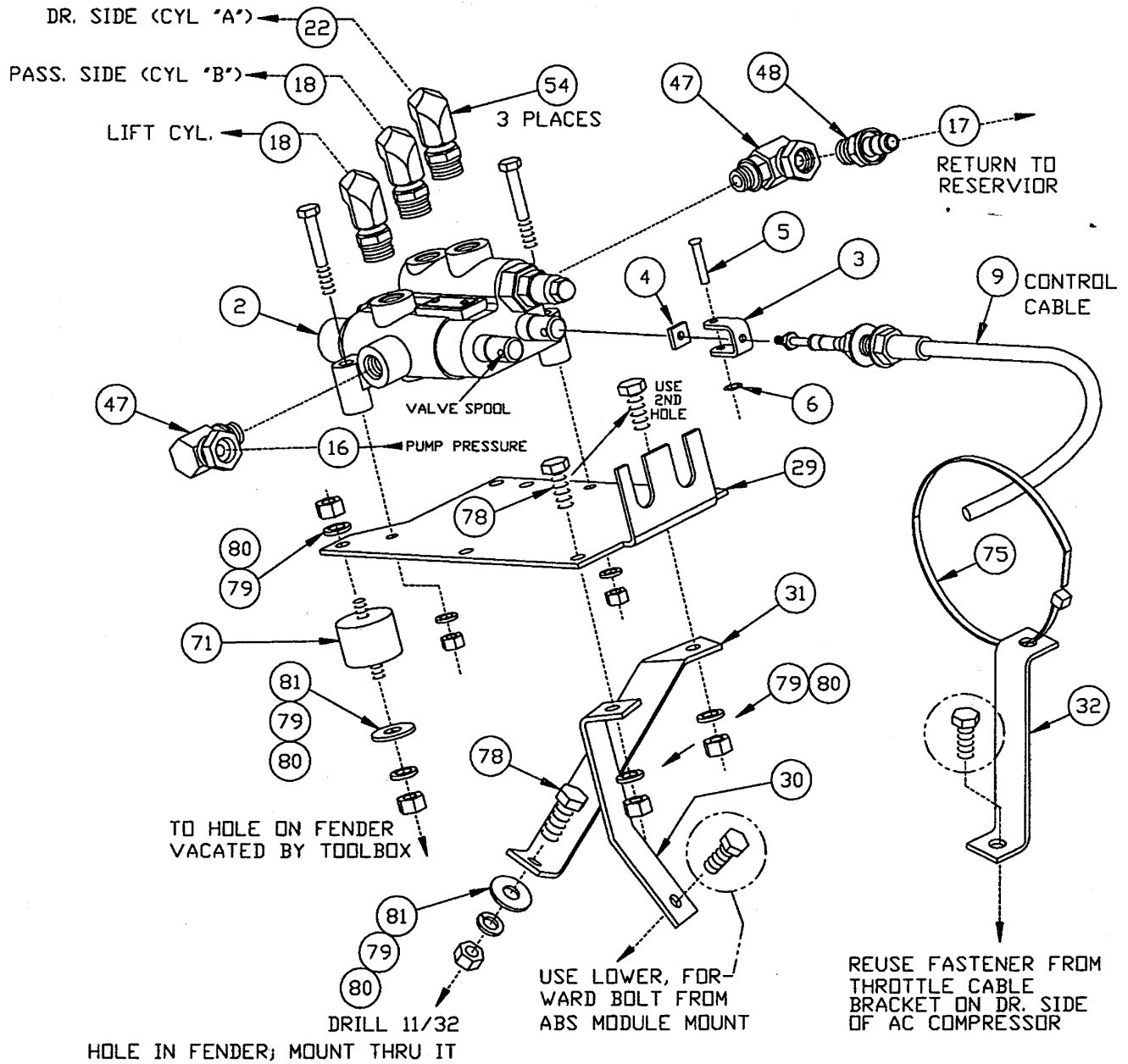


VALVE INSTALLATION: AS VIEWED FROM BEHIND



Parts List

Qty				Qty			
Ref #	21937	7556	Part # Description	Ref #	21937	7556	Part # Description
1	1		21981 Pump Assembly Kit	56	1		*8688 QD/Electric Plate -Short
2	1		A4466-40 Control Valve Assembly	57	1		*8686 2 QD Plate- Short
3	2		4483 Clevis - VM	58	4		*8687 Standoff Leg
4	2		4494 10-32 Square Nut - VM	59	4		*8324 Hose Tie - 3/16 x 14"
5	2		4491 Clevis Pin - 3/16 x 1"	61	8		*90687 1/4 x 1/2" (NC) Button Head Socket Screw
6	2		4493 3/16" Push Nut Zp	62	8		*90350 1/4" (NC) Locknut
8	1		4419 SLC Head - Belt Drive	64	2		21080 Split Hose Grommet - 1/2 x 3"
9	2		A4926 78" SLC Cable	65	1		*8741 Bracket - Cable Boot
10	1		20116 1-1/2 x 10" Cylinder Assy- XL	66	1		*8284 Cable Boot
11	2		20117 1-1/2 x 12" Cylinder Assy- XL	67	1		*8992 3" Fitting Protector (not shown)
12	2		6814 Clevis Pin - 1 x 3-5/16"	71	1		*5529 Shock Mount
13	4		6816 Anchor Pin - 1 x 4"	73	2		3042 Grommet - Rubber, Split
14	1		22066 Oil Reservoir	74	1		*4477 Grommet - Split Hose
15	6		90601 1/4 x 1-1/2" Cotter Pin	75	3	9	*3666 Tie Wrap, nylon 3/16 x 8"
16	1		4440 Hose -78" HP 1/4P - 3/8P	76	1		*90048 5/16 x 1-1/4" (NC) Gr. 5 Cap Screw
17	1		22082 1/2 x 48" LP Hose	77	1		90054 5/16 x 1-1/2" (NC) Gr. 5 Cap Screw
18	2		6066 66" HP Hose, 1/4P to 1/4P	78	5	9	*90042 5/16 x 1" (NC) Gr. 5 Cap Screw
19	1		22083 5/8 x 32" LP Hose	79	7	11	*90360 5/16" Sp Lk Washer
20	1		3074 Hose - 22" HP 1/4P - 1/4P	80	8	9	*90332 5/16" (NC) Nut
21	2		4424 Hose - 36" HP 1/4P - 1/4P	81	4	6	90313 5/16" Flat Washer
22	1		21061 Hose - 46" HP 1/4P - 1/4P	84	1		90614 1/4 x 1-1/4" (NC) Gr. 5 Cap Screw
23	1		1687 3/8 x 42" LP Hose -	85	1		90359 1/4" Lock Washer
