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Form No. 102547

Operating Instructions for:

014-051E	CAS-10280	HT200
4221	CAS-10283	HT200P
4222	D-01074AA	MEL-10005
4223	D-01075AA	WF-10054
4224	D-01169AA	Y94A
ACTP-1008	HT75	Y95
ACTP-1009	HT75P	Y96A
		Y97

## IN-LINE HYDRAULIC FLOW TESTER

The 75 GPM (300l/min.) and 200 GPM (750 l/min.) inline hydraulic flow testers are compact, self-contained, portable instruments for testing hydraulic systems in the shop or field. To simplify identification of the testers in this instruction sheet, the two versions are identified by their English (GPM) flow capacities. Individual components are identified in Figure 3.

### SAFETY PRECAUTIONS

#### WARNING

- Before operating the pump, all hose connections must be tightened with the proper tools. Do not overtighten. Connections should only be tightened securely and leak-free. Overtightening can cause premature thread failure or can cause high pressure fittings to split at pressures lower than their rated capacities.
- Should a hydraulic hose ever rupture, burst, or need to be disconnected, immediately shut off the pump. Never attempt to grasp a leaking pressurized hose with your hands. The force of the escaping hydraulic fluid could cause serious injury.
- Do not subject the hose to potential hazard such as fire, sharp surfaces, heavy impact or extreme heat or cold. Do not allow the hose to kink, twist, curl or bend so tightly that the oil flow within the hose is blocked or reduced. Periodically inspect the hose for wear because any of these conditions can damage the hose and result in personal injury.
- Do not use the hose to move attached equipment. Stress may damage the hose and cause personal injury.
- Hose material and coupler seals must be compatible with the hydraulic fluid used. Hoses also must not come in contact with corrosive materials such as creosote-impregnated objects and some paints. Consult the manufacturer before painting a hose. Never paint the couplers. Hose deterioration due to corrosive materials may result in personal injury.

### SET-UP

#### Battery Installation

**IMPORTANT:** If the tester is being operated on auxiliary power (not batteries), leave batteries in proper place and connected or insulate the battery contacts (both sides) to prevent shorting. The testers are provided with three nine-volt transistorized batteries that **must** be installed before operation. See Figure 1.

**75 GPM Tester:** Remove the four screws holding the battery panel on the underside of the tester. Remove the battery panel. Insert the batteries into the spring clips and fasten the battery contacts. See Figure 1.

**200 GPM Tester:** The battery panel is located to the right of the meter panel. Remove the two screws, and lift the panel from the case. Insert the batteries into the spring clips and fasten the battery contacts. See Figure 2.

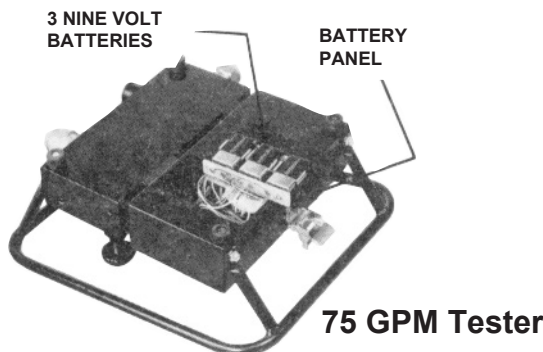
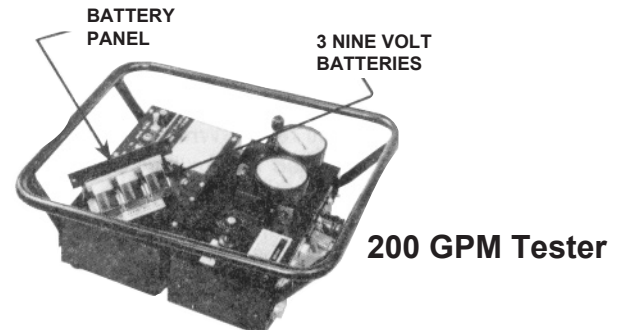


Figure 1



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Issue Date: Rev. 8-20-14

## Fittings

**75 GPM Tester:** The inlet and outlet ports (shown in Figure 2) are designed for SAE straight o-ring union adapters, 1-1/16-12 male thread by 3/4 NPSM female straight union. When the tester is not being used, always insert the port plugs to protect the unit from damage or contamination.

