SINGLE MODULATING VALVE

Service Instructions

TABLE 1 (Specifications)

Complete Unit Model Number	Valve Assembly Number	Repair Kit Number	Brake Pressure Setting		Complete Unit Model Number	Valve Assembly Number	Repair Kit Number	Brake Pressure Setting	
			bar	(PSI)				bar	(PSI)
03-466-102	20-100-534	06-400-148	103.4 ± 3.5	(1500 ± 50)	06-466-171	20-100-626	06-400-148	55.2 ± 3.5	(800 ± 50)
03-466-104	n/a	06-400-148	81.0 ± 1.7	(1175 ± 25)	06-466-172	20-100-786	06-400-148	103.4 ± 3.5	(1500 ± 50)
03-466-106	n/a	06-400-148	20.7 ± 3.5	(1750 ± 50)	06-466-173	20-100-942	06-400-148	11.0 ± 1.4	(160 ± 20)
03-466-107	n/a	06-400-148	93.1 ± 3.5	(1350 ± 50)	06-466-174	20-100-787	06-400-148	43.1 ± 1.7	(625 ± 25)
03-466-111	n/a	06-400-148	44.8 ± 3.5	(650 ± 50)	06-466-176	20-100-631	06-400-148	27.6 ± 1.7	(400 ± 25)
03-466-113	n/a	06-400-148	120.7 ± 3.5	(1750 ± 50)	06-466-180	20-100-594	06-400-148	79.3 ± 3.5	(1150 ± 50)
03-466-114	20-200-006	06-400-148	82.7 ± 3.5	(1200 ± 50)	06-466-181	20-100-960	06-400-148	137.9 ± 5.2	(2000 ± 75)
03-466-116	n/a	06-400-148	25.9 ± 1.7	(375 ± 25)	06-466-182	20-100-600	06-400-154	84.5 ± 1.7	(1225 ± 25)
03-466-117	n/a	06-400-148	144.8 ± 6.9	(2100 ± 100)	06-466-184	20-100-503	06-400-148	37.9 ± 3.5	(550 ± 50)
03-466-118	n/a	06-400-148	12.1 ± 1.7	(175 ± 25)	06-466-186	20-100-565	06-400-148	69.0 ± 3.5	(1000 ± 50)
06-466-100	20-100-513	06-400-148	82.7 ± 3.5	(1200 ± 50)	06-466-187	20-100-586	06-400-148	27.6 ± 1.7	(400 ± 25)
06-466-101	20-100-518	06-400-148	55.2 ± 3.5	(800 ± 50)	06-466-188	20-100-518	06-400-148	55.2 ± 3.5	(800 ± 50)
06-466-102	20-100-512	06-400-148	62.1 ± 3.5	(900 ± 50)	06-466-189	20-100-961	06-400-148	137.9 ± 6.9	(2000 ± 100)
06-466-103	20-100-534	06-400-148	103.4 ± 3.5	(1500 ± 50)	06-466-190	20-100-631	06-400-148	27.6 ± 1.7	(400 ± 25)
06-466-104	20-100-816	06-400-148	86.2 ± 3.5	(1250 ± 50)	06-466-191	20-100-935	06-400-148	53.8 ± 2.1	(780 ± 30)
06-466-105	20-100-829	06-400-148	48.3 ± 3.5	(700 ± 50)	06-466-192	20-100-534	06-400-148	103.4 ± 3.5	(1500 ± 50)
06-466-106	20-100-534	06-400-148	103.4 ± 3.5	(1500 ± 50)	06-466-194	20-100-513	06-400-148	82.7 ± 3.5	(1200 ± 50)
06-466-107	20-100-816	06-400-148	86.2 ± 3.5	(1250 ± 50)	06-466-196	20-100-871	06-400-148	131.0 ± 3.5	(1900 ± 50)
06-466-108	20-100-515	06-400-148	137.9 ± 3.5	(2000 ± 50)	06-466-197	20-100-631	06-400-148	27.6 ± 1.7	(400 ± 25)
