

Shafer Manual Hand Pump

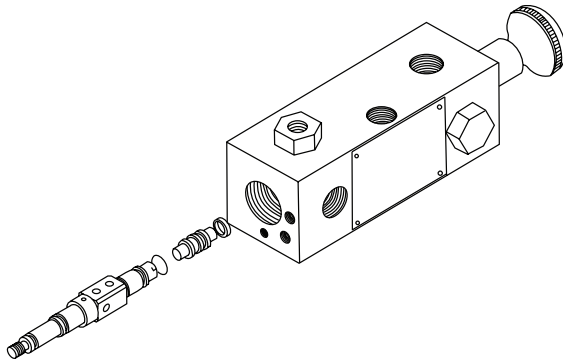
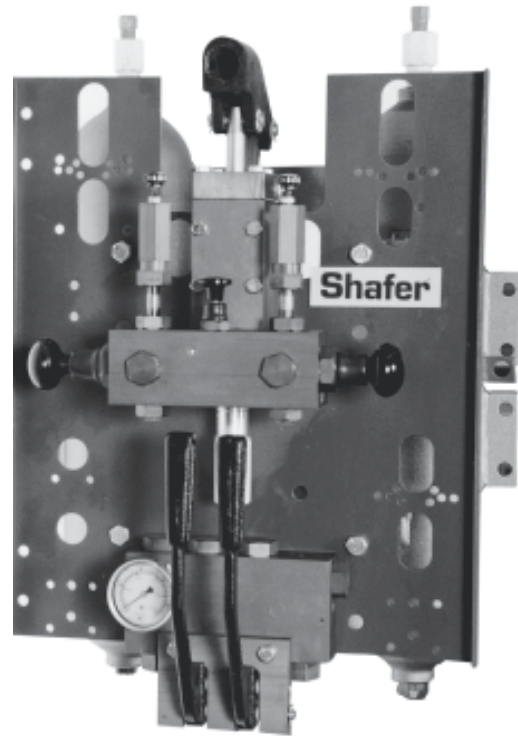
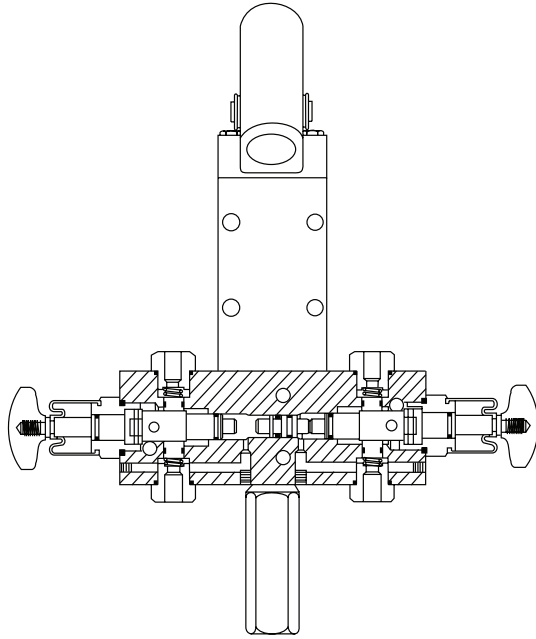


Table of Contents

Section 1: Gas-Hydraulic Hand Pump

1.1	Bill of Material	5
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Section 2: Central Hydraulic Hand Pump

2.1	Bill of Material	9
-----	------------------------	---

Section 3: Basic Check Out Procedures

3.1	Test 1	12
3.2	Test 2	12
3.3	Test 3	13

Section 4: Disassembly

4.1	Pump and Valve Components Disassembly	14
4.1.1	To remove the manual discharge relief assembly	14
4.1.2	To remove valve sleeve assembly	14
4.1.3	To remove the ring seal assembly	15
4.1.4	Disassembly of pump and valve combination	15
4.1.5	Disassembly of pump ram and piston	15

