Service and Maintenance Manual

Model
60H
70H

3120630
January 15, 1995

ANSI

SIZE	THD	BOLT DIA. (IN)	TENSILE STRESS AREA (SQ. IN.)	SAE GRADE 5 BOLTS & SAE GRADE 2 NUTS				SAE GRADE 8 BOLTS & SAE GRADE 8 NUTS				RECOMMENDED TORQUE WRENCH SIZE		
				CLAMP LOAD (LB.)	TORQUE (DRY) LB. IN.	TORQUE (LUB.) LB. IN.	TORQUE (LOCTITE) LB. IN.	CLAMP LOAD (LB.)	TORQUE (DRY) LB. IN.	TORQUE (LUB.) LB. IN.	TORQUE (LOCTITE) LB. IN.	IN. OZS.	IN. LBS.	FT. LBS.
4	40	0.1120	0.00604	380	8	6	—	540	12	9	—	160	10	—
	48		0.00661	420	9	7	—	600	13	10	—	160	10	—
6	32	0.1380	0.00909	580	16	12	—	820	23	17	—	—	25	—
	40		0.01015	610	18	13	—	920	25	19	—	—	25	—
8	32	0.1640	0.01400	900	30	22	—	1260	41	31	—	—	25	—
	36		0.01474	940	31	23	—	1320	43	32	—	—	25	—
10	24	0.1900	0.01750	1120	43	32	—	1580	60	45	—	—	50	—
	32		0.02000	1285	49	36	—	1800	68	51	—	—	50	—
1/4	20	0.2500	0.0318	2020	96	75	105	2860	144	108	160	—	100	—
	28		0.0364	2320	120	86	135	3280	168	120	185	—	200	—
					LB. FT.	LB. FT.	LB. FT.		LB. FT.	LB. FT.	LB. FT.			
5/16	18	0.3125	0.0524	3340	17	13	19	4720	25	18	30	—	200	—
	24		0.0580	3700	19	14	21	5220	25	20	30	—	200	—
3/8	16	0.3750	0.0775	4940	30	23	35	7000	45	35	50	—	300	25
	24		0.0878	5600	35	25	40	7900	50	35	55	—	300	50
7/16	14	0.4375	0.1063	6800	50	35	55	9550	70	55	80	—	600	50
	20		0.1187	7550	55	40	60	10700	80	60	90	—	600	50
1/2	13	0.5000	0.1419	9050	75	55	85	12750	110	80	120	—	1200	100
	20		0.1599	10700	90	65	100	14400	120	90	135	—	1200	100
9/16	12	0.5625	0.1820	11600	110	80	120	16400	150	110	165	—	1200	100
	18		0.2030	12950	120	90	135	18250	170	130	190	—	1200	100
5/8	11	0.6250	0.2260	14400	150	110	165	20350	220	170	240	—	1800	150
	18		0.2560	16300	170	130	190	23000	240	180	265	—	1800	150
3/4	10	0.7500	0.3340	21300	260	200	285	30100	380	280	420	—	2400	200
	16		0.3730	23800	300	220	330	33600	420	320	465	—	2400	200
7/8	9	0.8750	0.4620	29400	430	320	475	41600	600	460	660	—	3600	300
	14		0.5090	32400	470	350	520	45800	660	500	725	—	3600	300
1	8	1.000	0.6060	38600	640	480	675	51500	900	680	990	—	7200	600
	12		0.6630	42200	700	530	735	59700	1000	740	1100	—	7200	600
1-1/8	7	1.1250	0.7630	42300	800	600	840	68700	1280	960	1400	—	7200	600
	12		0.8560	47500	880	660	925	77000	1440	1080	1575	—	7200	600
1-1/4	7	1.2500	0.9690	53800	1120	840	1175	87200	1820	1360	2000	—	—	Multi*
	12		1.0730	59600	1240	920	1300	96600	2000	1500	2200	—	—	Multi*
1-3/8	6	1.3750	1.1550	64100	1460	1100	1525	104000	2380	1780	2625	—	—	—
	12		1.3150	73000	1680	1260	1750	118100	2720	2040	3000	—	—	—
1-1/2	6	1.500	1.4050	78000	1940	1460	2025	126500	3160	2360	3475	—	—	Multi*
	12		1.5800	87700	2200	1640	2300	142200	3560	2660	3925	—	—	Multi*

Figure 1-1. Torque Chart.

NOTE: Tensile strength for bolt size 4 to 1 - 120,000 (min. psi), size 1-1/8 to 1-1/2 - 105,000 (min. psi).
*Torque multiplier.
Torque specifications are usually given in foot-pounds; lower ranges in inch-pounds or inch-ounces.


SAE Grade 5


SAE Grade 8

b. Hydraulic Oil.

(1). Refer to Table 1-1 for recommendations for viscosity ranges.

(2). JLG recommends Kendall Hyken 052 hydraulic oil, which has an SAE viscosity of 10W-20 and a viscosity index of 152, or BP Energol SHS46.

Note

Start-up of hydraulic system with oil temperatures below -15° F. is not recommended. If it is necessary to start the system in a sub-zero environment, it will be necessary to heat the oil with a low density, 100VAC heater to a minimum temperature of -15° F.

(3). The only exception to the above is to drain and fill the system with Mobil DTE 11 oil or its equivalent. This will allow start up at temperatures down to -20°F. However, use of this oil will give poor performance at temperatures above 120° F. Systems using DTE 11 oil should not be operated at temperatures above 200°F. under any condition.

c. Changing Hydraulic Oil.

