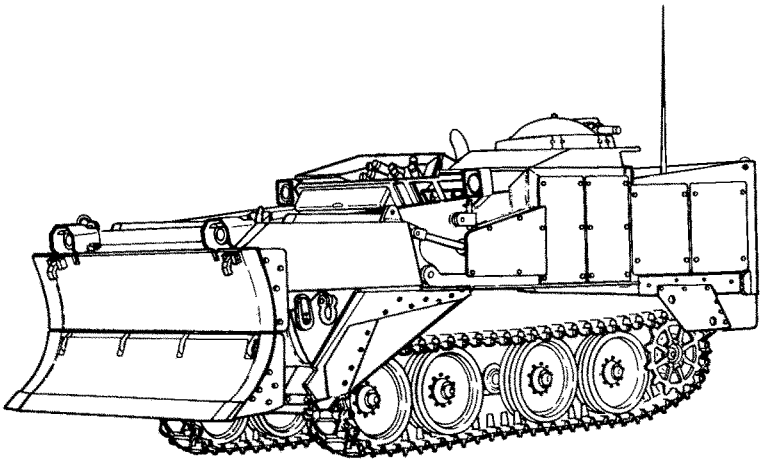
TM 5-2350-262-20-3

TECHNICAL MANUAL

UNIT MAINTENANCE MANUAL

VOLUME 3 OF 3

HYDRAULIC TROUBLESHOOTING
TEST PROCEDURES



ARMORED COMBAT EARTHMOVER (ACE), M9 (NSN 2350-00-808-7100)

HEADQUARTERS, DEPARTMENT OF THE ARMY

NOVEMBER 1998

Change 2

CHANGE

NO. 2

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., *27 March 2000*

UNIT MAINTENANCE MANUAL
ARMORED COMBAT EARTHMOVER
(ACE), M9
(NSN 2350-00-808-7100)

TM 5-2350-262-20-3, 16 NOV 1998 is changed as follows:

1. Remove old pages and insert new pages as indicated below.
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Remove Pages	**Insert Pages**
Cover	Cover
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1-3 and 1-4	1-3 and 1-4
2-3 through 2-6	2-3 through 2-6
3-7 and 3-8	3-7 and 3-8
3-27 and 3-28	3-27 and 3-28
3-67 and 3-68	3-67 and 3-68
3-215 through 3-230	3-215 through 3-230
A-1 through A-4(Blank)	A-1 through A-4 (Blank)
E-1 and E-2	E-1 and E-2 (Blank)
INDEX 1 through INDEX 10	INDEX 1 through INDEX 10
	FP-1 and FP-2 (Blank)
Rear Cover	Rear Cover

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Chief of Staff

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CHANGE

NO. 1

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UNIT MAINTENANCE MANUAL
ARMORED COMBAT EARTHMOVER
(ACE), M9
(NSN 2350-00-808-7100)

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Remove Pages	**Insert Pages**
	List of Effective Pages
i through vi	i through vi
3-15 and 3-16	3-15 and 3-16
3-231 and 3-232 (Blank)	3-231 through 3-250 (Blank)
INDEX 1 and INDEX 2 (Blank)	INDEX 1 through INDEX 10

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LIST OF EFFECTIVE PAGES/WORK PACKAGES

NOTE: The portion of text or illustration effected by the updates is indicated by a vertical line in the outer margin of the page. Updates to wiring diagrams are indicated by shaded areas.

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

Original 0 16..NOV 98
Change 1 30..JUN 99
Change 2 27..MAR 00

TOTAL NUMBER OF PAGES FOR FRONT AND REAR MATTER IS 41 AND TOTAL NUMBER OF PAGES IS 281 CONSISTING OF THE FOLLOWING:

Page/WP No.	Change No.
Cover	2
a-c	0
List of Effective Pages	2
i	1
ii-iii	0
iv	1
v	0
vi	1
1-1 thru 1-2	0
1-3 and 1-4	2
1-5 and 1-6 (Blank)	0
2-1 through 2-3	0
2-4 and 2-5	2
2-6 through 2-12 (Blank	0
3-1 through 3-6	0
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3-218 through 3-225	2
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3-227	2
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3-229	2
3-230	0
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A-1 through A-3	2
A-4(Blank)	0
B-1 through B-4	0
C-1 and C-2	0
D-1 and D-2 (Blank)	0
E-1 and E-2	2
INDEX 1 through INDEX 10	2
FP-1 and FP-2 (Blank)	2
Rear Cover	2

WARNING

CARBON MONOXIDE POISONING CAN BE DEADLY

CARBON MONOXIDE IS A COLORLESS, ODORLESS, DEADLY POISONOUS GAS WHICH, WHEN BREATHED, DEPRIVES THE BODY OF OXYGEN AND CAUSES SUFFOCATION. EXPOSURE TO AIR CONTAMINATED WITH CARBON MONOXIDE PRODUCES SYMPTOMS OF HEADACHE, DIZZINESS, LOSS OF MUSCULAR CONTROL, APPARENT DROWSINESS, AND COMA. PERMANENT BRAIN DAMAGE OR DEATH CAN RESULT FROM SEVERE EXPOSURE.

CARBON MONOXIDE OCCURS IN THE EXHAUST FUMES OF FUEL-BURNING HEATERS AND INTERNAL COMBUSTION ENGINES AND BECOMES DANGEROUSLY CONCENTRATED UNDER CONDITIONS OF INADEQUATE VENTILATION. THE FOLLOWING PRECAUTIONS MUST BE OBSERVED TO ENSURE THE SAFETY OF PERSONNEL WHENEVER THE PERSONNEL HEATER, MAIN, OR AUXILIARY ENGINE OF ANY VEHICLE IS OPERATED FOR MAINTENANCE PURPOSES OR TACTICAL USE.

1. DO NOT operate heater or engine of vehicle in an enclosed area unless it is ADEQUATELY VENTILATED.
2. DO NOT idle engine for long periods without maintaining ADEQUATE VENTILATION in personnel compartments.
3. DO NOT drive any vehicle with inspection plates, cover plates, or engine compartment doors removed unless necessary for maintenance purposes.
4. BE ALERT at all times during vehicle operation for exhaust odors and exposure symptoms. If either are present, IMMEDIATELY VENTILATE personnel compartments. If symptoms persist, remove affected personnel from vehicle and treat as follows: expose to fresh air, keep warm, DO NOT PERMIT PHYSICAL EXERCISE. If necessary, administer artificial respiration.

THE BEST DEFENSE AGAINST CARBON MONOXIDE POISONING IS ADEQUATE VENTILATION.

WARNING

- 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 to personnel.
- Do not stand or work in bowl area unless ejector lock is engaged. Do not stand in bowl to observe roller guide travel. Failure to comply may result in severe injury to personnel.
- Do not work under vehicle unless hull is blocked and apron lockpins are installed. Failure to comply may result in severe injury or death to personnel.
- Do not work under vehicle unless hull is blocked. Failure to comply may result in severe injury or death to personnel.
- Do not stand or work under raised apron and dozer assembly unless apron lockpins are installed. Failure to comply may result in severe injury or death to personnel.

WARNING - CONTINUED

- 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.

  solvent is flammable and must not be used near an open flame. A fire extinguisher will be kept nearby when the solvent is used. Use only in well-ventilated areas. Failure to comply may result in damage to equipment or injury to personnel.

- Always wear leather gloves when handling wire rope. Never allow wire rope to run through hands. Failure to comply may result in severe injury to personnel.

- Stand clear of wire rope. Should wire rope break or snap loose, severe injury or death to personnel may result.

- Compressed air can injury you and others. Do not aim compressed air hoses at anyone. Do not use more than 30 psi (207 kPa). Always wear goggles. Failure to comply may result in serious injury to personnel.

- Dozer blade weighs 585 lb (266 kg). Keep feet and hands from under ejector assembly while lifting or moving. Failure to comply may result in severe injury or death to personnel.

- Ejector cylinder weighs 325 lb (148 kg). Support ejector cylinder before disconnecting or removing. Failure to comply may result in severe injury to personnel.

- Support apron cylinder while removing or installing. Apron cylinder weighs 85 lb (39 kg) and can cause serious injury if dropped on hands or feet.

- Personnel must stand clear during lifting operations. A swinging or shifting load may result in injury to personnel.

- Do not lift apron and dozer assembly with dozer blade attached unless dozer lockpins are installed. Failure to comply may result in severe injury or death to personnel.

- Do not stand between ejector and ejector cylinder while performing ejector leak checks. Failure to comply may result in severe injury to personnel.

- Do not stand directly behind vehicle or directly in front of vehicle when positioning jack stands. Failure to comply may result in severe injury or death to personnel.

- Before performing any hydraulic troubleshooting in 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.

- Hot engine and engine components can cause severe burns. Do not work on engine or engine components unless engine is cool. Failure to comply may result in injury to personnel.

- Spilled hydraulic oil is very slippery. Use caution when entering or working in bowl area. Wipe up any spilled oil immediately. Failure to comply may result in severe injury to personnel.

- Do not work under vehicle or on track retainers unless hull is blocked or vehicle has settled on bump stops. Failure to comply may result in severe injury or death to personnel.

WARNING - CONTINUED

- Ensure hydraulic pressure is relieved after ejector cylinder is pushed forward. Pressure may build up and cause the ejector to retract. Failure to comply may result in severe injury to personnel.
- Hot exhaust systems can cause serious burns. Do not work on or near hot exhaust system components unless exhaust system is cool. Failure to comply may result in injury to personnel.
- Ensure stop is in locked position to prevent any movement of ejector control valve plunger, or ejector can move. Failure to comply may result in severe injury to personnel.
- Do not breathe nitrogen gas. Failure to comply may result in death to personnel.
- Hot hydraulic oil can cause serious burns. Pump and fittings must be cool to touch before working on hydraulic system. Failure to comply may result in severe injury to personnel.
- Wear face shield or goggles for eye protection when using wire brush. Failure to comply may result in injury to personnel.
- Ensure personnel are clear of bilge pump area before starting engine. Failure to comply may result in injury to personnel.
- High pressure is present in the M9 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 to personnel.
- Protective plates and hull access covers may be heavier than they appear due to accumulation of fluid and dirt. Take extra precautions when removing access covers. Failure to comply may result in severe injury or death to personnel.
- Wear face shield or goggles for eye and face protection when removing and installing hoses from bottom of hydraulic tank. Failure to comply may result in injury to personnel.

TECHNICAL MANUAL

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., *16 November 1998*

HYDRAULIC TROUBLESHOOTING TEST PROCEDURES

ARMORED COMBAT EARTHMOVER (ACE), M9
(NSN 2350-00-808-7100)

VOLUME 3 OF 3

REPORTING OF ERRORS AND RECOMMENDING IMPROVEMENTS

You can improve this publication. If you find any mistakes, or if you know of a way to improve the procedures, please let us know. Submit your DA Form 2028-2 (Recommended Changes to Equipment Technical Publications), through the Internet on the Army Electronic Product Support (AEPS) website. The Internet address is http://aeps.ria.army.mil. If you need a password, scroll down and click on "ACCESS REQUEST FORM". The DA Form 2028 is located in the ONLINE FORMS PROCESSING section of the AEPS. Fill out the form and click on SUBMIT. Using the form on the AEPS will enble us to respond quicker to your comments and better manage the DA Form 2028 program. You may also mail, fax or email your letter, DA Form 2020, or DA Form 2028-2 direct to: Comander, U.S. Army Tank-automotive and Armaments Command, ATTN: AMSTA-AC-NML, Rock Island, IL 61299-7630. The email address is amsta-ac-nml@ria.army.mil. The fax number is DSN 793-0726 or Commercial (309) 782-0726.

TABLE OF CONTENTS

HOW TO USE THIS MANUAL

This manual describes hydraulic troubleshooting test procedures for the M9, Armored Combat Earthmover (ACE). Before performing any work on the M9, you should become thoroughly familiar with this manual, its content, organization, and features.

ABOUT YOUR MANUAL

a. Spend some time looking through this manual. You'll find that it has an new look, different than most of the TMs you've been using. New features added to improve the convenience of this manual and increase your efficiency are:

1. **Accessing Information -** Extensive troubleshooting guides for specific systems lead directly to step by step directions for problem solving and troubleshooting tasks.
2. **Illustrations** - A variety of methods are used to make locating and fixing components much easier. Locator illustrations with keyed text, exploded views, and cutaway diagrams make the information in this manual easier to understand.
3. **Keying Text With Illustrations** - Instructions are located together with figures that illustrate the specific task you are working on. In most cases, the task steps are located after the figures making part identification and procedure sequence easier to follow.

The TM is the fundamental means by which the Army communicates to soldiers the requirements and procedures necessary to perform hydraulic troubleshooting.

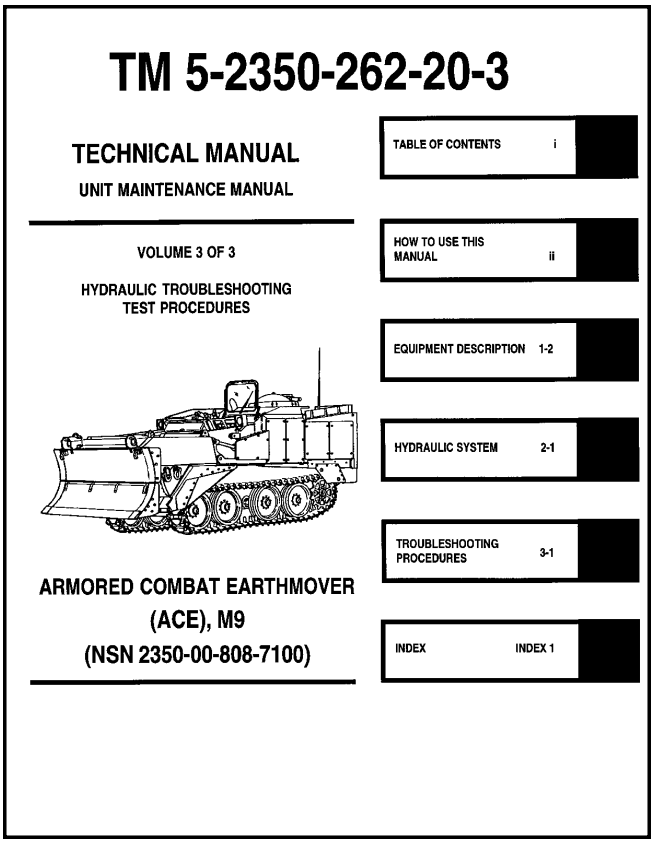
b. **General Features.** Your TM is the best source available for providing information and data critical to vehicle hydraulic troubleshooting:

- Safety summary (warning page a through c)
- General information and equipment descriptions (chapter 1)
- Principles of operation (chapter 2, section I)
- Troubleshooting (chapter 3, section II)
- Special Tools, TMDE, and Support Equipment (appendix B)
- Special Tools, Hydraulic Troubleshooting Parts Kit, 5705562 (appendix C)
- Torque Value Guide for Hydraulic Fittings (appendix D)
- Schematic Diagram (appendix E)

A typical example of how to use this manual is provided on the following pages.

USING YOUR MANUAL: AN EXAMPLE

a. **TASK:** The operator of an M9 ACE vehicle has complained that the apron will not raise. The vehicle has been assigned to you for repair.



b. **TROUBLESHOOTING STEPS:**

1. Look at the cover of this manual. You'll see chapter titles listed from top to bottom on the right hand side.

2. Look at the right edge of the manual. On some of the pages you'll see black bars (bleed-to-edge indicators) that are aligned with the chapter bars on the cover. These are the locations of the chapters in the text.

3. Look for "TROUBLESHOOTING PROCEDURES" on the cover. This is where the troubleshooting information is located.

4. Turn to those pages with the edge indicator matching the black bar for troubleshooting procedures. Page numbers are also listed next to chapter titles.

5. Chapter 3 is divided into two sections:

- Section I - General Hydraulic System Troubleshooting Procedures
- Section II - Troubleshooting Procedures

Section II. TROUBLESHOOTING PROCEDURES

SCOPE

This section contains information on locating faults and causes of hydraulic malfunctions that may develop in the M9 ACE. An alphabetical symptom index is provided.

GENERAL

Before you begin troubleshooting, ensure the defect is real. If possible, talk to the operator or mechanic that reported the problem. Look for any other problems that could cause the system or component to malfunction, such as a switch or lever in the wrong position. Refer to TM 5-2350-262-10 for correct operating procedures. Check fluid levels as shown in TM 5-2350-262-10.

Many faults can be located by a good visual inspection. Look for leaks, loose or corroded connections, damaged controls, and loose or damaged linkages.

When working on the hydraulic system, follow the general hydraulic system repair methods and refer to the general hydraulic system troubleshooting procedures.

If you use the optional STE/ICE-R tests, use the STE/ICE-R Operator's Manual (TM 9-4910-571-12&P) for reference before and during testing.

When trying to isolate a fault, review the past maintenance record on the affected vehicle. Although it doesn't happen often, an incomplete or poorly performed maintenance task may lead to another problem.

USING THE TROUBLESHOOTING PROCEDURES

Find the symptom in the symptom index. Go to the page referenced for that symptom. All possible malfunctions cannot be listed. If the specific malfunction is not listed in this section, refer to vehicle hydraulic schematic diagram for additional information or reference data.

6. Turn to section II, "TROUBLESHOOTING PROCEDURES" (page 3-14).

SYMPTOM INDEX

7. The second page of this section is the "SYMPTOM INDEX" (turn to page 3-15).

8. Look down the list of symptoms until you find "APRON WILL NOT RAISE."

9. Turn to the test indicated.

3 APRON WILL NOT RAISE (CONTINUED)

1. Check apron for interference.
   Is the apron binding or jammed as a result of damage to apron or hull?
   - YES → 3. Clear obstructions and repair mechanical damage.
   - NO → 2. Perform apron control valve pressure test.
     Is hydraulic pressure at circuit 19 less than 2,000 psi (13,790 kPa)?
     - NO → To block 7
     - YES → 4. Perform relief valve adjustment.
       Can circuit 19 relief valve be set to develop 3,500 psi (24,131 kPa)?
       - YES → 5. Verify problem is solved.
       - NO → 6. Replace directional control valve bank.

APRON CONTROL VALVE PRESSURE TEST

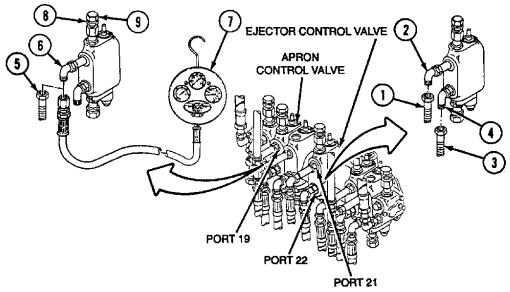
WARNING

Before performing any hydraulic troubleshooting in 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.

NOTE

Have suitable container ready to catch oil.

- Move ejector forward, stop engine, and relieve hydraulic pressure.
- Disable ejector from the hydraulic system by disconnecting CONT VLV-21 hose (1) from elbow (2) at port 21 of ejector control valve and CONT VLV-22 hose (3) from elbow (4) at port 22. Cap and plug hoses and fittings.
- Disconnect CONT VLV-19 hose (5) from elbow (6) at port 19 on apron control valve. Connect pressure measuring device (7) to elbow (6). Plug hose (5).
- Have assistant start engine and hold APRON CONTROL lever in UP position. Read pressure measuring device (7)



RELIEF VALVE ADJUSTMENT

As assistant holds APRON CONTROL lever in UP position, loosen jamnut (8) on apron, raise relief valve (9), rotate valve (9) clockwise to increase pressure and counterclockwise to decrease pressure, until hydraulic pressure is at a minimum 3,500 psi (24,131 kPa). Stop engine; relieve hydraulic pressure. Remove all test equipment and connect hoses.

Refer to TM 5-2350-262-20-2.

10. On page 3-36, steps relating to resolving the problem of apron not raising are listed in the form of a flow chart.

11. Just answer the questions on the left hand page and follow the YES or NO path. Helpful information about the question is also on the right hand page.

12. The procedures presume a basic working knowledge of the equipment to be used, but references are included for less experienced personnel.

13. At this point the diagnostic flow chart will direct you to a specific detailed procedure to solve the problem.

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

(a) Determine the maintenance responsibility for repair or replacement of the component.

(b) 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.

Refer to TM 5-2350-262-24P, Unit Direct Support and General Support Maintenance Repair Parts and Special Tools List for requisition data concerning replacement parts for this task.

LIST OF PROCEDURES

Hydraulic troubleshooting procedures included in this manual are listed below and on the following pages. Use the table of contents for page reference by chapter and section, and use the alphabetical index for page cross reference to procedures by component/part name.

Page

CHAPTER 1
INTRODUCTION

Section I. GENERAL INFORMATION

SCOPE

Type of Manual: Hydraulic Troubleshooting

Model Number and Equipment Name: M9, Armored Combat Earthmover (ACE)

Purpose of Equipment: A combat engineer vehicle used for dozing, grading, hauling and defilade preparation.

MAINTENANCE FORMS, RECORDS, AND REPORTS

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

REPORTING EQUIPMENT IMPROVEMENT RECOMMENDATIONS (EIR'S)

If your M9 ACE needs improvement, let us know. Send us an EIR. You, the user, are the only one who can tell us what you don't like about your equipment. Let us know why you don't like the design. Put it on an SF 368 (Quality Deficiency Report). Mail it to:

Commander
U.S. Army Tank-automotive and Armaments Command
Attn: AMSTA-AC-NML
Rock Island, IL 61299-7630

SCOPE

This section contains information that is useful when performing unit level hydraulic troubleshooting tasks on the M9. The following information is provided in this section:

- Equipment Characteristics, Capabilities, and Features
- Location and Description of Major Components
- Safety, Care, and Handling

SECTION II. EQUIPMENT DESCRIPTION

EQUIPMENT CHARACTERISTICS, CAPABILITIES, AND FEATURES

The M9 ACE is an armored, amphibious (wades) combat earthmover, used for:

- Dozing.
- Rough grading.
- Excavating.
- Hauling.
- Scraping.

It is a multi-purpose vehicle, and can be used as:

- An earth hauler.
- A cargo carrier.
- A prime mover.

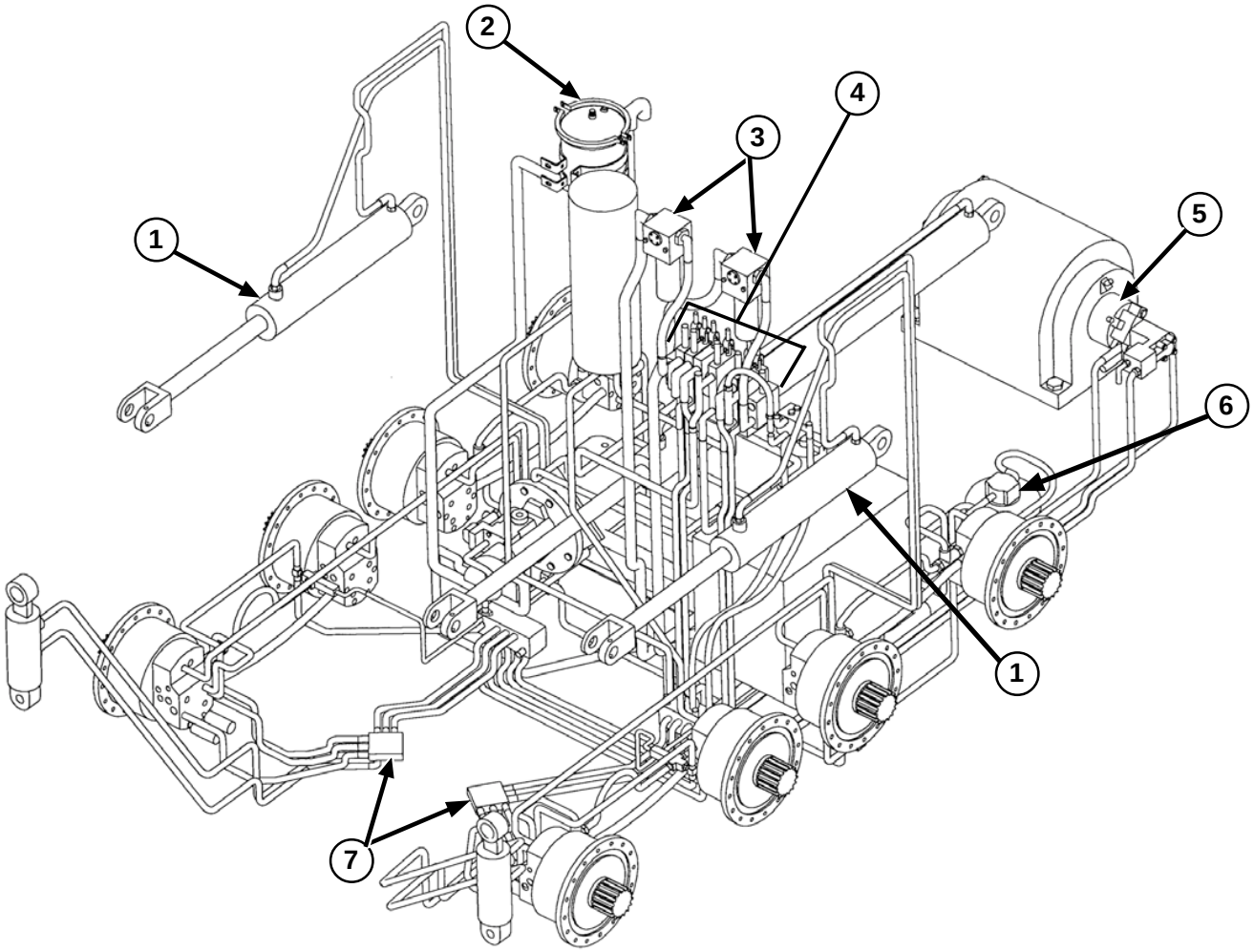
Some of the M9 capabilities are:

- Travels on land up to 30 mph (48 km/h).
- Climbs up to 60 percent grades.
- Drawbar pull of up to 30,000 lb (13,620 kg) at 1.5 mph (2.4 km/h).
- Winch (Invar) pull of up to 25,000 lb (11,350 kg).
- Winch (Lakeshore) pull of up to 35,000 lb (15,891 kg).

The features of the M9 are:

- Full-tracked.
- Air-transportable.
- Highly mobile.
- Armored.

LOCATION AND DESCRIPTION OF MAJOR COMPONENTS



(1) APRON CYLINDER. Raises and lowers apron and dozer assembly (one each side).

(2) RETURN LINE FILTER. Filters out contaminants from hydraulic oil that is returning to reservoir.

(3) HIGH PRESSURE FILTERS. Two high-pressure filters located directly in front of driver's compartment filter hydraulic fluid from the main hydraulic pump while it is enroute to the directional control valve bank.

(4) DIRECTIONAL CONTROL VALVE. 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. Operates the winch which is used in recovery operations.

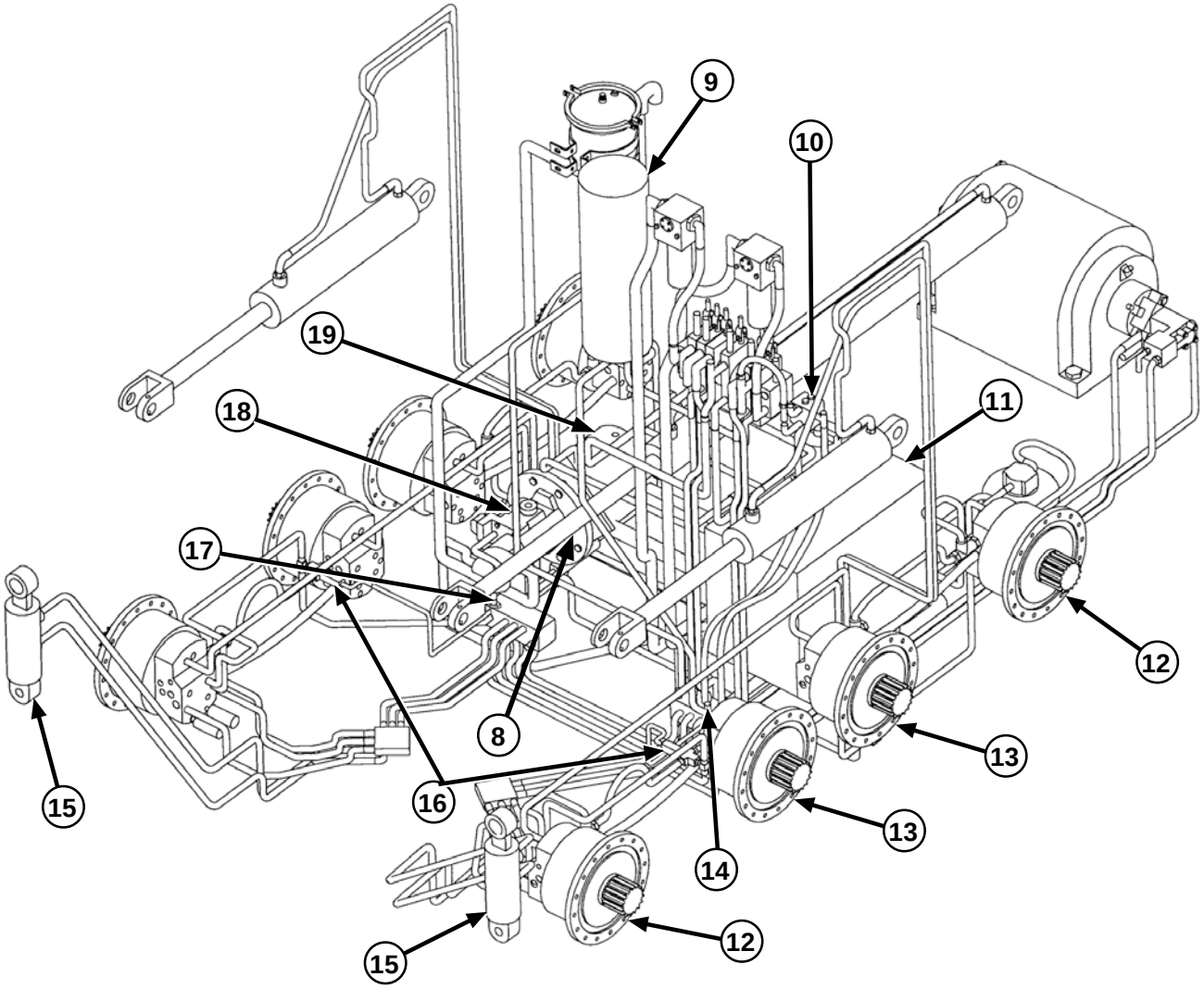
NOTE

Although the Bilge Pump is considered Not Mission Essential and will no longer be supported with spare and repair parts, this manual contains troubleshooting procedures For Your Information Only. See TB 43 0001-62-7 (dated Oct 98) for Instructions to Isolate and Disconnect a Non-functional Bilge Pump.

(6) BILGE PUMP MOTOR. Starts bilge pump operation through hydraulic pressure when bilge pump control lever is activated.

(7) FORWARD MANIFOLD. Routes the flow of hydraulic fluid to components.

LOCATION AND DESCRIPTION OF MAJOR COMPONENTS - CONTINUED



(8) EJECTOR CYLINDER. Moves ejector forward and back with hydraulic pressure.

(9) MAIN ACCUMULATOR. Helps keep pressure constant in hydropneumatic suspension system.

(10) SPRUNG/UNSPRUNG VALVE. Regulates pressurized fluid flow for whichever mode is selected.

(11) HYDRAULIC RESERVOIR. Supplies hydraulic oil through main pump, high-pressure filters, and directional control valve to activate hydraulic functions of vehicle.

(12) NO. 1 AND 4 ACTUATORS. 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.

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

LOCATION AND DESCRIPTION OF MAJOR COMPONENTS - CONTINUED

(14) SUSPENSION RELIEF VALVE. Relieves pressure surges or gradual increases in pressure to suspension.

(15) BUMP STOP CYLINDERS. Limit upward travel of roadwheel arms when in SPRUNG position (one on each side).

(16) INTERMEDIATE WHEEL VALVE. Prevents No. 2 and 3 actuators from raising when lowering front of vehicle.

(17) CHECK VALVE. A device to control the direction of fluid flow.

(18) COMPENSATING PUMP. Provides pressure to vehicle for SPRUNG/UNSPRUNG hydraulic operation.

(19) MAIN HYDRAULIC PUMP. Fixed displacement pump that pulls hydraulic oil from the reservoir to perform whatever function is necessary.

SAFETY, CARE, AND HANDLING

Warnings are listed in the warning summary front of the manual and before specific steps where they apply in the troubleshooting tests. In addition to these warnings, always keep in mind the following when working on the M9:

- The hydraulic system operates at pressures up to 4,500 psi (31,028 kPa).
- Ensure the upper apron lockpins are installed anytime personnel are working on the apron or dozer blade and anytime 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.

CHAPTER 2
HYDRAULIC SYSTEM

Section I. PRINCIPLES OF OPERATION

SCOPE

This section contains information relative to the principles of hydraulic system operation for the M9, Armored Combat Earthmover (ACE). The general functional description of the vehicle and separate systems are contained in TM 5-2350-262-20-1. Unit maintenance personnel should be familiar with the principles of operation of these systems before working on or troubleshooting hydraulic systems. A more thorough understanding of the hydraulic system and electrical system can be obtained by referring to the vehicle wiring diagram in TM 5-2350-262-20-1 and the vehicle hydraulic schematic in appendix E of this manual.

HYDRAULIC SYSTEM

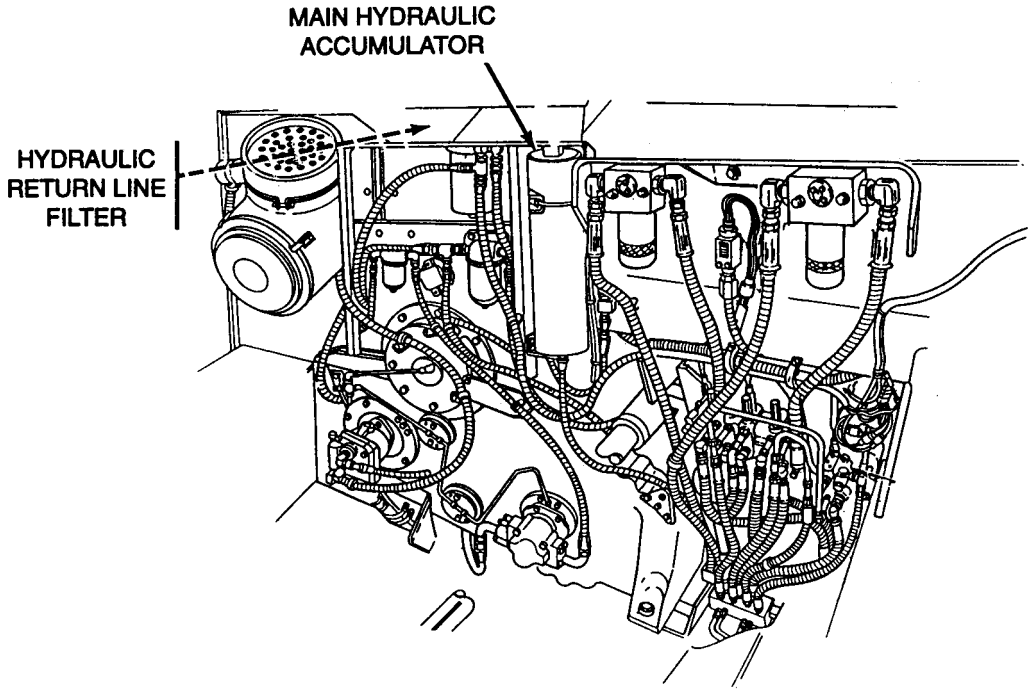
NOTE

Refer to the vehicle hydraulic schematic, appendix E.

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

HYDRAULIC RETURN LINE FILTER This filter, located on top of the engine, filters out contaminants from the hydraulic oil returning to the hydraulic reservoir.

MAIN HYDRAULIC ACCUMULATOR The main hydraulic accumulator 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 and is used to check accumulator charge status and to charge the accumulator.



HYDRAULIC HIGH-PRESSURE FILTERS Two high-pressure filters located directly in front of the driver's compartment filter hydraulic fluid from the main hydraulic pump while it is enroute to the directional control valve bank.

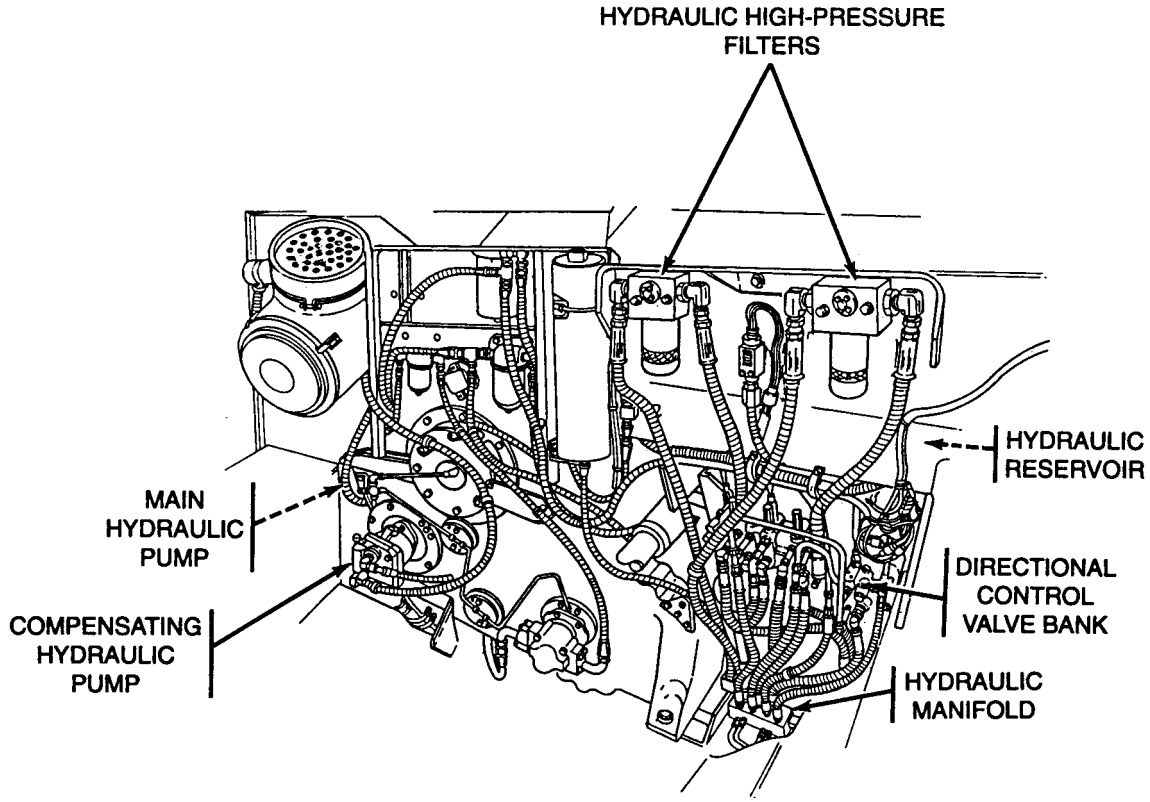
HYDRAULIC RESERVOIR The hydraulic reservoir is located beneath the driver's compartment and its check and fill point is located in the driver's compartment. It has a capacity of 32 gal. (121 L) of OE/HDO-10.

DIRECTIONAL CONTROL VALVE BANK The control valve bank is located beneath the hydraulic high-pressure filters. 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.

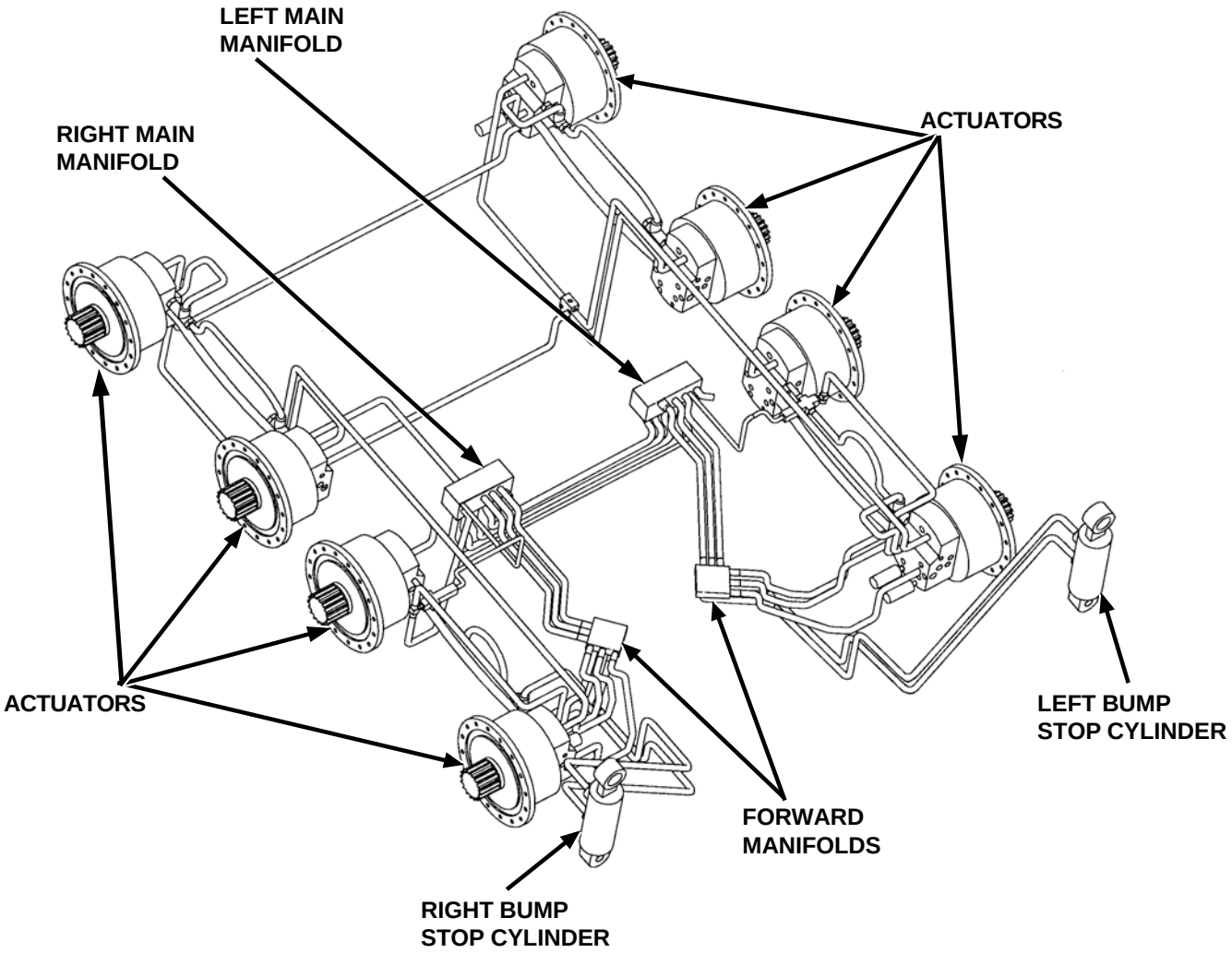
HYDRAULIC MANIFOLDS Located in the hull, the manifolds route the flow of hydraulic fluid to the vehicle components.

COMPENSATING HYDRAULIC PUMP Located on the front of the transfer case, the pump 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 directional control valves to provide pressure to both left and right suspension controls.



HYDRAULIC SYSTEM-CONTINUED



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 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 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.

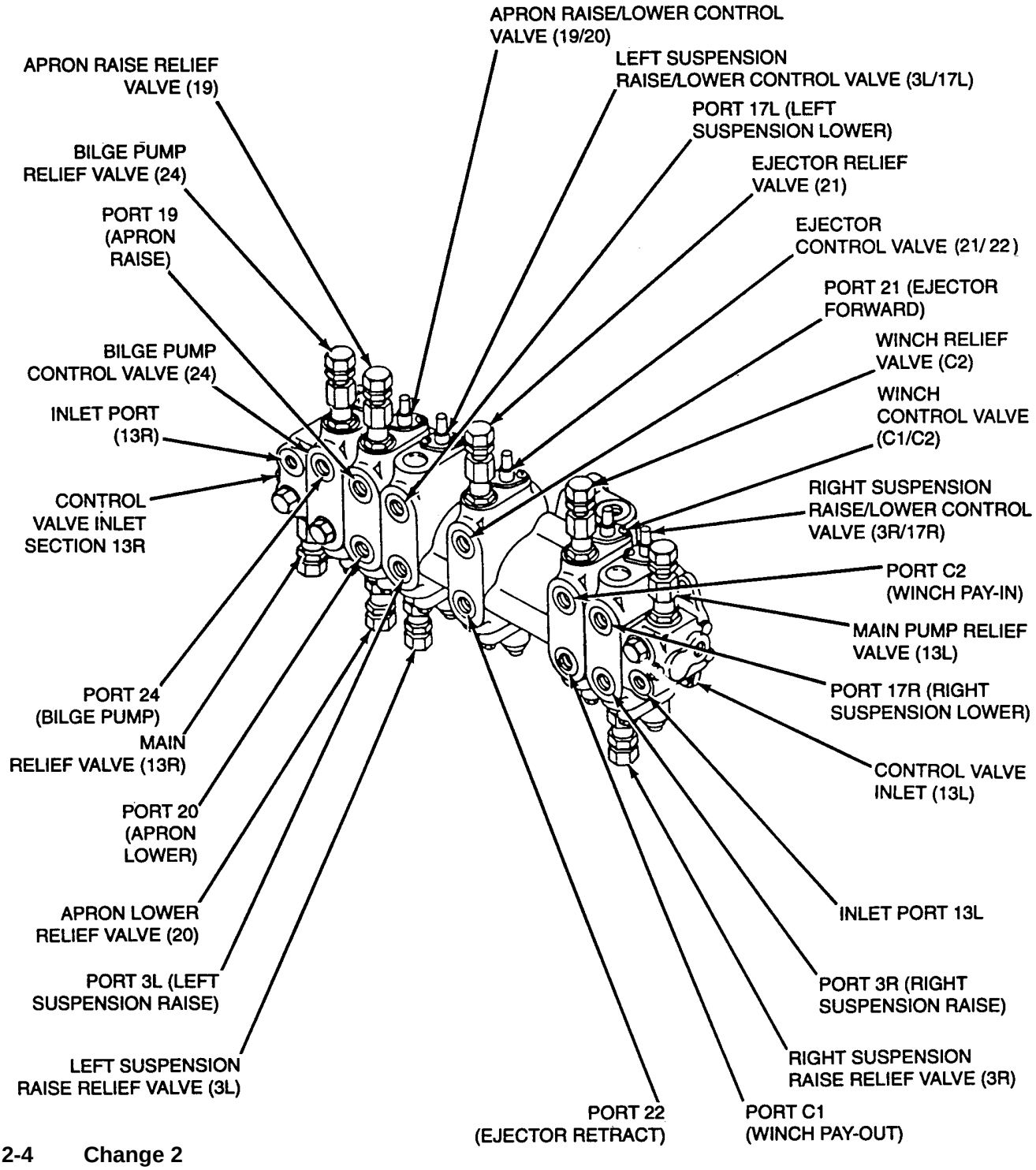
SPRUNG/UNSPRUNG CONTROL VALVE Located to the right of the main valve bank, facing rearward, this valve regulates fluid flow for whichever mode is selected.

HYDRAULIC CONTROL VALVE OPERATION The hydraulic control valves on the directional control valve bank are activated by mechanical linkages from the operator's compartment and they, in turn, activate the hydraulic functions of the vehicle.

NOTE

Although the Bilge Pump is considered Not Mission Essential and will no longer be supported with spare and repair parts, this manual contains troubleshooting procedures For Your Information Only. See TB 43 0001-62-7 (dated Oct 98) for Instructions to Isolate and Disconnect a Non-functional Bilge Pump.

This page and page 2-5 describe the functions of valves and circuits they activate. Refer to this page when following the bilge pump, apron raise/lower, winch, and ejector valve circuits.



BILGE PUMP CONTROL VALVE (24) When activated, pressurizes bilge pump circuit at 1,450-1,550 psi (9,998-10,687 kPa) and starts bilge pump action.

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 right-side hydraulic functions.

LEFT PUMP CONTROL VALVE (13L) Receives oil flow from main hydraulic pump and maintains pressure at 3,950-4,050 psi (27,235-27,925 kPa).

RIGHT SUSPENSION CONTROL VALVE (3R/17R) Port 3R, front bottom of valve, raises the right front-side of vehicle. Port 17R, above port 3R, 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, front bottom of valve, raises the left front-side of vehicle. Port 17L, above port 3L, lowers the 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, front top of valve, actuates circuit and raises apron. Port 20, below port 19, actuates circuit and lowers apron. Relief valve No. 19 is set at 4,450-4,550 psi (30,683-31,372 kPa) and relief valve No. 20 is set at 1,950-2,050 psi (13,445-14,135 kPa).

WINCH CONTROL VALVE (C1/C2) Port C1, front bottom of valve, actuates circuit and moves cable out of winch, Port C2, above port C1, 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, front top of valve, actuates circuit and moves ejector forward. Port 22, below port 21, actuates and moves the ejector back. Relief valve is set at 1,950-2,050 psi (13,445-14,135 kPa).

Section II. GENERAL HYDRAULIC SYSTEM REPAIR METHODS

SCOPE

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 5-2350-262-20-1.

GENERAL HYDRAULIC SYSTEM REPAIR

WARNING

- **High pressure is present in the M9 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 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 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.**
- **Ensure personnel are clear of bilge pump area before starting engine. Failure to comply may result in 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 chapter. 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.**

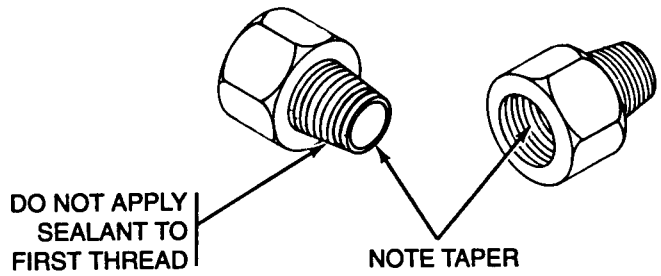
GENERAL HYDRAULIC SYSTEM REPAIR-CONTINUED

The following information is provided to familiarize personnel with the various types of hydraulic fittings. Refer to this section and the warning and cautions on the previous pages when working on hydraulic systems.

A 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. Torque valve guide, in appendix, is NOT to be used.

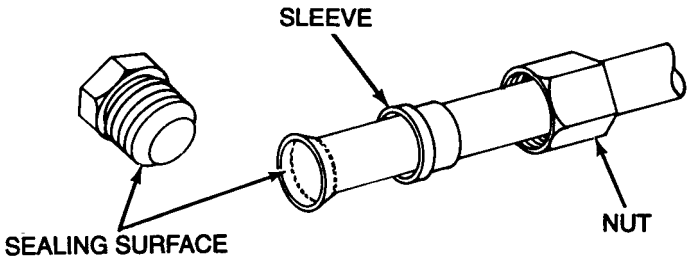
CAUTION

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.



NATIONAL PIPE THREAD (NPT)

B The 37°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°flare fitting. These sealing surfaces must be free of nicks and scratches in order to seal properly. If nicked or scratched, item must be replace. For torque requirements, see guide in appendix.

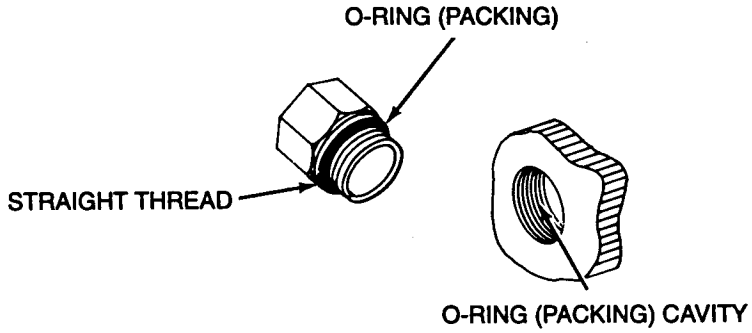


37° FLARE NUT

C 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. The installed packing must be free of nicks and cuts to seal properly. If packing is nicked or cut, it must be replaced.

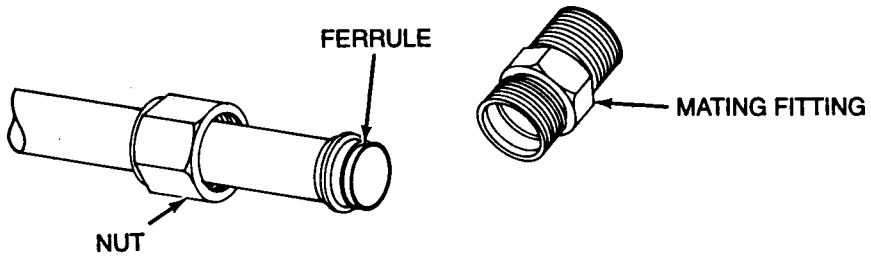
CAUTION

Packing must be located fully into groove and not on threads. Failure to comply may result in damage to equipment.



O-RING (PACKING) BOSS

D. A flareless fitting uses a straight thread. The female fitting contains a ferrule that mates with a cavity in the male fitting. Use recommended torque values in appendix D to tighten nut. If this fitting is overtorqued, the ferrule will be deformed and the fitting will leak.



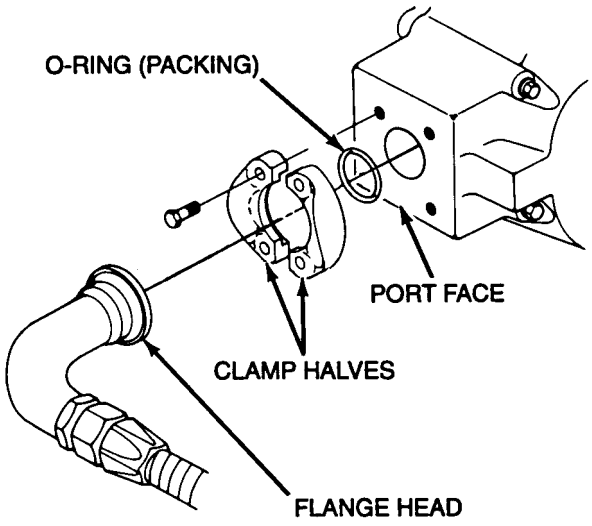
FLARELESS

GENERAL HYDRAULIC SYSTEM REPAIR-CONTINUED

E 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. 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.

CAUTION

Replace or repair parts with nicks, cuts, or scratches. Failure to comply may result in damage to equipment.



4-BOLT SPLIT FLANGE

INSTALLATION OF ADJUSTABLE FITTINGS

A Apply light weight oil (OE/HDO-10) to O-ring (preformed packing).

CAUTION

Packing must be positioned fully into groove and not on threads. Failure to comply may result in damage to equipment.

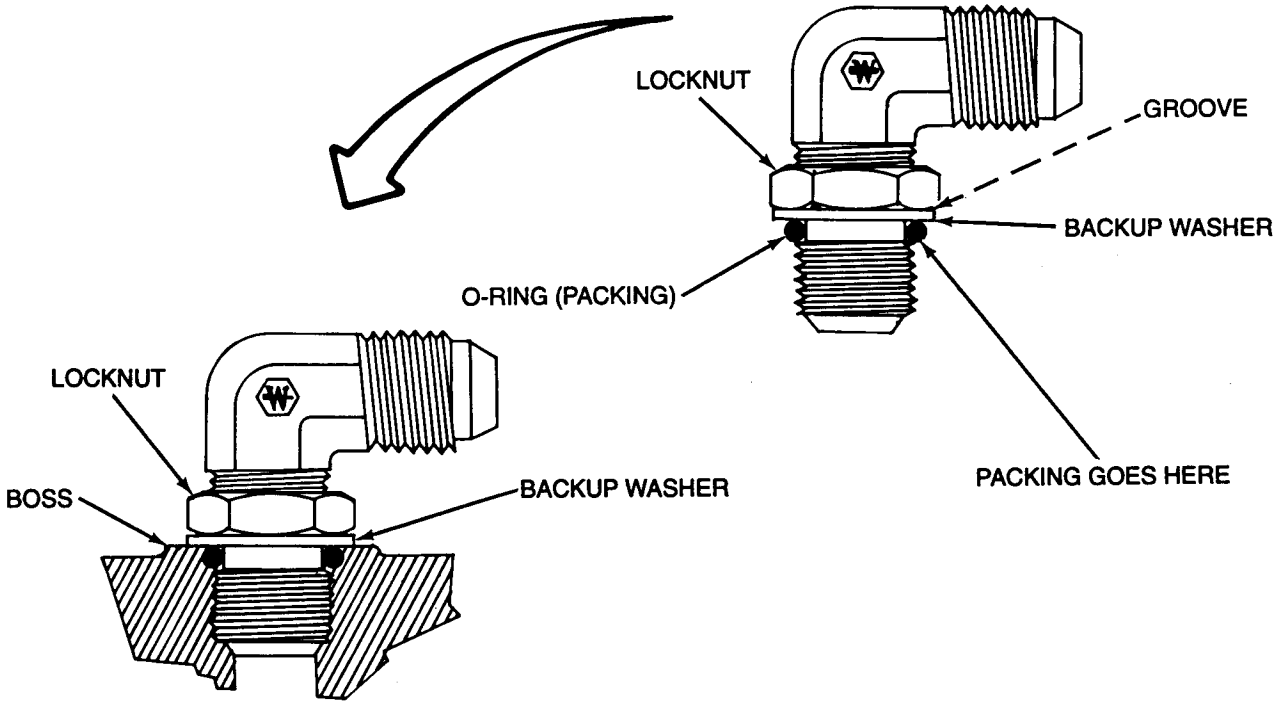
B Gently push backup washer and O-ring all the way into groove.

C Turn locknut down until locknut contacts backup washer.

D Install fitting on boss until backup washer contacts face of boss.

E Position fitting to desired position by backing out fitting up to one full turn. Hold fitting in desired position, and tighten locknut.

F Connect tube to fitting after fitting is properly positioned and tightened.



CHAPTER 3
TROUBLESHOOTING

SCOPE

This chapter contains information necessary to hydraulically troubleshoot the M9. It includes information on use of test equipment, hydraulic valves, hoses, and tubes identification; symptom index, and troubleshooting procedures.

Section I. GENERAL HYDRAULIC SYSTEM TROUBLESHOOTING PROCEDURES

SCOPE

This section describes the general procedures for troubleshooting the M9 hydraulic system at the unit maintenance level. These procedures should be referred to before you start troubleshooting, and during troubleshooting when these procedures are referenced in the troubleshooting procedures of section II. Procedures contained in this section are listed below.

GENERAL

The causes of many hydraulic system malfunctions cannot be isolated by visual inspection and require special procedures to locate. When a thorough visual inspection does not indicate the cause of a hydraulic malfunction, troubleshoot the hydraulic system to locate the faulty component. The troubleshooting procedures in this section and in the troubleshooting procedures cannot cover all the possible malfunctions and deficiencies that may occur on the M9. Carefully listen and observe all hydraulic actions to assist in the location of troubles. The more symptoms that can be evaluated, the easier it will be to isolate the defect.

Refer to the information in this section for preliminary troubleshooting procedures and connections of test equipment and adapters necessary for fault isolation. While troubleshooting the hydraulic system, refer to the vehicle hydraulic schematic diagram Appendix E to determine flow paths, pressures, routing of lines, and position of control valves.

GENERAL NOTES

WARNING

- **High pressure is present in the M9 hydraulic system. Do not disconnect any hydraulic system component unless hydraulic 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.**
- **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.**

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

- Before removing the hull access plates from the bottom of the hull, thoroughly and carefully inspect all readily and easily accessible hydraulic lines and components for leaks or damage.
- If hull access plates must be removed from the bottom of the hull, remove the front access plates first. More suspension malfunctions occur in the front of the vehicle than at the rear.
- Always observe the general hydraulic system repair methods described in this chapter.
- Instead of replacing a relief valve for troubleshooting purposes, temporarily switch it with another relief valve on the directional control valve bank.
- When proceeding from one troubleshooting task to another, read the next task to determine what test equipment or configuration is required. Time can be saved by not repeating gauge, fitting, and hose connections.

When troubleshooting is complete, make sure all test equipment and test fittings are removed, and all hydraulic components are returned to the original configuration, before operating the vehicle.

NOTE

Fluid leaks are classified as either Class I, Class II, or Class III.

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

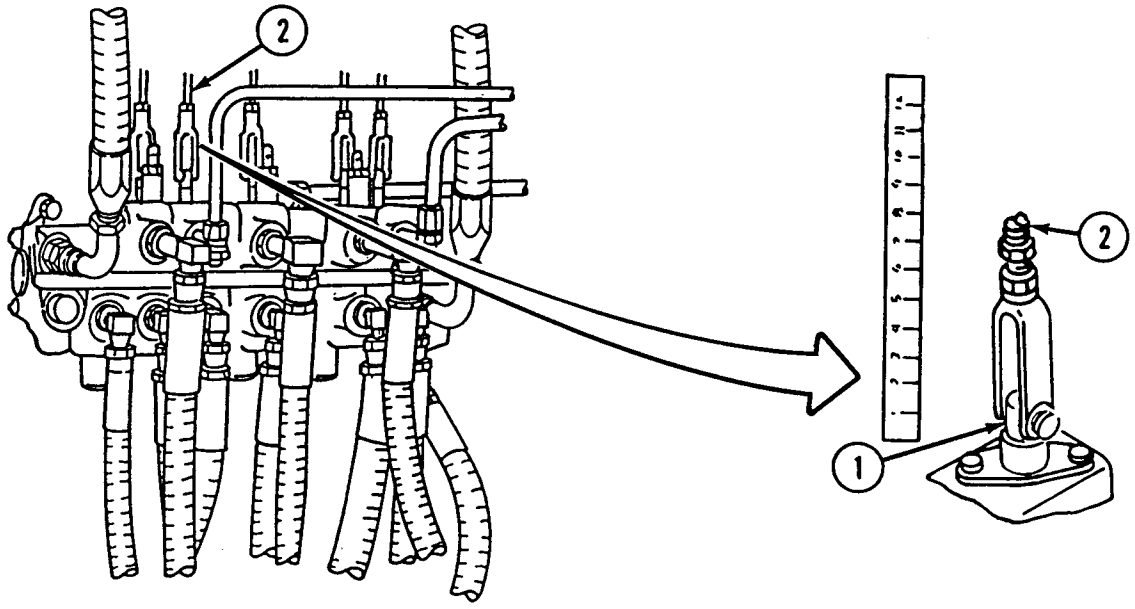
Class II Leakage of fluid great enough to form drops, but not enough to cause drops to drip from the item being checked or observed.

Class III Leakage of fluid great enough to form drops that fall from the item being checked or observed.

PRELIMINARY TROUBLESHOOTING PROCEDURES

Before starting any specific troubleshooting procedures, perform the following procedures:

- Visually check for ruptured oil hoses or tubes, and for Class II or Class III leaks. Replace any damaged components.
- Visually check both high-pressure filters and return line filter for cracks, loose fittings, damaged hoses, and broken brackets. Replace or repair any damaged components.
- Check for mechanical jamming or binding caused by rocks or other foreign matter.
- Check oil level in hydraulic tank and service as necessary.
- Check temperature of hydraulic oil at hydraulic oil temperature gauge in driver's compartment Temperature should not be more than 180°F (82°C).
- Check operation and adjustment of each hydraulic control and valve plunger (1). Plungers should move 9/32 in (7 mm) above or below neutral position when control rod (2) is operated. (Bilge pump and SPRUNG/UNSPRUNG plungers only move up).



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
STE/ICE-R-4910-01-222-6589-12258880 (optional)
Wiping rags
Hand tools from Common No.1 Kit
Bushing - 4730-00-580-7417-2081-8-4S
Adapter - N/A - 2027-12-12S
Tee - 4730-00-738-7558-203102-12-12S
Reducer - 4700-00-675-9216-221501-12-8S
Liquid measures from Common No.1 Kit:
2 qt (1.9 L) capacity - NSN 7240-00-255-8113
8 qt (7.6 L) capacity - NSN 7240-00-255-5996
Packing (O-rings) - Quantity determined by tasks. Refer to TM 5-2350-262-24P.
Hydraulic Troubleshooting Kit (NSN 2590-01-216-8646) Part No. 5705562 is comprised of the following components:

Item	NSN	Part No.	Quantity
Adapter	4730-00-441-8700	MS51500A8-4	4
Adapter	4730-00-800-7570	MS51503A4	2
Adapter	4730-01-305-5796	4-4F6BX-S	1
Adapter	4730-01-183-7167	2242-8-8S	2
Bushing	4730-00-729-4930	2081-8-2S	2
Cap	4730-00-542-5911	MS51532B10	2
Cap	4730-00-647-3311	MS51532B12	4
Cap	4730-01-044-0878	MS51532B4	4
Cap	4730-00-540-1525	MS51532B6	8
Cap	4730-00-625-2212	MS51532B8	8
Hose Assembly	4720-01-246-0992	12355351	2
Hose Assembly	4720-01-252-8425	12355352	2
Nipple	4730-00-855-4799	MS51519A10S	2
Nipple	4730-01-079-1986	MS51519A4	2
Nipple	4730-01-329-4994	MS51519A8	4
Nut	4730-00-203-3831	C5105X6	2
Plug	5365-01-249-9707	MS51518B10	2
Plug	4730-01-203-6941	MS51518B12	4
Plug	4730-01-021-3850	MS51518B4	8
Plug	4730-01-070-9214	MS51518B8	8
Plug	5365-01-251-2034	MS51518B6	4
Reducer	4730-00-805-5094	MS24399-19	4
Reducer	4730-01-214-1741	10-8-070123C	2
Reducer	4730-00-706-8711	MS51534A6-4	2
Reducer	4730-00-676-3075	MS51534A8-4	2
Tee	4730-00-074-0713	MS51523A8	4
Coupling Assembly	4730-01-270-7650	12355353	2
Check Valve	4820-00-045-7415	MS24593-8	2
Globe Valve	4820-00-513-5471	10F0-1-3T	2
Box Hydraulic Assembly Troubleshooting Kit	2540-01-298-3975	12367609	1

PRELIMINARY TROUBLESHOOTING PROCEDURES - CONTINUED

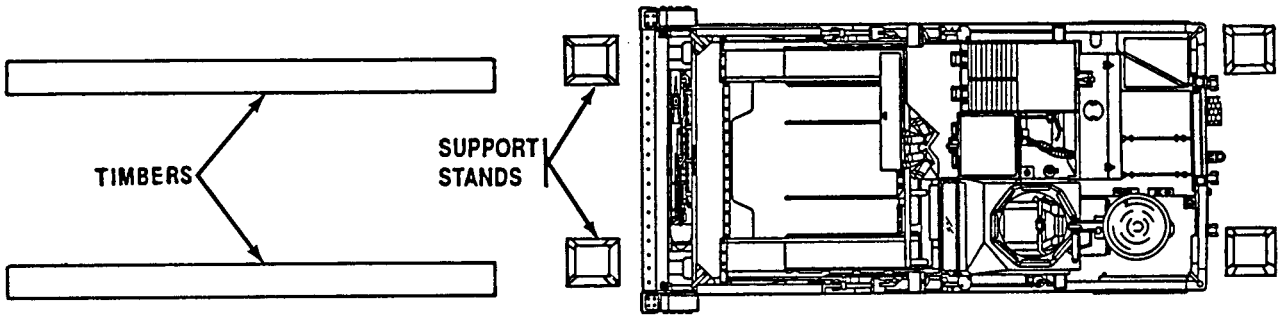
Wrench Set (NSN 5120-01-302-4387) Part No.5705566 is comprised of one each of the following components:

Item	NSN
Wrench, crowfoot, 9/16 in.	5120-00-184-8397
Wrench, crowfoot, 5/8 in.	5120-00-184-8398
Wrench, crowfoot, 11/16 in.	5120-00-236-2261
Wrench, crowfoot, 3/4 in.	5120-00-184-8400
Wrench, crowfoot, 13/16 in.	5120-00-184-8401
Wrench, crowfoot, 7/8 in.	5120-00-541-4071
Wrench, crowfoot, 15/16 in.	5120-00-184-8403
Wrench, crowfoot, 1 in.	5120-00-595-8213
Wrench, crowfoot, 1-1/16 in.	5120-00-184-8405
Wrench, crowfoot, 1-1/8 in.	5120-00-517-7021
Wrench, crowfoot, 1-3/16 in.	5120-00-184-8407
Wrench, crowfoot, 1-1/4 in.	5120-00-293-2567
Wrench, crowfoot, 1-5/16 in.	5120-00-184-8409
Wrench, crowfoot, 1-3/8 in.	5120-00-184-8410
Wrench, crowfoot, 1-1/2 in.	5120-00-184-8412
Wrench, crowfoot, 1-5/8 in.	5120-00-184-8414
Wrench, crowfoot, 1-11/16 in.	5120-00-184-8415
Wrench, crowfoot, 1-3/4 in.	5120-00-184-8416
Wrench, crowfoot, 1-7/8 in.	5120-00-184-8418
Wrench, crowfoot, 2 in.	5120-00-184-8420
Wrench, crowfoot, 2-1/8 in.	5120-00-184-8422
Wrench, crowfoot, 2-1/4 in.	5120-00-184-8424
Wrench, crowfoot, 2-1/2 in.	5120-00-184-8428
Box, tool	5140-01-298-3983

SUSPENDING THE M9 FOR SUSPENSION SYSTEM CHECKS

While troubleshooting the hydraulic components of the suspension system, the pressure tests are more reliable if the vehicle is supported by the suspension. If conditions do not permit this, pressure tests should be rechecked to insure accurate readings. If the suspension must be supported, perform the following procedure:

Place the vehicle on support stands to allow a safe working area under the vehicle while performing procedures that require working through hull access plate openings. If vehicle support stands are not available, use two long, parallel timbers, or similar supports, between 12 and 18 in. (30 and 46 cm) high.



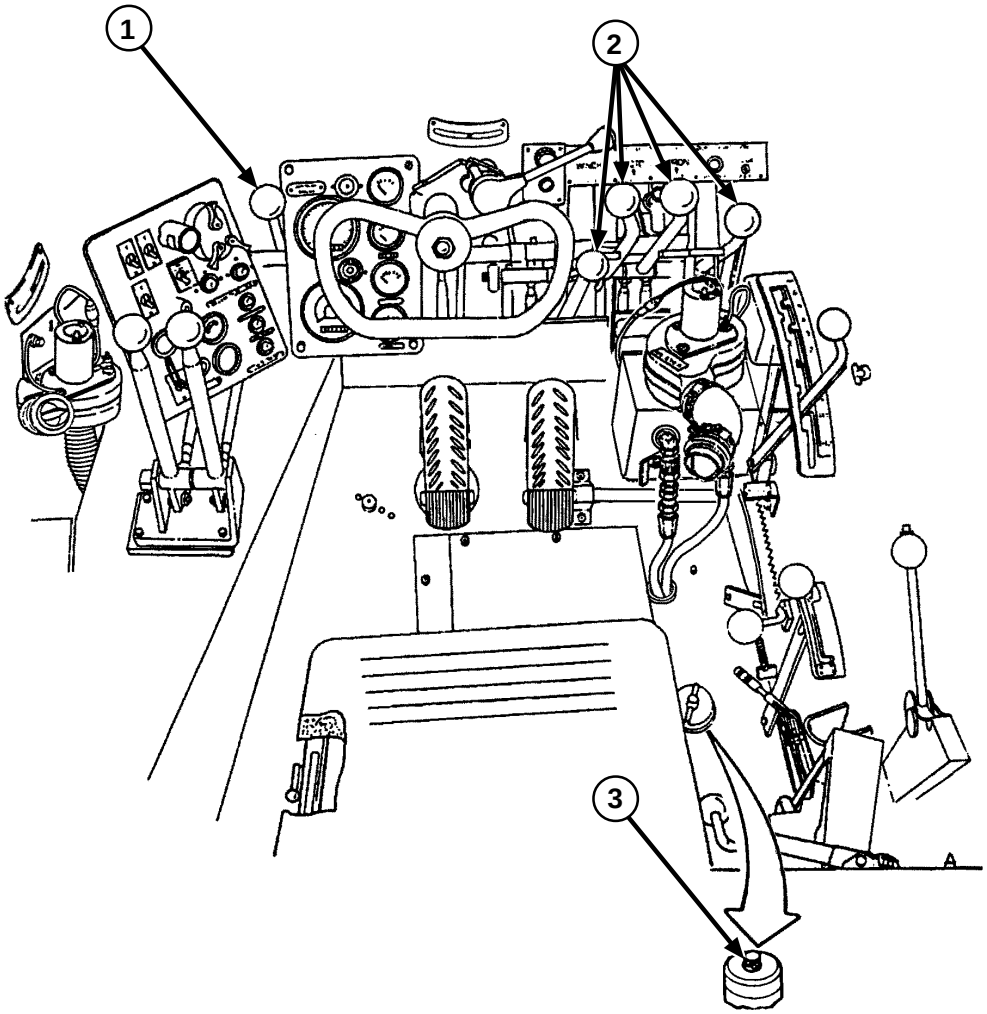
RELIEVING HYDRAULIC SYSTEM PRESSURE

A If necessary, stop vehicle engine. Place SPRUNG/UNSPRUNG control lever (1) in SPRUNG position.

B Relieve pressure from main accumulator by slowly moving SPRUNG/UNSPRUNG control lever (1) toward UNSPRUNG position until a hissing can be heard. Hold in that intermediate position until hissing ceases, then place SPRUNG/UNSPRUNG control lever (1) in SPRUNG position.

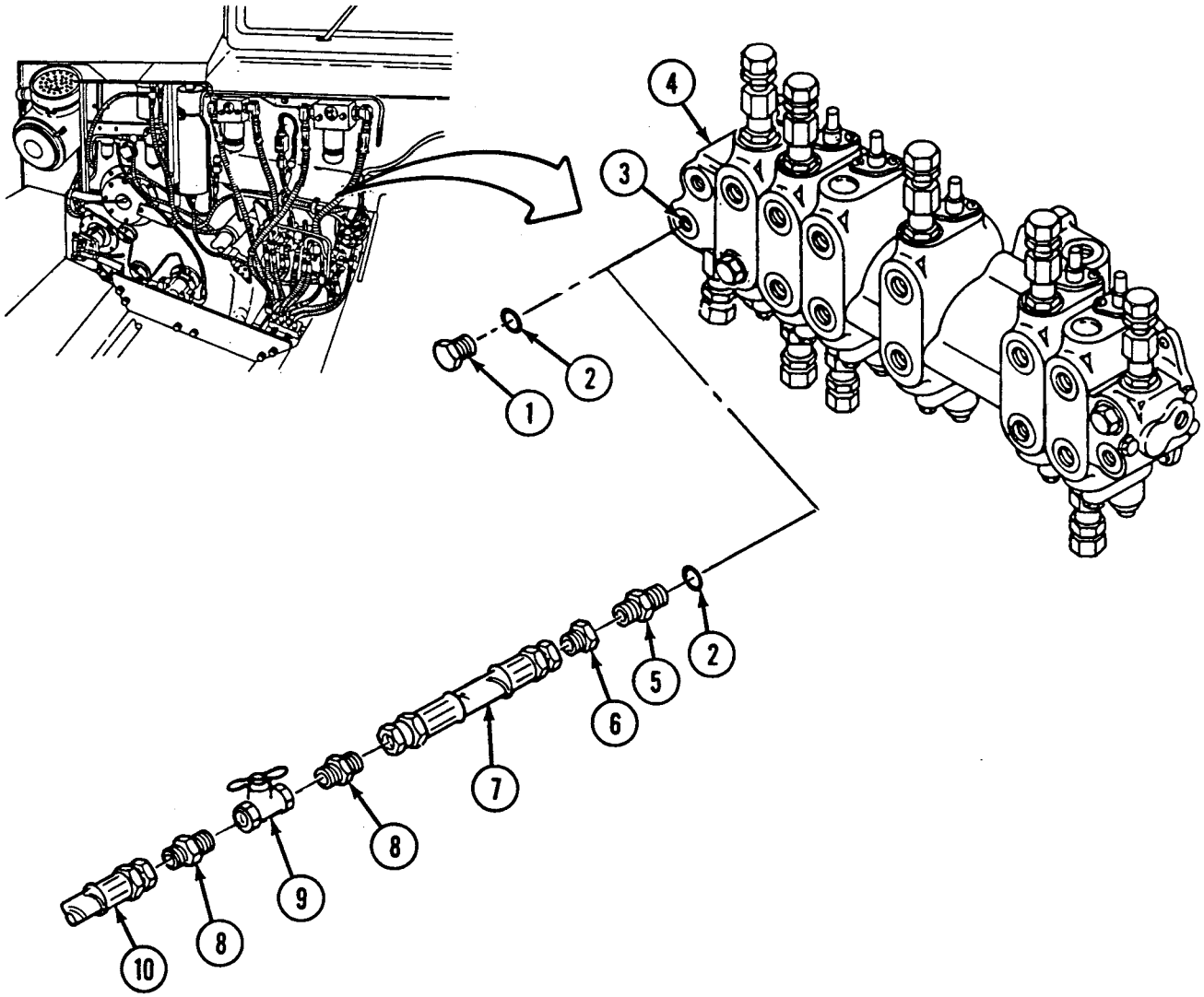
C Operate each of the four control levers (2) several times, through all positions, to relieve any residual pressure in hydraulic subsystems.

D Slowly loosen hydraulic tank dipstick (3) to allow air pressure to escape. Tighten dipstick (3).



ACCUMULATOR DUMP VALVE INSTALLATION

Some procedures in the troubleshooting charts require starting and stopping the engine several times. To rapidly and safely relieve pressure from the main hydraulic accumulator, a dump valve may be installed in the system. If installing a dump valve, use the procedure described below.



A Stop vehicle engine and relieve hydraulic pressure

B Remove plug (1) and packing (2) from port 7 (3) of valve 13R (4). Discard packing (2).

C Install new packing (2) and nipple (5) in port 7 (3).

D Install reducer (6) to nipple (5).

E Connect tube assembly (7) to reducer (6).

F Install two adapters (8) on globe valve (9), and connect this assembly to tube (7), with arrow of globe valve (9) pointed toward port 7 (3).

CAUTION

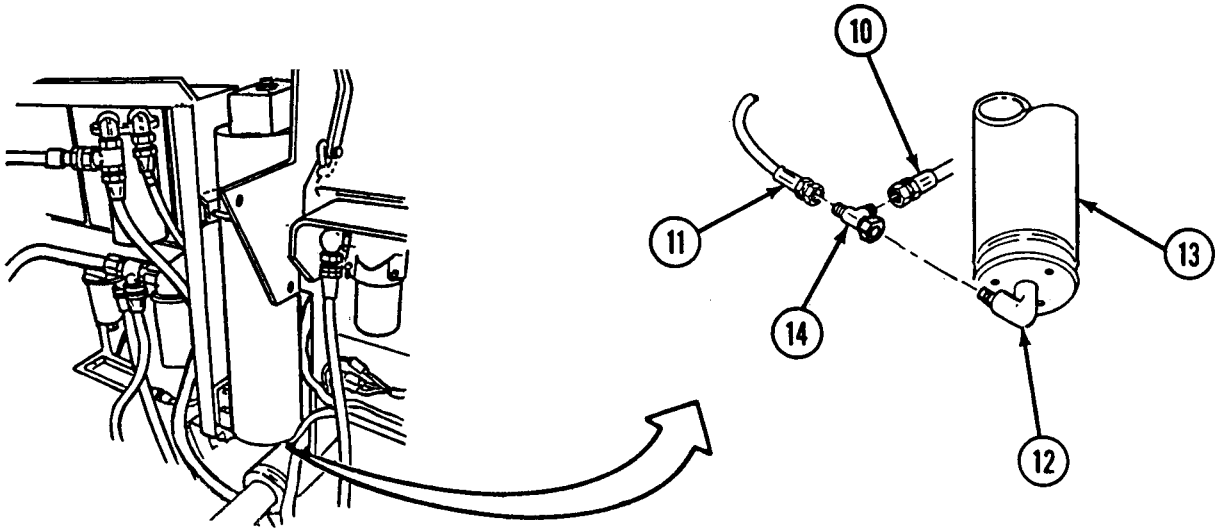
Make sure globe valve is closed when dump valve is not in use or when engine is running. Damage to equipment may result.

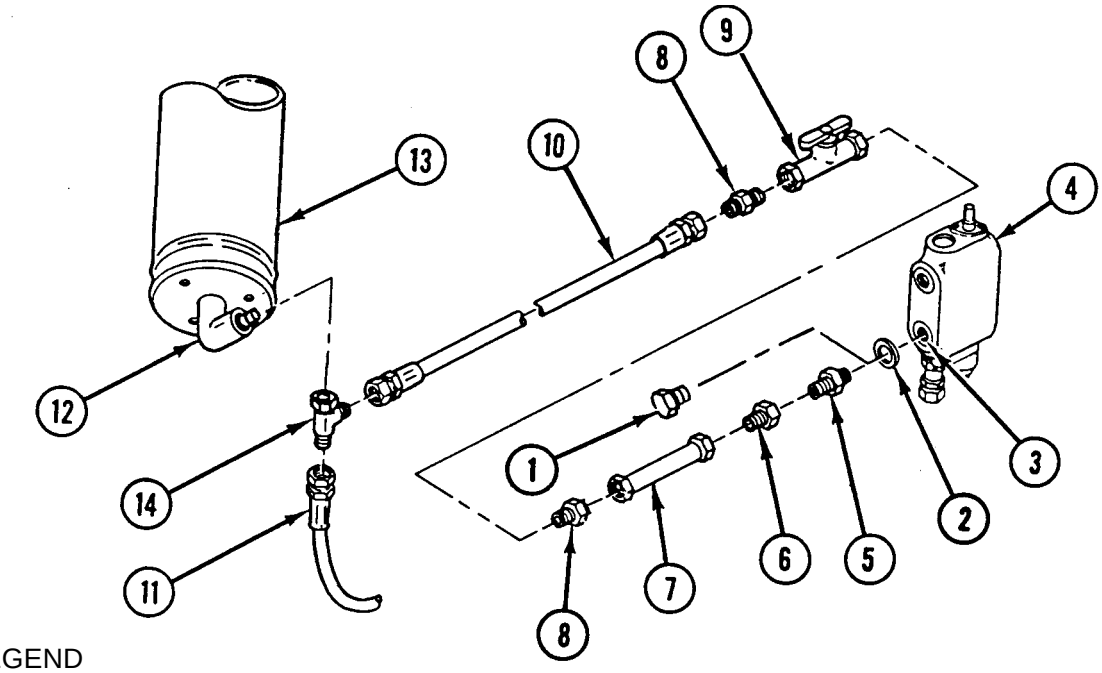
G Connect hose assembly (10) to adapter (8) at end of globe valve (9).

ACCUMULATOR DUMP VALVE INSTALLATION - CONTINUED

H Disconnect ACCUMULATOR-9 hose (11) from elbow (12) at bottom of main hydraulic accumulator (13).

I Install tee (14) on elbow (12), and connect hose (11) and hose assembly (10) to tee (14).





LEGEND

1	Plug	8	Adapter
2	Packing	9	Globe Valve
3	Port 7	10	Hose Assembly
4	Valve 13R	11	Accumulator Hose
5	Nipple	12	Accumulator Elbow
6	Reducer	13	Accumulator
7	Tube Assembly	14	Tee

GENERAL SUSPENSION TROUBLESHOOTING INFORMATION

A PRESSURE CHECKS: The 2,800-2,900 psi (19,306 - 19,996 kPa) maximum suspension system pressure is controlled by an adjustment on the compensating pump. This adjustment should always be checked prior to performing suspension system pressure checks. The suspension system pressure checks can then be performed as specified in the troubleshooting procedures.

B SUSPENSION SYSTEM RELIEF VALVE: The sole function of this valve is to protect the suspension hydraulic circuit in the event the pressure control device on the pump should fail. This valve is set to open at 3,700-3,800 psi (25,512-26,201 kPa).

C DESCRIPTION OF THE SPRUNG SUSPENSION CIRCUIT: When the SPRUNG/UNSPRUNG control lever is in the SPRUNG position, the operator has no control over the suspension. The height of the vehicle is automatically controlled by leveling valves in the No.1 and 4 actuators. Each No.1 and 4 actuator and its paired No. 2 or 3 actuator is independent of the other three corners (fully independent suspension). Therefore, the SPRUNG suspension system can be considered as consisting of five major areas as follows:

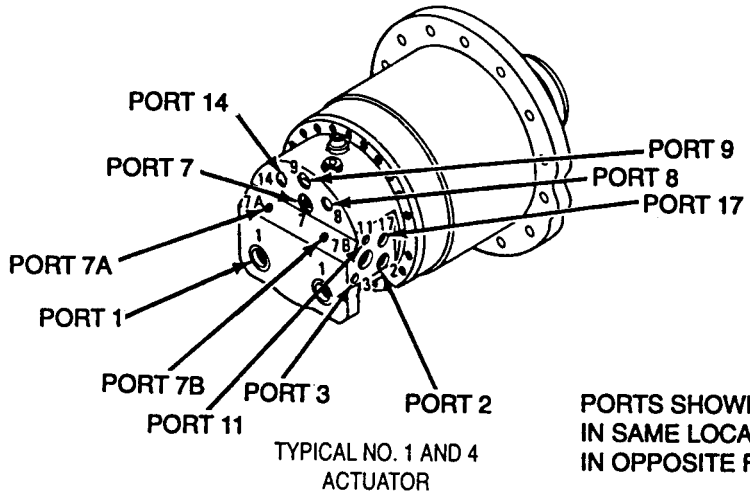
1. The right rear pair of actuators.
2. The left rear pair of actuators.
3. The right front pair of actuators, with the right front bump stop cylinder.
4. The left front pair of actuators, with the left front bump stop cylinder.
5. The power system: pump, suspension relief valve, SPRUNG/UNSPRUNG valve, and the main accumulator.

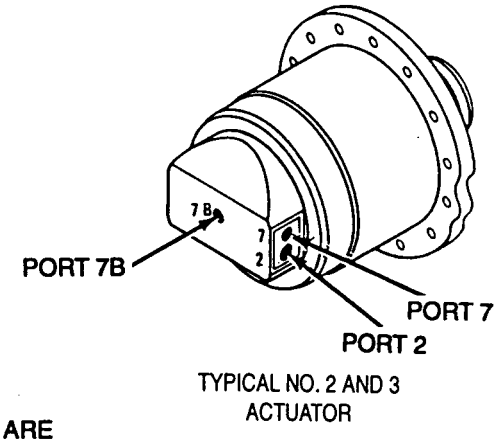
When the suspension will not raise, the most probable cause is excessive internal leakage in one or more components. The troubleshooting procedures eliminate these major areas from the circuit one by one to locate the fault.

D DESCRIPTION OF THE UNSPRUNG SUSPENSION CIRCUIT: When the SPRUNG/UNSPRUNG control lever is placed in the UNSPRUNG position, the operator assumes control of the four front actuators. However, the four rear actuators remain in an automatic mode. Hydraulic valves in the No.1 and 4 actuators shift position to cause all four rear actuators to share a common pressure line (the two rear No. 4's are no longer independent). This is necessary so the front of the vehicle can be tilted (one front side of the vehicle lowered more than the other side). Therefore, problems can develop in either the front or rear areas of the suspension hydraulic system that could affect performance in the SPRUNG mode only, the UNSPRUNG mode only, or both modes.

E OPERATIONAL VEHICLE: The vehicle should be considered operational if it will rise within 2 minutes of engine start and will stay up long enough to perform its mission.

ACTUATOR PORT INDENTIFICATION AND DESCRIPTION





Port	Description
1	Actuator accumulator to wheel valve and leveling dump valve.
2	External port and passage to wheel valve and actuator shaft vanes (pressurized to raise vehicle).
3	External port and passage to wheel valve (pressurized to raise vehicle when in UNSPRUNG mode).
4	Internal passage from leveling dump valve to wheel valve (see next page).
7	External port for relief valve outlet flow.
7A	External port and passage from wheel valve (carries leveling dump valve flow when vehicle is in SPRUNG mode).
7B	External port and passage from drain chamber.
8	External port and auxiliary passage to actuator accumulator from port 9.
9	External port and passage through leveling fill valve to actuator accumulator (pressurized to charge accumulator when leveling fill valve is held open by cam).
11	External port and passage to wheel valve (pressurized to shift wheel valve into UNSPRUNG mode).
14	External port and axillary passage to actuator accumulator.
17	External port and passages to actuator shaft vanes (pressurized to lower vehicle when in UNSPRUNG mode, and is return line passage when raising vehicle in both SPRUNG and UNSPRUNG modes).

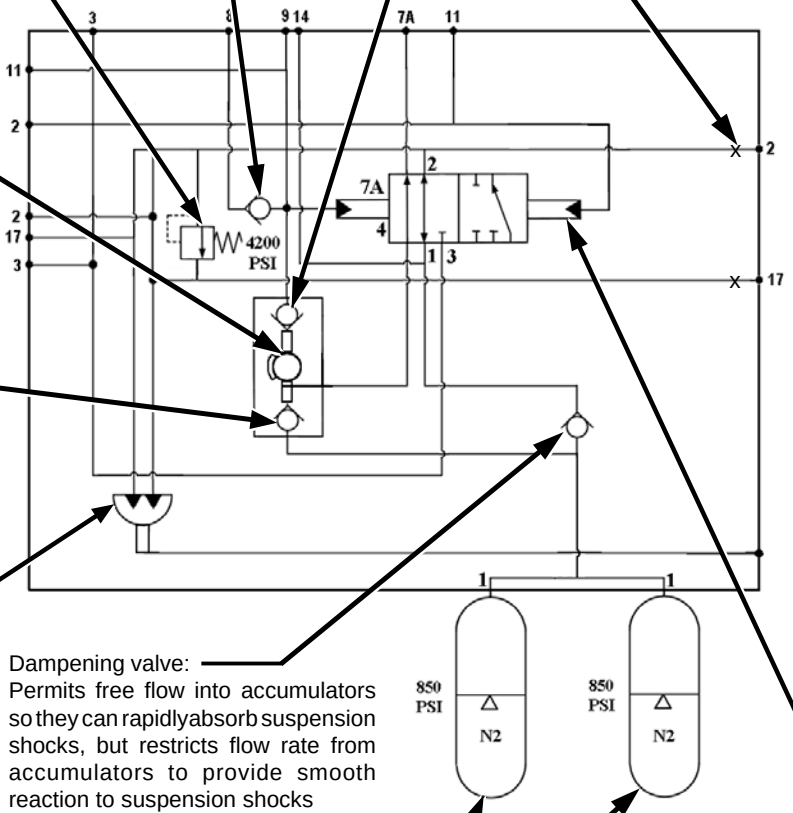
TYPICAL NO. 1 AND 4 ACTUATOR SCHEMATIC DIAGRAM

Shock load and replenishing check valve:
Permits replenishing of accumulator via port 9, but prevents accumulator pressure surges from entering circuit No. 9

Leveling fill valve:
Opened by cam to replenish accumulators and raise vehicle when vehicle is too low

Relief valve:
Protects unit from high- pressure surges

Ports 11, 17, 2 and 3 are plugged on LH or RH side of unit, depending on desired direction of shaft rotation. When plugs are installed as shown, pressure to port 2 will cause clockwise shaft rotation



Cam:
Bolted to actuator shaft, opens and closes leveling valves at appropriate points of shaft rotation (at appropriate vehicle height)

Leveling dump valve:
Opened by cam to drain accumulators and lower vehicle when vehicle is too high

Rotary actuator shaft:
(mounts roadwheel arm)

Dampening valve:
Permits free flow into accumulators so they can rapidlyabsorb suspension shocks, but restricts flow rate from accumulators to provide smooth reaction to suspension shocks

Wheel valve:

A. In SPRUNG mode (shown), actuator shaft is hydraulically connected to accumulators (suspension has springs), and flow from leveling dump valve can return to reservoir through port 7A

B. In UNSPRUNG mode (port 11 pressurized), actuator shaft is isolated from accumulator (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

Wheel accumulators:
Attach to port 1 of rotary actuator, function as suspension springs when vehicle is in SPRUNG mode

LOCKING AND DISABLING EJECTOR

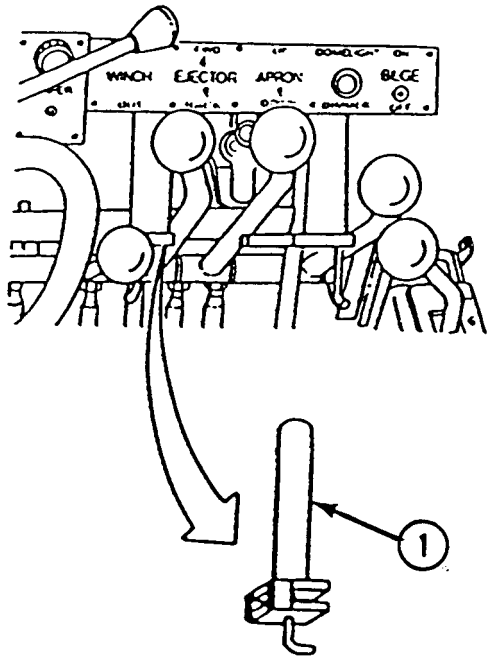
WARNING

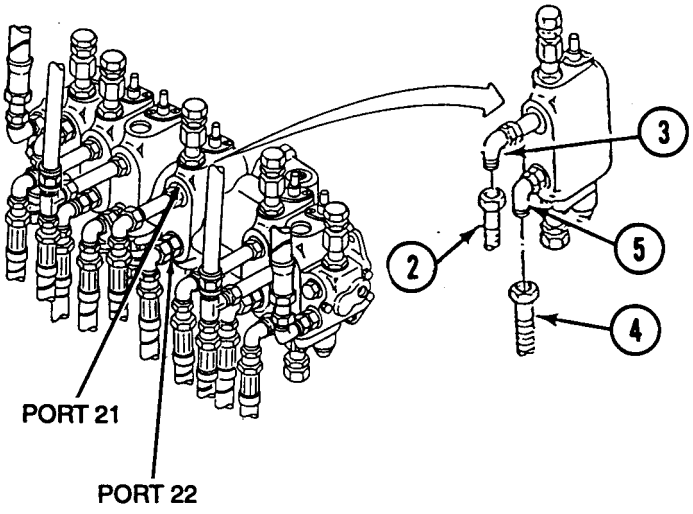
Do not operate ejector when personnel are in bowl. Do not work in bowl unless ejector lock is engaged. Failure to comply may result in severe injury or death to personnel.

A When working in the bowl, always engage the ejector lock (1) to prevent the ejector from being extended (FWD) or retracted (BACK).

B The ejector can also be disabled by disconnecting the ejector cylinder.

C Disable the ejector from the hydraulic system by disconnecting CONT VLV-21 hose (2) from elbow (3) at port 21 and CONT VLV-22 hose (4) from elbow (5) at port 22 on ejector control valve. Cap and plug hoses and fittings.





Section II. TROUBLESHOOTING PROCEDURES

SCOPE

This section contains information on locating faults and causes of hydraulic malfunctions that may develop in the M9 ACE. An alphabetical symptom index is provided.

GENERAL

Before you begin troubleshooting, ensure the defect is real. If possible, talk to the operator or mechanic that reported the problem. Look for any other problems that could cause the system or component to malfunction, such as a switch or lever in the wrong position. Refer to TM 5-2350-262-10 for correct operating procedures. Check fluid levels as shown in TM 5-2350-262-10.

Many faults can be located by a good visual inspection. Look for leaks, loose or corroded connections, damaged controls, and loose or damaged linkages.

When working on the hydraulic system, follow the general hydraulic system repair methods and refer to the general hydraulic system troubleshooting procedures.

If you use the optional STE/ICE-R tests, use the STE/ICE-R Operator's Manual (TM 9-4910-571-12&P) for reference before and during testing.

When trying to isolate a fault, review the past maintenance record on the affected vehicle. Although it doesn't happen often, an incomplete or poorly performed maintenance task may lead to another problem.

USING THE TROUBLESHOOTING PROCEDURES

Find the symptom in the symptom index. Go to the page referenced for that symptom. All possible malfunctions cannot be listed. If the specific malfunction is not listed in this section, refer to vehicle hydraulic schematic diagram for additional information or reference data.

SYMPTOM INDEX

1 ALL HYDRAULIC FUNCTIONS INOPERATIVE

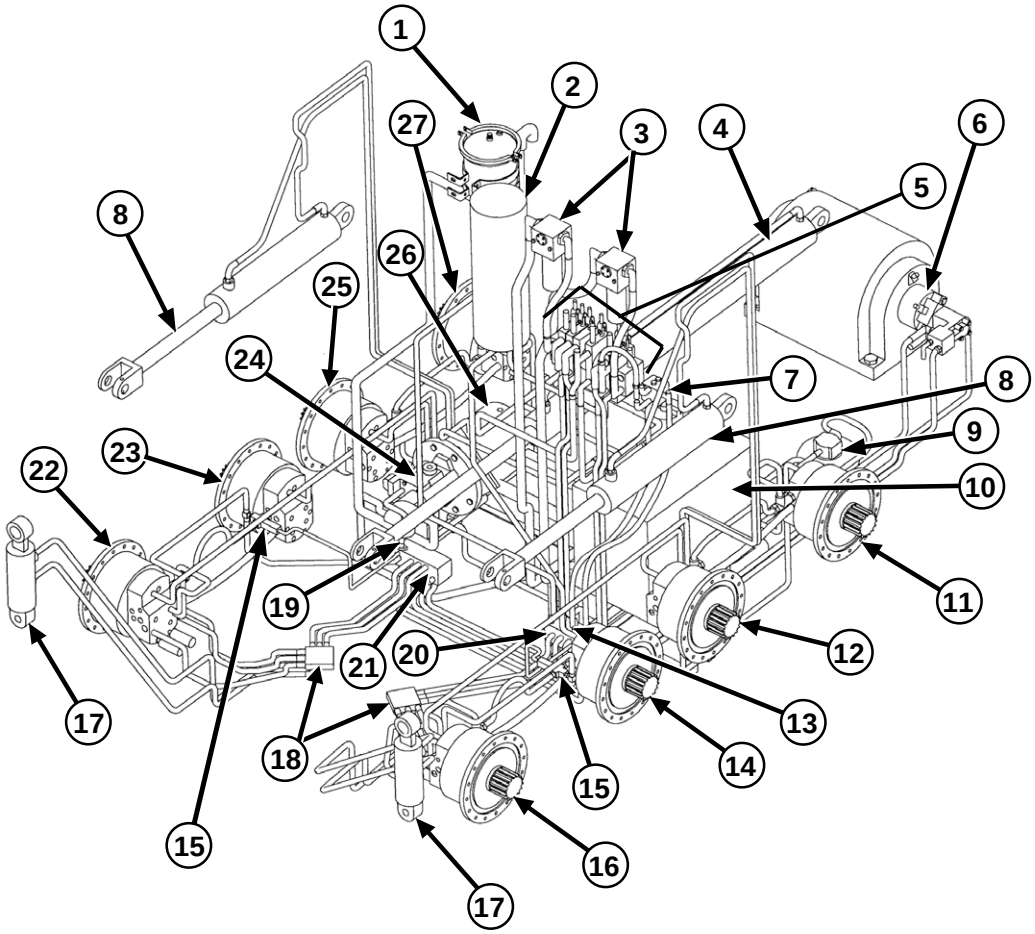
The hydraulic control valves on the directional control valve bank are activated by mechanical linkages from the operator's compartment which then activate hydraulic functions of the vehicle.

WARNING

High pressure is present in the M9 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.

NOTE

Perform this procedure only when all hydraulic functions are inoperative.
Refer to hydraulic schematic in appendix E.



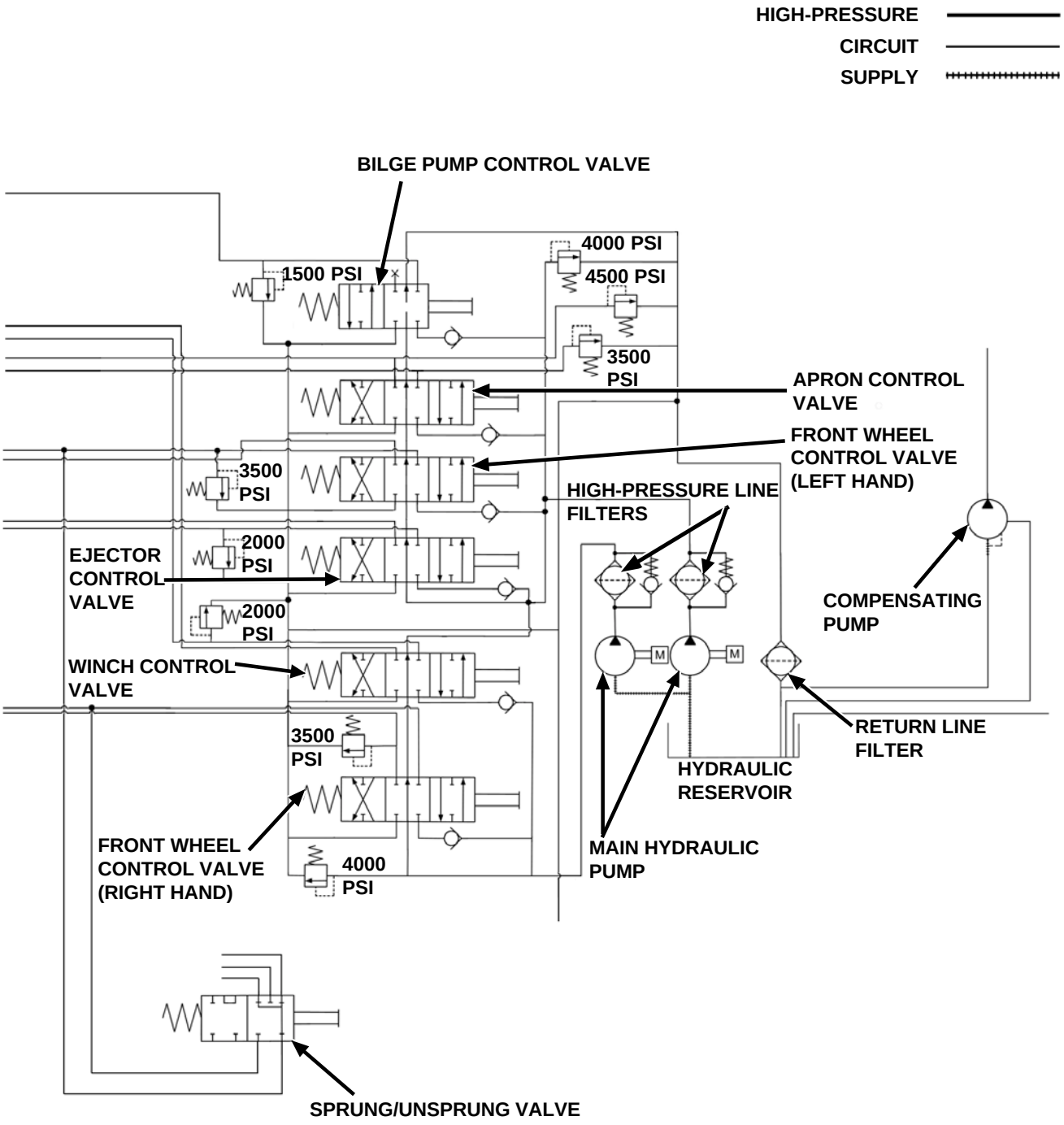
COMPONENTS:

1. RETURN LINE FILTER
2. MAIN ACCUMULATOR
3. HIGH-PRESSURE FILTERS
4. EJECTOR CYLINDER
5. DIRECTIONAL CONTROL VALVE BANK
6. WINCH MOTOR
7. SPRUNG/UNSPRUNG VALVE
8. APRON CYLINDER
9. BILGE PUMP MOTOR
10. HYDRAULIC RESERVOIR
11. NO. 4 ACTUATOR, LEFT HAND
12. NO. 3 ACTUATOR, LEFT HAND
13. SUSPENSION RELIEF VALVE (BEHIND)
14. NO. 2 ACTUATOR, LEFT HAND
15. INTERMEDIATE WHEEL VALVE

HYDRAULIC CIRCUIT

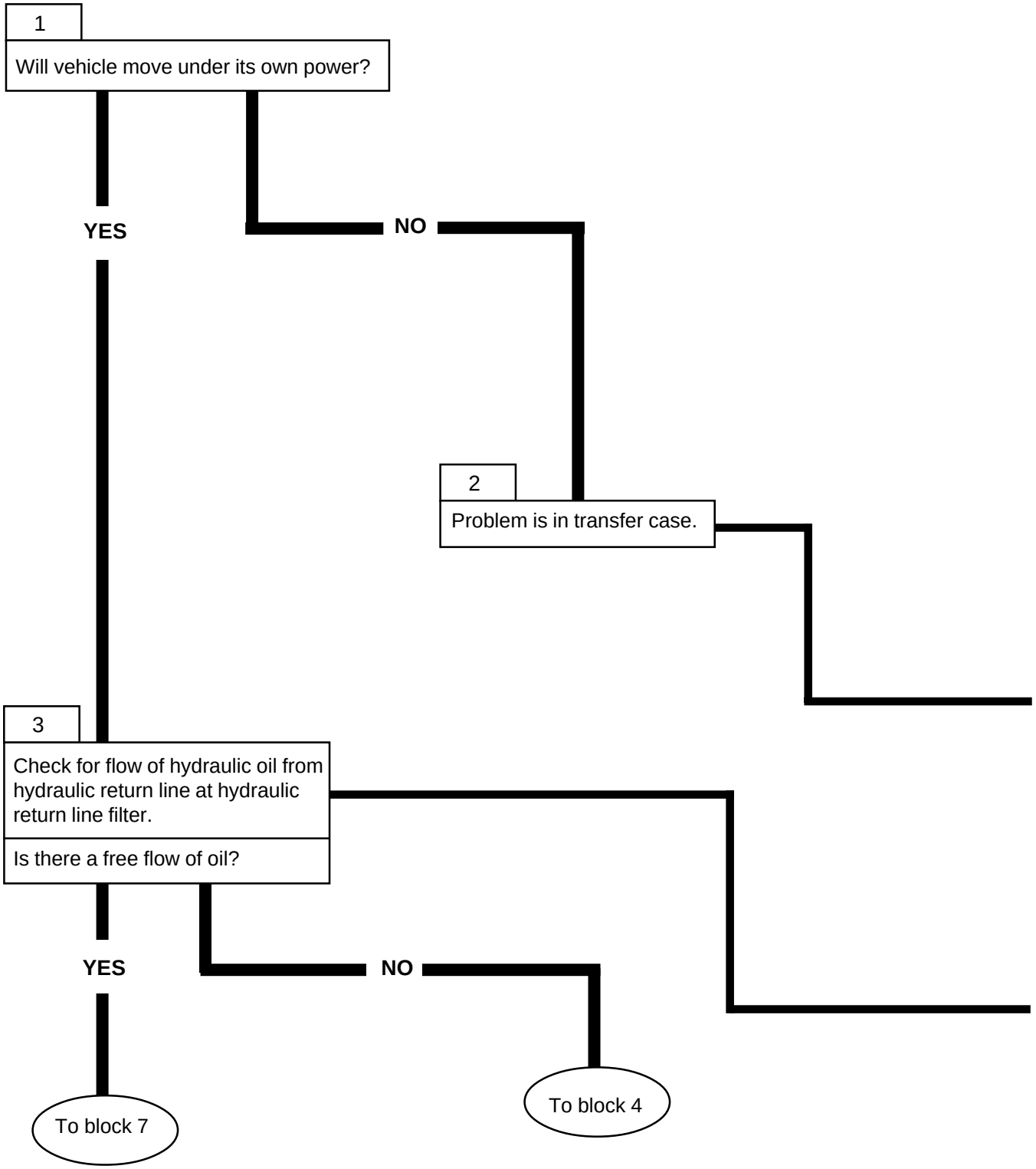
COMPONENTS (continued):

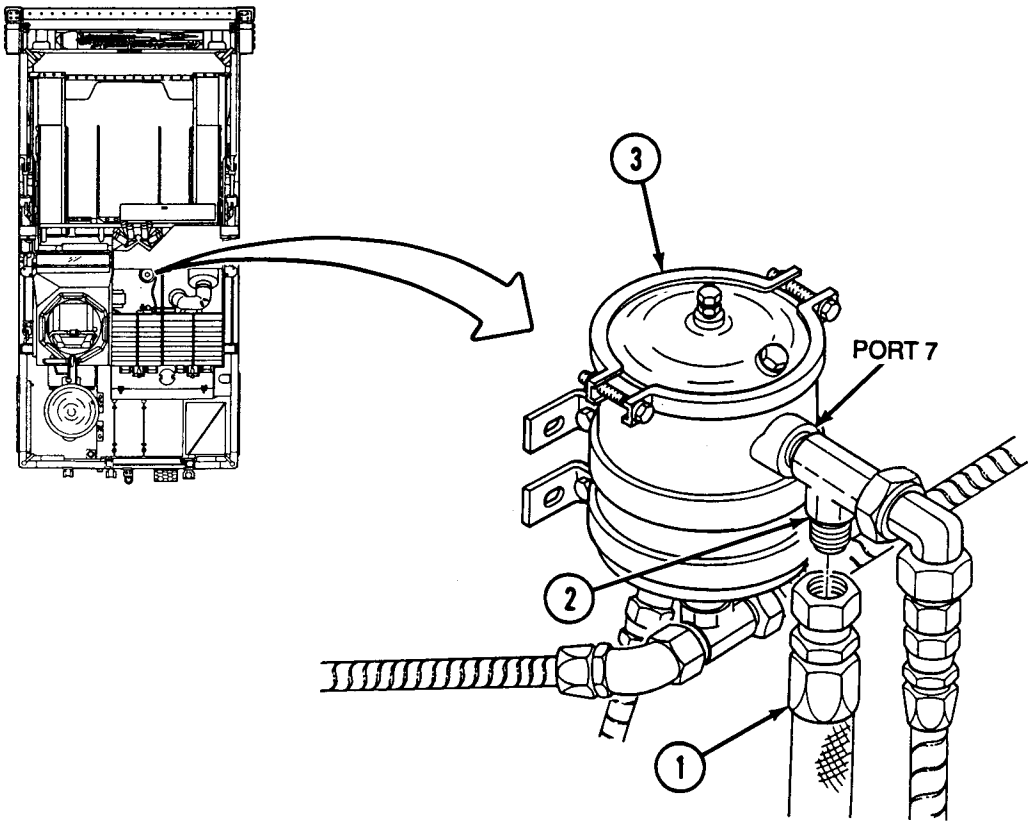
16. NO. 1 ACTUTATOR, LEFT HAND
17. BUMP STOP CYLINDERS
18. FORWARD MANIFOLDS
19. CHECK VALVE (ON TOP)
20. MAIN MANIFOLD, LEFT HAND
21. MAIN MANIFOLD, RIGHT HAND
22. NO. 1 ACTUATOR, RIGHT HAND
23. NO. 2 ACTUATOR, RIGHT HAND
24. COMPENSATING PUMP
25. NO. 3 ACTUATOR, RIGHT HAND
26. MAIN HYDRAULIC PUMP
27. NO. 4 ACTUATOR, RIGHT HAND



HYDRAULIC CONTROLS SCHEMATIC

1 ALL HYDRAULIC FUNCTIONS INOPERATIVE (CONTINUED)





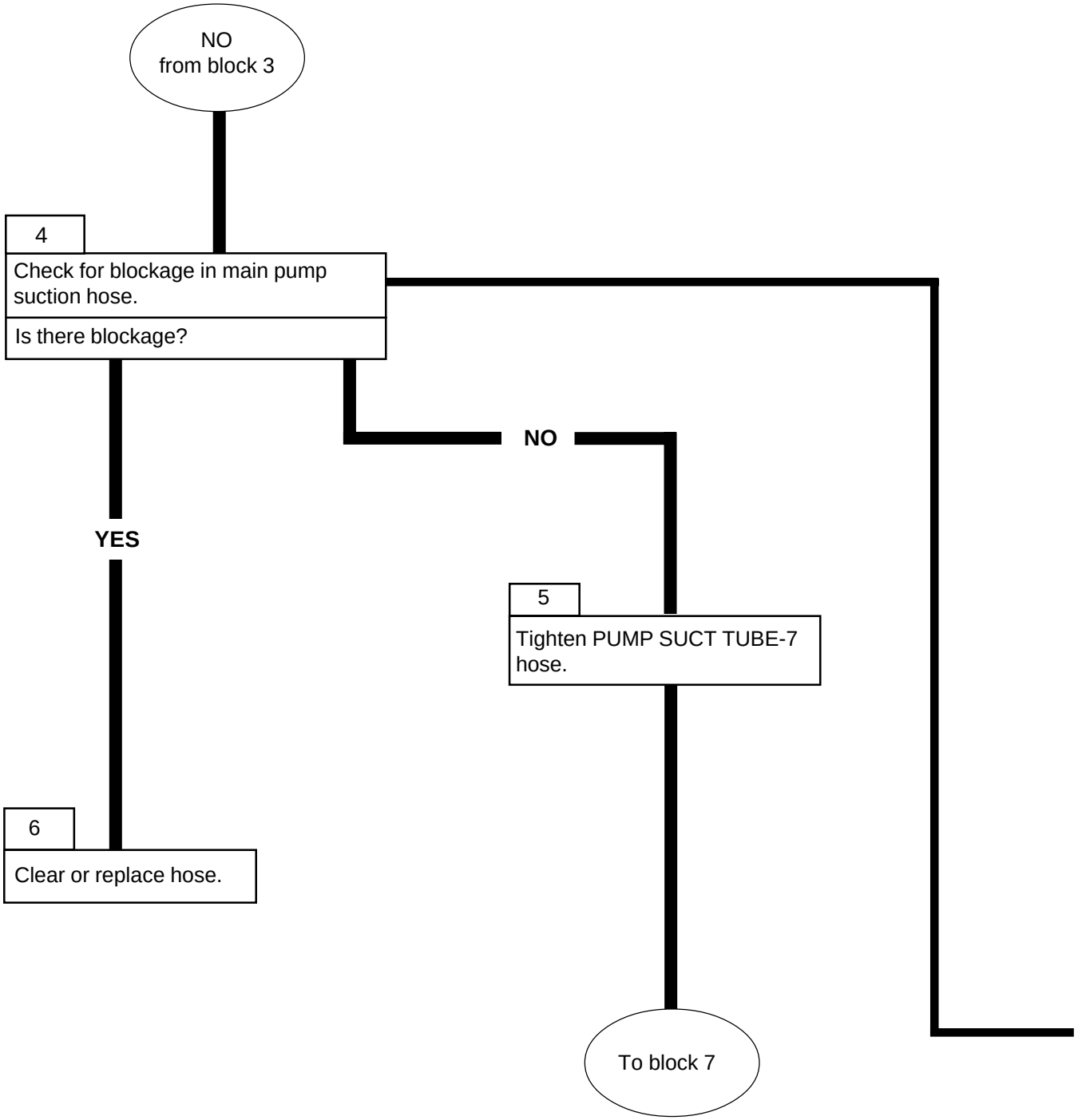
Notify Direct Support Maintenance.

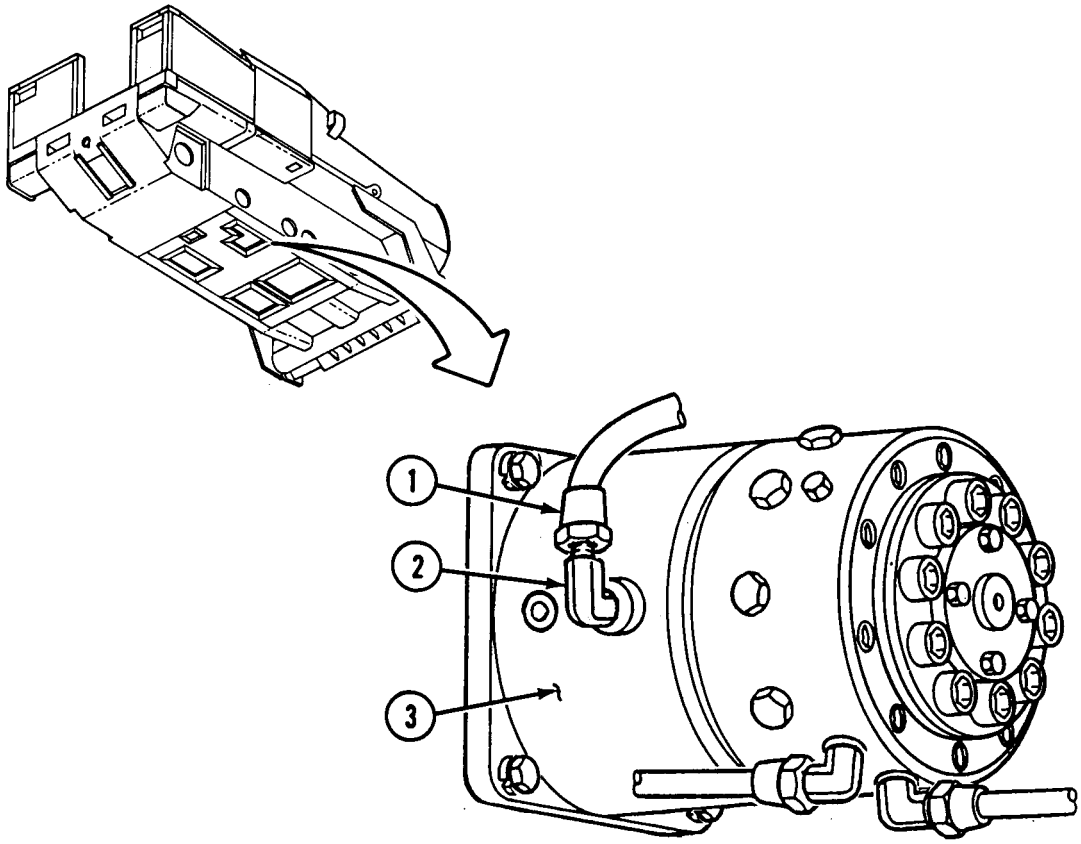
OIL FLOW TEST

NOTE
Have suitable container ready to catch oil.

- Stop engine; relieve hydraulic pressure. Disconnect HYDR FLTR-IN-7 hose (1) from tee (2) at port 7 on hydraulic return line filter (3). Cap tee (2).
- While holding open end of hose (1) in container, have assistant start engine. Check for free flow of hydraulic oil from hose (1).
- Stop engine; relieve hydraulic pressure. Connect hose (1) to tee (2).

1 ALL HYDRAULIC FUNCTIONS INOPERATIVE (CONTINUED)





MAIN PUMP SUCTION HOSE CHECK

WARNING

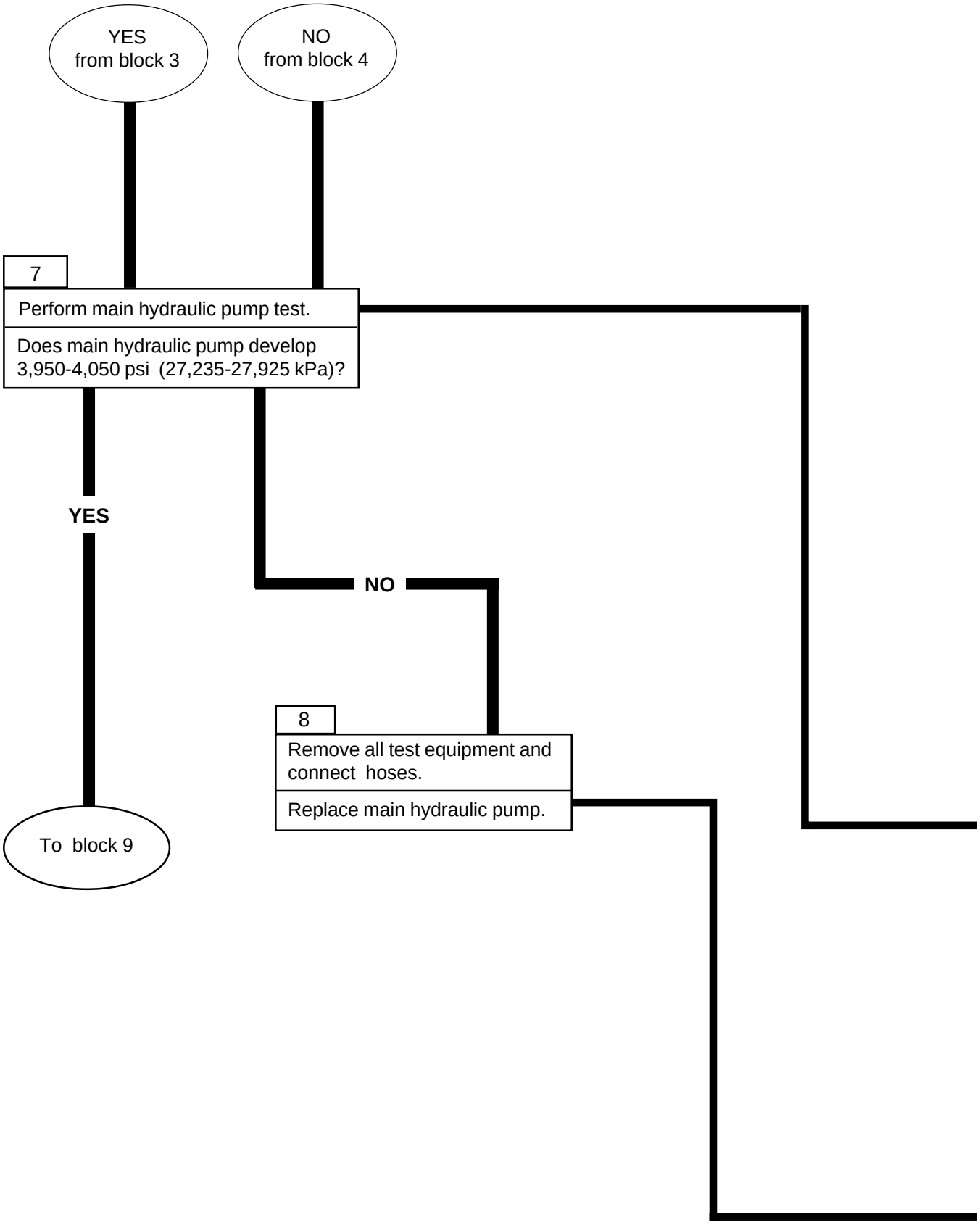
Do not work under vehicle unless hull has been properly blocked or allowed to settle on bump stops. Failure to comply may result in severe injury or death to personnel.