Section 5: Reconditioning and Assembly

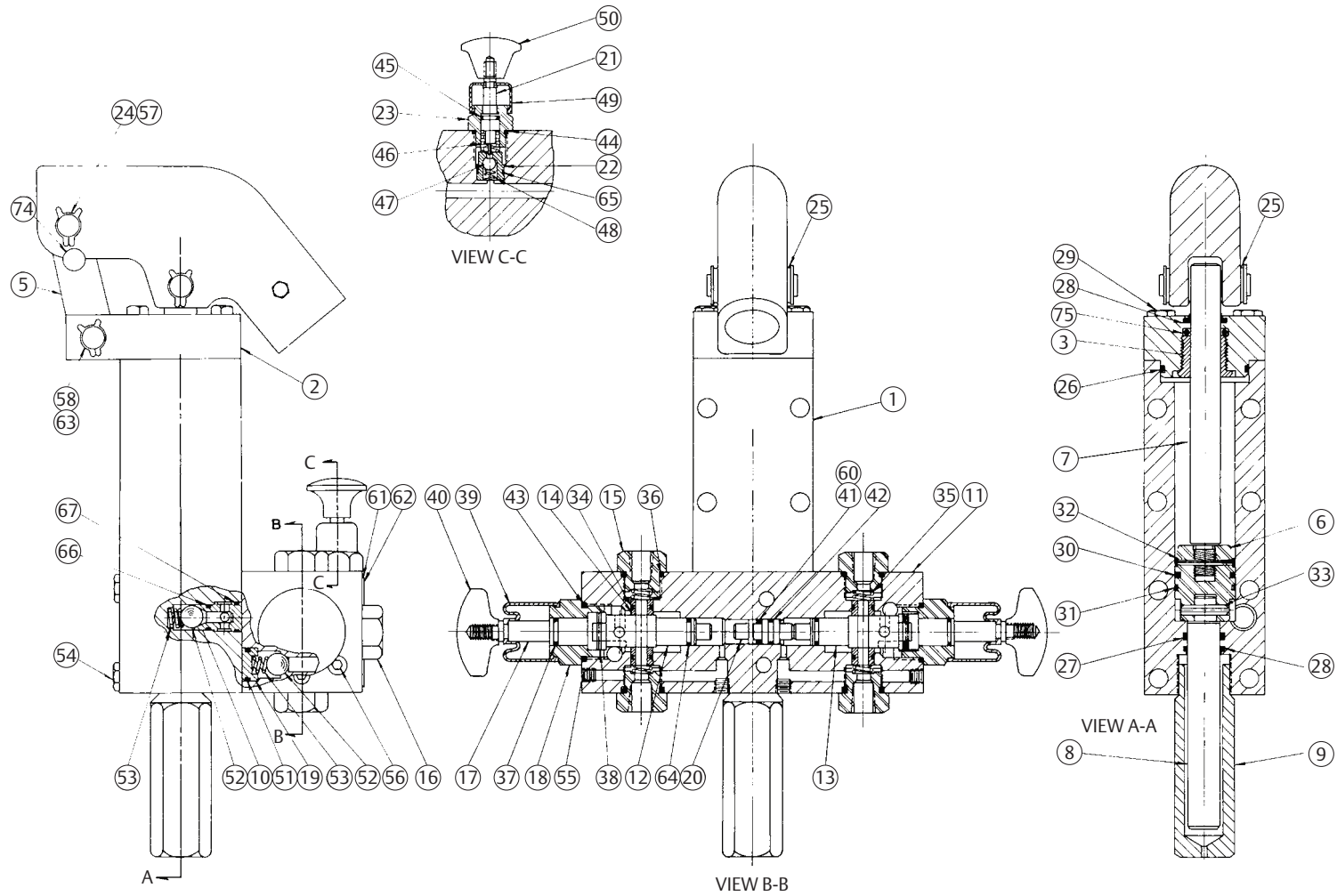
5.1	Relapping the Valve Sleeve	16
5.2	Reassembly Gas Hydraulic Pump	16
5.3	Reassembly Central Hydraulic System Pump	18

