TANDEM MODULATING VALVE with Pilot Apply

Service Instructions

TABLE 1 (Specifications)

Model Number	Valve Assembly Number	Repair Kit Number	Brake Pressure Setting	
			bar	(PSI)
06-466-948	20-100-898	06-400-277	60 ± 5.2	(870 ± 75)
06-466-981	20-100-848	06-400-277	159 ± 5.2	(2300 ± 100)
06-466-985	20-100-847	06-400-277	50 ± 3.4	(725 ± 50)

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

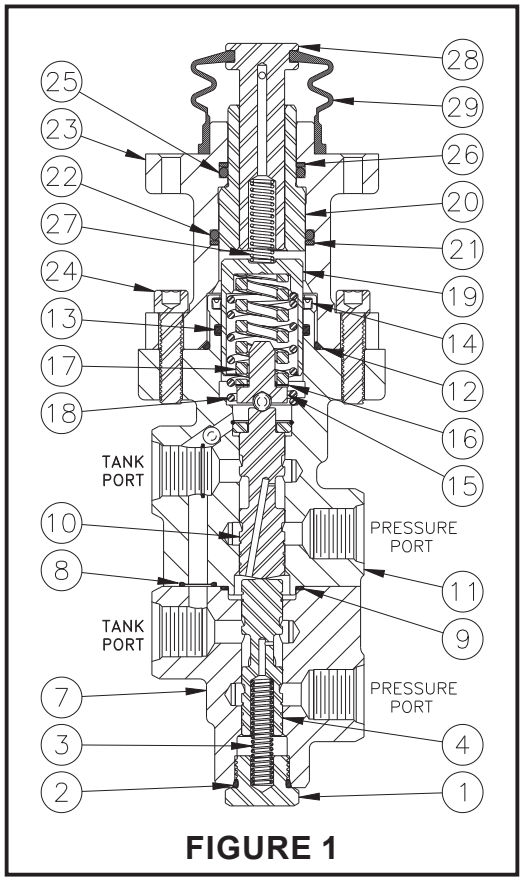

FIGURE 1

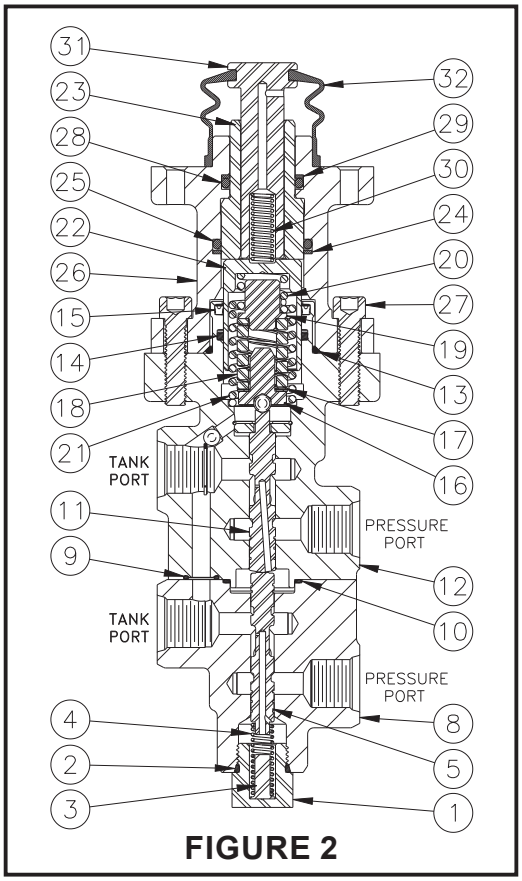

FIGURE 2

⚠ WARNING

Installation and test note: Piston (28 por 30) must be retained mechanically. This will prevent it from blowing out at high velocity if an incorrect connection occurs from power source to tank ports. **Be sure the tank ports are connected directly to tank.** Failure to do this could result in serious injury or death.

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Form No. 81-466-051 Revised 2019-01-28

www.mico.com

Model Numbers: 06-466-948
06-466-985

DISASSEMBLY
(Refer to Figures 1 and 3)

NOTE
Housings (7 & 11) and spools (4 & 10) are manufactured as matched sets. These sets, housing and spool, must not be intermixed with other parts.