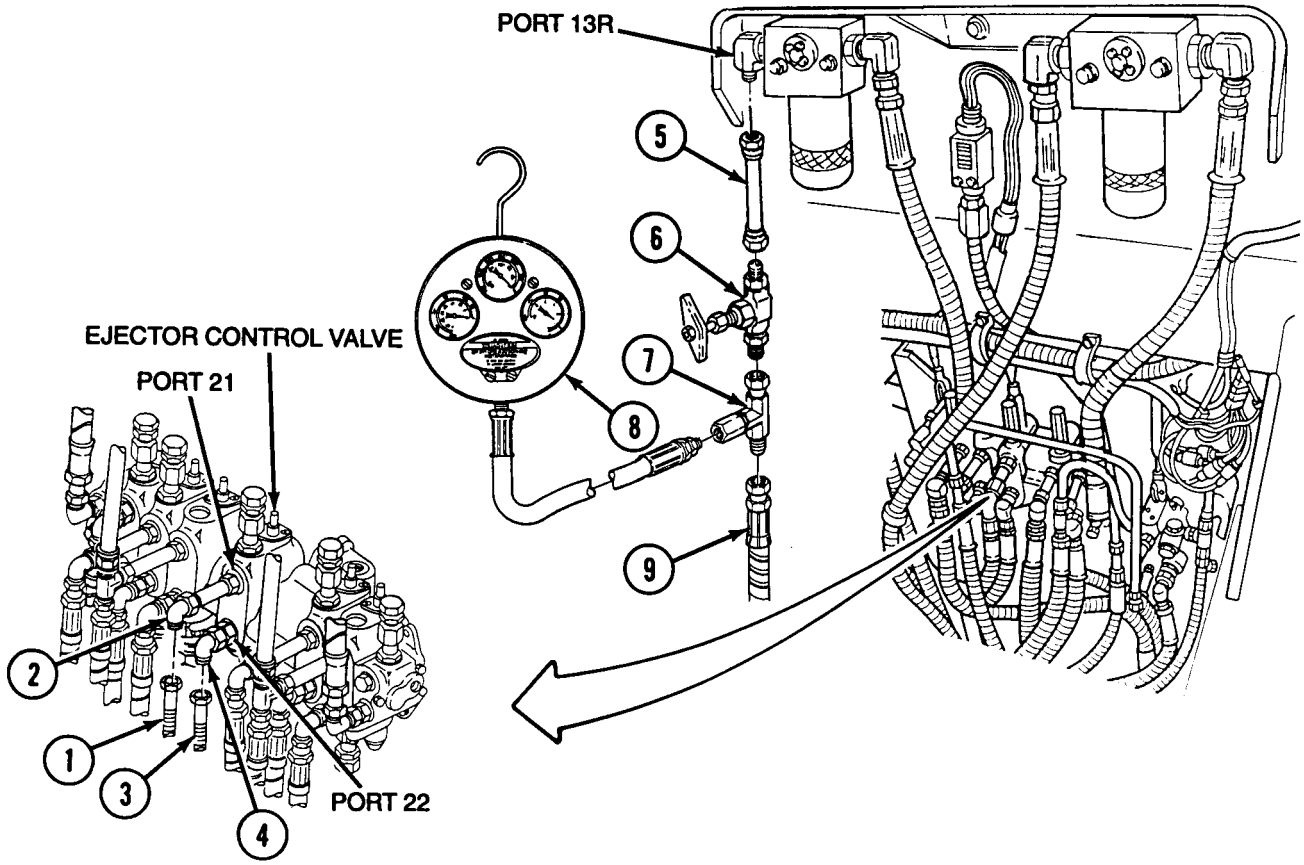
NOTE

Have suitable container ready to catch oil.

Loosen, but do not disconnect, PUMP SUCT TUBE-7 (1) from elbow (2) on main hydraulic pump (3). Hydraulic oil should flow freely from the loosened fitting.

1 ALL HYDRAULIC FUNCTIONS INOPERATIVE (CONTINUED)





MAIN HYDRAULIC PUMP TEST

WARNING

- **Before performing any troubleshooting in bowl, move the ejector forward and disable it by disconnecting ejector cylinder from hydraulic system. Failure to comply may result in severe injury or death to personnel.**
- **Ensure globe valve is fully opened prior to starting vehicle. A fully or partially closed valve will cause immediate high pressure. Failure to comply may result in injury or death to personnel and damage to equipment.**

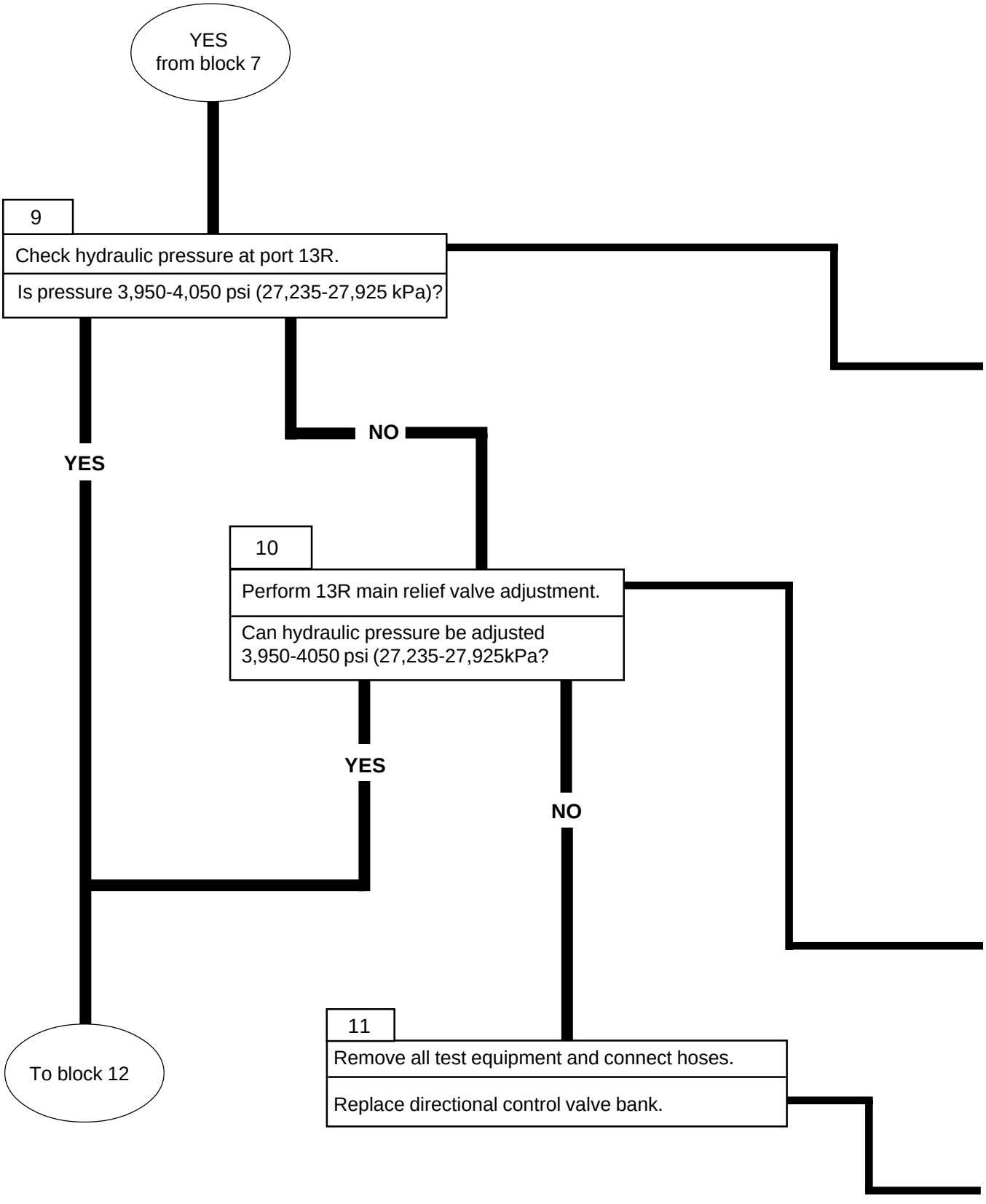
NOTE

Have a suitable container ready to catch oil.

- Disable ejector from hydraulic system by disconnecting CONT VLV-21 hose (1) from elbow (2) at port 21 and CONT VLV-22 hose (3) from elbow (4) at port 22 on ejector control valve. Cap plug hoses and fittings.
- Install coupling tube (5), globe valve (6), tee (7), and pressure measuring device (8) between HYDR FLTR-IN-13R hose (9) and high-pressure filter inlet port 13R.
- Have assistant start engine and allow engine to idle (750-800 rpm). Slowly close globe valve (6) until pressure reaches 3,950-4,050 psi (27,235-27,925 kPa).
- Open globe valve (6). Stop engine; relieve hydraulic pressure.

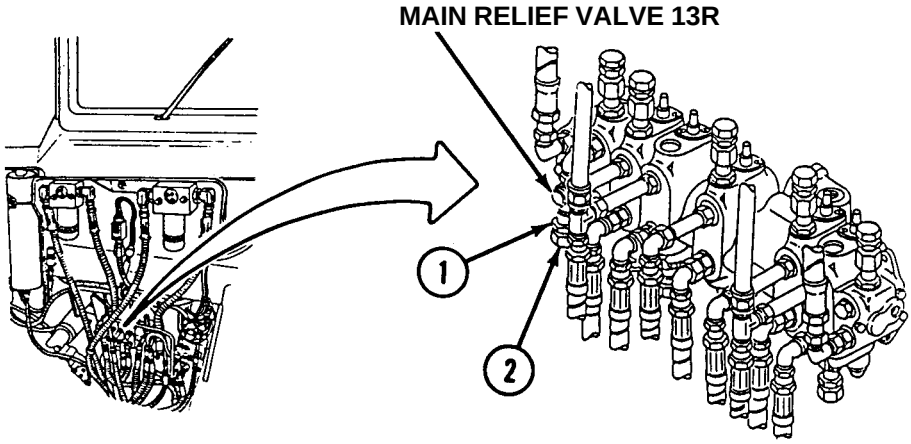
Notify Direct Support maintenance.

1 ALL HYDRAULIC FUNCTIONS INOPERATIVE (CONTINUED)



HYDRAULIC PRESSURE AT PORT 13R CHECK

- Have assistant start engine, move SPRUNG/UNSPRUNG lever to SPRUNG, and hold EJECTOR CONTROL lever in BACK. Read pressure measuring device. If hydraulic pressure is not within limits, continue with following step.
- While assistant is still holding EJECTOR CONTROL lever in BACK, have assistant move right-hand SUSPENSION CONTROL lever to RAISE. Read pressure measuring device. If pressure is not within limits, main relief valve 13R requires adjustment.
- Release EJECTOR CONTROL and right-hand SUSPENSION CONTROL levers.

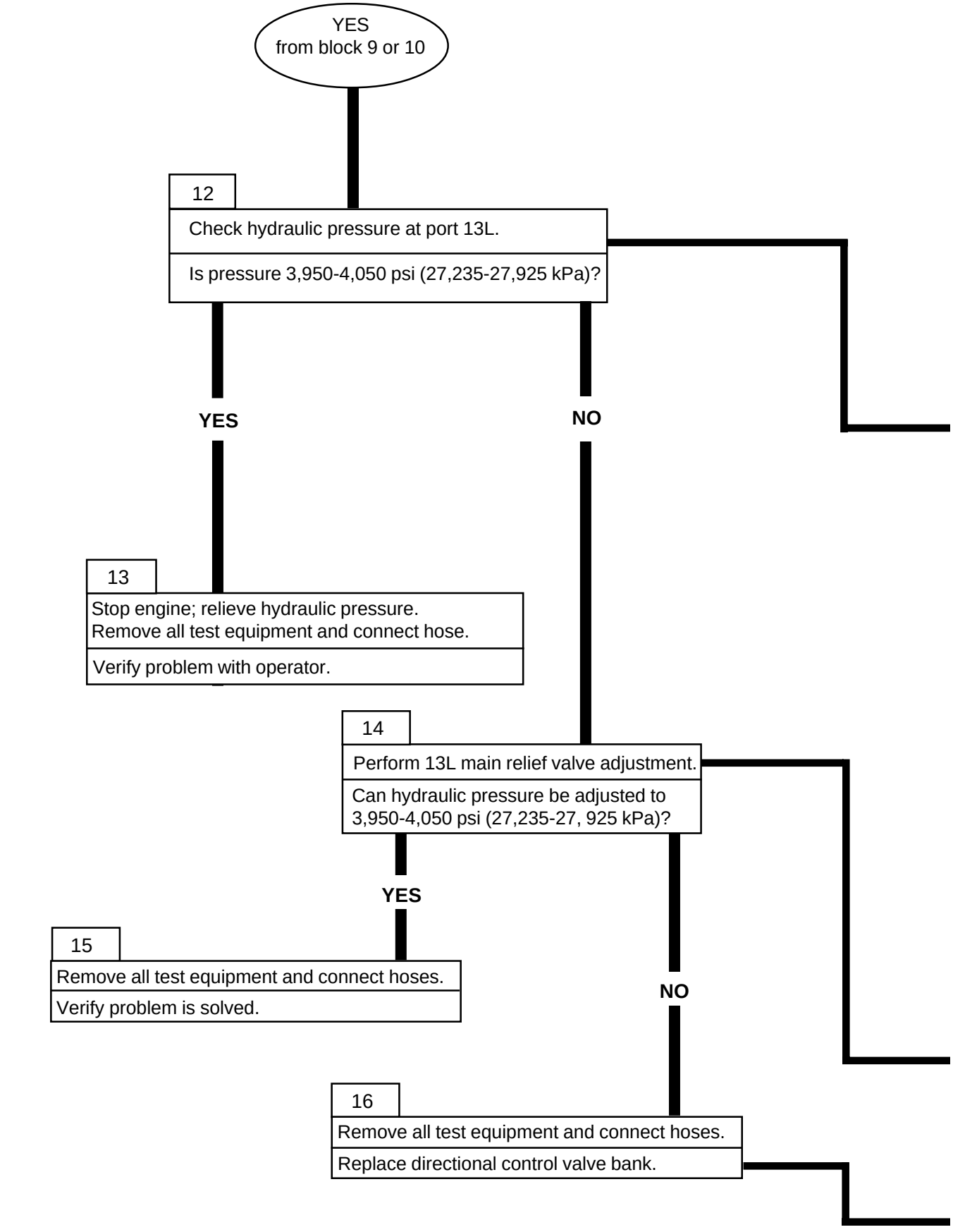


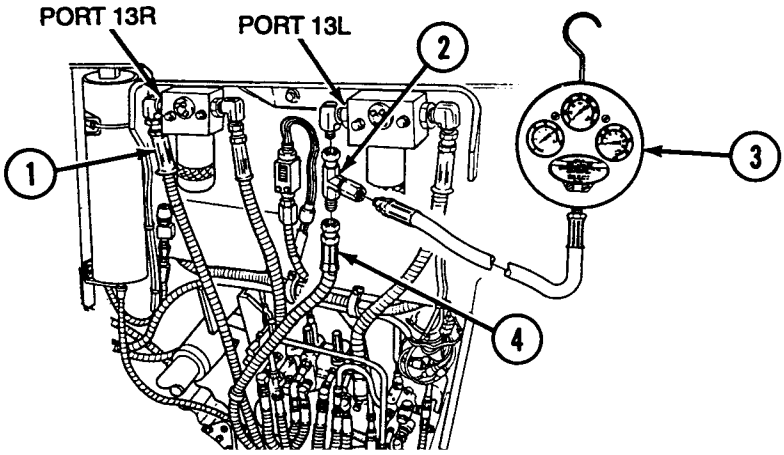
13R MAIN RELIEF VALVE ADJUSTMENT

- Loosen jamnut (1). Read pressure measuring device as assistant moves right-hand SUSPENSION CONTROL to RAISE and EJECTOR CONTROL to BACK. Rotate valve (2) clockwise to increase pressure; counterclockwise to decrease pressure.
- When pressure is 3,950-4,050 psi (27,235-27,925 kPa), tighten jamnut (1).
- Verify pressure is now within limits by having assistant move right SUSPENSION CONTROL lever to RAISE and hold EJECTOR CONTROL lever in BACK. Read pressure measuring device.
- Stop engine; relieve hydraulic pressure.

Refer to TM 5-2350-262-20-2.

1 ALL HYDRAULIC FUNCTIONS INOPERATIVE (CONTINUED)



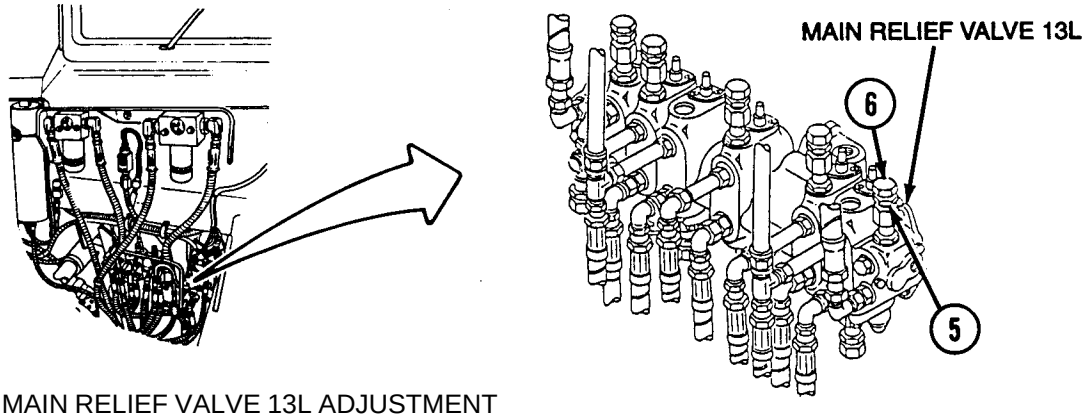


HYDRAULIC PRESSURE AT PORT 13L CHECK

NOTE

Have suitable container ready to catch oil.

- Stop engine; relieve hydraulic pressure. Remove all test equipment and connect HYDR FLTR-IN-13R hose (1) to high-pressure filter inlet port 13R..
- Connect tee (2) and pressure measuring device (3) between high-pressure inlet port 13L and HYDR FLTR-IN-13L hose (4).
- Have assistant start engine, move SPRUNG/UNSPRUNG lever to SPRUNG, and hold EJECTOR CONTROL lever in BACK. Read pressure measuring device (3). If hydraulic pressure is not within limits, continue with the following step.
- While still holding EJECTOR CONTROL lever in BACK, have assistant move left-hand SUSPENSION CONTROL lever to RAISE. Read pressure measuring device (3). If pressure is not within limits, main relief valve 13L requires adjustment.
- Release EJECTOR and SUSPENSION CONTROL levers.



MAIN RELIEF VALVE 13L ADJUSTMENT

- Loosen jamnut (5). Read pressure measuring device as assistant moves left-hand SUSPENSION CONTROL lever to RAISE and EJECTOR CONTROL lever to BACK. Rotate valve (6) clockwise to increase pressure; counterclockwise to decrease pressure.
- When pressure is 3,950-4,050 psi (27,235-27,925 kPa), tighten jamnut (5).
- Verify pressure is now within limits by having assistant move left-hand SUSPENSION CONTROL lever to RAISE and hold EJECTOR CONTROL lever in BACK. Read pressure measuring device (3).
- Stop engine; relieve hydraulic pressure.

Refer to TM 5-2350-262-20-2.

2 APRON, BILGE PUMP, AND LEFT-HAND WHEEL CONTROL INOPERATIVE

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.

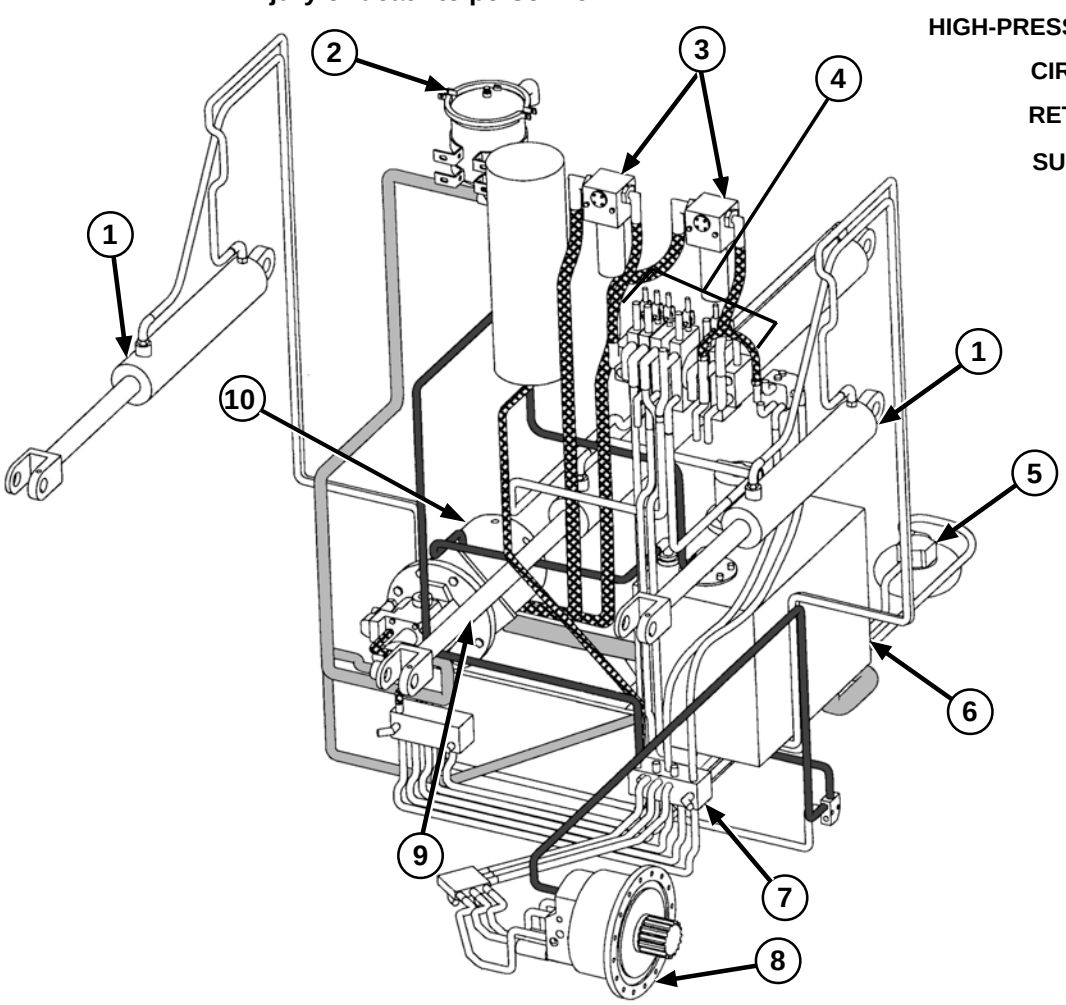
NOTE

Perform this procedure only when the bilge pump, apron, left-hand suspension controls, and ejector are all inoperative.

Although the Bilge Pump is considered Not Mission Essential and will no longer be supported with spare and repair parts, this task contains troubleshooting procedures For Your Information Only. See TB 43 0001-62-7 (dated Oct 98) for Instructions to Isolate and Disconnect a Non-functional Bilge Pump.

WARNING

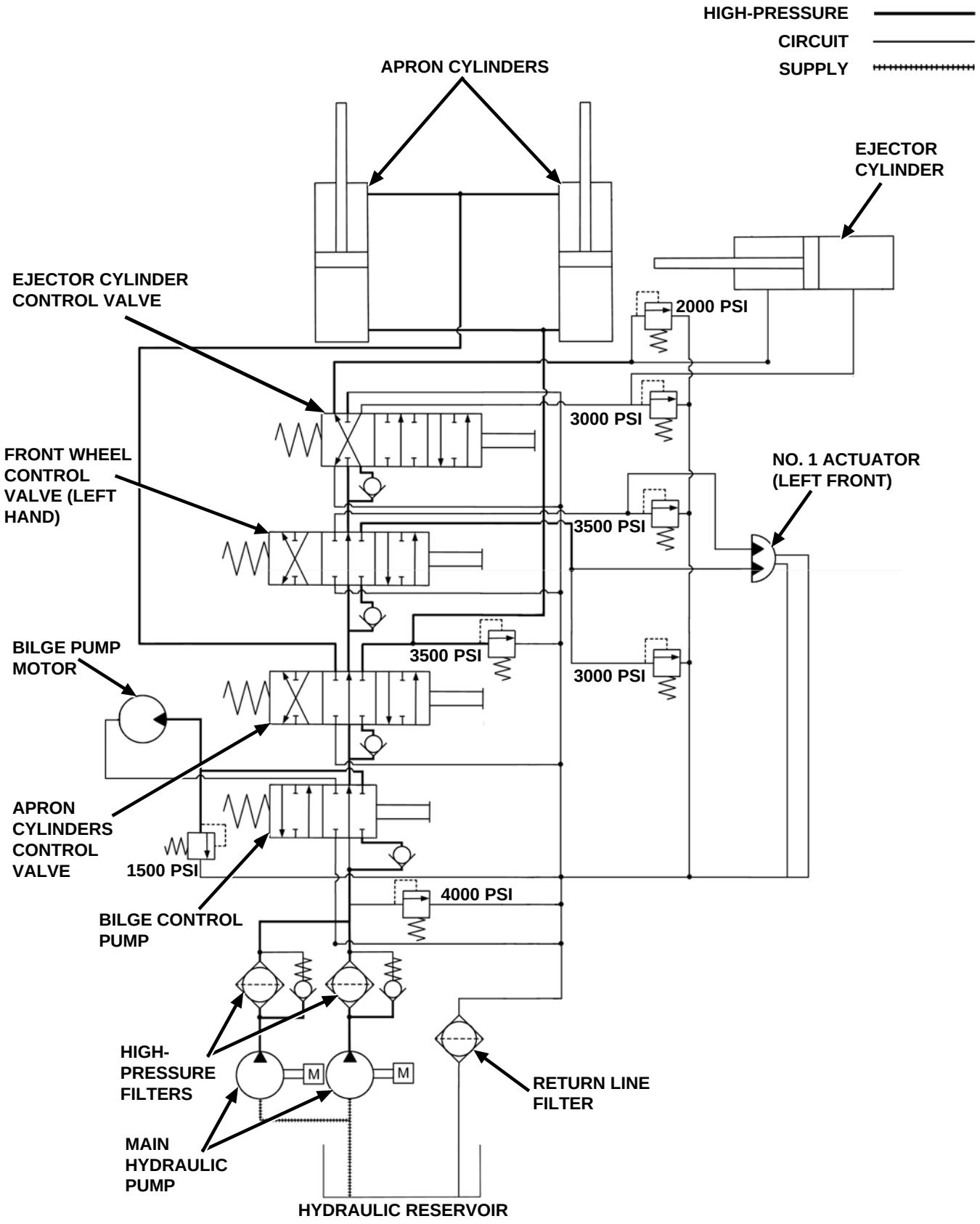
High pressure is present in the M9 hydraulic system. Do not disconnect any hydraulic system component unless hydraulic system pressure has been relieved. Ensure each hydraulic control lever is moved several times through all positions and hydraulic tank dipstick is slowly loosened to relieve pressure. Failure to comply may result in severe injury or death to personnel.



COMPONENTS:

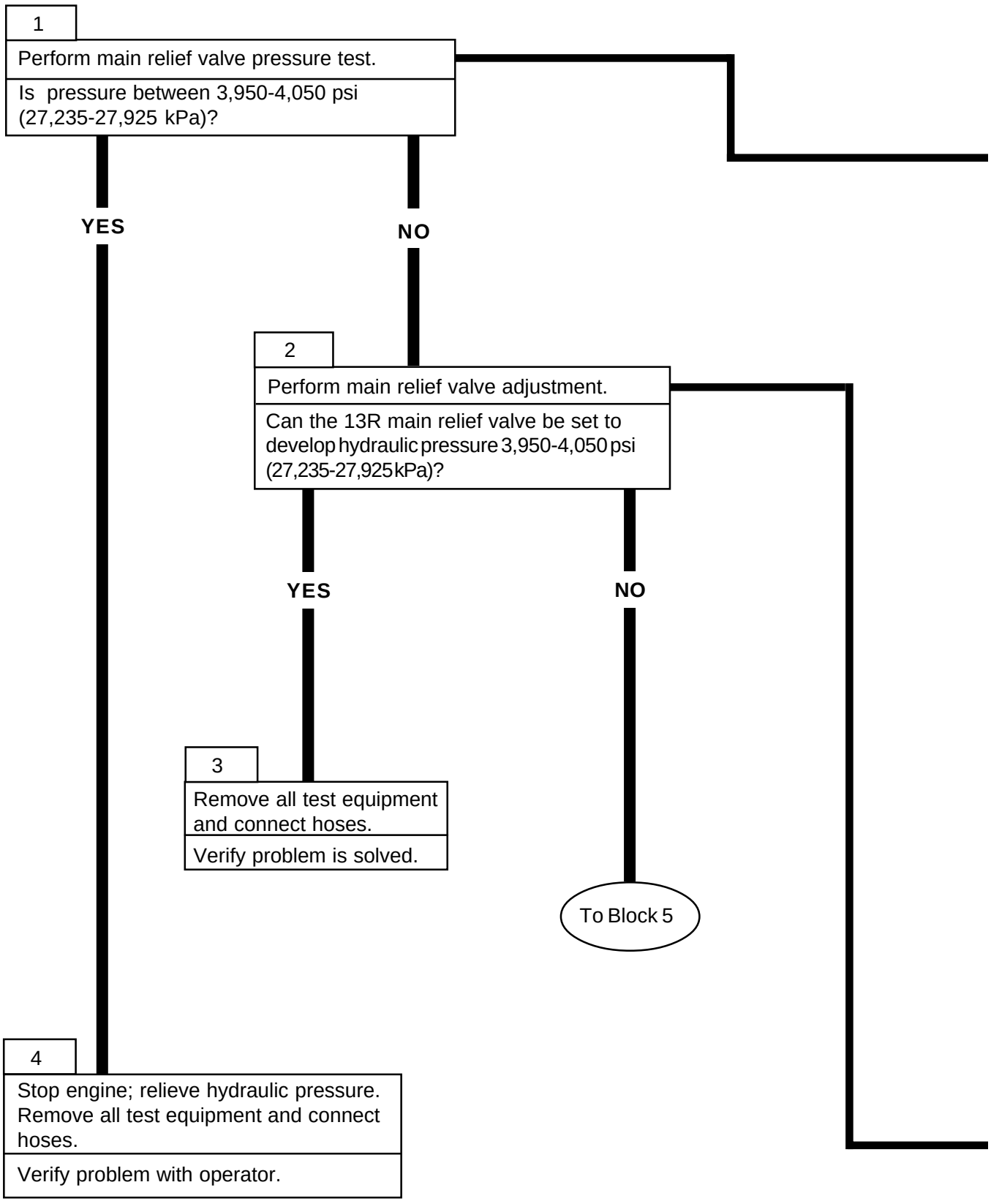
1. APRON CYLINDERS
2. RETURN LINE FILTER
3. HIGH-PRESSURE FILTERS
4. DIRECTIONAL CONTROL VALVE BANK
5. BILGE PUMP
6. HYDRAULIC RESERVOIR
7. MAIN HYDRAULIC MANIFOLD, RIGHT HAND
8. NO. 1 ACTUATOR,LEFT HAND
9. EJECTOR CYLINDER
10. MAIN HYDRAULIC PUMP

APRON, BILGE PUMP, AND LEFT-HAND WHEEL CONTROL CIRCUIT



APRON, BILGE PUMP, AND LEFT-HAND WHEEL CONTROL CIRCUIT

2 APRON, BILGE PUMP, AND LEFT-HAND WHEEL CONTROL INOPERATIVE (CONTINUED)



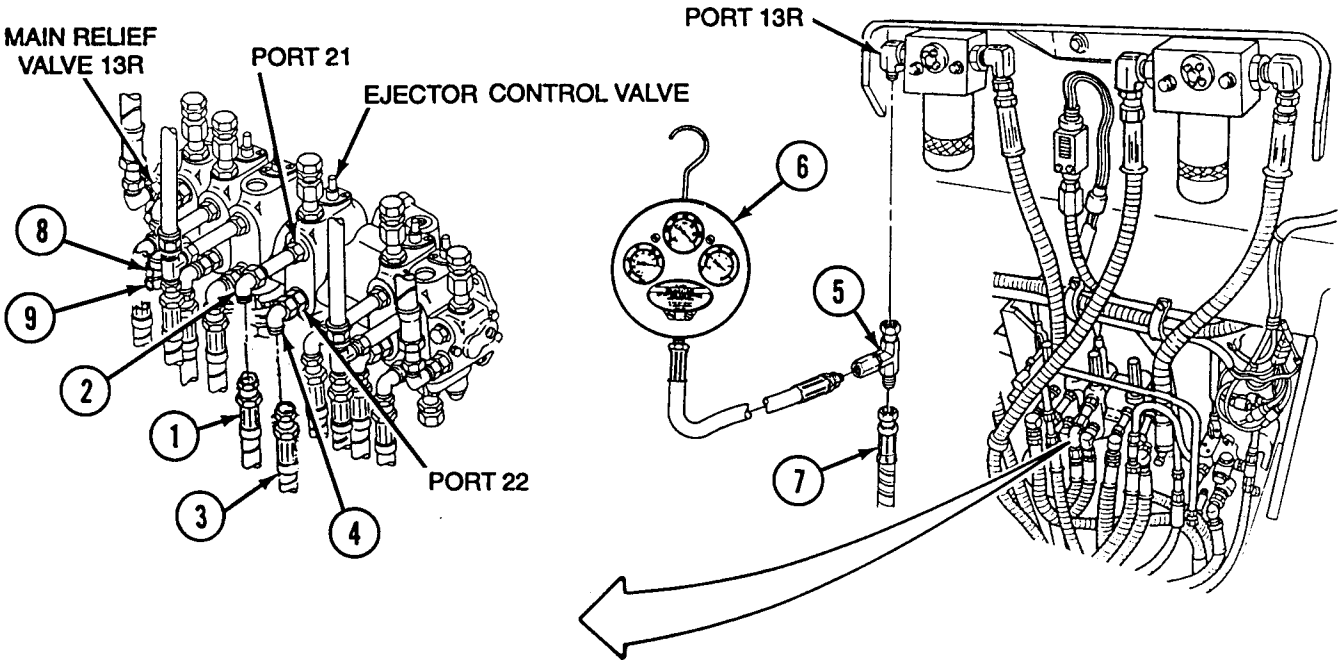
WARNING

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.

NOTE

Have suitable container ready to catch oil.

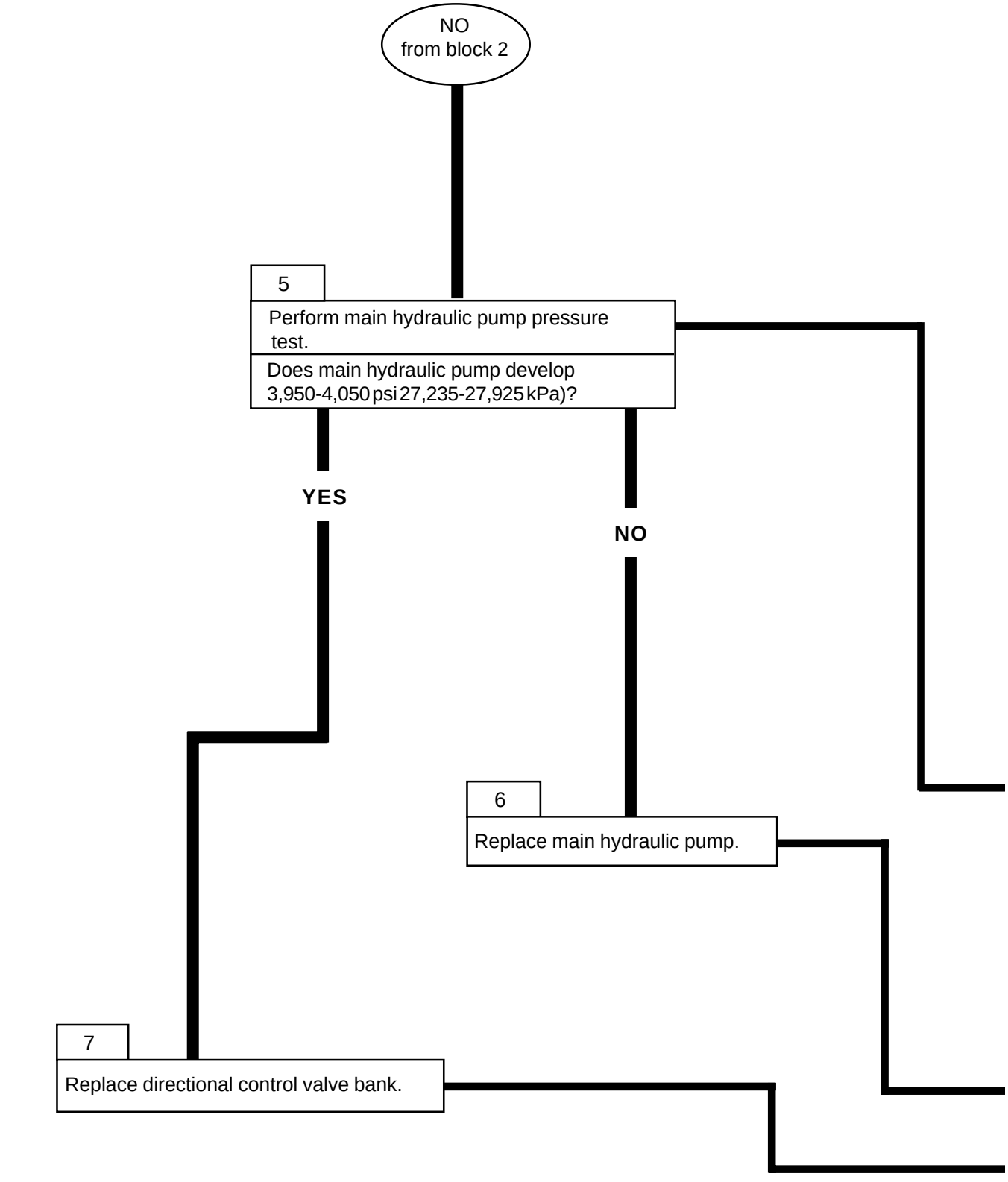
- Move ejector forward, stop engine, and relieve hydraulic pressure.
- Disable ejector by disconnecting CONT VLV-21 hose (1) from elbow (2) at port 21 and CONT VLV-22 hose (3) from elbow (4) at port 22 on ejector control valve. Cap and plug hoses and fittings.
- Connect tee (5) and pressure measuring device (6) between HYDR FLTR-IN-13R hose (7) and high-pressure inlet port 13R.
- Have assistant start engine, move the SPRUNG/UNSPRUNG lever to SPRUNG and move the EJECTOR CONTROL lever to BACK. Read pressure measuring device (6).
- While simultaneously holding the EJECTOR CONTROL lever in BACK, have assistant move the right-hand SUSPENSION CONTROL lever to RAISE. Read pressure measuring device (6).

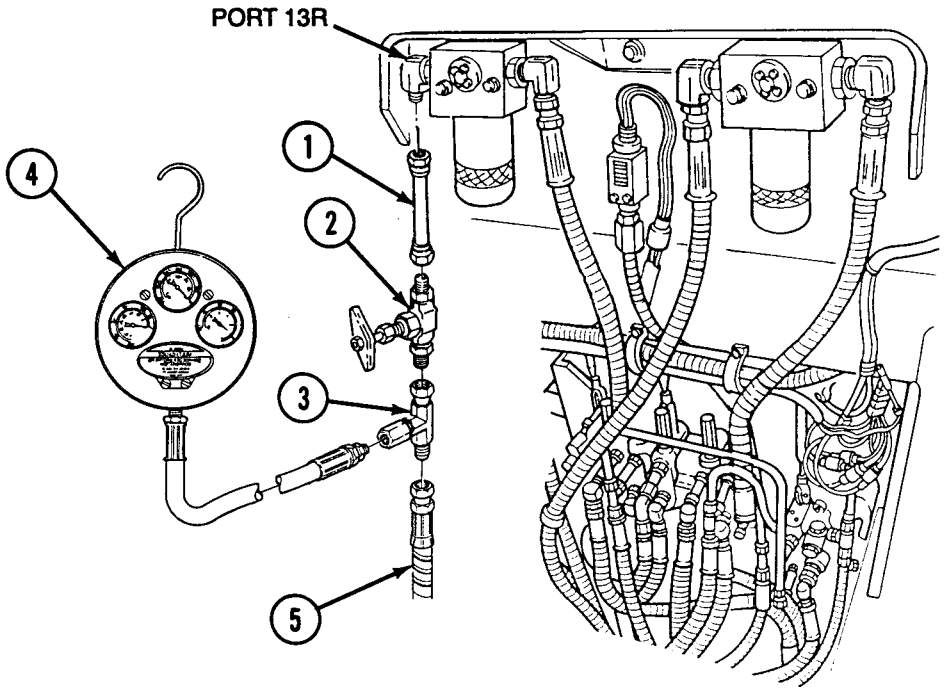


13R MAIN RELIEF VALVE ADJUSTMENT

- Loosen jamnut (8) on main relief valve 13R.
- Have assistant simultaneously hold EJECTOR CONTROL lever in BACK while holding the right-hand SUSPENSION CONTROL lever in RAISE.
- Rotate adjusting screw (9) clockwise to increase pressure; counterclockwise to decrease pressure. Tighten jamnut (8).
- Stop engine; relieve hydraulic pressure.

2 APRON, BILGE PUMP, AND LEFT-HAND WHEEL CONTROL INOPERATIVE (CONTINUED)





MAIN HYDRAULIC PUMP PRESSURE TEST

WARNING

Before performing any troubleshooting in bowl, move ejector forward and engage the ejector lock. Failure to comply may result in severe injury or death to personnel.

Ensure globe valve is fully opened prior to starting vehicle engine. A fully or partially closed valve will cause immediate high pressure. Failure to comply may result in damage to equipment or injury or death to personnel.

NOTE

Have suitable container ready to catch oil.

- Install coupling tube (1), globe valve (2), tee (3), and pressure measuring device (4) between HYDR FLTR-IN 13R hose (5) and high-pressure filter inlet port 13R.
- Turn globe valve (2) counterclockwise until fully opened.
- Have assistant start engine and allow engine to idle (750-800 rpm). Slowly close globe valve (2) until pressure reaches 3,950-4,050 psi (27,235-27, 925 kPa).
- Open globe valve (2). Stop engine; relieve hydraulic pressure. Remove all test equipment and connect hose.

Notify Direct Support maintenance.

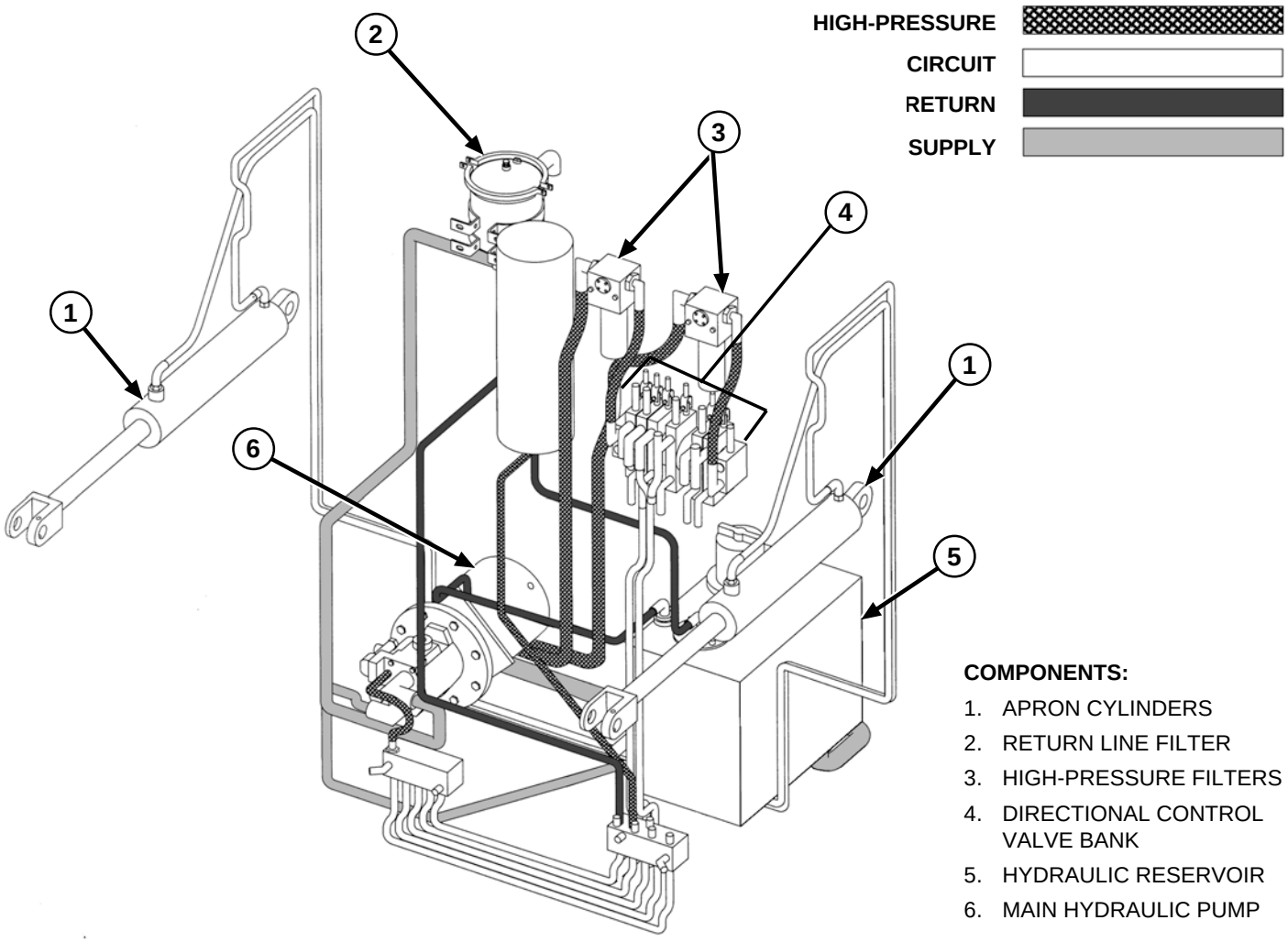
Refer to TM 5-2350-262-20-2.

3 APRON WILL NOT RAISE

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

WARNING

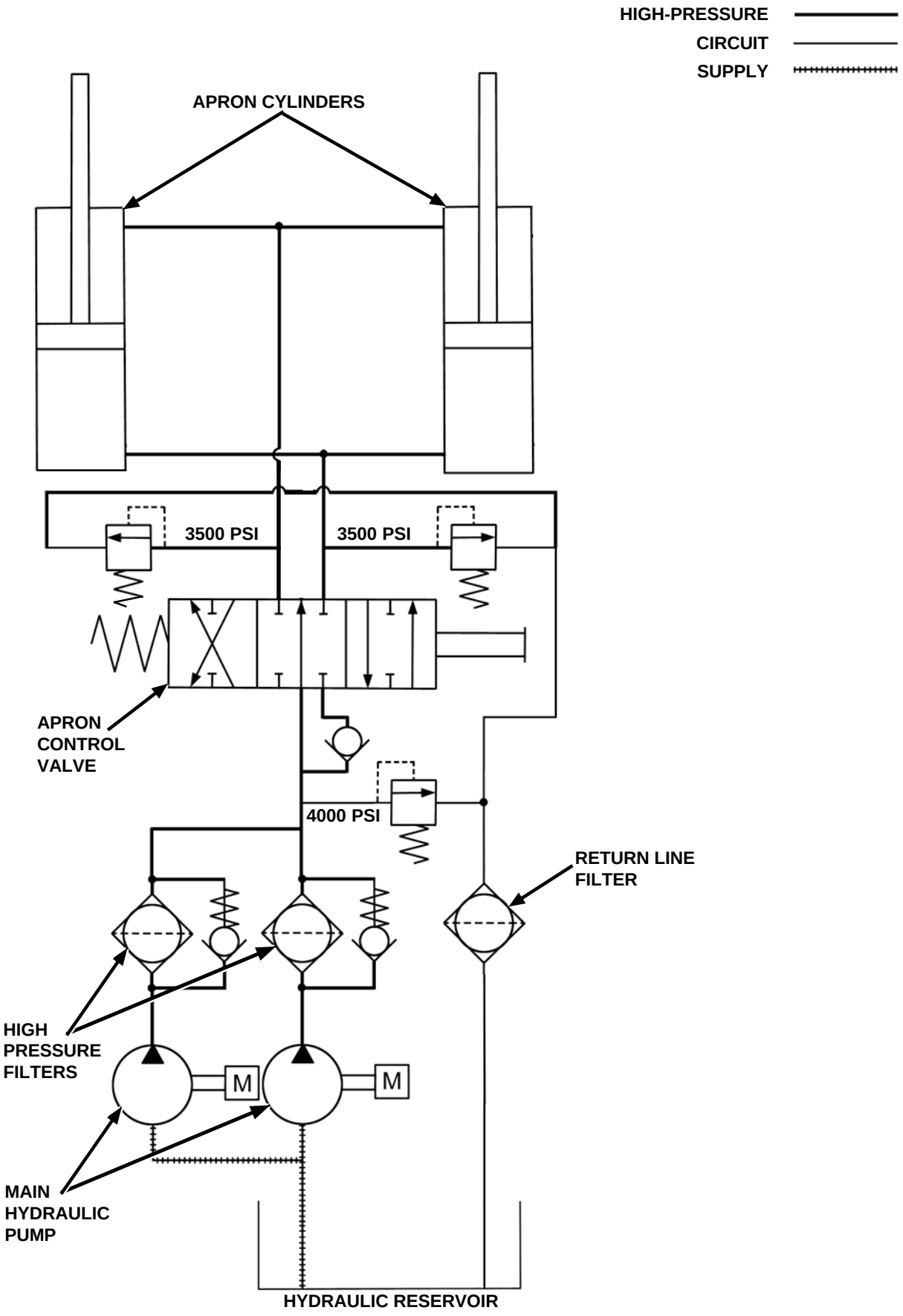
High pressure is present in the M9 hydraulic system. Do not disconnect any hydraulic system component unless hydraulic system pressure has been relieved. Ensure each hydraulic control lever is moved several times through all positions and hydraulic tank dipstick is slowly loosened to relieve pressure. Failure to comply may result in severe injury or death to personnel.



COMPONENTS:

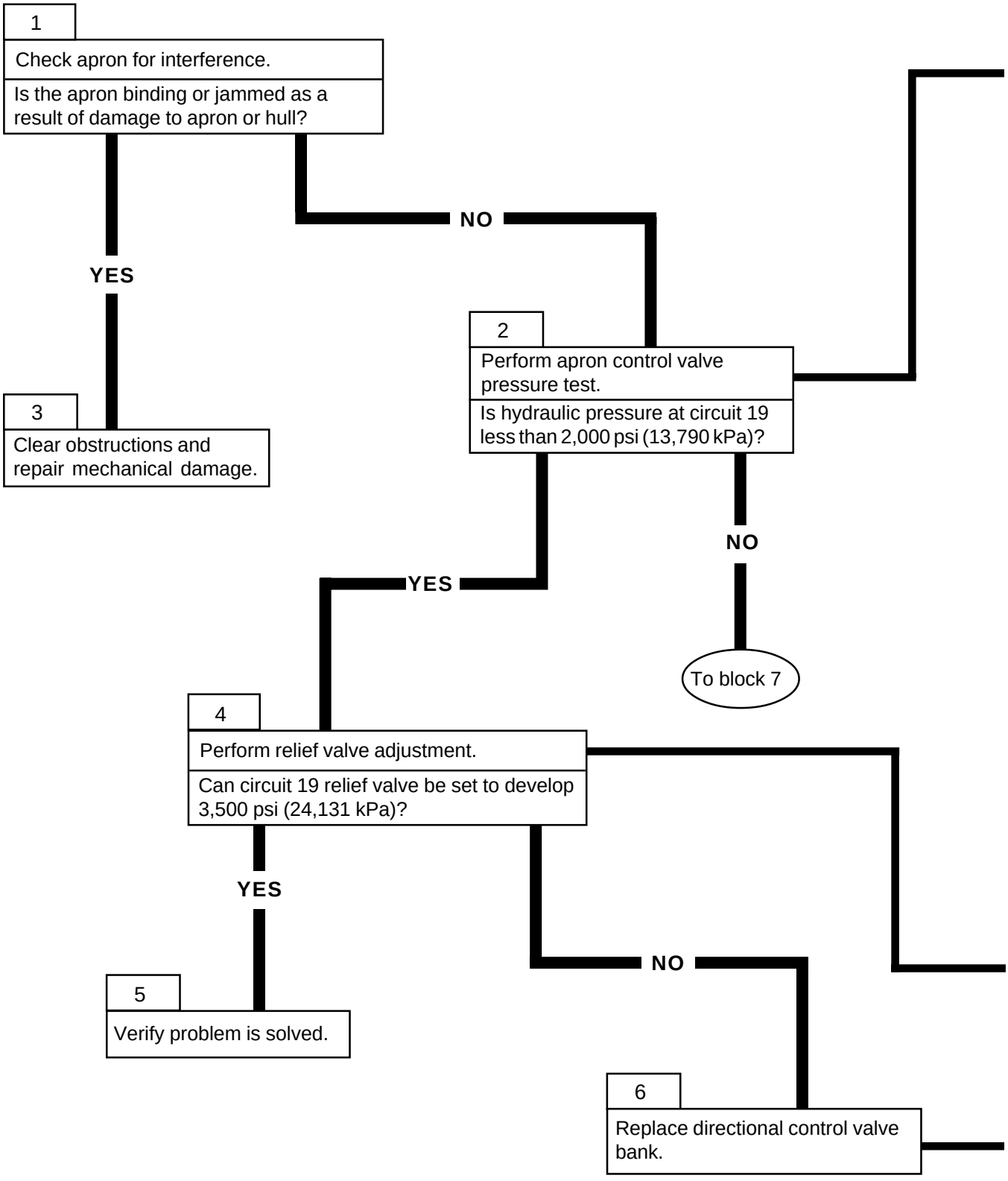
1. APRON CYLINDERS
2. RETURN LINE FILTER
3. HIGH-PRESSURE FILTERS
4. DIRECTIONAL CONTROL VALVE BANK
5. HYDRAULIC RESERVOIR
6. MAIN HYDRAULIC PUMP

APRON HYDRAULIC CIRCUIT



APRON HYDRAULIC SCHEMATIC

3 APRON WILL NOT RAISE (CONTINUED)



APRON CONTROL VALVE PRESSURE TEST

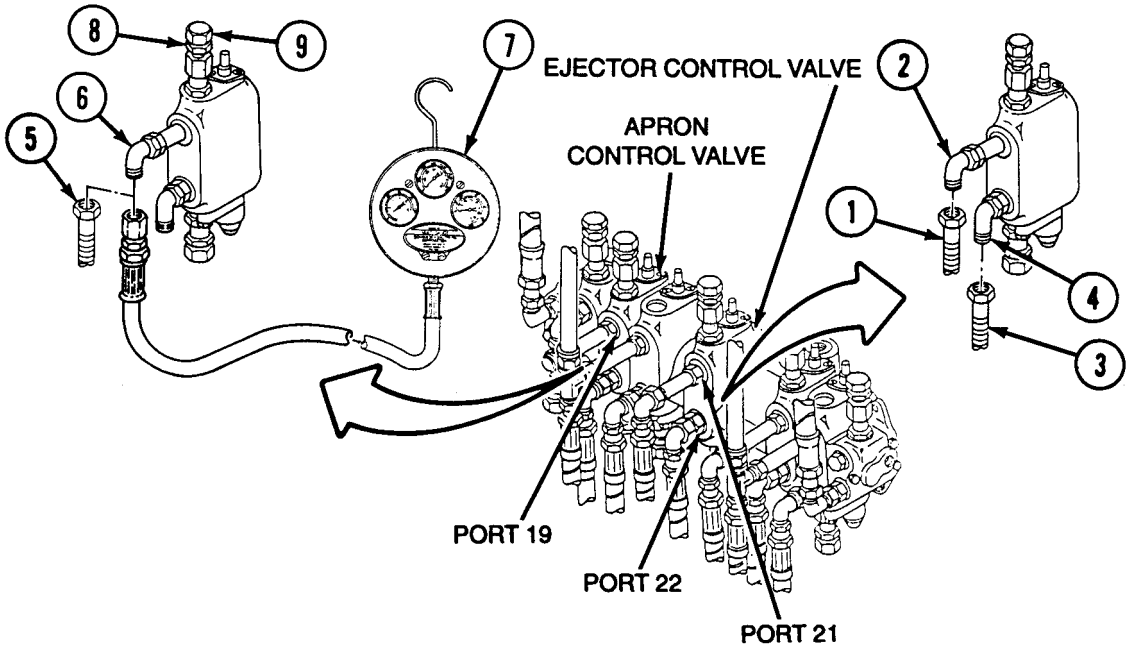
WARNING

Before performing any hydraulic troubleshooting in 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.

NOTE

Have suitable container ready to catch oil.

- Move ejector forward, stop engine, and relieve hydraulic pressure.
- Disable ejector from the hydraulic system by disconnecting CONT VLV-21 hose (1) from elbow (2) at port 21 of ejector control valve and CONT VLV-22 hose (3) from elbow (4) at port 22. Cap and plug hoses and fittings.
- Disconnect CONT VLV-19 hose (5) from elbow (6) at port 19 on apron control valve. Connect pressure measuring device (7) to elbow (6). Plug hose (5).
- Have assistant start engine and hold APRON CONTROL lever in UP position. Read pressure measuring device (7)

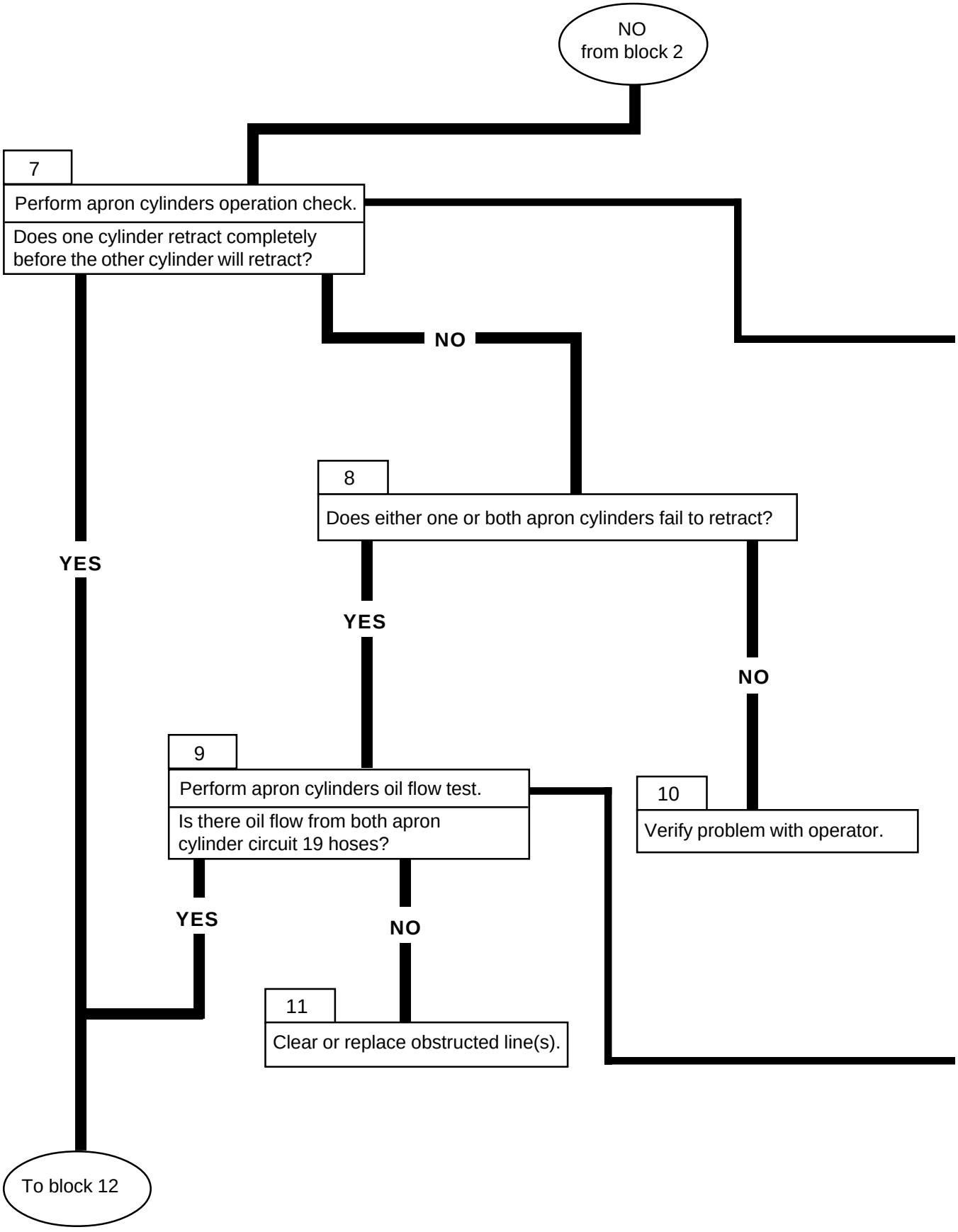


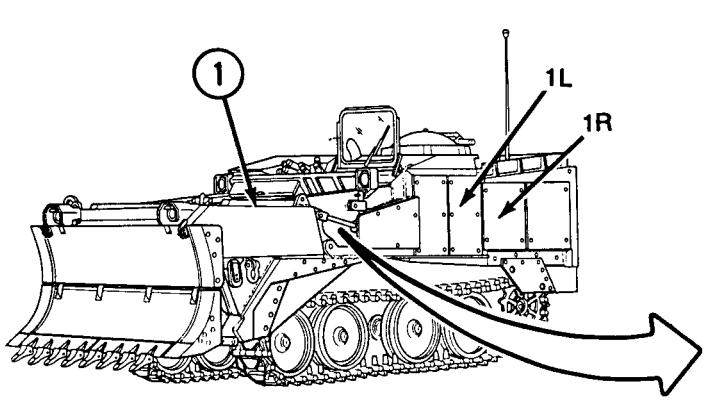
RELIEF VALVE ADJUSTMENT

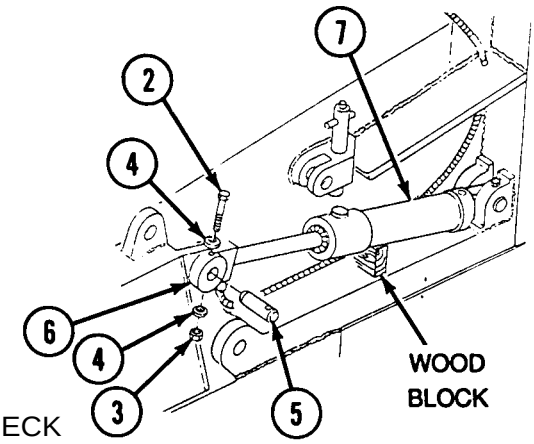
As assistant holds APRON CONTROL lever in UP position, loosen jamnut (8) on apron, raise relief valve (9), rotate valve (9) clockwise to increase pressure and counterclockwise to decrease pressure, until hydraulic pressure is at a minimum 3,500 psi (24,131 kPa). Stop engine; relieve hydraulic pressure. Remove all test equipment and connect hoses.

Refer to TM 5-2350-262-20-2.

3 APRON WILL NOT RAISE (CONTINUED)





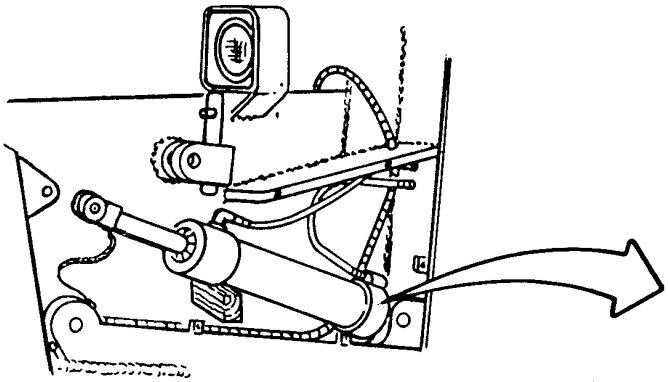


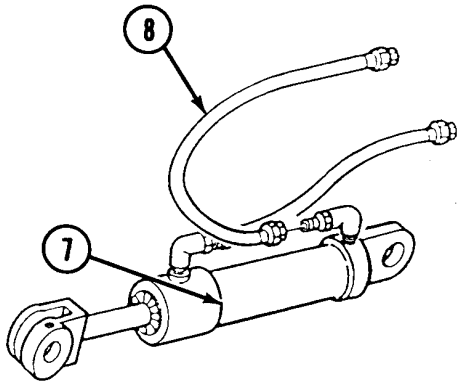
APRON CYLINDERS OPERATION CHECK

CAUTION

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

- Stop engine; relieve hydraulic pressure. Remove all test equipment and connect hoses.
- With apron (1) lowered, remove exterior armor plates 1L and 1R. Remove bolt (2), nut (3), two washers (4), and clevis pin (5) from rod end (6) of both apron cylinders (7). Block apron cylinders (7).
- Start engine and hold APRON CONTROL lever in UP position. Observe movement of apron cylinders (7).





APRON CYLINDERS OIL FLOW TEST

NOTE

Have suitable container ready to catch oil.

- Extend apron cylinders (7) fully. Stop engine. Relieve hydraulic pressure by moving APRON CONTROL lever UP and DOWN several times, and disconnect left and right APRON CYL-19 hoses (8) from apron cylinders (7). Hold open end of each hose (8) in a bucket.

NOTE

If there is no flow from one of the APRON CYL-19 hoses, the blockage is between the 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.

- Have assistant start engine and slowly move APRON CONTROL lever to UP position. Observe oil flow from both APRON CYL-19 hoses. Stop engine; relieve hydraulic pressure. Reconnect left and right APRON CYL-19 hoses (8) to cylinders (7).

3 APRON WILL NOT RAISE (CONTINUED)

YES
from block 7 or 9

12

Perform apron cylinder leakage test.

Is either apron cylinder leaking excessively?

YES

NO

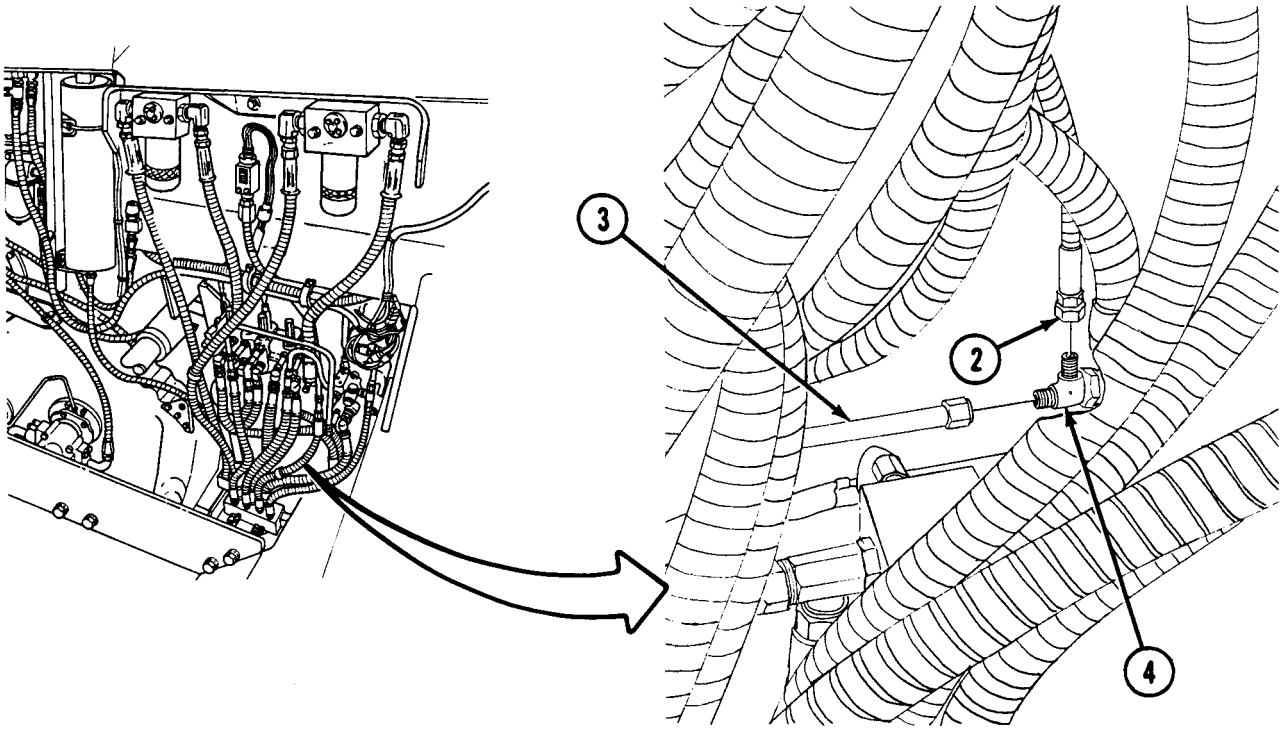
14

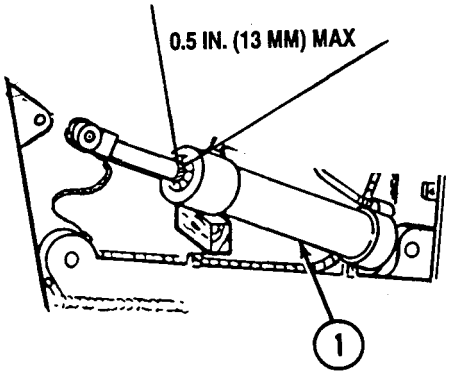
Connect hoses and tubes.

Verify problem with operator.

13

Replace or repair leaking apron cylinder.





APRON CYLINDER LEAKAGE TEST

NOTE

Have suitable container ready to catch oil.

- Have assistant start engine, and retract cylinders (1) approximately halfway. Stop engine; relieve hydraulic pressure.
- Disconnect CKT-20 (REAR) TEE hose (2) and CKT-20 (REAR) TEE tube (3) from tee (4) on hull floor. Plug hose (2) and tube (3), and cap tee (4).
- Start engine and have assistant hold APRON CONTROL lever in UP position. Measure cylinder rod extension of both apron cylinders (1). Continue to hold APRON CONTROL lever UP for one minute. Have assistant return APRON CONTROL lever to NEUTRAL position. Measure the cylinder rod extension of both apron cylinders (1) again. If extension rate is greater than 0.5 in. (13 mm) per minute, cylinder is leaking excessively.
- Stop engine; relieve hydraulic pressure.

Refer to TM 5-2320-262-20-1.

4 BUMP STOPS INOPERATIVE

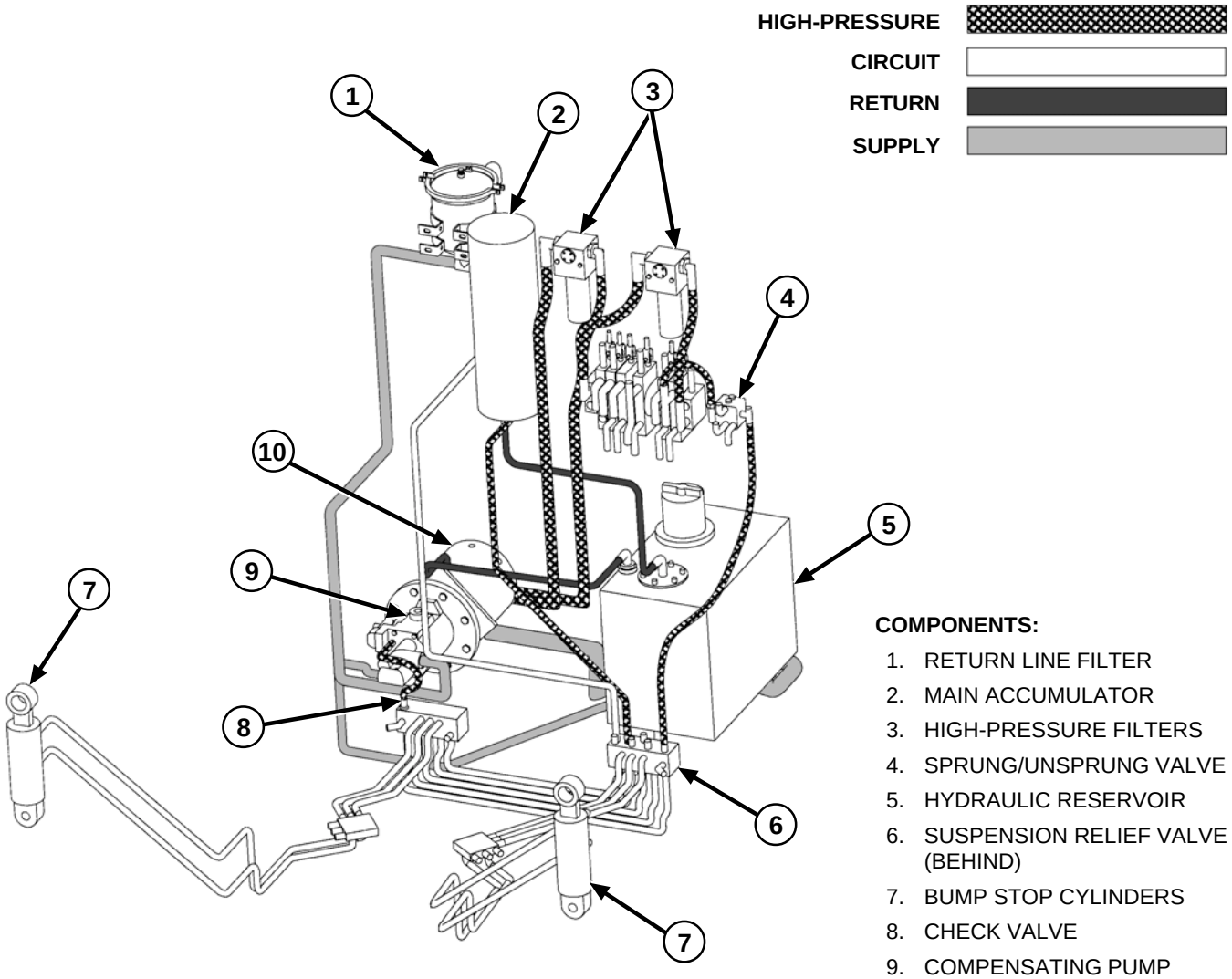
The bump stops limit travel of the vehicle's No. 1 left and right suspension unit in SPRUNG mode. Hydraulic pressure is supplied to bump stops by compensating pump through SPRUNG/UNSPRUNG valve.

NOTE

Perform these procedures for left or right bump stop.

WARNING

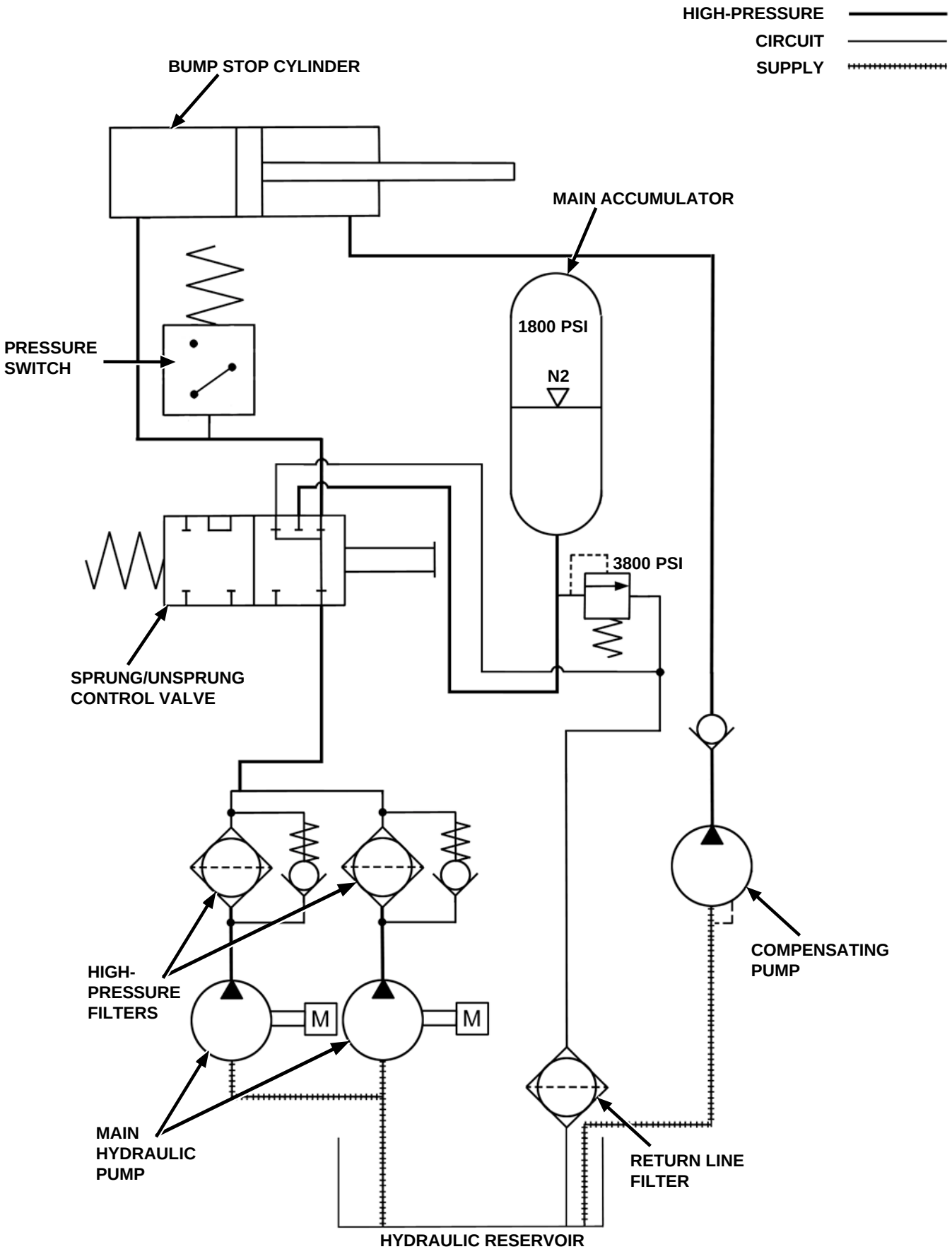
High pressure is present in the M9 hydraulic system. Do not disconnect any hydraulic system component unless hydraulic system pressure has been relieved. Ensure each hydraulic control lever is moved several times through all positions and hydraulic tank dipstick is slowly loosened to relieve pressure. Failure to comply may result in severe injury or death to personnel.



COMPONENTS:

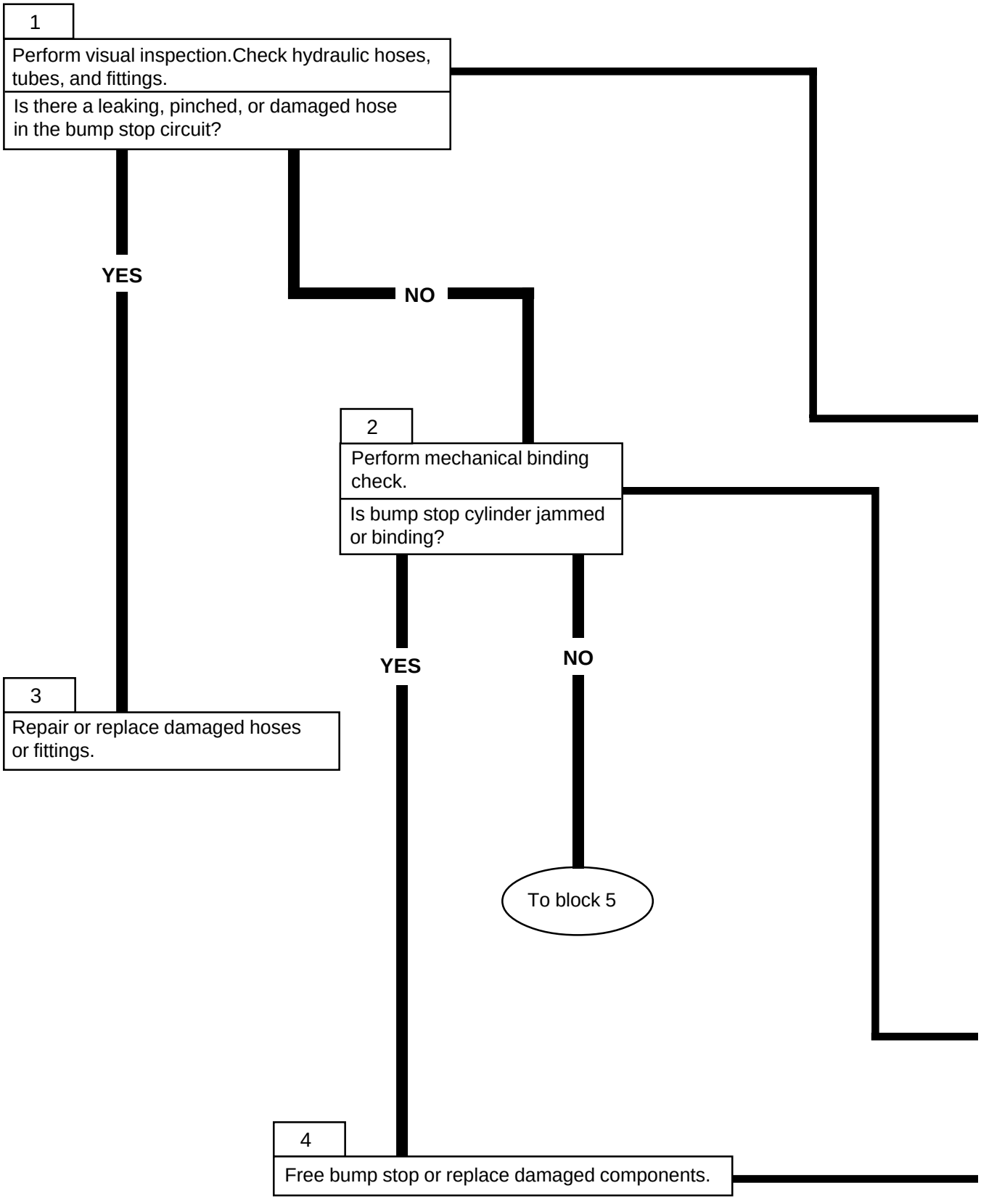
1. RETURN LINE FILTER
2. MAIN ACCUMULATOR
3. HIGH-PRESSURE FILTERS
4. SPRUNG/UNSPRUNG VALVE
5. HYDRAULIC RESERVOIR
6. SUSPENSION RELIEF VALVE (BEHIND)
7. BUMP STOP CYLINDERS
8. CHECK VALVE
9. COMPENSATING PUMP
10. MAIN HYDRAULIC PUMP

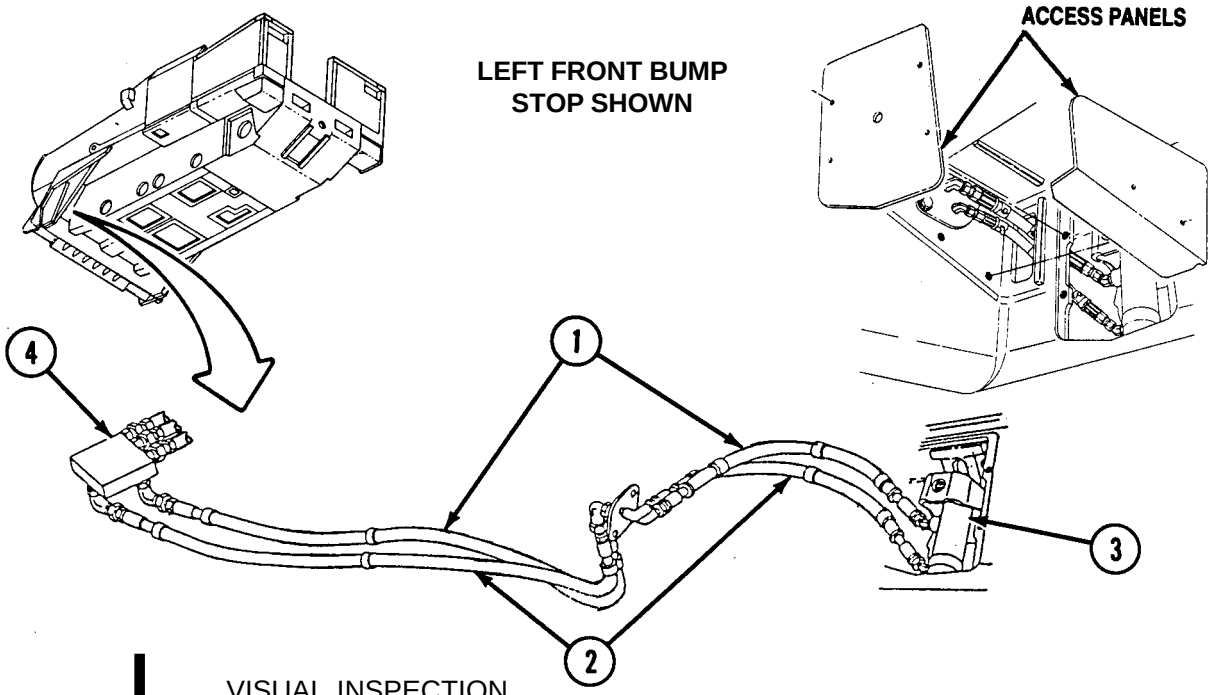
BUMP STOP CIRCUIT



BUMP STOP SCHEMATIC

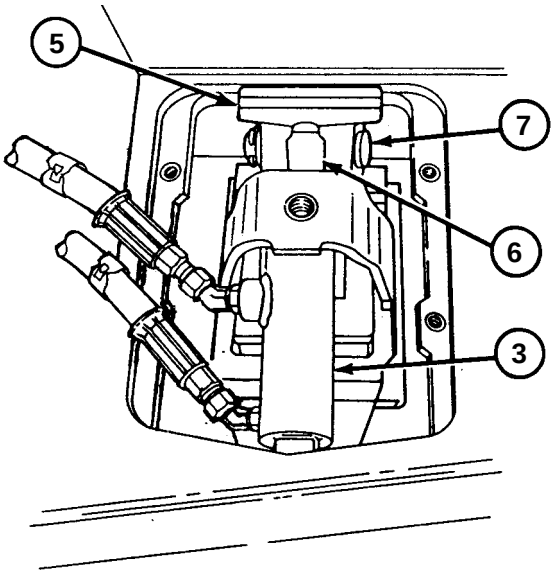
4 BUMP STOPS INOPERATIVE (CONTINUED)





VISUAL INSPECTION

Remove bump stop access panels from hull on inoperative side of vehicle, and check hydraulic lines at circuits 9 (1) and 11 (2) between bump stop cylinder (3) and forward manifold (4).



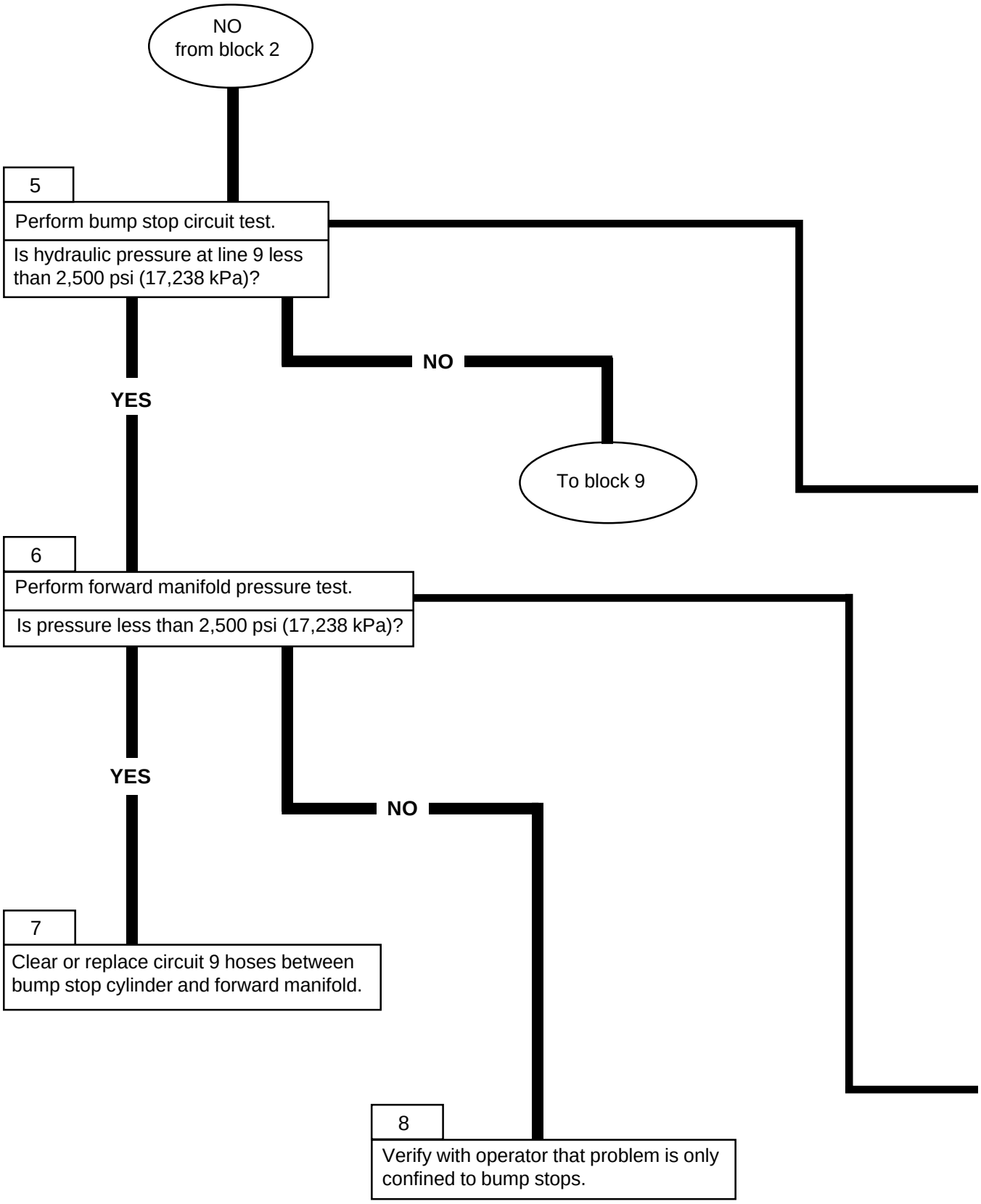
LEFT FRONT BUMP STOP SHOWN

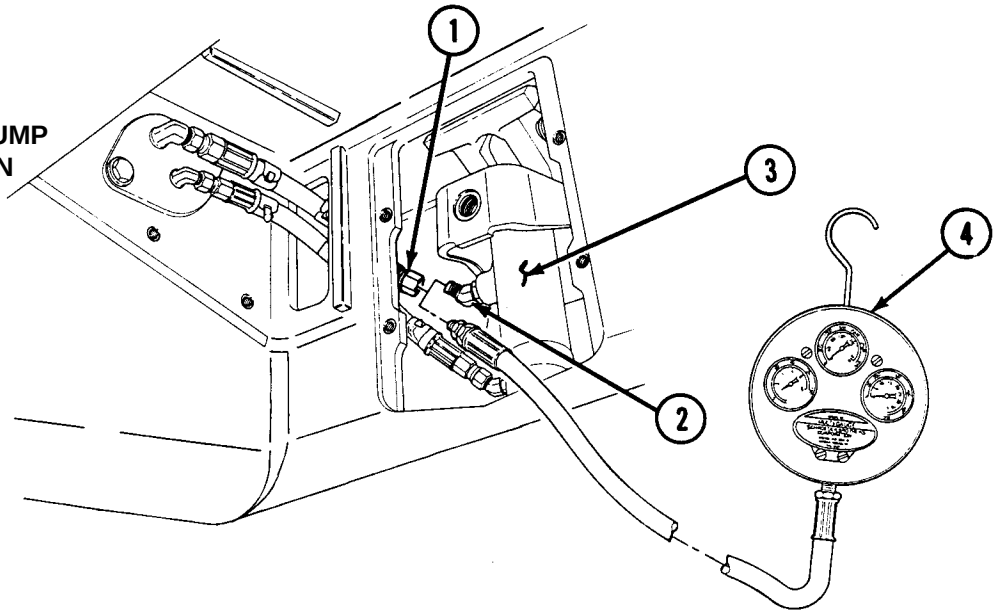
MECHANICAL BINDING CHECK

- Clear debris from area of bump stop (5).
- Start engine and allow to run for at least two minutes to build up hydraulic pressure.
- Have assistant shift SPRUNG/UNSPRUNG lever to SPRUNG, then to UNSPRUNG. Repeat several times. Check for free movement of bump stop cylinder (3). Check for missing or damaged components including cylinder rod (6), cylinder rod connecting pin (7), and bump stop (5).

Refer to TM 5-2350-262-20-2

4 BUMP STOPS INOPERATIVE (CONTINUED)



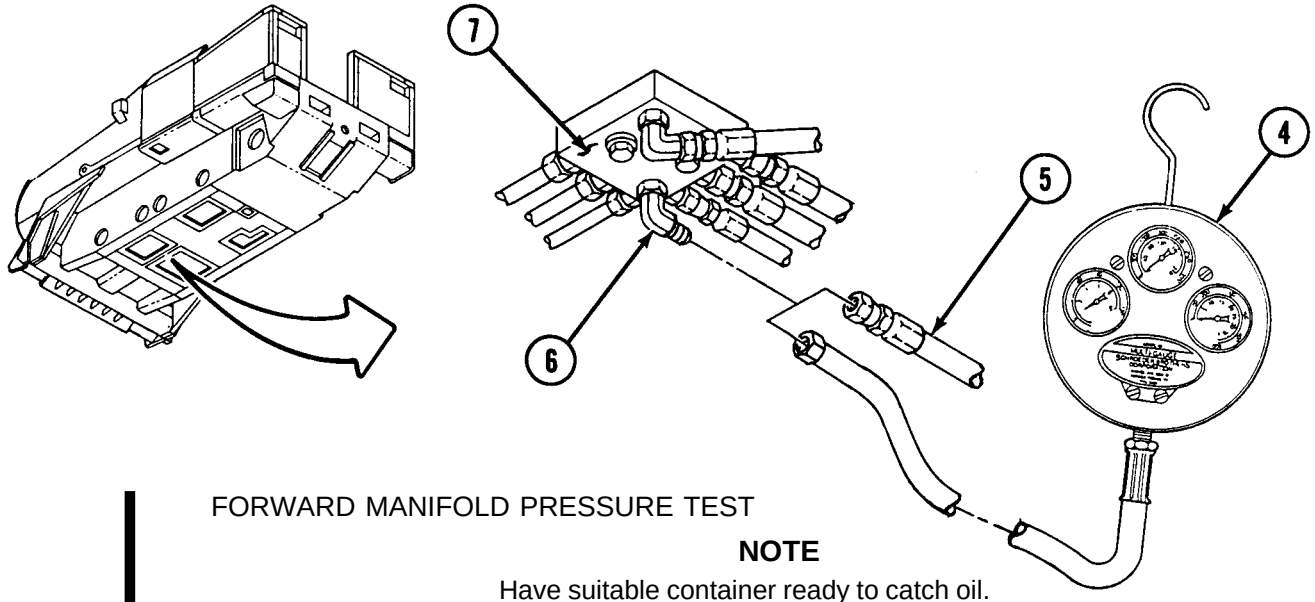


BUMP STOP CIRCUIT TEST

NOTE

Have suitable container ready to catch oil.

- Stop engine; relieve hydraulic pressure. Disconnect BUMP STOP CYL-9 hose (1) from elbow (2) on bump stop cylinder (3), and cap elbow (2). Connect pressure measuring device (4) to BUMP STOP CYL-9 hose (1).
- Start engine, place vehicle in SPRUNG mode, and read pressure measuring device (4).



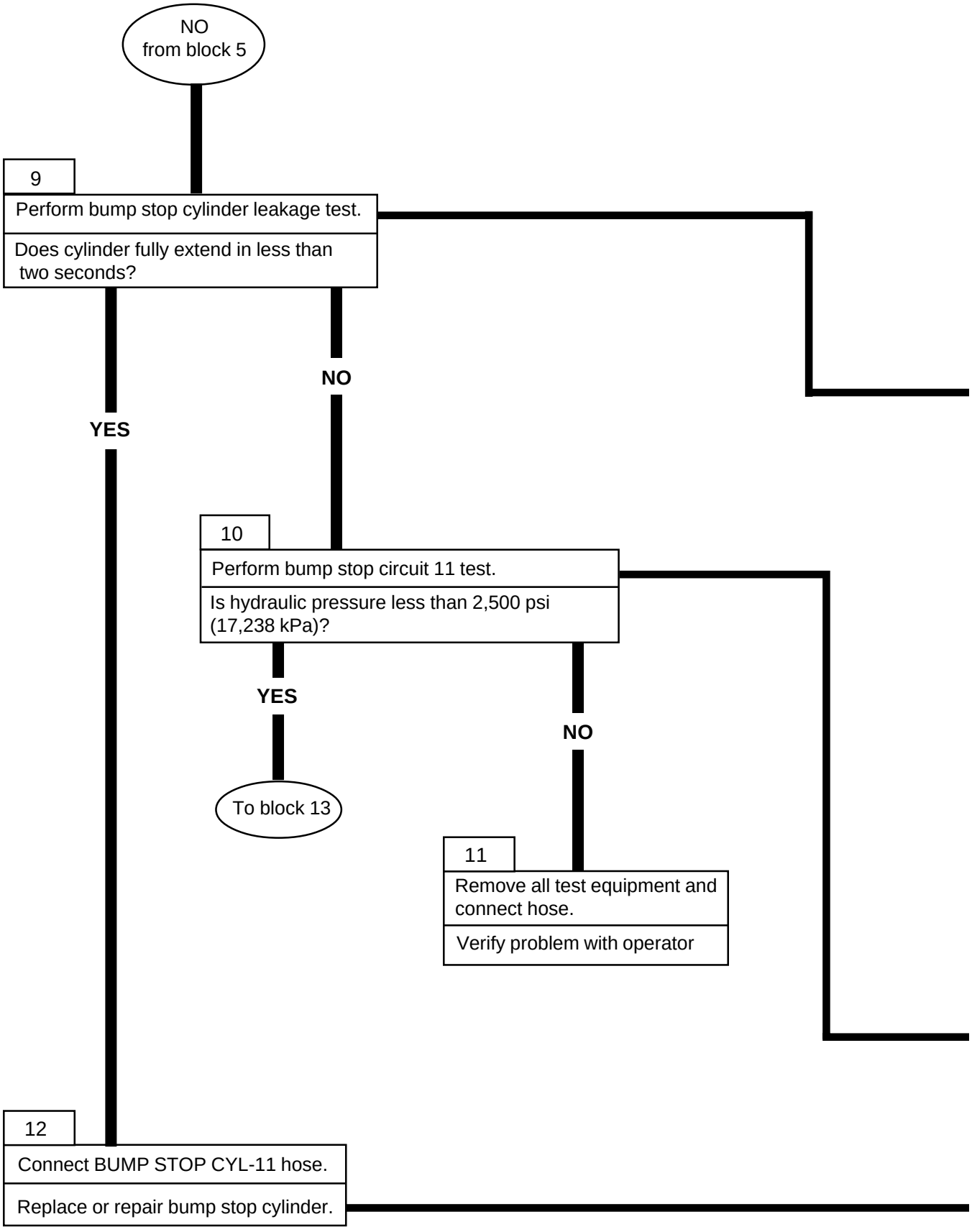
FORWARD MANIFOLD PRESSURE TEST

NOTE

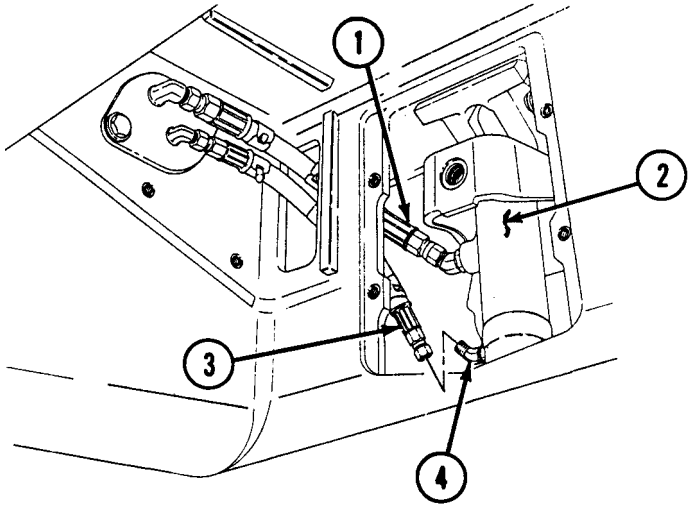
Have suitable container ready to catch oil.

- Stop engine; relieve hydraulic pressure. Remove measuring device (4) and connect hose (1).
- Disconnect FWD MANF-9 ELB hose (5) from elbow (6) on forward manifold (7), and plug hose (5). Connect pressure measuring device (4) to elbow (6).
- Start engine and read pressure measuring device (4).
- Stop engine; relieve hydraulic pressure. Remove all test equipment and connect hose.

4 BUMP STOPS INOPERATIVE (CONTINUED)



LEFT FRONT BUMP STOP SHOWN



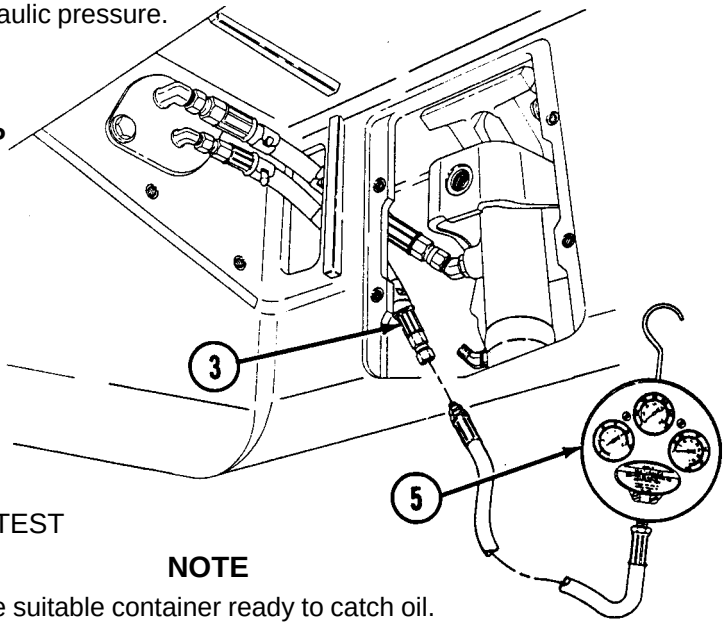
BUMP STOP CYLINDER LEAKAGE TEST

NOTE

Have suitable container ready to catch oil.

- Stop engine; relieve hydraulic pressure and remove all test equipment. Connect BUMP STOP CYL-9 hose (1) to bump stop cylinder (2).
- Disconnect BUMP STOP CYL-11 hose (3) from elbow (4) on bump stop cylinder (2). Cap elbow (4) and plug hose (3).
- Start engine and move SPRUNG/UNSPRUNG lever to SPRUNG. Note the time it takes for the bump stops to extend fully.
- Stop engine; relieve hydraulic pressure.

LEFT FRONT BUMP STOP SHOWN



BUMP STOP CIRCUIT 11 TEST

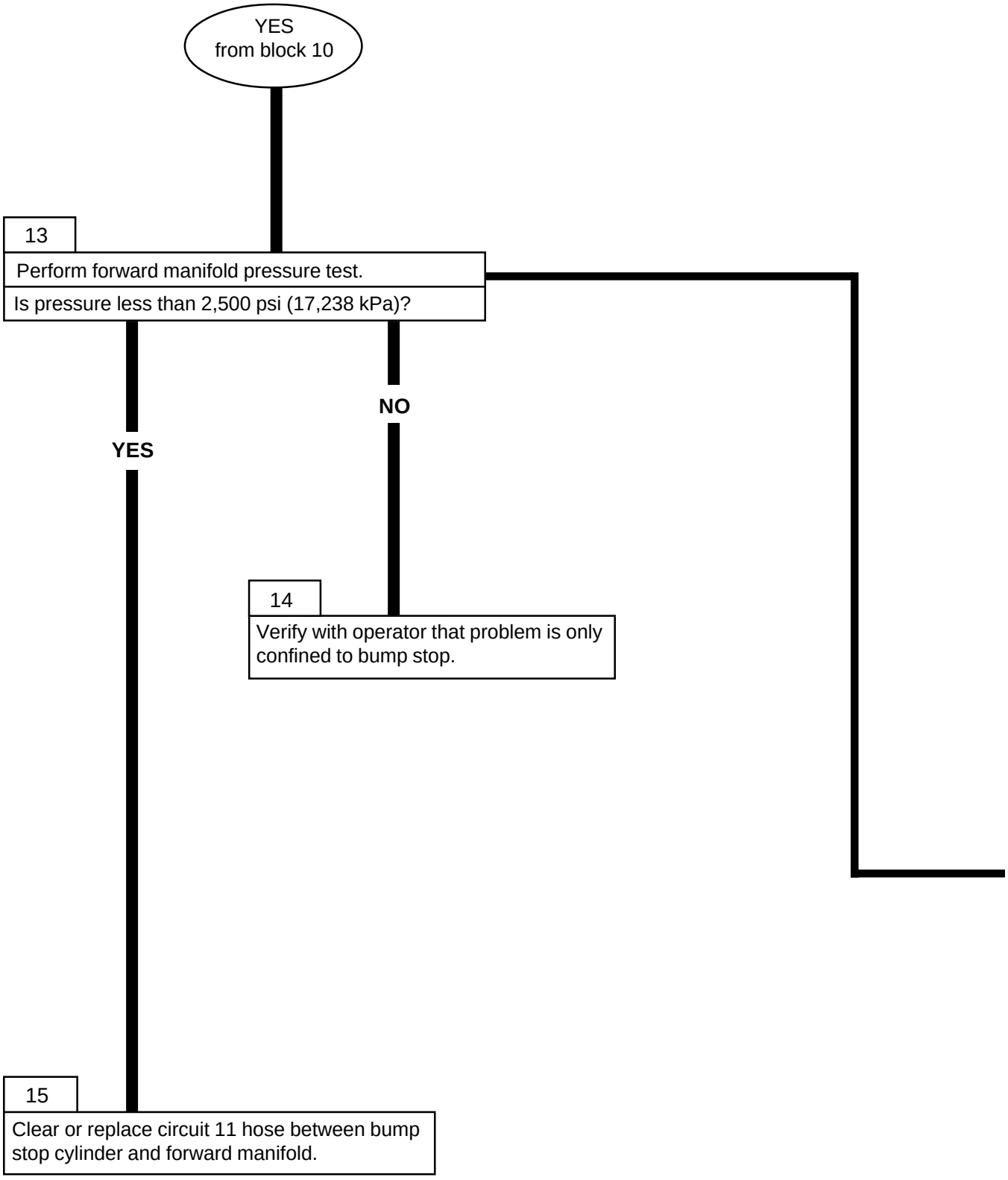
NOTE

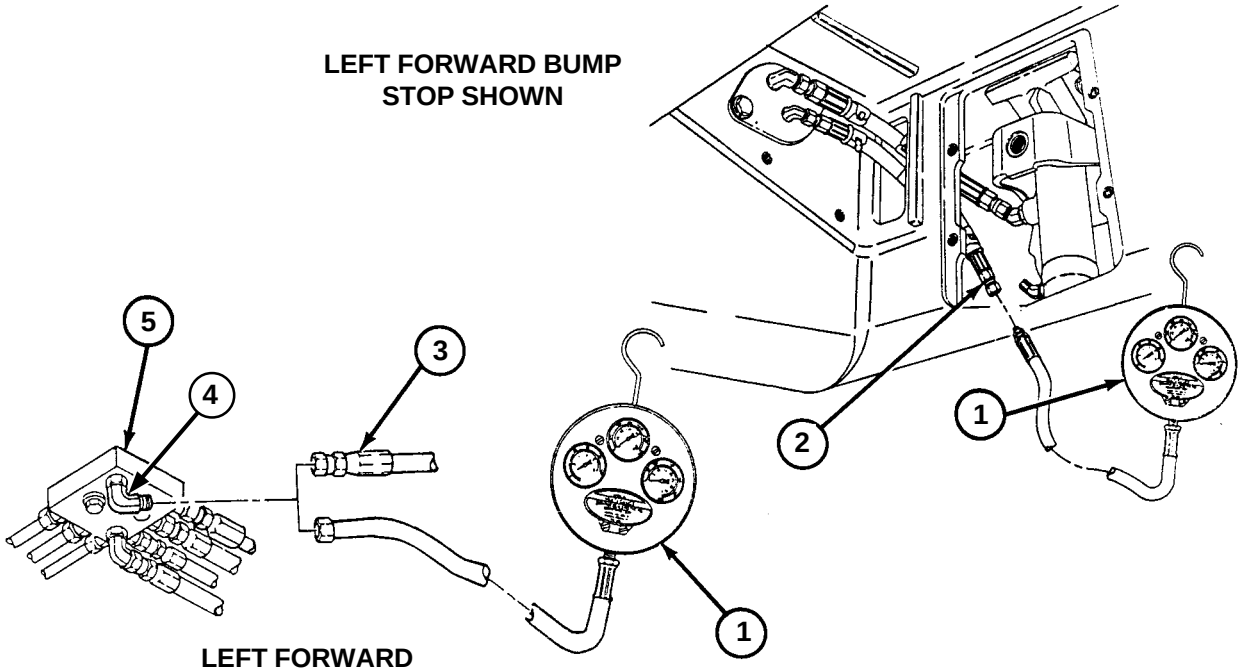
Have suitable container ready to catch oil.

- Connect pressure measuring device (5) to end of BUMP STOP CYL-11 hose (3).
- Start engine and move SPRUNG/UNSPRUNG lever to UNSPRUNG. Read pressure measuring device (5).
- Stop engine; relieve hydraulic pressure.

Refer to TM 5-2350-262-20-2.

4 BUMP STOPS INOPERATIVE (CONTINUED)





FORWARD MANIFOLD PRESSURE TEST

NOTE

Have suitable container ready to catch oil.

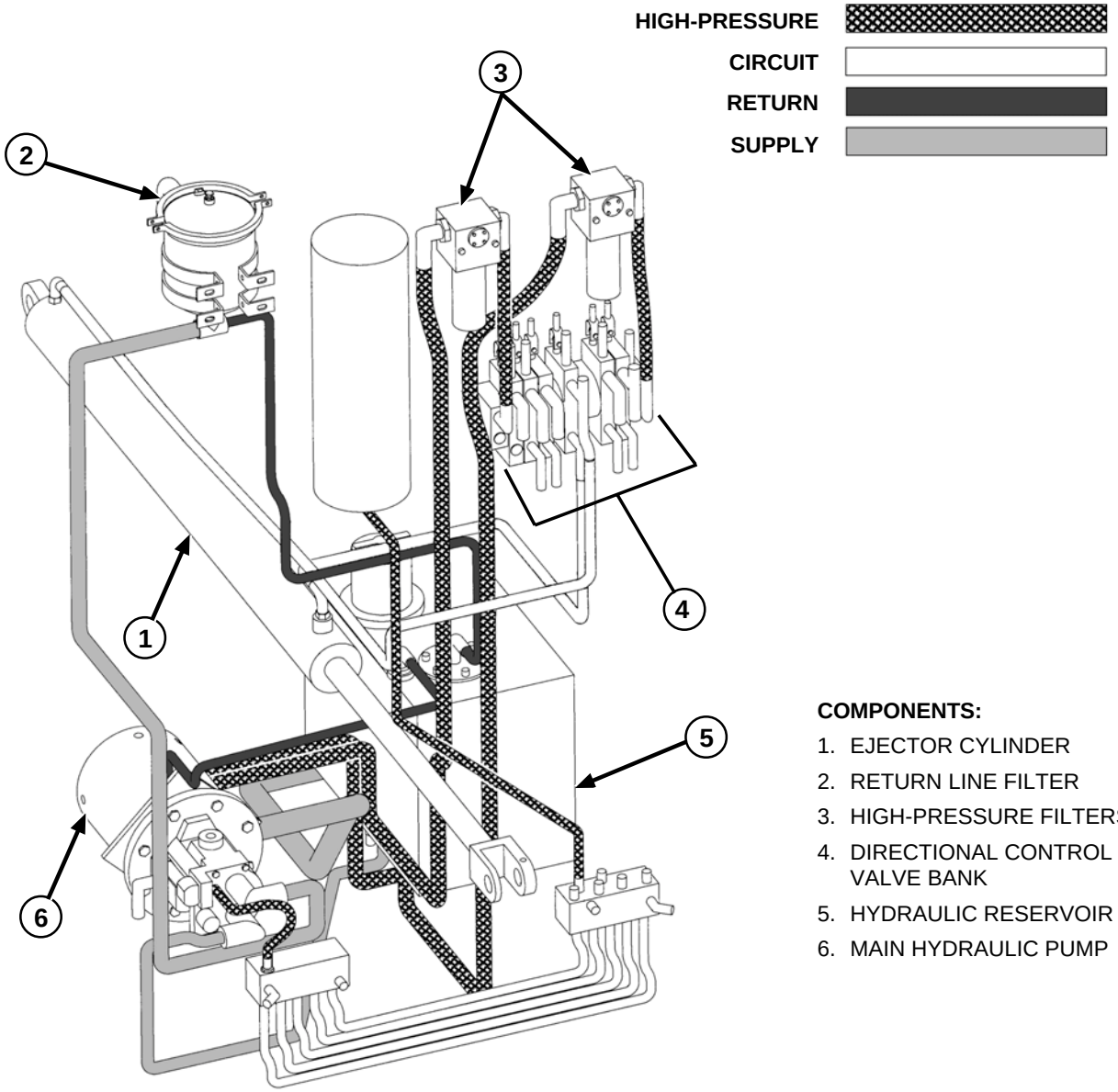
- Remove pressure measuring device (1) and connect BUMP STOP CYL-9 hose (2).
- Disconnect FWD MANF-11-ELB hose (3) from elbow (4) on forward manifold (5). Cap hose (3) and install pressure measuring device (1) on elbow (4).
- Start engine. With SPRUNG/UNSPRUNG lever in UNSPRUNG, read pressure measuring device (1).
- Stop engine; relieve hydraulic pressure. Remove all test equipment and connect hose.

5 EJECTOR CREEPS

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.

WARNING

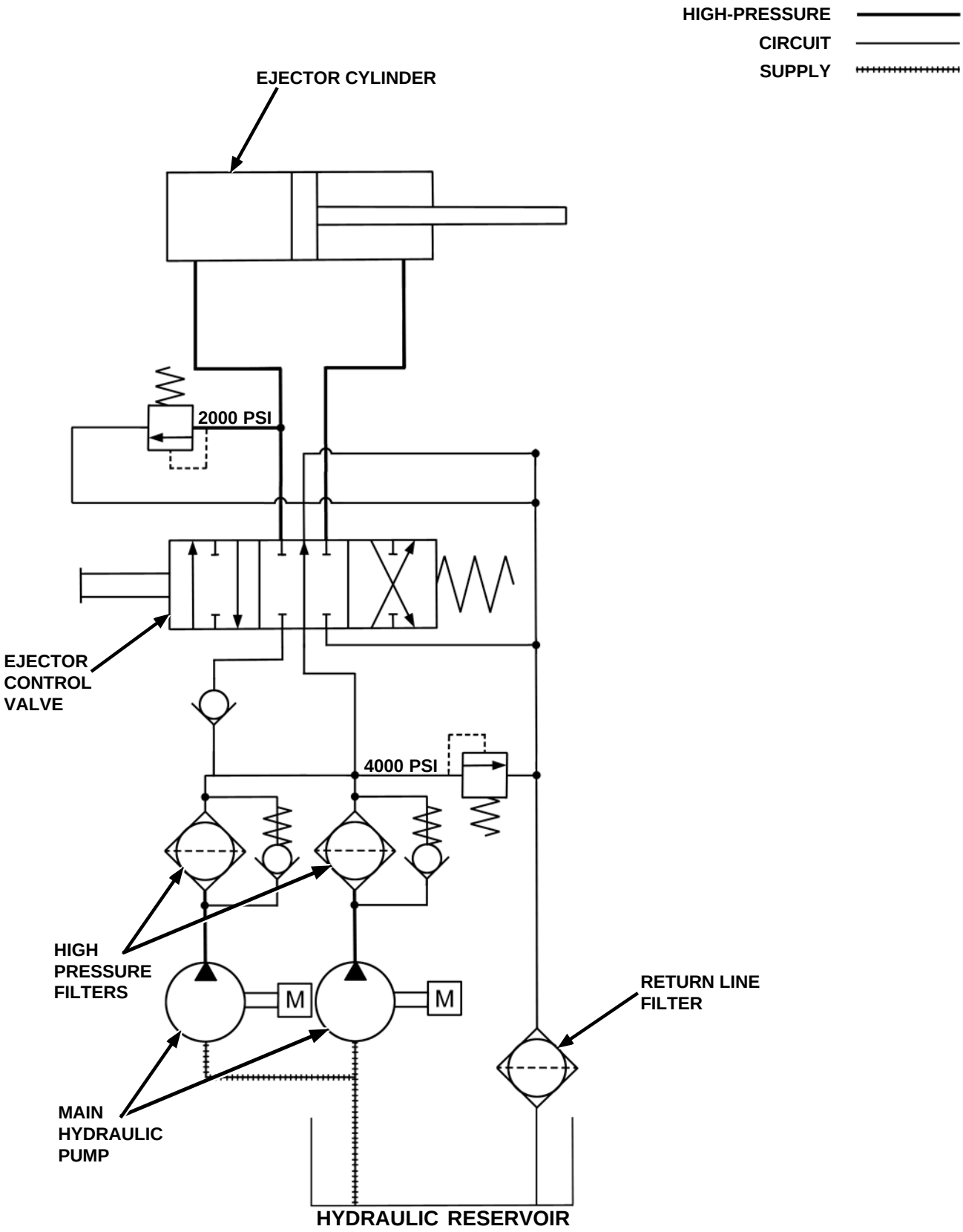
High pressure is present in the M9 hydraulic system. Do not disconnect any hydraulic system component unless hydraulic system pressure has been relieved. Ensure each hydraulic control lever is moved several times through all positions and hydraulic tank dipstick is slowly loosened to relieve pressure. Failure to comply may result in severe injury or death to personnel.