Appendix A: Gas Hydraulic System Circuit

Appendix B: Central Hydraulic System Circuit

Section: 1 Gas-Hydraulic Hand Pump

Figure 1 Assembly View



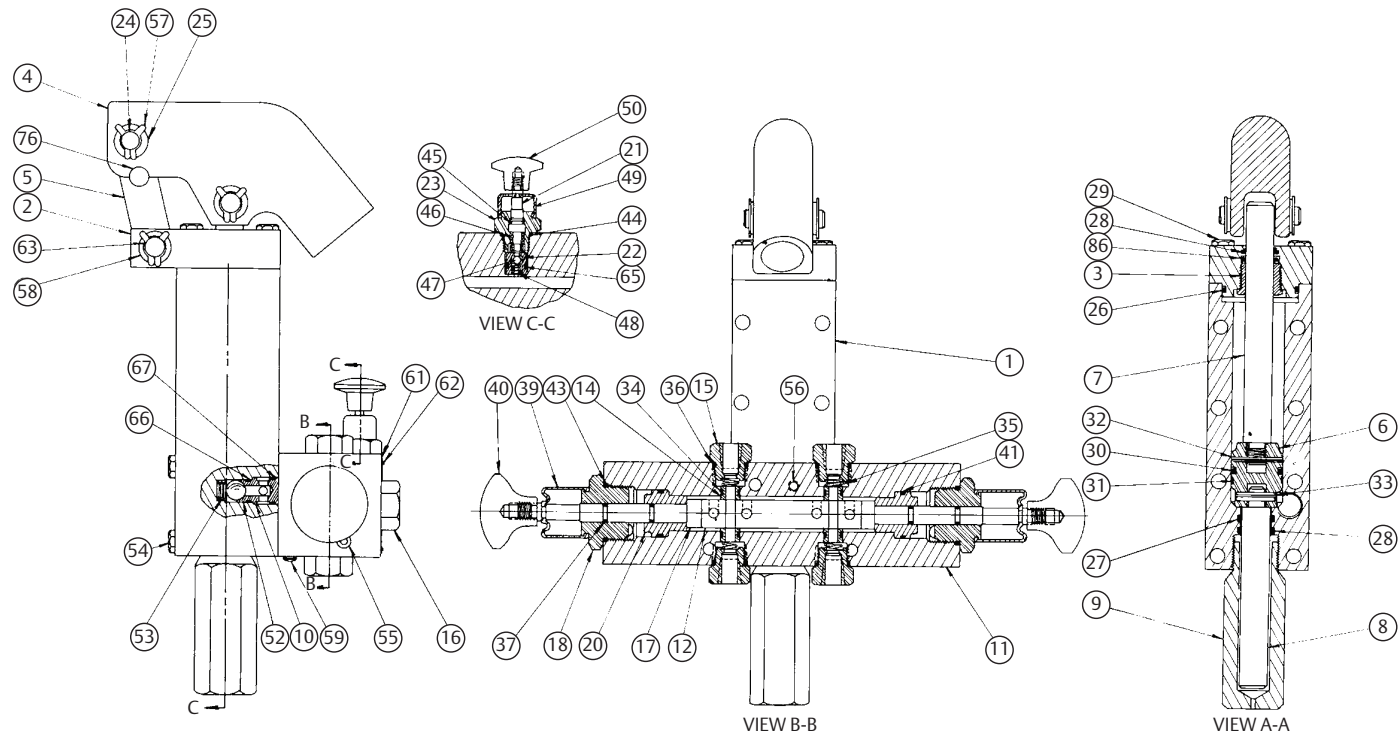
1.1 Bill of Material

1.	1 Pump Body		
2.	1 Pump Head		
3.	1 Packing Gland		
4.	1 Clevis		
5.	1 Pivot Bar		
6.	1 Pump Piston		
7.	1 Top Ram		
8.	1 Bottom Ram		
9.	1 Ram Protective Cover		
10.	1 Pump Suction Seat		
11.	1 Valve Body		
12.	1 Left Valve Steeve		
13.	1 Right Valve Steeve		
14.	6 Ring Seal		
15.	4 Ring Seal Cap		
16.	2 Valve Cap		
17.	2 Stem		
18.	2 Stem Cap		
19.	2 Suction Cap		
20.	1 Pilot Piston		
21.	1 Relief Stem		
22.	1 Relief Seat		
23.	1 Relief Cap		
24.	2 Clevis Pin S. S.		
25.	4 Acetal Bearing		
26.	1 Pump Head O-Ring	Comp.479-70	70 Duro
27.	1 Ram O-Ring	Comp.479-70	70 Duro
28.	2 Ram Wiper		90 Duro
29.	4 Head Bolt Hex Head Cap Screw S.S.		
30.	1 Piston O-Ring	Comp.479-70	70 Duro
31.	2 Piston Guide Ring		
32.	1 Top Ram Spring Pin		
33.	1 Bottom Ram Spring Pin		
34.	6 O-Ring	Comp.479-70	70 Duro
35.	6 Ring Seal Spring		
36.	6 Ring Seal Cap	Comp.479-70	70 Duro
37.	2 O-Ring	Comp.479-70	70 Duro

38.	2 Stem Spring Pin		
39.	2 Stem Boot		
40.	2 Stem Knob		
41.	1 Pilot Piston O-Ring	Comp.479-70	70 Duro
42.	1 Pilot Piston Guide Ring		
43.	2 Stem Cap O-Ring	Comp.479-70	70 Duro
44.	1 Relief Cap O-Ring	Comp.479-70	70 Duro
45.	1 Relief Stem O-Ring	Comp.479-70	70 Duro
46.	2 Relief Stem Spring		
47.	1 Relief Ball Nylon		
48.	1 Relief Spring		
49.	1 Relief Boot		
50.	1 Relief Knob		
51.	1 O-Ring	Comp.479-70	70 Duro
52.	4 Nylon Ball		
53.	3 Suction & Discharge Spring		
54.	4 Valve Bolts Hex Head Cap Screw S.S.		
55.	2 Flush Plug (STL) 7/8 Taper		
56.	9 Flush Plug (STL) 7/8 Taper		
57.	6 "X" Washer		
58.	2 Acetal Bearing		
59.	1 Flush Plug 7/8 Taper Steel		
60.	2 Pilot Piston Back-Up Ring		
61.	1 Instruction Plate		
62.	4 Instruction Plate Screws #4 Type "U"		
63.	1 Clevis Pin S.S.		
64.	2 O-Ring	Comp.479-70	70 Duro
65.	1 O-Ring	Comp.479-70	70 Duro
66.	1 O-Ring	Comp.479-70	70 Duro
67.	1 O-Ring	Comp.479-70	70 Duro
68.	1 O-Ring	Comp.479-70	70 Duro
69.	1 O-Ring	Comp.479-70	70 Duro
72.	1 Flush Plug 7/8 Taper Steel		
74.	1 Locking Pin		
75.	1 Upper Ram Seal Parker Poly Pak Rod Seal		Molythane

