

WCI-H10,000 & WCIS-H10,000 Coldwork Power Supplies Operations Manual





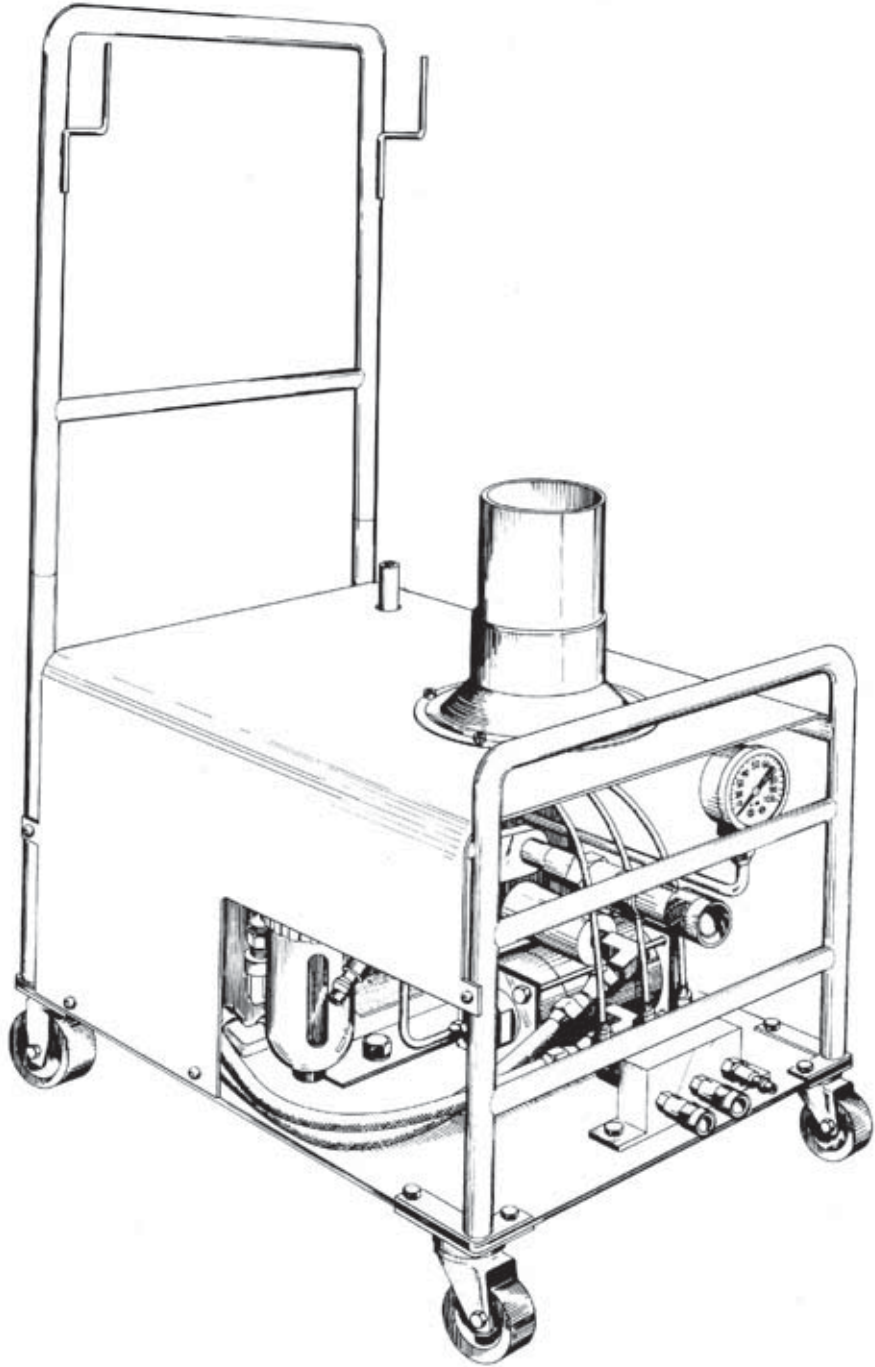
***H-Series
Coldwork Tooling
Hydraulic Power-Paks***