06-466-109	20-100-815	06-400-148	37.9 ± 3.5	(550 ± 50)	06-466-198	20-100-793	06-400-148	44.8 ± 1.7	(650 ± 25)
06-466-110	20-100-503	06-400-148	37.9 ± 3.5	(550 ± 50)	06-466-199	20-100-794	06-400-148	41.4 ± 3.5	(600 ± 50)
06-466-112	20-100-553	06-400-148	65.5 ± 1.7	(950 ± 25)	06-466-302	20-200-010	06-400-148	37.9 ± 2.1	(550 ± 30)
06-466-113	20-100-503	06-400-148	37.9 ± 3.5	(550 ± 50)	06-466-304	20-200-026	06-400-148	20.7 ± 1.7	(300 ± 25)
06-466-114	20-100-518	06-400-148	55.2 ± 3.5	(800 ± 50)	06-466-306	20-200-029	06-400-148	55.2 ± 3.5	(800 ± 50)
06-466-115	20-100-823	06-400-148	65.5 ± 3.5	(950 ± 50)	06-466-308	20-200-041	06-400-148	137.9 ± 6.8	(2000 ± 100)
06-466-116	20-100-568	06-400-148	158.6 ± 5.2	(2300 ± 75)	06-466-309	20-200-042	06-400-148	117.2 ± 3.5	(1700 ± 50)
06-466-117	20-100-787	06-400-148	44.8 ± 1.7	(650 ± 25)	06-466-311	20-100-518	06-400-148	55.2 ± 3.5	(800 ± 50)
06-466-118	20-100-518	06-400-148	55.2 ± 3.5	(800 ± 50)	06-466-312	20-200-056	06-400-148	19.0 ± 1.7	(275± 25)
06-466-120	20-100-565	06-400-148	69.0 ± 3.5	(1000 ± 50)	06-466-314	20-200-081	06-400-148	23.1 ± 1.4	(335 ± 20)
06-466-121	20-100-830	06-400-148	82.7 ± 3.5	(1200 ± 50)	06-466-320	20-100-590	06-400-148	93.1 ± 3.5	(1350 ± 50)
06-466-122	20-100-585	06-400-148	103.4 ± 3.5	(1500 ± 50)	06-466-322	20-100-590	06-400-148	93.1 ± 3.5	(1350 ± 50)
06-466-124	20-100-586	06-400-148	27.6 ± 1.7	(400 ± 25)	06-466-324	20-100-800	06-400-148	69.0 ± 3.5	(1000 ± 50)
06-466-126	20-100-527	06-400-148	75.8 ± 3.5	(1100 ± 50)	06-466-328	20-200-133	06-400-148	137.9 ± 6.9	(2000 ± 100)
06-466-128	20-100-549	06-400-148	51.7 ± 3.5	(750 ± 50)	06-466-332	20-200-145	06-400-148	68.9 ± 3.5	(1000 ± 50)
06-466-130	20-100-534	06-400-148	103.4 ± 3.5	(1500 ± 50)	06-466-343	20-200-170	06-400-148	55.2 ± 3.5	(800 ± 50)
06-466-132	20-100-590	06-400-148	93.1 ± 3.5	(1350 ± 50)	06-466-345	20-200-196	06-400-148	50.0 ± 3.5	(725 ± 50)
06-466-134	20-100-603	06-400-148	25.2 ± 2.4	(365 ± 35)	06-466-348	20-100-590	06-400-148	93.1 ± 3.5	(1350 ± 50)
06-466-135	20-100-837	06-400-148	20.7 ± 1.7	(300 ± 25)	06-466-353	20-100-626	06-400-148	55.2 ± 3.5	(800 ± 50)
06-466-136	20-100-534	06-400-148	103.4 ± 3.5	(1500 ± 50)	06-466-366	20-200-341	06-400-148	64.3 ± 3.5	(930 ± 50)
06-466-137	20-100-841	06-400-148	41.4 ± 3.5	(600 ± 50)	06-466-388	20-200-201	06-400-154	84.5 ± 1.7	(1225 ± 25)
06-466-138	20-100-600	06-400-154	84.5 ± 1.7	(1225 ± 25)	06-466-393	20-200-240	06-400-148	30.0 ± 1.7	(435 ± 25)