Section: 2 Central Hydraulic Hand Pump

Figure 3 Assembly View



PUMP AND SHUTTLE VALVE ASSEMBLY
1/8 NPTF FLUSH PLUG

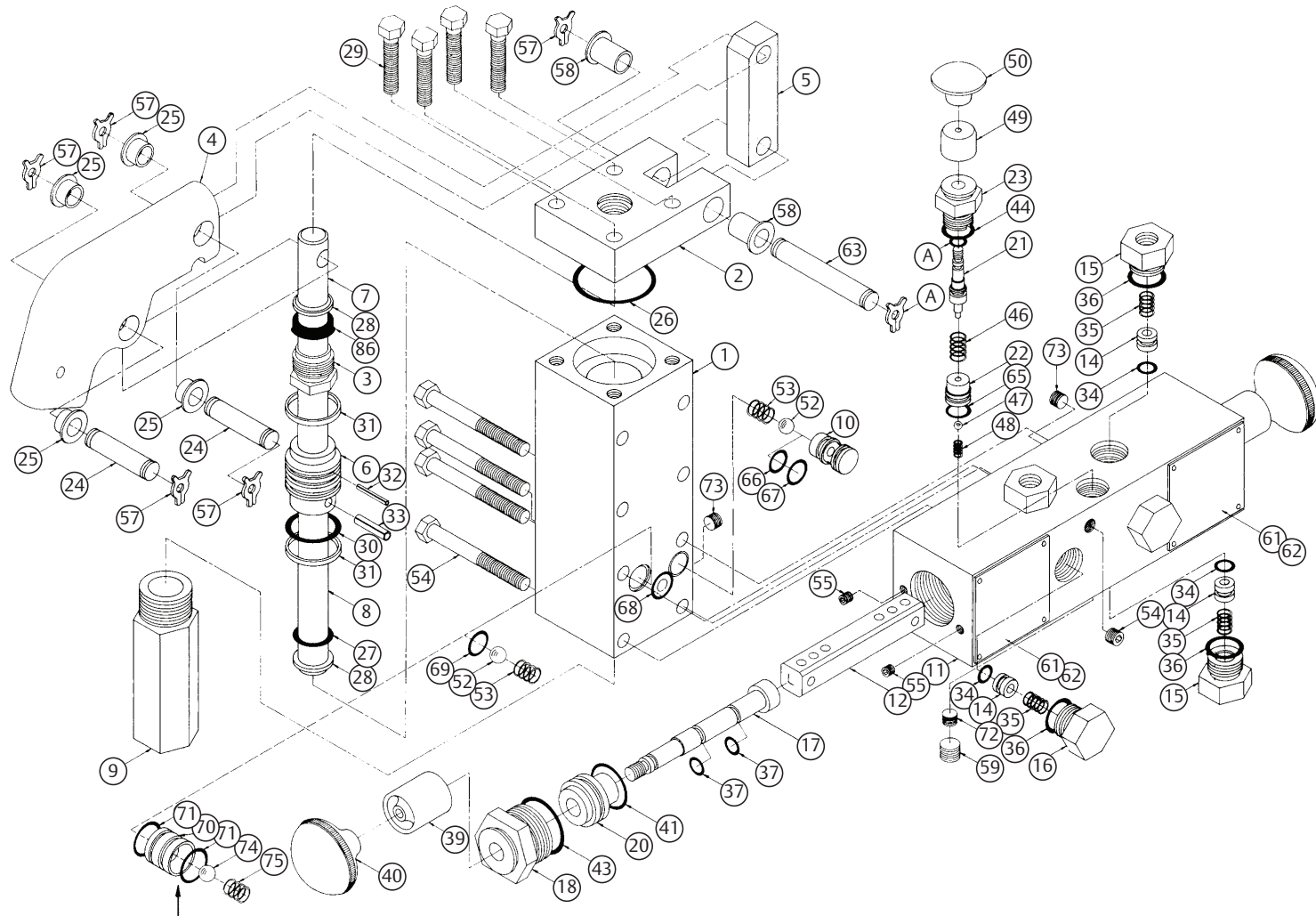
USE KEPNER SHUTTLE VALVE 2454 (1/8 NPTF PORTS) WITH THIS ASSEMBLY

2.1 Bill of Material

1.	1 Pump Body		
2.	1 Pump Head		
3.	1 Packing Gland		
4.	1 Clevis		
5.	1 Pivot Bar		
6.	1 Pump Piston		
7.	1 Top Ram		
8.	1 Bottom Ram		
9.	1 Ram Protective Cover		
10.	1 Pump Suction Seat		
11.	1 Valve Body		
12.	1 Valve Sleeve		
14.	6 Ring Seal		
15.	4 Ring Seal Cap		
16.	1 Pump Piston		
17.	2 Stem		
18.	2 Stem Cap		
20.	2 Pilot Piston		
21.	1 Relief Stem		
22.	1 Relief Seat		
23.	1 Relief Cap		
24.	2 Clevis Pin S.S.		
25.	4 Acetal Bearing		
26.	1 Pump Head O-Ring	Comp.479-70	70 Duro
27.	1 Ram O-Ring	Comp.479-70	70 Duro
28.	2 Ram Wiper		90 Duro
29.	4 Head Bolt Hex Head Cap Screw 316 S.S.		
30.	1 Piston O-Ring	Comp.479-70	70 Duro
31.	2 Piston Guide Ring		
32.	1 Top Ram Spring Pin		
33.	1 Bottom Ram Spring Pin		
34.	7 O-Ring	Comp.479-70	70 Duro
35.	7 Ring Seal Spring		
36.	6 Ring Seal Cap	Comp.479-70	70 Duro
37.	4 O-Ring	Comp.479-70	70 Duro
39.	2 Stem Boot		
40.	2 Stem Knob MPR-6		

41.	2 Pilot Piston O-Ring	Comp.470-70	70 Duro
43.	2 Stem Cap O-Ring	Comp.479-70	70 Duro
44.	1 Relief Cap O-Ring	Comp.479-70	70 Duro
45.	1 Relief Stem O-Ring	Comp.479-70	70 Duro
46.	2 Relief Stem Spring		
47.	1 Relief Ball Nylon		
48.	1 Relief Spring		
49.	1 Relief Boot		
50.	1 Relief Knob DK-49		
52.	2 Nylon Ball		
53.	2 Suction & Discharge Spring		
54.	4 Valve Bolts Hex Head Cap Screw S.S.		
55.	8 Flush Plug		
57.	6 "X" Washer		
58.	2 Acetal Bearing		
59.	1 Flush Plug		
61.	2 Instruction Plate		
62.	2 Instruction Plate Screws #4 Type "U"		
63.	1 Clevis Pin S.S.		
65.	2 O-Ring	Comp.479-70	70 Duro
66.	1 O-Ring	Comp.479-70	70 Duro
67.	1 O-Ring	Comp.479-70	70 Duro
68.	1 O-Ring	Comp.479-70	70 Duro
69.	1 O-Ring	Comp.479-70	70 Duro
70.	1 Flush Plug		
73.	1 Flush Plug		
76.	1 Kepner Shuttle Valve		
77.	1 Short Pipe Nipple S.S.		
78.	1 Locking Pin		
79.	2 SS-400-1-2 M.C. 1/8 Pipe 1.4 Tube		Swagelok
80.	2 SS-400-2-2 M.C. 1/8 Pipe 1.4 Tube		Swagelok
81.	1/4 O.D. Stainless Steel Tubing		
86.	1 Upper Ram Seal Parker PolyPak		
	Rod Seal		Molythane

