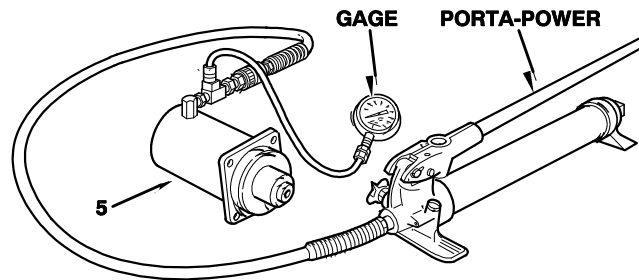
Back off screws (4) evenly to prevent heavy spring pressure inside from "popping" cylinder.

3. Remove four screws (4) and brake cylinder (5).



## Testing

1. Connect porta-power pump and gage to brake cylinder (5).



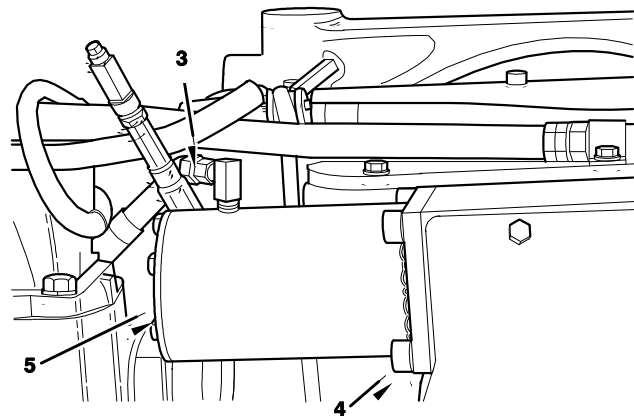
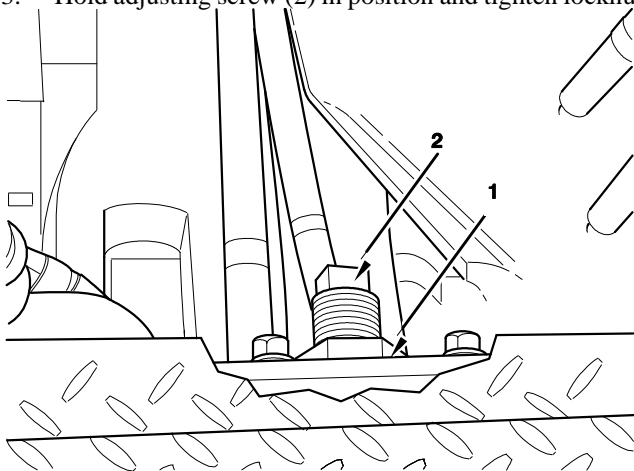
2. Stroke should be 3/4 in. (19 mm) at 250–500 psi (1724–3448 kPa), with no leakage.
3. Check for return stroke while bleeding off pressure.

## Installation

1. Install brake cylinder (5) and four screws (4).
2. Connect hose (3).

## Adjustment

1. Tighten adjusting screw (2) clockwise to the maximum.
2. Back off adjusting screw (2) one full turn.
3. Hold adjusting screw (2) in position and tighten locknut (1).



**END OF WORK PACKAGE**

**INTERMEDIATE MAINTENANCE**  
**RECOVERY VEHICLE, FULL TRACKED: MEDIUM, M88A1**  
**NSN 2350-00-122-6826, EIC AQA**

**MAIN WINCH BRAKE BAND ASSEMBLY MAINTENANCE**  
**REMOVAL, DISASSEMBLY, CLEANING, INSPECTION, REPAIR, ASSEMBLY, INSTALLATION, ADJUSTMENT**

**INITIAL SETUP:**

**Tools and Special Tools**

Tool kit, general mechanic's (item 34, WP 0086 00)

**Materials/Parts**

Cleaning compound (item 5, WP 0085 00)

Paint thinner (item 18, WP 0085 00)

Lockwashers (8) (item 150, WP 0087 00)

**Materials/Parts (cont.)**

Rivets (20) (item 88, WP 0087 00)

Screws (8) (item 56, WP 0087 00)

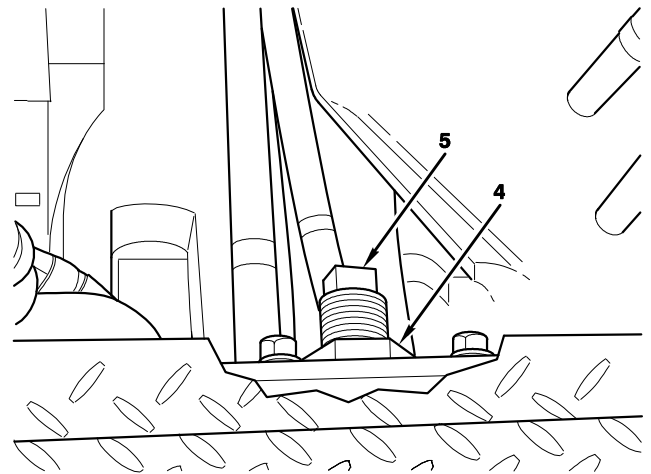
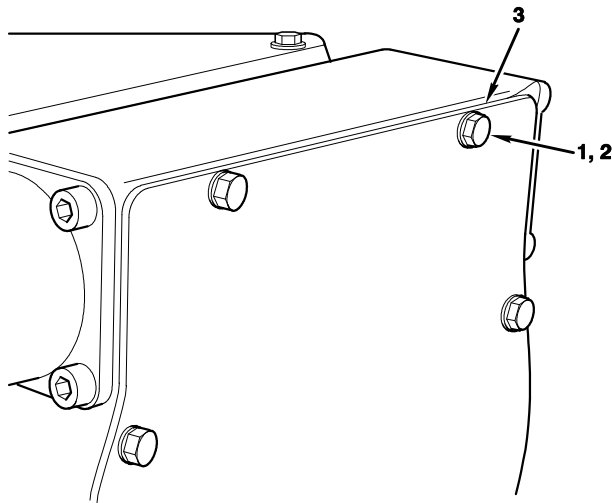
**Equipment Condition**

Subfloor plate 1 removed (TM 9-2350-256-20)

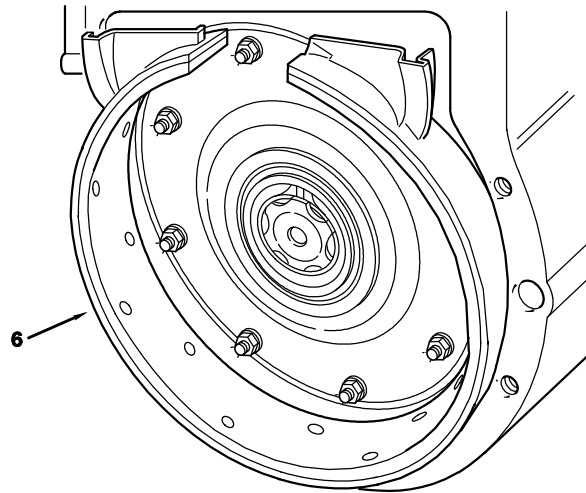
Subfloor plate 25 removed (WP 0046 00)

**Removal**

1. Remove eight screws (1), lockwashers (2), and cover (3). Discard lockwashers.
2. Loosen locknut (4) and adjusting screw (5).

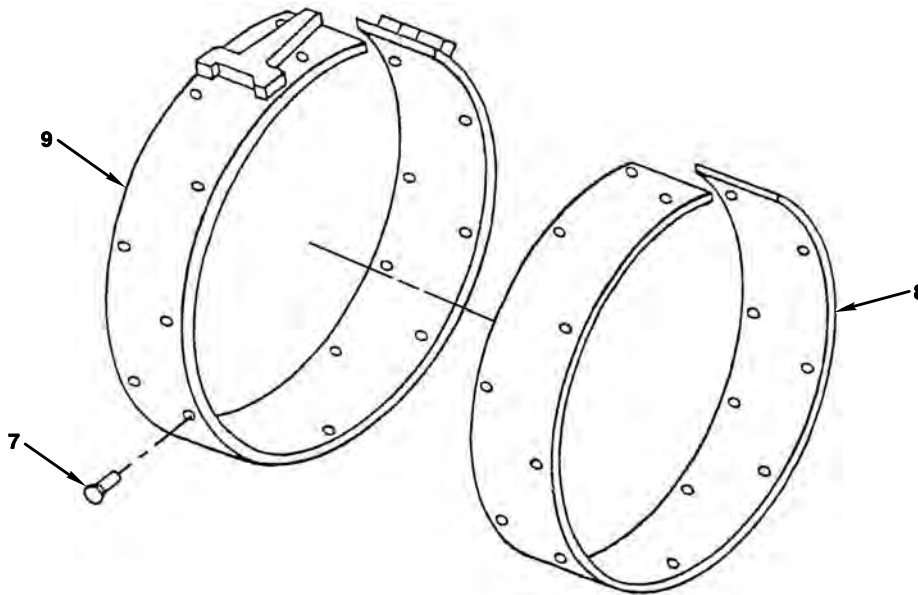


3. Remove brake band assembly (6).



### Disassembly

1. Remove 20 rivets (7) and brake lining (8) from brake band (9). Discard rivets.



### Cleaning

#### **WARNING**

Solvents 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 solvent gets on skin or clothing, wash immediately with soap and water.

1. Clean brake band and brake drum surfaces with cleaning compound or paint thinner.

**Inspection-Acceptance and Rejection Criteria**

1. Inspect brake lining for wear and damage.

**Repair or Replacement**

1. Repair worn or unserviceable brake linings and bands.

**Assembly**

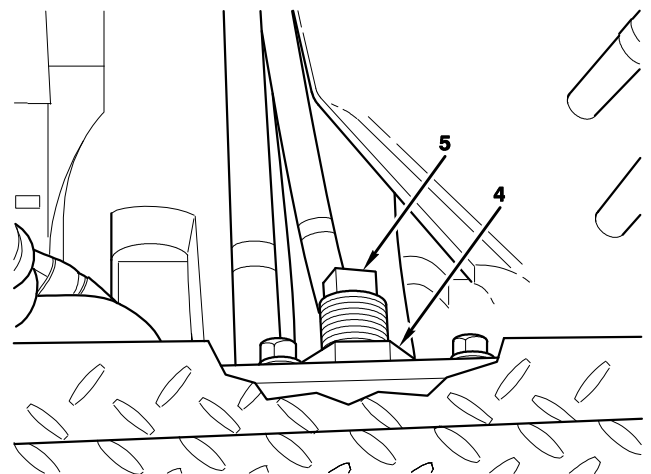
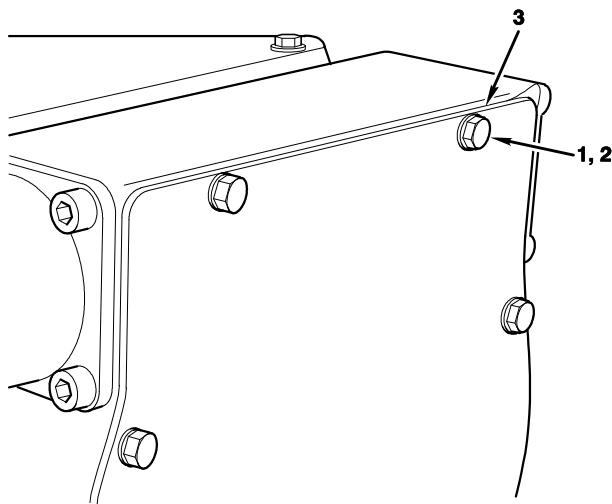
1. Install brake lining (8) and 20 rivets (7) to brake band (9).

**Installation**

1. Install brake band assembly (6).
2. Install cover (3), eight lockwashers (2), and screws (1).

**Adjustment**

1. Tighten adjusting screw (5) clockwise to the maximum.
2. Back off adjusting screw (5) one full turn.
3. Hold adjusting screw (5) in position and tighten locknut (4).



**END OF WORK PACKAGE**



**INTERMEDIATE MAINTENANCE**  
**RECOVERY VEHICLE, FULL TRACKED: MEDIUM, M88A1**  
**NSN 2350-00-122-6826, EIC AQA**

**HOIST WINCH BRAKE CYLINDER MAINTENANCE**  
**REMOVAL, TESTING, INSTALLATION, ADJUSTMENT**

**INITIAL SETUP:**

**Test Equipment**

Gage (item 9, WP 0086 00)

**Tools and Special Tools**

Tool kit, general mechanic's (item 34, WP 0086 00)

**Materials/Parts**

Screws (4) (item 101, WP 0087 00)

**Equipment Condition**

Subfloor plate 3 removed (TM 9-2350-256-20)

Subfloor plate 4 opened (WP 0022 00)

**WARNING**

Brake adjusting screw (2) must be loosened prior to removal of brake cylinder (5). Use care in removing brake cylinder.

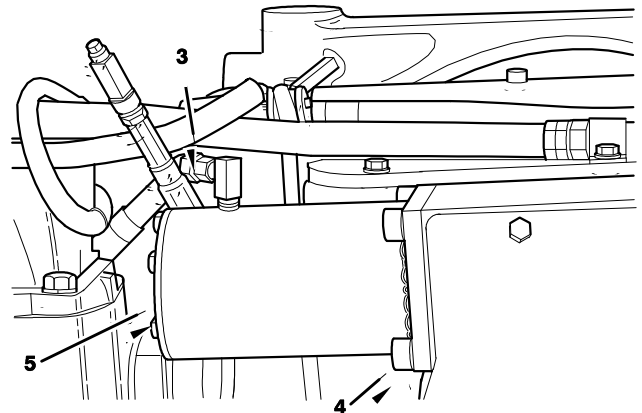
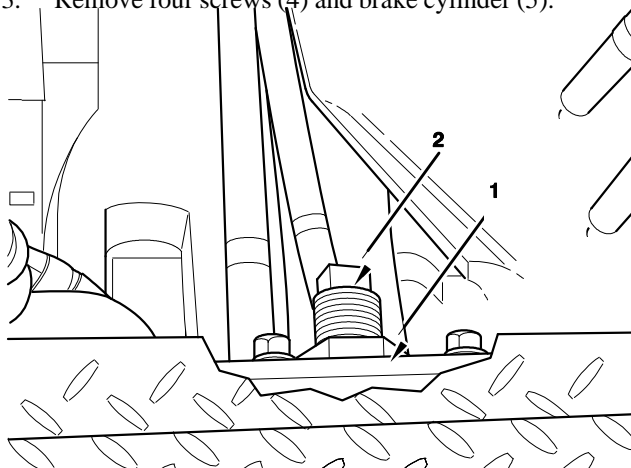
**Removal**

1. Loosen locknut (1) and adjusting screw (2).
2. Disconnect hose (3).

**WARNING**

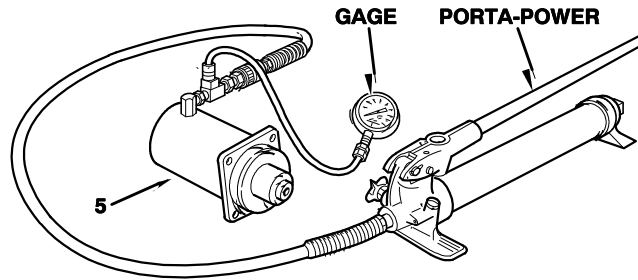
Back screws (4) off evenly to prevent heavy spring pressure inside from "popping" cylinder.

3. Remove four screws (4) and brake cylinder (5).



**Testing**

1. Connect porta-power and gage to brake cylinder (5).



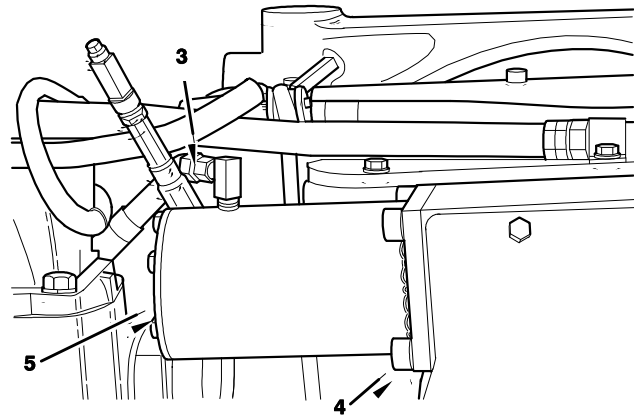
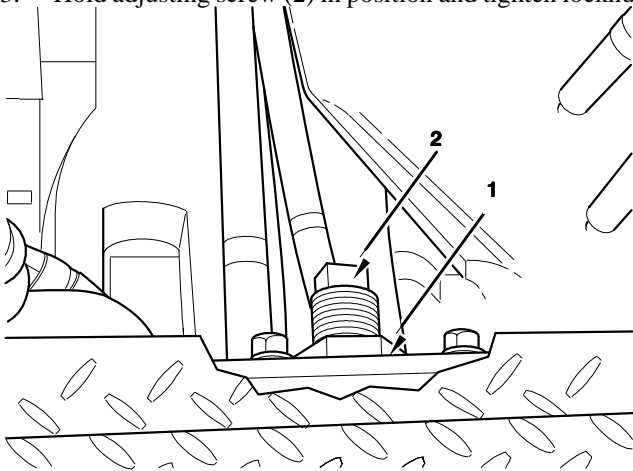
2. Stroke should be 3/4 in. (19 mm) at 250–500 psi (1724–3448 kPa), with no leakage.
3. Check for return stroke while bleeding off pressure.

**Installation**

1. Install brake cylinder (5) and four screws (4).
2. Connect hose (3).

**Adjustment**

1. Tighten adjusting screw (2) clockwise to the maximum.
2. Back off adjusting screw (2) one full turn.
3. Hold adjusting screw (2) in position and tighten locknut (1).



**END OF WORK PACKAGE**



**INTERMEDIATE MAINTENANCE**  
**RECOVERY VEHICLE, FULL TRACKED: MEDIUM, M88A1**  
**NSN 2350-00-122-6826, EIC AQA**

**HOIST WINCH BRAKE BAND ASSEMBLY MAINTENANCE**  
**REMOVAL, DISASSEMBLY, CLEANING, INSPECTION,**  
**REPAIR, ASSEMBLY, INSTALLATION, ADJUSTMENT**

**INITIAL SETUP:**

**Tools and Special Tools**

Tool kit, general mechanic's (item 34, WP 0086 00)

**Materials/Parts**

Cleaning compound (item 5, WP 0085 00)

Paint thinner (item 18, WP 0085 00)

Lockwashers (8) (item 150, WP 0087 00)

**Materials/Parts (cont.)**

Rivets (20) (item 88, WP 0087 00)

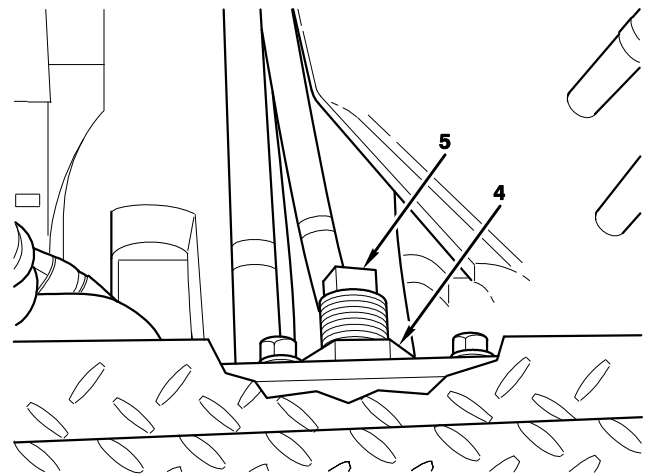
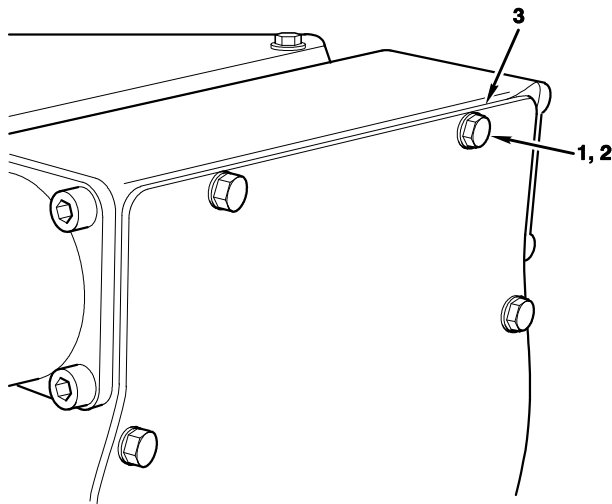
Screws (8) (item 56, WP 0087 00)

**Equipment Condition**

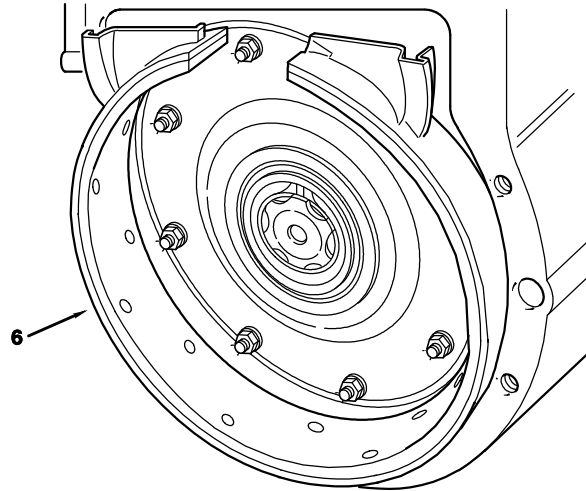
Subfloor plate 4 removed (TM 9-2350-256-20)

**Removal**

1. Remove eight screws (1), lockwashers (2), and cover (3). Discard lockwashers.
2. Loosen locknut (4) and adjusting screw (5).

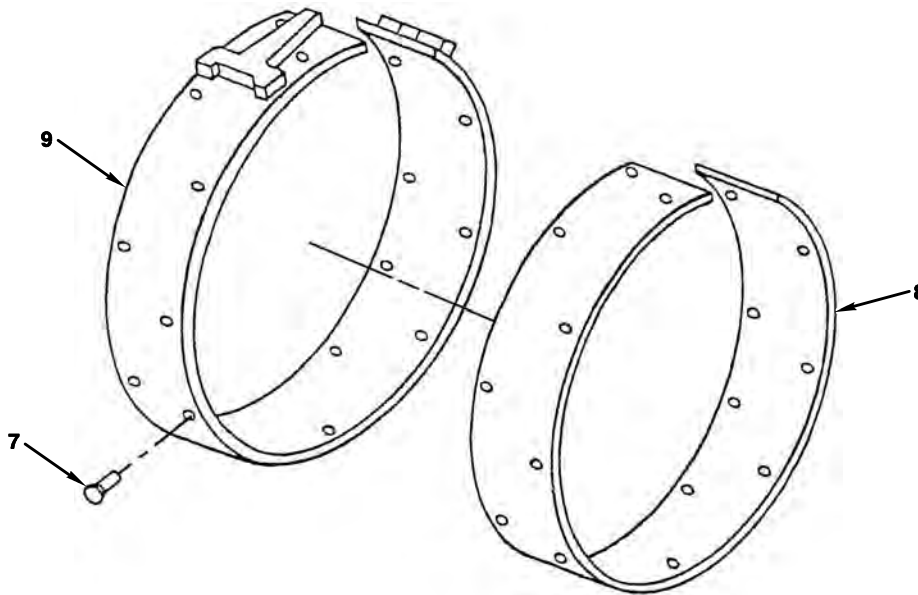


3. Remove brake band assembly (6).



### Disassembly

1. Remove 20 rivets (7) and brake lining (8) from brake band (9). Discard rivets.



### Cleaning

#### **WARNING**

Solvents 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 solvent gets on skin or clothing, wash immediately with soap and water.

1. Clean brake band and brake drum surfaces with cleaning compound or paint thinner.

**Inspection-Acceptance and Rejection Criteria**

1. Inspect brake lining for wear and damage.

**Repair or Replacement**

1. Repair worn or unserviceable brake linings and bands.

**Assembly**

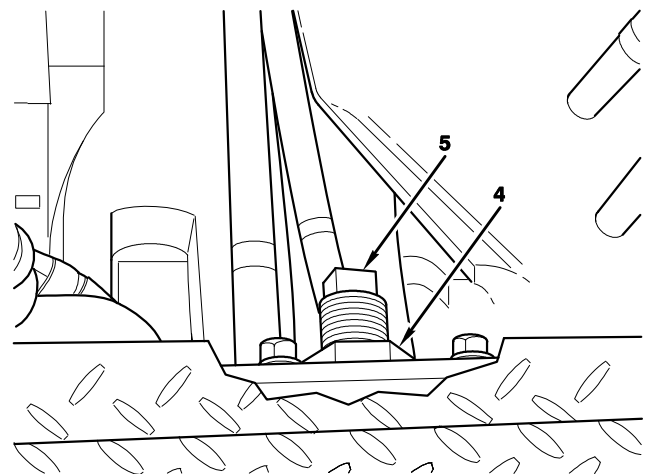
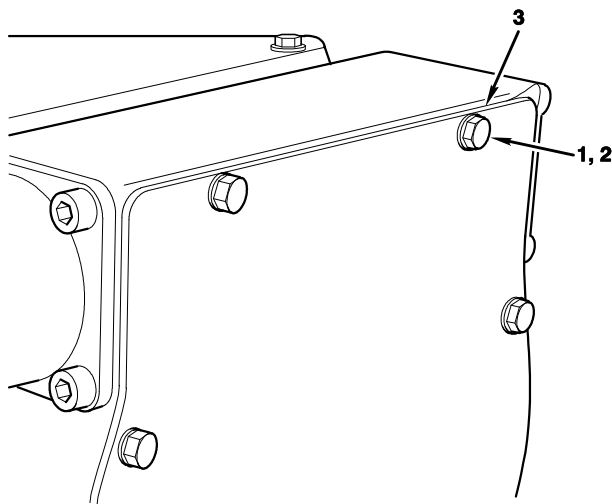
1. Install brake lining (8) and 20 rivets (7) to brake band (9).

**Installation**

1. Install brake band assembly (6).
2. Install cover (3), eight lockwashers (2), and screws (1).

**Adjustment**

1. Tighten adjusting screw (5) clockwise to the maximum.
2. Back off adjusting screw (5) one full turn.
3. Hold adjusting screw (5) in position and tighten locknut (4).



**END OF WORK PACKAGE**



**INTERMEDIATE MAINTENANCE**  
**RECOVERY VEHICLE, FULL TRACKED: MEDIUM, M88A1**  
**NSN 2350-00-122-6826, EIC AQA**

**MAIN WINCH LEVEL WINDER ASSEMBLY MAINTENANCE**  
**REMOVAL, DISASSEMBLY, CLEANING, INSPECTION, ASSEMBLY, INSTALLATION**

**INITIAL SETUP:****Tools and Special Tools**

Tool kit, general mechanic's (item 34, WP 0086 00)

**Materials/Parts**

Cleaning compound (item 5, WP 0085 00)  
 Oil (item 8, WP 0085 00)  
 Paint thinner (item 18, WP 0085 00)  
 Lockwashers (2) (item 158, WP 0087 00)  
 Nut, self-locking (item 86, WP 0087 00)  
 Nut, self-locking (item 108, WP 0087 00)

**Materials/Parts (cont.)**

Screw (item 4, WP 0087 00)  
 Screws (2) (item 143, WP 0087 00)  
 Shoulder bolt (item 3, WP 0087 00)  
 Washer (item 125, WP 0087 00)

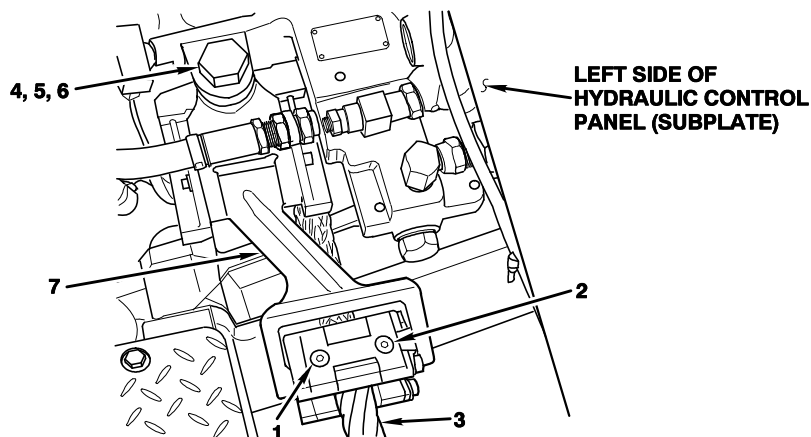
**References**

TM 9-2350-256-20  
 WP 0051 00

**Removal****NOTE**

Steps 1 thru 3 are for removing the arm without removing the entire main winch level winder assembly. Refer to WP 0051 00 for removal of the entire main winch level winder assembly.

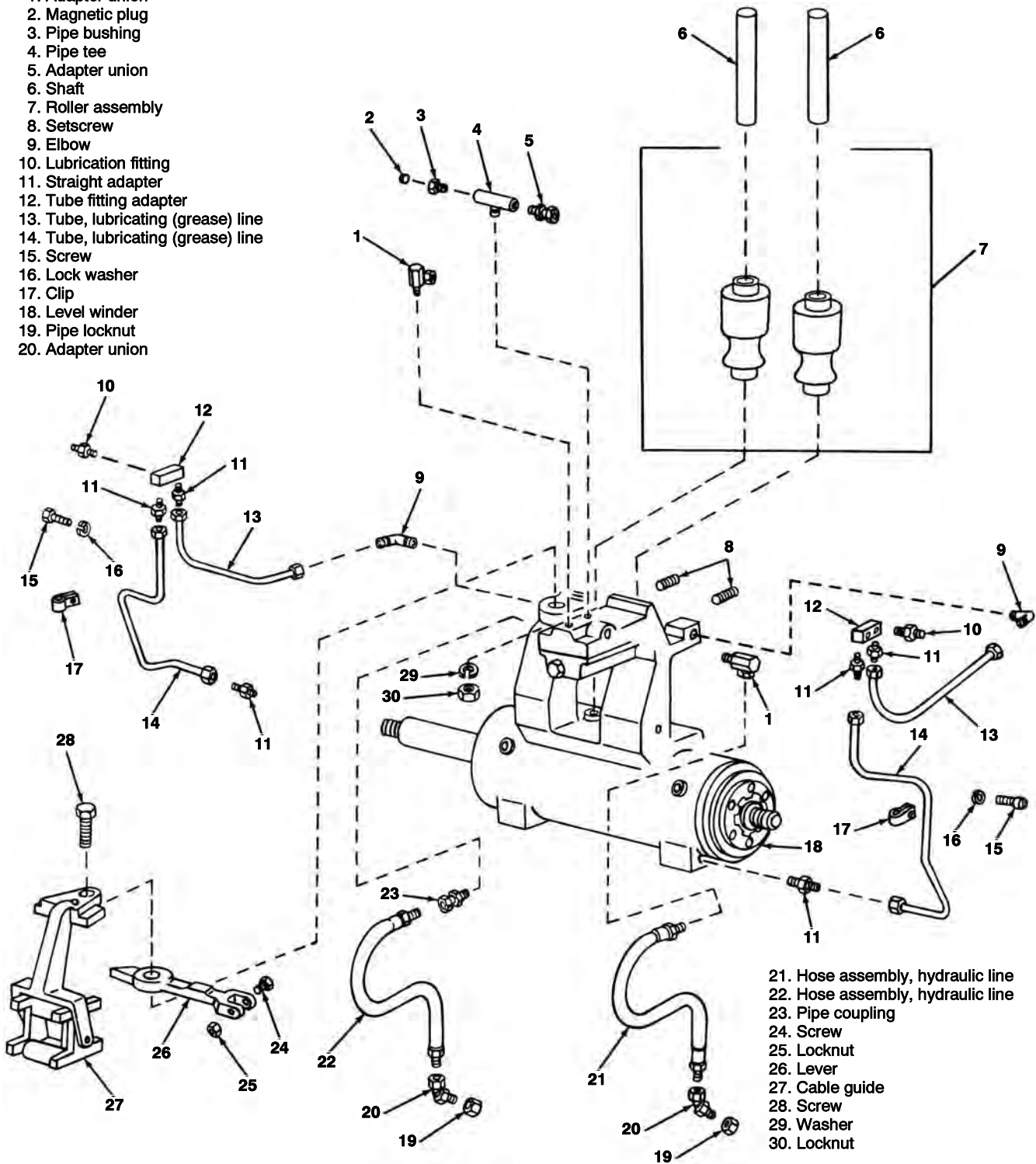
1. Remove two screws (1) and screws (2).
2. Remove main winch cable (3) in accordance with TM 9-2350-256-20.
3. Remove self-locking nut (hidden) (4), washer (hidden) (5), shoulder bolt (6), and arm (7). Discard self-locking nut.

**Disassembly**

1. The following illustration, with its accompanying legend, serves to identify all subassemblies and attaching parts. The step-by-step disassembly procedure is provided after this illustration:

**Legend:**

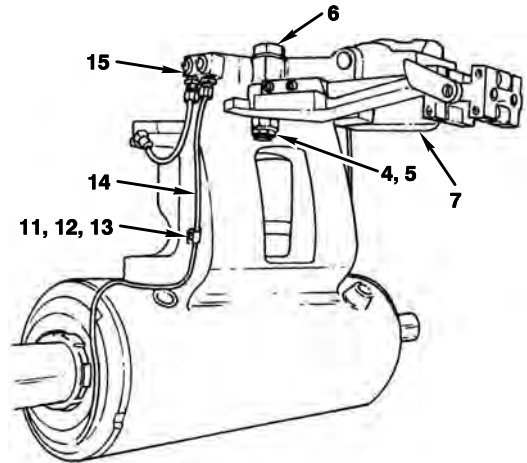
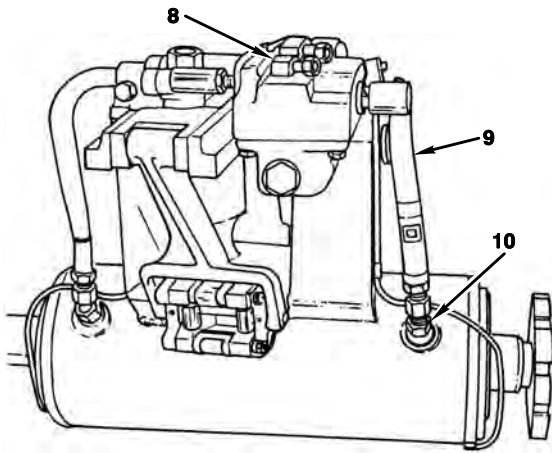
- 1. Adapter union
- 2. Magnetic plug
- 3. Pipe bushing
- 4. Pipe tee
- 5. Adapter union
- 6. Shaft
- 7. Roller assembly
- 8. Setscrew
- 9. Elbow
- 10. Lubrication fitting
- 11. Straight adapter
- 12. Tube fitting adapter
- 13. Tube, lubricating (grease) line
- 14. Tube, lubricating (grease) line
- 15. Screw
- 16. Lock washer
- 17. Clip
- 18. Level winder
- 19. Pipe locknut
- 20. Adapter union



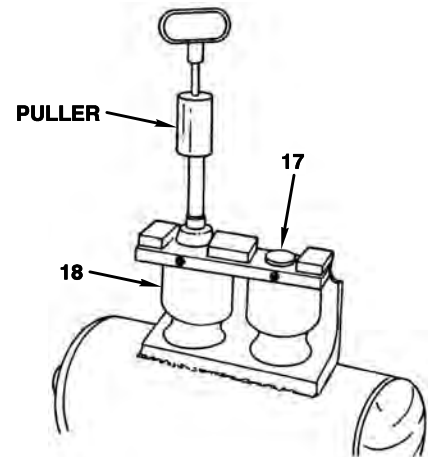
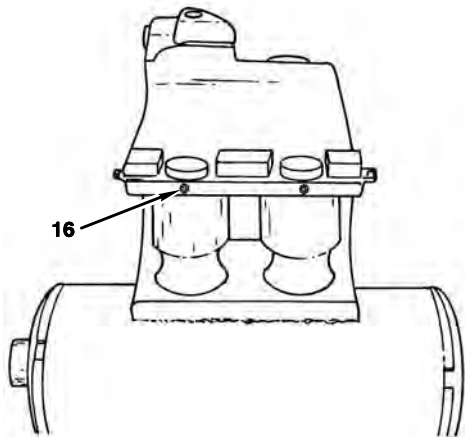
- 21. Hose assembly, hydraulic line
- 22. Hose assembly, hydraulic line
- 23. Pipe coupling
- 24. Screw
- 25. Locknut
- 26. Lever
- 27. Cable guide
- 28. Screw
- 29. Washer
- 30. Locknut

**MAIN WINCH LEVEL WINDER ASSEMBLY, LUBRICATING AND HYDRAULIC LINES.**

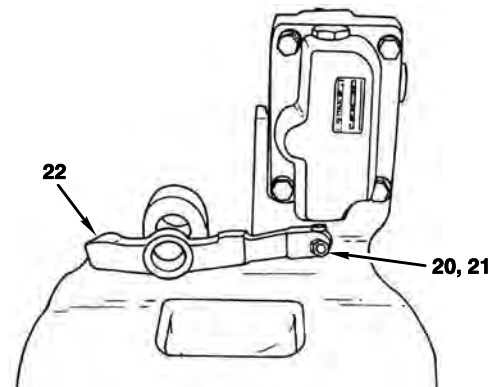
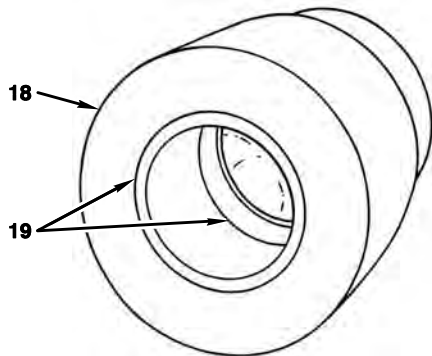
2. Remove two fittings (8), hose assemblies (9), and four hydraulic fittings (10).
3. Remove two screws (11), lockwashers (12), clips (13), tubings (14), and fittings (15). Discard lockwashers.
4. Remove self-locking nut (4), washer (5), shoulder bolt (6), and arm (7). Discard self-locking nut.



5. Remove two retaining screws (16).
6. Using puller, remove two shafts (17) and remove rollers (18).



7. Press out two bearings (19) from rollers (18).
8. Remove self-locking nut (20), screw (21), and lever (22). Discard self-locking nut.



## Cleaning

### WARNING

Solvents 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 solvent gets on skin or clothing, wash immediately with soap and water.

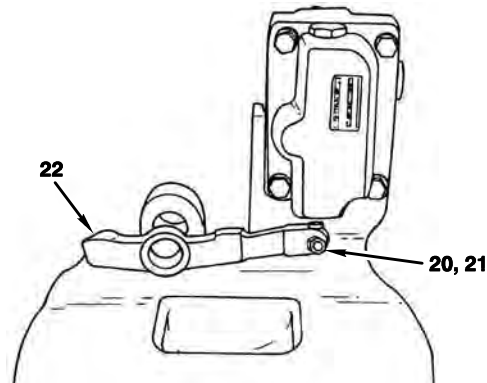
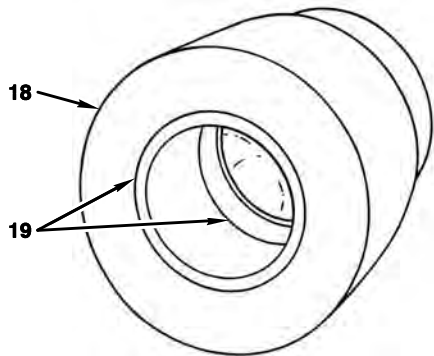
1. Wash all parts, except seals and gaskets, in cleaning compound or paint thinner. Blow parts dry with moisture-free compressed air; then immerse parts in clean oil to prevent rusting.

## Inspection-Acceptance and Rejection Criteria

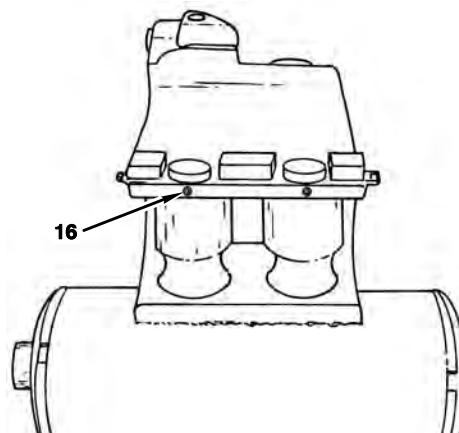
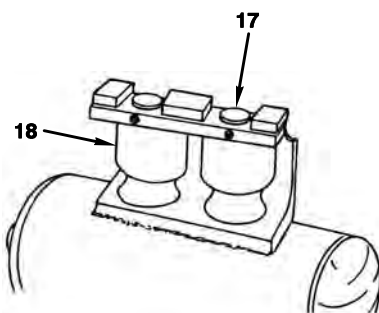
1. Inspect all threaded parts for burrs and damage to threads. Repair damaged threads with a thread chaser.
2. Inspect all hex nuts, hex head screws, and socket head screws for rounded corners. Check screws for bending.
3. Inspect rollers for freedom of movement.

## Assembly

1. Install lever (22), screw (21), and self-locking nut (20).
2. Install two bearings (19) to rollers (18).

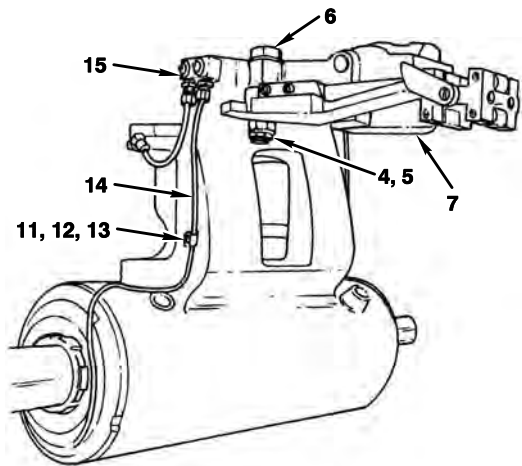
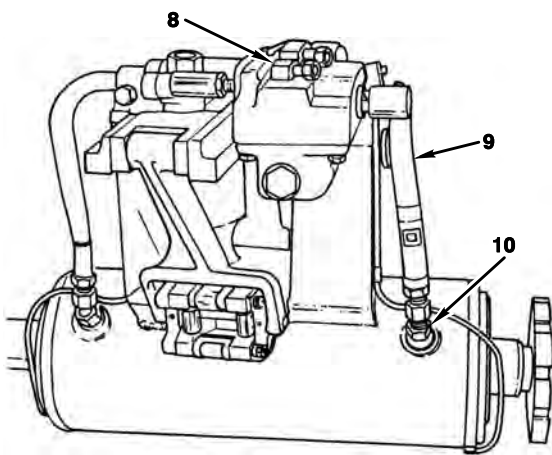


3. Install two rollers (18) and shafts (17).
4. Install two retaining screws (16).





5. Install arm (7), shoulder bolt (6), washer (5), and self-locking nut (4).
6. Install two fittings (15), tubings (14), clips (13), lockwashers (12), and screws (11).
7. Install four hydraulic fittings (10), two hose assemblies (9), and fittings (8).

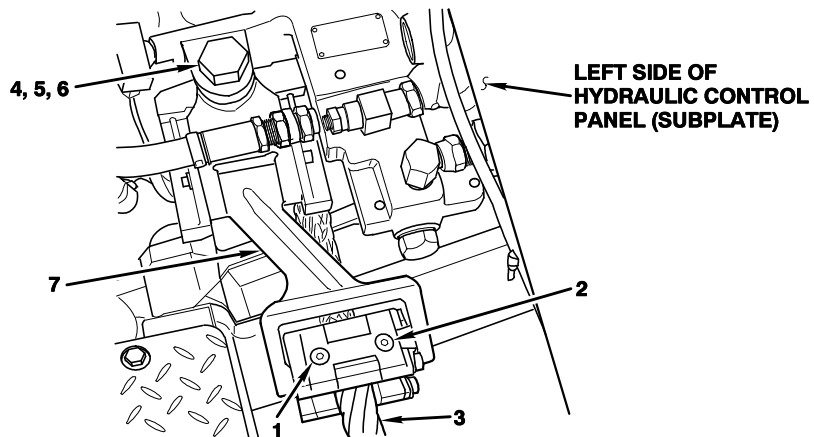


**Installation**

**NOTE**

Steps 1 thru 3 are for installing the arm if it was removed without the entire main winch level winder assembly being removed. Refer to WP 0051 00 for installing the entire main winch level winder assembly.

1. Install arm (7), shoulder bolt (6), washer (hidden) (5), and self-locking nut (hidden) (4).
2. Install main winch cable (3) in accordance with TM 9-2350-256-20.
3. Install two screws (2) and screws (1).



**END OF WORK PACKAGE**



**INTERMEDIATE MAINTENANCE**  
**RECOVERY VEHICLE, FULL TRACKED: MEDIUM, M88A1**  
**NSN 2350-00-122-6826, EIC AQA**

**MAIN WINCH CABLE MAINTENANCE**  
**REMOVAL, DISASSEMBLY, CLEANING, INSPECTION, ASSEMBLY, INSTALLATION**

**INITIAL SETUP:****Tools and Special Tools**

Tool kit, general mechanic's (item 34, WP 0086 00)

**References**

TM 5-725

TM 9-2350-256-10

TM 9-2350-256-20

**Materials/Parts**

Cleaning compound (item 5, WP 0085 00)

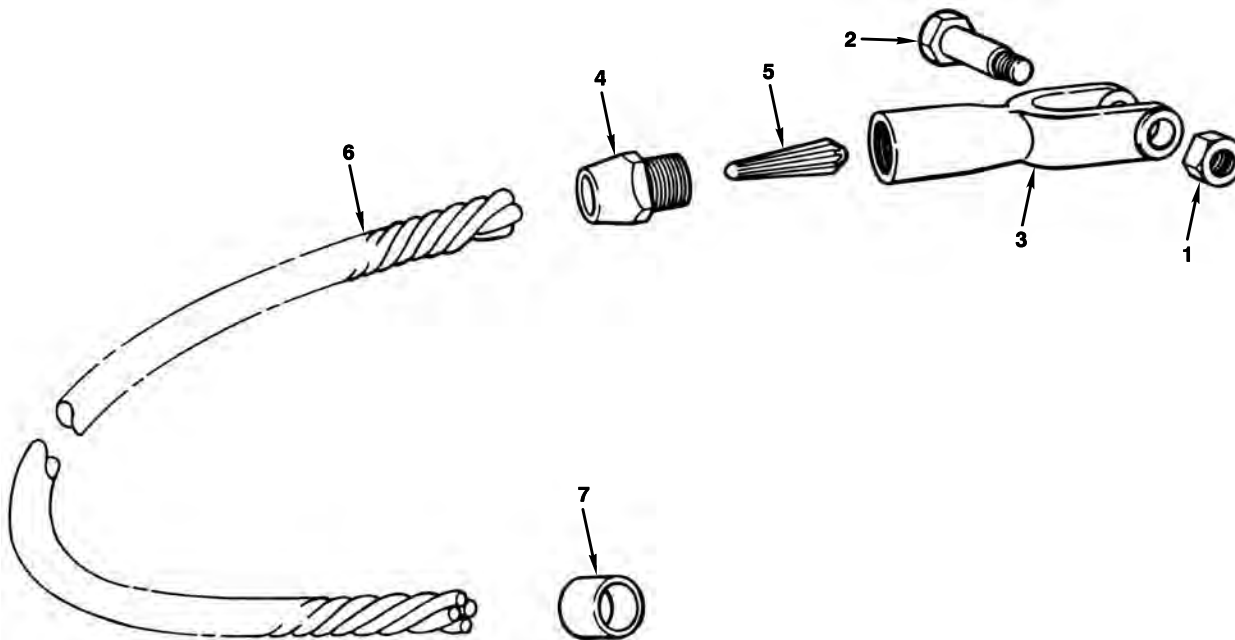
Paint thinner (item 18, WP 0085 00)

**Removal**

1. Pay out main winch cable in accordance with TM 9-2350-256-10 prior to removing it from the vehicle.
2. Remove main winch cable in accordance with TM 9-2350-256-20.

**Disassembly**

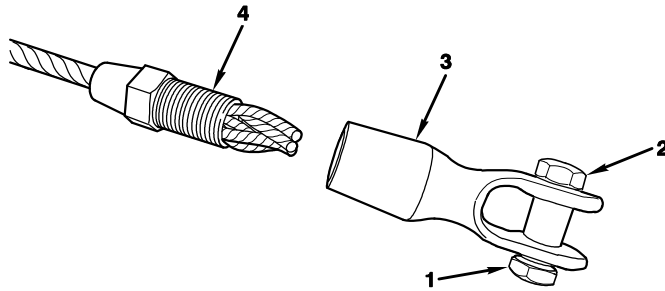
1. The following illustration, with its accompanying legend, serves to identify all parts of the main winch cable. The step-by-step disassembly procedure is provided after this illustration:

**Legend:**

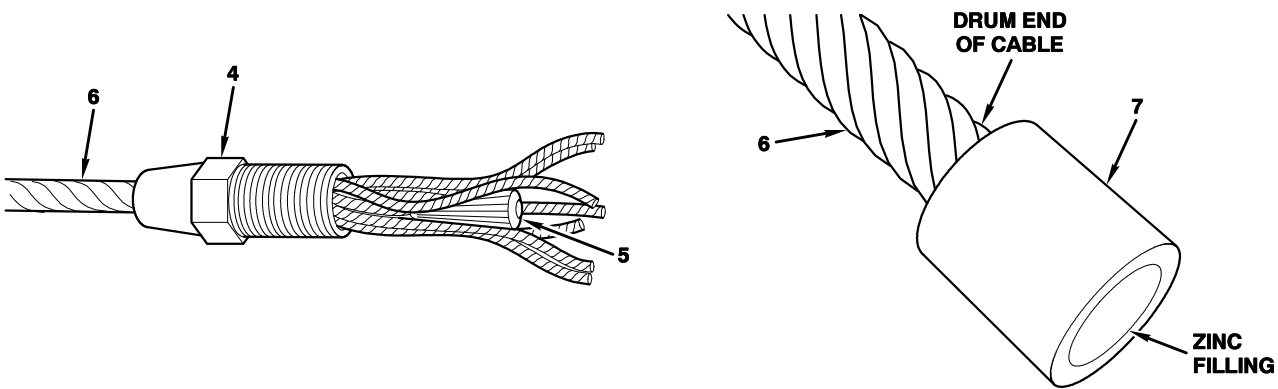
1. Nut
2. Bolt
3. Clevis
4. Sleeve

5. Tapered plug
6. Cable
7. Ferrule

2. Remove nut (1) and bolt (2) from clevis (3).
3. Remove clevis (3) from sleeve (4).



4. Remove tapered plug (5) and sleeve (4) from cable (6).
5. Remove zinc filling and ferrule (7) from drum end of cable (6).



## Cleaning

### **WARNING**

Solvents 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 solvent gets on skin or clothing, wash immediately with soap and water.

1. Wash all parts in cleaning compound or paint thinner, and dry with moisture-free compressed air.

## Inspection-Acceptance and Rejection Criteria

### **NOTE**

Unless otherwise specified, parts should be replaced if any of the defects described below are detected.

1. Inspect cable for kinks or broken strands.
2. Inspect clevis assembly and ferrule for distortion, cracks, and chipped surfaces.
3. Inspect all parts for nicks, burrs, rust, and corrosion. Remove rust, corrosion, burrs, and nicks with a fine file or crocus cloth.

**Assembly****NOTE**

Refer to TM 5-725 for zinc filling methods.

1. Install ferrule (7) and zinc filling to drum end of cable (6).
2. Clamp cable (6) in vise with approximately 12 in. (30.5 cm) projecting up.
3. Hammer sleeve (4) to cable (6), and install tapered plug (5) with small end of plug pointing into center of cable. Place a cable strand into each plug groove and drive plug into sleeve. Hammer cable strands down onto top of tapered plug and install clevis (3).
4. Install bolt (2) and nut (1) to clevis (3).
5. Lubricate main winch cable in accordance with TM 9-2350-256-10.

**Installation**

1. Install main winch cable in accordance with TM 9-2350-256-20.
2. Check cable level winding on winch drum by operating winch and inspecting cable as it winds on the drum. If cable does not spool evenly and fully across the drum, adjust level cylinder piston travel (TM 9-2350-256-20).

**END OF WORK PACKAGE**



**INTERMEDIATE MAINTENANCE**  
**RECOVERY VEHICLE, FULL TRACKED: MEDIUM, M88A1**  
**NSN 2350-00-122-6826, EIC AQA**

**HOIST WINCH CABLE MAINTENANCE**  
**REMOVAL, DISASSEMBLY, CLEANING, INSPECTION, ASSEMBLY, TEST, INSTALLATION**

**INITIAL SETUP:**

**Tools and Special Tools**

Tool kit, general mechanic's (item 34, WP 0086 00)

**References**

TM 5-725  
 TM 9-2350-256-10  
 TM 9-2350-256-20

**Materials/Parts**

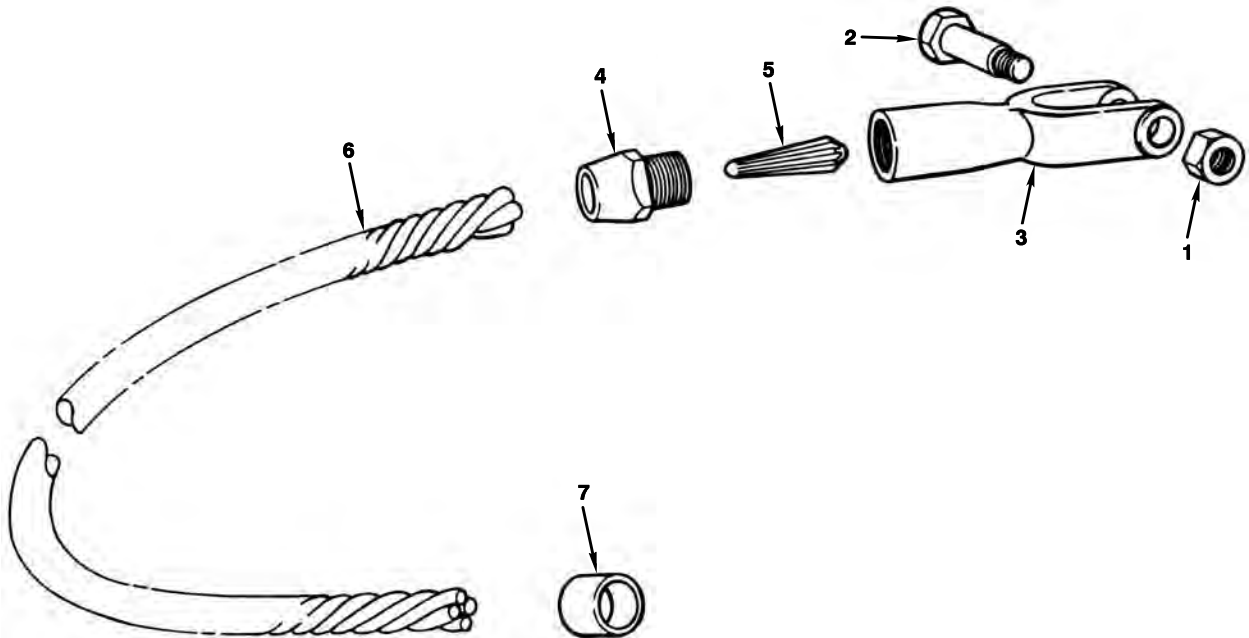
Cleaning compound (item 5, WP 0085 00)  
 Paint thinner (item 18, WP 0085 00)

**Removal**

1. Pay out hoist winch cable in accordance with TM 9-2350-256-10 prior to removing it from the vehicle.
2. Remove hoist winch cable in accordance with TM 9-2350-256-20.

**Disassembly**

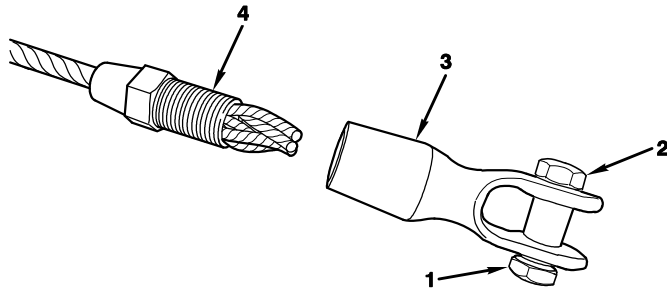
1. The following illustration, with its accompanying legend, serves to identify all parts of the hoist winch cable. The step-by-step disassembly procedure is provided after this illustration:



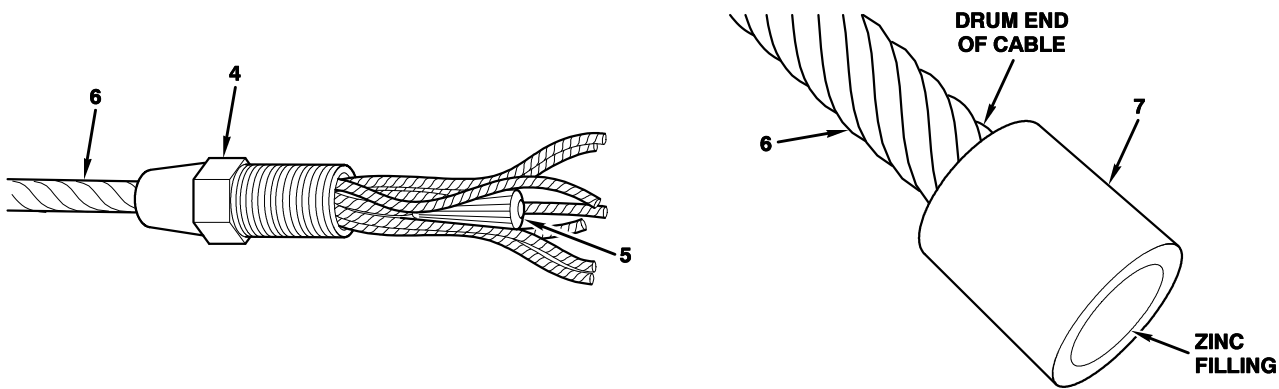
**Legend:**

- |           |                 |
|-----------|-----------------|
| 1. Nut    | 5. Tapered plug |
| 2. Bolt   | 6. Cable        |
| 3. Clevis | 7. Ferrule      |
| 4. Sleeve |                 |

2. Remove nut (1) and bolt (2) from clevis (3).
3. Remove clevis (3) from sleeve (4).



4. Remove tapered plug (5) and sleeve (4) from cable (6).
5. Remove zinc filling and ferrule (7) from drum end of cable (6).



## Cleaning

### **WARNING**

Solvents 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 solvent gets on skin or clothing, wash immediately with soap and water.

1. Wash all parts in cleaning compound or paint thinner, and dry with moisture-free compressed air.

## Inspection-Acceptance and Rejection Criteria

### **NOTE**

Unless otherwise specified, parts should be replaced if any of the defects described below are detected.

1. Inspect cable for kinks or broken strands.
2. Inspect clevis assembly and ferrule for distortion, cracks, and chipped surfaces.
3. Inspect all parts for nicks, burrs, rust, and corrosion. Remove rust, corrosion, burrs, and nicks with a fine file or crocus cloth.



**Assembly****NOTE**

Refer to TM 5-725 for zinc filling methods.

1. Install ferrule (7) and zinc filling to drum end of cable (6).
2. Clamp cable (6) in vise with approximately 12 in. (30.5 cm) projecting up.
3. Hammer sleeve (4) onto cable (6), and install tapered plug (5) with small end of plug pointing into center of cable. Place a cable strand into each plug groove and drive plug into sleeve. Hammer cable strands down onto top of tapered plug and install clevis (3).
4. Install bolt (2) and nut (1) to clevis (3).
5. Lubricate main winch cable in accordance with TM 9-2350-256-10.

**Test and Inspection**

1. Before installing cable on winch, the wire rope assembly is to be tested to 17,800 lb (8074 kg) prior to attaching ferrule on winch end, with the clevis installed and the winch end clamped.

**Installation**

1. Install hoist winch cable in accordance with TM 9-2350-256-20.

**END OF WORK PACKAGE**



**INTERMEDIATE MAINTENANCE**  
**RECOVERY VEHICLE, FULL TRACKED: MEDIUM, M88A1**  
**NSN 2350-00-122-6826, EIC AQA**

**HYDRAULIC CONTROL PANEL (SUBPLATE) ASSEMBLY AND CONTROL VALVES MAINTENANCE**  
**DESCRIPTION, REMOVAL, DISASSEMBLY, CLEANING, INSPECTION, ASSEMBLY, INSTALLATION**

**INITIAL SETUP:****Tools and Special Tools**

Lifting eyes (2) (item 21, WP 0086 00)  
 Sling (item 30, WP 0086 00)  
 Sling assembly, lifting (item 31, WP 0086 00)  
 Tool kit, general mechanic's (item 34, WP 0086 00)

**Materials/Parts**

Cleaning compound (item 5, WP 0085 00)  
 Oil (item 8, WP 0085 00)  
 Paint thinner (item 18, WP 0085 00)  
 Lockwashers (4) (item 158, WP 0087 00)  
 Lockwashers (11) (item 160, WP 0087 00)  
 Lockwashers (8) (item 161, WP 0087 00)  
 Lockwashers (8) (item 162, WP 0087 00)  
 Lockwashers (14) (item 163, WP 0087 00)  
 Nuts (4) (item 172, WP 0087 00)  
 Packings (3) (item 126, WP 0087 00)  
 Packings (2) (item 127, WP 0087 00)  
 Packings (8) (item 128, WP 0087 00)  
 Packings (3) (item 130, WP 0087 00)  
 Packings (2) (item 131, WP 0087 00)  
 Packings (6) (item 133, WP 0087 00)  
 Pin (item 178, WP 0087 00)  
 Pin (item 190, WP 0087 00)  
 Pins (2) (item 191, WP 0087 00)  
 Pins (2) (item 193, WP 0087 00)  
 Pins (2) (item 194, WP 0087 00)  
 Pins (2) (item 195, WP 0087 00)  
 Pin (item 196, WP 0087 00)

**Materials/Parts (cont.)**

Pins, cotter (20) (item 115, WP 0087 00)  
 Pins, cotter (2) (item 117, WP 0087 00)  
 Pins, spring (7) (item 92, WP 0087 00)  
 Screws (4) (item 50, WP 0087 00)  
 Screws (6) (item 60, WP 0087 00)  
 Screws (6) (item 71, WP 0087 00)  
 Screws (2) (item 72, WP 0087 00)  
 Screws (4) (item 73, WP 0087 00)  
 Screws (9) (item 98, WP 0087 00)  
 Screws (5) (item 101, WP 0087 00)  
 Screws (8) (item 103, WP 0087 00)  
 Screws (2) (item 208, WP 0087 00)  
 Screws (2) (item 209, WP 0087 00)  
 Screws (7) (item 210, WP 0087 00)  
 Screws (2) (item 212, WP 0087 00)  
 Screws (2) (item 214, WP 0087 00)  
 Screws (2) (item 217, WP 0087 00)  
 Washers (2) (item 119, WP 0087 00)  
 Washers (4) (item 120, WP 0087 00)  
 Washers (8) (item 122, WP 0087 00)

**Personnel Required**

Mechanics (3)

**Equipment Condition**

Shift control removed (TM 9-2350-256-20)  
 APU control box removed (TM 9-2350-256-20)  
 Mechanic's seat removed (TM 9-2350-256-20)

**DESCRIPTION**

The seven control valves comprising part of the main hydraulic subplate assembly can be removed and replaced individually if defective. Removal and installation of these individual valves, as well as the main hydraulic subplate assembly as a unit, are described and illustrated in this WP.

## Removal

1. Remove six knobs (1).
2. Remove three clamps (2) and wiring harness (3).
3. Disconnect two electrical connectors (4).
4. Remove two cotter pins (5), pin (6), and disconnect linkage (7). Discard cotter pins.
5. Remove two screws (8), lockwashers (9), and drain valve control (10). Discard lockwashers.

## CAUTION

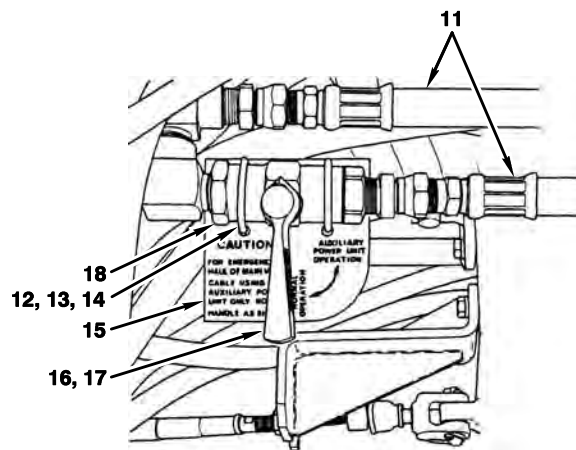
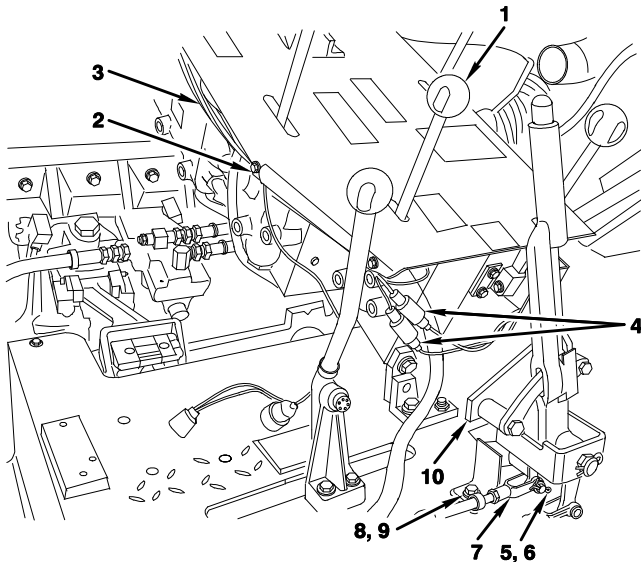
Close APU emergency winch control valve (18) for main hydraulic system operation.

6. Disconnect two hydraulic lines (11).

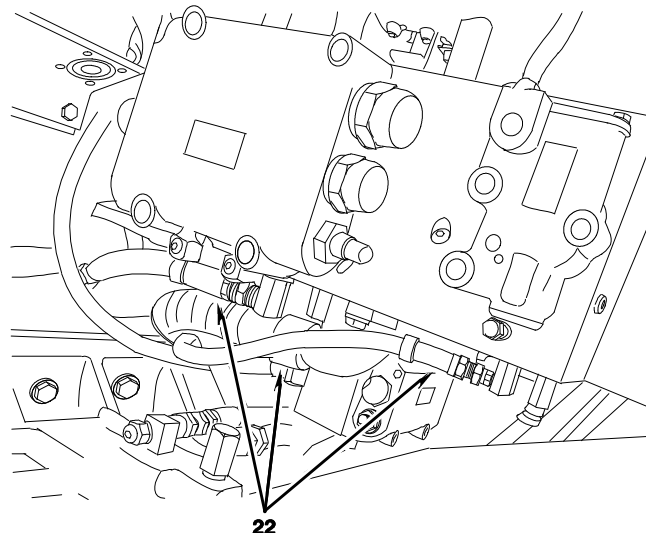
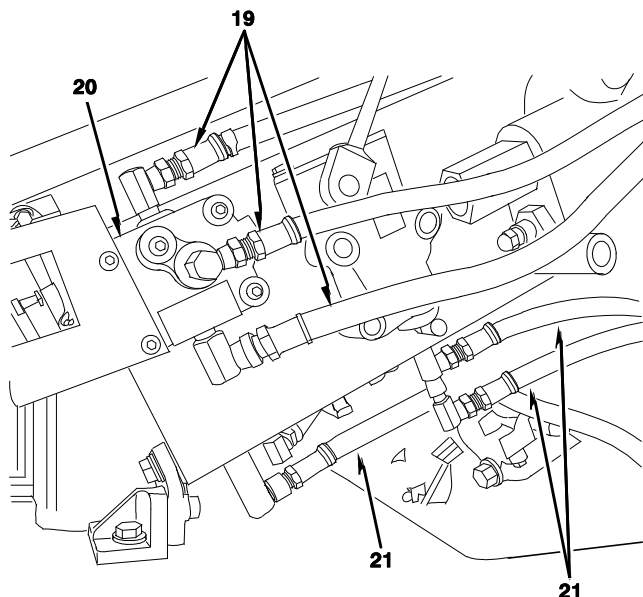
## NOTE

Perform steps 7 thru 9 to replace APU emergency winch control valve (18) only. If not replacing APU emergency winch control valve, proceed to step 10.

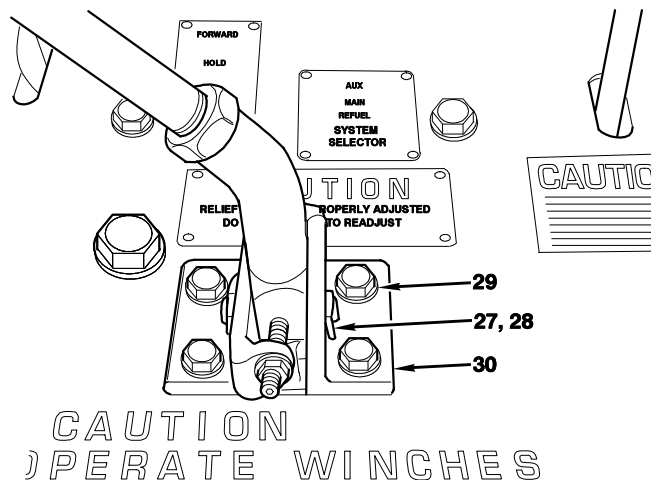
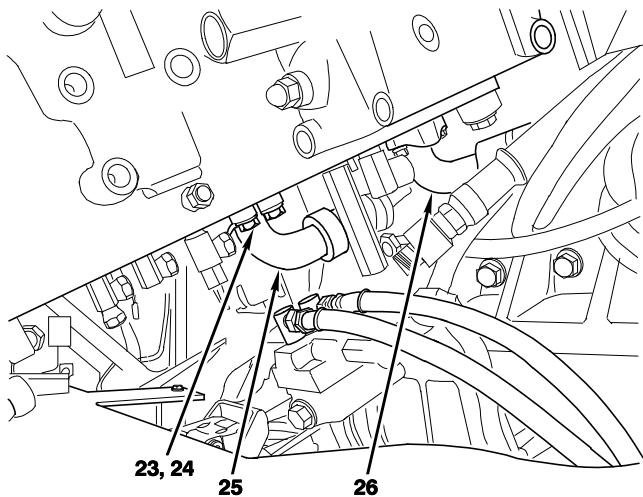
7. Remove four nuts (12), lockwashers (13), two U-clamps (14), and plate (15). Discard lockwashers.
8. Remove capscrew (hidden) (16) and handle (17).
9. Unscrew APU emergency winch control valve (18).



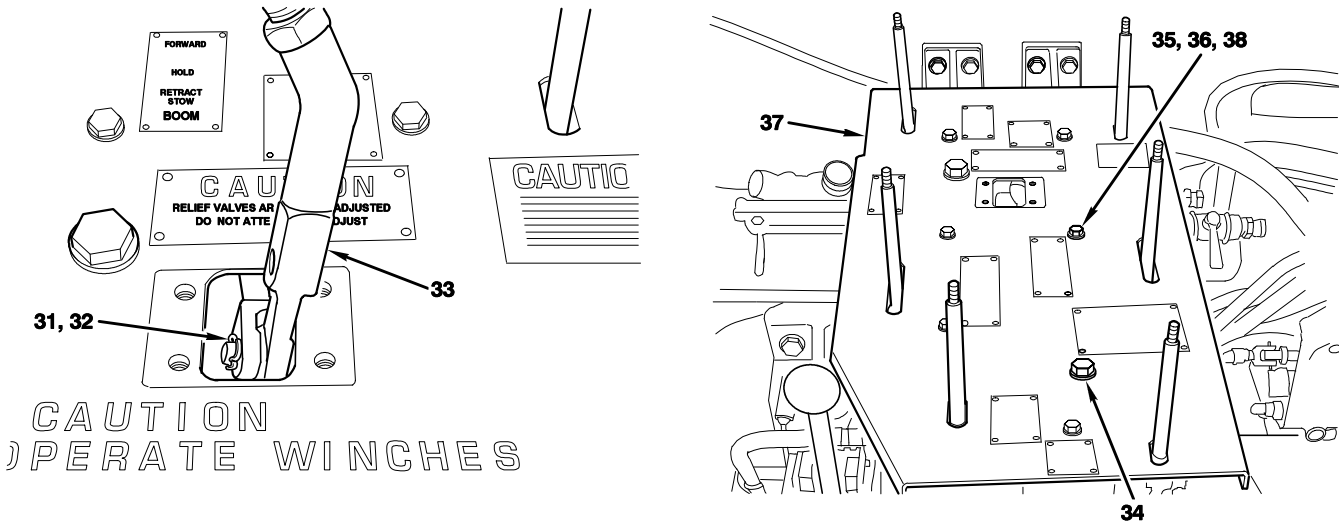
10. Disconnect three hydraulic lines (19) from power control valve (20).
11. Disconnect nine hydraulic lines (21) from underside.
12. Disconnect three hydraulic lines (22) from underside.



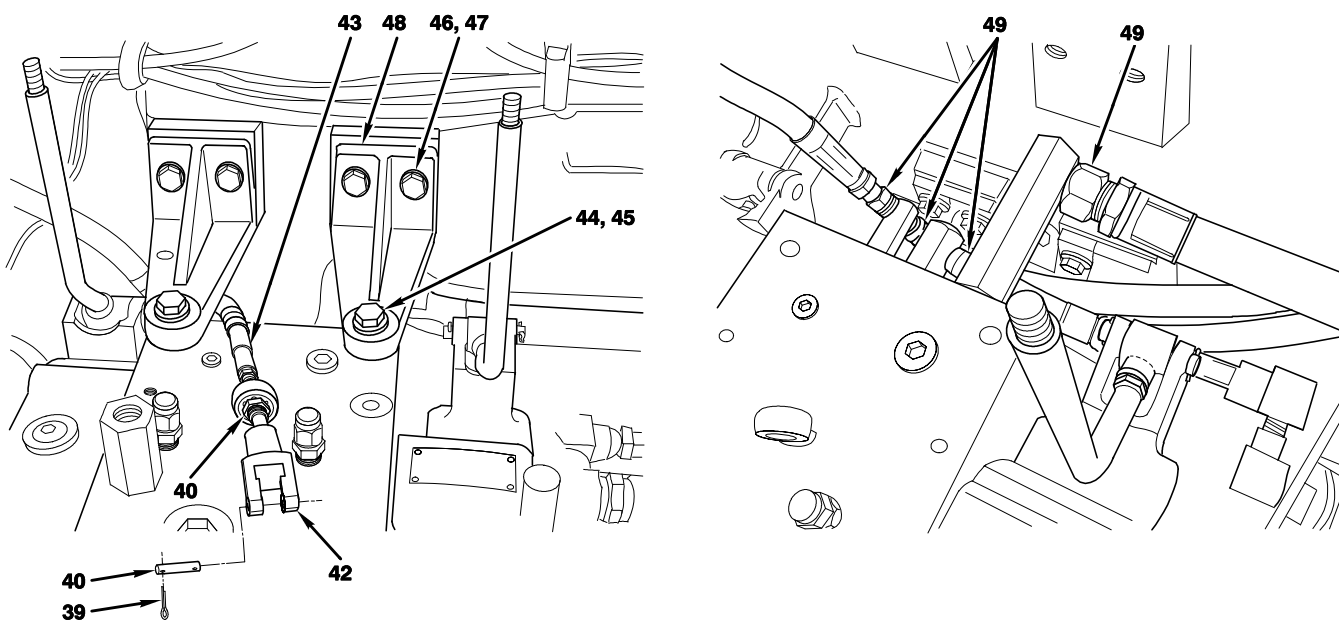
13. Remove eight screws (23) and lockwashers (24) and disconnect two flange-type hoses (25 and 26) from underside. Discard lockwashers.
14. Remove two cotter pins (27) and pin (28). Discard cotter pins.
15. Remove four screws (29) and bracket (with adjustment screws) (30).



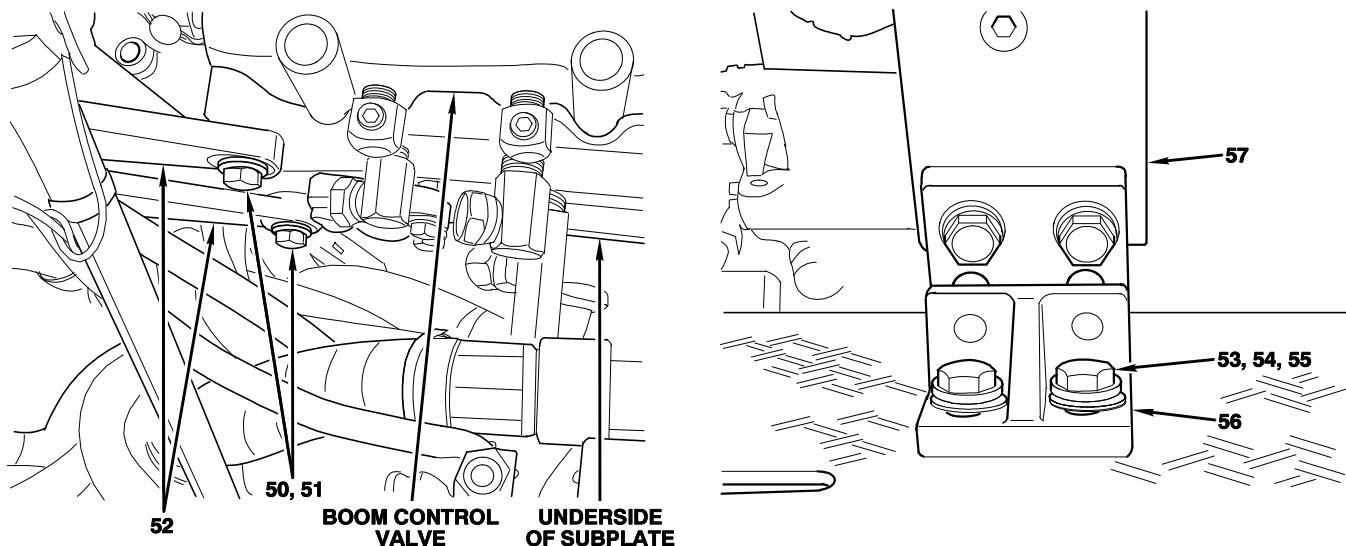
16. Remove two cotter pins (31), pin (32), and spade control lever (33). Discard cotter pins.
17. Remove two large screws (34), six small screws (35), lockwashers (36), cover (37), and spacers (beneath cover) (38). Discard lockwashers.



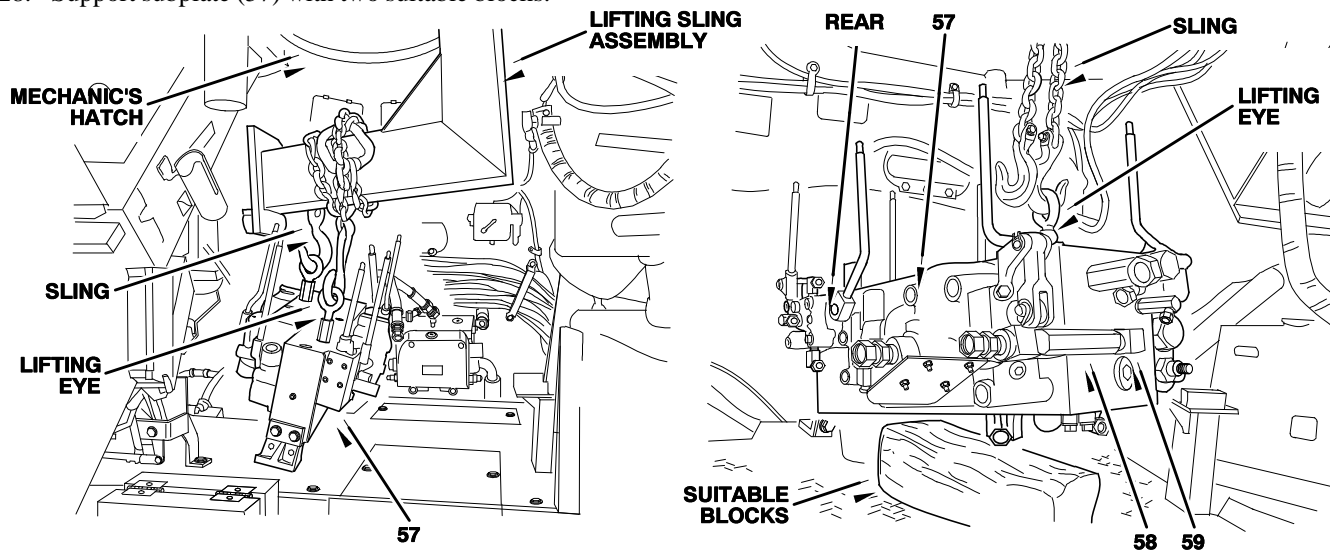
18. Remove two cotter pins (39) and pin (40). Discard cotter pins.
19. Loosen two jamnuts (41), unscrew clevis (42), and disconnect spade control cable (43).
20. Remove two screws (44), lockwashers (45), four screws (46), lockwashers (47), and two top front mounting brackets (48). Discard lockwashers.
21. Disconnect four hydraulic lines (49) from front.



22. Remove two screws (50) and lockwashers (51) from two bottom front mounting brackets (52). Discard lockwashers.
23. Remove two screws (53), lockwashers (54), and washers (55) from rear mounting bracket (56). Do not remove rear mounting bracket from subplate (57). Discard lockwashers.



24. Install lifting eye to subplate (57).
25. Lower sling thru mechanic's hatch. Support subplate (57) with two suitable blocks and attach sling to lifting eye. Using sling and lifting sling assembly, move subplate under mechanic's hatch.
26. Remove fittings (58) from elbow (59).
27. Remove sling and move lifting eye to rear of subplate (57).
28. Support subplate (57) with two suitable blocks.

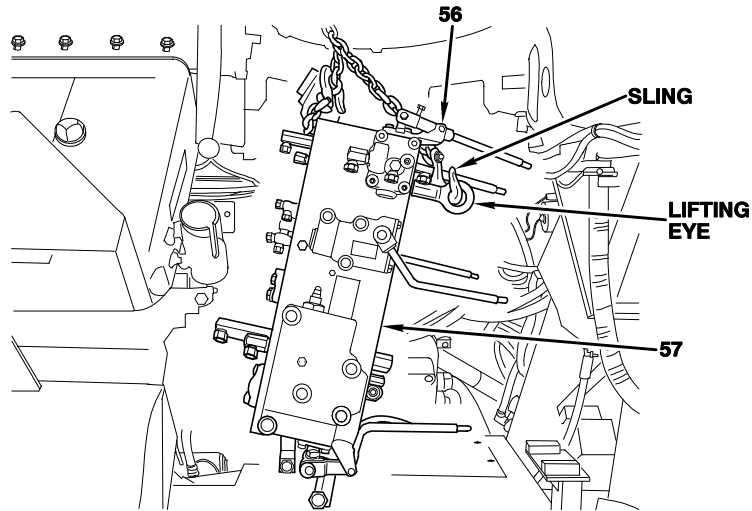


29. Attach sling to lifting eye and rear mounting bracket (56).

### **CAUTION**

Guide subplate (57) carefully thru mechanic's hatch to avoid damaging levers and fittings.