COMPONENTS:

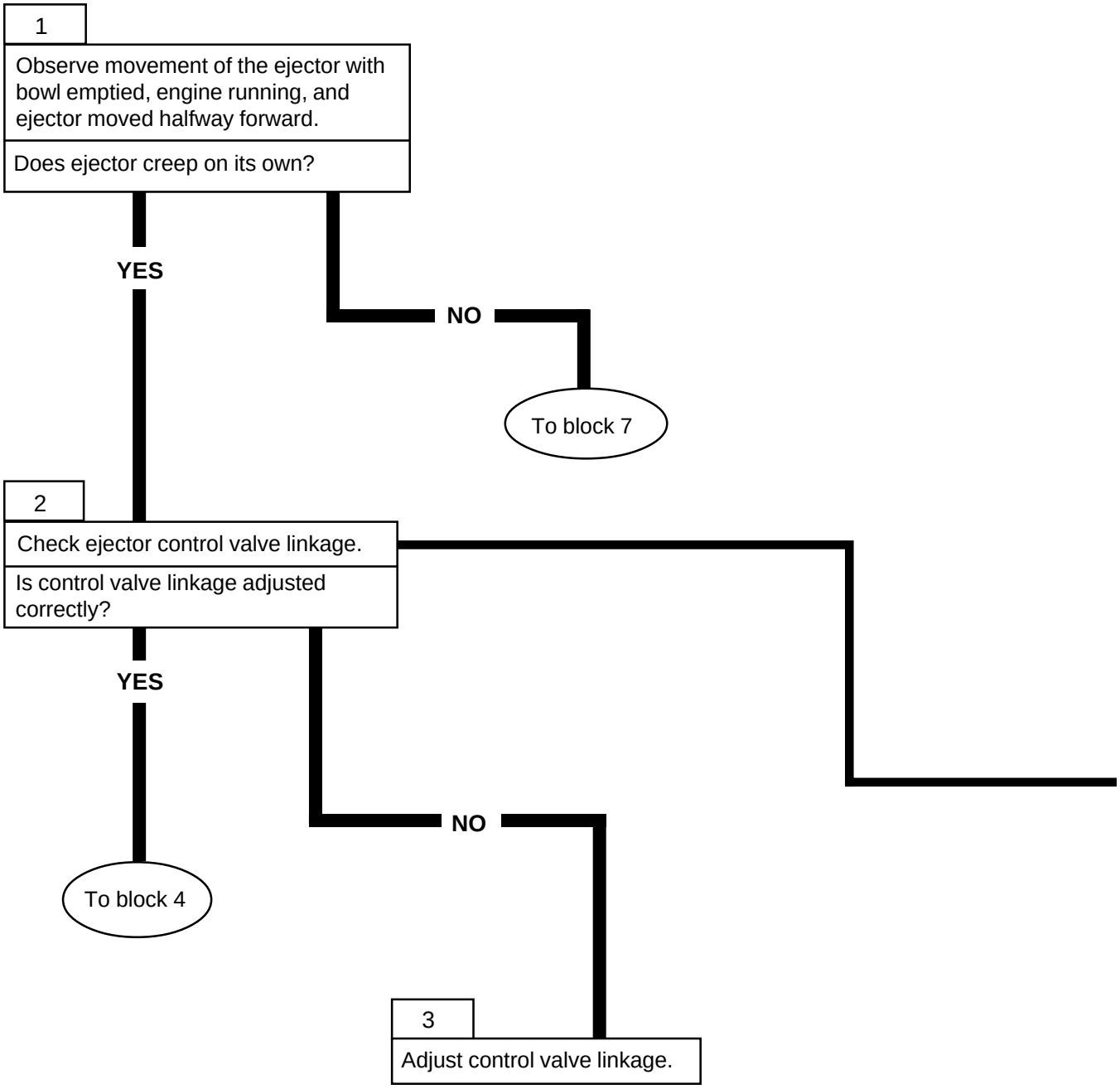
1. EJECTOR CYLINDER
2. RETURN LINE FILTER
3. HIGH-PRESSURE FILTERS
4. DIRECTIONAL CONTROL VALVE BANK
5. HYDRAULIC RESERVOIR
6. MAIN HYDRAULIC PUMP

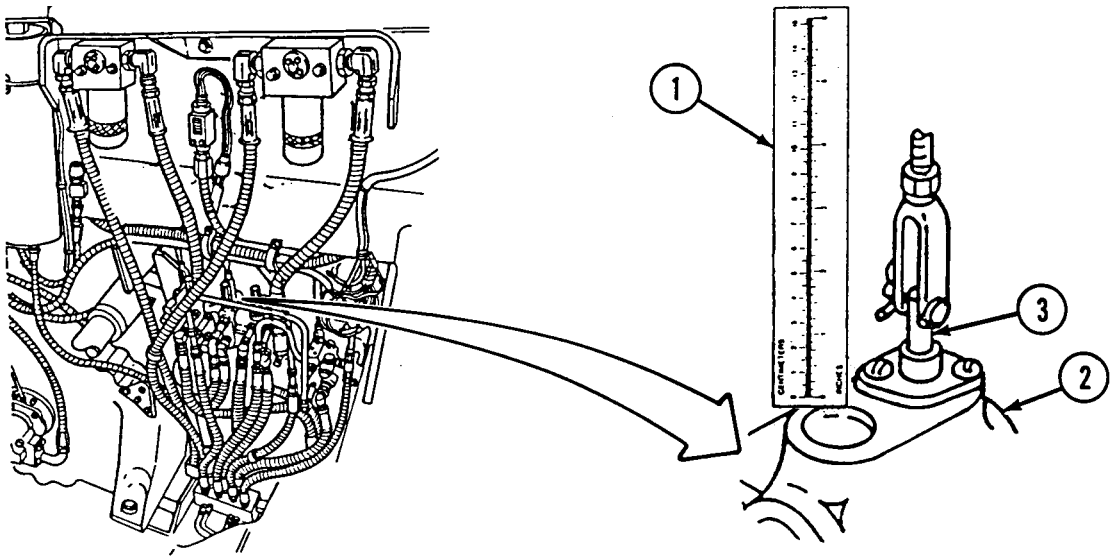
EJECTOR HYDRAULIC CIRCUIT



EJECTOR HYDRAULIC SCHEMATIC

5 EJECTOR CREEPS (CONTINUED)

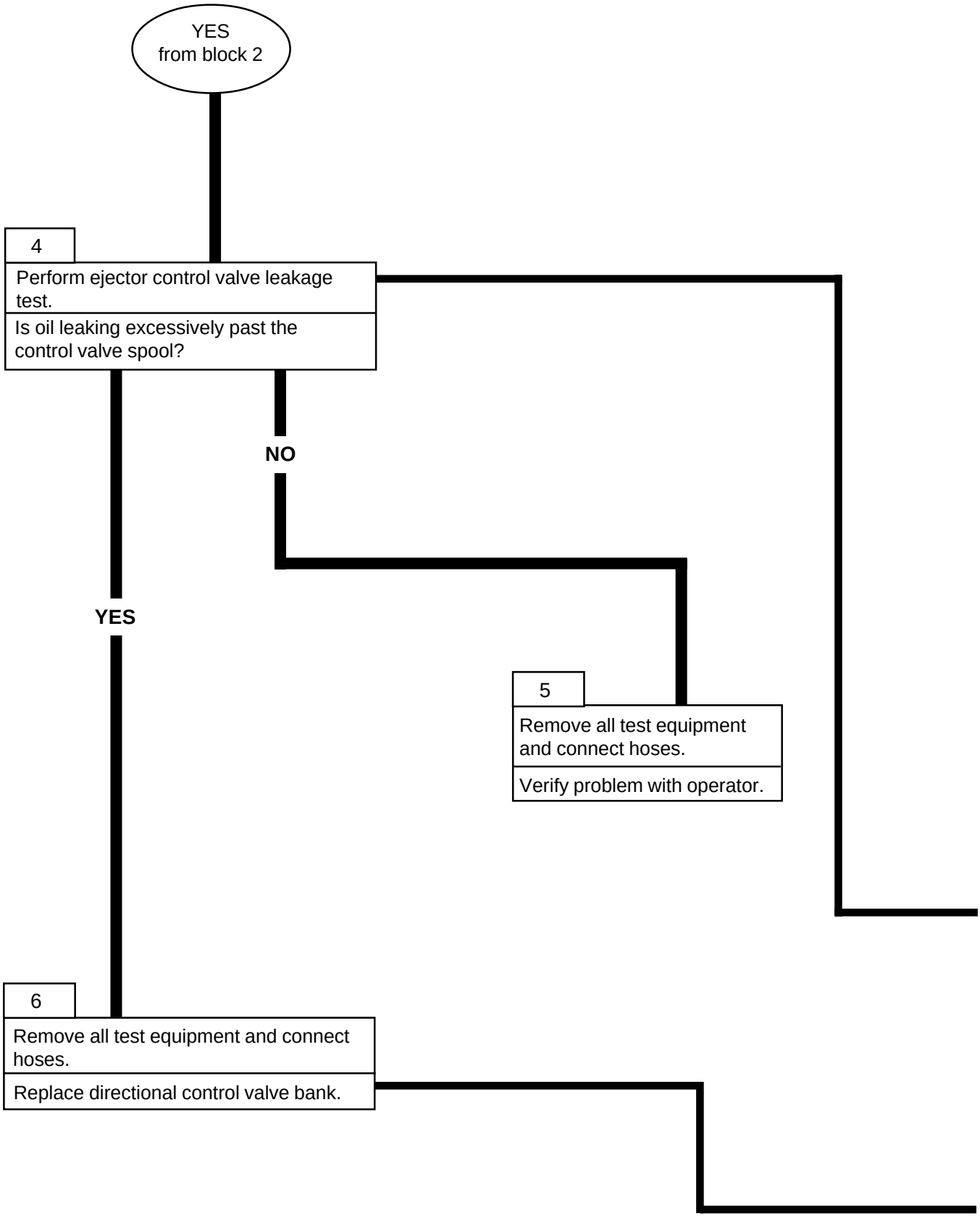


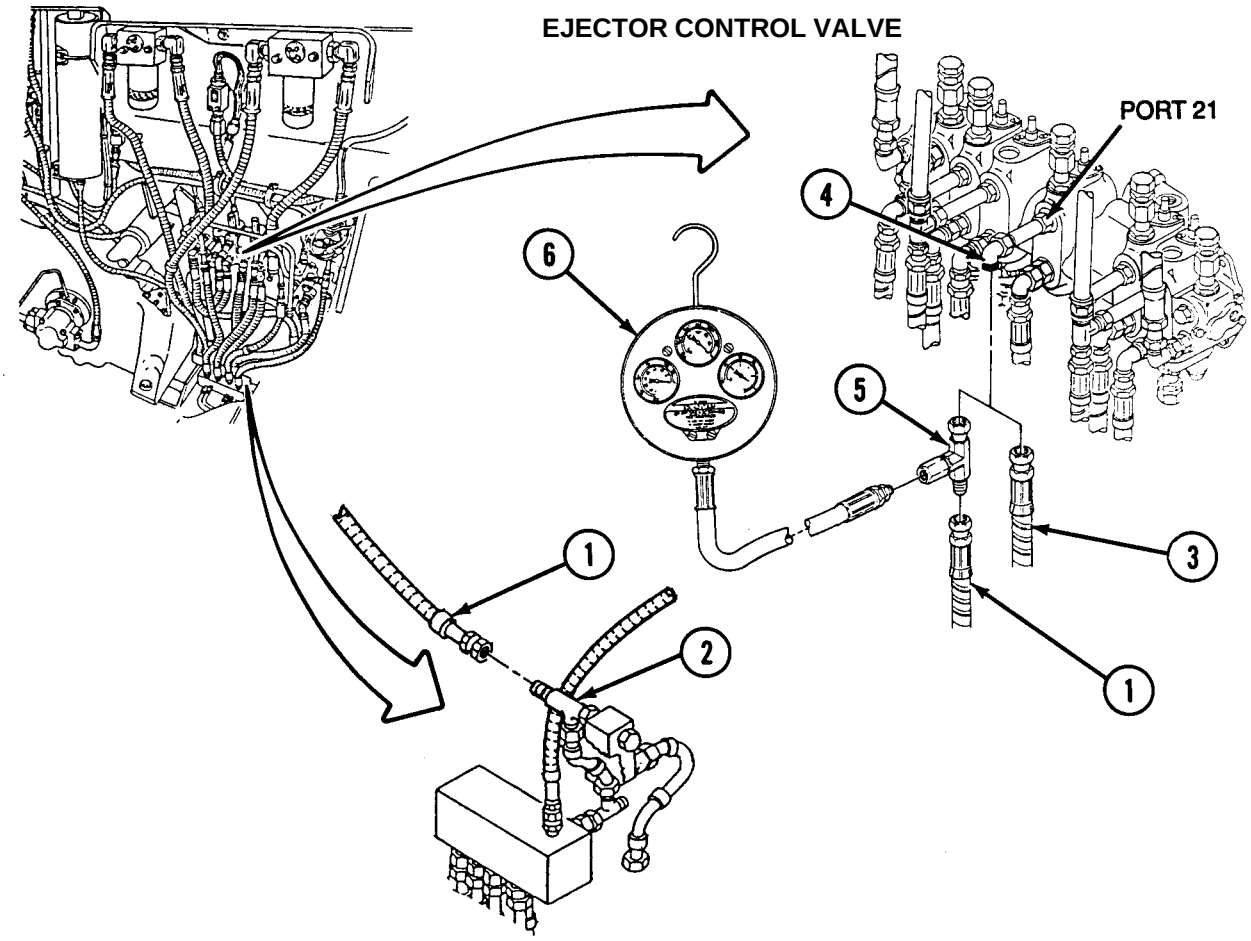


EJECTOR CONTROL VALVE LINKAGE CHECK

- Stop engine; relieve hydraulic pressure.
- Hold a measuring device (1) on the face of ejector control valve (2). Have assistant move EJECTOR CONTROL lever between FORWARD and BACK. Measure distance plunger (3) travels as lever is moved. The distance of travel should be 9/32 in. (7 mm).

5 EJECTOR CREEPS (CONTINUED)





EJECTOR CONTROL VALVE LEAKAGE TEST

NOTE

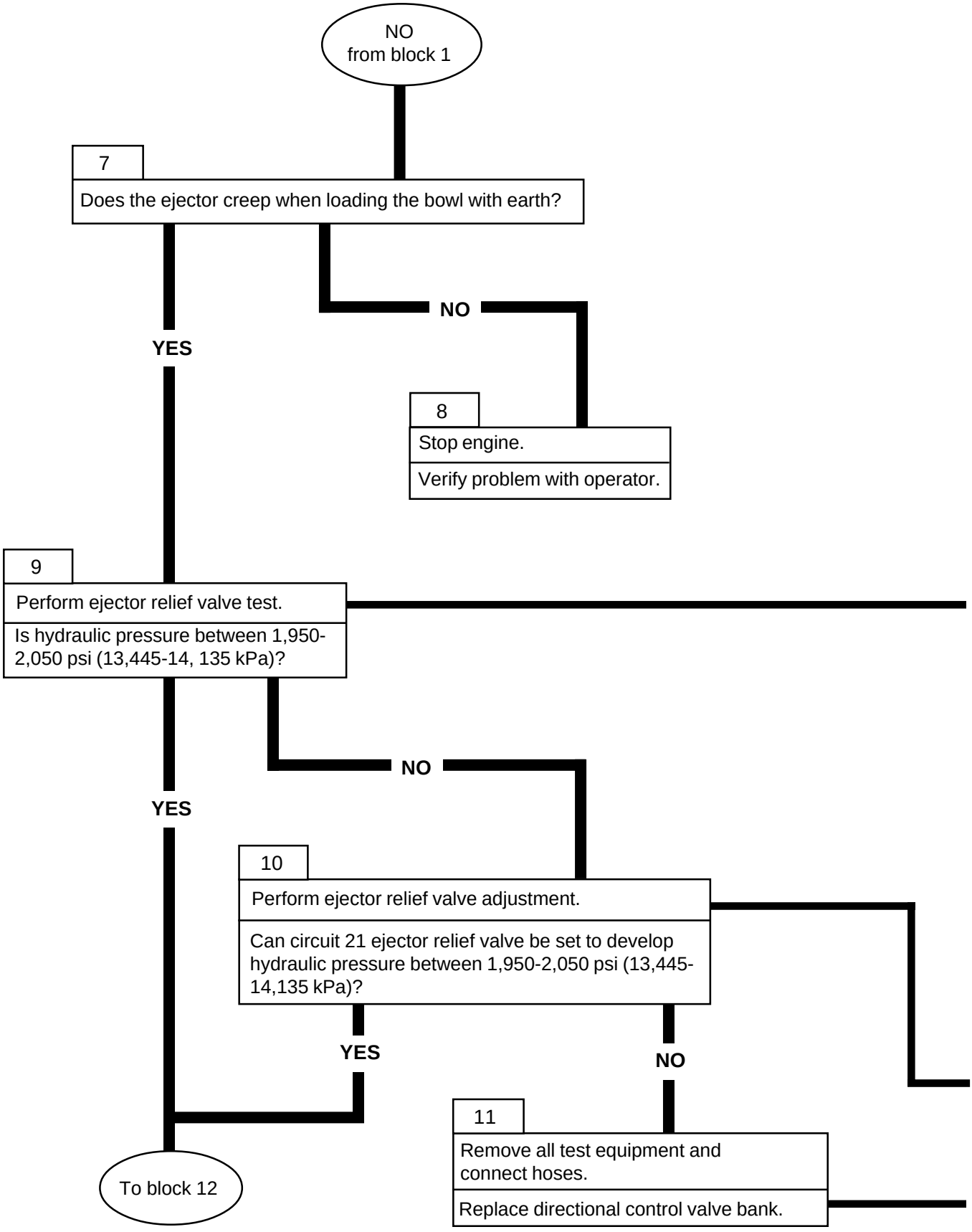
Have suitable container ready to catch oil

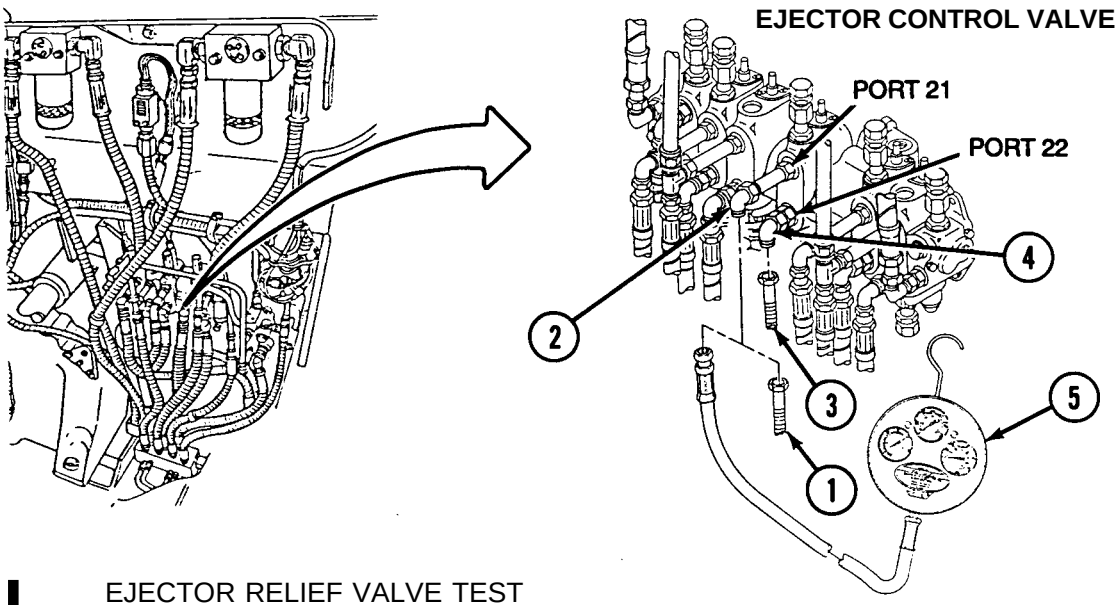
Connecting into the main accumulator is designed to maintain a steady supply of oil to the ejector cylinder while performing the leakage test.

- Disconnect accumulator RELIEF VLV-9 TEE hose (1) from suspension relief valve tee (2), and cap tee (2).
- Disconnect CONT VLV-21 hose (3) from elbow (4) on port 21 of ejector control valve, and plug hose (3), Connect RELIEF VLV-9 TEE hose (1), tee (5), and pressure measuring device (6) to elbow (4).
- Start engine and hold EJECTOR CONTROL lever in the FORWARD position until pressure measuring device (6) indicates 1,950-2,050 psi (13,445-14,135 kPa). Release EJECTOR CONTROL lever to the NEUTRAL position, allow hydraulic pressure to stabilize for thirty seconds, then time-pressure loss for one minute. If pressure loss is greater than 100 psi (690 kPa) per minute, oil is leaking excessively past the control valve spool. Stop engine and relieve hydraulic pressure.

Refer to TM 5-2350-262-20-2.

5 EJECTOR CREEPS (CONTINUED)





EJECTOR RELIEF VALVE TEST

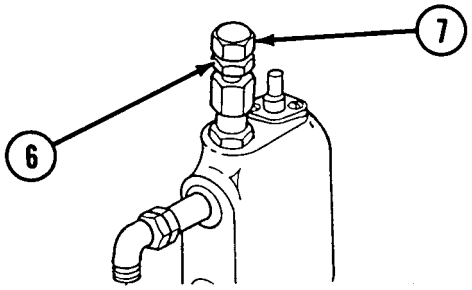
WARNING

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

NOTE

Have suitable container ready to catch oil.

- Move ejector halfway forward, stop engine, and relieve hydraulic pressure.
- Disable the ejector from the hydraulic system by disconnecting CONT VLV-21 hose (1) from elbow (2) on port 21 of ejector control valve and CONT VLV-22 hose (3) from elbow (4) on port 22. Cap and plug hoses and fittings.
- Connect pressure measuring device (5) to elbow (2) on port 21 of ejector control valve.
- Have assistant start engine and hold EJECTOR CONTROL lever in the FORWARD position. Read pressure measuring device (5).
- Stop engine; relieve hydraulic pressure.

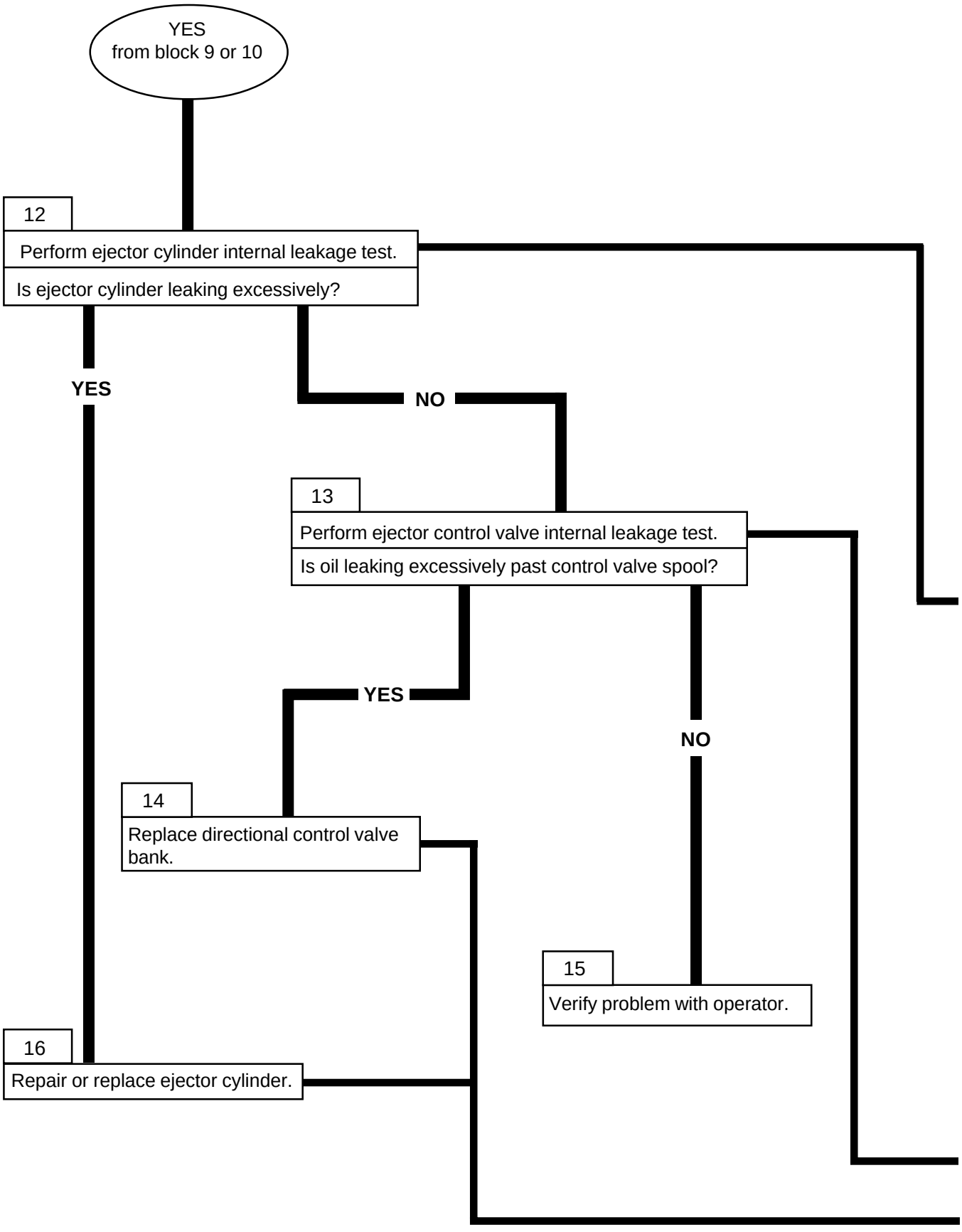


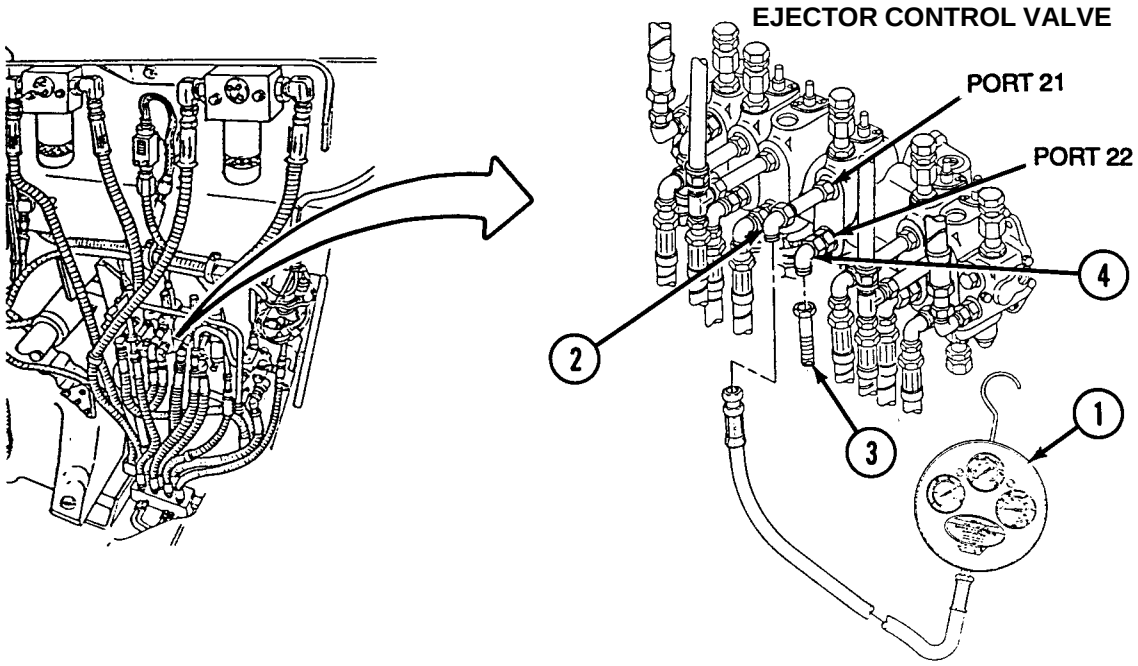
EJECTOR RELIEF VALVE ADJUSTMENT

- Start engine.
- Loosen jamnut (6) on ejector relief valve and turn adjusting screw (7) clockwise or counterclockwise until pressure is within limits. Tighten jamnut (6).
- Stop engine; relieve hydraulic pressue.

Refer to TM 5-2350-262-20-2.

5 EJECTOR CREEPS (CONTINUED)





EJECTOR CYLINDER INTERNAL LEAKAGE TEST

NOTE

Have suitable container ready to catch oil.

- Remove pressure measuring device (1) from elbow (2) on port 21 ejector control valve. Cap port 21 and connect CONT-VLV-22 hose (3) to elbow (4) on port 22.
- Start engine and have assistant hold EJECTOR CONTROL lever in the BACK position for one minute. Mark position of ejector at side of hull and continue to hold lever in the BACK position for one more minute. Check position of ejector while still holding lever in the BACK position. If ejector has moved more than 0.5 in. (13 mm), the ejector cylinder is leaking excessively.
- Stop engine and relieve hydraulic pressure. Remove all test equipment and connect hose.

Follow ejector control valve leakage test from block 4.

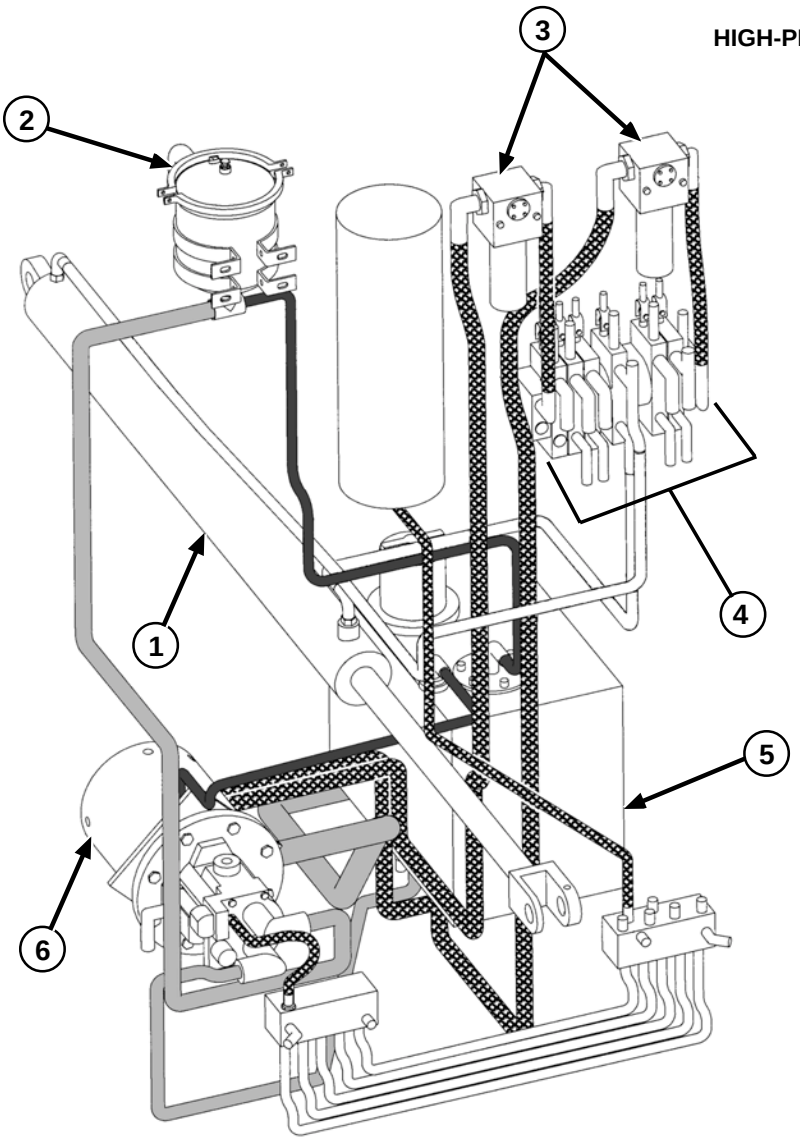
Refer to TM 5-2320-262-20-2.

6 EJECTOR DOES NOT EXTEND OR RETRACT

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 the 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 bowl. When ejector control valve is shifted to FORWARD positing, oil is supplied from port 21 and fed to the 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 the ejector cylinder.

WARNING

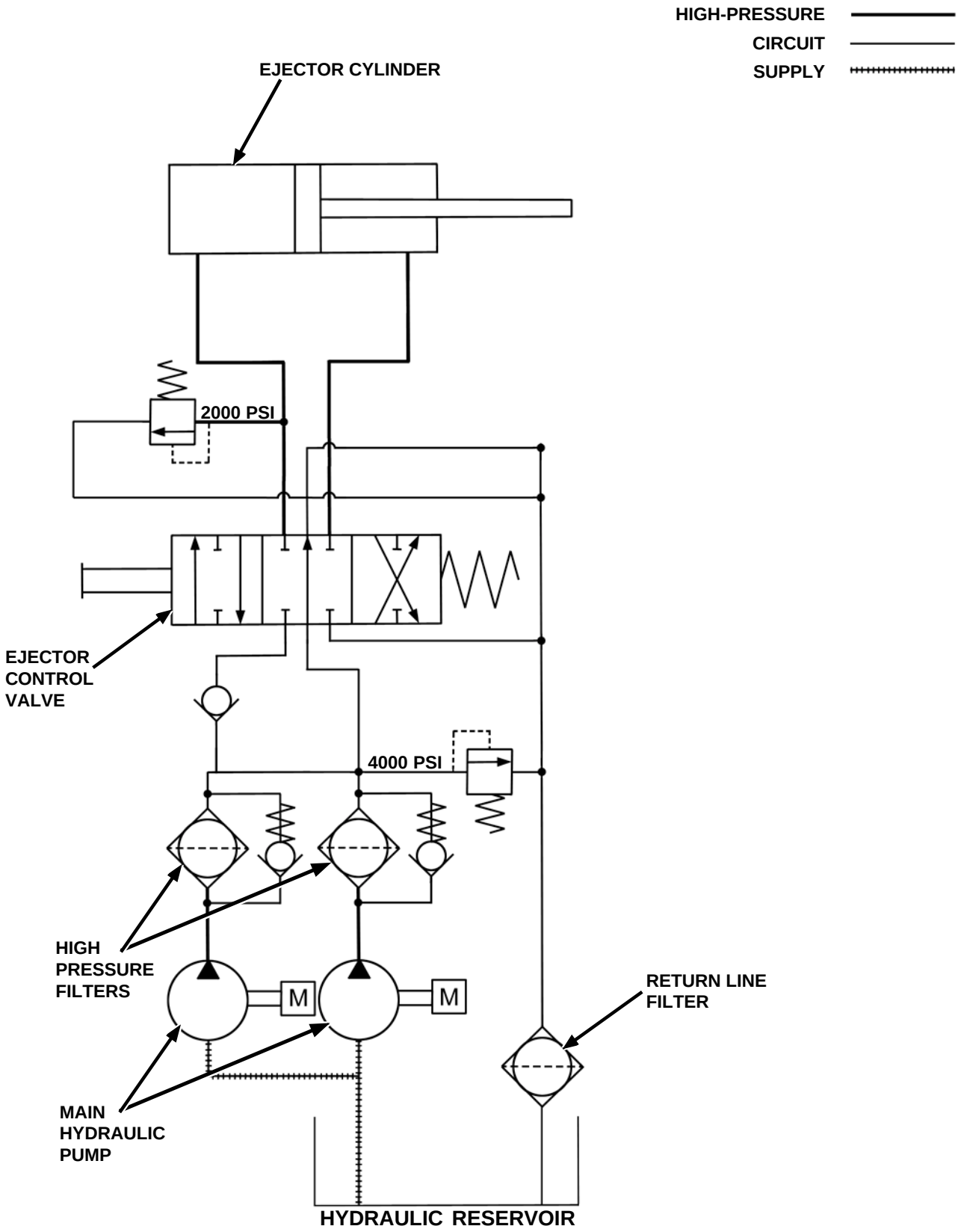
High pressure is present in the M9 hydraulic system. Do not disconnect any hydraulic system component unless hydraulic system pressure has been relieved. Ensure each hydraulic control lever is moved several times through all positions and hydraulic tank dipstick is slowly loosened to relieve pressure. Failure to comply may result in severe injury to personnel.



COMPONENTS:

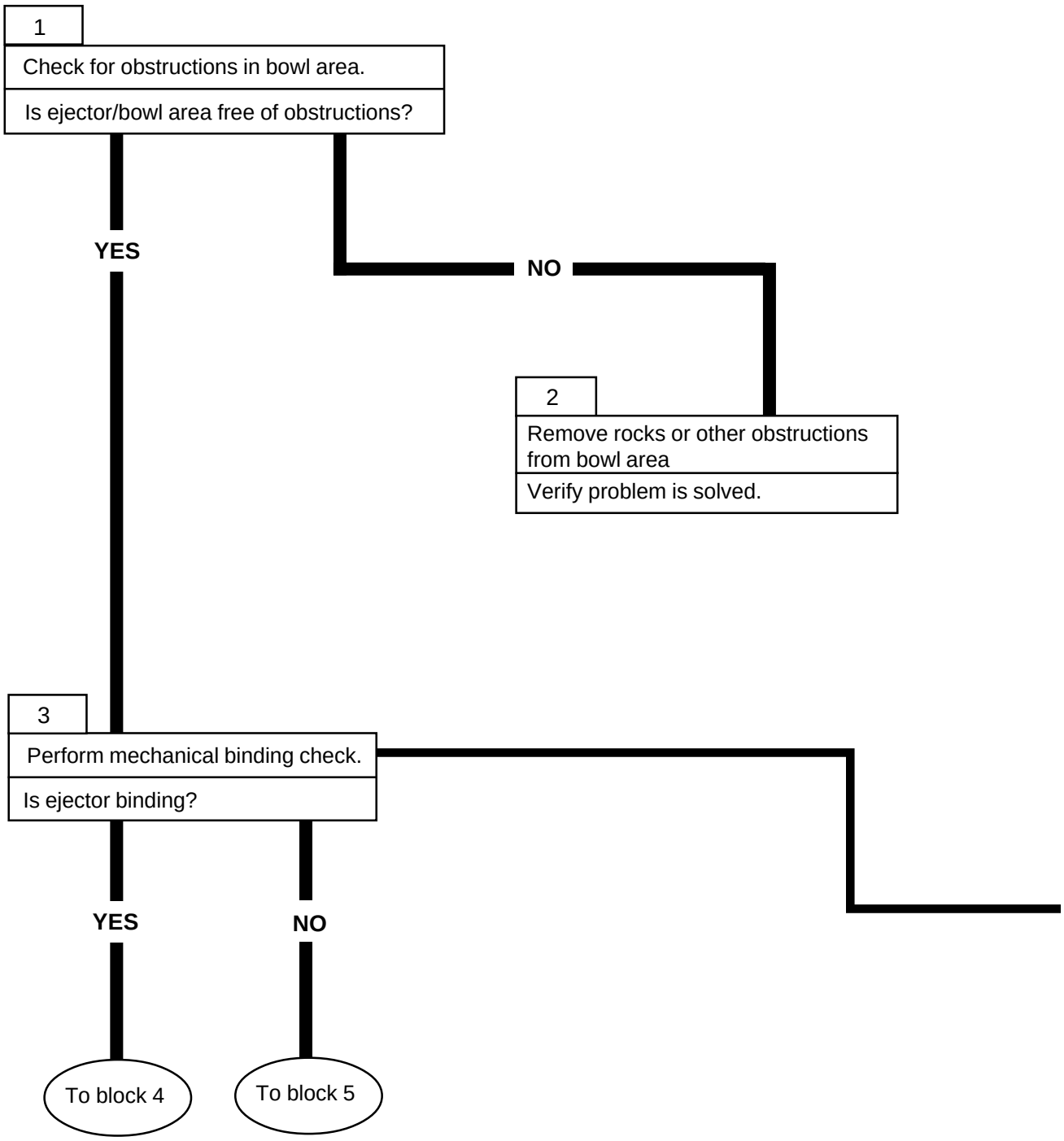
1. EJECTOR CYLINDER
2. RETURN LINE FILTER
3. HIGH-PRESSURE FILTERS
4. DIRECTIONAL CONTROL VALVE BANK
5. HYDRAULIC RESERVOIR
6. MAIN HYDRAULIC PUMP

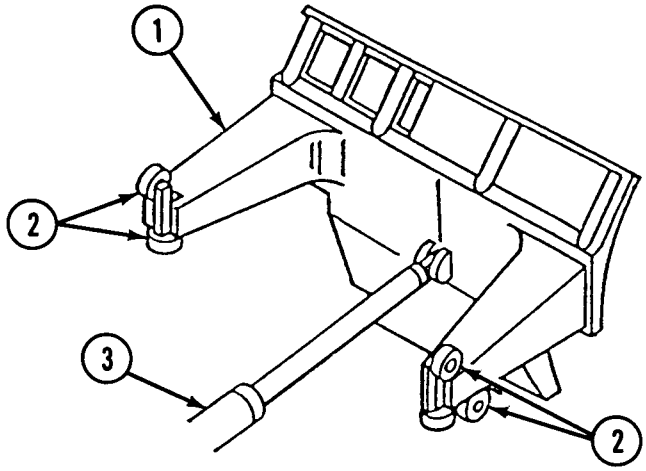
EJECTOR HYDRAULIC CIRCUIT

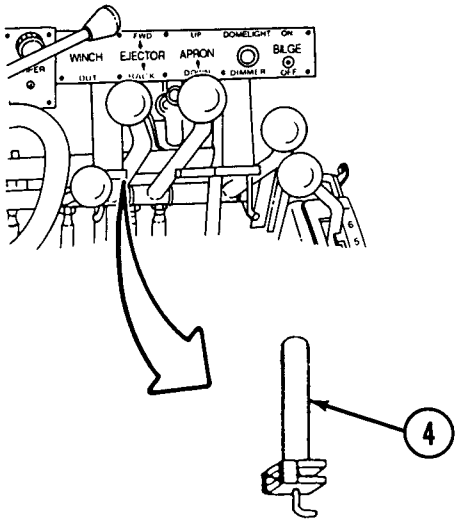


EJECTOR HYDRAULIC SCHEMATIC

6 EJECTOR DOES NOT EXTEND OR RETRACT (CONTINUED)







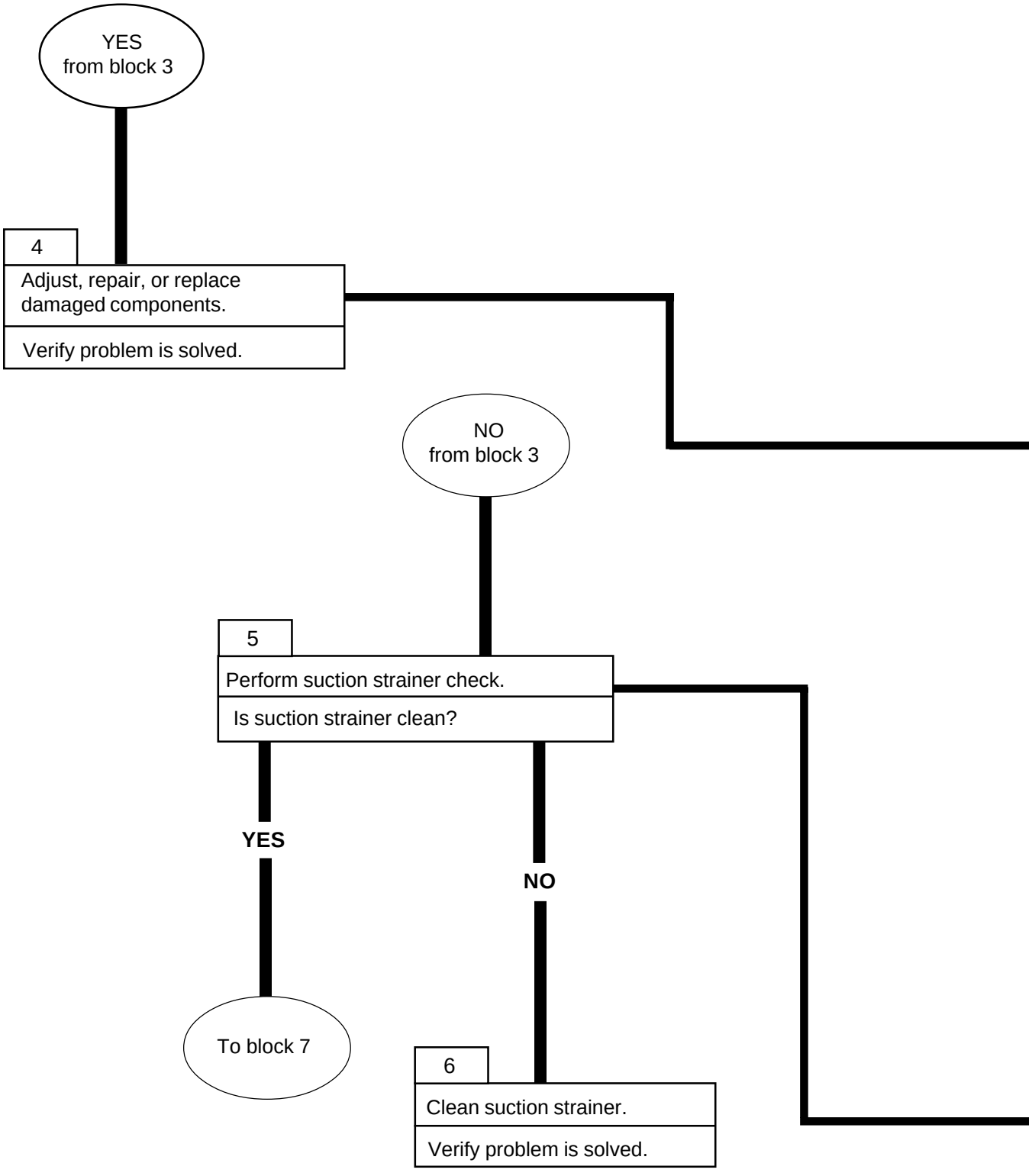
WARNING

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.

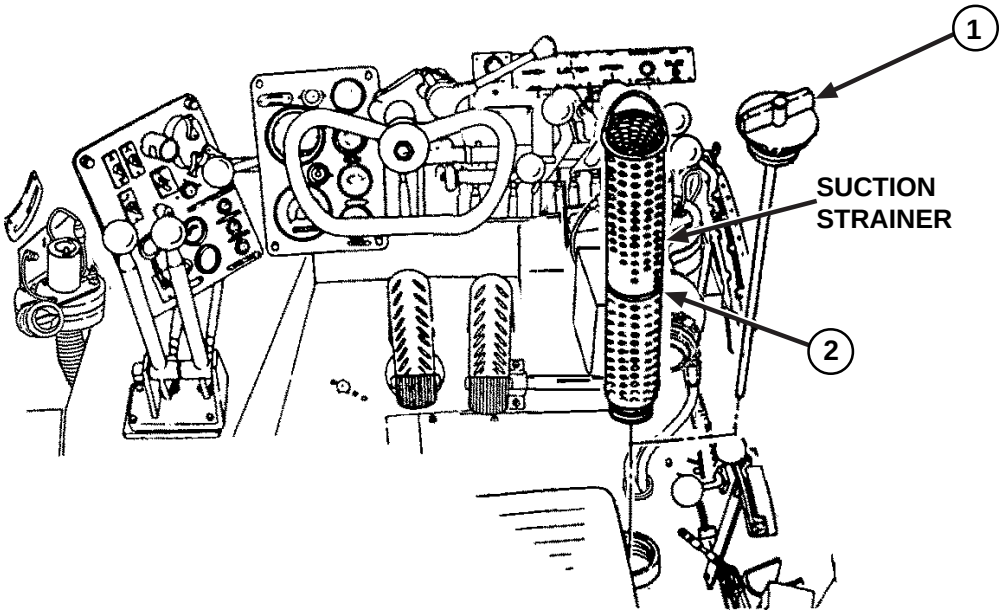
MECHANICAL BINDING CHECK

- Start engine, operate ejector (1), and check for mechanical binding. Check ejector (1), rollers (2), and ejector hydraulic cylinder (3) for damage or jamming. Check that ejector lock (4) is not restricting movement of control lever.
- Stop engine; relieve hydraulic pressure.

6 EJECTOR DOES NOT EXTEND OR RETRACT (CONTINUED)



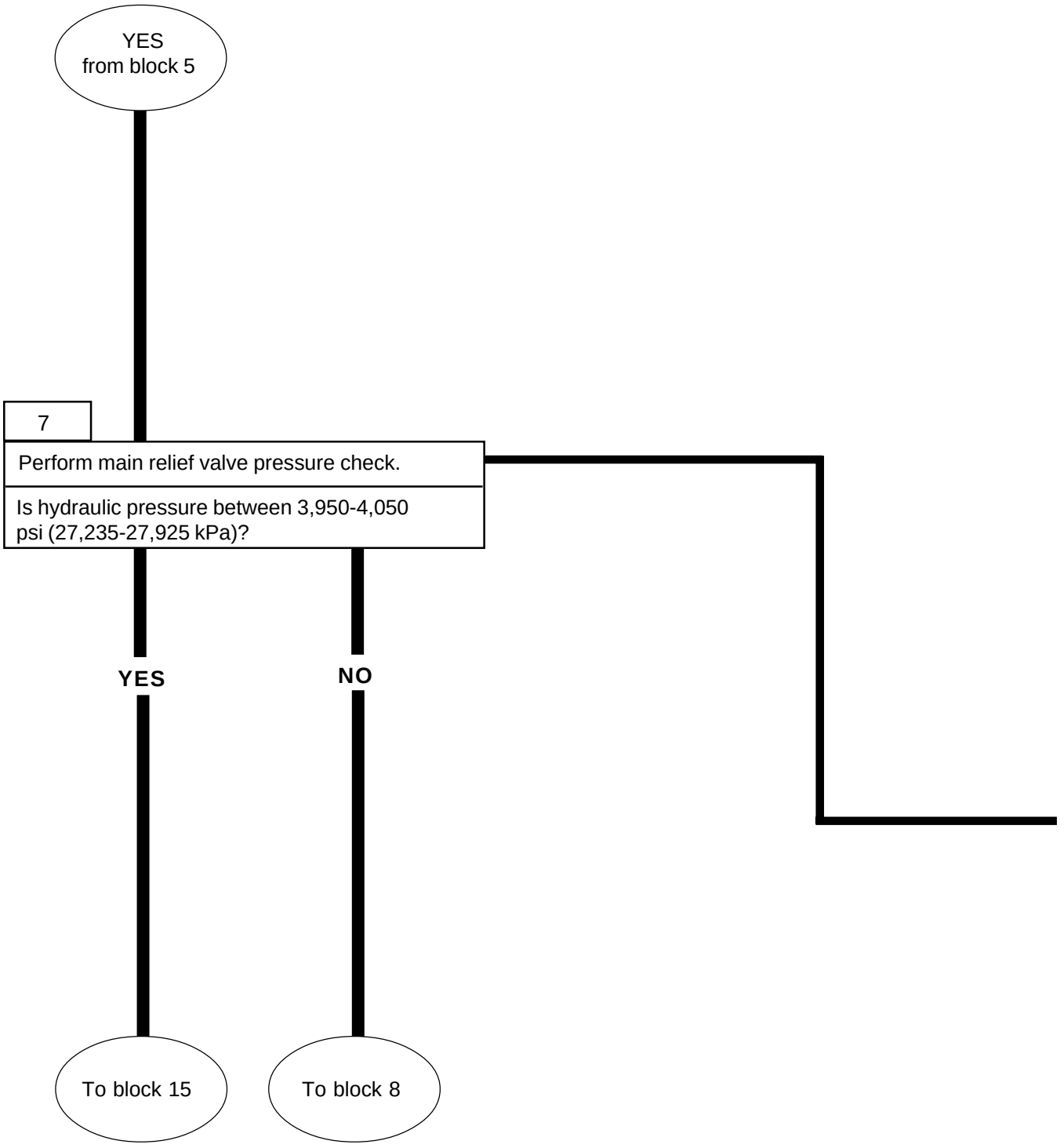
Refer to TM 5-2350-262-20-1

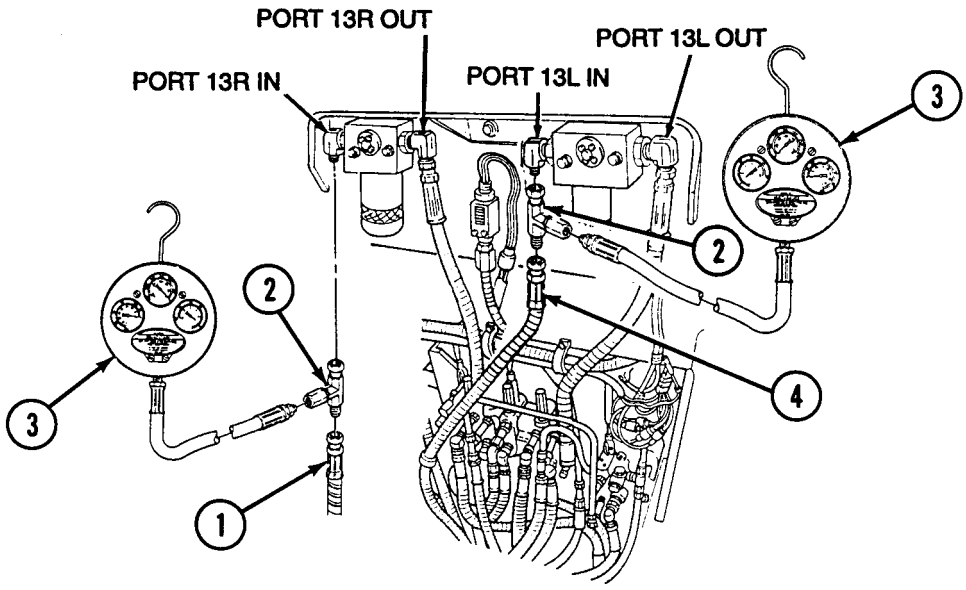


SUCTION STRAINER CHECK

- Slowly loosen hydraulic tank dipstick (1) to release pressure and remove dipstick.
- Remove suction strainer (2) and inspect for clogged ports or obstructions.
- If dirt, obstructions, or debris is found, clear and clean suction strainer (2).
- Replace suction strainer (2) and dipstick (1).

6 EJECTOR DOES NOT EXTEND OR RETRACT (CONTINUED)





MAIN RELIEF VALVE PRESSURE 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.

NOTE

Have suitable container ready to catch oil.

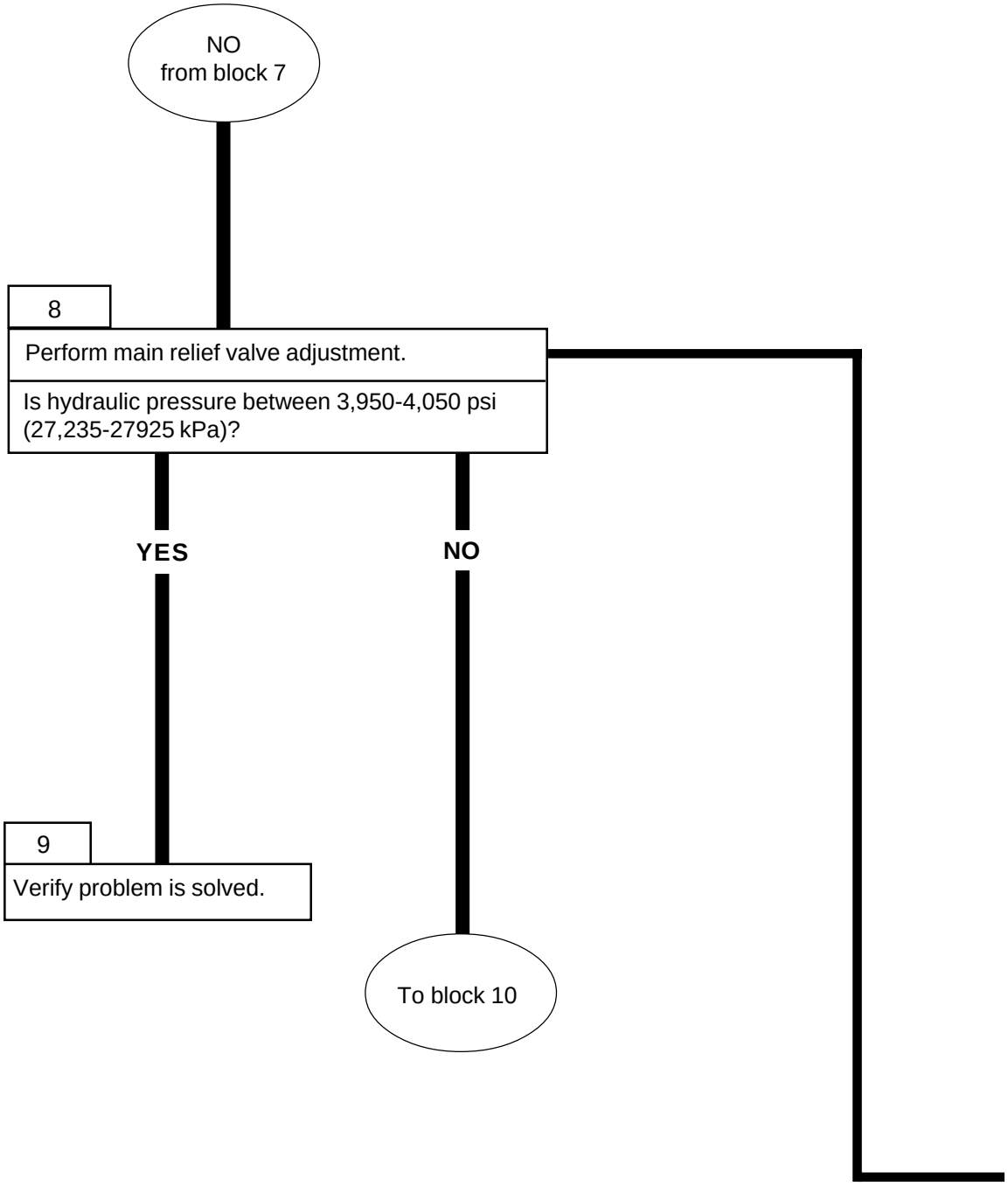
STEP 1

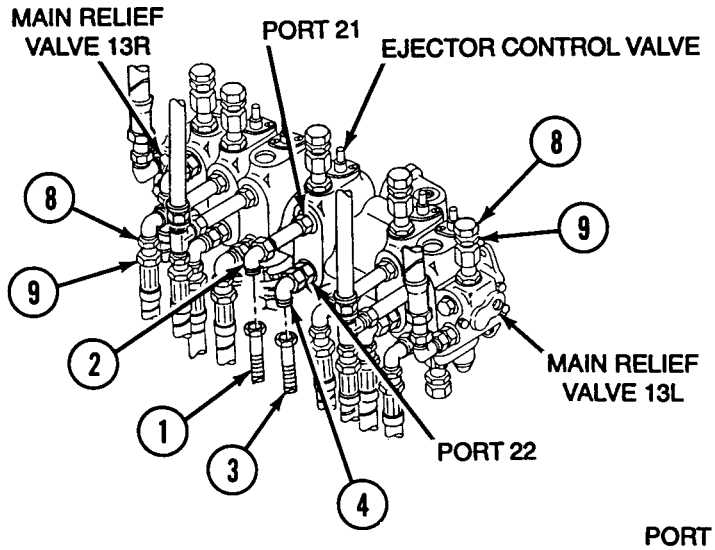
- To test 13R circuit, disconnect HYDR FLTR-IN-13R hose (1) from 13R high-pressure filter inlet port.
- Connect tee (2) between 13R high-pressure filter inlet port and HYDR FLTR-IN-13R hose (1). Connect pressure measuring device (3) to tee (2).
- Start vehicle engine and read pressure measuring device (3).
- With SPRUNG/UNSPRUNG control valve in SPRUNG mode, actuate left suspension control valve to RAISE position. Read pressure measuring device (3).
- Stop engine; relieve hydraulic pressure. Remove all test equipment and connect hoses.

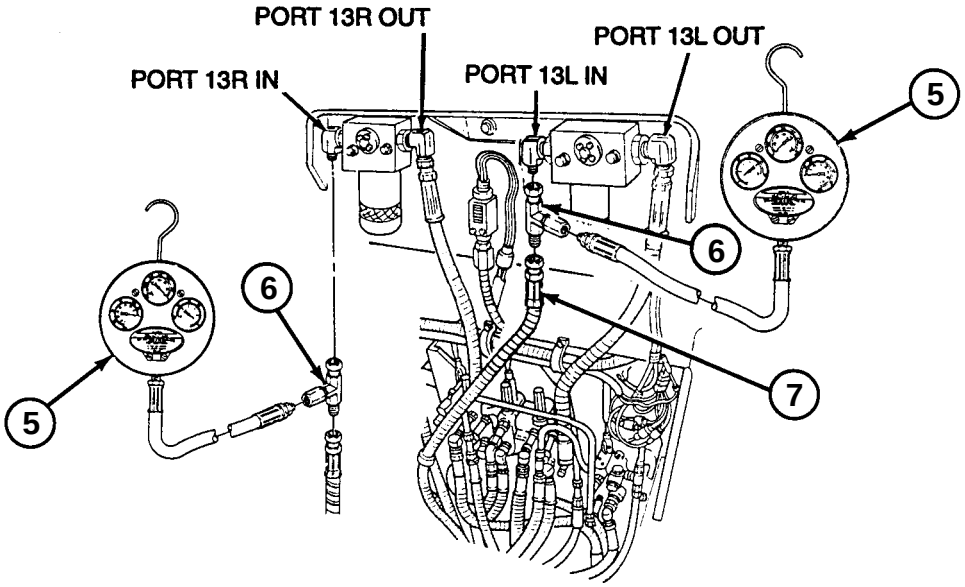
STEP 2

- To test 13L circuit, disconnect HYDR FLTR-IN-13L hose (4) from 13L high-pressure filter inlet port. Connect tee (2) and pressure measuring device (3) between 13L hose (4) and HYDR FLTR-IN-13L high-pressure filter inlet port.
- Using right suspension control valve, repeat the above test.
- Stop engine; relieve hydraulic pressure.

6 EJECTOR DOES NOT EXTEND OR RETRACT (CONTINUED)







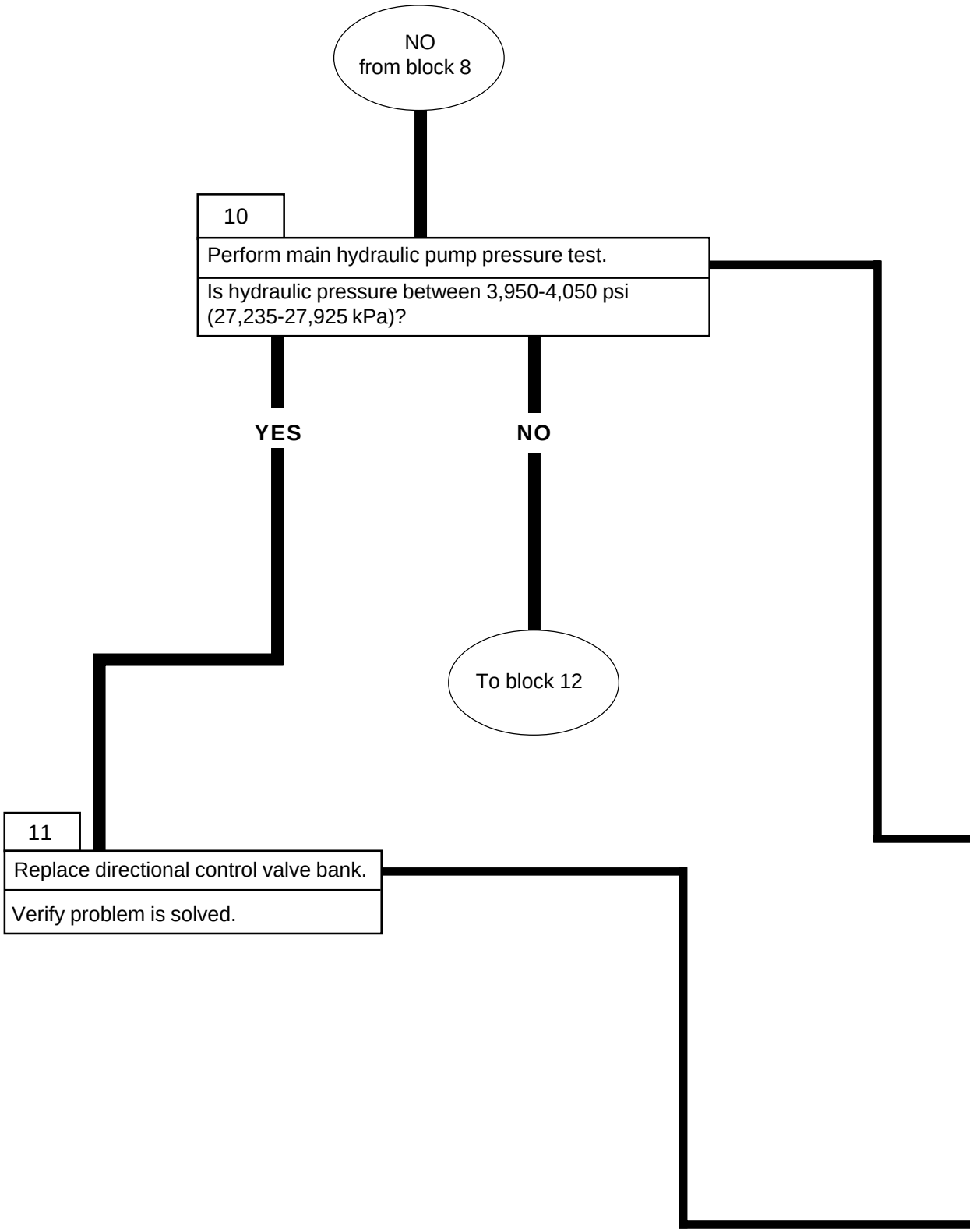
MAIN RELIEF VALVE ADJUSTMENT

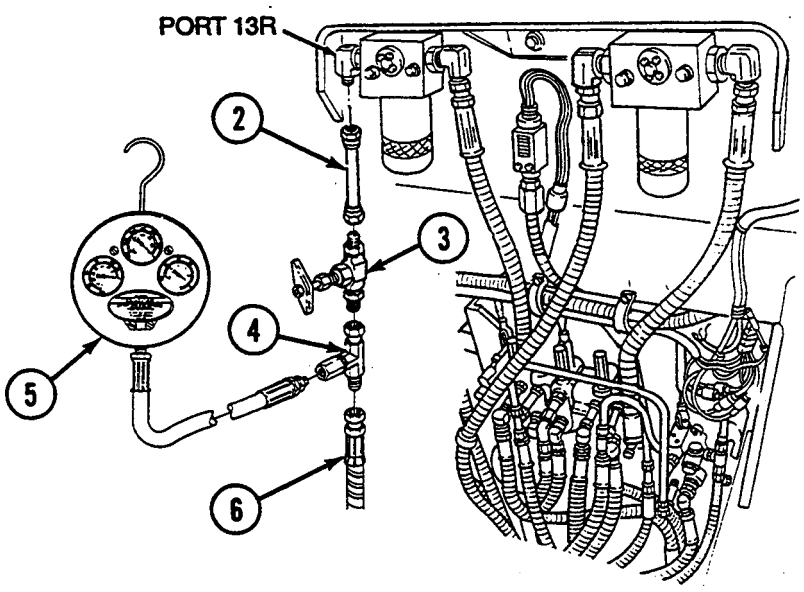
NOTE

Have suitable container ready to catch oil.

- Disable the ejector from the hydraulic system by disconnecting CONT VLV-21 hose (1) from elbow (2) at port 21 and CONT VLV-22 hose (3) from elbow (4) at port 22 on ejector control valve. Cap and plug hoses and fittings.
- With pressure measuring device (5) and tee (6) still connected to HYDR-FLTR-IN 13L hose (7) and high-pressure filter inlet port 13L and SPRUNG/UNSPRUNG lever 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. Read pressure measuring device (5). Adjust the main relief valve 13L by loosening jamnut (8) and rotating adjustment screw (9) clockwise to increase pressure;counterclockwise to decrease pressure. When hydraulic pressure is within limits, tighten jamnut (8).
- Stop engine; relieve hydraulic pressure.
- Move test equipment to high-pressure filter inlet port 13R and repeat the previous steps using the right-hand suspension control lever.
- Stop engine; relieve hydraulic pressure.

6 EJECTOR DOES NOT EXTEND OR RETRACT (CONTINUED)





MAIN HYDRAULIC PUMP PRESSURE TEST

WARNING

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

Ensure globe valve 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.

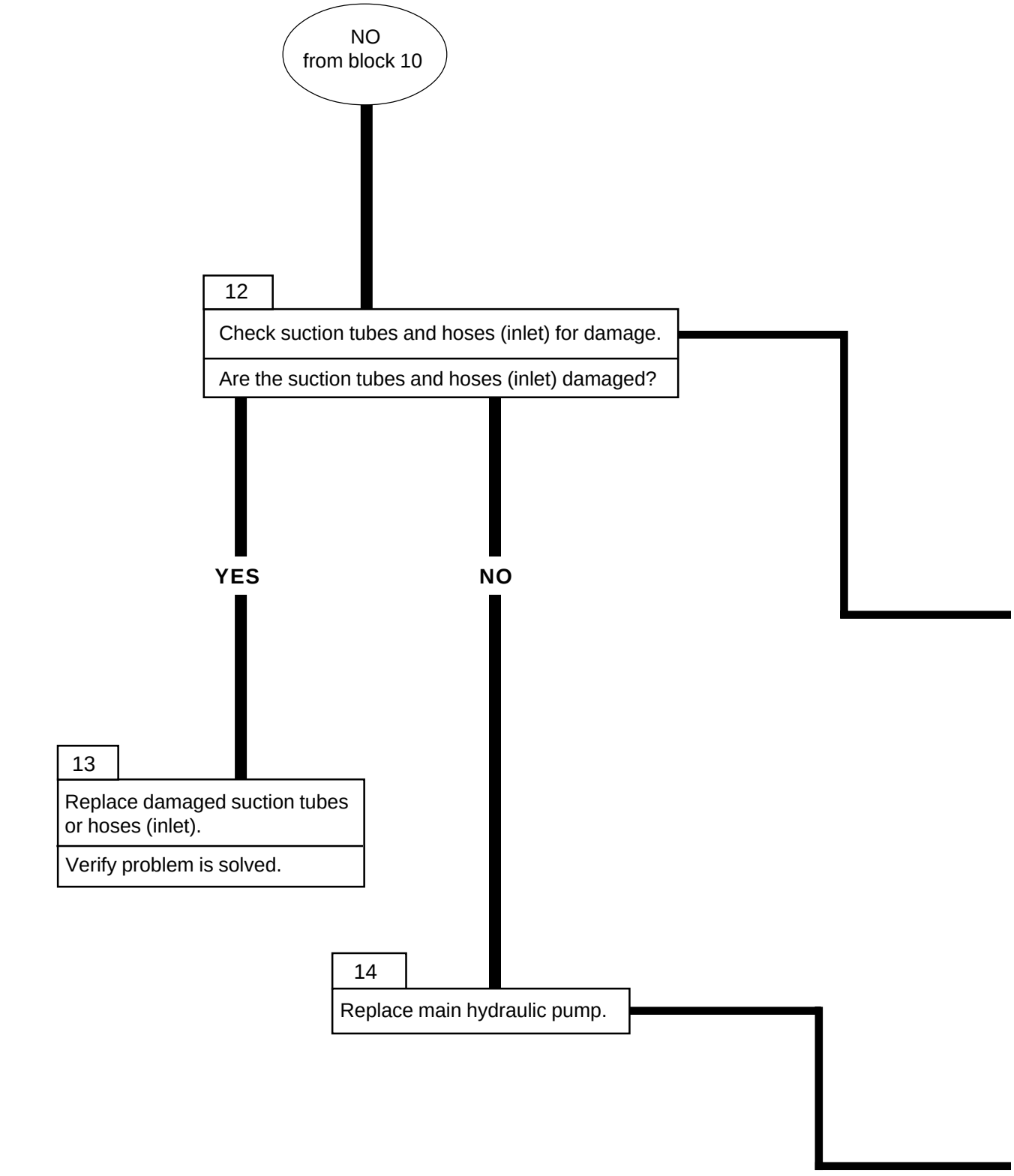
NOTE

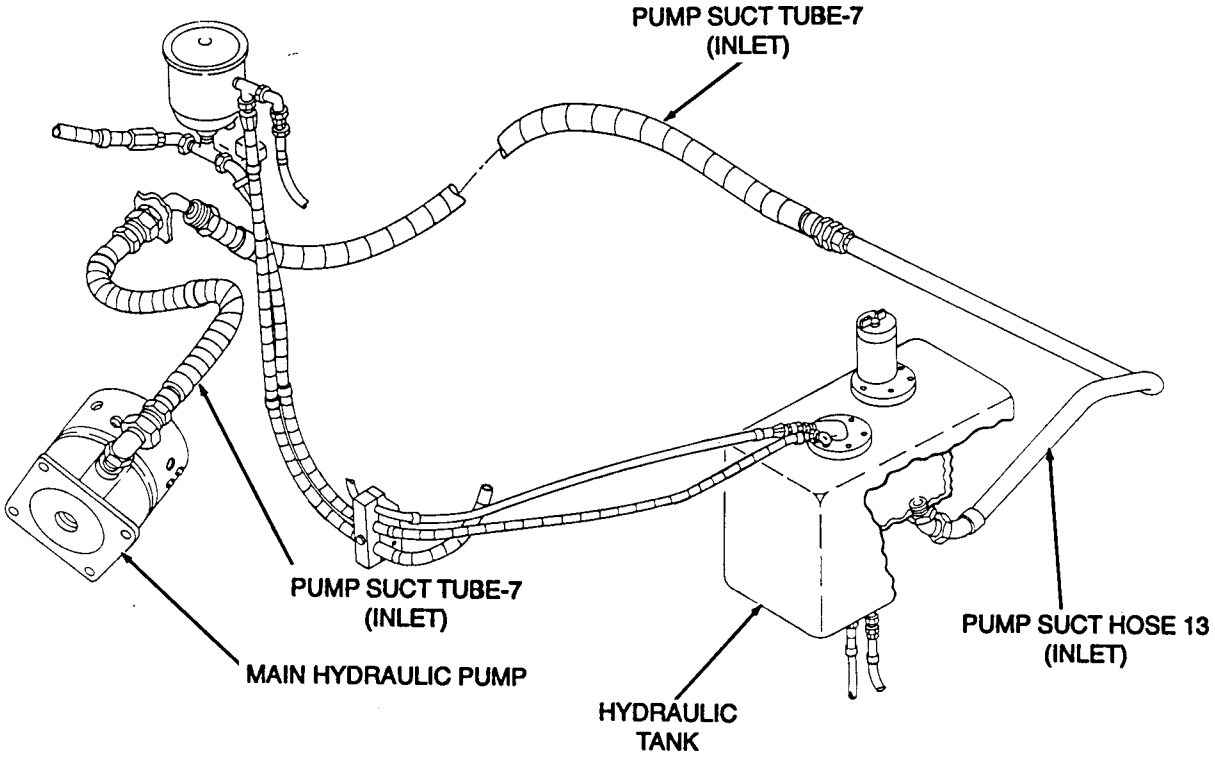
Have suitable container ready to catch oil.

- Disconnect tee (4) from 13R high pressure filter inlet port, install coupling tube (2), globe valve (3), tee (4), and pressure measuring device (5) between HYDR FLTR-IN-13R hose (6) and high-pressure filter inlet port 13R.
- Have assistant start engine and allow to idle. Slowly close globe valve (3) until pressure reaches 3,950-4,050 psi (27,235-27,925 kPa).
- Open globe valve (3). Stop engine; relieve hydraulic pressure. Remove all test equipment and connect hoses.

Refer to TM 5-2350-262-20-2

6 EJECTOR DOES NOT EXTEND OR RETRACT (CONTINUED)

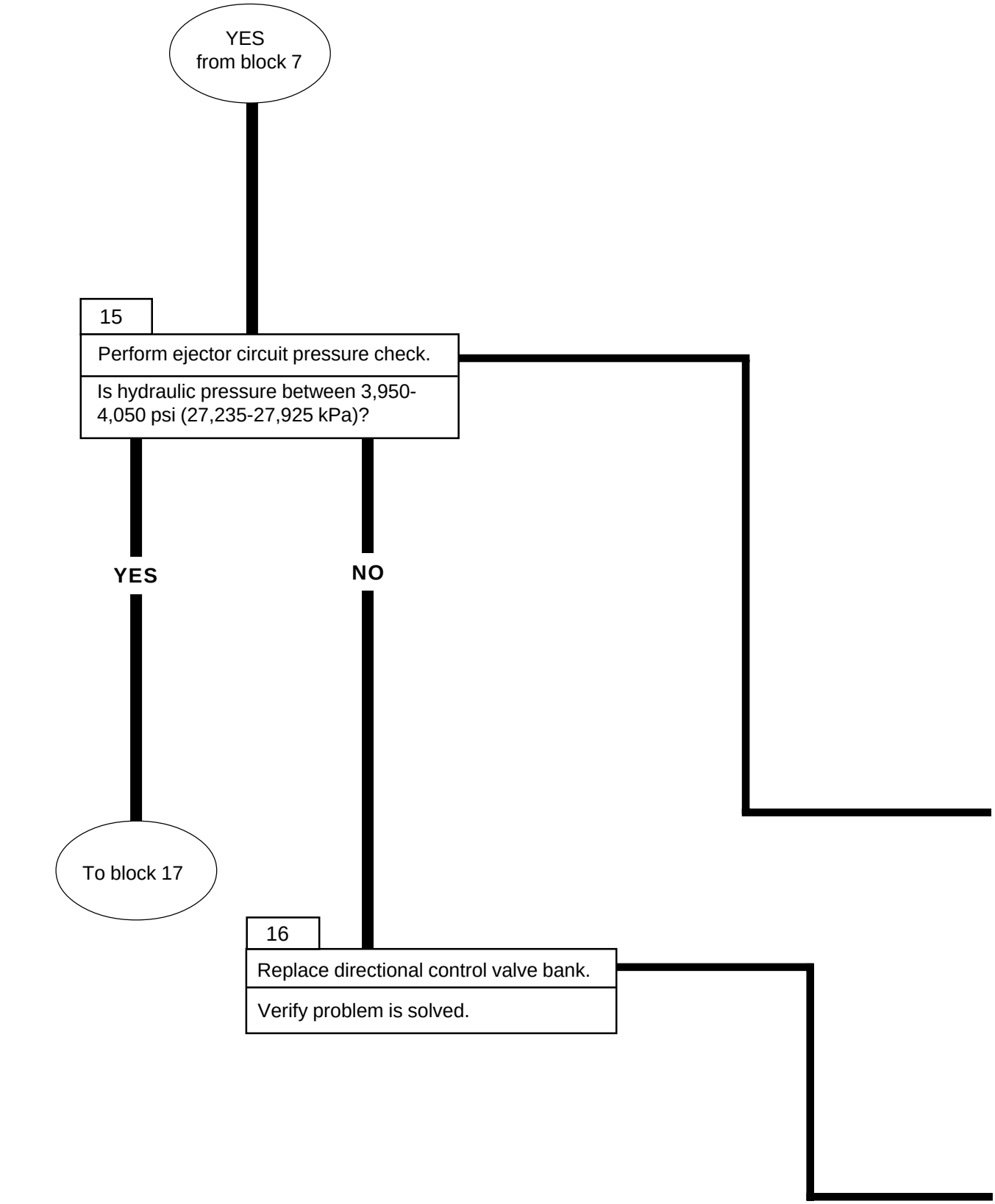


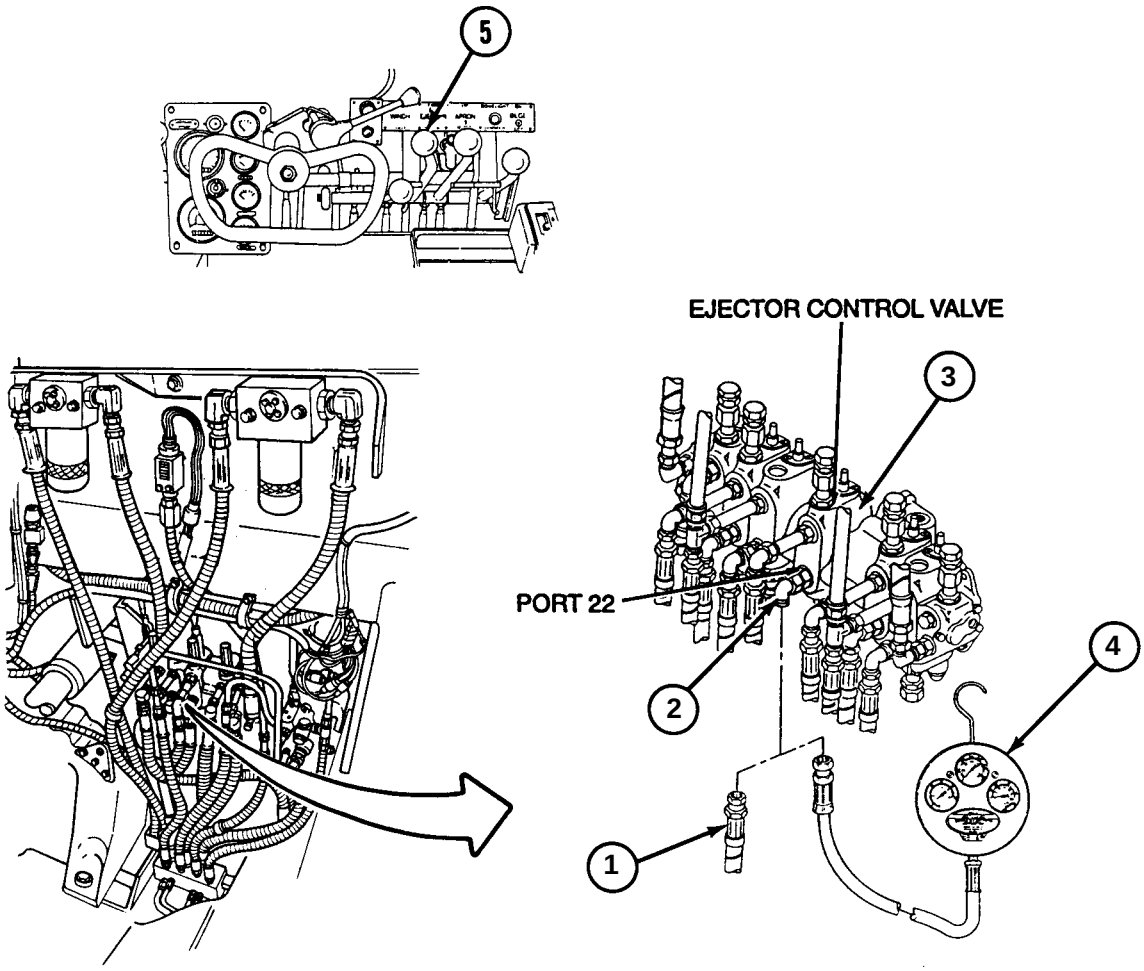


Inspect suction tubes and hoses (inlet).

Notify Direct Support maintenance.

6 EJECTOR DOES NOT EXTEND OR RETRACT (CONTINUED)





EJECTOR CIRCUIT PRESSURE 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 to personnel.

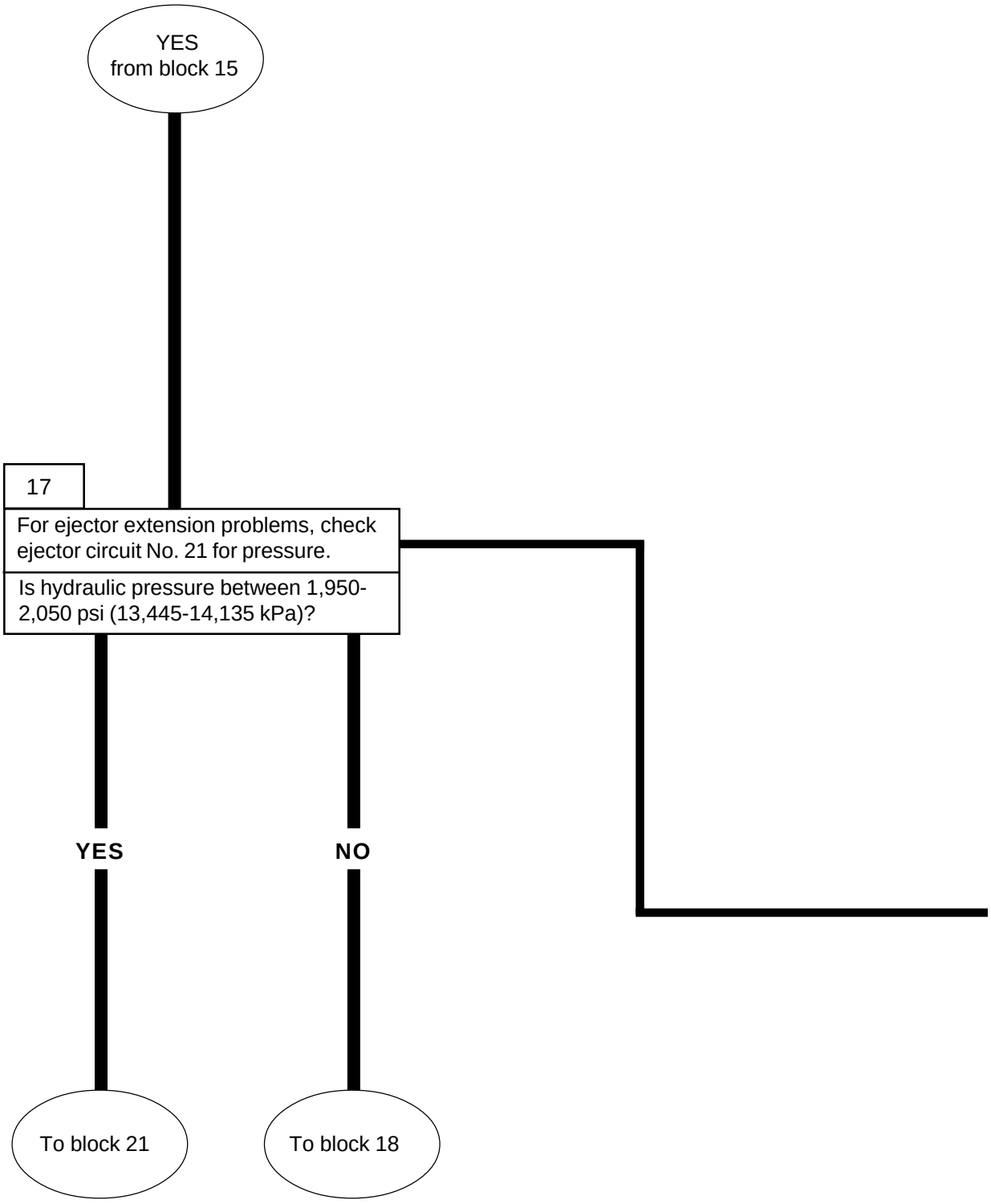
NOTE

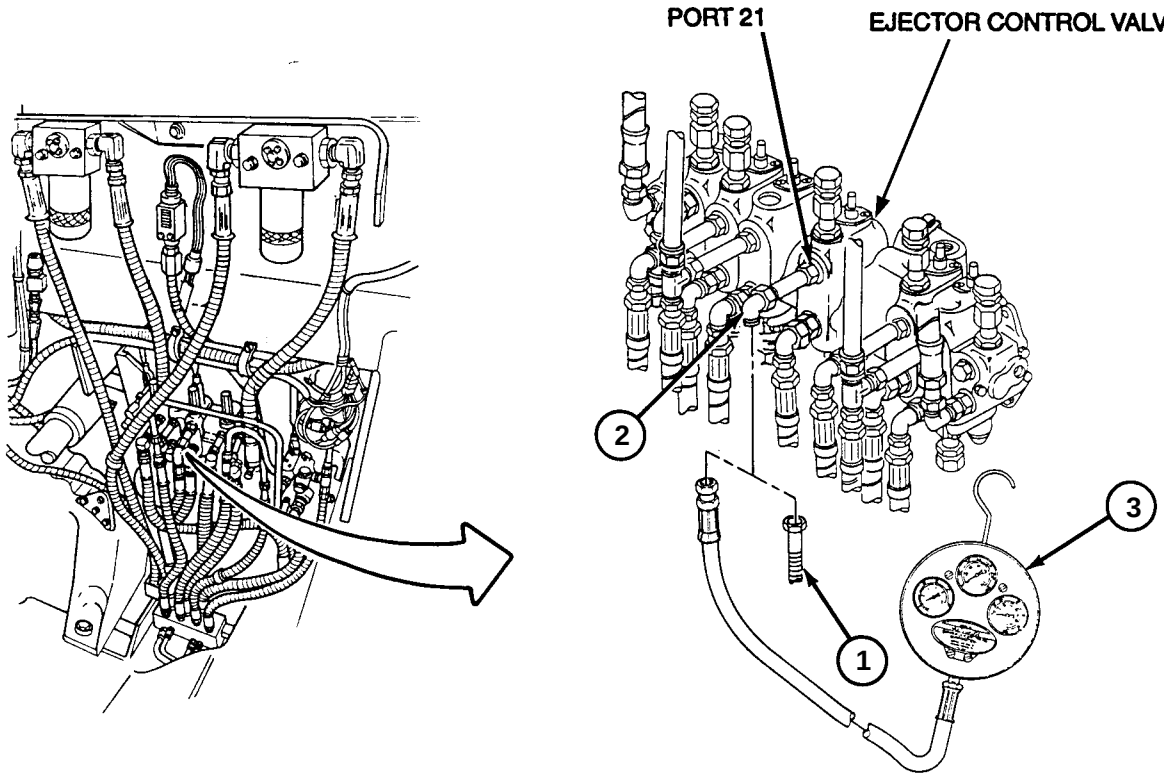
Have suitable container ready to catch oil.

- Remove all test equipment and connect lines.
- Disconnect hose (1) from ejector control valve port 22 elbow (2) on the ejector control valve (3). Plug hose (1).
- Install pressure measuring device (4) on elbow (2) in port 22.
- Start engine and actuate EJECTOR CONTROL lever (5) to BACK position. Read pressure measuring device (4). Pressure should be 3,950-4,050 psi (27,235-27,925kPa).
- Stop engine; relieve hydraulic pressure. Remove all test equipment and connect hoses.

Refer to TM 5-2350-262-20-2.

6 EJECTOR DOES NOT EXTEND OR RETRACT (CONTINUED)





EJECTOR CIRCUIT PRESSURE 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.

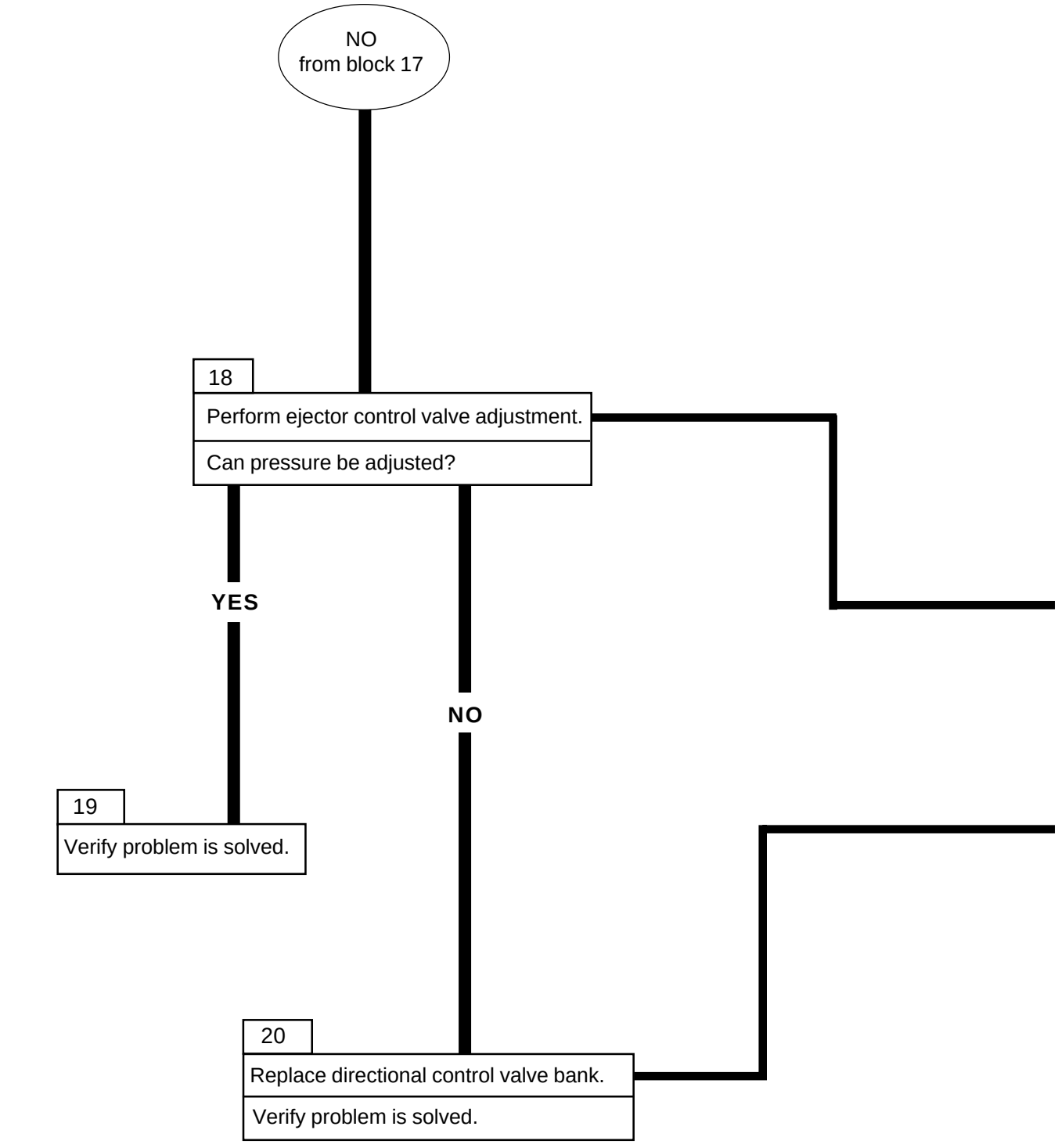
Start engine, move ejector halfway forward, stop engine, and relieve hydraulic pressure.

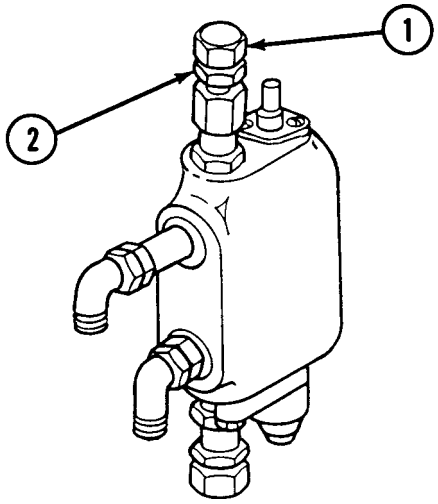
NOTE

Have suitable container ready to catch oil.

- Disconnect line (1) from elbow (2) and cap line.
- Connect pressure measuring device (3) to elbow (2) on port 21 of ejector control valve.
- Have assistant start engine and hold EJECTOR CONTROL lever in the FORWARD position. Read pressure measuring device (3).

6 EJECTOR DOES NOT EXTEND OR RETRACT (CONTINUED)





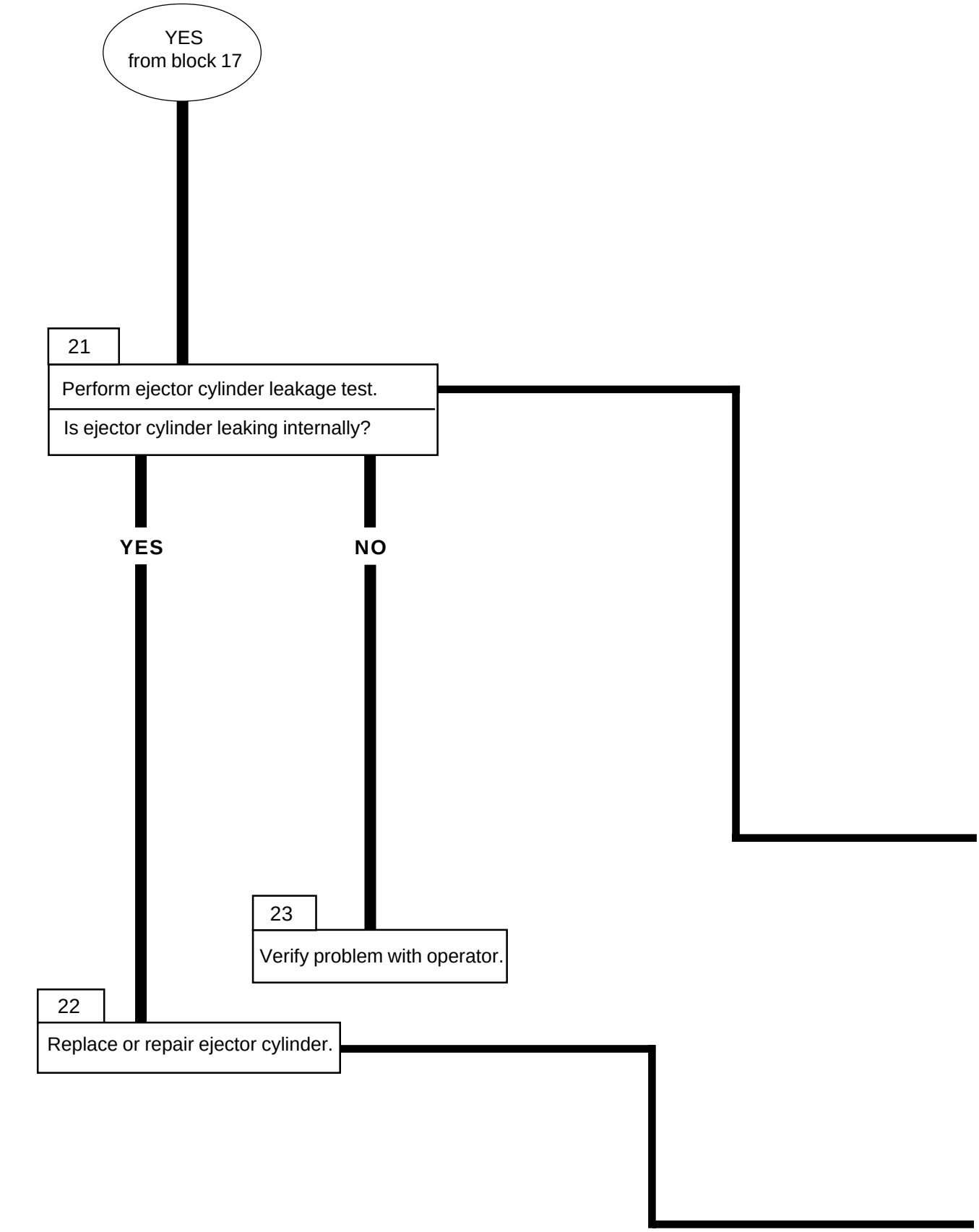
EJECTOR CONTROL VALVE

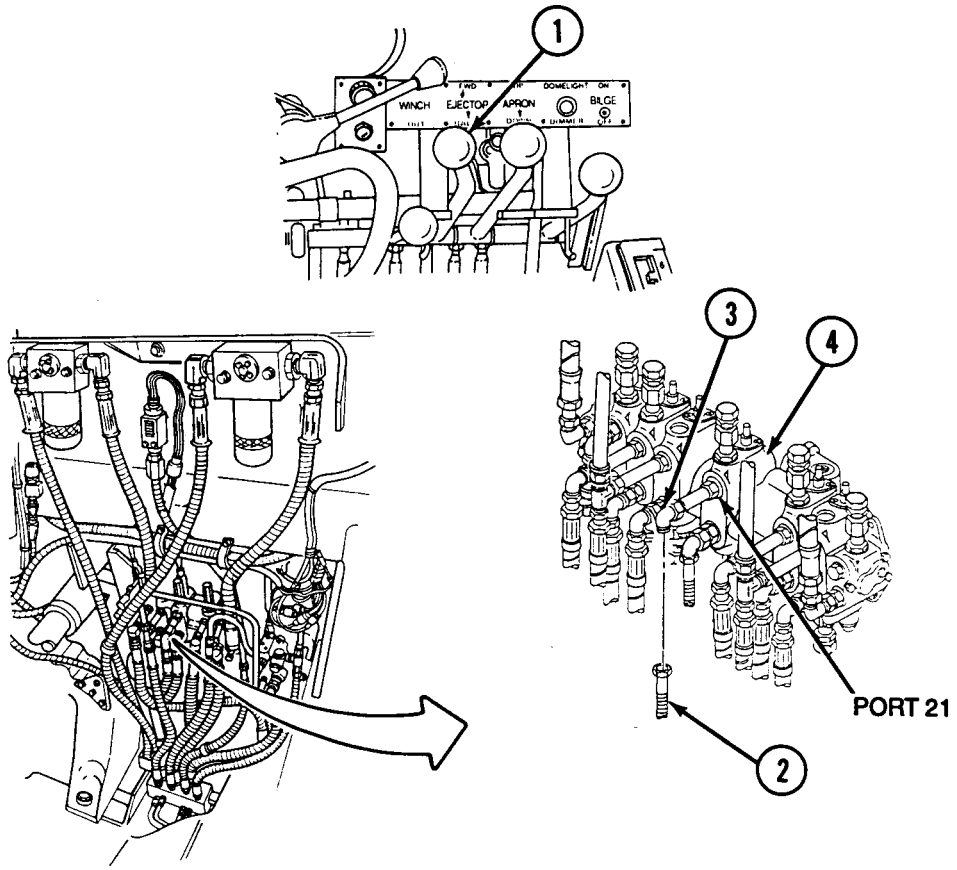
EJECTOR CONTROL VALVE ADJUSTMENT

- With engine still at idle speed and EJECTOR CONTROL lever in FORWARD position, loosen jamnut (1) on ejector control valve and turn adjusting screw (2) clockwise to increase pressure; counterclockwise to decrease pressure. Pressure should be 1,950-2,050 psi (13,445-14,135 kPa).
- Stop engine; relieve hydraulic pressure. Remove all test equipment and connect hoses.

Refer to TM 5-2350-262-20-2.

6 EJECTOR DOES NOT EXTEND OR RETRACT (CONTINUED)





EJECTOR CYLINDER LEAKAGE TEST

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

NOTE

Have suitable container ready to catch oil

- Have assistant actuate ejector control handle (1) to move ejector forward 3/4 of full travel.
- Stop engine and relieve hydraulic pressure.
- Remove pressure measuring device. Plug hose (2) and cap elbow (3).
- Start engine and have assistant hold ejector control lever in BACK position for one minute. Mark position of ejector at side of hull and continue to hold valve lever in BACK position for one more minute. Check position of ejector while still holding valve lever in BACK position. If ejector has moved more than 0.5 in. (13mm), the ejector cylinder is leaking excessively.
- Stop engine; relieve hydraulic pressure and connect line.

Refer to TM 5-2350-262-20-1

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

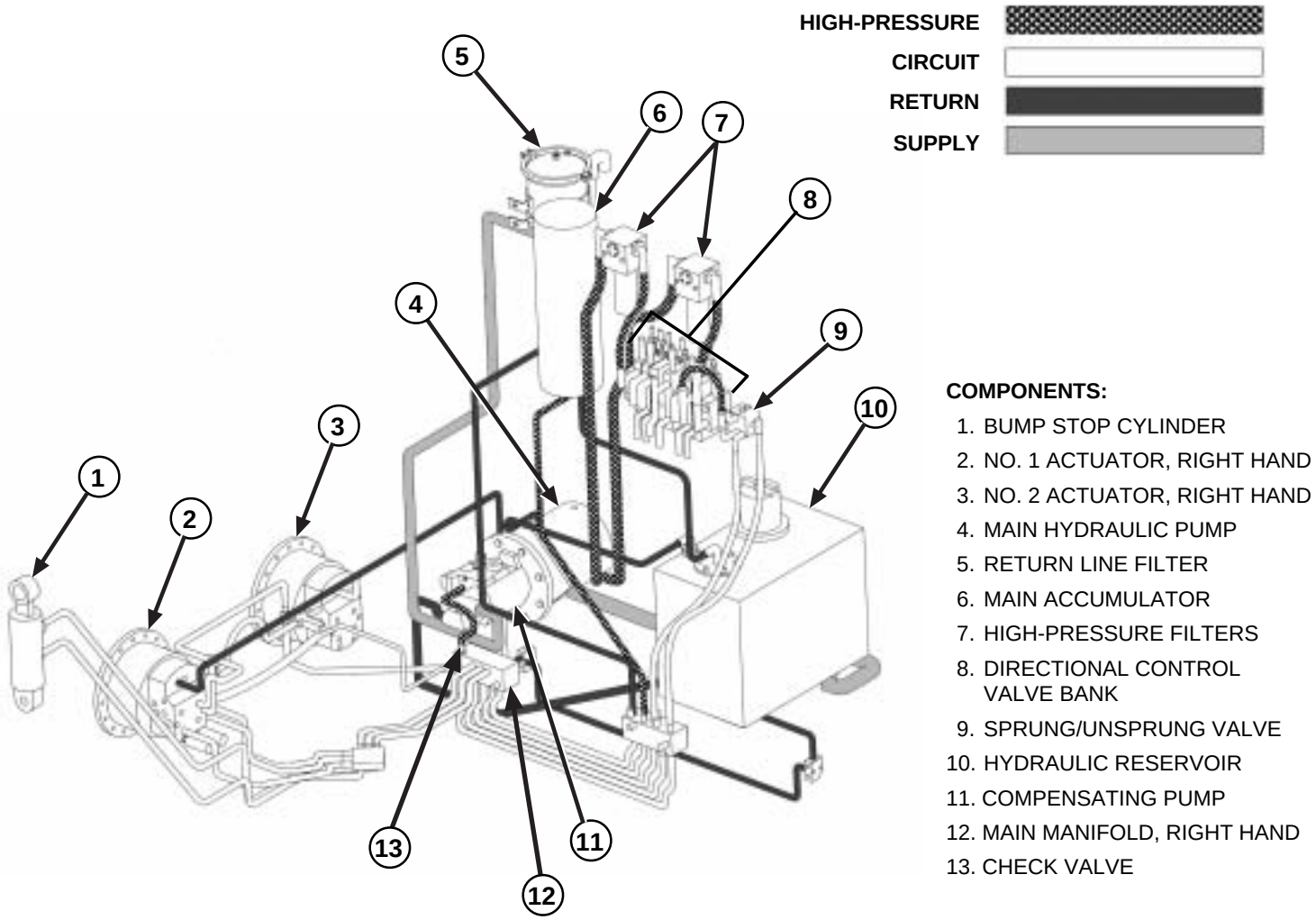
SPRUNG mode provides for a smooth ride up to 30 mph (48km/h) and is used for over the road marches and parking of the vehicle. Hydraulic pressure is supplied to the front actuators through line 9.

WARNING

High pressure is present in the M9 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.

NOTE

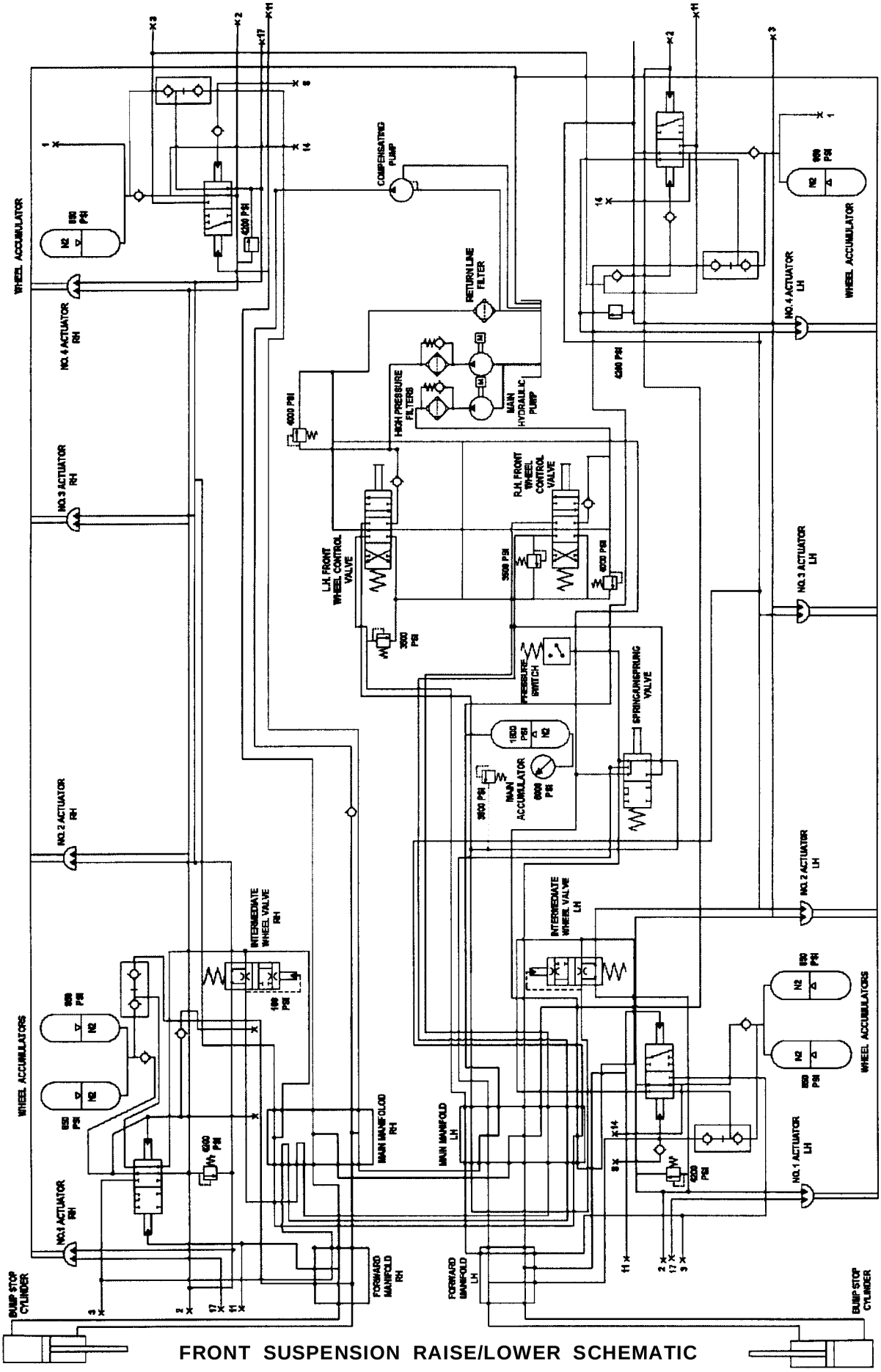
Use these procedures to troubleshoot either left or right front of vehicle.



COMPONENTS:

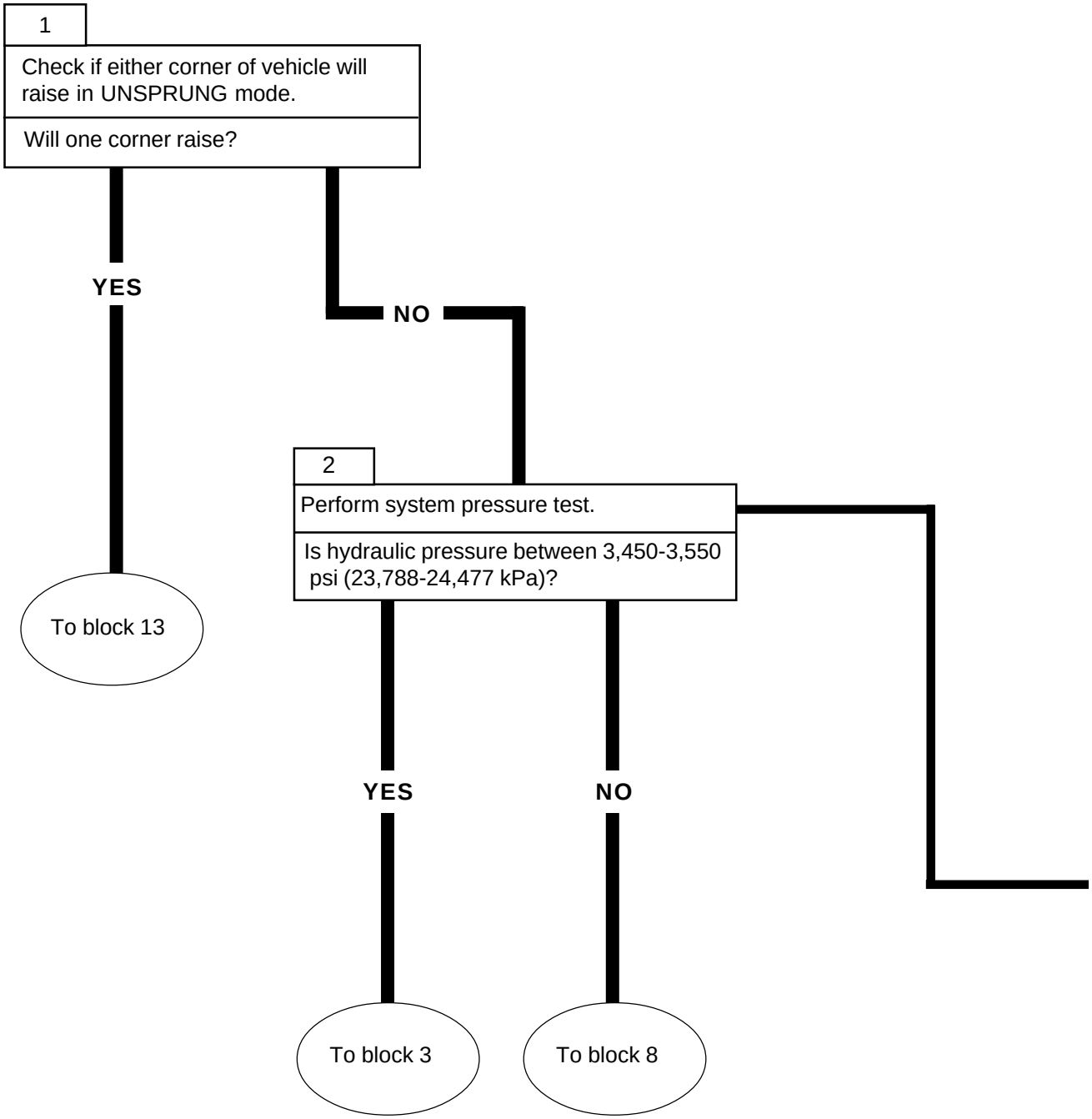
1. BUMP STOP CYLINDER
2. NO. 1 ACTUATOR, RIGHT HAND
3. NO. 2 ACTUATOR, RIGHT HAND
4. MAIN HYDRAULIC PUMP
5. RETURN LINE FILTER
6. MAIN ACCUMULATOR
7. HIGH-PRESSURE FILTERS
8. DIRECTIONAL CONTROL VALVE BANK
9. SPRUNG/UNSPRUNG VALVE
10. HYDRAULIC RESERVOIR
11. COMPENSATING PUMP
12. MAIN MANIFOLD, RIGHT HAND
13. CHECK VALVE

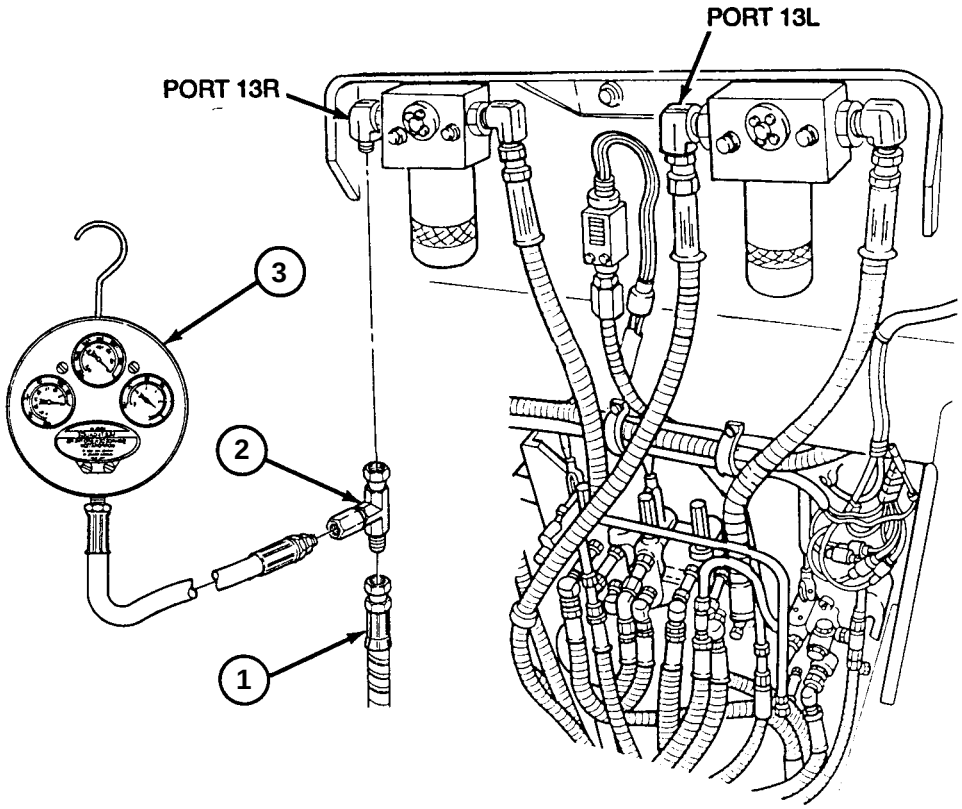
FRONT SUSPENSION RAISE/LOWER CIRCUIT



FRONT SUSPENSION RAISE/LOWER SCHEMATIC

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





SYSTEM PRESSURE TEST

WARNING

Before performing any hydraulic troubleshooting in bowl, move ejector forward and engage ejector lock. Failure to comply may result in severe injury or death to personnel.

NOTE

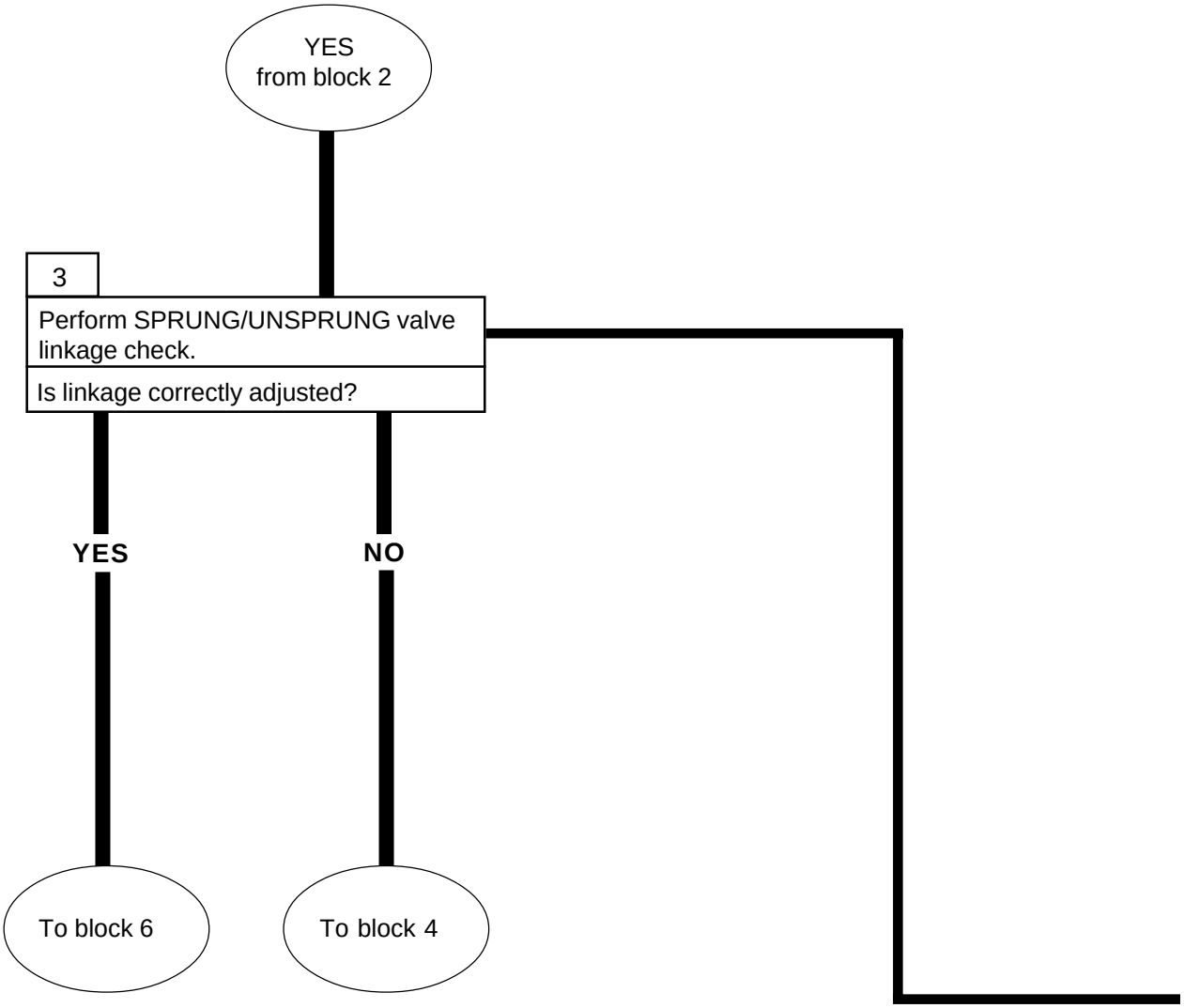
If right corner will not raise in UNSPRUNG mode, check 13L circuit using the right wheel control.

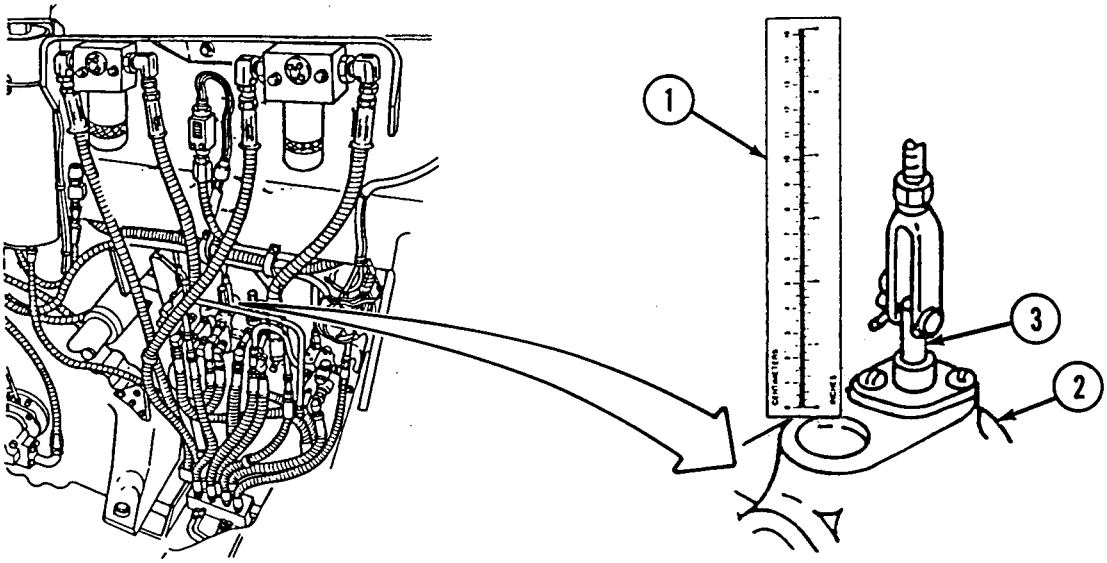
If left corner will not raise in UNSPRUNG mode, check 13R circuit using the left wheel control.

Have suitable container ready to catch oil.

- Start engine, move ejector forward, engage ejector lock, stop engine, and relieve hydraulic pressure.
- Disconnect inlet hose (1) from appropriate high-pressure filter inlet port.
- Connect tee (2) and pressure measuring device (3) between inlet hose (1) and high-pressure filter inlet port 13R or 13L.
- Have assistant start engine and move SPRUNG/UNSPRUNG lever to UNSPRUNG and SUSPENSION CONTROL lever to RAISE.
- Read pressure measuring device (3).
- Move SUSPENSION CONTROL lever to NEUTRAL.
- Stop engine; relieve hydraulic pressure. Remove all test equipment and connect hose.

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





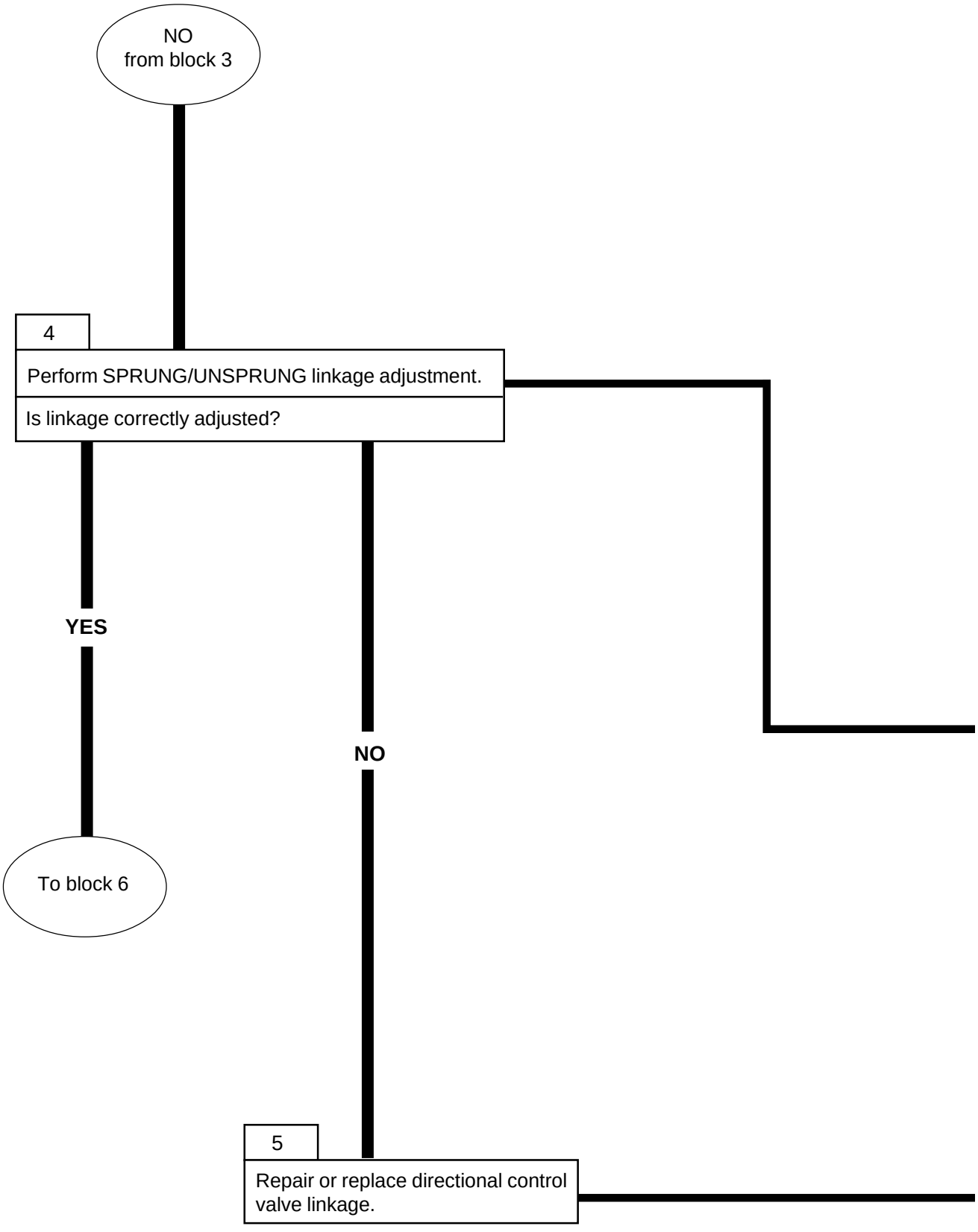
CONTROL SPRUNG/UNSPRUNG VALVE LINKAGE CHECK

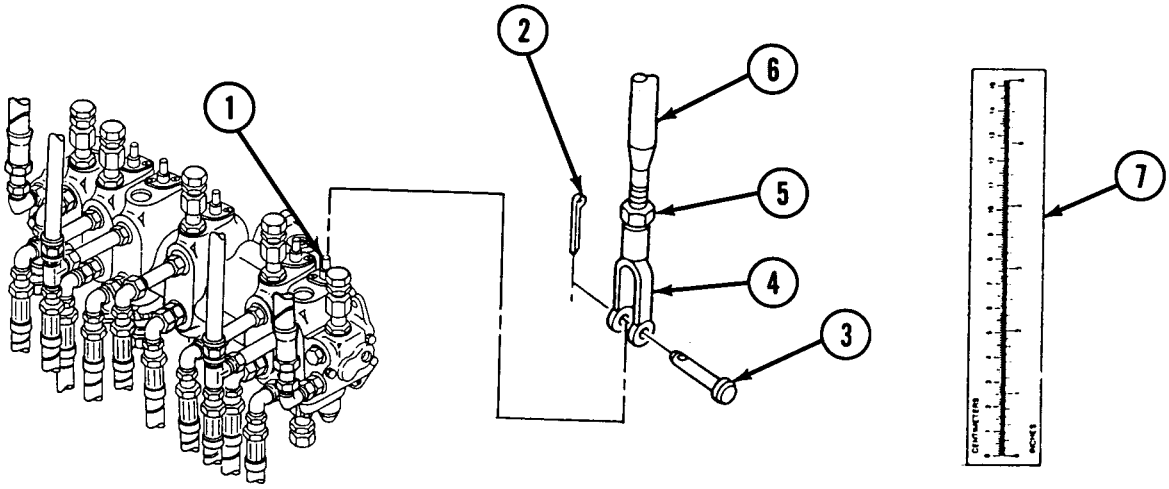
WARNING

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 to personnel.

- Hold measuring device (1) on face of SPRUNG/UNSPRUNG control valve (2). Have assistant move SPRUNG/UNSPRUNG lever between SPRUNG and UNSPRUNG mode. Measure distance plunger (3) travels as lever is moved. Distance of travel should be 9/32 in. (7mm).