**200 GPM Tester:** The inlet and outlet ports (shown in Figure 2) are designed for SAE Standard 1 1/2 inch, 4-bolt split flange fittings. Flange bolts must be 1/2-13 UNC by 1 1/2 inch long SAE Grade 5 with spring lockwashers, torqued at 55/65 ft. lbs. When the tester is not being used, always assemble the cover plates to protect the tester from damage or contamination.

## Hoses

1. Connect the pressure hose from the pump or pressure line of the system to the tester INLET port.
2. Connect the return hose to the tester OUTLET port. **NOTE: If the hoses are connected wrong, the tester gives flow readings but the pressure control valve does not function. No damage to the unit occurs.**

## TESTER CONNECTION PORTS

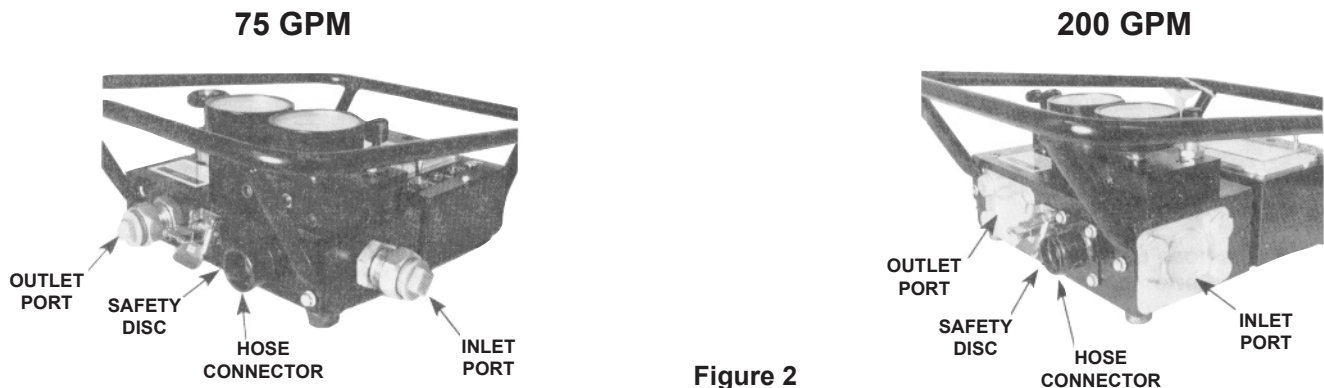


Figure 2

## Operating Controls

Both testers have similar operating controls, but the location of the controls may differ. Some controls are not available if the tester does not have the phototach accessory. Refer to Figure 3.

**ON/OFF:** Pull this switch to turn the tester ON; push to turn the tester OFF. When the tester is not being used, the switch must be in the OFF position.

**METER:** The meter displays flow and temperature readings, depending on the setting of the FLOW/RPM switch.

**IMPORTANT:** In an extremely dry environment, a static charge can build up on the meter face causing a false meter reading. To detect this condition, touch the meter face on either side of the needle. If the needle changes its position, discharge the meter face by wiping with a damp cloth.

**FUSE:** The fuse protects the meter from sudden power surges when using auxiliary power.

**LOW BATT:** This indicator light alerts the operator that battery power is low, which can result in false readings.

**FLOW/RPM:** Set this switch to read either flow or revolutions per minute on the meter.

**HI/LOW RANGE:** Use this switch to set the range for the flow meter. Refer to the following chart:

	GPM	l/min	
<b>75 GPM Tester</b>	3-15	10-60	Low Scale
	15-75	50-300	High Scale
<b>200 GPM Tester</b>	5-40	20-150	Low Scale
	25-200	100-750	High Scale

**TEMP:** When this switch is toggled ON, fluid temperature is displayed on the meter temperature scale in both degrees Fahrenheit and Celsius. When the toggle switch is released, the meter returns to its previous mode.

**AUX PWR:** Insert optional auxiliary power sources into this jack.

**CAL:** This jack is provided for calibration instrument input.

**ON/OFF LIGHT:** This is a two position toggle switch for the tachometer.

**INPUT:** Insert the optional phototach electrical cable into this jack.

**RPM SELECTOR:** This is a multi-position switch that allows selection of six different tachometer ratios.

**PRESSURE CONTROL VALVE:** The pressure control valve regulates system pressure by restricting the flow to develop back pressure in the system. The control valve maintains the pressure setting during and after change in flow. To increase pressure, turn the control valve clockwise; to reduce pressure, turn the control valve counterclockwise. **IMPORTANT:** Before testing the system, open the pressure control valve all the way by turning the valve counterclockwise. Increase pressure **SLOWLY**.