06-466-139	20-100-513	06-400-148	82.7 ± 3.5	(1200 ± 50)	06-466-397	20-200-284	06-400-148	63.4 ± 3.5	(920 ± 50)
06-466-140	20-100-626	06-400-148	55.2 ± 3.5	(800 ± 50)	06-466-431	20-200-052	06-400-148	93.1 ± 3.5	(1350 ± 50)
06-466-142	20-100-631	06-400-148	27.6 ± 1.7	(400 ± 25)	06-466-433	20-200-062	06-400-148	55.2 ± 3.5	(800 ± 50)
06-466-144	20-100-527	06-400-148	75.8 ± 3.5	(1100 ± 50)	06-466-456	20-100-994	06-400-148	48.3 ± 3.5	(700 ± 50)
06-466-146	20-100-638	06-400-148	62.1 ± 3.5	(900 ± 50)	06-466-490	20-200-015	06-400-148	55.2 ± 3.5	(800 ± 50)
06-466-147	20-100-841	06-400-148	41.4 ± 3.5	(600 ± 50)	06-466-497	20-100-585	06-400-148	103.4 ± 3.5	(1500 ± 50)
06-466-148	20-100-646	06-400-148	29.3 ± 1.7	(425 ± 25)	06-466-507	20-100-664	06-400-148	120.7 ± 3.5	(1750 ± 50)
06-466-150	20-100-647	06-400-148	33.8 ± 1.7	(490 ± 25)	06-466-535	20-200-156	06-400-148	144.8 ± 5.2	(2100 ± 75)
06-466-152	20-100-650	06-400-154	41.7 ± 1.7	(605 ± 25)	06-466-627	20-200-344	06-400-154	84.5 ± 1.7	(1225 ± 25)
06-466-154	20-100-664	06-400-148	120.7 ± 3.5	(1750 ± 50)	06-466-900	n/a	06-400-154	75.8 ± 3.5	(1100 ± 50)
06-466-158	20-100-675	06-400-148	44.8 ± 3.5	(650 ± 50)	06-466-902	n/a	06-400-148	100.0 ± 3.5	(1450 ± 50)
06-466-160	20-100-631	06-400-148	27.6 ± 1.7	(400 ± 25)	06-466-903	n/a	06-400-154	72.4 ± 3.5	(1050 ± 50)
06-466-161	20-100-565	06-400-148	69.0 ± 3.5	(1000 ± 50)	06-466-904	n/a	06-400-154	75.8 ± 3.5	(1100 ± 50)
06-466-162	20-100-680	06-400-148	124.1 ± 3.5	(1800 ± 50)	06-466-910	20-100-591	06-400-148	113.8 ± 5.2	(1650 ± 75)
06-466-163	20-100-680	06-400-148	124.1 ± 3.5	(1800 ± 50)	06-466-912	n/a	06-400-148	27.6 ± 1.7	(400 ± 25)
06-466-164	20-100-784	06-400-148	206.8 ± 3.5	(3000 ± 50)	06-466-913	20-100-870	06-400-148	137.9 ± 3.5	(2000 ± 50)
06-466-165	20-100-920	06-400-148	93.1 ± 3.5	(1350 ± 50)	06-466-983	20-100-515	06-400-148	137.9 ± 3.5	(2000 ± 50)
06-466-166	20-100-785	06-400-148	55.2 ± 3.5	(800 ± 50)	06-466-989	20-100-800	06-400-148	69.0 ± 3.5	(1000 ± 50)
06-466-167	20-100-926	06-400-148	62.1 ± 3.5	(900 ± 50)	20-200-021	n/a	06-400-148	55.2 ± 3.5	(800 ± 50)
06-466-169	20-100-927	06-400-148	6.6 ± 3.5	(95 ± 50)	20-200-108	n/a	06-400-148	172.4 ± 3.5	(2500 ± 50)
06-466-167	20-100-926	06-400-148	62.1 ± 3.5	(900 ± 50)	407 101 006 0	20-200-133	06-400-148	137.9 ± 6.9	(2000 ± 100)
06-466-169	20-100-927	06-400-148	6.6 ± 0.34	(95 ± 5)	407 101 040 0	407 101 023 2	06-400-148	25.5 +0/-19	(370 +0/-40)

