

REVERSE MODULATING VALVE (Poppet Design) Service Instructions

TABLE 1 (Specifications)

Model Number	Repair Kit Number	Brake Pressure Setting	
		bar	(PSI)
03-460-354	02-400-264	120.7 ± 5.0	(1750 ± 72)
03-460-355	02-400-264	120.7 ± 5.0	(1750 ± 72)
03-460-356	02-400-264	120.7 ± 5.0	(1750 ± 72)
03-460-358	02-400-264	120.7 ± 5.0	(1750 ± 72)

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

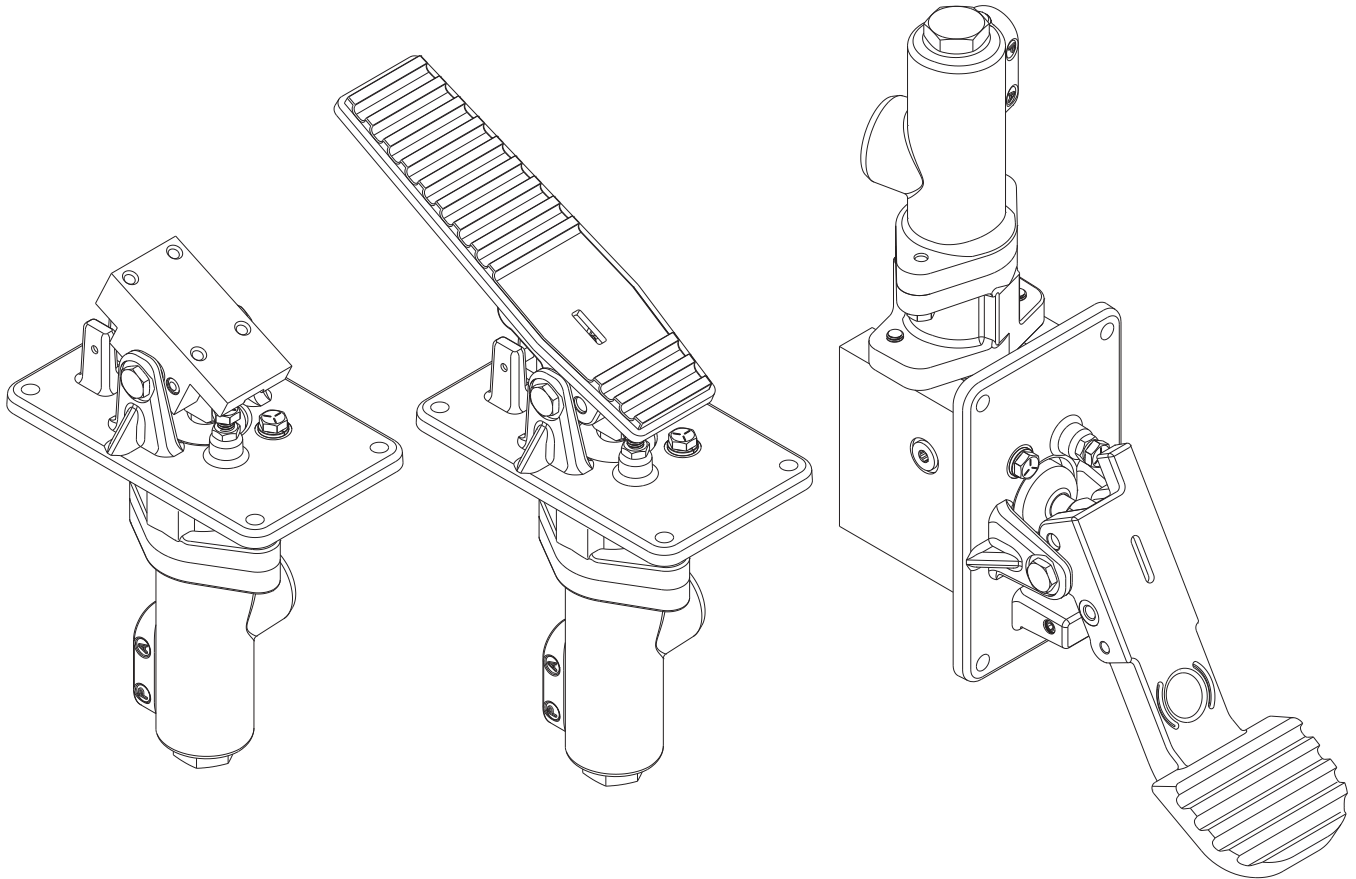


FIGURE 1

Models: 03-460-354
03-460-355
03-460-358

DISASSEMBLY

(Refer to Figure 2)