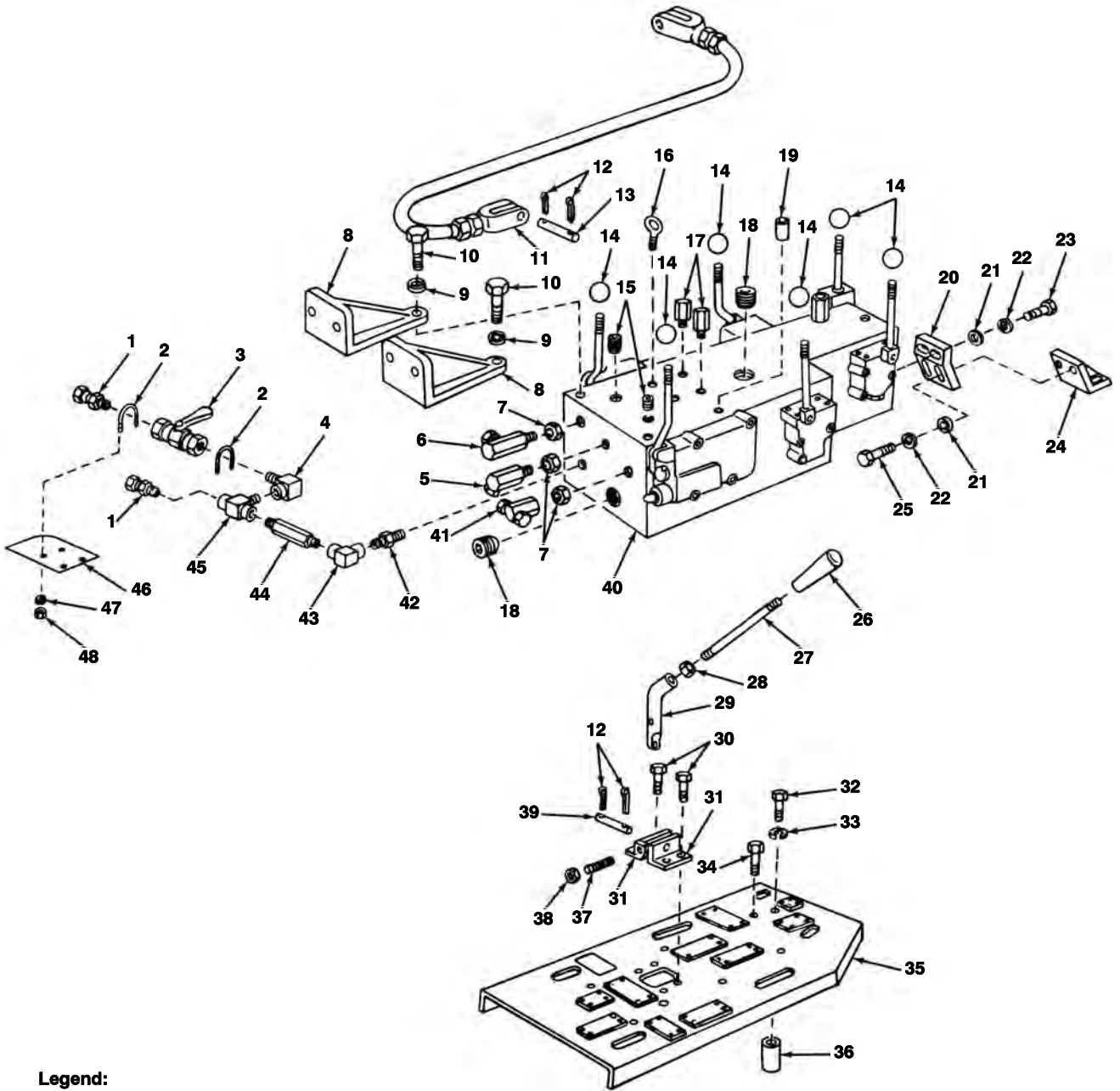
30. Remove subplate (57) thru mechanic's hatch.



### **Disassembly**

1. The following four illustrations, with accompanying legends, serve to identify all subassemblies and attaching parts. The step-by-step disassembly procedure is provided after these four illustrations:

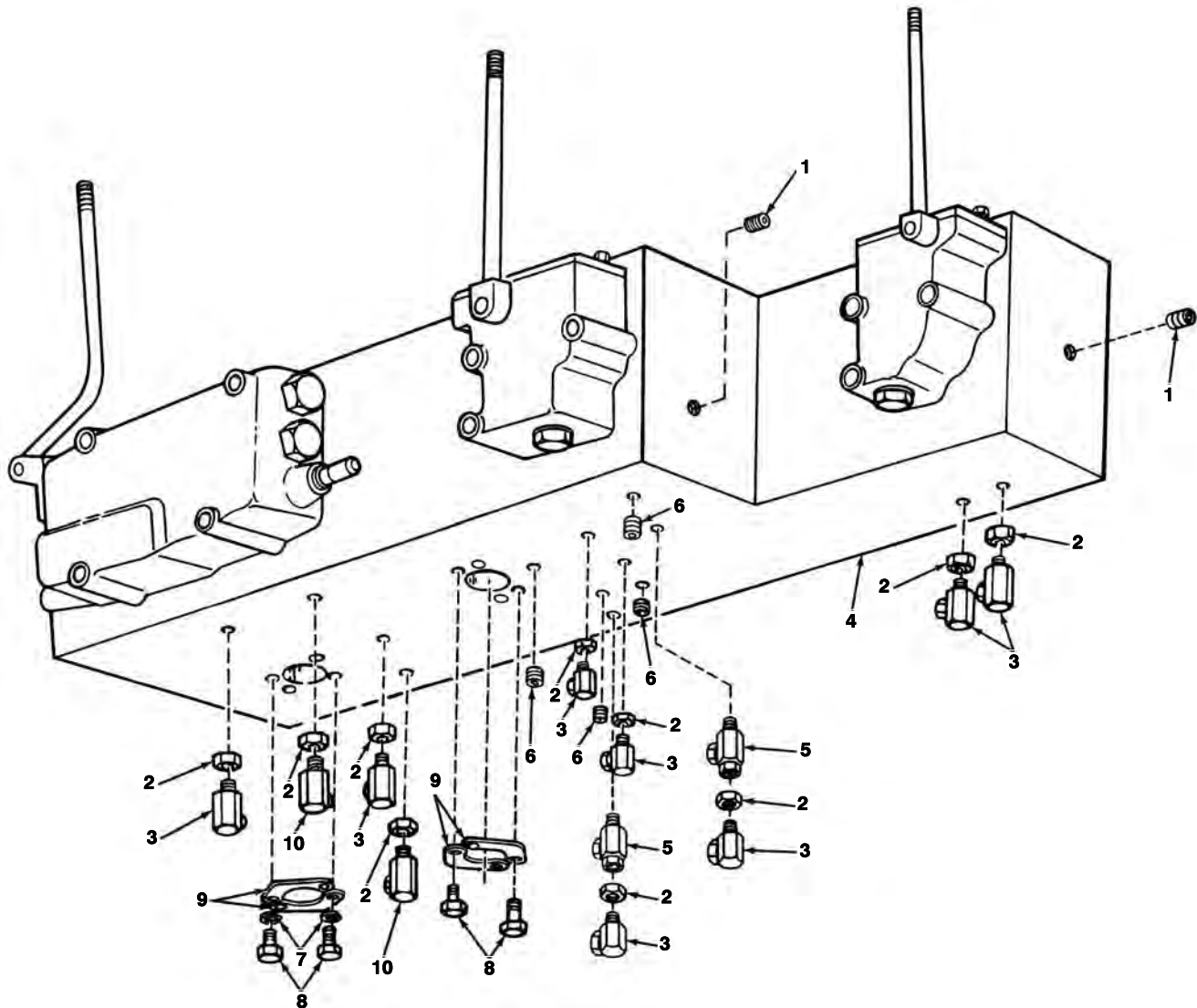




**Legend:**

- |                             |                        |                    |                      |
|-----------------------------|------------------------|--------------------|----------------------|
| 1. Union                    | 13. Pin                | 25. Screw          | 37. Adjustment screw |
| 2. Clamp                    | 14. Knob               | 26. Handle         | 38. Jamnut           |
| 3. APU control valve        | 15. Magnetic pipe plug | 27. Rod            | 39. Pin              |
| 4. Elbow                    | 16. Rod end            | 28. Nut            | 40. Main subplate    |
| 5. Elbow                    | 17. Bleeder valve      | 29. Connector      | 41. Tee              |
| 6. Adapter union            | 18. Magnetic pipe plug | 30. Screw          | 42. Nipple           |
| 7. Pipe nut                 | 19. Extension stud     | 31. Handle bracket | 43. Elbow            |
| 8. Front mounting bracket   | 20. Support            | 32. Screw          | 44. Nipple           |
| 9. Lockwasher               | 21. Washer             | 33. Lockwasher     | 45. Tee              |
| 10. Screw                   | 22. Lockwasher         | 34. Screw          | 46. Plate            |
| 11. Control lever and cable | 23. Screw              | 35. Cover plate    | 47. Lockwasher       |
| 12. Cotter pin              | 24. Bracket            | 36. Spacer         | 48. Nut              |

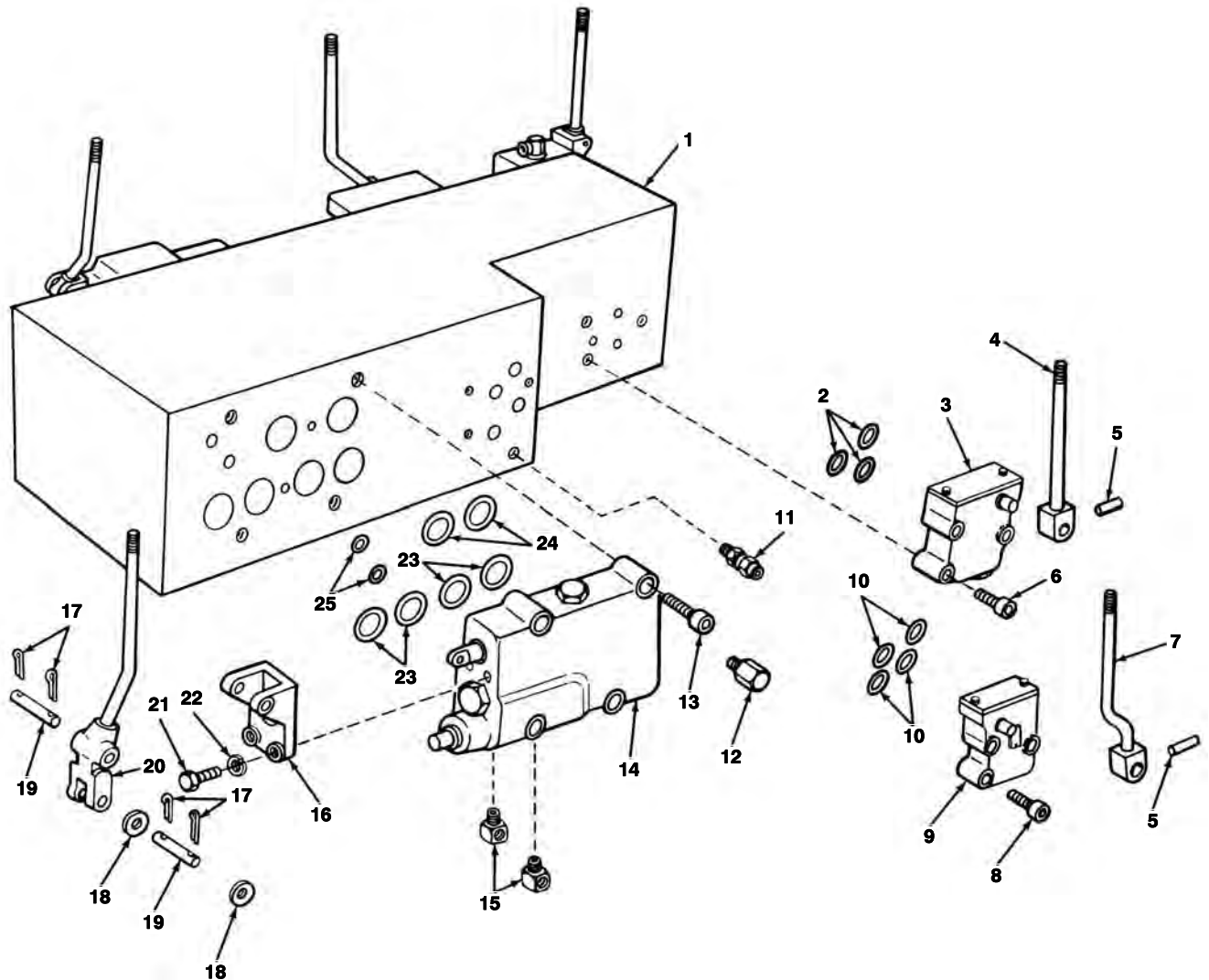
**HYDRAULIC SUBPLATE, COVER PLATE, AND PARTS.**



**Legend:**

- |                  |                  |
|------------------|------------------|
| 1. Magnetic plug | 6. Magnetic plug |
| 2. Pipe nut      | 7. Lockwasher    |
| 3. Elbow         | 8. Screw         |
| 4. Subplate      | 9. Flange        |
| 5. Tee           | 10. Elbow        |

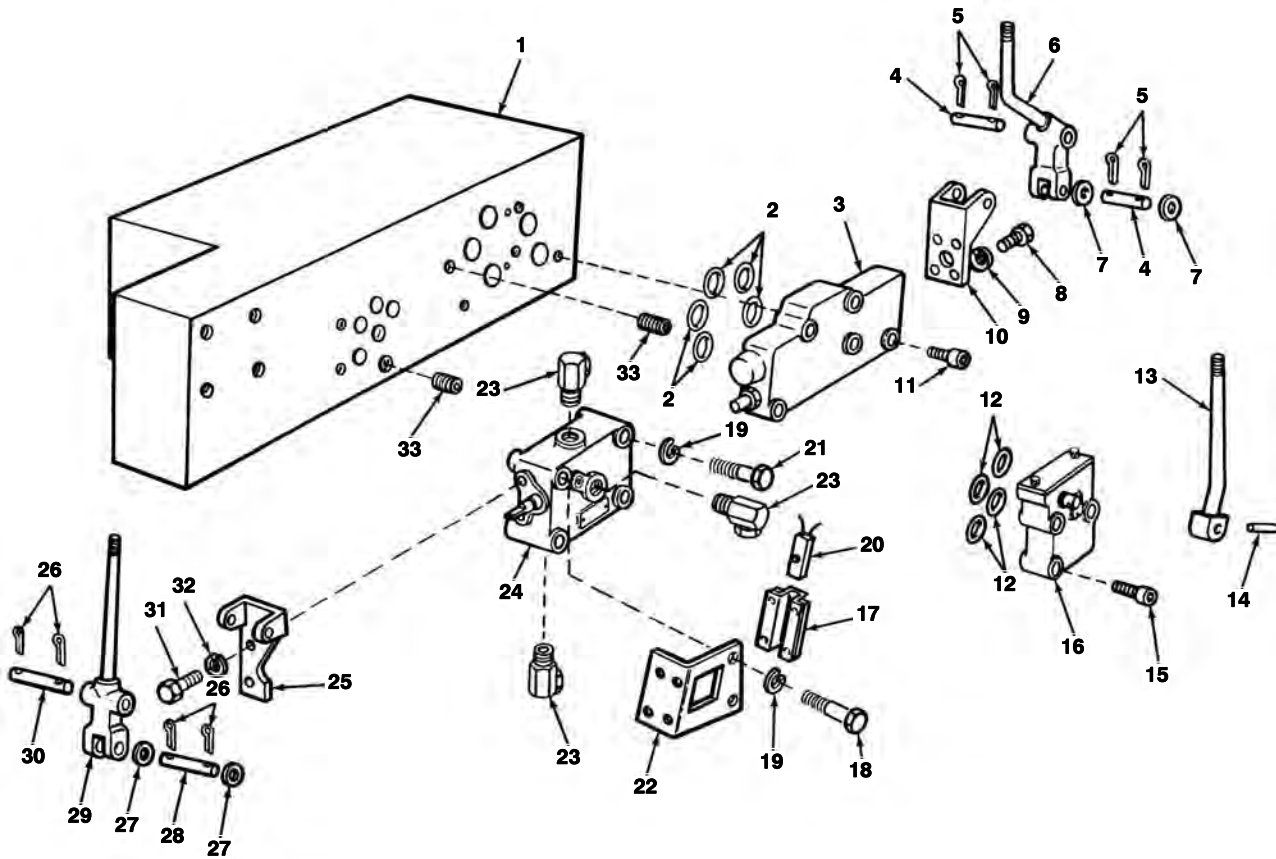
**SUBPLATE, FITTINGS, AND PLUGS.**



**Legend:**

- |                              |                                    |
|------------------------------|------------------------------------|
| 1. Subplate                  | 14. Boom combination control valve |
| 2. Packing ring              | 15. Elbow                          |
| 3. Boom safety valve         | 16. Bracket                        |
| 4. Lever                     | 17. Cotter pin                     |
| 5. Roll pin                  | 18. Washer                         |
| 6. Screw                     | 19. Pin                            |
| 7. Lever                     | 20. Lever                          |
| 8. Screw                     | 21. Screw                          |
| 9. Hoist winch control valve | 22. Lockwasher                     |
| 10. Packing                  | 23. Packing                        |
| 11. Bleeder valve            | 24. Packing                        |
| 12. Magnetic plug            | 25. Packing                        |

**BOOM SAFETY VALVE, CONTROL VALVES, AND CONTROL LEVERS.**



**Legend:**

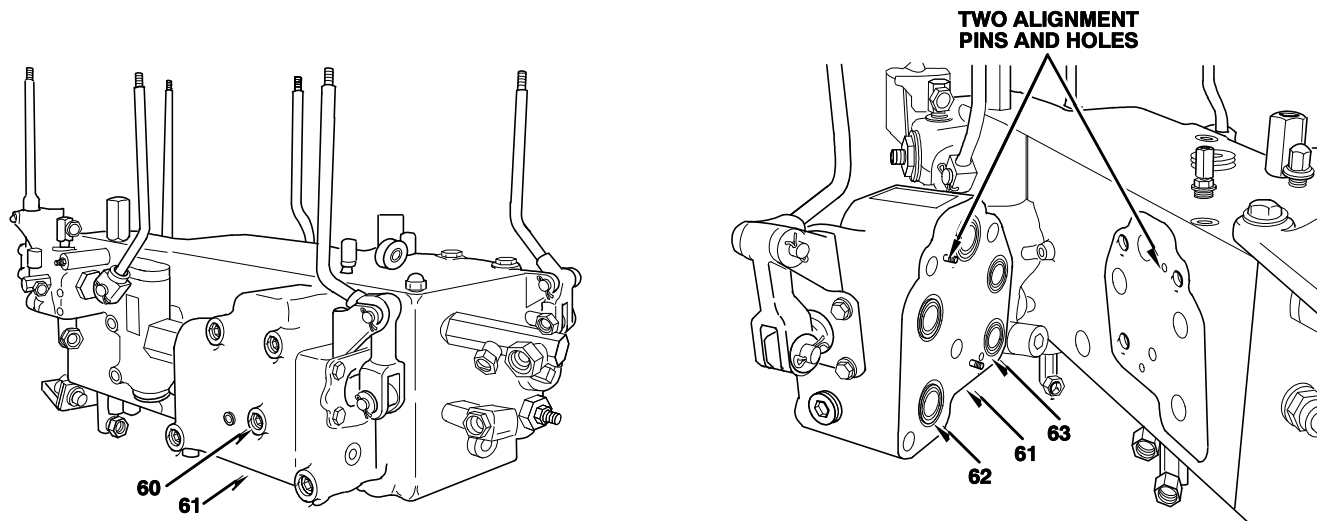
- |                              |                         |
|------------------------------|-------------------------|
| 1. Subplate                  | 18. Screw               |
| 2. Packing                   | 19. Lockwasher          |
| 3. System selector valve     | 20. Switch              |
| 4. Pin                       | 21. Screw               |
| 5. Cotter pin                | 22. Bracket             |
| 6. Lever                     | 23. Adapter union       |
| 7. Washer                    | 24. Power control valve |
| 8. Screw                     | 25. Bracket             |
| 9. Lockwasher                | 26. Cotter pin          |
| 10. Bracket                  | 27. Washer              |
| 11. Screw                    | 28. Pin                 |
| 12. Packing                  | 29. Lever               |
| 13. Lever                    | 30. Pin                 |
| 14. Spring pin               | 31. Screw               |
| 15. Screw                    | 32. Lockwasher          |
| 16. Main winch control valve | 33. Magnetic plug       |

**SYSTEM SELECTOR VALVE, CONTROL VALVES, AND CONTROL LEVERS.**

**NOTE**

Perform steps 2 thru 6 to remove system selector valve.

2. Remove five screws (60) and system selector valve (61).
3. Remove and discard three packings (62) and two packings (63) from system selector valve (61).

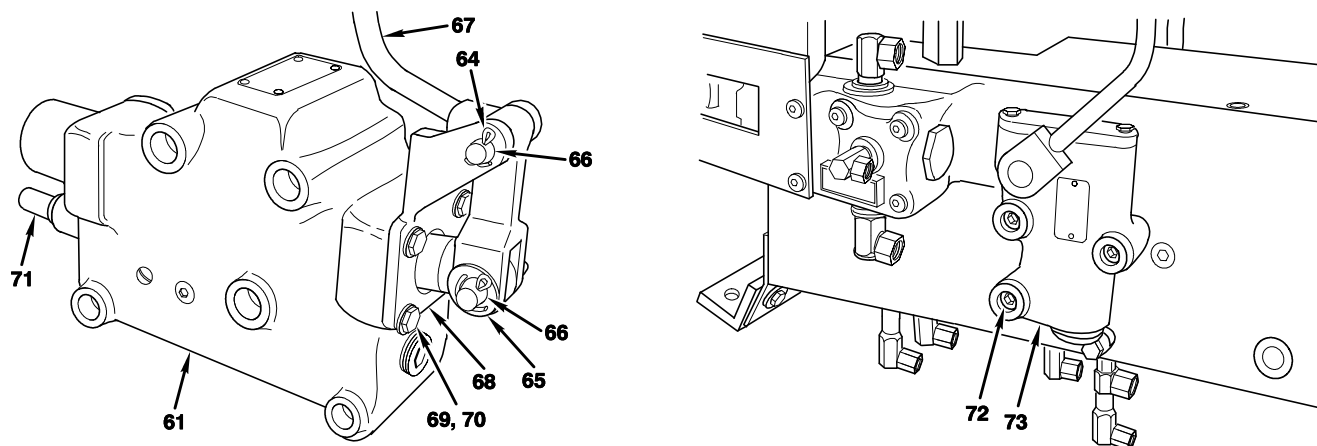


4. Remove four cotter pins (64), washers (65), two pins (66), and lever (67) from bracket (68). Discard cotter pins.
5. Remove four screws (69), lockwashers (70), and bracket (68) from system selector valve (61). Discard lockwashers.
6. Do not remove adjustment screw (71).

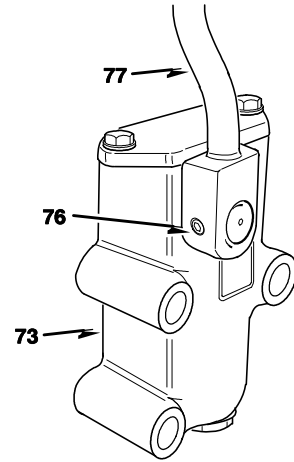
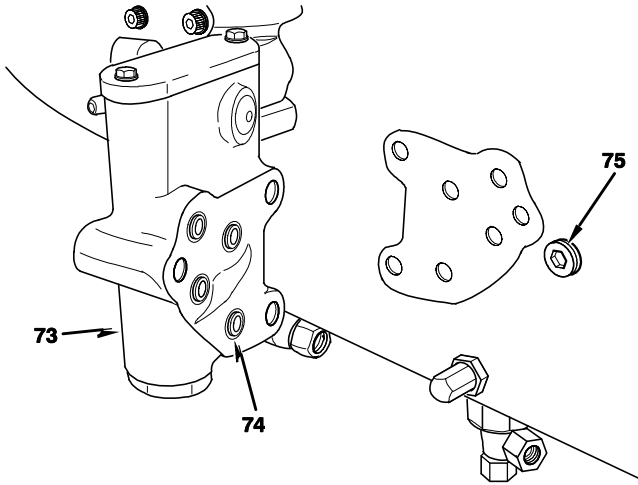
**NOTE**

Perform steps 7 thru 10 to remove main winch control valve.

7. Remove three screws (72) and main winch control valve (73).



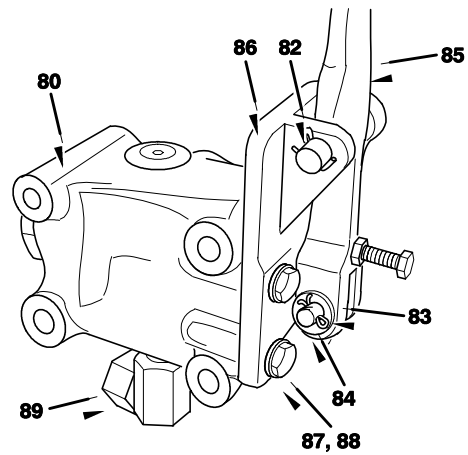
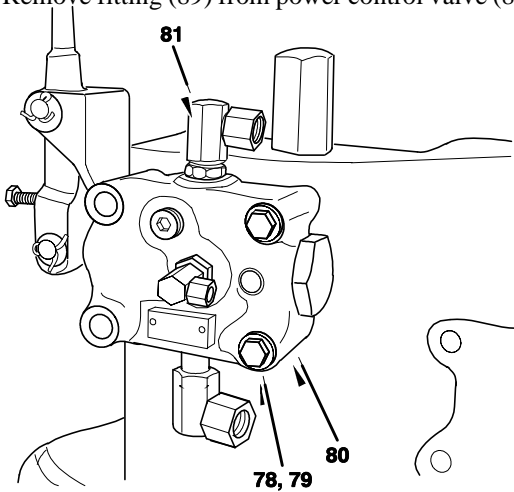
8. Remove and discard four packings (74) from main winch control valve (73).
9. Remove magnetic plug (75).
10. Drive out spring pin (76) and remove lever (77) from main winch control valve (73). Discard spring pin.



**NOTE**

Perform steps 11 thru 15 to remove power control valve.

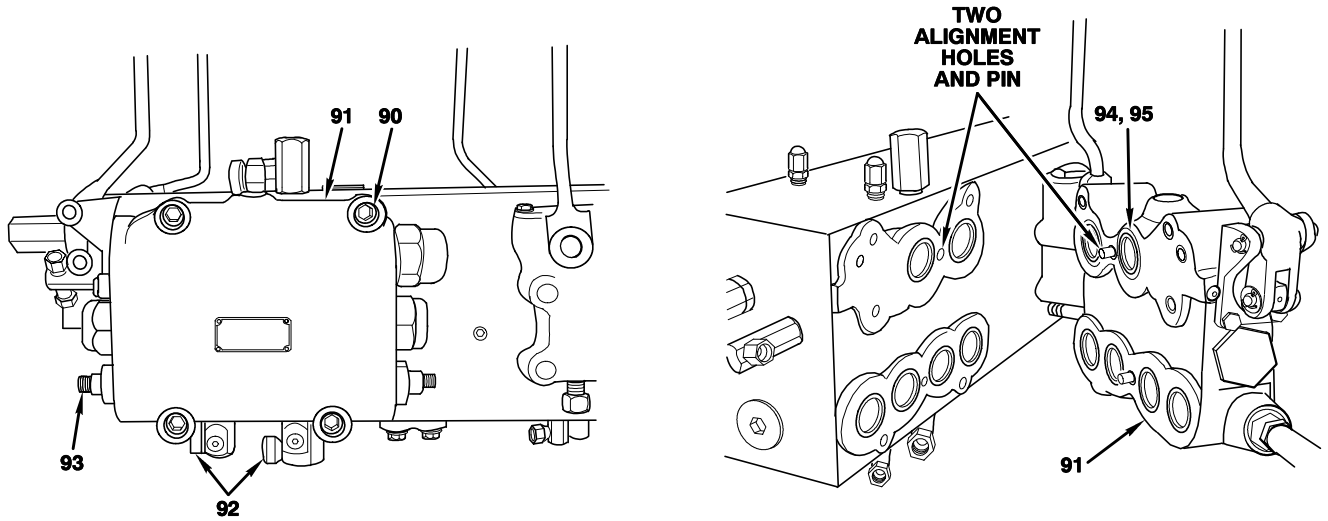
11. Remove two screws (78), lockwashers (79), and power control valve (80). Discard lockwashers.
12. Remove adapter union (81) from power control valve (80).
13. Remove four cotter pins (82), washers (83), two pins (84), and lever (85) from bracket (86). Discard cotter pins.
14. Remove two screws (87), lockwashers (88), and bracket (86) from power control valve (80). Discard lockwashers.
15. Remove fitting (89) from power control valve (80).



**NOTE**

Perform steps 16 thru 20 to remove boom combination control valve.

16. Remove four screws (90) and boom combination control valve (91).
17. Remove two gage ports (92). Do not remove adjustment screw (93).
18. Remove and discard two packings (94) and six packings (95) from boom combination control valve (91).

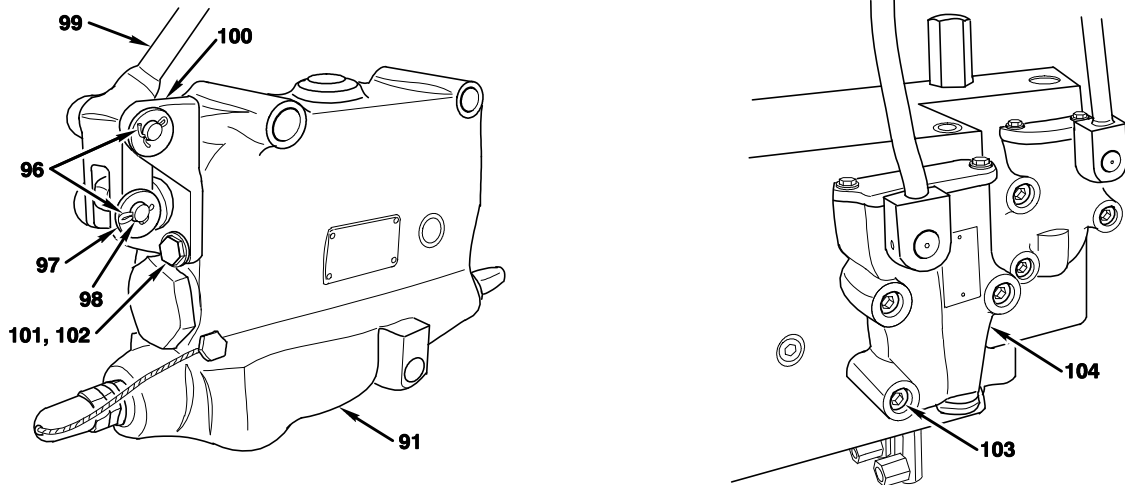


19. Remove four cotter pins (96), washers (97), two pins (98), and lever (99) from bracket (100). Discard cotter pins.
20. Remove three screws (101), lockwashers (102), and bracket (100) from boom combination control valve (91). Discard lockwashers.

**NOTE**

Perform steps 21 thru 24 to remove hoist winch control valve.

21. Remove three screws (103) and hoist winch control valve (104).

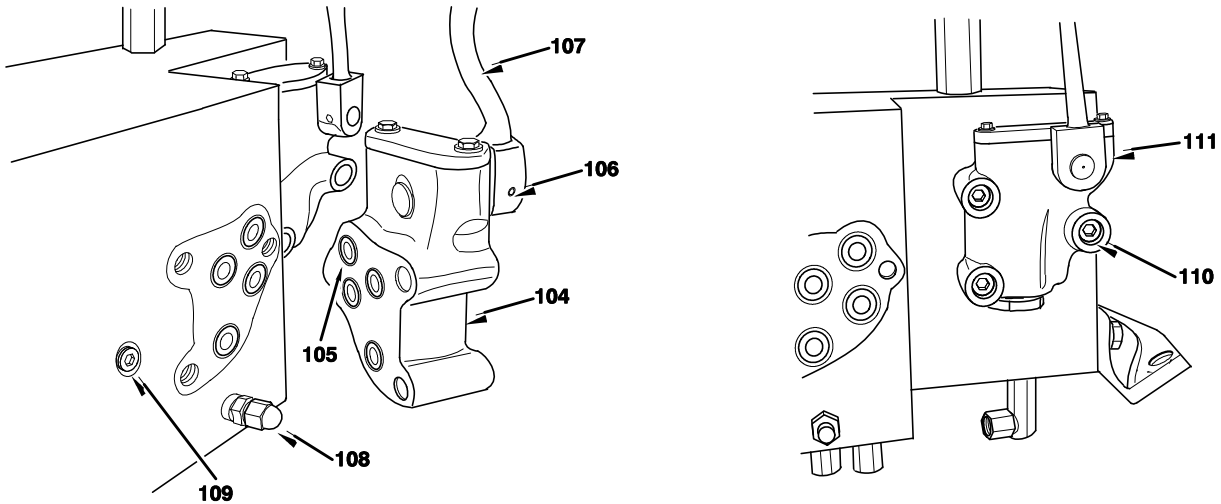


22. Remove and discard four packings (105) from hoist winch control valve (104).
23. Drive out spring pin (106) and remove lever (107) from hoist winch control valve (104). Discard spring pin.
24. Remove bleeder valve (108) and magnetic plug (109).

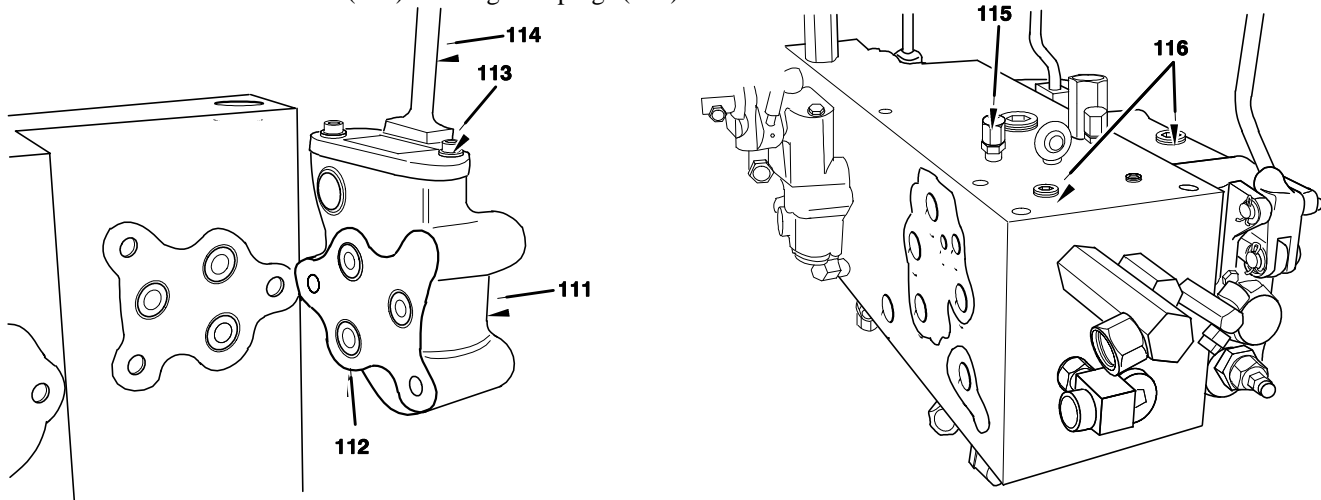
**NOTE**

Perform steps 25 thru 27 to remove boom safety valve.

25. Remove three screws (110) and boom safety valve (111).

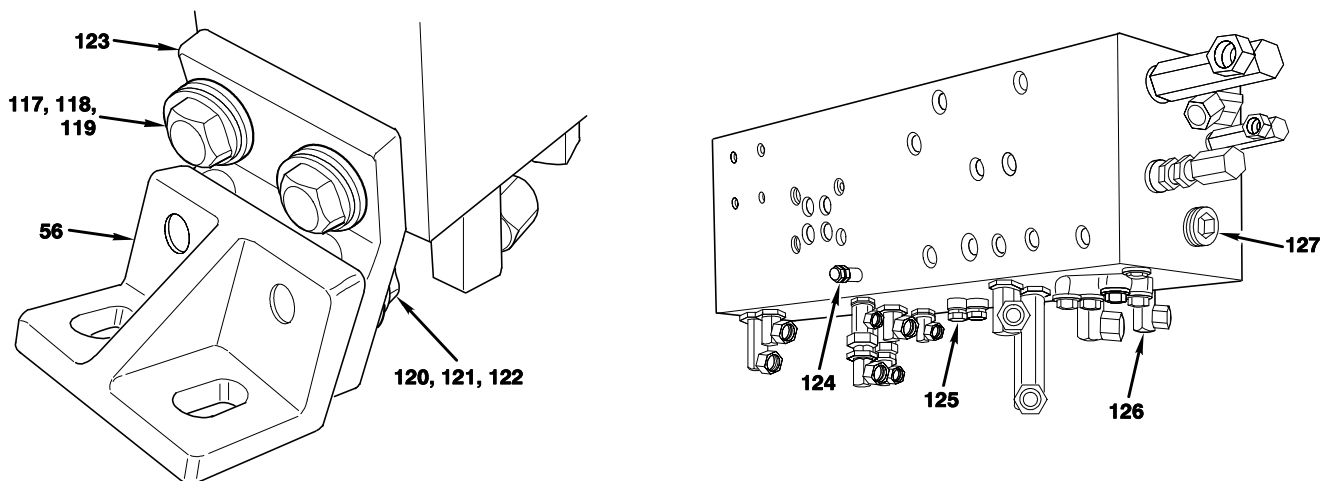


26. Remove and discard three packings (112).
27. Drive out spring pin (hidden) (113) and remove lever (114) from boom safety valve (111). Discard spring pin.
28. Remove two bleeder valves (115) and magnetic plugs (116).





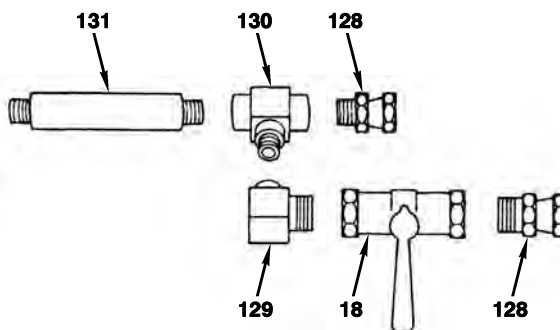
29. Remove two screws (117), lockwashers (118), washers (119), and bracket (56). Discard lockwashers.
30. Remove two screws (120), lockwashers (121), and washers (122) separating bracket (56) from metal bar (123). Discard lockwashers.
31. Remove bleeder valve (124), split flange (125), 16 hydraulic fittings (126), and magnetic plug (127).



**NOTE**

Perform step 32 to disassemble fittings (58) that were removed above. Note that the APU emergency winch control valve (18) may have been already removed.

32. Remove two couplings (128), APU emergency winch control valve (18), elbow (129), tee (130), and nipple (131).



**Cleaning**

**WARNING**

Solvents 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 solvent gets on skin or clothing, wash immediately with soap and water.

1. Wash parts, except seals and gaskets, in cleaning compound or paint thinner. Blow parts dry with moisture-free compressed air; then immerse parts in clean oil to prevent rusting.

**Inspection-Acceptance and Rejection Criteria**

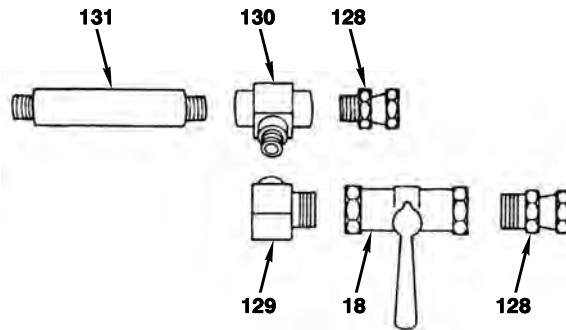
1. Inspect all screws, plugs, nuts, and fittings for damaged threads, and hex or socket heads for rounded corners.
2. Inspect all tapped holes for damaged threads. Repair damaged threads with a thread chaser.
3. Inspect valve bodies for cracks.

**Assembly**

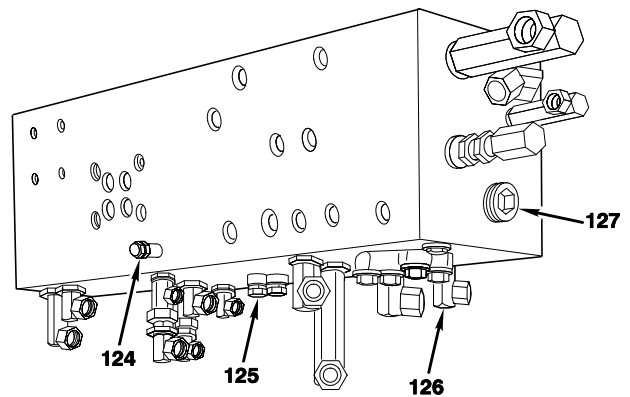
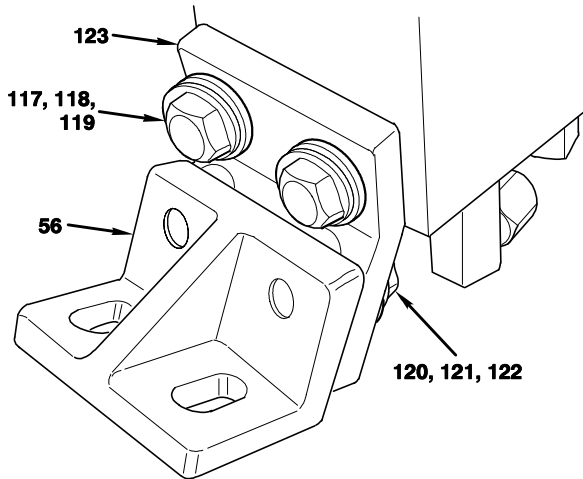
**NOTE**

The components that are assembled in step 1 will be installed to the subplate as “fittings (58)” during INSTALLATION.

1. Install nipple (131), tee (130), elbow (129), APU emergency winch control valve (18), and two couplings (128).



2. Install magnetic plug (127), 16 hydraulic fittings (126), split flange (125), and bleeder valve (124).
3. Connect metal bar (123) to bracket (56) with two washers (122), lockwashers (121), and screws (120).
4. Install bracket (56), two washers (119), lockwashers (118), and screws (117).

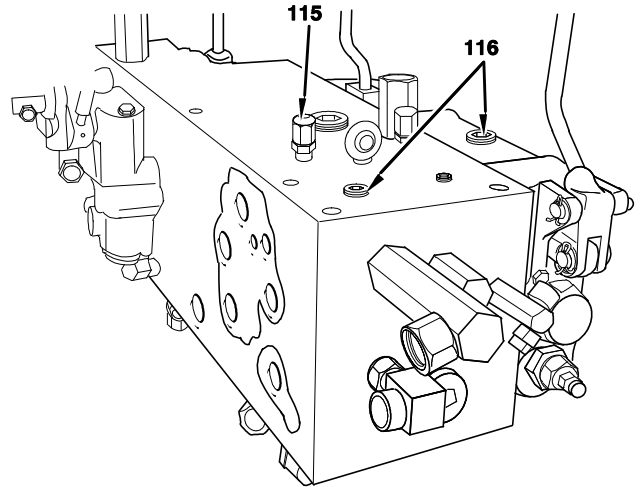
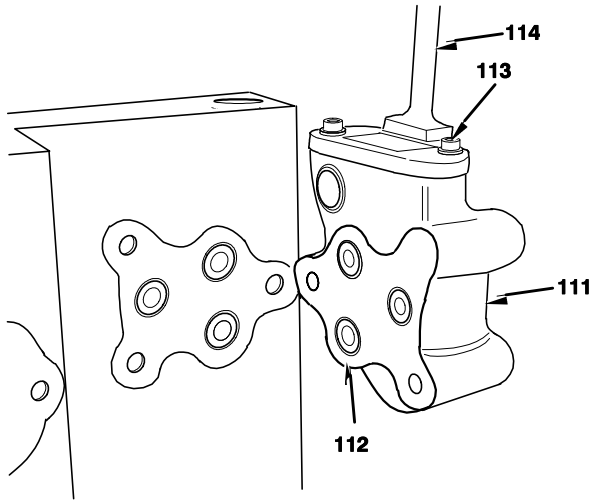


5. Install two magnetic plugs (116) and bleeder valves (115).

**NOTE**

Perform steps 6 thru 8 to install boom safety valve.

6. Install lever (114) and spring pin (hidden) (113) to boom safety valve (111).
7. Install three packings (112).

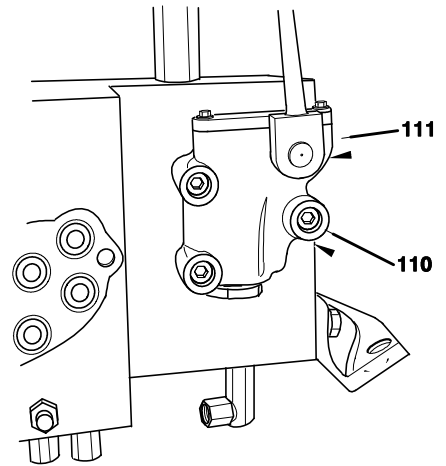
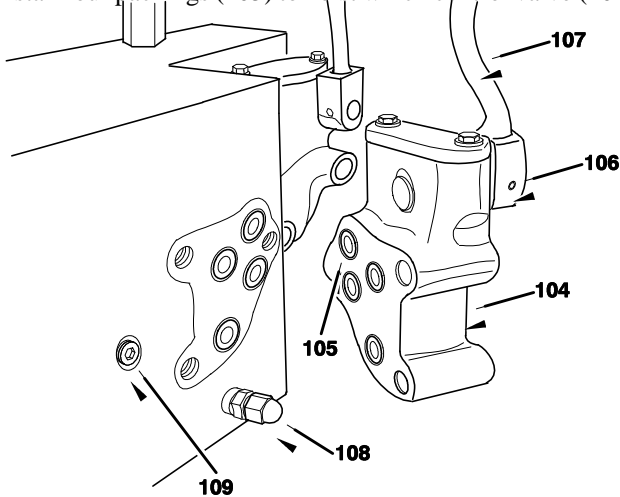


8. Install boom safety valve (111) and three screws (110).

**NOTE**

Perform steps 9 thru 12 to install hoist winch control valve.

9. Install magnetic plug (109) and bleeder valve (108).
10. Install lever (107) and spring pin (106) to hoist winch control valve (104).
11. Install four packings (105) to hoist winch control valve (104).

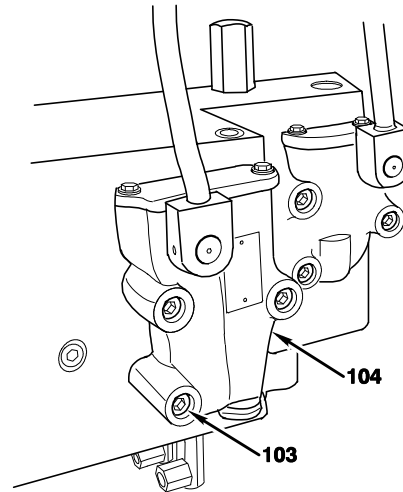
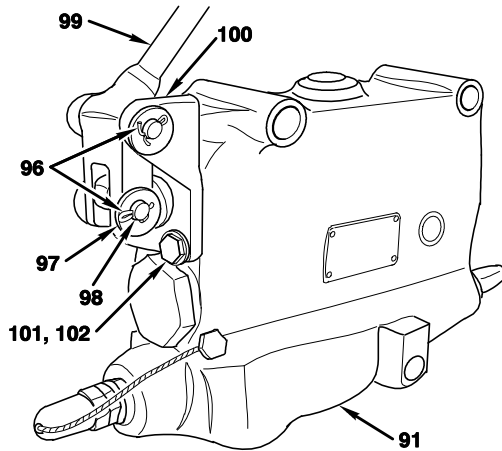


12. Install hoist winch control valve (104) and three screws (103).

**NOTE**

Perform steps 13 thru 17 to install boom combination control valve.

13. Install bracket (100), three lockwashers (102), and screws (101) to boom combination control valve (91).
14. Install lever (99), two pins (98), four washers (97), and cotter pins (96) to bracket (100).

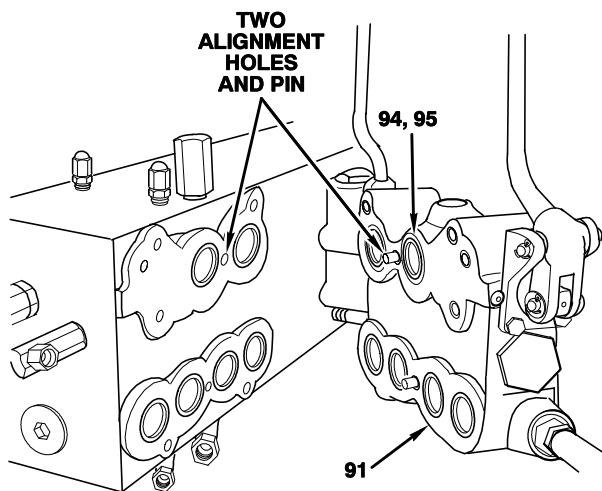
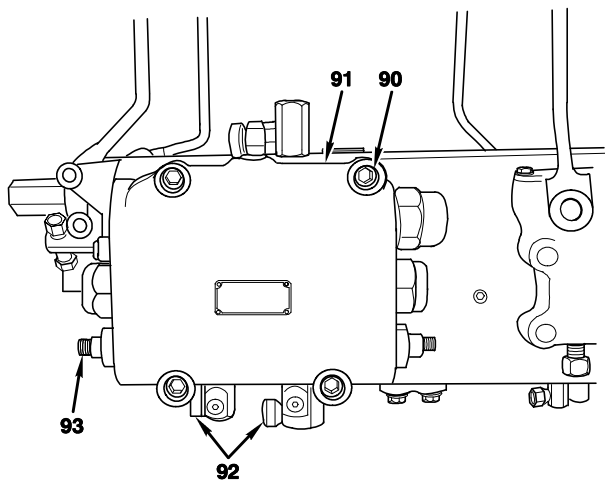


15. Install six packings (95) and two packings (94) to boom combination control valve (91).
16. Install two gage ports (92).

**NOTE**

During installation, align two pins on valve with two holes in subplate.

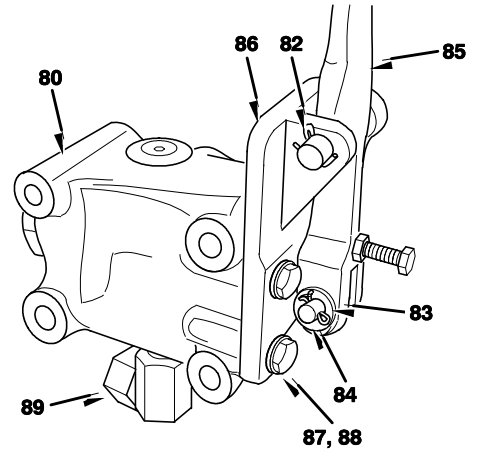
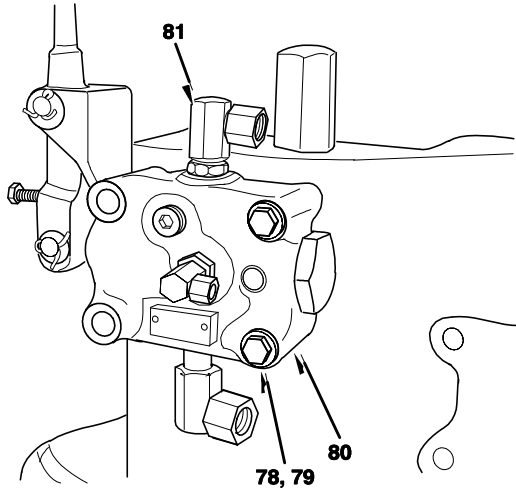
17. Install boom combination control valve (91) and four screws (90).



**NOTE**

Perform steps 18 thru 22 to install power control valve.

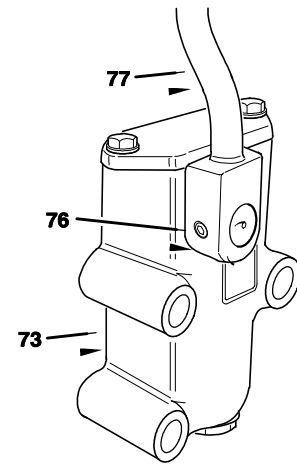
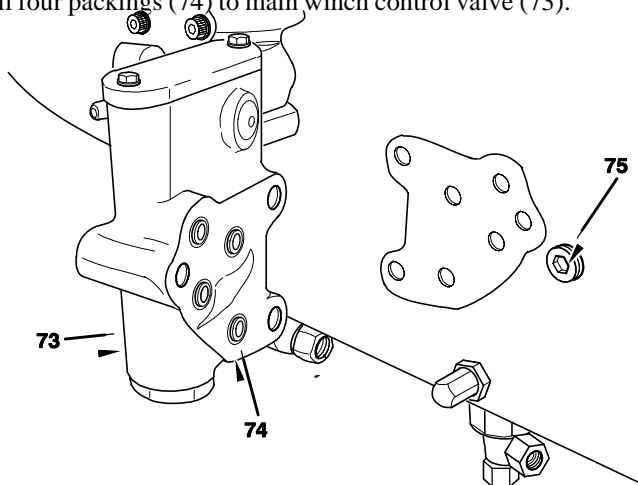
18. Install fitting (89) to power control valve (80).
19. Install bracket (86), two lockwashers (88), and screws (87) to power control valve (80).
20. Install lever (85), two pins (84), four washers (83), and cotter pins (82) to bracket (86).
21. Install adapter union (81) to power control valve (80).
22. Install power control valve (80), two lockwashers (79), and screws (78).



**NOTE**

Perform steps 23 thru 26 to install main winch control valve.

23. Install lever (77) and spring pin (76) to main winch control valve (73).
24. Install magnetic plug (75).
25. Install four packings (74) to main winch control valve (73).

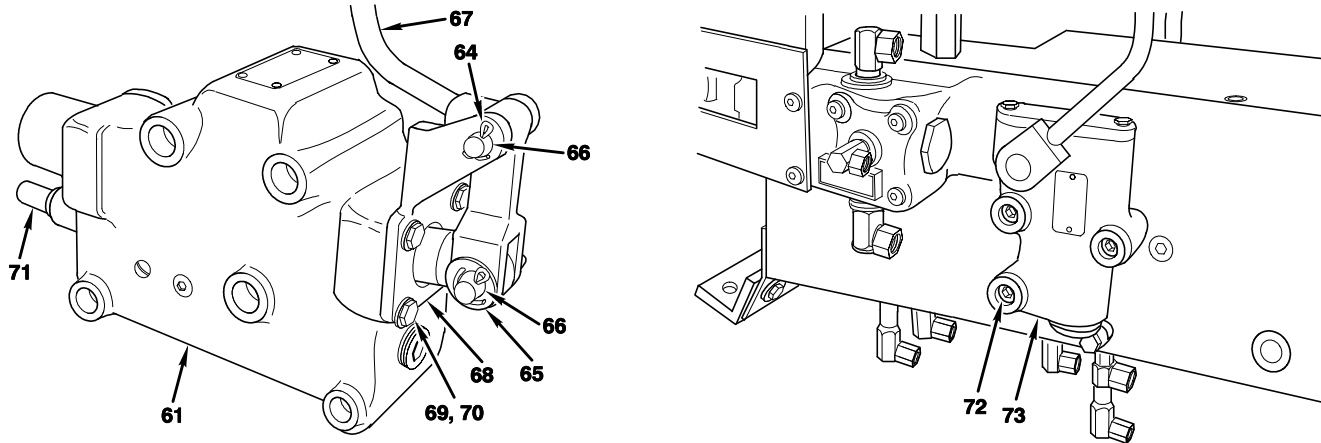


26. Install main winch control valve (73) and three screws (72).

**NOTE**

Perform steps 27 thru 30 to install system selector valve.

27. Install bracket (68), four lockwashers (70), and screws (69) to system selector valve (61).
28. Install lever (67), two pins (66), four washers (65), and cotter pins (64) to bracket (68).

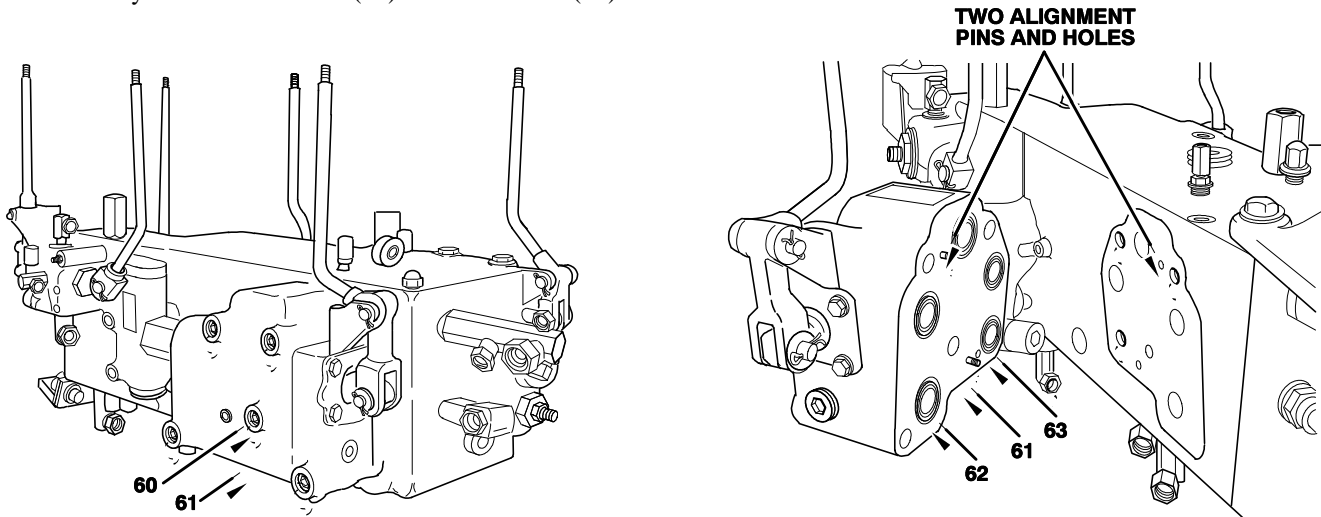


29. Install two packings (63) and three packings (62) to system selector valve (61).

**NOTE**

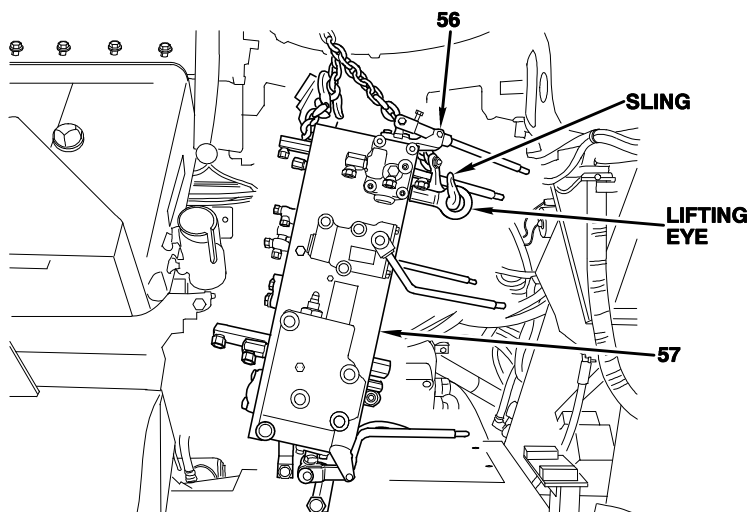
During installation, align two pins on valve with two holes in subplate.

30. Install system selector valve (61) and five screws (60).



**Installation**

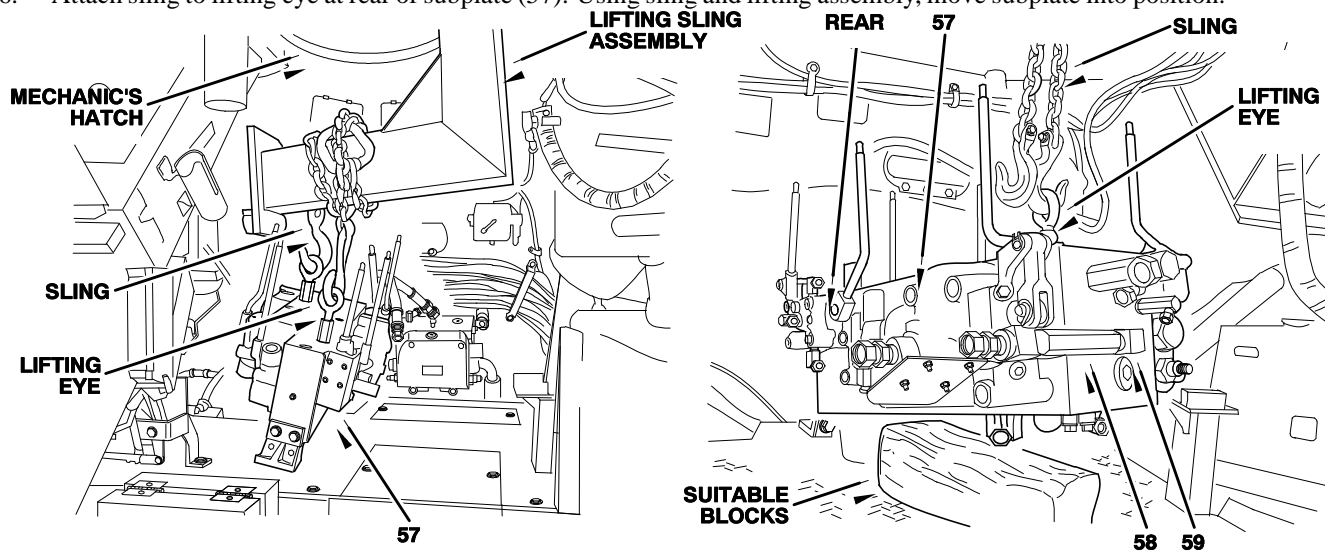
1. Install lifting eye to subplate (57).
2. Attach sling to lifting eye and rear mounting bracket (56) of subplate (57).



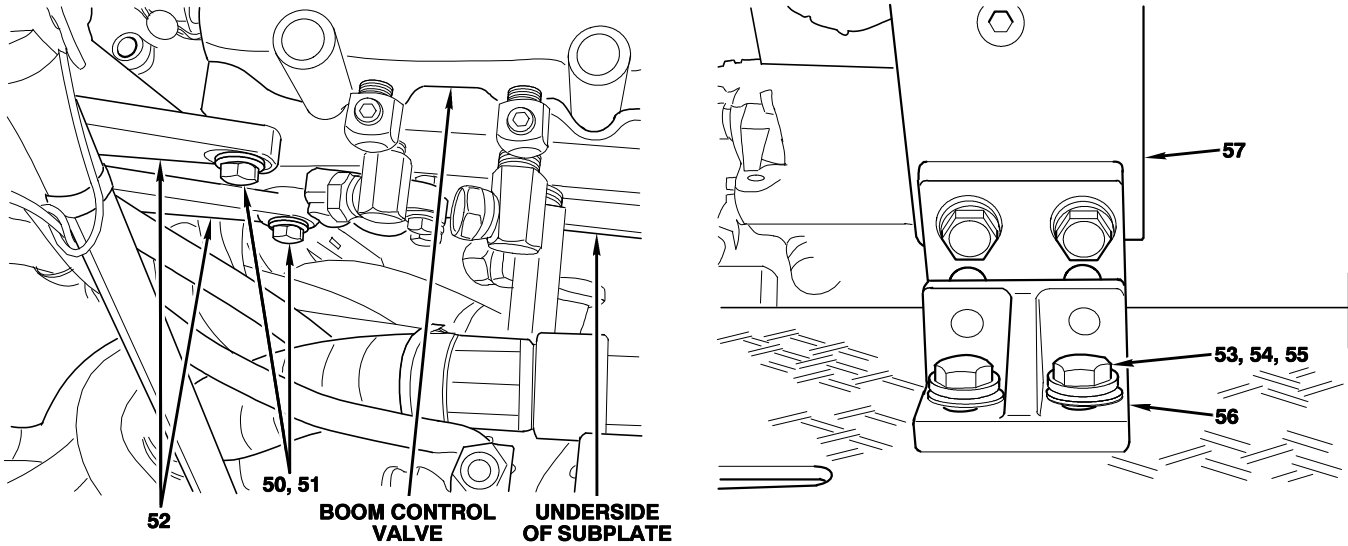
**CAUTION**

Guide subplate (57) carefully thru mechanic's hatch to avoid damaging levers and fittings.

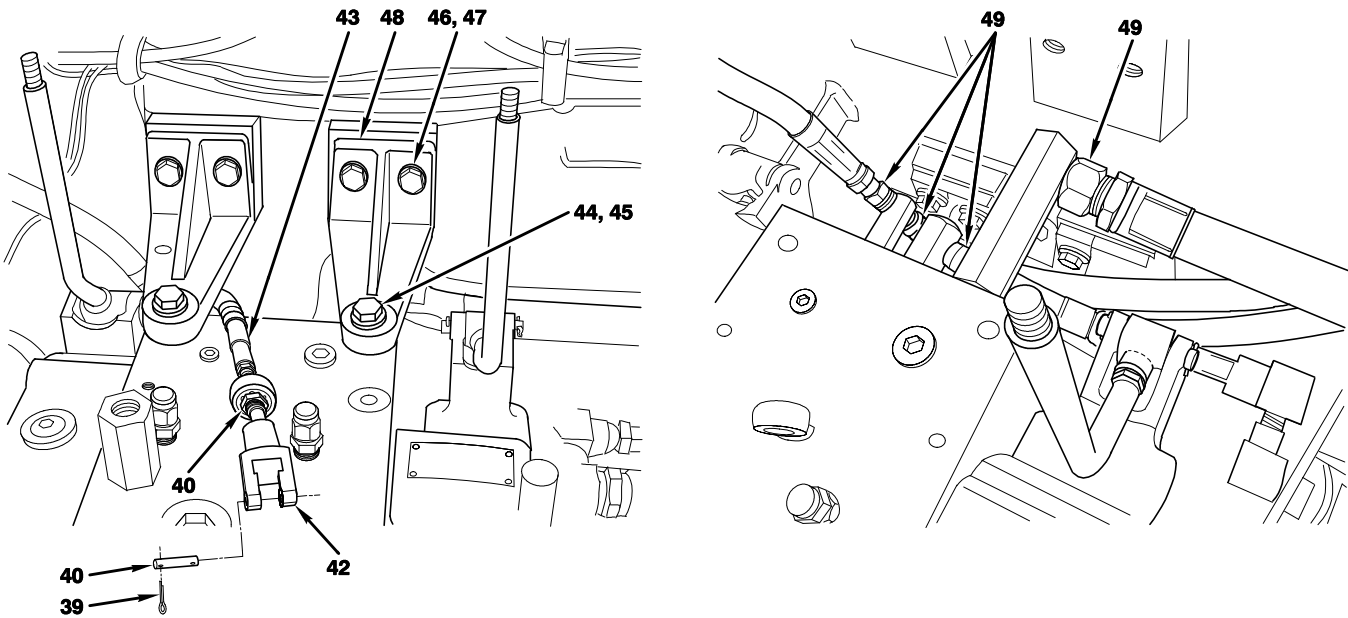
3. Using sling and lifting sling assembly, lower subplate (57) thru mechanic's hatch. Turn subplate until horizontal and support with two suitable blocks.
4. Install fittings (58) to elbow (59).
5. Remove sling and move lifting eye to rear of subplate (57).
6. Attach sling to lifting eye at rear of subplate (57). Using sling and lifting assembly, move subplate into position.



7. Install two washers (55), lockwashers (54), and screws (53) to rear mounting bracket (56) that is connected to subplate (57).
8. Install two lockwashers (51) and screws (50) to two bottom front mounting brackets (52).

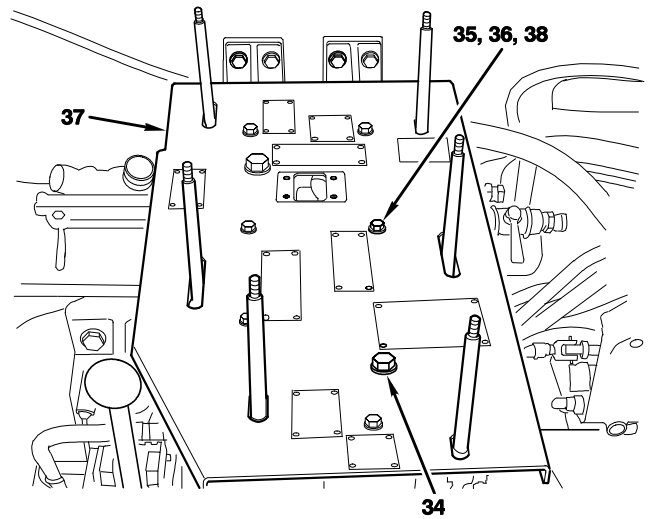
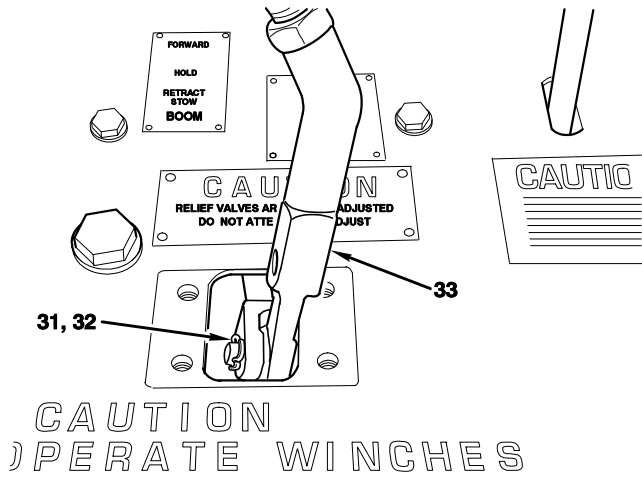


9. Connect four hydraulic lines (49) to front.
10. Install two top front mounting brackets (48), four lockwashers (47), screws (46), two lockwashers (45), and screws (44).
11. Connect spade control cable (43), install clevis (42), and tighten two jamnuts (41).
12. Install pin (40) and two cotter pins (39).

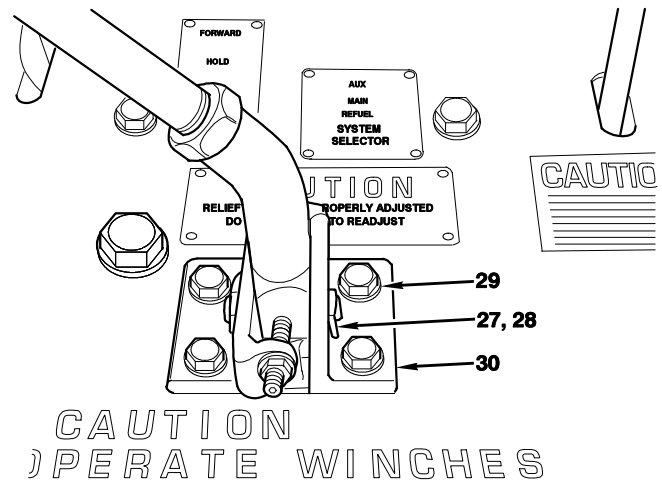
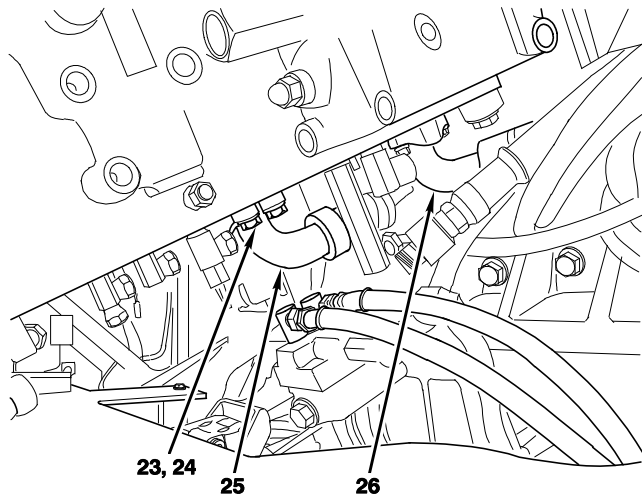




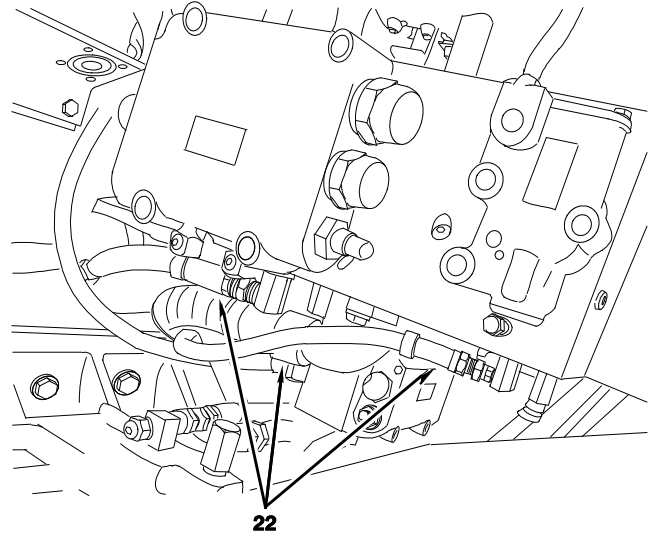
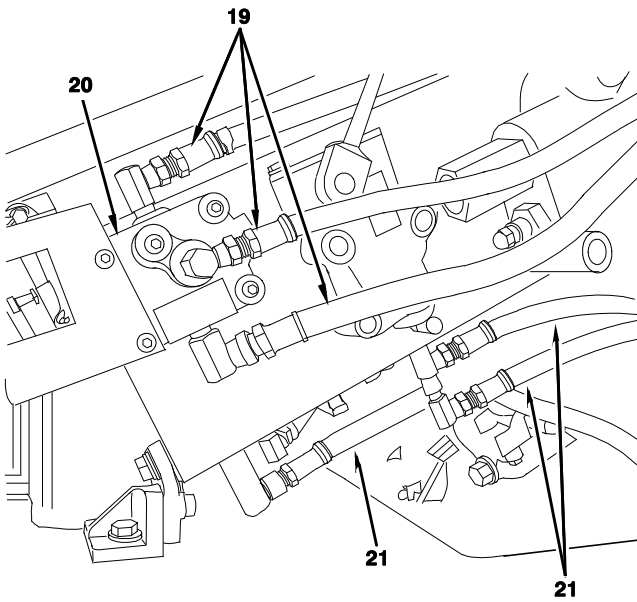
13. Install six spacers (beneath cover) (38), cover (37), six lockwashers (36), small screws (35), and two large screws (34).
14. Install spade control lever (33), pin (32), and two cotter pins (31).



15. Install bracket (with adjustment screws) (30) and four screws (29).
16. Install pin (28) and two cotter pins (27).
17. Connect two flange-type hoses (25 and 26) to underside with eight lockwashers (24) and screws (23).



18. Connect three hydraulic lines (22) to underside.
19. Connect nine hydraulic lines (21) to underside.
20. Connect three hydraulic lines (19) to power control valve (20).

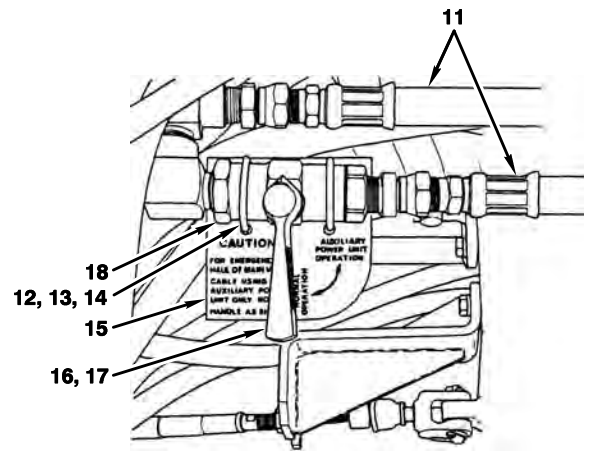
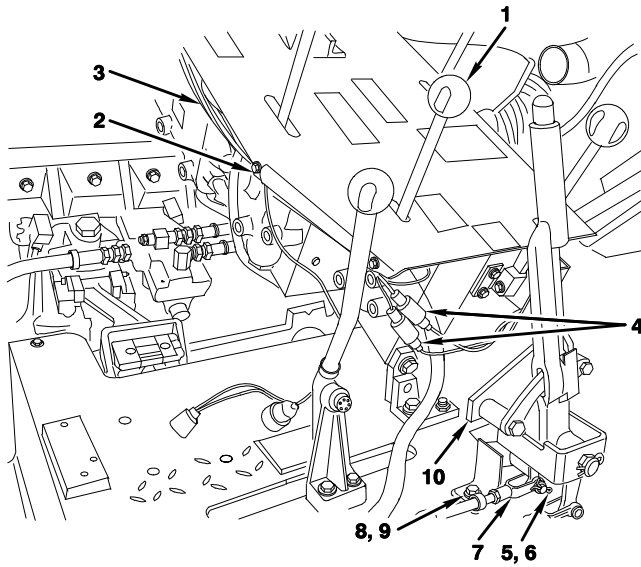


### NOTE

Perform steps 21 thru 23 if APU emergency winch control valve (18) was removed. If not removed, proceed to step 24.

21. Install APU emergency winch control valve (18).

22. Install handle (17) and capscrew (hidden) (16) to APU emergency winch control valve (18).
23. Install plate (15), two U-clamps (14), four lockwashers (13), and nuts (12).
24. Connect two hydraulic lines (11).
25. Install drain valve control (10), two lockwashers (9), and screws (8).
26. Connect linkage (7) with pin (6) and two cotter pins (5).
27. Connect two electrical connectors (4).
28. Install wiring harness (3) and three clamps (2).
29. Install six knobs (1).



**END OF WORK PACKAGE**



**INTERMEDIATE MAINTENANCE**  
**RECOVERY VEHICLE, FULL TRACKED: MEDIUM, M88A1**  
**NSN 2350-00-122-6826, EIC AQA**  
**MAIN HYDRAULIC PUMP UNLOADING VALVE REPLACEMENT**  
**REMOVAL, INSTALLATION**

**INITIAL SETUP:****Tools and Special Tools**

Tool kit, general mechanic's (item 34, WP 0086 00)

**Materials/Parts**

Lockwashers (8) (item 162, WP 0087 00)  
 Packing (item 133, WP 0087 00)  
 Screws (4) (item 66, WP 0087 00)

**Materials/Parts (cont.)**

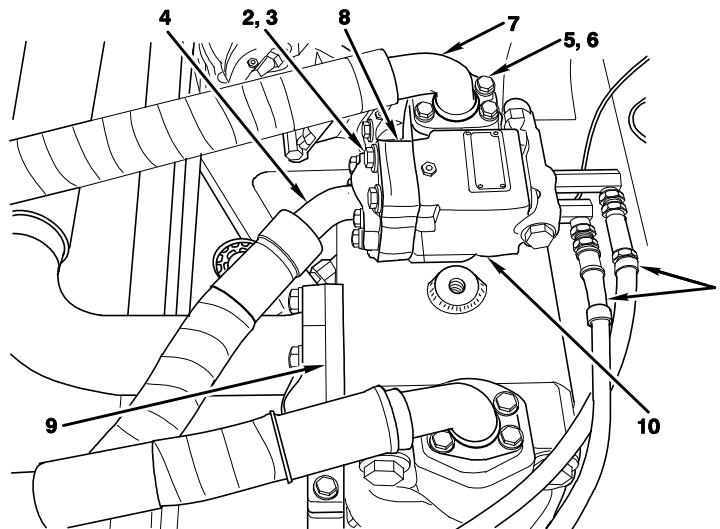
Screws (4) (item 68, WP 0087 00)

**Equipment Condition**

Subfloor plates 11, 12, and 14 removed (TM 9-2350-256-20)

**Removal**

1. Disconnect two hydraulic lines (1).
2. Remove four screws (2), lockwashers (3), and hydraulic line (4). Discard lockwashers.
3. Remove four screws (5), lockwashers (6), hydraulic line (7), and main hydraulic pump unloading valve (8) from main hydraulic pump (9). Discard lockwashers.
4. Remove and discard packing (hidden) (10) from main hydraulic pump unloading valve (8).

**Installation**

1. Install packing (hidden) (10) to main hydraulic pump unloading valve (8).
2. Install main hydraulic pump unloading valve (8), hydraulic line (7), four lockwashers (6), and screws (5) to main hydraulic pump (9).
3. Install hydraulic line (4), four lockwashers (3), and screws (2).
4. Connect two hydraulic lines (1).

**END OF WORK PACKAGE**



**INTERMEDIATE MAINTENANCE**  
**RECOVERY VEHICLE, FULL TRACKED: MEDIUM, M88A1**  
**NSN 2350-00-122-6826, EIC AQA**

**MECHANICAL TRANSMISSION AND MAIN HYDRAULIC PUMP ASSEMBLY MAINTENANCE**  
**DESCRIPTION, REMOVAL, DISASSEMBLY, CLEANING,**  
**INSPECTION, TESTING, ASSEMBLY, INSTALLATION**

**INITIAL SETUP:****Tools and Special Tools**

Sling (item 30, WP 0086 00)  
 Sling assembly, lifting (item 31, WP 0086 00)  
 Tool kit, general mechanic's (item 34, WP 0086 00)

**Materials/Parts**

Cleaning compound (item 5, WP 0085 00)  
 Oil (item 8, WP 0085 00)  
 Paint thinner (item 18, WP 0085 00)  
 Clamps (2) (item 28, WP 0087 00)  
 Gasket (item 239, WP 0087 00)  
 Lockwashers (4) (item 152, WP 0087 00)  
 Lockwashers (2) (item 160, WP 0087 00)  
 Lockwashers (4) (item 161, WP 0087 00)  
 Lockwashers (16) (item 162, WP 0087 00)  
 Lockwashers (8) (item 163, WP 0087 00)  
 Lockwashers (8) (item 164, WP 0087 00)  
 Lockwire (as required) (item 105, WP 0087 00)  
 Packings (4) (item 132, WP 0087 00)  
 Packing (item 133, WP 0087 00)  
 Packings (8) (item 237, WP 0087 00)  
 Screws (4) (item 58, WP 0087 00)  
 Screws (4) (item 64, WP 0087 00)

**Materials/Parts (cont.)**

Screws (8) (item 66, WP 0087 00)  
 Screws (8) (item 68, WP 0087 00)  
 Screws (4) (item 73, WP 0087 00)  
 Screws (4) (item 74, WP 0087 00)  
 Screws (2) (item 78, WP 0087 00)  
 Screws (2) (item 183, WP 0087 00)  
 Screws (8) (item 220, WP 0087 00)  
 Screws (8) (item 238, WP 0087 00)  
 Shims (as required) (item 39, WP 0087 00)

**Personnel Required**

Mechanics (3)

**Equipment Condition**

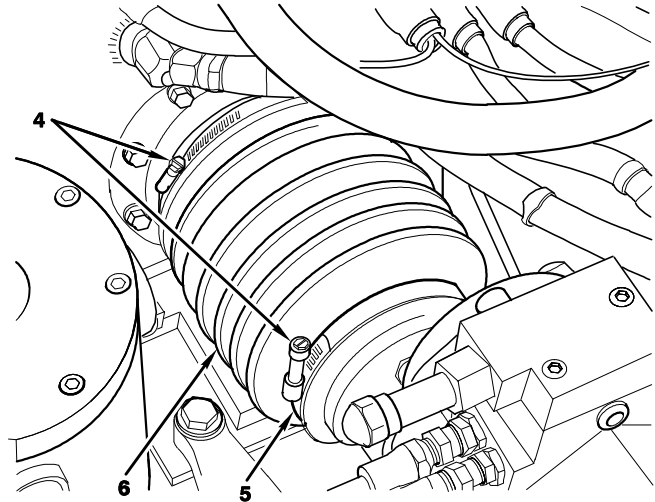
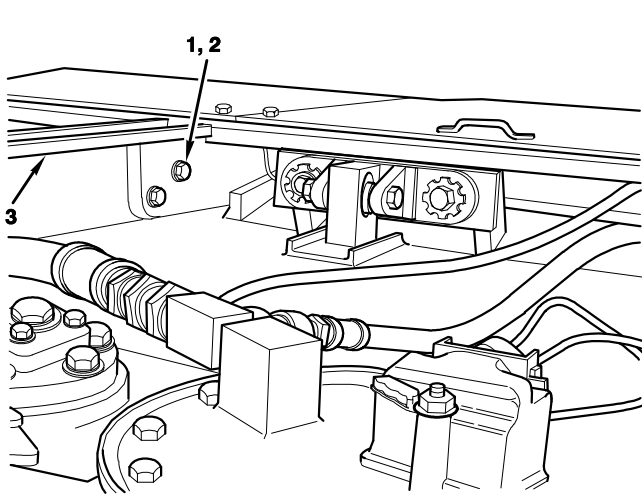
Cupola and cupola plate assembly, oddment trays, boxes, racks, or baskets removed, as required for clearance and to prevent damage (TM 9-2350-256-20)  
 Commander's seat and passenger seats removed (TM 9-2350-256-20)  
 Subfloor plates 11, 12 (with rigger's seat attached), 13, 14, 17, and 18 removed (TM 9-2350-256-20)

**DESCRIPTION**

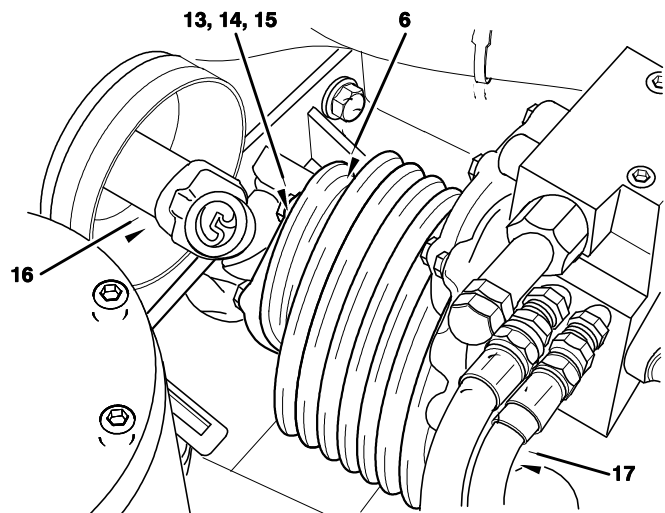
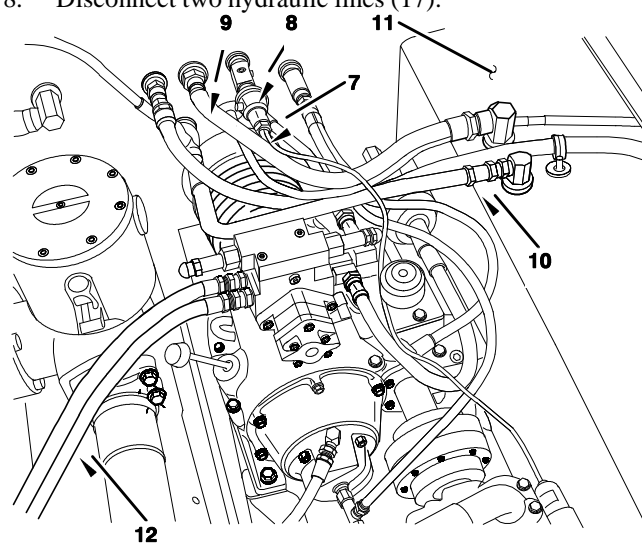
The mechanical transmission and main hydraulic pump assembly is mounted in the hull beneath the crew compartment. A power takeoff from the main engine drives the transmission which is coupled to the hydraulic pump. The power hydraulic takeoff is engaged or disengaged by an internal transmission clutch.

