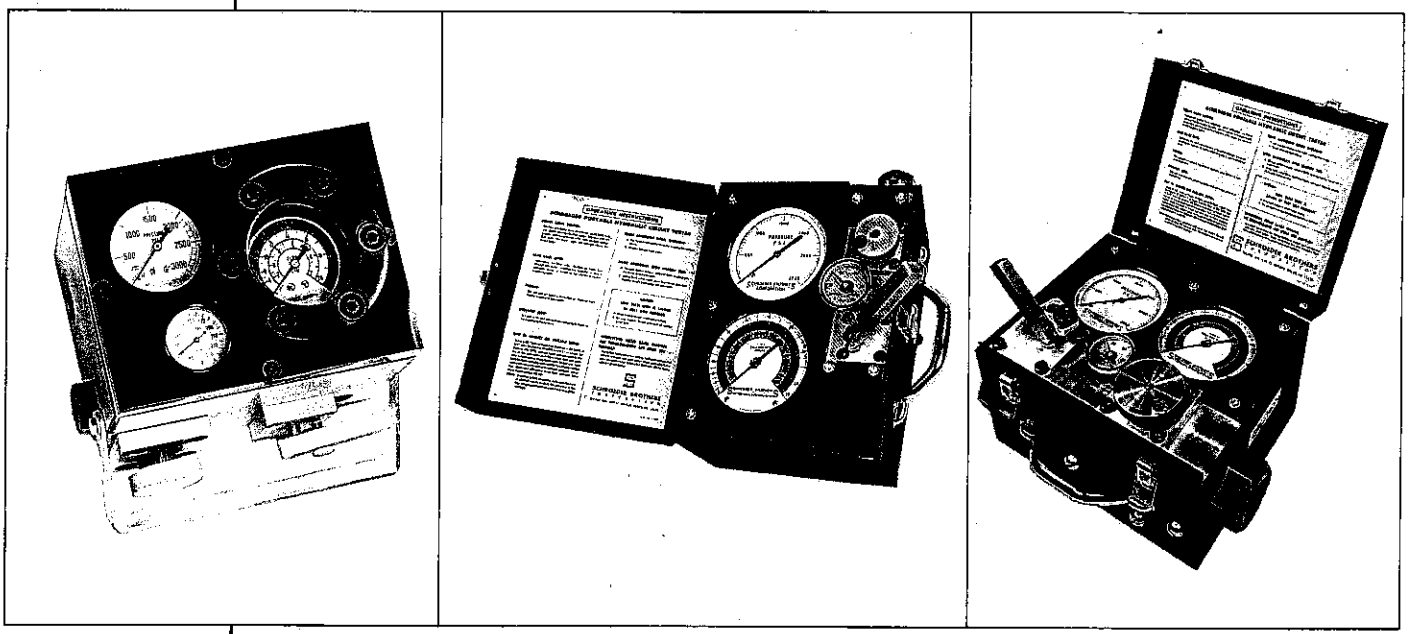
Here's how

to troubleshoot and check efficiency of your HYDRAULIC POWER SYSTEM



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SCHROEDER PORTABLE HYDRAULIC CIRCUIT TESTERS

INSTRUCTION MANUAL NO. L101A

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REPAIRS

Schroeder Industries maintains a service at McKees Rocks, PA for complete repair and test of portable testers. Units requiring repair should be tagged with the RGA (Return Goods Authorization) number, adequately packaged, and shipped prepaid to the address below.

Schroeder INDUSTRIES

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GENERAL INFORMATION ABOUT HYDRAULIC POWER SYSTEMS

Hydraulic power is recognized as an efficient method of delivering horsepower to accomplish a given job by means of pumping a specified amount of fluid through a confined system within prescribed pressure limits. If the amount of flow — or the pressure is unknowingly decreased, the amount of horsepower delivered to the working unit will be reduced and the system will not do the job it was designed to do.

When a hydraulic power system is not operating properly, the trouble usually is traced to one of several points in the system. The pump that propels the fluid may be slipping because of worn parts; pressure may be reduced because of a worn or improperly set spring; fluid may be leaking around the control valves; or the fluid may be leaking past the cylinder packing or the parts of the motor back into the fluid supply reservoir without having done its share of useful work.

Since hydraulic systems are confined, it is difficult to identify the particular component in the system that is not working properly, unless one measures the flow, pressure and temperature of the fluid at given points in the system in order to isolate the mal-functioning unit. If a relatively simple way to check the fluid is not used, the system must be dismantled so that each unit in the system can be checked for worn parts or faulty packing. This visual form of inspection can be costly, not only from the standpoint of maintenance time but also from the loss of time that the power system is not operating in its job capacity.

GENERAL INFORMATION ABOUT SCHROEDER HYDRAULIC CIRCUIT TESTERS

Schroeder Portable Hydraulic Circuit Testers are lightweight units that can be used to check or trouble-shoot a hydraulic power system on the job or in the maintenance shop. By simply connecting a Tester into the system circuit, a visual, accurate means is provided to determine the efficiency of the system. Quick preventive maintenance tests can be performed and hydraulic systems can be checked before and after re-building. Simple test procedures then permit the identification of each and every component in the system that is not doing its job properly. With the Schroeder Tester, you can:

1. Measure the volume (gallons per minute) and temperature (°F.) of the fluid passing through the system on the Tester's Flow and Temperature Gauges;

2. Apply pressure to the system and its components by restricting the fluid passing through the Tester with the manually-operated Tester Load Valve. The resultant pressure is then read on the Tester Pressure Gauge.