(1). Use of any of the recommended crankcase or hydraulic oils eliminates the need for changing the oil on a regular basis. However, filter elements must be changed after the first 40 hours of operation and every 250 hours thereafter. If it is necessary to change the oil, use only those oils meeting or exceeding the specifications appearing in this manual. If unable to obtain the same type of oil supplied with the machine, consult local supplier for assistance in selecting the proper equivalent. Avoid mixing petroleum and synthetic base oils. JLG Industries recommends changing the hydraulic oil annually.

(2). Use every precaution to keep the hydraulic oil clean. If the oil must be poured from the original container into another, be sure to clean all possible contaminants from the service container. Always clean the mesh element of the filter and replace the cartridge any time the system oil is changed.

(3). While the unit is shut down, a good preventive maintenance measure is to make a thorough inspection of all hydraulic components, lines, fittings, etc., as well as a functional check of each system, before placing the machine back in service.

d. Lubrication Specifications.

Specified lubricants, as recommended by the component manufacturers, are always the best choice, however, multi-purpose greases usually have the qualities which meet a variety of single purpose grease requirements. Should any question arise, regarding the use of greases in maintenance stock, consult your local supplier for evaluation. Refer to Table 1-2 for an explanation of the lubricant key designations appearing in the Lubrication Chart.

2-4. CYLINDERS - THEORY OF OPERATION.

a. Systems Incorporating Double Acting Cylinders:

Cylinders are of the double-acting type. Systems incorporating double-acting cylinders are as follows: Lift, Telescope, Platform Leveling, Steer and Lockout. A double acting cylinder is one that requires oil flow to operate the cylinder rod in both directions. Directing oil (by actuating the corresponding control valve to the piston side of the cylinder) forces the piston to travel toward the rod end of the barrel, extending the cylinder rod (piston attached to rod). When the oil flow is stopped, movement of rod will stop. By directing oil to the rod side of the cylinder, the piston will be forced in the opposite direction and the cylinder rod will retract.

b. Holding valves are used in the Lift, Telescope, Slave Level and lockout circuits to prevent retraction of the cylinder rod, should a hydraulic line rupture or a leak develop between the cylinder and its related control valve.

2-5. VALVES - THEORY OF OPERATION.

a. Solenoid Control Valves (Bang-Bang).

Control valves used are four-way three-position solenoid valves of the sliding spool design. When a circuit is activated and the control valve solenoid energizes, the spool is shifted and the corresponding work port opens to permit oil flow to the component in the selected circuit with the opposite work port opening to reservoir. Once the circuit is deactivated (control returned to neutral) the valve spool returns to neutral (center) and oil flow is then directed through the valve body and returns to reservoir. A typical control valve consist of the valve body, sliding spool, and two solenoid assemblies. The spool is machine fitted in the bore of the valve body. Lands on the spool divide the bore into various chambers, which when the spool is shifted, align with corresponding ports in the valve body open to common flow. At the same time other ports would be blocked to flow. The spool is spring loaded to center position, therefore when the control is released, the spool automatically returns to neutral, prohibiting any flow through the circuit.

Table 2-3. Holding Valve Torque Specifications.	
Description	Torque Value
SUN - 7/8 HEX M20 X 1.5 THDS.	30-35 ft. lbs. (41-48 NM)
SUN - 1 1/8 HEX 1 -14 UNS THDS.	45-50 ft. lbs. (61-68 NM)
SUN - 1 1/4 HEX M36 X 2 THDS.	150-160 ft. lbs. (204-217 NM)
RACINE - 1 1/8 HEX 1 1/16 - 12 THDS.	50-55 ft. lbs. (68-75 NM)
RACINE - 1 3/8 HEX 1 3/16 - 12 THDS.	75-80 ft. lbs. (102-109 NM)
RACINE - 1 7/8 HEX 1 5/8 - 12 THDS.	100-110 ft. lbs. (136-149 NM)

2-10. CYLINDER REMOVAL AND INSTALLATION.

a. Telescope Cylinder Removal.

(1). Be sure boom is fully retracted and in a horizontal position.

(2). Shut down engine. Support boom basket end with a prop. (See Figure 2-2.)

(3). Remove boom end-cover.

⚠ CAUTION

HYDRAULIC LINES AND PORTS SHOULD BE CAPPED IMMEDIATELY AFTER DISCONNECTING LINES TO AVOID THE ENTRY OF CONTAMINANTS INTO THE SYSTEM.

(4). Tag and disconnect hydraulic lines to telescope cylinder. Use suitable container to retain any residual hydraulic fluid. Cap hydraulic lines and ports.

(5). Remove the two setscrews that retain the telescope cylinder pin to the base boom.

(6). Using a suitable brass drift, carefully drive the telescope cylinder pin from the base boom.

(7). Remove the telescope cylinder trunnion pin covers from each side of the base boom.

(8). Remove the capscrews securing the trunnion pins from each side of the boom.

(9). Using a suitable slide hammer, remove the trunnion pins attaching the telescope cylinder to the mid boom.

(10). Attach a suitable sling to the telescope cylinder. Support with an overhead crane or other suitable lifting device.

(11). Remove the two (2) extension chain adjusting nuts from the eyebolt through the chain adjust assembly.