Figure 4 Exploded View

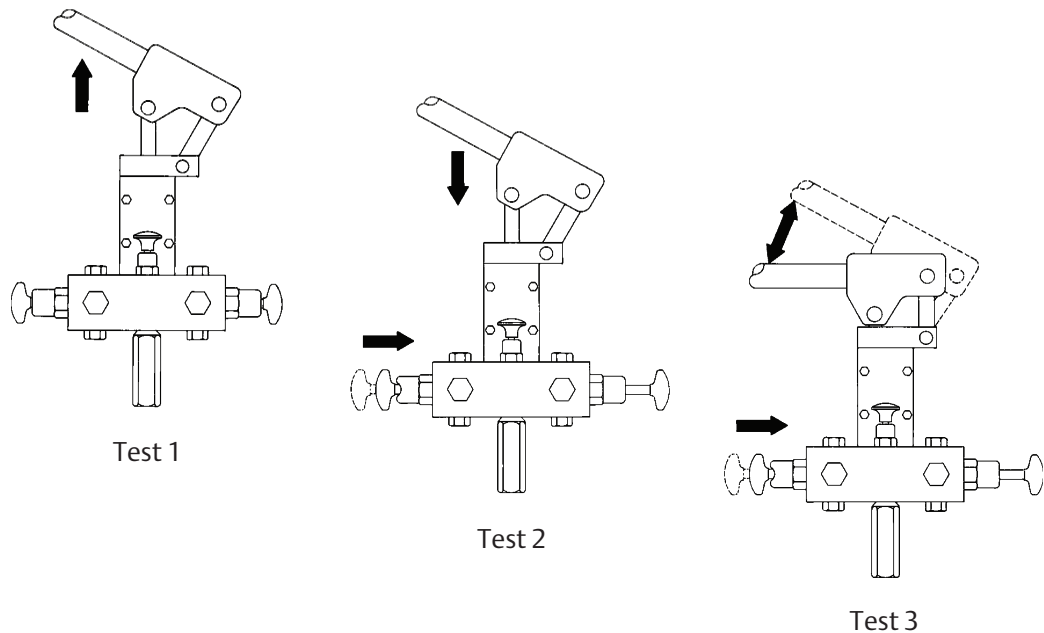


Note: Items 70, 71 & 73 pertain to the 12 cu. in. Hand Pump

Section: 3 Basic Check Out Procedures

The following three tests illustrate the proper working functions of the Shafer hand pump. Failure of any of these procedures may result in operating problems for the valve actuator.

Figure 5



3.1 Test 1

With both palm buttons out (automatic position) and with the ram in the "UP" position and fluid in the pump cylinder, stroke the hand pump. - If the ring seals, valve sleeves and the manual discharge check ball are sealing properly, it should be impossible to pull the pump ram down. The ram can be lowered or pulled down by holding in the manual discharge relief and pulling the ram down at the same time.

3.2 Test 2

With one palm button pushed in (selected for open or closed position) hand pump the actuator. If the pump is spongy or will only draw a partial ram of oil while pumping the actuator, check the gas/hydraulic tank for correct oil levels. If the control circuit is powered by a central hydraulic unit, check the pump reservoir tank for correct oil level and insure that the hand valve (if present) between the pump and reservoir is open. If the pump still will not draw oil during the suction cycle, reconditioning will be required.

3.3 Test 3

The final test is accomplished by pushing in the palm button to whatever position the valve is in, "open" or "closed". Raise the pump handle to draw fluid into the cylinder and then force the ram downward. The ram will discharge slowly on rotary vane actuators. Working properly, the ram should not move downward in an easy manner, when pumping against a fully stroked (open or closed) actuator. The same procedure can be applied to linear "gate type" actuators. Downward motion under great force may occur if relief settings are exceeded.

Section: 4 Disassembly

4.1 Pump and Valve Components Disassembly

Failure of the ram to "lock-up" as shown in Test #1 is a general indication of ring seal failure, suction check valve failure or manual relief check valve failure. Problem areas are usually due to a defective suction ball, discharge relief ball, ring seal or foreign matter imbedded in one or all three of the above mentioned components. A cut O-ring around the ring seat, suction check seat or discharge relief seat will produce the same malfunction.

NOTE:

During any component disassembly all O-rings, wear rings, wipers and nylon balls should be replaced.

4.1.1 To remove the manual discharge relief assembly

1. Push the relief knob (50) in to neutralize any trapped gas or oil pressure in the system.
2. Pull both palm buttons (40) out into automatic position.
3. Remove the discharge relief knob (50), boot (49) and hex head cap (23), stem (21) and spring (46).
4. Place one hand over the discharge relief cavity and jerk the pump ram (7) down to "pop" the relief seat (22) up for removal.
5. Inspect the O-ring on the discharge relief seat (22), the chamfered seat and the nylon check ball (47) for scoring or deep scratches.

4.1.2 To remove valve sleeve assembly

1. Push manual relief valve (50) down to neutralize any trapped gas or oil pressure in the system. (Neglect this if the relief assembly is already removed.)
2. Remove the palm valve knob (40), boot (39) and hex head cap (18).
3. Carefully pull the stem (17) and valve sleeve assembly (12) out of the valve body (11).
4. Inspect the flat surfaces on the valve sleeve (12) and the O-rings (37) on the stem (17).

NOTE:

The gas hydraulic pumps have two valve sleeves, items (12) and (13). The central hydraulic pumps have only one valve sleeve, item (12).

5. To remove the pilot pistons (20) inside the valve body (11) first remove the palm valve sleeve assembly (12). Care must be taken not to scratch or score the inside bore of the valve body. Replacement of the pilot piston O-rings (41) should be made at this time.

4.1.3 To remove the ring seal assembly

NOTE:

The valve sleeve assemblies, left (12) and right (13) apply to the gas hydraulic pumps. One valve sleeve assembly (12) applies to central system pumps. The valve sleeve assemblies for all pumps must be removed before removing the ring seal assemblies (14).

1. Disconnect the hydraulic tubing and fittings which connect the central ports to the control and the discharge ports to the actuator. The hex head cap retainers on the front face of the valve (11) also contain ring seal assemblies (14).
2. Remove hex head cap retainers (15) and (16) and springs (35).
3. Reach inside the valve body (11) through the valve sleeve hole and push the ring seals (14) out.
4. Inspect the flat faces of the ring seals (14) for wear and the O-rings (34) for cuts. Replacement of the ring seals (14) and O-rings (34) should be done at this time.

