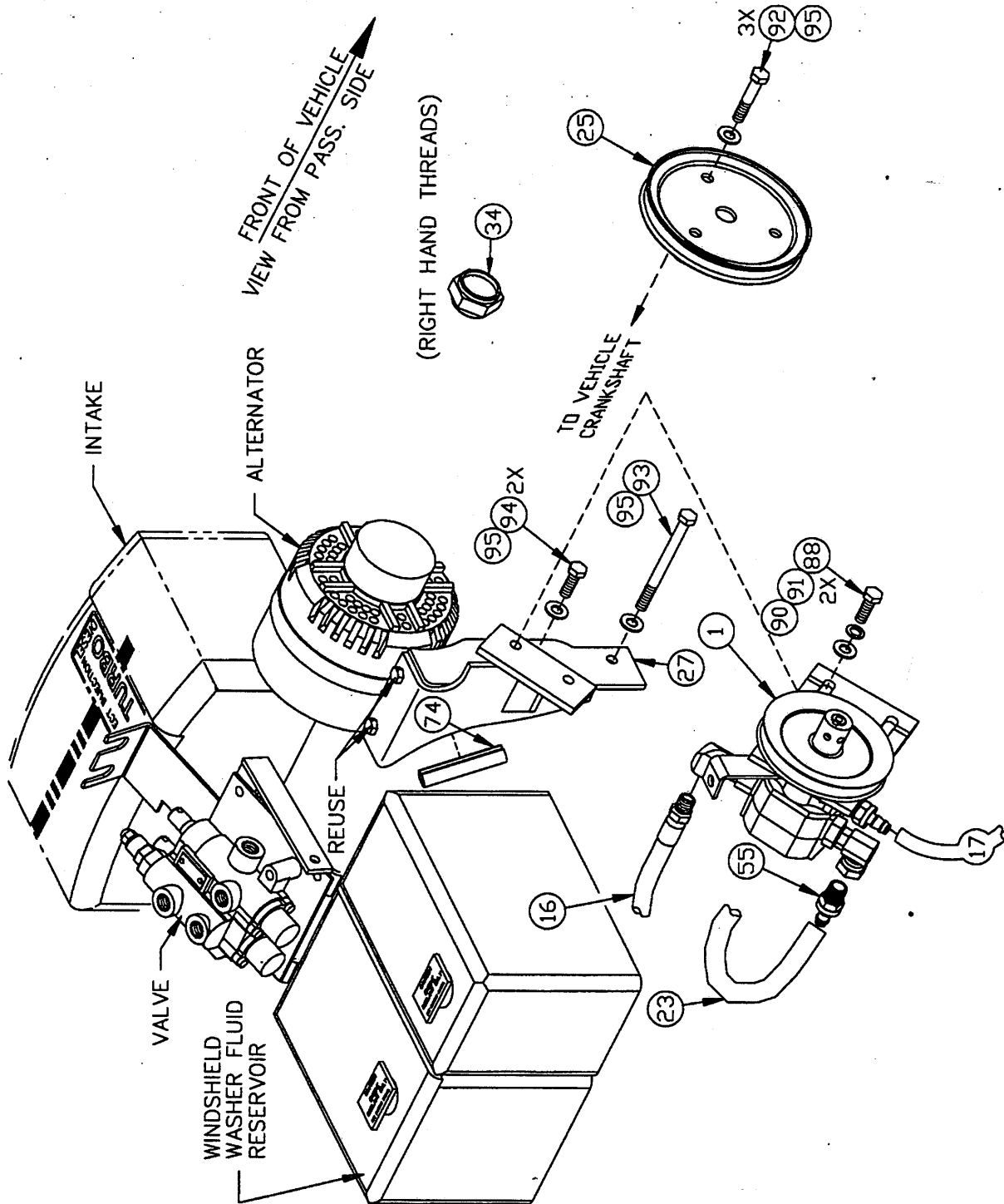


**Installation Diagram**

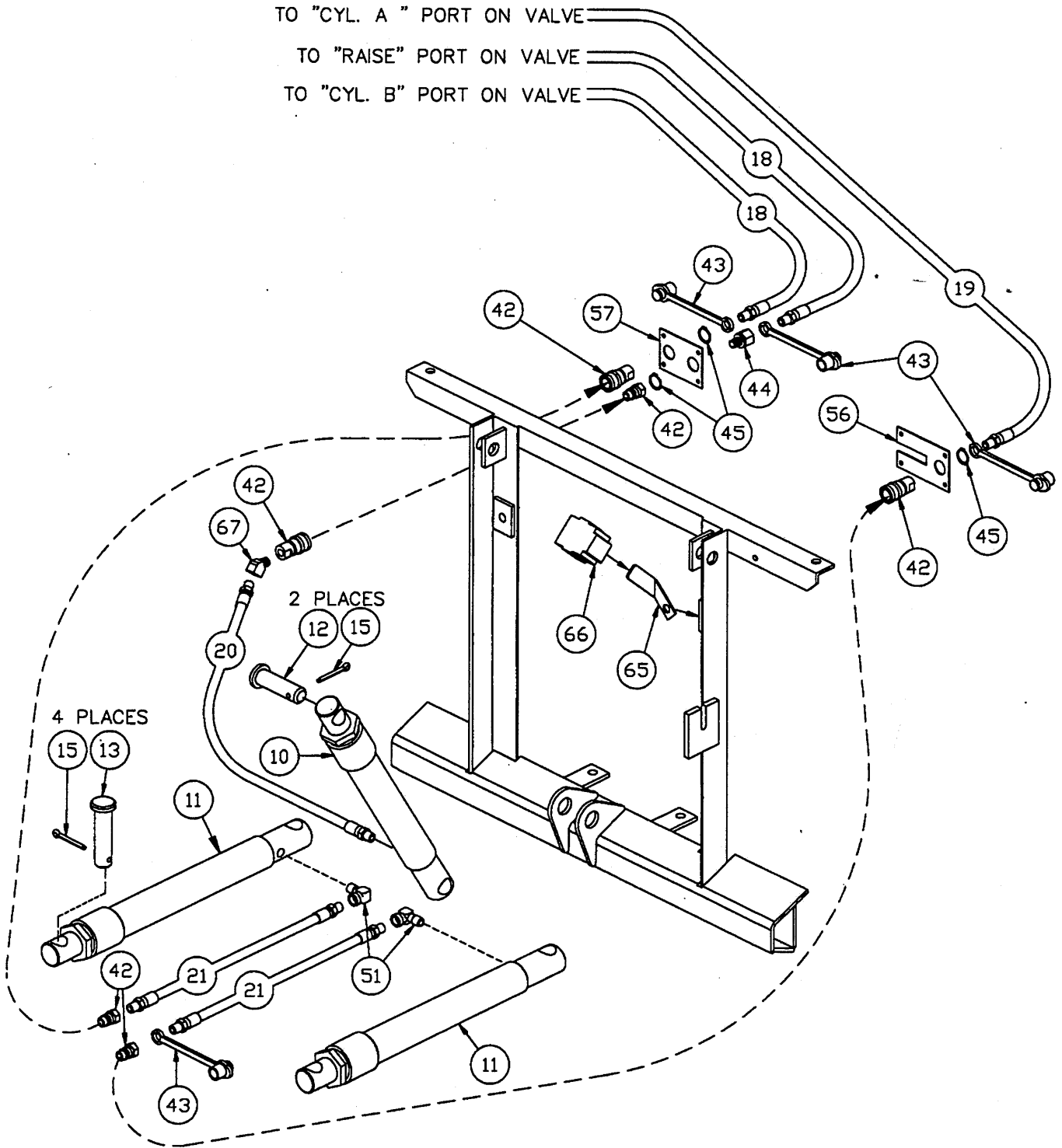