**Removal**

1. Remove four screws (1), lockwashers (2), and floor support (3). Discard lockwashers.
2. Loosen two screws (4) and remove two clamps (5) from universal boot (6).



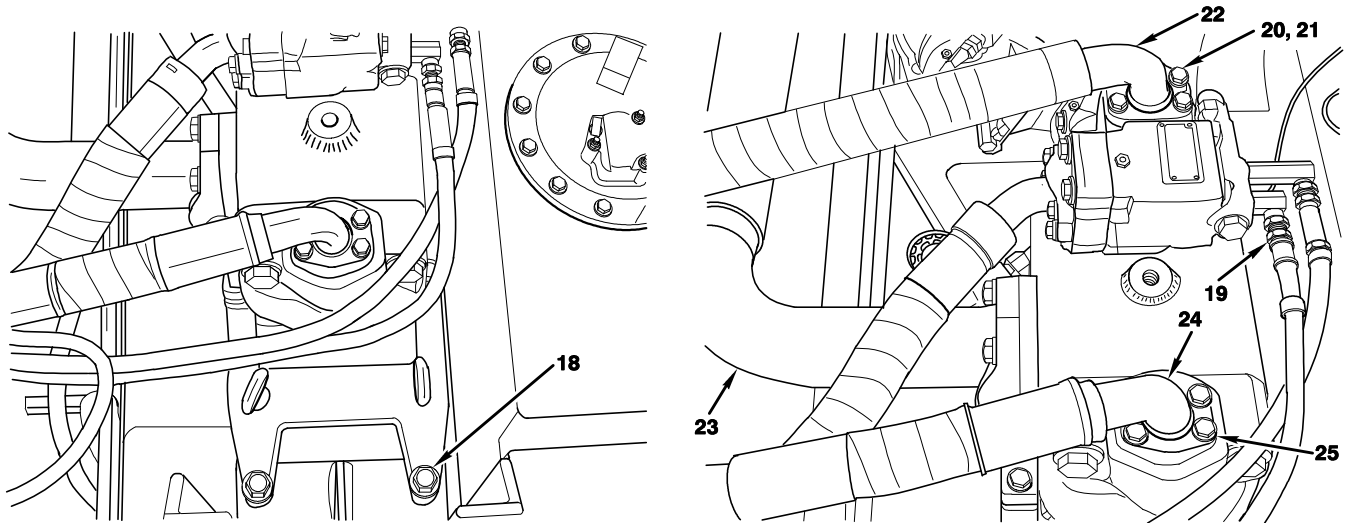
3. Disconnect cable (7) at sending unit (8).
4. Disconnect seven hydraulic and fuel lines (9).
5. Disconnect and remove two fuel lines (10) at tank (11).
6. Disconnect three hydraulic lines (12).
7. Pull universal boot (6) out of way, cut lockwire (13), remove four screws (14), lockwashers (15), and disconnect drive shaft (16). Discard lockwire and lockwashers.
8. Disconnect two hydraulic lines (17).



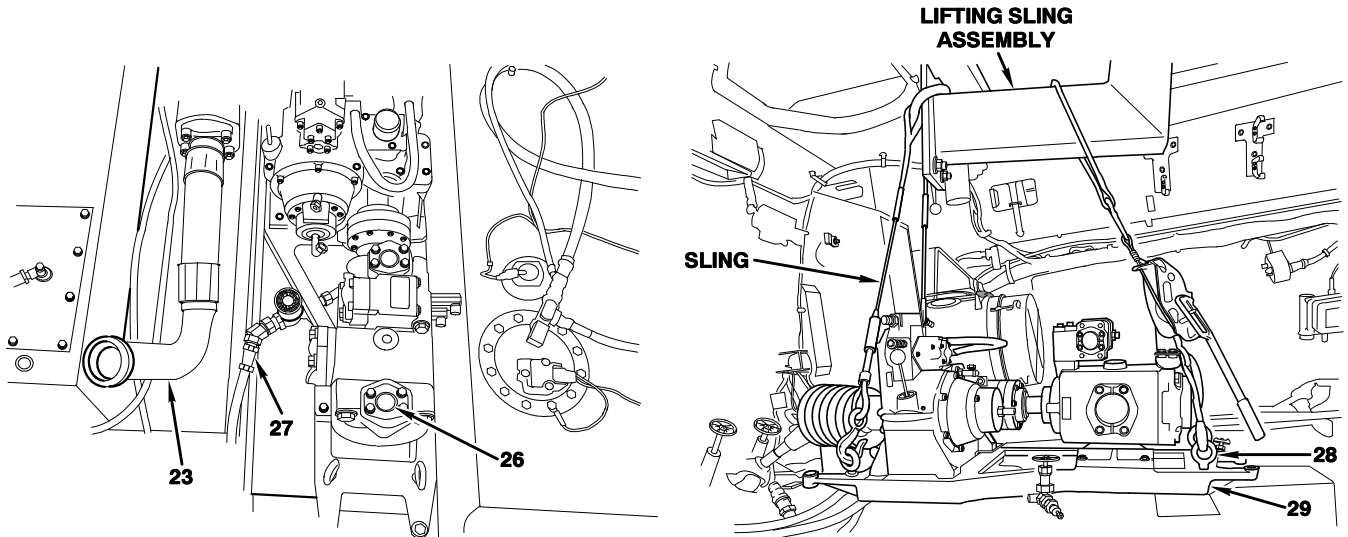
9. Remove four screws (18).
10. Disconnect two hydraulic lines (19).
11. Remove 16 screws (20), lockwashers (21), and disconnect four flange-type hoses (22) including suction line (23) and feed line (24). Discard lockwashers.



- Remove and discard four packings (25).

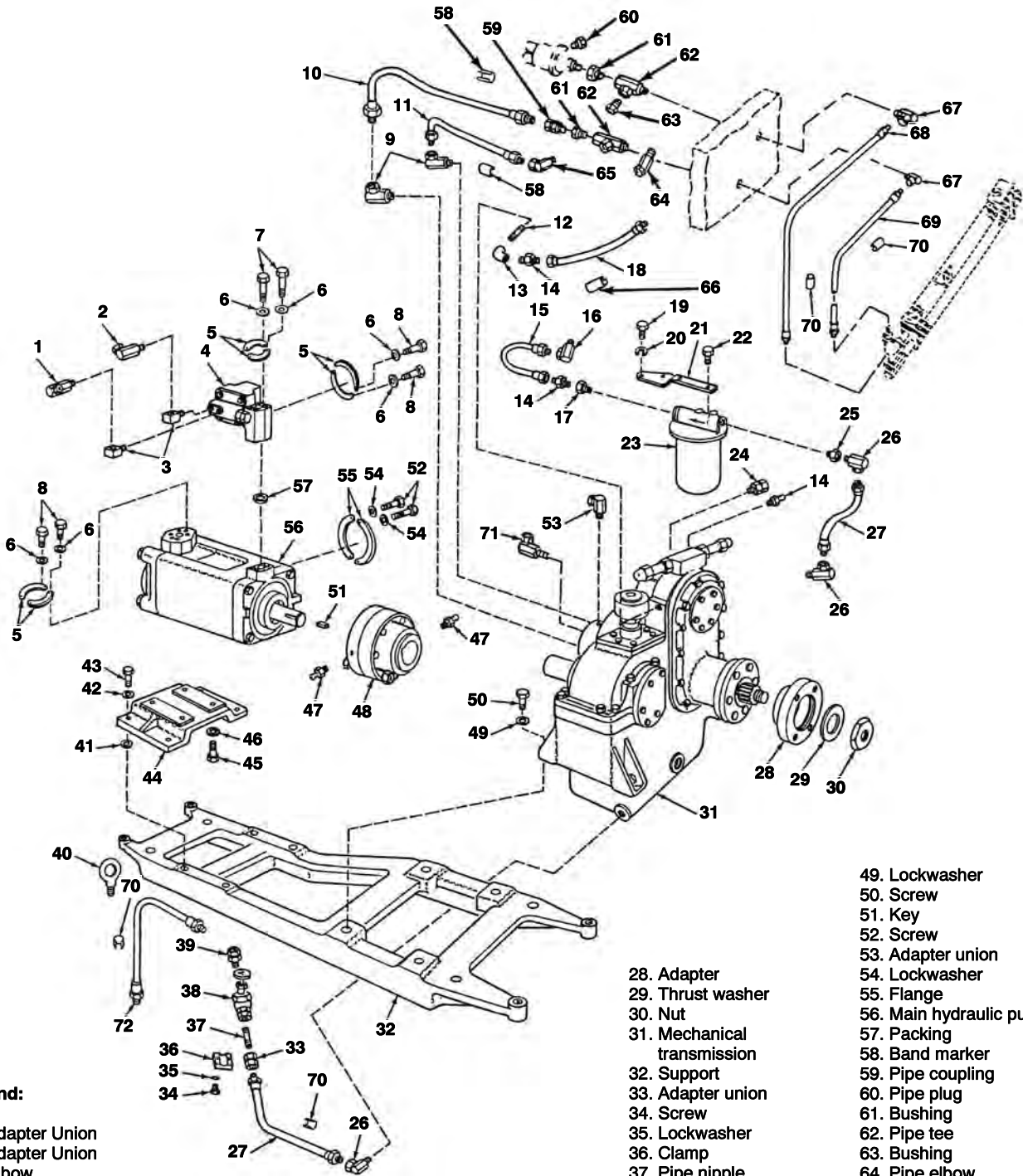


- Cover all hydraulic connector openings (26) to keep out dirt and dust.
- Disconnect drain line (27).
- Flex suction line (23) out of way. Cover to keep out dirt and dust.
- Attach sling to four lifting eyes (28) and remove mechanical transmission and main hydraulic pump assembly (29) through cupola plate opening.



**Disassembly**

- The following illustration, with its accompanying legend, serves to identify all subassemblies and attaching parts. The step-by-step disassembly procedure is provided after this illustration.



**Legend:**

- 1. Adapter Union
- 2. Adapter Union
- 3. Elbow
- 4. Unloading valve
- 5. Flange
- 6. Lockwasher
- 7. Screw
- 8. Screw
- 9. Pipe elbow
- 10. Hose assembly, hydraulic line
- 11. Hose assembly, hydraulic line
- 12. Cotter pin

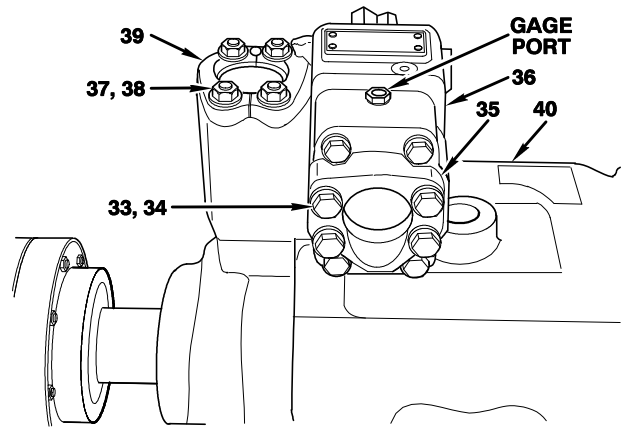
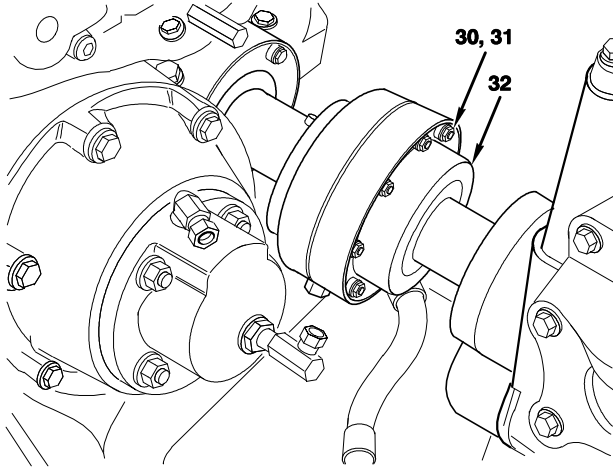
- 13. Pipe elbow
- 14. Pipe coupling
- 15. Hose assembly, hydraulic line
- 16. Pipe elbow
- 17. Pipe bushing
- 18. Hose assembly, hydraulic line
- 19. Screw

- 20. Lockwasher
- 21. Oil filter bracket
- 22. Screw
- 23. Oil filter
- 24. Pipe coupling
- 25. Pipe bushing
- 26. Pipe elbow
- 27. Hose assembly, hydraulic line

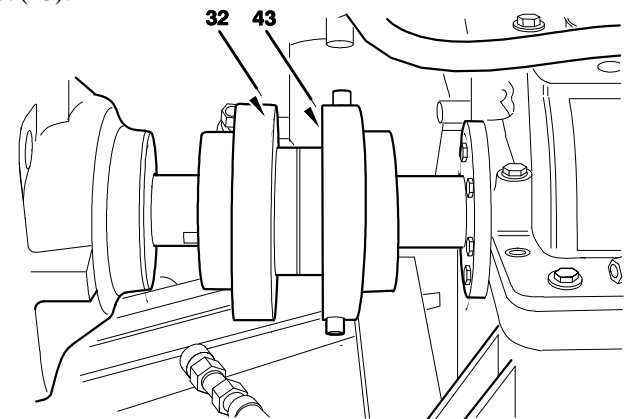
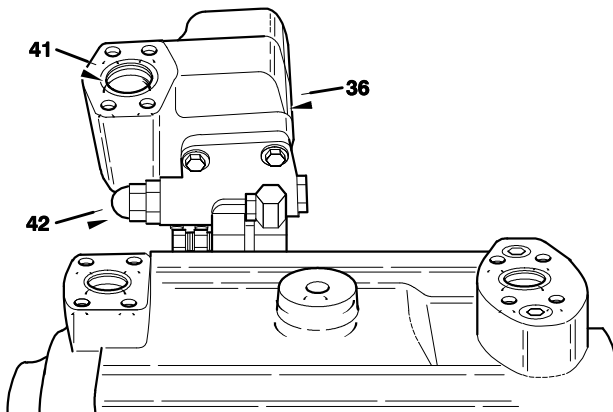
- 28. Adapter
- 29. Thrust washer
- 30. Nut
- 31. Mechanical transmission
- 32. Support
- 33. Adapter union
- 34. Screw
- 35. Lockwasher
- 36. Clamp
- 37. Pipe nipple
- 38. Globe valve
- 39. Pipe coupling
- 40. Lifting eye
- 41. Shim
- 42. Lockwasher
- 43. Screw
- 44. Pump mount
- 45. Screw
- 46. Lockwasher
- 47. Lubrication fitting
- 48. Shaft coupling

- 49. Lockwasher
- 50. Screw
- 51. Key
- 52. Screw
- 53. Adapter union
- 54. Lockwasher
- 55. Flange
- 56. Main hydraulic pump
- 57. Packing
- 58. Band marker
- 59. Pipe coupling
- 60. Pipe plug
- 61. Bushing
- 62. Pipe tee
- 63. Bushing
- 64. Pipe elbow
- 65. Pipe elbow
- 66. Band marker
- 67. Pipe elbow
- 68. Hose assembly, hydraulic line
- 69. Hose assembly, hydraulic line
- 70. Band marker
- 71. Pipe elbow
- 72. Hose assembly, hydraulic line

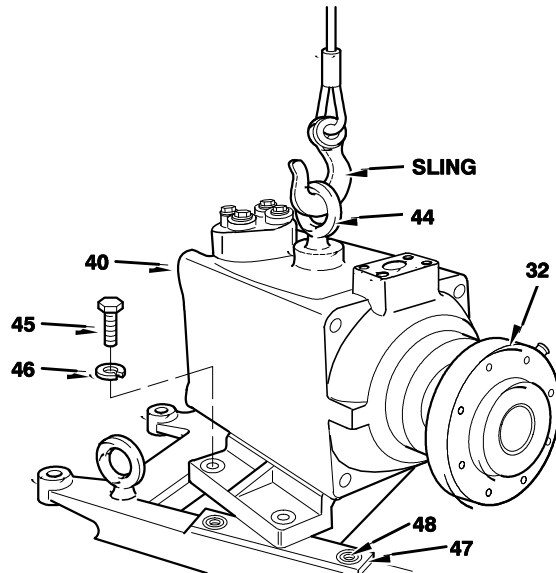
2. Remove eight locknuts (30) and screws (31) from coupling (32). Discard locknuts.
3. Remove four screws (33), lockwashers (34), and flange (35) from unloading valve (36). Discard lockwashers.
4. Remove four screws (37), lockwashers (38), flange (39), and unloading valve (36) from main hydraulic pump (40). Discard lockwashers.



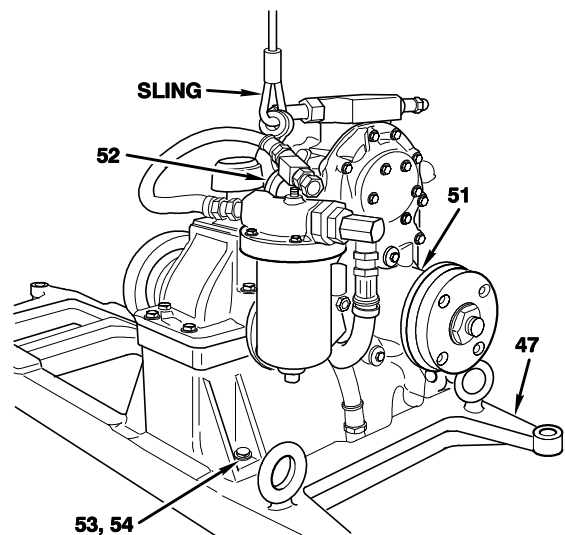
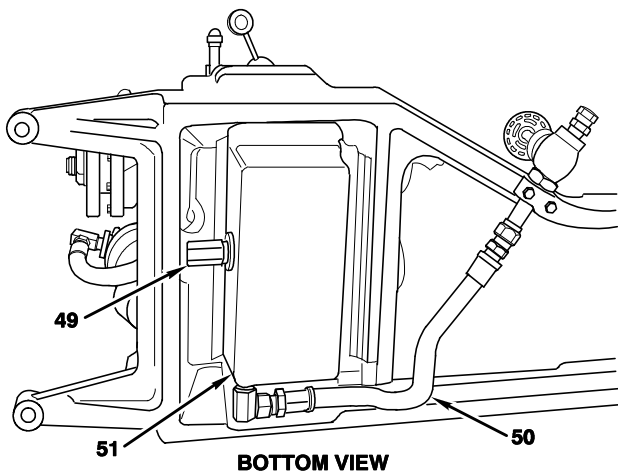
5. Remove and discard packing (41) from unloading valve (36). Do not remove adjustment screw (42) from unloading valve.
6. Separate coupling (32) housings and remove and discard gasket (43).



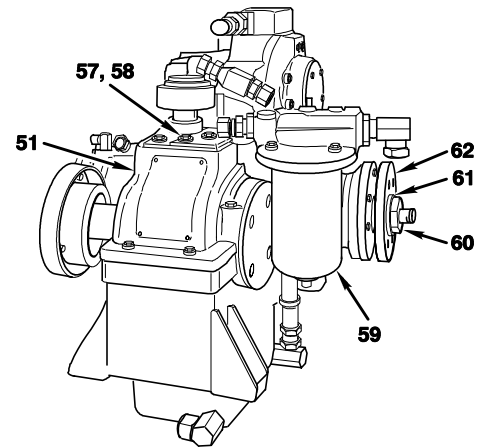
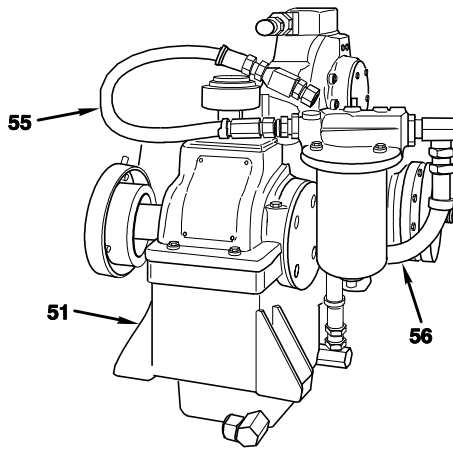
7. Attach sling to lifting eye (44).
8. Remove four screws (45), lockwashers (46), and main hydraulic pump (40) from support (47). Discard lockwashers.
9. Loosen setscrews on hubs and remove coupling (32) from main hydraulic pump (40) and mechanical transmission.
10. Remove shims (48) (if present) at four places.



11. Remove fitting (49) and hose assembly and valve (50) from mechanical transmission (51).
12. Attach sling to lifting eye (52).
13. Remove four screws (53), lockwashers (54), and mechanical transmission (51) from support (47). Discard lockwashers.



14. Remove hose assemblies (55 and 56) from mechanical transmission (51).
15. Remove two screws (57), lockwashers (58), and oil filter (59) from mechanical transmission (51). Discard lockwashers.
16. Remove nut (60), thrust washer (61), and adapter (62) from mechanical transmission (51).



## Cleaning

### WARNING

Solvents 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 solvent gets on skin or clothing, wash immediately with soap and water.

1. Wash parts, except seals and gaskets, in cleaning compound or mineral spirits paint thinner. Blow parts dry with moisture-free compressed air; then immerse parts in clean OE-10 oil to prevent rusting.

## Inspection-Acceptance and Rejection Criteria

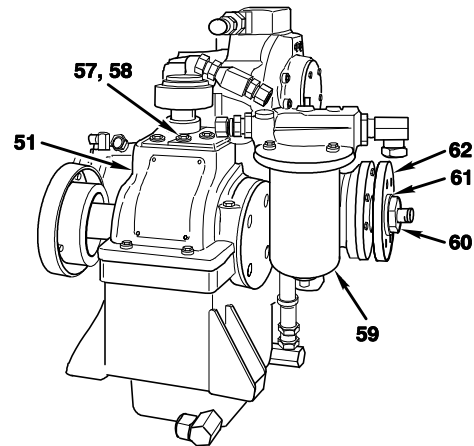
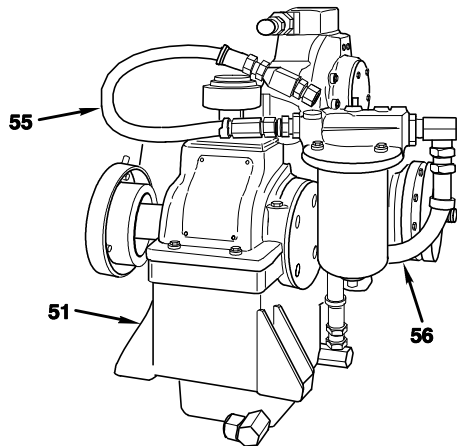
1. Inspect all screws, nuts, and fittings for damaged threads, and hex or socket heads for rounded corners.
2. Inspect all tapped holes for damaged threads. Repair damaged threads with a thread chaser.

## Testing

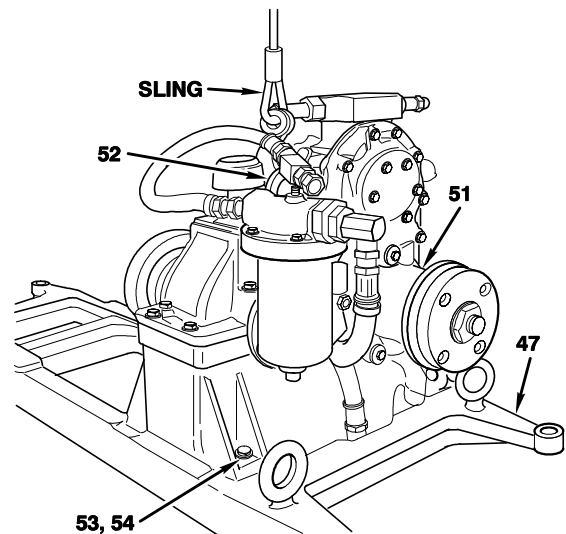
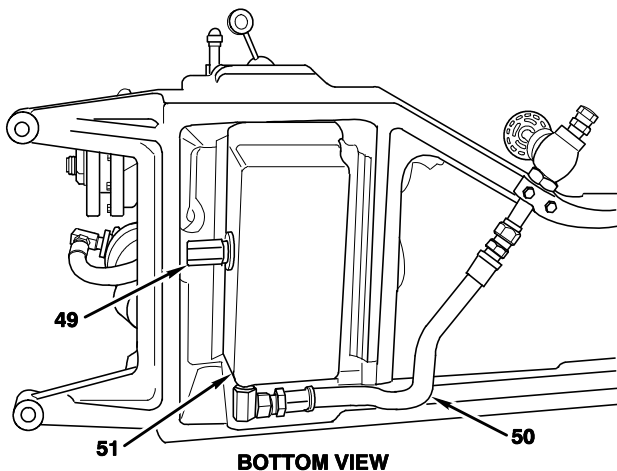
1. Test mechanical transmission oil pressure in accordance with TM 9-2350-256-20.

## Assembly

1. Install adapter (62), thrust washer (61), and nut (60) to mechanical transmission (51). Tighten nut on shaft to 125–150 lb-ft (169–203 N•m) torque, and stake sleeve on nut into keyway on shaft.
2. Install oil filter (59), two lockwashers (58), and screws (57) on mechanical transmission (51).
3. Install hose assemblies (55 and 56) on mechanical transmission (51).



4. Attach sling to lifting eye (52).
5. Install mechanical transmission (51), four lockwashers (54), and screws (53) on support (47).
6. Install hose assembly and valve (50) and fitting (49) on mechanical transmission (51).



7. Attach sling to lifting eye (44) of main hydraulic pump (40).
8. Install main hydraulic pump (40), four lockwashers (46), and screws (45).

## NOTE

Steps 9 and 10 are for vertical alignment.

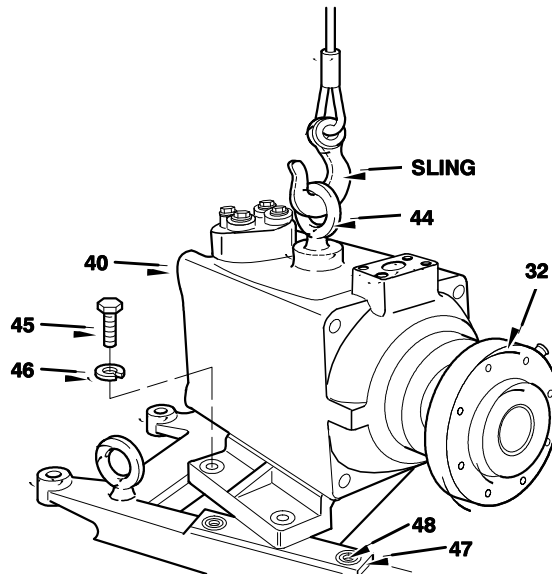
9. Place straight edge across top of opposing shaft coupling hubs and measure difference in height with a feeler gage. If main hydraulic pump hub is lower than mechanical transmission hub, perform step 10; if both hubs are level, proceed to step 11.

10. Remove four screws (45) and lockwashers (46). Discard lockwashers. Install shims (48) as required (four places) between main hydraulic pump (40) and support (47).

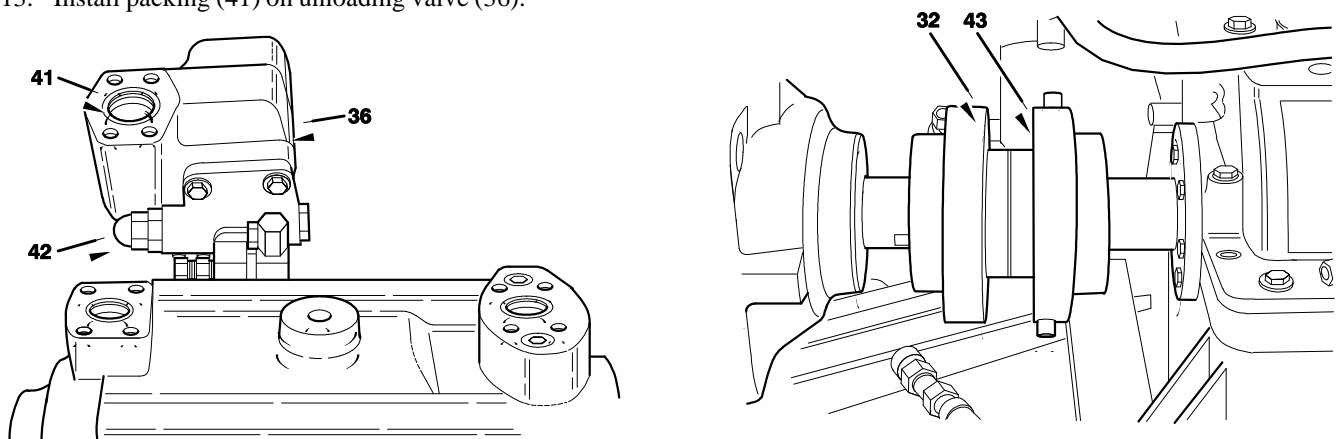
### NOTE

Step 11 is for horizontal alignment.

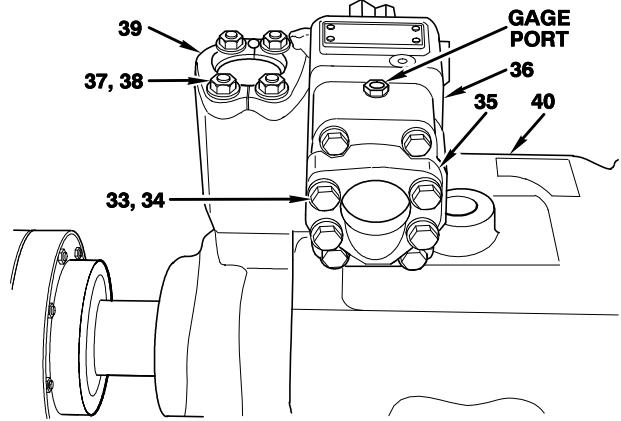
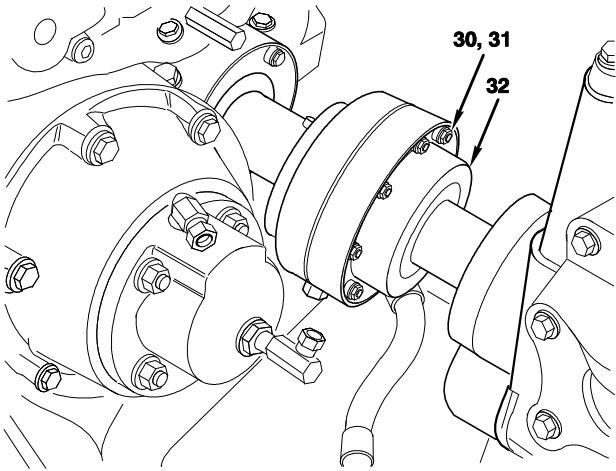
11. Slide coupling (32) hubs together with a 1/8-in. (3.2-mm) separation. Tighten setscrews on coupling hubs and check separation with a feeler gage at four places. If necessary, loosen four screws (45), move main hydraulic pump (40) as required, and tighten four screws.



12. Install gasket (43) on coupling (32) and slide housings together.
13. Install packing (41) on unloading valve (36).

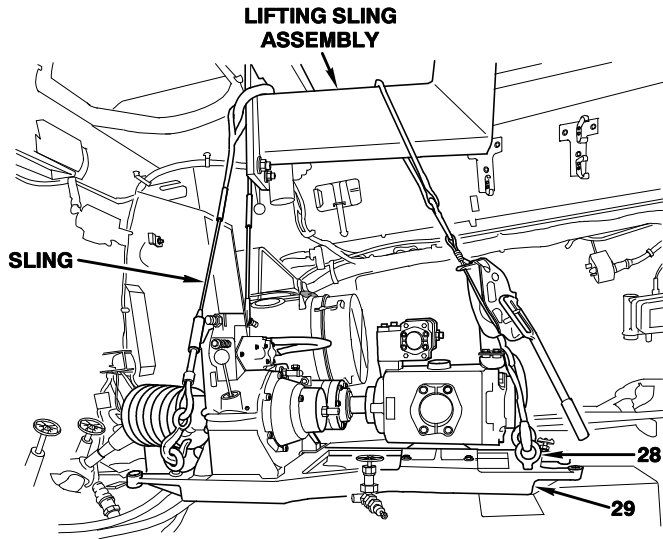
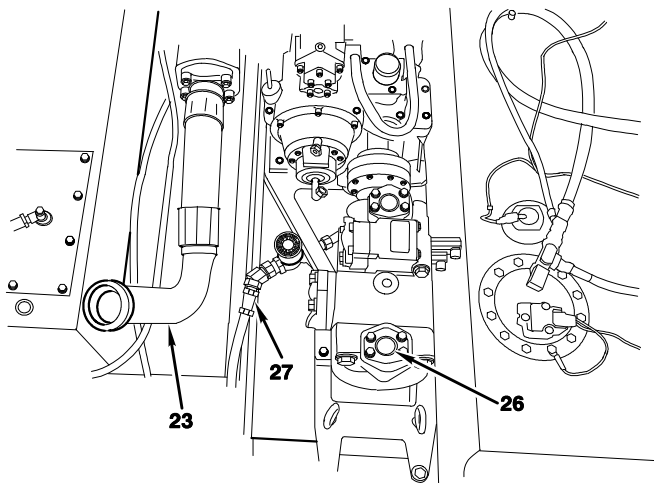


14. Install unloading valve (36), flange (39), four lockwashers (38), and screws (37) on main hydraulic pump (40).
15. Install flange (35), four lockwashers (34), and screws (33) on unloading valve (36).
16. Install eight screws (31) and locknuts (30) on coupling (32).



**Installation**

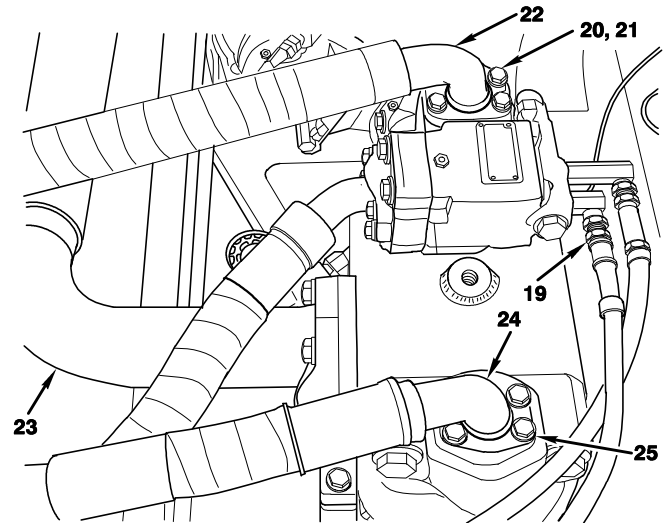
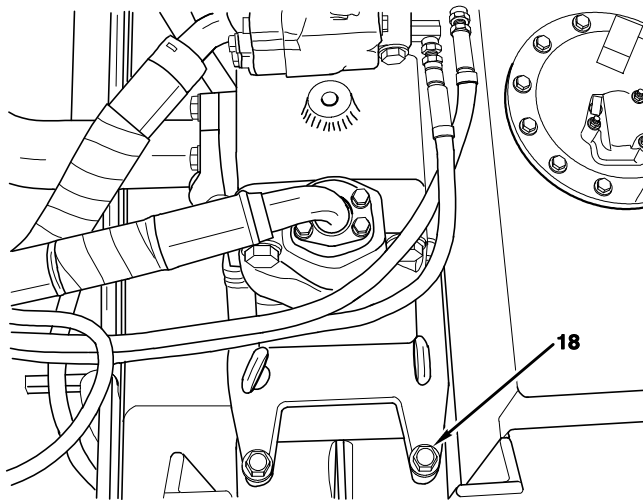
1. Attach sling to four lifting eyes (28) and move mechanical transmission and main hydraulic pump assembly (29) through cupola plate opening into position.
2. Remove covering and move suction line (23) into position.
3. Connect drain line (27).
4. Remove all hydraulic connector opening coverings (26).



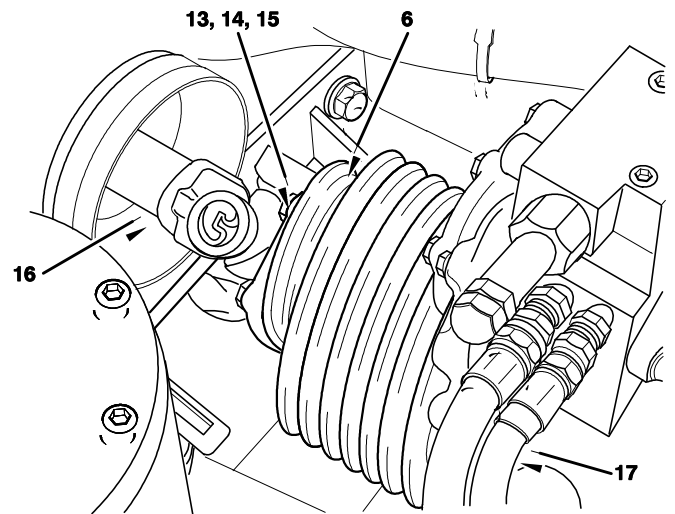
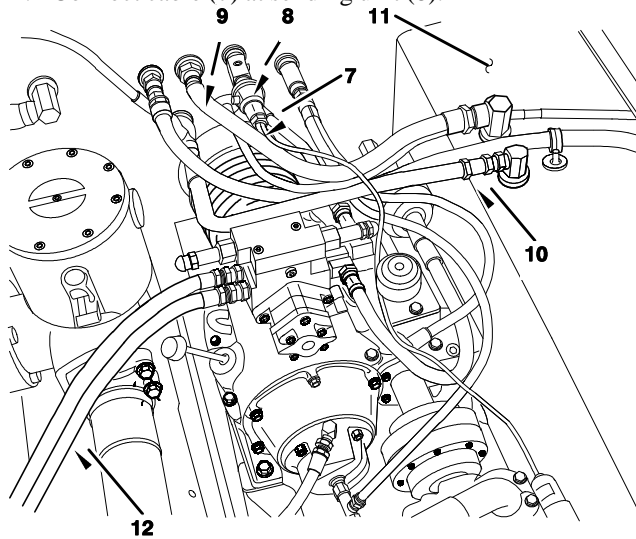
5. Install four packings (25).
6. Connect four flange-type hoses (22) including suction line (23) and feed line (24) and install 16 lockwashers (21) and screws (20).



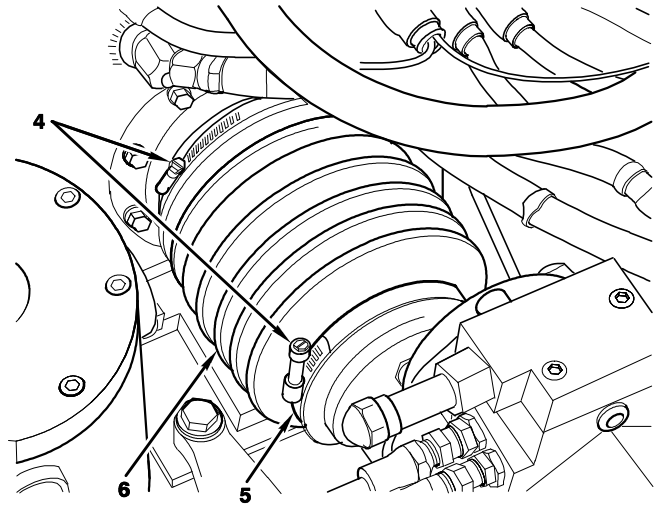
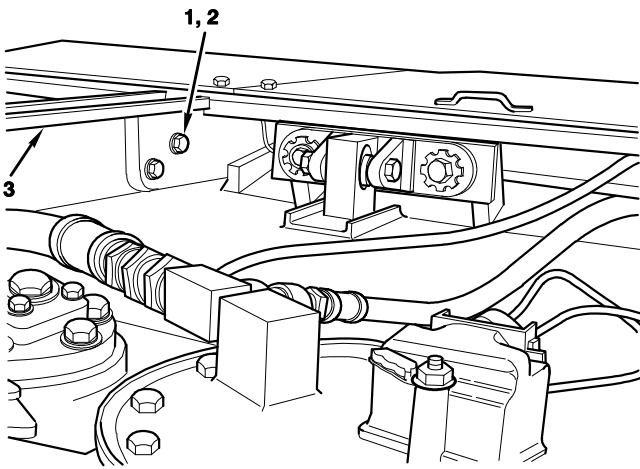
7. Connect two hydraulic lines (19).
8. Install four screws (18).



9. Connect two hydraulic lines (19).
10. Install drive shaft (16), four lockwashers (15), screws (14), lockwire (13), and move universal boot (6) into position.
11. Connect three hydraulic lines (12).
12. Install and connect two fuel lines (10) at tank (11).
13. Connect seven hydraulic and fuel lines (9).
14. Connect cable (7) at sending unit (8).



15. Install two clamps (5) on universal boot (6) and tighten two screws (4).
16. Install floor support (3), four lockwashers (2), and screws (1).



**END OF WORK PACKAGE**

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**INTERMEDIATE MAINTENANCE**  
**RECOVERY VEHICLE, FULL TRACKED: MEDIUM, M88A1**  
**NSN 2350-00-122-6826, EIC AQA**

**MECHANICAL TRANSMISSION POWER TAKEOFF DRIVE SHAFT MAINTENANCE**  
**REMOVAL, DISASSEMBLY, INSPECTION, ASSEMBLY, INSTALLATION**

---

**INITIAL SETUP:****Tools and Special Tools**

Tool kit, general mechanic's (item 34, WP 0086 00)

**Materials/Parts (cont.)**

Washer, split (item 25, WP 0087 00)

**Materials/Parts**

Lockwashers (8) (item 152, WP 0087 00)

Lockwire (as required) (item 105, WP 0087 00)

Screws (4) (item 63, WP 0087 00)

Screws (4) (item 64, WP 0087 00)

Seal (item 18, WP 0087 00)

Snap rings (8) (item 19, WP 0087 00)

**References**

WP 0022 00

**Equipment Condition**

Deck grilles 27, 28, and 29 removed (TM 9-2350-256-20)

Subfloor plate 12 removed (TM 9-2350-256-20)

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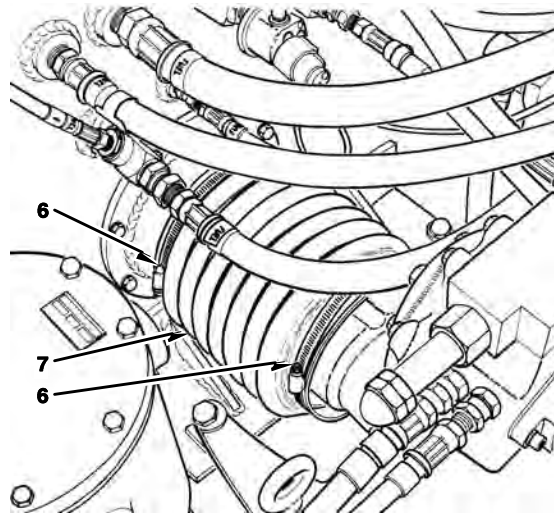
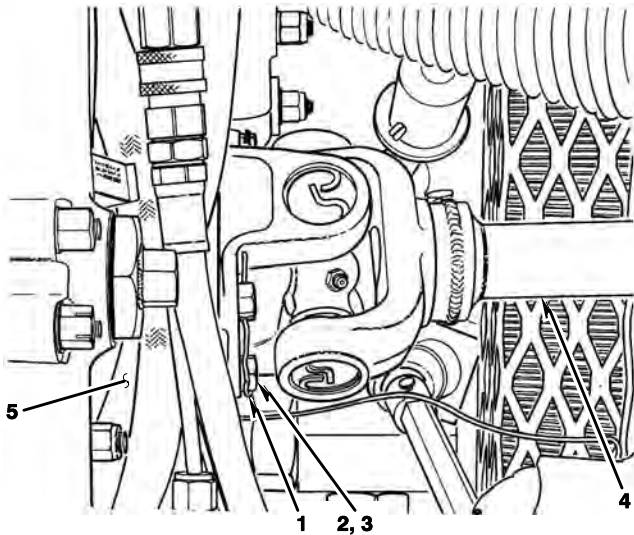
**Removal****NOTE**

Disconnect interfering lines and cables as necessary for access.

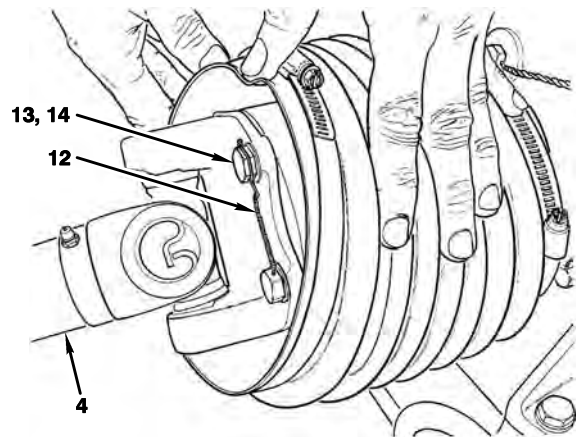
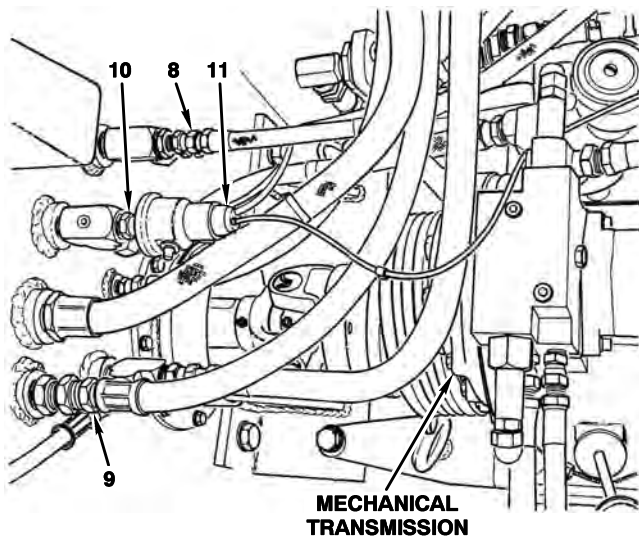
**NOTE**

If necessary to turn propeller shaft to reach screws, turn MASTER switch to on position. Hold ENGINE FUEL SHUT OFF switch in off position and touch START button. When screws are in position for removal, turn MASTER switch to OFF position.

1. Cut and discard lockwire (1).
2. Remove four screws (2), lockwashers (3), and disconnect drive shaft (4) from main engine (5). Discard lockwashers.
3. Loosen two screws (6) on universal boot (7).

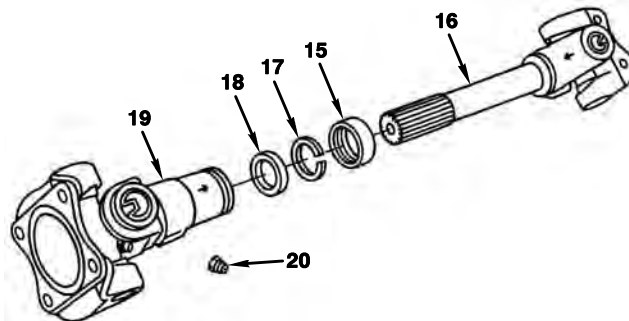


4. Disconnect five hydraulic lines (8).
5. Disconnect two fuel lines (9).
6. Unscrew warning light switch (10) and disconnect cable (11).
7. Pull universal boot (7) out of way, cut lockwire (12), and remove four screws (13), lockwashers (14), and drive shaft (4). Discard lockwashers.

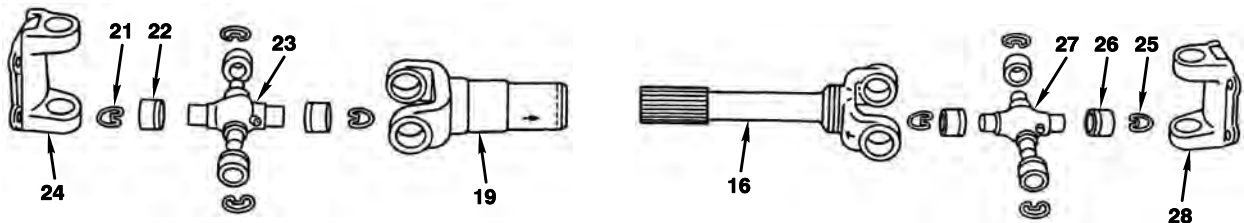


### Disassembly

1. Unscrew dust cap (15) and remove yoke shaft assembly (16), dust cap, split washer (17), and seal (18) from slip yoke assembly (19). Discard seal.
2. Remove fitting (20) from slip yoke assembly (19).



3. Remove four snap rings (21), roller bearing assemblies (22), journal cross assembly (23), and yoke (24) from slip yoke assembly (19). Discard snap rings.
4. Remove four snap rings (25), roller bearing assemblies (26), journal cross assembly (27), and yoke (28) from yoke shaft assembly (16). Discard snap rings.



### Inspection-Acceptance and Rejection Criteria

1. Inspect all parts for cracks, distortion, breakage, and other evidence of damage that would impair their use.

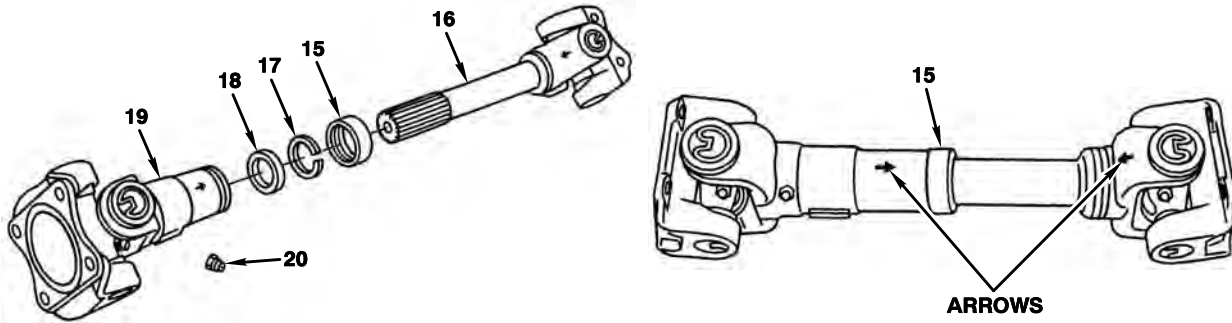
### Assembly

1. Install yoke (28), journal cross assembly (27), four roller bearing assemblies (26), and snap rings (25) to yoke shaft assembly (16).
2. Install yoke (24), journal cross assembly (23), four roller bearing assemblies (22), and snap rings (21) to slip yoke assembly (19).
3. Install fitting (20) to slip yoke assembly (19).

### NOTE

Do not tighten dust cap during step 4.

4. Install seal (18), split washer (17), dust cap (15), and yoke shaft assembly (16) to slip yoke assembly (19).
5. Align arrows and tighten dust cap (15).

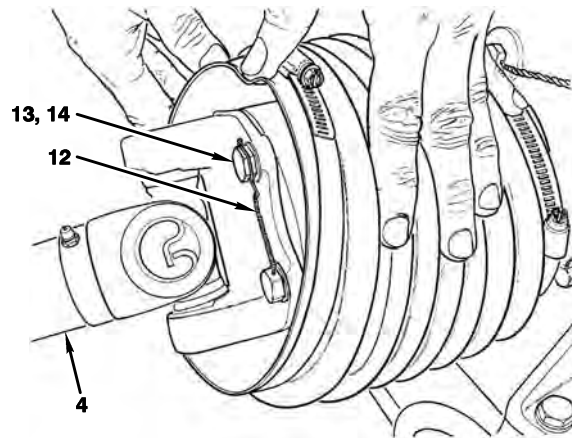
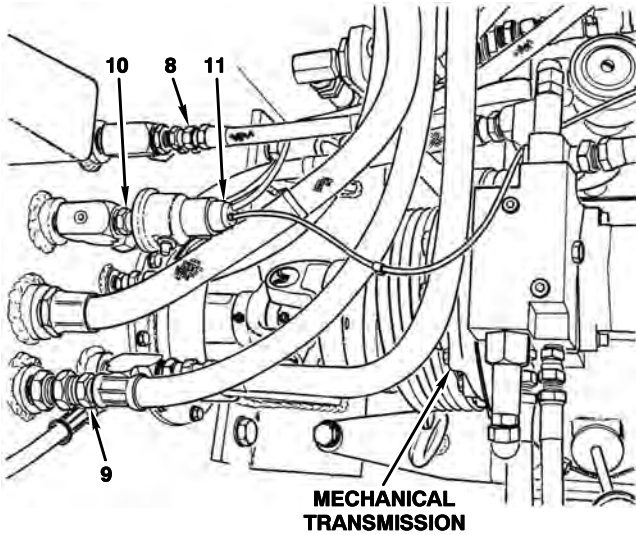


**Installation**

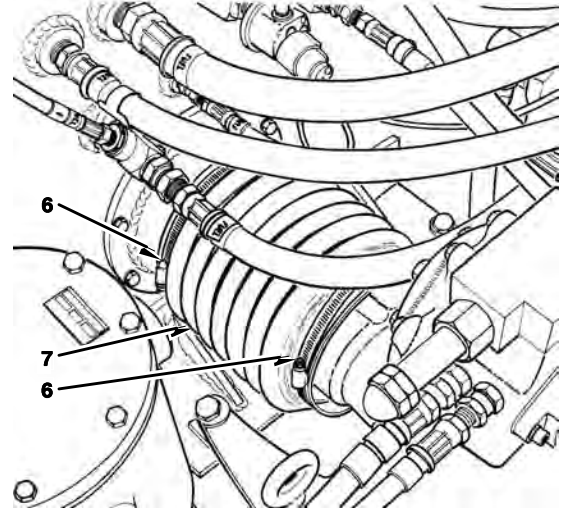
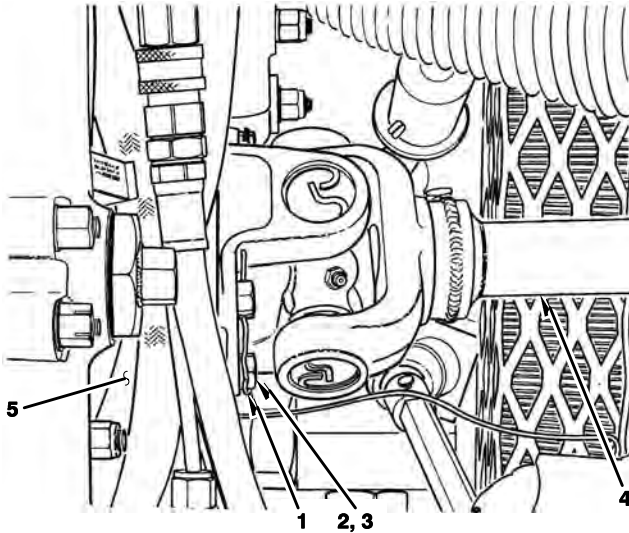
**NOTE**

Refer to WP 0022 00 for instructions on installing lockwire.

1. Connect drive shaft (4) and install four lockwashers (14), screws (13), and lockwire (12). Dry torque screws to 80–90 lb-ft (108–122 N•m).
2. Connect cable (11) and tighten warning light switch (10).
3. Connect two fuel lines (9).
4. Connect five hydraulic lines (8).



5. Position universal boot (7) and tighten two screws (6).
6. Install drive shaft (4), four lockwashers (3), and screws (2) to main engine (5). Dry torque screws to 80–90 lb-ft (108–122 N•m).
7. Install lockwire (1).



**END OF WORK PACKAGE**





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**INTERMEDIATE MAINTENANCE**  
**RECOVERY VEHICLE, FULL TRACKED: MEDIUM, M88A1**  
**NSN 2350-00-122-6826, EIC AQA**

**MECHANICAL TRANSMISSION OIL COOLER ASSEMBLY AND LINES MAINTENANCE**  
**REMOVAL, DISASSEMBLY, CLEANING, INSPECTION, ASSEMBLY, INSTALLATION**

---

**INITIAL SETUP:****Tools and Special Tools**

Tool kit, general mechanic's (item 34, WP 0086 00)

**Materials/Parts**

Brush, scrub (item 4, WP 0085 00)  
Cleaning compound (item 5, WP 0085 00)  
Lockwashers (3) (item 159, WP 0087 00)  
Lockwasher (item 161, WP 0087 00)  
Nuts (2) (item 200, WP 0087 00)  
Pin (item 90, WP 0087 00)

**Materials/Parts (cont.)**

Screw (item 48, WP 0087 00)  
Screws (2) (item 49, WP 0087 00)  
Screw (item 56, WP 0087 00)  
Washers (3) (item 118, WP 0087 00)  
Washer (item 120, WP 0087 00)

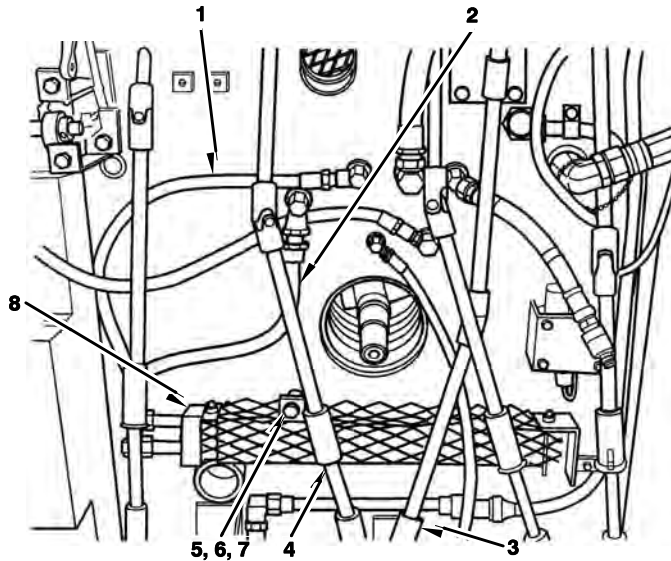
**Equipment Condition**

Powerplant removed (TM 9-2350-256-20)

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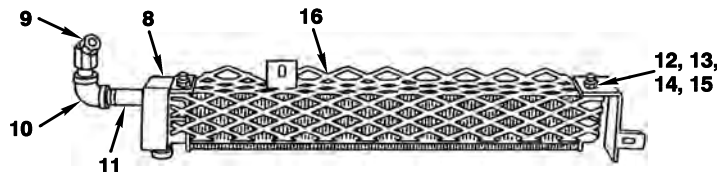
## Removal

1. Remove oil cooler inlet line (1) and oil cooler outlet line (2).
2. Remove pin (hidden) (3) and move rod (4) out of way.
3. Remove two screws (5), lockwashers (6), washers (7), and mechanical transmission oil cooler assembly (8). Discard lockwashers.



## Disassembly

1. Remove adapter union (9), elbow (10), and nipple (11) from mechanical transmission oil cooler assembly (8).
2. Remove two nuts (12), lockwashers (13), washers (14), screws (15), and guard (16). Discard lockwashers.



## Cleaning

### WARNING

Solvents 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 solvent gets on skin or clothing, wash immediately with soap and water.

1. Clean dirt and other foreign material from all parts with cleaning compound or paint thinner, followed by wire brushing where necessary. Dry with compressed air.

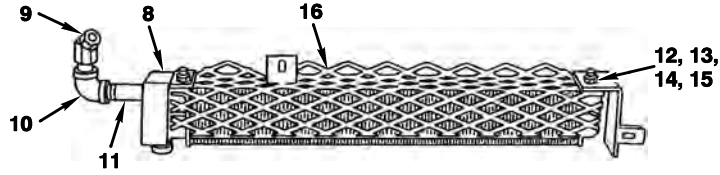
## Inspection-Acceptance and Rejection Criteria

1. Inspect mechanical transmission oil cooler assembly for cracks, distortion, breakage, and other damage that might cause leakage or otherwise impair its use.
2. Inspect threaded parts for nicks, cross-threading, and other evidence of excessive wear.

3. Inspect guard assembly for broken welds, cracks, and other damage that would impair its use.

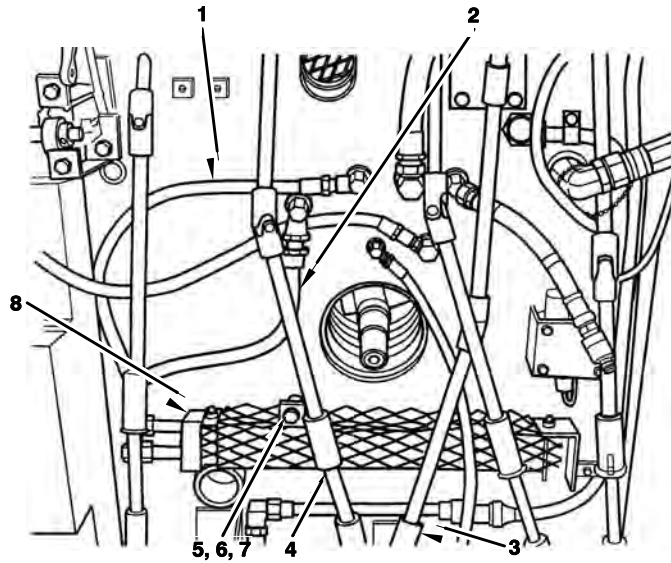
**Assembly**

1. Install guard (16), two screws (15), washers (14), lockwashers (13), and nuts (12).
2. Install nipple (11), elbow (10), and adapter union (9) to mechanical transmission oil cooler assembly (8).



**Installation**

1. Install mechanical transmission oil cooler (8), two washers (7), lockwashers (6), and screws (5).
2. Move rod (4) into position and install pin (hidden) (3).
3. Install oil cooler outlet line (2) and oil cooler inlet line (1).



**END OF WORK PACKAGE**



**INTERMEDIATE MAINTENANCE**  
**RECOVERY VEHICLE, FULL TRACKED: MEDIUM, M88A1**  
**NSN 2350-00-122-6826, EIC AQA**

**HOISTING BOOM ASSEMBLY MAINTENANCE**  
**DESCRIPTION, REMOVAL, DISASSEMBLY, INSPECTION, ASSEMBLY,**  
**INSTALLATION, ADJUSTMENT, TESTING**

---

**INITIAL SETUP:**

**Test Equipment**

Gage, pressure (item 9, WP 0086 00)

**Tools and Special Tools**

Adapter (item 1, WP 0086 00)  
 Puller (item 24, WP 0086 00)  
 Sling (item 30, WP 0086 00)  
 Sling assembly, lifting (item 31, WP 0086 00)  
 Tool kit, general mechanic's (item 34, WP 0086 00)

**Materials/Parts**

Adhesive (item 2, WP 0085 00)  
 Clamps (2) (item 27, WP 0087 00)  
 Lockwashers (40) (item 160, WP 0087 00)  
 Lockwashers (8) (item 161, WP 0087 00)  
 Screws (40) (item 50, WP 0087 00)  
 Screws (4) (item 184, WP 0087 00)  
 Screws (4) (item 215, WP 0087 00)

**Personnel Required**

Mechanics (4)

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**DESCRIPTION**

The hoisting boom assembly is a tubular A-frame that is pivot-mounted to the top of the vehicle. Hydraulic pressure raises or lowers the boom by means of two boom-actuating cylinders that are activated by the boom control lever. The hoisting boom assembly is capable of holding a 25-ton (22.68-metric ton) load. In operating position, the boom is supported by a stayline cable secured to crank arms located at the rear of the hull. These crank arms are connected to hydraulically actuated stayline cylinders that govern the reaching capacity of the hoisting boom assembly. A boom travel lock is provided for preventing movement of the boom, particularly sideways, while traveling.

**WARNING**

Removal of hoisting boom assembly when both the main engine and APU engine are inoperable is a safety hazard and may cause injury to personnel.

**NOTE**

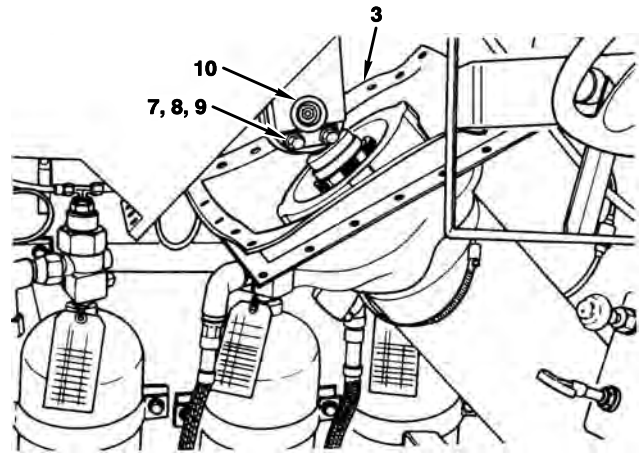
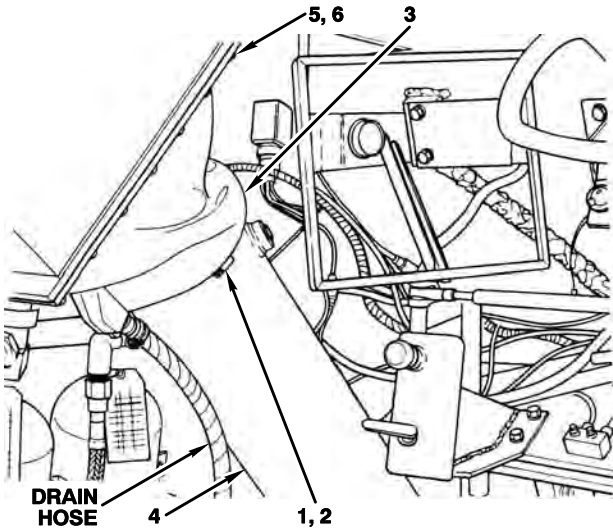
**LOAD TEST REQUIREMENT**—Load testing of hoisting boom assembly is mandatory, prior to use, under any of the following requirements: (1) When new. (2) Following any repairs, disassembly and assembly, adjustments, or parts replacement, of hoisting boom assembly. (3) When modifications are made that could affect the strength or lifting capabilities of the vehicle.

Load testing will be accomplished by support maintenance activities.

Refer to the TESTING section below for the detailed step-by-step procedure.

**Removal**

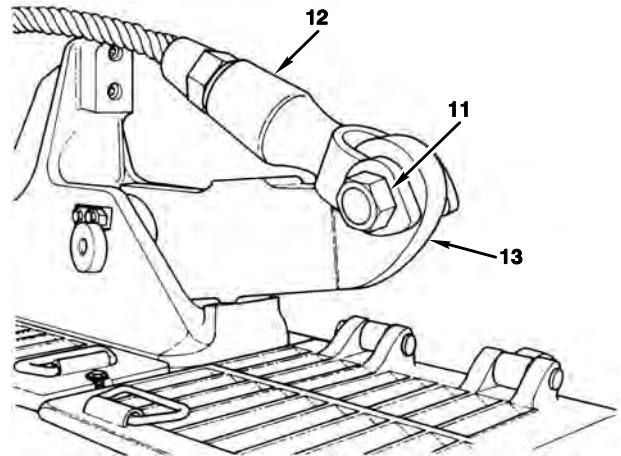
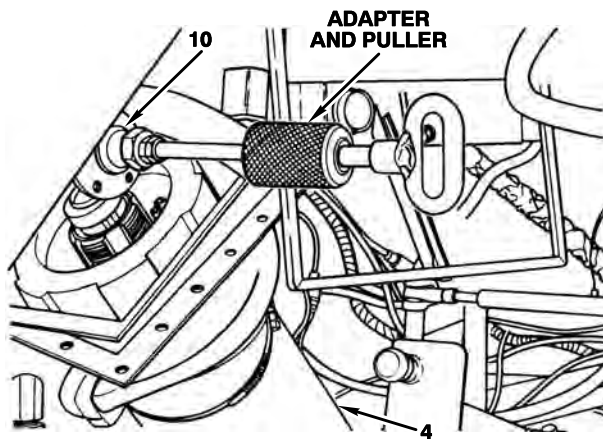
1. Loosen screw (1) on clamp (2) holding boot (3) to boom actuating cylinder (4).
2. Remove 20 screws (5) and lockwashers (6) from boot (3). Discard lockwashers.
3. Slip boot (3) down and remove two capscrews (7), lockwashers (8), and retainer (9) from piston eye pin (10). Discard lockwashers.



**NOTE**

Support boom actuating cylinder (4) while removing piston eye pin (10).

4. Using adapter and puller, remove piston eye pin (10).
5. Remove shoulder bolt (11) and stayline cable assembly (12) from crank arm (13).

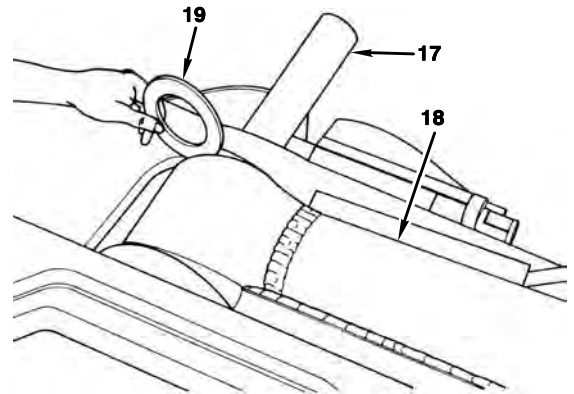
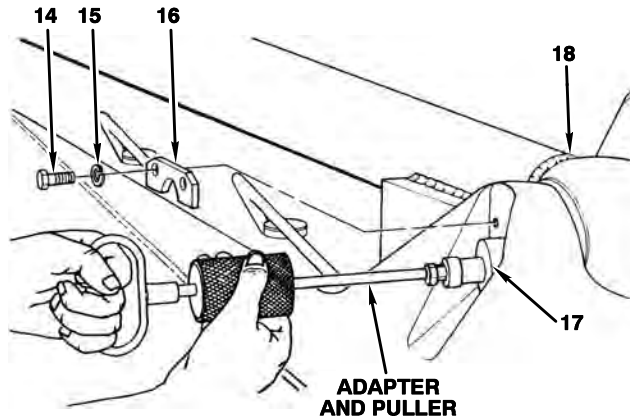


6. Remove two screws (14), lockwashers (15), and retainer (16). Discard lockwashers.
7. Attach sling to hoisting boom assembly (18) as near as possible to its balance points.

**NOTE**

Use sling to hold weight of hoisting boom assembly (18) while pulling boom pin (17).

8. Using adapter and puller, remove boom pin (17) from hoisting boom assembly (18).
9. Remove spacers (19).

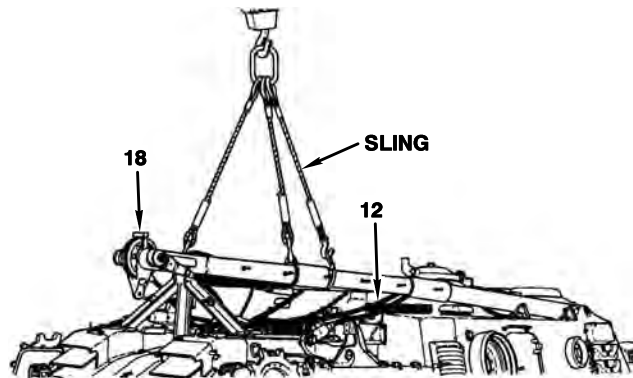


10. Repeat steps 1 thru 8 for other side.

### WARNING

Tie end of stayline cable assemblies (12) to hoisting boom assembly (18) to avoid injury to personnel.

11. Using sling, remove hoisting boom assembly (18).

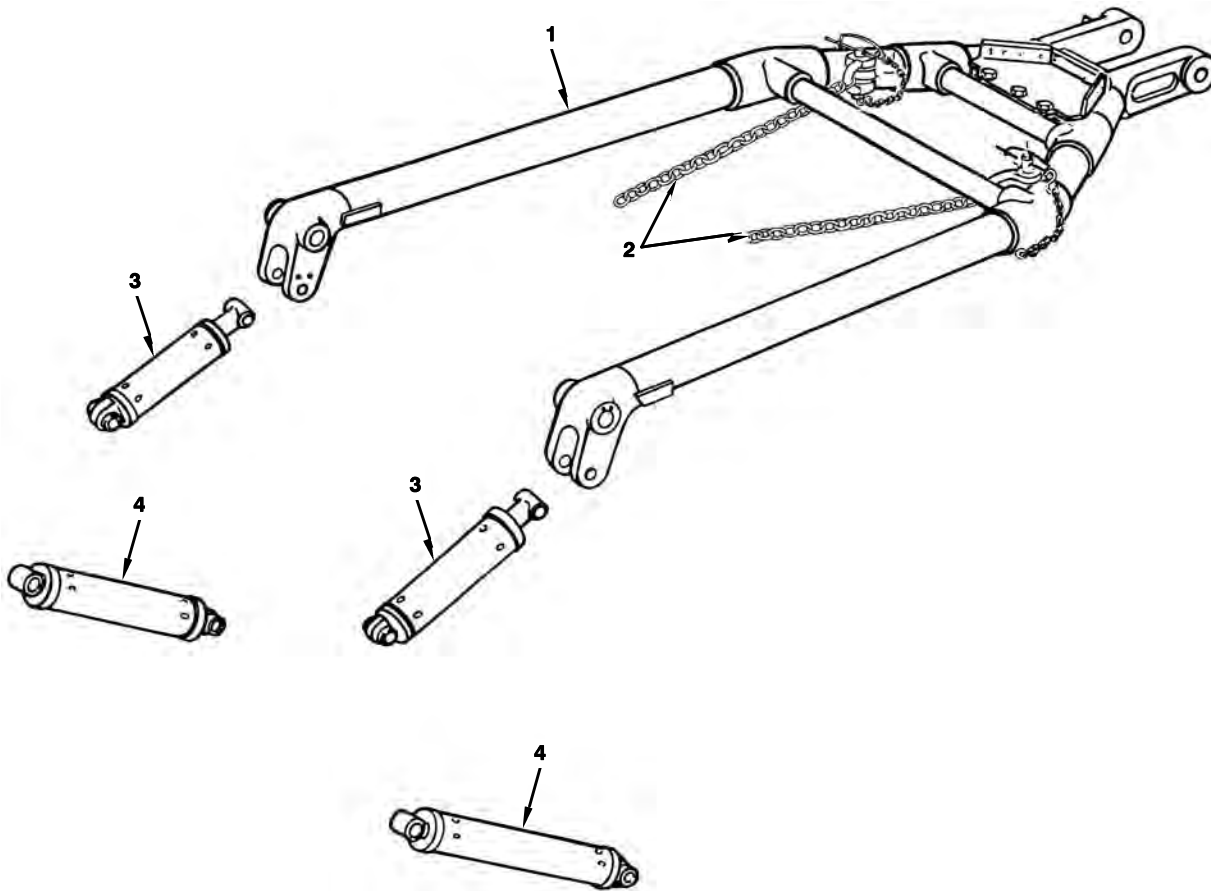


### NOTE

After powerplants are operable, start hydraulic system and exercise boom actuating cylinders through their entire stroke to purge all air from cylinders.

### Disassembly

1. The peculiar nature of the hoisting boom assembly makes it necessary to disassemble it into subassemblies during removal. Refer to REMOVAL above and the partially exploded view below for instructions of disassembly of the hoisting boom assembly.



#### Legend:

1. Hoisting Boom Assembly
2. Chain Assembly
3. Boom Actuating Cylinders
4. Boom Stayline Actuating Cylinders

### Inspection-Acceptance and Rejection Criteria

1. Inspect hoisting boom assembly for nicks, bends, and burrs. Remove nicks and burrs with a rough file.
2. Inspect welds for cracks and defects. Reweld where necessary and repaint all bare metal.

### Assembly

1. The peculiar nature of the hoisting boom assembly makes it necessary to assemble the subassemblies during installation. Refer to the partially exploded view above and INSTALLATION below for assembly instructions of the hoisting boom assembly.

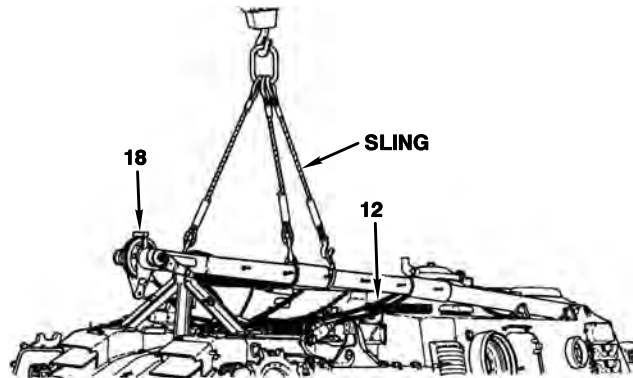


## Installation

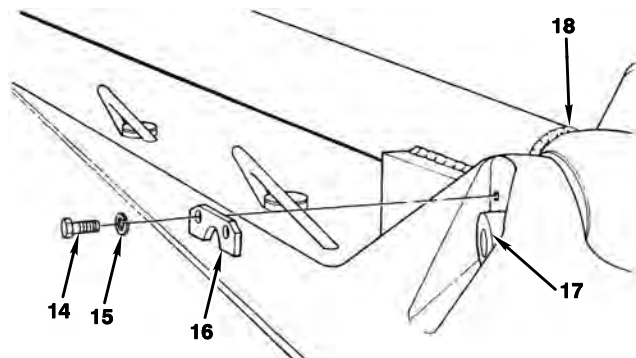
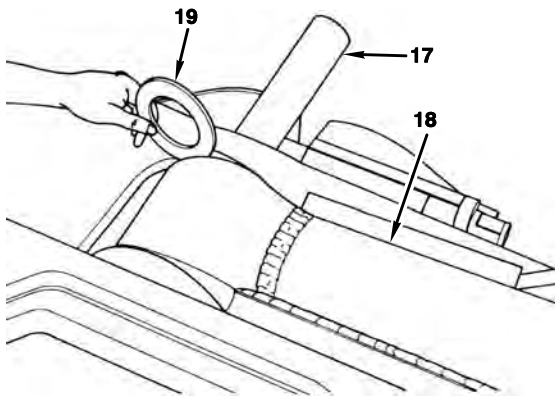
### WARNING

Tie end of stayline cable assemblies (12) to hoisting boom assembly (18) to avoid injury to personnel.

1. Attach sling to hoisting boom assembly (18) as near as possible to its balance points.
2. Using sling, move hoisting boom assembly (18) into position.



3. Install spacers (19) as required to adjust side play of hoisting boom assembly (18).
4. Align pin holes with tapered drift and install boom pin (17) to hoisting boom assembly (18) using wood block and hammer.
5. Install retainer (16), two lockwashers (15), and screws (14).

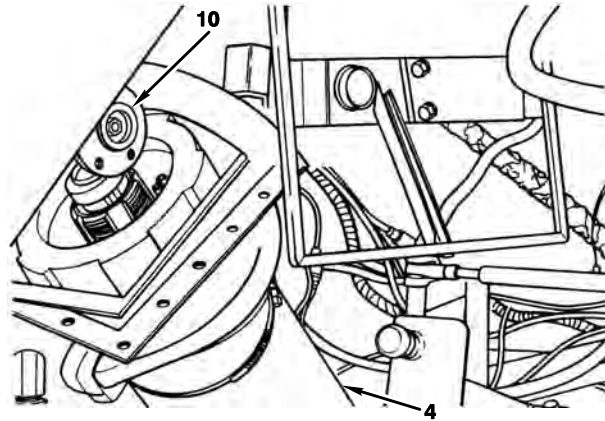
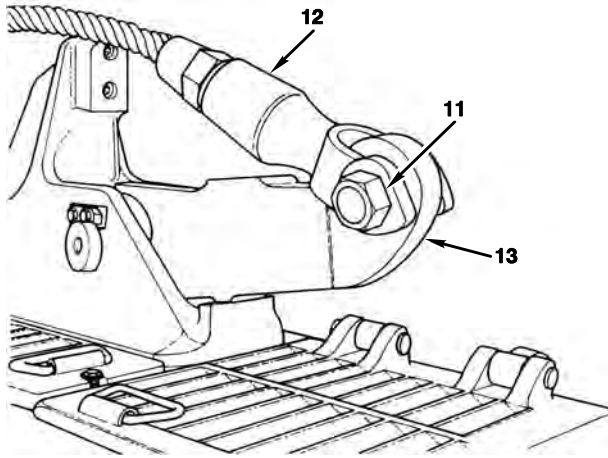


6. Install stayline cable assembly (12) and shoulder bolt (11) to crank arm (13).

**NOTE**

Support boom actuating cylinder (4) while installing piston eye pin (10).

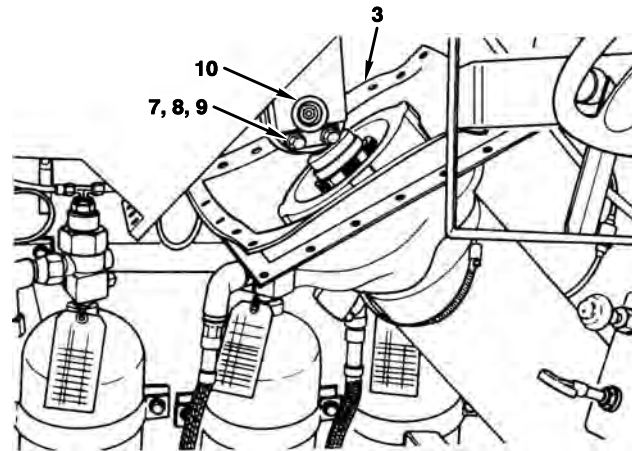
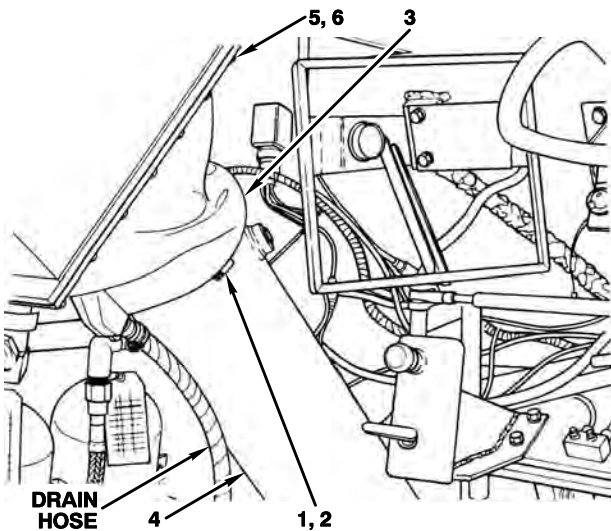
7. Align pin holes with tapered drift and install piston eye pin (10) using wood block and hammer.



**NOTE**

If boot (3) is replaced, use part number 11672351 and adhere joining strips at installation using adhesive.