4.1.4 Disassembly of pump and valve combination

1. Remove the four assembly bolts (54) located on the back of the pump body (1).
2. Carefully pull the valve body (11) and pump body (1) apart to prevent loss of the mounting O-rings between the two blocks.
3. To remove the pump suction seat (10) inserted in the pump body (1) place one hand over the seat cartridge (10) and one finger to hold the nylon discharge ball on its seat and jerk the pump ram (7) downward to create pressure to "pop" the cartridge (10) out into your hand.
4. Inspect the seat O-rings (66) and (67), check the ball (51) and chamfered seat for scratches and foreign matter.

NOTE:

This pertains to the 12 cu. in. pumps only. Remove the discharge check seat (70) and inspect O-rings (71) and chamfered seat for scratches and foreign matter.

4.1.5 Disassembly of pump ram and piston

1. Remove the snap ring (X-washers) (57) located outside each pin (24, 63), in the clevis pivot arm assembly (4) and (5).
2. Remove the pins (63 & 24), clevis (4) and pivot bar (5).
3. Remove the four pump head bolts (29) located at the top of the pump cylinder (1).
4. Carefully pull the ram (7), and piston assembly (6) out of the pump cylinder (1).
5. Inspect the ram (7), pump cylinder bore (1), piston O-rings (30) and piston wear rings (31) for scoring and excessive wear. The O-ring (27) and Poly Pak lip seal (86) and wiper rings (28) around each pump ram (7 & 8) should be replaced at this time. One set O-ring (27), Poly Pak lip seal (86) and wiper ring (28) can be found in the pump head (2). The other set can be reached by unscrewing the hex shaped ram cover (9) at the bottom of the pump body (1).

Section: 5 Reconditioning and Assembly

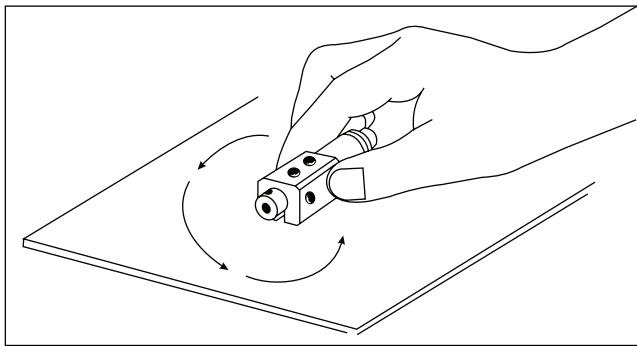
5.1 Relapping the Valve Sleeve

The valve sleeves (12) and (13) can be easily relapped to assure proper sealing surfaces; assuming the scratches in them are not too deep. Note each valve sleeve has four flat sides. Only the three with holes on them need to be relapped. Use a circular motion with a lapping compound on a flat surface to remove light scratches.

NOTE:

The central system pumps have only one valve sleeve (12) to lap.

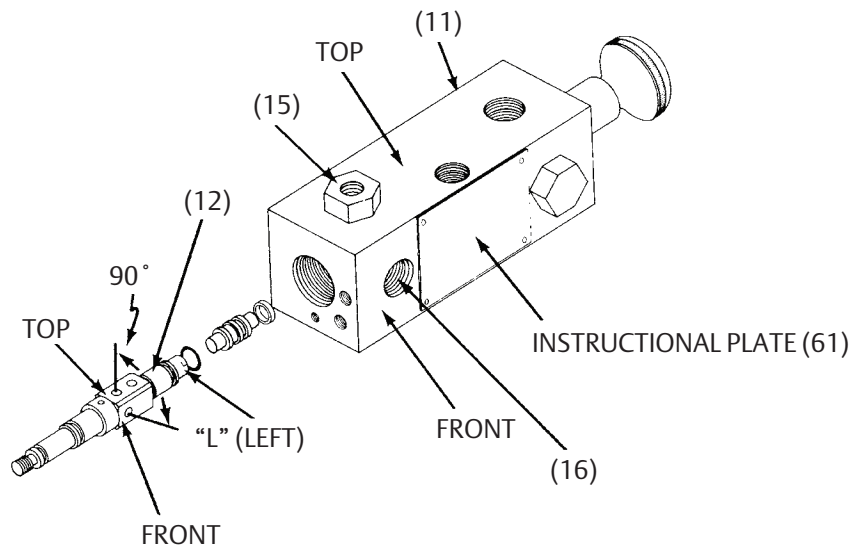
Figure 6



5.2 Reassembly Gas Hydraulic Pump

After relapping the valve sleeves (12) and (13) and replacement of the ring seals (14), with all six of the hex head cap retainers (15) and (16) removed, insert the left valve sleeve (12) (indicated left by the letter "L" stamped on the front face of the sleeve) into the valve body (11). The valve sleeve (12) has four port holes drilled through the flat surfaces. One set of holes are located 90° apart from the other. The other set is a drilled through hole. When inserting the left valve sleeve (12), the two 90° holes should line up with the top port (15) of the body (11) and the front port (16) of the valve body (1). The front being the face with the direction plate (61). After inserting the sleeve (12) as far as it will go, the 90° holes should be lined up with the above mentioned ports.

Figure 7

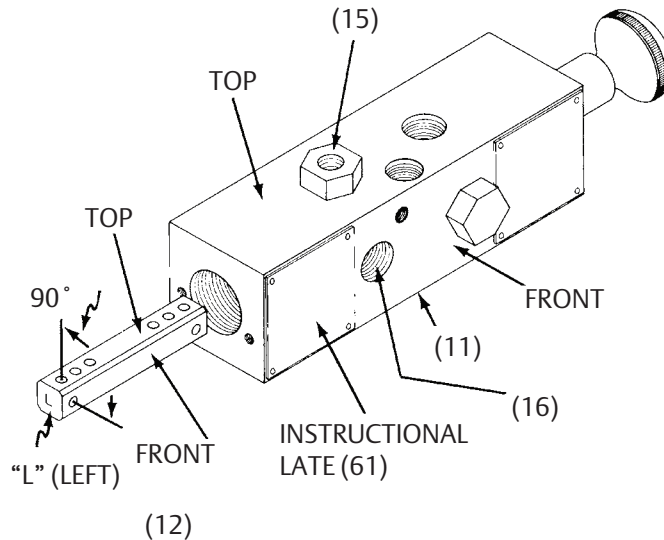


After one of the valve sleeves (12) is reassembled, insert the pilot piston (20) into the opposite sleeve hole. (The pilot piston (20) can be inserted in either direction). The pilot piston (20) should be pushed in with a screw driver or similar narrow tool once it's started into its cavity. This should be done carefully to prevent cutting the O-ring (41) or scratching the inside of the valve body.