Including a High Capacity GC Pump

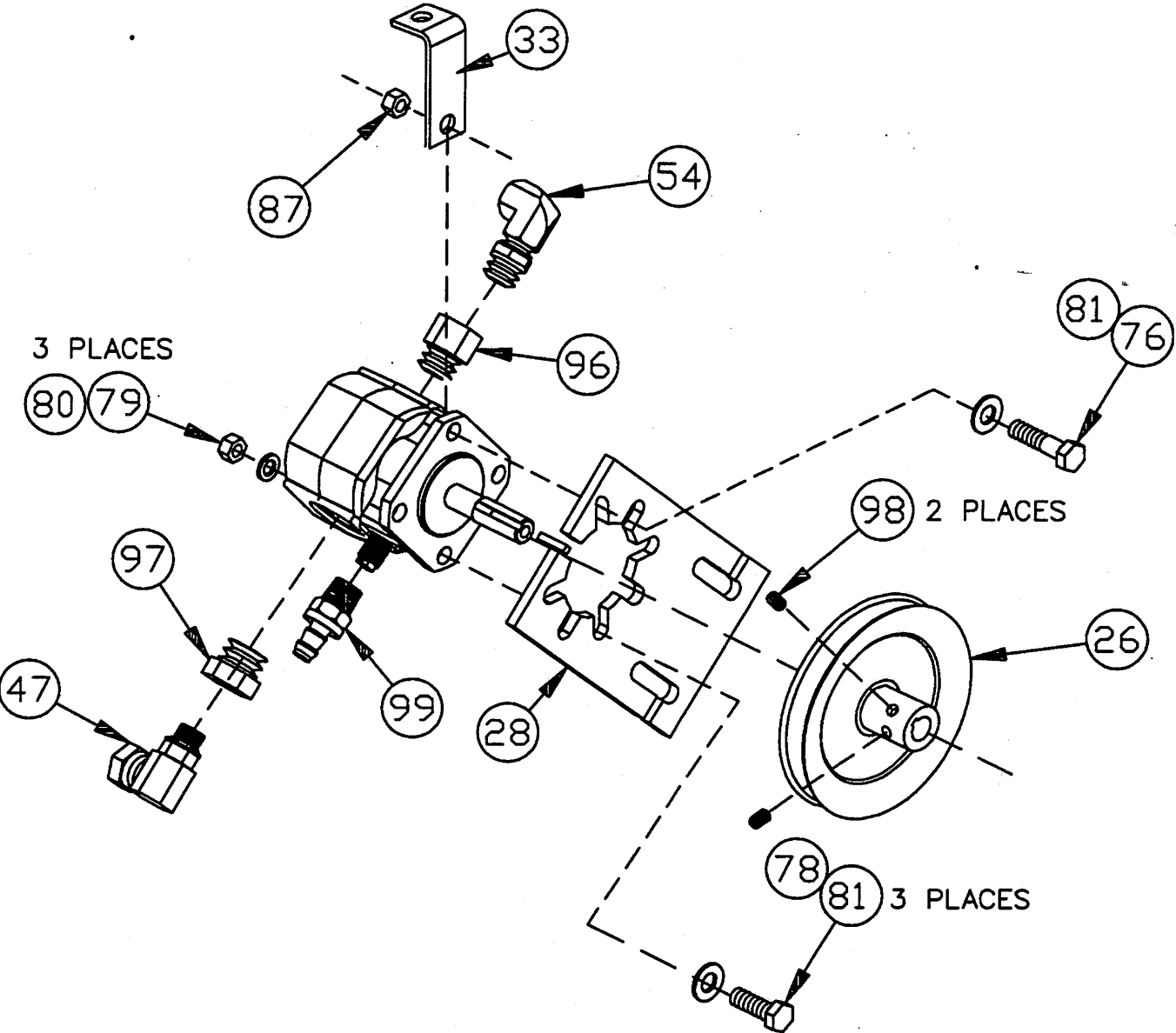
21947

Cylinder Installation