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Section 1—Theory

1.0 Introduction

The WCI-H Series power-paks are used to supply hydraulic power to coldwork puller guns. They use the 2.2 hp Haskel model AFD-B60 air driven intensifier piston pump. This provides 7,000 lbs hydraulic pressure. The H10000 unit adds a 1/3 HP air driven air-oil intensifier pump to produce 10,000 lbs hydraulic pressure. The H-Series features quiet operation and fast recycling. An optional Boelube automatic lubrication system can be fitted to provide mandrel lubrication when using the power-pak with the split mandrel process.

Air driven pumps offer many advantages over conventional air or electrical driven units:

- Ability to stall at any predetermined pressure and hold this fixed pressure without consuming power or generating heat.
- No heat, flame or spark risk.
- Infinitely variable cycling speed and output.
- Easy to apply automatic controls.
- No limit or adverse effect to continuous stop/start applications.
- Air drive does not require an external line lubricator thus saving on running cost and preventing oil vapor contamination of the surrounding environment.
- Reliable, easy to maintain, compact and robust.

The WCI-H7,000 and WCI-H10,000 pumps use patented seal systems to give a long working life and are capable of successfully pumping and pressurizing a wide variety of liquids.

1.1 An air driven pump consists of:

- 1.1.1 AIR DRIVE SECTION—This consists of a light weight inertia reducing piston complete with 'O' ring seal inside an epoxy filled wound fiberglass barrel. The diameter of the air piston is constant for any series of air driven pumps. When compressed air is fed into the air drive it forces the piston down on the compression stroke. The air then drives the piston back on the suction stroke (except in the case of the M series pumps which have a spring return). Air drive line lubricators are not required nor desired due to the inherent low friction characteristics of the design and pre-lubrication during assembly.
- 1.1.2 HYDRAULIC SECTION—The hydraulic piston is directly linked to the air piston and its lower portion is housed inside the hydraulic body. Its diameter determines the ratio of the pump (for any particular series) which in turn determines the outlet flow and maximum pressure capability. Its function is to induce liquid into the hydraulic body through the inlet check valve and force it out through the outlet check valve at a higher pressure.
- 1.1.3 AIR CYCLING VALVE—This consists of a pilot operated unbalanced light weight spool which channels the compressed air first to the top of the piston then to the underside causing it to reciprocate (cycle). The air piston actuates pilot valves at the top and bottom of its stroke which causes the unbalanced spool to reciprocate thus re-directing the flow of air. The air is exhausted from the pump through an exhaust muffler.
- 1.1.4 HYDRAULIC SEAL—This encircles the hydraulic piston and is one of the few wearing parts. Its function is to allow the hydraulic piston to reciprocate without letting any liquid pass into the air drive.
- 1.1.5 CHECK VALVES—These are spring loaded non-return valves that control the passage of liquid into and out of the pump. When the hydraulic piston is on the suction stroke the inlet check valve opens to the maximum, the liquid is induced into the pump while the outlet check valve is held closed by its spring. On the pressure stroke the inlet check valve is closed as the hydraulic piston pressurizes the liquid out through the outlet check valve.
- 1.1.6 The installation, operation, and maintenance of an air driven pump is simpler than the equivalent electrical pump. Service is carried out by a mechanic without having to call on the separate skills of an electrician.
- 1.1.7 Air driven pumps are more compact, sturdy and reliable. There is no metal-to-metal contact and the seal life is longer because of slower piston speeds.

Section 2—Operation

2.1 Principle of Operation

2.1.1 Haskel air driven liquid pumps work on an automatic reciprocating differential area piston principle that uses a large air-drive piston connected to a smaller area hydraulic piston to convert compressed air into hydraulic power.

2.1.2 Unlike other air driven pumps, the actual ratio is approximately 15% higher than the nominal so that the pump will still cycle when the ratio of the output hydraulic pressure to air drive pressure equals the nominal ratio.