THIS DATA THEN PERMITS YOU TO:

3. Determine the amount of horsepower the system is delivering.

4. Determine which component in the system, if any, that is not working properly.

TESTING A HYDRAULIC SYSTEM WITH A SCHROEDER TESTER CONSISTS OF:

1. First, determining how much fluid in gallons per minute is circulating through the system at no load, then. . .

2. By applying a desired pressure with the Tester Load Valve on each and every component, find out how much of the fluid is not available for power because it may be;

A. Flowing at a lower rate because of slippage inside the pump due to worn parts.

B. Flowing over pressure relief valves due to worn seats, weak or improperly set springs.

C. Leaking past valve spools and seats back into the fluid supply reservoir without having reached the working cylinder or motor.

D. Leaking past the cylinder packing or motor parts directly into the return line without having produced any useful work.

ALWAYS CHECK YOUR HYDRAULIC SYSTEM BEFORE CONNECTING THE TESTER

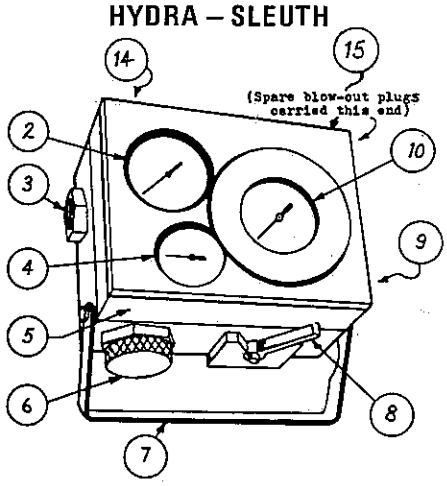
1. Determine and record the gallons-per-minute rating of the pump in the system (Refer to the system manufacturer's service manual, name plate, etc.)
2. Determine and record the proper relief valve setting of the system (See manual, name plate, etc.)

   CAUTION: WHEN APPLYING PRESSURE WITH THE TESTER LOAD VALVE, NEVER EXCEED THE RATED PRESSURE OF THE SYSTEM. ALWAYS KEEP LOAD VALVE PRESSURE WITHIN THE PRESSURE GAUGE LIMITS OF THE TESTER.
3. Before conducting tests, always operate the system long enough to bring the fluid up to normal operating temperature.
4. If gasoline or diesel engine is involved, keep engine RPM constant during all phases of the test program.

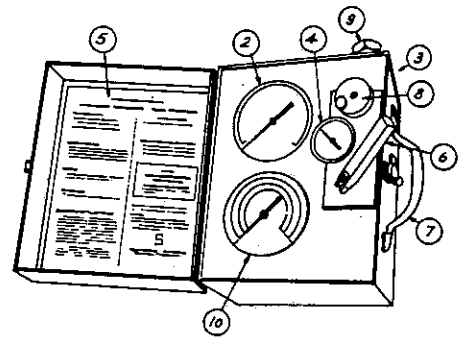
OPERATING INSTRUCTIONS FOR TESTING WITH SCHROEDER TESTERS

(Unless noted otherwise, Schroeder Testers are designed for use with petroleum hydraulic fluids.)

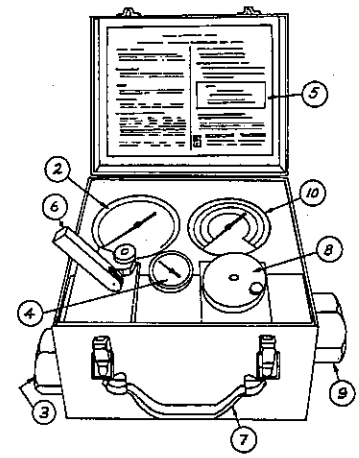
MODELS HS and PHS
HYDRA – SLEUTH



MODEL PHT-100



MODEL PHT-150



(2) - PRESSURE GAUGE - Reads directly in pounds per square inch (PSI)

(3) - INLET PORT.

(4) - TEMPERATURE GAUGE - Reads directly in degrees F. & indicates temperature of oil passing through tester.

(5) - OPERATING INSTRUCTIONS.

(6) - LOAD VALVE - Flow restrictor or shut-off valve.

(7) - CARRYING HANDLE.

(8) - VOLUME RANGE SELECTOR.

(9) - OUTLET PORT (Located on side of HS & PHS (Hydra-Sleuth) series as indicated.

(10) - FLOW GAUGE - Reads gallons per minute on selected scale.

(14) - UPSTREAM SAFETY BLOWOUT PLUG (HS - Hydra-Sleuth - series only) — vents to atmosphere when pressure exceeds the maximum reading on pressure gauge.

(15) - DOWNSTREAM BLOWOUT PLUG - vents to atmosphere when Hydra-Sleuth is hooked-up backwards. (On PHT - vents to inside of tester.)

