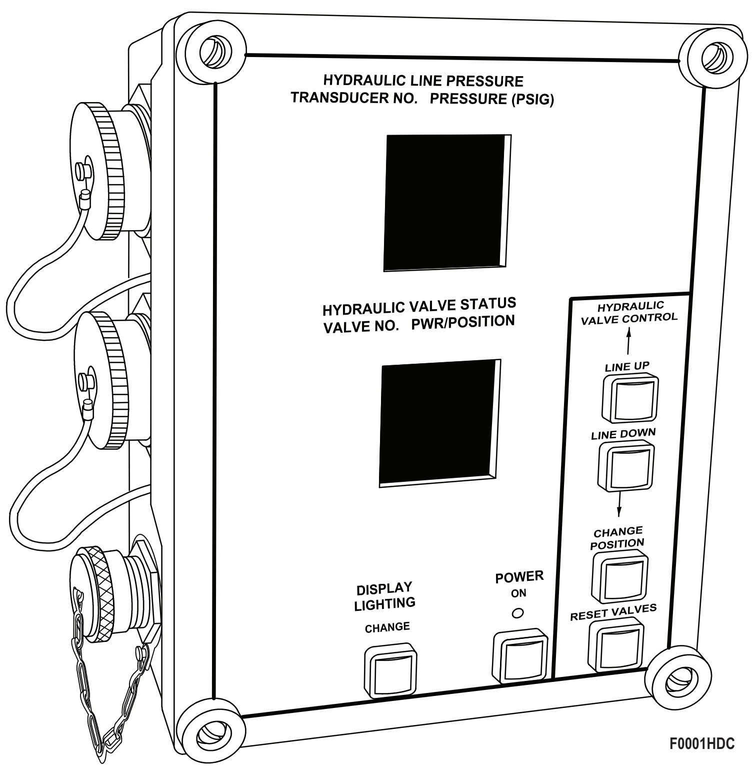
# *TM 5-2350-378-23&P

TECHNICAL MANUAL
FIELD MAINTENANCE MANUAL
INCLUDING REPAIR PARTS AND SPECIAL TOOLS LIST
FOR

# HYDRAULIC DIAGNOSTIC CENTER (HDC) SUPPORTING ARMORED COMBAT EARTHMOVER (ACE), M9 NSN 2350-00-808-7100




* **SUPERSEDURE NOTICE** - TM 5-2350-378-23&P dated 30 June 2012 supersedes TM 5-2350-378-24&P dated 26 December 2008, including all changes.

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

**HEADQUARTERS, DEPARTMENT OF THE ARMY**
**30 JUNE 2012**

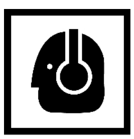
# WARNING SUMMARY

This warning summary contains general safety warnings and hazardous materials warnings that must be understood and applied during operation and maintenance of this equipment. Failure to observe these precautions could result in serious injury or death to personnel. Also included are explanations of safety and hazardous materials icons used within the technical manual.

## FIRST AID DATA

For information on first aid, refer to FM 4-25.11.

## EXPLANATION OF SAFETY WARNING ICONS

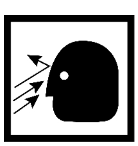


**EAR PROTECTION** - headphones over ears show that noise level will harm ears.

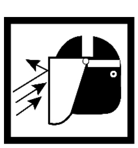
**ELECTRICAL** - electrical wire to arm with electricity symbol running through human body shows that shock hazard is present.

**ELECTRICAL** - electrical wire to hand with electricity symbol running through hand shows that shock hazard is present.

**FALLING PARTS** - arrow bouncing off human shoulder and head shows that falling parts present a danger to life or limb.



**FLYING PARTICLES** - arrows bouncing off face shows that particles flying through the air will harm face.



**FLYING PARTICLES** - arrows bouncing off face with face shield show that particles flying through the air will harm face.

**HEAVY OBJECT** - human figure stooping over heavy object shows physical injury potential from improper lifting technique.

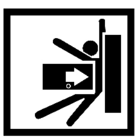
# WARNING SUMMARY - Continued

## EXPLANATION OF SAFETY WARNING ICONS - Continued

**HEAVY PARTS** - hand with heavy object on top shows that heavy parts can crush and harm.

**HEAVY PARTS** - foot with heavy object on top shows that heavy parts can crush and harm.

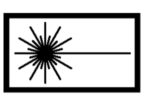
**HEAVY PARTS** - heavy object on human figure shows that heavy parts present a danger to life or limb.



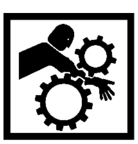
**HEAVY PARTS** - heavy object pinning human figure against wall shows that heavy, moving parts present a danger to life or limb.

**HELMET PROTECTION** - arrow bouncing off head with helmet shows that falling parts present a danger.

**HOT AREA** - hand over object radiating heat shows that part is hot and can burn.



**LASER LIGHT** - laser light hazard symbol indicates extreme danger for eyes from laser beams and reflections.



**MOVING PARTS** - human figure with arm caught between gears shows that the moving parts of the equipment present a danger to life or limb.

**MOVING PARTS** - hand with fingers caught between gears shows that the moving parts of the equipment present a danger to life or limb.

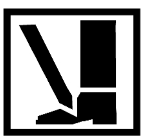
# WARNING SUMMARY - Continued

## EXPLANATION OF SAFETY WARNING ICONS - Continued

**MOVING PARTS** - hand with fingers caught between rollers shows that the moving parts of the equipment present a danger to life or limb.

**SHARP OBJECT** - pointed object in hand shows that a sharp object presents a danger to limb.

**SHARP OBJECT** - pointed object in hand shows that a sharp object presents a danger to limb.

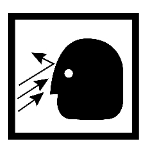


**SHARP OBJECT** - pointed object in foot shows that a sharp object presents a danger to limb.

**SLICK FLOOR** - wavy line on floor with legs prone shows that slick floor presents a danger for falling.

## GENERAL SAFETY WARNINGS DESCRIPTION

### WARNING

High oil pressure is present in the M9 hydraulic system. Do not disconnect any hydraulic system component unless hydraulic system pressure has been relieved. After hydraulic system has been relieved, wait at least four minutes before disconnecting any hose or fitting. Ensure each of the hydraulic control levers is moved several times through all positions and the hydraulic tank dipstick is slowly loosened to relieve pressure. Failure to comply may result in severe injury or death to personnel.

# WARNING SUMMARY - Continued

## GENERAL SAFETY WARNINGS DESCRIPTION - Continued

### WARNING

Do not operate ejector when personnel are in bowl. Do not work in bowl unless ejector lock is engaged. Failure to comply may result in severe injury or death to personnel.

Do not stand or work in bowl area unless ejector lock is engaged. Do not stand in bowl to observe roller guide travels. Failure to comply may result in severe injury or death to personnel.

When folding blade, work on blade latches from side of vehicle only. Do not stand in front of dozer blade while retracting ejector. Failure to comply may result in severe injury or death to personnel.

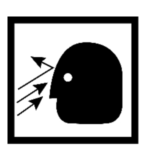
### WARNING

Do not work under vehicle unless hull is on jack stands and apron lockpins are installed. Failure to comply may result in severe injury or death to personnel.

### WARNING


Before performing any hydraulic troubleshooting in the bowl, move the ejector forward and disable it by disconnecting the ejector cylinder or by engaging the ejector lock. Failure to comply may result in severe injury to personnel.

### WARNING




High-pressure nitrogen gas is used in this equipment. Keep hands and face away from valves and hose ends. Failure to comply may result in severe injury or death to personnel.

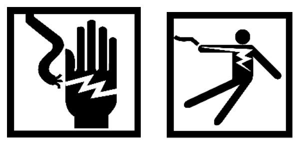
# WARNING SUMMARY - Continued

## GENERAL SAFETY WARNINGS DESCRIPTION - Continued

**WARNING**

Ensure right main hydraulic pressure inhibit valve V22 is fully opened prior to starting vehicle. A fully or partially closed valve will cause immediate high pressure. Failure to comply may result in damage to equipment and injury to personnel.

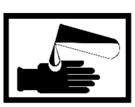
**WARNING**



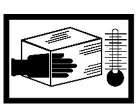
Ensure that vehicle power is off and battery disconnected. Remove all jewelry, such as rings, dog tags, bracelets, etc. If jewelry or disconnected battery ground cable contacts battery positive terminal, a direct short will result, causing instant heating of tools, tool damage, battery damage, or battery explosion. Failure to comply may result in severe injury or death.

## EXPLANATION OF HAZARDOUS MATERIALS ICONS AND DESCRIPTIONS

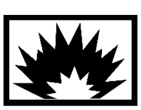
**BIOLOGICAL** - abstract symbol bug shows that a material may contain bacteria or viruses that present a danger to life or health.



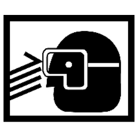
**CHEMICAL** - drops of liquid on hand shows that the material will cause burns or irritation to human skin or tissue.



**CRYOGENIC** - hand in block of ice shows that the material is extremely cold and can injure human skin or tissue.



**EXPLOSION** - rapidly expanding symbol shows that the material may explode if subjected to high temperatures, sources of ignition, or high pressure.



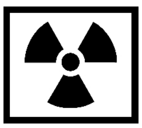
**EYE PROTECTION** - person with goggles shows that the material will injure the eyes.

# WARNING SUMMARY - Continued

## EXPLANATION OF HAZARDOUS MATERIALS ICONS AND DESCRIPTIONS - Continued

**FIRE** - flame shows that a material may ignite and cause burns.

**POISON** - skull and crossbones shows that a material is poisonous or is a danger to life.



**RADIATION** - three circular wedges shows that the material emits radioactive energy and can injure human tissue.

**VAPOR** - human figure in a cloud shows that material vapors present a danger to life or health.

# WARNING SUMMARY - Continued

## HAZARDOUS MATERIALS DESCRIPTIONS

### WARNING

**CARBON MONOXIDE**

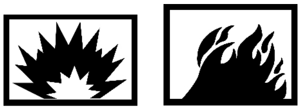
- Carbon monoxide is a colorless, odorless, deadly poison which, when breathed, deprives the body of oxygen and causes suffocation. Exposure to air containing carbon monoxide produces symptoms of headache, dizziness, loss of muscular control, apparent drowsiness, and coma. Permanent brain damage or death to personnel can result from sever exposure.
- Carbon monoxide occurs in exhaust fumes of fuel-burning heaters and internal combustion engines. Carbon monoxide can become 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.

    a. DO NOT operate heater or engine in enclosed area without adequate ventilation.
    b. DO NOT idle engine without adequate ventilation.
    c. DO NOT drive machine with inspection plates or cover plates removed.
    d. BE ALERT for exhaust poisoning symptoms. They are:
        - Headache
        - Dizziness
        - Sleepiness
        - Loss of muscular control
    e. If you see another person with exhaust poisoning symptoms:
        - Remove person from area
        - Expose to fresh air
        - Keep person warm
        - DO NOT permit physical exercise
        - Administer Cardiopulmonary Resuscitation (CPR) if necessary
        - Notify a Medic
    f. BE AWARE. The field protective mask for Chemical, Biological, Radiological, and Nuclear (CBRN) protection will not protect you from carbon monoxide poisoning.

# WARNING SUMMARY - Continued

## HAZARDOUS MATERIALS DESCRIPTIONS - Continued

**WARNING**



**FUEL**

Fuel is a combustible material. Do not smoke or allow sparks or open flames into areas where fuel is present. Failure to comply may result in severe injury or death to personnel. If injured, seek medical attention immediately.

**WARNING**

**NITROGEN GAS**

Do not breathe nitrogen gas. Failure to comply may result in severe injury or death to personnel.

# LIST OF EFFECTIVE PAGES/WORK PACKAGES

NOTE: TM 5-2350-378-23&P dated 30 June 2012 supersedes TM 5-2350-378-24&P dated 26 December 2008, including all changes. Zero in the "Change No." column indicates an original page or work package.

Date of issue for the original manual is:

Original 30 June 2012

**TOTAL NUMBER OF PAGES FOR FRONT AND REAR MATTER IS 74 AND TOTAL NUMBER OF WORK PACKAGES IS 56 CONSISTING OF THE FOLLOWING:**

| Page/WP No. | Change No. | Page/WP No. | Change No. |
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| Warning Summary (8 pages) | 0 | WP 0029 (4 pages) | 0 |
| Technical Manual Title Block Page | 0 | WP 0030 (4 pages) | 0 |
| Table of Contents (18 pages) | 0 | WP 0031 (8 pages) | 0 |
| How to Use This Manual (2 pages) | 0 | WP 0032 (10 pages) | 0 |
| Chapter 1 Title Page | 0 | WP 0033 (4 pages) | 0 |
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| WP 0025 (32 pages) | 0 | Inside Back Cover | 0 |
| WP 0026 (2 pages) | 0 | Back Cover | 0 |
| WP 0027 (4 pages) | 0 | | |

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., 30 JUNE 2012

TECHNICAL MANUAL
FIELD MAINTENANCE MANUAL
INCLUDING REPAIR PARTS AND SPECIAL TOOLS LIST
FOR

# HYDRAULIC DIAGNOSTIC CENTER (HDC) SUPPORTING ARMORED COMBAT EARTHMOVER (ACE), M9 NSN 2350-00-808-7100

**REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS**

You can help improve this publication. If you find any errors, or if you would like to recommend any improvements to the procedures in this publication, please let us know. The preferred method is to submit your DA Form 2028 (Recommended Changes to Publications and Blank Forms) through the Internet on the TACOM Unique Logistics Support Applications (TULSA) Web site. The Internet address is https://tulsa.tacom.army.mil. Access to all applications requires CAC authentication, and you must complete the Access Request form the first time you use it. The DA Form 2028 is located under the TULSA Applications on the left-hand navigation bar. Fill out the form and click on SUBMIT. Using this form on the TULSA Web site will enable us to respond more quickly to your comments and to better manage the DA Form 2028 program. You may also mail, e-mail, or fax your comments or DA Form 2028 directly to the U.S. Army TACOM Life Cycle Management Command. The postal mail address is U.S. Army TACOM Life Cycle Management Command, ATTN: AMSTA-LCL-MPP/ TECH PUBS, MS 727, 6501 E. 11 Mile Road, Warren, MI 48397-5000. The e-mail address is tacomlcmc.daform2028@us.army.mil. The fax number is DSN 786-1856 or Commercial (586) 282-1856. A reply will be furnished to you.

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# HOW TO USE THIS MANUAL

This manual is designed to help you operate and maintain the Hydraulic Diagnostic Center (HDC) supporting the Armored Combat Earthmover (ACE), M9. Listed below are special features which have been included to make it easier to locate and use the information you need.

## WARNINGS, CAUTIONS, AND NOTES

Read all WARNINGS, CAUTIONS, and NOTES before performing any procedure.

Warnings, cautions, notes, subject headings, and other essential information are printed in **BOLD** type, making them easier to see.

## GENERAL INFORMATION

This manual is divided into CHAPTERS and WORK PACKAGES. For a specific Chapter or Work Package, refer to the TABLE OF CONTENTS.

- The TABLE OF CONTENTS lists the titles of each Chapter and Work Package.
- CHAPTER 1 provides General Information, Equipment Description, and Theory of Operation.
- CHAPTER 2 provides Troubleshooting Procedures.
- CHAPTER 3 provides PMCS Introduction and PMCS Maintenance Instructions.
- CHAPTER 4 provides Maintenance Instructions.
- CHAPTER 5 provides Parts Information.
- CHAPTER 6 provides Supporting Information. The Supporting Information includes tables listing **References** used in this manual, a Maintenance Allocation Chart **(MAC)**, a listing of **Expendable and Durable Items**, and a listing of **Tools** and **Mandatory Replacement Parts** used in this manual.

This manual also provides text that works in conjunction with illustrations showing:

- Components, controls, and indicators.
- How to operate the vehicle and its components.
- How to remove, install, and maintain components.
- How to clean and inspect vehicle components.

The illustrations throughout this manual contain numerical callouts pointing to various components mentioned in the procedural steps. Replacement parts must be discarded after removal and replaced with a new part, which is listed in the Materials/Parts section located at the beginning of the task in the Initial Setup.

Prior to performing any maintenance functions on the HDC supporting the M9 ACE, ALWAYS do the following:

- Read and follow all WARNINGS in all work packages.
- Read the Safety Summary.
- Read the Equipment Description and Data located in Chapter 1.
- Read completely through the maintenance procedure to familiarize yourself with the procedure and the affected parts before beginning work.

# HOW TO USE THIS MANUAL - Continued

## GENERAL INFORMATION - Continued

The troubleshooting section is set up either by how a physical problem is occurring or how an active or stored trouble code is read from a diagnostic tool. Following a prescribed flow path through making decisions will lead you to a solution to remedy the problem. RPSTL (found in the Parts Information chapter) is to be used to help find needed parts for procurement. The RPSTL lists and authorizes spares and repair parts; special tools; special Test, Measurement, and Diagnostic Equipment (TMDE); and other special support equipment required for performance of maintenance on the HDC supporting the M9 ACE. It authorizes the requisitioning, issue, and disposition of spares, repair parts, and special tools as indicated by the Source, Maintenance, and Recoverability (SMR) codes.

## METRIC SYSTEM

The equipment described herein contains metric components and requires metric, common, and special tools. Therefore, metric units and English units will be used throughout this publication. An English-to-Metric conversion table is included as the last page of this manual inside the back cover.

# CHAPTER 1

# GENERAL INFORMATION, EQUIPMENT DESCRIPTION, AND THEORY OF OPERATION

# FIELD MAINTENANCE
# GENERAL INFORMATION

## SCOPE

**Type of Manual:** Field Maintenance

**Model Number and Equipment Name:**

M9 ACE HDC - Armored Combat Earthmover, Hydraulic Diagnostic Center.

**Purpose of Equipment:** Reduce maintenance time when vehicle's hydraulic system fails.

## MAINTENANCE FORMS, RECORDS, AND REPORTS

Department of the Army forms and procedures used for equipment maintenance will be those prescribed by DA PAM 750-8, The Army Maintenance Management System (TAMMS).

## REPORTING EQUIPMENT IMPROVEMENT RECOMMENDATIONS (EIR)

If your Hydraulic Diagnostic Center (HDC) needs improvement, let us know. Send us an EIR. You, the user, are the only one who can tell us what you do not like about your equipment. Let us know why you do not like the design or performance. If you have Internet access, the easiest and fastest way to report problems or suggestions is to follow the instructions and links below:

For ALL non-Aviation/Missile Warranty, EIR and PQDRs must be submitted through the Web Product Quality Deficiency Reporting (PQDR) site. The Web PQDR site is: http://www.nslcptsmh.csd.disa.mil/webpqdr/webpqdr.htm. New accounts can be established at the following address: http://www.nslcptsmh.csd.disa.mil/accessforms/uarform.htm.

You may also submit your information using an SF 368 (Product Quality Deficiency Report). You can send your SF 368 using e-mail, regular mail, or fax using the addresses/fax numbers specified in DA PAM 750-8, The Army Maintenance Management System (TAMMS) Users Manual. We will send you a reply.

## CORROSION PREVENTION AND CONTROL (CPC)

Corrosion prevention and control (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. Corrosion specifically occurs with metals. It is an electrochemical process that causes the degradation of metals. It is commonly caused by exposure to moisture, acids, bases, or salts. An example is the rusting of iron. Corrosion damage in metals can be seen, depending on the metal, as tarnishing, pitting, fogging, surface residue, and/or cracking. Plastics, composites, and rubber can also degrade. Degradation is caused by thermal (heat), oxidation (oxygen), solvation (solvents), or photolytic (light, typically UV) processes. The most common exposures are excessive heat or light. Damage from these processes will appear as cracking, softening, swelling, and/or breaking.

SF Form 368, Product Quality Deficiency Report, should be submitted to the address specified in DA PAM 750-8, The Army Maintenance Management System (TAMMS) Users Manual.

## DESTRUCTION OF MILITARY EQUIPMENT TO PREVENT ENEMY USE

When the tactical situation requires that Army materiel be abandoned, refer to TM 750-244-6, Procedures for Destruction of Tank-Automotive Equipment to Prevent Enemy Use.

## PREPARATION FOR STORAGE OR SHIPMENT

When not in use, stow HDC control box in stowage fixture with front of control box facing towards the rear wall and electrical connectors at top. To secure HDC control box in stowed position, hand-tighten wing nuts against retainer bar on threaded rods.

## LIST OF ABBREVIATIONS/ACRONYMS

The following abbreviations/acronyms are used in this manual.

| Term | Definition |
|---|---|
| ACE | Armored Combat Earthmover |
| ADPTR | Adapter |
| AEPS | Army Electronic Product Support |
| AWG | American Wire Gauge |
| BIT | Binary Digit |
| BIT | Built-In Test |
| °C | Centigrade, Celsius |
| CAGEC | Commercial and Government Entity Code |
| cm | Centimeter(s) |
| DA PAM | Department of the Army Pamphlet |
| DC | Direct Current |
| DCV | Directional Control Valve |
| EMP | Electromagnetic Pulse |
| °F | Fahrenheit |
| FLTR | Filter |
| FO | Foldout |
| FP | Foldout Page |
| FWD | Forward |
| gal. | Gallon(s) |
| gpm | Gallons per Minute |
| HCI | Hardness Critical Item |
| HDC | Hydraulic Diagnostic Center |
| HYDR | Hydraulic |
| in. | Inch(es) |
| INTMD | Intermediate |
| kg | Kilogram(s) |
| km/h | Kilometers per Hour |
| kPa | Kilopascal(s) |
| L | Liter(s) |
| lb | Pound(s) |
| LCD | Liquid Crystal Display |
| LED | Light Emitting Diode |
| LH | Left-Hand |
| Lpm | Liters per Minute |
| MAC | Maintenance Allocation Chart |
| MANF | Manifold |
| max | Maximum |
| mm | Millimeter(s) |
| mph | Miles per Hour |
| N·m | Newton Meter |
| NC | Normally Closed |
| NIIN | National Item Identification Number |
| NO | Normally Open |
| NPT | National Pipe Thread |

## LIST OF ABBREVIATIONS/ACRONYMS - Continued

| Term | Definition |
|---|---|
| NSN | National Stock Number |
| P/N | Part Number |
| PMCS | Preventive Maintenance Checks and Services |
| psi | Pounds per Square Inch |
| psig | Pounds per Square Inch Gauge |
| PWR | Power |
| qts | Quarts |
| RH | Right-Hand |
| rpm | Revolutions per Minute |
| RPSTL | Repair Parts and Special Tools List |
| SF | Standard Form |
| SMR | Source, Maintenance, and Recoverability |
| SPNSN | Suspension |
| SRA | Specialized Repair Activity |
| STE/ICE-R | Simplified Test Equipment for Internal Combustion Engines - Reprogrammable |
| SUCT | Suction |
| TB | Technical Bulletin |
| TM | Technical Manual |
| TMDE | Test, Measurement, and Diagnostic Equipment |
| TULSA | TACOM Unique Logistics Support Applications |
| UOC | Usable On Code |
| VDC | Volts Direct Current |
| VLV | Valve |
| WP | Work Package |

## QUALITY OF MATERIAL

Material used for replacement, repair, or modification must meet the requirements of this technical manual. If quality of material requirements are not stated in this technical manual, the material must meet the requirements of the drawings, standards, specifications, or approved engineering change proposals applicable to the subject equipment.

## SAFETY, CARE, AND HANDLING

Warnings are listed in the warning summary and before specific steps where they apply in the work package procedures. In addition to these warnings, always keep in mind the following when working on the M9 ACE:

- The hydraulic system operates at pressures up to 4,500 psi (31,028 kPa).
- Ensure the upper apron lockpins are installed any time personnel are working on the apron or dozer blade and any time the apron is raised.
- Never operate the ejector when personnel are in the bowl.
- Always place support stands under the hull before crawling under the vehicle. The vehicle suspension will settle down after engine has been shut off.

## END OF WORK PACKAGE

# FIELD MAINTENANCE
# EQUIPMENT DESCRIPTION AND DATA

## SCOPE

This section contains information that is useful when performing Hydraulic Diagnostic Center (HDC) troubleshooting tasks on the M9 ACE.

## PURPOSE

The HDC is used for troubleshooting the hydraulic system and components.

## CAPABILITIES AND FEATURES

- Highly mobile
- Efficient and accurate
- User Friendly
- Time saving

## EQUIPMENT CHARACTERISTICS, CAPABILITIES, AND FEATURES

The HDC (Figure 1) is used to aid in troubleshooting the M9 ACE's hydraulic system and components. The HDC consists of a control box with a display screen, 20 electrically controlled solenoid valves, three manually controlled valves, and 13 transducers. Four wiring harnesses connect the HDC to the vehicle's hydraulic system's test points (installed prior to use of the HDC, and left in place on the vehicle) and the LED screen. Each of the 20 electronically-controlled valves (V1 through V20) return to their normal operating positions when the HDC control box is shut off or power is disconnected for any other reason. Valves V1 through V20 can be opened and closed by using the LINE UP and LINE DOWN buttons on the display screen to select a valve, then pressing the CHANGE POSITION button to open or close the valve. The control box software allows up to four of the solenoid valves to be powered ON at one time. Pressing the RESET VALVES button returns all valves to their normal vehicle operating position (power OFF).

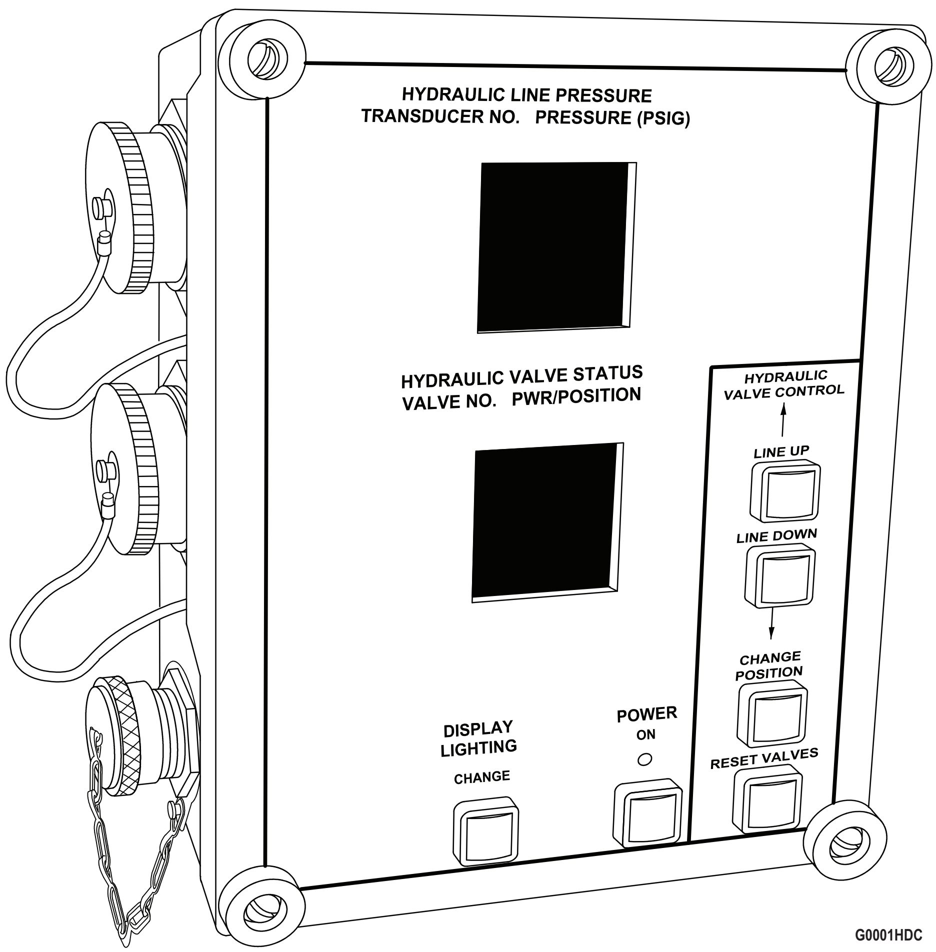



*Figure 1. Hydraulic Diagnostic Center (HDC) Control Box.*

## EQUIPMENT CHARACTERISTICS, CAPABILITIES, AND FEATURES - Continued

| VALVE NO. | PWR | / | POSITION |
|---|---|---|---|
| V1 | OFF | / | OPEN |
| V2 | OFF | / | OPEN |
| V3 | OFF | / | OPEN |
| V4 | OFF | / | OPEN |
| V5 | OFF | / | OPEN |
| V6 | OFF | / | OPEN |
| V7 | OFF | / | OPEN |
| V8 | OFF | / | OPEN |
| V9 | OFF | / | OPEN |
| V10 | OFF | / | OPEN |
| V11 | OFF | / | OPEN |
| V12 | OFF | / | OPEN |
| V13 | OFF | / | OPEN |
| V14 | OFF | / | OPEN |
| V15 | OFF | / | OPEN |
| V16 | OFF | / | OPEN |
| V17 | OFF | / | OPEN |
| V18 | OFF | / | CLOSED |
| V19 | OFF | / | CLOSED |
| V20 | OFF | / | CLOSED |

Valves V21 and V22, located in the bowl area near the high pressure filters, are manually operated and can be operated from outside the bowl, while standing on top of the vehicle.

Valve V23, also manually operated, is located on the front of the Directional Control Valve (DCV) bank in the bowl area, and must be operated while standing in the bowl. This valve is used to interrupt the flow to the ejector. It is recommended for safety purposes that the engine be shut down when operating valve V23.

The diagnostic unit is stowed in the operator's compartment. It is removed and becomes mobile for use, and, upon completion of troubleshooting, is stored in the operator's compartment. Harness W4 is also stowed in the operator's compartment.

## LOCATION AND DESCRIPTION OF MAJOR COMPONENTS

The major component of the HDC is a centrally located, permanently installed Control Box (Figure 2), connected to distributed sensors and hydraulic controls mounted throughout the vehicle that is used to diagnose the hydraulic system for malfunctions, routine, and breakdown maintenance.

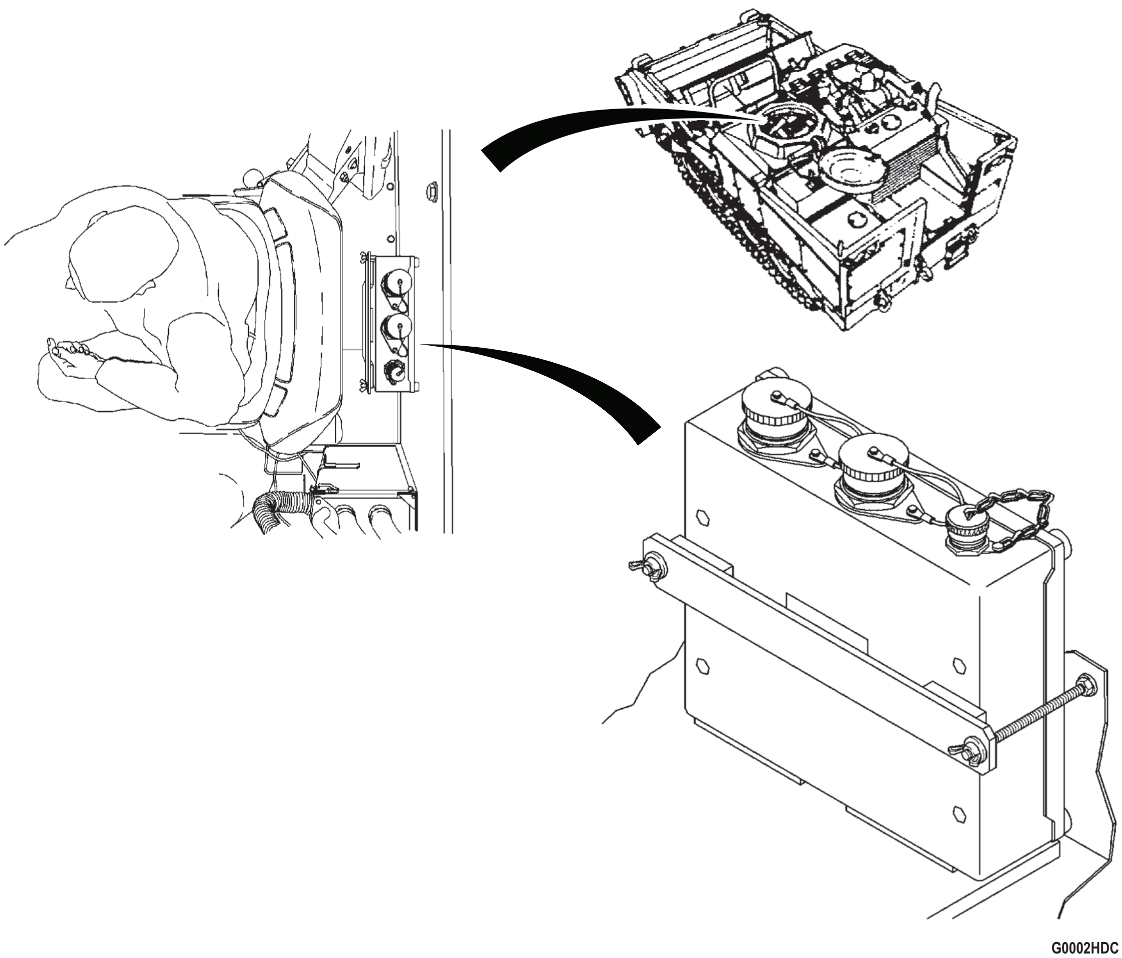



*Figure 2. Hydraulic Diagnostic Center (HDC) Control Box Locator.*

## LOCATION AND DESCRIPTION OF MAJOR COMPONENTS - Continued

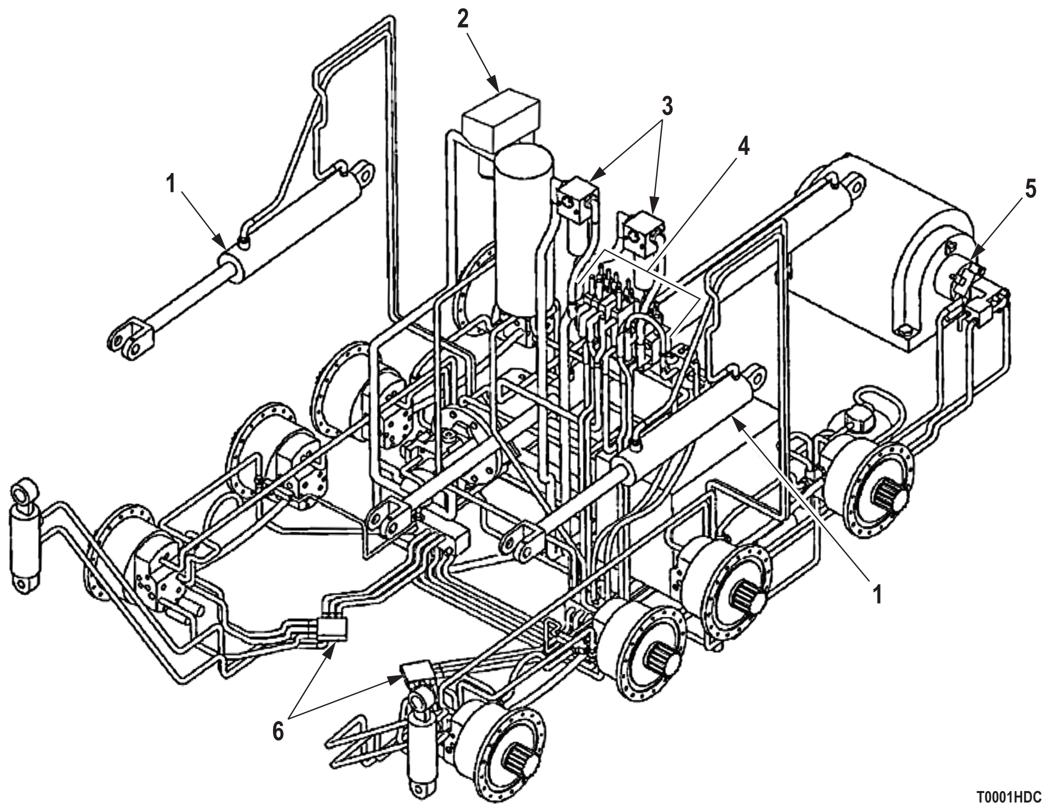



*Figure 3. M9 ACE Hydraulic System Major Components.*

1. APRON CYLINDER (Figure 3, Item 1). Raises and lowers apron and dozer assembly (one each side).
2. RETURN LINE FILTER (Figure 3, Item 2). Filters out contaminants from hydraulic oil that is returning to reservoir.
3. HIGH PRESSURE FILTERS (Figure 3, Item 3). Two high-pressure filters located directly in front of operator's compartment filter hydraulic fluid from the main hydraulic pump while it is enroute to the DCV bank.
4. DIRECTIONAL CONTROL VALVE (DCV) BANK (Figure 3, Item 4). Activated by mechanical linkages from the operator's controls to activate hydraulic functions in the vehicle. Controls direction of fluid flow and pressure.
5. WINCH MOTOR (Figure 3, Item 5). Operates the winch which is used in recovery operations.
6. FORWARD MANIFOLD (Figure 3, Item 6). Routes the flow of hydraulic fluid to components.

## LOCATION AND DESCRIPTION OF MAJOR COMPONENTS - Continued

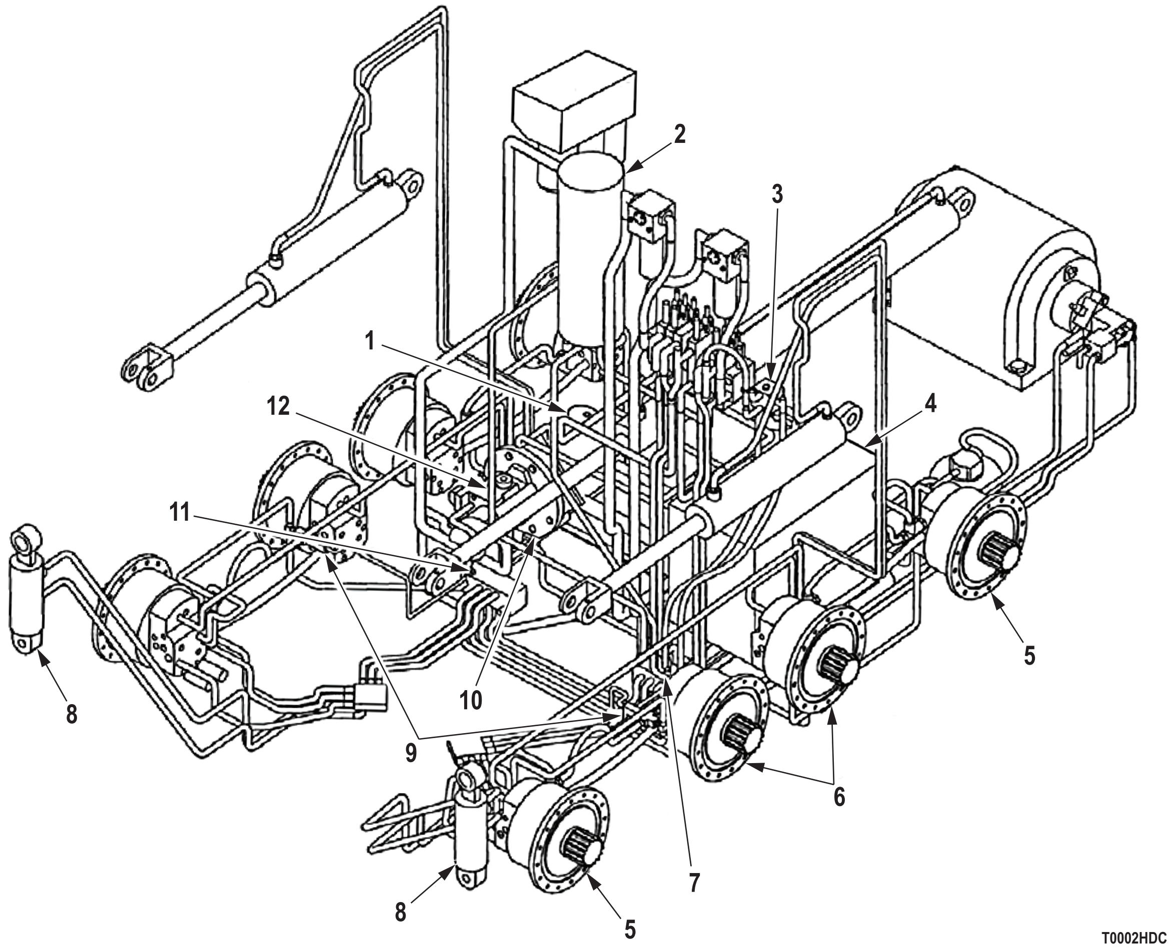



*Figure 4. M9 ACE Hydraulic System Major Components.*

1. MAIN HYDRAULIC PUMP (Figure 4, Item 1). Fixed displacement pump that pulls hydraulic oil from the reservoir to perform whatever function is necessary.

2. MAIN ACCUMULATOR (Figure 4, Item 2). Helps keep pressure constant in hydropneumatic suspension system.

3. SPRUNG/UNSPRUNG VALVE (Figure 4, Item 3). Regulates pressurized fluid flow for whichever mode is selected.

4. HYDRAULIC RESERVOIR (Figure 4, Item 4). Supplies hydraulic oil through main pump, high-pressure filters, and DCV to activate hydraulic functions of vehicle.

5. NO. 1 AND NO. 4 ACTUATORS (Figure 4, Item 5). Front: provides vehicle suspension in SPRUNG mode and allows vehicle to raise and lower in UNSPRUNG mode. Rear: No. 4 is same as front, except they cannot be raised or lowered.

6. NO. 2 AND NO. 3 ACTUATORS (Figure 4, Item 6). Operate off No. 1 and No. 4 actuators. Interwheel control valves allow them to follow, rather than lead No. 1 and No. 4 actuators when vehicle is lowered.

## LOCATION AND DESCRIPTION OF MAJOR COMPONENTS - Continued

7. SUSPENSION RELIEF VALVE (Figure 4, Item 7). Relieves pressure surges or gradual increases in pressure to suspension.

8. BUMP STOP CYLINDERS (Figure 4, Item 8). Limit upward travel of roadwheel arms when in SPRUNG position
(one on each side).

9. INTERMEDIATE WHEEL VALVE (Figure 4, Item 9). Prevents No. 2 and 3 actuators from raising when lowering front of vehicle.

10. EJECTOR CYLINDER (Figure 4, Item 10). Moves ejector forward and back with hydraulic pressure.

11. CHECK VALVE (Figure 4, Item 11). A device to control the direction of fluid flow.

12. COMPENSATING PUMP (Figure 4, Item 12). Provides pressure to vehicle for SPRUNG/UNSPRUNG hydraulic operation.

## EQUIPMENT DATA

### Hydraulic Diagnostic Center

Size

Length - 11 in. (28 cm)

Width - 10 in. (25.4 cm)

Depth - 2.75 in. (7 cm)

Weight

15 lb (6.8 kg)

**END OF WORK PACKAGE**

# FIELD MAINTENANCE
# THEORY OF OPERATION

## SCOPE

This section contains information relative to the principles of operation for the hydraulic system and the Hydraulic Diagnostic Center (HDC). The general functional description of the hydraulic system and HDC is contained in this section. Field maintenance personnel should be familiar with the principles of operation of these systems before working on or troubleshooting the hydraulic system. A more thorough understanding of the hydraulic system and electrical system/HDC integration may be obtained by referring to the interconnecting wiring diagram (FP-17) and the HDC hydraulic schematic (FP-6).

Components:

## HYDRAULIC DIAGNOSTIC CENTER

This component analyzes and diagnoses problems within the M9 ACE vehicle's hydraulic system. Connected to valves and transducers on manifolds and at components by wiring harness W4, it sends messages to the LED screen concerning problems it encounters within the hydraulic system. The HDC is stowed in the operator's compartment.

## LCD SCREEN

This screen is used to input commands to the unit itself and displays alerts and diagnoses as they become available.

## SOLENOID VALVES

The HDC uses twenty electronically-controlled solenoids, as well as three manual valves.

## TRANSDUCERS

Thirteen transducers are installed into the hydraulic lines at critical points and remain there. Connected to the HDC system, they aid in diagnosing any problems the M9 ACE may be having with the hydraulic system.

## WIRING HARNESSES

Four wiring harnesses connect the components of the HDS system to the vehicle's hydraulic system. When not in use, harness W4 is stowed in the operator's compartment.

## HYDRAULIC SYSTEM

The hydraulic system provides hydraulic pressure to energize the suspension system, operate the winch, ejector, and apron cylinders. Some hydraulic components are briefly described below.

### Hydraulic Return Line Filter

This filter (Figure 1), located behind the bowl area, on top of the engine, filters out contaminants from the hydraulic oil returning to the hydraulic reservoir.

### Main Hydraulic Accumulator

The main hydraulic accumulator (Figure 1) is located on the left side of the filter support. It is charged with nitrogen to 1,750-1,850 psi (12,066-12,756 kPa) at 70°F (21°C) and provides immediate response to temporary needs of the SPRUNG mode that the compensating pump cannot meet. A charge and gauge assembly is mounted on the accumulator (Figure 1) and is used to check accumulator charge status and to charge the accumulator (Figure 1).

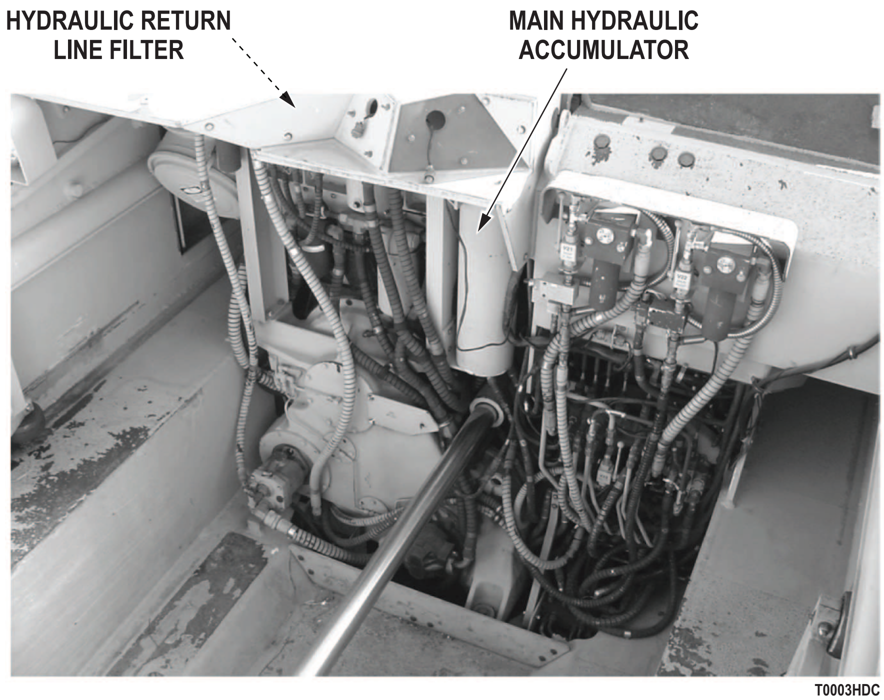



*Figure 1. Main Hydraulic Accumulator.*

### Hydraulic High-Pressure Filters

Two high-pressure filters (Figure 2) located directly in front of the operator's compartment, filter hydraulic fluid from the main hydraulic pump while it is enroute to the Directional Control Valve (DCV) bank.

### Hydraulic Reservoir

The hydraulic reservoir (Figure 2) is located beneath the operator's compartment and its check and fill point is located in the operator's compartment. It has a capacity of 32 gal. (121 L) of OE/HDO-10.

### Direction Control Valve (DCV) Bank

The control valve bank (Figure 2) is located beneath the hydraulic high-pressure filters (Figure 2). The control valves in the valve bank are activated by mechanical linkages from the operator's compartment and they, in turn, activate the hydraulic functions of the vehicle.

### Hydraulic Manifolds

Located in the hull, the manifolds (Figure 2) route the flow of hydraulic fluid to the vehicle components.

### Compensating Hydraulic Pump

Located on the front of the transfer case, the pump (Figure 2) provides pressure at a constant 2,800-2,900 psi (19,306-19,996 kPa) to the SPRUNG/UNSPRUNG hydraulic operation. Capacity of this variable displacement pump is 10 gpm (38 Lpm).

### Main Hydraulic Pump

A fixed displacement pump is mounted on the rear of the transfer case. The pump pulls fluid from the hydraulic reservoir and circulates it through the hydraulic filters at 13 gpm (49 Lpm), then splits the pressure at the DCVs to provide pressure to both left and right suspension controls. (Figure 2)

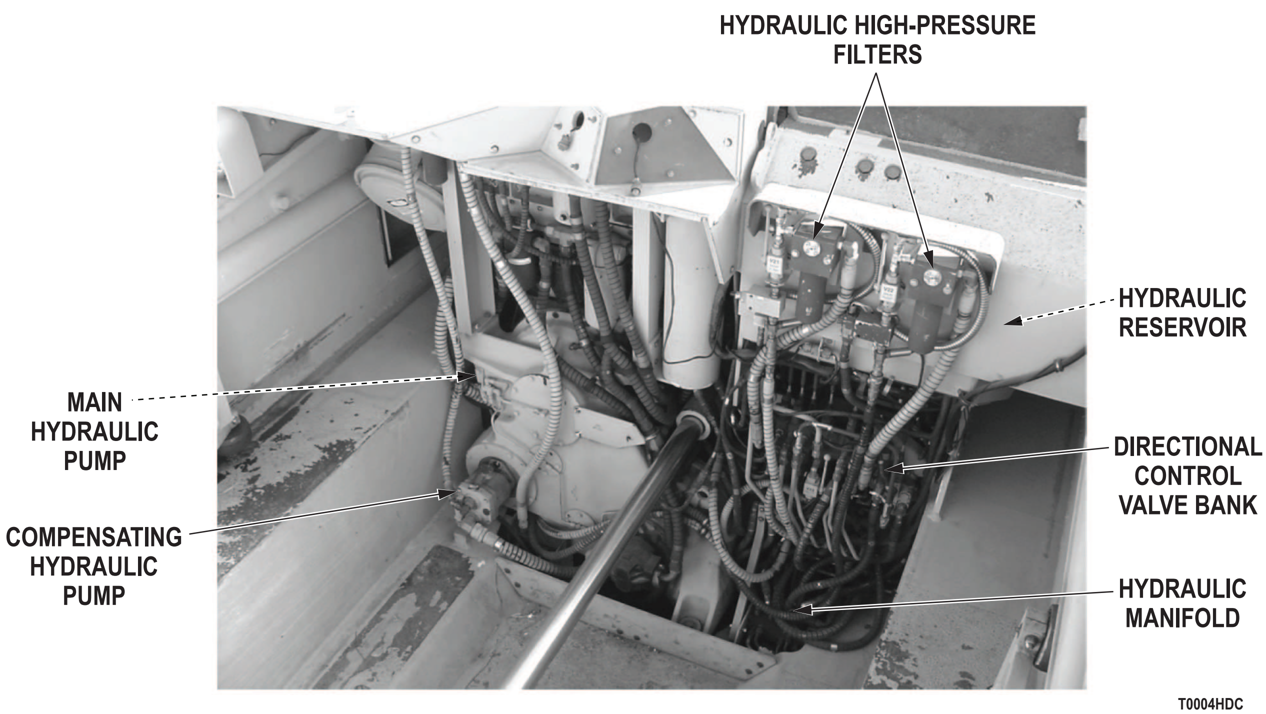



*Figure 2. Bowl Area Major Components.*

## Hydraulic Suspension Operation

**SPRUNG/UNSPRUNG Circuit** The key to the operation of the M9 ACE is its hydropneumatic suspension system that allows the vehicle to operate in both SPRUNG and UNSPRUNG modes.

**SPRUNG Mode** Pressure is delivered through line 9 to bump stops and front actuator fill valves, causing the bump stops to extend and limit movement of the front roadwheel arms. The actuators (Figure 3) become a fixed suspension with the accumulators acting like shock absorbers for the system, providing a smooth ride up to 30 MPH (48 Km/H). SPRUNG mode is used for road marches and parking.

**UNSPRUNG Mode** Pressure is routed through the SPRUNG/UNSPRUNG valve (Figure 3) to line 11 and to the actuator wheel valves, causing bump stops to retract and the suspension system to become variable. The front of the vehicle can be raised or lowered, and the operator has independent control of the left and right suspension components. UNSPRUNG mode is used for earthmoving operations.

## Sprung/Unsprung Control Valve

Located to the right of the main DCV bank, facing rearward, this valve (Figure 3) regulates fluid flow for whichever mode is selected.

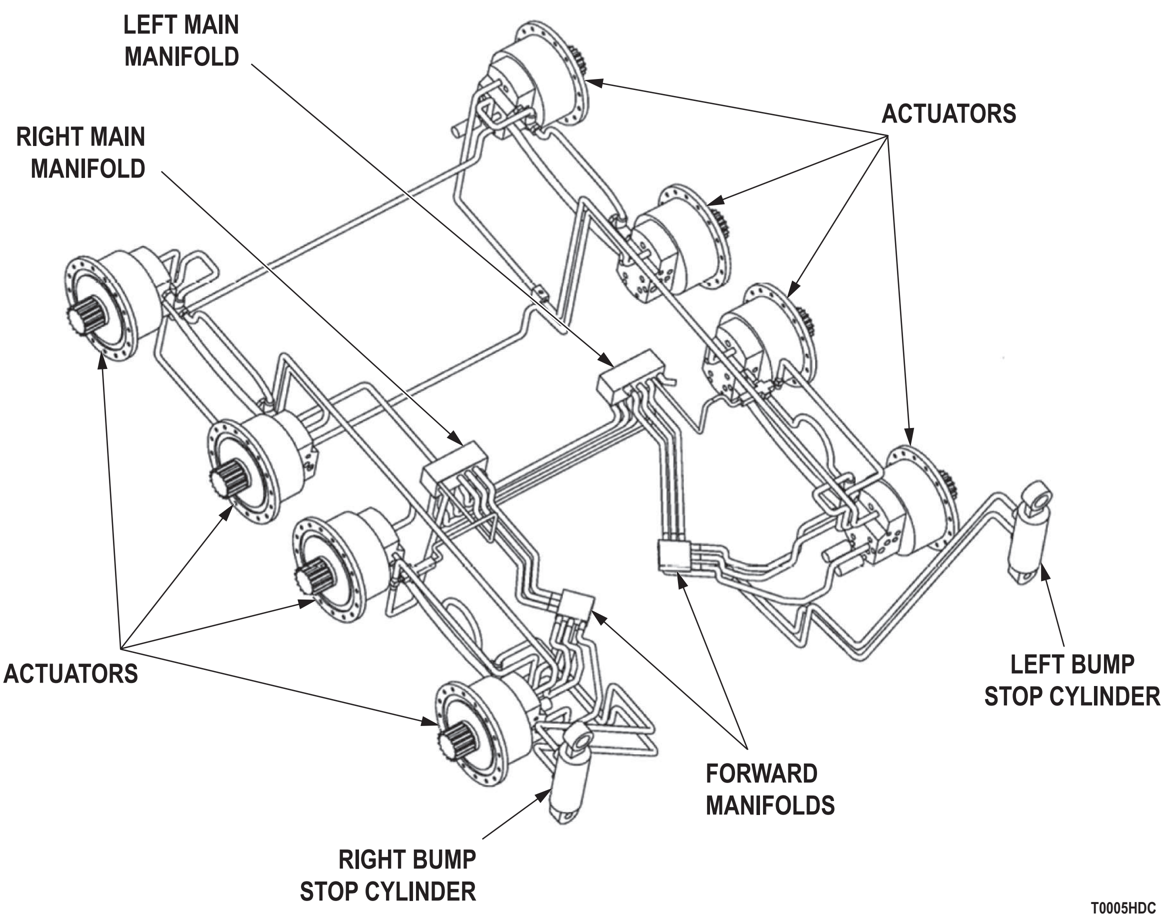



*Figure 3. Hydraulic Suspension Components.*

### Hydraulic Control Valve Operation

The hydraulic control valves on the DCV bank are activated by mechanical linkages from the operator's compartment and they, in turn, activate the hydraulic functions of the vehicle.

The following pages describe the functions of valves and circuits they activate. Refer to these pages when following the apron raise/lower, winch, and ejector valve circuits.

### Right Pump Control Valve (13R)

Receives oil flow from the main hydraulic pump and maintains pressure at 3,950-4,050 psi (27,235-27,925 kPa) for the right-side hydraulic functions (Figure 4).

### Left Pump Control Valve (13L)

Receives oil flow from the main hydraulic pump and maintains pressure at 3,950-4,050 psi (27,235-27,925 kPa) (Figure 4).

### Right Suspension Control Valve (3R/17R)

Port 3R (Figure 4), front bottom of valve, raises the right front-side of vehicle. Port 17R (Figure 4), above port 3R (Figure 4), lowers right front-side of vehicle. Relief valve is set at 3,450-3,550 psi (23,788-24,477 kPa).

### Left Suspension Control Valve (3L/17L)

Port 3L (Figure 4), front bottom of valve, raises the left front-side of vehicle. Port 17L (Figure 4), above port 3L (Figure 4), lowers left front-side of vehicle. Relief valve is set at 3,450-3,550 psi (23,788-24,477 kPa).

### Apron Raise/Lower Control Valve (19/20)

Port 19 (Figure 4), front top of valve, actuates circuit and raises apron. Port 20 (Figure 4), below port 19 (Figure 4), actuates circuit and lowers apron. Relief valve No. 19 (Figure 4) is set at 4,450-4,550 psi (30,688-31,372 kPa) and relief valve No. 20 (Figure 4) is set at 1,950-2,050 psi (13,445-14,135 kPa).

### Winch Control Valve (C1/C2)

Port C1 (Figure 4), front bottom of valve, actuates circuit, moves cable out of winch C2 (Figure 4), above port C1 (Figure 4), and brings cable into winch. Relief valve is set at 1,950-2,050 psi (13,445-14,135 kPa) on the winch.

### Ejector Control Valve (21/22)

Port 21 (Figure 4), front top of valve, actuates circuit and moves ejector forward. Port 22 (Figure 4), below port 21 (Figure 4), actuates and moves the ejector back. Relief valve is set at 1,950-2,050 psi (13,445-14,135 kPa).

**Ejector Control Valve (21/22) - Continued**

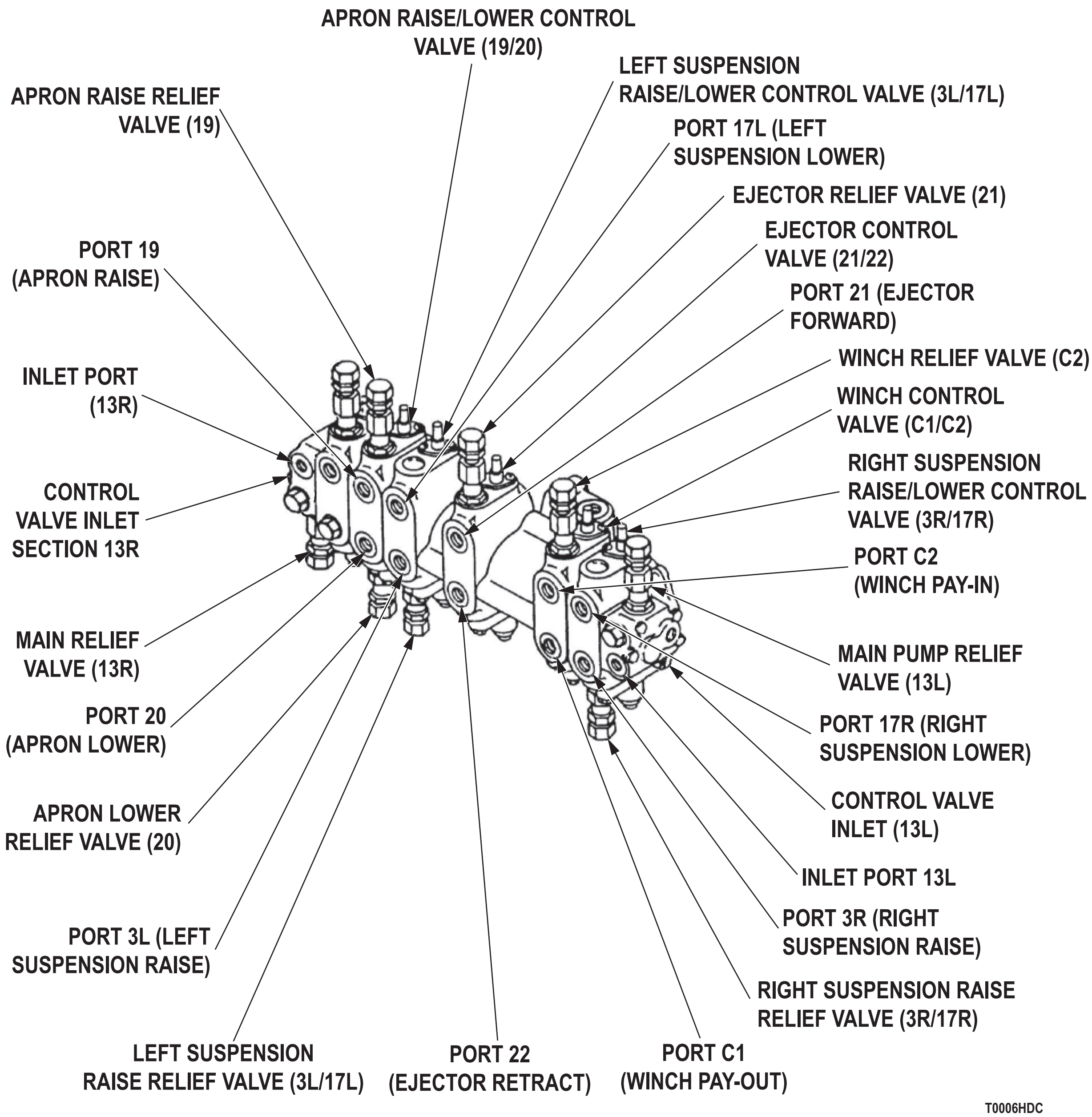



*Figure 4. DCV Bank.*

**END OF WORK PACKAGE**

# CHAPTER 2

# TROUBLESHOOTING PROCEDURES

## FIELD MAINTENANCE
## INTRODUCTION TO USING THE HYDRAULIC DIAGNOSTIC CENTER (HDC) SYSTEM TO TROUBLESHOOT THE M9 ACE HYDRAULIC SYSTEM

### INTRODUCTION

This work package contains information needed when troubleshooting the M9 ACE hydraulic system using the Hydraulic Diagnostic Center (HDC) System. It includes information for preparing the HDC System for use and procedures for performing a Functional Check-Out of the HDC System, both as a weekly PMCS check of the HDC System integrity, and as the initial step in using the HDC System to aid in troubleshooting the M9 ACE hydraulic system.

This work package describes the differences between troubleshooting the M9 ACE hydraulic system with, and without, the HDC System, and explains the additional items that need to be considered when using the HDC System to aid in troubleshooting the vehicle hydraulic system. Information as to how to use the HDC System to aid in troubleshooting the M9 ACE hydraulic system is included as well as information to aid in troubleshooting the specific HDC System hydraulic and electrical circuits, when used with the HDC System troubleshooting work package (WP 0021).

The HDC System is an aid, used to assist in the troubleshooting of the M9 ACE hydraulic system. The HDC is not an independent diagnostic tool; it does not provide an automated or semi-automated means of localizing hydraulic faults. The use of the HDC System allows the amount of time required to isolate faults and malfunctions in the vehicle hydraulic system to be dramatically reduced, when compared to the time required to troubleshoot the vehicle hydraulic system without the HDC System.

### TROUBLESHOOTING THE HDC SYSTEM

Using the HDC System does introduce some additional factors that should be considered when troubleshooting the vehicle hydraulic system. Components of the HDC System are located throughout the M9 ACE vehicle and, although they simplify the actual troubleshooting process, they also introduce additional components that interface with the previously existing vehicle hydraulic system, that also can fail or malfunction like any other component.

To aid in the troubleshooting of the M9 ACE hydraulic system, the HDC System must be operating properly, and there must be some way to assess the operational status of the HDC System. The M9 ACE HDC System Functional Check-Out (WP 0025) provides the means for the maintainer to easily check portions of the HDC System to determine if the HDC System is functionally operational.

When the HDC System is to be used (for troubleshooting the vehicle hydraulic system or when just being functionally checked as part of a PMCS requirement), the M9 ACE HDC System Functional Check-Out (WP 0025) should first be performed. If the HDC System does not pass all portions of the Functional Check-Out, refer to (WP 0021) and proceed to troubleshoot the HDC System as indicated.

Aside from the HDC Control Box and three electrical cables integrated into the vehicle, two main types of components comprise the HDC System; solenoid valves and hydraulic pressure transducers. Although both of these types of components are very reliable (as are the electrical cables), they can possibly fail like other electrical and hydraulic components. The solenoid valves are spring-loaded and can possibly fail in two ways. They can fail to energize, and they can fail to return to the original de-energized state (valve spool does not return to the de-energized state), when energizing (supply) voltage is removed. The probability of a solenoid valve being stuck (the valve spool does not return to the de-energized position) is very low and would only occur after a hydraulic maintenance test was performed in which the valve had been energized. The actual movement (or non-movement) of the valve spool cannot be detected by the HDC Control Box as part of the System BIT. The solenoid valves are normally not energized. They are only energized upon command, and are supplied 24 VDC only when energized. Normally all solenoid valves are de-energized (reset) and are not supplied any voltage.

## TROUBLESHOOTING THE HDC SYSTEM - Continued

When the HDC System is operating, a reference voltage is always supplied to the hydraulic pressure transducers from the HDC Control Box and the respective hydraulic pressure measured by the individual pressure transducers is displayed on the HDC Control Box upper LCD. The pressure transducer is supplied a 15 VDC reference voltage and returns a DC analog voltage between 0.5 VDC and 9.5 VDC to the HDC Control Box representing the hydraulic pressure measured by the transducer in the circuit.

The hydraulic pressure transducers can also fail in two ways; failure to measure any hydraulic pressure (complete failure) or failure to accurately measure the hydraulic pressure (producing erroneous measurement indications) and provide an analog voltage back to the HDC Control Box that is outside of the range of acceptable voltages (outside the 0.5 - 9.5 VDC range). If the "measured" DC voltage returned to the HDC Control Box from the pressure transducer is within the acceptable range of 0.5 to 9.5 VDC, regardless of how inaccurate the measurement may be, the inaccuracy/malfunction cannot be detected by the HDC Control Box as part of the System BIT.

The HDC System Functional Check-Out (WP 0025) addresses many of the HDC System components and fault isolates most problems/malfunctions associated with those components. For those HDC System solenoid valves and pressure transducers specified, and those not specifically addressed in the Functional Check-Out, refer to the applicable maintenance WP to aid in determining if an HDC System solenoid valve or hydraulic pressure transducer may have failed or malfunctioned, based on possible consequences and symptoms of a malfunctioning or failed HDC system component.

## USE OF THE HDC SYSTEM

The HDC is only used when a problem has been detected (or suspected) in the M9 ACE hydraulic system and formal troubleshooting of the system is necessary. Before the HDC System is actually used to aid in troubleshooting the vehicle hydraulic system, the M9 ACE HDC System Functional Check-Out (WP 0025) should be performed to establish the operational readiness of the HDC System. The HDC system is only used when the vehicle is not moving, the vehicle is in "neutral" and the parking brake is fully engaged.

## GENERAL HYDRAULIC SYSTEM TROUBLESHOOTING PROCEDURES

Refer to TM 5-2350-262-20.

## GENERAL

Refer to TM 5-2350-262-20.

## GENERAL NOTES

Refer to TM 5-2350-262-20.

Hydraulic troubleshooting can often be reduced by taking the following step:

• Instead of replacing an HDC System solenoid valve or pressure transducer, temporarily switch it with a spare item, or with another identical solenoid valve or pressure transducer.

### NOTE

Before attempting to repair or replace any hydraulic component you must:

1. Determine the maintenance responsibility for repair or replacement of the component.
2. If the task is at your echelon of maintenance responsibility, you must identify the tools needed and the replacement parts required.

Refer to the Maintenance Allocation Chart (MAC) to determine not only the maintenance responsibility of the item, but also to obtain an estimate of the time required to perform the task, tools needed, and any special notes/requirements necessary.

## GENERAL NOTES - Continued

Refer to Repair Parts and Special Tools List in TM 5-2350-262-20 for requisition data concerning replacement parts for this task.

## PRELIMINARY TROUBLESHOOTING PROCEDURES

Ensure all equipment and tools are available before performing hydraulic system troubleshooting. The following items are required for hydraulic system troubleshooting:

Pressure Measuring Devices:

Pressure Measuring Device-4940-00-595-5720-GS5

Refer to TM 5-2350-262-20 for procedures, additional equipment, and tools.

## SUSPENDING THE M9 ACE FOR SUSPENSION SYSTEM CHECKS

Refer to TM 5-2350-262-20.

## RELIEVING HYDRAULIC SYSTEM PRESSURE

Refer to TM 5-2350-262-20.

## ACCUMULATOR DUMP VALVE INSTALLATION

Refer to TM 5-2350-262-20.

## GENERAL SUSPENSION TROUBLESHOOTING INFORMATION

Refer to TM 5-2350-262-20.

## ACTUATOR PORT IDENTIFICATION AND DESCRIPTION

Refer to TM 5-2350-262-20.

## LOCKING AND DISABLING EJECTOR

Refer to TM 5-2350-262-20.

## HDC CONTROL BOX INSTALLATION

1. Loosen two thumb screws (Figure 1, Item 3) on two threaded rods (Figure 1, Item 2) until control box (Figure 1, Item 1) can be removed from stowage bracket (Figure 1, Item 4).

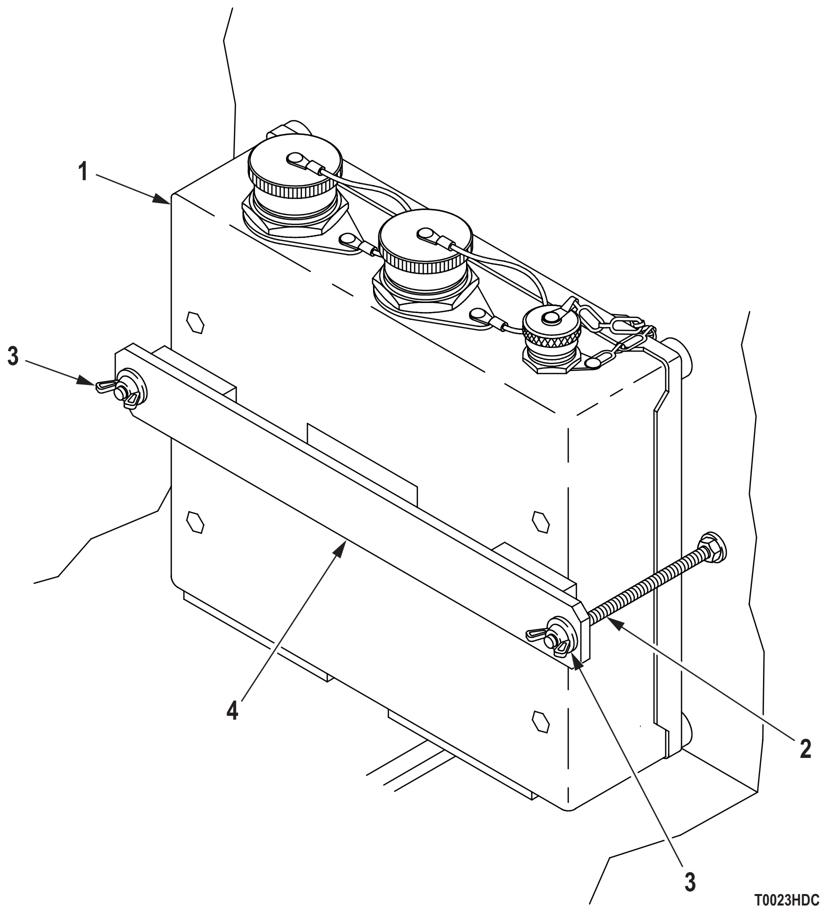



*Figure 1. Hydraulic Diagnostic Center (HDC) Control Box Installation.*

**HDC CONTROL BOX INSTALLATION - Continued**

2. Connect umbilical cable connector W4P4 (Figure 2, Item 5) to disconnect bracket harness W1 connector J1 (Figure 2, Item 6).

3. Connect umbilical cable connector W4P5 (Figure 2, Item 4) to disconnect bracket harness W2 connector J1 (Figure 2, Item 1).

4. Connect umbilical cable connector W4P6 (Figure 2, Item 3) to disconnect bracket harness W3 connector J1 (Figure 2, Item 2).

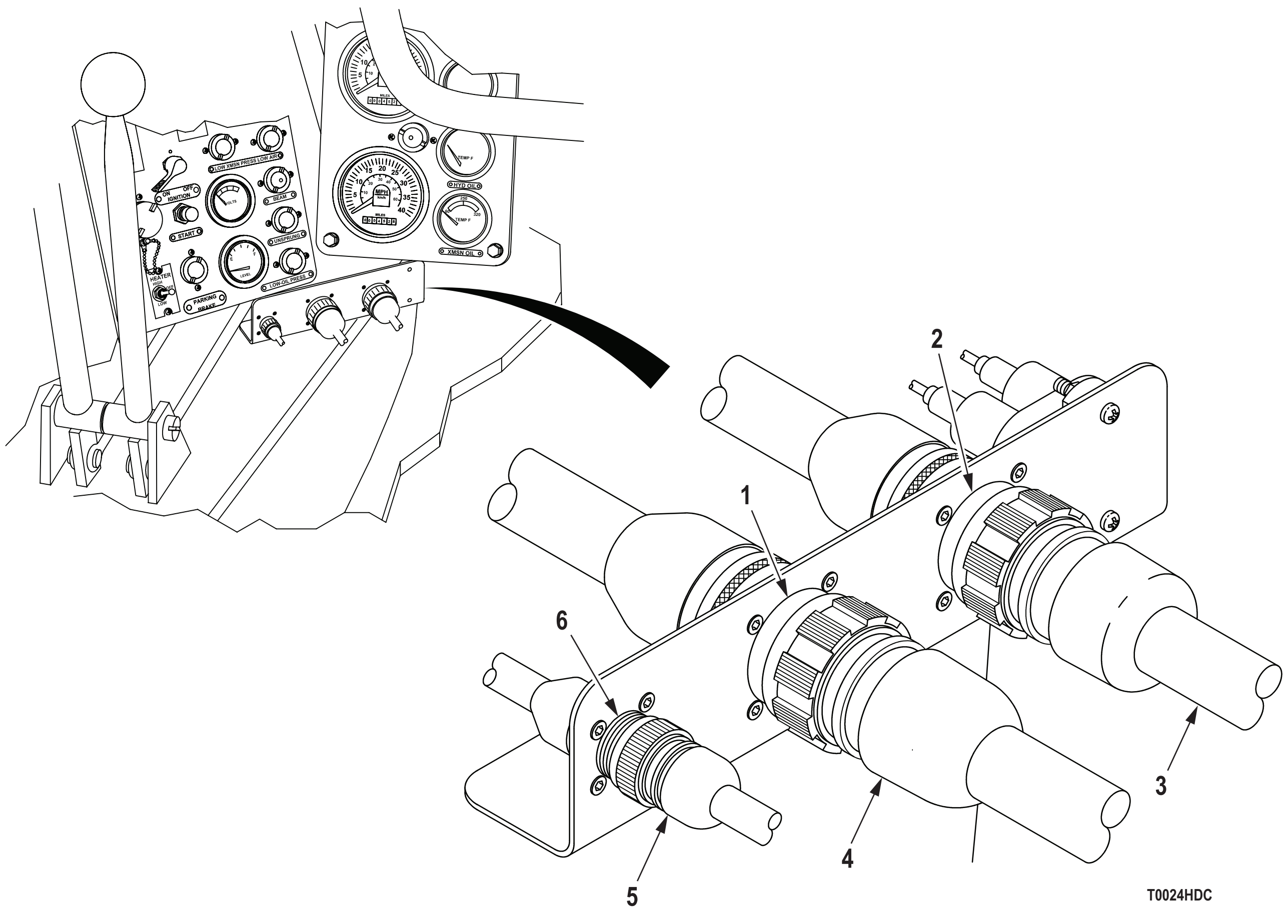



*Figure 2. Wiring Harness W4 (Umbilical Cable W4) Installation.*

## HDC CONTROL BOX INSTALLATION - Continued

5. Connect umbilical cable connector W4P1 (Figure 3, Item 5) to control box connector J1 (Figure 3, Item 4).

6. Connect umbilical cable connector W4P2 (Figure 3, Item 6) to control box connector J2 (Figure 3, Item 3).

7. Connect umbilical cable connector W4P3 (Figure 3, Item 1) to control box connector J3 (Figure 3, Item 2).

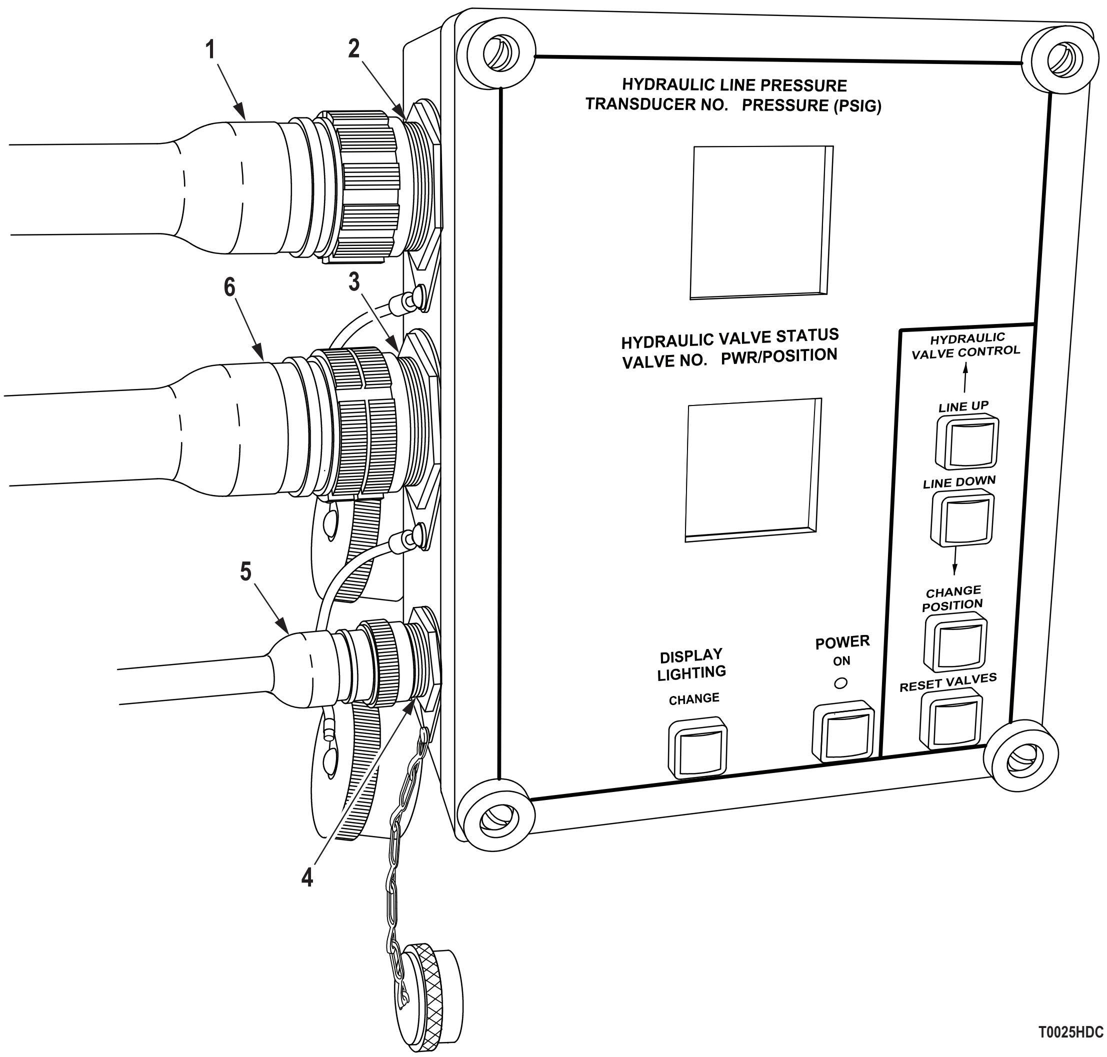



*Figure 3. Wiring Harness W4 (Umbilical Cable W4) Installation.*

## HDC CONTROL BOX REMOVAL

1. Remove umbilical cable connector W4P3 (Figure 4, Item 1) from control box connector J3 (Figure 4, Item 2).

2. Remove umbilical cable connector W4P2 (Figure 4, Item 6) from control box connector J2 (Figure 4, Item 3).

3. Remove umbilical cable connector W4P1 (Figure 4, Item 5) from control box connector J1 (Figure 4, Item 4).

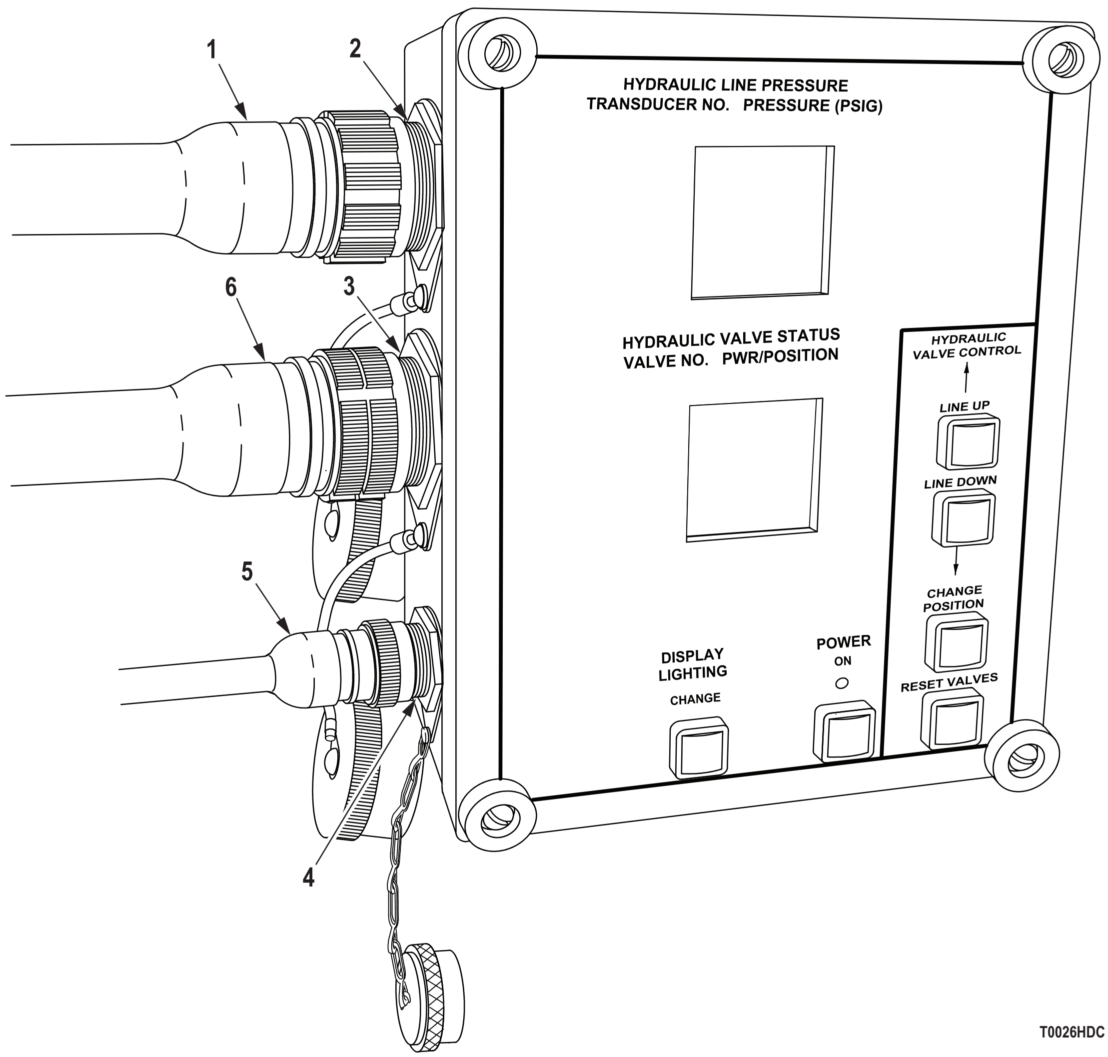



*Figure 4. Wiring Harness W4 (Umbilical Cable W4) Removal.*

## HDC CONTROL BOX REMOVAL - Continued

4. Remove umbilical cable connector W4P6 (Figure 5, Item 3) from disconnect bracket harness W3 connector J1 (Figure 5, Item 2).

5. Remove umbilical cable connector W4P5 (Figure 5, Item 4) from disconnect bracket harness W2 connector J1 (Figure 5, Item 1).

6. Remove umbilical cable connector W4P4 (Figure 5, Item 5) from disconnect bracket harness W1 connector J1 (Figure 5, Item 6).

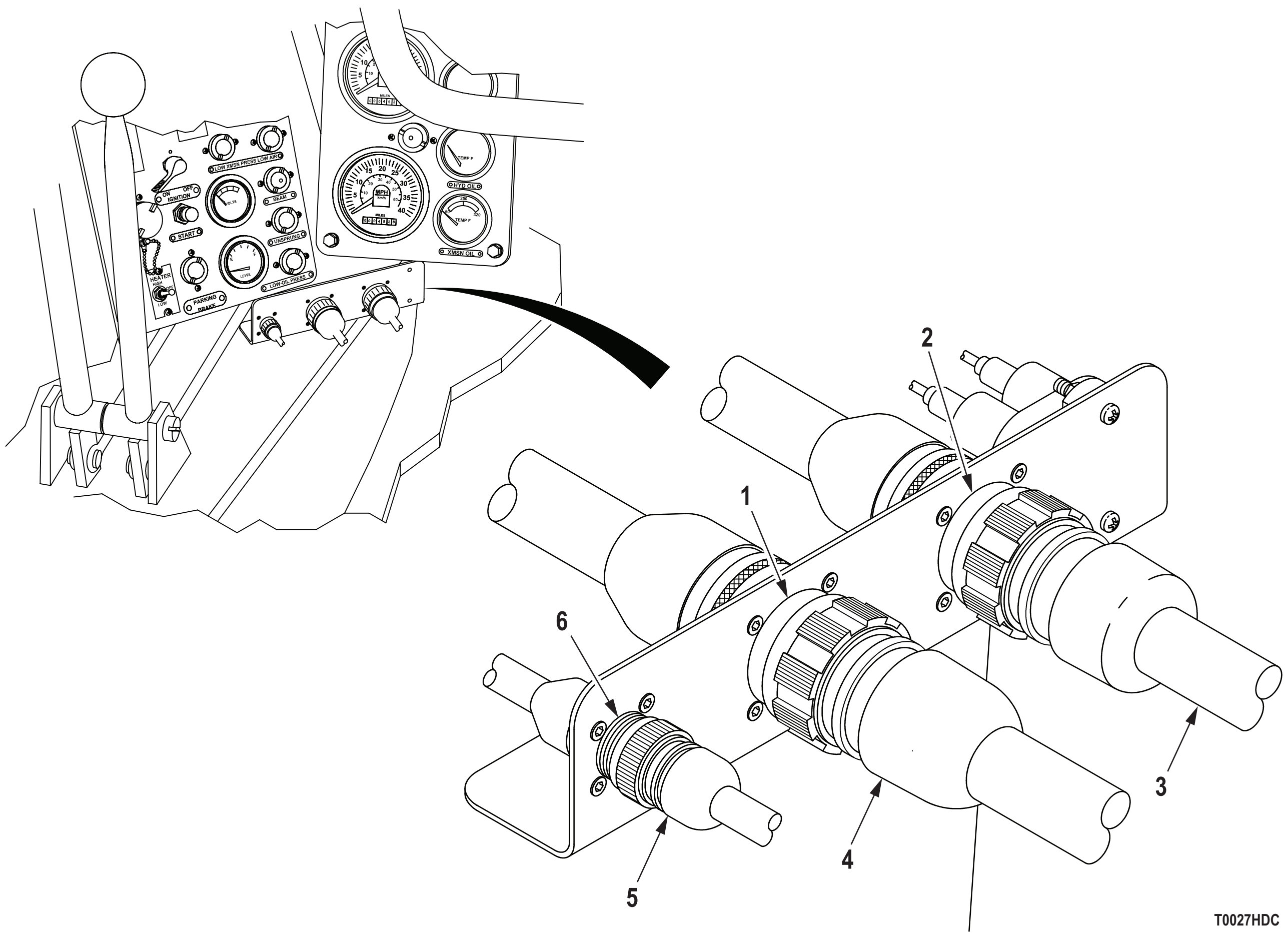



*Figure 5. Wiring Harness W4 (Umbilical Cable W4) Removal.*

## HDC CONTROL BOX REMOVAL - Continued

7. Place control box (Figure 6, Item 1) in stowage bracket (Figure 6, Item 4) and secure by tightening two wingnuts (Figure 6, Item 3) on two threaded rods (Figure 6, Item 2).

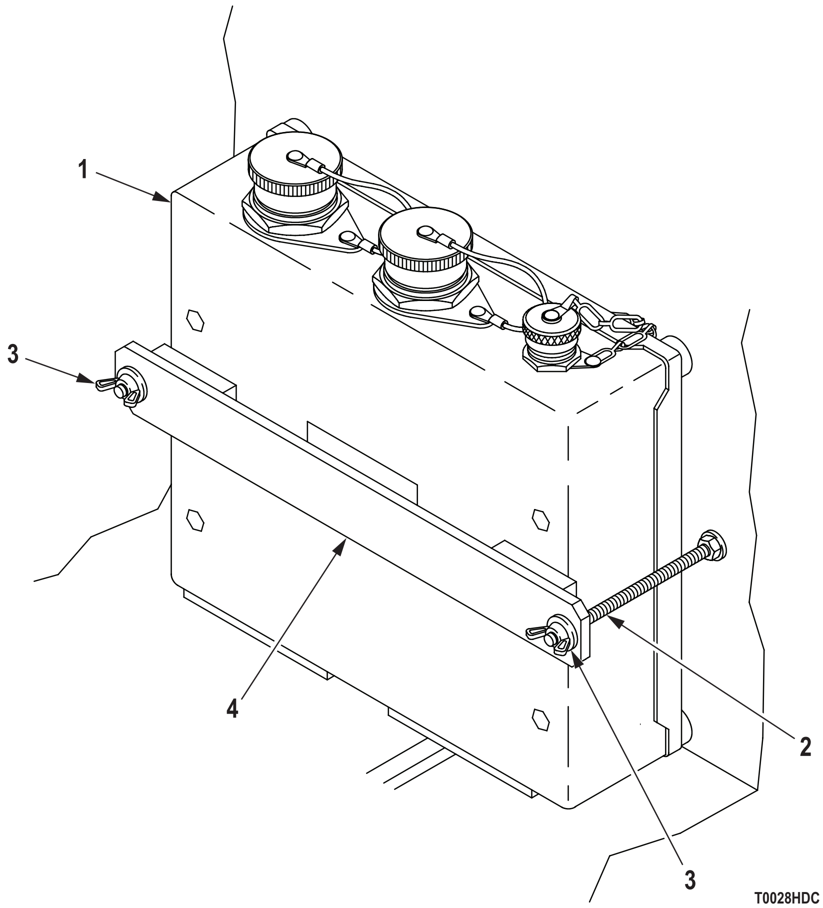



*Figure 6. Stowage of Hydraulic Diagnostic Center (HDC) Control Box.*

## END OF WORK PACKAGE

# FIELD MAINTENANCE
# TROUBLESHOOTING INDEX

## TROUBLESHOOTING SYMPTOM INDEX



**END OF WORK PACKAGE**

## FIELD MAINTENANCE
## TROUBLESHOOTING PROCEDURES - ALL HYDRAULIC FUNCTIONS INOPERATIVE

**INITIAL SETUP:**

**Tools and Special Tools**
Tool Kit, General Mechanic's: Automotive (WP 0054, Table 1, Item 7)
Parts Kit, Hydraulic (WP 0054, Table 1, Item 3)

**Personnel Required**
Construction Equipment Repairer 91L (Two)

**References**
FO-1

**References (cont.)**
FO-2
FO-3

**Equipment Condition**
Vehicle MASTER power OFF (TM 5-2350-262-10)
Vehicle on jack stands (TM 5-2350-262-20)

### TROUBLESHOOTING PROCEDURE

### ALL HYDRAULIC FUNCTIONS INOPERATIVE

**WARNING**

High oil pressure is present in the M9 ACE hydraulic system. Do not disconnect any hydraulic system component unless hydraulic system pressure has been relieved. After hydraulic system has been relieved, wait at least four minutes before disconnecting any hose or fitting. Ensure each of the hydraulic control levers is moved several times through all positions and the hydraulic tank dipstick is slowly loosened to relieve pressure. Failure to comply may result in severe injury or death to personnel.

**NOTE**

- The hydraulic control valves on the Directional Control Valve (DCV) bank are activated by mechanical linkages from the operator's compartment which then activate hydraulic functions of the vehicle.
- Perform this procedure only when all hydraulic functions are inoperative. Refer to Hydraulic Diagnostic Center (HDC) hydraulic system schematic (FO-1, FO-2, and FO-3).

## ALL HYDRAULIC FUNCTIONS INOPERATIVE - Continued

### STEP

1. Check if vehicle moves under its own power.

   Operate vehicle (TM 5-2350-262-10).

### CONDITION/INDICATION

Will vehicle move under its own power?

### DECISION

YES - Go to Step (2).
NO - Go to Step (9).

### STEP

2. Check for flow of hydraulic oil from hydraulic return line at hydraulic return line filter.

**NOTE**

Have suitable container ready to catch oil.

a. Stop engine; relieve hydraulic pressure.

b. Disconnect HYDR-FLTR-IN-7 hose (Figure 1, Item 3) from tee (Figure 1 Item 4) at port 7 (Figure 1, Item 2) on hydraulic return line filter (Figure 1, Item 1).

c. Cap tee (Figure 1, Item 4).

d. While holding open end of hose (Figure 1, Item 3) in container, have assistant start engine.

e. Check for free flow of hydraulic oil from hose (Figure 1, Item 3).

f. Stop engine; relieve hydraulic pressure.

g. Connect hose (Figure 1, Item 3) to tee (Figure 1, Item 4).

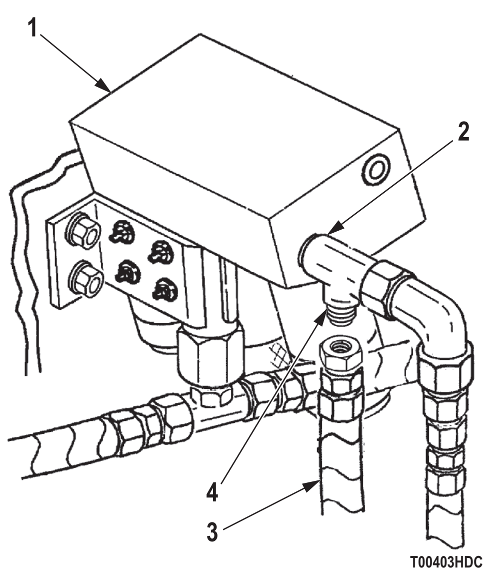



*Figure 1. Hydraulic Return Line Filter.*

**ALL HYDRAULIC FUNCTIONS INOPERATIVE - Continued**

**CONDITION/INDICATION**

Is there a free flow of oil?

**DECISION**

YES - Go to Step (4).
NO - Go to Step (3).

**STEP**

3. Check for blockage in main pump suction hose.

**WARNING**

Do not work under vehicle unless hull is properly blocked or allowed to settle on bump stops. Failure to comply may result in severe injury or death to personnel.

**NOTE**

Have suitable container ready to catch oil.

a. Loosen, but do not disconnect, PUMP SUCT TUBE-#7 (Figure 2, Item 1) from elbow (Figure 2, Item 3) on main hydraulic pump (Figure 2, Item 2).

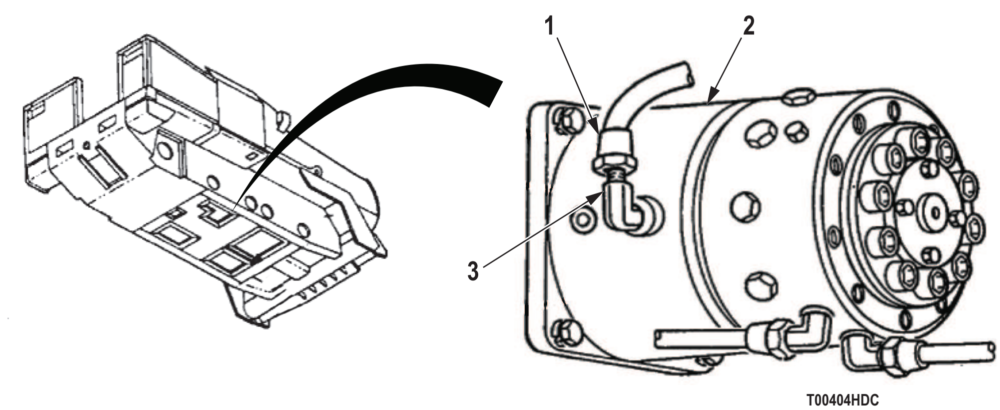



*Figure 2. Main Pump.*

b. Hydraulic oil should flow freely from the loosened fitting.

c. Tighten PUMP SUCT TUBE-#7 hose.

**CONDITION/INDICATION**

Is there blockage?

**DECISION**

YES - Clear blockage or replace hose.
NO - If there is no blockage, go to Step (4).

## ALL HYDRAULIC FUNCTIONS INOPERATIVE - Continued

**STEP**

4. Perform main hydraulic pump test. Check transducer T-3 hydraulic pressure on HDC display.

   a. Stop engine; relieve hydraulic pressure.

   b. Reset all HDC solenoid valves by selecting the RESET VALVES button (Figure 3, Item 5) on the HDC control box.

   c. Ensure right main hydraulic pressure inhibit valve V21 (Figure 3, Item 1) is fully opened.

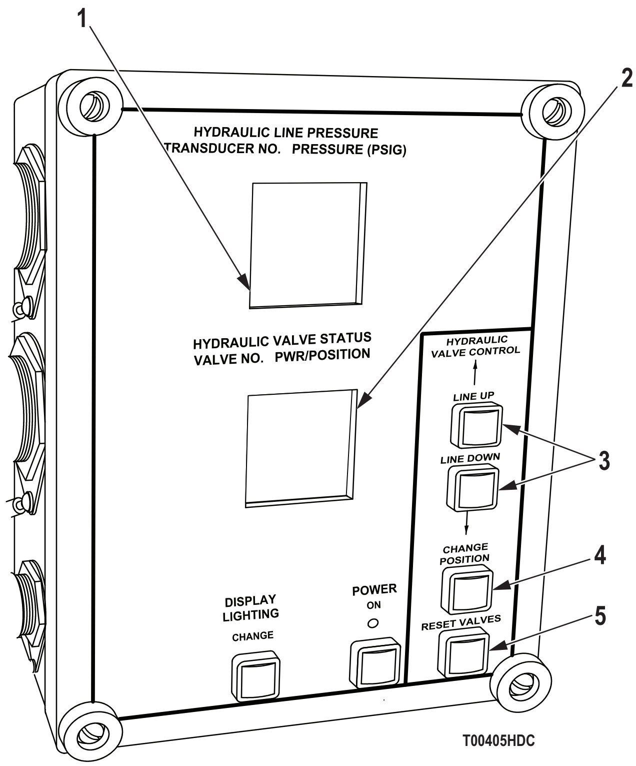
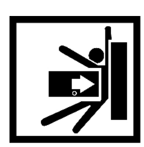



*Figure 3. Hydraulic Diagnostic Center (HDC) Control Box.*

## WARNING



- Do not operate ejector when personnel are in bowl. Do not work in bowl unless ejector lock is engaged. Failure to comply may result in severe injury or death to personnel.
- Do not stand or work in bowl area unless ejector lock is engaged. Do not stand in bowl to observe roller guide travels. Failure to comply may result in severe injury or death to personnel.

   d. Disable ejector by manually closing the ejector inhibit ball valve V23 (Figure 4, Item 2) on the DCV bank.

**ALL HYDRAULIC FUNCTIONS INOPERATIVE - Continued**

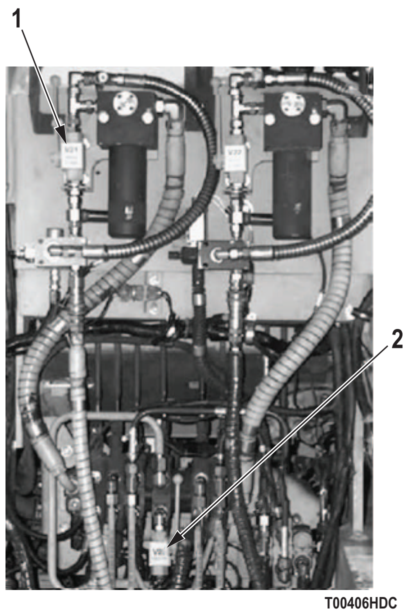



*Figure 4. Directional Control Valve (DCV) Bank.*

e. Using LINE UP or LINE DOWN button (Figure 3, Item 3), select V1 on the HDC display (Figure 3, Item 2).

f. Close V1 on the HDC display (Figure 3, Item 2) by selecting CHANGE POSITION button (Figure 3, Item 4) on HDC control box.

g. Have assistant start engine and allow engine to idle (750-800 rpm).

h. Slowly close right main hydraulic pressure inhibit valve V21 (Figure 4, Item 1), until transducer T-3 pressure on the HDC display (Figure 3, Item 1) indicates 3,950-4,050 psi (27,235-27,925 kPa).

i. Fully open right main hydraulic pressure inhibit valve V21 (Figure 4, Item 1).

j. Stop engine; relieve hydraulic pressure.

k. Open ejector inhibit ball valve V23 (Figure 4, Item 2) on the DCV bank.

l. Using LINE UP or LINE DOWN button (Figure 3, Item 3), select V1 on the HDC display (Figure 3, Item 2).

m. Open V1 on the HDC display (Figure 3, Item 2) by selecting the CHANGE POSITION button (Figure 3, Item 4) on the HDC control box.

**CONDITION/INDICATION**

Does main hydraulic pump develop 3,950-4,050 psi (27,235-27,925 kPa)?

**DECISION**

YES - Go to Step (5).
NO - Replace main hydraulic pump (TM 5-2350-262-20).

## ALL HYDRAULIC FUNCTIONS INOPERATIVE - Continued

### STEP

5. Check transducer T-3 hydraulic pressure at port 13R.
   a. Reset all HDC solenoid valves by selecting the RESET VALVES button (Figure 5, Item 5) on the HDC control box.
   b. Using LINE UP or LINE DOWN button (Figure 5, Item 3), select V1 on the HDC display (Figure 5, Item 2). Close V1 on the HDC display (Figure 5, Item 2) by selecting the CHANGE POSITION button (Figure 5, Item 4) on the HDC control box.
   c. Have assistant start engine, move SPRUNG/UNSPRUNG lever to SPRUNG, and hold EJECTOR CONTROL lever in BACK. Read transducer T-3 pressure on the HDC display (Figure 5, Item 1). If hydraulic pressure is not within limits, continue with the following step.
   d. While assistant is still holding EJECTOR CONTROL lever in BACK, have assistant move right-hand SUSPENSION CONTROL lever to RAISE. Read transducer T-3 pressure on HDC display (Figure 5, Item 1). If hydraulic pressure is not within limits, main relief valve 13R requires adjustment.
   e. Release EJECTOR CONTROL and right-hand SUSPENSION CONTROL levers.
   f. Reset all HDC solenoid valves by selecting the RESET VALVES button (Figure 5, Item 5) on the HDC control box.

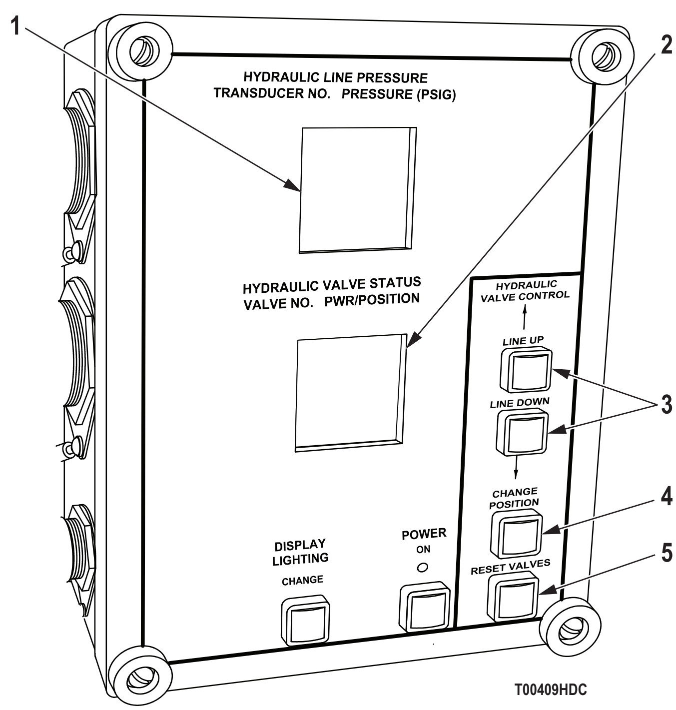



*Figure 5. Hydraulic Diagnostic Center (HDC) Control Box.*

### CONDITION/INDICATION

Is pressure 3,950-4,050 psi (27,235-27,925 kPa)?

**ALL HYDRAULIC FUNCTIONS INOPERATIVE - Continued**

**DECISION**

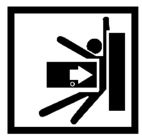
YES - Go to Step (7).
NO - Go to Step (6).

**STEP**

6. Perform 13R main pump relief valve adjustment using the HDC.

   a. Reset all HDC solenoid valves by selecting the RESET VALVES button (Figure 5, Item 5) on the HDC control box.

**WARNING**



- Do not operate ejector when personnel are in bowl. Do not work in bowl unless ejector lock is engaged. Failure to comply may result in severe injury or death to personnel.
- Do not stand or work in bowl area unless ejector lock is engaged. Do not stand in bowl to observe roller guide travels. Failure to comply may result in severe injury or death to personnel.

   b. Manually close the ejector inhibit ball valve V23 (Figure 6, Item 1) on the DCV bank.

   c. Using LINE UP or LINE DOWN button (Figure 5, Item 3), select V1 on the HDC display (Figure 5, Item 2). Close V1 on the HDC display (Figure 5, Item 2) by selecting the CHANGE POSITION button (Figure 5, Item 4) on the HDC control box.

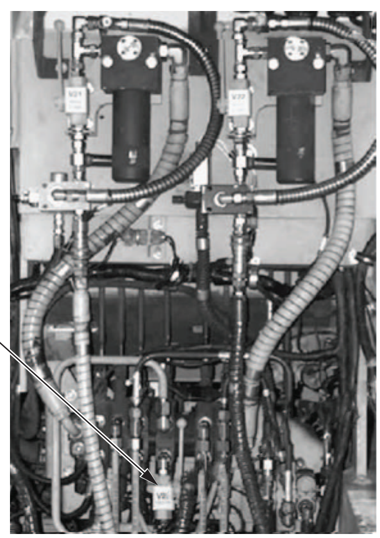



*Figure 6. Directional Control Valve (DCV) Bank.*

**ALL HYDRAULIC FUNCTIONS INOPERATIVE - Continued**

d. Loosen jam nut (Figure 7, Item 1).

e. Read transducer T-3 hydraulic pressure on the HDC display (Figure 8, Item 1), as assistant moves right-hand SUSPENSION CONTROL lever to RAISE and EJECTOR CONTROL lever to BACK.

f. Rotate relief valve adjustment (Figure 7, Item 2) clockwise to increase pressure; counterclockwise to decrease pressure.

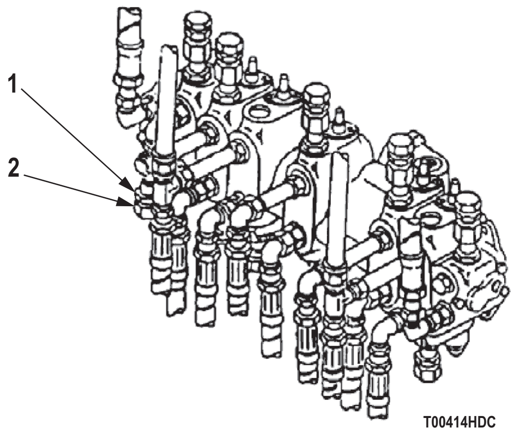



*Figure 7. Main Pump Relief Valve 13R.*

g. When transducer T-3 pressure indicates 3,950-4,050 psi (27,235-27,925 kPa) on the HDC display (Figure 8, Item 1), tighten jam nut (Figure 7, Item 1).

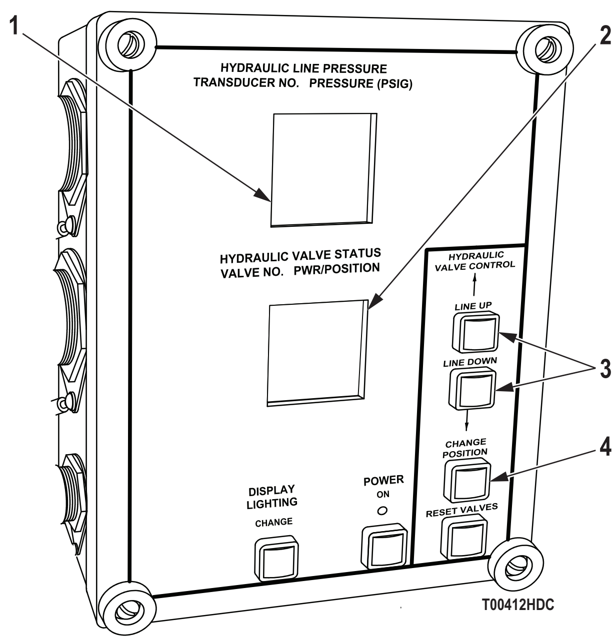



*Figure 8. Hydraulic Diagnostic Center (HDC) Control Box.*

## ALL HYDRAULIC FUNCTIONS INOPERATIVE - Continued

h. Verify pressure is now within limits by having assistant move right-hand SUSPENSION CONTROL lever to RAISE and EJECTOR CONTROL lever to BACK. Read transducer T-3 hydraulic pressure on the HDC display (Figure 8, Item 1).

i. Stop engine; relieve hydraulic pressure.

j. Manually open ejector inhibit ball valve V23 (Figure 9, Item 1) on the DCV bank. Using LINE UP or LINE DOWN button (Figure 8, Item 3), select V1 on the HDC display (Figure 8, Item 2). Open V1 on the HDC display (Figure 8, Item 2) by selecting the CHANGE POSITION button (Figure 8, Item 4) onf the HDC control box.

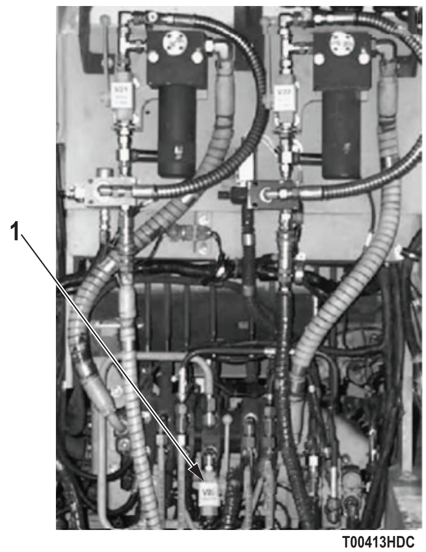



*Figure 9. Directional Control Valve (DCV) Bank.*

### CONDITION/INDICATION

Can hydraulic pressure be adjusted to 3,950-4,050 psi (27,235-27,925 kPa)?

### DECISION

YES - Go to Step (7).
NO - Replace DCV bank (TM 5-2350-262-20).

## ALL HYDRAULIC FUNCTIONS INOPERATIVE - Continued

**STEP**

7. Check transducer T-4 hydraulic pressure at port 13L.
   a. Stop engine and relieve hydraulic pressure.
   b. Reset all HDC solenoid valves by selecting the RESET VALVES button (Figure 10, Item 5) on the HDC control box.
   c. Using LINE UP or LINE DOWN button (Figure 10, Item 3), select V1 on the HDC display (Figure 10, Item 2). Close V1 on the HDC display (Figure 10, Item 2) by selecting the CHANGE POSITION button (Figure 10, Item 4) on the HDC control box.
   d. Have assistant start engine, move the SPRUNG/UNSPRUNG lever to SPRUNG, and hold EJECTOR CONTROL lever to BACK.
   e. Read transducer T-4 hydraulic pressure on the HDC display (Figure 10, Item 1).
   f. If hydraulic pressure is not within limits, continue with following steps.
   g. While still holding EJECTOR CONTROL lever in BACK, have assistant move left-hand SUSPENSION CONTROL lever to RAISE.
   h. Read transducer T-4 hydraulic pressure on the HDC display (Figure 10, Item 1).

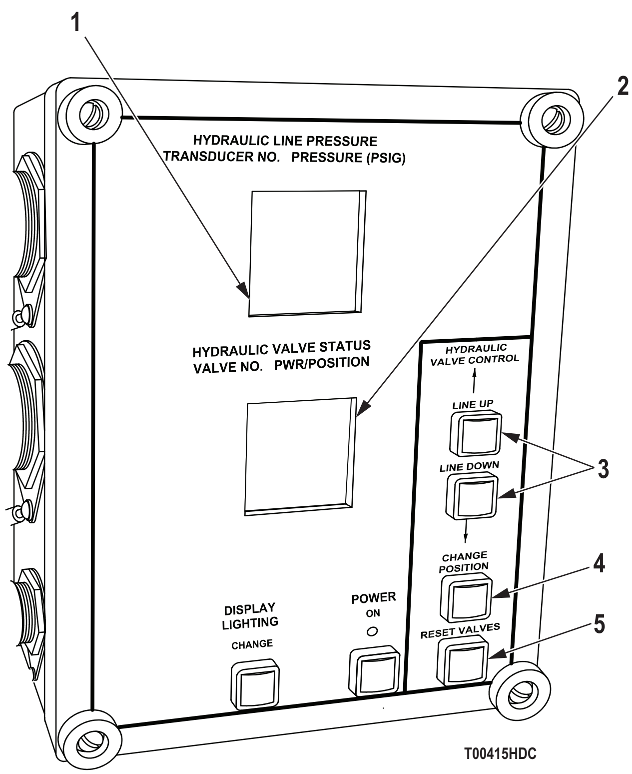



*Figure 10. Hydraulic Diagnostic Center (HDC) Control Box.*

## ALL HYDRAULIC FUNCTIONS INOPERATIVE - Continued

i. If pressure is not within limits, main relief valve 13L requires adjustment.

j. Release EJECTOR and SUSPENSION CONTROL levers.

k. Stop engine; relieve hydraulic pressure.

### CONDITION/INDICATION

Is pressure 3,950-4,050 psi (27,235-27,925 kPa)?

### DECISION

YES - Stop engine; relieve hydraulic pressure. Verify problem with operator.
NO - Go to Step (8).

## ALL HYDRAULIC FUNCTIONS INOPERATIVE - Continued

### STEP

8. Perform 13L main pump relief valve adjustment using the HDC.

   a. Reset all HDC solenoid valves by selecting the RESET VALVES button (Figure 11, Item 5) on the HDC control box.

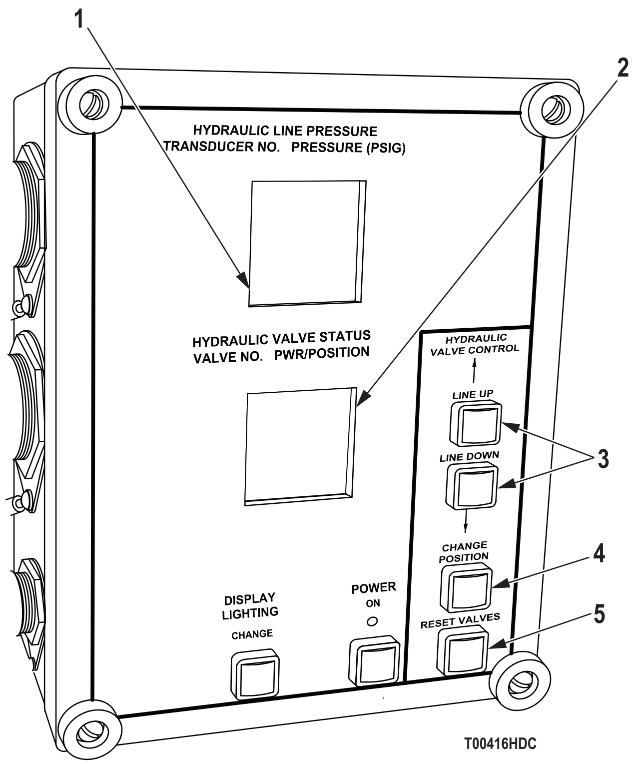
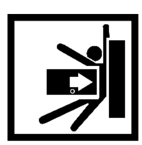



*Figure 11. Hydraulic Diagnostic Center (HDC) Control Box.*

## WARNING



- Do not operate ejector when personnel are in bowl. Do not work in bowl unless ejector lock is engaged. Failure to comply may result in severe injury or death to personnel.
- Do not stand or work in bowl area unless ejector lock is engaged. Do not stand in bowl to observe roller guide travels. Failure to comply may result in severe injury or death to personnel.

   b. Manually close the ejector inhibit ball valve V23 (Figure 12, Item 1) on the DCV bank.

**ALL HYDRAULIC FUNCTIONS INOPERATIVE - Continued**

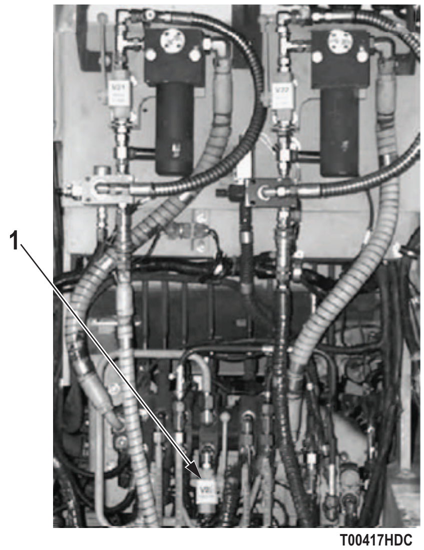



*Figure 12. Directional Control Valve (DCV) Bank.*

c. Using LINEUP or LINE DOWN button (Figure 11, Item 3), select V1 on the HDC display (Figure 11, Item 2).

d. Close V1 on the HDC display (Figure 11, Item 2) by selecting the CHANGE POSITION button (Figure 11, Item 4) on the HDC control box.

e. Loosen jam nut (Figure 13, Item 2).

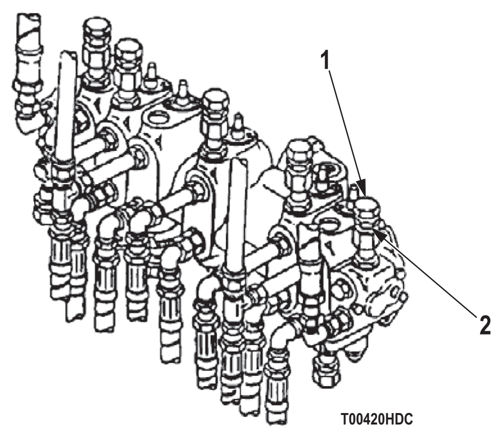



*Figure 13. Main Pump Relief Valve 13L.*

f. Read transducer T-4 hydraulic pressure on the HDC display (Figure 11, Item 1).

g. As assistant moves left-hand SUSPENSION CONTROL lever to RAISE and EJECTOR CONTROL lever to BACK, rotate valve (Figure 13, Item 1) clockwise to increase pressure; counterclockwise to decrease pressure.

h. When transducer T-4 pressure indicates 3,950–4,050 psi (27,235-27,925 kPa), tighten jam nut (Figure 13, Item 2).

i. Verify pressure is now within limits by having assistant move left-hand SUSPENSION CONTROL lever to RAISE and EJECTOR CONTROL lever to BACK.

## ALL HYDRAULIC FUNCTIONS INOPERATIVE - Continued

j. Read transducer T-4 hydraulic pressure on the HDC display (Figure 15, Item 1).

k. Stop engine; relieve hydraulic pressure.

l. Manually open ejector inhibit ball valve V23 (Figure 14, Item 1) on the DCV bank.

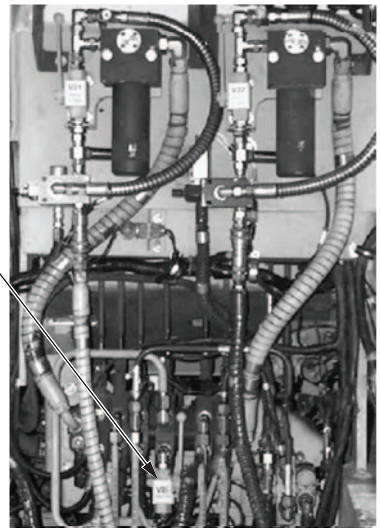



*Figure 14. Directional Control Valve (DCV) Bank.*

m. Using LINE UP or LINE DOWN button (Figure 15, Item 3), select V1 on the HDC display (Figure 15, Item 2).

n. Open V1 on the HDC display (Figure 15, Item 2) by selecting the CHANGE POSITION button (Figure 15, Item 4) on the HDC control box.

## ALL HYDRAULIC FUNCTIONS INOPERATIVE - Continued

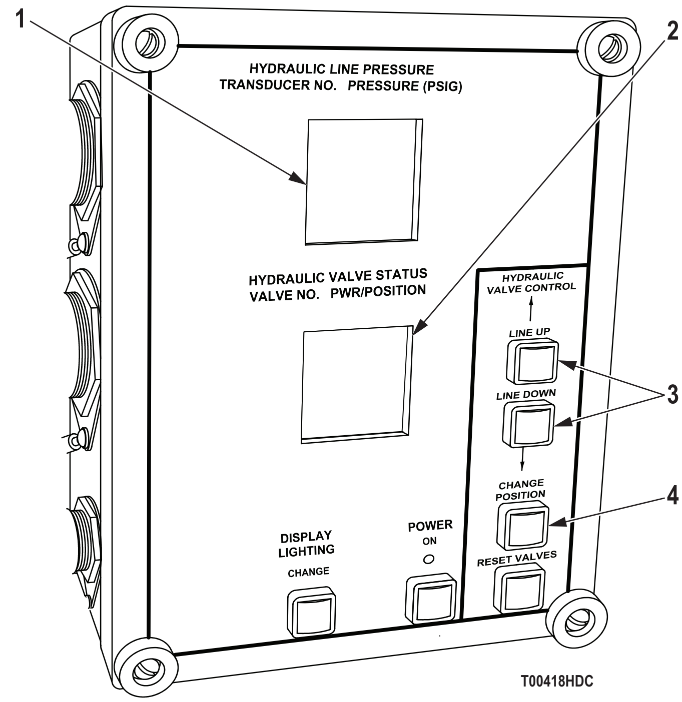



*Figure 15. Hydraulic Diagnostic Center (HDC) Control Box.*

### CONDITION/INDICATION

Can hydraulic pressure be adjusted to 3,950-4,050 psi (27,235-27,95 kPa)?

### DECISION

YES - Verify problem is solved.
NO - Replace DCV bank (TM 5-2350-262-20).

### STEP

9. Check if vehicle rises within two minutes.
   a. Start engine.
   b. Check if vehicle rises.

### CONDITION/INDICATION

Does vehicle "rise" (within two minutes) when engine is started with SPRUNG/UNSPRUNG lever in SPRUNG?

### DECISION

YES - Go to Step (10).
NO - Go to Step (11).

## ALL HYDRAULIC FUNCTIONS INOPERATIVE - Continued

**STEP**

10. Check operation of vehicle engine.

**CONDITION/INDICATION**

Does engine appear to be operating normally?

**DECISION**

YES - Go to Step (13).
NO - Go to Step (19).

**STEP**

11. Check main accumulator charge with engine off.

**CONDITION/INDICATION**

Does hydraulic pressure gauge indicate a pressure between 1,500-2,000 psi (10,343-13,790 kPa)?

**DECISION**

YES - Go to Step (12).
NO - Charge main accumulator (TM 5-2350-262-20).

**STEP**

12. Check accumulator pressure with engine running.

Start engine and check main accumulator charge with engine speed at 1,500 rpm.

**CONDITION/INDICATION**

Is hydraulic pressure at least 2,800 psi (19,306 kPa) with engine speed at 1,500 rpm?

**DECISION**

YES - Repair/replace compensating pump (TM 5-2350-262-20).
NO - Go to Step (13).

**STEP**

13. Check hydraulic oil level.

**CONDITION/INDICATION**

Are hydraulic oil levels at proper fill levels?

**DECISION**

YES - Charge main accumulator. If charge can not be maintained, repair or replace main accumulator (TM 5-2350-262-20).
NO - Add hydraulic oil, but do not overfill.

**ALL HYDRAULIC FUNCTIONS INOPERATIVE - Continued**

**STEP**

14. Check transmission, steer unit, transfer case, and final drive oil levels.

**CONDITION/INDICATION**

Are all oil levels at proper fill levels (TM 5-2350-262-10)?

**DECISION**

YES - Go to Step (15).
NO - Add oil where necessary, but do not overfill.

**STEP**

15. Check operation of transmission gear shift.

**CONDITION/INDICATION**

Does transmission gear shift apper to be operating properly?

**DECISION**

YES - Go to Step (16).
NO - Troubleshoot and repair/replace transmission gear shift linkage/mechanism (TM 5-2350-262-20).

**STEP**

16. Check transmission assembly for cracks, leaks, and warps in hoses, lines, and fittings.

**CONDITION/INDICATION**

Are there any cracks, leaks, or warps in transmission assembly?

**DECISION**

YES - Repair/replace transmission assembly (TM 5-2350-262-20).
NO - Go to Step (17).

**STEP**

17. Check transfer case for cracks, leaks, and warps in hoses, lines and fittings.

**CONDITION/INDICATION**

Are there any cracks, leaks, or warps in transfer case?

**DECISION**

YES - Repair/replace transfer case (TM 5-2350-262-20).
NO - Go to Step (18).

## ALL HYDRAULIC FUNCTIONS INOPERATIVE - Continued

**STEP**

18. Inspect/test final drive assemblies.

**CONDITION/INDICATION**

Do final drives appear to be operating normally?

**DECISION**

YES - Go to Step (19).
NO - Replace final drive assemblies (TM 5-2350-262-20).

**STEP**

19. Check if vehicle is operational.

    a. Turn off engine.

    b. Allow engine to cool down.

    c. Perform "Before Operation PMCS" procedures (TM 5-2350-262-10).

    d. Attempt to start and operate vehicle in a normal manner.

**CONDITION/INDICATION**

Can vehicle be operated in a normal manner?

**DECISION**

YES - Verify problem no longer exists.
NO - Notify Supervisor.

**END OF WORK PACKAGE**

## FIELD MAINTENANCE
## TROUBLESHOOTING PROCEDURES - APRON AND LEFT-HAND WHEEL CONTROL INOPERATIVE

**INITIAL SETUP:**

**Tools and Special Tools**
Tool Kit, General Mechanic's: Automotive
(WP 0054, Table 1, Item 7)

**Equipment Condition**
Vehicle MASTER power OFF (TM 5-2350-262-10)
Vehicle on jack stands (TM 5-2350-262-20)

**Personnel Required**
Construction Equipment Repairer, 91L (Two)

### TROUBLESHOOTING PROCEDURE

### APRON AND LEFT-HAND WHEEL CONTROL INOPERATIVE

**WARNING**

- High oil pressure is present in the M9 ACE hydraulic system. Do not disconnect any hydraulic system component unless hydraulic system pressure has been relieved. After hydraulic system has been relieved, wait at least four minutes before disconnecting any hose or fitting. Ensure each of the hydraulic control levers is moved several times through all positions and the hydraulic tank dipstick is slowly loosened to relieve pressure. Failure to comply may result in severe injury or death to personnel.
- Transmission shifting lines are pressurized. Do not disconnect lines, fittings, or accumulator unless transmission shift control valve pressure has been relieved. Discharge transmission shift accumulator by moving shift control lever through all forward and reverse ranges several times, with engine off. Failure to comply may result in severe injury to personnel.

**NOTE**

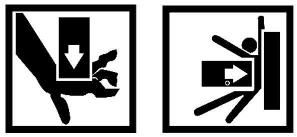
- The inboard valve bank hydraulic system 13R circuit is supplied by hydraulic pump port 13R and pressure is controlled by the relief valve at inlet port 13R.
- Perform this procedure only when the apron, left-hand suspension controls, and ejector are all inoperative.

## APRON AND LEFT-HAND WHEEL CONTROL INOPERATIVE - Continued

**STEP**

1. Perform main relief valve pressure test using the HDC.

**WARNING**



Before performing any hydraulic troubleshooting in the bowl, move ejector forward and disable it by disconnecting ejector cylinder from hydraulic system. Failure to comply may result in severe injury or death to personnel.

a. Move ejector forward, stop engine, and relieve hydraulic pressure.

b. Reset all HDC solenoid valves by selecting the RESET VALVES button (Figure 1, Item 5) on the HDC control box.

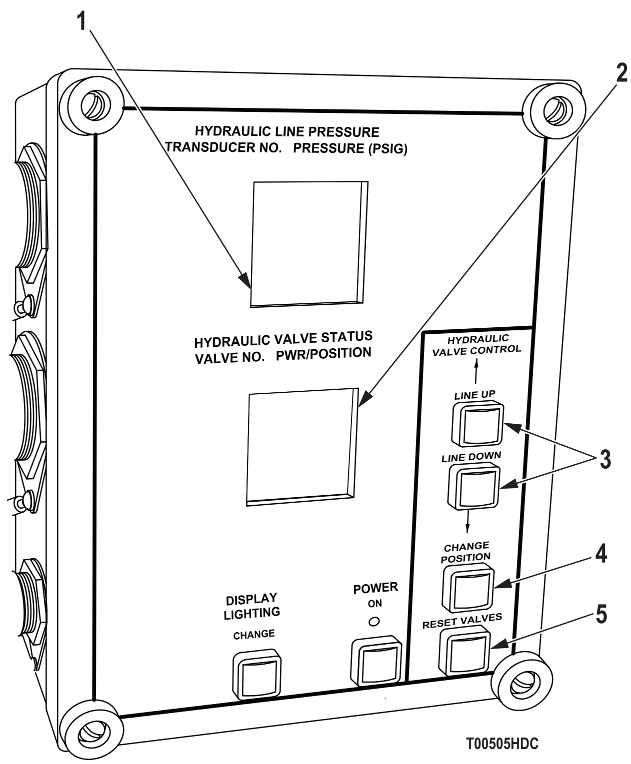



*Figure 1. Hydraulic Diagnostic Center (HDC) Control Box.*

## APRON AND LEFT-HAND WHEEL CONTROL INOPERATIVE - Continued

### WARNING

- Do not operate ejector when personnel are in bowl. Do not work in bowl unless ejector lock is engaged. Failure to comply may result in severe injury or death to personnel.
- Do not stand or work in bowl area unless ejector lock is engaged. Do not stand in bowl to observe roller guide travels. Failure to comply may result in severe injury or death to personnel.

c. Disable ejector by manually closing the ejector inhibit ball valve V23 (Figure 2, Item 1) on the Directional Control Valve (DCV) bank. Using LINE UP or LINE DOWN button (Figure 1, Item 3), select V1 on the HDC display (Figure 1, Item 2).

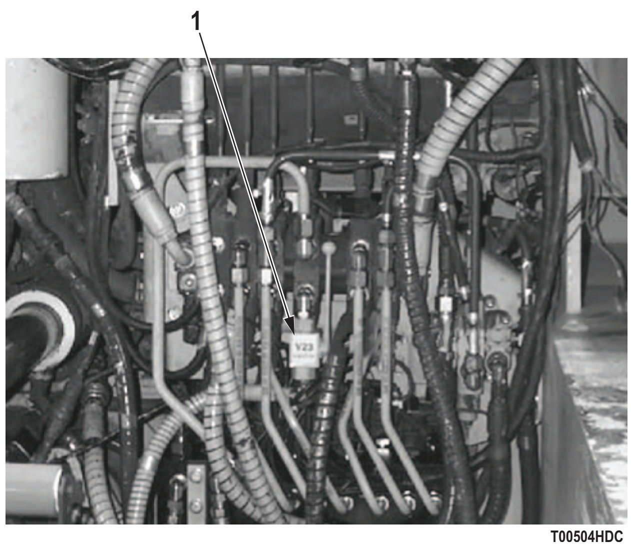



*Figure 2. Directional Control Valve (DCV) Bank.*

d. Close V1 on the HDC display (Figure 1, Item 2) by selecting the CHANGE POSITION button (Figure 1, Item 4) on the HDC control box.

e. Have assistant start engine, move the SPRUNG/UNSPRUNG lever to SPRUNG and move the EJECTOR CONTROL lever to BACK.

f. Read transducer T-3 hydraulic pressure on the HDC display (Figure 1, Item 1).

g. While simultaneously holding the EJECTOR CONTROL lever in BACK, have assistant move the right-hand SUSPENSION CONTROL lever to RAISE.

h. Read transducer T-3 hydraulic pressure on the HDC display (Figure 1, Item 1).

## APRON AND LEFT-HAND WHEEL CONTROL INOPERATIVE - Continued

### CONDITION/INDICATION

Is hydraulic pressure at transducer T-3 between 3,950-4,050 psi (27,235-27,925 kPa) on the HDC display?

### DECISION

YES - Stop engine; relieve hydraulic pressure. Verify the problem with operator.
NO - Go to Step (2).

### STEP

2. Perform 13R main relief valve adjustment.
   a. Loosen jam nut (Figure 4, Item 1) on main relief valve 13R (Figure 4, Item 2).
   b. Have assistant simultaneously hold EJECTOR CONTROL lever in BACK while holding the right-hand SUSPENSION CONTROL lever in RAISE.
   c. Read transducer T-3 hydraulic pressure on the HDC display (Figure 3, Item 1).

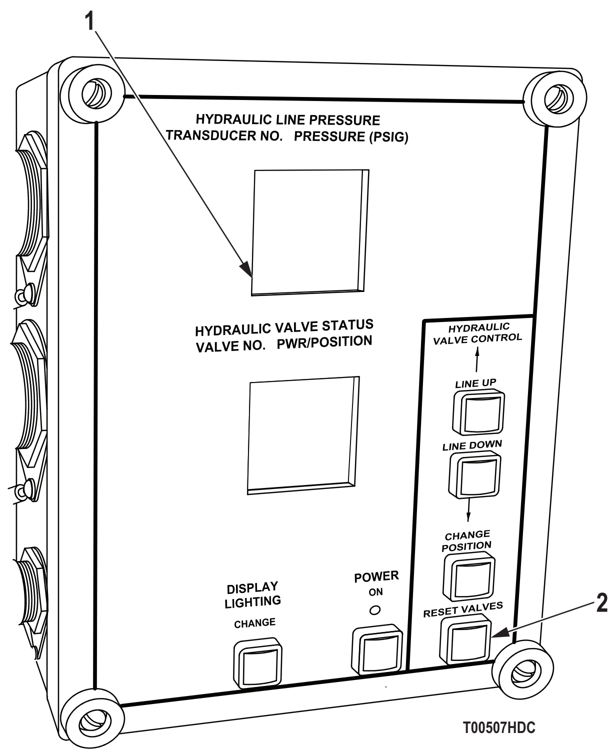



*Figure 3. Hydraulic Diagnostic Center (HDC) Control Box.*

## APRON AND LEFT-HAND WHEEL CONTROL INOPERATIVE - Continued

d. While reading transducer T-3 hydraulic pressure on the HDC display (Figure 3, Item 1), rotate adjusting screw (Figure 4, Item 3) clockwise to increase pressure; counterclockwise to decrease pressure, until correct pressure is indicated.

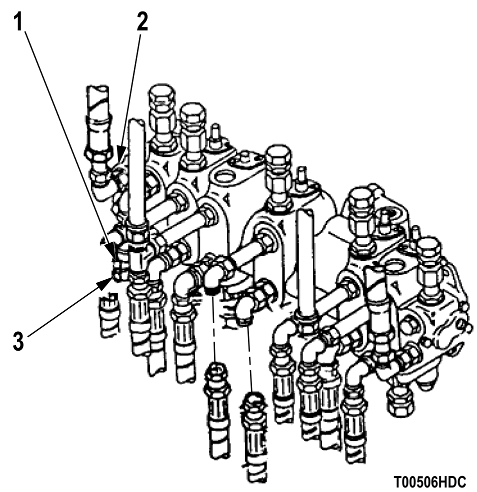



*Figure 4. Directional Control Valve (DCV) Bank.*

e. Tighten jam nut (Figure 4, Item 1).

f. Stop engine; relieve hydraulic pressure.

g. Reset all HDC solenoid valves by selecting the RESET VALVES button (Figure 3, Item 2) on the HDC control box.

### CONDITION/INDICATION

Can the 13R main relief valve be set to develop hydraulic pressure between 3,950-4,050 psi (27,235-27,925 kPa)?

### DECISION

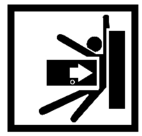
YES - If transducer T-3 hydraulic pressure is between 3,950-4,050 psi (27,235-27,925 kPa), verify problem is solved.
NO - Go to Step (3).

**APRON AND LEFT-HAND WHEEL CONTROL INOPERATIVE - Continued**

**STEP**

3. Perform main hydraulic pump pressure test using the HDC.

**WARNING**



- Do not operate ejector when personnel are in bowl. Do not work in bowl unless ejector lock is engaged. Failure to comply may result in severe injury or death to personnel.
- Do not stand or work in bowl area unless ejector lock is engaged. Do not stand in bowl to observe roller guide travels. Failure to comply may result in severe injury or death to personnel.

a. Reset all HDC solenoid valves by selecting the RESET VALVES button (Figure 5, Item 5) on the HDC control box.

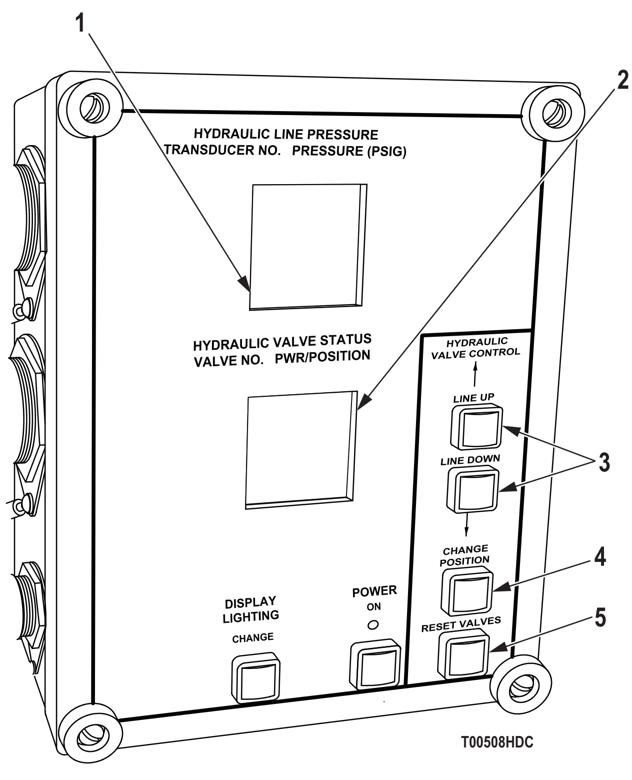



*Figure 5. Hydraulic Diagnostic Center (HDC) Control Box.*

b. Disable ejector by manually closing the ejector inhibit ball valve V23 (Figure 6, Item 2) on the DCV bank.

(1) Using LINE UP or LINE DOWN button (Figure 5, Item 3), select V1 on the HDC display (Figure 5, Item 2).

(2) Close V1 on the HDC display (Figure 5, Item 2) by selecting the CHANGE POSITION button

## APRON AND LEFT-HAND WHEEL CONTROL INOPERATIVE - Continued

(Figure 5, Item 4) on the HDC control box.

c. Ensure right main hydraulic pressure inhibit valve V21 (Figure 6, Item 1) is fully open.

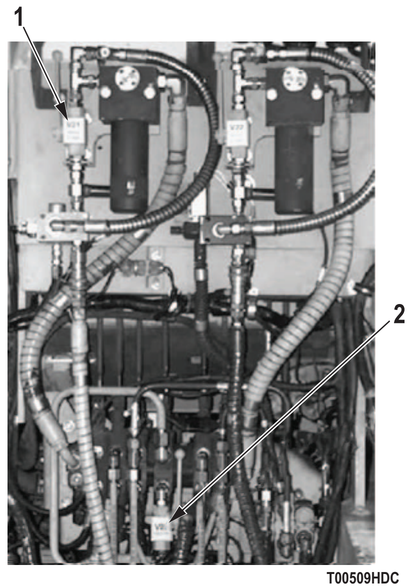



*Figure 6. Directional Control Valve (DCV) Bank.*

d. Have assistant start engine and allow engine to idle (750–800 rpm).

e. Slowly close right main hydraulic pressure inhibit valve V21 (Figure 6, Item 1) until transducer T-3 on the HDC display (Figure 5, Item 1) indicates 3,950-4,050 psi (27,235-27,925 kPa).

f. Open right main hydraulic pressure inhibit valve V21 (Figure 6, Item 1).

g. Stop engine; relieve hydraulic pressure.

h. Open ejector inhibit ball valve V23 (Figure 6, Item 2) on the DCV bank.

i. Reset all HDC solenoid valves by selecting the RESET VALVES button (Figure 5, Item 5) on the HDC control box.

### CONDITION/INDICATION

Does pressure transducer T-3 indicate main hydrualic pump develops 3,950-4,050 psi (27,235-27,925 kPa)?

### DECISION

YES - Replace Directional Control Valve (DCV) bank (TM 5-2350-262-20).
NO - Notify Direct Support maintenance to replace main hydraulic pump.

### END OF WORK PACKAGE

## FIELD MAINTENANCE
## TROUBLESHOOTING PROCEDURES - APRON WILL NOT RAISE

**INITIAL SETUP:**

**Tools and Special Tools**
Tool Kit, General Mechanic's: Automotive (WP 0054, Table 1, Item 7)
Parts Kit, Hydraulic (WP 0054, Table 1, Item 3)
Wood Blocks

**Personnel Required**
Construction Equipment Repairer, 91L (Two)

**References**
WP 0035

**Equipment Condition**
Vehicle MASTER power OFF (TM 5-2350-262-10)
Vehicle on jack stands (TM 5-2350-262-20)

### TROUBLESHOOTING PROCEDURE

### APRON WILL NOT RAISE

**WARNING**

High oil pressure is present in the M9 ACE hydraulic system. Do not disconnect any hydraulic system component unless hydraulic system pressure has been relieved. After hydraulic system has been relieved, wait at least four minutes before disconnecting any hose or fitting. Ensure each of the hydraulic control levers is moved several times through all positions and the hydraulic tank dipstick is slowly loosened to relieve pressure. Failure to comply may result in severe injury or death to personnel.

**NOTE**

The apron cylinders receive oil flow from main control valve circuits 19 and 20. Relief valves at port 19 and 20 of main control valve limit pressure to apron cylinders to 3,500 psi (24,131 kPa).

## APRON WILL NOT RAISE - Continued

**STEP**

1. Check apron for interference.

**CONDITION/INDICATION**

Is the apron binding or jammed as a result of damage to apron or hull?

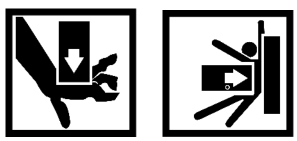
**DECISION**

YES - Clear obstructions and repair mechanical damage.
NO - Go to Step (2).

**STEP**

2. Perform apron control valve pressure test, using the Hydraulic Diagnostic Center (HDC).

**WARNING**



Before performing any hydraulic troubleshooting in the bowl, move ejector forward and disable it by disconnecting ejector cylinder from hydraulic system. Failure to comply may result in severe injury or death to personnel.

a. Start engine.

b. Move ejector forward, stop engine, and relieve hydraulic pressure.

c. Reset all HDC solenoid valves by selecting the RESET VALVES button (Figure 1, Item 5) on the HDC control box.

d. Using LINE UP or LINE DOWN button (Figure 1, Item 3), select V17 on the HDC display (Figure 1, Item 2).

e. Close V17 on the HDC display (Figure 1, Item 2) by selecting the CHANGE POSITION button (Figure 1, Item 4) on the HDC control box.

f. Have assistant start engine and hold APRON CONTROL lever in UP position (RAISE).

g. Read transducer T-1 hydraulic pressure on the HDC display (Figure 1, Item 1).

## APRON WILL NOT RAISE - Continued

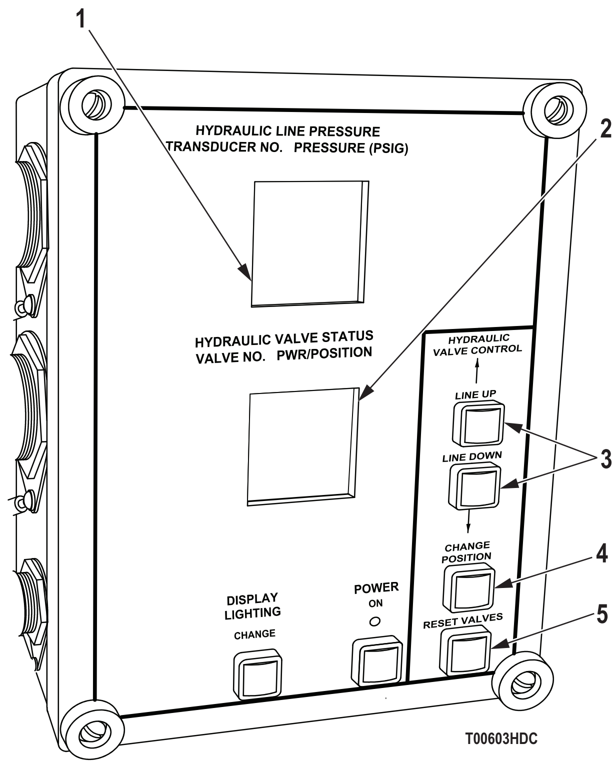



*Figure 1. Hydraulic Diagnostic Center (HDC) Control Box.*

## CONDITION/INDICATION

Is hydraulic pressure at transducer T-1 less than 2,000 psi (13,790 kPa)?

## DECISION

YES - Go to Step (4).
NO - Go to Step (3).

**APRON WILL NOT RAISE - Continued**

**STEP**

3. Perform V17 test.

   a. Reset all HDC solenoid valves by selecting RESET VALVES button (Figure 2, Item 5) on the HDC control box.

   b. Wait for transducer T-1 hydraulic pressure on the HDC display (Figure 2, Item 1) to drop below 500 psi (3,447 kPa).

   c. Using LINE UP or LINE DOWN button (Figure 2, Item 3), select V17 on the HDC display (Figure 2, Item 2).

   d. Close V17 on the HDC display (Figure 2, Item 2) by selecting the CHANGE POSITION button (Figure 2, Item 4) on the HDC control box.

   e. Have assistant start engine (if engine is already running) and move APRON CONTROL lever to UP position (RAISE).

   f. Read transducer T-1 hydraulic pressure on the HDC display (Figure 2, Item 1).

   g. Stop engine; relieve hydraulic pressure.

   h. Reset all HDC solenoid valves by selecting the RESET VALVES button (Figure 2, Item 5) on the HDC control box.

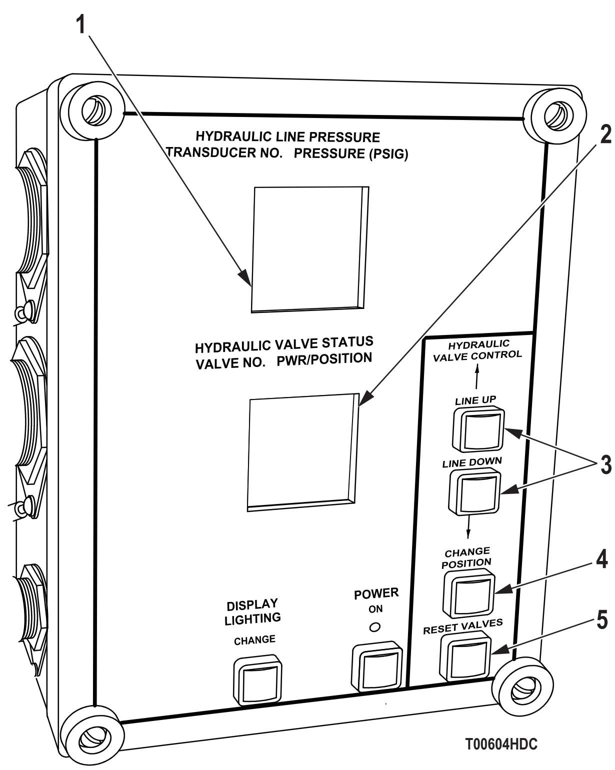



*Figure 2. Hydraulic Diagnostic Center (HDC) Control Box.*

**APRON WILL NOT RAISE - Continued**

**CONDITION/INDICATION**

Is hydraulic pressure at transducer T-1 less than 500 psi (3,447 kPa)?

**DECISION**

YES - Go to Step (5).
NO - Replace solenoid valve V17 on HDC system primary manifold (WP 0035).

**STEP**

4. Perform relief valve adjustment.

   a. Reset all HDC solenoid valves by selecting the RESET VALVES button (Figure 2, Item 5).

**WARNING**

- Do not operate ejector when personnel are in bowl. Do not work in bowl unless ejector lock is engaged. Failure to comply may result in severe injury or death to personnel.
- Do not stand or work in bowl area unless ejector lock is engaged. Do not stand in bowl to observe roller guide travels. Failure to comply may result in severe injury or death to personnel.

   b. Stop engine and relieve hydraulic pressure.

   c. Manually close ejector inhibit ball valve V23 (Figure 3, Item 1) on the DCV bank.

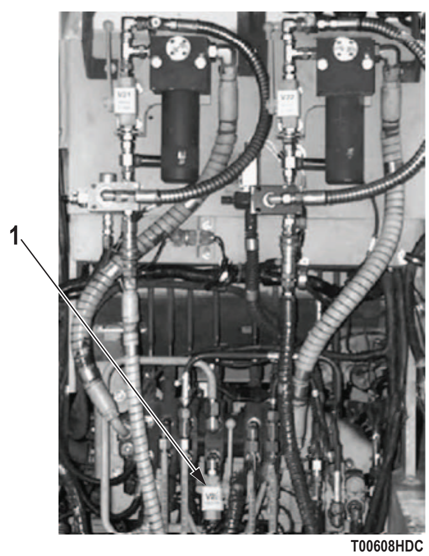



*Figure 3. Directional Control Valve (DCV) Bank.*

**APRON WILL NOT RAISE - Continued**

d. Using LINE UP or LINE DOWN button (Figure 4, Item 3), select V1 on the HDC display (Figure 4, Item 2).

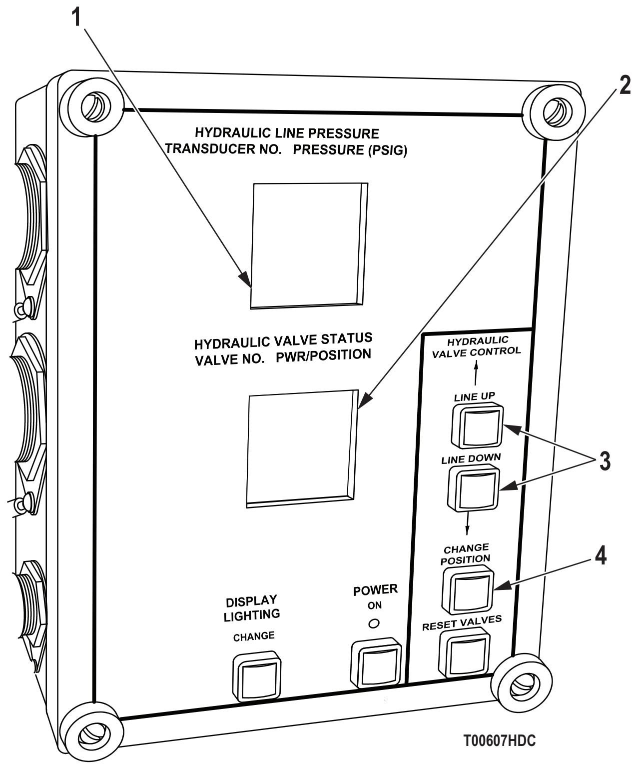



*Figure 4. Hydraulic Diagnostic Center (HDC) Control Box.*

e. Close V1 on the HDC display (Figure 4, Item 2) by selecting the CHANGE POSITION button (Figure 4, Item 4) on the HDC control box. Select V17 on the HDC display (Figure 4, Item 2).

f. Close V17 on the HDC display (Figure 4, Item 2) by selecting the CHANGE POSITION button (Figure 4, Item 4) on the HDC control box.

g. Have assistant start engine and hold APRON CONTROL lever to UP position.

h. Loosen jam nut (Figure 5, Item 1) on apron control pressure relief valve (Figure 5, Item 3).

**APRON WILL NOT RAISE - Continued**

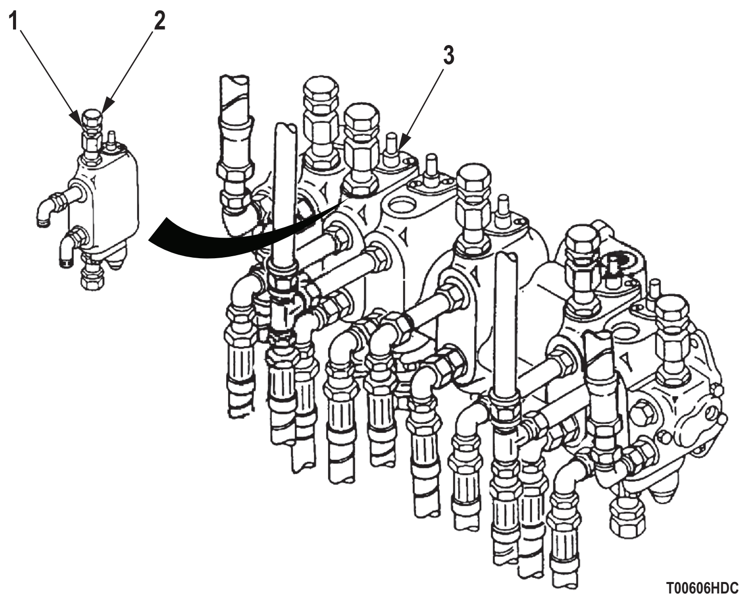



*Figure 5. Apron Control Pressure Relief Valve.*

i. Read transducer T-1 hydraulic pressure on the HDC display (Figure 4, Item 1).

j. Have assistant hold APRON CONTROL lever in UP position.

k. Rotate valve adustment (Figure 5, Item 2) clockwise to increase pressure, counterclockwise to decrease pressure, until hydraulic pressure is a minimum of 3,500 psi (24,131 kPa).

l. When transducer T-1 hydraulic pressure on the HDC display (Figure 4, Item 1) indicates 3,500 psi (24,131 kPa); tighten jam nut (Figure 5, Item 1).

m. Stop engine; relieve hydraulic pressure.

n. Manually open ejector inhibit ball valve V23 (Figure 6, Item 1) on the DCV bank.

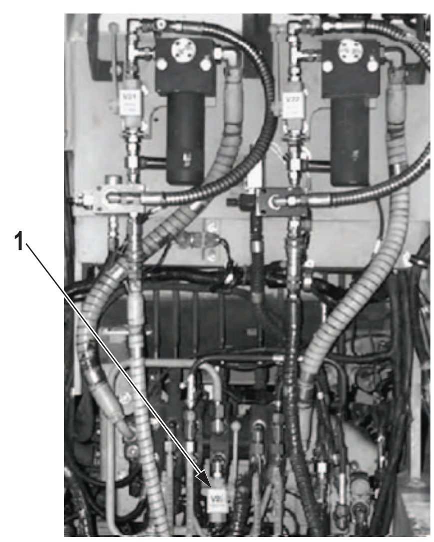



*Figure 6. Hydraulic Diagnostic Center (HDC) Control Box.*

## APRON WILL NOT RAISE - Continued

o. Using LINE UP or LINE DOWN button (Figure 7, Item 2), select V1 on the HDC display (Figure 7, Item 1).

p. Open V1 on the HDC display (Figure 7, Item 1) by selecting the CHANGE POSITION button (Figure 7, Item 3) on the HDC control box.

q. Select V17 on the HDC display (Figure 7, Item 1).

r. Open V17 on the HDC display (Figure 7, Item 1) by selecting the CHANGE POSITION button (Figure 7, Item 3) on the HDC control box.

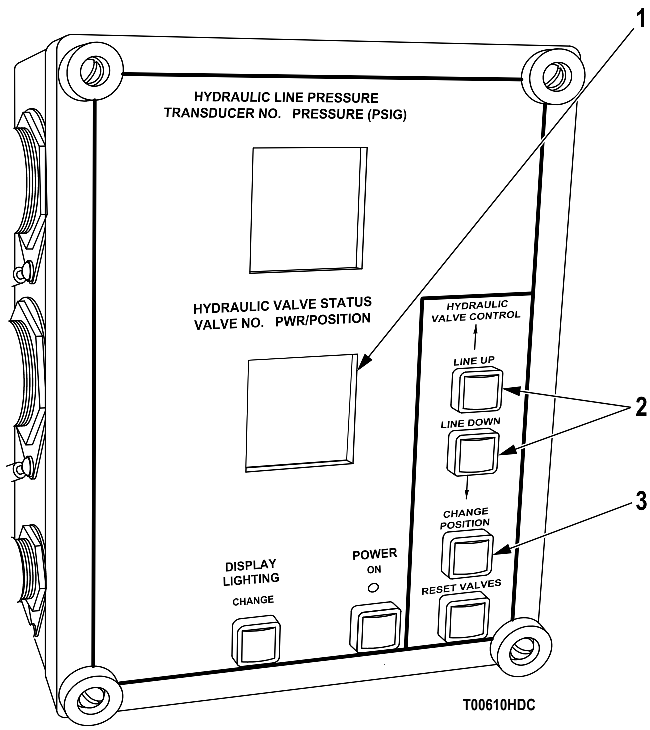



*Figure 7. Directional Control Valve (DCV) Bank.*

## CONDITION/INDICATION

Can circuit 19 relief valve be set to develop 3,500 psi (24,131 kPa)?

## DECISION

YES - Verify problem is solved.
NO - Replace Directional Control Valve (DCV) bank (TM 5-2350-262-20).

**APRON WILL NOT RAISE - Continued**

**STEP**

5. Perform apron cylinders operation check.

## CAUTION

Ensure apron cylinders are blocked prior to retracting disconnected cylinder rod ends. Cylinders will drop and damage hydraulic hoses.

a. Stop engine; relieve hydraulic pressure.

b. With apron (Figure 8, Item 1) lowered, remove exterior armor plates 1L (Figure 8, Item 2) and 1R (Figure 8, Item 3).

c. Remove bolt (Figure 8, Item 5), nut (Figure 8, Item 9), two washers (Figure 8, Items 4 and 10), and clevis pin (Figure 8, Item 8) from rod end (Figure 8, Item 11) of both apron cylinders (Figure 8, Item 6).

d. Insert wood blocks (Figure 8, Item 7) under apron cylinders (Figure 8, Item 6).

e. Start engine and hold APRON CONTROL lever in UP position.

f. Observe movement of apron cylinders (Figure 8, Item 6).