2.1.3 For example, the WCI-H7,000 has an actual ratio of 69:1.

If air drive piston area=54 sq in (350 sq cm)
and liquid piston area=.78 sq in (5 sq cm)

then actual pump ratio=69:1

and nominal pump ratio=60:1

If air drive pressure=75 psi (5.2 bar)

the maximum outlet stall pressure will be close to $60 \times 75 = 4500$ psi (depending on friction)

If the air drive pressure is increased to 100 psi, then maximum outlet pressure will approximate 6000 psi at stall.

2.1.4 When compressed air is first applied to the pump it will cycle at its maximum speed producing maximum flow and act as a transfer pump filling the pressure receiver with liquid. The pump will then gradually start to cycle at a slower rate as the pressure in the receiver increases and offers more resistance to the reciprocating differential piston assembly, until it stops (stalls) when a balance of forces is reached (i.e., when air drive pressure \times air drive area = stall pressure \times driven hydraulic piston area).

2.1.5 The hydraulic pressure drop (hysteresis) required to cause the Haskel air driven pump to restart is extremely small due to the very low frictional resistance offered by the larger diameter air drive piston seal.

2.2 Output Horsepower Ratings

2.2.1 Horsepower ratings peak at 100 psi (7 bar) air drive pressure and are approximate. They assume ample air supply at adequate pressure at the pump. Freezing of exhaust mufflers on humid days, inadequate air drive pipe line sizes, dirty air filters, etc., can effect

the performance of any pump. Peak HP is obtained at approximately 75% of nominal ratio \times air drive pressure (i.e., a 100:1 pump being driven at 100 psi (7 bar) will produce peak power at a hydraulic output pressure of 7500 psi/517 bar ($100 \times 100 \times 0.75$).

2.3 Operating Temperature

2.3.1 This subject involves two distinct operations; the drive section, and the liquid pump section.

2.3.2 Air Drive Section—The surrounding ambient condition is normally all that needs to be considered since this will usually determine the temperature of the seals and other parts at rest, and the drive air during operation.

Standard drive sections should reliably cycle within an ambient range of approximately +25°F to 150°F. Lower temperatures will cause excessive air leakage, higher temperatures reduced seal life. (Air directly from a dedicated air compressor should be routed through extended piping or an aftercooler before entering the drive).

2.3.3 Liquid Section—Low temperatures normally have little effect on the operation of standard parts and seals. The most important consideration is the effect on the fluid, either freezing or an increase in viscosity (which can cause cavitation on the suction stroke). For reasonable seal life, high temperatures should be limited to 125-130° F.

2.4 Compatible Liquids

2.4.1 If additional oil must be added to the reservoir, use only ISO 32 high-grade hydraulic oil, (215 SUS @ 100 DEG.) Examples include Shell Tellus 32, and Chevron AW. Clean the entire area around the filler plug before adding oil to the reservoir. Then remove the filler plug and insert a clean funnel with filter. The mandrel on the puller gun must be fully extended and the air supply disconnected when adding the oil to the reservoir.

2.5 Air-drive System—Specification and Performance

2.5.1 The air drive requires a minimum pressure of 40 psi (2.72 bar) to actuate the air cycling spool valve. The maximum air drive pressure is 100 psi (6.8 bar). It is not necessary or desirable to use an air line lubricator. The air drive section of all Haskel liquid pumps is prelubricated at the time of assembly.

2.6. Preparation and Setup

2.6.1 Air Supply Hookup

- 2.6.1.1 Select and install the thread fittings which are compatible with your air supply fittings. The air supply should be 20 CFM and 100 PSI to obtain the rated hydraulic output. Air pressure should be regulated to a maximum of 125 PSI. Secure your pump fitting to the air supply.

2.6.2 Hydraulic Connection

- 2.6.2.1 Clean all the areas around the oil ports of the pump and the puller equipment. Inspect all threads and fittings for signs of wear or damage and replace as needed. Clean all hose ends, couplers and union ends. Remove the thread protectors from the hydraulic oil outlets. Connect the hose assembly to the hydraulic oil outlet and couple the hose to the puller equipment.