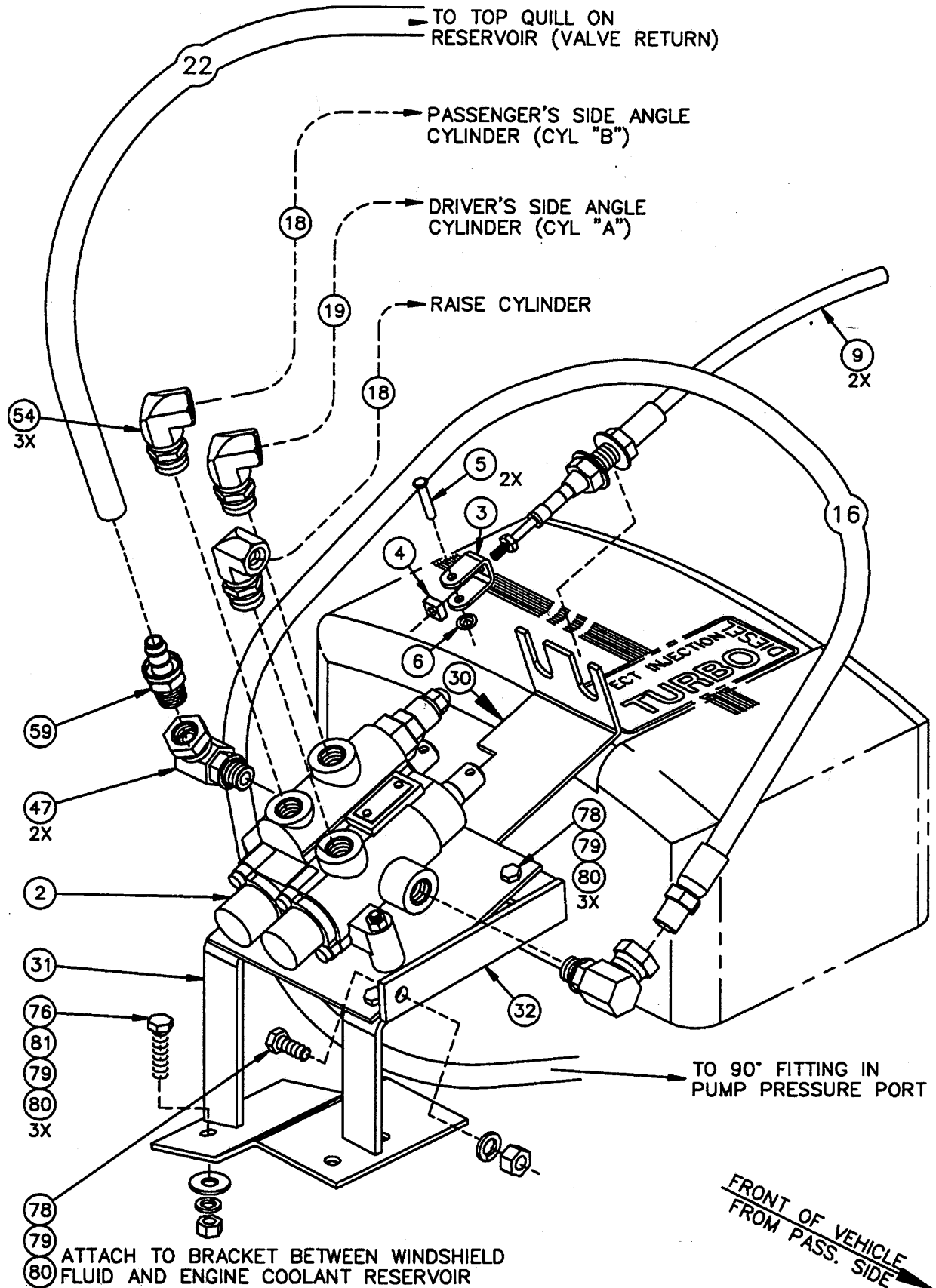
TO "CYL. A " PORT ON VALVE  
 TO "RAISE" PORT ON VALVE  
 TO "CYL. B" PORT ON VALVE