1. Depress pedal (48) and remove pedal stop screw (40) and jam nut (39) from base (42). Also loosen jam nut (38) for later removal of clevis (45).
2. Remove two cap screws (44) and two lock washers (43) from base (42).
3. Remove two threaded studs (41).
4. Remove set screw (47) from pedal (48).
5. Separate pedal and base by removing pin (46) through clearance hole in pedal (48). Remove pedal (48) and base (42).
6. Temporarily insert pin (46) into clevis (45) and record distance from top of pin (46) to mounting flange of housing (34). This measurement will be necessary for reassembly purposes. **NOTE: Apply slight downward force on clevis (45) while taking measurement to assure that rod (29) is in contact with piston (28).**
7. Remove clevis (45) and jam nut (38) from rod (29).
8. Separate housings (14 & 34) by removing two cap screws (36) and two lock washers (35).
9. Remove rod (29), piston (30), spring (31), spring (32), and washer (33) from housing (34). Remove boot (37) from housing (34). **NOTE: Not all models use spring (32).**
10. Remove piston (28), shim(s) (27), and spring (26) from housing (14) bore. Note the number of shims being removed for reassembly purposes.
11. Remove o-ring (25) from housing (14) bore. **NOTE: Be careful not to scratch or mar housing bore.**
12. Remove retaining ring (24) from housing (14) bore. **NOTE: Be careful not to scratch or mar housing bore.**
13. Remove retainer (23) from housing (14) bore.
14. Remove retaining ring (22) from housing (14) bore.
15. Remove piston and sleeve assembly (16 & 21) from housing (14) bore. Separate piston (16) from sleeve (21).
16. Remove o-ring (19) and back-up ring (20) from sleeve (21).
17. Remove spring (15) from housing (14) bore.
18. Remove cup (17) and back-up ring (18) from piston (16). **NOTE: A check ball is located inside piston (16). Make sure ball is clean and moves freely.**
19. Remove plug (1) from housing (14).
20. Remove o-ring (2), cup (4), back-up ring (3), washer (5), spring (6), and guide (7) from plug (1).
21. Remove cage (8) from housing (14) bore.
22. Remove valve assembly (9) from housing (14) bore.
23. Remove o-ring (10) from valve assembly (9).
24. Remove plug (11) and ball (13) from housing (14). Remove o-ring (12) from plug (11).

ASSEMBLY

(Refer to Figure 2)

CLEAN AND INSPECT ALL PARTS FOR WEAR. LUBRICATE ALL RUBBER COMPONENTS FROM REPAIR KIT WITH CLEAN SYSTEM FLUID.

1. Install new o-ring (12) on plug (11). Install new ball (13) and plug (11) in housing (14). Torque plug (11) 88.1-101.7 N·m (65-75 lb·in).
2. Install new o-ring (10) on valve assembly (9) and insert into housing (14) bore. Note direction of valve assembly. **NOTE: Be sure valve assembly is fully seated into housing.**
3. Install new cage (8) into housing (14) bore.

4. Install new o-ring (2) on plug (1).
5. Insert new back-up ring (3) and new cup (4) inside end of plug (1). Note order of back-up ring (3) and cup (4).
6. Install guide (7), spring (6), and washer (5) in plug (1). Install plug (1) in housing (14) and torque 54.3-67.8 N·m (40-50 lb·ft).
7. Install new cup (17) and new back-up ring (18) on piston (16) and insert piston into sleeve (21). Note direction of piston (16) and sleeve (21).
8. Install new back-up ring (20) and new o-ring (19) on sleeve (21).
9. Install spring (15) on piston (16).
10. Install piston and sleeve assembly (16 & 21) in housing (14) bore. Note direction of assembly.
11. Install new retaining ring (22) in housing (14) bore.
12. Install retainer (23) and retaining ring (24) in housing (14) bore. **NOTE: Be careful not to scratch or mar housing bore.**
13. Install new o-ring (25) in housing (14) bore.
14. Install spring (26), shim(s) (27) and piston (28) in housing (14) bore. Be sure to install the same number of shim(s) as were removed during disassembly.
15. Lightly coat inside bore of housing (34) with graphite based grease and install new boot (37) on housing (34).
16. Apply graphite based grease sparingly to piston (30) in chamfered area where rod (29) makes contact.
17. Insert rod (29), piston (30), spring (31), spring (32), and washer (33) into housing (34). **NOTE: Not all models use spring (32).**
18. Attach housings (14 & 34) using two cap screws (36) and two lock washers (35). Torque 29.8-36.6 N·m (22-27 lb·ft).
19. Install jam nut (38) and clevis (45) on end of rod (29). Adjust the clevis to the distance recorded during disassembly.

