Tandem MODULATING VALVE (464 Series)

Service Instructions

TABLE 1 (Specifications)

Model Number	Brake Pressure Setting		Model Number	Brake Pressure Setting		Model Number	Brake Pressure Setting	
	bar	(PSI)		bar	(PSI)		bar	(PSI)
03-464-202	27.6 ± 3.5	(400 ± 50)	06-464-218	69.0 ± 5.2	(1000 ± 75)	06-464-280	158.6 ± 6.9	(2300 ± 100)
03-464-280	103.4 ± 5.2	(1500 ± 75)	06-464-220	103.4 ± 5.2	(1500 ± 75)	06-464-282	103.4 ± 5.2	(1500 ± 75)
06-464-200	82.7 ± 5.2	(1200 ± 75)	06-464-222	48.3 ± 3.5	(700 ± 50)	06-464-284	137.9 ± 6.9	(2000 ± 100)
06-464-202	151.7 ± 6.9	(2200 ± 100)	06-464-224	86.2 ± 3.5	(1250 ± 50)	06-464-286	86.2 ± 3.5	(1250 ± 50)
06-464-206	103.4 ± 5.2	(1500 ± 75)	06-464-226	151.7 ± 5.2	(2200 ± 100)	06-464-288	182.7 ± 5.2	(1200 ± 75)
06-464-208	137.9 ± 6.9	(2000 ± 100)	06-464-228	82.7 ± 5.2	(1200 ± 75)	06-464-290	124.1 ± 6.9	(1800 ± 100)
06-464-210	69.0 ± 5.2	(1000 ± 75)	06-464-230	124.1 ± 6.9	(1800 ± 100)	06-464-292	41.4 ± 5.2	(600 ± 75)
06-464-212	100.0 ± 5.2	(1450 ± 75)	06-464-232	137.9 ± 6.9	(2000 ± 100)	06-464-916	120.7 ± 6.9	(1750 ± 75)
06-464-214	89.6 ± 5.2	(1300 ± 75)	06-464-234	141.3 ± 3.5	(2050 ± 50)	06-464-953	41.4 ± 5.2	(600 ± 75)
06-464-216	41.4 ± 5.2	(600 ± 75)	06-464-266	41.4 ± 5.2	(600 ± 75)	20-100-838	51.7 ± 5.2	(750 ± 75)