24	1		21045 Drive Sheave **	86	1		90330 1/4" (NC) Nut
25	1		21917 Pump Sheave	87	1		*91165 7/16 x 6" (NF) Gr. 5 Cap Screw
26	1		21040 Pump Bracket	88	1		*90317 7/16" Flat Washer
27	1		21039 Pump Bracket Brace	89	3		*91166 3/8 x 4-1/2" (NF) Gr. 5 Cap Screw
28	1		*20057 Drive Sheave Bushing .750 **	90	2		*90103 3/8 x 1" (NC) Cap Screw
29	1		5329 Valve Plate	91	4		*90361 3/8" Lock Washer
30	1		21037 Valve Plate Brace	92	2		*90334 3/8" (NC) Nut
31	1		21038 Valve Plate Brace	93	3		*4268 5/8" Spacer Washer
32	1		21062 Cable Support Brace	94	1		*91167 3/8 x 2-1/4" (NC) Gr. 5 Cap Screw
33	1		8380 Pump Plate	95	2		*90124 3/8 x 2" (NC) Gr. 5 Cap Screw
34	1		21034 Stand-Off Brace	96	2		*90315 3/8" Flat Washer
35	1		21074 Pump Bracket Spacer	97	1		20374 Dash Bracket Kit (not shown)
39	1		393 45" V-Belt (not shown)	98	2		90379 M8 x 1.25 x 30 Cap Screw Gr. 8.8
40	1		21032 Reservoir Bracket	99	2		90423 M8 x 1.25 Nut
41	1		21033 Reservoir Brace	100	2		90428 M8 Lock Washer
42	3		A1587 Hose Disconnect Assembly	101	1		8399 Relief Quill
43	2	2	*1588 Dust Plug - Closure/Male	102	1		8846 Red. Bushing 7/8" - 9/16" O-ring
44	1		*4486 Adapter - Bulkhead 1/4" NPT	103	2		9447 1/4"-20 Socket Head Set Screw
45	3		*4485 Snap Ring- 7/8" External Bowed	104	1		8079 Red. Bushing 3/4" - 9/16" O-ring
46	1	2	*319 1/4" x 90° Swivel Adapter				
47	3		2315 9/16"-18 w/ O-ring x 3/8" F Pi Swivel				
48	2		*8391 Quill - 3/8" NPTF to 1/2" ID Hose				
49	2		*22071 Quill - 3/8" NPTF to 5/8" ID Hose				
50	1		*8476 1/4" x 45° Street Elbow				
51	2		2780 1/4" NPT x 90° Street Elbow				
53	1		*3979 3/8" NPT x 90° Street Elbow				
54	4		*20316 9/16" O-ring to 1/4" NPT 90° Elbow				

