



MODULATING VALVE

Service Instructions

TABLE 1 (Specifications)

Complete Unit Model Number	Valve Assembly Number	Repair Kit Number	Brake Pressure Setting	
			bar	(PSI)
20-100-754	n/a	06-400-248	34.5 ± 1.7	(500 ± 25)

DISASSEMBLY

(Refer to Figure 1)

NOTE

Housings (6 & 13) and spools (7 & 10) are manufactured as matched sets. These sets (housing and spool) should not be intermixed with other parts.

1. Remove boot (28) from retainer (26) and piston (23).
2. Remove retainer (26), piston (23), spring (21), retainer (20), springs (18 & 19), spacer (22), shim(s) (17) and retainer assembly (16) from housing (13). **NOTE: Be aware of the number of shim(s) being removed from housing. Retaining ring (15) and spacer (14) need not be removed from housing (13).**
3. Carefully remove cup (27), quad ring (24), and o-ring (25) from retainer (26). Note direction and order of cup and quad ring. **NOTE: Be careful not to scratch or mar retainer bore.**
4. Remove end plug (1) and spring (3) from housing (6). Remove o-ring (2) from end plug (1).
5. Remove plug (11) from housing (13). Remove o-ring (12) from plug (11). Do not remove the retainer or ball that are inside this port. **NOTE: Not all models use plug (11) or o-ring (12).**
6. Separate housings (6 & 13) by removing cap screws (4) and washers (5). Remove o-rings (8 & 9) from housings (6 & 13).
7. Carefully remove spools (7 & 10) from housings (6 & 13). **NOTE: Be careful not to damage spools or housing bores.**

CAUTION

Do not intermix spools and housings. Spool (7) and housing (6) are a matched set as are spool (10) and housing (13).

ASSEMBLY

(Refer to Figure 1)

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 (10) with clean system fluid and carefully slide into bottom end of housing (13) bore. Note direction of spool (10). **NOTE: Spool must slide freely into bore. If either part is damaged, a new valve assembly may be required.**
3. Install new o-rings (8 & 9) in proper o-ring pockets on housings (6 & 13).
4. Reassemble housings (6 & 13) using cap screws (4) and washers (5). Use Loctite 242 on cap screws and torque 29.8-33.9 N·m (22-25 lb·ft). **NOTE: Make sure housings line up correctly and that o-rings (8 & 9) remain in the pockets during assembly.**

5. Lubricate spool (7) with clean system fluid and carefully slide into housing (6) bore. Note direction of spool (7). **NOTE: Spool must slide freely into bore. If either part is damaged, a new valve assembly may be required.**
6. Install new o-ring (2) on end plug (1).
7. Install spring (3) and end plug (1) into housing (6). Torque end plug 47.5-54.2 N·m (35-40 lb·ft).
8. Carefully install new cup (27), new quad ring (24), and new o-ring (25) on retainer (26). Note direction and order of cup and quad ring. **NOTE: Be careful not to scratch or mar retainer bore.**
9. Install spacer (22) in housing (13).
10. Assemble spring (21), retainer (20), springs (19 & 18), shim(s) (17), and retainer assembly (16) in piston (23).
11. Carefully install retainer (26) over piston (23) and install retainer (26) assembly into housing (13). Torque retainer 81.4-94.9 N·m (60-70 lb·ft).
12. Install new boot (28) on retainer (26) and piston (23).
13. Install new o-ring (12) on plug (11). Install plug (11) in housing (13) and torque 27.1-32.5 N·m (20-24 lb·ft). **NOTE: Not all models use plug (11) or o-ring (12).**

NOTE

After service, the valve must develop the pressure indicated in the specifications, TABLE 1. Shim(s) (17) 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.