FIGURE 1

A. GENERAL INFORMATION ABOUT CONNECTING YOUR SCHROEDER TESTER TO THE HYDRAULIC SYSTEM TO BE TESTED.

Schroeder Hydraulic Circuit Testers may be used to test individual components (pump, valve, etc.) of a system one at a time or can be connected into the system at one location to test each component, or for troubleshooting the entire circuit. Both types of tests and connections are described in this manual.

PUMP TEST

B. HOW TO CONNECT THE SCHROEDER TESTER TO THE SYSTEM FOR TESTING THE PUMP. (First step in testing individual components of the fluid supply system).

1. Refer to Figures 1 and 3.

2. Disconnect the circuit at the discharge port (A) of the pump.

3. Using a ½-inch or larger hose for flows up to 30 GPM, ¾-inch hose or larger for flows up to 75 GPM, a 1-inch or larger hose for flows up to 100 GPM, or a 1-¼ inch hose or larger for flows up to 150 GPM. . . . connect the Tester INLET PORT (3) to the discharge port of the pump at (A).

4. Using a hose the same size or larger than the piping or hose used in the system, connect the TESTER OUTLET PORT - or Return Port - (9) directly to the reservoir fill port or any low pressure return line to the reservoir. (NOTE: Maximum allowable back pressure from Portable Tester OUTLET PORT (9) is 100 POUNDS PER SQUARE INCH on the PHT models and 1000 POUNDS PER SQUARE INCH on the HS & PHS models. Excessive return pressures will cause flow gauge to read inaccurately and may damage the Flow Gauges.

5. Make sure all connections are secure.

C. MAKE THESE SCHROEDER TESTER ADJUSTMENTS BEFORE TESTING.

1. Depending on the flow (GPM) to be checked, move the VOLUME RANGE SELECTOR (8) to the proper scale setting. It is good practice to start the test on the highest scale. (Always read the scale on the FLOW GAUGE (10) that corresponds to the setting of the VOLUME RANGE SELECTOR.

2. Fully open the LOAD VALVE (6).

D. MAKE THESE SCHROEDER TESTER ADJUSTMENTS AFTER STARTING THE TEST.

1. Change the VOLUME RANGE SELECTOR (8) if gallons-per-minute reading can be made on the lower scale.

2. To develop test pressures during the test:

On the HS and PHS Hydra-Sleuth Series—slowly turn LOAD VALVE (6) to the right.

On the PHT Series, slowly depress the LOAD VALVE (6).

E.&F. IF YOU ARE USING ONE OF THE ORIGINAL SCHROEDER TESTER MODELS PT-50 or PT-100:

These Testers were equipped with manual gauge snubbers. If you have one of these models, first close the snubbers by turning them all the way to the right and then open slightly by turning ½ turn to the left.

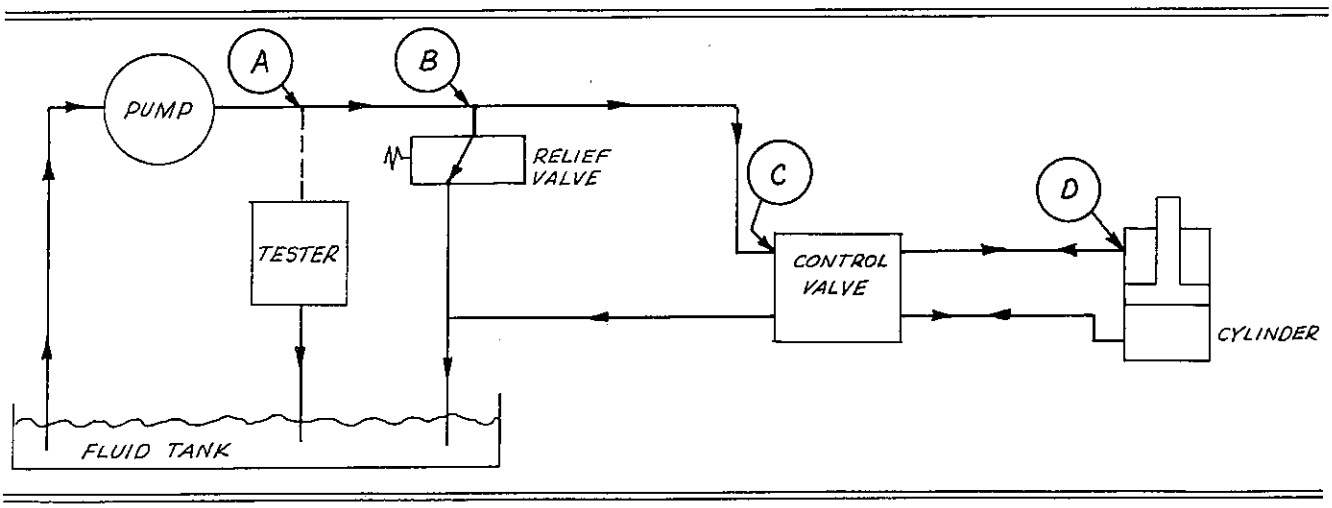


FIGURE 3 — A simple schematic showing connecting points for Tester for use in the pump and other component tests.