LUBRICATE ALL BUSHINGS AND PINS WITH GRAPHITE BASED GREASE BEFORE ASSEMBLING THE PEDAL AND BASE.

20. Place base (42) on housing (34) mounting flange. Position pedal (48) and insert pin (46) through clearance hole in pedal and into clevis (45). **NOTE: Position pin so the flat area is aligned with set screw hole in pedal.**
21. Install set screw (47) in pedal (48) and torque 8.5-9.6 N·m (75-85 lb·in).
22. Install two threaded studs (41) through base (42) and into pedal (48). Torque threaded screws (41) 47.5-54.3 N·m (35-40 lb·ft).
23. Attach base (42) to valve assembly using two cap screws (44) and two lock washers (43). Torque cap screws 29.8-36.6 N·m (22-27 lb·ft).
24. Fully depress pedal (48) and torque jam nut (38) 27.1-32.5 N·m (20-24 lb·ft) against clevis (45).
25. Install pedal stop screw (40) and jam nut (39). **NOTE: With pedal in the release position, adjust pedal stop screw and jam nut so there is 0.38 to 0.76 mm (0.015-0.030 in) of clearance between the pedal and top of pedal stop screw. Torque jam nut (38) 27.1-32.5 N·m (20-24 lb·ft).**

NOTE

After service, the valve must develop the pressure indicated in the specifications, TABLE 1. Shim(s) (27) may be added or removed to obtain the correct pressure setting.

● Items included in Repair Kit

* Not used in all models

NOTE: Not all models include pedal.