Items included in Repair Kit

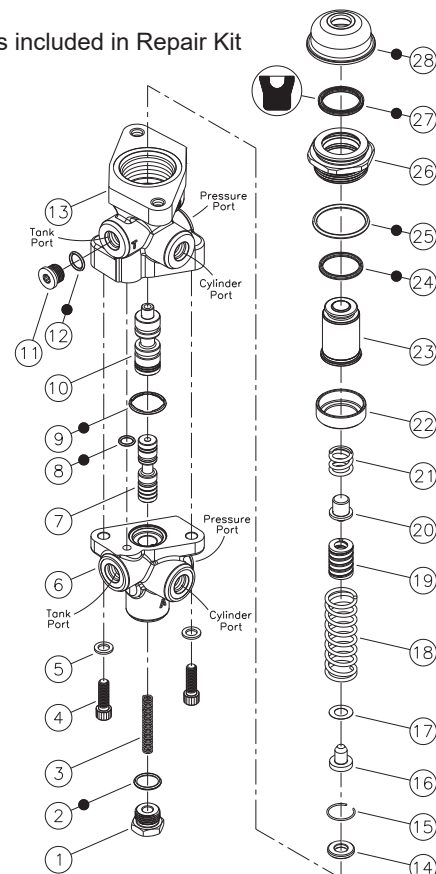


FIGURE 1

ZF Off-Highway Solutions Minnesota Inc.

TABLE 2 (Specifications)

Complete Unit Model Number	Valve Assembly Number	Repair Kit Number	Brake Pressure Setting	
			bar	(PSI)
06-466-423	20-200-048	06-400-248	69.0 ± 3.5	(1000 ± 50)
06-466-437	20-200-004	06-400-248	100.0 ± 3.5	(1450 ± 75)
06-466-451	20-100-924	06-400-248	79.3 ± 3.5	(1150 ± 50)
06-466-453	20-100-925	06-400-248	55.2 ± 3.5	(800 ± 50)
06-466-471	20-200-004	06-400-248	100.0 ± 3.5	(1450 ± 75)
06-466-474	20-100-925	06-400-248	55.2 ± 3.5	(800 ± 50)
06-466-476	20-100-924	06-400-248	79.3 ± 3.5	(1150 ± 50)
06-466-483	20-200-048	06-400-248	69.0 ± 3.5	(1000 ± 50)
06-466-493	20-100-924	06-400-248	100.0 ± 3.5	(1450 ± 75)
06-466-495	20-100-925	06-400-248	55.2 ± 3.5	(800 ± 50)
06-466-598	20-200-320	06-400-248	69.0 ± 3.5	(1000 ± 50)
06-466-613	20-200-320	06-400-248	69.0 ± 3.5	(1000 ± 50)
06-466-617	20-200-321	06-400-248	94.5 ± 4.5	(1370 ± 65)
06-466-620	20-200-321	06-400-248	94.5 ± 4.5	(1370 ± 65)
20-100-867	n/a	06-400-248	75.8 ± 3.5	(1100 ± 50)
20-100-916	n/a	06-400-248	62.1 ± 3.5	(900 ± 50)

DISASSEMBLY

(Refer to Figure 2)

NOTE

Housings (7 & 14) and spools (8 & 11) are manufactured as matched sets. These sets (housing and spool) should not be intermixed with other parts.

1. Remove boot (27) from retainer (25) and piston (22).
2. Remove retainer (25), piston (22), springs (21, 20 & 19), shim(s) (18) and retainer assembly (17) from housing (14). **NOTE: Be aware of the number of shim(s) being removed from housing. Not all models use spring (20). Retaining ring (16) and spacer (15) need not be removed from housing.**
3. Carefully remove cup (26), quad ring (23), and o-ring (24) from retainer (25). Note direction and order of cup and quad ring. **NOTE: Be careful not to scratch or mar retainer bore.**
4. Remove end plug (1), retainer (2) and spring (4) from housing (7). Remove o-ring (3) from end plug (1).
5. Remove plug (12) from housing (14). Remove o-ring (13) from plug (12). Do not remove the retainer or ball that are inside this port. **NOTE: Not all models use plug (12) or o-ring (13).**
6. Separate housings (7 & 14) by removing cap screws (5) and washers (6). Remove o-rings (9 & 10) from housings (7 & 14).
7. Carefully remove spools (8 & 11) from housings (7 & 14). **NOTE: Be careful not to damage spools or housing bores.**

CAUTION

Do not intermix spools and housings. Spool (8) and housing (7) are a matched set as are spool (11) and housing (14).