8. Install retainer (9), two lockwashers (8), and capscrews (7). Move boot (3) into position covering piston eye pin (10).
9. Install 20 lockwashers (6) and screws (5) securing boot (3) in position.
10. Tighten screw (1) on clamp (2) securing boot (3) to boom actuating cylinder (4).



11. Repeat steps 3 thru 10 for other side.

**Adjustment****WARNING**

Test components (pressure gages, hoses, and fitting) must be capable of withstanding a working pressure of 1950–2050 psi (13,445–14,135 kPa).

**NOTE**

VEHICLE PREPARATION—Perform steps 1 thru 3 for vehicle preparation.

1. Install pressure gage in rear gage port (toward rear of vehicle) (20) on boom combination control valve (21).
2. If using load cell or calibrated weights, rig a four-part line and extend the boom to an 8-ft (2.44-m) reach. Attach load cell or weights. Load cell must be anchored.

If a load cell or weights are not available, place boom in STOW position. Then block boom in a partially raised position using 2x4 wooden blocks on top of each armor air intake cover. (Covers are located at the top rear of the crew compartment.)

- Set engine speed at 1600–1800 rpm.

### **CAUTION**

Do not exceed 1700 psi (11,722 kPa) relief pressure.

### **NOTE**

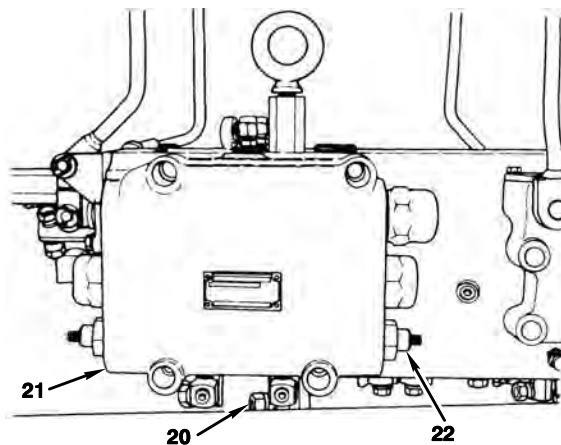
**BOOM COMBINATION CONTROL VALVE ADJUSTMENT**—Perform steps 4 thru 6 to adjust the boom combination control valve to achieve live boom capability.

### **NOTE**

This adjustment must be performed with the hydraulic reservoir oil temperature at 100°F–130°F (38°C–54°C).

- If using load cell or weights, activate boom valve to **RETRACT** position and use adjusting screw (22) on boom combination control valve (21) to achieve a pull of 50,000–55,000 lb (22,680–24,948 kg). Turning in a clockwise direction will increase pressure.

If blocking the boom, place boom operating lever in **RETRACT** position and boom safety control lever in **STOW** position. Adjust boom combination control valve rear relief (toward rear of vehicle) to 1600 psi (11,032 kPa) by turning adjusting screw (22). Turning in a clockwise direction will increase pressure.



### **NOTE**

Pressure must be between 1550 and 1650 psi (10,687 and 11,377 kPa). Do not exceed 1650 psi (11,377 kPa).

- Verify pressure with locking nut set in locked position and record new setting in Vehicle Log Book.
- Disconnect pressure gage. Remove load cell or weights. Remove blocking.

### **NOTE**

If adjustment procedure was done using load cell or calibrated weights, no further load test is required. If adjustment was made with boom blocked, verify capabilities with the load test that follows.

**Testing****NOTE**

LOAD TEST—Perform steps 1 thru 4 for the load test of the hoisting boom assembly.

**NOTE**

The following load test must be performed with the hydraulic reservoir oil temperature at 100°F–130°F (38°C–54°C).

1. Rig a four-part line and extend the boom to an 8-ft (2.44-m) reach.
2. Attach load. Use load cell or calibrated weights if available. The rear of an M88A1, a medium tank, or equivalent may be used if the load cell or weights are unavailable.
3. Activate boom valve to RETRACT position.
4. If vehicle fails to pass the load test, perform procedures as specified in ADJUSTMENT above.

**END OF WORK PACKAGE**



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**INTERMEDIATE MAINTENANCE**  
**RECOVERY VEHICLE, FULL TRACKED: MEDIUM, M88A1**  
**NSN 2350-00-122-6826, EIC AQA**  
**BOOM STAYLINE ACTUATING CYLINDERS REPLACEMENT**  
**REMOVAL, INSTALLATION**

---

**INITIAL SETUP:****Tools and Special Tools**

Adapter (item 1, WP 0086 00)  
 Puller (item 24, WP 0086 00)  
 Tool kit, general mechanic's (item 34, WP 0086 00)  
 Wire rope (item 36, WP 0086 00)

**Materials/Parts**

Lockwashers (12) (item 161, WP 0087 00)  
 Screws (12) (item 215, WP 0087 00)

**Personnel Required**

Mechanics (2)

**Equipment Condition**

Hoisting boom raised so that cylinder pistons are retracted  
 (TM 9-2350-256-10)  
 Engine deck removed (TM 9-2350-256-20)  
 Subfloor plates 8 and 17 removed (TM 9-2350-256-20)

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**CAUTION**

Do not operate hydraulic system when any hydraulic lines are disconnected.

**NOTE**

Both right and left cylinders are removed in the same manner. This procedure covers one cylinder.

**NOTE**

Disconnect interfering electric wires as required (TM 9-2350-256-20).

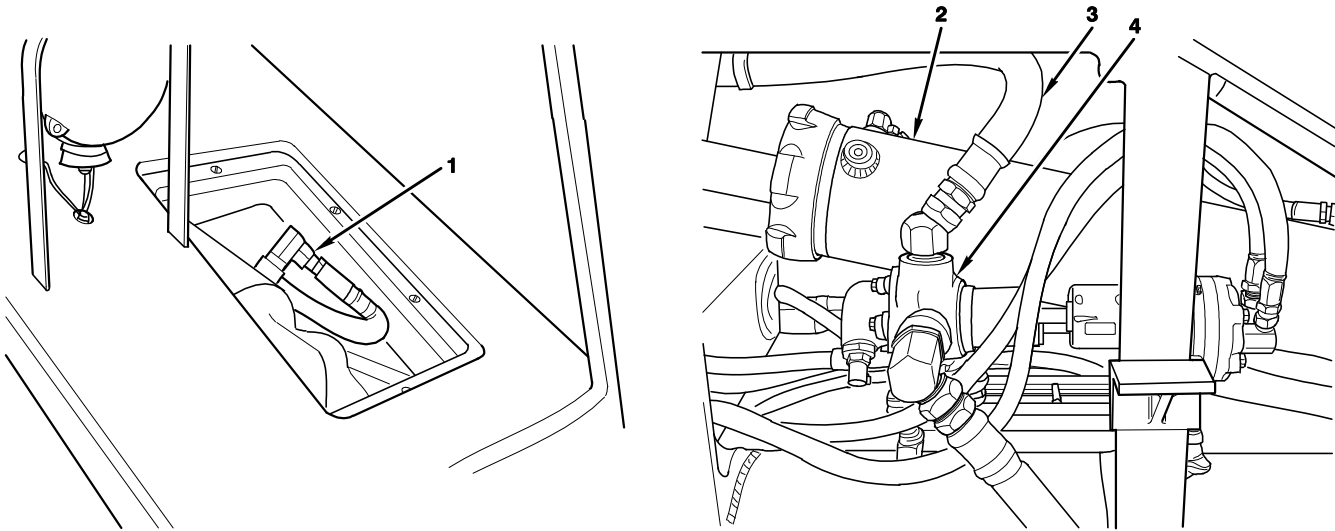
## Removal

1. Disconnect hydraulic line (1).

### NOTE

Steps 2 and 3 are for clearance for piston eye pin operation, right cylinder.

2. Disconnect hydraulic line (hidden) (2).
3. Remove fuel line (3) from auxiliary fuel transfer pump (4) for clearance.



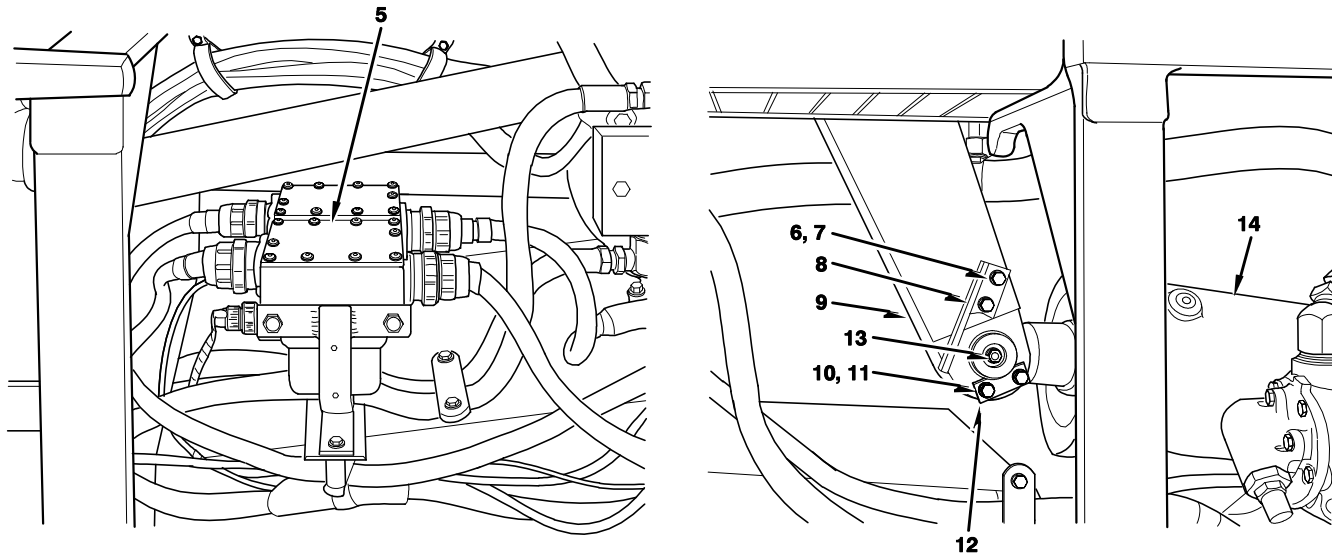
### NOTE

Step 4 is for clearance for piston eye pin operation, right cylinder.

4. Remove master and armature relays and bracket (5) in accordance with TM 9-2350-256-20.
5. Remove two screws (6), lockwashers (7), and limit valve cam follower bracket (8) from crank arm (9). Discard lockwashers.



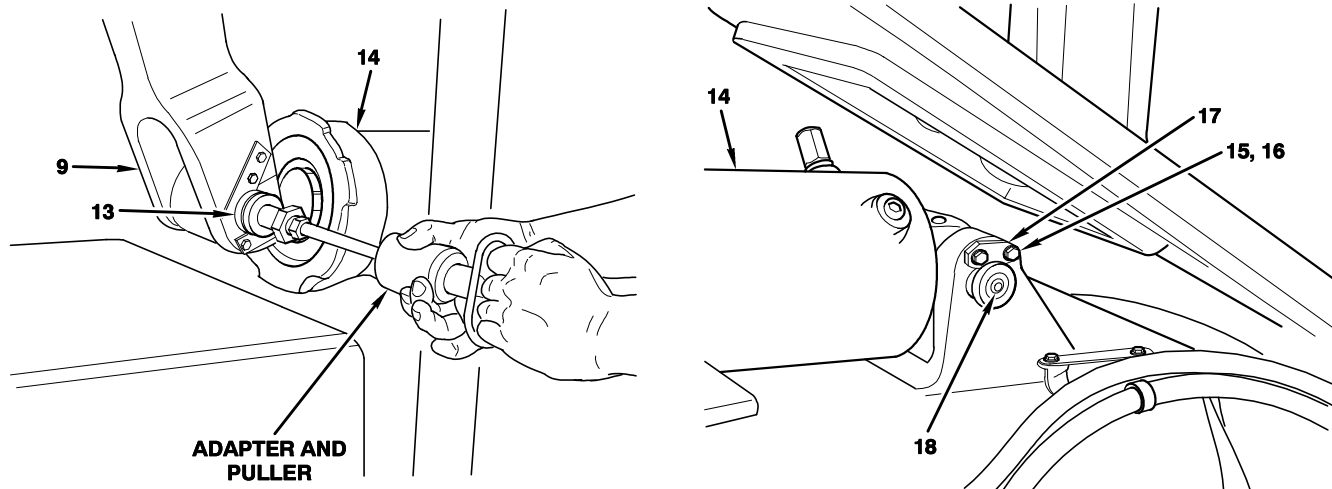
6. Remove two screws (10), lockwashers (11), and retainer (12) holding piston eye pin (13) to crank arm (9) and cylinder (14). Discard lockwashers.



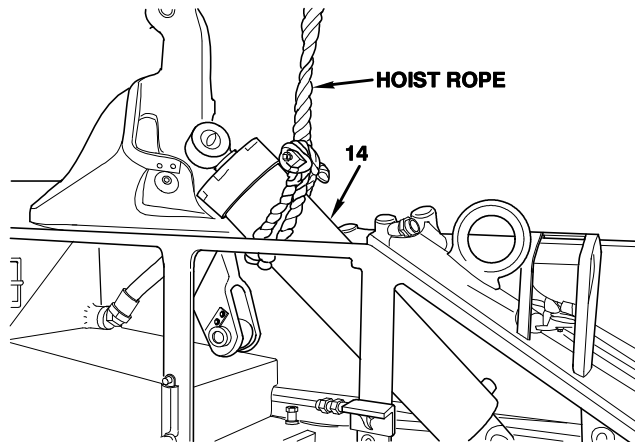
**CAUTION**

Tie or block cylinder (14) to prevent damage from drop when piston eye pin (13) is pulled.

7. Using adapter and puller, remove piston eye pin (13) from crank arm (9) and cylinder (14).
8. Remove two screws (15), lockwashers (16), and retainer (17) holding cylinder eye pin (18) to other end of cylinder (14). Discard lockwashers.
9. Using adapter and puller, remove cylinder eye pin (18) from cylinder (14).



10. Using hoist rope, remove cylinder (14) through sponson opening.



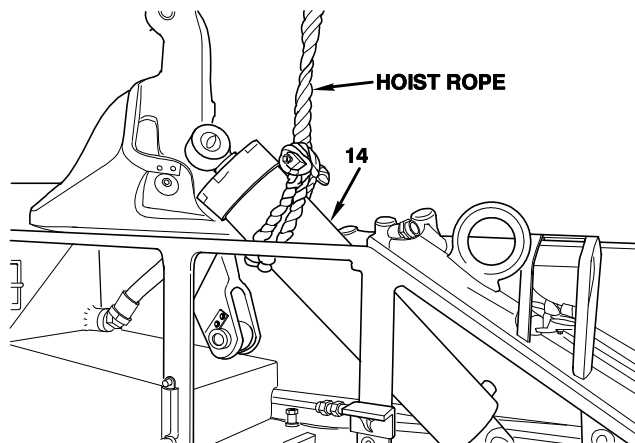
**AUXILIARY FUEL TRANSFER PUMP AND MOTOR ASSEMBLY SHOWN REMOVED FOR CLARITY.**

## Installation

### NOTE

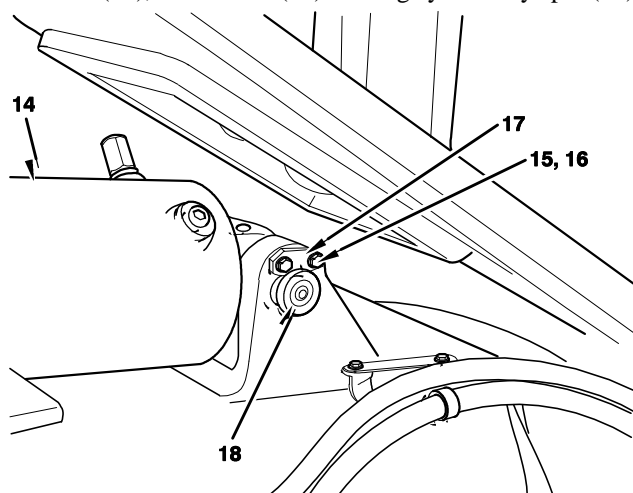
Both cylinders are installed in the same manner. This procedure covers one cylinder.

1. Using hoist rope, move cylinder (14) into position through sponson opening.



**AUXILIARY FUEL TRANSFER PUMP AND MOTOR ASSEMBLY SHOWN REMOVED FOR CLARITY.**

2. Tie or block cylinder (14) to position.
3. Align holes with tapered drift and install cylinder eye pin (18) to cylinder (14) using wood block and hammer to tap pin in place.
4. Install retainer (17), two lockwashers (16), and screws (15) holding cylinder eye pin (18) to cylinder (14).

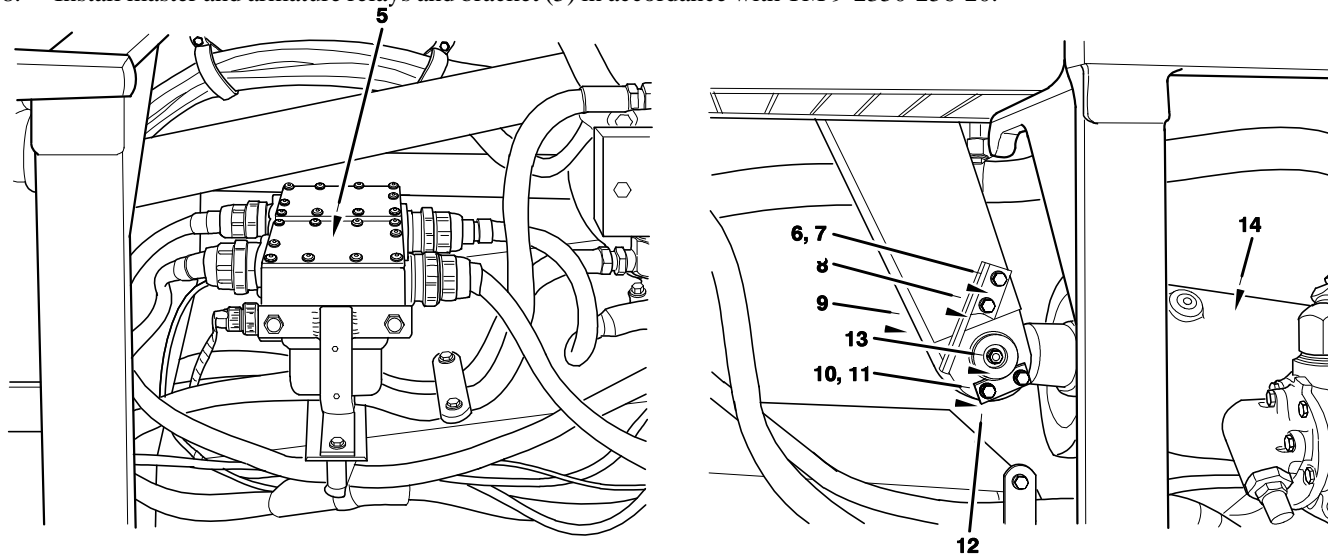


5. Align holes with tapered drift and install piston eye pin (13) to crank arm (9) and cylinder (14) using wood block and hammer to tap pin in place.
6. Install retainer (12), two lockwashers (11), and screws (10) holding piston eye pin (13) to crank arm (9) and cylinder (14).
7. Install limit valve cam follower bracket (8), two lockwashers (7), and screws (6) to crank arm (9).

### NOTE

Step 8 is for clearance for piston eye pin operation, right cylinder.

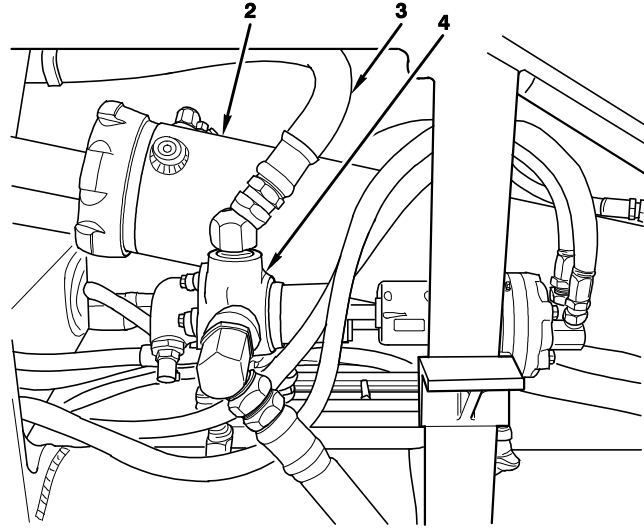
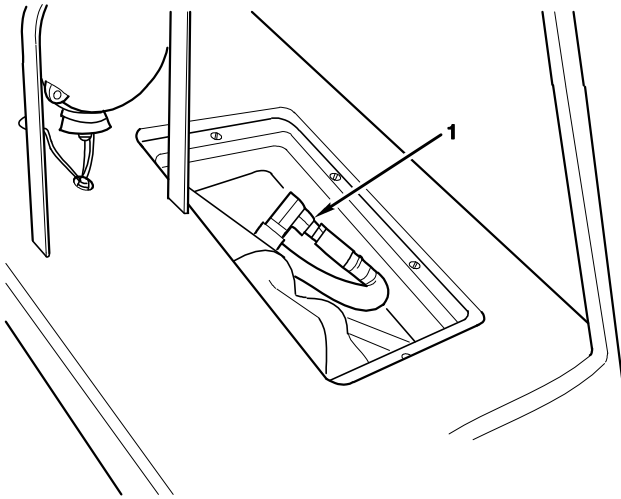
8. Install master and armature relays and bracket (5) in accordance with TM 9-2350-256-20.



**NOTE**

Steps 9 and 10 are for clearance for piston eye pin operation, right cylinder.

9. Install fuel line (3) to auxiliary fuel transfer pump (4).
10. Connect hydraulic line (hidden) (2).
11. Connect hydraulic line (1).



**END OF WORK PACKAGE**

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**INTERMEDIATE MAINTENANCE**  
**RECOVERY VEHICLE, FULL TRACKED: MEDIUM, M88A1**  
**NSN 2350-00-122-6826, EIC AQA**

**BOOM ACTUATING CYLINDERS REPLACEMENT**  
**REMOVAL, INSTALLATION**

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**INITIAL SETUP:****Tools and Special Tools**

Adapter (item 1, WP 0086 00)  
 Puller (item 24, WP 0086 00)  
 Tool kit, general mechanic's (item 34, WP 0086 00)  
 Wire rope (item 36, WP 0086 00)

**Materials/Parts**

Adhesive (item 2, WP 0085 00)  
 Clamps (2) (item 27, WP 0087 00)  
 Lockwashers (40) (item 160, WP 0087 00)  
 Lockwashers (8) (item 161, WP 0087 00)

**Materials/Parts (cont.)**

Screws (40) (item 50, WP 0087 00)  
 Screws (8) (item 215, WP 0087 00)

**Personnel Required**

Mechanics (2)

**Equipment Condition**

Driver's and mechanic's seats removed (TM 9-2350-256-20)  
 Subfloor plate 1 removed (TM 9-2350-256-20)

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**CAUTION**

Do not operate hydraulic system when any hydraulic lines are disconnected.

**NOTE**

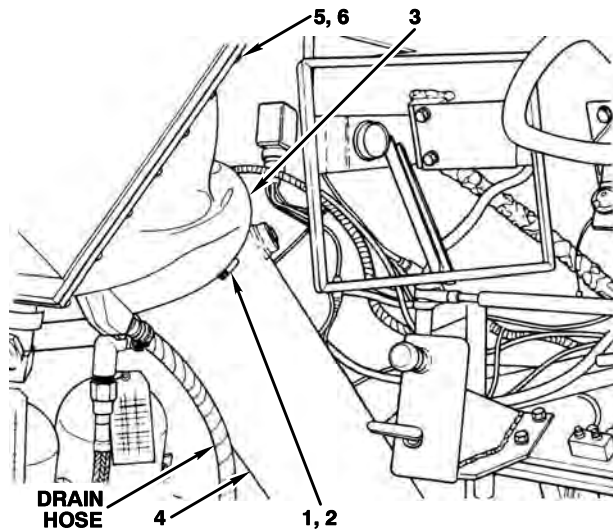
Both right and left cylinders are removed in the same manner. This procedure covers one cylinder.

**NOTE**

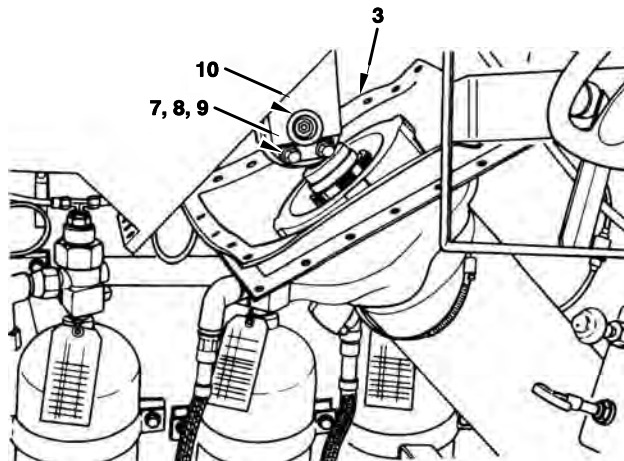
Disconnect interfering electric wires as required (TM 9-2350-256-20).

**Removal**

1. Loosen screw (1) on clamp (2) holding boot (3) to boom actuating cylinder (4).
2. Remove 20 screws (5) and lockwashers (6) from boot (3). Discard lockwashers.



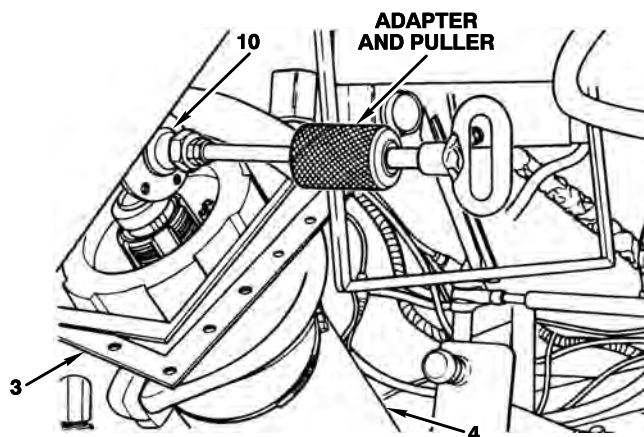
3. Slip boot (3) down and remove two capscrews (7), lockwashers (8), and retainer (9) from piston eye pin (10). Discard lockwashers.



**CAUTION**

Support boom actuating cylinder (4) while removing piston eye pin (10).

4. Using adapter and puller, remove piston eye pin (10).
5. Remove boot (3).

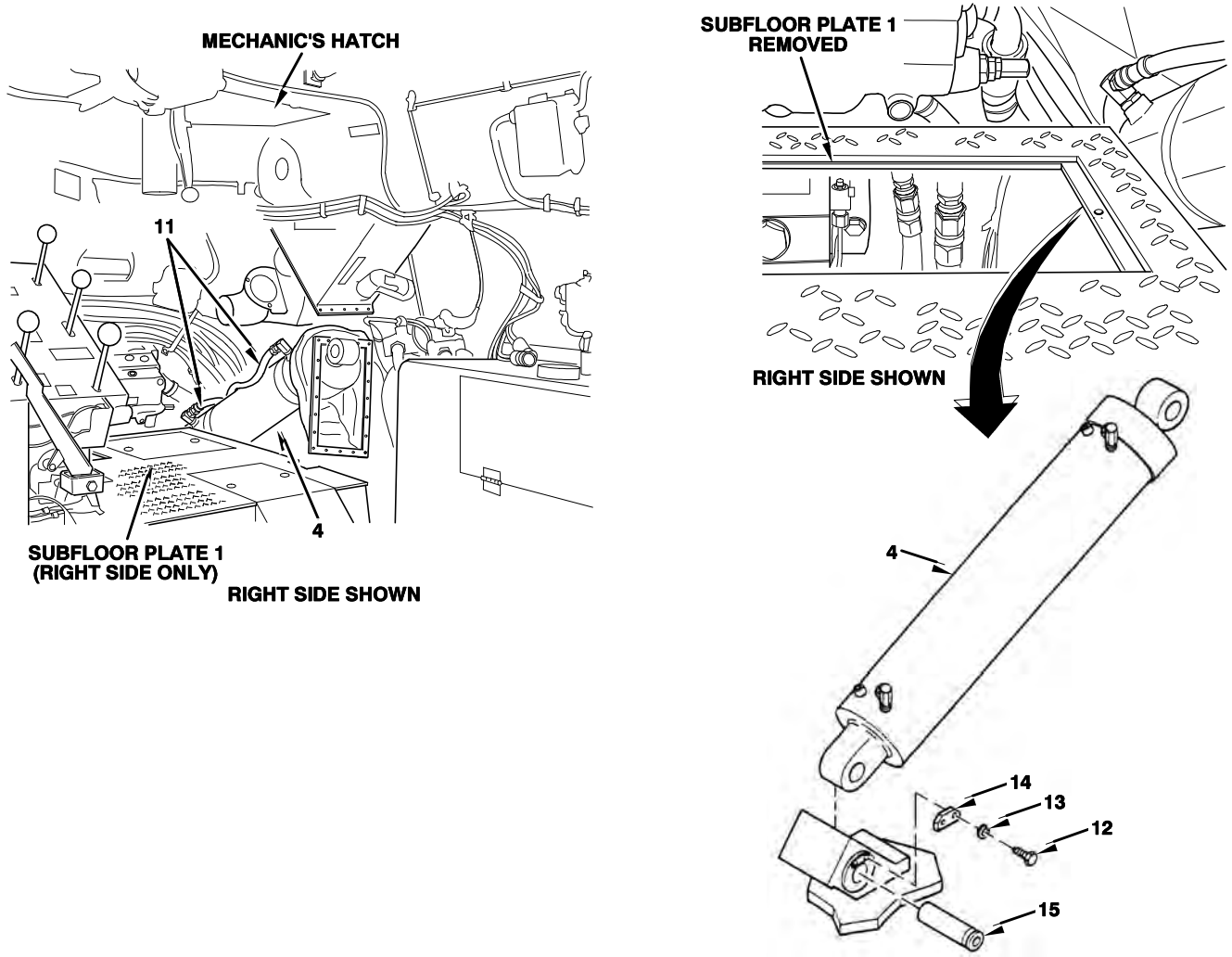


- Introduce hoist rope through mechanic's or driver's hatch and support weight of boom actuating cylinder (4).

**NOTE**

Refer to the illustration below for access to the right boom actuating cylinder (4).

- Disconnect two hydraulic lines (11).
- Remove two screws (12), lockwashers (13), and retainer (14). Discard lockwashers.
- Using adapter and puller, remove cylinder eye pin (15) from boom actuating cylinder (4).
- While guiding by hand and using hoist rope, remove boom actuating cylinder (4) out thru driver's or mechanic's hatch.





**Installation**

1. While guiding by hand and using hoist rope, move boom actuating cylinder (4) into position thru driver's or mechanic's hatch.
2. Align pin holes with tapered drift and install piston eye pin (15) using wood block and hammer.
3. Install retainer (14), two lockwashers (13), and screws (12).
4. Connect two hydraulic lines (11).
5. Install boot (3).

**NOTE**

Start hydraulic system and exercise boom actuating cylinders (4) through their entire strokes to purge all air from cylinders prior to installing piston eye pins (10).

**NOTE**

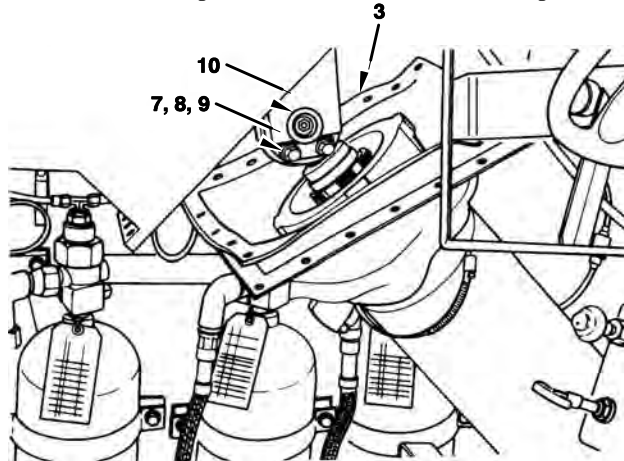
Support boom actuating cylinder (4) while installing piston eye pin (10).

6. Align pin holes with tapered drift and install piston eye pin (10) using wood block and hammer.

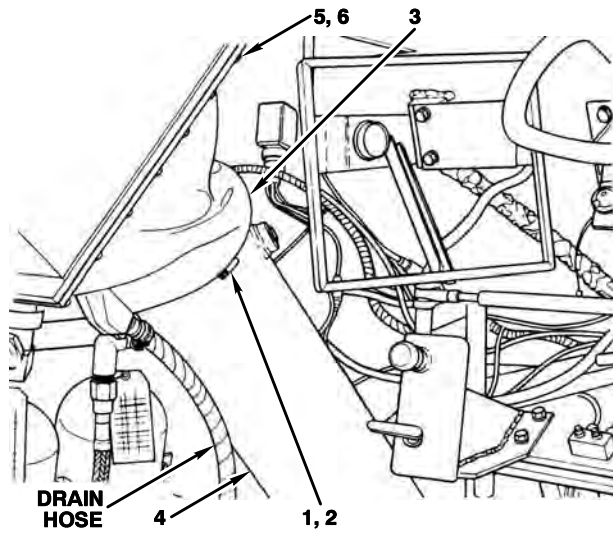
**NOTE**

If boot (3) is replaced, use part number 11672351 and adhere joining strips at installation using adhesive.

7. Install retainer (9), two lockwashers (8), and capscrews (7). Move boot (3) into position covering piston eye pin (10).



8. Install 20 lockwashers (6) and screws (5) securing boot (3) in position.
9. Tighten screw (1) on clamp (2) securing boot (3) to boom actuating cylinder (4).



**END OF WORK PACKAGE**

**INTERMEDIATE MAINTENANCE**  
**RECOVERY VEHICLE, FULL TRACKED: MEDIUM, M88A1**  
**NSN 2350-00-122-6826, EIC AQA**  
**BOOM STAYLINE ACTUATING CYLINDER CRANK ARMS REPLACEMENT**  
**REMOVAL, INSTALLATION**

**INITIAL SETUP:****Tools and Special Tools**

Adapter (item 1, WP 0086 00)  
 Puller (item 24, WP 0086 00)  
 Tool kit, general mechanic's (item 34, WP 0086 00)  
 Wire rope (item 36, WP 0086 00)

**Personnel Required**

Mechanics (2)

**References**

WP 0069 00

**Materials/Parts**

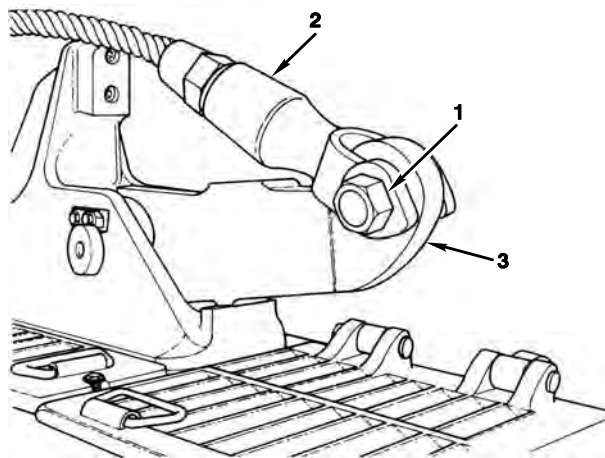
Lockwashers (4) (item 161, WP 0087 00)  
 Screws (4) (item 102, WP 0087 00)  
 Screws (4) (item 215, WP 0087 00)

**Equipment Condition**

Engine deck assembly removed (TM 9-2350-256-20)

**Removal**

1. Place suitable wood block in front of air intake covers and lower boom onto blocks.
2. Remove shoulder bolt (1) and stayline assembly (2) from crank arm (3).



3. Repeat step 2 for other side.

**NOTE**

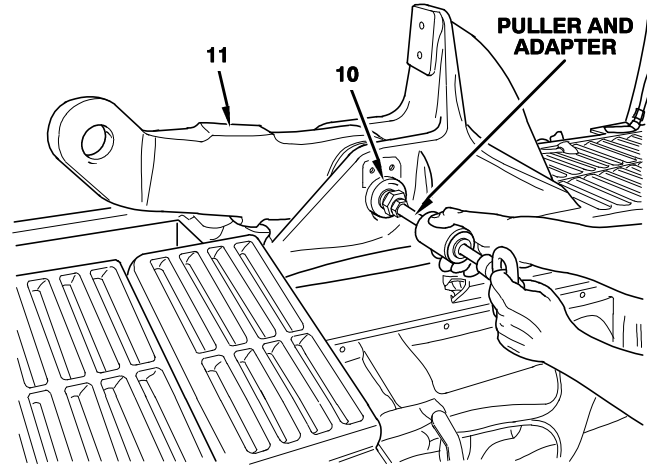
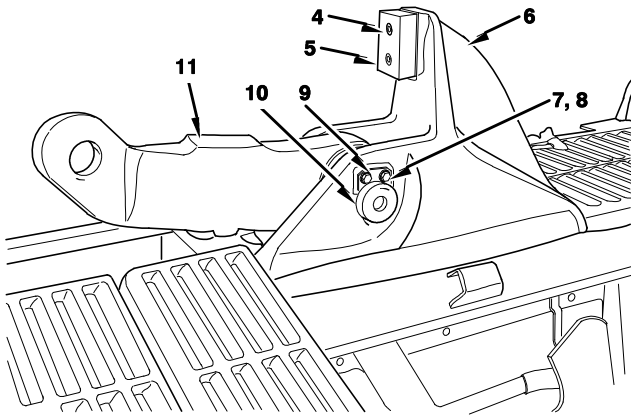
Install a hose on hydraulic line connections (callout 1 of WP 0069 00) for draining fluid into suitable container.

**NOTE**

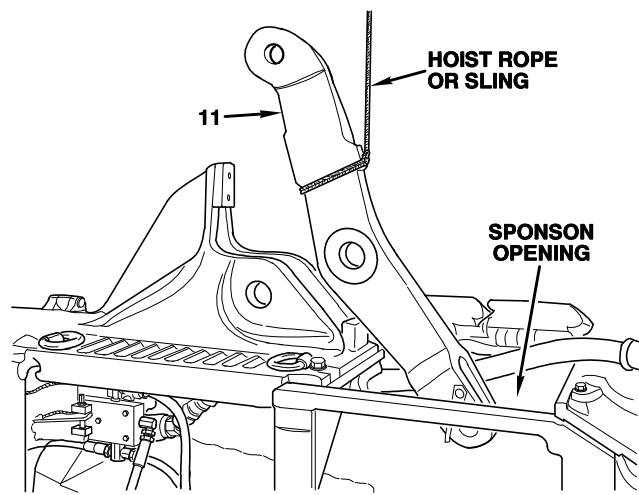
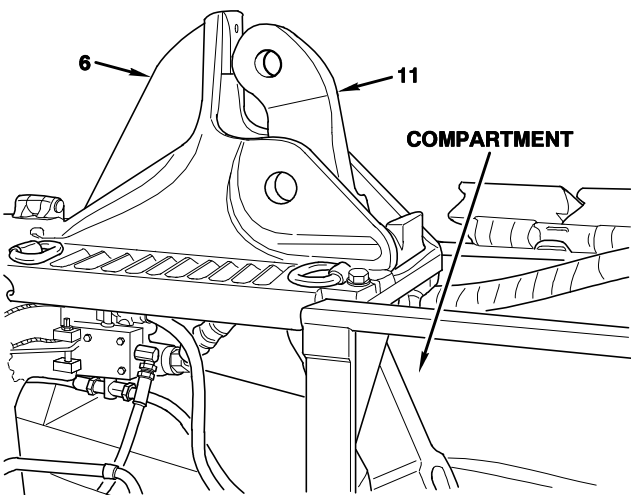
Prior to REMOVAL step 5 of WP 0069 00, place crank arms in the up position.

4. Remove boom stayline actuating cylinders in accordance with WP 0069 00 up to the point where the crank arms are disconnected from the boom stayline actuating cylinders.

5. Remove two screws (4) and stopblock (5) from crank arm bracket (6) for clearance.
6. Remove two screws (7), lockwashers (8), and retainer (9) holding crank arm pin (10) in crank arm (11). Discard lockwashers.
7. Using adapter and puller, remove crank arm pin (10) from crank arm (11).



8. Lower crank arm (11) thru bottom of crank arm bracket (6) into compartment.
9. Using hoist rope or sling, remove crank arm (11) up thru rear sponson opening.



**AUXILIARY FUEL TRANSFER PUMP AND MOTOR ASSEMBLY SHOWN REMOVED FOR CLARITY.**

10. Repeat steps 5 thru 9 for other side.

**Installation**

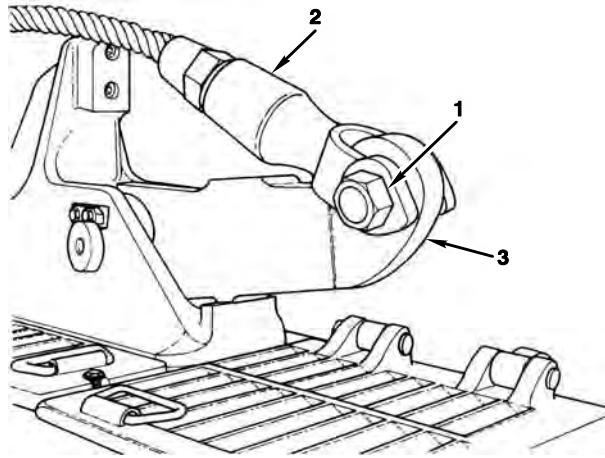
1. Using hoist rope or sling, lower crank arm (11) thru rear sponson opening into compartment.
2. Move crank arm (11) up thru bottom of crank arm bracket (6) into position.
3. Align holes with tapered drift and install crank arm pin (10) to crank arm (11) using wood block and hammer.
4. Install retainer (9), two lockwashers (8), and screws (7) holding crank arm pin (10) in crank arm (11).
5. Install stopblock (5) and two screws (4) to crank arm bracket (6).

6. Repeat steps 1 thru 5 for other side.

### NOTE

Prior to INSTALLATION step 5 of WP 0069 00, place crank arms in the up position.

7. Install boom stayline actuating cylinders in accordance with WP 0069 00 starting at the point where the cranks arms connect to the boom stayline actuating cylinders.
8. Install stayline assembly (2) and shoulder bolt (1) to crank arm (3).



9. Repeat step 8 for other side.

**END OF WORK PACKAGE**



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**INTERMEDIATE MAINTENANCE**  
**RECOVERY VEHICLE, FULL TRACKED: MEDIUM, M88A1**  
**NSN 2350-00-122-6826, EIC AQA**

**HYDRAULIC OIL TANK ASSEMBLY MAINTENANCE**  
**REMOVAL, DISASSEMBLY, CLEANING, INSPECTION, ASSEMBLY, INSTALLATION**

---

**INITIAL SETUP:****Tools and Special Tools**

Sling (item 30, WP 0086 00)  
 Tool kit, general mechanic's (item 34, WP 0086 00)

**Materials/Parts**

Cleaning compound (item 5, WP 0085 00)  
 Paint thinner (item 18, WP 0085 00)  
 Gaskets (3) (item 42, WP 0087 00)  
 Lockwashers (6) (item 159, WP 0087 00)  
 Lockwashers (44) (item 161, WP 0087 00)  
 Lockwashers (12) (item 162, WP 0087 00)  
 Lockwashers (17) (item 163, WP 0087 00)  
 Lockwashers (12) (item 164, WP 0087 00)  
 Lockwashers (4) (item 185, WP 0087 00)  
 Nuts (6) (item 200, WP 0087 00)  
 Nuts (2) (item 202, WP 0087 00)  
 Packings (4) (item 132, WP 0087 00)  
 Packing (item 135, WP 0087 00)  
 Packings (2) (item 136, WP 0087 00)  
 Screws (6) (item 47, WP 0087 00)  
 Screws (36) (item 56, WP 0087 00)  
 Screws (4) (item 62, WP 0087 00)  
 Screws (8) (item 66, WP 0087 00)  
 Screws (9) (item 72, WP 0087 00)  
 Screws (4) (item 99, WP 0087 00)

**Materials/Parts (cont.)**

Screws (4) (item 102, WP 0087 00)  
 Screws (4) (item 112, WP 0087 00)  
 Screws (2) (item 184, WP 0087 00)  
 Screws (2) (item 214, WP 0087 00)  
 Screws (4) (item 217, WP 0087 00)  
 Screws (12) (item 220, WP 0087 00)  
 Screws (4) (item 226, WP 0087 00)  
 Washers (5) (item 123, WP 0087 00)

**Personnel Required**

Mechanics (3)

**References**

WP 0073 00  
 WP 0074 00  
 WP 0075 00

**Equipment Condition**

Cupola and cupola plate removed (TM 9-2350-256-20)  
 Rigger's seat removed (TM 9-2350-256-20)  
 Subfloor plates removed as necessary (TM 9-2350-256-20)  
 Tank drained (TM 9-2350-256-20)

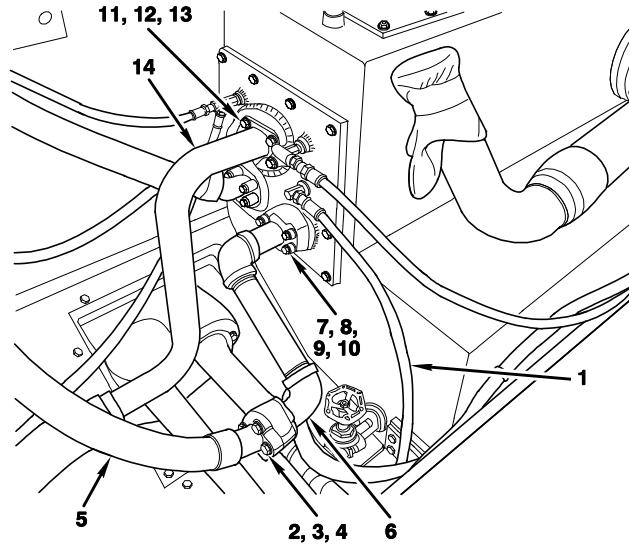
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**NOTE**

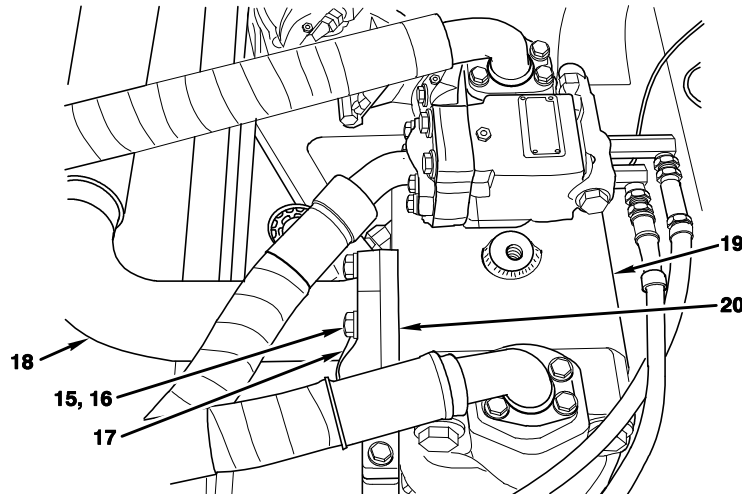
All hydraulic oil tank accessories can be replaced with the tank installed in the vehicle: refer to WP 0073 00 for replacement of the front top cover and rear top cover; refer to WP 0074 00 for replacement of the front cover and fittings; refer to WP 0075 00 for replacement of the suction pipe; and refer to TM 9-2350-256-20 for replacement of the gage rod, drain valve, and lifting bolts.

**Removal**

1. Disconnect five hydraulic lines (1).
2. Remove four screws (2), lockwashers (3), two flanges (4), and disconnect hydraulic hose (5) from fittings (6). Discard lockwashers.
3. Remove four screws (7), lockwashers (8), two flanges (9), and fittings (6). Discard lockwashers.
4. Remove and discard packing (hidden) (10).
5. Remove eight screws (11), lockwashers (12), four flanges (13), and disconnect two hydraulic hoses (14). Discard lockwashers.

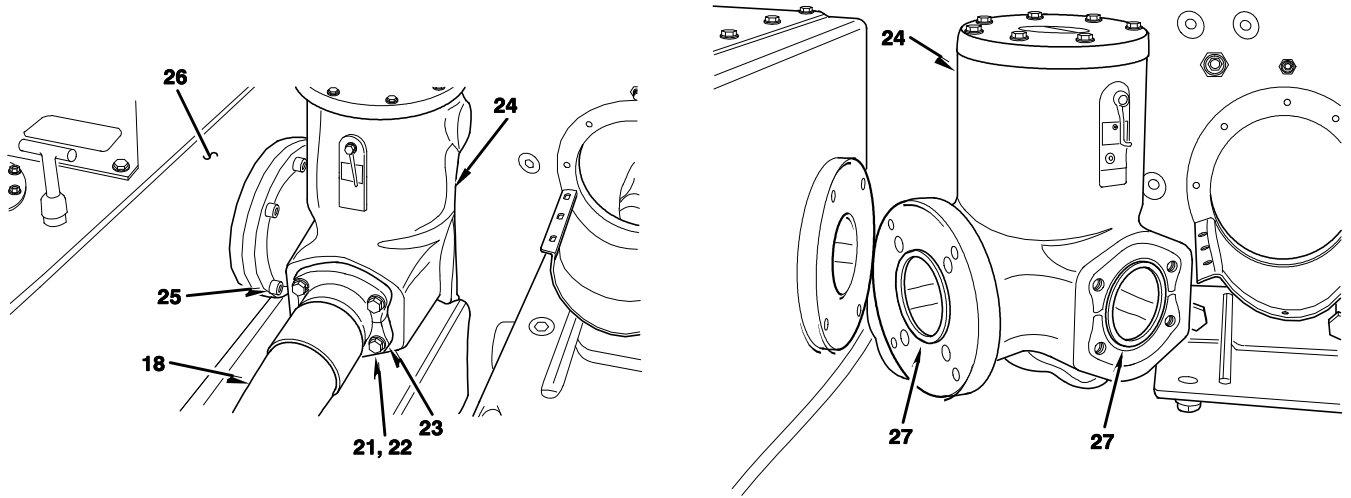


6. Remove four screws (15), lockwashers (16), two flanges (17), and disconnect suction line (18) from main hydraulic pump (19). Discard lockwashers.
7. Remove and discard packing (hidden) (20) from suction line (18). Cover suction line and main hydraulic pump (19) openings to keep out dirt and dust.





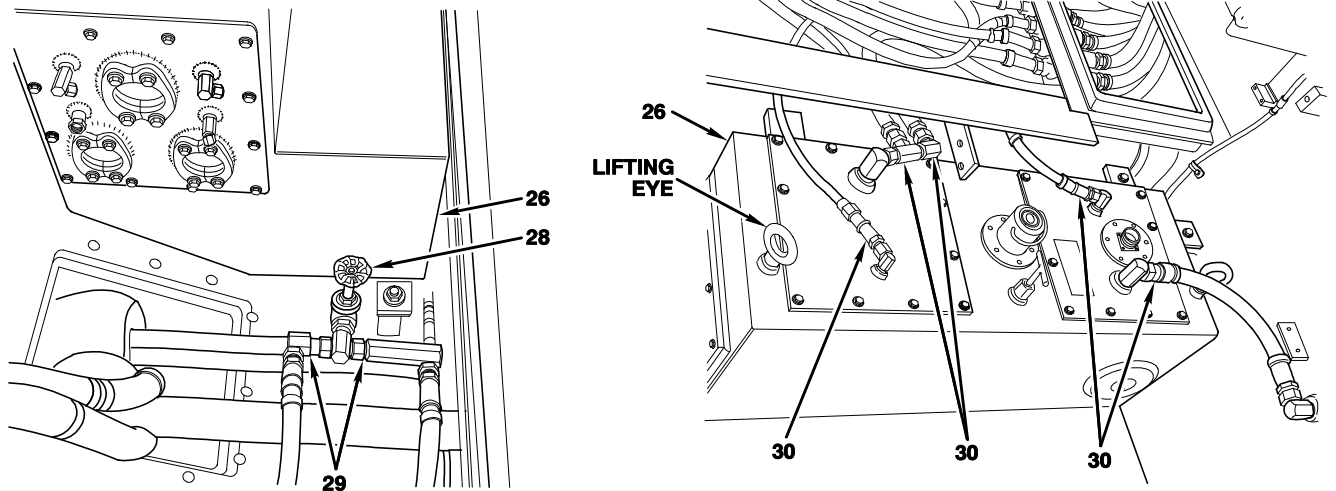
8. Remove four screws (21), lockwashers (22), two flanges (23), and suction line (18) from filter (24). Discard lockwashers.
9. Remove four socket head screws (25) and filter (24) from hydraulic oil tank (26).
10. Remove and discard two packings (27) from filter (24).



**NOTE**

Close hydraulic oil tank (26) drain valves (28).

11. Disconnect drain lines (29).
12. Disconnect five drain lines (30) and stow out of way.

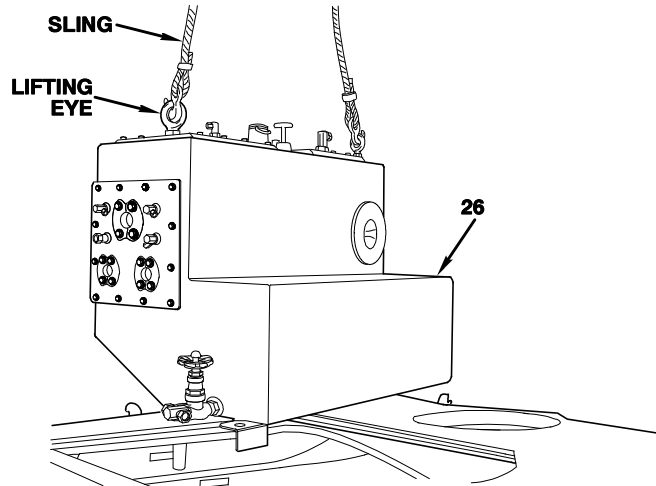
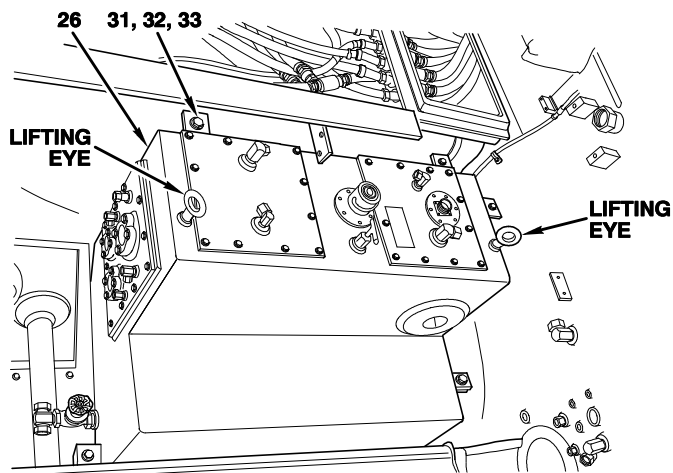


13. Attach sling to lifting eyes.
14. Remove five screws (31), lockwashers (32), and washers (33). Discard lockwashers.
15. Slide hydraulic oil tank (26) forward to clear mounting brackets welded to bulkhead.

### CAUTION

Carefully guide hydraulic oil tank (26) thru cupola plate opening to prevent damage to tank and fittings.

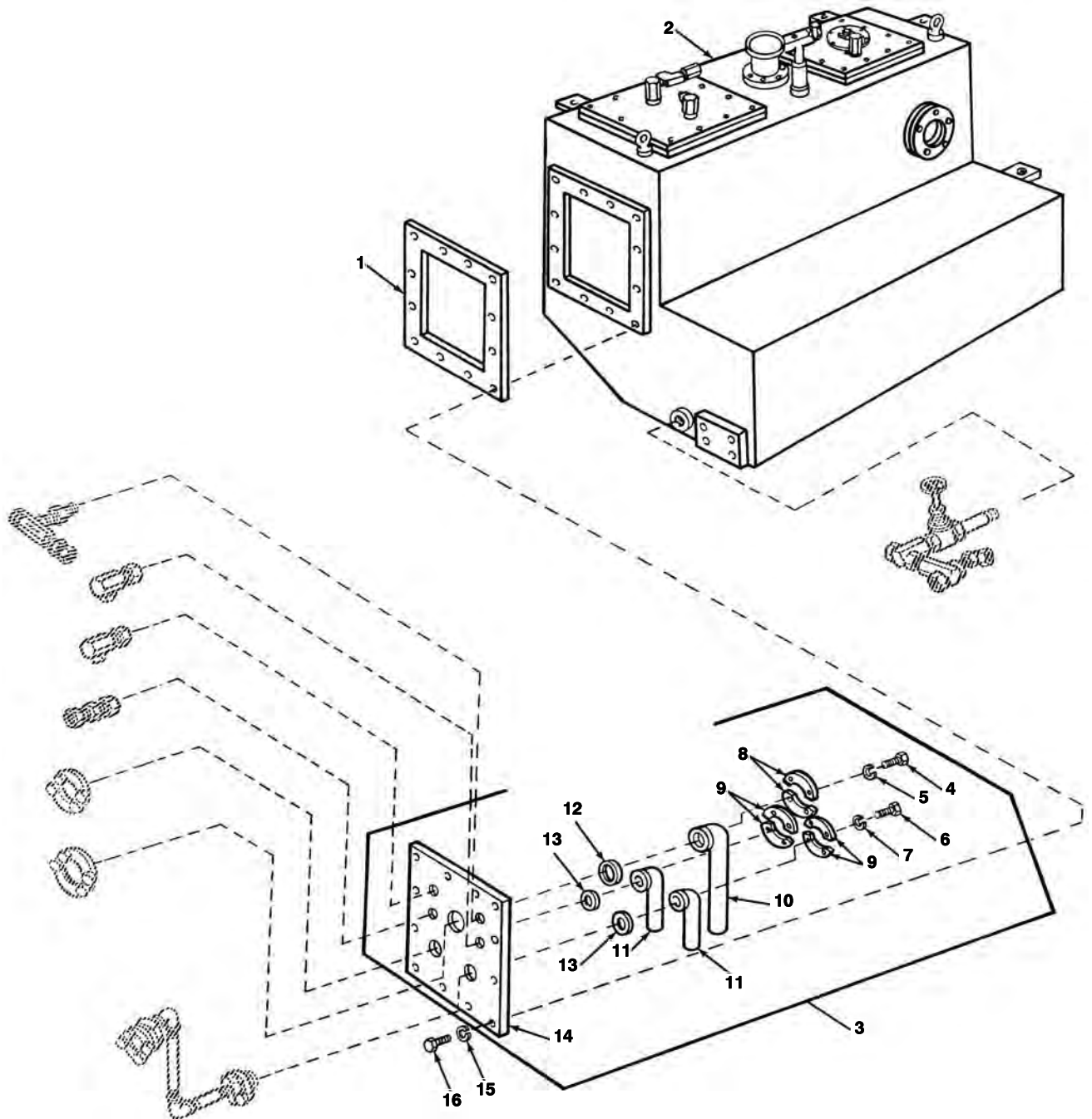
16. Remove hydraulic oil tank (26) thru cupola plate opening.



**HOIST WINCH ASSEMBLY AND MECHANICAL  
TRANSMISSION AND MAIN HYDRAULIC PUMP  
ASSEMBLY SHOWN REMOVED FOR CLARITY.**

### Disassembly

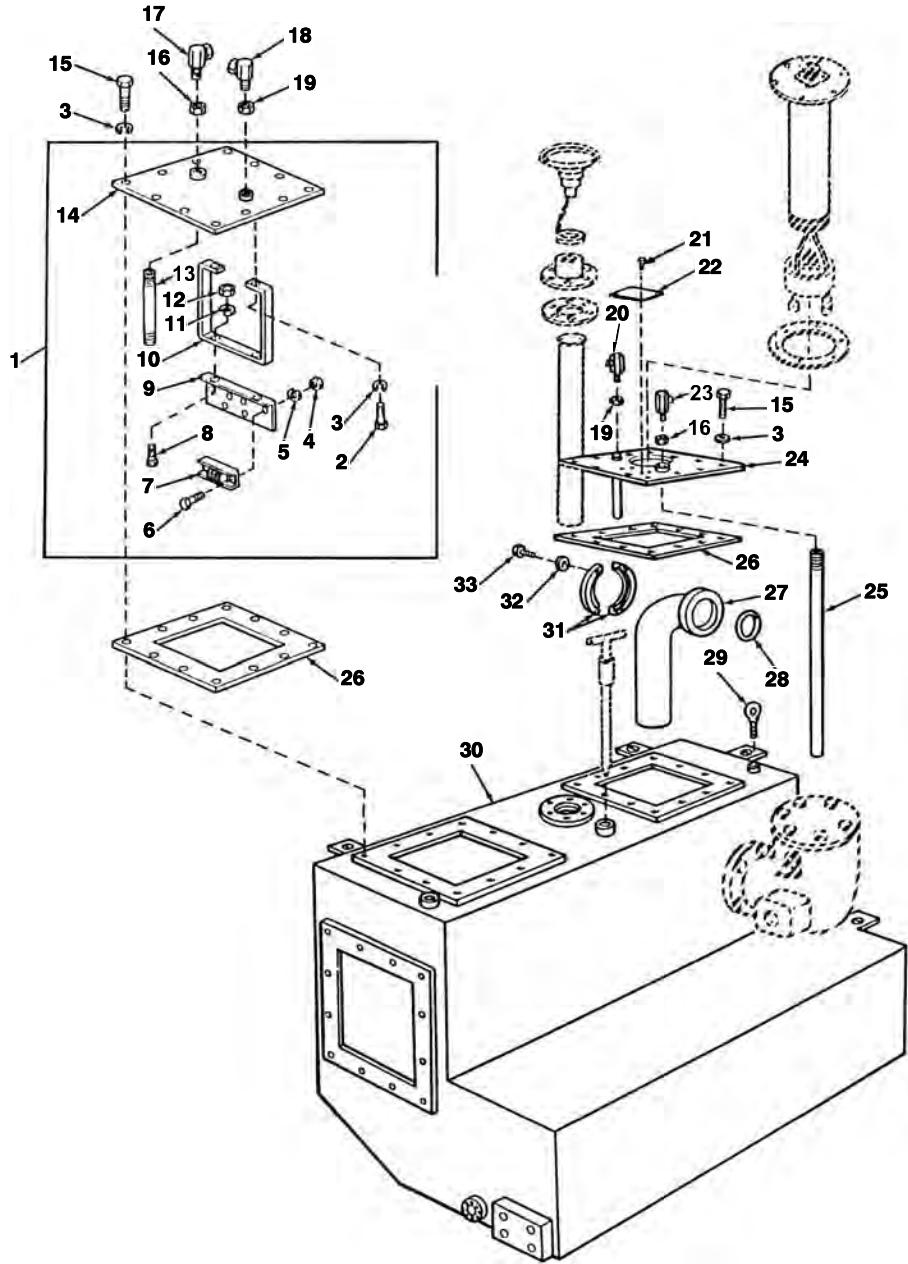
1. The following two illustrations, with accompanying legends, serve to identify all subassemblies and attaching parts. The step-by-step disassembly procedure is provided after these two illustrations:



**Legend:**

- |                       |               |             |                |
|-----------------------|---------------|-------------|----------------|
| 1. Gasket             | 5. Lockwasher | 9. Flanges  | 13. Packing    |
| 2. Hydraulic oil tank | 6. Screw      | 10. Pipe    | 14. Cover      |
| 3. Cover assembly     | 7. Lockwasher | 11. Pipes   | 15. Lockwasher |
| 4. Screw              | 8. Flanges    | 12. Packing | 16. Screw      |

**FRONT COVER ASSEMBLY AND ATTACHING PARTS, HYDRAULIC OIL TANK**

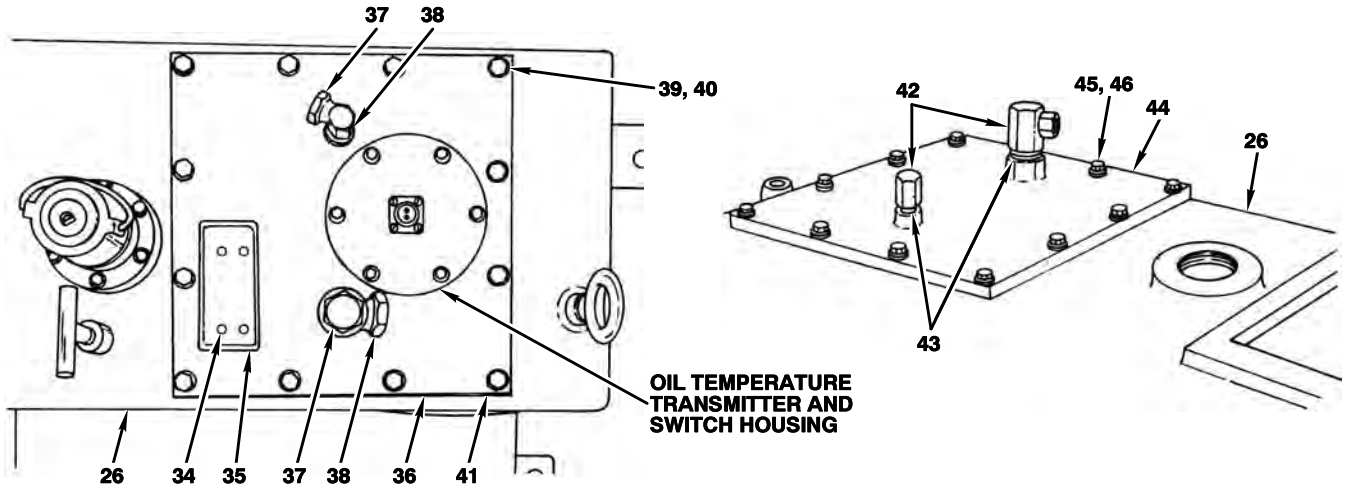


**Legend:**

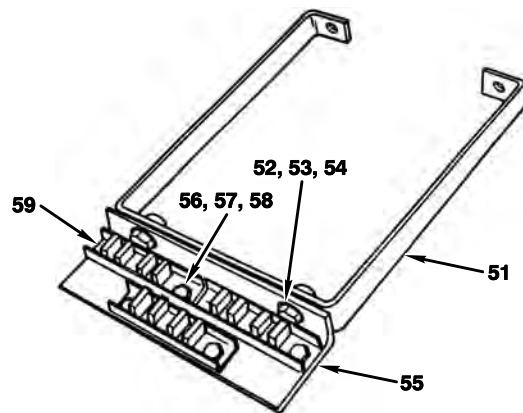
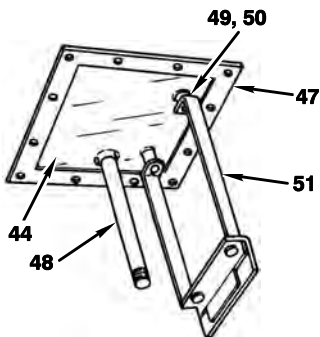
- |                   |                   |                          |                        |
|-------------------|-------------------|--------------------------|------------------------|
| 1. Cover assembly | 10. Bracket       | 19. Nut                  | 28. Packing            |
| 2. Screw          | 11. Lockwasher    | 20. Adapter union        | 29. Bolt               |
| 3. Lockwasher     | 12. Nut           | 21. Screw                | 30. Hydraulic oil tank |
| 4. Nut            | 13. Nipple        | 22. Identification plate | 31. Flanges            |
| 5. Lockwasher     | 14. Cover         | 23. Adapter union        | 32. Lockwasher         |
| 6. Screw          | 15. Screw         | 24. Cover                | 33. Screw              |
| 7. Magnet         | 16. Nut           | 25. Pipe                 |                        |
| 8. Nut            | 17. Adapter union | 26. Gasket               |                        |
| 9. Bracket        | 18. Adapter union | 27. Pipe                 |                        |

**TOP COVERS AND ATTACHING PARTS, HYDRAULIC OIL TANK.**

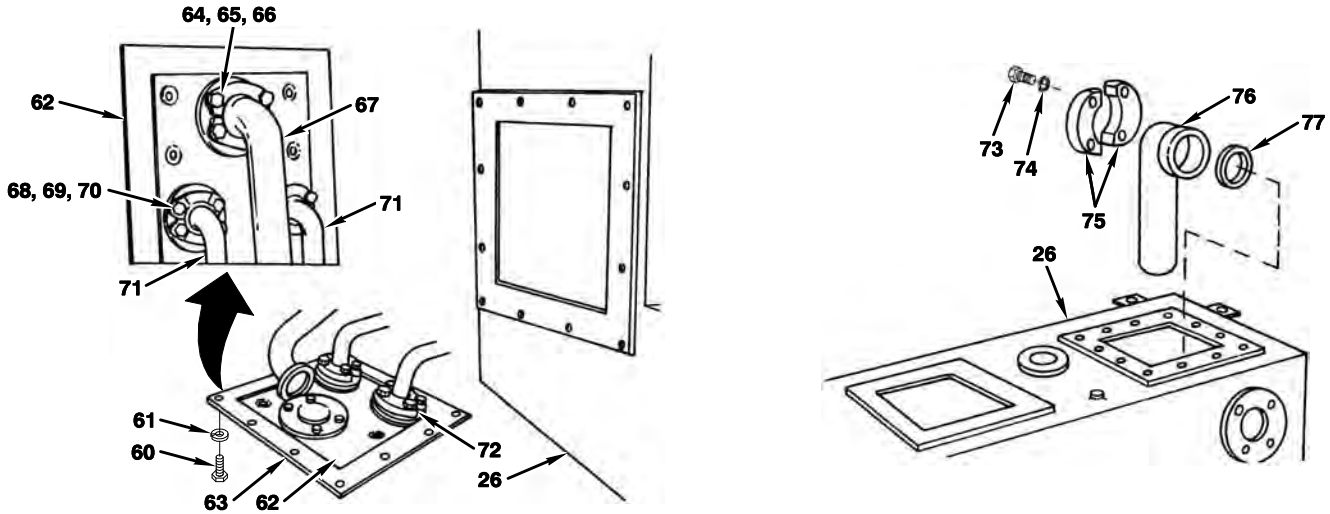
2. Remove four screws (34) and identification plate (35) from rear top cover (36).
3. Remove two adapter unions (37) and nuts (38) from rear top cover (36).
4. Remove 12 screws (39), lockwashers (40), rear top cover (36), and gasket (41) from hydraulic oil tank (26). Discard lockwashers and gasket.
5. Remove two adapter unions (42) and nuts (43) from front top cover (44).
6. Remove 12 screws (45), lockwashers (46), and front top cover (44) from hydraulic oil tank (26). Discard lockwashers.



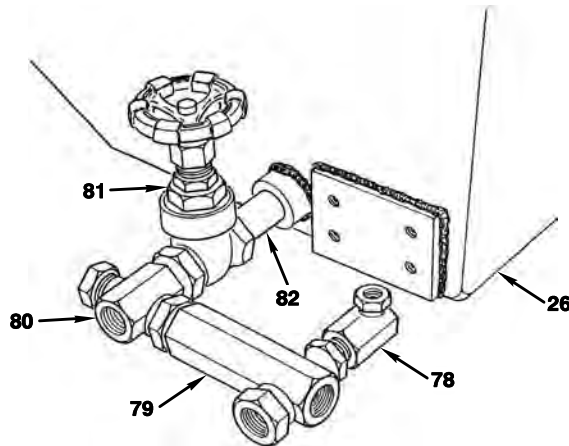
7. Remove gasket (47) and nipple (48) from front top cover (44). Discard gasket.
8. Remove two screws (49), lockwashers (50), and magnet bracket assembly (51) from front top cover (44).
9. Remove two nuts (52), lockwashers (53), screws (54), and bracket (55) from magnet bracket assembly (51). Discard lockwashers.
10. Remove six nuts (56), lockwashers (57), screws (58), and magnet assembly (59) from bracket (55). Discard lockwashers.



11. Remove 12 screws (60), lockwashers (61), front cover (62), and gasket (63) from hydraulic oil tank (26). Discard lockwashers and gasket.
12. Remove four screws (64), lockwashers (65), two flanges (66), and upper return pipe (67) from front cover (62). Discard lockwashers.
13. Remove eight screws (68), lockwashers (69), four flanges (70), and two lower return pipes (71) from front cover (62). Discard lockwashers.
14. Remove and discard two packings (hidden) (72) from two lower return pipes (71).
15. Remove four screws (73), lockwashers (74), two flanges (75), suction pipe (76), and packing (77) from hydraulic oil tank (26). Discard lockwashers and packing.



16. Remove elbow (78), pipe tee (79), adapter union (80), valve (81), and nipple (82) from hydraulic oil tank (26).



**Cleaning**

**WARNING**

Solvents 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 solvent gets on skin or clothing, wash immediately with soap and water.

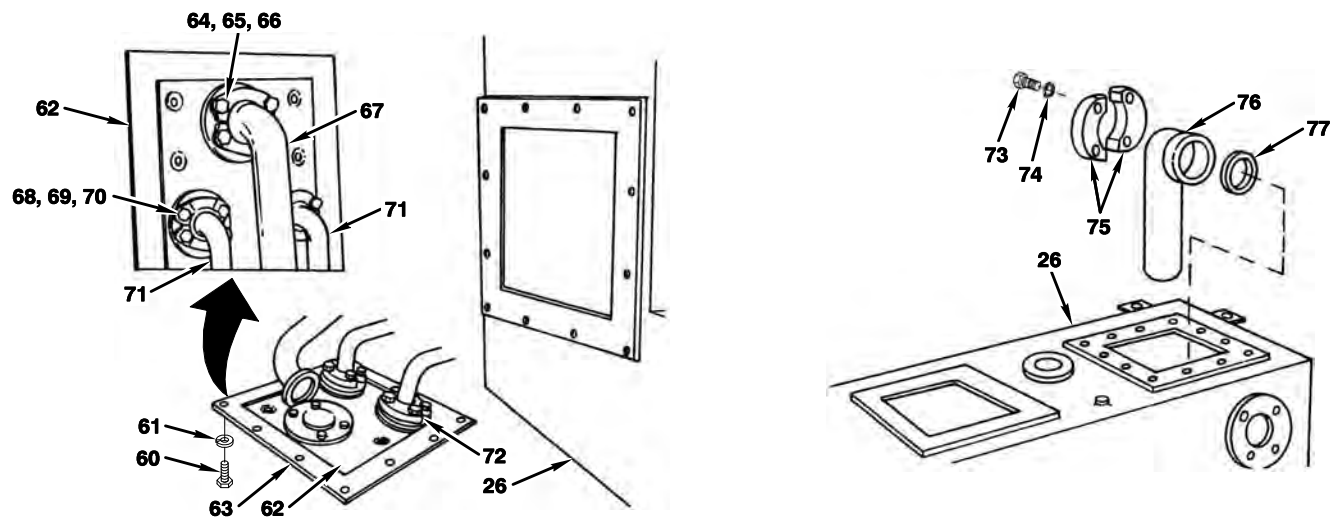
1. Steam clean inside of hydraulic oil tank and allow condensed water to drain off. Wash down outside of tank with a cloth saturated with cleaning compound or paint thinner.

### Inspection-Acceptance and Rejection Criteria

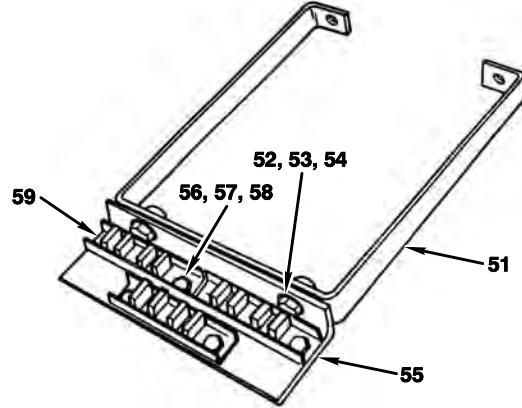
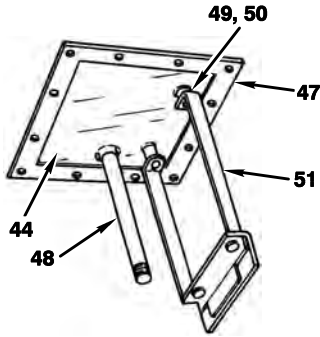
1. Inspect welds for cracks and defects. Repair defective welds.
2. Inspect tank surfaces for cracks, nicks, rust, and corrosion. Remove nicks with a fine file and crocus cloth. Remove rust or corrosion with crocus cloth.
3. Inspect painted surfaces for chipping and scraping. Clean and touch up painted surfaces that are chipped, scraped, rusted, or corroded.

### Assembly

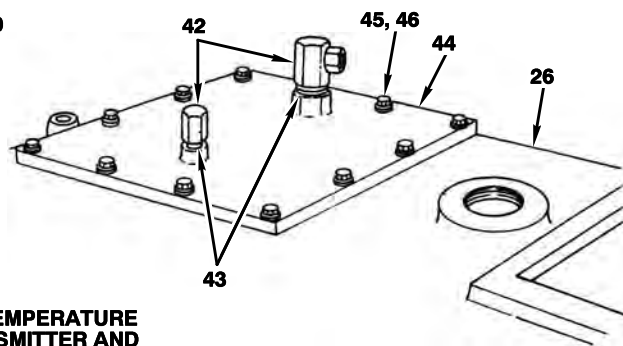
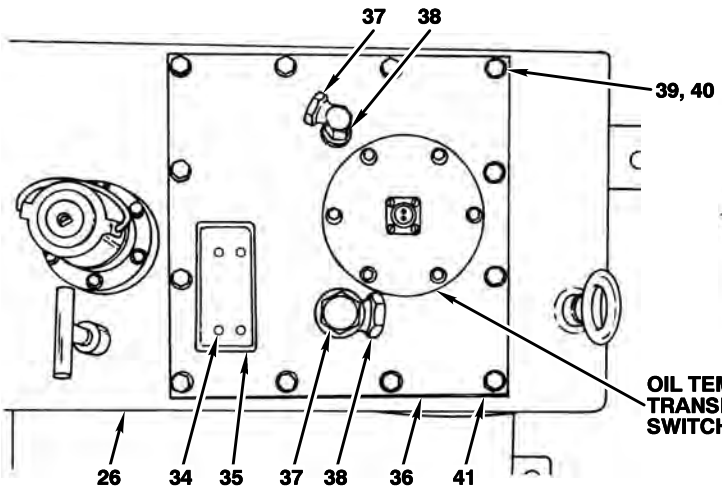
1. Install nipple (82), valve (81), adapter union (80), pipe tee (79), and elbow (78) to hydraulic oil tank (26).
2. Install packing (77), suction pipe (76), two flanges (75), four lockwashers (74), and screws (73) to hydraulic oil tank (26).
3. Install two packings (hidden) (72) to two lower return pipes (71).
4. Install two lower return pipes (71), four flanges (70), eight lockwashers (69), and screws (68) to front cover (62).
5. Install upper return pipe (67), two flanges (66), four lockwashers (65), and screws (64) to front cover (62).
6. Install gasket (63), front cover (62), 12 lockwashers (61), and screws (60) to hydraulic oil tank (26).



7. Install magnet assembly (59), six screws (58), lockwashers (57), and nuts (56) to bracket (55).
8. Install bracket (55), two screws (54), lockwashers (53), and nuts (52) to magnet bracket assembly (51).
9. Install magnet bracket assembly (51), two lockwashers (50), and screws (49) to front top cover (44).
10. Install nipple (48) and gasket (47) to front top cover (44).



11. Install front top cover (44), 12 lockwashers (46), and screws (45) to hydraulic oil tank (26).
12. Install two nuts (43) and adapter unions (42) to front top cover (44).
13. Install gasket (41), rear top cover (36), 12 lockwashers (40), and screws (39) to hydraulic oil tank (26).
14. Install two nuts (38) and adapter unions (37) to rear top cover (36).
15. Install identification plate (35) and four screws (34) to rear top cover (36).



**OIL TEMPERATURE  
TRANSMITTER AND  
SWITCH HOUSING**



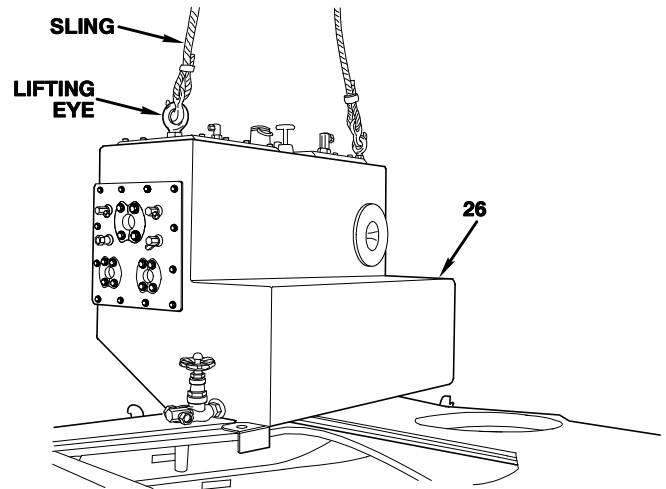
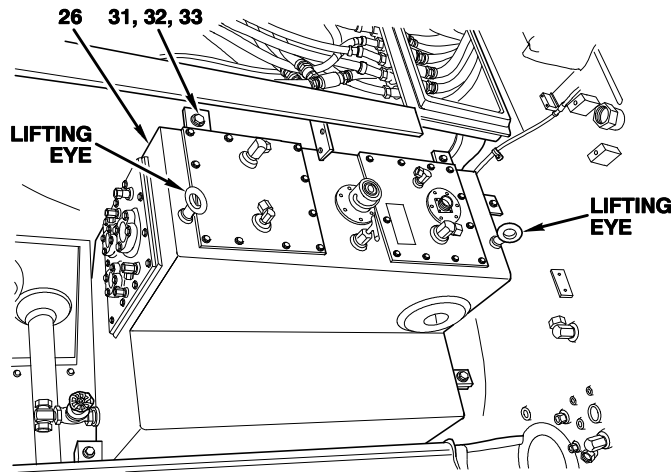
## Installation

1. Attach sling to lifting eyes.

### **CAUTION**

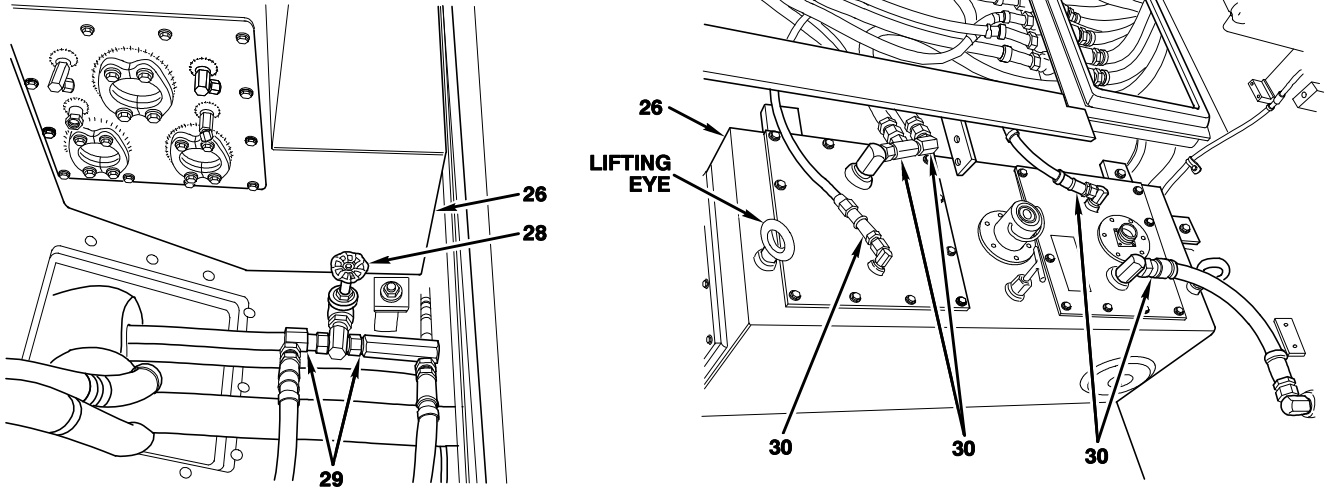
Carefully guide hydraulic oil tank (26) thru cupola plate opening to prevent damage to tank and fittings.

2. Lower hydraulic oil tank (26) thru cupola plate opening. Slide tank rearward to clear mounting brackets welded to bulkhead and move tank into position.
3. Install five washers (33), lockwashers (32), and screws (31).
4. Remove sling from lifting eyes.