...continued on page 2

Complete Unit Model Number	Valve Assembly Number	Repair Kit Number	Brake Pressure Setting		Complete Unit Model Number	Valve Assembly Number	Repair Kit Number	Brake Pressure Setting	
			bar	(PSI)				bar	(PSI)
407 101 065 0	20-100-870	06-400-148	137.9 ± 3.5	(2000 ± 50)					
407 101 112 0	407 101 113 2	06-400-148	26.5 +0/-19	(384 +0/-40)					
407 101 116 0	407 101 117 2	06-400-148	25.8 +0/-19	(374 +0/-40)					

NOTE: If your product number is not listed, contact ZF Off-Highway Solutions Minnesota Inc. for information.

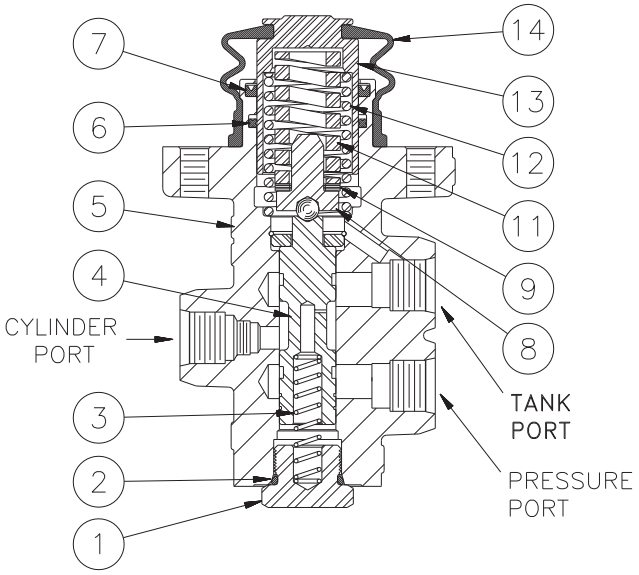

FIGURE 1

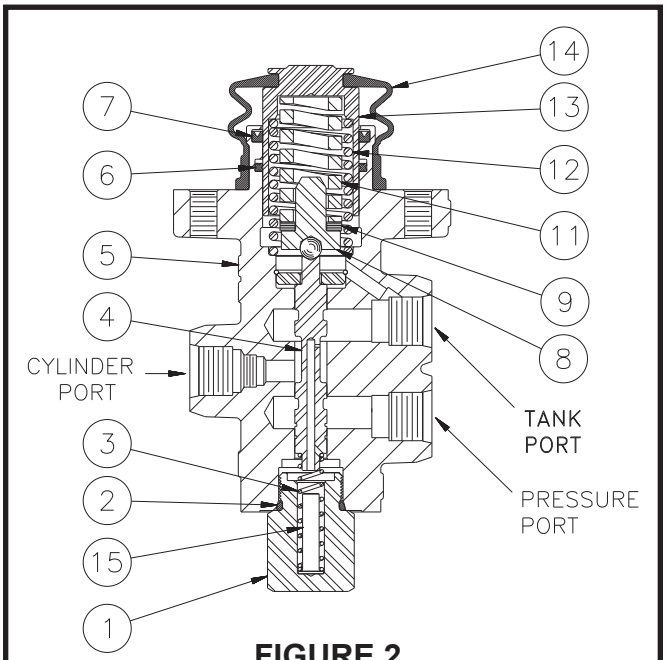

FIGURE 2

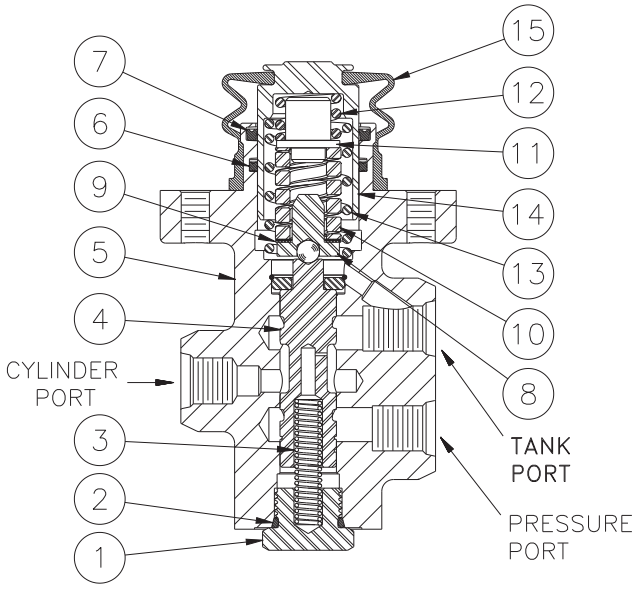

FIGURE 3

⚠ WARNING

Installation and test note: Piston (13) must be retained mechanically. This will prevent it from blowing out at high velocity if an incorrect connection occurs from power source to tank port. **Be sure the tank port is connected directly to tank.** Failure to do this could result in serious injury or death.

Models:		
03-466-102	06-466-138	06-466-302
03-466-111	06-466-139	06-466-304
03-466-114	06-466-140	06-466-306
03-466-116	06-466-142	06-466-311
03-466-118	06-466-144	06-466-312
06-466-100	06-466-146	06-466-320
06-466-101	06-466-147	06-466-322
06-466-102	06-466-148	06-466-324
06-466-103	06-466-150	06-466-332
06-466-104	06-466-152	06-466-345
06-466-105	06-466-158	06-466-366
06-466-106	06-466-160	06-466-393
06-466-107	06-466-161	06-466-431
06-466-109	06-466-166	06-466-433
06-466-110	06-466-167	06-466-343
06-466-112	06-466-170	06-466-348
06-466-113	06-466-172	06-466-353
06-466-114	06-466-173	06-466-388
06-466-115	06-466-174	06-466-397
06-466-117	06-466-176	06-466-456
06-466-118	06-466-180	06-466-627
06-466-120	06-466-182	06-466-912
06-466-121	06-466-184	06-466-989
06-466-124	06-466-186	4071010400
06-466-126	06-466-187	4071010650
06-466-128	06-466-188	
06-466-130	06-466-190	
06-466-132	06-466-191	
06-466-134	06-466-192	
06-466-135	06-466-194	
06-466-136	06-466-197	
06-466-137	06-466-198	
	06-466-199	