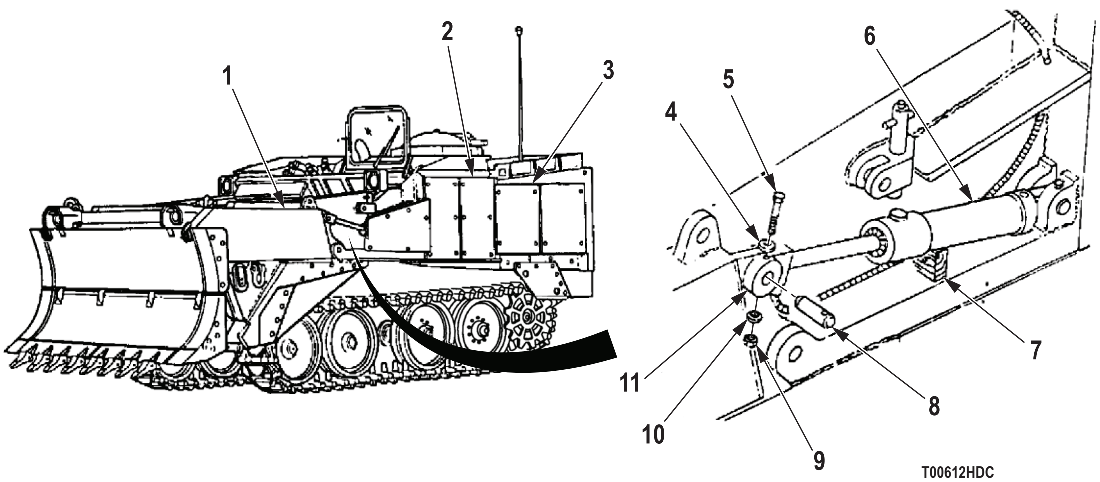



*Figure 8. Apron Cylinders Operation Check.*

**CONDITION/INDICATION**

Does one cylinder retract completely before the other cylinder will retract?

**DECISION**

YES - Go to Step (8).
NO - Go to Step (6).

**APRON WILL NOT RAISE - Continued**

**STEP**

6. Check which apron cylinder fails to retract.

**CONDITION/INDICATION**

Does either one or both apron cylinders fail to retract?

**DECISION**

YES - Go to Step (7).
NO - Verify problem with operator.

**STEP**

7. Perform apron cylinders oil flow test.

**NOTE**

Have suitable container ready to catch oil.

a. Extend apron cylinders (Figure 9, Item 1) fully.

b. Stop engine.

c. Relieve hydraulic pressure by moving APRON CONTROL lever UP and DOWN several times, and disconnect left and right APRON CYL-#19 hoses (Figure 9, Item 2) from apron cylinders (Figure 9, Item 1).

d. Hold open end of each hose (Figure 9, Item 2) in a bucket.

**NOTE**

If there is no flow from one of the APRON CYL-#19 hoses, the blockage is between cylinder end of that hose and circuit 19 tee on the hull floor. If no flow from either hose is observed, the blockage is in CONT VLV-#19 hose between circuit 19 control valve and tee on hull floor.

e. Have assistant start engine and slowly move APRON CONTROL lever to UP position.

f. Observe oil flow from both APRON CYL-#19 hoses.

g. Stop engine; relieve hydraulic pressure.

h. Reconnect left and right APRON CYL-#19 hoses (Figure 9, Item 2) to cylinders (Figure 9, Item 1).

**APRON WILL NOT RAISE - Continued**

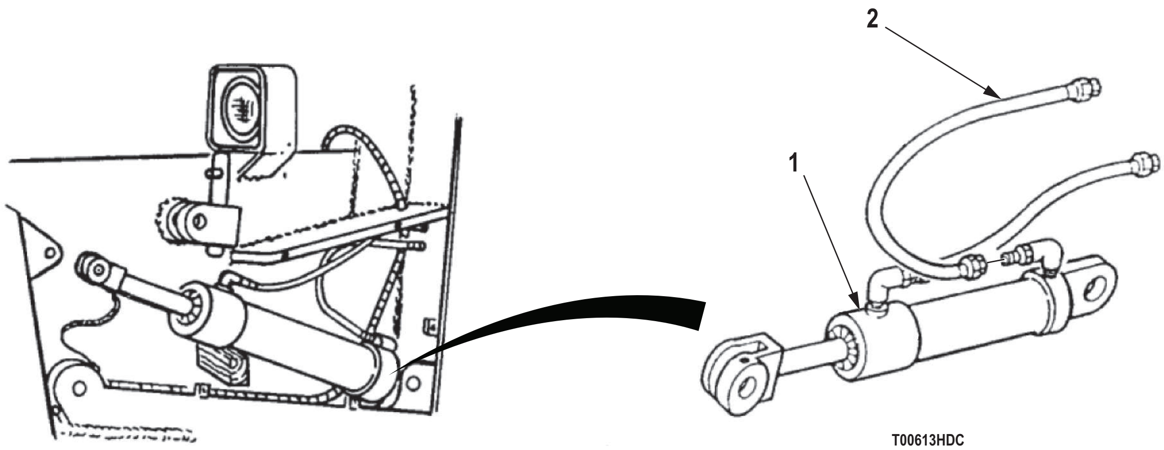



*Figure 9. Apron Cylinders Oil Flow Test.*

**CONDITION/INDICATION**

Is there oil flow from both apron cylinder circuit 19 hoses?

**DECISION**

YES - Go to Step (8).
NO - Clear blockage or replace obstructed line(s).

## APRON WILL NOT RAISE - Continued

**STEP**

8. Perform apron cylinder leakage test.

### NOTE

Have suitable container ready to catch oil.

a. Have assistant start engine, and retract cylinders (Figure 10, Item 4) approximately halfway.

b. Stop engine; relieve hydraulic pressure.

c. Disconnect CLT-20 (REAR) TEE hose (Figure 10, Item 2) and CKT-20 (REAR) TEE tube (Figure 10, Item 1) from tee (Figure 10, Item 3) on hull floor.

d. Plug hose (Figure 10, Item 2) and tube (Figure 10, Item 1), and cap tee (Figure 10, Item 3).

e. Start engine and have assistant hold APRON CONTROL lever in UP position.

f. Measure cylinder rod extension of both apron cylinders (Figure 10, Item 4).

g. Continue to hold APRON CONTROL lever UP for one minute.

h. Have assistant return APRON CONTROL lever to NEUTRAL position.

i. Measure cylinder rod extension of both apron cylinders (Figure 10, Item 4) again.

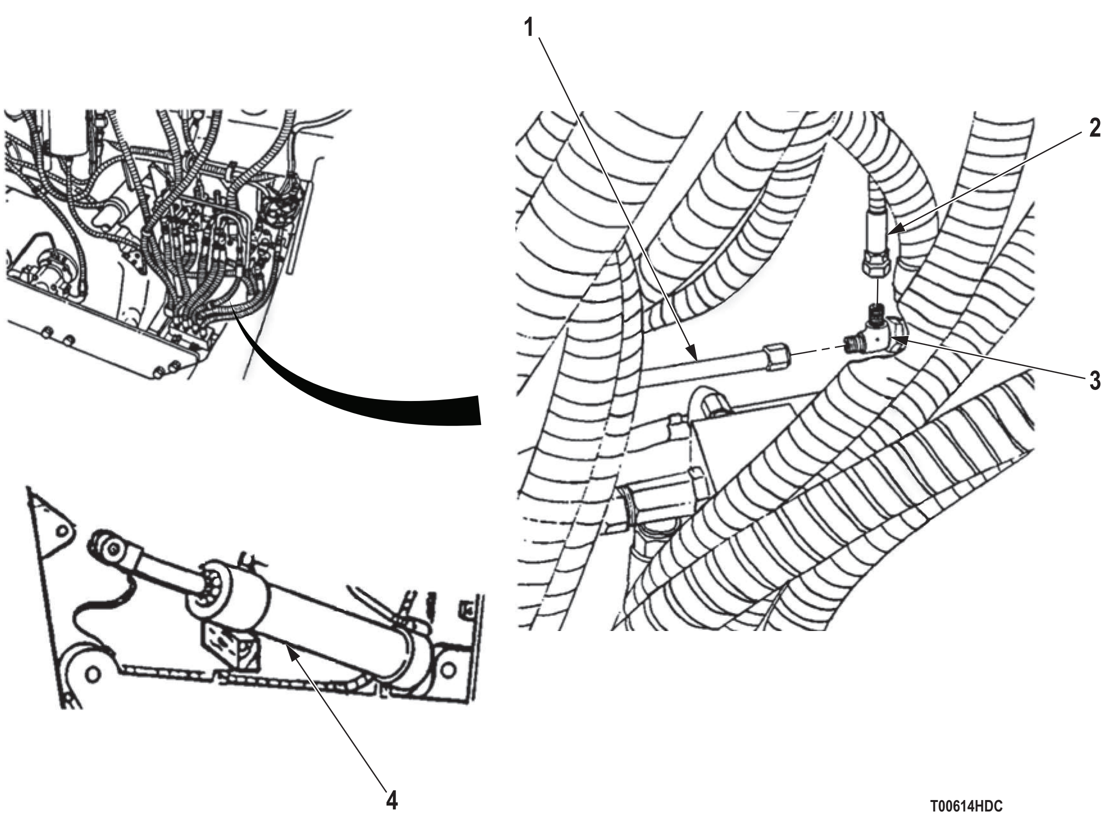



*Figure 10. Apron Cylinders Leakage Test.*

j. If extension rate is greater than 0.5 in. (13 mm) per minute, cylinder is leaking excessively.

## APRON WILL NOT RAISE - Continued

k. Stop engine; relieve hydraulic pressure.

### CONDITION/INDICATION

Is either apron cylinder leaking excessively?

### DECISION

YES - Replace or repair leaking apron cylinder (TM 5-2350-262-20).
NO - Connect hoses and tubes. Verify problem with operator.

**END OF WORK PACKAGE**

## FIELD MAINTENANCE
## TROUBLESHOOTING PROCEDURES - BUMP STOPS INOPERATIVE

### INITIAL SETUP:

**Tools and Special Tools**
Tool Kit, General Mechanic's: Automotive
(WP 0054, Table 1, Item 7)

**Equipment Condition**
Vehicle MASTER power OFF (TM 5-2350-262-10)
Vehicle on jack stands (TM 5-2350-262-20)

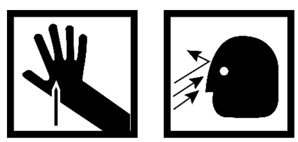
**Personnel Required**
Construction Equipment Repairer, 91L (Two)

**References**
WP 0036
WP 0037

### TROUBLESHOOTING PROCEDURE

### TROUBLESHOOTING PROCEDURES - BUMP STOPS INOPERATIVE

**WARNING**



- High oil pressure is present in the M9 ACE hydraulic system. Do not disconnect any hydraulic system component unless hydraulic system pressure has been relieved. After hydraulic system has been relieved, wait at least four minutes before disconnecting any hose or fitting. Ensure each of the hydraulic control levers is moved several times through all positions and the hydraulic tank dipstick is slowly loosened to relieve pressure. Failure to comply may result in severe injury or death to personnel.
- Transmission shifting lines are pressurized. Do not disconnect lines, fittings, or accumulator unless transmission shift control valve pressure has been relieved. Discharge transmission shift accumulator by moving shift control lever through all forward and reverse ranges several times, with engine off. Failure to comply may result in severe injury to personnel.

**NOTE**

- The bump stops limit travel of vehicle's No. 1 left and right suspension unit in the SPRUNG mode. Hydraulic pressure is supplied to bump stops by the compensating pump through SPRUNG/UNSPRUNG valve.
- Perform these procedures for left and right bump stop.

## TROUBLESHOOTING PROCEDURES - BUMP STOPS INOPERATIVE - Continued

### STEP

1. Perform visual inspection. Check hydraulic hoses, tubes, and fittings.
   a. Remove bump stop access panels (Figure 1, Item 1) from hull on inoperative side of vehicle.
   b. Check hydraulic lines at circuits 9 (Figure 1, Item 4) and 11 (Figure 1, Item 3) between bump stop cylinder (Figure 1, Item 2) and forward manifold (Figure 1, Item 5).

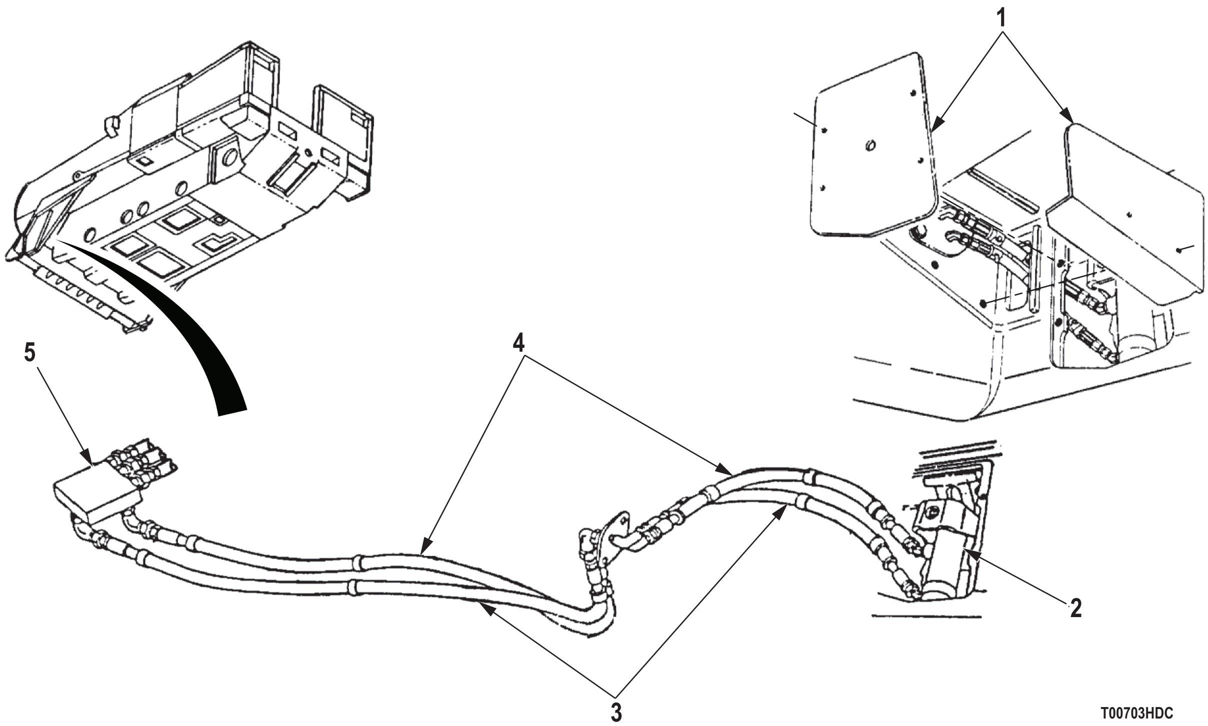



*Figure 1. Left Front Bump Stop.*

### CONDITION/INDICATION

Is there a leaking, pinched, or damaged hose in the bump stop circuit?

### DECISION

YES - Repair or replace damaged hoses or fittings (TM 5-2320-262-20).
NO - Go to Step (2).

## TROUBLESHOOTING PROCEDURES - BUMP STOPS INOPERATIVE - Continued

### STEP

2. Perform mechanical binding check.

    a. Clear debris from area of bump stop (Figure 2, Item 1).

    b. Start engine and allow to run for at least two minutes to build up hydraulic pressure.

    c. Have assistant shift SPRUNG/UNSPRUNG lever to SPRUNG, then to UNSPRUNG. Repeat several times.

    d. Check for free movement of bump stop cylinder (Figure 2, Item 3), cylinder rod connecting pin (Figure 2, Item 2), and bump stop (Figure 2, Item 1).

    e. Check for missing or damaged components including cylinder rod (Figure 2, Item 3), cylinder rod connecting pin (Figure 2, Item 2), and bump stop (Figure 2, Item 1).

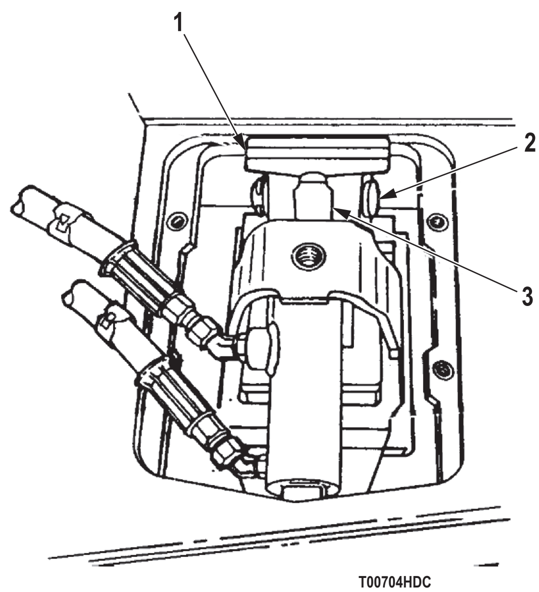



*Figure 2. Left Front Bump Stop.*

    f. Leave SPRUNG/UNSPRUNG lever in SPRUNG to support later test.

### CONDITION/INDICATION

Is bump stop cylinder jammed or binding?

### DECISION

YES - Free bump stop or replace damaged components (TM 5-2350-262-20).
NO - Go to Step (3).

## TROUBLESHOOTING PROCEDURES - BUMP STOPS INOPERATIVE - Continued

### STEP

3. Perform bump stop circuit test using the Hydraulic Diagnostic Center (HDC).

   a. Stop engine; relieve hydraulic pressure.

   b. Reset all HDC solenoid valves by selecting the RESET VALVES button (Figure 3, Item 5) on the HDC control box.

   c. Have assistant start engine and place vehicle in SPRUNG mode.

   d. For left side bump stop circuit, close left forward manifold valve, by using LINE UP or LINE DOWN button (Figure 3, Item 3), select V9 on HDC display (Figure 3, Item 2).

   e. Close V9 on the HDC display (Figure 3, Item 2), by selecting the CHANGE POSITION button (Figure 3, Item 4) on HDC control box.

   f. Read transducer T-9 hydraulic pressure on HDC display (Figure 3, Item 1).

   g. For right side bump stop circuit, close right forward manifold valve, by using LINE UP or LINE DOWN button (Figure 3, Item 3), select V10 on HDC display (Figure 3, Item 2).

   h. Close V10 on HDC display (Figure 3, Item 2), by selecting CHANGE POSITION button (Figure 3, Item 4) on HDC control box.

   i. Read transducer T-8 hydraulic pressure on HDC display (Figure 3, Item 1).

### CONDITION/INDICATION

Is transducer T-8 (right side) or T-9 (left side) hydraulic pressure at line 9 less than 2,500 psi (17,238 kPa)?

### DECISION

YES - Go to Step (4).
NO - Go to Step (5).

### STEP

4. Perform forward manifold pressure test using the HDC.

   a. Reset all HDC solenoid valves by selecting RESET VALVES button (Figure 3, Item 5) on the HDC control box.

   b. Start engine.

   c. For left forward manifold pressure, close left forward manifold valve.

   d. Using LINE UP or LINE DOWN button (Figure 3, Item 3), select V9 on the HDC display (Figure 3, Item 2).

   e. Close V9 on the HDC display (Figure 3, Item 2), by selecting the CHANGE POSITION button (Figure 3, Item 4) on HDC control box.

   f. Read transducer T-7 hydraulic pressure on the HDC display (Figure 3, Item 1).

   g. For right forward manifold pressure, close right forward manifold valve.

   h. Using LINE UP or LINE DOWN button (Figure 3, Item 3), select V10 on the HDC display (Figure 3, Item 2).

   i. Close V10 on HDC display (Figure 3, Item 2), by selecting CHANGE POSITION button (Figure 3, Item 4) on the HDC control box.

   j. Read transducer T-7 hydraulic pressure on the HDC display (Figure 3, Item 1).

**TROUBLESHOOTING PROCEDURES - BUMP STOPS INOPERATIVE - Continued**

k. Stop engine and relieve hydraulic pressure.

l. Reset all HDC solenoid valves by selecting the RESET VALVES button (Figure 3, Item 5) on the HDC control box.

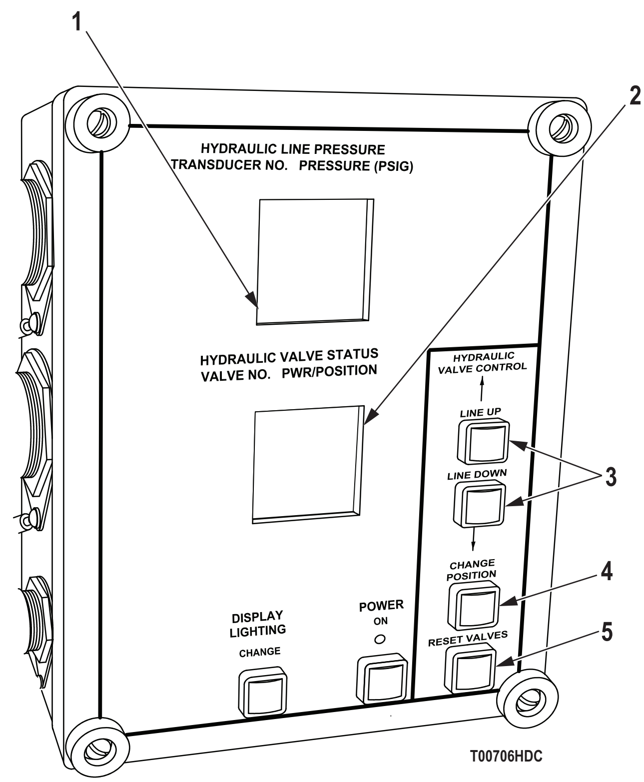



*Figure 3. Hydraulic Diagnostic Center (HDC) Control Box.*

**CONDITION/INDICATION**

Is transducer T-7 hydraulic pressure less than 2,500 psi (17,238 kPa)?

**DECISION**

YES - Verify with operator that problem is only confined to bump stops.
NO - Clear or replace circuit 9 hoses between bump stop cylinder and left main manifold port (TM 5-2350-262-20).

**TROUBLESHOOTING PROCEDURES - BUMP STOPS INOPERATIVE - Continued**

**STEP**

5. Perform bump stop cylinder leakage check using the HDC.

   a. Stop engine; relieve hydraulic pressure.

   b. Reset all HDC solenoid valves by selecting the RESET VALVES button (Figure 4, Item 5) on HDC control box.

   c. Move SPRUNG/UNSPRUNG lever to UNSPRUNG.

   d. For left bump stop circuit; using LINE UP or LINE DOWN button (Figure 4, Item 3), select V10 on HDC display (Figure 4, Item 2).

   e. Close V10 on the HDC display (Figure 4, Item 2), by selecting the CHANGE POSITION button (Figure4, Item 4) on HDC control box.

   f. For right bump stop circuit; using LINE UP or LINE DOWN button (Figure 4, Item 3), select V9 on HDC display (Figure 4, Item 2).

   g. Close V9 on HDC display (Figure 4, Item 2), by selecting the CHANGE POSITION button (Figure 4, Item 4) on HDC control box.

   h. Start engine and move SPRUNG/UNSPRUNG lever to SPRUNG. Note the time it takes for the bump stops to extend fully.

   i. Stop engine; relieve hydraulic pressure.

   j. Reset all HDC solenoid valves by selecting the RESET VALVES button (Figure 4, Item 5) on HDC control box.

**CONDITION/INDICATION**

Does cylinder fully extend in less than two seconds?

**DECISION**

YES - Replace or repair affected bump stop cylinder (TM 5-2350-262-20).
NO - Go to Step (6).

**STEP**

6. Perform bump stop circuit 11 test using HDC.

   a. Reset all HDC solenoid valves by selecting RESET VALVES button (Figure 4, Item 5) on HDC control box.

   b. Have assistant start engine and move SPRUNG/UNSPRUNG lever to UNSPRUNG.

   c. For left bump stop circuit; Using LINE UP or LINE DOWN button (Figure 4, Item 3), select V10 on HDC display (Figure 4, Item 2).

   d. Close V10 on HDC display (Figure 4, Item 2), by selecting CHANGE POSITION button (Figure 4, Item 4) on HDC control box.

   e. Read transducer T10 hydraulic pressure on HDC display (Figure 4, Item 1).

   f. For right bump stop circuit; Using LINE UP or LINE DOWN button (Figure 4, Item 3), select V9 on HDC display (Figure 4, Item 2).

   g. Close V9 on HDC display (Figure 4, Item 2), by selecting the CHANGE POSITION button (Figure 4, Item 4) on HDC control box.

## TROUBLESHOOTING PROCEDURES - BUMP STOPS INOPERATIVE - Continued

h. Read transducer T-11 hydraulic pressure on HDC display (Figure 4, Item 1).

i. Reset all HDC solenoid valves by selecting RESET VALVES button (Figure 4, Item 5) on HDC control box.

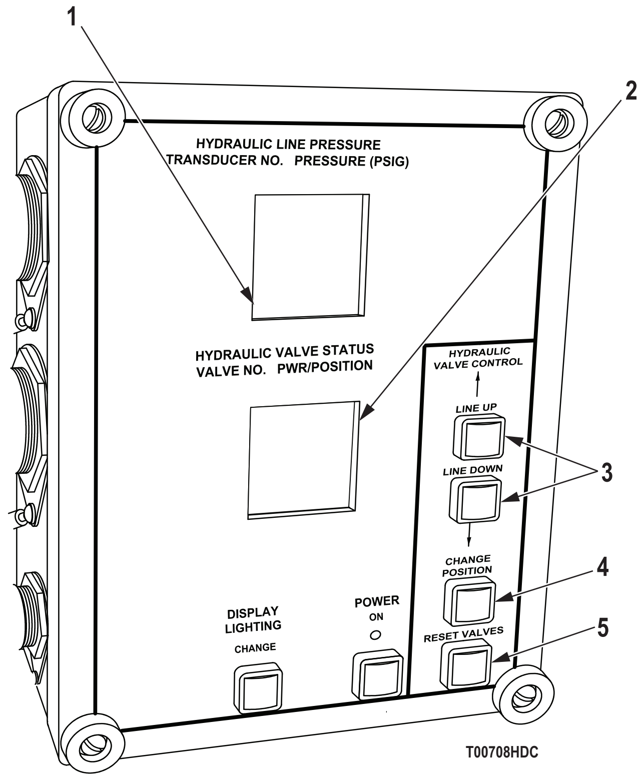



*Figure 4. Hydraulic Diagnostic Center (HDC) Control Box.*

j. Stop engine and relieve hydraulic pressure.

### CONDITION/INDICATION

Is transducer T-10 or T-11 hydraulic pressure less than 2,500 psi (17,238 kPa)?

### DECISION

YES - Verify problem with operator.
NO - Go to Step (7).

**TROUBLESHOOTING PROCEDURES - BUMP STOPS INOPERATIVE - Continued**

**STEP**

7. Perform forward manifold pressure test using HDC.

   a. Reset all HDC solenoid valves by selecting the RESET VALVES button (Figure 5, Item 5) on HDC control box.

   b. Have assistant start engine and move SPRUNG/UNSPRUNG lever to UNSPRUNG.

   c. For left forward manifold pressure: Using LINE UP or LINE DOWN button (Figure 5, Item 3), select V9 on HDC display (Figure 5, Item 2).

   d. Close V9 on HDC display (Figure 5, Item 2), by selecting the CHANGE POSITION button (Figure 5, Item 4) on HDC control box.

   e. Read transducer T-10 hydraulic pressure on HDC display (Figure 5, Item 1).

   f. For right forward manifold pressure; Using LINE UP or LINE DOWN button (Figure 5, Item 3), select V10 on HDC display (Figure 5, Item 2).

   g. Close V10 on HDC display (Figure 5, Item 2), by selecting CHANGE POSITION button (Figure 5, Item 4) on HDC control box.

   h. Read transducer T-11 hydraulic pressure on HDC display (Figure 5, Item 1).

   i. Reset all HDC solenoid valves by selecting RESET VALVES button (Figure 5, Item 5) on HDC control box.

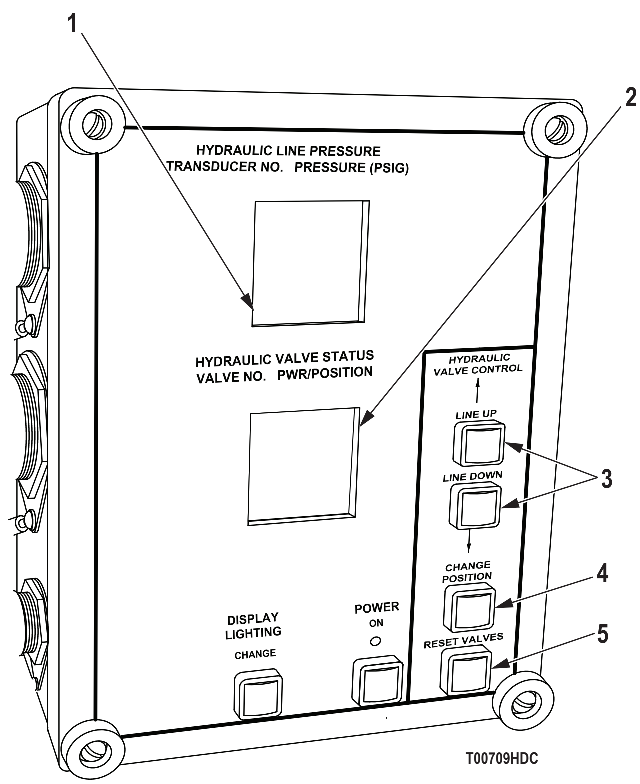



*Figure 5. Hydraulic Diagnostic Center (HDC) Control Box.*

   j. Stop engine and relieve hydraulic pressure.

**TROUBLESHOOTING PROCEDURES - BUMP STOPS INOPERATIVE - Continued**

**CONDITION/INDICATION**

Is transducer T-10 (left side) or T-11 (right side) hydraulic pressure less than 2,500 psi (17,238 kPa)?

**DECISION**

YES - Verify with operator that problem is only confined to bump stop. If so, repair or replace compensating pump (TM 5-2350-262-20).
NO - Go to Step (8).

**STEP**

8. Inspect appropriate circuit II hose between forward manifold and bump stop.

**CONDITION/INDICATION**

Is ciruit II blocked or damaged?

**DECISION**

YES - Clear blockage or replace circuit 11 hose between bump stop cylinder and forward manifold (TM 5-2350-262-20).
NO - Replace solenoid valve V9 (left side) on left forward manifold (WP 0036) or solenoid valve V10 (right side) on right forward manifold (WP 0037).

**END OF WORK PACKAGE**

## FIELD MAINTENANCE
## TROUBLESHOOTING PROCEDURES - EJECTOR CREEPS

**INITIAL SETUP:**

**Tools and Special Tools**
Tool Kit, General Mechanic's: Automotive (WP 0054, Table 1, Item 7)

**Personnel Required**
Construction Equipment Repairer, 91L (Two)

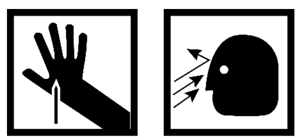
**References**
WP 0035

**Equipment Condition**
Vehicle MASTER power OFF (TM 5-2350-262-10)
Vehicle on jack stands (TM 5-2350-262-20)

**TROUBLESHOOTING PROCEDURE**

**EJECTOR CREEPS**

**WARNING**



- High oil pressure is present in the M9 ACE hydraulic system. Do not disconnect any hydraulic system component unless hydraulic system pressure has been relieved. After hydraulic system has been relieved, wait at least four minutes before disconnecting any hose or fitting. Ensure each of the hydraulic control levers is moved several times through all positions and the hydraulic tank dipstick is slowly loosened to relieve pressure. Failure to comply may result in severe injury or death to personnel.
- Transmission shifting lines are pressurized. Do not disconnect lines, fittings, or accumulator unless transmission shift control valve pressure has been relieved. Discharge transmission shift accumulator by moving shift control lever through all forward and reverse ranges several times, with engine off. Failure to comply may result in severe injury to personnel.

**NOTE**

Hydraulic oil is supplied to the ejector cylinder through circuits 21 and 22. When actuated, the ejector control valve distributes hydraulic pressure to extend the ejector cylinder through port 21 and retract the ejector cylinder through port 22. Hydraulic pressure is controlled by the ejector relief valve 21 on DCV control bank.

## EJECTOR CREEPS - Continued

### STEP

1. Check if ejector creeps on its own.

   Observer movement of the ejector with bowl emptied, engine running, and ejector moved halfway forward.

### CONDITION/INDICATION

Does ejector creep on its own?

### DECISION

YES - Go to Step (2).
NO - Go to Step (5).

### STEP

2. Check ejector valve linkage.

   a. Stop engine; relieve hydraulic pressure.

   b. Hold a measuring device (Figure 1, Item 1) on the face of ejector control valve (Figure 1, Item 3) on DCV bank.

   c. Have assistant move EJECTOR CONTROL lever between FORWARD and BACK.

   d. Measure distance plunger (Figure 1, Item 2) travels as lever is moved.

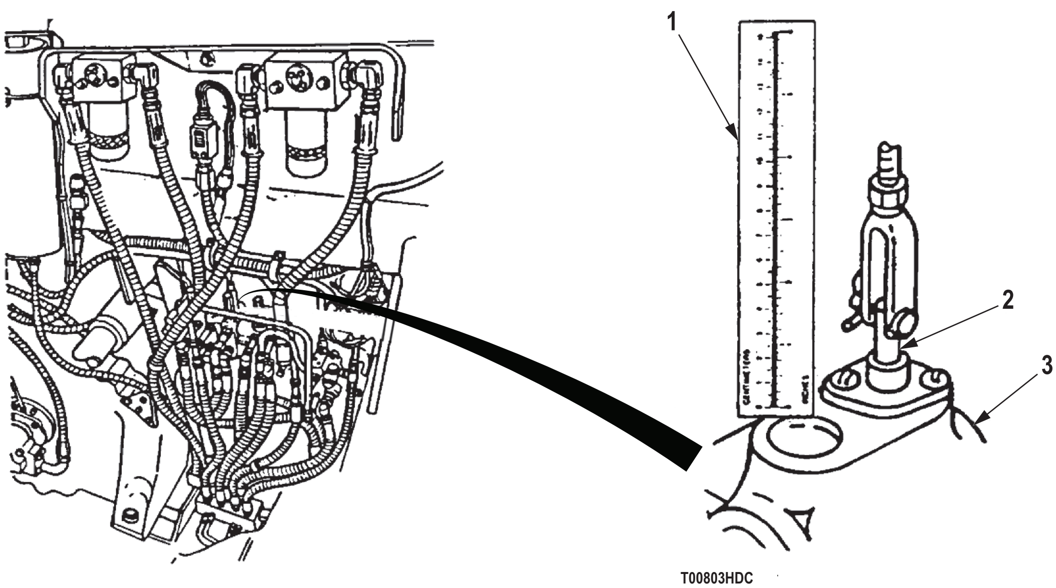



*Figure 1. Ejector Control Valve Linkage.*

   e. The distance of travel should be 9/32 in. (7 mm).

## EJECTOR CREEPS - Continued

### CONDITION/INDICATION

Is control valve linkage adjusted correctly?

### DECISION

YES - Go to Step (3).
NO - Adjust control valve linkage.

### STEP

3. Perform ejector control valve leakage test using Hydraulic Diagnostic Center (HDC).

    a. Reset all HDC solenoid valves by selecting RESET VALVES button (Figure 2, Item 1) on HDC control box.

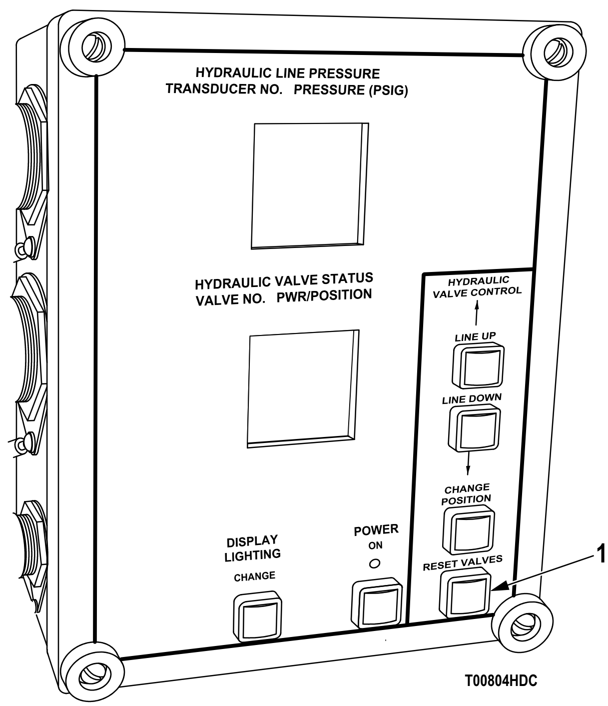



*Figure 2. Directional Control Valve (DCV) Bank.*

## EJECTOR CREEPS - Continued

b. Disable ejector by manually closing ejector inhibit ball valve V23 (Figure 3, Item 1) on HDC bank.

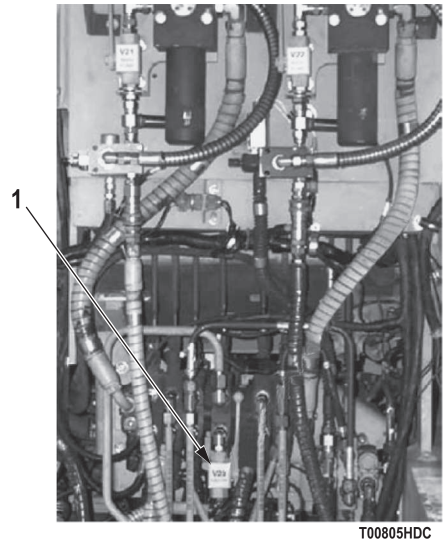



*Figure 3. Directional Control Valve (DCV) Bank.*

(1) Using LINE UP or LINE DOWN button (Figure 4, Item 3), select V1 on HDC display (Figure 4, Item 2).

(2) Close V1 on HDC display (Figure 4, Item 2), by selecting CHANGE POSITION button (Figure 4, Item 4) on HDC control box.

(3) Select V12 on HDC display (Figure 4, Item 2).

(4) Close V12 on HDC display (Figure 4, Item 2), by selecting CHANGE POSITION button (Figure 4, Item 4) on HDC control box.

(5) Select V20 on HDC display (Figure 4, Item 2).

(6) Open V20 on HDC display (Figure 4, Item 2), by selecting CHANGE POSITION button (Figure 4, Item 4) on HDC control box.

(7) Select V13 on HDC display (Figure 4, Item 2).

(8) Close V13 on HDC display (Figure 4, Item 2) by selecting CHANGE POSITION button (Figure 4, Item 4) on HDC control box.

c. Start engine and hold EJECTOR CONTROL lever in FORWARD or BACK position until transducer T-2 hydraulic pressure on HDC display (Figure 4, Item 1) indicates 1,950-2,050 psi (13,445-14,135 kPa).

d. Release EJECTOR CONTROL lever to NEUTRAL position, allow hydraulic pressure to stabilize for thirty seconds, then time the pressure loss for one minute.

e. If pressure loss is greater than 100 psi (690 kPa) per minute, oil is leaking excessively past the ejector control valve spool.

f. Stop engine and relieve hydraulic pressure.

g. Enable ejector by manually opening ejector inhibit ball valve V23 (Figure 3, Item 1) on DCV bank.

h. Reset all HDC solenoid valves by selecting RESET VALVES button (Figure 4, Item 5) on HDC control box.

**EJECTOR CREEPS - Continued**

**CONDITION/INDICATION**

Is oil leaking excessively past the control valve spool?

**DECISION**

YES - Replace Directional Control Valve (DCV) bank (TM 5-2350-262-20).
NO - Go to Step (4).

**STEP**

4. Perform HDC system solenoid valve V20 test.

   a. Reset all HDC solenoid valves by selecting RESET VALVES button (Figure 4, Item 5) on HDC control box.

   b. Start engine and leave it running.

   c. Wait until transducer T-13 hydraulic pressure on HDC display (Figure 4, Item 1) is greater than 2,000 psi (13,789.51 kPa).

   d. Using LINE UP or LINE DOWN button (Figure 4, Item 3), select V12 on HDC display (Figure 4, Item 2).

   e. Close V12 on HDC display (Figure 6, Item 2), by selecting CHANGE POSITION button (Figure 6, Item 4) on HDC control box.

   f. Allow hydraulic pressure to stabilize for thirty seconds, then time the pressure loss for one minute at pressure transducer T-13 as indicated on HDC display (Figure 4, Item 1).

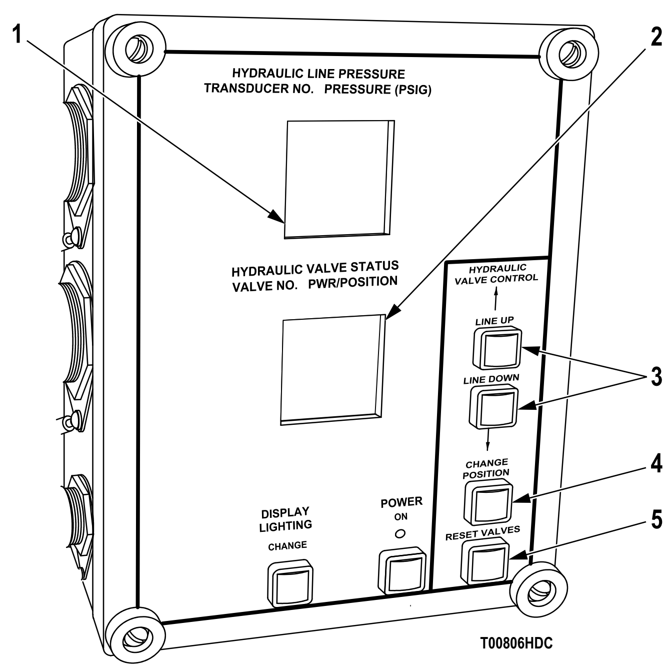



*Figure 4. Hydraulic Diagnostic Center (HDC) Control Box.*

   g. If pressure loss is greater than 100 psi (690 kPa) per minute, solenoid valve V20 is leaking.

   h. Stop engine and relieve hydraulic pressure.

**EJECTOR CREEPS - Continued**

**CONDITION/INDICATION**

Is solenoid valve V20 leaking?

**DECISION**

YES - Replace HDC system solenoid valve V20 on primary manifold (WP 0035).
NO - Verify problem with operator.

**STEP**

5. Check if ejector creeps when loading bowl with earth.

Operate vehicle to fill bowl with earth.

**CONDITION/INDICATION**

Does ejector creep when loading bowl with earth?

**DECISION**

YES - Go to Step (6).
NO - Stop engine. Verify problem with operator.

**STEP**

6. Perform ejector relief valve test using HDC.

a. Reset all HDC solenoid valves by selecting RESET VALVES button (Figure 5, Item 5) on HDC control box.

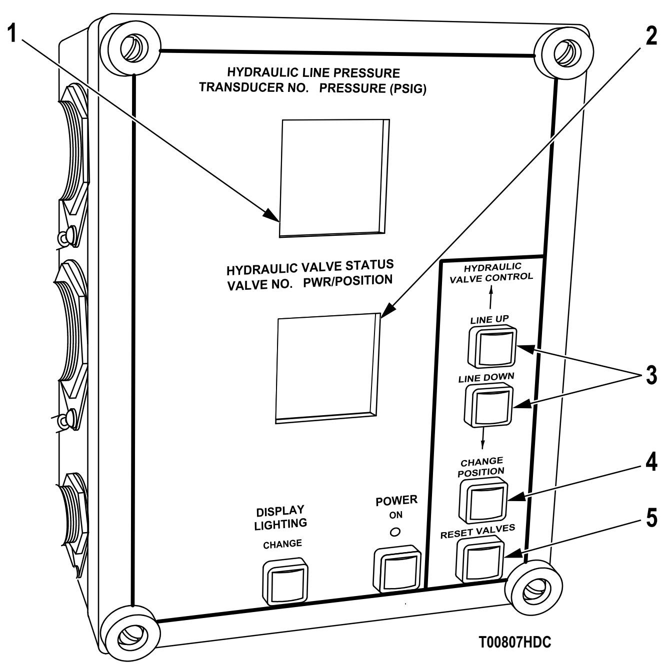
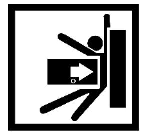



*Figure 5. Hydraulic Diagnostic Center (HDC) Control Bank.*

## EJECTOR CREEPS - Continued

### WARNING



- Do not operate ejector when personnel are in bowl. Do not work in bowl unless ejector lock is engaged. Failure to comply may result in severe injury or death to personnel.
- Do not stand or work in bowl area unless ejector lock is engaged. Do not stand in bowl to observe roller guide travels. Failure to comply may result in severe injury or death to personnel.

b. Disable ejector by manually closing the ejector inhibit ball valve V23 (Figure 6, Item 1) on DCV bank.

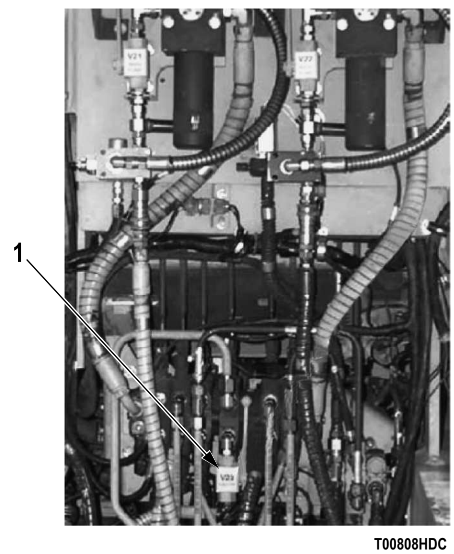



*Figure 6. Directional Control Valve (DCV) Bank.*

c. Using LINE UP or LINE DOWN button (Figure 5, Item 3), select V1 on HDC display (Figure 5, Item 2).

d. Close V1 on HDC display (Figure 5, Item 2) by selecting CHANGE POSITION button (Figure 5, Item 4) on HDC control box.

e. Have assistant start engine and hold EJECTOR CONTROL lever in FORWARD position.

f. Read transducer T-2 hydraulic pressure on HDC display (Figure 5, Item 1).

g. Stop engine; relieve hydraulic pressure.

h. Enable ejector by manually operating ejector inhibit ball valve V23 (Figure 6, Item 1) on DCV bank.

i. Using LINE UP or LINE DOWN button (Figure 5, Item 3), select V1 on HDC display (Figure 5, Item 2).

j. Open V1 on HDC display (Figure 5, Item 2) by selecting CHANGE POSITION button (Figure 5, Item 4) on HDC control box.

## EJECTOR CREEPS - Continued

### CONDITION/INDICATION

Is transducer T-2 hydraulic pressure between 1,950-2,050 psi (13,445-14,135 kPa)?

### DECISION

YES - Go to Step (8).
NO - Go to Step (7).

### STEP

7. Perform ejector relief valve adjustment.

   a. Disable ejector by manually closing the ejector inhibit ball valve V23 (Figure 7, Item 1) on DCV bank.

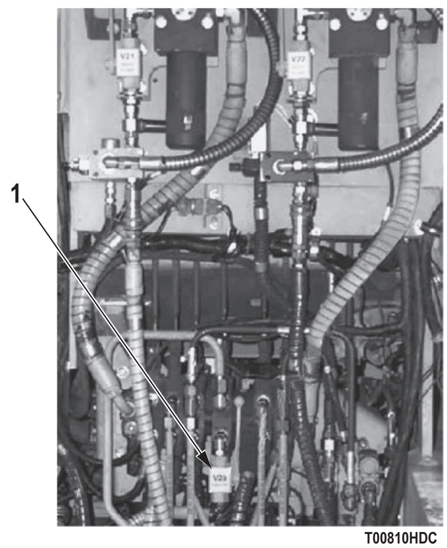



*Figure 7. Directional Control Valve (DCV) Bank.*

   b. Using LINE UP or LINE DOWN button (Figure 8, Item 3), select V1 on HDC display (Figure 8, Item 2).

   c. Close V1 on HDC display (Figure 8, Item 2) by selecting CHANGE POSITION button (Figure 8, Item 4) on HDC control box.

   d. Have assistant start engine and hold EJECTOR CONTROL lever in FORWARD position.

   e. Read transducer T-2 hydraulic pressure on HDC display (Figure 8, Item 1).

**EJECTOR CREEPS - Continued**

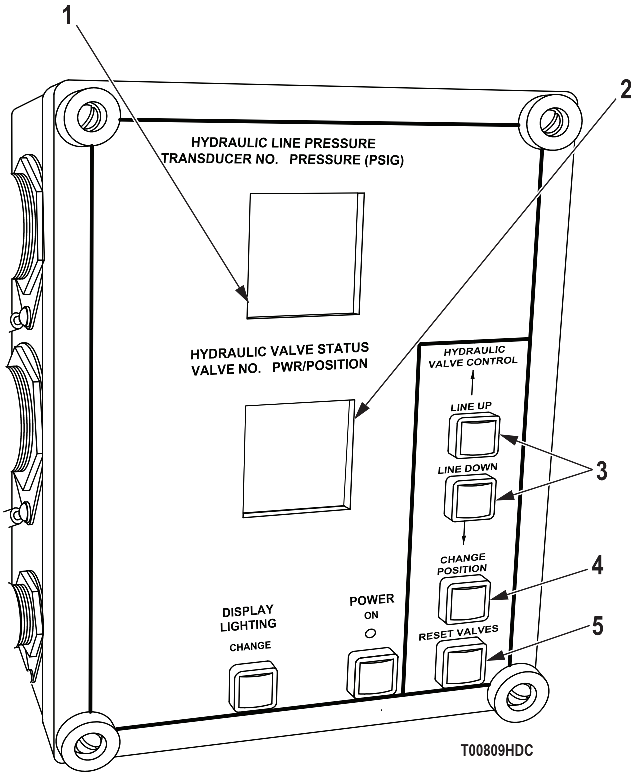



*Figure 8. Hydraulic Diagnostic Center (HDC) Control Box.*

f. Loosen jam nut (Figure 9, Item 1) on ejector relief valve and turn adjusting screw (Figure 9, Item 2) clockwise (to increase pressure) or counterclockwise (to decrease pressure) until pressure is within limits.

g. Tighten jam nut (Figure 9, Item 1).

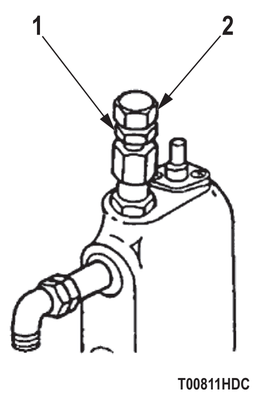



*Figure 9. Ejector Relief Valve Adjustment.*

h. Stop engine; relieve hydraulic pressure.

i. Reset all HDC solenoid valves by selecting RESET VALVES button (Figure 8, Item 5) on HDC control box.

## EJECTOR CREEPS - Continued

### CONDITION/INDICATION

Can circuit 21 ejector relief valve be set to develop hydraulic pressure between 1,950-2,050 psi (13,445-14,135 kPa)?

### DECISION

YES - Go to Step (8).
NO - Remove all test equipment and connect hoses. Replace DCV bank (TM 5-2350-262-20).

### STEP

8. Perform ejector cylinder internal leakage test.
   a. Reset all HDC solenoid valves by selecting RESET VALVES button (Figure 10, Item 4) on HDC control box.
   b. Using LINE UP or LINE DOWN button (Figure 10, Item 2), select V1 on HDC display (Figure 10, Item 1).
   c. Close V1 on HDC display (Figure 10, Item 1), by selecting CHANGE POSITION button (Figure 10, Item 3) on HDC control box.

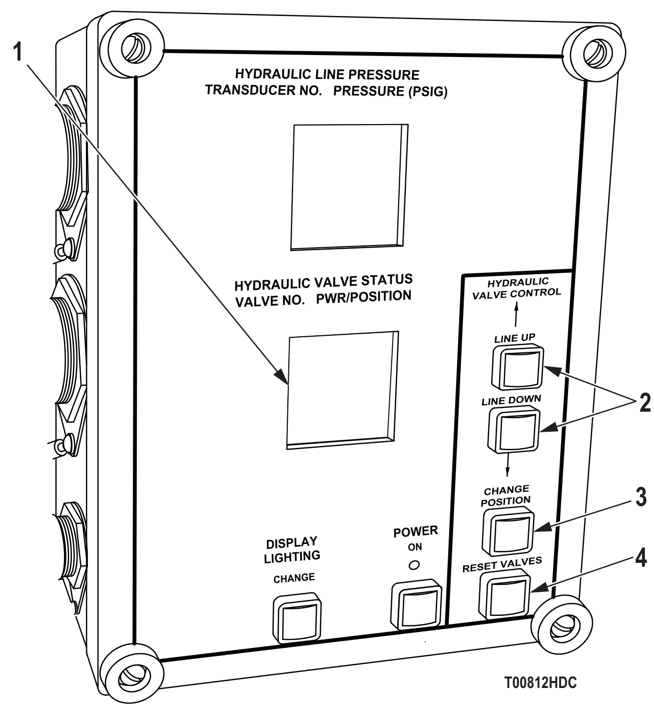



*Figure 10. Hydraulic Diagnostic Center (HDC) Control Box.*

   d. Start engine and have assistant hold EJECTOR CONTROL lever in BACK position for one minute.
   e. Mark position of ejector at side of hull and continue to hold lever in BACK position for one more minute.
   f. Check position of ejector while still holding lever in BACK position.
   g. If ejector has moved forward (extends) more than 0.5 in. (13 mm), ejector cylinder is leaking excessively.
   h. If ejector has moved backwards (retracts) more than 0.5 in. (13 mm), solenoid valve V1 on primary manifold is leaking.

**EJECTOR CREEPS - Continued**

i. Stop engine and relieve hydraulic pressure.

**CONDITION/INDICATION**

Is ejector cylinder leaking excessively?

**DECISION**

YES - Repair or replace ejector cylinder (TM 5-2350-262-20) or replace solenoid valve V1 on primary manifold as determined by results of ejector cylinder internal leakage test (WP 0035).
NO - Go to Step (9).

**STEP**

9. Perform ejector control valve internal leakage test.

Follow ejector control valve leakage test from Step (3).

**CONDITION/INDICATION**

Is oil leaking excessively past control valve spool?

**DECISION**

YES - Replace DCV bank (TM 5-2350-262-20).
NO - Verify problem with operator.

**END OF WORK PACKAGE**

## FIELD MAINTENANCE
## TROUBLESHOOTING PROCEDURES - EJECTOR DOES NOT EXTEND OR RETRACT

**INITIAL SETUP:**

**Tools and Special Tools**
Tool Kit, General Mechanic's: Automotive
(WP 0054, Table 1, Item 7)

**Personnel Required**
Construction Equipment Repairer, 91L (Two)

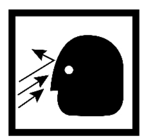
**References**
WP 0035
TM 5-2350-262-20

**Equipment Condition**
Vehicle MASTER power OFF (TM 5-2350-262-10)
Vehicle on jack stands (TM 5-2350-262-20)

### TROUBLESHOOTING PROCEDURE

### EJECTOR DOES NOT EXTEND OR RETRACT

**WARNING**

- High oil pressure is present in the M9 ACE hydraulic system. Do not disconnect any hydraulic system component unless hydraulic system pressure has been relieved. After hydraulic system has been relieved, wait at least four minutes before disconnecting any hose or fitting. Ensure each of the hydraulic control levers is moved several times through all positions and the hydraulic tank dipstick is slowly loosened to relieve pressure. Failure to comply may result in severe injury or death to personnel.
- Transmission shifting lines are pressurized. Do not disconnect lines, fittings, or accumulator unless transmission shift control valve pressure has been relieved. Discharge transmission shift accumulator by moving shift control lever through all forward and reverse ranges several times, with engine off. Failure to comply may result in severe injury to personnel.

**NOTE**

Ejector circuit oil is supplied by main pump outputs 13L and 13R. Oil enters main control valve through inlet ports 13L and 13R and combines at the ejector control valve section. When ejector control valve is shifted to BACK position, oil is supplied from port 22 and fed to rod end of ejector cylinder, which causes cylinder rod to retract, pulling ejector back in bow. When ejector control valve is shifted to FORWARD position, oil is supplied from port 21 and fed to ejector head end, causing cylinder rod to extend, pushing ejector forward in bowl. Pressure in ejector circuit is limited by main relief valves 13L and 13R to 3,950-4,050 psi (27,235-27,925 kPa) and circuit relieve valve 21, which limits pressure to extend ejector cylinder.

## EJECTOR DOES NOT EXTEND OR RETRACT - Continued

**STEP**

1. Check for obstructions in bowl area.

Check bowl area for rock or other debris.

**CONDITION/INDICATION**

Is ejector/bowl area free of obstructions?

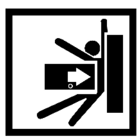
**DECISION**

YES - Go to Step (2).
NO - Remove rocks or other obstructions from bowl area. Verify problem is solved.

**STEP**

2. Perform mechanical binding check.

**WARNING**



- Do not operate ejector when personnel are in bowl. Do not work in bowl unless ejector lock is engaged. Failure to comply may result in severe injury or death to personnel.
- Do not stand or work in bowl area unless ejector lock is engaged. Do not stand in bowl to observe roller guide travels. Failure to comply may result in severe injury or death to personnel.
- When folding dozer blade, work on blade latches from side of vehicle only. Do not stand in front of dozer blade while retracting ejector. Failure to comply may result in severe injury or death to personnel.

a. Start engine, operate ejector (Figure 1, Item 1) and check for mechanical binding.

b. Check ejector (Figure 1, Item 1), rollers (Figure 1, Item 3), and ejector hydraulic cylinder (Figure 1, Item 4) for damage or jamming.

c. Check that ejector lock (Figure 1, Item 2) is not restricting movement of control lever.

**EJECTOR DOES NOT EXTEND OR RETRACT - Continued**

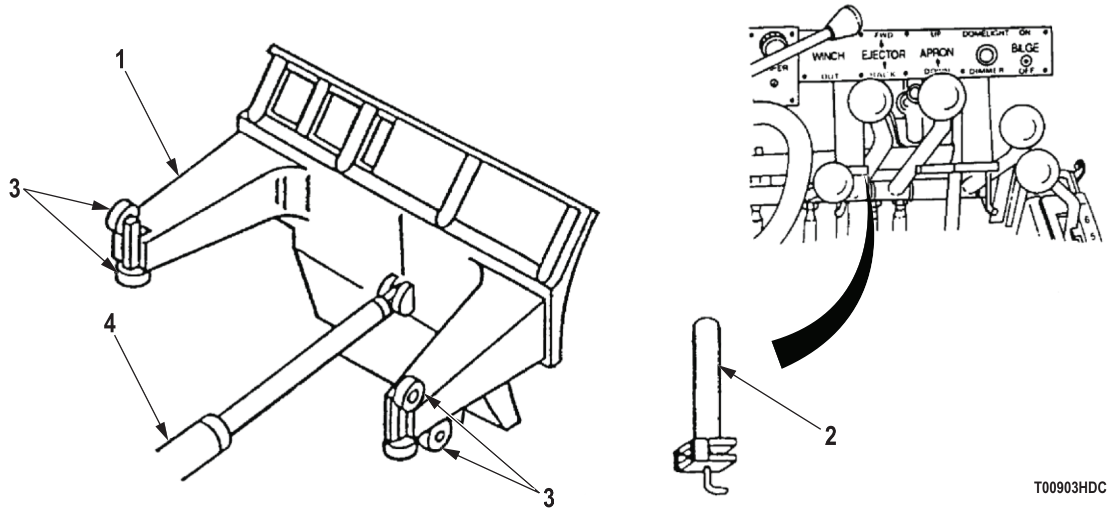



*Figure 1. Ejector.*

d. Check that ejector inhibit ball valve V23 (Figure 2, Item 1) is in the open position.

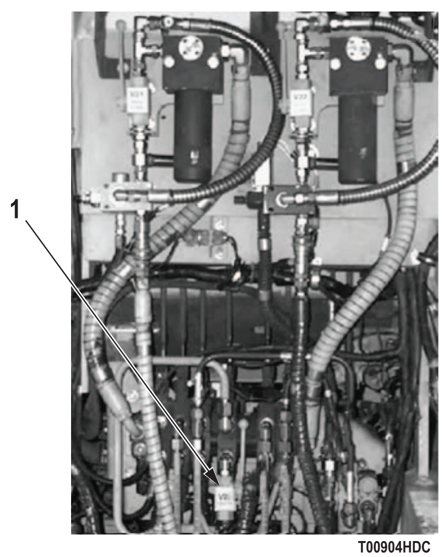



*Figure 2. Directional Control Valve (DCV) Bank.*

e. Stop engine; relieve hydraulic pressure.

## CONDITION/INDICATION

Is ejector binding?

## DECISION

YES - Adjust, repair, or replace damaged components (TM 5-2350-262-20). Verify problem is solved.
NO - Go to Step (3).

**EJECTOR DOES NOT EXTEND OR RETRACT - Continued**

**STEP**

3. Perform suction strainer check.
   a. Slowly loosen hydraulic tank dipstick (Figure 3, Item 1) to release pressure and remove dipstick.
   b. Remove suction strainer (Figure 3, Item 2) and inspect for clogged ports or obstructions.
   c. If dirt, obstructions, or debris is found, clear and clean suction strainer (Figure 3, Item 2).
   d. Replace suction strainer (Figure 3, Item 2) and dipstick (Figure 3, Item 1).

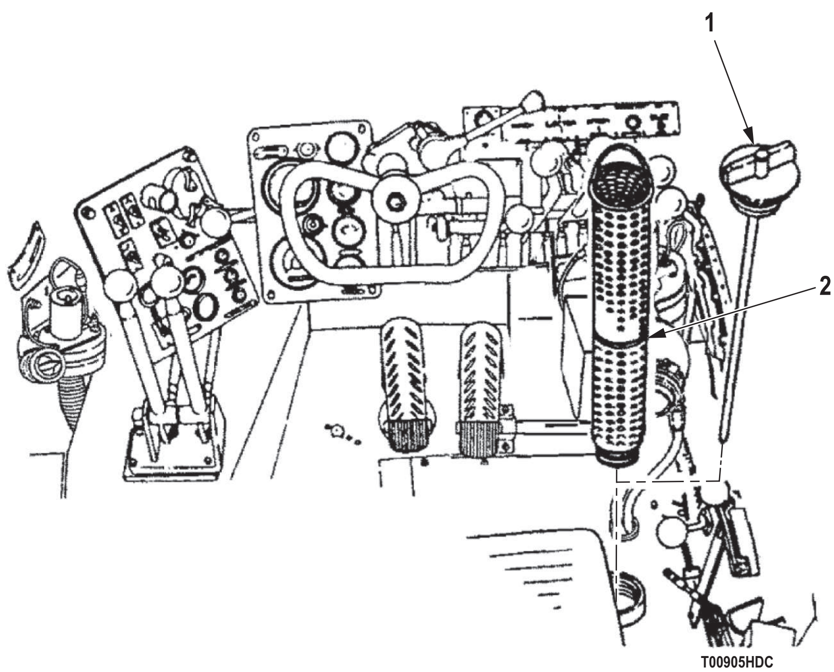



*Figure 3. Suction Strainer.*

**CONDITION/INDICATION**

Is suction strainer clean?

**DECISION**

YES - Go to Step (4).
NO - Clean suction strainer. Verify problem is solved.

## EJECTOR DOES NOT EXTEND OR RETRACT - Continued

**STEP**

4. Perform main relief valve pressure check using Hydraulic Diagnostic Center (HDC).

   a. Reset all HDC solenoid valves by selecting RESET VALVES button (Figure 4, Item 1) on HDC control box.

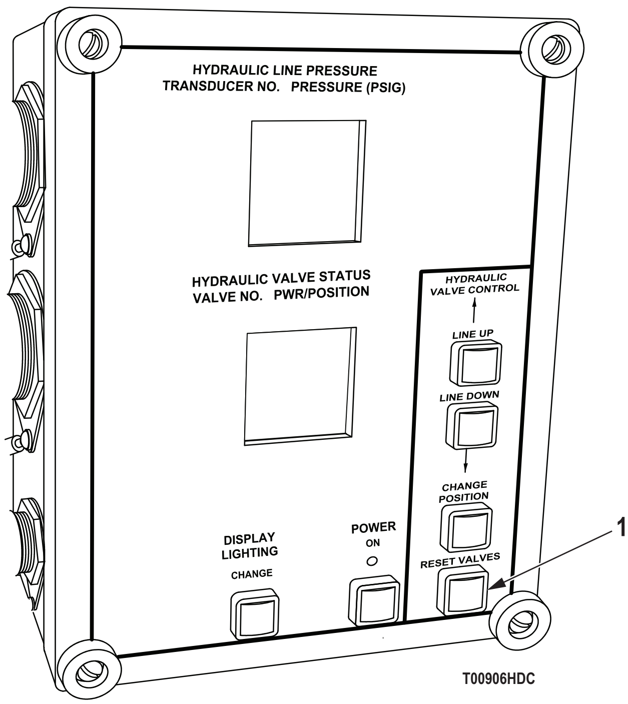



*Figure 4. Hydraulic Diagnostic Center (HDC) Control Box.*

**EJECTOR DOES NOT EXTEND OR RETRACT - Continued**

## WARNING

- Do not operate ejector when personnel are in bowl. Do not work in bowl unless ejector lock is engaged. Failure to comply may result in severe injury or death to personnel.
- Do not stand or work in bowl area unless ejector lock is engaged. Do not stand in bowl to observe roller guide travels. Failure to comply may result in severe injury or death to personnel.
- When folding dozer blade, work on blade latches from side of vehicle only. Do not stand in front of dozer blade while retracting ejector. Failure to comply may result in severe injury or death to personnel.

b. Disable ejector by manually closing ejector inhibit ball valve V23 (Figure 5, Item 1) on DCV bank.

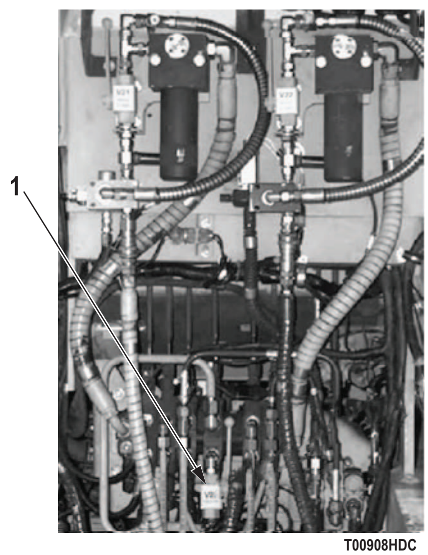



*Figure 5. Directional Control Valve (DCV) Bank.*

c. Using LINE UP or LINE DOWN button (Figure 6, Item 3), select V1 on HDC display (Figure 6, Item 2).

d. Close V1 on HDC display (Figure 6, Item 2) by selecting CHANGE POSITION button (Figure 6, Item 4) on HDC control box.

e. Start vehicle engine.

f. To test 13R circuit:

(1) With SPRUNG/UNSPRUNG control valve in SPRUNG mode, actuate left SUSPENSION CONTROL valve to RAISE position.

(2) Read transducer T-3 hydraulic pressure on HDC display (Figure 6, Item 1).

## EJECTOR DOES NOT EXTEND OR RETRACT - Continued

g. To test 13L circuit:

(1) With SPRUNG/UNSPRUNG control valve in SPRUNG mode, actuate right SUSPENSION CONTROL valve to RAISE position.

(2) Read transducer T-4 hydraulic pressure on HDC display (Figure 6, Item 1).

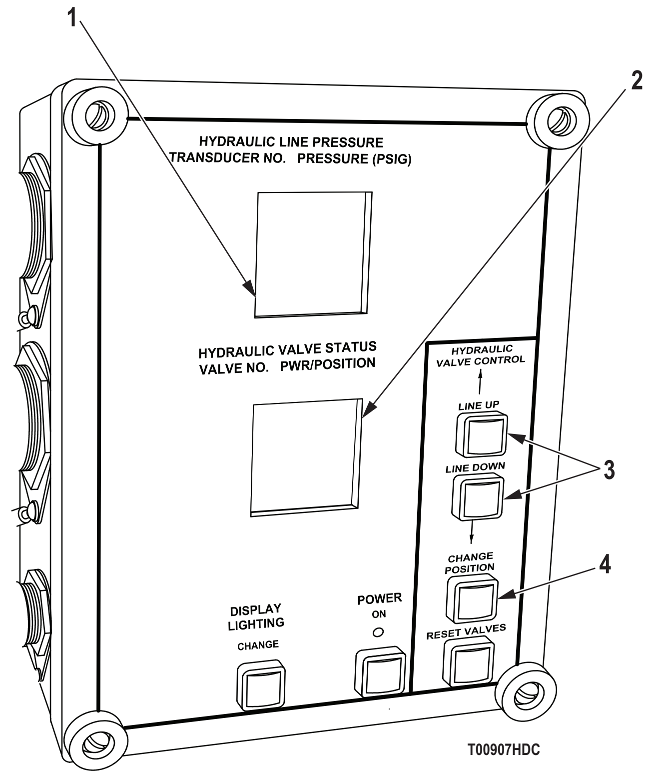



*Figure 6. Hydraulic Diagnostic Center (HDC) Control Box.*

h. Stop engine; relieve hydraulic pressure.

### CONDITION/INDICATION

Is hydraulic pressure between 3,950-4,050 psi (27,235-27,925 kPa)?

### DECISION

YES - Go to Step (8).
NO - Go to Step (5).

## EJECTOR DOES NOT EXTEND OR RETRACT - Continued

**STEP**

5. Perform main relief valve adjustment, using HDC.

   a. Main relief valve adjustment.

      (1) Reset all HDC solenoid valves by selecting RESET VALVES button (Figure 8, Item 5) on HDC control box.

      (2) Disable ejector by manually closing ejector inhibit ball valve V23 (Figure 7, Item 1) on DCV bank.

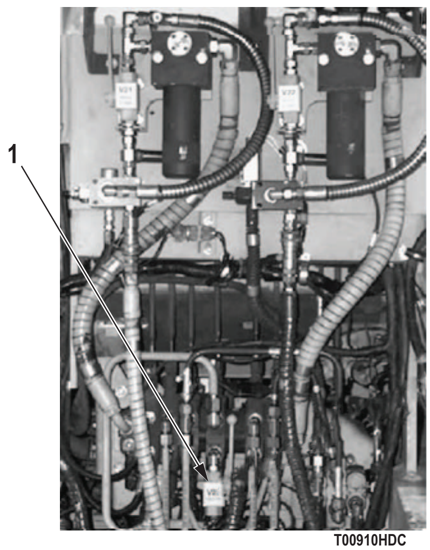



*Figure 7. Directional Control Valve (DCV) Bank.*

      (3) Using LINE UP or LINE DOWN button (Figure 8, Item 3), select V1 on HDC display (Figure 8, Item 2).

      (4) Close V1 on HDC display (Figure 8, Item 2) by selecting CHANGE POSITION button (Figure 8, Item 4) on HDC control box.

   b. Main relief valve 13L.

      (1) With the SPRUNG/UNSPRUNG lever still in SPRUNG, have assistant start engine and move left-hand SUSPENSION CONTROL lever to RAISE, while at the same time, holding EJECTOR CONTROL lever in BACK.

      (2) Read transducer T-4 hydraulic pressure on HDC display (Figure 8, Item 1).

**EJECTOR DOES NOT EXTEND OR RETRACT - Continued**

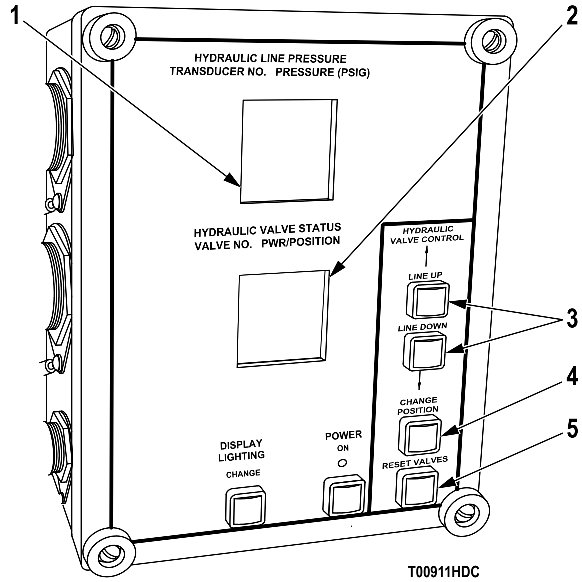



*Figure 8. Hydraulic Diagnostic Center (HDC) Control Box.*

(3) Adjust main relief valve 13L (Figure 9, Item 4) by loosening jam nut (Figure 9, Item 3) and rotating adjustment screw (Figure 9, Item 2) clockwise to increase pressure; counterclockwise to decrease pressure.

(4) When hydraulic pressure is within limits, tighten jam nut (Figure 9, Item 3).

(5) Stop engine; relieve hydraulic pressure.

c. Main relief valve 13R (Figure 9, Item 1).

(1) Repeat previous steps using the right-hand SUSPENSION CONTROL lever, main relief valve 13R (Figure 9, Item 1), and read T-3 pressure.

(2) Adjustment for main relief valve 13R (Figure 9, Item 1) is on underside of main relief valve 13R (Figure 9, Item 1).

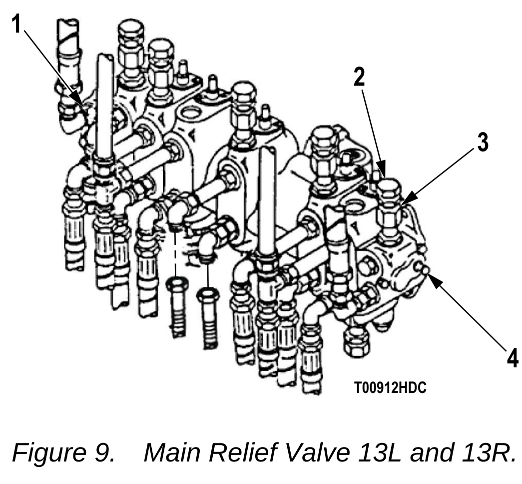



*Figure 9. Main Relief Valve 13L and 13R.*

(3) Stop engine; relieve hydraulic pressure.

**EJECTOR DOES NOT EXTEND OR RETRACT - Continued**

**CONDITION/INDICATION**

Is transducer T-3 and T-4 hydraulic pressure between 3,950-4,050 psi (27,235-27,925 kPa)?

**DECISION**

YES - Verify problem is solved.
NO - Go to Step (6).

**STEP**

6. Perform main hydraulic pump pressure test using HDC.

   a. Reset all HDC solenoid valves by selecting RESET VALVES button (Figure 10, Item 5) on HDC control box.

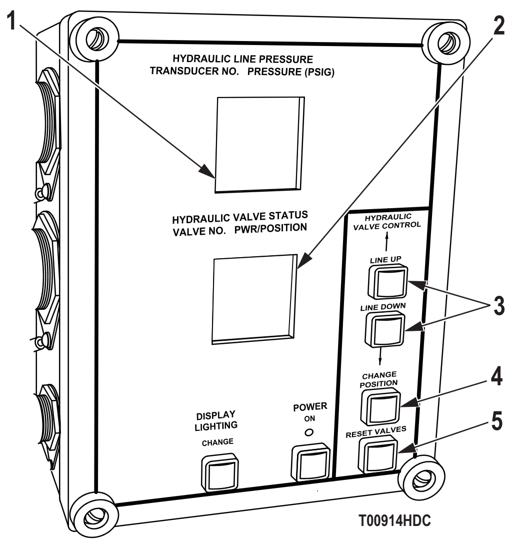
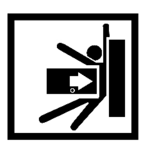



*Figure 10. Hydraulic Diagnostic Center (HDC) Control Bank.*

**WARNING**



- Before performing any troubleshooting in bowl, move ejector forward and disable it from hydraulic system. Do not operate ejector when personnel are in bowl. Do not work in bowl unless ejector lock is engaged. Failure to comply may result in severe injury or death to personnel.
- Do not stand or work in bowl area unless ejector lock is engaged. Do not stand in bowl to observe roller guide travels. Failure to comply may result in severe injury or death to personnel.
- When folding dozer blade, work on blade latches from side of vehicle only. Do not stand in front of dozer blade while retracting ejector. Failure to comply may result in severe injury or death to personnel.

## EJECTOR DOES NOT EXTEND OR RETRACT - Continued

b. Disable ejector by manually closing ejector inhibit ball valve V23 (Figure 11, Item 2) on DCV bank.

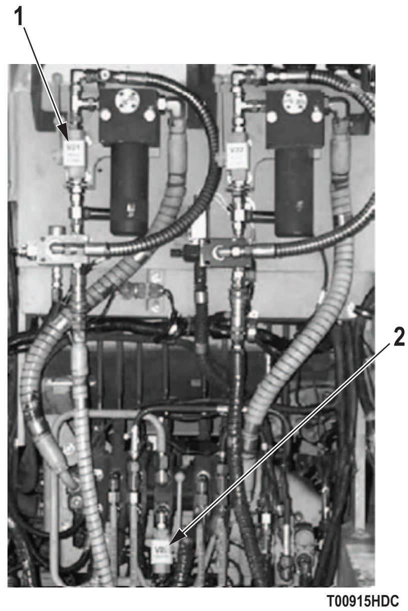



*Figure 11. Directional Control Valve (DCV) Bank.*

c. Using LINE UP or LINE DOWN button (Figure 10, Item 3), select V1 on HDC display (Figure 10, Item 2).

d. Close V1 on HDC display (Figure 10, Item 2) by selecting CHANGE POSITION button (Figure 10, Item 4) on HDC control box.

e. Have assistant start engine and allow engine to idle (750-800 rpm).

f. Slowly close right main hydraulic pressure inhibit valve V21 (Figure 11, Item 1) until transducer T-3 hydraulic pressure on HDC display (Figure 10, Item 1) indicates 3,950-4,050 psi (27,235-27,925 kPa).

g. Fully open right main hydraulic pressure inhibit valve V21 (Figure 11, Item 1) on DCV bank.

h. Stop engine; relieve hydraulic pressure.

i. Enable ejector by manually opening ejector inhibit ball valve V23 (Figure 11, Item 2) on DCV bank.

j. Using LINE UP or LINE DOWN button (Figure 10, Item 3), select V1 on HDC display (Figure 10, Item 2).

k. Open V1 on HDC display (Figure 10, Item 2) by selecting CHANGE POSITION button (Figure 10, Item 4) on HDC control box.

### CONDITION/INDICATION

Is transducer T-3 hydraulic pressure between 3,950-4,050 psi (27,235-27,925 kPa)?

### DECISION

YES - Replace Directional Control Valve (DCV) bank (TM 5-2350-262-20).
NO - Go to Step (7).

## EJECTOR DOES NOT EXTEND OR RETRACT - Continued

### STEP

7. Check suction tubes and hoses (inlet) for damage.

    Inspect suction tubes and hoses (inlet) (Figure 12).

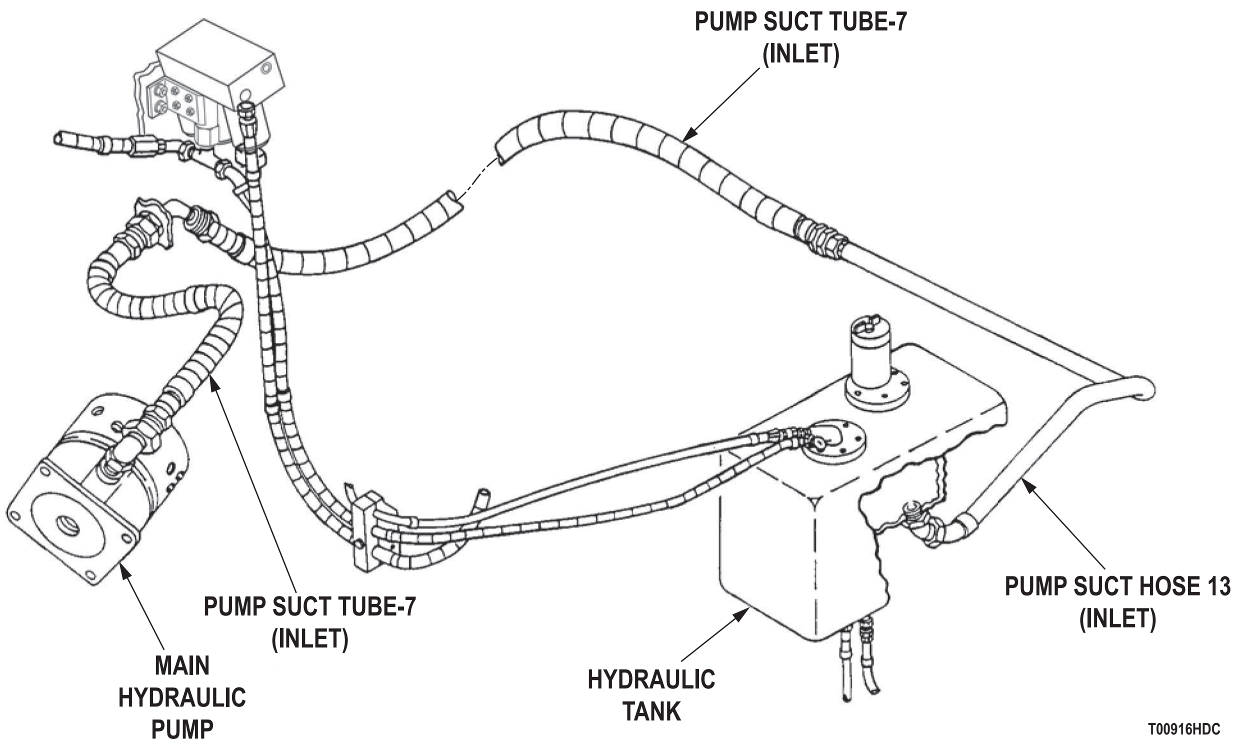



*Figure 12. Suction Tubes and Hoses.*

### CONDITION/INDICATION

Are suction tubes and hoses (inlet) damaged?

### DECISION

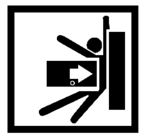
YES - Replace damaged suction tubes or hoses (inlet) (TM 5-2350-262-20).
NO - Replace main hydraulic pump (TM 5-2350-262-20).

**EJECTOR DOES NOT EXTEND OR RETRACT - Continued**

**STEP**

8. Perform ejector circuit pressure check using HDC.

**WARNING**



- Do not operate ejector when personnel are in bowl. Do not work in bowl unless ejector lock is engaged. Failure to comply may result in severe injury or death to personnel.
- Do not stand or work in bowl area unless ejector lock is engaged. Do not stand in bowl to observe roller guide travels. Failure to comply may result in severe injury or death to personnel.
- When folding dozer blade, work on blade latches from side of vehicle only. Do not stand in front of dozer blade while retracting ejector. Failure to comply may result in severe injury or death to personnel.

a. Reset all HDC solenoid valves by selecting RESET VALVES button (Figure 13, Item 1) on HDC control box.

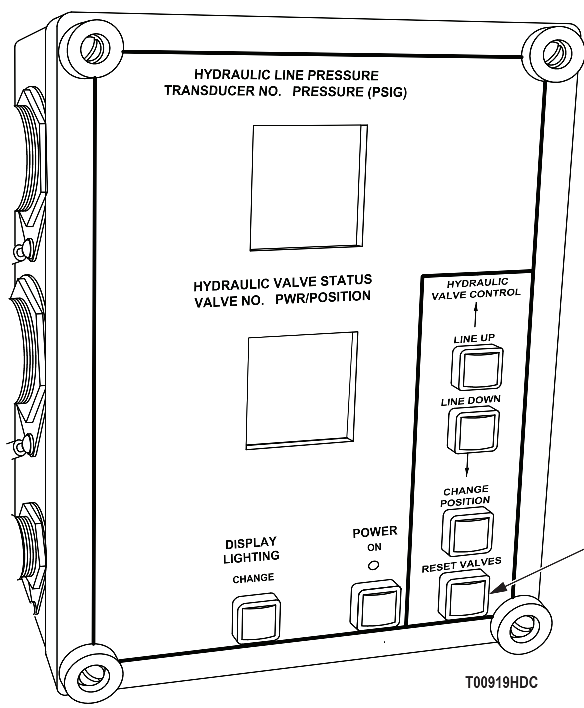



*Figure 13. Hydraulic Diagnostic Center (HDC) Control Box.*

## EJECTOR DOES NOT EXTEND OR RETRACT - Continued

b. Have assistant start engine and actuate EJECTOR CONTROL lever (Figure 14, Item 1) to BACK position.

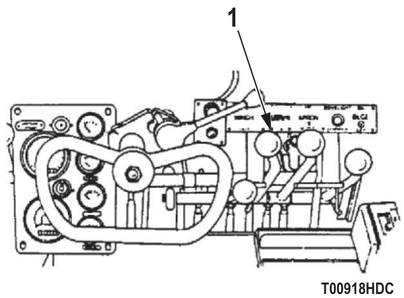



*Figure 14. Ejector Control.*

c. Read transducer T-2 hydraulic pressure on HDC display (Figure 15, Item 1).

d. Pressure should be 3,950-4,050 psi (27,235-27,925 kPa).

e. Stop engine; relieve hydraulic pressure.

### CONDITION/INDICATION

Is transducer T-2 hydraulic pressure between 3,950-4,050 psi (27,235-27,925 kPa)?

### DECISION

YES - Go to Step (9).
NO - Replace DCV bank (TM 5-2350-262-20).

### STEP

9. For ejector extension problems, check ejector circuit No. 21 for pressure.

a. Reset all HDC solenoid valves by selecting RESET VALVES button (Figure 15, Item 2) on HDC control box.

**EJECTOR DOES NOT EXTEND OR RETRACT - Continued**

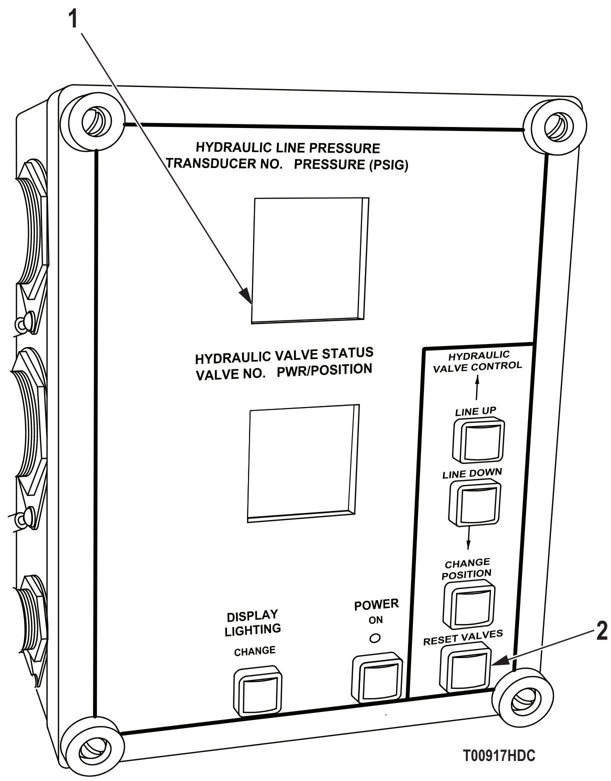
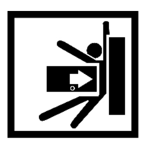



*Figure 15. Hydraulic Diagnostic Center (HDC) Control Box.*

## WARNING



- Do not operate ejector when personnel are in bowl. Do not work in bowl unless ejector lock is engaged. Failure to comply may result in severe injury or death to personnel.
- Do not stand or work in bowl area unless ejector lock is engaged. Do not stand in bowl to observe roller guide travels. Failure to comply may result in severe injury or death to personnel.
- When folding dozer blade, work on blade latches from side of vehicle only. Do not stand in front of dozer blade while retracting ejector. Failure to comply may result in severe injury or death to personnel.

b. Start engine, move ejector halfway forward; stop engine and relieve hydraulic pressure.

## EJECTOR DOES NOT EXTEND OR RETRACT - Continued

c. Disable ejector by manually closing ejector inhibit valve V23 (Figure 16, Item 1) on DCV bank.

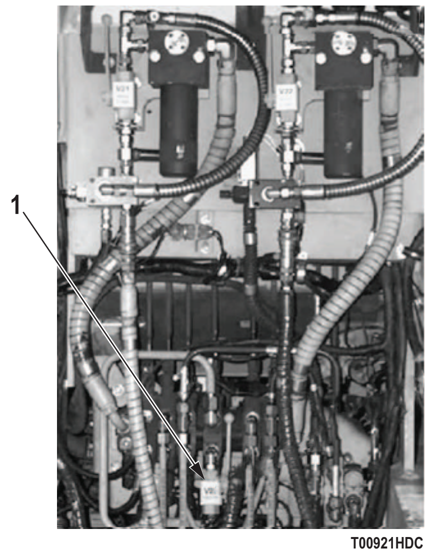



*Figure 16. Directional Control Valve (DCV) Bank.*

d. Using LINE UP or LINE DOWN button (Figure 17, Item 3), select V1 on HDC display (Figure 17, Item 2).

e. Close V1 on HDC display (Figure 17, Item 2) by selecting CHANGE POSITION button (Figure 17, Item 4) on HDC control box.

f. Have assistant start engine and hold EJECTOR CONTROL lever in FORWARD position.

g. Read transducer T-2 hydraulic pressure on HDC display (Figure 17, Item 1).

h. Stop engine; relieve hydraulic pressure.

i. Enable ejector by manually operating ejector inhibit ball valve V23 (Figure 16, Item 1) on DCV bank.

j. Using LINE UP or LINE DOWN button (Figure 18, Item 3), select V1 on HDC display (Figure 17, Item 2).

k. Open V1 on HDC display (Figure 17, Item 2), by selecting CHANGE POSITION button (Figure 17, Item 4) on HDC control box.

## EJECTOR DOES NOT EXTEND OR RETRACT - Continued

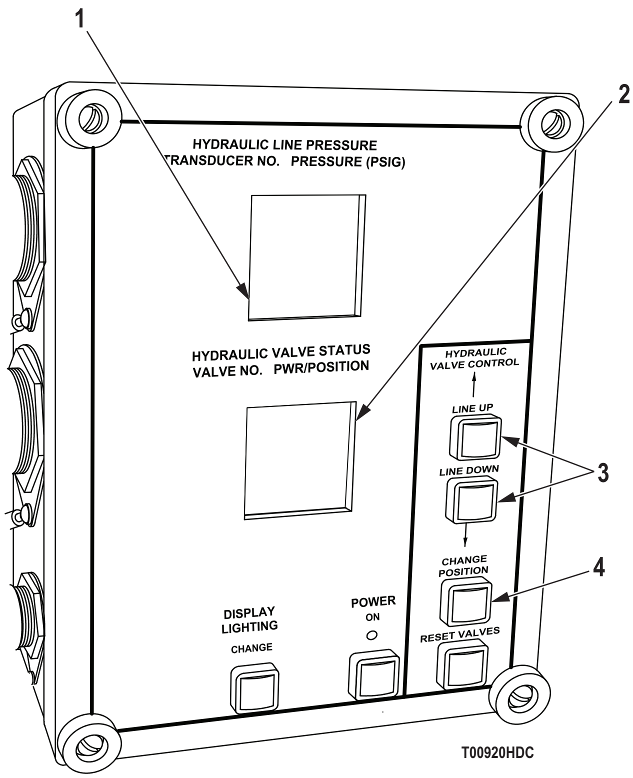



*Figure 17. Hydraulic Diagnostic Center (HDC) Control Box.*

### CONDITION/INDICATION

Is transducer T-2 hydraulic pressure between 1,950-2,050 psi (13,445-14,135 kPa)?

### DECISION

YES - Go to Step (11).
NO - Go to Step (10).

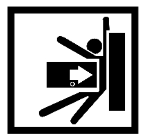
## EJECTOR DOES NOT EXTEND OR RETRACT - Continued

**STEP**

10. Perform ejector control valve adjustment using HDC.

    a. Reset all HDC solenoid valves by selecting RESET VALVES button (Figure 19, Item 5) on HDC control box.

**WARNING**



- Do not operate ejector when personnel are in bowl. Do not work in bowl unless ejector lock is engaged. Failure to comply may result in severe injury or death to personnel.
- Do not stand or work in bowl area unless ejector lock is engaged. Do not stand in bowl to observe roller guide travels. Failure to comply may result in severe injury or death to personnel.
- When folding dozer blade, work on blade latches from side of vehicle only. Do not stand in front of dozer blade while retracting ejector. Failure to comply may result in severe injury or death to personnel.

    b. Disable ejector by manually closing ejector inhibit valve V23 (Figure 18, Item 1) on DCV bank.

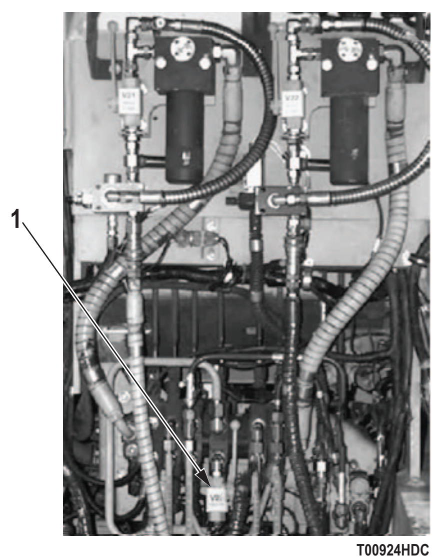



*Figure 18. Directional Control Valve (DCV) Bank.*

    c. Using LINE UP or LINE DOWN button (Figure 19, Item 3), select V1 on HDC display (Figure 19, Item 2).

    d. Close V1 on HDC display (Figure 19, Item 2) by selecting CHANGE POSITION button (Figure 19, Item 4) on HDC control box.

**EJECTOR DOES NOT EXTEND OR RETRACT - Continued**

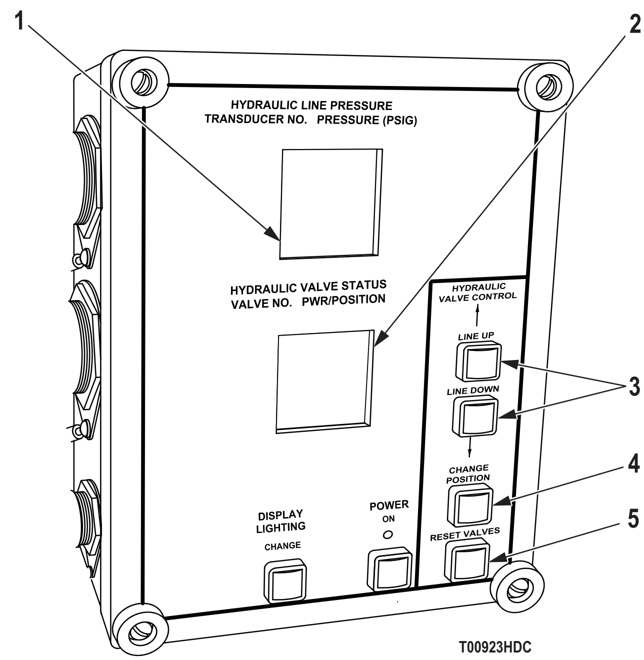



*Figure 19. Hydraulic Diagnostic Center (HDC) Control Box.*

e. Start engine.

f. With engine at idle speed and EJECTOR CONTROL lever in FORWARD position, loosen jam nut (Figure 20, Item 1) on ejector control valve and turn adjusting screw (Figure 20, Item 2) clockwise to increase pressure; counterclockwise to decrease pressure.

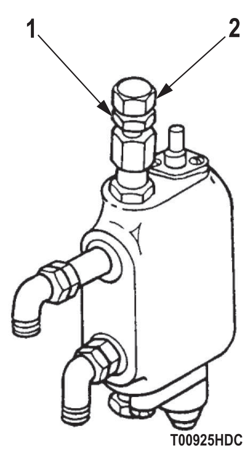



*Figure 20. Ejector Control Valve.*

g. Transducer T-2 hydraulic pressure on HDC display (Figure 19, Item 1) should indicate 1,950-2,050 psi (13,445-15,135 kPa).

**EJECTOR DOES NOT EXTEND OR RETRACT - Continued**

h. Stop engine; relieve hydraulic pressure.

i. Manually open ejector inhibit ball valve V23 (Figure 21, Item 1) on DCV bank.

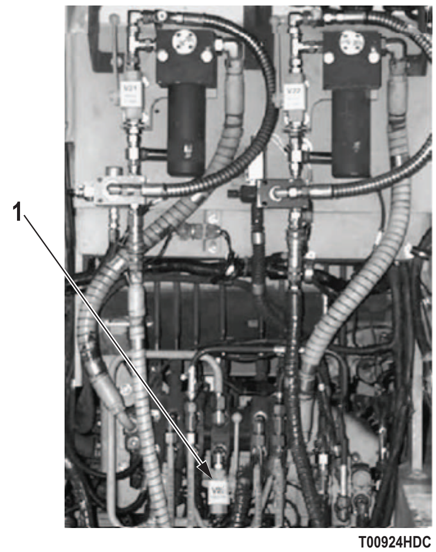



*Figure 21. Directional Control Valve (DCV) Bank.*

j. Using LINE UP or LINE DOWN button (Figure 22, Item 2), select V1 on HDC display (Figure 22, Item 1).

k. Close V1 on HDC display (Figure 22, Item 1), by selecting CHANGE POSITION button (Figure 22, Item 4) on HDC control box.

**CONDITION/INDICATION**

Can pressure be adjusted?

**DECISION**

YES - Verify problem is solved.
NO - Replace DCV bank (TM 5-2350-262-20).

**STEP**

11. Perform ejector cylinder leakage test using HDC.

**EJECTOR DOES NOT EXTEND OR RETRACT - Continued**

## WARNING

- Do not operate ejector when personnel are in bowl. Do not work in bowl unless ejector lock is engaged. Failure to comply may result in severe injury or death to personnel.
- Do not stand or work in bowl area unless ejector lock is engaged. Do not stand in bowl to observe roller guide travels. Failure to comply may result in severe injury or death to personnel.
- When folding dozer blade, work on blade latches from side of vehicle only. Do not stand in front of dozer blade while retracting ejector. Failure to comply may result in severe injury or death to personnel.

a. Reset all HDC solenoid valves by selecting RESET VALVES button (Figure 22, Item 4) on HDC control box.

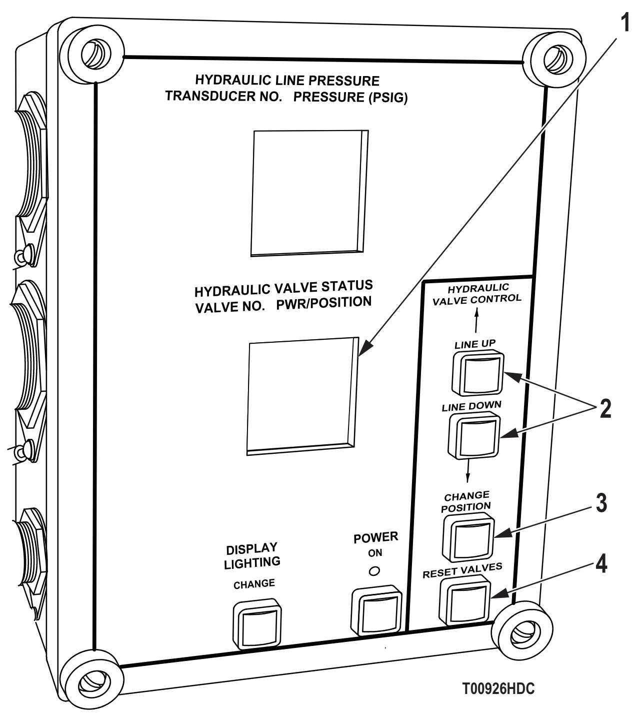



*Figure 22. Hydraulic Diagnostic Center (HDC) Control Box.*

## EJECTOR DOES NOT EXTEND OR RETRACT - Continued

b. Have assistant actuate EJECTOR CONTROL lever (Figure 23, Item 1) to move ejector forward 3/4 of full travel.

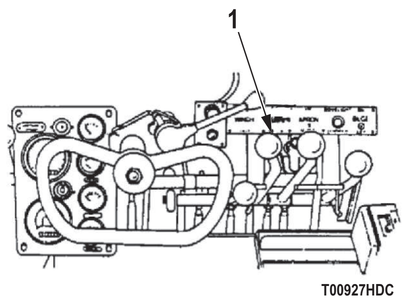



*Figure 23. Ejector Control Lever.*

c. Stop engine and relieve hydraulic pressure.

d. Close main ejector valve (V1) on HDC primary manifold.

e. Using LINE UP or LINE DOWN button (Figure 24, Item 2), select V1 on HDC display (Figure 24, Item 1).

f. Close V1 on HDC display (Figure 24, Item 1) by selecting CHANGE POSITION button (Figure 24, Item 3) on HDC control box.

g. Have assistant start engine and hold EJECTOR CONTROL lever in BACK position for one minute.

h. Mark position of ejector at side of hull and continue to hold valve lever in BACK position for one more minute.

i. Check position of ejector while still holding valve lever in BACK position.

j. If ejector has moved forward more than 0.5 in. (13 mm), the ejector cylinder is leaking excessively.

k. If cylinder moves aft more than 0.5 in. (13 mm), solenoid valve V1 on HDC primary manifold valve is leaking.

l. Open main ejector valve; by using LINE UP or LINE DOWN button (Figure 24, Item 2), select V1 on HDC display (Figure 24, Item 1).

m. Open V1 on HDC display (Figure 24, Item 1), by selecting CHANGE POSITION button (Figure 24, Item 3) on HDC control box.

## EJECTOR DOES NOT EXTEND OR RETRACT - Continued

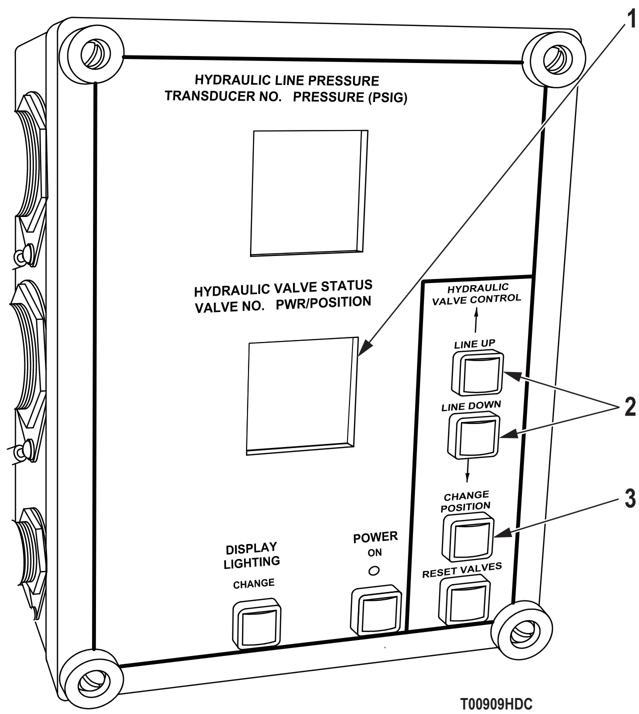



*Figure 24. Hydraulic Diagnostic Center (HDC) Control Box.*

## CONDITION/INDICATION

Is ejector cylinder leaking internally?

## DECISION

YES - Replace or repair ejector cylinder (TM 5-2350-262-20) if ejector moved forward, or replace solenoid valve V1 on HDC primary manifold if ejector moved AFT (WP 0035).
NO - Replace solenoid valve V1 on HDC primary manifold (WP 0035).

## END OF WORK PACKAGE

## FIELD MAINTENANCE
## TROUBLESHOOTING PROCEDURES - FRONT CORNER (LEFT OR RIGHT) RAISES IN SPRUNG, BUT NOT UNSPRUNG MODE

**INITIAL SETUP:**

**Tools and Special Tools**
Tool Kit, General Mechanic's: Automotive
(WP 0054, Table 1, Item 7)

**Materials/Parts**
Sealing Compound (WP 0053, Table 1, Item 3)
Pin, Cotter (WP 0055, Table 1, Item 1) Qty: 1

**Personnel Required**
Construction Equipment Repairer, 91L (Two)

**References**
WP 0035

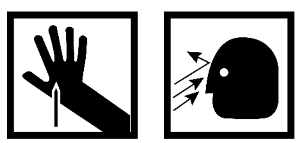
**References (cont.)**
WP 0036
WP 0037

**Equipment Condition**
Vehicle MASTER power OFF (TM 5-2350-262-10)
Vehicle on jack stands (TM 5-2350-262-20)

### TROUBLESHOOTING PROCEDURE

### FRONT CORNER (LEFT OR RIGHT) RAISES IN SPRUNG, BUT NOT UNSPRUNG MODE

**WARNING**



- High oil pressure is present in the M9 ACE hydraulic system. Do not disconnect any hydraulic system component unless hydraulic system pressure has been relieved. After hydraulic system has been relieved, wait at least four minutes before disconnecting any hose or fitting. Ensure each of the hydraulic control levers is moved several times through all positions and the hydraulic tank dipstick is slowly loosened to relieve pressure. Failure to comply may result in severe injury or death to personnel.
- Transmission shifting lines are pressurized. Do not disconnect lines, fittings, or accumulator unless transmission shift control valve pressure has been relieved. Discharge transmission shift accumulator by moving shift control lever through all forward and reverse ranges several times, with engine off. Failure to comply may result in severe injury to personnel.

**NOTE**

- SPRUNG mode provides for a smooth ride up to 30 mph (48 km/h) and is used for over the road marches and parking of vehicle. Hydraulic pressure is supplied to front actuators through line 9.
- Use these procedures to troubleshoot either left or right front of vehicle.

**FRONT CORNER (LEFT OR RIGHT) RAISES IN SPRUNG, BUT NOT UNSPRUNG MODE - Continued**

**STEP**

1. Check if either corner of vehicle will raise in UNSPRUNG mode.
   a. Start vehicle.
   b. Move SPRUNG/UNSPRUNG lever to UNSPRUNG.
   c. Check if one corner raises.

**CONDITION/INDICATION**

Will one corner raise?

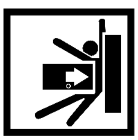
**DECISION**

YES - Go to Step (10).
NO - Go to Step (2).

**STEP**

2. Perform system pressure test using Hydraulic Diagnostic Center (HDC).
   a. Reset all HDC solenoid valves be selecting RESET VALVES button (Figure 1, Item 2) on HDC control box.

## WARNING



- Do not operate ejector when personnel are in bowl. Do not work in bowl unless ejector lock is engaged. Failure to comply may result in severe injury or death to personnel.
- Do not stand or work in bowl area unless ejector lock is engaged. Do not stand in bowl to observe roller guide travels. Failure to comply may result in severe injury or death to personnel.
- When folding dozer blade, work on blade latches from side of vehicle only. Do not stand in front of dozer blade while retracting ejector. Failure to comply may result in severe injury or death to personnel.

## NOTE

- If right corner will not raise in UNSPRUNG mode, check 13L circuit using right wheel control.
- If left corner will not raise in UNSPRUNG mode, check 13R circuit using left wheel control.

   b. Start engine, move ejector forward, engage ejector lock.
   c. Stop engine, and relieve hydraulic pressure.
   d. Have assistant start engine and move SPRUNG/UNSPRUNG lever to UNSPRUNG and SUSPENSION CONTROL lever to RAISE.
   e. To read 13R circuit pressure, read transducer T-3 hydraulic pressure on HDC display (Figure 1, Item 1).

## FRONT CORNER (LEFT OR RIGHT) RAISES IN SPRUNG, BUT NOT UNSPRUNG MODE - Continued

f. To read 13L circuit pressure, read transducer T-4 hydraulic pressure on HDC display (Figure 1, Item 1).

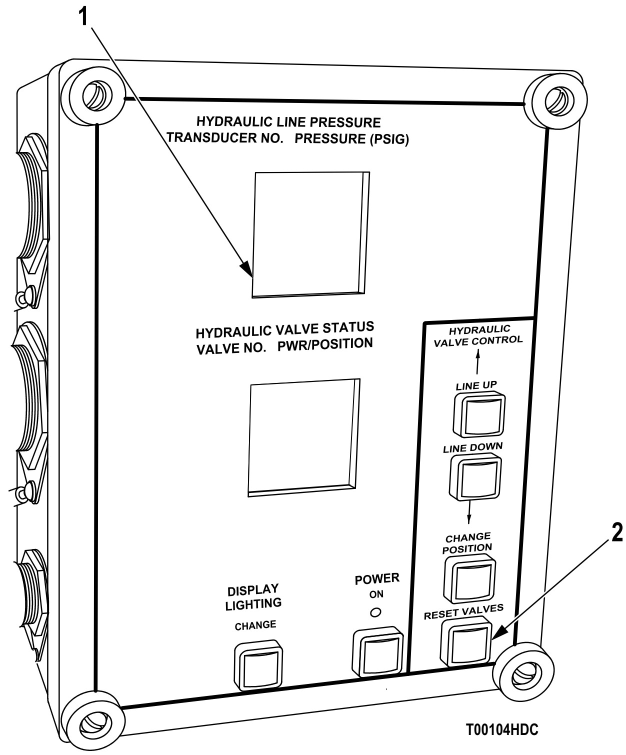



*Figure 1. Hydraulic Diagnostic Center (HDC) Control Box.*

g. Move SUSPENSION CONTROL lever to NEUTRAL.

h. Stop engine; relieve hydraulic pressure.

### CONDITION/INDICATION

Is transducer T-3 or T-4 hydraulic pressure between 3,450-3,550 psi (23,788-24,477 kPa)?

### DECISION

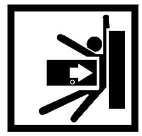
YES - Go to Step (3).
NO - Go to Step (6).

**FRONT CORNER (LEFT OR RIGHT) RAISES IN SPRUNG, BUT NOT UNSPRUNG MODE - Continued**

**STEP**

3. Perform SPRUNG/UNSPRUNG valve linkage check.

**WARNING**



Do not operate ejector when personnel are in bowl. Do not work in bowl unless ejector lock is engaged. Failure to comply may result in severe injury or death to personnel.

a. Hold measuring device (Figure 2, Item 1) on face of SPRUNG/UNSPRUNG control valve (Figure 2, Item 3).

b. Have assistant move SPRUNG/UNSPRUNG lever between SPRUNG and UNSPRUNG mode.

c. Measure distance plunger (Figure 2, Item 2) travels as lever is moved.

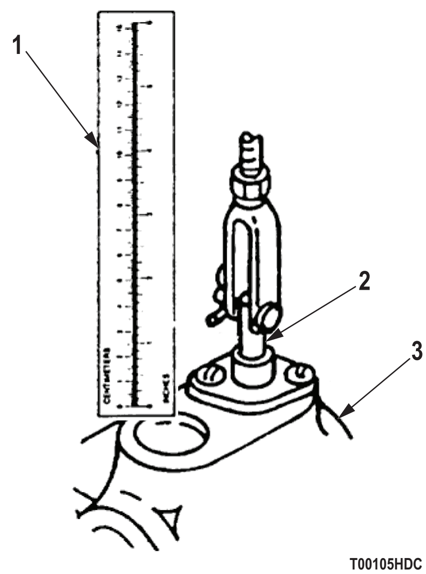



*Figure 2. Control Valve Linkage.*

d. Distance of travel should be 9/32 in. (7 mm).

**CONDITION/INDICATION**

Is linkage correctly adjusted?

**DECISION**

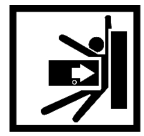
YES - Go to Step (5).
NO - Go to Step (4).

**STEP**

4. Perform SPRUNG/UNSPRUNG control valve linkage adjustment.

**FRONT CORNER (LEFT OR RIGHT) RAISES IN SPRUNG, BUT NOT UNSPRUNG MODE - Continued**

## WARNING



Do not operate ejector when personnel are in bowl. Do not work in bowl unless ejector lock is engaged. Failure to comply may result in severe injury or death to personnel.

## NOTE

All control rods are adjusted same way. This procedure covers SPRUNG/UNSPRUNG control rod.

a. Note position of control valve plunger (Figure 3, Item 1) when SPRUNG/UNSPRUNG control lever is in NEUTRAL (off) position.

## NOTE

Normal control valve plunger travel is 9/32 in. (7 mm).

b. Remove cotter pin (Figure 3, Item 2), straight pin (Figure 3, Item 5), and clevis (Figure 3, Item 6) from control valve plunger (Figure 3, Item 1). Discard cotter pin (Figure 3, Item 2).

c. Loosen jam nut (Figure 3, Item 7). Turn clevis (Figure 3, Item 6) clockwise to shorten rod (Figure 3, Item 3); counterclockwise to lengthen rod (Figure 3, Item 3).

d. Hold measuring device (Figure 3, Item 4) on face of SPRUNG/UNSPRUNG control valve.

e. Have assistant move SPRUNG/UNSPRUNG lever between SPRUNG and UNSPRUNG mode.

f. Measure distance of plunger travel.

g. Adjust length of rod (Figure 3, Item 3) travel to desired distance by turning clevis (Figure 3, Item 6) as necessary.

h. Coat threads of rod (Figure 3, Item 3) with sealing compound.

i. Tighten jam nut (Figure 3, Item 7) against clevis (Figure 3, Item 6).

j. Connect clevis (Figure 3, Item 6) to control valve plunger (Figure 3, Item 1) with straight pin (Figure 3, Item 5) and new cotter pin (Figure 3, Item 2).

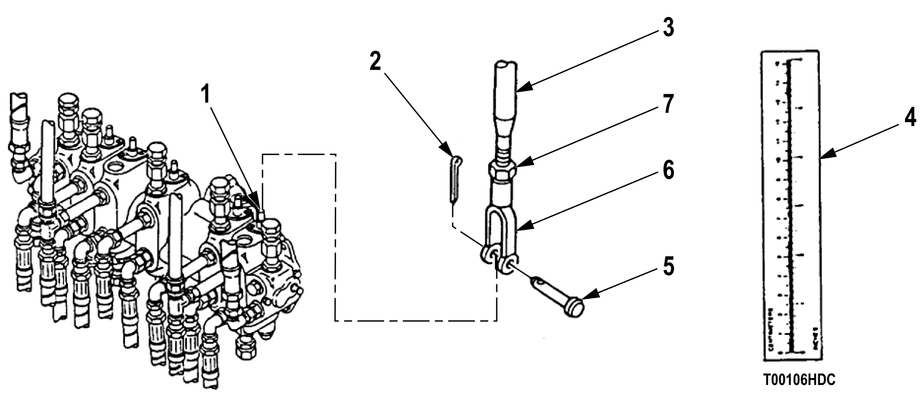



*Figure 3. SPRUNG/UNSPRUNG Control Valve Linkage.*

## FRONT CORNER (LEFT OR RIGHT) RAISES IN SPRUNG, BUT NOT UNSPRUNG MODE - Continued

### CONDITION/INDICATION

Is linkage correctly adjusted?

### DECISION

YES - Go to Step (5).
NO - Repair or replace SPRUNG/UNSPRUNG control valve linkage (TM 5-2350-262-20).

### STEP

5. Perform SPRUNG/UNSPRUNG control valve pressure test using HDC.
   a. Reset all HDC solenoid valves by selecting RESET VALVES button (Figure 4, Item 5) on HDC control box.
   b. Start engine and have assistant move SPRUNG/UNSPRUNG lever between SPRUNG and UNSPRUNG mode several times.
   c. Read transducer T-12 hydraulic pressure on HDC display (Figure 4, Item 1).
   d. Hydraulic pressure should be less than 145 psi (1,000 kPa) in SPRUNG mode and greater than 2,500 psi (17,238 kPa) in UNSPRUNG mode.
   e. Stop engine; relieve hydraulic pressure.

### CONDITION/INDICATION

Is transducer T-12 pressure between 145 psi (1,000 kPa) AND 2,500 psi (17,238 kPa)?

### DECISION

YES - Go to Step (15).
NO - Replace SPRUNG/UNSPRUNG control valve assembly (TM 5-2350-262-20).

### STEP

6. Perform main relief valve pressure test using HDC.
   a. Reset all HDC solenoid valves by selecting RESET VALVES button (Figure 4, Item 5) on HDC control box.
   b. Using LINE UP or LINE DOWN button (Figure 4, Item 3), select V1 on HDC display (Figure 4, Item 2).
   c. Close V1 on HDC display (Figure 4, Item 2) by selecting CHANGE POSITION button (Figure 4, Item 4) on HDC control box.
   d. Have assistant start engine and move ejector forward.
   e. Move SPRUNG/UNSPRUNG lever to SPRUNG and move EJECTOR CONTROL lever to BACK.
   f. Read transducer T-3 hydraulic pressure on HDC display (Figure 4, Item 1).
   g. While simultaneously holding EJECTOR CONTROL lever in BACK, have assistant move right-hand SUSPENSION CONTROL lever to RAISE.
   h. Read transducer T-3 hydraulic pressure on HDC display (Figure 4, Item 1).
   i. Using LINE UP or LINE DOWN button (Figure 4, Item 3), select V1 on HDC display (Figure 4, Item 2).
   j. Open V1 on HDC display (Figure 4, Item 2) by selecting CHANGE POSITION button (Figure 4, Item 4) on HDC control box.

**FRONT CORNER (LEFT OR RIGHT) RAISES IN SPRUNG, BUT NOT UNSPRUNG MODE - Continued**

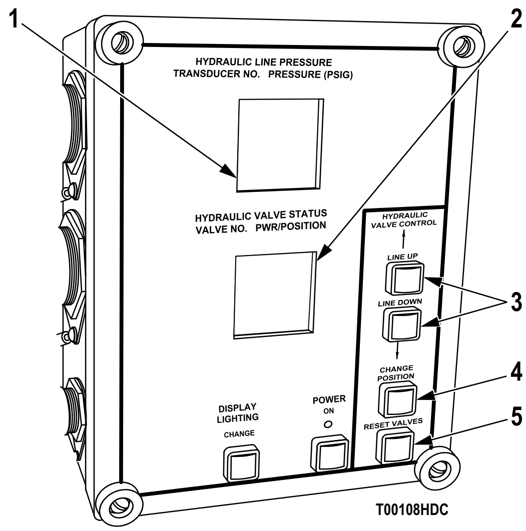



*Figure 4. Hydraulic Diagnostic Center (HDC) Control Box.*

k. Stop engine and relieve hydraulic pressure.

**CONDITION/INDICATION**

Is transducer T-3 hydraulic pressure between 3,950-4,050 psi (27,235-27,925 kPa)?

**DECISION**

YES - Go to Step (7).
NO - Go to Step (20).

**STEP**

7. Perform main pump flow test.

## NOTE

As insufficient flow of hydraulic oil is indicated if ejector requires more than 32 seconds to fully extend or if apron requires more than 15 seconds to fully raise.

a. Start engine and allow engine to idle (750-850 rpm).

b. With ejector fully retracted, hold EJECTOR CONTROL lever in FORWARD, and note length of time required for ejector to fully extend.

c. With apron in full down position, move APRON CONTROL lever to UP, and note length of time required for apron to fully raise. Lower apron.

d. Stop engine; relieve hydraulic pressure.

**CONDITION/INDICATION**

Does ejector fully extend in less than 32 seconds and apron raise fully in less than 15 seconds?

**DECISION**

YES - Go to Step (8).
NO - Go to Step (19).

**FRONT CORNER (LEFT OR RIGHT) RAISES IN SPRUNG, BUT NOT UNSPRUNG MODE - Continued**

**STEP**

8. Perform suspension pressure test using HDC.

   a. Reset all HDC solenoid valves by selecting RESET VALVES button (Figure 5, Item 5) on HDC control box.

   **NOTE**

   Perform this test for ports 17R and 17L on Directional Control Valve (DCV) bank. Use the right-hand SUSPENSION CONTROL lever for port 17R and left-hand SUSPENSION CONTROL lever for port 17L.

   b. Port 17L: Using LINE UP or LINE DOWN button (Figure 5, Item 3), select V11 on HDC display (Figure 5, Item 2).

   c. Close V11 on HDC display (Figure 5, Item 2) by selecting CHANGE POSITION button (Figure 5, Item 4) on HDC control box.

   d. Port 17R: Repeat previous step for port 17R, but close V5 instead of V11.

   e. Start engine and have assistant move SPRUNG/UNSPRUNG lever to UNSPRUNG and SUSPENSION CONTROL lever to LOWER.

   f. Read 17L or 17R circuit pressure from transducer T-1 hydraulic pressure on HDC display (Figure 5, Item 1).

   g. Port 17L: Using LINE UP or LINE DOWN button (Figure 5, Item 3), select V11 on HDC display (Figure 5, Item 2).

   h. Open V11 on HDC display (Figure 5, Item 2) by selecting CHANGE POSITION button (Figure 5, Item 4) on HDC control box.

**FRONT CORNER (LEFT OR RIGHT) RAISES IN SPRUNG, BUT NOT UNSPRUNG MODE - Continued**

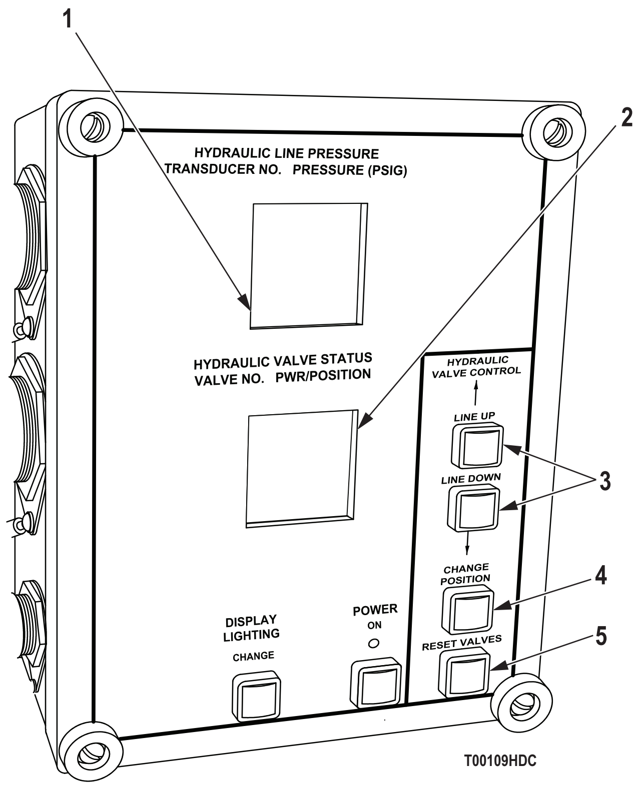



*Figure 5. Hydraulic Diagnostic Center (HDC) Control Box.*

i. Port 17R: Repeat previous step for port 17R, but open V5 instead of V11.

j. Stop engine; relieve hydraulic pressure.

k. Remove all test equipment and connect hose.

## CONDITION/INDICATION

Is transducer T-1 hydraulic pressure at least 3,900 psi (26,891 kPa)?

## DECISION

YES - Go to Step (9).
NO - Replace DCV bank (TM 5-2350-262-20). Verify problem is solved.

**FRONT CORNER (LEFT OR RIGHT) RAISES IN SPRUNG, BUT NOT UNSPRUNG MODE - Continued**

**STEP**

9. Perform solenoid valve V11 or V5 (as applicable) pressure check.

   a. Reset all HDC solenoid valves by selecting RESET VALVES button (Figure 6, Item 5) on HDC control box.

   b. Using LINE UP or LINE DOWN button (Figure 6, Item 3), select V1 on HDC display (Figure 6, Item 2).

   c. Close V1 on HDC display (Figure 6, Item 2) by selecting CHANGE POSITION button (Figure 6, Item 4) on HDC control box.

   d. Verify that transducer T-1 hydraulic pressure on HDC display (Figure 6, Item 1), reads less than 500 psi (3,447.379 kPa).

   e. Have assistant start engine and place vehicle in UNSPRUNG mode.

   f. For solenoid valve V11 (circuit 17L): Have assistant move left SUSPENSION CONTROL lever to LOWER.

   g. Verify that transducer T-1 hydraulic pressure on HDC display (Figure 6, Item 1), reads greater than 3,000 psi (20,684.27 kPa).

**NOTE**

This indicates that V11 has directed flow from suspension to transducer T1, which now reads system relief valve pressure setting.

   h. If pressure is 3,000 psi (20,684.27 kPa) or more, solenoid valve V11 on primary manifold is bad.

   i. For solenoid valve V5 (circuit 17R): Have assistant move the right SUSPENSION CONTROL lever to LOWER.

   j. Verify that transducer T-1 hydraulic pressure on HDC display (Figure 6, Item 1), reads greater than 3,000 psi (20,684.27 kPa).

**NOTE**

This indicates that V5 has directed flow from the suspension to transducer T-1, which now reads system relief valve pressure setting.

   k. If pressure is 3,000 psi (20,684.27 kPa) or more, solenoid valve V11 on primary manifold is bad.

   l. Stop engine; relieve hydraulic pressure.

**CONDITION/INDICATION**

Is transducer T-1 hydraulic pressure greater than 3,000 psi (20,684 kPa)?

**DECISION**

YES - Replace solenoid valve V11 or V5, on primary manifold, as applicable (WP 0035).
NO - Go to Step (10).

**STEP**

10. Perform suspension control valve pressure test using HDC.

   a. Reset all HDC solenoid valves by selecting RESET VALVES button (Figure 6, Item 5) on HDC control box.

**FRONT CORNER (LEFT OR RIGHT) RAISES IN SPRUNG, BUT NOT UNSPRUNG MODE - Continued**

## NOTE

If left corner of vehicle will not raise, perform test at port 3L and actuate left-hand SUSPENSION CONTROL lever. If right corner of vehicle will not raise, perform test at port 3R and actuate right-hand SUSPENSION CONTROL lever.

b. Port 3R: Using LINE UP or LINE DOWN button (Figure 6, Item 3), select V15 on HDC display (Figure 6, Item 2).

c. Close V15 on HDC display (Figure 6, Item 2) by selecting CHANGE POSITION button (Figure 6, Item 4) on HDC control box.

d. Port 3L: Repeat previous step for port 3L and close V16 instead of V15.

e. Start engine and have assistant move SPRUNG/UNSPRUNG lever to UNSPRUNG and SUSPENSION CONTROL lever to RAISE.

f. Read transducer T-1 hydraulic pressure on HDC display (Figure 6, Item 1).

g. Port 3R: Using LINE UP or LINE DOWN button (Figure 6, Item 3), select V15 on HDC display (Figure 6, Item 2).

h. Open V15 on HDC display (Figure 6, Item 2) by selecting CHANGE POSITION button (Figure 6, Item 4) on HDC control box.

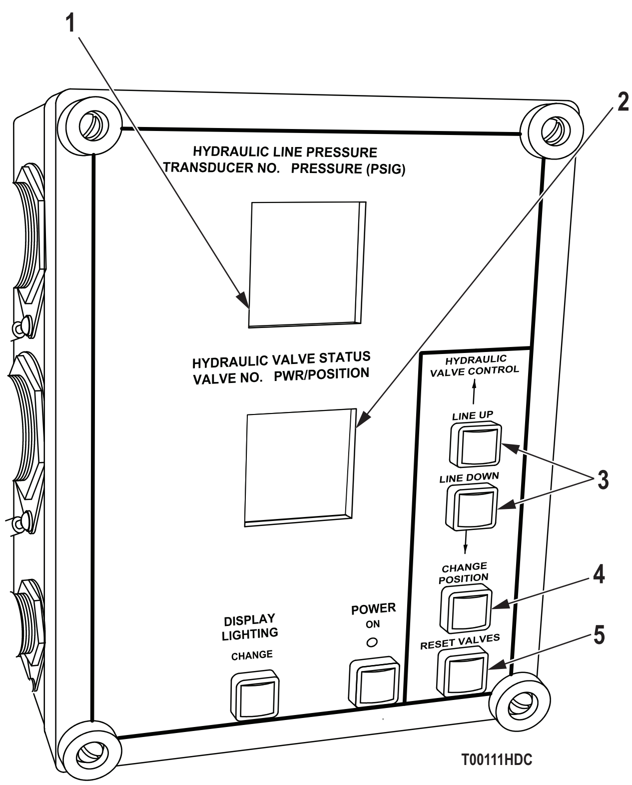



*Figure 6. Hydraulic Diagnostic Center (HDC) Control Box.*

i. Port 3L: Repeat previous step for port 3L and open V16 instead of V15.

## FRONT CORNER (LEFT OR RIGHT) RAISES IN SPRUNG, BUT NOT UNSPRUNG MODE - Continued

### CONDITION/INDICATION

Is transducer T-1 hydraulic pressure between 3,400-3,550 psi (23,788-24,477 kPa)?

### DECISION

YES - Go to Step (12).
NO - Go to Step (11).

### STEP

11. Perform suspension control relief valve adjustment using HDC.
    a. Stop engine; relieve hydraulic pressure.
    b. Reset all HDC solenoid valves by selecting RESET VALVES button (Figure 7, Item 5) on HDC control box.

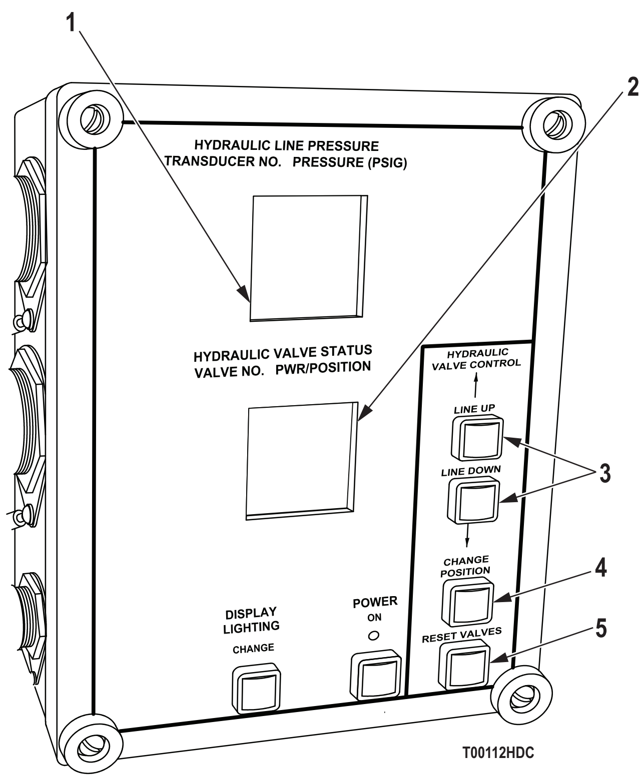



*Figure 7. Hydraulic Diagnostic Center (HDC) Control Box.*

## NOTE

If left corner of vehicle will not raise, perform this adjustment at relief valve 3L and actuate left-hand SUSPENSION CONTROL lever. If right corner of vehicle will not raise, perform this adjustment at relief valve 3R and actuate right-hand SUSPENSION CONTROL lever.

c. Port 3R RELIEF VALVE: Using LINE UP or LINE DOWN button (Figure 7, Item 3), select V15 on HDC display (Figure 7, Item 2).

## FRONT CORNER (LEFT OR RIGHT) RAISES IN SPRUNG, BUT NOT UNSPRUNG MODE - Continued

d. Close V15 on HDC display (Figure 7, Item 2) by selecting CHANGE POSITION button (Figure 7, Item 4) on HDC control box.

e. Port 3L relief valve: Repeat previous step for port 3L and close V16 instead of V15.

f. Start engine and have assistant move SPRUNG/UNSPRUNG lever to UNSPRUNG and SUSPENSION CONTROL lever to RAISE.

g. Read transducer T-1 hydraulic pressure on HDC display (Figure 7, Item 1).

h. Loosen jam nut (Figure 8, Item 2) and turn adjusting screw (Figure 8, Item 3) clockwise to increase pressure; counterclockwise to decrease pressure, as necessary.

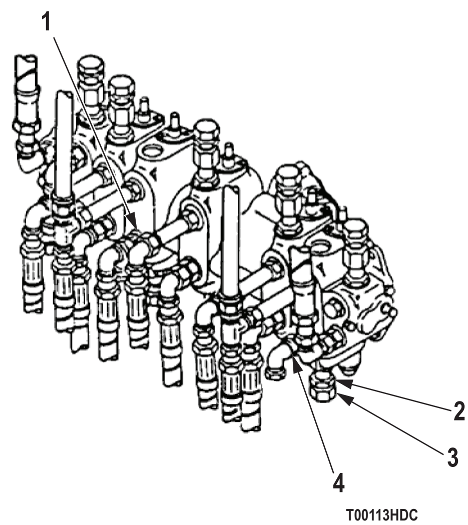



*Figure 8. Suspension Control Relief Valve Adjustment.*

i. Adjust pressure to within limits, and tighten jam nut (Figure 8, Item 2).

j. Stop engine; relieve hydraulic pressure.

k. Port 3R relief valve (Figure 8, Item 4): Using LINE UP or LINE DOWN button (Figure 7, Item 3), select V15 on HDC display (Figure 7, Item 2).

l. Open V15 on HDC display (Figure 7, Item 2) by selecting CHANGE POSITION button (Figure 7, Item 4) on HDC control box.

m. Port 3L relief valve (Figure 8, Item 1): Repeat previous step for port 3L and open V16 instead of V15.

### CONDITION/INDICATION

Can relief valve be adjusted to 3,450-3,550 psi (23,788-24,477 kPa)?

### DECISION

YES - Go to Step (12).
NO - Replace DCV bank (TM 5-2350-262-20).

## FRONT CORNER (LEFT OR RIGHT) RAISES IN SPRUNG, BUT NOT UNSPRUNG MODE - Continued

**STEP**

12. Perform No. 1 actuator pressure test (port 3) using HDC.
    a. Stop engine; relieve hydraulic pressure.
    b. Reset all HDC solenoid valves by selecting RESET VALVES button (Figure 9, Item 2) on HDC control box.

**NOTE**

This test is performed at No. 1 actuator of front corner which will not raise.

    c. Start engine. Place SPRUNG/UNSPRUNG lever in SPRUNG. Move (right or left, as applicable) SUSPENSION CONTROL lever to RAISE.
    d. Read transducer T-5 (front right actuator) or T-6 (front left actuator) hydraulic pressure on HDC display (Figure 9, Item 1).
    e. Stop engine; relieve hydraulic pressure.

**CONDITION/INDICATION**

Is transducer T-5 (front right actuator) and T-6 (front left actuator) hydraulic pressure greater than 3,000 psi (20,685 kPa)?

**DECISION**

YES - Go to Step (15).
NO - Go to Step (13).

**STEP**

13. Perform solenoid valve V15/V16 test.
    a. Reset all HDC solenoid valves by selecting RESET VALVES button (Figure 9, Item 2) on HDC control box.
    b. Start engine.
    c. Wait until transducer T-1 hydraulic pressure on HDC display (Figure 9, Item 1) is less than 500 psi (3,447.379 kPa).
    d. Move SUSPENSION CONTROL lever (left-hand or right-hand lever, as applicable) to RAISE.
    e. Read transducer T-1 hydraulic pressure on HDC display (Figure 9, Item 1).

**FRONT CORNER (LEFT OR RIGHT) RAISES IN SPRUNG, BUT NOT UNSPRUNG MODE - Continued**

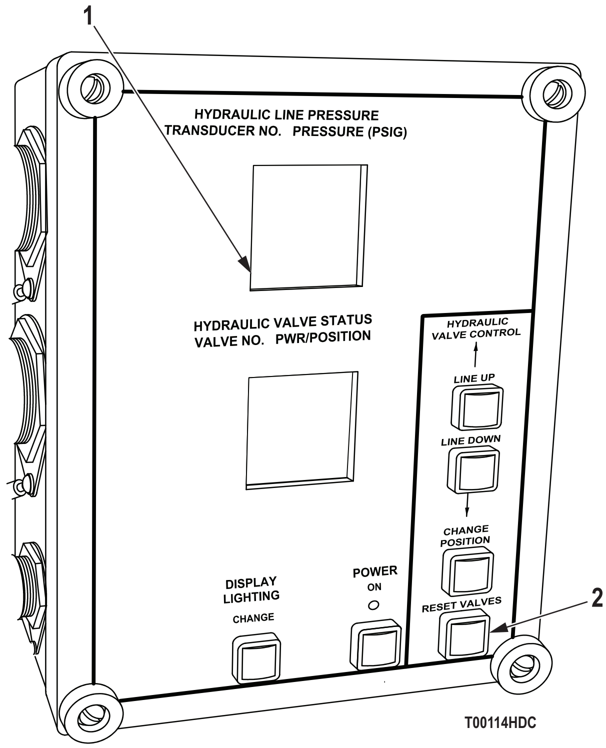



*Figure 9. Hydraulic Diagnostic Center (HDC) Control Box.*

f. Stop engine; relieve hydraulic pressure.

## CONDITION/INDICATION

Is transducer T-1 hydraulic pressure less than 1,000 psi (6,894.757 kPa)?

## DECISION

YES - Go to Step (14).
NO - Replace solenoid valve V15 on primary manifold if right side of vehicle will not raise (WP 0035). Replace solenoid valve V16 on primary manifold if left side of vehicle will not raise (WP 0035).

**FRONT CORNER (LEFT OR RIGHT) RAISES IN SPRUNG, BUT NOT UNSPRUNG MODE - Continued**

**STEP**

14. Perform circuit 3 hoses and lines blockage check.

**WARNING**

Do not work under vehicle unless hull is properly blocked or allowed to settle on bump stops. Failure to comply may result in severe injury or death to personnel.

a. Check for blockage in all hoses and lines applicable to corner of vehicle which will not raise (Figure 10).

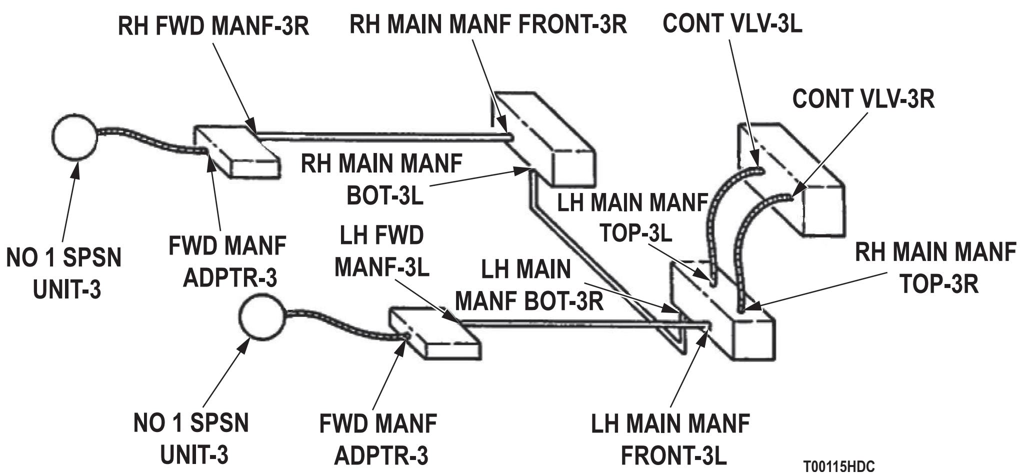



*Figure 10. Circuit 3 Components, Hoses and Lines.*

b. Connect hoses. Verify problem with operator.

**CONDITION/INDICATION**

Is there any blockage?

**DECISION**

YES - Clear blockage or replace lines (TM 5-2350-262-20). Verify problem is solved.
NO - A previous task was incorrectly performed or results misinterpreted. Verify results of all previous tests, beginning at Step (1).

**STEP**

15. Perform No. 1 actuator pressure test (port 11) using HDC.

a. Reset all HDC solenoid valves by selecting RESET VALVES button (Figure 11, Item 5) on HDC control box.

## FRONT CORNER (LEFT OR RIGHT) RAISES IN SPRUNG, BUT NOT UNSPRUNG MODE - Continued

### NOTE

This test is performed at No. 1 front actuator which will not raise.

b. To test RIGHT No. 1 front actuator that will not rise: Using LINE UP or LINE DOWN button (Figure 11, Item 3) on HDC control box, select V2 on HDC display (Figure 11, Item 2).

c. Using CHANGE POSITION button (Figure 11, Item 4), close V2 on HDC display (Figure 11, Item 2).

d. Start engine and move SPRUNG/UNSPRUNG lever to UNSPRUNG.

e. Read transducer T-11 hydraulic pressure on HDC display (Figure 11, Item 1).

f. Using LINE UP or LINE DOWN button (Figure 11, Item 3) on HDC control box, select V2 on HDC display (Figure 11, Item 2).

g. Using CHANGE POSITION button (Figure 11, Item 4), open V2 on HDC display (Figure 11, Item 2).

h. To test LEFT No. 1 front actuator that will not rise: Using LINE UP or LINE DOWN button (Figure 11, Item 3) on HDC control box, select V3 on HDC display (Figure 11, Item 2)

i. Using CHANGE POSITION button (Figure 11, Item 4), close V3 on HDC display (Figure 11, Item 2).

j. Move SPRUNG/UNSPRUNG lever to UNSPRUNG.

k. Read transducer T-10 hydraulic pressure on HDC display (Figure 11, Item 1).

l. Using LINE UP or LINE DOWN button (Figure 11, Item 3) on HDC control box, select V3 on HDC display (Figure 11, Item 2).

m. Using CHANGE POSITION button (Figure 11, Item 4), open V3 on HDC display (Figure 11, Item 2).

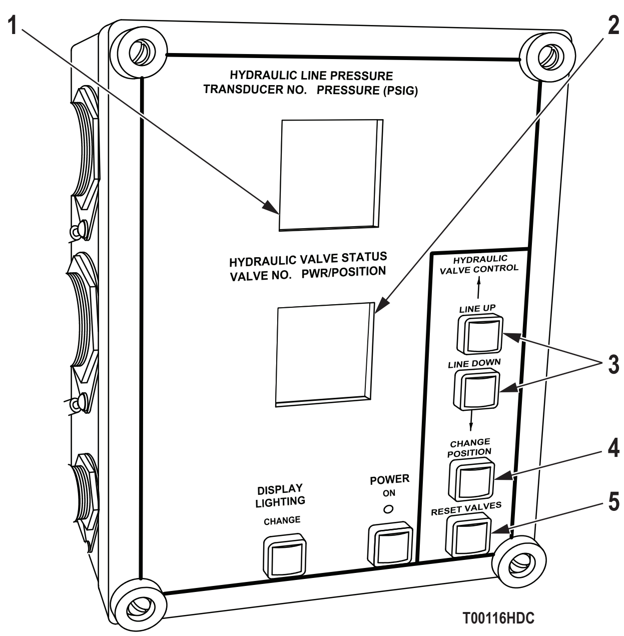



*Figure 11. Hydraulic Diagnostic Center (HDC) Control Box.*

n. Stop engine; relieve hydraulic pressure.

## FRONT CORNER (LEFT OR RIGHT) RAISES IN SPRUNG, BUT NOT UNSPRUNG MODE - Continued

### CONDITION/INDICATION

Is transducer T-10 (front left actuator) and T-11 (front right actuator) hydraulic pressure between 2,800-2,900 psi (19,306-19,996 kPa)?

### DECISION

YES - Go to Step (17).
NO - Go to Step (16).

### STEP

16. Perform circuit 11 hoses and lines blockage check.

Check for blockage in all hoses and lines applicable to corner of vehicle which will not raise (Figure 12).

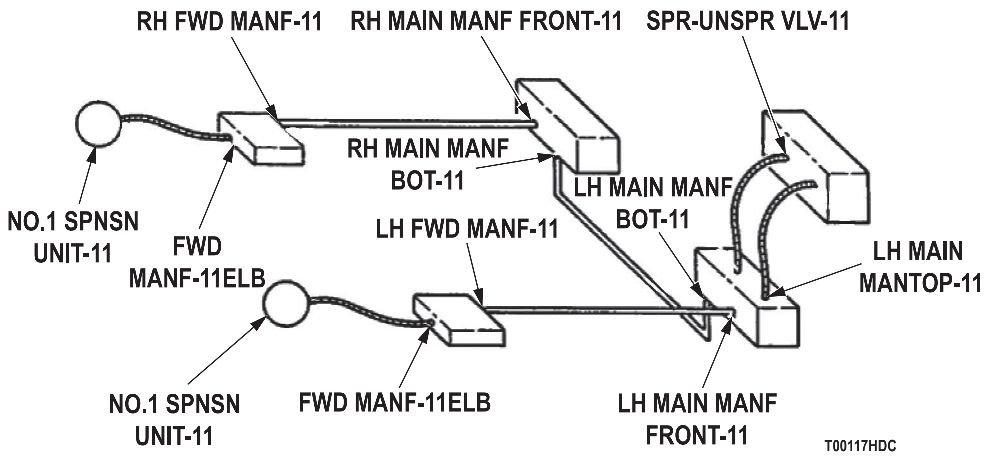



*Figure 12. Circuit 11 Components, Hoses and Lines.*

### CONDITION/INDICATION

Is there any blockage?

### DECISION

YES - Clear blockage or replace lines. Verify problem is solved.
NO - Verify problem with operator.

### STEP

17. Check lines between actuator and forward manifold.

### CONDITION/INDICATION

Is there any blockage?

### DECISION

YES - Clear blockage or replace lines. Verify problem is solved.
NO - Go to Step (18).

**FRONT CORNER (LEFT OR RIGHT) RAISES IN SPRUNG, BUT NOT UNSPRUNG MODE - Continued**

**STEP**

18. Perform solenoid valve V2/V3 flow test using HDC.

    a. Reset all HDC solenoid valves by selecting RESET VALVES button (Figure 13, Item 1) on HDC control box.

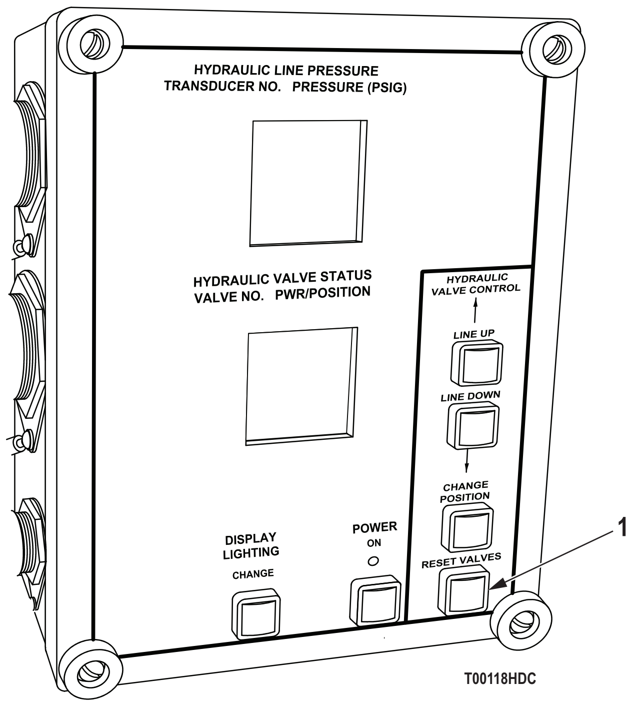



*Figure 13. Hydraulic Diagnostic Center (HDC) Control Box.*

**WARNING**

Do not work under vehicle unless hull is on jack stands and apron lockpins are installed. Failure to comply may result in severe injury or death to personnel.

**NOTE**

Have suitable container ready to catch oil.

    b. Disconnect right forward manifold line 11 for solenoid valve V2.

    c. Disconnect left forward manifold line 11 for solenoid valve V3.

**FRONT CORNER (LEFT OR RIGHT) RAISES IN SPRUNG, BUT NOT UNSPRUNG MODE - Continued**

d. Start engine and have assistant move SPRUNG/UNSPRUNG lever to UNSPRUNG.

e. Observe flow.

f. Stop engine; relieve hydraulic pressure.

g. Reconnect right forward manifold line 11 for solenoid valve V2.

h. Reconnect left forward manifold line 11 for solenoid valve V3.

**CONDITION/INDICATION**

Is there any flow?

**DECISION**

YES - Notify Direct Support maintenance to replace No. 1 actuator.
NO - Replace solenoid valve V2 on right forward manifold (WP 0037) or replace solenoid valve V3 on left forward manifold, as applicable (WP 0036).

**STEP**

19. Perform main pump suction hose blockage check.

**WARNING**

Do not work under vehicle unless hull is properly blocked or allowed to settle on bump stops. Failure to comply may result in severe injury or death to personnel.

**NOTE**

Have suitable container ready to catch oil.

a. Stop engine; relieve hydraulic pressure.

b. Loosen, but do not disconnect, PUMP SUCT TUB-7 (Figure 14, Item 1) from elbow (Figure 14, Item 3) on main hydraulic pump (Figure 14, Item 2).

**FRONT CORNER (LEFT OR RIGHT) RAISES IN SPRUNG, BUT NOT UNSPRUNG MODE - Continued**

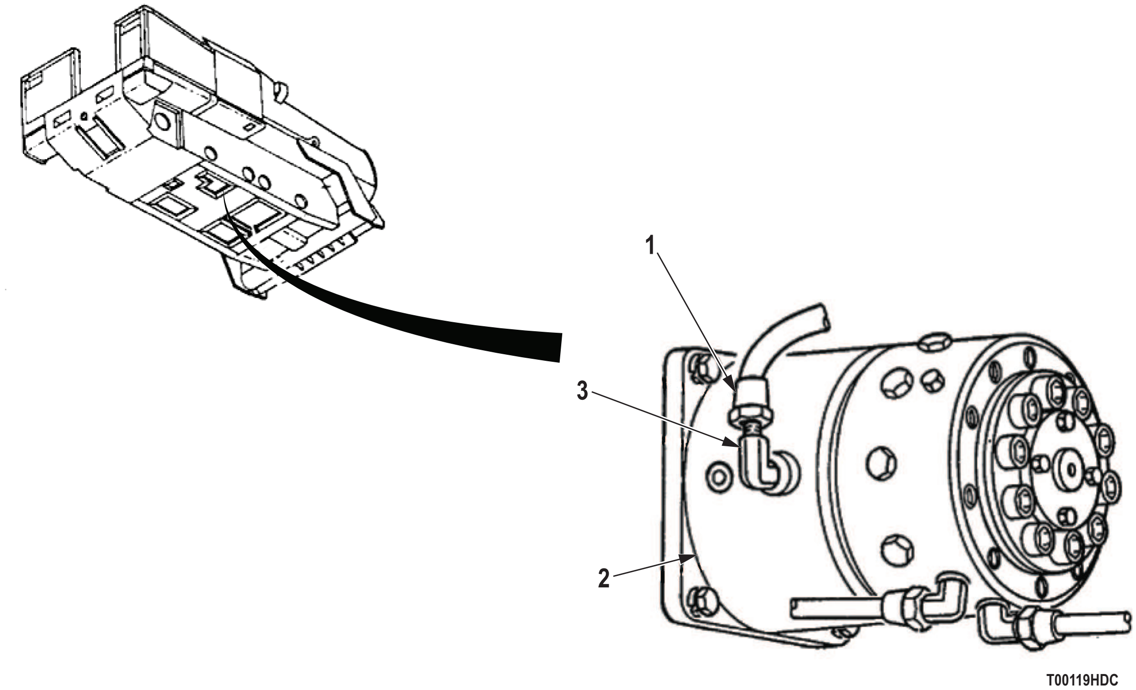



*Figure 14. Main Pump Suction Hose Blockage Test.*

c. Hydraulic oil should flow freely from loosened fitting.

d. Reconnect line.

**CONDITION/INDICATION**

Is suction hose blocked?

**DECISION**

YES - Clear blockage or replace hose. Verify problem is solved.
NO - Go to Step (21).

## FRONT CORNER (LEFT OR RIGHT) RAISES IN SPRUNG, BUT NOT UNSPRUNG MODE - Continued

**STEP**

20. Perform main relief valve adjustment using HDC.

    a. Reset all HDC solenoid valves by selecting RESET VALVES button (Figure 16, Item 5) on HDC control box.

### WARNING

- Do not operate ejector when personnel are in bowl. Do not work in bowl unless ejector lock is engaged. Failure to comply may result in severe injury or death to personnel.
- Do not stand or work in bowl area unless ejector lock is engaged. Do not stand in bowl to observe roller guide travels. Failure to comply may result in severe injury or death to personnel.

    b. Disable ejector by manually closing ejector inhibit ball valve V23 (Figure 15, Item 1) on DCV bank.

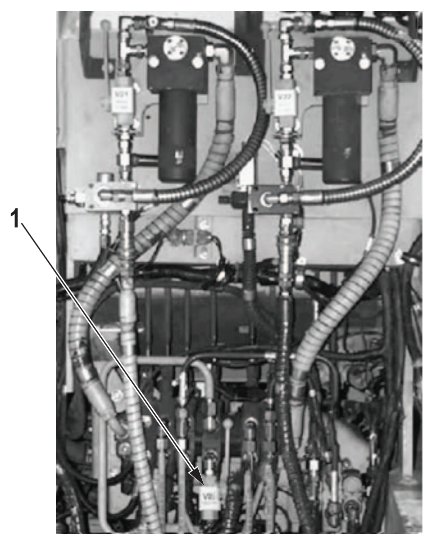



*Figure 15. Directional Control Valve (DCV) Bank.*

**FRONT CORNER (LEFT OR RIGHT) RAISES IN SPRUNG, BUT NOT UNSPRUNG MODE - Continued**

c. Using LINE UP or LINE DOWN button (Figure 16, Item 3), select V1 on HDC display (Figure 16, Item 2).

d. Close V1 on HDC display (Figure 16, Item 2) by selecting CHANGE POSITION button (Figure 16, Item 4) on HDC control box.

e. With SPRUNG/UNSPRUNG lever in SPRUNG, have assistant move left hand SUSPENSION CONTROL lever to RAISE, while at same time, holding EJECTOR CONTROL lever in BACK.

f. Observe transducer T-4 hydraulic pressure on HDC display (Figure 16, Item 1).

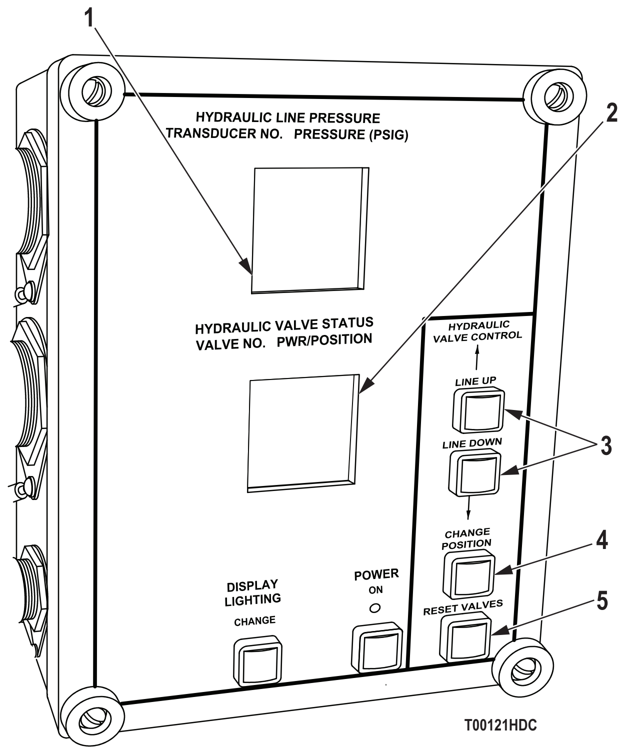



*Figure 16. Hydraulic Diagnostic Center (HDC) Control Box.*

## FRONT CORNER (LEFT OR RIGHT) RAISES IN SPRUNG, BUT NOT UNSPRUNG MODE - Continued

g. If pressure is not within limits adjust main relief valve 13L (Figure 17, Item 4) by loosening jam nut (Figure 17, Item 3) and rotating adjustment screw (Figure 17, Item 2) clockwise to increase pressure; counterclockwise to decrease pressure.

h. When hydraulic pressure is within limits, tighten jam nut (Figure 17, Item 2).

i. Stop engine; relieve hydraulic pressure.

j. Repeat previous steps for main relief valve 13R (Figure 17, Item 1) using right-hand SUSPENSION CONTROL lever and observe transducer T-3 hydraulic pressure on HDC display (Figure 19, Item 1).

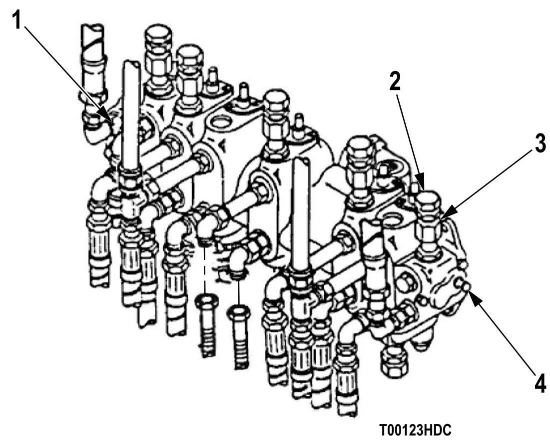



*Figure 17. Main Relief Valve.*

k. Stop engine; relieve hydraulic pressure.

l. Enable ejector by manually opening ejector inhibit ball valve V23 (Figure 18, Item 1) on DCV bank.

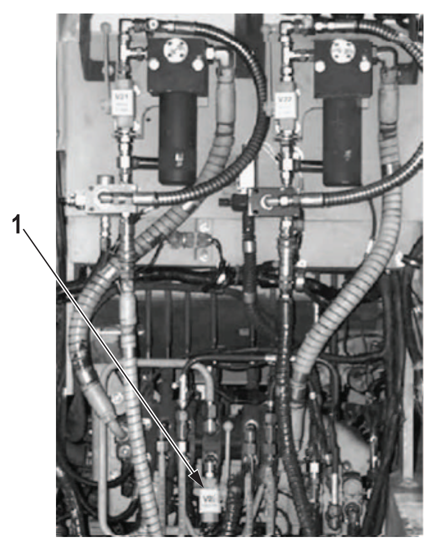



*Figure 18. Directional Control Valve (DCV) Bank.*

## FRONT CORNER (LEFT OR RIGHT) RAISES IN SPRUNG, BUT NOT UNSPRUNG MODE - Continued

m. Using LINE UP or LINE DOWN button (Figure 19, Item 3), select V1 on HDC display (Figure 19, Item 2).

n. Open V1 on HDC display (Figure 19, Item 2) by selecting CHANGE POSITION button (Figure 19, Item 4) on HDC control box.

### CONDITION/INDICATION

Can hydraulic pressure be adjusted to 3,950-4,050 psi (27,235-27,925 kPa)?

### DECISION

YES - Verify problem is solved.
NO - Go to Step (21).

### STEP

21. Perform main hydraulic pump testing using HDC.

a. Reset all HDC solenoid valves by selecting RESET VALVES button (Figure 19, Item 5) on HDC control box.

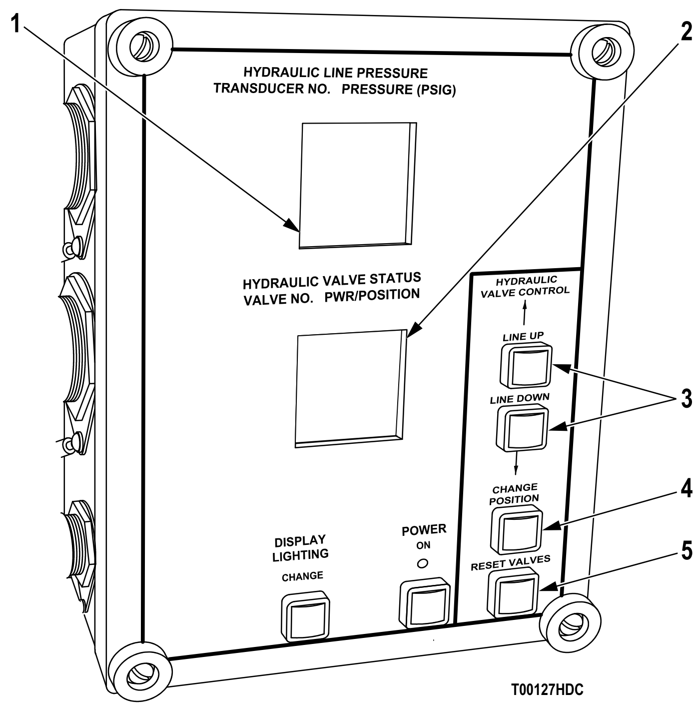



*Figure 19. Hydraulic Diagnostic Center (HDC) Control Box.*

## FRONT CORNER (LEFT OR RIGHT) RAISES IN SPRUNG, BUT NOT UNSPRUNG MODE - Continued

### WARNING

- Do not operate ejector when personnel are in bowl. Do not work in bowl unless ejector lock is engaged. Failure to comply may result in severe injury or death to personnel.
- Do not stand or work in bowl area unless ejector lock is engaged. Do not stand in bowl to observe roller guide travels. Failure to comply may result in severe injury or death to personnel.
- When folding dozer blade, work on blade latches from side of vehicle only. Do not stand in front of dozer blade while retracting ejector. Failure to comply may result in severe injury or death to personnel.

b. Stop engine; relieve hydraulic pressure.

c. Disable ejector by manually closing ejector inhibit ball valve V23 (Figure 20, Item 2) on DCV bank.