The reassembly of the right valve sleeve (13) should follow the same instructions as the left valve sleeve (12). After inserting both valve sleeves (12) and (13) and their respective caps (18), insert the six ring seals (14) through the ports with the lapped surfaces of the ring seals (14) making contact with the flat sides of the valve sleeve (12) and (13). Insert the springs (35) and retaining hex head caps (15) and (16) and pull each valve sleeve (12) and (13) in and out several times so the sleeves (12) and (13) center themselves against each ring seal (14). To insure correct assembly of the sleeve (12) and (13) and ring seal (14) assemblies, push one sleeve at a time in as far as it will go and check to see if the 90° port holes in the sleeve line up with the top (actuator port) (15) and the front port (16). If this alignment is correct, follow the same instructions for the opposite sleeve.

5.3 Reassembly Central Hydraulic System Pump

Figure 8



After relapping the valve sleeve (12) and replacement of the ring seals (14), with all six of the hex head cap retainers (15) and (16) removed, insert the valve sleeve (12) into the valve body (11). The valve sleeve has five port holes per end.

NOTE:

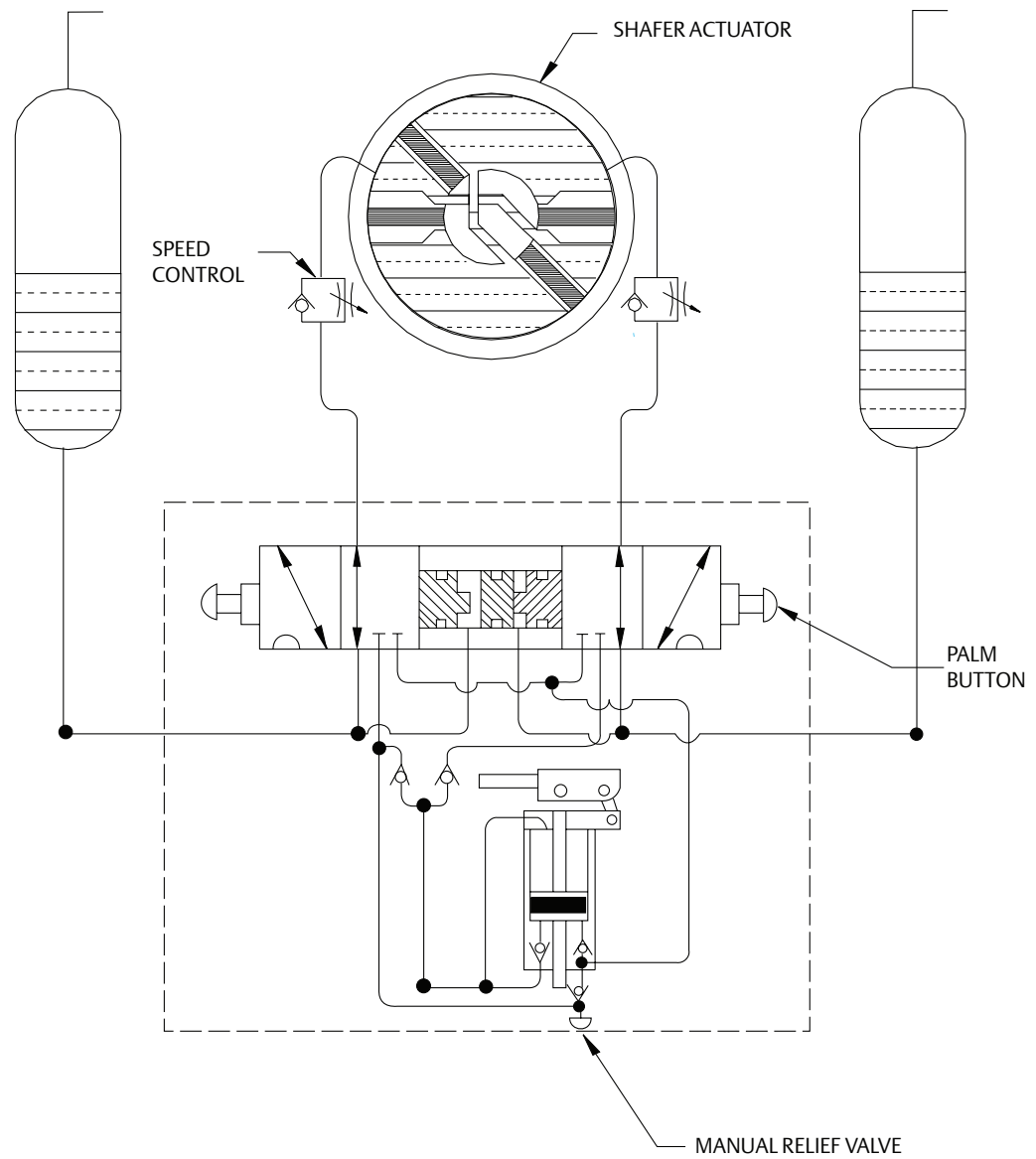
The sleeve is marked "L" for left and "R" for right. The five port holes are drilled through the four lapped flat surfaces of the valve sleeve. Figure 8 indicates how to reinstall the valve sleeve (12) into the valve body in the correct position.