IMPORTANT:

Seal all external pipe connections with a high quality, nonhardening pipe sealant. Teflon tape may also be used to seal hydraulic connections, provided only one layer of tape is used. Apply the tape carefully to prevent it from being "pinched" by the coupler and broken off inside the system. Any loose pieces of tape could travel through the system and obstruct the flow of oil or cause jamming of precision-fit parts.

2.6.3 Venting the Reservoir

- 2.6.3.1 To improve oil delivery and increase useable oil capacity, vent the reservoir by removing the shipping plug from the reservoir and install the vent plug (on the opposite end of the rubber strap).

2.6.4 Priming the Pump Unit

- 2.6.4.1 If the pump unit must be primed, perform the following procedure:
- 2.6.4.2 Remove the hydraulic hose from the pump. Leave the remaining hoses connected to the puller equipment.
- 2.6.4.3 Place a small container under the female fitting on the pump unit to catch any hydraulic fluid which will be bled off during the next step.

- 2.6.4.4 Use a blunt object (i.e., steel rod, allen wrench, etc.) and depress the ball check inside the female part of the fitting on the pump unit.

Warning

Do not operate the pump unit without first depressing the ball check. High hydraulic pressure is present when the unit is turned on.

Eye protection is required during this procedure to prevent operator injury

- 2.6.4.5 Cycle the pump unit using the puller equipment.

- 2.6.4.6 When hydraulic fluid runs out of the female fitting the pump unit is primed.

- 2.6.4.7 If the pump does not respond, repeat the above procedure, repeatedly jogging the ball check in the female fitting while cycling the puller equipment.

2.7 Operation and Connection of Puller Gun

- 2.7.1 The liquid outlet pressure can be controlled quite accurately by regulating the air drive pressure. The pump will cycle rapidly initially and as it approaches an output pressure equal to the ratio times the air drive pressure, it will gradually slow down and stall.

- 2.7.2 Ensure there is no water contained in the air filter (7). If any water is in the filter, unscrew the base and drain.

- 2.7.3 Check that the fluid level in the hydraulic reservoir (13) in the back of the unit is filled to between the orange bands.

- 2.7.4 Connect a 1/2" clean air supply of 70 CFM @ 90 psi to the pump

- 2.7.5 Connect the control, supply, and puller lines from the puller (also the lube line if using the optional BoeLube unit with the Split Mandrel System) to the manifold.

- 2.7.6 BoeLube Unit (optional)

- 2.7.6.1 The optional BoeLube automatic lubrication system is provided to supply BoeLube lubricant to the nose cap of the Split Mandrel puller gun. It is important when using this process that lubricant be supplied to the mandrel, since a pre-lubricated sleeve is not used.

- 2.7.6.2 Fill the BoeLube reservoir

- 2.7.6.3 Press the prime button. This will bleed the system and fill the lubrication lines with Boelube.
- 2.7.6.4 Adjust the reservoir pressure to read no more than 20 psi.
- 2.7.6.5 The Lube Flow Adjust is factory preset to provide 1 drop of Boelube per cycle at the puller nose cap. If adjustment is necessary, loosen the set screw, turn counterclockwise to increase the flow, clockwise to lessen flow. Retighten set screw.

Section 3—Preventative Maintenance

IMPORTANT

Any repair or servicing which requires dismantling the pump must be performed in a dirt-free environment by a qualified technician.

3.1 Lubrication

- 3.1.1 No air-line oiler is needed

3.2 Bleeding Air From the System

- 3.2.1 During the initial moments of activation or after prolonged use, a significant amount of air may accumulate within the hydraulic system. This entrapped air may cause the puller equipment to respond slowly or behave in an unstable manner. To remove the air, run the system through several cycles free of any load. The puller equipment must be at a lower level than the pump to allow air to be released through the pump reservoir.

3.3 Inspecting the Fluid Level

- 3.3.1 Check the oil level in the reservoir after every 10 hours of use. The oil level should come to within 1/2" of the filler plug with the puller equipment in the start position. Drain and replenish the reservoir with an approved, high-grade hydraulic oil after every 300 hours of use.