Pump Assembly






Valve Installation



## Parts List

Ref #	Qty		Part #	Description
	21937	7558		
1	1		21981	Pump assembly - Service Kit
2	1		A4466-40	Control Valve Assembly
3	2		4483	Clevis
4	2		4494	10-32 Square Nut - VM
5	2		4491	3/16 x 1" Clevis Pin
6	2		4493	3/16" Push Nut
7	1		22066	Oil Reservoir
9		2	A4489	84" SLC Cable
10	1		20116	1-1/2" x 10" Cyl Assy - XL
11	2		20117	1-1/2" x 12" Cyl Assy - XL
12	2		6814	1 x 3-5/16" Clevis Pin
13	4		6816	1 x 4" Anchor Pin
15	6		90601	1/4 x 1-1/2" Cotter Pin
16		1	5652	28" HP Hose 1/4P - 3/8P
17		1	1663	54" LP Hose 3/8"
18		2	375	42" HP Hose 1/4P - 1/4P
19		1	5192	60" HP Hose 1/4P - 1/4P
20		1	3074	22" HP Hose 1/4P - 1/4P
21		2	4424	36" HP Hose 1/4P - 1/4P
22		1	22100	64" LP Hose 1/2" HI-Temp
23		1	22101	54" LP Hose 5/8"
25		1	20196	Drive Sheave
26		1	21917	Pump Sheave
27		1	20197	Pump Bracket
28		1	8380	Pump Plate
29		1	20207	Oil Reservoir Bracket
30		1	5594	Valve Plate
31		1	20205	Valve Plate Bracket
32		1	20206	Valve Plate Brace
33		1	2115	Universal Brace Tab
34		1	*20209	Fan Adapter - Right Hand Thread
42	3		A1587	Disconnect Assembly
43	2	2	*1588	Dust Plug
44		1	* 4486	1/4" NPT Bulkhead Adapter
45		3	* 4485	7/8" Snap Ring
46	1		319	1/4" NPT x 90° Swivel Adapter
47	3		2315	9/16"-18 w/ O-ring x 3/8" NPTF 90° Swivel
51	2		2780	1/4" NPT x 90° Street Elbow
54		4	*20316	9/16" O-ring to 1/4" NPT 90° Elbow
55		2	*22071	Quill - 3/8" NPTM to 5/8" ID Hose
56		1	*8599	QD/Electric Grille Plate (Long)
57		1	*8600	2 QD Grille Plate (Long)
59		2	*8391	Quill - 3/8" NPTM to 1/2" ID Hose
65		1	*8741	Cable Boot Bracket
66		1	*8284	Cable Boot
67		1	*8476	1/4" x 45° Street Elbow
71		1	*6595	3/4 x 2-1/2" Split Hose Grommet
74	1	3	*4477	3/8 x 6" Split Hose Grommet
75	3	12	*3666	3/16 x 8" Nylon Hose Tie
76		4	*90048	5/16 x 1-1/4" (NC) Gr. 5 Cap Screw
77	1		90054	5/16 x 1-1/2" (NC) Gr. 5 Cap Screw