NOTE:

The valve sleeve has a total of twelve holes drilled in four flat surfaces. The surface with six holes is the TOP. The surface with the two holes closest to the two extreme ends (left and right) is the FRONT. Figure 8 shows the sleeve in this position. The sleeve should be inserted into the valve body in this position only. The front of the valve body is the surface with the instruction plate. After reinstalling the valve sleeve (12) into the valve body (11), insert the pilot pistons (20) and stem caps (18). Next install the six ring seals (14) through the parts until they make contact with the lapped surfaces of the valve sleeve (12). Insert the springs (35) and the retaining hex caps (15) and (16) and push the valve sleeve palm buttons back and forth several times to insure the ring seals (14) and seat themselves against the lapped faces of the valve sleeve (12).

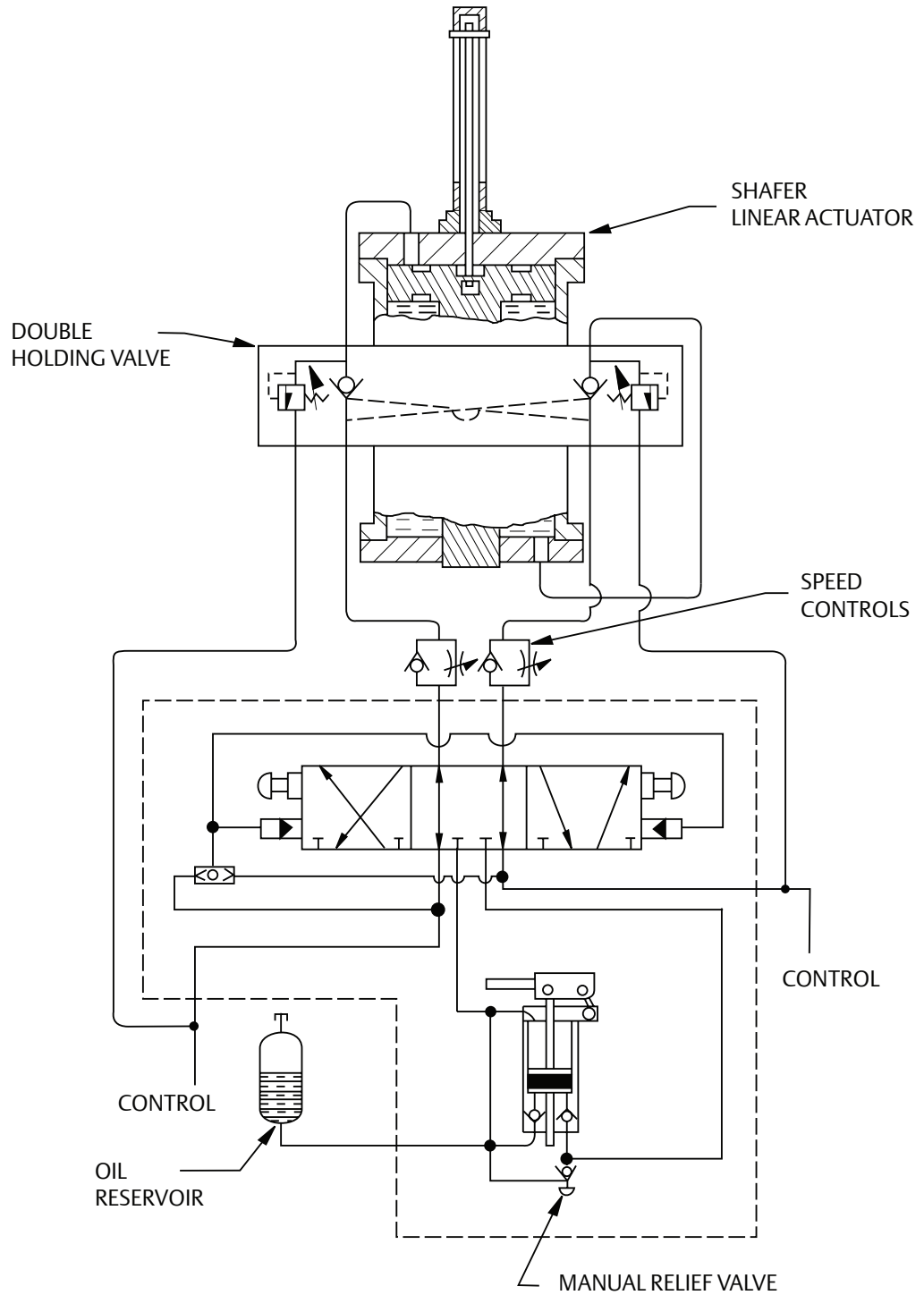
Appendix: A Gas Hydraulic System Circuit

Figure 9



Appendix: B Central Hydraulic System Circuit

Figure 10



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F +419 529 3688

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SP 18087-105
Brazil
T +55 15 3238 3788
F +55 15 3228 3300

ASIA PACIFIC

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#01-02 Singapore 629361
T +65 6777 8211
F +65 6268 0028

No. 1 Lai Yuan Road
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P. R. China
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F +86 22 8212 3308

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MIDDLE EAST & AFRICA

P. O. Box 17033
Dubai
United Arab Emirates
T +971 4 811 8100
F +971 4 886 5465

P. O. Box 10305
Jubail 31961
Saudi Arabia
T +966 3 340 8650
F +966 3 340 8790

24 Angus Crescent
Longmeadow Business Estate East
P.O. Box 6908 Greenstone
1616 Modderfontein Extension 5
South Africa
T +27 11 451 3700
F +27 11 451 3800

EUROPE

Berenyi u. 72- 100
Videoton Industry Park
Building #230
Székesfehérvár 8000
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T +36 22 53 0950
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