ASSEMBLY

(Refer to Figure 2)

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 (11) with clean system fluid and carefully slide into bottom end of housing (14) bore. Note direction of spool (11). **NOTE: Spool must slide freely into bore. If either part is damaged, a new valve assembly may be required.**
3. Install new o-rings (9 & 10) in proper o-ring pockets on housings (7 & 14).

4. Reassemble housings (7 & 14) using cap screws (5) and washers (6). Use Loctite 242 on cap screws and torque 29.8-33.9 N·m (22-25 lb·ft). **NOTE: Make sure housings line up correctly and that o-rings (9 & 10) remain in the pockets during assembly.**
5. Lubricate spool (8) with clean system fluid and carefully slide into housing (7) bore. Note direction of spool (8). **NOTE: Spool must slide freely into bore. If either part is damaged, a new valve assembly may be required.**
6. Install new o-ring (3) on end plug (1).
7. Install spring (4), retainer (2), and end plug (1) into housing (7). Torque end plug 47.5-54.2 N·m (35-40 lb·ft).
8. Carefully install new cup (26), new quad ring (23), and new o-ring (24) on retainer (25). Note direction and order of cup and quad ring. **NOTE: Be careful not to scratch or mar retainer bore.**
9. Assemble springs (19, 20, & 21), shim(s) (18), and retainer assembly (17) in piston (22). Not all models use spring (20).
10. Carefully install retainer (25) over piston (22) and install retainer (25) assembly into housing (14). Torque retainer 81.4-94.9 N·m (60-70 lb·ft).
11. Install new boot (27) on retainer (25) and piston (22).
12. Install new o-ring (13) on plug (12). Install plug (12) in housing (14) and torque 27.1-32.5 N·m (20-24 lb·ft). **NOTE: Not all models use plug (12) or o-ring (13).**

NOTE

After service, the valve must develop the pressure indicated in the specifications, TABLE 2. Shim(s) (18) 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.

● Items included in Repair Kit

* Not used in all models

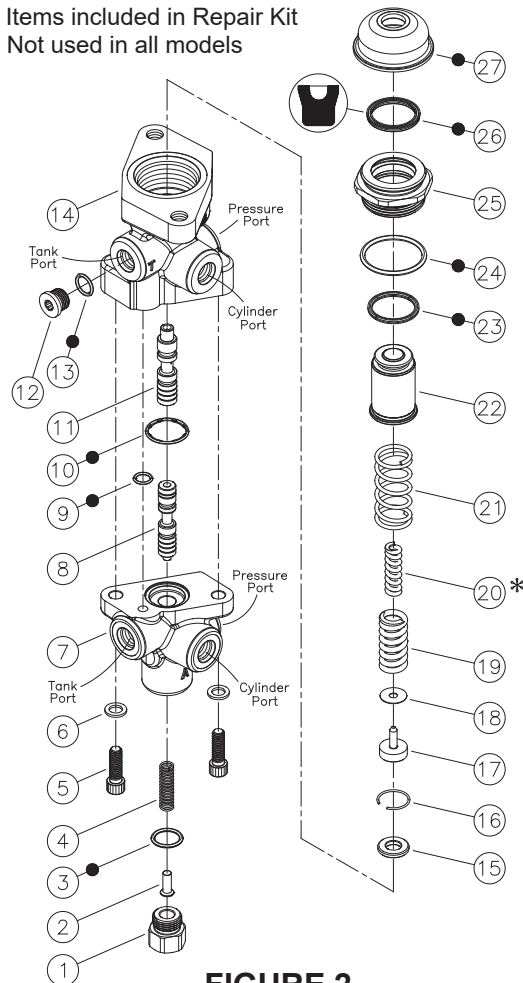


FIGURE 2

TABLE 3 (Specifications)

Complete Unit Model Number	Valve Assembly Number	Repair Kit Number	Brake Pressure Setting	
			bar	(PSI)
20-100-831	n/a	06-400-248	27.6 ± 1.7	(400 ± 25)

DISASSEMBLY

(Refer to Figure 3)

NOTE

Housing (9) and spool (8) are manufactured as a matched set. This set (housing and spool) should not be intermixed with other parts.