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





SPRUNG/UNSPRUNG LINKAGE ADJUSTMENT

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 the same way. This procedure covers SPRUNG/UNSPRUNG control rod.

- Note position of control valve plunger (1) when SPRUNG/UNSPRUNG control lever is in NEUTRAL (off) position.

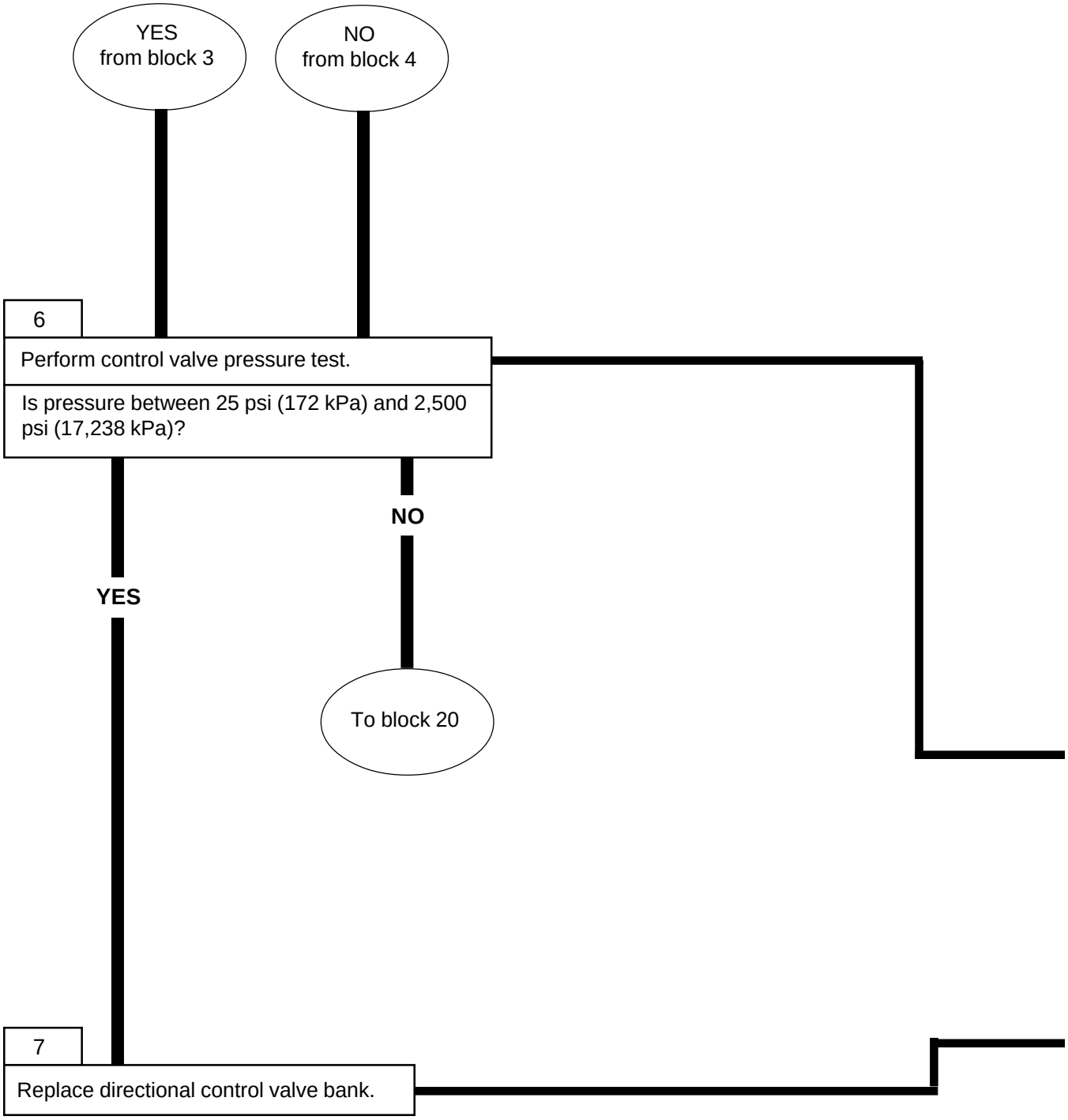
NOTE

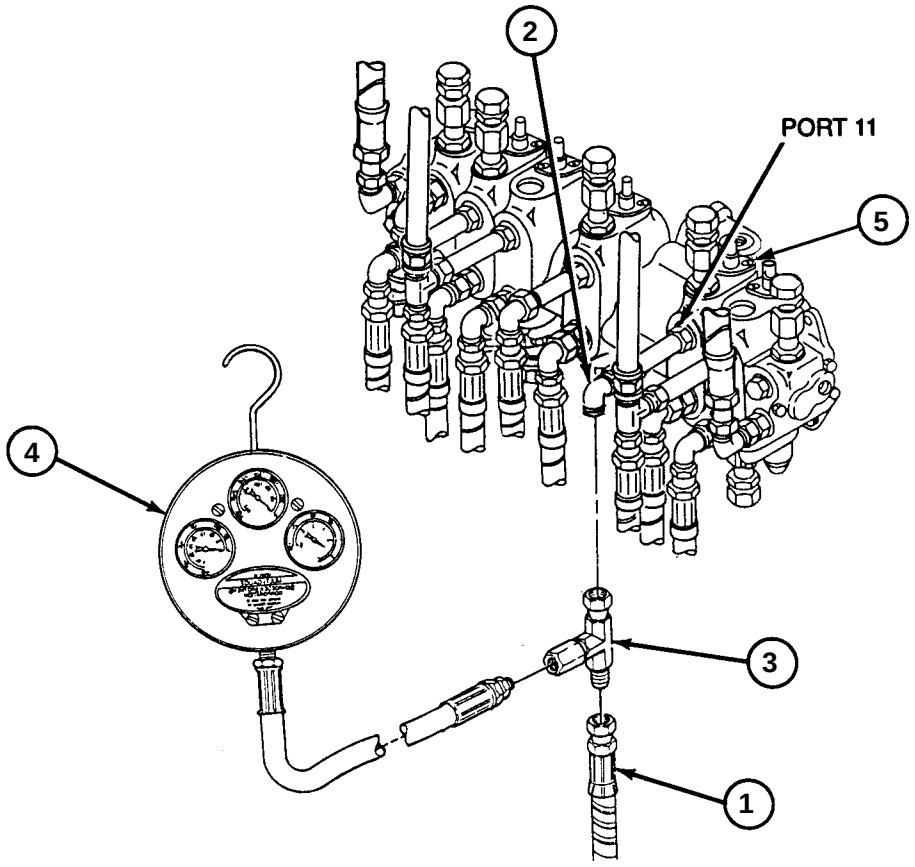
Normal control valve plunger travel is 9/32 in. (7 mm).

- Remove cotter pin (2), straight pin (3), and clevis (4) from control valve plunger (1). Discard cotter pin (2).
- Loosen jamnut (5). Turn clevis (4) clockwise to shorten rod (6); counterclockwise to lengthen rod (6).
- Hold measuring device (7) on face of SPRUNG/UNSPRUNG control valve. Have assistant move SPRUNG/UNSPRUNG lever between SPRUNG and UNSPRUNG mode. Measure distance of plunger travel.
- Coat threads of rod (6) with sealing compound primer and sealing compound. Tighten jamnut (5) against clevis (4).
- Connect clevis (4) to control valve plunger (1) with straight pin (3) and new cotter pin (2).

Refer to TM 5-2320-262-20-1

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





CONTROL VALVE PRESSURE TEST

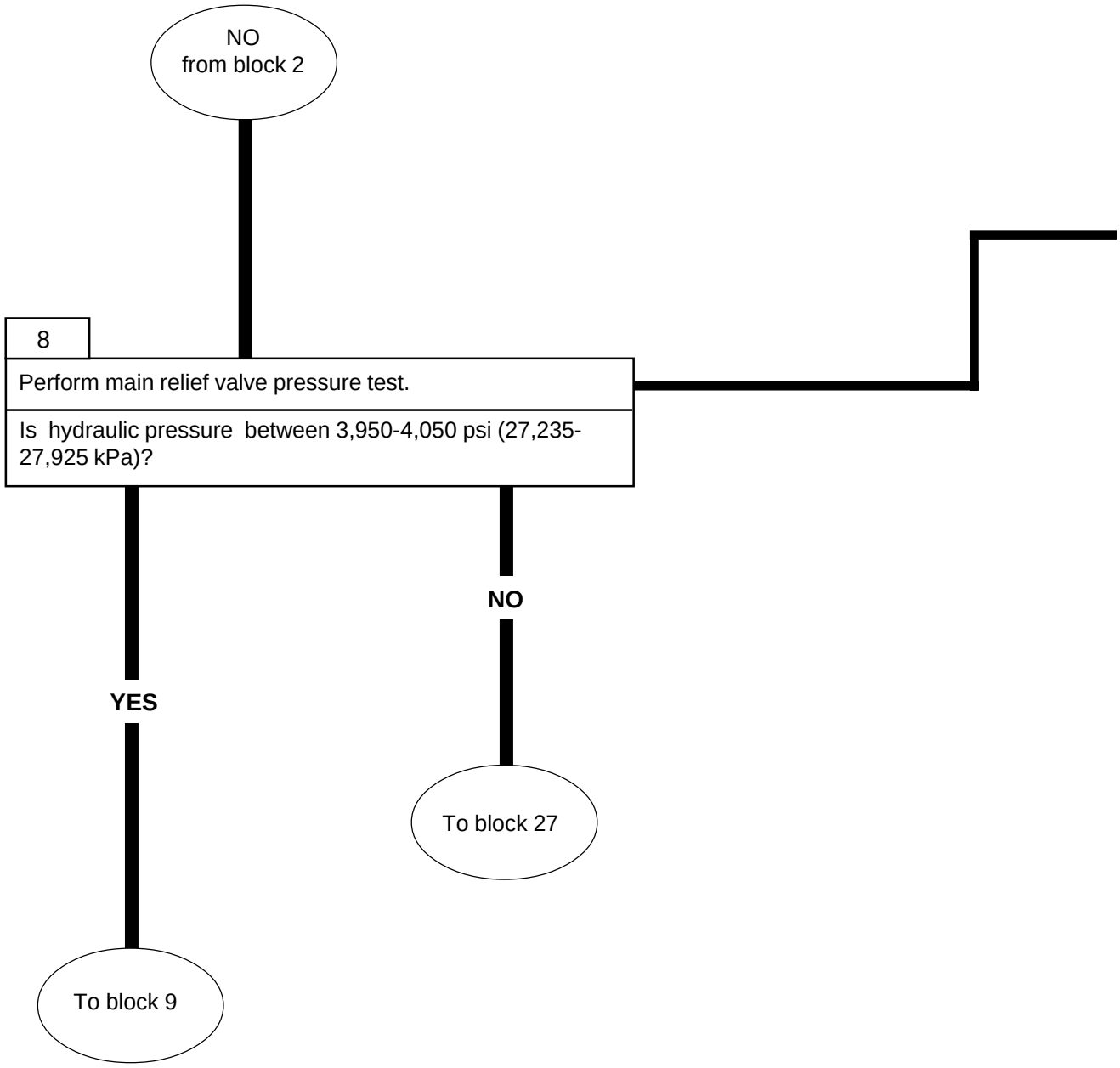
NOTE

Have suitable container ready to catch oil.

- Disconnect UNSPR VLV-11 hose (1) from elbow (2).
- Install tee (3) and pressure measuring device (4) between UNSPR VLV-11 hose (1) and elbow (2) on port 11 of SPRUNG/UNSPRUNG control valve (5).
- Start engine and have assistant move SPRUNG/UNSPRUNG lever between SPRUNG and UNSPRUNG several times. Hydraulic pressure should be less than 25 psi (172 kPa) in SPRUNG mode and greater than 2,500 psi (17,238 kPa) in UNSPRUNG mode.
- Stop engine; relieve hydraulic pressure. Remove all test equipment and connect hose.

Refer to TM 5-2350-262-20-2.

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



MAIN RELIEF VALVE PRESSURE TEST

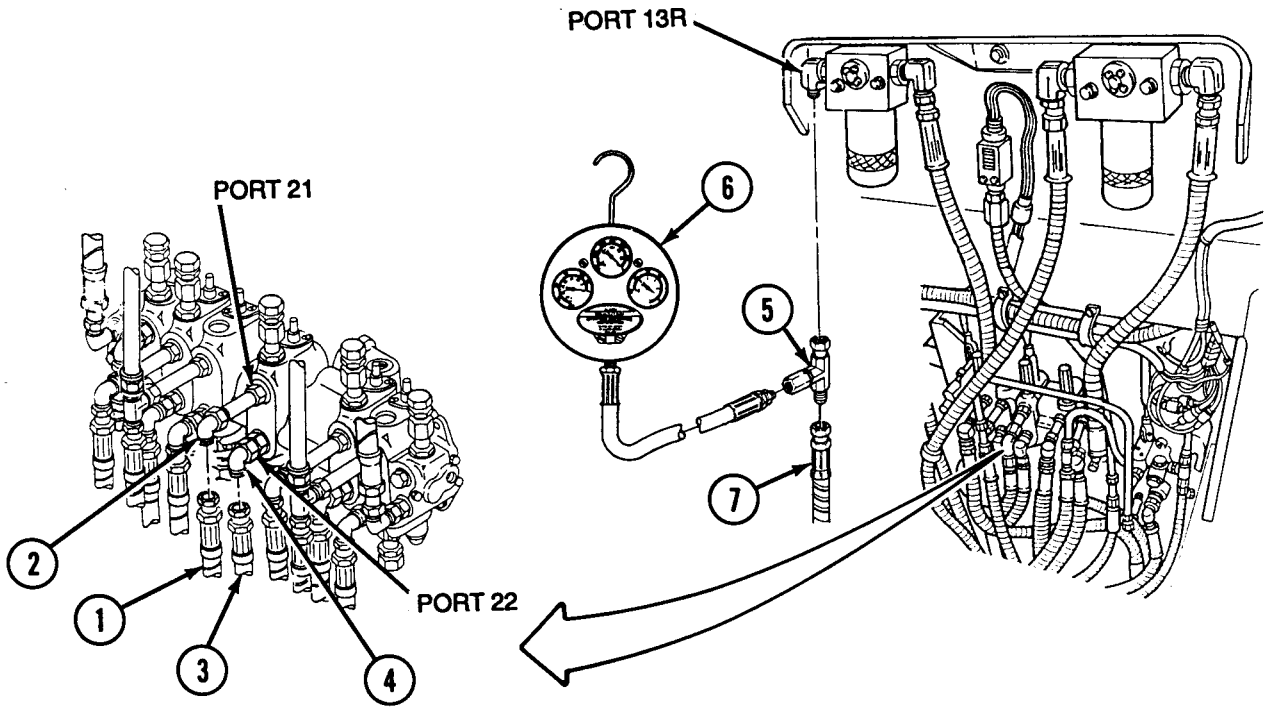
WARNING

Before performing any hydraulic troubleshooting in 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.

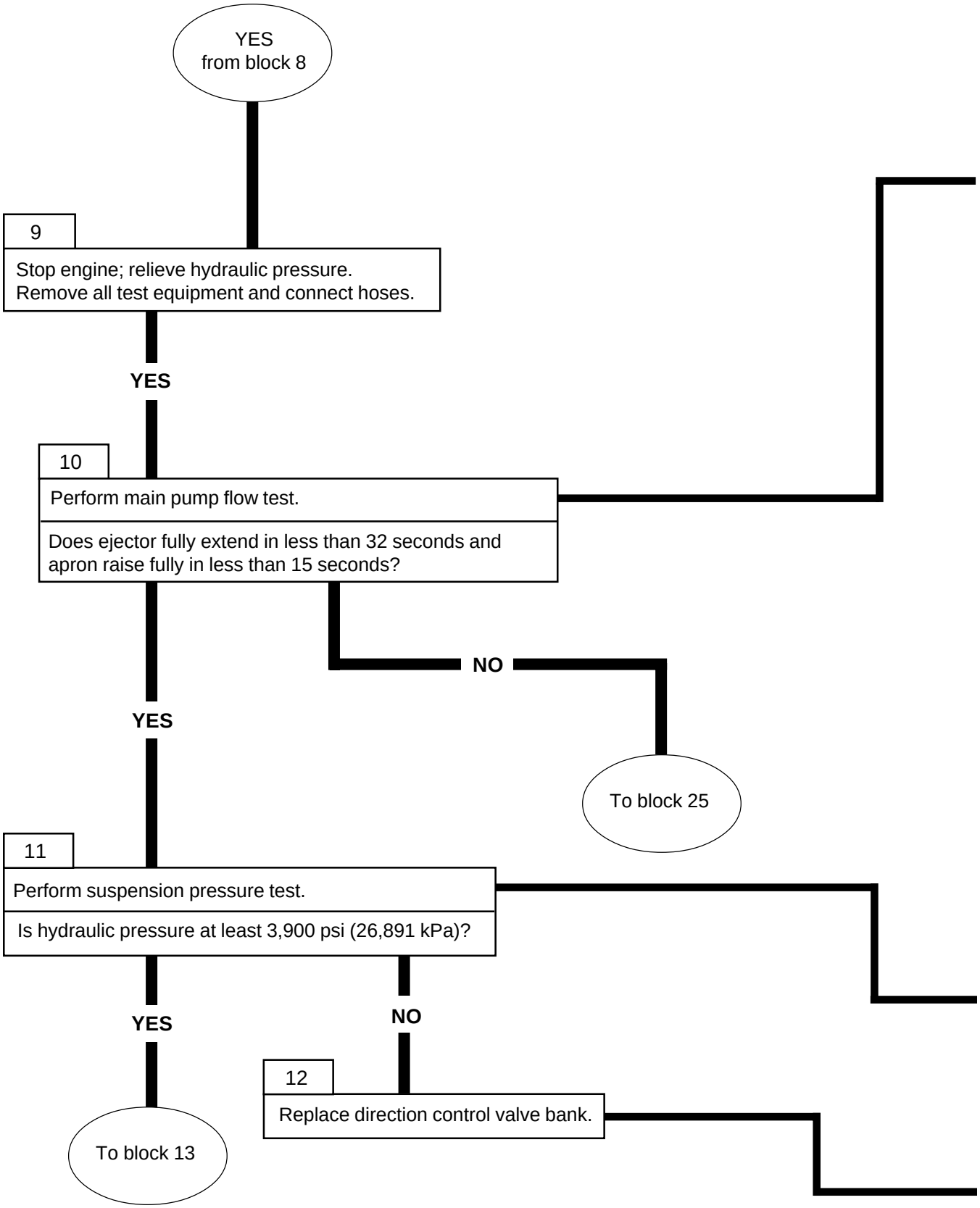
NOTE

Have suitable container ready to catch oil.

- Have assistant start engine and move ejector forward, stop engine and relieve hydraulic pressure.
- Disable ejector by disconnecting CONT VLV-21 hose (1) from elbow (2) at port 21 and CONT VLV-22 hose (3) from elbow (4) at port 22 on ejector control valve. Cap and plug hoses and fittings.
- Connect tee (5) and pressure measuring device (6) between HYDR FLTR-IN-13R hose (7) and high pressure inlet port 13R.
- Have assistant start engine, move SPRUNG/UNSPRUNG lever to SPRUNG and move EJECTOR CONTROL lever to BACK. Read pressure measuring device (6).
- While simultaneously holding EJECTOR CONTROL lever in BACK, have assistant move right-hand SUSPENSION CONTROL lever to RAISE. Read pressure measuring device (6).



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



MAIN PUMP FLOW TEST

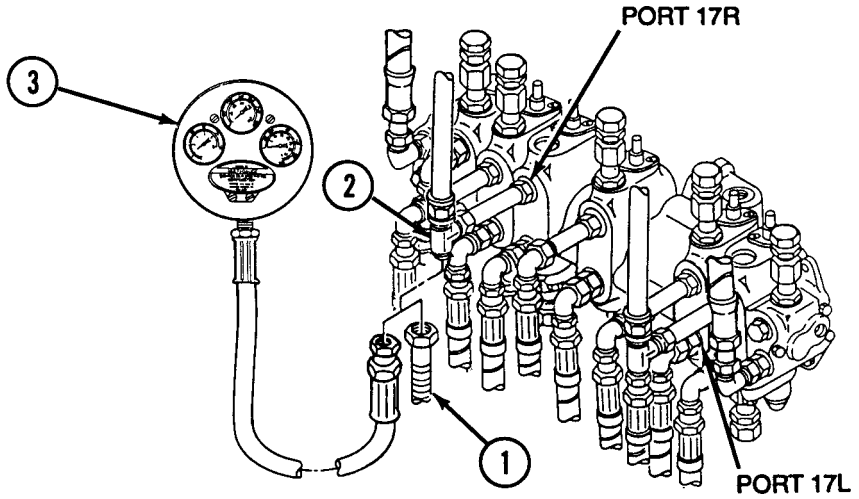
WARNING

Remove all tools and exit bowl before performing this test. Failure to comply may result in severe injury to personnel or damage to equipment.

NOTE

An 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.

- Start engine and allow engine to idle (750-850 rpm).
- With ejector fully retracted, hold EJECTOR CONTROL lever in FORWARD, and note length of time required for ejector to fully extend.
- 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.
- Stop engine; relieve hydraulic pressure.



SUSPENSION PORT 17 PRESSURE TEST

NOTE

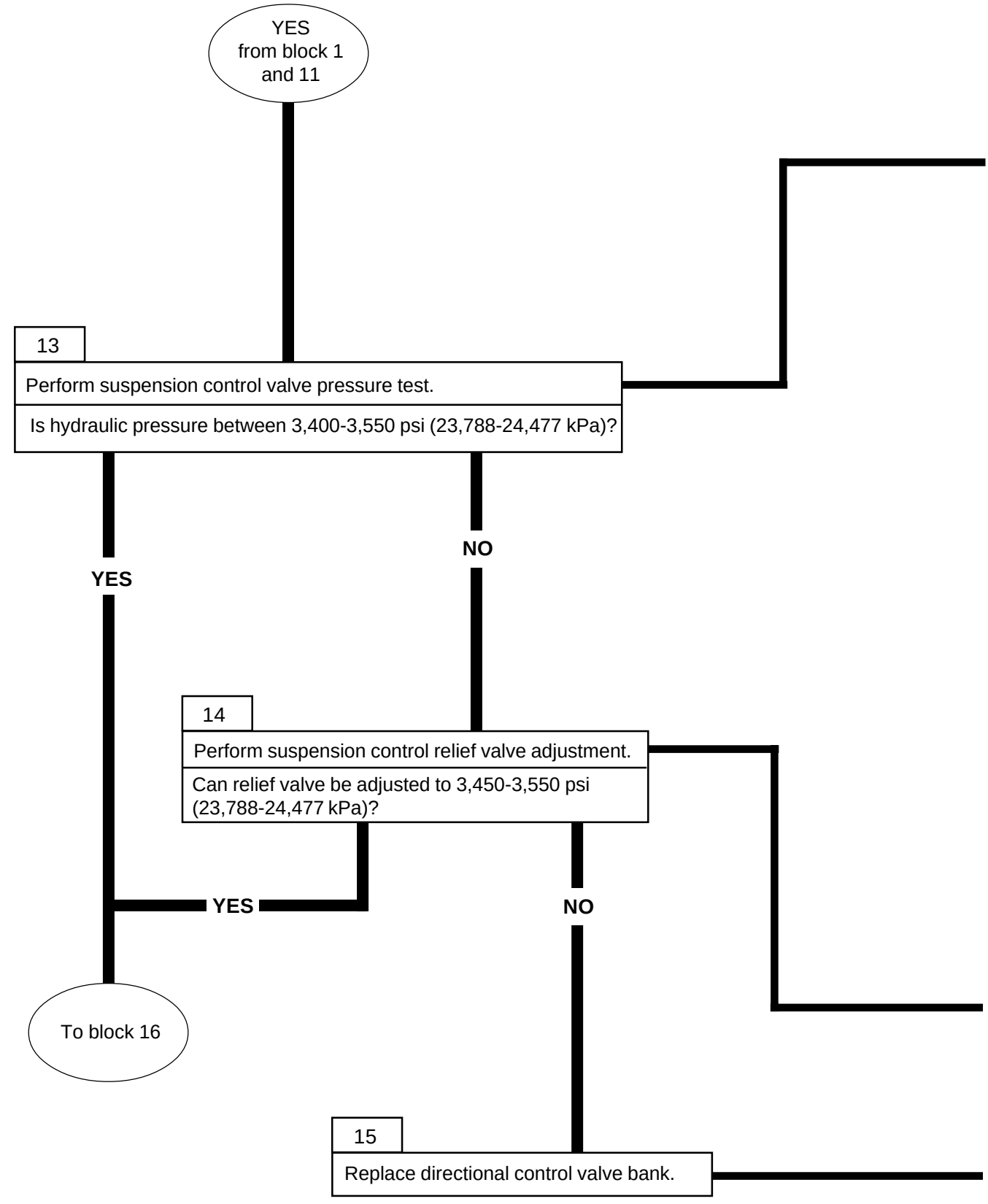
Perform this test at ports 17R and 17L on the directional control valve bank. Use the right-hand suspension control lever for port 17R and the left-hand suspension control lever for port 17L.

Have suitable container ready to catch oil.

- Disconnect hose (1) from tee (2) on port 17 of suspension control valve. Plug hose (1).
- Connect pressure measuring device (3) to tee (2).
- Have assistant start engine, move SPRUNG/UNSPRUNG lever to SPRUNG, and SUSPENSION CONTROL lever to RAISE. Read pressure measuring device (3).
- Stop engine; relieve hydraulic pressure. Remove all test equipment and connect hose.

Refer to TM 5-2350-262-20-2.

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



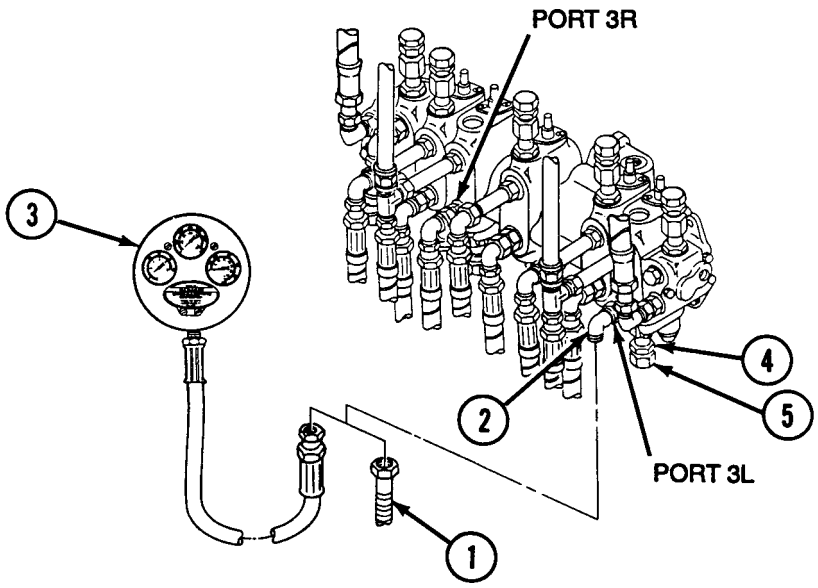
SUSPENSION CONTROL VALVE PRESSURE TEST

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.

Have suitable container ready to catch oil.

- Stop engine; relieve hydraulic pressure.
- Disconnect hose (1) from elbow (2) at port 3 of suspension control valve 3L or 3R. Plug hose (1).
- Connect pressure measuring device (3) to elbow (2).
- Have assistant start engine, move SPRUNG/UNSPRUNG lever to UNSPRUNG, and SUSPENSION CONTROL lever to RAISE. Read pressure measuring device (3).



SUSPENSION CONTROL RELIEF VALVE ADJUSTMENT

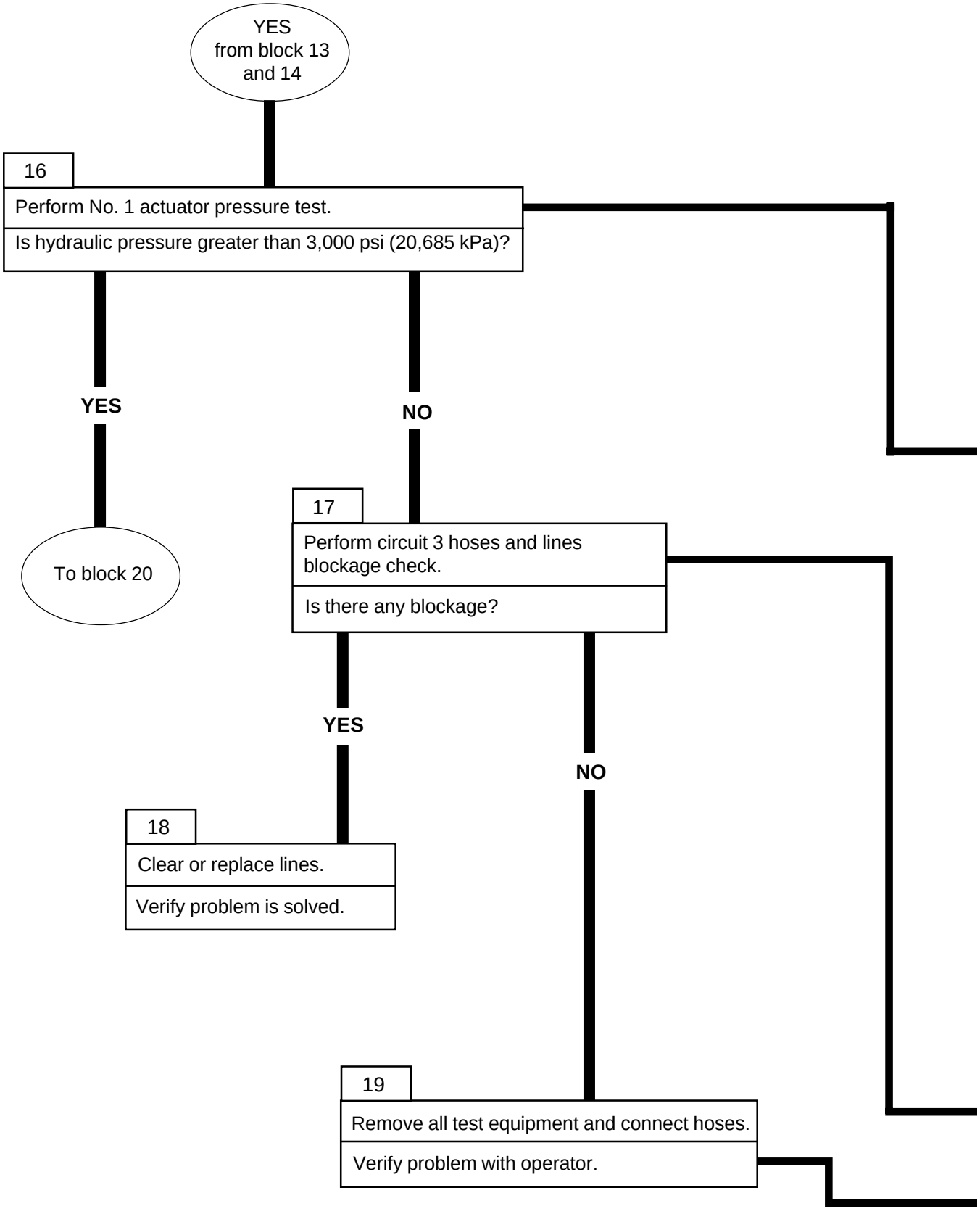
NOTE

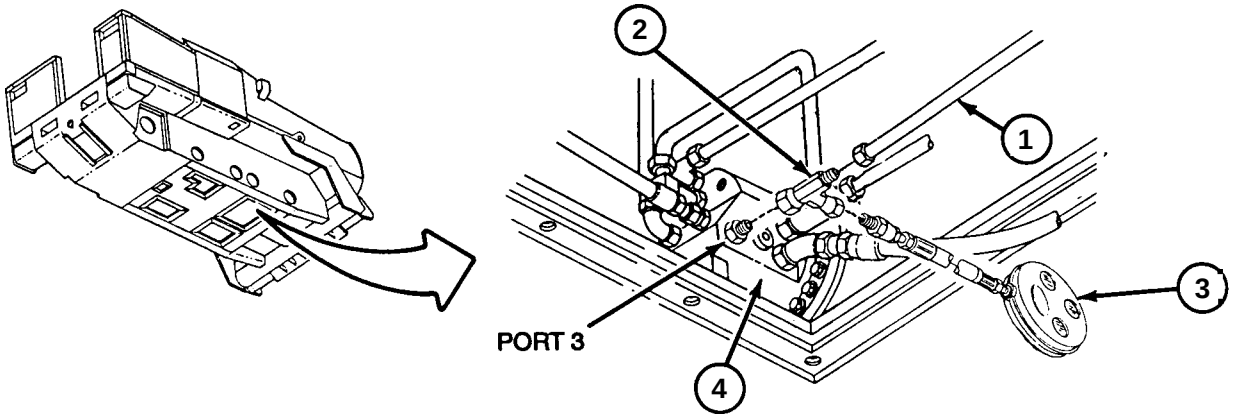
Perform this adjustment at relief valve 3L if left corner of vehicle will not raise, or at relief valve 3R if right corner of vehicle will not raise.

- Loosen jamnut (4) and turn adjusting screw (5) clockwise to increase pressure; counterclockwise to decrease pressure. Adjust pressure within limits, and tighten jamnut (4).
- Stop engine; relieve hydraulic pressure. Remove all test equipment and connect hose.

Refer to TM 5-2350-262-20-2.

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





NO. 1 ACTUATOR PRESSURE TEST

WARNING

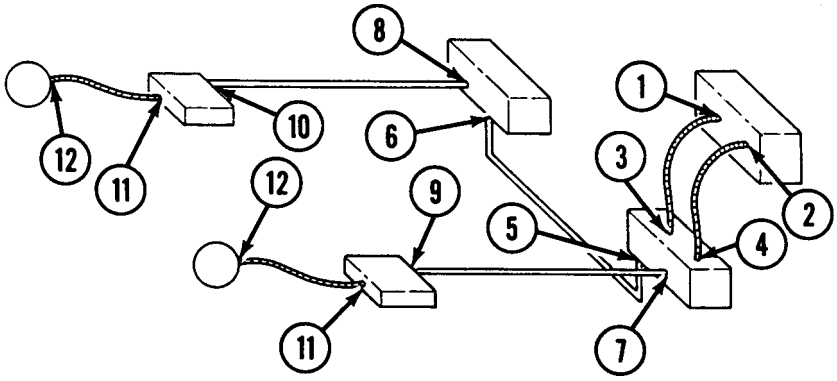
Do not work under vehicle unless hull has been properly blocked or allowed to settle on bump stops. Failure to comply may result in severe injury or death to personnel.

NOTE

This test is performed at No. 1 actuator of front corner which will not raise.

Have suitable container ready to catch oil.

- Stop engine, relieve hydraulic pressure, remove all test equipment and connect lines.
- Disconnect NO. 1 SPNSN UNIT-3 hose (1).
- Connect tee (2) and pressure measuring device (3) between NO 1 SPNSN UNIT-3 hose (1) and port 3 on No. 1 actuator (4).
- Start engine. Read pressure measuring device (3).
- Stop engine; relieve hydraulic pressure.
- Remove all test equipment and connect lines.



LINE IDENTIFIERS:

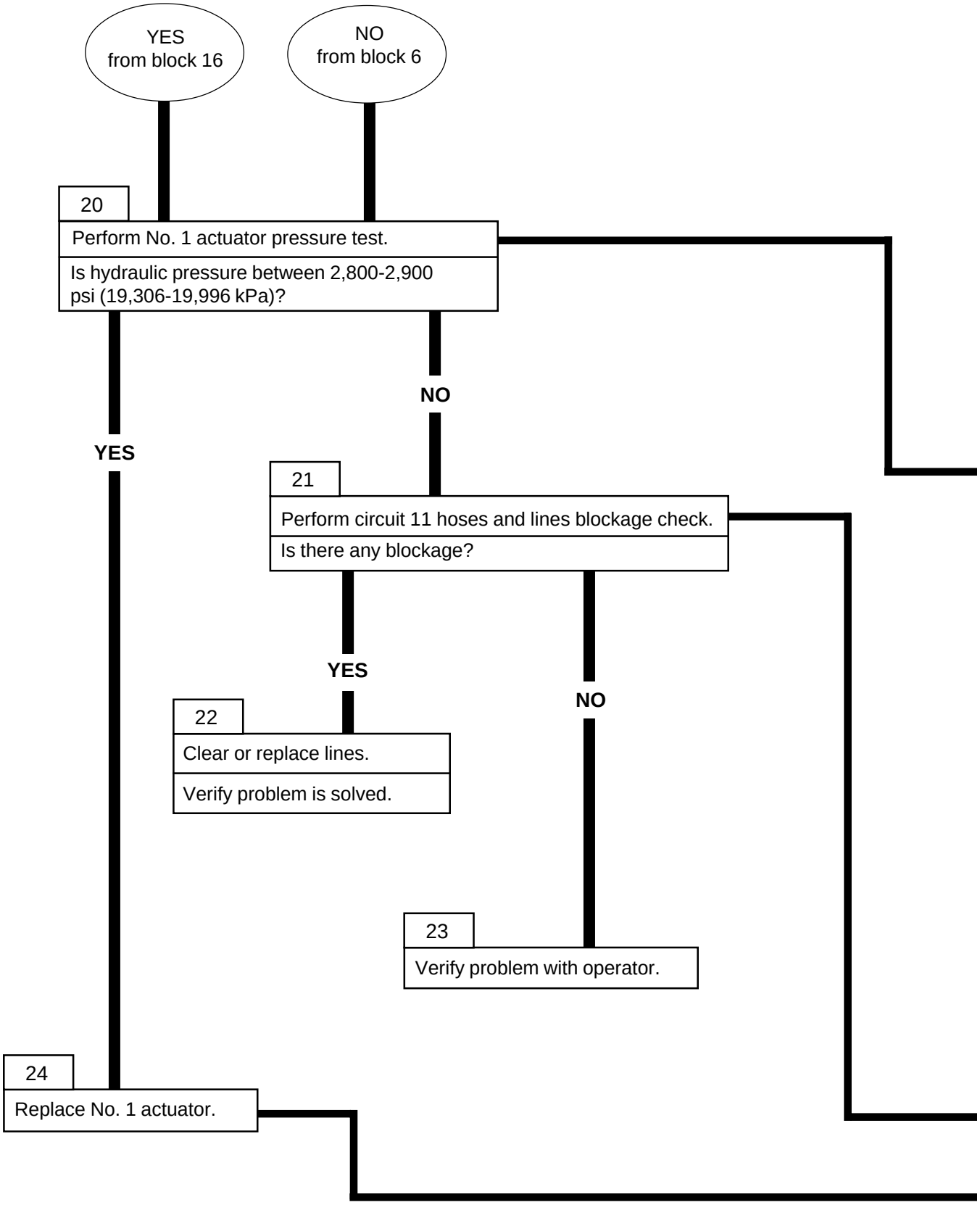
1. CONT VLV-3L
2. CONT VLV-3R
3. LH MAIN MANF TOP-3L
4. RH MAIN MANF TOP-3R
5. LH MAIN MANF BOT-3L
6. RH MAIN MANF BOT-3R
7. LH MAIN MANF FRONT-3L
8. RH MAIN MANF FRONT-3R
9. LH FWD MANF-3L
10. RH FWD MANF-3R
11. FWD NAMF ADPTR-3
12. NO 1 SPNSN UNIT-3

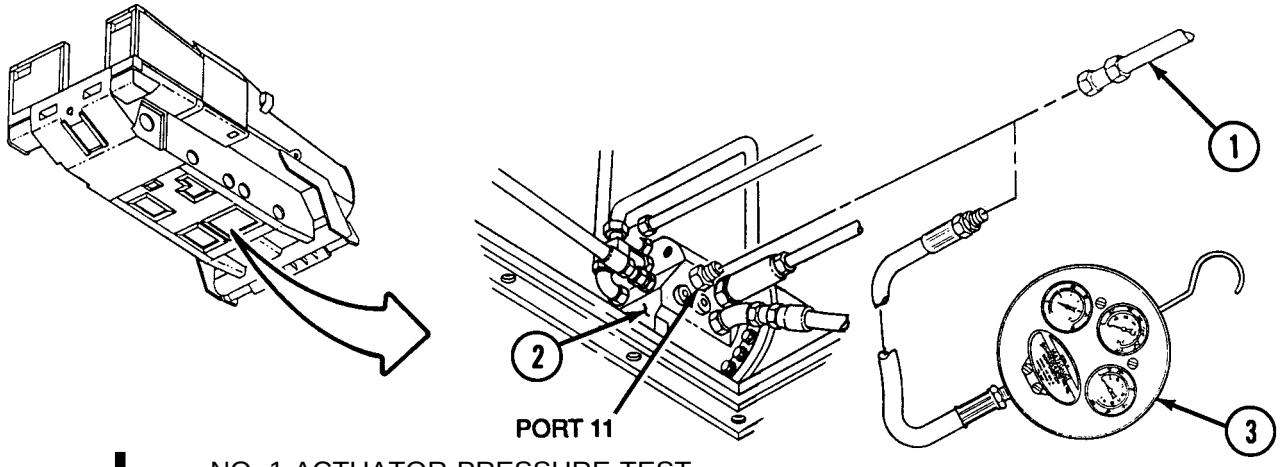
CIRCUIT 3 HOSES AND LINES BLOCKAGE CHECK

- Check for blockage in all hoses and lines applicable to corner of vehicle which will not raise.

A previous task was incorrectly performed or results misinterpreted. Verify results of all previous tests, beginning at block 1.

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





NO. 1 ACTUATOR PRESSURE TEST

WARNING

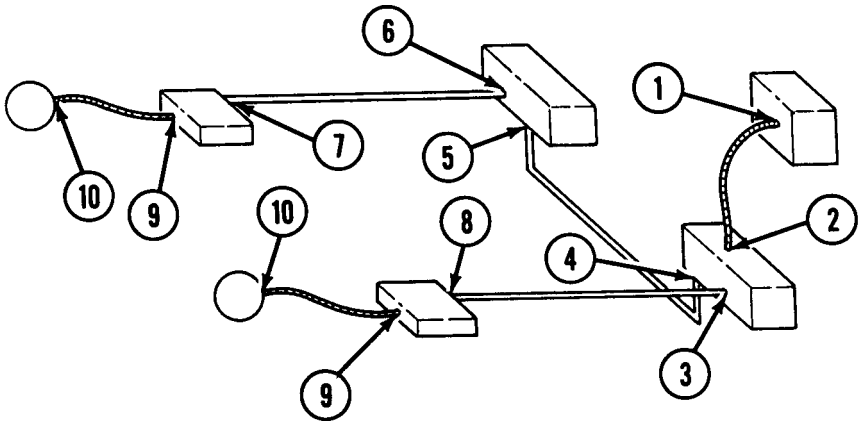
Do not work under vehicle unless hull has been properly blocked or allowed to settle on bump stops. Failure to comply may result in severe injury or death to personnel.

NOTE

This test is performed at No. 1 front actuator which will not raise.

Have suitable container ready to catch oil.

- Stop engine; relieve hydraulic pressure. Disconnect NO 1 SPNSN UNIT-11 hose (1) from port 11 on No. 1 actuator (2). Cap port 11.
- Connect pressure measuring device (3) to NO 1 SPNSN UNIT-11 hose (1).
- Start engine and move SPRUNG/UNSPRUNG lever to UNSPRUNG. Read pressure measuring device (3).
- Stop engine; relieve hydraulic pressure. Remove all test equipment and connect hose.



LINE IDENTIFIERS:

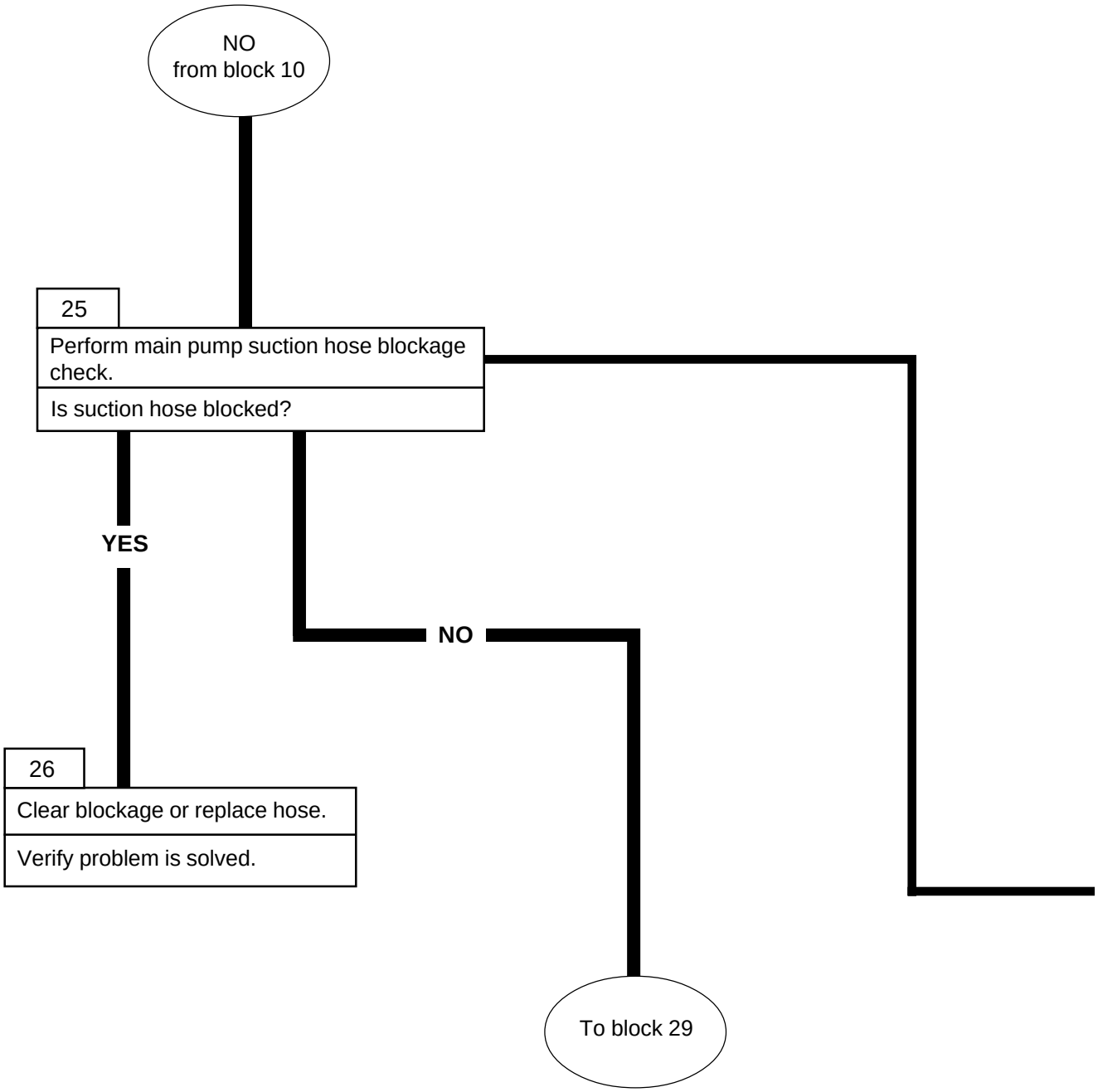
1. SPR-UNSPR VLV-11
2. LH MAIN MANTOP-11
3. LH MAIN MANF FRONT-11
4. LH MAIN MANF BOT-11
5. RH MAIN MANF BOT-11
6. RH MAIN MANF FRONT-11
7. RH FWD MANF-11
8. LH FWD MANF-11
9. FWD MANF-11ELB
10. NO. 1 SPNSN UNIT-11

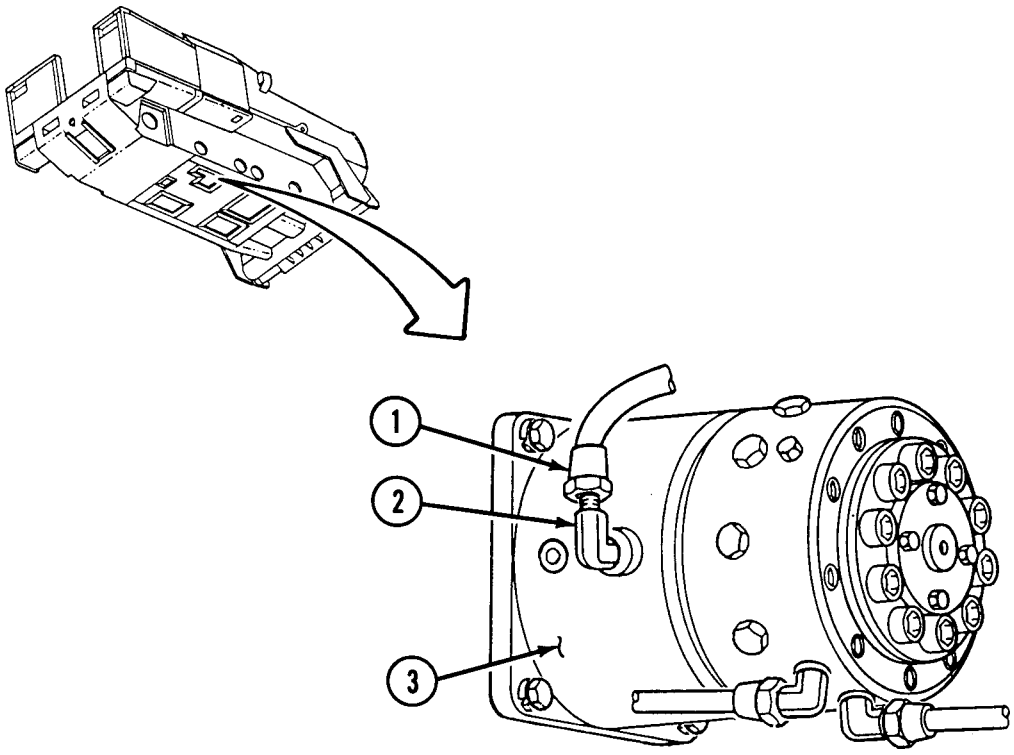
CIRCUIT 11 HOSES AND LINES BLOCKAGE CHECK

Check for blockage in all hoses and lines applicable to corner of vehicle which will not raise.

Notify Direct Support maintenance.

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





MAIN PUMP SUCTION HOSE BLOCKAGE CHECK

WARNING

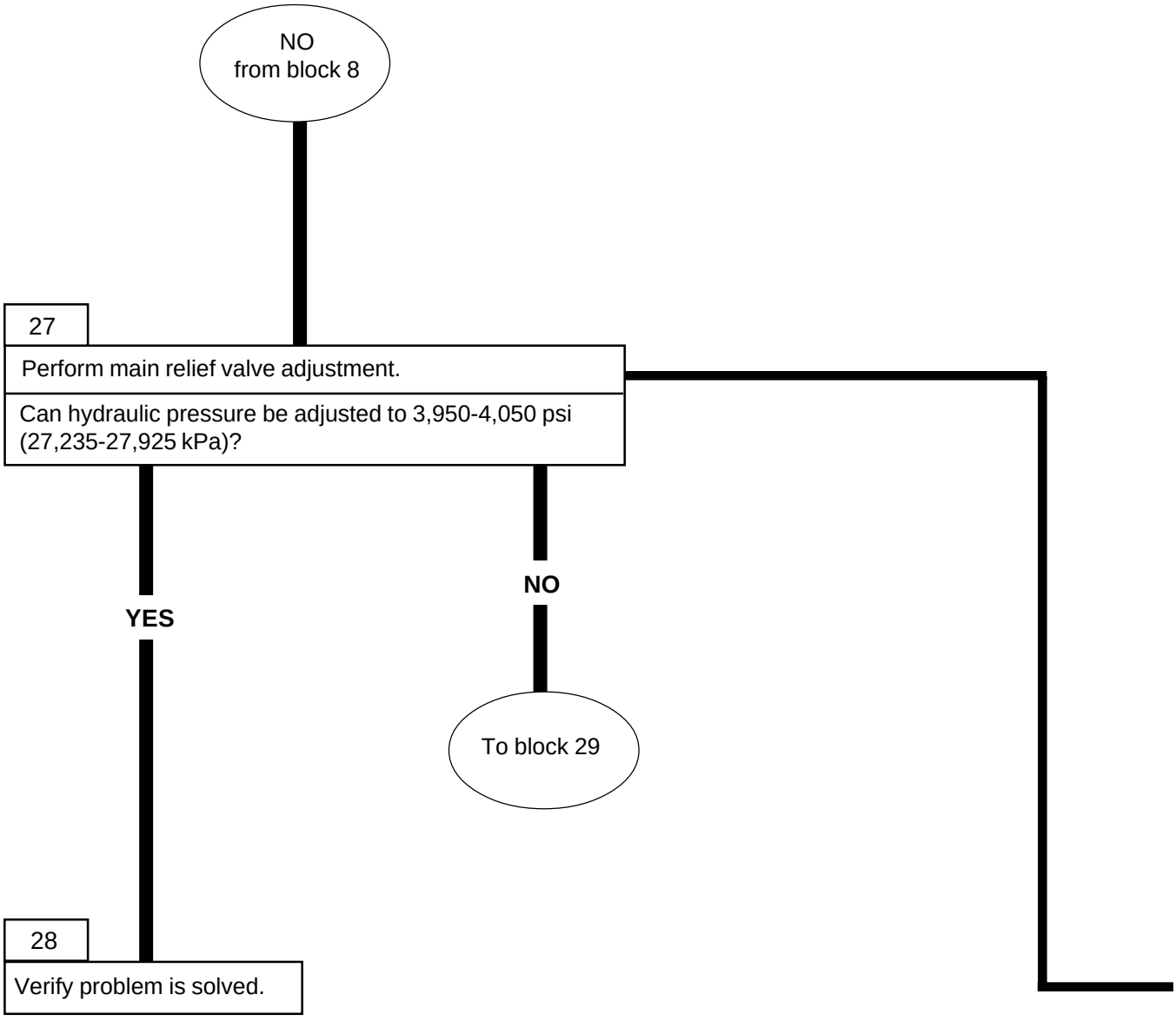
Do not work under vehicle unless hull has been properly blocked or allowed to settle on bump stops. Failure to comply may result in severe injury or death to personnel.

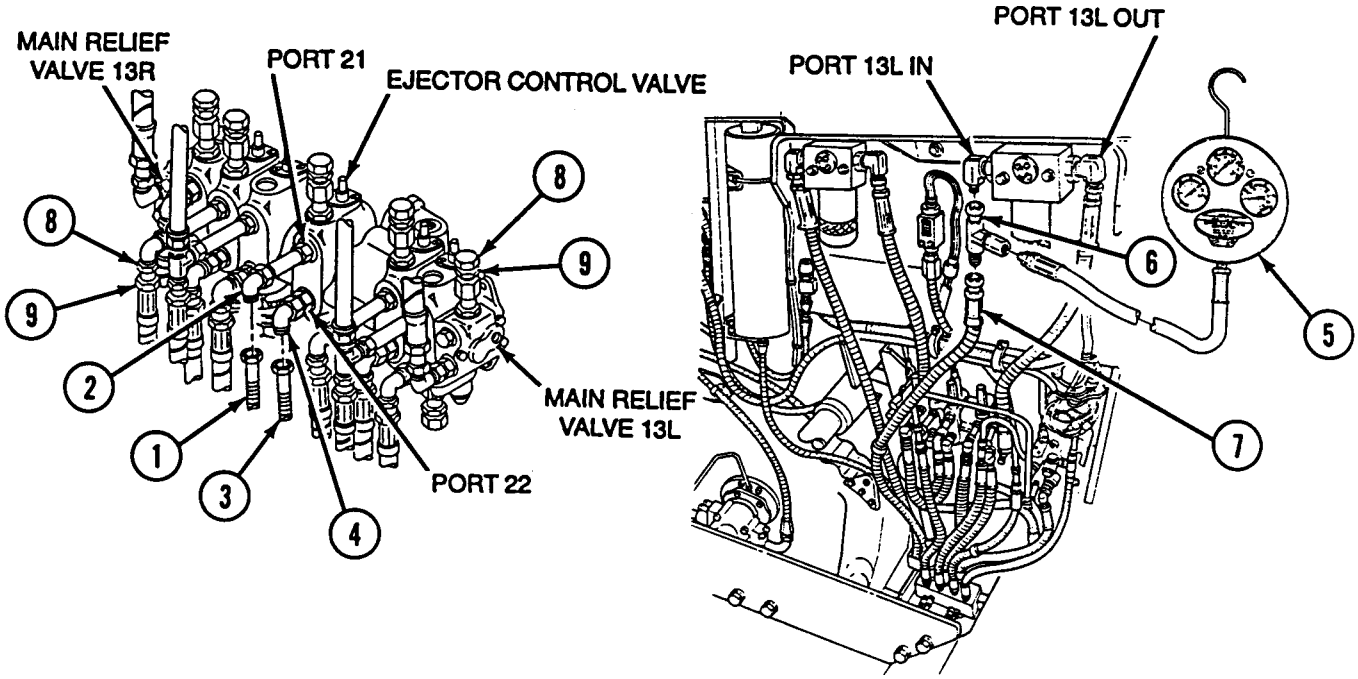
NOTE

Have suitable container ready to catch oil.

- Stop engine; relieve hydraulic pressure.
- Loosen, but do not disconnect, PUMP SUCT TUBE-7 (1) from elbow (2) on main hydraulic pump (3). Hydraulic oil should flow freely from the loosened fitting. Reconnect line.

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





MAIN RELIEF VALVE ADJUSTMENT

WARNING

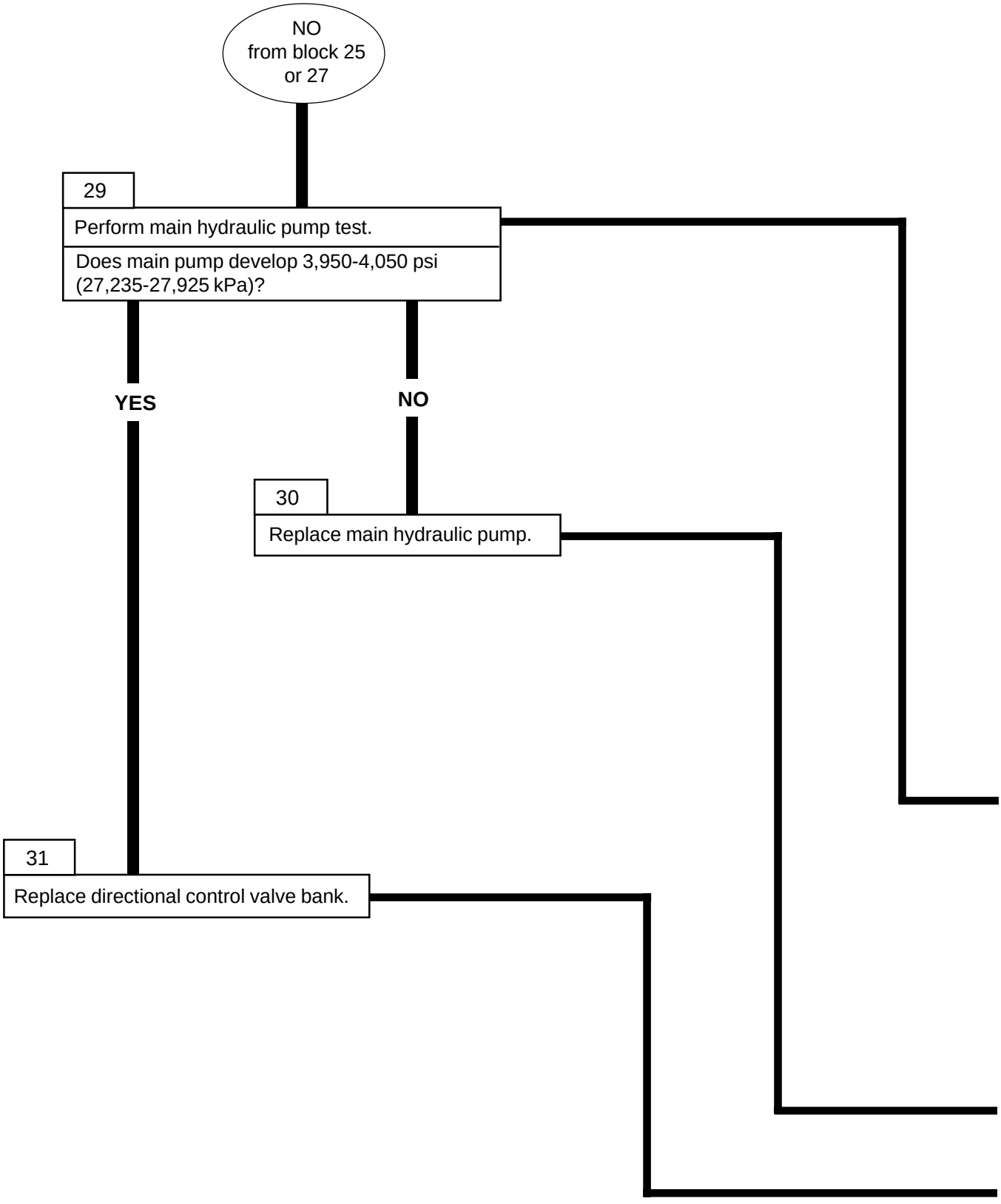
Before performing any hydraulic troubleshooting in bowl, move ejector forward and disable it by disconnecting ejector cylinder from hydraulic system. Failure to comply may result in severe injury or death to personnel.

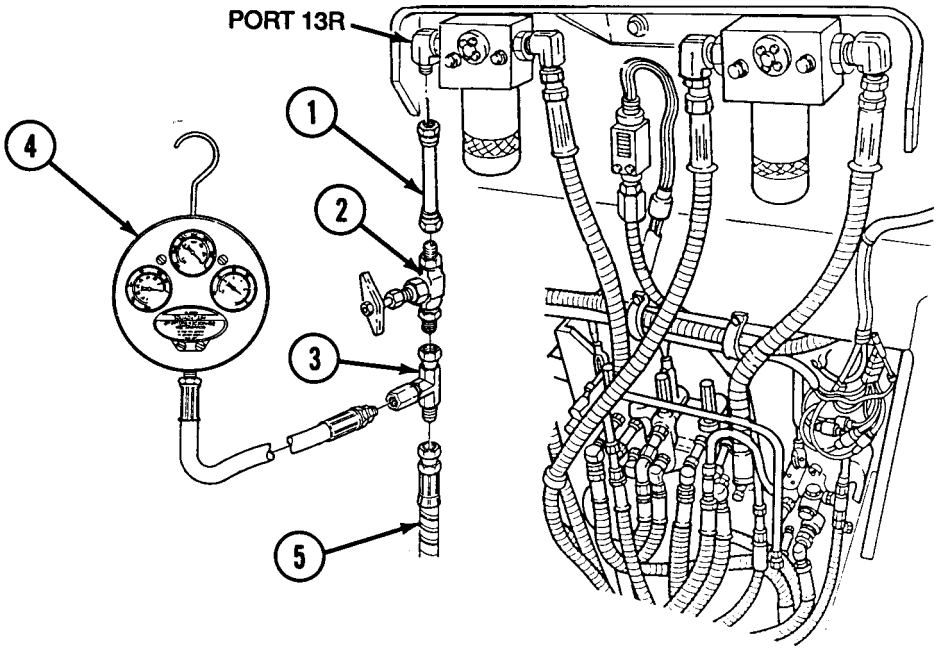
NOTE

Have suitable container ready to catch oil.

- Disable the ejector from the hydraulic system by disconnecting CONT VLV-21 hose (1) from elbow (2) at port 21 and CONT VLV-22 hose (3) from elbow (4) at port 22 on ejector control valve. Cap and plug hoses and fittings.
- With pressure measuring device (5) and tee (6) still connected to HYDR-FLTR-IN 13L hose (7) and high-pressure filter inlet port 13L and SPRUNG/UNSPRUNG lever in SPRUNG, have assistant move left hand SUSPENSION CONTROL lever to RAISE, while at the same time, holding EJECTOR CONTROL lever in BACK. Read pressure measuring device (5). If the pressure is not within limits, adjust the main relief valve 13L by loosening jamnut (8) and rotating adjustment screw (9) clockwise to increase pressure; counterclockwise to decrease pressure. When hydraulic pressure is within limits, tighten jamnut (8).
- Stop engine; relieve hydraulic pressure.
- Move test equipment to high-pressure filter inlet port 13R and repeat the previous steps using the right-hand suspension control lever.
- Stop engine; relieve hydraulic pressure. Remove all test equipment and connect hoses.

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





MAIN HYDRAULIC PUMP TEST

WARNING

- **Before performing any troubleshooting in bowl, move ejector forward and engage the ejector lock. Failure to comply may result in severe injury or death to personnel.**
- **Ensure globe valve 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.**

NOTE

Have suitable container ready to catch oil.

- Stop engine; relieve hydraulic pressure.
- Install coupling tube (1), globe valve (2), tee (3), and pressure measuring device (4) between HYDR FLTR-IN-13R hose (5) and high pressure filter inlet port 13R.
- Turn globe valve (2) counterclockwise until fully opened.
- Have assistant start engine and allow engine to idle (750-800 rpm). Slowly close globe valve (2) until pressure reaches 3,950-4,050 psi (27,235-27,925 kPa).
- Open globe valve (2). Stop engine; relieve hydraulic pressure. Remove all test equipment and connect hoses.

Notify Direct Support maintenance.

Refer to TM 5-2350-262-20-2.

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

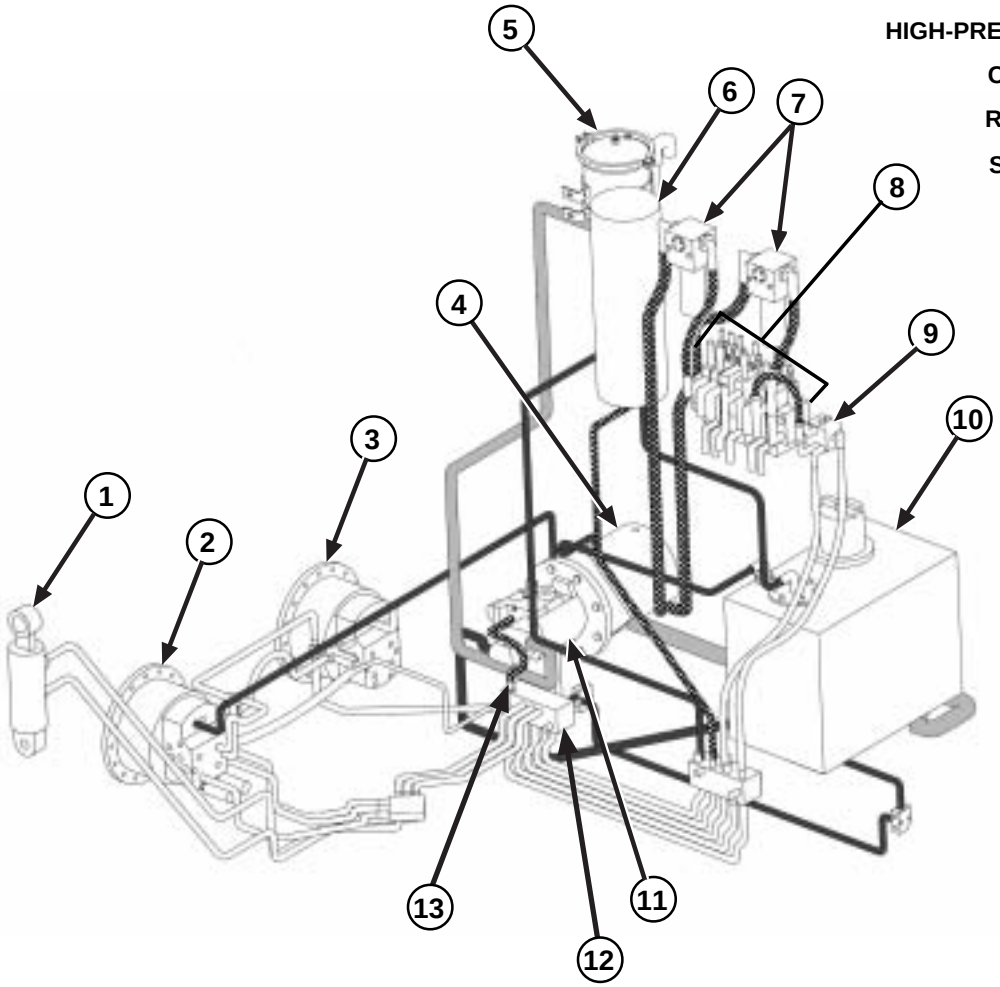
SPRUNG mode provides for a smooth ride up to 30 mph (48 km/h) and is used for over the road marches and parking of the vehicle. Hydraulic pressure is supplied to front actuators through line 9.

WARNING

High pressure is present in the M9 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.

NOTE

Use these procedures to troubleshoot either left or right front of vehicle.

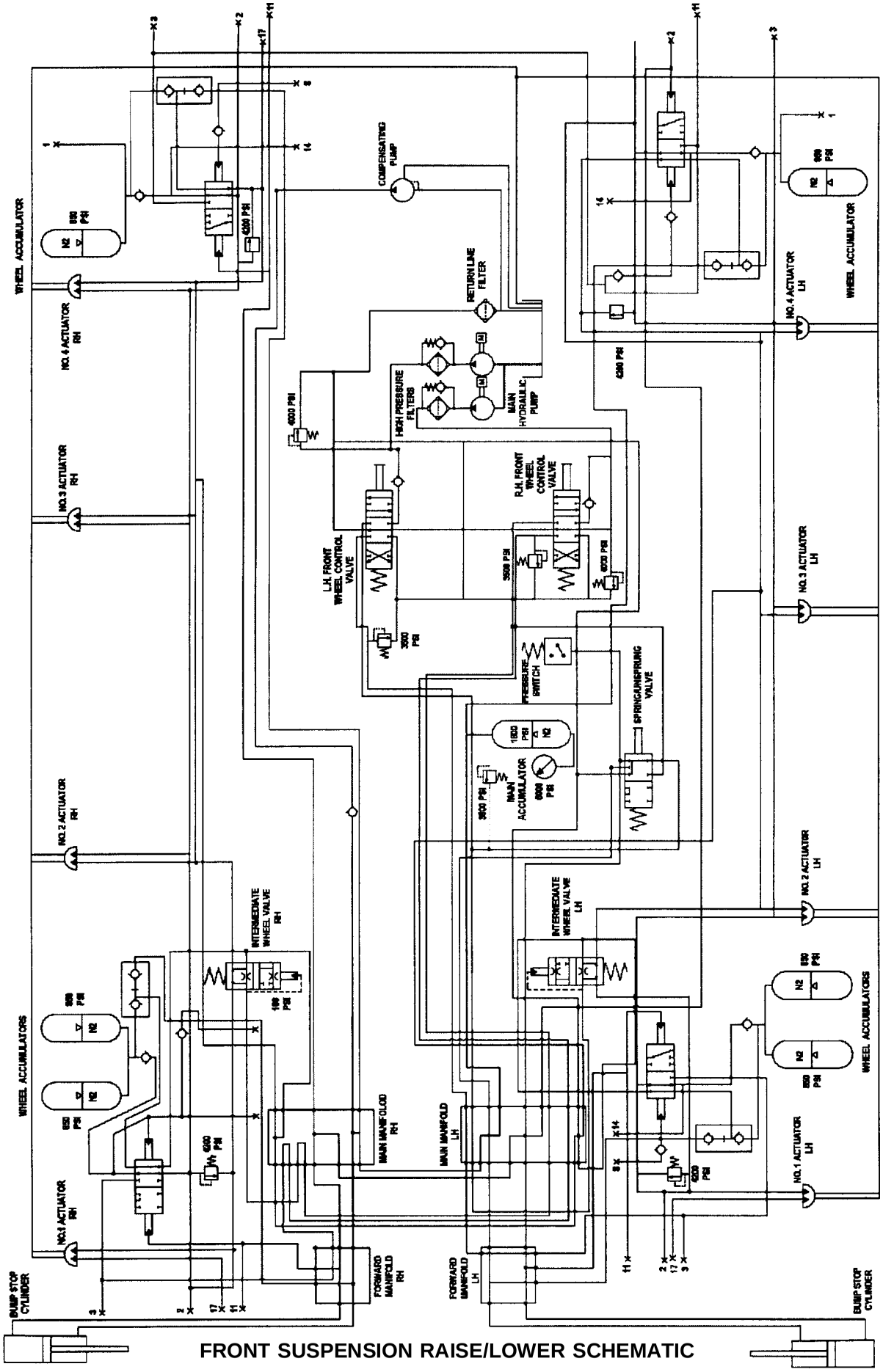


HIGH-PRESSURE
CIRCUIT
RETURN
SUPPLY

COMPONENTS:

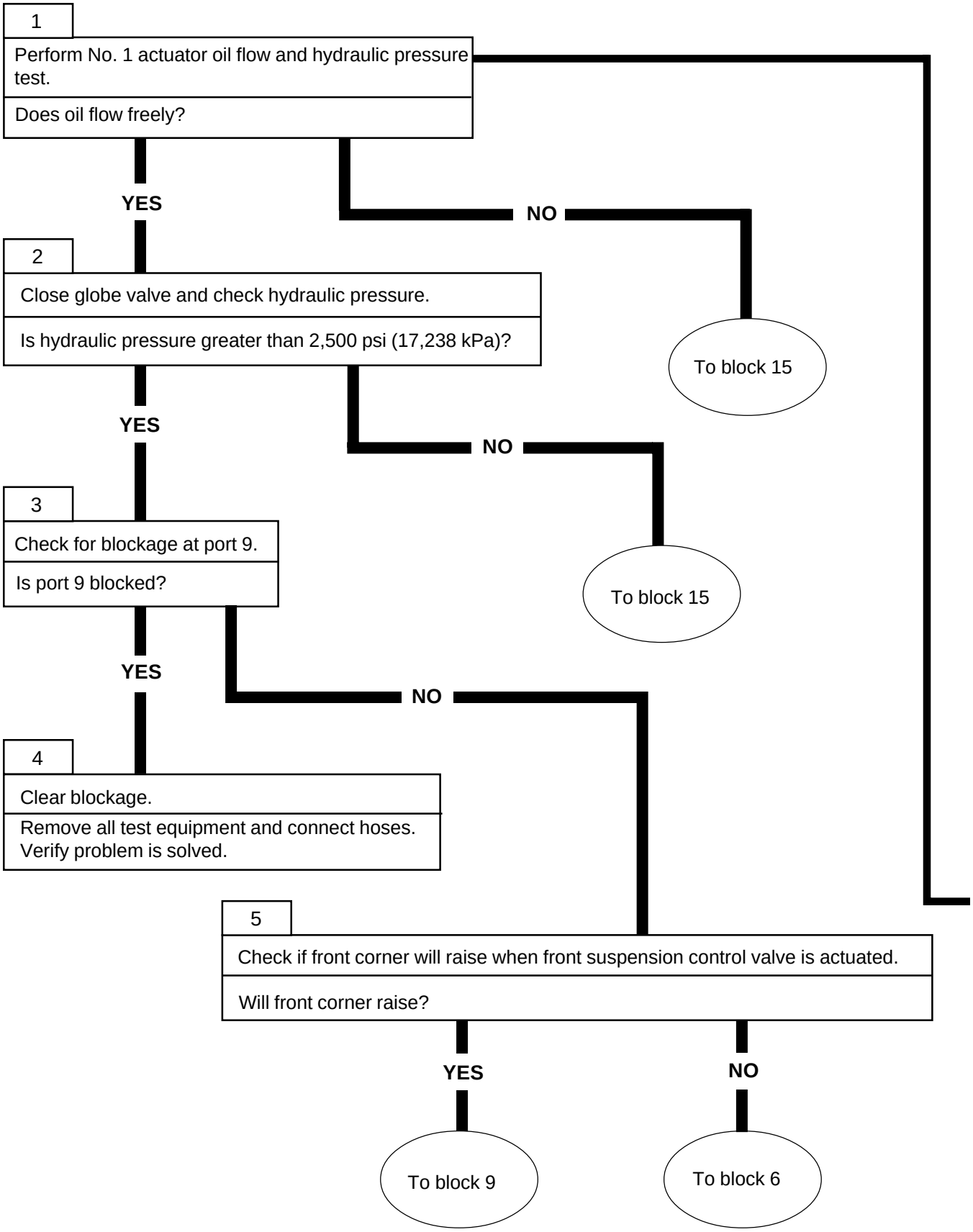
1. BUMP STOP CYLINDER
2. NO. 1 ACTUATOR, RIGHT HAND
3. NO. 2 ACTUATOR, RIGHT HAND
4. MAIN HYDRAULIC PUMP
5. RETURN LINE FILTER
6. MAIN ACCUMULATOR
7. HIGH-PRESSURE FILTERS
8. DIRECTIONAL CONTROL VALVE BANK
9. SPRUNG/UNSPRUNG VALVE
10. HYDRAULIC RESERVOIR
11. COMPENSATING PUMP
12. MAIN MANIFOLD, RIGHT HAND
13. CHECK VALVE

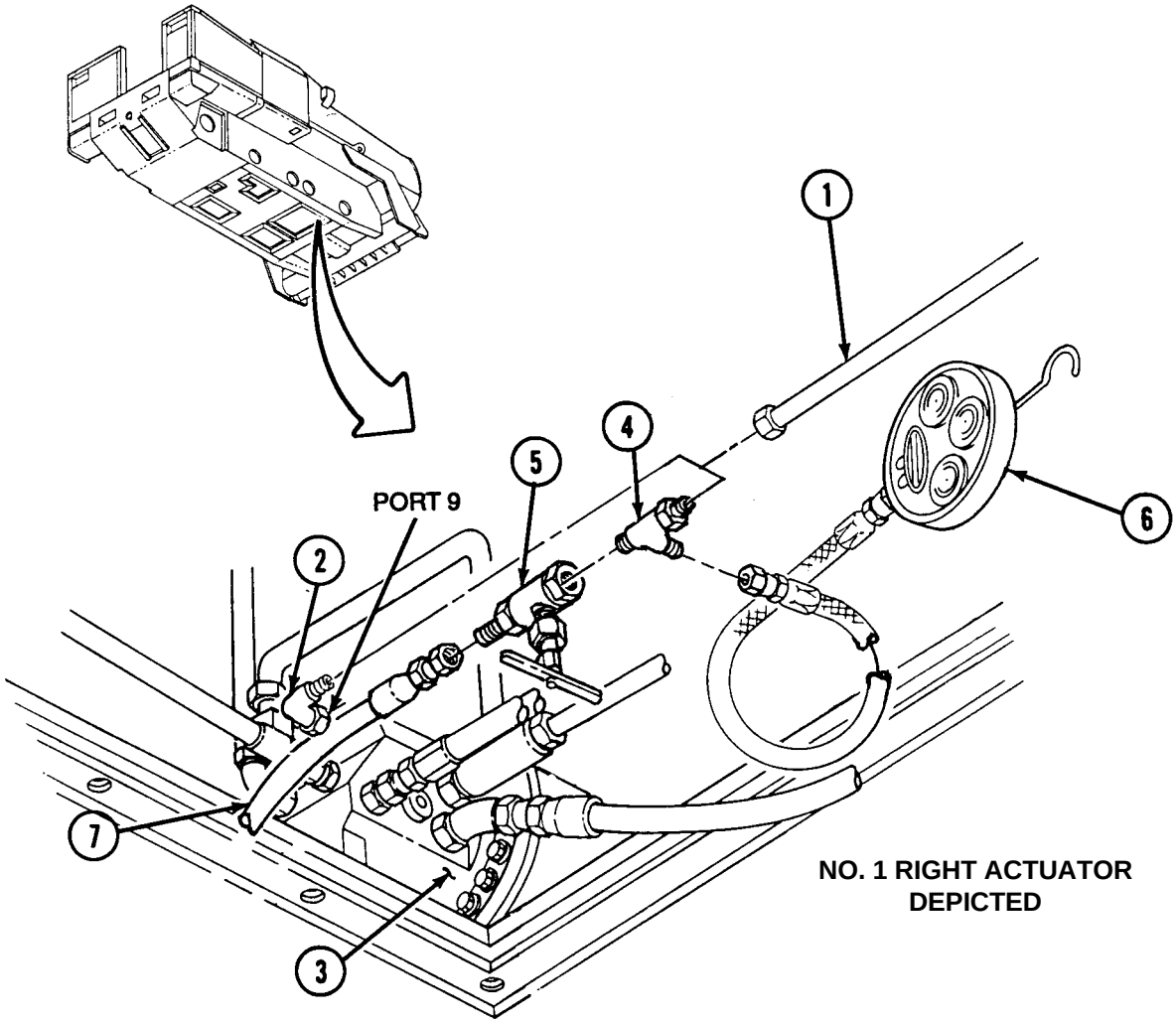
FRONT SUSPENSION RAISE/LOWER CIRCUIT



FRONT SUSPENSION RAISE/LOWER SCHEMATIC

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





NO. 1 RIGHT ACTUATOR DEPICTED

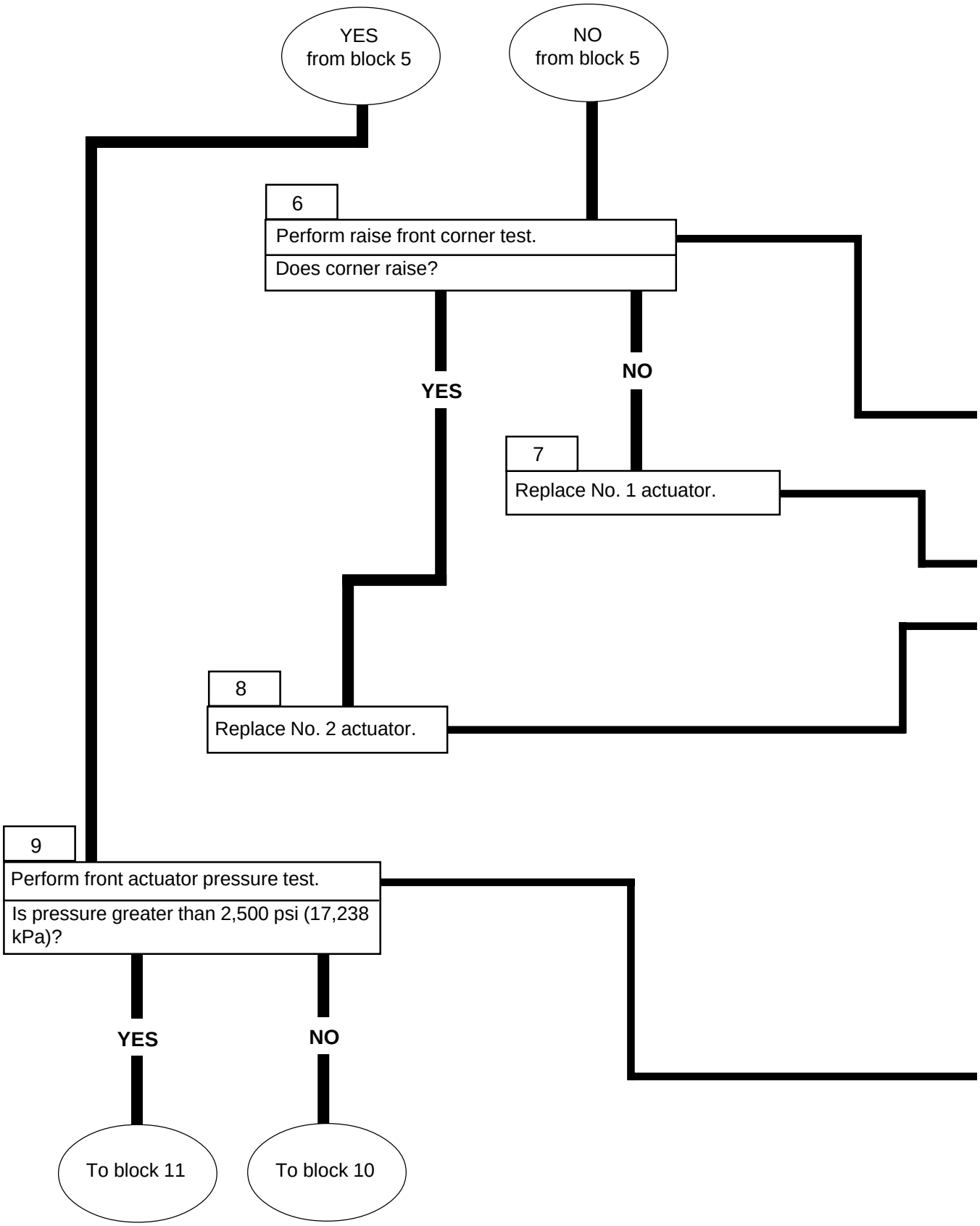
NO. 1 ACTUATOR OIL FLOW AND HYDRAULIC PRESSURE TEST

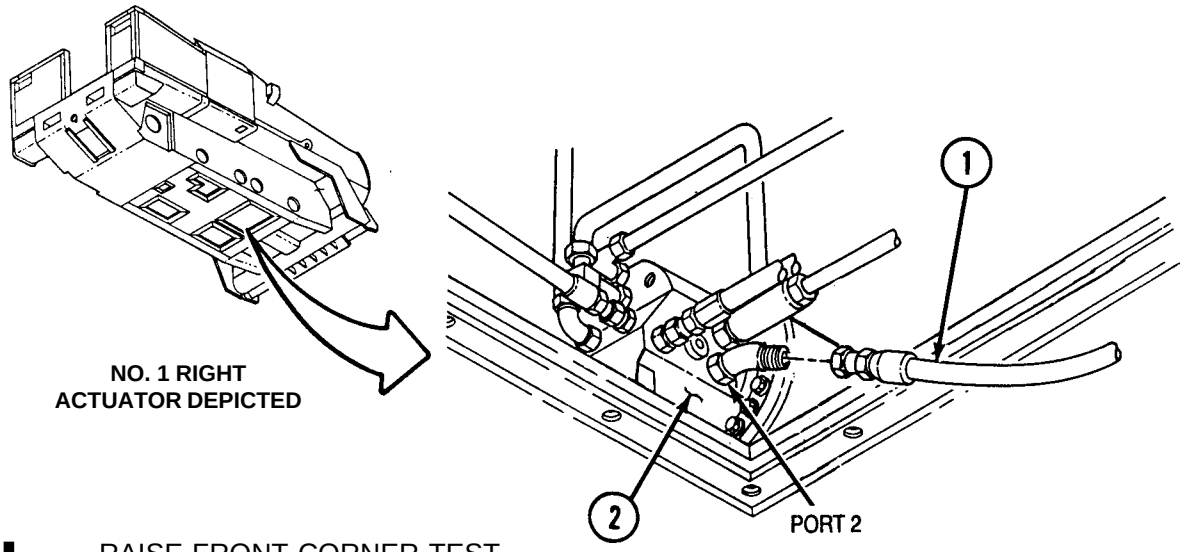
NOTE

Have suitable container ready to catch oil.

- Stop engine; relieve hydraulic pressure. Disconnect NO 1 SPNSN UNIT-9 hose (1) at elbow (2) on port 9 of No. 1 actuator (3). Cap elbow (2).
- Connect tee (4), globe valve (5), and pressure measuring device (6) to end of NO 1 SPNSN UNIT-9 hose (1). Connect a drain hose (7) to open end of globe valve (5).
- Place end of hose (7) in container. Start engine. Open globe valve (5). Observe for flow of oil.

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





RAISE FRONT CORNER TEST

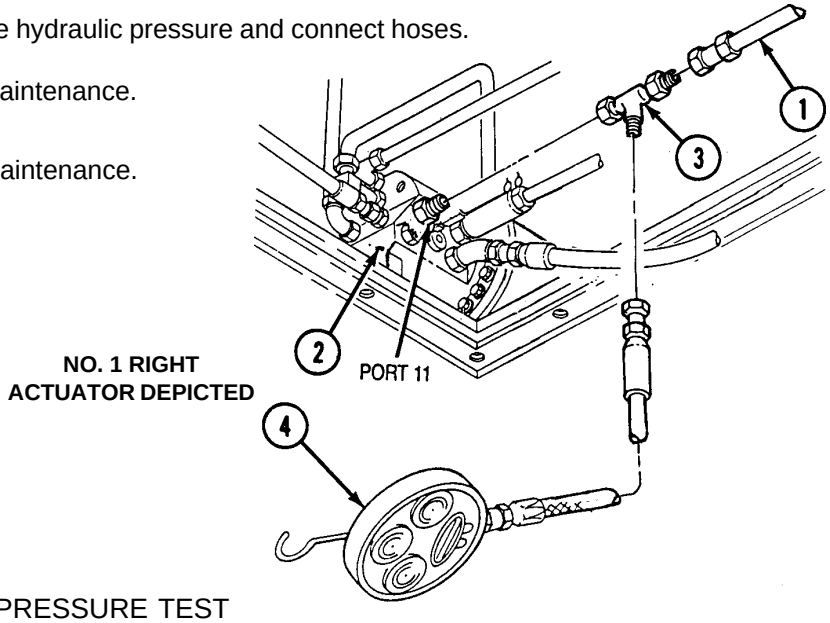
NOTE

Have suitable container ready to catch oil.

- Disconnect SPNSN UNIT-2 hose (1) from port 2 on No. 1 actuator (2). Cap and plug port 2 and SPNSN UNIT-2 hose (1).
- Start engine. Move SPRUNG/UNSPRUNG lever to SPRUNG mode.
- Stop engine; relieve hydraulic pressure and connect hoses.

Notify Direct Support maintenance.

Notify Direct Support maintenance.



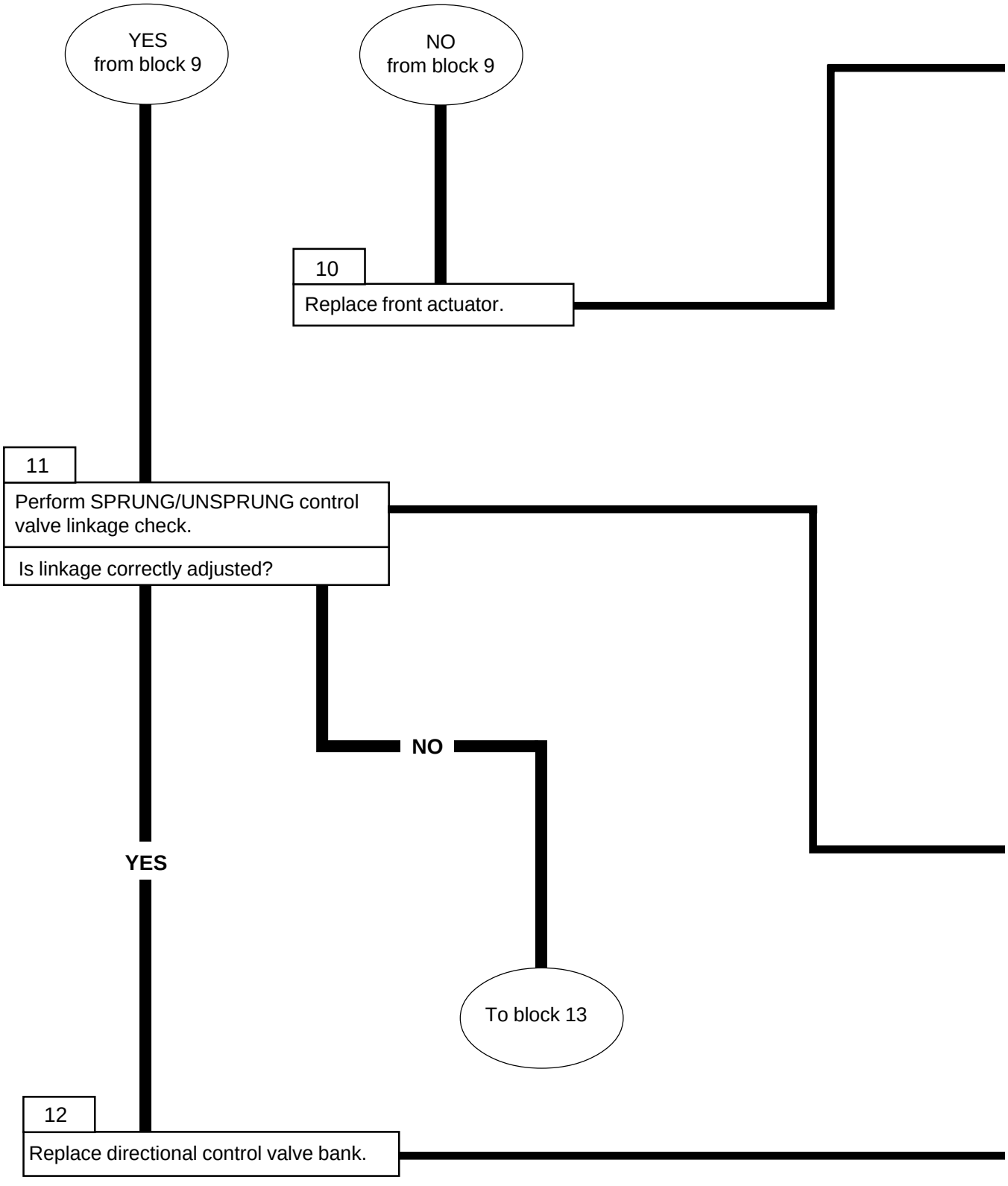
FRONT ACTUATOR PRESSURE TEST

NOTE

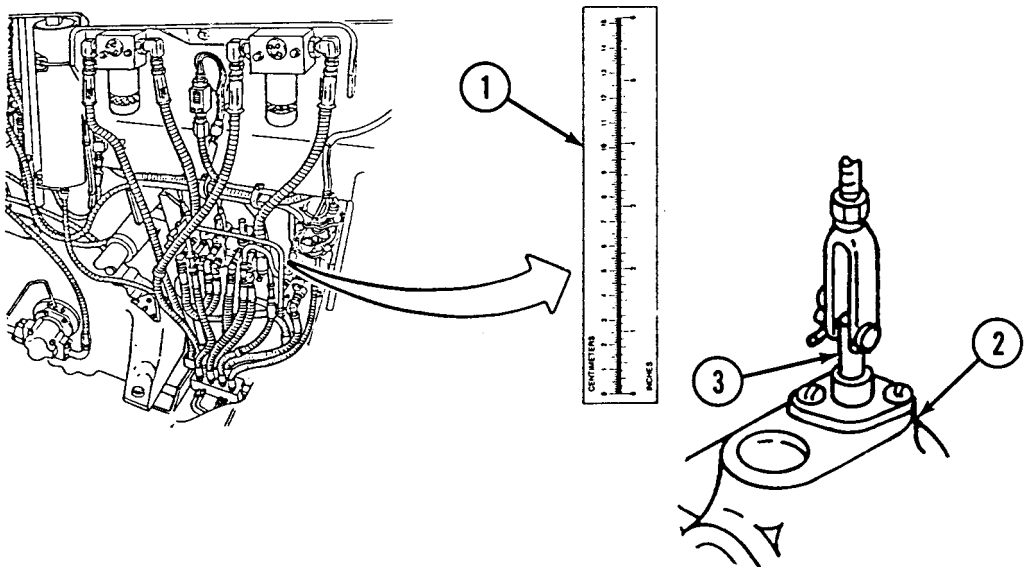
Have suitable container ready to catch oil.

- Stop engine; relieve hydraulic pressure. Remove all test equipment and connect lines. Disconnect NO 1 SPNSN UNIT-11 hose (1) from port 11 on No. 1 actuator (2). Cap port 11.
- Connect tee (3) and pressure measuring device (4) to NO 1 SPNSN UNIT-11 hose (1). Cap tee (3).
- Start engine Move SPRUNG/UNSPRUNG lever to UNSPRUNG mode. Read pressure measuring device (4).
- Stop engine; relieve hydraulic pressure. Remove all test equipment and connect hose.

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



Notify Direct Support maintenance.

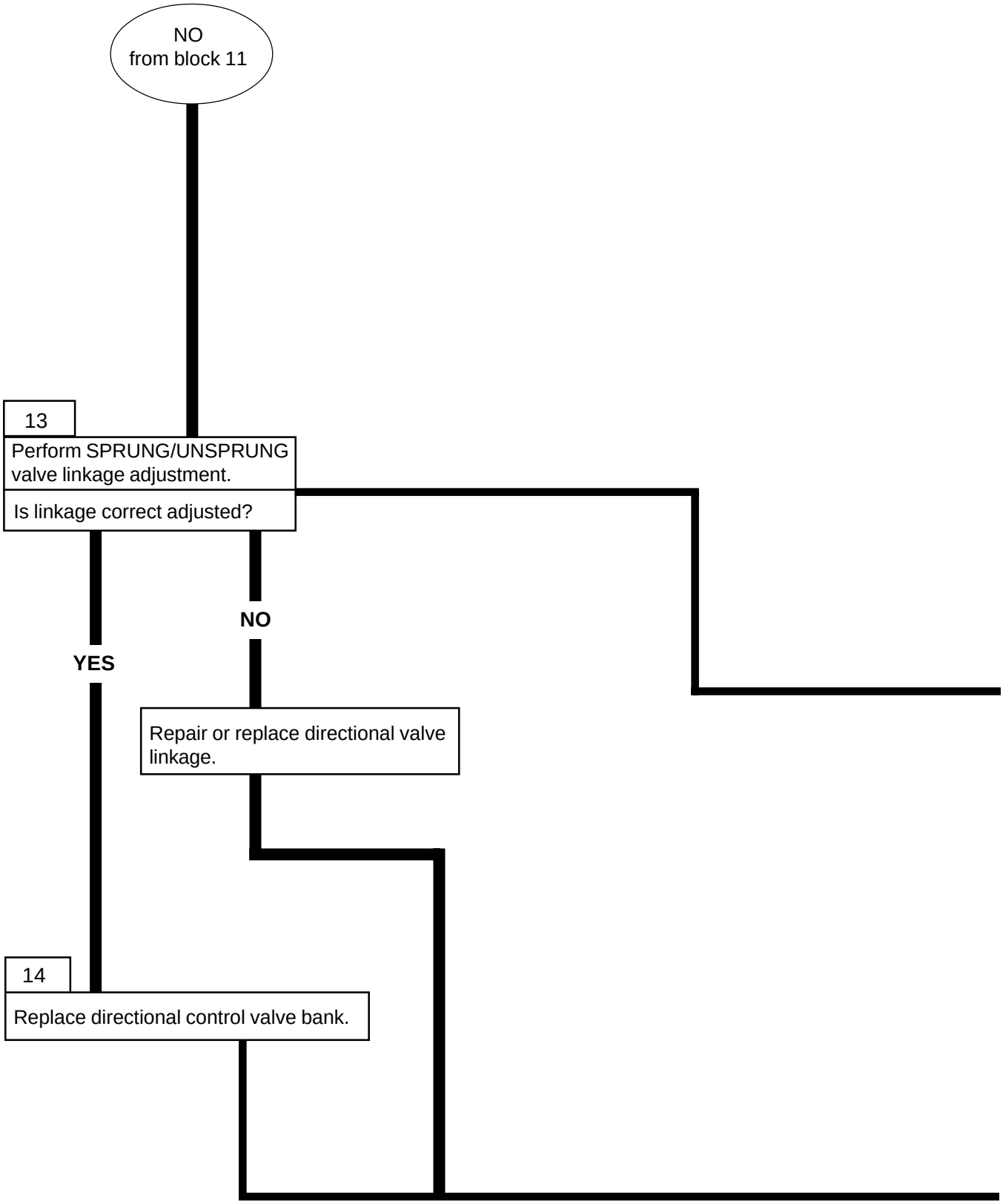


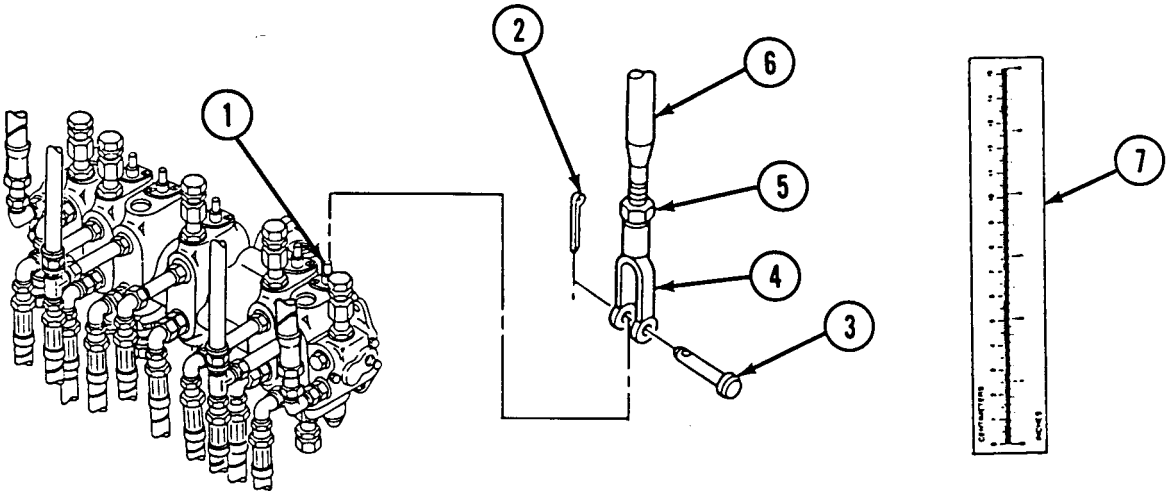
SPRUNG/UNSPRUNG CONTROL VALVE LINKAGE CHECK

Hold measuring device (1) on face of SPRUNG/UNSPRUNG control valve (2). Have assistant move SPRUNG/UNSPRUNG lever between SPRUNG and UNSPRUNG mode. Measure distance plunger (3) travels as lever is moved. Distance of travel should be 9/32 in. (7 mm).

Refer to TM 5-2320-262-20-2.

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





SPRUNG/UNSPRUNG LINKAGE ADJUSTMENT

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 basically the same way. This procedure covers SPRUNG/UNSPRUNG control rod.

- Note position of control valve plunger (1) when SPRUNG/UNSPRUNG control lever is in neutral (off) position.

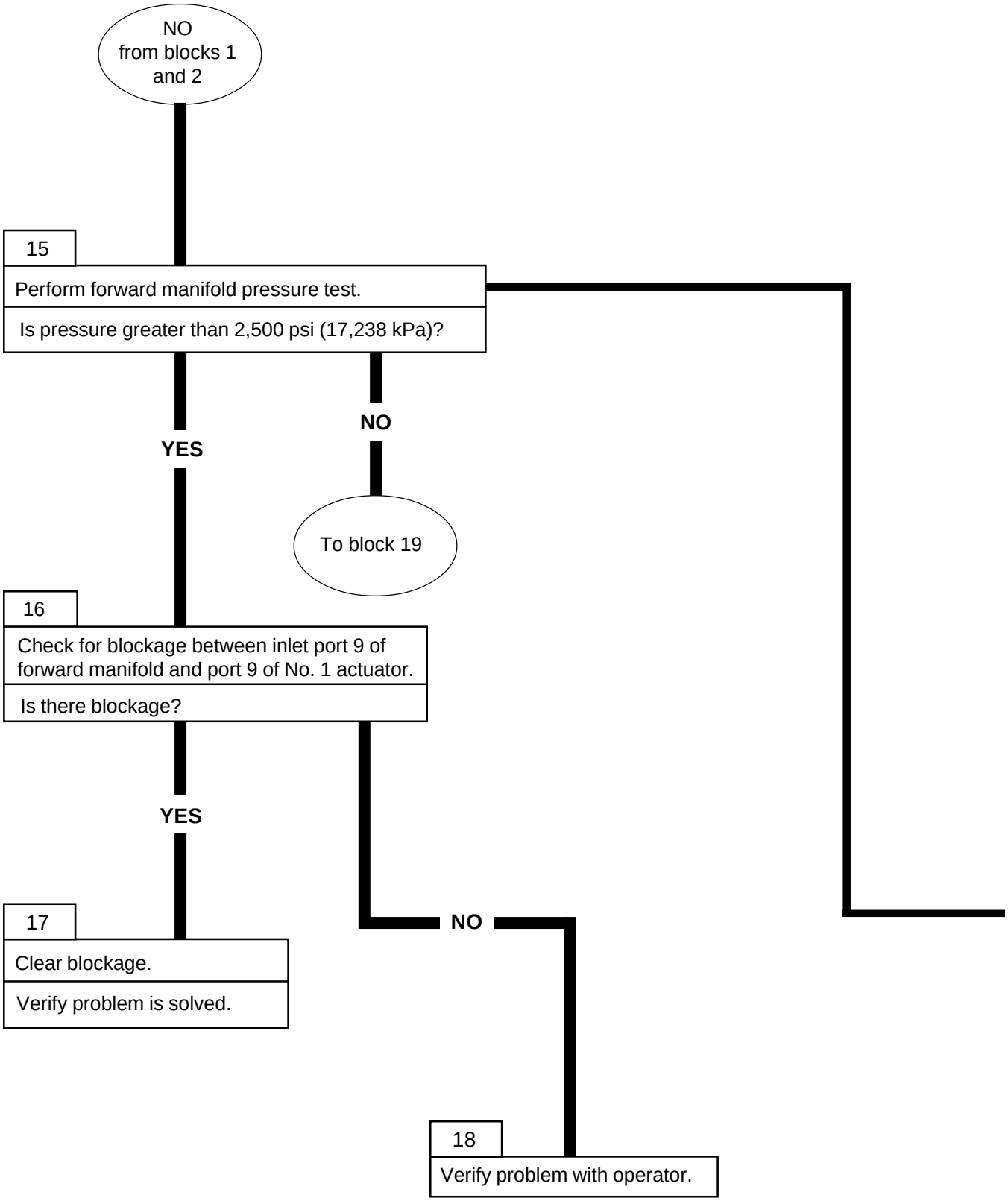
NOTE

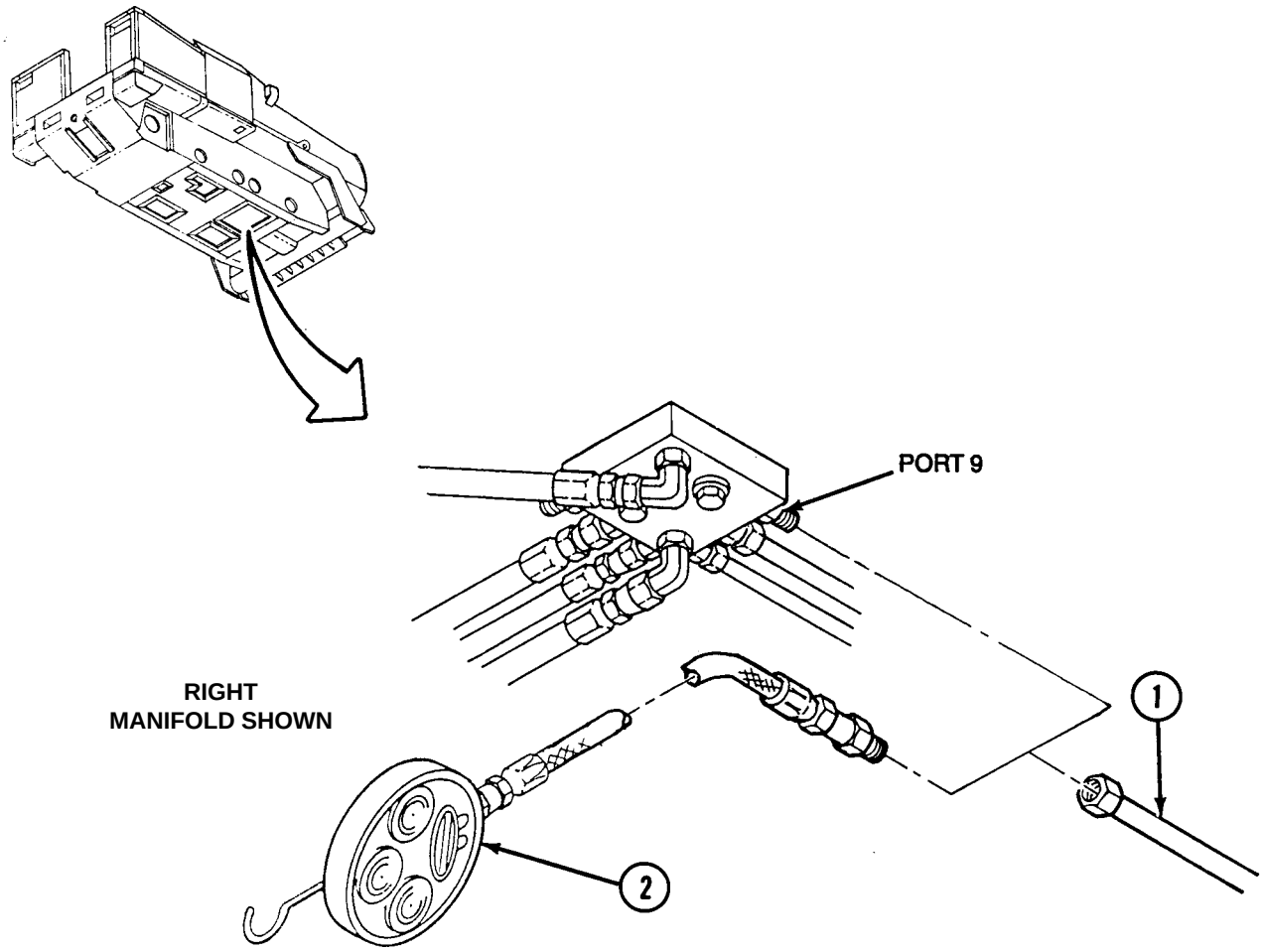
Normal control valve plunger travel is 9/32 in. (7 mm).

- Remove cotter pin (2), straight pin (3), and clevis (4) from control valve plunger (1). Discard cotter pin (2).
- Loosen jamnut (5). Turn clevis (4) clockwise to shorten rod (6); counterclockwise to lengthen rod (6).
- Hold measuring device (7) on face of SPRUNG/UNSPRUNG control valve. Have assistant move SPRUNG/UNSPRUNG lever between SPRUNG and UNSPRUNG mode. Measure distance of plunger travel.
- Coat threads of rod (6) with sealing compound primer and sealing compound. Tighten jamnut (5) against clevis (4).
- Connect clevis (4) to control valve plunger (1) with straight pin (3) and new cotter pin (2).

Refer to TM 5-5320-262-20-2.

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





FORWARD MANIFOLD PRESSURE TEST

WARNING

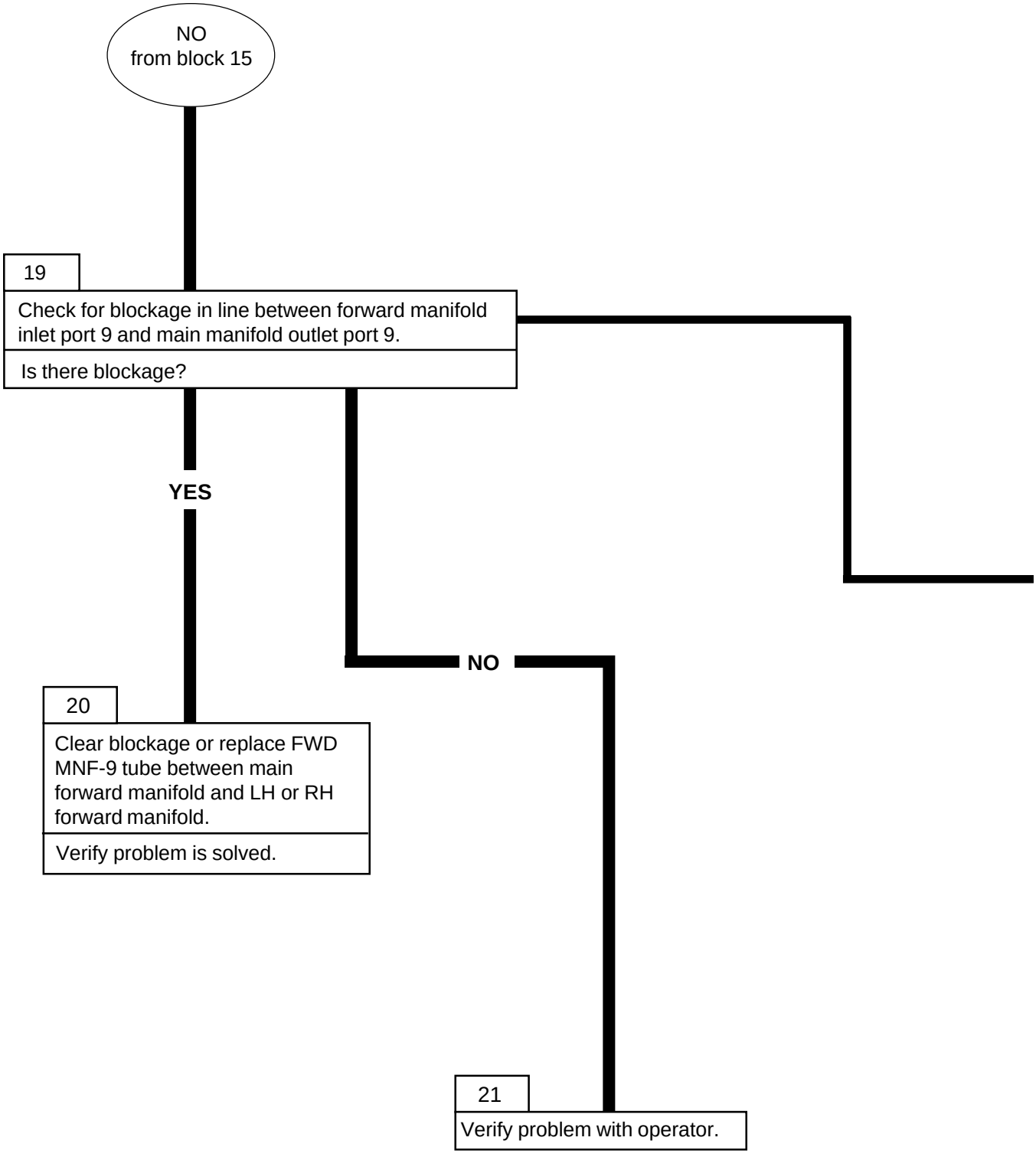
Do not work under vehicle unless hull is blocked. Failure to comply may result in severe injury or death to personnel.

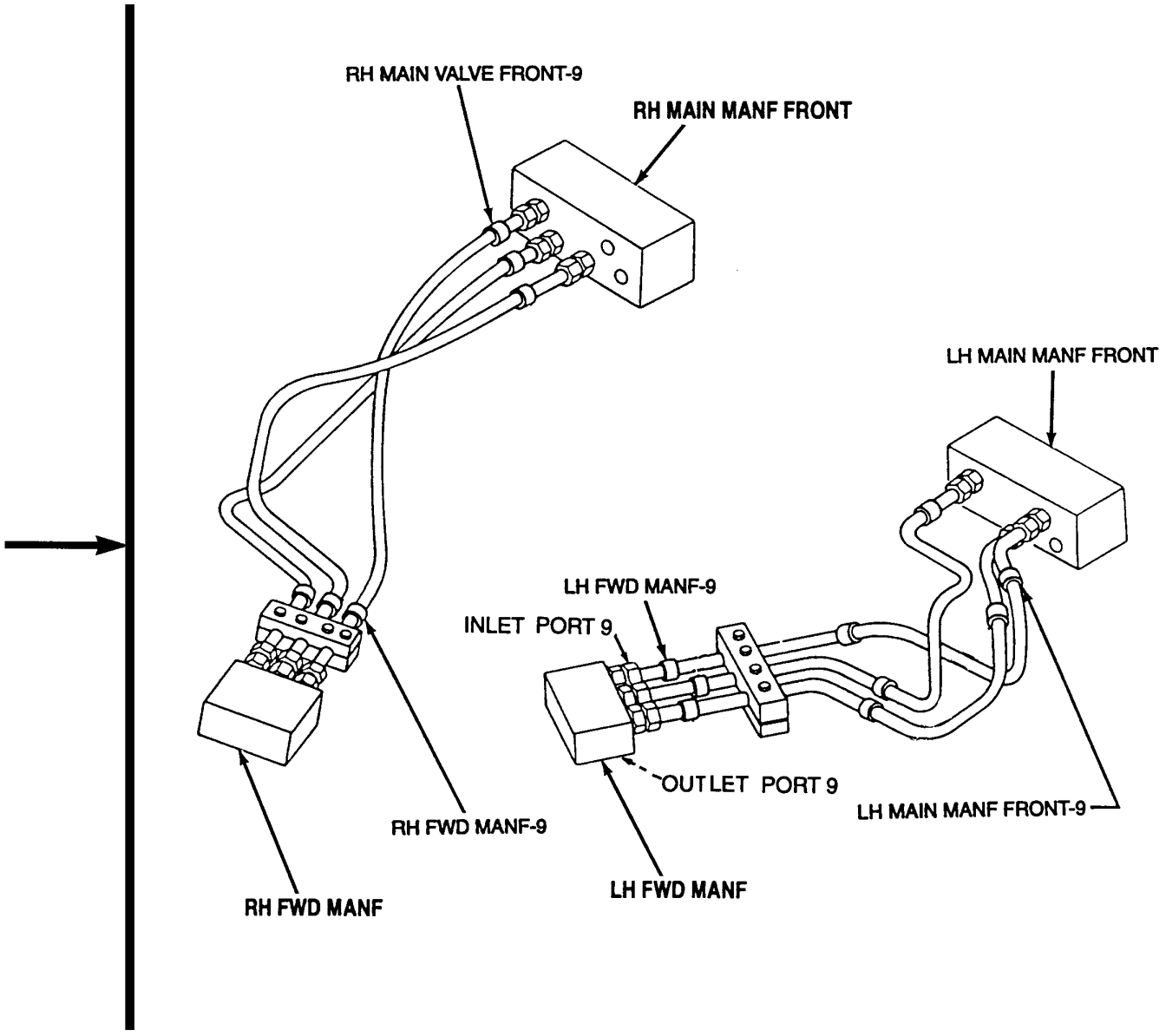
NOTE

Have suitable container ready to catch oil.

- Stop engine; relieve hydraulic pressure. Remove all test equipment and connect lines. Disconnect FWD MNF-9 tube (1) at forward manifold inlet port 9. Install pressure measuring device (2) at end of FWD MANF-9 tube (1). Cap port 9.
- Have assistant start engine and move SPRUNG/UNSPRUNG control valve lever to SPRUNG mode. Read pressure measuring device.
- Stop engine; relieve hydraulic pressure. Remove test equipment and connect hose.

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




RH MAIN VALVE FRONT-9
RH MAIN MANF FRONT
LH MAIN MANF FRONT
LH FWD MANF-9
INLET PORT 9
OUTLET PORT 9
LH MAIN MANF FRONT-9
RH FWD MANF-9
RH FWD MANF
LH FWD MANF

9 FRONT CORNER (LEFT OR RIGHT) DOES NOT RAISE IN SPRUNG OR UNSPRUNG MODE

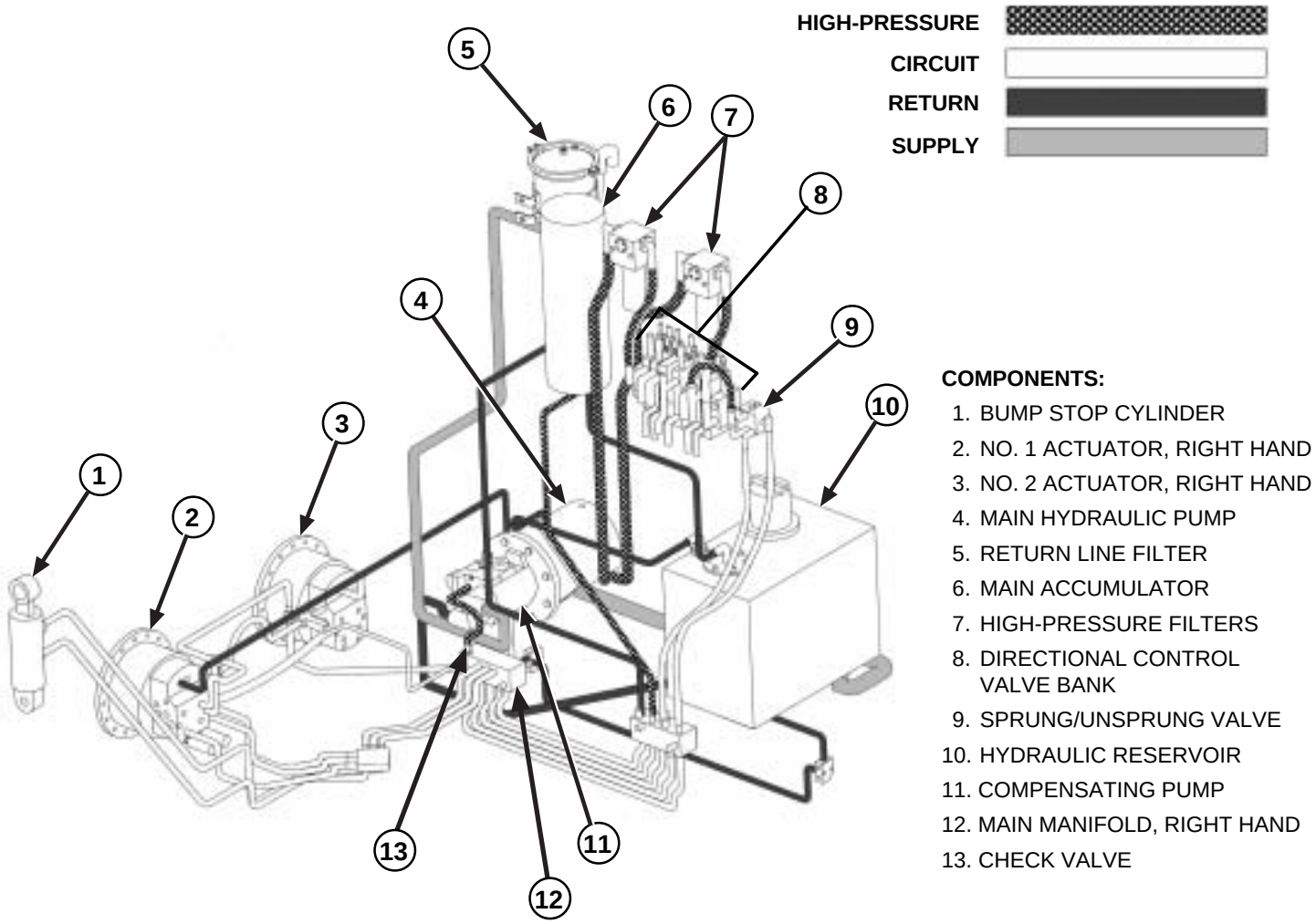
In SPRUNG mode, hydraulic pressure is delivered to front actuator through line 9. In UNSPRUNG mode, hydraulic pressure to raise front corner of vehicle is delivered through line 3.

WARNING

High pressure is present in the M9 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.