G. TESTING THE HYDRAULIC PUMP

1. Connect the Tester as described previously in Step B for the Tester in use.

2. Complete pre-test adjustments (Step C) for the tester you are using.

3. Put the hydraulic system into operation. If gasoline or diesel engine is involved, maintain constant RPM. Bring oil up to operating temperature before proceeding.

4. Drive the pump at desired RPM - DO NOT APPLY LOAD PRESSURE WITH TESTER AT THIS TIME.

5. Read the FLOW GAUGE (10) and record reading of gallons per minute at no load.

6. Slowly apply load through operating the Tester LOAD VALVE (6) until desired working pressure is reached.

7. Now read FLOW GAUGE (10) and record new reading of gallons per minute at working pressure and same RPM as used in Step 4.

8. Release load pressure on system by returning LOAD VALVE (6) to fully-opened position.

9. Check the difference between recorded readings of Points 5 and 7 above. The difference in readings will show the efficiency of the pump by indicating how much flow is being delivered to the working part of the system.

10. See Figure 4 for an example of how to interpret any difference in readings that you may have.

11. Disconnect Tester INLET PORT hose from the hydraulic circuit.

12. Reconnect pump discharge port into the circuit of the system.

RELIEF VALVE TEST

H. HOW TO TEST RELIEF VALVE IN THE CIRCUIT

1. Refer to C, Figure 3, and Figure 1.

2. Disconnect the circuit line at the inlet port of the control valve. Figure 3 (C).

3. Connect the hose from the Tester INLET PORT (3) to the circuit line from the Relief Valve.

4. REPEAT THE TEST PROCEDURE OF STEP G. The pump and relief valve will be tested together.

5. Any reduction in GPM readings from those taken originally during the pump test will represent flow loss through the relief valve.

NOTE: With the relief valve in the circuit now under test, you may completely load the system by closing the LOAD VALVE (6) of the Tester in order to find the setting of the relief valve. Simply read the pressure on the PRESSURE GAUGE (2) when the GPM flow on the FLOW GAUGE (10) falls off to 0. This pressure point is the relief valve setting.

If the GPM reading at no load was:	And the GPM at desired load was:	Then the pump is:
20	19	ok
20	10	50% efficient. Working part of the system will take twice as long to complete cycle.
20	0	Completely bad. Working part of system will not function.
15	14	*OK, but there is a problem in the suction line.

FIGURE 4 — Typical example of interpreting pump flow test readings.

* On pumps driven by gasoline or diesel engines, another method of checking for suction problems is to take 2 GPM readings. Take one reading at 50% of operating RPM and one reading at operating RPM. If the GPM reading does not approximately double, look for CAVITATION PROBLEMS.

6. Refer to Figure 5 on how to interpret readings.

7. Disconnect Tester INLET PORT hose from hydraulic circuit.

8. Reconnect relief valve discharge port into the circuit.

CONTROL VALVE TEST

I. HOW TO TEST THE CONTROL VALVE IN THE CIRCUIT

1. Refer to D, Figure 3, and Figures 1 or 2.

2. Disconnect the circuit line at the inlet port of the cylinder (D).

3. Connect the hose from the INLET PORT (3) of the Tester to the circuit line from the control valve.

4. Place the control valve to direct oil to Point D (thru Tester).

5. REPEAT THE TEST PROCEDURE OF STEP G. The pump, relief valve and control valve will now be tested together.

6. Any further reduction in GPM readings from those taken in previous tests will represent flow loss through the control valve. When Tester is connected at point D you are also measuring the oil delivered to the cylinder or motor for actual work.

7. Refer to Figure 5 on how to interpret readings.

When test was conducted at . . .	GPM reading at no load was . . .	GPM reading at 1400 PSI operating pressure was . . .	GPM at 1500 PSI relief valve setting was . . .
Point A or B Figure 3	20	18	Not taken
Point C, Fig. 3	20	12	0
Point D, Fig. 3	20	10	0

From these readings we know . . .

a. The pump is slipping 2 gallons per minute at 1400 PSI
b. The relief valve is passing 6 gallons per minute before it reaches its 1500 PSI setting
c. The 4-way control valve is leaking 2 gallons per minute at 1400 PSI
d. The total supply system loss is 10 gallons per minute.

Conclusions, therefore, are:

System is 50% efficient; cylinder will take twice as long as it should to complete cycle; replacement of relief valve is indicated at once; 4-way control valve should be changed at next convenient time; pump is okay.

FIGURE 5 — An example of how to interpret readings when checking each component in the system.

HOW TO TEST AND TROUBLESHOOT THE ENTIRE CIRCUIT FROM ONE POINT.

THE "TEE" TEST

This test consists of installing a "tee" at one point in the pump discharge line and connecting the Tester. From this installation at one point, the overall efficiency of the system can be checked, the setting of the relief valve verified, individual components checked for efficiency or you can troubleshoot an entire circuit to quickly determine where the fault is.

J. HOW TO INSTALL THE SCHROEDER TESTER FOR THE "TEE" TEST.

1. Refer to Figure 6 and Figure 1.

2. A proper-sized "tee" can be installed permanently in the discharge line of the pump at A.

3. Using a ½-inch or larger hose for flows up to 30 gallons per minute, a ¾-inch or larger hose for flows up to 60 gallons per minute, or a 1-inch or larger hose for flows up to 100 gallons per minute, or a 1-¼ inch or larger hose for flows up to 150 gallons per minute, connect the Tester INLET PORT (3) to the "tee".