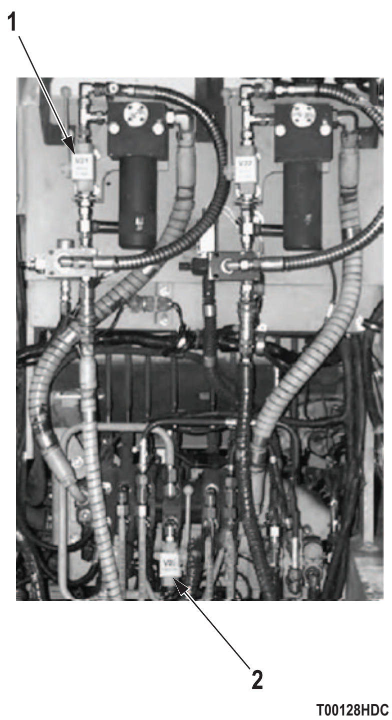



*Figure 20. Directional Control Valve (DCV) Bank.*

d. Using LINE UP or LINE DOWN button (Figure 21, Item 3), select V1 on HDC display (Figure 21, Item 2).

e. Close V1 on HDC display (Figure 21, Item 2) by selecting CHANGE POSITION button (Figure 21, Item 4) on HDC control box.

f. Ensure right main hydraulic pressure inhibit valve V21 (Figure 20, Item 1) is fully opened.

g. Have assistant start engine and allow engine to idle (750-800 rpm).

**FRONT CORNER (LEFT OR RIGHT) RAISES IN SPRUNG, BUT NOT UNSPRUNG MODE - Continued**

h. Slowly close right main hydraulic pressure inhibit valve V21 (Figure 20, Item 1), until transducer T-3 hydraulic pressure on HDC display (Figure 21, Item 1) reaches 3,950-4,050 psi (27,235-27,925 kPa).

i. Fully open right main hydraulic pressure inhibit valve V21 (Figure 20, Item 1).

j. Stop engine; relieve hydraulic pressure.

k. Open ejector inhibit ball valve V23 (Figure 20, Item 2) on DCV bank.

l. Using LINE UP or LINE DOWN button (Figure 21, Item 3), select V1 on HDC display (Figure 21, Item 2).

m. Open V1 on HDC display (Figure 21, Item 2) by selecting CHANGE POSITION button (Figure 21, Item 4) on HDC control box.

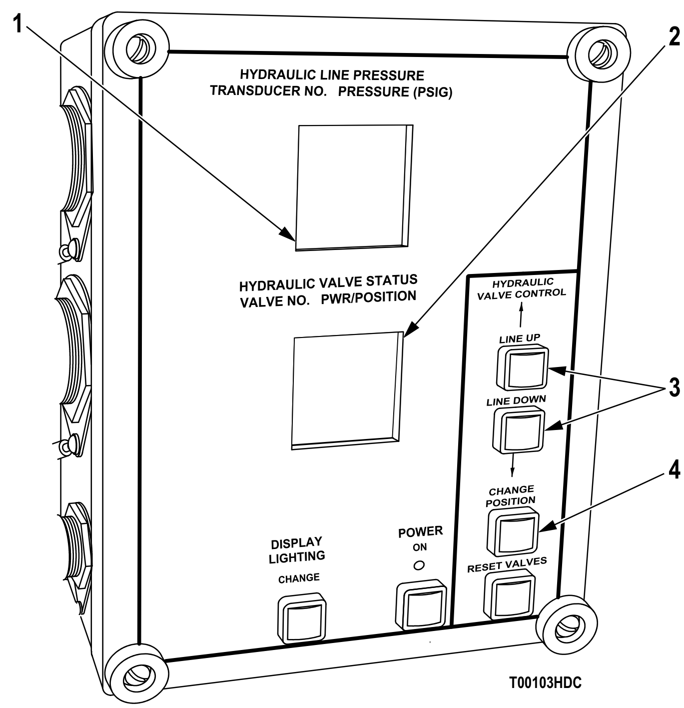



*Figure 21. Hydraulic Diagnostic Center (HDC) Control Box.*

**CONDITION/INDICATION**

Does transducer T-3 hydraulic pressure indicate that main pump develops 3,950-4,050 psi (27,235-27,925 kPa)?

**DECISION**

YES - Replace DCV bank (TM 5-2350-262-20).
NO - Notify Direct Support maintenance to replace main hydraulic pump.

**END OF WORK PACKAGE**

# FIELD MAINTENANCE
# TROUBLESHOOTING PROCEDURES - FRONT CORNER (LEFT OR RIGHT) RAISES IN UNSPRUNG, BUT NOT SPRUNG MODE

## INITIAL SETUP:

**Tools and Special Tools**
Tool Kit, General Mechanic's: Automotive (WP 0054, Table 1, Item 7)
Parts Kit, Hydraulic (WP 0054, Table 1, Item 3)
Tester, Hydraulic Hose Assembly (WP 0054, Table 1, Item 6)

**Materials/Parts**
Pin, Cotter (WP 0055, Table 1, Item 1) Qty: 1

**Personnel Required**
Construction Equipment Repairer, 91L (Two)

**References**
WP 0035

**Equipment Condition**
Vehicle MASTER power OFF (TM 5-2350-262-10)
Vehicle on jack stands (TM 5-2350-262-20)

## TROUBLESHOOTING PROCEDURE

## FRONT CORNER (LEFT OR RIGHT) RAISES IN UNSPRUNG, BUT NOT SPRUNG MODE

### WARNING

- High oil pressure is present in the M9 ACE hydraulic system. Do not disconnect any hydraulic system component unless hydraulic system pressure has been relieved. After hydraulic system has been relieved, wait at least four minutes before disconnecting any hose or fitting. Ensure each of the hydraulic control levers is moved several times through all positions and the hydraulic tank dipstick is slowly loosened to relieve pressure. Failure to comply may result in severe injury or death to personnel.
- Transmission shifting lines are pressurized. Do not disconnect lines, fittings, or accumulator unless transmission shift control valve pressure has been relieved. Discharge transmission shift accumulator by moving shift control lever through all forward and reverse ranges several times, with engine off. Failure to comply may result in severe injury to personnel.

### NOTE

- SPRUNG mode provides for a smooth ride up to 30 mph (48 km/h) and is used for over the road marches and parking of vehicle. Hydraulic pressure is supplied to front actuators through line 9.
- Use these procedures to troubleshoot either left or right front of vehicle.

**STEP**

1. Perform V19 test.
   a. Start engine.
   b. Reset all Hydraulic Diagnostic Center (HDC) solenoid valves by selecting RESET VALVES button (Figure 1, Item 5) on HDC control box.
   c. Using LINE UP or LINE DOWN button (Figure 1, Item 3) on HDC control box.
   d. Select V5 on HDC display (Figure 1, Item 2), and using CHANGE POSITION button (Figure 1, Item 4), close V5 on HDC display (Figure 1, Item 2).
   e. Move SPRUNG/UNSPRUNG lever to UNSPRUNG.
   f. Read transducer T-1 hydraulic pressure on HDC display (Figure 1, Item 1).
   g. Using LINE UP or LINE DOWN button (Figure 1, Item 3) on HDC control box, select V5 on HDC display (Figure 1, Item 2).
   h. Using CHANGE POSITION button (Figure 1, Item 4), open V5 on HDC display (Figure 1, Item 3).

**FRONT CORNER (LEFT OR RIGHT) RAISES IN UNSPRUNG, BUT NOT SPRUNG MODE - Continued**

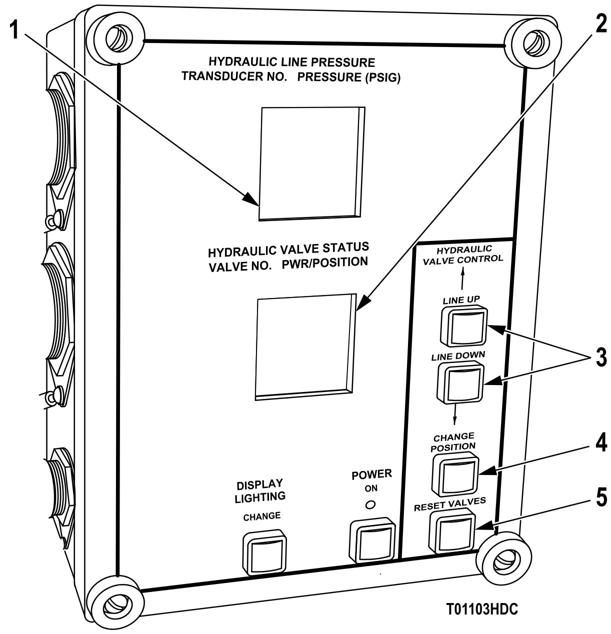



*Figure 1. Hydraulic Diagnostic Center (HDC) Control Box.*

i. Stop engine; relieve hydraulic pressure.

### CONDITION/INDICATION

Is transducer T-1 hydraulic pressure greater than 500 psi (3,447.79 kPa)?

### DECISION

YES - Replace solenoid V19 on primary manifold (WP 0035).
NO - Go to Step (2).

**FRONT CORNER (LEFT OR RIGHT) RAISES IN UNSPRUNG, BUT NOT SPRUNG MODE - Continued**

**STEP**

2. Perform No. 1 actuator oil flow and hydraulic pressure test.

**NOTE**

Have suitable container ready to catch oil.

a. Stop engine; relieve hydraulic pressure.

b. Disconnect No. 1 SPNSN UNIT- #9 hose (Figure 2, Item 2) at elbow (Figure 2, Item 6) on port 9 (Figure 2, Item 7) of No. 1 actuator (Figure 2, Item 4).

c. Cap elbow (Figure 2, Item 6).

d. Connect tee (Figure 2, Item 1), globe valve (Figure 2, Item 8), and pressure measuring device (Figure 2, Item 3) to end of No. 1 SPNSN UNIT-#9 hose (Figure 2, Item 2).

e. Connect a drain hose (Figure 2, Item 5) to open end of globe valve (Figure 2, Item 8).

f. Place end of hose (Figure 2, Item 5) in container. Start engine. Open globe valve (Figure 2, Item 8).

g. Observe for flow of oil.

**CONDITION/INDICATION**

Does oil flow freely?

**DECISION**

YES - Go to Step (3).
NO - Go to Step (10).

**STEP**

3. Close globe valve and check hydraulic pressure.

Close globe valve (Figure 2, Item 8) and measure pressure on pressure measuring device (Figure 2, Item 3).

**CONDITION/INDICATION**

Is hydraulic pressure greater than 2,500 psi (17,238 kPa)?

**DECISION**

YES - Go to Step (4).
NO - Go to Step (10).

**STEP**

4. Check for blockage at port 9.

**CONDITION/INDICATION**

Is port 9 blocked?

**DECISION**

YES - Clear blockage. Remove all test equipment and connect hoses. Verify problem is solved.
NO - Go to Step (10).

**FRONT CORNER (LEFT OR RIGHT) RAISES IN UNSPRUNG, BUT NOT SPRUNG MODE - Continued**

**STEP**

5. Check if front corner will raise when front suspension control valve is actuated.

   Close globe valve (Figure 2, Item 8) and measure pressure on pressure measuring device (Figure 2, Item 3).

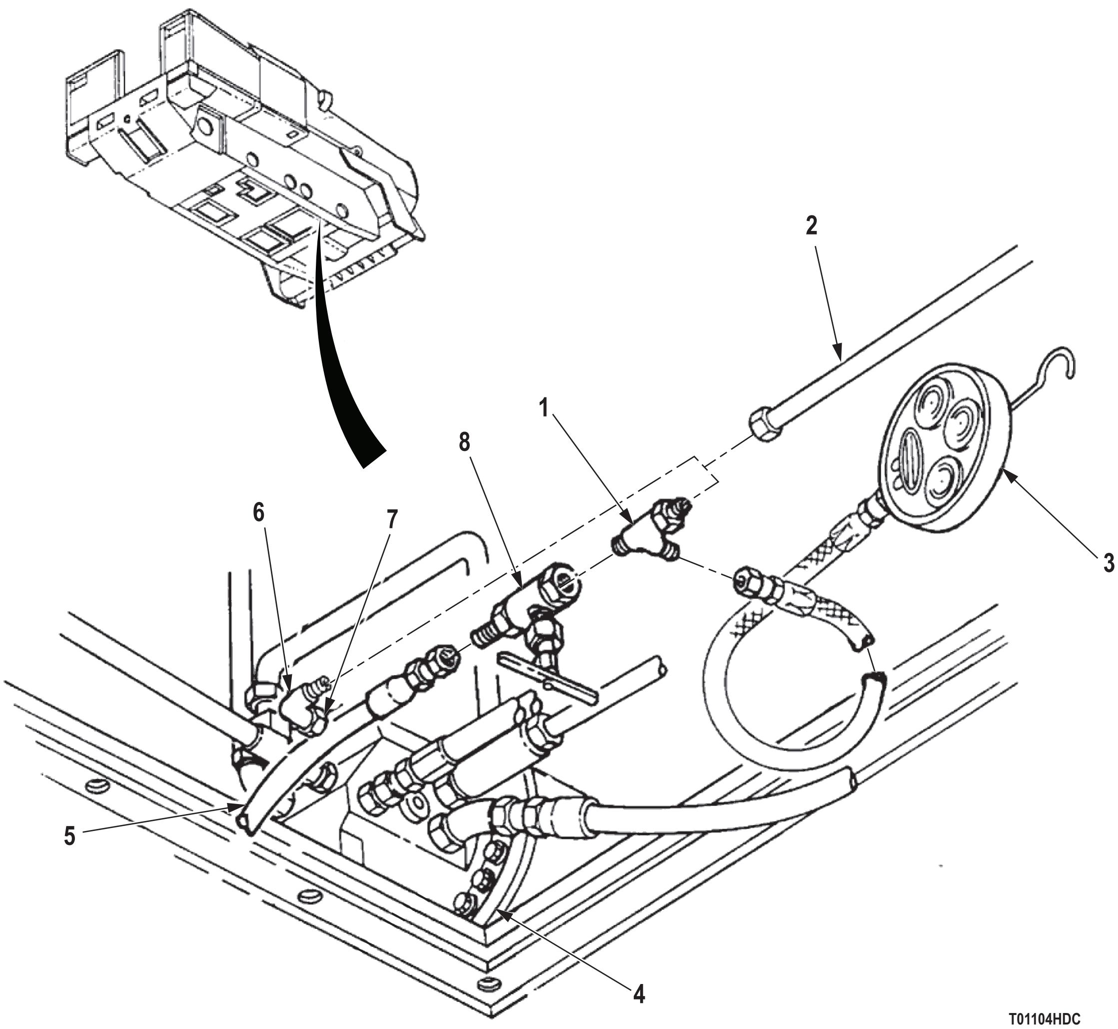



*Figure 2. No. 1 Right Actuator.*

**CONDITION/INDICATION**

Will front corner raise?

**DECISION**

YES - Go to Step (8).
NO - Go to Step (6).

## FRONT CORNER (LEFT OR RIGHT) RAISES IN UNSPRUNG, BUT NOT SPRUNG MODE - Continued

### STEP

6. Perform raise front corner test.

### NOTE

Have suitable container ready to catch oil.

a. Disconnect SPNSN UNIT-2 hose (Figure 3, Item 1) from port 2 (Figure 3, Item 2) on No. 1 actuator (Figure 3, Item 3).

b. Cap and plug port 2 (Figure 3, Item 2) and SPNSN UNIT-2 hose (Figure 3, Item 1).

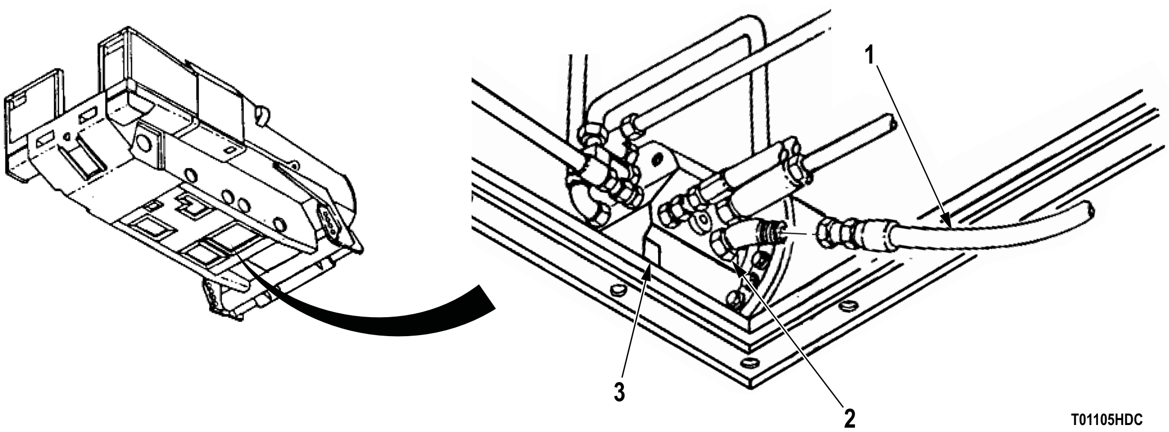



*Figure 3. No. 1 Right Actuator.*

c. Start engine. Move SPRUNG/UNSPRUNG lever to SPRUNG mode.

d. Stop engine; relieve hydraulic pressure and connect hoses.

### CONDITION/INDICATION

Does corner raise?

### DECISION

YES - Replace No. 2 actuator (TM 5-2350-262-20).
NO - Replace No. 1 actuator (TM 5-2350-262-20).

### STEP

7. Perform front actuator pressure test using HDC.

a. Reset all HDC solenoid valves by selecting RESET VALVES button (Figure 4, Item 5) on HDC control box.

b. For front left:

(1) Using LINE UP or LINE DOWN button (Figure 4, Item 3), select V3 on HDC display (Figure 4, Item 2).

(2) Close V3 on HDC display (Figure 4, Item 2) by selecting CHANGE POSITION button (Figure 4, Item 4) on HDC control box.

c. Have assistant start engine and move SPRUNG/UNSPRUNG lever to UNSPRUNG mode.

**FRONT CORNER (LEFT OR RIGHT) RAISES IN UNSPRUNG, BUT NOT SPRUNG MODE - Continued**

d. Read transducer T-10 hydraulic pressure on HDC display (Figure 4, Item 1).

e. Using LINE UP or LINE DOWN button (Figure 4, Item 3), select V3 on HDC display (Figure 4, Item 2).

f. Open V3 on HDC display (Figure 4, Item 2) by selecting CHANGE POSITION button (Figure 4, Item 4) on HDC control box.

g. For front right:

(1) Using LINE UP or LINE DOWN button (Figure 4, Item 3), select V2 on HDC display (Figure 4, Item 2).

(2) Close V2 on HDC display (Figure 4, Item 2) by selecting CHANGE POSITION button (Figure 4, Item 4) on HDC control box.

h. Have assistant keep SPRUNG/UNSPRUNG lever in UNSPRUNG mode.

i. Read transducer T-11 hydraulic pressure on HDC display (Figure 4, Item 1).

j. Using LINE UP or LINE DOWN button (Figure 4, Item 3), select V2 on HDC display (Figure 4, Item 2).

k. Open V2 on HDC display (Figure 4, Item 2) by selecting CHANGE POSITION button (Figure 4, Item 4) on HDC control box.

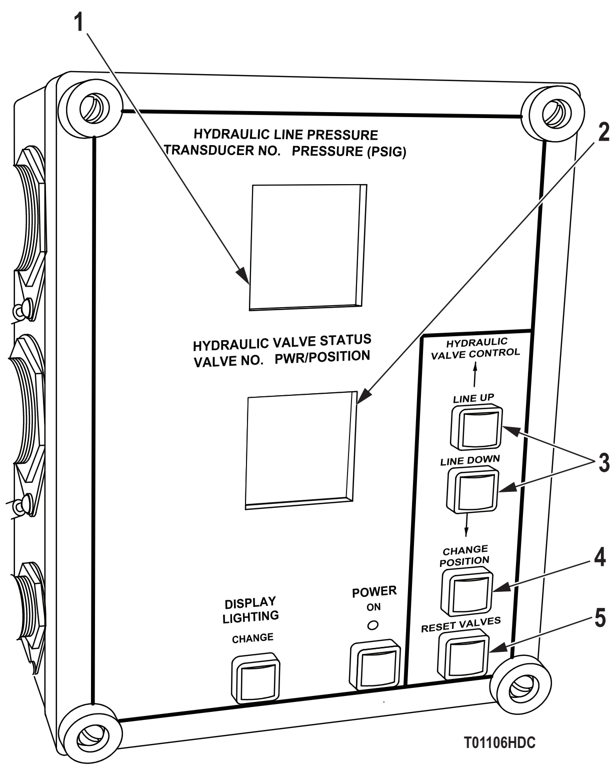



*Figure 4. Hydraulic Diagnostic Center (HDC) Control Box.*

l. Stop engine; relieve hydraulic pressure.

## FRONT CORNER (LEFT OR RIGHT) RAISES IN UNSPRUNG, BUT NOT SPRUNG MODE - Continued

### CONDITION/INDICATION

Is transducer T-10 (front left) and T-11 (front right) pressure greater than 2,500 psi (17,238 kPa)?

### DECISION

YES - Go to Step (9).
NO - Replace front actuator (TM 5-2350-262-20).

### STEP

8. Perform SPRUNG/UNSPRUNG control valve linkage check.
   a. Hold measuring device (Figure 5, Item 1) on face of SPRUNG/UNSPRUNG control valve (Figure 5, Item 2).
   b. Have assistant move SPRUNG/UNSPRUNG lever between SPRUNG and UNSPRUNG mode.
   c. Measure distance plunger (Figure 5, Item 3) travels as lever is moved.

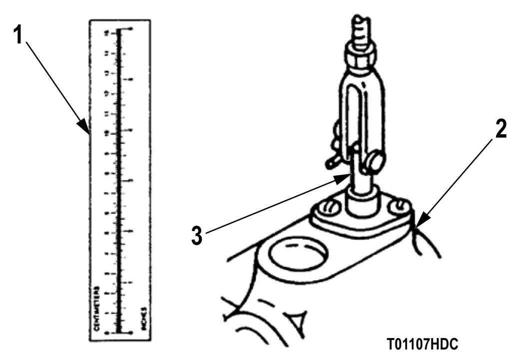



*Figure 5. SPRUNG/UNSPRUNG Control Valve Linkage.*

   d. Distance of travel should be 9/32 in. (7 mm).

### CONDITION/INDICATION

Is linkage correctly adjusted?

### DECISION

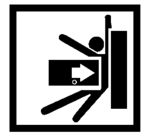
YES - Replace Directional Control Valve (DCV) bank (TM 5-2350-262-20).
NO - Go to Step (9).

### STEP

9. Perform SPRUNG/UNSPRUNG valve linkage adjustment.

**FRONT CORNER (LEFT OR RIGHT) RAISES IN UNSPRUNG, BUT NOT SPRUNG MODE - Continued**

## WARNING



Do not operate ejector when personnel are in bowl. Do not work in bowl unless ejector lock is engaged. Failure to comply may result in severe injury or death to personnel.

## NOTE

All valve control rods are adjusted basically the same way. This procedure covers SPRUNG/UNSPRUNG valve control rod.

a. Note position of control valve plunger (Figure 6, Item 1) when SPRUNG/UNSPRUNG control lever is in neutral (off) position.

## NOTE

Normal control valve plunger travel is 9/32 in. (7 mm).

b. Remove cotter pin (Figure 6, Item 2), straight pin (Figure 6, Item 5), and clevis (Figure 6, Item 6) from control valve plunger (Figure 6, Item 1).

c. Discard cotter pin (Figure 6, Item 2).

d. Loosen jam nut (Figure 6, Item 7).

e. Turn clevis (Figure 6, Item 6) clockwise to shorten rod (Figure 6, Item 3), counterclockwise to lengthen rod (Figure 6, Item 3).

f. Hold measuring device (Figure 6, Item 4) on face of SPRUNG/UNSPRUNG control valve.

g. Have assistant move SPRUNG/UNSPRUNG lever between SPRUNG and UNSPRUNG mode.

h. Measure distance of plunger travel.

i. Adjust clevis (Figure 6, Item 6) so plunger (Figure 6, Item 1) travel distance is correct (9/32 in. (7 mm)).

j. When proper adjustment has been made, coat threads of rod (Figure 6, Item 3) with sealing compound primer and sealing compound.

k. Tighten jam nut (Figure 6, Item 7) against clevis (Figure 6, Item 6).

l. Connect clevis (Figure 6, Item 6) to control valve plunger (Figure 6, Item 1) with straight pin (Figure , Item 5) and new cotter pin (Figure 6, Item 2).

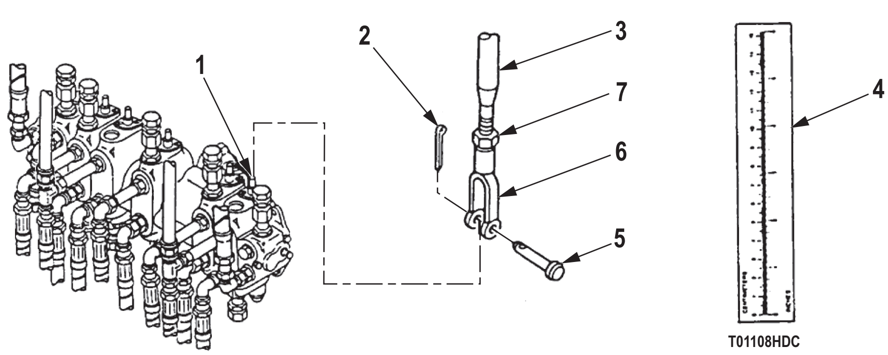



*Figure 6. SPRUNG/UNSPRUNG Valve Linkage.*

**FRONT CORNER (LEFT OR RIGHT) RAISES IN UNSPRUNG, BUT NOT SPRUNG MODE - Continued**

**CONDITION/INDICATION**

Is linkage correctly adjusted? Can it be adjusted?

**DECISION**

YES - Replace DCV bank (TM 5-2350-262-20).
NO - Repair or replace DCV linkage (TM 5-2350-262-20).

**STEP**

10. Perform forward manifold pressure test using HDC.

    a. Stop engine; relieve hydraulic pressure.

    b. Reset all HDC solenoid valves by selecting RESET VALVES button (Figure 7, Item 5) on HDC control box.

    c. For front left (left forward manifold): Using LINE UP or LINE DOWN button (Figure 7, Item 3), select V9 on HDC display (Figure 7, Item 2).

    d. Close V9 on HDC display (Figure 7, Item 2) by selecting CHANGE POSITION button (Figure 7, Item 4) on HDC control box.

    e. Have assistant start engine and move SPRUNG/UNSPRUNG control valve lever to SPRUNG mode.

    f. Read transducer T-7 hydraulic pressure on HDC display (Figure 7, Item 1).

    g. For front right (right forward manifold): Using LINE UP or LINE DOWN button (Figure 7, Item 3), select V10 on HDC display (Figure 7, Item 2).

    h. Close V10 on HDC display (Figure 7, Item 2), by selecting CHANGE POSITION button (Figure 7, Item 4) on HDC control box.

    i. With SPRUNG/UNSPRUNG control valve lever still in SPRUNG mode, read transducer T-8 hydraulic pressure on HDC display (Figure 7, Item 1).

    j. Stop engine; relieve hydraulic pressure.

    k. Reset all HDC solenoid valves by selecting RESET VALVES button (Figure 7, Item 5) on HDC control box.

**FRONT CORNER (LEFT OR RIGHT) RAISES IN UNSPRUNG, BUT NOT SPRUNG MODE - Continued**

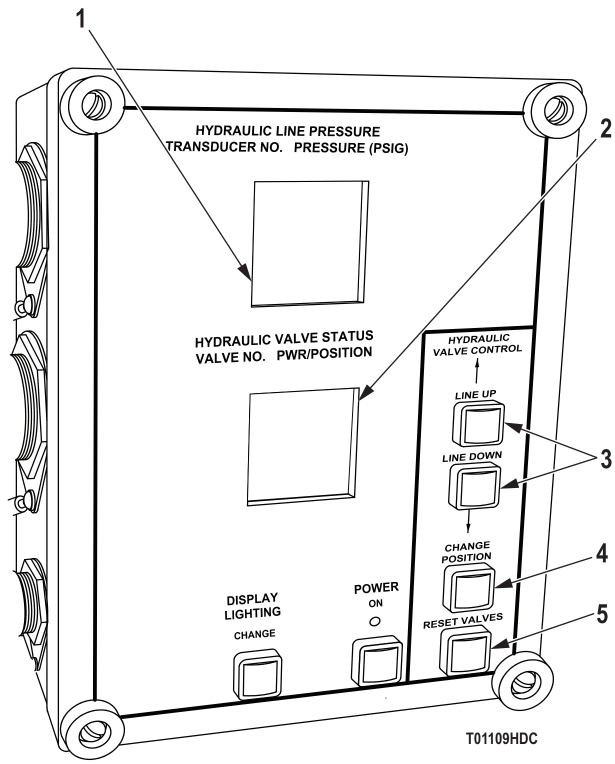



*Figure 7. Hydraulic Diagnostic Center (HDC) Control Box.*

**CONDITION/INDICATION**

Is transducer T-7 (left) and T-8 (right) hydraulic pressure greater than 2,500 psi (17,238 kPa)?

**DECISION**

YES - Go to Step (11).
NO - Go to Step (12).

**STEP**

11. Check for blockage between inlet port 9 of forward manifold and port 9 of No. 1 actuator, and between left main manifold and No. 1 actuator.

**CONDITION/INDICATION**

Is there blockage?

**DECISION**

YES - Clear blockage. Verify problem is solved.
NO - Verify problem with operator.

## FRONT CORNER (LEFT OR RIGHT) RAISES IN UNSPRUNG, BUT NOT SPRUNG MODE - Continued

### STEP

12. Check for blockage in line between forward manifold inlet port 9 and main manifold outlet port 9 (Figure 8).

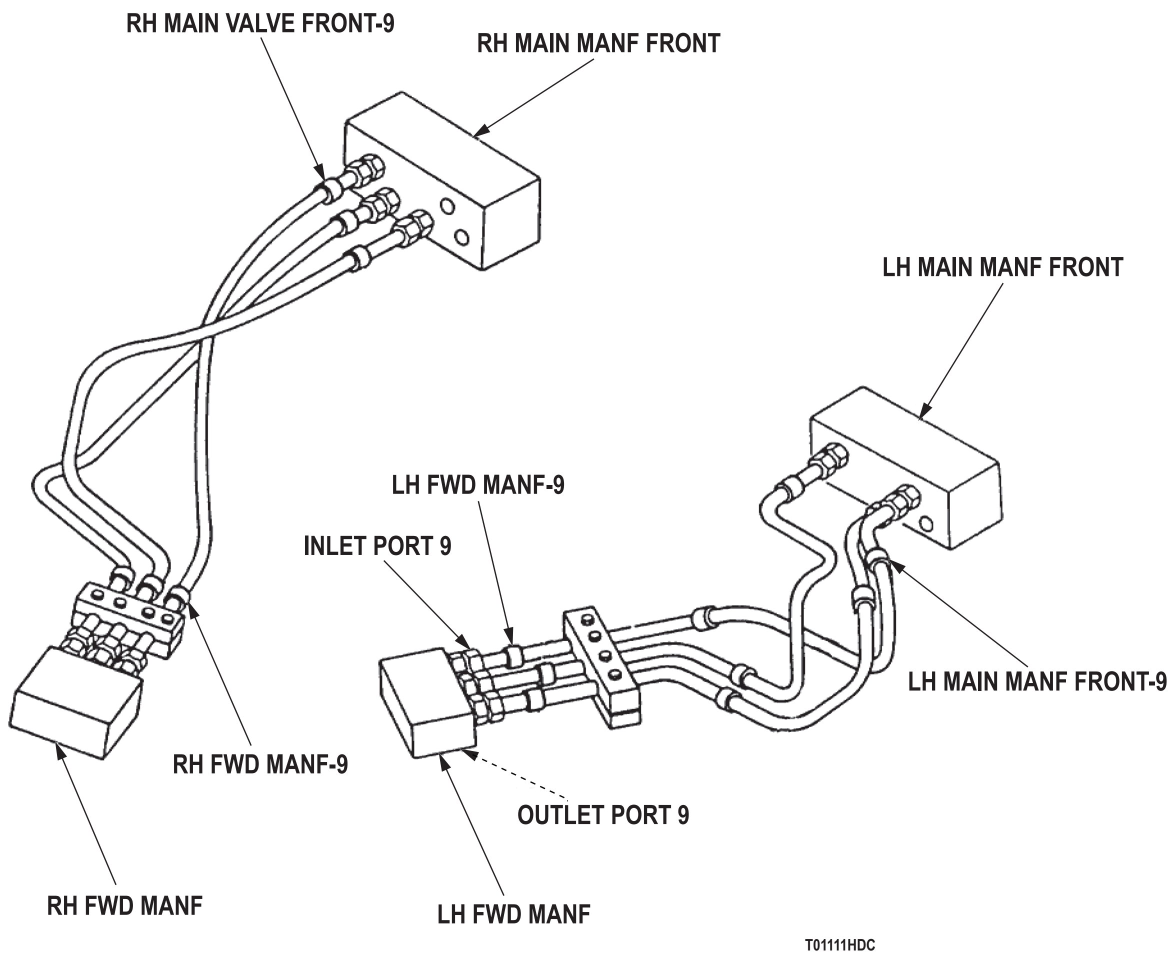



*Figure 8. Manifold Inlet/Outlet Port 9.*

### CONDITION/INDICATION

Is there blockage?

### DECISION

YES - Clear blockage or replace FWD MNF-9 tube between main forward manifold and LH or RH forward manifold. Verify problem is solved.
NO - Verify problem with operator.

### END OF WORK PACKAGE

## FIELD MAINTENANCE
## TROUBLESHOOTING PROCEDURES - FRONT CORNER (LEFT OR RIGHT) DOES NOT RAISE IN SPRUNG OR UNSPRUNG MODE

**INITIAL SETUP:**

**Tools and Special Tools**
Tool Kit, General Mechanic's: Automotive (WP 0054, Table 1, Item 7)
Parts Kit, Hydraulic (WP 0054, Table 1, Item 3)

**Equipment Condition**
Vehicle MASTER power OFF (TM 5-2350-262-10)
Vehicle on jack stands (TM 5-2350-262-20)

**Personnel Required**
Construction Equipment Repairer, 91L (Two)

### TROUBLESHOOTING PROCEDURE

### FRONT CORNER (LEFT OR RIGHT) DOES NOT RAISE IN SPRUNG OR UNSPRUNG MODE

**WARNING**

- High oil pressure is present in the M9 ACE hydraulic system. Do not disconnect any hydraulic system component unless hydraulic system pressure has been relieved. After hydraulic system has been relieved, wait at least four minutes before disconnecting any hose or fitting. Ensure each of the hydraulic control levers is moved several times through all positions and the hydraulic tank dipstick is slowly loosened to relieve pressure. Failure to comply may result in severe injury or death to personnel.
- Transmission shifting lines are pressurized. Do not disconnect lines, fittings, or accumulator unless transmission shift control valve pressure has been relieved. Discharge transmission shift accumulator by moving shift control lever through all forward and reverse ranges several times, with engine off. Failure to comply may result in severe injury to personnel.

**NOTE**

- In SPRUNG mode, hydraulic pressure is delivered to front actuator through line 9. In UNSPRUNG mode, hydraulic pressure to raise front corner of vehicle is delivered through line 3.
- Use these procedures to troubleshoot either left or right front of vehicle.

## FRONT CORNER (LEFT OR RIGHT) DOES NOT RAISE IN SPRUNG OR UNSPRUNG MODE - Continued

### STEP

1. Perform front actuator port 9 pressure test using the Hydraulic Diagnostic Center (HDC).
   a. Reset all HDC solenoid valves by selecting RESET VALVES button (Figure 1, Item 2) on HDC control box.
   b. Have assistant start engine and move SPRUNG/UNSPRUNG lever to SPRUNG mode.
   c. Read transducer T-8 (right) and T-9 (left) hydraulic pressure on HDC display (Figure 1, Item 1).

### CONDITION/INDICATION

Is transducer T-8 (right) and T-9 (left) hydraulic pressure greater than 2,500 psi (17,238 kPa)?

### DECISION

YES - Go to Step (3).
NO - Go to Step (2).

### STEP

2. Perform front actuator port 3 pressure test using HDC.
   a. Reset all HDC solenoid valves by selecting RESET VALVES button (Figure 1, Item 2) on HDC control box.
   b. Have assistant start engine and move SPRUNG/UNSPRUNG lever to UNSPRUNG mode and SUSPENSION CONTROL lever to RAISE.
   c. Read transducer T-5 (right) and T-6 (left) hydraulic pressure on HDC display (Figure 1, Item 1).

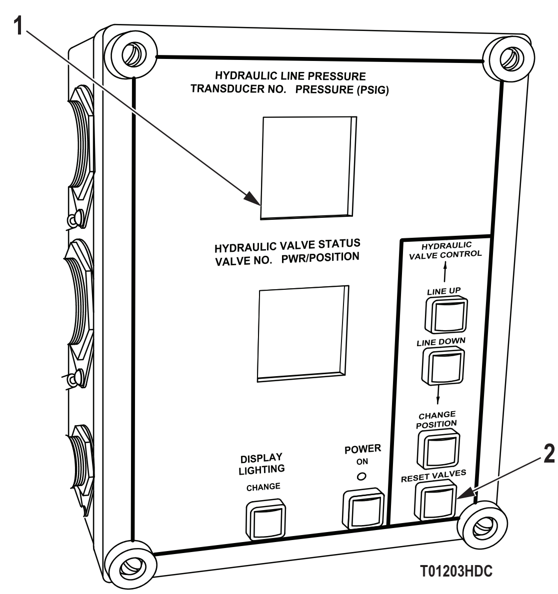



*Figure 1. Hydraulic Diagnostic Center (HDC) Control Box.*

   d. Stop engine; relieve hydraulic pressure.

**FRONT CORNER (LEFT OR RIGHT) DOES NOT RAISE IN SPRUNG OR UNSPRUNG MODE - Continued**

**CONDITION/INDICATION**

Is transducer T-5 (right) and T-6 (left) hydraulic pressure greater than 2,500 psi (17,238 kPa)?

**DECISION**

YES - Go to Step (3)
NO - Replace No. 1 actuator (TM 5-2350-262-20).

**STEP**

3. Determine if there is excessive internal leakage from No. 1 actuator by checking if front corner will raise in both SPRUNG and UNSPRUNG mode.

**NOTE**

Have suitable container ready to catch oil.

a. Disconnect NO 1 SPNSN UNIT-2 hose (Figure 2, Item 4) from elbow (Figure 2, Item 3) at port 2 (Figure 2, Item 2)on No. 1 actuator (Figure 2, Item 1).

b. Cap elbow (Figure 2, Item 3) and plug hose (Figure 2, Item 4).

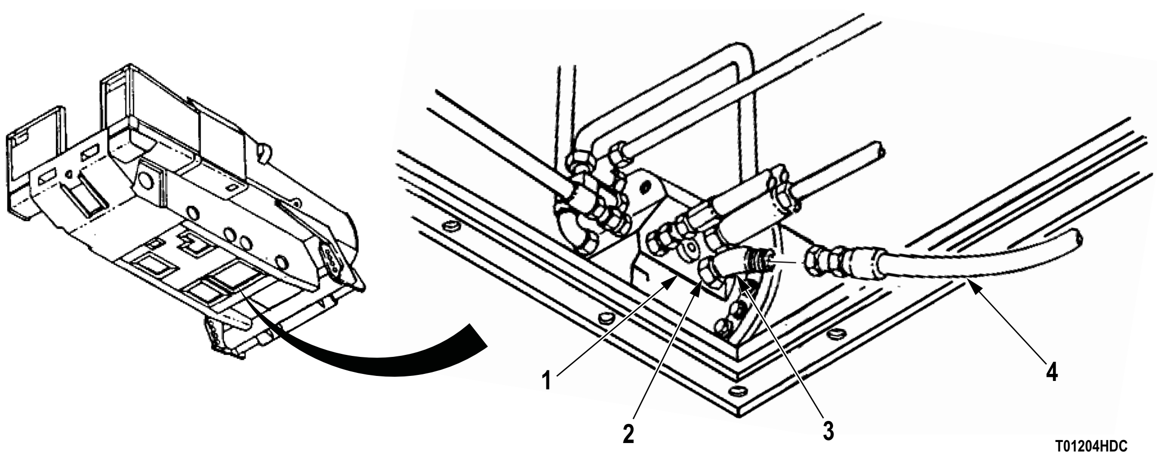



*Figure 2. No. 1 Right Actuator Depicted.*

c. Have assistant start engine and move SPRUNG/UNSPRUNG lever to SPRUNG. Observe that corner of vehicle does raise.

d. Have assistant move SPRUNG/UNSPRUNG lever to UNSPRUNG and SUSPENSION CONTROL lever to RAISE. Observe that corner of vehicle does raise.

e. Stop engine; relieve hydraulic pressure and connect lines.

## FRONT CORNER (LEFT OR RIGHT) DOES NOT RAISE IN SPRUNG OR UNSPRUNG MODE - Continued

### CONDITION/INDICATION

Does front corner raise in SPRUNG mode?

### DECISION

YES - Go to Step (4).
NO - Go to Step (5).

### STEP

4. Check if front corner raises in UNSPRUNG mode.

### CONDITION/INDICATION

Will front corner raise in UNSPRUNG mode?

### DECISION

YES - Go to Step (6).
NO - Verify with operator that problem is only confined to front corner.

### STEP

5. Check if front corner raises in UNSPRUNG mode.

### CONDITION/INDICATION

Does front corner raise in UNSPRUNG mode?

### DECISION

YES - Verify with operator that problem is only confined to front corner.
NO - Replace No. 1 actuator (TM 5-2350-262-20).

### STEP

6. Perform No. 2 actuator leakage check.

### NOTE

Have suitable container ready to catch oil.

a. Connect NO 1 SPNSN UNIT-2 hose (Figure 3, Item 3) to NO 1 SPNSN UNIT-3 hose (Figure 3, Item 2).

b. Start engine and move SUSPENSION CONTROL lever to RAISE. Excessive leakage is indicated if corner of vehicle fails to raise.

c. If front corner does raise, problem is most likely No. 1 actuator (Figure 3, Item 1).

## FRONT CORNER (LEFT OR RIGHT) DOES NOT RAISE IN SPRUNG OR UNSPRUNG MODE - Continued

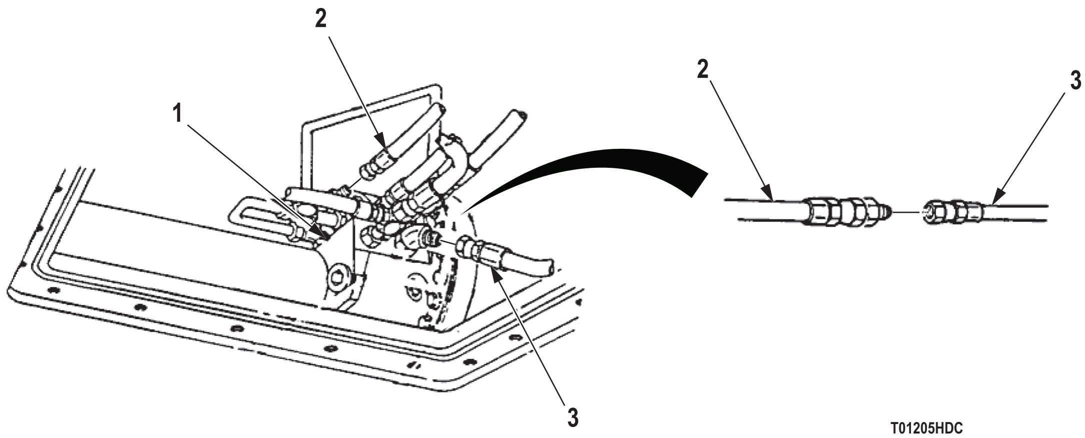



*Figure 3. No. 1 Right Actuator Depicted.*

d. Stop engine; relieve hydraulic pressure and connect lines.

### CONDITION/INDICATION

Does front corner raise?

### DECISION

YES - Verify problem with operator.
NO - Go to Step (7).

### STEP

7. Check for blockage in line between No. 1 and No. 2 actuators.

### CONDITION/INDICATION

Is there blockage?

### DECISION

YES - Clear blockage or replace line. Verify problem is solved.
NO - Replace No. 2 actuator (TM 5-2350-262-20).

### END OF WORK PACKAGE

## FIELD MAINTENANCE
## TROUBLESHOOTING PROCEDURES - HYDRAULIC OIL OVERHEATS

**INITIAL SETUP:**

**Tools and Special Tools**
- Tool Kit, General Mechanic's: Automotive (WP 0054, Table 1, Item 7)
- Parts Kit, Hydraulic (WP 0054, Table 1, Item 3)

**Materials/Parts**
- Suitable Container, Minimum Capacity 2 gal. (7.6 L)
- Suitable Support Block(s)

**Personnel Required**
- Construction Equipment Repairer, 91L (Two)

**References**
- WP 0035
- WP 0038

**Equipment Condition**
- Vehicle MASTER power OFF (TM 5-2350-262-10)
- Vehicle on jack stands (TM 5-2350-262-20)

### TROUBLESHOOTING PROCEDURE

### HYDRAULIC OIL OVERHEATS

**WARNING**

- High oil pressure is present in the M9 ACE hydraulic system. Do not disconnect any hydraulic system component unless hydraulic system pressure has been relieved. After hydraulic system has been relieved, wait at least four minutes before disconnecting any hose or fitting. Ensure each of the hydraulic control levers is moved several times through all positions and the hydraulic tank dipstick is slowly loosened to relieve pressure. Failure to comply may result in severe injury or death to personnel.
- Transmission shifting lines are pressurized. Do not disconnect lines, fittings, or accumulator unless transmission shift control valve pressure has been relieved. Discharge transmission shift accumulator by moving shift control lever through all forward and reverse ranges several times, with engine off. Failure to comply may result in severe injury to personnel.

## HYDRAULIC OIL OVERHEATS - Continued

### STEP

1. Perform Hydraulic Diagnostic Center (HDC) manual valve status check. Ensure that manually-operated HDC valves V21, V22, and V23 are open.

    a. Check status of manually-operated valves V21 (Figure 1, Item 1), V22 (Figure 1, Item 2), and V23 (Figure 1, Item 3).

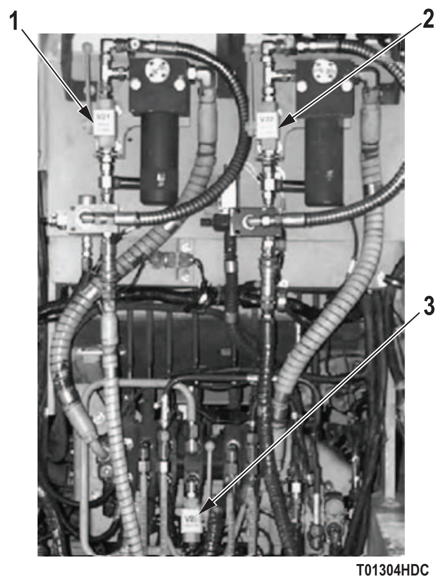



*Figure 1. Directional Control Valve (DCV) Bank.*

    b. Ensure these manually-operated valves are completely open.

### CONDITION/INDICATION

Are all manual valves open?

### DECISION

YES - Go to Step (2).
NO - Open valves.

### STEP

2. Perform HDC solenoid valve V19 test.

    a. Reset all HDC solenoid valves by selecting RESET VALVES button (Figure 2, Item 5) on HDC control box.

    b. Start engine and have assistant move SPRUNG/UNSPRUNG lever to SPRUNG mode.

    c. Using LINE UP or LINE DOWN button (Figure 2, Item 3), select V5 on HDC display (Figure 2, Item 2).

    d. Close V5 on HDC display (Figure 2, Item 2) by selecting CHANGE POSITION button (Figure 2, Item 4) on HDC control box.

    e. Have assistant move SPRUNG/UNSPRUNG lever to UNSPRUNG mode.

    f. Read transducer T-1 hydraulic pressure on HDC display (Figure 2, Item 1).

## HYDRAULIC OIL OVERHEATS - Continued

g. Using LINE UP or LINE DOWN button (Figure 2, Item 3), select V5 on HDC display (Figure 2, Item 2).

h. Open V5 on HDC display (Figure 2, Item 2) by selecting CHANGE POSITION button (Figure 2, Item 4) on HDC control box.

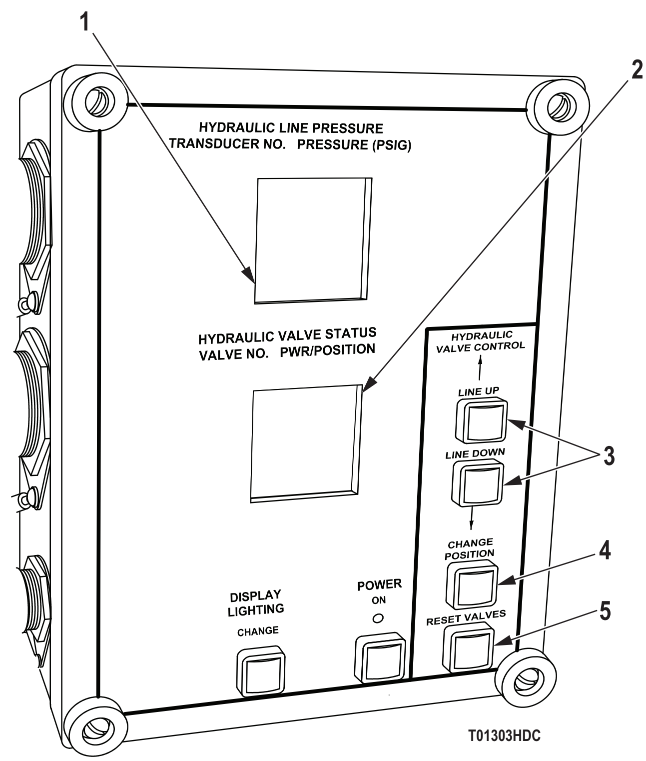



*Figure 2. Hydraulic Diagnostic Center (HDC) Control Box.*

i. Stop engine; relieve hydraulic pressure.

## CONDITION/INDICATION

Is transducer T-1 hydraulic pressure greater than 1,000 psi (6,894.757 kPa)?

## DECISION

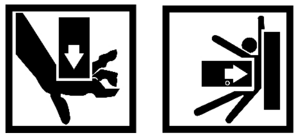
YES - Replace solenoid valve V19 on HDC primary manifold (WP 0035).
NO - Go to Step (3).

**HYDRAULIC OIL OVERHEATS - Continued**

**STEP**

3. Perform overheated hoses check.

## WARNING



- Before performing any hydraulic troubleshooting in the bowl, move the ejector forward and engage the ejector lock. Failure to comply may result in severe injury to personnel.
- Do not operate ejector when personnel are in bowl. Do not work in bowl unless ejector lock is engaged. Failure to comply may result in severe injury or death to personnel.
- Do not stand or work in bowl area unless ejector lock is engaged. Do not stand in bowl to observe roller guide travels. Failure to comply may result in severe injury or death to personnel.
- When folding dozer blade, work on blade latches from side of vehicle only. Do not stand in front of dozer blade while retracting ejector. Failure to comply may result in severe injury to personnel.

## NOTE

Begin this procedure with engine cold.

a. Start engine and allow engine to run for about five minutes before testing for overheating.

b. As engine warms, carefully feel CONT VLV-19 (Figure 3, Item 2), CONT VLV-20 (Figure 3, Item 5), SPNSN PUMP DRAIN-7V hose (Figure 3, Item 1), relief VLV-7 tube (Figure 3, Item 6), CONT VLV-21 hose (Figure 3, Item 4), and CON VLV-22 hose (Figure 3, Item 3) with an ungloved hand.

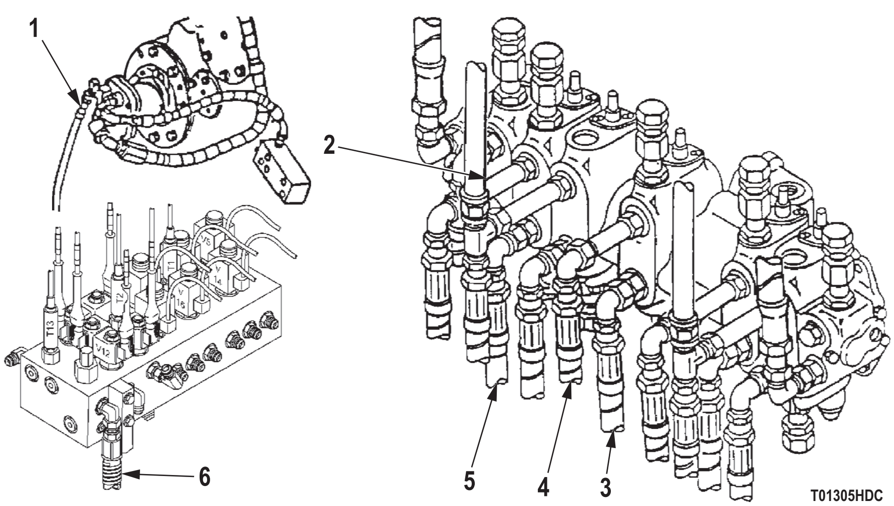



*Figure 3. Manifold Hoses.*

c. Hoses should feel warm but not hot.

**HYDRAULIC OIL OVERHEATS - Continued**

d. Cycle apron and ejector control levers for total oil flow through systems.

e. Operate vehicle for 1/2 hour.

f. Stop and repeat previous two steps every 10 minutes to check if an overheated hose or tube can be detected.

g. Stop engine; relieve hydraulic pressure.

**CONDITION/INDICATION**

Are hoses overheated?

**DECISION**

YES - Go to Step (4).
NO - Troubleshoot temperature indicator and transmitter.

**STEP**

4. Check if SPNSN PUMP DRAIN 7V hose is over heated.

**CONDITION/INDICATION**

Is SPNSN PUMP DRAIN 7V hose overheated?

**DECISION**

YES - Go to Step (10).
NO - Go to Step (5).

**STEP**

5. Check if RELIEF VLV-7 tube is overheated.

**CONDITION/INDICATION**

Is RELIEF VLV-7 tube overheated?

**DECISION**

YES - Go to Step (11).
NO - Go to Step (6).

**STEP**

6. Check if CONT VLV-21 or CONT VLV-22 hose is overheated.

**CONDITION/INDICATION**

Is CONT VLV-21 or CONT VLV-22 hose overheated?

**DECISION**

YES - Go to Step (13).
NO - Go to Step (7).

## HYDRAULIC OIL OVERHEATS - Continued

**STEP**

7. Check if control valve hose 19 or 20 is overheated.

**CONDITION/INDICATION**

Is control valve hose 19 OR 20 overheated?

**DECISION**

YES - Go to Step (13).
NO - Go to Step (8).

**STEP**

8. Check if circuits 9 or 2 hoses at right or left No. 1 or No. 4 actuators are overheated.
    a. Start engine and allow to run for 5 minutes before testing for overheating.
    b. Feel circuit No. 2 line between HDC system aft manifold and No. 4 left actuator, and circuit No. 2 line between aft manifold and No. 3 left actuator.
    c. Stop engine; relieve hydraulic pressure.

**CONDITION/INDICATION**

Are circuits 9 OR 2 hoses at right or left No. 1 or No. 4 actuators overheated?

**DECISION**

YES - Go to Step (26).
NO - Go to Step (9).

**STEP**

9. Perform solenoid valve V18 check.
    a. Start engine and allow to run 5 minutes before testing for overheating.
    b. Feel circuit No. 2 line between HDC system aft manifold and No. 4 left actuator, and circuit No. 2 line between aft manifold and No. 3 left actuator.
    c. Stop engine, relieve hydraulic pressure.

**CONDITION/INDICATION**

Is line to NO. 4 actuator noticeably hotter than line to NO. 3 actuator?

**DECISION**

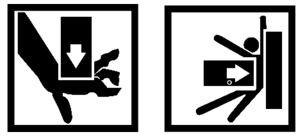
YES - Replace solenoid valve V18 on HDC aft manifold (WP 0038).
NO - Verify problem with operator.

**STEP**

10. Perform case drain leakage test to check for excessive internal leakage from compensating pump.

## HYDRAULIC OIL OVERHEATS - Continued

### WARNING



Before performing any troubleshooting in bowl, move ejector forward and engage ejector lock. Failure to comply may result in severe injury or death to personnel.

### NOTE

- Have a graduated container of at least two quart (1.9 liter) capacity available to catch hydraulic oil while test is being performed.
- Have suitable container ready to catch oil.

a. Start engine, move ejector forward.

b. Stop engine, engage ejector lock, and relieve hydraulic pressure.

c. Disconnect SPNSN PUMP-9 hose (Figure 4, Item 3) and elbow (Figure 4, Item 4) on compensating pump (Figure 4, Item 2).

d. Cap elbow (Figure 4, Item 4) and plug hose (Figure 4, Item 3).

e. Disconnect SPNSN PUMP DRAIN-7V hose (Figure 4, Item 5) from elbow (Figure 4, Item 1). Plug hose (Figure 4, Item 5).

f. Connect drain hose (Figure 4, Item 6) to elbow (Figure 4, Item 1).

g. Hold end of drain hose (Figure 4, Item 6) in graduated container.

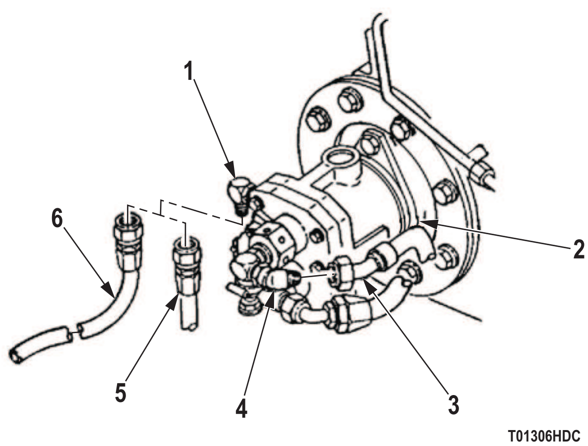



*Figure 4. Compensating Pump.*

h. Have assistant start engine and run at 1,800 rpm for 15 seconds.

i. Observe quantity of hydraulic oil in container.

j. More than 1.25 qts (1.2 L) indicates excessive leakage.

k. Stop engine; relieve hydraulic pressure, remove all test equipment, and connect hoses.

## HYDRAULIC OIL OVERHEATS - Continued

### CONDITION/INDICATION

Is internal leakage more than 1.25 QTS (1.2 L) for 15 seconds?

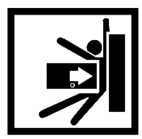
### DECISION

YES - Replace compensating pump (TM 5-2350-262-20).
NO - Go to Step (11).

### STEP

11. Perform pressure test on suspension relief valve using HDC.

**WARNING**



- Do not operate ejector when personnel are in bowl. Do not work in bowl unless ejector lock is engaged. Failure to comply may result in severe injury or death to personnel.
- Do not stand or work in bowl area unless ejector lock is engaged. Do not stand in bowl to observe roller guide travels. Failure to comply may result in severe injury or death to personnel.

a. Start engine, move ejector forward, engage ejector lock.

b. Stop engine and relieve hydraulic pressure.

c. Reset all HDC solenoid valves by selecting RESET VALVES button (Figure 5, Item 4) on HDC control box.

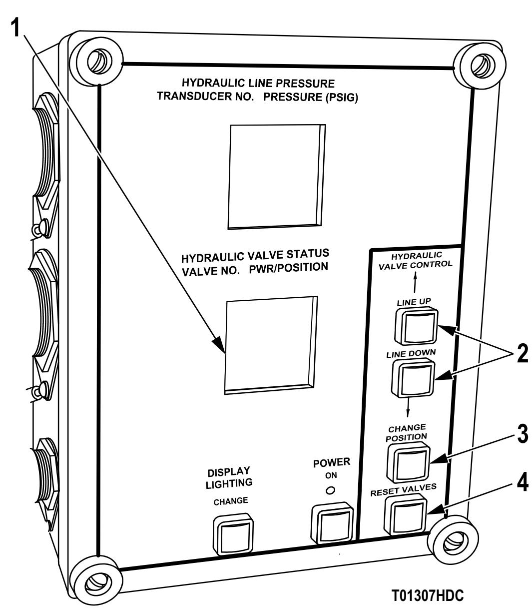



*Figure 5. Hydraulic Diagnostic Center (HDC) Control Box.*

## HYDRAULIC OIL OVERHEATS - Continued

d. Manually close ejector inhibit ball valve V23 (Figure 6, Item 1) on DCV bank.

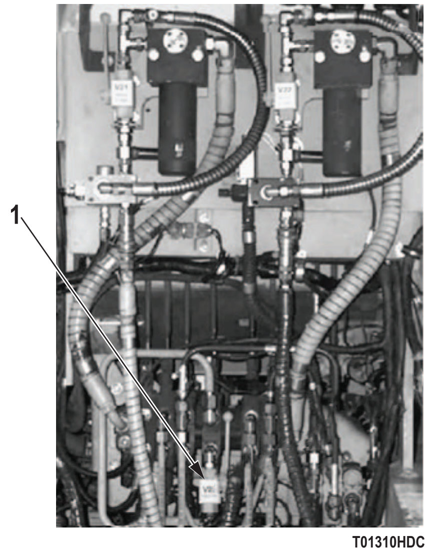



*Figure 6. Directional Control Valve (DCV) Bank.*

e. Using LINE UP or LINE DOWN button (Figure 5, Item 2) on HDC control box, select V5 on HDC display (Figure 5, Item 1).

f. Using CHANGE POSITION button (Figure 5, Item 3), close V5 on HDC display (Figure 5, Item 1).

g. Repeat step for V12, V13, and V19; closing V12 and V13, and opening V19.

h. Have assistant start engine and move SPRUNG/UNSPRUNG lever to UNSPRUNG and right SUSPENSION CONTROL lever to LOWER.

i. Read transducer T-13 pressure on HDC display (Figure 5, Item 1).

j. Stop engine; relieve hydraulic pressure.

k. Using LINE UP or LINE DOWN button (Figure 5, Item 2) on HDC control box, select V5 on HDC display (Figure 5, Item 1).

l. Using CHANGE POSITION button (Figure 5, Item 3), open V5 on HDC display (Figure 7, Item 1).

m. Repeat step for V12, V13 and V19, opening V12 and V13, and closing V19.

n. Manually open ejector inhibit ball valve V23 (Figure 6, Item 1) on DCV bank.

## CONDITION/INDICATION

Is transducer T-13 hydraulic pressure 3,700-3,800 psi (25,512-26,201 kPa)?

## DECISION

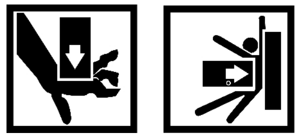
YES - Go to Step (13).
NO - Go to Step (12).

## HYDRAULIC OIL OVERHEATS - Continued

**STEP**

12. Perform suspension relief valve adjustment using HDC.

**WARNING**



- Before performing any hydraulic troubleshooting in the bowl, move the ejector forward and engage the ejector lock. Failure to comply may result in severe injury to personnel.
- Do not operate ejector when personnel are in bowl. Do not work in bowl unless ejector lock is engaged. Failure to comply may result in severe injury or death to personnel.
- Do not stand or work in bowl area unless ejector lock is engaged. Do not stand in bowl to observe roller guide travels. Failure to comply may result in severe injury or death to personnel.
- When folding dozer blade, work on blade latches from side of vehicle only. Do not stand in front of dozer blade while retracting ejector. Failure to comply may result in severe injury to personnel.

a. Reset all HDC solenoid valves by selecting RESET VALVES button (Figure 7, Item 5) on HDC control box.

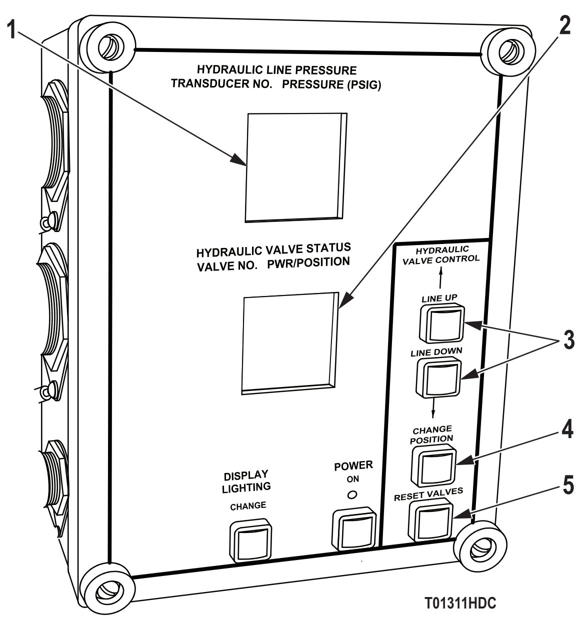



*Figure 7. Hydraulic Diagnostic Center (HDC) Control Box.*

b. Manually close ejector inhibit ball valve V23 (Figure 8, Item 1) on DCV bank.

**HYDRAULIC OIL OVERHEATS - Continued**

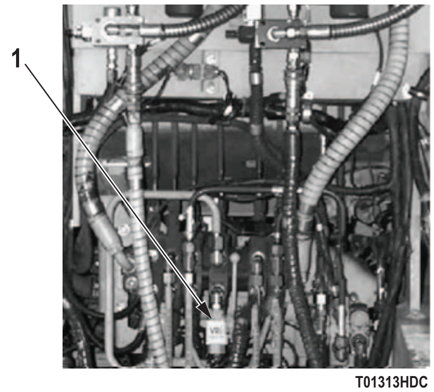



*Figure 8. Directional Control Valve (DCV) Bank.*

c. Using LINE UP or LINE DOWN button (Figure 7, Item 3) on HDC control box, select V5 on HDC display (Figure 7, Item 2).

d. Using CHANGE POSITION button (Figure 7, Item 4), close V5 on HDC display (Figure 7, Item 2).

e. Repeat steps for V12, V13 and V19, closing V12 and V13, and opening V19.

f. Start engine.

g. Adjust pressure as follows: remove cap (Figure 9, Item 3) from suspension relief valve adjustment shaft (Figure 9, Item 2) and loosen jam nut (Figure 9, Item 1).

h. Turn adjusting shaft (Figure 9, Item 2) clockwise to increase pressure; counterclockwise to decrease pressure.

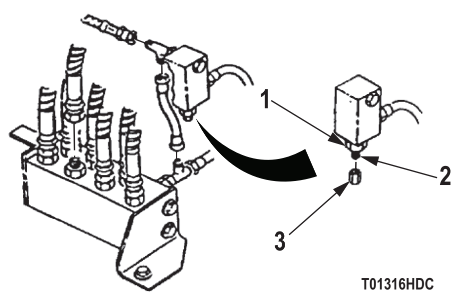



*Figure 9. Suspension Relief Valve.*

i. Read transducer T-13 hydraulic pressure on HDC display (Figure 7, Item 1).

j. Turn adjusting shaft (Figure 9, Item 2) to obtain proper pressure indication on transducer T-13 (Figure 7, Item 1) on HDC control box.

k. Tighten jam nut (Figure 9, Item 1) and replace cap (Figure 9, Item 3).

l. Stop engine; relieve hydraulic pressure.

m. Using LINE UP or LINE DOWN button (Figure 7, Item 3) on HDC control box, select V5 on HDC display (Figure 7, Item 2).

n. Manually open ejector inhibit ball valve V23 (Figure 8, Item 1) on DCV bank.

## HYDRAULIC OIL OVERHEATS - Continued

o. Using CHANGE POSITION button (Figure 10, Item 4), open V5 on HDC display (Figure 10, Item 2).

p. Repeat step for V12, V13 and V19; opening V12 and V13, and closing V19.

q. Stop engine; relieve hydraulic pressure.

### CONDITION/INDICATION

Is transducer T-13 hydraulic pressure 3,700-3,800 psi (25,512-26,201 kPa)?

### DECISION

YES - Verify problem is solved.
NO - Replace suspension relief valve (TM 5-2350-262-20).

### STEP

13. Perform main hydraulic pump pressure test using HDC.

**WARNING**

- Before performing any troubleshooting in bowl, move ejector forward and engage ejector lock. Failure to comply may result in severe injury or death to personnel.
- Ensure right main hydraulic pressure inhibit valve V21 is fully opened prior to starting vehicle. A fully or partially closed valve will cause immediate high pressure. Failure to comply may result in damage to equipment and injury to personnel.

a. Reset all HDC solenoid valves by selecting RESET VALVES button (Figure 10, Item 5) on HDC control box.

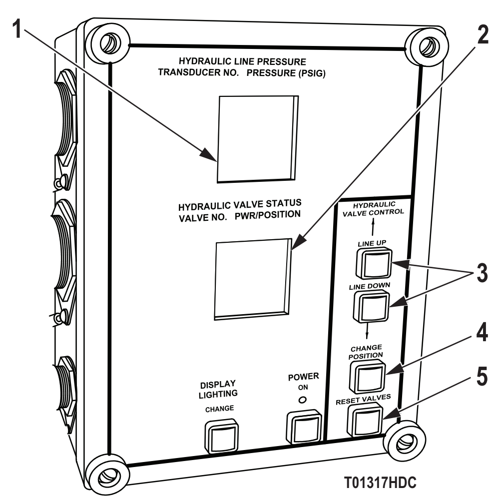
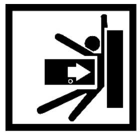



*Figure 10. Hydraulic Diagnostic Center (HDC) Control Box.*

**HYDRAULIC OIL OVERHEATS - Continued**

## WARNING



- Do not operate ejector when personnel are in bowl. Do not work in bowl unless ejector lock is engaged. Failure to comply may result in severe injury or death to personnel.
- Do not stand or work in bowl area unless ejector lock is engaged. Do not stand in bowl to observe roller guide travels. Failure to comply may result in severe injury or death to personnel.

b. Stop engine; relieve hydraulic pressure.

c. Ensure right main hydraulic pressure inhibit valve V21 (Figure 11, Item 1) is fully opened.

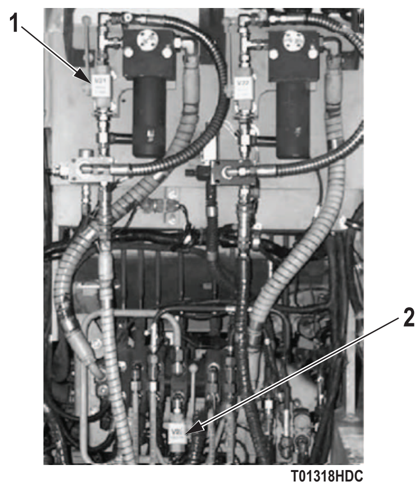



*Figure 11. Directional Control Valve (DCV) Bank.*

d. Disable ejector by manually closing ejector inhibit ball valve V23 (Figure 11, Item 2) on DCV bank.

e. Using LINE UP or LINE DOWN button (Figure 10, Item 3), select V1 on HDC display (Figure 10, Item 2).

f. Close V1 on HDC display (Figure 10, Item 2) by selecting CHANGE POSITION button (Figure 10, Item 4) on HDC control box.

g. Have assistant start engine and allow engine to idle (750-800 rpm).

h. Slowly close right main hydraulic pressure inhibit valve V21 (Figure 11, Item 1), until transducer T-3 hydraulic pressure on HDC display (Figure 10, Item 1) indicates 3,950-4,050 psi (27,235-27,925 kPa).

i. Open right main hydraulic pressure inhibit valve V21 (Figure 11, Item 1) fully.

j. Stop engine; relieve hydraulic pressure.

k. Open ejector inhibit ball valve V23 (Figure 11, Item 2) on DCV bank.

l. Using LINE UP or LINE DOWN button (Figure 10, Item 3), select V1 on HDC display (Figure 10, Item 2).

m. Open V1 (Figure 10, Item 2) on HDC display by selecting CHANGE POSITION button (Figure 10, Item 4) on HDC control box.

## HYDRAULIC OIL OVERHEATS - Continued

### CONDITION/INDICATION

Does main hydraulic pump develop 3,950-4,050 psi (27,235-27,925 kPa)?

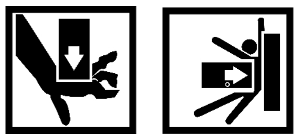
### DECISION

YES - Go to Step (14).
NO - Stop engine; relieve hydraulic pressure. Replace main hydraulic pump (TM 5-2350-262-20).

### STEP

14. Perform main relief valve test using HDC.

**WARNING**



Before performing any hydraulic troubleshooting in the bowl, move ejector forward and disable it by disconnecting ejector cylinder from hydraulic system. Failure to comply may result in severe injury or death to personnel.

a. Reset all HDC solenoid valves by selecting RESET VALVES button (Figure 12, Item 5) on HDC control box.

b. Start engine, move ejector forward.

c. Using LINE UP or LINE DOWN button (Figure 12, Item 3), select V1 on HDC display (Figure 12, Item 2). Close V1 on HDC display (Figure 12, Item 2) by selecting CHANGE POSITION button (Figure 12, Item 4) on HDC control box.

d. Have assistant hold EJECTOR CONTROL lever in BACK. Read transducer T-3 (13R) and T-4 (13L) pressure valves individually on HDC display (Figure 12, Item 1). Check main relief valves 13R and 13L as follows:

e. For 13R; With SPRUNG/UNSPRUNG lever in SPRUNG position, have assistant move right-hand SUSPENSION CONTROL lever to RAISE, while at the same time holding the EJECTOR CONTROL lever in BACK. Read transducer T-3 hydraulic pressure on HDC display (Figure 12, Item 1). If pressure is not within limits, adjust main relief valve 13R.

f. For 13L; Repeat steps for main relief valve 13L (pressure transducer T-4) moving left-hand SUSPENSION CONTROL lever to RAISE while at same time holding EJECTOR CONTROL lever in BACK.

g. Read transducer T-4 hydraulic pressure on HDC display (Figure 12, Item 1).

h. Using LINE UP or LINE DOWN button (Figure 12, Item 3), select V1 on HDC display (Figure 12, Item 2). Close V1 on HDC display (Figure 12, Item 2) by selecting CHANGE POSITION button (Figure 12, Item 4) on HDC control box.

## HYDRAULIC OIL OVERHEATS - Continued

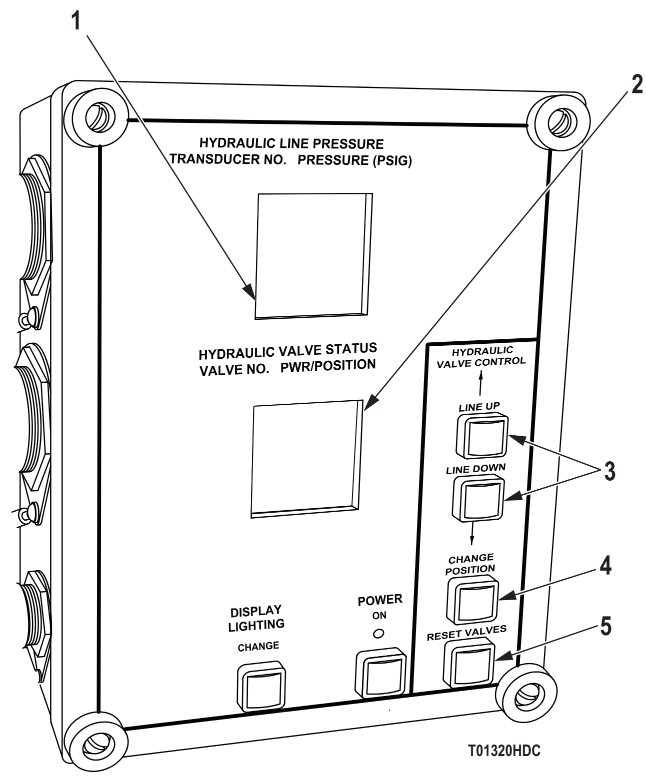



*Figure 12. Hydraulic Diagnostic Center (HDC) Control Box.*

i. Stop engine; relieve hydraulic pressure.

### CONDITION/INDICATION

Is transducer T-3 AND T-4 hydraulic pressure 3,950-4,050 psi (27,235-27,925 kPa)?

### DECISION

YES - Go to Step (16).
NO - Go to Step (15).

**HYDRAULIC OIL OVERHEATS - Continued**

**STEP**

15. Perform main relief valve adjustment using HDC.

    a. Reset all HDC solenoid valves by selecting RESET VALVES button (Figure 13, Item 4) on HDC control box.

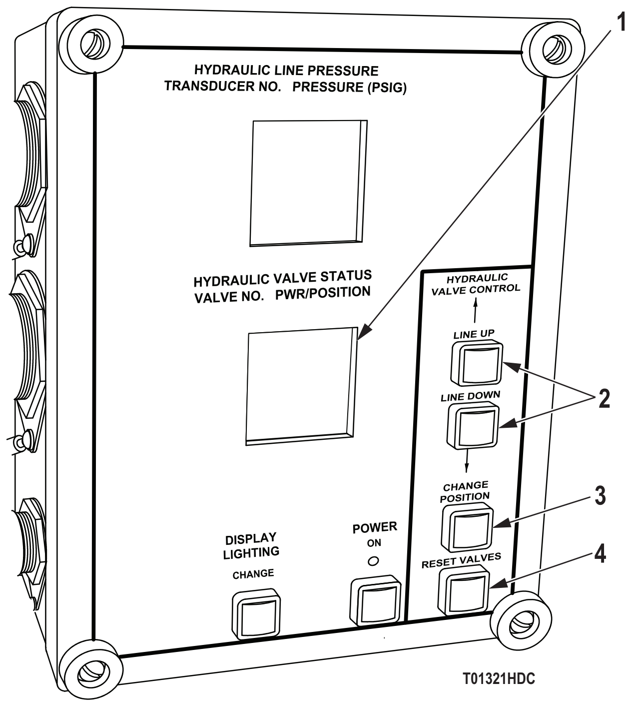
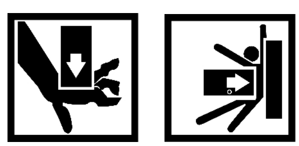



*Figure 13. Hydraulic Diagnostic Center (HDC) Control Box.*

**WARNING**



- Before performing any hydraulic troubleshooting in the bowl, move the ejector forward and engage the ejector lock. Failure to comply may result in severe injury to personnel.
- Do not operate ejector when personnel are in bowl. Do not work in bowl unless ejector lock is engaged. Failure to comply may result in severe injury or death to personnel.
- Do not stand or work in bowl area unless ejector lock is engaged. Do not stand in bowl to observe roller guide travels. Failure to comply may result in severe injury or death to personnel.
- When folding dozer blade, work on blade latches from side of vehicle only. Do not stand in front of dozer blade while retracting ejector. Failure to comply may result in severe injury to personnel.

**HYDRAULIC OIL OVERHEATS - Continued**

b. Disable ejector; manually close V23 (Figure 14, Item 1) on DCV bank.

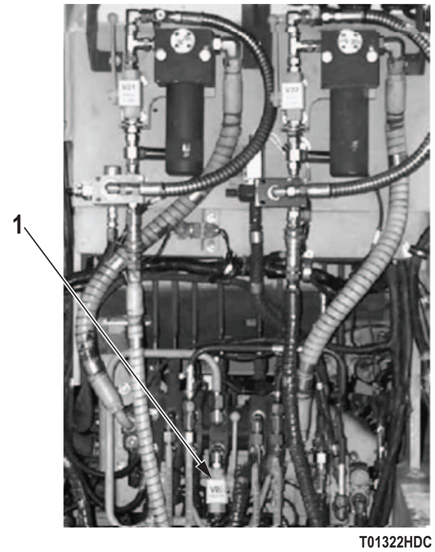



*Figure 14. Directional Control Valve (DCV) Bank.*

c. Using LINE UP or LINE DOWN button (Figure 13, Item 2), select V1 on HDC display (Figure 13, Item 1).

d. Close V1 on HDC display (Figure 13, Item 1) by selecting CHANGE POSITION button (Figure 13, Item 3) on HDC control box.

**HYDRAULIC OIL OVERHEATS - Continued**

e. Loosen jam nut (Figure 15, Item 6) on main relief valve 13R (Figure 15, Item 1).

f. For 13R (Figure 15, Item 1); have assistant simultaneously hold EJECTOR CONTROL lever in BACK while holding right-hand SUSPENSION CONTROL lever in RAISE.

g. Rotate adjusting screw (Figure 15, Item 5) on main relief valve 13R (Figure 15, Item 1) clockwise to increase pressure or counterclockwise to decrease pressure.

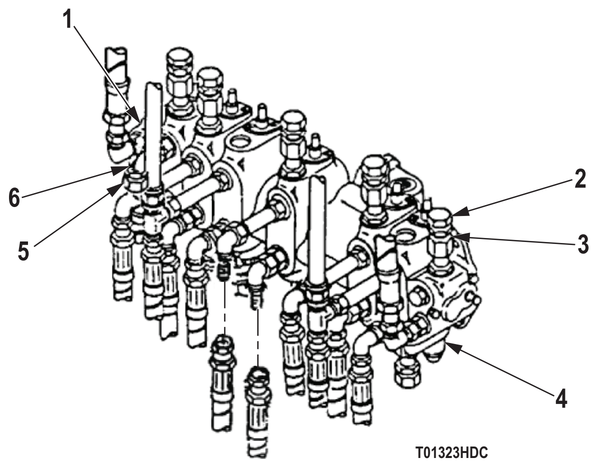



*Figure 15. Main Pump Relief Valves.*

h. Once indication from transducer T-3 on HDC display (Figure 16, Item 1) hydraulic pressure is within desired limits, tighten jam nut (Figure 15, Item 6).

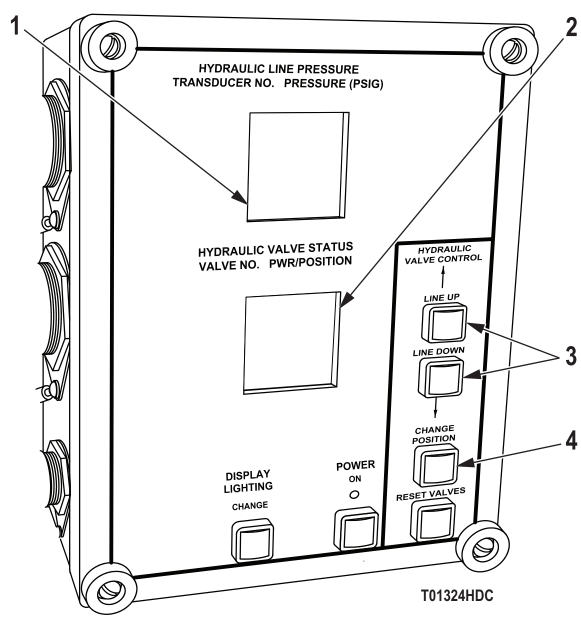



*Figure 16. HDC Control Valve.*

i. For 13L (Figure 15, Item 4); repeat previous steps for main relief valve 13L (Figure 15, Item 4) using left-hand SUSPENSION CONTROL lever.

## HYDRAULIC OIL OVERHEATS - Continued

j. Reference main relief valve 13L (Figure 15, Item 4) jam nut (Figure 15, item 3), adjusting screw (Figure 15, Item 2), and pressure transducer T-4 (Figure 16, Item 1) on HDC display, when adjusting 13L main relief valve (Figure 15, Item 4).

k. Stop engine; relieve hydraulic pressure.

l. Enable ejector; manually open V23 (Figure 17, Item 1) on DCV bank.

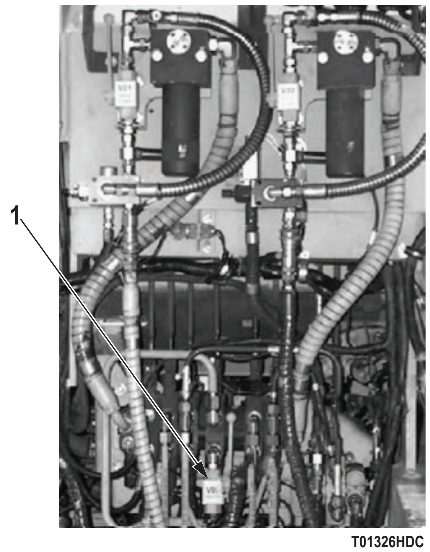



*Figure 17. Directional Control Valve (DCV) Bank.*

m. Using LINE UP or LINE DOWN button (Figure 16, Item 3) select V1 on HDC display (Figure 16, Item 2).

n. Open V1 on HDC display (Figure 16, Item 2) by selecting CHANGE POSITION button (Figure 16, Item 4) on HDC control box.

## CONDITION/INDICATION

Is transducer T-3 hydraulic pressure 3,950-4,050 psi (27,235-27,925 kPa)?

## DECISION

YES - Stop engine, relieve hydraulic pressure. Verify problem is solved.
NO - Stop engine, relieve hydraulic pressure. Replace Directional Control Valve (DCV) bank (TM 5-2350-262-20).

**HYDRAULIC OIL OVERHEATS - Continued**

**STEP**

16. Perform suspension raise/lower relief valve test using HDC.

    a. Reset all HDC solenoid valves by selecting RESET VALVES button (Figure 18, Item 5) on HDC control box.

    **NOTE**

    This test is done at both right-hand and left-hand suspension raise/lower relief valves. For the right-hand valve (port 3R), actuate right-hand SUSPENSION CONTROL lever. For left-hand valve (port 3L), actuate left-hand SUSPENSION CONTROL lever.

    b. For 3R; using LINE UP or LINE DOWN button (Figure 18, Item 3) select V15 on HDC display (Figure 18, Item 2).

    c. Close V15 on HDC display (Figure 18, Item 2) by selecting CHANGE POSITION button (Figure 18, Item 4) on HDC control box.

    d. Have assistant start engine, move right-hand SUSPENSION CONTROL lever to RAISE.

    e. Read transducer T-1 hydraulic pressure on HDC display (Figure 18, Item 1).

    f. Using LINE UP or LINE DOWN button (Figure 18, Item 3) select V15 on HDC display (Figure 18, Item 2).

    g. Open V15 on HDC display (Figure 18, Item 2) by selecting CHANGE POSITION button (Figure 18, Item 4) on HDC control box.

    h. Reset all HDC solenoid valves by selecting RESET VALVES button (Figure 18, Item 5) on HDC control box.

    i. For 3L; using LINE UP or LINE DOWN button (Figure 18, Item 3) select V16 on HDC display (Figure 18, Item 2).

    j. Close V16 on HDC display (Figure 18, Item 2) by selecting CHANGE POSITION button (Figure 18, Item 4) on HDC control box.

    k. Have assistant start engine (if not already running).

    l. Move left-hand SUSPENSION CONTROL lever to RAISE.

    m. Read transducer T-1 hydraulic pressure on HDC display (Figure 18, Item 1).

    n. Using LINE UP or LINE DOWN button (Figure 18, Item 3) select V16 on HDC display (Figure 18, Item 2).

    o. Open V16 on HDC display (Figure 18, Item 2) by selecting CHANGE POSITION button (Figure 18, Item 4) on HDC control box.

## HYDRAULIC OIL OVERHEATS - Continued

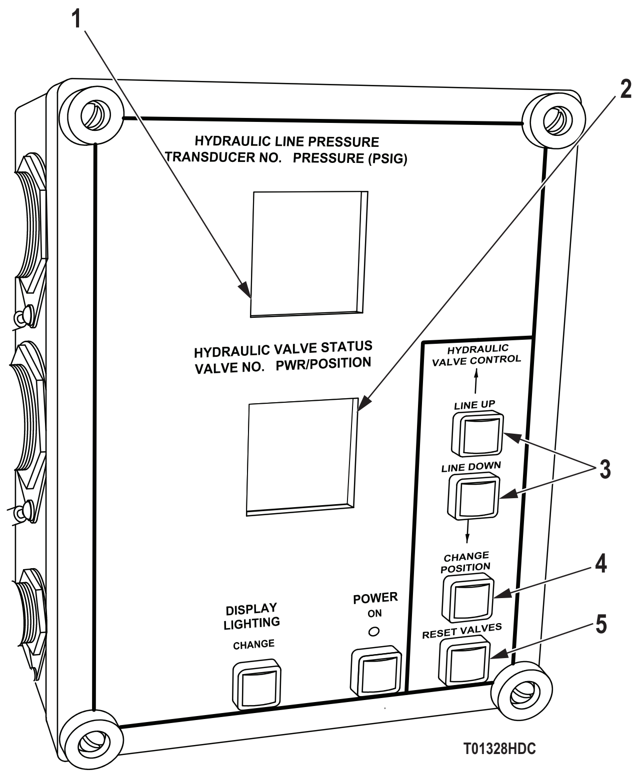



*Figure 18. Hydraulic Diagnostic Center (HDC) Control Box.*

## CONDITION/INDICATION

Is transducerT-1 hydraulic pressure 3,450-3,550 psi (23,788-24,477 kPa)?

## DECISION

YES - Stop engine; relieve hydraulic pressure. Go to Step (18).
NO - Go to Step (17).

## HYDRAULIC OIL OVERHEATS - Continued

### STEP

17. Perform suspension raise/lower relief valve adjustment using HDC.

    a. Reset all HDC solenoid valves by selecting RESET VALVES button (Figure 19, Item 5) on HDC control box.

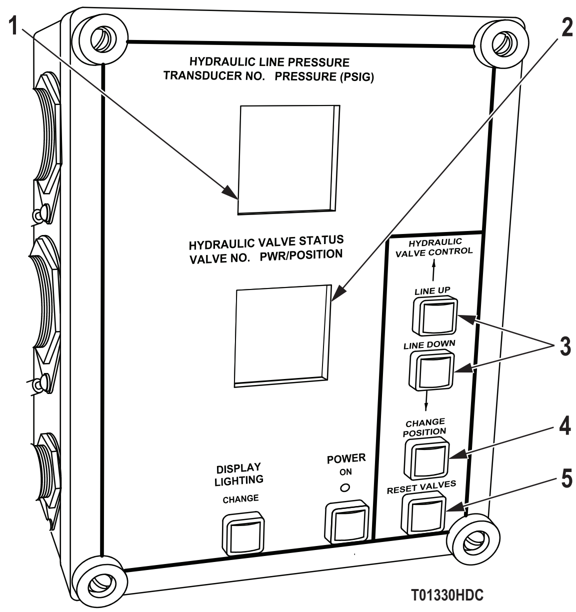



*Figure 19. Hydraulic Diagnostic Center (HDC) Control Box.*

    b. For port 3R relief valve (Figure 20, Item 2); loosen jam nut (Figure 20, Item 3) on port 3R suspension raise/lower relief valve (Figure 20, Item 2).

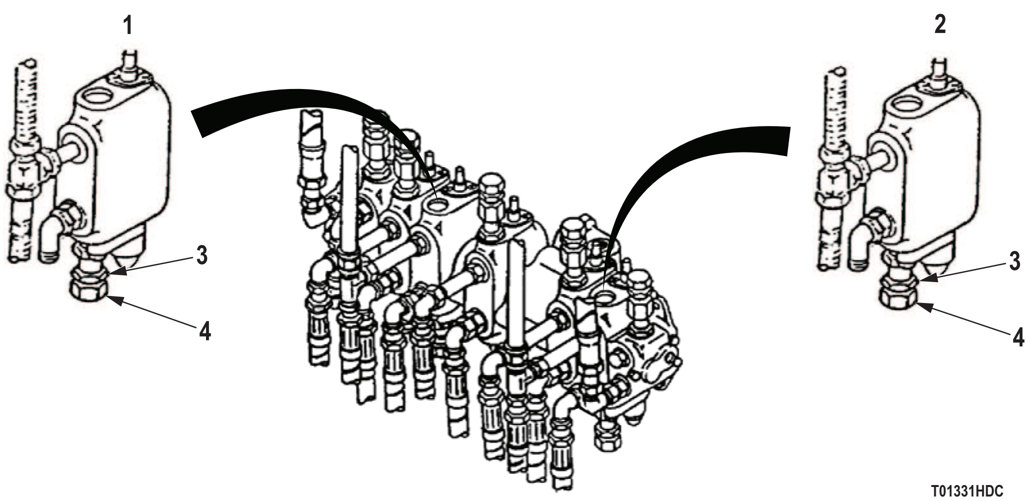



*Figure 20. Suspension Relief Valve Port 3L and Port 3R.*

    c. Using LINE UP or LINE DOWN button (Figure 19, Item 3) select V15 on HDC display (Figure 19, Item 2).

## HYDRAULIC OIL OVERHEATS - Continued

d. Close V15 on HDC display (Figure 19, Item 2) by selecting CHANGE POSITION button (Figure 19, Item 4) on HDC control box.

e. With right-hand SUSPENSION CONTROL lever still in RAISE position, and observing transducer T-1 hydraulic pressure on HDC display (Figure 19, Item 1), turn adjusting screw (Figure 20, Item 4) clockwise to increase pressure or counterclockwise to decrease pressure, until desired pressure is indicated.

f. Tighten jam nut (Figure 20, Item 3).

g. Using LINE UP or LINE DOWN button (Figure 19, Item 3) select V15 on HDC display (Figure 19, Item 2).

h. Open V15 on HDC display (Figure 19, Item 2) by selecting CHANGE POSITION button (Figure 19, Item 4) on HDC control box.

i. Reset all HDC solenoid valves by selecting RESET VALVES button (Figure 19, Item 5) on HDC control box.

j. For port 3L relief valve (Figure 20, Item 1); loosen jam nut (Figure 20, Item 3) on port 3L suspension raise/lower relief valve (Figure 20, Item 1).

k. Using LINE UP or LINE DOWN button (Figure 19, Item 3) select V16 on HDC display (Figure 19, Item 2).

l. Close V16 on HDC display (Figure 19, Item 2) by selecting CHANGE POSITION button (Figure 19, Item 4) on HDC control box.

m. With left-hand SUSPENSION CONTROL lever still in RAISE position, and observing transducer T-1 hydraulic pressure on HDC display (Figure 19, Item 1), turn adjusting screw (Figure 20, Item 4) clockwise to increase pressure or counterclockwise to decrease pressure until desired pressure is indicated.

n. Tighten jam nut (Figure 20, Item 3).

o. Using LINE UP or LINE DOWN button (Figure 19, Item 3) select V16 on HDC display (Figure 19, Item 2).

p. Open V16 on HDC display (Figure 19, Item 2) by selecting CHANGE POSITION button (Figure 19, Item 4) on HDC control box.

q. Stop engine; relieve hydraulic pressure.

r. Observe transducer T-1 hydraulic pressure.

### CONDITION/INDICATION

Can pressure at suspension raise/lower relief valve be adjusted to 3,450-3,550 psi (23,788-24,477 kPa)?

### DECISION

YES - Verify problem is solved.
NO - Replace DCV bank (TM 5-2350-262-20).

**HYDRAULIC OIL OVERHEATS - Continued**

**STEP**

18. Perform ejector relief valve test using HDC.

    a. Reset all HDC solenoid valves by selecting RESET VALVES button (Figure 21, Item 5) on HDC control box.

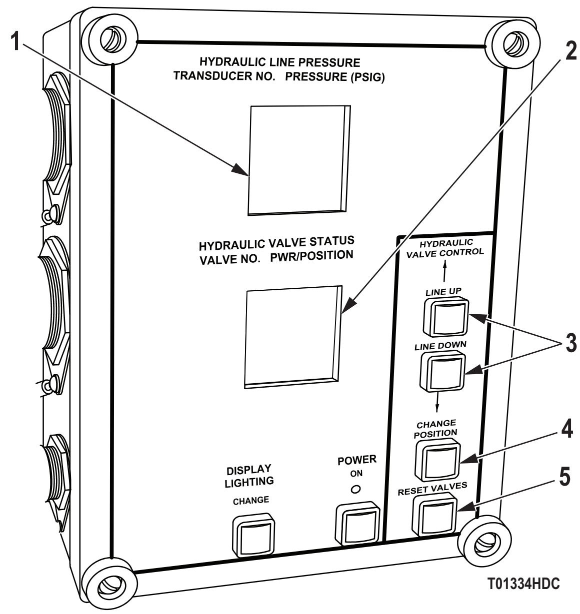
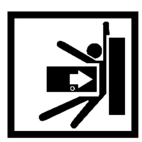



*Figure 21. Hydraulic Diagnostic Center (HDC) Control Box.*

**WARNING**



- Do not operate ejector when personnel are in bowl. Do not work in bowl unless ejector lock is engaged. Failure to comply may result in severe injury or death to personnel.
- Do not stand or work in bowl area unless ejector lock is engaged. Do not stand in bowl to observe roller guide travels. Failure to comply may result in severe injury or death to personnel.

    b. Move ejector halfway forward.

    c. Stop engine and relieve hydraulic pressure.

    d. Disable ejector; manually close V23 (Figure 22, Item 1) on DCV bank.

**HYDRAULIC OIL OVERHEATS - Continued**

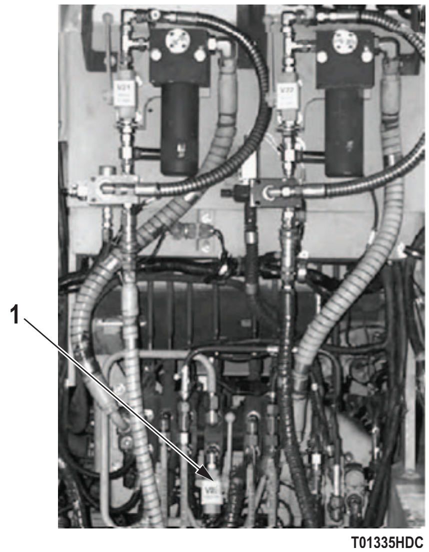



*Figure 22. Directional Control Valve (DCV) Bank.*

e. Using LINE UP or LINE DOWN button (Figure 21, Item 3) select V1 on HDC display (Figure 21, Item 2).

f. Close V1 on HDC display (Figure 21, Item 2) by selecting CHANGE POSITION button (Figure 21, Item 4) on HDC control box.

g. Have assistant start engine and hold EJECTOR CONTROL lever in FORWARD position.

h. Read transducer T-2 hydraulic pressure on HDC display (Figure 21, Item 1).

**CONDITION/INDICATION**

Is transducer T-2 hydraulic pressure 2,950-3,050 psi (20,340-21,030 kPa)?

**DECISION**

YES - Stop engine; relieve hydraulic pressure. Go to Step (20).
NO - Go to Step (19).

**HYDRAULIC OIL OVERHEATS - Continued**

**STEP**

19. Perform ejector relief valve adjustment using HDC.

    a. Stop engine and relieve hydraulic pressure.

    b. Reset all HDC solenoid valves by selecting RESET VALVES button (Figure 23, Item 5) on HDC control box.

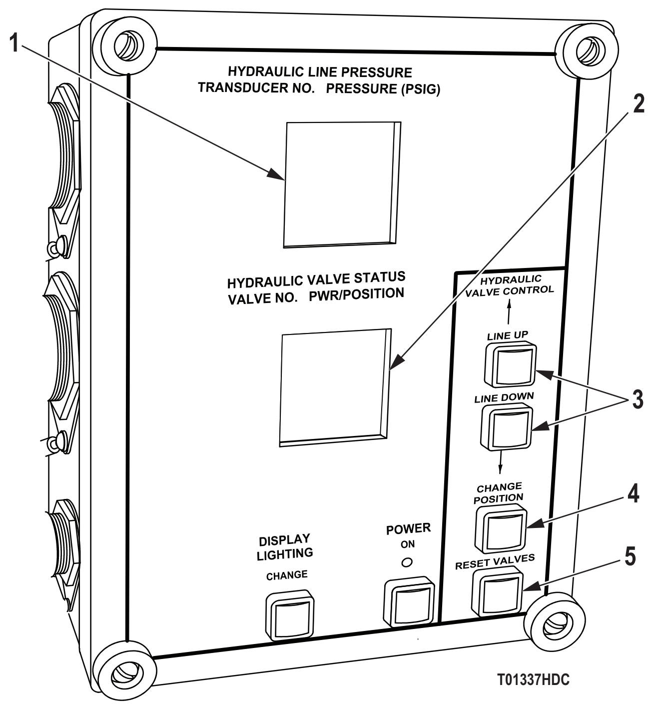
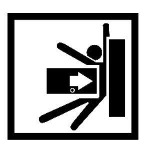



*Figure 23. Hydraulic Diagnostic Center (HDC) Control Box.*

## WARNING



- Do not operate ejector when personnel are in bowl. Do not work in bowl unless ejector lock is engaged. Failure to comply may result in severe injury or death to personnel.
- Do not stand or work in bowl area unless ejector lock is engaged. Do not stand in bowl to observe roller guide travels. Failure to comply may result in severe injury or death to personnel.
- When folding dozer blade, work on blade latches from side of vehicle only. Do not stand in front of dozer blade while retracting ejector. Failure to comply may result in severe injury or death to personnel.

    c. Disable ejector; manually close V23 (Figure 24, Item 1) on DCV bank.

**HYDRAULIC OIL OVERHEATS - Continued**

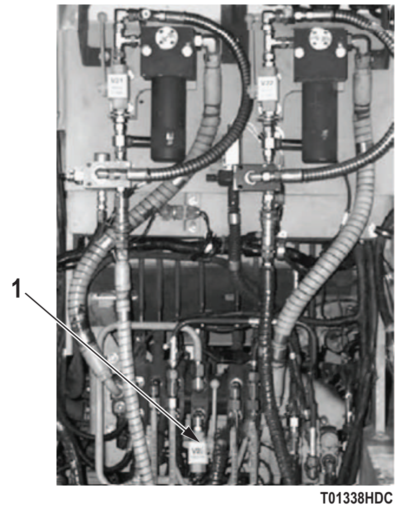



*Figure 24. Directional Control Valve (DCV) Bank.*

d. Using LINE UP or LINE DOWN button (Figure 23, Item 3) select V1 on HDC display (Figure 23, Item 2).

e. Close V1 on HDC display (Figure 23, Item 2) by selecting CHANGE POSITION button (Figure 23, Item 4) on HDC control box.

f. Start engine.

g. Loosen jam nut (Figure 25, Item 1) on ejector relief valve.

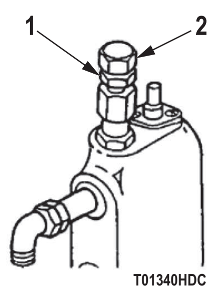



*Figure 25. Ejector Relief Valve.*

h. While observing transducer T-2 hydraulic pressure on HDC display (Figure 23, Item 1); turn relief valve adjustment (Figure 25, Item 2) clockwise (to increase pressure) or counterclockwise (to decrease pressure) until hydraulic pressure is within limits.

i. Tighten jam nut (Figure 25, Item 1) on ejector relief valve.

j. Stop engine; relieve hydraulic pressure.

k. Enable ejector; manually open V23 (Figure 24, Item 1) on DCV bank.

l. Using LINE UP or LINE DOWN button (Figure 23, Item 3) select V1 on HDC display (Figure 23, Item 2). Close V1 on HDC display (Figure 23, Item 2).

m. Open V1 on HDC display (Figure 23, Item 2) by selecting CHANGE POSITION button (Figure 23, Item 4) on HDC control box.

n. Stop engine; relieve hydraulic pressure.

## HYDRAULIC OIL OVERHEATS - Continued

### CONDITION/INDICATION

Can ejector relief valve observed transducer T-2 hydraulic pressure be adjusted to 2,950-3,050 psi (20,340-21,030 kPa)?

### DECISION

YES - Verify problem is solved.
NO - Replace DCV bank (TM 5-2350-262-20).

### STEP

20. Perform ejector cylinder internal leakage test using HDC.
    a. Reset all HDC solenoid valves by selecting RESET VALVES button (Figure 26, Item 5) on HDC control box.
    b. Using LINE UP or LINE DOWN button (Figure 26, Item 3), select V1 on HDC display (Figure 26, Item 2).
    c. Close V1 on HDC display (Figure 26, Item 2) by selecting CHANGE POSITION button (Figure 26, Item 4) on HDC control box.
    d. Start engine and have assistant hold EJECTOR CONTROL lever in BACK position for one minute.
    e. Mark position of ejector at side of hull and continue to hold valve lever in BACK position for one more minute.
    f. Check position of ejector while still holding valve lever in BACK position.
    g. If ejector has moved forward more than 1/2 in. (12 mm), the ejector cylinder is leaking excessively.
    h. If ejector has moved aft more than 1/2 in. (12 mm), solenoid valve V1 on HDC primary manifold is leaking.
    i. Reset all HDC solenoid valves by selecting RESET VALVES button (Figure 26, Item 5) on HDC control box.

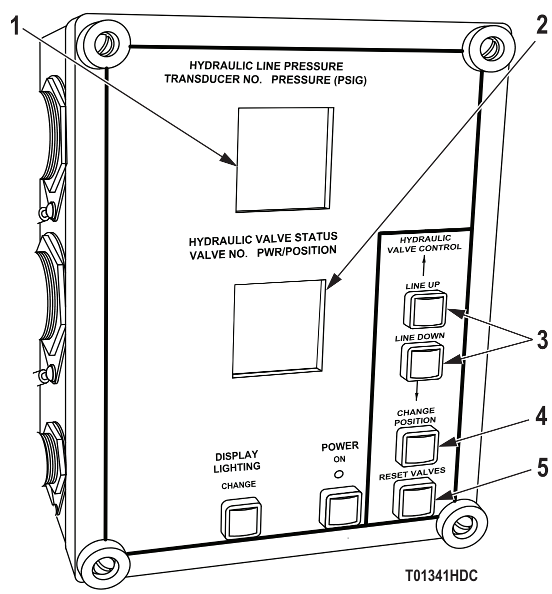



*Figure 26. Hydraulic Diagnostic Center (HDC) Control Box.*

## HYDRAULIC OIL OVERHEATS - Continued

### CONDITION/INDICATION

Is solenoid valve V1 on HDC system primary manifold or ejector leaking excessively?

### DECISION

YES - Replace or repair leaking components, as applicable; solenoid valve V1 on HDC primary manifold (WP 0035) or ejector cylinder (TM 5-2350-262-20).
NO - Go to Step (21).

### STEP

21. Perform apron relief valve pressure test (port 19) using HDC.
    a. Reset all HDC solenoid valves by selecting RESET VALVES button (Figure 26, Item 1) on HDC control box.
    b. Move ejector forward, engage ejector lock.
    c. Using LINE UP or LINE DOWN button (Figure 26, Item 3), select V17 on HDC display (Figure 26, Item 2).
    d. Close V17 on HDC display (Figure 26, Item 2) by selecting CHANGE POSITION button (Figure 26, Item 4) on HDC control box.
    e. Have assistant start engine and hold APRON CONTROL lever in UP position.
    f. Read transducer T-1 hydraulic pressure on HDC display (Figure 26, Item 1).
    g. If pressure is low, adjust apron RAISE relief valve.

### CONDITION/INDICATION

Is observed transducer T-1 hydraulic pressure 3,450-3,550 psi (23,780-24,475 kPa)?

### DECISION

YES - Stop engine; relieve hydraulic pressure. Go to Step (23).
NO - Go to Step (22).

## HYDRAULIC OIL OVERHEATS - Continued

**STEP**

22. Perform apron relief valve adjustment using HDC.

    a. Stop engine; relieve hydraulic pressure.

### WARNING

- Do not operate ejector when personnel are in bowl. Do not work in bowl unless ejector lock is engaged. Failure to comply may result in severe injury or death to personnel.
- Do not stand or work in bowl area unless ejector lock is engaged. Do not stand in bowl to observe roller guide travels. Failure to comply may result in severe injury or death to personnel.
- When folding dozer blade, work on blade latches from side of vehicle only. Do not stand in front of dozer blade while retracting ejector. Failure to comply may result in severe injury or death to personnel.

    b. Reset all HDC solenoid valves by selecting RESET VALVES button (Figure 27, Item 5) on HDC control box.

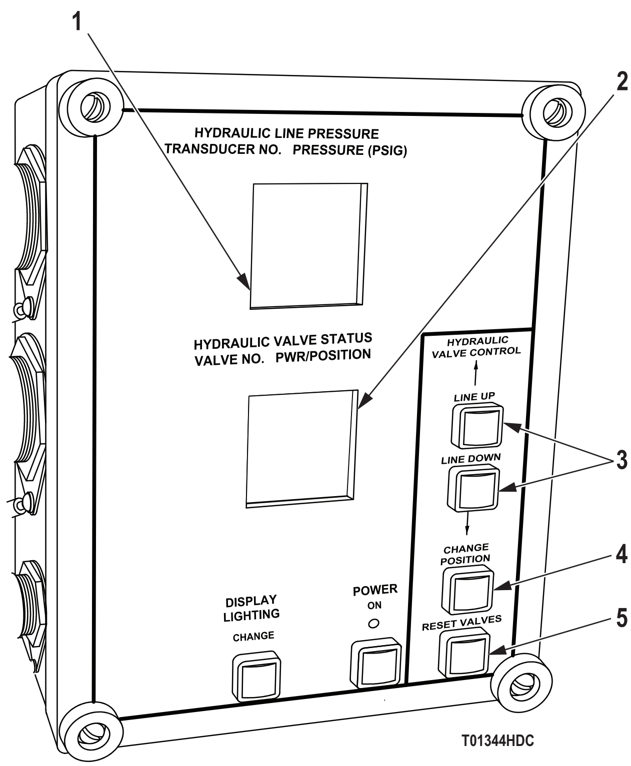



*Figure 27. Hydraulic Diagnostic Center (HDC) Control Box.*

## HYDRAULIC OIL OVERHEATS - Continued

c. Disable ejector; manually close V23 (Figure 28, Item 1) on DCV bank.

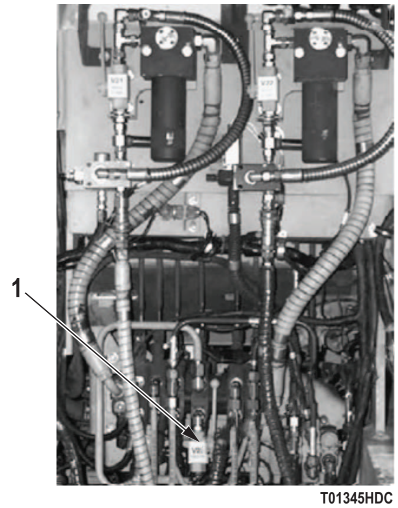



*Figure 28. Directional Control Valve (DCV) Bank.*

d. Using LINE UP or LINE DOWN button (Figure 27, Item 3), select V1 on HDC display (Figure 27, Item 2).

e. Close V17 on HDC display (Figure 27, Item 2) by selecting CHANGE POSITION button (Figure 27, Item 4) on HDC control box.

f. Using LINE UP or LINE DOWN button (Figure 27, Item 3), select V17 on HDC display (Figure 27, Item 2).

g. Close V17 on HDC display (Figure 27, Item 2) by selecting CHANGE POSITION button (Figure 27, Item 4) on HDC control box.

h. Start engine.

i. As assistant holds APRON CONTROL lever in UP position, loosen jam nut (Figure 29, Item 1) while observing transducer T-1 hydraulic pressure on HDC display (Figure 27, Item 1).

j. Rotate adjusting screw (Figure 29, Item 2) clockwise to increase pressure; counterclockwise to decrease pressure, as necessary to obtain desired pressure. Tighten jam nut (Figure 29, Item 1).

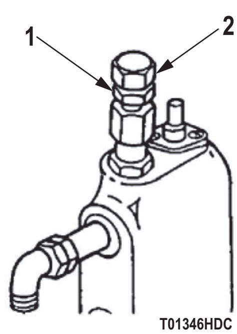



*Figure 29. Apron Relief Valve.*

k. Stop engine; relieve hydraulic pressure.

**HYDRAULIC OIL OVERHEATS - Continued**

l. Manually open V23 (Figure 30, Item 1) on DCV bank.

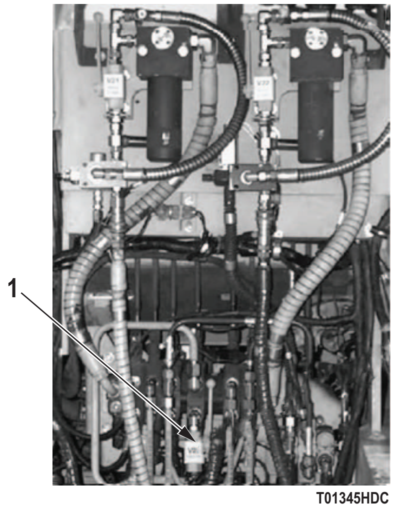



*Figure 30. Apron Relief Valve.*

(1) Using LINE UP or LINE DOWN button (Figure 31, Item 2), select V1 on HDC display (Figure 31, Item 1).

(2) Open V1 on HDC display (Figure 31, Item 1) by selecting CHANGE POSITION button (Figure 31, Item 3) on HDC control box.

(3) Using LINE UP or LINE DOWN button (Figure 31, Item 2), select V17 on HDC display (Figure 31, Item 1).

(4) Open V17 on HDC display (Figure 31, Item 1) by selecting CHANGE POSITION button (Figure 31, Item 3) on HDC control box.

## HYDRAULIC OIL OVERHEATS - Continued

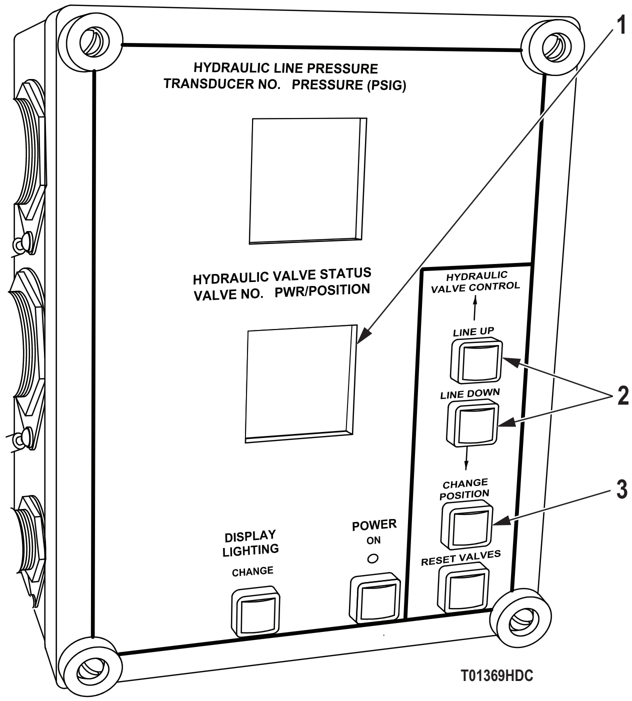



*Figure 31. Hydraulic Diagnostic Center (HDC) Control Box.*

## CONDITION/INDICATION

Can transducer T–1 hydraulic pressure be adjusted to 3,450-3,550 psi (23,780-24,475 kPa)?

## DECISION

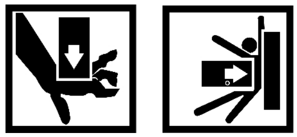
YES - Verify problem is solved.
NO - Replace DCV bank (TM 5-2350-262-20).

## HYDRAULIC OIL OVERHEATS - Continued

**STEP**

23. Perform apron relief valve (port 20) pressure test.

### WARNING



Before performing any hydraulic troubleshooting in the bowl, move ejector forward and engage the ejector lock. Failure to comply may result in severe injury to personnel.

### NOTE

Have suitable container ready to catch oil.

a. Start engine, move ejector forward, engage ejector lock.

b. Stop engine; relieve hydraulic pressure.

c. Disconnect CONT VLV-20 hose (Figure 32, Item 5) from elbow (Figure 32, Item 1) at port 20 (Figure 32, Item 4) of apron control valve (Figure 32, Item 3).

d. Connect pressure measuring device (Figure 32, Item 2) to elbow (Figure 32, Item 1).

e. Plug hose (Figure 32, Item 5).

f. Have assistant start engine and hold APRON CONTROL lever in DOWN position. Read pressure measuring device (Figure 32, Item 2).

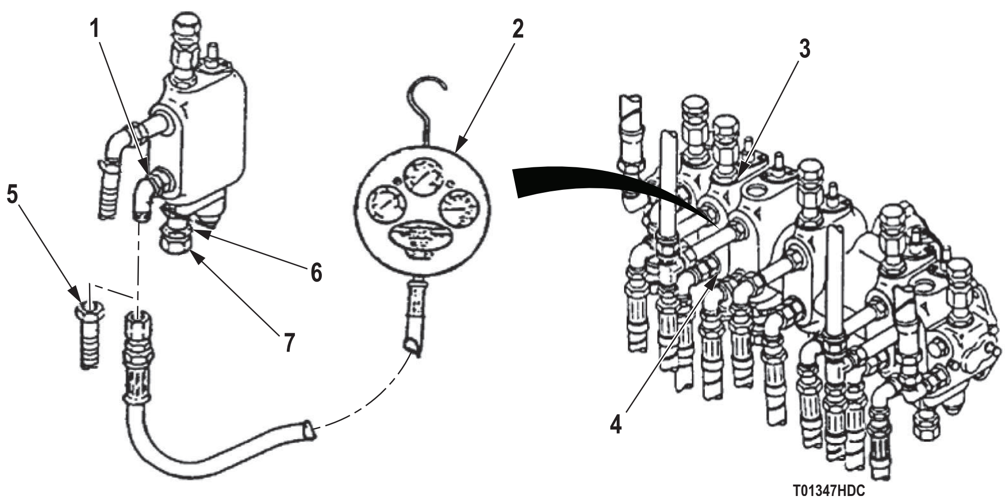



*Figure 32. Apron Control Valve.*

**HYDRAULIC OIL OVERHEATS - Continued**

**CONDITION/INDICATION**

Is pressure 3,450-3,550 psi (23,780-24,475 kPa)?

**DECISION**

YES - Stop engine; relieve hydraulic pressure. Go to Step (25).
NO - Go to Step (24).

**STEP**

24. Perform apron relief valve adjustment.

    a. As assistant holds APRON CONTROL lever DOWN, loosen jam nut (Figure 32, Item 6) and rotate adjusting screw (Figure 32, Item 7) clockwise to increase pressure; counterclockwise to decrease pressure.

    b. When adjustment is completed, tighten jam nut (Figure 32, Item 6).

    c. Stop engine; relieve hydraulic pressure.

**CONDITION/INDICATION**

Can pressure be adjusted to 3,450-3,550 psi (23,780-24,475 kPa)?

**DECISION**

YES - Remove all test equipment and connect lines. Verify problem is solved.
NO - Replace DCV (TM 5-2350-262-20).

**HYDRAULIC OIL OVERHEATS - Continued**

**STEP**

25. Perform apron cylinder leakage test.

**CAUTION**

Ensure apron cylinders are blocked (Figure 33, Item 4) prior to retracting disconnected cylinder rod ends. Cylinders will drop and damage hoses.

**NOTE**

- Armor plates 1L and 1R must be removed to expose apron cylinder.
- Have suitable container ready to catch oil.

a. Start engine, lower apron completely, and disconnect right-hand and left-hand end of cylinder rods (Figure 33, Item 5) from apron (Figure 33, Item 6).

b. Retract cylinder rods (Figure 33, Item 5) approximately halfway.

c. Stop engine; relieve hydraulic pressure.

d. Disconnect CKT-20 (REAR) TEE hose (Figure 33, Item 2) and CKT-20 (REAR) TEE tube (Figure 33, Item 1) from tee (Figure 33, Item 3) on hull floor.

e. Cap and plug hose, tube, and fittings.

f. Start engine, have assistant hold APRON CONTROL lever in UP position.

g. Measure extension of both cylinder rods (Figure 33, Item 5).

h. Continue to hold APRON CONTROL lever in UP position for one minute.

i. Measure extension of both cylinder rods (Figure 33, Item 5) again.

## HYDRAULIC OIL OVERHEATS - Continued

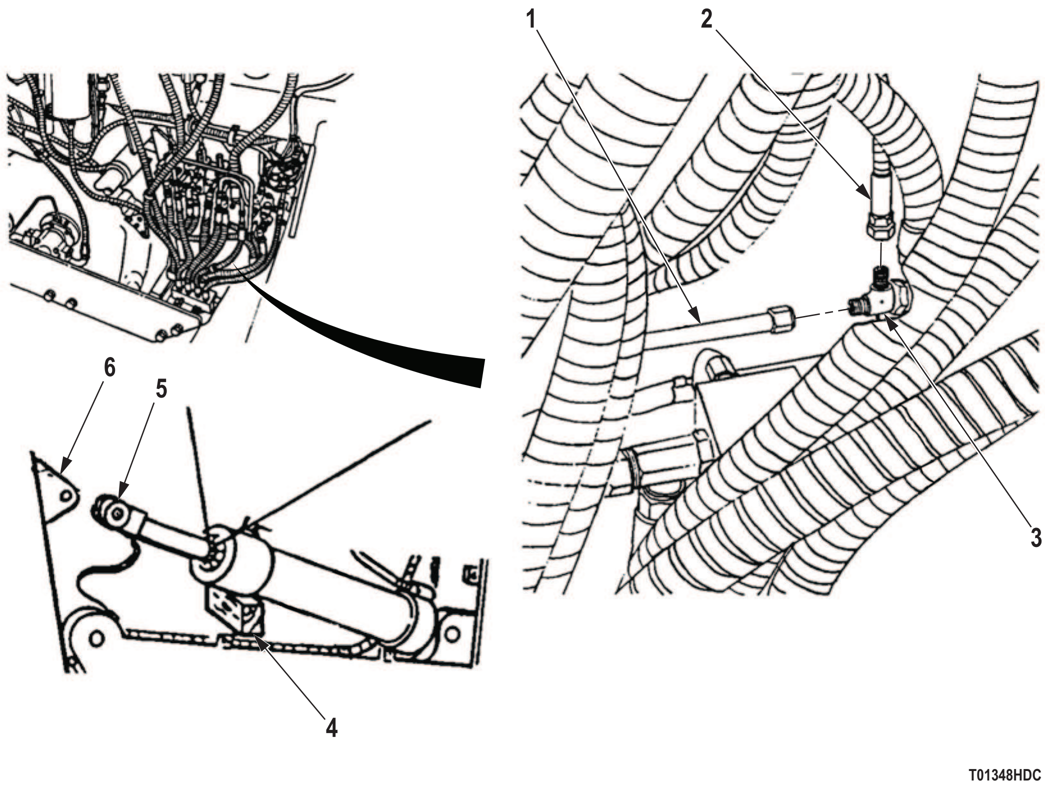



*Figure 33. Apron Cylinder Leakage Test.*

j. Have assistant return APRON CONTROL lever to NEUTRAL position.

k. If extension rate is greater than 1/2 in. (13 mm) per minute, the cylinder is leaking excessively.

l. Stop engine; relieve hydraulic pressure.

## CONDITION/INDICATION

Is extension rate greater than 1/2 IN. (13 MM) per minute?

## DECISION

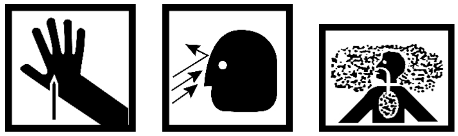
YES - Remove all test equipment and connect lines. Replace or repair apron cylinder (TM 5-2350-262-20).
NO - Go to Step (26).

**HYDRAULIC OIL OVERHEATS - Continued**

**STEP**

26. Perform main accumulator pressure test.

## WARNING



- High-pressure nitrogen gas is used in this equipment. Keep hands and face away from valves and hose ends. Failure to comply may result in severe injury or death to personnel.
- Do not breathe nitrogen gas. Failure to comply may result in severe injury or death to personnel.

a. Connect pressure measuring device (Figure 34, Item 4) to bleed valve (Figure 34, Item 10) on charging harness (Figure 34, Item 12). Close shutoff valve (Figure 34, Item 3).

b. Open nitrogen tank valve (Figure 34, Item 1) and adjust regulator valve (Figure 34, Item 2) to 50 psi (353 kPa).

c. Open shutoff valve (Figure 34, Item 3) for about 10 seconds to clear charging hoses. Close valve (Figure 34, Item 3).

d. Remove valve guard (Figure 34, Item 11).

e. Remove charge valve cap (Figure 34, Item 8) from charge valve assembly (Figure 34, Item 6) on accumulator (Figure 34, Item 9).

f. Loosely connect adapter valve (Figure 34, Item 5) to charge valve (Figure 34, Item 6) and again open shutoff valve (Figure 34, Item 3) for about 10 seconds.

g. Close shutoff valve (Figure 34, Item 3).

h. Fully tighten adapter valve (Figure 34, Item 5).

## NOTE

Accumulator gas valve is fully open after about 2-1/2 turns.

i. Open charge valve (Figure 34, Item 6) by loosening nut (Figure 34, Item 7).

j. Read pressure measuring device (Figure 34, Item 4).

**HYDRAULIC OIL OVERHEATS - Continued**

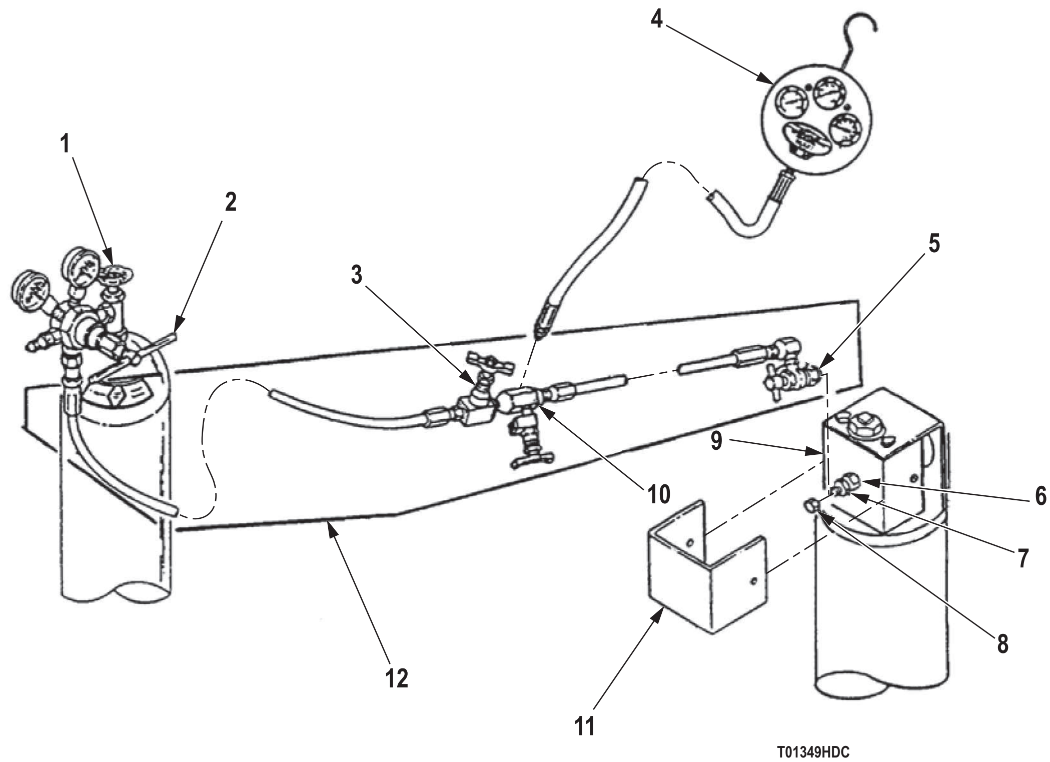



*Figure 34. Main Hydraulic Accumulator.*

**CONDITION/INDICATION**

Is gas valve pressure 1,750-1,850 psi (12,066-12,756 kPa)?

**DECISION**

YES - Go to Step (27).
NO - Go to Step (28).

## HYDRAULIC OIL OVERHEATS - Continued

### STEP

27. Remove all test equipment.

    a. Tighten nut (Figure 35, Item 6) on charge valve (Figure 35, Item 5).

    b. Close nitrogen tank valve (Figure 35, Item 1).

    c. Back off regulator valve (Figure 35, Item 2), open bleed valve (Figure 35, Item 8), and bleed hose pressure to 0 psi.

    d. Remove adapter valve (Figure 35, Item 4) from charge valve (Figure 35, Item 5).

    e. Remove pressure measuring device (Figure 35, Item 3) from bleed valve (Figure 35, Item 8) on charging harness (Figure 35, Item 10).

    f. Install charge valve cap (Figure 35, Item 7) on charge valve (Figure 35, Item 5).

    g. Install valve guard (Figure 35, Item 9).

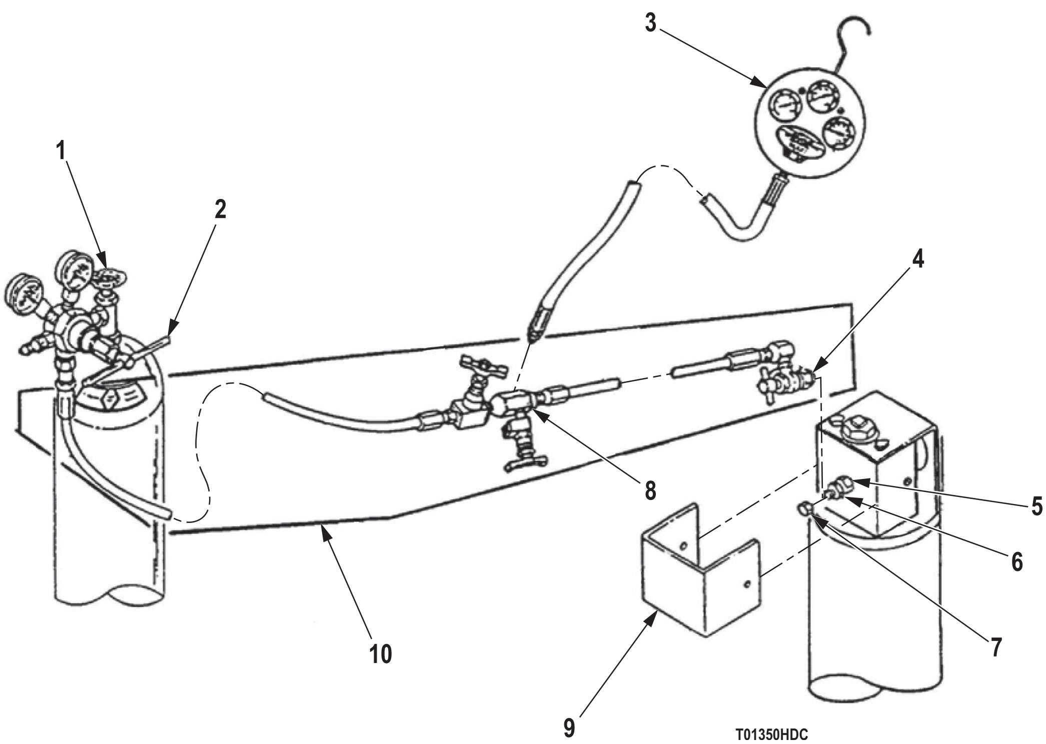



*Figure 35. Main Hydraulic Accumulator.*

### CONDITION/INDICATION

Is all test equipment removed?

### DECISION

YES - Go to Step (29).
NO - Repeat Step (27).

**HYDRAULIC OIL OVERHEATS - Continued**

**STEP**

28. Charge main accumulator.

## CAUTION

Ensure regulator valve is fully backed off to relieve tension on diaphragm. Failure to comply may result in damage to equipment.

## NOTE

Rapid pressurization will cause an inaccurate pressure reading due to heating of nitrogen gas. Always pressurize slowly.

a. Adjust regulator valve (Figure 36, Item 3) on nitrogen tank (Figure 36, Item 1) to 1,750-1,850 psi (12,066-12,756 kPa).

b. Open shutoff valve (Figure 36, Item 4).

c. Read pressure measuring device (Figure 36, Item 5).

d. When pressure reaches 1,750-1,850 psi (12,066-12,756 kPa), close shutoff valve (Figure 36, Item 4), nitrogen tank valve (Figure 36, Item 2), and accumulator charge valve (Figure 36, Item 6).

e. Wait 15 minutes and open charge valve (Figure 36, Item 6).

f. Read pressure measuring device (Figure 36, Item 5) to determine if accumulator can retain charge.

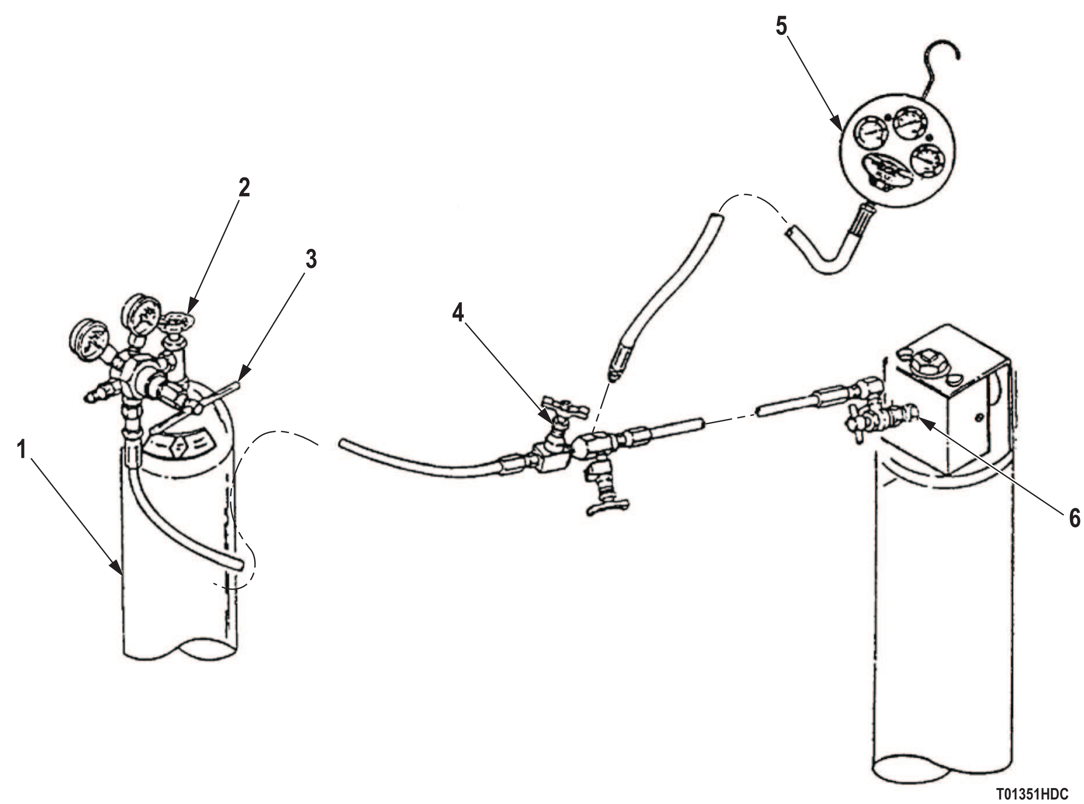



*Figure 36. Main Accumulator Charging.*

## HYDRAULIC OIL OVERHEATS - Continued

### CONDITION/INDICATION

Can main accumulator be charged to 1,750-1,850 psi (12,066-12,756 kPa)?

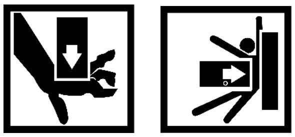
### DECISION

YES - Remove all test equipment and connect hoses. Verify problem is solved.
NO - Remove all test equipment and connect hoses. Replace main accumulator (TM 5-2350-262-20).

### STEP

29. Perform case drain leakage test.

**WARNING**



Before performing any hydraulic troubleshooting in the bowl, move ejector forward and engage the ejector lock. Failure to comply may result in severe injury to personnel.

**NOTE**

- Have a graduated container of at least 2 qts (1.9 L) capacity available to catch hydraulic oil while test is being performed.
- Have suitable container ready to catch oil.

a. Start engine, move ejector forward.

b. Stop engine, engage ejector lock, and relieve hydraulic pressure.

c. Disconnect SPNSN PUMP DRAIN-9 hose (Figure 37, Item 3) from elbow (Figure 37, Item 4) on compensating pump (Figure 37, Item 2). Cap elbow (Figure 37, Item 4) and plug hose (Figure 37, Item 1).

d. Disconnect SPNSN PUMP DRAIN-7V hose (Figure 37, Item 5) from elbow (Figure 37, Item 1). Plug hose (Figure 37, Item 5).

e. Connect drain hose (Figure 37, Item 6) to elbow (Figure 37, Item 1).

f. Hold end of drain hose (Figure 37, Item 6) in graduated container.

**HYDRAULIC OIL OVERHEATS - Continued**

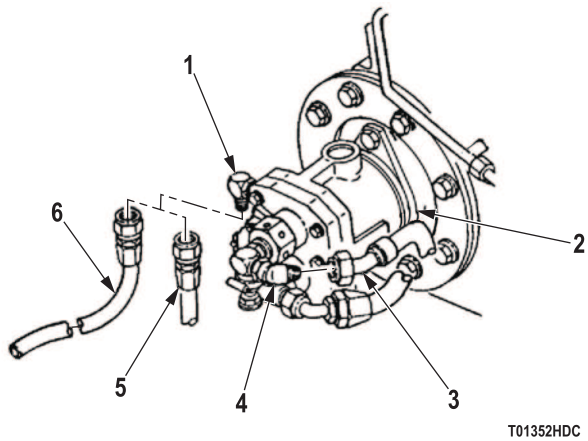



*Figure 37. Compensating Pump.*

g. Have assistant start engine and run at 1,800 rpm for 15 seconds.

h. Observer quantity of hydraulic oil in container.

i. Stop engine; relieve hydraulic pressure and connect hoses.

**CONDITION/INDICATION**

Is internal leakage more than 1.25 qts (1.2 L) for 15 seconds?

**DECISION**

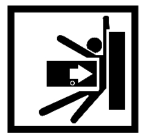
YES - Replace compensating pump (TM 5-2350-262-20).
NO - Go to Step (30).

**HYDRAULIC OIL OVERHEATS - Continued**

**STEP**

30. Perform suspension relief valve pressure test using HDC.

**WARNING**

Before performing any hydraulic troubleshooting in the bowl, move ejector forward and engage the ejector lock. Failure to comply may result in severe injury to personnel.

a. Reset all HDC solenoid valves by selecting RESET VALVES button (Figure 38, Item 5) on HDC control box.

b. Start engine; move ejector forward, engage ejector lock.

c. Stop engine and relieve hydraulic pressure.

d. Using LINE UP or LINE DOWN button (Figure 38, Item 3) on HDC control box, select V5 on HDC display (Figure 38, Item 2).

e. Using CHANGE POSITION button (Figure 38, Item 4), close V5 on HDC display (Figure 38, Item 2).

f. Repeat steps and close V12 and V13, and open V19.

g. Have assistant start engine and move SPRUNG/UNSPRUNG lever to UNSPRUNG and right-hand SUSPENSION CONTROL lever to LOWER.

h. Read transducer T-13 hydraulic pressure on HDC display (Figure 38, Item 1).

i. Using LINE UP or LINE DOWN button (Figure 38, Item 3) on HDC control box, select V5 on HDC display (Figure 38, Item 2).

j. Using CHANGE POSITION button (Figure 38, Item 4), close V5 on HDC display (Figure 38, Item 2).

**HYDRAULIC OIL OVERHEATS - Continued**

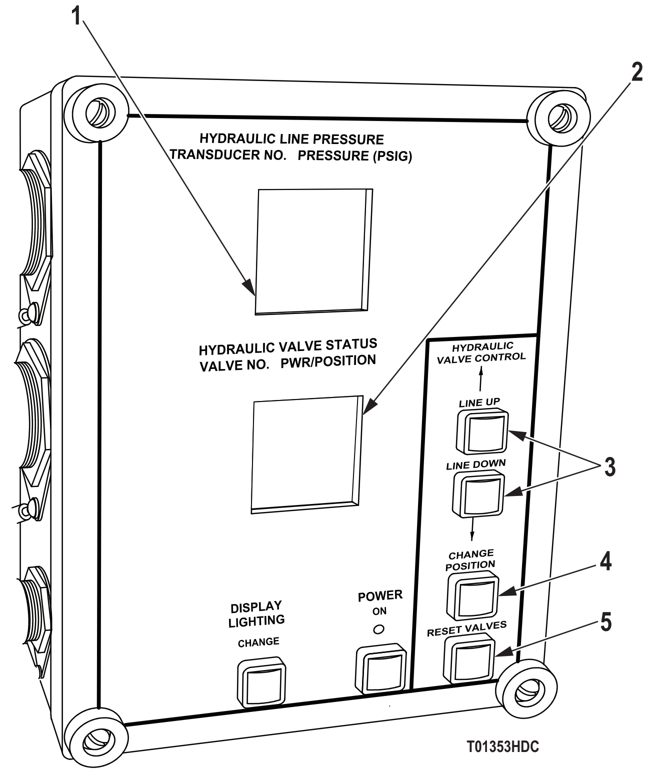



*Figure 38. Hydraulic Diagnostic Center (HDC) Control Box.*

k. Repeat steps and open V12 and V13, and close V19.

l. Stop engine; relieve hydraulic pressure.

**CONDITION/INDICATION**

Is transducer T-13 hydraulic pressure 3,700-3,800 psi (25,512-26,201 kPa)?

**DECISION**

YES - Go to Step (32).
NO - Go to Step (31).

**HYDRAULIC OIL OVERHEATS - Continued**

**STEP**

31. Perform suspension relief valve adjustment using HDC.

    a. Reset all HDC solenoid valves by selecting RESET VALVES button (Figure 39, Item 5) on HDC control box.

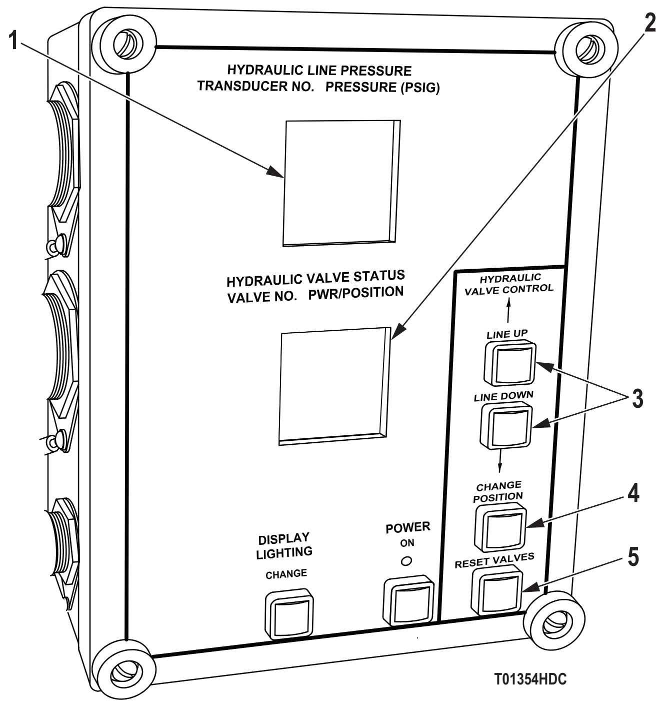
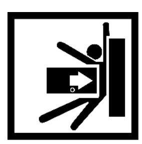



*Figure 39. Hydraulic Diagnostic Center (HDC) Control Box.*

## WARNING



- Do not operate ejector when personnel are in bowl. Do not work in bowl unless ejector lock is engaged. Failure to comply may result in severe injury or death to personnel.
- Do not stand or work in bowl area unless ejector lock is engaged. Do not stand in bowl to observe roller guide travels. Failure to comply may result in severe injury or death to personnel.
- When folding dozer blade, work on blade latches from side of vehicle only. Do not stand in front of dozer blade while retracting ejector. Failure to comply may result in severe injury or death to personnel.

    b. Stop engine and relieve hydraulic pressure.

    c. Manually close ejector inhibit ball valve V23 (Figure 40, Item 1) on DCV bank.

**HYDRAULIC OIL OVERHEATS - Continued**

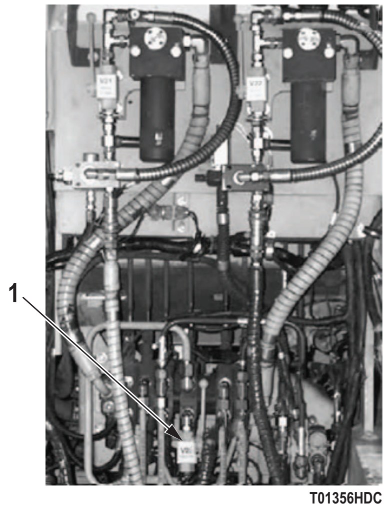



*Figure 40. Directional Control Valve (DCV) Bank.*

d. Using LINE UP or LINE DOWN button (Figure 39, Item 3) on HDC control box, select V5 on HDC display (Figure 39, Item 2).

e. Using CHANGE POSITION button (Figure 39, Item 4), close V5 on HDC display (Figure 39, Item 2).

f. Repeat last two steps for V12, V13, and V19; closing V12 and V13, and opening V19.

g. Start engine.

h. Remove cap (Figure 41, Item 3) from suspension relief valve adjusting shaft (Figure 41, Item 2) and loosen jam nut (Figure 41, Item 1).

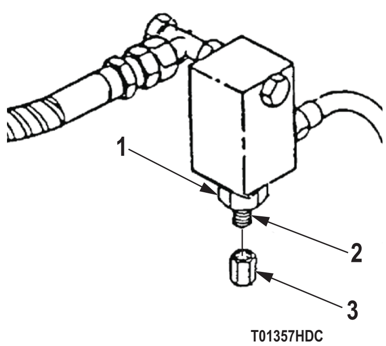



*Figure 41. Suspension Relief Valve.*

(1) Observe transducer T-13 hydraulic pressure on HDC display (Figure 39, Item 1).

(2) Turn adjusting shaft (Figure 41, Item 2) clockwise to increase pressure or counterclockwise to decrease pressure, as necessary, to obtain desired pressure.

(3) Tighten jam nut (Figure 41, Item 1) and replace cap (Figure 41, Item 3).

i. Stop engine and relieve hydraulic pressure

j. Manually open ejector ball valve V23 (Figure 40, Item 1) on DCV bank.

## HYDRAULIC OIL OVERHEATS - Continued

k. Reset all HDC solenoid valves by selecting RESET VALVES button (Figure 42, Item 5) on HDC control box.

### CONDITION/INDICATION

Is transducer T-13 hydraulic pressure 3,700-3,800 psi (25,512-26,201 kPa)?

### DECISION

YES - Verify problem is solved.
NO - Replace suspension relief valve (TM 5-2350-262-20).

### STEP

32. Perform suspension raise/lower relief valve test at port 3R or 3L using HDC.

a. Reset all HDC solenoid valves by selecting RESET VALVES button (Figure 42, Item 5) on HDC control box.

#### NOTE

This test is done at both the right-hand and left-hand suspension raise/lower relief valves. For right-hand valve (port 3R), actuate right-hand SUSPENSION CONTROL lever. For left-hand valve (port 3L), actuate left-hand SUSPENSION CONTROL lever.

b. For 3R; using LINE UP or LINE DOWN button (Figure 42, Item 3), select V15 on HDC display (Figure 42, Item 2).

c. Close V15 on HDC display (Figure 42, Item 2) by selecting CHANGE POSITION button (Figure 42, Item 4) on HDC control box.

d. Have assistant start engine and move right-hand SUSPENSION CONTROL lever to RAISE.

e. Read transducer T-1 hydraulic pressure on HDC display (Figure 42, Item 1).

f. Using LINE UP or LINE DOWN button (Figure 42, Item 3), select V15 on HDC display (Figure 42, Item 2).

g. Open V15 on HDC display (Figure 42, Item 2) by selecting CHANGE POSITION button (Figure 42, Item 4) on HDC control box.

**HYDRAULIC OIL OVERHEATS - Continued**

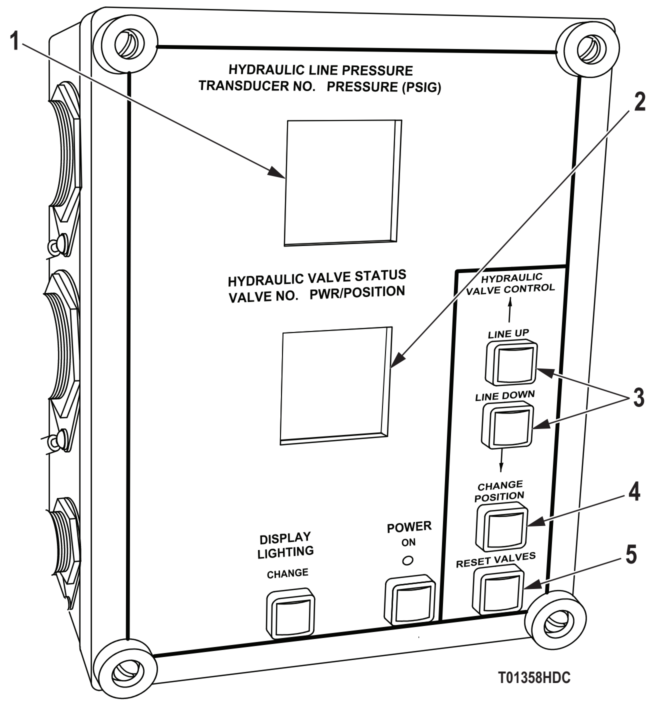



*Figure 42. Hydraulic Diagnostic Center (HDC) Control Box.*

h. For 3L; repeat above steps, closing and opening solenoid valve V16 as instructed, using left-hand SUSPENSION CONTROL lever, and monitoring hydraulic pressure at transducer T-1.

**CONDITION/INDICATION**

Is transducer T-1 hydraulic pressure 3,450-3,550 psi (23,788-24,477 kPa)?

**DECISION**

YES - Go to Step (35).
NO - Go to Step (33).

## HYDRAULIC OIL OVERHEATS - Continued

### STEP

33. Perform suspension raise/lower relief valve adjustment at 3R or 3L using HDC.

    a. Reset all HDC solenoid valves by selecting RESET VALVES button (Figure 43, Item 5) on HDC control box.

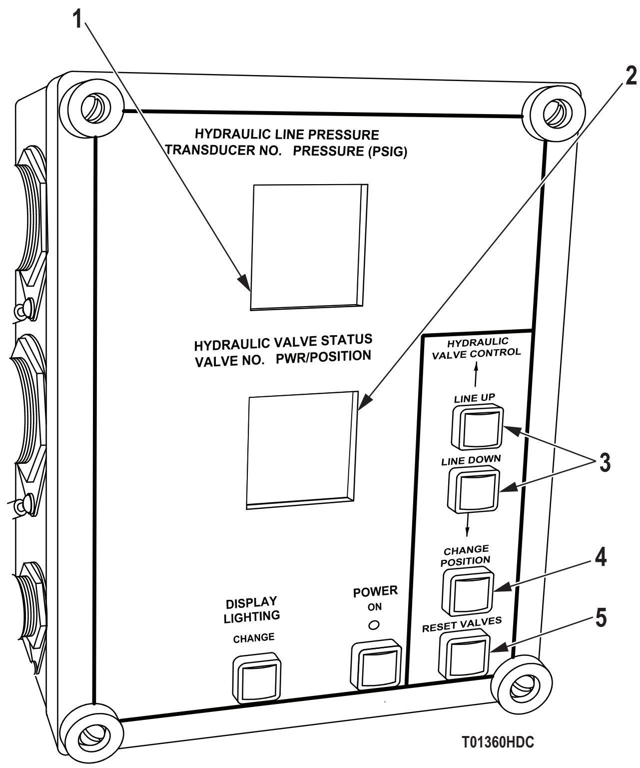



*Figure 43. Hydraulic Diagnostic Center (HDC) Control Box.*

    b. For 3R (Figure 44, Item 2); Using LINE UP or LINE DOWN button (Figure 43, Item 3), select V15 on HDC display (Figure 43, Item 2).

    c. Close V15 on HDC display (Figure 43, Item 2) by selecting CHANGE POSITION button (Figure 43, Item 4) on HDC control box.

    d. Loosen jam nut (Figure 44, Item 3) on port 3R (Figure 44, Item 2) of suspension raise/lower relief valve.

    e. With right-hand SUSPENSION CONTROL lever in RAISE position, while observing transducer T-1 hydraulic pressure on HDC display (Figure 43, Item 1), turn suspension raise/lower relief valve 3R adjusting screw (Figure 44, Item 4), clockwise to increase pressure or counterclockwise to decrease pressure, until desired pressure is indicated.

## HYDRAULIC OIL OVERHEATS - Continued

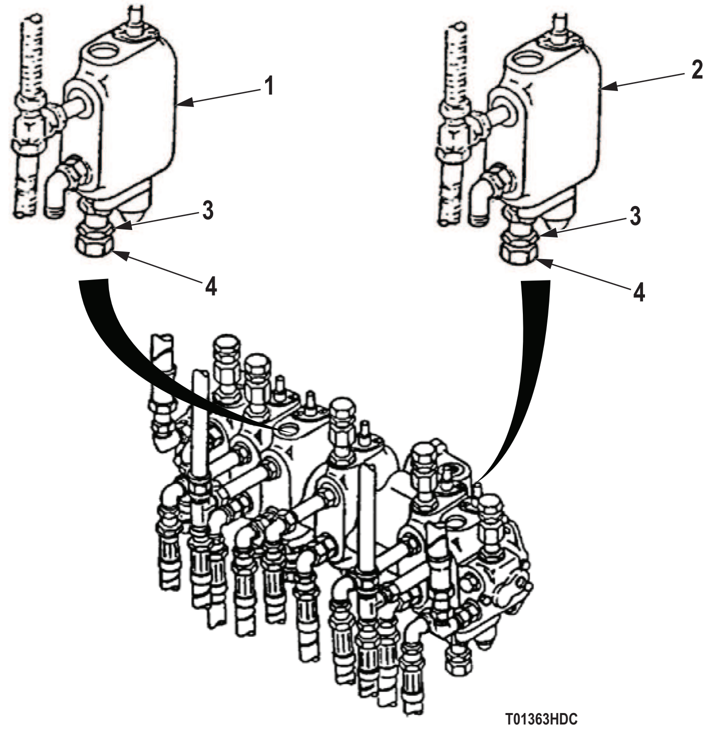



*Figure 44. Suspension Raise/Lower Relief Valve 3L and Relief Valve 3R.*

f. Tighten jam nut (Figure 44, Item 3).

g. Using LINE UP or LINE DOWN button (Figure 43, Item 3), select V15 on HDC display (Figure 43, Item 2). Open V15 on HDC display (Figure 43, Item 2) by selecting CHANGE POSITION button (Figure 43, Item 4) on HDC control box.

h. For 3L (Figure 44, Item 1); repeat above steps, closing and opening solenoid valve V16 as instructed, using left-hand SUSPENSION CONTROL lever, adjusting suspension raise/lower relief valve 3L adjusting screw (Figure 44, Item 4) for port 3L and monitoring hydraulic pressure at transducer T-1.

i. Stop engine; relieve hydraulic pressure.

### CONDITION/INDICATION

Can pressure at suspension relief valves be adjusted to 3,450-3,550 psi (23,788-24,477 kPa)?

### DECISION

YES - Verify problem is solved.
NO - Replace DCV bank (TM 5-2350-262-20).

**HYDRAULIC OIL OVERHEATS - Continued**

**STEP**

34. Perform actuator internal leakage test on No. 1 or No. 4 actuators where excessive heat in circuit 9 or 2 hoses was detected using HDC.

## WARNING

Do not work under vehicle unless hull is properly blocked or allowed to settle on bump stops. Failure to comply may result in severe injury or death to personnel.

## NOTE

- First procedure below, using HDC system, is for No. 4 left actuator internal leakage test. Manual procedures for No. 4 right, No. 1 left, and No. 1 right actuators are same, but HDC system is not used during test. Ports are in same location on opposite face. Circuits 2 and 9 are same.
- Have suitable container ready to catch oil.

a. Stop engine; relieve hydraulic pressure.

b. No. 4 Left Actuator (using HDC system).

(1) Reset all HDC solenoid valves by selecting RESET VALVES button (Figure 45, Item 4) on HDC control box.

(2) Using LINE UP or LINE DOWN button (Figure 45, Item 2) on HDC control box, select V4 on HDC display (Figure 45, Item 1).

(3) Using CHANGE POSITION button (Figure 45, Item 3), close V4 on HDC display (Figure 45, Item 1). Repeat steps for V7 and V8; closing V7 and opening V18.

(4) Catch oil in a 2 gal. (7.6 L) container.

(5) With suspension in SPRUNG mode start engine and check leakage from ports 7 (Figure 46, Item 10), 7B (Figure 46, Item 9), and 17 (Figure 46, Item 2).

(6) Stop engine; relieve hydraulic pressure.

(7) Reset all HDC solenoid valves by selecting RESET VALVES button (Figure 45, Item 4) on HDC control box.

**HYDRAULIC OIL OVERHEATS - Continued**

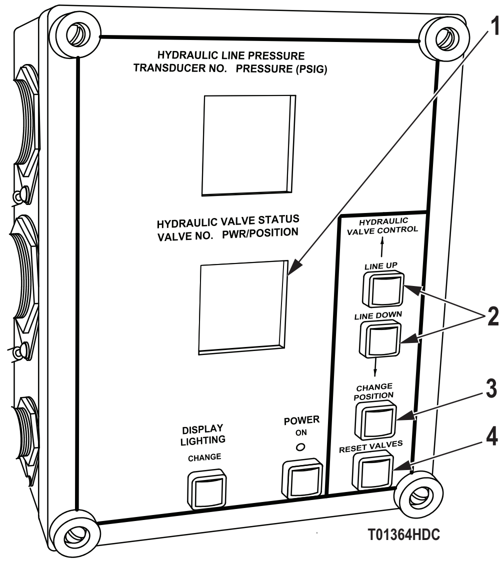



*Figure 45. Hydraulic Diagnostic Center (HDC) Control Box.*

c. No. 4 Left Actuator, No. 1 Left Actuator, and No. 1 Right Actuator manual procedure.

(1) Stop engine; relieve hydraulic pressure.

(2) Disconnect SPNSN UNIT-9 hose (Figure 46, Item 4) from elbow (Figure 46, Item 3) on port 9 (Figure 46, Item 1) of No. 1 right actuator (Figure 46, Item 7).

(3) Cap elbow (Figure 46, Item 3).

(4) Disconnect CORNER SPNSN UNIT-2 hose (Figure 46, Item 5) from elbow (Figure 46, Item 6) on port 2 (Figure 46, Item 8) of No. 1 right actuator (Figure 46, Item 7).

(5) Plug hose (Figure 46, Item 5).

(6) Connect hose (Figure 46, Item 4) to elbow (Figure 46, Item 6) on port 2 (Figure 46, Item 8).

(7) Catch oil in a graduated 2 gal. (7.6 L) container.

(8) With suspension in SPRUNG mode, start engine and check for leakage from ports 7 (Figure 46, Item 10), 7B (Figure 46, Item 9) and 17 (Figure 46, Item 2).

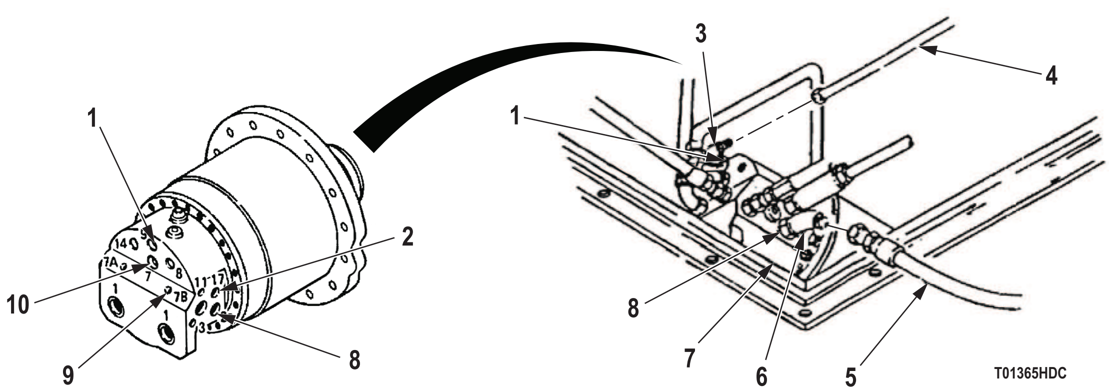



*Figure 46. Right-Hand Corner Actuators.*

## HYDRAULIC OIL OVERHEATS - Continued

(9) Stop engine; relieve hydraulic pressure.