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

Ref #	Qty		Part #	Description
	21937	7558		
78	4	6	*90042	5/16 x 1" (NC) Gr. 5 Cap Screw
79	6	6	* 90360	5/16" Lock Washer
80	7	5	*90332	5/16" (NC) Nut
81	4	4	90313	5/16" Plain Washer
84	1		90614	1/4 x 1-1/4" (NC) Gr. 5 Cap Screw
85	1		90330	1/4" (NC) Nut
86	1		90359	1/4" Lock Washer
87		1	*90675	5/16" Locknut
88		2	*90106	3/8 x 1-1/4" (NC) Gr. 5 Cap Screw
90		2	*90315	3/8" Plain Washer
91		2	*90361	3/8" Lock Washer
92		3	*91029	M10 x 1.5 x 50 Gr. 10.9 Cap Screw
93		1	*91028	M10 x 1.5 x 110 Gr. 10.9 Cap Screw
94		2	*90391	M10 x 1.5 x 30 Gr. 8.8 Cap Screw
95		6	*90429	M10 Lock Washer
96	1		8079	Reducing Bushing 3/4" - 9/16" O-ring
97	1		8846	Reducing Bushing 7/8" - 9/16" O-ring
98	2		9447	1/4-20 x 1/2" Socket Head Set Screw
99	1		8399	Relief Quill
ns		1	4419	SLC Head - Belt Drive
ns	2		3042	Split Rubber Grommet
ns		1	7991	Dash Bracket Kit
ns		8	*8324	3/16 x 14" Hose Tie
ns		1	20486	3VX-630 Ind Gr. Belt

**21937 uses bolt bag 5425 \* Part of 21946 Bolt Bag**

## Installation Instructions

### 1. Cylinder and Cylinder Hose Assembly

- A. Attach the female half of the disconnect (42) and 1/4" x 45° street ell (67) to the 22" HP hose (20). Using a bench vise to hold the lift cylinder (10), remove the closure from the port and screw the other end of the hose directly into this port. Place the lift cylinder into the ears on the lift arm and the upper gear with the hose pointing to the passenger side. Secure with clevis pins (12) and cotter pins (15).
- B. Attach the male disconnect half (42) to one end of a 36" HP hose (21). Attach a male disconnect half (42) and a dust plug (43) to one end of another 36" HP hose (21).
- C. Using a bench vise to hold the angle cylinders (11), remove the closures from the ports and screw brass forged street elbows (51) into the ports. Point them forward toward the live end of the 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 plug and male disconnect half. The passenger-side cylinder uses the 36" hose with the male disconnect half and no dust cover. This male half will be plugged into the lift cylinder female half for plow storage. Install the cylinders to their respective sides so that the brass elbows are between the cylinders and the A-frame. Secure the cylinders with the anchor pins (13) and cotter pins (15) at both ends.

## 2. Control Head and Control Cables

- A. Drill two 5/8" holes in the fire wall for the control cables using the drilling guide as a reference. Be sure both sides of the fire wall are clear of obstructions before drilling.
- B. Install the dash bracket according to the instructions in the Dash Bracket Kit.
- C. Loosen the "jam nuts" on the control head of the cables (9) and install them into the slots in the control head. Raise the cable centers in the beginning of the lower slot. Snap the cable ends onto the ball studs and tighten the jam nuts to secure the cable to the control head. Remove the nuts and the washers from the valve end of the cables. Route the cables out through the fire wall and up to the top of the driver side fender well. Attach the control head to the dash bracket according to the dash bracket instructions. Install the rubber grommets around the 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 fan belt and fan/clutch assembly from the water pump *These are right hand threads*. Attach fan adapter (34) to water pump and reinstall fan/clutch assembly. Tighten.
- B. Place drive sheave (25) with pilot into center bore of harmonic balancer. Line up the three holes in the sheave with the threaded holes on the balancer. Apply "Lock-tite" to threads and attach drive sheave with three M10 x 1.5 x 50 grade 10.9 cap screws (92) and lock washers (95). Torque these fasteners to 51 ft-lbs.

## 4. Pump Bracket and Pump Assembly

- A. Remove the clip holding the positive battery cable clamp. Rotate clamp counter clock wise as far as possible and tighten. Relocate clip and cable to the bolt that fastens the bracket holding the radiator coolant overflow container to the battery box. This is needed to allow more room for mounting of the pump.
- B. Remove and discard the bolt just above the idler pulley below alternator. Remove and save the two top and outer bolts from the alternator. Place pump bracket (27) on the front of engine over the two alternator bolt holes. Reinstall the two alternator bolts through the top of pump bracket. Install a M10 x 1.5 x 110 grade 10.9 cap screw (93) with lock washer (95) through front of pump bracket in hole of previously removed fastener. Install two M10 x 1.5 x 30 grade 8.8 cap screws (94) with lock washers (95) to the two remaining holes in the front of the pump bracket. Tighten all pump bracket fasteners and reinstall vehicle fan belt.
- C. Mount the pump (1) to the pump plate (28) with three 5/16 x 1" (NC) Gr. 5 cap screws (78), flat washers (81), lock washers (79) and nuts (80) and one 5/16 x 1-1/4" (NC) cap screw (76), flat washer (81), brace tab (33) and locknut (87) in the orientation shown in the Pump Assembly diagram. The bolts and flat washers will be inserted from the pump plate side as shown.