* Part of 21944 Bolt Bag ** Order PN 21081 Drive Sheave w/Bushing for service

1. Cylinder and Cylinder Hose Assembly

- A. Attach female half of the disconnect (42) and a 1/4" NPT 45° street ell (50) to the 22" HP Hose (20). Using bench vise to hold lift cylinder (10), remove closure from port and screw the other end of the hose directly into this port. Place lift cylinder with hose pointing to passenger side into ears on lift arm and upper gear. Secure with clevis pins (12) and cotter pins (15).
- B. Attach male half of quick disconnect (42) to one end of a 36" HP hose (21). Place a dust cover (43) on the end of the other 36" HP hose (21) and put another male half of a disconnect (42) on this hose.
- C. Using a bench vise to hold angle cylinders (11), remove closures from the ports and screw the brass forged street ells (51) into ports. Point forward toward live end of cylinder and slightly upward as they will be installed on the A-frame. The driver-side cylinder uses the 36" HP hose with the dust cover and male disconnect half. The passenger-side cylinder uses the 36" HP hose with the male disconnect half and **no dust cover**. Install the cylinders into their respective sides so that ells are between the cylinders and the A-frame. Secure cylinders with anchor pins (13) at both ends, with cotter pins (15) in each anchor.

2. Control Head and Control Cables

- A. Drill two 5/8" holes in the firewall for the control cables using drilling guide as a reference only. **Be sure both sides of the firewall are clear of obstructions before drilling.** Drill 1/2" hole in underside of dash as shown in the dash illustration.
- B. Install the dash bracket according to the dash bracket instructions.
- C. Loosen the "jam nuts" on control head end of cables (9) and install into slots in control head (8). The raise cable centers in beginning of lower slot. Snap cable ends onto ball studs and tighten jam nuts to secure cables to control head. Remove the nuts and washers from the valve end of the cables. Route the cables out through the firewall up to top of the driver-side fender well. Attach control head to dash bracket according to the dash bracket instructions. Install rubber grommets (73) around cables where they pass through the fire wall.




3. Drive Sheave Installation

Note: Apply a removable loosening prevention compound (such as "Lock-tite") to all drive sheave fasteners prior to installation.