**CONDITION/INDICATION**

Is leakage greater than 1/2 GPM (1.89 LPM)?

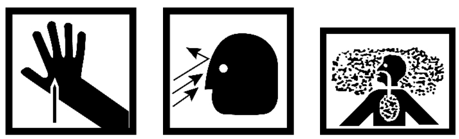
**DECISION**

YES - Reconnect hoses and Replace leaking actuator (TM 5-2320-262-20).
NO - Go to Step (35).

**STEP**

35. Perform a pressure test on all No. 1 or No. 4 actuator accumulators.

**WARNING**



- High-pressure nitrogen gas is used in this equipment. Keep hands and face away from valves and hose ends. Failure to comply may result in severe injury or death to personnel.
- Do not breathe nitrogen gas. Failure to comply may result in severe injury or death to personnel.

a. Connect pressure measuring device (Figure 47, Item 5) to bleed valve (Figure 47, Item 11) on charging harness (Figure 47, Item 4). Close shutoff valve (Figure 47, Item 3).

b. Open nitrogen tank valve (Figure 47, Item 1) and adjust regulator valve (Figure 47, Item 2) to 50 psi (353 kPa).

c. Open shutoff valve (Figure 47, Item 3) for about 10 seconds to clear charging hoses. Close shutoff valve (Figure 47, Item 3).

d. Remove charge valve cap (Figure 47, Item 8).

e. Loosely connect adapter valve (Figure 47, Item 9) to charge valve (Figure 47, Item 7) on actuator accumulator (Figure 47, Item 10).

f. Open shutoff valve (Figure 47, Item 3) for about 10 seconds.

g. Close shutoff valve (Figure 47, Item 3). Tighten adapter valve (Figure 47, Item 9).

h. Open charge valve (Figure 47, Item 7) by loosening nut (Figure 47, Item 6).

i. Read pressure measuring device (Figure 47, Item 5).

## HYDRAULIC OIL OVERHEATS - Continued

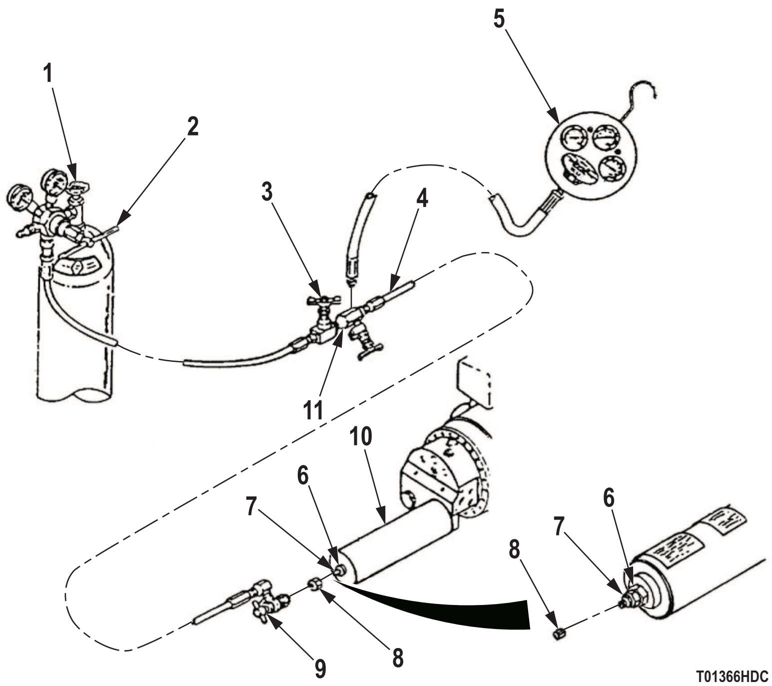



*Figure 47. Actuator Accumulator Pressure Test.*

### CONDITION/INDICATION

Is pressure 800-900 psi (5,516-6,206 kPa)?

### DECISION

YES - Go to Step (36).
NO - Go to Step (37).

## HYDRAULIC OIL OVERHEATS - Continued

### STEP

36. Remove all test equipment and connect hoses.
    a. Tighten nut (Figure 48, Item 4) on actuator accumulator (Figure 48, Item 7).
    b. Close nitrogen tank valve (Figure 48, Item 1) to ease pressure.
    c. Open bleed valve (Figure 48, Item 8), bleed line pressure to 0 psi.
    d. Remove adapter valve (Figure 48, Item 6) from actuator accumulator (Figure 48, Item 7).
    e. Remove pressure measuring device (Figure 48, Item 3) from bleed valve (Figure 48, Item 8) on charging harness (Figure 48, Item 2).
    f. Install valve cap (Figure 48, Item 5) on actuator accumulator (Figure 48, Item 7).

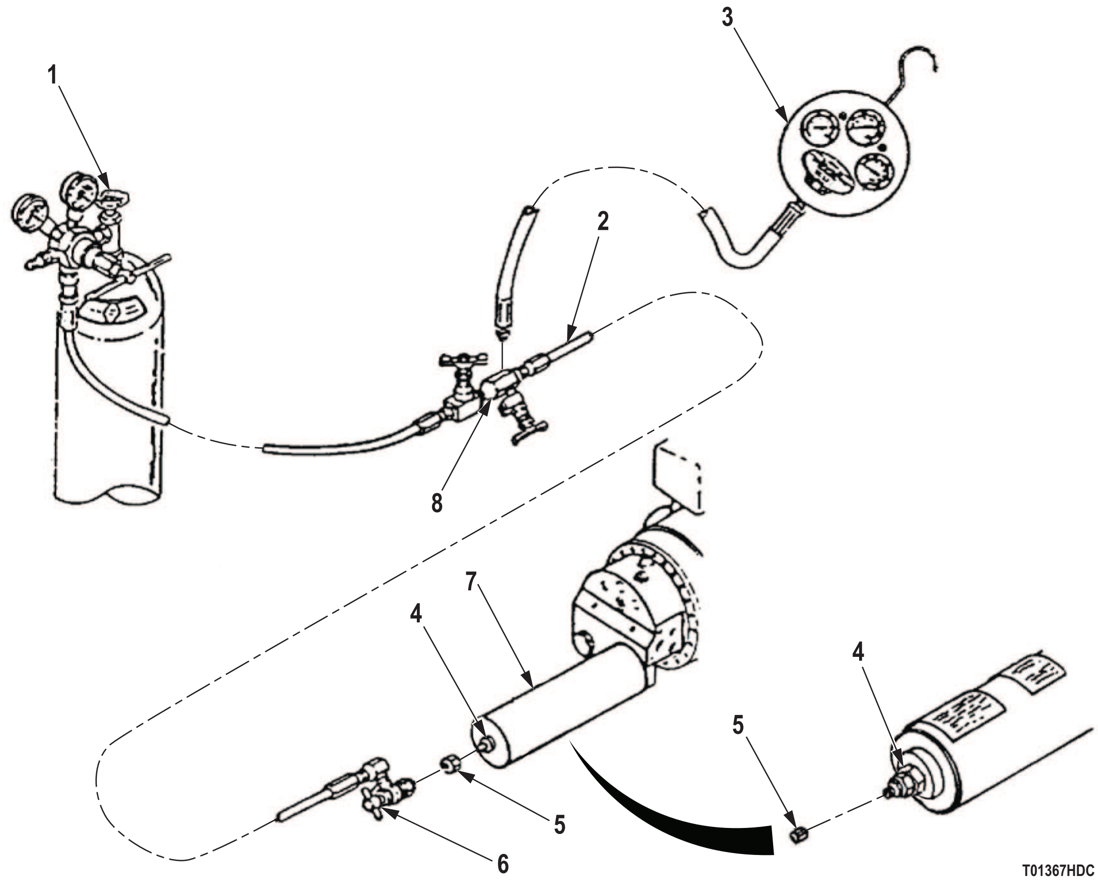



*Figure 48. Actuator Accumulator Pressure Test.*

### CONDITION/INDICATION

Is all test equipment removed?

### DECISION

YES - Verify with operator.
NO - Repeat Step (36).

**HYDRAULIC OIL OVERHEATS - Continued**

**STEP**

37. Charge actuator accumulator.

## CAUTION

Ensure regulator valve is fully backed off to relieve tension in diaphragm. Failure to comply may result in damage to equipment.

## NOTE

Have suitable container ready to catch oil.

a. Adjust regulator valve (Figure 49, Item 2) on nitrogen tank (Figure 49, Item 3) to 800-900 psi (5,516-6,206 kPa).

b. Open shutoff valve (Figure 49, Item 4). Read pressure measuring device (Figure 49, Item 5).

c. When pressure reaches 800-900 psi (5,516-6,206 kPa), close shutoff valve (Figure 49, Item 4), nitrogen tank valve (Figure 49, Item 1), and accumulator charge valve (Figure 49, Item 6).

d. Wait 15 minutes and open accumulator charge valve (Figure 49, Item 6).

e. Read pressure measuring device (Figure 49, Item 5) to determine if accumulator can retain charge.

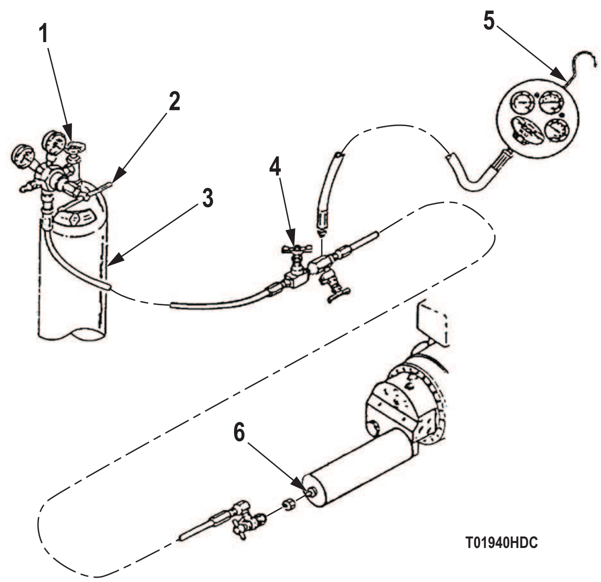



*Figure 49. Actuator Accumulator Charging.*

**CONDITION/INDICATION**

Can accumulator be charged to 800-900 psi (5,516-6,206 kPa)?

**DECISION**

YES - Go to Step (38).
NO - Remove all test equipment. Replace or repair actuator accumulator (TM 5-2320-262-20).

## HYDRAULIC OIL OVERHEATS - Continued

### STEP

38. Remove all test equipment.

    a. Tighten nut (Figure 50, Item 4) on charge valve (Figure 50, Item 5).

    b. Close nitrogen tank valve (Figure 50, Item 1).

    c. Back off regulator valve (Figure 50, Item 2), open bleed valve (Figure 50, Item 9), and bleed hose pressure to 0 psi.

    d. Remove adapter valve (Figure 50, Item 7) from charge valve (Figure 50, Item 5).

    e. Remove pressure measuring device (Figure 50, Item 3) from bleed valve (Figure 50, Item 9) on charging harness.

    f. Install charge valve cap (Figure 50, Item 6) on actuator accumulator (Figure 50, Item 8).

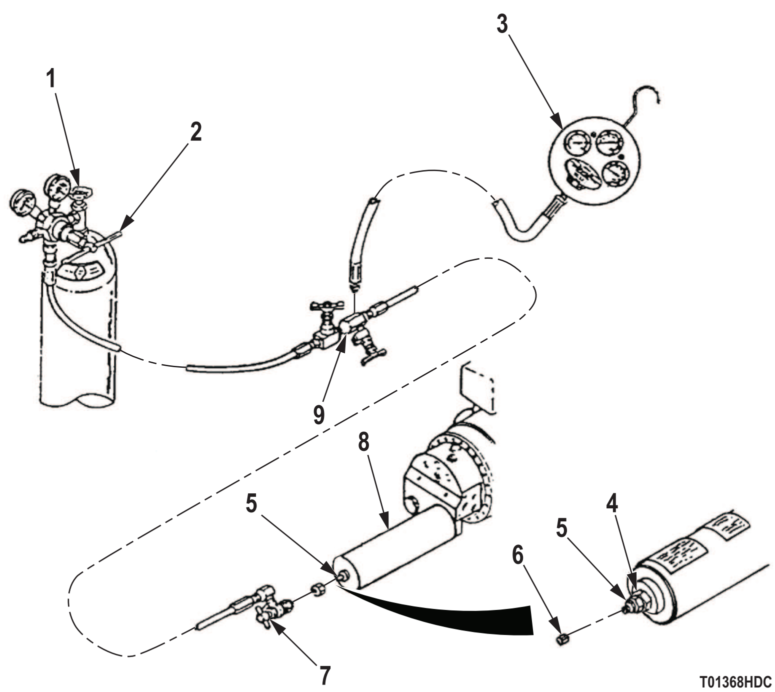



*Figure 50. Actuator Accumulator Charging.*

### CONDITION/INDICATION

Verify problem is solved.

### DECISION

YES - Problem is solved.
NO - Notify Supervisor.

### END OF WORK PACKAGE

## FIELD MAINTENANCE
## TROUBLESHOOTING PROCEDURES - LEFT REAR CORNER DOES NOT RAISE IN SPRUNG OR UNSPRUNG MODE

**INITIAL SETUP:**

**Tools and Special Tools**
Tool Kit, General Mechanic's: Automotive (WP 0054, Table 1, Item 7)
Parts Kit, Hydraulic (WP 0054, Table 1, Item 3)

**Personnel Required**
Construction Equipment Repairer, 91L (Two)

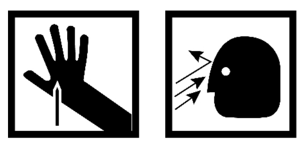
**References**
WP 0038

**Equipment Condition**
Vehicle MASTER power OFF (TM 5-2350-262-10)
Vehicle on jack stands (TM 5-2350-262-20)

### TROUBLESHOOTING PROCEDURE

### LEFT REAR CORNER DOES NOT RAISE IN SPRUNG OR UNSPRUNG MODE

**WARNING**



- High oil pressure is present in the M9 ACE hydraulic system. Do not disconnect any hydraulic system component unless hydraulic system pressure has been relieved. After hydraulic system has been relieved, wait at least four minutes before disconnecting any hose or fitting. Ensure each of the hydraulic control levers is moved several times through all positions and the hydraulic tank dipstick is slowly loosened to relieve pressure. Failure to comply may result in severe injury or death to personnel.
- Transmission shifting lines are pressurized. Do not disconnect lines, fittings, or accumulator unless transmission shift control valve pressure has been relieved. Discharge transmission shift accumulator by moving shift control lever through all forward and reverse ranges several times, with engine off. Failure to comply may result in severe injury to personnel.

**NOTE**

No. 4 left and right actuators provide vehicle suspension in SPRUNG mode and allow vehicle to raise and lower in UNSPRUNG mode. The compensating pump provides fluid through line 9 for SPRUNG mode and line 11 for UNSPRUNG mode.

**LEFT REAR CORNER DOES NOT RAISE IN SPRUNG OR UNSPRUNG MODE - Continued**

**STEP**

1. Perform actuator hose 9 flow test.

**NOTE**

Have suitable container ready to catch oil.

a. Stop engine; relieve hydraulic pressure. Disconnect REAR SPNSN UNIT-9 hose (Figure 1, Item 2) from port 9 (Figure 1, Item 1) on No. 4 left actuator (Figure 1, Item 3).

b. Cap port 9 (Figure 1, Item 1).

c. Connect drain hose to open end of REAR SPNSN UNIT-9 hose (Figure 1, Item 1).

d. Place end of drain hose in container and have assistant start engine.

e. Observe a free flow of oil from drain hose.

f. Stop engine; relieve hydraulic pressure.

**CONDITION/INDICATION**

Is there steady flow of hydraulic oil to actuator?

**DECISION**

YES - Go to Step (4).
NO - Go to Step (2).

**STEP**

2. Check for blockage in REAR SPNSN UNIT-9 hose.

**CONDITION/INDICATION**

Is there blockage?

**DECISION**

YES - Clear blockage or replace REAR SPNSN UNIT-9 hose. Reconnect hose to proper port.
NO - Go to Step (3).

**STEP**

3. Perform left manifold blockage test using Hydraulic Diagnostic Center (HDC).

a. Connect REAR SPNSN UNIT-9 hose (Figure 1, Item 2) to port 9 (Figure 1, Item 1) on No. 4 left actuator (Figure 1, Item 2)

**LEFT REAR CORNER DOES NOT RAISE IN SPRUNG OR UNSPRUNG MODE - Continued**

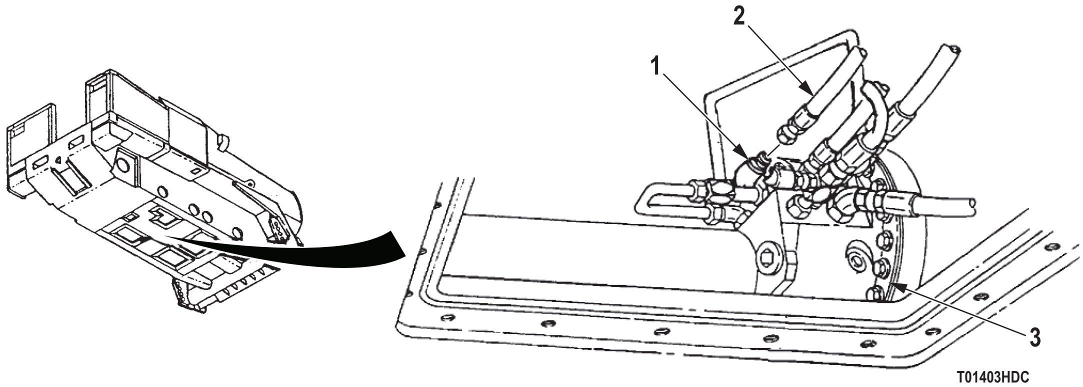



*Figure 1. No. 4 Left Actuator.*

b. Reset all HDC solenoid valves by selecting RESET VALVES button (Figure 2, Item 2) on HDC control box.

c. Start engine; read transducer T-7 hydraulic pressure on HDC display (Figure 2, Item 1).

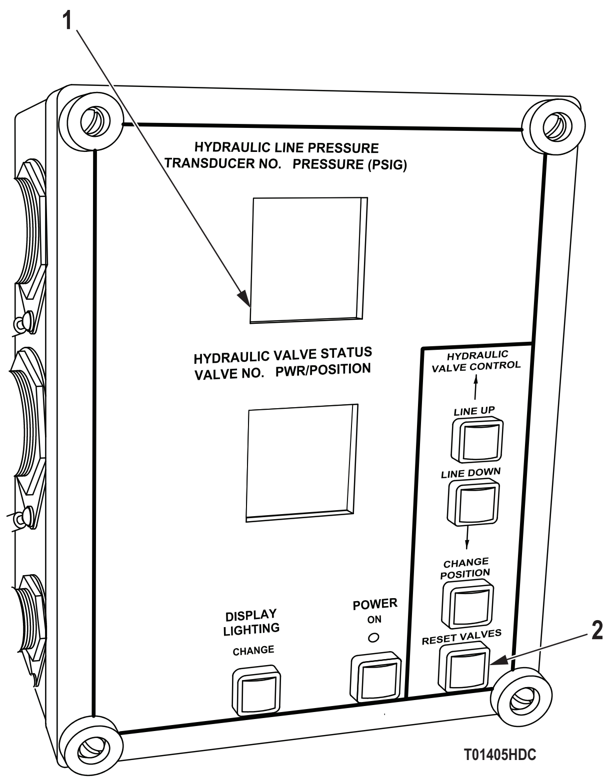



*Figure 2. Hydraulic Diagnostic Center (HDC) Control Box.*

d. Stop engine; relieve hydraulic pressure.

**CONDITION/INDICATION**

Is transducer T-7 hydraulic pressure at port 9 less than 2,500 PSI (17,238 KPA)?

## LEFT REAR CORNER DOES NOT RAISE IN SPRUNG OR UNSPRUNG MODE - Continued

### DECISION

YES - Clear blockage or replace manifold.
NO - Replace AFT manifold solenoid valve V4 (WP 0038).

### STEP

4. Perform No. 3 left actuator internal leakage test using HDC (pressure transducer T-7).
   a. Reset all HDC solenoid valves by selecting RESET VALVES button (Figure 3, Item 4) on HDC control box.
   b. Using LINE UP or LINE DOWN button (Figure 3, Item 2) on HDC control box, select V4 on HDC display (Figure 3, Item 1).
   c. Using the CHANGE POSITION button (Figure 3, Item 3), close V4 on HDC display (Figure 3, Item 1).
   d. Repeat steps and close V6 and open V18.
   e. Start engine and observe that transducer T-7 hydraulic pressure is greater than 2,500 psi (17,238 kPa).
   f. Less than 2,500 psi (17,238 kPa) indicates leakage from No. 3 left actuator.
   g. Stop engine; relieve hydraulic pressure.
   h. Using LINE UP or LINE DOWN button (Figure 3, Item 2) on HDC control box, select V4 on HDC display (Figure 3, Item 1).
   i. Using the CHANGE POSITION button (Figure 3, Item 3), open V4 on HDC display (Figure 3, Item 1).

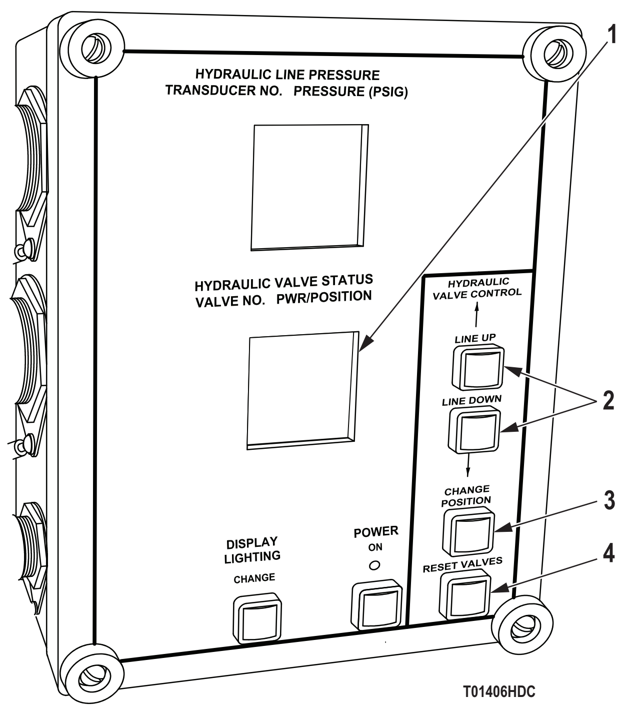



*Figure 3. Hydraulic Diagnostic Center (HDC) Control Box.*

   j. Repeat steps and open V7 and close V18.

**LEFT REAR CORNER DOES NOT RAISE IN SPRUNG OR UNSPRUNG MODE - Continued**

**CONDITION/INDICATION**

Is #3 left actuator leaking internally?

**DECISION**

YES - If transducer T-7 pressure is less than 2,500 psi (17,238 kPa), replace No. 3 left actuator (TM 5-2350-262-20).
NO - If transducer T-7 pressure is equal or greater than 2,500 psi (17,238 kPa), then go to Step (5).

**STEP**

5. Check for binding in No. 3 left actuator.

**NOTE**

Have suitable container ready to catch oil.

a. Disconnect INTMD SPNSN UNIT-2 hose (Figure 4, Item 10) from adapter (Figure 4, Item 9) at port 2 (Figure 4, Item 8), and disconnect LH 3 SPNSN UNIT-7 TEE tube (Figure 4, Item 1) and NO 3 SPNSN UNIT-7 TEE hose (Figure 4, Item 2) from elbow (Figure 4, Item 3) and tee (Figure 4, Item 4) at port 7 (Figure 4, Item 7) on No. 3 left actuator (Figure 4, Item 5).

b. Plug all lines.

c. Check for binding in No. 3 left actuator (Figure 4, Item 5) by using a prybar (Figure 4, Item 6) to determine if No. 3 lift road-wheel can be moved up or down.

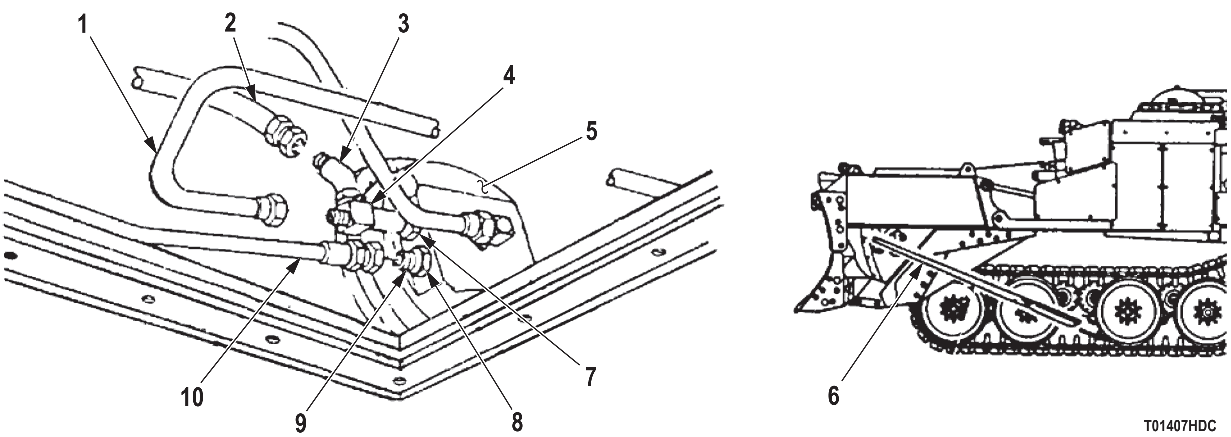



*Figure 4. No. 3 Left Actuator.*

d. Reconnect lines.

## LEFT REAR CORNER DOES NOT RAISE IN SPRUNG OR UNSPRUNG MODE - Continued

### CONDITION/INDICATION

Is #3 left actuator binding?

### DECISION

YES - Replace No. 3 left actuator (TM 5-2350-262-20).
NO - Replace No. 4 left actuator (TM 5-2350-262-20).

### END OF WORK PACKAGE

# FIELD MAINTENANCE
# TROUBLESHOOTING PROCEDURES - REAR OF VEHICLE RAISES IN SPRUNG, BUT NOT UNSPRUNG MODE

**INITIAL SETUP:**

**Tools and Special Tools**
Tool Kit, General Mechanic's: Automotive (WP 0054, Table 1, Item 7)
Parts Kit, Hydraulic (WP 0054, Table 1, Item 3)

**Materials/Parts**
Sealing Compound (WP 0053, Table 1, Item 3)
Pin, Cotter (WP 0055, Table 1, Item 1) Qty: 1

**Personnel Required**
Construction Equipment Repairer, 91L (Two)

**References**
TM 5-2350-262-20
WP 0038

**Equipment Condition**
Vehicle MASTER power OFF (TM 5-2350-262-10)
Vehicle on jack stands (TM 5-2350-262-20)

## TROUBLESHOOTING PROCEDURE

## REAR OF VEHICLE RAISES IN SPRUNG, BUT NOT UNSPRUNG MODE

### WARNING

- High oil pressure is present in the M9 ACE hydraulic system. Do not disconnect any hydraulic system component unless hydraulic system pressure has been relieved. After hydraulic system has been relieved, wait at least four minutes before disconnecting any hose or fitting. Ensure each of the hydraulic control levers is moved several times through all positions and the hydraulic tank dipstick is slowly loosened to relieve pressure. Failure to comply may result in severe injury or death to personnel.
- Transmission shifting lines are pressurized. Do not disconnect lines, fittings, or accumulator unless transmission shift control valve pressure has been relieved. Discharge transmission shift accumulator by moving shift control lever through all forward and reverse ranges several times, with engine off. Failure to comply may result in severe injury to personnel.

### NOTE

The rear of the vehicle is raised by left and right actuators, interconnected by hydraulic circuit 8. The SPRUNG and UNSPRUNG circuits operate left and right rear actuators through valves and mechanical controls. Circuit 9 operates SPRUNG mode; circuit 11 operates UNSPRUNG mode.

**REAR OF VEHICLE RAISES IN SPRUNG, BUT NOT UNSPRUNG MODE - Continued**

**STEP**

1. Perform port 8 check valve flow test.

## NOTE

Have suitable container ready to catch oil.

a. Stop engine; relieve hydraulic pressure.

b. Disconnect LH 4 SPNSN UNIT-8 hose (Figure 1, Item 5) from check valve (Figure 1, Item 3) at port 8 (Figure 1, Item 1) on No. 4 left actuator (Figure 1, Item 2).

c. Plug end of LH 4 SPNSN UNIT-8 hose (Figure 1, Item 5).

d. Connect drain hose to check valve (Figure 1, Item 3).

e. While holding end of drain hose in container, have assistant start engine and move SPRUNG/ UNSPRUNG lever to SPRUNG mode.

f. Observe for steady flow of oil from drain hose.

g. Vehicle should raise.

h. Stop engine; relieve hydraulic pressure and connect line.

**CONDITION/INDICATION**

Does hydraulic oil flow freely through check valve?

**DECISION**

YES - Go to Step (6).
NO - Go to Step (2).

**STEP**

2. Perform check valve inspection.

a. Inspect check valve (Figure 1, Item 3).

b. Ensure arrow (Figure 1, Item 4) points away from actuator (Figure 1, Item 2).

c. Connect LH 4 SPNSN UNIT-8 hose (Figure 1, Item 5) to check valve (Figure 1, Item 3) at port 8 (Figure 1, Item 1).

**REAR OF VEHICLE RAISES IN SPRUNG, BUT NOT UNSPRUNG MODE - Continued**

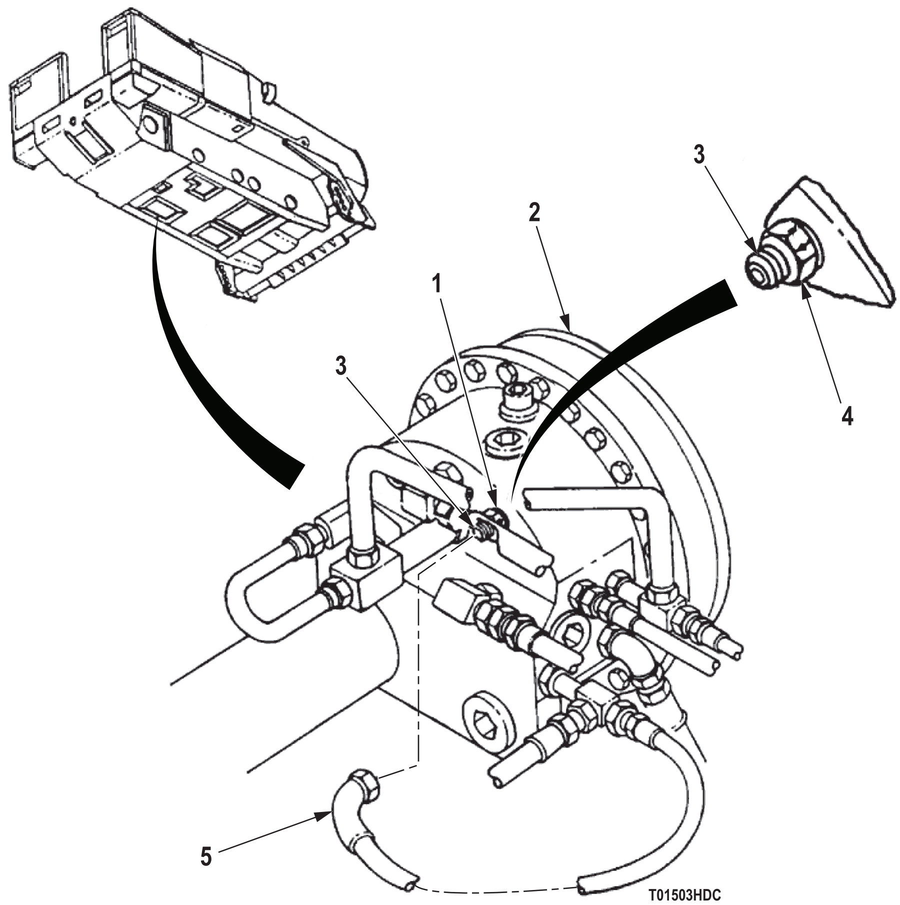



*Figure 1. No. 4 Left Actuator Port 8 Check Valve.*

**CONDITION/INDICATION**

Is valve installed correctly?

**DECISION**

YES - Go to Step (3).
NO - Install valve correctly. Verify problem is solved.

**STEP**

3. Check for blockage in check valve.

**CONDITION/INDICATION**

Is check valve plugged?

**DECISION**

YES - Clear blockage or replace check valve (TM 5-2350-262-20). Verify problem is solved.
NO - Go to Step (4).

## REAR OF VEHICLE RAISES IN SPRUNG, BUT NOT UNSPRUNG MODE - Continued

### STEP

4. Perform actuator hose 9 flow test.

**NOTE**

Have suitable container ready to catch oil.

a. Disconnect REAR SPNSN UNIT-#9 hose (Figure 2, Item 2) at port 9 (Figure 2, Item 1) on No. 4 left actuator (Figure 2, Item 3).

b. Cap port 9.

c. Connect a drain hose to open end of REAR SPNSN UNIT-#9 hose (Figure 2, Item 2).

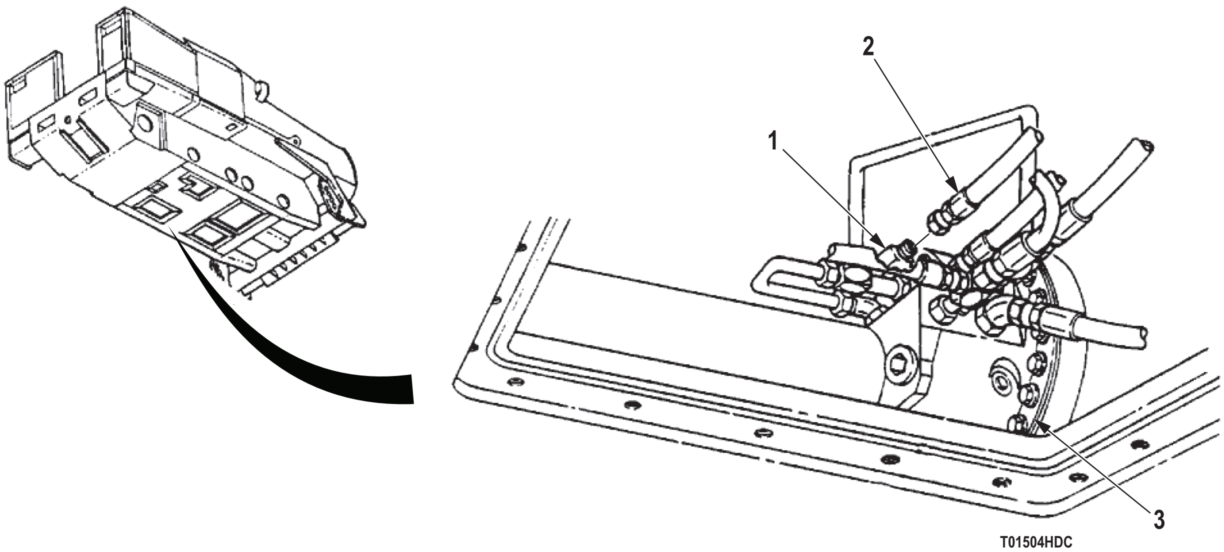



*Figure 2. No. 4 Left Actuator.*

d. Hold free end of drain hose in clean container.

e. Have assistant start engine and move SPRUNG/UNSPRUNG lever to UNSPRUNG.

f. Look for a steady flow of oil from drain hose.

g. Stop engine; relieve hydraulic pressure and connect hose.

### CONDITION/INDICATION

Is there a steady flow of oil?

### DECISION

YES - Go to Step (7).
NO - Go to Step (5).

**REAR OF VEHICLE RAISES IN SPRUNG, BUT NOT UNSPRUNG MODE - Continued**

**STEP**

5. Check for blockage in REAR SPNSN UNIT-#9 hose.

**CONDITION/INDICATION**

Is there blockage?

**DECISION**

YES - Clear blockage or replace hose (TM 5-2350-262-20).
NO - Go to Step (13).

**STEP**

6. Check for blockage in LH 4 SPNSN UNIT-#8 hose.

**CONDITION/INDICATION**

Is there blockage?

**DECISION**

YES - Clear blockage or replace hose (TM 5-2350-262-20).
NO - Go to Step (7).

## REAR OF VEHICLE RAISES IN SPRUNG, BUT NOT UNSPRUNG MODE - Continued

### STEP

7. Perform actuator port 11 pressure test using Hydraulic Diagnostic Center (HDC).
   a. Reset all HDC solenoid valves by selecting RESET VALVES button (Figure 3, Item 5) on HDC control box.
   b. Using LINE UP or LINE DOWN button (Figure 3, Item 3) on HDC control box, select V8 on HDC display (Figure 3, Item 2).
   c. Using CHANGE POSITION button (Figure 3, Item 4), close V8 on HDC display (Figure 3, Item 2).
   d. Have assistant start engine and move SPRUNG/UNSPRUNG lever to UNSPRUNG.
   e. Observe transducer T-12 hydraulic pressure on HDC display (Figure 3, Item 1).
   f. Using LINE UP or LINE DOWN button (Figure 3, Item 3) on HDC control box, select V8 on HDC display (Figure 3, Item 2).
   g. Using CHANGE POSITION button (Figure 3, Item 4), open V8 on HDC display (Figure 3, Item 2).

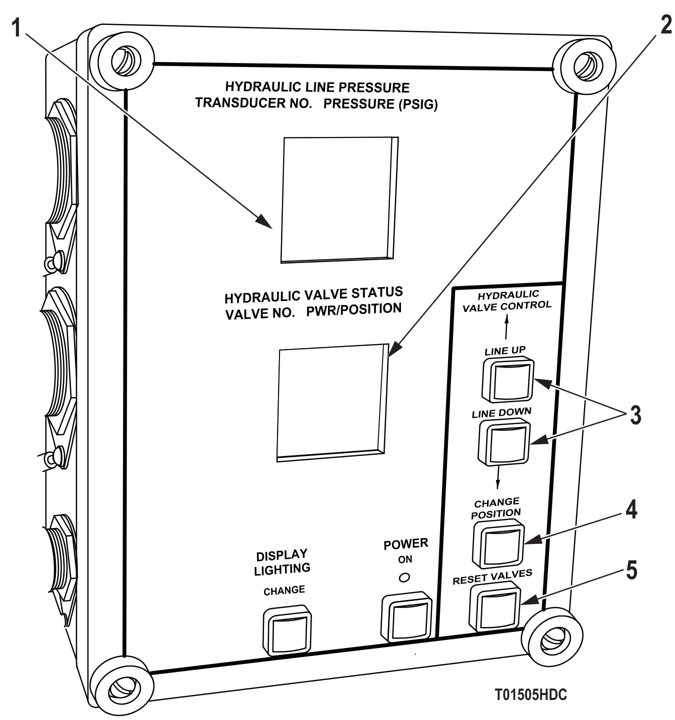



*Figure 3. Hydraulic Diagnostic Center (HDC) Control Box.*

   h. Stop engine; relieve hydraulic pressure.

### CONDITION/INDICATION

Is transducer T-12 hydraulic pressure greater than 2,500 psi (17,238 kPa)?

### DECISION

YES - Go to Step (11).
NO - Go to Step (8).

## REAR OF VEHICLE RAISES IN SPRUNG, BUT NOT UNSPRUNG MODE - Continued

### STEP

8. Check SPRUNG/UNSPRUNG control valve linkage.
    a. Hold measuring device (Figure 4, Item 1) on face of SPRUNG/UNSPRUNG control valve (Figure 4, Item 3).
    b. Have assistant move SPRUNG/UNSPRUNG lever between SPRUNG and UNSPRUNG modes.
    c. Measure distance that plunger (Figure 4, Item 2) travels as lever is moved.

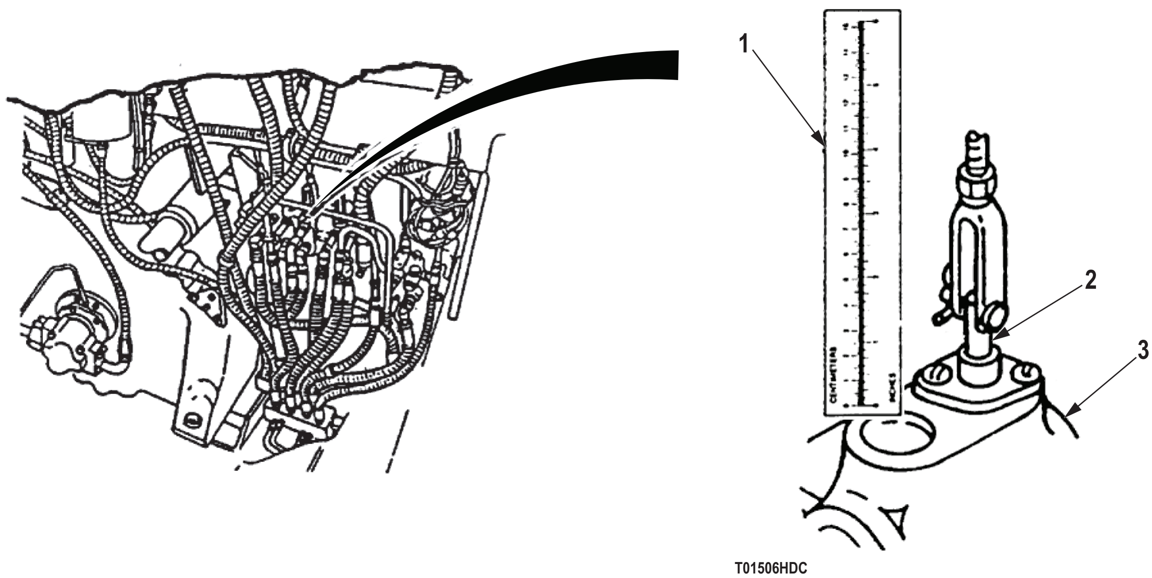



*Figure 4. SPRUNG/UNSPRUNG Control Valve Linkage.*

    d. Distance of travel should be 9/32 in. (7 mm).

### CONDITION/INDICATION

Is linkage adjusted correctly?

### DECISION

YES - Go to Step (9).
NO - Go to Step (10).

## REAR OF VEHICLE RAISES IN SPRUNG, BUT NOT UNSPRUNG MODE - Continued

### STEP

9. Perform SPRUNG/UNSPRUNG control valve operation test using HDC.
   a. Reset all HDC solenoid valves by selecting RESET VALVES button (Figure 5, Item 2) on HDC control box.
   b. Start engine and have assistant move SPRUNG/UNSPRUNG lever between SPRUNG and UNSPRUNG several times.
   c. Observe transducer T-12 hydraulic pressure on HDC display (Figure 5, Item 1).

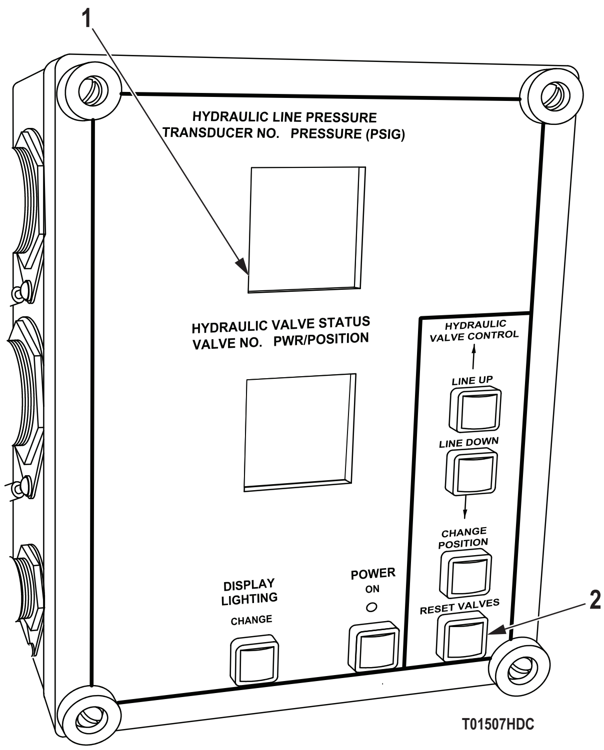



*Figure 5. Hydraulic Diagnostic Center (HDC) Control Box.*

   d. Hydraulic pressure should be less than 145 psi (1,000 kPa) in SPRUNG mode and greater than 2,500 psi (17,238 kPa) in UNSPRUNG mode.
   e. Stop engine; relieve hydraulic pressure.

### CONDITION/INDICATION

Is valve operating correctly?

### DECISION

YES - Verify problem with operator.
NO - Replace SPRUNG/UNSPRUNG control valve (TM 5-2350-262-20).

### STEP

10. Adjust SPRUNG/UNSPRUNG control valve linkage.

**REAR OF VEHICLE RAISES IN SPRUNG, BUT NOT UNSPRUNG MODE - Continued**

## WARNING

Do not operate ejector when personnel are in bowl. Do not work in bowl unless ejector lock is engaged. Failure to comply may result in severe injury or death to personnel.

## NOTE

All control rods are adjusted same way. This procedure covers the SPRUNG/UNSPRUNG control rod.

a. Note position of control valve plunger (Figure 6, Item 1) when SPRUNG/UNSPRUNG control lever is in neutral (off) position.

## NOTE

Normal control valve plunger travel is 9/32 in. (7mm).

b. Remove cotter pin (Figure 6, Item 2), straight pin (Figure 6, Item 6), and clevis (Figure 6, Item 5) from control valve plunger (Figure 6, Item 1).

c. Discard cotter pin (Figure 6, Item 2).

d. Loosen jam nut (Figure 6, Item 4), turn clevis (Figure 6, Item 5) clockwise to shorten rod (Figure 6, Item 3) and counterclockwise to lengthen rod (Figure 6, Item 3) as necessary to obtain correct valve plunger (Figure 6, Item 1) travel.

e. Hold measuring device (Figure 6, Item 7) on face of SPRUNG/UNSPRUNG control valve.

f. Have assistant move SPRUNG/UNSPRUNG lever between SPRUNG and UNSPRUNG mode.

g. Measure distance of plunger travel.

h. When rod (Figure 6, Item 3) is adjusted for desired length of travel, coat thread of rod (Figure 6, Item 3) with sealing compound primer and sealing compound.

i. Tighten jam nut (Figure 6, Item 4) against clevis (Figure 6, Item 5).

j. Connect clevis (Figure 6, Item 5) to control valve plunger (Figure 6, Item 1) with straight pin (Figure 6, Item 6) and new cotter pin (Figure 6, Item 2).

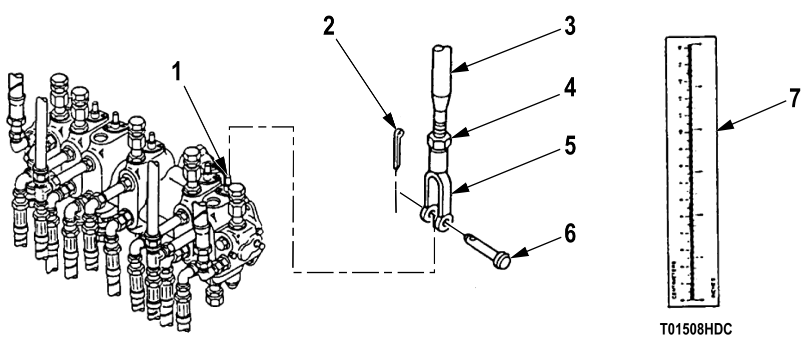



*Figure 6. SPRUNG/UNSPRUNG Control Valve Control Rod Travel.*

## REAR OF VEHICLE RAISES IN SPRUNG, BUT NOT UNSPRUNG MODE - Continued

### CONDITION/INDICATION

Can linkage be adjusted?

### DECISION

YES - Verify problem is solved.
NO - Repair or replace control valve linkage (TM 5-2350-262-20).

### STEP

11. Check REAR SPNSN UNIT-#11 hose for blockage.

### CONDITION/INDICATION

Is there blockage?

### DECISION

YES - Clear blockage or replace hose (TM 5-2350-262-20). Verify problem is solved.
NO - Go to Step (12).

### STEP

12. Check left main manifold II hose to aft manifold for blockage.

### CONDITION/INDICATION

Is there blockage?

### DECISION

YES - Clear blockage or replace hose (TM 5-2350-262-20). Verify problem is solved.
NO - Replace solenoid valve V8 on HDC aft manifold (WP 0038).

### STEP

13. Perform left manifold blockage test using HDC.
    a. Stop engine; relieve hydraulic pressure.
    b. Reset all HDC solenoid valves by selecting RESET VALVES button (Figure 7, Item 2) on HDC control box.
    c. Start engine; read transducer T-7 hydraulic pressure on HDC display (Figure 7, Item 1).

**REAR OF VEHICLE RAISES IN SPRUNG, BUT NOT UNSPRUNG MODE - Continued**

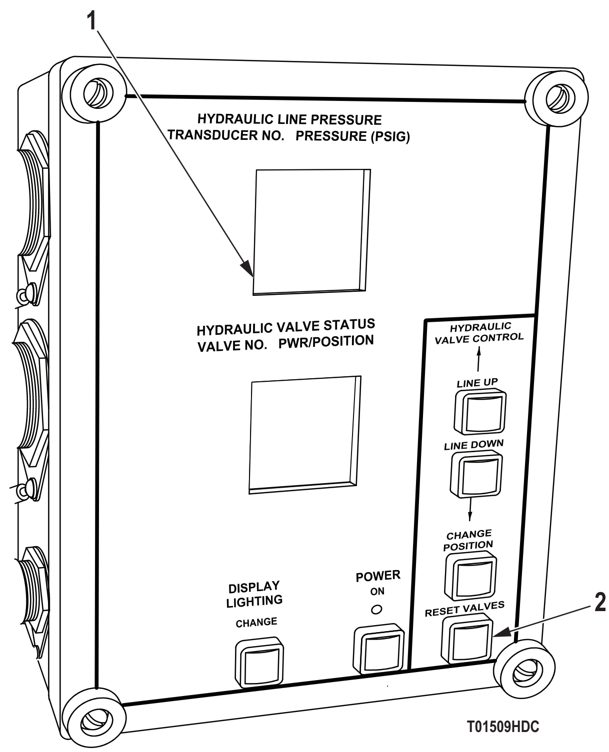



*Figure 7. Hydraulic Diagnostic Center (HDC) Control Box.*

d. Stop engine; relieve hydraulic pressure.

**CONDITION/INDICATION**

Is port 9 transducer T-7 hydraulic pressure less than 2,500 psi (17, 238 kPa)?

**DECISION**

YES - Clear blockage or replace left manifold (TM 5-2350-262-20). Verify problem is solved.
NO - Verify problem with operator.

**END OF WORK PACKAGE**

## FIELD MAINTENANCE
## TROUBLESHOOTING PROCEDURES - VEHICLE DOES NOT RESPOND TO OPERATOR CONTROLS

**INITIAL SETUP:**

**Tools and Special Tools**
Tool Kit, General Mechanic's: Automotive
(WP 0054, Table 1, Item 7)

**Personnel Required**
Construction Equipment Repairer, 91L (Three)

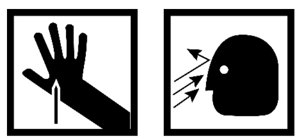
**References**
WP 0006

**Equipment Condition**
Vehicle MASTER power OFF (TM 5-2350-262-10)
Vehicle on jack stands (TM 5-2350-262-20)

**TROUBLESHOOTING PROCEDURE**

**VEHICLE DOES NOT RESPOND TO OPERATOR CONTROLS**

**WARNING**



- High oil pressure is present in the M9 ACE hydraulic system. Do not disconnect any hydraulic system component unless hydraulic system pressure has been relieved. After hydraulic system has been relieved, wait at least four minutes before disconnecting any hose or fitting. Ensure each of the hydraulic control levers is moved several times through all positions and the hydraulic tank dipstick is slowly loosened to relieve pressure. Failure to comply may result in severe injury or death to personnel.
- Transmission shifting lines are pressurized. Do not disconnect lines, fittings, or accumulator unless transmission shift control valve pressure has been relieved. Discharge transmission shift accumulator by moving shift control lever through all forward and reverse ranges several times, with engine off. Failure to comply may result in severe injury to personnel.

**NOTE**

- Valve bank hydraulic system is supplied by hydraulic ports 13L and 13R. Pressure is controlled by relief valves 13L and 13R.
- Perform this procedure when all operator controls are inoperative. Refer to vehicle hydraulic system schematic diagram (FP-1 through FP-6).

## VEHICLE DOES NOT RESPOND TO OPERATOR CONTROLS - Continued

### STEP

1. Check if vehicle can move under its own power.

### CONDITION/INDICATION

Does vehicle move under its own power?

### DECISION

YES - Go to Step (2).
NO - Refer to Step (1) of All Hydraulic Functions Inoperative troubleshooting symptom (WP 0006).

### STEP

2. Perform oil flow test.

## NOTE

- Three personnel are required to perform this test.
- Have suitable container ready to catch oil.

a. Stop engine; relieve hydraulic pressure.

b. Disconnect HYDR FLTR-IN-13R hose (Figure 1, Item 2) from high-pressure filter inlet port 13R (Figure 1, Item 1).

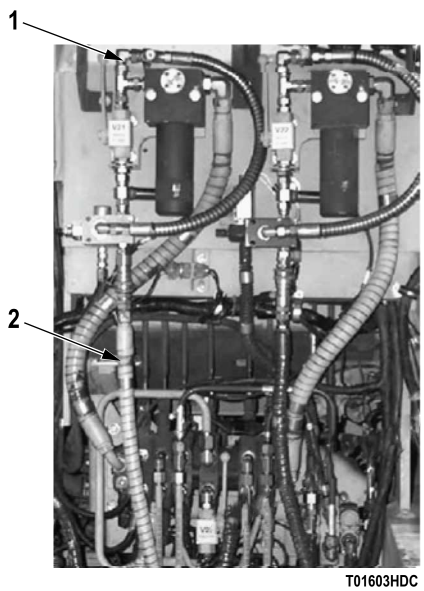



*Figure 1. High-Pressure Filter Inlet Port 13R.*

c. While assistant one is holding disconnected end of hose (Figure 1, Item 2) over container, assistant two will hold fuel solenoid shutoff toggle switch (Figure 2, Item 2) on STE/ICE-R interface box (Figure 2, Item 1) in shutoff position.

**VEHICLE DOES NOT RESPOND TO OPERATOR CONTROLS - Continued**

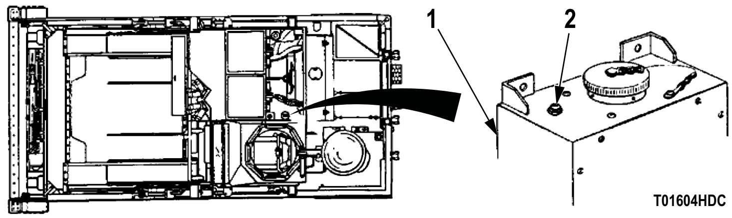



*Figure 2. STE/ICE-R Interface Box.*

d. Crank engine for approximately 15 seconds.

e. Hydraulic oil should flow freely.

**CONDITION/INDICATION**

Is there hydraulic oil flow from main hydraulic pump?

**DECISION**

YES - Go to Step (4).
NO - Go to Step (3).

**STEP**

3. Perform suction hose check.

**NOTE**

Have suitable container ready to catch oil.

a. Loosen PUMP SUCT TUBE-7 hose (Figure 3, Item 1) approximately three-quarters of the way at main hydraulic pump (Figure 3 Item 2).

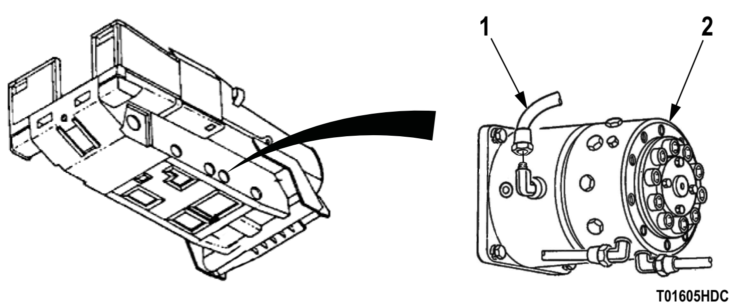



*Figure 3. Main Hydraulic Pump Suction Hose.*

b. Hydraulic oil should flow freely.

**CONDITION/INDICATION**

Is suction hose blocked?

**DECISION**

YES - Clear blockage or replace hose (TM 5-2350-262-20).
NO - Go to Step (4).

**VEHICLE DOES NOT RESPOND TO OPERATOR CONTROLS - Continued**

**STEP**

4. Perform main hydraulic pump pressure test using Hydraulic Diagnostic Center (HDC).

**WARNING**

- Before performing any troubleshooting in bowl, move ejector forward and engage ejector lock. Failure to comply may result in severe injury or death to personnel.
- Ensure right main hydraulic pressure inhibit valve V21 is fully opened prior to starting vehicle. A fully or partially closed valve will cause immediate high pressure. Failure to comply may result in damage to equipment and injury to personnel.

a. Stop engine; relieve hydraulic pressure (if not previously done).

b. Ensure right main hydraulic pressure inhibit valve V21 (Figure 4, Item 1) is fully opened.

c. Reset all HDC solenoid valves by selecting RESET VALVES button (Figure 5, Item 5) on HDC control box.

d. Disable ejector by manually closing ejector inhibit ball valve V23 (Figure 4, Item 2) on DCV bank.

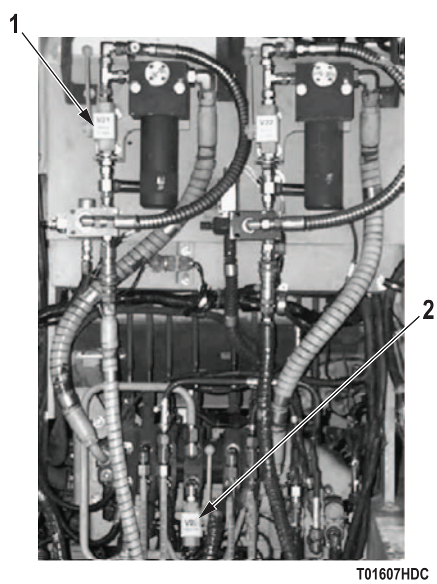



*Figure 4. No. 4 Left Actuator.*

e. Using LINE UP or LINE DOWN button (Figure 5, Item 3), select V1 on HDC display (Figure 5, Item 2).

f. Close V1 on HDC display (Figure 5, Item 2) by selecting CHANGE POSITION button (Figure 5, Item 4) on HDC control box.

g. Have assistant start engine and allow engine to idle (750-800 rpm).

h. Slowly close right main hydraulic pressure inhibit valve V21 (Figure 4, Item 1) until transducer T-3 on HDC display (Figure 5, Item 1) indicates 3,950-4,050 psi (27,235-27,925 kPa).

## VEHICLE DOES NOT RESPOND TO OPERATOR CONTROLS - Continued

i. Fully open right main hydraulic pressure inhibit valve V21 (Figure 4, Item 1).

j. Stop engine; relieve hydraulic pressure.

k. Manually open ejector inhibit ball valve V23 (Figure 4, Item 2) on DCV bank.

l. Ensure both valves are fully open.

m. Using LINE UP or LINE DOWN button (Figure 5, Item 3), select V1 on HDC display (Figure 5, Item 2).

n. Open V1 on HDC display (Figure 5, Item 2) by selecting CHANGE POSITION button (Figure 5, Item 4) on HDC control box.

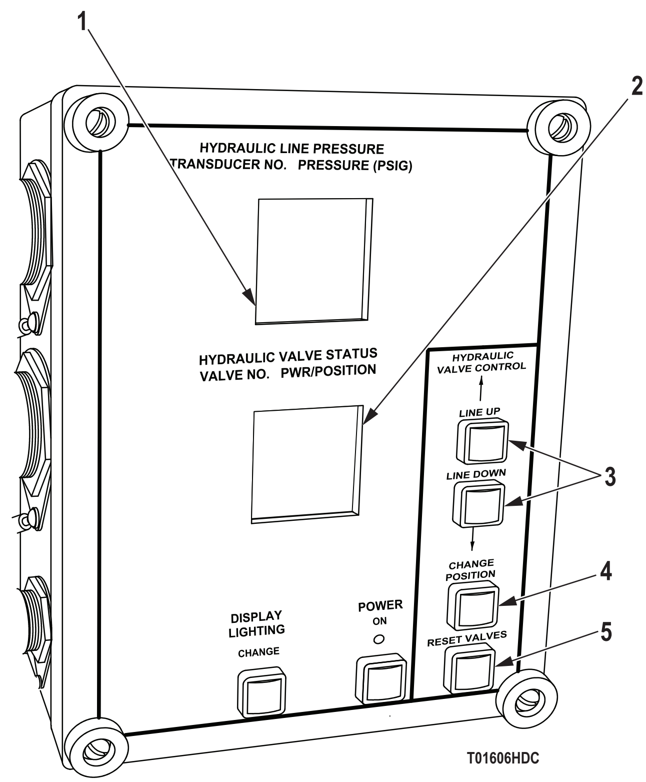



*Figure 5. Hydraulic Diagnostic Center (HDC) Control Box.*

### CONDITION/INDICATION

Does transducer T-3 main hydraulic pump pressure read 3,950-4,050 psi (27,235-27,925 kPa)?

### DECISION

YES - Go to Step (5).
NO - Replace main hydraulic pump (TM 5-2350-262-20).

## VEHICLE DOES NOT RESPOND TO OPERATOR CONTROLS - Continued

### STEP

5. Perform control valve flow test.

**NOTE**

Have suitable container ready to catch oil.

a. Start engine.

b. Remove cap (Figure 6, Item 1) from hydraulic system sample valve (Figure 6, Item 2).

c. Open valve (Figure 6, Item 2) by turning it clockwise.

d. Hold valve (Figure 6, Item 2) open for several seconds.

e. Oil should flow freely from sample valve (Figure 6, Item 2).

f. Close valve (Figure 6, Item 2), and replace cap (Figure 6, Item 1).

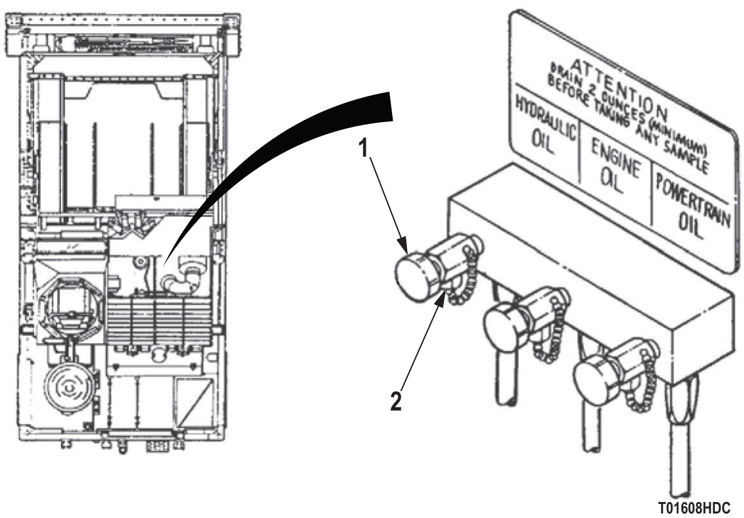



*Figure 6. Hydraulic System Sample Control Valve.*

g. Stop engine; relieve hydraulic pressure.

### CONDITION/INDICATION

Is there a flow of oil?

### DECISION

YES - Go to Step (6).
NO - Replace Directional Control Valve (DCV) bank (TM 5-2350-262-20).

**VEHICLE DOES NOT RESPOND TO OPERATOR CONTROLS - Continued**

**STEP**

6. Perform main relief valve test using HDC.

   a. Stop engine; relieve hydraulic pressure (if not already done).

   b. Reset all HDC solenoid valves by selecting RESET VALVES button (Figure 7, Item 1) on HDC control box.

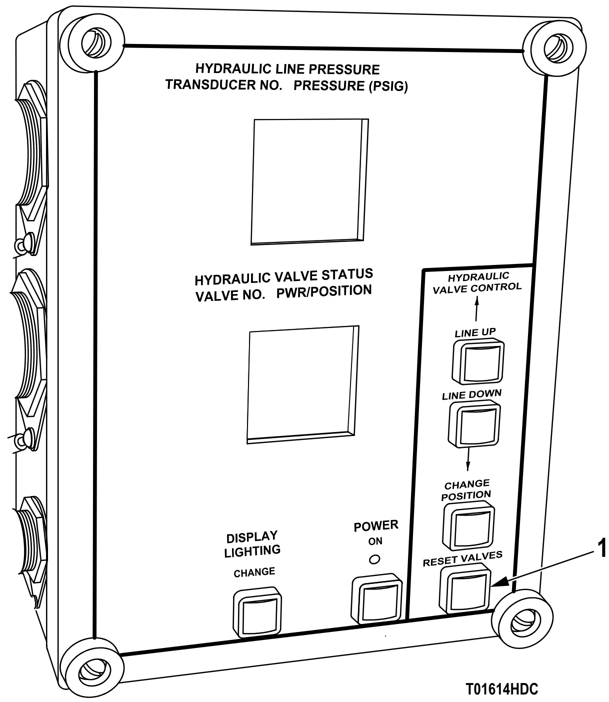



*Figure 7. Hydraulic Diagnostic Center (HDC) Control Box.*

## VEHICLE DOES NOT RESPOND TO OPERATOR CONTROLS - Continued

c. Disable ejector by manually closing ejector inhibit ball valve V23 (Figure 8, Item 1) on DCV bank.

d. Using LINE UP or LINE DOWN button (Figure 9, Item 3), select V1 on HDC display (Figure 9, Item 2).

e. Close V1 on HDC display (Figure 9, Item 2) by selecting CHANGE POSITION button (Figure 9, Item 4) on HDC control box.

f. Have assistant start engine, move SPRUNG/UNSPRUNG lever to SPRUNG and move EJECTOR CONTROL lever to BACK.

g. Read transducer T-3 hydraulic pressure on HDC display (Figure 9, Item 1).

h. While holding EJECTOR CONTROL lever to BACK, have assistant move right-hand SUSPENSION CONTROL lever to RAISE.

i. Read transducer T-3 hydraulic pressure on HDC display (Figure 8, Item 1).

j. Stop engine; relieve hydraulic pressure.

k. Enable ejector by manually opening ejector inhibit ball valve V23 (Figure 8, Item 1) on DCV bank.

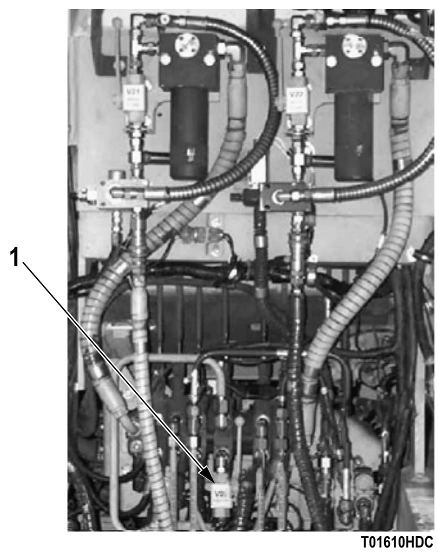



*Figure 8. Directional Control Valve (DCV) Bank.*

l. Using LINE UP or LINE DOWN button (Figure 9, Item 3), select V1 on HDC display (Figure 9, Item 2).

m. Open V1 on HDC display (Figure 9, Item 2) by selecting CHANGE POSITION button (Figure 9, Item 4) on HDC control box.

## VEHICLE DOES NOT RESPOND TO OPERATOR CONTROLS - Continued

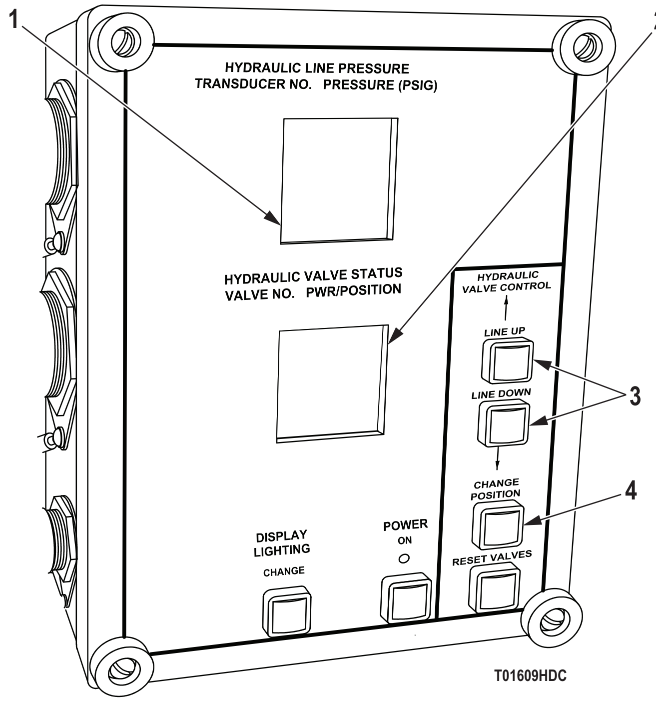



*Figure 9. Hydraulic Diagnostic Center (HDC) Control Box.*

## CONDITION/INDICATION

Is transducer T-3 pressure between 3,950-4,050 psi (27,235-27,925 kPa)?

## DECISION

YES - Verify problem with operator.
NO - Go to Step (7).

## VEHICLE DOES NOT RESPOND TO OPERATOR CONTROLS - Continued

**STEP**

7. Perform main relief valve adjustment using HDC.

   a. Reset all HDC solenoid valves by selecting RESET VALVES button (Figure 11, Item 4) on HDC control box.

### WARNING

- Do not operate ejector when personnel are in bowl. Do not work in bowl unless ejector lock is engaged. Failure to comply may result in severe injury or death to personnel.
- Do not stand or work in bowl area unless ejector lock is engaged. Do not stand in bowl to observe roller guide travels. Failure to comply may result in severe injury or death to personnel.
- When folding dozer blade, work on blade latches from side of vehicle only. Do not stand in front of dozer blade while retracting ejector. Failure to comply may result in severe injury or death to personnel.

   b. Disable ejector by manually closing ejector inhibit ball valve V23 (Figure 10, Item 1) on DCV bank.

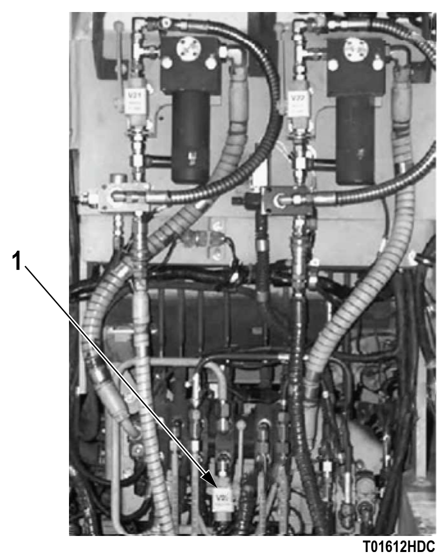



*Figure 10. Directional Control Valve (DCV) Bank.*

   c. Using LINE UP or LINE DOWN button (Figure 11, Item 2), select V1 on HDC display (Figure 11, Item 1).

   d. Close V1 on HDC display (Figure 11, Item 1) by selecting CHANGE POSITION button (Figure 11, Item 3) on HDC control box.

**VEHICLE DOES NOT RESPOND TO OPERATOR CONTROLS - Continued**

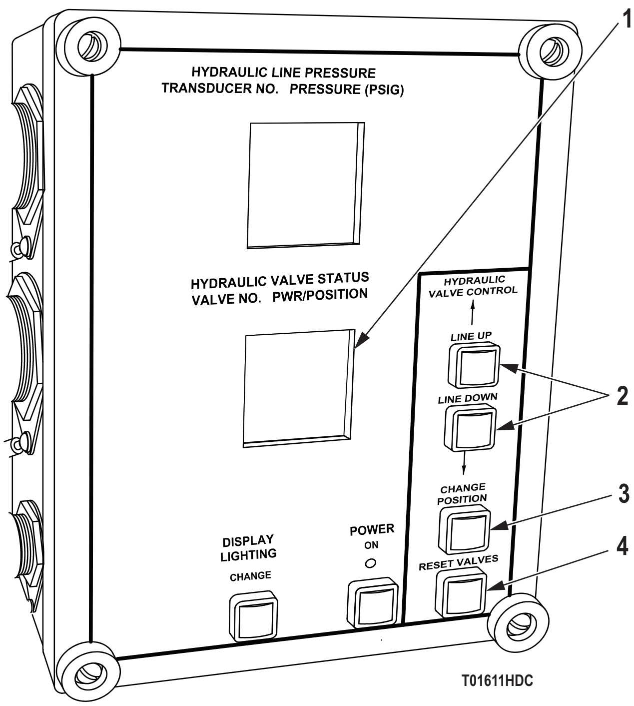



*Figure 11. Hydraulic Diagnostic Center (HDC) Control Box.*

e. Loosen jam nut (Figure 12, Item 3) on main relief valve 13R (Figure 12, Item 1).

f. Have assistant start engine and simultaneously hold EJECTOR CONTROL lever in BACK while holding right-hand SUSPENSION CONTROL lever to RAISE.

g. Rotate adjusting screw (Figure 12, Item 2) clockwise to increase pressure and counterclockwise to decrease pressure as necessary to obtain desired pressure.

h. Tighten jam nut (Figure 12, Item 3).

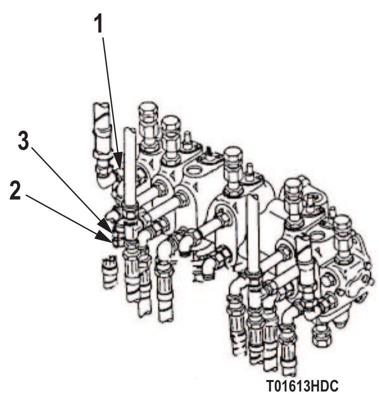



*Figure 12. Main Relief Valve 13R.*

## VEHICLE DOES NOT RESPOND TO OPERATOR CONTROLS - Continued

i. Stop engine; relieve hydraulic pressure.

j. Enable ejector by manually opening ejector inhibit ball valve V23 (Figure 13, Item 1).

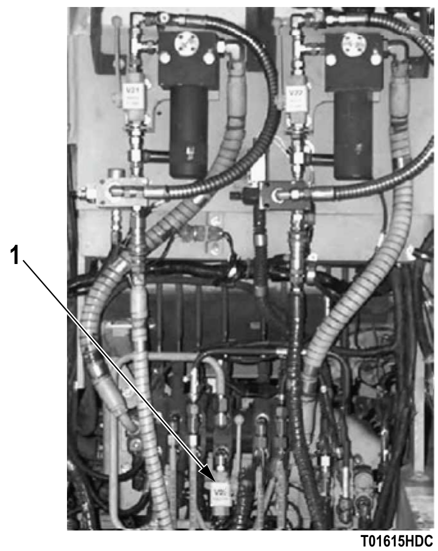



*Figure 13. Directional Control Valve (DCV) Bank.*

k. Reset all HDC solenoid valves by selecting RESET VALVES button (Figure 14, Item 1) on HDC control box.

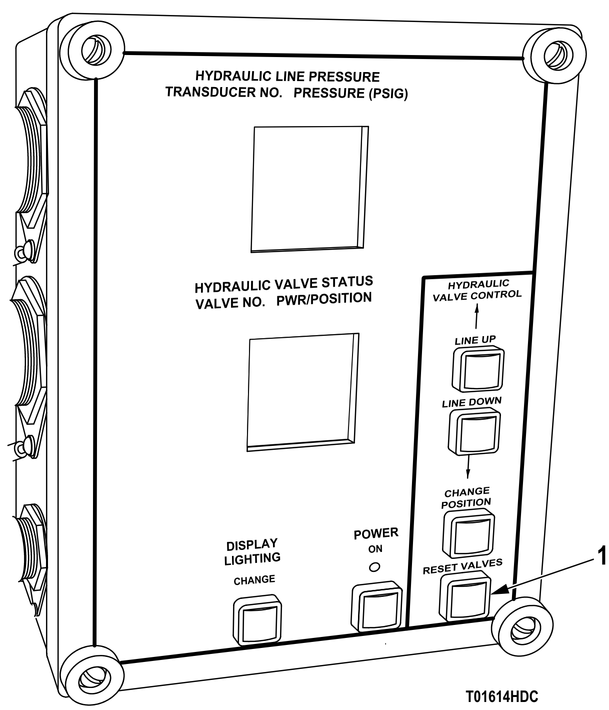



*Figure 14. Hydraulic Diagnostic Center (HDC) Control Box.*

## VEHICLE DOES NOT RESPOND TO OPERATOR CONTROLS - Continued

### CONDITION/INDICATION

Can main relief valve be adjusted to 3,950-4,050 psi (27,235-27,925 kPa)?

### DECISION

YES - Verify problem with operator.
NO - Replace DCV bank (TM 5-2350-262-20).

### END OF WORK PACKAGE

## FIELD MAINTENANCE
## TROUBLESHOOTING PROCEDURES - WINCH AND RIGHT-HAND WHEEL CONTROL INOPERATIVE

**INITIAL SETUP:**

**Tools and Special Tools**
Tool Kit, General Mechanic's: Automotive
(WP 0054, Table 1, Item 7)

**Personnel Required**
Construction Equipment Repairer, 91L (Two)

**Equipment Condition**
Vehicle MASTER power OFF (TM 5-2350-262-10)
Vehicle on jack stands (TM 5-2350-262-20)

**TROUBLESHOOTING PROCEDURE**

**WINCH AND RIGHT-HAND WHEEL CONTROL INOPERATIVE**

**WARNING**

- High oil pressure is present in the M9 ACE hydraulic system. Do not disconnect any hydraulic system component unless hydraulic system pressure has been relieved. After hydraulic system has been relieved, wait at least four minutes before disconnecting any hose or fitting. Ensure each of the hydraulic control levers is moved several times through all positions and the hydraulic tank dipstick is slowly loosened to relieve pressure. Failure to comply may result in severe injury or death to personnel.
- Transmission shifting lines are pressurized. Do not disconnect lines, fittings, or accumulator unless transmission shift control valve pressure has been relieved. Discharge transmission shift accumulator by moving shift control lever through all forward and reverse ranges several times, with engine off. Failure to comply may result in severe injury to personnel.

**NOTE**

- The outboard valve bank hydraulic system 13L circuit is supplied by hydraulic pump port 13L; pressure is controlled by relief valve at inlet port 13L.
- Perform this procedure only when the winch and right-hand suspension controls are inoperative.

## WINCH AND RIGHT-HAND WHEEL CONTROL INOPERATIVE - Continued

**STEP**

1. Perform main relief valve test to verify hydraulic pressure at 13L main relief valve using Hydraulic Diagnostic Center (HDC).

**WARNING**

Before performing any hydraulic troubleshooting in the bowl, move ejector forward and disable it by disconnecting ejector cylinder from hydraulic system. Failure to comply may result in severe injury or death to personnel.

a. Reset all HDC solenoid valves by selecting RESET VALVES button (Figure 2, Item 5) on HDC control box.

b. Move ejector forward, stop engine, and relieve hydraulic pressure.

c. Disable ejector by manually closing ejector inhibit ball valve V23 (Figure 1, Item 1) on DCV bank.

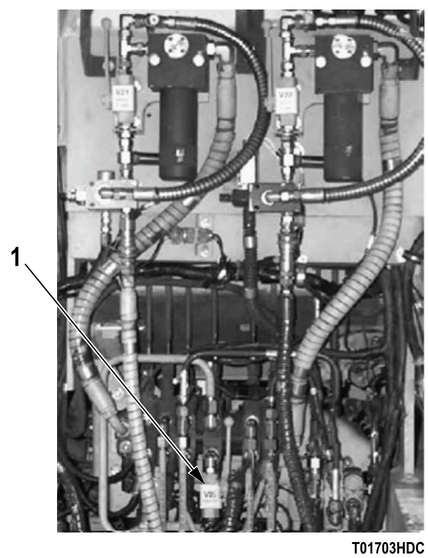



*Figure 1. Directional Control Valve (DCV) Bank.*

d. Using LINE UP or LINE DOWN button (Figure 2, Item 3), select V1 on HDC display (Figure 2, Item 2).

e. Close V1 on HDC display (Figure 2, Item 2) by selecting CHANGE POSITION button (Figure 2, Item 4) on HDC control box.

f. Have assistant start engine, move SPRUNG/UNSPRUNG lever to SPRUNG, and move EJECTOR CONTROL lever to BACK.

g. Read transducer T-4 hydraulic pressure on HDC display (Figure 2, Item 1).

h. While simultaneously holding EJECTOR CONTROL lever in BACK, have assistant move left-hand SUSPENSION CONTROL lever to RAISE.

i. Read transducer T-4 hydraulic pressure on HDC display (Figure 2, Item 1).

## WINCH AND RIGHT-HAND WHEEL CONTROL INOPERATIVE - Continued

j. Using LINE UP or LINE DOWN button (Figure 2, Item 3), select V1 on HDC display (Figure 2, Item 2).

k. Open V1 on HDC display (Figure 2, Item 2) by selecting CHANGE POSITION button (Figure 2, Item 4) on HDC control box.

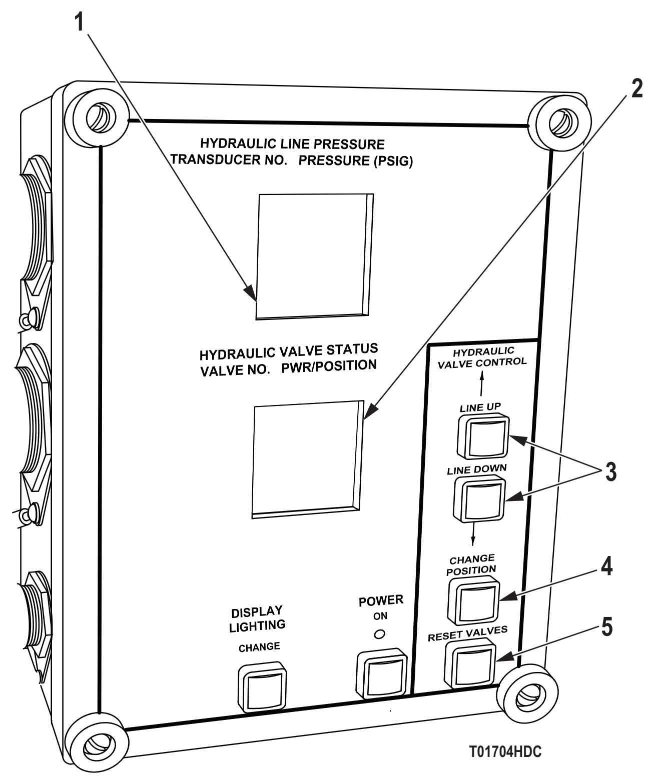



*Figure 2. Hydraulic Diagnostic Center (HDC) Control Box.*

l. Stop engine; relieve hydraulic pressure.

### CONDITION/INDICATION

Is transducer T-4 hydraulic pressure between 3,950-4,050 psi (27,235-27,925 kPa)?

### DECISION

YES - Verify problem with operator.
NO - Go to Step (2).

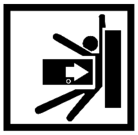
**WINCH AND RIGHT-HAND WHEEL CONTROL INOPERATIVE - Continued**

**STEP**

2. Perform main relief valve adjustment using HDC.

   a. Reset all HDC solenoid valves by selecting RESET VALVES button (Figure 5, Item 5) on HDC control box.

**WARNING**



- Do not operate ejector when personnel are in bowl. Do not work in bowl unless ejector lock is engaged. Failure to comply may result in severe injury or death to personnel.
- Do not stand or work in bowl area unless ejector lock is engaged. Do not stand in bowl to observe roller guide travels. Failure to comply may result in severe injury or death to personnel.

   b. Disable ejector by manually closing ejector inhibit ball valve V23 (Figure 4, Item 1) on DCV bank.

   c. Using LINE UP or LINE DOWN button (Figure 5, Item 3), select V1 on HDC display (Figure 5, Item 2).

   d. Close V1 on HDC display (Figure 5, Item 2) by selecting CHANGE POSITION button (Figure 5, Item 4) on HDC control box.

   e. Loosen jam nut (Figure 3, Item 2) on main relief valve 13L (Figure 3, Item 3).

   f. Have assistant start engine and simultaneously hold EJECTOR CONTROL lever in BACK while holding left-hand SUSPENSION CONTROL lever is RAISE.

   g. While observing transducer T-4 hydraulic pressure on HDC display (Figure 5, Item 1); rotate adjusting screw (Figure 3, Item 1) clockwise to increase hydraulic pressure, counterclockwise to decrease hydraulic pressure until desired pressure is obtained; tighten jam nut.

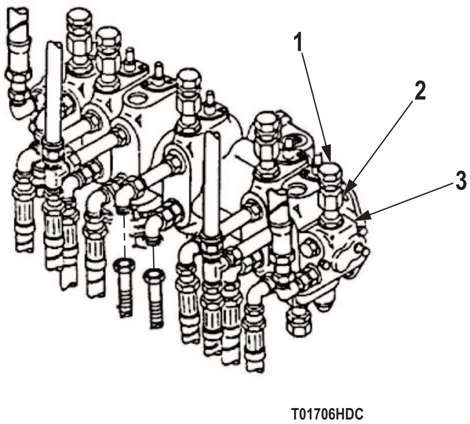



*Figure 3. Main Relief Valve 13L.*

   h. Stop engine; relieve hydraulic pressure.

## WINCH AND RIGHT-HAND WHEEL CONTROL INOPERATIVE - Continued

i. Manually open ejector inhibit ball valve V23 (Figure 4, Item 1) on DCV bank. Using LINE UP or LINE DOWN button (Figure 5, Item 3) select V1 on HDC display (Figure 5, Item 2).

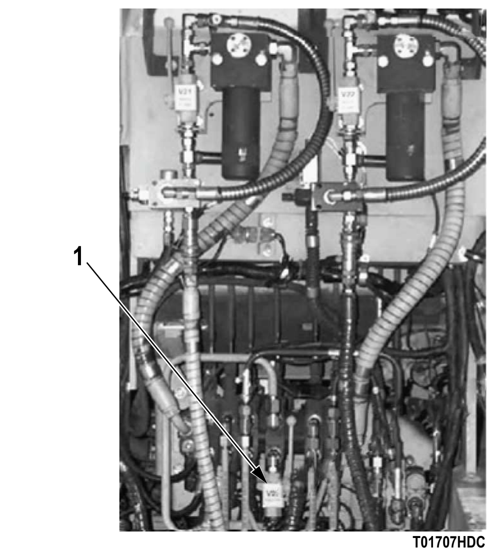



*Figure 4. Directional Control Valve (DCV) Bank.*

j. Open V1 on HDC display (Figure 5, Item 2) by selecting CHANGE POSITION button (Figure 5, Item 4) on HDC control box.

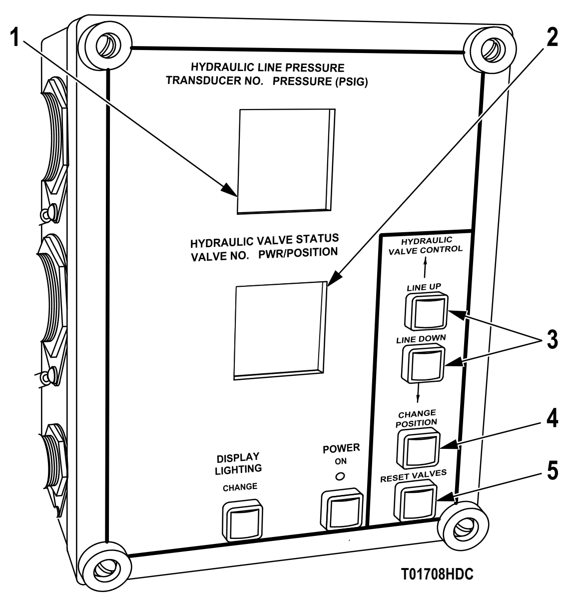



*Figure 5. Hydraulic Diagnostic Center (HDC) Control Box.*

## CONDITION/INDICATION

Can the 13L main relief valve be set to develop hydraulic pressure 3,950-4,050 psi (27,235-28,925 kPa)?

## WINCH AND RIGHT-HAND WHEEL CONTROL INOPERATIVE - Continued

### DECISION

YES - Verify problem is solved.
NO - Go to Step (3).

### STEP

3. Perform main hydraulic pump pressure test using HDC.

**WARNING**

- Before performing any troubleshooting in bowl, move ejector forward and engage ejector lock. Failure to comply may result in severe injury or death to personnel.
- Ensure left main hydraulic pressure inhibit valve V22 is fully opened prior to starting vehicle. A fully or partially closed valve will cause immediate high pressure. Failure to comply may result in damage to equipment and injury to personnel.

a. Stop engine; relieve hydraulic pressure.

b. Reset all HDC solenoid valves by selecting RESET VALVES button (Figure 6, Item 5) on HDC control box.

c. Disable ejector by manually closing the ejector inhibit ball valve V23 (Figure 7, Item 2) on DCV bank.

d. Using LINE UP or LINE DOWN button (Figure 6, Item 3), select V1 on HDC display (Figure 6, Item 2).

e. Close V1 on HDC display (Figure 6, Item 2) by selecting CHANGE POSITION button (Figure 6, Item 4) on HDC control box.

f. Ensure left main hydraulic pressure inhibit valve V22 (Figure 7, Item 1) is fully opened.

g. Have assistant start engine and allow engine to idle (750-800 rpm).

h. Slowly close left main hydraulic pressure inhibit valve V22 (Figure 7, Item 1), until transducer T-4 on HDC display (Figure 6, Item 1) reaches 3,950-4,050 psi (27,235-27,925 kPa).

i. Open left main hydraulic pressure inhibit valve V22 (Figure 7, Item 1) fully.

j. Using LINE UP or LINE DOWN button (Figure 6, Item 3), select V1 on HDC display (Figure 6, Item 2).

k. Open V1 (Figure 6, Item 2) on HDC display by selecting CHANGE POSITION button (Figure 6, Item 4) on HDC control box.

**WINCH AND RIGHT-HAND WHEEL CONTROL INOPERATIVE - Continued**

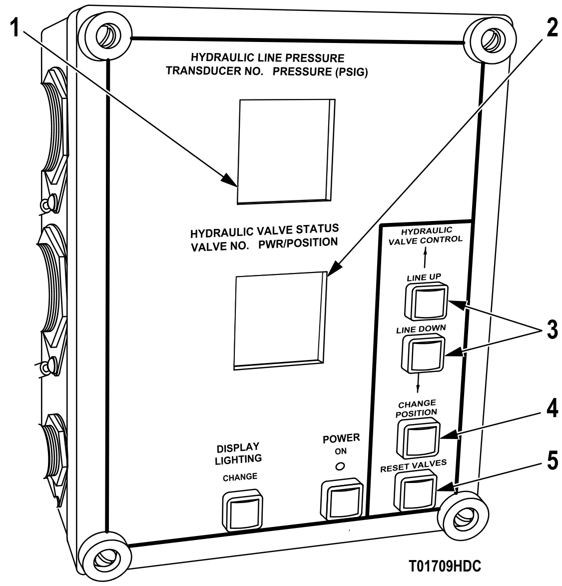



*Figure 6. Hydraulic Diagnostic Center (HDC) Control Box.*

l. Stop engine; relieve hydraulic pressure.

m. Open ejector inhibit ball valve V23 (Figure 7, Item 2).

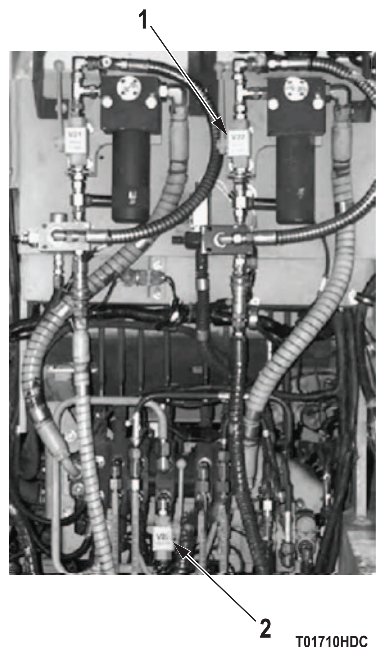



*Figure 7. Directional Control Valve (DCV) Bank.*

**CONDITION/INDICATION**

Does main hydraulic pump develop 3,950-4,050 psi (27,235-27,925 kPa)?

## WINCH AND RIGHT-HAND WHEEL CONTROL INOPERATIVE - Continued

### DECISION

YES - Replace Directional Control Valve (DCV) bank (TM 5-2350-262-20).
NO - Replace main hydraulic pump (TM 5-2350-262-20).

**END OF WORK PACKAGE**

## FIELD MAINTENANCE
## TROUBLESHOOTING PROCEDURES - WINCH WILL NOT PULL RATED LOAD

**INITIAL SETUP:**

**Tools and Special Tools**
Tool Kit, General Mechanic's: Automotive
(WP 0054, Table 1, Item 7)
Parts Kit, Hydraulic (WP 0054, Table 1, Item 3)

**Materials/Parts**
Pin, Cotter (WP 0055, Table 1, Item 10) Qty: 1

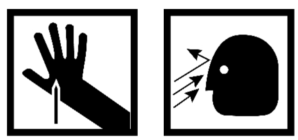
**Personnel Required**
Construction Equipment Repairer, 91L (Two)

**Equipment Condition**
Vehicle MASTER power OFF (TM 5-2350-262-10)
Vehicle on jack stands (TM 5-2350-262-20)

**TROUBLESHOOTING PROCEDURE**

**WINCH WILL NOT PULL RATED LOAD**

### WARNING



- High oil pressure is present in the M9 ACE hydraulic system. Do not disconnect any hydraulic system component unless hydraulic system pressure has been relieved. After hydraulic system has been relieved, wait at least four minutes before disconnecting any hose or fitting. Ensure each of the hydraulic control levers is moved several times through all positions and the hydraulic tank dipstick is slowly loosened to relieve pressure. Failure to comply may result in severe injury or death to personnel.
- Transmission shifting lines are pressurized. Do not disconnect lines, fittings, or accumulator unless transmission shift control valve pressure has been relieved. Discharge transmission shift accumulator by moving shift control lever through all forward and reverse ranges several times, with engine off. Failure to comply may result in severe injury to personnel.

### CAUTION

Do not reuse drained captured hydraulic oil unless it has been filtered and is clean. Failure to comply may result in damage to equipment.

### NOTE

The winch hydraulic motor receives oil flow from control valve through circuit VA to PAY OUT cable and through circuit VB to PAY IN cable. Hydraulic pressure is controlled by winch relief valve C2. The winch motor case drain line is 7W.

## WINCH WILL NOT PULL RATED LOAD - Continued

**STEP**

1. Perform winch control valve hydraulic pressure check using Hydraulic Diagnostic Center (HDC).

### WARNING

Do not operate ejector when personnel are in bowl. Do not work in bowl unless ejector lock is engaged. Failure to comply may result in severe injury or death to personnel.

a. Reset all HDC solenoid valves by selecting RESET VALVES button (Figure 2, Item 5) on HDC control box.

b. Start vehicle engine and move ejector forward. Stop engine and relieve hydraulic pressure.

c. Engage ejector lock (Figure 1, Item 2).

d. Using LINE UP or LINE DOWN button (Figure 2, Item 3), select V14 on HDC display (Figure 2, Item 2).

e. Close V14 on HDC display (Figure 2, Item 2) by selecting CHANGE POSITION button (Figure 2, Item 4) on HDC control box.

f. Have assistant start vehicle engine and hold WINCH CONTROL lever (Figure 1, Item 1) in PAY IN position.

g. Read transducer T-1 hydraulic pressure on HDC display (Figure 2, Item 1).

h. Return WINCH CONTROL lever (Figure 1, Item 1) to NEUTRAL position.

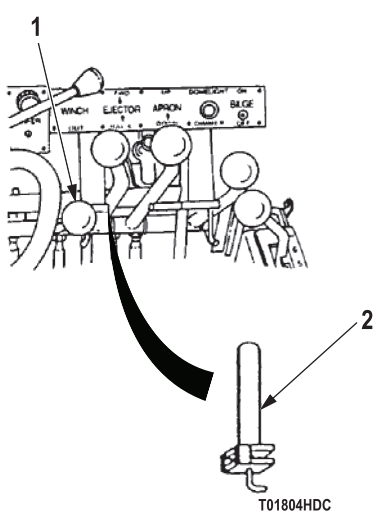



*Figure 1. Winch Control and Ejector Lock.*

## WINCH WILL NOT PULL RATED LOAD - Continued

i. Using LINE UP or LINE DOWN button (Figure 2, Item 3), select V14 on HDC display (Figure 2, Item 2).

j. Open V14 on HDC display (Figure 2, Item 2) by selecting CHANGE POSITION button (Figure 2, Item 4) on HDC control box.

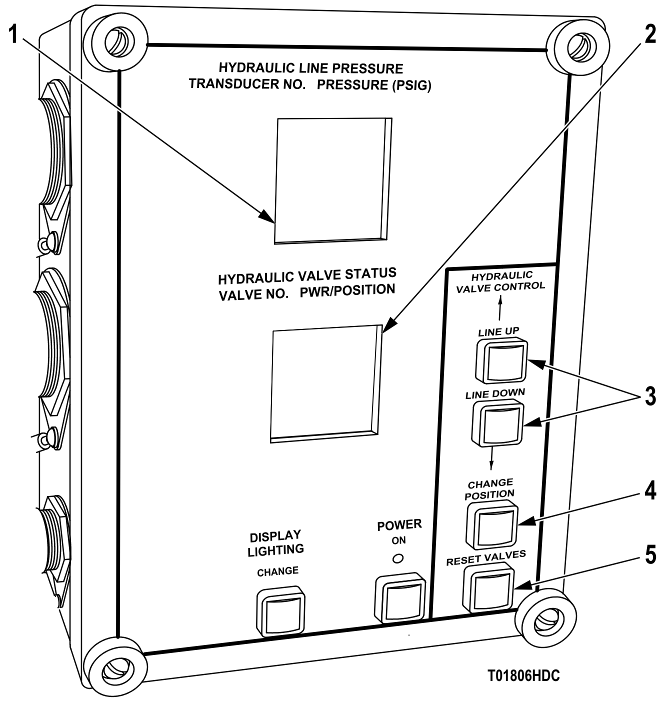



*Figure 2. Hydraulic Diagnostic Center (HDC) Control Box.*

k. Stop engine; relieve hydraulic pressure.

### CONDITION/INDICATION

Is transducer T-1 hydraulic pressure at port VB 1,950-2,050 psi (13,445-14,135 kPa)?

### DECISION

YES - Go to Step (3).
NO - Go to Step (2).

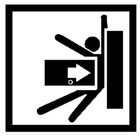
**WINCH WILL NOT PULL RATED LOAD - Continued**

**STEP**

2. Perform winch relief valve VB adjustment using HDC.

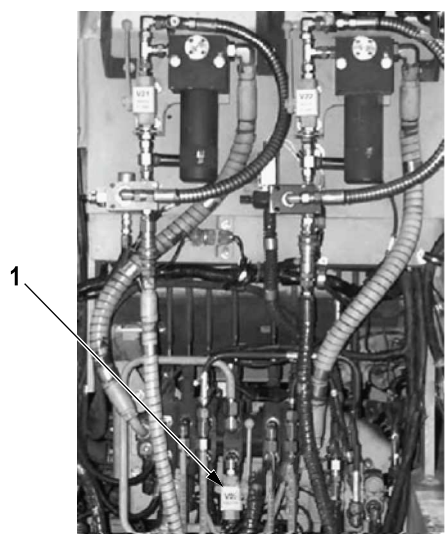
   a. Reset all HDC solenoid valves by selecting RESET VALVES button (Figure 4, Item 4) on HDC control box.

**WARNING**



- Do not operate ejector when personnel are in bowl. Do not work in bowl unless ejector lock is engaged. Failure to comply may result in severe injury or death to personnel.
- Do not stand or work in bowl area unless ejector lock is engaged. Do not stand in bowl to observe roller guide travels. Failure to comply may result in severe injury or death to personnel.
- When folding dozer blade, work on blade latches from side of vehicle only. Do not stand in front of dozer blade while retracting ejector. Failure to comply may result in severe injury or death to personnel.

   b. With engine off, disable ejector; manually close ejector inhibit ball valve V23 (Figure 3, Item 1) on DCV bank.




T01808HDC

*Figure 3. Directional Control Valve (DCV) Bank.*

**WINCH WILL NOT PULL RATED LOAD - Continued**

c. Using LINE UP or LINE DOWN button (Figure 4, Item 2), select V1 on HDC display (Figure 4, Item 1).

d. Close V1 on HDC display (Figure 4, Item 1) by selecting CHANGE POSITION button (Figure 4, Item 3) on HDC control box.

e. Select V14 on HDC display (Figure 4, Item 1).

f. Close V14 on HDC display (Figure 4, Item 1) by selecting CHANGE POSITION button (Figure 4, Item 3) on HDC control box.

g. Have assistant start engine and hold WINCH CONTROL in PAY IN position.

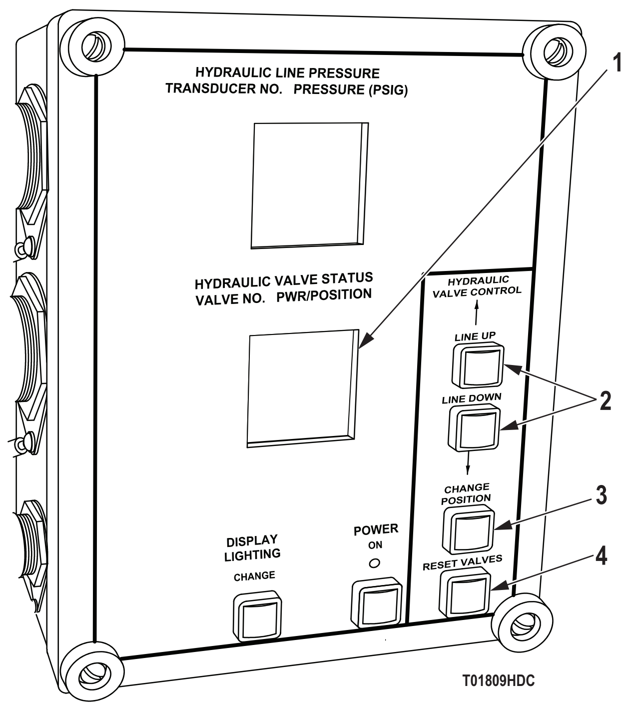



*Figure 4. Hydraulic Diagnostic Center (HDC) Control Box.*

## WINCH WILL NOT PULL RATED LOAD - Continued

h. Read transducer T-1 hydraulic pressure on HDC display (Figure 7, Item 1).

i. While observing transducer T-1 hydraulic pressure on HDC display (Figure 7, Item 1), loosen jam nut (Figure 5, Item 2) and turn relief valve adjustment screw (Figure 5, Item 1), clockwise to increase pressure; counterclockwise to decrease pressure until desired pressure is obtained.

j. Tighten jam nut (Figure 5, Item 2).

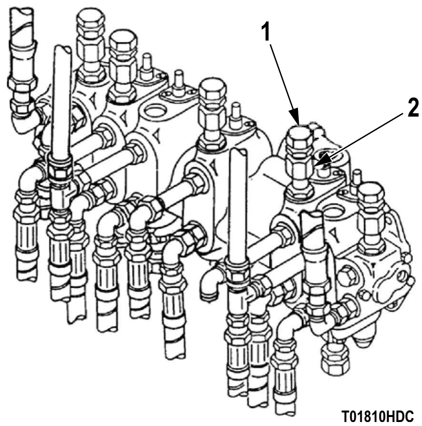



*Figure 5. Winch Relief Valve.*

k. Stop engine and relieve hydraulic pressure.

l. Open ejector inhibit ball valve V23 (Figure 6, Item 1) on DCV bank. Using LINE UP or LINE DOWN button (Figure 7, Item 3), select V1 on HDC display (Figure 7, Item 2).

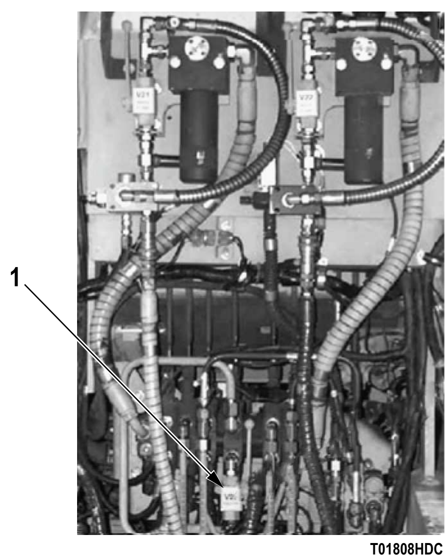



*Figure 6. Directional Control Valve (DCV) Bank.*

## WINCH WILL NOT PULL RATED LOAD - Continued

m. Open V1 on HDC display (Figure 7, Item 2) by selecting CHANGE POSITION button (Figure 7, Item 4) on HDC control box.

n. Repeat for V14; Open V14.

o. Reset all HDC solenoid valves by selecting RESET VALVES button (Figure 7, Item 5) on HDC control box.

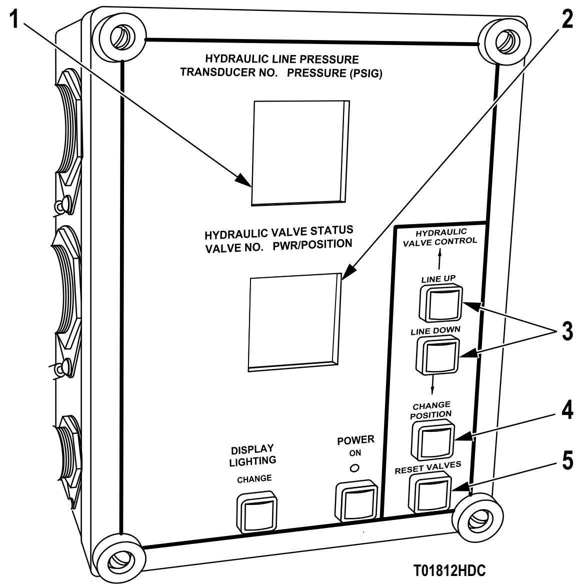



*Figure 7. Hydraulic Diagnostic Center (HDC) Control Box.*

### CONDITION/INDICATION

Can relief valve be set to develop correct hydraulic pressure: 1,950-2,050 psi (13,445-14,135 kPa)?

### DECISION

YES - Verify problem is solved.
NO - Replace Directional Control Valve (DCV) bank assembly (TM 5-2350-262-20).

## WINCH WILL NOT PULL RATED LOAD - Continued

**STEP**

3. Perform winch motor internal leakage test.

### NOTE

Have suitable container ready to catch oil.

a. Disconnect WINCH DRAIN-7W hose (Figure 8, Item 3) from winch motor port 7W and plug hose (Figure 8, Item 3).

b. Connect drain hose (Figure 8, Item 2) to elbow (Figure 8, Item 4) on port 7W (Figure 8, Item 5) and place end of hose (Figure 8, Item 2) in container.

c. Disconnect CONT-VLV-VA (FWD) hose (Figure 8, Item 7) from winch.

d. Plug hose (Figure 8, Item 7) and cap elbow (Figure 8, Item 6).

### NOTE

Two containers are necessary for a true metered 15-second reading during winch motor internal leakage test.

e. Have assistant start vehicle engine and hold WINCH CONTROL lever (Figure 8, Item 1) in PAY IN position.

f. With lever held in PAY IN position and oil flowing, move drain hose 7W (Figure 8, Item 2) to a graduated container for exactly 15 seconds.

g. Return WINCH CONTROL lever (Figure 8, Item 1) to NEUTRAL position.

h. Measure oil in graduated container.

i. Allowable internal leakage flow from drain hose (Figure 8, Item 2) is 1.25 qts (1.18 L) in 15 seconds or 1.25 gpm (4.73 Lpm).

## WINCH WILL NOT PULL RATED LOAD - Continued

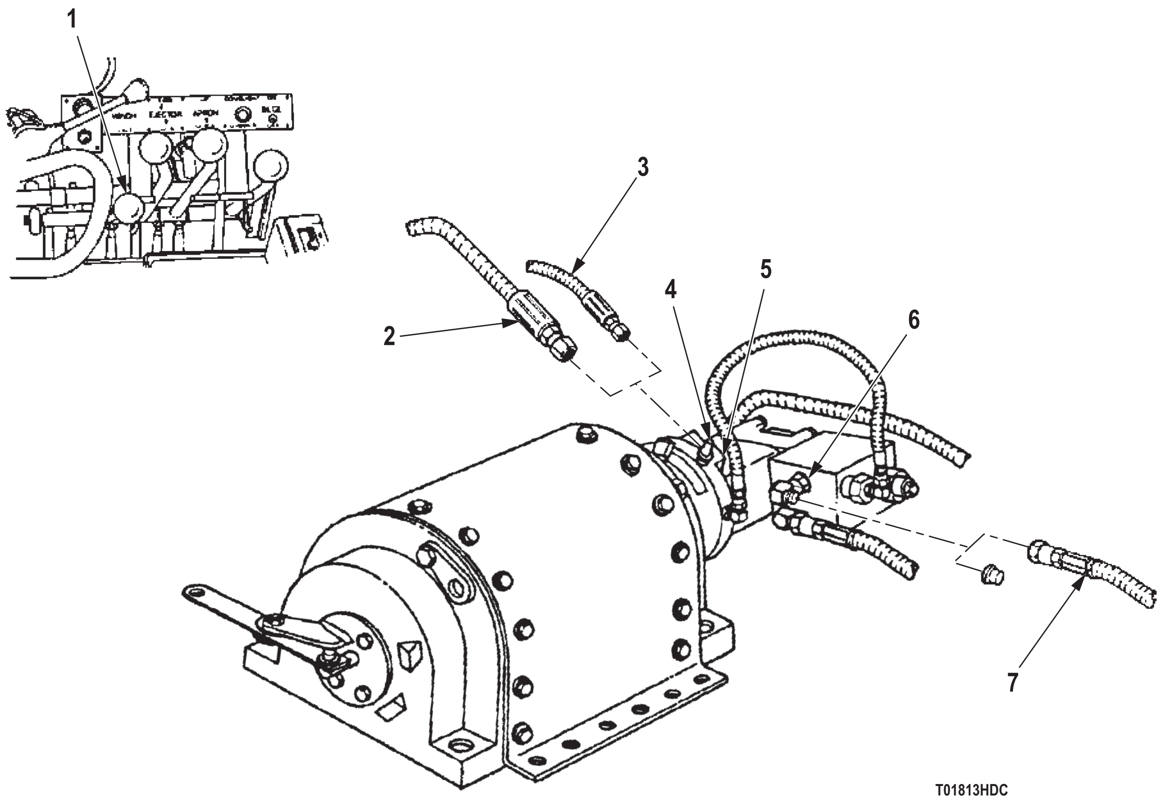



*Figure 8. Winch Motor.*

j. Stop engine; relieve hydraulic pressure and connect all hoses.

## CONDITION/INDICATION

Is winch leakage rate greater than 1.25 gpm (4.73 Lpm)?

## DECISION

YES - Replace winch motor (TM 5-2350-262-20).
NO - Go to Step (4).

## WINCH WILL NOT PULL RATED LOAD - Continued

### STEP

4. Perform winch shift linkage adjustment check.
    a. Set control lever (Figure 9, Item 2) in NEUTRAL detent (Figure 9, Item 1).
    b. Move lever (Figure 9, Item 4) from side to side and measure for proper shift rod (Figure 9, Item 3) NEUTRAL position.
    c. Shift rod (Figure 9, Item 3) must move at least 0.10 in. (2.54 mm) in either direction without engaging LOW or HIGH gear.
    d. Total NEUTRAL zone travel is 0.34 in. (8.64 mm).
    e. Go to Step (5) if shift rod (Figure 9, Item 3) NEUTRAL travel is not within limits.

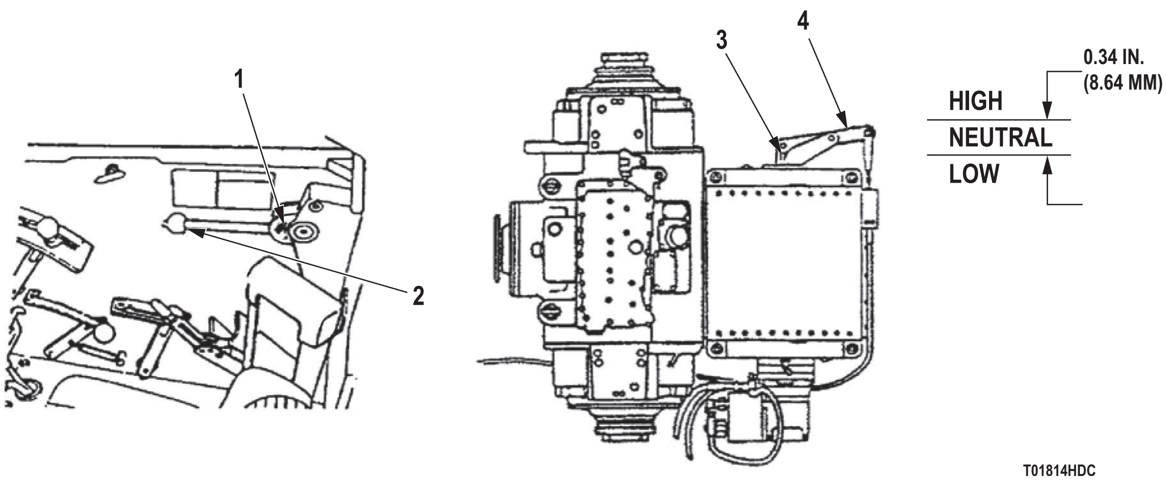



*Figure 9. Winch Shift Linkage.*

### CONDITION/INDICATION

Does linkage fully engage high and low positions?

### DECISION

YES - Replace winch motor (TM 5-2350-262-20).
NO - Go to Step (5).

### STEP

5. Adjust winch HIGH/LOW linkage.

## NOTE

- Ensure control lever is in NEUTRAL detent.
- Control lever must move 0.10 in. (2.54 mm) in either direction without engaging winch. Total NEUTRAL travel zone is 0.34 in. (8.64 mm).

    a. Remove cotter pin (Figure 10, Item 4) and clevis pin (Figure 10, Item 1) from clevis (Figure 10, Item 2) and control lever (Figure 10, Item 5).
    b. Discard cotter pin (Figure 10, Item 4).

**WINCH WILL NOT PULL RATED LOAD - Continued**

c. Pull shift rod (Figure 10, Item 3) out as far as possible.

d. This is the end of travel in high-gear position.

e. Push shift rod (Figure 10, Item 3) back in 1.220 in. (30.99 mm) to locate center of NEUTRAL position.

f. Adjustment can be made by turning clevis (Figure 10, Item 2) clockwise for NEUTRAL position out; counterclockwise for NEUTRAL position in.

g. Install clevis (Figure 10, Item 2) on control lever (Figure 10, Item 5) with clevis pin (Figure 10, Item 1) and new cotter pin (Figure 10, Item 4).

h. Verify shift rod (Figure 10, Item 3) is within NEUTRAL travel limits.

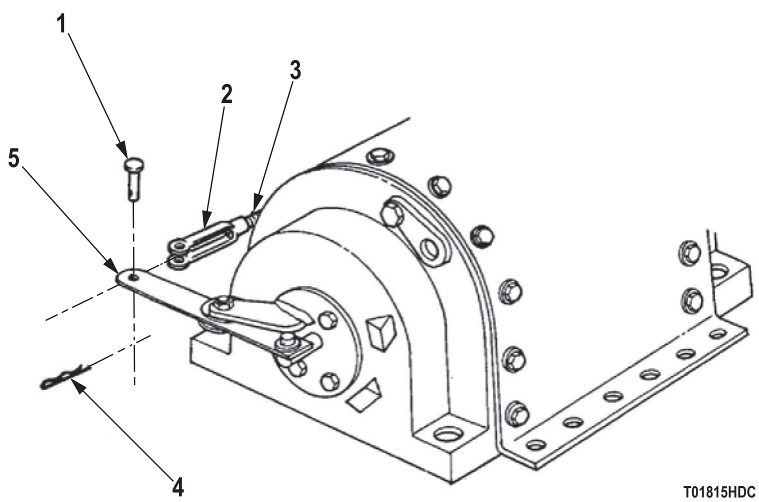



*Figure 10. Winch Linkage.*

i. Operate winch and check for proper operation.

j. If winch does not function properly, notify supervisor.

**CONDITION/INDICATION**

Can linkage be adjusted?

**DECISION**

YES - Verify problem is solved.
NO - Replace winch (TM 5-2350-262-20).

**END OF WORK PACKAGE**

## FIELD MAINTENANCE
## TROUBLESHOOTING PROCEDURES - APPARENT HYDRAULIC DIAGNOSTIC CENTER (HDC) SYSTEM PROBLEM

**INITIAL SETUP:**

**Tools and Special Tools**
Tool Kit, General Mechanic's: Automotive (WP 0054, Table 1, Item 7)

**Personnel Required**
Construction Equipment Repairer, 91L (Two)

**References**
WP 0004
WP 0005
WP 0023
WP 0025

**References (cont.)**
WP 0028
WP 0029
WP 0030
WP 0036
WP 0037
WP 0038
WP 0034

**Equipment Condition**
Vehicle MASTER power OFF (TM 5-2350-262-10)
Vehicle on jack stands (TM 5-2350-262-20)

### TROUBLESHOOTING PROCEDURE

### APPARENT HYDRAULIC DIAGNOSTIC CENTER (HDC) SYSTEM PROBLEM

**WARNING**

- High oil pressure is present in the M9 ACE hydraulic system. Do not disconnect any hydraulic system component unless hydraulic system pressure has been relieved. After hydraulic system has been relieved, wait at least four minutes before disconnecting any hose or fitting. Ensure each of the hydraulic control levers is moved several times through all positions and the hydraulic tank dipstick is slowly loosened to relieve pressure. Failure to comply may result in severe injury or death to personnel.
- Transmission shifting lines are pressurized. Do not disconnect lines, fittings, or accumulator unless transmission shift control valve pressure has been relieved. Discharge transmission shift accumulator by moving shift control lever through all forward and reverse ranges several times, with engine off. Failure to comply may result in severe injury to personnel.

## APPARENT HYDRAULIC DIAGNOSTIC CENTER (HDC) SYSTEM PROBLEM - Continued

### STEP

1. Perform HDC system functional check-out (WP 0025).

### CONDITION/INDICATION

Can HDC system functional check-out be performed successfully?

### DECISION

YES - HDC system appears to be functioning properly and ready to aid in troubleshooting the M9 ACE hydraulic system. If this functional checkout was performed as part of weekly HDC system PMCS (WP 0023), power off HDC system, disconnect it from vehicle, and stow HDC control box and umbilical cable W4. If this functional checkout was performed prior to troubleshooting a problem in vehicle hydraulic system using HDC system, refer to applicable problem symptom work package as applicable and proceed as indicated (WP 0005).
NO - Go to Step (2).

### STEP

2. Check installation of HDC control box and umbilical cable W4. Check for clean and secure HDC system ground connection in vehicle (Figures 1, 2, and 3).

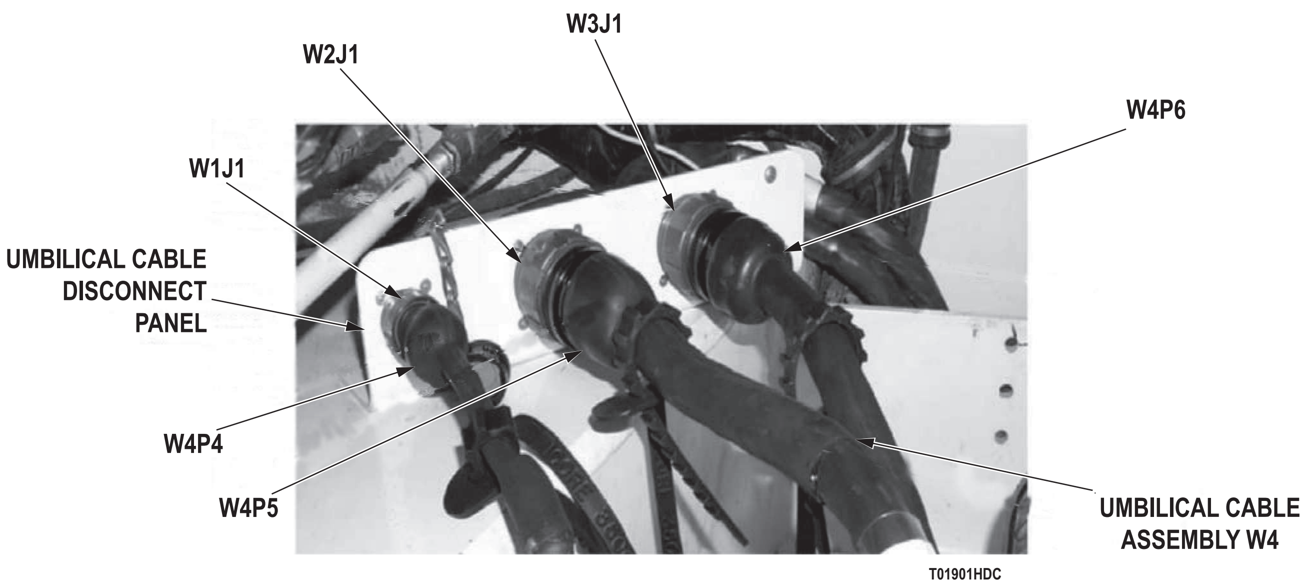



*Figure 1. Umbilical Cable Assembly W4 Connection to Umbilical Cable Disconnect Bracket.*

## APPARENT HYDRAULIC DIAGNOSTIC CENTER (HDC) SYSTEM PROBLEM - Continued

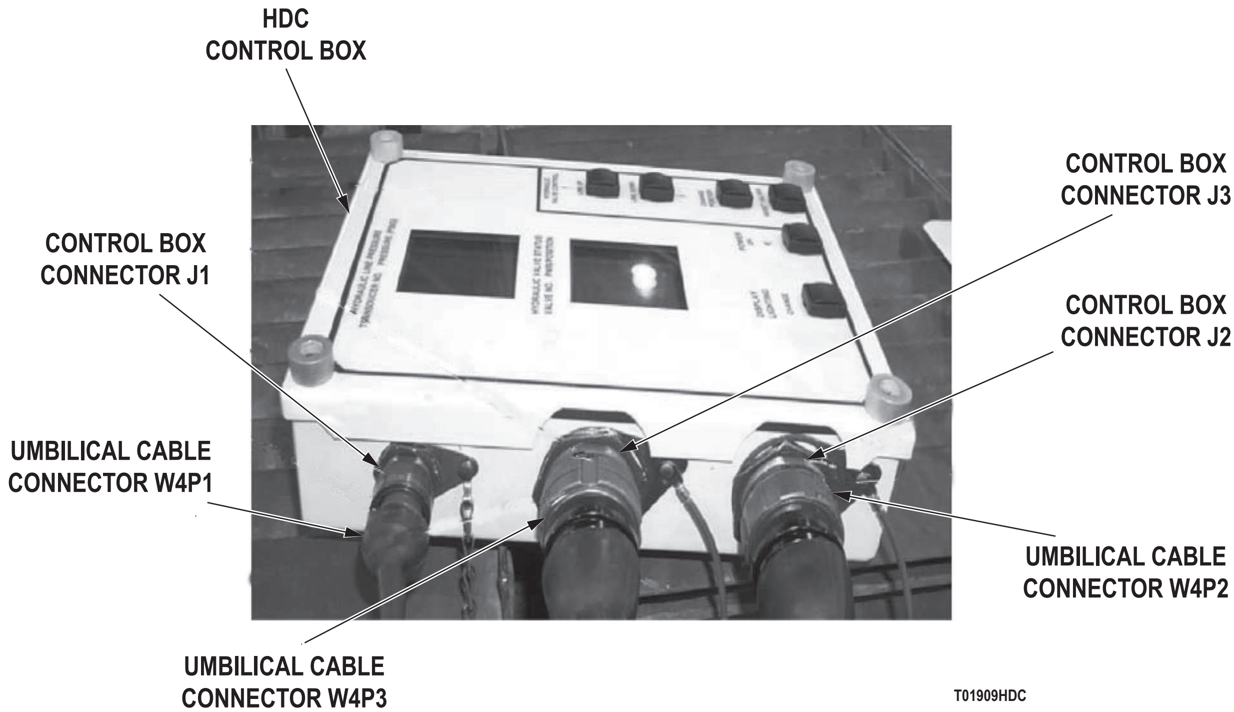



*Figure 2. Umbilical Cable Assembly W4 Connections to Hydraulic Diagnostic Center (HDC) Control Box.*

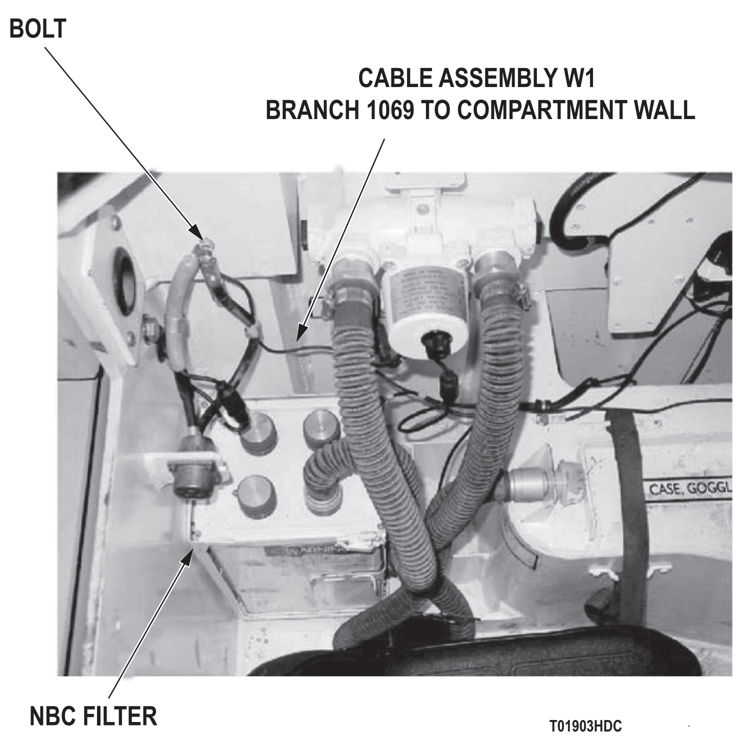



*Figure 3. Hydraulic Diagnostic Center (HDC) System Ground Connection in Vehicle.*

## APPARENT HYDRAULIC DIAGNOSTIC CENTER (HDC) SYSTEM PROBLEM - Continued

### CONDITION/INDICATION

Is HDC control box and umbilical cable W4 installed properly with all cable connectors tight? Is HDC system ground connection in vehicle clean and secure?

### DECISION

YES - Go to Step (3).
NO - Install HDC control box and umbilical cable W4 properly, and tighten all cable W4 connectors and HDC system ground connection in vehicle. Go to Step (3).

### STEP

3. Check for indication that power is applied to HDC control box (Figure 4, Item 1).

### CONDITION/INDICATION

Does red POWER ON led on HDC control box illuminate indicating power is applied to control box, when POWER ON button is pressed?

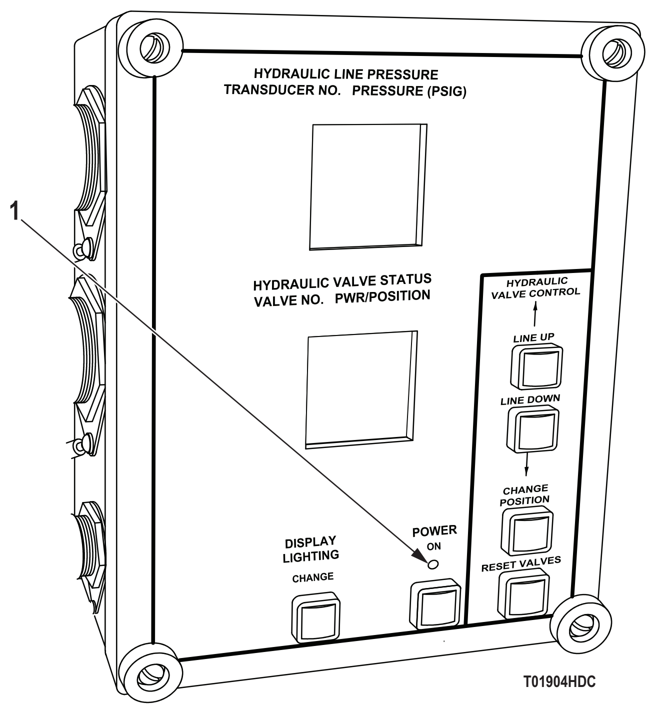



*Figure 4. Hydraulic Diagnostic Center (HDC) Control Box Front Panel.*

### DECISION

YES - Go to Step (4).
NO - Go to Step (7).

## APPARENT HYDRAULIC DIAGNOSTIC CENTER (HDC) SYSTEM PROBLEM - Continued

**STEP**

4. Check if HDC system powers up after normal startup delay and performs start up BIT (Built-In-Test).

**CONDITION/INDICATION**

Does HDC system appear to power up after normal start-up delay and perform start-up BIT (Built-In-Test)?

**DECISION**

YES - Go to Step (5).
NO - Go to Step (6).

**STEP**

5. Check if HDC displays pass message after BIT.

**CONDITION/INDICATION**

Does HDC system perform a start-up BIT (Built-In-Test) and display a PASS message on HDC control box LCD screen?

**DECISION**

YES - Go to Step (20).
NO - Go to Step (23).

**STEP**

6. Power off HDC system. Wait a few moments, then power up HDC system again.

**CONDITION/INDICATION**

Does same problem still exist?

**DECISION**

YES - Replace HDC control box.
NO - Continue with HDC system functional check out (WP 0025).

## APPARENT HYDRAULIC DIAGNOSTIC CENTER (HDC) SYSTEM PROBLEM - Continued

### STEP

7. Check if vehicle is in neutral and check if parking brake is engaged (Figures 5 and 6).

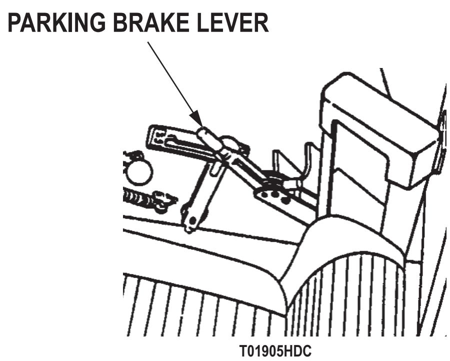



*Figure 5. Vehicle Transmission in Neutral with Parking Brake Fully Engaged.*

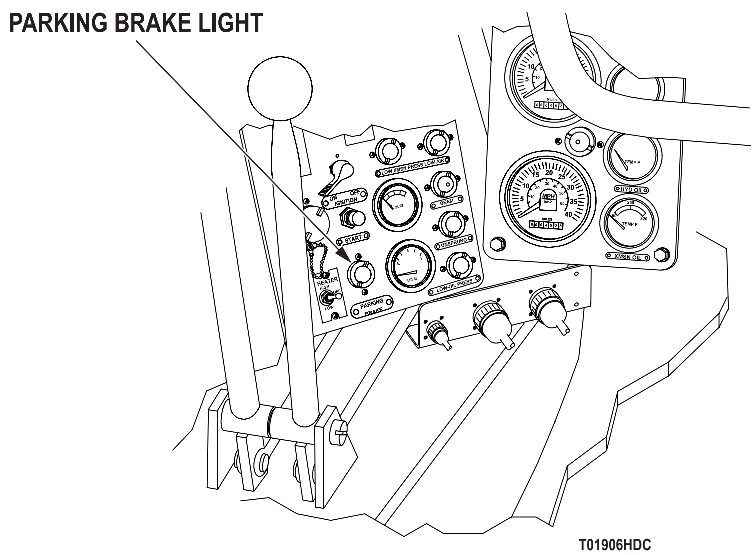



*Figure 6. Parking Brake Light Location.*

### CONDITION/INDICATION

Is vehicle transmission in neutral with parking brake fully engaged (parking brake light in vehicle is illuminated)?

### DECISION

YES - Go to Step (8).
NO - Place vehicle transmission in neutral and fully engage parking brake (parking brake light in vehicle should illuminate). Continue with HDC system functional check-out. (WP 0025)

**APPARENT HYDRAULIC DIAGNOSTIC CENTER (HDC) SYSTEM PROBLEM - Continued**

**STEP**

8. Disconnect umbilical cable connector W4P1 from HDC control box connector J1 (Figures 7 and 8).

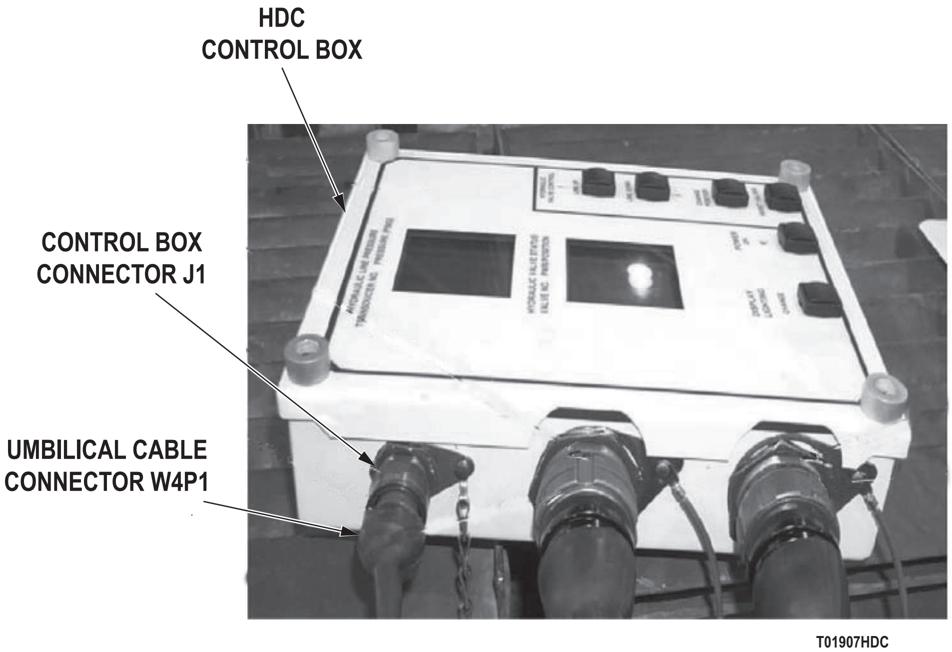



*Figure 7. Umbilical Cable Assembly W4 Connections to Hydraulic Diagnostic Center (HDC) Control Box.*

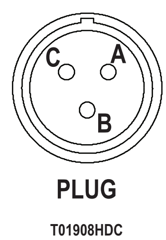



*Figure 8. Pin Layout for Connector W4P1.*

**CONDITION/INDICATION**

Is 28 VDC present between umbilical cable connector W4P1 pins A and B?

**DECISION**

YES - Replace HDC control box.
NO - Go to Step (9).

## APPARENT HYDRAULIC DIAGNOSTIC CENTER (HDC) SYSTEM PROBLEM - Continued

### STEP

9. Check for 28 VDC at connector W1J1 pins A and B.

   Disconnect umbilical cable connector W4P4 from power cable connector W1J1, on umbilical disconnect bracket (Figures 9 and 10).

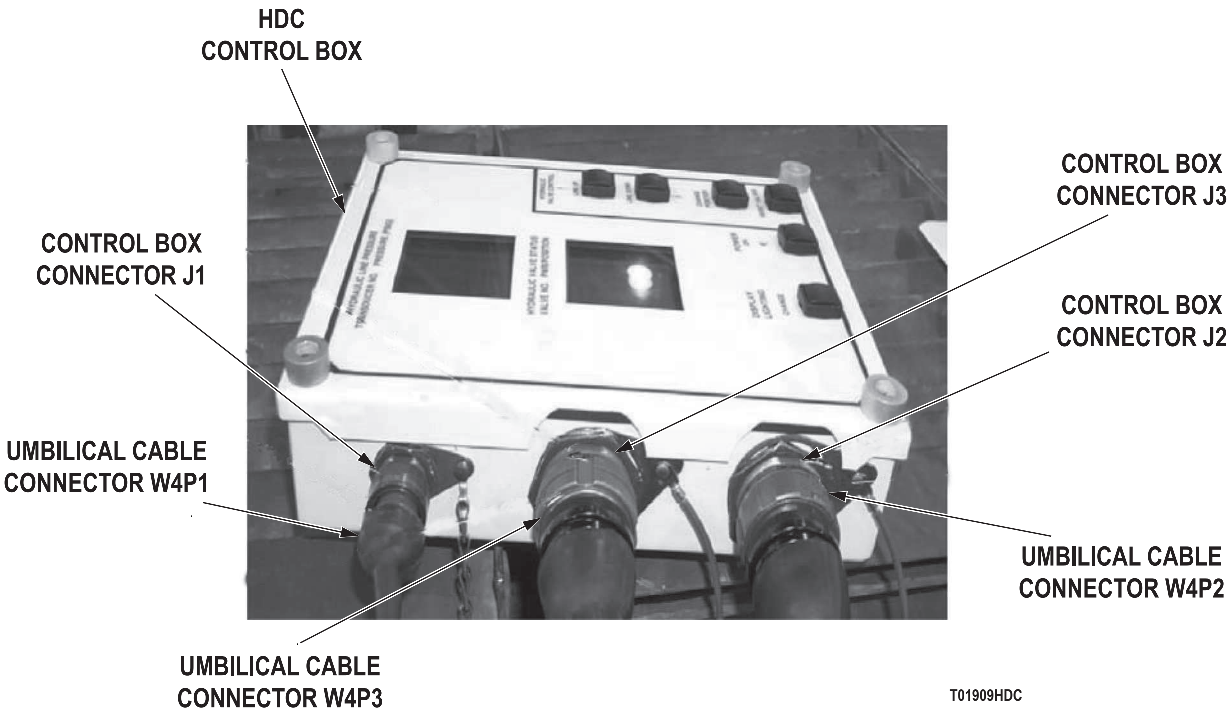



*Figure 9. Umbilical Cable Assembly W4 Connection to Umbilical Cable Disconnect Bracket.*

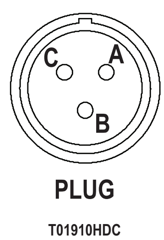



*Figure 10. Pin Layout for Connector W1J1.*

### CONDITION/INDICATION

Is 28 VDC present between power cable connector W1J1, pins A and B, on umbilical cable disconnect bracket?

### DECISION

YES - Go to Step (10).
NO - Go to Step (12).

## APPARENT HYDRAULIC DIAGNOSTIC CENTER (HDC) SYSTEM PROBLEM - Continued

### STEP

10. Check for continuity across umbilical cables.
    a. Power off HDC system.
    b. Perform continuity check between umbilical cable connector W4P1-A, and connector W4P4-A, and between W4P1-B and W4P4-B (Figure 11).

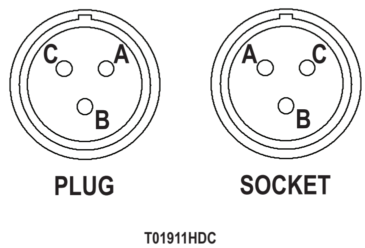



*Figure 11. Pin Layout for Connectors W4P1 and W4P4.*

### CONDITION/INDICATION

Does continuity exist between umbilical cable connector W4P1-A and connector W4P4-A, and between W4P1-B and W4P4-B?

### DECISION

YES - Go to Step (11).
NO - Replace umbilical cable W4.

## APPARENT HYDRAULIC DIAGNOSTIC CENTER (HDC) SYSTEM PROBLEM - Continued

### STEP

11. Check cable W4P1-A and W4P4-A pins for short circuit to cable W4 connector pin B or to W4 connector shell (Figures 12 and 13).

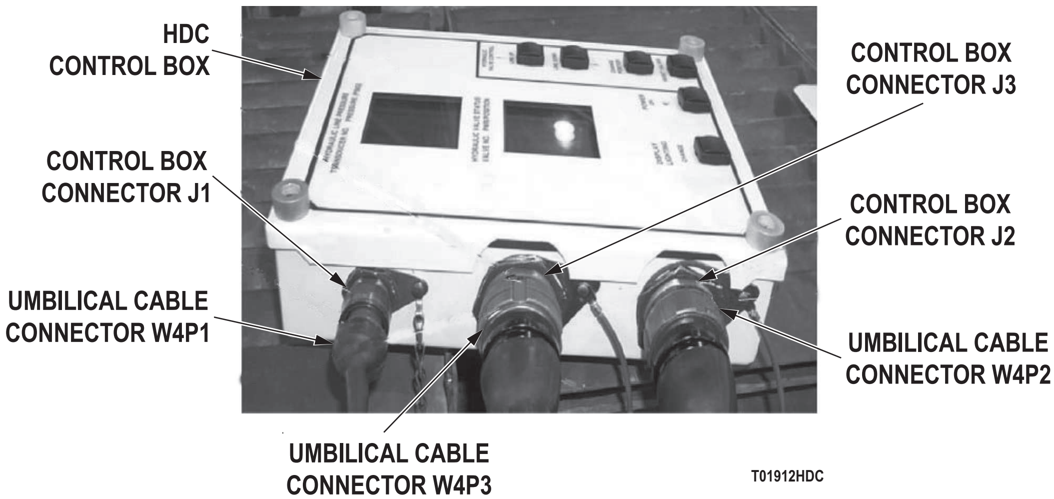



*Figure 12. Umbilical Cable Assembly W4 Connections to Hydraulic Diagnostic Center (HDC) Control Box.*

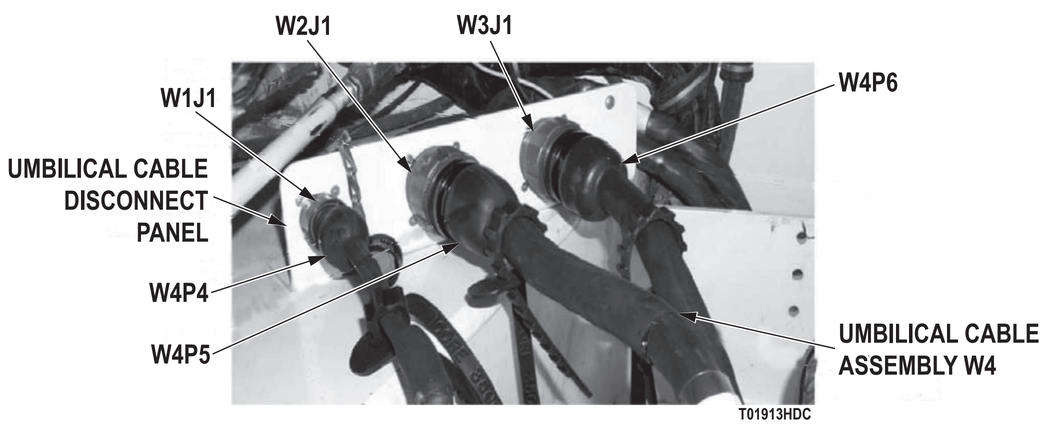



*Figure 13. Umbilical Cable Assembly W4 Connection to Umbilical Cable Disconnect Bracket.*

### CONDITION/INDICATION

Does a short circuit exist in umbilical cable W4 at W4P1-A or W4P4-A?

### DECISION

YES - Replace umbilical cable W4.
NO - Reconnect umbilical cable W4, tighten all HDC system connectors securely, and check vehicle 28 VDC power circuits.

**APPARENT HYDRAULIC DIAGNOSTIC CENTER (HDC) SYSTEM PROBLEM - Continued**

**STEP**

12. Check for 28 VDC on parking brake relay terminal B1 (Figure 14).

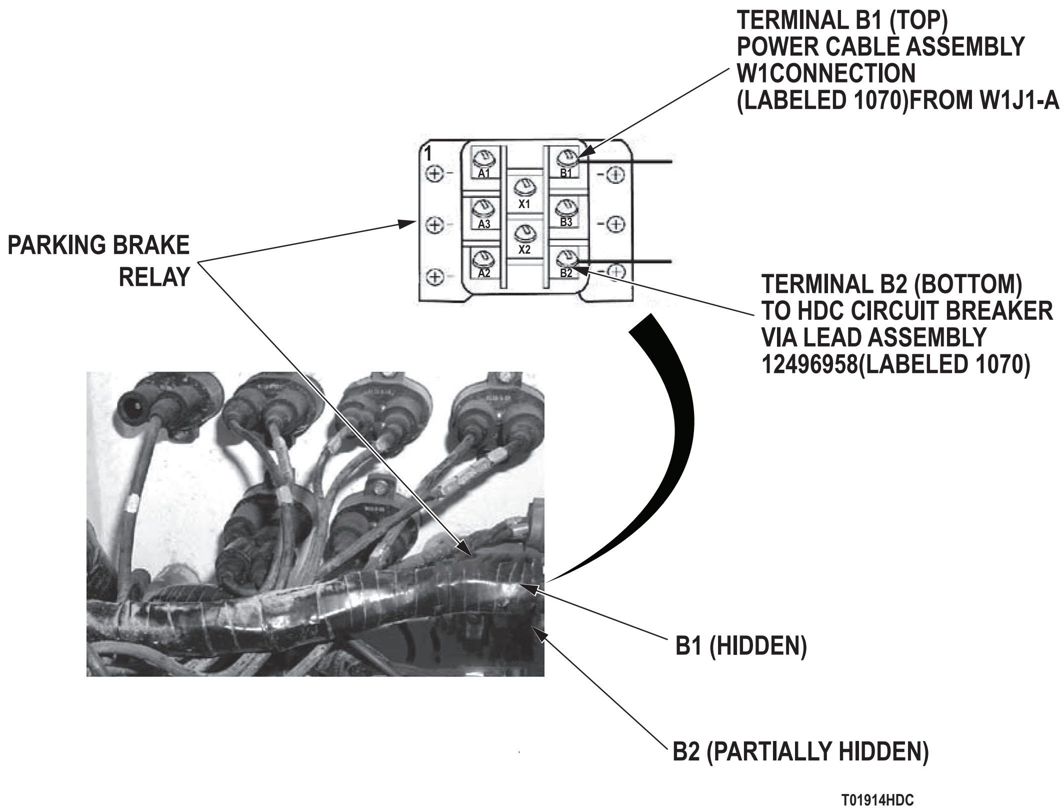



*Figure 14. Hydraulic Diagnostic Center (HDC) Power Cable Assembly W1 Connection to Parking Brake Relay.*

**CONDITION/INDICATION**

Is 28 VDC present on parking brake relay terminal B1?

**DECISION**

YES - Go to Step (14).
NO - Go to Step (13).

**STEP**

13. Check for 28 VDC on parking brake relay terminal B2.

**CONDITION/INDICATION**

Is 28 VDC present on parking brake relay terminal B2?

**DECISION**

YES - Replace parking brake relay (TM 5-2350-262-20).
NO - Go to Step (16).

## APPARENT HYDRAULIC DIAGNOSTIC CENTER (HDC) SYSTEM PROBLEM - Continued

### STEP

14. Perform continuity check between parking brake relay terminal B1 and power cable connector pin W1J1-A (Figure 15).


*Figure 15. Location of Power Cable Assembly Connector W1J1.*

### CONDITION/INDICATION

Does continuity exist between parking brake terminal B1 and power cable connector pin W1J1-A?

### DECISION

YES - Go to Step (15).
NO - Replace power cable W1 (WP 0030).

## APPARENT HYDRAULIC DIAGNOSTIC CENTER (HDC) SYSTEM PROBLEM - Continued

### STEP

15. Check power cable W1 for short circuit from W1J1-A to connector W1J1 shell or other pins.

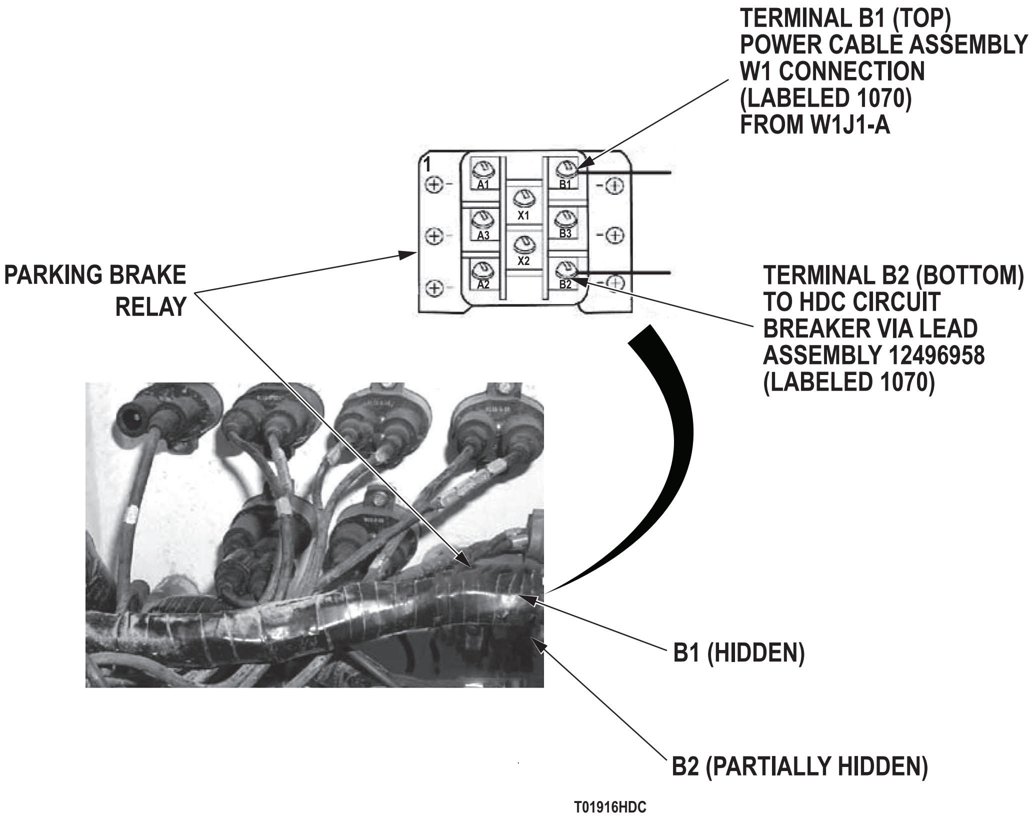



*Figure 16. Parking Brake Relay Terminals.*

### CONDITION/INDICATION

Does a short circuit exist in power cable W1?

### DECISION

YES - Replace power cable W1 (WP 0030).
NO - Check for loose or damaged terminals B1 and B2 on parking brake relay (Figure 16). Check terminals, tighten wiring and replace parking brake relay if defective.

## APPARENT HYDRAULIC DIAGNOSTIC CENTER (HDC) SYSTEM PROBLEM - Continued

### STEP

16. Check for 28 VDC at master relay (input) side of HDC circuit breaker (Figure 17).

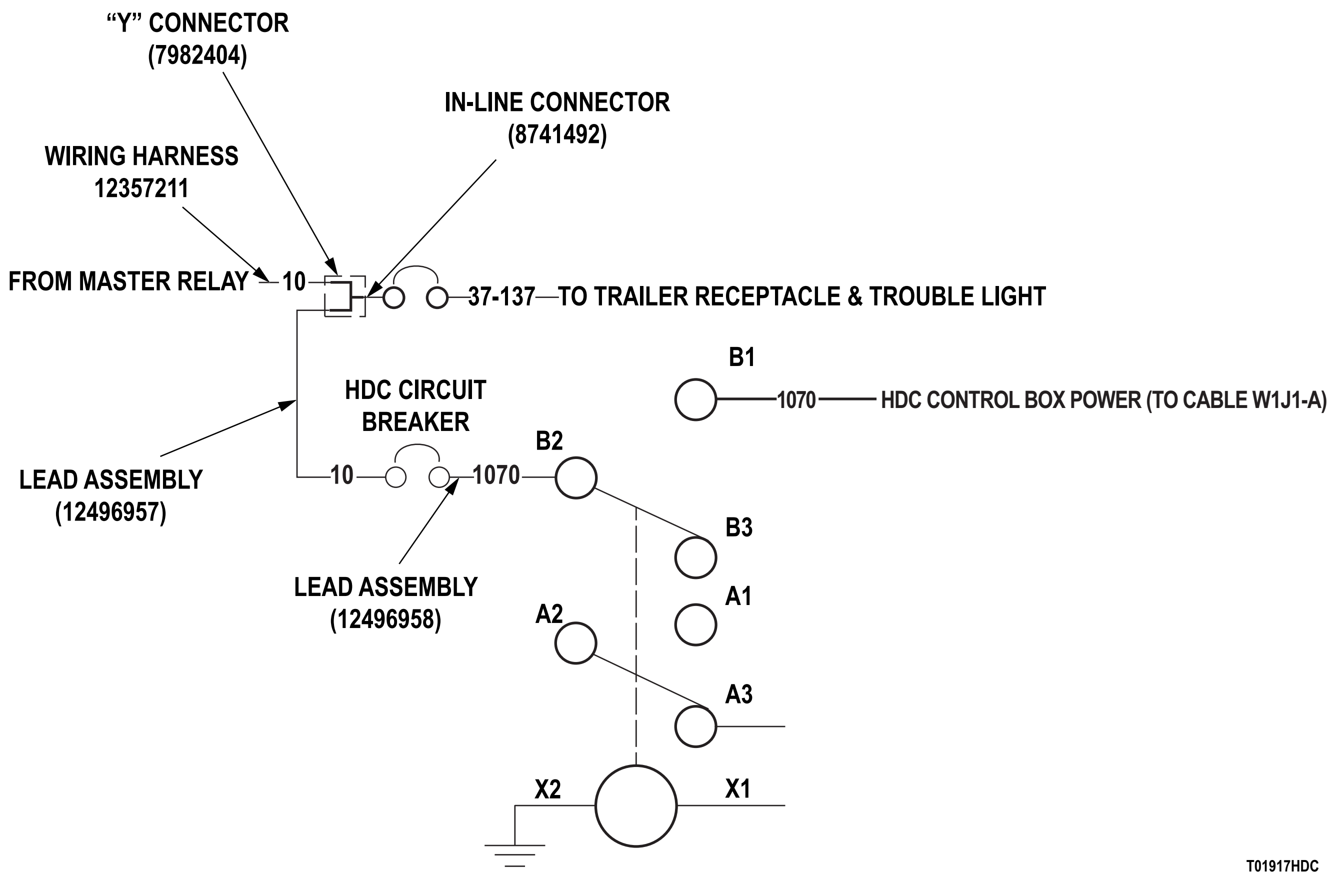



*Figure 17. Hydraulic Diagnostic Center (HDC) Simplified Power Input Circuit.*

### CONDITION/INDICATION

Is 28 VDC present at master relay (input) side of HDC circuit breaker?

### DECISION

YES - Go to Step (18).
NO - Go to Step (17).

## APPARENT HYDRAULIC DIAGNOSTIC CENTER (HDC) SYSTEM PROBLEM - Continued

### STEP

17. Check for 28 VDC at Y-connector terminal going to master relay.

    Remove "Y" -connector (Figure 18, Item 1) from in-line connector (Figure 18, Item 2). Power up vehicle. Check for 28 VDC on "Y"-connector terminal coming from master relay (wiring harness 12357211).

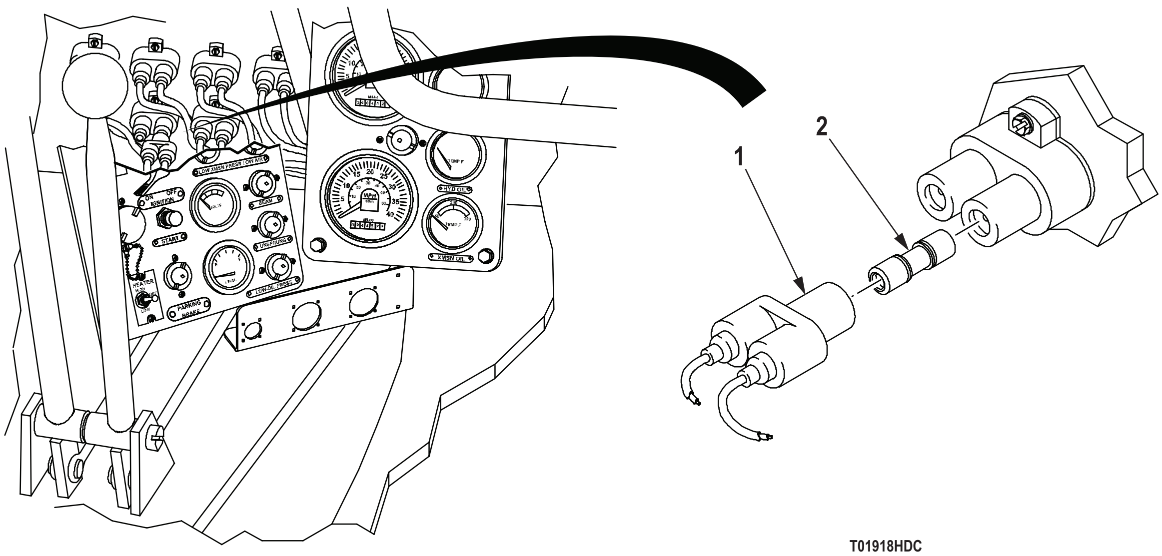



*Figure 18. Hydraulic Diagnostic Center (HDC) System Power Input Circuit Components.*

### CONDITION/INDICATION

Is 28 VDC present at input to "Y"-connector from wiring harness 12357211 coming from master relay?

### DECISION

YES - Go to Step (19).
NO - Troubleshoot portion of vehicle electrical system associated with wiring harness 12357211 coming from master relay and repair/replace wiring or components as necessary.

**APPARENT HYDRAULIC DIAGNOSTIC CENTER (HDC) SYSTEM PROBLEM - Continued**

**STEP**

18. Check for 28 VDC at parking brake relay side of HDC circuit breaker (Figure 19).

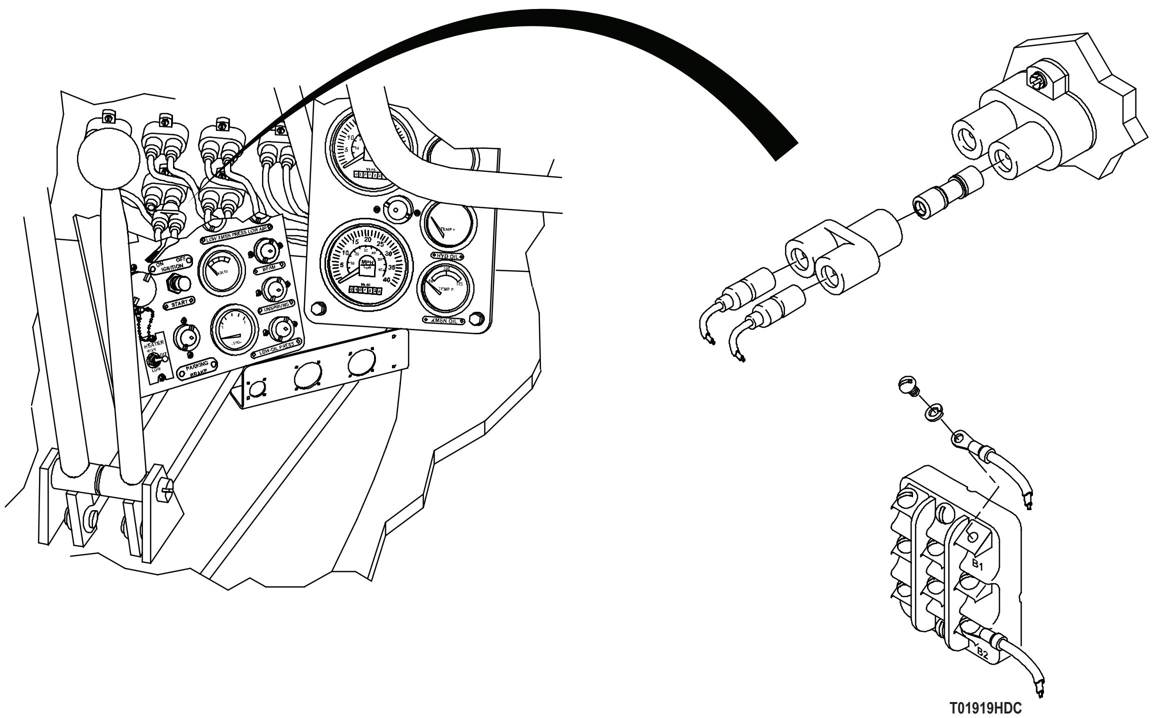



*Figure 19. Hydraulic Diagnostic Center (HDC) Simplified Power Input Circuit Components.*

**CONDITION/INDICATION**

Is 28 VDC present at parking brake relay (output) side of HDC circuit breaker?