Slide the pump pulley (26) 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 (98). 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 (97) 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. Screw a 3/8" NPT x 5/8" ID hose quill (55) into the swivel elbow. The elbow should point away from the pump shaft. Screw the 3/4" - 9/16" O-ring bushing (96) into the pressure

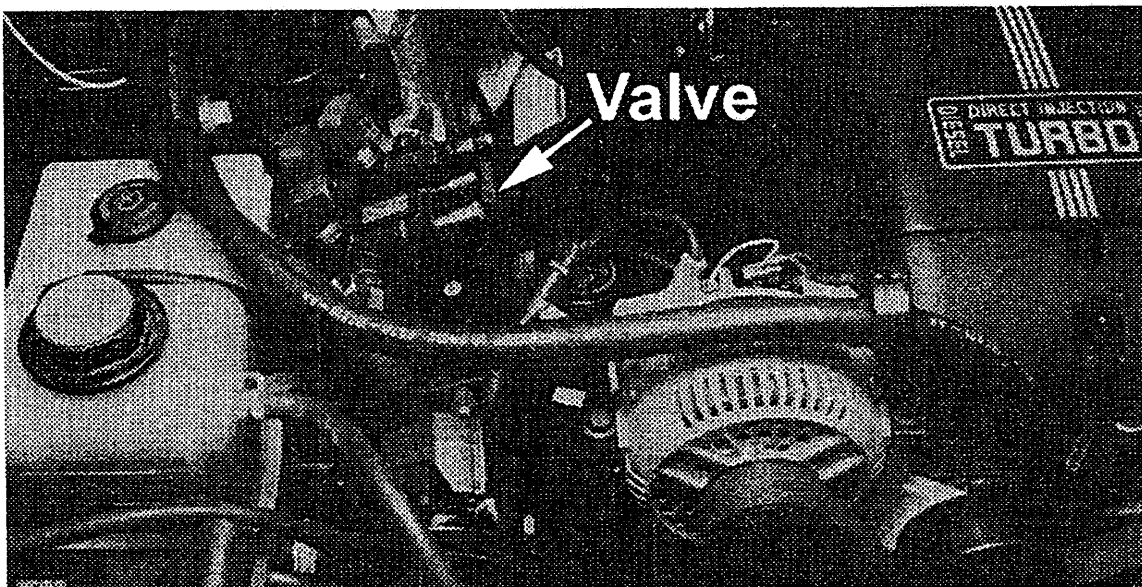
port. Screw a 9/16"-18 with O-ring x 1/4" NPTF elbow (54) into the pressure port bushing. The elbow should point away from the pump shaft

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 (99) 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.**

- E. Cut a 6" split hose grommet (74) in half and place one half on the edge of the pump bracket where the heater hose passes by.
- F. Attach the pump assembly to the previously installed pump bracket (27) with two 3/8 x 1-1/4" (NC) Gr. 5 cap screws (88), lock washers (91) and flat washers (90). **Do not fully tighten at this time.** Install a 63" V-belt over the drive and pump sheaves and tighten the belt upwards and away from the drive sheave so that the belt is clear of all hardware. Tighten the pump plate fasteners.

**5. Valve and Valve Plate**

- A. Using a bench vise to hold the control valve assembly (2), remove the closures from the valve ports. Screw the 90° swivel adapter unions (47) into the "in" and "out" ports. Screw a quill (59) into the installed adapter in the "out" port.
- B. Install three 9/16" O-rings to 1/4" NPT 90° elbows (54) in the lift and angle ports. Tighten so that the angle fittings will be at 8 o'clock and the raise fitting will be at 9 o'clock from the open spool end of valve. This will allow for adjustments when installing the hoses.
- C. Mount the valve plate (30) to the valve plate bracket (31), according to the illustration on page 3, using 5/16 x 1" cap screws (78) lock washers (79), and nuts (80). Attach the valve plate brace (32) to the front, right hole in the valve plate according to the illustration. Position the valve plate assembly on the passenger-side fender so the valve plate points toward the engine. Fasten the valve plate brace (32) to the vehicle bracket between the windshield wash tank and the coolant tank; use the top hole, if available, or the stud that holds the windshield wash tank. Using the holes in the valve plate bracket (31) as a guide, mark and drill the fender using an 11/32" drill. All three holes in the valve plate bracket may not be used. If there is a large gap, 1/4" or more, between the valve plate bracket and the fender do not use the inner most hole. Mount the valve plate assembly to the fender using 5/16 x 1-1/4" cap screws (76), flat washers (81), lock washers (79) and nuts (80). Reinstall the valve plate brace on the vehicle bracket between the two tanks. Tighten all fasteners.



*General valve placement. Completed installation may look different.*



**Note:** There should be approximately 3-1/2" between the valve plate and the oil fill cap on the engine's valve cover.

- D. Mount the valve to the valve plate using two 1/4 x 1-3/4" cap screws, lock washers and nuts from the valve bag. Install the cap screws from the bottom of the valve plate with the lock washers and nuts on the top of the valve.