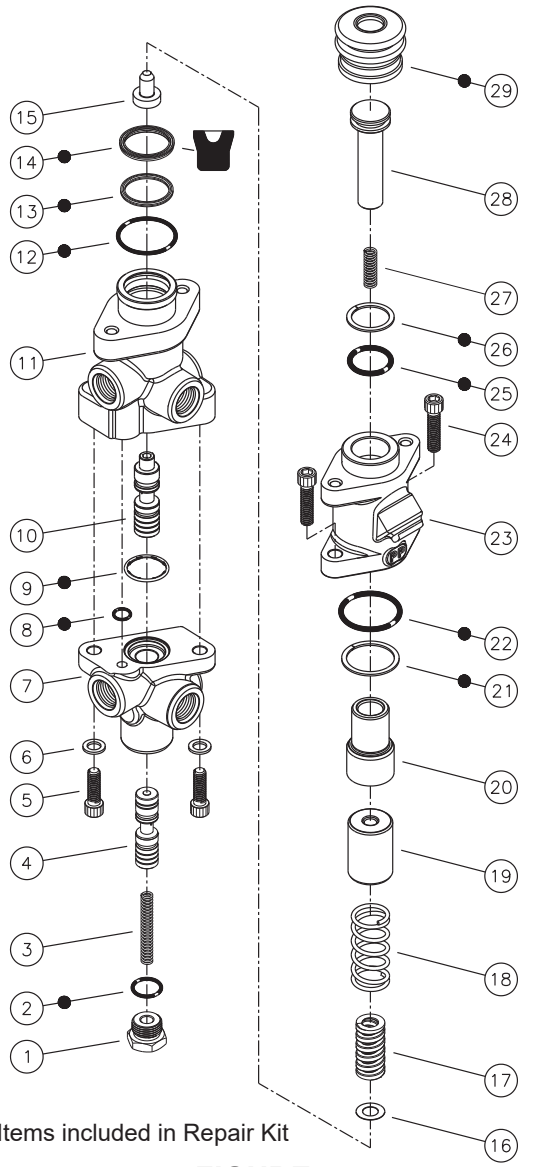
1. Remove boot (29) from push rod (28). Remove push rod (28) and spring (27) from housing (23) bore.
2. Seperate housing (23) and housing (11) by removing cap screws (24). Remove o-ring (12) from housing (11).
3. Remove piston (20) from housing (23). Piston (20) must be removed through the bottom side of housing (23). **NOTE: Be careful not to scratch or mar housing bore.**
4. Remove o-rings (22 & 25) and back-up rings (21 & 26) from housing (23). **NOTE: Be careful not to damage o-ring or back-up ring grooves.**
5. Remove piston (19), springs (17 & 18), shim(s) (16), and retainer assembly (15) from housing (11). **NOTE: Be aware of the number of shim(s) being removed from housing.**
6. Carefully remove cup (14) and seal (13) from housing (11) bore. **NOTE: Be careful not to scratch or mar housing bore.**
7. Remove end plug (1) and spring (3) from housing (7). Remove o-ring (2) from end plug (1).
8. Separate housings (7 & 11) by removing cap screws (5) and washers (6). Remove o-rings (8 & 9) from housing (7).
9. Carefully remove spools (4 & 10) from housings (7 & 11). **NOTE: Be careful not to damage spools or housing bores.**

⚠ CAUTION
Do not intermix spools and housings. Spool (4) and housing (7) are a matched set as are spool (10) and housing (11).

ASSEMBLY
(Refer to Figures 1 and 3)

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

1. Clean all parts thoroughly before assembling.
2. Install new o-rings (8 & 9) in proper o-ring pockets on housings (7 & 11).
3. Lubricate spool (10) with clean system fluid and carefully slide into bottom side of housing (11) bore. Note direction spool (10). **NOTE: Spool must slide freely into bore. If either part is damaged, a new valve assembly may be required.**
4. Reassemble housings (7 & 11) using cap screws (5) and washers (6). Use Loctite 242 on cap screws and torque 27.1-33.9 N·m (22-25 lb·ft). **NOTE: Be sure housings line up correctly and that o-rings (8 & 9) remain in the pockets during assembly.**
5. Lubricate spool (4) with clean system fluid and carefully slide into housing (7) 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.**
6. Install new o-ring (2) on end plug (1).
7. Install spring (3) and end plug (1) into housing (7). Torque end plug (1) 47.5-54.2 N·m (35-40 lb·ft).
8. Carefully install new seal (13) and new cup (14) in housing (11) bore. Note direction and order of seal and cup. **NOTE: Be careful not to scratch or mar housing bore.**
9. Assemble springs (17 & 18), shim(s) (16), and retainer assembly (15) in piston (19).