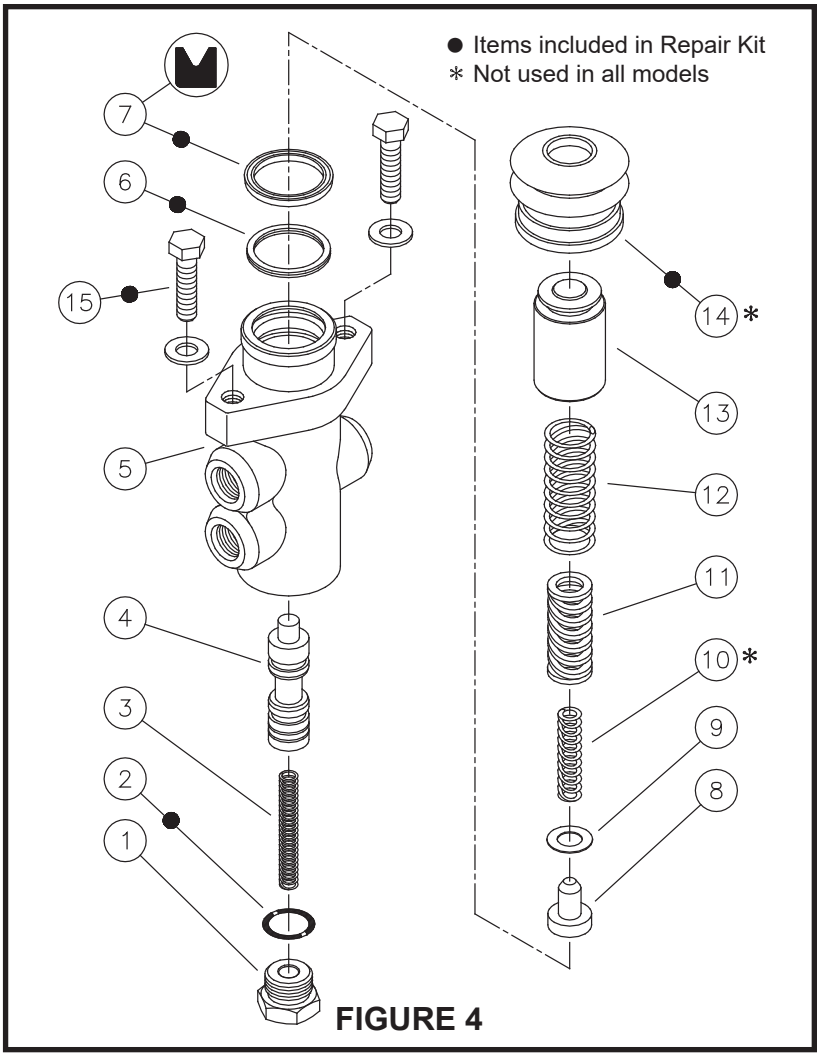

FIGURE 4

DISASSEMBLY
(Refer to Figures 1 and 4)

NOTE
Housing (5) and the spool (4) are manufactured as a matched set. This set (housing and spool) should not be intermixed with other parts.

1. Remove boot (14) from piston (13) and housing (5). Not all models use boot (14).
2. Remove piston (13), springs (12, 11 & 10), shim(s) (9) and retainer assembly (8) from housing (5). Not all models use spring (10). **NOTE: Be aware of the number of shim(s) being removed from housing.**
3. Carefully remove cup (7) and seal (6) from housing (5) bore. **NOTE: Be careful not to scratch or mar housing bore.**
4. Remove end plug (1) and spring (3) from housing (5). Remove o-ring (2) from end plug (1).
5. Carefully remove spool (4) from end plug (1) end of housing (5). **NOTE: Be careful not to damage spool or housing bore.**

ASSEMBLY
(Refer to Figures 1 and 4)

LUBRICATE ALL RUBBER COMPONENTS FROM REPAIR KIT WITH CLEAN TYPE FLUID USED IN THE SYSTEM.

1. Clean all parts thoroughly before assembling.
2. Lubricate spool (4) with clean system fluid and carefully slide into plug (1) end of housing (5) bore. Note direction of spool (4). **NOTE: Spool must slide freely into bore. If either part is damaged, a new valve assembly may be required.**
3. Install new o-ring (2) on end plug (1).

NOTE
Only model 06-466-124 uses the larger of the two o-rings in Repair Kit to replace item (2).

4. Install spring (3) and end plug (1) into housing (5). Torque 47.5-54.2 N·m (35-40 lb·ft).
5. Carefully install new cup (7) and new seal (6) into housing (5) bore. Note direction and order of cup and seal. **NOTE: Be careful not to scratch or mar housing bore.**
6. Install springs (10, 11 & 12), shim(s) (9) and retainer assembly (8) in piston (13). Not all models use spring (10). Be sure to install the same number of shim(s) as| were removed.
7. Carefully install piston (13) assembly into housing (5) bore.
8. Install new boot (14) on housing (5) and piston (13).
9. When reinstalling pedal actuated valve use new hex cap screws (15), 5/16-18UNC SAE grade 8. Torque cap screws 24.4-29.8 N·m (18-22 lb·ft). **NOTE: Not all repair kits include new cap screws (15).**

NOTE
After service, the valve must develop the pressure indicated in the specifications, TABLE 1. Shim(s) (9) are used to obtain the correct pressure setting. Contact ZF Off-Highway Solutions Minnesota Inc. if brake pressure setting is not able to be obtained.

Models:

03-466-104	**06-466-328**
03-466-106	**06-466-490**
03-466-107	**06-466-497**
03-466-113	**06-466-507**
03-466-117	**06-466-535**
06-466-108	**06-466-900**
06-466-116	**06-466-902**
06-466-122	**06-466-903**
06-466-152	**06-466-904**
06-466-154	**06-466-910**
06-466-158	**06-466-913**
06-466-162	**06-466-983**
06-466-163	**20-100-870**
06-466-164	**20-200-108**
06-466-181	**407 101 006 0**
06-466-189	**407 101 016 0**
06-466-196	**407 101 112 0**
06-466-308	
06-466-309	
06-466-314	