- A. Remove the top half of the fan shroud, fan and clutch from the water pump shaft (right hand thread) and loosen the serpentine belt. Remove and discard the three cap screws holding the vehicle crank pulley to the harmonic balancer. If the vehicle is equipped with a fourth cap screw in the center of the vehicle pulley remove and discard it. Check the vehicle crank pulley and remove any burrs around the mounting holes.

Caution: Before inserting bushing, check center of crankshaft for rust or foreign material and remove.

- B. Install drive sheave bushing (28) into center of crank shaft and reinstall the vehicle sheave. Place the drive sheave (24) center hub through the vehicle sheave and bushing. Place a 7/16 x 6" (NF) Gr. 5 cap screw (87) and flat washer (88) in center of sheave, plus three 3/8 x 4-1/2" (NF) Gr. 5 cap screws (89) with spacer washers (93) through sheave spacers. **Tighten 7/16 x 6" cap screw (torque to 50 ft-lbs) before tightening the three 3/8 x 4-1/2" cap screws (torque to 31 ft-lbs).**

NF FASTENER TORQUE (FT-LB)			
DIAMETER- THREADS PER INCH	GRADE		
			
	G2	G5	G8
1/4 - 28	6	10	14
5/16 - 24	12	19	27
3/8 - 24	23	35	50
7/16 - 20	38	55	80
1/2 - 20	55	85	120
9/16 - 18	80	120	170
5/8 - 18	110	170	240
3/4 - 16	200	300	420
7/8 - 14	180	470	670
1 - 12	270	700	980

4. Pump, Pump Bracket, and Vehicle Hose Standoff Brace

- A. Remove the battery ground and the vehicle harness ground from the ground stud at the base of the engine, beside the mechanical fuel pump port. Discard the ground stud. Remove the front passenger-side exhaust manifold bolt and discard it. Position the pump bracket (26) against the block where the grounding stud was removed. Attach the pump bracket (26) to the block using the threaded hole vacated by the grounding stud and the threaded hole directly above it with two 3/8 x 1" (NC) cap screws (90) and 3/8" lock washers (91). Reinstall the battery ground and the vehicle harness ground to the bottom bolt. Do not tighten at this time.

Attach the rounded end of the pump bracket brace (27) to the exhaust manifold replacing the previously removed bolt with a 3/8 x 2-1/4" (NC) cap screw (94). Attach the bent end of the pump bracket brace (27) to the pump bracket (26) with a 5/16 x 1-1/4" cap screw (76), lock washer (79) and nut (80). Tighten all fasteners. Cut a length of 1/2" split hose grommet (64) and slip it over the angled part of the pump bracket (26). Cut another piece and slip it over the pump bracket brace (27).

- B. Remove and save the bolt holding the vehicle hose bracket below the alternator. Attach the hose standoff brace (34) to the alternator bracket reusing the bolt previously removed. The bracket will point up and slightly forward. Attach the vehicle hose bracket, previously removed, to the hose standoff bracket (34) by inserting a 5/16 x 1" cap screw (78) through the hole in the center of the vehicle hose bracket and through the outer hole in the standoff bracket. Fasten with a 5/16" lock washer (79) and nut (80). The vehicle hose bracket will run parallel with the standoff bracket.
- C. Mount the pump (1) to the pump plate (33) with four 5/16 x 1" (NC) Gr. 5 cap screws (78), flat washers (81), lock washers (79) and nuts (80) in the orientation shown. The bolts and flat washers will be inserted from the pump plate side as shown.

Slide the pump pulley (25) onto the pump shaft. Make sure the shaft key remains in the key slot so it contacts both the pump shaft and the pump pulley. Slide the pulley on until the end of the pump shaft is even with the hub of the pulley. Apply a removable loosening prevention compound, such as "Lock-tite", to the set screws (103). Tighten the set screws onto the pump shaft. Torque the set screws to 10 ft-lb.