● Items included in Repair Kit

FIGURE 4

10. Carefully install piston (19) assembly into housing (11) bore.
11. Install new o-rings (22 & 25) and new back-up rings (21 & 26) in housing (23). Note order of o-rings and back-up rings.
12. Install piston (20) into bottom side of housing (23) bore. Be sure to install piston (20) as far as it will go into the housing bore.
13. Install new o-ring (12) on housing (11).
14. Carefully attach housing (23) to housing (11) using cap screws (24) and torque 29.8-33.9 N·m (22-25 lb·ft).
15. Install spring (27) and push rod (28) into housing (23) bore.
16. Install new boot (29) on push rod (28) and over housing (23).
17. When assembling valve to pedal assembly, torque cap screws 24.4-29.8 N·m (18-22 lb·ft).

NOTE
After service, the valve must develop the pressure indicated in the specifications, TABLE 1. Shim(s) (16) 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.

DISASSEMBLY
(Refer to Figures 2 and 4)

NOTE
Housings (8 & 12) and spools (4 & 11) are manufactured as matched sets. These sets, housing and spool, must not be intermixed with other parts.

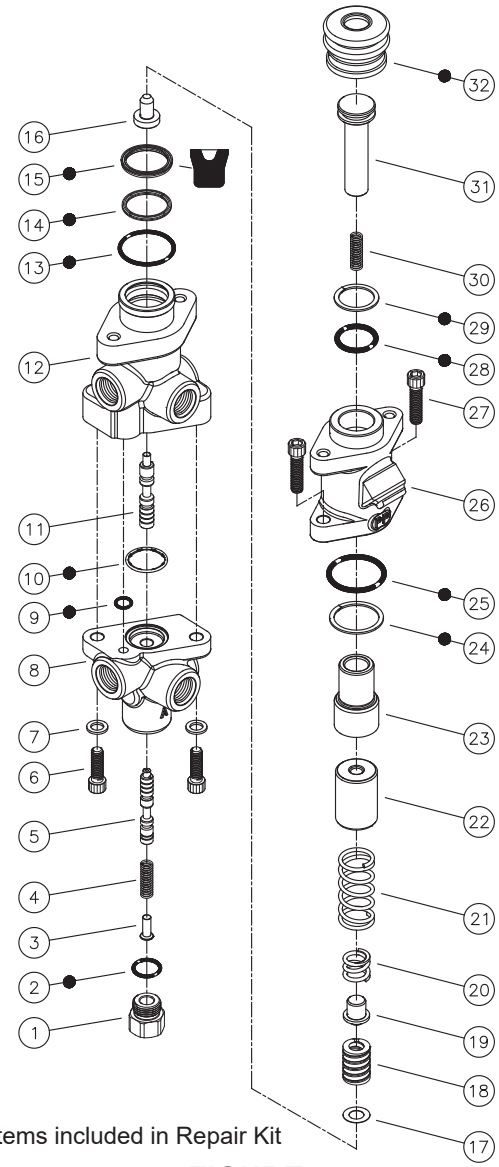
1. Remove boot (32) from push rod (31). Remove push rod (31) and spring (30) from housing (26) bore.
2. Seperate housing (26) and housing (12) by removing cap screws (27). Remove o-ring (13) from housing (12).
3. Remove piston (23) from housing (26). Piston (23) must be removed through the bottom side of housing (26). **NOTE: Be careful not to scratch or mar housing bore.**
4. Remove o-rings (25 & 28) and back-up rings (24 & 29) from housing (26). **NOTE: Be careful not to damage o-ring or back-up ring grooves.**
5. Remove piston (22), springs (20 & 21), retainer (19), spring (18), shim(s) (17), and retainer assembly (16) from housing (12). **NOTE: Be aware of the number of shim(s) being removed from housing.**
6. Carefully remove cup (15) and seal (14) from housing (12) bore. **NOTE: Be careful not to scratch or mar housing bore.**
7. Remove end plug (1), retainer (3), and spring (4) from housing (8). Remove o-ring (2) from end plug (1).
8. Separate housings (8 & 12) by removing cap screws (6) and washers (7). Remove o-rings (9 & 10) from housing (8).
9. Carefully remove spools (5 & 11) from housings (8 & 12). **NOTE: Be careful not to damage spools or housing bores.**

⚠ CAUTION
Do not intermix spools and housings. Spool (5) and housing (8) are a matched set as are spool (11) and housing (12).