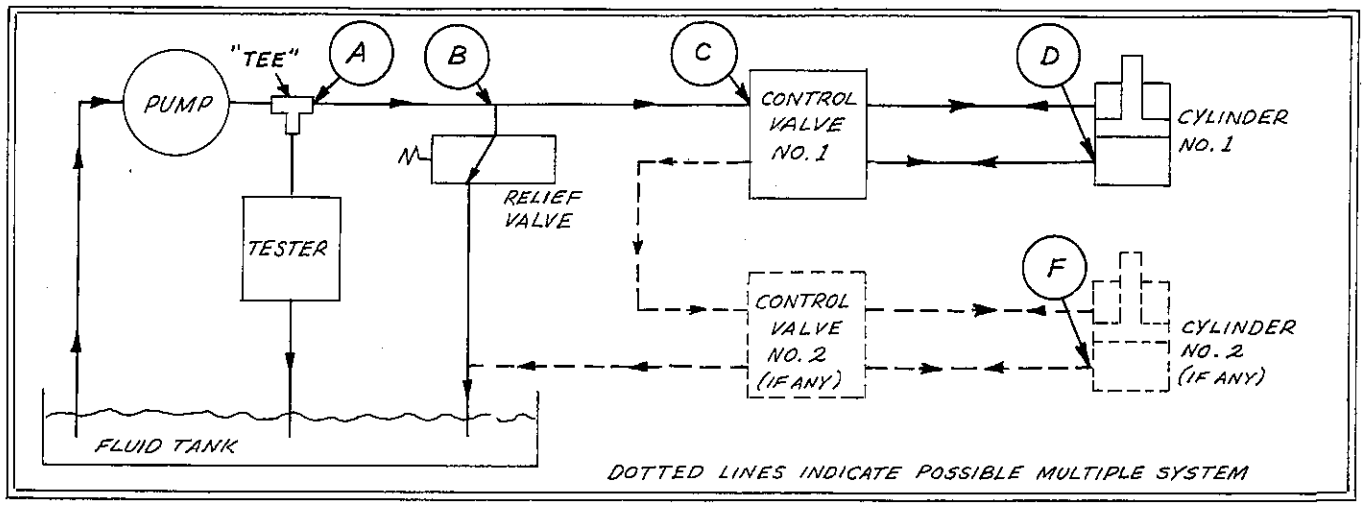


FIGURE 6 — Simple schematic showing the test points for the "TEE" test.

4. Using a hose the same size or larger than the piping or hose used in the system, connect the Tester OUTLET PORT (9) directly to the reservoir fill port or any low pressure return line into the reservoir.

5. Make sure all connections are secure.

6. Make the pre-test and during-test adjustments outlined previously in Steps C and D for the Portable Tester.

K. USING THE "TEE" TEST TO CHECK OVERALL EFFICIENCY OF THE SYSTEM, AND TO CHECK RELIEF VALVE SETTING.

1. Refer to Figure 6 and Figure 1.

2. Put hydraulic system into operation (engine at constant RPM; bring oil up to operating temperature).

3. Position the spool of the 4-way valve to direct oil flow to cylinder port D.

4. Operate the LOAD VALVE (6) of the Tester just enough to run the piston out to the end of the cylinder,- (oil now flows to the fluid tank through the Tester or through passages that are supposed to be closed.)

5. Release the test pressure by returning the Tester LOAD VALVE (6) to its full-open position. (All the oil is now flowing through the Tester at no load).

6. Record GPM reading of FLOW GAUGE (10) at the no load pressure and operating temperature.

7. Operate Tester LOAD VALVE (6) to produce pressure amounting to about 90% of relief valve setting.

8. Record GPM reading on Tester FLOW GAUGE (10). The difference in readings at no load and 90% of relief valve setting will indicate any component leakage or system inefficiency at high operating pressure.

9. Increase pressure with Tester LOAD VALVE (6). When GPM reading on FLOW GAUGE (10) drops to zero, record pressure shown on PRESSURE GAUGE (2). This pressure is the relief valve setting.

L. USING THE "TEE" TEST TO TROUBLESHOOT THE ENTIRE CIRCUIT (SIMPLE OR MULTIPLE) TO DETERMINE WHERE LEAKAGE IS TAKING PLACE.

1. Install Tester in circuit according to Step. J.

2. Observe all pre-test and during-test adjustments outlined previously in Steps C and D.

3. Refer to Figure 6 and Figure 1.

4. Place hydraulic system in operation (engine RPM constant; bring oil up to operating temperature).

5. Shift Control Valve No. 1 to operating position.

6. Operate Tester LOAD VALVE (6) just enough to run the piston out to the end of the cylinder. Observe pressure on PRESSURE GAUGE (2) while piston is moving; excessive pressure indicates a mechanical bind.