- D. Remove the dust plugs and covers from the pump ports. Screw the 7/8" - 9/16" O-ring bushing (102) into the suction port beside the relief valve adjustment. Screw the 9/16"-18 with O-ring x 3/8" NPTF swivel elbow (47) into the previously installed bushing. The elbow should point away from the pump shaft. Screw the 3/4" - 9/16" O-ring bushing (104) into the pressure port. Screw the 9/16"-18 with O-ring x 1/4" NPTF elbow (54) into the pressure port bushing. The elbow should point away from the pump shaft.

Carefully remove the jam nut from the relief valve adjustment stem. Hold the adjustment stem from turning with a screw driver. Save the copper gasket under the jam nut. Carefully screw the relief quill (101) on to the relief stem making sure the stem does not move. Tighten the quill down until just snug. ***The stem can easily be pulled out of the pump.***

Tighten the 1/4" end of the 78" HP hose (16) into the 90° fitting just installed. Screw a 3/8 x 5/8" quill (49) into the 3/8" suction port of the pump (1). Install the 32" length of 5/8" LP hose (19) onto the quill. Also install the 42" length of 3/8" LP hose (23) onto the relief quill. Make sure all fittings are tight.

- E. Route the loose ends of the pump hoses between the vehicle A/C and heater hoses and the pump bracket (26). Loop the loose ends of the hoses back toward the front of the vehicle over the A/C and heater hoses. Mount the pump, with the pump bracket spacer (35), between the pump plate and the pump bracket, to the front of the pump bracket with two 3/8 x 2" (NC) cap screws (95), flat washers (96), lock washers (91) and nuts (92). Install the 45" V-belt (39) over the drive sheave and pump sheave. Tighten the belt and the pump mounting bolts, allowing for maximum clearance around the pump assembly and belt.

5. Valve Assembly and Valve Plate

- A. Remove the plastic tool box or unused battery box from the driver-side fender
- B. Using a bench vise to hold the control valve assembly (2), screw the 90° swivel adapter unions (47) into the "in" and "out" ports. Point these fittings toward the spools and slightly up. Screw 3/8 x 1/2" quill (48) into the adapter in the "out" port. Install three 9/16" O-ring x 1/4" NPT 90° elbows (54) into the lift and the angle ports. The elbows will point at approximately 7 o'clock with the spools at 12 o'clock.
- C. Mount the valve to the valve plate (29) using two 1/4 x 1-3/4" cap screws, lock washers and nuts from the valve bag. Install the valve plate braces (30 and 31) loosely to the valve plate, according to the illustration, using 5/16 x 1" cap screws (78), lock washers (79) and nuts (80). Attach a rubber shock mount (71) to the valve plate, according to the illustration, using a 5/16 lock washer (79) and nut (80). Remove and save the forward, bottom bolt from the anti-lock brake module. Place the valve plate assembly in the space vacated by the tool box or battery box with the control cable bulkheads pointed toward the engine. Route the control cables under the brake master cylinder, over the engine and connect them to the valve plate with the cables in their respective slots so they are in line with the valve spools. Attach the cable clevis (3) to the cables using square nuts (4). Slip the cable clevis over the spools and install the clevis pins (5) through the clevis and spool and secure them with push nuts (6). Temporarily adjust cables so control lever is near centered in the control head. Remove and save the fastener holding the throttle cable bracket on the driver side of the A/C compressor. Using the previously removed fastener, mount the cable support brace (32), with the throttle cable bracket back on to the engine. This will be used to support the control cables to ensure proper routing.
- D. With the cable bulkhead of the valve pointing toward the engine, loosely attach the valve brace (30) to the ABS bracket using the previously removed bolt. Place the other end of the rubber shock mount (71) into the hole in the fender vacated by the tool box fastener. Mark and drill an 11/32" hole in the fender for the valve brace (31). Fasten the valve brace (31) to the fender with a 5/16 x 1" cap screw (78), flat washer (81), lock washer (79), and nut (80). Fasten the rubber shock mount (71) with a flat washer (81), lock washer (79) and nut (80). Tighten all fasteners.