**NOTE:**

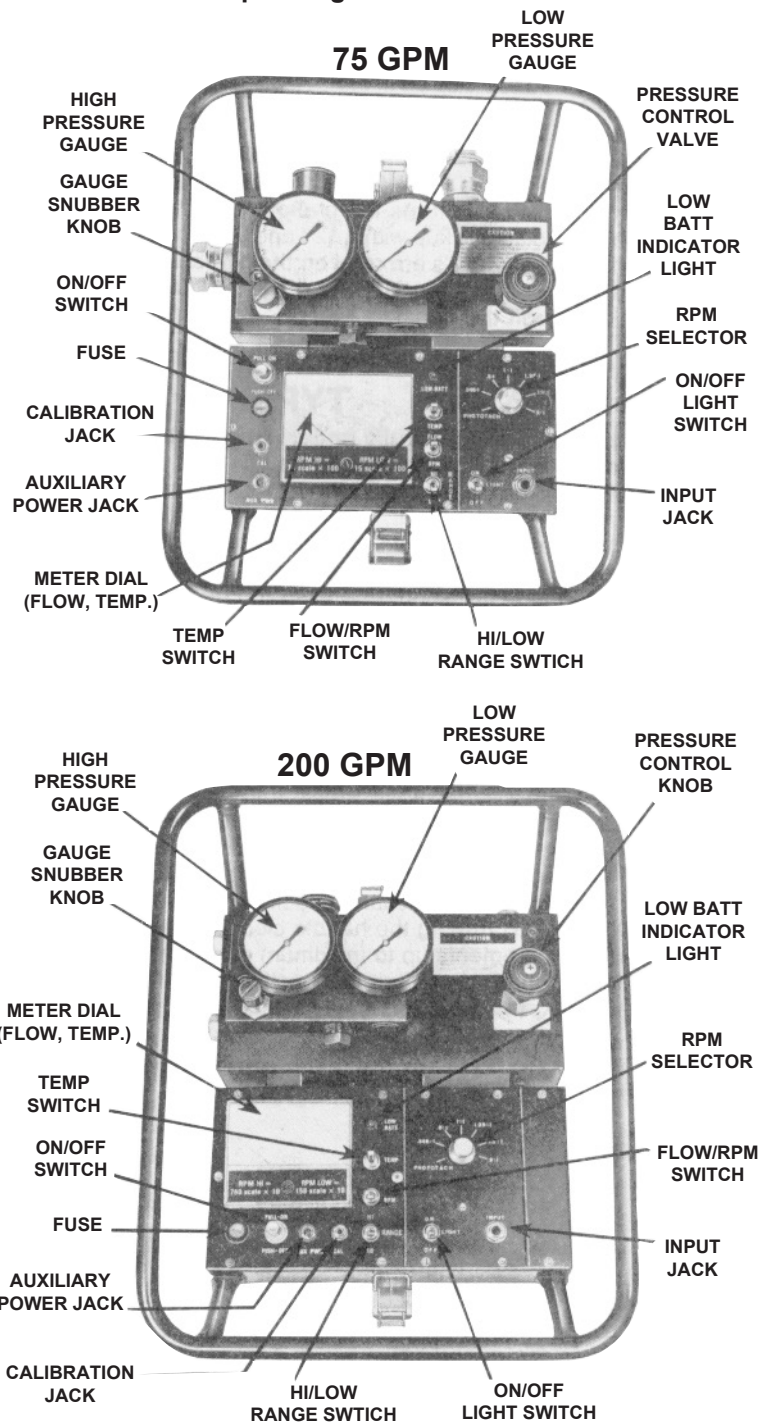
- Oil the pressure control valve regularly.
- Each time the flow tester is connected to a hydraulic system for testing, the unit may be noisy the first time pressure is increased with the control valve. The noise is caused by air trapped in the internal parts of the control valve. To flush the air out, increase pressure to approximately 2000 PSI and then back to 0 PSI.
- It may be difficult to adjust the pressure control valve when testing in a closed center system or under high back pressure. Even when the control valve stem threads are lubricated with a good grade of oil, the valve becomes difficult to adjust by hand at approximately 1100 PSI back pressure and almost impossible to adjust by hand at approximately 1600 PSI back pressure.