3.4 Refilling the Reservoir

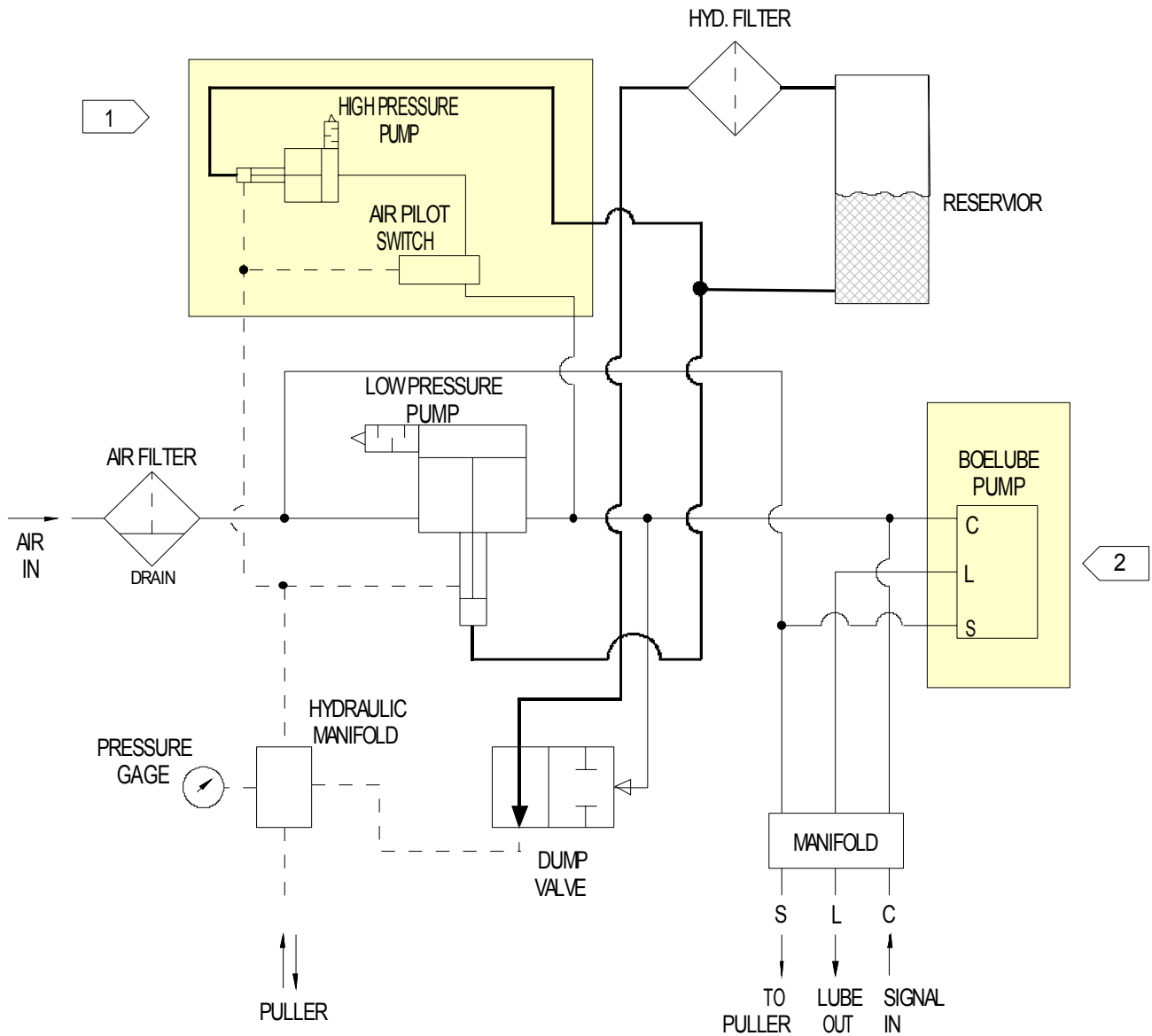
- 3.4.1 If additional oil must be added to the reservoir, use only ISO 32 high-grade hydraulic oil, (215 SUS @ 100 DEG.) Examples include Shell Tellus 32, and Chevron AW.