1. Remove boot (22) from retainer (20) and piston (17).
2. Remove retainer (20), piston (17), springs (16, 15 & 14), shim(s) (13), and retainer assembly (12) from housing (9). **NOTE: Be aware of the number of shim(s) being removed from housing. Retaining ring (11) and spacer (10) need not be removed from housing.**
3. Carefully remove cup (21), quad ring (18), and o-ring (19) from retainer (20). Note direction and order of cup and quad ring. **NOTE: Be careful not to scratch or mar retainer bore.**
4. Separate housing (9) and end cap (3) by removing cap screws (1) and washers (2). Remove o-rings (6 & 7) from housing (9).
5. Remove retainer (5) and spring (4).
6. Carefully remove spool (8) from housing (9). **NOTE: Be careful not to damage spool or housing bore.**

CAUTION

Do not intermix spools and housings. Spool (8) and housing (9) are a matched set.

ASSEMBLY

(Refer to Figure 3)

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 (8) with clean system fluid and carefully slide into bottom end of housing (9) bore. Note direction of spool (8). **NOTE: Spool must slide freely into bore. If either part is damaged, a new valve assembly may be required.**
3. Install new o-rings (6 & 7) in proper o-ring pockets on housing (9) and end cap (3). Install spring (4) and retainer (5).
4. Reassemble housing (9) and end cap (3) using cap screws (1) and washers (2). Use Loctite 242 on cap screws and torque 24.4-29.8 N·m (18-22 lb·ft). **NOTE: Make sure o-rings (6 & 7) remain in the pockets during assembly.**
5. Carefully install new cup (21), new quad ring (18), and new o-ring (19) on retainer (20). Note direction and order of cup and quad ring. **NOTE: Be careful not to scratch or mar retainer bore.**

6. Assemble springs (16, 15, & 14), shim(s) (13) and retainer assembly (12) in piston (17). Carefully install retainer (20) over piston (17) and install retainer (20) assembly into housing (9). Torque retainer 81.4-94.9 N·m (60-70 lb·ft).
7. Install new boot (22) on retainer (20) and piston (17).

NOTE

After service, the valve must develop the pressure indicated in the specifications, TABLE 3. Shim(s) (13) 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.

● Items included in Repair Kit

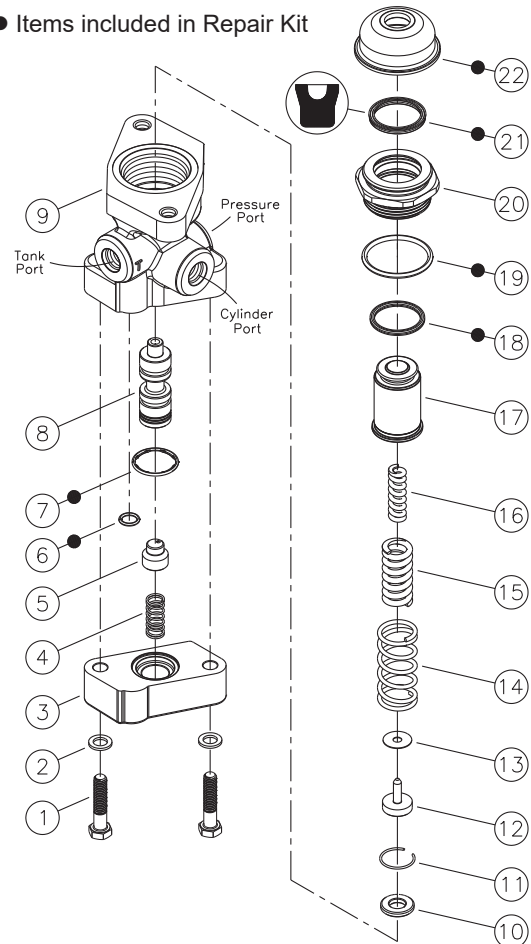


FIGURE 3

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