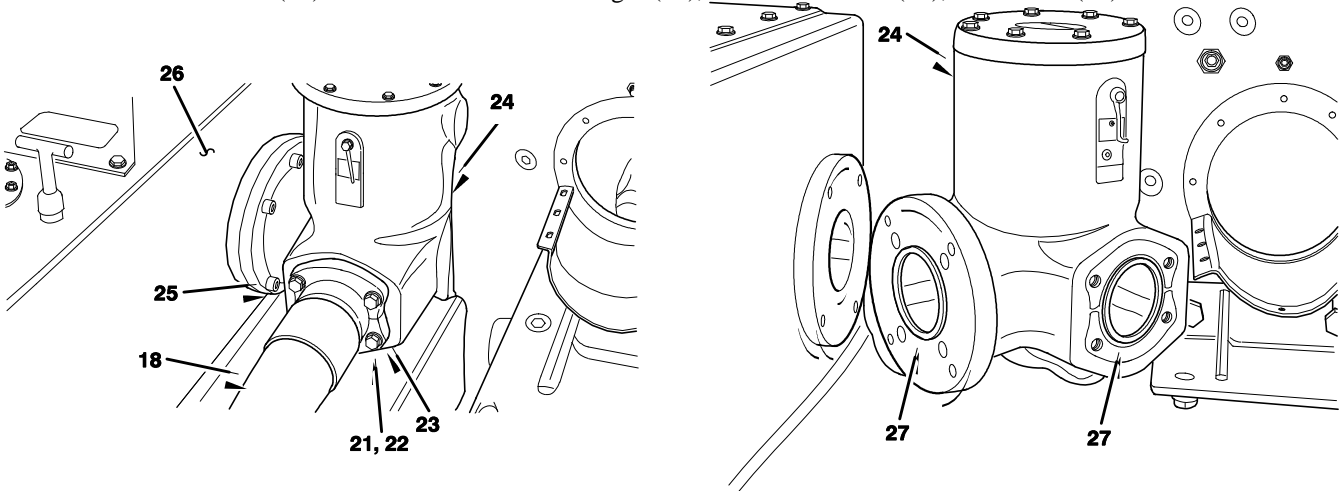


**HOIST WINCH ASSEMBLY AND MECHANICAL TRANSMISSION AND MAIN HYDRAULIC PUMP ASSEMBLY SHOWN REMOVED FOR CLARITY.**

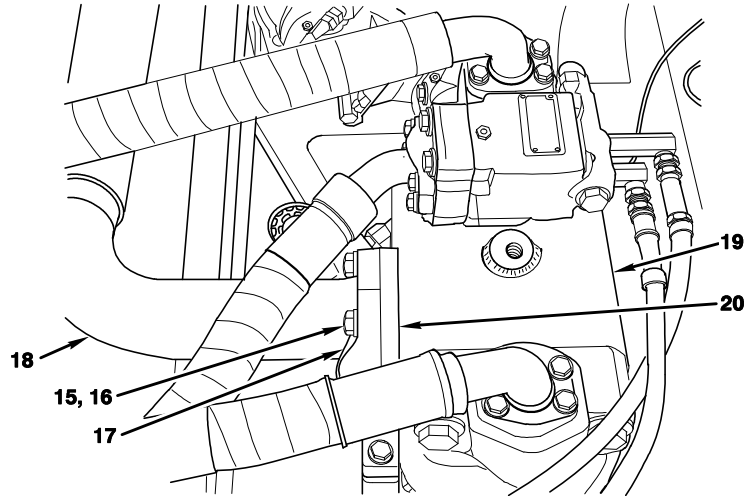
5. Connect five drain lines (30).
6. Connect drain lines (29).
7. Open hydraulic oil tank (26) drain valves (28).



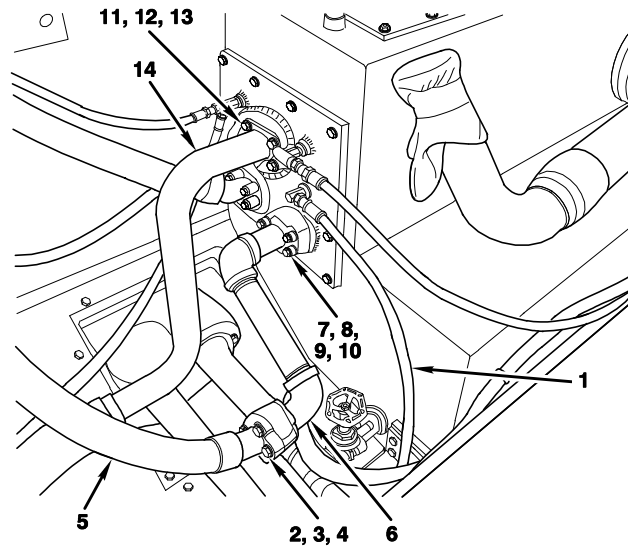
8. Install two packings (27) to filter (24).
9. Install filter (24) and four socket head screws (25) to hydraulic oil tank (26).
10. Connect suction line (18) to filter and install two flanges (23), four lockwashers (22), and screws (21).



11. Install packing (hidden) (20) to suction line (18).
12. Install suction line (18), two flanges (17), four lockwashers (16), and screws (15) to main hydraulic pump (19).



13. Connect two hydraulic hoses (14) and install four flanges (13), eight lockwashers (12), and screws (11).
14. Install packing (10).
15. Install fittings (6), two flanges (9), four lockwashers (8), and screws (7).
16. Connect hydraulic hose (5) to fittings (6) with two flanges (4), four lockwashers (3), and screws (2).
17. Connect five hydraulic lines (1).



18. Fill hydraulic oil tank in accordance with TM 9-2350-256-20.

**END OF WORK PACKAGE**



**INTERMEDIATE MAINTENANCE**  
**RECOVERY VEHICLE, FULL TRACKED: MEDIUM, M88A1**  
**NSN 2350-00-122-6826, EIC AQA**  
**HYDRAULIC OIL TANK TOP COVER ASSEMBLIES REPLACEMENT**  
**REMOVAL, INSTALLATION**

**INITIAL SETUP:****Tools and Special Tools**

Tool kit, general mechanic's (item 34, WP 0086 00)

**Materials/Parts**

Gaskets (2) (item 42, WP 0087 00)  
 Lockwashers (26) (item 161, WP 0087 00)  
 Screws (24) (item 56, WP 0087 00)

**Materials/Parts (cont.)**

Screws (4) (item 112 WP 0087 00)  
 Screws (2) (item 214, WP 0087 00)

**Equipment Condition**

Subfloor plates 8, 10, and 11 removed (TM 9-2350-256-20)

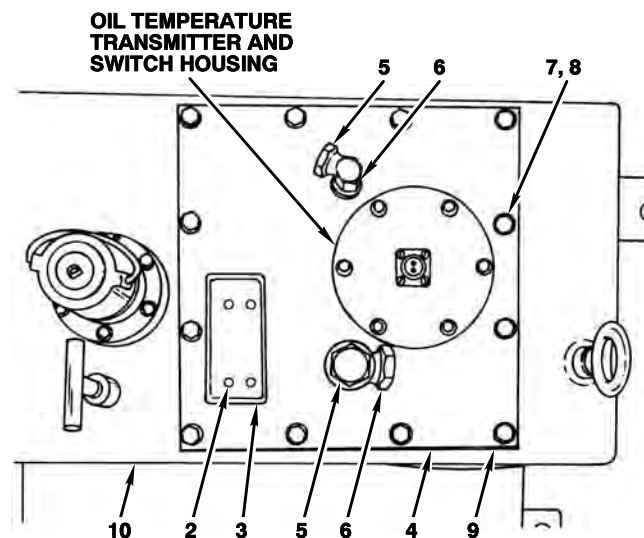
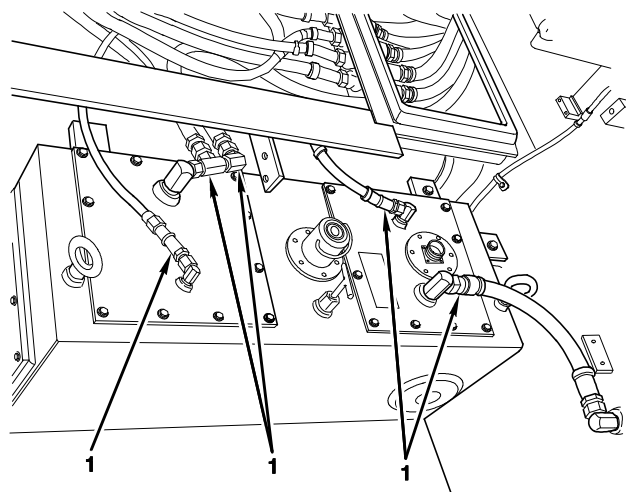
**Removal**

1. Disconnect five drain lines (1) and stow out of way.

**NOTE**

Perform steps 2 thru 4 to remove rear top cover (4).

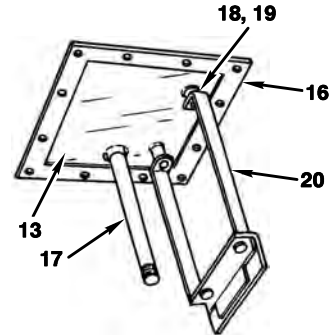
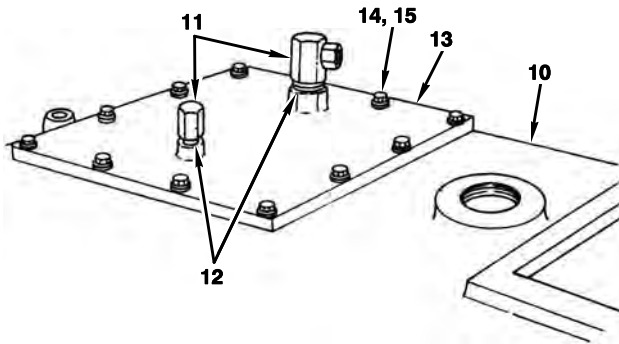
2. Remove four screws (2) and identification plate (3) from rear top cover (4).
3. Remove two adapter unions (5) and nuts (6) from rear top cover (4).
4. Remove 12 screws (7), lockwashers (8), rear top cover (4), and gasket (9) from hydraulic oil tank (10). Discard lockwashers and gasket.



**NOTE**

Perform steps 5 thru 8 to remove front top cover (13).

5. Remove two adapter unions (11) and nuts (12) from front top cover (13).
6. Remove 12 screws (14), lockwashers (15), and front top cover (13) from hydraulic oil tank (10). Discard lockwashers.
7. Remove gasket (16) and nipple (17) from front top cover (13). Discard gasket.
8. Remove two screws (18), lockwashers (19), and magnet bracket assembly (20) from front top cover (13). Discard lockwashers.



## Installation

### NOTE

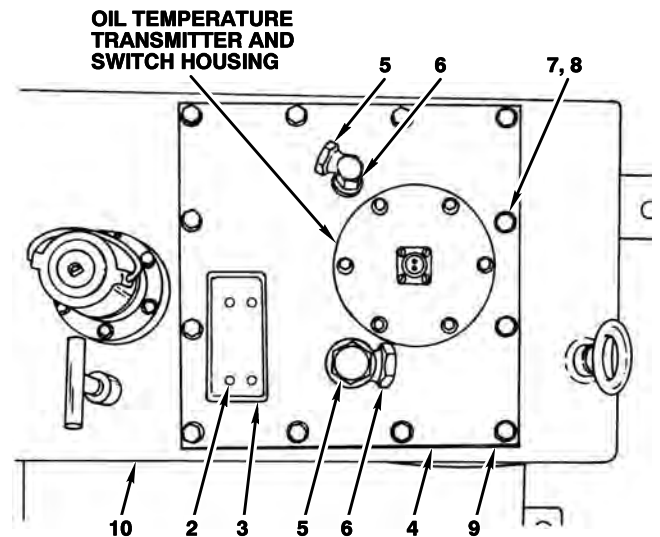
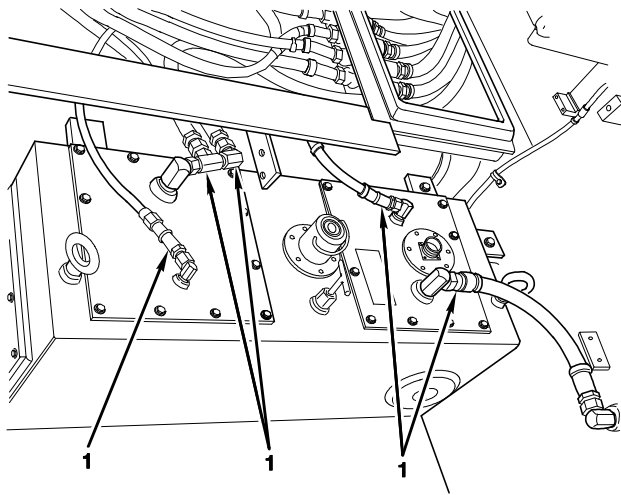
Perform steps 1 thru 4 to install front top cover (13).

1. Install magnet bracket assembly (20), two lockwashers (19), and screws (18) to front top cover (13).
2. Install nipple (17) and gasket (16) to front top cover (13).
3. Install front top cover (13), 12 lockwashers (15), and screws (14) to hydraulic oil tank (10).
4. Install two nuts (12) and adapter unions (11) to front top cover (13).

### NOTE

Perform steps 5 thru 7 to install rear top cover (4).

5. Install gasket (9), rear top cover (4), 12 lockwashers (8), and screws (7) to hydraulic oil tank (10).
6. Install two nuts (6) and adapter unions (5) to rear top cover (4).
7. Install identification plate (3) and four screws (2) to rear top cover (4).
8. Connect five drain lines (1).



**END OF WORK PACKAGE**





**INTERMEDIATE MAINTENANCE**  
**RECOVERY VEHICLE, FULL TRACKED: MEDIUM, M88A1**  
**NSN 2350-00-122-6826, EIC AQA**

**HYDRAULIC OIL TANK FRONT COVER ASSEMBLY REPLACEMENT**  
**REMOVAL, INSTALLATION**

**INITIAL SETUP:****Tools and Special Tools**

Tool kit, general mechanic's (item 34, WP 0086 00)

**Materials/Parts**

Gasket (item 42, WP 0087 00)  
 Lockwashers (12) (item 161, WP 0087 00)  
 Lockwashers (12) (item 162, WP 0087 00)  
 Lockwashers (12) (item 163, WP 0087 00)  
 Lockwashers (4) (item 185, WP 0087 00)  
 Packings (3) (item 132, WP 0087 00)  
 Screws (12) (item 56, WP 0087 00)  
 Screws (4) (item 62, WP 0087 00)

**Materials/Parts (cont.)**

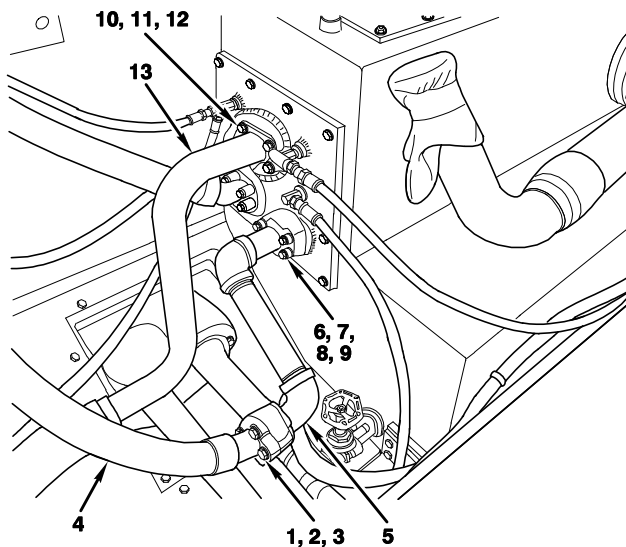
Screws (8) (item 66, WP 0087 00)  
 Screws (4) (item 72, WP 0087 00)  
 Screws (4) (item 99, WP 0087 00)  
 Screws (4) (item 217, WP 0087 00)  
 Screws (4) (item 226, WP 0087 00)

**Equipment Condition**

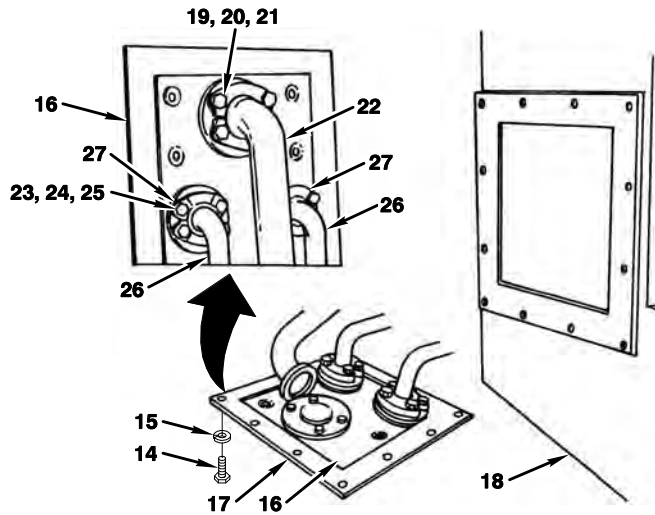
Subfloor plate 11 removed (TM 9-2350-256-20)  
 Tank drained below level of front cover (TM 9-2350-256-20)

**Removal**

1. Remove four screws (1), lockwashers (2), two flanges (3), and disconnect hydraulic hose (4) from fittings (5). Discard lockwashers.
2. Remove four screws (6), lockwashers (7), two flanges (8), and fittings (5). Discard lockwashers.
3. Remove and discard packing (hidden) (9).
4. Remove eight screws (10), lockwashers (11), four flanges (12), and disconnect two hydraulic hoses (13). Discard lockwashers.

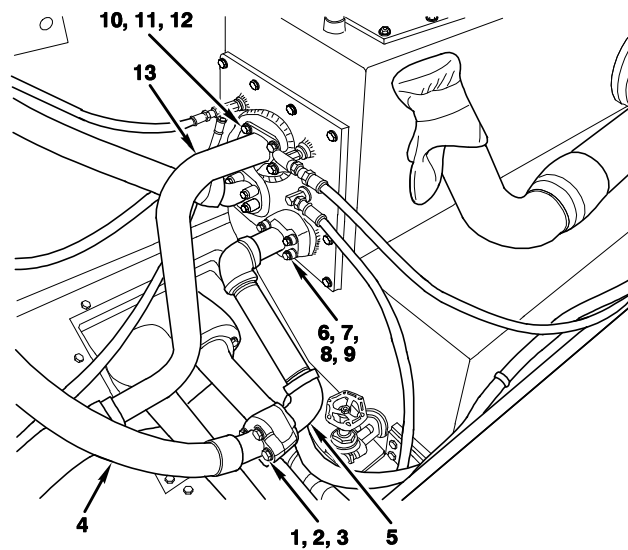


5. Remove 12 screws (14), lockwashers (15), front cover (16), and gasket (17) from hydraulic oil tank (18). Discard lockwashers and gasket.
6. Remove four screws (19), lockwashers (20), two flanges (21), and upper return pipe (22) from front cover (16). Discard lockwashers.
7. Remove eight screws (23), lockwashers (24), four flanges (25), and two lower return pipes (26) from front cover (16). Discard lockwashers.
8. Remove and discard two packings (hidden) (27) from two lower return pipes (26).



**Installation**

1. Install two packings (hidden) (27) to two lower return pipes (26).
2. Install two lower return pipes (26), four flanges (25), eight lockwashers (24), and screws (23) to front cover (16).
3. Install upper return pipe (22), two flanges (21), four lockwashers (20), and screws (19) to front cover (16).
4. Install gasket (17), front cover (16), 12 lockwashers (15), and screws (14) to hydraulic oil tank (18).
5. Connect two hydraulic hoses (13) and install four flanges (12), eight lockwashers (11), and screws (10).
6. Install packing (9).
7. Install fittings (5), two flanges (8), four lockwashers (7), and screws (6).
8. Connect hydraulic hose (4) to fittings (5) with two flanges (3), four lockwashers (2), and screws (1).
9. Fill hydraulic oil tank (18) in accordance with TM 9-2350-256-20.

**END OF WORK PACKAGE**



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**INTERMEDIATE MAINTENANCE**  
**RECOVERY VEHICLE, FULL TRACKED: MEDIUM, M88A1**  
**NSN 2350-00-122-6826, EIC AQA**  
**HYDRAULIC OIL TANK SUCTION PIPE REPLACEMENT**  
**REMOVAL, INSTALLATION**

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**INITIAL SETUP:****Tools and Special Tools**

Tool kit, general mechanic's (item 34, WP 0086 00)

**Equipment Condition**

Rear top cover removed (WP 0073 00)

Tank drained below level of filter (TM 9-2350-256-20)

**Materials/Parts**

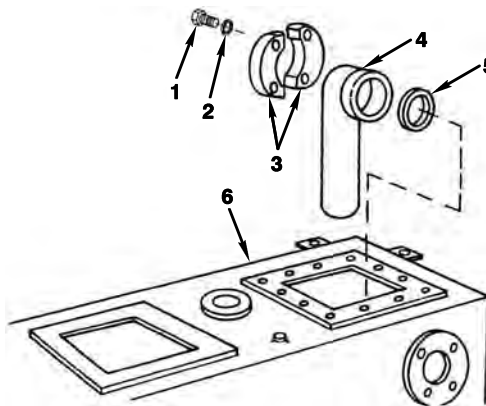
Lockwashers (4) (item 163, WP 0087 00)

Packing (item 134, WP 0087 00)

Screws (4) (item 72, WP 0087 00)

**Removal**

1. Remove four screws (1), lockwashers (2), two flanges (3), suction pipe (4), and packing (5) from hydraulic oil tank (6). Discard lockwashers and packing.

**Installation**

1. Install packing (5), suction pipe (4), two flanges (3), four lockwashers (2), and screws (1) to hydraulic oil tank (6).

**END OF WORK PACKAGE**



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**INTERMEDIATE MAINTENANCE**  
**RECOVERY VEHICLE, FULL TRACKED: MEDIUM, M88A1**  
**NSN 2350-00-122-6826, EIC AQA**

**PRESSURE SWITCH ASSEMBLY MAINTENANCE**  
**REMOVAL, TESTING, INSTALLATION, ADJUSTMENT**

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**INITIAL SETUP:****Test Equipment**

Gage (item 10, WP 0086 00)  
Multimeter (item 23, WP 0086 00)

**Tools and Special Tools**

Tool kit, general mechanic's (item 34, WP 0086 00)

**References**

TM 9-2350-256-20

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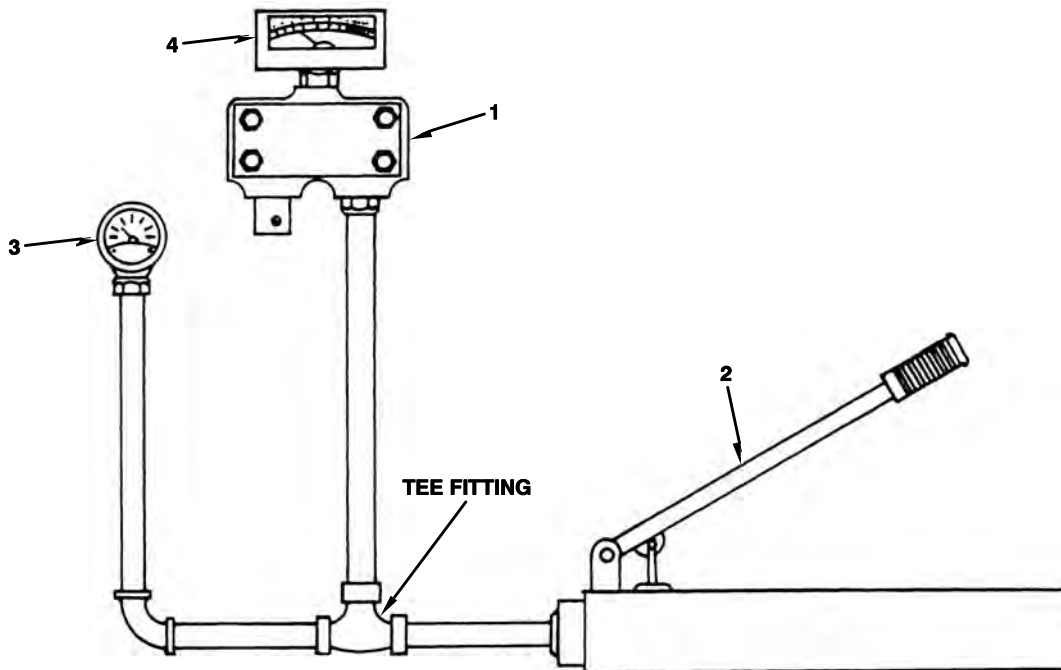
**Removal**

1. Remove pressure switch assembly in accordance with TM 9-2350-256-20.

**Testing****NOTE**

The pressure switch assembly should open when hydraulic pressure of  $235 \pm 3$  psi ( $1620 \pm 21$  kPa) is applied and should close when the pressure drops to approximately  $221 \pm 8$  psi ( $1524 \pm 55$  kPa). Instructions for testing and adjusting the pressure switch assembly are provided below.

1. Connect pressure switch assembly (1) to porta-power pump (2) and pressure gage (3) and connect ohmmeter (4) to two electrical leads on pressure switch assembly as shown below:



**Legend:**

1. Pressure switch assembly
2. Porta-power pump
3. Pressure gage
4. Ohmmeter

**NOTE**

Ohmmeter must read “0” ohms with no hydraulic pressure applied. If ohmmeter does not read “0,” replace the pressure switch assembly and perform the test and adjustment procedure on a new pressure switch assembly.

2. Actuate pump and slowly raise pressure to  $235 \pm 3$  psi ( $1620 \pm 21$  kPa) while watching ohmmeter. The pressure switch assembly should open (ohmmeter reads infinity) at this pressure. If it does not or if it opens before this pressure is reached, adjust the pressure switch assembly as instructed in the ADJUSTMENT procedure below.
3. Slowly relieve pressure until pressure switch assembly closes (ohmmeter reads “0”). The pressure gage should read  $221 \pm 8$  psi ( $1524 \pm 55$  kPa) at this point. If it does not, replace pressure switch assembly and perform this TESTING procedure and the ADJUSTMENT procedure below on the new pressure switch assembly.
4. Again raise the pressure slowly to  $235 \pm 3$  psi ( $1620 \pm 21$  kPa) to check repeatability of the pressure switch assembly. It should open again at this pressure. If it does not, replace the pressure switch assembly and perform this TESTING procedure and the ADJUSTMENT procedure below on the new pressure switch assembly.
5. Relieve pressure and disconnect test equipment.

**Installation**

1. Install pressure switch assembly in accordance with TM 9-2350-256-20.



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**Adjustment****NOTE**

Refer to the TESTING procedure above.

1. If the pressure switch assembly has not opened when a pressure of  $235 \pm 3$  psi ( $1620 \pm 21$  kPa) is reached:
  - a. Loosen pressure switch assembly setscrew and apply 235 psi (1620 kPa) hydraulic pressure.
  - b. While maintaining pressure at 235 psi (1620 kPa), slowly turn pressure switch assembly adjustment screw counterclockwise until the ohmmeter reads infinity. If pressure switch assembly cannot be adjusted in this manner, replace pressure switch assembly and perform the above TESTING procedure and this ADJUSTMENT procedure on the new pressure switch assembly.
  - c. Test action of the pressure switch assembly by performing steps 3 and 4 of the above TESTING procedure.
  - d. Tighten pressure switch assembly setscrew, relieve pressure, disconnect test equipment, and install pressure switch assembly in accordance with TM 9-2350-256-20.
2. If the pressure switch assembly opens before a pressure of  $235 \pm 3$  psi ( $1620 \pm 21$  kPa) is reached:
  - a. Loosen pressure switch assembly setscrew and apply 235 psi (1620 kPa) hydraulic pressure.
  - b. While maintaining pressure at 235 psi (1620 kPa), slowly turn pressure switch assembly adjustment screw clockwise until the ohmmeter reads "0." If the ohmmeter does not read "0" when the adjustment screw is turned fully clockwise, replace pressure switch assembly and perform the above TESTING procedure and this ADJUSTMENT procedure on the new pressure switch assembly.
  - c. Very slowly back off the adjustment screw (turn counterclockwise) until the ohmmeter reads infinity.
  - d. Test the action of the pressure switch assembly by performing steps 3 and 4 of the above TESTING procedure.
  - e. Tighten pressure switch assembly setscrew, relieve pressure, disconnect test equipment, and install pressure switch assembly in accordance with TM 9-2350-256-20.

**END OF WORK PACKAGE**



**INTERMEDIATE MAINTENANCE**  
**RECOVERY VEHICLE, FULL TRACKED: MEDIUM, M88A1**  
**NSN 2350-00-122-6826, EIC AQA**  
**FUEL TRANSFER PUMP AND AUXILIARY HYDRAULIC**  
**MOTOR ASSEMBLY MOTOR CONTROL VALVE REPLACEMENT**  
**REMOVAL, INSTALLATION**

**INITIAL SETUP:****Tools and Special Tools**

Tool kit, general mechanic's (item 34, WP 0086 00)

**Materials/Parts**

Gasket (item 6, WP 0087 00)

Pin, spring (item 92, WP 0087 00)

**Materials/Parts (cont.)**

Screws (2) (item 50, WP 0087 00)

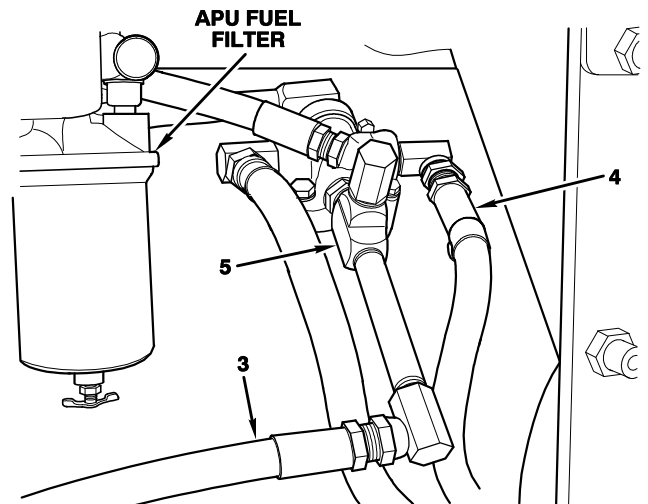
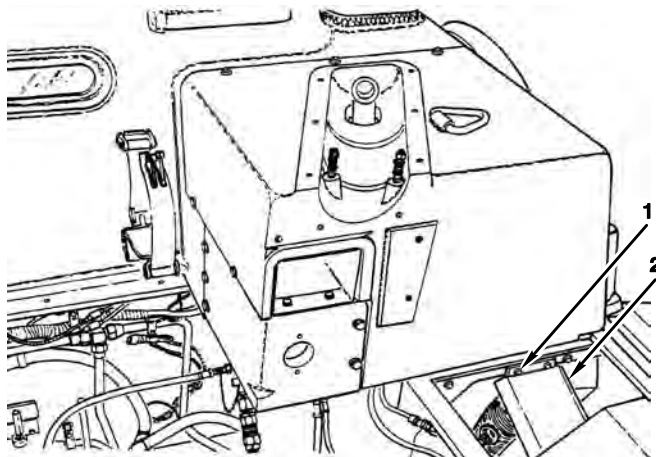
Screws (4) (item 53, WP 0087 00)

**Equipment Condition**

Deck doors 3 and 4 opened (WP 0022 00)

**Removal**

1. Remove two screws (1) and guard (2).
2. Disconnect hydraulic line (3) and three hydraulic lines (4) from fuel transfer pump and auxiliary hydraulic motor assembly motor control valve (5).

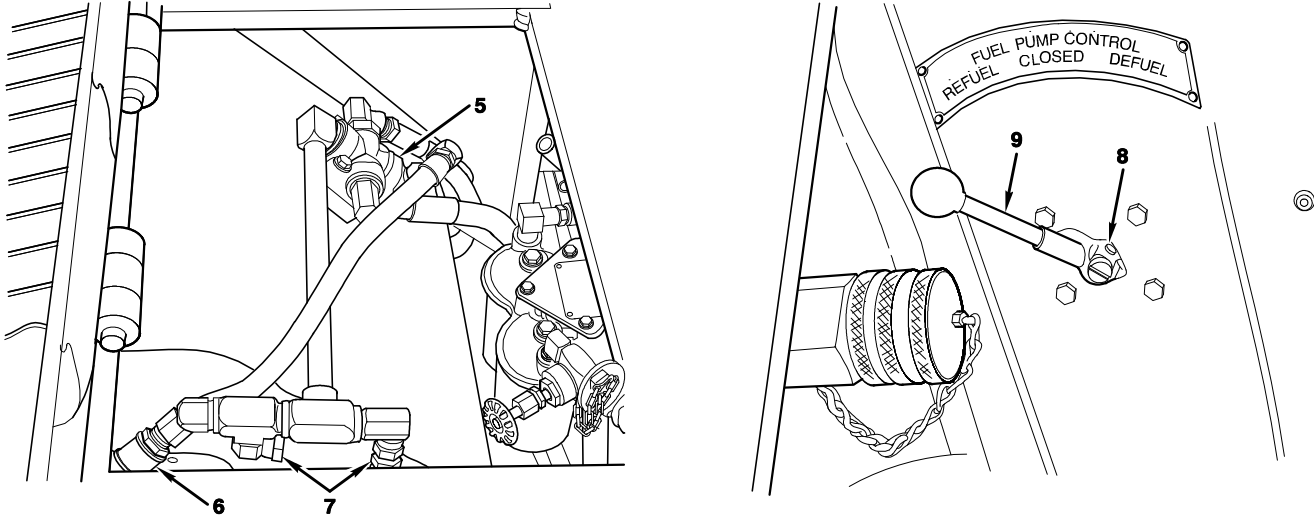


3. Disconnect hydraulic line (6) and two hydraulic lines (7).

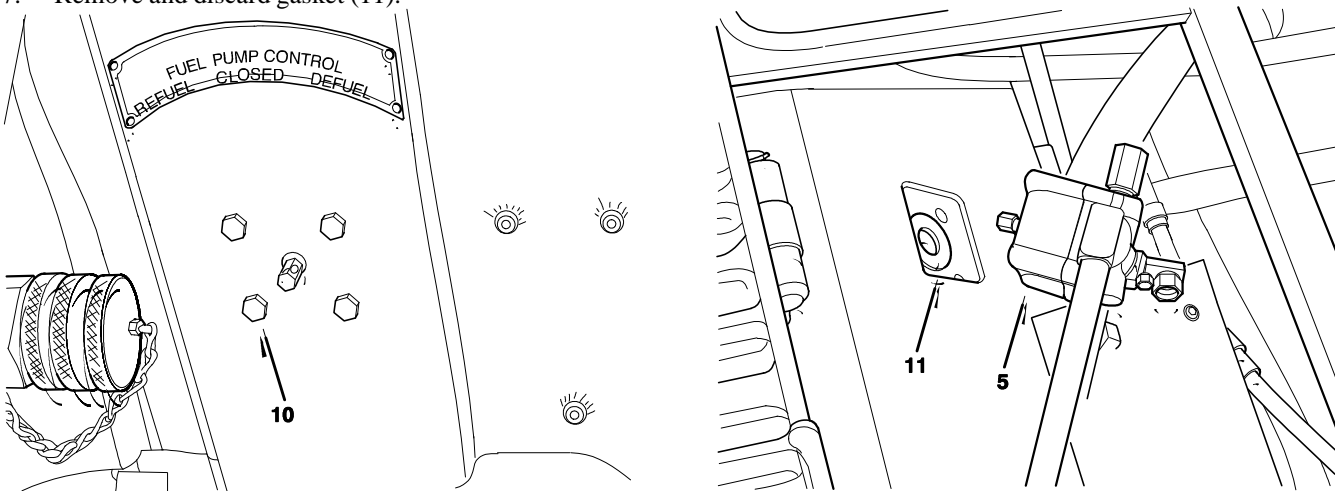
**NOTE**

Spring pin (8), handle (9), and screws (10) are located in the right stowage compartment.

4. Remove spring pin (8) and handle (9). Discard spring pin.



5. Remove four screws (10).
6. Remove fuel transfer pump and auxiliary hydraulic motor assembly motor control valve (5) with nipple, pipe, and tee connected.
7. Remove and discard gasket (11).



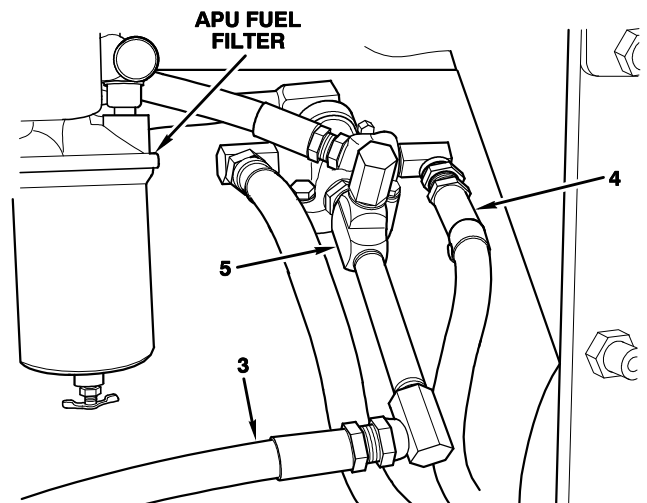
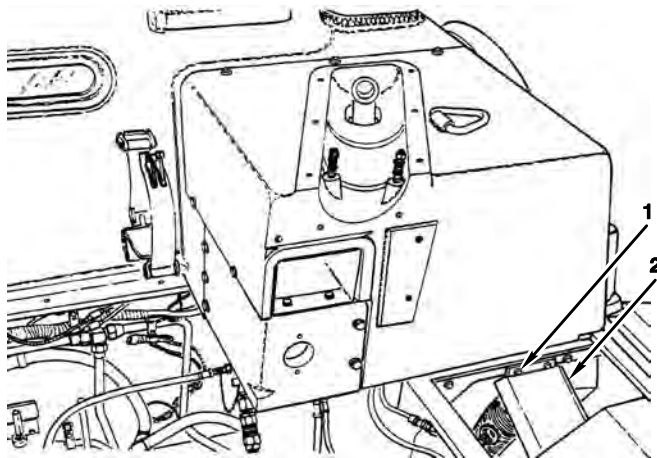
## Installation

1. Install gasket (11).
2. Install fuel transfer pump and auxiliary hydraulic motor assembly motor control valve (5) with nipple, pipe, and tee connected.

### NOTE

Screws (10), handle (9), and spring pin (8) are installed in the right stowage compartment.

3. Install four screws (10).
4. Install handle (9) and spring pin (8).
5. Connect two hydraulic lines (7) and hydraulic line (6).
6. Connect three hydraulic lines (4) and hydraulic line (3) to fuel transfer pump and auxiliary hydraulic motor assembly motor control valve (5).
7. Install guard (2) and two screws (1).



**END OF WORK PACKAGE**



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**INTERMEDIATE MAINTENANCE**  
**RECOVERY VEHICLE, FULL TRACKED: MEDIUM, M88A1**  
**NSN 2350-00-122-6826, EIC AQA**  
**ADJUSTABLE FLOW HYDRAULIC REGULATOR REPLACEMENT**  
**REMOVAL, INSTALLATION**

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**INITIAL SETUP:****Tools and Special Tools**

Tool kit, general mechanic's (item 34, WP 0086 00)

**Materials/Parts**

Gasket (item 8, WP 0087 00)

Lockwashers (4) (item 160, WP 0087 00)

**Materials/Parts (cont.)**

Screws (2) (item 50, WP 0087 00)

Screws (4) (item 51, WP 0087 00)

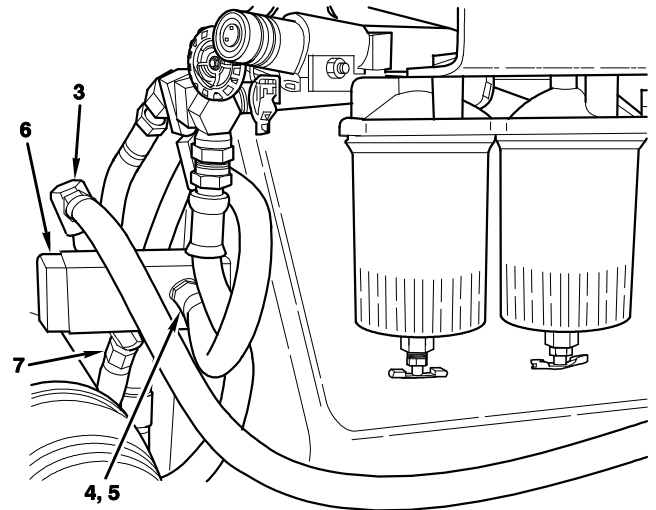
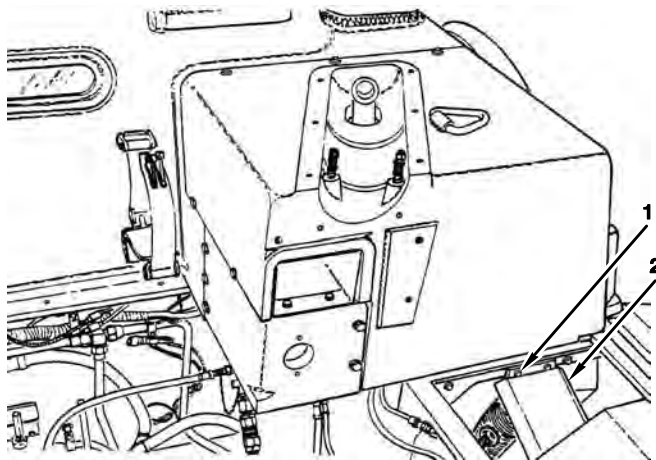
**Equipment Condition**

Deck doors 3 and 4 opened (WP 0022 00)

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**Removal**

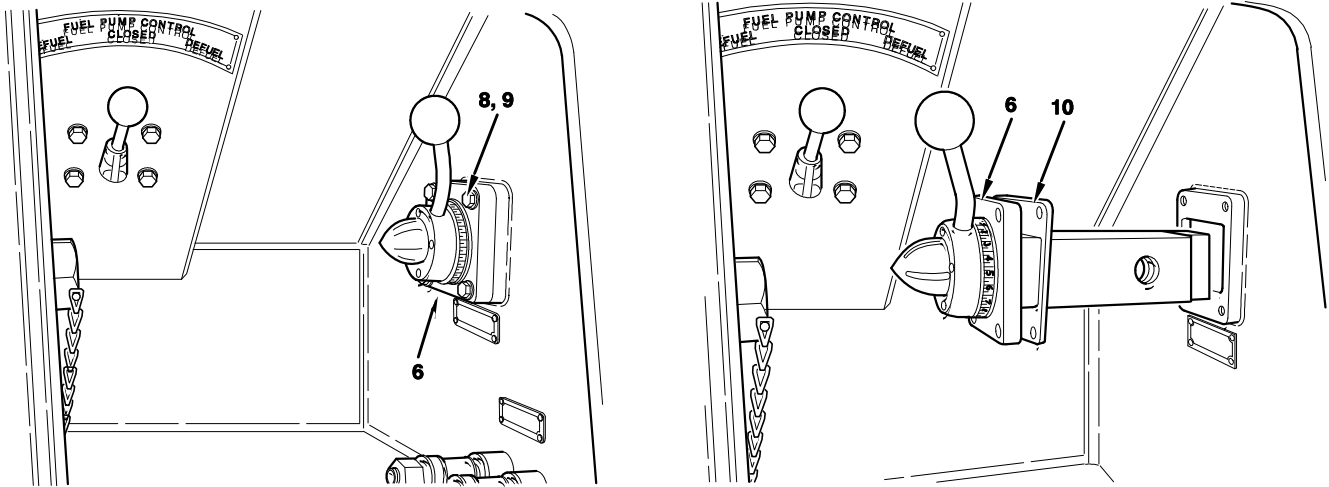
1. Remove two screws (1) and guard (2).
2. Disconnect two hydraulic lines (3).
3. Disconnect hydraulic line (4) and remove fitting (5) from adjustable flow hydraulic regulator (6).
4. Remove fittings (7) with elbows attached.



**NOTE**

Screws (8), lockwashers (9), adjustable flow hydraulic regulator (6), and gasket (10) are located in the right stowage compartment.

5. Remove four screws (8), lockwashers (9), and adjustable flow hydraulic regulator (6). Discard lockwashers.
6. Remove and discard gasket (10) from adjustable flow hydraulic regulator (6).



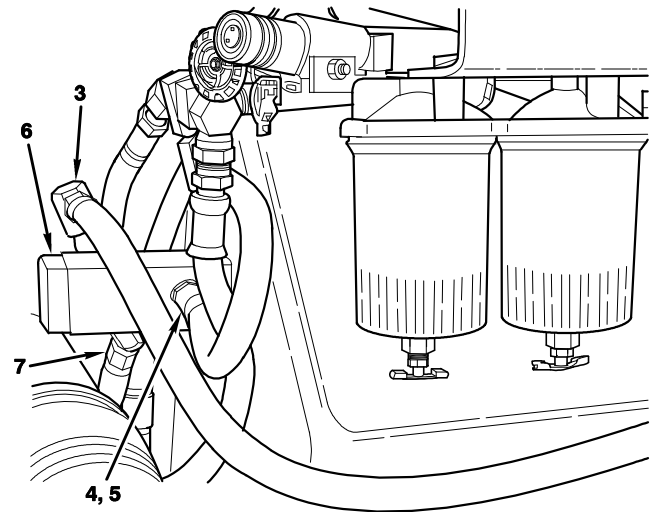
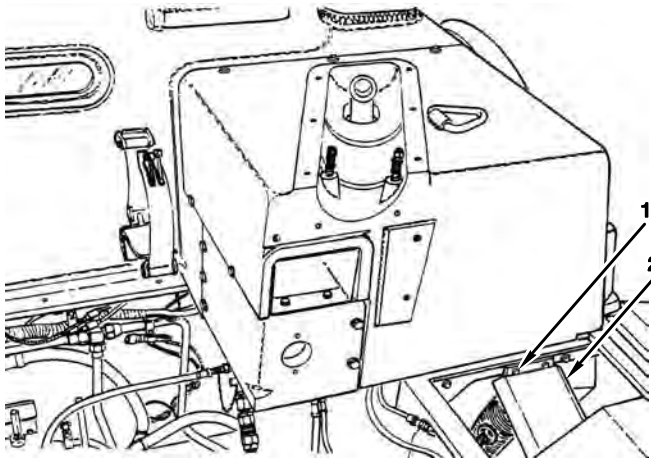


## Installation

### NOTE

Gasket (10), adjustable flow hydraulic regulator (6), lockwashers (9), and screws (8) are installed in the right stowage compartment.

1. Install gasket (10) to adjustable flow hydraulic regulator (6).
2. Install adjustable flow hydraulic regulator (6), four lockwashers (9), and screws (8).
3. Install fittings (7) with elbows attached.
4. Install fitting (5) to adjustable flow hydraulic regulator (6) and connect hydraulic line (4).
5. Connect two hydraulic lines (3).
6. Install guard (2) and two screws (1).



**END OF WORK PACKAGE**



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**INTERMEDIATE MAINTENANCE**  
**RECOVERY VEHICLE, FULL TRACKED: MEDIUM, M88A1**  
**NSN 2350-00-122-6826, EIC AQA**

**SPADE SUBPLATE AND CONTROL VALVE ASSEMBLY MAINTENANCE**  
**REMOVAL, DISASSEMBLY, CLEANING, INSPECTION, ASSEMBLY, INSTALLATION**

---

**INITIAL SETUP:****Tools and Special Tools**

Tool kit, general mechanic's (item 34, WP 0086 00)

**Materials/Parts**

Cleaning compound (item 5, WP 0085 00)  
 Oil (item 8, WP 0085 00)  
 Paint thinner (item 18, WP 0085 00)  
 Lockwashers (4) (item 161, WP 0087 00)  
 Lockwashers (4) (item 162, WP 0087 00)  
 Packings (2) (item 127, WP 0087 00)

**Materials/Parts (cont.)**

Packings (6) (item 133, WP 0087 00)  
 Pin (item 193, WP 0087 00)  
 Pins, cotter (2) (item 115, WP 0087 00)  
 Screws (4) (item 66, WP 0087 00)  
 Screws (4) (item 101, WP 0087 00)  
 Screws (4) (item 184, WP 0087 00)

**Equipment Condition**

Subfloor plate removed (TM 9-2350-256-20)

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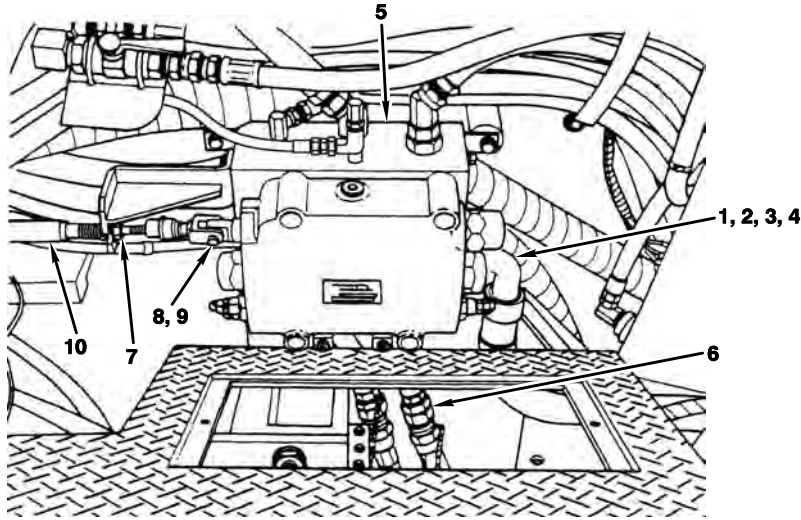
**Removal****NOTE**

The spade combination control valve can be removed without removing the entire spade subplate and control valve assembly from the vehicle. This procedure covers removing the subplate and control valve assembly or the spade combination control valve only.

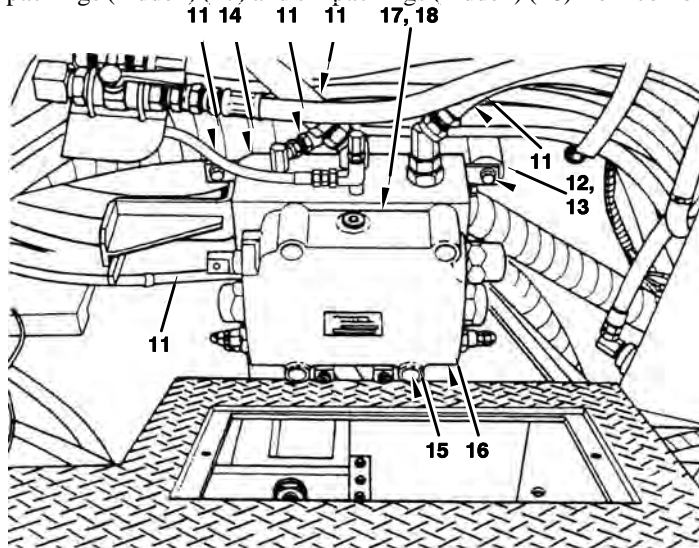
**NOTE**

If removing entire spade subplate and control valve assembly (14), perform steps 1 thru 5 only. If removing only combination control valve (16), perform steps 3, 6, and 7 only.

1. Remove four screws (1), lockwashers (2), two flanges (3), and disconnect hydraulic line (4) from subplate (5). Discard lockwashers.
2. Disconnect two hydraulic lines (6).
3. Loosen two jamnuts (7), remove two cotter pins (8) and pin (9), and disconnect spade control cable (10). Discard cotter pins.

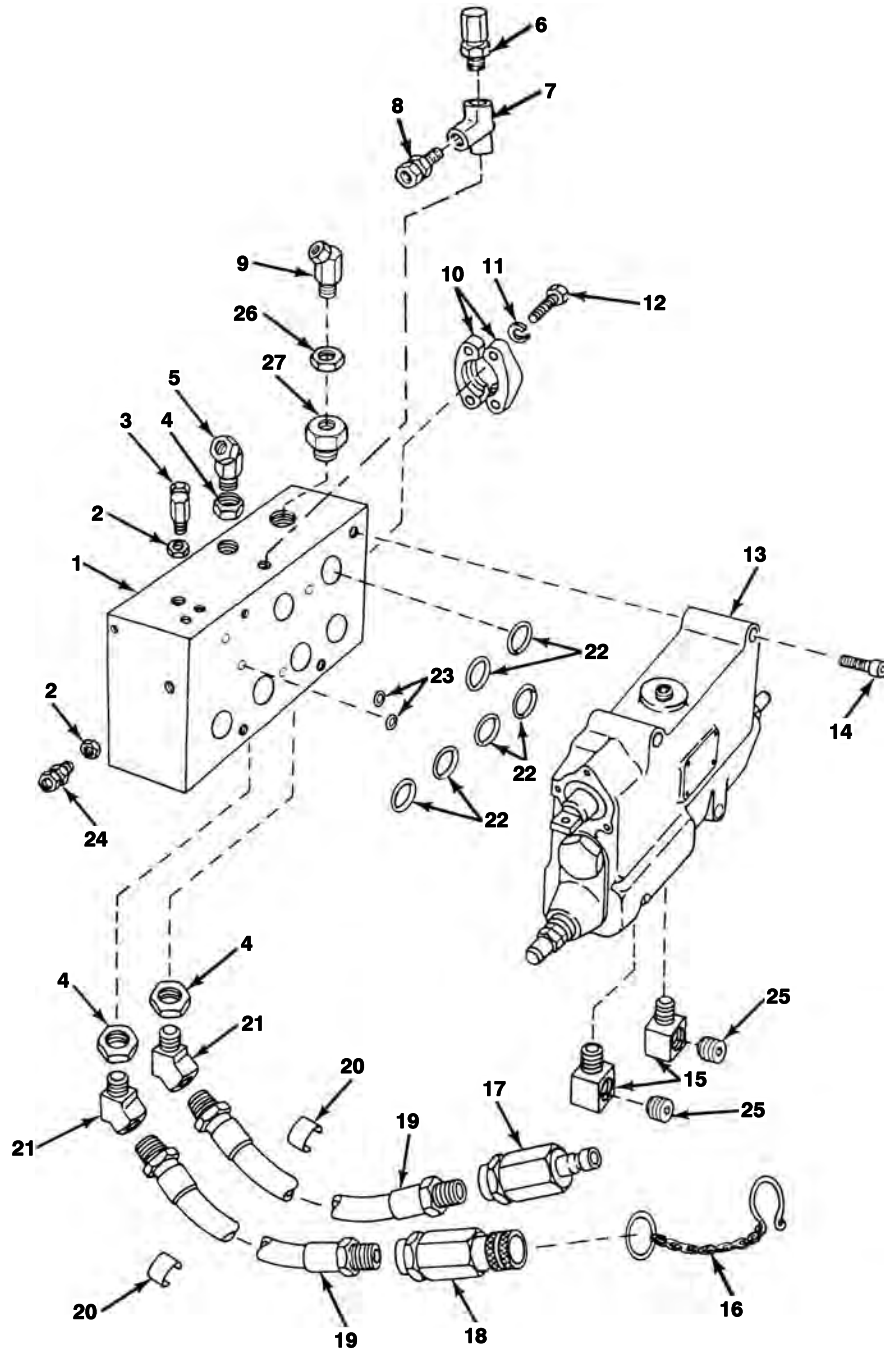


4. Disconnect hydraulic lines (11).
5. Remove four screws (12), lockwashers (13), and subplate and control valve assembly (14) with brackets attached. Discard lockwashers.
6. Remove four socket head screws (15) and combination control valve (16).
7. Remove and discard two packings (hidden) (17) and six packings (hidden) (18) from combination control valve (16).



**Disassembly**

1. The following illustration, with its accompanying legend, serves to identify all subassemblies and attaching parts. The step-by-step disassembly procedure is provided after this illustration:

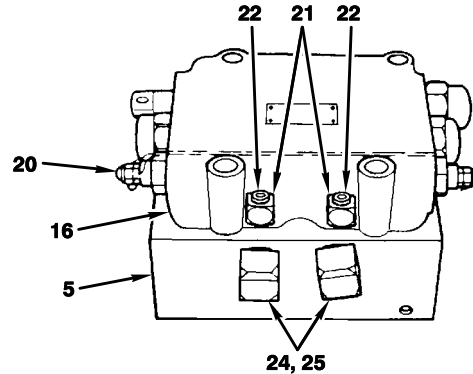
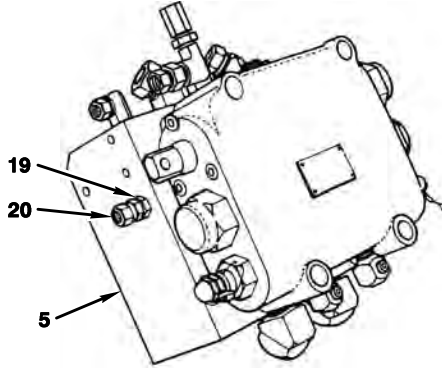


**Legend:**

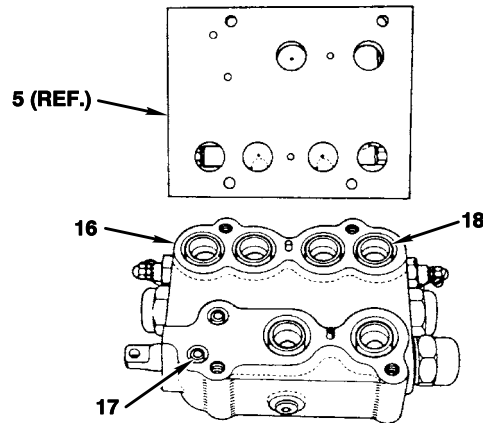
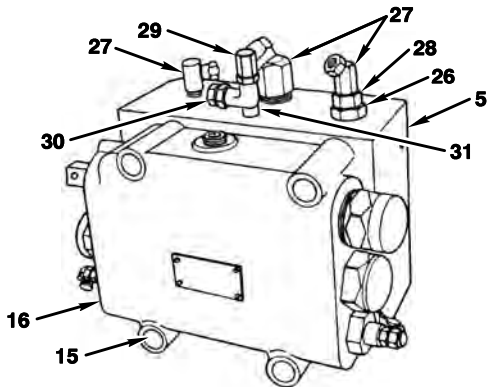
- |                  |                               |                                   |             |
|------------------|-------------------------------|-----------------------------------|-------------|
| 1. Subplate      | 8. Coupling pipe              | 15. Elbow                         | 22. Packing |
| 2. Nut           | 9. Adapter union              | 16. Retainer assembly             | 23. Packing |
| 3. Adapter union | 10. Flange                    | 17. Coupling                      | 24. Union   |
| 4. Nut           | 11. Lockwasher                | 18. Coupling                      | 25. Plug    |
| 5. Adapter union | 12. Screw                     | 19. Hose assembly, hydraulic line | 26. Nut     |
| 6. Valve         | 13. Combination control valve | 20. Marker band                   | 27. Bushing |
| 7. Tee           | 14. Screw                     | 21. Elbow                         |             |

**SPADE SUBPLATE AND COMBINATION CONTROL VALVE ASSEMBLY,  
EXPLODED VIEW.**

2. Loosen nut (19) and remove union (20) and nut from subplate (5).
3. Remove two plugs (21) and gage ports (22) from combination control valve (16).
4. Do not remove adjustment screw (23).
5. Loosen two nuts (24) and remove two elbows (25) and nuts from subplate (5).



6. Loosen three nuts (26) and remove adapter unions (27), nuts, and bushing (28) from subplate (5).
7. Remove valve (29), coupling pipe (30), and tee (31) from subplate (5).
8. Remove four screws (15) and combination control valve (16) from subplate (5).
9. Remove and discard two packings (17) and six packings (18) from combination control valve (16).



**Cleaning**

**WARNING**

Solvents 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 solvent gets on skin or clothing, wash immediately with soap and water.

1. Wash all parts in cleaning compound or mineral spirits paint thinner. Dry parts with moisture-free compressed air; then immerse parts in clean oil to prevent rusting.

### Inspection-Acceptance and Rejection Criteria

1. Inspect all threaded parts for nicks, burrs, and cross-threading. Repair with a thread chaser.
2. Inspect combination control valve for cracks or dented surfaces.
3. Inspect fittings for nicks, burrs, cracks, or leakage. Remove burrs with a fine, hard sharpening stone.

### Assembly

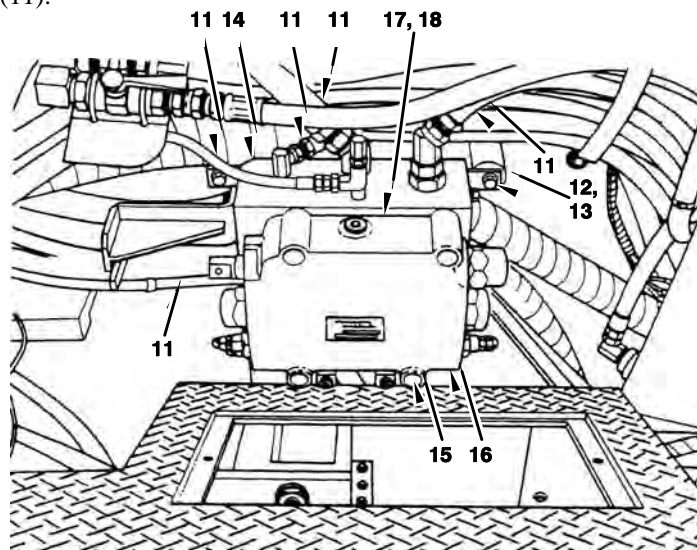
1. Install six packings (18) and two packings (17) to combination control valve (16).
2. Install combination control valve (16) and four screws (15) to subplate (5).
3. Install tee (31), coupling pipe (30), and valve (29) to subplate (5).
4. Install bushing (28), three nuts (26), and adapter unions (27) to subplate (5).
5. Install two nuts (24) and elbows (25) to subplate (5).
6. Install two gage ports (22) and plugs (21) to combination control valve (16).
7. Install nut (19) and union (20) to subplate (5).

### Installation

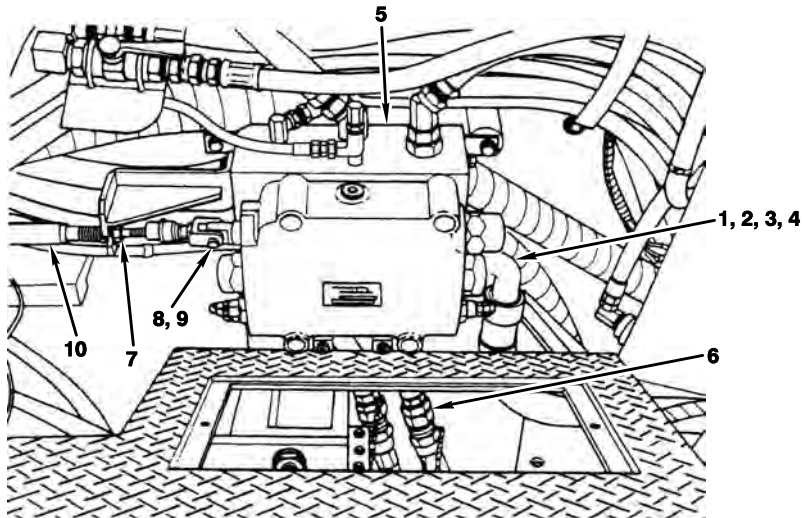
#### NOTE

If entire spade subplate and control valve assembly (14) was removed, perform steps 3 thru 7 only.  
If only combination control valve (16) was removed, perform steps 1, 2, and 5 only.

1. Install six packings (hidden) (18) and two packings (hidden) (17) to combination control valve (16).
2. Install combination control valve (16) and four socket head screws (15).
3. Install subplate and control valve assembly (14) with brackets attached, four lockwashers (13), and screws (12).
4. Connect hydraulic lines (11).



5. Connect spade control cable (10), install pin (9) and two cotter pins (8), and tighten two jamnuts (7).
6. Connect two hydraulic lines (6).
7. Connect hydraulic line (4) to subplate (5) and install two flanges (3), four lockwashers (2), and screws (1).



**END OF WORK PACKAGE**



**INTERMEDIATE MAINTENANCE**  
**RECOVERY VEHICLE, FULL TRACKED: MEDIUM, M88A1**  
**NSN 2350-00-122-6826, EIC AQA**

**SPADE CABLE CONTROL ASSEMBLY MAINTENANCE**  
**REMOVAL, INSTALLATION, ADJUSTMENT**

**INITIAL SETUP:**

**Tools and Special Tools**

Tool kit, general mechanic's (item 34, WP 0086 00)

**Materials/Parts**

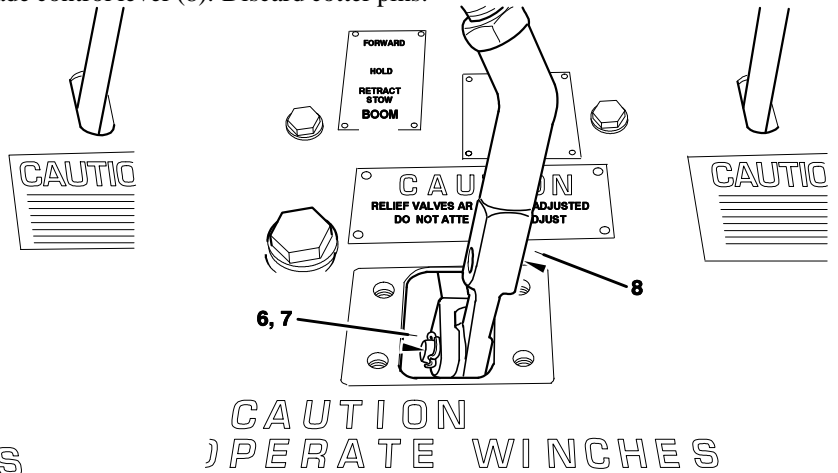
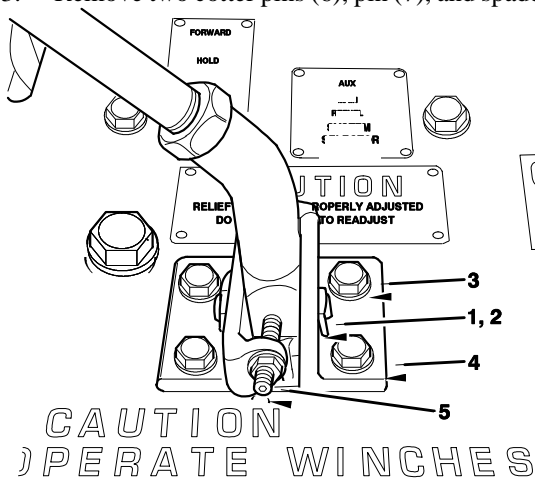
Lockwashers (6) (item 161, WP 0087 00)  
 Pins (3) (item 193, WP 0087 00)

**Materials/Parts (cont.)**

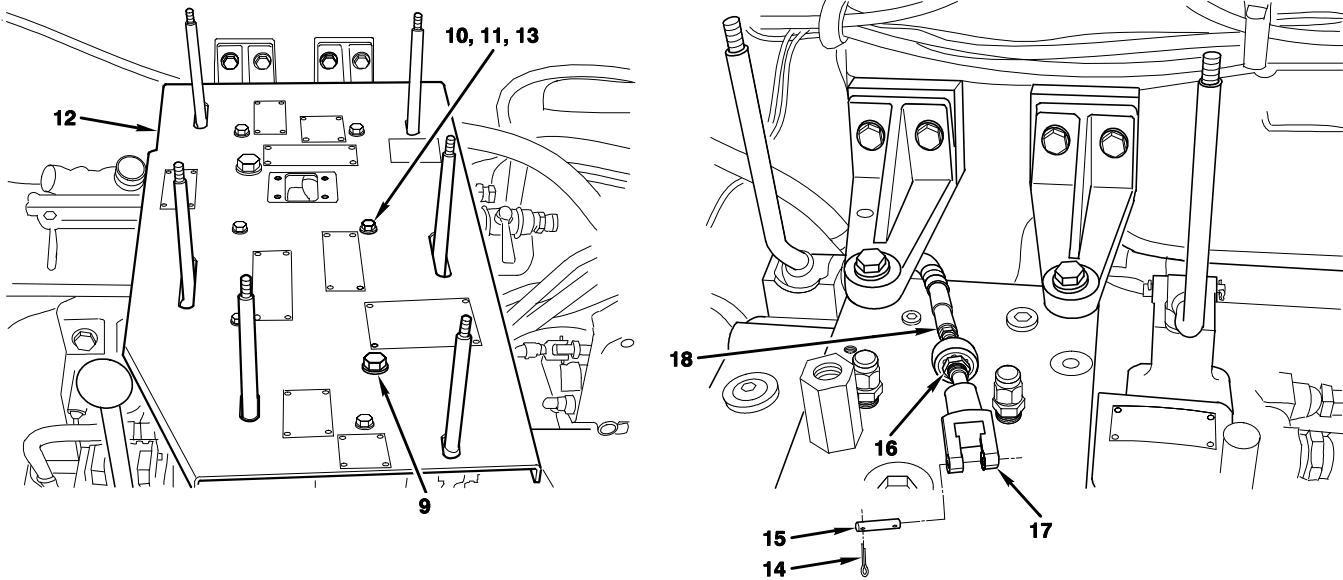
Pin (item 194, WP 0087 00)  
 Pins, cotter (8) (item 115, WP 0087 00)  
 Screws (4) (item 50, WP 0087 00)  
 Screws (6) (item 60, WP 0087 00)  
 Screws (2) (item 208, WP 0087 00)

**Removal**

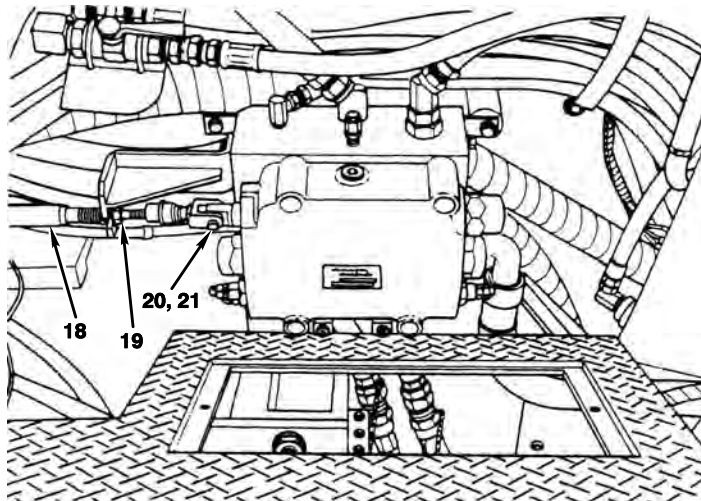
1. Remove two cotter pins (1) and pin (2). Discard cotter pins.
2. Remove four screws (3) and bracket (4) with adjustment screws (5).
3. Remove two cotter pins (6), pin (7), and spade control lever (8). Discard cotter pins.



4. Remove two large screws (9), six small screws (10), lockwashers (11), cover (12), and six spacers (beneath cover) (13). Discard lockwashers.
5. Remove two cotter pins (14) and pin (15). Discard cotter pins.
6. Loosen two jamnuts (16), unscrew clevis (17), and disconnect spade control cable (18).

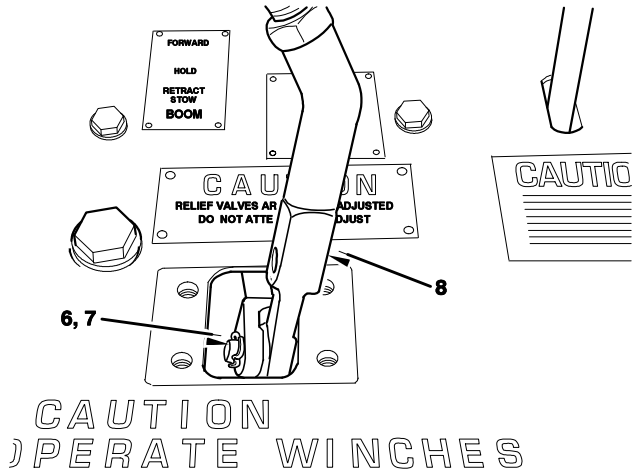
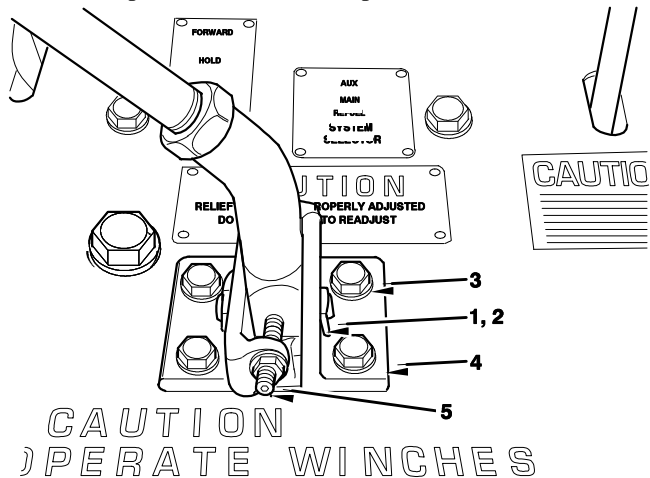


7. Loosen two jamnuts (19) and remove two cotter pins (20), pin (21), and spade control cable (18). Discard cotter pins.

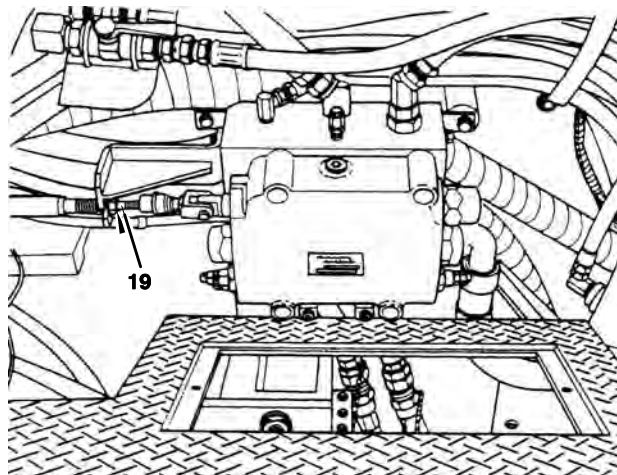
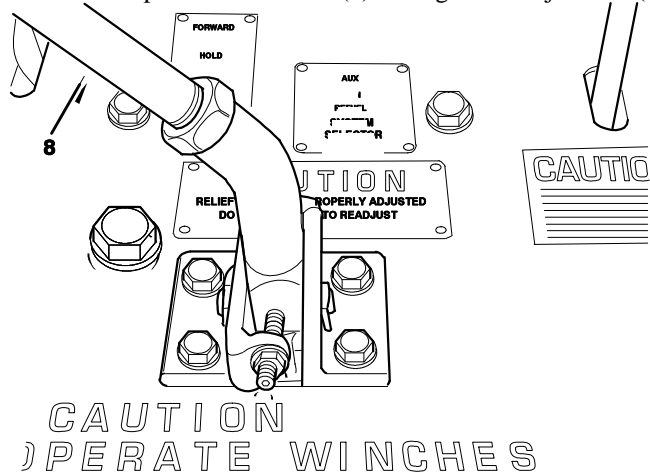


**Installation**

1. Connect spade control cable (18) and install pin (21) and two cotter pins (20). Do not tighten two jamnuts (19).
2. Install spade control cable (18) and clevis (17) and tighten two jamnuts (16).
3. Install pin (15) and two cotter pins (14).
4. Install six spacers (beneath cover) (13), cover (12), six lockwashers (11), small screws (10), and two large screws (9).
5. Install spade control lever (8), pin (7), and two cotter pins (6).
6. Install bracket (4) with adjustment screws (5) and four screws (3).
7. Install pin (2) and two cotter pins (1).

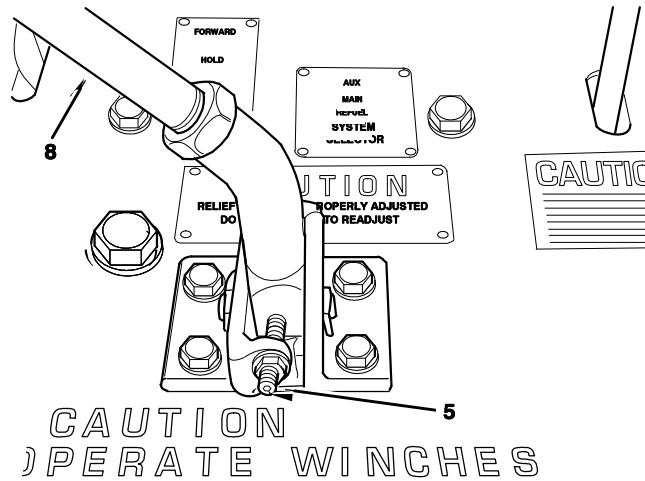


8. Center spade control lever (8) and tighten two jamnuts (19).



**Adjustment**

1. Loosen jamnuts on adjustment screws (5).
2. Back off adjustment screws (5).
3. Move spade control lever (8) completely back. Adjust back adjustment screw (5) until it touches spade control lever and add one full turn. Tighten jamnut.
4. Move spade control lever (8) completely forward. Adjust front adjustment screw (5) until it touches spade control lever and add one full turn. Tighten jamnut.

**END OF WORK PACKAGE**

**INTERMEDIATE MAINTENANCE**  
**RECOVERY VEHICLE, FULL TRACKED: MEDIUM, M88A1**  
**NSN 2350-00-122-6826, EIC AQA**

**FLOW REGULATING SUBPLATE ASSEMBLY MAINTENANCE**  
**DESCRIPTION, REMOVAL, DISASSEMBLY, CLEANING, INSPECTION, ASSEMBLY, INSTALLATION**

**INITIAL SETUP:****Tools and Special Tools**

Tool kit, general mechanic's (item 34, WP 0086 00)

**Materials/Parts**

Cleaning compound (item 5, WP 0085 00)

**Materials/Parts (cont.)**

Oil (item 8, WP 0085 00)

Paint thinner (item 18, WP 0085 00)

Lockwashers (3) (item 161, WP 0087 00)

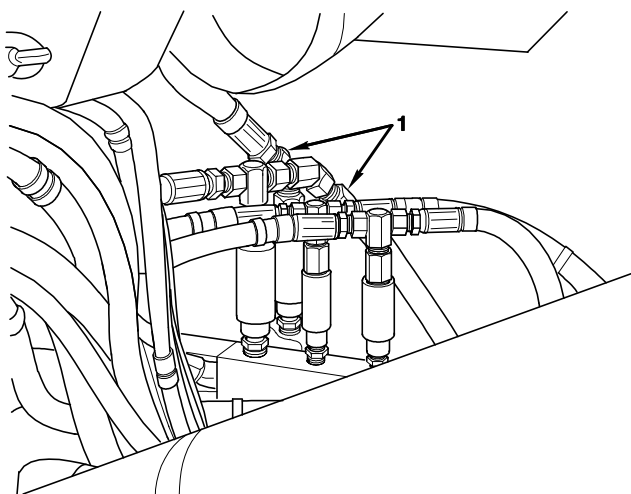
Screws (3) (item 214, WP 0087 00)

**DESCRIPTION**

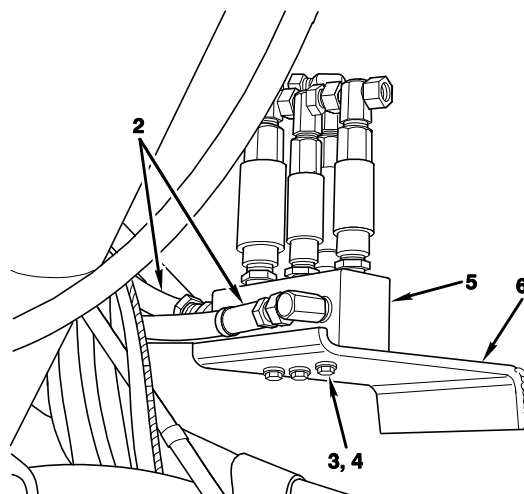
The flow regulating subplate assembly is mounted to the wall behind the right front boom cylinder in the crew compartment. The four flow regulators in this assembly are installed in the main hydraulic system, regulate oil flow in one direction regardless of pressure, and permit unrestricted flow in the opposite direction. The regulators control the speed of raising and lowering the boom and spade.

**Removal**

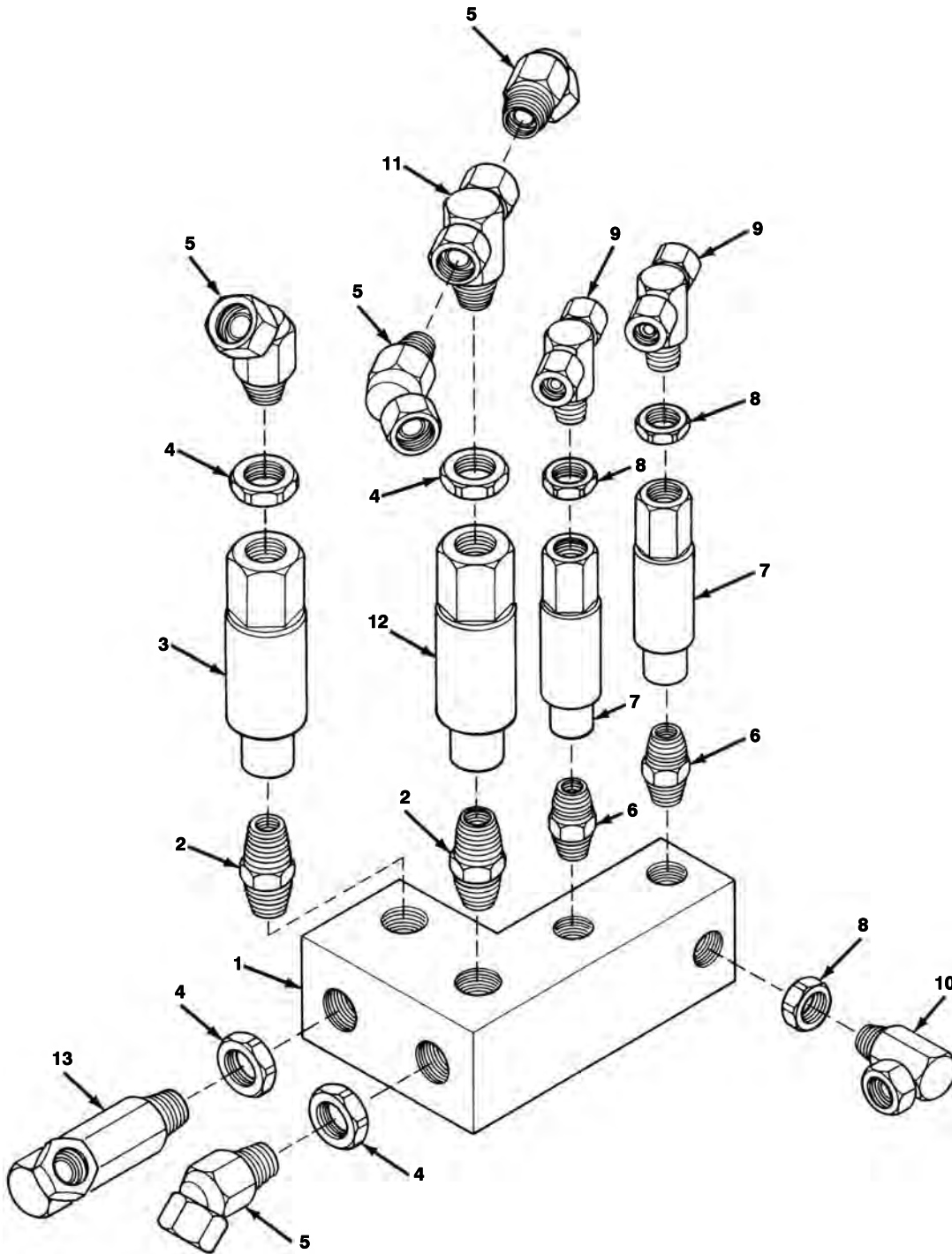
1. Disconnect seven hydraulic lines (1).
2. Disconnect three hydraulic lines (2).
3. Remove three screws (3), lockwashers (4), and flow regulating subplate assembly (5) from subplate assembly mounting bracket (6). Discard lockwashers.