Clean the entire area around the filler plug before adding oil to the reservoir. Then remove the filler plug and insert a clean funnel with filter. The mandrel on the puller gun must be fully extended and the air supply disconnected when adding the oil to the reservoir.

3.5 Periodic Cleaning

- 3.5.1 All unused couplers should be sealed with thread protectors. All hose connections must be free of grit and grime. Any equipment hooked up to the pump should also be kept clean. Use only an approved, clean hydraulic oil in this unit and change as recommended (every 300 hours).

WCI-H,7000 and WCI-H10,000 Power-Pak Schematic



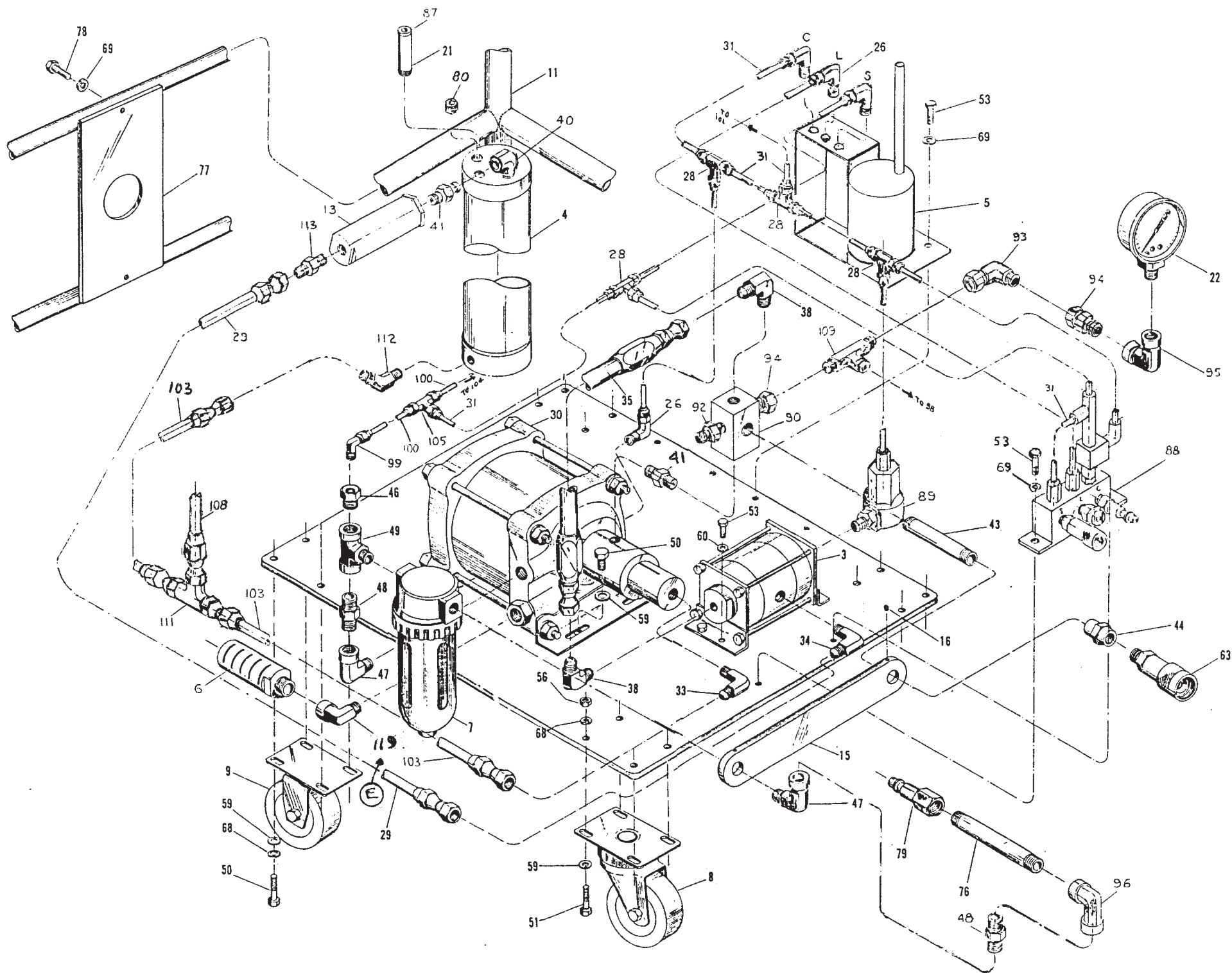
HYDRAULIC PUMP SCHEMATIC

WCI-H7,000

1 WCI-H10,000

2 SPLIT MANDREL SYSTEM ONLY

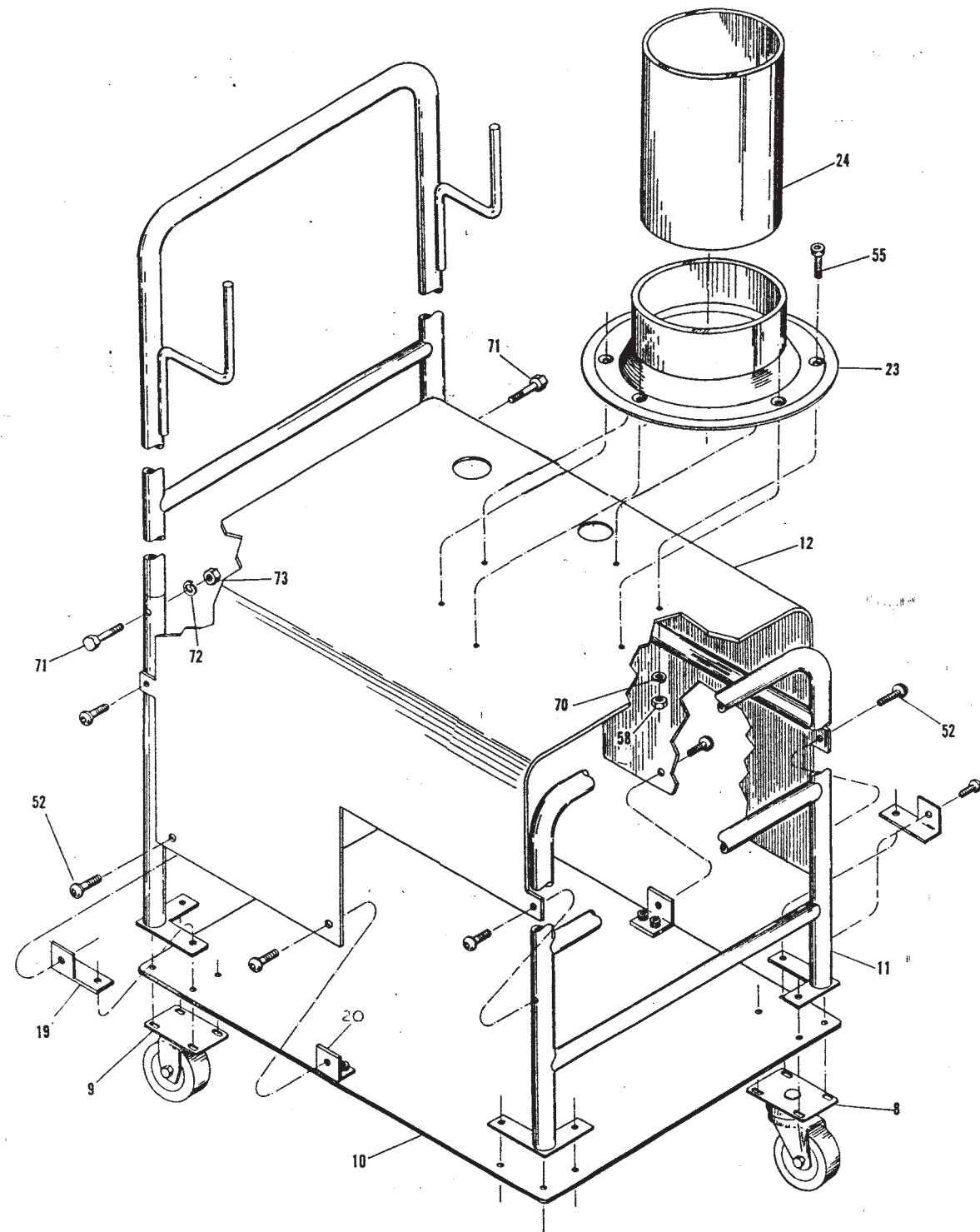
— HIGH PRESSURE LINES
 - - - LOW PRESSURE LINE
 — AIR LINES