7. When piston is fully extended, return Tester LOAD VALVE (6) to full open position.

8. Read GPM on Tester FLOW GAUGE (10) at no load pressure and operating temperature and record.

9. Operate Tester LOAD VALVE (6) to bring system up to operating pressure.

10. Read GPM on Tester FLOW GAUGE (10) at operating pressure and operating temperature and record.

11. Operate LOAD VALVE (6) until needle on FLOW GAUGE (10) drops to O. Read and record pressure on PRESSURE GAUGE (2) at this point. This is the relief valve setting.

12. Return Tester LOAD VALVE (6) to full open position.

13. Shift Control Valve No. 1 to neutral position. Shift Control Valve No. 2 to operating position and repeat Steps 6, 7, 8, 9, 10 and 11 of this test.

14. Return all controls to pre-test positions.

ANALYZE YOUR READINGS AT THIS POINT

In previous steps 7, 8, 9, 10 and 11 you have determined the combined leakage of all the components in the circuit except Control Valve No. 2 and Cylinder No. 2.

In Step 13, you have determined the combined leakage of all circuit components except Control Valve No. 1 and Cylinder No. 1.

Compare the two sets of readings, and . . .

a. If both sets of readings show good circuit gallonage and pressures according to system specifications, then the whole system is sound (THIS IS CERTAIN).

b. If both sets of readings show poor gallonage under pressure you have pump or relief valve trouble. (THIS IS PROBABLE since these components are common to both sets of readings).

c. If one circuit shows good gallonage under pressure and the other poor gallonage under pressure, the circuit with the poor reading has a faulty valve or cylinder, or both. (THIS IS CERTAIN). You may refer to Figures 4 or 5 for a better understanding of the GPM readings.

IF THE CIRCUITS HAVE FAULTS, THEN PROCEED IN THIS MANNER:

1. If readings to both sets of the system's control valves and cylinders are faulty;

a. Refer to Figure 6 and Figure 1.

b. Disconnect circuit line at point C and block the line.

c. With hydraulic pump in operation, read GPM on Tester FLOW GAUGE (10) at no load and record.

d. Operate Tester LOAD VALVE (6) and apply operating pressure.

e. Read GPM on Tester FLOW GAUGE (10) at operating pressure and record.

f. If readings are the same as previous, you are certain that the trouble is in the pump or relief valve.

g. Return controls to pre-test positions.

h. Reconnect circuit at Point C.

NOTE: IF PUMP AND RELIEF VALVE ARE COMBINED INTO ONE UNIT ON YOUR SYSTEM, NO FURTHER TEST CAN BE MADE. PUMP-RELIEF VALVE UNIT SHOULD BE REMOVED FOR SERVICE OR REPLACED. IF PUMP AND RELIEF ARE SEPARATE, PROCEED . . .

i. Disconnect circuit line to relief valve at Point B and block line.

j. With hydraulic pump in operation, read GPM on Tester FLOW GAUGE (10) at no load and record.

k. Operate Tester LOAD VALVE (6) and apply operating pressure.

l. Read GPM on Tester FLOW GAUGE (10) at operating pressure and record.

m. If GPM readings are similar at no load and at operating pressure, the pump is okay but the relief valve is faulty because the low gallonage reading from the previous test has to be flowing past the relief valve.

n. If GPM readings show same loss at no load and operating pressure as before, the relief valve is okay but the pump is faulty. Refer to Figure 4 for pump reading interpretations.

o. Return controls to pre-test positions.

p. Reconnect circuit line at Point B.

2. If original GPM readings indicate that only one set of valves and cylinders is faulty;

a. Refer to Figure 6.

b. Disconnect the circuit line going to the cylinder at Point D (or Point F) and block the line.

c. With hydraulic system in operation, read GPM on Tester FLOW GAUGE (10) and record.

d. Operate Tester LOAD VALVE (6) and apply operating pressure.

e. Read GPM on FLOW GAUGE (10) and record.

f. If GPM readings at both no load and at operating pressures show a loss similar to the original test, a faulty control valve is indicated. (CERTAIN)

g. If GPM readings at both no load and at operating pressures show okay (close to the rated system GPM and pressures) then the cylinder is faulty. The GPM loss previously recorded has to be by-passing the cylinder packings.

h. Reconnect system circuit and return all controls to pre-test positions.