NOTE

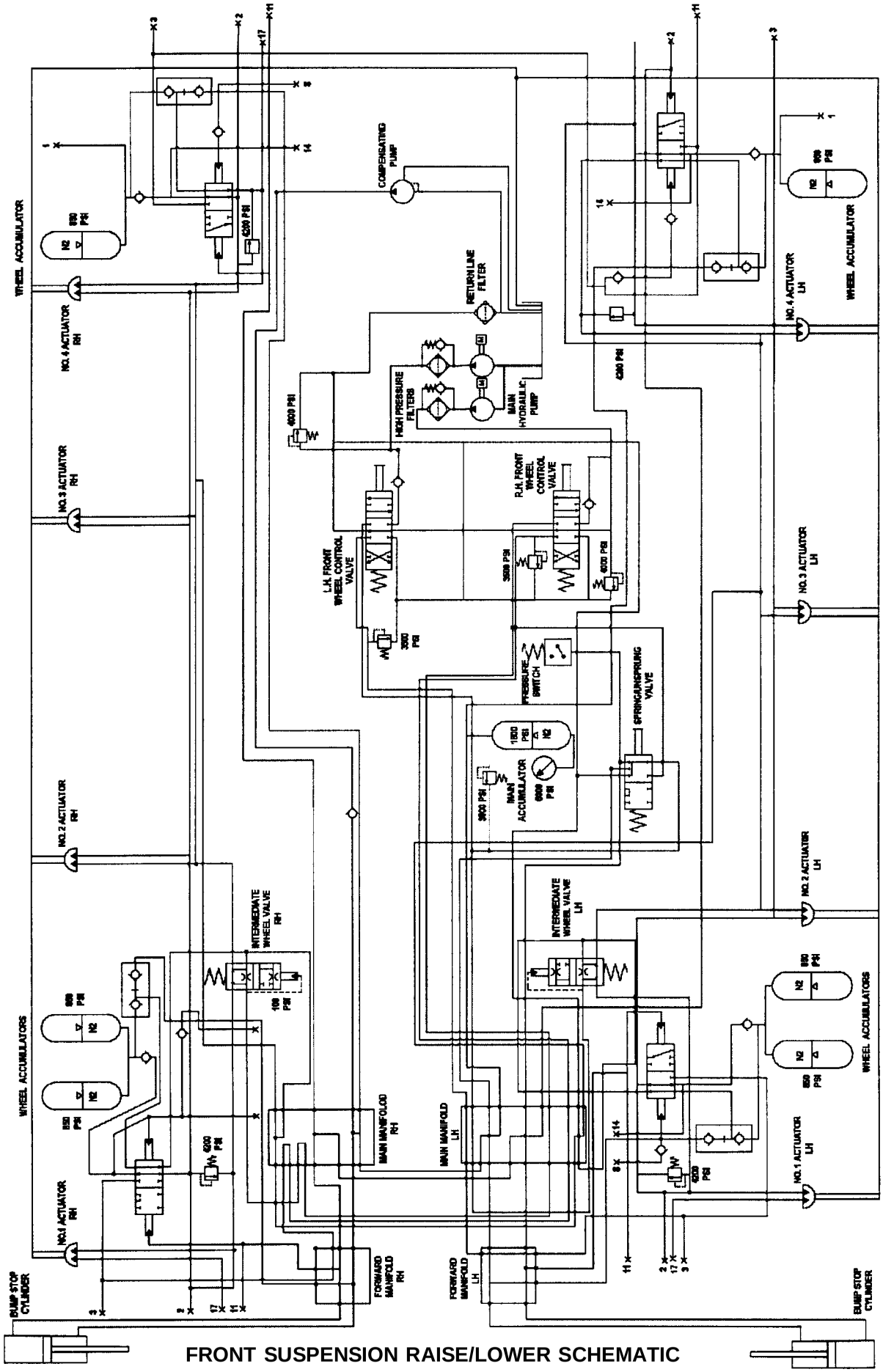
Use these procedures to troubleshoot either left or right front of vehicle.



COMPONENTS:

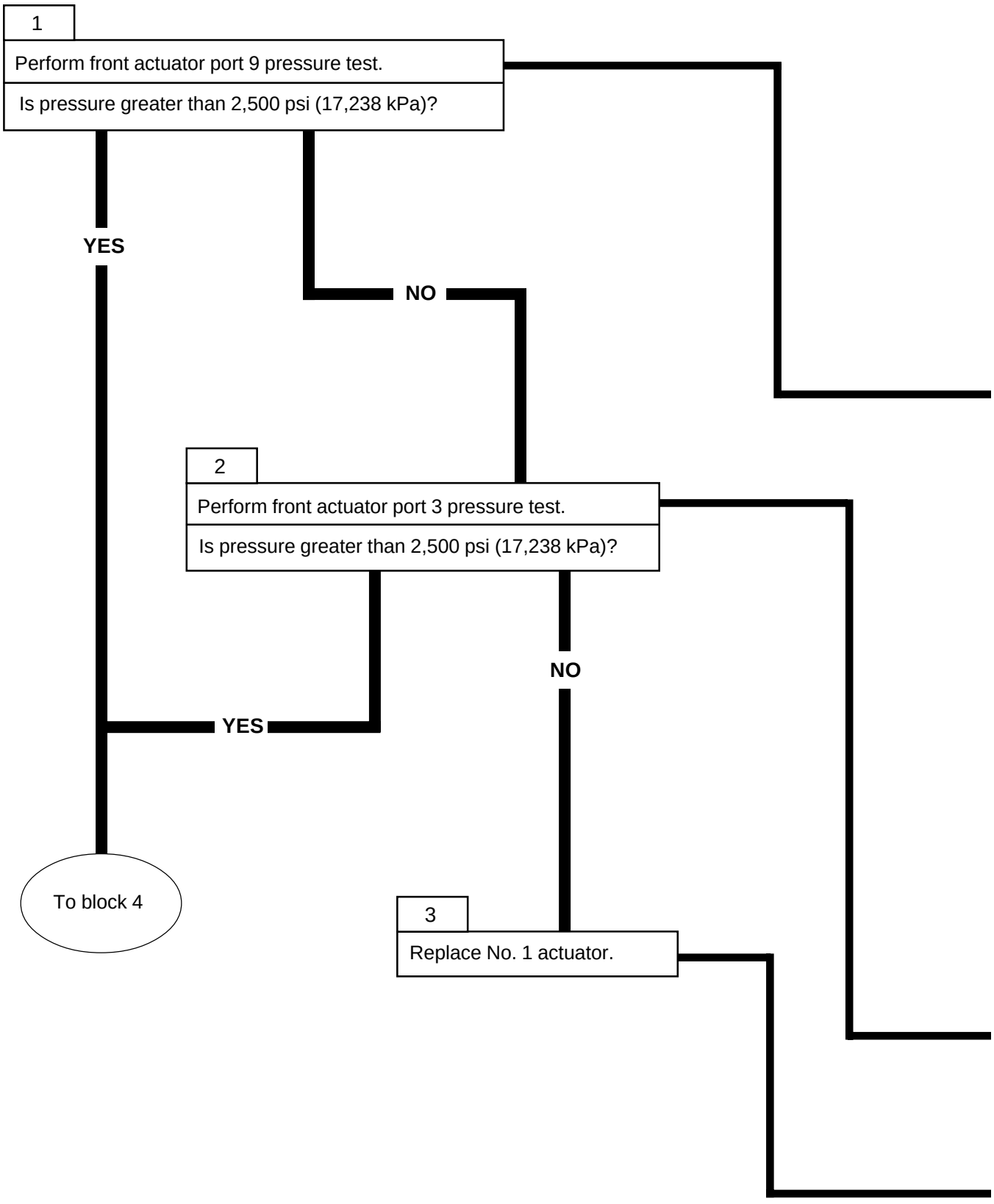
1. BUMP STOP CYLINDER
2. NO. 1 ACTUATOR, RIGHT HAND
3. NO. 2 ACTUATOR, RIGHT HAND
4. MAIN HYDRAULIC PUMP
5. RETURN LINE FILTER
6. MAIN ACCUMULATOR
7. HIGH-PRESSURE FILTERS
8. DIRECTIONAL CONTROL VALVE BANK
9. SPRUNG/UNSPRUNG VALVE
10. HYDRAULIC RESERVOIR
11. COMPENSATING PUMP
12. MAIN MANIFOLD, RIGHT HAND
13. CHECK VALVE

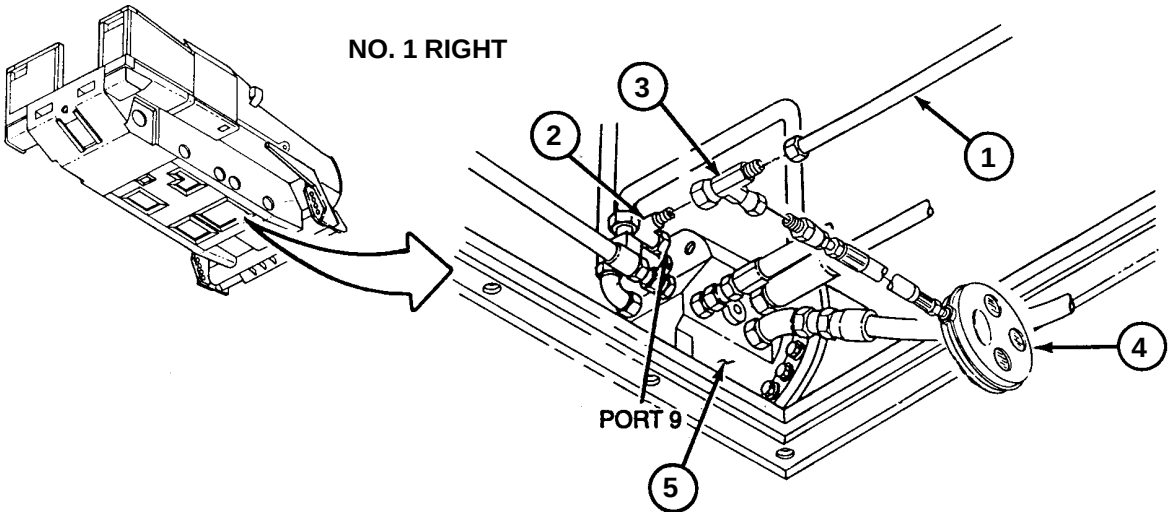
FRONT SUSPENSION RAISE/LOWER CIRCUIT



FRONT SUSPENSION RAISE/LOWER SCHEMATIC

9 FRONT CORNER (LEFT OR RIGHT) DOES NOT RAISE IN SPRUNG OR UNSPRUNG MODE (CONTINUED)



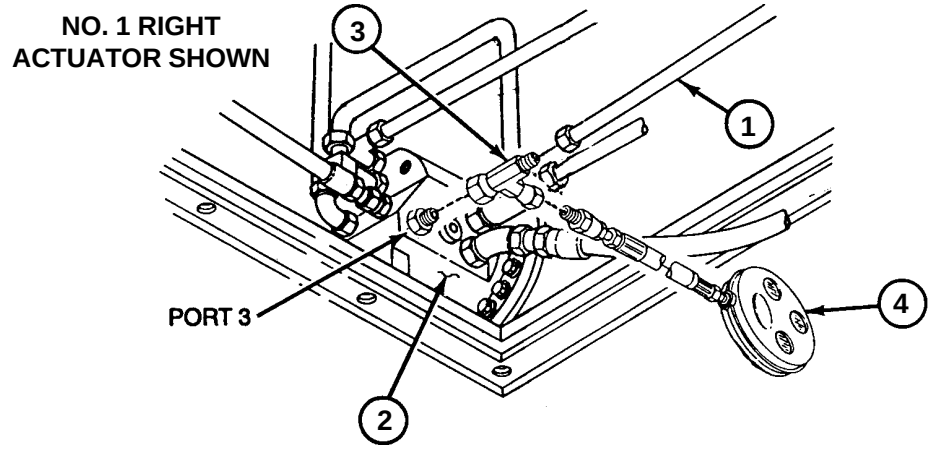


FRONT ACTUATOR PORT 9 PRESSURE TEST

NOTE

Have suitable container ready to catch oil.

- Stop engine; relieve hydraulic pressure.
- Disconnect NO 1 SPNSN UNIT-9 hose (1) from elbow (2).
- Connect tee (3) and pressure measuring device (4) between NO 1 SPNSN UNIT-9 hose (1) and elbow (2) at port 9 on No. 1 actuator (5).
- Have assistant start engine and move SPRUNG/UNSPRUNG lever to SPRUNG mode. Read pressure measuring device (4).
- Stop engine; relieve hydraulic pressure. Remove tee (3) and pressure measuring device (4) and connect NO 1 SPNSN UNIT-9 hose (1) to elbow (2) on port 9.



FRONT ACTUATOR PORT 3 PRESSURE TEST

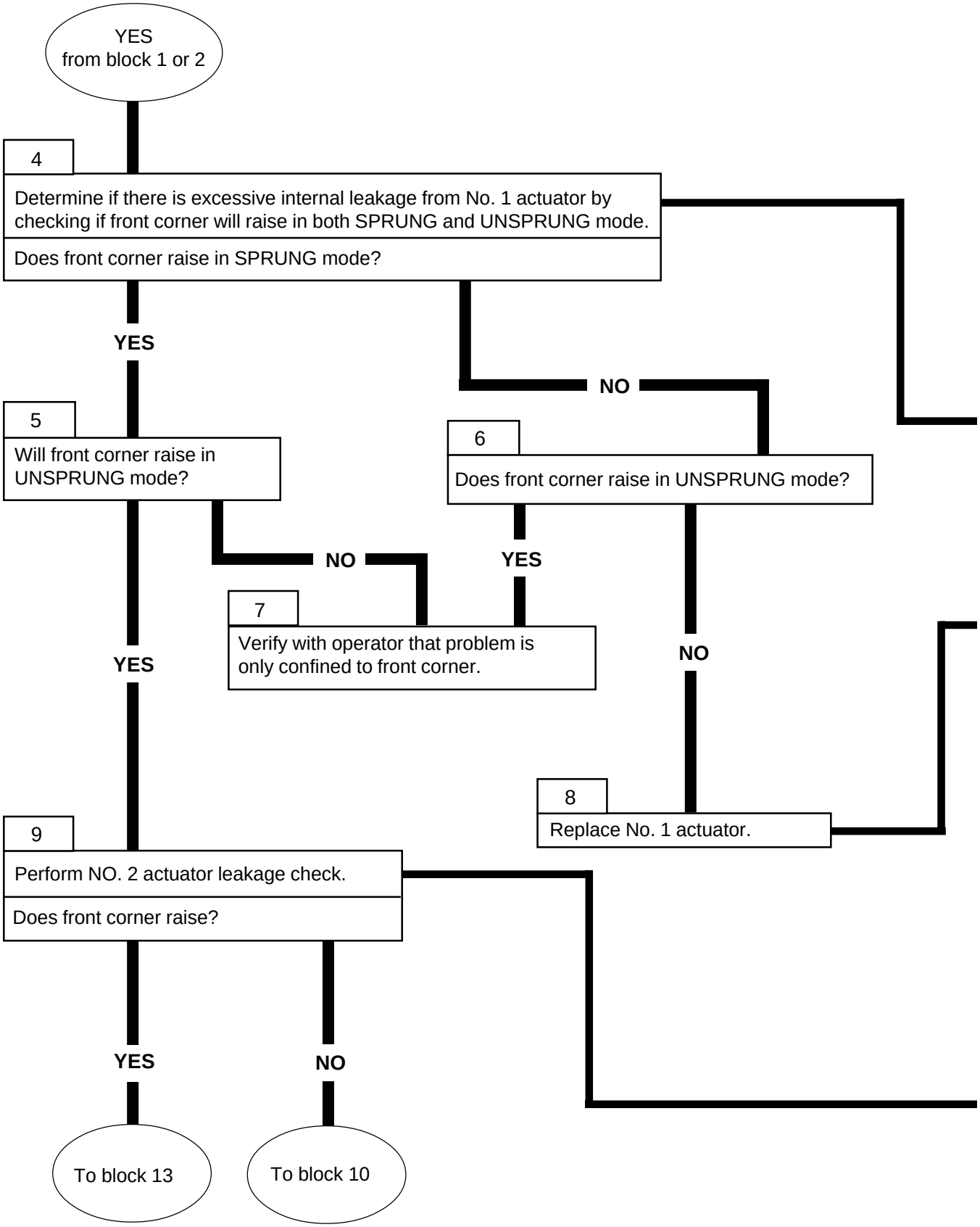
NOTE

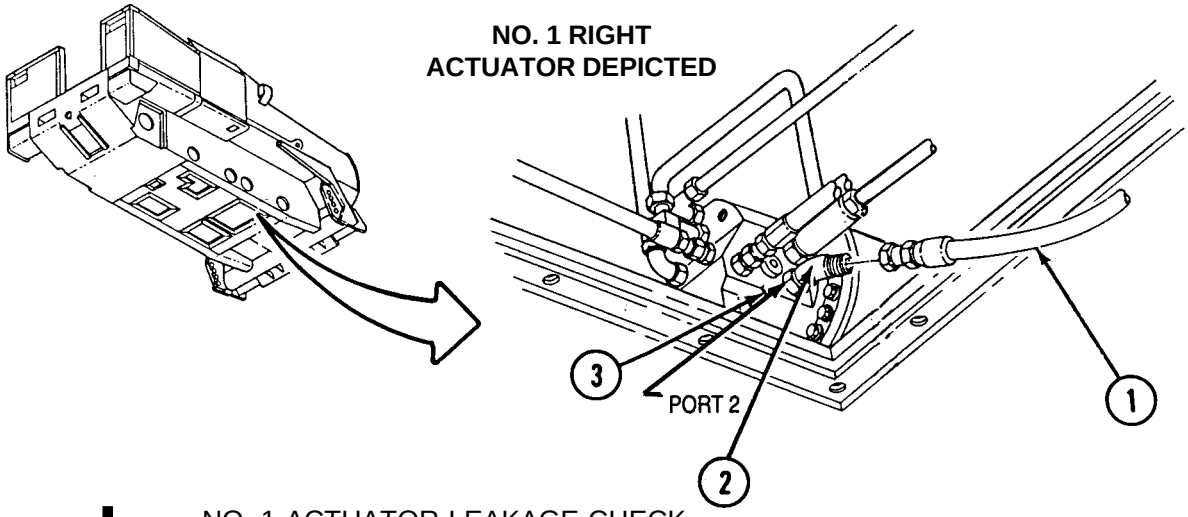
Have suitable container ready to catch oil.

- Disconnect NO 1. SPNSN UNIT-3 hose (1) from port 3 on NO. 1 actuator (2).
- Connect tee (3) and pressure measuring device (4) between NO 1 SPNSN UNIT-3 hose (1) and port 3 on No. 1 actuator (2).
- Start engine. Have assistant move SUSPENSION CONTROL lever to RAISE. Read pressure measuring device (4).
- Stop engine; relieve hydraulic pressure. Remove test equipment and connect lines.

Notify Direct Support maintenance.

9 FRONT CORNER (LEFT OR RIGHT) DOES NOT RAISE IN SPRUNG OR UNSPRUNG MODE (CONTINUED)





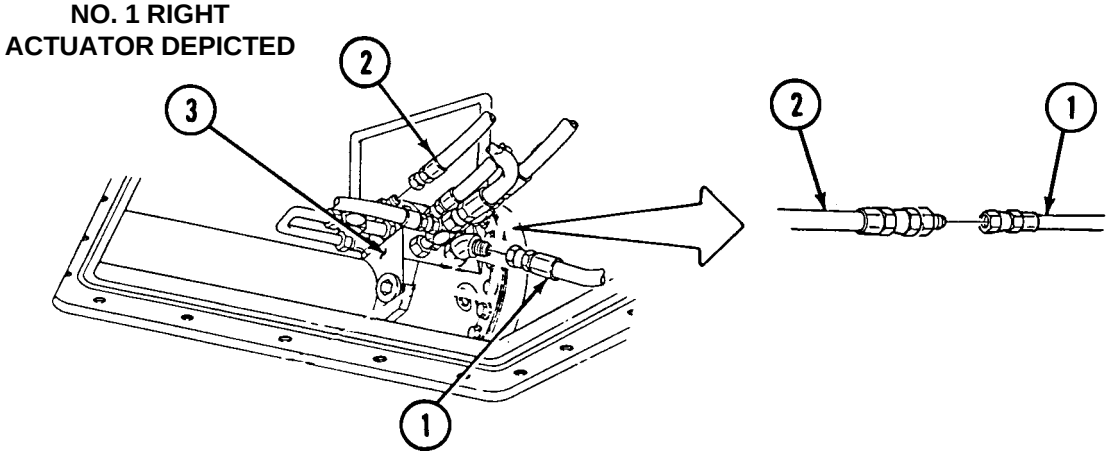
NO. 1 ACTUATOR LEAKAGE CHECK

NOTE

Have suitable container ready to catch oil.

- Disconnect NO 1 SPNSN UNIT-2 hose (1) from elbow (2) at port 2 on No. 1 actuator (3). Cap elbow (2) and plug hose (1).
- Have assistant start engine and move SPRUNG/UNSPRUNG lever to SPRUNG. Observe that corner of vehicle does raise.
- Have assistant move SPRUNG/UNSPRUNG lever to UNSPRUNG and SUSPENSION CONTROL lever to RAISE. Observe that corner of vehicle does raise.
- Stop engine; relieve hydraulic pressure and connect lines.

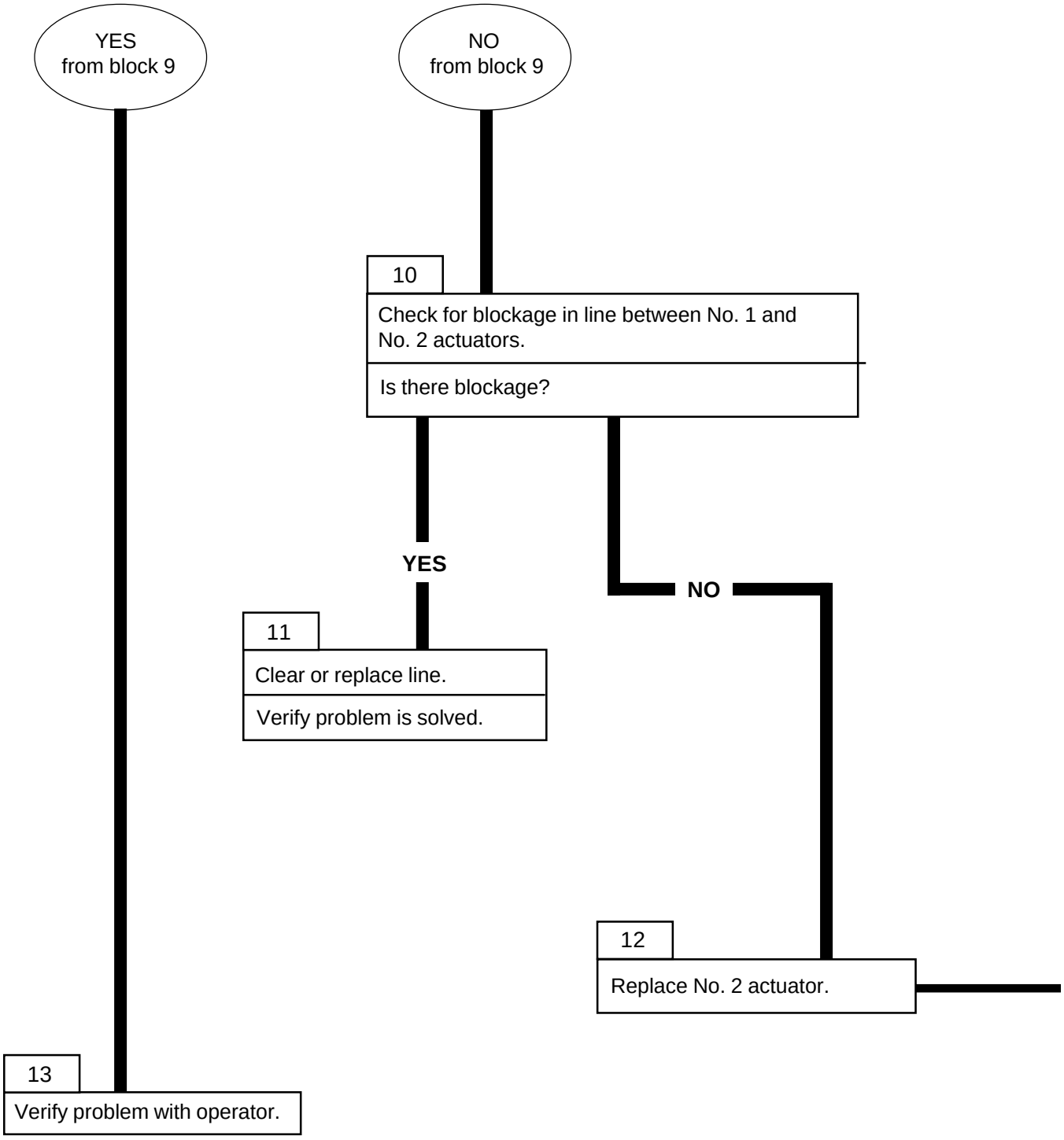
Notify Direct Support maintenance.



NO. 2 ACTUATOR LEAKAGE CHECK

- Connect NO 1 SPNSN UNIT-2 hose (1) to NO 1 SPNSN UNIT-3 hose (2).
- Start engine and move SUSPENSION CONTROL lever to RAISE. Excessive leakage is indicated if corner of vehicle fails to raise. If front corner does raise, problem is most likely in No. 1 actuator (3).
- Stop engine; relieve hydraulic pressure and connect lines.

9 **FRONT CORNER (LEFT OR RIGHT) DOES NOT RAISE IN SPRUNG OR UNSPRUNG MODE (CONTINUED)**

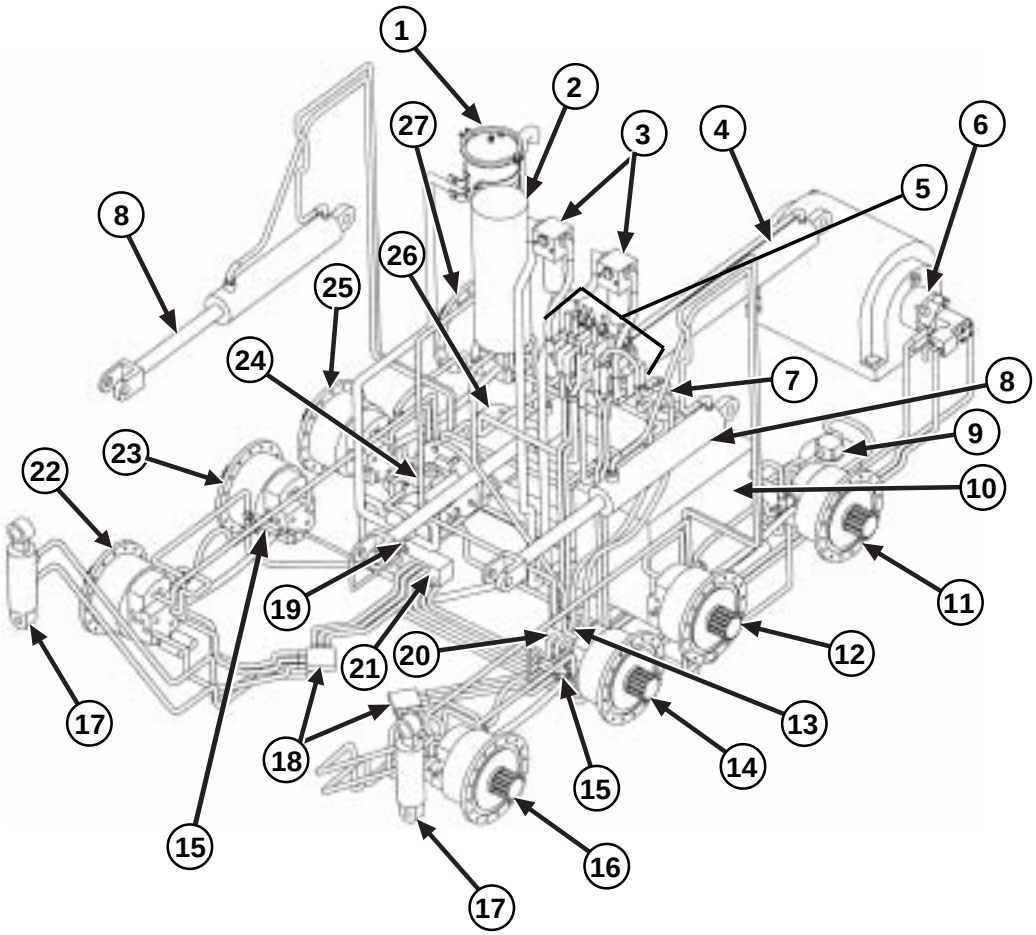


→ Notify Direct Support maintenance.

10 HYDRAULIC OIL OVERHEATS

WARNING

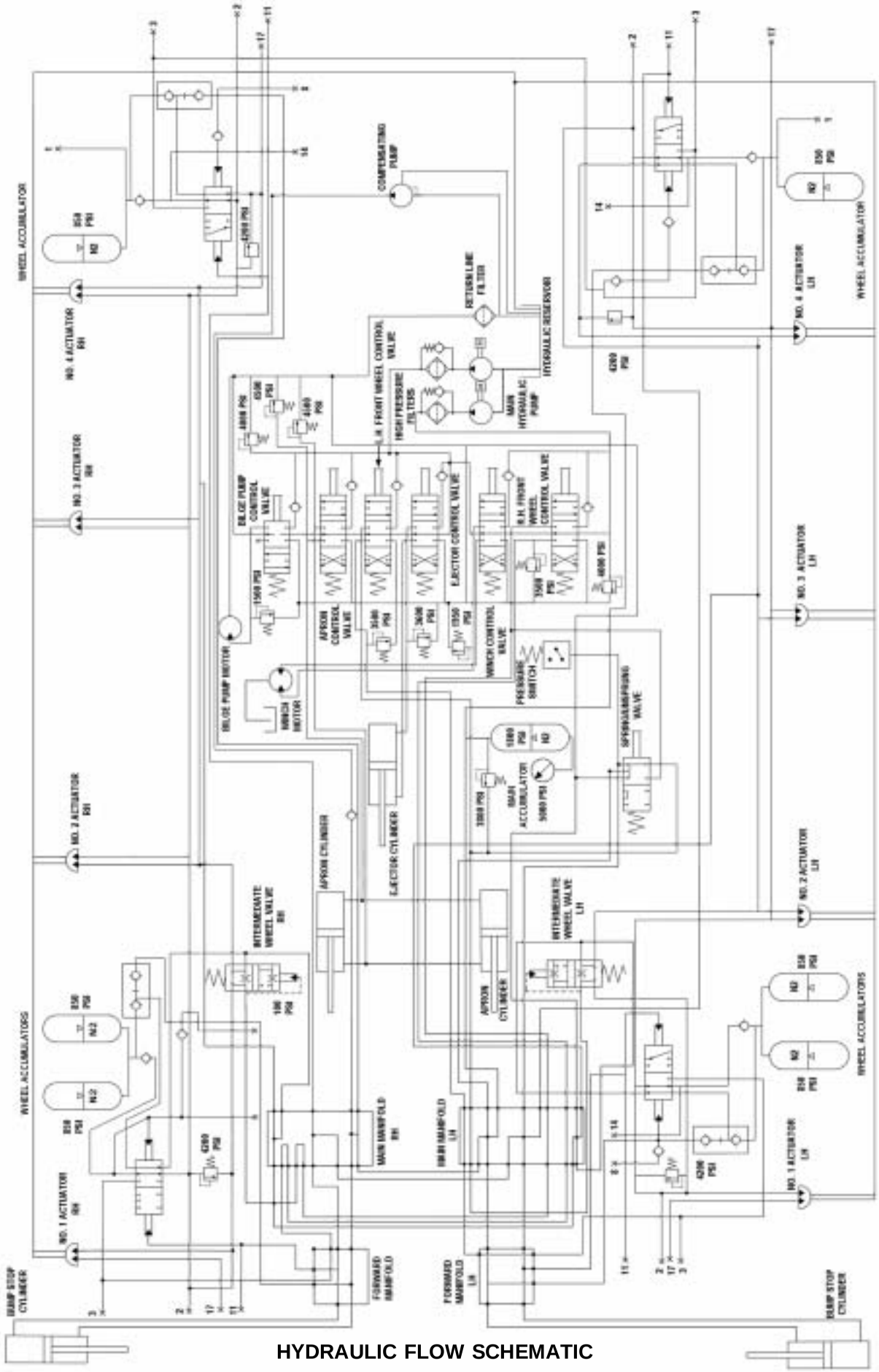
High pressure is present in the M9 hydraulic system. Do not disconnect any hydraulic system component unless hydraulic system pressure has been relieved. Ensure each hydraulic control lever is moved several times through all positions and hydraulic tank dipstick is slowly loosened to relieve pressure. Failure to comply may result in severe injury or death to personnel.



COMPONENTS:

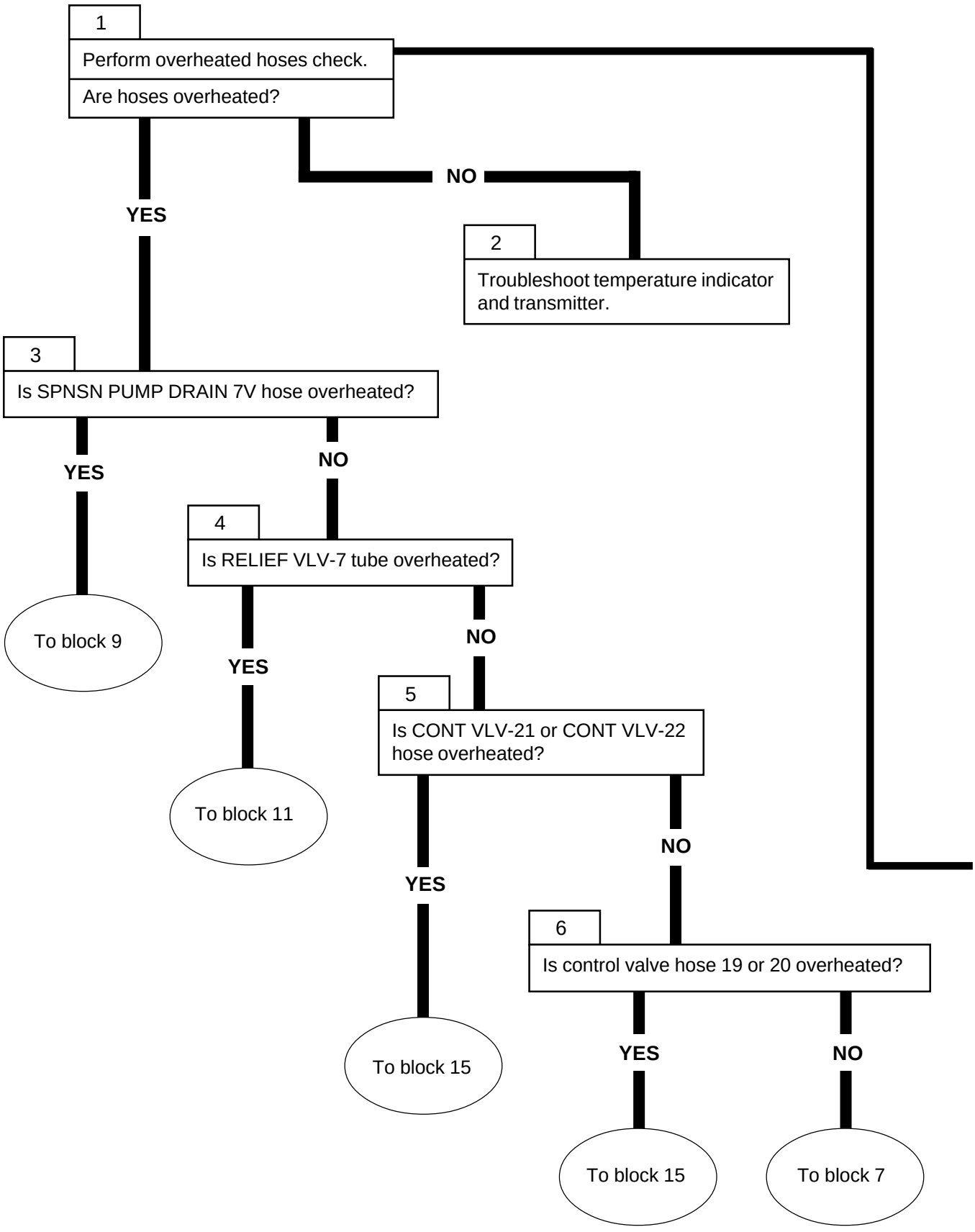
1. RETURN LINE FILTER
2. MAIN ACCUMULATOR
3. HIGH-PRESSURE FILTERS
4. EJECTOR CYLINDER
5. DIRECTION CONTROL VALVE BANK
6. WINCH MOTOR
7. SPRUNG/UNSPRUNG VALVE
8. APRON CYLINDER
9. BILGE PUMP MOTOR
10. HYDRAULIC RESERVOIR
11. NO. 4 ACTUATOR, LEFT HAND
12. NO. 3 ACTUATOR, LEFT HAND
13. SUSPENSION RELIEF VALVE (BEHIND)
14. NO. 2 ACTUATOR, LEFT HAND
15. INTERMEDIATE WHEEL VALVE
16. NO. 1 ACTUTUATOR, LEFT HAND
17. BUMP STOP CYLINDERS
18. FORWARD MANIFOLDS
19. CHECK VALVE
20. MAIN MANIFOLD, LEFT HAND
21. FORWARD MANIFOLDS, RIGHT HAND
22. NO. 1 ACTUATOR, RIGHT HAND
23. NO. 2 ACTUATOR, RIGHT HAND
24. COMPENSATING PUMP
25. NO. 3 ACTUATOR, RIGHT HAND
26. MAIN HYDRAULIC PUMP
27. NO. 4 ACTUATOR, RIGHT HAND

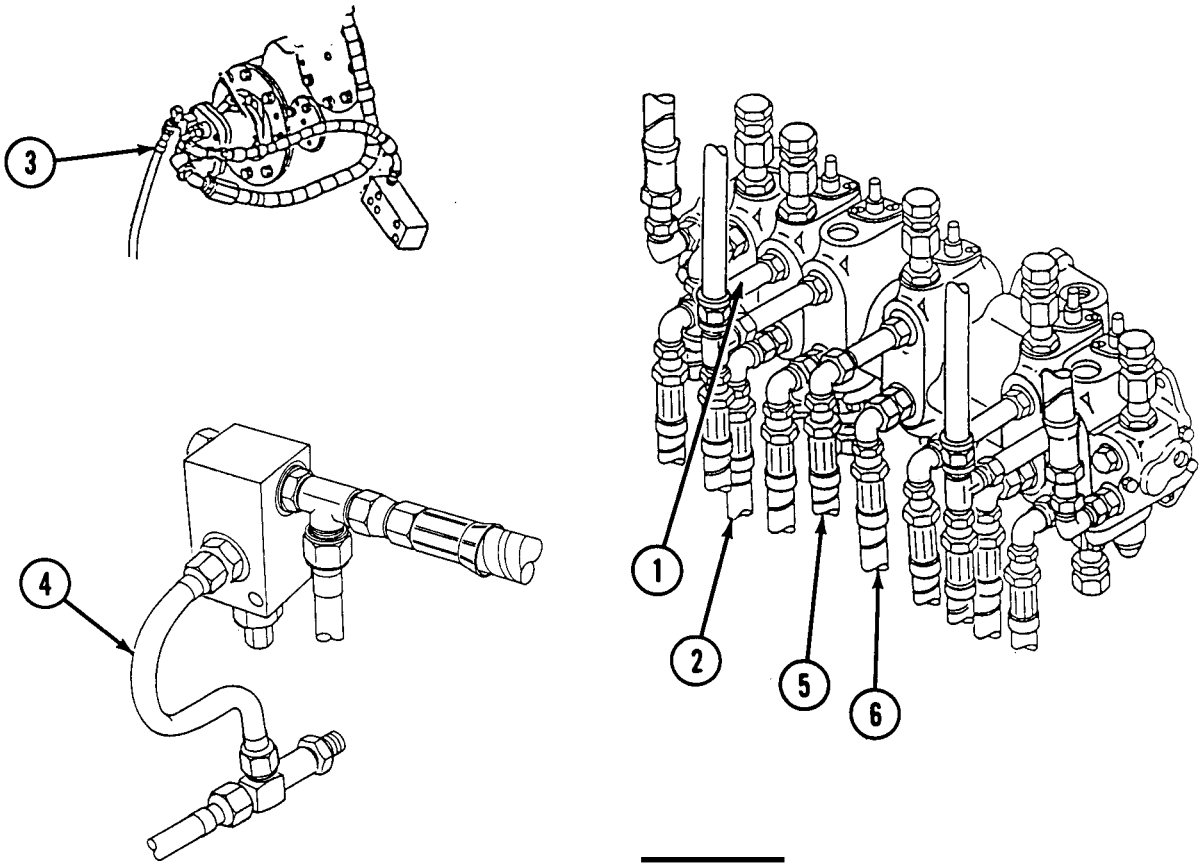
HYDRAULIC CIRCUIT



HYDRAULIC FLOW SCHEMATIC

10 HYDRAULIC OIL OVERHEATS (CONTINUED)





WARNING

Before performing any troubleshooting in bowl, move ejector forward and engage the ejector lock. Failure to comply may result in severe injury or death to personnel.

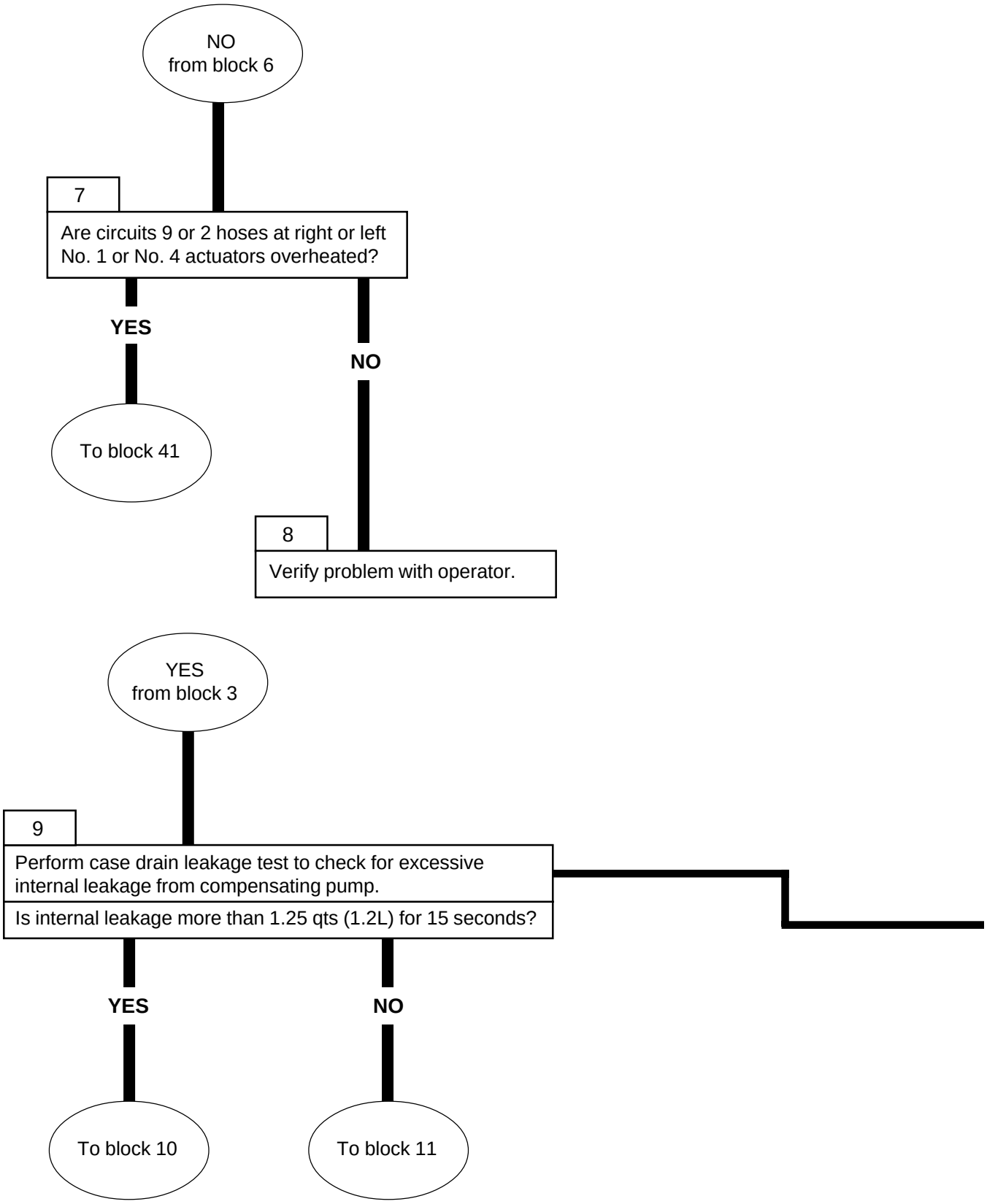
OVERHEATED HOSES CHECK

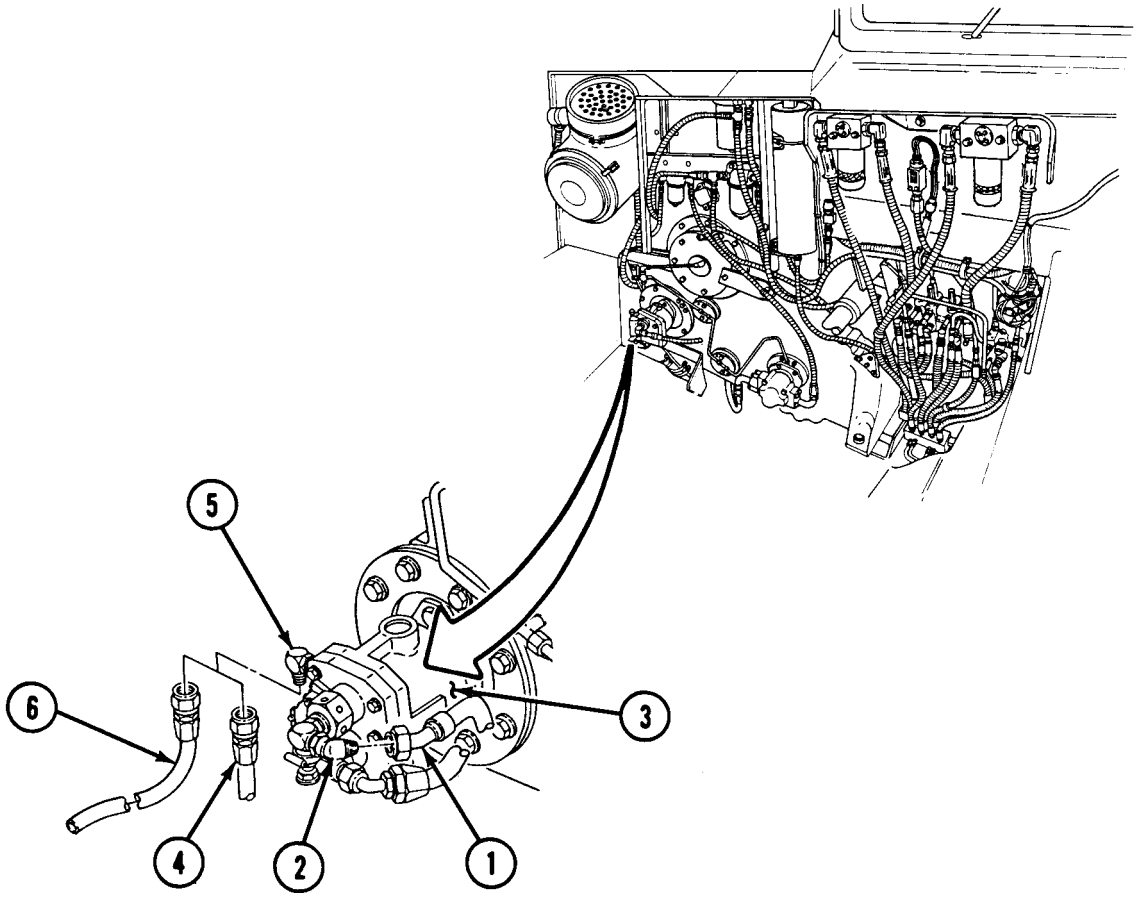
NOTE

Begin this procedure with the engine cold.

- Start engine and allow to run for about five minutes.
- As engine warms, carefully feel CONT VLV-19 (1), CONT VLV-20 (2), SPNSN PUMP DRAIN-7V hose (3), relief VLV-7 tube (4), CONT VLV-21 hose (5), and CON VLV-22 hose (6) with an ungloved hand. Hoses should feel warm but not hot.
- Cycle apron and ejector control levers for total oil flow through the systems.
- Operate vehicle for 1/2 hour. Stop and repeat steps 2 and 3 every 10 minutes to check if an overheated hose or tube can be detected.
- Stop engine; relieve hydraulic pressure.

10 HYDRAULIC OIL OVERHEATS (CONTINUED)





CASE DRAIN LEAKAGE TEST

WARNING

Before performing any hydraulic troubleshooting in bowl, move ejector forward and engage the ejector lock. Failure to comply may result in severe injury or death to personnel.

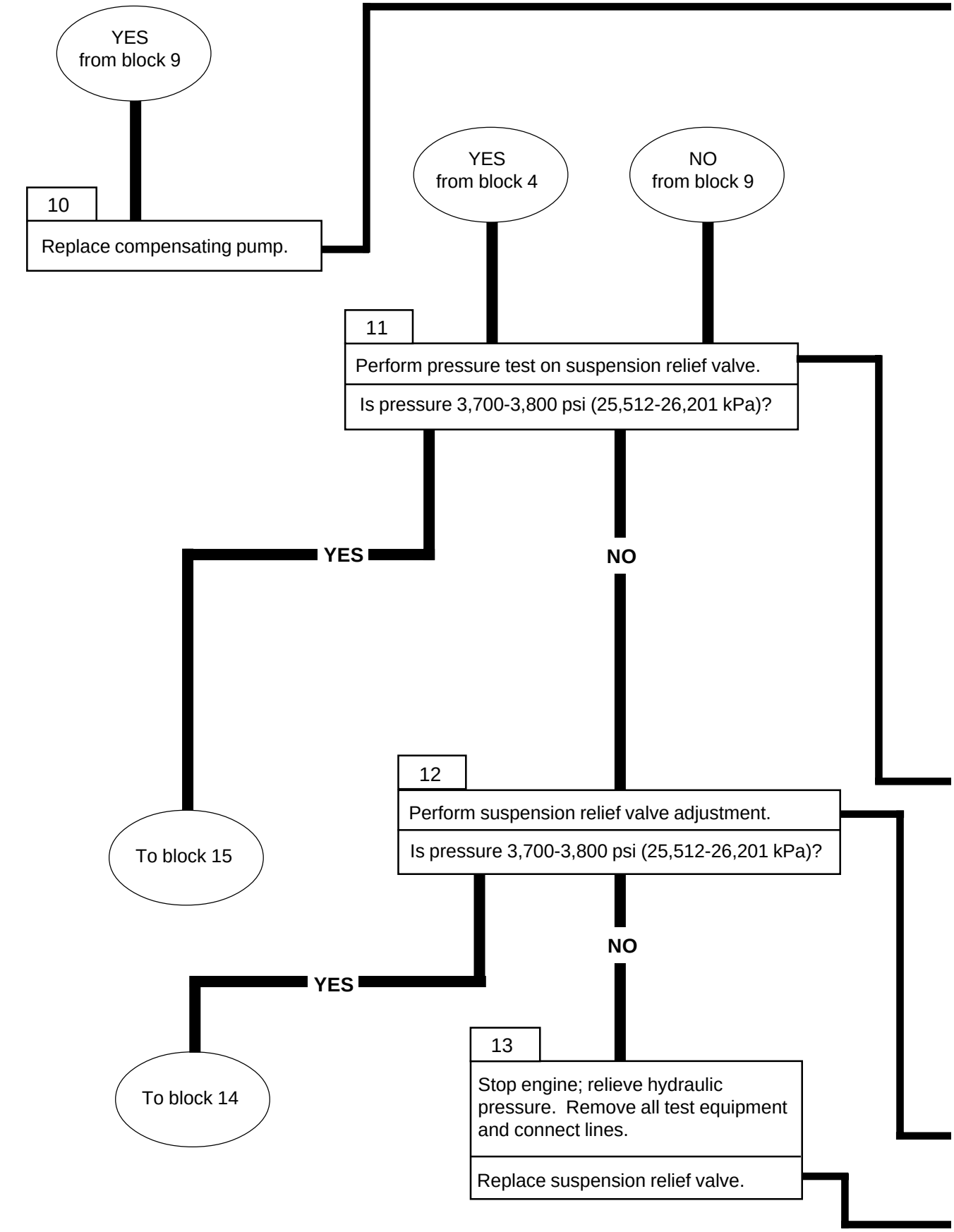
NOTE

Have a graduated container of at least two quart (1.9 liter) capacity available to catch hydraulic oil while test is being performed.

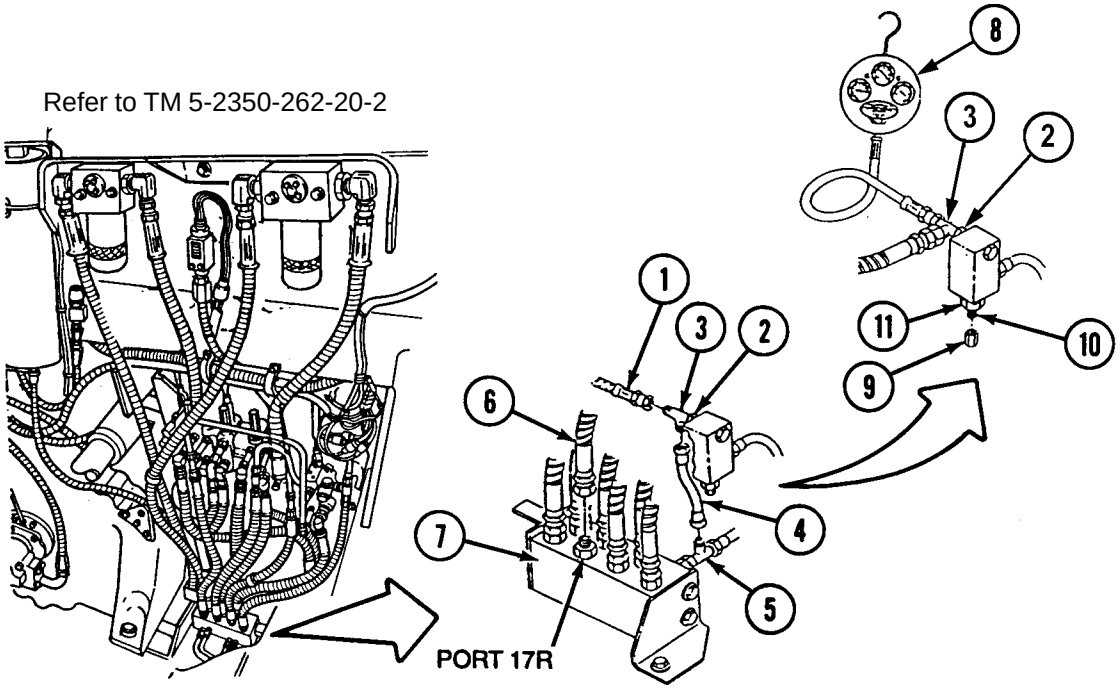
Have suitable container ready to catch oil.

- Start engine, move ejector forward, stop engine, engage ejector lock, and relieve hydraulic pressure.
- Disconnect SPNSN PUMP-9 hose (1) from elbow (2) on compensating pump (3). Cap elbow (2) and plug hose (1).
- Disconnect SPNSN PUMP DRAIN-7V hose (4) from elbow (5). Plug hose (4). Connect drain hose (6) to elbow (5).
- Hold end of drain hose (6) in graduated container.
- Have assistant start engine and run at 1,800 rpm for 15 seconds. Observe the quantity of hydraulic oil in container. More than 1.25 qts (1.2L) indicates excessive leakage.
- Stop engine; relieve hydraulic pressure, remove all test equipment, and connect hoses.

10 HYDRAULIC OIL OVERHEATS (CONTINUED)



Refer to TM 5-2350-262-20-2



SUSPENSION RELIEF VALVE PRESSURE TEST

WARNING

Before performing any hydraulic troubleshooting in bowl, move ejector forward and engage the ejector lock. Failure to comply may result in severe injury or death to personnel.

NOTE

Have suitable container ready to catch oil.

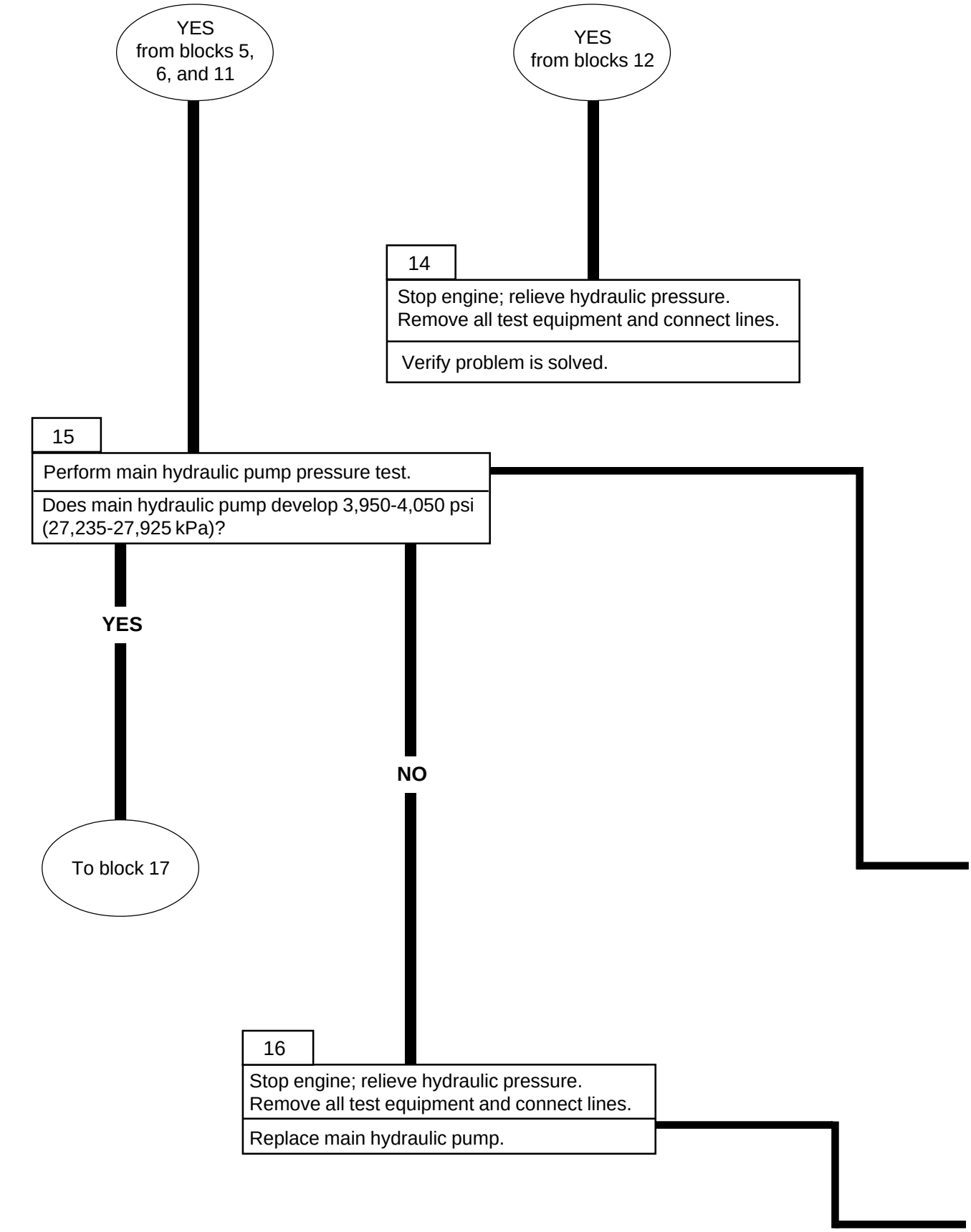
- Start engine, move ejector forward, engage ejector lock, stop engine, and relieve hydraulic pressure.
- Disconnect RELIEF VLV-9 hose (1) and loosen jamnut (2) on suspension relief valve tee (3). Plug hose (1).
- Disconnect RELIEF VLV-9 tube (4) from suspension relief valve tee (3) and rear left-hand main manifold tee (5). Cap tee (5).
- Rotate suspension relief valve tee (3) 90° toward front of vehicle. Tighten jamnut (2).
- Disconnect LH MAIN MANF TOP-17R hose (6) from port 17R on left-hand main manifold (7) and connect it to suspension relief valve tee (3). Cap port 17R.
- Connect pressure measuring device (8) to suspension relief valve tee (3).
- Have assistant start engine, move SPRUNG/UNSPRUNG lever to SPRUNG and SUSPENSION CONTROL lever to LOWER. Read pressure measuring device (8).

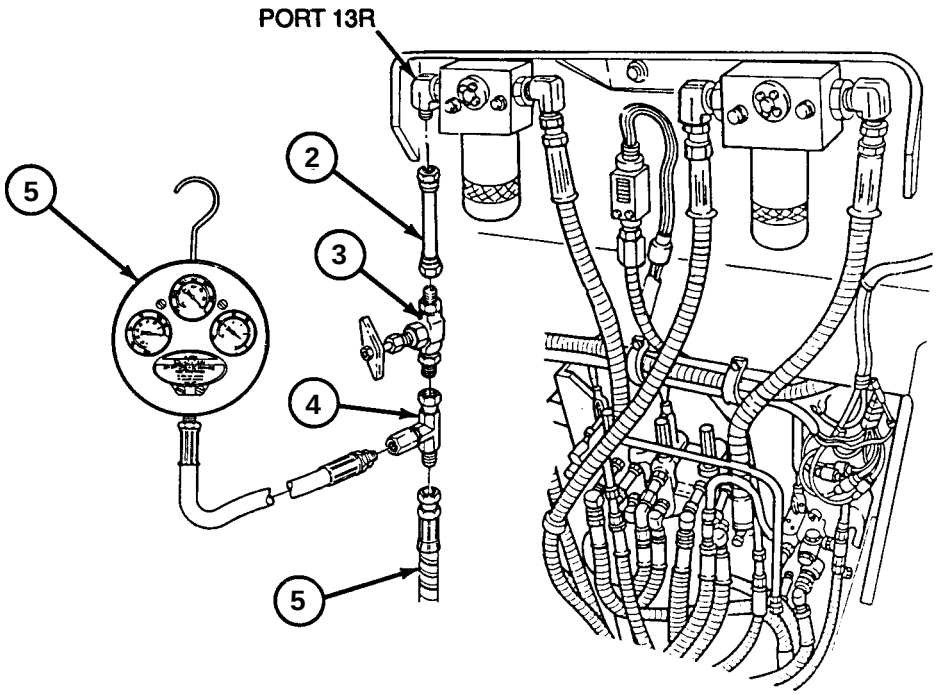
SUSPENSION RELIEF VALVE ADJUSTMENT

- Adjust the pressure as follows: remove cap (9) from suspension relief valve adjusting shaft (10) and loosen jamnut (11).
- Turn adjusting shaft (1) clockwise to increase pressure; counterclockwise to decrease pressure. Read pressure measuring device (8). Tighten jamnut (11) and replace cap (9).

Refer to TM 5-2350-262-20-2.

10 HYDRAULIC OIL OVERHEATS (CONTINUED)





MAIN HYDRAULIC PUMP PRESSURE TEST

WARNING

Before performing any troubleshooting in bowl, move ejector forward and engage the ejector lock. Failure to comply may result in severe injury or death to personnel.

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

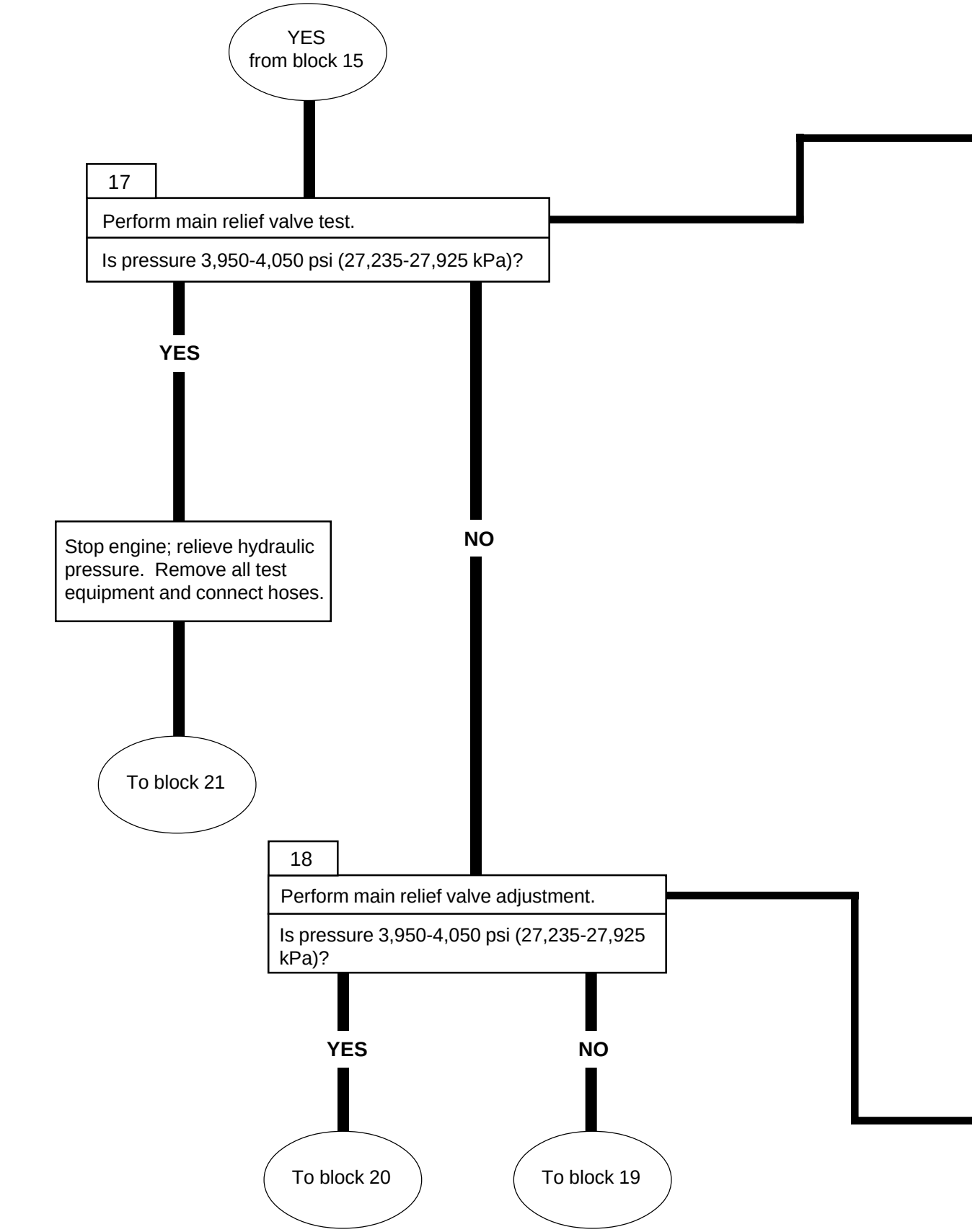
NOTE

Have suitable container ready to catch oil.

- Stop engine; relieve hydraulic pressure. Remove all test equipment and connect hoses.
- Disconnect HYDR FLTR-IN-13R hose (1) from high-pressure filter inlet port 13R.
- Install coupling tube (2), globe valve (3), tee (4), and pressure measuring device (5) between HYDR FLTR-IN-13R hose (5) and high-pressure filter inlet port 13R.
- Have assistant start engine and allow engine to idle (750-800 rpm). Slowly close globe valve (3) until pressure reaches 3,950-4,050 psi (27,235-27,925 kPa).
- Open globe valve (3).
- Stop engine; relieve hydraulic pressure.

Refer to TM 5-2350-262-20-2.

10 **HYDRAULIC OIL OVERHEATS (CONTINUED)**



MAIN RELIEF VALVE TEST

WARNING

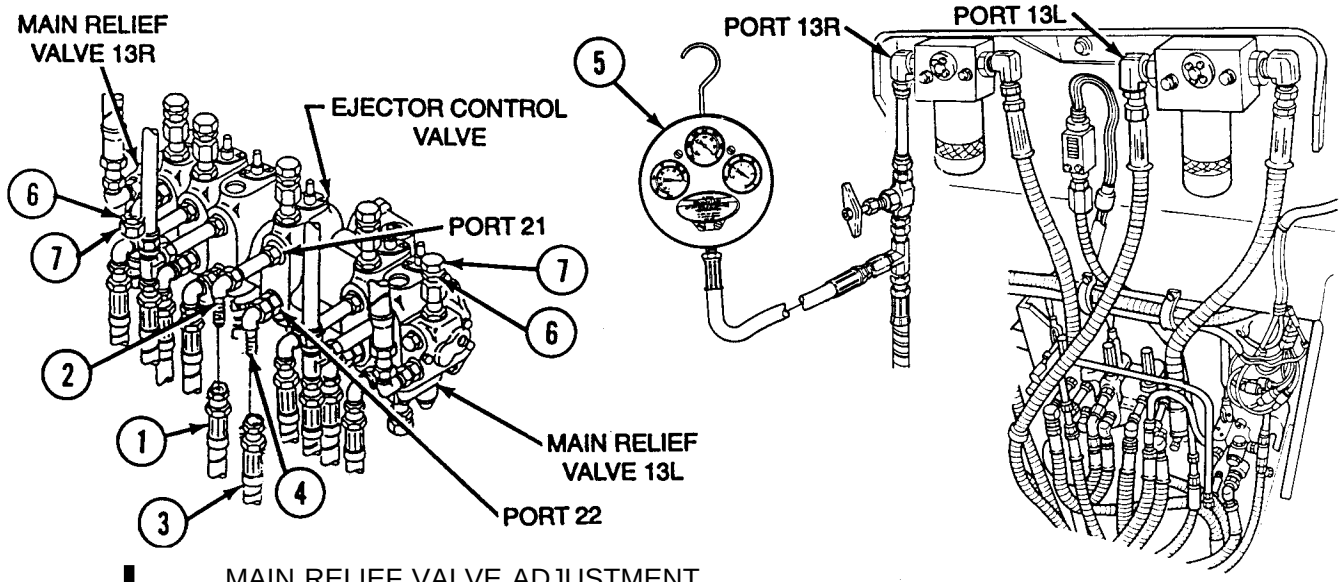
Before performing any hydraulic troubleshooting in bowl, move ejector forward and disable it by disconnecting ejector cylinder from hydraulic system. Failure to comply may result in severe injury or death to personnel.

NOTE

When moving test equipment to high-pressure filter inlet port 13L, the coupling tube and globe valve installed during the main hydraulic pump test will not be required.

Have suitable container ready to catch oil.

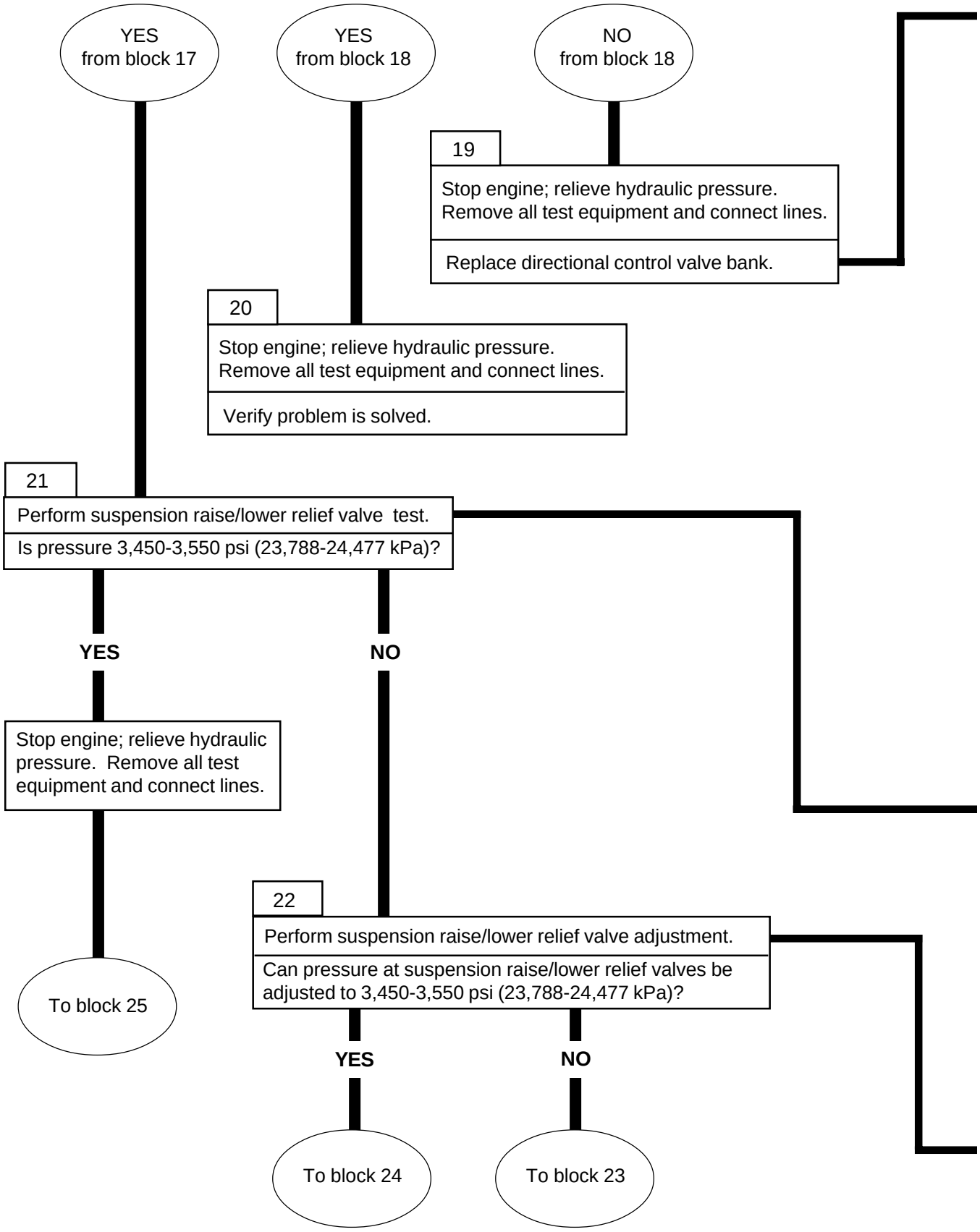
- Start engine, move ejector forward, stop engine, and relieve hydraulic pressure.
- Disable ejector by disconnecting CONT VLV-21 at port 22 on ejector control valve. Plug hoses; cap elbows.
- Start engine; have assistant hold EJECTOR CONTROL lever in BACK position. Read pressure measuring device (5). Check main relief valves 13R and 13L individually as follows:
- 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 pressure measuring device (5). If the pressure is not within limits adjust the main relief valve 13R.



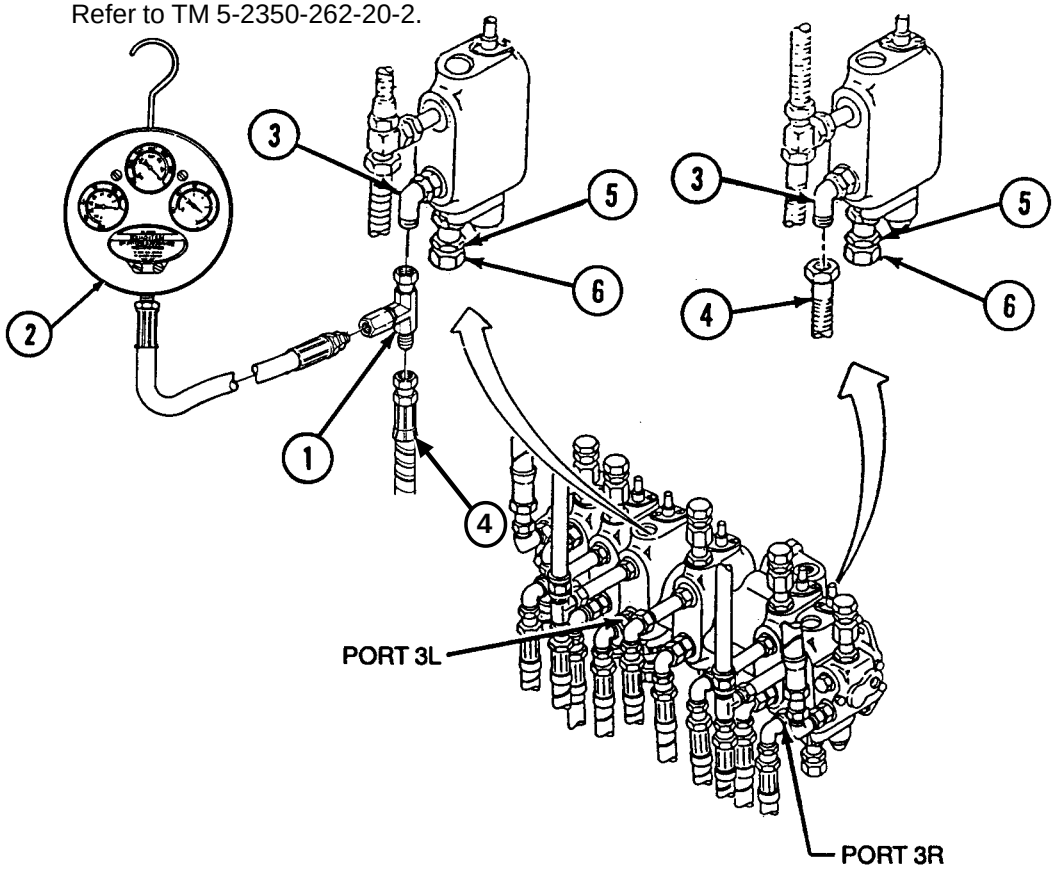
MAIN RELIEF VALVE ADJUSTMENT

- Loosen jamnut (6) on main relief valve 13R.
- Have assistant simultaneously hold EJECTOR CONTROL lever in BACK while holding the right-hand SUSPENSION CONTROL lever in RAISE.
- Rotate adjusting screw (7) on main relief valve 13R clockwise to increase pressure and counterclockwise to decrease pressure. Once hydraulic pressure is within limits, tighten jamnut (6).
- Stop engine; relieve hydraulic pressure.
- Move test equipment to high-pressure filter inlet port 13L and repeat the previous steps using the left-hand SUSPENSION CONTROL lever.

10 HYDRAULIC OIL OVERHEATS (CONTINUED)



Refer to TM 5-2350-262-20-2.



SUSPENSION RAISE/LOWER RELIEF VALVE TEST

NOTE

This test is done at both right-hand and left-hand suspension raise/lower relief valves. For the right-hand valve, install test equipment at port 3R and actuate the right-hand SUSPENSION CONTROL lever. For the left-hand valve, install test equipment at port 3L and actuate the left-hand SUSPENSION CONTROL lever.

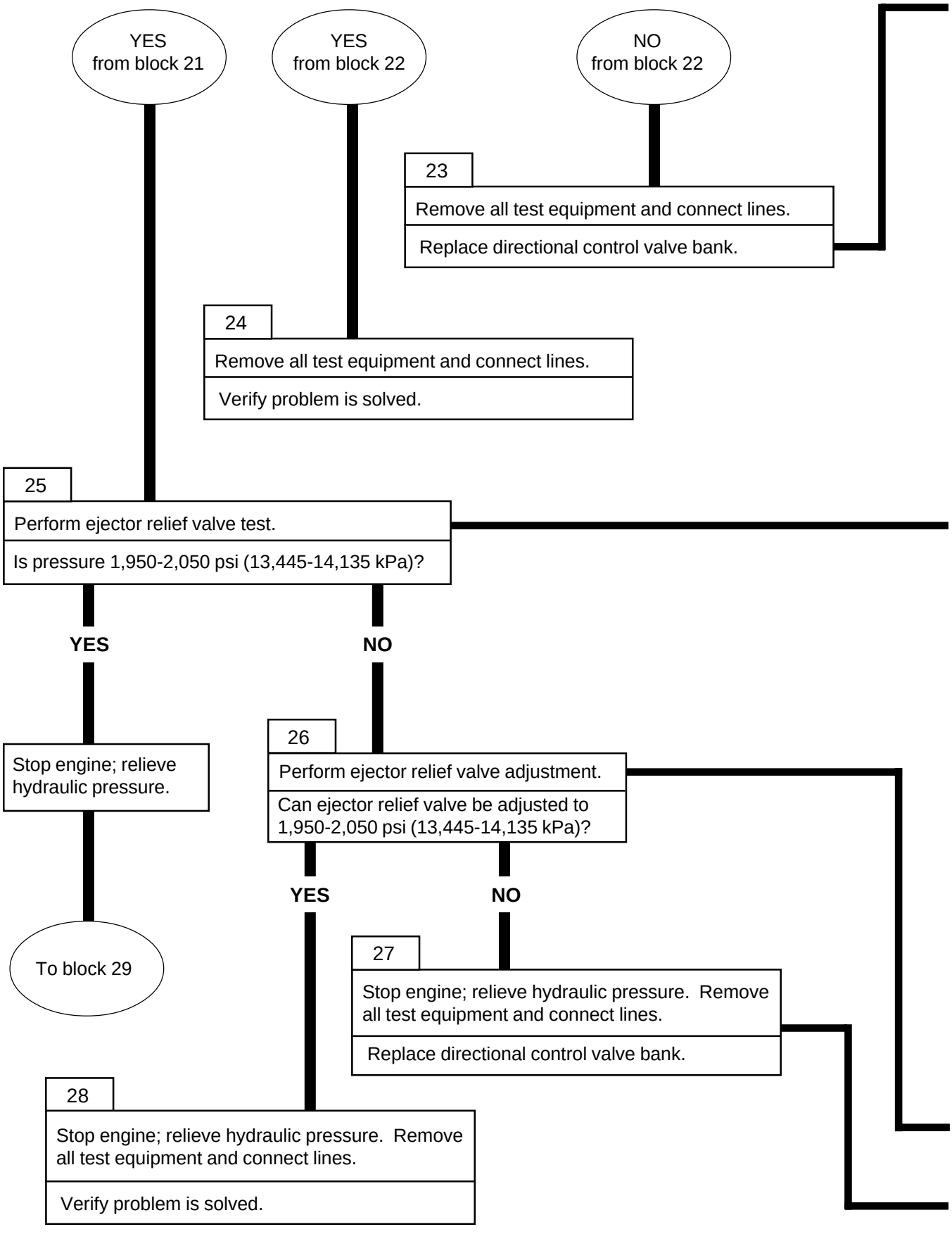
Have suitable container ready to catch oil.

- Install tee (1) and pressure measuring device (2) between elbow (3) on port 3R or port 3L and port 3 hose (4).
- Have assistant start engine and move SUSPENSION CONTROL lever to RAISE. Read pressure measuring device (2). Adjust pressure.

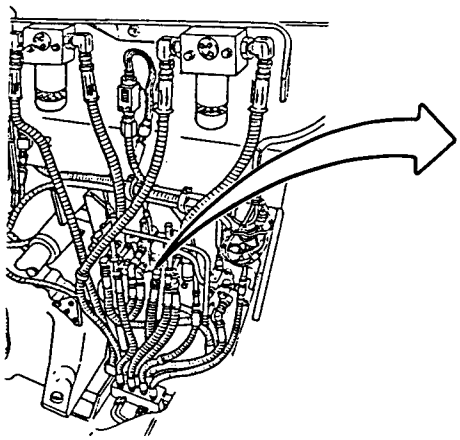
SUSPENSION RAISE/LOWER RELIEF VALVE ADJUSTMENT

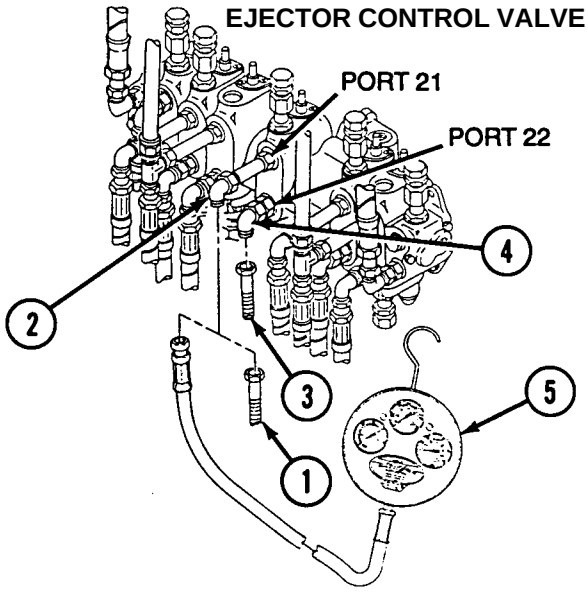
- Loosen jamnut (5) on port 3R or port 3L of suspension raise/lower relief valve.
- With SUSPENSION CONTROL elver still in RAISE, turn adjusting screw (6) clockwise to increase pressure; counterclockwise to decrease pressure.
- Tighten jamnut (5).
- Stop engine; relieve hydraulic pressure.

10 HYDRAULIC OIL OVERHEATS (CONTINUED)



Refer to TM 5-2350-262-20-1





EJECTOR RELIEF VALVE TEST

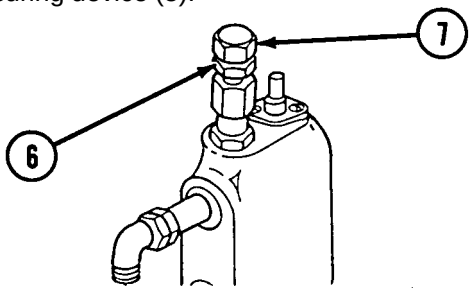
WARNING

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

NOTE

Have suitable container ready to catch oil.

- Move ejector halfway forward, stop engine, and relieve hydraulic pressure.
- Disable the ejector from the hydraulic system by disconnecting CONT VLV-21 hose (1) from elbow (2) on port 21 of ejector control valve and CONT VLV-22 hose (3) from elbow (4) on port 22. Cap elbow (4) on port 22 and plug hoses (1 and 3)
- Connect pressure measuring device (5) to elbow (2) on port 21 of ejector control valve.
- Have assistant start engine and hold EJECTOR CONTROL lever in the FORWARD position. Read pressure measuring device (5).



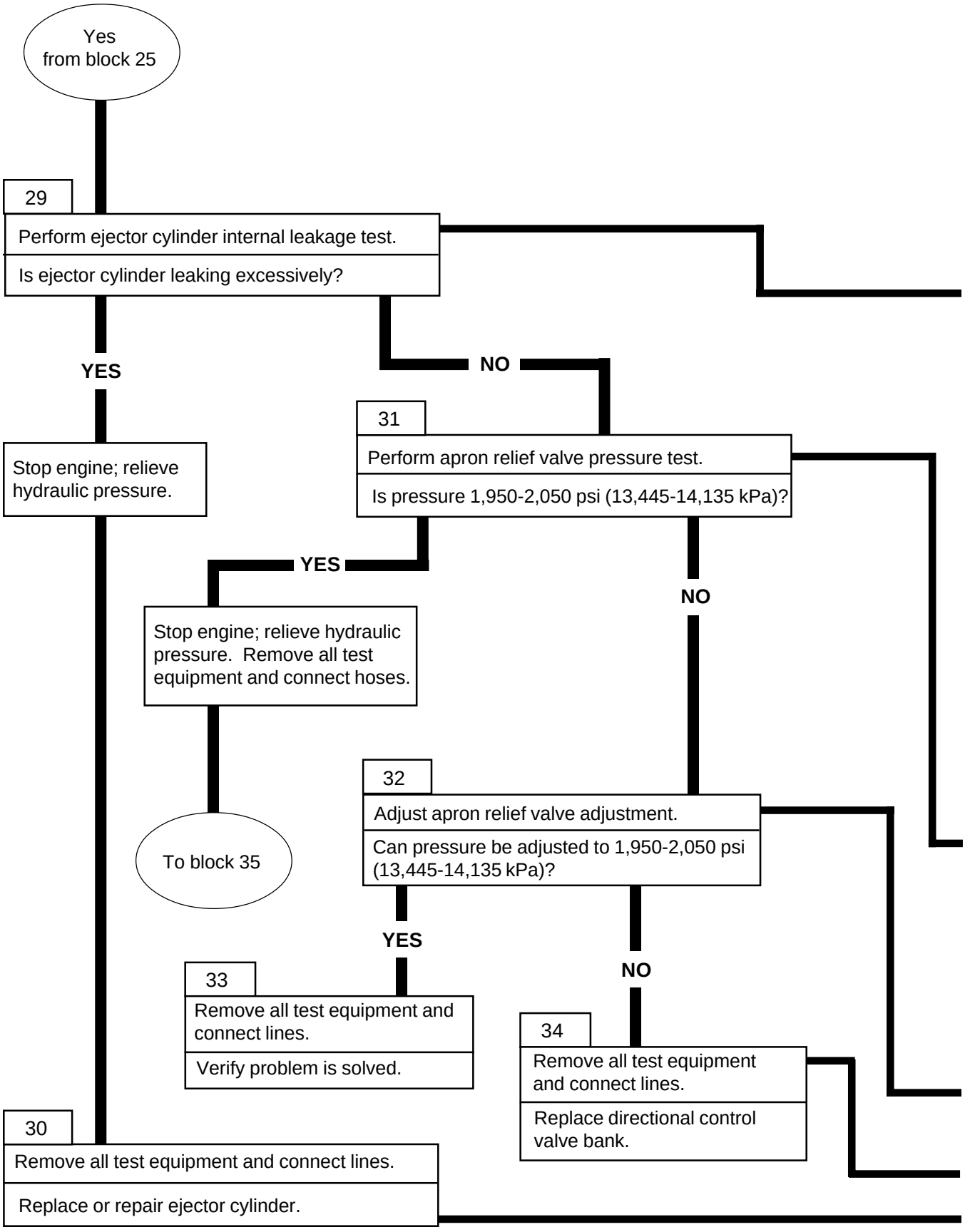
EJECTOR CONTROL VALVE

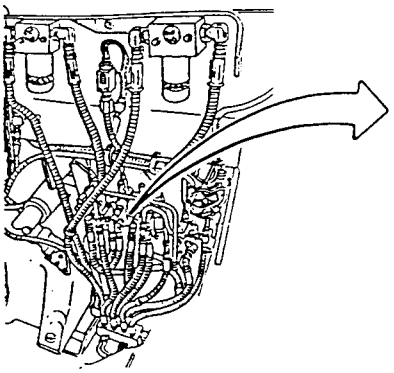
EJECTOR RELIEF VALVE ADJUSTMENT

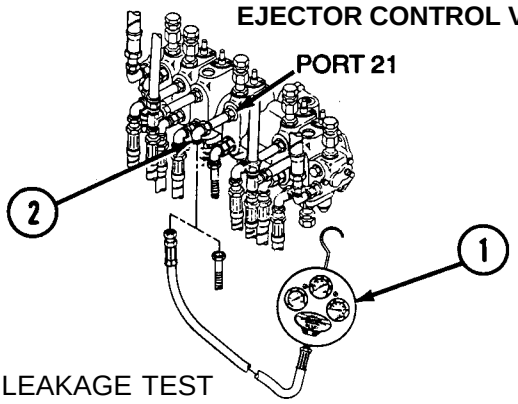
Loosen jamnut (6) on ejector relief valve and turn valve (7) clockwise or counterclockwise until pressure is within limits. Tighten jamnut (6).

Refer to TM 5-2350-262-20-2.

10 HYDRAULIC OIL OVERHEATS (CONTINUED)





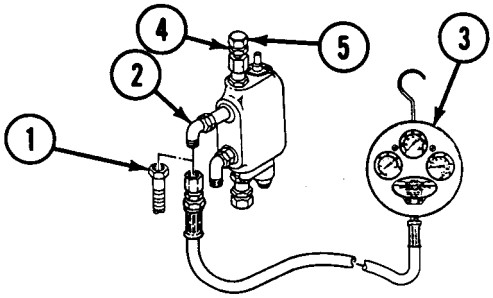


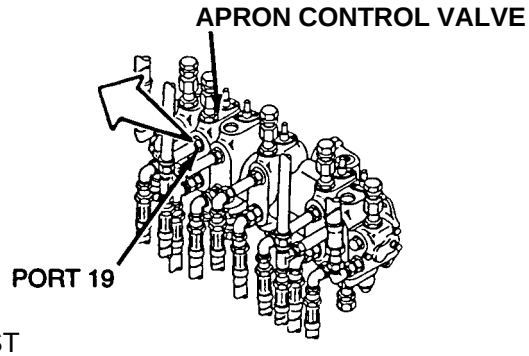
EJECTOR CYLINDER INTERNAL LEAKAGE TEST

NOTE

Have suitable container ready to catch oil.

- Remove pressure measuring device (1) from elbow (2) on port 21 of ejector control valve. Cap port 21.
- Start engine and have assistant hold EJECTOR CONTROL lever in the BACK position for one minute. Mark position of ejector at side of hull and continue to hold valve lever in the BACK position for one more minute. Check position of ejector while still holding valve lever in the BACK position. If ejector has moved more than 1/2 in (12 mm), the ejector cylinder is leaking excessively.





APRON RELIEF VALVE PRESSURE TEST

WARNING

Before performing any hydraulic troubleshooting in bowl, move ejector forward and engage the ejector lock. Failure to comply may result in severe injury or death to personnel.

NOTE

Have suitable container ready to catch oil.

- Move ejector forward, engage ejector lock, stop engine, and relieve hydraulic pressure.
- Disconnect CONT VLV-19 hose (1) from elbow (2) at port 19 of apron control valve. Connect pressure measuring device (3) to elbow (2). Plug hose (1).
- Have assistant start engine and hold APRON CONTROL lever in UP position. Read pressure measuring device (3). If pressure is low, adjust apron raise relief valve.

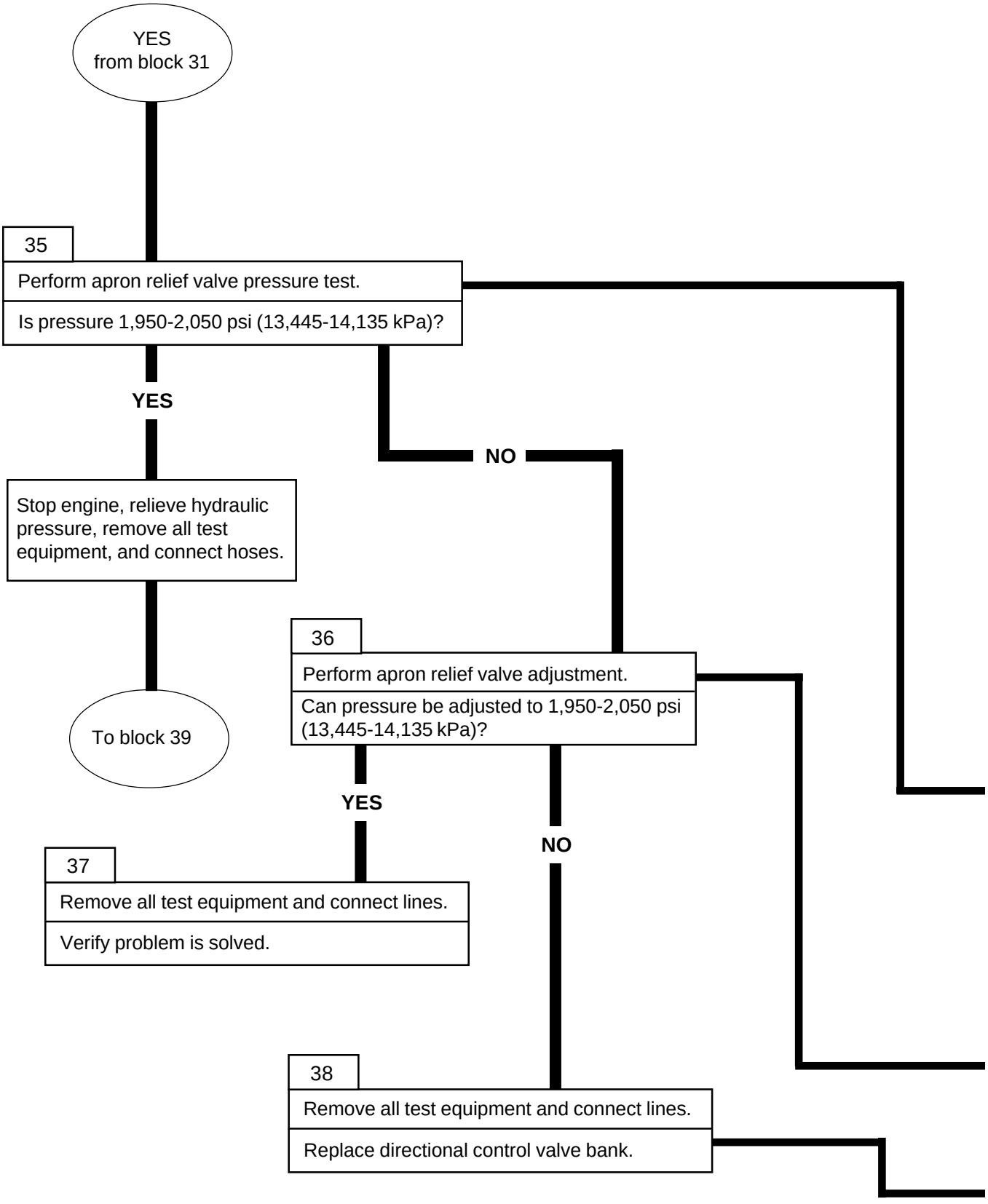
APRON RELIEF VALVE ADJUSTMENT

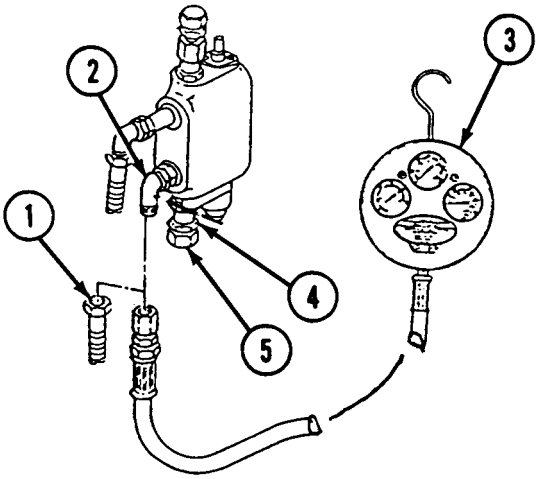
- As assistant holds APRON CONTROL lever in UP position, loosen jamnut (4), and rotate adjusting screw (5) clockwise to increase pressure; counterclockwise to decrease pressure.
- Tighten jamnut (4). Stop engine; relieve hydraulic pressure.

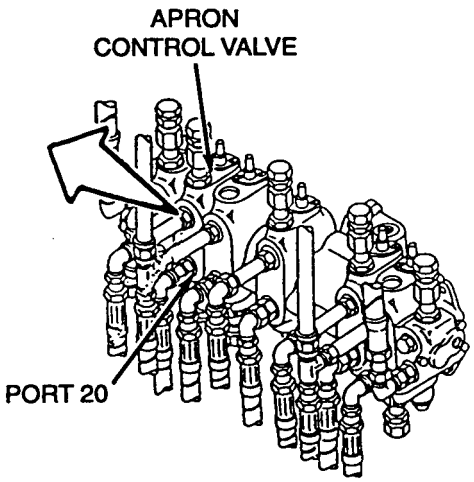
Refer to TM 5-2350-262-20-2.

Refer to TM 5-2350-262-20-2.

10 HYDRAULIC OIL OVERHEATS (CONTINUED)







APRON RELIEF VALVE PRESSURE TEST

WARNING

Before performing any hydraulic troubleshooting in bowl, move ejector forward and engage the ejector lock. Failure to comply may result in severe injury or death to personnel.

NOTE

Have suitable container ready to catch oil.

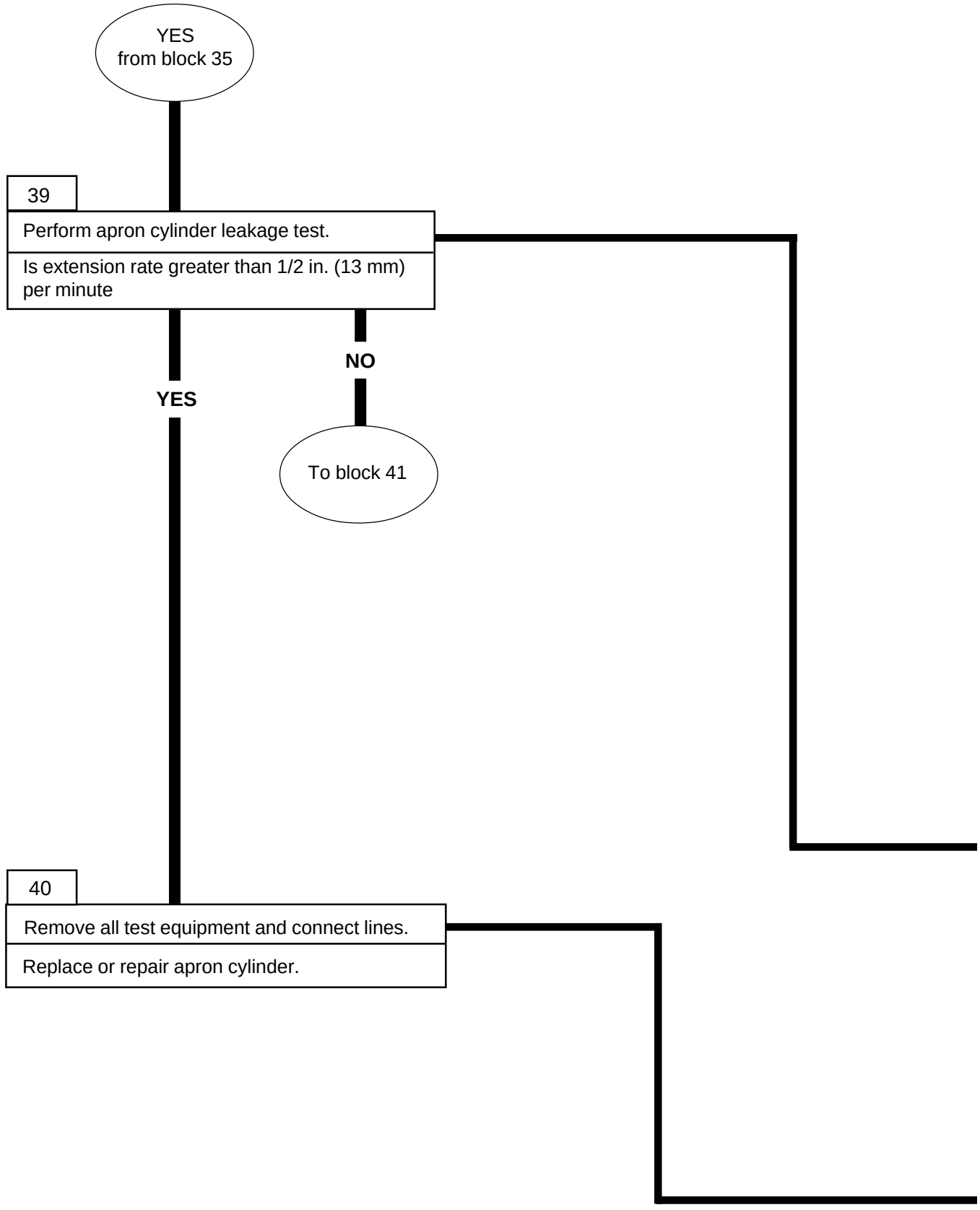
- Start engine, move ejector forward, engage ejector lock, stop engine, and relieve hydraulic pressure.
- Disconnect CONT VLV-20 hose (1) from elbow (2) at port 20 of apron control valve. Connect pressure measuring device (3) to elbow (2). Plug hose (1).
- Have assistant start engine and hold APRON CONTROL lever in DOWN position. Read pressure measuring device (3).

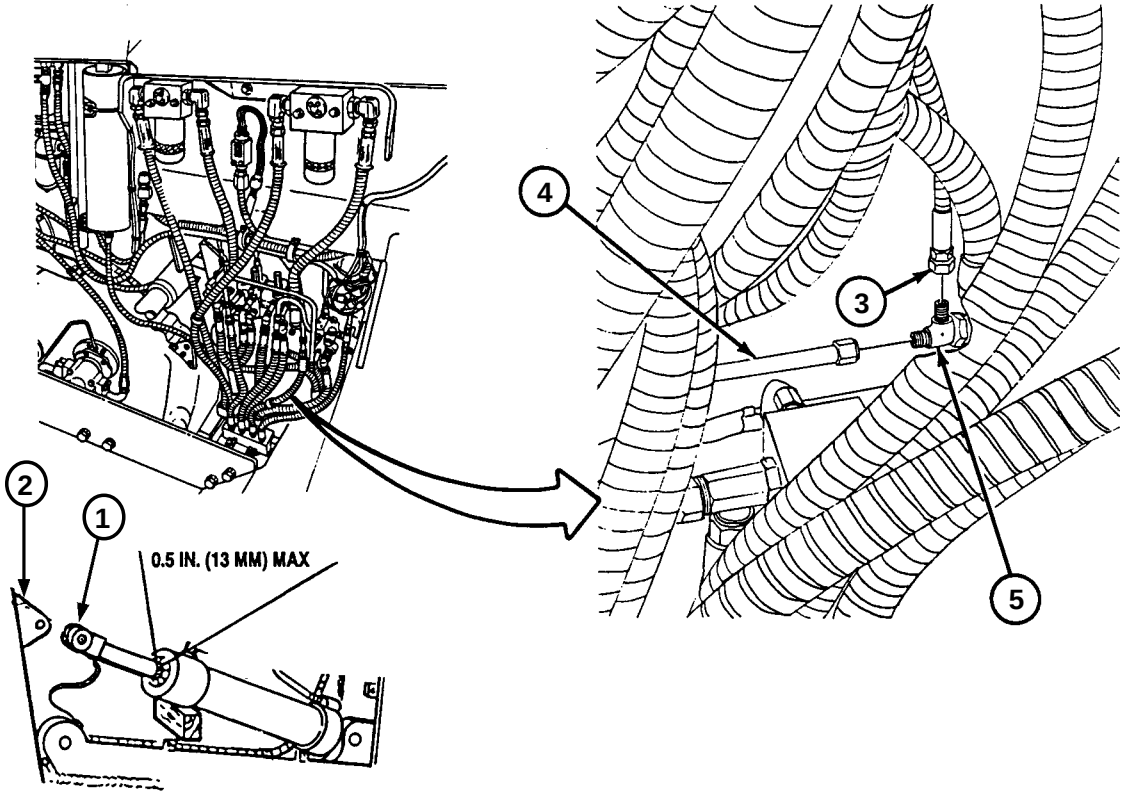
APRON RELIEF VALVE ADJUSTMENT

- As assistant holds APRON CONTROL lever DOWN, loosen jamnut (4) and rotate adjusting screw (5) clockwise to increase pressure; counterclockwise to decrease pressure. When adjustment is completed, tighten jamnut (4).
- Stop engine; relieve hydraulic pressure.

Refer to TM 5-2350-262-20-2.

10 **HYDRAULIC OIL OVERHEATS (CONTINUED)**





APRON CYLINDER LEAKAGE TEST

CAUTION

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

NOTE

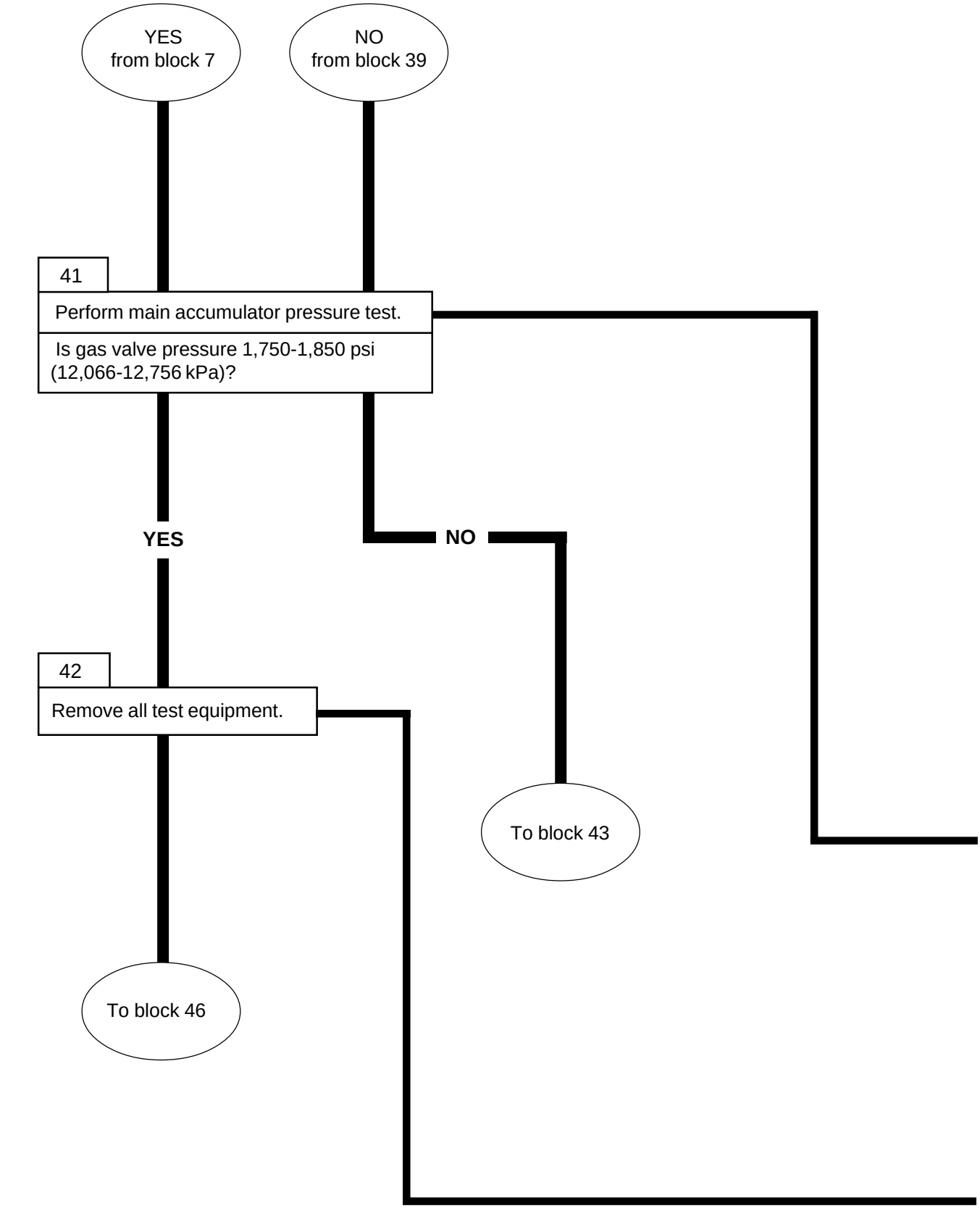
Armor plates 1L and 1R must be removed to expose apron cylinder.

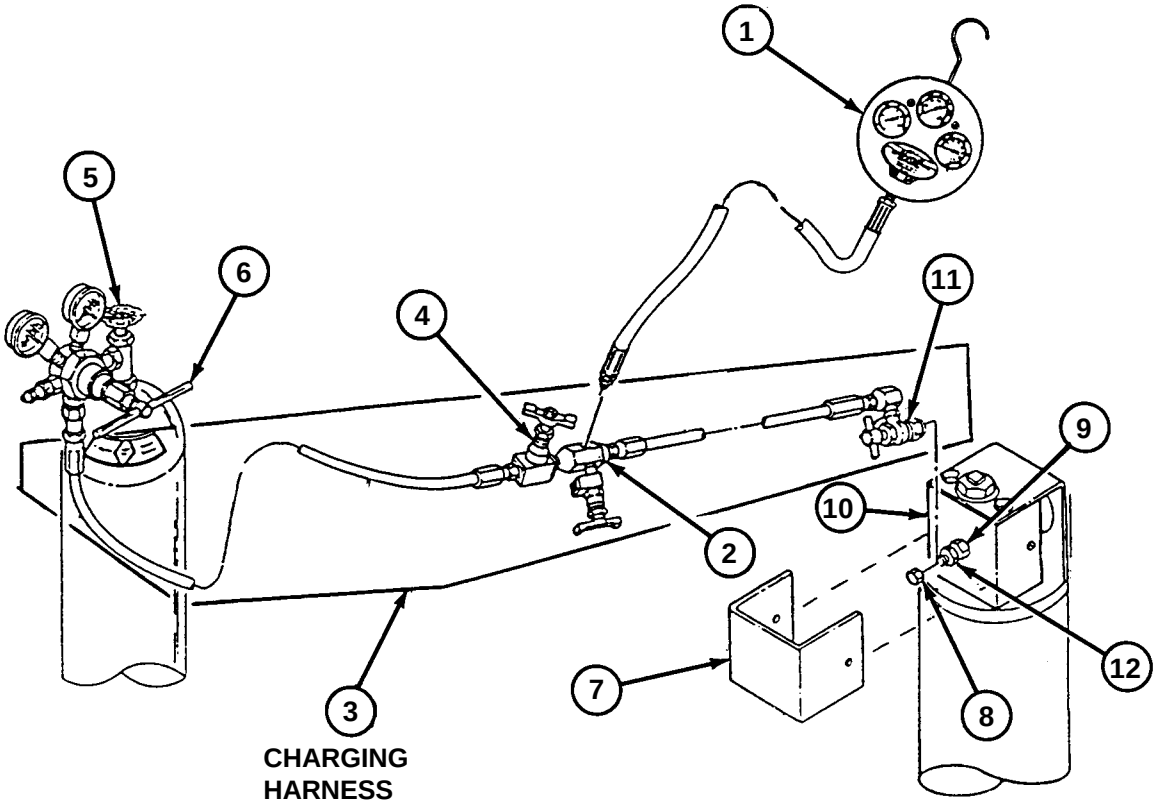
Have suitable container ready to catch oil.

- Start engine, lower apron completely, and disconnect right-hand and left-hand end of cylinder rods (1) from apron (2).
- Retract cylinder rods (1) approximately halfway, stop engine, and relieve hydraulic pressure.
- Disconnect CKT-20 (REAR) TEE hose (3) and CKT-20 (REAR) TEE tube (4) from tee (5) on hull floor. Cap and plug hose, tube, and fittings.
- Start engine, have assistant hold APRON CONTROL lever in UP position. Measure the extension of both cylinder rods (1). Continue to hold APRON CONTROL lever in UP position for one minute. Measure the extension of both cylinder rods (1) again. Have assistant return APRON CONTROL lever to NEUTRAL position. If extension rate is greater than 1/2 in. (13 mm) per minute, the cylinder is leaking excessively.
- Stop engine; relieve hydraulic pressure.

Refer to TM 5-2350-262-20-1.

10 **HYDRAULIC OIL OVERHEATS (CONTINUED)**





MAIN HYDRAULIC 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.

- Connect pressure measuring device (1) to bleed valve (2) on charging harness (3). Close shutoff valve (4).
- Open nitrogen tank valve (5) and adjust regulator valve (6) to 50 psi (353 kPa).
- Open shutoff valve (4) for about 10 seconds to clear charging hoses . Close valve (4).
- Remove valve guard (7). Remove charge valve cap (8) from charge valve assembly (9) on accumulator (10).
- Loosely connect adapter valve (11) to charge valve (9) and again open shutoff valve (4) for about 10 seconds. Close shutoff valve (4). Fully tighten adapter valve (11).

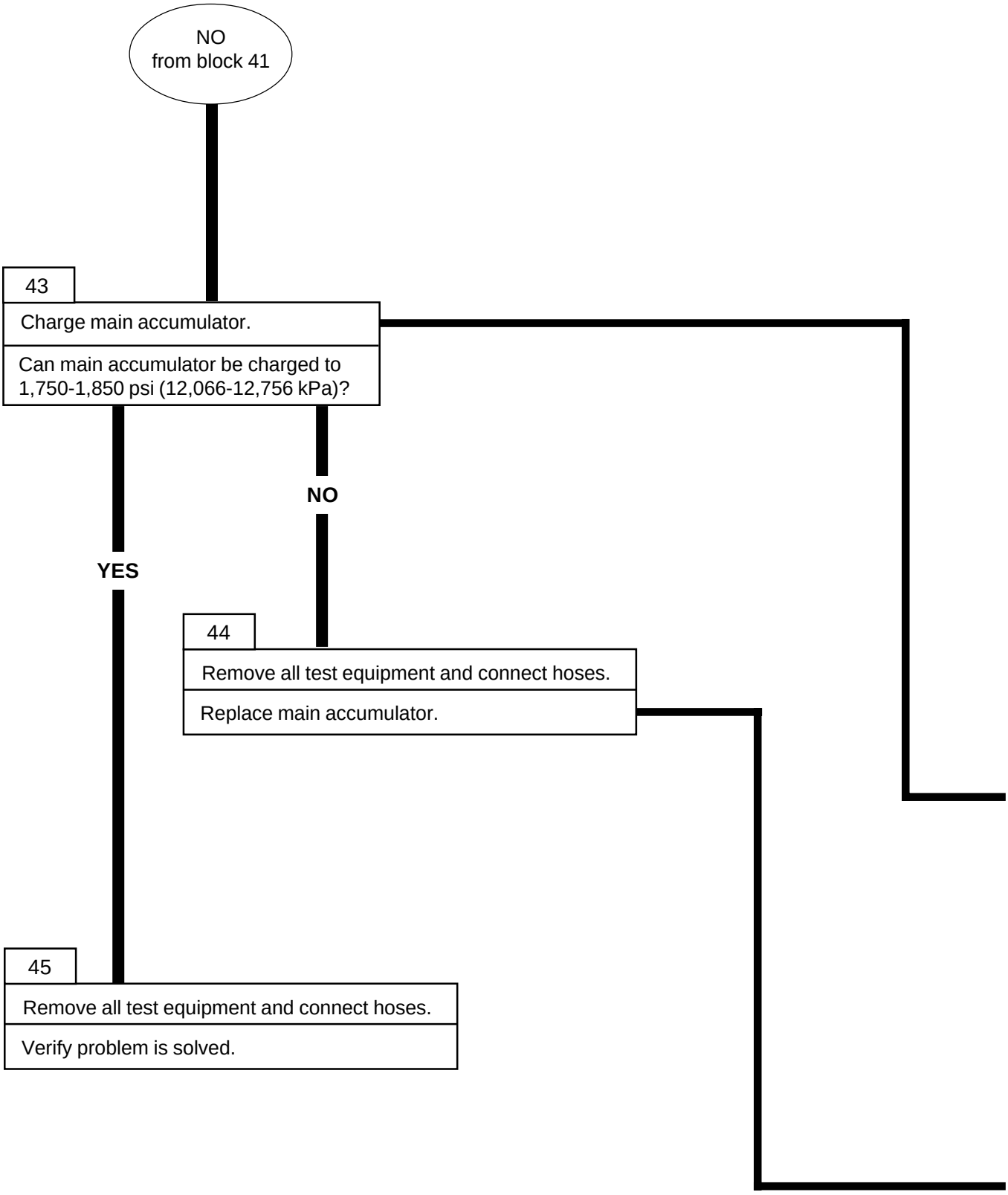
NOTE

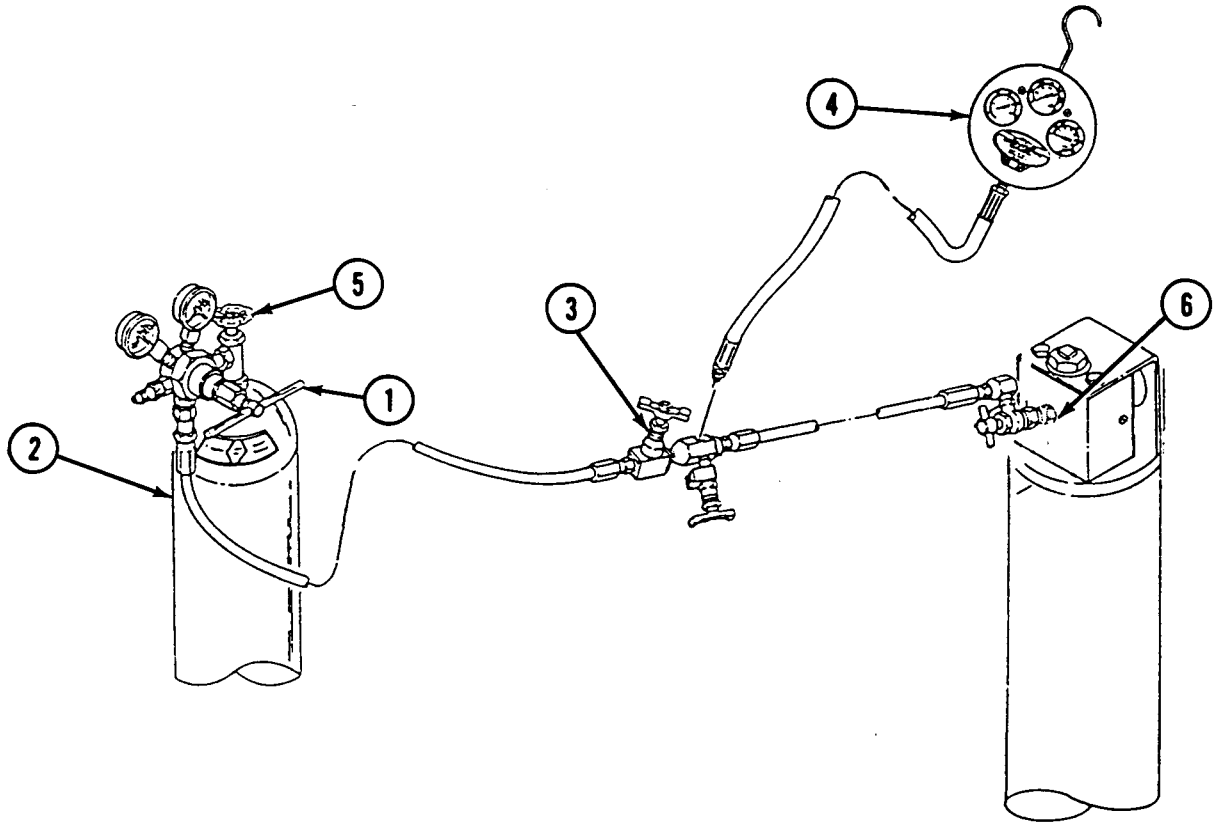
Accumulator gas valve is fully open after about 2-1/2 turns.

- Open charge valve (9) by loosening nut (12). Read pressure measuring device (1).

Tighten nut (12) on charge valve (9). Close nitrogen tank valve (5). Back off regulator valve (6), open bleed valve (2), and bleed hose pressure to 0 psi. Remove adapter valve (11) from charge valve (9). Remove pressure measuring device (1) from bleed valve (2) on charging harness (3). Install charge valve cap (8) on charge valve (9). Install valve guard (7).

10 HYDRAULIC OIL OVERHEATS (CONTINUED)





MAIN ACCUMULATOR CHARGING

CAUTION

Ensure regulator valve is fully backed off to relieve tension on diaphragm. Failure to comply may result in damage to equipment.