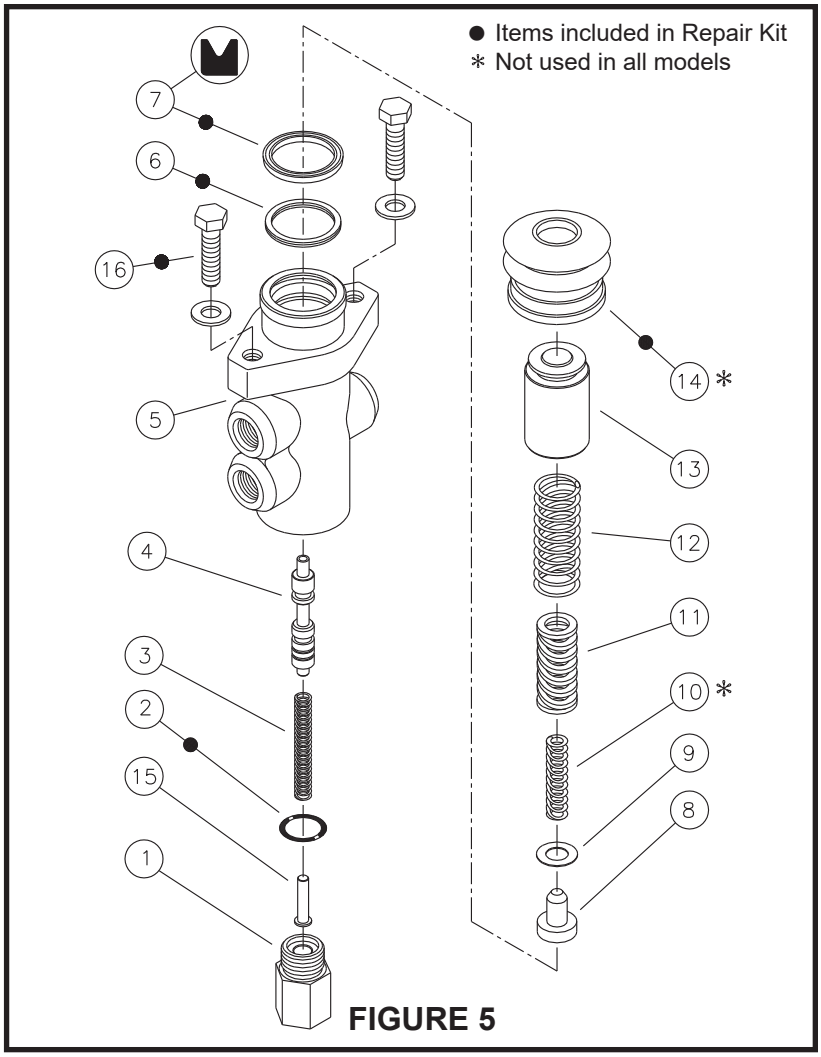

FIGURE 5

DISASSEMBLY

(Refer to Figures 2 and 5)

NOTE

Housing (5) and the spool (4) are manufactured as a matched set. This set (housing and spool) should not be intermixed with other parts.

1. Remove boot (14) from piston (13) and housing (5). Not all models use boot (14).
2. Remove piston (13), springs (12, 11 & 10), shim(s) (9) and retainer assembly (8) from housing (5). Not all models use spring (10). **NOTE: Be aware of the number of shim(s) being removed from housing.**
3. Carefully remove cup (7) and seal (6) from housing (5) bore. **NOTE: Be careful not to scratch or mar housing bore.**
4. Remove end plug (1), retainer (15) and spring (3) from housing (5). Remove o-ring (2) from end plug (1).
5. Carefully remove spool (4) from end plug (1) end of housing (5). **NOTE: Be careful not to damage spool or housing bore.**

ASSEMBLY

(Refer to Figures 2 and 5)

LUBRICATE ALL RUBBER COMPONENTS FROM REPAIR KIT WITH CLEAN TYPE FLUID USED IN THE SYSTEM.

1. Clean all parts thoroughly before assembling.
2. Lubricate spool (4) with clean system fluid and carefully slide into plug (1) end of housing (5) bore. Note the direction of spool (4). **NOTE: Spool must slide freely into bore. If either part is damaged, a new valve assembly may be required.**
3. Install new o-ring (2) on end plug (1).
4. Install spring (3), retainer (15) and end plug (1) into housing (5). Torque 47.5-54.2 N·m (35-40 lb·ft).
5. Carefully install new cup (7) and new seal (6) into housing (5) bore. Note direction and order of cup and seal. **NOTE: Be careful not to scratch or mar housing bore.**
6. Install springs (10, 11 & 12), shim(s) (9) and retainer assembly (8) in piston (13). Not all models uses spring (10). Be sure to install the same number of shim(s) as were removed.
7. Carefully install piston (13) assembly into housing (5) bore.
8. Install new boot (14) on housing (5) and piston (13). Not all models use boot (14).
9. When reinstalling pedal actuated valve use new hex cap screws (16), 5/16-18UNC SAE grade 8. Torque cap screws 24.4-29.8 N·m (18-22 lb·ft). **NOTE: Not all repair kits include new cap screws (16).**

NOTE

After service, the valve must develop the pressure indicated in the specifications, TABLE 1. Shim(s) (9) are used to obtain the correct pressure setting. Contact ZF Off-Highway Solutions Minnesota Inc. if brake pressure setting is not able to be obtained.