ASSEMBLY
(Refer to Figures 2 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. Install new o-rings (9 & 10) in proper o-ring pockets on housings (8 & 12).
3. Lubricate spool (11) with clean system fluid and carefully slide into bottom side of housing (12) bore. Note direction spool (11). **NOTE: Spool must slide freely into bore. If either part is damaged, a new valve assembly may be required.**
4. Reassemble housings (8 & 12) using cap screws (6) and washers (7). Use Loctite 242 on cap screws and torque 27.1-33.9 N·m (22-25 lb·ft). **NOTE: Be sure housings line up correctly and that o-rings (9 & 10) remain in the pockets during assembly.**
5. Lubricate spool (5) with clean system fluid and carefully slide into housing (8) bore. Note direction of spool (5). **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 (4), retainer (3), and end plug (1) into housing (8). Torque end plug (1) 47.5-54.2 N·m (35-40 lb·ft).
8. Carefully install new seal (14) and new cup (15) in housing (12) bore. Note direction and order of seal and cup. **NOTE: Be careful not to scratch or mar housing bore.**
9. Assemble springs (21 & 20), retainer (19), spring (18), shim(s) (17), and retainer assembly (16) in piston (22).



● Items included in Repair Kit

FIGURE 5

10. Carefully install piston (22) assembly into housing (12) bore.
11. Install new o-rings (25 & 28) and new back-up rings (24 & 29) in housing (26). Note order of o-rings and back-up rings.
12. Install piston (23) into bottom side of housing (26) bore. Be sure to install piston (23) as far as it will go into the housing bore.
13. Install new o-ring (13) on housing (12).
14. Carefully attach housing (26) to housing (12) using cap screws (27) and torque 29.8-33.9 N·m (22-25 lb·ft).
15. Install spring (30) and push rod (31) into housing (26) bore.
16. Install new boot (32) on push rod (31) and over housing (26).
17. When assembling valve to pedal assembly, torque cap screws 24.4-29.8 N·m (18-22 lb·ft).

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 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 through out 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 466 SERIES POWER BRAKE 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
5. **Check adjuster operation**
6. Damaged hydraulic brake lines
6. **Check lines for dents that restrict flow of oil**

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**
9. Inoperative system relief valve
9. **Check pressure in pressure line to valve**
10. Worn pump
10. **Check pressure in pressure line to 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. Pressure on return line too high
7. **Reduce pressure**
8. Inoperative brake valve
8. **Replace brake valve**

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 3)

BRAKES WILL NOT RELEASE COMPLETELY

1. Piston (19) binding
2. Pedal angle out of adjustment
3. Spring (3) broken

BRAKES WILL NOT RELEASE

1. Binding spools (4 & 10)
2. Piston (19) binding

NO BRAKES

1. Piston (19) binding
2. Broken spring (17).

OUTLET PRESSURE TOO HIGH (EXCESSIVE BRAKING)

1. Too many shims (16) installed in valve.

EXCESSIVE ACCUMULATOR LEAKAGE WHEN BRAKES ARE APPLIED

1. Damaged spools (4 & 10)
2. amaged housings (7 & 11)

EXCESSIVE ACCUMULATOR LEAKAGE WHEN BRAKES ARE NOT BEING USED

1. Damaged spools (4 & 10)
2. Damaged housings (7 & 11)

INSUFFICIENT BRAKES

1. Broken pressure regulating spring (17)
2. Pedal travel is inhibited

SERVICE DIAGNOSIS

(Refer to Figures 2 and 4)

BRAKES WILL NOT RELEASE COMPLETELY

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

BRAKES WILL NOT RELEASE

1. Binding spools (9 & 12)
2. Piston (22) binding

NO BRAKES

1. Piston (22) binding
2. Broken spring (18)

OUTLET PRESSURE TOO HIGH (EXCESSIVE BRAKING)

1. Too many shims (17) installed in valve.

EXCESSIVE ACCUMULATOR LEAKAGE WHEN BRAKES ARE APPLIED

1. Damaged spools (5 & 11)
2. Damaged housings (8 & 12)

EXCESSIVE ACCUMULATOR LEAKAGE WHEN BRAKES ARE NOT BEING USED

1. Damaged spools (5 & 11)
2. Damaged housings (8 & 12)

INSUFFICIENT BRAKES

1. Broken pressure regulating spring (18)
2. Pedal travel is inhibited