IF YOUR TESTER SHOWS "STRANGE" READINGS:			
READING	TESTER MODEL	CAUSE	REMEDY
(1) Flow Gauge Needle moves wildly and erratically	All Testers	Air leak in pump or pump or pump suction line. Not enough oil in reservoir tank.	Check all pump and pump line connections and seals Check and fill reservoir tank.
(2) Flow gauge needle starts moving in wrong direction.	PT Models	Upstream Flow Gauge Snubber is closed or nearly closed.	Open snubber slightly by turning to the left about 1/8 turn.
(3) Flow Gauge Needle shows below correct pump flow at both noload and load or high pressure reading.	All Testers	Suction problem: restriction in the suction lines; clogged suction strainer; low oil level.	Clean lines and strainer or add oil.
(4) Pressure does not register when load valve is depressed, and flow gauge is below zero.	PHT Models	Inlet and outlet connections reversed.	Connect inlet and outlet ports correctly.
(5) Flow Gauge "freezes" in any position.	PHT Models	Excessive back pressure. Incorrect orifice.	Limit return line to 100 PSI. Choose proper flow gauge scale.
(6) Oil flows out of Safety Blow-Out Plug on side of Tester.	HS & PHS Models	Safety blow-out disc has been ruptured by excessive pressure.	Replace disc - See Field Repairs.
(7) Flow Gauge Needle persistently reads backwards (drops below zero GPM).	HS & PHS Models	Direction of flow thru Tester is reversed.	Interchange inlet and outlet connections or change position of directional control valve. Flow gauge may be damaged - See Field Repairs.
(8) Flow Gauge Needle swishes quickly back and forth during start up of system or at throwing of a valve.	HS & PHS Models	High flows and pressure surges.	Check system lines for restrictions. Only in extreme cases will flow gauge be damaged. (See Field Repairs.)
(9) Temperature gauge shows higher reading when load is applied.	HS, PHS and PT Models	Applied pressure increases oil temperature.	Normal oil temperature increases approximately 7° per 1000 PSI. Will return to inlet oil temp. when load pressure is removed.
(10) Flow Gauge Needle does not return exactly to zero when Tester is subjected to extreme temperatures.	HS & PHS Models		Flow readings are still correct. If gauge does not return to 0 at room temperature (68° F), check for cause. (See Field Repairs).
(11) Not able to register pressure on pressure gauge and GPM volume drops off fast.	PT Models	Tester connected in reverse. Reverse flow check is not properly seated.	Check connections. See field repairs.
(12) Oil flows or bubbles out of lower screw on right hand side of Tester.	PT Models	Too much back pressure.	Limit Tester Return Line Pressure to 100 PSI or less.

ADDITIONAL TEST DATA

Schroeder Industries has run extensive tests on pressure drops through 1/4" gauge ports on flow control valves and relief valves (Vickers, DX-703) at both 100 F and 150 F.

The gauge ports at 50 GPM have an average drop of 165 PSI (low 155; high 170). At 35 GPM the drop is 90 PSI.

There is very little difference with temperature (orifice effect).

"Tee" tests with Schroeder Testers can be run by using 1/4" or larger gauge ports (commonly found in relief valves) as "tees" if the flow rate does not exceed 50 GPM with 1/4" port.

With this type of hookup, add the following pressures to the reading of the load gauge:

Flows up to 20 GPM add 50 PSI;
Flows up to 35 GPM add 90 PSI;
Flows up to 50 GPM add 160 PSI.

The return line from the Tester must be run directly to the tank.

Do not apply these additions to the load gauge readings when testing relief valve settings.

HOW TO FIELD TEST THE PORTABLE TESTER SERIES FOR FLOW ACCURACY

TEST REQUIREMENTS:

1. Warm oil to about 130° F.
2. Connect Tester as for any pump or "tee" test.
3. Three variables must be observed: pump speed must be constant for proper test; use load valve to get the same pressure reading for all tests; run tests quickly to get all tests with minimum temperature change (more than a few degrees change of oil temperature will disqualify results).

TEST PROCEDURE:

With oil flowing through the tester:

a. Pick out the two GPM scales on which you can get the clearest reading;

b. Begin Step No. 1 on lowest of the above scales (Example: With Flow readable on green and orange scale, start on green scale).

STEP NO. 1: Take flow and pressure readings on lower of two GPM scales.

STEP NO. 2: Take flow and pressure readings on next higher GPM scales.

STEP NO. 3: Repeat Step No. 1. This is a double check and should read the same as Step No. 1. If readings are not the same, check for variations of RPM, temperature or use of load valve and PSI readings.

RESULTS:

When the three variables of RPM, temperature and load remain constant, flow readings which vary more than 5% (total 10%) indicate damage or maladjustment of the flow gauge.

How to Make Field Repairs to the Portable Hydraulic Testers

IF VOLUME NEEDLE WILL NOT ZERO OR READS INACCURATELY AND RETURNS TO DIFFERENT POSITIONS EACH TIME: Disconnect fluid lines at Flow Gauge. If Flow Gauge zeroes after removal, then trouble lies in the gauge protectors (plug up small orifices). If it does not zero, then it is the gauge itself. Examine Bourdon tubes. If undamaged, reset pointer.

IF YOUR READINGS ARE INCONSISTENT, AND DON'T SEEM TO MAKE SENSE: Look into the reservoir port of the Tester with a light to see if the orifice in the volume range selector cylinder is centered. A loose selector handle set-screw may mean that the cylinder is not correctly positioned when the handle is engaged. Correct by tightening set-screw into hole in shaft.

IF TEMPERATURE GAUGE DOES NOT SHOW APPROXIMATE ROOM TEMPERATURE WHEN TESTER IS COOL AND NOT IN USE: Remove temperature gauge and replace it with a new unit.

IF PRESSURE GAUGE IS NOT ACCURATE: Remove gauge and examine Bourdon tube and hairspring for defects. If okay, then reset pointer to zero. If damaged, a new gauge must be installed.

HOW TO FIELD-SERVICE YOUR HYDRA-SLEUTH TESTER

The Schroeder Hydra-Sleuth Tester is a rugged instrument which seldom needs repair. It is constructed for easy maintenance and all repairs can be made in the field.