**FORWARD RIGHT SIDE, CREW COMPARTMENT**

**Disassembly**

1. The following illustration, with its accompanying legend, serves to identify all subassemblies and attaching parts. The step-by-step disassembly procedure is provided after this illustration:

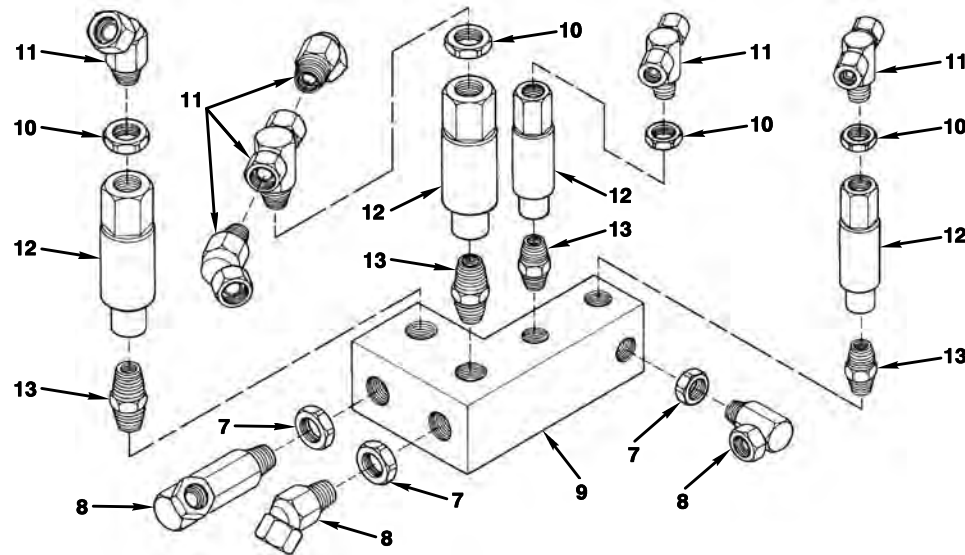


**Legend:**

- |                   |                   |                    |
|-------------------|-------------------|--------------------|
| 1. Subplate       | 6. Nipple         | 11. Adapter union  |
| 2. Nipple         | 7. Flow regulator | 12. Flow regulator |
| 3. Flow regulator | 8. Nut            | 13. Adapter union  |
| 4. Nut            | 9. Adapter union  |                    |
| 5. Adapter union  | 10. Adapter union |                    |

**FLOW REGULATING SUBPLATE ASSEMBLY, EXPLODED VIEW.**

2. Loosen three nuts (7) and remove three adapter unions (8) and nuts from subplate (9).
3. Loosen four nuts (10) and remove six adapter unions (11) and four nuts.
4. Remove four flow regulators (12) and nipples (13) from subplate (9).



## Cleaning

### WARNING

Solvents 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 solvent gets on skin or clothing, wash immediately with soap and water.

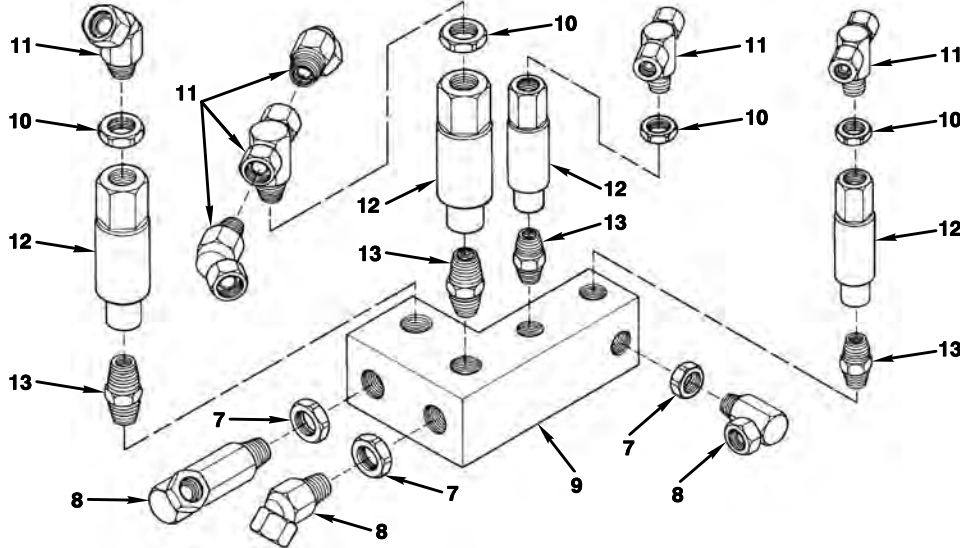
1. Wash all parts in cleaning compound or mineral spirits paint thinner. Dry parts with moisture-free compressed air; then immerse parts in clean oil to prevent rusting.

## Inspection-Acceptance and Rejection Criteria

1. Inspect all threaded parts for nicks, burrs, and cross-threading. Repair with a thread chaser.
2. Inspect flow regulators for cracks or dented surfaces.
3. Inspect fittings for nicks, burrs, cracks, or leakage. Remove burrs with a fine, hard sharpening stone.

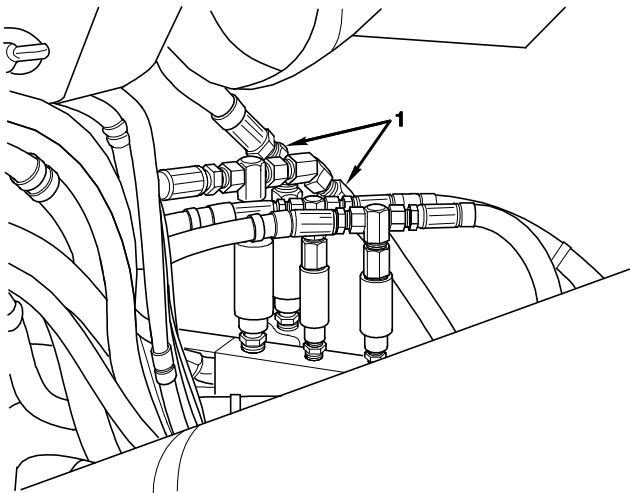
**Assembly**

1. Install four nipples (13) and flow regulators (12) to subplate (9).
2. Install four nuts (10) and six adapter unions (11).
3. Install three nuts (7) and adapter unions (8) to subplate (9).

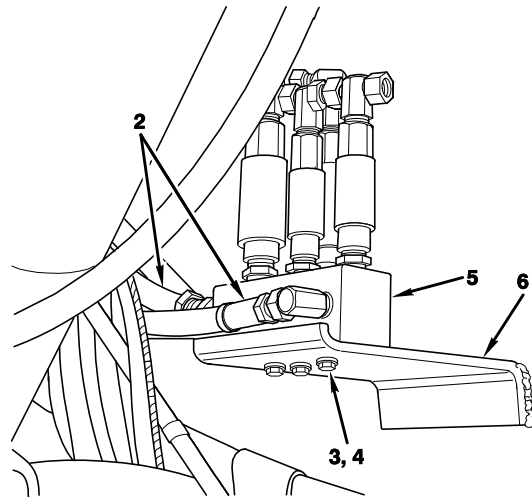


**Installation**

1. Install flow regulating subplate assembly (5), three lockwashers (4), and screws (3) to subplate assembly mounting bracket (6).
2. Connect three hydraulic lines (2).
3. Connect seven hydraulic lines (1).



**FORWARD RIGHT SIDE, CREW COMPARTMENT**



**END OF WORK PACKAGE**



**INTERMEDIATE MAINTENANCE**  
**RECOVERY VEHICLE, FULL TRACKED: MEDIUM, M88A1**  
**NSN 2350-00-122-6826, EIC AQA**

**BOOM LIMIT PILOT VALVES MAINTENANCE**  
**REMOVAL, INSTALLATION, ADJUSTMENT**

**INITIAL SETUP:**

**Tools and Special Tools**

Tool kit, general mechanic's (item 34, WP 0086 00)

**Materials/Parts**

Lockwashers (10) (item 161, WP 0087 00)

Packings (6) (item 126, WP 0087 00)

Pins, spring (2) (item 91, WP 0087 00)

Screws (6) (item 56, WP 0087 00)

**Materials/Parts (cont.)**

Screws (4) (item 57, WP 0087 00)

Screws (6) (item 98, WP 0087 00)

Washers (4) (item 121, WP 0087 00)

**Equipment Condition**

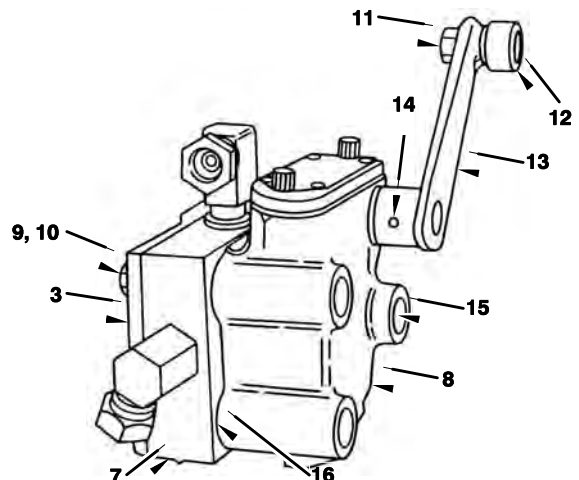
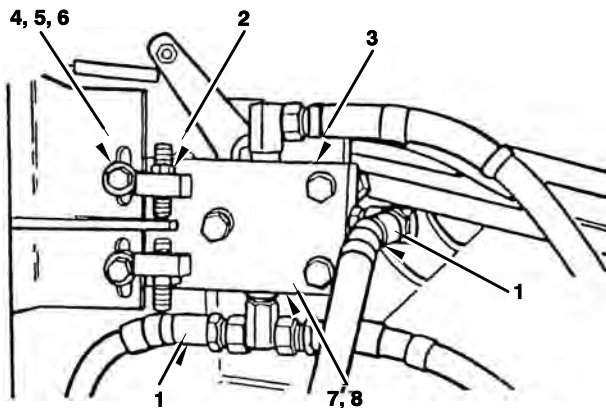
Deck grilles 6 and 20 removed (TM 9-2350-256-20)

**Removal**

**NOTE**

This procedure covers the right-hand valve. The left-hand valve is removed in the same manner except there are only two hydraulic lines to be disconnected in step 1 for the left-hand valve.

1. Disconnect four hydraulic lines (1).
2. Loosen two jamnuts (2) on support (3).
3. Remove two screws (4), lockwashers (5), washers (6), and support (3), subplate (hidden) (7), and valve (hidden) (8) together as an assembly. Discard lockwashers.
4. Remove three screws (9), lockwashers (10), and support (3) from subplate (7). Discard lockwashers.
5. Remove nut (11) and cam follower (12) from arm (13).
6. Drive out spring pin (14) and remove arm (13) from valve (8). Discard spring pin.
7. Remove three socket head screws (15) and valve (8) from subplate (7).
8. Remove and discard three packings (hidden) (16).

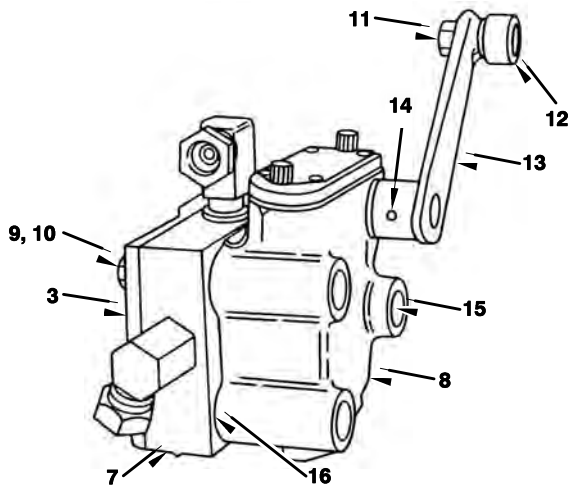
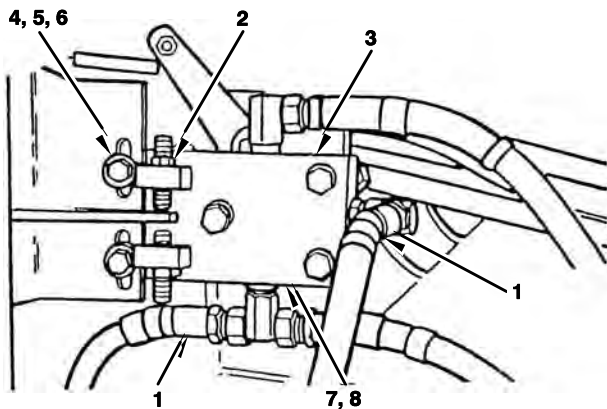


## Installation

### NOTE

This procedure covers the right-hand valve. The left-hand valve is installed in the same manner except there are only two hydraulic lines to be connected in step 8 for the left-hand valve.

1. Install three packings (hidden) (16).
2. Install valve (8) and three socket head screws (15) to subplate (7).
3. Install arm (13) and spring pin (14) to valve (8).
4. Install cam follower (12) and nut (11) to arm (13).
5. Install support (3), three lockwashers (10), and screws (9) to subplate (7).
6. Install support (3), subplate (hidden) (7), and valve (hidden) (8) together as an assembly, two washers (6), lockwashers (5), and screws (4).
7. Tighten two jamnuts (2) on support (3).
8. Connect four hydraulic lines (1).



## Adjustment

1. Adjust boom limit pilot valve in accordance with TM 9-2350-256-20.

**END OF WORK PACKAGE**

**INTERMEDIATE MAINTENANCE**  
**RECOVERY VEHICLE, FULL TRACKED: MEDIUM, M88A1**  
**NSN 2350-00-122-6826, EIC AQA**

**AUXILIARY POWER UNIT (APU) MAINTENANCE**  
**REMOVAL, DISASSEMBLY, CLEANING, INSPECTION, REPAIR,**  
**ASSEMBLY, TEST, INSTALLATION, ADJUSTMENT**

**INITIAL SETUP:****Test Equipment**

Multimeter (item 23, WP 0086 00)  
 Test stand (Table 2, WP 0088 00)

**Tools and Special Tools**

Brush, scrub (item 3, WP 0085 00)  
 Cable, ground (item 5, WP 0086 00)  
 Cable assembly (item 6, WP 0086 00)  
 Cable assembly (item 7, WP 0086 00)  
 Gage (item 9, WP 0086 00)  
 Gage, alignment (item 11, WP 0086 00)  
 Hose assembly (item 14, WP 0086 00)  
 Hose assembly (item 15, WP 0086 00)  
 Hose assembly (item 16, WP 0086 00)  
 Hose assembly (item 17, WP 0086 00)  
 Hose assembly (item 18, WP 0086 00)  
 Puller (item 25, WP 0086 00)  
 Sling (item 30, WP 0086 00)  
 Tool kit, general mechanic's (item 34, WP 0086 00)

**Materials/Parts**

Adhesive (item 1, WP 0085 00)  
 Cleaning compound (item 5, WP 0085 00)  
 Paint thinner (item 18, WP 0085 00)  
 Sealing compound (item 14, WP 0085 00)  
 Gasket (item 11, WP 0087 00)  
 Gaskets (2) (item 12, WP 0087 00)  
 Gasket (item 13, WP 0087 00)  
 Lockwashers (13) (item 147, WP 0087 00)  
 Lockwashers (15) (item 148, WP 0087 00)  
 Lockwasher (item 150, WP 0087 00)  
 Lockwashers (2) (item 155, WP 0087 00)  
 Lockwashers (13) (item 156, WP 0087 00)  
 Lockwashers (2) (item 161, WP 0087 00)  
 Lockwashers (5) (item 162, WP 0087 00)  
 Lockwashers (4) (item 163, WP 0087 00)  
 Nut (item 32, WP 0087 00)  
 Nut (item 189, WP 0087 00)  
 Nuts, self-locking (6) (item 87, WP 0087 00)  
 Nuts, self-locking (2) (item 107, WP 0087 00)

**Materials/Parts (cont.)**

Packing (item 138, WP 0087 00)  
 Packing (item 139, WP 0087 00)  
 Pin (item 230, WP 0087 00)  
 Pin, cotter (item 228, WP 0087 00)  
 Screws (4) (item 33, WP 0087 00)  
 Screws (2) (item 34, WP 0087 00)  
 Screw (item 35, WP 0087 00)  
 Screws (4) (item 52, WP 0087 00)  
 Screws (2) (item 53, WP 0087 00)  
 Screws (4) (item 54, WP 0087 00)  
 Screw (item 55, WP 0087 00)  
 Screw (item 61, WP 0087 00)  
 Screws (4) (item 67, WP 0087 00)  
 Screws (12) (item 94, WP 0087 00)  
 Screws (15) (item 95, WP 0087 00)  
 Screws (4) (item 104, WP 0087 00)  
 Screws (13) (item 187, WP 0087 00)  
 Screw (item 204, WP 0087 00)  
 Screws (4) (item 206, WP 0087 00)  
 Screws (2) (item 213, WP 0087 00)  
 Seals, oil (2) (item 14, WP 0087 00)  
 Studs (6) (item 188, WP 0087 00)  
 Washers (4) (item 23, WP 0087 00)  
 Washers (2) (item 45, WP 0087 00)  
 Washers (6) (item 84, WP 0087 00)  
 Washers (2) (item 181, WP 0087 00)

**Personnel Required**

Mechanics (3)

**References**

TM 9-2350-256-10  
 TM 9-2815-221-34&P  
 WP 0033 00

**Equipment Condition**

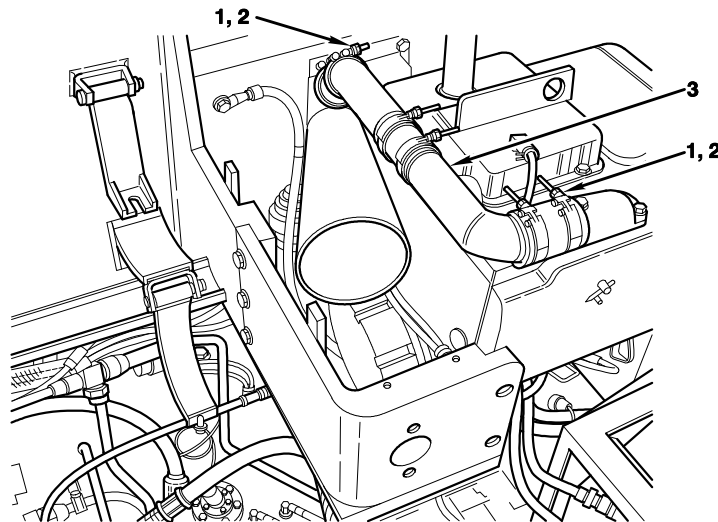
APU access cover removed (TM 9-2350-256-20)  
 APU cooling air exhaust removed (TM 9-2350-256-20)  
 Personnel heater exhaust removed (TM 9-2350-256-20)

**WARNING**

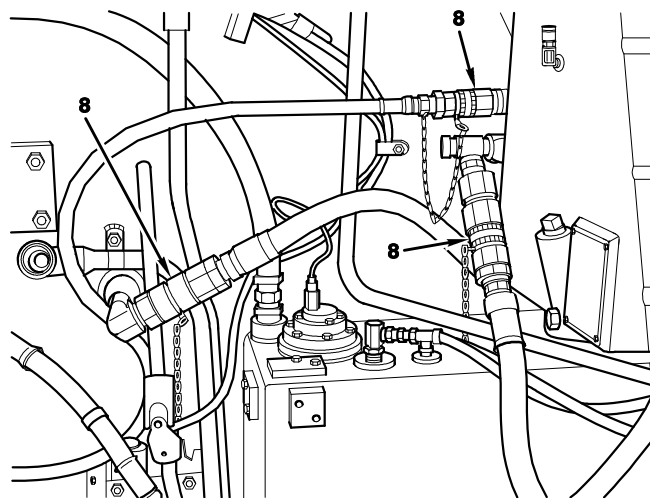
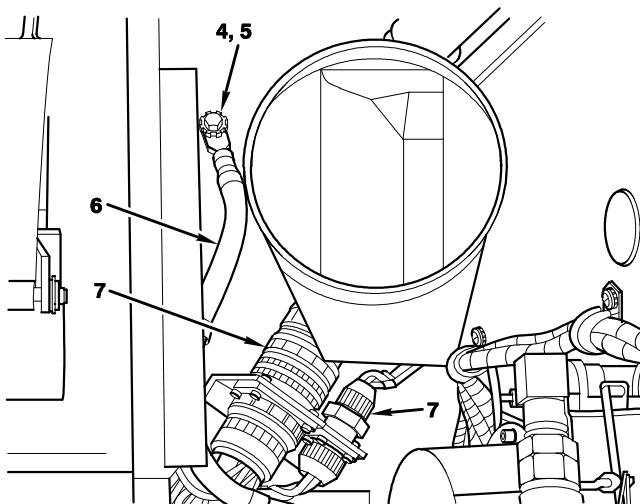
Elevating the hoisting boom when the APU and main engine are both inoperable is a safety hazard and may cause injury to personnel. If the APU and main engine are both inoperable, refer to TM 9-2350-256-20 for boom elevating instructions.

**Removal**

1. Loosen nut (1) and clamp (2) and remove engine air intake tube (3).

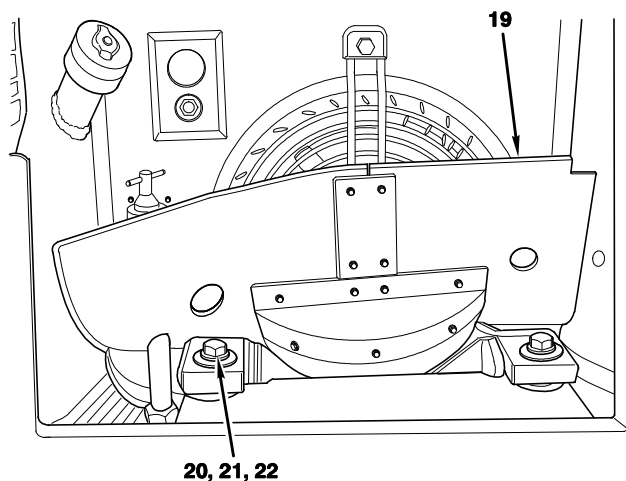
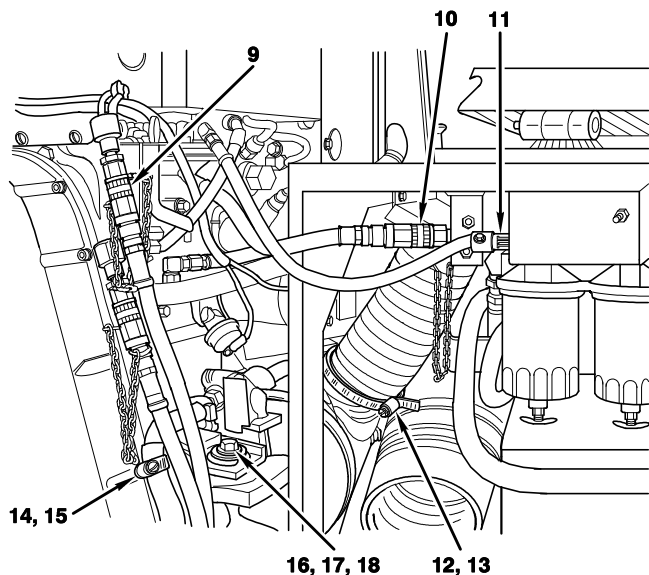


2. Remove two screws (4), star washers (5), and ground cable (6). Discard star washers.
3. Disconnect two wiring harnesses (7).
4. Disconnect three hydraulic lines (8).



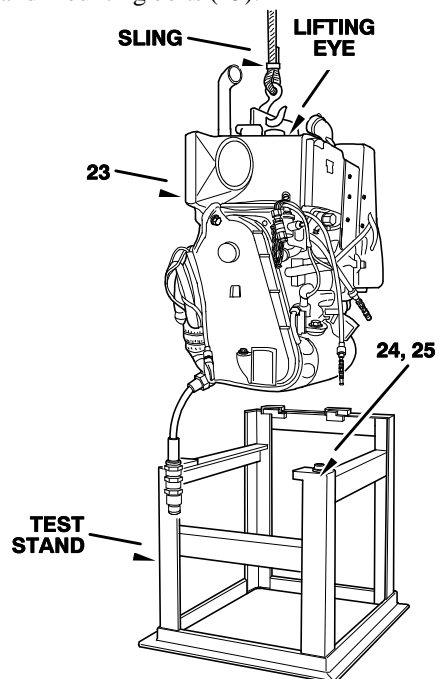
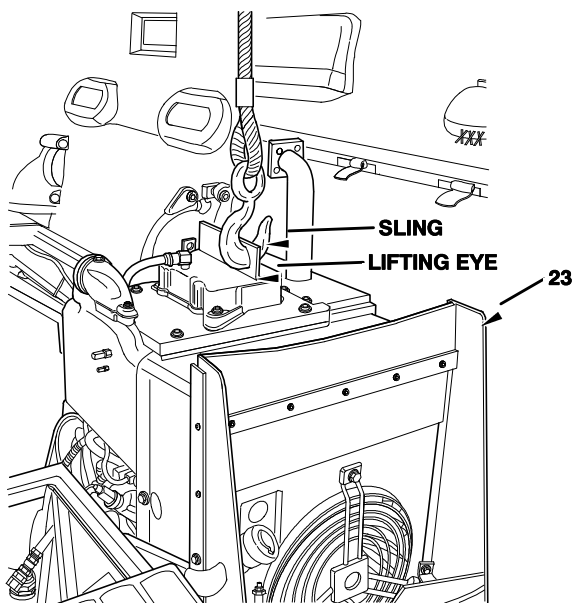
5. Disconnect two fuel lines (9), fuel line (10), and fuel line (hidden) (11).
6. Loosen clamp (12) and remove hose (13).
7. Loosen clamp (14) and remove hose (15).

8. Remove two rear mounting screws (16), lockwashers (17), and washers (18). Discard lockwashers.
9. Lift panel (19) and remove two front mounting screws (20), lockwashers (21), and washers (22). Discard lockwashers.



APU COMPARTMENT (OPEN DOOR)

10. Attach sling to lifting eye and remove APU (23) from vehicle.
11. Lower APU (23) onto test stand and secure with four lockwashers (24) and mounting bolts (25).



**Disassembly****NOTE**

Refer to TM 9-2815-221-34&P for repair of the auxiliary engine and to TM 9-2350-256-20 for components not covered in this manual.

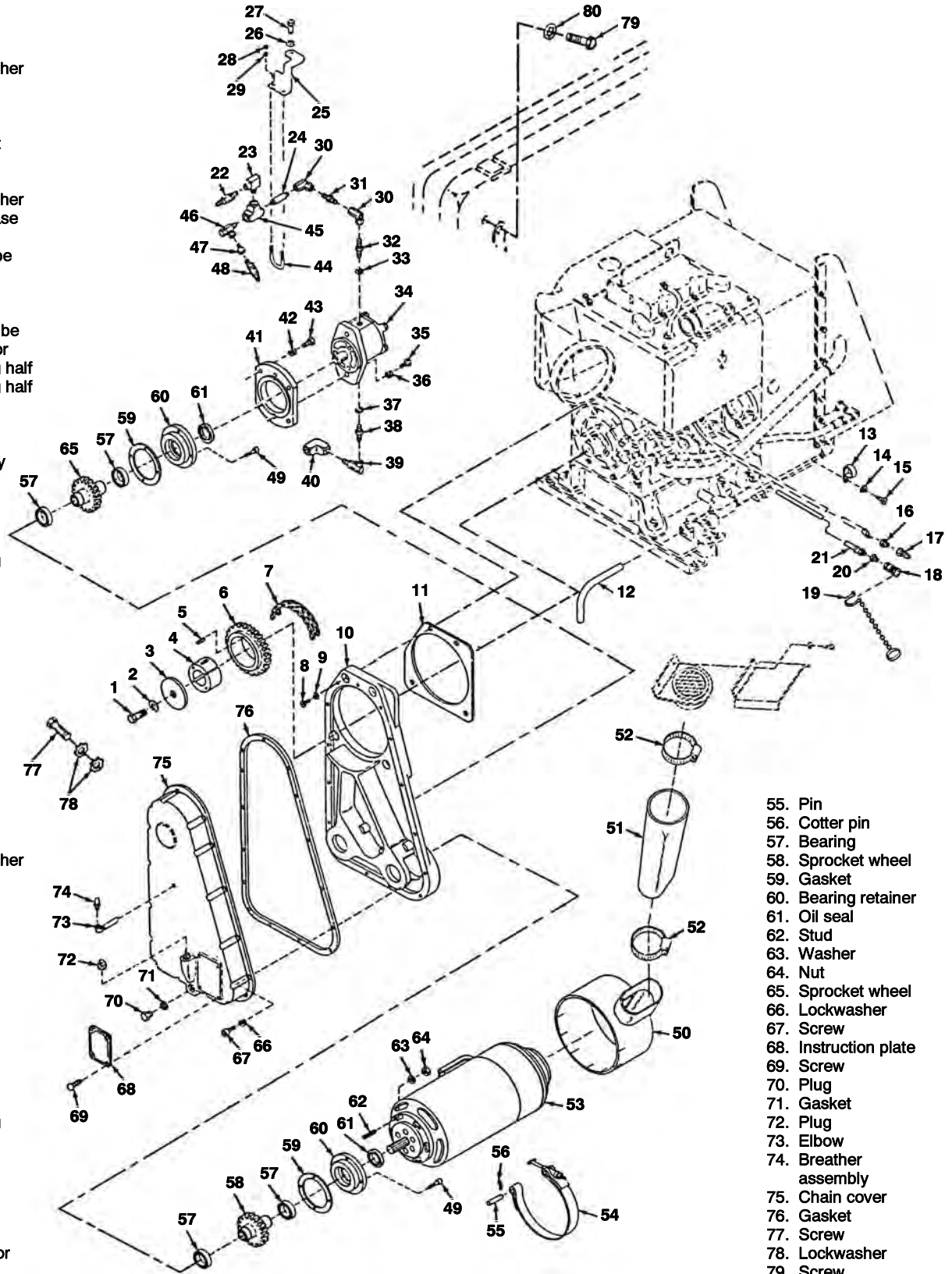
1. The following three illustrations, with accompanying legends, serve to identify the components of the APU. Following these three illustrations is a schematic guide to the connection of the wiring harnesses, high air temperature switch lead, and ground leads. The step-by-step disassembly procedure is provided after these four illustrations:

**Legend:**

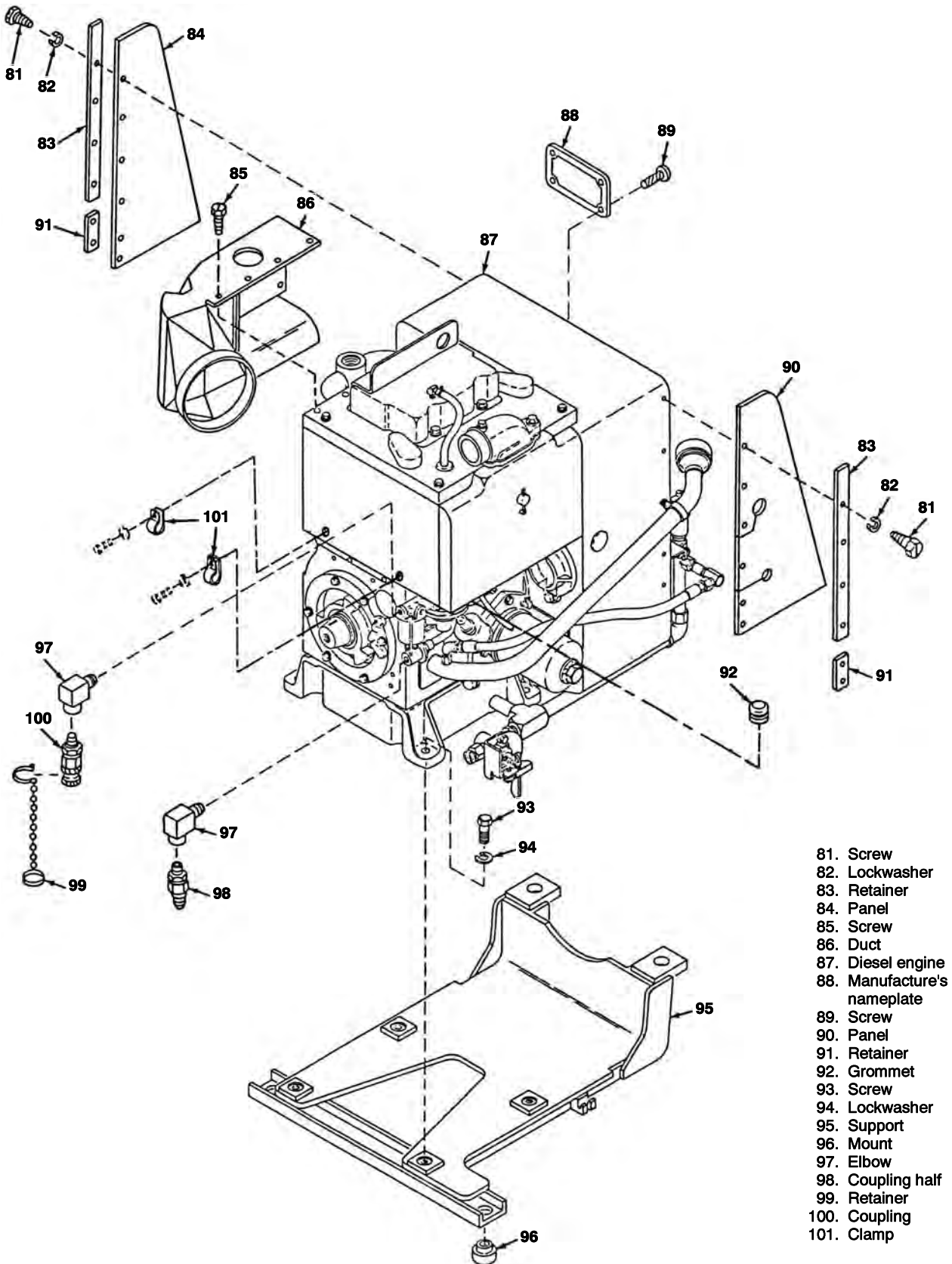
- 1. Screw
- 2. Lockwasher
- 3. Plate
- 4. Bushing
- 5. Key
- 6. Sprocket
- 7. Chain
- 8. Screw
- 9. Lockwasher
- 10. Chain case
- 11. Gasket
- 12. Drain tube
- 13. Clamp
- 14. Washer
- 15. Screw
- 16. Flared tube connector
- 17. Coupling half
- 18. Coupling half
- 19. Retainer
- 20. Bushing
- 21. Hose assembly

- 22. Coupling half
- 23. Elbow
- 24. Nipple
- 25. Bracket
- 26. Washer
- 27. Screw
- 28. Nut
- 29. Washer
- 30. Adapter union
- 31. Nipple
- 32. Adapter
- 33. Packing
- 34. Pump
- 35. Screw
- 36. Lockwasher
- 37. Packing
- 38. Adapter
- 39. Adapter union
- 40. Elbow
- 41. Pump adapter
- 42. Washer
- 43. Screw
- 44. U-Bolt
- 45. Tee
- 46. Valve
- 47. Adapter
- 48. Coupling half
- 49. Screw
- 50. Duct
- 51. Air duct hose
- 52. Clamp
- 53. Generator
- 54. Support strap

- 55. Pin
- 56. Cotter pin
- 57. Bearing
- 58. Sprocket wheel
- 59. Gasket
- 60. Bearing retainer
- 61. Oil seal
- 62. Stud
- 63. Washer
- 64. Nut
- 65. Sprocket wheel
- 66. Lockwasher
- 67. Screw
- 68. Instruction plate
- 69. Screw
- 70. Plug
- 71. Gasket
- 72. Plug
- 73. Elbow
- 74. Breather assembly
- 75. Chain cover
- 76. Gasket
- 77. Screw
- 78. Lockwasher
- 79. Screw
- 80. Lockwasher



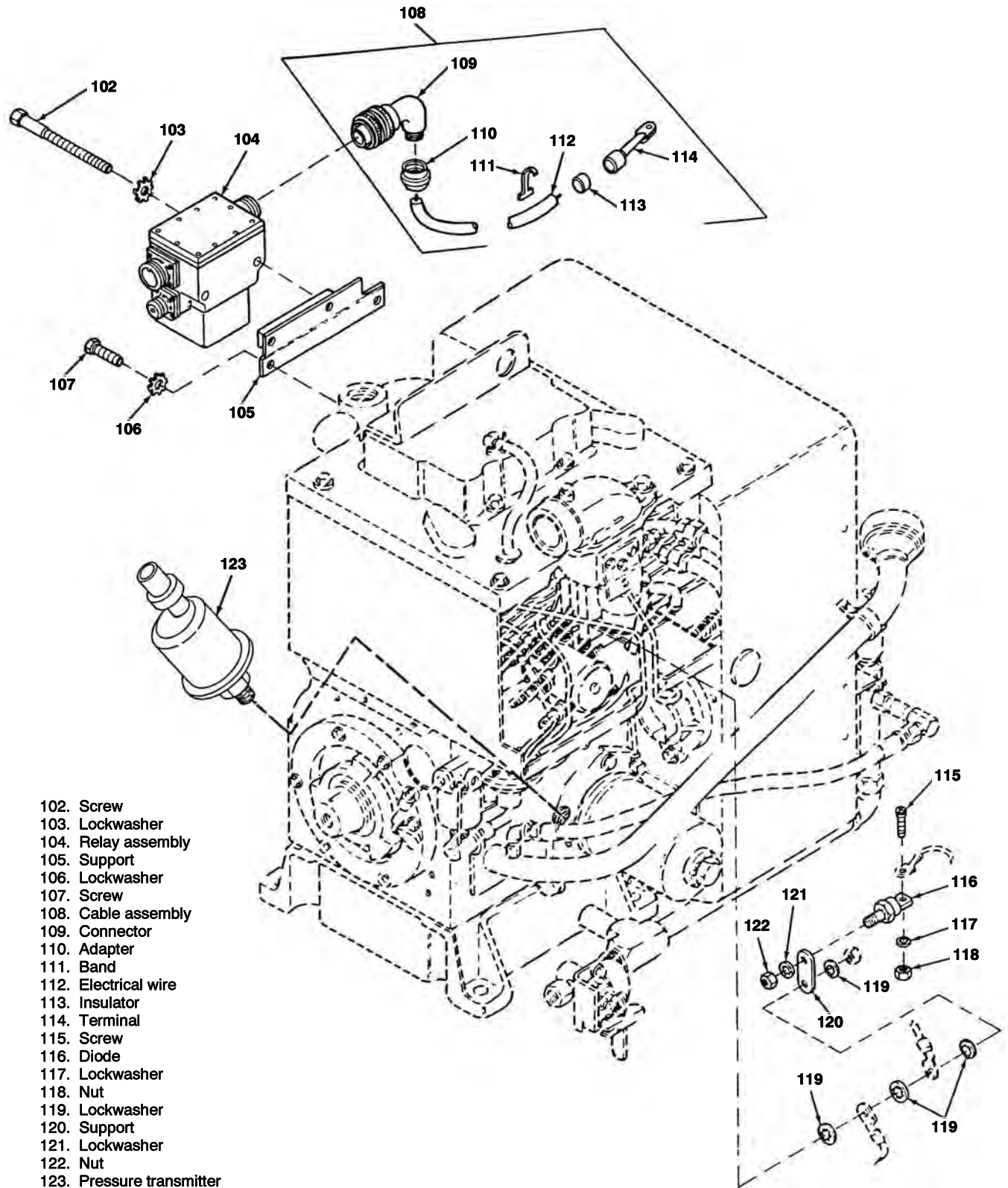
**APU, EXPLODED VIEW (SHEET 1 OF 3).**



- 81. Screw
- 82. Lockwasher
- 83. Retainer
- 84. Panel
- 85. Screw
- 86. Duct
- 87. Diesel engine
- 88. Manufacture's nameplate
- 89. Screw
- 90. Panel
- 91. Retainer
- 92. Grommet
- 93. Screw
- 94. Lockwasher
- 95. Support
- 96. Mount
- 97. Elbow
- 98. Coupling half
- 99. Retainer
- 100. Coupling
- 101. Clamp

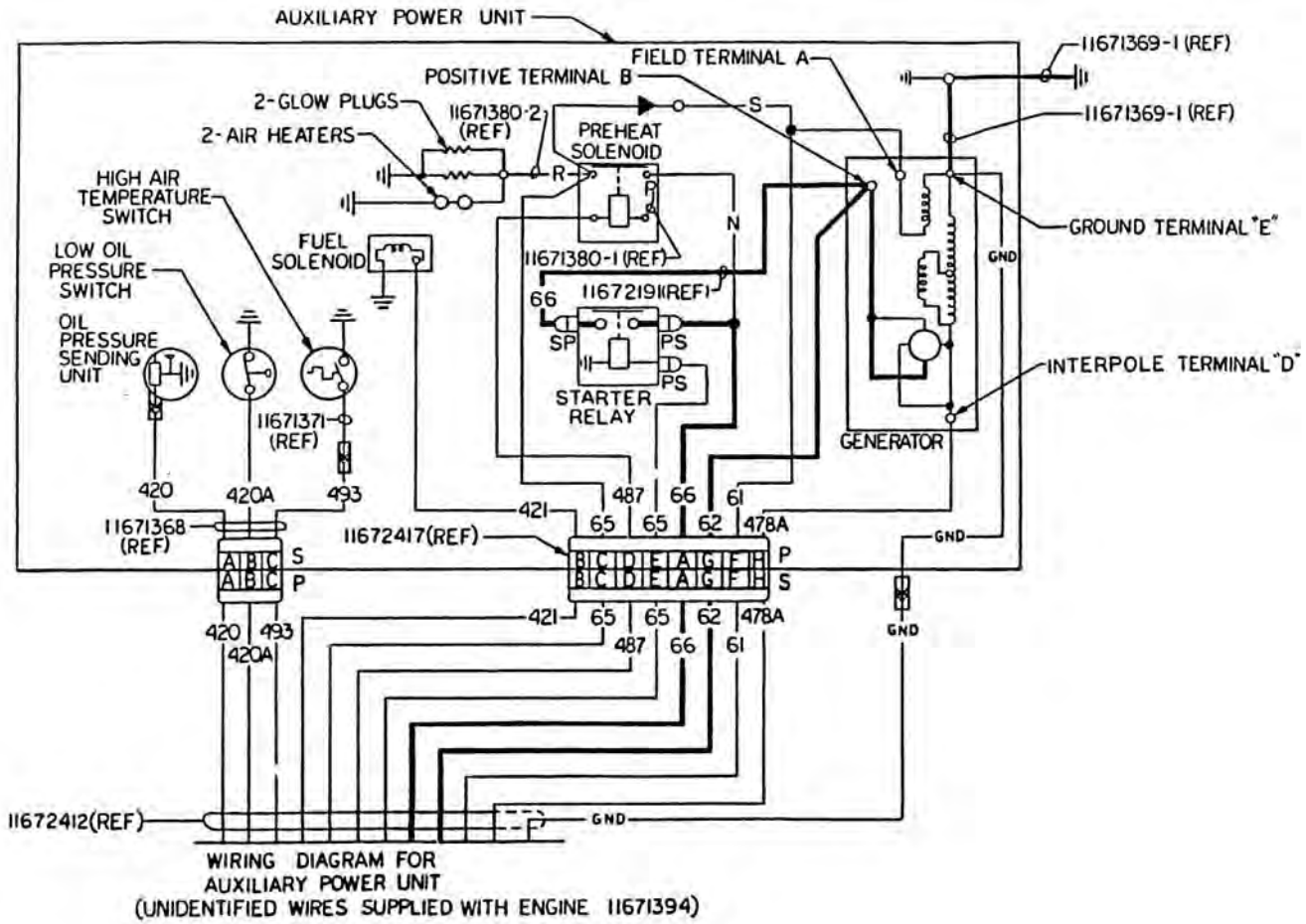
APU, EXPLODED VIEW (SHEET 2 OF 3).





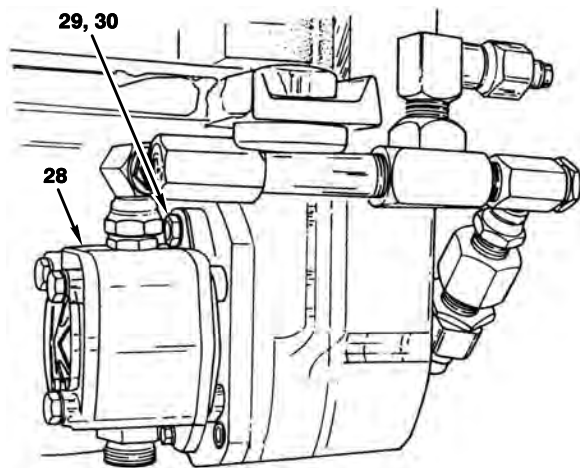
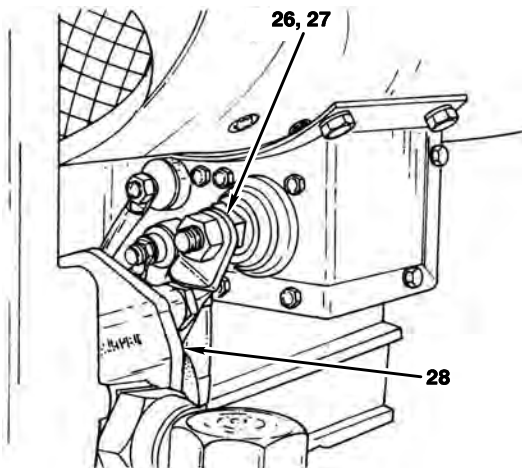
- 102. Screw
- 103. Lockwasher
- 104. Relay assembly
- 105. Support
- 106. Lockwasher
- 107. Screw
- 108. Cable assembly
- 109. Connector
- 110. Adapter
- 111. Band
- 112. Electrical wire
- 113. Insulator
- 114. Terminal
- 115. Screw
- 116. Diode
- 117. Lockwasher
- 118. Nut
- 119. Lockwasher
- 120. Support
- 121. Lockwasher
- 122. Nut
- 123. Pressure transmitter

**APU, EXPLODED VIEW (SHEET 3 OF 3).**

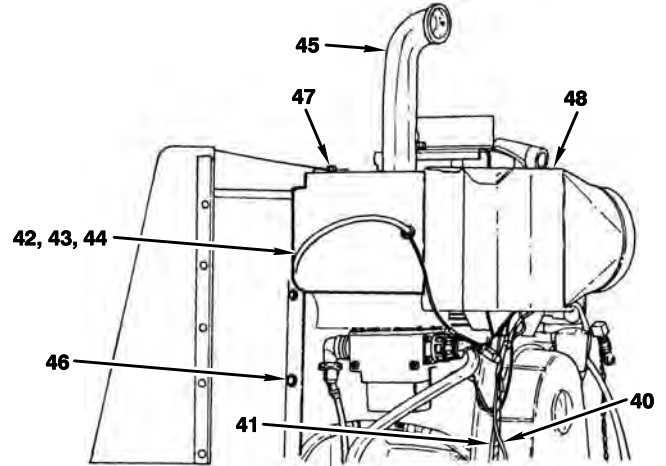
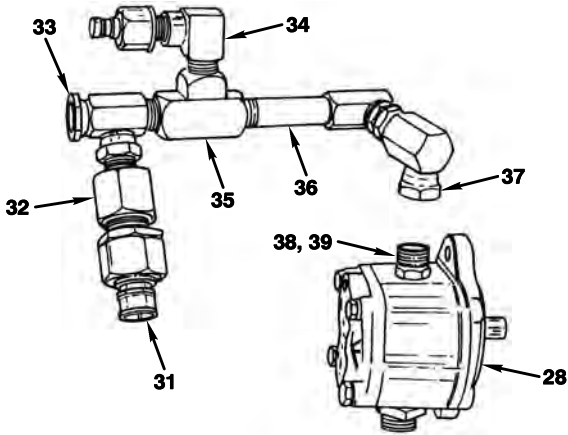


**APU WIRING DIAGRAM.**

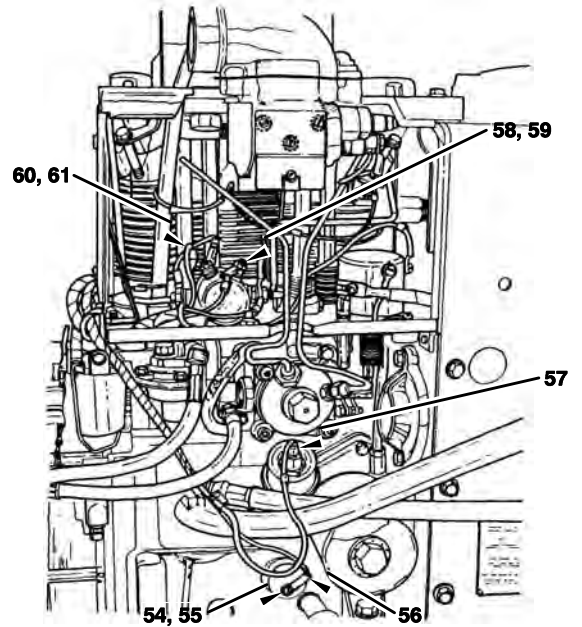
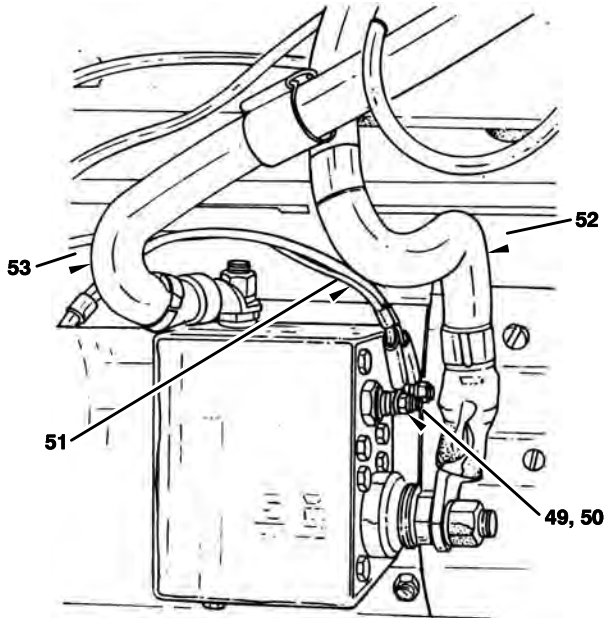
- Loosen terminal (26) and push electric cable (27) to provide clearance for auxiliary hydraulic pump (28).
- Remove two screws (29), lockwashers (30), and auxiliary hydraulic pump (28) with fittings attached. Discard lockwashers.



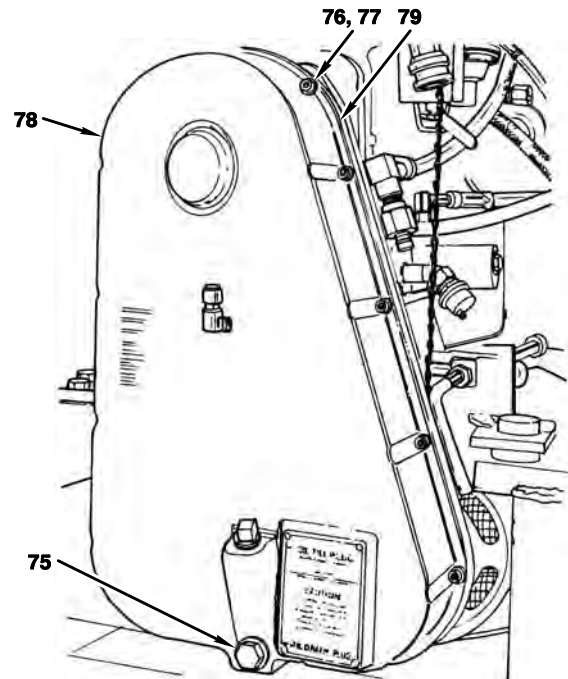
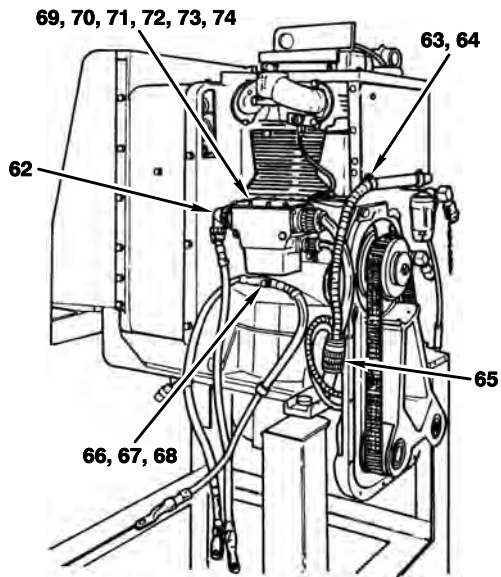
4. Remove two coupling halves (31), adapter (32), valve (33), elbow (34), tee (35), two nipples (36), adapter unions (37), adapter (38), and two packings (hidden) (39) from auxiliary hydraulic pump (28). Discard packings.
5. Disconnect lead (hidden) (40) and remove shell (hidden) (41).
6. Remove screw (42) and washer (43) and disconnect ground lead (44).
7. Unscrew exhaust tube (45).
8. Remove screw (46), four screws (47), and air inlet duct (48).



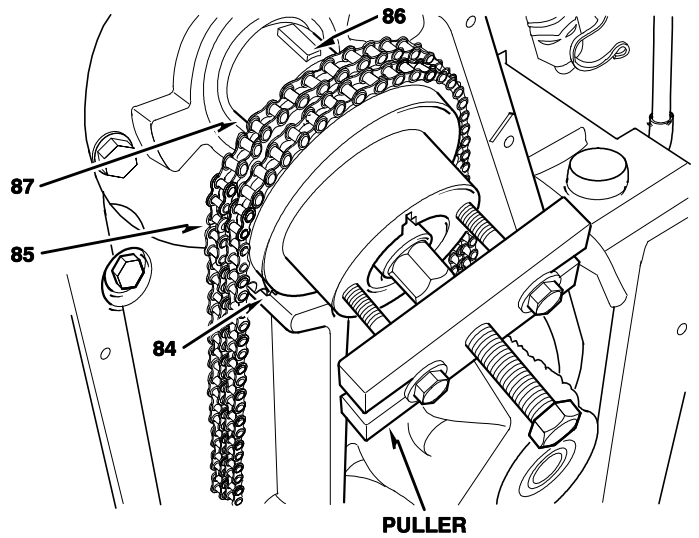
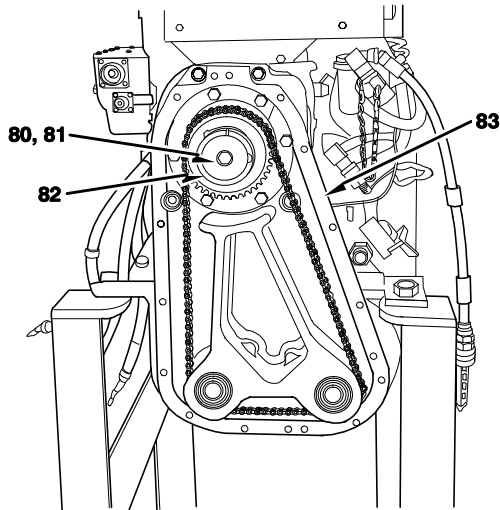
9. Remove four nuts (49) and washers (50) and disconnect two leads (51), armature cable (52), and ground cable (53).
10. Remove screw (54) and washer (55) and disconnect lead (56).
11. Disconnect lead (57).
12. Remove four screws (58) and lockwashers (59) and disconnect four leads (60) from preheat solenoid (61). Discard lockwashers.



13. Remove wiring harness (62).
14. Remove two screws (63), clamps (64), and wiring harness (65).
15. Remove screw (66), three washers (67), and two cables (68).
16. Remove two screws (69), lockwashers (70), relay housing (71), two screws (72), lockwashers (73), and bracket (74). Discard lockwashers.
17. Remove plug (75) and drain oil in accordance with TM 9-2350-256-10.
18. Remove 15 screws (76), lockwashers (77), chain case cover (78), and gasket (79). Discard lockwashers and gasket.



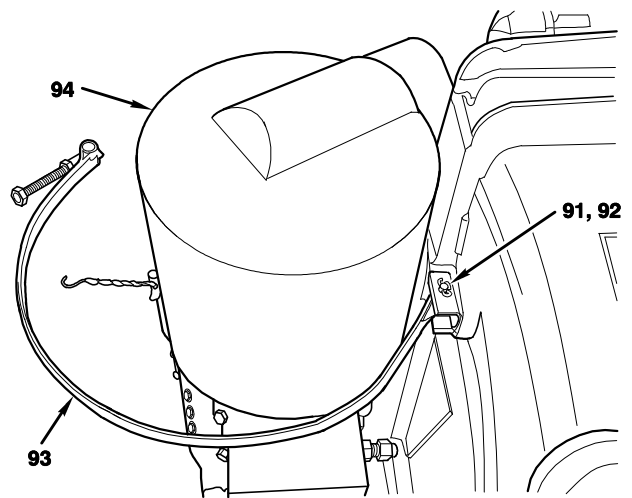
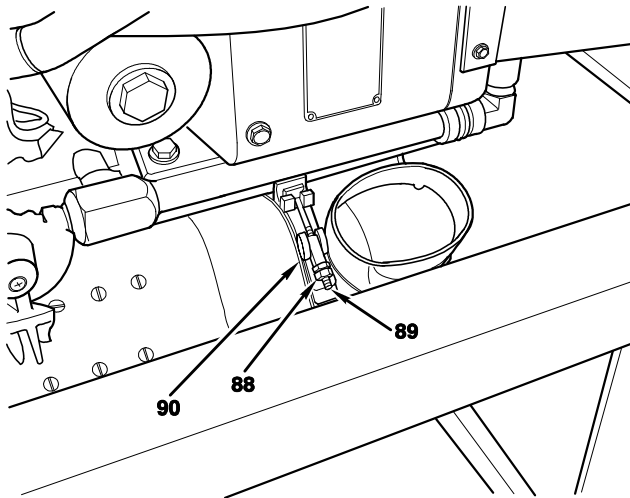
19. Remove screw (80), lockwasher (81), and plate (82) from chain case (83). Discard lockwasher.
20. Using puller, remove sprocket (84) and chain (85).
21. Remove key (86) and bushing (87).



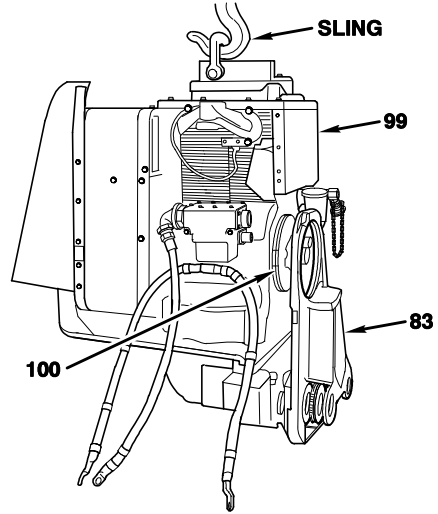
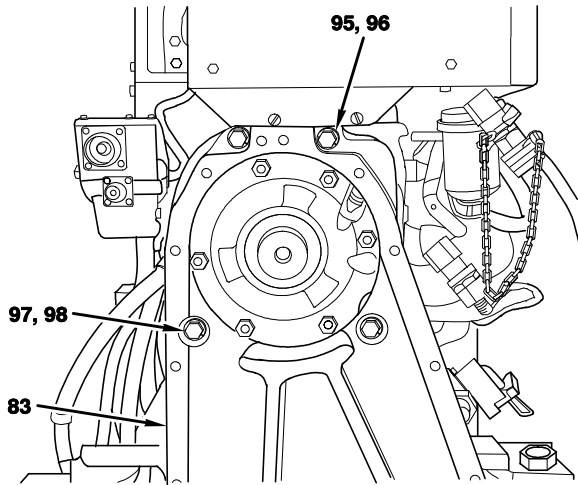
**NOTE**

Remove APU from test stand and place on floor to remove generator.

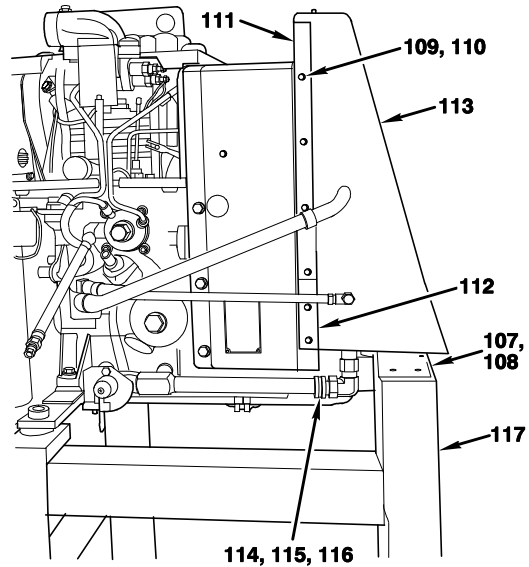
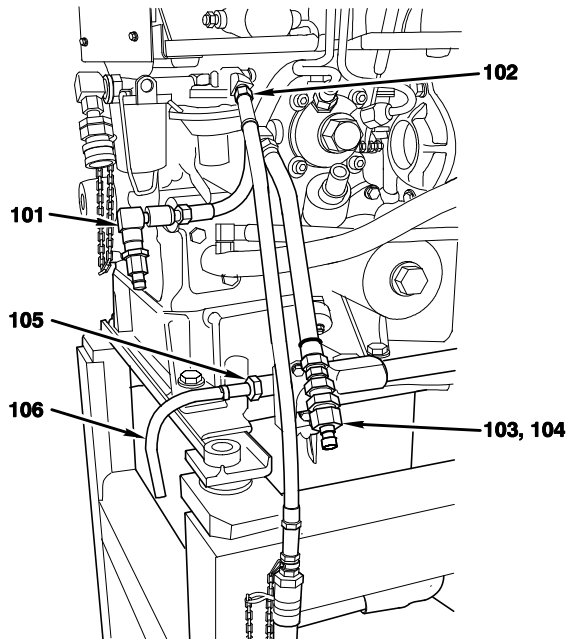
22. Back off nut (88), loosen screw (89), and disconnect clamp (90).
23. Remove cotter pin (91), pin (92), generator clamp (93), and generator duct (94). Discard cotter pin.



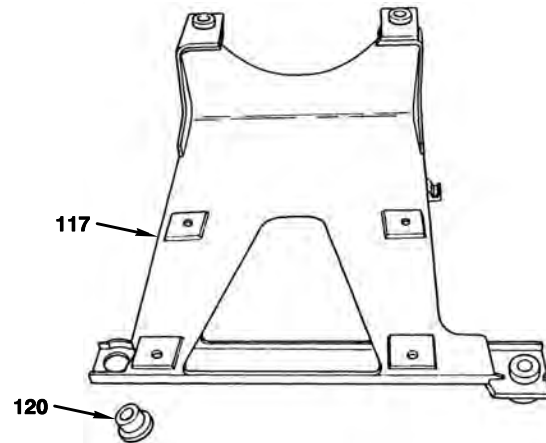
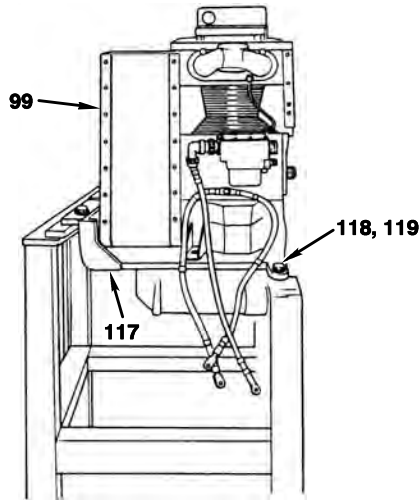
24. Attach sling to lifting eye to support weight of auxiliary engine (99) and remove two screws (95), lockwashers (96), screws (97), and lockwashers (98) from chain case (83). Discard lockwashers.
25. Using sling, lift auxiliary engine (99) from chain case (83) and place on test stand or other suitable support.
26. Remove and discard gasket (100).



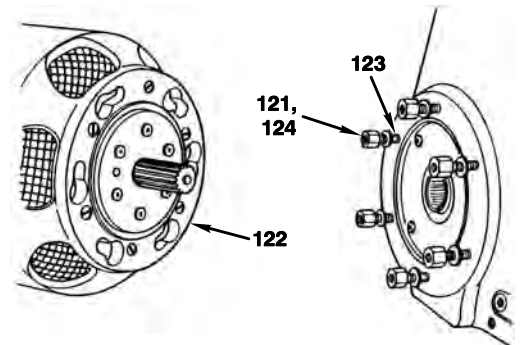
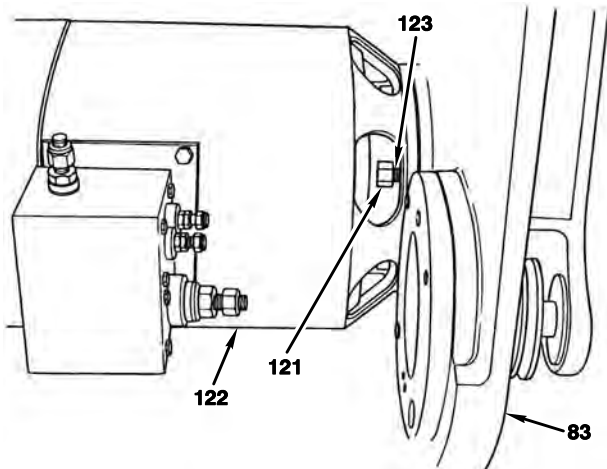
27. Disconnect two elbows (101) with coupling halves and retainer attached.
28. Disconnect hose assembly (102) with bushing, coupling half, and retainer attached.
29. Disconnect inverted flared tube connector (103) and coupling half (104).
30. Back off nut (105) and disconnect drain tube (106).
31. Remove four screws (hidden) (107) and name plate (hidden) (108).
32. Remove 12 screws (109), lockwashers (110), two long retainers (111), short retainers (112), and side panels (113). Discard lockwashers.
33. Remove screw (114), washer (115), and clamp (116) from support (117).



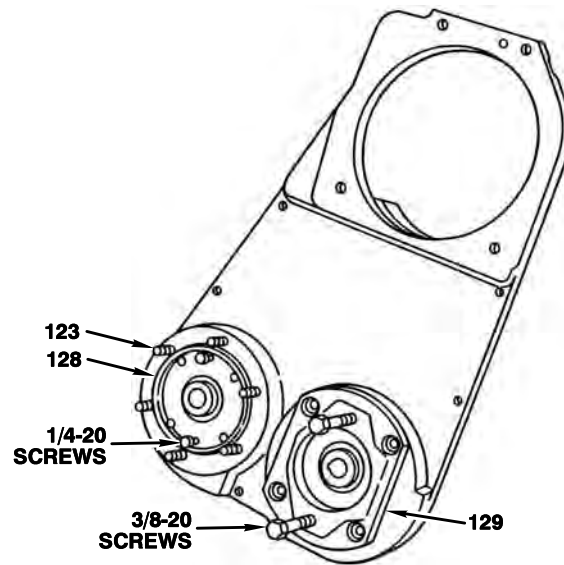
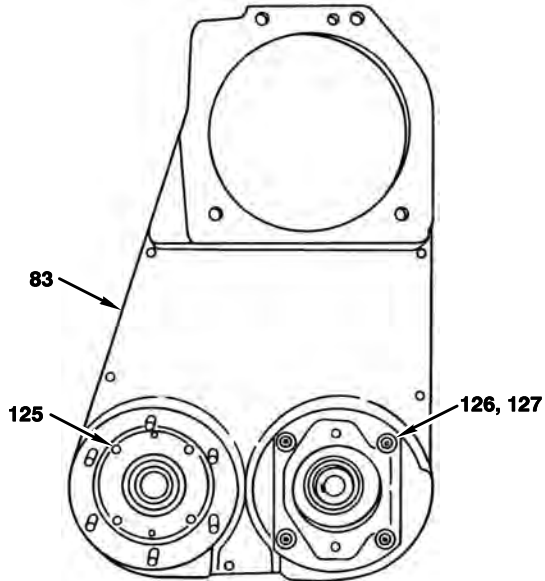
34. Remove four screws (118), lockwashers (119), and auxiliary engine (99) from support (117). Discard lockwashers.
35. Remove four mounts (120) from support (117).



36. Loosen six nuts (121), rotate generator (122) counterclockwise on studs (123), and remove generator from chain case (83).
37. Remove six nuts (121) and washers (124) from studs (123).



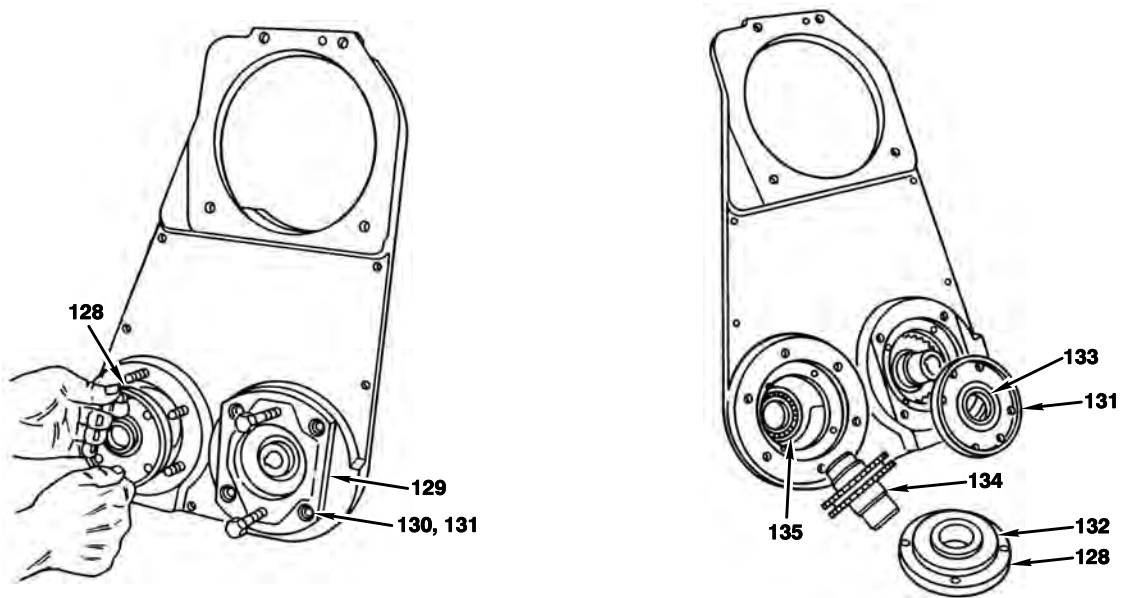
38. Remove four screws (125), screws (126), and washers (127) from back of chain case (83).
39. Remove six studs (123).
40. Install two 1/4-20 screws in generator bearing retainer (128).
41. Install two 3/8-20 screws in pump adapter (129).



42. Use two 1/4-20 screws to pull out generator bearing retainer (128).
43. Remove four screws (hidden) (130).
44. Use two 3/8-20 screws to remove pump adapter (129).
45. Remove pump bearing retainer (hidden) (131).



46. Remove two gaskets (132), oil seals (133), sprockets (134), and bearings (135). Discard gaskets and oil seals.



### Cleaning

### WARNING

Solvents 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 solvent gets on skin or clothing, wash immediately with soap and water.

### NOTE

Whenever the APU is out of the vehicle, clean the fuel filter sediment bowl.

1. Scrape cork gasket and adhesive sealant from all areas. Clean with a wire brush, then with cleaning compound or paint thinner. Dry with compressed air.
2. Clean dirt and other foreign material from all metal parts with cleaning compound or paint thinner. Dry with compressed air.
3. Remove dirt and other foreign material from electrical leads and connectors with a wire brush and clean water. Dry with compressed air.
4. Clean fuel filter sediment bowl.

### Inspection-Acceptance and Rejection Criteria

1. Inspect support, mounts, cooling duct, chain case, and chain cover for cracks, distortion, and breakage.
2. Inspect threaded parts for nicks, cross-threading, and other evidence of excessive wear.
3. Inspect drive chain for cracks, breakage, and other evidence of wear that could cause breakage.
4. Inspect hose and hose assemblies for fraying, cracks, distortion, and other evidence of excessive wear.
5. Inspect sprockets for damaged teeth, cracks, distortion, and other damage that would impair their use.
6. Check continuity of electrical leads and inspect for cuts, damaged connectors, and other evidence of excessive wear.

7. Inspect panels, gaskets, and grommets on engine for cracks, tears, and hardening.
8. Inspect hydraulic pump, generator, and other parts for damage that would impair their use.

### Repair or Replacement

1. Replace support, mounts, cooling duct, chain case, and chain cover if not repairable by welding.
2. Repair damaged threads with a thread chaser or replace threaded parts that are defective.
3. Replace damaged lead wires and connectors (refer to WP 0033 00).
4. Replace any other parts that are defective.
5. To seat the generator brushes sufficiently and eliminate hard-starting problems, when replacing the generator or its brushes, sand the brushes as specified in a thru l below:
  - a. Remove generator from APU.
  - b. Remove brush guard band from generator.
  - c. Remove screw to brush lead wire.
  - d. Move aside brush retainer springs sufficiently to clear brushes. A screwdriver or stiff piece of wire bent into a hook shape can be used to accomplish this.
  - e. Remove both brushes in any one brush set, and insert a piece of sandpaper (approximately 2 in. [5 cm] and 180 grit) beneath empty brush holder.
  - f. Insert only one brush back into holder, and while pressing down on top of the brush lightly, move it back and forth in the holder, and against the sandpaper until the entire face of the brush is sanded. This only requires about a dozen firm strokes of the brush against the sandpaper.
  - g. Replace brush set back into the brush holder.
  - h. Replace brush retainer springs on top of brush.
  - i. Replace brush lead wire using its respective mounting screw.
  - j. Repeat steps c thru i above for all six brush sets in the generator.
  - k. Replace brush guard band.
  - l. Replace generator on APU.

### Assembly

#### NOTE

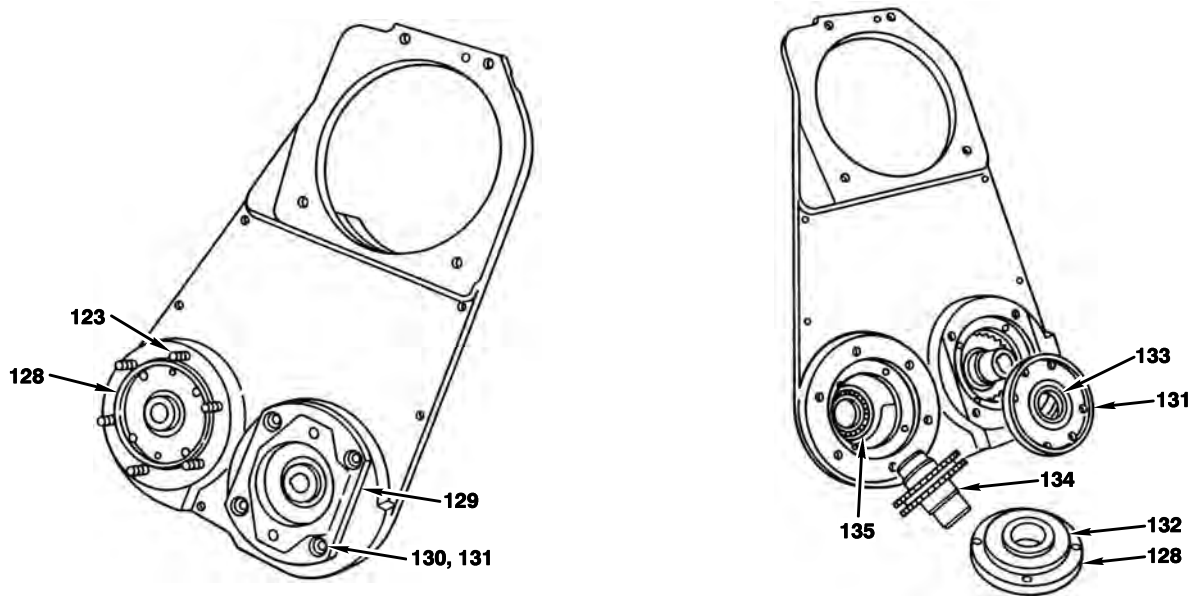
Apply sealing compound to all pipe threads except swivel fittings.

#### NOTE

Apply adhesive sealant on gaskets (132) during installation.

1. Install two bearings (135), sprockets (134), oil seals (133), and gaskets (132).
2. Install pump bearing retainer (hidden) (131), four screws (hidden) (130), and pump adapter (129).

3. Install generator bearing retainer (128) and six studs (123).

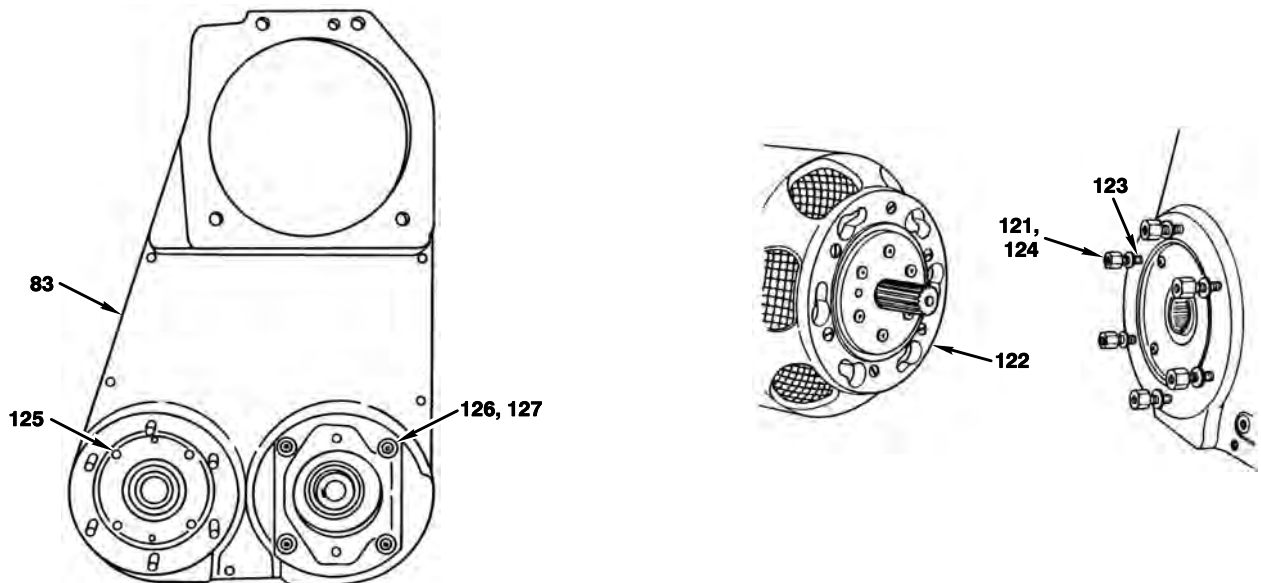


4. Install four washers (127), screws (126), and screws (125) to back of chain case (83).

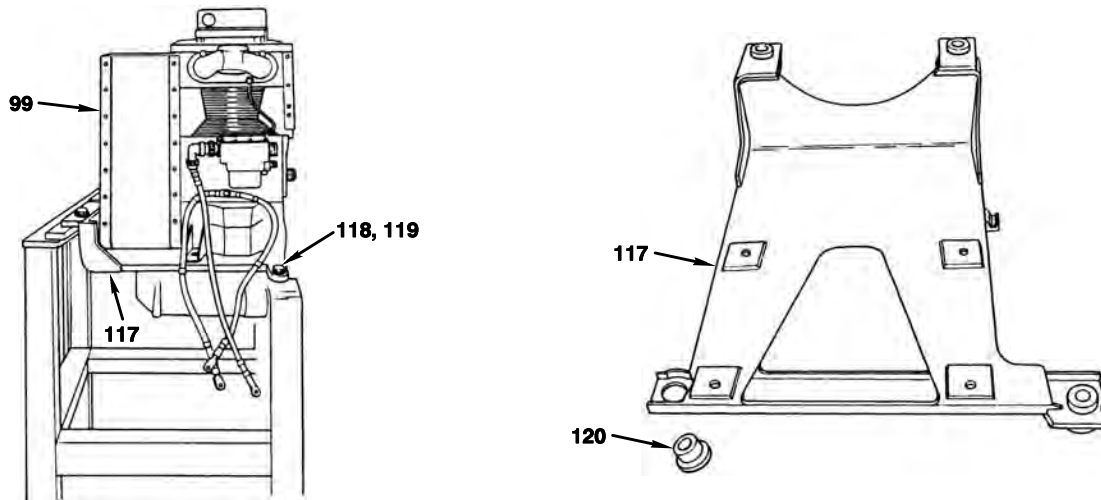
**NOTE**

Prior to installation, the generator (122) must meet a locked rotor torque test of 30 lb-ft (40.7 N•m) output torque for an input voltage of 15 volts applied to both fields and armature circuits.

5. Loosely assemble six washers (124) and nuts (121) on studs (123). Align nuts with slots on generator (122), rotate generator clockwise, and tighten six nuts.



6. Install four mounts (120) to support (117).
7. Install auxiliary engine (99), four lockwashers (119), and screws (118) to support (117).

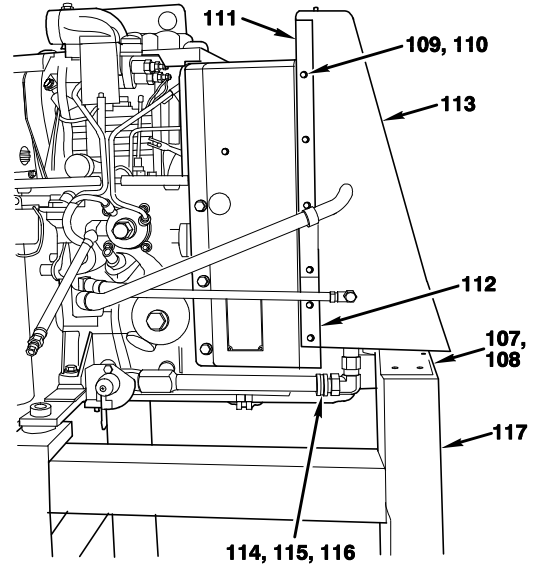
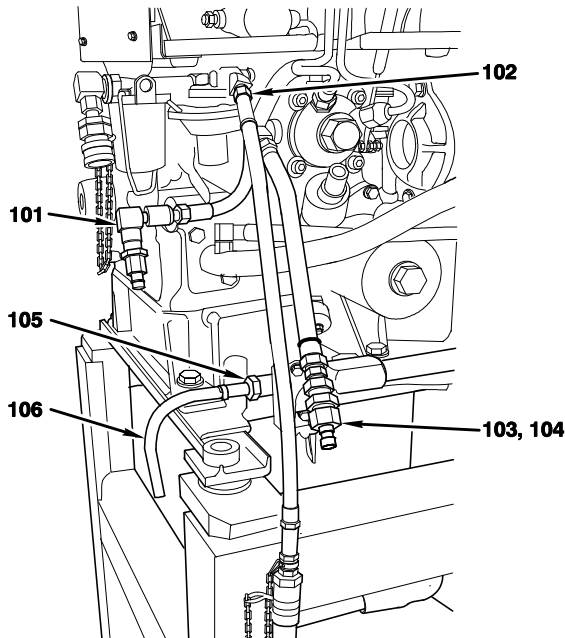


### NOTE

When replacing support (117), install drain tube (106) and position clamp (116) to support weight. Tap 10-32NF-28 hole in support.

8. Install clamp (116), washer (115), and screw (114) to support (117).
9. Install two side panels (113), short retainers (112), long retainers (111), 12 lockwashers (110), and screws (109).
10. Install name plate (108) and four screws (107).
11. Connect drain tube (106) and tighten nut (105).
12. Connect coupling half (104) and inverted flared tube connector (103).
13. Connect hose assembly (102) with bushing, coupling half, and retainer attached.

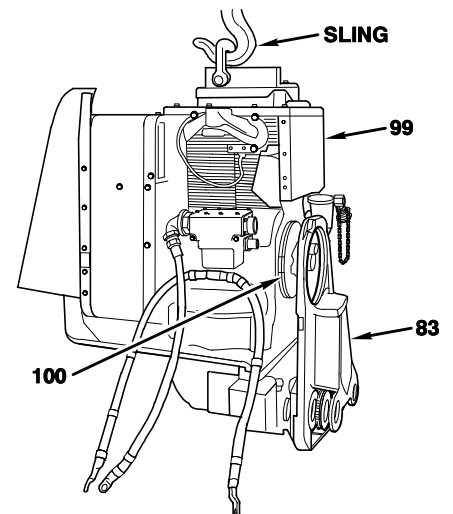
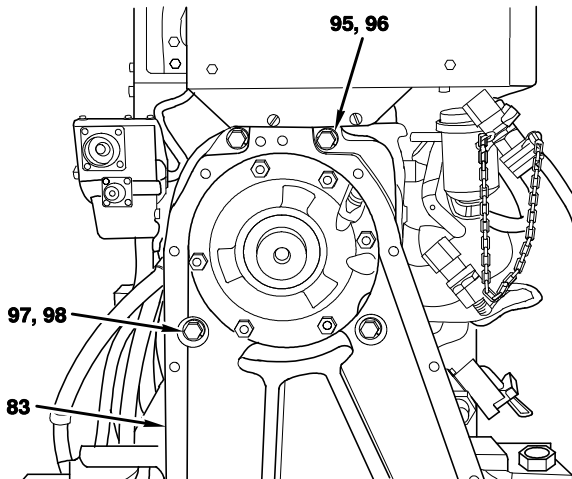
14. Connect two elbows (101) with coupling halves and retainer attached.