Models:
06-466-140
06-466-171

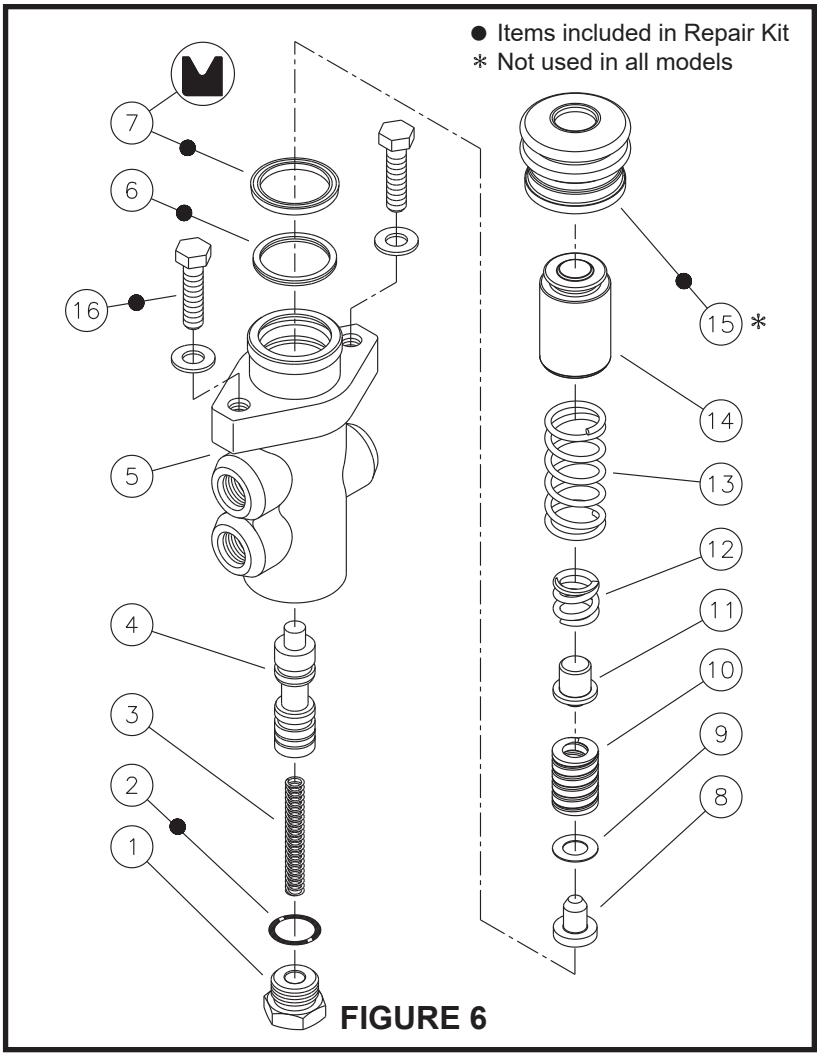

FIGURE 6

DISASSEMBLY
(Refer to Figures 3 and 6)

NOTE
Housing (5) and the spool (4) are manufactured as a matched set. This set (Housing & Spool) should not be intermixed with other parts.

1. Remove boot (15) from piston (14) and housing (5). Not all models use boot (15).
2. Remove piston (14), springs (13 & 12), retainer (11), spring (10), shim(s) (9) and retainer assembly (8) from housing (5). **NOTE: Be aware of the number of shim(s) being removed from housing.**
3. Carefully remove cup (7) and seal (6) from housing (5) bore. **NOTE: Be careful not to scratch or mar housing bore.**
4. Remove end plug (1) and spring (3) from housing (5). Remove o-ring (2) from end plug (1).
5. Carefully remove spool (4) from end plug (1) end of housing (5). **NOTE: Be careful not to damage spool or housing bore.**

ASSEMBLY
(Refer to Figures 3 and 6)

LUBRICATE ALL RUBBER COMPONENTS FROM REPAIR KIT WITH CLEAN TYPE FLUID USED IN THE SYSTEM.

1. Clean all parts thoroughly before assembling.
2. Lubricate spool (4) with clean system fluid and carefully slide into plug (1) end of housing (5) bore. Note the direction of spool (4). **NOTE: Spool must slide freely into bore. If either part is damaged, a new valve assembly may be required.**
3. Install new o-ring (2) on end plug (1).
4. Install spring (3) and end plug (1) into housing (5). Torque 47.5-54.2 N·m (35-40 lb·ft).
5. Carefully install new cup (7) and new seal (6) into housing (5) bore. Note direction and order of cup and seal. **NOTE: Be careful not to scratch or mar housing bore.**
6. Install springs (13 & 12), retainer (11), spring (10), shim(s) (9) and retainer assembly (8) in piston (14). Not all models use spring (10). Be sure to install the same number of shim(s) as were removed.
7. Carefully install piston (14) assembly into housing (5) bore.
8. Install new boot (15) on housing (5) and piston (14).
9. When reinstalling pedal actuated valve use new hex cap screws (15), 5/16-18UNC SAE grade 8. Torque cap screws 24.4-29.8 N·m (18-22 lb·ft). **NOTE: Not all repair kits include new cap screws (16).**

NOTE
After service, the valve must develop the pressure indicated in the specifications, TABLE 1. Shim(s) (9) are used to obtain the correct pressure setting. Contact ZF Off-Highway Solutions Minnesota Inc. if brake pressure setting is not able to be obtained.

BLEEDING

Brake lines should be bled very carefully as soon as the valve is installed in the machine. Air in the system will not allow the brakes to release properly and may severely damage them.

1. Start engine and allow accumulator to reach full charge. Shut down engine, then slowly apply and release brakes, waiting one minute between applications until brakes will not apply. Repeat this step three times.
2. Operate engine to maintain accumulator pressure within working limits throughout the bleeding procedure.
3. Open bleeder screw at wheel closest to brake valve and apply brakes cautiously until all air is bled out of line. Then close bleeder screw. Repeat this step at each wheel, moving to the next farthest wheel from the brake valve each time, as follows:
    a. Left front
    b. Right front
    c. Right rear
    d. Left rear
4. Release brake pressure for at least one (1) minute.
5. Apply brakes, holding pedal down 10 seconds; then release pressure for one (1) minute. Repeat this step two more times.
6. Repeat step 3.
7. Check for system leaks and be sure of proper brake operation.