**PRESSURE GAUGES:** Pressure readings are taken from the high pressure (0-6000 PSI, 0-410 BAR) and low pressure (0-600 PSI, 0-41 BAR) gauges on the flow block. As pressure increases, the low pressure gauge gives readings up to 500 PSI (35 BAR) and then cuts out, switching to the high pressure gauge.

**GAUGE SNUBBER KNOB:** A gauge snubber knob is located at the lower left corner of the gauge block. To dampen (slow) the movement (pulsation) in the gauge needles, turn the snubber knob clockwise at a low pressure setting. **NOTE: When the gauges are dampened, the reaction time of the needles will be slow. Build pressure very slowly to allow time for the needles to react.**

**OVERLOAD PROTECTION SAFETY DISC:** A safety disc located at the back of the tester (See Figure 2) protects the flow tester from extreme pressure. If pressure exceeds the ranges listed in the following chart, the disc ruptures, relieving oil and reducing pressure before damage can occur. A hose connector surrounds the disc to act as a shield against oil spray should the disc rupture. For more protection, a 1 1/4 inch I.D. hose should be inserted into the connector and clamped in place. This hose should be long enough to direct oil back to the reservoir or another container.

Figure 3  
Operating Controls



Safety Disc Burst Range	
<b>75 GPM</b>	5510/6093 PSI @ 60° F 5250/5835 PSI @ 160° F
<b>200 GPM</b>	5220/6790 PSI @ 105° F 6000/7000 PSI @ 72° F

## PHOTOTACH ACCESSORY

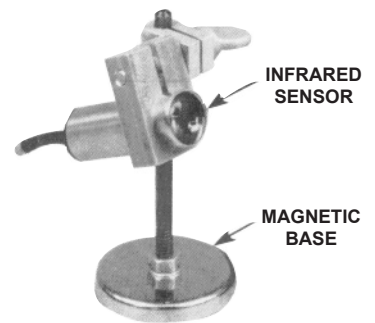
Use the phototach accessory to read an object's RPM on the high or low flow scale (depending on the position of the HI/LOW RANGE selector switch). **NOTE: The phototach accessory must be used with an auxiliary power source because the phototach requires more power than the batteries can supply.**



### WARNING

To help prevent personal injury,

- Stay clear of all moving mechanical parts while using the tachometer.
  - The object to be tested must be motionless while applying the light-reflective material.
1. Apply a light-reflective material (such as a small piece of white tape) to the object.
  2. Insert the electrical cable of the phototach assembly into the INPUT jack on the tester panel.
  3. Set the FLOW/RPM toggle switch to RPM. To turn the phototach pickup bulb ON, set the ON/OFF LIGHT switch to the ON position for incandescent sensor and OFF for infrared sensor.
  4. Hold the phototach pickup perpendicular to, and within 12 inches of the reflective material on the rotating object. Read the flow meter on the tester.



## ACCESSORIES

(For more complete descriptions, request a current catalog from your distributor.)

### Calibrator

Use the calibrator to check meter readings on the 75 or 200 GPM hydraulic tester at any time the tester is not connected into a hydraulic system. Insert the cable from the calibrator into the CAL jack on the tester. Under normal conditions, the meters should be calibrated about every six months to a year. However, the calibrator should be used whenever flow readings seem suspect or when the tester has been repaired.



### Auxiliary Power Cord

This power cord is convenient for field use as a back-up if the internal battery power drops too low to operate the tester. The unit draws power from a 12 or 24 volt vehicle battery and automatically overrides tester internal battery function without harming good batteries. The Auxiliary Power Cord can be used with any tester.

**NOTE: Do not use this cord on positive (+) ground systems.**  
**Use only internal batteries or auxiliary power converter.**

### Auxiliary Power Converter

By using this power converter, any tester can be operated from any 120 volt, 60 cycle outlet.



## TYPICAL TESTING PROCEDURES

The following test procedures show how the tester can be used to locate a problem in the hydraulic system by checking the efficiency of each component. In this example, the system consists of a reservoir, pump, relief valve, directional control valve and double-acting cylinder.

**EXAMPLE OF A PROBLEM:** The cylinder's piston moves out at almost normal speed under no load, but gradually slows down as the load increases.

1. Check all hoses and connections for leakage before beginning any test.

### TESTING THE PUMP (See Figure 4)

**IMPORTANT:** Do not allow the pressure reading on the tester gauges to exceed the maximum relief valve pressure of the pump. Serious damage to the pump can result because the system relief valve no longer protects the pump.