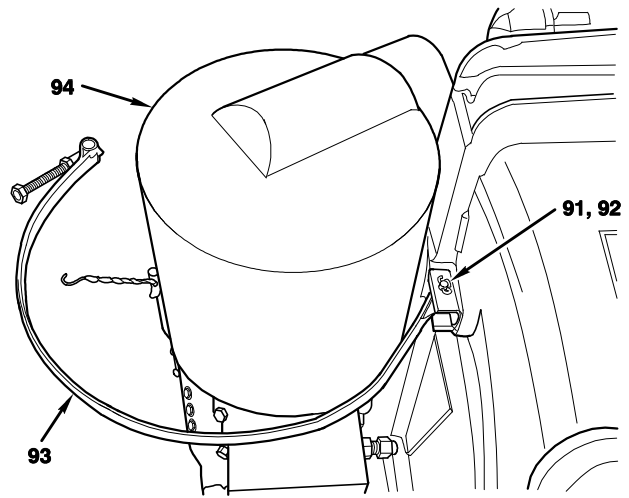
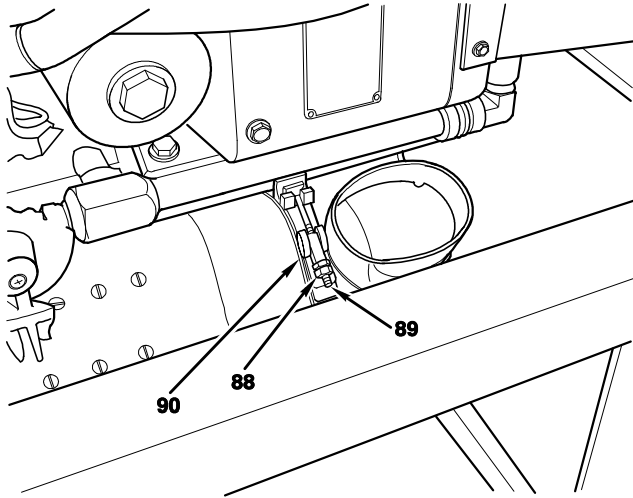
**NOTE**

Apply adhesive sealant on gasket (100) during installation.

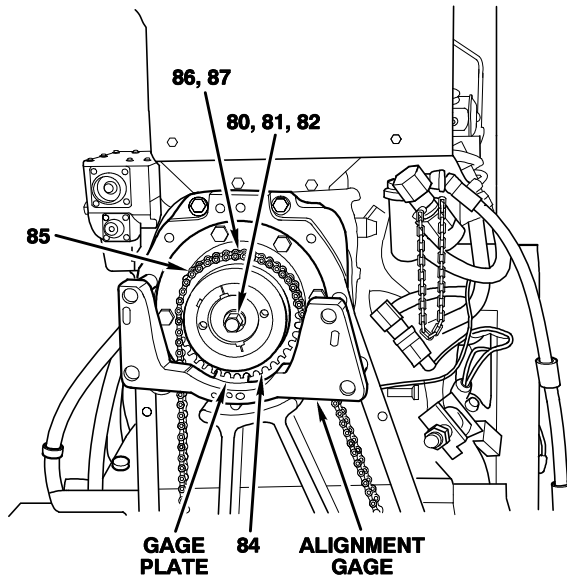
15. Install gasket (100).
16. Attach sling to auxiliary engine (99) and position auxiliary engine on chain case (83).
17. Support weight of auxiliary engine (99) with sling and install two lockwashers (98), screws (97), lockwashers (96), and screws (95) to chain case (83).



18. Install generator duct (94), generator clamp (93), pin (92), and cotter pin (91).
19. Connect clamp (90) and tighten screw (89) and nut (88).



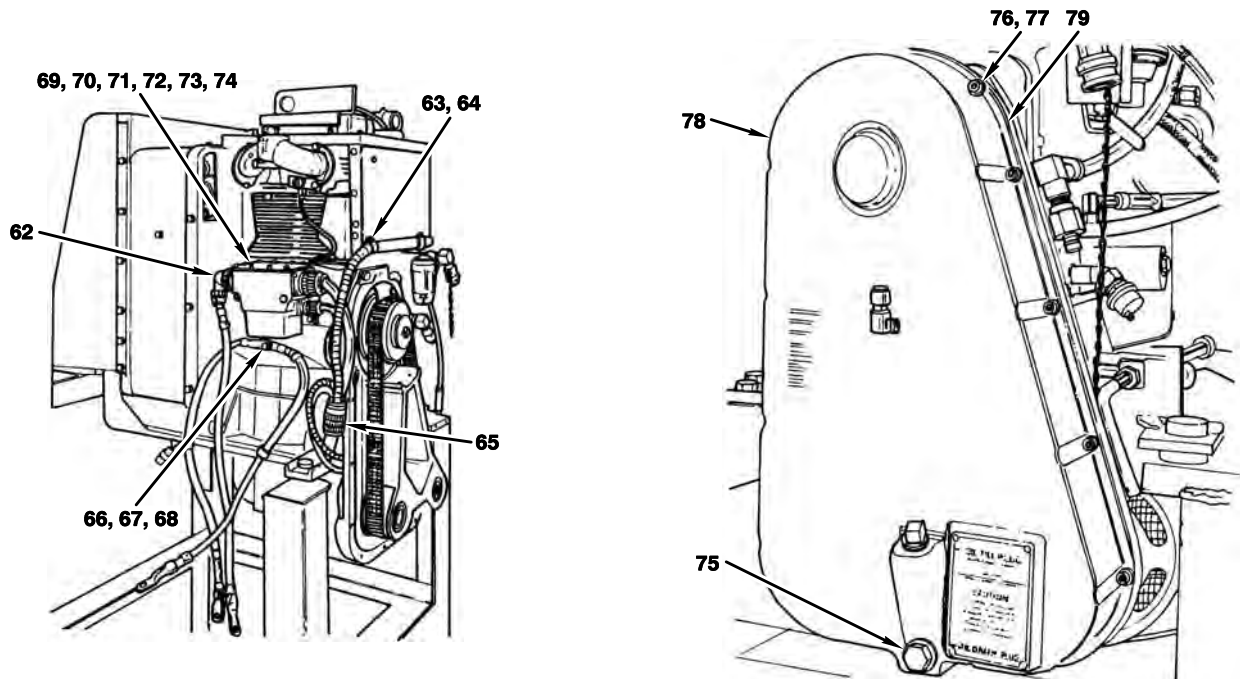
20. Install bushing (hidden) (87) and key (hidden) (86).
21. Install sprocket (84) and chain (85). Position alignment gage so that all four feet are flat against chain case (83) and gage plate is between sprocket teeth. Install plate (not shown) (82), lockwasher (not shown) (81), and screw (not shown) (80). Torque screw to 50–55 lb-ft (67.8–74.6 N•m).



**NOTE**

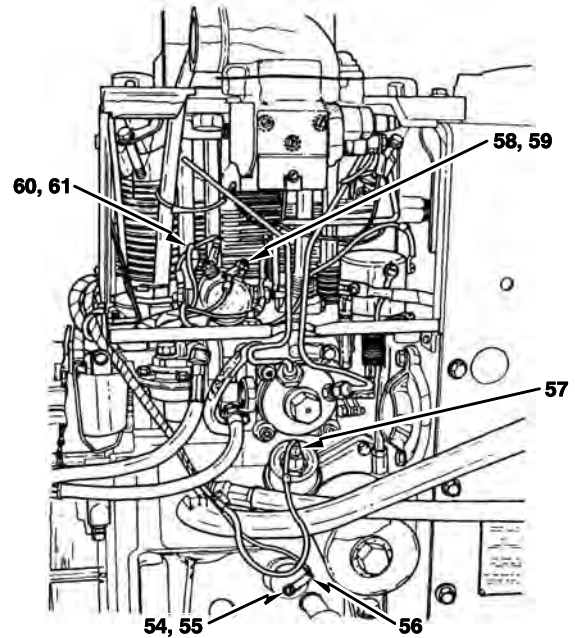
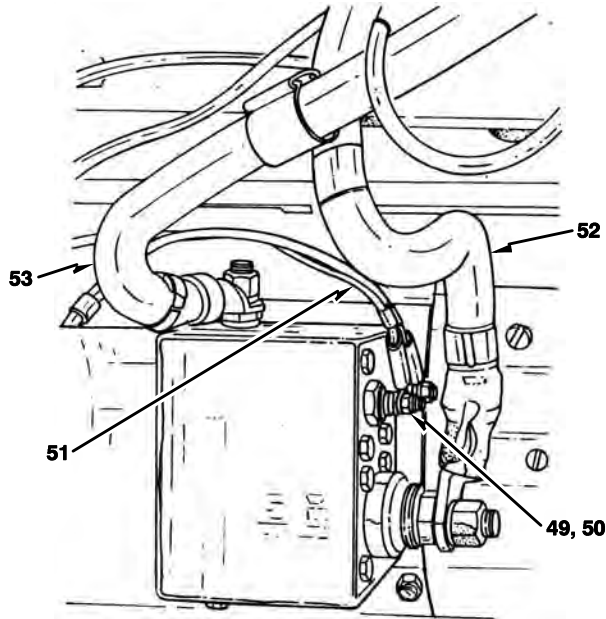
Use adhesive sealant on gasket (79) during installation.

22. Install gasket (79), chain case cover (78), 15 lockwashers (77), and screws (76). Torque screws to 35–40 lb-in. (3.95–4.52 N•m).
23. Install plug (75) and fill with oil in accordance with TM 9-2350-256-10.
24. Install bracket (74), two lockwashers (73), screws (72), relay housing (71), two lockwashers (70), and screws (69).
25. Install two cables (68), three washers (67), and screw (66).
26. Install wiring harness (65), two clamps (64), and screws (63).
27. Install wiring harness (62).





28. Connect four leads (60), four lockwashers (59), and screws (58) to preheat solenoid (61).
29. Connect lead (57).
30. Connect lead (56) and install washer (55) and screw (54).
31. Connect ground cable (53), armature cable (52), and two leads (51) and install four washers (50) and nuts (49).



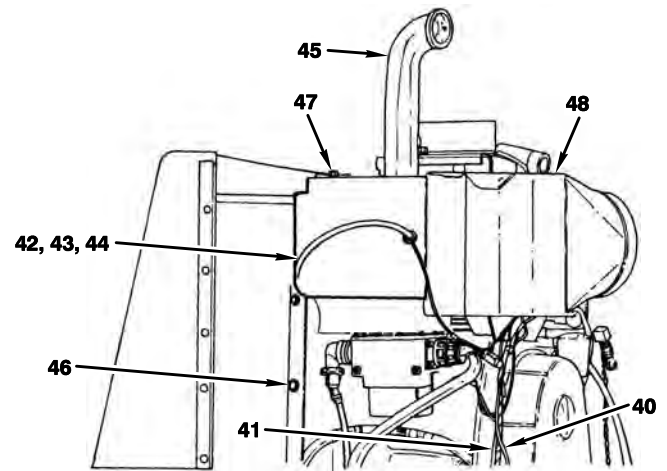
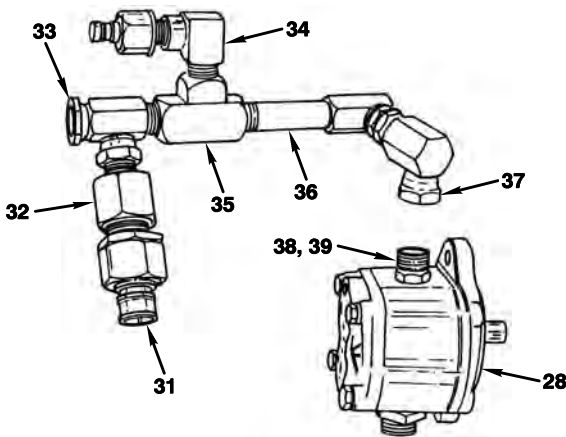
### NOTE

Drill thru 0.125 (+0.005, -0.000 in.) (3.18 [+0.127, -0.000 mm]) diameter when assembling screws (47) on engine.

32. Install air inlet duct (48), four screws (47), and screw (46).
33. Install exhaust tube (45).
34. Connect ground lead (44) and install washer (43) and screw (42).
35. Install shell (hidden) (41) and connect lead (hidden) (40).

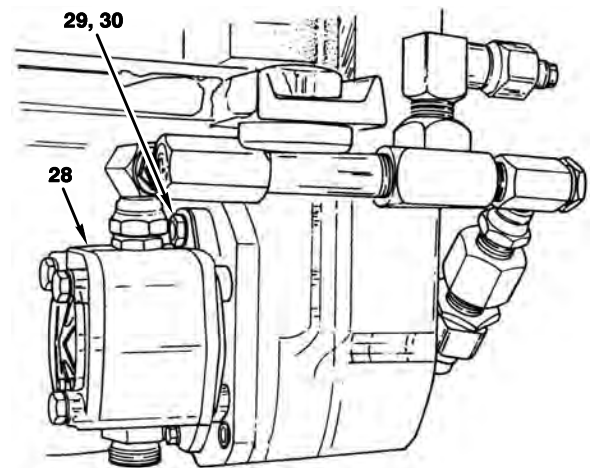
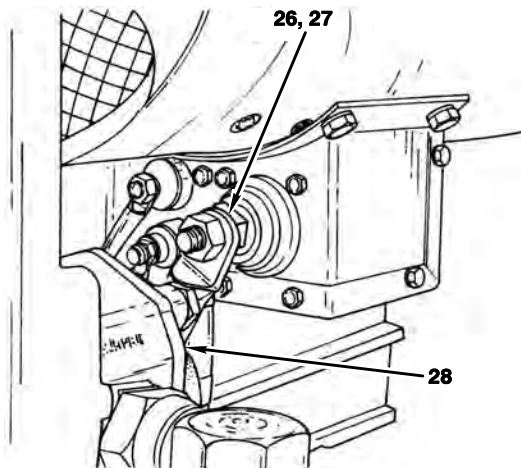


36. Install two packings (hidden) (39), adapter (38), two adapter unions (37), nipples (36), tee (35), elbow (34), valve (33), adapter (32), and two coupling halves (31) to auxiliary hydraulic pump (28).



37. Install auxiliary hydraulic pump (28) with fittings attached, two lockwashers (30), and screws (29).

38. Position electrical cable (27) next to auxiliary hydraulic pump (28) and tighten terminal (26).



### Test and Inspection

- All testing and adjusting of the APU must be accomplished with the unit outside the vehicle (groundhopping). A test stand is required. Refer to WP 0088 00 for information on constructing a test stand to support the APU during groundhopping tests.
- Fill chain case and crankcase to the proper levels in accordance with TM 9-2350-256-10 if required.
- Connect ground cable, cable assemblies, and hose assemblies provided for the test run outside the vehicle.
- Start auxiliary engine and allow a 3-minute warmup period with no load on the generator or pump. Then check the engine speed with a hand tachometer or stroboscope. Adjust to  $2000 \pm 100$  rpm, if necessary, in the following manner:
  - Locate the governor speed adjustment screw on the front of the engine
  - Loosen locknut and turn screw slowly until tachometer or stroboscope reads  $2000 \pm 100$  rpm.
  - Carefully tighten locknut so that the tachometer or stroboscope reading does not change.
- Stop engine, check crankcase oil, and fill to the proper levels in accordance with TM 9-2350-256-10 if required.
- Install a pressure gage in the gage port of the system selector valve relief valve, place the manual shutoff valve in NORMAL OPERATION position, and place the system selector valve in AUXILIARY position.

7. Check the pressure gage to confirm a hydraulic load on the auxiliary pump of  $2000 \pm 50$  psi ( $13,790 \pm 345$  kPa). If necessary, adjust the system selector valve relief valve with the adjusting screw to obtain a pressure reading of  $2000 \pm 50$  psi ( $13,790 \pm 345$  kPa). Check engine rpm for  $2000 \pm 100$  rpm. If engine rpm is below  $2000 \pm 100$  rpm, troubleshoot.
8. Continue to operate the auxiliary engine for 10 minutes with a  $2000 \pm 50$  psi ( $13,790 \pm 345$  kPa) load on the auxiliary hydraulic pump and no load on the generator.
9. Check all points for leakage in accordance with TM 9-2350-256-20 and correct any other defects. Return system selector valve to MAIN position and shut off engine.
10. Calibrate the current limiter in accordance with TM 9-2350-256-20. With the load as specified, verify that the engine speed remains within  $2000 \pm 100$  rpm. If not, readjust the governor speed control. If the engine cannot maintain  $2000 \pm 100$  rpm under generator load, troubleshoot.

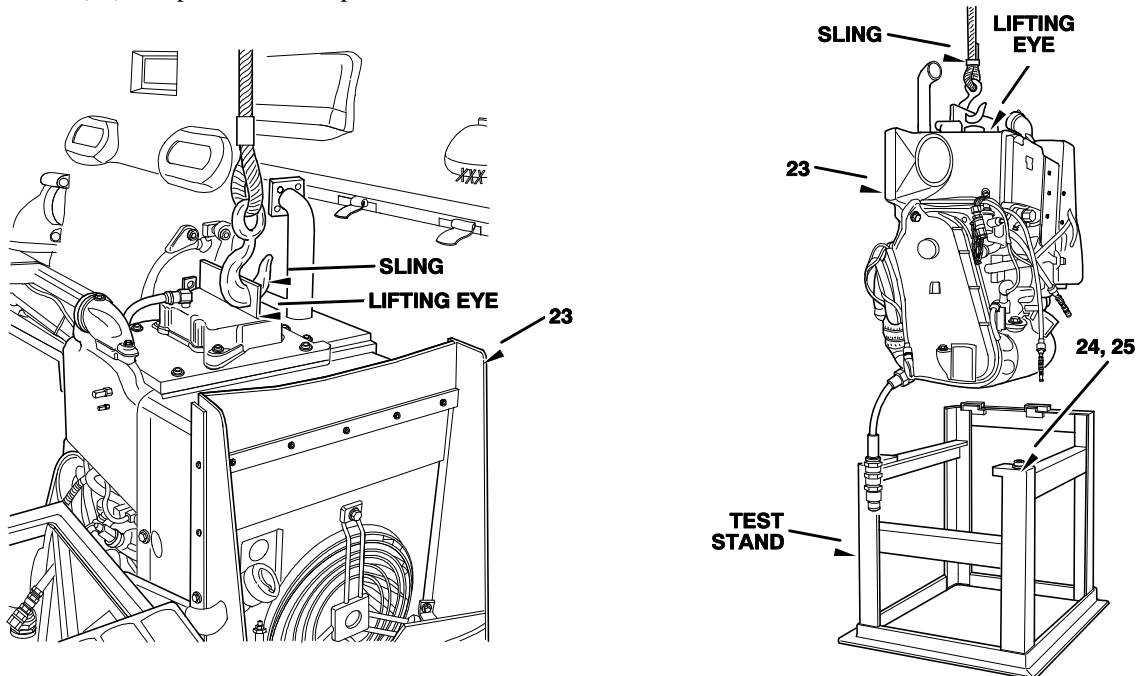
### Installation

1. Attach sling to lifting eye and remove four lockwashers (24), mounting bolts (25), and APU (23) from test stand. Discard lockwashers.

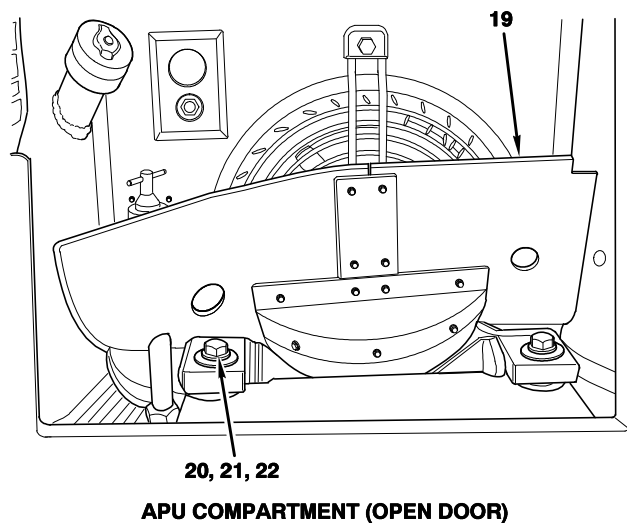
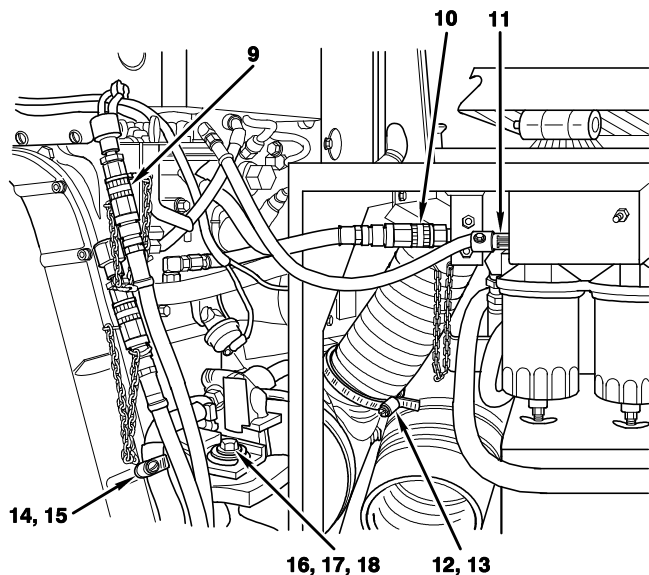
### CAUTION

Carefully guide APU (23) into proper position in compartment.

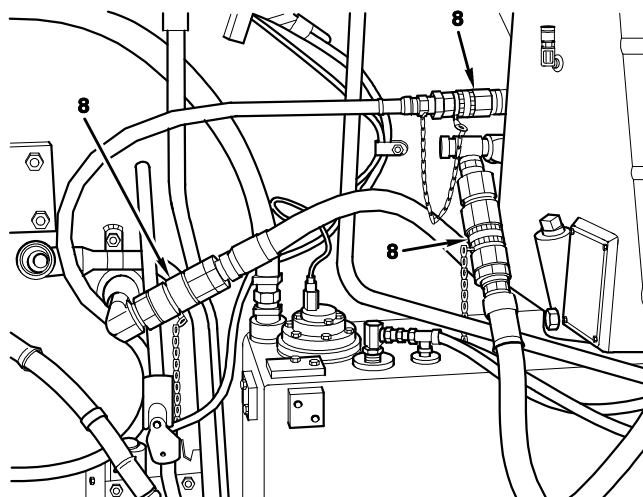
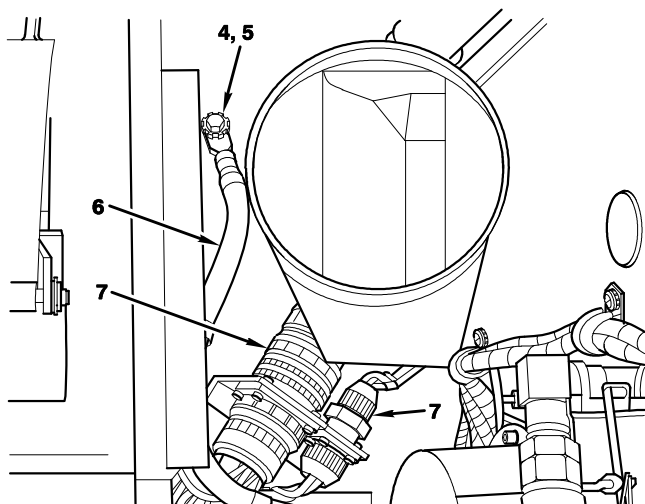
3. Move APU (23) into position in compartment.



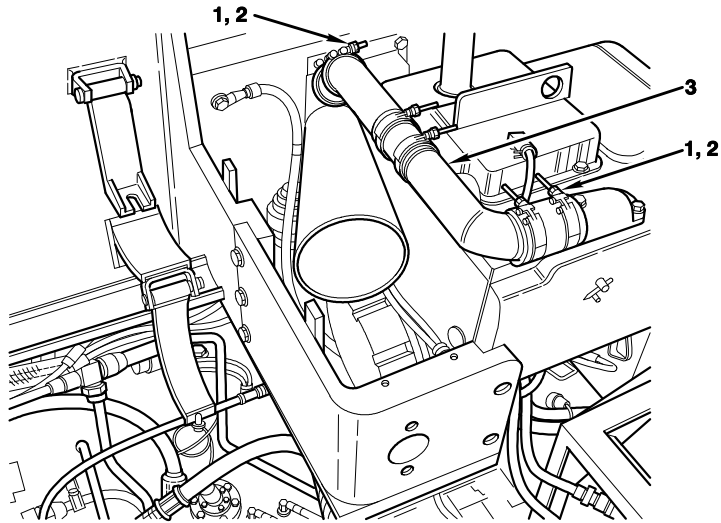
4. Lift panel (19) and install two washers (22), lockwashers (21), and front mounting screws (20).
5. Install two washers (18), lockwashers (17), and rear mounting screws (16).
6. Install hose (15) and tighten clamp (14).
7. Install hose (13) and tighten clamp (12).
8. Connect fuel line (hidden) (11), fuel line (10), and two fuel lines (9).



9. Connect three hydraulic lines (8).
10. Connect two wiring harnesses (7).
11. Install ground cable (6), two star washers (5), and screws (4).



12. Install engine air intake tube (3) and tighten clamp (2) and nut (1). Torque nut to 20–25 lb-in (2.3–2.8 N•m).



### Adjustment

1. Whenever the auxiliary generator, voltage regulator, APU assembly, or relay box is replaced, or the auxiliary engine is replaced or repaired, the rheostat in the switching relay box must be adjusted to limit the auxiliary generator output current to approximately 150 amperes with the APU in the vehicle. TM 9-2350-256-20 provides instructions for calibrating the current limiter.

**END OF WORK PACKAGE**

**CHAPTER 4**  
**INTERMEDIATE MAINTENANCE**  
**SUPPORTING INFORMATION**  
**FOR**  
**RECOVERY VEHICLE, FULL TRACKED: MEDIUM, M88A1**  
**(NSN: 2350-00-122-6826)**



**CHAPTER 4**  
**INTERMEDIATE MAINTENANCE**  
**SUPPORTING INFORMATION**

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**WORK PACKAGE INDEX**

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<u>Title</u>	<u>WP Sequence No.</u>
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Expendable and Durable Items List.....	0085 00
Tool Identification List.....	0086 00
Mandatory Replacement Parts List.....	0087 00
Fabricated Tools and Equipment.....	0088 00





**INTERMEDIATE MAINTENANCE  
RECOVERY VEHICLE, FULL TRACKED: MEDIUM, M88A1  
NSN 2350-00-122-6826, EIC AQA**

**REFERENCES**

**Scope**

This WP lists all documents referenced in this manual.

**Army Regulation**

AR 700-138 Army Logistics Readiness and Sustainability

**Department of the Army Forms**

DA Form 2408-10 Equipment Component Register  
DA Form 2028-2 Recommended Change to Equipment Technical Publications  
DA Form 2028 Recommended Changes to Publications and Blank Forms

**Department of the Army Pamphlet**

DA PAM 738-750 The Army Maintenance Management System (TAMMS)

**Standard Form**

SF Form 368 Product Quality Deficiency Report

**Technical Bulletin**

TB 750-1047 Elimination of Combustibles from Interiors of Metal or Plastic Gasoline and Diesel Fuel Tanks

**Technical Manuals**

TM 9-2520-215-34 Direct Support and General Support Maintenance Manual: Cross-Drive Transmission Assembly  
TM 9-2815-220-34 Direct Support and General Support Maintenance Manual: Engine with Container; Turbosupercharged, Diesel, Fuel Injection, 90-degree "V" Type, Air-Cooled, 12-Cylinder, Assembly  
TM 9-2815-221-34&P Direct Support and General Support Maintenance Manual (Including Repair Parts and Special Tools List): Engine, Diesel, Industrial Type  
TM 9-5130-338-12&P Operator's and Unit Maintenance Manual (Including Repair Parts and Special Tools List) for Wrench, Impact, Hydraulic  
TM 9-2350-256-10 Operator's Manual for Recovery Vehicle, Full-Tracked: Medium, M88A1 (NSN 2350-00-122-6826)  
TM 9-2350-256-24P-1 Organizational Maintenance Repair Parts and Special Tools List for Recovery Vehicle, Full-Tracked: Medium, M88A1 (NSN 2350-00-122-6826), Volume 1  
TM 9-2350-256-24P-2 Organizational Maintenance Repair Parts and Special Tools List for Recovery Vehicle, Full-Tracked: Medium, M88A1 (NSN 2350-00-122-6826), Volume 2  
TM 750-244-6 Procedures for Destruction of Tank-Automotive Equipment to Prevent Enemy Use  
TM 5-725 Rigging  
TM 9-2350-256-20-1 Unit Maintenance Manual for Recovery Vehicle, Full-Tracked: Medium, M88A1 (NSN 2350-00-122-6826), Volume 1  
TM 9-2350-256-20-2 Unit Maintenance Manual for Recovery Vehicle, Full-Tracked: Medium, M88A1 (NSN 2350-00-122-6826), Volume 2  
TM 9-237 Welding Theory and Application

**END OF WORK PACKAGE**



**INTERMEDIATE MAINTENANCE  
RECOVERY VEHICLE, FULL TRACKED: MEDIUM, M88A1  
NSN 2350-00-122-6826, EIC AQA**

**EXPENDABLE AND DURABLE ITEMS LIST**

### Introduction

#### Scope

This WP lists expendable and durable items that you will need to operate and maintain the M88A1. This list is for information only and is not authority to requisition the listed items. These items are authorized to you by CTA 50-970, Expendable/Durable Items (Except Medical, Class V Repair Parts, and Heraldic Items), or CTA 8-100, Army Medical Department Expendable/Durable Items.

#### Explanation of Columns in the Expendable/Durable Items List

Column (1)—Item Number. This number is assigned to the entry in the list and is referenced in the narrative instructions to identify the item, e.g., Use adhesive (item 1, WP 0085 00).

Column (2)—Level. This column identifies the lowest level of maintenance that requires the listed item: C=Operator/Crew, O=Unit, F=Direct Support, H=General Support, D=Depot.

Column (3)—National Stock Number (NSN). This is the NSN assigned to the item which you can use to requisition it.

Column (4)—Item Name, Description, Commercial and Government Entity Code (CAGEC), and Part Number (P/N). This column provides the other information you need to identify the item.

Column (5)—Unit of Measure (U/M). This code shows the physical measurement or count of an item, such as gallon, dozen, gross, etc.

Table 1. Expendable and Durable Items List

(1) ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) ITEM NAME, DESCRIPTION, CAGE, PART NUMBER	(5) U/M
1	F	8040-00-225-4548	Adhesive - (81349)- MIL-A-46106	KT
2	F	8040-00-273-8717	Adhesive - bonding rubber to steel, 1-pint can (81348)- MMM-A-121	PT
3	F	8040-00-281-1972	Adhesive - liquid, rubber, natural and rubber, re- claimed, 1-gallon can (81348)- MMM-A-1617	GL
4	F	7920-00-061-0038	Brush - scrub (83421)- 7920-00-061-0038	EA
5	F	7930-01-328-2030	Cleaning compound - solvent-detergent, PF degreaser, 5-gallon can (66724)-	CN
6	F	7930-00-282-9699	Detergent - general purpose, 1-gallon can (81349)- MIL-D-16791	GL
7	F	9140-01-413-7511	Diesel fuel - 1-gallon can (81348)- VV-F-800	GL
8	F	9150-00-186-6668	Lubricating oil - engine, 5-gallon can (81349)- MIL-PRF-2104	CN
9	F	9905-00-537-8954	Marker tags - (81349)- MIL-T-12755	EA
10	F	6810-01-464-1289	Methylene chloride - 1-liter bottle (19631)- D151-1	BT

Table 1. Expendable and Durable Items List--Continued

(1) ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) ITEM NAME, DESCRIPTION, CAGE, PART NUMBER	(5) U/M
11	F	7920-00-205-1711	Rags - (64067)- 7920-00-205-1711	LB
12	F	9390-00-180-7289	Rod - ( )-	LG
13	F	9320-01-056-8308	Rubber sheet - solid, oil and ozone resistant, 36 in. long (96906)- MIL-STD-417, type S, class SC, grade SC515C1	SH
14	F	8030-00-543-4384	Sealing compound - 1-pint can (81349)- MIL-S-7916	PT
15	F	3439-01-150-1051	Solder - alloy S060 rosin multicore, 18 SWG5 core, 1-pound roll (17794)- 1243-0001	EA
16	F	8030-00-889-3534	Tape - antiseizing (81349)- MIL-T-27730	EA
17	F	5970-00-816-6056	Tape - insulation, electrical, pressure-sensitive, black overall (81348)- HH-I-595	RO
18	F	8010-00-558-7026	Thinner - paint products, 5-gallon can (81348)- TT-T-291	CN

END OF WORK PACKAGE

**INTERMEDIATE MAINTENANCE**  
**RECOVERY VEHICLE, FULL TRACKED: MEDIUM, M88A1**  
**NSN 2350-00-122-6826, EIC AQA**  
**TOOL IDENTIFICATION LIST**

**Introduction****Scope**

This WP lists the tools, special tools, and test equipment needed to maintain the M88A1.

**Explanation of Columns in the Tool Identification List**

Column (1)—Item No. This number is assigned to the entry in the list and is referenced in the initial setup to identify the item, e.g., Adapter (item 1, WP 0086 00).

Column (2)—Item Name. This column lists the item name.

Column (3)—National Stock Number (NSN). This is the NSN assigned to the item; use it to requisition the item.

Column (4)—Part Number (P/N). Indicates the primary number used by the manufacturer (individual, company, corporation, or Government activity) which controls the design and characteristics of the item by means of its engineering drawings, specifications, standards, and inspection requirements to identify an item or range of items.

Column (5)—Reference. This column identifies the Repair Parts and Special Tools List (RPSTL) or authorizing supply catalog for items listed in this work package.

**Table 1. Tool Identification List**

<b>ITEM NO.</b>	<b>ITEM NAME</b>	<b>NSN</b>	<b>P/N</b>	<b>REFERENCE</b>
1	Adapter. Used with puller 8708712 to remove spade hydraulic cylinder pins.	5120-00-767-9102	10867497	TM 9-2350-256-24P-2
2	Adapter, socket wrench. Attaching power wrench to fixture 12252120 (2 per operation).	5120-00-632-5797	7026898	TM 9-2350-256-24P-1
3	Bushing, pipe. Used with gage 7950330.	4730-00-186-3024, WW-P-471, type II, size 1/4-18 x 1/8-27	144035	TM 9-2350-256-24P-2
4	Bushing, pipe. Used with gage 10884612 and main hydraulic pump pressure tester kit 5705354 when checking main hydraulic pump.	4730-00-193-0869, WW-P-471, type II, size 3/8-18 x 1/4-18	BM11352-77	TM 9-2350-256-24P-1
5	Cable, ground. Test run APU outside vehicle.	5995-00-521-6223	8708290	TM 9-2350-256-24P-1
6	Cable assembly, power electrical. Test run APU outside vehicle.	2590-00-614-7544	11671581-3	TM 9-2350-256-24P-1
7	Cable assembly, power electrical. Test run APU outside vehicle.	2590-00-614-7545	11671581-4	TM 9-2350-256-24P-1

Table 1. Tool Identification List--Continued

ITEM NO.	ITEM NAME	NSN	P/N	REFERENCE
8	Fixture. Connecting track.	5120-01-016-2149	12252120	TM 9-2350-256-24P-1
9	Gage. Checking main winch system pressure, hoist winch system pressure, spade system pressure, boom system pressure, or auxiliary hydraulic system pressure.	4910-00-766-3355	10884612	TM 9-2350-256-24P-2
10	Gage. Used with bushing 144035 to check power takeoff lubricating oil pressure and power takeoff clutch oil pressure.	6620-00-795-0330	7950330	TM 9-2350-256-24P-2
11	Gage, alignment. Aligning APU drive sprocket.	5210-00-613-6779	11671961	TM 9-2350-256-24P-1
12	Guide, spade shaft. Used with handle 10867499 to install spade shaft through oil seal.	4910-00-767-0419	10884600	TM 9-2350-256-24P-2
13	Handle, spade shaft guide. Used with guide 10884600.	4910-00-766-1964	10867499	TM 9-2350-256-24P-2
14	Hose assembly, nonmetallic. Test run APU outside vehicle; fuel tank to fuel pump line and fuel filter to injection pump line (2 per operation).	4720-00-617-6929	11671580-1	TM 9-2350-256-24P-1
15	Hose assembly, nonmetallic. Test run APU outside vehicle; engine to fuel tank return line 11671065-15 and fuel pump hose 11671065-22 to primary fuel filter (2 per operation).	4720-00-619-9706	11671580-2	TM 9-2350-256-24P-1
16	Hose assembly, nonmetallic. Test run APU outside vehicle; hydraulic pump section line from bulkhead coupling to suction line 11671065-21.	4720-00-619-9691	11671580-3	TM 9-2350-256-24P-1
17	Hose assembly, nonmetallic. Test run APU outside vehicle; pressure switch line hydraulic pump to pressure line 11671065-16.	4720-00-619-9689	11671580-4	TM 9-2350-256-24P-1

Table 1. Tool Identification List--Continued

ITEM NO.	ITEM NAME	NSN	P/N	REFERENCE
18	Hose assembly, nonmetallic. Test run APU outside vehicle; hydraulic pump line to discharge line 11671065-19.	4720-00-619-9681	11671580-5	TM 9-2350-256-24P-1
19	Impact wrench			TM 9-5130-338-12&P
20	Kit, parts, main hydraulic pump pressure tester. Used with gage 10884612 and bushing BM11352-77 when checking main hydraulic pump. Consists of:	4320-01-389-8573	5705354	TM 9-2350-256-24P-2
20A	Bushing, pipe	4730-01-029-4573	8395411-1	TM 9-2350-256-24P-2
20B	Bushing, pipe	4730-01-046-0373	8395412	TM 9-2350-256-24P-2
20C	Nipple, pipe	4730-00-735-0741	C3069X20	TM 9-2350-256-24P-2
20D	Tee pipe, high pressure	4730-01-016-2532	PF31-20	TM 9-2350-256-24P-2
20E	Valve, needle	4820-01-207-1048	N2000SV-11	TM 9-2350-256-24P-2
21	Lifting eye (2 required). Remove hydraulic control panel (1 per operation) and hoist winch (2 per operation).	4910-00-766-1963	10884605	TM 9-2350-256-24P-1
22	Lifting eye (2 required). Removing and installing main winch.	4910-00-766-1962	10884606	TM 9-2350-256-24P-1
23	Multimeter	6625-01-139-2512	T0037	SC 4910-95-CL-A72
24	Puller. Used with adapter 10867497 to remove hydraulic cylinder pins.	5120-00-310-4668	8708712	TM 9-2350-256-24P-2
25	Puller, mechanical; flywheel and sprocket. Removing APU drive sprocket.	5120-00-613-6775	11671732	TM 9-2350-256-24P-1
26	Shop equipment, automotive vehicle maintenance and repair: field maintenance, supplemental no. 1	4910-00-754-0706		SC 4910-95-CL-A62
27	Shop equipment, automotive maintenance and repair: Organizational maintenance, common no. 1, less power	4910-00-754-0654		SC 4910-95-CL-A74

Table 1. Tool Identification List--Continued

ITEM NO.	ITEM NAME	NSN	P/N	REFERENCE
28	Shop equipment, automotive vehicle maintenance and repair: Organizational maintenance, common no. 2, less power	4910-00-754-0650		SC 4910-95-CL-A72
29	Shop equipment, welding, S/E welding field maintenance	3470-00-357-7268		SC 3470-95-CL-A08
30	Sling, lifting. Removing rear fuel tanks, hoist winch, hydraulic control panel (subplate), APU, and mechanical transmission and hydraulic pump.	4910-00-473-7556	7081593	TM 9-2350-256-24P-1
31	Sling assembly, lifting. Removing hydraulic control panel (subplate) and mechanical transmission and hydraulic pump and suspension.	4910-01-046-8944	11672258	TM 9-2350-256-24P-1
32	Soldering gun	3439-00-618-6623	W-S-564	SC 4910-95-CL-A72
33	Tool kit, electrical	5180-00-876-9336	7550526	SC 4910-95-CL-A72
34	Tool kit, general mechanic's	5180-00-177-7033		SC 5180-90-CL-N26
35	Tool kit, welder's	5180-00-754-0661		SC 5180-90-CL-N39
36	Wire rope assembly	4010-00-800-8900	10884613	TM 9-2350-256-24P-2
37	Wrench. Adjusting track tension.	5120-00-277-6470	GGG-W-631	TM 9-2350-256-10
38	Wrench. Removing and replacing level winder flange nut.	5120-00-293-0316	GGG-W-665	
39	Wrench. Connecting and disconnecting hydraulic lines.	5120-00-555-0060	8395504	TM 9-2350-256-24P-2
40	Wrench. Adjusting hydraulic cylinder packing nut.	5120-00-777-1388	10884649	TM 9-2350-256-24P-2
41	Wrench. Adjusting level winder cylinder adjusting nut.	5120-00-767-9099	10884603	TM 9-2350-256-24P-2



(1)	(2)	(3)	(4)	(5)
ITEM NO	ITEM NAME	NATIONAL STOCK NUMBER	PART NUMBER	REFERENCE
1	Adapter. Used with puller 8708712 to remove spade hydraulic cylinder pins.	5120-00-767-9102	10867497	TM 9-2350-256-24P-2
2	Adapter, socket wrench. Attaching power wrench to fixture 12252120 (2 per operation).	5120-00-632-5797	7026898	TM 9-2350-256-24P-1
3	Bushing, pipe. Used with gage 7950330.	4730-00-186-3024, WW-P-471, type II, size 1/4-18 x 1/8-27	144035	TM 9-2350-256-24P-2
4	Bushing, pipe. Used with gage 10884612 and main hydraulic pump pressure tester kit 5705354 when checking main hydraulic pump.	4730-00-193-0869, WW-P-471, type II, size 3/8-18 x 1/4-18	BM11352-77	TM 9-2350-256-24P-1
5	Cable, ground. Test run APU outside vehicle.	5995-00-521-6223	8708290	TM 9-2350-256-24P-1
6	Cable assembly, power electrical. Test run APU outside vehicle.	2590-00-614-7544	11671581-3	TM 9-2350-256-24P-1
7	Cable assembly, power electrical. Test run APU outside vehicle.	2590-00-614-7545	11671581-4	TM 9-2350-256-24P-1
8	Fixture. Connecting track.	5120-01-016-2149	12252120	TM 9-2350-256-24P-1
9	Gage. Checking main winch system pressure, hoist winch system pressure, spade system pressure, boom system pressure, or auxiliary hydraulic system pressure.	4910-00-766-3355	10884612	TM 9-2350-256-24P-2
10	Gage. Used with bushing 144035 to check power takeoff lubricating oil pressure and power takeoff clutch oil pressure.	6620-00-795-0330	7950330	TM 9-2350-256-24P-2
11	Gage, alignment. Aligning APU drive sprocket.	5210-00-613-6779	11671961	TM 9-2350-256-24P-1
12	Guide, spade shaft. Used with handle 10867499 to install spade shaft through oil seal.	4910-00-767-0419	10884600	TM 9-2350-256-24P-2
13	Handle, spade shaft guide. Used with guide 10884600.	4910-00-766-1964	10867499	TM 9-2350-256-24P-2
14	Hose assembly, nonmetallic. Test run APU outside vehicle; fuel tank to fuel pump line and fuel filter to injection pump line (2 per operation).	4720-00-617-6929	11671580-1	TM 9-2350-256-24P-1
15	Hose assembly, nonmetallic. Test run APU outside vehicle; engine to fuel tank return line 11671065-15 and fuel pump hose 11671065-22 to primary fuel filter (2 per operation).	4720-00-619-9706	11671580-2	TM 9-2350-256-24P-1

(1)	(2)	(3)	(4)	(5)
ITEM NO	ITEM NAME	NATIONAL STOCK NUMBER	PART NUMBER	REFERENCE
16	Hose assembly, nonmetallic. Test run APU outside vehicle; hydraulic pump section line from bulkhead coupling to suction line 11671065-21.	4720-00-619-9691	11671580-3	TM 9-2350-256-24P-1
17	Hose assembly, nonmetallic. Test run APU outside vehicle; pressure switch line hydraulic pump to pressure line 11671065-16.	4720-00-619-9689	11671580-4	TM 9-2350-256-24P-1
18	Hose assembly, nonmetallic. Test run APU outside vehicle; hydraulic pump line to discharge line 11671065-19.	4720-00-619-9681	11671580-5	TM 9-2350-256-24P-1
19	Impact wrench			TM 9-5130-338-12&P
20	Kit, parts, main hydraulic pump pressure tester. Used with gage 10884612 and bushing BM11352-77 when checking main hydraulic pump. Consists of:	4320-01-389-8573	5705354	TM 9-2350-256-24P-2
20A	Bushing, pipe	4730-01-029-4573	8395411-1	TM 9-2350-256-24P-2
20B	Bushing, pipe	4730-01-046-0373	8395412	TM 9-2350-256-24P-2
20C	Nipple, pipe	4730-00-735-0741	C3069X20	TM 9-2350-256-24P-2
20D	Tee pipe, high pressure	4730-01-016-2532	PF31-20	TM 9-2350-256-24P-2
20E	Valve, needle	4820-01-207-1048	N2000SV-11	TM 9-2350-256-24P-2
21	Lifting eye (2 required). Remove hydraulic control panel (1 per operation) and hoist winch (2 per operation).	4910-00-766-1963	10884605	TM 9-2350-256-24P-1
22	Lifting eye (2 required). Removing and installing main winch.	4910-00-766-1962	10884606	TM 9-2350-256-24P-1
23	Multimeter	6625-01-139-2512	T0037	SC 4910-95-CL-A72
24	Puller. Used with adapter 10867497 to remove hydraulic cylinder pins.	5120-00-310-4668	8708712	TM 9-2350-256-24P-2
25	Puller, mechanical; flywheel and sprocket. Removing APU drive sprocket.	5120-00-613-6775	11671732	TM 9-2350-256-24P-1
26	Shop equipment, automotive vehicle maintenance and repair: field maintenance, supplemental no. 1	4910-00-754-0706		SC 4910-95-CL-A62
27	Shop equipment, automotive maintenance and repair: Organizational maintenance, common no. 1, less power	4910-00-754-0654		SC 4910-95-CL-A74
28	Shop equipment, automotive vehicle maintenance and repair: Organizational maintenance, common no. 2, less power	4910-00-754-0650		SC 4910-95-CL-A72

(1)	(2)	(3)	(4)	(5)
ITEM NO	ITEM NAME	NATIONAL STOCK NUMBER	PART NUMBER	REFERENCE
29	Shop equipment, welding, S/E welding field maintenance	3470-00-357-7268		SC 3470-95-CL-A08
30	Sling, lifting. Removing rear fuel tanks, hoist winch, hydraulic control panel (subplate), APU, and mechanical transmission and hydraulic pump.	4910-00-473-7556	7081593	TM 9-2350-256-24P-1
31	Sling assembly, lifting. Removing hydraulic control panel (subplate) and mechanical transmission and hydraulic pump and suspension.	4910-01-046-8944	11672258	TM 9-2350-256-24P-1
32	Soldering gun	3439-00-618-6623	W-S-564	SC 4910-95-CL-A72
33	Tool kit, electrical	5180-00-876-9336	7550526	SC 4910-95-CL-A72
34	Tool kit, general mechanic's	5180-00-177-7033		SC 5180-90-CL-N26
35	Tool kit, welder's	5180-00-754-0661		SC 5180-90-CL-N39
36	Wire rope assembly	4010-00-800-8900	10884613	TM 9-2350-256-24P-2
37	Wrench. Adjusting track tension.	5120-00-277-6470	GGG-W-631	TM 9-2350-256-10
38	Wrench. Removing and replacing level winder flange nut.	5120-00-293-0316	GGG-W-665	
39	Wrench. Connecting and disconnecting hydraulic lines.	5120-00-555-0060	8395504	TM 9-2350-256-24P-2
40	Wrench. Adjusting hydraulic cylinder packing nut.	5120-00-777-1388	10884649	TM 9-2350-256-24P-2
41	Wrench. Adjusting level winder cylinder adjusting nut.	5120-00-767-9099	10884603	TM 9-2350-256-24P-2

**END OF WORK PACKAGE**



**INTERMEDIATE MAINTENANCE**  
**RECOVERY VEHICLE, FULL TRACKED: MEDIUM, M88A1**  
**NSN 2350-00-122-6826, EIC AQA**  
**MANDATORY REPLACEMENT PARTS LIST**

**Explanation of Columns****Column (1)—Item Number**

This number is assigned to the entry in the listing for cross-referencing to the part number.

**Column (2)—Part Number**

Indicates the primary number used by the manufacturer (individual, company, firm, corporation, or Government activity), which controls the design and characteristics of the item by means of its engineering drawings, specification, standards, and inspection requirements to identify an item of range of items.

**Column (3)—Nomenclature**

This column contains the description that appears on the first page of the task under the subheading Materials.

**Column (4)—Quantity**

This column indicates the total quantity of each particular part in this manual.

ITEM NO.	PART NUMBER/ CAGEC	NSN	NOMENCLATURE	QTY
1	03106 (14153)	5330-01-435-4551	Gasket	2
2	10862062 (19207)	5315-00-176-6802	Screw	2
3	10867133 (19207)	5306-00-690-2706	Shoulder bolt	1
4	10867134 (19207)	5305-01-037-6828	Screw	1
5	10867160 (19207)	5306-00-804-4798	Screw, lock	4
6	10867415 (19207)	5330-00-773-9414	Gasket	1
7	10867446 (19207)	5330-00-804-1429	Gasket	4
8	10884619 (19207)	5330-00-773-9411	Gasket	1
9	10894393-8 (19207)	3040-01-030-1684	Pin, spring	1
10	1-126090 (60145)	5310-01-413-1765	Nut, hexagon	1
11	11671375 (19207)	5330-00-613-6855	Gasket	1
12	11671389 (19207)	5330-00-622-7395	Gasket	2
13	11671392 (19207)	5330-00-614-9128	Gasket	1
14	11671660 (19207)	5330-00-613-6854	Seal, oil	2
15	11672203 (19207)	5315-01-061-5679	Pin	4
16	137195 (12204)	5315-00-012-0123	Pin, cotter	1
17	193477 (62983)	5331-00-248-3847	Packing	1
18	31683 (95019)	5330-00-297-6330	Seal	1
19	3-7-39 (95019)	5325-00-509-9526	Snap ring	8
20	425567 (24617)	5305-00-042-5567	Screw	1
21	48488 (62983)	5310-00-167-0820	Washer	32
22	50-2245 (47258)	6515-00-075-6637	Washer	2
23	50-4-20-17-12- (04236)	5310-00-989-3086	Washer	4
24	505048(21450)	5315-00-050-5048	Pin	2
25	5283723 (19207)	5310-00-528-3723	Washer, split	1

ITEM NO.	PART NUMBER/ CAGEC	NSN	NOMENCLATURE	QTY
26	589977 (21450)	5315-01-049-1392	Pin	2
27	6215 (81646)	4730-00-980-6293	Clamp	4
28	701122 (78385)	4730-00-980-6294	Clamp	2
29	7064833 (19207)	5310-00-551-5897	Lockwasher	18
30	7359593 (19207)	5315-00-824-0509	Pin, straight	2
31	7359808 (19207)	5330-00-291-1720	Gasket	1
32	7767952 (19207)	5310-00-167-1300	Nut	1
33	800-0004 (44940)	5305-01-014-8817	Screw	4
34	813-0097 (44940)	5305-01-009-6944	Screw	2
35	815-0235 (44940)	5305-01-109-1344	Screw	1
36	8338180 (19207)	5310-00-935-9043	Lockwasher	11
37	8682815 (19207)	5360-00-678-3276	Spring	1
38	8697866 (19207)	5310-00-615-8968	Washer	10
39	8704245 (19207)	5365-00-610-1123	Shim	AR
40	8725240 (19207)	5360-00-678-3222	Spring	1
41	8761337 (19207)	5306-00-678-3325	Bolt	32
42	8764496 (19207)	5330-00-670-5552	Gasket	6
43	AA55610-46 (81349)		Lockwasher	10
44	AN365-836A (88044)	5310-00-207-9078	Nut, self-locking	12
45	AN960B616 (88044)	5310-00-331-3225	Washer	2
46	B1821BH025F050N (80204)	5305-00-267-8952	Screw	31
47	B1821BH025F056N (80204)	5305-00-068-0512	Screw	6
48	B1821BH025F075N (80204)	5306-00-068-0513	Screw	1
49	B1821BH025F100N (80204)	5305-00-068-0515	Screw	3
50	B1821BH031F075N (80204)	5306-00-050-1238	Screw	93
51	B1821BH031F113N (80204)	5306-00-051-4077	Screw	4
52	B1821BH038C075D (80204)	5305-00-115-9526	Screw	4
53	B1821BH038C075N (80204)	5305-00-543-4372	Screw	15
54	B1821BH038C113N (80204)	5305-00-543-2419	Screw	28
55	B1821BH038F050N (80204)	5305-00-269-3231	Screw	5
56	B1821BH038F075N (80204)	5305-00-269-3234	Screw	99
57	B1821BH038F125N (80204)	5305-00-269-3238	Screw	24
58	B1821BH038F138N (80204)	5305-00-269-3239	Screw	16
59	B1821BH038F175N (80204)	5305-00-269-3241	Bolt	2

ITEM NO.	PART NUMBER/ CAGEC	NSN	NOMENCLATURE	QTY
60	B1821BH038F275N (80204)	5305-00-269-3245	Screw	12
61	B1821BH044C138N (80204)	5305-00-071-1789	Screw	1
62	B1821BH044C150N (80204)	5305-00-071-2055	Screw	8
63	B1821BH044F088D (80204)	5305-00-926-5519	Screw	4
64	B1821BH044F125D (80204)	5305-00-914-6132	Screw	8
65	B1821BH044F125N (80204)	5305-00-709-8523	Screw	8
66	B1821BH044F138N (80204)	5305-00-709-8515	Screw	32
67	B1821BH044F200N (80204)	5305-00-709-8542	Screw	4
68	B1821BH044F475N (80204)	5305-00-709-8299	Screw	12
69	B1821BH050C175N (80204)	5305-00-071-2070	Screw	2
70	B1821BH050C275N (80204)	5305-00-071-2074	Screw	28
71	B1821BH050F138N (80204)	5305-00-725-0154	Screw	30
72	B1821BH050F150N (80204)	5305-00-719-5221	Screw	23
73	B1821BH050F175N (80204)	5305-00-719-5235	Screw	8
74	B1821BH050F200N (80204)	5305-00-719-5238	Screw	10
75	B1821BH050F250N (80204)	5305-00-719-5240	Bolt	1
76	B1821BH050F400N (80204)	5305-00-719-5270	Screw	12
77	B1821BH063F200N (80204)	5305-00-726-2551	Screw	2
78	B1821BH063F325N (80204)	5305-00-726-2556	Screw	2
79	B1821BH075F200N (80204)	5305-00-916-2345	Screw	21
80	B1821BH075F225N (80204)	5305-00-948-0749	Screw	31
81	B1821BH075F275N (80204)	5305-00-926-1826	Screw	31
82	B1821BH075F400N (80204)	5305-00-903-7767	Screw	8
83	B1821BH125F500N (80204)	5305-00-066-8173	Bolt	12
84	M2025103 (61465)	5310-00-167-0821	Washer	6

ITEM NO.	PART NUMBER/ CAGEC	NSN	NOMENCLATURE	QTY
85	M45913/1-20FG5C (81349)	5310-00-143-6145	Nut, self-locking	32
86	M45913/2-12FG5C (81349)	5310-00-832-9719	Nut, self-locking	1
87	M45913/2-6FG5C (81349)	5310-00-959-1488	Nut, self-locking	6
88	MS16536-174 (96906)	5320-00-058-9884	Rivet	40
89	MS16555-48 (96906)	5315-00-845-5110	Pin	4
90	MS16555-77 (96906)	5315-00-816-1329	Pin	1
91	MS16562-50 (80205)	5315-00-814-3531	Pin, spring	2
92	MS16562-51 (80205)	5315-00-809-8786	Pin, spring	8
93	MS16625-2162 (96906)	5325-00-282-2437	Snap, ring	2
94	MS16997-58 (96906)	5305-00-978-9378	Screw	12
95	MS16997-61 (96906)	5305-00-978-9380	Screw	15
96	MS16998-102 (96906)	5305-00-983-8076	Screw	8
97	MS16998-57 (96906)	5305-00-983-6669	Screw	4
98	MS16998-74 (96906)	5305-00-983-7448	Screw	15
99	MS16998-89 (96906)	5305-00-983-7437	Screw	8
100	MS16998-96 (96906)	5305-00-983-8074	Screw	2
101	MS16998-97 (96906)	5305-00-983-7456	Screw	17
102	MS16998-98 (96906)	5305-00-983-7457	Screw	8
103	MS18153-88 (96906)	5305-00-914-6133	Screw	32
104	MS20600AD4W2 (96906)	5320-00-582-3304	Screw	4
105	MS20995F41 (80205)	9505-00-684-4843	Lockwire	AR
106	MS20995NC40 (80205)	9525-00-990-7799	Lockwire	AR
107	MS21044B3 (80205)	5310-00-982-5064	Nut, self-locking	2
108	MS21044N4 (80205)	5310-00-877-5796	Nut, self-locking	1
109	MS21044N5 (80205)	5310-00-088-0553	Nut, self-locking	2
110	MS21044-N8 (80205)	5310-00-877-5795	Nut, self-locking	1
111	MS21045-5 (96906)	5310-00-982-4912	Nut, self-locking	2
112	MS21318-20 (80205)	5305-00-253-5614	Screw	8
113	MS24665-132 (80205)	5315-00-839-2325	Pin, cotter	32
114	MS24665-281 (80205)	5315-00-839-2325	Pin, cotter	4
115	MS24665-283 (80205)	5315-00-842-3044	Pin, cotter	33
116	MS24665-287 (80205)	5315-00-011-9120	Pin, cotter	2
117	MS24665-353 (80205)	5315-00-839-5822	Pin, cotter	7
118	MS27183-10 (96906)	5310-00-809-4058	Washer	3
119	MS27183-12 (96906)	5310-00-081-4219	Washer	2
120	MS27183-14 (96906)	5310-00-080-6004	Washer	5
121	MS27183-15 (96906)	5310-00-809-4061	Washer	4
122	MS27183-18 (96906)	5310-00-809-5998	Washer	8
123	MS27183-19 (96906)	5310-00-809-3079	Washer	12
124	MS27183-24 (96906)	5310-00-809-8536	Washer	6
125	MS27183-27 (96906)	5310-00-809-8541	Washer	1
126	MS28775-113 (81343)	5331-00-582-2855	Packing	9
127	MS28775-114 (81343)	5331-00-618-0801	Packing	4



ITEM NO.	PART NUMBER/ CAGEC	NSN	NOMENCLATURE	QTY
128	MS28775-115 (81343)	5331-00-579-7916	Packing	8
129	MS28775-210 (81343)	5331-00-292-0570	Packing	2
130	MS28775-215 (81343)	5331-00-579-7911	Packing	4
131	MS28775-217 (81343)	5331-00-579-7914	Packing	2
132	MS28775-222 (81343)	5331-00-297-9990	Packing	19
133	MS28775-223 (81343)	5331-00-171-6649	Packing	26
134	MS28775-228 (81343)	5331-00-807-8993	Packing	9
135	MS28775-237 (81343)	5331-00-608-6432	Packing	1
136	MS28775-238 (81343)	5331-00-579-7545	Packing	2
137	MS28775-241 (81343)	5331-00-579-3162	Packing	2
138	MS28778-12 (81343)	5331-00-251-8839	Packing	1
139	MS28778-8 (81343)	5330-00-808-0794	Packing	1
140	MS35206-243 (80205)	5305-00-984-6191	Screw	6
141	MS35207-231 (96906)	5305-00-958-0662	Screw	4
142	MS35207-245 (96906)	5305-00-989-4864	Screw	12
143	MS35207-261 (96906)	5305-00-990-6444	Screw	2
144	MS35207-264 (80205)	5305-00-989-7435	Screw	4
145	MS35207-279 (96906)	5305-00-993-2463	Screw	3
146	MS35333-37 (96906)	5310-00-579-0079	Lockwasher	4
147	MS35333-39 (80205)	5310-00-576-5752	Lockwasher	16
148	MS35333-40 (96906)	5310-00-550-1130	Lockwasher	19
149	MS35333-41 (96906)	5310-00-167-0721	Lockwasher	1
150	MS35333-42 (80205)	5310-00-595-7237	Lockwasher	17
151	MS35333-47 (96906)	5310-00-550-3714	Lockwasher	19
152	MS35334-22 (96906)	5310-00-883-8741	Lockwasher	12
153	MS35335-31 (96906)	5310-00-596-7693	Lockwasher	8
154	MS35335-33 (96906)	5310-00-209-0786	Lockwasher	29
155	MS35335-34 (96906)	5310-00-514-6674	Lockwasher	2
156	MS35335-35 (96906)	5310-00-627-6128	Lockwasher	24
157	MS35335-37 (96906)	5310-00-209-5116	Lockwasher	6
158	MS35338-43 (96906)	5310-00-045-3296	Lockwasher	6
159	MS35338-44 (80205)	5310-00-582-5965	Lockwasher	54
160	MS35338-45 (96906)	5310-00-407-9566	Lockwasher	107
161	MS35338-46 (80205)	5310-00-637-9541	Lockwasher	207
162	MS35338-47 (96906)	5310-00-209-0965	Lockwasher	105
163	MS35338-48 (80205)	5310-00-584-5272	Lockwasher	146
164	MS35338-49 (96906)	5310-00-167-0680	Lockwasher	20
165	MS35338-50 (96906)	5310-00-820-6653	Lockwasher	2
166	MS35338-51 (96906)	5310-00-584-7888	Lockwasher	42
167	MS35338-53 (96906)	5310-00-584-7889	Lockwasher	2
168	MS35340-48 (96906)	5310-00-834-7606	Lockwasher	32
169	MS35340-51 (96906)	5310-00-052-6454	Lockwasher	52
170	MS35649-282 (96906)	5310-00-934-9757	Nut	6
171	MS35650-302 (80205)	5310-00-934-9751	Nut	4
172	MS35650-304 (80205)	5310-00-934-9765	Nut	4
173	MS35650-362 (96906)	5310-00-934-9755	Nut	4
174	MS35691-77 (96906)	5310-00-891-3428	Locknut	4
175	MS35692-14 (96906)	5310-00-401-0825	Nut	32
176	MS35743-47 (96906)	5320-00-191-4179	Rivet	4

ITEM NO.	PART NUMBER/ CAGEC	NSN	NOMENCLATURE	QTY
177	MS35769-47 (81343)	5330-00-269-2844	Gasket	1
178	MS35810-3 (96906)	5315-00-754-0848	Pin	1
179	MS35810-7 (96906)	5315-00-245-3144	Pin, straight	2
180	MS35842-11 (81646)	4730-00-908-3194	Clamp, hose	1
181	MS45901-4 (96906)	5310-00-264-1390	Washer	2
182	MS45904-76 (96906)	5310-00-061-1258	Lockwasher	3
183	MS51095-334 (96906)	5305-00-753-4322	Screw	2
184	MS51096-359 (96906)	5305-00-912-5113	Screw	18
185	MS51848-13 (96906)	5310-01-016-9348	Lockwasher	8
186	MS51849-85 (96906)	5305-01-006-2050	Screw	24
187	MS51850-64 (96906)	5305-00-446-9901	Screw	13
188	MS51864-104-16 (80205)	5307-01-006-5515	Stud	6
189	MS51922-23 (96906)	5310-00-902-0183	Nut	1
190	MS51932-105 (96906)	5315-01-006-4063	Pin	1
191	MS51932-30 (96906)	5315-01-006-9195	Pin	2
192	MS51932-52 (96906)	5315-01-006-2186	Pin, straight	2
193	MS51932-53 (96906)	5315-01-006-4064	Pin	6
194	MS51932-54 (96906)	5315-01-006-2187	Pin	3
195	MS51932-59 (96906)	5315-00-999-4241	Pin	2
196	MS51932-62 (96906)	5315-00-131-7018	Pin	1
197	MS51967-8 (96906)	5310-00-732-0558	Nut	4
198	MS51968-11 (96906)	5310-00-880-7745	Nut	10
199	MS51968-14 (96906)	5310-00-732-0560	Nut	38
200	MS51968-2 (96906)	5310-00-768-0319	Nut	11
201	MS51968-5 (96906)	5310-00-880-7746	Nut	6
202	MS51968-8 (96906)	5310-00-732-0559	Nut	4
203	MS90725-1 (80205)	5305-00-068-0498	Screw	1
204	MS90725-59 (80205)	5305-00-269-3210	Screw	1
205	MS90726-109 (96906)	5305-00-226-7767	Screw	5
206	MS90726-113 (80205)	5305-00-725-4183	Screw	8
207	MS90726-118 (80205)	5305-00-716-8181	Screw	14
208	MS90726-155 (80205)	5305-00-725-4088	Screw	4
209	MS90726-33 (80205)	5306-00-225-9088	Screw	18
210	MS90726-34 (80205)	5306-00-225-9089	Screw	11
211	MS90726-37 (80205)	5305-00-225-9092	Screw	4
212	MS90726-44 (80205)	5305-00-225-9099	Screw	2
213	MS90726-47 (80205)	5305-00-225-9102	Screw	2
214	MS90726-60 (80205)	5305-00-269-2803	Screw	13
215	MS90726-61 (80205)	5305-00-269-2804	Screw	32
216	MS90726-99 (80205)	5305-00-710-4205	Screw	16
217	MS90727-111 (96906)	5305-00-719-5219	Screw	26
218	MS90727-116 (96906)	5305-00-719-5239	Screw	8
219	MS90727-127 (96906)	5305-00-945-6412	Screw	4
220	MS90727-139 (96906)	5305-00-725-0140	Screw	20
221	MS90727-184 (96906)	5305-01-277-0407	Screw	3
222	MS90727-243 (96906)	5305-01-006-2072	Screw	2
223	MS90727-274 (96906)	5305-01-006-2074	Screw	20
224	MS90727-34 (96906)	5305-00-051-4076	Screw	2

ITEM NO.	PART NUMBER/ CAGEC	NSN	NOMENCLATURE	QTY
225	MS90727-61 (96906)	5305-00-269-3237	Screw	2
226	MS90727-86 (96906)	5305-00-709-8516	Screw	8
227	MS90727-96 (96906)	5305-00-709-8482	Screw	10
228	MS9245-24 (81343)	5315-00-087-0850	Pin, cotter	1
229	MS9321-11 (96906)	5310-00-945-0528	Washer	2
230	MS9845-19 (96906)	5315-01-009-6800	Pin	1
231	SC8725239 (63728)	5330-01-393-9087	Gasket	1
232	2-126574 (07666)	5310-01-166-0602	Lockwasher	1
233	TBD (TBD)	TBD	Nut	3
234	TBD (TBD)	TBD	Lockwasher	3
235	TBD (TBD)	TBD	Setscrew	2
236	TBD (TBD)	TBD	Clamp	2
237	TBD (TBD)	TBD	Packing	8
238	TBD (TBD)	TBD	Screw	8
239	TBD (TBD)	TBD	Gasket	1
240	61040 (79150)	5330-00-178-5177	Seal	2
241	MILS45005TYPE1 CLASS10RZ (81349)	5330-00-682-4639	Seal	2
242	MS90727-112 (96906)	5305-00-725-0154	Screw	2
243	AA55610-48 (81349)		Lockwasher	2

**END OF WORK PACKAGE**



**INTERMEDIATE MAINTENANCE**  
**DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE MANUAL RECOVERY VEHICLE, FULL**  
**TRACKED: MEDIUM, M88A1**  
**NSN 2350-00-122-6826, EIC AQA**  
**FABRICATED TOOLS AND EQUIPMENT**

**GENERAL**

This WP includes instructions for fabricating items locally. All materials needed to fabricate the items are listed in the tables. Illustrations are provided following each table.

**Engine and Transmission Cart**

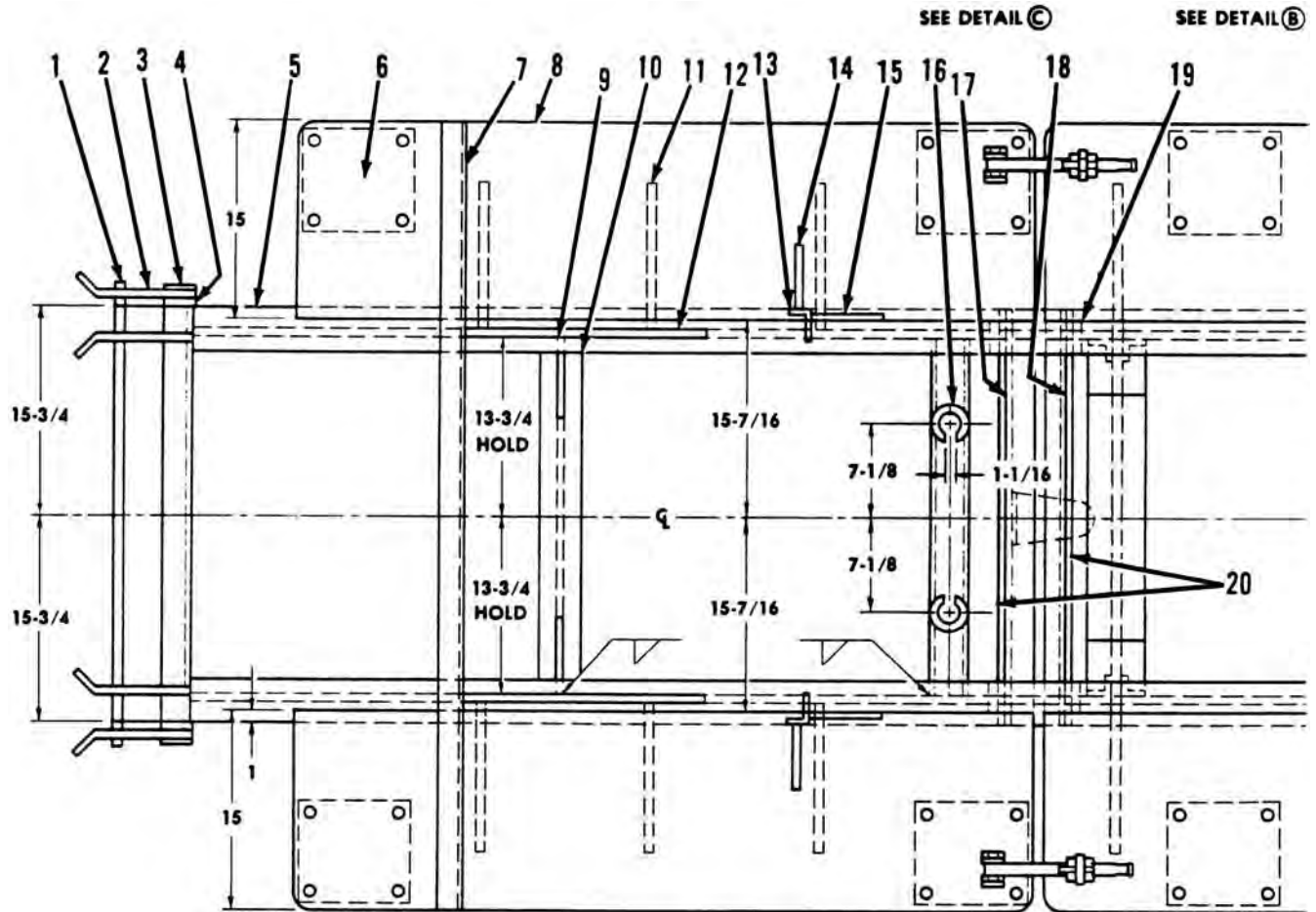
The engine and transmission cart is used to support and maneuver the powerpack outside the vehicle. Refer to Table 1 and Figure 1 for fabrication instructions.

**Table 1. Bill of Materials for Engine and Transmission Cart**

Item	Qty.	Description	Material
1	2	Rod 0.75 dia x 34 in. lg (1.91 x 86.4 cm)	cr steel
2	8	Bracket 4 x 0.25 x 9 in. lg (10.2 x 0.64 x 22.9 cm)	hr steel
3	2	Plate 1.50 x 0.37 x 2.25 in. lg (3.81 x 0.94 x 5.72 cm)	hr steel
4	1	Channel C 6 x 10.50 lb x 31.50 in. lg (4.76 kg x 80.0 cm)	steel
5	2	Beam S 6 x 12.50 lb x 62 in. lg (5.67 kg x 157.5 cm)	steel
6	8	Caster, dual, 360° swivel	—
7	1	Channel C 6 x 10.50 lb x 59.50 in. lg (4.76 kg x 151 cm)	steel
8	2	Plate 15 x 0.75 x 56 in. lg (38.1 x 1.91 x 142.2 cm)	hr steel
9	2	Gusset 6 x 0.62 x 6 in. lg (15.2 x 1.57 x 15.2 cm)	hr steel
10	1	Beam S 6 x 12.50 lb x 28 in. lg (5.67kg x 71.1 cm)	steel
11	12	Gusset 5.50 x 0.62 x 11 in. lg (14.0 x 1.57 x 27.9 cm)	hr steel
12	2	Plate, cradle 12.75 x 0.62 x 18 in. lg (32.4 x 1.57 x 45.7 cm)	hr steel
13	2	Guide, angle 2 x 2 x 0.25 x 8 in. lg (5.1 x 5.1 x 0.64 x 20.3 cm)	steel
14	2	Gusset 5.25 x 0.62 x 5.25 in. lg (13.3 x 1.57 x 13.3 cm)	hr steel
15	2	Gusset 2.50 x 0.62 x 5.50 in. lg (6.4 x 1.57 x 14.0 cm)	hr steel
16	2	Post, rest 2.75 od x 0.75 id x 1.62 in. lg (7.0 x 1.91 x 4.1 cm), mech tbg	steel
17	1	Channel C 6 x 10.50 lb x 31.50 in. lg (4.76 kg x 80.0 cm) (see detail C)	steel
18	1	Channel C 6 x 10.50 lb x 31.50 in. lg (4.76 kg x 80.0 cm) (see detail C)	steel
19	2	Plate, locator 2 x 0.75 x 7.50 in. lg (5.1 x 1.91 x 19.1 cm) (see detail B)	(.50C-Sil) steel
20	2	Plate, reinf 6 x 0.50 x 31.50 in. lg (15.2 x 1.27 x 80.0 cm) (see detail C)	hr steel
21	1	Channel, boxed 4 x 28 in. lg (10.2 x 71.1 cm)	steel
22	1	Locator 3.50 dia x 6 in. lg (8.9 x 15.2 cm) (see detail A)	AISI-4140 steel
23	2	Plate 15 x 0.75 x 27 in. lg (38.1 x 1.91 x 68.6 cm)	hr steel
24	1	Beam S 6 x 12.50 lb x 28 in. lg (5.67 kg x 71.1 cm)	steel

Table 1. Bill of Materials for Engine and Transmission Cart--Continued

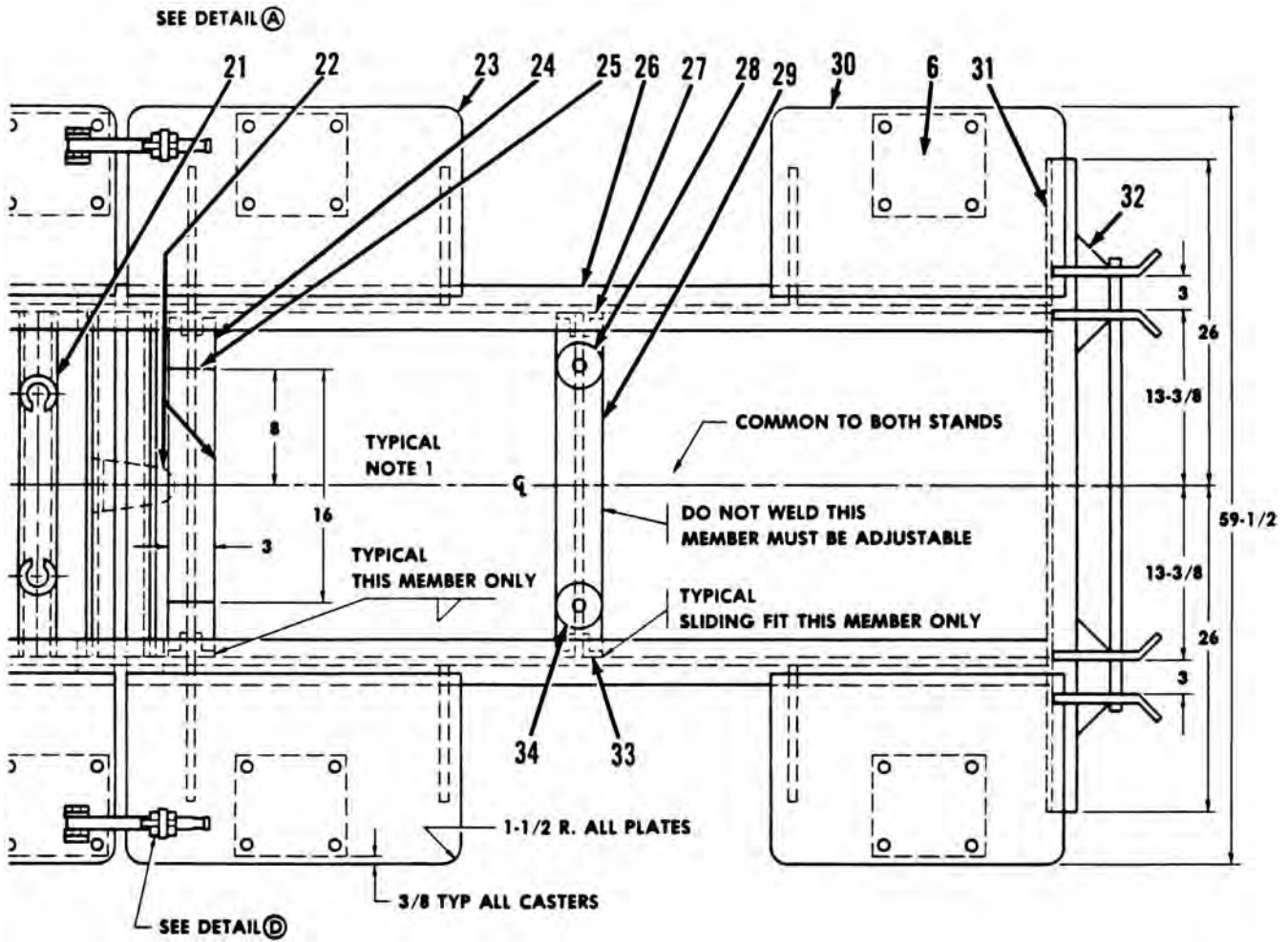
Item	Qty.	Description	Material
25	1	Pad 2.25 x 3 x 16 in. lg (5.72 x 7.62 x 40.6 cm)	steel
26	2	Beam S 6 x 12.50 lb x 71.37 in. lg (5.67 kg x 181 cm)	steel
27	8	Clip, angle 2 x 2 x 0.25 x 4.50 in. lg (5.1 x 5.1 x 0.64 x 11.4 cm)	steel
28	1	Post, rest 3 od x 0.62 id x 4.75 in. lg (7.62 x 1.57 x 12.1 cm), mech tbg	steel
29	1	Beam S 6 x 12.50 lb x 28 in. lg (5.67 kg x 71.1 cm)	steel
30	2	Plate 15 x 0.75 x 23 in. lg (38.1 x 1.91 x 58.4 cm)	hr steel
31	1	Channel C 6 x 10.50 lb 52 in. lg (4.76 kg x 132 cm)	steel
32	6	Gusset 3 x 0.25 x 3 in. lg (7.62 x 0.64 x 7.62 cm)	hr steel
33	2	Plate, guide 3 x 0.75 x 3.50 in. lg (7.62 x 1.91 x 8.9 cm)	hr steel
34	1	Post, rest 3 od x 1 id x 4.75 in. lg (7.62 x 2.54 x 12.1 cm), mech tbg	steel
35	2	Pin 0.50 dia x 1.75 in. lg (1.27 x 4.45 cm)	hr steel
36	2	Rod end 1 dia x 0.75 in. lg (2.54 x 1.91 cm)	cr steel
37	2	Post 2 x 0.50 x 3 in. lg (5.1 x 1.27 x 7.62 cm) (see detail D)	hr steel
38	2	Rod, adj 0.75 dia x 10.50 in. lg, 6.25-10 UNC thd (1.91 x 26.7 cm) (see detail D)	cr steel
39	4	Nut, hex slotted 0.75-10 UNC	steel
40	3	Pin 0.50 dia x 7 in. lg (1.27 x 17.8 cm) (see detail E)	hr steel
41	3	Chain, safety 12 in. lg (30.5 cm), Spec. RR-C-271, Type II, CL6	steel
42	3	Stand, fulcrum 1.50 x 0.37 x 16 in. lg (3.81 x 0.940 x 40.6 cm) (see detail D)	hr steel



**Note**

1.  $\bar{C}$  casters is  $\bar{C}$  swivel radius (9-1/2 R).
2. Dimension check must be made before final welding is done.
3. Casters must swivel 360° pin front only.
4. Adjustable according to engine case holes.
5. Place pins in holes when coupled.
6. Do not scale drawing.
7. All dimensions shown are in inches.

Figure 1. Engine and Transmission Cart—M88A1 (Sheet 1 of 6).



**Note**

Item 25 must align with engine case holes.

Figure 1. Engine and Transmission Cart—M88A1 (Sheet 2 of 6).



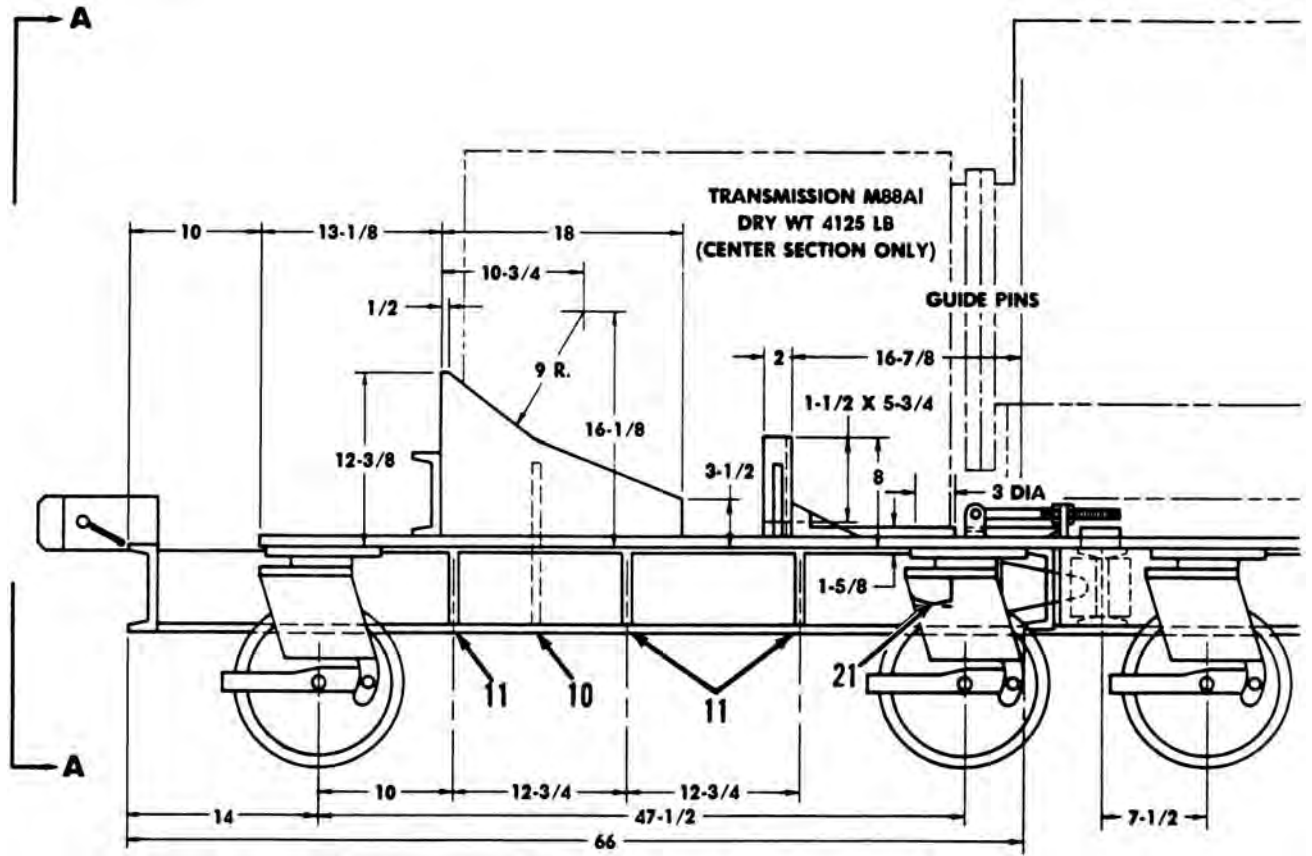


Figure 1. Engine and Transmission Cart—M88A1 (Sheet 3 of 6).