(12). Remove the four (4) bolts and lock washers attaching the chain attach block to the base boom section and remove block.

(13). Attach a suitable lifting device to the extension chain adjusting eyebolt above the cylinder rod.

Note

The extension chain will come out of the boom twice as far as the telescope cylinder.

(14). Using both lifting devices, carefully pull the cylinder from the boom assembly.

(15). As the cylinder is removed from the boom, lay the extension chain on top of the base boom.

(16). Using another lifting device, support the sheave wheel end of the cylinder and remove the cylinder from the boom assembly.

(17). Carefully lift the cylinder clear of the boom assembly and lower to the ground or suitably supported work area.

b. Telescope Cylinder Installation.

(1). Using suitable lifting equipment, carefully lower the cylinder to the boom assembly.

(2). Using another lifting device, support the sheave wheel, or rod end, of the cylinder and install the cylinder into the boom assembly.

(3). Slide the cylinder into boom, sliding the extension chain in place as the cylinder is moving in.

(4). Attach a suitable lifting device to the extension chain adjusting eyebolt.

(5). Install chain adjust block with four (4) lockwasher and bolts to base boom section.

(6). Install the two (2) extension chain adjusting nuts that attach the eyebolt to the chain adjust block.

(7). Remove the lifting device from the telescope cylinder.

(8). Using a suitable brass drift install the trunnion pins attaching the telescope cylinder to the mid boom section.

(9). Install the capscrews securing the trunnion pins to each side of the boom. Note that loctite 242 is required on the capscrew threads.

(10). Install trunnion pin covers on each side of boom.

(11). Carefully install the telescope cylinder barrel attach pin into base boom.

(12). Install the setscrews that retain the telescope cylinder pin to the base boom.

c. Carburetor amd Governor Adjustment.

(1). With the aid of an assistant, start the engine at the platform console and allow it to come up to operating temperature with air cleaner installed. Adjust carburetor idle screw until engine idles at 1000 RPM. Shut down engine.

Note

Steps (2) and (3) are preliminary settings.

(2). On controller (in ground control box) turn 'high engine' (P1) adjusting screw 25-30 turns CCW, then 10 turns CW.

(3). On controller (in ground control box) turn 'gain' (P2) adjusting screw CCW to the stop, then CW until screw slot is vertical (approximately 1/4 turn).

(4). On controller (in ground control box) turn 'droop' (P3) adjusting screw CCW to the stop, then CW until screw slot is vertical (approximately 1/4 turn). No further adjustment should be necessary to 'droop' (P3).

(5). With the aid of an assistant at platform console start the engine and allow to come up to operating temperature. Then have assistant depress footswitch and place engine speed switch to HIGH ENGINE.

(6). If engine surging occurs at this point, turn 'gain' (P2) adjusting screw CCW until surging ceases. Turn 'high engine' (P1) adjusting screw until engine runs at 3000 RPM (2500 RPM for machines with piston pump). Turning the screw CW increases RPM. Turning the screw CCW decreases RPM.

(7). While your assistant continues to depress the footswitch, have him place engine speed switch to LOW ENGINE. Turn 'low (mid) engine' adjusting screw until engine runs at 1800 RPM. Turning the screw CW increases RPM. Turning the screw CCW decreases RPM. Shut down engine. Seal all trim pots when finished with finger nail polish.

Note

If engine surges under no load, on HIGH ENGINE and you cannot get enough response from adjusting 'gain' (P2), try adjusting surge screw on actuator. Loosen surge screw locknut. Disconnect throttle linkage. Turn surge screw CW until linkage arm moves. Manually stroke the linkage fully and allow to return slowly until it stops. Try to move linkage towards return position. If linkage moves, turn surge screw CCW 1/2 turn. Again stroke linkage and allow to return slowly until it stops. Try to move linkage towards return position. If linkage moves, turn surge screw CCW 1/2 turn. Repeat this procedure until linkage does not move after stroking. Do not turn any more. This will set buffer spring tension properly. Reconnect throttle linkage.

(9). With engine speed switch set to LOW ENGINE, when footswitch is depressed engine should immediately respond, if response time lags, turn 'gain' (P2) adjusting screw CW to improve response time. Turn adjusting screw in small increments only until response time is correct. Turning adjusting screw too far CW can cause surging. (See 7 above)

2-17. THROTTLE CHECKS AND ADJUSTMENTS - DEUTZ ENGINE. (See Figure 2-8.)

Note

Never run fuel tank dry. Diesel engines cannot be restarted after running out of fuel until fuel system has been air-vented or 'bled' of air. See Deutz Instruction Manual for procedure.

a. Disconnect actuator cable from throttle lever. With the aid of an assistant, start the engine and allow it to come up to operating temperature. Adjust throttle lever stop until engine runs at 2000 RPM. Shut down engine. Reattach actuator cable to throttle lever making sure that low engine setting remains the same. If necessary, adjust slide pin to contact low engine limit switch at 2000 RPM. Shut down engine.

b. With the aid of an assistant, start engine from basket and allow to come up to operating temperature. Disconnect proportional dump valve wire. Activate footswitch. Turn on HIGH ENGINE switch. Hold drive controller in full drive position. Adjust slide pin to contact high engine limit switch at 3000 RPM. Shut off all switches and controllers. Reconnect proportional dump valve wire.

Note

Actuator cable travel must stop slightly before lever makes contact with throttle lever stop. Failure to do so will burn out actuator.