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

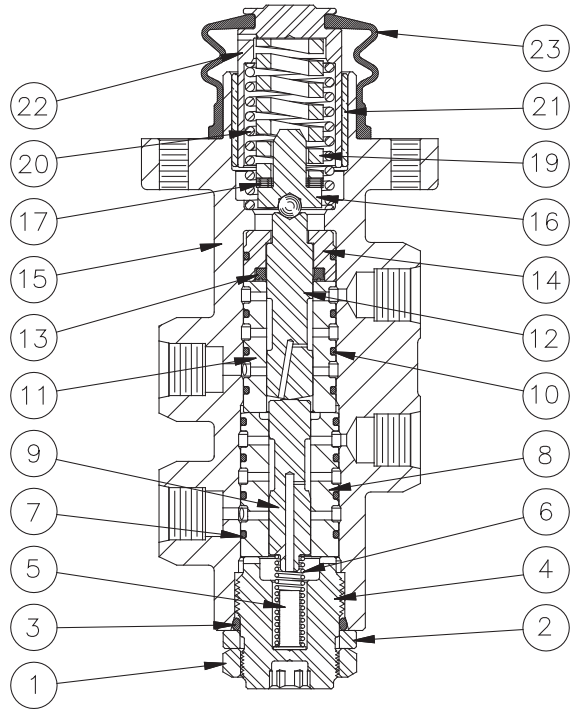

FIGURE 1

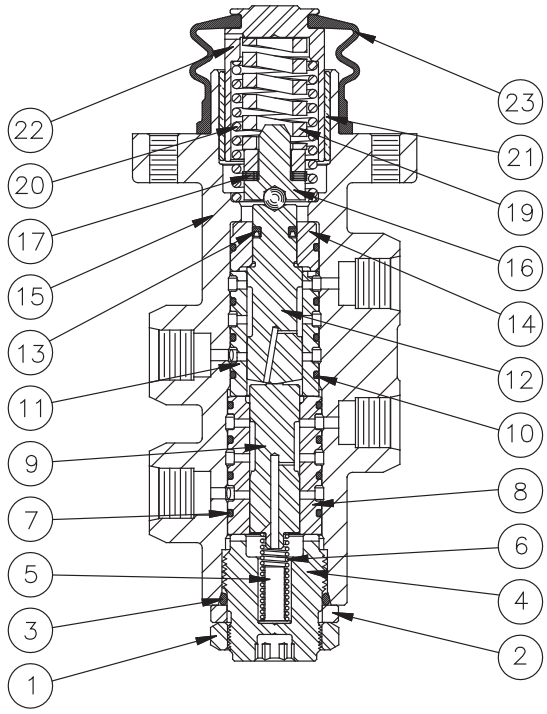

FIGURE 2

ZF Off-Highway Solutions Minnesota Inc.
1911 Lee Boulevard / North Mankato, MN U.S.A. 56003
Tel: +1 507 625 6426 **Fax:** +1 507 625 3212

Form No. 81-464-002 Revised 2009-09-22

www.mico.com

Models:

03-464-280	**06-464-212**	**06-464-228**	**06-464-284**
06-464-200	**06-464-214**	**06-464-230**	**06-464-286**
06-464-202	**06-464-220**	**06-464-234**	**06-464-288**
06-464-206	**06-464-224**	**06-464-280**	**06-464-290**
06-464-208	**06-464-226**	**06-464-282**	**06-464-916**

DISASSEMBLY

(Refer to Figures 1 and 3)

NOTE

Spool (9)/sleeve (8) and spool(12)/sleeve (11) are matched sets and should not be intermixed with other parts.

1. Remove boot (23) from piston (22).
2. Remove piston (22), springs (18, 19 & 20) and shim(s) (17) from housing bore. **NOTE: Not all models use spring (18). Some models also use a 6.35 mm (0.25 in) spacer with shims. Note the number of shim(s) being removed from housing.**
3. Bearing (21) should not be removed from housing bore. **NOTE: Excessive wear in both bearing (21) and piston (22) may require replacement.**
4. Remove retainer assembly (16) from housing bore. **NOTE: Ball is pressed into retainer.**
5. Loosen nut (1) and remove end plug (4) from housing. Remove spring (6), retainer (5), nut (1), washer (2), and o-ring (3) from end plug (4).
6. Remove spacer (14), sleeves (8 & 11) and spools (9 & 12) assembly from housing bore. This assembly must be taken out by way of end plug (4) end of housing (15). NOTE: Be careful not to scratch housing bore. A wooden dowel will help in this procedure.
7. Separate spacer (14) and spools (9 & 12) from sleeves (8 & 11). **NOTE: Excessive wear on either spools (9 & 12) or sleeves (8 & 11) may require replacement.**
8. Remove o-ring (10) and cup (13) from spacer (14). Remove other o-ring (10) from sleeve (11) and o-rings (7) from sleeve (8). **NOTE: Be careful not to damage cup and o-ring grooves or bores.**

ASSEMBLY

(Refer to Figures 1 and 3)

LUBRICATE ALL RUBBER COMPONENTS FROM REPAIR KIT, SPOOLS (9 & 12) AND SLEEVES (8 & 11) WITH CLEAN TYPE FLUID USED IN THE SYSTEM.