**CAUTION:** The valve spools must be free and self centering when the cables and the control head are attached. Failure to center the spools will restrict the fluid flow through the valve. This may cause hydraulic hose failure. Hose failures can cause engine fires. When adjusted, the control lever must be in the neutral position to allow enough spool travel each way for proper valve actuation.

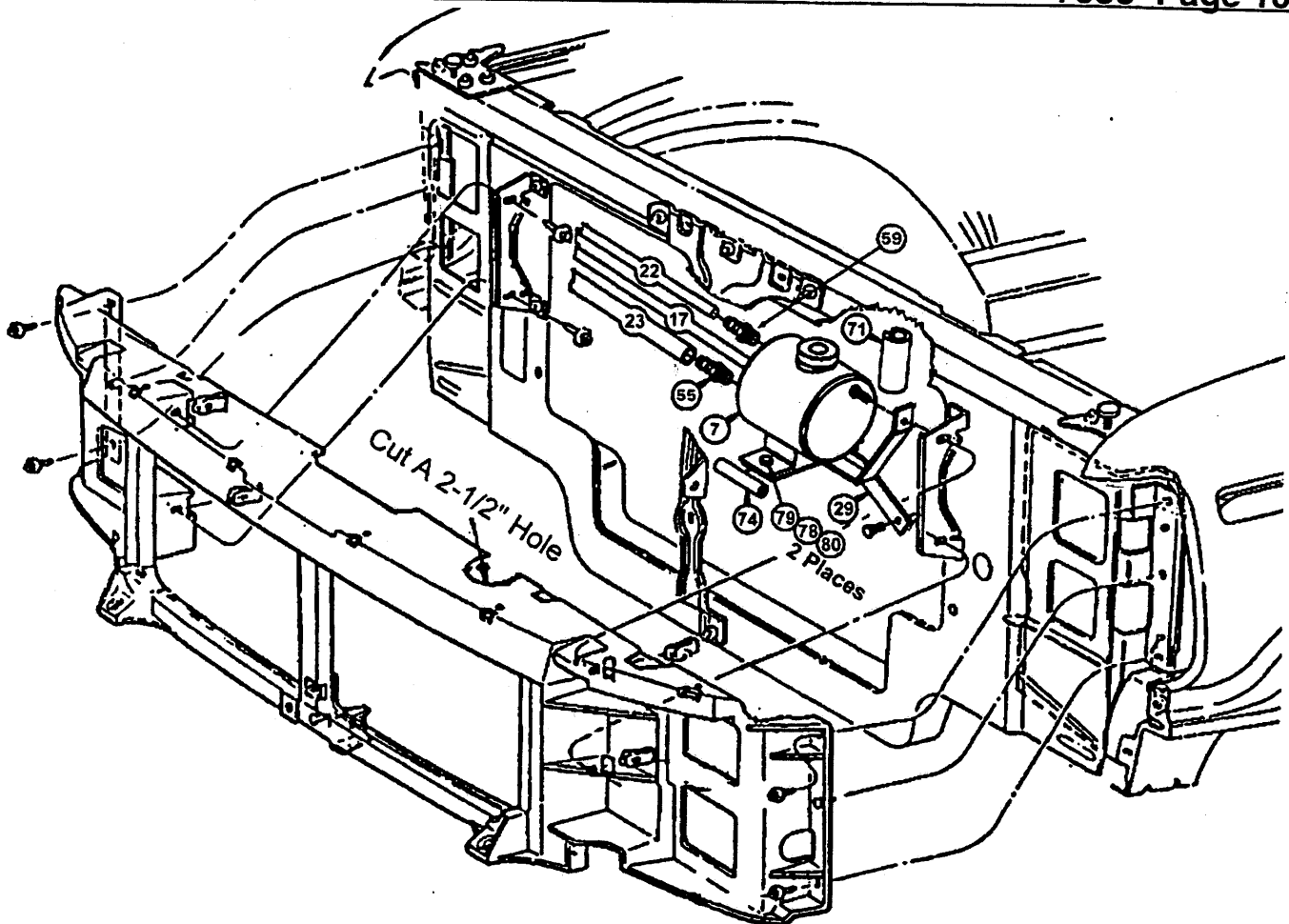
- E. Install the control cables to the valve plate by reinstalling the jam nuts and washers on the cables. Place the control cables in respective slots of the valve plate bulkhead with one nut and one washer on each side of the bulkhead. Center the cables in the slots so that they are exactly in line with the valve spool centers. Attach the cable clevis (3) to the cables using the square nuts (4). Slip the cable clevises over the spools. Install the clevis pin (5) through the clevis and spools and secure with a push nut (6). Adjust the cables so that the control lever is centered between both the angle and the raise/lower positions. If the cable clevis does not allow enough adjustment, reposition the cable at the valve plate bulkhead. After checking to see that the valve spools are in the centered position, tighten cable clevis nuts. Use three nylon ties (75) to run cables along air intake hoses.