Note

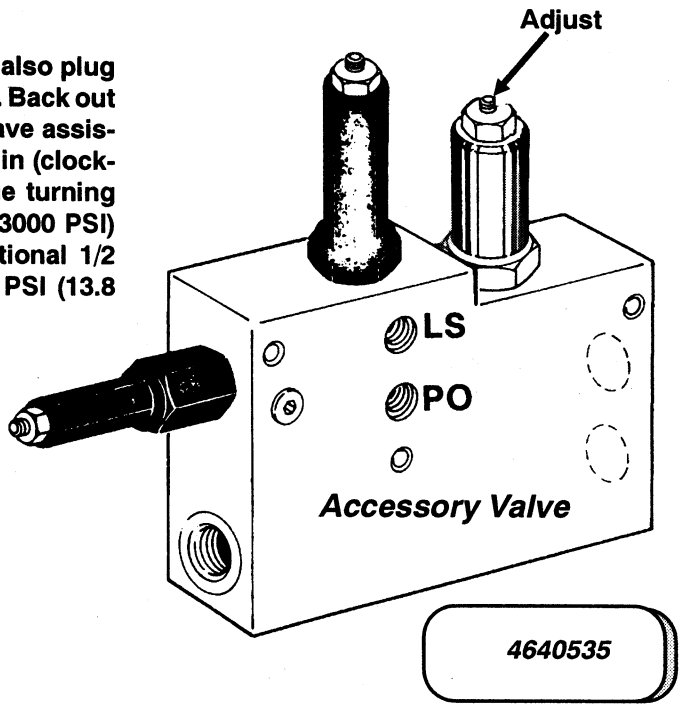
Early machines are at idle until a function is activated. Later machines are at idle only at platform without footswitch activated. Therefore when setting low engine speed on later machines it will not be necessary to disconnect bang-bang dump valve wire or operate a bang-bang function. Just activate footswitch to get low engine.

STEP 4

To Set Main Relief (Proportional Functions).

Note: This adjustment to be made after all proportional functions are set.

Disconnect and cap hoses to drive motor, also plug ports on drive section of proportional valve. Back out adjustment 2 turns (counter-clockwise). Have assistant activate drive. Slowly turn adjustment in (clockwise) and watch pressure gauge. Continue turning until gauge stops moving (approximately 3000 PSI) (206.8 Bar). Turn adjustment in and additional 1/2 turn, this will result in approximately 200 PSI (13.8 Bar) higher than Drive relief setting.



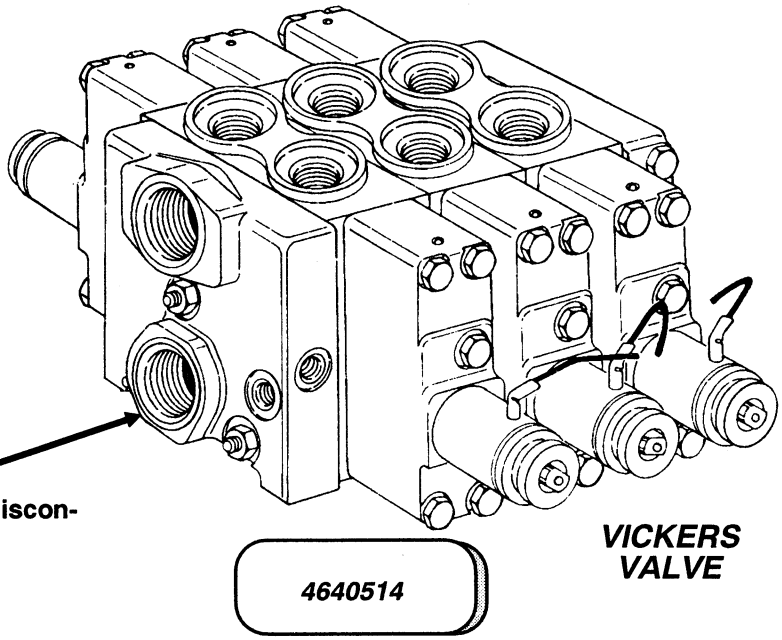
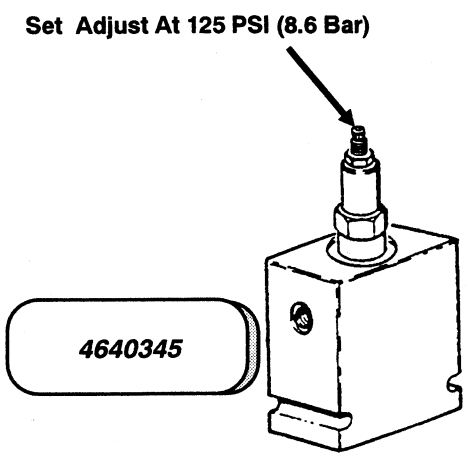
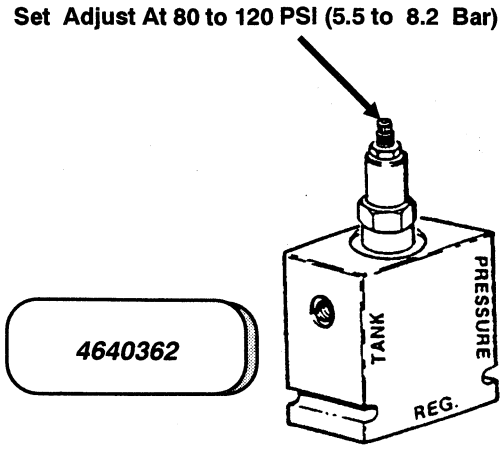


Figure 2-10. Vickers Proportional Valve Pressure Setting, Machines Built Prior To 1989 With Accessory Valve (Sheet 4 of 4).