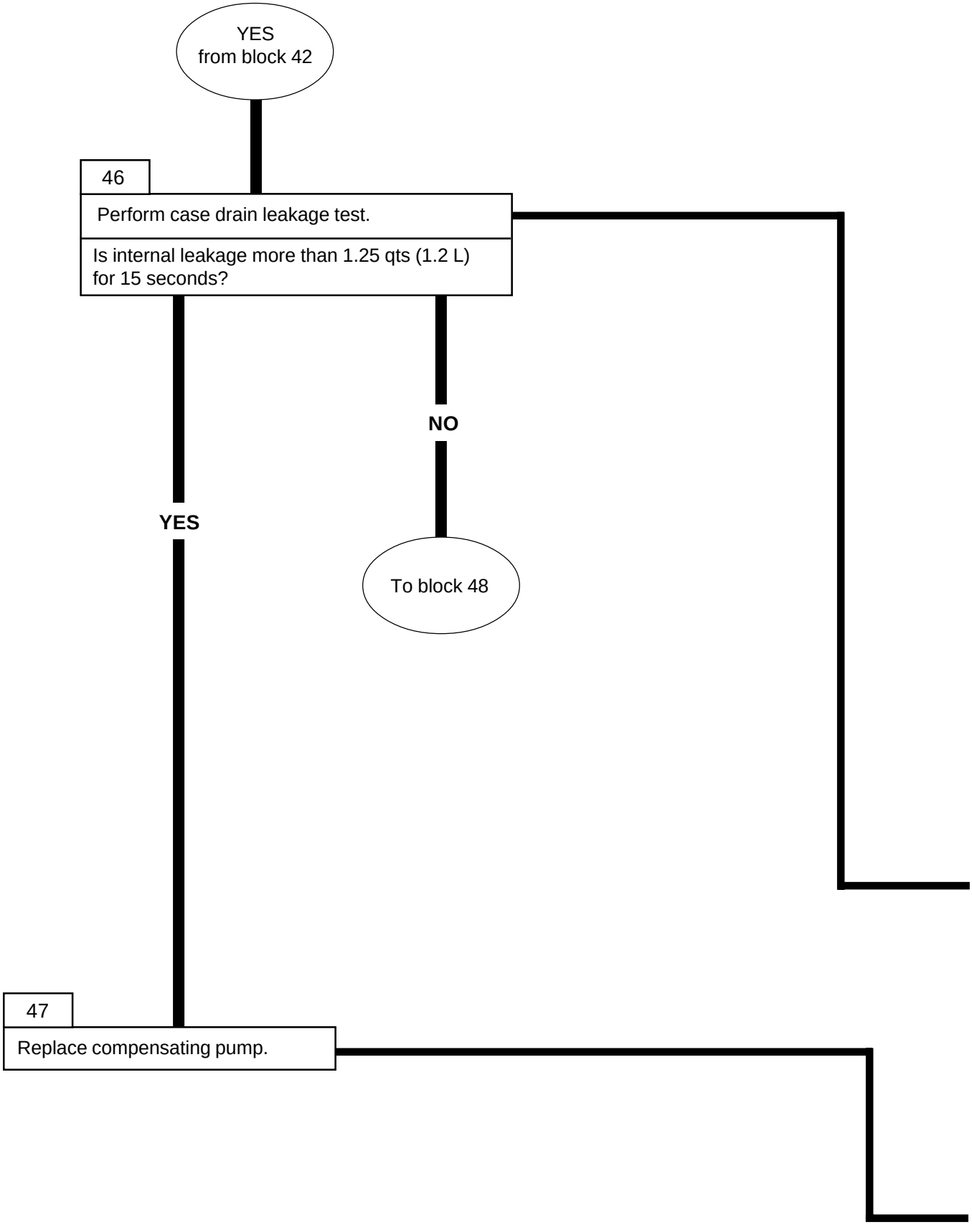
NOTE

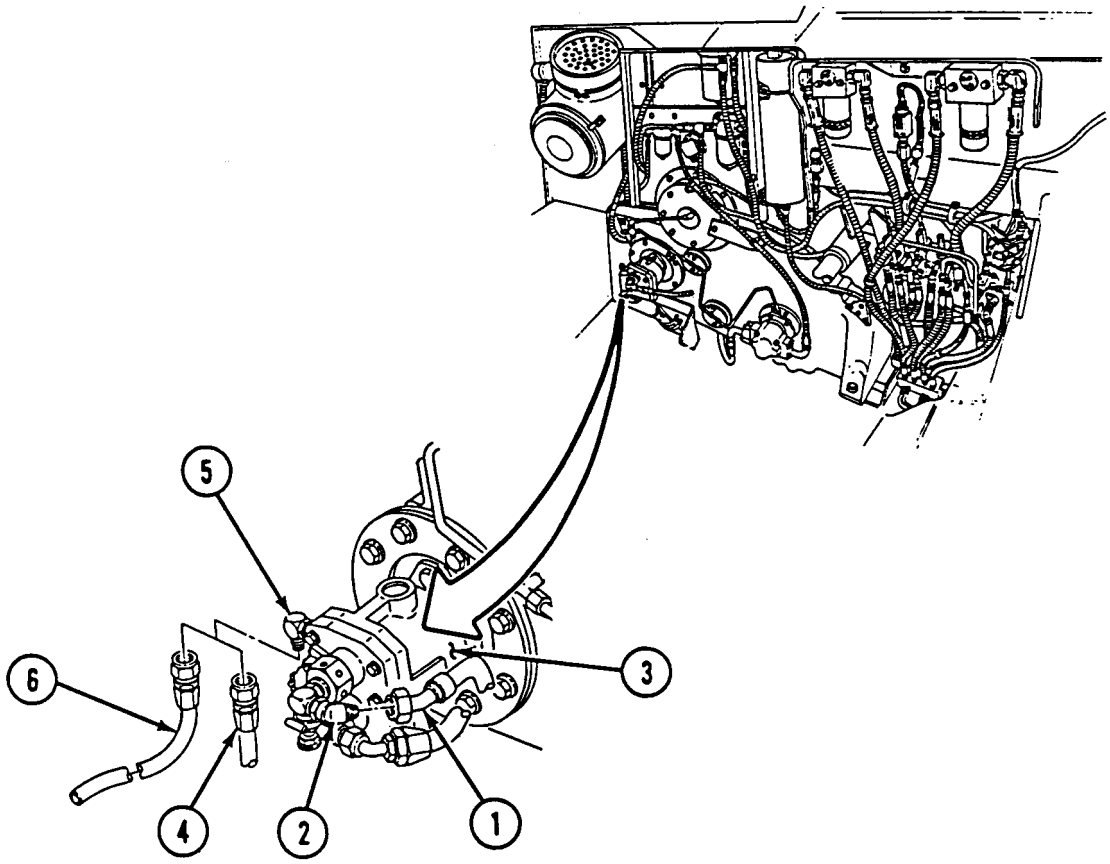
Rapid pressurization will cause an inaccurate pressure reading due to heating of nitrogen gas. Always pressurize slowly.

- Adjust regulator valve (1) on nitrogen tank (2) to 1,750-1,850 psi (12,066-12,756 kPa).
- Open shutoff valve (3). Read pressure measuring device (4). When pressure reaches 1,750-1,850 psi (12,066-12,756 kPa), close shutoff valve (3), nitrogen tank valve (5), and accumulator charge valve (6).
- Wait 15 minutes and open charge valve (6). Read pressure measuring device (4).

Refer to TM 5-2350-262-20-2.

10 **HYDRAULIC OIL OVERHEATS (CONTINUED)**





CASE DRAIN LEAKAGE TEST

WARNING

Before performing any hydraulic troubleshooting in bowl, move ejector forward and engage the ejector lock. Failure to comply may result in severe injury or death to personnel.

NOTE

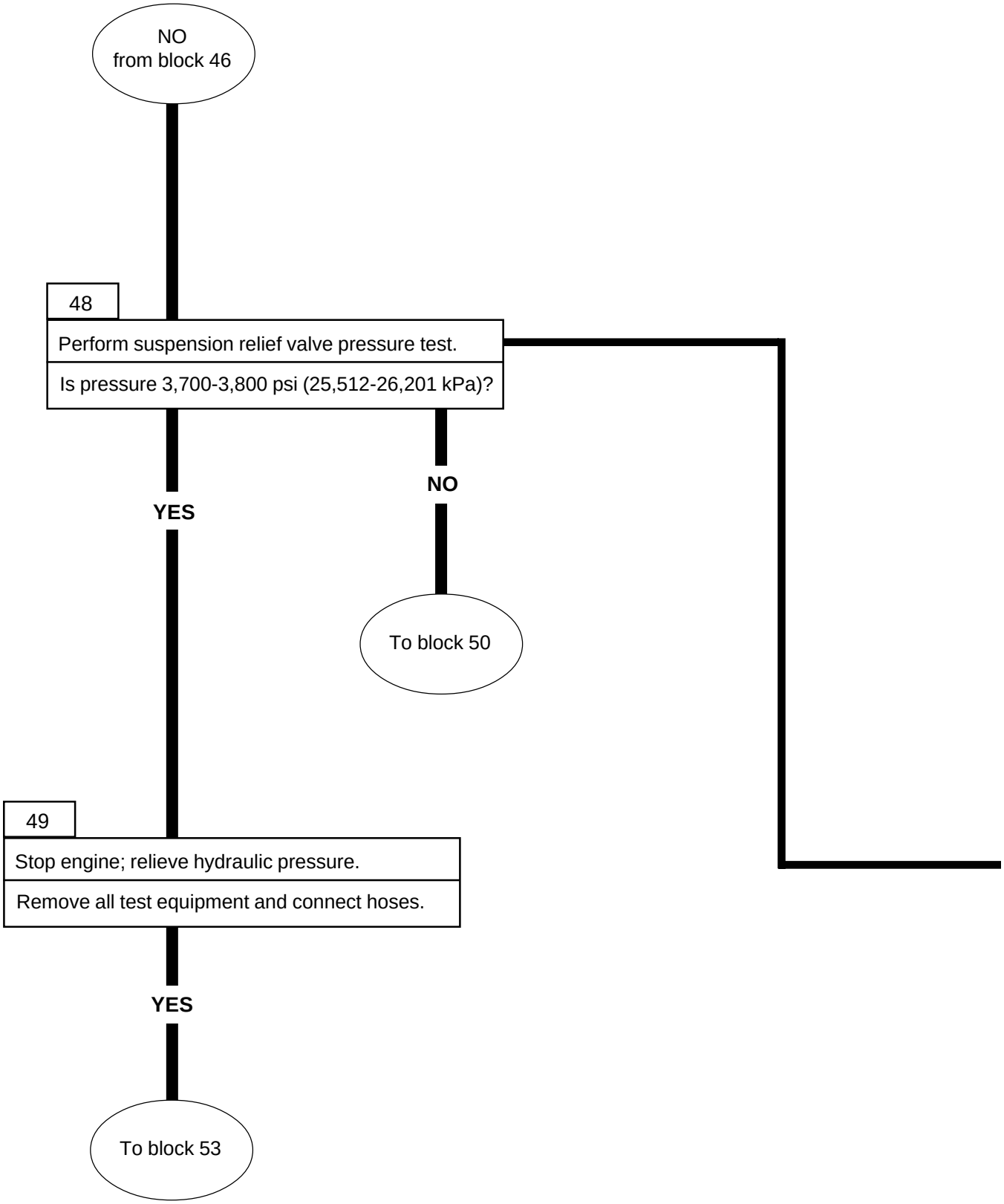
Have a graduated container of at least 2 qts (1.9 L) capacity available to catch hydraulic oil while test is being performed.

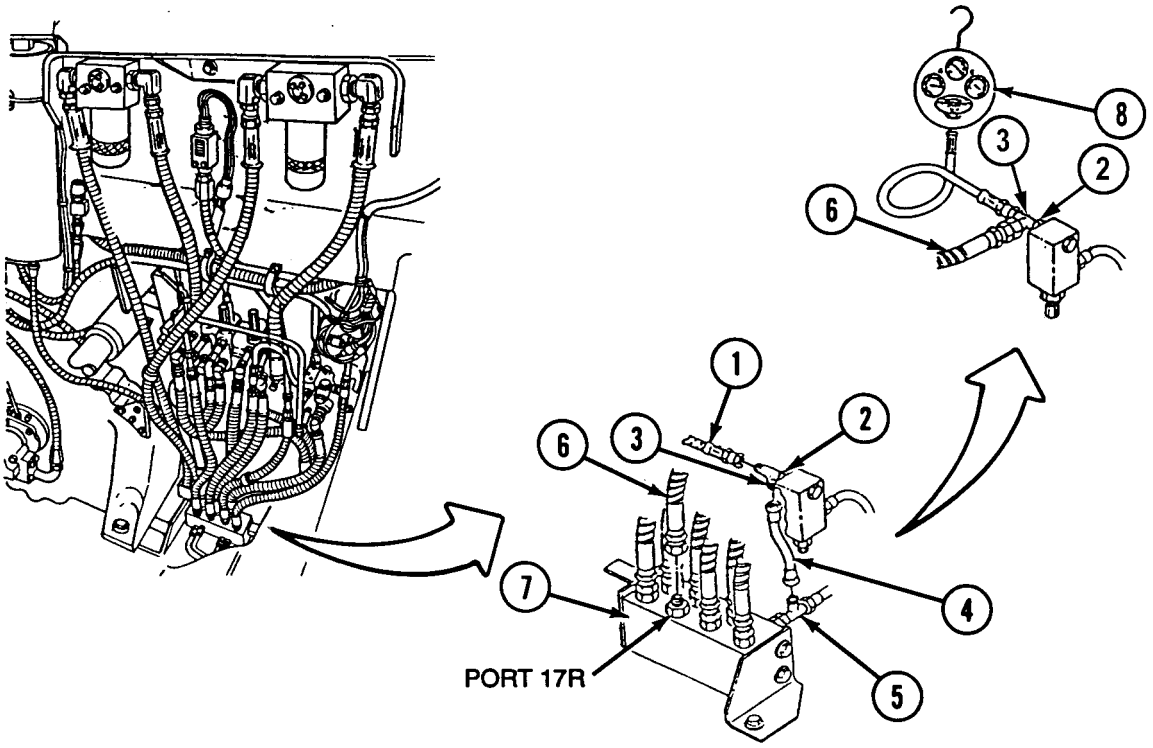
Have suitable container ready to catch oil.

- Start engine, move ejector forward, stop engine, engage ejector lock, and relieve hydraulic pressure.
- Disconnect SPNSN PUMP-9 hose (1) from elbow (2) on compensating pump (3). Cap elbow (2) and plug hose (1).
- Disconnect SPNSN PUMP DRAIN-7V hose (4) from elbow (5). Plug hose (4). Connect drain hose (6) to elbow (5).
- Hold end of drain hose (6) in graduated container.
- Have assistant start engine and run at 1,800 rpm for 15 seconds. Observe the quantity of hydraulic oil in container.
- Stop engine, relieve hydraulic pressure and connect hoses.

Refer to TM 5-2350-262-20-2.

10 HYDRAULIC OIL OVERHEATS (CONTINUED)





SUSPENSION RELIEF VALVE PRESSURE TEST

WARNING

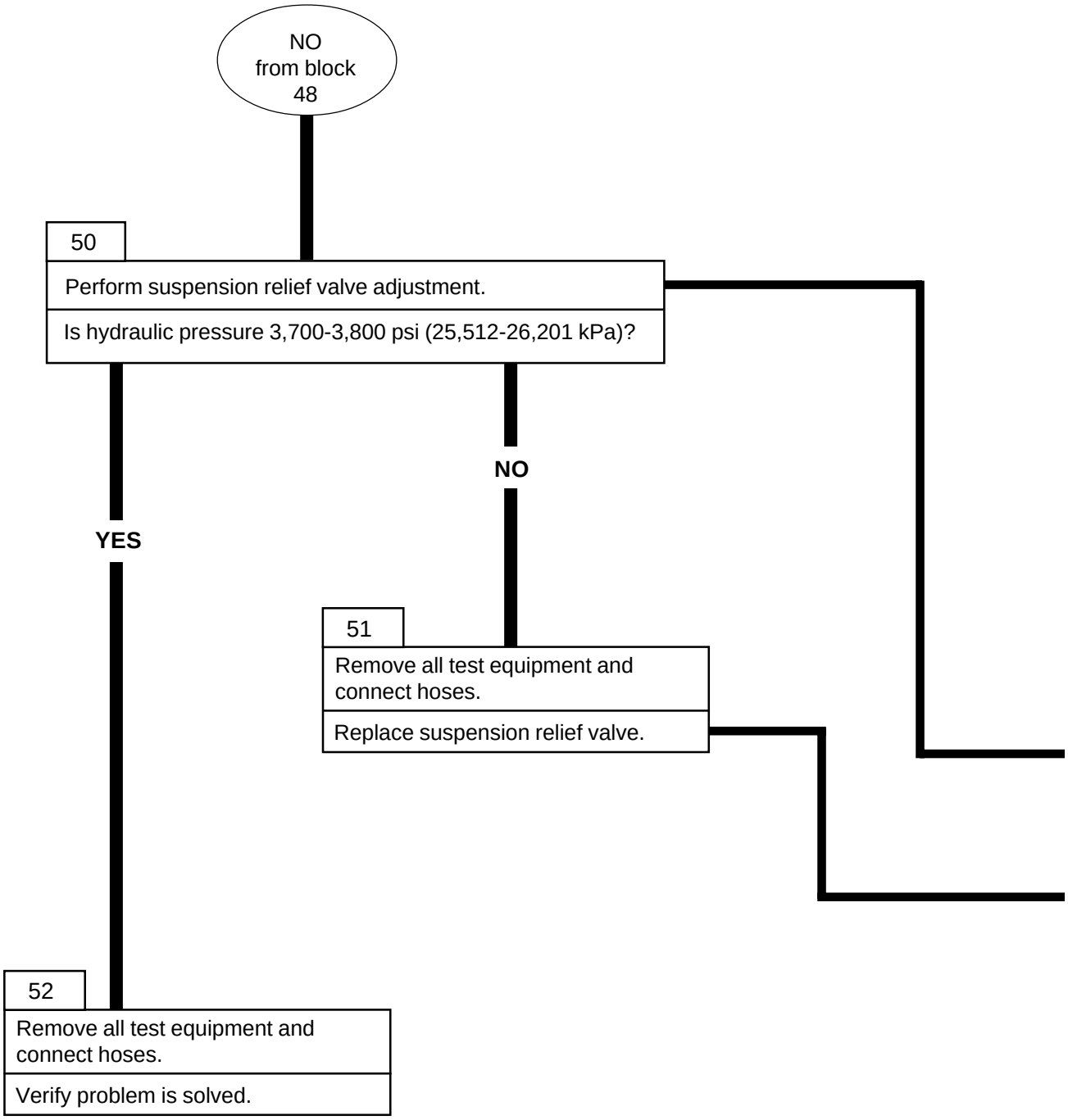
Before performing any hydraulic troubleshooting in bowl, move ejector forward and engage the ejector lock. Failure to comply may result in severe injury or death to personnel.

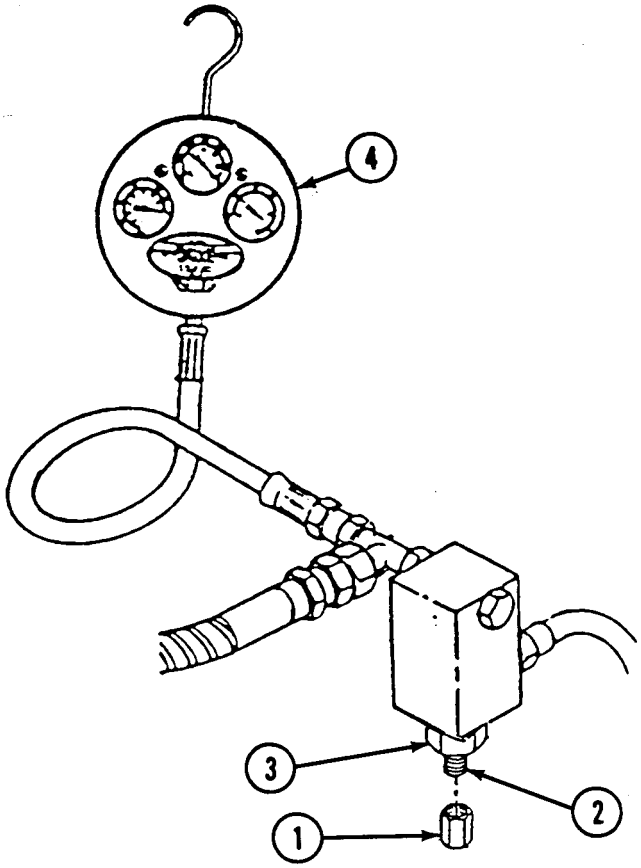
NOTE

Have suitable container ready to catch oil.

- Start engine, move ejector forward, engage ejector lock, stop engine, and relieve hydraulic pressure.
- Disconnect RELIEF VLV-9 tube (4) from suspension relief valve tee (3) and rear left-hand main manifold tee (5). Cap tee (5).
- Rotate suspension relief valve tee (3) 90 upward toward front of vehicle. Tighten jamnut (2).
- Disconnect LH MAIN MANF TOP-17R hose (6) from port 17R on left-hand main manifold (7) and connect it to suspension relief valve tee (3). Cap port 17R
- Connect pressure measuring device (8) to suspension relief valve tee (3).
- Have assistant start engine and move SPRUNG/UNSPRUNG lever to SPRUNG and right-hand SUSPENSION CONTROL lever to LOWER. Read pressure measuring device (8).

10 HYDRAULIC OIL OVERHEATS (CONTINUED)



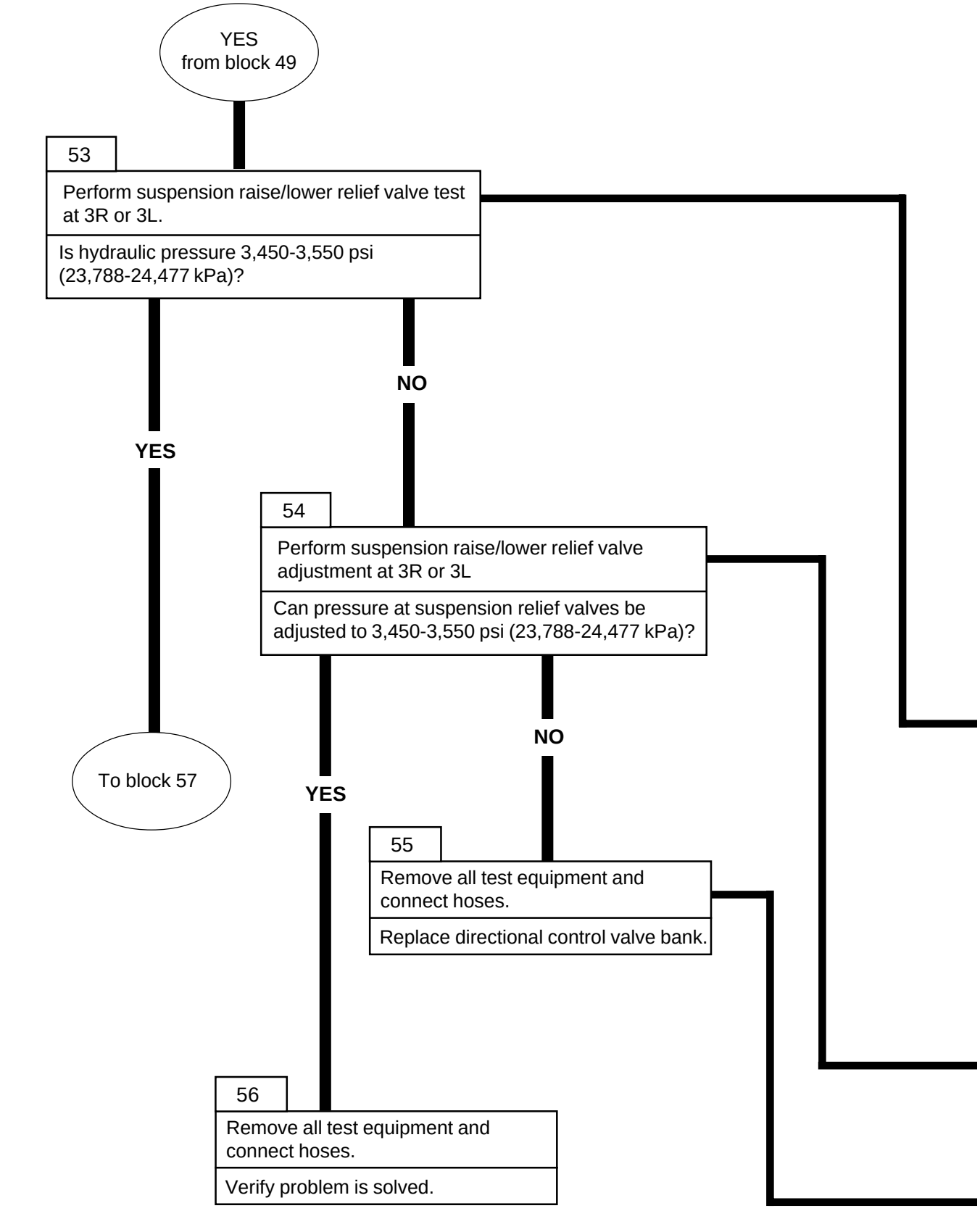


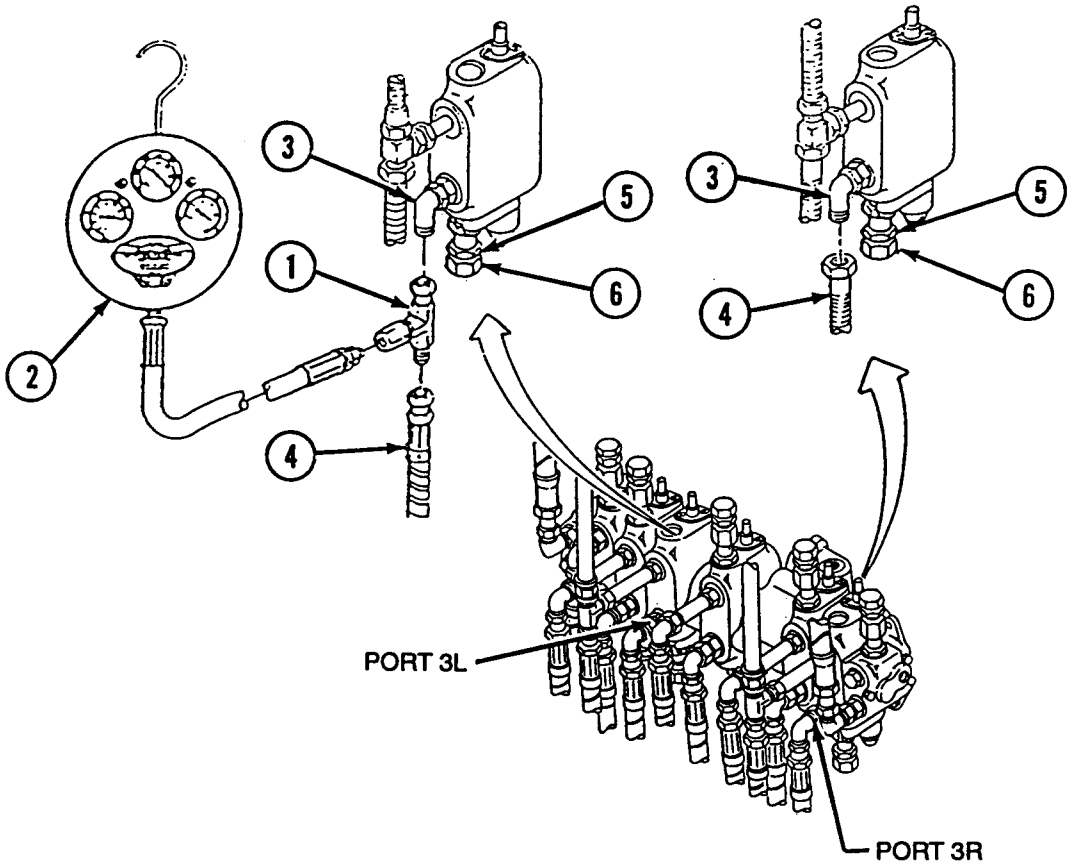
SUSPENSION RELIEF VALVE ADJUSTMENT

- Remove cap (1) from suspension relief valve adjusting shaft (2), and loosen jamnut (3). Turn adjusting shaft (2) clockwise to increase pressure; counterclockwise to decrease pressure. Read pressure measuring device (4). Tighten jamnut (3); replace cap (1).
- Stop engine; relieve hydraulic pressure.

Refer to TM 5-2350-262-20-2.

10 HYDRAULIC OIL OVERHEATS (CONTINUED)





SUSPENSION RAISE/LOWER RELIEF VALVE TEST

NOTE

This test is done at both the right-hand and left-hand suspension raise/lower relief valves. For the right-hand valve, install test equipment at port 3R and actuate the right-hand SUSPENSION CONTROL lever. For the left-hand valve, install test equipment at port 3L and actuate the left-hand SUSPENSION CONTROL lever.

Have suitable container ready to catch oil.

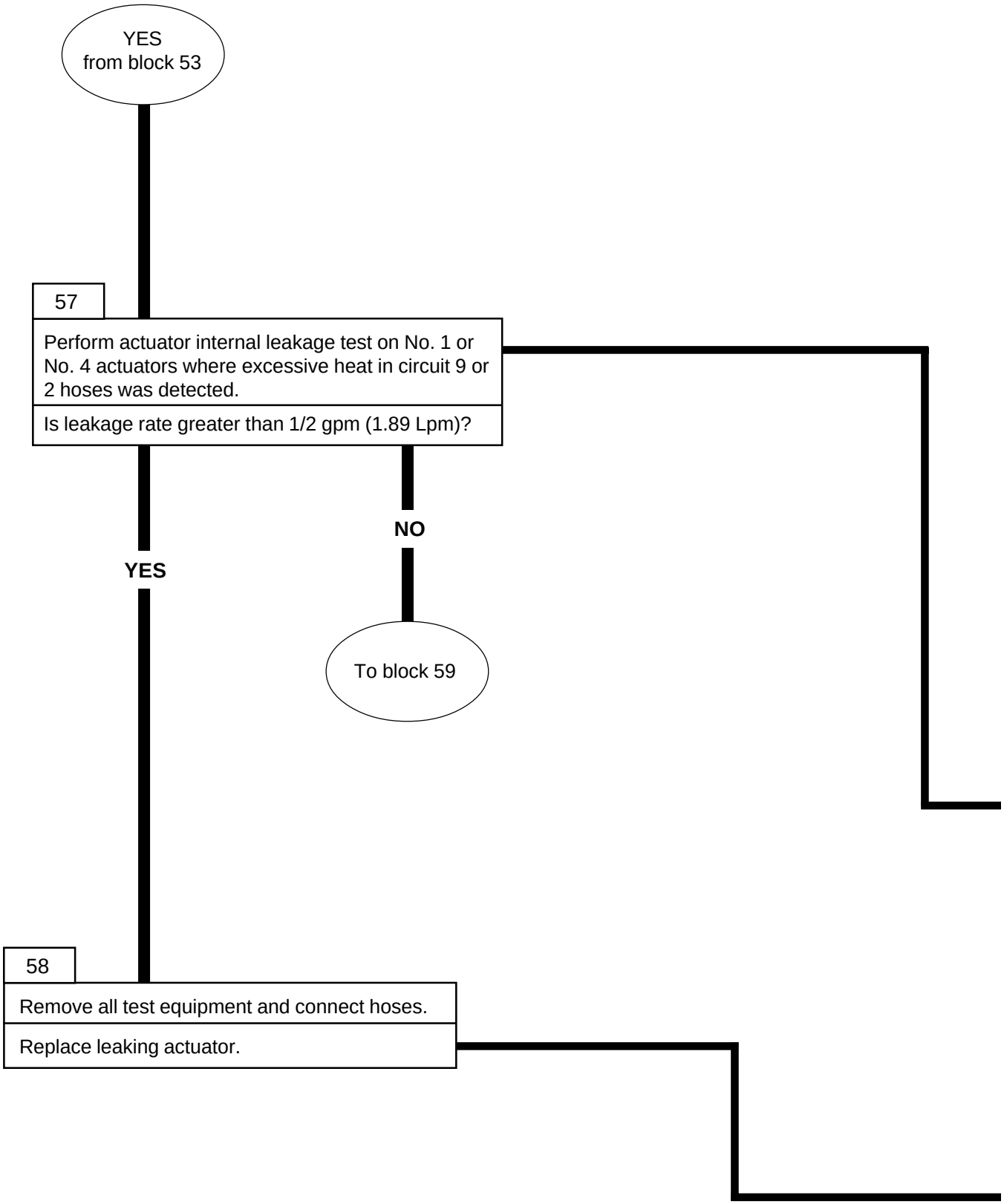
- Install tee (1) and pressure measuring device (2) between elbow (3) on port 3R or 3L and port 3 hose (4).
- Have assistant start engine and move SUSPENSION CONTROL lever to RAISE. Read pressure measuring device (2).

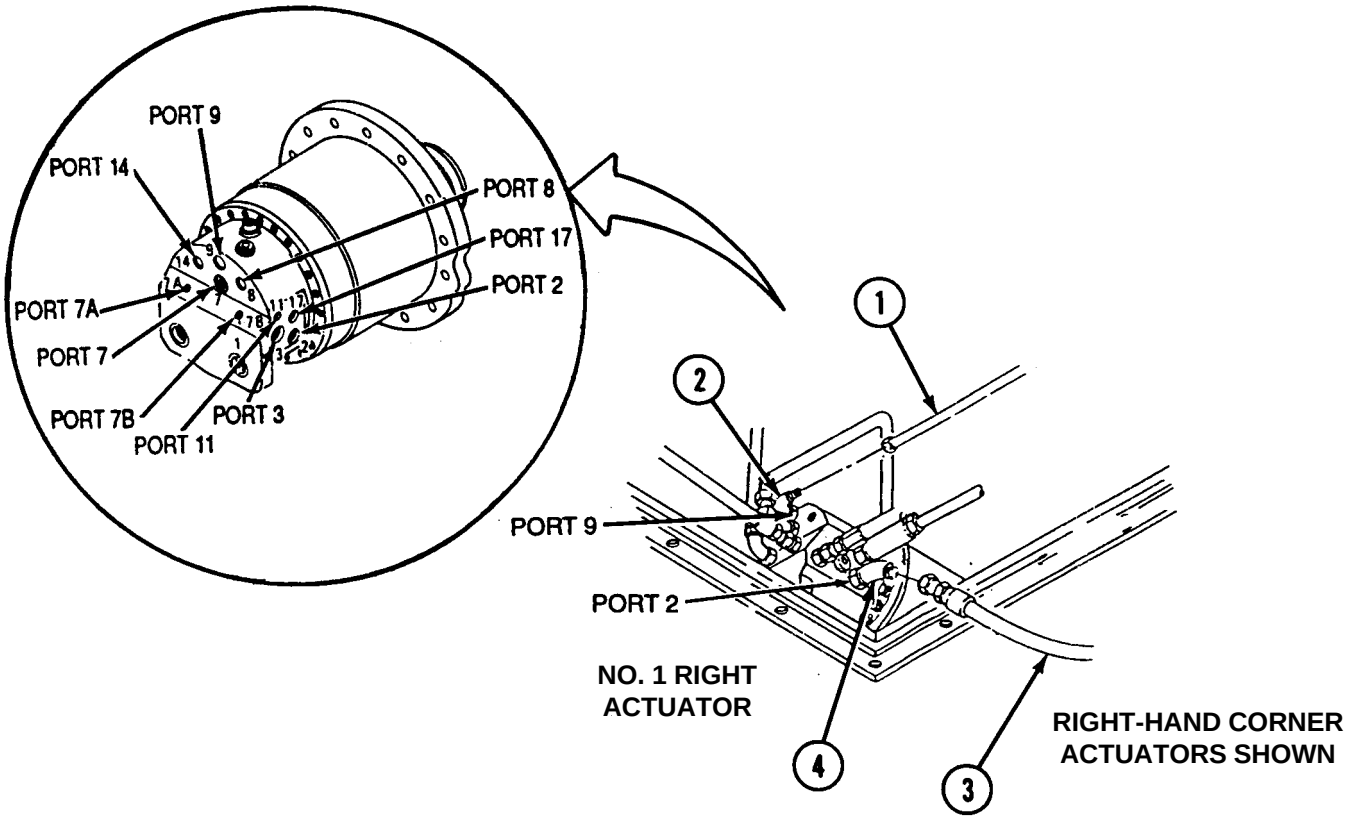
SUSPENSION RAISE/LOWER RELIEF VALVE ADJUSTMENT

- Loosen jamnut (5) on port 3R or 3L of suspension raise/lower relief valve.
- With SUSPENSION CONTROL lever still in RAISE, turn adjusting screw (6) clockwise to increase pressure; counterclockwise to decrease pressure.
- Tighten jamnut (5). Stop engine; relieve hydraulic pressure.

Refer to TM 5-2350-262-20-2.

10 HYDRAULIC OIL OVERHEATS (CONTINUED)





ACTUATOR INTERNAL LEAKAGE TEST

WARNING

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

NOTE

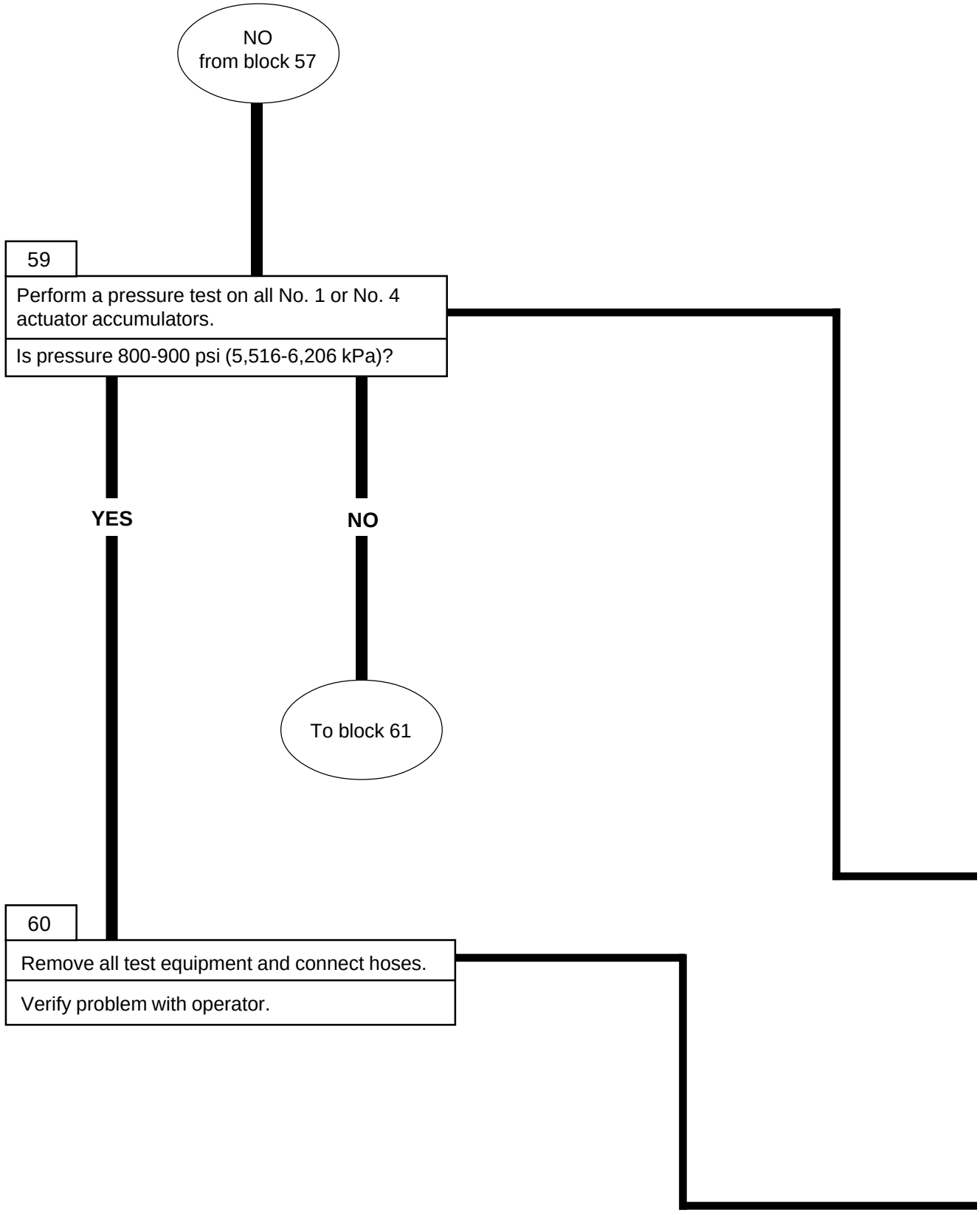
Procedure below is for internal leakage test on No.1 right actuator. Procedures for No. 4 right, No. 1 left, and No. 4 left actuators are the same. Ports are in same location on opposite face. Circuits 2 and 9 are the same.

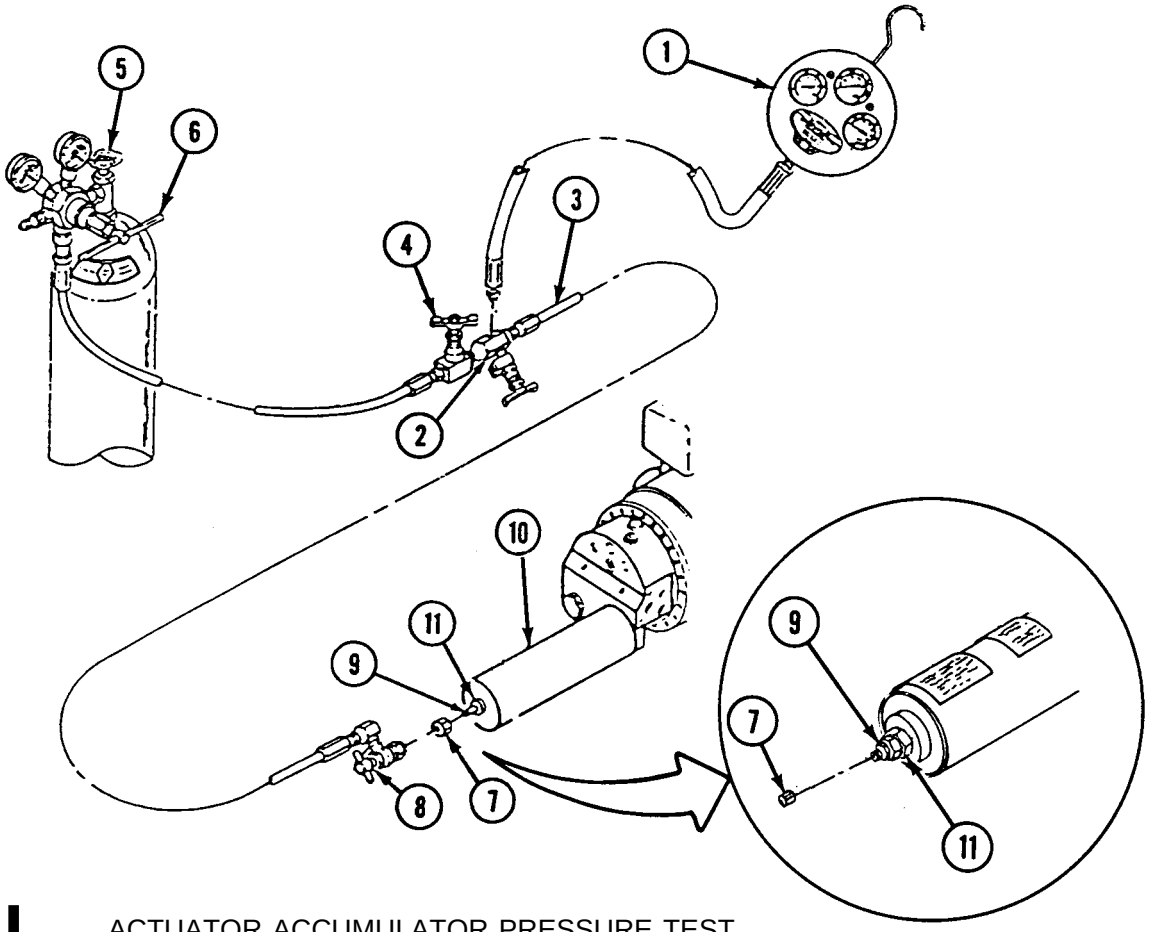
Have suitable container ready to catch oil.

- Stop engine; relieve hydraulic pressure.
- Disconnect SPNSN UNIT-9 hose (1) from elbow (2) on port 9 of No. 1 right actuator. Cap elbow (2).
- Disconnect CORNER SPNSN UNIT-2 hose (3) from elbow (4) on port 2 of No. 1 right actuator. Plug hose (3). Connect hose (1) to elbow (4) on port 2.
- Catch oil in a graduated 2 gal. (7.6L) container.
- With suspension in SPRUNG mode, start engine and check leakage from ports 7, 7B, and 17.
- Stop engine; relieve hydraulic pressure.

Notify Direct Support maintenance.

10 HYDRAULIC OIL OVERHEATS (CONTINUED)





ACTUATOR ACCUMULATOR PRESSURE TEST

WARNING

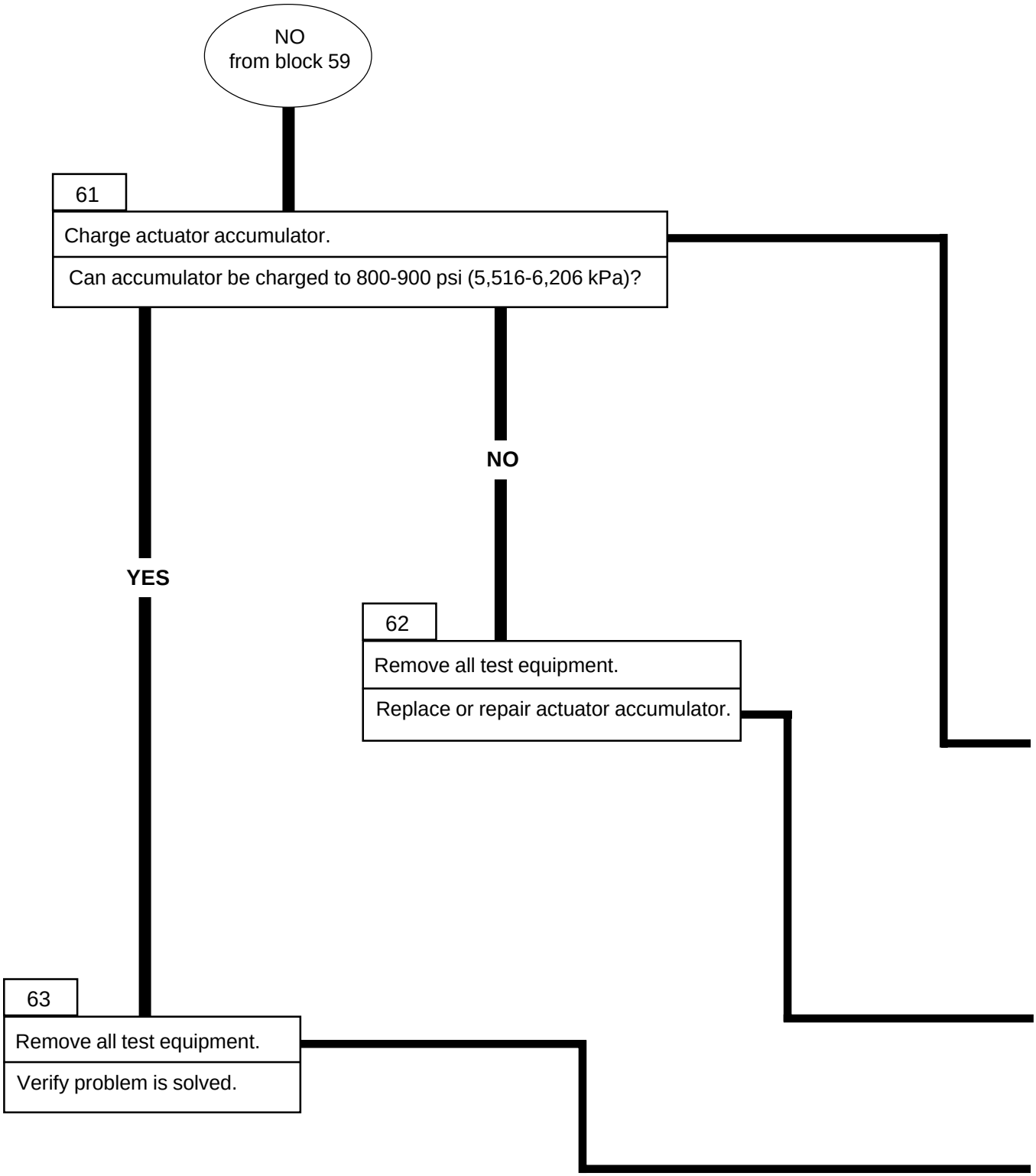
High pressure nitrogen gas is used in this equipment. Keep face and hands away from valves and hose ends. Failure to comply may result in serious injury or death to personnel.

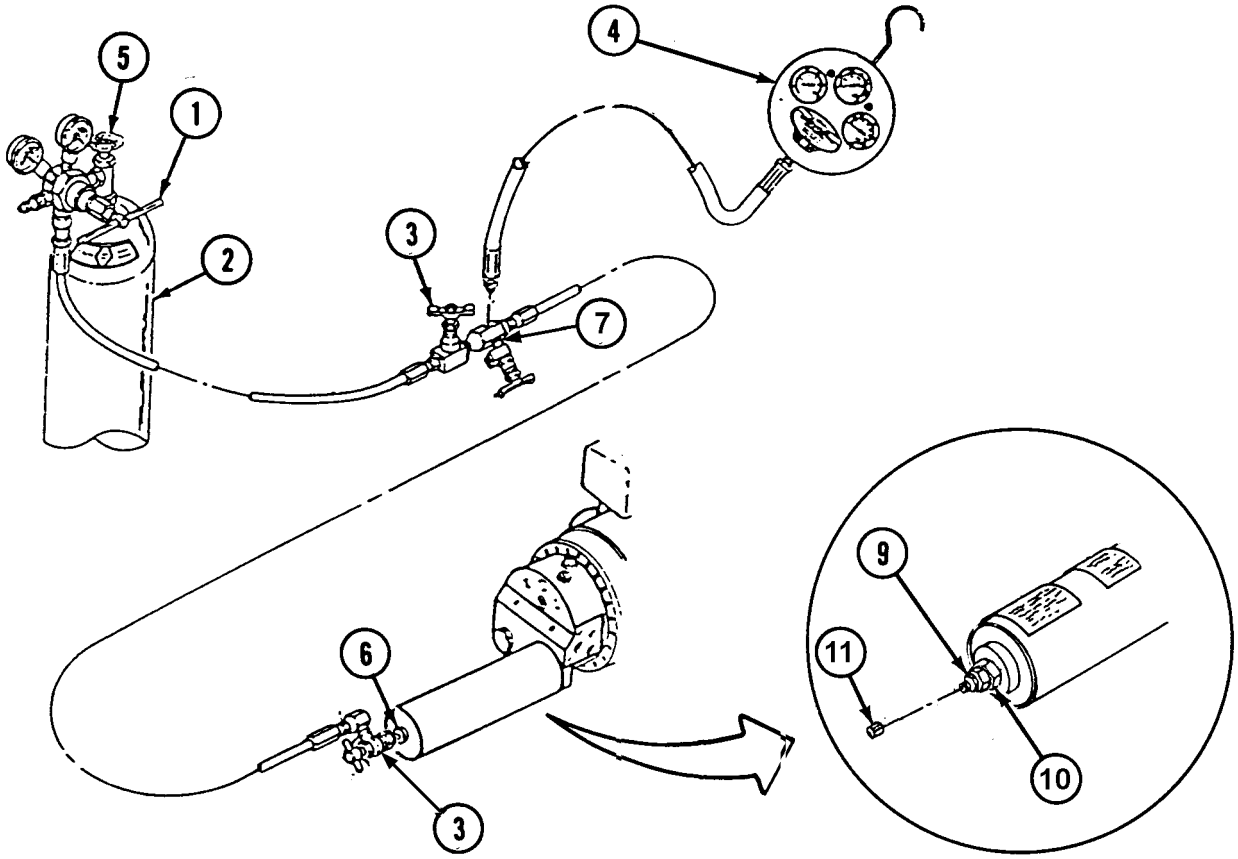
Do not breathe nitrogen gas. Failure to comply may result in serious injury or death to personnel.

- Connect pressure measuring device (1) to bleed valve (2) on charging harness (3). Close shutoff valve (4).
- Open nitrogen tank valve (5) and adjust regulator valve (6) to 50 psi (353 kPa).
- Open shutoff valve (4) for about 10 seconds to clear charging hoses. Close valve (4).
- Remove charge valve cap (7).
- Loosely connect adapter valve (8) to charge valve (9) on actuator accumulator (10).
- Open shutoff valve (4) for about 10 seconds. Close shutoff valve (4). Tighten adapter valve (8).
- Open charge valve (9) by loosening nut (11). Read pressure measuring device (1).

Tighten nut (11) on actuator accumulator (10). Close nitrogen tank valve (5) to ease pressure. Open bleed valve (2), bleed line pressure to 0 psi. Remove adapter valve (8) from actuator accumulator (10). Remove pressure measuring device (1) from bleed valve (2) on charging harness (3). Install valve cap (7) on actuator accumulator (10).

10 HYDRAULIC OIL OVERHEATS (CONTINUED)





ACTUATOR ACCUMULATOR CHARGING

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.

- Adjust regulator valve (1) on nitrogen tank (2) to 800-900 psi (5,516-6,206 kPa).
- Open shutoff valve (3). Read pressure measuring device (4).
- When pressure reaches 800-900 psi (5,516-6,206 kPa), close shutoff valve (3), nitrogen tank valve (5), and accumulator charge valve (6).
- Wait 15 minutes and open accumulator charge valve (6). Read pressure measuring device (4).

Notify Direct Support maintenance.

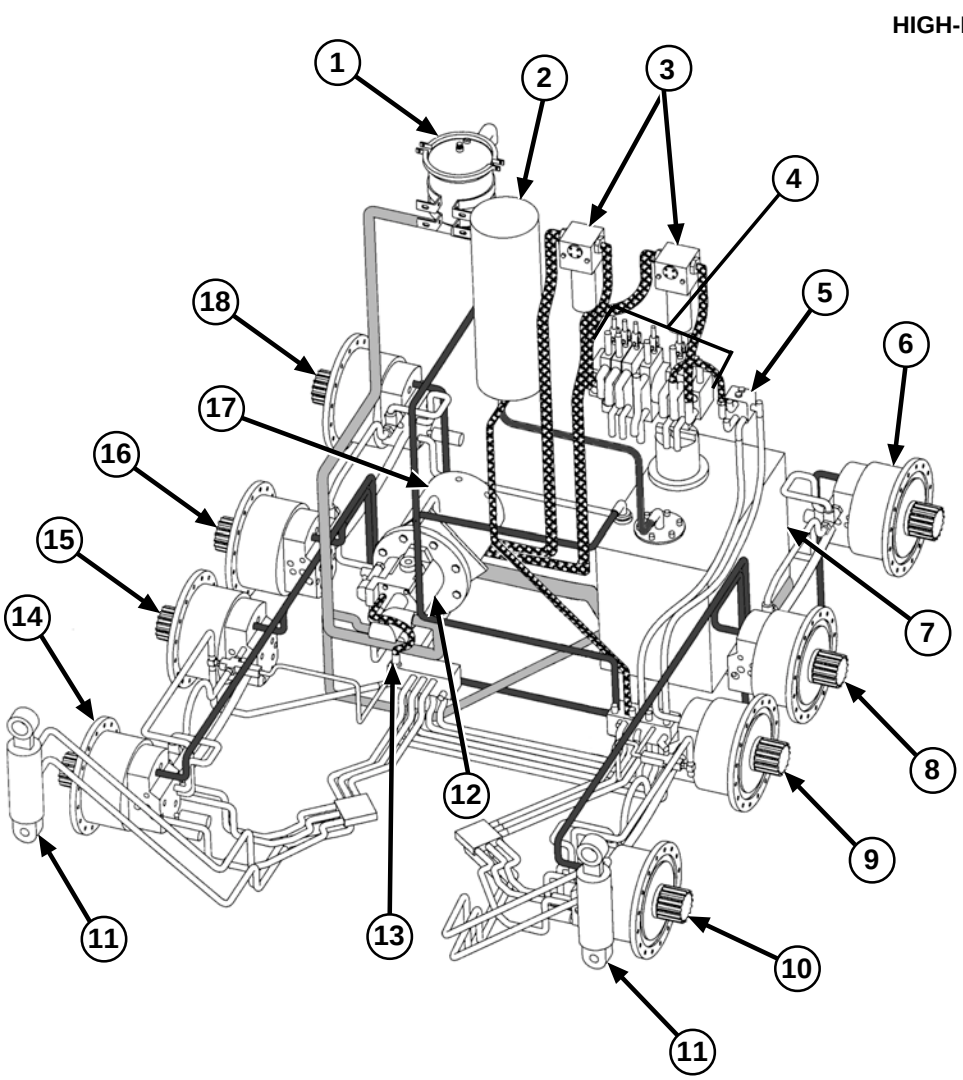
Tighten nut (9) on charge valve (6). Close nitrogen tank valve (5). Back off regulator valve (1), open bleed valve (7), and bleed hose pressure to 0 psi. Remove adapter valve (8) from charge valve (6). Remove pressure measuring devise (4) from bleed valve (7) on charging harness. Install charge cap (11) on actuator accumulator (10).

11 LEFT REAR CORNER DOES NOT RAISE IN SPRUNG OR UNSPRUNG MODE

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.

WARNING

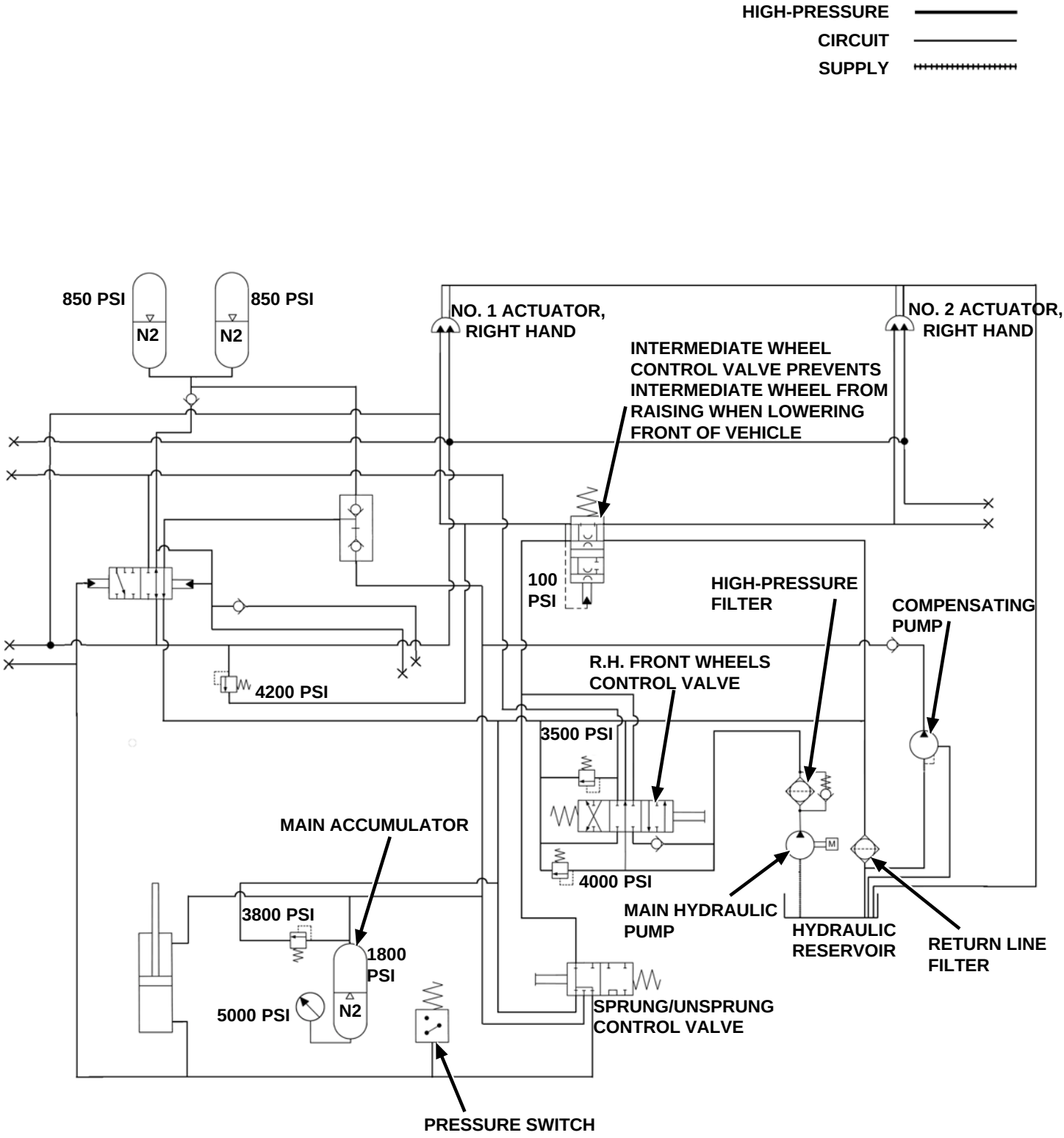
High pressure is present in the M9 hydraulic system. Do not disconnect any hydraulic system component unless hydraulic system pressure has been relieved. Ensure each hydraulic control lever is moved several times through all positions and hydraulic tank dipstick is slowly loosened to relieve pressure. Failure to comply may result in severe injury or death to personnel.



COMPONENTS:

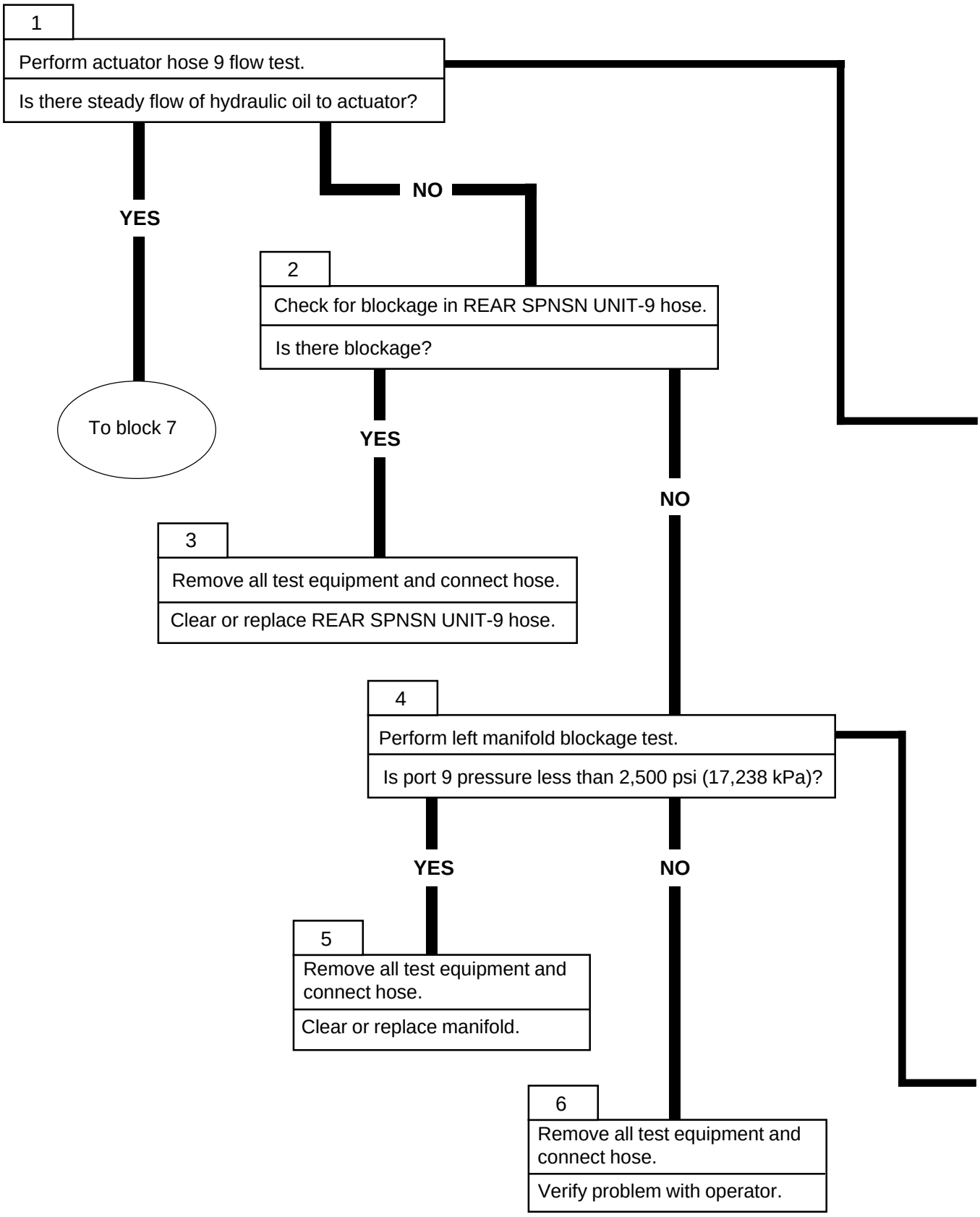
1. RETURN LINE FILTER
2. MAIN ACCUMULATOR
3. HIGH-PRESSURE FILTERS
4. DIRECTIONAL CONTROL VALVE BANK
5. SPRUNG/UNSPRUNG VALVE
6. NO. 4 ACTUATOR, LEFT HAND
7. HYDRAULIC RESERVOIR
8. NO. 3 ACTUATOR, LEFT HAND
9. NO. 2 ACTUATOR, LEFT HAND
10. NO. 1 ACTUATOR, LEFT HAND
11. BUMP STOP CYLINDERS
12. COMPENSATING PUMP
13. CHECK VALVE
14. NO. 1 ACTUATOR, RIGHT HAND
15. NO. 2 ACTUATOR, RIGHT HAND
16. NO. 3 ACTUATOR, RIGHT HAND
17. MAIN HYDRAULIC PUMP
18. NO. 4 ACTUATOR, RIGHT HAND

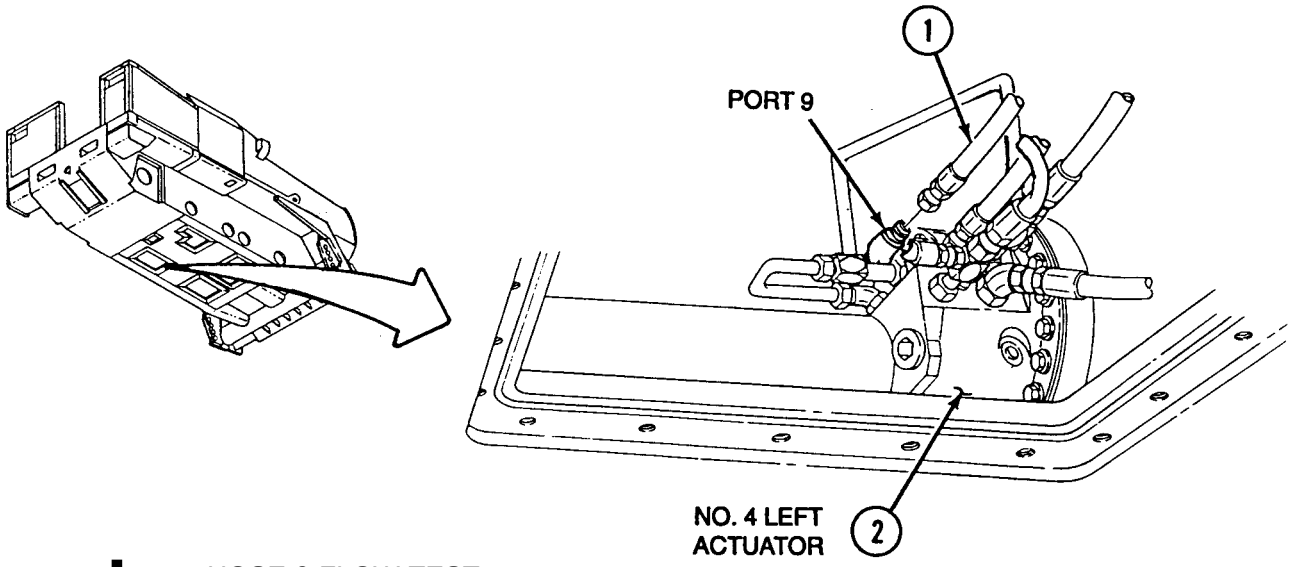
SUSPENSION CIRCUIT



SUSPENSION SCHEMATIC

11 LEFT REAR CORNER DOES NOT RAISE IN SPRUNG OR UNSPRUNG MODE (CONTINUED)



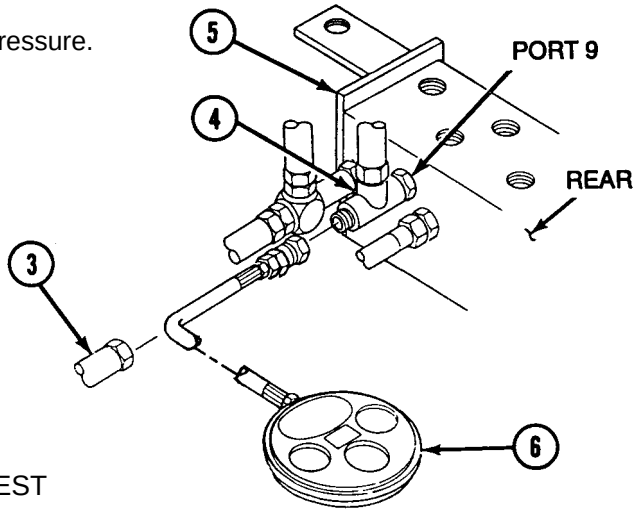


HOSE 9 FLOW TEST

NOTE

Have suitable container ready to catch oil.

- Stop engine; relieve hydraulic pressure. Disconnect REAR SPNSN UNIT-9 hose (1) from port 9 on No. 4 left actuator (2). Cap port 9.
- Connect drain hose to open end of REAR SPSN UNIT-9 hose (1).
- Place end of drain hose in container and have assistant start engine. Observe a free flow of oil from drain hose.
- Stop engine; relieve hydraulic pressure.



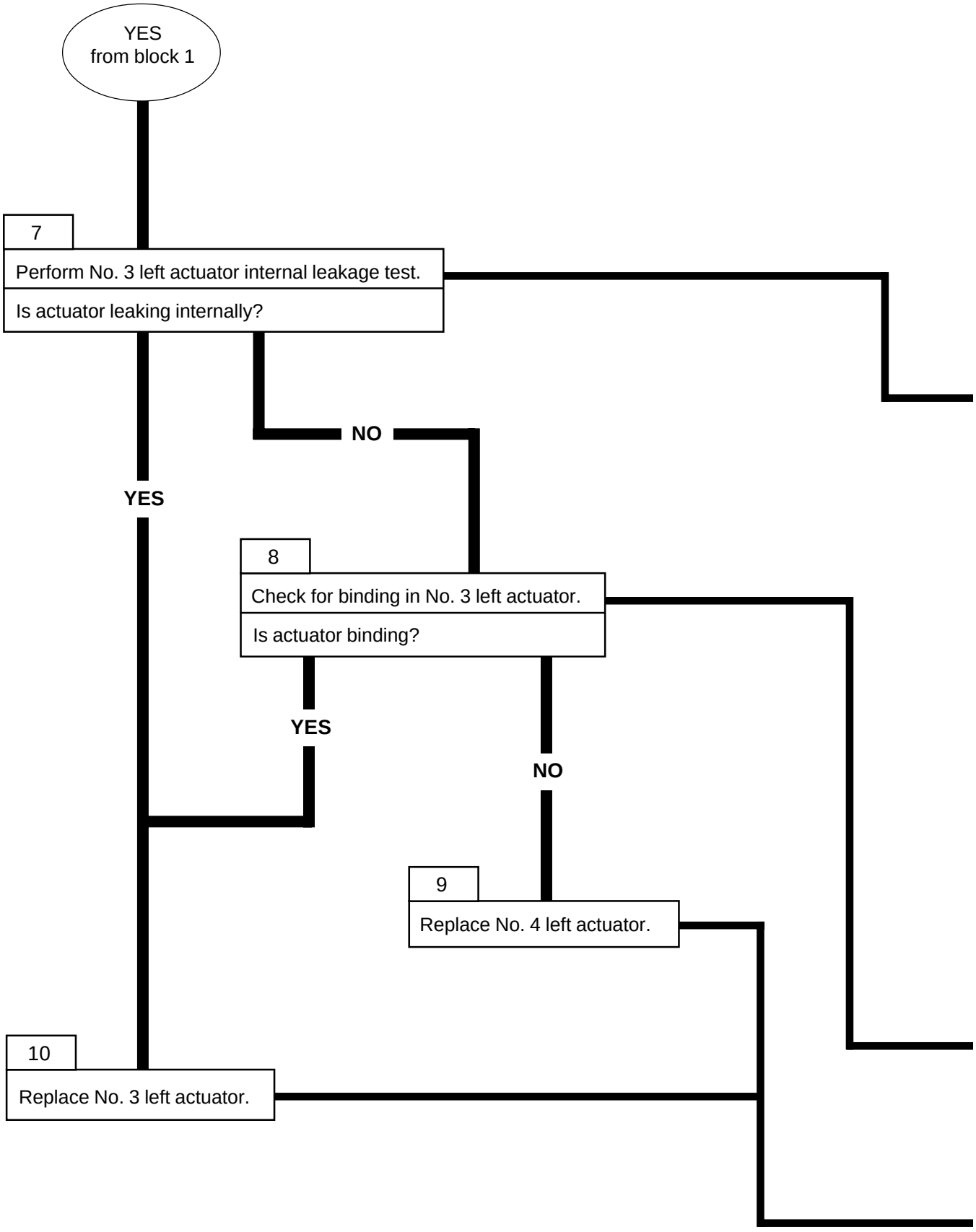
LEFT MANIFOLD BLOCKAGE TEST

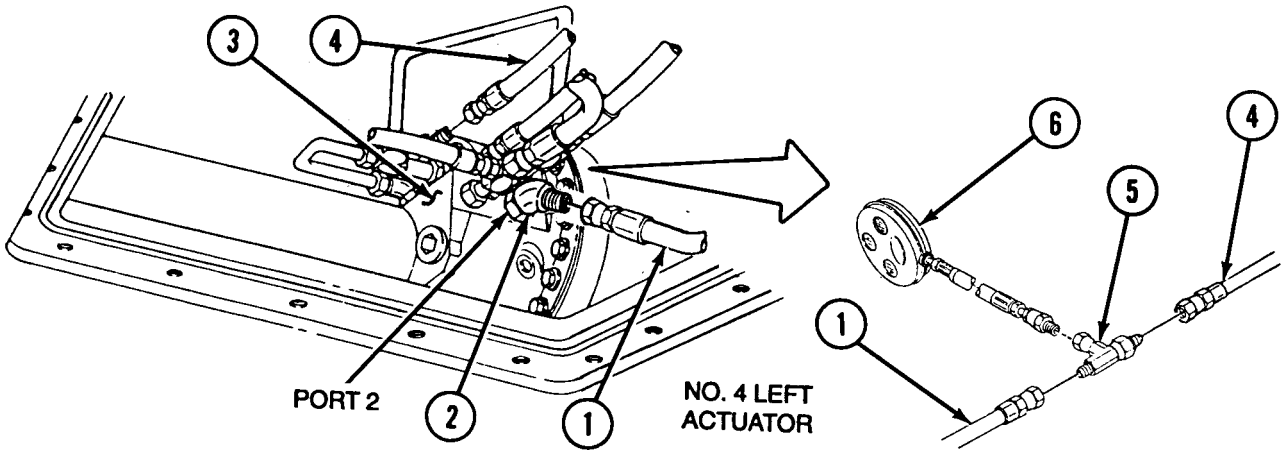
NOTE

Have suitable container ready to catch oil.

- Connect REAR SPNSN UNIT-9 hose (1) to port 9 on No. 4 left actuator (2).
- Disconnect MAIN MANF REAR-9 hose (3) from tee (4) on port 9 of left manifold (5). Plug MAIN MANF REAR-9 hose (3).
- Install pressure measuring device (6) on tee (4) at port 9.
- Start engine; read pressure measuring device.
- Stop engine; relieve hydraulic pressure. Remove all test equipment and connect hose.

11 LEFT REAR CORNER DOES NOT RAISE IN SPRUNG OR UNSPRUNG MODE (CONTINUED)



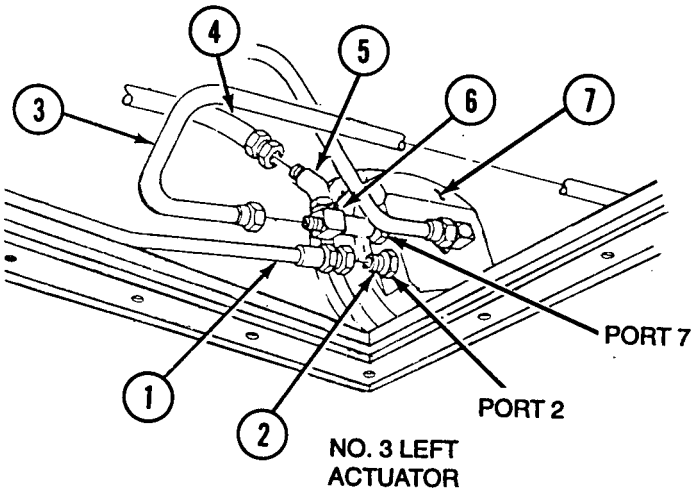


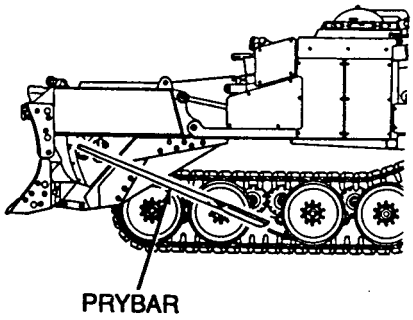
NO. 3 LEFT ACTUATOR INTERNAL LEAKAGE TEST

NOTE

Have suitable container ready to catch oil.

- Disconnect CORNER SPNSN UNIT-2 hose (1) from elbow (2) at port 2 on NO. 4 left actuator (3). Cap elbow (2).
- Remove drain hose from REAR SPNSN UNIT-9 hose (4) and connect tee (5) and pressure measuring device (6) between REAR SPNSN UNIT-9 hose (4) and CORNER SPNSN UNIT-2 hose (1).
- Start engine and observe that hydraulic pressure is greater than 2,500 psi (17,238 kPa). Less than 2,500 psi (17,238 kPa) indicates leakage from No. 3 left actuator. Stop engine; relieve hydraulic pressure. Remove all test equipment and connect hoses.





NO. 3 LEFT ACTUATOR BINDING CHECK

NOTE

Have suitable container ready to catch oil.

- Disconnect INTMD SPNSN UNIT-2 hose (1) from adapter (2) at port 2, and disconnect LH 3 SPNSN UNIT-7 TEE tube (3) and NO 3 SPNSN UNIT-7 TEE hose (4) from elbow (5) and tee (6) at port 7 on No. 3 left actuator (7). Plug all lines.
- Check for binding in No. 3 left actuator (7) by using a prybar to determine if No. 3 lift road-wheel arm can be moved up or down. Reconnect lines.

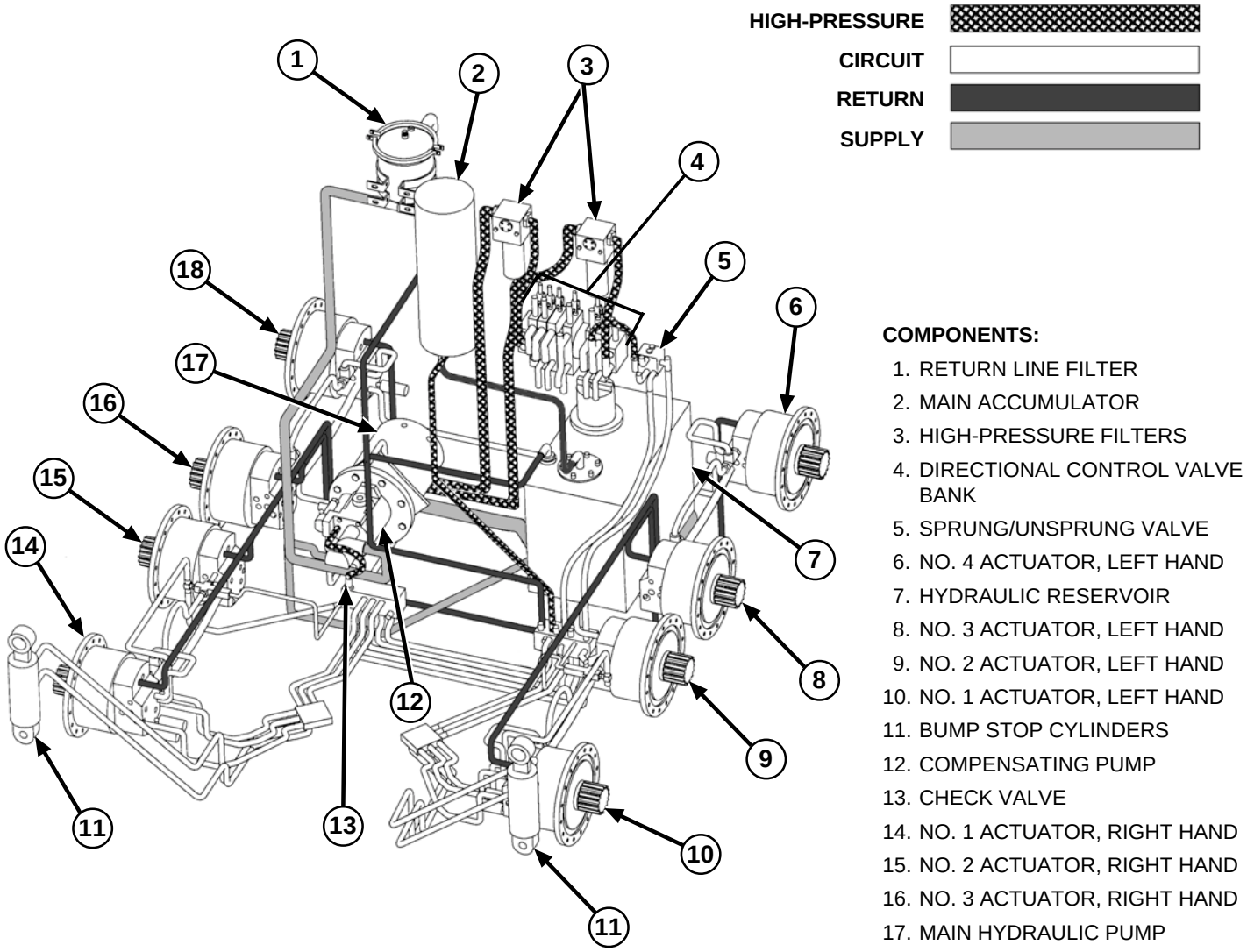
Notify Direct Support maintenance.

12 REAR OF VEHICLE RAISES IN SPRUNG, BUT NOT UNSPRUNG MODE

The rear of 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 and circuit 11 operates UNSPRUNG mode.

WARNING

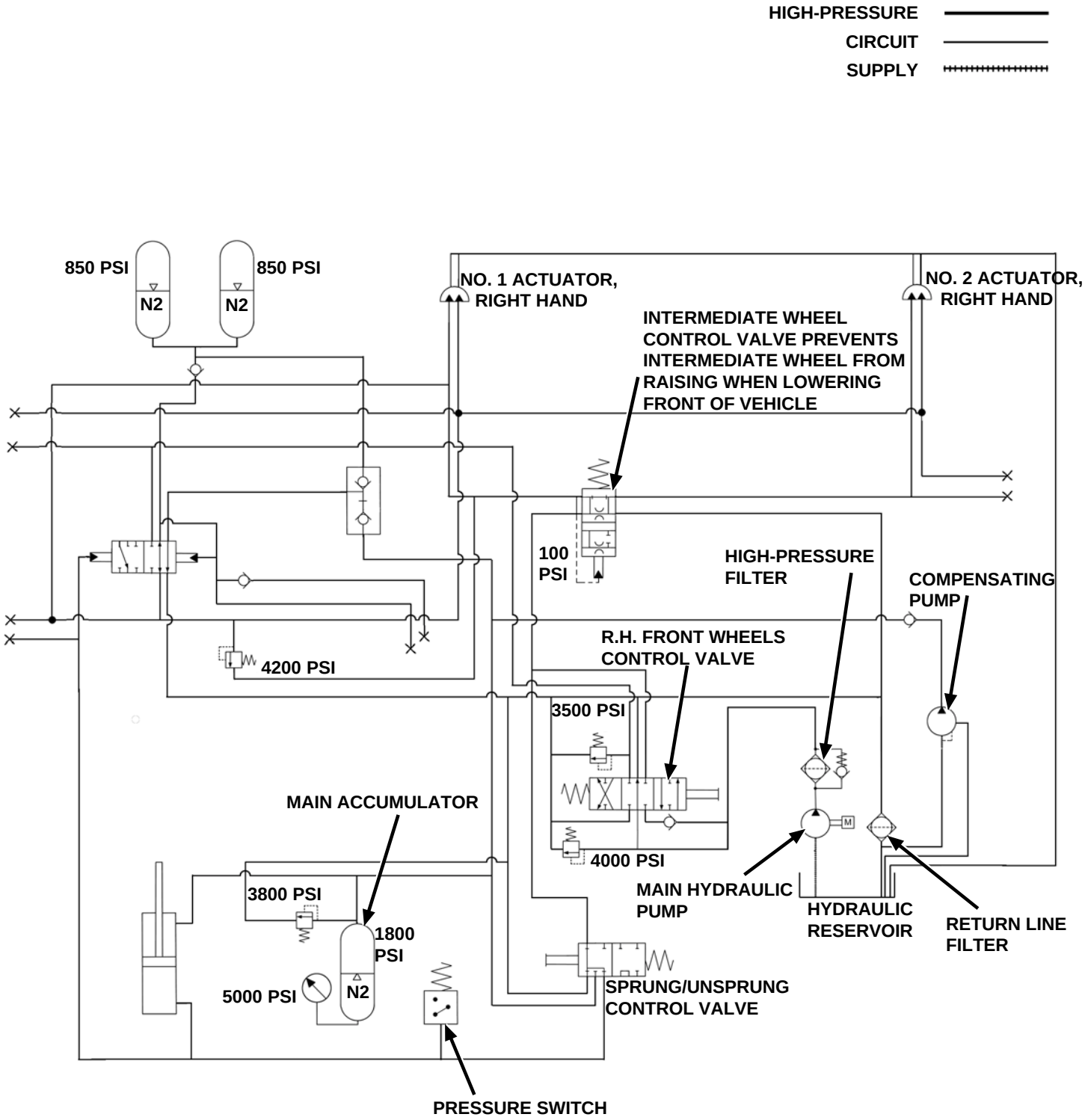
High pressure is present in the M9 hydraulic system, Do not disconnect any hydraulic system component unless hydraulic system pressure has been relieved. Ensure each hydraulic control lever is moved several times through all positions and hydraulic tank dipstick is slowly loosened to relieve pressure. Failure to comply may result in severe injury or death to personnel.



COMPONENTS:

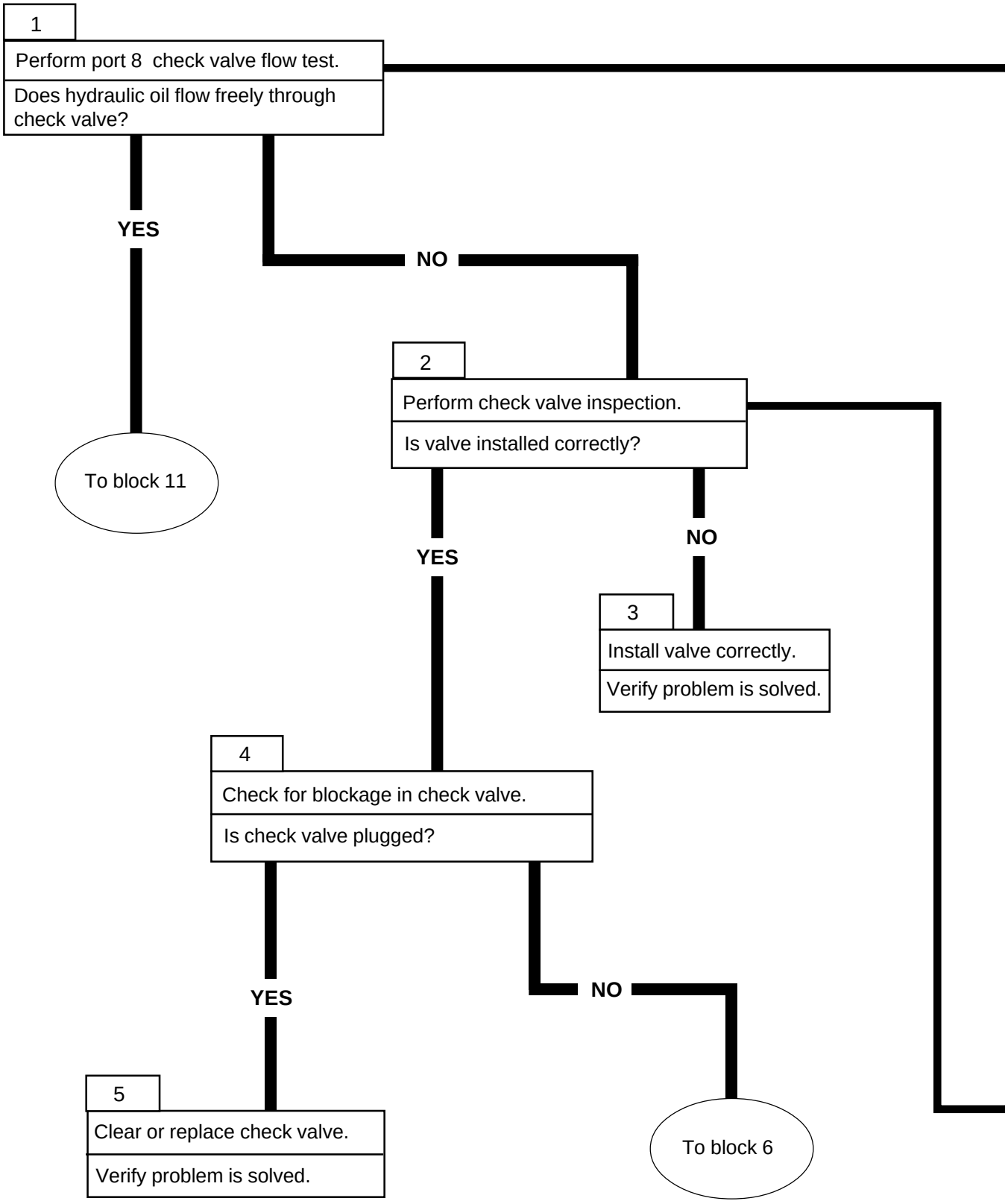
1. RETURN LINE FILTER
2. MAIN ACCUMULATOR
3. HIGH-PRESSURE FILTERS
4. DIRECTIONAL CONTROL VALVE BANK
5. SPRUNG/UNSPRUNG VALVE
6. NO. 4 ACTUATOR, LEFT HAND
7. HYDRAULIC RESERVOIR
8. NO. 3 ACTUATOR, LEFT HAND
9. NO. 2 ACTUATOR, LEFT HAND
10. NO. 1 ACTUATOR, LEFT HAND
11. BUMP STOP CYLINDERS
12. COMPENSATING PUMP
13. CHECK VALVE
14. NO. 1 ACTUATOR, RIGHT HAND
15. NO. 2 ACTUATOR, RIGHT HAND
16. NO. 3 ACTUATOR, RIGHT HAND
17. MAIN HYDRAULIC PUMP
18. NO. 4 ACTUATOR, RIGHT HAND

SUSPENSION CIRCUIT



SUSPENSION SCHEMATIC

12 REAR OF VEHICLE RAISES IN SPRUNG, BUT NOT UNSPRUNG MODE (CONTINUED)

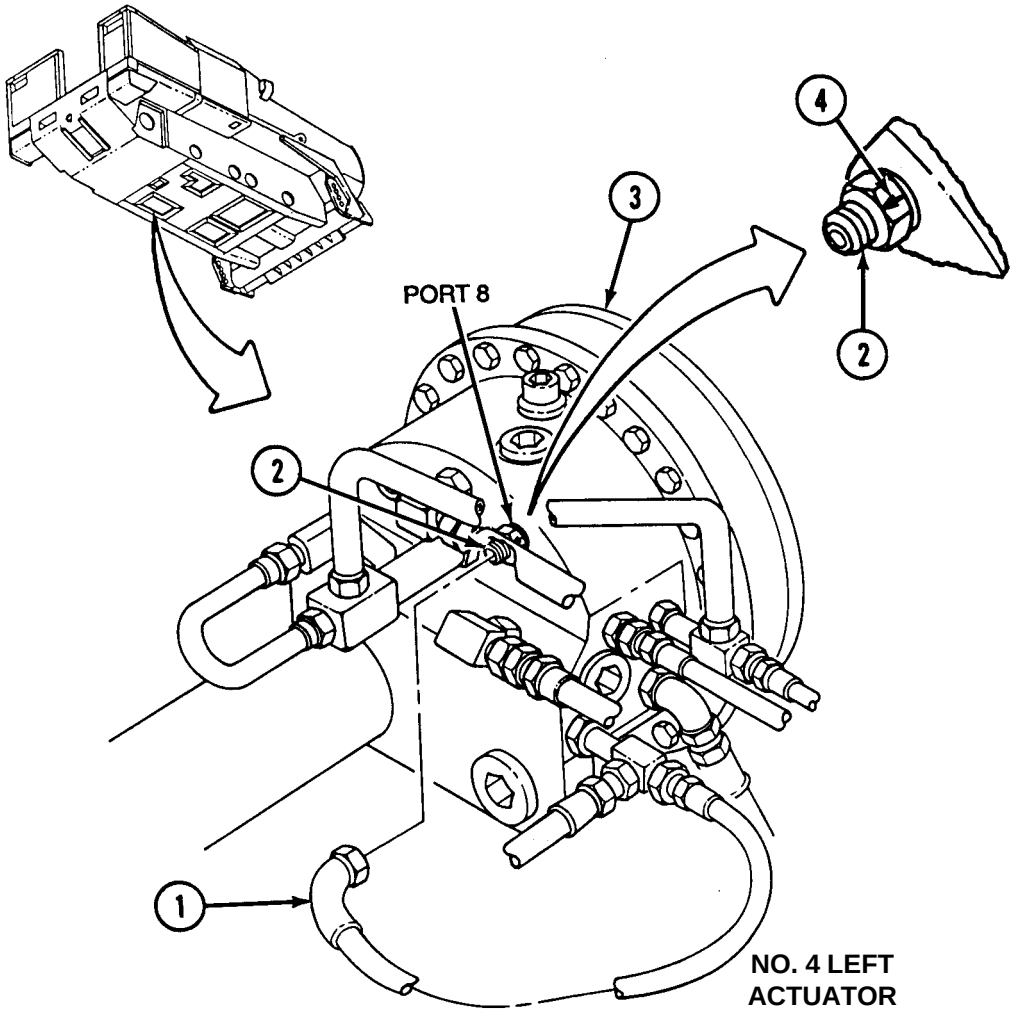


PORT 8 CHECK VALVE FLOW TEST

NOTE

Have suitable container ready to catch oil.

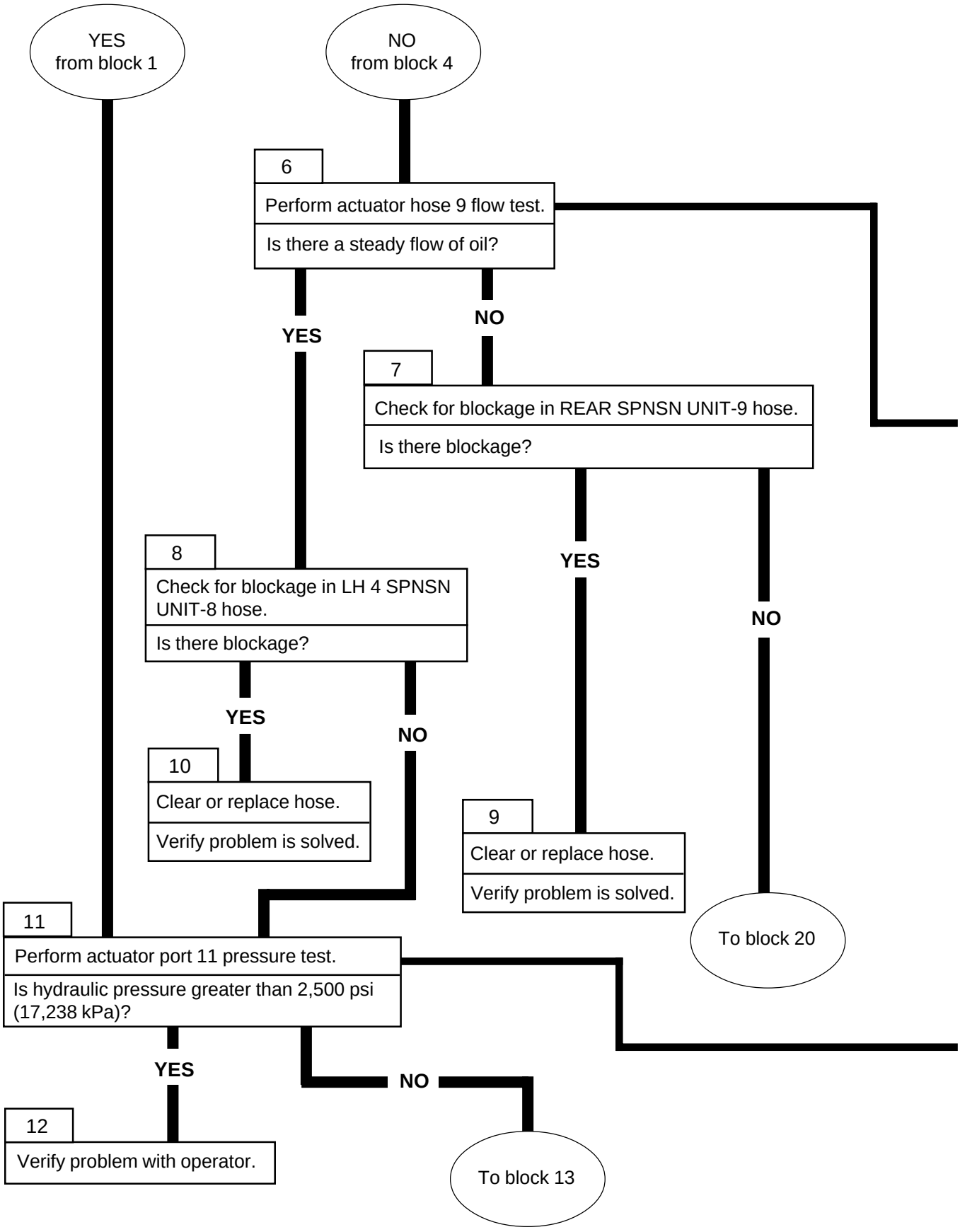
- Stop engine; relieve hydraulic pressure. Disconnect LH 4 SPNSN UNIT-8 hose (1) from check valve (2) at port 8 on No. 4 left actuator (3). Plug end of LH 4 SPNSN UNIT-8 hose (1).
- Connect drain hose to check valve (2).
- While holding end of drain hose in container, have assistant start engine and move SPRUNG/UNSPRUNG lever to SPRUNG mode. Observe for steady flow of oil from drain hose. Vehicle should raise.
- Stop engine; relieve hydraulic pressure and connect line.

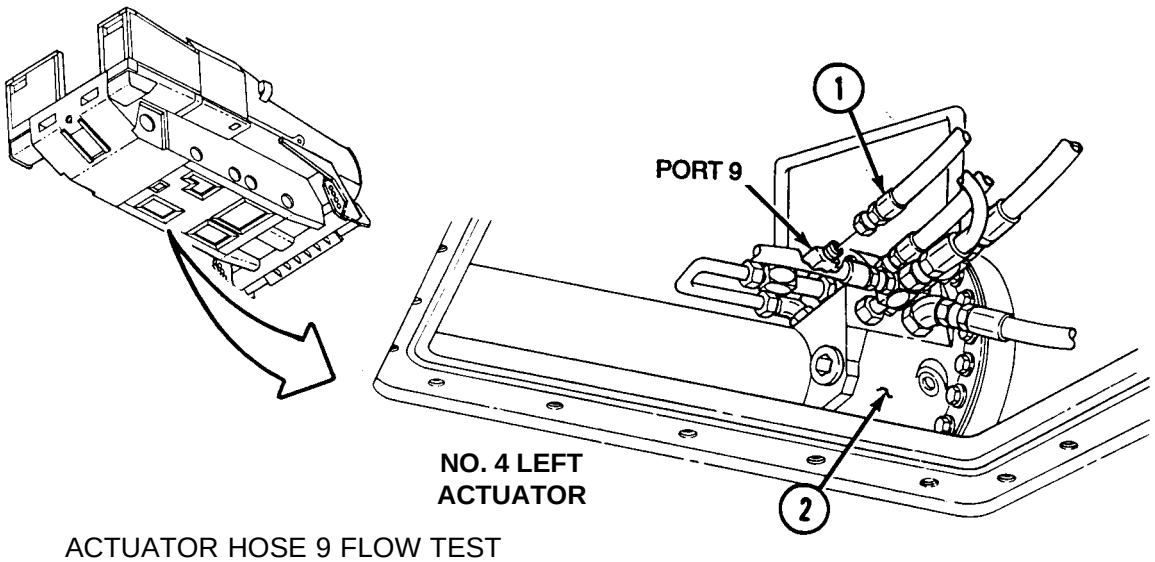


CHECK VALVE INSPECTION

- Inspect check valve (2). Ensure arrow (4) points away from actuator (3).
- Connect LH 4 SPNSN UNIT-8 hose (1) to check valve (2) at port 8.

12 REAR OF VEHICLE RAISES IN SPRUNG, BUT NOT UNSPRUNG MODE (CONTINUED)



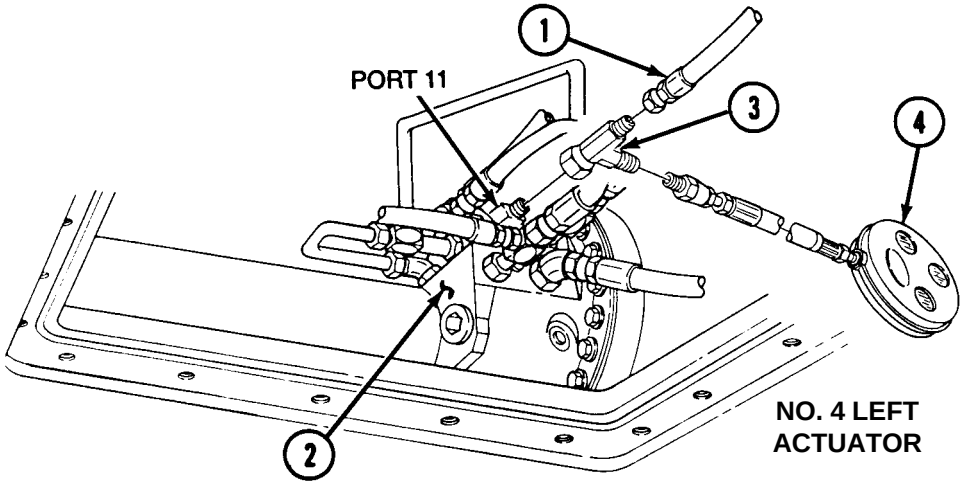


ACTUATOR HOSE 9 FLOW TEST

NOTE

Have suitable container ready to catch oil.

- Disconnect REAR SPNSN UNIT-9 hose (1) at port 9 on No. 4 left actuator (2). Cap port 9.
- Connect a drain hose to open end of REAR SPNSN UNIT-9 hose (1).
- Hold free end of drain hose in clean container. Have assistant start engine and move SPRUNG/UNSPRUNG lever to UNSPRUNG. Observe for a steady flow of oil from drain hose.
- Stop engine; relieve hydraulic pressure and connect hose.



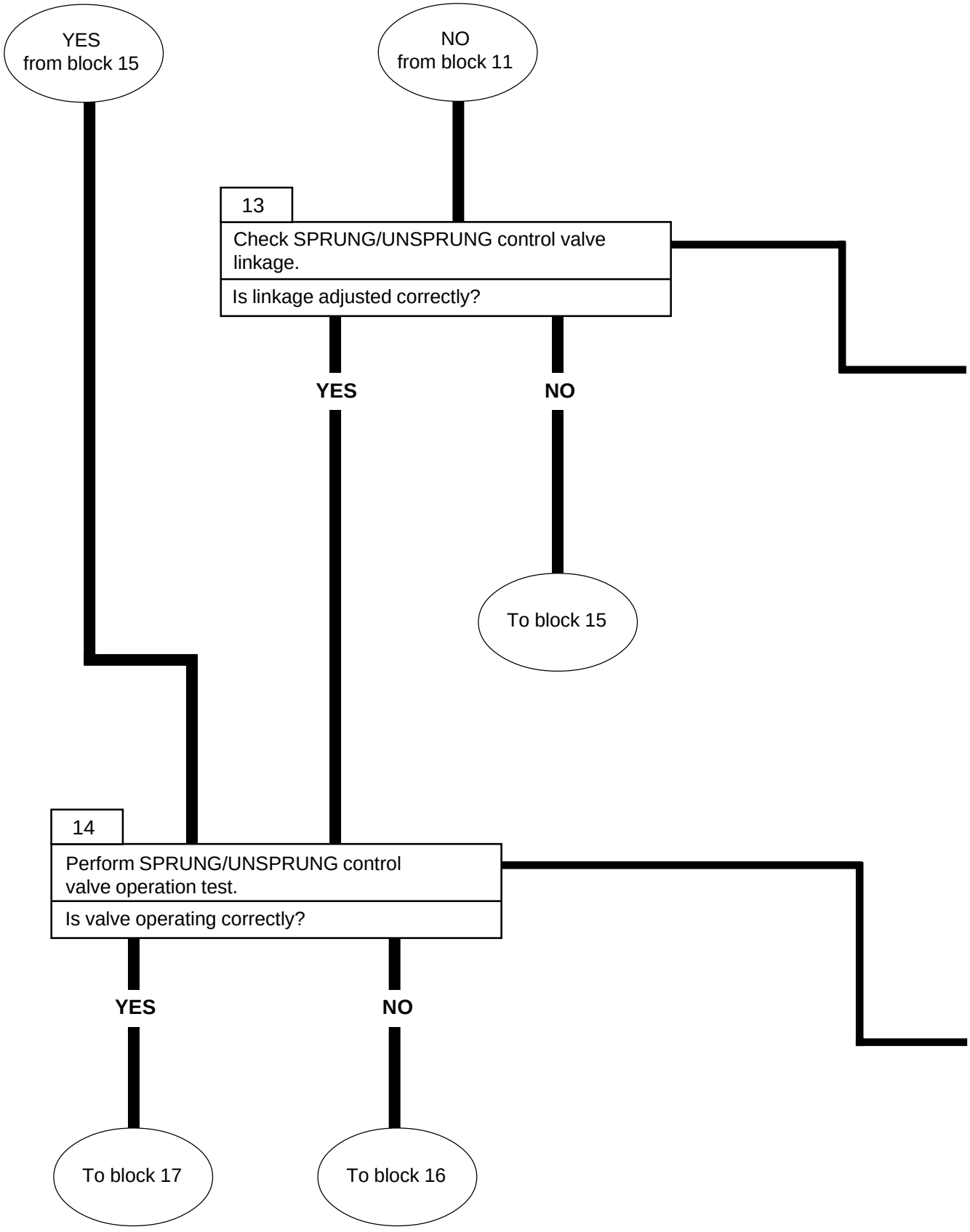
ACTUATOR PORT 11 PRESSURE TEST

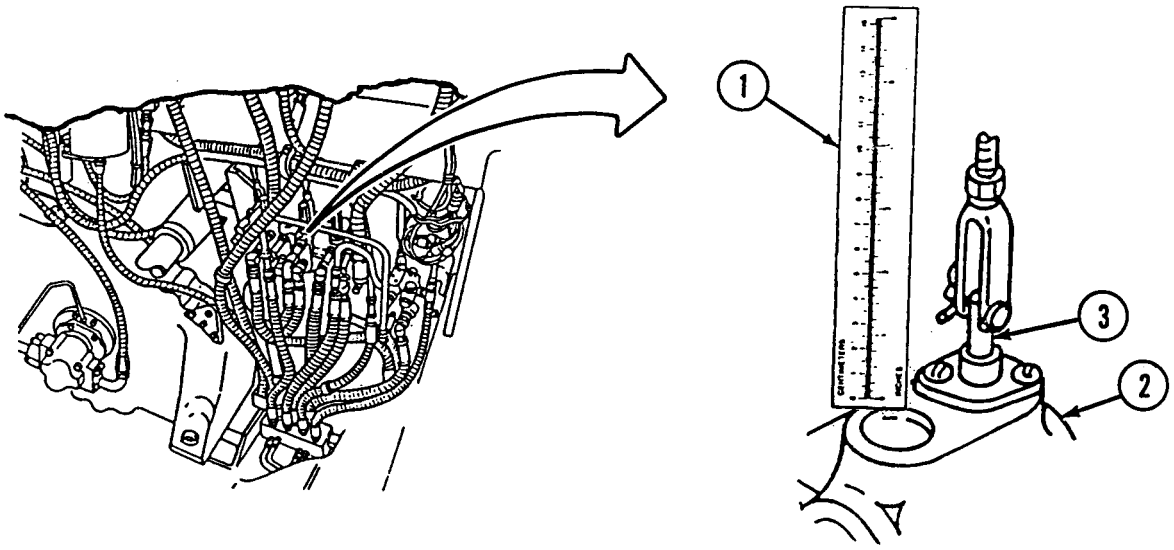
NOTE

Have suitable container ready to catch oil.

- Disconnect REAR SPNSN UNIT-11 hose (1) at port 11 on No. 4 left actuator (2). Cap port 11.
- Install tee (3) and pressure measuring device (4) on end of REAR SPNSN UNIT-11 hose (1). Cap open end of tee (3).
- Have assistant start engine and move SPRUNG/UNSPRUNG lever to UNSPRUNG. Observe hydraulic pressure.
- Stop engine; relieve hydraulic pressure. Remove all test equipment and connect hose.

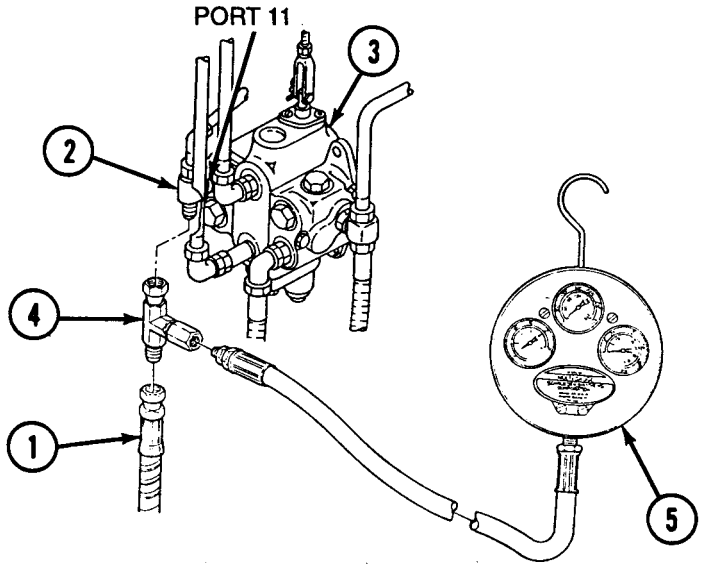
12 REAR OF VEHICLE RAISES IN SPRUNG, BUT NOT UNSPRUNG MODE (CONTINUED)





SPRUNG/UNSPRUNG CONTROL VALVE LINKAGE CHECK

Hold measuring device (1) on face of SPRUNG/UNSPRUNG control valve (2). Have assistant move SPRUNG/UNSPRUNG lever between SPRUNG and UNSPRUNG modes. Measure distance plunger (3) travels as lever is moved. Distance of travel should be 9/32 in. (7 mm).



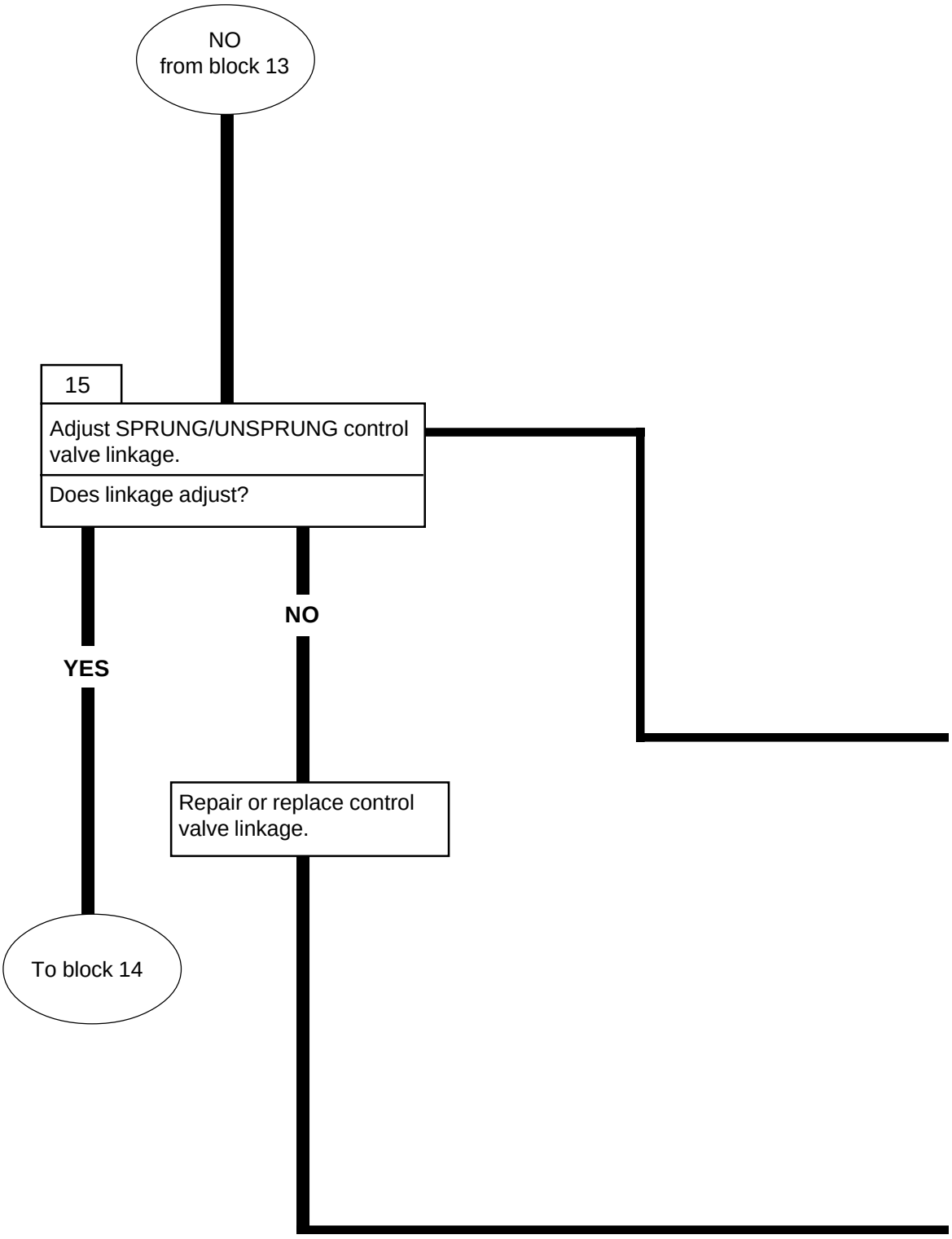
SPRUNG/UNSPRUNG CONTROL VALVE OPERATION TEST

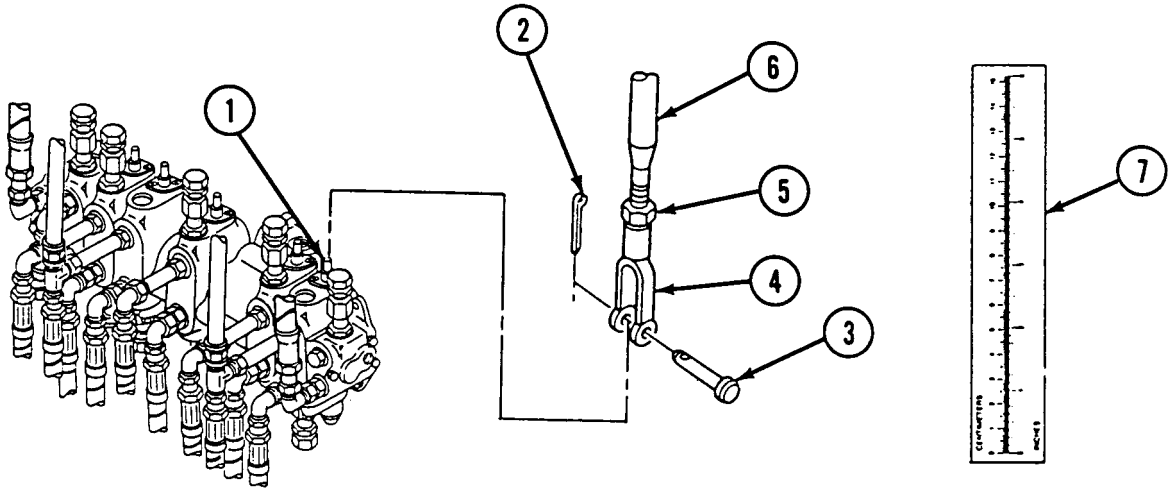
NOTE

Have suitable container ready to catch oil.

- Disconnect UNSPR VLV-11 TEE hose (1) from tee (2) at port 11 of SPRUNG/UNSPRUNG control valve (3).
- Install tee (4) and pressure measuring device (5) between UNSPR VLV-11 TEE hose (1) and tee (2) at port 11.
- Start engine and have assistant move SPRUNG/UNSPRUNG lever between SPRUNG and UNSPRUNG several times. Hydraulic pressure should be less than 25 psi (172 kPa) in SPRUNG mode and greater than 2,500 psi (17,238 kPa) in UNSPRUNG mode.
- Stop engine; relieve hydraulic pressure. Remove all test equipment and connect hose.

12 REAR OF VEHICLE RAISES IN SPRUNG, BUT NOT UNSPRUNG MODE (CONTINUED)





SPRUNG/UNSPRUNG LINKAGE ADJUSTMENT

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 the same way. This procedure covers SPRUNG/UNSPRUNG control rod.

- Note position of control valve plunger (1) when SPRUNG/UNSPRUNG control lever is in neutral (off) position.

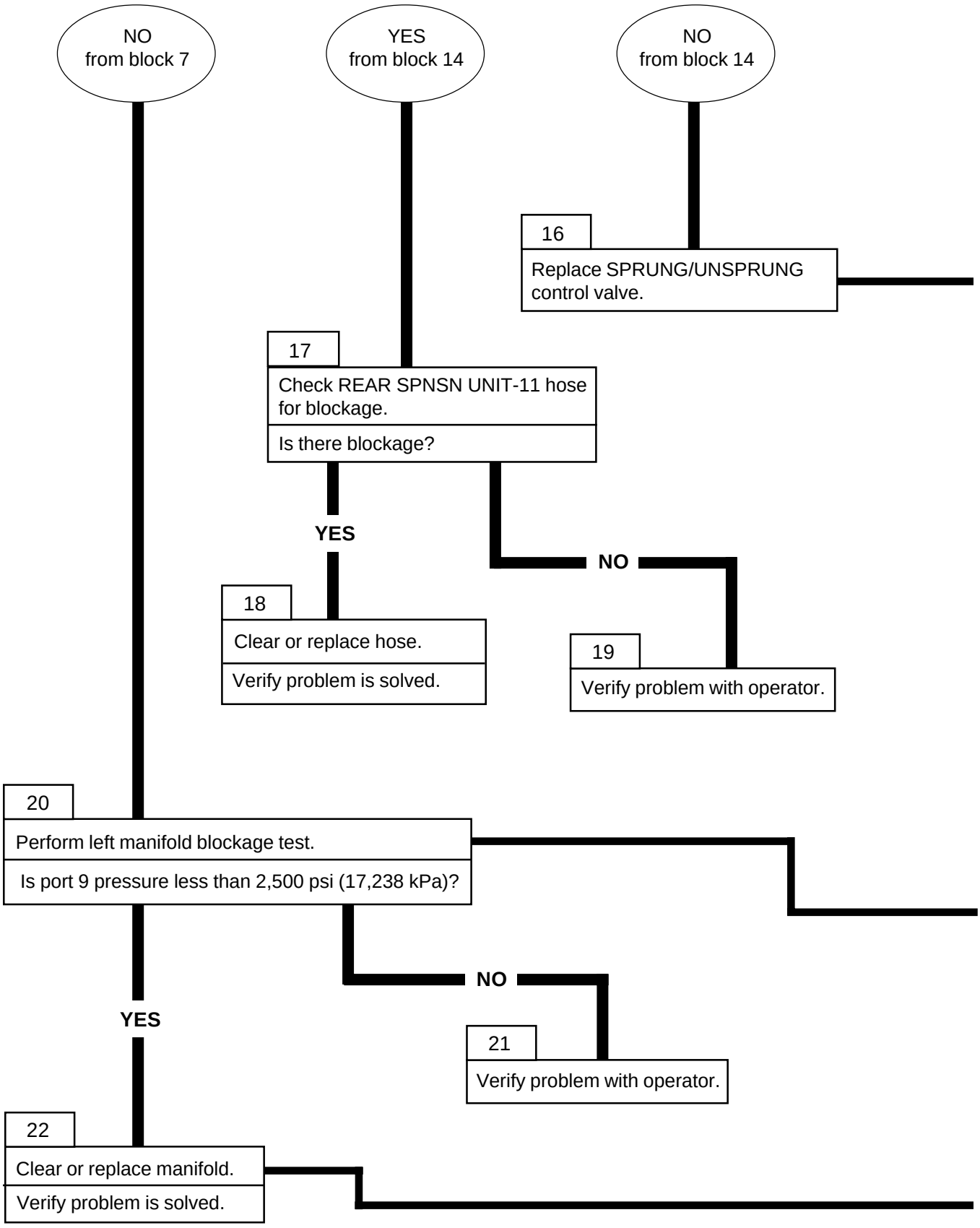
NOTE

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

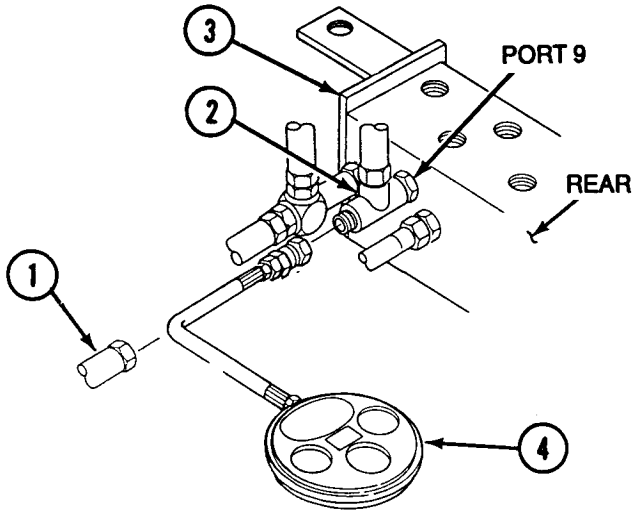
- Remove cotter pin (2), straight pin (3), and clevis (4) from control valve plunger (1). Discard cotter pin. (2).
- Loosen jamnut (5). Turn clevis (4) clockwise to shorten rod (6); counterclockwise to lengthen rod (6).
- Hold measuring device (7) on face of SPRUNG/UNSPRUNG control valve. Have assistant move SPRUNG/UNSPRUNG lever between SPRUNG and UNSPRUNG mode. Measure distance of plunger travel.
- Coat threads of rod (6) with sealing compound primer and sealing compound. Tighten jamnut (5) against clevis (4).
- Connect clevis (4) to control valve plunger (1) with straight pin (3) and new cotter pin (2).

Refer to TM 5-2350-262-20-2.

12 REAR OF VEHICLE RAISES IN SPRUNG, BUT NOT UNSPRUNG MODE (CONTINUED)



Refer to TM 5-2350-262-20-2.



LEFT MANIFOLD BLOCKAGE TEST

NOTE

Have suitable container ready to catch oil.

- Stop engine; relieve hydraulic pressure.
- Disconnect MAIN MANF REAR-9 hose (1) from tee (2) on port 9 of LH manifold (3). Plug MAIN MANF REAR-9 hose (1).
- Install pressure measuring device (4) on tee (2) at port 9.
- Start engine; read pressure measuring device (4).
- Stop engine; relieve hydraulic pressure. Remove all test equipment and connect hose.