1. Shut the pump OFF, and place the control valve in the neutral position. Disconnect the line between the pump and relief valve.
2. Connect line "A" (outlet from the tester) to the pressure port of the relief valve.
3. Connect line "B" (inlet of the tester) to the discharge port of the pump.
4. Open the pressure control valve on the tester all the way by turning the knob counterclockwise several turns. Turn the dampener knob counterclockwise several turns.
5. Start the pump and set engine RPM for the rated speed of the pump (equipment manufacturer's specific RPM level for a given rate of flow).

**Symptom:** If the action of the gauges is erratic, and severe pulsations occur even after the dampener knob has been adjusted, cavitation could be a problem. **Solution:** Check the oil level, filter and suction line.

6. Induce a load on the pump with the tester pressure control valve at approximately 50% of the maximum system pressure. Slowly increase pressure by turning the control valve clockwise while watching the pressure gauges on the tester.
7. When normal operating temperature is reached (per manufacturer's specification), open the tester pressure control valve. Record the volume at low pressure displayed on the flow meter.
8. Increase pressure by turning the handle clockwise, maintaining required engine RPM at all pressure check points. Record the volume at various increments up to maximum pressure.
9. Open the pressure control valve and shut off the pump. Compare the test result against the manufacturer's specifications.

**Symptom:** Low flow readings. **Solution:** Repair pump, suction line or filter. If the flow readings are OK, test the relief valve next.

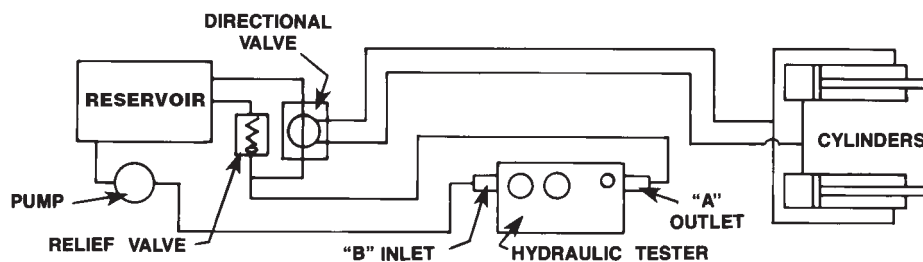


Figure 4

## TESTING THE RELIEF VALVE (See Figure 5)

**IMPORTANT:** When testing the system relief valve, refer to the valve manufacturer's manual to determine the relief valve setting.

1. Shut the pump OFF, and place the control valve in the neutral position. Disconnect the line between the relief valve and the directional control valve.
2. Connect the line "A" (outlet from the tester) to the pressure port of the directional control valve.
3. Connect the line "B" (inlet of the tester) to the discharge line after the relief valve.
4. Open the pressure control valve on the tester all the way by turning the knob counterclockwise several turns. Turn the dampener knob counterclockwise several turns.
5. Start the pump and set engine RPM for the rated speed of the pump (equipment manufacturer's specific RPM level for a given rate of flow).
6. When normal operating temperature is reached (per manufacturer's specification), maintain the required engine RPM at all pressure check points.
7. Turn the tester pressure control valve clockwise until the relief valve setting has been reached. (The relief valve setting is easily recognized. The pressure gauge needle will fluctuate, indicating unloading or bypassing of oil over the relief valve. The GPM indicator will show a decrease in flow through the tester indicating that the balance of pump output is going through the relief valve.) Record volume and pressure at various increments to maximum pressure.

**Symptom:** The pressure at which the flow falls to 0 (the relief pressure) is lower than maximum operating pressure.

**Solution:** Adjust the relief valve.

**Symptom:** The flow reading on the tester is not the same as the pump. **Solution:** The relief valve is leaking and must be repaired. If the problem is not in the relief valve, test the directional valve next.