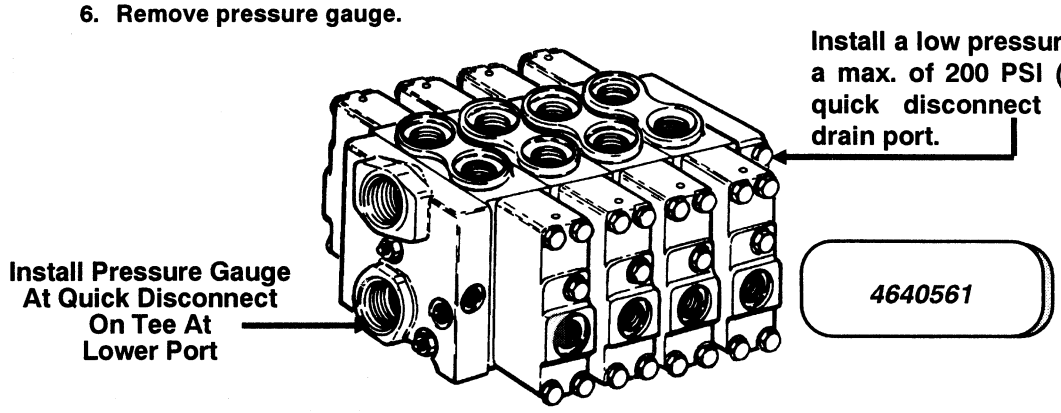




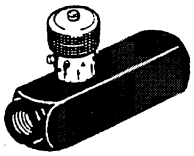
Relief Valve Assembly *Pressure Reducing Valve Assembly*

STEP 5. SETTING RELIEF AND PRESSURE REDUCING VALVES

1. Plug a low pressure gauge into quick disconnect on Vickers Valve Pressure drain port at end cap.
2. Adjust relief all the way in "temporary".
3. Set pressure reducing valve to 150 PSI (10.34 Bar) temporary.
4. Reset relief valve pressure to 140 PSI (9.6 Bar) and lock.
5. Reset pressure reducing valve to 80 to 120 PSI (5.5 to 8.2 Bar) and lock.
6. Remove pressure gauge.



Control Valve Assembly - Vickers 4 Section.



4640128 AND 4640216 COLOR FLOW VALVES

STEP 6. SETTING FLOW CONTROL VALVES

Adjust out - for faster start response to control. Adjust in - for slower start response to control.

Figure 2-14. Vickers All Hydraulic Machines Pressure Setting (Sheet 4 of 4).

c. Repair.

(1). Cover Assembly.

(a). Remove two bolts (25) securing disconnect cap (26) to cover (23) and remove cap.

(b). Remove two bolts (25) securing cover cap (24) to cover and remove cap.

(c). Remove disconnect rod (27) from cap and remove o-rings (28,29) from cover cap. Discard o-rings.

(d). If necessary, remove pipe plug (30) from cover.

(e). Clean and inspect parts in accordance with paragraph b. Replace parts as necessary.

(f). If removed, screw pipe into cover.

(g). Slip o-ring (29) over cover cap and against face.

(h). Place o-ring (28) into cover cap internal groove. Disconnect rod may be used to push o-ring into groove.

(i). Place cover cap into cover with large hole located over pipe plug. Secure cover cap to cover with two bolts. Torque bolts to 70-80 in. lbs. (7.9-9.0 NM).

(j). Place disconnect cap over cover cap with nipple facing out and secure with two bolts. Torque bolts to 70-80 in. lbs. (7.9-9.0 NM).

(k). Turn cover over and push disconnect rod into cover cap. Rod will be held in place by friction from o-ring.

(2). Carrier Assembly.

(a). Drive anti-roll pin (19) into planet (17) using a suitable punch.

(b). Using a suitable press, press planet shaft from carrier (13). After planet shaft is removed, drive anti-roll pin from shaft.

(c). Remove cluster gear (18) and thrust washers (20,14) from carriers.

(d). Remove sixteen needle rollers (15) from cluster gear bore.

(e). Remove spacer (16) from cluster gear bore and remove second set of sixteen needle rollers (15).

(f). Repeat steps (a) through (e) for remaining two cluster gears.

(g). Clean and inspect all parts in accordance with paragraph b. Replace parts as necessary.

(h). Apply a coat of grease or petroleum jelly to cluster gear bore.

(i). Place sixteen needle rollers into cluster gear bore.

(j). Place spacer into opposite side of cluster gear and against needle rollers.

(k). Place second set of sixteen needle rollers into cluster gear.

(l). Apply grease or petroleum jelly to tang side of two thrust washers. Place thrust washers against bosses in carrier with washer tang fitting into slot in carrier outside diameter.

(m). While keeping thrust washers in place, slide cluster gear into carrier with larger gear on side with small pin hole.

(n). Line up cluster gear and thrust washers with hole in carrier and slide planet shaft through. Ensure chamfered side of hole in planet shaft is lined up with pin hole in carrier.