**DECISION**

YES - Replace lead assembly 12496958 (WP 0029).
NO - Replace HDC circuit breaker (WP 0028).

## APPARENT HYDRAULIC DIAGNOSTIC CENTER (HDC) SYSTEM PROBLEM - Continued

### STEP

19. Check for 28 VDC at Y connector input terminal of HDC circuit breaker.
    a. Remove end of lead assembly 12496957 (Figure 20, Item 2) from other terminal of "Y" connector.
    b. Check for 28 VDC on "Y" connector terminal going to input terminal of HDC circuit breaker.

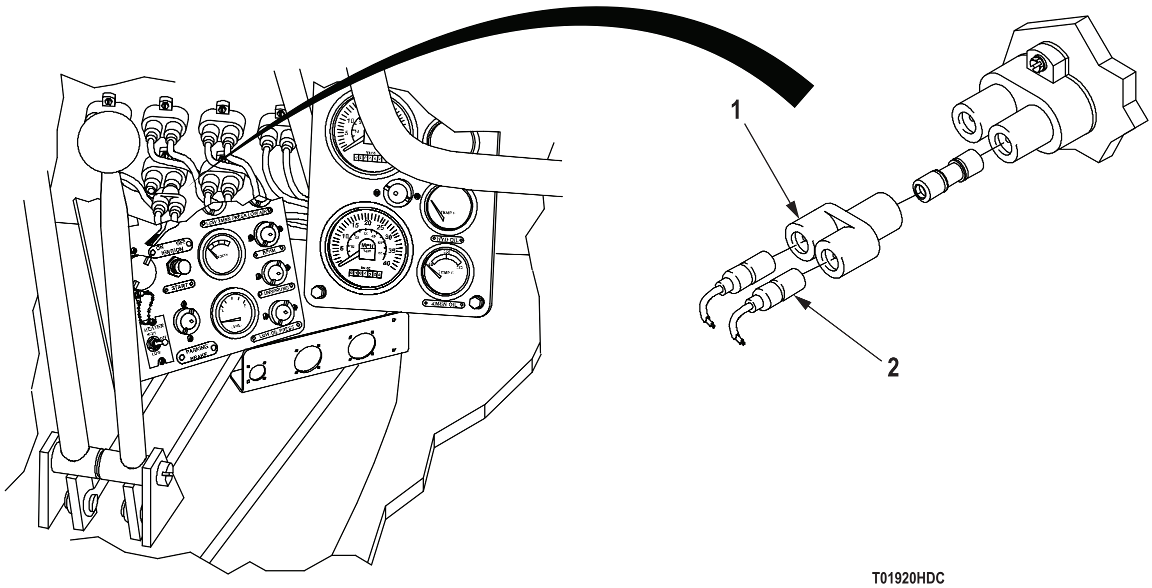



*Figure 20. Hydraulic Diagnostic Center (HDC) Simplified Power Input Circuit Components.*

### CONDITION/INDICATION

Is 28 VDC present at "Y"-connector terminal going to input terminal of HDC circuit breaker?

### DECISION

YES - Replace lead assembly 12496957 (WP 0029).
NO - Replace "Y" connector 7982404 (Figure 20, Item 1) (WP 0029).

**APPARENT HYDRAULIC DIAGNOSTIC CENTER (HDC) SYSTEM PROBLEM - Continued**

**STEP**

20. Check HDC control box LCD screen display for proper startup de-energized state information for HDC system solenoid valves (Figure 21, Items 1 and 2).

**CONDITION/INDICATION**

Do HDC control box LCD screens (PRESSURE TRANSDUCER, UPPER LCD SCREEN, and SOLENOID VALVES STATUS, LOWER LCD SCREEN) display proper start up (initial conditions) de-energized state information for HDC system solenoid valves?

**DECISION**

YES - Go to Step (22).
NO - Go to Step (21).

**STEP**

21. Check LCD screens display for proper start up information (Figure 21, Items 1 and 2).
    a. Power off HDC system.
    b. Wait a few moments, then power up HDC system again.

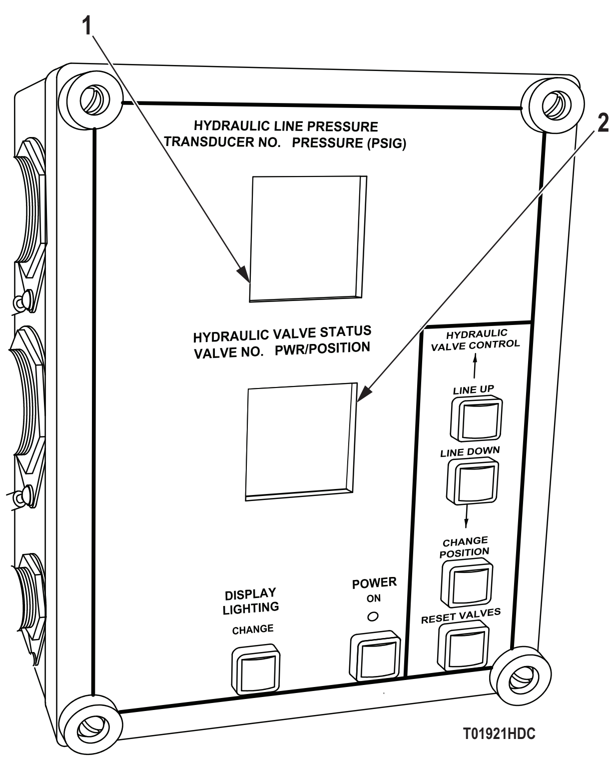



*Figure 21. Hydraulic Diagnostic Center (HDC) Control Box Front Panel.*

**CONDITION/INDICATION**

Do LCD screens display proper start up (initial conditions) information?

## APPARENT HYDRAULIC DIAGNOSTIC CENTER (HDC) SYSTEM PROBLEM - Continued

### DECISION

YES - HDC control box now appears to have passed start-up BIT. Continue with HDC system functional check-out (WP 0025).
NO - Go to Step (27).

### STEP

22. Proceed to functionally check out HDC system and individual HDC system components in accordance with procedure and sequence listed in HDC system functional check-out (WP 0025).

    Refer to "Introduction to Using the Hydraulic Diagnostic Center (HDC) System to Troubleshoot the M9 Hydraulic System" (WP 0004).

### CONDITION/INDICATION

Do all of HDC control box push button switches operate properly?

### DECISION

YES - Go to Step (25).
NO - Replace HDC control box.

### STEP

23. Check HDC for fault message.

### CONDITION/INDICATION

Is a BIT fault, DO NOT USE FOR TESTING message, or any abnormal group of characters displayed?

### DECISION

YES - Go to Step (24).
NO - Replace HDC control box.

### STEP

24. Check if control box performs BIT startup and displays a PASS message.
    a. Power off HDC system.
    b. Wait a few moments, then power up HDC system again.

### CONDITION/INDICATION

Does control box perform a start-up BIT and display a PASS message?

### DECISION

YES - HDC control box now appears to have passed start-up BIT. Continue with HDC system functional check-out (WP 0025).
NO - Replace HDC control box.

**APPARENT HYDRAULIC DIAGNOSTIC CENTER (HDC) SYSTEM PROBLEM - Continued**

**STEP**

25. Check if HDC system is fully operational.

**CONDITION/INDICATION**

Is HDC system fully operational as indicated by all of individual HDC system components specified in check-out procedure passing their functional check-out?

**DECISION**

YES - The HDC system has passed functional check-out and can be used to aid in troubleshooting vehicle hydraulic system.
NO - Go to Step (26).

**STEP**

26. If here, at least one HDC system component failed to pass the functional check-out.

**CONDITION/INDICATION**

Did all components of the HDC system pass the functional check-out?

**DECISION**

YES - Replace HDC control box.
NO - Go to Step (29).

**STEP**

27. Check if CIRCUIT FAULT message is displayed.

**CONDITION/INDICATION**

Is CIRCUIT FAULT message displayed on either LCD screen indicating that a problem exists in one (or more) of HDC system solenoid valves or pressure transducer circuits?

**DECISION**

YES - Go to Step (31).
NO - Go to Step (28).

**STEP**

28. Check if same condition exists.
    a. Power off HDC system.
    b. Wait a few moments, then power up HDC system again.

**CONDITION/INDICATION**

Do same CONDITIONS/INDICATIONS still exist?

**DECISION**

YES - Replace HDC control box.
NO - Continue with HDC system functional check-out (WP 0025) .

**APPARENT HYDRAULIC DIAGNOSTIC CENTER (HDC) SYSTEM PROBLEM - Continued**

**STEP**

29. Check if check fails.
    a. Power off HDC system.
    b. Change out HDC system component that did not pass functional check-out with an identical, known good spare, component (solenoid valve or pressure transducer, as applicable) or temporarily switch identical type component from another nearby location in HDC system.
    c. Repeat functional test of HDC system components th (WP 0025) .

**CONDITION/INDICATION**

Did functional check-out test fail again for same component designator as it did for original component in previous test?

**DECISION**

YES - Go to Step (30).
NO - Replace HDC system component (the original solenoid valve or pressure transducer) that did not pass functional test first time.

**STEP**

30. Check if CIRCUIT FAULT is a solenoid valve.

**CONDITION/INDICATION**

Is the CIRCUIT FAULT component that did not pass functional test a solenoid valve?

**DECISION**

YES - Go to Step (33).
NO - Go to Step (38).

## APPARENT HYDRAULIC DIAGNOSTIC CENTER (HDC) SYSTEM PROBLEM - Continued

### STEP

31. Check if CIRCUIT FAULT message is displayed on either screen.

    a. Check all umbilical cable W4 electrical connectors on HDC control box and umbilical cable disconnect bracket for proper connections and tightness (Figures 22 and 23).

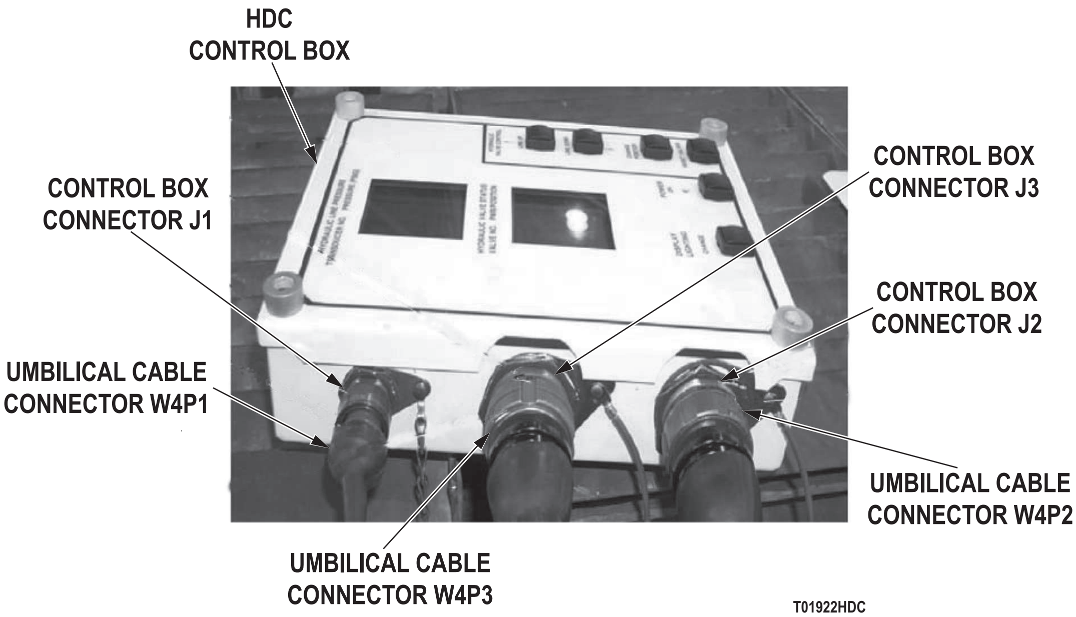



*Figure 22. Umbilical Cable Assembly W4 Connections to Hydraulic Diagnostic Center (HDC) Control Box.*

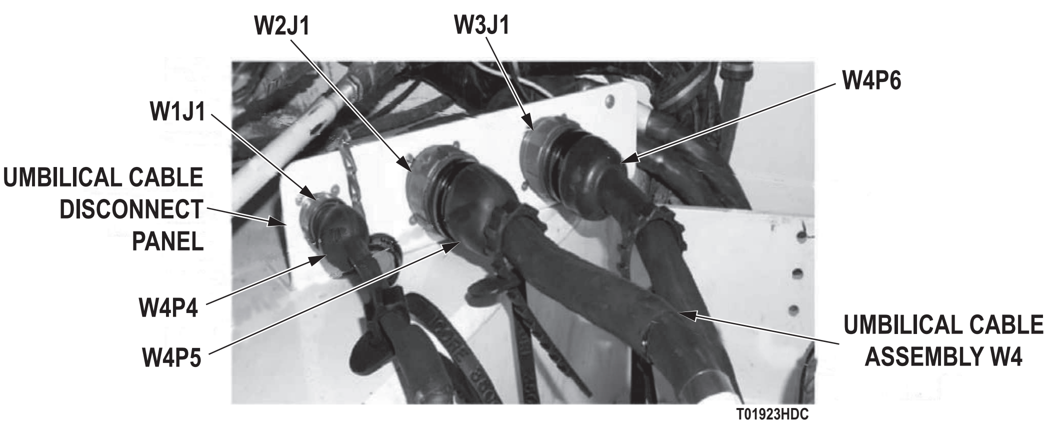



*Figure 23. Umbilical Cable Assembly W4 Connection to Umbilical Cable Disconnect Bracket.*

    b. Tighten as necessary.

    c. Power off HDC system, wait a few moments, then power up HDC system again.

### CONDITION/INDICATION

Is a CIRCUIT FAULT message displayed on either HDC control box LCD screen (upper or lower)?

**APPARENT HYDRAULIC DIAGNOSTIC CENTER (HDC) SYSTEM PROBLEM - Continued**

**DECISION**

YES - Go to Step (32).
NO - HDC system appears to have passed start-up BIT. Continue to perform HDC system functional check-out (WP 0025) .

**STEP**

32. Check what CIRCUIT FAULT message is associated with.

**CONDITION/INDICATION**

Is CIRCUIT FAULT message associated with a solenoid valve? (CIRCUIT FAULT message is displayed on hydraulic valve status LCD screen (lower LCD display))?

**DECISION**

YES - Go to Step (33).
NO - Go to Step (38).

**STEP**

33. If "CIRCUIT FAULT" message is associated with a solenoid valve (lower LCD screen display).

   a. Power off HDC system.

   b. Tag W2 or W3 cable assembly electrical lead to HDC system solenoid valve (on HDC system primary manifold, right forward manifold, left forward manifold, or aft manifold, as applicable) identified in "CIRCUIT FAULT" message and switch electrical leads with another (identical type) solenoid valve on same manifold assembly.

   c. Power up HDC system again.

   d. Power off HDC system.

   e. If a "good" solenoid valve was switched with another valve to check out first valve, make sure good valve is returned to original location.

   f. Reconnect proper electrical leads and ensure all W2 or W3 electrical leads are mated with proper solenoid valves.

**CONDITION/INDICATION**

Does lower LCD screen display same CIRCUIT FAULT message (identifying same solenoid valve as previous CIRCUIT FAULT message)?

**DECISION**

YES - Go to Step (34).
NO - Replace applicable HDC system solenoid valve identified in first "CIRCUIT FAULT" message on forward left manifold (WP 0036).
NO - Replace applicable HDC system solenoid valve identified in first "CIRCUIT FAULT" message on forward right manifold (WP 0037).
NO - Replace applicable HDC system solenoid valve identified in first "CIRCUIT FAULT" message on HDC aft manifold (WP 0038).
NO - Replace applicable HDC system solenoid valve identified in first "CIRCUIT FAULT" message on HDC primary manifold (WP 0034).

## APPARENT HYDRAULIC DIAGNOSTIC CENTER (HDC) SYSTEM PROBLEM - Continued

**STEP**

34. Check for open or short circuit in cable assemblies W2 and W3.

    a. Disconnect W2 or W3 cable assembly electrical lead going into electrical connector of solenoid valve on primary manifold, forward manifolds, or aft manifold identified in "CIRCUIT FAULT" message (Figures 24 and 25).

    b. Reference individual cable assembly wiring schematic diagrams (for cable assemblies W2 through W4) in FP-23 through FP-28, and HDC control box connections pin number signal name (WP 0004) , and trace signal path for the "CIRCUIT FAULT" solenoid valve energizing voltage (28 VDC) from a connector on HDC control box (J2 or J3) to a connector on umbilical disconnect bracket (W2J1 or W3J1), through umbilical cable connectors W4P5 or W4P6, respectively.

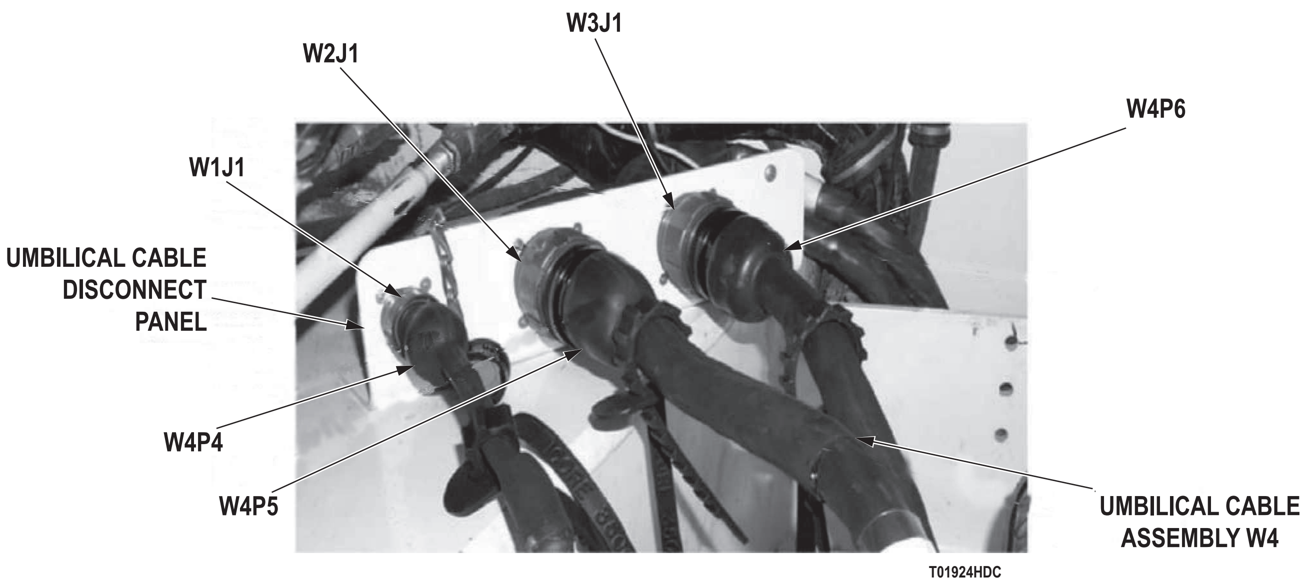



*Figure 24. Umbilical Cable Assembly W4 Connection to Umbilical Cable Disconnect Bracket.*

    c. Disconnect umbilical cable connector W4P5 or W4P6 (as applicable) associated with "CIRCUIT FAULT" solenoid valve from cable assembly W2J1 or cable assembly W3J1 (as applicable) connector on umbilical disconnect bracket.

    d. Perform continuity test and check for short circuit to cable ground (connector case/shell) for two pins/wires in applicable embedded cable assembly (W2J1 or W3J1) that route 28 VDC energizing voltage from HDC control box to solenoid valve associated with "CIRCUIT FAULT" message (28 VDC energizing voltage is applied between pins 1 and 2 on three-pin solenoid valve electrical connector on all solenoid valves).

    Refer to FP-21 Solenoid Valve Electrical Wiring Diagram.

## APPARENT HYDRAULIC DIAGNOSTIC CENTER (HDC) SYSTEM PROBLEM - Continued

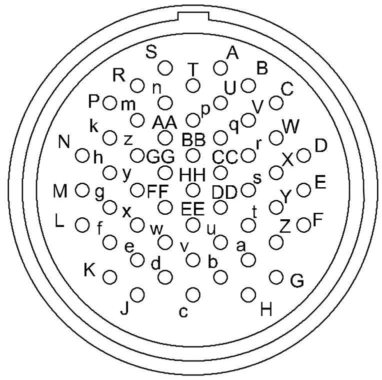



*Figure 25. Upper Cable Assembly W2J1 and Lower Cable Assembly W3J1 Electrical Connections.*

### CONDITION/INDICATION

Does an open circuit or short circuit exist in applicable cable assembly W2 or W3 wiring circuit (CIRCUIT FAULT solenoid valve 28 VDC energizing circuit) being checked? (Refer to FP-23 through FP-26) for wiring schematic diagrams of electrical cable assemblies (W2 and W3).

### DECISION

YES - Replace embedded cable assembly (W2 or W3 as applicable) associated with designated "CIRCUIT FAULT" solenoid valve 28 VDC energizing circuit wiring.
NO - Go to Step (35).

## APPARENT HYDRAULIC DIAGNOSTIC CENTER (HDC) SYSTEM PROBLEM - Continued

**STEP**

35. Check for an open or short circuit in cable assembly W4.

    a. Disconnect umbilical cable W4 connector W4P2 or W4P3 (Figures 26, 27, and 28) (from HDC control box connector J2 or J3, as applicable) associated with designated "CIRCUIT FAULT" solenoid valve.

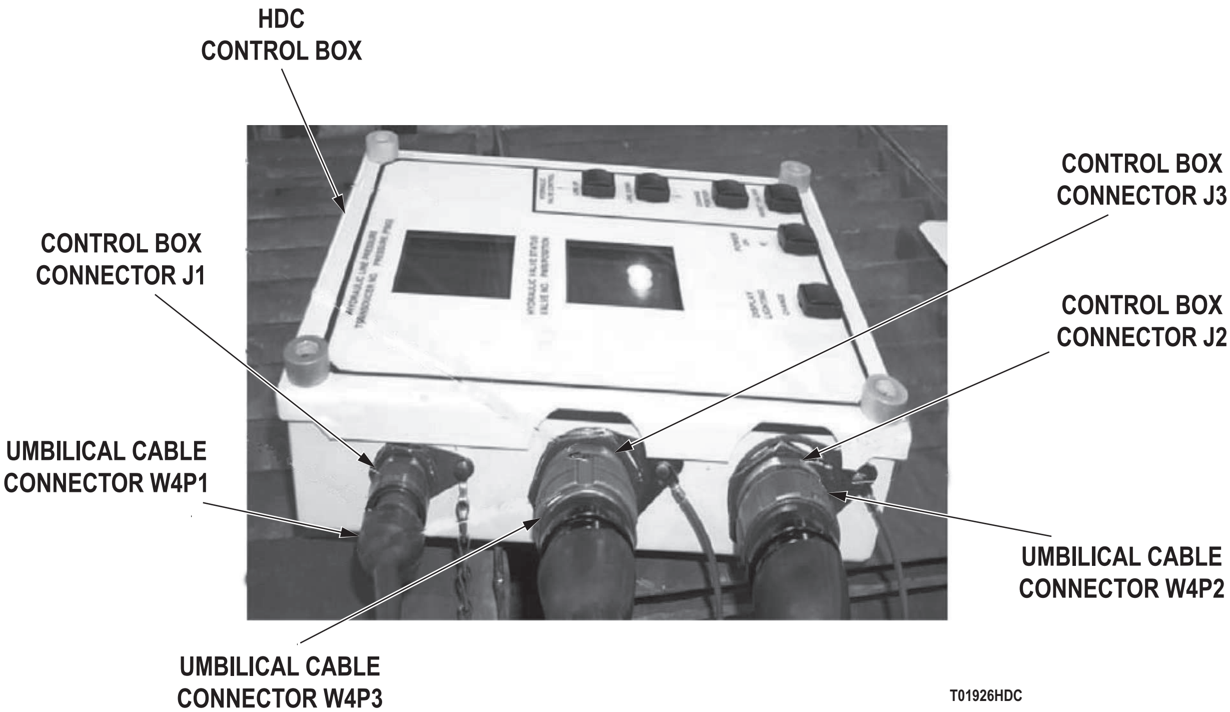
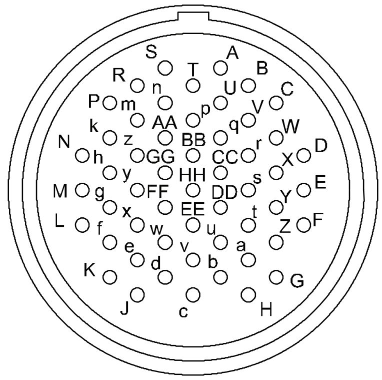



*Figure 26. Umbilical Cable Assembly W4P2 and W4P3 Connections to Hydraulic Diagnostic Center (HDC) Control Box.*

    b. Perform continuity test and check for short circuit to cable (connector case/shell) for two pins/wires in W4 cable that go from connector W4P2 or W4P3 (as applicable) normally connected to HDC control box, to W4P5 or W4P6 connector (as applicable) normally connected to umbilical disconnect bracket.

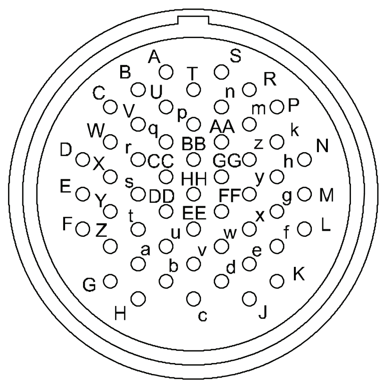
## APPARENT HYDRAULIC DIAGNOSTIC CENTER (HDC) SYSTEM PROBLEM - Continued




**PLUG**

T01927HDC

*Figure 27. Umbilical Cable Assembly W4P2 and W4P3 Electrical Connections.*




**SOCKET**

T01928HDC

*Figure 28. Umbilical Cable Assembly W4P5 and W4P6 Electrical Connections.*

### CONDITION/INDICATION

Does an open circuit or short circuit exist in umbilical cable assembly W4 wiring circuit (CIRCUIT FAULT solenoid valve 28 VDC energizing circuit) being checked?

### DECISION

YES - Replace umbilical cable assembly W4. Resume HDC system functional check-out (WP 0025) .
NO - Go to Step (36).

## APPARENT HYDRAULIC DIAGNOSTIC CENTER (HDC) SYSTEM PROBLEM - Continued

### STEP

36. Substitute a spare (good) solenoid valve with "CIRCUIT FAULT" solenoid valve and repeat test.

### CONDITION/INDICATION

ARE RESULTS SAME?

### DECISION

YES - Replace HDC control box. Resume HDC system functional check-out (WP 0025) .
NO - Replace applicable HDC system solenoid valve identified in first "CIRCUIT FAULT" message on forward left manifold (WP 0036).
NO - Replace applicable HDC system solenoid valve identified in first "CIRCUIT FAULT" message on forward right manifold (WP 0037).
NO - Replace applicable HDC system solenoid valve identified in first "CIRCUIT FAULT" message on HDC aft manifold (WP 0038).
NO - Replace applicable HDC system solenoid valve identified in first "CIRCUIT FAULT" message on HDC primary manifold (WP 0034).

### STEP

37. Check if CIRCUIT FAULT appears after faulty transducer is replaced with known good transducer.

a. If here, "CIRCUIT FAULT" message is associated with a pressure transducer (upper LCD screen display).

b. Power off HDC system.

c. Tag W2 or W3 cable assembly electrical lead to hydraulic pressure transducer identified in "CIRCUIT FAULT" message and switch electrical leads with another (or spare) hydraulic pressure transducer. If a spare of another pressure transducer is not nearby, temporarily exchange identified pressure transducer with another pressure transducer from elsewhere in vehicle.

d. Power up HDC system again.

e. Power off HDC system.

f. If a "good" pressure transducer was switched with another pressure transducer to check out first transducer, make sure good transducer is returned to original location.

g. Reconnect proper electrical leads and ensure all W2 or W3 electrical leads are mated with proper pressure transducer.

## APPARENT HYDRAULIC DIAGNOSTIC CENTER (HDC) SYSTEM PROBLEM - Continued

### CONDITION/INDICATION

Does upper LCD screen display same CIRCUIT FAULT message (identifying same hydraulic pressure transducer as previous CIRCUIT FAULT message)?

### DECISION

YES - Go to Step (38)
NO - Replace applicable HDC system solenoid valve identified in first "CIRCUIT FAULT" message on forward left manifold (WP 0036).
NO - Replace applicable HDC system solenoid valve identified in first "CIRCUIT FAULT" message on forward right manifold (WP 0037).
NO - Replace applicable HDC system solenoid valve identified in first "CIRCUIT FAULT" message on HDC aft manifold (WP 0038).
NO - Replace applicable HDC system solenoid valve identified in first "CIRCUIT FAULT" message on HDC primary manifold (WP 0034).

### STEP

38. Check if cable assemblies W2 or W3 have an open or short circuit.

    a. Disconnect applicable W2 or W3 cable assembly electrical lead going to electrical connector of pressure transducer identified in "CIRCUIT FAULT" message.

    b. Reference individual cable assembly wiring schematic diagrams (for cable assemblies W2 through W4) in FP-23 through FP-28, and HDC control box connectors pin number signal names information in "Introduction to Using the Hydraulic Diagnostic Center (HDC) System to Troubleshoot the M9 Hydraulic System" (WP 0004), and trace signal path for "CIRCUIT FAULT: pressure transducer reference voltage (15 VDC) from a connector on HDC control box (J2 or J3) to a connector on umbilical disconnect bracket (W2J1 or W3J1), through applicable umbilical cable connector W4P5 or W4P6, respectively (Figure 29).

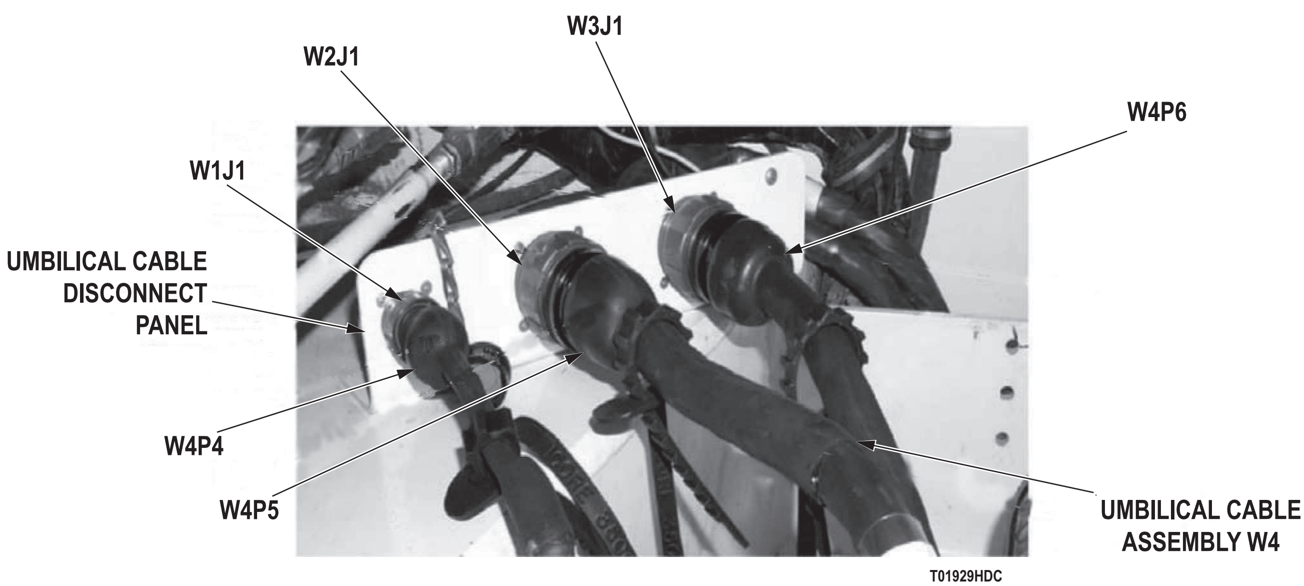



*Figure 29. Umbilical Cable Assembly W4 Connection to Umbilical Cable Disconnect Bracket.*

## APPARENT HYDRAULIC DIAGNOSTIC CENTER (HDC) SYSTEM PROBLEM - Continued

c. Disconnect umbilical cable connector W4P5 or W4P6 (as applicable) associated with "CIRCUIT FAULT" pressure transducer from cable assembly W2J1 or cable assembly W3J1 (as applicable) connector on umbilical disconnect bracket (Figures 30 and 31).

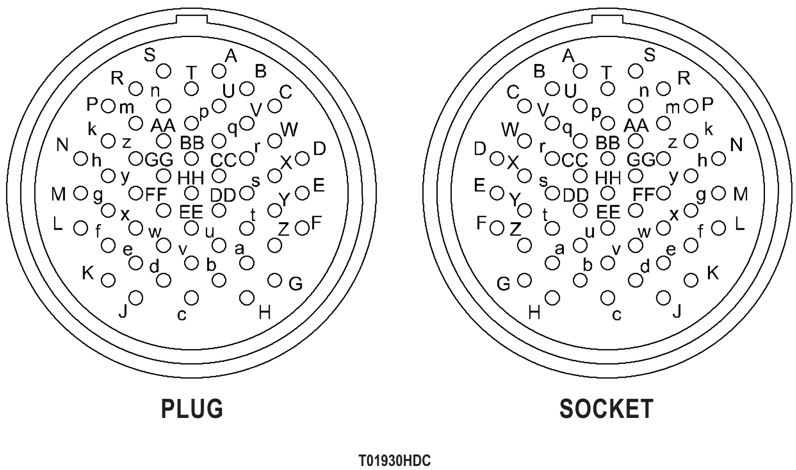



*Figure 30. Pin Locations for W2J1 and W3J1 Connectors.*

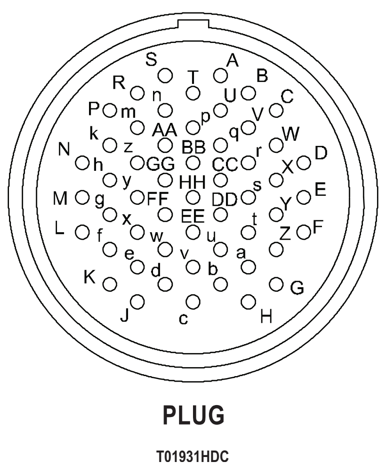



*Figure 31. Upper Cable Assembly W2 and Lower Cable Assembly W3 Electrical Connections.*

d. Perform continuity test and check for short circuit to cable ground (connector case/shell) for two pins/ wires in embedded cables assembly (W2J1 or W3J1, as applicable) that route 15 VDC reference voltage from HDC control box to pressure transducer associated with "CIRCUIT FAULT" message. (15 VDC reference voltage is applied between pins 1 and 2 on 5-pin hydraulic pressure transducer electrical connector J1 on all pressure transducers. The DC voltage representing hydraulic pressure measured by pressure transducer is returned to HDC control box between pins 4 and 5 on transducer electrical connector J1).

Refer to FP-19 Hydraulic Pressure Transducer Electrical Wiring Diagram.

**APPARENT HYDRAULIC DIAGNOSTIC CENTER (HDC) SYSTEM PROBLEM - Continued**

**CONDITION/INDICATION**

Does an open circuit or short circuit exist in cable assembly W2 or W3 wiring circuit (CIRCUIT FAULT pressure transducer 15 VDC reference circuit) being checked? (Refer to FP-23 through FP26, for wiring schematic diagrams of electrical cable assemblies W2 and W3).

**DECISION**

YES - Replace embedded cable assembly (W2 or W3, as applicable) associated with designated "CIRCUIT FAULT" pressure transducer 15 VDC reference voltage circuit wiring.
NO - Go to Step (39).

**STEP**

39. Check if cable assembly W4 has an open or shorted circuit.

a. Disconnect umbilical cable W4 connector W4P2 on W4P3 (Figure 32) (from HDC control box connector J2 or J3, as applicable) associated with designated "CIRCUIT FAULT" pressure transducer.

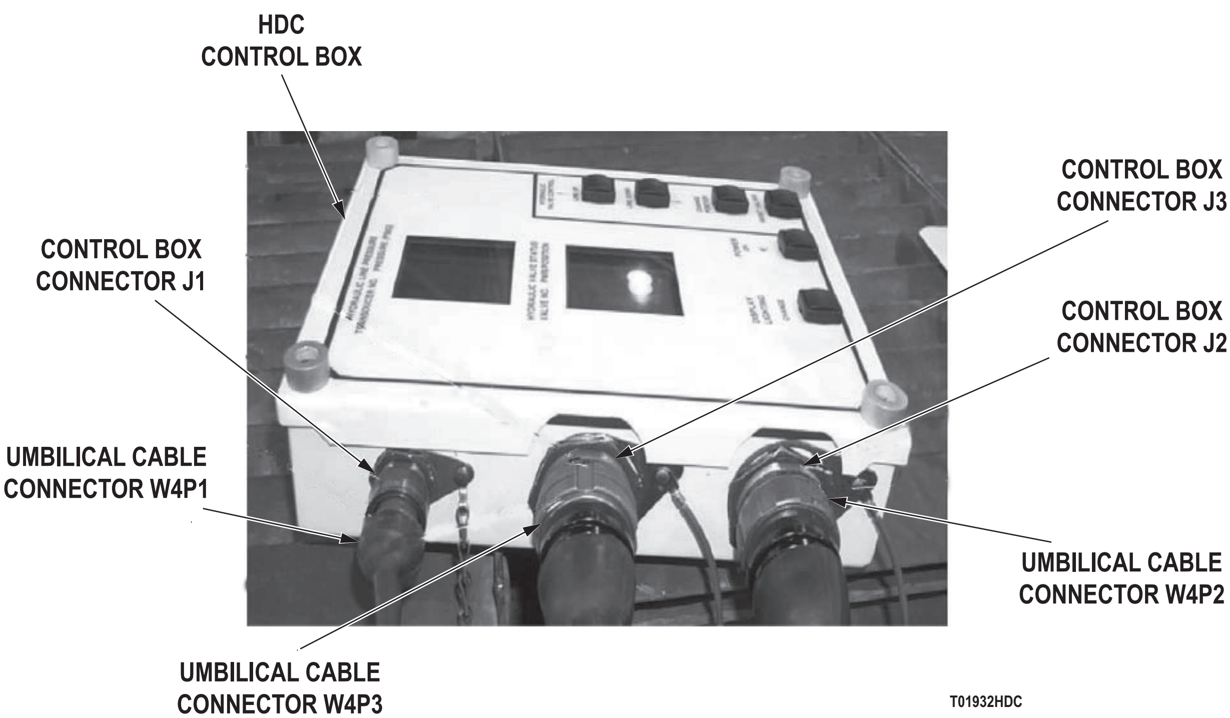



*Figure 32. Umbilical Cable Assembly W4 Connections to Hydraulic Diagnostic Center (HDC) Control Box.*

## APPARENT HYDRAULIC DIAGNOSTIC CENTER (HDC) SYSTEM PROBLEM - Continued

b. Perform continuity test and check for short circuit to cable (connector case/shell) for two pins/wires in W4 cable that go from either connector W4P2 or W4P3 (as applicable), normally connected to HDC control box, to W4P5 or W4P6 connector (as applicable) normally connected to umbilical disconnect bracket (Figures 33 and 34).

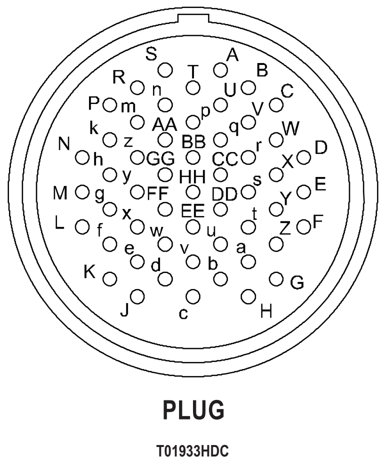



*Figure 33. Umbilical Cable Assembly W4P2 and W4P3 Electrical Connectors.*

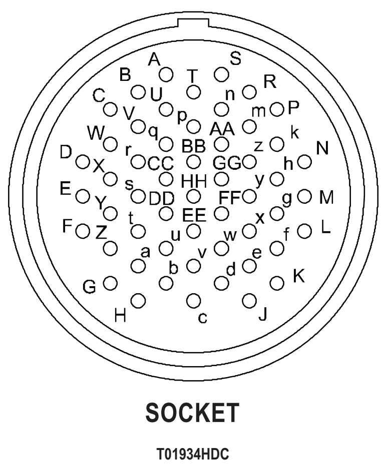



*Figure 34. Umbilical Cable Assembly W4P5 and W4P6 Electrical Connectors.*

### CONDITION/INDICATION

Does an open circuit or short circuit exist for umbilical cable assembly W4 wiring circuit (CIRCUIT FAULT pressure transducer 15 VDC referenced voltage circuit) being checked?

### DECISION

YES - Replace umbilical cable assembly W4. Resume HDC system functional check-out (WP 0025) .
NO - Go to Step (40).

## APPARENT HYDRAULIC DIAGNOSTIC CENTER (HDC) SYSTEM PROBLEM - Continued

### STEP

40. Substitute a spare (good) pressure transducer for "CIRCUIT FAULT" pressure transducer identified during BIT and repeat test.

### CONDITION/INDICATION

Are results same?

### DECISION

YES - Replace HDC control box. Resume HDC system functional check-out (WP 0025) .
NO - Replace applicable HDC system solenoid valve identified in first "CIRCUIT FAULT" message on forward left manifold (WP 0036).
NO - Replace applicable HDC system solenoid valve identified in first "CIRCUIT FAULT" message on forward right manifold (WP 0037).
NO - Replace applicable HDC system solenoid valve identified in first "CIRCUIT FAULT" message on HDC aft manifold (WP 0038).
NO - Replace applicable HDC system solenoid valve identified in first "CIRCUIT FAULT" message on HDC primary manifold (WP 0034).

### END OF WORK PACKAGE

# CHAPTER 3

# PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS) MAINTENANCE INSTRUCTIONS

## OPERATOR MAINTENANCE
## PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS) INTRODUCTION

This work package contains the Preventive Maintenance Checks and Services (PMCS) required for the M9 ACE Hydraulic Diagnostic Center (HDC) System. PMCS is a scheduled, step-by-step inspection and service of the vehicle and vehicle components. Its purpose is to keep the vehicle in good condition and to identify and correct problems before costly and time-consuming repairs are needed.

### MAINTENANCE FORMS AND RECORDS

Use DA Form 2404, Equipment Inspection and Maintenance Worksheet, to record periodic maintenance service performed and faults corrected. The item number on the DA Form 2404 must be the same as the item number of the PMCS. For information on maintenance forms and records, see DA Pam 750-8.

### MECHANIC PARTICIPATION

The operator may perform operator PMCS (TM 5-2350-262-10) and may also help Field Maintenance perform field PMCS and lubrication in accordance with TM 5-2350-262-10.

### INTERVALS

HDC PMCS should be performed every week.

**END OF WORK PACKAGE**

# FIELD MAINTENANCE
# PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS)

**INITIAL SETUP:**

**Tools and Special Tools**
Tool Kit, General Mechanic's: Automotive (WP 0054, Table 1, Item 7)

**Materials/Parts**
Rag, Wiping (WP 0053, Table 1, Item 2)

**Personnel Required**
Construction Equipment Repairer, 91L (Two)

**References**
WP 0021
WP 0025

**Equipment Condition**
Vehicle MASTER power OFF (TM 5-2350-262-10)

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

| ITEM NO. | INTERVAL | ITEM TO BE CHECKED OR SERVICED | PROCEDURE | EQUIPMENT NOT READY/ AVAILABLE IF: |
|---|---|---|---|---|
| 1 | Weekly | Nuts, Bolts, and Screws (Figure 1) | Check for loose parts by looking for cracked or chipped paints around screws and bolt heads. Check for missing or broken cotter pins or lock wire. | Nuts, bolts, or screws missing, loose, stripped, or improperly installed. |

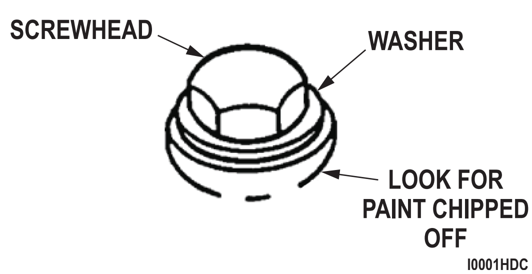



*Figure 1. Bolt.*

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

| ITEM NO. | INTERVAL | ITEM TO BE CHECKED OR SERVICED | PROCEDURE | EQUIPMENT NOT READY/ AVAILABLE IF: |
|---|---|---|---|---|
| 2 | Weekly | Hydraulic Diagnostic Center (HDC) System Components (Figure 2) | a. Clean HDC system components. They should be free of dirt, oil, and hydraulic fluids. | Any condition would prevent safe operation of vehicle. |
| | | | b. Check condition of Umbilical Disconnect Bracket and attached cables in Operator's Compartment. | Bracket is not secured and/or cables are missing or broken. |

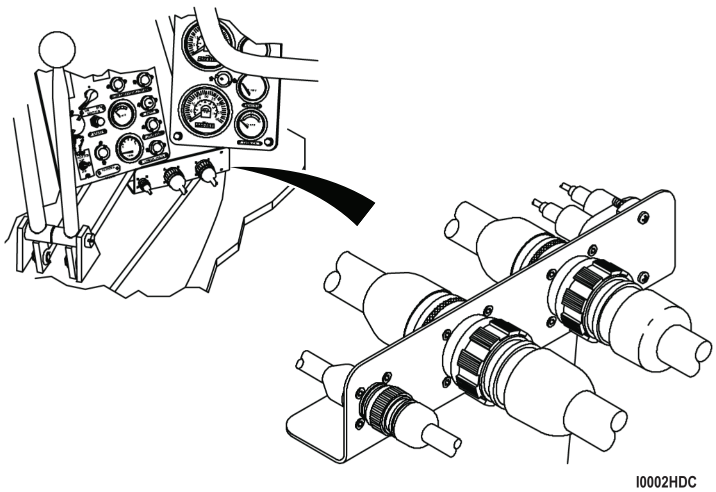



*Figure 2. Hydraulic Diagnostic Center (HDC) Bracket.*

| ITEM NO. | INTERVAL | ITEM TO BE CHECKED OR SERVICED | PROCEDURE | EQUIPMENT NOT READY/ AVAILABLE IF: |
|---|---|---|---|---|
| 3 | Weekly | HDC System Electrical Components (Figure 3) | a. Check that all HDC electrical connections and connectors are clean and tight. | |
| | | | b. Check condition of HDC Control Box and Umbilical Cable Assembly W4. | Any condition would prevent safe operation of vehicle. |

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

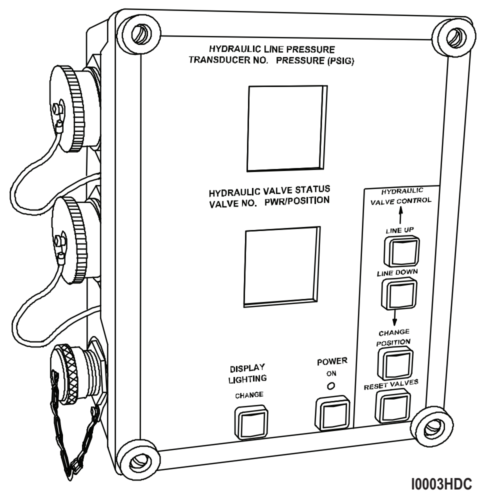



*Figure 3. Hydraulic Diagnostic Center (HDC) Control Box.*

| ITEM NO. | INTERVAL | ITEM TO BE CHECKED OR SERVICED | PROCEDURE | EQUIPMENT NOT READY/ AVAILABLE IF: |
|---|---|---|---|---|
| | | | c. Check condition of HDC Power Cable W1, Upper Cable Assembly W2, and Lower Cable Assembly W3. | |
| | | | d. Check HDC system solenoid valves and pressure transducer electrical connectors for proper connections and tight fit. Tighten as required. | Any condition would prevent safe operation of vehicle. |
| 4 | Weekly | HDC System Hydraulic Components (Figure 4) | a. Check all HDC hydraulic hoses, tubes, and fittings for damage, loose clamps, improper routing, leaks, and chafing. | Any condition would prevent safe operation of vehicle. |
| | | | b. Check fittings for evidence of leaks and looseness. Do not overtighten hoses, tubes, or fittings. | |

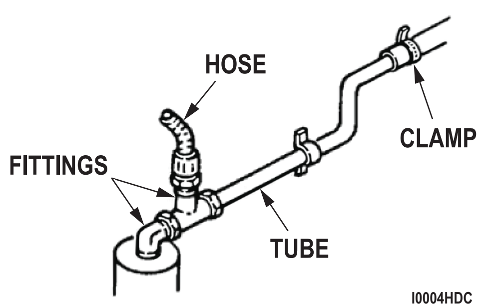



*Figure 4. Hydraulic Hoses, Tubes, and Fittings.*

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

| ITEM NO. | INTERVAL | ITEM TO BE CHECKED OR SERVICED | PROCEDURE | EQUIPMENT NOT READY/ AVAILABLE IF: |
|---|---|---|---|---|
| 5 | Weekly | Primary Manifold/ Directional Control Valve (DCV) Bank (Figure 5) | Ensure that the seven hydraulic metal tubes connected between primary manifold and DCV bank are tight and that there are no leaking fittings. | Any condition would prevent safe operation of vehicle. |


*Figure 5. Hydraulic Metal Tubes.*

| ITEM NO. | INTERVAL | ITEM TO BE CHECKED OR SERVICED | PROCEDURE | EQUIPMENT NOT READY/ AVAILABLE IF: |
|---|---|---|---|---|
| 6 | Weekly | HDC System Pressure Transducers | Check that all HDC system pressure transducers are tightly seated in adapters. | Any condition would prevent safe operation of vehicle. |
| 7 | Weekly | | Perform M9 ACE HDC system Functional Check-Out pro (WP 0025) . If the HDC system does not pass all portions of the Functional Check-out procedure, refer to (WP 0021) and proceed to troubleshoot as applicable. | Any condition would prevent safe operation of vehicle. |

## PMCS MANDATORY REPLACEMENT PARTS

There are no mandatory replacement parts for these PMCS procedures.

## END OF TASK

## END OF WORK PACKAGE

# CHAPTER 4

# MAINTENANCE INSTRUCTIONS

## FIELD MAINTENANCE
## SERVICE UPON RECEIPT

**INITIAL SETUP:**

**Personnel Required**
Construction Equipment Repairer, 91L

**References**
WP 0004

**References (cont.)**
DA PAM 750-8
SF 361, Transportation Discrepancy Report

### SERVICE UPON RECEIPT OF MATERIEL

Inspect the equipment for damage incurred during shipment. If the equipment has been damaged, report the damage on the SF 361, Transportation Discrepancy Report.

Check the equipment against the packing slip to see if the shipment is complete. Report all discrepancies in accordance with applicable service instructions (e.g., for Army instructions, see DA PAM 750-8).

Check to see whether the equipment has been modified.

Refer to INTRODUCTION TO USING THE HYDRAULIC DIAGNOSTIC CENTER (HDC) SYSTEM TO TROUBLESHOOT THE M9 ACE HYDRAULIC SYSTEM (WP 0004) for the required equipment and tools.

### INSTALLATION INSTRUCTIONS

Refer to INTRODUCTION TO USING THE HYDRAULIC DIAGNOSTIC CENTER (HDC) SYSTEM TO TROUBLESHOOT THE M9 ACE HYDRAULIC SYSTEM (WP 0004) for installation instructions.

**END OF TASK**

**END OF WORK PACKAGE**

**FIELD MAINTENANCE**
**M9 ACE HYDRAULIC DIAGNOSTIC CENTER (HDC) SYSTEM FUNCTIONAL CHECK-OUT**

**INITIAL SETUP:**

**Personnel Required**
Combat Engineer, 21B
Construction Equipment Repairer, 91L

**References**
TM 5-2350-262-10

## M9 ACE HYDRAULIC DIAGNOSTIC CENTER (HDC) SYSTEM FUNCTIONAL CHECK-OUT

**Purpose:**

The purpose of the Functional Check-Out is to ensure that the vehicle and the HDC System are functioning properly.

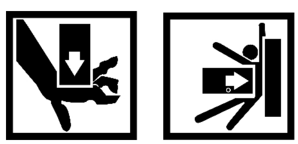
**Assumptions:**

1. Vehicle relief valve settings have previously been adjusted using a GS-5 pressure gauge, with a tolerance of +/− 100 psi (689.4757 kPa).
2. The accuracy of the HDC system is +/− 100 psi (689.4757 kPa).
3. Pressure values within +/− 200 psi (1378.951 kPa) are considered within specification.
4. Other vehicle operational characteristics meet the specifications.

**Procedure:**

The individual tests should be conducted in accordance with this procedure. Figures and tables provide additional information. The HDC System is considered fully operational when it has passed all of the tests.

**WARNING**



Before performing any troubleshooting in bowl, move the ejector forward and disconnect the ejector cylinder from the hydraulic system by pulling the handle down on ball valve V23, located in the rear of the bowl area, just below the main Directional Control Valve (DCV) bank. Failure to comply may result in severe injury or death to personnel.

**NOTE**

Problems existing in the vehicle hydraulic system when the HDC System Functional Check-Out is performed could result in the HDC System not passing all portions of the Functional Check-Out. Because of this, it is important that all applicable vehicle PMCS checks have been performed and that vehicle hydraulic functions be exercised prior to performing the HDC System Functional Check-Out to determine exactly which vehicle hydraulic functions are impaired and to use this information with the results of the Functional Check-Out to help isolate the problem area.

1. Exercise vehicle functions:
   a. Confirm that the three HDC System manual valves V21 (Figure 1, Item 1), V22 (Figure 1, Item 2), and V23 (Figure 1, Item 3) are in fully OPEN position. Handles must be vertical.

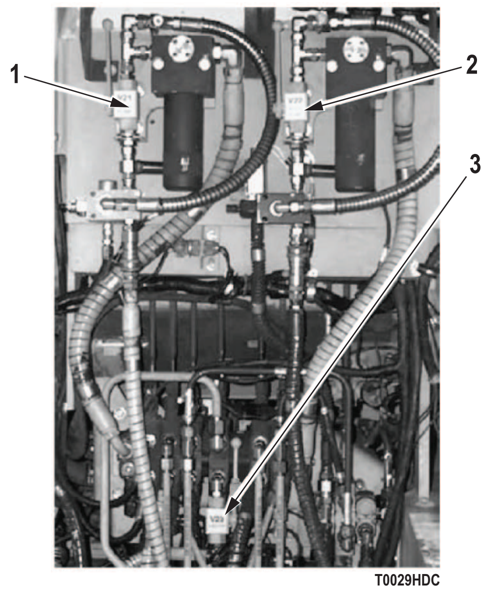
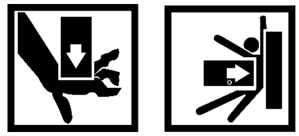



*Figure 1. Directional Control Valve (DCV) Bank.*

   b. Start engine.
   c. Confirm that vehicle rises up and levels out normally when the engine is started within two minutes.
   d. Confirm that ejector extends and retracts.
   e. Confirm that apron moves up and down.
   f. Confirm that left suspension moves up and down.
   g. Confirm that right suspension moves up and down.
   h. Confirm that the left and right bump stops extend when the vehicle is placed in SPRUNG mode, and retract when the vehicle is placed in UNSPRUNG mode.
   i. Confirm that winch pays out and pays in.
2. Valve V23 check:
   a. Stop engine.
   b. Manually place valve V23 in the closed position. Handle horizontal (down).
   c. Start engine.
   d. Confirm that the ejector does not extend or retract. (This indicates that valve V23 is working properly.)
   e. Stop engine and ensure that engine is off before connecting HDC control box.

3. HDC Control Box power-up and operation.

**WARNING**



Do not activate the vehicle’s hydraulic control levers or depress any buttons on the HDC control box unless directed by this procedure. Failure to comply could result in serious injury or death to personnel.

a. Ensure vehicle power is off.

b. Remove HDC Control Box and umbilical cable W4 from stowage location behind operator's seat.

c. Place HDC Control Box in operating location.

d. Connect HDC Control Box and umbilical cable W4 to vehicle as per (WP 0004).

e. Place vehicle power on.

f. Ensure parking brake is on and transmission is in neutral, then start vehicle engine. HDC System will not receive operating power from vehicle unless parking brake is on and transmission is in neutral.

g. With the vehicle engine running and the transmission in neutral, turn the HDC Control Box on by pressing the POWER button. (Depressing the POWER button again will turn the HDC Control box off.) Note that:

(1) Power to the HDC System is disconnected if the vehicle is taken out of neutral.

(2) The solenoid valves will return to their normal vehicle operating positions (de-energized/not powered) when the HDC Control Box is turned off (or power is disconnected).

**NOTE**

The HDC System automatically initiates a start-up Built-In-Test (BIT) when power is applied to the system.

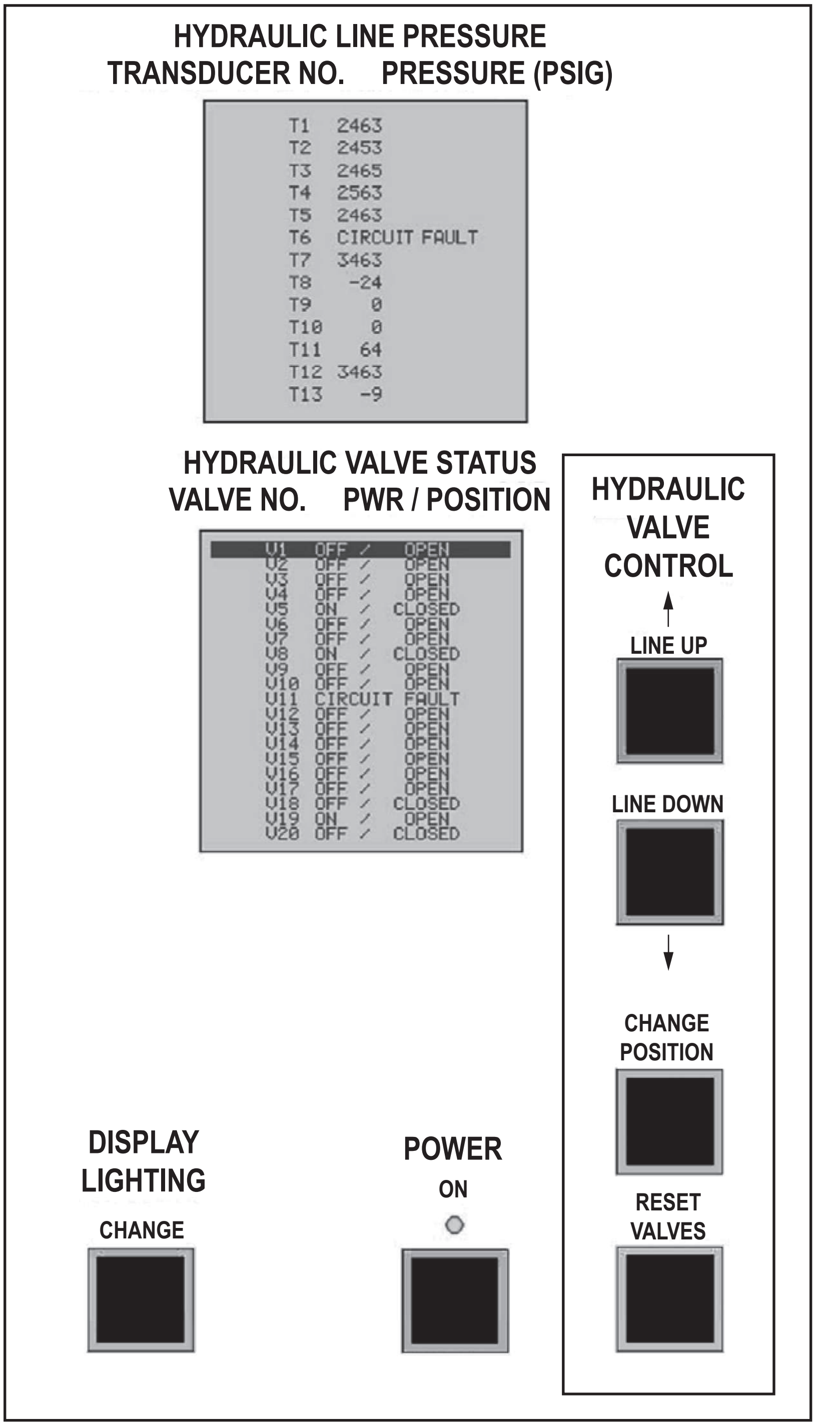
h. After power is applied to the HDC System, and a start-up BIT is performed, if a BIT fault message is displayed on the Liquid Crystal Display (LCD), do not use the HDC Control Box for testing.

i. When system powers up, displays will be dark for 3 seconds. If significant sections of the displays are missing, displays will be unreadable; do not use if displays are unreadable.

j. If the temperature is below -4°F (-20°C), the displays will not come on until warmed up. The power light will blink until the displays have warmed up.

k. If the start-up BIT passed, and the HDC System is operating properly, the initial default display for the status of the HDC System solenoid valves will appear as shown in Table 1. This is the normal de-energized (unpowered) state of the HDC System solenoid valves.

l. Confirm that the HDC Control Box displays the pressure transducer number, hydraulic line pressure, solenoid valve number, valve power status (on/off) (PWR), and valve position (open/closed) status similar to Table 1 (for the solenoid valves). (Note: a CIRCUIT FAULT message indicates a disconnected or malfunctioning wire harness, electrical cable, or defective component. Check all connections in the event of a CIRCUIT FAULT message as shown in the test display example on Figure 2).




T0030HDC

*Figure 2. Typical Hydraulic Diagnostic Center (HDC) Control Box Test Display (Not The Start-up Display).*

m. If the solenoid valves portion of the HDC Control Box start-up LCD display does not appear as shown in Table 1, refer toTroubleshooting (WP 0021), for troubleshooting procedures to aid in isolating a fault or problem in the HDC System.

n. The HDC Control Box default solenoid valve display (all solenoid valves in the OFF position) should be as shown in Table 1.

*Table 1. Default Solenoid Valve LCD Display.*

| VALVE NO. | PWR | / | POSITION |
|---|---|---|---|
| V1 | OFF | / | OPEN |
| V2 | OFF | / | OPEN |
| V3 | OFF | / | OPEN |
| V4 | OFF | / | OPEN |
| V5 | OFF | / | OPEN |
| V6 | OFF | / | OPEN |
| V7 | OFF | / | OPEN |
| V8 | OFF | / | OPEN |
| V9 | OFF | / | OPEN |
| V10 | OFF | / | OPEN |
| V11 | OFF | / | OPEN |
| V12 | OFF | / | OPEN |
| V13 | OFF | / | OPEN |
| V14 | OFF | / | OPEN |
| V15 | OFF | / | OPEN |
| V16 | OFF | / | OPEN |
| V17 | OFF | / | OPEN |
| V18 | OFF | / | CLOSED |
| V19 | OFF | / | CLOSED |
| V20 | OFF | / | CLOSED |

## NOTE

- Electrical solenoid valves V1 through V20 can be opened and closed by using the LINE UP and LINE DOWN buttons on the HDC Control Box to select a valve, and then pressing the CHANGE POSITION button to open or close the valve. The HDC Control Box software allows up to four of the solenoid valves (V1-V20) to be powered ON at one time. Pressing the RESET VALVES button returns all solenoid valves to their normal (default) operating position (power to the valves is OFF).
- Valves V21 and V22 are manually operated, and are located in the bowl area, near the high pressure filters.
- Valve V23 is also manually operated, and is located in the bowl area, on the front of the Directional Control Valve (DCV) bank. It is operated while standing in the bowl. This valve is used to interrupt hydraulic fluid flow to the ejector. It is recommended that the engine be shut down when operating valve V23, for safety purposes.

o. Use LINE UP or LINE DOWN buttons to scroll to desired solenoid valve number and select CHANGE POSITION to energize (open or close) valve. Note: A maximum of four valves can be powered on at one time. If a solenoid valve circuit has failed, CIRCUIT FAULT will be displayed next to the solenoid valve number on the HDC Control Box LCD display and that valve cannot be selected/powered.

p. After solenoid valves are selected, read applicable hydraulic line pressures on the other LCD. If a hydraulic pressure transducer circuit has failed, a CIRCUIT FAULT message will be displayed next to the transducer number and the pressure will not be displayed.

q. Use "RESET VALVES" to place all solenoid valves in their normal de-energized (un-powered) position.

r. Select "CHANGE" to adjust display lighting.

4. Transducer T7, T8, T9, T10, T11, T12, and T13 check:

   a. Have the vehicle operator move the SPRUNG/UNSPRUNG lever to the UNSPRUNG position.

   b. With the vehicle running, confirm that T7, T8, T9, T10, T11, T12, and T13 read greater than 2500 psi (17236.89 kPa). (This is the pressure provided by the compensating pump, and it indicates that transducers T7 through T13 are working properly).

5. Transducer T5 check:

   a. Push the RESET VALVES button on the HDC Control Box, and verify that all the valves are set to the power OFF setting and are in the default position as shown in Table 1.

   b. Verify that the SPRUNG/UNSPRUNG lever is in the UNSPRUNG position.

   c. Have the vehicle operator move the right SUSPENSION CONTROL lever to the RAISE position, and hold it there until the vehicle reaches the maximum height.

   d. Verify that the pressure reading for T5 is at least 2,800 psi (19305.32 kPa). (T5 is now indicating the pressure setting of the right suspension relief valve, and indicates that transducer T5 is working properly.)

   e. Have the vehicle operator release the right SUSPENSION CONTROL lever.

6. Transducer T6 check:

   a. Push the RESET VALVES button and verify all the valves are set to the power OFF setting and are in the default position, as shown in Table 1.

   b. Verify that the SPRUNG/UNSPRUNG lever is in the UNSPRUNG position.

   c. Have the vehicle operator move the left SUSPENSION CONTROL lever to the RAISE position, and hold it there until the vehicle reaches the maximum height.

   d. Verify that the pressure reading for T6 is at least 2,800 psi (19305.32 kPa). (T6 is now indicating the pressure setting of the left suspension relief valve, and indicates that transducer T6 is working properly.)

   e. Have the vehicle operator release the left SUSPENSION CONTROL lever.

7. Valve V21 and transducer T3 check:

   a. Push the RESET VALVES button on the HDC Control Box, and verify all the valves are set to the power OFF setting and are in the default position as shown in Table 1.

   b. Slowly close ball valve V21 until the pressure reading on T3 display exceeds 3,000 psi (20684.27 kPa). (This indicates that V21 and T3 are both working properly.)

   c. Open ball valve V21 completely.

8. Valve V22 and transducer T4 check:

   a. Push the RESET VALVES button on the HDC Control Box, and verify all the valves are set to the power OFF setting and are in the default position as shown in Table 1.

   b. Slowly close ball valve V22 until the pressure reading on T4 display exceeds 3,000 psi (20684.27 kPa). (This indicates that V22 and T4 are both working properly).

   c. Open ball valve V22 completely.

9. Valve V5 and transducer T1 check:

   a. Push the RESET VALVES button on the HDC Control Box, and verify all the valves are set to the power OFF setting and are in the default position as shown in Table 1.

   b. Have the vehicle operator place the vehicle in UNSPRUNG mode.

   c. Use the LINE UP and LINE DOWN buttons to select valve V5. Press CHANGE POSITION to close valve V5.

   d. Have the vehicle operator move the right SUSPENSION CONTROL lever to LOWER. Verify that the right suspension does NOT lower, and that transducer T1 reads greater than 3500 psi (24131.65 kPa). (This indicates that valve V5 has redirected flow from the suspension to transducer T1, which will now read the value of the system relief valves.)

10. Valve V9 and V10 check:

   a. Push the RESET VALVES button on the HDC Control Box, and verify all the valves are set to the power OFF setting and are in the default position as shown in Table 1.

   b. Have the vehicle operator place the vehicle in SPRUNG mode.

   c. Verify that the bump stops are extended.

   d. Use the LINE UP and LINE DOWN buttons to select valve V9. Press CHANGE POSITION to close valve V9.

   e. Use the LINE UP and LINE DOWN buttons to select valve V10. Press CHANGE POSITION to close valve V10.

   f. Have the vehicle operator place the vehicle in UNSPRUNG mode.

   g. Verify that the bump stops are still extended. (This indicates that V9 and V10 are closed, preventing operation of the bump stops.)

   h. Push the RESET VALVES button on the HDC Control Box, and verify all the valves are set to the power OFF setting and are in the default position as shown in Table 1.

   i. Verify that the bump stops are now retracted. (This verifies that V9 and V10 have opened.)

11. Valve V11 check:

   a. Push the RESET VALVES button on the HDC Control Box, and verify all the valves are set to the power OFF setting and are in the default position as shown in Table 1.

   b. Have the vehicle operator place the vehicle in SPRUNG mode.

c. Use the LINE UP and LINE DOWN buttons to select valve V11. Press CHANGE POSITION to close valve V11.

d. Verify that transducer T1 reads less than 500 psi (3447.379 kPa).

e. Have the vehicle operator place the vehicle in UNSPRUNG mode.

f. Have the vehicle operator move the left SUSPENSION CONTROL lever to LOWER.

g. Verify that transducer T1 reads greater than 3000 psi (20684.27 kPa). (This indicates that V11 has directed flow from the suspension to transducer T1, which now reads the system relief valve pressure setting.)

12. Valve V14 check:

a. Push the RESET VALVES button on the HDC Control Box, and verify all the valves are set to the power OFF setting and are in the default position as shown in Table 1.

b. Use the LINE UP and LINE DOWN buttons to select valve V14. Press CHANGE POSITION to close valve V14.

c. Have the vehicle operator move the winch control lever to PAY OUT until transducer T1 reads less than 500 psi (3447.379 kPa).

d. Have the vehicle operator move the winch control lever to PAY IN until transducer T1 reads greater than 1500 psi (10342.14 kPa). (This indicates that V14 has directed flow from the winch circuit to transducer T1.)

13. Valve V15 check:

a. Push the RESET VALVES button on the HDC Control Box, and verify all the valves are set to the power OFF setting and are in the default position as shown in Table 1.

b. Use the LINE UP and LINE DOWN buttons to select valve V15. Press CHANGE POSITION to close valve V15.

c. Have the vehicle operator move the right SUSPENSION CONTROL lever to LOWER until transducer T1 reads less than 500 psi (3447.379 kPA).

d. Have the vehicle operator move the right SUSPENSION CONTROL lever to RAISE until transducer T1 reads greater than 3000 psi (20684.27 kPa). (This indicates that V15 has directed flow from the suspension circuit to transducer T1.)

14. Valve V16 check:

a. Push the RESET VALVES button on the HDC Control Box, and verify all the valves are set to the power OFF setting and are in the default position as shown in Table 1.

b. Use the LINE UP and LINE DOWN buttons to select valve V16. Press CHANGE POSITION to close valve V16.

c. Have the vehicle operator move the left SUSPENSION CONTROL lever to LOWER until transducer T1 reads less than 500 psi (3447.379 kPa).

d. Have the vehicle operator move the left SUSPENSION CONTROL lever to RAISE until transducer T1 reads greater than 3000 psi (20684.227 kPa). (This indicates that V16 has directed flow from the suspension circuit to transducer T1.)

15. Valve V17 check:

a. Push the RESET VALVE button on the HDC Control Box, and verify all the valves are set to the power OFF setting and are in the default position as shown in Table 1.

b. Use the LINE UP and LINE DOWN buttons to select valve V17. Press CHANGE POSITION to close valve V17.

c. Have the vehicle operator move the APRON control lever to LOWER until transducer T1 reads less than 500 psi (3447.379 kPa).

d. Have the vehicle operator move the APRON control lever to RAISE until transducer T1 reads greater than 3000 psi (20684.27 kPa). (This indicates that V17 has directed flow from the apron circuit to transducer T1.)

16. Valve V1 check:

a. Turn off the HDC Control Box by depressing the POWER button.

b. Have the vehicle operator stop the engine.

c. Manually open valve V23 by moving the handle to a fully vertical position.

d. Have the vehicle operator start the engine.

e. Power up the HDC Control Box by pressing the POWER button.

f. Use the LINE UP and LINE DOWN buttons to select valve V1. Press CHANGE POSITION button to close valve V1.

g. Have vehicle operator move the EJECTOR CONTROL lever forward and backward. Ensure that the ejector does not move. (This indicates that valve V1 has closed.)

h. Push the RESET VALVE button on the HDC Control Box and verify all the valves are set to the power OFF setting and are in the default position as shown in Table 1.

17. When the Functional Check-Out is complete, proceed to use the HDC system as an aid to troubleshoot a problem with the vehicle hydraulic system or shut down the vehicle per TM 5-2350-262-10 and stow the HDC Control Box and umbilical cable W4.

***Table 2. HDC System Solenoid Valve Definition.***

| VALVE NO. | ELECTRICAL MATING CONNECTOR | PHYSICAL LOCATION | DEFINITION | CIRCUIT/PORT | NOTES |
|---|---|---|---|---|---|
| V1 | W2P1 | Primary Manifold | Ejector Control Extend | 21 | Shutoff Valve (Normally Open) |
| V2 | W3P2 | Forward Right Manifold | No. 1 Actuator, Right Suspension Port 11 | 11/11A | Shutoff Valve (Normally Open) |
| V3 | W3P3 | Forward Left Manifold | No 1. Actuator, Left Suspension Port 11 | 11/11A | Shutoff Valve (Normally Open) |
| V4 | W3P4 | Aft Manifold | No. 4 Actuator, Left Suspension Port 9 | 9 | Shutoff Valve (Normally Open) |
| V5 | W2P5 | Primary Manifold | Right Hand Suspension Lower | 17R | Three-Way Valve |

*Table 2. HDC System Solenoid Valve Definition - Continued.*

| VALVE NO. | ELECTRICAL MATING CONNECTOR | PHYSICAL LOCATION | DEFINITION | CIRCUIT/PORT | NOTES |
|---|---|---|---|---|---|
| V6 | W3P6 | Aft Manifold | No. 4 Actuator, Left Suspension Port 2 | 2 | Shutoff Valve (Normally Open) |
| V7 | W3P7 | Aft Manifold | No. 3 Actuator, Left Suspension Port 2 | 2A/2 | Shutoff Valve (Normally Open) |
| V8 | W3P8 | Aft Manifold | No. 4 Actuator, Left Suspension Port 11 | 11 | Shutoff Valve (Normally Open) |
| V9 | W3P9 | Forward Left Manifold | Left Bump Stop Cylinder Extend | 11/11B | Shutoff Valve (Normally Open) |
| V10 | W3P10 | Forward Right Manifold | Right Bump Stop Cylinder Extend | 11/11B | Shutoff Valve (Normally Open) |
| V11 | W2P11 | Primary Manifold | Left Hand Suspension Lower | 17L/7 | Three-Way Valve |
| V12 | W2P12 | Primary Manifold | Suspension Relief Valve Port 9 | 9 | Shutoff Valve (Normally Open) |
| V13 | W2P13 | Primary Manifold | Suspension Relief Valve, Main Accumulator | 9A | Shutoff Valve (Normally Open) |
| V14 | W2P14 | Primary Manifold | Winch Control Shutoff | C2 | Three-Way Valve |
| V15 | W2P15 | Primary Manifold | Right Hand Suspension Raise | 3R | Three-Way Valve |
| V16 | W2P16 | Primary Manifold | Left Hand Suspension Raise | 3L | Three-Way Valve |
| V17 | W2P17 | Primary Manifold | Apron Cylinder Retract (Raise) | 19 | Three-Way Valve |
| V18 | W3P18 | Aft Manifold | No. 4 Actuator, Left Suspension Port 9 to Port 2 | | Shutoff Valve (Normally Open) |

*Table 2. HDC System Solenoid Valve Definition - Continued.*

| VALVE NO. | ELECTRICAL MATING CONNECTOR | PHYSICAL LOCATION | DEFINITION | CIRCUIT/PORT | NOTES |
|---|---|---|---|---|---|
| V19 | W2P19 | Primary Manifold | Suspension Relief Valve Port 17R | 17R | Shutoff Valve (Normally Closed) |
| V20 | W2P20 | Primary Manifold | Ejector Cylinder Extend to Main Accumulator | 9A | Shutoff Valve (Normally Closed) |

*Table 3. HDC System Pressure Transducers.*

| TRANSDUCER NO. | ELECTRICAL MATING CONNECTOR | PHYSICAL LOCATION | DEFINITION |
|---|---|---|---|
| T1 | W2P31 | Primary Manifold | Shared |
| T2 | W2P2 | Primary Manifold | Ejector Control Valve Extend Pressure |
| T3 | W2P3 | Near Left Main Pump Filter | Right Main Hydraulic Pressure |
| T4 | W2P4 | Near Right Main Pump Filter | Left Main Hydraulic Pressure |
| T5 | W3P5 | Forward Right Actuator #1 | #1 Actuator, Right Suspension Port 3 Pressure |
| T6 | W3P31 | Forward Left Actuator #1 | #1 Actuator, Left Suspension Port 3 Pressure |
| T7 | W2P7 | Left Main Manifold | Left Manifold Port 9 Pressure |
| T8 | W3P33 | Right Side Underneath Sprung Stop Cylinder | Right Bump Stop Cylinder Retract Pressure |
| T9 | W3P32 | Left Side Underneath Sprung Stop Cylinder | Left Bump Stop Cylinder Retract Pressure |
| T10 | W3P30 | Forward Left Manifold | Left Bump Stop Cylinder Extend Pressure |
| T11 | W3P11 | Forward Right Manifold | Right Bump Stop Cylinder Extend Pressure |

*Table 3. HDC System Pressure Transducers - Continued.*

| TRANSDUCER NO. | ELECTRICAL MATING CONNECTOR | PHYSICAL LOCATION | DEFINITION |
|---|---|---|---|
| T12 | W2P30 | Near Suspension (Sprung/ Unsprung) Valve | Sprung/Unsprung Control Valve Port 11 Pressure |
| T13 | W2P32 | Primary Manifold | Suspension Relief Valve Pressure |

| Connector J1: Mates with Umbilical Cable Connector W4P1 | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Pin Number | AWG | Signal Name Description | Reference Designator | Signal Source | Signal Designation | Signal Circuit No. | Signal Description | Comments |
| A | 16 | HDC Control Box Power | | Vehicle 15A Circuit Breaker | HDC Control Box | 1070 | 18 - 32VDC per MIL-STD-1 275, 10A Maximum | The maximum current rating includes the 4 spare transducers and 4 valves turned 'ON' simultaneously. |
| B | 16 | HDC Control Box Power Return | | Vehicle Ground Connection | HDC Control Box | 1069 | 24VDC Ground | |
| C | 16 | Spare | | | | | | |

| Connector J2: Mates with Umbilical Cable Connector W4P2 | | | | | | | |
|---|---|---|---|---|---|---|---|
| Pin Number | AWG | Signal Name Description | Reference Designator | Signal Source | Signal Designation | Signal Circuit No. | Signal Description |
| A | 20 | Spare Shutoff Valve Power 1 | | HDC Control Box | | | 18 - 32VDC per MIL-STD-1275 |
| B | 20 | Spare Shutoff Valve Power Return 1 | | HDC Control Box | | | 18 - 32VDC per MIL-STD-1275 Power Return |
| C | 20 | Spare Shutoff Valve Power 2 | | HDC Control Box | | | 18 - 32VDC per MIL-STD-1275 |
| D | 20 | Spare Shutoff Valve Power Return 2 | | HDC Control Box | | | 18 - 32VDC per MIL-STD-1275 Power Return |
| E | 20 | Spare Shutoff Valve Power 3 | | HDC Control Box | | | 18 - 32VDC per MIL-STD-1275 |
| F | 20 | Spare Shutoff Valve Power Return 3 | | HDC Control Box | | | 18 - 32VDC per MIL-STD-1275 Power Return |

M0055HDC

*Figure 3. Hydraulic Diagnostic Center (HDC) Control Box Connectors-Pin Designation Signal Names/Identification.*

| Connector J2: Mates with Umbilical Cable Connector W4P2 | | | | | | | |
|---|---|---|---|---|---|---|---|
| Pin Number | AWG | Signal Name Description | Reference Designator | Signal Source | Signal Designation | Signal Circuit No. | Signal Description |
| G | 20 | Spare Shutoff Valve Power 4 | | HDC Control Box | | | 18 - 32VDC per MIL-STD-1275 |
| H | 20 | Spare Shutoff Valve Power Return 4 | | HDC Control Box | | | 18 - 32VDC per MIL-STD-1275 Power Return |
| J | 20 | Spare | | | | | |
| K | 20 | Spare | | | | | |
| L | 20 | Spare | | | | | |
| M | 20 | Spare | | | | | |
| N | 20 | Spare | | | | | |
| P | 20 | Ejector Control Extend Shutoff Valve Power | V1 | HDC Control Box | Ejector Control Extend Shutoff Valve | 1029 | 18 - 32VDC per MIL-STD-1275 |
| R | 20 | Ejector Control Extend Shutoff Valve Power Return | V1 | HDC Control Box | Ejector Control Extend Shutoff Valve | 1030 | 18 - 32VDC per MIL-STD-1275 Power Return |
| S | 20 | Right Suspension Port 11 Shutoff Valve No. 1 Actuator Power | V2 | HDC Control Box | Right Suspension Port 11 Shutoff Valve No. 1 Actuator | 1031 | 18 - 32VDC per MIL-STD-1275 |
| T | 20 | Right Suspension Port 11 Shutoff Valve No. 1 Actuator Power Return | V2 | HDC Control Box | Right Suspension Port 11 Shutoff Valve No. 1 Actuator | 1032 | 18 - 32VDC per MIL-STD-1275 Power Return |
| U | 20 | Left Suspension Port 11 Shutoff Valve No. 1 Actuator Power | V3 | HDC Control Box | Left Suspension Port 11 Shutoff Valve No. 1 Actuator | 1033 | 18 - 32VDC per MIL-STD-1275 |

M0056HDC

*Figure 4. Hydraulic Diagnostic Center (HDC) Control Box Connectors-Pin Designation Signal Names/Identification.*

| Connector J2: Mates with Umbilical Cable Connector W4P2 | | | | | | | |
|---|---|---|---|---|---|---|---|
| Pin Number | AWG | Signal Name Description | Reference Designator | Signal Source | Signal Designation | Signal Circuit No. | Signal Description |
| V | 20 | Left Suspension Port 11 Shutoff Valve No. 1 Actuator Power Return | V3 | HDC Control Box | Left Suspension Port 11 Shutoff Valve No. 1 Actuator | 1034 | 18 - 32VDC per MIL-STD-1275 Power Return |
| W | 20 | Left Suspension Port 9 Shutoff Valve No. 4 Actuator Power | V4 | HDC Control Box | Left Suspension Port 9 Shutoff Valve No. 4 Actuator | 1035 | 18 - 32VDC per MIL-STD-1275 |
| X | 20 | Left Suspension Port 9 Shutoff Valve No. 4 Actuator Power Return | V4 | HDC Control Box | Left Suspension Port 9 Shutoff Valve No. 4 Actuator | 1036 | 18 - 32VDC per MIL-STD-1275 Power Return |
| Y | 20 | Right Hand Suspension Lower Shutoff Valve Power | V5 | HDC Control Box | Right Hand Suspension Lower Shutoff | 1037 | 18 - 32VDC per MIL-STD-1275 |
| Z | 20 | Right Hand Suspension Lower Shutoff Valve Power Return | V5 | HDC Control Box | Right Hand Suspension Lower Shutoff | 1038 | 18 - 32VDC per MIL-STD-1275 Power Return |
| a | 20 | Left Suspension Port 2 Shutoff Valve No. 4 Actuator Power | V6 | HDC Control Box | Left Suspension Port 2 Shutoff Valve No. 4 Actuator | 1039 | 18 - 32VDC per MIL-STD-1275 |
| b | 20 | Left Suspension Port 2 Shutoff Valve No. 4 Actuator Power Return | V6 | HDC Control Box | Left Suspension Port 2 Shutoff Valve No. 4 Actuator | 1040 | 18 - 32VDC per MIL-STD-1275 Power Return |
| c | 20 | Left Suspension Port 2 Shutoff Valve No. 3 Actuator Power | V7 | HDC Control Box | Left Suspension Port 2 Shutoff Valve No. 3 Actuator | 1041 | 18 - 32VDC per MIL-STD-1275 |

M0057HDC

*Figure 5. Hydraulic Diagnostic Center (HDC) Control Box Connectors-Pin Designation Signal Names/Identification.*

| Connector J2: Mates with Umbilical Cable Connector W4P2 | | | | | | | |
|---|---|---|---|---|---|---|---|
| Pin Number | AWG | Signal Name Description | Reference Designator | Signal Source | Signal Designation | Signal Circuit No. | Signal Description |
| d | 20 | Left Suspension Port 2 Shutoff Valve No. 3 Actuator Power Return | V7 | HDC Control Box | Left Suspension Port 2 Shutoff Valve No. 3 Actuator | 1042 | 18 - 32VDC per MIL-STD-1275 Power Return |
| e | 20 | Left Suspension Port 11 Shutoff Valve No. 4 Actuator Power | V8 | HDC Control Box | Left Suspension Port 11 Shutoff Valve No. 4 Actuator | 1043 | 18 - 32VDC per MIL-STD-1275 |
| f | 20 | Left Suspension Port 11 Shutoff Valve No. 4 Actuator Power Return | V8 | HDC Control Box | Left Suspension Port 11 Shutoff Valve No. 4 Actuator | 1044 | 18 - 32VDC per MIL-STD-1275 Power Return |
| g | 20 | Left Bump Stop Cylinder Extend Shutoff Valve Power | V9 | HDC Control Box | Left Bump Stop Cylinder Extend Shutoff Valve | 1045 | 18 - 32VDC per MIL-STD-1275 |
| h | 20 | Left Bump Stop Cylinder Extend Shutoff Valve Power Return | V9 | HDC Control Box | Left Bump Stop Cylinder Extend Shutoff Valve | 1046 | 18 - 32VDC per MIL-STD-1275 Power Return |
| k | 20 | Right Bump Stop Cylinder Extend Shutoff Valve Power | V10 | HDC Control Box | Right Bump Stop Cylinder Extend Shutoff Valve | 1047 | 18 - 32VDC per MIL-STD-1275 |
| m | 20 | Right Bump Stop Cylinder Extend Shutoff Valve Power Return | V10 | HDC Control Box | Right Bump Stop Cylinder Extend Shutoff Valve | 1048 | 18 - 32VDC per MIL-STD-1275 Power Return |
| n | 20 | Left Hand Suspension Lower Shutoff Valve Power | V11 | HDC Control Box | Left Hand Suspension Lower Shutoff Valve | 1049 | 18 - 32VDC per MIL-STD-1275 |

M0058HDC

*Figure 6. Hydraulic Diagnostic Center (HDC) Control Box Connectors-Pin Designation Signal Names/Identification.*

| Connector J2: Mates with Umbilical Cable Connector W4P2 | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Pin Number** | **AWG** | **Signal Name Description** | **Reference Designator** | **Signal Source** | **Signal Designation** | **Signal Circuit No.** | **Signal Description** |
| p | 20 | Left Hand Suspension Lower Shutoff Valve Power Return | V11 | HDC Control Box | Left Hand Suspension Lower Shutoff Valve | 1050 | 18 - 32VDC per MIL-STD-1275 Power Return |
| q | 20 | Suspension Relief Valve Port 9 Shutoff Valve Power | V12 | HDC Control Box | Suspension Relief Valve Port 9 Shutoff Valve | 1051 | 18 - 32VDC per MIL-STD-1275 |
| r | 20 | Suspension Relief Valve Port 9 Shutoff Valve Power Return | V12 | HDC Control Box | Suspension Relief Valve Port 9 Shutoff Valve | 1052 | 18 - 32VDC per MIL-STD-1275 Power Return |
| s | 20 | Suspension Relief Valve - Main Accumulator Shutoff Valve Power | V13 | HDC Control Box | Suspension Relief Valve - Main Accumulator Shutoff Valve | 1053 | 18 - 32VDC per MIL-STD-1275 |
| t | 20 | Suspension Relief Valve - Main Accumulator Shutoff Valve Power Return | V13 | HDC Control Box | Suspension Relief Valve - Main Accumulator Shutoff Valve | 1054 | 18 - 32VDC per MIL-STD-1275 Power Return |
| u | 20 | Winch Control Shutoff Valve Power | V14 | HDC Control Box | Winch Control Shutoff Valve | 1055 | 18 - 32VDC per MIL-STD-1275 |
| v | 20 | Winch Control Shutoff Valve Power Return | V14 | HDC Control Box | Winch Control Shutoff Valve | 1056 | 18 - 32VDC per MIL-STD-1275 Power Return |

M0059HDC

*Figure 7. Hydraulic Diagnostic Center (HDC) Control Box Connectors-Pin Designation Signal Names/Identification.*

| Connector J2: Mates with Umbilical Cable Connector W4P2 | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Pin Number** | **AWG** | **Signal Name Description** | **Reference Designator** | **Signal Source** | **Signal Designation** | **Signal Circuit No.** | **Signal Description** |
| w | 20 | Right Hand Suspension Raise Shutoff Valve Power | V15 | HDC Control Box | Right Hand Suspension Raise Shutoff Valve | 1057 | 18 - 32VDC per MIL-STD-1275 |
| x | 20 | Right Hand Suspension Raise Shutoff Valve Power Return | V15 | HDC Control Box | Right Hand Suspension Raise Shutoff Valve | 1058 | 18 - 32VDC per MIL-STD-1275 Power Return |
| y | 20 | Left Hand Suspension Raise Shutoff Valve Power | V16 | HDC Control Box | Left Hand Suspension Raise Shutoff Valve | 1059 | 18 - 32VDC per MIL-STD-1275 |
| z | 20 | Left Hand Suspension Raise Shutoff Valve Power Return | V16 | HDC Control Box | Left Hand Suspension Raise Shutoff Valve | 1060 | 18 - 32VDC per MIL-STD-1275 Power Return |
| AA | 20 | Apron Cylinder Retract Shutoff Valve Power | V17 | HDC Control Box | Apron Cylinder Retract Shutoff Valve | 1061 | 18 - 32VDC per MIL-STD-1275 |
| BB | 20 | Apron Cylinder Retract Shutoff Valve Power Return | V17 | HDC Control Box | Apron Cylinder Retract Shutoff Valve | 1062 | 18 - 32VDC per MIL-STD-1275 Power Return |
| CC | 20 | Left Suspension Port 9 to Port 2 Shutoff Valve No. 4 Actuator Power | V18 | HDC Control Box | Valve Left Suspension Port 9 to Port 2 Shutoff Valve No. 4 Actuator | 1063 | 18 - 32VDC per MIL-STD-1275 |
| DD | 20 | Left Suspension Port 9 to Port 2 Shutoff Valve No. 4 Actuator Power Return | V18 | HDC Control Box | Valve Left Suspension Port 9 to Port 2 Shutoff Valve No. 4 Actuator | 1064 | 18 - 32VDC per MIL-STD-1275 Power Return |

M0060HDC

*Figure 8. Hydraulic Diagnostic Center (HDC) Control Box Connectors-Pin Designation Signal Names/Identification.*

| Connector J2: Mates with Umbilical Cable Connector W4P2 | | | | | | | |
|---|---|---|---|---|---|---|---|
| Pin Number | AWG | Signal Name Description | Reference Designator | Signal Source | Signal Designation | Signal Circuit No. | Signal Description |
| EE | 20 | Suspension Relief Valve Port 17R Shutoff Valve Power | V19 | HDC Control Box | Suspension Relief Valve Port 17R Shutoff Valve | 1065 | 18 - 32VDC per MIL-STD-1275 |
| FF | 20 | Suspension Relief Valve Port 17R Shutoff Valve Power Return | V19 | HDC Control Box | Suspension Relief Valve Port 17R Shutoff Valve | 1066 | 18 - 32VDC per MIL-STD-1275 Power Return |
| GG | 20 | Ejector Cylinder Extend to Main Accumulator Shutoff Valve Power | V20 | HDC Control Box | Ejector Cylinder Extend to Main Accumulator Shutoff Valve | 1067 | 18 - 32VDC per MIL-STD-1275 |
| HH | 20 | Ejector Cylinder Extend to Main Accumulator Shutoff Valve Power Return | V20 | HDC Control Box | Ejector Cylinder Extend to Main Accumulator Shutoff Valve | 1068 | 18 - 32VDC per MIL-STD-1275 Power Return |

| Connector J3: Mates with Umbilical Cable Connector W4P3 | | | | | | | |
|---|---|---|---|---|---|---|---|
| Pin Number | AWG | Signal Name Description | Reference Designator | Signal Source | Signal Designation | Signal Circuit No. | Signal Description |
| A | 20 | Spare Transducer Signal Output 1 | | Pressure Transducer | HDC Control Box | | 0.5 VDC - 0 PSIG 9.5 VDC - 4000 PSIG |
| B | 20 | Spare Transducer Signal Output Return 1 | | HDC Control Box | Pressure Transducer | | HDC Control Box Signal Output Return |
| C | 20 | Spare Transducer Signal Output 2 | | Pressure Transducer | HDC Control Box | | 0.5 VDC - 0 PSIG 9.5 VDC - 4000 PSIG |
| D | 20 | Spare Transducer Signal Output Return 2 | | HDC Control Box | Pressure Transducer | | HDC Control Box Signal Output Return |
| E | 20 | Spare Transducer Signal Output 3 | | Pressure Transducer | HDC Control Box | | 0.5 VDC - 0 PSIG 9.5 VDC - 4000 PSIG |

M0061HDC

*Figure 9. Hydraulic Diagnostic Center (HDC) Control Box Connectors-Pin Designation Signal Names/Identification.*

| Connector J3: Mates with Umbilical Cable Connector W4P3 | | | | | | | |
|---|---|---|---|---|---|---|---|
| Pin Number | AWG | Signal Name Description | Reference Designator | Signal Source | Signal Designation | Signal Circuit No. | Signal Description |
| F | 20 | Spare Transducer Signal Output Return 3 | | HDC Control Box | Pressure Transducer | | HDC Control Box Signal Output Return |
| G | 20 | Spare Transducer Signal Output 4 | | Pressure Transducer | HDC Control Box | | 0.5VDC - 0 PSIG 9.5VDC - 4000 PSIG |
| H | 20 | Spare Transducer Signal Output Return 4 | | HDC Control Box | Pressure Transducer | | HDC Control Box Signal Output Return |
| J | 20 | CANH | | HDC Control Box | | | |
| K | 20 | CANL | | HDC Control Box | | | |
| L | 20 | CAN BUS SHIELD | | HDC Control Box | | | |
| M | 20 | Spare | | | | | |
| N | 20 | Spare | | | | | |
| P | 20 | Spare | | | | | |
| R | 20 | Spare | | | | | |
| S | 20 | Shared Transducer Signal Output<br>Function Utilizing Shared Transducer:<br>Right Hand Suspension Raise Pressure<br>Apron Cylinder Retract Pressure<br>Right Hand Suspension Lower Pressure<br>Left Hand Suspension Lower Pressure | T1 | Pressure Transducer | HDC Control Box | 1000 | 0.5VDC - 0 PSIG 9.5VDC - 4000 PSIG |

M0062HDC

*Figure 10. Hydraulic Diagnostic Center (HDC) Control Box Connectors-Pin Designation Signal Names/ Identification.*

| Connector J3: Mates with Umbilical Cable Connector W4P3 | | | | | | | |
|---|---|---|---|---|---|---|---|
| Pin Number | AWG | Signal Name Description | Reference Designator | Signal Source | Signal Designation | Signal Circuit No. | Signal Description |
| S (cont) | 20 | Winch Control Pressure Left Hand Suspension Raise Pressure | T1 | Pressure Transducer | HDC Control Box | 1000 | 0.5 VDC - 0 PSIG 9.5 VDC - 4000 PSIG |
| T | 20 | Shared Transducer Signal Output Return | T1 | HDC Control Box | Pressure Transducer | 1001 | HDC Control Box Signal Output Return |
| U | 20 | Ejector Control Valve Extend Pressure Signal Output | T2 | Pressure Transducer | HDC Control Box | 1002 | 0.5 VDC - 0 PSIG 9.5 VDC - 4000 PSIG |
| V | 20 | Ejector Control Valve Extend Pressure Signal Output Return | T2 | HDC Control Box | Pressure Transducer | 1003 | HDC Control Box Signal Output Return |
| W | 20 | Right Main Hydraulic Pressure Signal Output | T3 | Pressure Transducer | HDC Control Box | 1004 | 0.5 VDC - 0 PSIG 9.5 VDC - 4000 PSIG |
| X | 20 | Right Main Hydraulic Pressure Signal Output Return | T3 | HDC Control Box | Pressure Transducer | 1005 | HDC Control Box Signal Output Return |
| Y | 20 | Left Main Hydraulic Pressure Signal Output | T4 | Pressure Transducer | HDC Control Box | 1006 | 0.5 VDC - 0 PSIG 9.5 VDC - 4000 PSIG |
| Z | 20 | Left Main Hydraulic Pressure Signal Output Return | T4 | HDC Control Box | Pressure Transducer | 1007 | HDC Control Box Signal Output Return |
| a | 20 | Right Suspension Port 3 Pressure No. 1 Actuator Signal Output | T5 | Pressure Transducer | HDC Control Box | 1008 | 0.5 VDC - 0 PSIG 9.5 VDC - 4000 PSIG |
| b | 20 | Right Suspension Port 3 Pressure No. 1 Actuator Signal Output Return | T5 | HDC Control Box | Pressure Transducer | 1009 | HDC Control Box Signal Output Return |
| c | 20 | Left Suspension Port 3 Pressure No. 1 Actuator Signal Output | T6 | Pressure Transducer | HDC Control Box | 1010 | 0.5 VDC - 0 PSIG 9.5 VDC - 4000 PSIG |

M0063HDC

*Figure 11. Hydraulic Diagnostic Center (HDC) Control Box Connectors-Pin Designation Signal Names/ Identification.*

| Connector J3: Mates with Umbilical Cable Connector W4P3 | | | | | | | |
|---|---|---|---|---|---|---|---|
| Pin Number | AWG | Signal Name Description | Reference Designator | Signal Source | Signal Designation | Signal Circuit No. | Signal Description |
| d | 20 | Left Suspension Port 3 Pressure No. 1 Actuator Signal Output Return | T6 | HDC Control Box | Pressure Transducer | 1011 | HDC Control Box Signal Output Return |
| e | 20 | Left Manifold Port 9 Pressure Signal Output | T7 | Pressure Transducer | HDC Control Box | 1012 | 0.5 VDC - 0 PSIG 9.5 VDC - 4000 PSIG |
| f | 20 | Left Manifold Port 9 Pressure Signal Output Return | T7 | HDC Control Box | Pressure Transducer | 1013 | HDC Control Box Signal Output Return |
| g | 20 | Right Bump Stop Cylinder Retract Pressure Signal Out | T8 | Pressure Transducer | HDC Control Box | 1014 | 0.5 VDC - 0 PSIG 9.5 VDC - 4000 PSIG |
| h | 20 | Right Bump Stop Cylinder Retract Pressure Signal Output Return | T8 | HDC Control Box | Pressure Transducer | 1015 | HDC Control Box Signal Output Return |
| k | 20 | Left Bump Stop Cylinder Retract Pressure Signal Output | T9 | Pressure Transducer | HDC Control Box | 1016 | 0.5 VDC - 0 PSIG 9.5 VDC - 4000 PSIG |
| m | 20 | Left Bump Stop Cylinder Retract Pressure Signal Output Return | T9 | HDC Control Box | Pressure Transducer | 1017 | HDC Control Box Signal Output Return |
| n | 20 | Left Bump Stop Cylinder Extend Pressure Signal Output | T10 | Pressure Transducer | HDC Control Box | 1018 | 0.5 VDC - 0 PSIG 9.5 VDC - 4000 PSIG |
| p | 20 | Left Bump Stop Cylinder Extend Pressure Signal Output Return | T10 | HDC Control Box | Pressure Transducer | 1019 | HDC Control Box Signal Output Return |
| q | 20 | Right Bump Stop Cylinder Extend Pressure Signal Output | T11 | Pressure Transducer | HDC Control Box | 1020 | 0.5 VDC - 0 PSIG 9.5 VDC - 4000 PSIG |
| r | 20 | Right Bump Stop Cylinder Extend Pressure Signal Output Return | T11 | HDC Control Box | Pressure Transducer | 1021 | HDC Control Box Signal Output Return |

M0064HDC

*Figure 12. Hydraulic Diagnostic Center (HDC) Control Box Connectors-Pin Designation Signal Names/ Identification.*

| Connector J3: Mates with Umbilical Cable Connector W4P3 | | | | | | | |
|---|---|---|---|---|---|---|---|
| Pin Number | AWG | Signal Name Description | Reference Designator | Signal Source | Signal Designation | Signal Circuit No. | Signal Description |
| s | 20 | Sprung/Unsprung Control Valve Port 11 Pressure Signal Output | T12 | Pressure Transducer | HDC Control Box | 1022 | 0.5 VDC - 0 PSIG 9.5 VDC - 4000 PSIG |
| t | 20 | Sprung/Unsprung Control Valve Port 11 Pressure Signal Output Return | T12 | HDC Control Box | Pressure Transducer | 1023 | HDC Control Box Signal Output Return |
| u | 20 | Suspension Relief Valve Pressure Signal Output | T13 | Pressure Transducer | HDC Control Box | 1024 | 0.5 VDC - 0 PSIG 9.5 VDC - 4000 PSIG |
| v | 20 | Suspension Relief Valve Pressure Signal Output Return | T13 | HDC Control Box | Pressure Transducer | 1025 | HDC Control Box Signal Output Return |
| w | 20 | Pressure Transducer Excitation (+) | | HDC Control Box | Pressure Transducer | 1026A | 15VDC +/- 0.5VDC, Ripple and Noise: 200 mVpk - pk |
| x | 20 | Pressure Transducer Excitation (-) | | HDC Control Box | Pressure Transducer | 1027A | HDC Control Box Pressure Transducer Power Return |
| y | 20 | Pressure Transducer Excitation (+) | | HDC Control Box | Pressure Transducer | 1026B | 15VDC +/- 0.5VDC, Ripple and Noise: 200 mVpk - pk |
| z | 20 | Pressure Transducer Excitation (-) | | HDC Control Box | Pressure Transducer | 1027B | HDC Control Box Pressure Transducer Power Return |
| AA | 20 | Pressure Transducer Excitation (+) | | HDC Control Box | Pressure Transducer | 1026C | 15VDC +/- 0.5VDC, Ripple and Noise: 200 mVpk - pk |
| BB | 20 | Pressure Transducer Excitation (-) | | HDC Control Box | Pressure Transducer | 1027C | HDC Control Box Pressure Transducer Power Return |
| CC | 20 | Pressure Transducer Excitation (+) | | HDC Control Box | Pressure Transducer | 1026D | 15VDC +/- 0.5VDC, Ripple and Noise: 200 mVpk - pk |

M0065HDC

*Figure 13. Hydraulic Diagnostic Center (HDC) Control Box Connectors-Pin Designation Signal Names/ Identification.*

| Connector J3: Mates with Umbilical Cable Connector W4P3 | | | | | | | |
|---|---|---|---|---|---|---|---|
| Pin Number | AWG | Signal Name Description | Reference Designator | Signal Source | Signal Designation | Signal Circuit No. | Signal Description |
| DD | 20 | Pressure Transducer Excitation (-) | | HDC Control Box | Pressure Transducer | 1027D | HDC Control Box Pressure Transducer Power Return |
| EE | 20 | Signal Output Shield | | HDC Control Box | Pressure Transducer | 1028A | HDC Control Box Signal Output Shield (Chassis Ground) |
| FF | 20 | Signal Output Shield | | HDC Control Box | Pressure Transducer | 1028B | HDC Control Box Signal Output Shield (Chassis Ground) |
| GG | 20 | Signal Output Shield | | HDC Control Box | Pressure Transducer | 1028C | HDC Control Box Signal Output Shield (Chassis Ground) |
| HH | 20 | Signal Output Shield | | HDC Control Box | Pressure Transducer | 1028D | HDC Control Box Signal Output Shield (Chassis Ground) |

M0066HDC

*Figure 14. Hydraulic Diagnostic Center (HDC) Control Box Connectors-Pin Designation Signal Names/ Identification.*

***Table 4. Possible Symptoms Of Failed HDC System Components.***

| HDC SYSTEM | POSSIBLE CONSEQUENCES |
|---|---|
| **NOTE**<br>• The probability of a stuck solenoid valve is low and would occur after a hydraulic maintenance test is performed where a solenoid valve was energized (to change status) as part of a specific test.<br>• Numbers in parentheses (possible consequences) correspond to vehicle hydraulic line numbers as shown on M9 ACE HDC hydraulic system schematic (FO-1 through FO-3). | |
| Solenoid Valve V-1 - Shutoff valve - ejector control valve extend | • Cannot extend ejector cylinder or cannot retract ejector cylinder.<br>• Cannot dump load or cannot retract ejector to fill load.<br>• Cannot fold or unfold apron. |
| Solenoid Valve V2 - Shutoff valve - No. 1 actuator right front | SPRUNG MODE:<br>• No hydraulic fluid return (11) from right front wheel valve.<br>• Wheel valve stays in unsprung position.<br>• No hydraulic fluid supply (9) to right front actuators 1 & 2.<br>• Front right of vehicle will not be raised.<br>• Right front of vehicle will drag or bottom out.<br>• No suspension shock absorbing capability on right front side.<br>UNSPRUNG MODE:<br>• No hydraulic fluid supply (11) to right front wheel valve.<br>• Wheel valve stays in sprung position.<br>• No hydraulic fluid return (3) connection from actuators 1 & 2 to DCV.<br>• Undesired hydraulic fluid supply (9) to front right actuators 1 & 2.<br>• Right front of vehicle is raised to sprung position.<br>• Undesired suspension dampening on right front side.<br>UNSPRUNG-LOWER:<br>• No hydraulic fluid supply (17) to front right actuator 1.<br>• No hydraulic fluid return (3) from right front actuators 1 & 2.<br>• Front right of vehicle will not be lowered. |

*Table 4. Possible Symptoms Of Failed HDC System Components - Continued.*

| HDC SYSTEM | POSSIBLE CONSEQUENCES |
|---|---|
| | UNSPRUNG-RAISE:<br><br>• No hydraulic fluid supply (3) to right front actuators 1 & 2.<br>• No hydraulic fluid return (17) from right front actuators 1 & 2.<br>• Front right of vehicle cannot be raised but is already in sprung/raised position. |
| Solenoid Valve V3 - Shutoff valve - No. 1 actuator left front | SPRUNG MODE:<br><br>• No hydraulic fluid return (11) from left front wheel valve.<br>• Wheel valve stays in unsprung position.<br>• No hydraulic fluid supply (9) to left front actuators 1 & 2.<br>• Front left of vehicle will not be raised.<br>• No suspension shock absorbing capability on left front side.<br><br>UNSPRUNG MODE:<br><br>• No hydraulic fluid supply (11) to left front wheel valve.<br>• Wheel valve stays in sprung position.<br>• No hydraulic fluid return (3) connection from actuators 1 & 2 to DCV.<br>• Undesired hydraulic fluid supply (9) to front left actuators 1 & 2.<br>• Left front of vehicle is raised to sprung position.<br>• Undesired suspension dampening on left front side.<br><br>UNSPRUNG-LOWER:<br><br>• No hydraulic fluid supply (17) to front left actuator 1.<br>• No hydraulic fluid return (3) from left front actuators 1 & 2.<br>• Front left of vehicle will not be lowered.<br><br>UNSPRUNG-RAISE:<br><br>• No hydraulic fluid supply (3) to left front actuators 1 & 2.<br>• No hydraulic fluid return (17) from left front actuators 1 & 2.<br>• Front left of vehicle cannot be raised but is already in sprung/raised position. |

*Table 4. Possible Symptoms Of Failed HDC System Components - Continued.*

| HDC SYSTEM | POSSIBLE CONSEQUENCES |
|---|---|
| Solenoid Valve V4 - Shutoff valve - No. 4 left actuator port 9 | SPRUNG MODE:<br>• No hydraulic fluid supply (9) to left rear wheel valve.<br>• Wheel valve in unsprung position.<br>• No hydraulic fluid supply (9) to left rear actuators 3 & 4.<br>• Rear left of vehicle will not be raised.<br>• Left rear of vehicle will drag or bottom out.<br>• No suspension shock absorbing capability on rear left side.<br>UNSPRUNG MODE:<br>• No hydraulic fluid supply (9) to left and right rear wheel valves.<br>• No hydraulic fluid supply to left actuators 3 & 4 and right actuators 3 & 4.<br>• Rear of vehicle will not be raised. |
| Solenoid Valve V5 - Shutoff valve - right hand suspension | SPRUNG MODE:<br>• No hydraulic fluid return (17).<br>• Delay in intermediate valve operation.<br>• Delay in raising right front side.<br>UNSPRUNG MODE-LOWER:<br>• No hydraulic fluid supply (17 lower) to intermediate wheel control valve.<br>• No hydraulic fluid supply (17) to right front actuator 1.<br>• Inability to completely lower right front side of vehicle.<br>UNSPRUNG MODE-RAISE:<br>• No hydraulic fluid return (17) from right front actuator 1 & 2.<br>• Hydraulic fluid will return through (7). |

***Table 4. Possible Symptoms Of Failed HDC System Components - Continued.***

| HDC SYSTEM | POSSIBLE CONSEQUENCES |
|---|---|
| Solenoid Valve V6 - Shutoff valve - No. 3 left actuator | SPRUNG MODE:<br>• No hydraulic fluid supply (9) to left rear intermediate actuator 3.<br>• Rear left of vehicle partially raised.<br>• Left rear of vehicle will bottom out.<br>• Possible vehicle damage.<br>• Partial suspension shock absorbing capability on rear left side.<br><br>UNSPRUNG MODE:<br>• No hydraulic fluid supply (9) to left rear intermediate actuator 3.<br>• Rear left of vehicle will only be partially raised. |
| Solenoid Valve V7 - Shutoff valve - No. 3 actuator, left suspension port 2 | SPRUNG MODE:<br>• No hydraulic fluid supply (9) to left rear intermediate actuator 3.<br>• Rear left of vehicle partially raised.<br>• Left rear of vehicle will bottom out.<br>• Partial suspension shock absorbing capability on rear left side.<br><br>UNSPRUNG MODE:<br>• No hydraulic fluid supply (9) to left rear intermediate actuator 3.<br>• Rear left of vehicle will only be partially raised. |
| Solenoid Valve V8 - Shutoff valve - No. 4 left actuator | SPRUNG MODE:<br>• No hydraulic fluid return (11) from left rear wheel valve.<br>• Wheel valve in unsprung position.<br>• No suspension shock absorbing capability on rear left side.<br><br>UNSPRUNG MODE:<br>• No hydraulic fluid supply (11) to left rear wheel valve.<br>• Wheel valve in sprung position.<br>• Undesired suspension shock absorbing capability on rear left side.<br>• Right rear actuators maintain position or lower.<br>• Rear actuators maintain sprung position. |
| Solenoid Valve V9 - Shutoff valve - Front left bump stop extend | SPRUNG MODE: |

*Table 4. Possible Symptoms Of Failed HDC System Components - Continued.*

| HDC SYSTEM | POSSIBLE CONSEQUENCES |
|---|---|
| | • No hydraulic fluid return (11) from left side spring stop cylinder (extend).<br>• Left front wheel road arm upper travel not limited.<br>• Suspension can bottom out.<br>• Track may be thrown if vehicle is backed.<br><br>UNSPRUNG MODE:<br><br>• No hydraulic fluid supply (11) to left side stop cylinder (retract).<br>• Left front wheel road arm upper travel limited.<br>• Left front of vehicle cannot be lowered to doze or scrape. |
| Solenoid Valve V10 - Shutoff valve - Front right bump stop extend | SPRUNG MODE:<br><br>• No hydraulic fluid return (11) from right side spring stop cylinder (extend).<br>• Right front wheel road arm upper travel not limited.<br>• Suspension can bottom out.<br>• Track may be thrown if vehicle is backed.<br><br>UNSPRUNG MODE:<br><br>• No hydraulic fluid return (11) to right side stop cylinder (retract).<br>• Right front wheel road upper arm travel limited.<br>• Right front of vehicle cannot be lowered to doze or scrape. |
| Solenoid Valve V11 - Shutoff valve - Left hand suspension lower | SPRUNG MODE:<br><br>• No impact.<br><br>UNSPRUNG MODE-LOWER:<br><br>• No hydraulic fluid supply (17 lower) to intermediate wheel control valve.<br>• No hydraulic fluid supply (17) to left front actuator 1.<br>• Inability to completely lower left front side of vehicle.<br>• Degraded dozing and scraping.<br><br>UNSPRUNG MODE-RAISE:<br><br>• No hydraulic fluid supply (17) from left front actuators 1 & 2.<br>• Hydraulic fluid will return through (7). |

*Table 4. Possible Symptoms Of Failed HDC System Components - Continued.*

| HDC SYSTEM | POSSIBLE CONSEQUENCES |
| --- | --- |
| Solenoid Valve V12 - Shutoff valve - Suspension relief valve port 9 | SPRUNG MODE:<br><br>• Inability to charge main accumulator.<br>• Delayed response in suspension adjustment if compensating pump cannot keep up with system demand.<br>• Relief valve inactive.<br>• Possible hydraulic system damage if compensating pump fails to regulate pressure. |
| Solenoid Valve V13 - Shutoff valve - Suspension relief valve, main accumulator | SPRUNG MODE:<br><br>• Inability to charge main accumulator.<br>• Delayed response in suspension adjustment if compensating pump cannot keep up with system demand. |
| Solenoid Valve V14 - Shutoff valve - Winch control valve | • Cannot supply hydraulic fluid to, or return fluid from, winch motor.<br>• Cannot pay out or pay in winch. |
| Solenoid Valve V15 - Shutoff valve - Right hand suspension raise/lower relief | UNSPRUNG MODE-RAISE:<br><br>• No hydraulic fluid supply (3) to right front actuators 1 & 2 through right front wheel valve.<br>• Right front of vehicle cannot be raised (was raised in sprung mode and now supply is cut off and cannot get 3500 psi [24131.65 kPa] pressure.)<br><br>UNSPRUNG MODE-LOWER:<br><br>• No hydraulic fluid return (3) from front actuators 1 & 2 through right front wheel valve.<br>• Cannot lower right front of vehicle.<br>• Cannot doze or fill load evenly. |
| Solenoid Valve V16 - Shutoff valve - Left hand suspension raise/lower relief | UNSPRUNG MODE-RAISE:<br><br>• No hydraulic fluid supply (3) to left front actuators 1 & 2 through left front wheel valve.<br>• Cannot raise left front of vehicle (was raised in sprung mode and now supply is cut off and cannot get 3500 psi [24131.65 kPa] pressure.)<br><br>UNSPRUNG MODE-LOWER:<br><br>• No hydraulic fluid supply (3) from front actuators 1 & 2 through left front wheel valve.<br>• Cannot lower left front of vehicle.<br>• Degraded dozing or scraping capability. |

*Table 4. Possible Symptoms Of Failed HDC System Components - Continued.*

| HDC SYSTEM | POSSIBLE CONSEQUENCES |
|---|---|
| Solenoid Valve V17 - Shutoff valve - Apron retract | • No hydraulic fluid supply going to (raise) or from (lower) apron cylinders.<br>• Apron cannot be raised or lowered.<br>• Cannot unload or cannot retain load in bowl. |
| Solenoid Valve V18 - Shutoff valve - No. 4 actuator, left suspension port 9 to port 2 (normally closed) | STUCK OPEN<br>SPRUNG MODE:<br><br>• Compensating pressure continuously supplied to left rear actuators 3 & 4.<br><br>UNSPRUNG MODE:<br><br>• Compensating pressure at 2850 psi (19650.06 kPa) continuously supplied to left rear actuators 3 & 4 and right rear actuators 3 & 4. If this is normal pressure in unsprung mode, there is no impact. |
| Solenoid Valve V19 - Shutoff valve - Suspension relief valve port 17R (normally closed) | STUCK OPEN<br>SPRUNG MODE:<br><br>• Compensating pump pressure is directed to reservoir return.<br>• No hydraulic fluid supply (9) to wheel valves.<br>• No hydraulic fluid supply (9) to actuators.<br>• Vehicle will not be raised.<br>• Track may be thrown if vehicle is backed.<br>• No suspension shock absorbing capability.<br><br>UNSPRUNG MODE:<br><br>• Main accumulator/compensating pump pressure is directed to right front intermediate control valve.<br>• Main accumulator pressure is directed to right front actuator lower side.<br>• No vehicle change in height since raise side pressure is trapped.<br><br>UNSPRUNG MODE-LOWER:<br><br>• No impact.<br><br>UNSPRUNG MODE-RAISE:<br><br>• Hydraulic fluid supply is directed to return. |

*Table 4. Possible Symptoms Of Failed HDC System Components - Continued.*

| HDC SYSTEM | POSSIBLE CONSEQUENCES |
| --- | --- |
| Solenoid Valve V20 - Shutoff valve - Ejector cylinder extend to main accumulator (normally closed) | STUCK OPEN:<br>• Undesired compensating pressure on ejector cylinder extend.<br>• Ejector will slowly extend due to leakage.<br>UNSPRUNG MODE:<br>• Maximum suspension pressure 2000 psi (13789.51 kPa).<br>• Vehicle cannot be fully raised. |
| Solenoid Valve V21 - Shutoff valve - (manual) | • No hydraulic fluid supply to 5/15 micron filters, suspension, apron, winch, main ejector from one side of main pump.<br>• Main pump output is cut off on one side, no flow. |
| Solenoid Valve V22 - Shutoff valve - (manual) | • No hydraulic fluid supply to main pump filters, suspension, winch, main ejector, apron from one side of main pump.<br>• Main pump output is cut off on one side, no flow. |
| Solenoid Valve V23 - Shutoff valve - (manual) | • Cannot extend ejector cylinder or cannot retract ejector cylinder.<br>• Cannot dump load or cannot retract ejector to fill load.<br>• Cannot fold dozer blade. |

**END OF TASK**

**END OF WORK PACKAGE**

## FIELD MAINTENANCE
## HYDRAULIC DIAGNOSTIC CENTER (HDC) STOWAGE BRACKET REPLACEMENT

### INITIAL SETUP:

**Tools and Special Tools**
Tool Kit, General Mechanic's: Automotive (WP 0054, Table 1, Item 7)

**Personnel Required**
Construction Equipment Repairer, 91L

**Equipment Condition**
HDC distribution box removed (WP 0004)

**Equipment Condition (cont.)**
Vehicle MASTER power OFF (TM 5-2350-262-10)
Operator's seat forward (TM 5-2350-262-10)

### REMOVAL

1. Loosen two jam nuts (Figure 1, Item 2) on two threaded rods (Figure 1, Item 1) at compartment bulkhead.
2. Remove two threaded rods (Figure 1, Item 1), two washers (Figure 1, Item 3), and stowage bracket (Figure 1, Item 4) from compartment bulkhead.

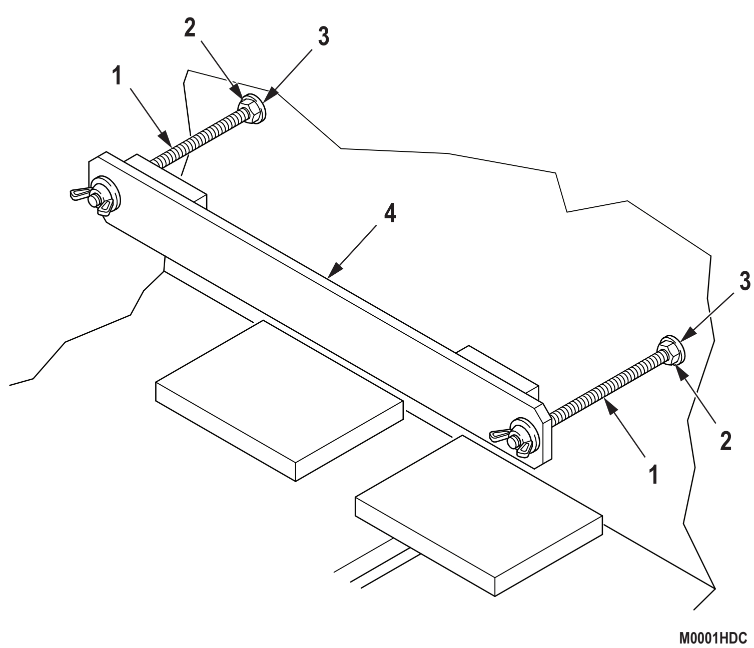



*Figure 1. Hydraulic Diagnostic Center (HDC) Stowage Bracket Removal.*

**END OF TASK**

## INSTALLATION

1. Install stowage bracket (Figure 2, Item 4) with two washers (Figure 2, Item 3) and two threaded rods (Figure 2, Item 1) onto compartment bulkhead.
2. Tighten two jam nuts (Figure 2, Item 2) against bulkhead to secure two threaded rods (Figure 2, Item 1).

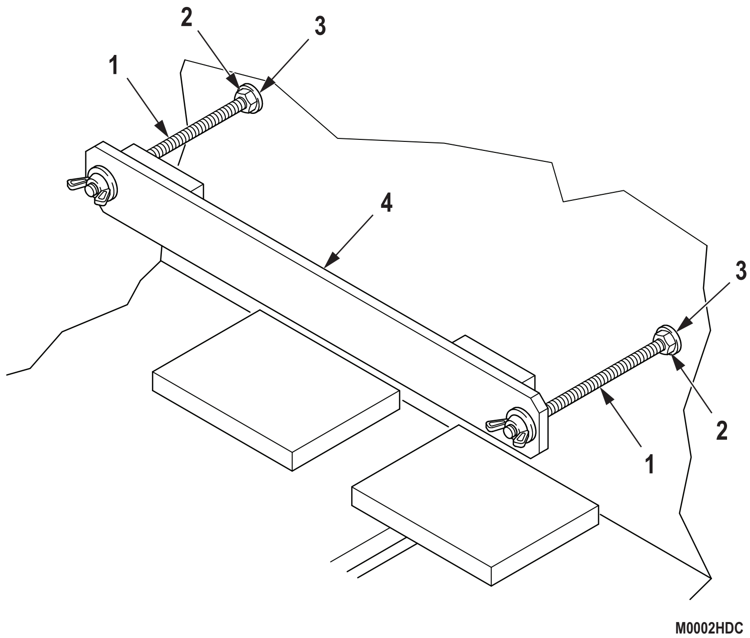



*Figure 2. Hydraulic Diagnostic Center (HDC) Stowage Bracket Installation.*

## END OF TASK

## FOLLOW-ON MAINTENANCE

1. Install Hydraulic Diagnostic Center (HDC) distribution box (WP 0004).
2. Return operator's seat to ready position (TM 5-2350-262-10).

## END OF TASK

## END OF WORK PACKAGE

## FIELD MAINTENANCE
## HYDRAULIC DIAGNOSTIC CENTER (HDC) DISCONNECT BRACKET REPLACEMENT

**INITIAL SETUP:**

**Tools and Special Tools**
Tool Kit, General Mechanic's: Automotive (WP 0054, Table 1, Item 7)

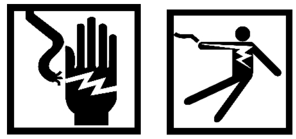
**Materials/Parts**
Bolt, Machine (WP 0055, Table 1, Item 3) Qty: 2
Washer, Lock (WP 0055, Table 1, Item 22) Qty: 2

**Personnel Required**
Construction Equipment Repairer, 91L

**Equipment Condition**
Vehicle MASTER power OFF (TM 5-2350-262-10)
Negative battery cables disconnected (TM 5-2350-262-20)

## REMOVAL

### WARNING



Ensure that vehicle power is off and battery disconnected. Remove all jewelry, such as rings, dog tags, bracelets, etc. If jewelry or disconnected battery ground cable contacts battery positive terminal, a direct short will result, causing instant heating of tools, tool damage, battery damage, or battery explosion. Failure to comply may result in severe injury or death.

1. Remove dust caps (Figure 1, Item 14) from wiring harness connectors W1J1 (Figure 1, Item 18), W2J1 (Figure 1, Item 19), and W3J1 (Figure 1, Item 4).
2. Remove four screws (Figure 1, Item 16), nutplate (Figure 1, Item 1), and wiring harness connector W1J1 (Figure 1, Item 18) from disconnect bracket (Figure 1, Item 17).
3. Remove four screws (Figure 1, Item 15), nutplate (Figure 1, Item 2), and wiring harness connector W2J1 (Figure 1, Item 19) from disconnect bracket (Figure 1, Item 17).
4. Remove four screws (Figure 1, Item 13), nutplate (Figure 1, Item 3), and wiring harness connector W3J1 (Figure 1, Item 4) from disconnect bracket (Figure 1, Item 17).
5. Disconnect circuit 10 (Figure 1, Item 8) and circuit 1070 (Figure 1, Item 5) connectors from Hydraulic Diagnostic Center (HDC) circuit breaker (Figure 1, Item 11).
6. Remove two nuts (Figure 1, Item 9), two lockwashers (Figure 1, Item 10), two screws (Figure 1, Item 12), and HDC circuit breaker (Figure 1, Item 11) from HDC disconnect bracket (Figure 1, Item 17). Discard lockwashers.
7. Remove two machine bolts (Figure 1, Item 6), two flat washers (Figure 1, Item 7), and disconnect bracket (Figure 1, Item 17) from bulkhead. Discard machine bolts.

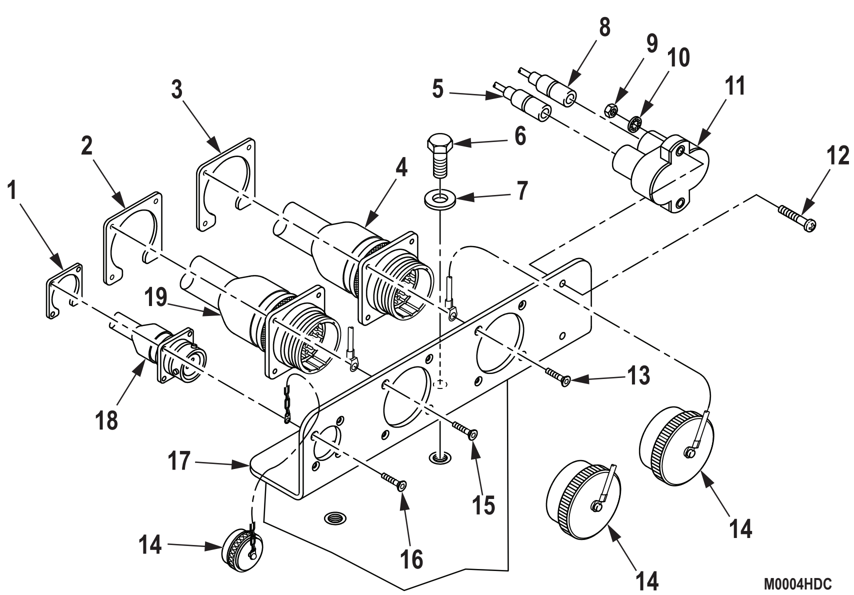
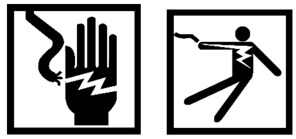



*Figure 1. Hydraulic Diagnostic Center (HDC) Disconnect Bracket Removal.*

**END OF TASK**

## INSTALLATION

### WARNING



Ensure that vehicle power is off and battery disconnected. Remove all jewelry, such as rings, dog tags, bracelets, etc. If jewelry or disconnected battery ground cable contacts battery positive terminal, a direct short will result, causing instant heating of tools, tool damage, battery damage, or battery explosion. Failure to comply may result in severe injury or death.

1. Install disconnect bracket (Figure 2, Item 17) on bulkhead with two flat washers (Figure 2, Item 7) and two new machine bolts (Figure 2, Item 6).
2. Install HDC circuit breaker (Figure 2, Item 11) with two screws (Figure 2, Item 12), two new lockwashers (Figure 2, Item 10), and two nuts (Figure 2, Item 9) to HDC disconnect bracket (Figure 2, Item 17).
3. Connect circuit 1070 (Figure 2, Item 5) and circuit 10 (Figure 2, Item 8) connectors to HDC circuit breaker (Figure 2, Item 11).
4. Connect wiring harness connector W3J1 (Figure 2, Item 4) to disconnect bracket (Figure 2, Item 17) with nutplate (Figure 2, Item 3) and four screws (Figure 2, Item 13).
5. Connect wiring harness connector W2J1 (Figure 2, Item 19) to disconnect bracket (Figure 2, Item 17) with nutplate (Figure 2, Item 2) and four screws (Figure 2, Item 15).
6. Connect wiring harness connector W1J1 (Figure 2, Item 18) to disconnect bracket (Figure 2, Item 17) with nutplate (Figure 2, Item 1) and four screws (Figure 2, Item 16).
7. Install dust caps (Figure 2, Item 14) on wiring harness connectors W3J1 (Figure 2, Item 4), W2J1 (Figure 2, Item 19), and W1J1 (Figure 2, Item 18).

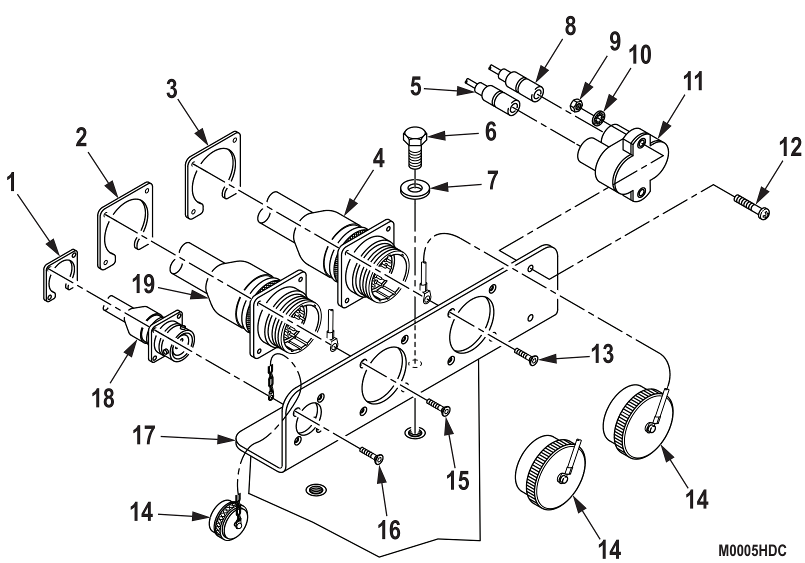



*Figure 2. Hydraulic Diagnostic Center (HDC) Disconnect Bracket Installation.*

**END OF TASK**

## FOLLOW-ON MAINTENANCE

Connect negative battery cables (TM 5-2350-262-20).

## END OF TASK

## END OF WORK PACKAGE

# FIELD MAINTENANCE
# HYDRAULIC DIAGNOSTIC CENTER (HDC) CIRCUIT BREAKER REPLACEMENT

## INITIAL SETUP:

**Tools and Special Tools**
Tool Kit, General Mechanic's: Automotive (WP 0054, Table 1, Item 7)

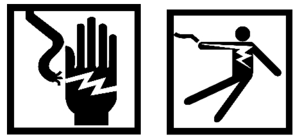
**Materials/Parts**
Bolt, Machine (WP 0055, Table 1, Item 3)
Washer, Lock (WP 0055, Table 1, Item 22)

**Personnel Required**
Construction Equipment Repairer, 91L

**Equipment Condition**
Vehicle MASTER power OFF (TM 5-2350-262-10)
Negative battery cables disconnected (TM 5-2350-262-20)

## REMOVAL

### WARNING



Ensure that vehicle power is off and battery disconnected. Remove all jewelry, such as rings, dog tags, bracelets, etc. If jewelry or disconnected battery ground cable contacts battery positive terminal, a direct short will result, causing instant heating of tools, tool damage, battery damage, or battery explosion. Failure to comply may result in severe injury or death.

1. Remove two machine bolts (Figure 1, Item 2), washers (Figure 1, Item 1), and disconnect bracket (Figure 1, Item 9) from bulkhead. Discard machine bolts.
2. Disconnect circuit 1070 and circuit 10 (Figure 1, Items 3 and 4) from Hydraulic Diagnostic Center (HDC) circuit breaker (Figure 1, Item 7).
3. Remove two nuts (Figure 1, Item 5), lockwashers (Figure 1, Item 6), screws (Figure 1, Item 8), and HDC circuit breaker (Figure 1, Item 7) from HDC disconnect bracket (Figure 1, Item 9). Discard lockwashers.

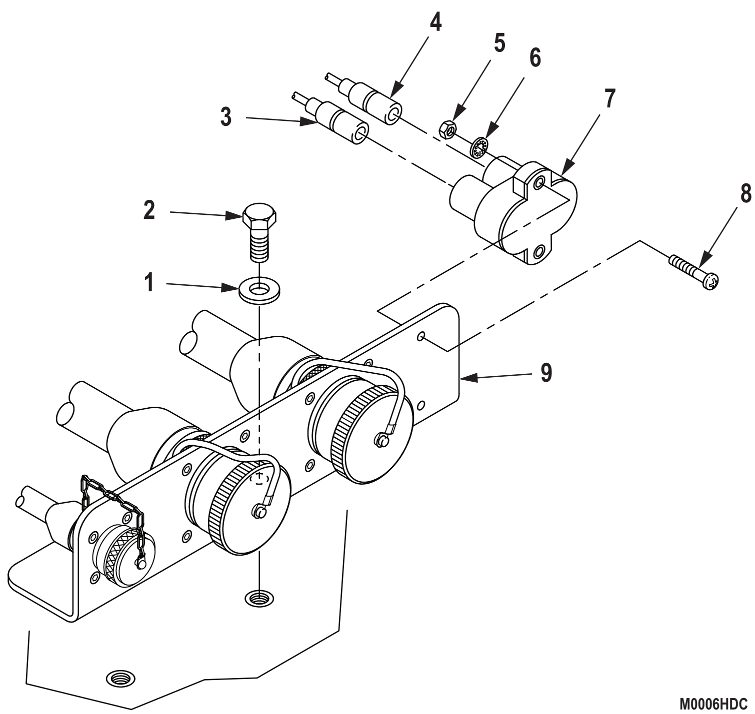



*Figure 1. Hydraulic Diagnostic Center (HDC) Circuit Breaker Removal.*

**END OF TASK**

## INSTALLATION

1. Install HDC circuit breaker (Figure 2, Item 7) on HDC disconnect bracket (Figure 2, Item 9) with two screws (Figure 2, Item 8), new lockwashers (Figure 2, Item 6), and nuts (Figure 2, Item 5).
2. Connect circuit 10 and circuit 1070 connectors (Figure 2, Items 3 and 4) to HDC circuit breaker (Figure 2, Item 7).
3. Install disconnect bracket (Figure 2, Item 9) on bulkhead with two washers (Figure 2, Item 1) and new machine bolts (Figure 2, Item 2).

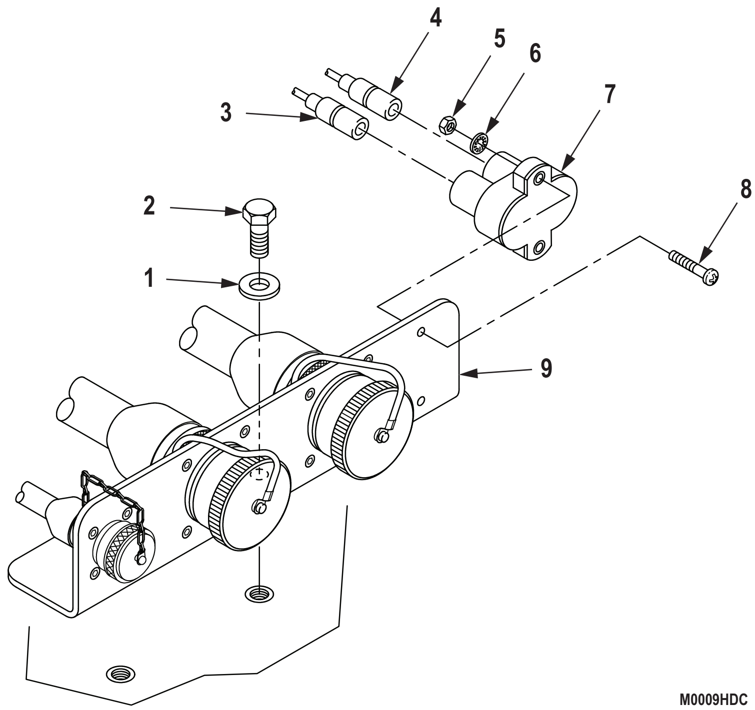



*Figure 2. Hydraulic Diagnostic Center (HDC) Circuit Breaker Installation.*

**END OF TASK**

## FOLLOW-ON MAINTENANCE

Connect negative battery cables (TM 5-2350-262-20).

**END OF TASK**

**END OF WORK PACKAGE**

# FIELD MAINTENANCE
# HYDRAULIC DIAGNOSTIC CENTER (HDC) POWER COMPONENTS REPLACEMENT

**INITIAL SETUP:**

**Tools and Special Tools**
Tool Kit, General Mechanic's: Automotive (WP 0054, Table 1, Item 7)

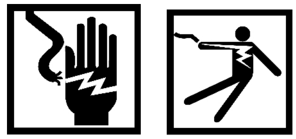
**Materials/Parts**
Washer, Lock (WP 0055, Table 1, Item 22)

**Personnel Required**
Construction Equipment Repairer, 91L (Two)

**Equipment Condition**
Vehicle MASTER power off (TM 5-2350-262-10)
Negative battery cables disconnected (TM 5-2350-262-20)

## REMOVAL

### WARNING



Ensure that vehicle power is off and battery disconnected. Remove all jewelry, such as rings, dog tags, bracelets, etc. If jewelry or disconnected battery ground cable contacts battery positive terminal, a direct short will result, causing instant heating of tools, tool damage, battery damage, or battery explosion. Failure to comply may result in severe injury or death.

1. Remove screw (Figure 1, Item 5), lockwasher (Figure 1, Item 4), and lead assembly 1070 (Figure 1, Item 3) from terminal B2 on parking brake relay (Figure 1, Item 2). Discard lockwasher.
2. Remove lead assemblies (Figure 1, Item 6), "Y"-connector (Figure 1, Item 7), and in-line connector (Figure 1, Item 8) from trailer receptacle and trouble light circuit breaker (Figure 1, Item 1) located behind operator's compartment switch and gauge panel.

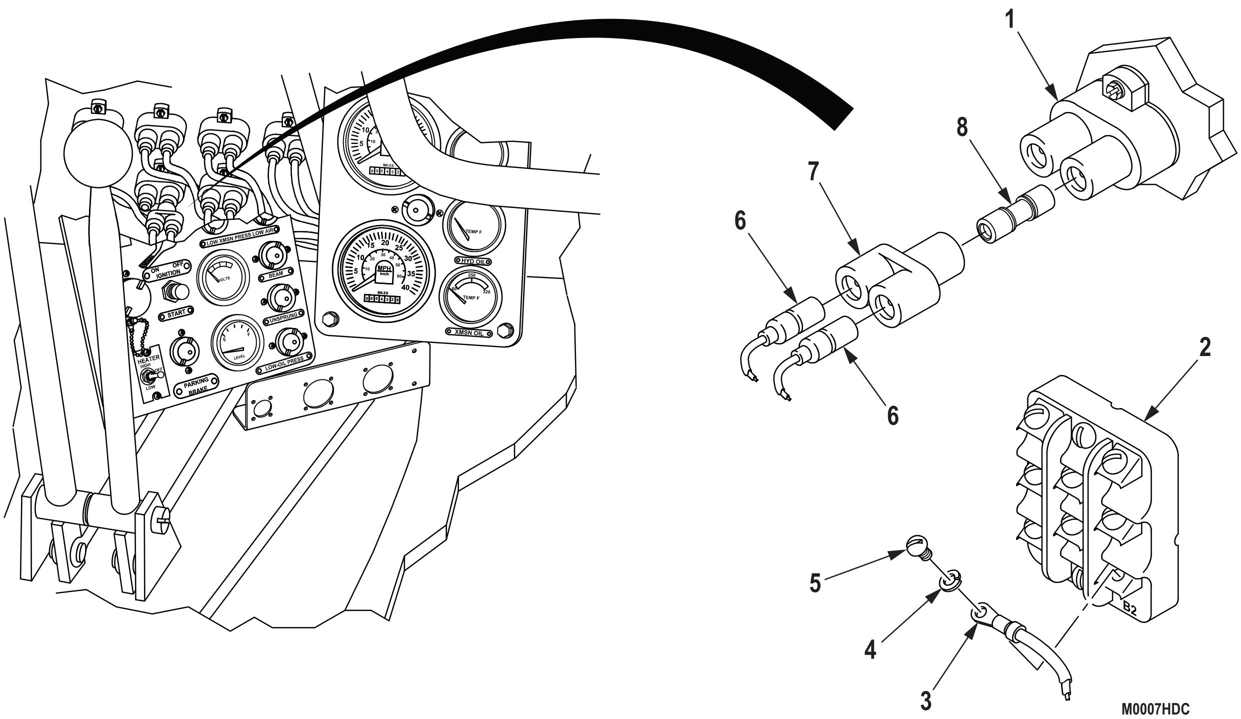



*Figure 1. Hydraulic Diagnostic Center (HDC) Power Distribution Components Removal.*

**END OF TASK**

## INSTALLATION

1. Install in-line connector (Figure 2, Item 8), "Y"-connector (Figure 2, Item 7), and lead assemblies (Figure 2, Item 6) on trailer receptacle and trouble light circuit breaker (Figure 2, Item 1) located behind operator's compartment switch and gauge panel.
2. Install lead assembly 1070 (Figure 2, Item 3) on terminal B2 on parking brake relay (Figure 2, Item 2) with new lockwasher (Figure 2, Item 4) and screw (Figure 2, Item 5).

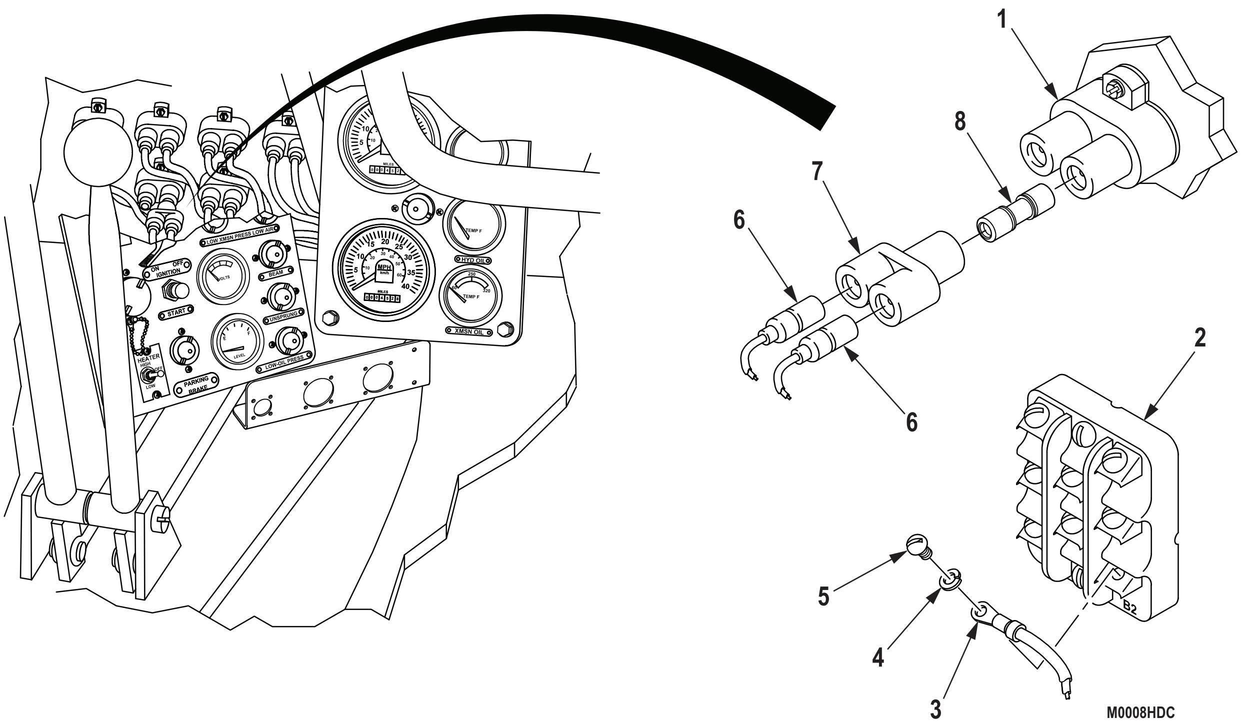



*Figure 2. Hydraulic Diagnostic Center (HDC) Power Distribution Components Installation.*

## END OF TASK

## FOLLOW-ON MAINTENANCE

Connect negative battery cables (TM 5-2350-262-20).

## END OF TASK

## END OF WORK PACKAGE

## FIELD MAINTENANCE
## WIRING HARNESS W1 REPLACEMENT

**INITIAL SETUP:**

**Tools and Special Tools**
Tool Kit, General Mechanic's: Automotive (WP 0054, Table 1, Item 7)

**Materials/Parts**
Washer, Lock (WP 0055, Table 1, Item 2) Qty: 1

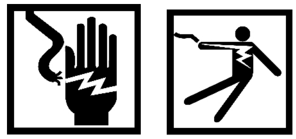
**Personnel Required**
Construction Equipment Repairer, 91L

**Equipment Condition**
Vehicle MASTER power OFF (TM 5-2350-262-10)

**Equipment Condition (cont.)**
Apron locked in full-up position (TM 5-2350-262-10)
Ejector to front of vehicle (TM 5-2350-262-10)
Negative battery cables disconnected (TM 5-2350-262-20)

## REMOVAL

### WARNING



Ensure that vehicle power is off and battery disconnected. Remove all jewelry, such as rings, dog tags, bracelets, etc. If jewelry or disconnected battery ground cable contacts battery positive terminal, a direct short will result, causing instant heating of tools, tool damage, battery damage, or battery explosion. Failure to comply may result in severe injury or death.

1. Remove screw (Figure 1, Item 1), lockwasher (Figure 1, Item 2), and wiring harness W1 lead 1070 (Figure 1, Item 3) from parking brake relay (Figure 1, Item 4) terminal B1. Discard lockwasher.
2. Remove bolt (Figure 1, Item 10), from the compartment wall above the CBRN filter and remove wiring harness lead 1069 (Figure 1, Item 11).
3. Remove dust cap (Figure 1, Item 8), four screws (Figure 1, Item 6), nutplate (Figure 1, Item 5), and wiring harness W1 connector J1 (Figure 1, Item 9) from Hydraulic Diagnostic Center (HDC) disconnect bracket (Figure 1, Item 7).
4. Pull wiring harness W1 leads 1070 (Figure 1, Item 3) and 1069 (Figure 1, Item 11) through wire clamps and remove wiring harness W1 from vehicle.

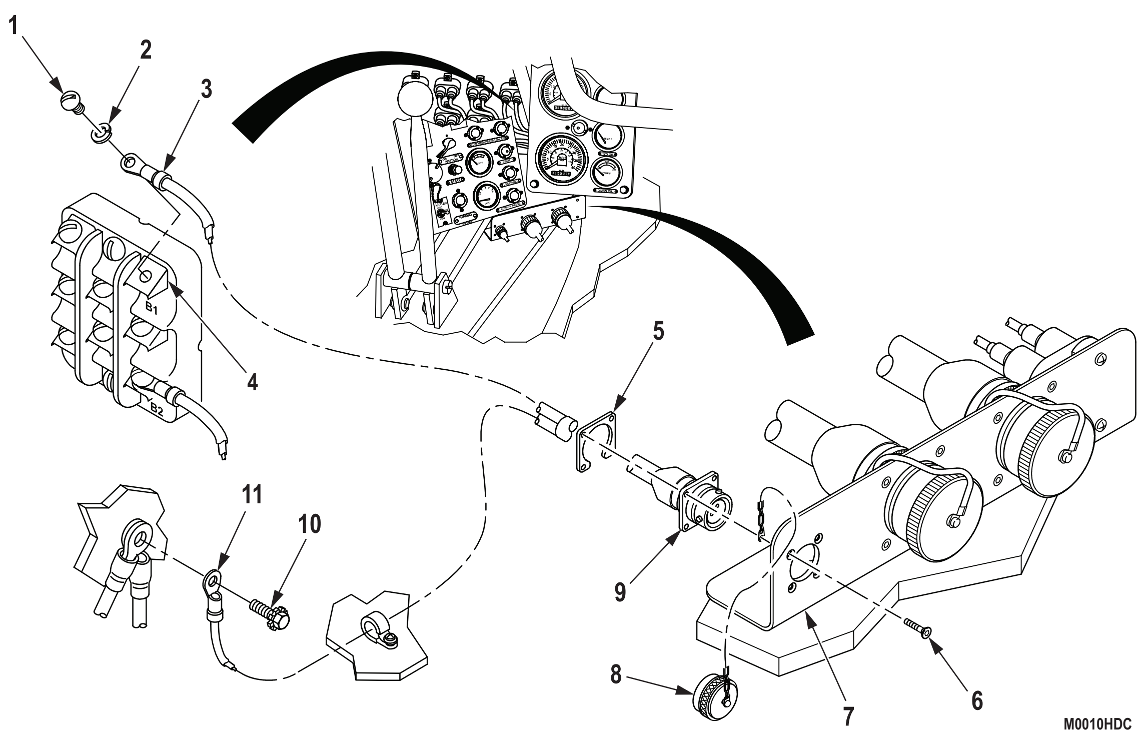
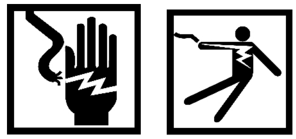



*Figure 1. Wiring Harness W1 Removal.*

**END OF TASK**

## INSTALLATION

### WARNING



Ensure that vehicle power is off and battery disconnected. Remove all jewelry, such as rings, dog tags, bracelets, etc. If jewelry or disconnected battery ground cable contacts battery positive terminal, a direct short will result, causing instant heating of tools, tool damage, battery damage, or battery explosion. Failure to comply may result in severe injury or death.

1. Thread wiring harness W1 leads 1070 (Figure 2, Item 3) and 1069 (Figure 2, Item 11) through wire clamps to parking brake relay (Figure 2, Item 4) and battery box.
2. Connect wiring harness W1 connector J1 (Figure 2, Item 9) to HDC disconnect bracket (Figure 2, Item 7) with nutplate (Figure 2, Item 5), and four screws (Figure 2, Item 6). Attach dust cap (Figure 2, Item 8) to connector J1.
3. Install wiring harness W1 lead 1069 (Figure 2, Item 11) on compartment wall above the CBRN filter with bolt (Figure 2, Item 10).
4. Install wiring harness W1 lead 1070 (Figure 2, Item 3) on parking brake relay (Figure 2, Item 4) with new lockwasher (Figure 2, Item 2) and screw (Figure 2, Item 1).

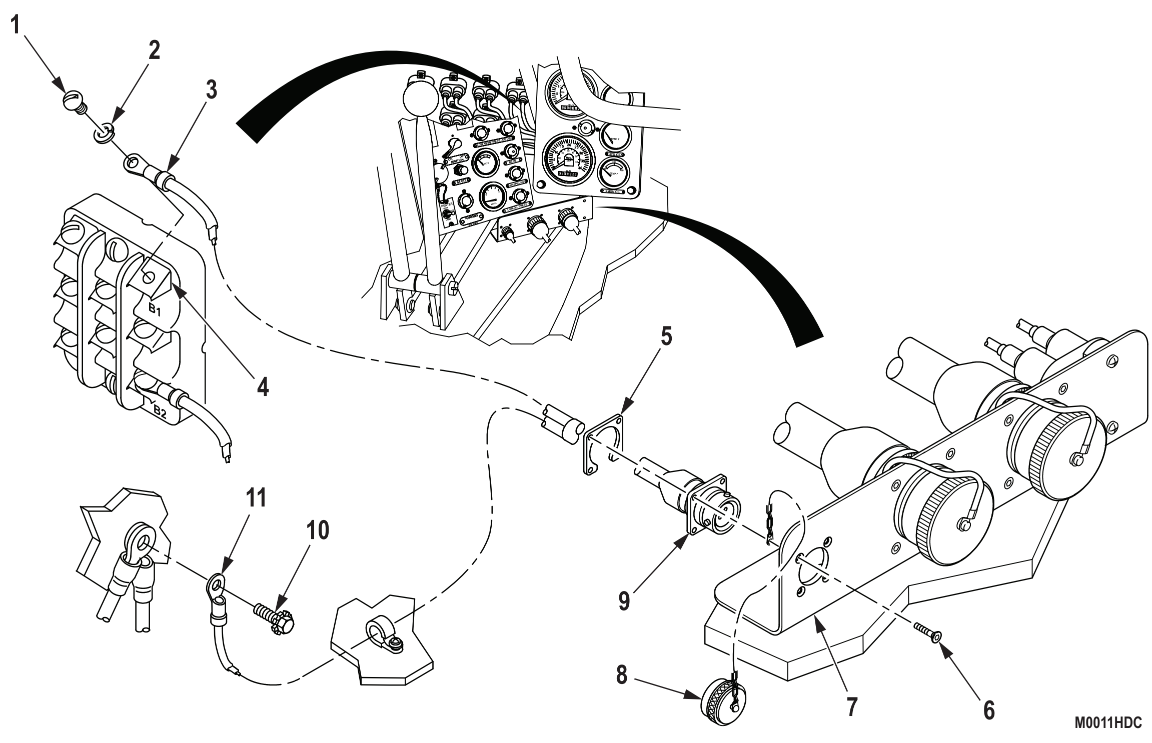



*Figure 2. Wiring Harness W1 Installation.*

**END OF TASK**

## FOLLOW-ON MAINTENANCE

1. Return ejector to stowed position (TM 5-2350-262-10).
2. Return apron to stowed position (TM 5-2350-262-10).
3. Connect negative battery cables (TM 5-2350-262-20).

**END OF TASK**

**END OF WORK PACKAGE**

# FIELD MAINTENANCE
# WIRING HARNESS W2 REPLACEMENT

**INITIAL SETUP:**

**Tools and Special Tools**
Tool Kit, General Mechanic's: Automotive (WP 0054, Table 1, Item 7)

**Materials/Parts**
Strap, Tiedown, Electrical (WP 0053, Table 1, Item 4)

**Personnel Required**
Construction Equipment Repairer, 91L

**Equipment Condition**
Vehicle MASTER power OFF (TM 5-2350-262-10)

**Equipment Condition (cont.)**
Apron locked in full-up position (TM 5-2350-262-10)
Ejector to front of vehicle (TM 5-2350-262-10)
Negative battery cables disconnected (TM 5-2350-262-20)

## REMOVAL

### WARNING

- Do not operate ejector when personnel are in bowl. Do not work in bowl unless ejector lock is engaged. Failure to comply may result in severe injury or death to personnel.
- Do not stand or work in bowl area unless ejector lock is engaged. Do not stand in bowl to observe roller guide travels. Failure to comply may result in severe injury or death to personnel.
- When folding dozer blade, work on blade latches from side of vehicle only. Do not stand in front of dozer blade while retracting ejector. Failure to comply may result in severe injury or death to personnel.

1. At the main hydraulic pump left and right high-pressure filter area, remove wiring harness W2 connector P3 (Figure 1, Item 6) from transducer T3 (Figure 1, Item 5), wiring harness W2 connector P4 (Figure 1, Item 4) from transducer T4 (Figure 1, Item 3), and wiring harness W2 connector P30 (Figure 1, Item 1) from transducer T12 (Figure 1, Item 2).

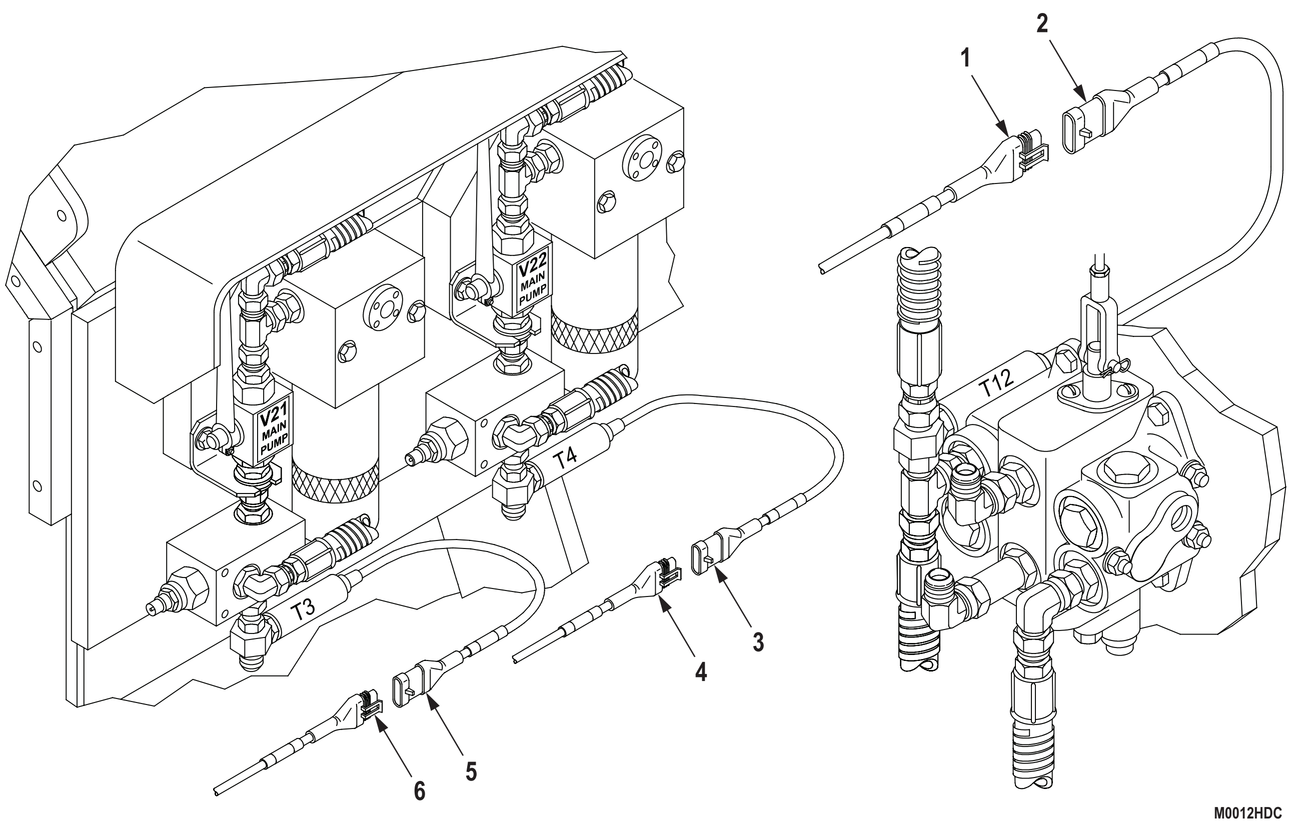



*Figure 1. Wiring Harness W2 from Filter Area Removal.*

**REMOVAL - Continued**

2. In the vehicle bowl bottom area, remove wiring harness W2 connector P7 (Figure 2, Item 7) from transducer T7 (Figure 2, Item 6) at left main manifold (Figure 2, Item 5).
3. In the vehicle bowl at the Hydraulic Diagnostic Center (HDC) main manifold remove wiring harness W2 connectors as follows: P1, P5, P11, P12, P13, P14, P15, P16, P17, P19, and P20 (Figure 2, Item 4) from valves V1, V5, V11, V12, V13, V14, V15, V16, V17, V18, V19, and V20 (Figure 2, Item 3).
4. In the vehicle bowl at the HDC main manifold remove wiring harness W2 connectors as follows: P2, P31, and P32 (Figure 2, Item 1) from transducers T2, T1, and T13 (Figure 2, Item 2).