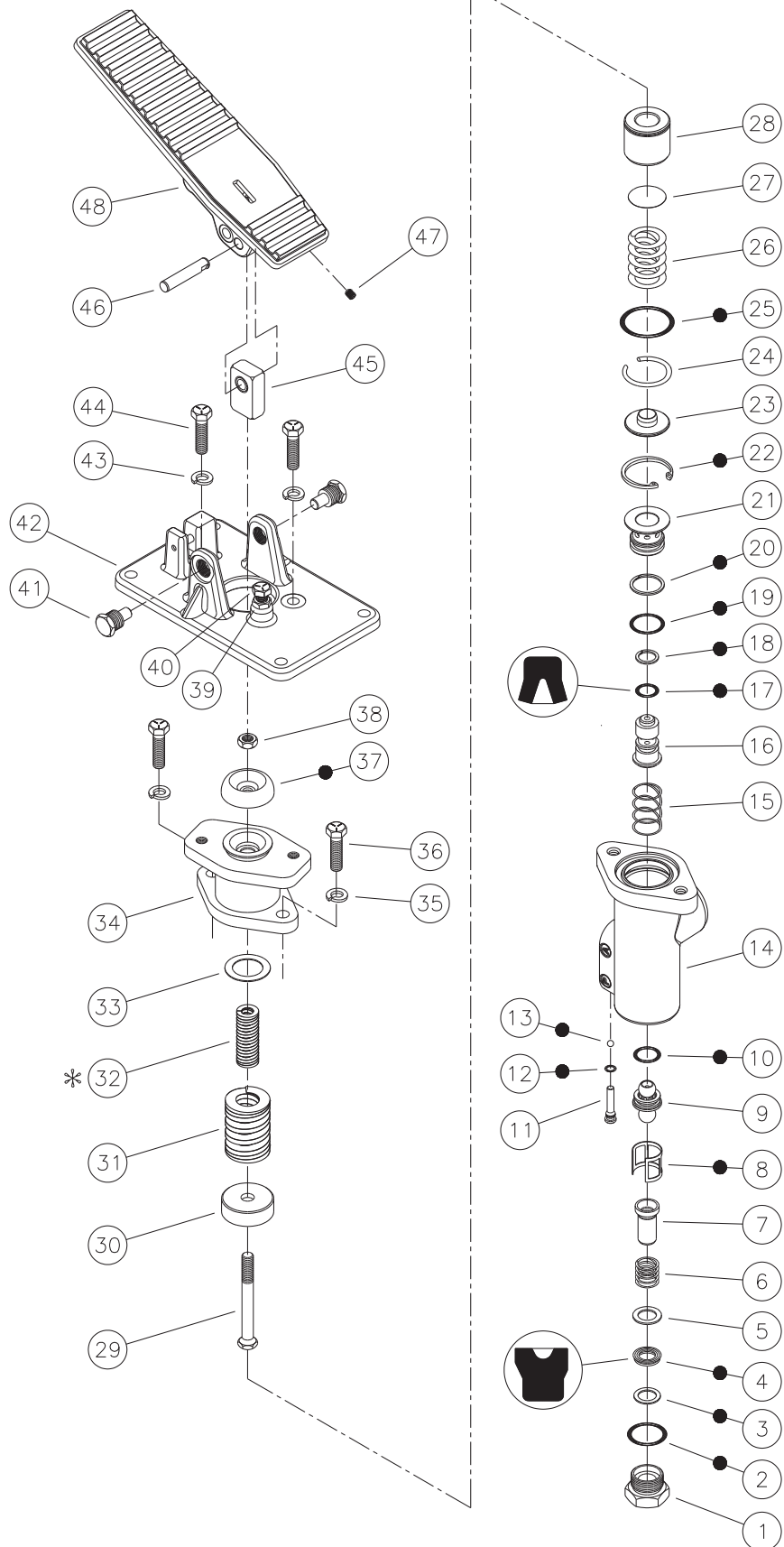


FIGURE 2

Model: 03-460-356

DISASSEMBLY

(Refer to Figure 3)

1. Separate assembly (29) from valve assembly by removing two cap screws (31) and two lock washers (30). Inspect pedal assembly for damage or wear and replace components as necessary.
2. Remove piston (28), shim(s) (27), and spring (26) from housing (14) bore. Note the number of shims being removed for reassembly purposes.
3. Remove o-ring (25) from housing (14) bore. **NOTE: Be careful not to scratch or mar housing bore.**
4. Remove retaining ring (24) from housing (14) bore. **NOTE: Be careful not to scratch or mar housing bore.**
5. Remove retainer (23) from housing (14) bore.
6. Remove retaining ring (22) from housing (14) bore.
7. Remove piston and sleeve assembly (16 & 21) from housing (14) bore. Separate piston (16) from sleeve (21).
8. Remove o-ring (19) and back-up ring (20) from sleeve (21).
9. Remove spring (15) from housing (14) bore.
10. Remove cup (17) and back-up ring (18) from piston (16). **NOTE: A check ball is located inside piston (16). Make sure ball is clean and moves freely.**
11. Remove plug (1) from housing (14).
12. Remove o-ring (2), cup (4), back-up ring (3), washer (5), spring (6), and guide (7) from plug (1).
13. Remove cage (8) from housing (14) bore.
14. Remove valve assembly (9) from housing (14) bore.
15. Remove o-ring (10) from valve assembly (9).
16. Remove plug (11) and ball (13) from housing (14). Remove o-ring (12) from plug (11).

ASSEMBLY

(Refer to Figure 3)

CLEAN AND INSPECT ALL PARTS FOR WEAR. LUBRICATE ALL RUBBER COMPONENTS FROM REPAIR KIT WITH CLEAN SYSTEM FLUID.

1. Install new o-ring (12) on plug (11). Install new ball (13) and plug (11) in housing (14). Torque plug (11) 88.1-101.7 N·m (65-75 lb·in).
2. Install new o-ring (10) on valve assembly (9) and insert into housing (14) bore. Note direction of valve assembly. **NOTE: Be sure valve assembly is fully seated into housing.**
3. Install new cage (8) into housing (14) bore.
4. Install new o-ring (2) on plug (1).
5. Insert new back-up ring (3) and new cup (4) inside end of plug (1). Note order of back-up ring and cup.
6. Install guide (7), spring (6), and washer (5) in plug (1). Install plug (1) in housing (14) and torque 54.3-67.8 N·m (40-50 lb·ft).
7. Install new cup (17) and new back-up ring (18) on piston (16) and insert piston into sleeve (21). Note direction of piston (16) and sleeve (21).
8. Install new back-up ring (20) and new o-ring (19) on sleeve (21).
9. Install spring (15) on piston (16).
10. Install piston and sleeve assembly (16 & 21) in housing (14) bore. Note direction of assembly.
11. Install new retaining ring (22) in housing (14) bore.
12. Install retainer (23) and retaining ring (24) in housing (14) bore. **NOTE: Be careful not to scratch or mar housing bore.**
13. Install new o-ring (25) in housing (14) bore.
14. Install spring (26), shim(s) (27), and piston (28) in housing (14) bore. Be sure to install the same number of shim(s) as were removed during disassembly.