(o). Drive anti-roll pin flush into carrier hole, locking planet shaft into place.

(p). Repeat steps (h) through (o) for remaining two cluster gears.

(3). Input Shaft Assembly.

⚠ CAUTION

EYE PROTECTION SHOULD BE WORN DURING RETAINING RING REMOVAL AND INSTALLATION.

(a). Carefully remove retaining ring (34) from input shaft (35) and discard retaining ring.

(b). Remove two spacers (31) and spring (32) from input shaft.

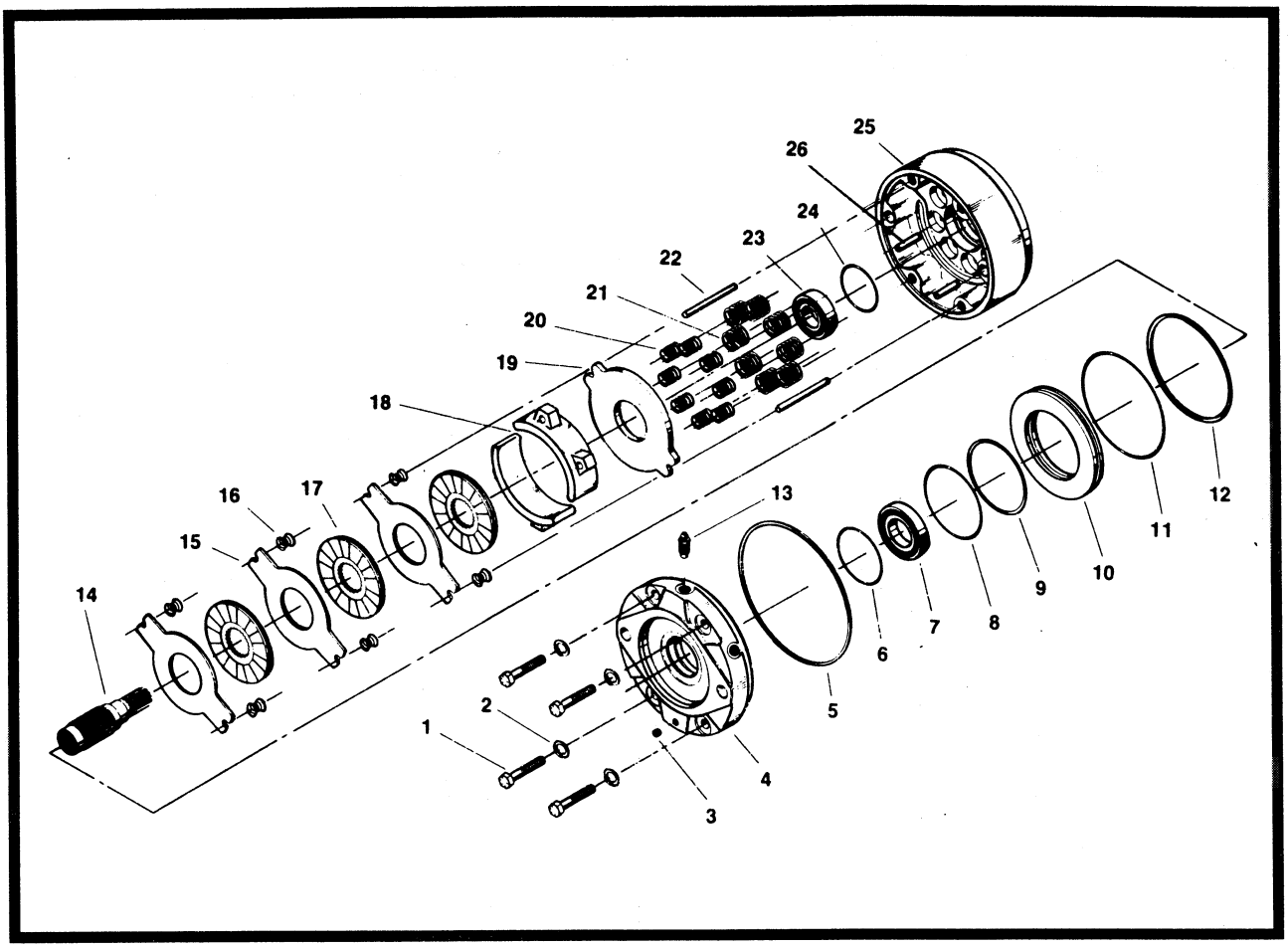


Figure 2-26. Drive Brake Assembly - Mico (Machines Built Prior To May 1992).

(10). Position end cover on housing, aligning dowel pins with holes in cover, and push end cover until top friction disc aligns with spline shaft.

(11). Install capscrew (1) and lockwashers (2). Tighten evenly to draw end cover to housing and bearing onto shaft. Torque capscrews to 55 ft. lbs. (75 NM).

Note

If available, a hydraulic press will simplify installation of end cover on housing. Clamp cover in position while tightening capscrews.

(12). To eliminate binding on bearings, press on inner ring of bearing (7) until it shoulders on shaft. Restrain opposite end of shaft to avoid excessive thrust loading of bearing (24).

⚠ IMPORTANT

IF HYDROSTATIC BENCH TESTING IS PERFORMED ON THE BRAKE ASSEMBLY. RELEASE PRESSURE SHOULD NOT EXCEED 2000 PSI (137.9 BAR) UNLESS TWO ADDITIONAL BOLTS ARE USED FOR SUPPLEMENTAL CLAMPING.

d. Bleeding

(1). Install brake and connect pressure lines.