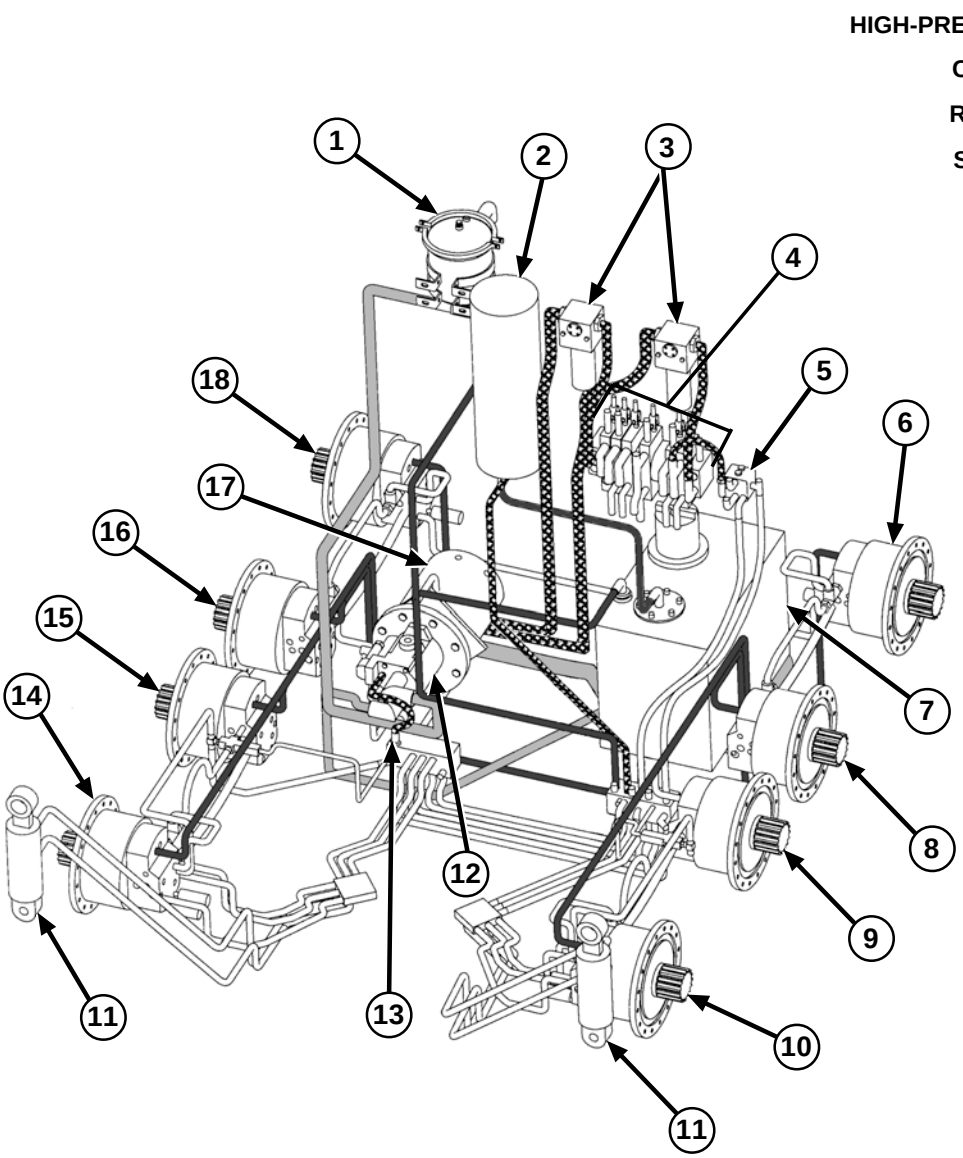
Refer to TM 5-2350-262-20-2.

13 RIGHT REAR CORNER RAISES IN SPRUNG, BUT NOT UNSPRUNG MODE

The No. 4 right and No. 4 left actuators are interconnected through circuit 3 which balances the pressure between the two actuators. Hydraulic pressure is supplied to the No. 4 right actuator at port 3.

WARNING

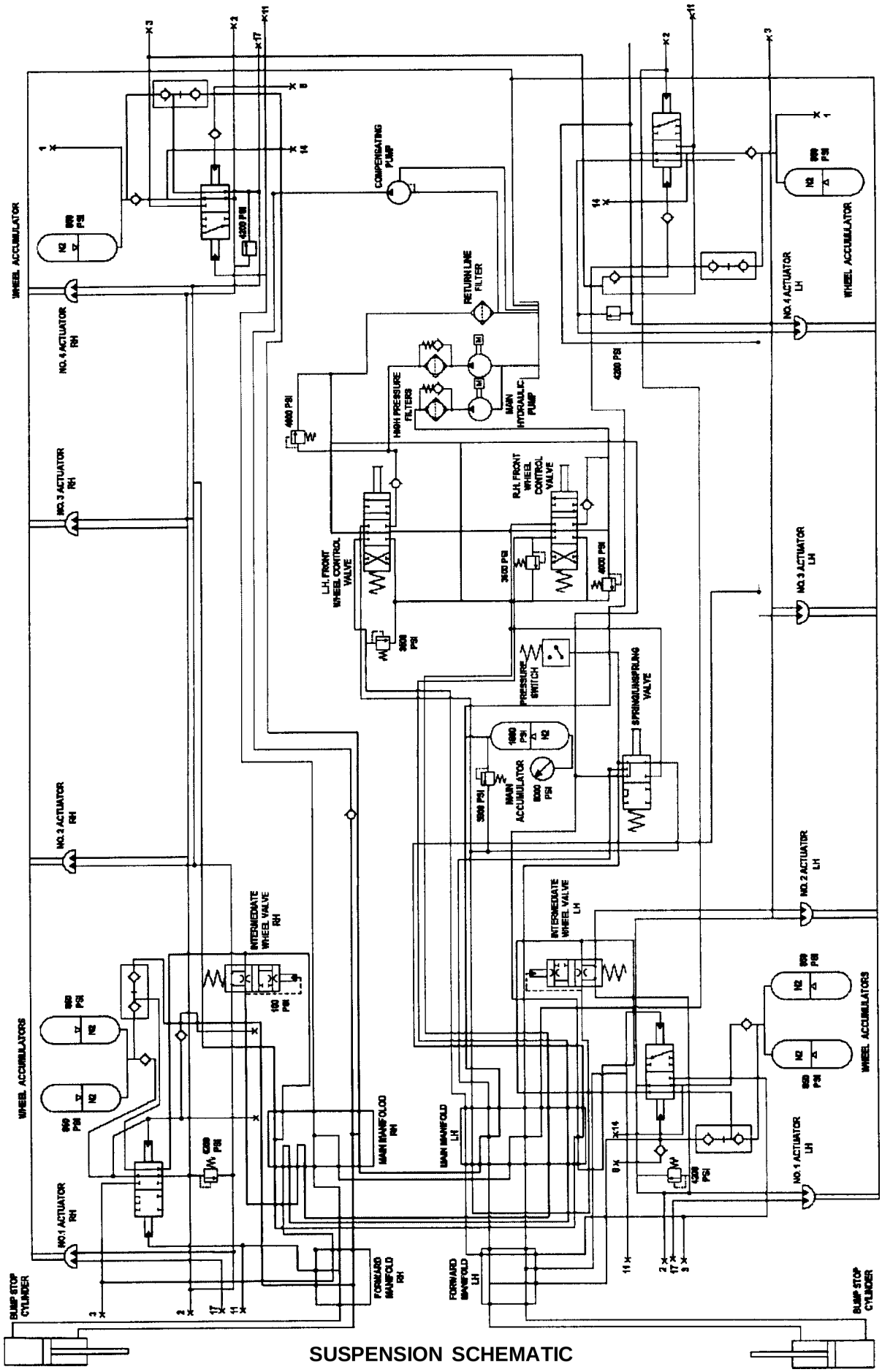
High pressure is present in the M9 hydraulic system. Do not disconnect any hydraulic system component unless hydraulic system pressure has been relieved. Ensure each hydraulic control lever is moved several times through all positions and hydraulic tank dipstick is slowly loosened to relieve pressure. Failure to comply may result in severe injury or death to personnel.



COMPONENTS:

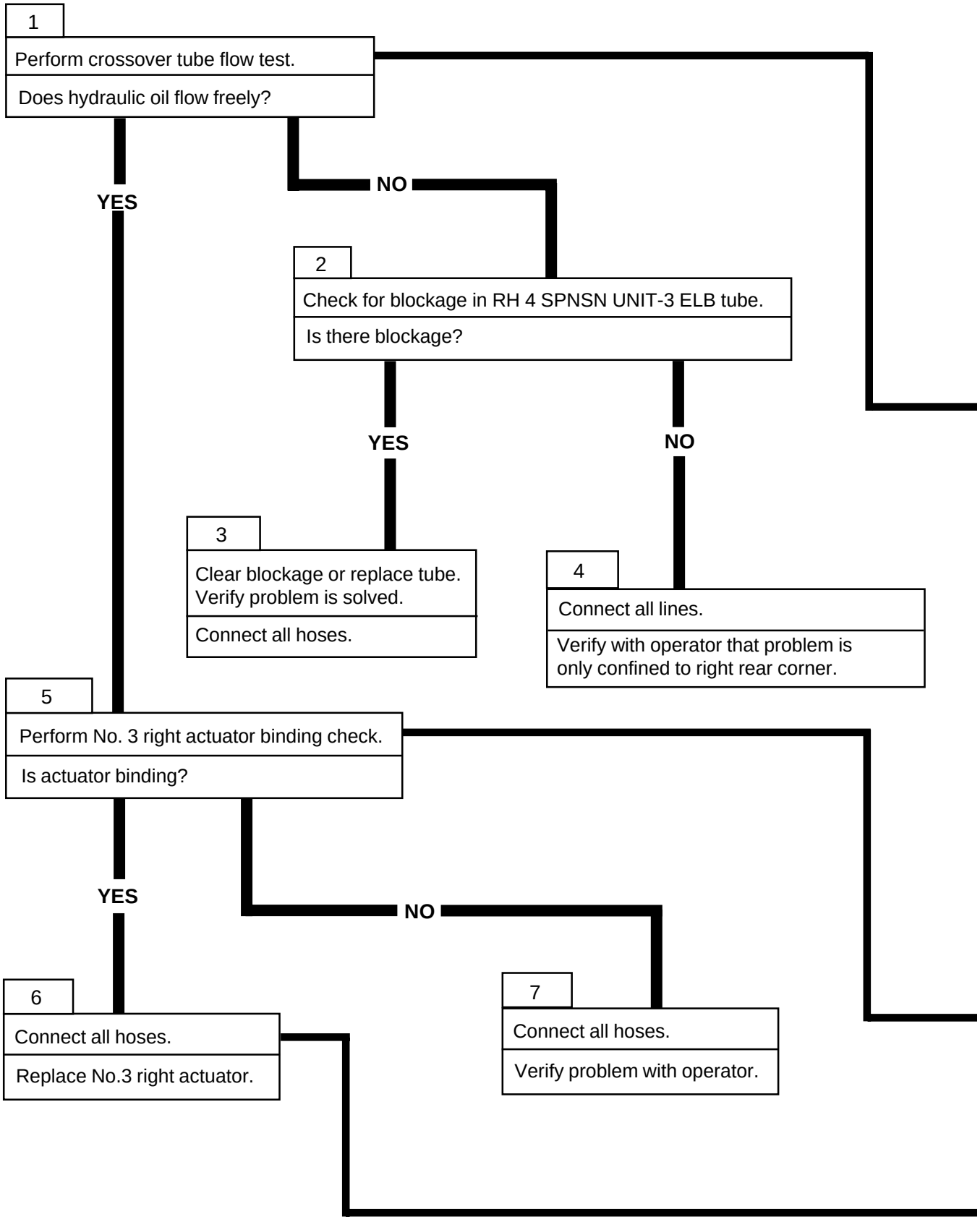
1. RETURN LINE FILTER
2. MAIN ACCUMULATOR
3. HIGH-PRESSURE FILTERS
4. DIRECTIONAL CONTROL VALVE BANK
5. SPRUNG/UNSPRUNG VALVE
6. NO. 4 ACTUATOR, LEFT HAND
7. HYDRAULIC RESERVOIR
8. NO. 3 ACTUATOR, LEFT HAND
9. NO. 2 ACTUATOR, LEFT HAND
10. NO. 1 ACTUATOR, LEFT HAND
11. BUMP STOP CYLINDERS
12. COMPENSATING PUMP
13. CHECK VALVE
14. NO. 1 ACTUATOR, RIGHT HAND
15. NO. 2 ACTUATOR, RIGHT HAND
16. NO. 3 ACTUATOR, RIGHT HAND
17. MAIN HYDRAULIC PUMP
18. NO. 4 ACTUATOR, RIGHT HAND

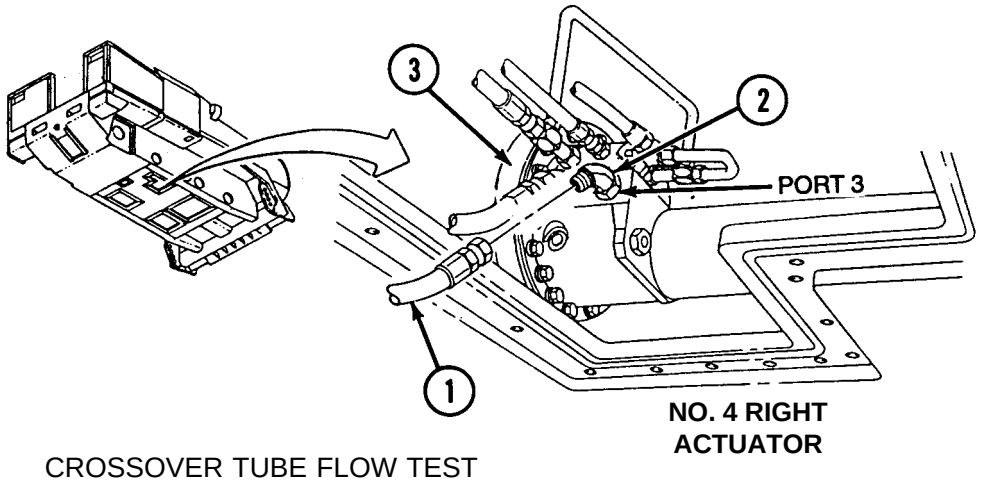
SUSPENSION CIRCUIT



SUSPENSION SCHEMATIC

13 RIGHT REAR CORNER RAISES IN SPRUNG, BUT NOT UNSPRUNG MODE (CONTINUED)



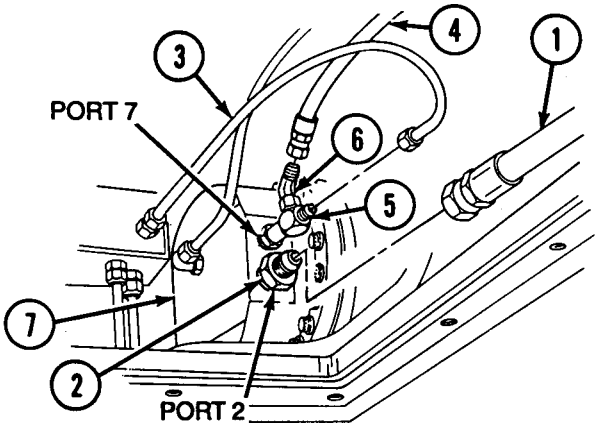


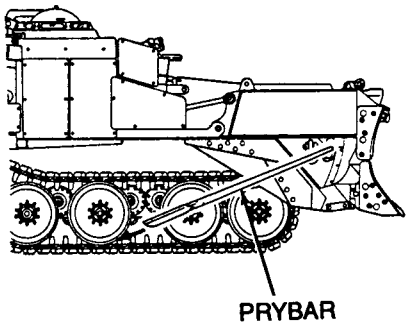
CROSSOVER TUBE FLOW TEST

NOTE

Have suitable container ready to catch oil.

- Stop engine; relieve hydraulic pressure. Disconnect RH 4 SPNSN UNIT-3 ELB hull crossover hose (1) from elbow (2) at port 3 on No. 4 right actuator (3). Cap elbow (2).
- Connect drain hose to open end of RH 4 SPNSN UNIT-3 ELB hull crossover hose (1). Place end of hose in container.
- Have assistant start engine and move SPRUNG/UNSPRUNG control lever to UNSPRUNG. Observe a free flow of hydraulic oil.
- Stop engine; relieve hydraulic pressure. Remove drain hose and connect RH 4 SPNSN UNIT-3 ELB hose (1).





NO. 3 RIGHT ACTUATOR BINDING CHECK

NOTE

Have suitable container ready to catch oil.

- Disconnect INTMD SPNSN UNIT-2 hose (1) from adapter (2) at port 2. Disconnect R/H 3 SPNSN UNIT-7 tee tube (3) and NO 3 SPNSN UNIT-7 tee hose (4) from tee (5) and elbow (6) at port 7 on No. 3 right actuator (7). Plug all lines.
- Check for binding in No. 3 right actuator (6) by using a prybar to determine if No.3 right roadwheel can be moved up and down.

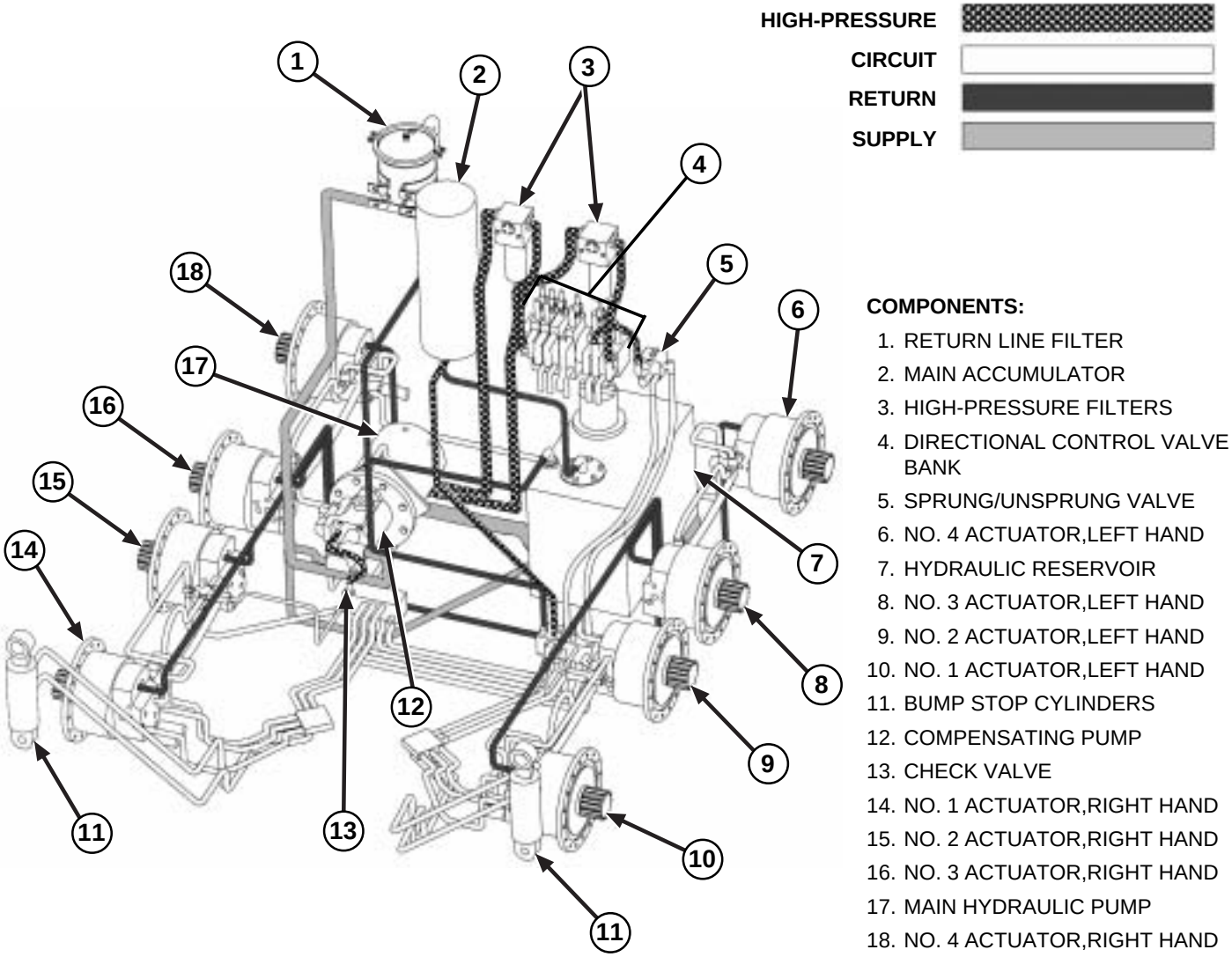
Notify Direct Support maintenance.

14 RIGHT REAR CORNER RAISES UNSPRUNG, BUT NOT SPRUNG MODE

Hydraulic pressure to No. 4 right actuator is provided by compensating pump through right-hand manifold by way of circuit 9.

WARNING

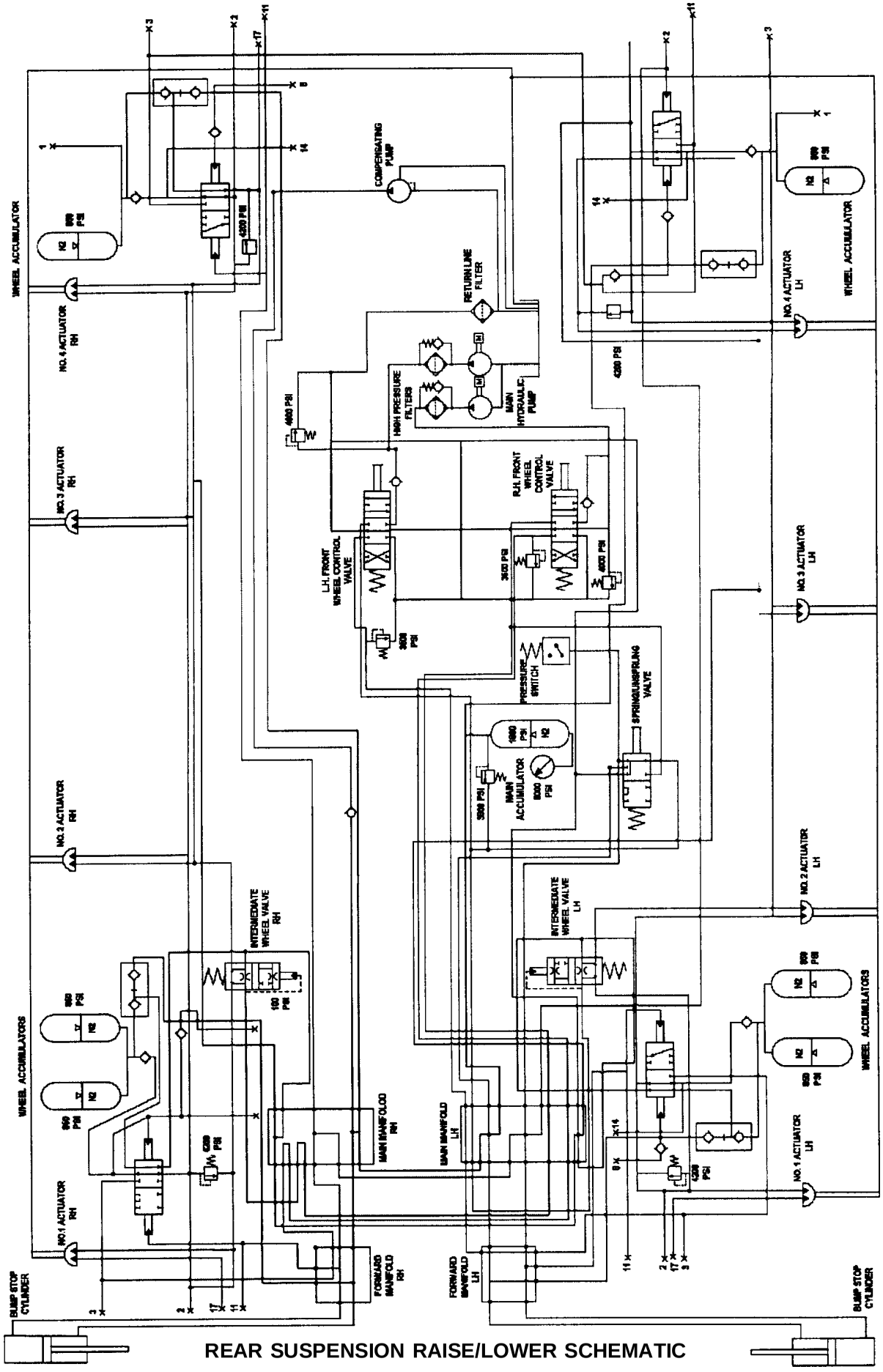
High pressure is present in the M9 hydraulic system. Do not disconnect any hydraulic system component unless hydraulic system pressure has been relieved. Ensure each hydraulic control lever is moved several times through all positions and hydraulic tank dipstick is slowly loosened to relieve pressure. Failure to comply may result in severe injury or death to personnel.



COMPONENTS:

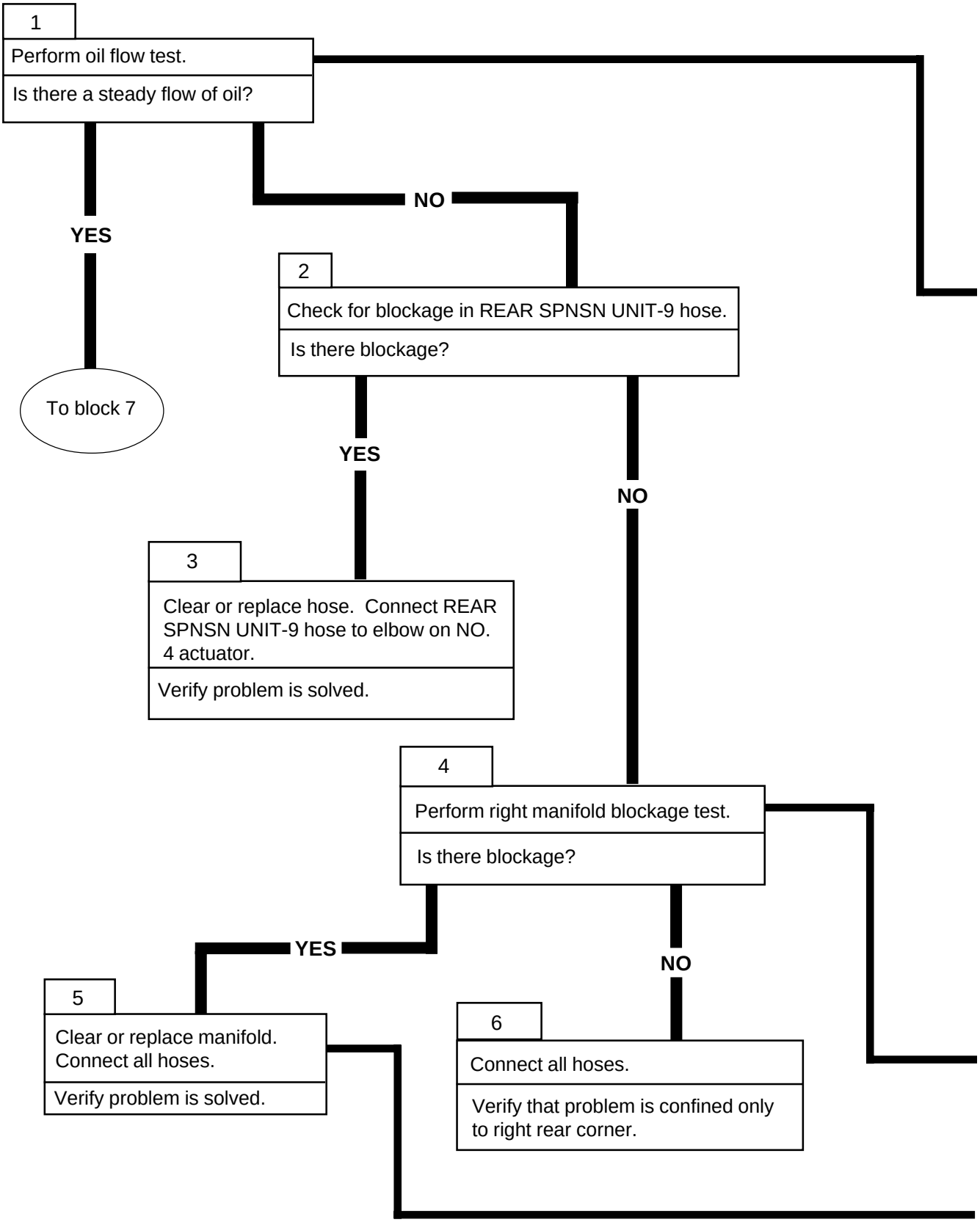
1. RETURN LINE FILTER
2. MAIN ACCUMULATOR
3. HIGH-PRESSURE FILTERS
4. DIRECTIONAL CONTROL VALVE BANK
5. SPRUNG/UNSPRUNG VALVE
6. NO. 4 ACTUATOR,LEFT HAND
7. HYDRAULIC RESERVOIR
8. NO. 3 ACTUATOR,LEFT HAND
9. NO. 2 ACTUATOR,LEFT HAND
10. NO. 1 ACTUATOR,LEFT HAND
11. BUMP STOP CYLINDERS
12. COMPENSATING PUMP
13. CHECK VALVE
14. NO. 1 ACTUATOR,RIGHT HAND
15. NO. 2 ACTUATOR,RIGHT HAND
16. NO. 3 ACTUATOR,RIGHT HAND
17. MAIN HYDRAULIC PUMP
18. NO. 4 ACTUATOR,RIGHT HAND

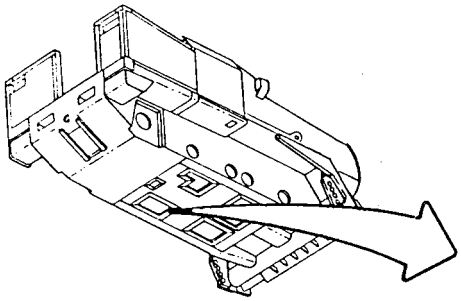
REAR SUSPENSION RAISE/LOWER CIRCUIT

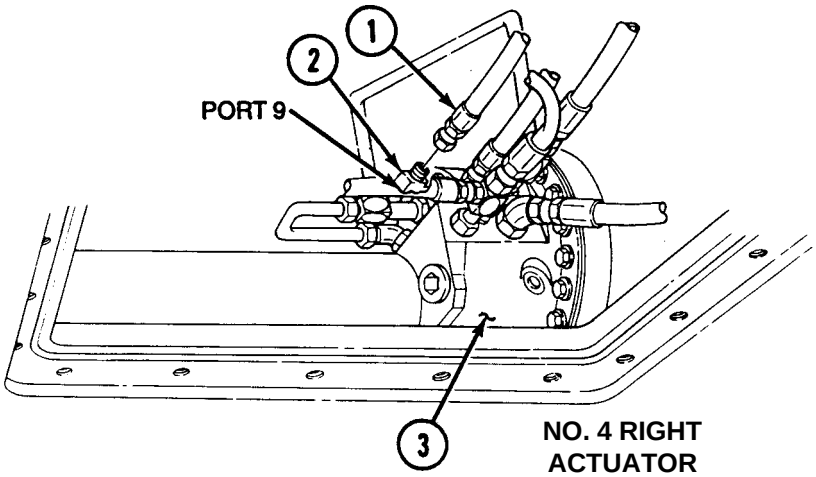


REAR SUSPENSION RAISE/LOWER SCHEMATIC

14 RIGHT REAR CORNER RAISES IN UNSPRUNG, BUT NOT SPRUNG MODE (CONTINUED)





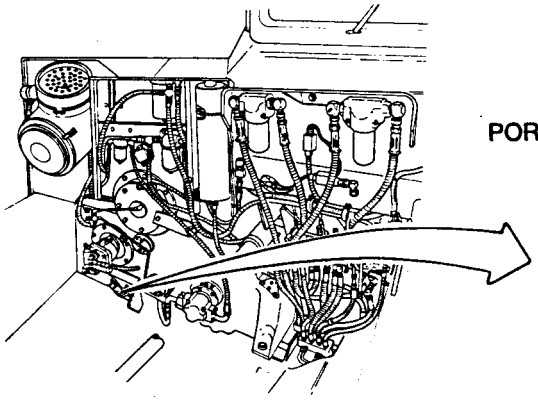


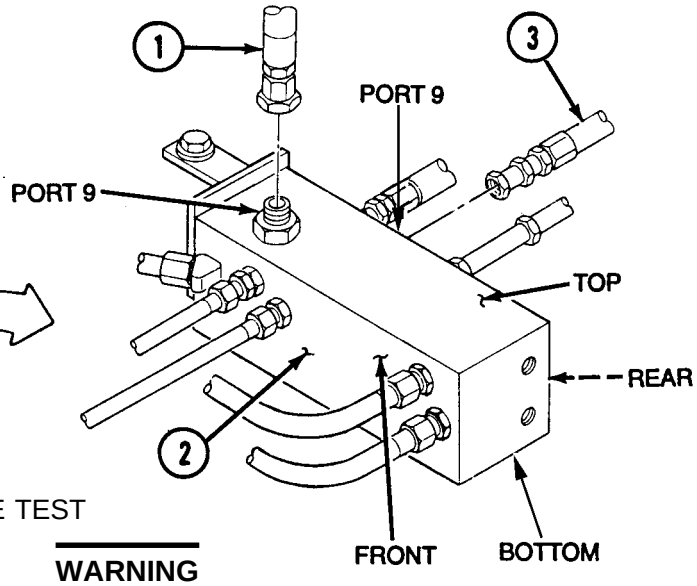
OIL FLOW TEST

NOTE

Have suitable container ready to catch oil.

- Stop engine; relieve hydraulic pressure. Disconnect REAR SPNSN UNIT-9 hose (1) from elbow (2) at port 9 on No. 4 right actuator (3). Cap elbow (2).
- While holding end of hose (1) in container, have assistant start engine and move SPRUNG/UNSPRUNG lever to SPRUNG. Observe for free flow of hydraulic oil from hose (1).
- Stop engine; relieve hydraulic pressure.





RIGHT MANIFOLD BLOCKAGE TEST

WARNING

Compressed air can injure you and others. Do not aim compressed air hoses at anyone. Do not use more than 30 psi (207kPa). Always wear goggles.

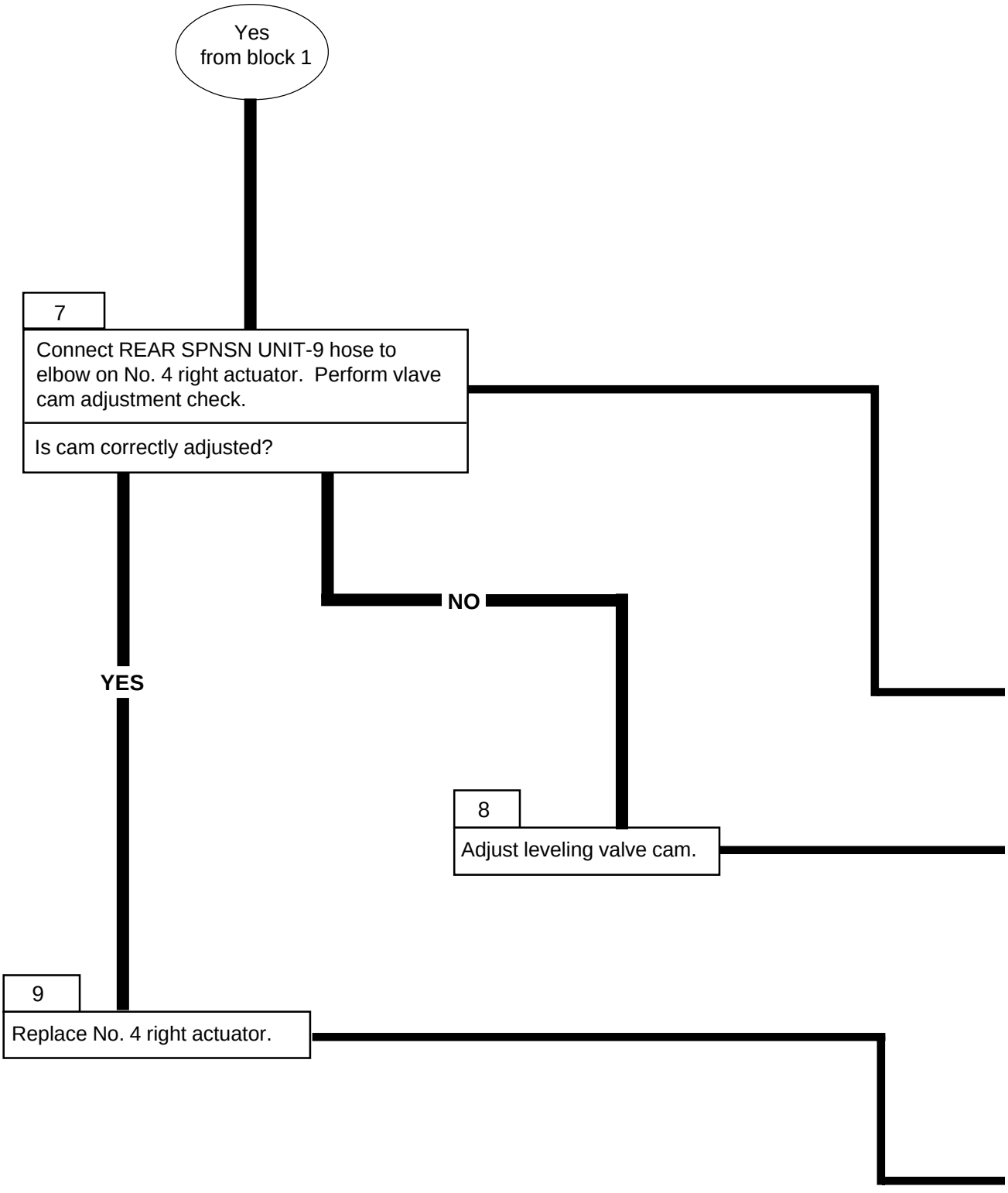
NOTE

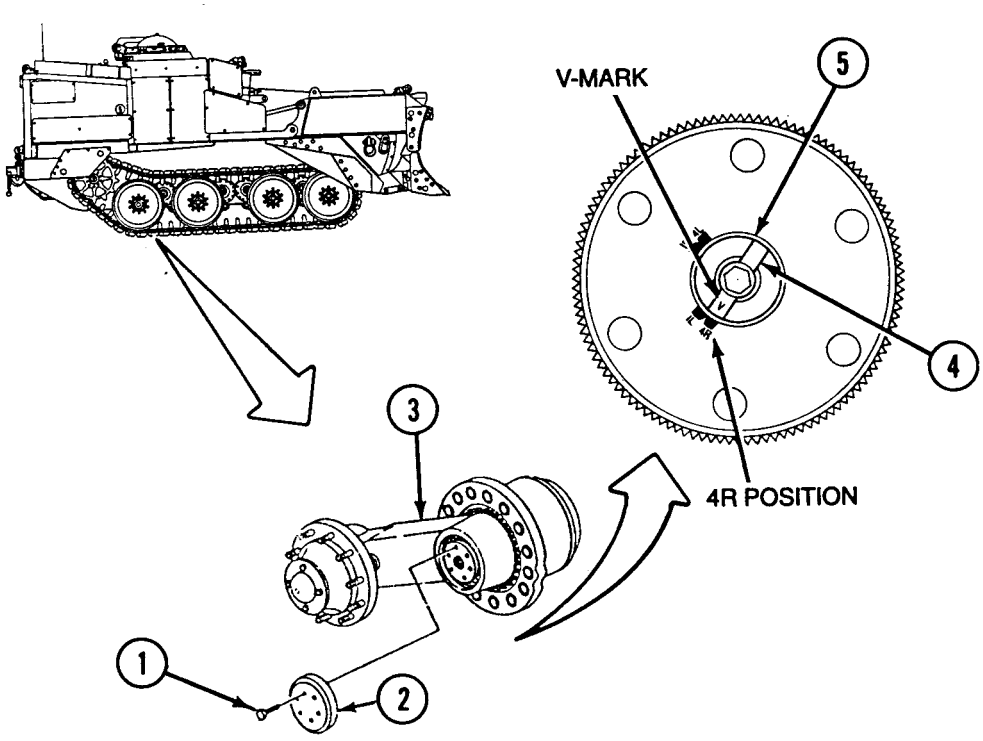
Have suitable container ready to catch oil.

- Disconnect MAIN MANF TOP-9 hose (1) from port 9 at top of right manifold (2).
- Disconnect MAIN MANF REAR-9 hose (3) from port 9 at rear of right manifold (2).
- Apply air pressure through top port 9. Observe for air flow through rear port 9.

Refer to TM 5-2350-262-20-2.

14 RIGHT REAR CORNER RAISES IN UNSPRUNG, BUT NOT SPRUNG MODE (CONTINUED)





CHECK LEVELING VALVE CAM ADJUSTMENT

- Remove six self-locking screws (1) and retainer (2) from roadwheel arm (3) on No. 4 right roadwheel. Verify that V-mark on index key (4) is set to 4R position on camshaft (5).
- Install retainer (2) with six self-locking screws (1).

Notify Direct Support maintenance.

Notify Direct Support maintenance.

15 VEHICLE DOES NOT RESPOND TO DRIVER CONTROLS

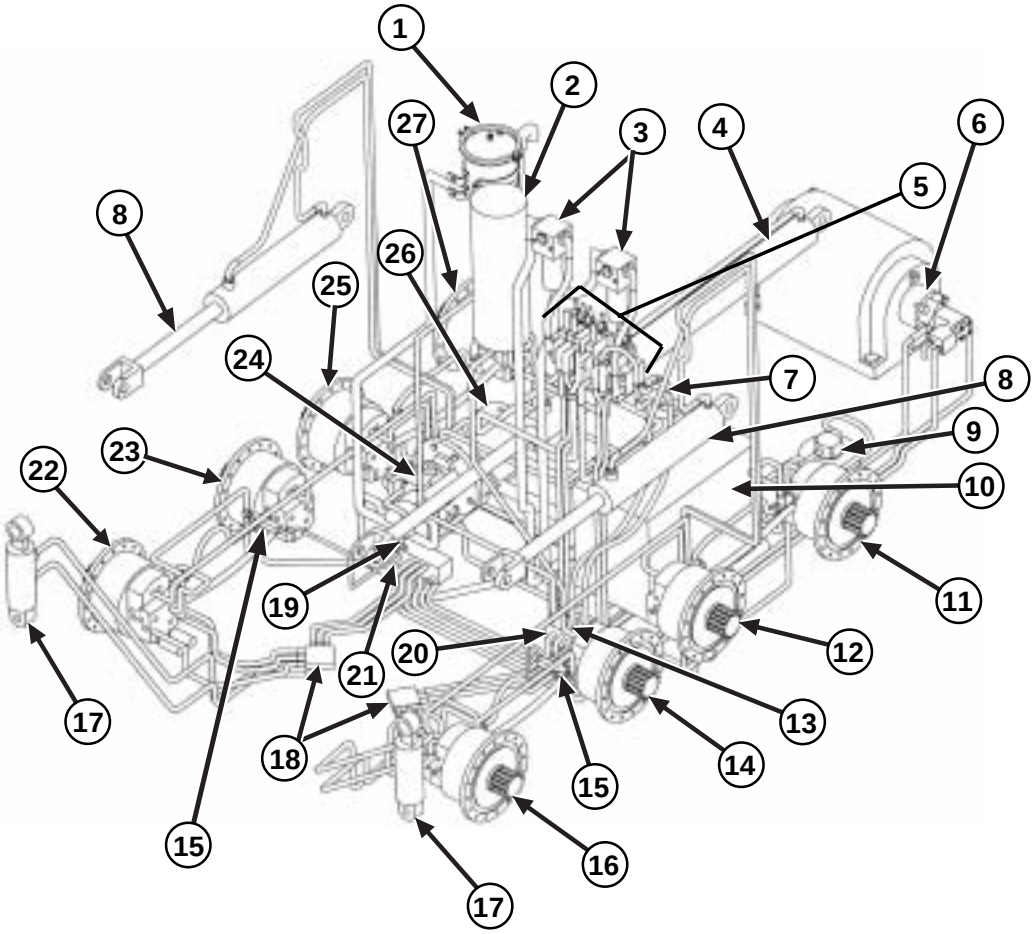
Valve bank hydraulic system is supplied by hydraulic ports 13L and 13R. Pressure is controlled by relief valves 13L and 13R.

WARNING

High pressure is present in the M9 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.

NOTE

Perform this procedure when all driver controls are inoperative. Refer to hydraulic schematic in appendix E.



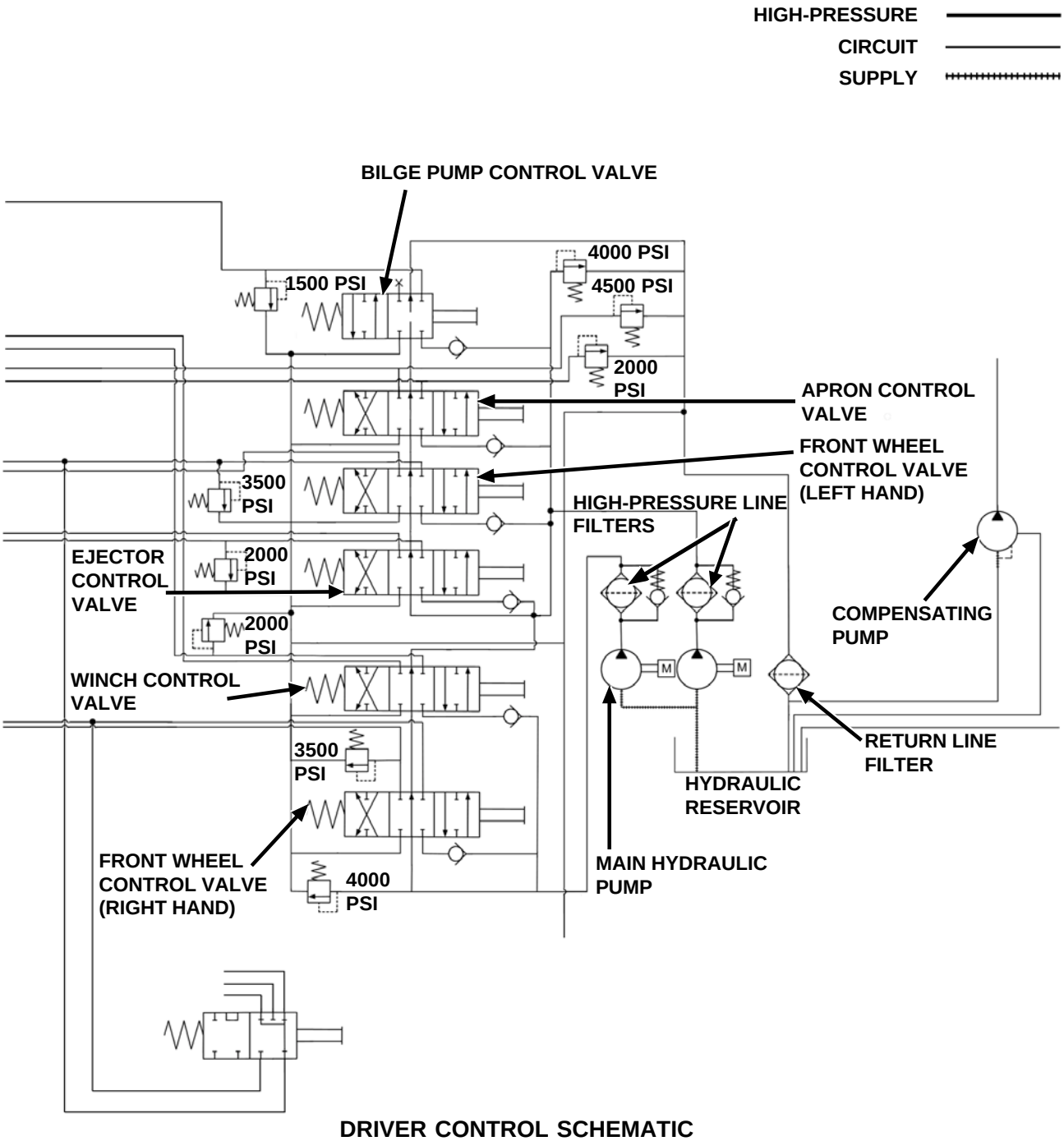
COMPONENTS:

1. RETURN LINE FILTER
2. MAIN ACCUMULATOR
3. HIGH-PRESSURE FILTERS
4. EJECTOR CYLINDER
5. DIRECTIONAL CONTROL VALVE BANK
6. WINCH MOTOR
7. SPRUNG/UNSPRUNG VALVE
8. APRON CYLINDER
9. BILGE PUMP MOTOR
10. HYDRAULIC RESERVOIR
11. NO. 4 ACTUATOR, LEFT HAND
12. NO. 3 ACTUATOR, LEFT HAND
13. SUSPENSION RELIEF VALVE (BEHIND)
14. NO. 2 ACTUATOR, LEFT HAND
15. INTERMEDIATE WHEEL VALVE

DRIVER CONTROL CIRCUIT

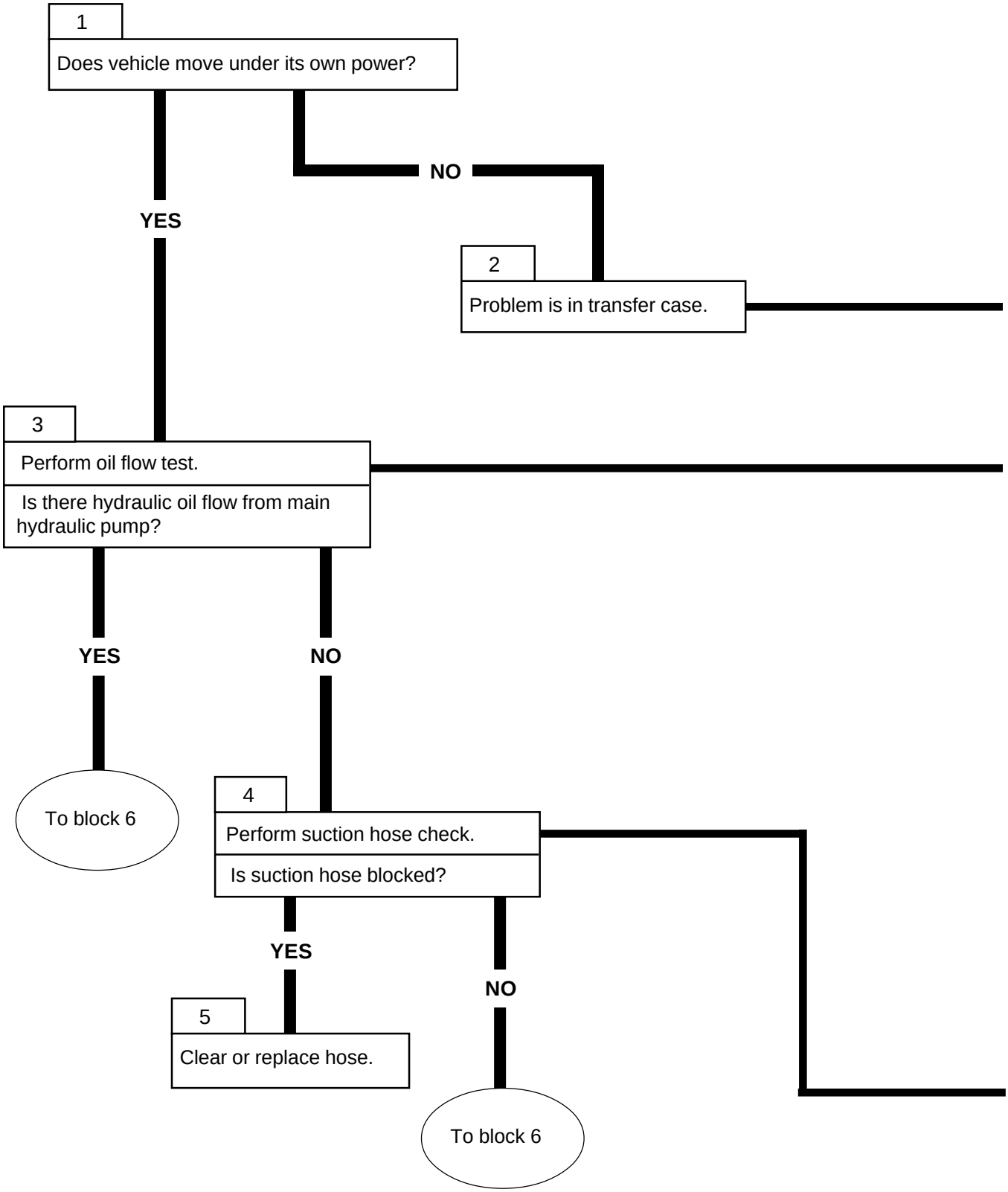
COMPONENTS (continued):

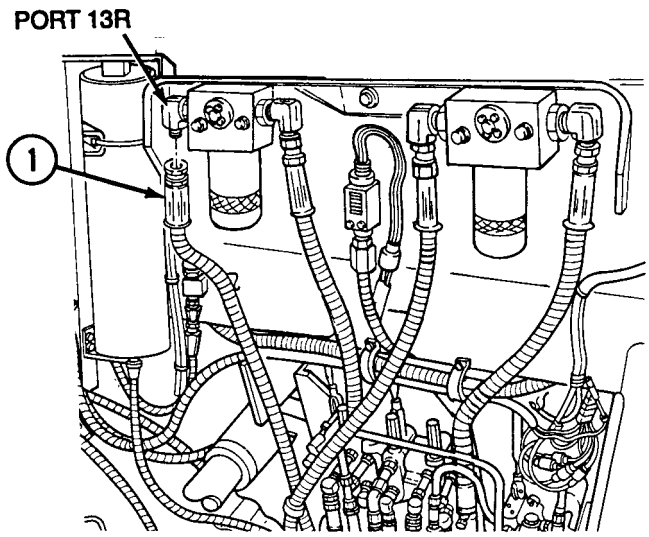
16. NO. 1 ACTUTAOR, LEFT HAND
17. BUMP STOP CYLINDERS
18. FORWARD MANIFOLDS
19. CHECK VALVE
20. MAIN MANIFOLD, LEFT HAND
21. MAIN MANIFOLD, RIGHT HAND
22. NO. 1 ACTUATOR, RIGHT HAND
23. NO. 2 ACTUATOR, RIGHT HAND
24. COMPENSATING PUMP
25. NO. 3 ACTUATOR, RIGHT HAND
26. MAIN HYDRAULIC PUMP
27. NO. 4 ACTUATOR, RIGHT HAND

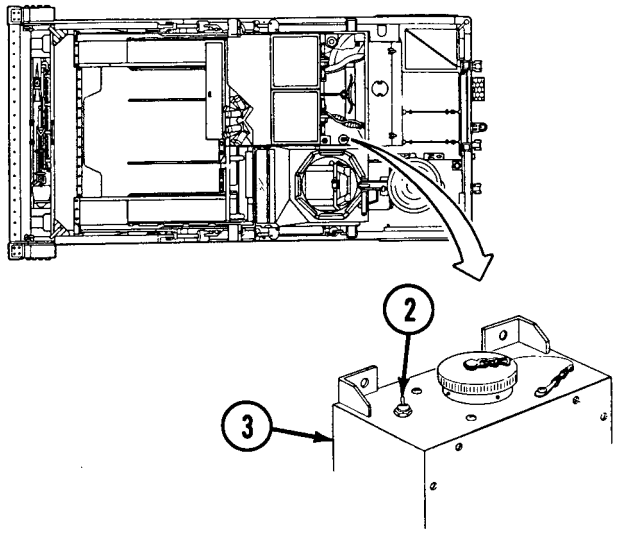


DRIVER CONTROL SCHEMATIC

15 VEHICLE DOES NOT RESPOND TO DRIVER CONTROLS (CONTINUED)







Notify Direct Support Maintenance.

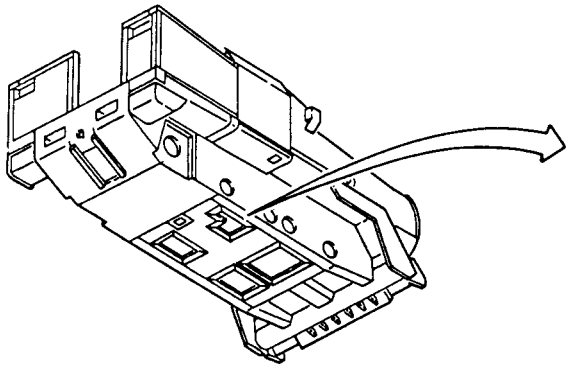
OIL FLOW TEST

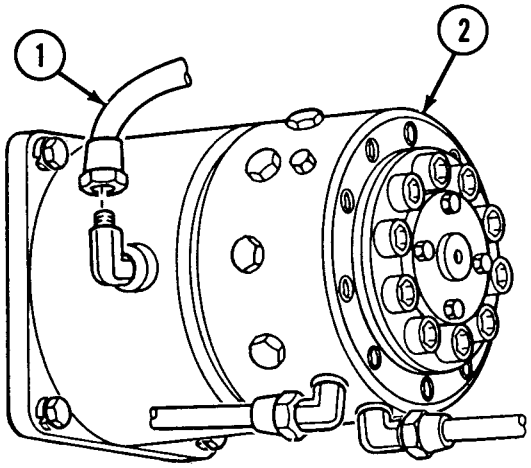
NOTE

Three personnel are required to perform this test.

Have suitable container ready to catch oil.

- Stop engine; relieve hydraulic pressure. Disconnect HYDR FLTR-IN-13R hose (1) from high-pressure filter inlet port 13R.
- While assistant one is holding disconnected end of hose over container, assistant two will hold fuel solenoid shutoff toggle switch (2) on STE/ICE-R interface box (3) in shutoff position. Crank engine for approximately 15 seconds. Hydraulic oil should flow freely.





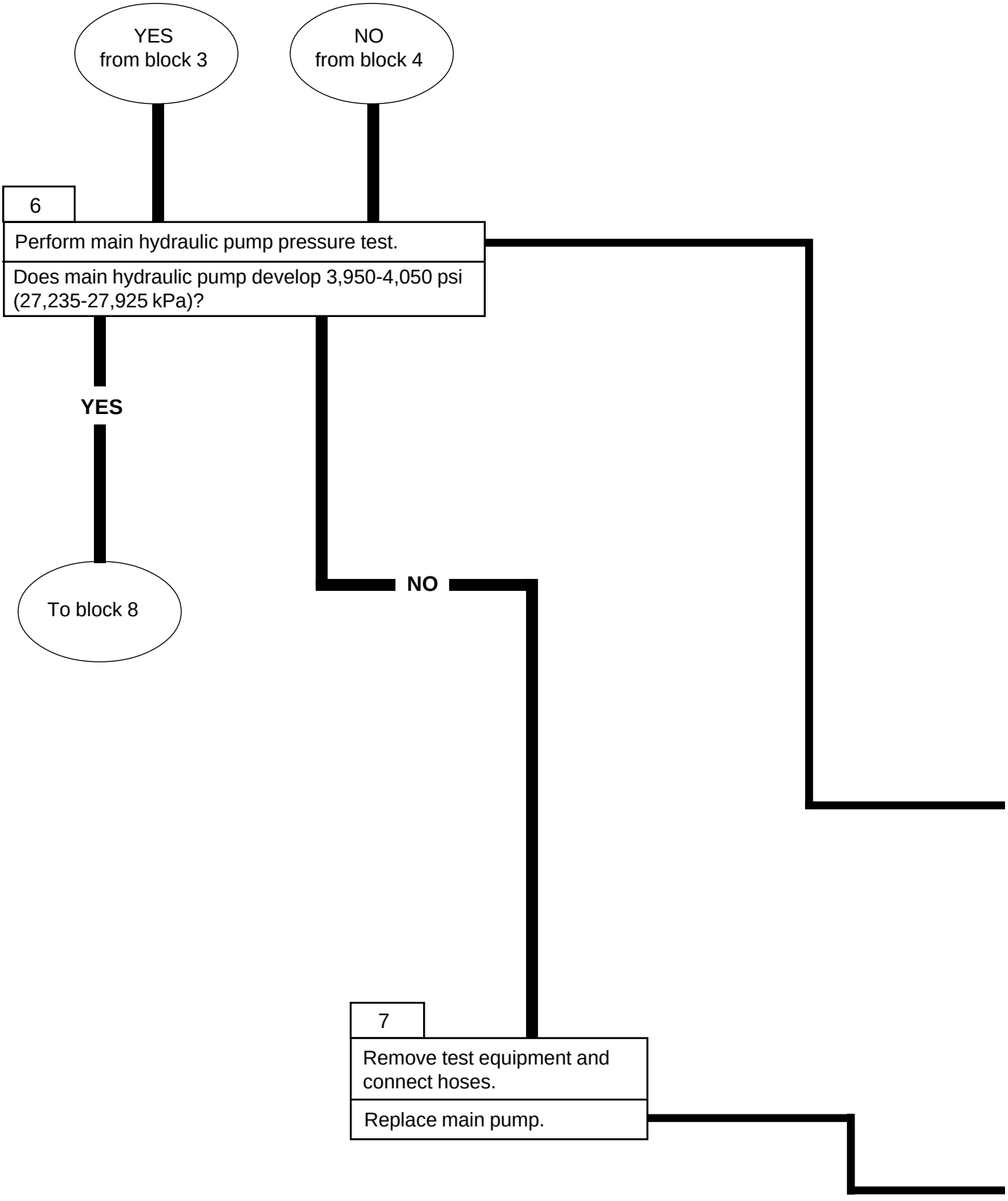
SUCTION HOSE CHECK

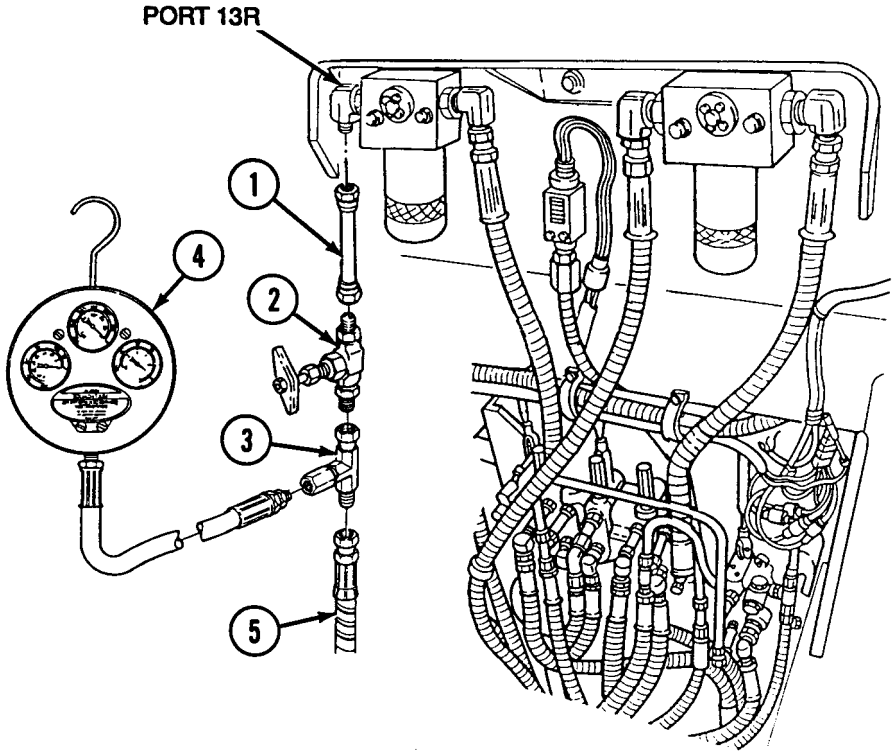
NOTE

Have suitable container ready to catch oil.

- Loosen PUMP SUCT TUBE-7 hose (1) approximately three-quarters of the way at main hydraulic pump (2). Hydraulic oil should flow freely.

15 VEHICLE DOES NOT RESPOND TO DRIVER CONTROLS (CONTINUED)





MAIN HYDRAULIC PUMP PRESSURE TEST

WARNING

Before performing any troubleshooting in bowl, move ejector forward and engage the ejector lock. Failure to comply may result in severe injury or death to personnel.

Ensure globe valve 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 or death to personnel.

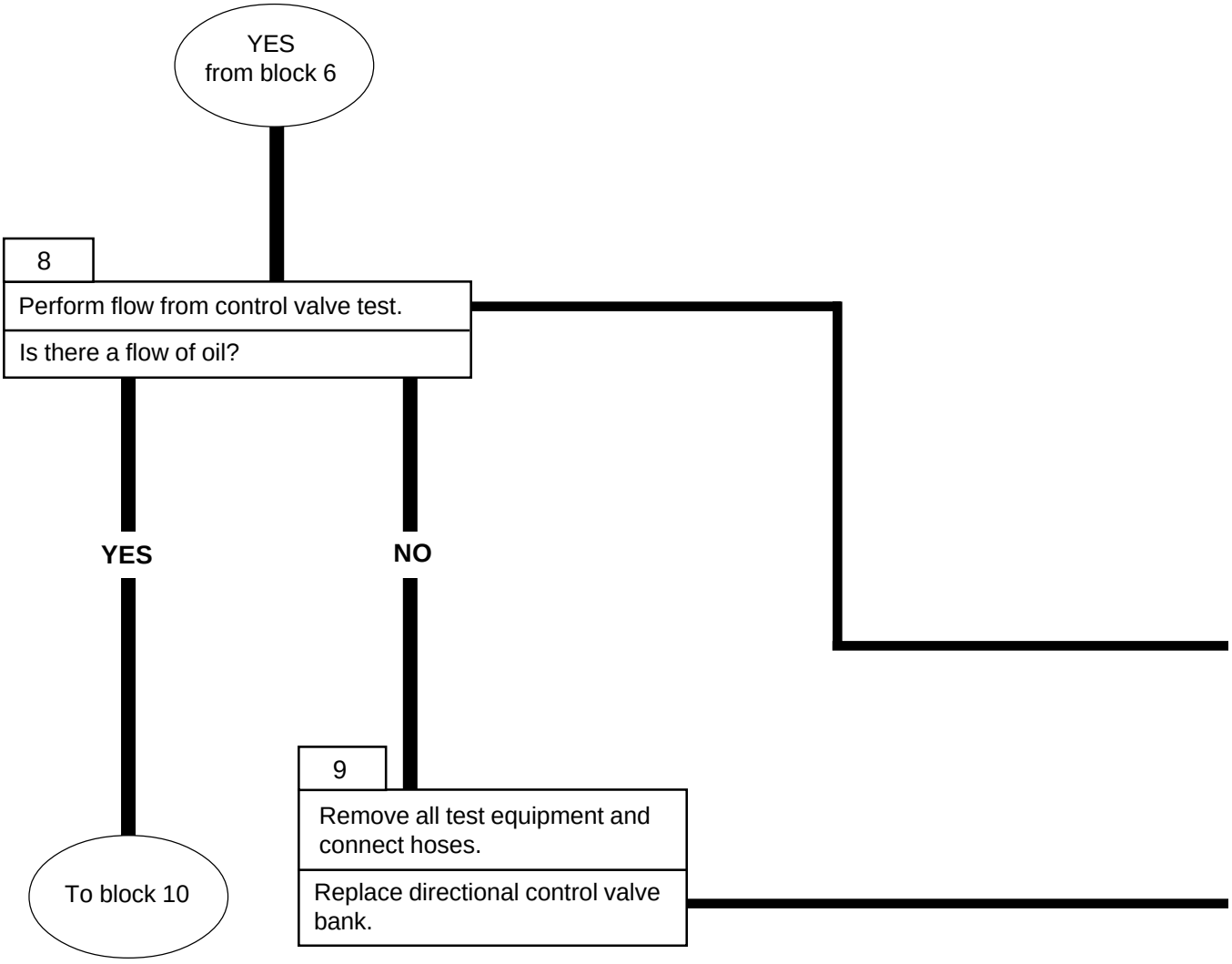
NOTE

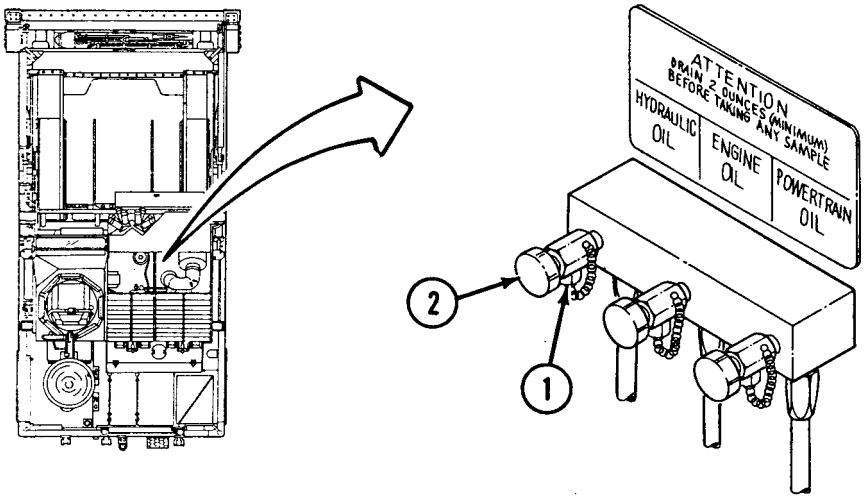
Have suitable container ready to catch oil.

- Install coupling tube (1), globe valve (2), tee (3), and pressure measuring device (4) between HYDR FLTR-IN-13R hose (5) and high-pressure filter inlet port 13R.
- Turn globe valve (2) counterclockwise until fully opened.
- Have assistant start engine and allow engine to idle (750-800 rpm). Slowly close globe valve (2) until pressure reaches 3,950-4,050 psi (27,235-27,925 kPa).
- Open globe valve (2). Stop engine; relieve hydraulic pressure.

Notify Direct Support maintenance.

15 **VEHICLE DOES NOT RESPOND TO DRIVER CONTROLS (CONTINUED)**





FLOW FROM CONTROL VALVE TEST

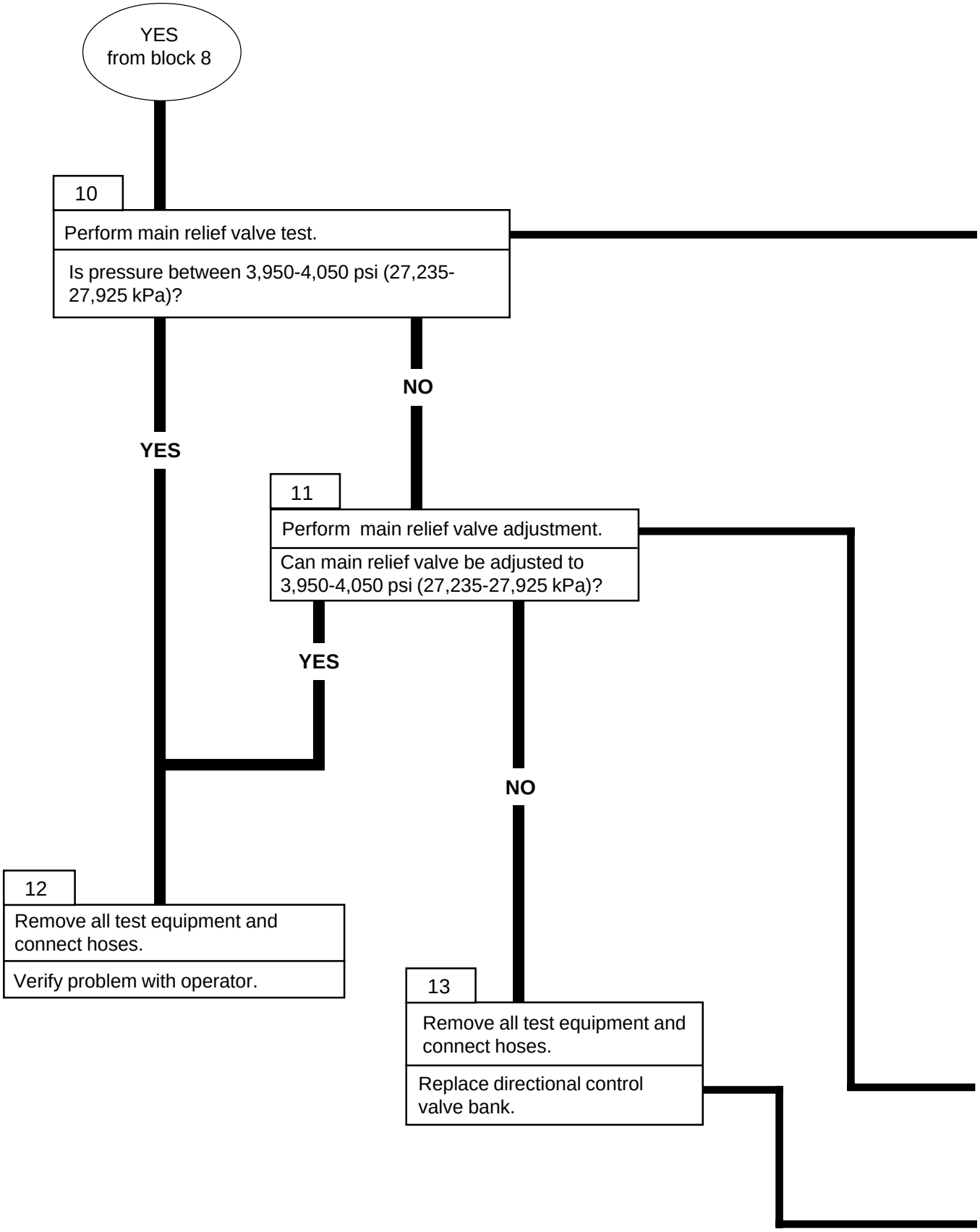
NOTE

Have suitable container ready to catch oil.

- Start engine. Remove cap (1) from hydraulic system sample valve (2).
- Open valve (2) by turning it clockwise. Hold valve (2) open for several seconds. Oil should flow freely from sample valve (2).
- Close valve (2) and replace cap (1). Stop engine; relieve hydraulic pressure.

Refer to TM 5-2320-262-20-2.

15 VEHICLE DOES NOT RESPOND TO DRIVER CONTROLS (CONTINUED)



MAIN RELIEF VALVE TEST

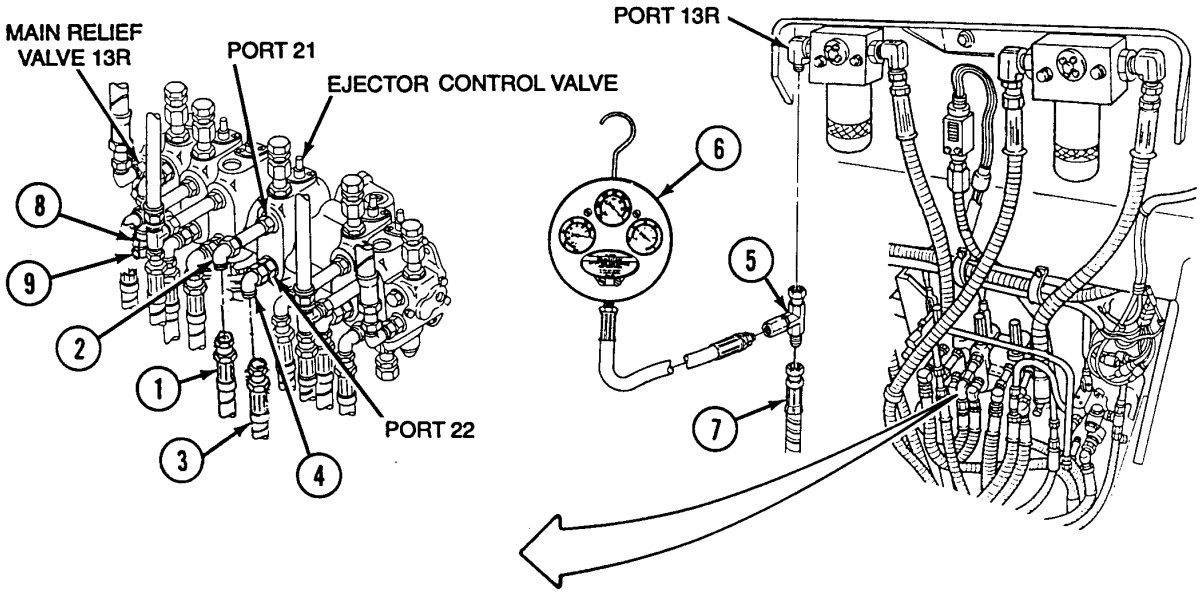
WARNING

Before performing any hydraulic troubleshooting in 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.

NOTE

Have suitable container ready to catch oil.

- Have assistant start engine and move ejector forward, stop engine, and relieve hydraulic pressure.
- Disable ejector by disconnecting CONT VLV-21 hose (1) from elbow (2) at port 21 and CONT VLV-22 hose (3) from elbow (4) at port 22 on ejector control valve. Cap and plug hoses and fittings.
- Remove globe valve and coupling tube between tee (5) and port 13R. Connect tee (5) and pressure measuring device (6) between HYDR FLTR-IN-13R hose (7) and high-pressure inlet port 13R.
- Have assistant start engine, move the SPRUNG/UNSPRUNG lever to SPRUNG and move the EJECTOR CONTROL lever to BACK. Read pressure measuring device (6).
- While simultaneously holding the EJECTOR CONTROL lever in BACK, have assistant move the right-hand SUSPENSION CONTROL lever to RAISE. Read pressure measuring device (6).
- Stop engine; relieve hydraulic pressure.



MAIN RELIEF VALVE ADJUSTMENT

- Loosen jamnut (8) on main relief valve 13R.
- Have assistant start engine and simultaneously hold EJECTOR CONTROL lever in BACK while holding the right-hand SUSPENSION CONTROL lever in RAISE.
- Rotate adjusting screw (9) clockwise to increase pressure; counterclockwise to decrease pressure. Tighten jamnut (8).
- Stop engine; relieve hydraulic pressure.

Refer to TM 5-2320-262-20-2.

16 WINCH AND RIGHT-HAND WHEEL CONTROL INOPERATIVE

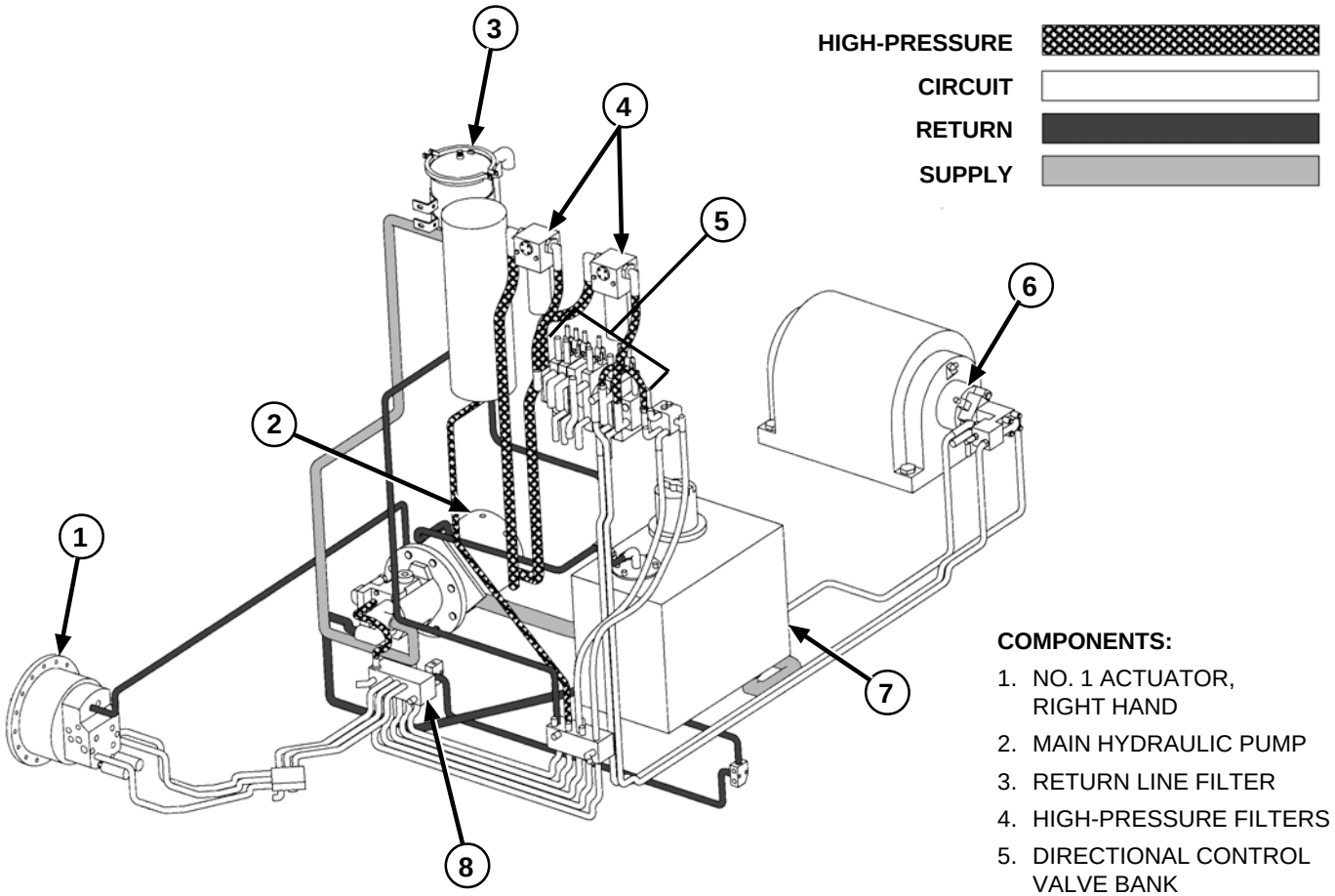
The outboard valve bank hydraulic system 13L circuit is supplied by hydraulic pump port 13L and pressure is controlled by the relief valve at inlet port 13L.

NOTE

Perform this procedure only when the winch and right-hand suspension controls are inoperative.

WARNING

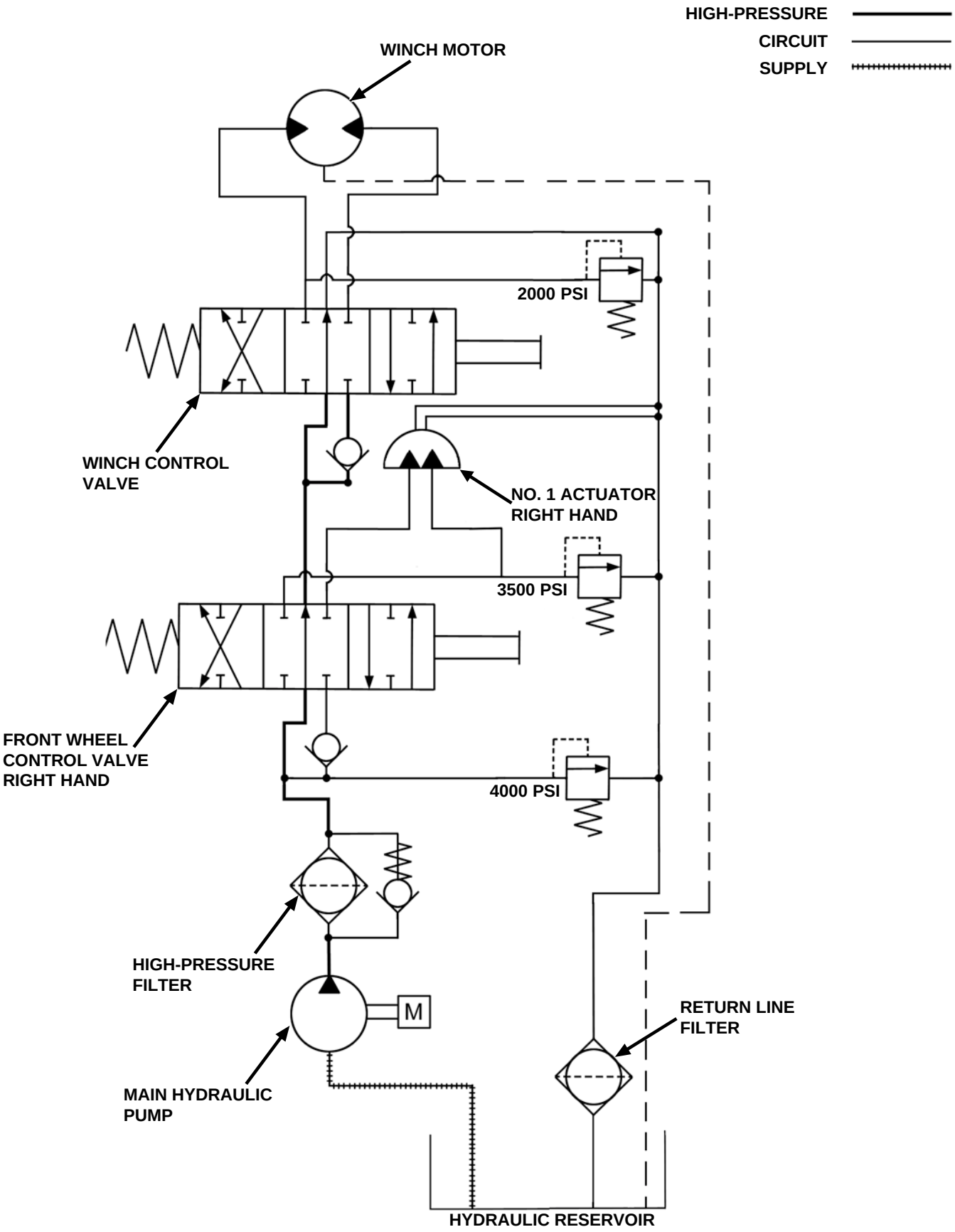
High pressure is present in the M9 hydraulic system. Do not disconnect any hydraulic system component unless hydraulic system pressure has been relieved. Ensure each hydraulic control lever is moved several times through all positions and hydraulic tank dipstick is slowly loosened to relieve pressure. Failure to comply may result in severe injury or death to personnel.



COMPONENTS:

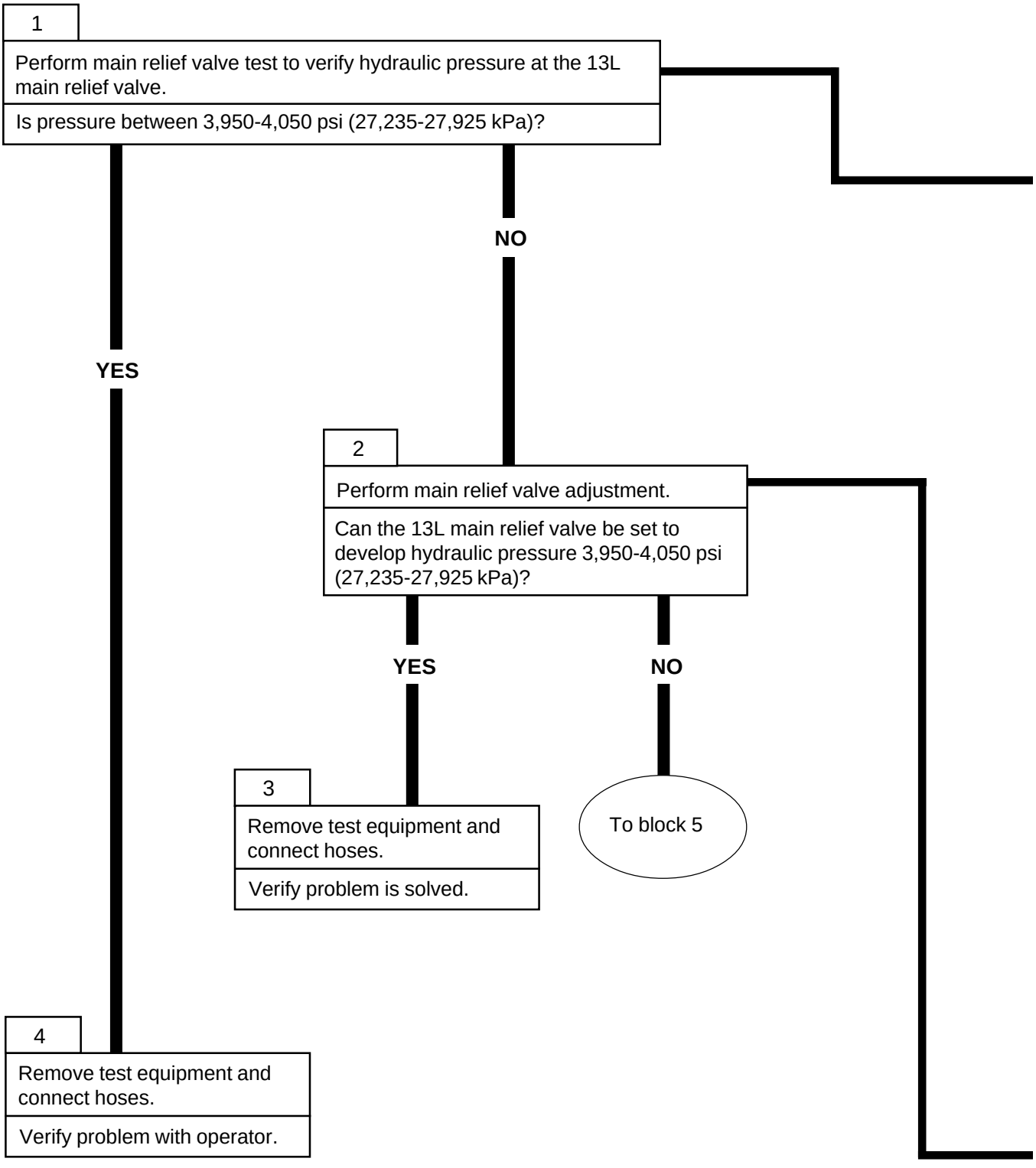
1. NO. 1 ACTUATOR, RIGHT HAND
2. MAIN HYDRAULIC PUMP
3. RETURN LINE FILTER
4. HIGH-PRESSURE FILTERS
5. DIRECTIONAL CONTROL VALVE BANK
6. WINCH MOTOR
7. HYDRAULIC RESERVOIR
8. MAIN MANIFOLD, RIGHT HAND

OUTBOARD HYDRAULIC VALVE BANK CIRCUIT



OUTBOARD HYDRAULIC VALVE BANK SCHEMATIC

16 WINCH AND RIGHT-HAND WHEEL CONTROL INOPERATIVE (CONTINUED)



MAIN RELIEF VALVE TEST

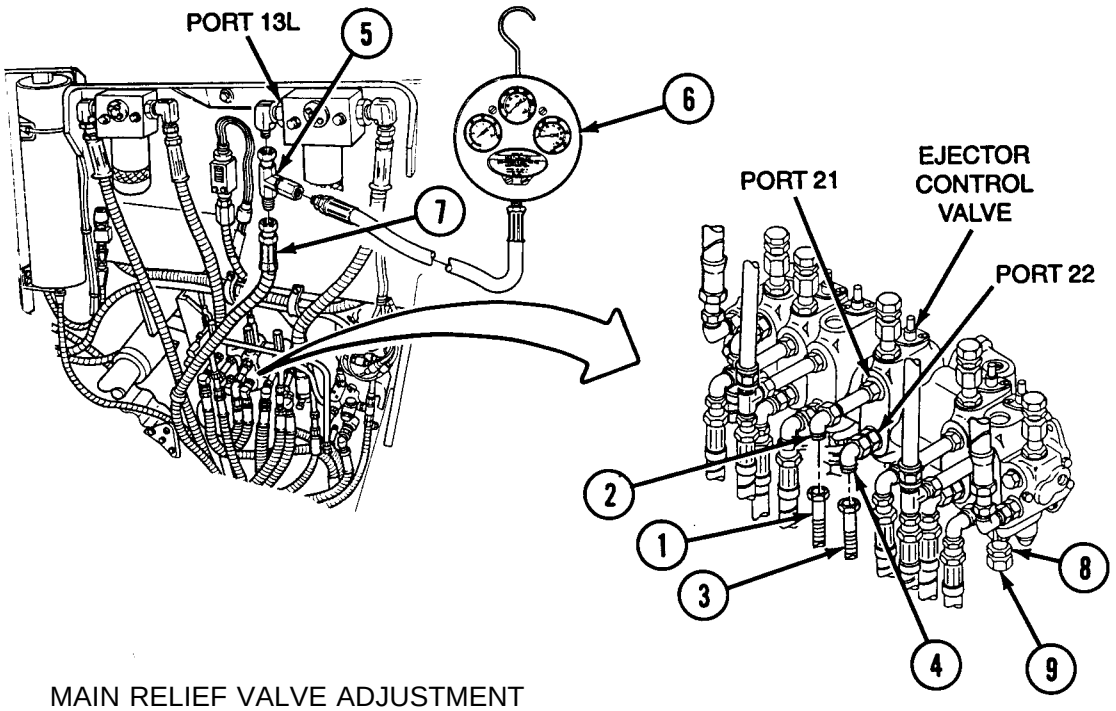
WARNING

Before performing any hydraulic troubleshooting in 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.

NOTE

Have suitable container ready to catch oil.

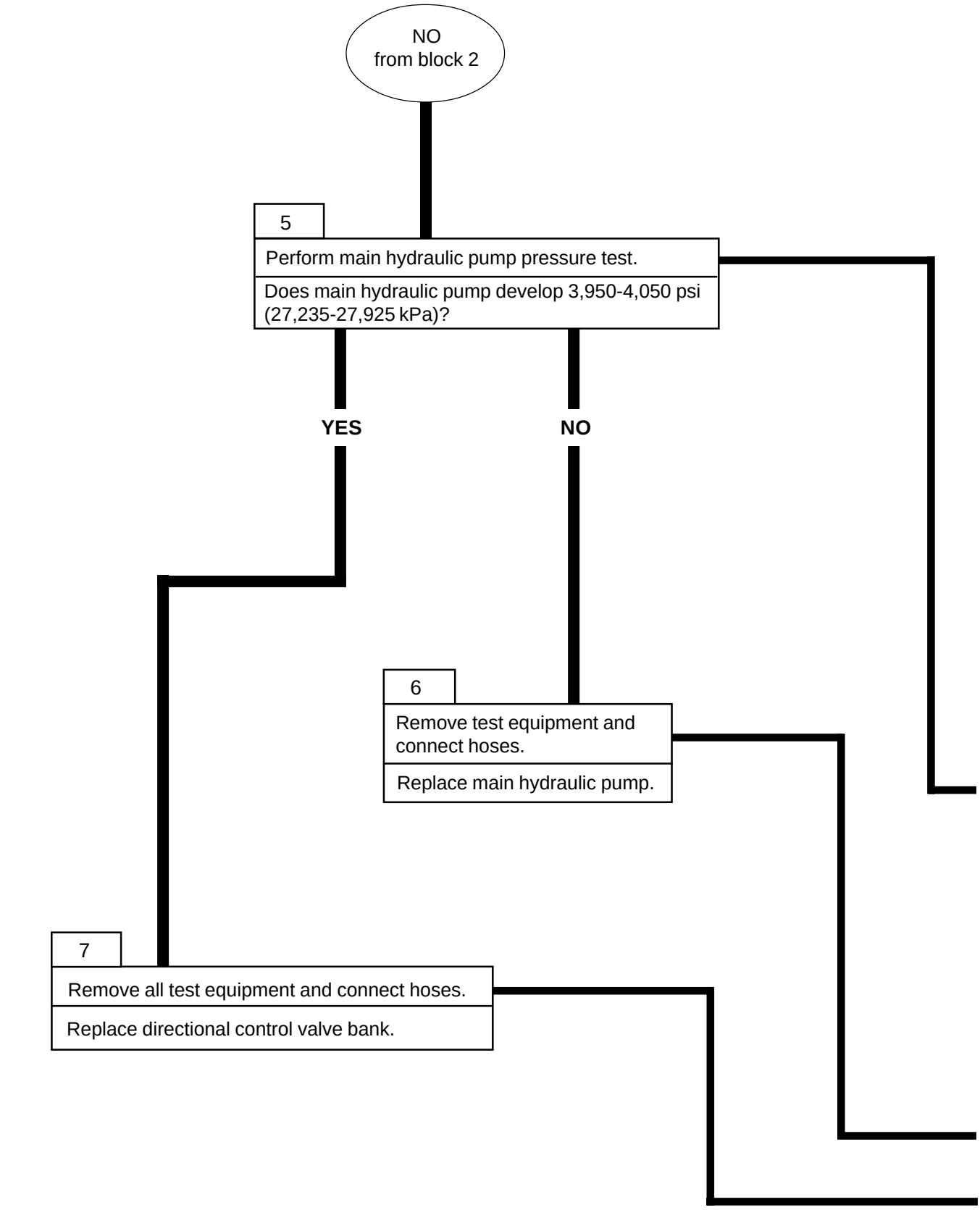
- Move ejector forward, stop engine, and relieve hydraulic pressure.
- Disable ejector by disconnecting CONT VLV-21 hose (1) from elbow (2) at port 21 and CONT VLV-22 hose (3) from elbow (4) at port 22 on ejector control valve. Cap and plug hoses and fittings
- Connect tee (5) and pressure measuring device (6) between HYDR FLTR-IN-13L hose (7) and high-pressure inlet port 13L.
- Have assistant start engine, move the SPRUNG/UNSPRUNG lever to SPRUNG, and move EJECTOR CONTROL lever to BACK. Read pressure measuring device (6).
- While simultaneously holding the EJECTOR CONTROL lever in BACK, have assistant move left-hand SUSPENSION CONTROL lever to RAISE. Read pressure measuring device (6).
- Stop engine; relieve hydraulic pressure.

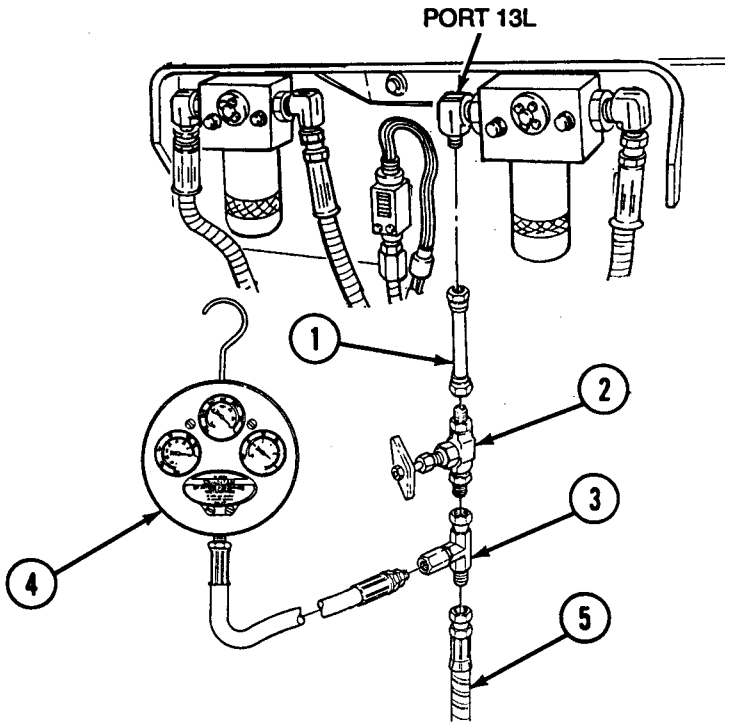


MAIN RELIEF VALVE ADJUSTMENT

- Loosen jamnut (8) on main relief valve 13L (9).
- Have assistant start engine and simultaneously hold EJECTOR CONTROL lever in BACK while holding left-hand SUSPENSION CONTROL lever in RAISE.
- Rotate adjusting screw clockwise to increase pressure; counterclockwise to decrease pressure. Tighten jamnut (8).
- Stop engine; relieve hydraulic pressure.

16 WINCH AND RIGHT-HAND WHEEL CONTROL INOPERATIVE (CONTINUED)





MAIN HYDRAULIC PUMP PRESSURE TEST

WARNING

Before performing any troubleshooting in bowl, move ejectorforward and engage ejector lock. Failure to comply may result in severe injury or death to personnel.

Ensure globe valve 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.

NOTE

Have suitable container ready to catch oil.

- Install coupling tube (1), globe valve (2), tee (3), and pressure measuring device (4) between HYDR FLTR-IN 13L hose (5) and high-pressure filter inlet port 13L.
- Turn globe valve (2) counterclockwise until fully opened.
- Have assistant start engine and allow engine to idle (750-800 rpm). Slowly close globe valve (2) until pressure reaches 3,950-4,050 psi (27,235-27,925 kPa).
- Open globe valve (2). Stop engine; relieve hydraulic pressure.

Notify Direct Support maintenance.

Refer to TM 5-2350-262-20-2.

17 WINCH WILL NOT PULL RATED LOAD

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.

WARNING

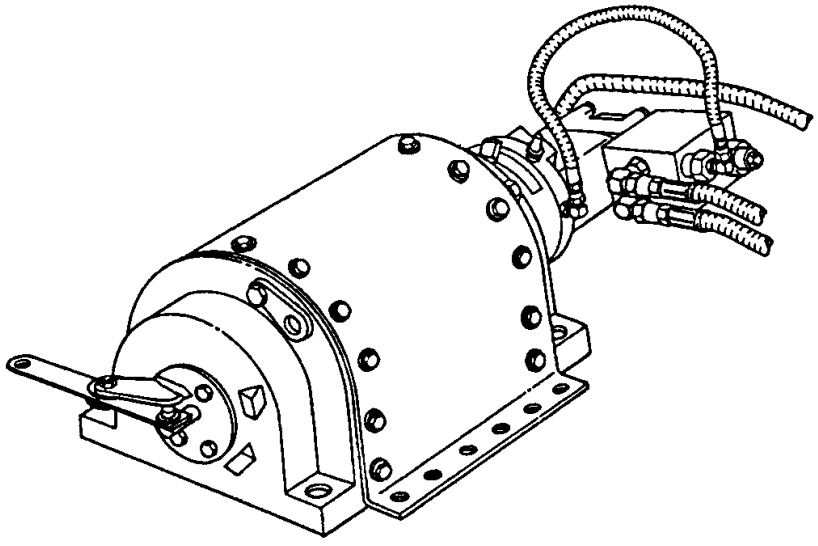
High pressure is present in the M9 hydraulic system. Do not disconnect any hydraulic system component unless hydraulic system pressure has been relieved. Ensure each hydraulic control lever is moved several times through all positions and hydraulic tank dipstick is slowly loosened to relieve pressure. Failure to comply may result in severe injury or death to personnel.

CAUTION

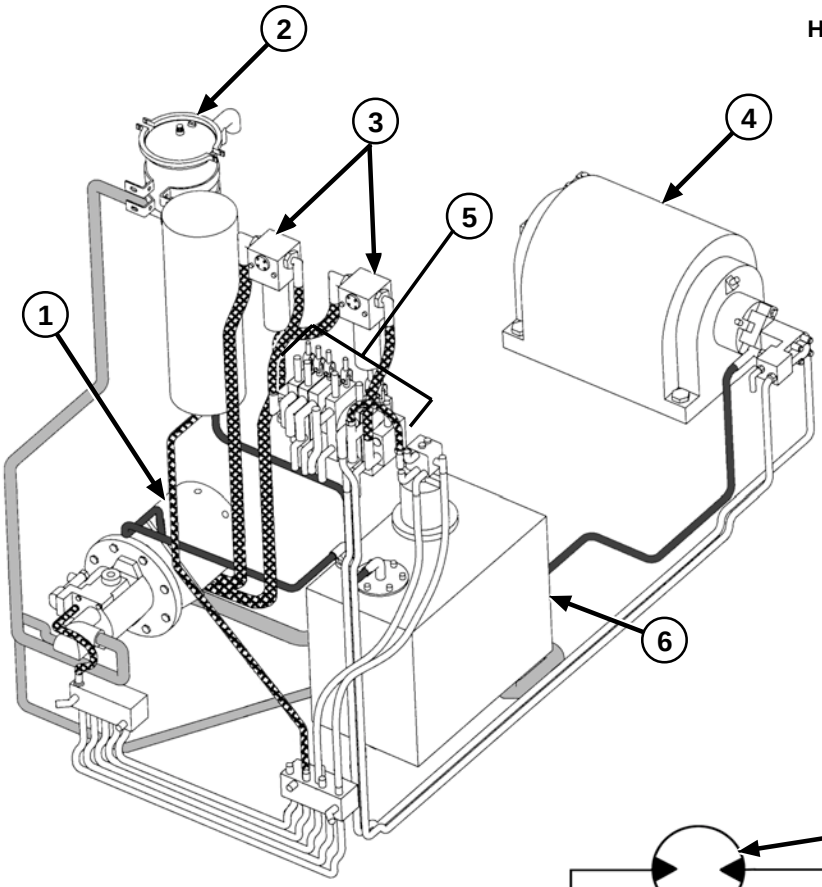
Do not reuse drained captured hydraulic oil unless it has been filtered and is clean. Failure to comply may result in damage to equipment.

NOTE

DELETED



35,000 LB (15,890 KG) WINCH

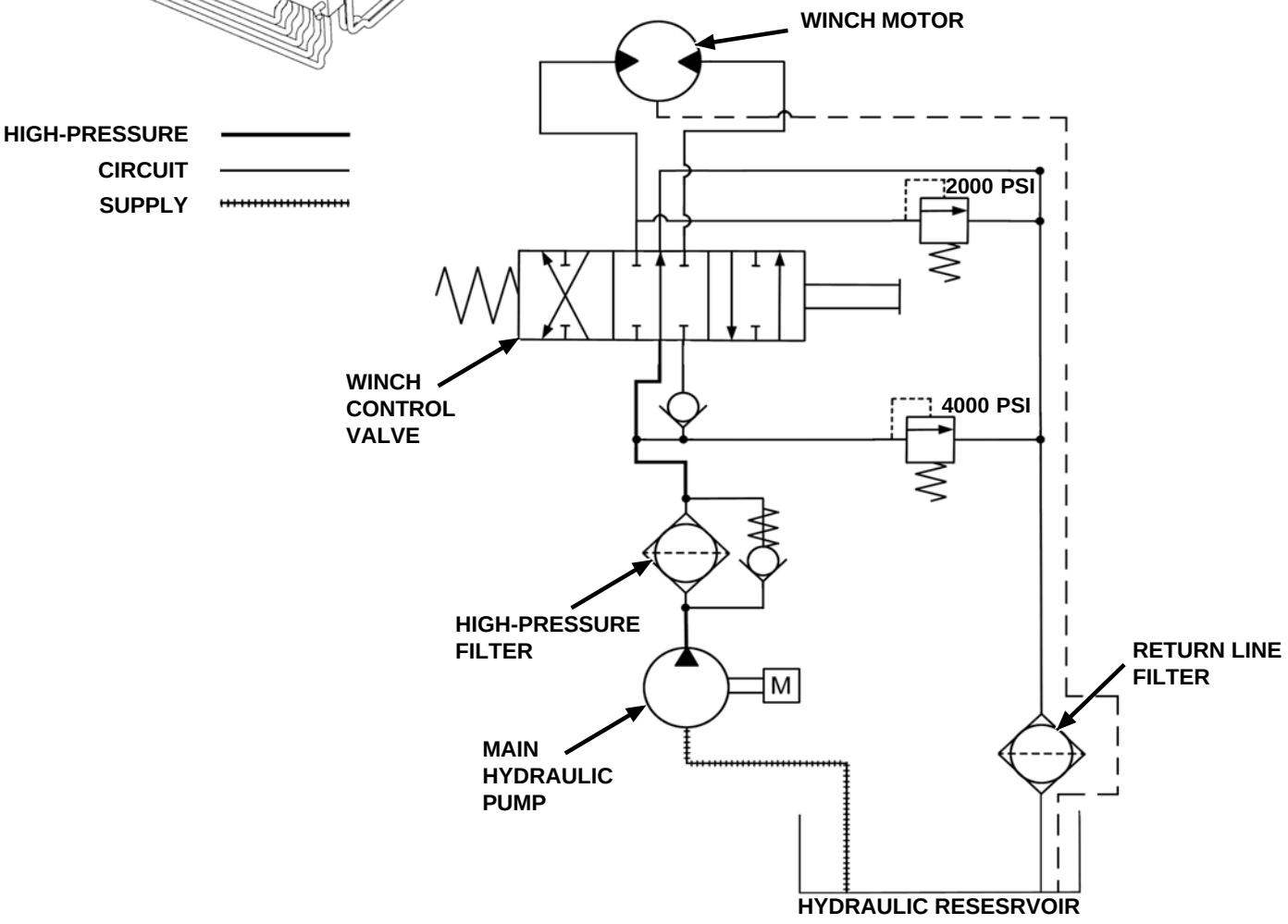


HIGH-PRESSURE
CIRCUIT
RETURN
SUPPLY

WINCH HYDRAULIC CIRCUIT

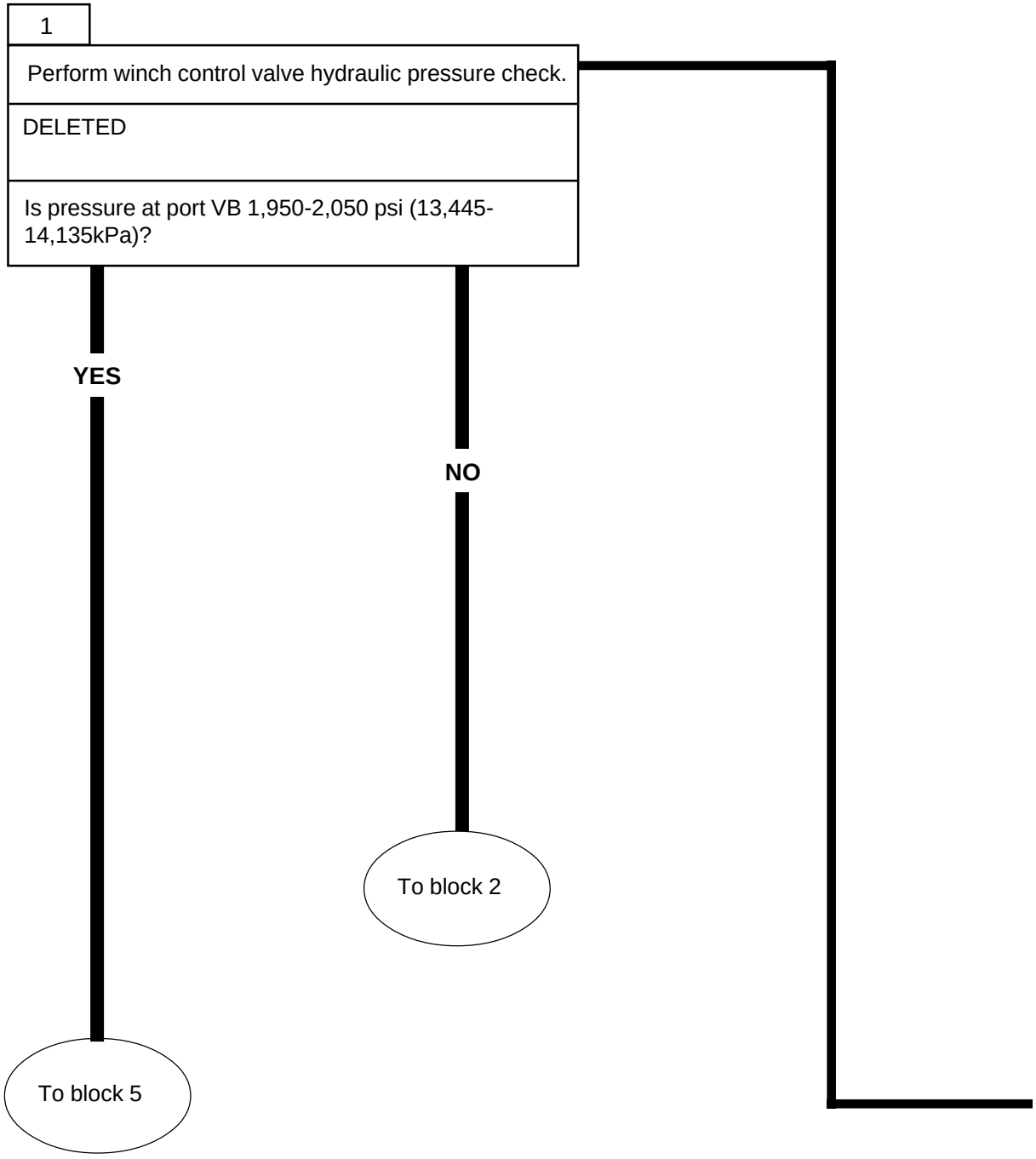
COMPONENTS:

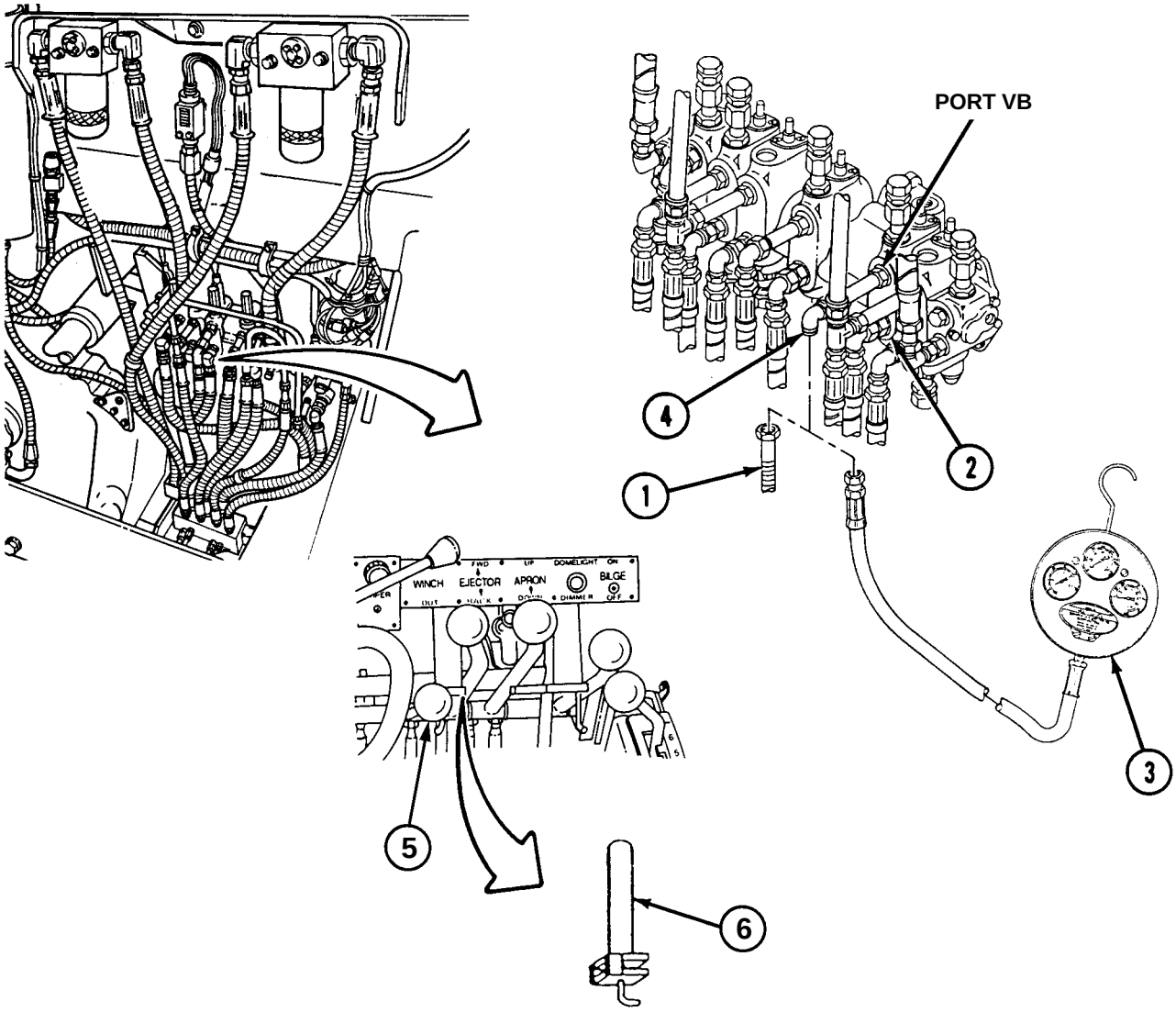
1. MAIN HYDRAULIC PUMP
2. RETURN LINE FILTER
3. HIGH PRESSURE FILTERS
4. WINCH ASSEMBLY
5. DIRECTIONAL CONTROL VALVE BANK
6. HYDRAULIC RESERVOIR



WINCH HYDRAULIC SCHEMATIC

17 WINCH WILL NOT PULL RATED LOAD (CONTINUED)





WINCH CONTROL VALVE HYDRAULIC PRESSURE 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.

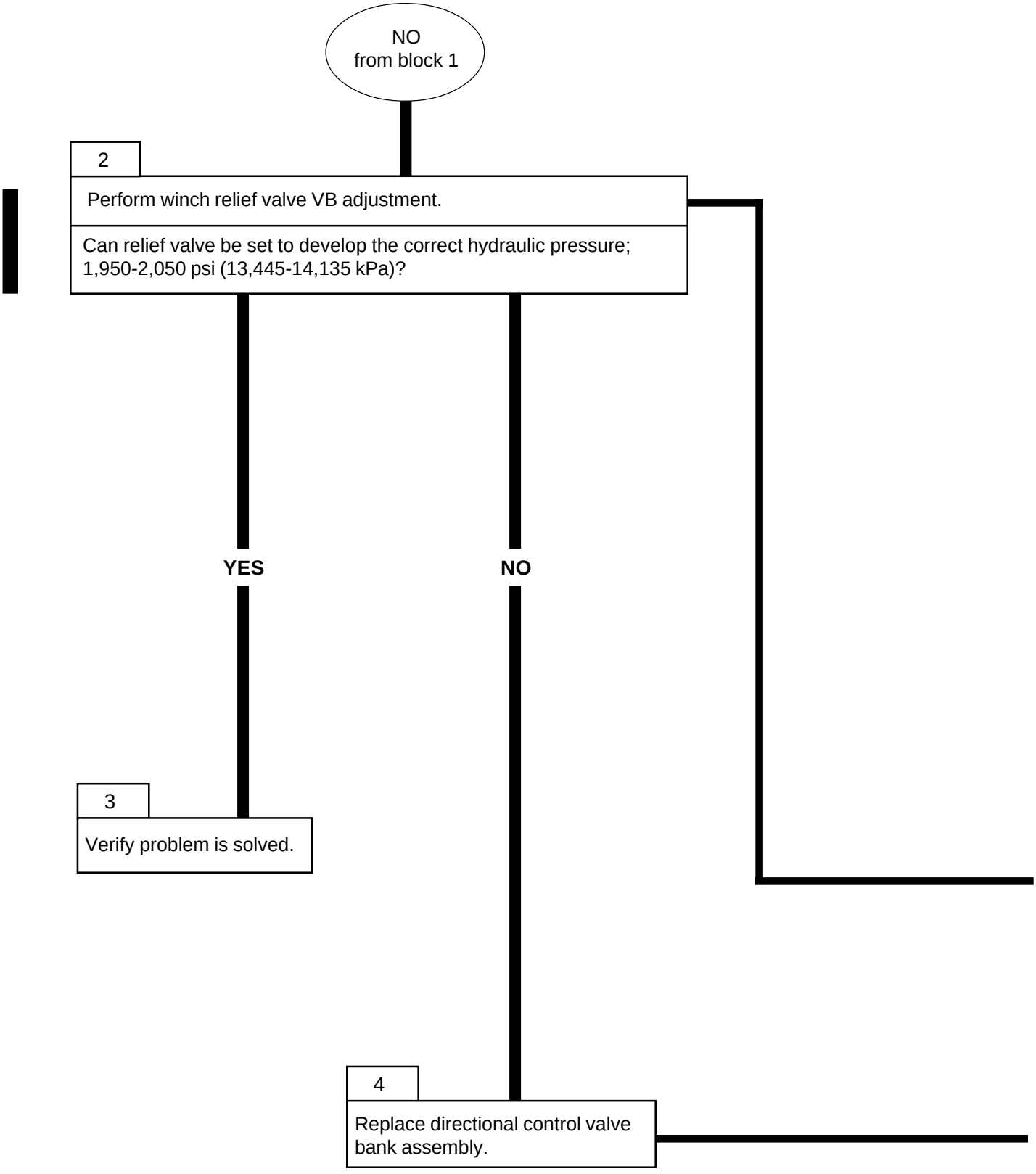
- Start vehicle engine and move ejector forward. Stop engine and relieve hydraulic pressure.
- Engage ejector lock (6).

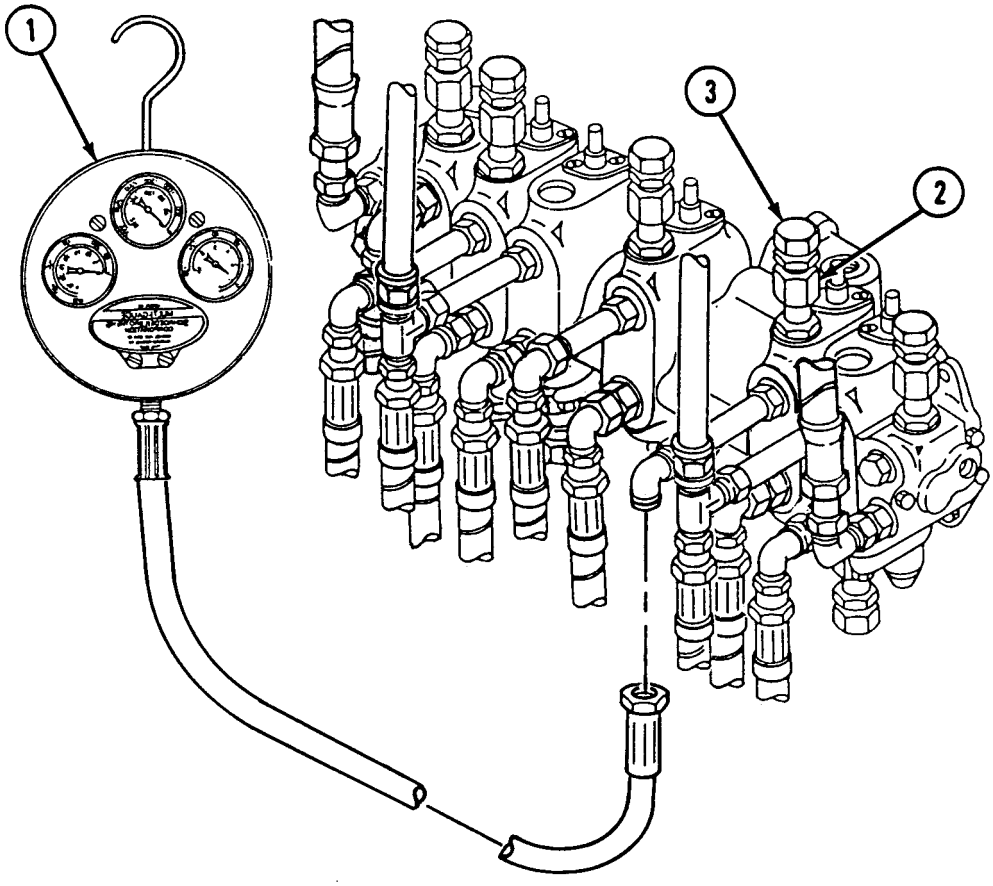
NOTE

Have suitable container ready to catch oil.

- Disconnect CONT VLV-VB hose (1) from winch control valve (2). Plug CONT VLV-VB hose (1). Connect pressure measuring device (3) to elbow (4) on port VB of winch control valve.
- Have assistant start vehicle engine and hold WINCH CONTROL lever (5) in PAY IN position. Read pressure measuring device (3).
- Return winch control lever (5) to NEUTRAL position.