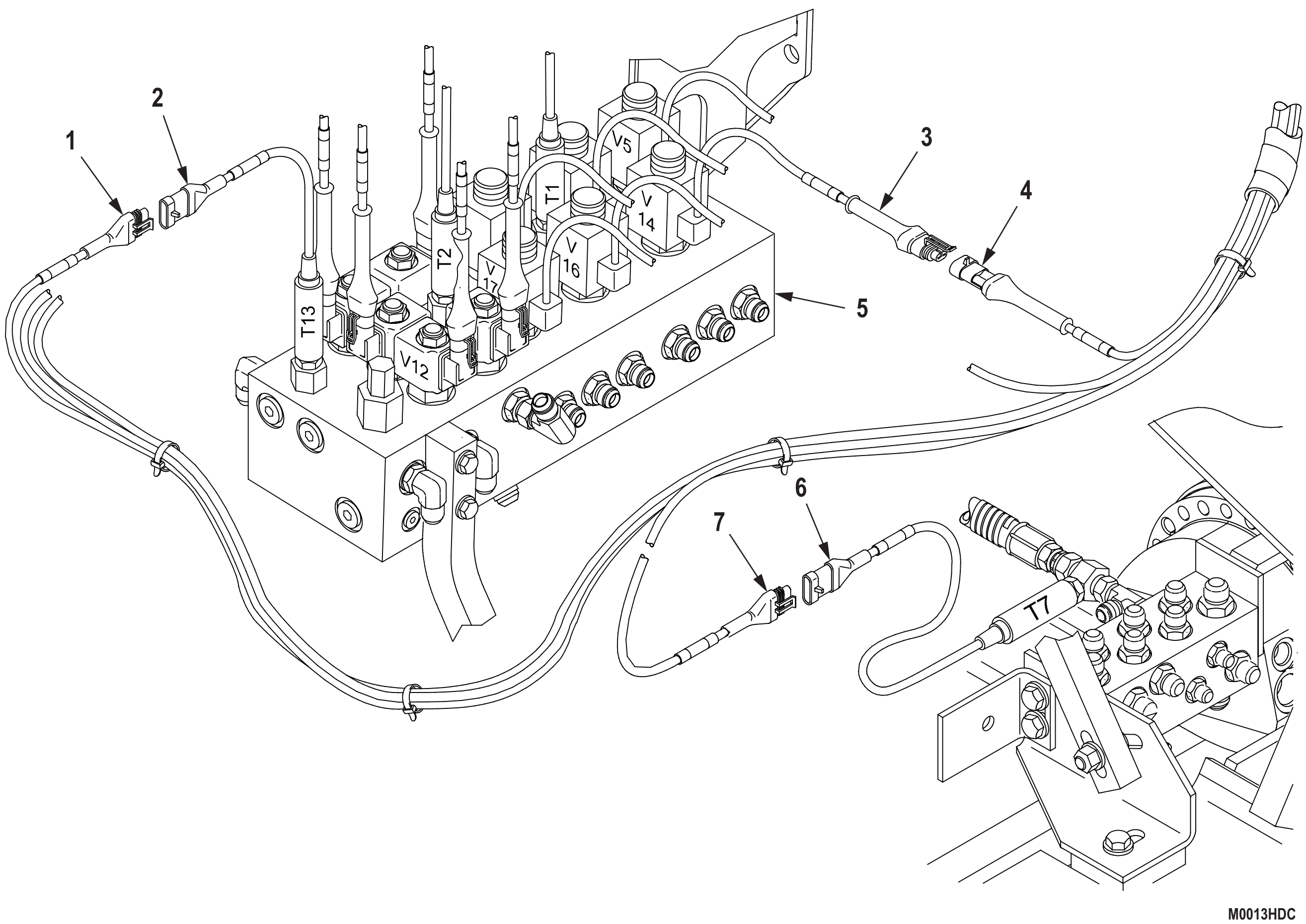



*Figure 2. Wiring Harness W2 from Main Manifold Removal.*

**REMOVAL - Continued**

5. Remove dust cap (Figure 3, Item 4), four screws (Figure 3, Item 3), nutplate (Figure 3, Item 1), and wiring harness W2 connector J1 (Figure 3, Item 2) from HDC disconnect bracket (Figure 3, Item 5).
6. Cut and remove tie down straps, pull leads through wire clamps, and remove wiring harness from vehicle. Discard tie down straps.

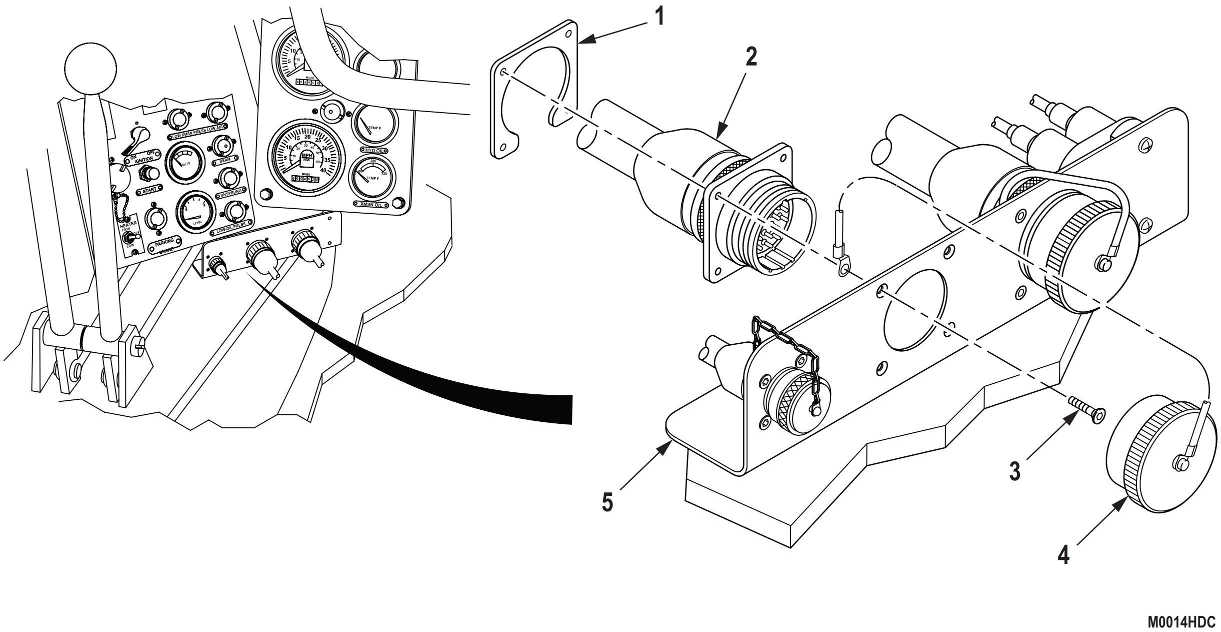



*Figure 3. Wiring Harness W2 Connector J1 at Disconnect Bracket Removal.*

**END OF TASK**

## INSTALLATION

### WARNING

- Do not operate ejector when personnel are in bowl. Do not work in bowl unless ejector lock is engaged. Failure to comply may result in severe injury or death to personnel.
- Do not stand or work in bowl area unless ejector lock is engaged. Do not stand in bowl to observe roller guide travels. Failure to comply may result in severe injury or death to personnel.
- When folding dozer blade, work on blade latches from side of vehicle only. Do not stand in front of dozer blade while retracting ejector. Failure to comply may result in severe injury or death to personnel.

1. Thread wiring harness leads through wire clamps and secure harness with new tie down straps.
2. Install wiring harness W2 connector J1 (Figure 4, Item 2) to HDC disconnect bracket (Figure 4, Item 5) with nutplate (Figure 4, Item 1), and four screws (Figure 4, Item 3). Attach dust cap (Figure 4, Item 4) to connector J1.

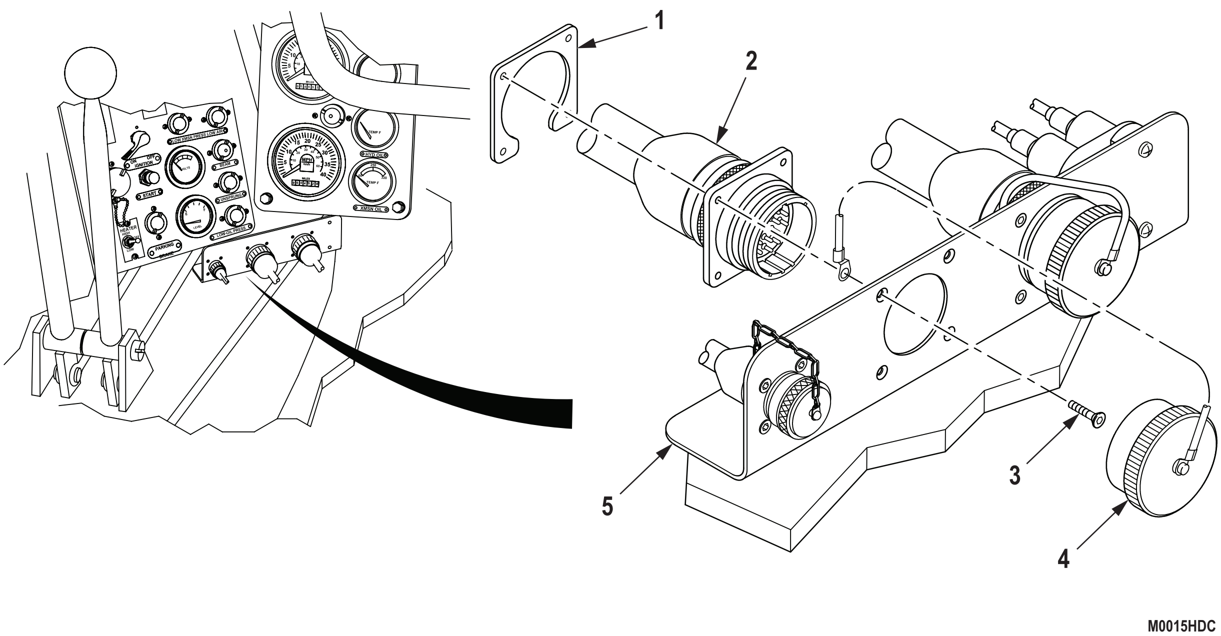



*Figure 4. Wiring Harness W2 Connector J1 at Disconnect Bracket Installation.*

**INSTALLATION - Continued**

3. In the vehicle bowl at the HDC main manifold connect wiring harness W2 connectors as follows: P2, P31, and P32 (Figure 5, Item 1) to transducers T2, T1, and T13 (Figure 5, Item 2).
4. In the vehicle bowl at the HDC main manifold connect wiring harness W2 connectors as follows: P1, P5, P11, P12, P13, P14, P15, P16, P17, P19, and P20 (Figure 5, Item 4) to valves V1, V5, V11, V12, V13, V14, V15, V16, V17, V19, and V20 (Figure 5, Item 3).
5. In the vehicle bowl bottom area connect wiring harness W2 connector P7 (Figure 5, Item 7) to transducer T7 (Figure 5, Item 6) at the left main manifold (Figure 5, Item 5).

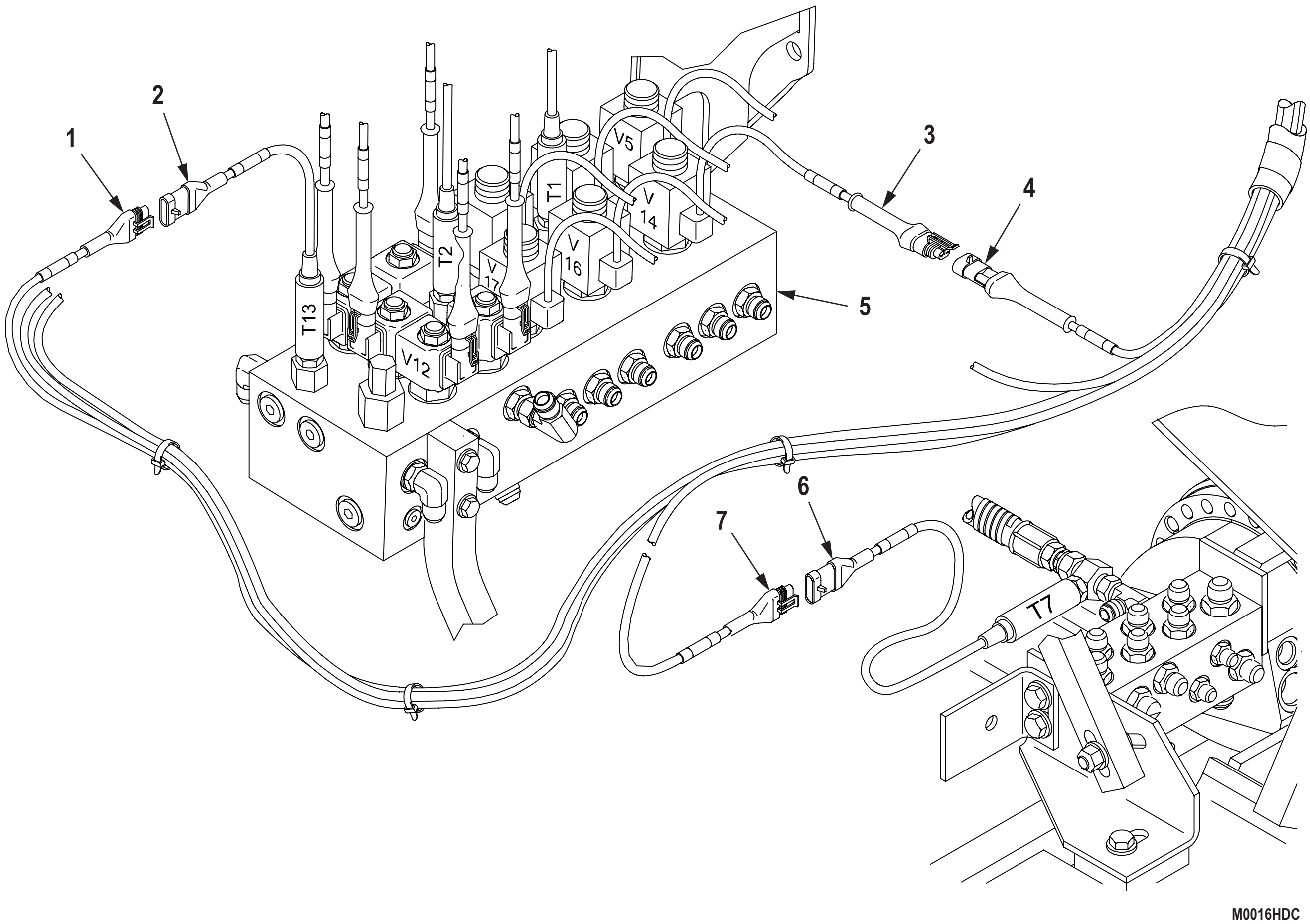



*Figure 5. Wiring Harness W2 to Main Manifold Installation.*

**INSTALLATION - Continued**

6. At the main hydraulic pump left and right high-pressure filter area, connect wiring harness W2 connector P3 (Figure 6, Item 6) to transducer T3 (Figure 6, Item 5), wiring harness W2 connector P4 (Figure 6, Item 4) to transducer T4 (Figure 6, Item 3), and wiring harness W2 connector P30 (Figure 6, Item 1) to transducer T12 (Figure 6, Item 2).

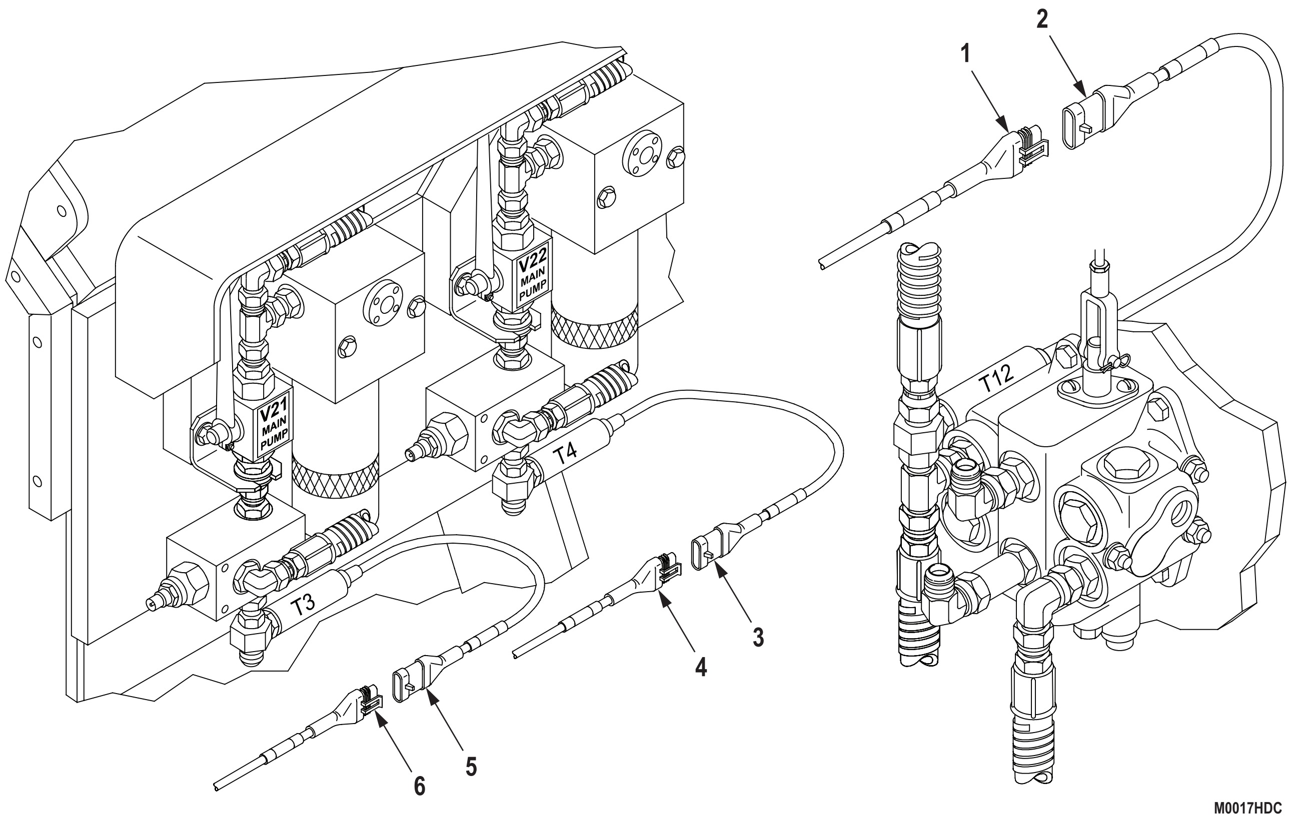



*Figure 6. Wiring Harness W2 to Filter Area Installation.*

**END OF TASK**

**FOLLOW-ON MAINTENANCE**

1. Connect negative battery cables (TM 5-2350-262-20).
2. Return vehicle ejector to stowed position (TM 5-2350-262-10).
3. Return vehicle apron to stowed position (TM 5-2350-262-10).

**END OF TASK**

**END OF WORK PACKAGE**

# FIELD MAINTENANCE
# WIRING HARNESS W3 REPLACEMENT

## INITIAL SETUP:

**Tools and Special Tools**
Tool Kit, General Mechanic's: Automotive
(WP 0054, Table 1, Item 7)
Stand, Vehicle Support
(WP 0054, Table 1, Item 5)

**Materials/Parts**
Strap, Tiedown, Electrical
(WP 0053, Table 1, Item 4)

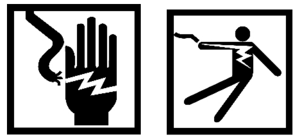
**Personnel Required**
Construction Equipment Repairer, 91L

**Equipment Condition**
Vehicle MASTER power OFF (TM 5-2350-262-10)

**Equipment Condition (cont.)**
Apron locked in full-up position
(TM 5-2350-262-10)
Ejector to front of vehicle (TM 5-2350-262-10)
Hull raised on jack stands (TM 5-2350-262-20)
Hull access plates removed (TM 5-2350-262-20)
Negative battery cables disconnected
(TM 5-2350-262-20)

## REMOVAL

### WARNING



Ensure that vehicle power is off and battery disconnected. Remove all jewelry, such as rings, dog tags, bracelets, etc. If jewelry or disconnected battery ground cable contacts battery positive terminal, a direct short will result, causing instant heating of tools, tool damage, battery damage, or battery explosion. Failure to comply may result in severe injury or death.

1. Remove dust cap (Figure 1, Item 5), four screws (Figure 1, Item 4), nutplate (Figure 1, Item 1), and wiring harness W3 connector J1 (Figure 1, Item 2) from Hydraulic Diagnostic Center (HDC) disconnect bracket (Figure 1, Item 3).
2. Remove wiring harness W3 connector P5 (Figure 1, Item 7) from transducer T5 (Figure 1, Item 6) at forward right actuator #1 (Figure 1, Item 8).
3. Remove wiring harness W3 connector P31 (Figure 1, Item 10) from transducer T6 (Figure 1, Item 11) at forward left actuator #1 (Figure 1, Item 9).

## REMOVAL - Continued

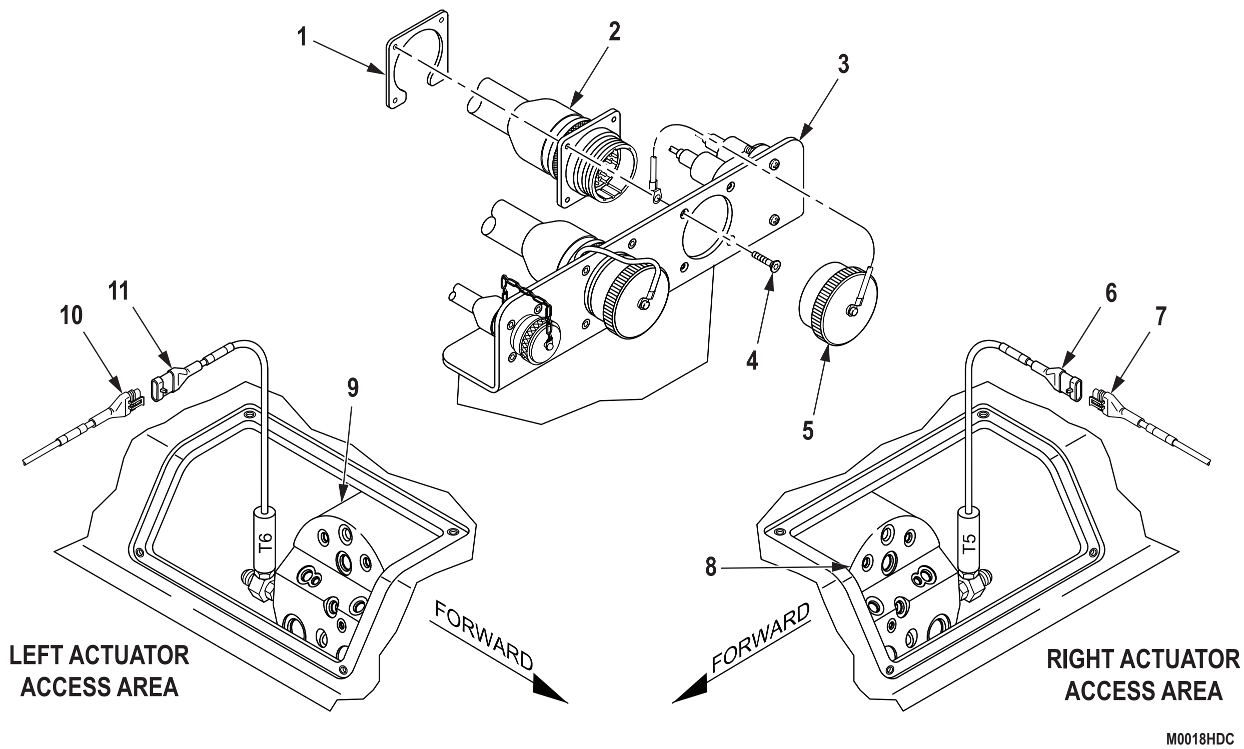



*Figure 1. Wiring Harness W3 from Disconnect Bracket and Actuator Area Removal.*

**REMOVAL - Continued**

## WARNING

Do not work under vehicle unless hull is on jack stands and apron lockpins are installed. Failure to comply may result in severe injury or death to personnel.

4. From access under vehicle, remove the following W3 wiring harness connectors from the forward right manifold (Figure 2, Item 21): connector P2 (Figure 2, Item 24) from valve V2 (Figure 2, Item 25), connector P10 (Figure 2, Item 23) from valve V10 (Figure 2, Item 22), and connector P11 (Figure 2, Item 1) from transducer T11 (Figure 2, Item 2).
5. From access under vehicle, remove the following W3 wiring harness connectors from the forward left manifold (Figure 2, Item 9): connector P3 (Figure 2, Item 7) from valve V3 (Figure 2, Item 8), connector P9 (Figure 2, Item 6) from valve V9 (Figure 2, Item 5), and connector P30 (Figure 2, Item 4) from transducer T10 (Figure 2, Item 3).
6. From access under vehicle, remove the following W3 wiring harness connectors from the aft manifold (Figure 2, Item 12): connector P4 (Figure 2, Item 20) from valve V4 (Figure 2, Item 11), connector P6 (Figure 2, Item 14) from valve V6 (Figure 2, Item 13), connector P7 (Figure 2, Item 16) from valve P7 (Figure 2, Item 15), connector P8 (Figure 2, Item 18) from valve V8 (Figure 2, Item 17), and connector P18 (Figure 2, Item 19) from valve V18 (Figure 2, Item 10).

**REMOVAL - Continued**

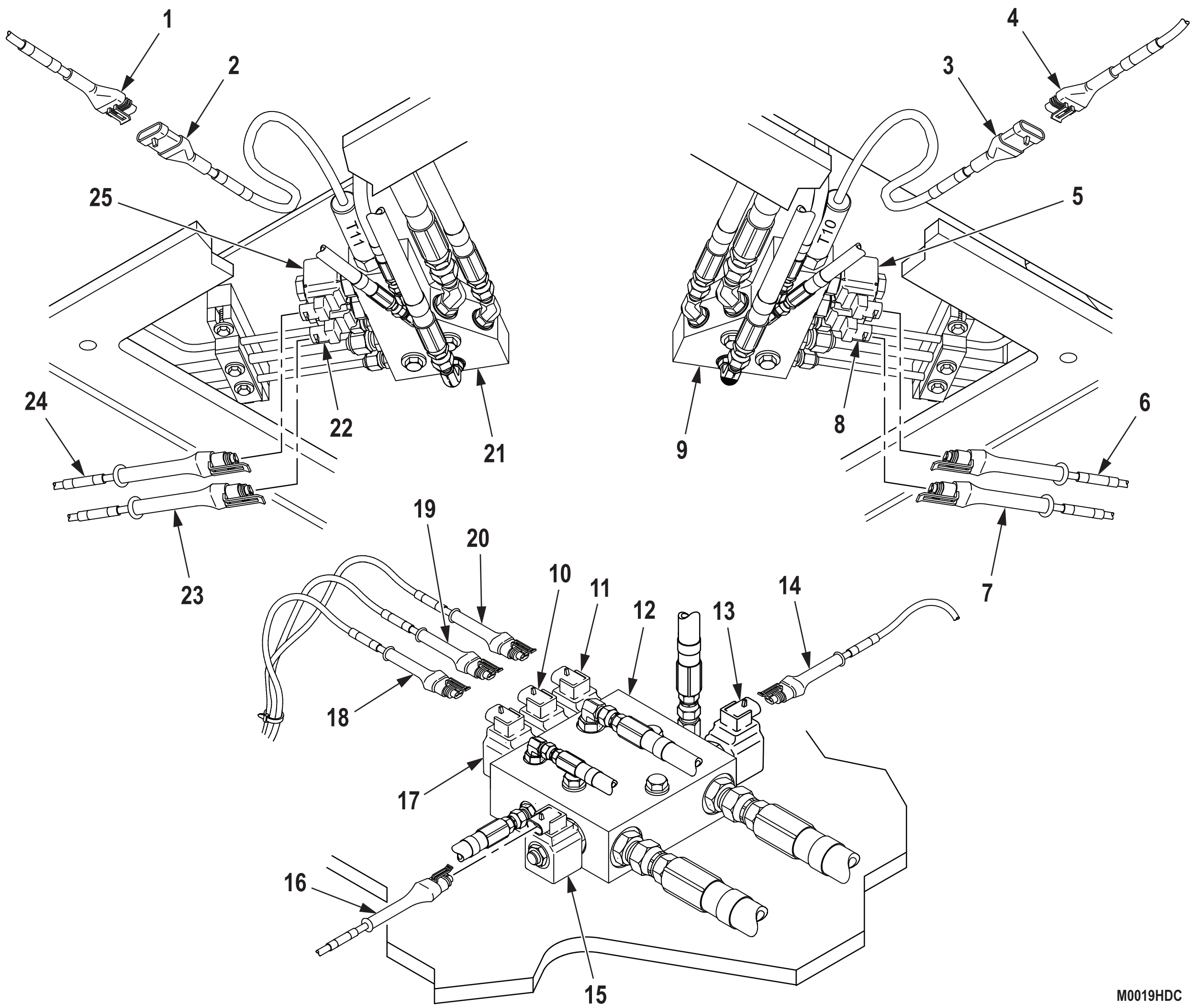



*Figure 2. Wiring Harness W3 from Under Vehicle Removal.*

**REMOVAL - Continued**

7. Remove wiring harness W3 connector P32 (Figure 3, Item 3) from transducer T9 (Figure 3, Item 2) at left sprung stop cylinder (Figure 3, Item 1).
8. Remove wiring harness W3 connector P33 (Figure 3, Item 6) from transducer T8 (Figure 3, Item 5) at right sprung stop cylinder (Figure 3, Item 4).
9. Remove tie down straps, open cable clamps, and remove wiring harness W3 from vehicle. Discard tie down straps.

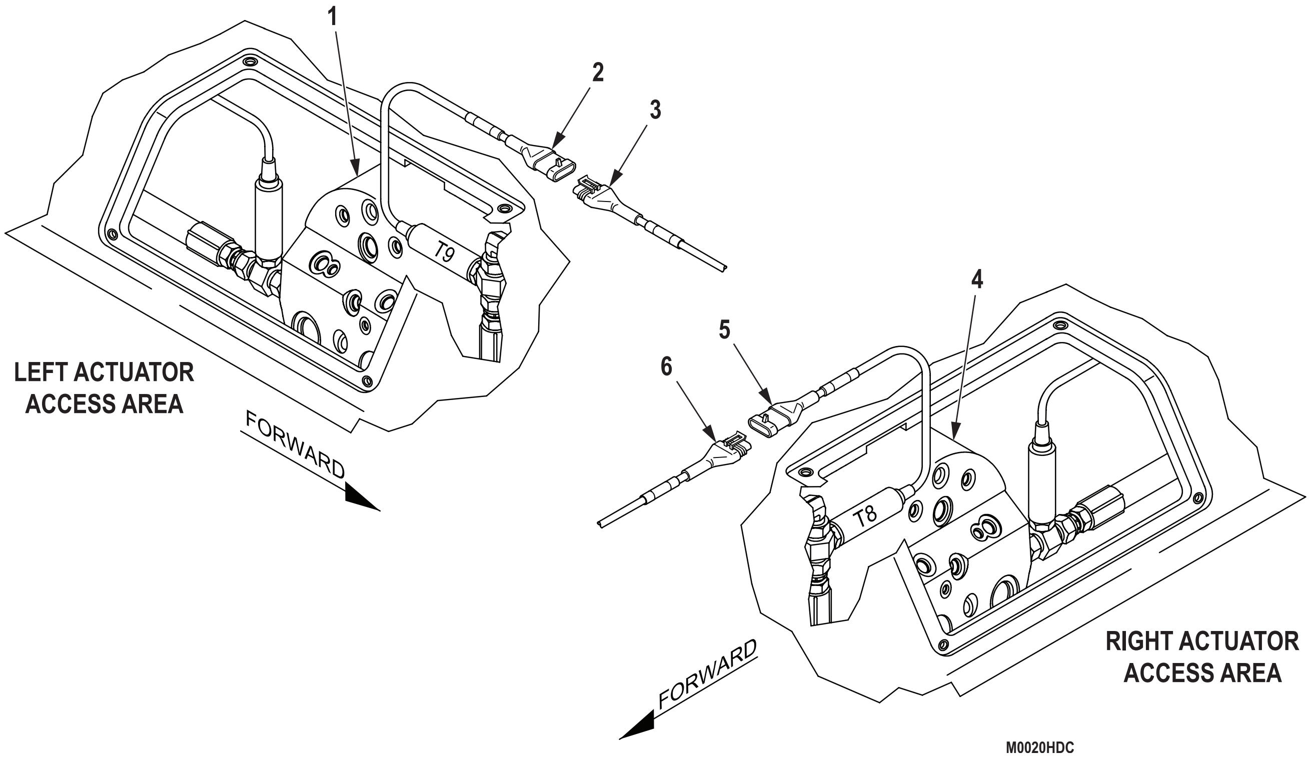
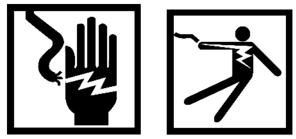



*Figure 3. Wiring Harness W3 at Actuator Area Removal.*

**END OF TASK**

## INSTALLATION

### WARNING



Ensure that vehicle power is off and battery disconnected. Remove all jewelry, such as rings, dog tags, bracelets, etc. If jewelry or disconnected battery ground cable contacts battery positive terminal, a direct short will result, causing instant heating of tools, tool damage, battery damage, or battery explosion. Failure to comply may result in severe injury or death.

1. Position wiring harness W3 in vehicle, secure in cable clamps, and secure with new tie down straps.
2. Connect wiring harness W3 connector P33 (Figure 4, Item 6) to transducer T8 (Figure 4, Item 5) at right sprung stop cylinder (Figure 4, Item 4).
3. Connect wiring harness W3 connector P32 (Figure 4, Item 3) to transducer T9 (Figure 4, Item 2) at left sprung stop cylinder (Figure 4, Item 1).

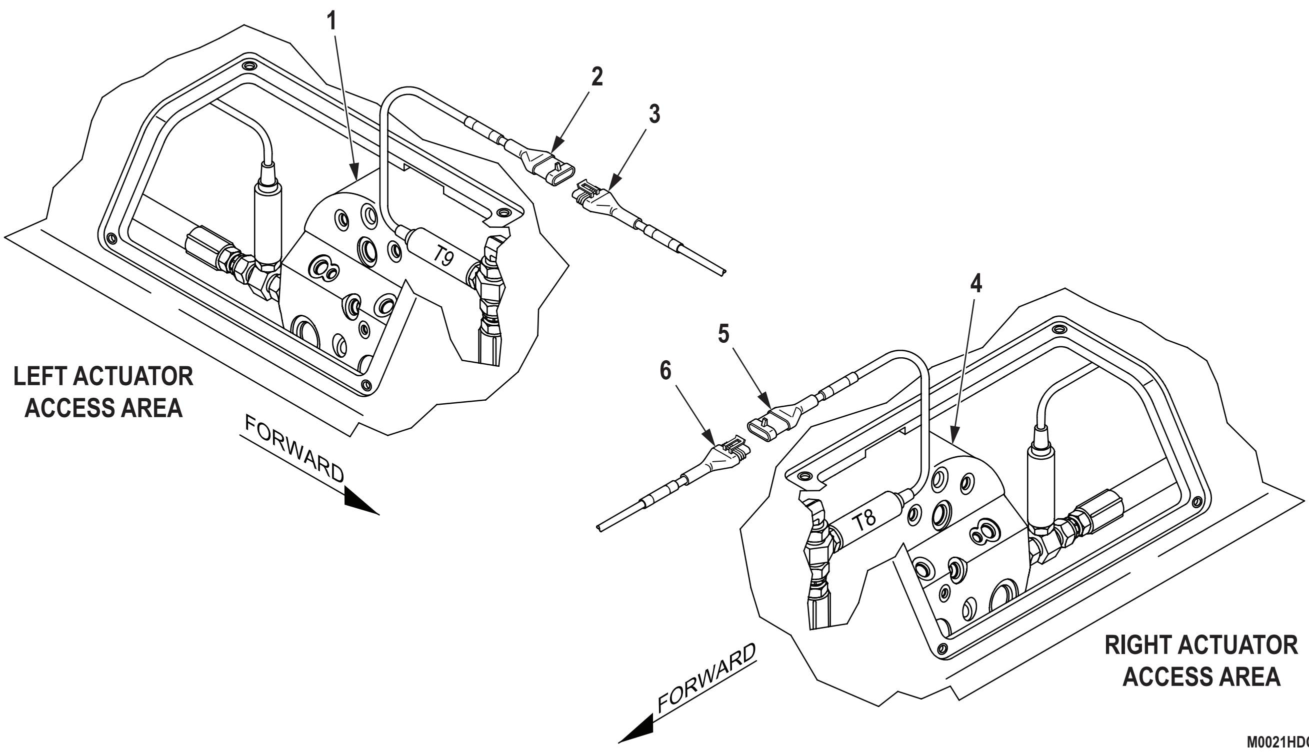



*Figure 4. Wiring Harness W3 at Actuator Area Installation.*

**INSTALLATION - Continued**

## WARNING

Do not work under vehicle unless hull is on jack stands and apron lockpins are installed. Failure to comply may result in severe injury or death to personnel.

4. From access under vehicle, connect the following W3 wiring harness connectors to the aft manifold (Figure 5, Item 12): connector P4 (Figure 5, Item 20) to valve V4 (Figure 5, Item 11), connector P6 (Figure 5, Item 14) to valve V6 (Figure 5, Item 13), connector P7 (Figure 5, Item 16) to valve P7 (Figure 5, Item 15), connector P8 (Figure 5, Item 18) to valve V8 (Figure 5, Item 17), and connector P18 (Figure 5, Item 19) to valve V18 (Figure 5, Item 10).
5. From access under vehicle, connect the following W3 wiring harness connectors to the forward left manifold (Figure 5, Item 9): connector P3 (Figure 5, Item 7) to valve V3 (Figure 5, Item 8), connector P9 (Figure 5, Item 6) to valve V9 (Figure 5, Item 5), and connector P30 (Figure 5, Item 4) to transducer T10 (Figure 5, Item 3).
6. From access under vehicle, connect the following W3 wiring harness connectors to the forward right manifold (Figure 5, Item 21): connector P2 (Figure 5, Item 24) to valve V2 (Figure 5, Item 25), connector P10 (Figure 5, Item 23) to valve V10 (Figure 5, Item 22), and connector P11 (Figure 5, Item 1) to transducer T11 (Figure 5, Item 2).

**INSTALLATION - Continued**

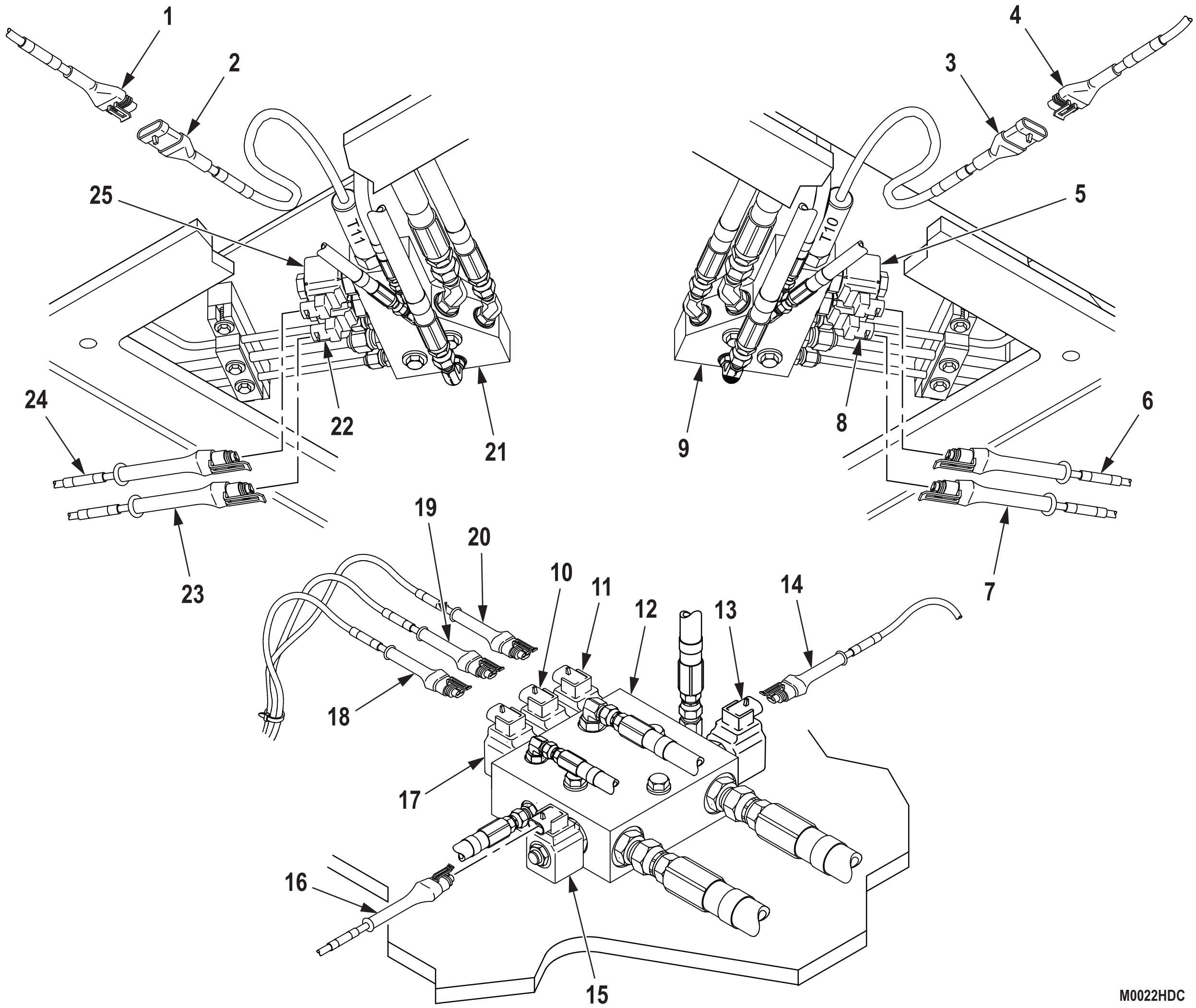



*Figure 5. Wiring Harness W3 Connections Under Vehicle Installation.*

## INSTALLATION - Continued

7. Connect wiring harness W3 connector P31 (Figure 6, Item 10) to transducer T6 (Figure 6, Item 11) at forward left actuator #1 (Figure 6, Item 9).
8. Connect wiring harness W3 connector P5 (Figure 6, Item 7) to transducer T5 (Figure 6, Item 6) at forward right actuator #1 (Figure 6, Item 8).
9. Install wiring harness W3 connector J1 (Figure 6, Item 2) to HDC disconnect bracket (Figure 6, Item 3) with nutplate (Figure 6, Item 1) and four screws (Figure 6, Item 4). Attach dust cap (Figure 6, Item 5) to connector J1.

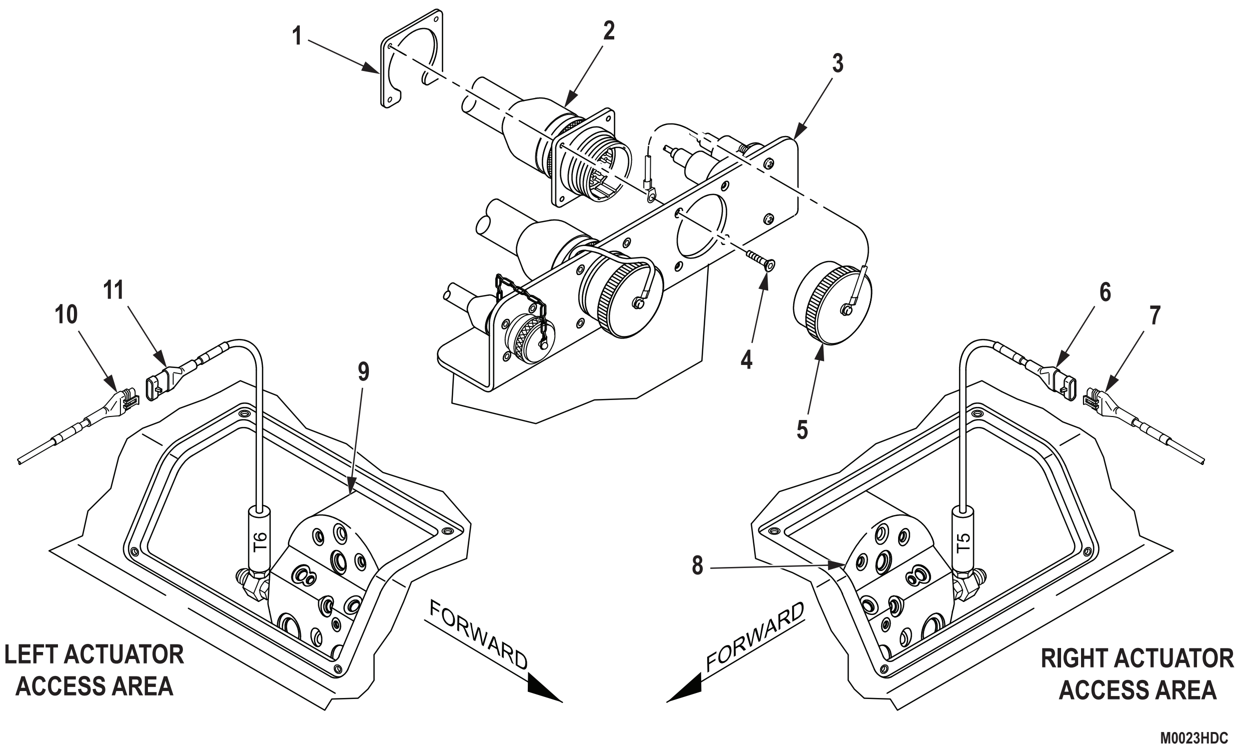



*Figure 6. Wiring Harness W3 to Disconnect Bracket and Actuator Area Installation.*

## END OF TASK

## FOLLOW-ON MAINTENANCE

1. Connect negative battery cables (TM 5-2350-262-20).
2. Install hull access plates (TM 5-2350-262-20).
3. Remove vehicle from jack stands and lower hull (TM 5-2350-262-20).
4. Return ejector to stowed position (TM 5-2350-262-10).
5. Return apron to stowed position (TM 5-2350-262-10).

## END OF TASK

## END OF WORK PACKAGE

# FIELD MAINTENANCE
# PRESSURE TRANSDUCERS REPLACEMENT

**INITIAL SETUP:**

**Tools and Special Tools**

Tool Kit, General Mechanic's: Automotive (WP 0054, Table 1, Item 7)
Adapter, Socket Wrench (WP 0054, Table 1, Item 1)
Parts Kit, Hydraulic (WP 0054, Table 1, Item 3)
Stand, Vehicle Support (WP 0054, Table 1, Item 5)
Wrench Set, Crowfoot (WP 0054, Table 1, Item 8)

**Materials/Parts**

O-ring (WP 0055, Table 1, Item 19) Qty: 13

**Personnel Required**

Construction Equipment Repairer, 91L

**Equipment Condition**

Vehicle MASTER power OFF (TM 5-2350-262-10)

**Equipment Condition (cont.)**

Hydraulic pressure relieved (WP 0004)
Filter guard protective bracket removed for transducers T3, T4, and T12 (TM 5-2350-262-20)
Vehicle hull raised and on jack stands for transducers T5 and T6 (TM 5-2350-262-20)
Hull access plates removed for transducers T5 and T6 (TM 5-2350-262-20)
Apron locked in full-up position for transducer T7 (TM 5-2350-262-10)
Ejector to front of vehicle for transducer T7 (TM 5-2350-262-10)
Negative battery cables disconnected (TM 5-2350-262-20)

## REMOVAL

### NOTE

- All transducers are removed and replaced in the same manner. This task covers the removal and replacement of only one transducer.
- Refer to Table 1. Hydraulic Diagnostic Center (HDC) Pressure Transducer Locations for the location of each pressure transducer.
- Tag electrical connector and hydraulic hose/tube to assist in installation. Plug fitting that transducer is removed from to prevent leakage.

***Table 1. Hydraulic Diagnostic Center (HDC) Pressure Transducer Locations.***

| Transducer | Location | WP # |
|---|---|---|
| T3, T4, T12 | Main hydraulic filter area | WP 0031 |
| T5, T8 | Right actuator access area | WP 0032 |
| T6, T9 | Left actuator access area | WP 0032 |
| T7 | Left main manifold | WP 0047 |
| T1, T2, T13 | Primary manifold | WP 0035 |
| T10 | Left forward manifold | WP 0036 |
| T11 | Main hydraulic filter area | WP 0037 |

1. If wiring harness and connector are connected, disconnect transducer connector (Figure 1, Item 2) from wiring harness connector (Figure 1, Item 1).
2. Remove transducer (Figure 1, Item 4) and O-ring (Figure 1, Item 3) from component. Discard O-ring.

**END OF TASK**

## INSTALLATION

1. Install new O-ring (Figure 1, Item 3) and transducer (Figure 1, Items 2 and 4) on component.
2. Connect transducer connector (Figure 1, Item 2) to wiring harness connector (Figure 1, Item 1).

**INSTALLATION - Continued**

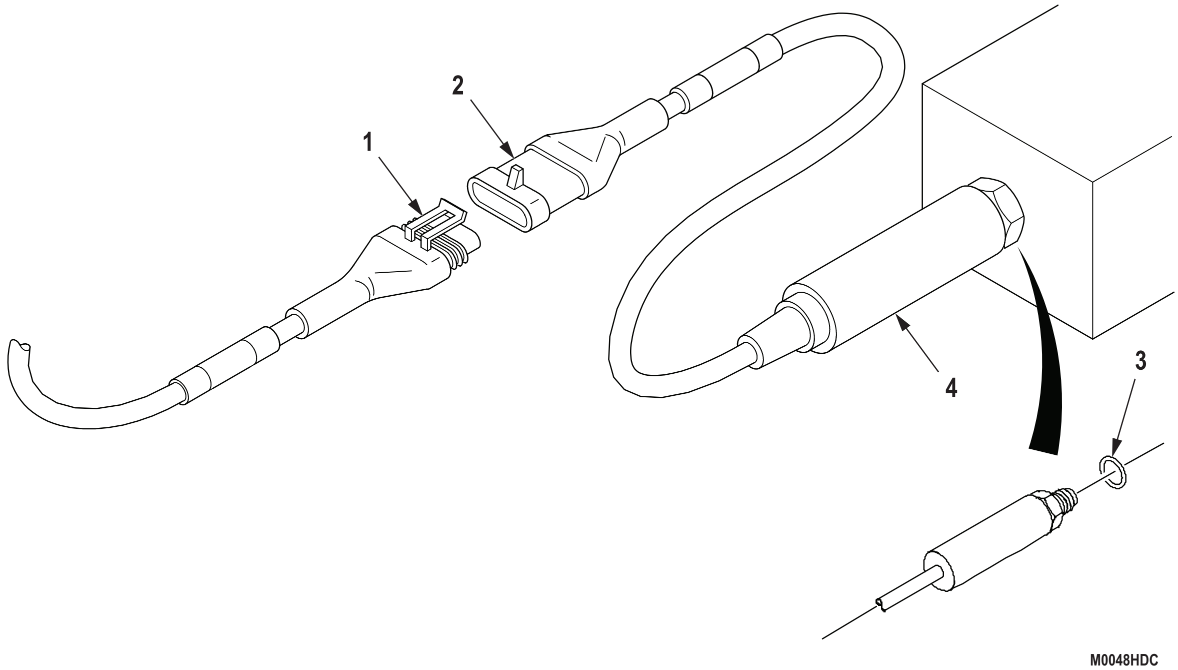



*Figure 1. Transducer Removal/Installation.*

**END OF TASK**

**FOLLOW-ON MAINTENANCE**

1. Return ejector to properly stowed position (TM 5-2350-262-10).
2. Restore hydraulic pressure to system (TM 2350-262-10).
3. Connect negative battery cables (TM 5-2350-262-20).
4. Install filter guard protective bracket for transducers T3, T4, and T12 (TM 5-2350-262-20).
5. Remove vehicle hull from jack stands for transducers T5 and T6 (TM 5-2350-262-20).
6. Install hull access plates for transducers T5 and T6 (TM 5-2350-262-20).

**END OF TASK**

**END OF WORK PACKAGE**

## FIELD MAINTENANCE
## HYDRAULIC DIAGNOSTIC CENTER (HDC) PRIMARY MANIFOLD ASSEMBLY AND MOUNTING BRACKET REPLACEMENT

### INITIAL SETUP:

**Tools and Special Tools**

Tool Kit, General Mechanic's: Automotive
(WP 0054, Table 1, Item 7)
Parts Kit, Hydraulic (WP 0054, Table 1, Item 3)
Plug, Hydraulic Tank (WP 0054, Table 1, Item 4)
Wrench Set, Crowfoot (WP 0054, Table 1, Item 8)

**Materials/Parts**

Rag, Wiping (WP 0053, Table 1, Item 2)
Bolt, Machine (WP 0055, Table 1, Item 4)
Qty: 11
Bolt, Machine (WP 0055, Table 1, Item 6) Qty: 2
Bolt, Machine (WP 0055, Table 1, Item 5) Qty: 3
Nut, Self-Locking (WP 0055, Table 1, Item 9)

**Personnel Required**

Construction Equipment Repairer, 91L (Two)

**Equipment Condition**

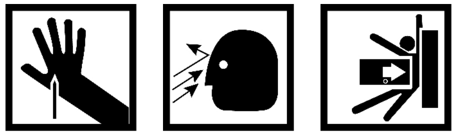
Vehicle MASTER power OFF (TM 5-2350-262-10)

**Equipment Condition (cont.)**

Apron locked in full-up position
(TM 5-2350-262-10)
Ejector to front of vehicle (TM 5-2350-262-10)
Hydraulic pressure relieved (WP 0004)
Directional Control Valve (DCV) bank removed
(TM 5-2350-262-20)
Sprung/Unsprung valve removed
(TM 5-2350-262-20)
Negative battery cables disconnected
(TM 5-2350-262-20)

## REMOVAL

### WARNING



- High oil pressure is present in the M9 ACE hydraulic system. Do not disconnect any hydraulic system component unless hydraulic system pressure has been relieved. After hydraulic system has been relieved, wait at least four minutes before disconnecting any hose or fitting. Ensure each of the hydraulic control levers is moved several times through all positions and the hydraulic tank dipstick is slowly loosened to relieve pressure. Failure to comply may result in severe injury or death to personnel.
- Do not operate ejector when personnel are in bowl. Do not work in bowl unless ejector lock is engaged. Failure to comply may result in severe injury or death to personnel.
- Do not stand or work in bowl area unless ejector lock is engaged. Do not stand in bowl to observe roller guide travels. Failure to comply may result in severe injury or death to personnel.
- When folding dozer blade, work on blade latches from side of vehicle only. Do not stand in front of dozer blade while retracting ejector. Failure to comply may result in severe injury or death to personnel.

### CAUTION

Cap or plug all oil ports and ends of hoses and tubes when oil hoses or tubes are disconnected or removed to prevent contamination. Failure to comply may result in damage to equipment.

### NOTE

Tag all hydraulic lines and wiring harness leads being disconnected to assist in installation.

1. Remove 17 hydraulic hoses and tubes (Figure 1, Items 6 through 19) from primary manifold (Figure 1, Item 5). Plug ends of hoses and tubes and cap ends of adapters to prevent leakage.
2. Remove wiring harness W2 connectors P1, P5, P11, P12, P13, P14, P15, P16, P17, P19, and P20 (Figure 1, Item 3) from valves V1, V5, V11, V12, V13, V14, V15, V16, V17, V19, and V20 (Figure 1, Item 4) at primary manifold (Figure 1, Item 5).
3. Remove wiring harness W2 connectors P2, P31, and P32 (Figure 1, Item 1) from transducers T2, T1, and T13 (Figure 1, Item 2) at primary manifold (Figure 1, Item 5).

**REMOVAL - Continued**

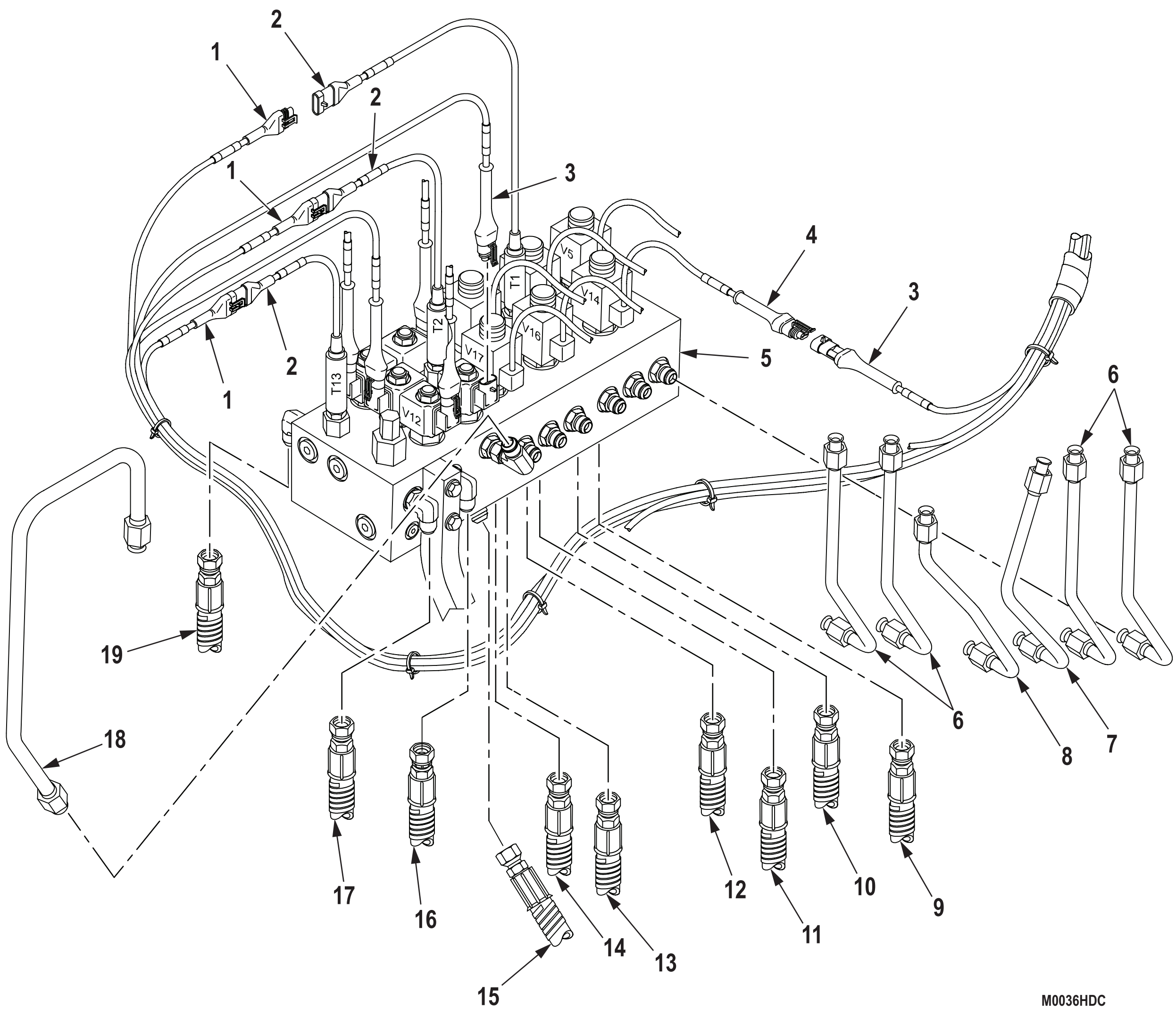



*Figure 1. Hydraulic Diagnostic Center (HDC) Primary Manifold Assembly and Mounting Bracket Removal.*

**REMOVAL - Continued**

4. Remove two machine bolts (Figure 2, Item 7), two flat washers (Figure 2, Item 6), screw (Figure 2, Item 9), three flat washers (Figure 2, Item 10), self-locking nut (Figure 2, Item 13), and lateral support bracket (Figure 2, Item 14) from primary manifold (Figure 2, Item 5) and hull floor support bracket (Figure 2, Item 8). Discard machine bolts and self-locking nut.
5. Remove three machine bolts (Figure 2, Item 12), three flat washers (Figure 2, Item 11), and hull floor support bracket (Figure 2, Item 8). Discard machine bolts.
6. Fully supporting weight of primary manifold (Figure 2, Item 5), remove seven machine bolts (Figure 2, Item 3), seven flat washers (Figure 2, Item 4), and primary manifold (Figure 2, Item 5) with mounting plate (Figure 2, Item 1) from bracket (Figure 2, Item 2). Discard machine bolts.
7. Remove four machine bolts (Figure 2, Item 3), four flat washers (Figure 2, Item 4), and mounting plate (Figure 2, Item 1) from primary manifold (Figure 2, Item 5). Discard machine bolts.

## REMOVAL - Continued

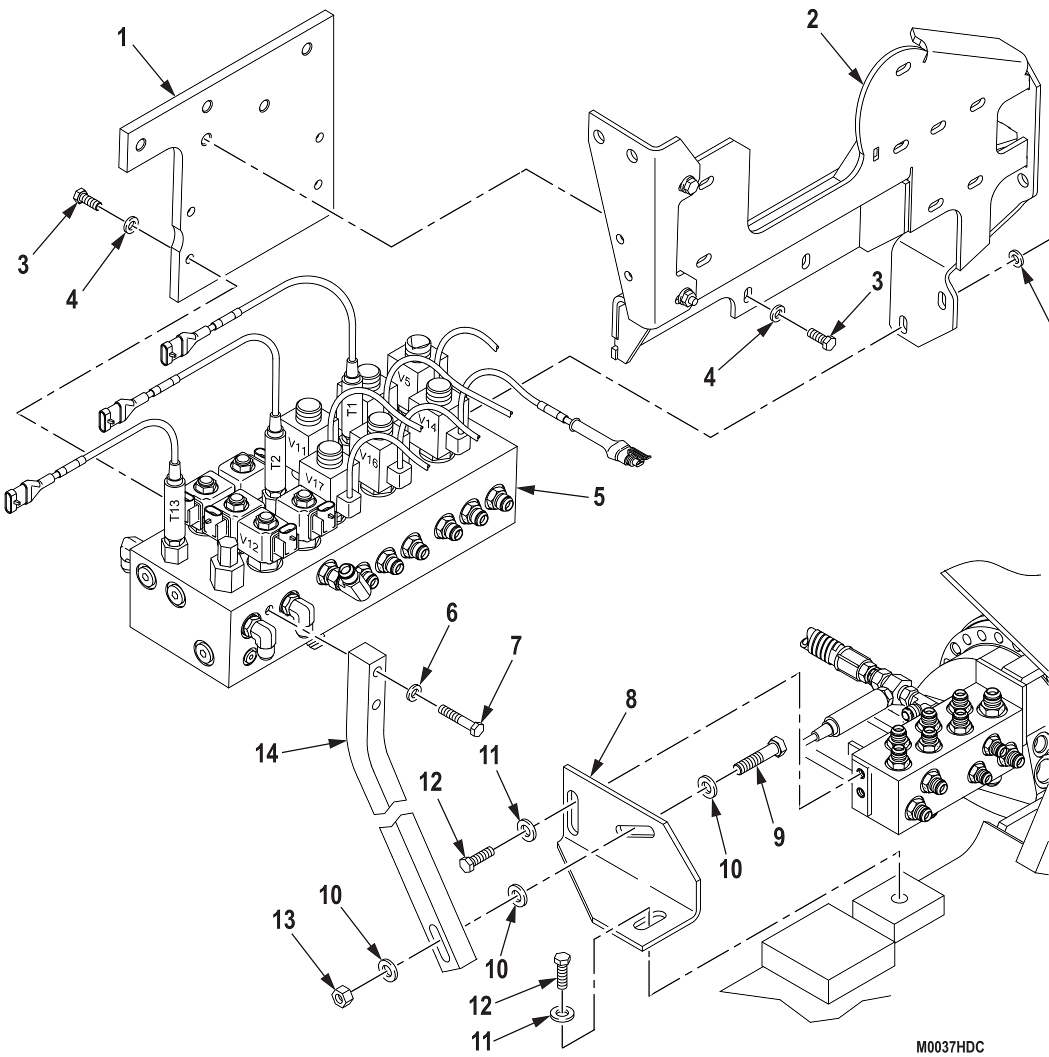



*Figure 2. Hydraulic Diagnostic Center (HDC) Primary Manifold Assembly and Mounting Bracket Removal.*

## END OF TASK

## INSTALLATION

### WARNING

- Do not operate ejector when personnel are in bowl. Do not work in bowl unless ejector lock is engaged. Failure to comply may result in severe injury or death to personnel.
- Do not stand or work in bowl area unless ejector lock is engaged. Do not stand in bowl to observe roller guide travels. Failure to comply may result in severe injury or death to personnel.
- When folding dozer blade, work on blade latches from side of vehicle only. Do not stand in front of dozer blade while retracting ejector. Failure to comply may result in severe injury or death to personnel.

1. Install mounting plate (Figure 3, Item 1) on primary manifold (Figure 3, Item 5) with four flat washers (Figure 3, Item 4) and four new machine bolts (Figure 3, Item 3).
2. Supporting weight of primary manifold (Figure 3, Item 5), install primary manifold (Figure 3, Item 5) with seven flat washers (Figure 3, Item 4) and seven new machine bolts (Figure 3, Item 3).
3. Install hull floor support bracket (Figure 3, Item 8) with three flat washers (Figure 3, Item 11) and three new machine bolts (Figure 3, Item 12).
4. Install lateral support bracket (Figure 3, Item 14) with screw (Figure 3, Item 9), three flat washers (Figure 3, Item 10), two flat washers (Figure 3, Item 6), and two new machine bolts (Figure 3, Item 7).

**INSTALLATION - Continued**

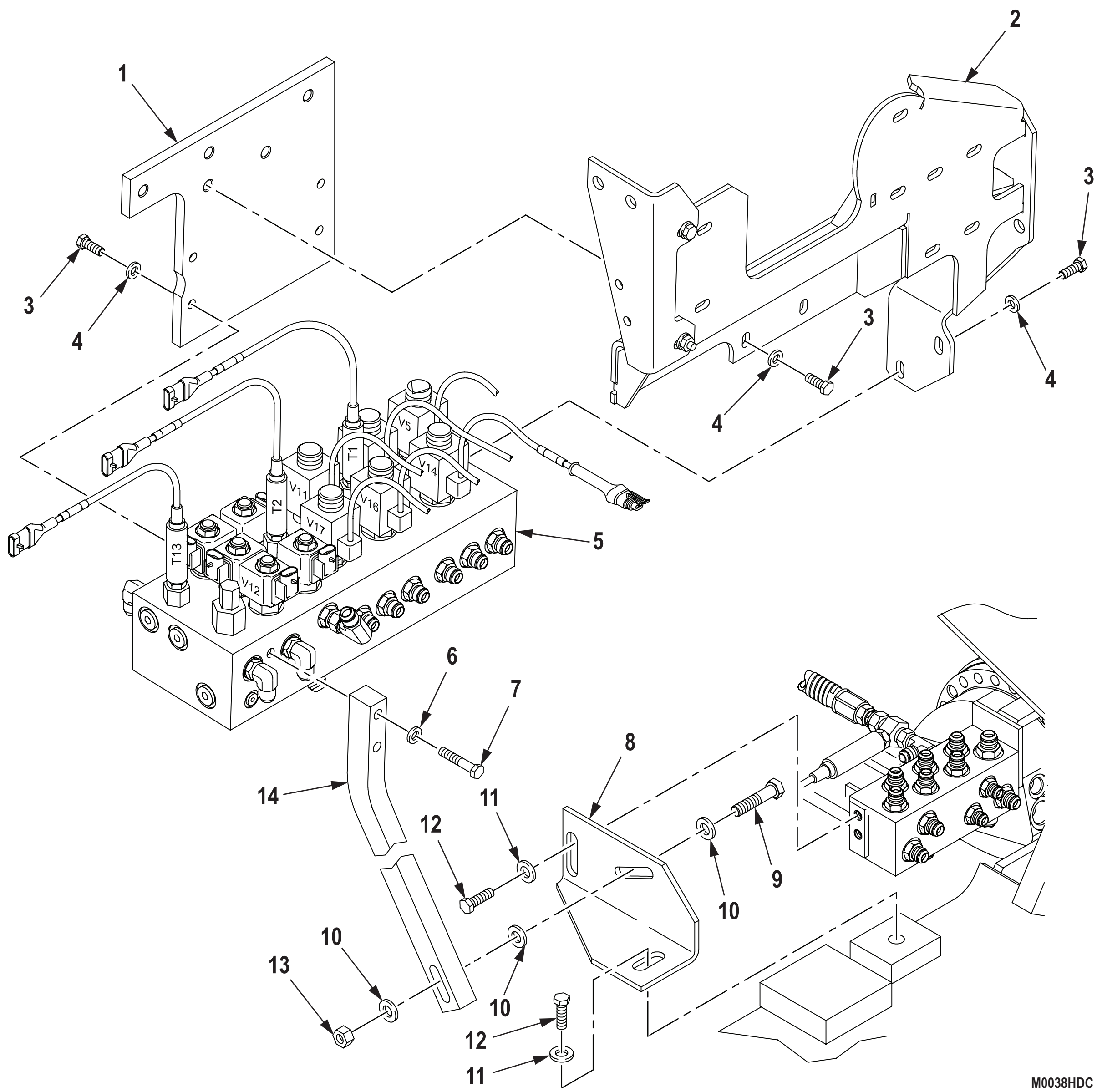



*Figure 3. Hydraulic Diagnostic Center (HDC) Primary Manifold Assembly and Mounting Bracket Installation.*

**INSTALLATION - Continued**

5. At primary manifold (Figure 4, Item 5) connect wiring harness W2 connectors P2, P31, and P32 (Figure 4, Item 1) to transducers T2, T1, and T13 (Figure 4, Item 2).
6. At primary manifold (Figure 4, Item 5) connect wiring harness W2 connectors P1, P5, P11, P12, P13, P14, P15, P16, P17, P19, and P20 (Figure 4, Item 3) to valves V1, V5, V11, V12, V13, V14, V15, V16, V17, V19, and V20 (Figure 4, Item 4).
7. Remove caps from adapters and plugs from 17 hydraulic hoses and tubes and connect 17 hydraulic hoses and tubes (Figure 4, Items 6 through 19) to primary manifold (Figure 4, Item 5).

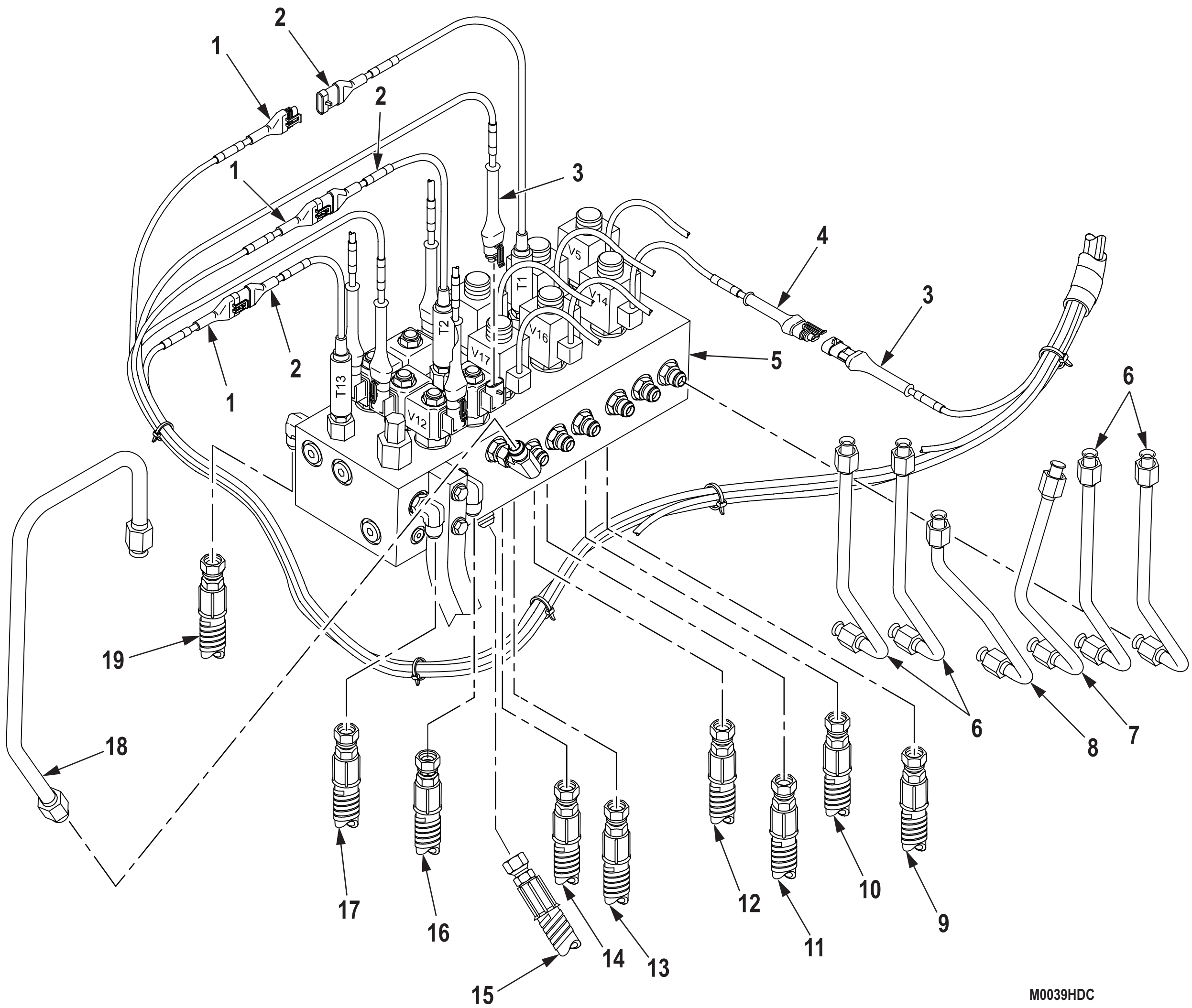



*Figure 4. Hydraulic Diagnostic Center (HDC) Primary Manifold Assembly and Mounting Bracket Installation.*

**END OF TASK**

## FOLLOW-ON MAINTENANCE

1. Connect negative battery cables (TM 5-2350-262-20).
2. Install Sprung/Unsprung valve (TM 5-2350-262-20).
3. Install DCV bank (TM 5-2350-262-20).
4. Restore hydraulic pressure to system (TM 5-2350-262-10).
5. Return ejector to properly stowed position (TM 5-2350-262-10).
6. Return apron to properly stowed position (TM 5-2350-262-10).

**END OF TASK**

**END OF WORK PACKAGE**

# FIELD MAINTENANCE
# HYDRAULIC DIAGNOSTIC CENTER (HDC) PRIMARY MANIFOLD REPAIR

## INITIAL SETUP:

### Tools and Special Tools

Tool Kit, General Mechanic's: Automotive (WP 0054, Table 1, Item 7)
Plug, Hydraulic Tank (WP 0054, Table 1, Item 4)
Wrench Set, Crowfoot (WP 0054, Table 1, Item 8)

### Materials/Parts

Rag, Wiping (WP 0053, Table 1, Item 2)
O-ring (WP 0055, Table 1, Item 16) Qty: 6
O-ring (WP 0055, Table 1, Item 14) Qty: 6
O-ring (WP 0055, Table 1, Item 15) Qty: 11
O-ring (WP 0055, Table 1, Item 17) Qty: 5
O-ring (WP 0055, Table 1, Item 19) Qty: 11
O-ring (WP 0055, Table 1, Item 20) Qty: 2
O-ring (WP 0055, Table 1, Item 21) Qty: 21
O-ring (WP 0055, Table 1, Item 18) Qty: 1

### Materials/Parts (cont.)

Retainer, Packing (WP 0055, Table 1, Item 13) Qty: 12
Retainer, Packing (WP 0055, Table 1, Item 12) Qty: 12
Retainer, Packing (WP 0055, Table 1, Item 11) Qty: 10

### Personnel Required

Construction Equipment Repairer, 91L

### Equipment Condition

Primary manifold removed from vehicle (WP 0034)

## DISASSEMBLY

### CAUTION

- Disassembly should be performed in a clean environment and protective dust covers or caps should be installed on all openings to prevent contamination. Dirt can damage parts and cause malfunctions.
- When securing primary manifold in vise, exercise extreme care not to mar any surfaces or damage components.

1. Remove 11 adapters (Figure 1, Item 7), 11 O-rings (Figure 1, Item 2), three adapters (Figure 1, Item 1), and three O-rings (Figure 1, Item 2), from primary manifold (Figure 1, Item 3). Discard O-rings.
2. Remove adapter (Figure 1, Item 12), O-ring (Figure 1, Item 13), adapter (Figure 1, Item 8), O-ring (Figure 1, Item 2), adapter (Figure 1, Item 11), and O-ring (Figure 1, Item 2) from primary manifold (Figure 1, Item 3). Discard O-rings.
3. Remove five plugs (Figure 1, Item 5), five O-rings (Figure 1, Item 4), plug (Figure 1, Item 9), O-ring (Figure 1, Item 10), six plugs (Figure 1, Item 6), and six O-rings (Figure 1, Item 2) from primary manifold (Figure 1, Item 3). Discard O-rings.

**DISASSEMBLY - Continued**

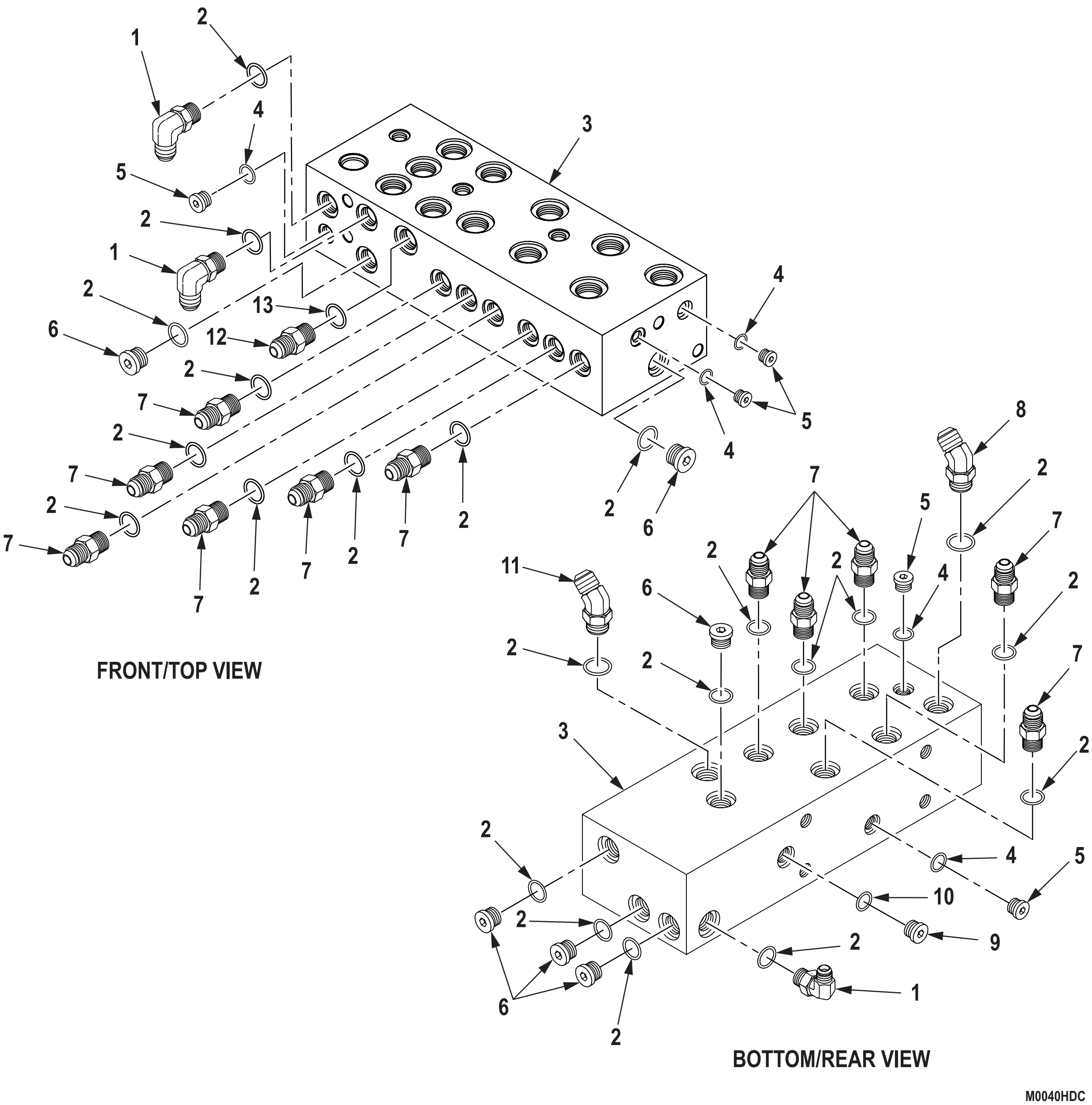



*Figure 1. Adapters and Plugs from Primary Manifold Disassembly.*

## DISASSEMBLY - Continued

4. Remove three transducers (Figure 2, Item 12), three O-rings (Figure 2, Item 13), and relief valve (Figure 2, Item 15), from primary manifold (Figure 2, Item 14). Discard O-rings.
5. Remove six three-way valves (Figure 2, Item 6), six packing retainers (Figure 2, Item 10), six O-rings (Figure 2, Item 11), six packing retainers (Figure 2, Item 10), six packing retainers (Figure 2, Item 8), six O-rings (Figure 2, Item 9), six packing retainers (Figure 3, Item 8), and six O-rings (Figure 2, Item 7) from primary manifold (Figure 2, Item 14). Discard O-rings and packing retainers.
6. Remove two (NC) valves (Figure 2, Item 5), two packing retainers (Figure 2, Item 3), two O-rings (Figure 2, Item 4), two packing retainers (Figure 2, Item 3), and two O-rings (Figure 2, Item 2), from primary manifold (Figure 2, Item 14). Discard O-rings and packing retainers.
7. Remove three (NO) valves (Figure 2, Item 1), three O-rings (Figure 2, Item 2), three packing retainers (Figure 2, Item 3), three O-rings (Figure 2, Item 4), and three packing retainers (Figure 2, Item 3), from primary manifold (Figure 2, Item 14). Discard O-rings and packing retainers.

**DISASSEMBLY - Continued**

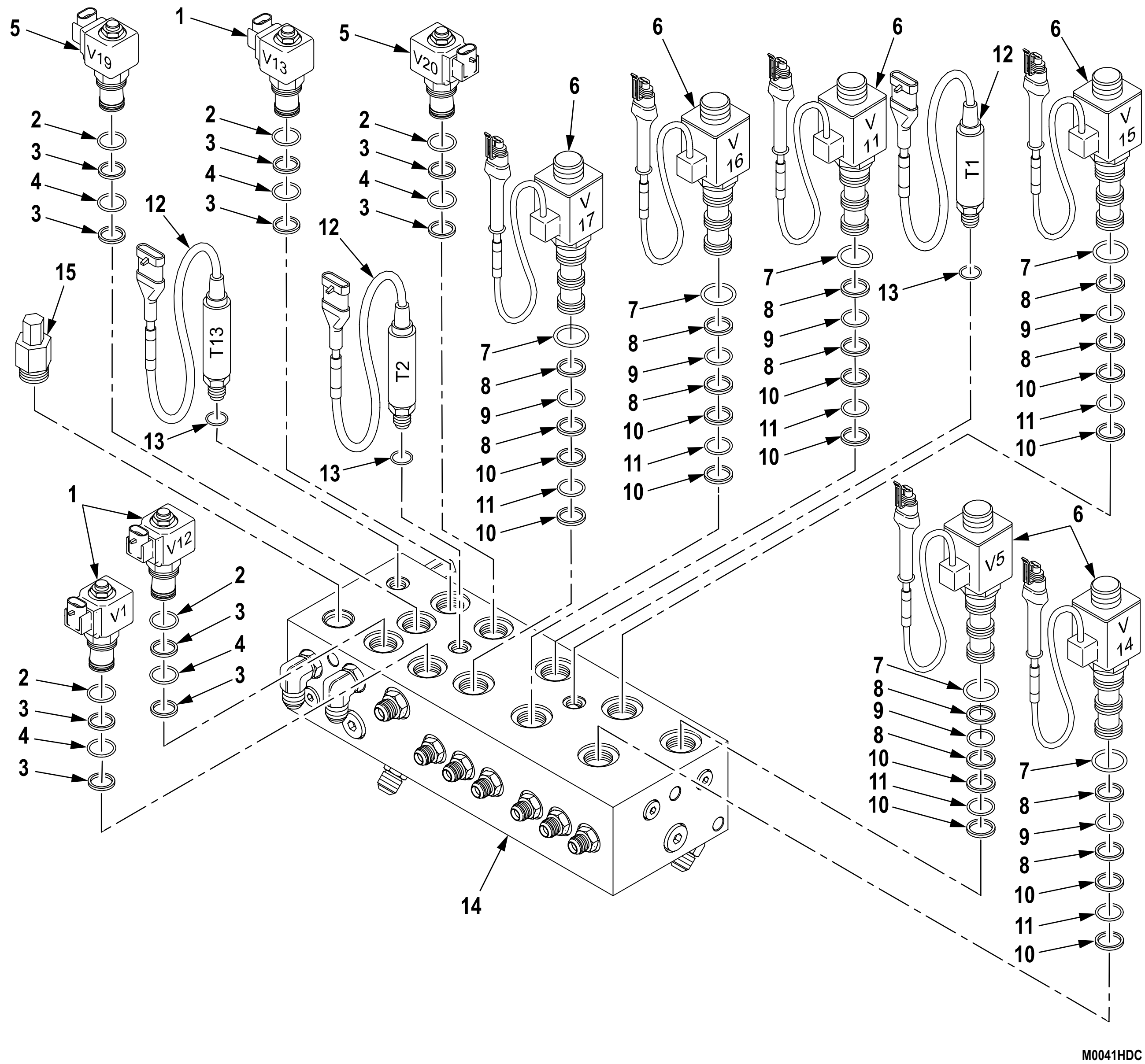



*Figure 2. Transducers and Valves from Primary Manifold Disassembly.*

**END OF TASK**

## ASSEMBLY

### CAUTION

- Assembly should be performed in a clean environment and protective dust covers or caps should be installed on all openings to prevent contamination. Dirt can damage parts and cause malfunctions.
- When securing primary manifold in vise, exercise extreme care not to mar any surfaces or damage components.
- Do not over torque.

1. Install three new O-rings (Figure 3, Item 2), three new packing retainers (Figure 3, Item 3), three new O-rings (Figure 3, Item 4), three new packing retainers (Figure 3, Item 3), and three (NO) valves (Figure 3, Item 1) on primary manifold (Figure 3, Item 14).
2. Install two new O-rings (Figure 3, Item 2), two new packing retainers (Figure 3, Item 3), two new O-rings (Figure 3, Item 4), two new packing retainers (Figure 3, Item 3), and two (NC) valves (Figure 3, Item 5).
3. Install six new O-rings (Figure 3, Item 7), six new packing retainers (Figure 3, Item 8), six new O-rings (Figure 3, Item 9), six new packing retainers (Figure 3, Item 8), six new packing retainers (Figure 3, Item 10), six new O-rings (Figure 3, Item 11), six new packing retainers (Figure 3, Item 10), and six three-way valves (Figure 3, Item 6) on primary manifold (Figure 3, Item 14).
4. Install relief valve (Figure 3, Item 15), three O-rings (Figure 3, Item 13), and three transducers (Figure 3, Item 12) on primary manifold (Figure 3, Item 14).

**ASSEMBLY - Continued**

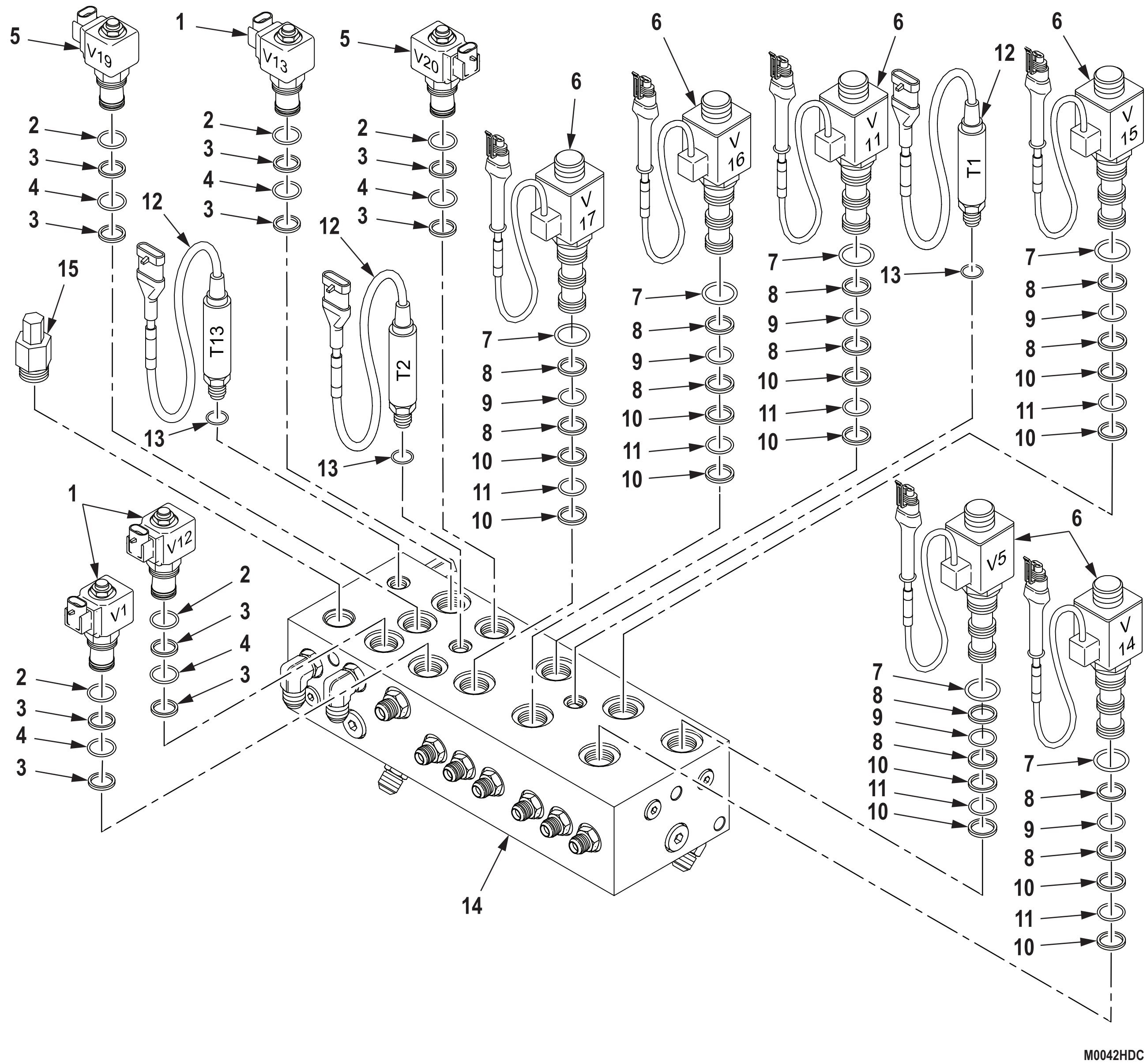



*Figure 3. Valves and Transducers on Primary Manifold Assembly.*

**ASSEMBLY - Continued**

5. Install six new O-rings (Figure 4, Item 2), six plugs (Figure 4, Item 6), new O-ring (Figure 4, Item 10), plug (Figure 4, Item 9), five new O-rings (Figure 4, Item 4), and five plugs (Figure 4, Item 5) on primary manifold (Figure 4, Item 3).
6. Install O-ring (Figure 4, Item 2), adapter (Figure 4, Item 11), O-ring (Figure 4, Item 2), adapter (Figure 4, Item 8), O-ring (Figure 4, Item 13), and adapter (Figure 4, Item 12) on primary manifold (Figure 4, Item 3).
7. Install three new O-rings (Figure 4, Item 2), three adapters (Figure 4, Item 1), 11 new O-rings (Figure 4, Item 2), and 11 adapters (Figure 4, Item 7) on primary manifold (Figure 4, Item 3).

## ASSEMBLY - Continued

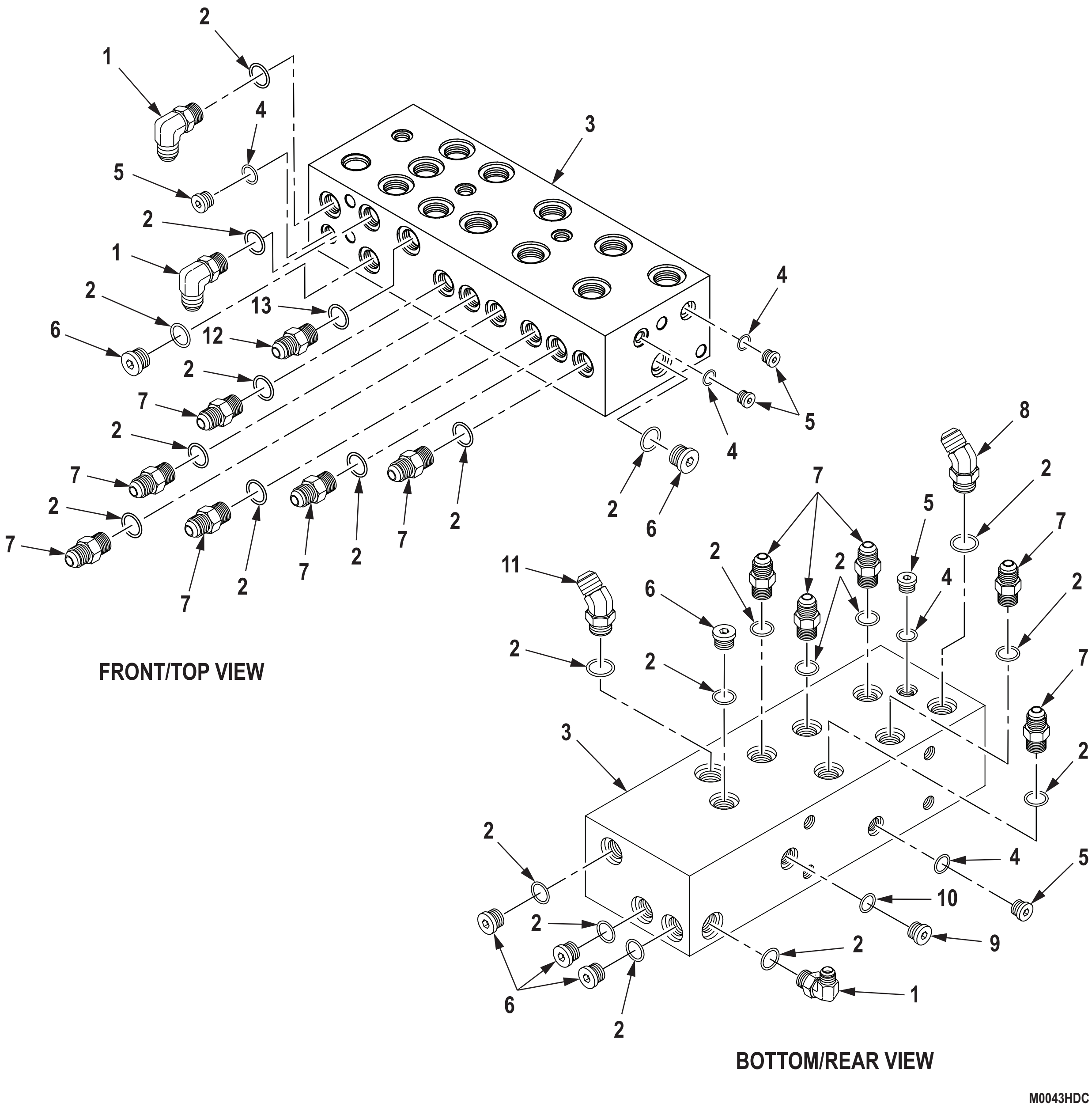



*Figure 4. Plugs and Adapters on Primary Manifold Assembly.*

## END OF TASK

## FOLLOW-ON MAINTENANCE

Install primary manifold (WP 0034).

## END OF TASK

## END OF WORK PACKAGE

## FIELD MAINTENANCE
## HYDRAULIC DIAGNOSTIC CENTER (HDC) FORWARD LEFT MANIFOLD ASSEMBLY REPAIR

**INITIAL SETUP:**

**Tools and Special Tools**

Tool Kit, General Mechanic's: Automotive
(WP 0054, Table 1, Item 7)
Adapter, Socket Wrench
(WP 0054, Table 1, Item 1)
Parts Kit, Hydraulic (WP 0054, Table 1, Item 3)
Plug, Hydraulic Tank
(WP 0054, Table 1, Item 4)
Stand, Vehicle Support
(WP 0054, Table 1, Item 5)
Wrench Set, Crowfoot
(WP 0054, Table 1, Item 8)

**Materials/Parts**

Rag, Wiping (WP 0053, Table 1, Item 2)
Bolt, Machine (WP 0055, Table 1, Item 6) Qty: 2
O-ring (WP 0055, Table 1, Item 19) Qty: 3
O-ring (WP 0055, Table 1, Item 20) Qty: 4
O-ring (WP 0055, Table 1, Item 21) Qty: 2

**Materials/Parts (cont.)**

O-ring (WP 0055, Table 1, Item 15) Qty: 2
O-ring (WP 0055, Table 1, Item 17) Qty: 2
Retainer, Packing (WP 0055, Table 1, Item 11)
Qty: 4

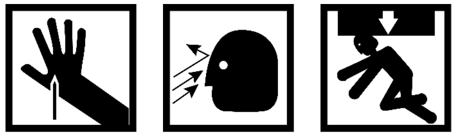
**Personnel Required**

Construction Equipment Repairer, 91L

**Equipment Condition**

Hydraulic pressure relieved (WP 0004)
Vehicle MASTER power OFF (TM 5-2350-262-10)
Vehicle hull raised and on jack stands
(TM 5-2350-262-20)
Hull access plates removed (TM 5-2350-262-20)
Negative battery cables disconnected
(TM 5-2350-262-20)

## WARNING



- High oil pressure is present in the M9 ACE hydraulic system. Do not disconnect any hydraulic system component unless hydraulic system pressure has been relieved. After hydraulic system has been relieved, wait at least four minutes before disconnecting any hose or fitting. Ensure each of the hydraulic control levers is moved several times through all positions and the hydraulic tank dipstick is slowly loosened to relieve pressure. Failure to comply may result in severe injury or death to personnel.
- Do not work under vehicle unless hull is on jack stands and apron lockpins are installed. Failure to comply may result in severe injury or death to personnel.

## NOTE

- All removal steps are accomplished through access under vehicle.
- Tag all hydraulic lines and wiring harness leads being disconnected to assist in installation.

### REMOVAL

1. Remove wiring harness W3 connectors P3 and P9 (Figure 1, Item 6) from two two-way (NO) valves V3 and V9 (Figure 1, Item 5) on left forward manifold (Figure 1, Item 9).
2. Remove wiring harness W3 connector P30 (Figure 1, Item 3) from transducer T10 (Figure 1, Item 4) on left forward manifold (Figure 1, Item 9).

## CAUTION

Cap or plug all oil ports and ends of hoses and tubes when oil hoses or tubes are disconnected or removed to prevent contamination. Failure to comply may result in damage to equipment.

3. Remove five hydraulic hoses (Figure 1, Item 2) and three hydraulic tubes (Figure 1, Item 1) from left forward manifold (Figure 1, Item 9).
4. Remove two machine bolts (Figure 1, Item 7), two flat washers (Figure 1, Item 8), and left forward manifold (Figure 1, Item 9) from vehicle. Discard machine bolts.

**REMOVAL - Continued**

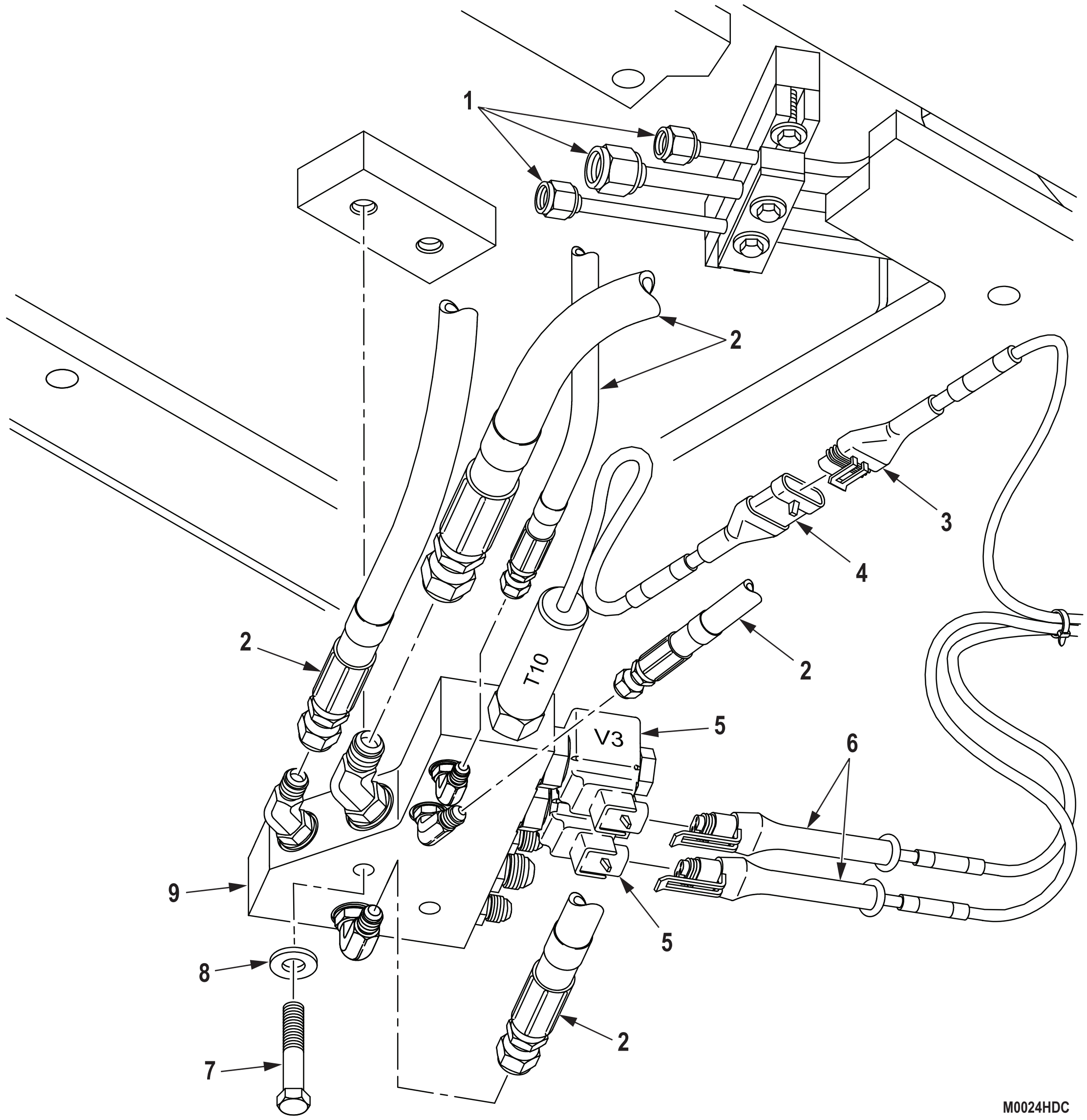



*Figure 1. Hydraulic Diagnostic Center (HDC) Forward Left Manifold Assembly Removal.*

**END OF TASK**

## DISASSEMBLY

### CAUTION

- Disassembly should be performed in a clean environment and protective dust covers or caps should be installed on all openings to prevent contamination. Dirt can damage parts and cause malfunctions.
- When securing forward left manifold in vise, exercise extreme care not to mar any surfaces or damage components.

1. Remove two adapters (Figure 2, Item 3), two O-rings (Figure 2, Item 4), two adapters (Figure 2, Item 12), two O-rings (Figure 2, Item 13), adapter (Figure 2, Item 11), O-ring (Figure 2, Item 2), adapter (Figure 2, Item 15), O-ring (Figure 2, Item 13), two adapters (Figure 2, Item 1), and two O-rings (Figure 2, Item 2) from left forward manifold (Figure 2, Item 14). Discard O-rings.
2. Remove two two-way (NO) valves V3 and V9 (Figure 2, Item 10), two packing retainers (Figure 2, Item 7), two O-rings (Figure 2, Item 8), two packing retainers (Figure 2, Item 7), two O-rings (Figure 2, Item 9), transducer T10 (Figure 2, Item 6), and O-ring (Figure 2, Item 5) from left forward manifold (Figure 2, Item 14). Discard O-rings and packing retainers.

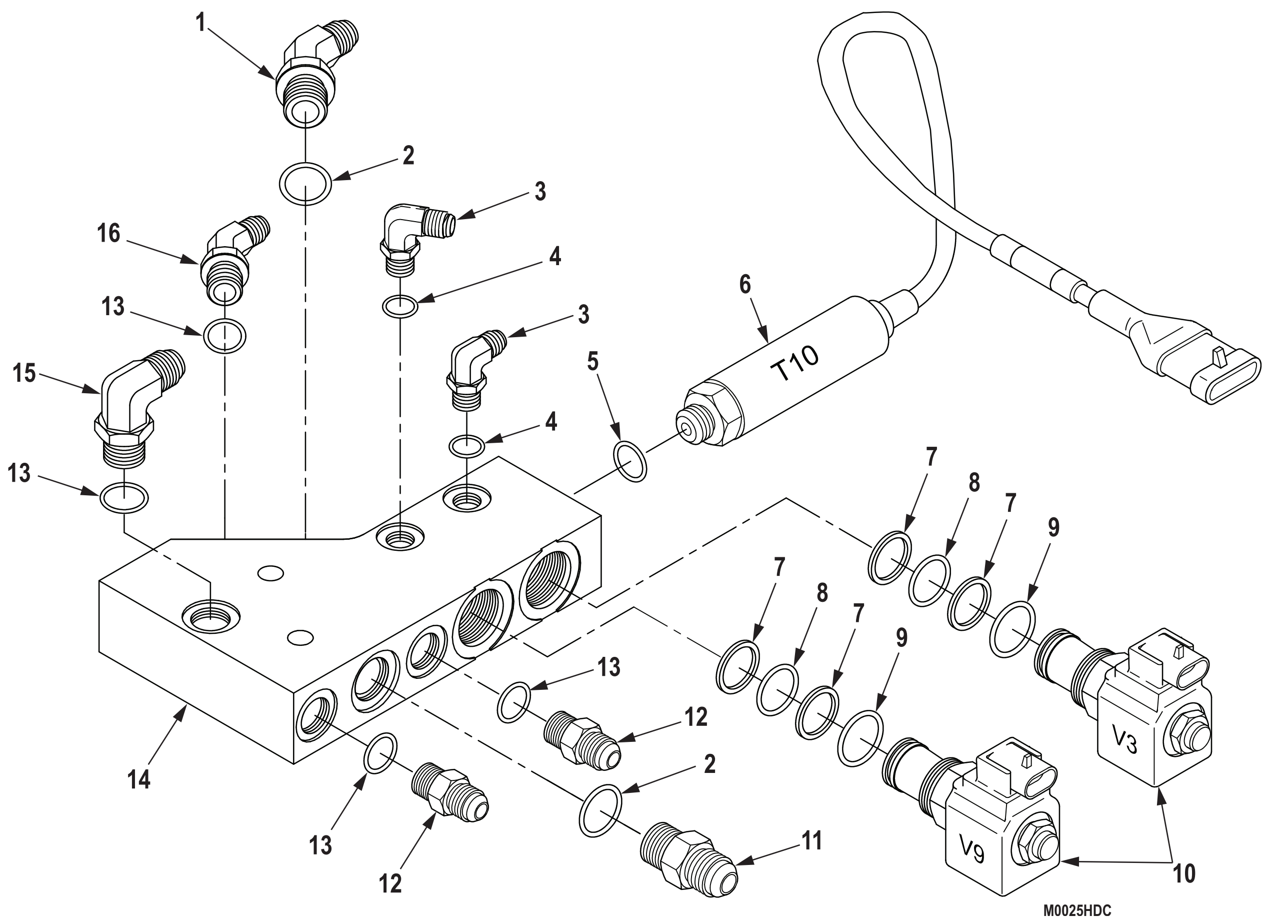



*Figure 2. Hydraulic Diagnostic Center (HDC) Forward Left Manifold Disassembly.*

**END OF TASK**

## ASSEMBLY

### CAUTION

- Assembly should be performed in a clean environment and protective dust covers or caps should be installed on all openings to prevent contamination. Dirt can damage parts and cause malfunctions.
- When securing forward left manifold in vise, exercise extreme care not to mar any surfaces or damage components.
- Do not over torque.

1. Install new O-ring (Figure 3, Item 5), transducer T10 (Figure 3, Item 6), two new O-rings (Figure 3, Item 9), two new packing retainers (Figure 3, Item 7), two new O-rings (Figure 3, Item 8), two new packing retainers (Figure 3, Item 7), and two two-way (NO) valves V3 and V9 (Figure 3, Item 10) into left forward manifold (Figure 3, Item 14).
2. Install new O-ring (Figure 3, Item 2), adapter (Figure 3, Item 1), new O-ring (Figure 3, Item 13), adapter (Figure 3, Item 16), new O-ring (Figure 3, Item 13), adapter (Figure 3, Item 15), new O-ring (Figure 3, Item 2), adapter (Figure 3, Item 11), two new O-rings (Figure 3, Item 13), two adapters (Figure 3, Item 12), two new O-rings (Figure 3, Item 4), and two adapters (Figure 3, Item 3) into left forward manifold (Figure 3, Item 14).

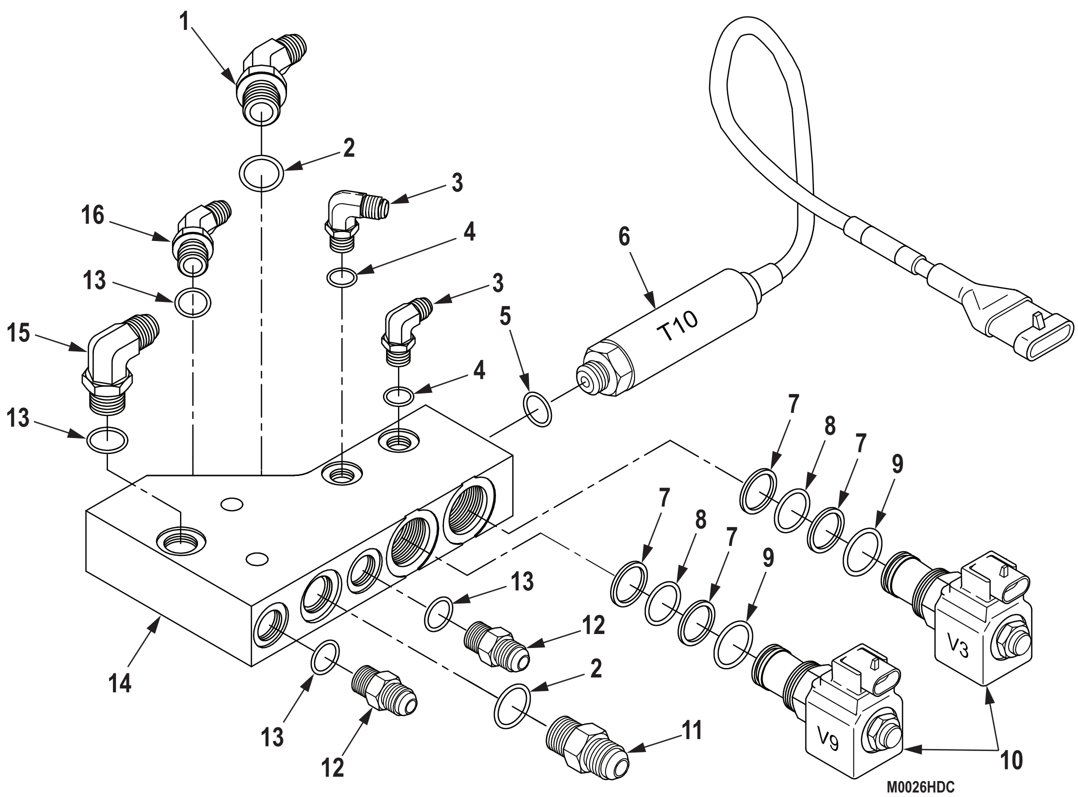



*Figure 3. Hydraulic Diagnostic Center (HDC) Forward Left Manifold Assembly.*

**END OF TASK**

## INSTALLATION

### WARNING

Do not work under vehicle unless hull is on jack stands and apron lockpins are installed. Failure to comply may result in severe injury or death to personnel.

### NOTE

- Installation steps are accomplished through access under vehicle.
- After installation is complete, remove tags from all hydraulic lines and wiring harness leads.

1. Install left forward manifold (Figure 4, Item 9) using two flat washers (Figure 4, Item 8) and two new machine bolts (Figure 4, Item 7).
2. Connect wiring harness W3 connector P30 (Figure 4, Item 3) to transducer T10 (Figure 4, Item 4) on left forward manifold (Figure 4, Item 9).
3. Connect wiring harness W3 connectors P3 and P9 (Figure 4, Item 6) to two two-way (NO) valves V3 and V9 (Figure 4, Item 5) on left forward manifold (Figure 4, Item 9).
4. Remove all caps and plugs from hydraulic fittings.
5. Connect five hydraulic hoses (Figure 4, Item 2) and three hydraulic tubes (Figure 4, Item 1) to left forward manifold (Figure 4, Item 9).

**INSTALLATION - Continued**

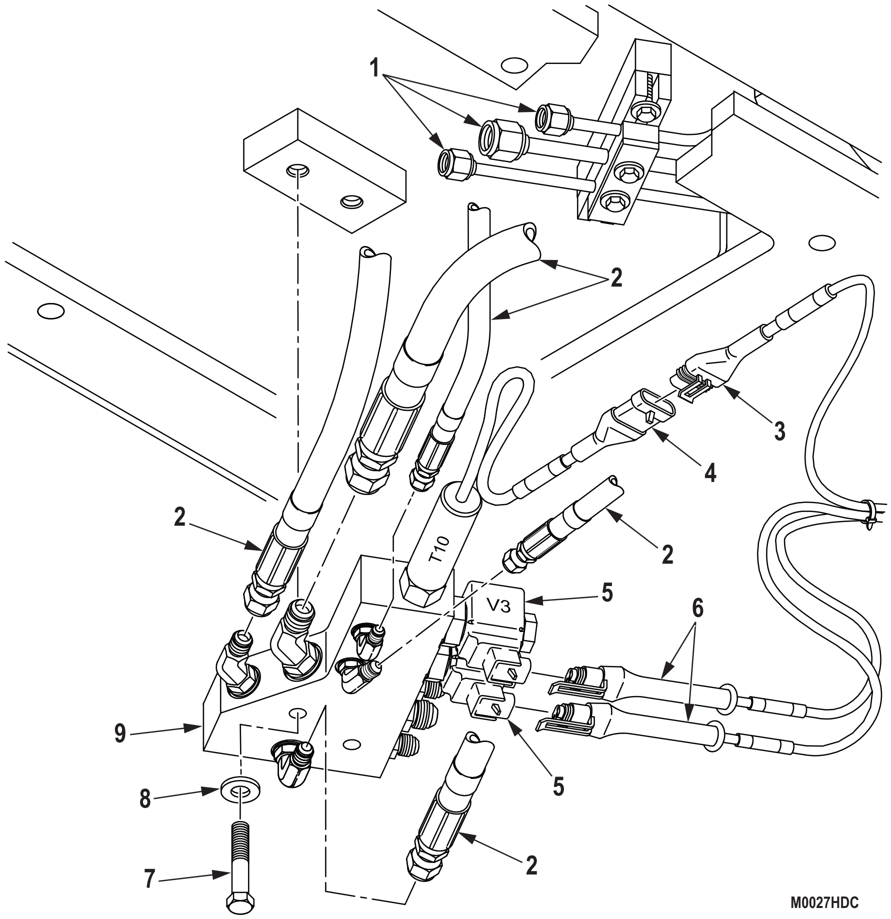



*Figure 4. Hydraulic Diagnostic Center (HDC) Forward Left Manifold Assembly Installation.*

**END OF TASK**

**FOLLOW-ON MAINTENANCE**

1. Connect negative battery cables (TM 5-2350-262-20).
2. Install hull access plates (TM 5-2350-262-20).
3. Remove vehicle from jack stands and lower hull (TM 5-2350-262-20).
4. Bring hydraulic system to operating pressure (TM 5-2350-262-10).

**END OF TASK**

**END OF WORK PACKAGE**

## FIELD MAINTENANCE
## HYDRAULIC DIAGNOSTIC CENTER (HDC) FORWARD RIGHT MANIFOLD ASSEMBLY REPAIR

**INITIAL SETUP:**

**Tools and Special Tools**

Tool Kit, General Mechanic's: Automotive (WP 0054, Table 1, Item 7)
Adapter, Socket Wrench (WP 0054, Table 1, Item 1)
Parts Kit, Hydraulic (WP 0054, Table 1, Item 3)
Plug, Hydraulic Tank (WP 0054, Table 1, Item 4)
Stand, Vehicle Support (WP 0054, Table 1, Item 5)
Wrench Set, Crowfoot (WP 0054, Table 1, Item 8)

**Materials/Parts**

Rag, Wiping (WP 0053, Table 1, Item 2)
Bolt, Machine (WP 0055, Table 1, Item 6) Qty: 2
O-ring (WP 0055, Table 1, Item 19) Qty: 3
O-ring (WP 0055, Table 1, Item 20) Qty: 4
O-ring (WP 0055, Table 1, Item 21) Qty: 2
O-ring (WP 0055, Table 1, Item 15) Qty: 2

**Materials/Parts (cont.)**

O-ring (WP 0055, Table 1, Item 17) Qty: 2
Retainer, Packing (WP 0055, Table 1, Item 11) Qty: 4

**Personnel Required**

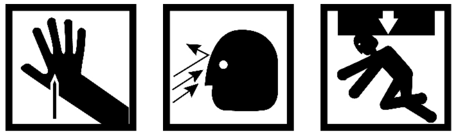
Construction Equipment Repairer, 91L

**Equipment Condition**

Hydraulic pressure relieved (WP 0004)
Vehicle MASTER power OFF (TM 5-2350-262-10)
Vehicle hull raised and on jack stands (TM 5-2350-262-20)
Hull access plates removed (TM 5-2350-262-10)
Negative battery cables disconnected (TM 5-2350-262-20)

## REMOVAL

### WARNING



- High oil pressure is present in the M9 ACE hydraulic system. Do not disconnect any hydraulic system component unless hydraulic system pressure has been relieved. After hydraulic system has been relieved, wait at least four minutes before disconnecting any hose or fitting. Ensure each of the hydraulic control levers is moved several times through all positions and the hydraulic tank dipstick is slowly loosened to relieve pressure. Failure to comply may result in severe injury or death to personnel.
- Do not work under vehicle unless hull is on jack stands and apron lockpins are installed. Failure to comply may result in severe injury or death to personnel.

### NOTE

- All removal steps are accomplished through access under vehicle.
- Tag all hydraulic lines and wiring harness leads being disconnected to assist in installation.

### CAUTION

Cap or plug all oil ports and ends of hoses and tubes when oil hoses or tubes are disconnected or removed to prevent contamination. Failure to comply may result in damage to equipment.

1. Remove five hydraulic hoses (Figure 1, Item 1) and three hydraulic tubes (Figure 1, Item 2) from forward right manifold (Figure 1, Item 3).
2. Remove wiring harness W3 connectors P2 and P10 (Figure 1, Item 7) from two two-way (NO) valves V2 and V10 (Figure 1, Item 6), and wiring harness W3 connector P11 (Figure 1, Item 9) from transducer T11 (Figure 1, Item 8).
3. Remove two machine bolts (Figure 1, Item 5), two flat washers (Figure 1, Item 4), and forward right manifold (Figure 1, Item 3) from vehicle. Discard machine bolts.

**REMOVAL - Continued**

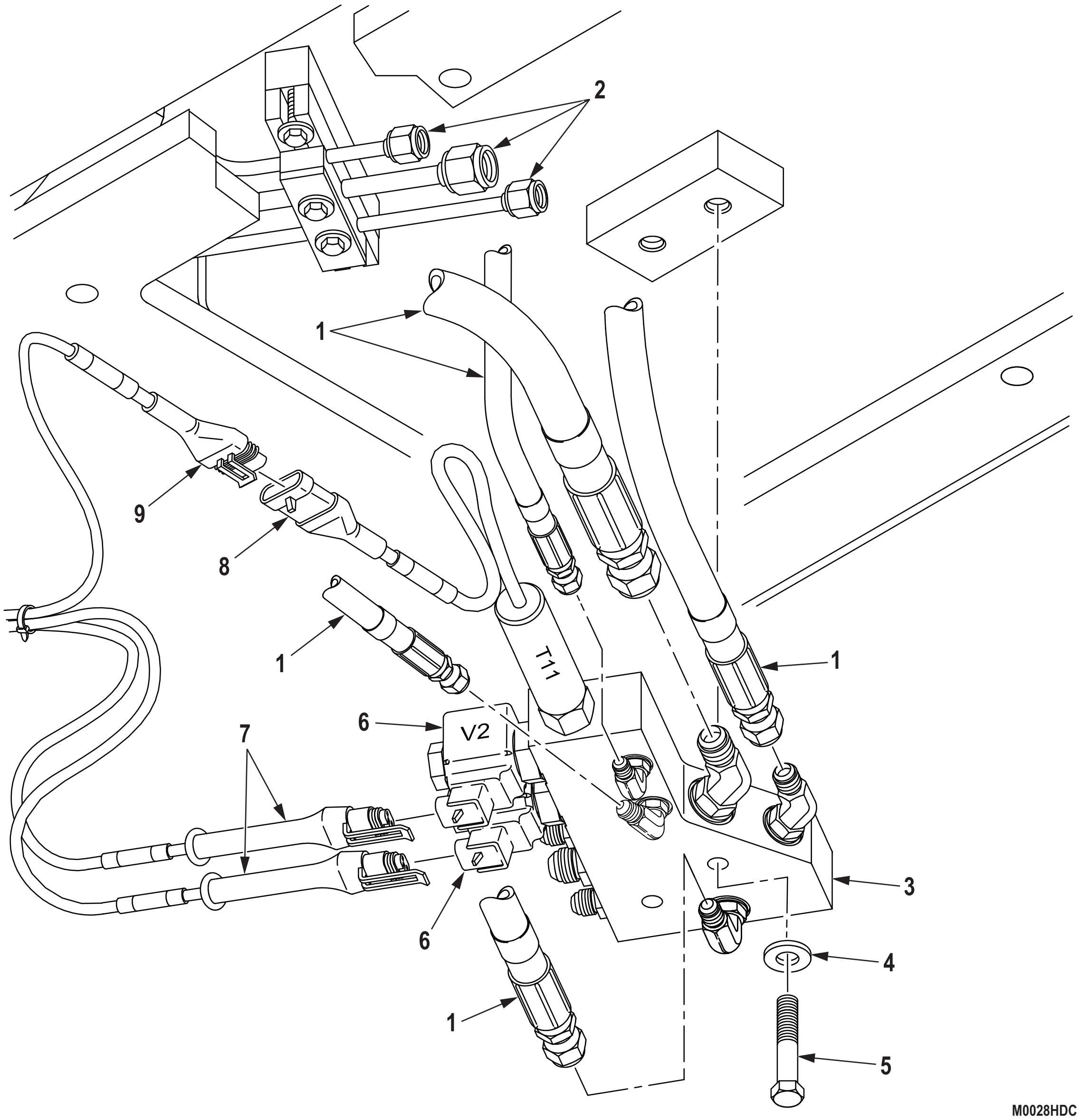



*Figure 1. Hydraulic Diagnostic Center (HDC) Forward Right Manifold Removal.*

**END OF TASK**

## DISASSEMBLY

### CAUTION

- Disassembly should be performed in a clean environment and protective dust covers or caps should be installed on all openings to prevent contamination. Dirt can damage parts and cause malfunctions.
- When securing forward right manifold in vise, exercise extreme care not to mar any surfaces or damage components.

1. Remove two adapters (Figure 2, Item 3), two O-rings (Figure 2, Item 2), two adapters (Figure 2, Item 10), two O-rings (Figure 2, Item 7), adapter (Figure 2, Item 11), O-ring (Figure 2, Item 4), adapter (Figure 2, Item 8), O-ring (Figure 2, Item 7), adapter (Figure 2, Item 5), O-ring (Figure 2, Item 4), adapter (Figure 2, Item 6), and O-ring (Figure 2, Item 7) from right manifold (Figure 2, Item 9). Discard O-rings.
2. Remove two two-way (NO) valves V2 and V10 (Figure 2, Item 12), two packing retainers (Figure 2, Item 14), two O-rings (Figure 2, Item 15), two packing retainers (Figure 2, Item 14), two O-rings (Figure 2, Item 13), transducer T11 (Figure 2, Item 1), and O-ring (Figure 2, Item 2) from right manifold (Figure 2, Item 9). Discard O-rings and packing retainers.

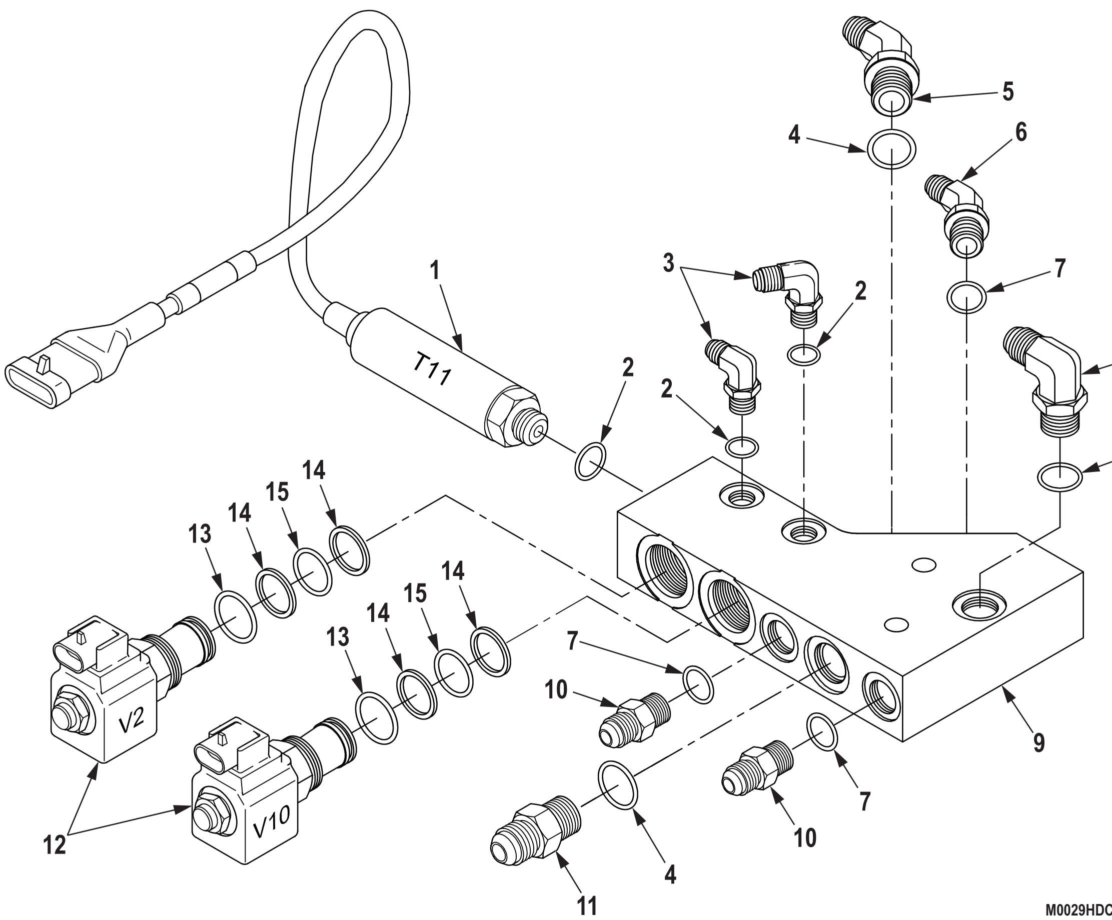



*Figure 2. Hydraulic Diagnostic Center (HDC) Forward Right Manifold Disassembly.*

**END OF TASK**

## ASSEMBLY

### CAUTION

- Assembly should be performed in a clean environment and protective dust covers or caps should be installed on all openings to prevent contamination. Dirt can damage parts and cause malfunctions.
- When securing forward right manifold in vise, exercise extreme care not to mar any surfaces or damage components.
- Do not over torque.

1. Install new O-ring (Figure 3, Item 2), transducer T11 (Figure 3, Item 1), two new O-rings (Figure 3, Item 13), two new packing retainers (Figure 3, Item 14), two new O-rings (Figure 3, Item 15), two new packing retainers (Figure 3, Item 14), and two two-way (NO) valves V2 and V10 (Figure 3, Item 12) into right forward manifold (Figure 3, Item 9).
2. Install new O-ring (Figure 3, Item 4), adapter (Figure 3, Item 5), new O-ring (Figure 3, Item 7), adapter (Figure 3, Item 6), new O-ring (Figure 3, Item 7), adapter (Figure 3, Item 8), new O-ring (Figure 3, Item 4), adapter (Figure 3, Item 11), two new O-rings (Figure 3, Item 7), two adapters (Figure 3, Item 10), two new O-rings (Figure 3, Item 2), and two adapters (Figure 3, Item 3) into right forward manifold (Figure 3, Item 9).

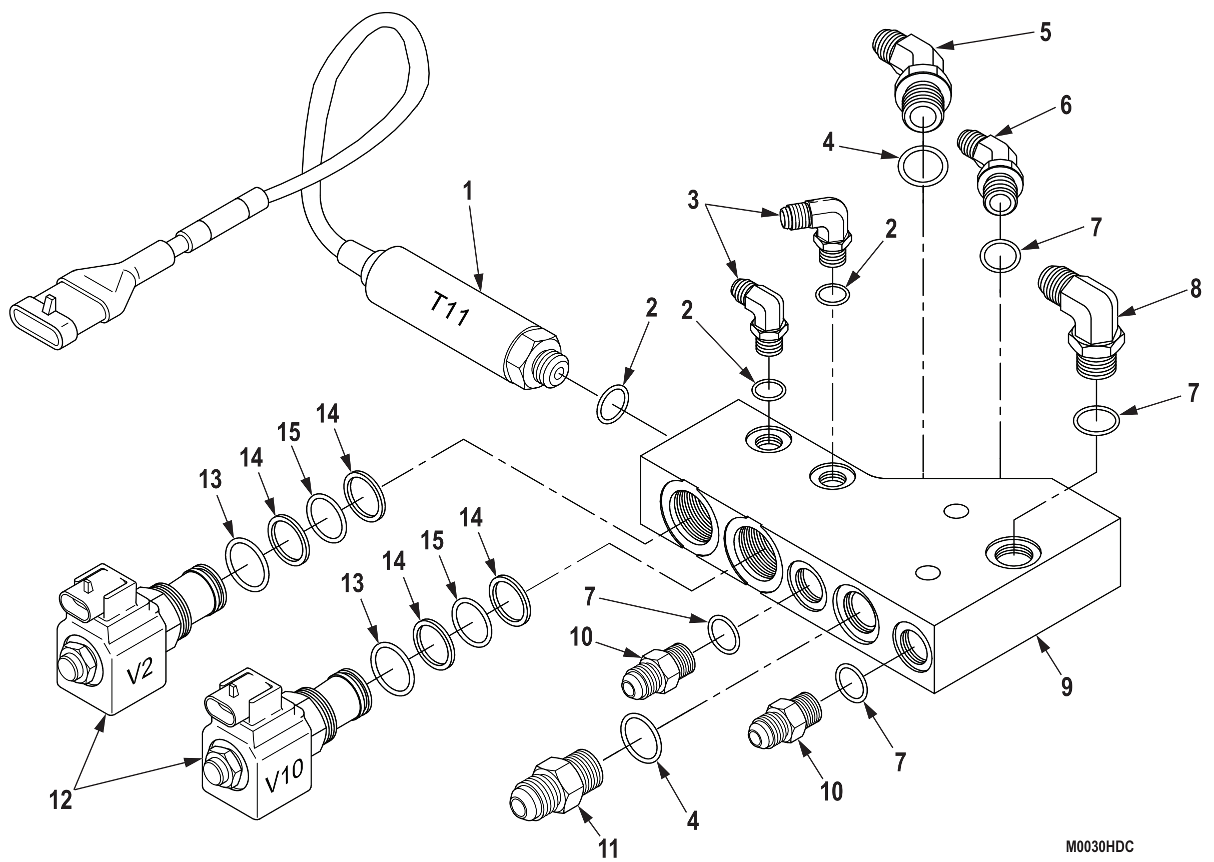



*Figure 3. Hydraulic Diagnostic Center (HDC) Forward Right Manifold Assembly.*

**END OF TASK**

## INSTALLATION

### WARNING

Do not work under vehicle unless hull is on jack stands and apron lockpins are installed. Failure to comply may result in severe injury or death to personnel.

### NOTE

- Installation steps are accomplished through access under vehicle.
- After installation is complete, remove tags from all hydraulic lines and wiring harness leads.

1. Install right forward manifold (Figure 4, Item 3) using two flat washers (Figure 4, Item 4) and two new machine bolts (Figure 4, Item 5).
2. Connect wiring harness W3 connector P11 (Figure 4, Item 9) to transducer T11 (Figure 4, Item 8) on right forward manifold (Figure 4, Item 3).
3. Connect wiring harness W3 connectors P2 and P10 (Figure 4, Item 7) to two two-way (NO) valves V2 and V10 (Figure 4, Item 6) on right forward manifold (Figure 4, Item 3).
4. Remove all caps and plugs from hydraulic fittings.
5. Connect five hydraulic hoses (Figure 4, Item 1) and three hydraulic tubes (Figure 4, Item 2) to right forward manifold (Figure 4, Item 3).

**INSTALLATION - Continued**

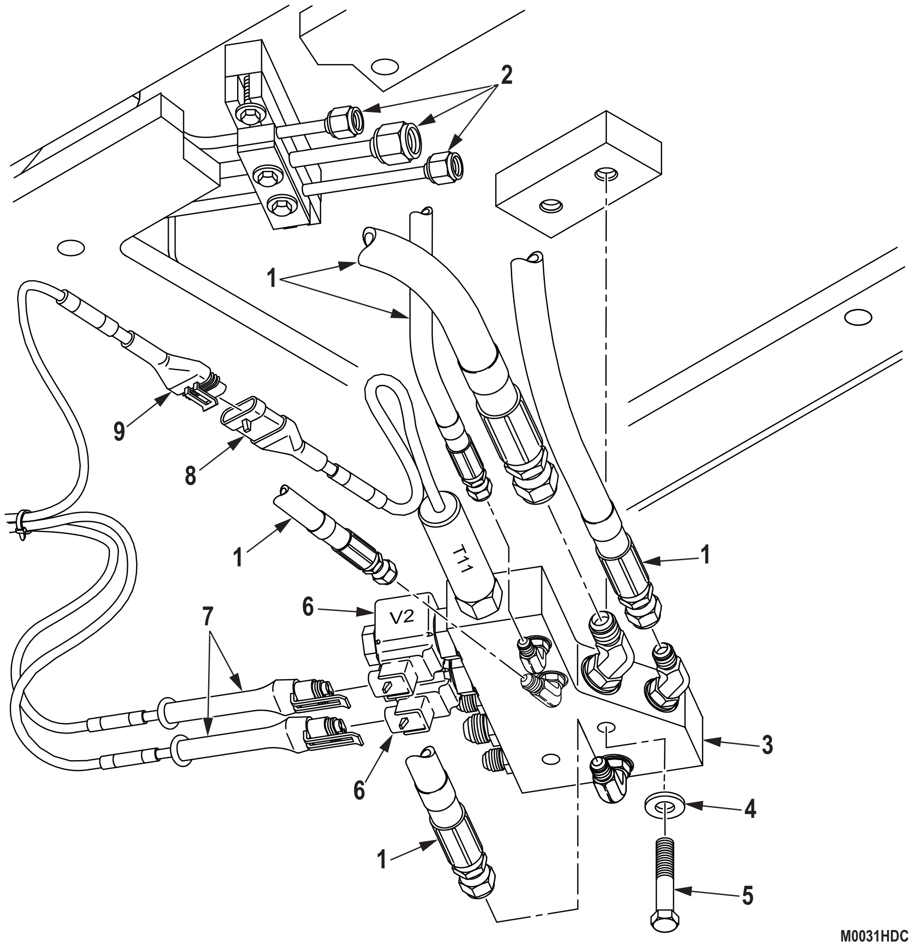



*Figure 4. Hydraulic Diagnostic Center (HDC) Forward Right Manifold Installation.*

**END OF TASK**

**FOLLOW-ON MAINTENANCE**

1. Connect negative battery cables (TM 5-2350-262-20).
2. Install hull access plates (TM 5-2350-262-10).
3. Remove vehicle from jack stands and lower hulls (TM 5-2350-262-20).
4. Bring hydraulic system to operating pressure (TM 5-2350-262-10).

**END OF TASK**

**END OF WORK PACKAGE**

# FIELD MAINTENANCE
# HYDRAULIC DIAGNOSTIC CENTER (HDC) AFT MANIFOLD ASSEMBLY REPAIR

## INITIAL SETUP:

### Tools and Special Tools

Tool Kit, General Mechanic's: Automotive
(WP 0054, Table 1, Item 7)
Adapter, Socket Wrench
(WP 0054, Table 1, Item 1)
Parts Kit, Hydraulic (WP 0054, Table 1, Item 3)
Plug, Hydraulic Tank (WP 0054, Table 1, Item 4)
Stand, Vehicle Support
(WP 0054, Table 1, Item 5)
Wrench Set, Crowfoot (WP 0054, Table 1, Item 8)

### Materials/Parts

Rag, Wiping (WP 0053, Table 1, Item 2)
O-ring (WP 0055, Table 1, Item 20) Qty: 2
O-ring (WP 0055, Table 1, Item 16) Qty: 2
O-ring (WP 0055, Table 1, Item 21) Qty: 1
O-ring (WP 0055, Table 1, Item 19) Qty: 2
O-ring (WP 0055, Table 1, Item 15) Qty: 5
O-ring (WP 0055, Table 1, Item 17) Qty: 5

### Materials/Parts (cont.)

Retainer, Packing
(WP 0055, Table 1, Item 11) Qty: 10
Screw, Cap, Hexagon Head
(WP 0055, Table 1, Item 7) Qty: 3

### Personnel Required

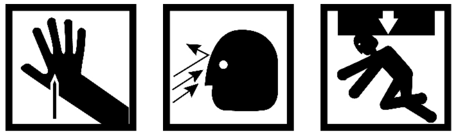
Construction Equipment Repairer, 91L

### Equipment Condition

Hydraulic pressure relieved (WP 0004)
Vehicle MASTER power OFF (TM 5-2350-262-10)
Vehicle hull raised and on jack stands
(TM 5-2350-262-20)
Hull access plates removed (TM 5-2350-262-20)
Negative battery cables disconnected
(TM 5-2350-262-20)

## REMOVAL

### WARNING



- High oil pressure is present in the M9 ACE hydraulic system. Do not disconnect any hydraulic system component unless hydraulic system pressure has been relieved. After hydraulic system has been relieved, wait at least four minutes before disconnecting any hose or fitting. Ensure each of the hydraulic control levers is moved several times through all positions and the hydraulic tank dipstick is slowly loosened to relieve pressure. Failure to comply may result in severe injury or death to personnel.
- Do not work under vehicle unless hull is on jack stands and apron lockpins are installed. Failure to comply may result in severe injury or death to personnel.

### NOTE

- All removal steps are accomplished through access under vehicle.
- Tag all hydraulic lines and wiring harness leads being disconnected to assist in installation.

1. Remove wiring harness W3 connectors P4, P6, P7, P8, and P18 (Figure 1, Item 1) from five two-way valves V4, V6, V7, V8, and V18 (Figure 1, Item 2) on aft manifold (Figure 1, Item 6).

### CAUTION

Cap or plug all oil ports and ends of hoses and tubes when oil hoses or tubes are disconnected or removed to prevent contamination. Failure to comply may result in damage to equipment.

2. Remove six hydraulic hoses (Figure 1, Item 3) from aft manifold (Figure 1, Item 6).
3. Remove three hexagon head cap screws (Figure 1, Item 4), three flat washers (Figure 1, Item 5), and aft manifold (Figure 1, Item 6) from vehicle. Discard cap screws.

**REMOVAL - Continued**

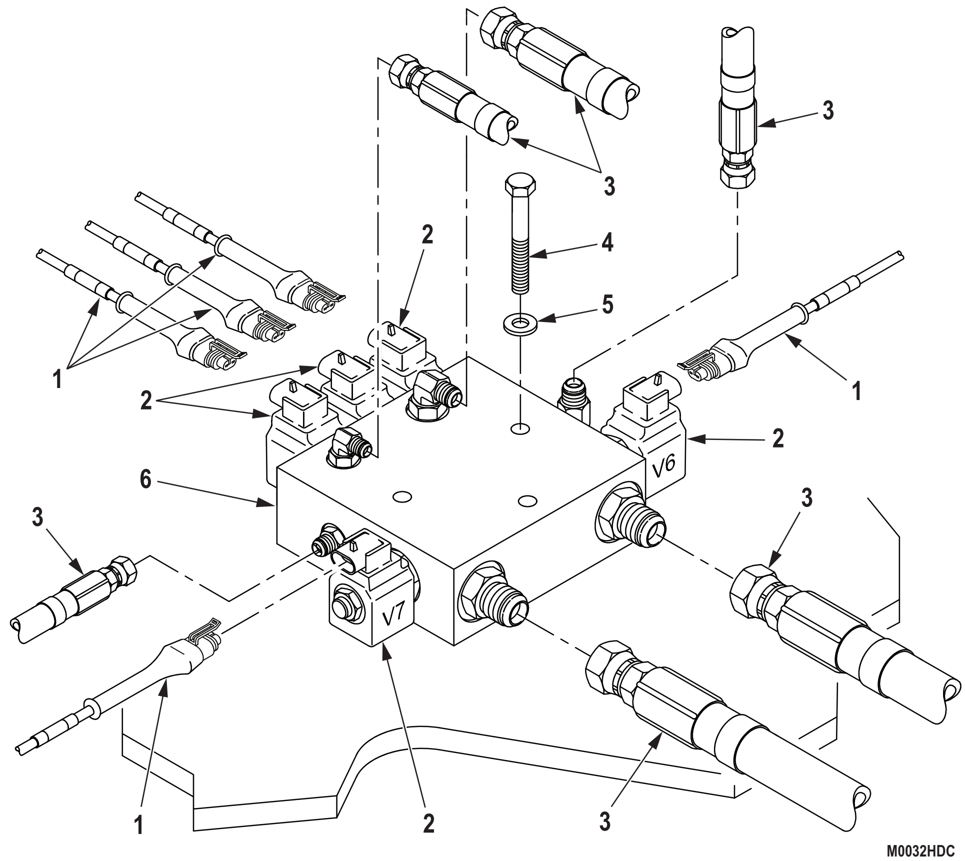



*Figure 1. Hydraulic Diagnostic Center (HDC) Manifold Assembly Removal.*

**END OF TASK**

## DISASSEMBLY

### CAUTION

- Disassembly should be performed in a clean environment and protective dust covers or caps should be installed on all openings to prevent contamination. Dirt can damage parts and cause malfunctions.
- When securing aft manifold in vise, exercise extreme care not to mar any surfaces or damage components.

1. Remove adapter (Figure 2, Item 10), adapter (Figure 2, Item 9), adapter (Figure 2, Item 14), O-ring (Figure 2, Item 6), O-ring (Figure 2, Item 15), two adapters (Figure 2, Item 12), two O-rings (Figure 2, Item 11), plug (Figure 2, Item 8), O-ring (Figure 2, Item 7), adapter (Figure 2, Item 5), O-ring (Figure 2, Item 6), adapter (Figure 2, Item 16), and O-ring (Figure 2, Item 15) from aft manifold (Figure 2, Item 13).
2. Remove four two-way (NO) valves V4, V6, V7, and V8 (Figure 2, Item 1), one two-way (NC) valve (Figure 2, Item 17), five packing retainers (Figure 2, Item 3), five O-rings (Figure 2, Item 4), five packing retainers (Figure 2, Item 3), and five O-rings (Figure 2, Item 2) from aft manifold (Figure 2, Item 13). Discard O-rings and packing retainers.

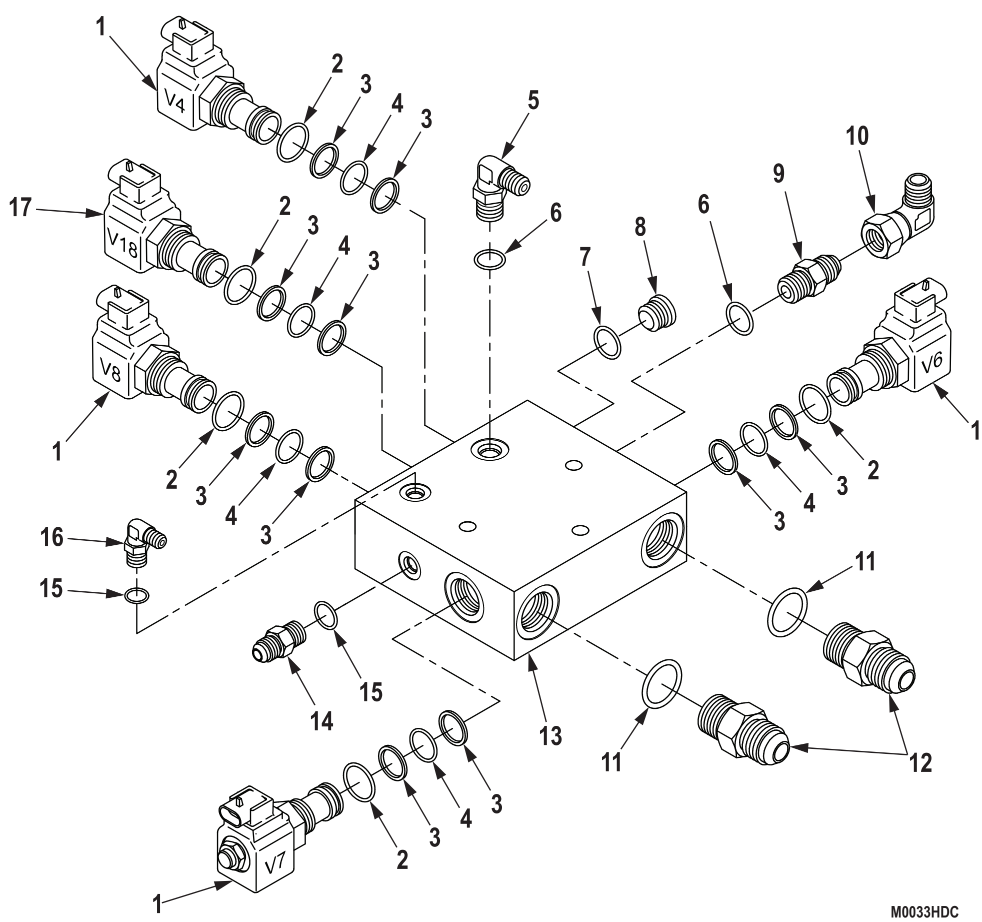



*Figure 2. Hydraulic Diagnostic Center (HDC) Manifold Disassembly.*

**END OF TASK**

## ASSEMBLY

### CAUTION

- Assembly should be performed in a clean environment and protective dust covers or caps should be installed on all openings to prevent contamination. Dirt can damage parts and cause malfunctions.
- When securing aft manifold in vise, exercise extreme care not to mar any surfaces or damage components.
- Do not over torque.

1. Install five new O-rings (Figure 3, Item 2), five new packing retainers (Figure 3, Item 3), five new O-rings (Figure 3, Item 4), five new packing retainers (Figure 3, Item 3), one two-way (NC) valve V18 (Figure 3, Item 17), and four two-way (NO) valves V4, V6, V7, and V8 (Figure 3, Item 1) into aft manifold (Figure 3, Item 13).
2. Install new O-ring (Figure 3, Item 6), adapter (Figure 3, Item 5), new O-ring (Figure 3, Item 15), adapter (Figure 3, Item 16), new O-ring (Figure 3, Item 7), plug (Figure 3, Item 8), two new O-rings (Figure 3, Item 11), two adapters (Figure 3, Item 12), new O-ring (Figure 3, Item 15), adapter (Figure 3, Item 14), new O-ring (Figure 3, Item 6), adapter (Figure 3, Item 9), and adapter (Figure 3, Item 10) into aft manifold (Figure 3, Item 13).

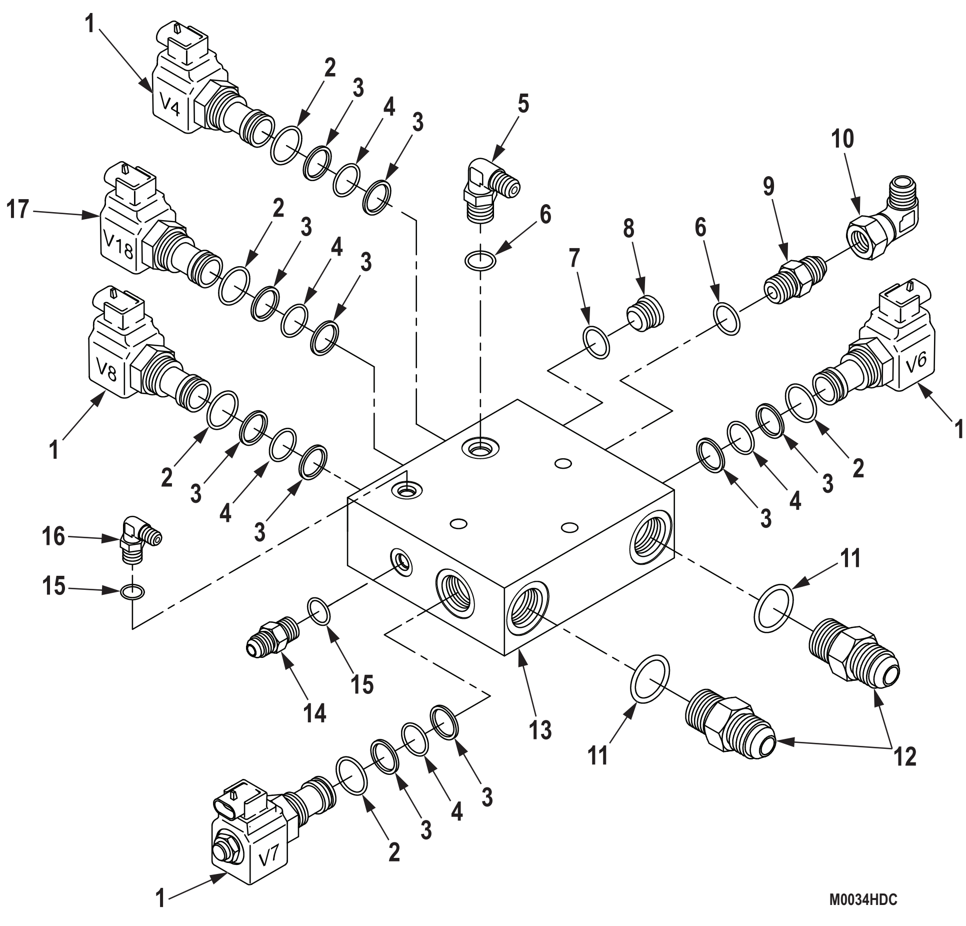



*Figure 3. Hydraulic Diagnostic Center (HDC) Aft Manifold Assembly.*

**ASSEMBLY - Continued**

## WARNING

Do not work under vehicle unless hull is on jack stands and apron lockpins are installed. Failure to comply may result in severe injury or death to personnel.

## NOTE

- Installation steps are accomplished through access under vehicle.
- After installation is complete, remove tags from all hydraulic lines and wiring harness leads.

3. Install aft manifold (Figure 4, Item 6) in vehicle with three new hexagon head cap screws (Figure 4, Item 4) and three flat washers (Figure 4, Item 5).
4. Remove caps from adapters and plugs from hydraulic hose connector ends and connect six hydraulic hoses (Figure 4, Item 3) to aft manifold (Figure 4, Item 6).
5. Connect wiring harness W3 connectors P4, P6, P7, P8, and P18 (Figure 4, Item 1) to five two-way valves V4, V6, V7, V8, and V18 (Figure 4, Item 2) on aft manifold (Figure 4, Item 6).
6. Remove tags from all hydraulic hoses and wiring harness W3 connectors.

**ASSEMBLY - Continued**

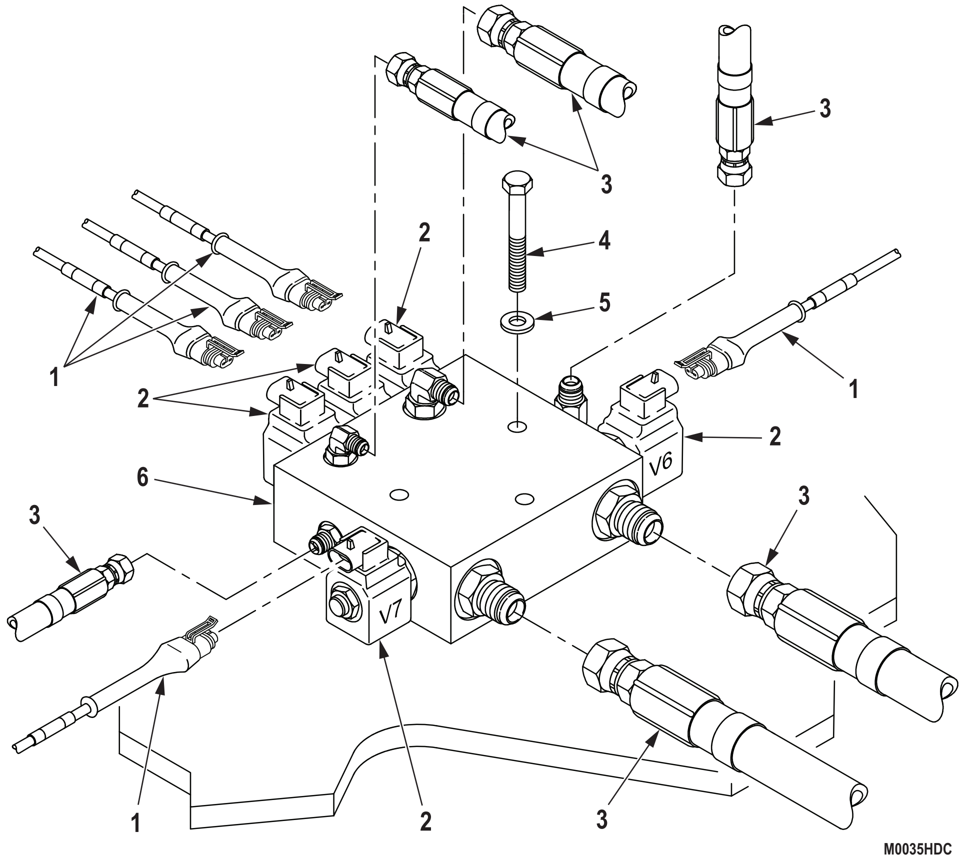



*Figure 4. Hydraulic Diagnostic Center (HDC) Aft Manifold Assembly Installation.*

**END OF TASK**

**FOLLOW-ON MAINTENANCE**

1. Connect negative battery cables (TM 5-2350-262-20).
2. Install hull access plates (TM 5-2350-262-20).
3. Remove vehicle from jack stands and lower hull (TM 5-2350-262-20).
4. Bring hydraulic system to operating pressure (TM 5-2350-262-10).

**END OF TASK**

**END OF WORK PACKAGE**

## FIELD MAINTENANCE
## MAIN PUMP HYDRAULIC FILTER AREA REPLACEMENT

**INITIAL SETUP:**

**Tools and Special Tools**
- Tool Kit, General Mechanic's: Automotive (WP 0054, Table 1, Item 7)
- Parts Kit, Hydraulic (WP 0054, Table 1, Item 3)
- Plug, Hydraulic Tank (WP 0054, Table 1, Item 4)

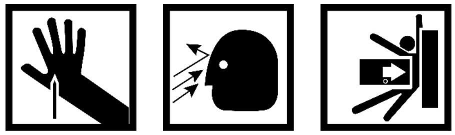
**Materials/Parts**
- Rag, Wiping (WP 0053, Table 1, Item 2)
- O-ring (WP 0055, Table 1, Item 21) Qty: 14

**Personnel Required**
- Construction Equipment Repairer, 91L

**Equipment Condition**
- Vehicle MASTER power OFF (TM 5-2350-262-10)
- Filter guard protective bracket removed (TM 5-2350-262-20)
- Hydraulic pressure relieved (WP 0004)

## REMOVAL

### WARNING



- High oil pressure is present in the M9 ACE hydraulic system. Do not disconnect any hydraulic system component unless hydraulic system pressure has been relieved. After hydraulic system has been relieved, wait at least four minutes before disconnecting any hose or fitting. Ensure each of the hydraulic control levers is moved several times through all positions and the hydraulic tank dipstick is slowly loosened to relieve pressure. Failure to comply may result in severe injury or death to personnel.
- Do not operate ejector when personnel are in bowl. Do not work in bowl unless ejector lock is engaged. Failure to comply may result in severe injury or death to personnel.
- Do not stand or work in bowl area unless ejector lock is engaged. Do not stand in bowl to observe roller guide travels. Failure to comply may result in severe injury or death to personnel.
- When folding dozer blade, work on blade latches from side of vehicle only. Do not stand in front of dozer blade while retracting ejector. Failure to comply may result in severe injury or death to personnel.

### CAUTION

Cap or plug all oil ports and ends of hoses and tubes when oil hoses or tubes are disconnected or removed to prevent contamination. Failure to comply may result in damage to equipment.

### NOTE

The procedure for replacing valve V21, relief valve, and bypass hose is identical for valve 22, relief valve, and bypass hose. This task covers the V21 valve, relief valve, and bypass hose.

1. Remove bypass hose (Figure 1, Item 4), adapter (Figure 1, Item 5), and O-ring (Figure 1, Item 2) from relief valve (Figure 1, Item 3). Discard O-ring.
2. Remove adapter (Figure 1, Item 1) and O-ring (Figure 1, Item 2) from bottom of relief valve (Figure 1, Item 3) and tee (Figure 1, Item 6). Discard O-ring.
3. Remove adapter (Figure 1, Item 1), O-ring (Figure 1, Item 2), and relief valve (Figure 1, Item 3) from bulkhead bracket (Figure 1, Item 7). Discard O-ring.