(2). Bleed pressure release section of brake by pressurizing side inlet port and allowing air to escape from top port. Pressure should not exceed 100 psi (6.9 Bar) during bleeding.

(3). Apply sufficient pressure to release brake and check for proper operation.

(6). Depress footswitch and activate DRIVE CONTROLLER to "FORWARD" position.

(7). Using a suitable lifting equipment lift front of machine and place a 6 in. (15.2 cm) high block under right front wheel.

(8). Lower machine so both of the lockout cylinders are oscillated; one extended, the other retracted.

(9). Use suitable containers to retain any residual hydraulic fluid, place containers under each lockout cylinder.

(10). With DRIVE CONTROLLER activated and engine at idle, open all four bleeder screws (two on each lockout cylinder), one at a time, then close bleeder screws when all air is dissipated (bled).

(11). Using a suitable lifting equipment lift front of machine and remove the 6 in. (15.2 cm) high block.

(12). Transfer the 6 in. (15.2 cm) high block to the left front wheel and repeat steps 2 thru 7, substituting the word "right" for "left" in step 5.

(13). Perform oscillating axle lockout test.

2-31. OSCILLATING AXLE LOCKOUT TEST.

⚠ IMPORTANT

LOCKOUT SYSTEM TEST MUST BE PERFORMED QUARTERLY, ANY TIME A SYSTEM COMPONENT IS REPLACED, OR WHEN IMPROPER SYSTEM OPERATION IS SUSPECTED.

Note

Ensure boom is fully retracted, lowered, and centered between drive wheels prior to beginning lockout cylinder test.

(1). Place a 6 in. (15.2 cm) high block with ascension ramp in front of left front wheel.

(2). From platform control station, activate machine hydraulic system.

(3). Place HIGH ENGINE, DRIVE SPEED and WHEEL MOTOR SPEED control switches to their respective LOW positions.

(4). Place DRIVE control lever to FORWARD position and carefully drive machine up ascension ramp until left front wheel is on top of block.

(5). Carefully activate SWING control lever and position boom over right side of machine.

(6). With boom over right side of machine, place DRIVE control lever to REVERSE and drive machine off of block and ramp.

(7). Have an assistant check to see that left front wheel remains locked in position off of ground.

(8). Carefully activate SWING control lever and return boom to stowed position (centered between drive wheels). After boom reaches stowed position, activate DRIVE and lockout cylinders should release and allow wheel to rest on ground.

(9). Place the 6 in. (15.2 cm) high block with ascension ramp in front of right front wheel.

(10). Place DRIVE control lever to FORWARD and carefully drive machine up ascension ramp until right front wheel is on top of block.

(11). Carefully activate SWING control lever and position boom over left side of machine.

(12). With boom over left side of machine, place DRIVE control lever to REVERSE and drive machine off of block and ramp.

(13). Have an assistant check to see that right front wheel remains locked in position off of ground.

(14). Carefully activate SWING control lever and return boom to stowed position (centered between drive wheels). After boom reaches stowed position, activate DRIVE and lockout cylinders should release and allow wheel to rest on ground.

(15). If lockout cylinders do not function properly, have qualified personnel correct the malfunction prior to any further operation.

TROUBLE	PROBABLE CAUSE	REMEDY
Boom will not extend.	Control valve not functioning properly.	Repair or replace control valve.
	Damaged wiring on control switch or solenoid valve.	Repair or replace wiring.
	Restricted or broken supply line on fitting.	Clean, repair, or replace line or fitting.
	Pressure setting incorrect.	Check pressure/readjust as necessary.
	Telescope cylinder not functioning properly.	Repair or replace cylinder.
Boom extends and retracts erratically.	Hydraulic system oil low.	Replenish oil as necessary.
	Wear pads worn.	Replace pads as required.
	Restricted or broken supply line on fitting.	Clean, repair, or replace line or fitting.
	Control valve not functioning properly.	Repair or replace valve.
	Worn seal(s) in telescope cylinder.	Replace seal(s).
	Cylinder not functioning properly.	Repair or replace cylinder.
	Distorted boom section (s).	Replace distorted section (s).
	Counterbalance valve not functioning properly.	Replace counterbalance valve.
Boom Swing System.		
No response to control.	Hydraulic system oil low.	Replenish oil as necessary.
	Swing control lever not functioning.	Repair or replace swing control lever.
	Restricted or broken supply line on valve bank or hydraulic pump.	Clean or replace line.
	Control valve not functioning properly.	Repair or replace valve.
	Swing motor not functioning properly.	Repair or replace motor.
	Swing brake not releasing.	Repair or replace brake.
	Restrictor valve(s) plugged.	Clean or replace restrictor valve.
	Foreign objects wedged between swing motor pinion and swing gear.	Remove objects, check for damage, and repair or replace component (s) as required.
	Sheared shaft on swing motor/brake.	Repair or replace motor/brake.
	Pressure reducing valve in swing circuit malfunctioning.	Repair or replace pressure reducing valve.
	No electric power to valve.	See proper wiring diagram.

Table 3-6. Electrical Assembly Troubleshooting.