17 WINCH WILL NOT PULL RATED LOAD (CONTINUED)



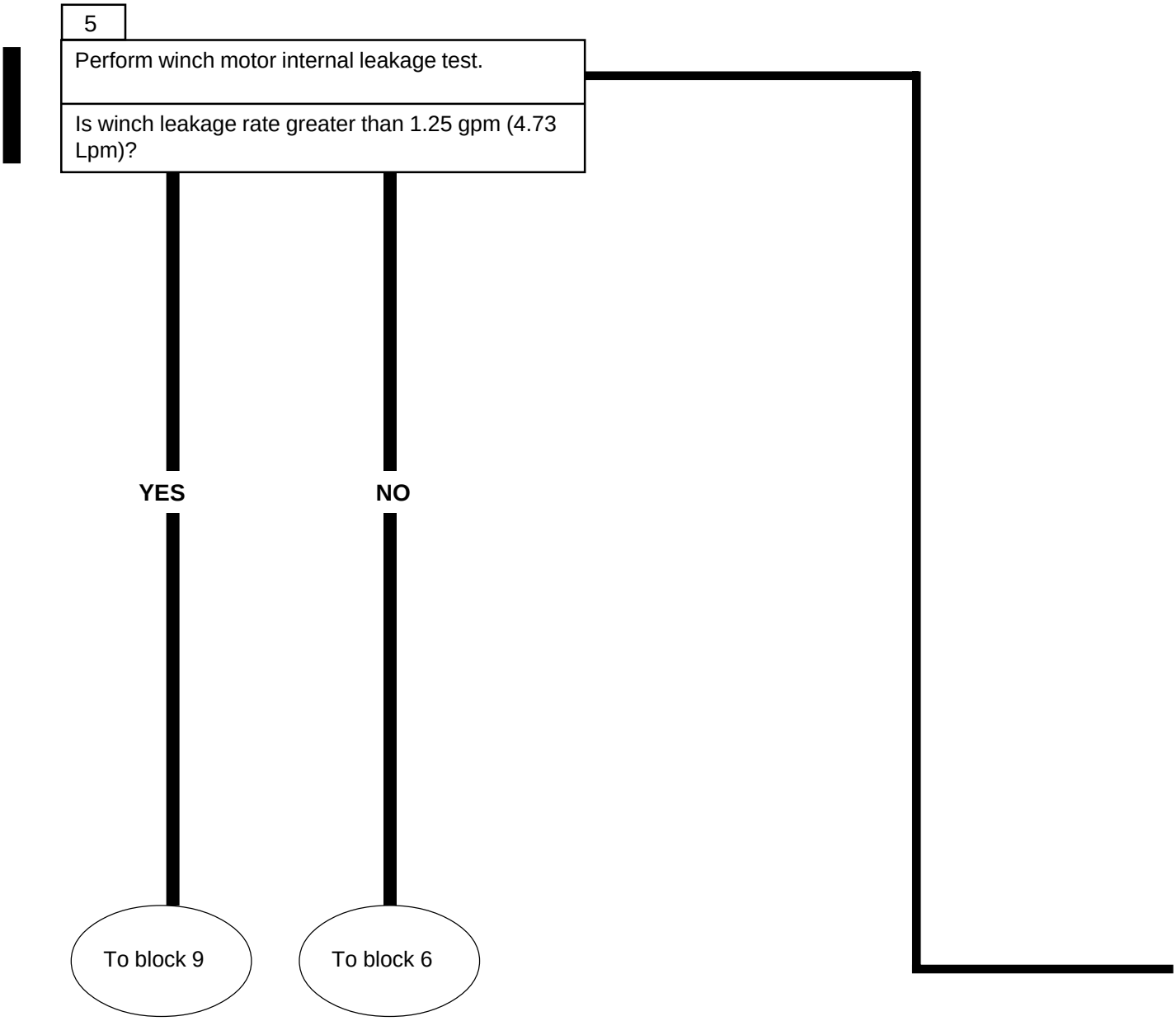


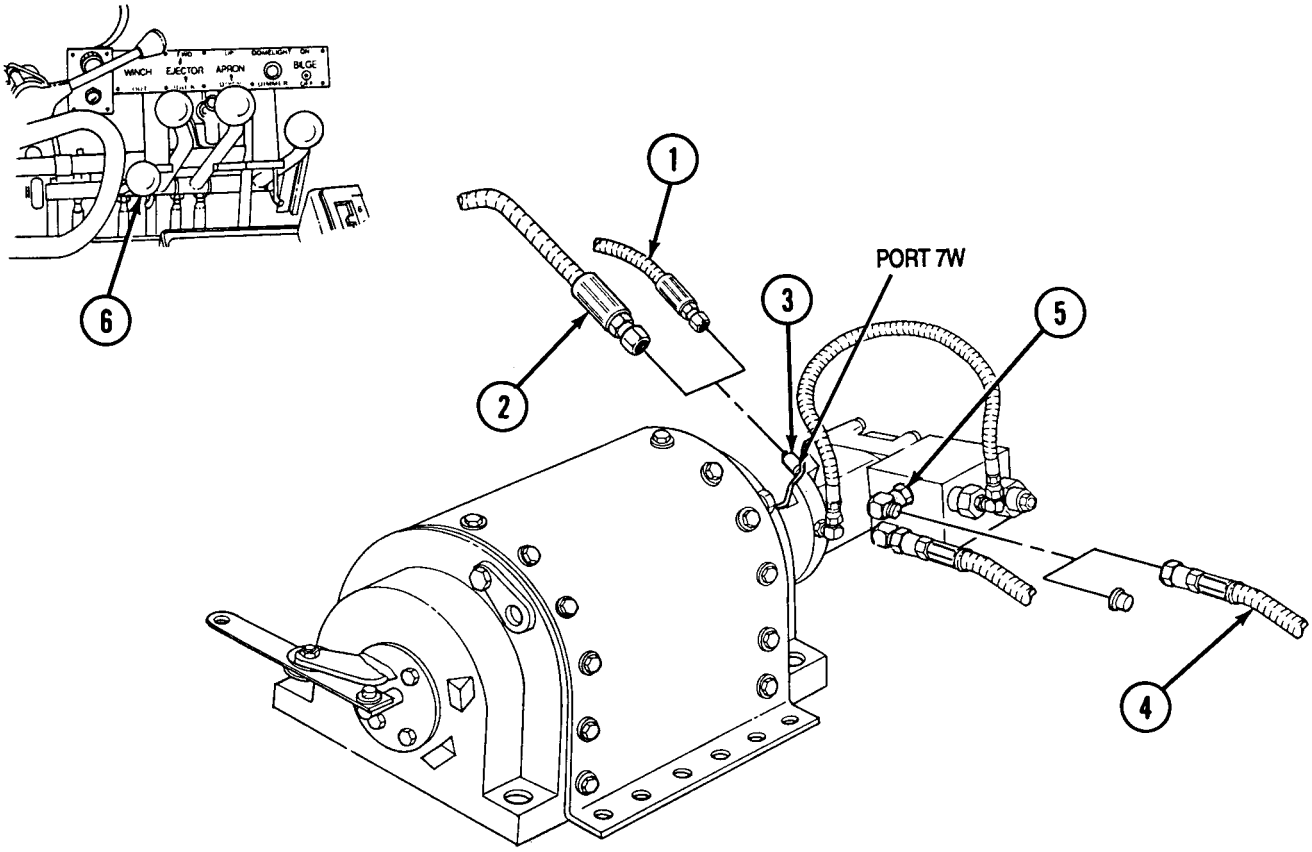
WINCH RELIEF VALVE VB ADJUSTMENT

- Have assistant hold WINCH CONTROL lever in PAY IN position.
- Read pressure measuring device (1), loosen jamnut (2), and turn relief valve adjusting screw (3). Tighten jamnut (2).
- Stop engine; relieve pressure. Remove all test equipment and connect all hoses.

Refer to TM 5-2350-262-20-2.

17 WINCH WILL NOT PULL RATED LOAD (CONTINUED)





WINCH MOTOR INTERNAL LEAKAGE TEST (CONTINUED)

NOTE

Have suitable container ready to catch oil.

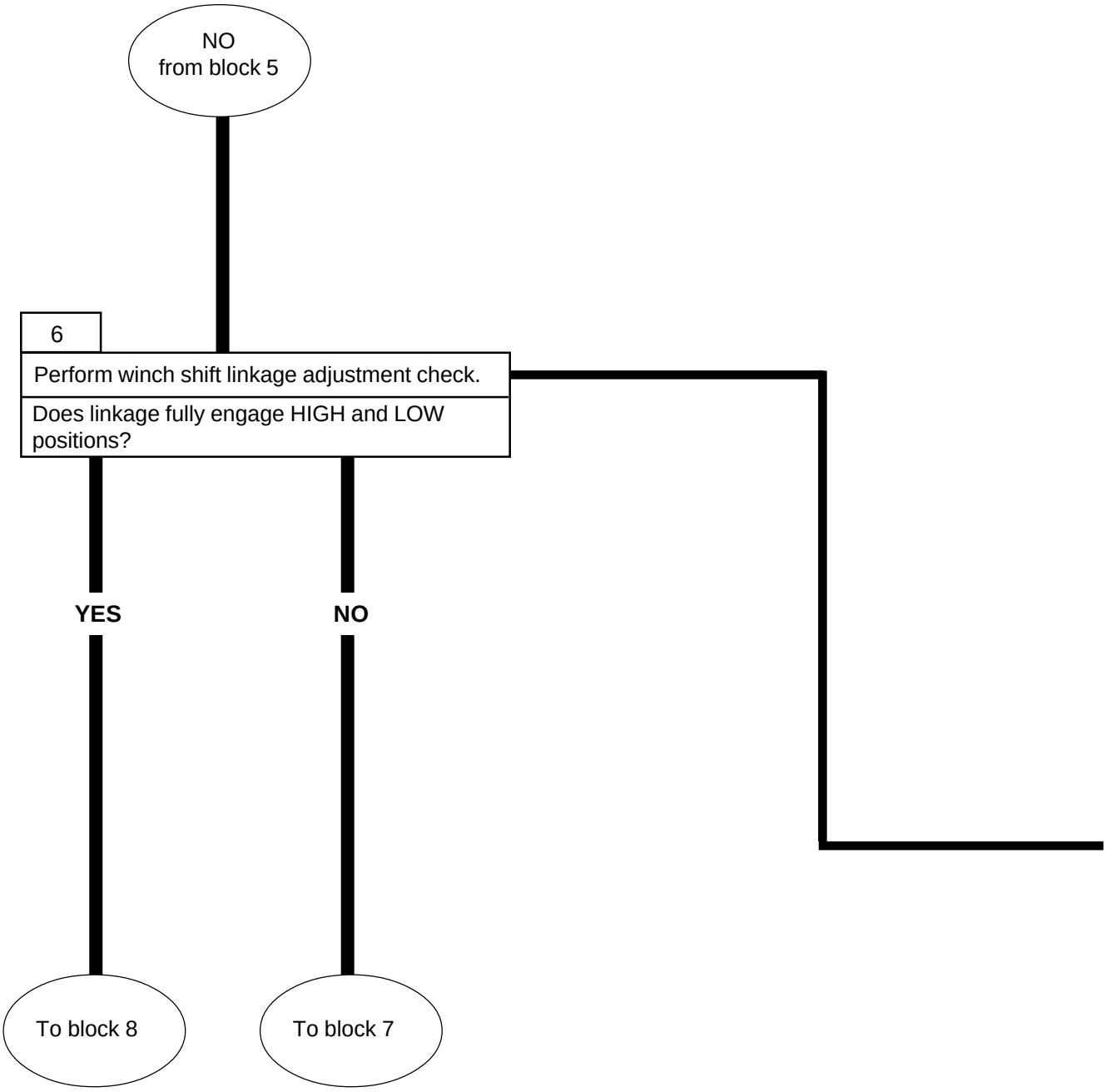
- Disconnect WINCH DRAIN-7W hose (1) from winch motor port 7W and plug hose (1). Connect drain hose (2) to elbow (3) on port 7W and place end of hose (2) in container.
- Disconnect CONT-VLV-VA (FWD) hose (4) from winch. Plug hose (4) and cap elbow (5).

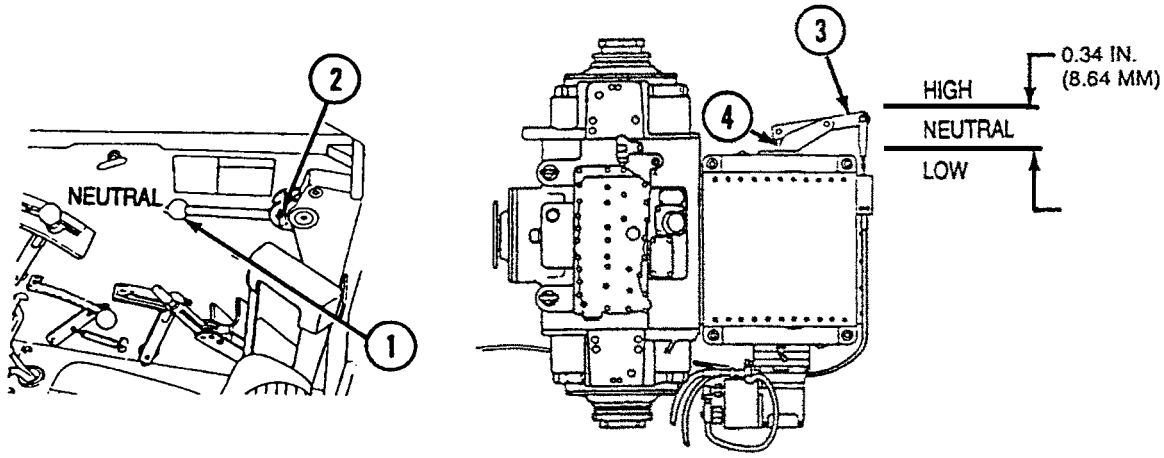
NOTE

Two containers are necessary for a true metered 15-second reading during winch motor internal leakage test.

- Have assistant start vehicle engine and hold WINCH CONTROL lever (6) in PAY IN position. With lever held in PAY IN position and oil flowing, move drain hose 7W (2) to a graduated container for exactly 15 seconds. Return lever (6) to NEUTRAL position.
- Measure oil in graduated container. Allowable internal leakage flow from drain hose (2) is 1.25 qts (1.18 L) in 15 seconds or 1.25 gpm (4.73 Lpm).
- Stop engine; relieve hydraulic pressure and connect all hoses.

17 WINCH WILL NOT PULL RATED LOAD (CONTINUED)

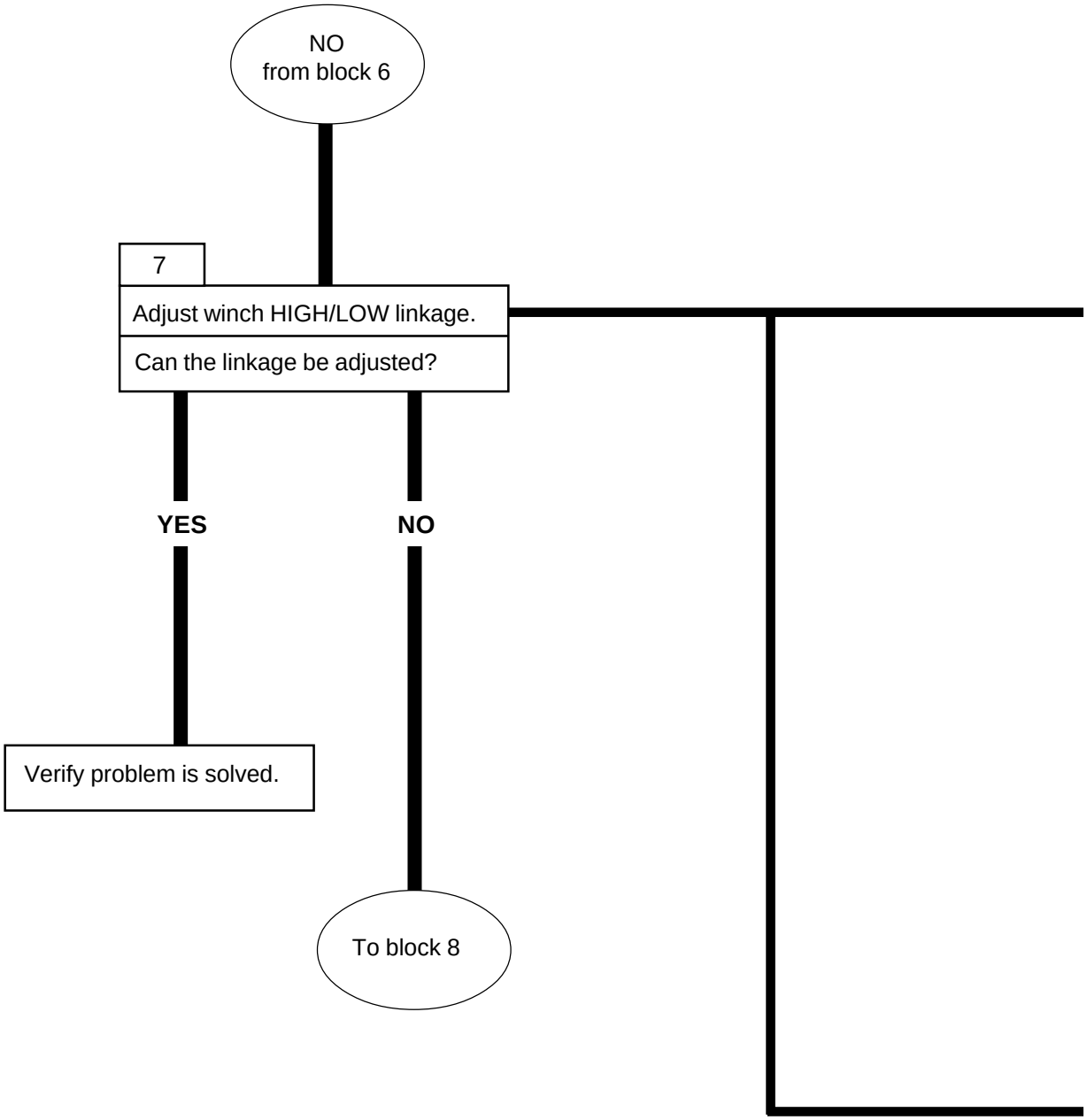




SHIFT LINKAGE ADJUSTMENT CHECK

- Set control lever (1) in NEUTRAL detent (2).
- Move lever (3) from side to side and measure for proper shift rod (4) NEUTRAL position. Shift rod (4) must move at least 0.10 in. (2.54 mm) in either direction without engaging LOW or HIGH gear. Total NEUTRAL zone travel is 0.34 in. (8.64 mm). Go to block 7 if shift rod (4) NEUTRAL travel is not within limits.

17 WINCH WILL NOT PULL RATED LOAD (CONTINUED)



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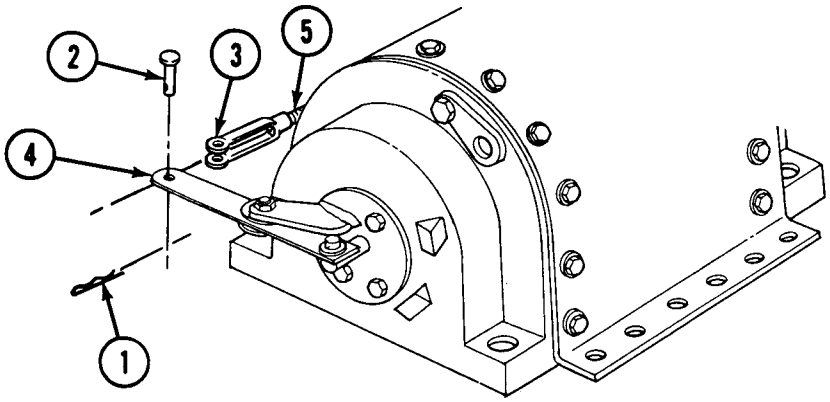


HIGH/LOW LINKAGE WINCH ADJUSTMENT

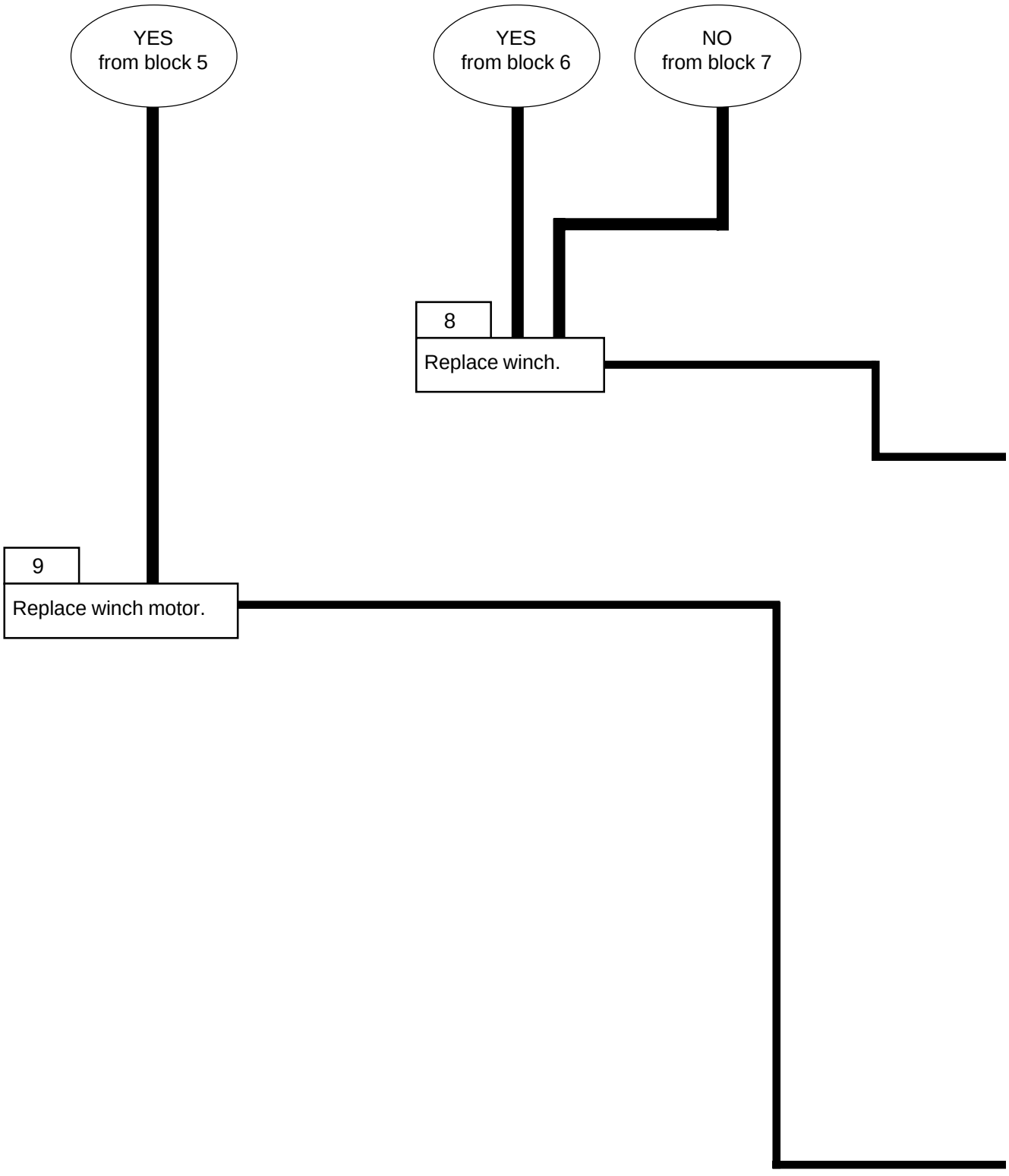
NOTE

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. (8.64mm).

- Remove cotter pin (1) and clevis pin (2) from clevis (3) and control lever (4). Discard cotter pin (1).
- Pull shift rod (5) out as far as possible. This is the end of travel in high-gear position.
- Push shift rod (5) back in 1.220 in. (30.99 mm) to locate center of NEUTRAL position.
- Adjustment can be made by turning clevis (3) clockwise for NEUTRAL position out; counterclockwise for NEUTRAL position in.
- Install clevis (3) on control lever (4) with clevis pin (2) and new cotter pin (1). Verify shift rod (5) is within NEUTRAL travel limits.
- Operate winch and check for proper operation. If winch does not function properly, notify Direct Support maintenance.

17 WINCH WILL NOT PULL RATED LOAD (CONTINUED)



Refer to TM 5-2350-262-20-2.

Refer to TM 5-2350-262-20-2.

18 TRACK (LEFT OR RIGHT) WILL NOT TIGHTEN OR LOOSEN, SEMI-AUTOMATIC TRACK ADJUSTER (NEW PRODUCTION)

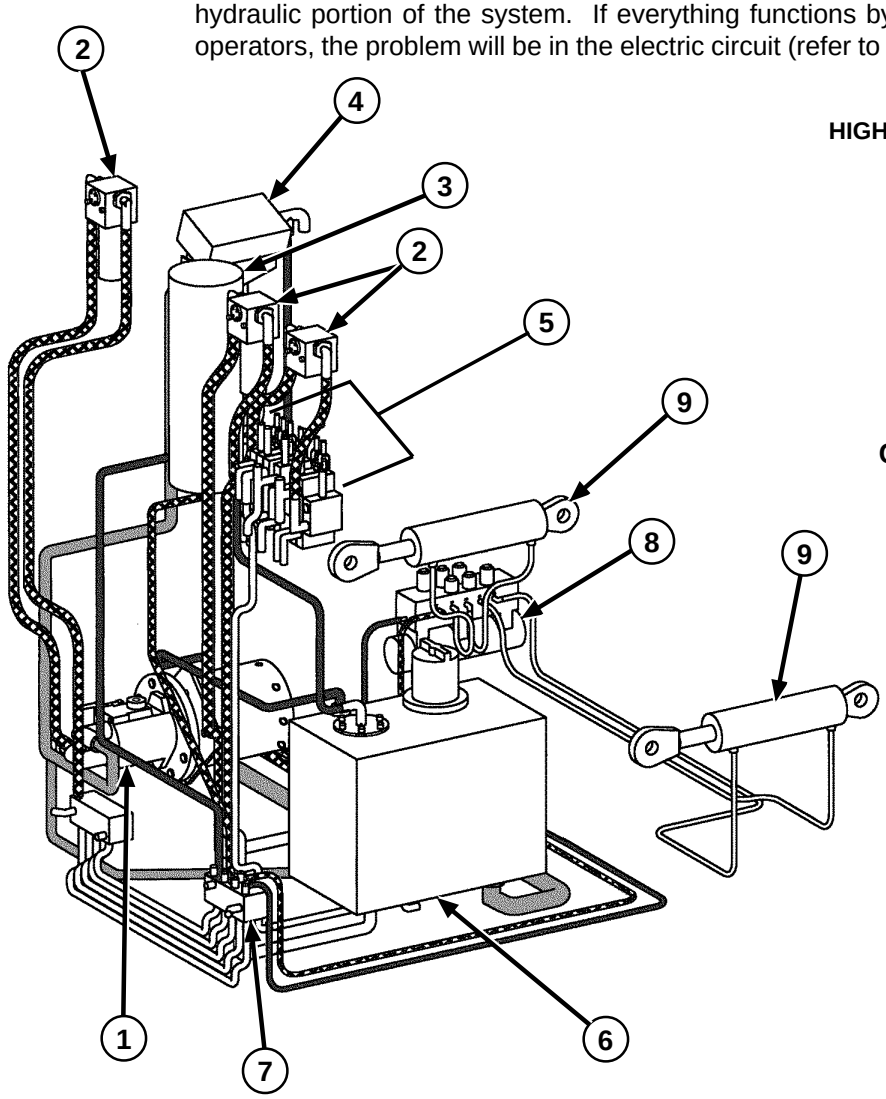
Track adjustment is provided by hydraulic pressure from the compensating pump and controlled by electric current tapped at the UNSPRUNG switch. In the SPRUNG or UNSPRUNG mode, hydraulic pressure is delivered to the track adjuster manifold from line nine (9) and returned through line seven (7) at the left manifold.

WARNING

High pressure is present in the M9 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.

NOTE

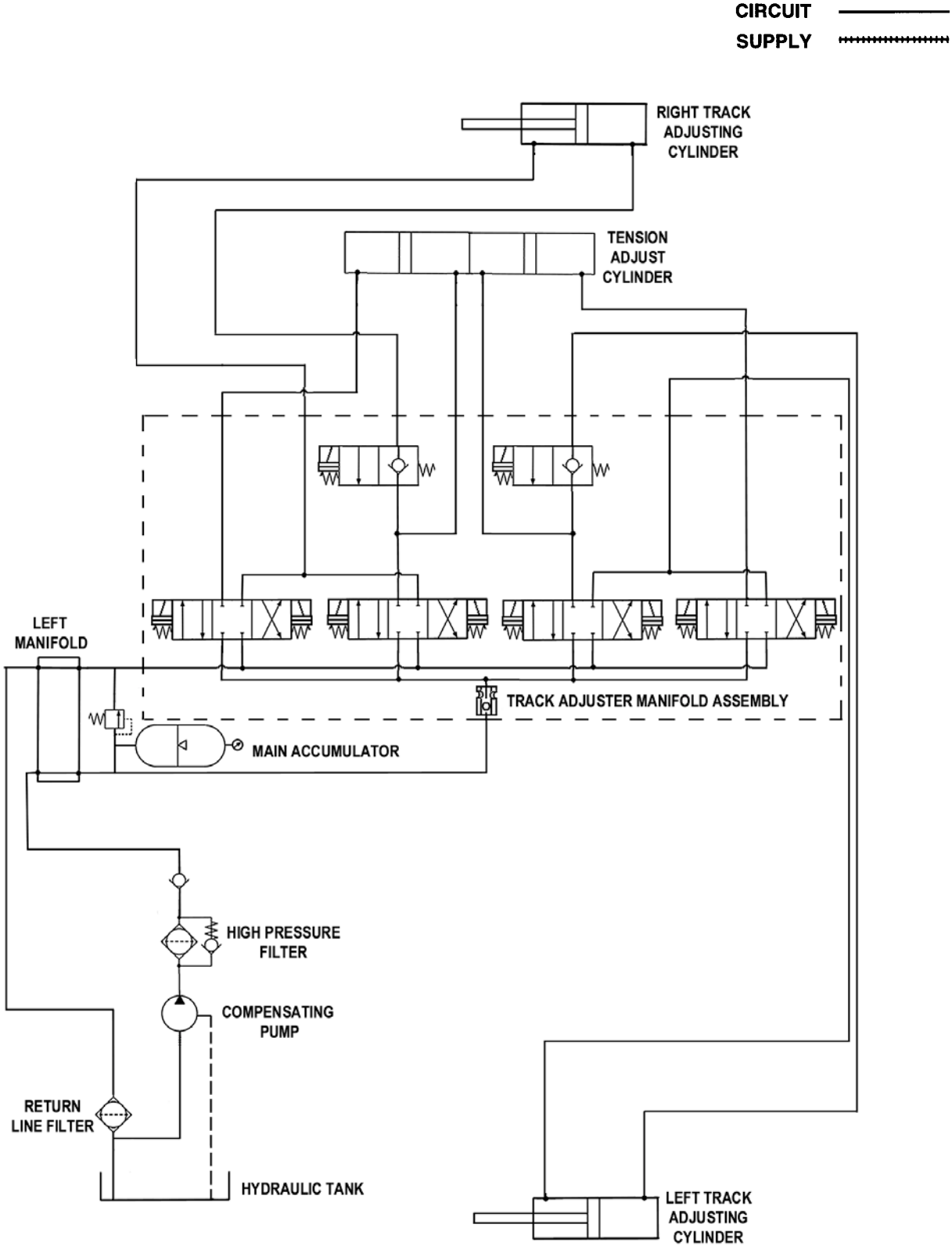
Use these procedures to troubleshoot either left or right track adjuster cylinder. The hydraulic valves are equipped with manual operators which can be used to check the hydraulic portion of the system. If everything functions by the manual hydraulic operators, the problem will be in the electric circuit (refer to TM 5-2350-262-20-1).



HIGH-PRESSURE
CIRCUIT
RETURN
SUPPLY

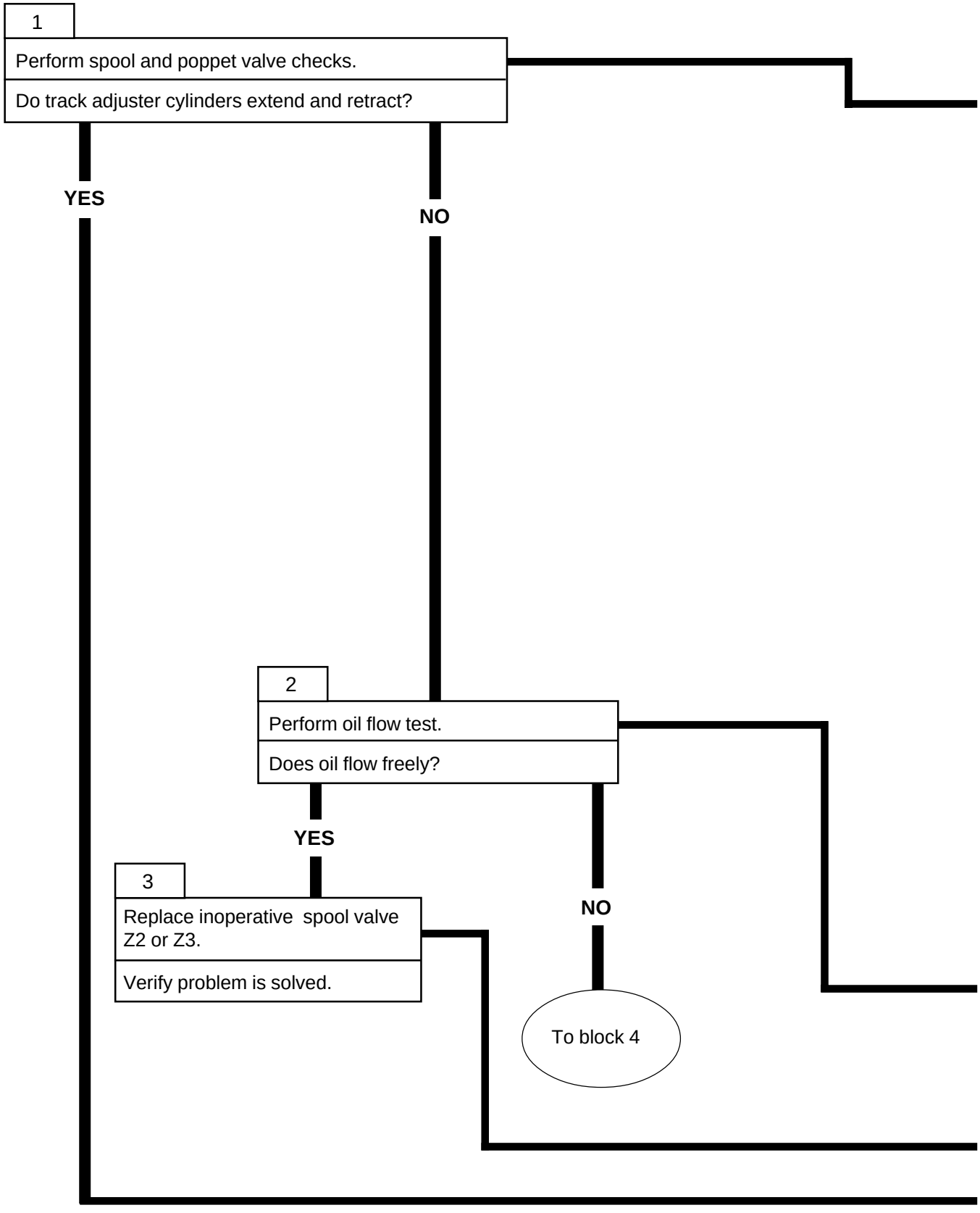
COMPONENTS:

1. COMPENSATING PUMP
2. HIGH-PRESSURE FILTER
3. MAIN ACCUMULATOR
4. RETURN LINE FILTER
5. DIRECTIONAL CONTROL VALVE BANK
6. HYDRAULIC RESERVOIR
7. MANIFOLD, LEFT HAND
8. TRACK ADJUSTING MANIFOLD ASSEMBLY
9. TRACK ADJUSTING CYLINDERS



TRACK ADJUSTER HYDRAULIC SCHEMATIC

18 TRACK (LEFT OR RIGHT) WILL NOT TIGHTEN OR LOOSEN, SEMI-AUTOMATIC TRACK ADJUSTER (NEW PRODUCTION) (CONTINUED)

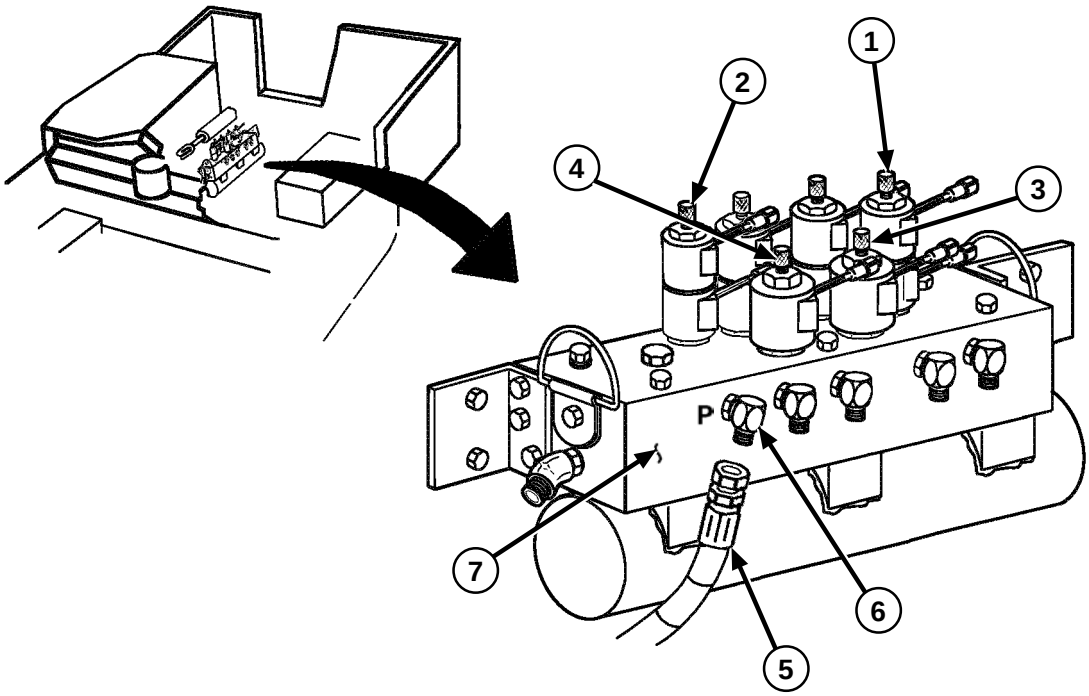


SPOOL AND POPPET VALVE CHECKS

NOTE

To test spool valve, extend and retract track adjuster cylinders. To retract track adjuster cylinders, the poppet valves must be overridden. To override the poppet valves (X1 or X2), depress manual override, rotate 180° counter clockwise and release (it will be up).

- Have assistant start engine
- To extend left cylinder, depress manual override spool valve Z3 (1).
- To extend right cylinder, depress manual override spool valve Z2 (2).
- To retract left cylinder, override poppet valve X2 (3) and lift manual override spool valve Z3 (1).
- To retract right cylinder, override poppet valve X1 (4) and lift manual override spool valve Z2 (2).
- Stop engine; relieve hydraulic pressure.



OIL FLOW TEST

NOTE

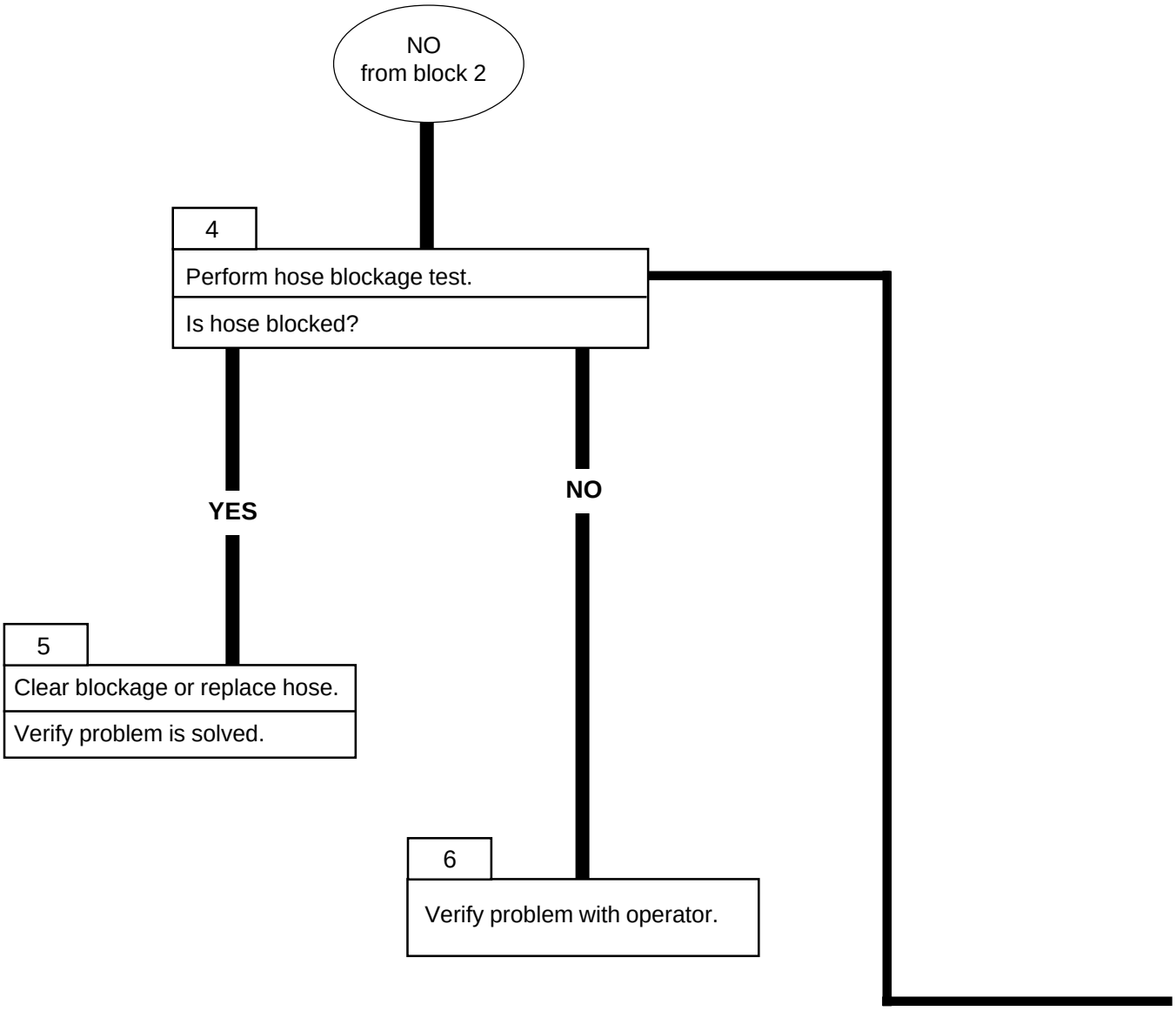
Have suitable container ready to catch oil.

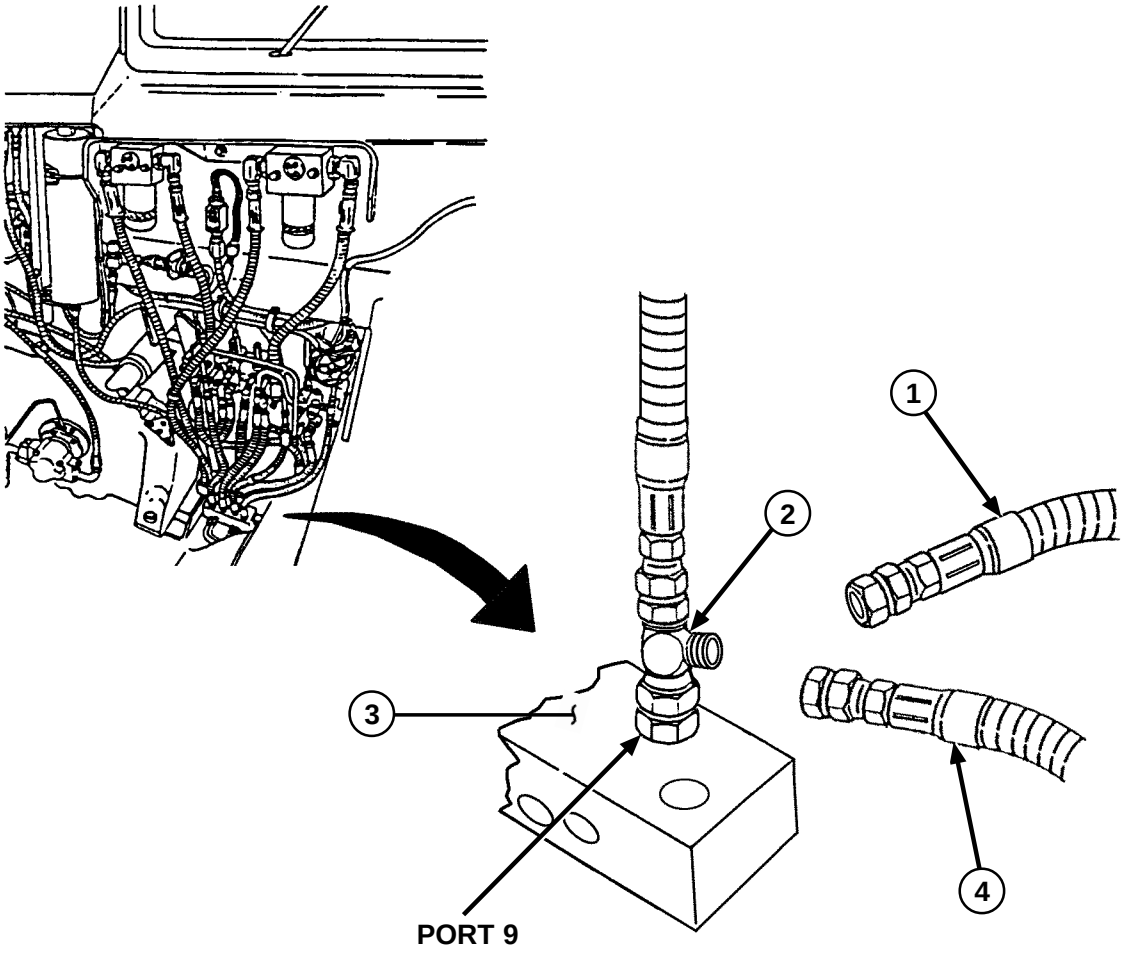
- Disconnect HYDR-MAN-IN-9 hose (5) from elbow (6) at port P on track adjuster manifold (7). Cap elbow (6).
- While holding open end of hose (5) in suitable container, have assistant start engine. Check for free flow of hydraulic oil from hose (5).
- Stop engine; relieve hydraulic pressure. Connect hose (5) to elbow (6).

Refer to TM 5-2350-262-20-2.

Perform Semi-automatic track adjuster electrical troubleshooting, refer to TM 5-2350-262-20-1.

18 TRACK (LEFT OR RIGHT) WILL NOT TIGHTEN OR LOOSEN, SEMI-AUTOMATIC TRACK ADJUSTER (NEW PRODUCTION) (CONTINUED)





HOSE BLOCKAGE TEST

NOTE

Have suitable container ready to catch oil.

- Disconnect HYDR-MAN-IN-9 hose (1) from tee (2) at port 9 on LH MAN (3). Plug pressure hose (1). Add short hose (4) to tee (2).
- While holding open end of hose (4) in container, have assistant start engine. Check for free flow of hydraulic oil from hose (4).
- Stop engine; relieve hydraulic pressure. Disconnect hose (4) from tee (2) and connect HYDR-MAN-IN-9 hose (1) to tee (2).

19 FRONT CORNER (LEFT OR RIGHT) DOES NOT RAISE OR LOWER IN UNSPRUNG MODE, SEMI-AUTOMATIC TRACK ADJUSTER (NEW PRODUCTION)

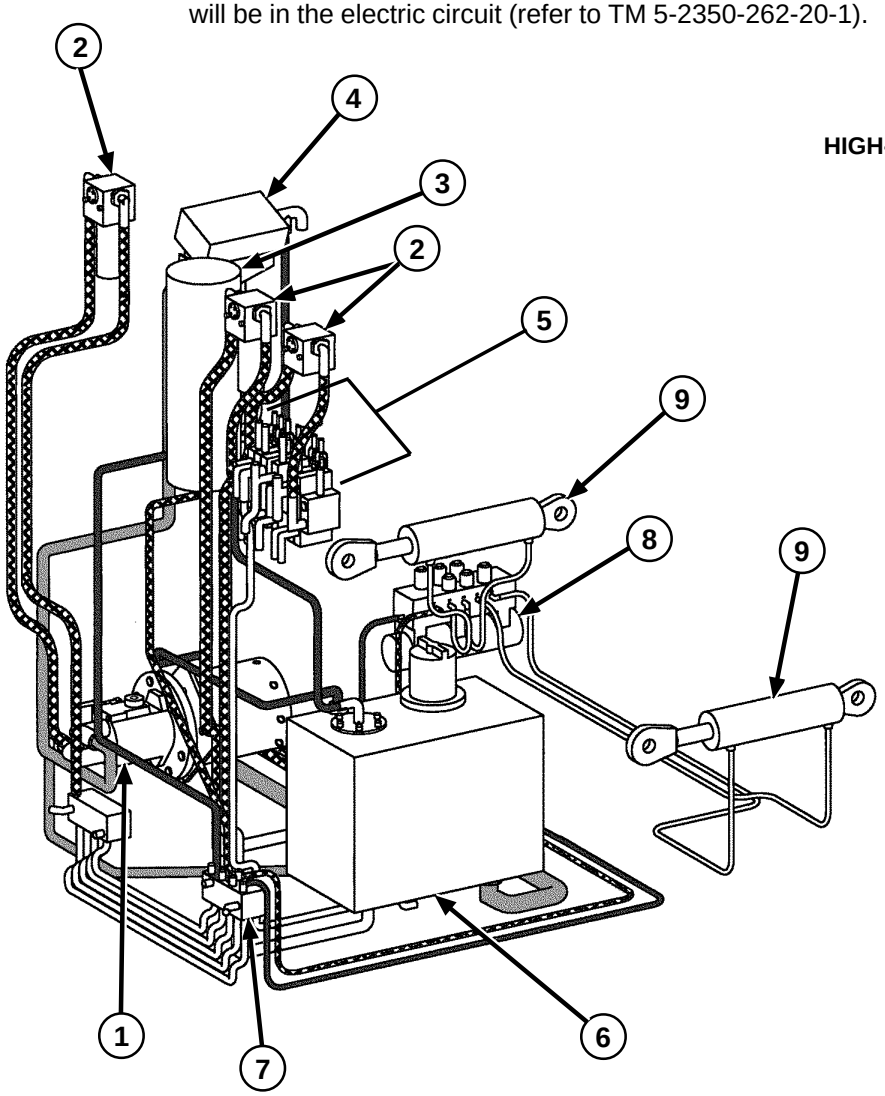
Track adjustment is provided by hydraulic pressure from the compensating pump and controlled by electric current tapped at the SPRUNG/UNSPRUNG pressure switch. In the UNSPRUNG mode, hydraulic pressure is delivered to the track adjuster manifold from line nine (9) and returned through line seven (7) at the left manifold.

WARNING

High pressure is present in the M9 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.

NOTE

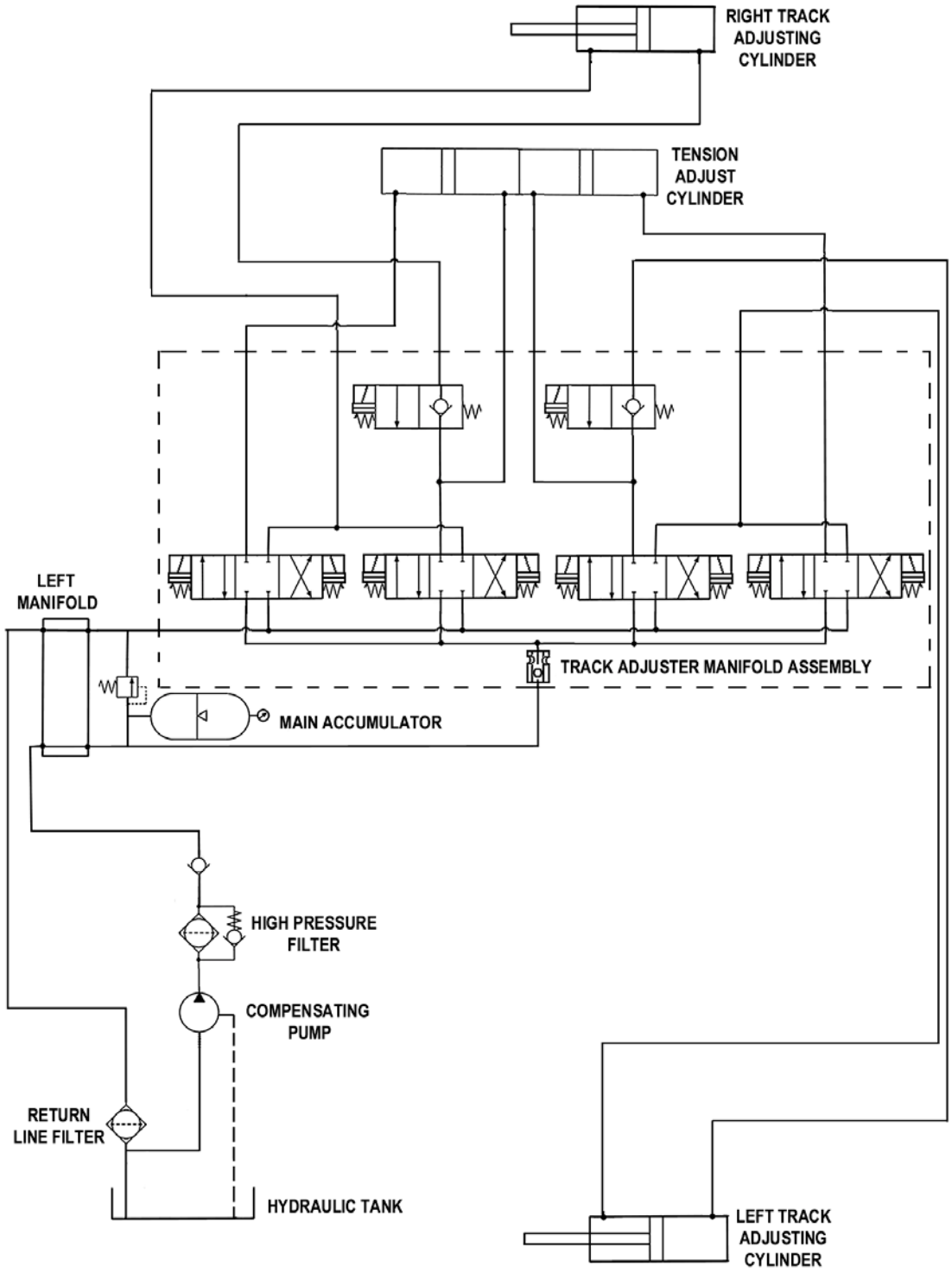
Use these procedures to troubleshoot either left or right front corner. Front corners will not lower if the track adjuster cylinders are not retracted. The hydraulic valves are equipped with manual operators which can be used to check the hydraulic portion of the system. If everything functions by the manual hydraulic operators, the problem will be in the electric circuit (refer to TM 5-2350-262-20-1).



HIGH-PRESSURE
CIRCUIT
RETURN
SUPPLY

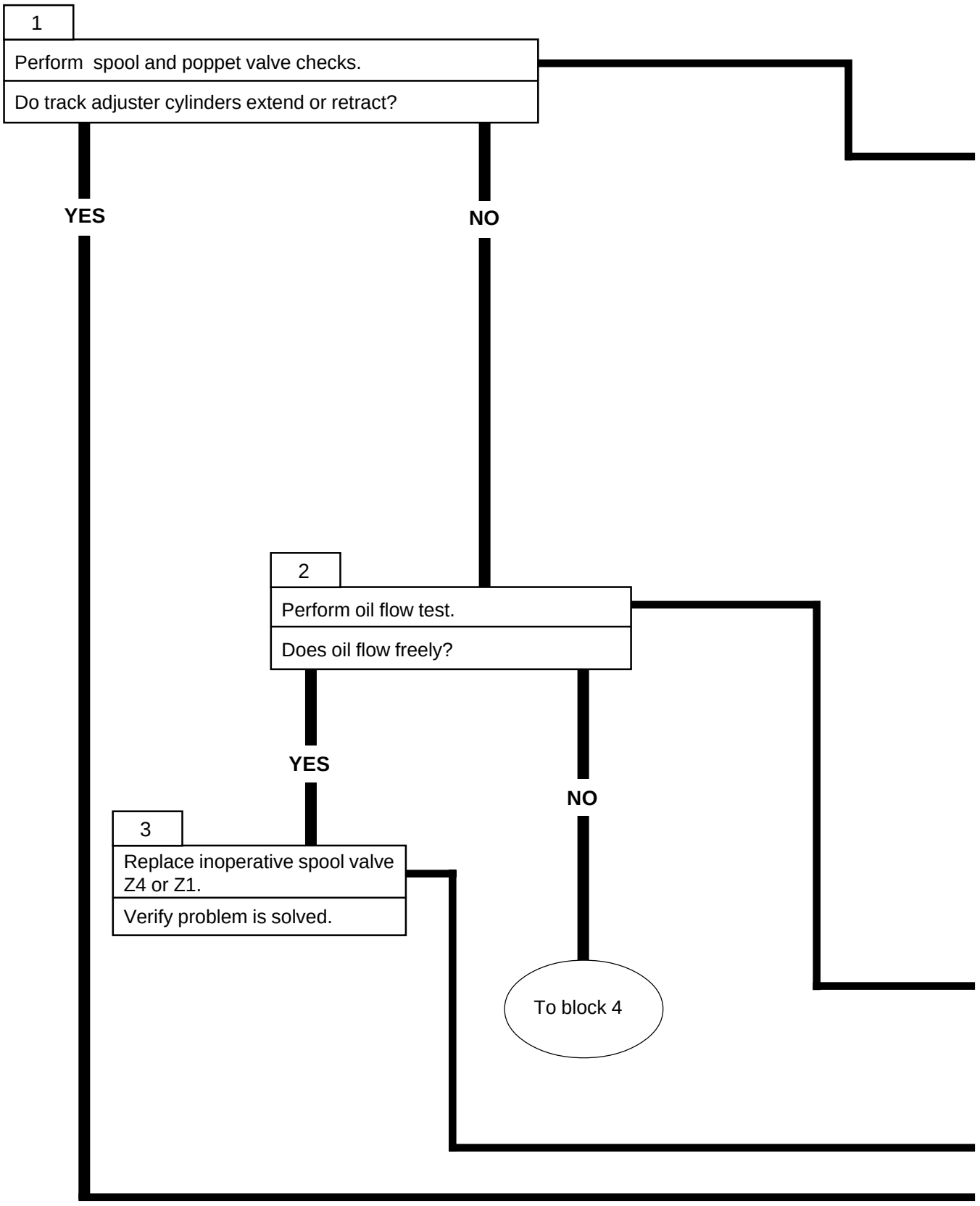
COMPONENTS:

1. COMPENSATING PUMP
2. HIGH-PRESSURE FILTER
3. MAIN ACCUMULATOR
4. RETURN LINE FILTER
5. DIRECTIONAL CONTROL VALVE BANK
6. HYDRAULIC RESERVOIR
7. MANIFOLD, LEFT HAND
8. TRACK ADJUSTING MANIFOLD ASSEMBLY
10. TRACK ADJUSTING CYLINDERS



TRACK ADJUSTER HYDRAULIC SCHEMATIC

19 **FRONT CORNER (LEFT OR RIGHT) DOES NOT RAISE OR LOWER IN UNSPRUNG MODE, SEMI-AUTOMATIC TRACK ADJUSTER (NEW PRODUCTION) (CONTINUED)**

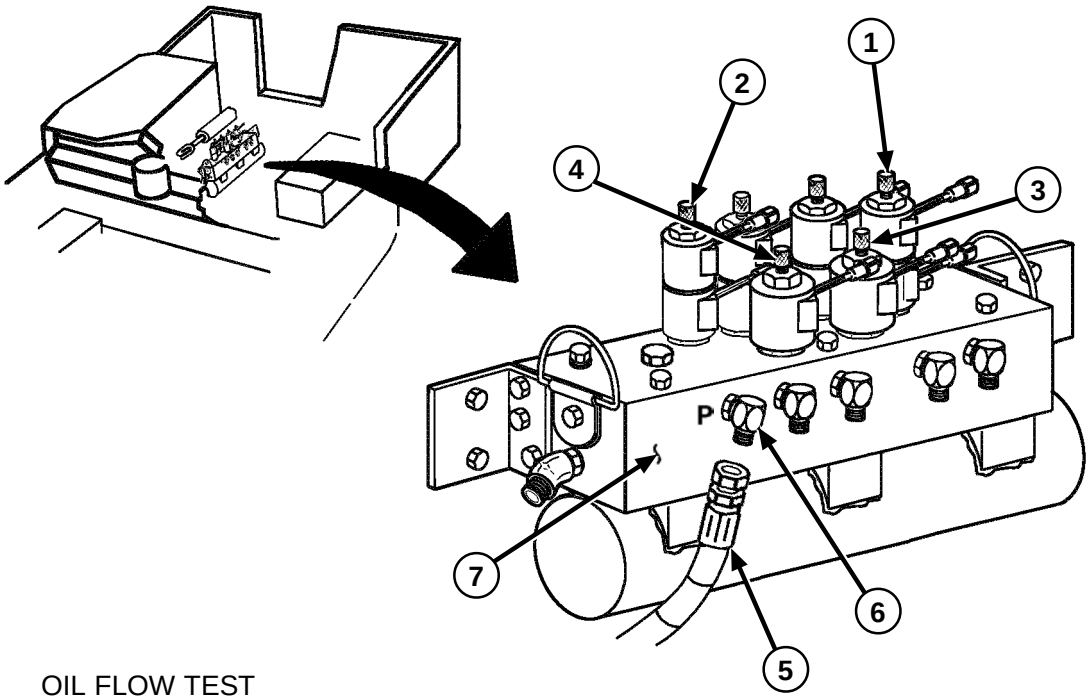


SPOOL AND POPPET VALVE CHECKS

NOTE

The track adjuster cylinders must be retracted to raise or lower front corner(s). To test spool valve, extend and retract track adjuster cylinders. To retract track adjuster cylinders, the poppet valves must be overriden. To override poppet valves (X1 or X2), depress manual override, rotate 180° counter clockwise and release (it will be up).

- Have assistant start engine.
- To extend left cylinder, depress manual override spool valve Z4 (1).
- To extend right cylinder, depress manual override spool valve Z1 (2).
- To retract left cylinder, override poppet valve X2 (3) and lift manual override spool valve Z4(1).
- To retract right cylinder, override popet valve X1 (4) and lift manual override spool valve Z1 (2).
- Stop engine; relieve hydraulic pressure.



OIL FLOW TEST

NOTE

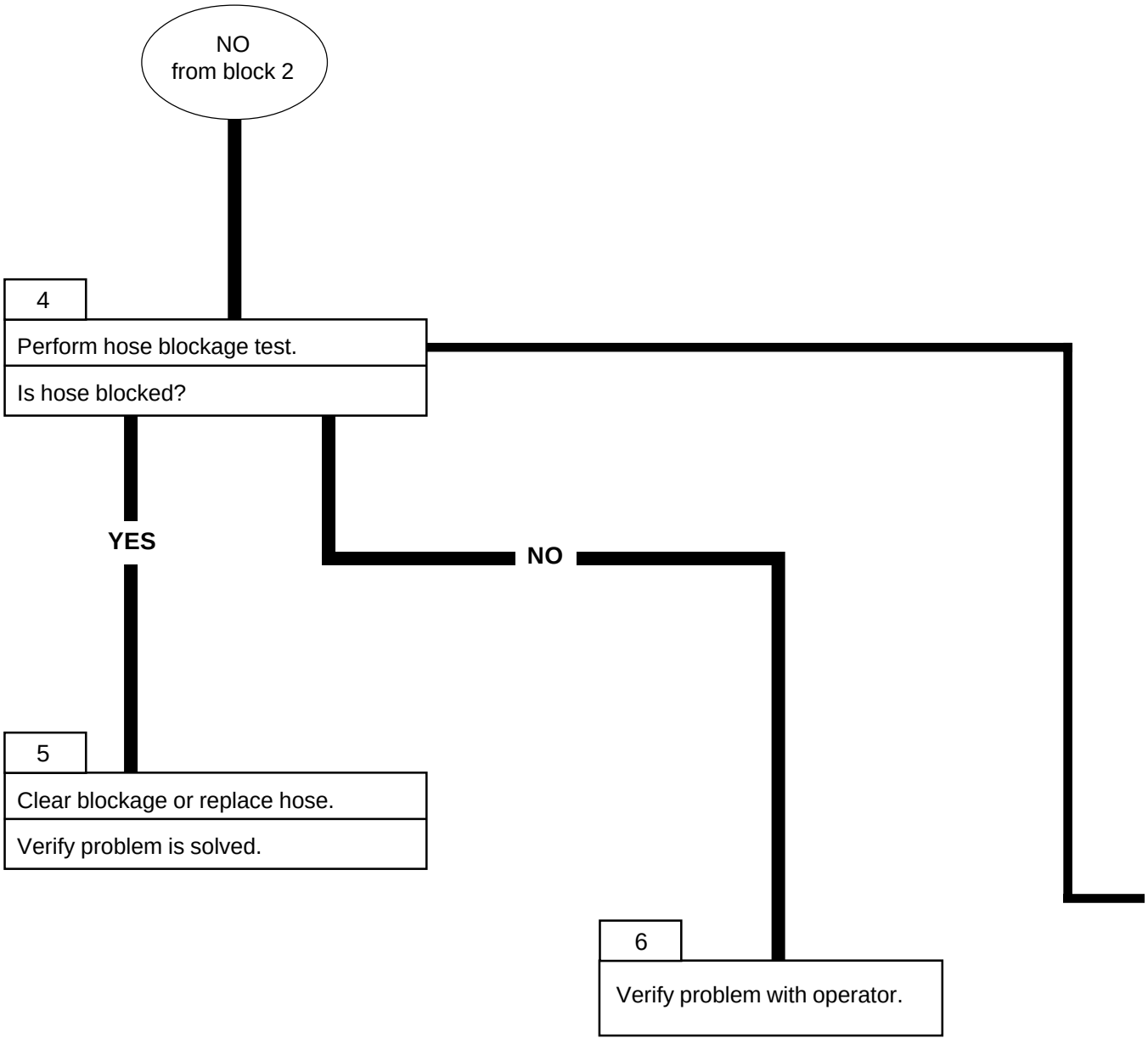
Have suitable container ready to catch oil.

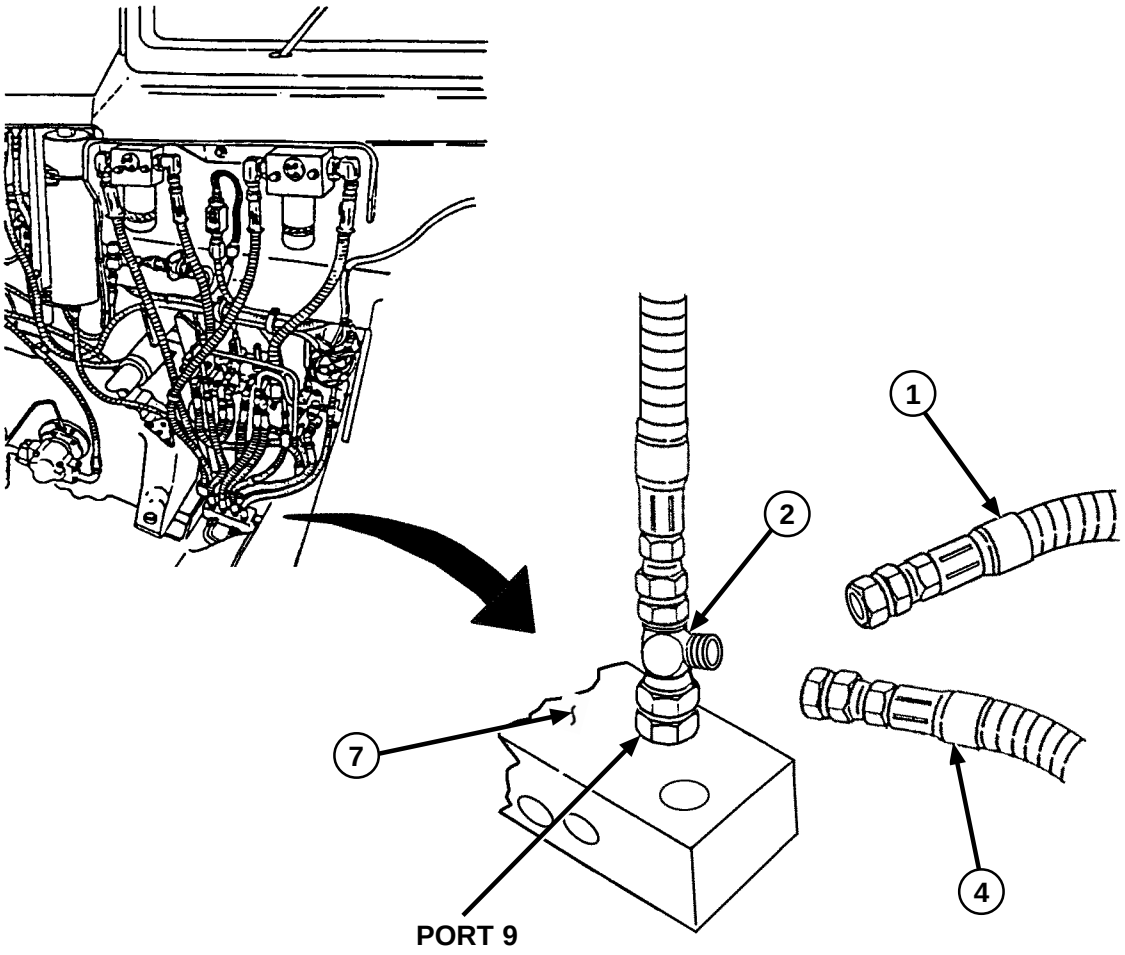
- Disconnect HYDR-MAN-IN-9 hose (5) from elbow (6) at port P on track adjuster manifold (7). Cap elbow (6).
- While holding open end of hose (5) in container, have assistant start engine. Check for free flow of hydraulic oil from hose (5).
- Stop engine; relieve hydraulic pressure. Connect hose (5) to elbow (6).

Refer to TM 5-2350-262-20-2.

Perform Semi-automatic track adjuster electrical troubleshooting, refer to TM 5-2350-262-20-1.

19 **FRONT CORNER (LEFT OR RIGHT) DOES NOT EXTEND OR LOWER IN UNSPRUNG MODE, SEMI-AUTOMATIC TRACK ADJUSTER (NEW PRODUCTION) (CONTINUED)**





HOSE BLOCKAGE TEST

NOTE

Have suitable container ready to catch oil.

- Disconnect HYDR-MAN-IN-9 hose (1) from tee (2) at port 9 on LH MAN (3). Plug pressure hose (1), and add short hose (4) to tee (2).
- While holding open end of hose (4) in suitable container, have assistant start engine. Check for free flow of hydraulic oil from hose (4).
- Stop engine; relieve hydraulic pressure. Disconnect hose (4) from tee (2) and connect HYDR-MAN-IN-9 hose (1) to tee (2).

20 LEFT OR RIGHT TRACK ADJUSTER WILL NOT EXTEND AFTER THE SUSPENSION CONTROL LEVERS ARE RETURNED TO NEUTRAL (NEW PRODUCTION)

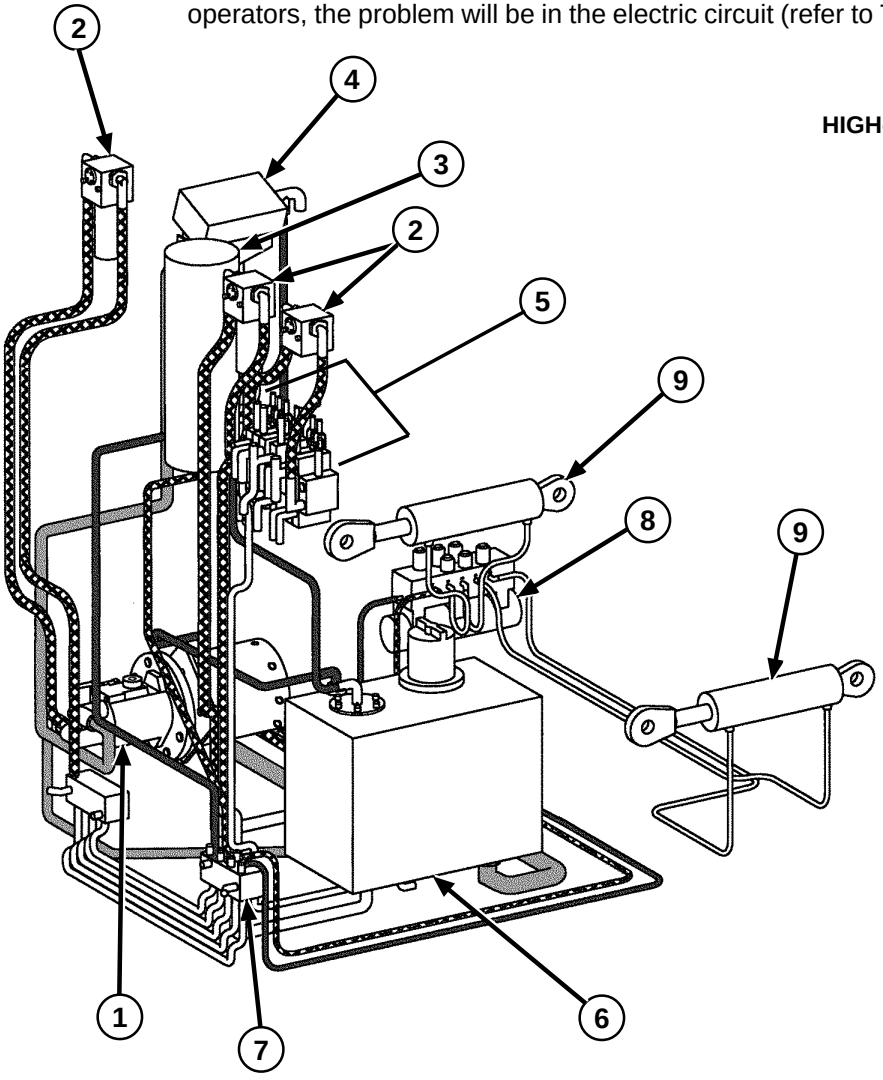
Track adjustment is powered by hydraulic pressure from the compensating pump and controlled by electric current tapped at the SPRUNG/UNSPRUNG pressure switch. In the UNSPRUNG mode, hydraulic pressure is delivered to the track adjuster manifold from line nine and returned through line seven at the left manifold.

WARNING

High pressure is present in the M9 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.

NOTE

Use these procedures to troubleshoot either left or right track adjusting cylinder. After reaching required dozer blade height, tracks are tightened for retention. The hydraulic valves are equipped with manual operators which can be used to check the hydraulic portion of the system. If everything functions by the manual hydraulic operators, the problem will be in the electric circuit (refer to TM 5-2350-262-20-1).



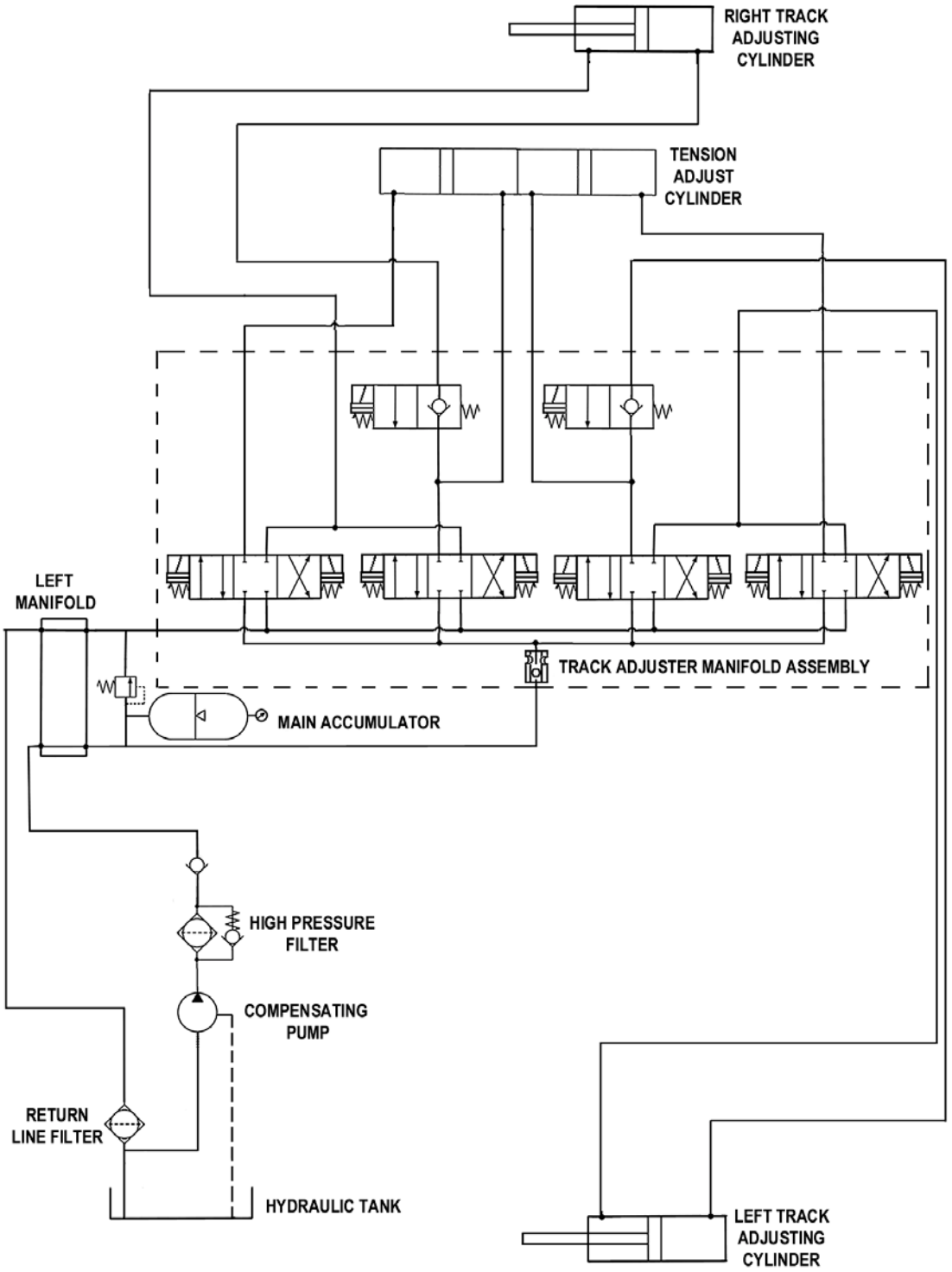
HIGH-PRESSURE CIRCUIT

RETURN

SUPPLY

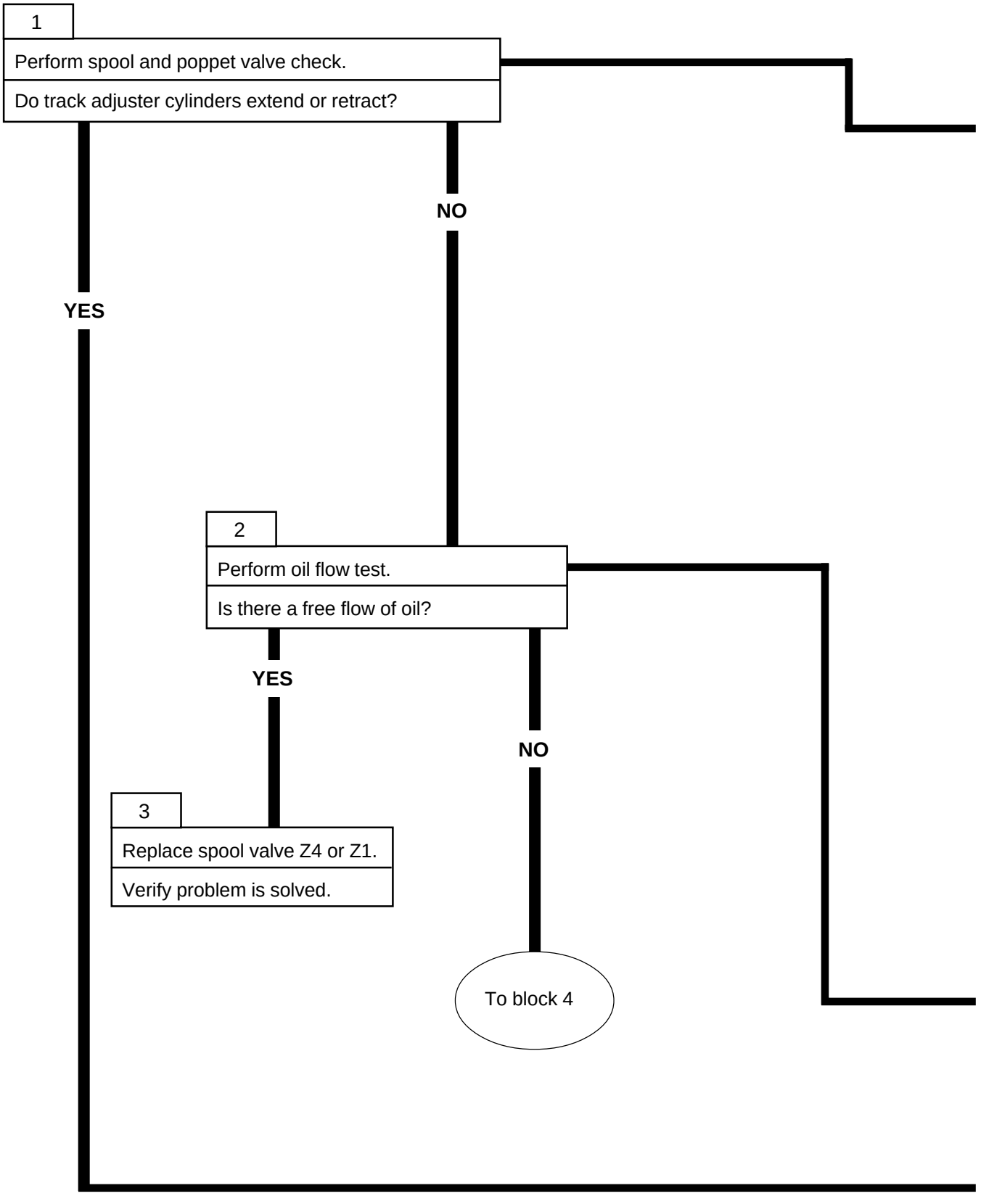
COMPONENTS:

1. COMPENSATING PUMP
2. HIGH-PRESSURE FILTER
3. MAIN ACCUMULATOR
4. RETURN LINE FILTER
5. DIRECTIONAL CONTROL VALVE BANK
6. HYDRAULIC RESERVOIR
7. MANIFOLD, LEFT HAND
8. TRACK ADJUSTING MANIFOLD ASSEMBLY
10. TRACK ADJUSTING CYLINDERS



TRACK ADJUSTER HYDRAULIC SCHEMATIC

20 **LEFT OR RIGHT TRACK ADJUSTER WILL NOT EXTEND AFTER THE SUSPENSION CONTROL LEVERS ARE RETURNED TO NEUTRAL (NEW PRODUCTION) (CONTINUED)**

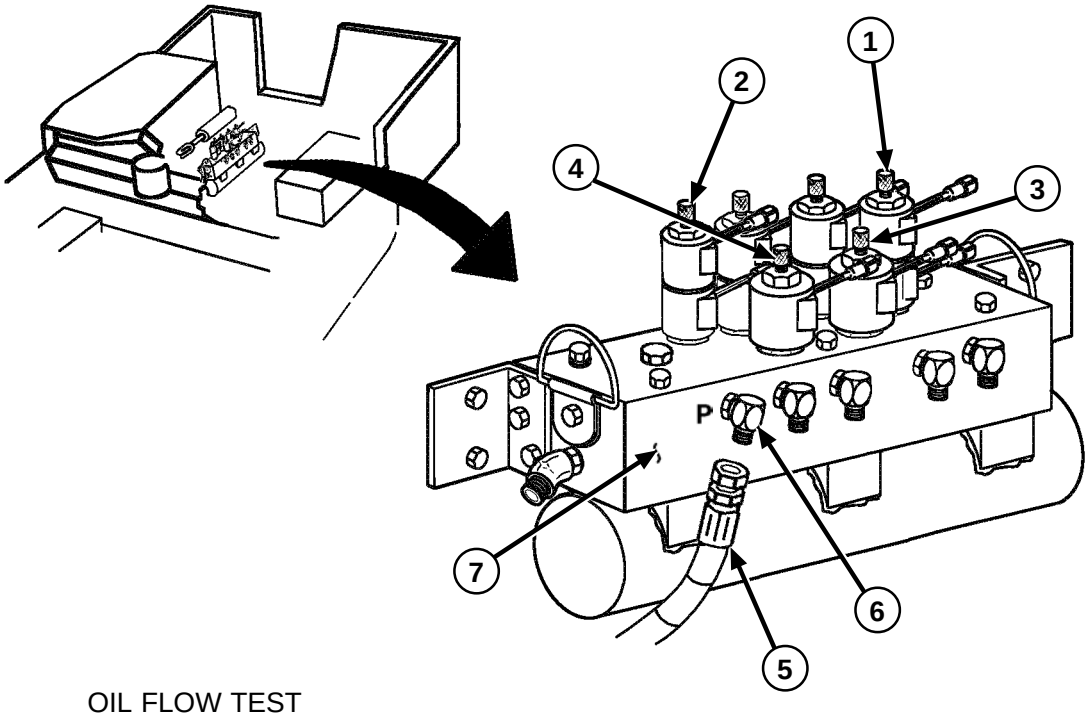


SPOOL AND POPPET VALVE CHECKS

NOTE

The track adjuster cylinders must be extended (after reaching desired height) to tighten the track. To retract track adjuster cylinders, the poppet valves must be overriden. To override poppet valve (X1 0r X2), depress manual override, rotate 180° counter clockwise and release (it will be up).

- To test spool valve, retract and extend track adjuster cylinders.
- Have assistant start engine.
- To retract left cylinder, override poppet valve X2 (3) and lift manual override spool valve Z4 (1).
- To retract right cylinder, override poppet valve X1 (4) and lift manual override spool valve Z1 (2).
- To extend left cylinder, depress manual override spool valve Z4 (1).
- To extend right cylinder, depress manual override spool valve Z1 (2).
- Stop engine; relieve hydraulic pressure.



OIL FLOW TEST

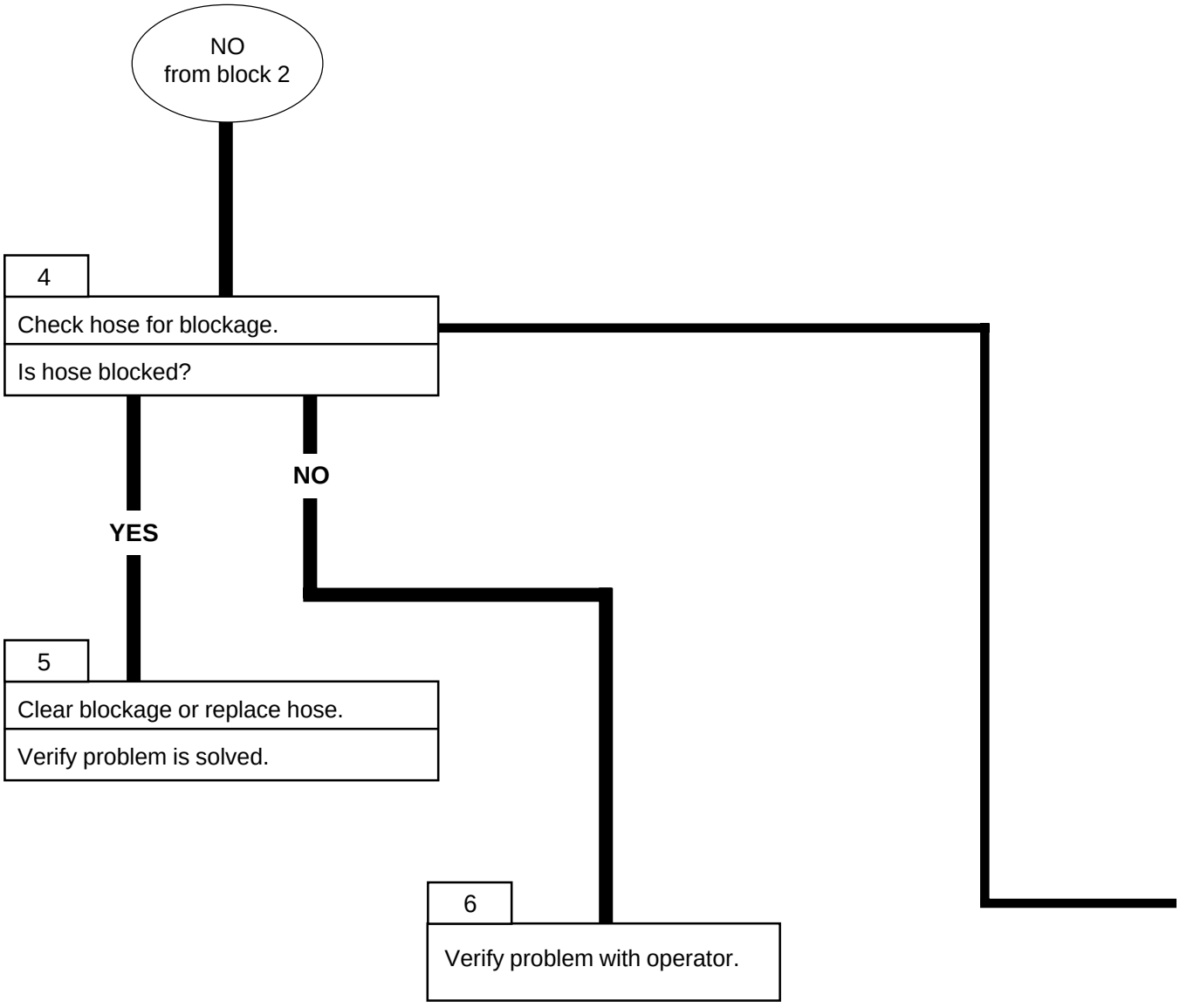
NOTE

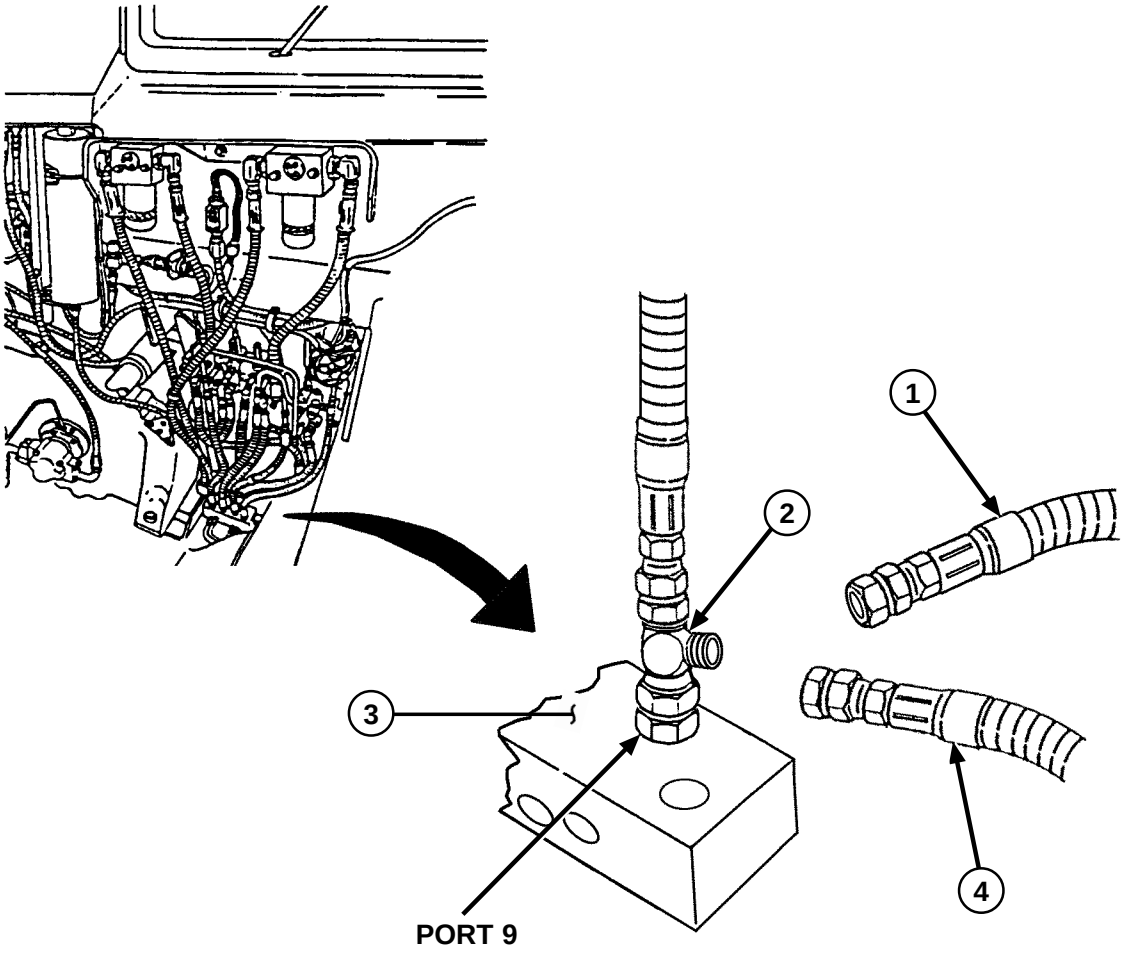
Have suitable container ready to catch oil.

- Disconnect HYDR-MAN-IN-9 hose (5) from elbow (6) at port P on track adjuster manifold (7). Cap elbow (6).
- While holding open end of hose (5) in suitable container, have assistant start engine. Check for free flow of hydraulic oil from hose (5).
- Stop engine; relieve hydraulic pressure. Connect hose (5) to elbow (6).

Perform semi-automatic track adjuster electrical troubleshooting. Refer to TM 5-2350-262-20-1.

20 **LEFT OR RIGHT TRACK ADJUSTER WILL NOT EXTEND AFTER THE SUSPENSION CONTROL LEVERS ARE RETURNED TO NEUTRAL (NEW PRODUCTION) (CONTINUED)**





OIL FLOW TEST

NOTE

Have suitable container ready to catch oil.

- Disconnect HYDR-MAN-IN-9 hose (1) from tee (2) at port 9 on LH MAN (3). Plug pressure hose (1). Add short hose (4) to tee (2).
- While holding open end of hose (4) in suitable container, have assistant start engine. Check for free flow of hydraulic oil from hose (4).
- Stop engine; relieve hydraulic pressure. Disconnect hose (4) from tee (2) and connect HYDR-MAN-IN-9 hose (1) to tee (2).

APPENDIX A
REFERENCES

A-1. SCOPE

This appendix lists Army regulations, forms, field manuals, technical manuals, and other publications referenced in the three volumes of this manual and which apply to unit maintenance of the M9 (ACE).

A-2. ARMY REGULATIONS

Reporting of Transportation Discrepancies in Shipments ..... AR 55-38
Department of the Army Information Security Program Regulation ..... AR 380-5

A-3. DEPARTMENT OF THE ARMY PAMPHLETS

Consolidated Index of Army Publications and Forms ..... DA Pam 25-30
The Army Maintenance Management System (TAMMS) ..... DA Pam 738-750
U.S. Army Equipment Index of Modification Work Orders ..... DA Pam 750-10

A-4. FORMS

Army Accident Investigation Report ..... DA Form 285
Equipment Operator's Qualifications Record (Except Aircraft) ..... DA Form 348
Recommended Changes to Publications and Blank Forms ..... DA Form 2028
Recommended Changes to Equipment Technical Manuals ..... DA Form 2028-2
Organizational Control-Record for Equipment ..... DA Form 2401
Equipment Inspection and Maintenance Worksheet ..... DA Form 2404
Maintenance Request ..... DA Form 2407
Preventive Maintenance Schedule and Record ..... DD Form 314
Processing and Deprocessing Record for Shipment, Storage, and
Issue of Vehicles and Spare Engines ..... DD Form 1397
DOD-Fire Incident Report ..... DD Form 2324
U.S. Government Motor Vehicle Operator's Identification Card ..... OF Form 346
Operator's Report on Motor Vehicle Accident ..... SF Form 91
Transportation Discrepancy Report ..... SF Form 361
Report of Discrepancey (ROD) ..... SF Form 364
Product Quality Deficiency Report (7540-00-113-5541) ..... SF Form 368

A-5. FIELD MANUALS

NBC-Contamination Avoidance ..... FM 3-3
NBC Protection ..... FM 3-4
NBC-Decontamination ..... FM 3-5
Field Behavior of NBC Agents (Including Smoke and Incendiaries) ..... FM 3-6
Camouflage ..... FM 5-20
Vehicle Recovery Operations ..... FM 20-22
First Aid for Soldiers ..... FM 21-11
Visual Signals ..... FM 21-60
Basic Cold Weather Manual ..... FM 31-70
Northern Operations ..... FM 31-71
Desert Operations ..... FM 90-3
Mountain Operations (How to Fight) ..... FM 90-6
Rigging ..... FM 5-125

A-6. TECHNICAL BULLETINS

Occupational and Environmental Health: Hearing Conservation ..... TB MED 501
Solder and Soldering ..... TB SIG 222
Installation Instructions of Rotating Amber Warning Light Kit ..... TB 9-2590-510-23
Color, Marking, and Camouflage Painting of Military Vehicles, Construction Equipment, and Materiels Handling Equipment ..... TB 43-0209
Maintenance in the Desert ..... TB 43-0239
Warranty Technical Bulletin for M9 ACE ..... TB 5-2350-262-15
Use of antifreeze Solutions and Cleaning Compounds in Engine Cooling Systems ..... TB 750-651

A-7. TECHNICAL MANUALS

Operator's and Unit Maintenance Manual (including Repair Parts and Special Tools List) for Decontaminating Apparatus, Portable DS2, 1-1/2 Quart, ABC M11 (4230-00-720-1618) ..... TM 3-4230-204-12&P
Operator's Manual for Mask, Chemical-Biological, Aircraft ABC-M24 and Accessories forMask, Chemical-Biological; Tank M25A1 and Accessories ..... TM 3-4240-280-10
Operator's Manual: Training Set, Chemical Agent Identification: Simulants, M72A2 (6910-01-043-2090) ..... TM 3-6910-227-10
Operator's Manual for Armored Combat Earthmover (ACE), M9 (2350-00-808-7100) ..... TM 5-2350-262-10
Hand Receipt Manual Covering End Item/Components of End Item (COEI), Basic Issue Items (BII), and Additional Authorization List (AAL) for Armored Combat Earthmover (ACE), M9 (2350-00-808-7100) ..... TM 5-2350-262-10-HR
Unit Maintenance Repair Parts and Special Tools Lists for Armored Combat Earthmover (ACE), M9 (2350-00-808-7100) ..... TM 5-2350-262-24P
Operator's, Unit and Direct Support Maintenance Manual Including Repair Parts and Special Tools List for Recovery/Recharger Unit Fire Extinguisher, Monobromotrifluoromethane, Skid Mounted, Electric Motor Driven Model RHA-101-M, Part No. 350501-001, S/N 3505-1 to 3505-368 (4210-01-176-3517) ..... TM 5-4210-218-13&P
Organizational Maintenance Manual Including Repair Parts and Special Tools List for Launcher, Grenade, Smoke: Screening, RP,l M243 (1040-01-059-0560), M257 (1040-01-070-1213), and M259 (1040-01-107-7051) ..... TM 9-1040-267-20&P
Inspection, Care, and Maintenance of Antifriction Bearings ..... TM 9-214
Operator's Manual for Welding Theory and Application ..... TM 9-237
Organizational, Direct Support, and General Support Maintenance Manual: Standards for Inspection and Classification of Tracks, Track Components, and Solid Rubber Tires (FSC 2530) ..... TM 9-2530-200-24
Operator and Organizational Maintenance Manual, Including Repair Parts and Special Tools List, Simplified Test Equipment for Internal Combustion Engines (STE-ICE) (4910-00-124-2554) ..... TM 9-4910-571-12&P
Operator's, Organizational, Direct Support, and General Support Maintenance Manual for Lead-Acid Storage Batteries; 4HN, 24V, (6140-00-069-3528) MS75047-1;2HN, 12V (6140-00-057-2553) MS35000-1; 6TN, 12V (6140-00-057-2554) MS35000-3 ..... TM 9-6140-200-14

A-7. TECHNICAL MANUALS - CONTINUED

Operator's Manual for Radio Sets AN/VRC-12 (5820-00-223-7412), AN/VRC-43 (5820-00-223-7415), AN/VRC-44 (5820-00-223-7417), AN VRC-45 (5820-00-223-7418), AN/VRC-46 (5820-00-223-7433, AN/VRC-47 (5820-00-223-7434), AN/VRC-48 (5820-00-223-7435), and AN/VRC-49 (5820-00-223-7437); (Used Without Intercom Systems) [EE150-JA-OP1-101-E154; to 31R2-2VRC-191] ..... TM 11-5820-401-10-1
Operator's and Organizational Maintenance Manual: Radio Sets, AN/VRC-53 (5820-00-223-7467), AN/VRC-64 (5820-00-223-7475), AN/GRC-125 (5820-00-223-7411), and AN/GRC-160 (5820-00-223-7473) and Amplifier-Power Supply Groups, OA-3633/GRC and OA-3633A/GRC (5820-00-973-3383) ..... TM 11-5820-498-12
Organizational Maintenance Repair Parts and Special Tools List for Radio Sets, AN/VRC-53 (5820-00-223-7467, AN/VRC-64 (5820-00-223-7475), AN/VRC-125 (5820-00-223-7411), AN/GRC-160 (5820-00-223-7473) and Amplifier, Power Supply Groups, OA-3633/GRC and OA-3633A/GRC (Parts List for OA-3633/GRC and OA-3633A/GRC (5820-00-973-3383) Only) ..... TM 11-5820-498-20P
Operator's Manual for Radio Set AN/VRC-87, SINGARS, ... TM 11-5820-890-10-3
Hand Receipt Manual Covering End Items/Components of End Item (COEI), Basic Issue Items (BII), and Additional Authorization List (AAL) for SINGARS Radio AN/VRC-87 ..... TM 11-5820-890-10-HR
Organizational Maintenance Manual: Night Vision Goggles AN/PVS-5 and AN/PVS-5A (5855-00-150-1820) ..... TM 11-5855-238-20
Organizational, Direct Support, and General Support Maintenance Manual, Including Repair Parts and Special Tools Lists (Including Depot Maintenance Repair Parts and Special Tools), Night Vision Goggles AN/PVS-5 and AN/PVS-5A (5855-00-150-1820) ..... TM 11-5855-238-24&P
Operator's, Organizational, Direct Support, and General Support Maintenance Manual, Multimeter, Digital AN/PSM-45 (6625-01-139-2512) ..... TM 11-6625-3052-14
Army Equipment Data Sheets: Chemical Defense Equipment (Reprinted with Basic INCL-1) ..... TM 43-0001-26-1
Painting Instructions for Field Use ..... TM 43-0139
Transportability Guidance, Armored Combat Earthmover (ACE), M9 (2350-00-808-7100) ..... TM 55-2350-262-14
Cooling Systems: Tactical Vehicles ..... TM 750-254

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

A-8. OTHER PUBLICATIONS

Army Medical Department Expendable/Durable Items ..... CTA 8-100
Expendable/Durable Items (Except Medical, Class V, Repair Parts, and Heraldic Items) ..... CTA 50-970
Catalog of Audiovisual Productions, Army Productions, Volume 1 (PA) DOD5040.2-C-1
Vehicular Radio Sets and Authorized Instructions ..... SB 11-131-2

APPENDIX B
SPECIAL TOOLS, TMDE, AND SUPPORT EQUIPMENT

SCOPE

Repair parts, special tools, and support equipment are issued for maintaining the vehicle. Tools and equipment should not be used for purposes other than those prescribed. When not in use, they should be properly stowed.

COMMON TOOLS AND EQUIPMENT

Standard and commonly used tools and equipment that have general application to this material are authorized for issue by tables of allowances and modified tables of organization and equipment. Refer to the tables applicable to your unit for common tools and equipment.

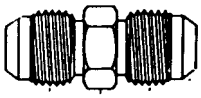
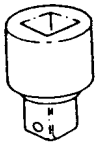
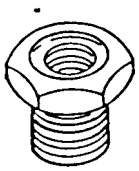
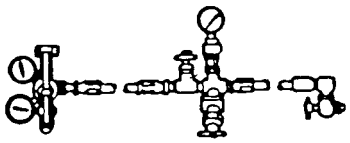
SPECIAL TOOLS, TMDE, AND SUPPORT EQUIPMENT

Special tools and equipment necessary to perform the maintenance described in this manual are listed for your information. Special tools and support equipment are listed in TM 5-2350-262-24P, which is the authority for requisitioning replacement parts.

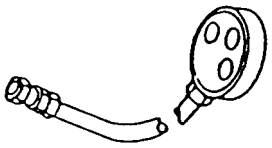
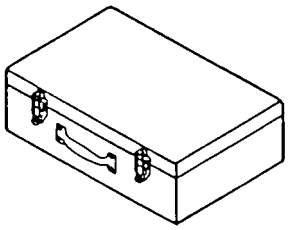
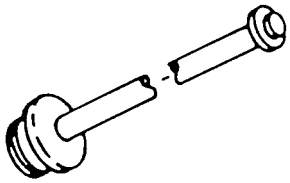
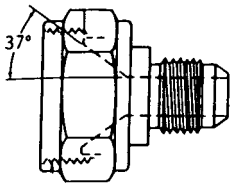
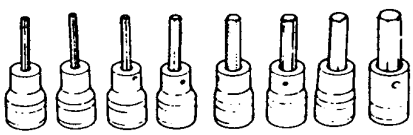
REPAIR PARTS

Repair parts are issued for the replacement of parts that have become worn, broken, or otherwise unserviceable. Repair parts are listed in TM 5-2350-262-24P, which is the authority for requisitioning replacements.

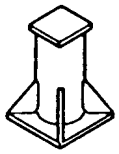
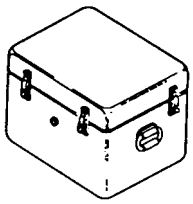
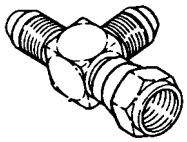
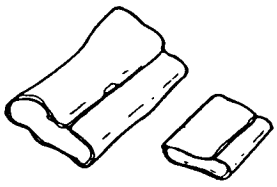
APPENDIX B
SPECIAL TOOLS, TMDE, AND SUPPORT EQUIPMENT - CONTINUED

ITEM	NUMBER	USE
 ADAPTER	2027-12-12S	For hydraulic troubleshooting
 ADAPTER, SOCKET WRENCH	5120-00-240-8702 (GAX-1)	For use with crowfoot wrenches
 BUSHING	4730-00-580-7417 (2081-8-4S)	For hydraulic troubleshooting
 BUSHING, PIPE	4730-00-873-0110 (C3109X6X2)	To adapt gauge, 4940-00-595-5720 to charging device, 4933-01-046-7109
 CHARGING DEVICE	4940-01-046-7109 (12252157)	For charging accumulators

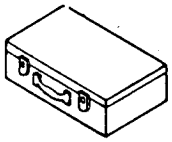
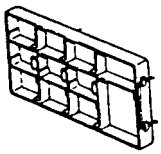
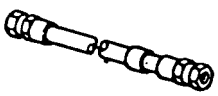
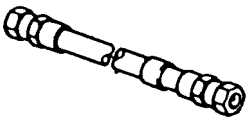
APPENDIX B
SPECIAL TOOLS, TMDE, AND SUPPORT EQUIPMENT - CONTINUED

ITEM	NUMBER	USE
 HYDRAULIC TESTER (GAUGE)	4940-00-595-5720 (GS-5)	For checking pressures
 PARTS KIT	2590-01-216-8646 (5705562)	For troubleshooting hydraulic system
 PLUG, HYDRAULIC TANK	5120-01-222-7934 (12355501)	To plug hydraulic tank outlet to prevent drainage when hydraulic lines are disconnected
 REDUCER	4700-00-675-9216 (221501-12-8S)	For hydraulic troubleshooting
 SOCKET SET, SOCKET WRENCH	5120-01-195-0640 (208fa)	To tighten screws on track wear plate and compensating pump compensator screws

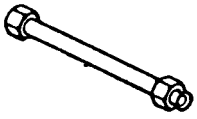
APPENDIX B
SPECIAL TOOLS, TMDE, AND SUPPORT EQUIPMENT - CONTINUED

ITEM	NUMBER	USE
 STAND, VEHICLE	2590-01-228-5802 (12355345)	To support hull during maintenance
 STE/ICE-R	4910-001-222-6589 (2389409)	For hydraulic electrical and engine troubleshooting
 TEE	4730-00-738-7558 (203102-12-12S)	For hydraulic troubleshooting
 WRENCH SET, OPEN END	5120-01-301-5783 (5705565)	To disconnect and connect various oil lines
 WRENCH SET, CROWFOOT	5120-01-302-4387 (5705566)	To disconnect and connect miscellaneous hydraulic lines

APPENDIX C
SPECIAL TOOLS, HYDRAULIC
TROUBLESHOOTING PARTS KIT 5705562

ITEM	NUMBER	ITEM	NUMBER
 STORAGE BOX	2540-01-298-3975 (12367609)	 ACCESSORIES DRAWER	25400-01-326-8178 (1236707)
 KIT DECAL	7690-01-413-3020 (12367608)	 ADAPTER	4730-00-441-8700 (MS51500A8-4)
 ADAPTER	4730-00-800-7570 (MS51503A4)	 ADAPTER	4730-01-183-7167 (2242-8-8S)
 PIPE BUSHING	4730-00-729-4930 (2081-8-2S)	 TUBE CAP 5/8 OD	4730-00-542-5911 (MS51532B10)
 TUBE CAP 3/4 OD	4730-00-647-3311 (MS51532B12)	 TUBE CAP 1/4 OD	4730-01-044-0878 (MS51532B4)
 TUBE CAP 3/8 OD	4730-00-540-1525 (MS51532B6)	 TUBE CAP 1/2 OD	4730-00-625-2212 (MS551532B8)
 HOSE ASSEMBLY 1/4 ID	4720-01-246-0992 (12355351)	 HOSE ASSEMBLY 1/2 ID	4720-01-252-8425 (12355352)
 NIPPLE 5/8 OD	4730-00-855-4799 (MS51519B10S)	 NIPPLE 1/4 OD	4730-01-079-1986 (MS51519A4)

APPENDIX C
SPECIAL TOOLS, HYDRAULIC
TROUBLESHOOTING PARTS KIT 5705562 - CONTINUED

ITEM	NUMBER	ITEM	NUMBER
 NIPPLE 1/2 OD	4730-01-329-4994 (MS51519A8)	 TUBE NUT 3/8 OD	4730-00-203-3831 (C5105X6)
 PLUG 5/8 OD	5365-01-249-9707 (MS51518B10)	 PLUG 3/4 OD	4730-01-203-6941 (MS51518B12)
 PLUG 1/4 OD	4730-01-021-3850 (MS51518B4)	 PLUG 3/8 OD	5365-01-251-2034 (MS51518B6)
 PLUG 1/2 OD	4730-01-070-9214 (MS51518B8)	 REDUCER 3/4 X 3/8	4730-00-805-5094 (MS51534A6-4)
 REDUCER 5/8 X 1/2	4730-00-676-3075 (MS51534A8-4)	 REDUCER 3/8 X 1/4	4730-00-706-8711 (MS51523A8)
 REDUCER 1/2 X 1/4	4730-00-676-3075 (MS51534A8-4)	 TUBE TEE	4730-00-074-0713 (MS551532B8)
 COUPLING 1/2 OD	4730-01-270-47650 (12355351)	 CHECK VALVE	4820-00-045-7415 (MS24593-8)
 GLOBE VALVE	4820-00-513-5471 (12355353)	 ADAPTER	4730-01-305-5796 (4-4F6BX-S)

APPENDIX D
TORQUE VALUE GUIDE FOR HYDRAULIC FITTINGS

WARNING

Do not use table for assembly of NPT fittings. Failure to comply may result in damage to equipment.

Size	Torque in Pound-Inches	Torque in Pound-Feet
-2 (5/16-24 Thread)	40-50	3-4
-3 (3/8-24 Thread)	90-100	7-8
-4 (7/16-20 Thread)	135-150	11-12
-5 (1/2-20 Thread)	180-200	15-16
-6 (9/16-18 Thread)	270-300	22-25
-8 (3/4-16 Thread	450-500	37-41
-10 (7/8-14 Thread)	650-700	54-58
-12 (1 1/6-12 Thread)	900-1000	75-83
-14 (1 3/16-12 Thread)	1050-1200	87-100
-16 (1 5/16-12 Thread)	1200-1400	100-116
-20 (1 5/8-12 Thread)	1900-2100	158-175
-24 (1 7/8-12 Thread)	2700-3000	225-250
-32 (2 1/2-12 Thread)	4000-4500	333-375

Note 1. Torquing requirements are extracted from MIL-F-18866D, Table III.

Note 2. Torque to be used on hose fittings, tube fittings, straight thread fittings, and SAE/AN ports.

APPENDIX E
SCHEMATIC DIAGRAMS

SCOPE

This appendix identifies the following schematic for the M9 ACE:

INDEX

This alphabetical index covers tasks in TM 5-2350-262-20-1,TM 5-2350-262-20-2, and TM 5-2350-262-20-3.

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INDEX - Continued

INDEX - Continued

INDEX - Continued

INDEX - Continued

INDEX - Continued

By Order of the Secretary of the Army:

DENNIS J. REIMER
General, United States Army
Chief of Staff

Official:

JOEL B. HUDSON
Administrative Assistant to the
Secretary of the Army
03033

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BE EXACT. . .PIN-POINT WHERE IT IS

PAGE NO.	PARA-GRAPH	FIGURE NO.	TABLE NO.
3-193		2	
3-227			

IN THIS SPACE TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT:

Step No. 1 says to connect LH 4 SPNSN Unit-8 hose from where to what? It is also not identified.

Procedure is continued from another page, but cap is not removed - add step to procedure.

PRINTED NAME, GRADE OR TITLE, AND TELEPHONE NUMBERS	SIGN HERE:
Doe, John, CPL 755-1313	*CPL John Doe*

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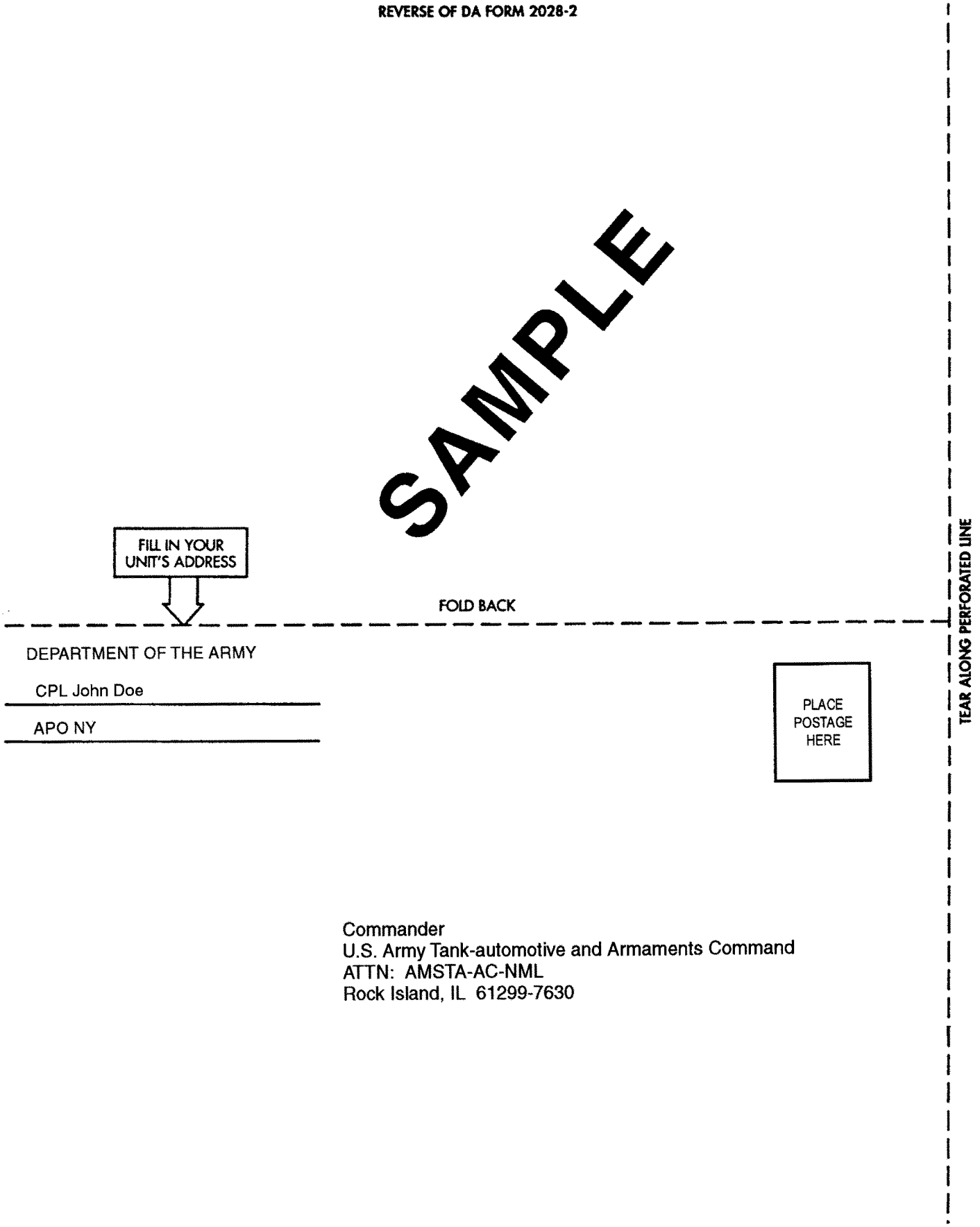

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TM 5-2350-262-20-3.	3 JAN 97	M9 Unit Maintenance Manual

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PAGE NO.	PARA-GRAPH	FIGURE NO.	TABLE NO.

IN THIS SPACE TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT:

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TM 5-2350-262-20-3.	3 JAN 97	M9 Unit Maintenance Manual

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PAGE NO.	PARA-GRAPH	FIGURE NO.	TABLE NO.

IN THIS SPACE TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT:

PRINTED NAME, GRADE OR TITLE, AND TELEPHONE NUMBERS

SIGN HERE:

DA FORM 1 JUL 79 2028-2

PREVIOUS EDITIONS ARE OBSOLETE.

P.S.—IF YOUR OUTFIT WANTS TO KNOW ABOUT YOUR RECOMMENDATION MAKE A CARBON COPY OF THIS AND GIVE IT TO YOUR HEADQUARTERS.

REVERSE OF DA FORM 2028-2

FILL IN YOUR UNIT'S ADDRESS

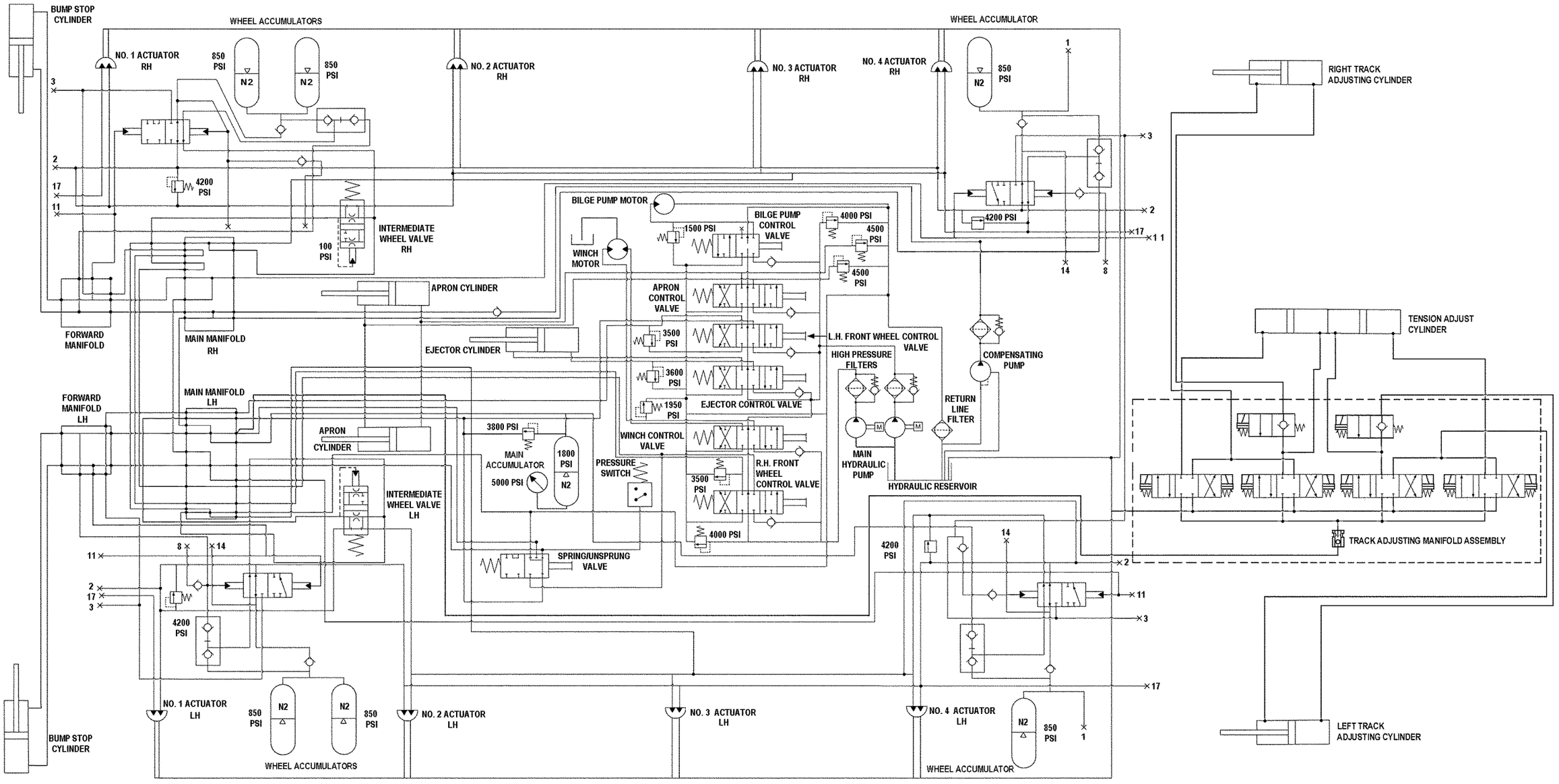
FOLD BACK

DEPARTMENT OF THE ARMY

PLACE POSTAGE HERE

TEAR ALONG PERFORATED LINE

Commander
U.S. Army Tank-automotive and Armaments Command
ATTN: AMSTA-AC-NML
Rock Island, IL 61299-7630



HYDRAULIC SCHEMATIC

THE METRIC SYSTEM AND EQUIVALENTS

LINEAR MEASURE
1 Centimeter = 10 Millimeters = 0.01 Meters = 0.3937 Inches
1 Meter = 100 Centimeters = 1,000 Millimeters = 39.37 Inches
1 Kilometer = 1,000 Meters = 0.621 Miles

WEIGHTS
1 Gram = 0.001 Kilograms = 1,000 Milligrams = 0.035 Ounces
1 Kilogram = 1,000 Grams = 2.2 Lb
1 Metric Ton = 1,000 Kilograms = 1 Megagram = 1.1 Short Tons

LIQUID MEASURE
1 Milliliter = 0.001 Liters = 0.0338 Fluid Ounces
1 Lilter = 1,000 Millimeters = 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 = 1,000 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 Per Square 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
Square Centimeters	Square Inches	0.155
Square Meters	Square Feet	10.764
Square Meters	Square Yards	1.196
Square Kilometers	Square Miles	0.386
Square 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 Square Inch	0.145
Kilometers Per Liter	Miles Per Gallon	2.354
Kilometers Per Hour	Miles Per Hour	0.621