DTL#	QTY	DETAIL NAME
1	1	PUMP ASSEMBLY
2	1	NIPPLE
3	1	DUMP VALVE
4	1	RESERVOIR
5	1	BOELUBE PUMP
6	1	MUFFLER
7	1	AIR FILTER
8	2	CASTERS (S)
9	2	CASTERS (R)
10	1	BASE PLATE
11	1	FRAME
12	1	COVER
13	1	HYD FILTER
14	1	S-C-L BLOCK
15	1	PIPE BRACKET
16	2	SET SCREW
17	3	FITTING
19	2	BRACKET
20	2	BRACKET
21	1	RESERVOIR FILL
22	1	PRESSURE GAGE
23	1	RING
24	1	PIPE
25	1	MANIFOLD
26	6	FITTING
28	4	FITTING
29	1	HOSE ASSEMBLY
30	1	PUMP
31	A/R	TUBING
33	1	FITTING
34	4	FITTING
35	1	HOSE ASSEMBLY
38	2	FITTING
40	1	FITTING
41	2	NIPPLE
43	1	NIPPLE
44	1	COUPLING
46	1	BUSHING
47	2	FITTING
48	2	NIPPLE
49	1	FITTING
50	12	SCREW
51	8	SCREW
52	7	SCREW
53	16	SCREW
55	6	SCREW
56	12	NUT
58	6	NUT
59	20	WASHER
60	8	WASHER
62	1	VALVE

DTL#	QTY	DETAIL NAME
63	1	Q/D FITTING
64	1	Q/D FITTING
65	1	Q/D FITTING
66	1	Q/D FITTING
68	20	LOCK WASHER
69	11	LOCK WASHER
70	6	LOCK WASHER
71	2	BOLT
72	2	LOCK WASHER
73	2	NUT
76	1	PIPE
77	1	BRACKET
78	2	SCREW
79	1	AIR Q/D
80	1	FITTING
81	1	FITTING
82	1	VALVE ASSEMBLY
83	1	NIPPLE
84	1	PILOT ACUTATOR
85	1	VALVE
86	1	FITTING
87	1	PLUG
88	1	MANIFOLD ASSY
89	1	VALVE ASSY
90	1	MANIFOLD ASSY
92	2	FITTING
93	2	FITTING
94	2	FITTING
95	1	FITTING
96	1	FITTING
97	1	PUMP
98	1	VALVE
99	3	FITTING
100	1	TUBING
103	2	HOSE ASSEMBLY
104	1	FITTING
105	1	FITTING
107	2	PUMP MOUNT
108	1	HOSE ASSEMBLY
109	1	FITTING
110	1	HOSE ASSEMBLY
111	1	FITTING
112	1	FITTING
113	1	FITTING
114	1	PLUG ASSY
115	1	PLUG
116	1	DOWEL PIN
117	1	FUNNEL
118	1	FILL KIT REFURB
119	1	FITTING

WEST COAST INDUSTRIES		
SCALE: NONE	APPROVED BY:	DRAWN BY G. BLACK
DATE:		REVISED
WCI-H 10 000 POWER SUPPLY		
		DRAWING NUMBER Sht 1 of 3



WEST COAST INDUSTRIES		
SCALE: _____	APPROVED BY: _____	DRAWN BY G. BLACK
DATE: 11/5/96		REVISED
WCI-H 10 000 POWER SUPPLY		
		DRAWING NUMBER
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