TROUBLE	PROBABLE CAUSE	REMEDY
Platform Controls.		
No power to platform controls.	Self-reset circuit breaker open.	Check footswitch to ensure that both switches are making contact when pedal is depressed. Repair or replace footswitch as required.
	Contact block in footswitch malfunctioning.	Repair, replace or adjust contact block as required.
	Faulty power circuit wiring.	Check wiring continuity. Refer to proper wiring diagram.
	Select switch in wrong position.	Place select switch to correct position.
Engine starter system.		
Starter will not crank.	Discharged battery or loose battery terminals.	Check and charge battery or replace battery as necessary. Clean and secure battery terminals.
	Starter relay faulty or faulty relay connections.	Using a test meter, check relay coil termimals for presence of electrical power and for energization of relay coil. Also check relay terminals for correct switching of contacts. Replace relay as necessary.
	Malfunctioning starter solenoid or motor.	Replace solenoid or motor in accordance with applicable manufacturer's manual.
	Malfunctioning ignition switch.	Using a test meter, check ignition switch for correct switching of contacts. Replace switch as necessary.
	Faulty ignition and/or starter circuit wiring.	Check wiring continuity. See proper wiring diagram.
	Faulty starter lockout system.	See correct wiring diagram.
	Faulty starter switch.	Replace switch.
Engine continues to crank.	Faulty ignition and/or starter circuit wiring.	Check wiring continuity. See proper wiring diagram.
	Malfunctioning starter solenoid or motor.	Replace solenoid or motor in accordance with applicable manufacturer's manual.
	Faulty starter switch.	Replace switch.

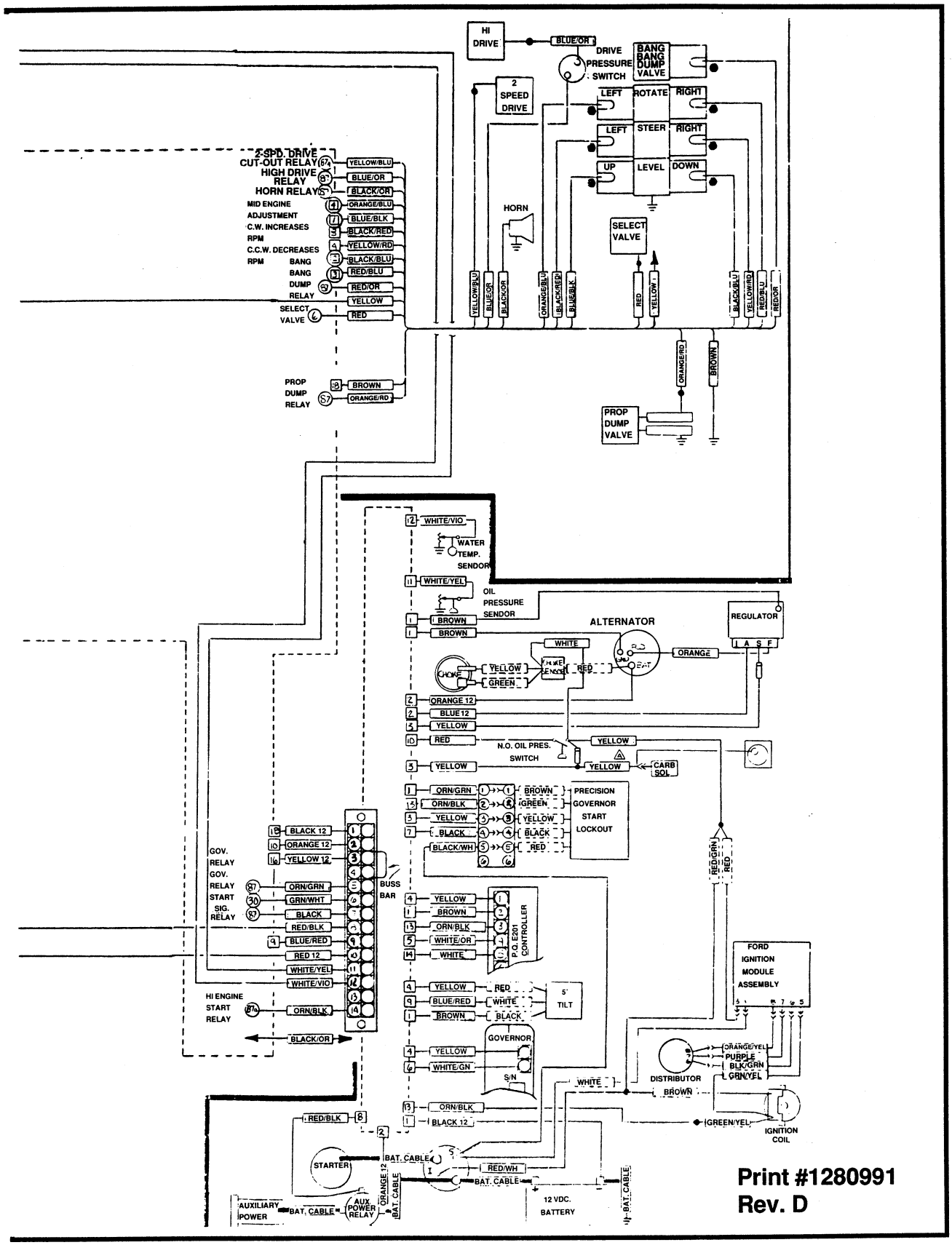


Figure 3-6. Wiring Diagram - Precision Governor (Sheet 2 of 2).