IF BLOW-OUT PLUGS ARE RUPTURED: It has been caused by excessive pressure or hooking up backwards. Install new disc or cap and disc assembly (2 spares—for upstream and downstream—are carried in the side of Sleuth.) Torque should be limited to approximately 150 inch-pounds when installing.

IF FLOW GAUGE DOES NOT READ CORRECTLY AND DOES NOT RETURN TO ZERO: Check whether orifice holes are in center of outlet port. Correct with set-screw on orifice handle. Remove plexiglass cover and see if pointer on flow gauge is tight. If not, center in zero zone and tighten. If it is tight and orifice holes are centered, replace the flow gauge. Also examine the rubber bag in flow gauge housing; replace if broken. To reassemble the Hydra-Sleuth, proceed as follows:

Install flow gauge housing and "O" rings around the flow gauge. Make sure the flow gauge pointer is below the upper edge of the flow gauge housing to prevent binding of the pointer against the plexiglass cover. Also make sure that the rubber bag is not pinched at the bottom or top of the assembly .Pour clean glycerin into the housing until it is almost full. Replace the plexiglass cover and metal ring. Torque should be limited to approximately 150 inch-pounds when tightening cover and ring bolts. Turn Hydra-Sleuth upside down. Remove wax seal from 1/8" "O" ring port. Wax seal is used to prevent tampering. Remove port plug and pour glycerin into cavity until it is full. Tilt the Tester to let all the air escape. Tighten the bottom plug. Turn the Tester over. You should see an air bubble, less than ½ inch in diameter. It takes some patience to work the air up through the glycerin. If it is bigger, add more glycerin through "O" ring port. It takes 5½ fluid ounces of glycerin to fill cavity. Glycerin is preferred because it is completely clear. Clear machine oil can be used in place of glycerin.

IF TEMPERATURE GAUGE DOES NOT RECORD TEMPERATURE CHANGES: Install new temperature gauge. Thread deep enough into bushing to clear plexiglass cover.

IF PRESSURE GAUGE READS INCORRECTLY: Install new pressure gauge. Thread deep enough into block so that the gauge clears the plexiglass cover.

IF THERE IS LEAKAGE: Tighten gauges or plugs to eliminate leakage. The inlet and outlet threads are straight threads with "O" rings to seal. Replace "O" rings.

IF THERE IS LOAD VALVE AND ORIFICE SELECTOR LEAKAGE: Replace faulty "O" rings.

FIELD REPLACEMENT PARTS LIST

(SHOW MODEL NUMBER AND SERIAL NUMBER ON YOUR ORDER)

PORTABLE HYDRAULIC TESTER SERIES (PHT)

QUAN.	PART NO.	DESCRIPTION
	(Orifice Selector Lever Assembly)	
1	PT-360	Knob
1	PT-208	Knob (PHT-150 only)
1	PT-230	Setscrew
	(Load Valve Lever Assembly)	
1	PT-225	Lever
1	PT-224	Roller
2	PT-227	Dowel Pin
1	PT-222	Screw
1	PT-223	Nut

QUAN.	PART NO.	DESCRIPTION
	(Pressure Gauges)	
	PT-362	3000 PSI
1	PT-465	6000 SPI Gauge Only
	PT-466	6000 PSI Gauge Assembly
		(Flow Gauges)
1	PT-370	100 GPM
1	PT-383	150 GPM
	(Temperature Gauges)	
1	HS-6	50 to 250° F.

(PLASTIC INSTRUCTION SHEET - Printed copies available without charge)

HYDRA-SLEUTH TESTER SERIES (HS & PHS)

QUAN.	PART NO.	DESCRIPTION
1	HS-3A	Plexiglass Cover
1	HS-4-3000	Pressure Gauge 3000 lbs.
1	HS-4-4000	Pressure Gauge 4000 lbs.
1	HS-4-6000	Pressure Gauge 6000 lbs.

QUAN.	PART NO.	SCALES - GPM
	(Flow Gauges)	
1	HS-104	4-20 18-60
1	HS-5-200	2-10 8-30
1	HS-152P	2-7 6-20 18-60
	(Dial Faces)	
1	HS-123	1.5-6 5-18
1	HS-125	1.5-6 7-30
1	HS-126	3-18 15-54
1	HS-129	1-3 3-9

QUAN.	PART NO.	DESCRIPTION
1	HS-6	Temperature Gauge
2	HS-101B	DOWNSTREAM Blowout Plug Assembly

(UPSTREAM Blowout plug & Rupture Disc Assem.)

QUAN.	MODEL	PART NO.
2	HS-3000	HS-8-3500
2	HS-4000	HS-8-4800
2	HS-6000	HS-108-6200

(Orifice Assemblies)

QUAN.	PART NO.	SCALES - GPM
1	HS-49D	4-20 18-60
1	HS-141	1.5-6 5-18
1	HS-142	1.5-6 7-30
1	HS-143	3-18 15-54
1	HS-144	1-3 3-9
1	HS-49C	2-10 9-30
1	HS-147 (PHS)	2-7 6-20 18-60

QUAN.	PART NO.	DESCRIPTION
1	HS-20	Flow Gauge Bushing and Capillary Tube Assembly
2	HS-51	Flow Gauge Housing "O" Ring
1	HS-95B	Flow Gauge Bag (Bladder)

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