Caution: Valve spools must be free and self centering when cables and control head are attached. Failure to center spools will restrict fluid flow through valve. This may cause hydraulic fluid to overheat resulting in pump damage and/or hydraulic hose failure. Hose failures can cause engine fires.

- E. With the valve plate (29) fastened to the fender, readjust the control cables (9) so the control head lever is centered and the valve spools are in the neutral position. If the cable clevis does not allow enough adjustment, reposition the cable at the bulk head. After making sure the valve spools are centered, tighten the cable fasteners. Fasten the cables to the cable support brace (32) using a tie wrap (75).

6. Remote Reservoir Installation

Caution: Reservoir fill cap must be vertical to engine.

- A. Attach the remote reservoir bracket (40) to the battery box using the two existing holes in the webbing below the battery. The bracket will need to be placed behind the transmission oil cooler line. Attach the bracket with two 5/16 x 1" cap screws (78), lock washers (79) and nuts (80).

On some vehicles the holes under the battery, which are used to mount the remote reservoir, are already being utilized to hold a stiffener between the battery box and the head lamp webbing. In this case remove the battery and battery box with the stiffener attached. Replace the two fasteners holding the stiffener to the battery box with two M8 x 1.25 x 30 cap screws (98) and a 5/16" flat washer (81) under the head of the fastener. These fasteners will be used as the mounting "studs" for the reservoir mounting bracket. Reinstall the battery box and battery. Install the remote reservoir bracket (40) to the two "studs" with M8 nuts (99) and

M8 lock washers (100). **Note:** Be sure to isolate and secure the transmission oil lines from the reservoir bracket to eliminate rubbing.

Attach the remote reservoir (14) and remote reservoir brace (41) to the remote reservoir bracket (40) temporarily with two 5/16 x 1" cap screws (78), lock washers (79) and nuts (80). Position the reservoir so there is no contact with any vehicle equipment. The positive battery connections may need to be repositioned to eliminate any rubbing on the reservoir. Mark the fender to locate a fastening point for the reservoir brace (41). Drill a 1 1/32" hole as marked and fasten the brace to the fender with a 5/16 x 1" cap screw (78), flat washer (81), lock washer (79) and nut (80). Tighten all fasteners. Screw a 3/8" street elbow (53) into the **top** threaded port of the reservoir and screw a 3/8 x 5/8" quill (49) into the elbow; point the elbow and quill back toward the fire wall. Screw a 3/8 x 1/2" quill (48) into the **bottom** port.

- B. Tighten the serpentine belt. Replace the fan/clutch assembly and the top half of the radiator shroud at this time.

7. Hydraulic Hose Installation

Caution: Keep hoses away from hot or moving engine components. Failure to do so may cause hose to burst resulting in a possible fire.

- A. Route the loose end of the pump high pressure hose (16) over the top of the radiator shroud and screw it into the "in" port fitting on the valve. Install one end of the 1/2 x 48" low pressure hose (17) on to the return quill on the reservoir, run it along with the high pressure hose on top of the radiator shroud and attach the other end to the quill in the "out" port on the valve. Route the loose end of the 5/8" suction hose over the vehicle A/C lines and heater hoses and install it on to the 5/8" quill (49) already screwed into the reservoir. Run the relief hose along with the suction hose and install it into the relief quill on the reservoir. At this time secure the hoses around the pump and reservoir with plastic ties (59) to ensure no contact with any moving engine parts. **Be sure to fasten the suction and relief hoses away from the exhaust manifold and any other hot components. To ensure safe clearance from the exhaust manifold, it may be necessary to cut the LP hose to a slightly shorter length.**
- B. Remove the vehicle grille. Route the three working cylinder hoses, angle right, angle left and lift, through the gap between the headlight webbing and the driver-side fender. Screw one of the 66" HP hoses (18) into the "Cyl B" port in the valve (the passenger-side angle hose). Screw the other 66" HP hose (18) into the lift port on the valve. Route these hoses to the passenger side of the vehicle and out through the grille, low and about 14" from the center. Route the 46" driver-side angle hose (22) from the driver-side angle port on the valve and out through the grille, low and about 14" to the driver side of center. Run the head lamp connector with dust cover along with this angle cylinder hose.