15. Reassemble valve assembly to assembly (29) using two cap screws (31) and two lock washers (30). Torque cap screws (31) 29.8-36.6 N·m (22-27 lb·ft).

NOTE

After service, the valve must develop the pressure indicated in the specifications, TABLE 1. Shim(s) (27) may be added or removed to obtain the correct pressure setting.

● Items included in Repair Kit

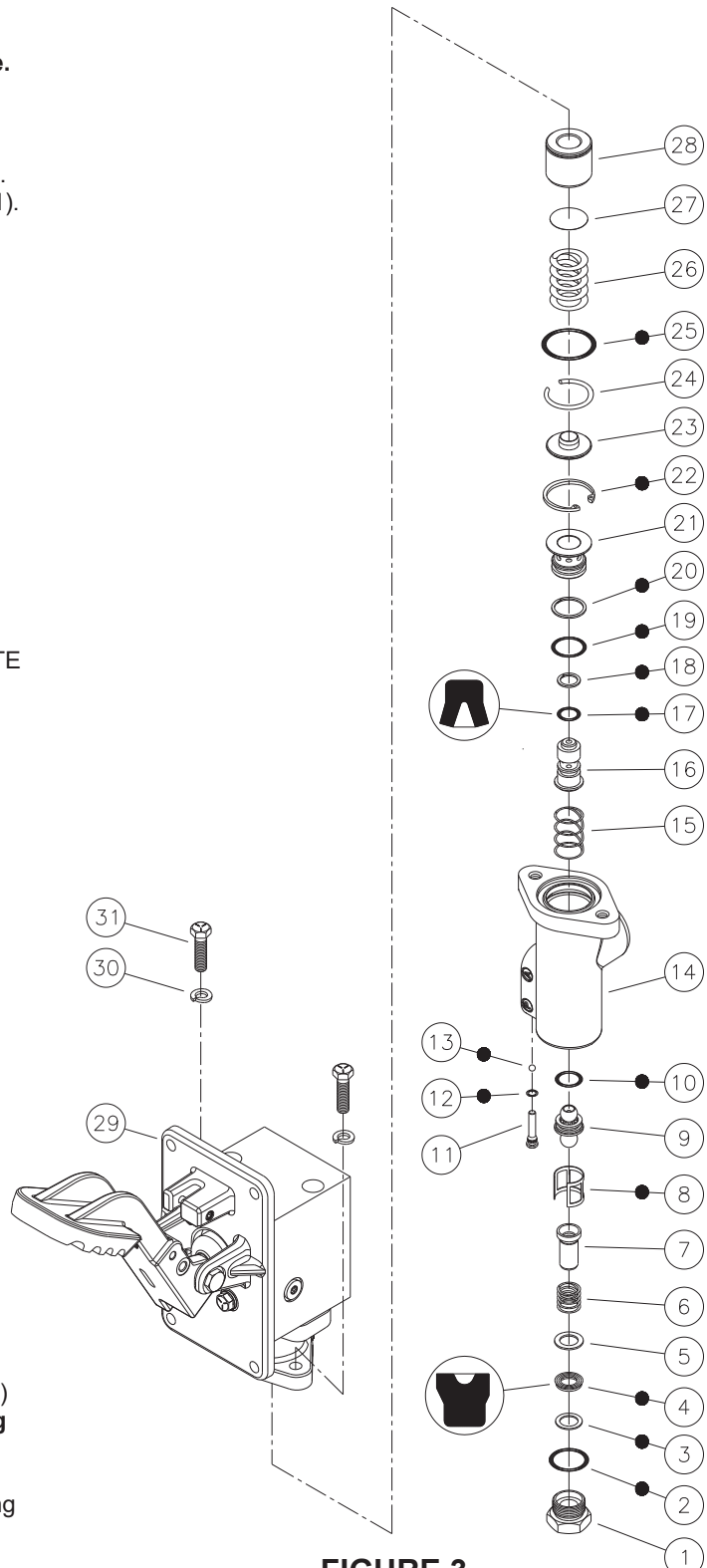


FIGURE 3