**REMOVAL - Continued**

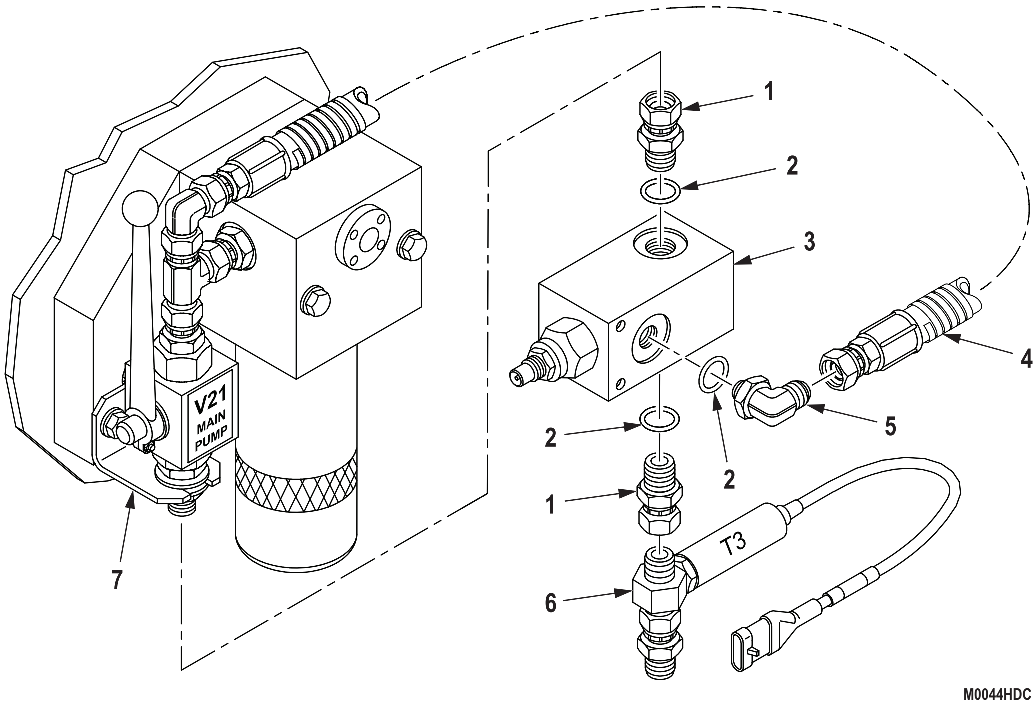



*Figure 1. Valve V21 (V22), Relief Valve, and Bypass Hose Removal.*

**REMOVAL - Continued**

4. Remove nut (Figure 2, Item 6), adapter (Figure 2, Item 9), two flat washers (Figure 2, Item 7), O-ring (Figure 2, Item 4), and valve V21 (Figure 2, Item 10) from bulkhead bracket (Figure 2, Item 8). Discard O-ring.
5. Remove adapter (Figure 2, Item 3) and O-ring (Figure 2, Item 4) from top of valve V21 (Figure 2, Item 10) and from tee (Figure 2, Item 11). Discard O-ring.
6. Remove bypass hose (Figure 2, Item 2) from adapter (Figure 2, Item 1).
7. Remove adapter (Figure 2, Item 1) from tee (Figure 2, Item 11) and tee (Figure 2, Item 11) from adapter (Figure 2, Item 3).
8. Remove adapter (Figure 2, Item 3) and O-ring (Figure 2, Item 4) from filter (Figure 2, Item 5). Discard O-ring.

**REMOVAL - Continued**

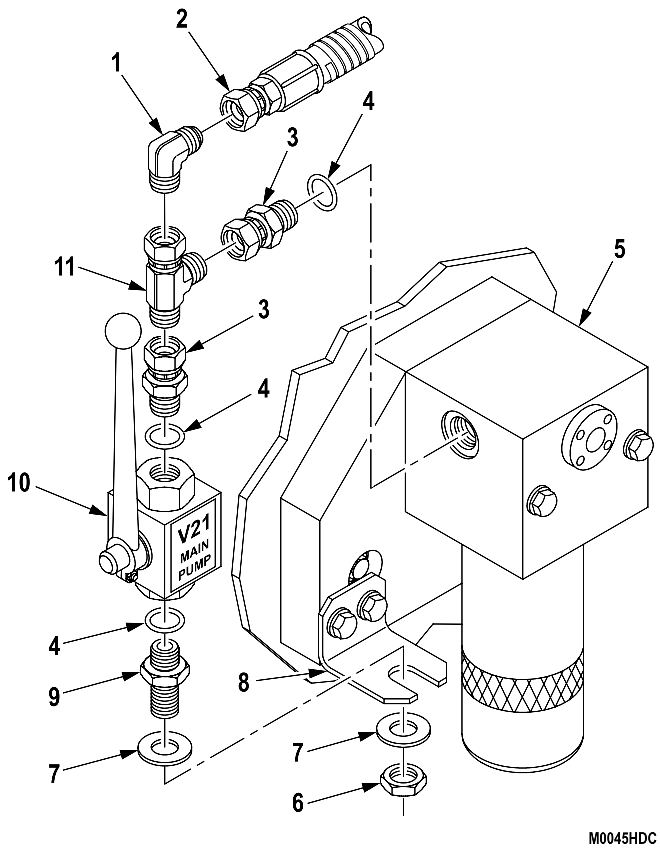



*Figure 2. Valve V21 (V22), Relief Valve, and Bypass Hose Removal.*

**END OF TASK**

## INSTALLATION

### WARNING

- Do not operate ejector when personnel are in bowl. Do not work in bowl unless ejector lock is engaged. Failure to comply may result in severe injury or death to personnel.
- Do not stand or work in bowl area unless ejector lock is engaged. Do not stand in bowl to observe roller guide travels. Failure to comply may result in severe injury or death to personnel.
- When folding dozer blade, work on blade latches from side of vehicle only. Do not stand in front of dozer blade while retracting ejector. Failure to comply may result in severe injury or death to personnel.

1. Install new O-ring (Figure 3, Item 4) and adapter (Figure 3, Item 3) into filter (Figure 3, Item 5).
2. Install tee (Figure 3, Item 11) on adapter (Figure 3, Item 3) and adapter (Figure 3, Item 1) onto top of tee (Figure 3, Item 11).
3. Install bypass hose (Figure 3, Item 2) onto adapter (Figure 3, Item 1).
4. Install new O-ring (Figure 3, Item 4) with adapter (Figure 3, Item 3) on top of valve V21 (Figure 3, Item 10).
5. Install valve V21 (Figure 3, Item 10), new O-ring (Figure 3, Item 4), two flat washers (Figure 3, Item 7), adapter (Figure 3, Item 9), and nut (Figure 3, Item 6) on bulkhead bracket (Figure 3, Item 8) and tee (Figure 3, Item 11).

## INSTALLATION - Continued

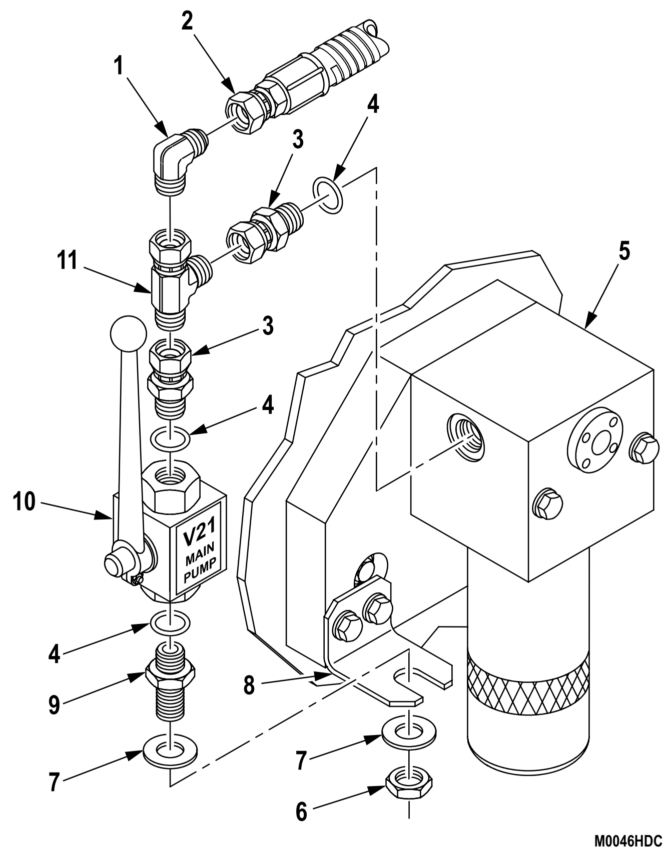



*Figure 3. Valve V21 (V22), Relief Valve, and Bypass Hose Installation.*

**INSTALLATION - Continued**

6. Install new O-ring (Figure 4, Item 2) and adapter (Figure 4, Item 1) on relief valve (Figure 4, Item 3) and attach to bulkhead bracket (Figure 4, Item 7).
7. Install new O-ring (Figure 4, Item 2) and adapter (Figure 4, Item 1) on relief valve (Figure 4, Item 3) and attach tee (Figure 4, Item 6) to adapter (Figure 4, Item 1).
8. Install new O-ring (Figure 4, Item 2) and adapter (Figure 4, Item 5) on relief valve (Figure 4, Item 3) and attach bypass hose (Figure 4, Item 4) to adapter (Figure 4, Item 5).

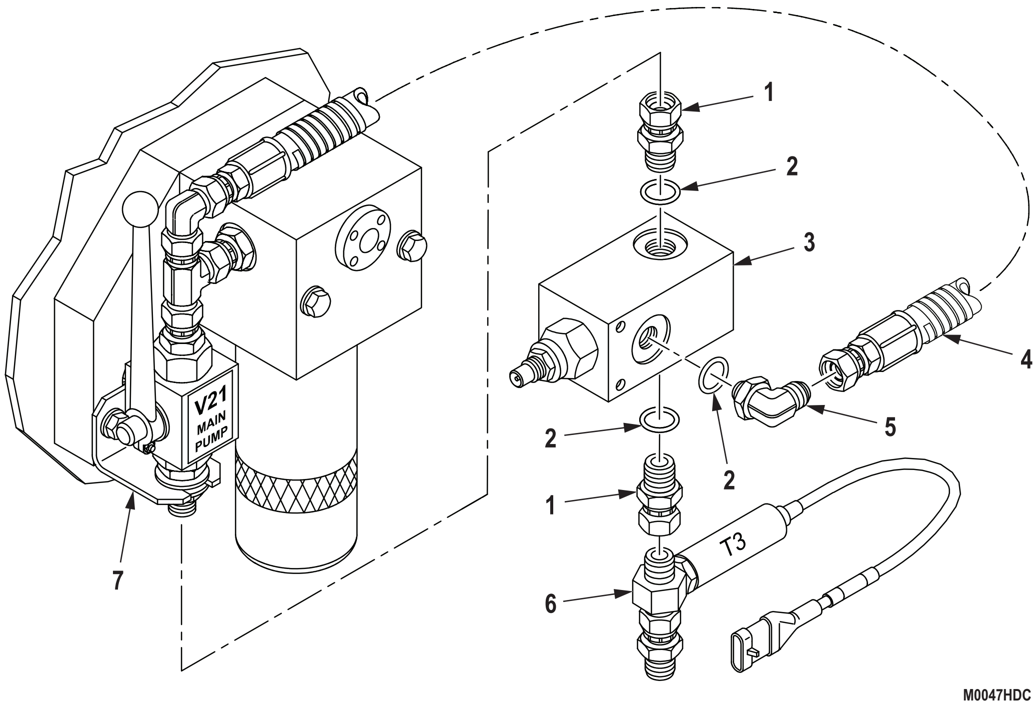



*Figure 4. Valve V21 (V22), Relief Valve, and Bypass Hose Installation.*

**END OF TASK**

**FOLLOW-ON MAINTENANCE**

**WARNING**

Ensure right main hydraulic pressure inhibit valve V22 is fully opened prior to starting vehicle. A fully or partially closed valve will cause immediate high pressure. Failure to comply may result in damage to equipment and injury to personnel.

1. Restore hydraulic pressure (TM 5-2350-262-10).
2. Install filter guard protective bracket (TM 5-2350-262-20).

**END OF TASK**

**END OF WORK PACKAGE**

# FIELD MAINTENANCE
# HYDRAULIC DIAGNOSTIC CENTER (HDC) INTERCONNECTING HYDRAULIC HOSES AND TUBES REPLACEMENT

## INITIAL SETUP:

**Tools and Special Tools**
- Tool Kit, General Mechanic's: Automotive (WP 0054, Table 1, Item 7)
- Adapter, Socket Wrench (WP 0054, Table 1, Item 1)
- Parts Kit, Hydraulic (WP 0054, Table 1, Item 3)
- Plug, Hydraulic Tank (WP 0054, Table 1, Item 4)
- Wrench Set, Crowfoot (WP 0054, Table 1, Item 8)

**Materials/Parts**
- Rag, Wiping (WP 0053, Table 1, Item 2)

**Personnel Required**
- Construction Equipment Repairer, 91L (Two)

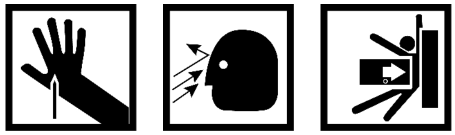
**References**
- TM 5-2350-262-20

**Equipment Condition**
- Hydraulic pressure relieved (WP 0004)

**Equipment Condition (cont.)**
- Vehicle MASTER power OFF (TM 5-2350-262-10)
- Apron locked in full-up position for hoses in the filter area (TM 5-2350-262-10)
- Ejector to front of vehicle for hoses in the filter area (TM 5-2350-262-10)
- Vehicle hull raised and blocked for hoses and tubes at the primary manifold and aft manifolds (TM 5-2350-262-20)
- Hull access plates removed for hoses and tubes at the primary and aft manifolds (TM 5-2350-262-20)

## REMOVAL

### WARNING



- High oil pressure is present in the M9 ACE hydraulic system. Do not disconnect any hydraulic system component unless hydraulic system pressure has been relieved. After hydraulic system has been relieved, wait at least four minutes before disconnecting any hose or fitting. Ensure each of the hydraulic control levers is moved several times through all positions and the hydraulic tank dipstick is slowly loosened to relieve pressure. Failure to comply may result in severe injury or death to personnel.
- Do not operate ejector when personnel are in bowl. Do not work in bowl unless ejector lock is engaged. Failure to comply may result in severe injury or death to personnel.
- Do not stand or work in bowl area unless ejector lock is engaged. Do not stand in bowl to observe roller guide travels. Failure to comply may result in severe injury or death to personnel.
- When folding dozer blade, work on blade latches from side of vehicle only. Do not stand in front of dozer blade while retracting ejector. Failure to comply may result in severe injury or death to personnel.

### NOTE

- The initial setup in this task indicates the materials/parts, references, and equipment conditions required to replace all associated Hydraulic Diagnostic Center (HDC) hydraulic tubes and hoses. You need only to requisition the items and perform the steps necessary for the hose or tube that you are replacing.
- Though in different locations, all hydraulic tubes and hoses are disconnected and removed in the same manner. This task covers the replacement of only one hose. For location and configuration of hoses and tubes, refer to TM 5-2350-262-20.

1. Remove hose (Figure 1, Item 3) from adapter (Figure 1, Item 4) on primary manifold assembly (Figure 1, Item 5). Plug hose (Figure 1, Item 3) and cap adapter (Figure 1, Item 4) on manifold to prevent leakage.
2. Remove other end of hose (Figure 1, Item 3) from adapter (Figure 1, Item 2) on main accumulator (Figure 1, Item 1). Plug hose (Figure 1, Item 2) and cap adapter (Figure 1, Item 2) to prevent leakage.

**END OF TASK**

## INSTALLATION

1. Install hose (Figure 1, Item 3) at main accumulator (Figure 1, Item 1) adapter (Figure 1, Item 2).
2. Install other end of hose (Figure 1, Item 3) at primary manifold (Figure 1, Item 5) on adapter (Figure 1, Item 4).

**INSTALLATION - Continued**

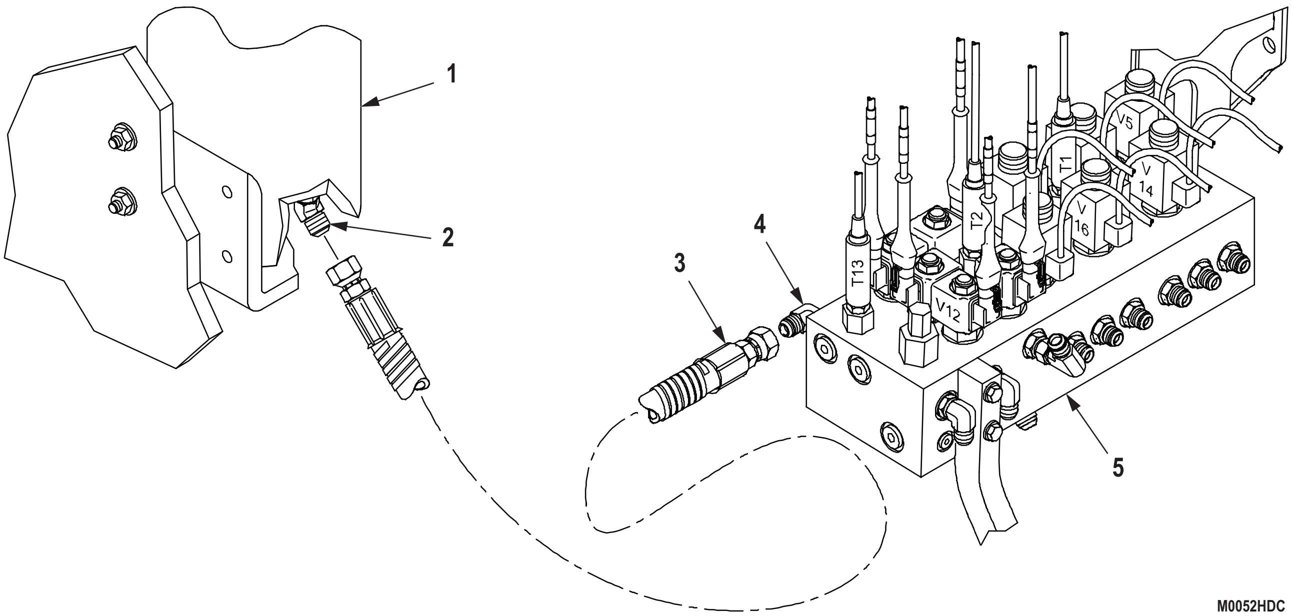



*Figure 1. Hydraulic Diagnostic Center (HDC) Interconnecting Hydraulic Hoses and Tubes Removal/Installation.*

**END OF TASK**

**FOLLOW-ON MAINTENANCE**

1. Return ejector to stowed position (TM 5-2350-262-10).
2. Return apron to stowed position (TM 5-2350-262-10).
3. Recharge hydraulic system (TM 5-2350-262-10).
4. Unblock and lower vehicle (TM 5-2350-262-20).
5. Install hull access plates (TM 5-2350-262-20).

**END OF TASK**

**END OF WORK PACKAGE**

## FIELD MAINTENANCE
## DIRECTIONAL CONTROL VALVE (DCV) BANK REPLACEMENT

### INITIAL SETUP:

**Tools and Special Tools**

Tool Kit, General Mechanic's: Automotive (WP 0054, Table 1, Item 7)

Parts Kit, Hydraulic (WP 0054, Table 1, Item 3)

**Materials/Parts**

Rag, Wiping (WP 0053, Table 1, Item 2) Qty: 2

O-ring (WP 0055, Table 1, Item 21) Qty: 2

**Personnel Required**

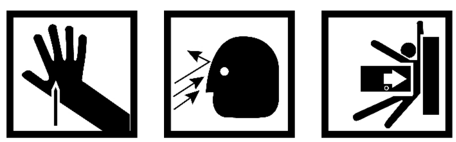
Construction Equipment Repairer, 91L

**Equipment Condition**

Ejector moved to front of vehicle (TM 5-2350-262-10)

### REMOVAL

**WARNING**



- High oil pressure is present in the M9 ACE hydraulic system. Do not disconnect any hydraulic system component unless hydraulic system pressure has been relieved. After hydraulic system has been relieved, wait at least four minutes before disconnecting any hose or fitting. Ensure each of the hydraulic control levers is moved several times through all positions and the hydraulic tank dipstick is slowly loosened to relieve pressure. Failure to comply may result in severe injury or death to personnel.
- Do not operate ejector when personnel are in bowl. Do not work in bowl unless ejector lock is engaged. Failure to comply may result in severe injury or death to personnel.
- Do not stand or work in bowl area unless ejector lock is engaged. Do not stand in bowl to observe roller guide travels. Failure to comply may result in severe injury or death to personnel.
- When folding dozer blade, work on blade latches from side of vehicle only. Do not stand in front of dozer blade while retracting ejector. Failure to comply may result in severe injury or death to personnel.

**CAUTION**

Cap or plug all oil ports and ends of hoses and tubes when oil hoses or tubes are disconnected or removed to prevent contamination. Failure to comply may result in damage to equipment.

**REMOVAL - Continued**

1. Remove hose (Figure 1, Item 5) from bottom adapter (Figure 1, Item 4) of manual shutoff valve V23 (Figure 1, Item 2).
2. Remove adapter (Figure 1, Item 4) and O-ring (Figure 1, Item 3) from bottom of manual shutoff valve V23 (Figure 1, Item 2). Discard O-ring.
3. Remove adapter (Figure 1, Item 6) and manual shutoff valve V23 (Figure 1, Item 2) from port 22 of Directional Control Valve (DCV) bank (Figure 1, Item 1).
4. Remove adapter (Figure 1, Item 6) and O-ring (Figure 1, Item 3) from top of manual shutoff valve V23 (Figure 1, Item 2). Discard O-ring.

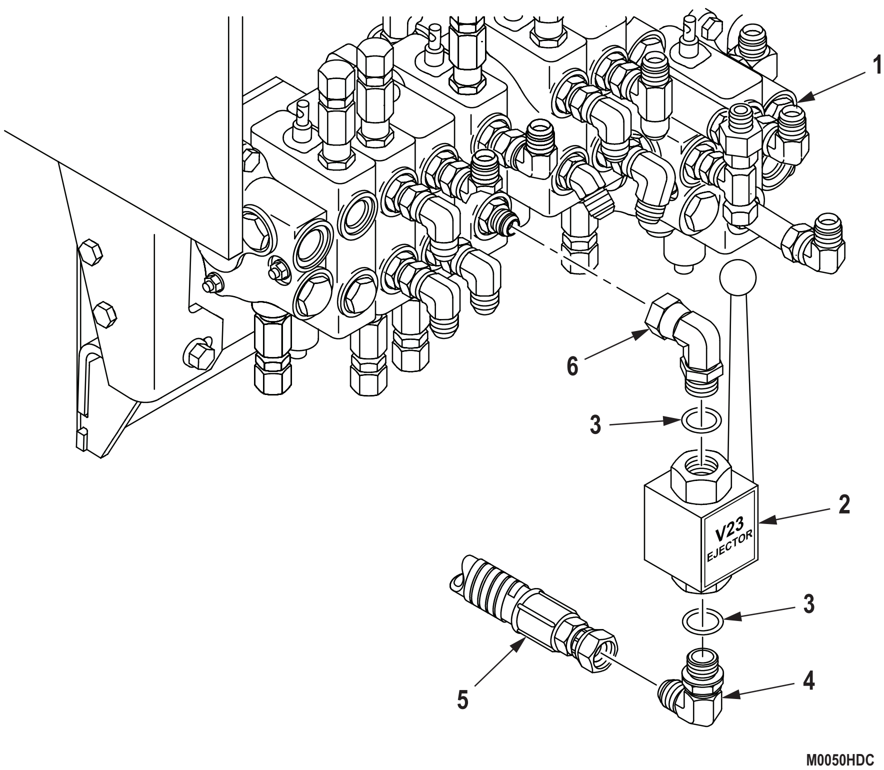
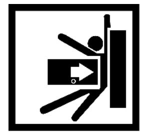



*Figure 1. Manual Shutoff Valve V23 Removal.*

**END OF TASK**

## INSTALLATION

### WARNING



- Do not operate ejector when personnel are in bowl. Do not work in bowl unless ejector lock is engaged. Failure to comply may result in severe injury or death to personnel.
- Do not stand or work in bowl area unless ejector lock is engaged. Do not stand in bowl to observe roller guide travels. Failure to comply may result in severe injury or death to personnel.
- When folding dozer blade, work on blade latches from side of vehicle only. Do not stand in front of dozer blade while retracting ejector. Failure to comply may result in severe injury or death to personnel.

1. Install new O-ring (Figure 2, Item 3) and adapter (Figure 2, Item 6) in top of manual shutoff valve V23 (Figure 2, Item 2).
2. Install adapter (Figure 2, Item 6) and manual shutoff valve V23 (Figure 2, Item 2) to port 22 of DCV bank (Figure 2, Item 1).
3. Install new O-ring (Figure 2, Item 3) and adapter (Figure 2, Item 4) in bottom port of manual shutoff valve V23 (Figure 2, Item 2).
4. Connect hose (Figure 2, Item 5) to bottom adapter (Figure 2, Item 4) of manual shutoff valve V23 (Figure 2, Item 2).

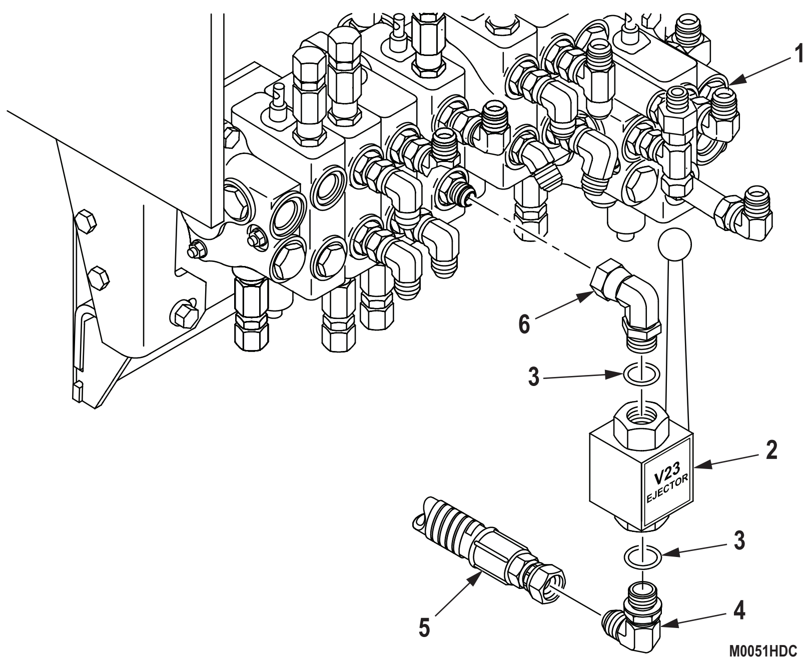



*Figure 2. Manual Shutoff Valve V23 Installation.*

**END OF TASK**

## FOLLOW-ON MAINTENANCE

Return ejector to stowed position (TM 5-2350-262-10).

## END OF TASK

## END OF WORK PACKAGE

# FIELD MAINTENANCE
# HULL/EJECTOR INTERFERENCE REPLACEMENT

**INITIAL SETUP:**

**Tools and Special Tools**
Tool Kit, General Mechanic's: Automotive
(WP 0054, Table 1, Item 7)
Lifting Device, Minimum Capacity 325 lb (148 kg)

**Materials/Parts**
Lubricating Oil, Engine
(WP 0053, Table 1, Item 1)

**Materials/Parts (cont.)**
Bolt, Machine (WP 0055, Table 1, Item 23)
Qty: 4
Nut, Self-Locking (WP 0055, Table 1, Item 8)
Qty: 1

**Personnel Required**
Construction Equipment Repairer, 91L

**Equipment Condition**
Hydraulic pressure relieved (WP 0004)
Rear floor plates removed (TM 5-2350-262-20)

## WARNING

Ejector cylinder weighs 325 lb (148 kg). Support ejector cylinder before disconnecting. Failure to comply may result in severe injury to personnel.

## CAUTION

Ensure ejector cylinder end is securely supported when replacing bracket to avoid damaging engine and transmission hoses and fittings.

## REMOVAL

1. Support rear ejector cylinder end (Figure 1, Item 5) and remove screw (Figure 1, Item 3), locknut (Figure 1, Item 6), and pin (Figure 1, Item 4) from ejector cylinder (Figure 1, Item 5) and bracket (Figure 1, Item 7). Discard locknut.
2. Remove four machine bolts (Figure 1, Item 2), washers (Figure 1, Item 1), and bracket (Figure 1, Item 7) from hull (Figure 1, Item 8). Discard machine bolts.

**END OF TASK**

## INSTALLATION

### NOTE

Apply lubricating oil to threads of screws prior to installation.

1. Install bracket (Figure 1, Item 7) on hull (Figure 1, Item 8) with four washers (Figure 1, Item 1) and new machine bolts (Figure 1, Item 2). Tighten four machine bolts (Figure 1, Item 2) to 123-135 lb-ft (167-183 N·m).
2. Install rear ejector cylinder end (Figure 1, Item 5) on bracket (Figure 1, Item 7) with pin (Figure 1, Item 4), screw (Figure 1, Item 3), and locknut (Figure 1, Item 6). Tighten screw (Figure 1, Item 3) to 20-22 lb-ft (27-30 N·m).

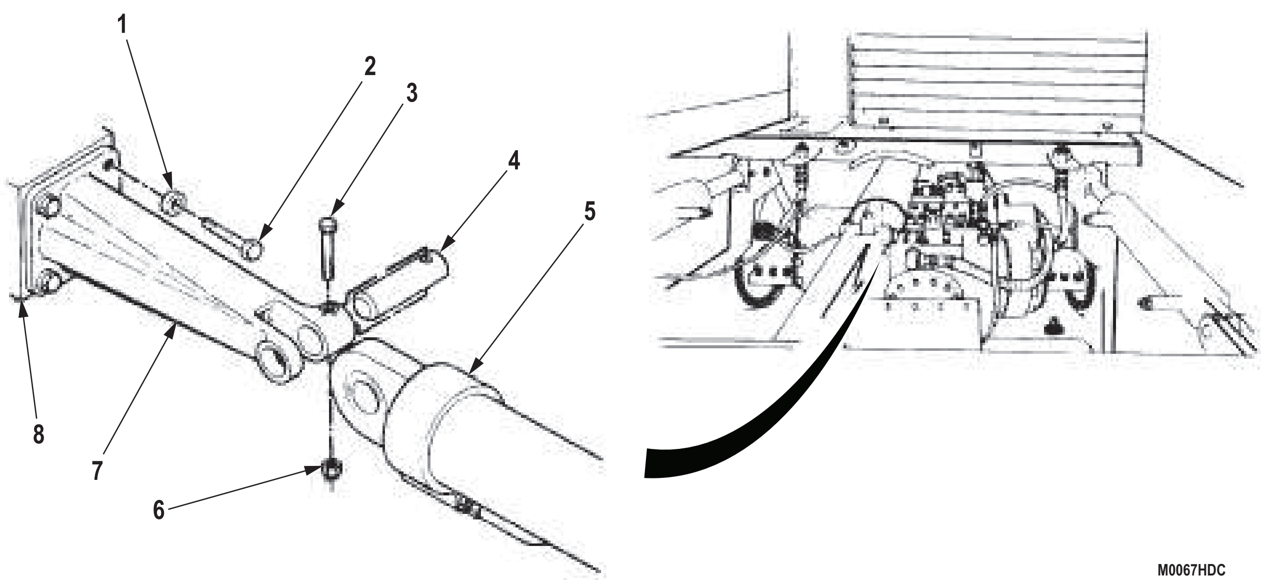



*Figure 1. Hull/Ejector Interference Modification Removal/Installation.*

**END OF TASK**

## FOLLOW-ON MAINTENANCE

Install rear floor plates (TM 5-2350-262-20).

**END OF TASK**

**END OF WORK PACKAGE**

## FIELD MAINTENANCE
## GENERAL MAINTENANCE

**INITIAL SETUP:**

**Tools and Special Tools**
Parts Kit, Hydraulic (WP 0054, Table 1, Item 3)

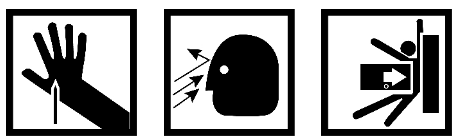
**Materials/Parts**
Lubricating Oil, Engine
(WP 0053, Table 1, Item 1)

### GENERAL HYDRAULIC SYSTEM REPAIR METHODS

This section contains repair methods for the hydraulic system. If special repair methods or procedures are required for the hydraulic system components or parts, specific repair instructions are included in the individual maintenance tasks in TM 5-2350-262-20.

### GENERAL HYDRAULIC SYSTEM REPAIR

**WARNING**



- High pressure is present in the M9 ACE hydraulic system. Do not disconnect any hydraulic system component unless hydraulic system pressure has been relieved. Ensure each hydraulic control lever is moved several times through all positions, and hydraulic tank dipstick is slowly loosened to relieve pressure. Failure to comply may result in severe injury or death to personnel.
- Main hydraulic pump weighs approximately 130 lb (59 kg). Severe injury to personnel could result if pump is not handled with caution.
- Before performing any hydraulic troubleshooting in the bowl, move the ejector forward and disable it by disconnecting the ejector cylinder or by engaging the ejector lock. Failure to comply may result in severe injury or death to personnel.
- Spilled hydraulic oil is very slippery. Be careful when entering or working in bowl area. Wipe up any spilled oil immediately. Failure to comply may result in severe injury to personnel.

**GENERAL HYDRAULIC SYSTEM REPAIR - Continued**

## CAUTION

- Always clean around fittings before disconnecting or connecting hoses or fittings. Ensure area is clean before installing hydraulic components. Failure to comply may result in damage to equipment.
- Cover, cap, or plug all openings, ports, and tube or hose ends when they are disconnected. Failure to comply may result in damage to equipment.
- Ensure you mate only fittings designed to be mated with each other. Never depend on trial and error. Just because two fittings will screw together is no guarantee that the connection will not leak. See illustrations of fitting types in this work package. Failure to comply may result in damage to equipment.
- Fittings must be installed and hand-tightened. If a fitting cannot be hand-tightened, it may be cross-threaded or have damaged threads. Use wrench only for final tightening. Failure to comply may result in damage to equipment.
- Do not use Teflon tape as a sealer on any fittings. It can separate from the fittings and cause control valves, relief valves, and actuators to become contaminated and fail.
- It is possible to screw a male National Pipe Thread (NPT) into a female straight thread, but the fitting will leak. Learn to recognize the very slight taper which an NPT has. Do not attempt to connect NPT and female straight threads.
- Do not apply sealant to the first threads of NPT fittings. If sealant enters the hydraulic system, it may cause components to fail.
- When connecting NPTs, care must be exercised. If overtightened, the female pipe thread will split. Replace it. If a connection leaks, disconnect and apply thread sealant. Reconnect the threads and snug up with an open-end wrench. Failure to comply may result in damage to equipment.
- Be careful when installing preformed packings. Sharp threads can nick the packing, causing it to leak. If fitting leaks, check packing for nicks or cuts and replace if necessary.
- Do not overtighten a flareless connection. Observe torque values in appendix for hydraulic fittings. Overtightening can cause leakage, requiring replacement of entire tube assembly.
- When connecting a hose to a fitting, always use two wrenches. Use one wrench to turn the swivel nut onto the fitting, and use another wrench to keep the hose from rotating. If the hose rotates, it can loosen the other end of the hose, or loosen the fitting at the other end.

The following information is provided to familiarize personnel with the various types of hydraulic fittings. Refer to this work package and the WARNINGs and CAUTIONs on the previous pages when working on hydraulic systems.

GENERAL HYDRAULIC SYSTEM REPAIR - Continued

## CAUTION

Do not apply sealant to the leading edge or the first thread of hydraulic fitting, or sealant may get into the hydraulic system and contaminate it. Failure to comply may result in damage to equipment.

1. National Pipe Thread (NPT) is commonly found in hydraulic systems. It differs from other fittings because it is tapered. In order to obtain a proper seal with this thread, you must use a sealant. The sealant should be applied to the male fitting (Figure 1). Torque value guide is NOT to be used.

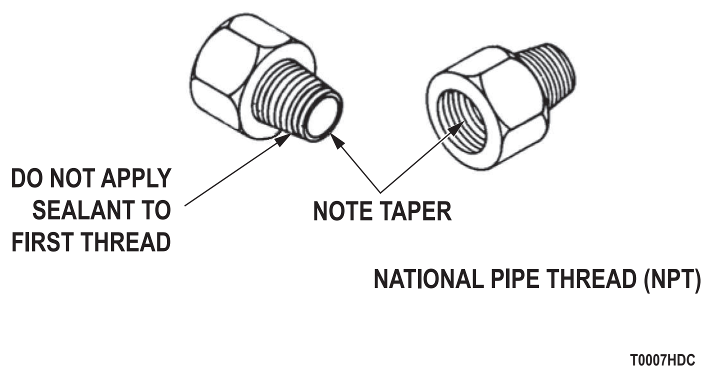



*Figure 1. National Pipe Thread (NPT) Fittings.*

2. The 37 degree flare termination has a male straight thread that mates with a female straight thread. The sealing surface for this termination is the angled nose at the end of the male fitting. This nose mates with a similar surface in the female 37 degree flare fitting (Figure 2). These sealing surfaces must be free of nicks and scratches in order to seal properly. If nicked or scratched, item must be replaced. For torque requirements, see guide in appendix.

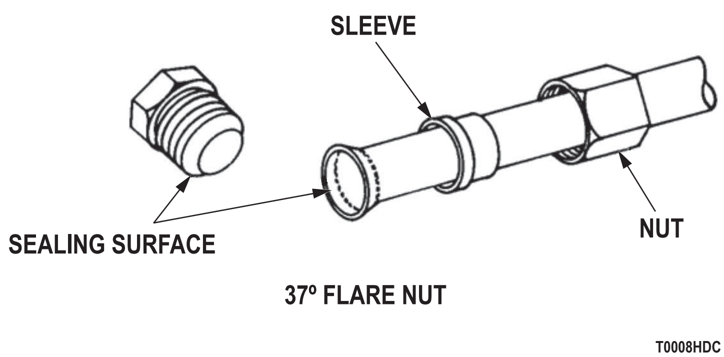



*Figure 2. 37 Degree Flare Termination Fitting.*

## GENERAL HYDRAULIC SYSTEM REPAIR - Continued

3. An O-ring (preformed packing) boss has a straight thread. The seal for this termination is a preformed packing that fits at the top of the threads on the male fitting. This packing is squeezed into the extra space at the top of the threads of the female fitting and seals the connection (Figure 3). The installed packing must be free of nicks and cuts to seal properly. If packing is nicked or cut, it must be replaced.

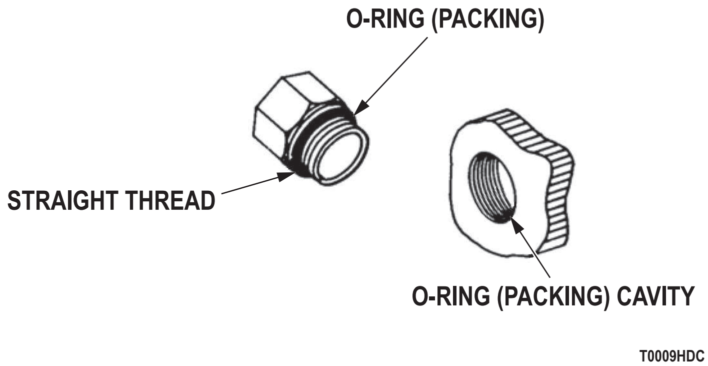



*Figure 3. O-Ring (Packing) Boss.*

### CAUTION

Packing must be located fully into groove and not on threads. Failure to comply may result in damage to equipment.

4. A flareless fitting uses a straight thread. The female fitting contains a ferrule that mates with a cavity in the male fitting (Figure 4). Use recommended torque values to tighten nut (TM 5-2350-262-20). If this fitting is overtorqued, the ferrule will be deformed and the fitting will leak.

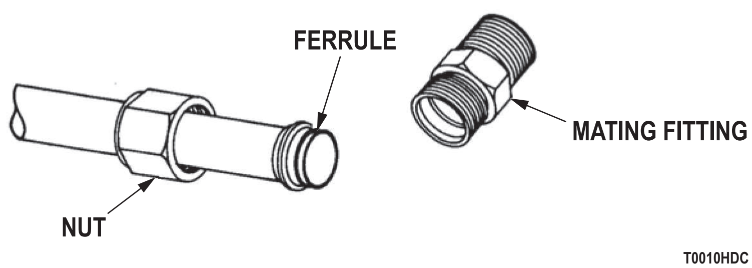



*Figure 4. Flareless Fitting.*

**GENERAL HYDRAULIC SYSTEM REPAIR - Continued**

## CAUTION

Replace or repair parts with nicks, cuts, or scratches. Failure to comply may result in damage to equipment.

5. A four-bolt split flange has a flange head that is clamped to a smooth face. The flange head uses a preformed packing that is squeezed between the head and the face (Figure 5). The face and the end of flange head must be free of nicks and scratches to seal properly. The packing must also be free of nicks and cuts, or the connection will leak.

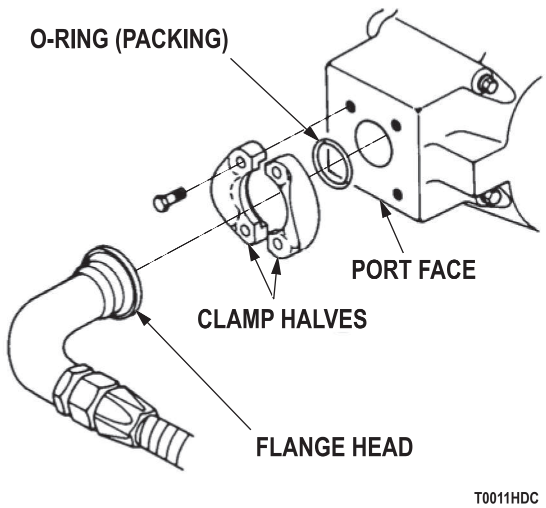



*Figure 5. Four-Bolt Split Flange.*

**END OF TASK**

## INSTALLATION OF ADJUSTABLE FITTINGS

1. Apply engine lubricating oil to O-ring (preformed packing) (Figure 6).

### CAUTION

Packing must be positioned fully into groove and not on threads. Failure to comply may result in damage to equipment.

2. Gently push backup washer and O-ring all the way into groove (Figure 6).
3. Turn locknut down until locknut contacts backup washer (Figure 6).
4. Install fitting on boss until backup washer contacts face of boss (Figure 6).
5. Position fitting to desired position by backing out fitting up to one full turn. Hold fitting in desired position, and tighten locknut (Figure 6).
6. Connect tube to fitting after fitting is properly positioned and tightened (Figure 6).

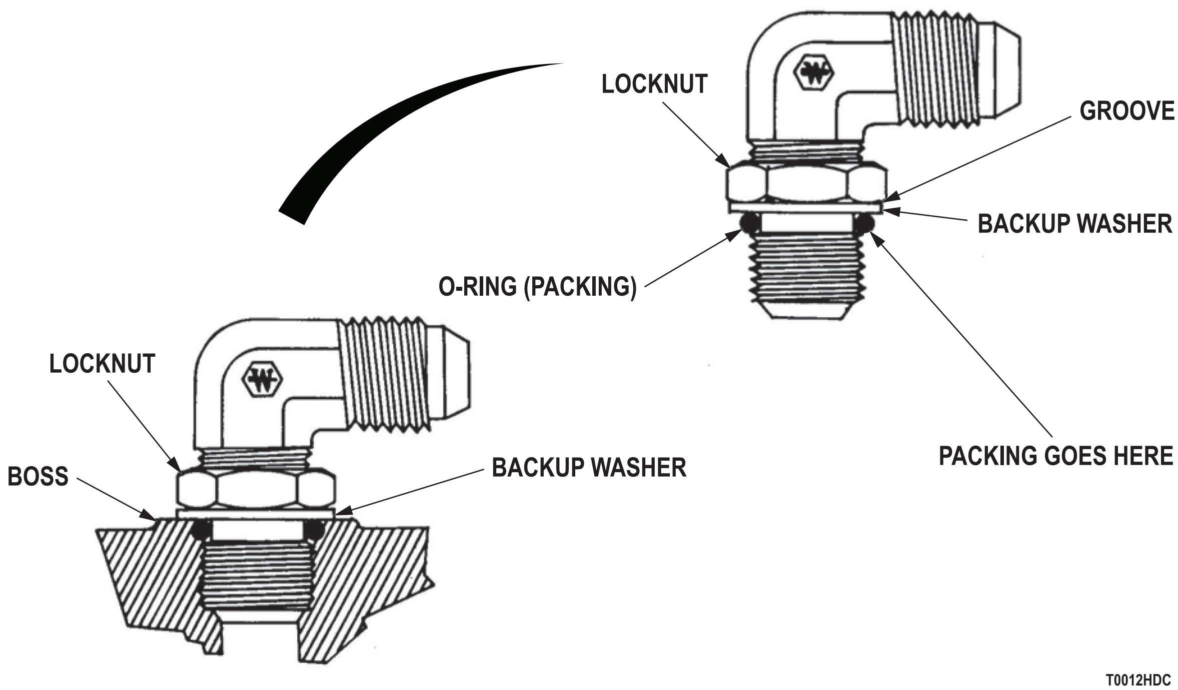



*Figure 6. Adjustable Fittings.*

**END OF TASK**

**END OF WORK PACKAGE**

# CHAPTER 5

# PARTS INFORMATION

# FIELD MAINTENANCE
# REPAIR PARTS AND SPECIAL TOOLS LISTS (RPSTL) INTRODUCTION

## SCOPE

This RPSTL lists and authorizes spares and repair parts; special tools; special test, measurement, and diagnostic equipment (TMDE); and other special support equipment required for performance of Field maintenance of the Hydraulic Diagnostic Center (HDC) supporting the M9 ACE. It authorizes the requisitioning, issue, and disposition of spares, repair parts, and special tools as indicated by the source, maintenance, and recoverability (SMR) codes.

## GENERAL

In addition to the Introduction work package, this RPSTL is divided into the following work packages.

1. **Repair Parts List Work Packages.** Work packages containing lists of spares and repair parts authorized by this RPSTL for use in the performance of maintenance. These work packages also include parts which must be removed for replacement of the authorized parts. Parts lists are composed of functional groups in ascending alphanumeric sequence, with the parts in each group listed in ascending figure and item number sequence. Sending units, brackets, filters, and bolts are listed with the component they mount on. Bulk materials are listed by item name in FIG. BULK at the end of the work packages. Repair parts kits are listed separately in their own functional group and work package. Repair parts for reparable special tools are also listed in a separate work package. Items listed are shown on the associated illustrations.

2. **Special Tools List Work Packages.** Work packages containing lists of special tools, special TMDE, and special support equipment authorized by this RPSTL (as indicated by Basis of Issue (BOI) information in the DESCRIPTION AND USABLE ON CODE (UOC) column). Tools that are components of common tool sets and/or Class VII are not listed.

3. **Cross-Reference Indexes Work Packages.** There are two cross-reference indexes work packages in this RPSTL: the National Stock Number (NSN) Index work package, and the Part Number (P/N) Index work package. The National Stock Number Index work package refers you to the figure and item number. The Part Number Index work package refers you to the figure and item number.

## EXPLANATION OF COLUMNS IN THE REPAIR PARTS LIST AND SPECIAL TOOLS LIST WORK PACKAGES

**ITEM NO. (Column (1)).** Indicates the number used to identify items called out in the illustration.

**SMR CODE (Column (2)).** The SMR code containing supply/requisitioning information, maintenance level authorization criteria, and disposition instruction, as shown in the following breakout. This entry may be subdivided into 4 subentries, one for each service.

## EXPLANATION OF COLUMNS IN THE REPAIR PARTS LIST AND SPECIAL TOOLS LIST WORK PACKAGES - Continued

*Table 1. SMR Code Explanation.*

| SOURCE CODE | MAINTENANCE CODE | | RECOVERABILITY CODE |
|---|---|---|---|
| XX | XX | | X |
| 1st two positions: How to get an item. | 3rd position: Who can install, replace, or use the item. | 4th position: Who can do complete repair* on the item. | 5th position: Who determines disposition action on unserviceable items. |

*Complete Repair: Maintenance capacity, capability, and authority to perform all corrective maintenance tasks of the "Repair" function in a use/user environment in order to restore serviceability to a failed item.

Source Code. The source code tells you how you get an item needed for maintenance, repair, or overhaul of an end item/equipment. Explanations of source codes follow:

*Table 2. Source Code First and Second Position.*

| SOURCE CODE | APPLICATION/EXPLANATION |
|---|---|
| PA<br>PB<br>PC<br>PD<br>PE<br>PF<br>PG<br>PH<br>PR<br>PZ | **NOTE**<br>Items coded PC are subject to deterioration.<br>Stock items; use the applicable NSN to requisition/request items with these source codes. They are authorized to the level indicated by the code entered in the third position of the SMR code. |
| KD<br>KF<br>KB | Items with these codes are not to be requested/ requisitioned individually. They are part of a kit which is authorized to the maintenance level indicated in the third position of the SMR code. The complete kit must be requisitioned and applied. |
| MF-Made at field<br>MH-Made at below sustainment level<br>ML-Made at SRA<br>MD-Made at depot | Items with these codes are not to be requisitioned/ requested individually. They must be made from bulk material which is identified by the part number in the DESCRIPTION AND USABLE ON CODE (UOC) column and listed in the bulk material group work package of the RPSTL. If the item is authorized to you by the third position code of the SMR code, but the source code indicates it is |

## EXPLANATION OF COLUMNS IN THE REPAIR PARTS LIST AND SPECIAL TOOLS LIST WORK PACKAGES - Continued

***Table 2. Source Code First and Second Position - Continued.***

| SOURCE CODE | APPLICATION/EXPLANATION |
|---|---|
| | made at higher level, order the item from the higher level of maintenance. |
| AF-Assembled by field<br>AH-Assembled by below depot sustainment level<br>AL-Assembled by SRA<br>AD-Assembled by depot | Items with these codes are not to be requested/ requisitioned individually. The parts that make up the assembled item must be requisitioned or fabricated and assembled at the level of maintenance indicated by the source code. If the third position of the SMR code authorizes you to replace the item, but the source code indicates the item is assembled at a higher level, order the item from the higher level of maintenance. |
| XA | Do not requisition an "XA" coded item. Order the next higher assembly. (Refer to NOTE below.) |
| XB | If an item is not available from salvage, order it using the CAGEC and part number. |
| XC | Installation drawings, diagrams, instruction sheets, field service drawings; identified by manufacturer's part number. |
| XD | Item is not stocked. Order an XD-coded item through local purchase or normal supply channels using the CAGEC and part number given, if no NSN is available. |

### NOTE

Cannibalization or controlled exchange, when authorized, may be used as a source of supply for items with the above source codes except for those items source coded "XA" or those aircraft support items restricted by requirements of AR 750-1.

**Maintenance Code.** Maintenance codes tell you the level(s) of maintenance authorized to use and repair support items. The maintenance codes are entered in the third and fourth positions of the SMR code as follows:

**Third Position.** The maintenance code entered in the third position tells you the lowest maintenance level authorized to remove, replace, and use an item. The maintenance code entered in the third position will indicate authorization to the following levels of maintenance:

***Table 3. Maintenance Code Third Position.***

| MAINTENANCE CODE | APPLICATION/EXPLANATION |
|---|---|
| F- | Field maintenance can remove, replace, and use the item. |

## EXPLANATION OF COLUMNS IN THE REPAIR PARTS LIST AND SPECIAL TOOLS LIST WORK PACKAGES - Continued

***Table 3. Maintenance Code Third Position - Continued.***

| MAINTENANCE CODE | APPLICATION/EXPLANATION |
|---|---|
| H- | Below Depot Sustainment maintenance can remove, replace, and use the item. |
| L- | Specialized repair activity can remove, replace, and use the item. |
| Z- | Item is not authorized to be removed, replaced, or used at any maintenance level. |
| D- | Depot can remove, replace, and use the item. |

### NOTE

Army may use C in the third position. However, for joint service publications, Army will use O.

**Fourth Position.** The maintenance code entered in the fourth position tells you whether or not the item is to be repaired and identifies the lowest maintenance level with the capability to do complete repair (perform all authorized repair functions).

### NOTE

Some limited repair may be done on the item at a lower level of maintenance, if authorized by the Maintenance Allocation Chart (MAC) and SMR codes.

***Table 4. Maintenance Code Fourth Position.***

| MAINTENANCE CODE | APPLICATION/EXPLANATION |
|---|---|
| F- | Field is the lowest level that can do complete repair of the item. |
| H- | Below Depot Sustainment is the lowest level that can do complete repair of the item. |
| L- | Specialized repair activity (SRA) is the lowest level that can do complete repair of the item. |
| D- | Depot is the lowest level that can do complete repair of the item. |
| Z- | Nonreparable. No repair is authorized. |
| B- | No repair is authorized. No parts or special tools are authorized for maintenance of "B" coded item. However, the item may be reconditioned by adjusting, lubricating, etc., at the user level. |

**Recoverability Code.** Recoverability codes are assigned to items to indicate the disposition action on unserviceable items. The recoverability code is shown in the fifth position of the SMR code as follows:

**EXPLANATION OF COLUMNS IN THE REPAIR PARTS LIST AND SPECIAL TOOLS LIST WORK PACKAGES - Continued**

***Table 5. Recoverability Code Fifth Position.***

| RECOVERABILITY CODE | APPLICATION/EXPLANATION |
|---|---|
| Z- | Nonreparable item. When unserviceable, condemn and dispose of the item at the level of maintenance shown in the third position of SMR Code. |
| F- | Reparable item. When uneconomically reparable, condemn and dispose of the item at the field level. |
| H- | Reparable item. When uneconomically reparable, condemn and dispose of the item at the below depot sustainment level. |
| D- | Reparable item. When beyond lower level repair capability, return to depot. Condemnation and disposal of item are not authorized below depot level. |
| L- | Reparable item. Condemnation and disposal not authorized below Specialized Repair Activity (SRA). |
| A- | Item requires special handling or condemnation procedures because of specific reasons (such as precious metal content, high dollar value, critical material, or hazardous material). Refer to appropriate manuals/directives for specific instructions. |

**NSN (Column (3)).** The NSN for the item is listed in this column.

**CAGEC (Column (4)).** The Commercial and Government Entity Code (CAGEC) is a five-digit code which is used to identify the manufacturer, distributor, or Government agency/activity that supplies the item.

**PART NUMBER (Column (5)).** 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, specifications, standards, and inspection requirements to identify an item or range of items.

## NOTE

When you use an NSN to requisition an item, the item you receive may have a different part number from the number listed.

**DESCRIPTION AND USABLE ON CODE (UOC) (Column (6)).** This column includes the following information:

1. The federal item name, and when required, a minimum description to identify the item.
2. Part numbers of bulk materials are referenced in this column in the line entry to be manufactured or fabricated.
3. Hardness Critical Item (HCI). A support item that provides the equipment with special protection from electromagnetic pulse (EMP) damage during a nuclear attack.
4. The statement END OF FIGURE appears just below the last item description in column (6) for a given figure in both the repair parts list and special tools list work packages.

**QTY (Column (7)).** The QTY (quantity per figure) column indicates the quantity of the item used in the breakout shown on the illustration/figure, which is prepared for a functional group, subfunctional group, or an assembly. A "V" appearing in this column instead of a quantity indicates that the quantity is variable and quantity may change from application to application.

## EXPLANATION OF CROSS-REFERENCE INDEXES WORK PACKAGES FORMAT AND COLUMNS

1. **National Stock Number (NSN) Index Work Package.** NSN's in this index are listed in National Item Identification Number (NIIN) sequence.

STOCK NUMBER Column. This column lists the NSN in NIIN sequence. The NIIN consists of the last nine digits of the NSN. When using this column to locate an item, ignore the first four digits of the NSN. However, the complete NSN should be used when ordering items by stock number.

For example, if the NSN is 5385-01-574-1476, the NIIN is 01-574-1476.

FIG. Column. This column lists the number of the figure where the item is identified/located. The figures are in numerical order in the repair parts list and special tools list work packages.

ITEM Column. The item number identifies the item associated with the figure listed in the adjacent FIG. column. This item is also identified by the NSN listed on the same line.

2. **Part Number (P/N) Index Work Package.** Part numbers in this index are listed in ascending alphanumeric sequence (vertical arrangement of letter and number combinations which places the first letter or digit of each group in order A through Z, followed by the numbers 0 through 9 and each following letter or digit in like order).

PART NUMBER Column. Indicates the part number assigned to the item.

FIG. Column. This column lists the number of the figure where the item is identified/located in the repair parts list and special tools list work packages.

ITEM Column. The item number is the number assigned to the item as it appears in the figure referenced in the adjacent figure number column.

## SPECIAL INFORMATION

**Fabrication Instructions.** Bulk materials required to manufacture items are listed in the bulk material functional group of this RPSTL. Part numbers for bulk material are also referenced in the Description Column of the line item entry for the item to be manufactured/fabricated. Detailed fabrication instructions for items source coded to be manufactured or fabricated are found in Illustrated List of Manufactured Items.

**Index Numbers.** Items which have the word BULK in the figure column will have an index number shown in the item number column. This index number is a cross-reference between the NSN/Part Number (P/N) Index work packages and the bulk material list in the repair parts list work package.

## HOW TO LOCATE REPAIR PARTS

1. **When NSNs or Part Numbers Are Not Known.**

First. Using the table of contents, determine the assembly group to which the item belongs. This is necessary since figures are prepared for assembly groups and subassembly groups, and lists are divided into the same groups.

Second. Find the figure covering the functional group or the subfunctional group to which the item belongs.

Third. Identify the item on the figure and note the number(s).

Fourth. Look in the repair parts list work packages for the figure and item numbers. The NSNs and part numbers are on the same line as the associated item numbers.

2. **When NSN Is Known.**

First. If you have the NSN, look in the STOCK NUMBER column of the NSN index work package. The NSN is arranged in NIIN sequence. Note the figure and item number next to the NSN.

Second. Turn to the figure and locate the item number. Verify that the item is the one you are looking for.

**HOW TO LOCATE REPAIR PARTS - Continued**

3. **When Part Number is Known.**

First. If you have the part number and not the NSN, look in the PART NUMBER column of the part number index work package. Identify the figure and item number.

Second. Look up the item on the figure in the applicable repair parts list work package.

**END OF WORK PACKAGE**

# FIELD MAINTENANCE
# GROUP AQ01 HYDRAULIC CONTROL INSTALLATION

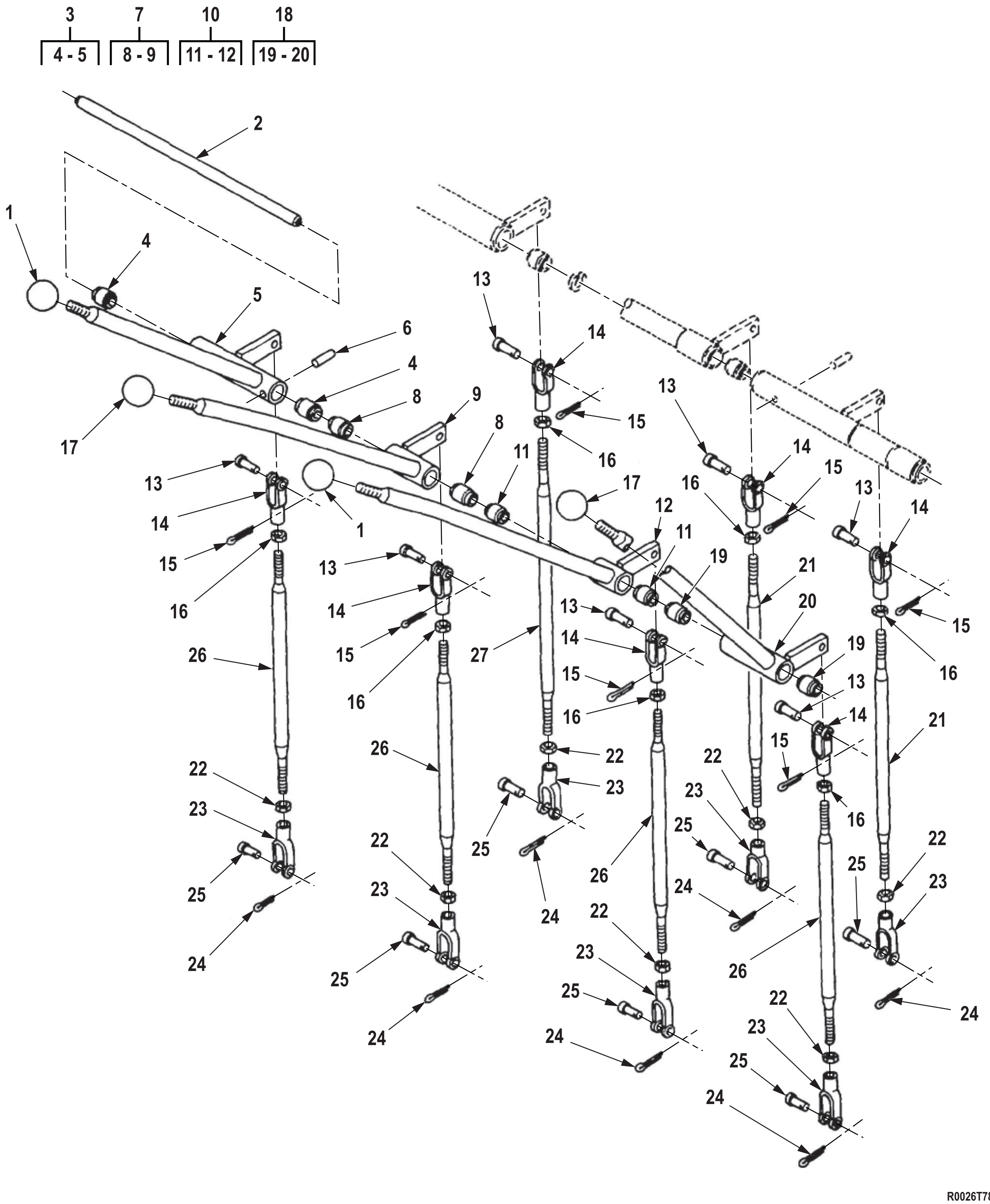



Figure 1. Hydraulic Control Levers and Linkage.

| (1) ITEM NO. | (2) SMR CODE | (3) NSN | (4) CAGEC | (5) PART NUMBER | (6) DESCRIPTION AND USABLE ON CODE (UOC) | (7) QTY |
|---|---|---|---|---|---|---|
| | | | | | **GROUP AQ01 HYDRAULIC CONTROL INSTALLATION.** | |
| | | | | | **FIG. 1. HYDRAULIC CONTROL LEVERS AND LINKAGE.** | |
| 1 | PAFZZ | 5355-01-179-9116 | 97403 | 13211E9392-2 | KNOB RED | 2 |
| 2 | PFFZZ | 3040-01-179-9210 | 19207 | 12325792 | SHAFT,STRAIGHT | 1 |
| 3 | PFFFF | 3040-01-179-9222 | 19207 | 12332232 | BELL CRANK | 1 |
| 4 | PAFZZ | 3120-01-179-9151 | 19207 | 12331895-1 | . BEARING,SLEEVE | 2 |
| 5 | XAFZZ | | 19207 | 12331885 | . BELLCRANK | 1 |
| 6 | PAFZZ | 5315-00-468-1635 | 80205 | MS35674-48 | PIN,GROOVED,HEADLES | 1 |
| 7 | PFFFF | 3040-01-186-8004 | 19207 | 12332097-3 | BELL CRANK | 1 |
| 8 | PAFZZ | 3120-01-179-9151 | 19207 | 12331895-1 | . BEARING,SLEEVE | 2 |
| 9 | XAFZZ | | 19207 | 12325799-3 | . BELLCRANK | 1 |
| 10 | PFFFF | 3040-01-179-9221 | 19207 | 12332097-2 | BELL CRANK | 1 |
| 11 | PAFZZ | 3120-01-179-9151 | 19207 | 12331895-1 | . BEARING,SLEEVE | 2 |
| 12 | XAFZZ | | 19207 | 12325799-2 | . BELLCRANK | 1 |
| 13 | PAFZZ | 5315-00-815-8840 | 96906 | MS35810-4 | PIN,STRAIGHT,HEADED | 7 |
| 14 | PAFZZ | 5340-00-985-0823 | 08277 | 2708-4A | CLEVIS,ROD END | 7 |
| 15 | PAFZZ | 5315-00-842-3044 | 80205 | MS24665-283 | PIN,COTTER | 7 |
| 16 | PAFZZ | 5310-00-975-2075 | 96906 | MS35691-21 | NUT,PLAIN,HEXAGON | 7 |
| 17 | PAFZZ | 5355-01-181-6415 | 97403 | 13211E9392-1 | KNOB BLACK | 2 |
| 18 | PFFFF | 3040-01-179-9220 | 19207 | 12332097-1 | BELL CRANK | 1 |
| 19 | PAFZZ | 3120-01-179-9151 | 19207 | 12331895-1 | . BEARING,SLEEVE | 2 |
| 20 | XAFZZ | | 19207 | 12325799-1 | . BELLCRANK | 1 |
| 21 | PFFZZ | 5306-01-194-0004 | 19207 | 12335109-2 | ROD,THREADED END | 2 |
| 22 | PAFZZ | 5310-00-853-9335 | 96906 | MS35691-13 | NUT,PLAIN,HEXAGON | 7 |
| 23 | PAFZZ | 5340-01-212-0433 | 97403 | 13214E2272 | CLEVIS,ROD END | 7 |
| 24 | PAFZZ | 5315-00-839-2325 | 15434 | 109155 | PIN,COTTER | 7 |
| 25 | PAFZZ | 5315-00-081-7875 | 00462 | 1141-51 | PIN,STRAIGHT,HEADED | 7 |
| 26 | PFFZZ | 5306-01-194-0003 | 19207 | 12335109-1 | ROD,THREADED END | 4 |
| 27 | PFFZZ | 5306-01-194-7033 | 19207 | 12335109-3 | ROD,THREADED END | 1 |

**END OF FIGURE**

# FIELD MAINTENANCE
## GROUP A501 WINCH INSTALLATION

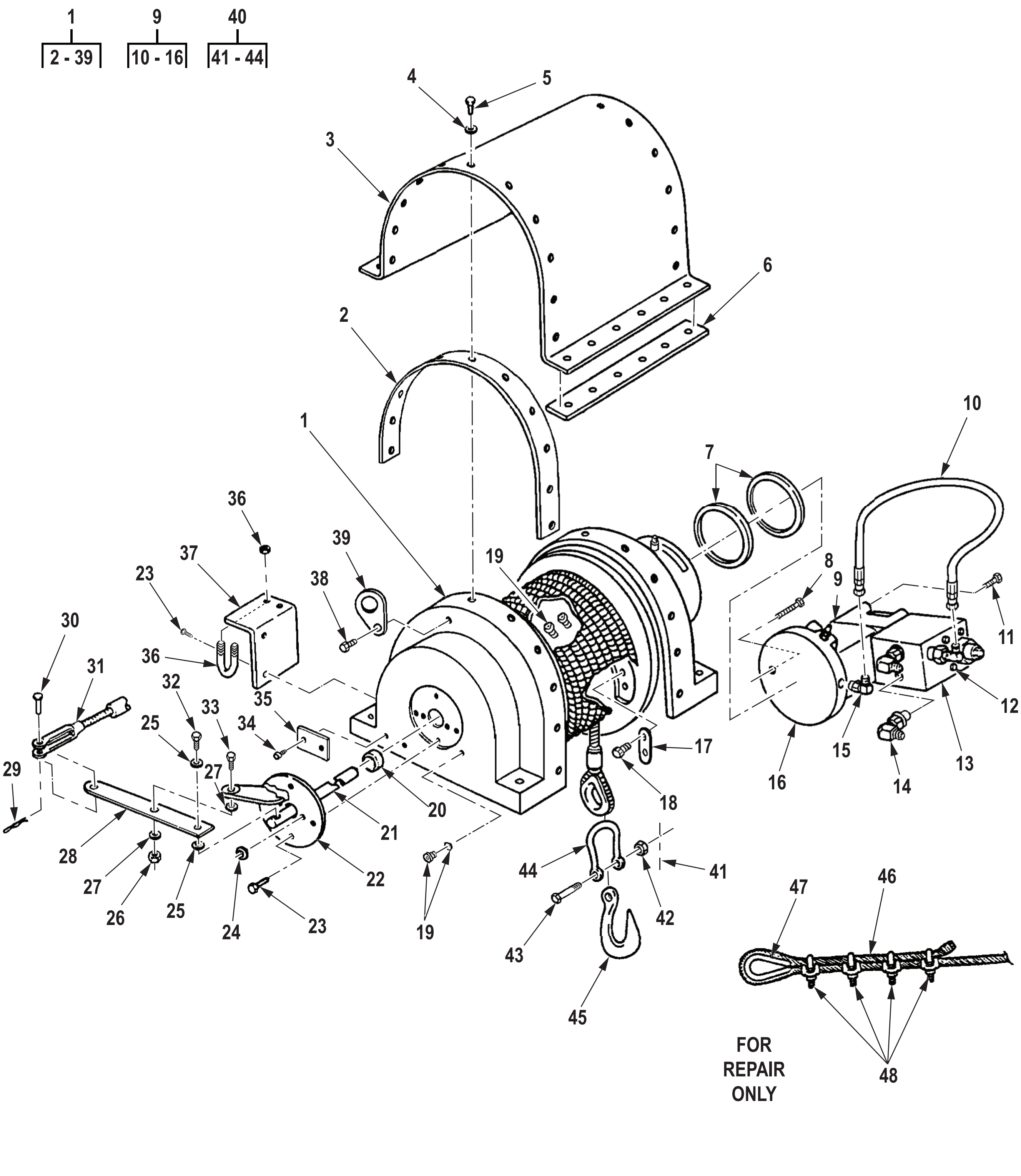



Figure 2. Winch Assembly -7D3-05815.

| (1) ITEM NO. | (2) SMR CODE | (3) NSN | (4) CAGEC | (5) PART NUMBER | (6) DESCRIPTION AND USABLE ON CODE (UOC) | (7) QTY |
|---|---|---|---|---|---|---|
| | | | | | **GROUP A501 WINCH INSTALLATION.** | |
| | | | | | **FIG. 2. WINCH ASSEMBLY -7D3-05815.** | |
| 1 | PAFHH | 2590-01-440-8736 | 34712 | 7D3-05815 | WINCH,DRUM,VEHICLEM 35,000 LB FULL CAPACITY.................................... | 1 |
| 2 | PAFZA | 5330-01-440-7575 | 34712 | 7B1-06951 | . PACKING,PREFORMED.......................... | 2 |
| 3 | PFFZZ | 2590-01-440-8752 | 34712 | 7D1-06124 | . COVER,WINCH........................................ | 1 |
| 4 | PAFZZ | 5310-00-809-5998 | 96906 | MS27183-18 | . WASHER,FLAT....................................... | 20 |
| 5 | PAFZZ | 5305-00-543-4372 | 80204 | B1821BH038C075N | . SCREW,CAP,HEXAGON H..................... | 20 |
| 6 | PAFZA | 5330-01-440-7577 | 34712 | 7B1-06965 | . GASKET................................................... | 2 |
| 7 | PFFZZ | 3120-01-175-9336 | 70417 | TT-2304-02 | . BEARING,WASHER,THRU....................... | 2 |
| 8 | PAFZZ | 5305-00-071-2081 | 80204 | B1821BH050C450N | . SCREW,CAP,HEXAGON H....................... | 2 |
| 9 | PAFFF | 2540-01-461-5899 | 34712 | 7D3-06212 | . MOTOR,HYDRAULIC................................ | 1 |
| 10 | PAFZZ | 4720-01-441-1294 | 34712 | 7B8-06961 | . . HOSE ASSEMBLY,NONME................... | 1 |
| 11 | PAFZZ | 5305-00-071-2067 | 80204 | B1821BH050C125N | . . SCREW,CAP,HEXAGON H.................... | 4 |
| 12 | PAFZZ | 5305-00-846-5703 | 80204 | B1821BH038C300N | . . SCREW,CAP,HEXAGON H.................... | 3 |
| 13 | PAFZZ | 4730-01-440-5269 | 54035 | 9510-179-A06 | . . MANIFOLD ASSEMBLY,H...................... | 1 |
| 14 | PAFZZ | 4730-00-822-5609 | 96906 | MS51527A8 | . . ELBOW,TUBE TO BOSS 90 DEGREES WITH O-RING............................ | 2 |
| 15 | PAFZZ | 4730-00-811-1848 | 96906 | MS51527A4P | . . ELBOW,TUBE TO BOSS 90 DEGREES WITH O-RING............................ | 3 |
| 16 | XAFZZ | 2530-01-415-9449 | 92865 | 3B-131240-L2 | . . BRAKE,MULTIPLE DISK........................ | 1 |
| 17 | PAFZZ | 4010-01-440-9273 | 34712 | 7B1-6946 | . WIRE ROPE ASSEMBLY,......................... | 1 |
| 18 | PAFZZ | 5305-00-071-2067 | 80204 | B1821BH050C125N | . SCREW,CAP,HEXAGON H....................... | 2 |
| 19 | PAFZZ | 5365-01-116-3731 | 30780 | 5HP50NSS | . PLUG,MACHINE THREAD........................ | 3 |
| 20 | PAFZA | 5330-00-180-9037 | 80201 | 4984 | . SEAL,PLAIN ENCASED............................ | 1 |
| 21 | PAFDD | 3040-01-495-5955 | 34712 | 7D3-06213 | ACTUATOR,MECHANICAL......................... | 1 |
| 22 | PFFZZ | 5340-01-440-1445 | 34712 | 7C1-05925 | . COVER,ACCESS...................................... | 1 |
| 23 | PAFZZ | 5305-00-068-0510 | 05047 | B1821BH038C100N | . SCREW,CAP,HEXAGON H....................... | 8 |
| 24 | PAFZZ | 5310-01-442-6932 | 39428 | 93783A031 | . WASHER,SEAL........................................ | 2 |
| 25 | PAFZZ | 5310-01-335-7092 | 96906 | MS27183-11 | . WASHER,FLAT........................................ | 2 |
| 26 | PAFZZ | 5310-00-851-2682 | 96906 | MS35691-17 | . NUT,PLAIN,HEXAGON............................. | 2 |
| 27 | PAFZZ | 5310-00-809-5997 | 96906 | MS27183-17 | . WASHER,FLAT........................................ | 2 |
| 28 | PFFZZ | 3040-01-440-7132 | 34712 | 7B1-06949 | . LEVER,REMOTE CONTRO...................... | 1 |
| 29 | PAFZZ | 5315-00-842-3044 | 80205 | MS24665-283 | . PIN,COTTER............................................ | 1 |
| 30 | PAFZZ | 5315-01-317-2696 | 06970 | CP103 | . PIN,STRAIGHT,HEADED.......................... | 1 |
| 31 | PAFZZ | 5340-00-400-3606 | 06970 | AC218 | . CLEVIS..................................................... | 1 |

| (1) ITEM NO. | (2) SMR CODE | (3) NSN | (4) CAGEC | (5) PART NUMBER | (6) DESCRIPTION AND USABLE ON CODE (UOC) | (7) QTY |
|---|---|---|---|---|---|---|
| 32 | PAFZZ | 5306-00-226-4824 | 80204 | B1821BH031C063N | . BOLT,MACHINE....................................... | 1 |
| 33 | PAFZZ | 5305-01-373-6291 | 96906 | MS51576-37 | . SCREW,SHOULDER................................ | 1 |
| 34 | PFFZZ | 5305-00-253-5625 | 80205 | MS21318-46 | . SCREW,DRIVE......................................... | 2 |
| 35 | PFFZZ | 9905-01-440-7208 | 34712 | 7B1-07039 | . PLATE,IDENTIFICATIO............................ | 1 |
| 36 | PAFZZ | 5306-01-456-9447 | 06970 | 161-010-004 | . BOLT,U..................................................... | 1 |
| 37 | PFFZZ | 5340-01-440-1443 | 34712 | 7B1-06950 | . BRACKET,ANGLE................................... | 1 |
| 38 | PAFZZ | 5305-00-071-2066 | 80204 | B1821BH050C100N | . SCREW,CAP,HEXAGON H....................... | 2 |
| 39 | PFFZZ | 5340-01-440-8652 | 34712 | 7B1-06991 | . BRACKET,MOUNTING............................ | 2 |
| 40 | PAFZZ | 4030-01-472-9767 | 19207 | 12466295-1 | SHACKLE.................................................... | 1 |
| 41 | PAFZZ | 5315-00-234-1673 | 80205 | MS24665-688 | . PIN,COTTER PART OF P/N 12466295...................................................... | 1 |
| 42 | PAFZZ | 5310-01-454-5759 | 2T469 | C0122-N | . NUT,PLAIN,HEXAGON PART OF P/N 12466295............................................. | 1 |
| 43 | XAFZZ | | 19207 | 12466295-A | . BOLT,MACHINE PART OF P/N 12466295...................................................... | 1 |
| 44 | XAFZZ | | 19207 | 12466295-B | . SHACKLE PART OF P/N 12466295..... | 1 |
| 45 | PAFZZ | 2540-01-454-0663 | 2T469 | C0120 | HOOK,TOW................................................. | 1 |
| 46 | PAFFF | 4010-01-460-7224 | 19207 | 12412159 | WIRE ROPE ASSEMBLY,............................ | 1 |
| 47 | PAFZZ | 4030-01-454-2066 | 75535 | 1037390 | THIMBLE,ROPE USE FOR WIRE ROPE REPAIR ONLY.................................. | 1 |
| 48 | PAFZZ | 4030-00-243-4442 | 96906 | MS16842-9 | CLAMP,WIRE ROPE,SAD USE FOR WIRE ROPE REPAIR ONLY............... | 4 |

**END OF FIGURE**

# FIELD MAINTENANCE
## GROUP A801 HYDRAULIC DIAGNOSTIC CENTER COMPONENTS

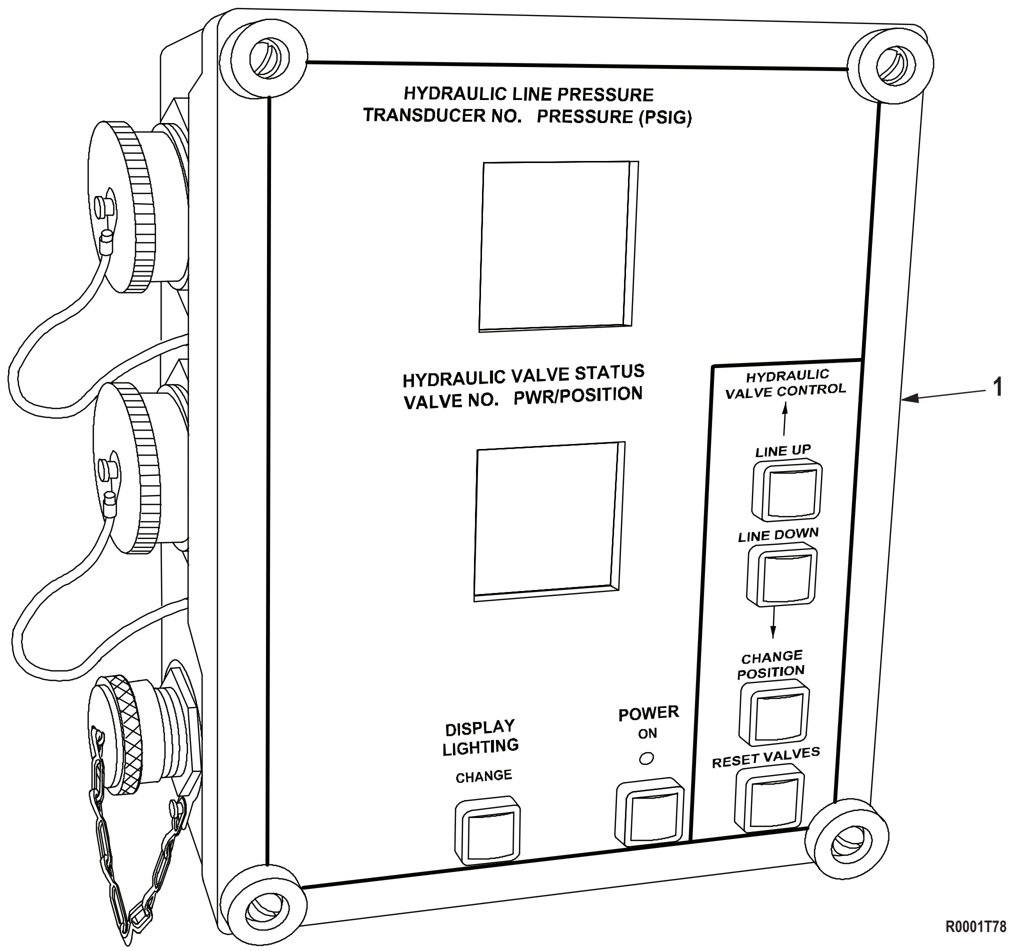



Figure 3. Hydraulic Diagnostic Center (HDC) Control Box.

| (1) ITEM NO. | (2) SMR CODE | (3) NSN | (4) CAGEC | (5) PART NUMBER | (6) DESCRIPTION AND USABLE ON CODE (UOC) | (7) QTY |
|---|---|---|---|---|---|---|
| | | | | | **GROUP A801 HYDRAULIC DIAGNOSTIC CENTER COMPONENTS.** | |
| | | | | | **FIG. 3. HYDRAULIC DIAGNOSTIC CENTER (HDC) CONTROL BOX.** | |
| 1 | PAFHL | 6110-01-537-8428 | 19207 | 12496937 | DISTRIBUTION BOX.................................... | 1 |
| | | | | | **END OF FIGURE** | |

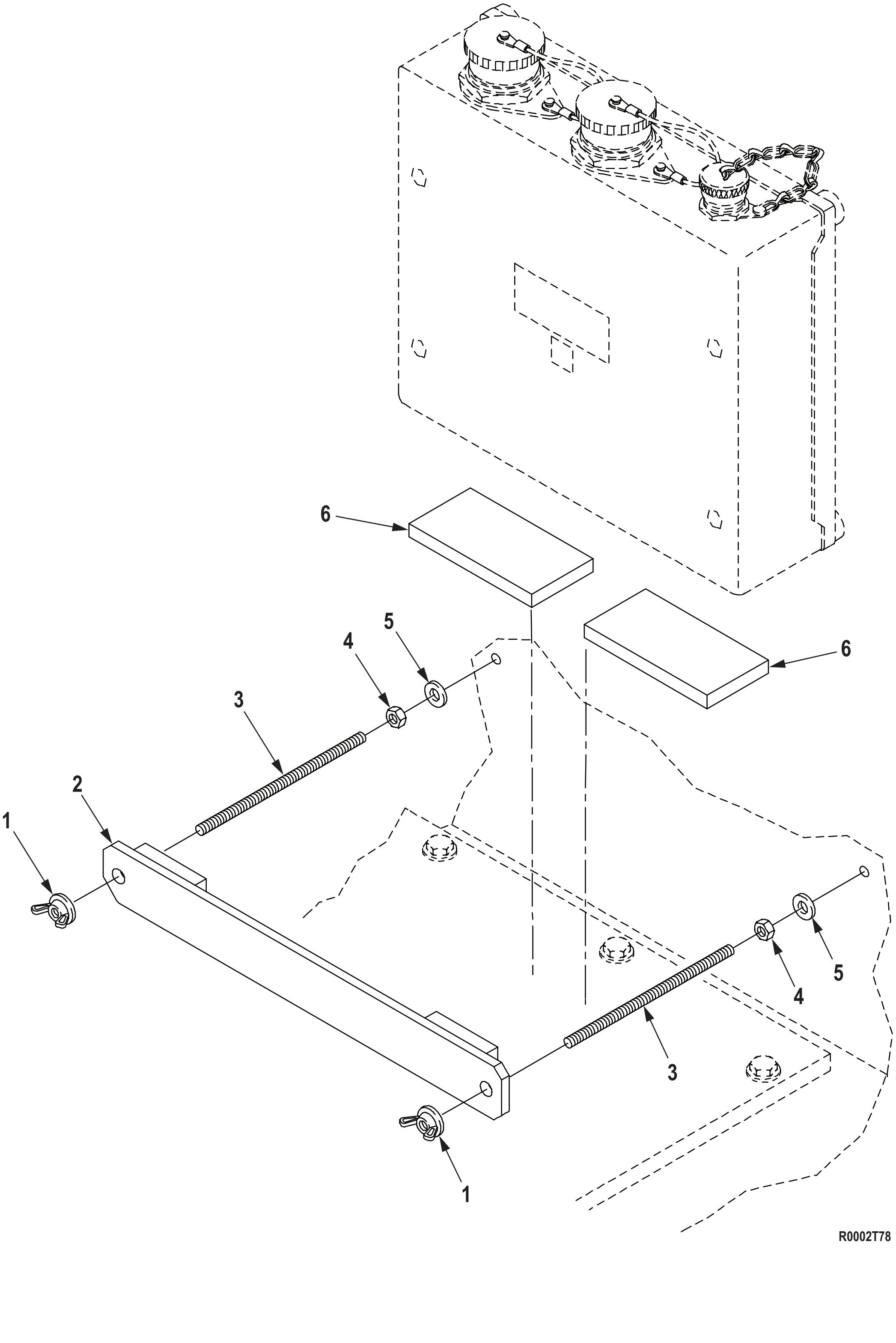



Figure 4. Hydraulic Diagnostic Center (HDC) Stowage Bracket.

| (1) ITEM NO. | (2) SMR CODE | (3) NSN | (4) CAGEC | (5) PART NUMBER | (6) DESCRIPTION AND USABLE ON CODE (UOC) | (7) QTY |
|---|---|---|---|---|---|---|
| | | | | | **GROUP A801 HYDRAULIC DIAGNOSTIC CENTER COMPONENTS.** | |
| | | | | | **FIG. 4. HYDRAULIC DIAGNOSTIC CENTER (HDC) STOWAGE BRACKET.** | |
| 1 | PAFZZ | 5310-00-815-1073 | 26233 | S-7926 | NUT,SELF-LOCKING,WI............................. | 2 |
| 2 | PAFZZ | 5340-01-536-9863 | 19207 | 12496933 | BRACKET,MOUNTING................................ | 1 |
| 3 | PAFZZ | 5307-01-536-0580 | 80205 | NAS1454C4A-0504 | STUD,CONTINUOUS THR.......................... | 2 |
| 4 | PAFZZ | 5310-00-761-6882 | 96906 | MS51967-2 | NUT,PLAIN,HEXAGON................................ | 2 |
| 5 | PAFZZ | 5310-00-285-8124 | 96906 | MS27183-50 | WASHER,FLAT........................................... | 2 |
| 6 | PAFZZ | 2590-01-536-1519 | 19207 | 12496932 | PAD,CUSHIONING..................................... | 2 |

**END OF FIGURE**

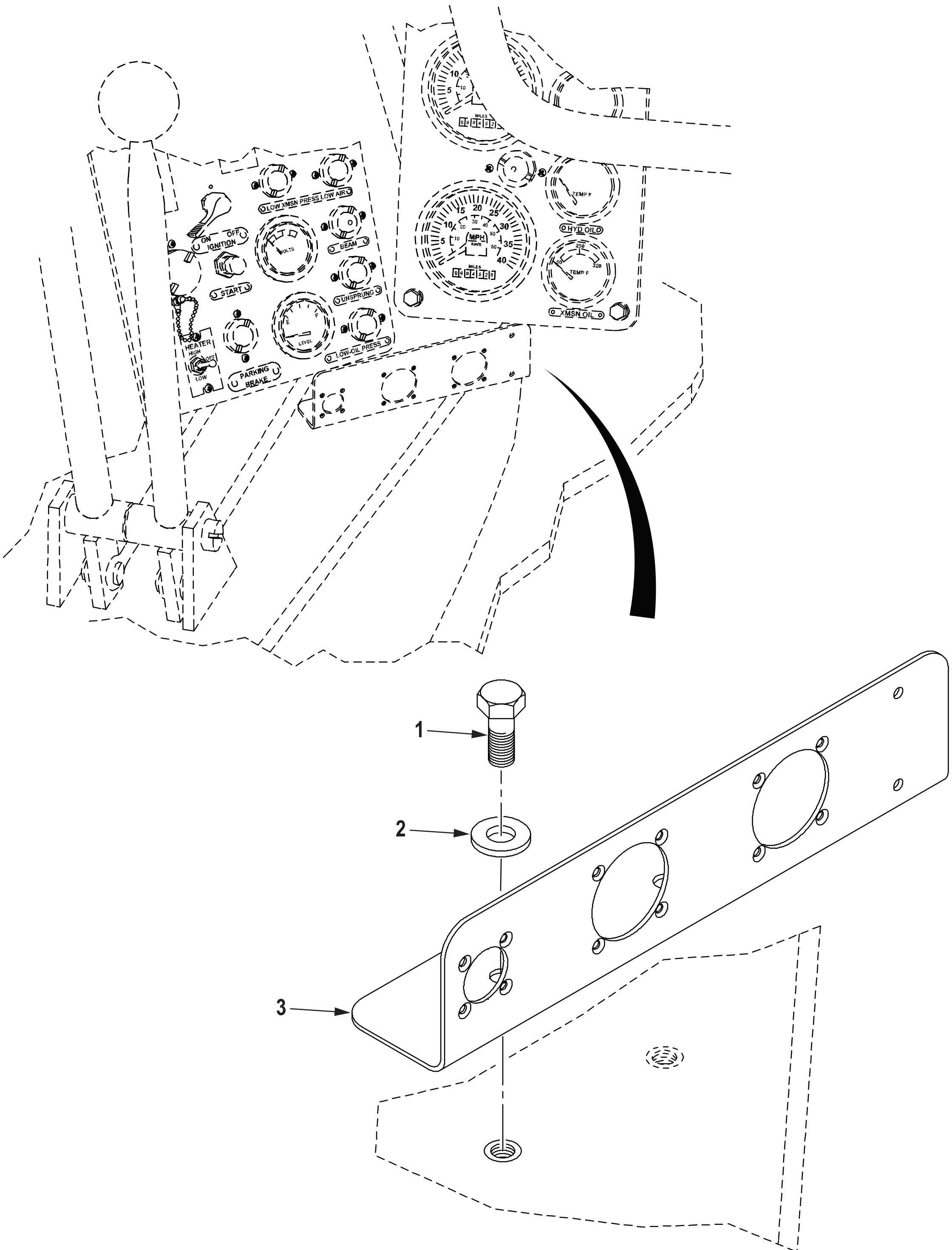



Figure 5. Hydraulic Diagnostic Center (HDC) Disconnect Bracket.

| (1) ITEM NO. | (2) SMR CODE | (3) NSN | (4) CAGEC | (5) PART NUMBER | (6) DESCRIPTION AND USABLE ON CODE (UOC) | (7) QTY |
|---|---|---|---|---|---|---|
| | | | | | **GROUP A801 HYDRAULIC DIAGNOSTIC CENTER COMPONENTS.** | |
| | | | | | **FIG. 5. HYDRAULIC DIAGNOSTIC CENTER (HDC) DISCONNECT BRACKET.** | |
| 1 | PAFZZ | 5306-01-175-7558 | 80204 | B1821BH025C075L | BOLT,MACHINE.......................................... | 2 |
| 2 | PAFZZ | 5310-00-285-8124 | 96906 | MS27183-50 | WASHER,FLAT........................................... | 2 |
| 3 | PAFZZ | 2590-01-536-3813 | 19207 | 12496964 | BRACKET,VEHICULAR C............................ | 1 |

**END OF FIGURE**

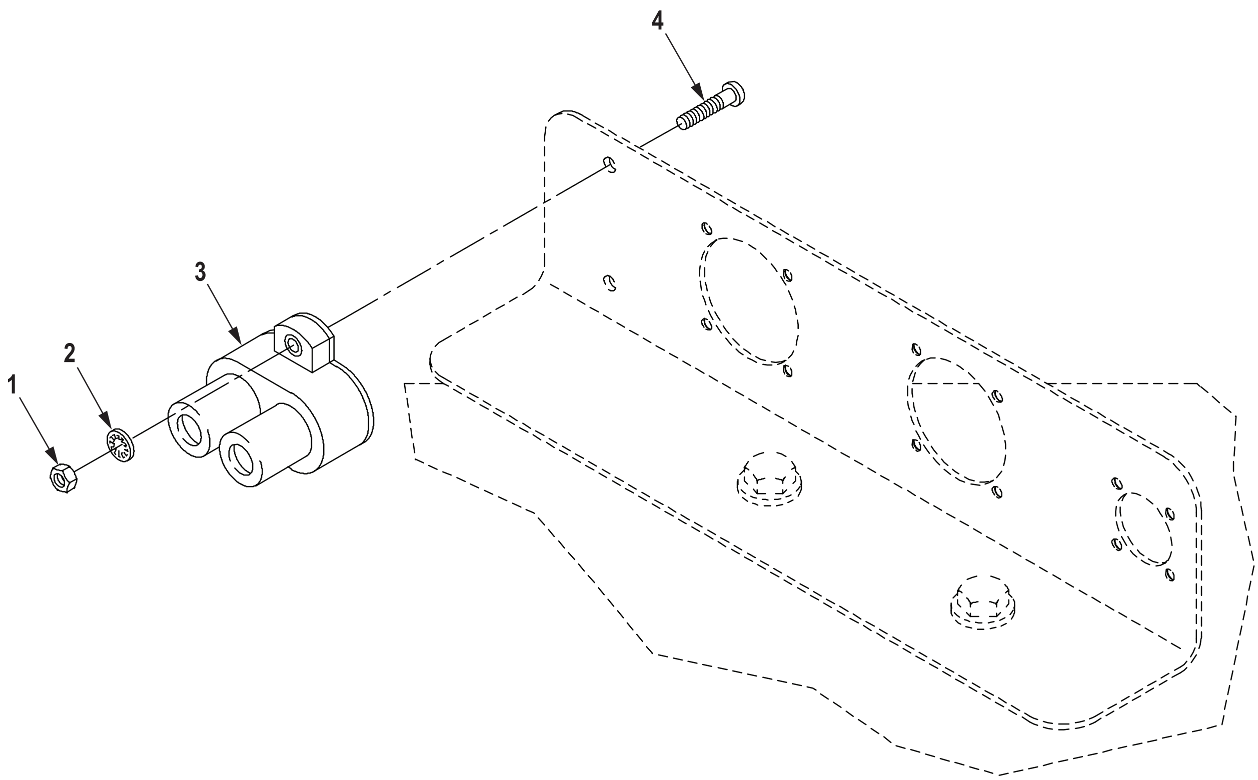



Figure 6. Hydraulic Diagnostic Center (HDC) Circuit Breaker.

| (1) ITEM NO. | (2) SMR CODE | (3) NSN | (4) CAGEC | (5) PART NUMBER | (6) DESCRIPTION AND USABLE ON CODE (UOC) | (7) QTY |
|---|---|---|---|---|---|---|
| | | | | | **GROUP A801 HYDRAULIC DIAGNOSTIC CENTER COMPONENTS.** | |
| | | | | | **FIG. 6. HYDRAULIC DIAGNOSTIC CENTER (HDC) CIRCUIT BREAKER.** | |
| 1 | PAFZZ | 5310-00-934-9757 | 80205 | MS35649-282 | NUT,PLAIN,HEXAGON................................ | 2 |
| 2 | PAFZZ | 5310-00-559-0070 | 72582 | 115544 | WASHER,LOCK.......................................... | 2 |
| 3 | PAFZZ | 5925-01-430-2318 | 58536 | AA55571/01-001 | CIRCUIT BREAKER.................................... | 1 |
| 4 | PAFZZ | 5305-00-984-6197 | 05869 | 4177205-028 | SCREW,MACHINE...................................... | 2 |
| | | | | | **END OF FIGURE** | |

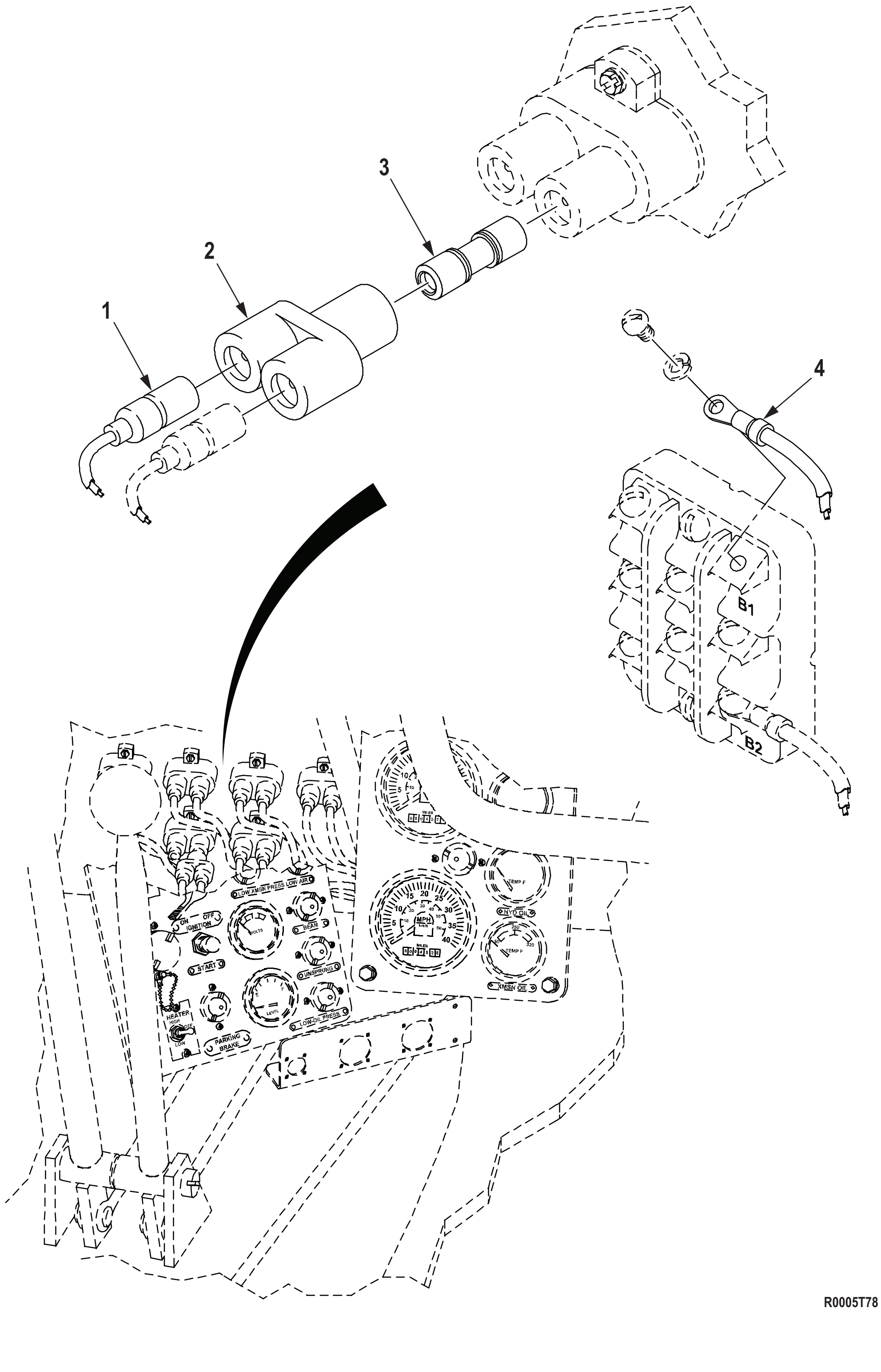



Figure 7. Hydraulic Diagnostic Center (HDC) Power Components.

| (1) ITEM NO. | (2) SMR CODE | (3) NSN | (4) CAGEC | (5) PART NUMBER | (6) DESCRIPTION AND USABLE ON CODE (UOC) | (7) QTY |
|---|---|---|---|---|---|---|
| | | | | | **GROUP A801 HYDRAULIC DIAGNOSTIC CENTER COMPONENTS.** | |
| | | | | | **FIG. 7. HYDRAULIC DIAGNOSTIC CENTER (HDC) POWER COMPONENTS.** | |
| 1 | PAFZZ | 6150-01-536-3072 | 19207 | 12496957 | LEAD,ELECTRICAL.................................... | 1 |
| 2 | PAFZZ | 5935-00-900-6281 | 96906 | MS27147-1 | ADAPTER,CONNECTOR............................ | 1 |
| 3 | PAFZZ | 5935-00-807-4109 | 19207 | 8741492 | ADAPTER,CONNECTOR............................ | 1 |
| 4 | PAFZZ | 6150-01-536-2015 | 19207 | 12496958 | LEAD,ELECTRICAL.................................... | 1 |
| | | | | | **END OF FIGURE** | |

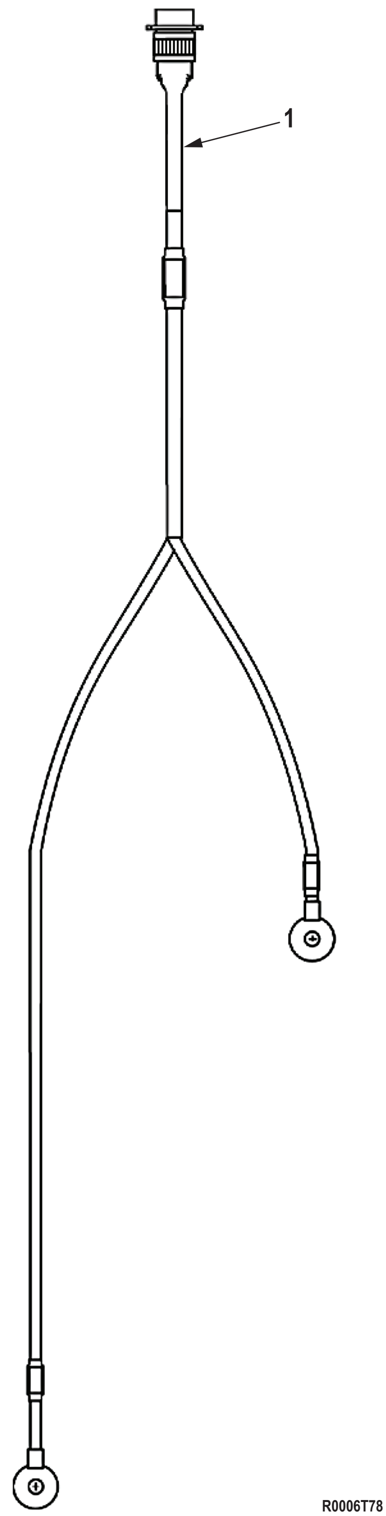



Figure 8. Wiring Harness W1.

| (1) ITEM NO. | (2) SMR CODE | (3) NSN | (4) CAGEC | (5) PART NUMBER | (6) DESCRIPTION AND USABLE ON CODE (UOC) | (7) QTY |
|---|---|---|---|---|---|---|
| | | | | | **GROUP A801 HYDRAULIC DIAGNOSTIC CENTER COMPONENTS.** | |
| | | | | | **FIG. 8. WIRING HARNESS W1.** | |
| 1 | PAFZZ | 6150-01-536-1117 | 19207 | 12496953 | CABLE ASSEMBLY,SPEC........................... | 1 |
| | | | | | **END OF FIGURE** | |

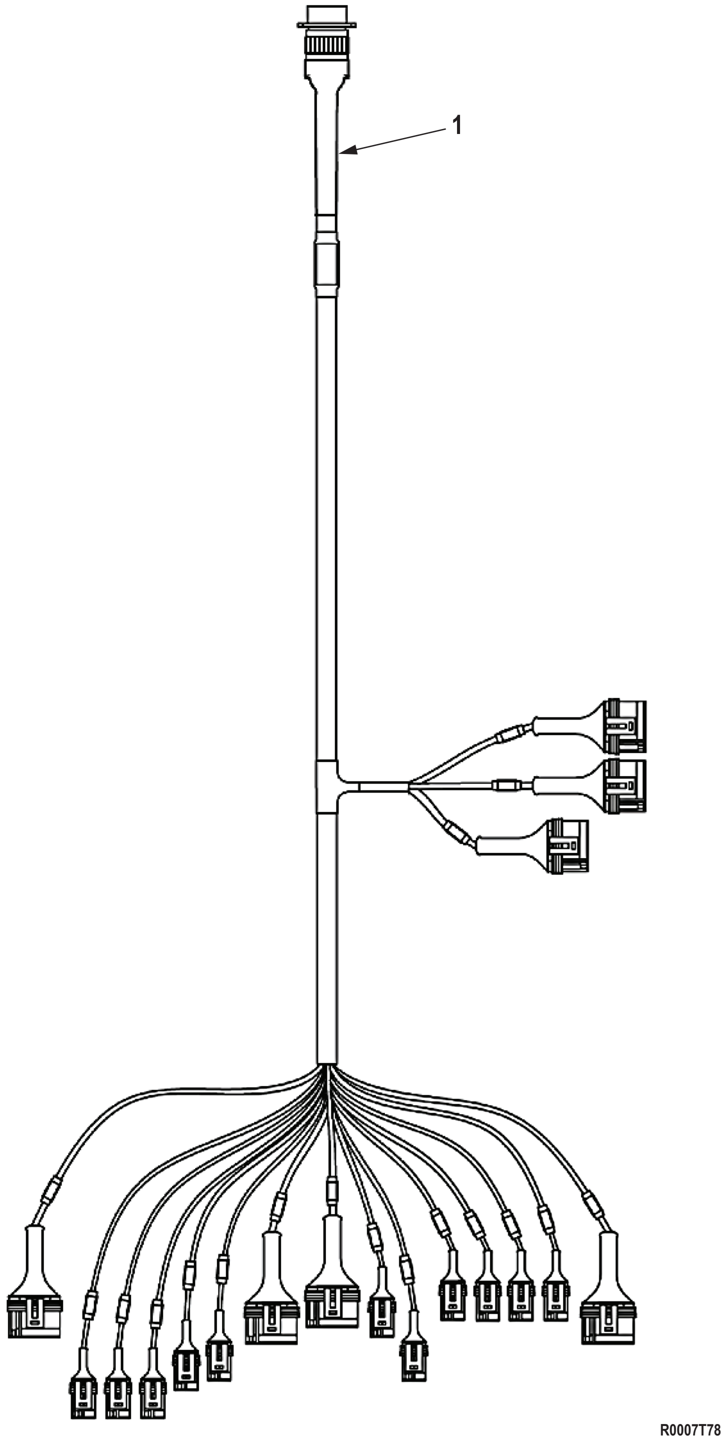



Figure 9. Wiring Harness W2.

| (1) ITEM NO. | (2) SMR CODE | (3) NSN | (4) CAGEC | (5) PART NUMBER | (6) DESCRIPTION AND USABLE ON CODE (UOC) | (7) QTY |
|---|---|---|---|---|---|---|
| | | | | | **GROUP A801 HYDRAULIC DIAGNOSTIC CENTER COMPONENTS.** | |
| | | | | | **FIG. 9. WIRING HARNESS W2.** | |
| 1 | PAFZA | 6150-01-536-2129 | 19207 | 12496954 | CABLE ASSEMBLY,SPEC.......................... | 1 |
| | | | | | **END OF FIGURE** | |

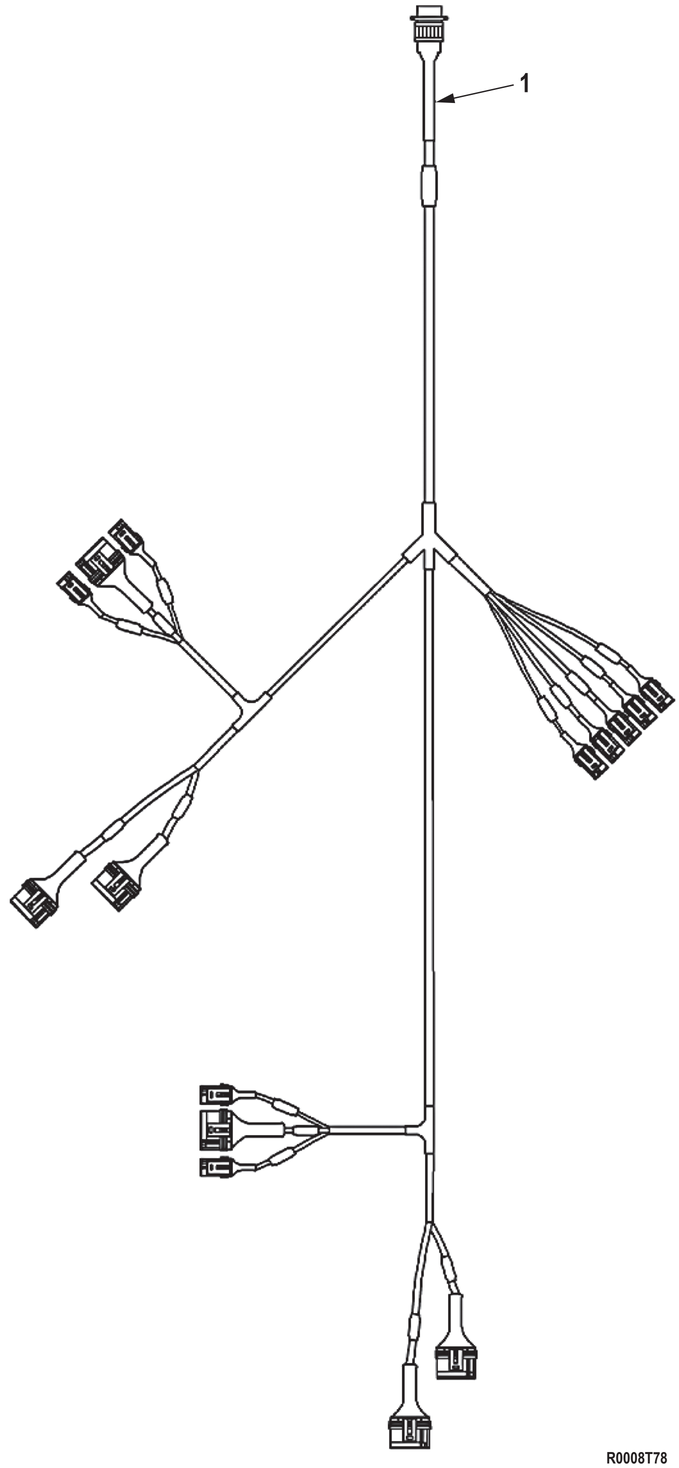



Figure 10. Wiring Harness W3.

| (1) ITEM NO. | (2) SMR CODE | (3) NSN | (4) CAGEC | (5) PART NUMBER | (6) DESCRIPTION AND USABLE ON CODE (UOC) | (7) QTY |
|---|---|---|---|---|---|---|
| | | | | | **GROUP A801 HYDRAULIC DIAGNOSTIC CENTER COMPONENTS.** | |
| | | | | | **FIG. 10. WIRING HARNESS W3.** | |
| 1 | PAFZA | 6150-01-536-3311 | 19207 | 12496955 | CABLE ASSEMBLY,SPEC.......................... | 1 |
| | | | | | **END OF FIGURE** | |

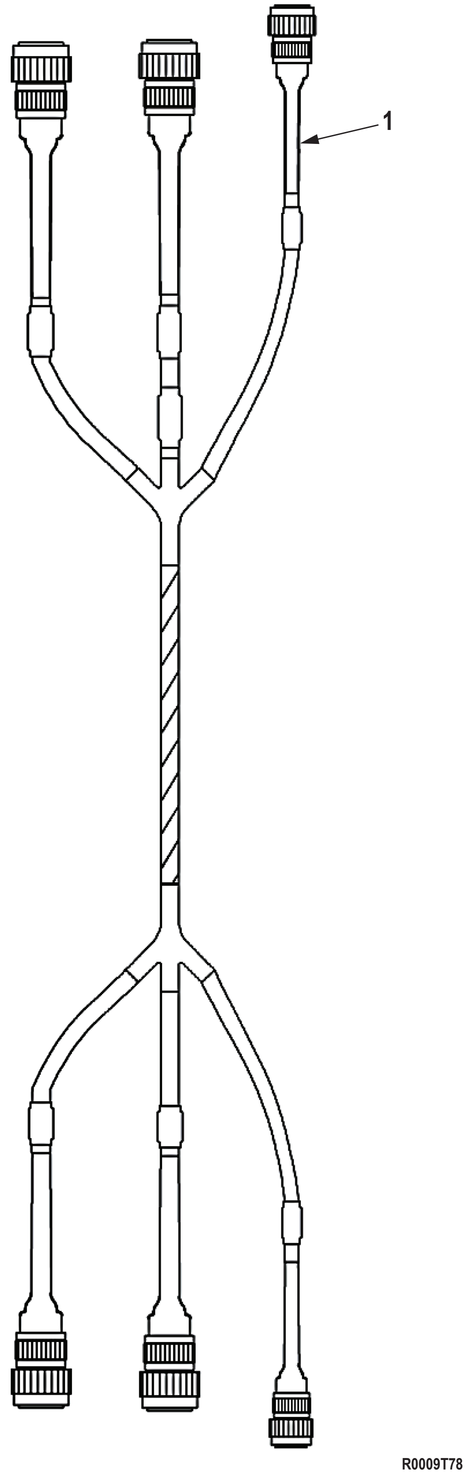



Figure 11. Wiring Harness W4.

| (1) ITEM NO. | (2) SMR CODE | (3) NSN | (4) CAGEC | (5) PART NUMBER | (6) DESCRIPTION AND USABLE ON CODE (UOC) | (7) QTY |
|---|---|---|---|---|---|---|
| | | | | | **GROUP A801 HYDRAULIC DIAGNOSTIC CENTER COMPONENTS.** | |
| | | | | | **FIG. 11. WIRING HARNESS W4.** | |
| 1 | PAFZZ | 6150-01-536-5854 | 19207 | 12496956 | CABLE ASSEMBLY,SPEC.......................... | 1 |
| | | | | | **END OF FIGURE** | |

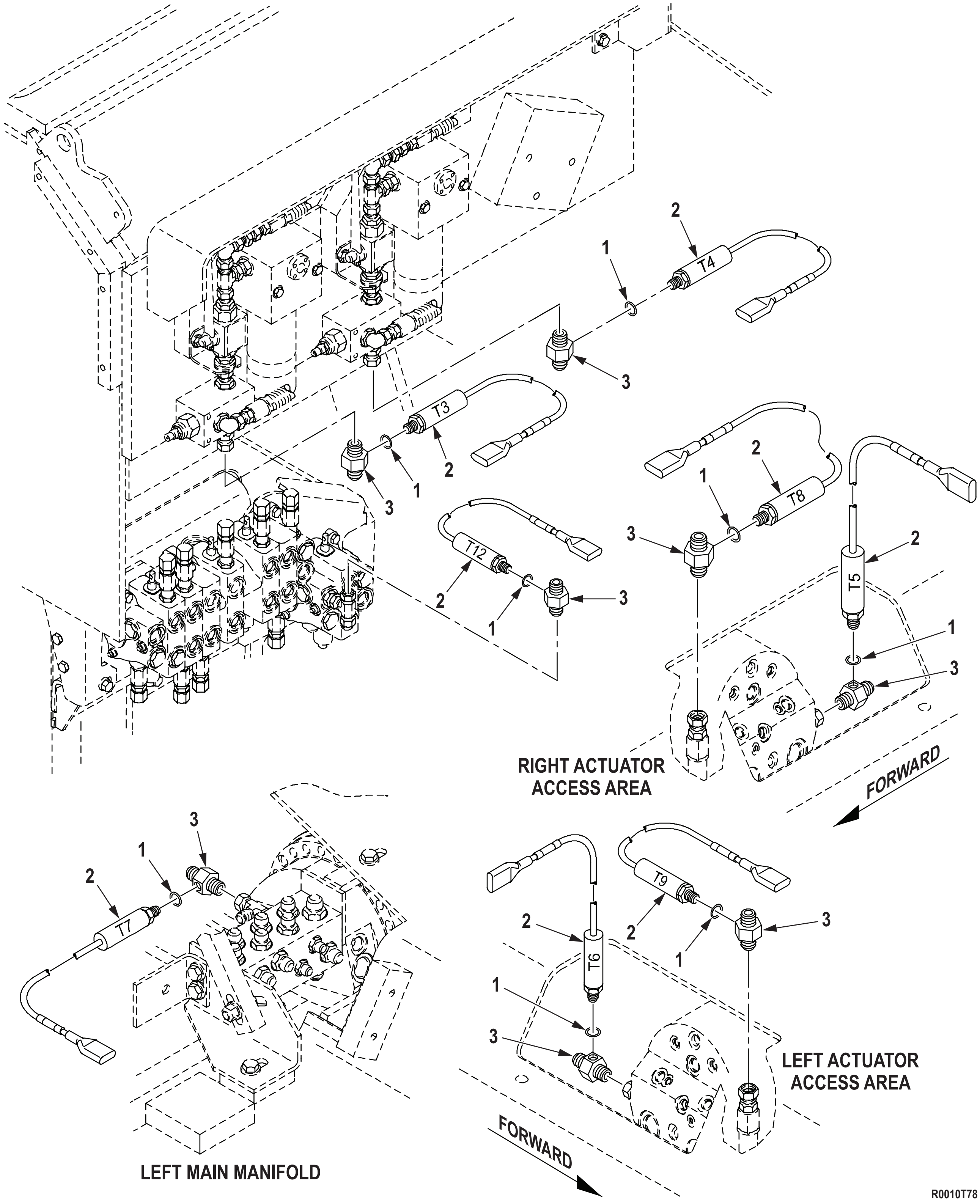



Figure 12. Pressure Transducers.

| (1) ITEM NO. | (2) SMR CODE | (3) NSN | (4) CAGEC | (5) PART NUMBER | (6) DESCRIPTION AND USABLE ON CODE (UOC) | (7) QTY |
|---|---|---|---|---|---|---|
| | | | | | **GROUP A801 HYDRAULIC DIAGNOSTIC CENTER COMPONENTS.** | |
| | | | | | **FIG. 12. PRESSURE TRANSDUCERS.** | |
| 1 | PCFZZ | 5331-00-805-2966 | 81343 | MS28778-4 | O-RING........................................................ | 3 |
| 2 | PAFZZ | 6695-01-536-2040 | 19207 | 12496923 | TRANSDUCER,PRESSURE........................ | 3 |
| 3 | PAFZZ | 4730-01-537-0516 | 30780 | 8-4XHX6G5TP | TEE,BOSS................................................... | 8 |
| | | | | | **END OF FIGURE** | |

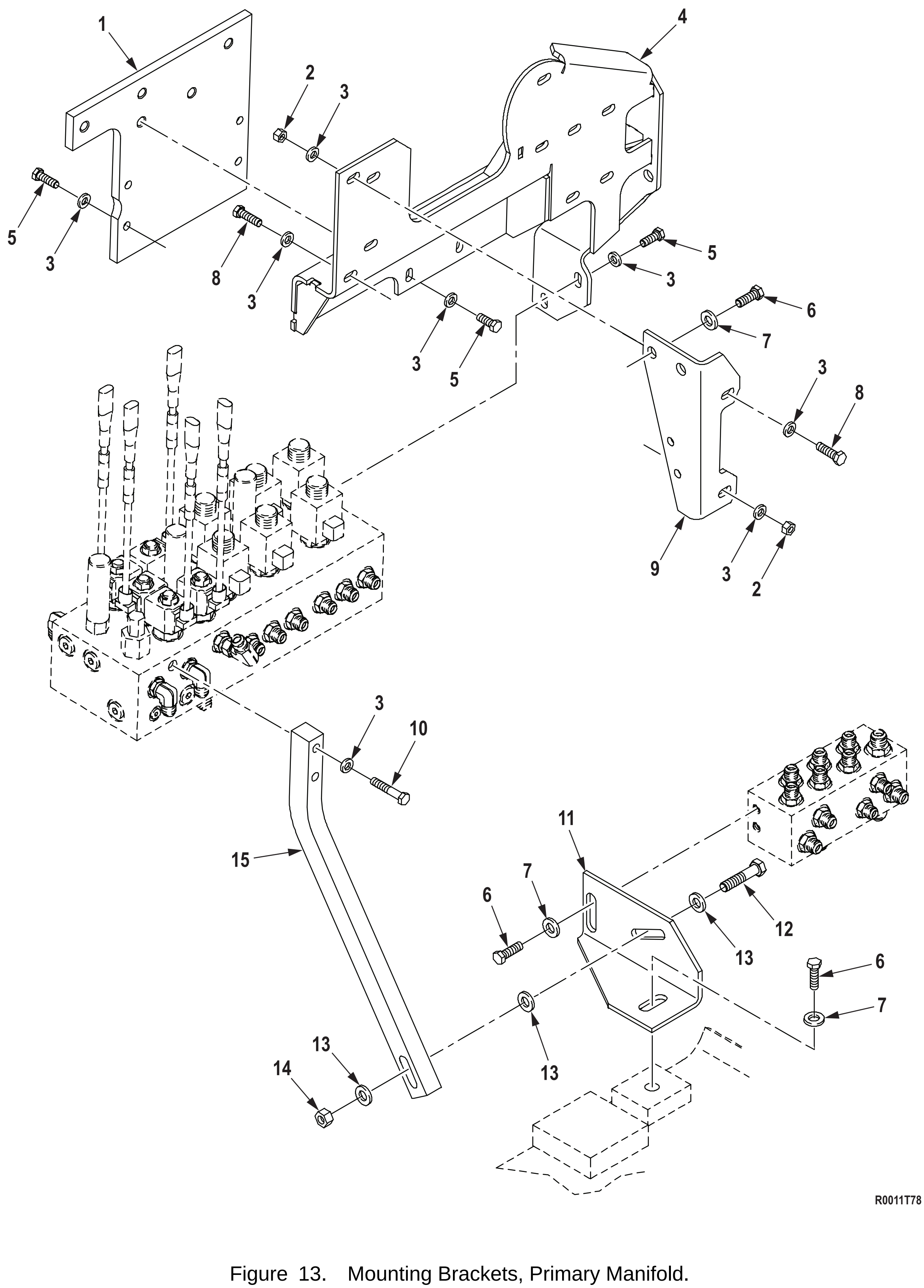



Figure 13. Mounting Brackets, Primary Manifold.

| (1) ITEM NO. | (2) SMR CODE | (3) NSN | (4) CAGEC | (5) PART NUMBER | (6) DESCRIPTION AND USABLE ON CODE (UOC) | (7) QTY |
|---|---|---|---|---|---|---|
| | | | | | **GROUP A801 HYDRAULIC DIAGNOSTIC CENTER COMPONENTS.** | |
| | | | | | **FIG. 13. MOUNTING BRACKETS, PRIMARY MANIFOLD.** | |
| 1 | PAFZZ | 5340-01-536-1486 | 19207 | 12496959 | PLATE,MOUNTING...................................... | 1 |
| 2 | PAFZZ | 5310-00-483-8790 | 80205 | MS17829-6C | NUT,SELF-LOCKING,HE............................. | 2 |
| 3 | PAFZZ | 5310-00-877-5972 | 19200 | 10910174-3 | WASHER,FLAT (USED IN DISTRIBUTION BOX)PRIMARY MANIF/GPA............................................... | 17 |
| 4 | PAFZZ | 2590-01-537-2318 | 19207 | 12496944 | BRACKET,VEHICULAR C........................... | 1 |
| 5 | PAFZZ | 5306-01-114-0963 | 80204 | B1821BH038C100L | BOLT,MACHINE (USED IN PRIMARY MANIFOLD)BKTS/GPA............. | 11 |
| 6 | PAFZZ | 5306-01-196-0442 | 80204 | B1821BH050C113L | BOLT,MACHINE.......................................... | 8 |
| 7 | PAFZZ | 5310-00-809-5998 | 96906 | MS27183-18 | WASHER,FLAT........................................... | 8 |
| 8 | PAFZZ | 5305-00-068-0511 | 80204 | B1821BH038C125N | SCREW,CAP,HEXAGON H......................... | 2 |
| 9 | PAFZZ | 5340-01-536-2060 | 19207 | 12496952 | BRACKET,ANGLE....................................... | 1 |
| 10 | PAFZZ | 5306-01-194-0591 | 80204 | B1821BH038C200L | BOLT,MACHINE (USED IN DIST BOX)MANIF BKT/PRIMARY MANIF/ GPA............................................................. | 2 |
| 11 | PAFZZ | 5340-01-536-4160 | 19207 | 12496927 | BRACKET,ANGLE....................................... | 1 |
| 12 | PAFZZ | 5305-00-071-2073 | 80204 | B1821BH050C250N | SCREW,CAP,HEXAGON H......................... | 1 |
| 13 | PAFZZ | 5310-00-866-4417 | 19207 | 10910174-5 | WASHER,FLAT........................................... | 3 |
| 14 | PAFZZ | 5310-00-595-7421 | 80205 | MS17829-8C | NUT,SELF-LOCKING,HE............................. | 1 |
| 15 | PAFZZ | 5340-01-536-7170 | 19207 | 12496924 | BRACKET,MOUNTING................................ | 1 |

**END OF FIGURE**

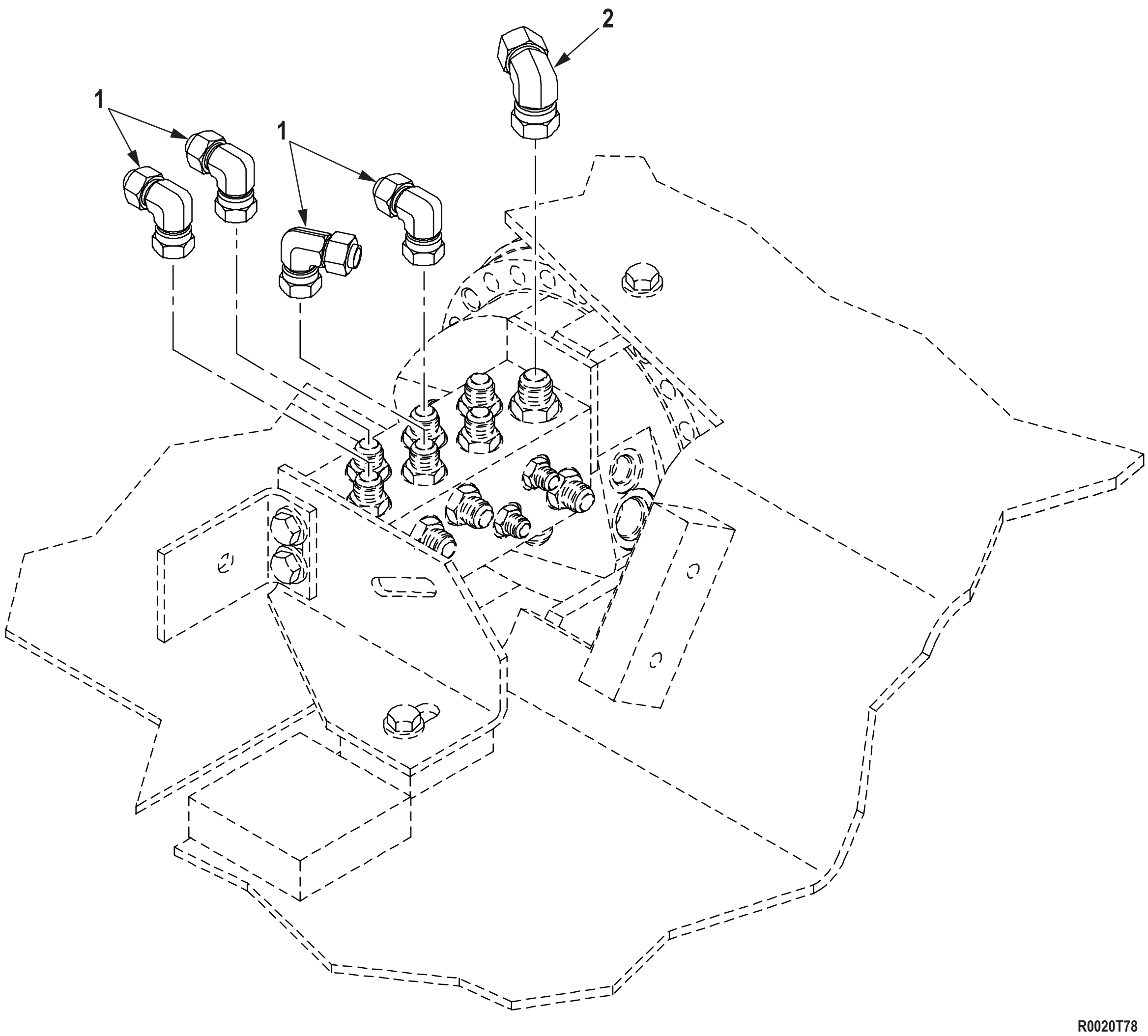



Figure 14. Left Main Manifold.

| (1) ITEM NO. | (2) SMR CODE | (3) NSN | (4) CAGEC | (5) PART NUMBER | (6) DESCRIPTION AND USABLE ON CODE (UOC) | (7) QTY |
|---|---|---|---|---|---|---|
| | | | | | **GROUP A801 HYDRAULIC DIAGNOSTIC CENTER COMPONENTS.** | |
| | | | | | **FIG. 14. LEFT MAIN MANIFOLD.** | |
| 1 | PAFZZ | 4730-00-812-2434 | 96906 | MS51521A8 | ELBOW,TUBE (USED IN DISTRIBUTION BOX)LT.MAIN MANIF/GP:A................................................ | 4 |
| 2 | PAFZZ | 4730-01-139-1585 | 81343 | SAE J514 10-10 070221S | ELBOW,TUBE (USED IN DISTRIBUTION BOX)LT.MAIN MANIF/GP:A................................................ | 1 |
| | | | | | **END OF FIGURE** | |

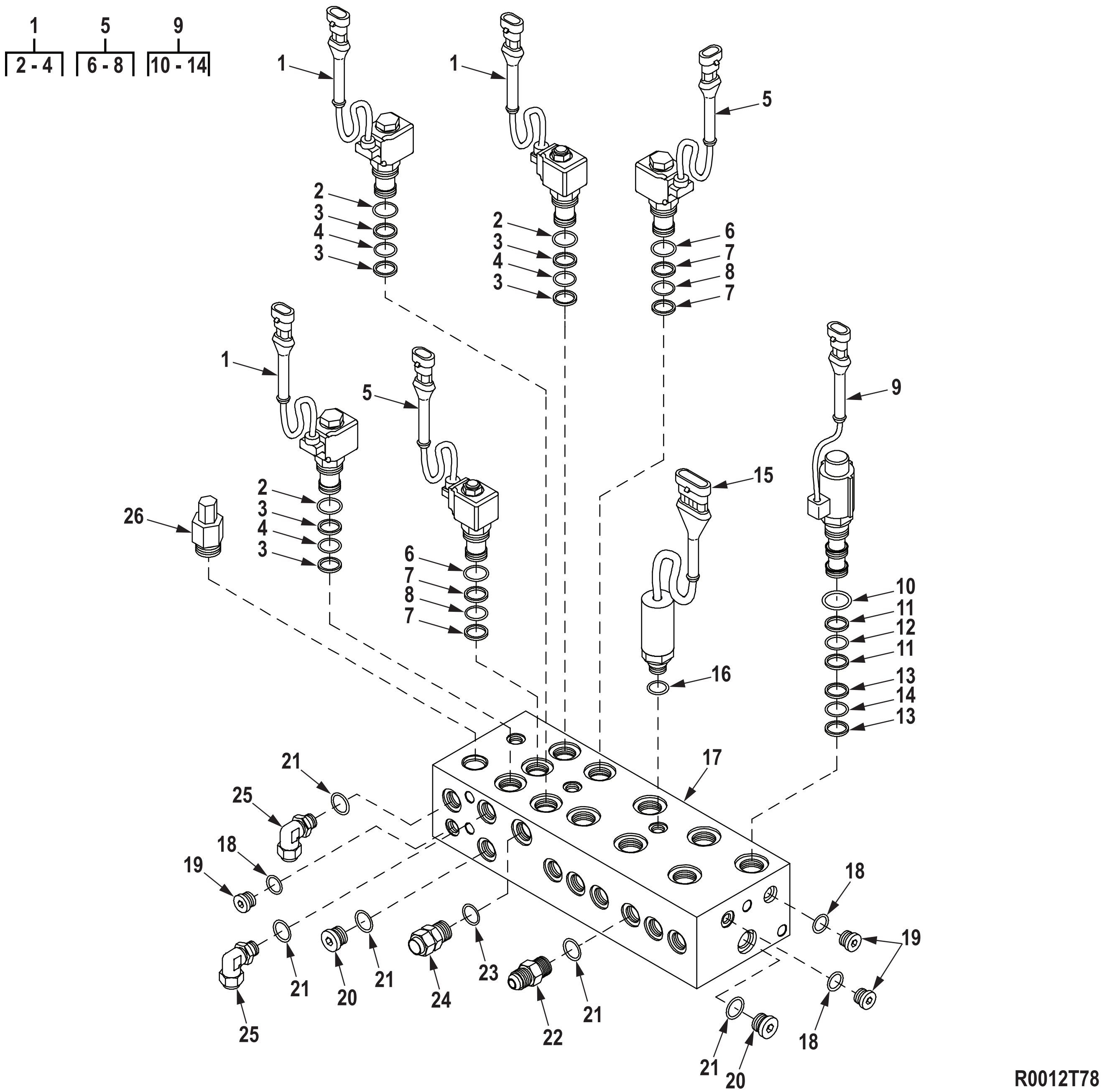



Figure 15. Primary Manifold Assembly. (Sheet 1 of 2)

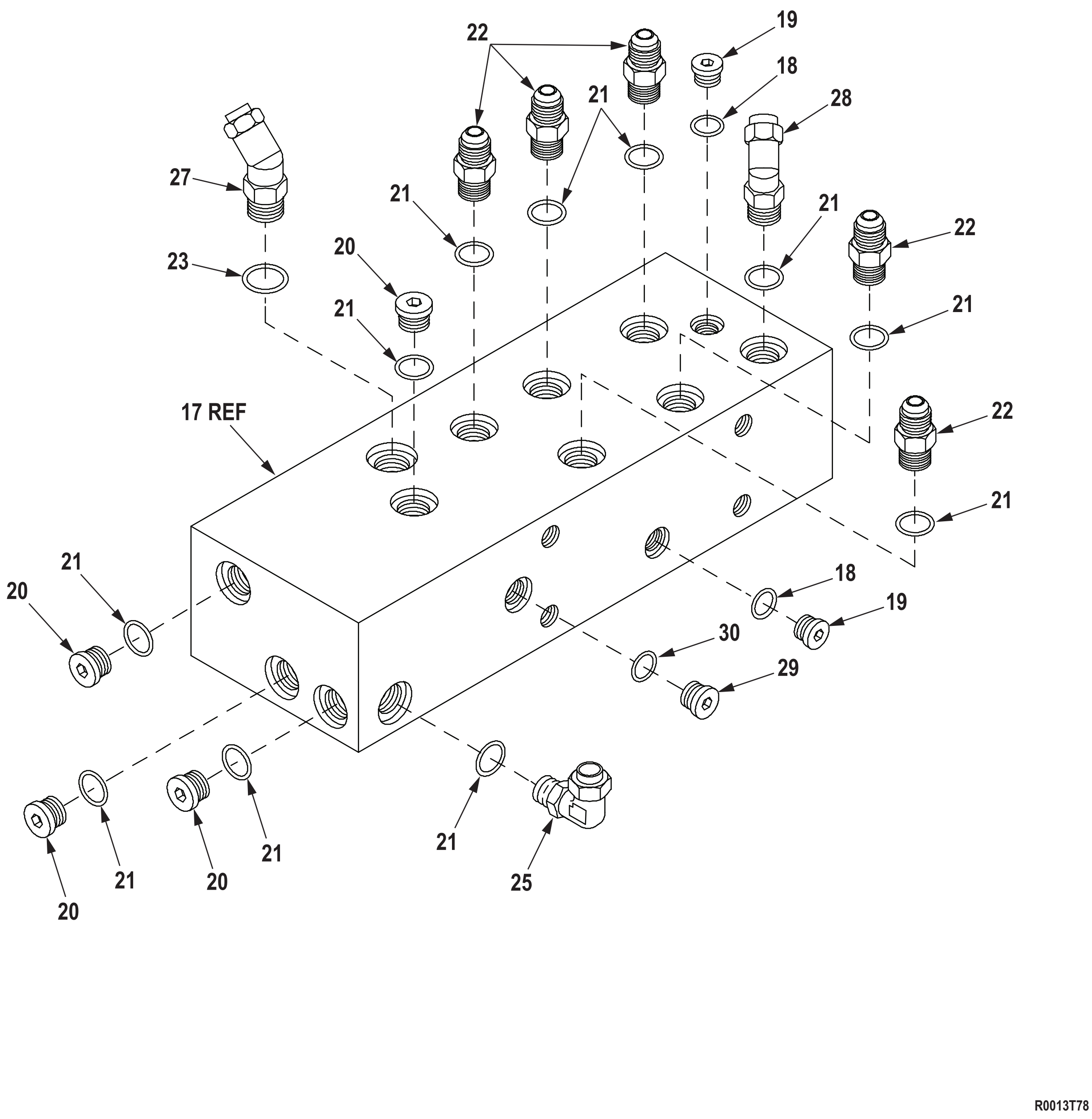



Figure 15. Primary Manifold Assembly. (Sheet 2 of 2)

| (1) ITEM NO. | (2) SMR CODE | (3) NSN | (4) CAGEC | (5) PART NUMBER | (6) DESCRIPTION AND USABLE ON CODE (UOC) | (7) QTY |
|---|---|---|---|---|---|---|
| | | | | | **GROUP A801 HYDRAULIC DIAGNOSTIC CENTER COMPONENTS.** | |
| | | | | | **FIG. 15. PRIMARY MANIFOLD ASSEMBLY.** | |
| 1 | PAFFZ | 4810-01-536-2997 | 14775 | SB70-DO-24AD | VALVE,SOLENOID...................................... | 3 |
| 2 | PAFZZ | 5331-01-514-0923 | 81343 | MS28775-118 | . O-RING.................................................... | 1 |
| 3 | PAFZZ | 5330-01-118-5705 | 96906 | MS27595-019 | . RETAINER,PACKING............................... | 2 |
| 4 | PAFZZ | 5331-00-551-8441 | 62983 | 175962 | . O-RING.................................................... | 1 |
| 5 | PAFFZ | 4810-01-536-6609 | 14775 | SB70-DC-24AD | VALVE,SOLENOID...................................... | 2 |
| 6 | PAFZZ | 5331-01-514-0923 | 81343 | MS28775-118 | . O-RING.................................................... | 1 |
| 7 | PAFZZ | 5330-01-118-5705 | 96906 | MS27595-019 | . RETAINER,PACKING............................... | 2 |
| 8 | PAFZZ | 5331-00-551-8441 | 62983 | 175962 | . O-RING.................................................... | 1 |
| 9 | PAFFZ | 4810-01-536-5871 | 19207 | 12496936 | VALVE,SOLENOID...................................... | 6 |
| 10 | PCFZZ | 5331-01-219-7930 | 81343 | MS28778-12 | . O-RING.................................................... | 1 |
| 11 | PAFZZ | 5330-00-720-3652 | 96906 | MS28774-019 | . RETAINER,PACKING............................... | 2 |
| 12 | PAFZZ | 5331-00-551-8441 | 62983 | 175962 | . O-RING.................................................... | 1 |
| 13 | PAFZZ | 5330-00-839-1846 | 96906 | MS28774-018 | . RETAINER,PACKING............................... | 2 |
| 14 | PCFZZ | 5331-00-618-0799 | 62983 | 196425 | . O-RING.................................................... | 1 |
| 15 | PAFZZ | 6695-01-536-2040 | 19207 | 12496923 | TRANSDUCER,PRESSURE........................ | 1 |
| 16 | PCFZZ | 5331-00-805-2966 | 81343 | MS28778-4 | O-RING....................................................... | 1 |
| 17 | PAFZZ | 4730-01-536-3025 | 19207 | 12496935 | MANIFOLD,HYDRAULIC............................. | 1 |
| 18 | PCFZZ | 5331-00-805-2966 | 81343 | MS28778-4 | O-RING....................................................... | 5 |
| 19 | PAFZZ | 5365-01-200-1519 | 19207 | 12335054-2 | PLUG,MACHINE THREAD.......................... | 5 |
| 20 | PCFZZ | 5365-01-228-0730 | 19207 | 12335054-5 | PLUG,MACHINE THREAD.......................... | 6 |
| 21 | PCFZZ | 5331-00-808-0794 | 81343 | MS28778-8 | O-RING..................................................... | 16 |
| 22 | PAFZZ | 4730-01-156-4835 | 96906 | MS51525A8 | ADAPTER,STRAIGHT,TU........................... | 6 |
| 23 | PCFZZ | 5331-00-108-5691 | 81343 | MS28778-10 | O-RING....................................................... | 2 |
| 24 | PAFZZ | 4730-01-192-9590 | 96906 | MS51526A10 | ADAPTER,STRAIGHT,TU........................... | 1 |
| 25 | PAFZZ | 4730-00-822-5609 | 96906 | MS51527A8 | ELBOW,TUBE TO BOSS............................ | 3 |
| 26 | PAFZA | 4820-00-550-6786 | 8Z296 | 1A30-01-V-0-E-D-304 | VALVE,SAFETY RELIEF............................ | 1 |
| 27 | PAFZZ | 4730-00-936-2172 | 96906 | MS51528A10Z | ELBOW,TUBE TO BOSS............................ | 1 |
| 28 | PAFZZ | 4730-01-236-2682 | 96906 | MS51528A8Z | ELBOW,TUBE TO BOSS............................ | 1 |
| 29 | PAFZZ | 5365-01-242-4564 | 19207 | 12335054-4 | PLUG,MACHINE THREAD.......................... | 1 |

| (1) ITEM NO. | (2) SMR CODE | (3) NSN | (4) CAGEC | (5) PART NUMBER | (6) DESCRIPTION AND USABLE ON CODE (UOC) | (7) QTY |
|---|---|---|---|---|---|---|
| 30 | PCFZZ | 5331-00-804-5695 | 62983 | 151548 | O-RING....................................................... | 1 |

**END OF FIGURE**

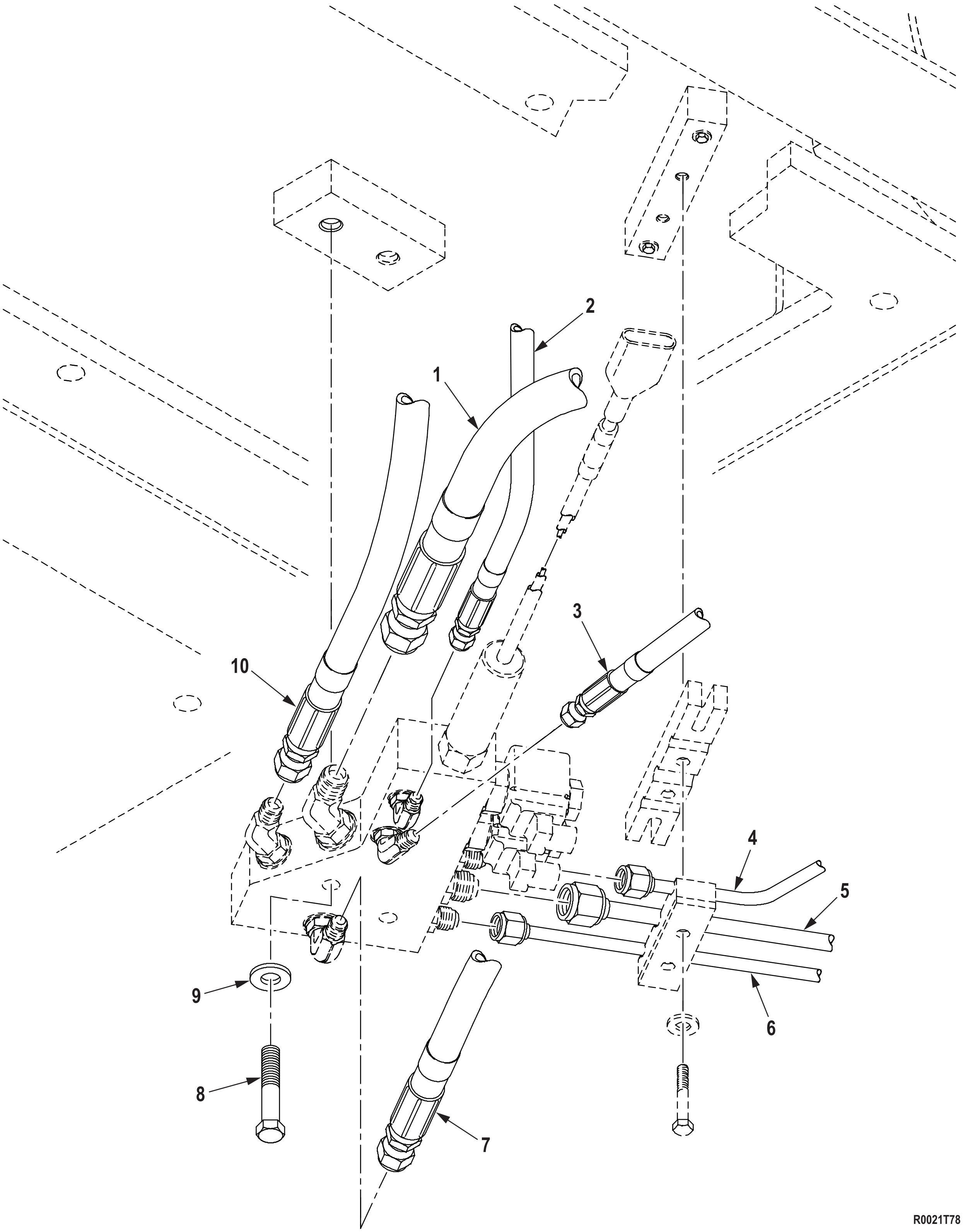



Figure 16. Forward Left Manifold Mounting and Hose Interconnections.

| (1) ITEM NO. | (2) SMR CODE | (3) NSN | (4) CAGEC | (5) PART NUMBER | (6) DESCRIPTION AND USABLE ON CODE (UOC) | (7) QTY |
|---|---|---|---|---|---|---|
| | | | | | **GROUP A801 HYDRAULIC DIAGNOSTIC CENTER COMPONENTS.** | |
| | | | | | **FIG. 16. FORWARD LEFT MANIFOLD MOUNTING AND HOSE INTERCONNECTIONS.** | |
| 1 | PCFZZ | 4720-01-195-3838 | 97403 | 13214E2495-2 | HOSE ASSEMBLY,NONME HOSE,ASSY,NONME(USED DIST BOX)FWR LT. MANIF/HOSE/GP:A.............. | 1 |
| 2 | PAFZZ | 4720-01-541-1308 | 97403 | 13214E2495-8 | HOSE ASSEMBLY,NONME (USED DIST BOX)FWR LT. MANIF/HOSE/GP:A.... | 1 |
| 3 | PAFZZ | 4720-01-541-0697 | 97403 | 13214E2495-9 | HOSE ASSEMBLY,NONME......................... | 1 |
| 4 | PAFZZ | 4710-01-179-7619 | 97403 | 13214E2751 | TUBE ASSEMBLY,METAL.......................... | 1 |
| 5 | PAFZZ | 4710-01-179-7623 | 97403 | 13214E2755 | TUBE ASSEMBLY,METAL.......................... | 1 |
| 6 | PAFZZ | 4710-01-179-7621 | 97403 | 13214E2753 | TUBE ASSEMBLY,METAL.......................... | 1 |
| 7 | PAFZZ | 4720-01-181-6166 | 19207 | 13214E2500-1 | HOSE ASSEMBLY,NONME HOSE,ASSY,NONME(USED DIST BOX)FWR LT. MANIF/HOSE/GP:A.............. | 1 |
| 8 | PAFZZ | 5306-01-194-0591 | 80204 | B1821BH038C200L | BOLT,MACHINE (USED IN DIST BOX)FWR LT.MANIF/HOSE/GP:A............... | 2 |
| 9 | PAFZZ | 5310-00-877-5972 | 19200 | 10910174-3 | WASHER,FLAT (USED DISTRIBUTION BOX)FORWARD LT.MANIF/GPA............................................ | 2 |
| 10 | PCFZZ | 4720-01-195-3841 | 98441 | A2660-1 | HOSE ASSEMBLY,NONME (USED DIST BOX)FWR LT. MANIF/HOSE/GP:A.... | 1 |

**END OF FIGURE**

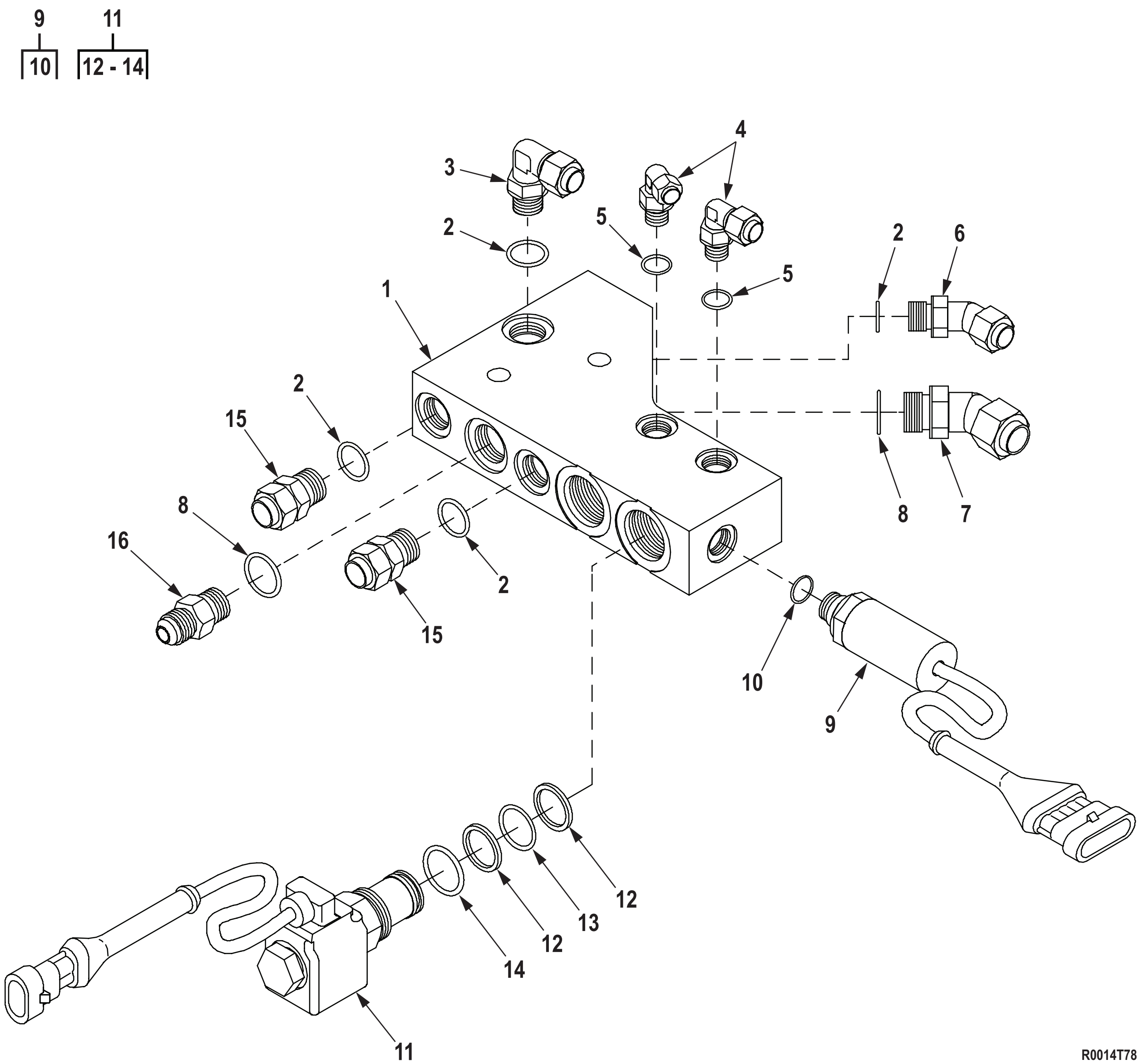



Figure 17. Forward Left Manifold Assembly.

| (1) ITEM NO. | (2) SMR CODE | (3) NSN | (4) CAGEC | (5) PART NUMBER | (6) DESCRIPTION AND USABLE ON CODE (UOC) | (7) QTY |
|---|---|---|---|---|---|---|
| | | | | | **GROUP A801 HYDRAULIC DIAGNOSTIC CENTER COMPONENTS.** | |
| | | | | | **FIG. 17. FORWARD LEFT MANIFOLD ASSEMBLY.** | |
| 1 | PAFFZ | 4730-01-536-2677 | 19207 | 12496934 | MANIFOLD,HYDRAULIC............................. | 1 |
| 2 | PCFZZ | 5331-00-804-5695 | 62983 | 151548 | O-RING....................................................... | 4 |
| 3 | PAFZZ | 4730-00-143-3941 | 96906 | MS51527A6 | ELBOW,TUBE TO BOSS............................. | 1 |
| 4 | PAFZZ | 4730-00-585-2309 | 96906 | MS51527A4 | ELBOW,TUBE TO BOSS............................. | 2 |
| 5 | PCFZZ | 5331-00-805-2966 | 81343 | MS28778-4 | O-RING....................................................... | 2 |
| 6 | PAFZZ | 4730-00-679-9766 | 96906 | MS51528A6 | . ELBOW,TUBE TO BOSS.......................... | 1 |
| 7 | PAFZZ | 4730-00-062-5470 | 96906 | MS51528B8 | ELBOW,TUBE TO BOSS............................. | 1 |
| 8 | PCFZZ | 5331-00-808-0794 | 81343 | MS28778-8 | O-RING....................................................... | 2 |
| 9 | PAFFZ | 6695-01-536-2040 | 19207 | 12496923 | TRANSDUCER,PRESSURE........................ | 1 |
| 10 | PCFZZ | 5331-00-805-2966 | 81343 | MS28778-4 | . O-RING.................................................... | 1 |
| 11 | PAFFZ | 4810-01-536-2997 | 14775 | SB70-DO-24AD | VALVE,SOLENOID...................................... | 2 |
| 12 | PAFZZ | 5330-01-118-5705 | 96906 | MS27595-019 | . RETAINER,PACKING............................... | 2 |
| 13 | PAFZZ | 5331-00-551-8441 | 62983 | 175962 | . O-RING.................................................... | 1 |
| 14 | PAFZZ | 5331-01-514-0923 | 81343 | MS28775-118 | . O-RING.................................................... | 1 |
| 15 | PAFZZ | 4730-00-491-9576 | 96906 | MS51525A6 | ADAPTER,STRAIGHT,TU............................ | 2 |
| 16 | PAFZZ | 4730-01-156-4835 | 96906 | MS51525A8 | ADAPTER,STRAIGHT,TU............................ | 1 |

**END OF FIGURE**

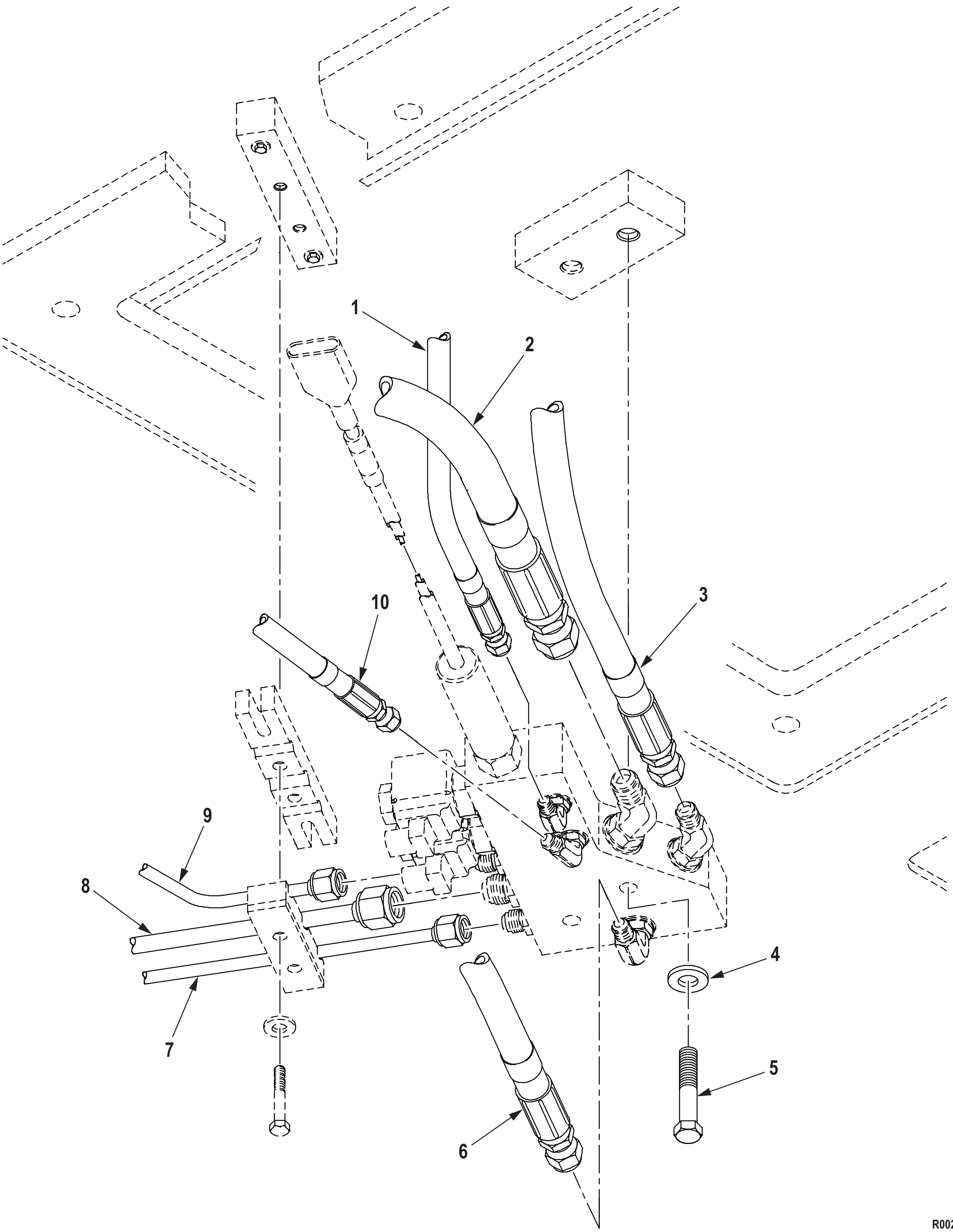



Figure 18. Forward Right Manifold Mounting and Hose Interconnections.

| (1) ITEM NO. | (2) SMR CODE | (3) NSN | (4) CAGEC | (5) PART NUMBER | (6) DESCRIPTION AND USABLE ON CODE (UOC) | (7) QTY |
|---|---|---|---|---|---|---|
| | | | | | **GROUP A801 HYDRAULIC DIAGNOSTIC CENTER COMPONENTS.** | |
| | | | | | **FIG. 18. FORWARD RIGHT MANIFOLD MOUNTING AND HOSE INTERCONNECTIONS.** | |
| 1 | PAFZZ | 4720-01-541-1308 | 97403 | 13214E2495-8 | HOSE ASSEMBLY,NONME......................... | 1 |
| 2 | PCFZZ | 4720-01-195-3838 | 97403 | 13214E2495-2 | HOSE ASSEMBLY,NONME......................... | 1 |
| 3 | PCFZZ | 4720-01-195-3841 | 98441 | A2660-1 | HOSE ASSEMBLY,NONME (USED DIST BOX)FWR RT. MANIF/HOSE/ GP:A............................................................ | 1 |
| 4 | PAFZZ | 5310-00-877-5972 | 19200 | 10910174-3 | WASHER,FLAT (USED DISTRIBUTION BOX)FORWARD RT.MANIF/GPA........................................... | 2 |
| 5 | PAFZZ | 5306-01-194-0591 | 80204 | B1821BH038C200L | BOLT,MACHINE (USED IN DIST BOX)FWR RT.MANIF/HOSE/GP:A.............. | 2 |
| 6 | PAFZZ | 4720-01-181-6166 | 19207 | 13214E2500-1 | HOSE ASSEMBLY,NONME......................... | 1 |
| 7 | PAFZZ | 4710-01-179-7620 | 19207 | 13214E2752 | TUBE ASSEMBLY,METAL.......................... | 1 |
| 8 | PAFZZ | 4710-01-179-7622 | 97403 | 13214E2754 | TUBE ASSEMBLY,METAL.......................... | 1 |
| 9 | PAFZZ | 4710-01-179-7618 | 97403 | 13214E2750 | TUBE ASSEMBLY,METAL.......................... | 1 |
| 10 | PAFZZ | 4720-01-541-0697 | 97403 | 13214E2495-9 | HOSE ASSEMBLY,NONME......................... | 1 |
| | | | | | **END OF FIGURE** | |