Note: Some GMC models with fine mesh grills may have to use stand off legs (58) fastened with four 1/4 x 1/2" socket head cap screws (61) and locknuts (62) on each grille plate (56 and 57).




Vehicles with heavy duty cooling and air conditioning may need the 3" fitting protector (67) on hoses rubbing the edge of the coil between the radiator and the grille. Place the fitting protector around all three hoses and secure with tie wraps (75).

- C. Attach the female half of a quick disconnect (QD) (42) to one hole in the two QD grille plate (57) with a snap ring (45). Attach the bulk head adapter (44) to the other hole in this grille plate with another snap ring (45). If the vehicle does not need the previously mentioned stand off legs on the grille plates, install a 1/4 x 90° swivel fitting (46) with dust plug (43) into the female QD. Install a 1/4 x 90° swivel fitting (46) with dust plug (43) into the bulk head adapter. Install a male QD half (42) onto the bulk head adapter. The 90° swivel fittings will not be used if the stand off legs are used. Attach the passenger-side angle cylinder hose to the female QD and the lift cylinder hose to the bulk head adapter. Attach the grille plate assembly to the grille with plastic ties (75). The female QD should be placed toward the outside of the vehicle.

- D. Attach a female QD half (42) to the QD/Electric grille plate (56) with a snap ring (45). If the vehicle does not need the stand off legs on the grille plates put a dust plug (43) on the end of a 90° swivel fitting (46) and screw it into the female QD. Screw the driver-side angle cylinder hose into the 90° fitting. Slide the head lamp connector into the slot on this grille plate. Attach the grille plate assembly to the grille with plastic ties (75). The QD should be placed to the outside of the vehicle. Reinstall the grille.
- E. Install cable boot bracket (65) on driver-side headgear brace between the brace and fasteners. Insert cable boot (66) on over bracket.
- F. Align all the fittings on the valve and make sure they are tight.

8. Operations

- A. Check all fittings and fasteners for tightness. Secure hoses with nylon tie wraps (75).
- B. Fill reservoir with FISHER® High Performance Hydraulic Fluid (recommended for superior cold-weather performance) or type "A" automatic transmission fluid. Start the engine, lift and angle the blade. **If the blade angles opposite from the control lever position, reverse the two HP hose connections on valve.** Raise the front end of the vehicle until the plow is off the ground with the lift cylinder fully retracted. Check the reservoir oil level. Angle the blade (with the lift cylinder retracted) to remove air from the system. Recheck the reservoir oil level.

NC FASTENER TORQUE (FT-LB)			
DIAMETER- THREADS PER INCH	GRADE		
	 G2	 G5	 G8
1/4 - 20	6	9	13
5/16 - 18	11	18	28
3/8 - 16	19	31	46
7/16 - 14	30	50	75
1/2 - 13	45	75	115
9/16 - 12	66	110	165
5/8 - 11	93	150	225
3/4 - 10	150	250	370
7/8 - 9	150	378	591
1 - 8	220	583	893

Note: The installer must inform the end user of the proper procedure for removing any residual hydraulic pressure that may be trapped in the raise or angle hoses. The plow will be much easier to install or remove if the proper procedures are followed.

Before coupling or uncoupling the hydraulic disconnects you must first turn off the ignition. Move the control to all four plowing positions and return the control to lower.

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