1. Clean all parts thoroughly before assembling.
2. Install new cup (13) in spacer (14) and one new o-ring (10) on spacer (14). Note direction of cup.
3. Install other new o-rings (10) on sleeve (11) and new o-rings (7) on sleeve (8).
4. Carefully insert spool (12) into sleeve (11). Note direction of spool.
5. Insert spacer (14) into housing bore through end plug (4) end. Note direction of spacer.
6. Carefully insert sleeve (11) and spool (12) assembly into housing bore using a wooden dowel. Note direction of assembly.
7. Carefully insert sleeve (8) into housing until it rests against sleeve (11). Gently insert spool (9) into sleeve (8). Note direction of spools and sleeves.
8. Install spring (6) and retainer (5) into housing bore.
9. Install end plug (4) and torque 10.9-20.3 N·m (96-180 lb·in) to seat sleeves. Then turn back end plug 1/4 turn and torque 1.1-6.8 N·m (10-60 lb·in). Install new o-ring (3), washer (2) and nut (1). Hold end plug and torque nut 67.8-81.4 N·m (50-60 lb·ft).
10. Install retainer assembly (16) in housing. **NOTE: Depress retainer (16) until it bottoms on spacer (14). Spools (9 & 12) and retainer (16) should return when released. If the spools and retainer do not return when released, the bore of sleeves (8 & 11) were possibly damaged when installed.**
11. Install shim(s) (17), springs (18,19 & 20) and piston (22) in housing bore. **NOTE: Not all models use spring (18). Some models also use a 6.35 mm (0.25 in) spacer with shims. For proper brake pressure setting, install the same number of shims and spacer that were removed during disassembly. If spools (9 & 12), sleeves (8 & 11), or spring (20) were replaced, shim adjustment may be required. Refer to brake pressure settings TABLE 1.**
12. Install new boot (23) on housing (15).

● Items included in Repair Kit 06-400-110
✻ Not used in all models

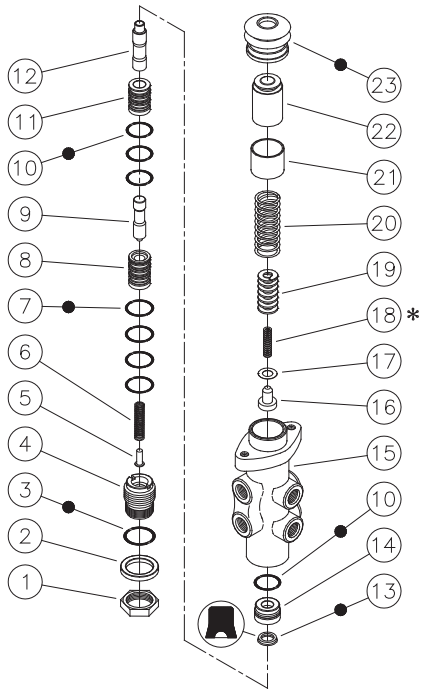

FIGURE 3

Models:

03-464-200	**06-464-218**	**06-464-292**
03-464-202	**06-464-222**	**06-464-953**
06-464-210	**06-464-232**	**20-100-838**
06-464-216	**06-464-266**	

DISASSEMBLY

(Refer to Figures 2 and 4)

NOTE

Spool (9)/sleeve (8) and spool(12)/sleeve (11) are matched sets and should not be intermixed with other parts.

1. Remove boot (23) from piston (22).
2. Remove piston (22), springs (18, 19 and 20) and shim(s) (17) from housing bore. **NOTE: Not all models use spring (18). Some models also use a 6.35 mm (0.25 in) spacer with shims. Note the number of shim(s) being removed from housing.**
3. Bearing (21) should not be removed from housing bore. **NOTE: Excessive wear in both bearing (21) and piston (22) may require replacement.**
4. Remove retainer assembly (16) from housing bore. NOTE: Ball is pressed into retainer.
5. Loosen nut (1) and remove end plug (4) from housing. Remove spring (6), retainer (5), nut (1), washer (2), and o-ring (3) from end plug (4).
6. Remove spacer (14), sleeves (8 & 11) and spools (9 & 12) assembly from housing bore. This assembly must be taken out by way of end plug (4) end of housing. **NOTE: Be careful not to scratch housing bore. A wooden dowel will help in this procedure.**
7. Separate spacer (14) and spools (9 and 12) from sleeves (8 & 11). **NOTE: Excessive wear on either spools (9 & 12) or sleeves (8 & 11) may require replacement.**
8. Remove o-ring (10) from retainer (14) and cup (13) from spool (12). Remove other o-rings (10) from sleeve (11) and o-rings (7) from sleeve (8). **NOTE: Be careful not to damage cup and o-ring grooves or bores.**

ASSEMBLY

(Refer to Figures 2 and 4)

LUBRICATE ALL RUBBER COMPONENTS FROM REPAIR KIT, SPOOLS (9 & 12), AND SLEEVES (8 & 11) WITH CLEAN TYPE FLUID USED IN THE SYSTEM.