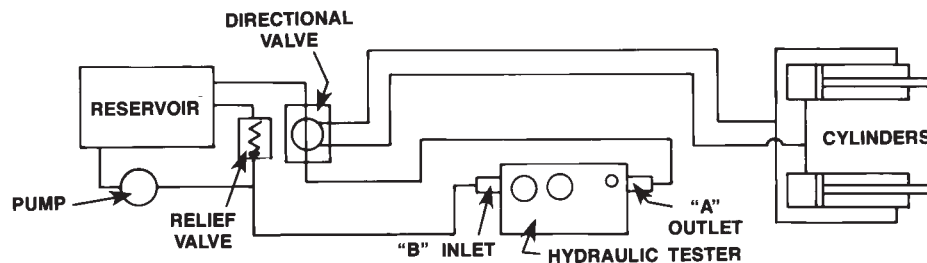


Figure 5

## TESTING THE DIRECTIONAL VALVE (See Figure 6)

1. Shut the pump OFF, and place the control valve in the neutral position. Disconnect the line between the cylinder and the tee. Plug the port on the tee.
2. Connect line "A" (outlet from the tester) to reservoir.
3. Connect line "B" (inlet of the tester) to the outlet port on the directional control valve.
4. Open the pressure control valve on the tester all the way by turning the knob counterclockwise several turns. Turn the dampener knob counterclockwise several turns.
5. Start the pump and set engine RPM for the rated speed of the pump (equipment manufacturer's specific RPM level for a given rate of flow).
6. When normal operating temperature is reached (per manufacturer's specification), shift the directional valve from neutral to the advance (lift) position. This directs the oil to line "B" (the inlet port of the tester).
7. Turn the tester pressure control valve clockwise until the relief valve setting has been reached. Record volume and pressure at various increments to maximum pressure, maintaining required engine RPM at all pressure check points.
8. Repeat this test procedure on the other side of the directional control valve.

**Symptom:** Full volume and pressure can not be reached. **Solution:** Repair or replace the directional control valve. If full rated volume at full pressure is recorded, the problem must be in the cylinder.

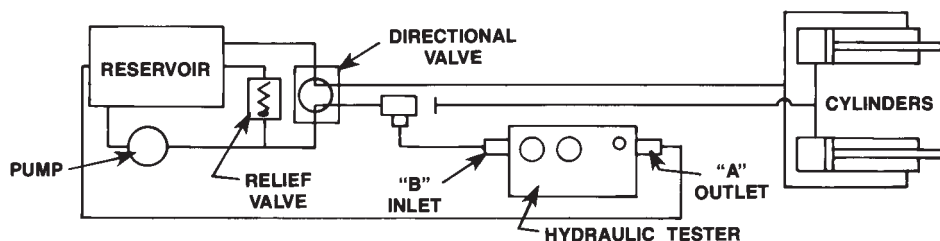


Figure 6

**TESTING WITH A TEE CONNECTION** (See Figure 7)

The following procedure illustrates a method of testing overall circuit performance.

1. Shut the pump OFF, and place the control valve in the neutral position.
2. Connect line "A" (outlet from the tester) to reservoir.
3. Connect line "B" (inlet of the tester) to a tee connection in the circuit between the control valve and cylinder.
4. Open the pressure control valve on the tester all the way by turning the knob counterclockwise several turns. Turn the dampener knob counterclockwise several turns.
5. Start the pump and set engine RPM for the rated speed of the pump (equipment manufacturer's specific RPM level for a given rate of flow).
6. When normal operating temperature is reached (per manufacturer's specification), shift the directional valve from neutral to the cylinder extend position.
7. Partially close the tester pressure control valve to allow the cylinders to extend and "dead-end." **NOTE: If design characteristics of the cylinder make a "dead-end" inadvisable, a greater-than-capacity load can be put on the unit to simulate dead-ending. Oil will flow to the reservoir either through the tester or through leaks in components of the circuit.**
8. Record the flow at no load. Increase the load on the circuit by slowly closing the tester pressure control valve. Record the flow at various pressure check points, maintaining required engine RPM. The difference in readings indicates oil lost because of leaks somewhere in the circuits.

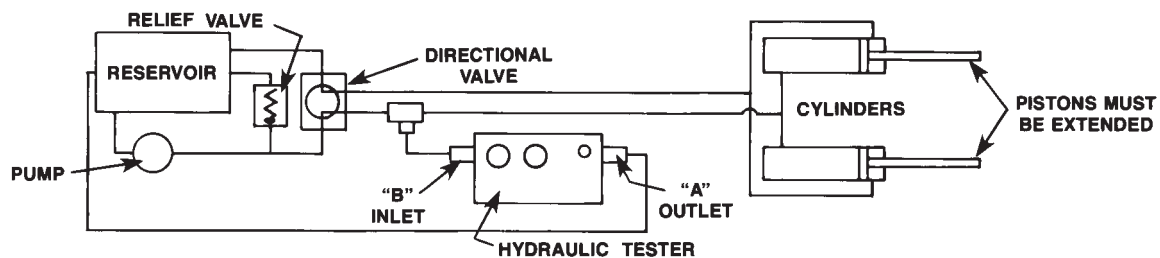


Figure 7