SERVICE CHECKS FOR SINGLE MODULATING VALVES

BRAKES SLOW TO APPLY

1. No or improper gas charge in accumulator
1. **Check gas charge**
2. Brakes not properly adjusted
2. **Adjust brakes**
3. Inoperative brakes
3. **Check brakes**
4. Hydraulic lines or fittings leaking
4. **Check for leaks and repair**
5. Inoperative automatic adjuster (Goodrich Hi-torque Brakes only)
5. **Check adjuster operation**
6. Damaged hydraulic brake lines
6. **Check lines for dents that restrict flow of oi**l

BRAKES WILL NOT RELEASE

1. Pedal angle out of adjustment
1. **Check for proper pedal angle**
2. Inoperative brakes
2. **Check brakes**
3. Inoperative automatic adjusters
3. **Check operation of adjusters**
4. Inoperative brake valve
4. **Replace brake valve**

INSUFFICIENT BRAKES

1. No oil or low oil level in tank
1. **Check oil level in tank**
2. Brakes not properly adjusted
2. **Check brake adjustment**
3. Oil or grease on brake lining
3. **Clean or install new linings**
4. Brake line damaged
4. **Check lines and replace**
5. Inoperative automatic adjusters
5. **Check operation of adjusters**
6. No or improper gas charge in accumulator
6. **Check gas charge**
7. Inoperative brakes
7. **Check brakes**
8. Brake valve inoperative
8. **Replace valve**

EXCESSIVE BRAKING

1. Inoperative brakes
1. **Check brakes**
2. Inoperative brake valve
2. **Replace brake valve**

BRAKES WILL NOT RELEASE COMPLETELY

1. Brakes not properly adjusted
1. **Adjust brakes**
2. Inoperative brakes
2. **Check brakes**
3. Pedal angle out of adjustment
3. **Adjust pedal angle**
4. Inoperative wheel cylinders
4. **Replace wheel cylinders**
5. Inoperative automatic adjuster
5. **Check operation of adjusters**
6. Air in brakes (when automatic adjusters used Goodrich Hi-torque Brakes only)
6. **Bleed brakes**
7. Inoperative brake valve
7. **Replace brake valve**
8. Back pressure on return line too high
8. **Remove restriction**

NO BRAKES

1. No oil in hydraulic system
1. **Check oil level in tank**
2. Broken or damaged brake line
2. **Check lines for breaks or damaged condition**
3. Brakes not properly adjusted
3. **Adjust brakes**
4. Inoperative system relief valve
4. **Check pressure in pressure line to valve**
5. Worn pump
5. **Check pressure in pressure line to valve**
6. Inoperative automatic adjuster
6. **Check brake line pressure**
7. Inoperative or worn brakes
7. **Check brakes**
8. Inoperative brake valve
8. **Replace brake valve**

PEDAL KICKBACK WHEN BRAKES ARE APPLIED

1. Air in brakes
1. **Bleed brakes**

SERVICE DIAGNOSIS

(Refer to Figures 1, 2, 4, and 5)

BRAKES WILL NOT RELEASE COMPLETELY

1. Piston (13) binding
2. Pedal angle out of adjustment
3. Spring (3) broken

BRAKES WILL NOT RELEASE

1. Binding spool (4)
2. Piston (13) binding

NO BRAKES

1. Piston (13) binding
2. Broken spring (11)

OUTLET PRESSURE TOO HIGH (EXCESSIVE BRAKING)

1. Too many shims (9) installed in valve

EXCESSIVE ACCUMULATOR LEAKAGE WHEN BRAKES ARE APPLIED

1. Damaged spool (4)

EXCESSIVE ACCUMULATOR LEAKAGE WHEN BRAKES ARE NOT BEING USED

1. Damaged spool (4)
2. Spring (bottom) (3) broken

INSUFFICIENT BRAKES

1. Broken pressure regulating spring (11)
2. Pedal travel is inhibited

SERVICE DIAGNOSIS

(Refer to Figures 3 and 6)

BRAKES WILL NOT RELEASE COMPLETELY

1. Piston (14) binding
2. Pedal angle out of adjustment
3. Spring (3) broken

BRAKES WILL NOT RELEASE

1. Binding spool (4)
2. Piston (14) binding

NO BRAKES

1. Piston (14) binding
2. Broken spring (10)

OUTLET PRESSURE TOO HIGH (EXCESSIVE BRAKING)

1. Too many shims (9) installed in valve

EXCESSIVE ACCUMULATOR LEAKAGE WHEN BRAKES ARE APPLIED

1. Damaged spool (4)

EXCESSIVE ACCUMULATOR LEAKAGE WHEN BRAKES ARE NOT BEING USED

1. Damaged spool (4)
2. Spring (bottom) (3) broken

INSUFFICIENT BRAKES

1. Broken pressure regulating spring (10)
2. Pedal travel is inhibited

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