1. Clean all parts thoroughly before assembling.
2. Install one new o-ring (10) on spacer (14) and new cup (13) on spool (12). Note direction of cup.
3. Install other new o-rings (10) on sleeve (11) and new o-rings (7) on sleeve (8).
4. Carefully insert spool (12) into sleeve (11). Note direction of spool and cup.
5. Carefully insert spacer (14) into housing bore through end plug (4) end. Note direction of spacer.
6. Carefully insert sleeve (11) and spool (12) assembly into housing bore using a wooden dowel. Note direction of assembly.
7. Carefully insert sleeve (8) into housing until it rests against sleeve (11). Gently insert spool (9) into sleeve (8). Note direction of spools and sleeves.
8. Install spring (6) and retainer (5) into housing bore.
9. Install end plug (4) and torque 10.9-20.3 N·m (96-180 lb·in) to seat sleeves. Then turn back end plug 1/4 turn and torque 1.1-6.8 N·m (10-60 lb·in). Install new o-ring (3), washer (2) and nut (1). Hold end plug and torque nut 67.8-81.4 N·m (50-60 lb·ft).
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11. Install shim(s) (17), springs (18, 19 and 20) and piston (22) in housing bore. **NOTE: Not all models use spring (18). Some models also use a 6.35 mm (0.25 in) spacer with shims. For proper brake pressure setting, install the same number of shims and spacer that were removed during disassembly. If spools (9 & 12), sleeves (8 & 11), or spring (20) were replaced, shim adjustment may be required. Refer to brake pressure settings TABLE 1.**
12. Install new boot (23) on housing (15).

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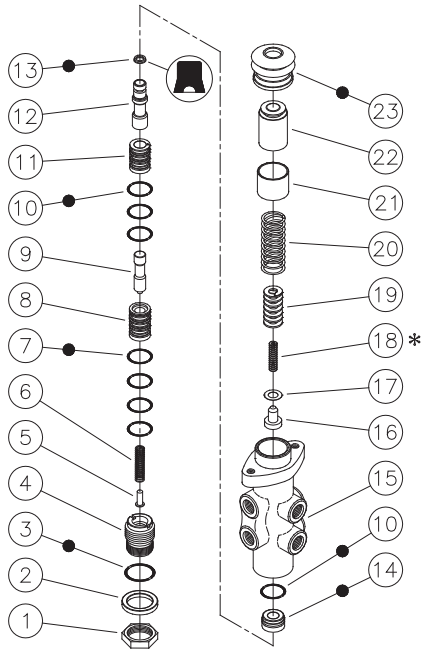

FIGURE 4

BLEEDING

Brakelines 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 closest 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 464 SERIES 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 oil**

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 and 4)

BRAKES WILL NOT RELEASE COMPLETELY

1. Piston (22) sticking
2. Pedal angle out of adjustment
3. Spring (6) broken

BRAKE WILL NOT RELEASE

1. Binding spool (9 and 12)
2. Damaged sleeve (8 and 11)
3. Piston (22) binding

NO BRAKES

1. Piston (22) binding
2. Broken spring (19)

EXCESSIVE BRAKING

1. Too many shims (17) installed in valve

EXCESSIVE ACCUMULATOR LEAKAGE WHEN BRAKES ARE APPLIED

1. Damaged spool (9 and 12)
2. Damaged sleeve (8 and 11)
3. O-rings (6) leaking
4. O-rings (7 or 10) leaking

EXCESSIVE ACCUMULATOR LEAKAGE WHEN BRAKES ARE NOT BEING USED

1. Damaged spool (9 and 12)
2. Damaged sleeve (8 and 11)
3. O-rings (7 or 10) leaking
4. Spring (6) broken

INSUFFICIENT BRAKES

1. Broken pressure regulating spring (19)
2. Boot cut, allowing dirt to accumulate under piston (22) flange