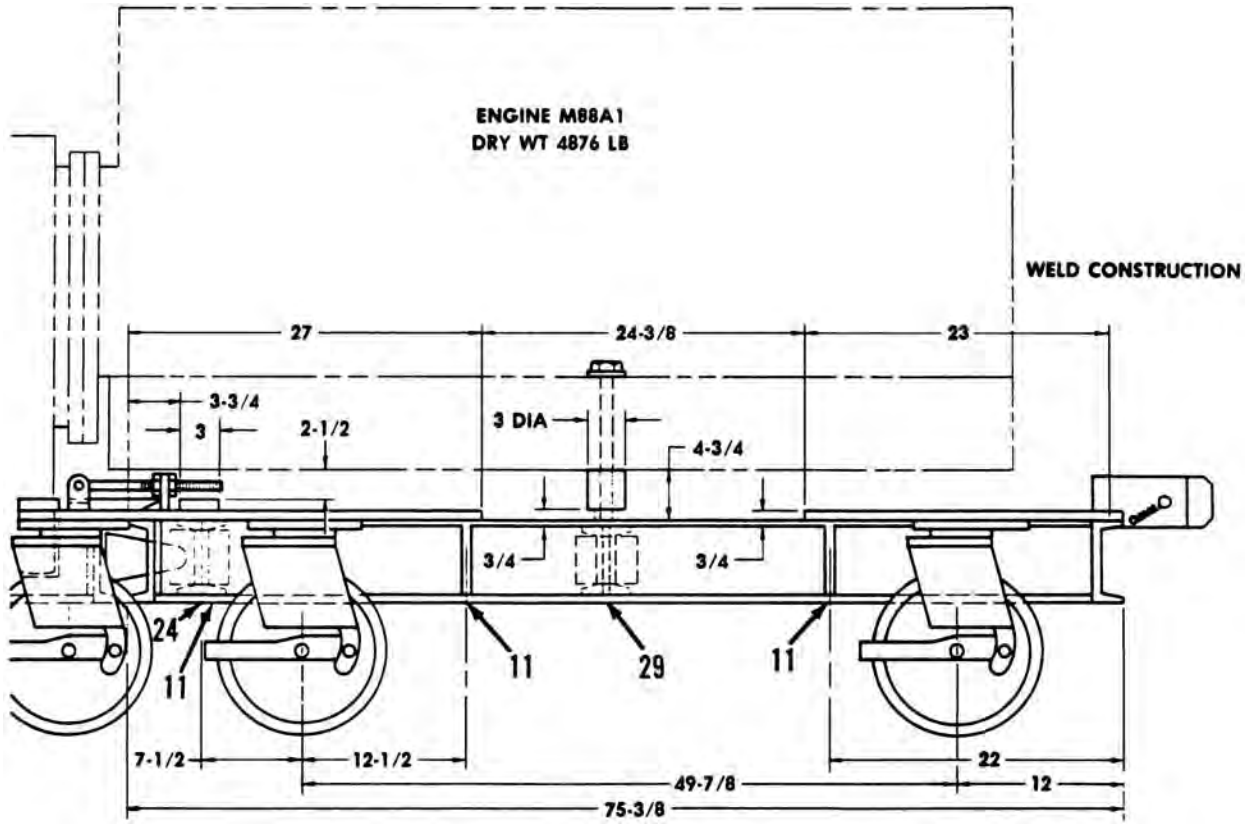


Figure 1. Engine and Transmission Cart—M88A1 (Sheet 4 of 6).

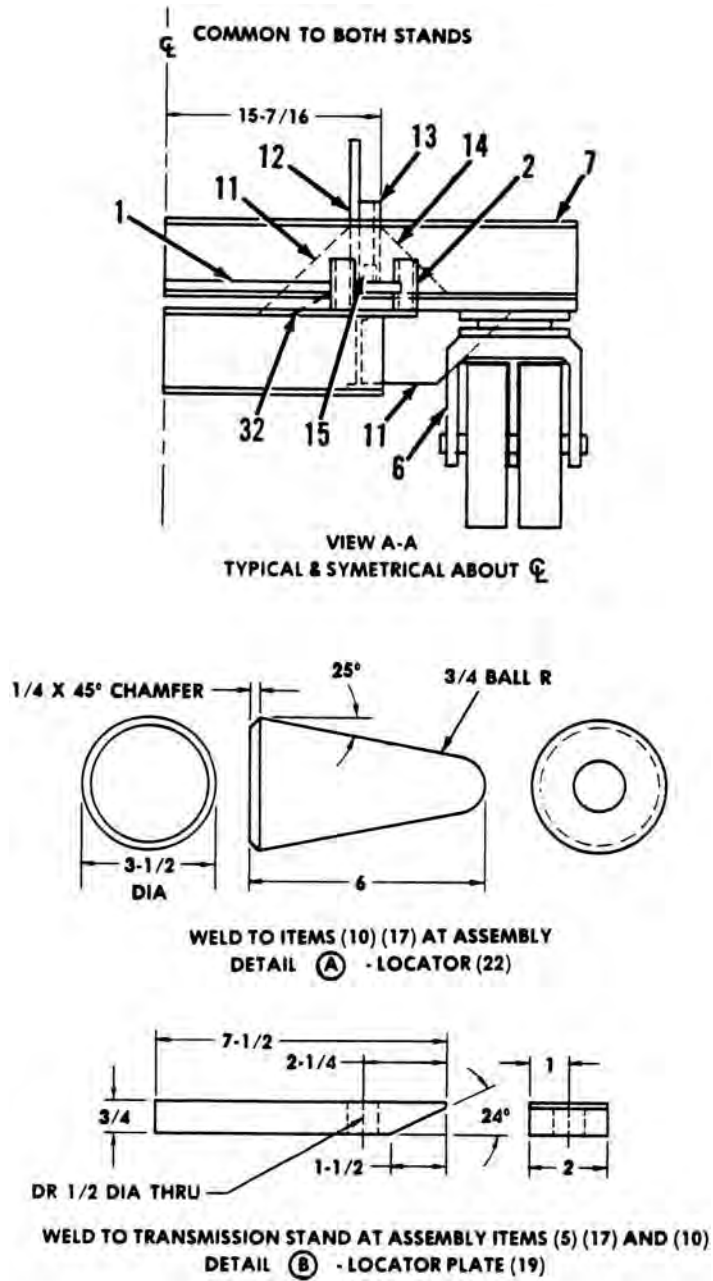
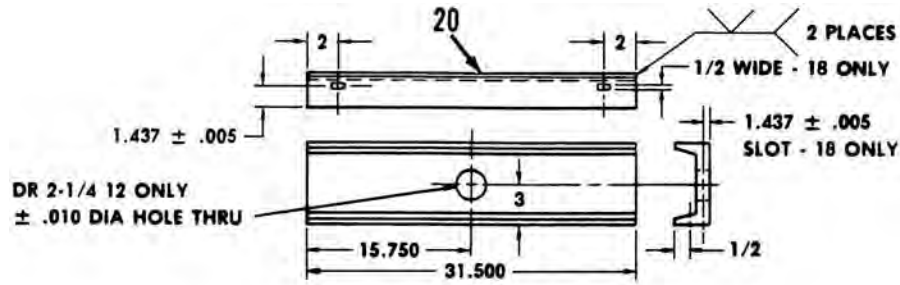
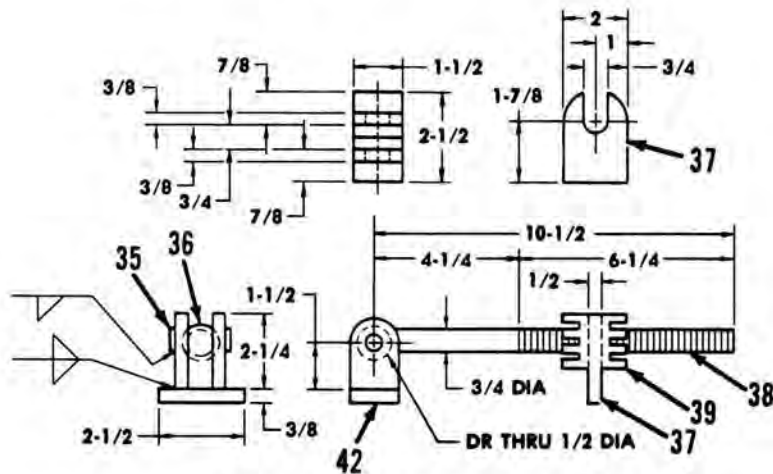


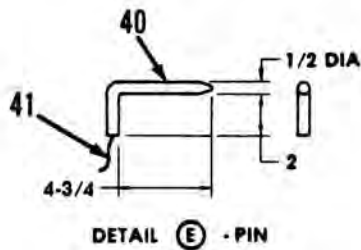
Figure 1. Engine and Transmission Cart—M88A1 (Sheet 5 of 6).



18 CHANNEL - WELD ON PLATE 20 - HOLES AS SHOWN  
 17 CHANNEL - WELD ON PLATE 20 - OMIT ALL HOLES  
 DETAIL (C) - ITEMS (17) (18) AND (20)



WELD ROD END (36) TO ROD (38)  
 DETAIL (D) - LOCKING DEVICE



DETAIL (E) - PIN

Figure 1. Engine and Transmission Cart—M88A1 (Sheet 6 of 6).

**Test Stand for APU**

The APU test stand is used to support the auxiliary engine to operate it outside the vehicle (groundhopping). Refer to Table 2 and Figure 2 for fabrication instructions.

**Table 2. Test Stand for APU**

<b>Item</b>	<b>Qty</b>	<b>Description</b>	<b>Material</b>
1	2	Angle, base 2 x 2 x 0.25 x 27.44 in. lg (5.1 x 5.1 x 0.64 x 69.7 cm)	steel
2	2	Angle, base 2 x 2 x 0.25 x 24.75 in. lg (5.1 x 5.1 x 0.64 x 62.9 cm)	steel
3	2	Angle, support 2 x 2 x 0.25 x 23.06 in. lg (5.1 x 5.1 x 0.64 x 58.6 cm)	steel
4	2	Angle, support 2 x 2 x 0.25 x 28.25 in. lg (5.1 x 5.1 x 0.64 x 71.8 cm)	steel
5	1	Angle, support 2 x 2 x 0.25 x 19.38 in. lg (5.1 x 5.1 x 0.64 x 49.2 cm)	steel
6	3	Angle, support 2 x 2 x 0.25 x 20.10 in. lg (5.1 x 5.1 x 0.64 x 51.1 cm)	steel
7	4	Gusset 0.25 x 1.75 x 1.75 in. lg (0.64 x 4.45 x 4.45 cm)	hr steel
8	2	Pad 0.75 x 3 x 2.88 in. lg (1.91 x 7.62 x 7.32 cm)	hr steel
9	1	Pad 0.25 x 2.25 x 2 in. lg (0.64 x 5.72 x 5.1 cm)	hr steel
10	1	Pad 0.25 x 2.25 x 3 in. lg (0.64 x 5.72 x 7.62 cm)	hr steel
11	1	Angle, support 2 x 2 x 0.25 x 19.38 in. lg (5.1 x 5.1 x 0.64 x 49.2 cm)	steel

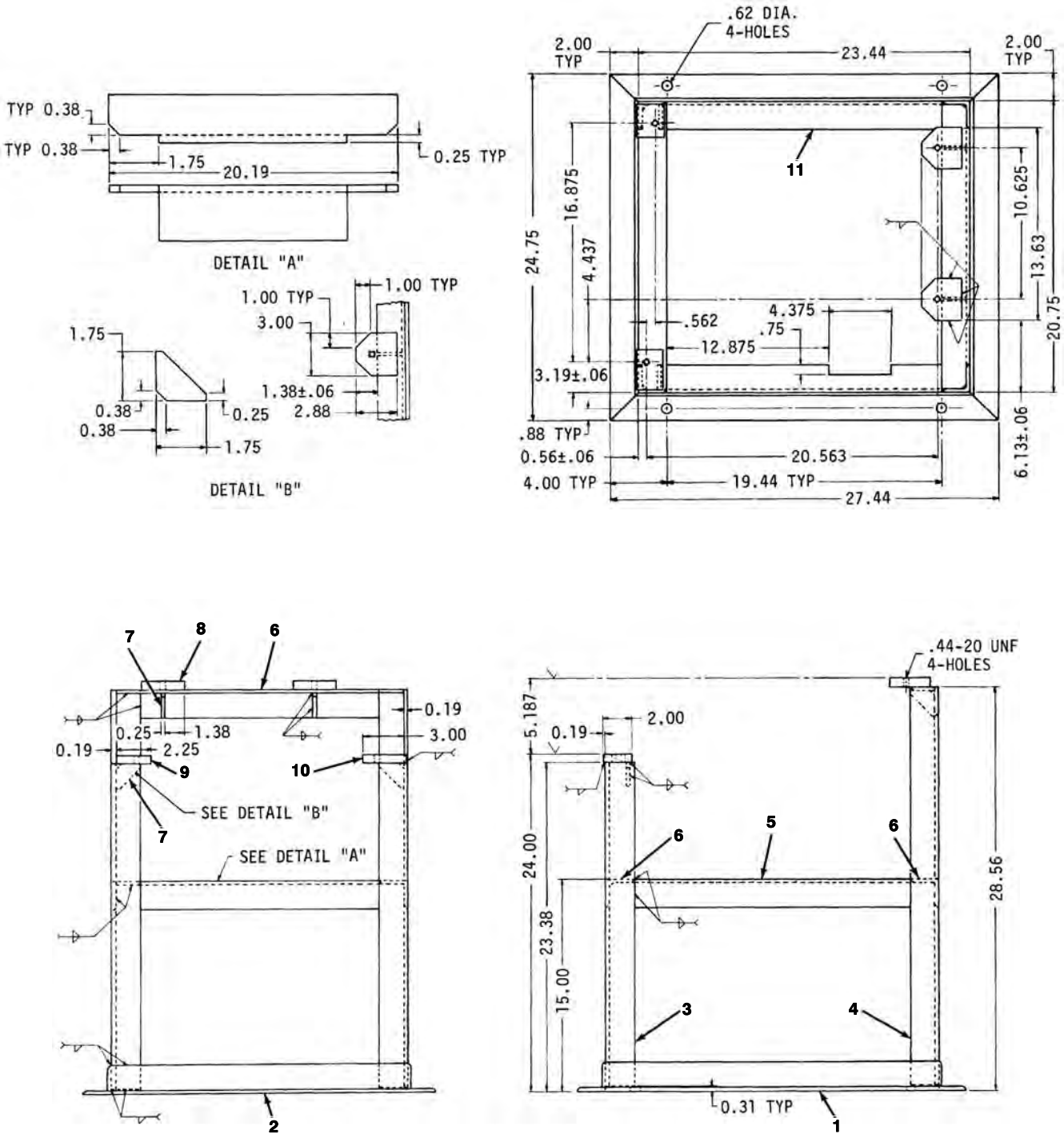


Figure 2. Test Stand for APU.

**Safety Boom Stands**

The improvised safety boom stands are used to support the boom in a partially raised position, allowing the vehicle to be serviced in a shop area with a low ceiling. The stands can be readily constructed from ordinary wall pipes mounted to a metal base plate. Refer to Table 3 and Figure 3 for fabrication instructions.

Table 3. Safety Boom Stands

Item	Qty.	Description	Material
1	2	Pipe 4 in. dia x 7 in. lg (10.2 x 17.8 cm) (cut lengthwise)	steel
2	2	Pipe 3 in. dia x 7 ft lg (7.62 x 17.8 cm)	steel
3	2	Plate, base, metal 12 x 12 x 0.25 in. (30.5 x 30.5 x 0.64 cm)	steel
4	2	Bottom, mat 12 x 12 x 0.25 in. (30.5 x 30.5 x 0.64 cm)	rubber

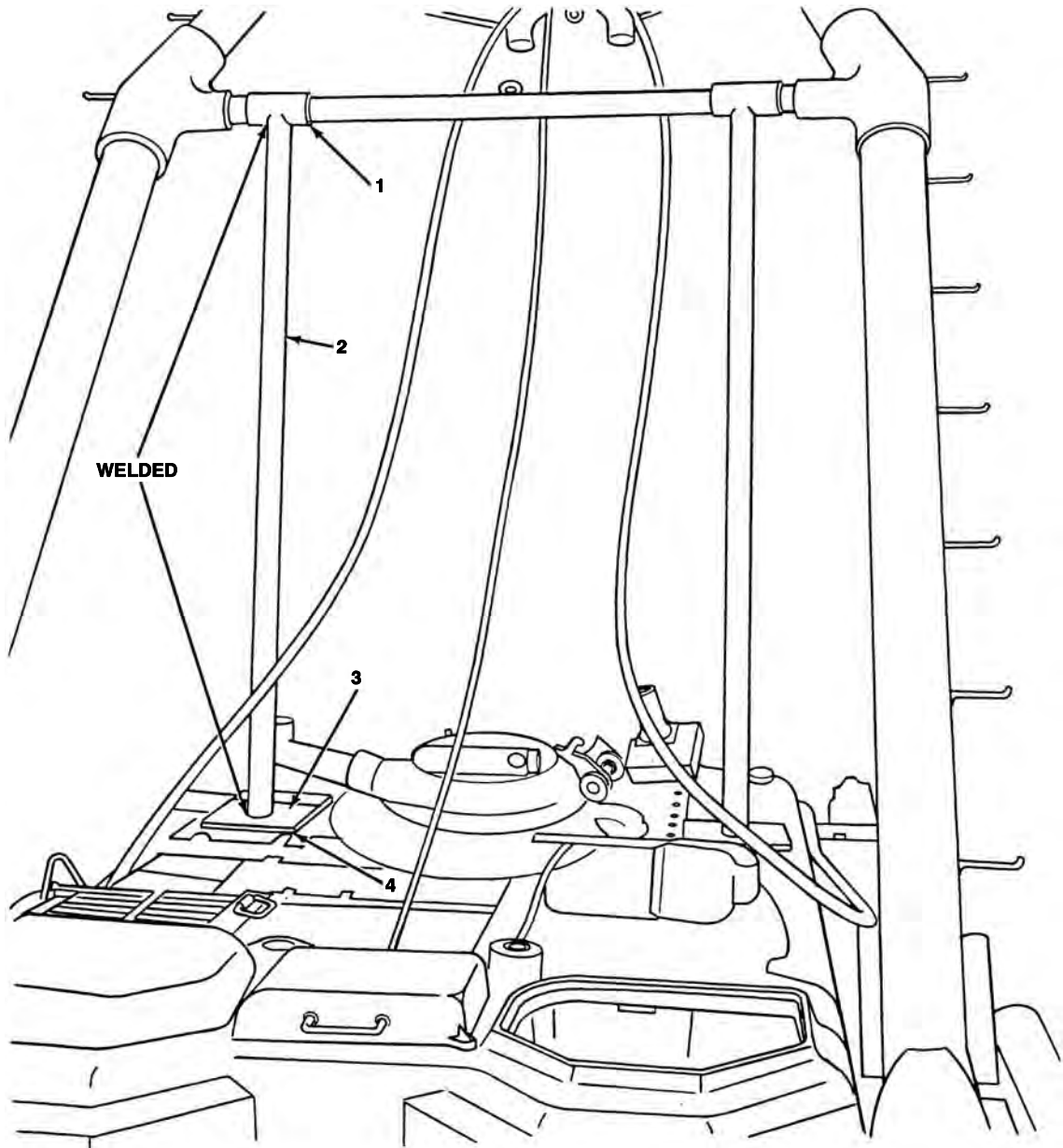


Figure 3. Safety Boom Stands.

END OF WORK PACKAGE





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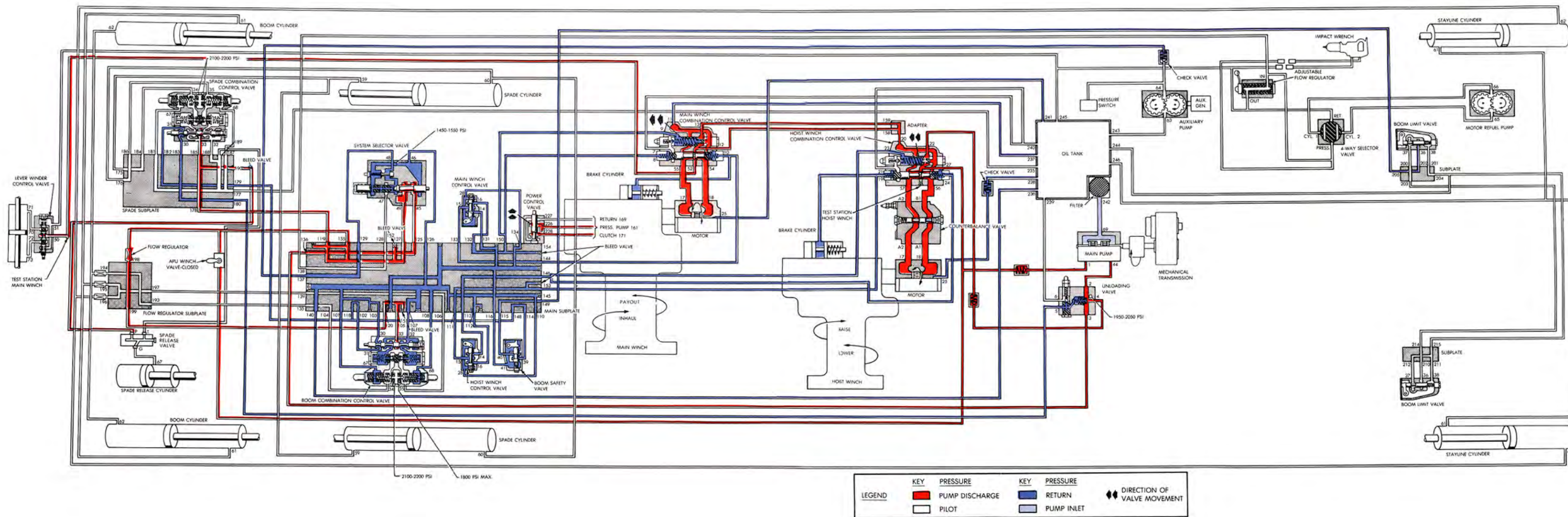
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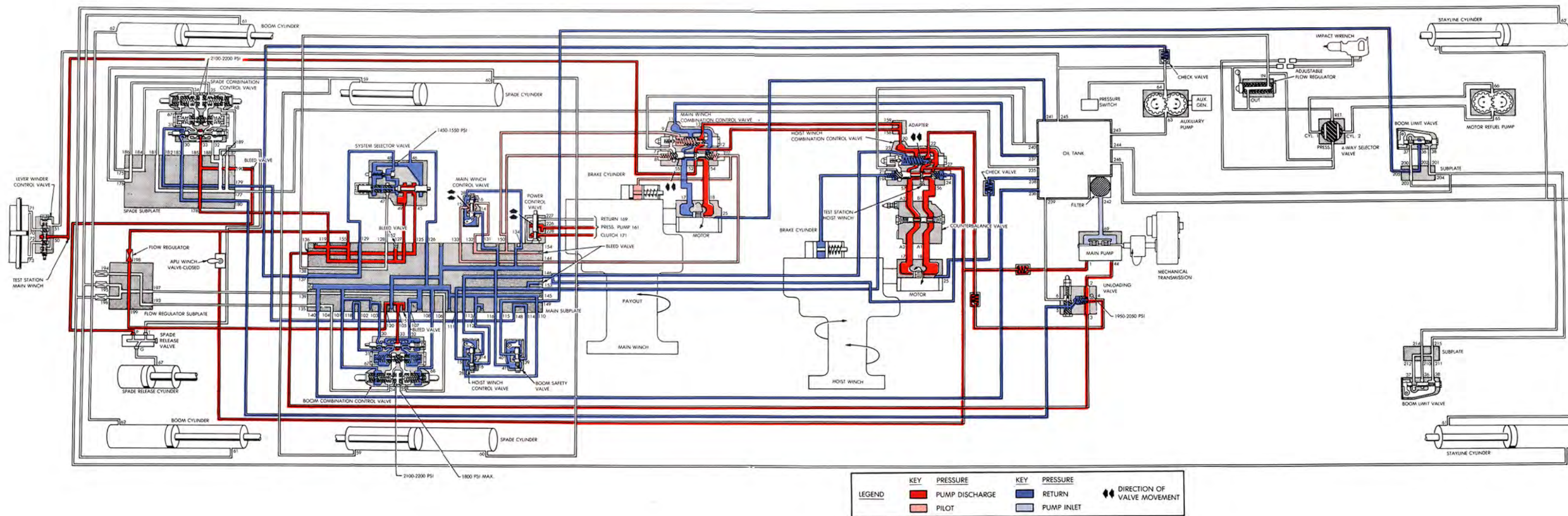




FO-1. Winch, Power Takeoff, and Hoist System—Schematic Diagram—Main Hydraulic System Idling.



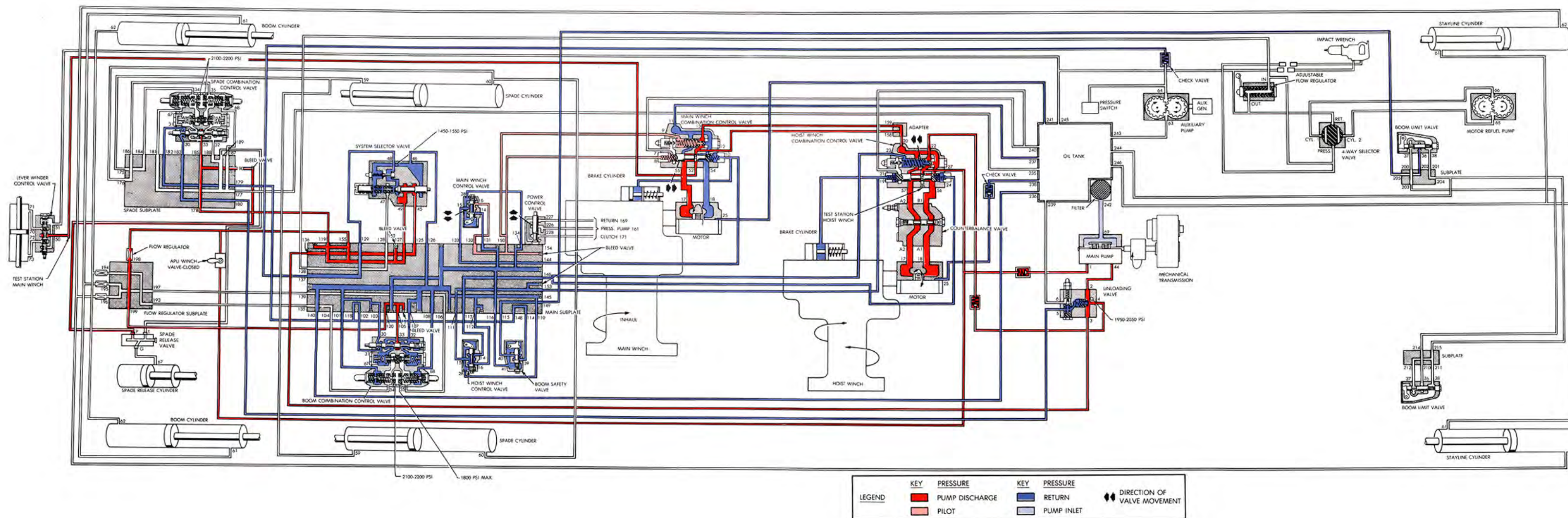




FO-2. Winch, Power Takeoff, and Hoist System—Schematic Diagram—Main Winch—Payout.



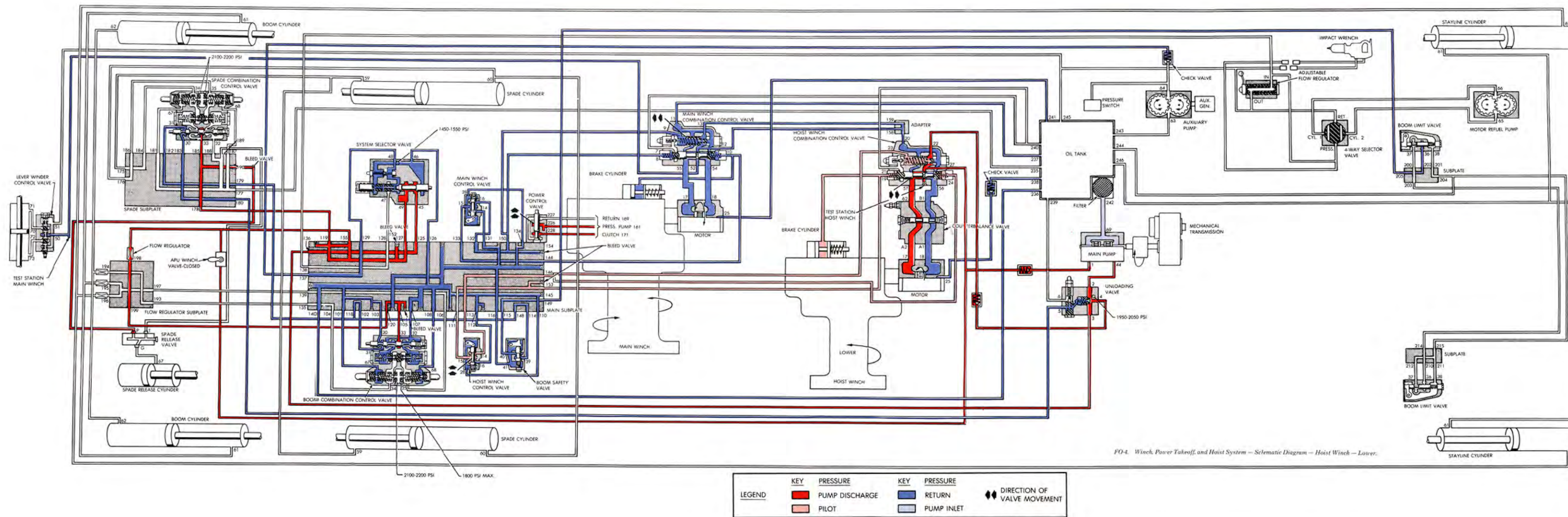




FO-3. Winch Power Takeoff and Hoist System—Schematic Diagram—Main Winch—Inhaul.







FO-4. Winch, Power Takeoff, and Hoist System — Schematic Diagram — Hoist Winch — Lower.





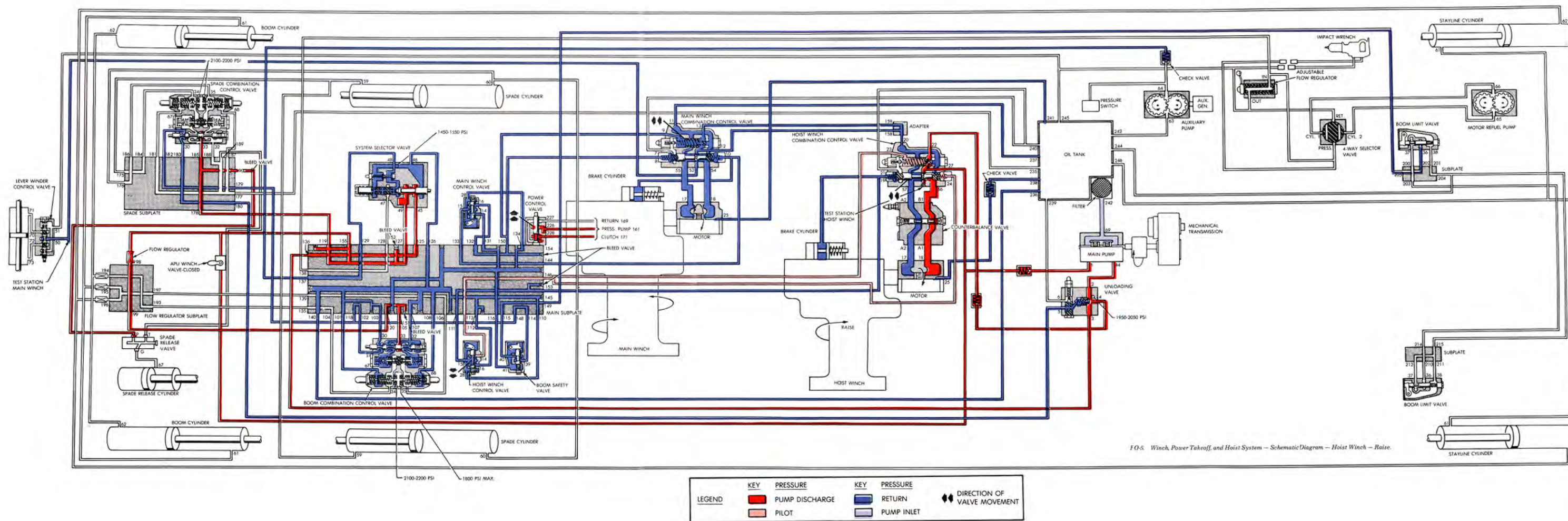
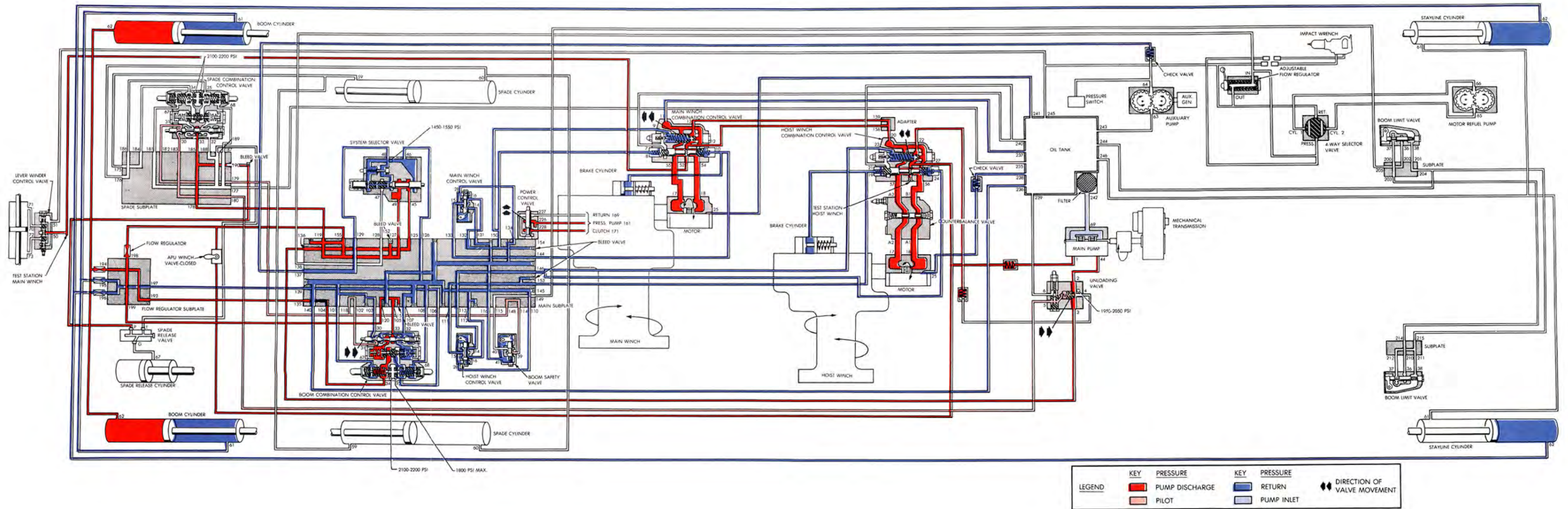


FIG. 5. Winch, Power Takeoff, and Hoist System — Schematic Diagram — Hoist Winch — Raise.

FO-5. Winch, Power Takeoff, and Hoist System—Schematic Diagram—Hoist Winch—Raise.



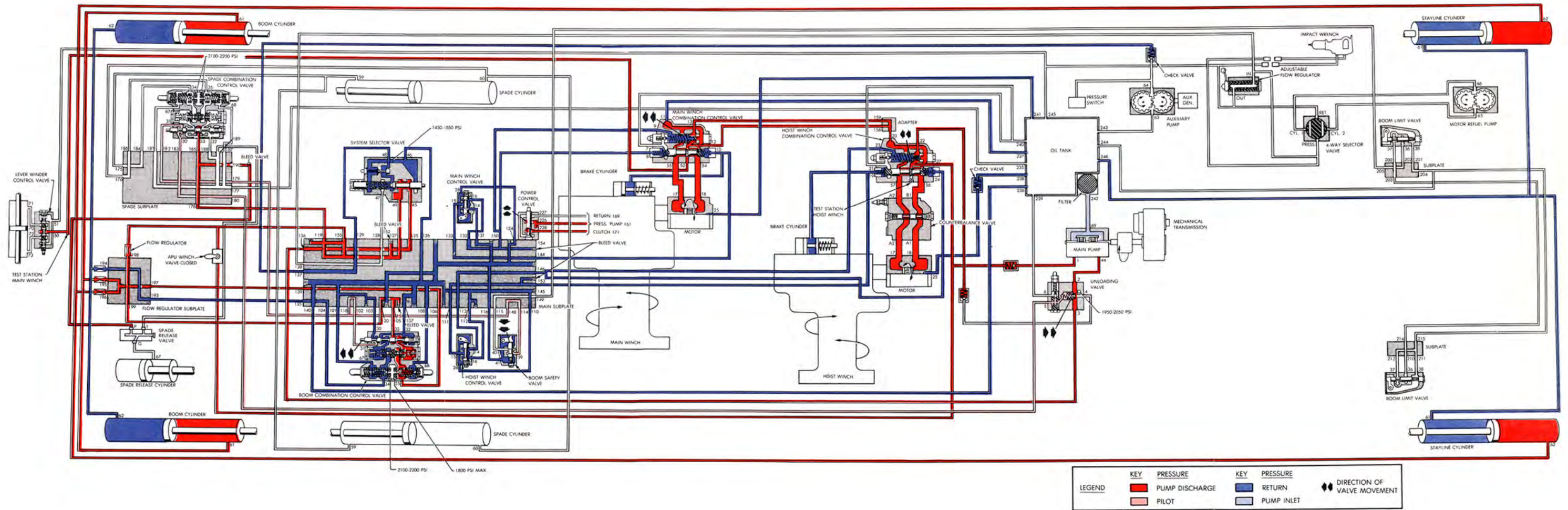




FO-6. Winch, Power Takeoff, and Hoist System—Schematic Diagram—Hoisting Boom—Forward.



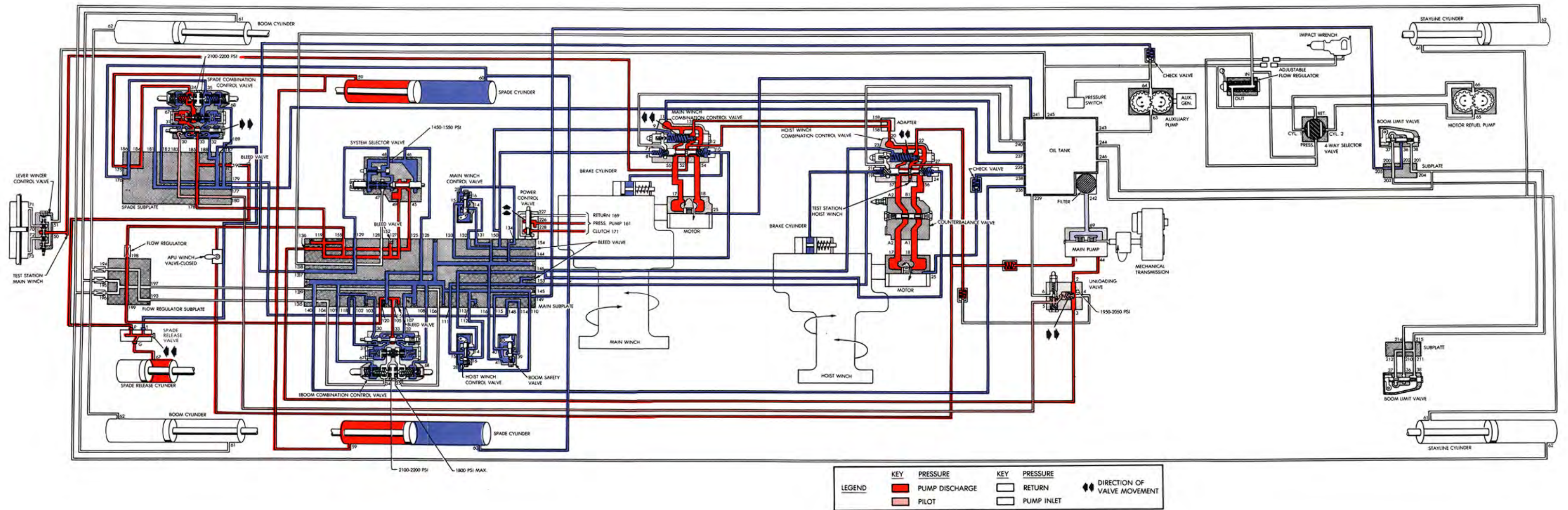




FO-7. Winch, Power Takeoff, and Hoist System—Schematic Diagram—Hoisting Boom—Retract/Stow.



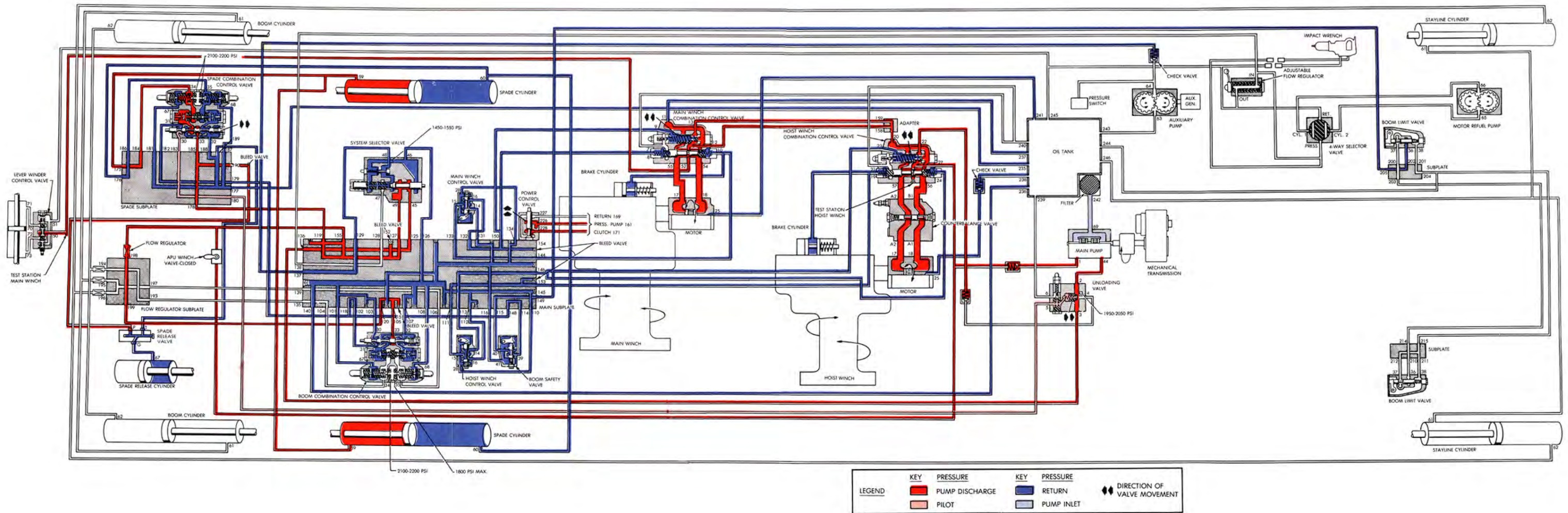




FO-8. Winch, Power Takeoff, and Hoist System—Schematic Diagram—Spade—Release.



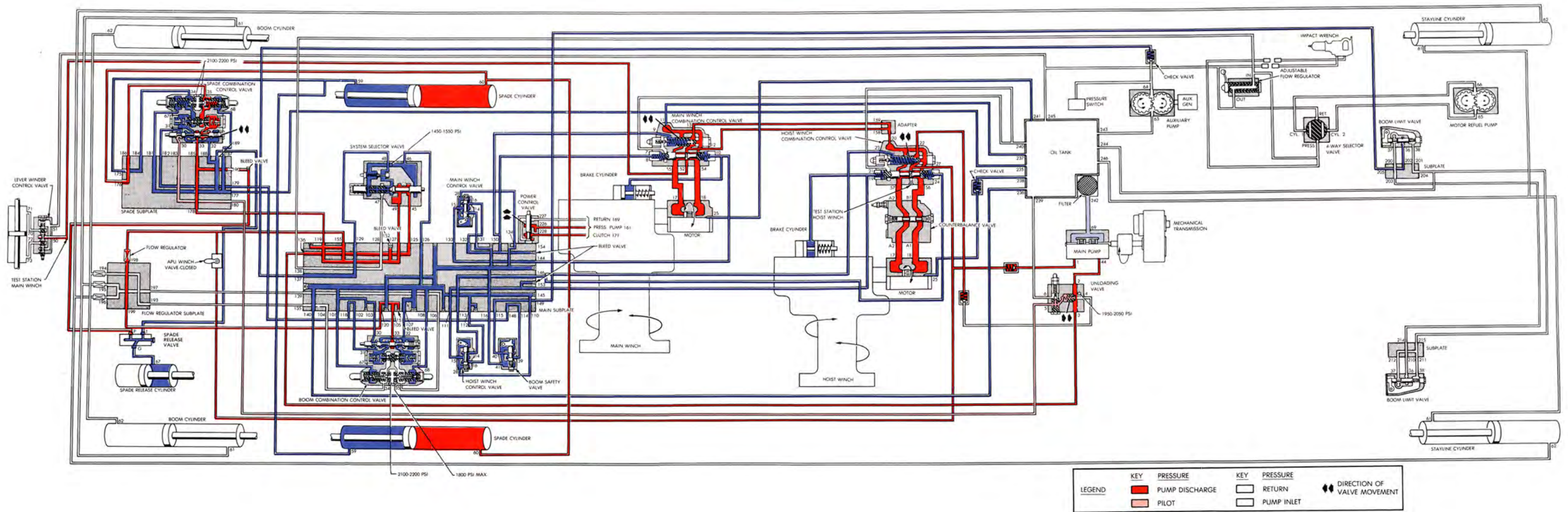




FO-9. Winch, Power Takeoff, and Hoist System—Schematic Diagram—Spade—Raise.



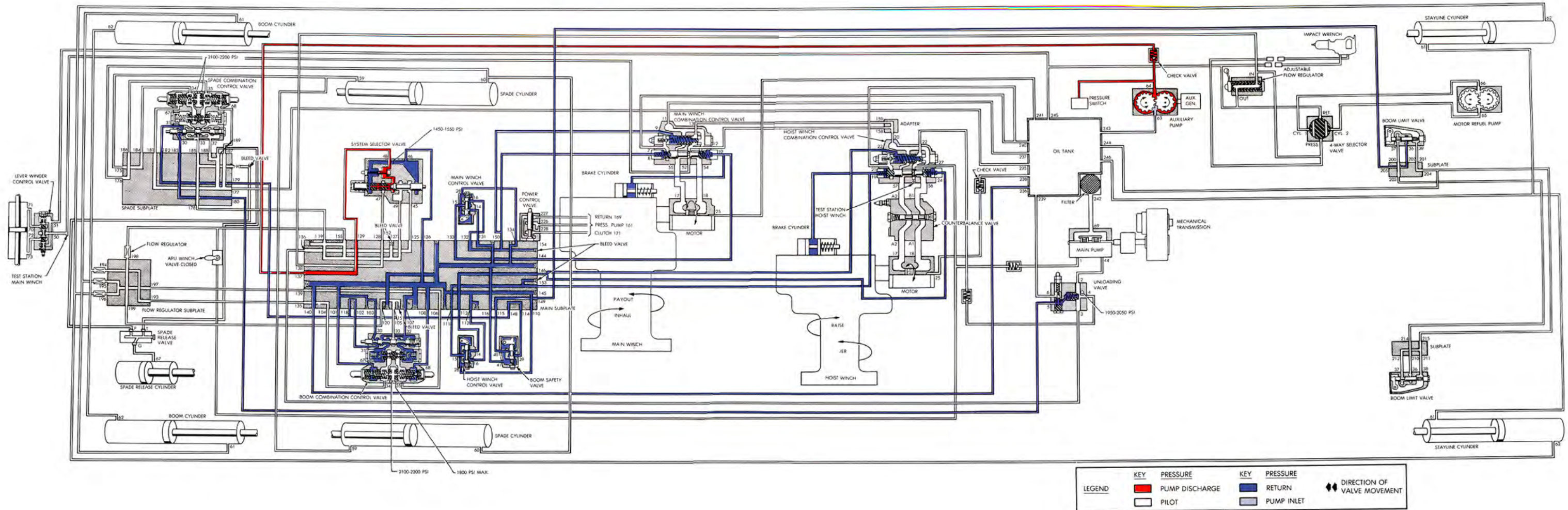




FO-10. Winch, Power Takeoff, and Hoist System—Schematic Diagram—Spade—Lower.



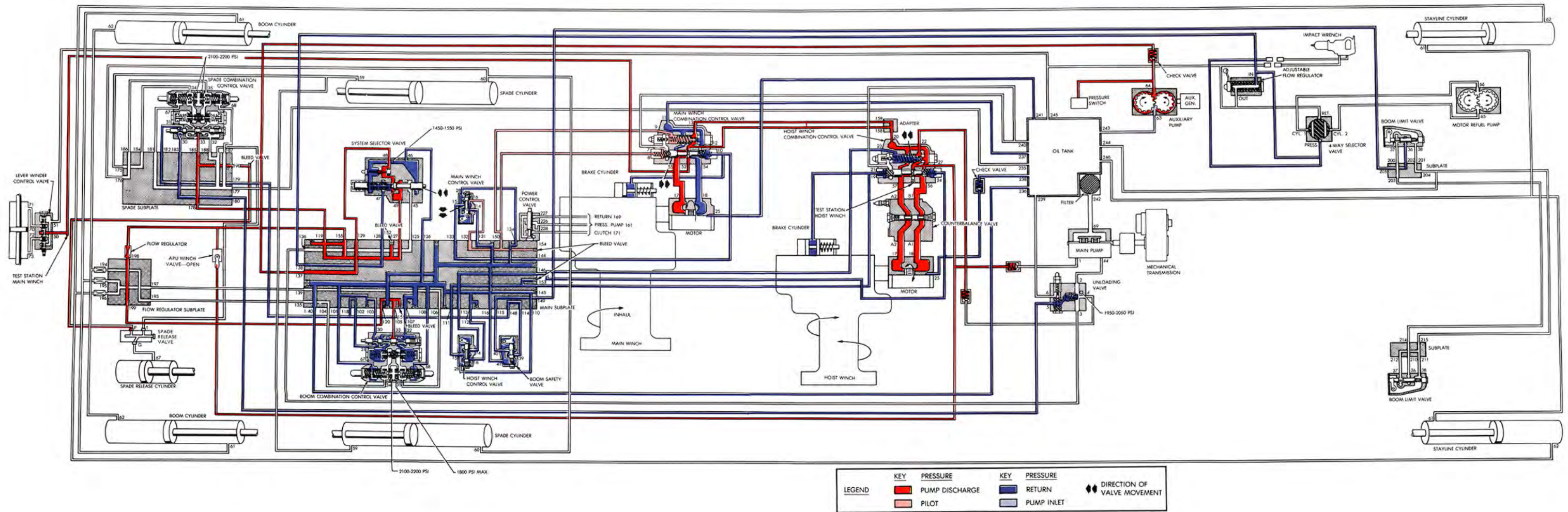




FO-11. Auxiliary Hydraulic System—Schematic Diagram—Idling.



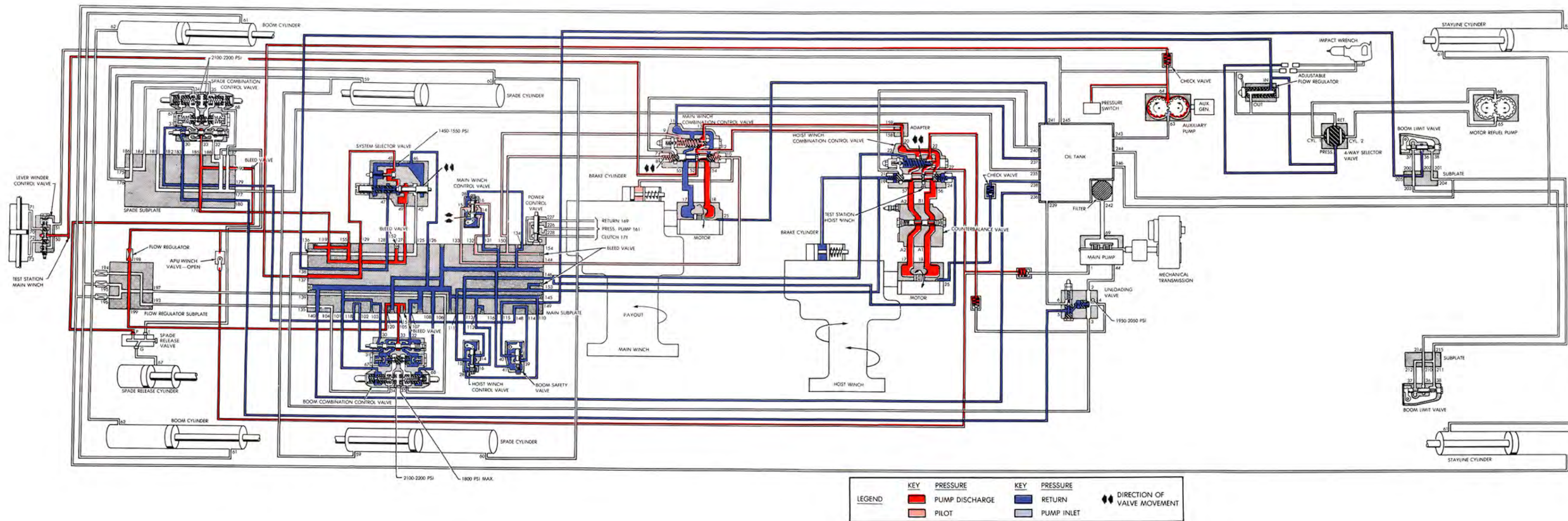




FO-12. Auxiliary Hydraulic System—Schematic Diagram—Main Winch—Inhaul.



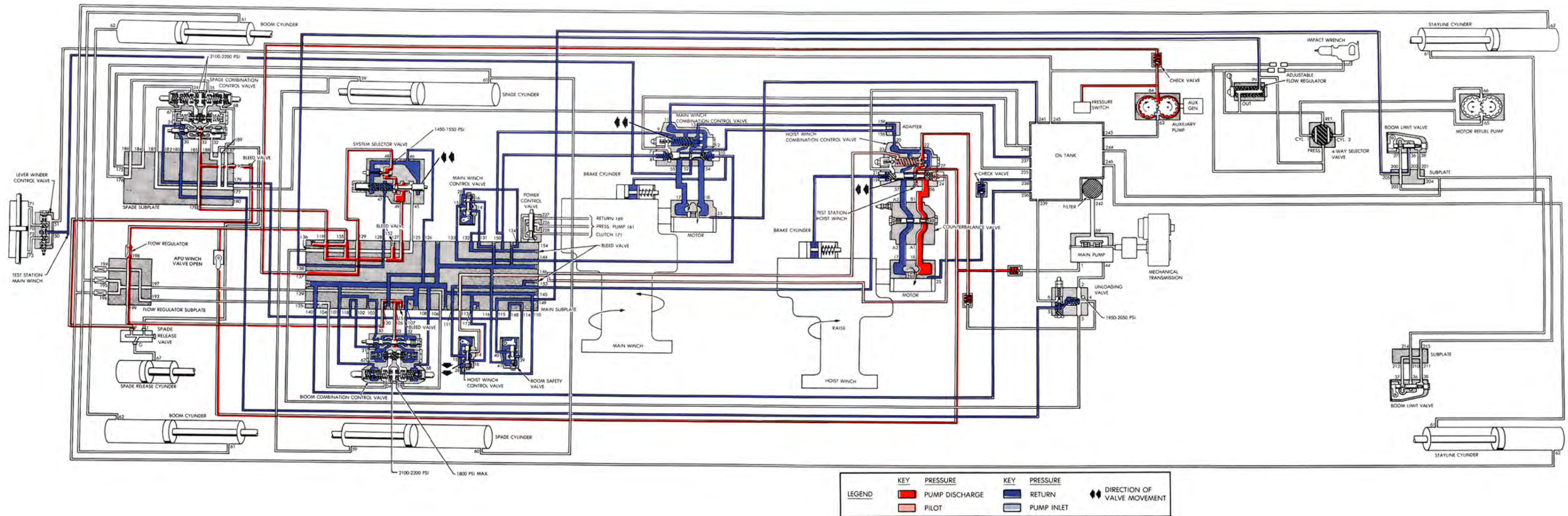




FO-13. Auxiliary Hydraulic System—Schematic Diagram—Main Winch—Payout.



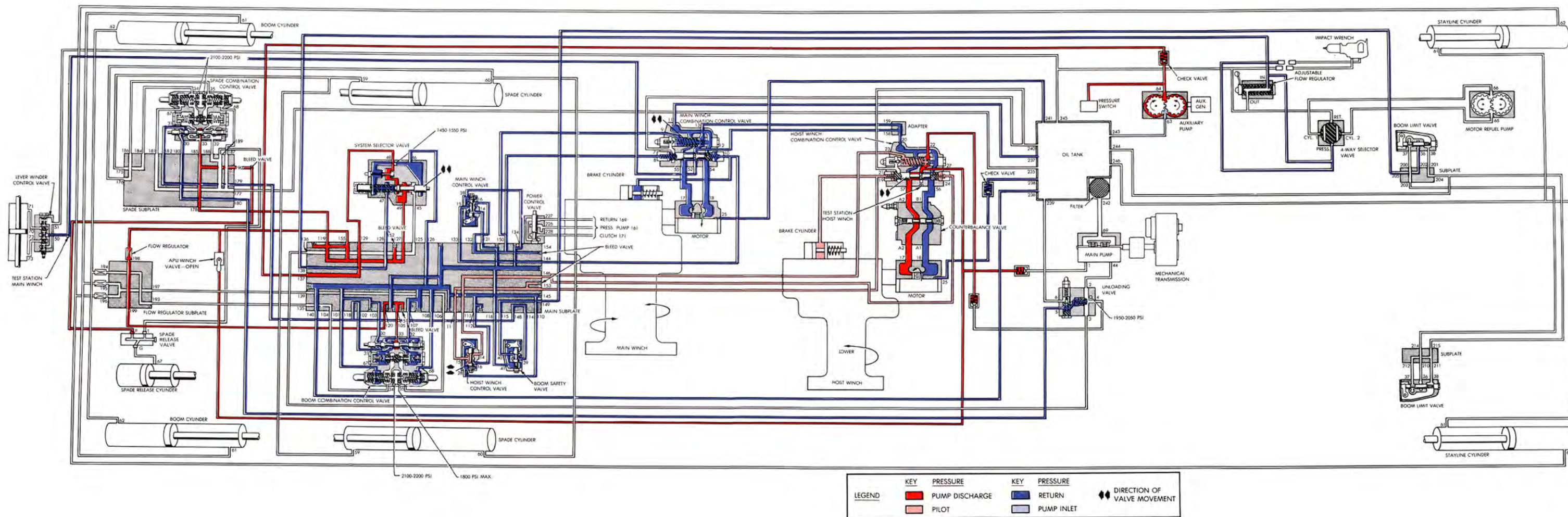




FO-14. Auxiliary Hydraulic System—Schematic Diagram—Hoist Winch—Raise.



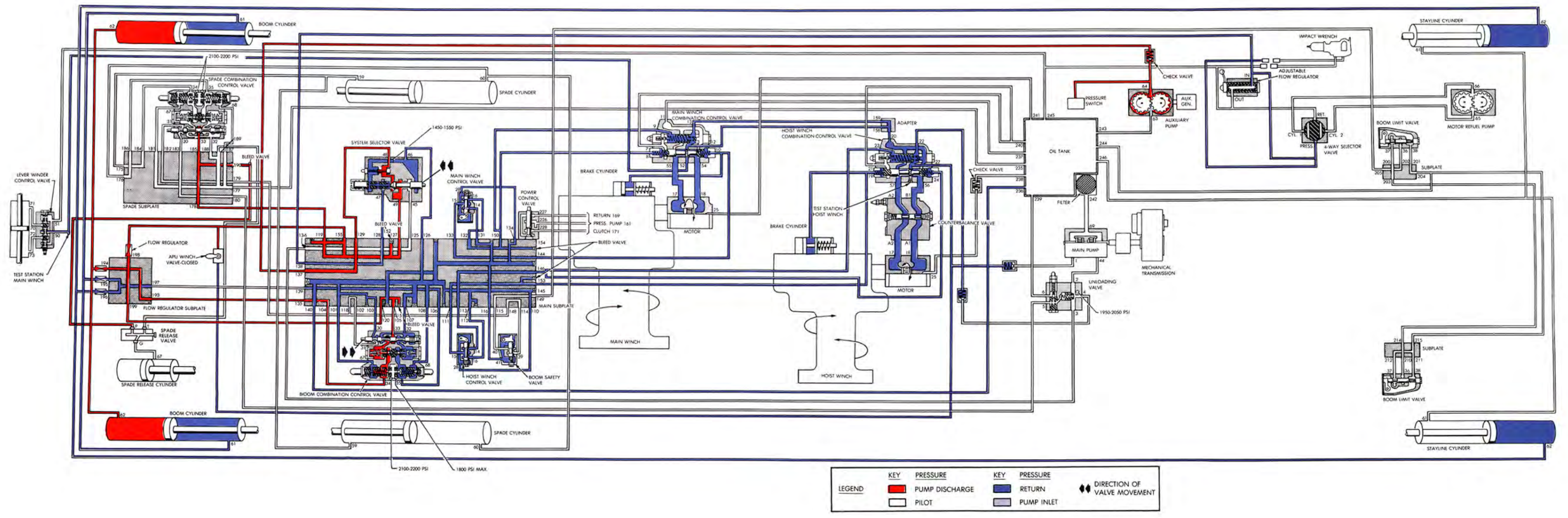




FO-15. Auxiliary Hydraulic System—Schematic Diagram—Hoist Winch—Lower.



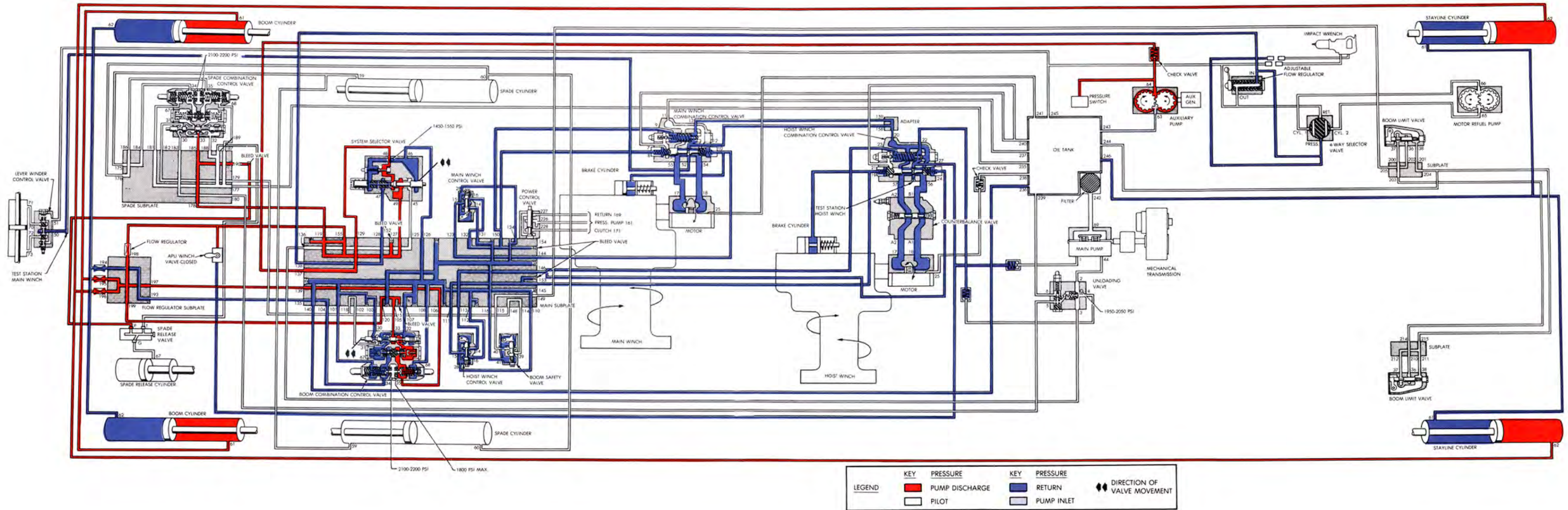




FO-16. Auxiliary Hydraulic System—Schematic Diagram—Hoist Boom—Forward.



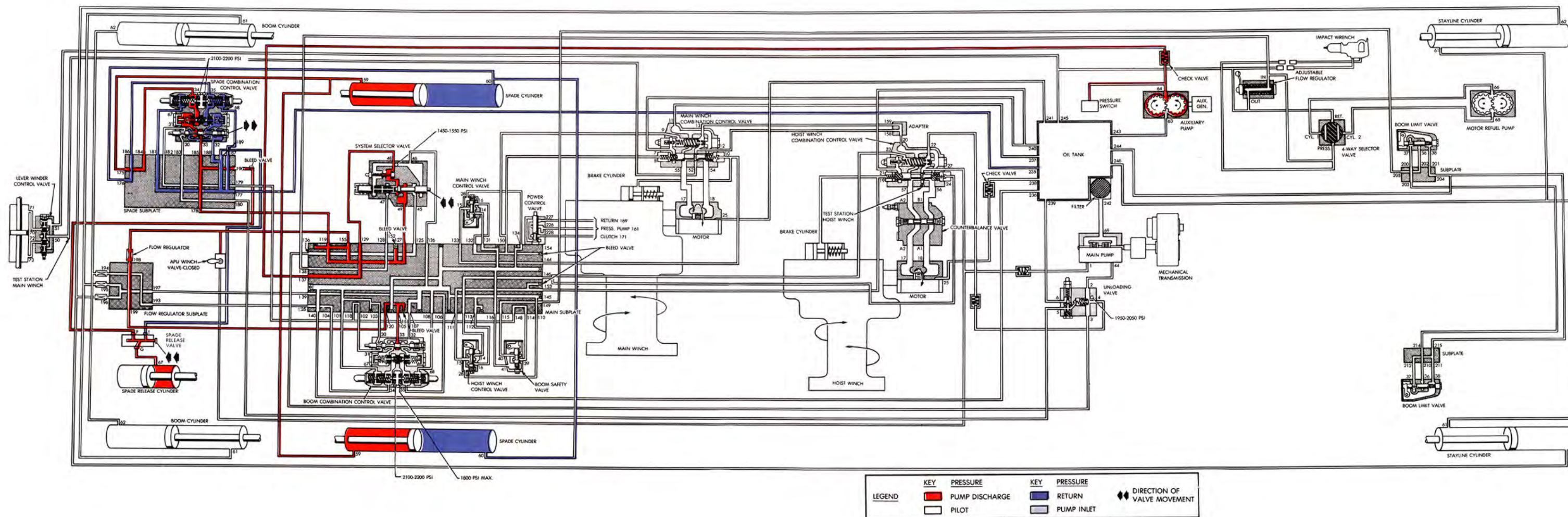




FO-17. Auxiliary Hydraulic System—Schematic Diagram—Hoisting Boom—Retract/Stow.



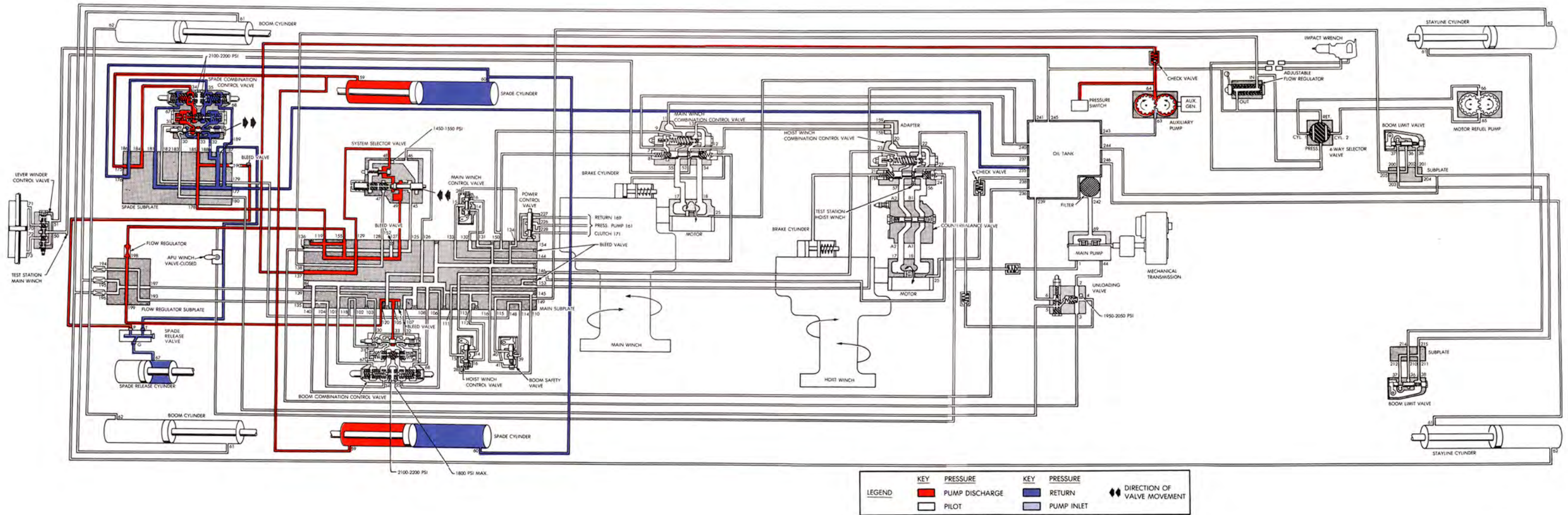




FO-18. Auxiliary Hydraulic System—Schematic Diagram—Spade—Release.



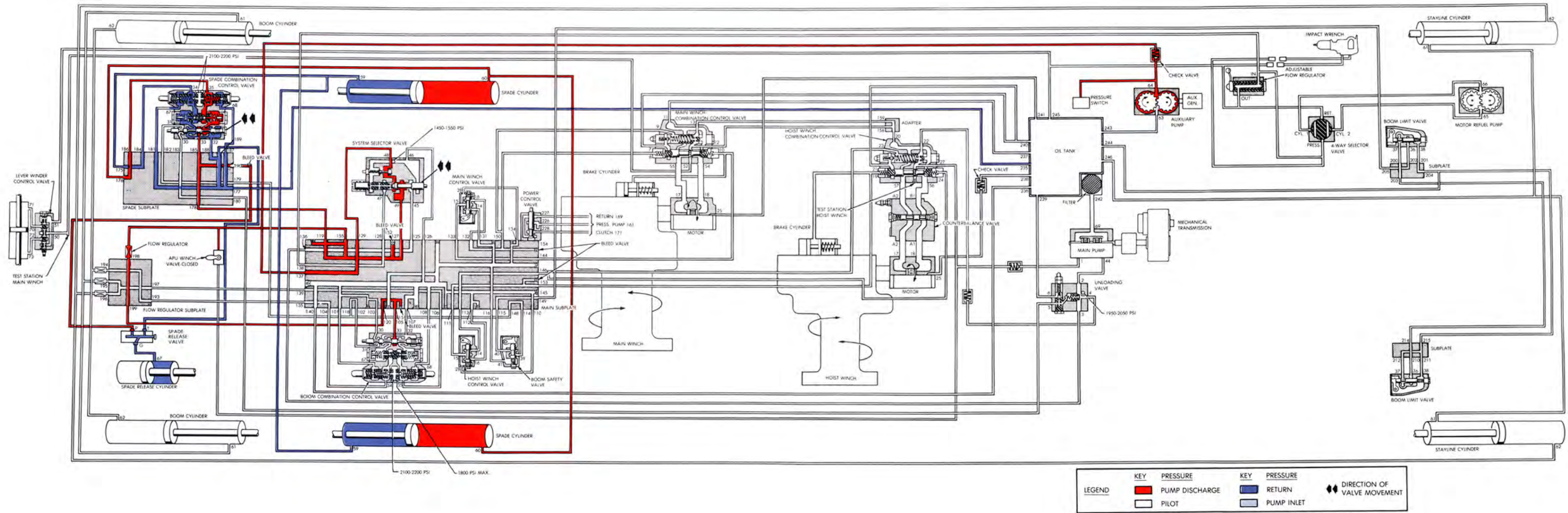




FO-19 . Auxiliary Hydraulic System—Schematic Diagram—Spade—Raise.



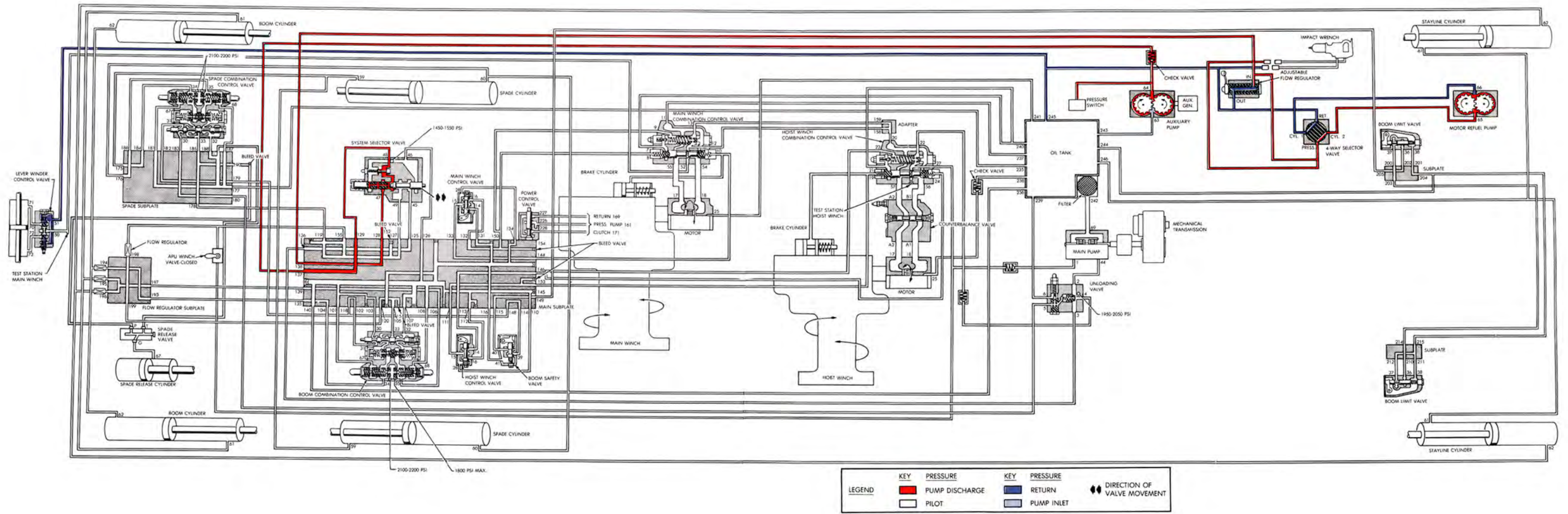




FO-20. Auxiliary Hydraulic System—Schematic Diagram—Spade—Lower.



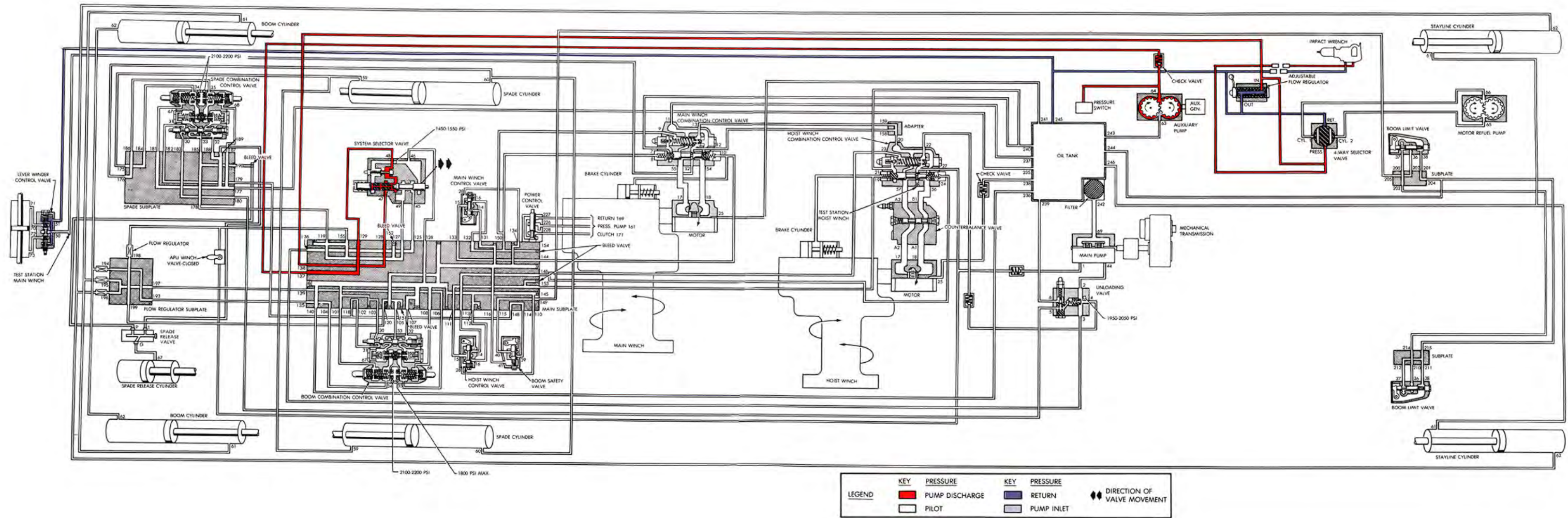




FO-21. Auxiliary Hydraulic System—Schematic Diagram—Refuel.







FO-22. Auxiliary Hydraulic System—Schematic Diagram—Impact Wrench.





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For use of this form, see AR 25-30; the proponent agency is ODISC4.							
TO: (Forward to proponent of publication or form) (Include ZIP Code) AMSTALC-LMIT / TECH PUBS, TACOM-RI 1 Rock Island Arsenal Rock Island, IL 61299-7630						FROM: (Activity and location) (Include ZIP Code)  Your mailing address	
<b>PART I – ALL PUBLICATIONS (EXCEPT RPSTL AND SC/SM) AND BLANK FORMS</b>							
PUBLICATION/FORM NUMBER TM 9-2350-256-34				DATE 15 July 2005	TITLE Recovery Vehicle, Full Tracked: Medium, M88A1		
ITEM NO.	PAGE NO.	PARA-GRAPH	LINE NO. *	FIGURE NO.	TABLE NO.	RECOMMENDED CHANGES AND REASON (Provide exact wording of recommended changes, if possible).	
	0004 00-2	4-7				Wrong POC is listed.  <div style="border: 1px solid black; padding: 20px; text-align: center; font-size: 48px; font-weight: bold; transform: rotate(-10deg);">SAMPLE</div>	
<i>*Reference to line numbers within the paragraph or subparagraph.</i>							
TYPED NAME, GRADE OR TITLE  Your Name				TELEPHONE EXCHANGE/AUTOVON, PLUS EXTENSION		SIGNATURE  Your Signature	

<b>TO:</b> <i>(Forward direct to addressee listed in publication)</i> AMSTALC-LMIT / TECH PUBS, TACOM-RI 1 Rock Island Arsenal Rock Island, IL 61299-7630	<b>FROM:</b> <i>(Activity and location) (Include ZIP Code)</i> Your address	<b>DATE</b> Date you filled out this form
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**PART II – REPAIR PARTS AND SPECIAL TOOL LISTS AND SUPPLY CATALOGS/SUPPLY MANUALS**

PUBLICATION NUMBER TM 9-2350-256-34	DATE 15 July 2005	TITLE Recovery Vehicle, Full Tracked: Medium, M88A1
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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 Your Name	TELEPHONE EXCHANGE/AUTOVON, PLUS EXTENSION	SIGNATURE Your Signature
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By Order of the Secretary of the Army:

PETER J. SCHOOMAKER  
*General, United States Army*  
*Chief of Staff*

Official:



SANDRA R. RILEY  
*Administrative Assistant to the*  
*Secretary of the Army*  
0517817

DISTRIBUTION: To be distributed in accordance with the initial distribution requirements for IDN: 370947, requirements for TM 9-2350-256-34.



# The Metric System and Equivalents

## Linear Measure

1 centimeter = 10 millimeters = .39 inch  
 1 decimeter = 10 centimeters = 3.94 inches  
 1 meter = 10 decimeters = 39.37 inches  
 1 decameter = 10 meters = 32.8 feet  
 1 hectometer = 10 decameters = 328.08 feet  
 1 kilometer = 10 hectometers = 3,280.8 feet

## Weights

1 centigram = 10 milligrams = .15 grain  
 1 decigram = 10 centigrams = 1.54 grains  
 1 gram = 10 decigrams = .035 ounce  
 1 decagram = 10 grams = .35 ounce  
 1 hectogram = 10 decagrams = 3.52 ounces  
 1 kilogram = 10 hectograms = 2.2 pounds  
 1 quintal = 100 kilograms = 220.46 pounds  
 1 metric ton = 10 quintals = 1.1 short tons

## Liquid Measure

1 centiliter = 10 milliliters = .34 fl. ounce  
 1 deciliter = 10 centiliters = 3.38 fl. ounces  
 1 liter = 10 deciliters = 33.81 fl. ounces  
 1 dekaliters = 10 liters = 2.64 gallons  
 1 hectoliter = 10 dekaliters = 26.42 gallons  
 1 kiloliter = 10 hectoliters = 264.18 gallons

## Square Measure

1 sq. centimeter = 100 sq. millimeters = .155 sq. inch  
 1 sq. decimeter = 100 sq. centimeters = 15.5 sq. inches  
 1 sq. meter (centare) = 100 sq. decimeters = 10.76 sq. feet  
 1 sq. decameter (are) = 100 sq. meters = 1,076.4 sq. feet  
 1 sq. hectometer (hectare) = 100 sq. decameters = 2.47 acres  
 1 sq. kilometer = 100 sq. hectometers = .386 sq. mile

## Cubic Measure

1 cu. centimeter = 1000 cu. millimeters = .06 cu. inch  
 1 cu. decimeter = 1000 cu. centimeters = 61.02 cu. inches  
 1 cu. meter = 1000 cu. decimeters = 35.31 cu. feet

## Approximate Conversion Factors

<i>To change</i>	<i>To</i>	<i>Multiply by</i>	<i>To change</i>	<i>To</i>	<i>Multiply by</i>
inches	centimeters	2.540	ounce-inches	Newton-meters	.007062
feet	meters	.305	centimeters	inches	.394
yards	meters	.914	meters	feet	3.280
miles	kilometers	1.609	meters	yards	1.094
square inches	square centimeters	6.451	kilometers	miles	.621
square feet	square meters	.093	square centimeters	square inches	.155
square yards	square meters	.836	square meters	square feet	10.764
square miles	square kilometers	2.590	square meters	square yards	1.196
acres	square hectometers	.405	square kilometers	square miles	.386
cubic feet	cubic meters	.028	square hectometers	acres	2.471
cubic yards	cubic meters	.765	cubic meters	cubic feet	35.315
fluid ounces	milliliters	29.573	cubic meters	cubic yards	1.308
pints	liters	.473	milliliters	fluid ounces	.034
quarts	liters	.946	liters	pints	2.113
gallons	liters	3.785	liters	quarts	1.057
ounces	grams	28.349	liters	gallons	.264
pounds	kilograms	.454	grams	ounces	.035
short tons	metric tons	.907	kilograms	pounds	2.205
pound-feet	Newton-meters	1.356	metric tons	short tons	1.102
pound-inches	Newton-meters	.11296			

## Temperature (Exact)

°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C
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PIN: 078750-000