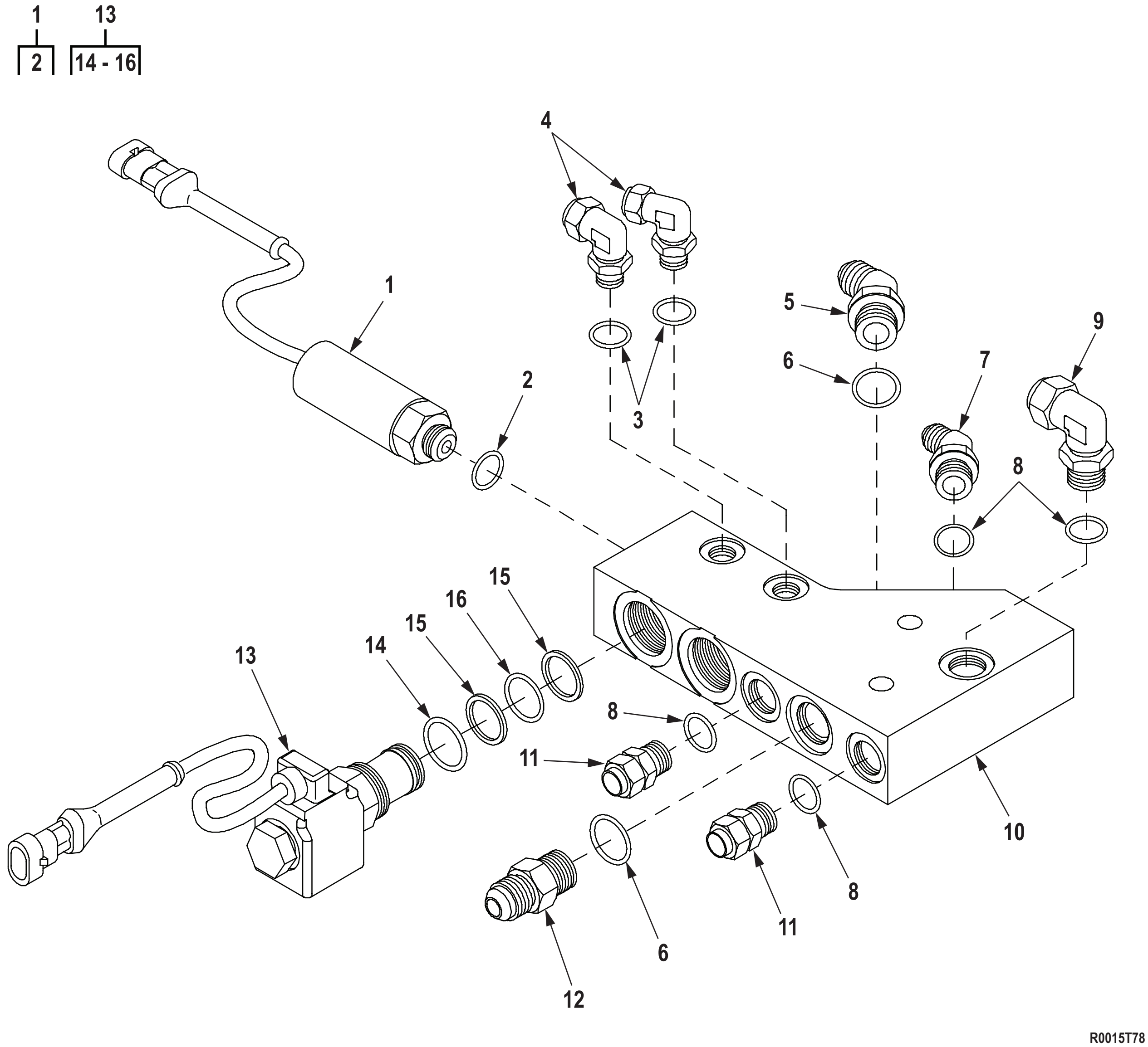



Figure 19. Forward Right Manifold Assembly.

| (1) ITEM NO. | (2) SMR CODE | (3) NSN | (4) CAGEC | (5) PART NUMBER | (6) DESCRIPTION AND USABLE ON CODE (UOC) | (7) QTY |
|---|---|---|---|---|---|---|
| | | | | | **GROUP A801 HYDRAULIC DIAGNOSTIC CENTER COMPONENTS.** | |
| | | | | | **FIG. 19. FORWARD RIGHT MANIFOLD ASSEMBLY.** | |
| 1 | PAFZZ | 6695-01-536-2040 | 19207 | 12496923 | TRANSDUCER,PRESSURE........................ | 1 |
| 2 | PCFZZ | 5331-00-805-2966 | 81343 | MS28778-4 | . O-RING.................................................... | 1 |
| 3 | PCFZZ | 5331-00-805-2966 | 81343 | MS28778-4 | O-RING....................................................... | 2 |
| 4 | PAFZZ | 4730-00-585-2309 | 96906 | MS51527A4 | ELBOW,TUBE TO BOSS............................ | 2 |
| 5 | PAFZZ | 4730-00-062-5470 | 96906 | MS51528B8 | ELBOW,TUBE TO BOSS............................ | 1 |
| 6 | PCFZZ | 5331-00-808-0794 | 81343 | MS28778-8 | O-RING....................................................... | 2 |
| 7 | PAFZZ | 4730-00-679-9766 | 96906 | MS51528A6 | . ELBOW,TUBE TO BOSS.......................... | 1 |
| 8 | PCFZZ | 5331-00-804-5695 | 62983 | 151548 | O-RING....................................................... | 4 |
| 9 | PAFZZ | 4730-00-143-3941 | 96906 | MS51527A6 | ELBOW,TUBE TO BOSS............................ | 1 |
| 10 | PAFZZ | 4730-01-536-5726 | 19207 | 12496948 | MANIFOLD,HYDRAULIC............................ | 1 |
| 11 | PAFZZ | 4730-00-491-9576 | 96906 | MS51525A6 | ADAPTER,STRAIGHT,TU........................... | 2 |
| 12 | PAFZZ | 4730-01-156-4835 | 96906 | MS51525A8 | ADAPTER,STRAIGHT,TU........................... | 1 |
| 13 | PAFFZ | 4810-01-536-2997 | 14775 | SB70-DO-24AD | VALVE,SOLENOID...................................... | 2 |
| 14 | PAFZZ | 5331-01-514-0923 | 81343 | MS28775-118 | . O-RING.................................................... | 2 |
| 15 | PAFZZ | 5330-01-118-5705 | 96906 | MS27595-019 | . RETAINER,PACKING............................... | 4 |
| 16 | PAFZZ | 5331-00-551-8441 | 62983 | 175962 | . O-RING.................................................... | 2 |

**END OF FIGURE**

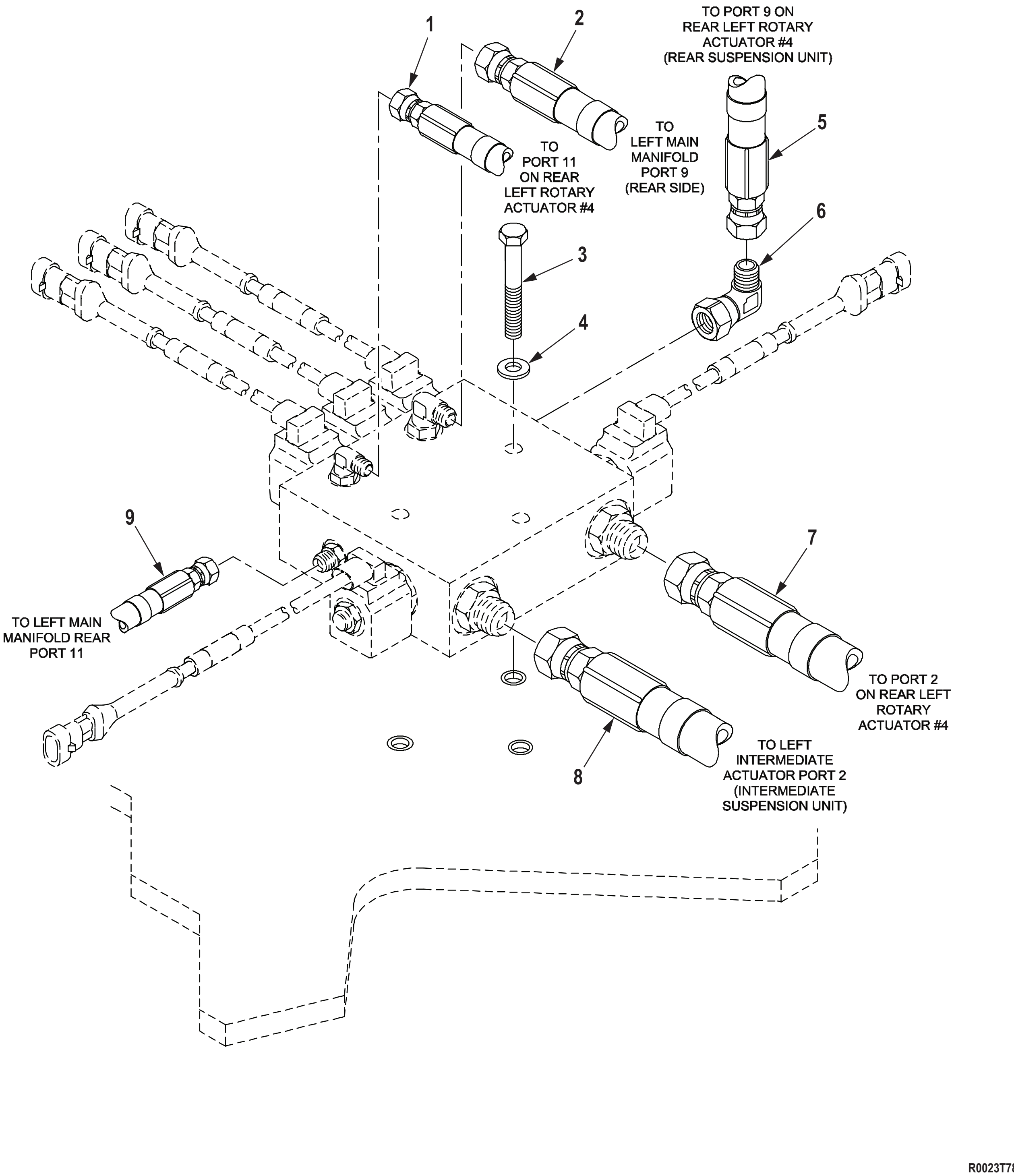



Figure 20. Aft Manifold Mounting and Hose Interconnections.

| (1) ITEM NO. | (2) SMR CODE | (3) NSN | (4) CAGEC | (5) PART NUMBER | (6) DESCRIPTION AND USABLE ON CODE (UOC) | (7) QTY |
|---|---|---|---|---|---|---|
| | | | | | **GROUP A801 HYDRAULIC DIAGNOSTIC CENTER COMPONENTS.** | |
| | | | | | **FIG. 20. AFT MANIFOLD MOUNTING AND HOSE INTERCONNECTIONS.** | |
| 1 | PAFZZ | 4720-01-540-6760 | 97403 | 13214E2495-7 | HOSE ASSEMBLY,NONME......................... | 1 |
| 2 | PAFZZ | 4720-01-446-7545 | 01276 | FG1011GGG0360 | HOSE ASSEMBLY,NONME......................... | 1 |
| 3 | PAFZZ | 5305-01-449-7391 | 80204 | B1821BH038C325L | SCREW,CAP,HEXAGON H......................... | 3 |
| 4 | PAFZZ | 5310-00-877-5972 | 19200 | 10910174-3 | WASHER,FLAT (USED DISTRIBUTION BOX)AFT MANIFOLD/GPA.......................................... | 3 |
| 5 | PAFZZ | 4720-01-537-0586 | 97403 | 13214E2501-11 | HOSE ASSEMBLY,NONME......................... | 1 |
| 6 | PAFZZ | 4730-00-618-5372 | 96906 | MS51521A6 | ELBOW,TUBE............................................. | 1 |
| 7 | PAFZZ | 4720-01-536-8728 | 97403 | 13214E2486-2 | HOSE ASSEMBLY,NONME......................... | 1 |
| 8 | PAFZZ | 4720-01-538-3157 | 97403 | 13214E2486-3 | HOSE ASSEMBLY,NONME......................... | 1 |
| 9 | PCFZZ | 4720-01-536-8024 | 97403 | 13214E2495-6 | HOSE ASSEMBLY,NONME......................... | 1 |

**END OF FIGURE**

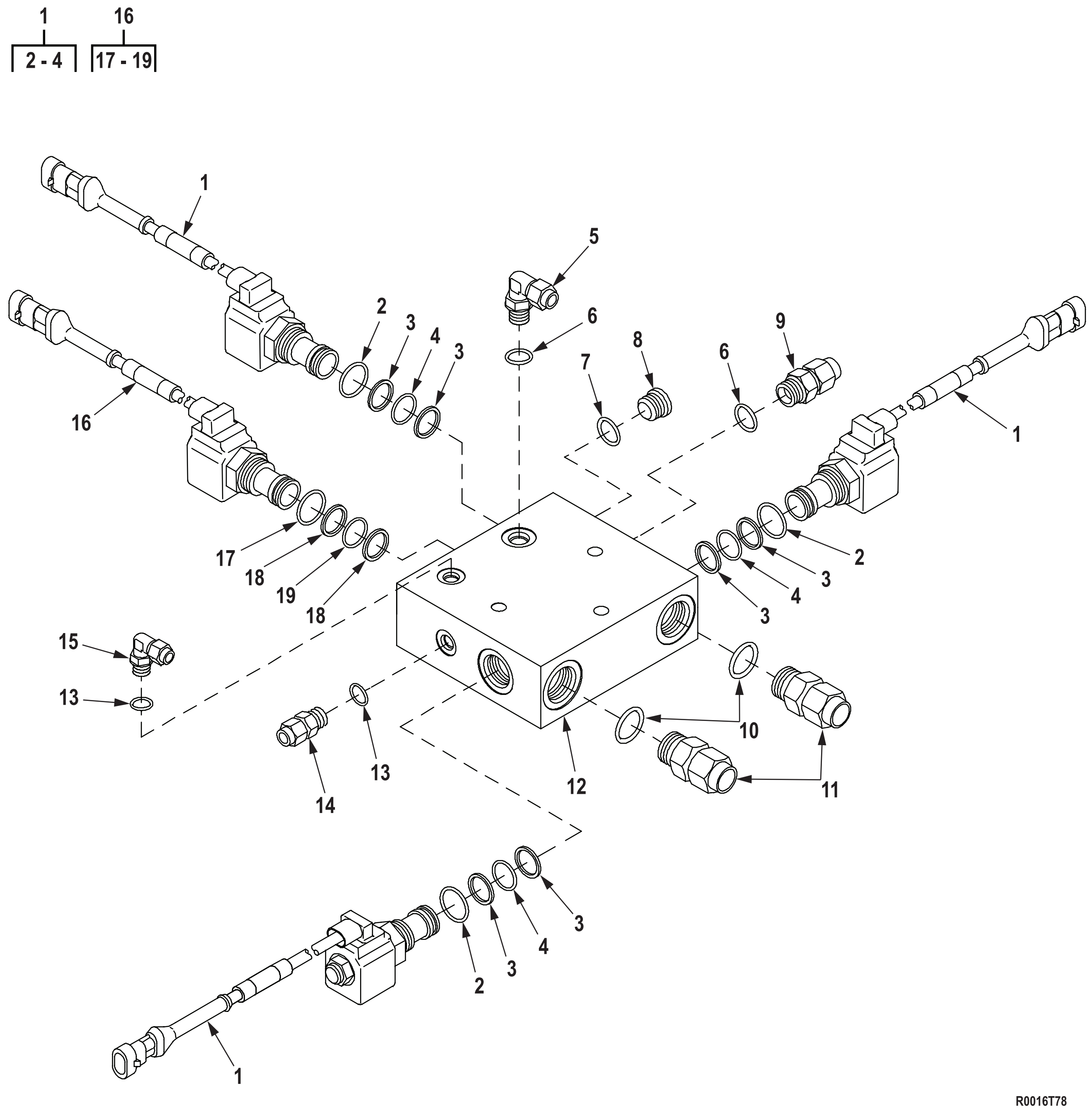



Figure 21. Aft Manifold Assembly.

| (1) ITEM NO. | (2) SMR CODE | (3) NSN | (4) CAGEC | (5) PART NUMBER | (6) DESCRIPTION AND USABLE ON CODE (UOC) | (7) QTY |
|---|---|---|---|---|---|---|
| | | | | | **GROUP A801 HYDRAULIC DIAGNOSTIC CENTER COMPONENTS.** | |
| | | | | | **FIG. 21. AFT MANIFOLD ASSEMBLY.** | |
| 1 | PAFFZ | 4810-01-536-2997 | 14775 | SB70-DO-24AD | VALVE,SOLENOID...................................... | 3 |
| 2 | PAFZZ | 5331-01-514-0923 | 81343 | MS28775-118 | . O-RING..................................................... | 1 |
| 3 | PAFZZ | 5330-01-118-5705 | 96906 | MS27595-019 | . RETAINER,PACKING................................ | 2 |
| 4 | PAFZZ | 5331-00-551-8441 | 62983 | 175962 | . O-RING..................................................... | 1 |
| 5 | PAFZZ | 4730-00-143-3941 | 96906 | MS51527A6 | ELBOW,TUBE TO BOSS............................. | 1 |
| 6 | PCFZZ | 5331-00-804-5695 | 62983 | 151548 | O-RING....................................................... | 2 |
| 7 | PCFZZ | 5331-00-808-0794 | 81343 | MS28778-8 | O-RING....................................................... | 1 |
| 8 | PCFZZ | 5365-01-228-0730 | 19207 | 12335054-5 | PLUG,MACHINE THREAD........................... | 1 |
| 9 | PAFZZ | 4730-00-491-9576 | 96906 | MS51525A6 | ADAPTER,STRAIGHT,TU............................ | 1 |
| 10 | PCFZZ | 5331-01-219-7930 | 81343 | MS28778-12 | O-RING....................................................... | 2 |
| 11 | PAFZZ | 4730-00-710-5571 | 96906 | MS51525A12 | ADAPTER,STRAIGHT,TU............................ | 2 |
| 12 | PAFZZ | 4730-01-543-4250 | 19207 | 12496938 | MANIFOLD ASSEMBLY,H........................... | 1 |
| 13 | PCFZZ | 5331-00-805-2966 | 81343 | MS28778-4 | O-RING....................................................... | 2 |
| 14 | PAFZZ | 4730-01-007-5232 | 81343 | SAE J514 4-4 070120S | ADAPTER,STRAIGHT,TU............................ | 1 |
| 15 | PAFZZ | 4730-00-585-2309 | 96906 | MS51527A4 | ELBOW,TUBE TO BOSS............................. | 1 |
| 16 | PAFZZ | 4810-01-536-6609 | 14775 | SB70-DC-24AD | VALVE,SOLENOID...................................... | 1 |
| 17 | PAFZZ | 5331-01-514-0923 | 81343 | MS28775-118 | . O-RING..................................................... | 1 |
| 18 | PAFZZ | 5330-01-118-5705 | 96906 | MS27595-019 | . RETAINER,PACKING................................ | 2 |
| 19 | PAFZZ | 5331-00-551-8441 | 62983 | 175962 | . O-RING..................................................... | 1 |

**END OF FIGURE**

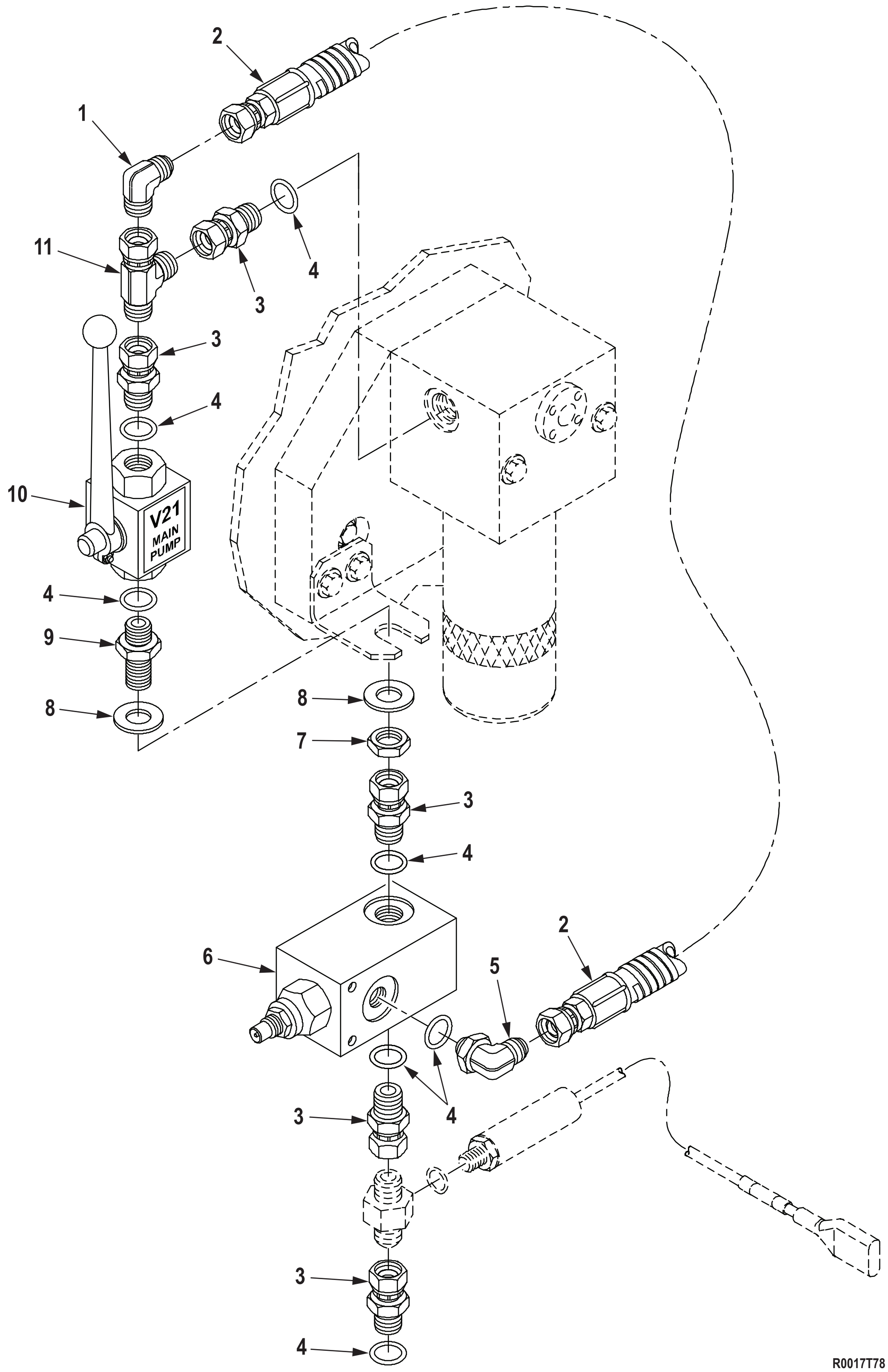



Figure 22. Main Pump Hydraulic Filter Area, Right Side and Left Side (Left Side Shown).

| (1) ITEM NO. | (2) SMR CODE | (3) NSN | (4) CAGEC | (5) PART NUMBER | (6) DESCRIPTION AND USABLE ON CODE (UOC) | (7) QTY |
|---|---|---|---|---|---|---|
| | | | | | **GROUP A801 HYDRAULIC DIAGNOSTIC CENTER COMPONENTS.** | |
| | | | | | **FIG. 22. MAIN PUMP HYDRAULIC FILTER AREA, RIGHT SIDE AND LEFT SIDE (LEFT SIDE SHOWN).** | |
| 1 | PAFZZ | 4730-01-284-2195 | 81343 | SAE J514 8-6 070201C | ELBOW,TUBE............................................ | 2 |
| 2 | PCFZZ | 4720-01-536-7713 | 19207 | 13214E2501-12 | HOSE ASSEMBLY,NONME........................ | 2 |
| 3 | PAFZZ | 4730-01-441-9417 | 30780 | 8F650X-SS | ADAPTER,STRAIGHT,TU........................... | 4 |
| 4 | PCFZZ | 5331-00-808-0794 | 81343 | MS28778-8 | O-RING (USED IN HDC)MAIN PUMP HYD FILTER RT/LT SIDE/GPA...... | 14 |
| 5 | PAFZZ | 4730-00-225-0699 | 46717 | AC-1-390 | ELBOW,TUBE TO BOSS............................. | 2 |
| 6 | PAFZZ | 4820-01-158-4066 | 8Z296 | 1A30-01-V-8S-E-D | VALVE,RELIEF,PRESSU (V22 RIGHT)........................................................ | 2 |
| 6 | PAFZZ | 4820-01-550-0151 | 8Z296 | 1A30-01-V-8ST1-E-D-430 | VALVE,RELIEF,PRESSU (V21 LEFT)..... | 1 |
| 7 | PAFZZ | 4730-01-143-9017 | 96906 | MS51860-56Z | LOCKNUT,TUBE FITTIN............................. | 4 |
| 8 | PAFZZ | 5310-00-877-7527 | 19200 | 10910174-8 | WASHER,FLAT........................................... | 2 |
| 9 | PAFZZ | 4730-01-536-8399 | 30780 | 8WF50X | UNION,TUBE.............................................. | 2 |
| 10 | PAFZZ | 4820-01-536-6135 | 09990 | BVHP-08-SSS-1NG | VALVE,REGULATING,FL (V21USED IN DIST BOX MAIN PUMP ) GP:A.............................................. | 2 |
| 11 | PAFZZ | 4730-01-054-3881 | 96906 | MS51523-B8 | TEE,TUBE.................................................. | 2 |

**END OF FIGURE**

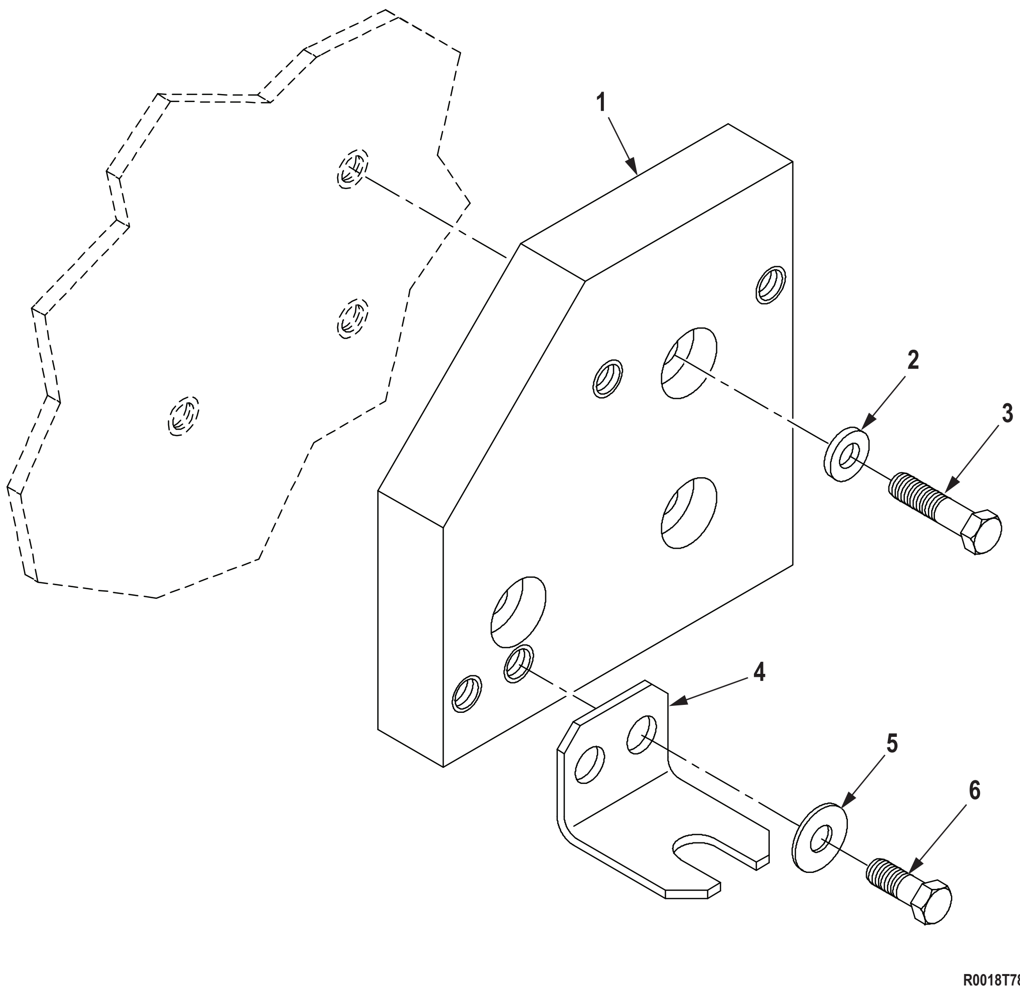



Figure 23. Hydraulic Filter Mounting.

| (1) ITEM NO. | (2) SMR CODE | (3) NSN | (4) CAGEC | (5) PART NUMBER | (6) DESCRIPTION AND USABLE ON CODE (UOC) | (7) QTY |
|---|---|---|---|---|---|---|
| | | | | | **GROUP A801 HYDRAULIC DIAGNOSTIC CENTER COMPONENTS.** | |
| | | | | | **FIG. 23. HYDRAULIC FILTER MOUNTING.** | |
| 1 | PAFZZ | 5340-01-536-3775 | 19207 | 12496966 | PLATE,MOUNTING..................................... | 2 |
| 2 | PAFZZ | 5310-00-877-5972 | 19200 | 10910174-3 | WASHER,FLAT (USED IN DISTRIBUTION BOX)FILTER/MOD/ GPA.............................................................. | 6 |
| 3 | PAFZZ | 5306-01-119-6763 | 80204 | B1821BH038C150L | BOLT,MACHINE.......................................... | 6 |
| 4 | PAFZZ | 5340-01-541-5407 | 19207 | 12496967 | BRACKET,ANGLE....................................... | 2 |
| 5 | PAFZZ | 5310-00-080-6004 | 96906 | MS27183-14 | WASHER,FLAT........................................... | 4 |
| 6 | PAFZZ | 5306-01-114-0963 | 80204 | B1821BH038C100L | BOLT,MACHINE (USED IN HYD FILTER MOD)/GPA...................................... | 4 |
| | | | | | **END OF FIGURE** | |

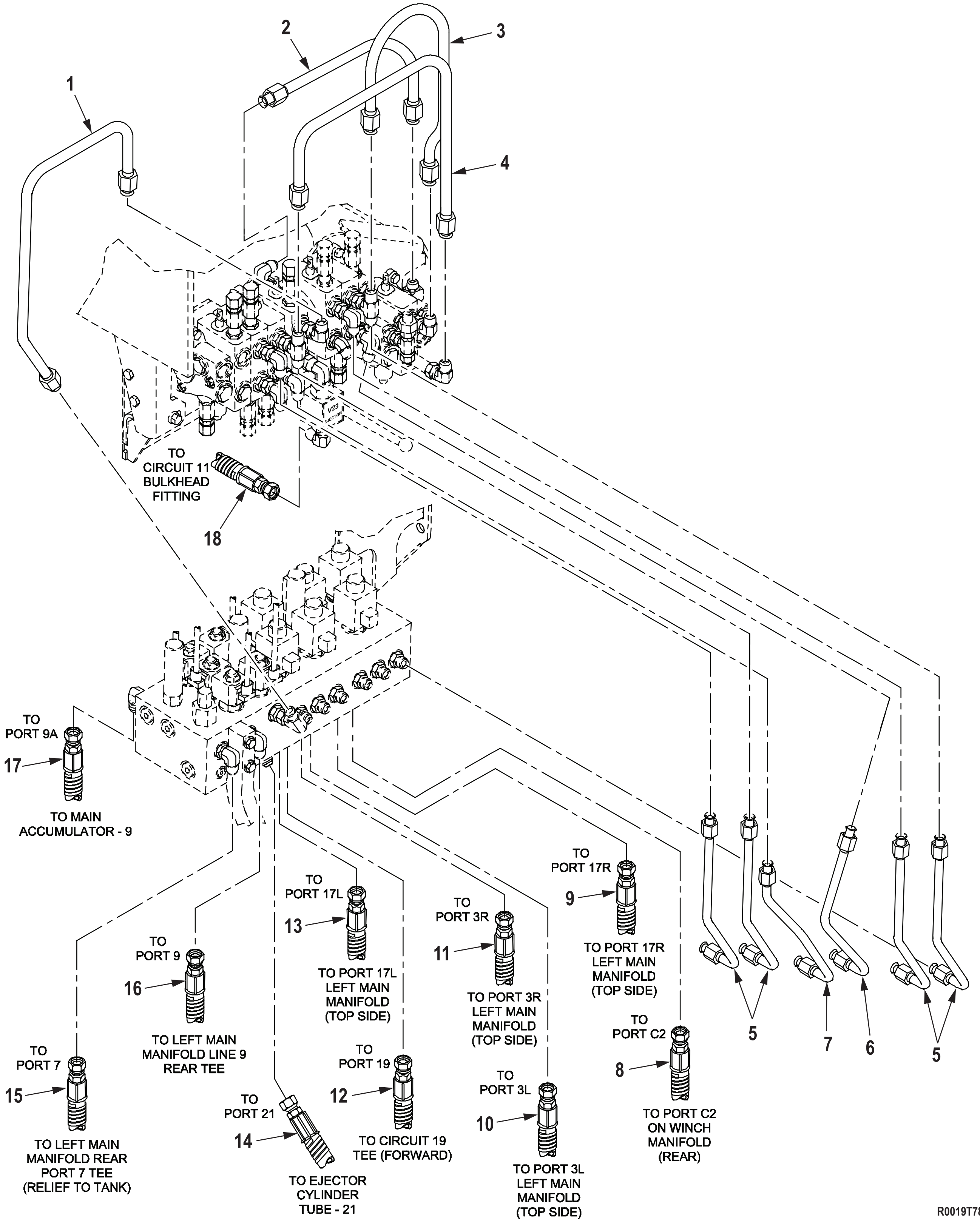



Figure 24. Hydraulic Diagnostic Center (HDC) Primary Manifold Assembly Hydraulic Tubes and Hoses.

| (1) ITEM NO. | (2) SMR CODE | (3) NSN | (4) CAGEC | (5) PART NUMBER | (6) DESCRIPTION AND USABLE ON CODE (UOC) | (7) QTY |
|---|---|---|---|---|---|---|
| | | | | | **GROUP A801 HYDRAULIC DIAGNOSTIC CENTER COMPONENTS.** | |
| | | | | | **FIG. 24. HYDRAULIC DIAGNOSTIC CENTER (HDC) PRIMARY MANIFOLD ASSEMBLY HYDRAULIC TUBES AND HOSES.** | |
| 1 | PAFZZ | 4710-01-543-3418 | 19207 | 12496941 | TUBE ASSEMBLY,METAL.......................... | 1 |
| 2 | PAFZZ | 4710-01-179-9200 | 97403 | 13211E9566 | TUBE ASSEMBLY,METAL.......................... | 1 |
| 3 | PAFZZ | 4710-01-179-7634 | 97403 | 13211E9564 | TUBE ASSEMBLY,METAL.......................... | 1 |
| 4 | PAFZZ | 4710-01-179-9199 | 97403 | 13211E9565 | TUBE ASSEMBLY,METAL.......................... | 1 |
| 5 | PAFZZ | 4710-01-543-0840 | 19207 | 12496940 | TUBE ASSEMBLY,METAL.......................... | 4 |
| 6 | PAFZZ | 4710-01-543-3416 | 19207 | 12496939 | TUBE ASSEMBLY,METAL.......................... | 1 |
| 7 | PAFZZ | 4710-01-543-5071 | 19207 | 12496963 | TUBE ASSEMBLY,METAL.......................... | 1 |
| 8 | PCFZZ | 4720-01-563-6545 | 97403 | 13214E2478-3 | HOSE ASSEMBLY,NONME........................ | 1 |
| 9 | PAFZZ | 4720-01-536-6678 | 19207 | 13214E2457-21 | HOSE ASSEMBLY,NONME........................ | 1 |
| 10 | PAFZZ | 4720-01-543-4246 | 19207 | 13214E2457-25 | HOSE ASSEMBLY,NONME........................ | 1 |
| 11 | PAFZZ | 4720-01-543-1165 | 19207 | 13214E2457-24 | HOSE ASSEMBLY,NONME........................ | 1 |
| 12 | PAFZZ | 4720-01-536-7657 | 19207 | 13214E2457-22 | HOSE ASSEMBLY,NONME........................ | 1 |
| 13 | PAFZZ | 4720-01-543-4241 | 19207 | 13214E2457-23 | HOSE ASSEMBLY,NONME........................ | 1 |
| 14 | PAFZZ | 4720-01-181-6462 | 97403 | 13214E2457-3 | HOSE ASSEMBLY,NONME........................ | 1 |
| 15 | PCFZZ | 4720-01-536-9957 | 19207 | 13214E2457-18 | HOSE ASSEMBLY,METAL.......................... | 1 |
| 16 | PCFZZ | 4720-01-536-6252 | 19207 | 13214E2457-19 | HOSE ASSEMBLY,NONME........................ | 1 |
| 17 | PAFZZ | 4720-01-536-8277 | 19207 | 13214E2457-20 | HOSE ASSEMBLY,METAL.......................... | 1 |
| 18 | PCFZZ | 4720-01-249-2026 | 97403 | 13214E2457-9 | HOSE ASSEMBLY,NONME........................ | 1 |

**END OF FIGURE**

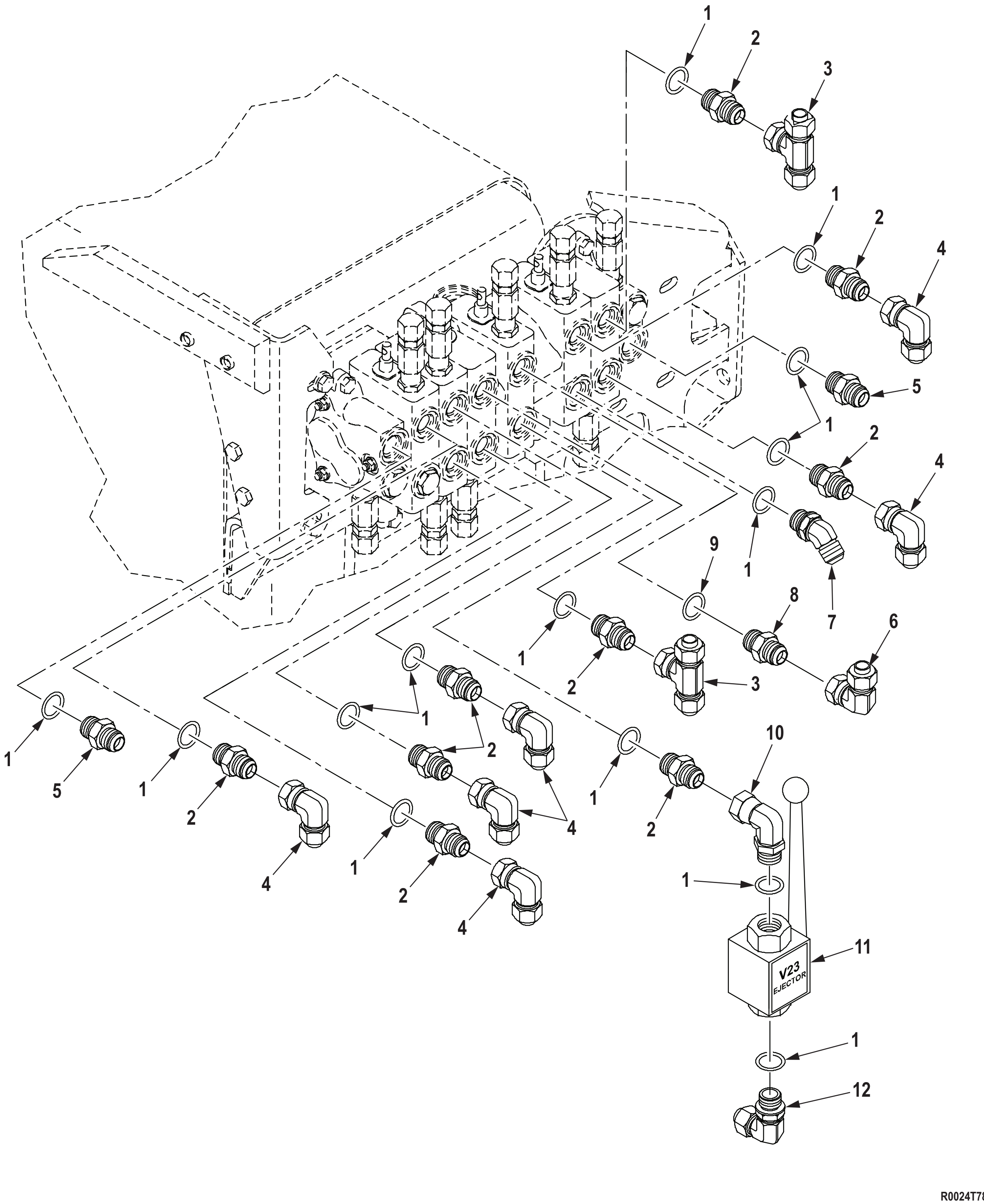



Figure 25. Directional Control Valve (DCV) Bank.

| (1) ITEM NO. | (2) SMR CODE | (3) NSN | (4) CAGEC | (5) PART NUMBER | (6) DESCRIPTION AND USABLE ON CODE (UOC) | (7) QTY |
|---|---|---|---|---|---|---|
| | | | | | **GROUP A801 HYDRAULIC DIAGNOSTIC CENTER COMPONENTS.** | |
| | | | | | **FIG. 25. DIRECTIONAL CONTROL VALVE (DCV) BANK.** | |
| 1 | PCFZZ | 5331-00-808-0794 | 81343 | MS28778-8 | O-RING (USED IN HDC MOD)DCV BANK MOD/ GP: A.................................... | 14 |
| 2 | PAFZZ | 4730-01-156-4835 | 96906 | MS51525A8 | ADAPTER,STRAIGHT,TU............................ | 9 |
| 3 | PAFZZ | 4730-01-042-0228 | 96906 | MS51524A8 | TEE,TUBE.................................................. | 2 |
| 4 | PAFZZ | 4730-00-812-2434 | 96906 | MS51521A8 | ELBOW,TUBE............................................. | 6 |
| 5 | PAFZZ | 4730-00-224-7757 | 22031 | 6400-12-8 | ADAPTER,STRAIGHT,TU............................ | 2 |
| 6 | PAFZZ | 4730-01-139-1585 | 81343 | SAE J514 10-10 070221S | ELBOW,TUBE............................................. | 1 |
| 7 | PAFZZ | 4730-00-062-5470 | 96906 | MS51528B8 | ELBOW,TUBE TO BOSS............................. | 1 |
| 8 | PAFZZ | 4730-00-623-3889 | 01276 | J514 10-10 070120SA | ADAPTER,STRAIGHT,TU............................ | 1 |
| 9 | PCFZZ | 5331-00-108-5691 | 81343 | MS28778-10 | O-RING....................................................... | 1 |
| 10 | PAFZZ | 4730-01-536-9912 | 30780 | 8A0EX6 | ELBOW,PIPE.............................................. | 1 |
| 11 | PAFZZ | 4820-01-536-6135 | 09990 | BVHP-08-SSS-1NG | VALVE,REGULATING,FL............................ | 1 |
| 12 | PAFZZ | 4730-00-822-5609 | 96906 | MS51527A8 | ELBOW,TUBE TO BOSS............................. | 1 |

**END OF FIGURE**

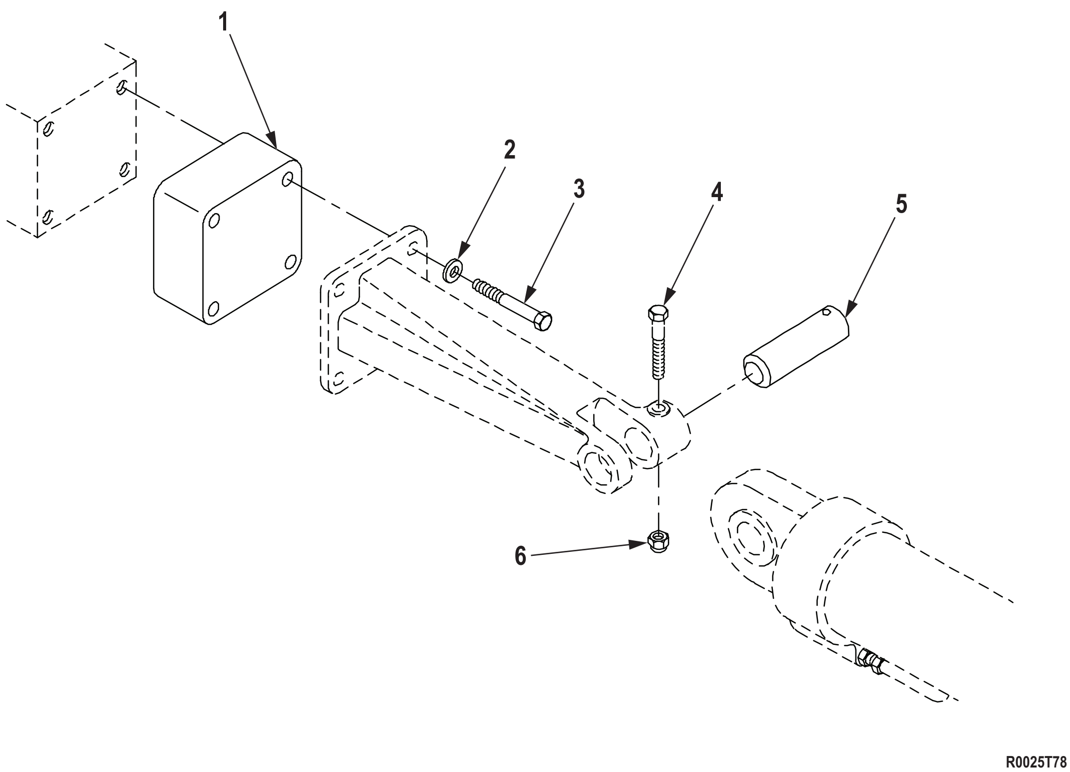



Figure 26. Hull/Ejector Interference.

| (1) ITEM NO. | (2) SMR CODE | (3) NSN | (4) CAGEC | (5) PART NUMBER | (6) DESCRIPTION AND USABLE ON CODE (UOC) | (7) QTY |
|---|---|---|---|---|---|---|
| | | | | | **GROUP A801 HYDRAULIC DIAGNOSTIC CENTER COMPONENTS.** | |
| | | | | | **FIG. 26. HULL/EJECTOR INTERFERENCE.** | |
| 1 | XDFZZ | | 19207 | 12488667 | SPACER,EJECT CYL................................... | 1 |
| 2 | PAFZZ | 5310-00-585-3243 | 81343 | MS9320-16 | WASHER,FLAT........................................... | 4 |
| 3 | PAFZZ | 5306-01-206-8396 | 80205 | NASM51095-446 | BOLT,MACHINE.......................................... | 4 |
| 4 | PAFZZ | 5305-00-846-5703 | 80204 | B1821BH038C300N | SCREW,CAP,HEXAGON H......................... | 1 |
| 5 | PAFZZ | 5315-01-180-8641 | 19207 | 13211E8634 | PIN,STRAIGHT,HEADLE............................. | 1 |
| 6 | PAFZZ | 5310-00-483-8790 | 80205 | MS17829-6C | NUT,SELF-LOCKING,HE............................. | 1 |

**END OF FIGURE**

## FIELD MAINTENANCE
## NATIONAL STOCK NUMBER INDEX

| STOCK NUMBER | FIG. | ITEM |
|---|---|---|
| 4730-00-062-5470 | 17 | 7 |
| | 19 | 5 |
| | 25 | 7 |
| 5305-00-068-0510 | 2 | 23 |
| 5305-00-068-0511 | 13 | 8 |
| 5305-00-071-2066 | 2 | 38 |
| 5305-00-071-2067 | 2 | 11 |
| | 2 | 18 |
| 5305-00-071-2073 | 13 | 12 |
| 5305-00-071-2081 | 2 | 8 |
| 5310-00-080-6004 | 23 | 5 |
| 5315-00-081-7875 | 1 | 25 |
| 5331-00-108-5691 | 15 | 23 |
| | 25 | 9 |
| 4730-00-143-3941 | 17 | 3 |
| | 19 | 9 |
| | 21 | 5 |
| 5330-00-180-9037 | 2 | 20 |
| 4730-00-224-7757 | 25 | 5 |
| 4730-00-225-0699 | 22 | 5 |
| 5306-00-226-4824 | 2 | 32 |
| 5315-00-234-1673 | 2 | 41 |
| 4030-00-243-4442 | 2 | 48 |
| 5305-00-253-5625 | 2 | 34 |
| 5310-00-285-8124 | 4 | 5 |
| | 5 | 2 |
| 5340-00-400-3606 | 2 | 31 |
| 5315-00-468-1635 | 1 | 6 |
| 5310-00-483-8790 | 13 | 2 |
| | 26 | 6 |
| 4730-00-491-9576 | 17 | 15 |
| | 19 | 11 |
| | 21 | 9 |
| 5305-00-543-4372 | 2 | 5 |
| 4820-00-550-6786 | 15 | 26 |
| 5331-00-551-8441 | 15 | 4 |
| | 15 | 8 |
| | 15 | 12 |
| | 17 | 13 |
| | 19 | 16 |
| | 21 | 4 |
| | 21 | 19 |
| 5310-00-559-0070 | 6 | 2 |
| 4730-00-585-2309 | 17 | 4 |
| | 19 | 4 |
| | 21 | 15 |
| 5310-00-585-3243 | 26 | 2 |
| 5310-00-595-7421 | 13 | 14 |
| 5331-00-618-0799 | 15 | 14 |
| 4730-00-618-5372 | 20 | 6 |
| 4730-00-623-3889 | 25 | 8 |
| 4730-00-679-9766 | 17 | 6 |
| | 19 | 7 |
| 4730-00-710-5571 | 21 | 11 |
| 5330-00-720-3652 | 15 | 11 |
| 5310-00-761-6882 | 4 | 4 |
| 5331-00-804-5695 | 15 | 30 |
| | 17 | 2 |
| | 19 | 8 |
| | 21 | 6 |
| 5331-00-805-2966 | 12 | 1 |
| | 15 | 16 |
| | 15 | 18 |
| | 17 | 5 |
| | 17 | 10 |
| | 19 | 2 |
| | 19 | 3 |
| | 21 | 13 |
| 5935-00-807-4109 | 7 | 3 |
| 5331-00-808-0794 | 15 | 21 |
| | 17 | 8 |
| | 19 | 6 |
| | 21 | 7 |
| | 22 | 4 |
| | 25 | 1 |
| 5310-00-809-5997 | 2 | 27 |
| 5310-00-809-5998 | 2 | 4 |
| | 13 | 7 |
| 4730-00-811-1848 | 2 | 15 |
| 4730-00-812-2434 | 14 | 1 |
| | 25 | 4 |
| 5310-00-815-1073 | 4 | 1 |
| 5315-00-815-8840 | 1 | 13 |
| 4730-00-822-5609 | 2 | 14 |
| | 15 | 25 |
| | 25 | 12 |
| 5330-00-839-1846 | 15 | 13 |
| 5315-00-839-2325 | 1 | 24 |
| 5315-00-842-3044 | 1 | 15 |
| | 2 | 29 |
| 5305-00-846-5703 | 2 | 12 |
| | 26 | 4 |
| 5310-00-851-2682 | 2 | 26 |
| 5310-00-853-9335 | 1 | 22 |
| 5310-00-866-4417 | 13 | 13 |
| 5310-00-877-5972 | 13 | 3 |

| STOCK NUMBER | FIG. | ITEM |
|---|---|---|
| | 16 | 9 |
| | 18 | 4 |
| | 20 | 4 |
| | 23 | 2 |
| 5310-00-877-7527 | 22 | 8 |
| 5935-00-900-6281 | 7 | 2 |
| 5310-00-934-9757 | 6 | 1 |
| 4730-00-936-2172 | 15 | 27 |
| 5310-00-975-2075 | 1 | 16 |
| 5305-00-984-6197 | 6 | 4 |
| 5340-00-985-0823 | 1 | 14 |
| 4730-01-007-5232 | 21 | 14 |
| 4730-01-042-0228 | 25 | 3 |
| 4730-01-054-3881 | 22 | 11 |
| 5306-01-114-0963 | 13 | 5 |
| | 23 | 6 |
| 5365-01-116-3731 | 2 | 19 |
| 5330-01-118-5705 | 15 | 3 |
| | 15 | 7 |
| | 17 | 12 |
| | 19 | 15 |
| | 21 | 3 |
| | 21 | 18 |
| 5306-01-119-6763 | 23 | 3 |
| 4730-01-139-1585 | 14 | 2 |
| | 25 | 6 |
| 4730-01-143-9017 | 22 | 7 |
| 4730-01-156-4835 | 15 | 22 |
| | 17 | 16 |
| | 19 | 12 |
| | 25 | 2 |
| 4820-01-158-4066 | 22 | 6 |
| 5306-01-175-7558 | 5 | 1 |
| 3120-01-175-9336 | 2 | 7 |
| 4710-01-179-7618 | 18 | 9 |
| 4710-01-179-7619 | 16 | 4 |
| 4710-01-179-7620 | 18 | 7 |
| 4710-01-179-7621 | 16 | 6 |
| 4710-01-179-7622 | 18 | 8 |
| 4710-01-179-7623 | 16 | 5 |
| 4710-01-179-7634 | 24 | 3 |
| 5355-01-179-9116 | 1 | 1 |
| 3120-01-179-9151 | 1 | 4 |
| | 1 | 8 |
| | 1 | 11 |
| | 1 | 19 |
| 4710-01-179-9199 | 24 | 4 |
| 4710-01-179-9200 | 24 | 2 |
| 3040-01-179-9210 | 1 | 2 |
| 3040-01-179-9220 | 1 | 18 |
| 3040-01-179-9221 | 1 | 10 |
| 3040-01-179-9222 | 1 | 3 |
| 5315-01-180-8641 | 26 | 5 |

| STOCK NUMBER | FIG. | ITEM |
|---|---|---|
| 4720-01-181-6166 | 16 | 7 |
| | 18 | 6 |
| 5355-01-181-6415 | 1 | 17 |
| 4720-01-181-6462 | 24 | 14 |
| 3040-01-186-8004 | 1 | 7 |
| 4730-01-192-9590 | 15 | 24 |
| 5306-01-194-0003 | 1 | 26 |
| 5306-01-194-0004 | 1 | 21 |
| 5306-01-194-0591 | 13 | 10 |
| | 16 | 8 |
| | 18 | 5 |
| 5306-01-194-7033 | 1 | 27 |
| 4720-01-195-3838 | 16 | 1 |
| | 18 | 2 |
| 4720-01-195-3841 | 16 | 10 |
| | 18 | 3 |
| 5306-01-196-0442 | 13 | 6 |
| 5365-01-200-1519 | 15 | 19 |
| 5306-01-206-8396 | 26 | 3 |
| 5340-01-212-0433 | 1 | 23 |
| 5331-01-219-7930 | 15 | 10 |
| | 21 | 10 |
| 5365-01-228-0730 | 15 | 20 |
| | 21 | 8 |
| 4730-01-236-2682 | 15 | 28 |
| 5365-01-242-4564 | 15 | 29 |
| 4720-01-249-2026 | 24 | 18 |
| 4730-01-284-2195 | 22 | 1 |
| 5315-01-317-2696 | 2 | 30 |
| 5310-01-335-7092 | 2 | 25 |
| 5305-01-373-6291 | 2 | 33 |
| 2530-01-415-9449 | 2 | 16 |
| 5925-01-430-2318 | 6 | 3 |
| 5340-01-440-1443 | 2 | 37 |
| 5340-01-440-1445 | 2 | 22 |
| 4730-01-440-5269 | 2 | 13 |
| 3040-01-440-7132 | 2 | 28 |
| 9905-01-440-7208 | 2 | 35 |
| 5330-01-440-7575 | 2 | 2 |
| 5330-01-440-7577 | 2 | 6 |
| 5340-01-440-8652 | 2 | 39 |
| 2590-01-440-8736 | 2 | 1 |
| 2590-01-440-8752 | 2 | 3 |
| 4010-01-440-9273 | 2 | 17 |
| 4720-01-441-1294 | 2 | 10 |
| 4730-01-441-9417 | 22 | 3 |
| 5310-01-442-6932 | 2 | 24 |
| 4720-01-446-7545 | 20 | 2 |
| 5305-01-449-7391 | 20 | 3 |
| 2540-01-454-0663 | 2 | 45 |
| 4030-01-454-2066 | 2 | 47 |
| 5310-01-454-5759 | 2 | 42 |
| 5306-01-456-9447 | 2 | 36 |

| STOCK NUMBER | FIG. | ITEM |
|---|---|---|
| 4010-01-460-7224 | 2 | 46 |
| 2540-01-461-5899 | 2 | 9 |
| 4030-01-472-9767 | 2 | 40 |
| 3040-01-495-5955 | 2 | 21 |
| 5331-01-514-0923 | 15 | 2 |
| | 15 | 6 |
| | 17 | 14 |
| | 19 | 14 |
| | 21 | 2 |
| | 21 | 17 |
| 5307-01-536-0580 | 4 | 3 |
| 6150-01-536-1117 | 8 | 1 |
| 5340-01-536-1486 | 13 | 1 |
| 2590-01-536-1519 | 4 | 6 |
| 6150-01-536-2015 | 7 | 4 |
| 6695-01-536-2040 | 12 | 2 |
| | 15 | 15 |
| | 17 | 9 |
| | 19 | 1 |
| 5340-01-536-2060 | 13 | 9 |
| 6150-01-536-2129 | 9 | 1 |
| 4730-01-536-2677 | 17 | 1 |
| 4810-01-536-2997 | 15 | 1 |
| | 17 | 11 |
| | 19 | 13 |
| | 21 | 1 |
| 4730-01-536-3025 | 15 | 17 |
| 6150-01-536-3072 | 7 | 1 |
| 6150-01-536-3311 | 10 | 1 |
| 5340-01-536-3775 | 23 | 1 |
| 2590-01-536-3813 | 5 | 3 |
| 5340-01-536-4160 | 13 | 11 |
| 4730-01-536-5726 | 19 | 10 |
| 6150-01-536-5854 | 11 | 1 |
| 4810-01-536-5871 | 15 | 9 |
| 4820-01-536-6135 | 22 | 10 |
| | 25 | 11 |
| 4720-01-536-6252 | 24 | 16 |
| 4810-01-536-6609 | 15 | 5 |
| | 21 | 16 |
| 4720-01-536-6678 | 24 | 9 |
| 5340-01-536-7170 | 13 | 15 |
| 4720-01-536-7657 | 24 | 12 |
| 4720-01-536-7713 | 22 | 2 |
| 4720-01-536-8024 | 20 | 9 |
| 4720-01-536-8277 | 24 | 17 |
| 4730-01-536-8399 | 22 | 9 |
| 4720-01-536-8728 | 20 | 7 |
| 5340-01-536-9863 | 4 | 2 |
| 4730-01-536-9912 | 25 | 10 |
| 4720-01-536-9957 | 24 | 15 |
| 4730-01-537-0516 | 12 | 3 |
| 4720-01-537-0586 | 20 | 5 |
| 2590-01-537-2318 | 13 | 4 |
| 6110-01-537-8428 | 3 | 1 |
| 4720-01-538-3157 | 20 | 8 |
| 4720-01-540-6760 | 20 | 1 |
| 4720-01-541-0697 | 16 | 3 |
| | 18 | 10 |
| 4720-01-541-1308 | 16 | 2 |
| | 18 | 1 |
| 5340-01-541-5407 | 23 | 4 |
| 4710-01-543-0840 | 24 | 5 |
| 4720-01-543-1165 | 24 | 11 |
| 4710-01-543-3416 | 24 | 6 |
| 4710-01-543-3418 | 24 | 1 |
| 4720-01-543-4241 | 24 | 13 |
| 4720-01-543-4246 | 24 | 10 |
| 4730-01-543-4250 | 21 | 12 |
| 4710-01-543-5071 | 24 | 7 |
| 4820-01-550-0151 | 22 | 6 |
| 4720-01-563-6545 | 24 | 8 |

**END OF WORK PACKAGE**

# FIELD MAINTENANCE
# PART NUMBER INDEX

| PART NUMBER | FIG. | ITEM |
|---|---|---|
| A2660-1 | 16 | 10 |
| | 18 | 3 |
| AA55571/01-001 | 6 | 3 |
| AC-1-390 | 22 | 5 |
| AC218 | 2 | 31 |
| B1821BH025C075L | 5 | 1 |
| B1821BH031C063N | 2 | 32 |
| B1821BH038C075N | 2 | 5 |
| B1821BH038C100L | 13 | 5 |
| | 23 | 6 |
| B1821BH038C100N | 2 | 23 |
| B1821BH038C125N | 13 | 8 |
| B1821BH038C150L | 23 | 3 |
| B1821BH038C200L | 13 | 10 |
| | 16 | 8 |
| | 18 | 5 |
| B1821BH038C300N | 2 | 12 |
| | 26 | 4 |
| B1821BH038C325L | 20 | 3 |
| B1821BH050C100N | 2 | 38 |
| B1821BH050C113L | 13 | 6 |
| B1821BH050C125N | 2 | 11 |
| | 2 | 18 |
| B1821BH050C250N | 13 | 12 |
| B1821BH050C450N | 2 | 8 |
| BVHP-08-SSS-1NG | 22 | 10 |
| | 25 | 11 |
| C0120 | 2 | 45 |
| C0122-N | 2 | 42 |
| CP103 | 2 | 30 |
| FG1011GGG0360 | 20 | 2 |
| J514 10-10 070120SA | 25 | 8 |
| MS16842-9 | 2 | 48 |
| MS17829-6C | 13 | 2 |
| | 26 | 6 |
| MS17829-8C | 13 | 14 |
| MS21318-46 | 2 | 34 |
| MS24665-283 | 1 | 15 |
| | 2 | 29 |
| MS24665-688 | 2 | 41 |
| MS27147-1 | 7 | 2 |
| MS27183-11 | 2 | 25 |
| MS27183-14 | 23 | 5 |
| MS27183-17 | 2 | 27 |
| MS27183-18 | 2 | 4 |
| | 13 | 7 |
| MS27183-50 | 4 | 5 |
| | 5 | 2 |
| MS27595-019 | 15 | 3 |
| | 15 | 7 |
| | 17 | 12 |
| | 19 | 15 |
| | 21 | 3 |
| | 21 | 18 |
| MS28774-018 | 15 | 13 |
| MS28774-019 | 15 | 11 |
| MS28775-118 | 15 | 2 |
| | 15 | 6 |
| | 17 | 14 |
| | 19 | 14 |
| | 21 | 2 |
| | 21 | 17 |
| MS28778-10 | 15 | 23 |
| | 25 | 9 |
| MS28778-12 | 15 | 10 |
| | 21 | 10 |
| MS28778-4 | 12 | 1 |
| | 15 | 16 |
| | 15 | 18 |
| | 17 | 5 |
| | 17 | 10 |
| | 19 | 2 |
| | 19 | 3 |
| | 21 | 13 |
| MS28778-8 | 15 | 21 |
| | 17 | 8 |
| | 19 | 6 |
| | 21 | 7 |
| | 22 | 4 |
| | 25 | 1 |
| MS35649-282 | 6 | 1 |
| MS35674-48 | 1 | 6 |
| MS35691-13 | 1 | 22 |
| MS35691-17 | 2 | 26 |
| MS35691-21 | 1 | 16 |
| MS35810-4 | 1 | 13 |
| MS51521A6 | 20 | 6 |
| MS51521A8 | 14 | 1 |
| | 25 | 4 |
| MS51523-B8 | 22 | 11 |
| MS51524A8 | 25 | 3 |
| MS51525A12 | 21 | 11 |
| MS51525A6 | 17 | 15 |
| | 19 | 11 |
| | 21 | 9 |
| MS51525A8 | 15 | 22 |

| PART NUMBER | FIG. | ITEM |
|---|---|---|
| | 17 | 16 |
| | 19 | 12 |
| | 25 | 2 |
| MS51526A10 | 15 | 24 |
| MS51527A4 | 17 | 4 |
| | 19 | 4 |
| | 21 | 15 |
| MS51527A4P | 2 | 15 |
| MS51527A6 | 17 | 3 |
| | 19 | 9 |
| | 21 | 5 |
| MS51527A8 | 2 | 14 |
| | 15 | 25 |
| | 25 | 12 |
| MS51528A10Z | 15 | 27 |
| MS51528A6 | 17 | 6 |
| | 19 | 7 |
| MS51528A8Z | 15 | 28 |
| MS51528B8 | 17 | 7 |
| | 19 | 5 |
| | 25 | 7 |
| MS51576-37 | 2 | 33 |
| MS51860-56Z | 22 | 7 |
| MS51967-2 | 4 | 4 |
| MS9320-16 | 26 | 2 |
| NAS1454C4A-0504 | 4 | 3 |
| NASM51095-446 | 26 | 3 |
| S-7926 | 4 | 1 |
| SAE J514 10-10 070221S | 14 | 2 |
| | 25 | 6 |
| SAE J514 4-4 070120S | 21 | 14 |
| SAE J514 8-6 070201C | 22 | 1 |
| SB70-DC-24AD | 15 | 5 |
| | 21 | 16 |
| SB70-DO-24AD | 15 | 1 |
| | 17 | 11 |
| | 19 | 13 |
| | 21 | 1 |
| TT-2304-02 | 2 | 7 |
| 1037390 | 2 | 47 |
| 10910174-3 | 13 | 3 |
| | 16 | 9 |
| | 18 | 4 |
| | 20 | 4 |
| | 23 | 2 |
| 10910174-5 | 13 | 13 |
| 10910174-8 | 22 | 8 |
| 109155 | 1 | 24 |
| 1141-51 | 1 | 25 |
| 115544 | 6 | 2 |
| 12325792 | 1 | 2 |
| 12325799-1 | 1 | 20 |
| 12325799-2 | 1 | 12 |
| 12325799-3 | 1 | 9 |
| 12331885 | 1 | 5 |
| 12331895-1 | 1 | 4 |
| | 1 | 8 |
| | 1 | 11 |
| | 1 | 19 |
| 12332097-1 | 1 | 18 |
| 12332097-2 | 1 | 10 |
| 12332097-3 | 1 | 7 |
| 12332232 | 1 | 3 |
| 12335054-2 | 15 | 19 |
| 12335054-4 | 15 | 29 |
| 12335054-5 | 15 | 20 |
| | 21 | 8 |
| 12335109-1 | 1 | 26 |
| 12335109-2 | 1 | 21 |
| 12335109-3 | 1 | 27 |
| 12412159 | 2 | 46 |
| 12466295-1 | 2 | 40 |
| 12466295-A | 2 | 43 |
| 12466295-B | 2 | 44 |
| 12488667 | 26 | 1 |
| 12496923 | 12 | 2 |
| | 15 | 15 |
| | 17 | 9 |
| | 19 | 1 |
| 12496924 | 13 | 15 |
| 12496927 | 13 | 11 |
| 12496932 | 4 | 6 |
| 12496933 | 4 | 2 |
| 12496934 | 17 | 1 |
| 12496935 | 15 | 17 |
| 12496936 | 15 | 9 |
| 12496937 | 3 | 1 |
| 12496938 | 21 | 12 |
| 12496939 | 24 | 6 |
| 12496940 | 24 | 5 |
| 12496941 | 24 | 1 |
| 12496944 | 13 | 4 |
| 12496948 | 19 | 10 |
| 12496952 | 13 | 9 |
| 12496953 | 8 | 1 |
| 12496954 | 9 | 1 |
| 12496955 | 10 | 1 |
| 12496956 | 11 | 1 |
| 12496957 | 7 | 1 |
| 12496958 | 7 | 4 |
| 12496959 | 13 | 1 |
| 12496963 | 24 | 7 |
| 12496964 | 5 | 3 |
| 12496966 | 23 | 1 |
| 12496967 | 23 | 4 |
| 13211E8634 | 26 | 5 |

**END OF WORK PACKAGE**

# CHAPTER 6

# SUPPORTING INFORMATION

# FIELD MAINTENANCE
# REFERENCES

## SCOPE

This work package lists all field manuals, forms, technical manuals, and miscellaneous publications referenced in this manual.

## PUBLICATION INDEXES

The following indexes should be consulted frequently for latest changes or revisions and for new publications relating to material covered in this technical manual.

## FIELD MANUALS

| | |
|---|---|
| FM 4-25.11 | First Aid |

## FORMS

| | |
|---|---|
| DA Form 2028 | Recommended Changes to Publications and Blank Forms |
| DA Form 2404 | Equipment Inspection and Maintenance Worksheet |
| SF 361 | Transportation Discrepancy Report |
| SF 368 | Product Quality Deficiency Report |

## PAMPHLETS

| | |
|---|---|
| DA PAM 750-8 | The Army Maintenance Management System (TAMMS) Users Manual |

## TECHNICAL MANUALS

| | |
|---|---|
| TM 5-2350-262-10 | Operator's Manual for Armored Combat Earthmover (ACE), M9 (2350-00-808-7100) |
| TM 5-2350-262-20 | Unit Maintenance Manual for Armored Combat Earthmover (ACE) |
| TM 5-2350-262-24P | Field Maintenance Repair Parts and Special Tools List for Armored Combat Earthmover (ACE), M9 |
| TM 750-244-6 | Procedures for Destruction of Equipment to Prevent Enemy Use (Mobility Equipment Command) |

**END OF WORK PACKAGE**

# FIELD MAINTENANCE
# MAINTENANCE ALLOCATION CHART (MAC) INTRODUCTION

## The Army Maintenance System MAC

This introduction provides a general explanation of all maintenance and repair functions authorized at the two maintenance levels under the Two-Level Maintenance System concept.

This MAC (immediately following the introduction) designates overall authority and responsibility for the performance of maintenance functions on the identified end item or component. The application of the maintenance functions to the end item or component shall be consistent with the capacities and capabilities of the designated maintenance levels, which are shown on the MAC in column (4) as:

Field - includes two subcolumns, Crew (C) and Maintainer (F)
Sustainment - includes two subcolumns, Below Depot (H) and Depot (D)

The maintenance to be performed at field and sustainment levels is described as follows:

1. **Crew maintenance.** The responsibility of using organization to perform maintenance on its assigned equipment. It normally consists of inspecting, servicing, lubricating, adjusting, and replacing parts, minor assemblies, and subassemblies. The replace function for this level of maintenance is indicated by the letter "C" in the third position of the SMR code. A "C" appearing in the fourth position of the SMR code indicates complete repair is possible at the crew maintenance level.

2. **Maintainer maintenance.** Maintenance accomplished on a component, accessory, assembly, subassembly, plug-in unit, or other portion either on the system or after it is removed. The replace function for this level of maintenance is indicated by the letter "F" appearing in the third position of the SMR code. An "F" appearing in the fourth position of the SMR code indicates complete repair is possible at the field maintenance level. Items are returned to the user after maintenance is performed at this level.

3. **Below depot sustainment.** Maintenance accomplished on a component, accessory, assembly, subassembly, plug-in unit, or other portion either on the system or after it is removed. The replace function for this level of maintenance is indicated by the letter "H" appearing in the third position of the SMR code. An "H" appearing in the fourth position of the SMR code indicates complete repair is possible at the below depot sustainment maintenance level. Items are returned to the supply system after maintenance is performed at this level.

4. **Depot sustainment.** Maintenance accomplished on a component, accessory, assembly, subassembly, plug-in unit, or other portion either on the system or after it is removed. The replace function for this level of maintenance is indicated by the letter "D" or "K" appearing in the third position of the SMR code. Depot sustainment maintenance can be performed by either depot personnel or contractor personnel. A "D" or "K" appearing in the fourth position of the SMR code indicates complete repair is possible at the depot sustainment maintenance level. Items are returned to the supply systems after maintenance is performed at this level.

   The tools and test equipment requirements table (immediately following the MAC) lists the tools and test equipment (both special tools and common tool sets) required for each maintenance function as referenced from the MAC.

   The remarks table (immediately following the tools and test equipment requirements) contains supplemental instructions and explanatory notes for a particular maintenance function.

### The Army Maintenance System MAC - Continued

Maintenance functions are limited to and defined as follows:

1. **Inspect.** To determine the serviceability of an item by comparing its physical, mechanical, and/or electrical characteristics with established standards through examination (e.g., by sight, sound, or feel) this includes scheduled inspection and gauging and evaluation of cannon tubes.

2. **Test.** To verify serviceability by measuring the mechanical, pneumatic, hydraulic, or electrical characteristics of an item and comparing those characteristics with prescribed standards on a scheduled basis, i.e., load testing of lift devices and hydrostatic testing of pressure hoses.

3. **Service.** Operations required periodically to keep an item in proper operation condition; e.g., to clean (includes decontamination, when required), to preserve, to drain, to paint, or to replenish fuel, lubricants, chemical fluids, or gases. This includes scheduled exercising and purging of recoil mechanisms. The following are examples of service functions:

    a. Unpack. To remove from packing box for service or when required for the performance of maintenance operations.

    b. Repack. To return item to packing box after service and other maintenance operations.

    c. Clean. To rid the item of contamination.

    d. Touch up. To spot paint scratched or blistered surfaces.

    e. Mark. To restore obliterated identification.

4. **Adjust.** To maintain or regulate, within prescribed limits, by bringing into proper position, or by setting the operating characteristics to specified parameters.

5. **Align.** To adjust specified variable elements of an item to bring about optimum or desired performance.

6. **Calibrate.** To determine and cause corrections to be made or to be adjusted on instruments of test, measuring, and diagnostic equipment used in precision measurements. Consists of comparisons of two instruments, one of which is a certified standard of known accuracy, to detect and adjust any discrepancy in the accuracy of the instrument being compared.

7. **Remove/Install.** To remove and install the same item when required to perform service or other maintenance functions. Install may be the act of emplacing, seating, or fixing into position a spare, repair part, or module (component or assembly) in a manner to allow the proper functioning of an equipment or system.

8. **Paint (ammunition only).** To prepare and spray color coats of paint so that the ammunition can be identified and protected. The color indicating primary use is applied, preferably, to the entire exterior surface as the background color of the item. Other markings are to be repainted as original so as to retain proper ammunition identification.

9. **Replace.** To remove an unserviceable item and install a serviceable counterpart in its place. "Replace" is authorized by the MAC and assigned maintenance level is shown as the third position code of the Source, Maintenance and Recoverability (SMR) code.

10. **Repair.** The application of maintenance services, including fault location/troubleshooting, removal/installation, disassembly/assembly procedures and maintenance actions to identify troubles and restore serviceability to an item by correcting specific damage, fault, malfunction, or failure in a part, subassembly, module (component or assembly), end item, or system.

**The Army Maintenance System MAC - Continued**

**NOTE**

The following definitions are applicable to the "repair" maintenance function:

Services: Inspect, test, service, adjust, align, calibrate, and/or replace.

Fault location/troubleshooting. The process of investigating and detecting the cause of equipment malfunctioning; the act of isolating a fault within a system or Unit Under Test (UUT).

Disassembly/assembly. The step-by-step breakdown (taking apart) of a spare/ functional group coded item to the level of its least component, that is assigned an SMR code for the level of maintenance under consideration (i.e., identified as maintenance significant).

Actions. Welding, grinding, riveting, straightening, facing, machining, and/or resurfacing.

11. **Overhaul.** That maintenance effort (service/action) prescribed to restore an item to a completely serviceable/operational condition as required by maintenance standards in appropriate technical publications. Overhaul is normally the highest degree of maintenance performed by the Army. Overhaul does not normally return an item to like new condition.

12. **Rebuild.** Consists of those services/actions necessary for the restoration of unserviceable equipment to a like new condition in accordance with original manufacturing standards. Rebuild is the highest degree of material maintenance applied to Army equipment. The rebuild operation includes the act of returning to zero those age measurements (e.g., hours/miles) considered in classifying Army equipment/components.

**EXPLANATION OF COLUMNS IN THE MAC**

Maintenance functions are limited to and defined as follows:

**Column (1) Group Number.** Column (1) lists Functional Group Code (FGC) numbers, the purpose of which is to identify maintenance significant components, assemblies, subassemblies, and modules with the Next Higher Assembly (NHA).

**Column (2) Component/Assembly.** Column (2) contains the item names of components, assemblies, subassemblies, and modules for which maintenance is authorized.

**Column (3) Maintenance Function.** Column (3) lists the functions to be performed on the item listed in column (2). (For a detailed explanation of these functions refer to "Maintenance Functions" outlined above).

**Column (4) Maintenance Level.** Column (4) specifies each level of maintenance authorized to perform each function listed in column (3), by indicating work time required (expressed as manhours in whole hours or decimals) in the appropriate subcolumn. This work time figure represents the active time required to perform that maintenance function at the indicated level of maintenance. If the number or complexity of the tasks within the listed maintenance function carries at different maintenance levels, appropriate work time figures are to be shown for each level. The work time figure represents the average time required to restore an item (assembly, subassembly, component, module, end item, or system) to a serviceable condition under typical field operating conditions. This time includes preparation time (including any necessary disassembly/assembly time), troubleshooting/fault location time, and quality assurance time in addition to the time required to perform the specific tasks identified for the maintenance functions authorized in the MAC. The symbol designations for the various maintenance levels are as follows:

**The Army Maintenance System MAC - Continued**

Field:
C Crew maintenance
F Maintainer maintenance

Sustainment:
L Specialized Repair Activity (SRA)
H Below depot maintenance
D Depot maintenance

## NOTE

The "L" maintenance level is not included in column (4) of the MAC. Functions to this level of maintenance are identified by work time figure in the "H" column of column (4), and an associated reference code is used in the REMARKS column (6). This code is keyed to the remarks and the SRA complete repair application is explained there.

**Column (5) Tools and Equipment Reference Code.** Column (5) specifies, by code, those common tool sets (not individual tools), common Test, Measurement and Diagnostic Equipment (TMDE), and special tools, special TMDE and special support equipment required to perform the designated function. Codes are keyed to the entries in the tools and test equipment table.

**Column (6) Remarks Code.** When applicable, this column contains a letter code, in alphabetical order, which is keyed to the remarks table entries.

**Explanation of Columns in the Tools and Test Equipment Requirements**

**Column (1) - Tool or Test Equipment Reference Code.** The tool or test equipment reference code correlates with a code used in column (5) of the MAC.

**Column (2) - Maintenance Level.** The lowest level of maintenance authorized to use the tool or test equipment.

**Column (3) - Nomenclature.** Name or identification of the tool or test equipment.

**Column (4) - National Stock Number (NSN).** The NSN of the tool or test equipment.

**Column (5) - Tool Number.** The manufacturer's part number.

**Explanation of Columns in the Remarks**

**Column (1) - Remarks Code.** The code recorded in column (6) of the MAC.

**Column (2) - Remarks.** This column lists information pertinent to the maintenance functions being performed as indicated in the MAC.

**END OF WORK PACKAGE**

## FIELD MAINTENANCE
## STANDARD TWO-LEVEL MAC

*Table 1. Maintenance Allocation Chart (MAC).*

| (1) GROUP NUMBER | (2) COMPONENT/ ASSEMBLY | (3) MAINTENANCE FUNCTION | (4) MAINTENANCE LEVEL: FIELD: CREW C | FIELD: MAINTAINER F | SUSTAINMENT: BELOW DEPOT H | SUSTAINMENT: DEPOT D | (5) TOOLS AND EQUIPMENT REFERENCE CODE | (6) REMARKS CODE |
|---|---|---|---|---|---|---|---|---|
| A801-00 | HDC Control Box | | | | | | | |
| A801-01 | HDC Stowage Bracket | Replace | | 0.5 | | | 5 | A |
| A801-02 | HDC Disconnect Bracket | Replace | | 1.0 | | | 5 | A |
| A801-03 | HDC Circuit Breaker | Replace | | 0.5 | | | 5 | A |
| A801-04 | HDC Power Components | Replace | | 0.5 | | | 5 | A |
| A801-05 | Wiring Harness W1 | Replace | | 0.5 | | | 5 | A |
| A801-06 | Wiring Harness W2 | Replace | | 2.5 | | | 5 | A |
| A801-07 | Wiring Harness W3 | Replace | | 4.4 | | | 4, 5 | A |
| A801-08 | Wiring Harness W4 | Replace | | 0.1 | | | | A |
| A801-09 | Pressure Transducers | Replace | | 0.4 | | | 5, 6 | A, B |
| A801-10 | HDC Primary Manifold Assembly and Mounting Bracket | Replace | | 9.0 | | | 1, 3, 5, 6 | A, B |
| A801-11 | HDC Primary Manifold Assembly | Repair | | 10.0 | | | 1, 3, 5, 6 | A, B |

*Table 1. Maintenance Allocation Chart (MAC) - Continued.*

| (1) GROUP NUMBER | (2) COMPONENT/ ASSEMBLY | (3) MAINTENANCE FUNCTION | (4) MAINTENANCE LEVEL FIELD CREW C | FIELD MAINTAINER F | SUSTAINMENT BELOW DEPOT H | SUSTAINMENT DEPOT D | (5) TOOLS AND EQUIPMENT REFERENCE CODE | (6) REMARKS CODE |
|---|---|---|---|---|---|---|---|---|
| A801-12 | HDC Forward Left Manifold Assembly | Replace | | 2.8 | | | 2, 3, 4, 5, 6 | A, B |
| | | Repair | | 1.0 | | | 2, 3, 4, 5, 6 | A, B |
| A801-13 | HDC Forward Right Manifold Assembly | Replace | | 2.8 | | | 2, 3, 4, 5, 6 | A, B |
| | | Repair | | 1.0 | | | 2, 3, 4, 5, 6 | A, B |
| A801-14 | HDC Aft Manifold Assembly | Replace | | 2.8 | | | 2, 3, 4, 5, 6 | A, B |
| | | Repair | | 1.0 | | | 2, 3, 4, 5, 6 | A, B |
| A801-15 | Main Pump Hydraulic Filter Area | Replace | | 1.3 | | | 3, 5 | A, B |
| A801-16 | Interconnect-ing Hydraulic Hoses and Tubes | Replace | | 1.9 | | | 3, 5, 6 | A, B |
| A801-17 | DCV Bank | Replace | | 0.5 | | | 5 | A, B |
| A801-18 | Hull/Ejector Interference | Replace | | 1.0 | | | 5 | A |

*Table 2. Tools and Test Equipment.*

| TOOL OR TEST EQUIPMENT REF CODE | MAINTENANCE CATEGORY | NOMENCLATURE | NATIONAL/NATO STOCK NUMBER | TOOL NUMBER |
|---|---|---|---|---|
| 1 | F | Automotive Tool Set (SATS) | 4910-01-490-6453 | SC 4910-95-A81 |
| 2 | F | Adapter, Socket Wrench | 5120-00-240-8702 | 11655788-2 |
| 3 | F | Plug, Hydraulic Tank | 5340-01-222-7934 | 12355501 |
| 4 | F | Stand, Vehicle | 2590-01-228-5802 | 12355345 |
| 5 | F | Tool Kit, General Mechanic's: Automotive | 5180-01-548-7634 | PD484 |
| 6 | F | Wrench Set, Crowfoot | 5120-01-302-4387 | 5705566 |

*Table 3. Remarks.*

| REMARK CODE | REMARKS |
|---|---|
| A | Check for proper operation |
| B | Inspect for leaks, unusual noises |

**END OF WORK PACKAGE**

# FIELD MAINTENANCE
# EXPENDABLE AND DURABLE ITEMS LIST

## INTRODUCTION

### Scope

This work package lists expendable and durable items that you will need to operate and maintain the Hydraulic Diagnostic Center (HDC). 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), CTA 50-909, Field and Garrison Furnishings and Equipment or CTA 8-100, Army Medical Department Expendable/Durable Items.

### Explanation of Columns in the Expendable/Durable Items List

**Column (1) Item No.** This number is assigned to the entry in the list and is referenced in the narrative instructions to identify the item (e.g., Use brake fluid (WP 0098, Item 5)).

**Column (2) Level.** This column identifies the lowest level of maintenance that requires the listed item (F = Maintainer or ASB).

**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, Part Number/(CAGEC).** This column provides the other information you need to identify the item. The last line below the description is the part number and the Commercial and Government Entity Code (CAGEC) (in parentheses).

**Column (5) U/I.** Unit of Issue (U/I) 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 NO. | (2) LEVEL | (3) NATIONAL STOCK NUMBER (NSN) | (4) ITEM NAME, DESCRIPTION, PART NUMBER/ (CAGEC) | (5) U/I |
|---|---|---|---|---|
| **Lubricating Oil, Engine** | | | | |
| 1 | F | 9150-00-186-6668 | Lubricating Oil, Engine OE/HDO-10, 5 gal<br>M2104-3-10W (81349) | CN |
| **Rag, Wiping** | | | | |
| 2 | F | 7920-00-205-1711 | Rag, Wiping<br>7920-00-205-1711 (64067) | BE |
| **Sealing Compound** | | | | |
| 3 | F | 8030-01-299-1762 | Sealing Compound<br>81724 (1PBQ8) | TU |
| **Strap, Tiedown, Electrical** | | | | |
| 4 | F | 5975-00-074-2072 | Strap, Tiedown, Electrical<br>MS3367-1-9 (81343) | HD |

**END OF WORK PACKAGE**

# FIELD MAINTENANCE
# TOOL IDENTIFICATION LIST

## INTRODUCTION

### Scope

This work package lists all common tools and supplements and special tools/fixtures needed to maintain the Hydraulic Diagnostic Center (HDC).

Most PM-SKOT products have lifetime warranties and replacement capabilities and are supported worldwide through PM-SKOT. The PM-SKOT implemented a Web-based tool replacement and warranty program in May 2005 for tools authorized in SKO. User may access the online program by first accessing the PM-SKOT Web site at https://pmskot.army.mil and clicking on the Tool Replacement/Warranty banner.

### Explanation of Columns in the Tool Identification List

**Column (1) - Item Number**. This number is assigned to the entry in the list and is referenced in the initial setup to identify the item (e.g., Extractor (WP 0090, Item 32)).

**Column (2) - Item Name**. This column lists the item by noun nomenclature and other descriptive features (e.g., Gage, Belt Tension).

**Column (3) - National Stock Number**. This is the National Stock Number (NSN) assigned to the item; use it to requisition the item.

**Column (4) - Part Number/CAGEC**. 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, specifications, standards, and inspection requirements to identify an item or range of items. The manufacturer's Commercial and Government Entity Code (CAGEC) is also included.

**Column (5) - Reference**. This column identifies the authorizing supply catalog or RPSTL for items listed in this work package.

*Table 1. Tool Identification List.*

| (1) ITEM NO. | (2) ITEM NAME | (3) NATIONAL STOCK NUMBER (NSN) | (4) PART NUMBER /(CAGEC) | (5) REFERENCE |
|---|---|---|---|---|
| 1 | Adapter, Socket Wrench | 5120-00-240-8702 | B107.10 (05047) | TM 5-2350-262-24P |
| 2 | Charging Kit, Pressuring | 4940-01-046-7109 | 12252157 (19200) | TM 5-2350-262-24P |
| 3 | Parts Kit, Hydraulic | 2590-01-216-8646 | 5705562 (19207) | TM 5-2350-262-24P |
| 4 | Plug, Hydraulic Tank | 5120-01-222-7934 | 12355501 (19207) | TM 5-2350-262-24P |
| 5 | Stand, Vehicle Support | 2590-01-228-5802 | 12355345 (19207) | TM 5-2350-262-24P |

*Table 1. Tool Identification List - Continued.*

| (1) ITEM NO. | (2) ITEM NAME | (3) NATIONAL STOCK NUMBER (NSN) | (4) PART NUMBER /(CAGEC) | (5) REFERENCE |
|---|---|---|---|---|
| 6 | Tester, Hydraulic Hose Assembly | 4940-00-595-5720 | GS5 (08832) | TM 5-2350-262-24P |
| 7 | Tool Kit, General Mechanic's: Automotive | 5180-01-548-7634 | PD484 (19200) | TM 5-2350-262-24P |
| 8 | Wrench Set, Crowfoot | 5120-01-302-4387 | 5705566 (19207) | TM 5-2350-262-24P |

**END OF WORK PACKAGE**

# FIELD MAINTENANCE
# MANDATORY REPLACEMENT PARTS LIST

## MANDATORY REPLACEMENT PARTS LIST

This work package includes a list of all mandatory replacement parts referenced in the task initial setups and procedures. These are items that must be replaced during maintenance whether they have failed or not. This includes items based on usage intervals such as miles, time, rounds fired, etc.

***Table 1. Mandatory Replacement Parts List.***

| ITEM NO. | PART NUMBER /(CAGEC) | NATIONAL STOCK NUMBER (NSN) | NOMENCLATURE | QTY |
|---|---|---|---|---|
| 1 | 109155 (15434) | 5315-00-839-2325 | Pin, Cotter | 3 |
| 2 | 1133610 (0Y3H3) | 5310-01-583-5824 | Washer, Lock | 1 |
| 3 | B1821BH025C075L (80204) | 5306-01-175-7558 | Bolt, Machine | 8 |
| 4 | B1821BH038C100L (80204) | 5306-01-114-0963 | Bolt, Machine | 11 |
| 5 | B1821BH038C113L (80204) | 5306-01-205-2799 | Bolt, Machine | 3 |
| 6 | B1821BH038C200L (80204) | 5306-01-194-0591 | Bolt, Machine | 6 |
| 7 | B1821BH038C325L (80204) | 5305-01-449-7391 | Screw, Cap, Hexagon, Head | 3 |
| 8 | MS17829-6C (80205) | 5310-00-483-8790 | Nut, Self-Locking | 2 |
| 9 | MS17829-8C (80205) | 5310-00-595-7421 | Nut, Self-Locking | 1 |
| 10 | MS24665-283 (80205) | 5315-00-842-3044 | Pin, Cotter | 1 |
| 11 | MS27595-019 (96906) | 5330-01-118-5705 | Retainer, Packing | 18 |
| 12 | MS28774-018 (96906) | 5330-00-839-1846 | Retainer, Packing | 12 |
| 13 | MS28774-019 (96906) | 5330-00-720-3652 | Retainer, Packing | 12 |
| 14 | MS28775-018 (81343) | 5331-00-618-0799 | O-ring | 6 |

*Table 1. Mandatory Replacement Parts List - Continued.*

| ITEM NO. | PART NUMBER /(CAGEC) | NATIONAL STOCK NUMBER (NSN) | NOMENCLATURE | QTY |
|---|---|---|---|---|
| 15 | MS28775-019 (81343) | 5331-00-551-8441 | O-ring | 14 |
| 16 | MS28775-10 (81343) | 5331-01-306-9602 | O-ring | 1 |
| 17 | MS28775-118 (81343) | 5331-01-514-0923 | O-ring | 12 |
| 18 | MS28778-12 (81343) | 5331-01-219-7930 | O-ring | 8 |
| 19 | MS28778-4 (81343) | 5331-00-805-2966 | O-ring | 27 |
| 20 | MS28778-6 (81343) | 5331-00-804-5695 | O-ring | 12 |
| 21 | MS28778-8 (81343) | 5331-00-808-0794 | O-ring | 42 |
| 22 | MS35333-38 (80205) | 5310-00-559-0070 | Washer, Lock | 8 |
| 23 | NASM51095-446 (80205) | 5306-01-206-8396 | Bolt, Machine | 4 |

**END OF WORK PACKAGE**

# FIELD MAINTENANCE
# DIAGRAMS

## DIAGRAMS

The following diagrams are for the M9 ACE Hydraulic Diagnostic Center (HDC):



**END OF WORK PACKAGE**

# INDEX

**Subject** **WP Sequence No.-Page No.**

## D



## E



## G



## H



## I



## M



## N

# INDEX - Continued

**Subject** **WP Sequence No.-Page No.**

# INDEX - Continued

| RECOMMENDED CHANGES TO PUBLICATIONS AND BLANK FORMS<br>For use of this form, see AR 25-30; the proponent agency is OAASA. | Use Part II *(reverse)* for Repair Parts and Special Tool Lists (RPSTL) and Supply Catalogs/Supply Manuals (SC/SM). | DATE<br>*Date you filled out this form.* |
|---|---|---|

| **TO** *(Forward to proponent of publication or form) (Include ZIP Code)* | **FROM** *(Activity and location) (Include ZIP Code)* |
|---|---|
| U.S. Army TACOM Life Cycle Management Command<br>ATTN: AMSTA-LCL-MPP/TECH PUBS<br>6501 E. 11 Mile Road, Warren, MI 48397-5000 | *Your mailing address* |

**PART I – ALL PUBLICATIONS (EXCEPT RPSTL AND SC/SM) AND BLANK FORMS**

| PUBLICATION/FORM NUMBER | DATE | TITLE |
|---|---|---|
| *TM Number* | *Date of the TM* | *Title of the TM* |

| ITEM | PAGE | PARA-GRAPH | LINE | FIGURE NO. | TABLE | RECOMMENDED CHANGES AND REASON<br>(Exact wording of recommended change must be given) |
|---|---|---|---|---|---|---|
| | *0007-3* | | | | | *Figure 2, Item 9 should show a lockwasher. Currently shows a flat washer.* |
| | *0018-2* | | | | | *Cleaning and inspection, Step 6, reference to governor support pin (14) is wrong reference. Reference should be change to (12).* |

**SAMPLE**

| TYPED NAME, GRADE OR TITLE | TELEPHONE EXCHANGE/AUTOVON, PLUS EXTENSION | SIGNATURE |
|---|---|---|
| *Your Name* | *Your Phone Number* | *Your Signature* |

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**PART II - REPAIR PARTS AND SPECIAL TOOL LISTS AND SUPPLY CATALOGS/SUPPLY MANUALS**

| PUBLICATION NUMBER | DATE | TITLE |
|---|---|---|
| TM 5-2350-378-23&P | 30 March 2012 | Field Maintenance Manual Including Repair Parts and Special Tools List for Hydraulic Diagnostic Center (HDC) Supporting Armored Combat Earthmover (ACE), M9 |

| PAGE NO. | COLM NO. | LINE NO. | NATIONAL STOCK NUMBER | REFERENCE NO. | FIGURE NO. | ITEM NO. | TOTAL NO. OF MAJOR ITEMS SUPPORTED | RECOMMENDED ACTION |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | |



**PART III - REMARKS** *(Any general remarks or recommendations, or suggestions for improvement of publications and blank forms. Additional blank sheets may be used if more space is needed.)*

| TYPED NAME, GRADE OR TITLE | TELEPHONE EXCHANGE/AUTOVON, PLUS EXTENSION | SIGNATURE |
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| Your name | Your telephone number | Your signature |

| **RECOMMENDED CHANGES TO PUBLICATIONS AND BLANK FORMS**<br>For use of this form, see AR 25-30; the proponent agency is OAASA | Use Part II *(reverse)* for Repair Parts and Special Tool Lists (RPSTL) and Supply Catalogs/Supply Manuals (SC/SM). | DATE |
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| PUBLICATION/FORM NUMBER | DATE | TITLE |
|---|---|---|
| TM 5-2350-378-23&P | 30 March 2012 | Field Maintenance Manual Including Repair Parts and Special Tools List for Hydraulic Diagnostic Center (HDC) Supporting Armored Combat Earthmover (ACE), M9 |

| ITEM | PAGE NO. | PARA-GRAPH | LINE NO.* | FIGURE NO. | TABLE NO. | RECOMMENDED CHANGES AND REASON<br>(Provide exact wording of recommended changes, if possible). |
|---|---|---|---|---|---|---|
| | | | | | | |

| TYPED NAME, GRADE OR TITLE | TELEPHONE EXCHANGE/AUTOVON, PLUS EXTENSION | SIGNATURE |
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| U.S. Army TACOM Life Cycle Management Command<br>ATTN: AMSTA-LCL-MPP/TECH PUBS, MS 727<br>6501 E. 11 Mile Road, Warren, MI 48397-5000 | | |

**PART II - REPAIR PARTS AND SPECIAL TOOL LISTS AND SUPPLY CATALOGS/SUPPLY MANUALS**

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| PAGE NO. | COLM NO. | LINE NO. | NATIONAL STOCK NUMBER | REFERENCE NO. | FIGURE NO. | ITEM NO. | TOTAL NO. OF MAJOR ITEMS SUPPORTED | RECOMMENDED ACTION |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | |

**PART III - REMARKS** *(Any general remarks or recommendations, or suggestions for improvement of publications and blank forms. Additional blank sheets may be used if more space is needed.)*

| TYPED NAME, GRADE OR TITLE | TELEPHONE EXCHANGE/AUTOVON, PLUS EXTENSION | SIGNATURE |
|---|---|---|
| | | |

**RECOMMENDED CHANGES TO PUBLICATIONS AND BLANK FORMS**

For use of this form, see AR 25-30; the proponent agency is OAASA

Use Part II *(reverse)* for Repair Parts and Special Tool Lists (RPSTL) and Supply Catalogs/Supply Manuals (SC/SM).

DATE

**TO:** *(Forward to proponent of publication or form) (Include ZIP Code)*

U.S. Army TACOM Life Cycle Management Command
ATTN: AMSTA-LCL-MPP/TECH PUBS, MS 727
6501 E. 11 Mile Road, Warren, MI 48397-5000

**FROM:** *(Activity and location) (Include ZIP Code)*

**PART I - ALL PUBLICATIONS (EXCEPT RPSTL AND SC/SM) AND BLANK FORMS**

| PUBLICATION/FORM NUMBER | DATE | TITLE |
|---|---|---|
| TM 5-2350-378-23&P | 30 March 2012 | Field Maintenance Manual Including Repair Parts and Special Tools List for Hydraulic Diagnostic Center (HDC) Supporting Armored Combat Earthmover (ACE), M9 |

| ITEM | PAGE NO. | PARA-GRAPH | LINE NO.* | FIGURE NO. | TABLE NO. | RECOMMENDED CHANGES AND REASON (Provide exact wording of recommended changes, if possible). |
|---|---|---|---|---|---|---|
| | | | | | | |

| TYPED NAME, GRADE OR TITLE | TELEPHONE EXCHANGE/AUTOVON, PLUS EXTENSION | SIGNATURE |
|---|---|---|
| | | |

| **TO:** *(Forward direct to addressee listed in publication)* | **FROM:** *(Activity and location) (Include ZIP Code)* | **DATE** |
|---|---|---|
| U.S. Army TACOM Life Cycle Management Command<br>ATTN: AMSTA-LCL-MPP/TECH PUBS, MS 727<br>6501 E. 11 Mile Road, Warren, MI 48397-5000 | | |

**PART II - REPAIR PARTS AND SPECIAL TOOL LISTS AND SUPPLY CATALOGS/SUPPLY MANUALS**

| PUBLICATION NUMBER | DATE | TITLE |
|---|---|---|
| TM 5-2350-378-23&P | 30 March 2012 | Field Maintenance Manual Including Repair Parts and Special Tools List for Hydraulic Diagnostic Center (HDC) Supporting Armored Combat Earthmover (ACE), M9 |

| PAGE NO. | COLM NO. | LINE NO. | NATIONAL STOCK NUMBER | REFERENCE NO. | FIGURE NO. | ITEM NO. | TOTAL NO. OF MAJOR ITEMS SUPPORTED | RECOMMENDED ACTION |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | |

**PART III - REMARKS** *(Any general remarks or recommendations, or suggestions for improvement of publications and blank forms. Additional blank sheets may be used if more space is needed.)*

| TYPED NAME, GRADE OR TITLE | TELEPHONE EXCHANGE/AUTOVON, PLUS EXTENSION | SIGNATURE |
|---|---|---|
| | | |

| **RECOMMENDED CHANGES TO PUBLICATIONS AND BLANK FORMS**<br>For use of this form, see AR 25-30; the proponent agency is OAASA | Use Part II *(reverse)* for Repair Parts and Special Tool Lists (RPSTL) and Supply Catalogs/Supply Manuals (SC/SM). | DATE |
|---|---|---|
| **TO:** *(Forward to proponent of publication or form) (Include ZIP Code)*<br>U.S. Army TACOM Life Cycle Management Command<br>ATTN: AMSTA-LCL-MPP/TECH PUBS, MS 727<br>6501 E. 11 Mile Road, Warren, MI 48397-5000 | **FROM:** *(Activity and location) (Include ZIP Code)* | |

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|---|---|---|---|---|---|---|
| | | | | | | |

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|---|---|---|---|---|---|---|---|---|
| | | | | | | | | |

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| TYPED NAME, GRADE OR TITLE | TELEPHONE EXCHANGE/AUTOVON, PLUS EXTENSION | SIGNATURE |
|---|---|---|
| | | |

*DA FORM 2028, FEB 1974*

By Order of the Secretary of the Army:

RAYMOND T. ODIERNO
*General, United States Army*
*Chief of Staff*

Official:

Joyce E. Morrow

JOYCE E. MORROW
*Administrative Assistant to the*
*Secretary of the Army*

1214215

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| REVISIONS | | | | |
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| | - | PRODUCT BASELINE ERR GSDU4462 | 05-09-30 | DMA |

CAD MAINTAINED DRAWING. CHANGES SHALL BE INCORPORATED BY THE DESIGN ACTIVITY. DO NOT REVISE DRAWING MANUALLY.

NOTES: (UNLESS OTHERWISE SPECIFIED)

1. APPLICABLE STANDARDS / SPECIFICATIONS:
   A. INTERPRET DRAWING IAW MIL-STD-100.
   B. DIMENSIONING AND TOLERANCING IAW ANSI Y14.5M-1982.

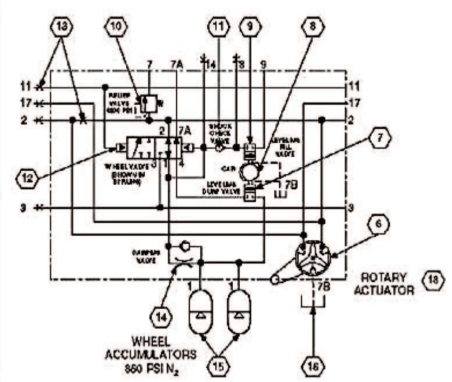
2. LINE TO TRACK ADJUSTOR CIRCUIT. TRACK ADJUSTOR CIRCUIT NOT SHOWN.

3. INTERMEDIATE WHEEL CONTROL VALVE PREVENTS INTERMEDIATE WHEEL FROM FROM RAISING WHEN LOWERING FRONT OF VEHICLE

4. PRESSURE COMPENSATED VARIABLE DISPLACEMENT PUMP: 13 GPM FLOW AT 2400 RPM, 2650 PSI COMPENSATOR SETTING (MAINTAINS 2650 PSI OUTLET PRESSURE WHENEVER FLOW DEMAND DOES NOT EXCEED FLOW CAPACITY)

5. MAIN PUMP. DOUBLE OR SPLIT FLOW FIXED DISPLACEMENT PUMP 26 GPM @ 2400 PSI (13 PER SIDE)

DETAIL SCHEMATIC OF TYPICAL CORNER ACTUATOR. SEE NOTE 17 FOR PORT PASSAGE AND INTERNAL PASSAGE CODE




6. ROTARY ACTUATOR SHAFT (MOUNTS ROAD WHEEL ARM)

7. LEVELING DUMP VALVE: OPENED BY CAM TO DRAIN ACCUMULATORS AND LOWER VEHICLE WHEN VEHICLE IS TOO HIGH

8. CAM: BOLTED TO ACTUATOR SHAFT, OPENS AND CLOSES LEVELING VALVES AT APPROPRIATE POINTS OF SHAFT ROTATION (AT APPROPRIATE VEHICLE HEIGHT)

9. LEVELING FILL VALVE: OPENED BY CAM TO REPLENISH ACCUMULATORS AND RAISE VEHICLE WHEN VEHICLE IS TOO LOW

10. RELIEF VALVE: PROTECTS UNIT FROM HIGH PRESSURE SURGES

11. SHOCK LOAD AND REPLENISHING CHECK VALVE: PERMITS REPLENISHING OF ACCUMULATOR VIA PORT 9, BUT PREVENTS ACCUMULATOR PRESSURE SURGES FROM ENTERING CIRCUIT No.9

12. WHEEL VALVE:
A. IN 'SPRUNG' (SHOWN) ACTUATOR SHAFT IS HYDRAULICALLY CONNECTED TO ACCUMULATORS (SUSPENSION HAS SPRINGS), AND FLOW FROM LEVELING DUMP VALVE CAN RETURN TO TANK THRU PORT 7A
B. IN 'UNSPRUNG' MODE (PORT 11 PRESSURIZED), ACTUATOR SHAFT IS ISOLATED FROM ACCUMULATORS (SUSPENSION HAS NO SPRINGS), FLOW FROM LEVELING DUMP VALVE IS BLOCKED TO PREVENT LOSS OF ACCUMULATOR PRESSURE DURING DOZING AND ACTUATOR SHAFT IS HYDRAULICALLY CONNECTED TO MAIN CONTROL VALVE VIA PORT 3

13. PORTS 11,17,2 AND 3 ARE PLUGGED ON L.H. OR R.H. SIDE OF UNIT DEPENDING ON DESIRED DIRECTION OF SHAFT ROTATION. WHEN PLUGS ARE INSTALLED AS SHOWN, PRESSURE TO PORT 2 WILL CAUSE C.W. SHAFT ROTATION

14. DAMPENING VALVE. PERMITS FREE FLOW INTO ACCUMULATOR SO THEY CAN RAPIDLY ABSORB SUSPENSION SHOCKS, BUT RESTRICTS FLOW RATE FROM ACCUMULATORS TO PROVIDE SMOOTH REACTION TO SUSPENSION SHOCKS

15. WHEEL ACCUMULATORS (850 PSI DRY $N_2$) ATTACH TO PORT 1 OF ROTARY ACTUATOR. FUNCTION AS SUSPENSION SPRINGS WHEN VEHICLE IS IN 'SPRUNG' MODE

16. CASE DRAIN

17. ROTARY ACTUATOR PORT AND INTERNAL PASSAGE CODE

1. WHEEL ACCUMULATOR TO WHEEL VALVE AND LEVELING DUMP VALVE (size -14)

2. EXTERNAL PORT AND PASSAGES TO WHEEL VALVE AND ACTUATOR SHAFT VANES (PRESSURIZED TO RAISE VEHICLE) (size -12)

3. EXTERNAL PORT AND PASSAGES TO WHEEL VALVE (PRESSURIZED TO RAISE VEHICLE WHEN IN 'UNSPRUNG' MODE) (size -8)

4. EXTERNAL PASSAGE FROM LEVELING DUMP VALVE TO WHEEL VALVE

7. EXTERNAL PORT FOR RELIEF VALVE OUTLET FLOW (size -8)

7A. EXTERNAL PORT AND PASSAGE FROM WHEEL VALVE (CARRIES LEVELING DUMP VALVE FLOW WHEN VEHICLE IS IN 'UNSPRUNG' MODE) (size -6)

7B. EXTERNAL PORT AND PASSAGE FROM DRAIN CHAMBER (size -6)

8. EXTERNAL PORT AND AUXILIARY PASSAGE TO WHEEL ACCUMULATOR AND FROM PORT 9 (size -4)

9. EXTERNAL PORT AND PASSAGE THRU LEVELING FILL VALVE TO WHEEL ACCUMULATOR (PRESSURIZED TO CHARGE ACCUMULATOR WHEN LEVELING FILL VALVE IS HOLD OPEN BY CAM) (size -6)

11. EXTERNAL PORT AND PASSAGE TO WHEEL VALVE (PRESSURIZED TO SHIFT WHEEL VALVE INTO 'UNSPRUNG' MODE) ( (size -4)

14. EXTERNAL PORT AND AUXILIARY PASSAGE TO WHEEL ACCUMULATOR

17. EXTERNAL PORT AND PASSAGES TO ACTUATOR SHAFT VANES (PRESSURIZED TO LOWER VEHICLE WHEN IN 'UNSPRUNG' MODE, IS RETURN LINE PASSAGE WHEN RAISING VEHICLE IN BOTH 'SPRUNG' AND 'UNSPRUNG' MODE) (size -8)

18. FOR ESTIMATING PURPOSE THE SIZE OF THE ROTARY ACTUATOR AS AN EQUIVALENT THREE LOBE MOTOR IS 325 CU.IN.

ADDED GRAPHIC SYMBOLS

- SOLENOID VALVE, POPPET, 2 POSITION, 2 WAY, BIDIRECTINAL, NORMALLY OPEN
- SOLENOID VALVE, POPPET, 2 POSITION, 2 WAY, BIDIRECTINAL, NORMALLY CLOSED
- SOLENOID VALVE, SPOOL, 2 POSITION, 3 WAY, BIDIRECTIONAL, SIDE CYLIDER PORT
- SHUT-OFF VALVE
- PRESSURE TRANSDUCER
- PRESSURE RELIEF

COLOR SCHEME

- RESERVOIR AND RETURN/DRAIN LINES
- PUMP PRESSURE LINES
- WHEEL SUSPENSION AND HEIGHT CONTROL
- SPRUNG/UNSPRUNG CONTROL CIRCUIT
- MAIN EJECTOR AND APRON CIRCUITS
- WINCH AND BILGE CIRCUITS
- FORWARD AND MAIN MANIFOLDS
- PRESSURE TRANSDUCERS AND VALVES
- NEW TUBES AND HOSES FROM HDC

DRAWING CONTENT:

SHEET 1: NOTES AND DOCUMENT REVISION CONTROL

SHEET 2: M9 ACE HDC HYDRAULIC SCHEMATIC

SHEET 3: VEHICLE SCHEMATIC BEFORE REWORK

ACE00202 1



UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETERS

CONTRACTOR: United Defense, L.P. Ground Systems Division Arlington, Virginia 22209

DESIGN ACTIVITY APPROVAL: J.BAJWA

PART NO.

U.S. Army Tank-Automotive and Armaments Command Warren, Michigan 48397-5000

M9 ACE HDC HYDRAULIC SCHEMATIC

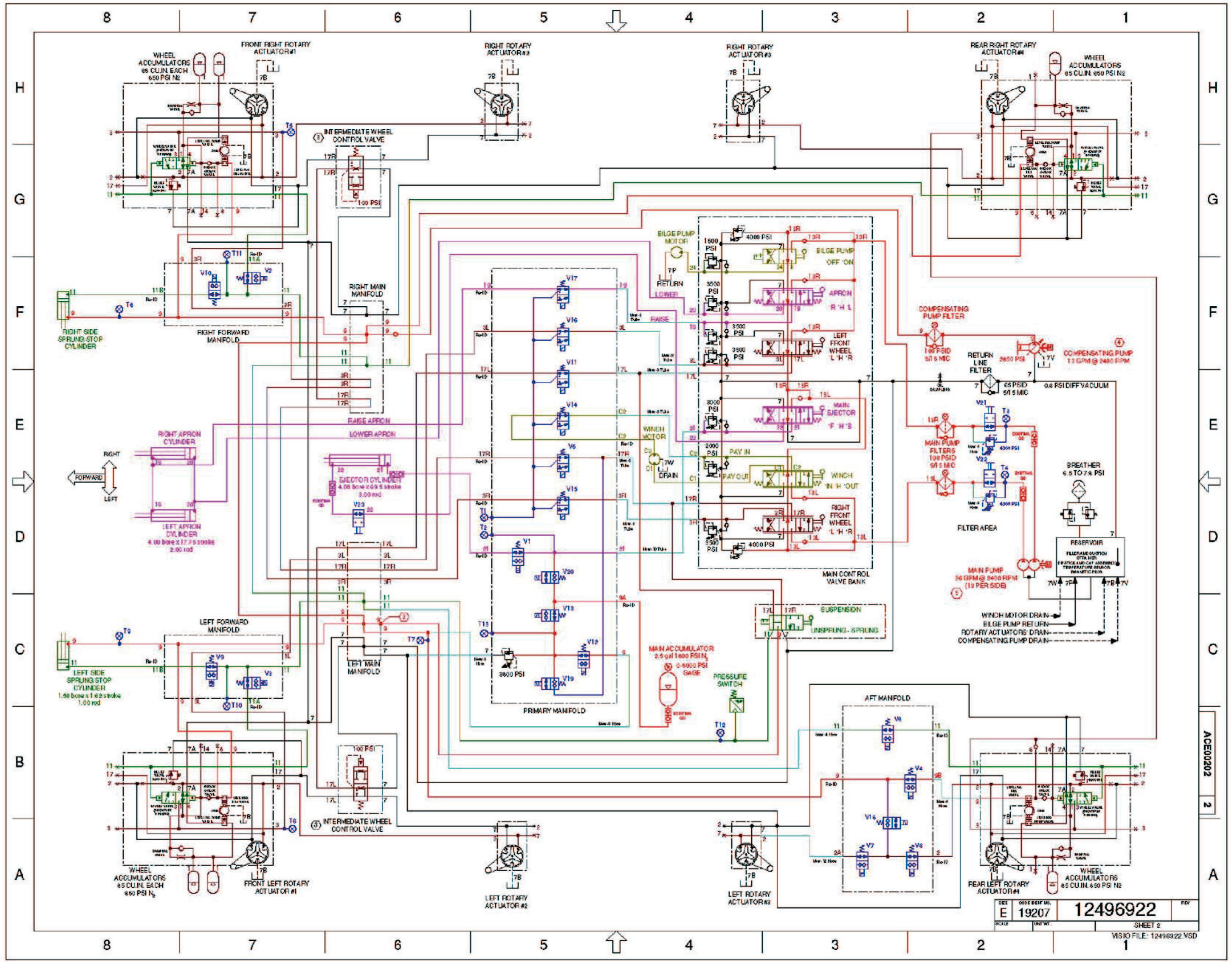
SIZE E | CODE IDENT NO. 19207 | 12496922

SHEET 1 OF 3

VISIO FILE: 12496922.VSD

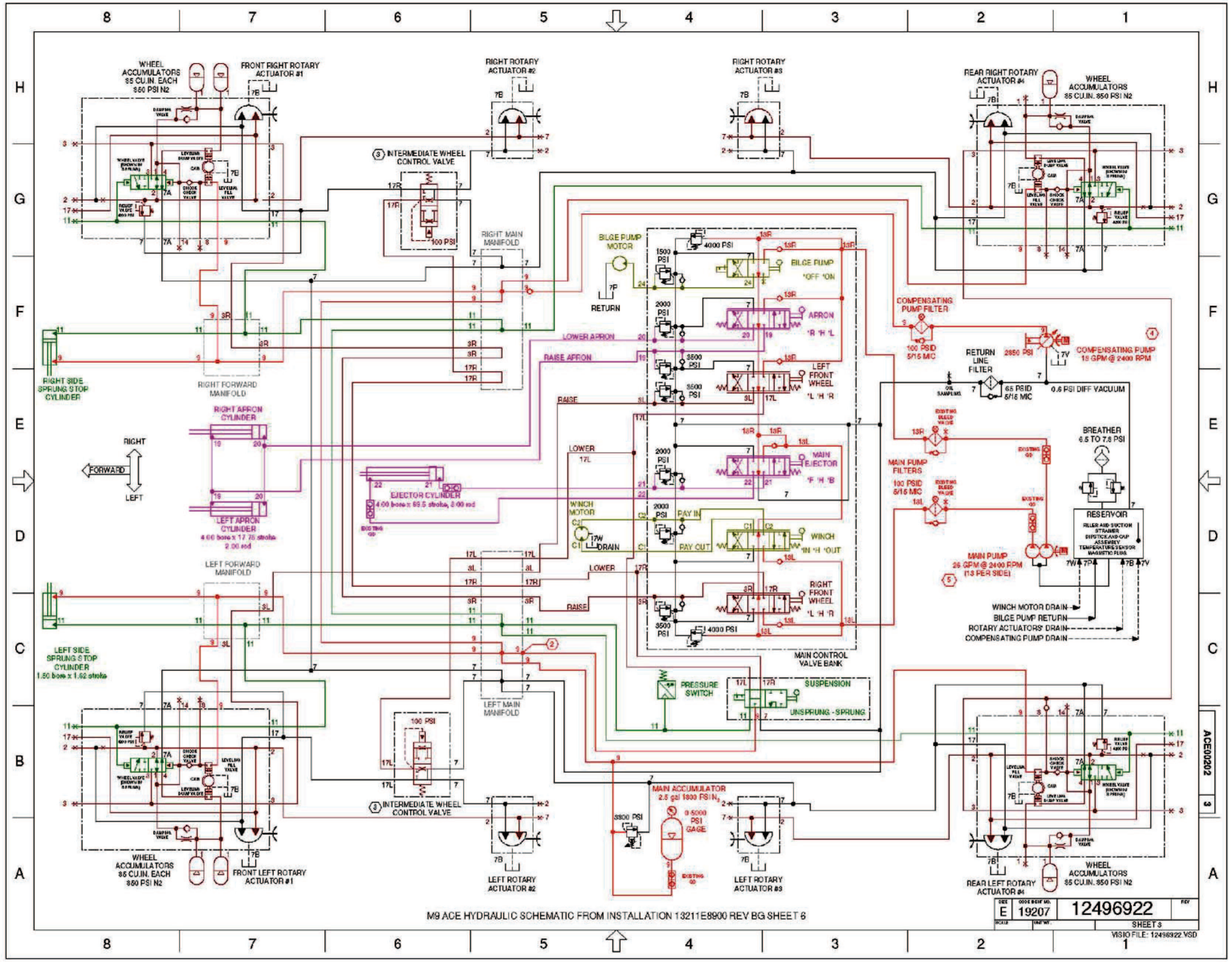
D0001HDC

*FO-1. M9 ACE HDC Hydraulic Schematic (Sheet 1 of 3).*



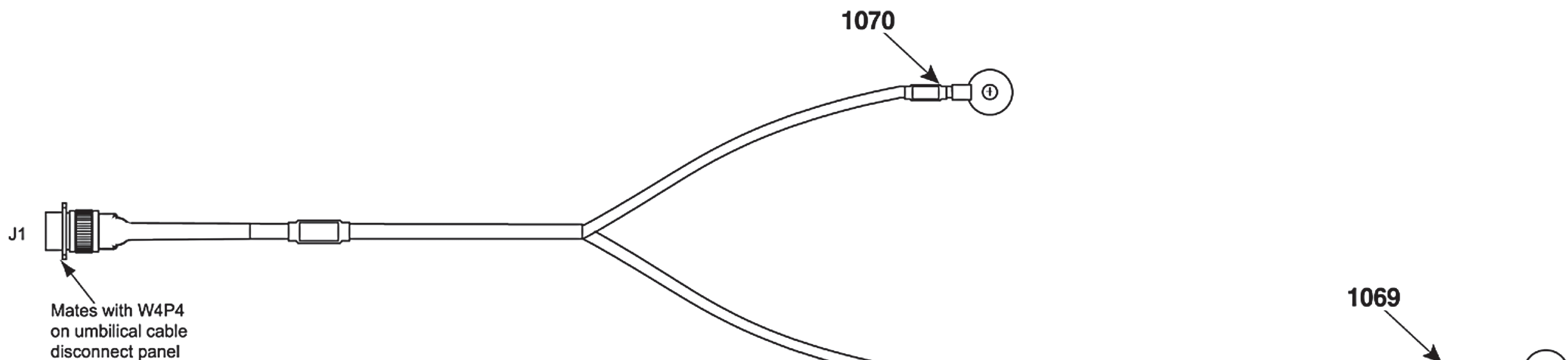
D0002HDC

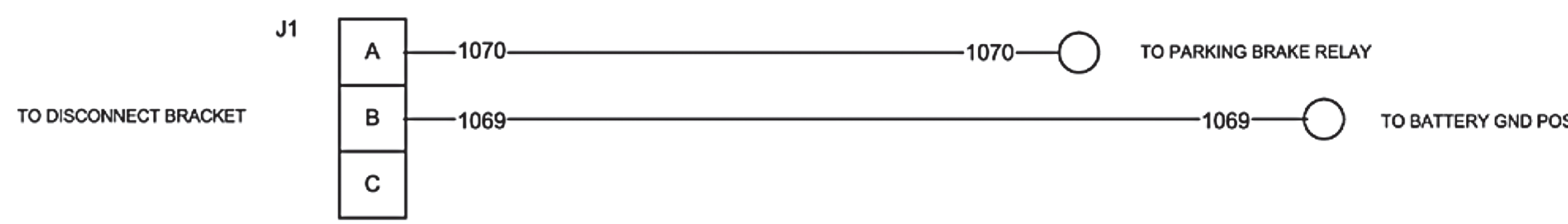
FO-2. M9 ACE HDC Hydraulic Schematic (Sheet 2 of 3).



D0003HDC

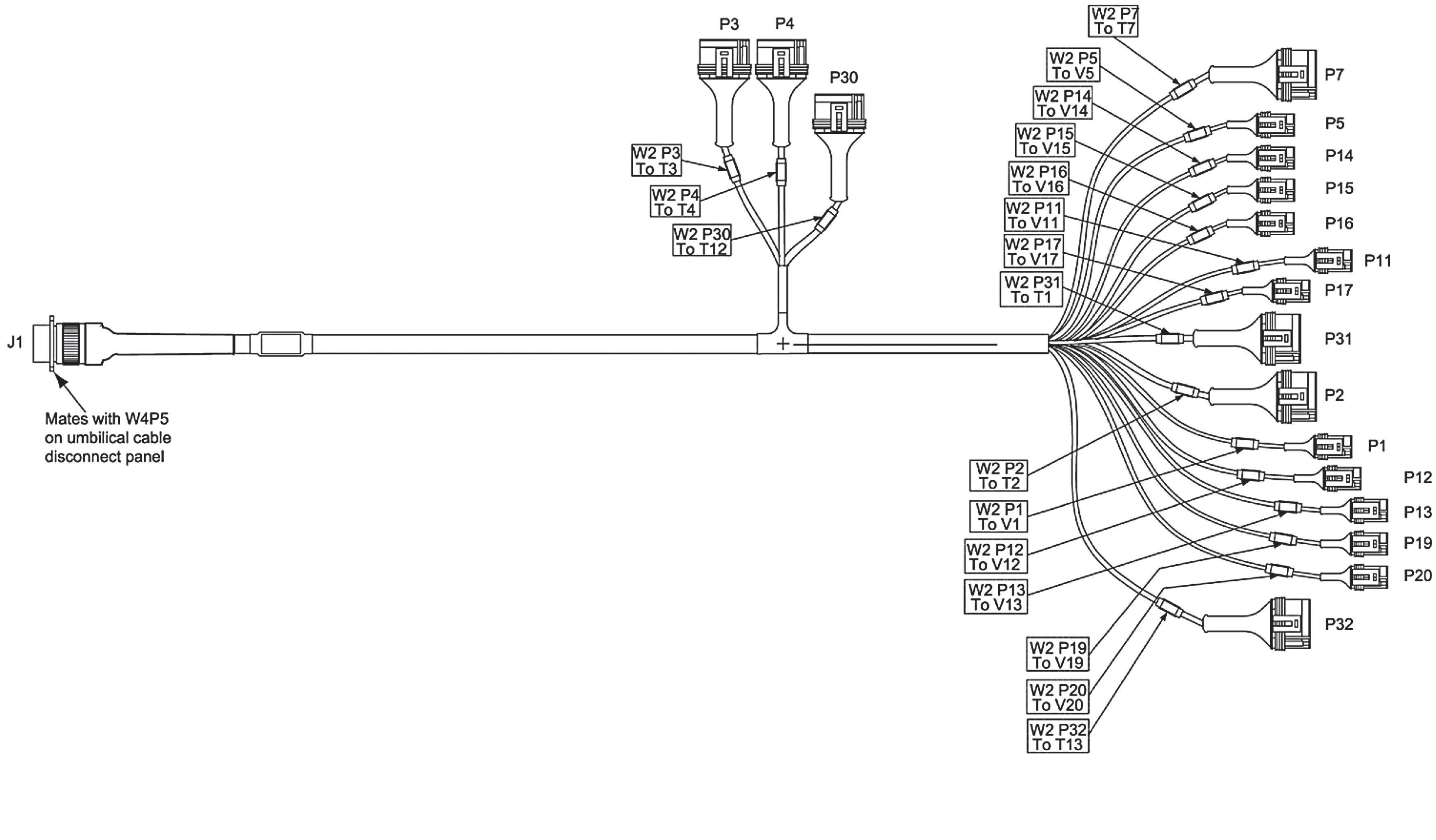
*FO-3. M9 ACE HDC Hydraulic Schematic (Sheet 3 of 3).*



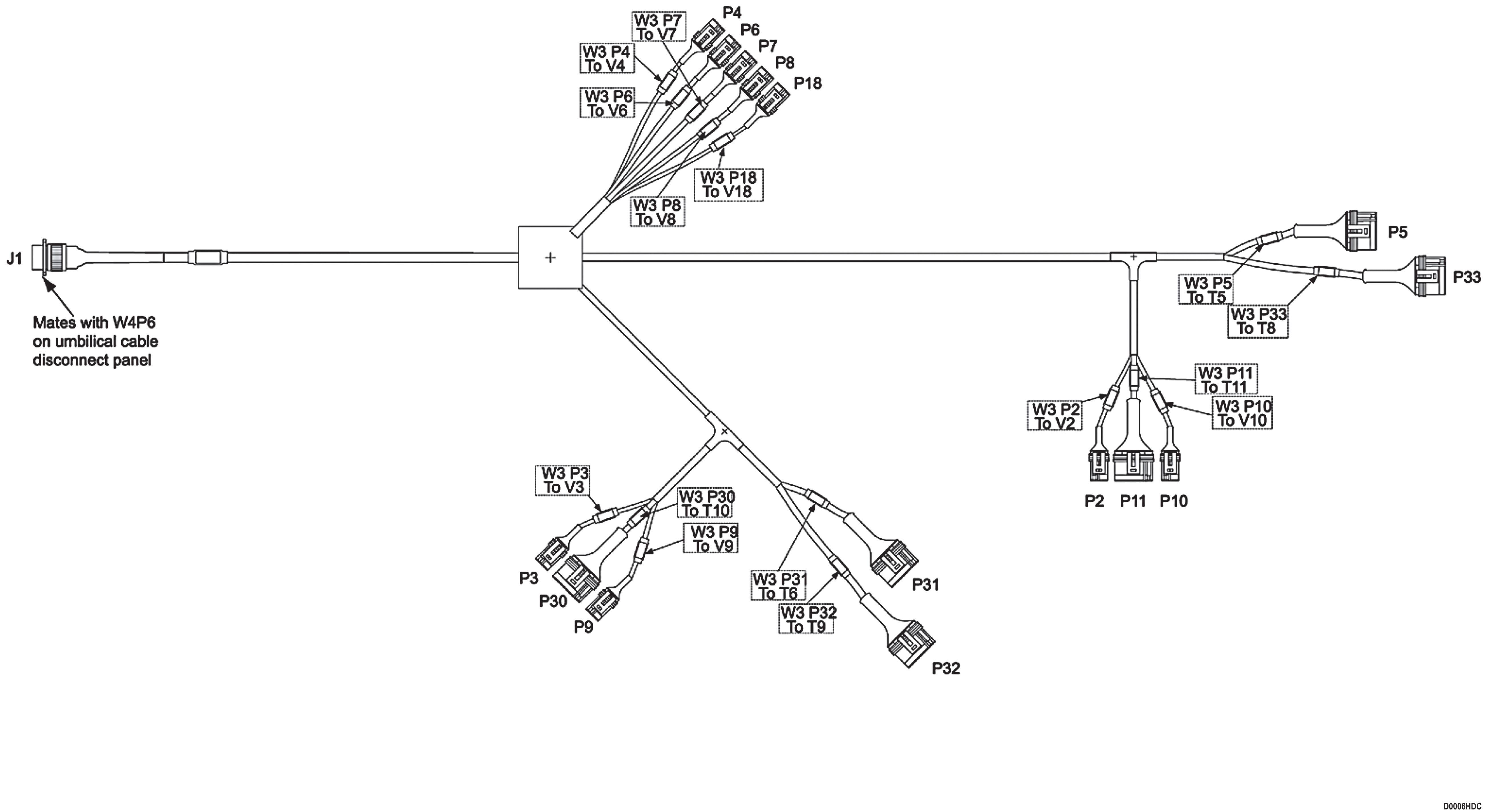




D0004HDC

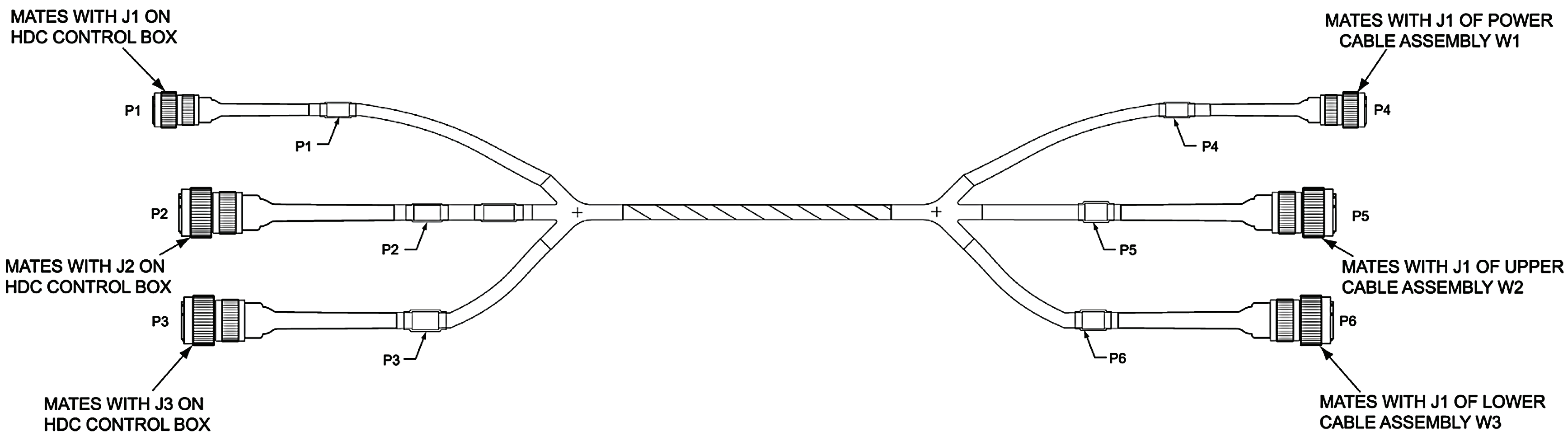
*FO-4. Power Cable Assembly W1.*



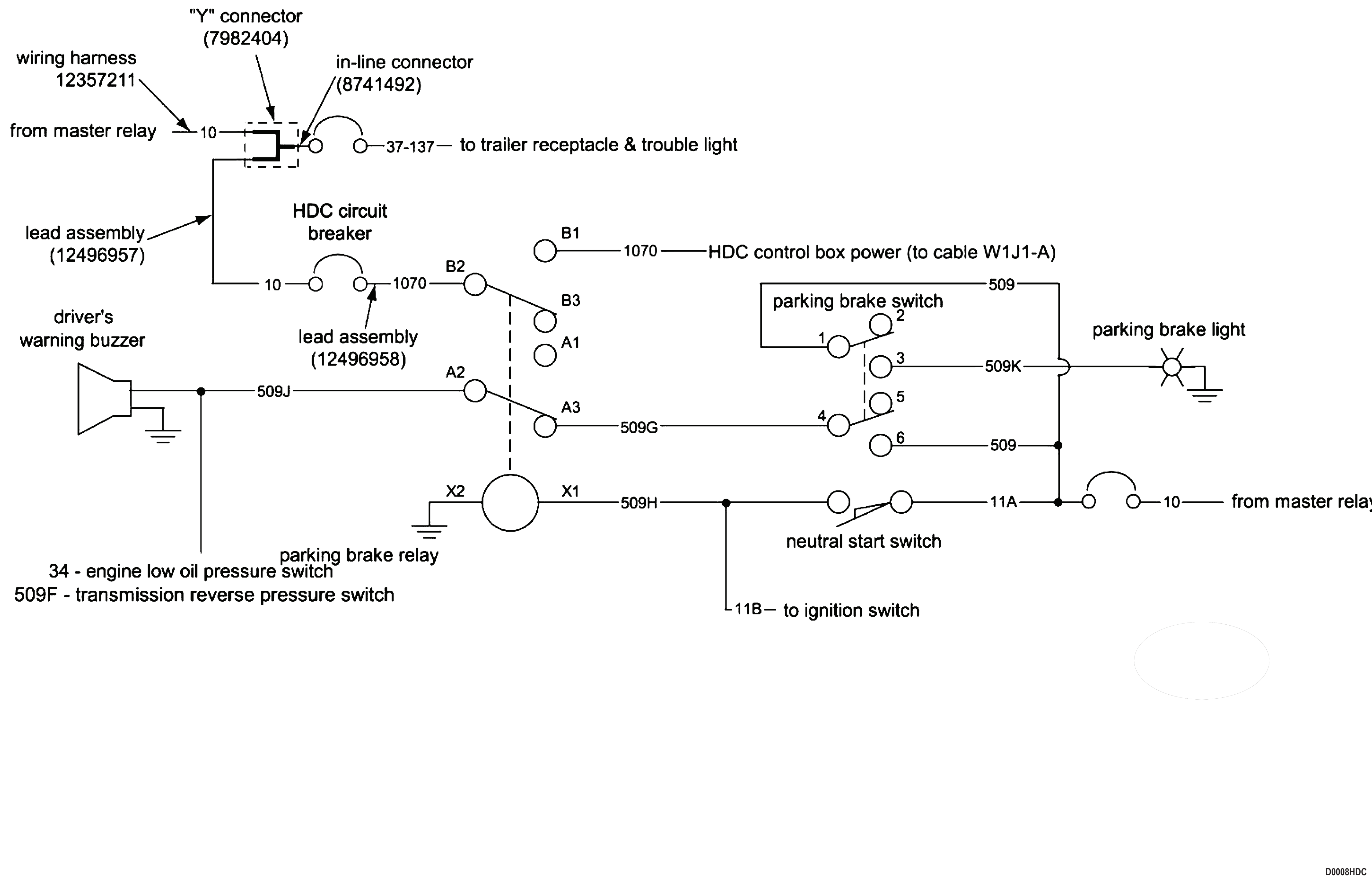

*FO-5. Upper Cable Assembly W2.*



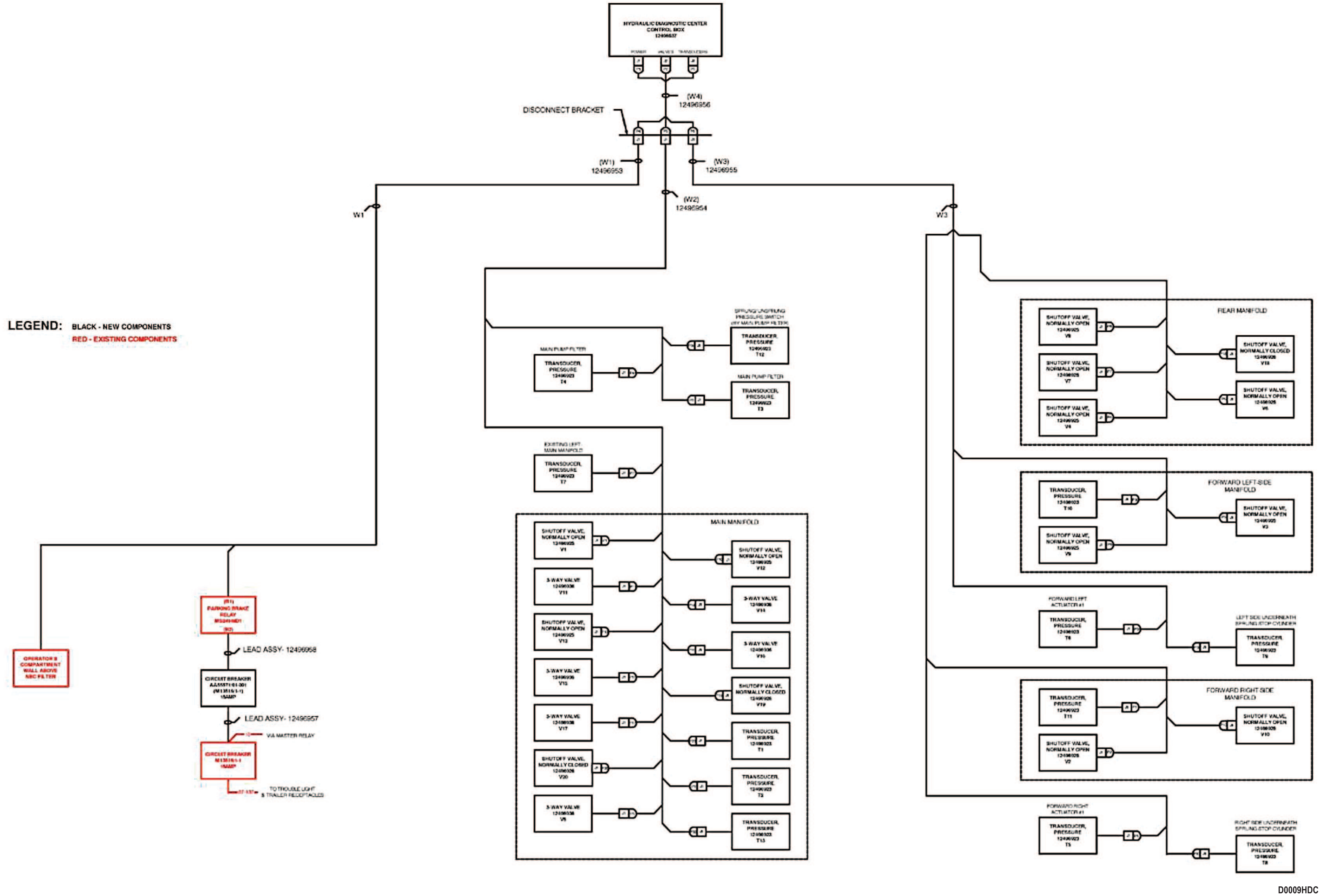

*FO-6. Lower Cable Assembly W3.*



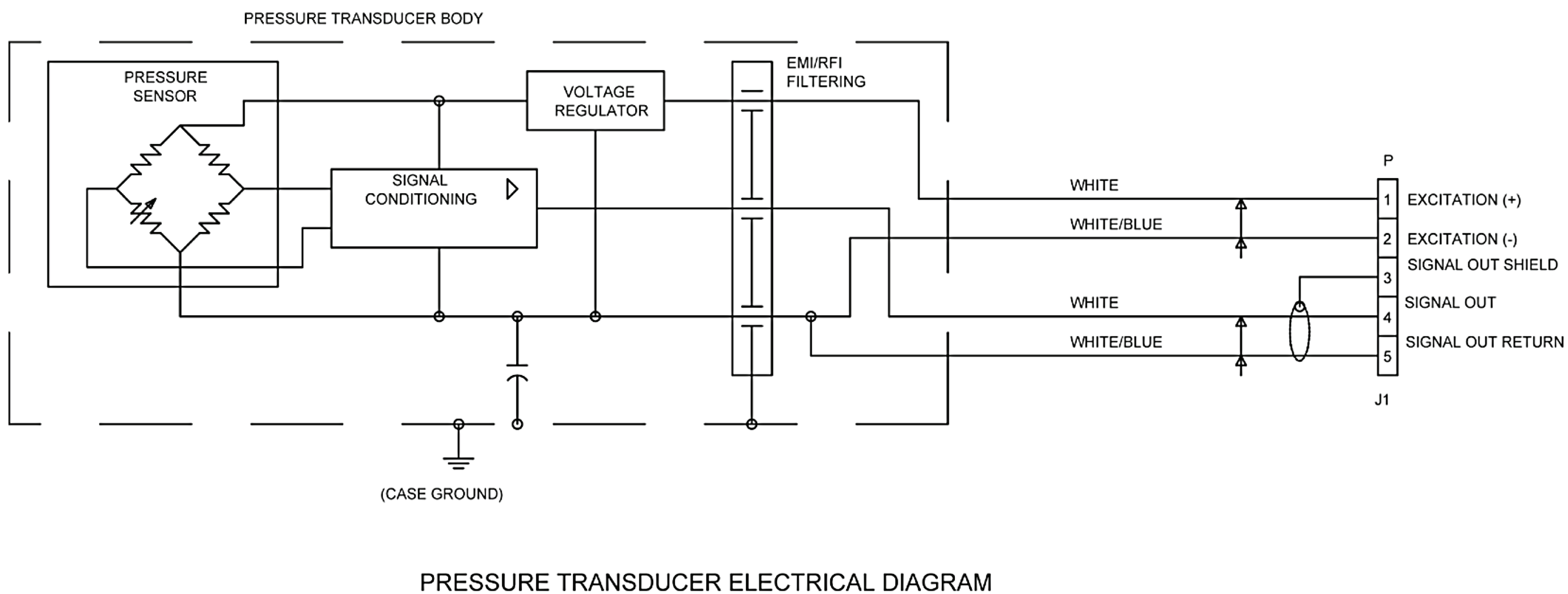

*FO-7. Umbilical Cable Assembly W4.*



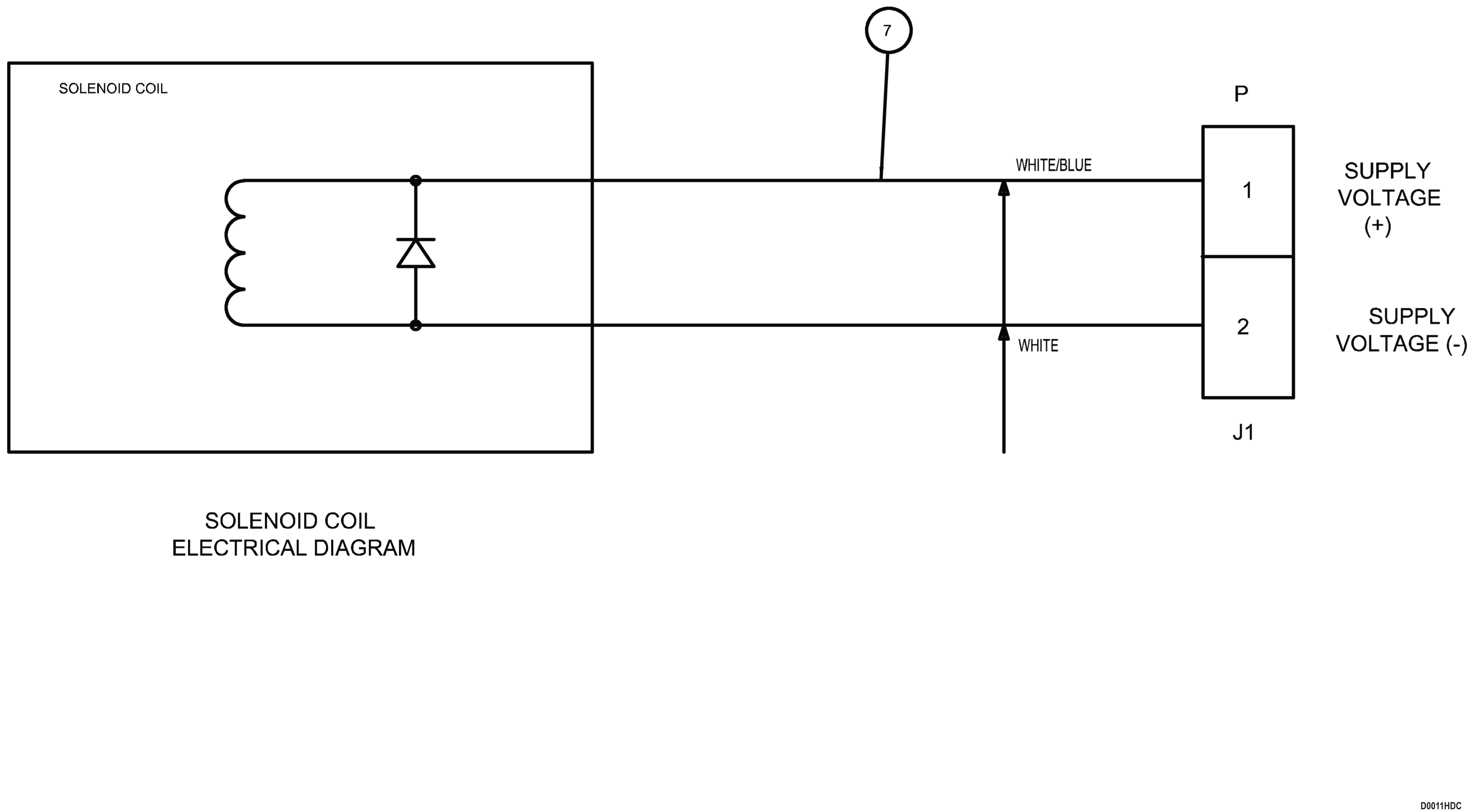

*FO-8. Simplified Electrical Schematic Diagram of HDC System Power Distribution.*



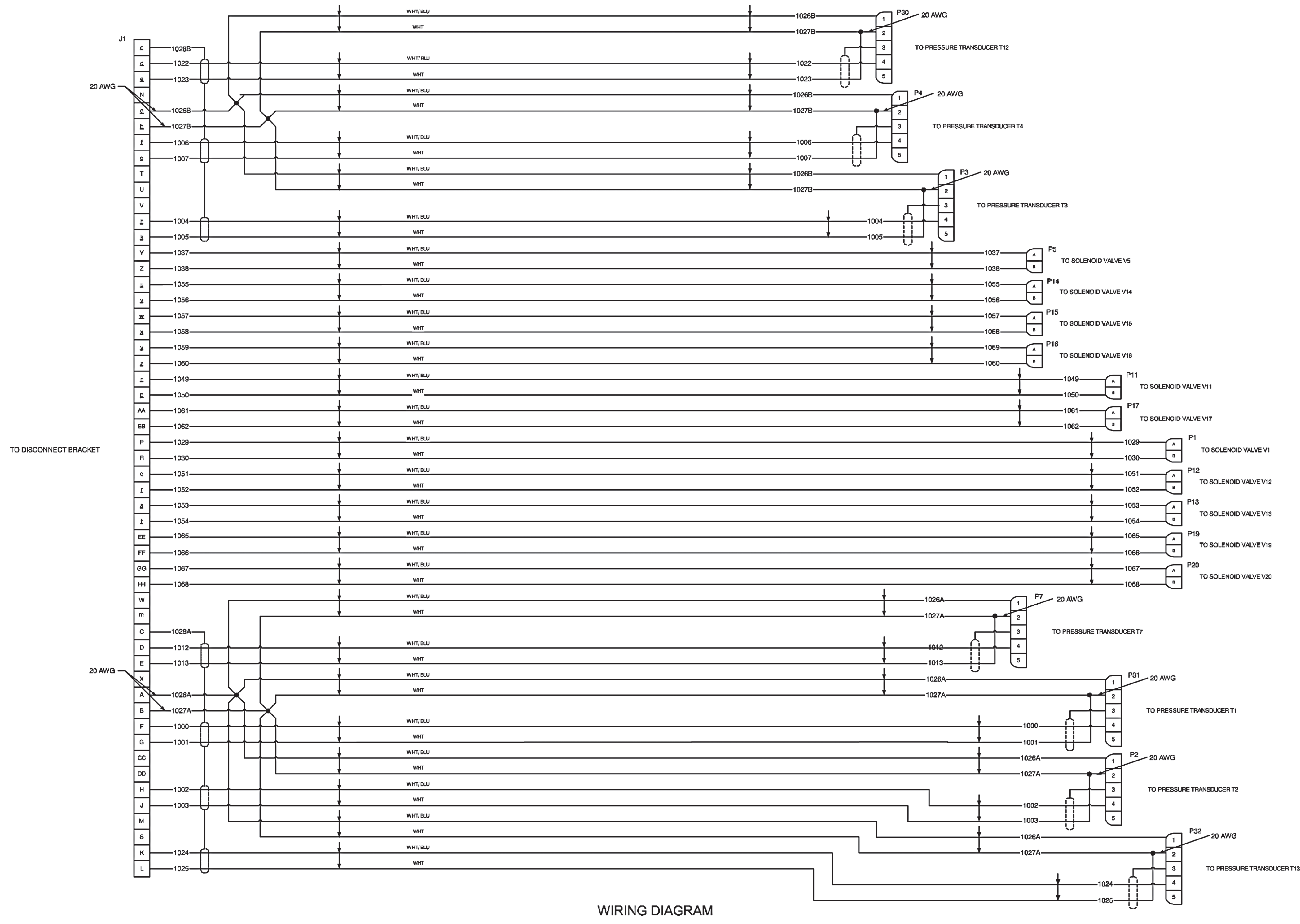

*FO-9. HDC System Electrical Interconnection Diagram.*



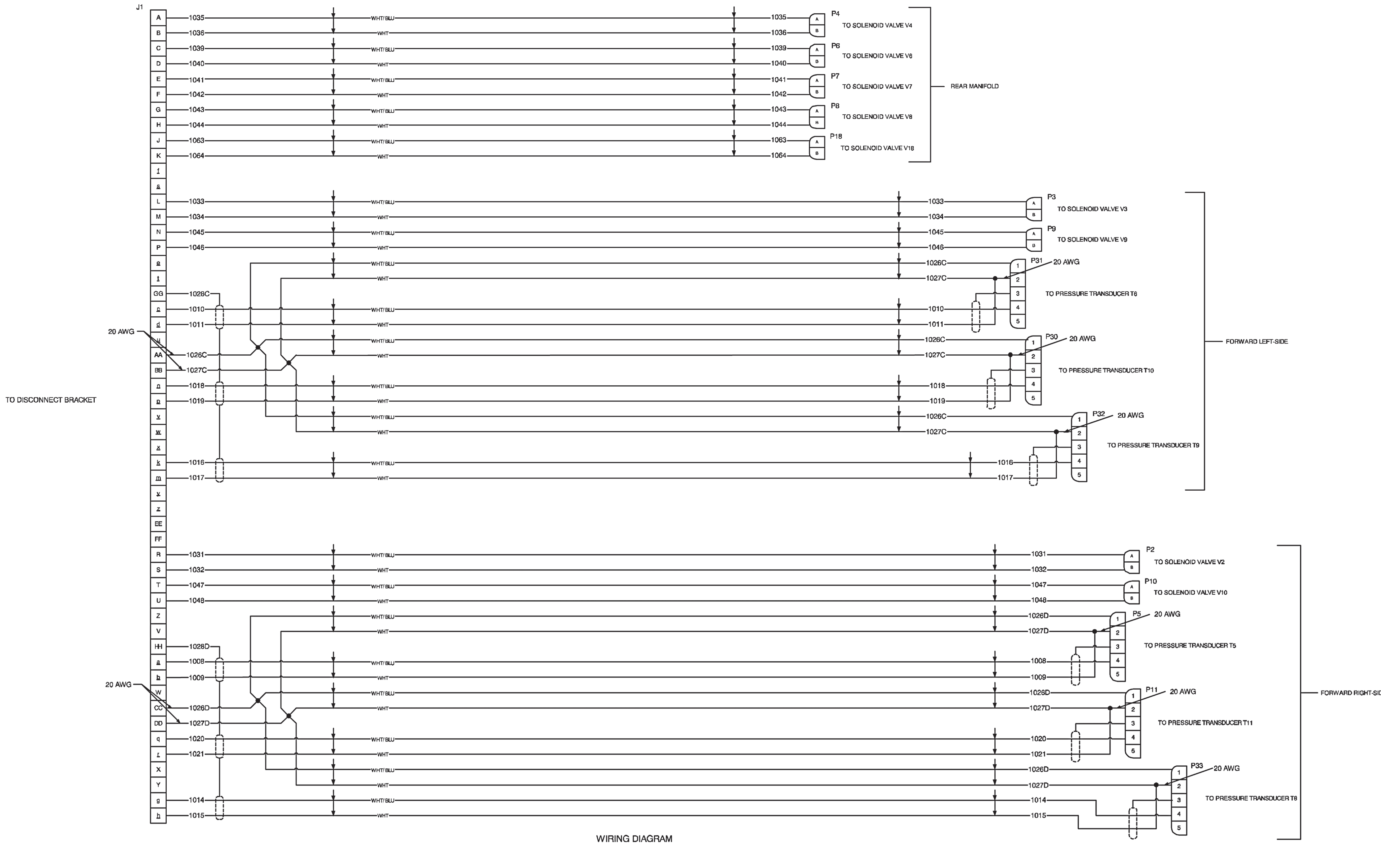

*FO-10. Hydraulic Pressure Transducer Electrical Diagram.*



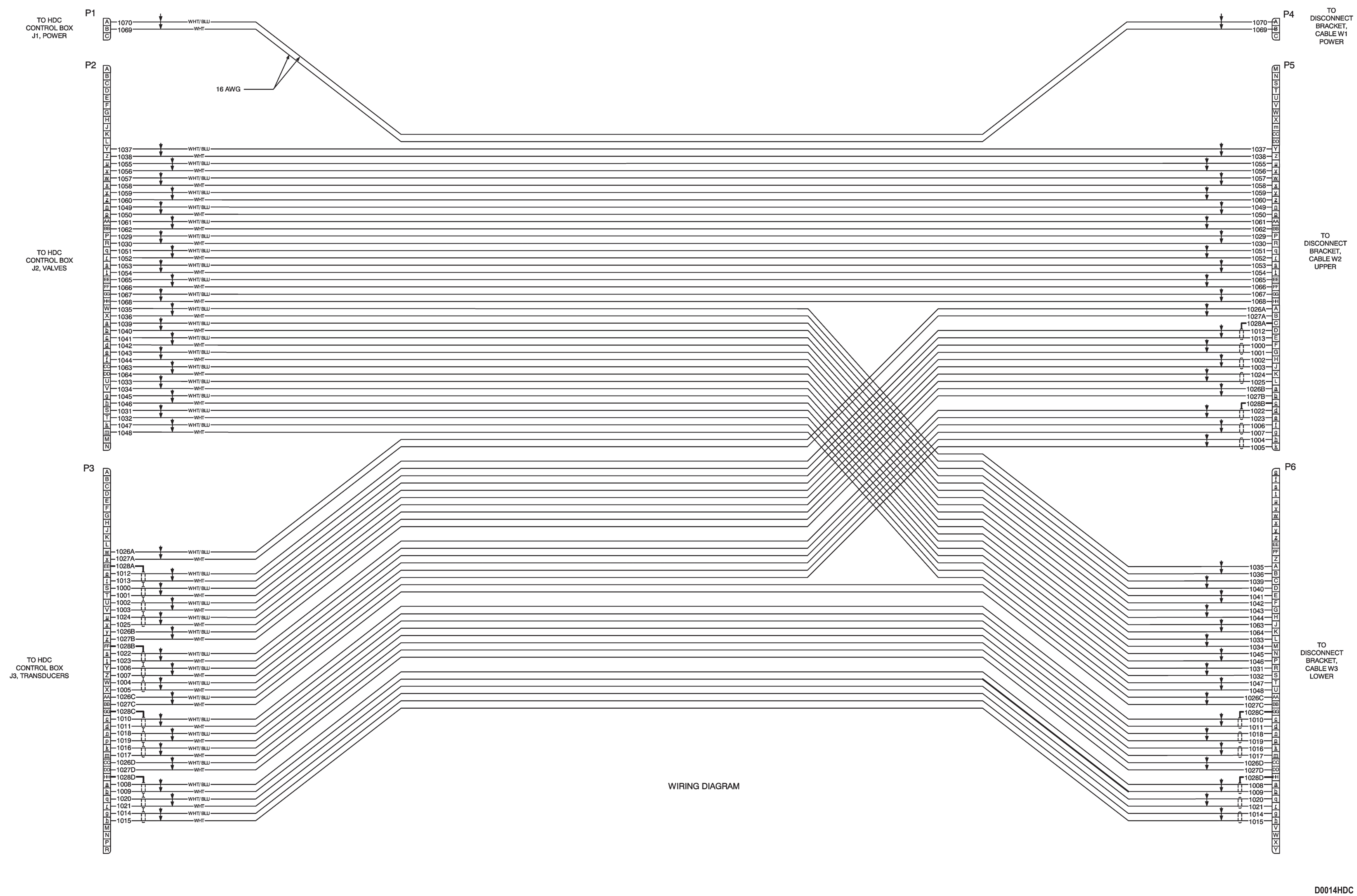

*FO-11. Solenoid Valve Electrical Diagram.*




*FO-12. W2 Wiring Diagram.*




*FO-13. W3 Wiring Diagram.*




*FO-14. W4 Wiring Diagram.*

# THE METRIC SYSTEM AND EQUIVALENTS

## LINEAR MEASURE

1 Centimeter=10 Millimeters=0.01 Meters=0.3937 Inches
1 Meter=100 Centimeters=1000 Millimeters=39.37 Inches
1 Kilometer=1000 Meters=0.621 Miles

## WEIGHTS

1 Gram=0.001 Kilograms=1000 Milligrams=0.035 Ounces
1 Kilogram=1000 Grams=2.2 Lb
1 Metric Ton=1000 Kilograms=1 Megagram=1.1 Short Tons

## LIQUID MEASURE

1 Milliliter=0.001 Liters=0.0338 Fluid Ounces
1 Liter=1000 Milliliters=33.82 Fluid Ounces

## SQUARE MEASURE

1 Sq Centimeter=100 Sq Millimeters=0.155 Sq Inches
1 Sq Meter=10,000 Sq Centimeters=10.76 Sq Feet
1 Sq Kilometer=1,000,000 Sq Meters=0.386 Sq Miles

## CUBIC MEASURE

1 Cu Centimeter=1000 Cu Millimeters=0.06 Cu Inches
1 Cu Meter=1,000,000 Cu Centimeters=35.31 Cu Feet

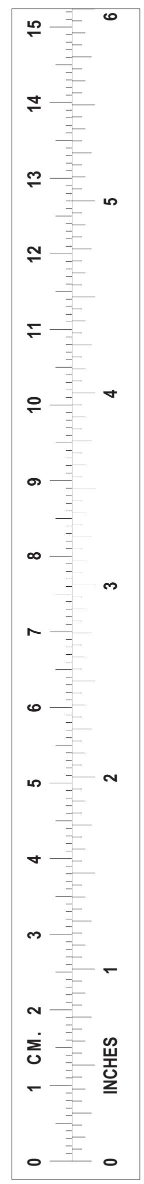
## TEMPERATURE

5/9 (°F – 32) = °C
212°Fahrenheit is equivalent to 100°Celsius
90°Fahrenheit is equivalent to 32.2°Celsius
32°Fahrenheit is equivalent to 0°Celsius
9/5 (°C + 32) = °F

## APPROXIMATE CONVERSION FACTORS

| TO CHANGE | TO | MULTIPLY BY |
|---|---|---|
| Inches | Centimeters | 2.540 |
| Feet | Meters | 0.305 |
| Yards | Meters | 0.914 |
| Miles | Kilometers | 1.609 |
| Square Inches | Square Centimeters | 6.451 |
| Square Feet | Square Meters | 0.093 |
| Square Yards | Square Meters | 0.836 |
| Square Miles | Square Kilometers | 2.590 |
| Acres | Square Hectometers | 0.405 |
| Cubic Feet | Cubic Meters | 0.028 |
| Cubic Yards | Cubic Meters | 0.765 |
| Fluid Ounces | Milliliters | 29.573 |
| Pints | Liters | 0.473 |
| Quarts | Liters | 0.946 |
| Gallons | Liters | 3.785 |
| Ounces | Grams | 28.349 |
| Pounds | Kilograms | 0.454 |
| Short Tons | Metric Tons | 0.907 |
| Pound-Feet | Newton-Meters | 1.356 |
| Pounds/Sq Inch | Kilopascals | 6.895 |
| Miles per Gallon | Kilometers per Liter | 0.425 |
| Miles per Hour | Kilometers per Hour | 1.609 |

| TO CHANGE | TO | MULTIPLY BY |
|---|---|---|
| Centimeters | Inches | 0.394 |
| Meters | Feet | 3.280 |
| Meters | Yards | 1.094 |
| Kilometers | Miles | 0.621 |
| Sq Centimeters | Square Inches | 0.155 |
| Square Meters | Square Feet | 10.764 |
| Square Meters | Square Yards | 1.196 |
| Square Kilometers | Square Miles | 0.386 |
| Sq Hectometers | Acres | 2.471 |
| Cubic Meters | Cubic Feet | 35.315 |
| Cubic Meters | Cubic Yards | 1.308 |
| Milliliters | Fluid Ounces | 0.034 |
| Liters | Pints | 2.113 |
| Liters | Quarts | 1.057 |
| Liters | Gallons | 0.264 |
| Grams | Ounces | 0.035 |
| Kilograms | Pounds | 2.205 |
| Metric Tons | Short Tons | 1.102 |
| Newton-Meters | Pound-Feet | 0.738 |
| Kilopascals | Pounds per Sq Inch | 0.145 |
| Km per Liter | Miles per Gallon | 2.354 |
| Km per Hour | Miles per Hour | 0.621 |



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