## 6. Oil Reservoir Installation

**Caution:** Reservoir tank fill must be vertical to engine.

- A. Remove the five screws holding the vehicle grille and set the grille aside. Install a 1/2" quill (59) into the top threaded port and a 5/8" quill (55) into the bottom threaded port in the oil reservoir (7). Mount the oil reservoir to the reservoir bracket (29) using two 5/16 x 1" cap screws (78), lock washers (79) and nuts (80) with the quills pointed away from the bracket mounting holes.  
**Vehicles Equipped with Air Conditioning:** Attach a 3/4 x 2-1/2" split hose grommet (71) around the driver-side end of the AC condenser. Slide the grommet up as far as possible on the condenser.
- B. Mount the reservoir/bracket assembly on the driver-side of the radiator using two of the four existing bolts holding the galvanized grille brace according to the illustration. Making sure that the split rubber hose grommet is between the reservoir and the condenser. Cut a 2-1/2" diameter hole directly above the reservoir filler cap in the plastic cowl and molding to gain access to the cap. Install a 3" piece of the split hose grommet (74) over the front leg of the reservoir to inhibit any grille interference.

**Note:** The reservoir leg on older style reservoirs may interfere with the vehicle grille on some vehicles. New reservoirs have narrower legs to prevent this problem. If the reservoir leg interferes with reinstalling the grill (Step 7), remove material from the leg as needed.



## 7. Hydraulic Hose Installation

- A. Attach the 3/8 x 54" gray LP hose (17) to the relief quill on the pump. Push the hose all the way onto the quill. **Do not shorten this hose. Bends in all hoses must have sufficient radius to prevent crimping.** Route the hose between the windshield fluid holder brace, the wheel well and then through the bottom opening between the radiator and the body. Attach this hose all the way onto the 3/8" quill in the reservoir. Attach the 5/8 x 54" black LP hose (23) all the way onto the quill previously installed into the pump suction port. Route the hose over the top of the pump and through the top opening between the radiator and the body. Attach this hose onto the 5/8" quill of the reservoir. Attach the 1/2 x 64" blue HI-Temp LP hose (22) all the way onto the quill in the "out" port of the valve. Route this hose along the same path as the 5/8" LP hose. Attach it all the way onto the top 1/2" quill on the reservoir. Attach the 28" - 1/4" to 3/8" HP hose (16) to the 90° elbow previously installed in the pump pressure port. Route this hose under the valve plate and to the "in" port of the valve. Find a convenient location where the hose passes in front of the radiator. Reinstall vehicle grille with previously removed fasteners.
- B. Attach the hoses passing through the opening between the radiator and the body to the hole in the brace tab (33) previously installed onto the pump assembly with a nylon tie-wrap.
- C. Install the 60" HP hose (19) to the elbow in the angle port closest to the cables on the valve (Cyl. A). Pass the hose over the universal brace tab (33) above pump, down to top of radiator core, through hole and across behind grille. Pass hose out through grille, low and about 14" off center towards the driver side. Attach a female disconnect half (42) to the QD/Electric grille plate (56) with a snap ring (45). Pass the 54" hose through a rubber dust plug (43) and attach it to the female disconnect half (42). Route the head lamp connector with dust cover from previously installed light kit harness to the QD/Electric grille plate. Slide it into the slot provided. Attach the grille plate to the vehicle grille with 4 long hose ties.

- D. Attach a 42" HP hose (18) to the "raise" port elbow on the valve and another 42" HP hose (18) to the angle port elbow, farthest from the cables (Cyl. B) on valve. Pass these hoses over the top of the pump and tie all three hoses together and to hole on universal brace tab (33). Pass hoses down through hole at bottom of radiator and out through lower most part of grille about 14" off center towards the passenger side of the grille. Attach a bulkhead adapter (44) to one hole of the two QD grille plate (57) with a snap ring (45). Attach a male disconnect half (42) to this adapter. Secure a female disconnect half (42) to the other hole in the grille plate with a snap ring (45). Slide a rubber dust plug (43) over the end of the raise hose and attach to the male disconnect half on the inboard side of the grille plate. Slide a dust plug (43) over the angle hose and attach it to the female disconnect half on the outboard side of the grille plate. Slide the grille plate back to the vehicle grille and attach it with four long hose ties. Using the smaller hose ties (75), tie the hoses together and keep the hoses away from battery cables. Use split hose grommets (74) in 3" lengths on cables to isolate noise. Use hose ties (75) on all hoses to keep from chaffing on vehicle components.
- E. Install the cable boot bracket (65) on the driver-side headgear brace, between the brace and fasteners. Insert the cable boot (66) on over the bracket.

## 8. Operations

- A. Check all fittings and fasteners for tightness. Secure hoses with nylon tie wraps (75).
- B. Fill the 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 hoses.*** Raise the front end of the vehicle until the plow is clear of 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.

**Note: The installer must inform the end user of the proper procedure for removing any residual hydraulic hose pressure that may be trapped in the lift 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 control to all four plowing positions and return the control to lower. You may then remove or install the plow.

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