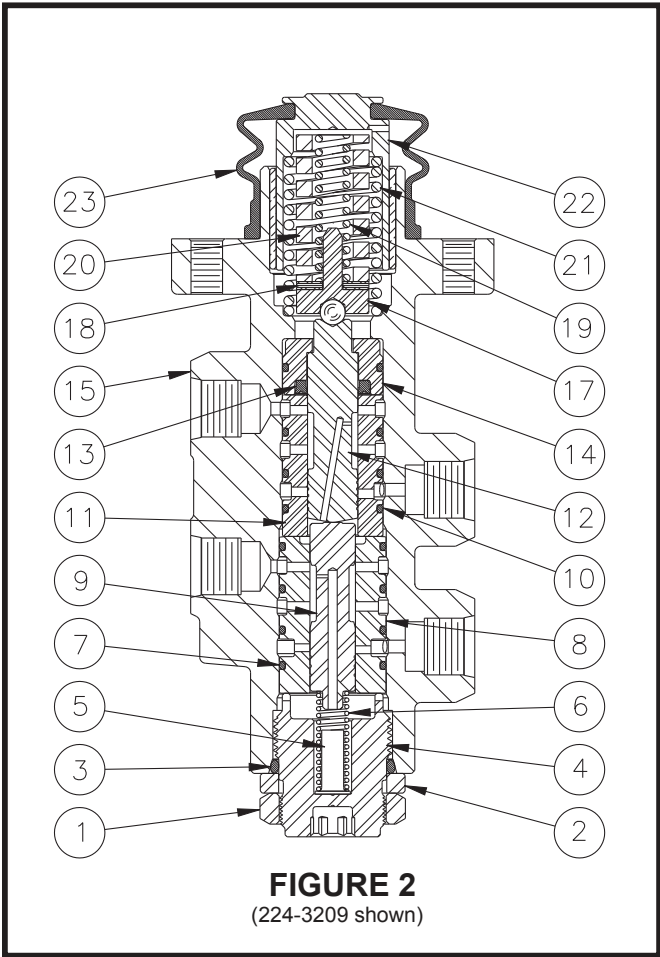
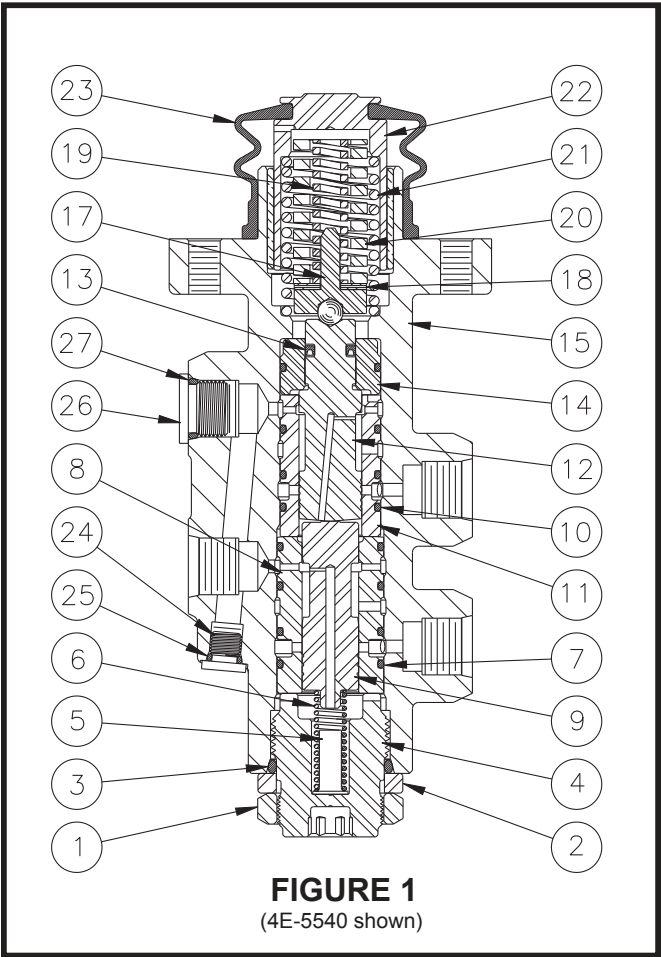


Tandem Modulating Valve Service Instructions

TABLE 1 (Specifications)

Caterpillar Model Number	Caterpillar Repair Kit Number	Brake Pressure Setting	
		bar	(PSI)
*4E-5540	4E-5550	69.0 ± 3.5	(1000 ± 50)
*224-3209	4E-5550	110.3 ± 3.5	(1600 ± 50)

* Valve only, no pedal and base



DISASSEMBLY

NOTE

This literature services more than one brake valve. Components shown in Figure 3 may appear different than what is found in your brake. Spool (9) and sleeve (8) are a matched set as are spool (12) and sleeve (11) and should not be intermixed with other parts.

1. Prevent contamination to the brake valve and hydraulic system. Thoroughly clean brake valve and surrounding area of all dirt, grease, oil, etc.
2. Remove boot (23) from piston (22).
3. Remove piston (22), springs (19, 20 & 21) and shim(s) (18) from housing bore. **NOTE: Be aware of the number of shim(s) being removed from housing.**

NOTE

The bearing inside of housing bore should not be removed. Excessive wear of both bearing and piston may necessitate replacement.

4. Remove retainer assembly (17) 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)/spools (9 & 12) assembly from housing bore. This assembly must be removed out 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 necessitate replacement.**
8. Remove o-ring (10) from spacer (14). Remove other o-rings (10) from sleeve (11) and o-rings (7) from sleeve (8). **NOTE: Be careful not to damage o-ring grooves or bores.**
9. Remove cup (13) from spool (12) or spacer (14). **NOTE: Be careful not to damage spool.**
10. Remove plug (26) from housing (15). Remove o-ring (27) from plug (26). **NOTE: Model 224-3209 does not use plug (26) or o-ring (27).**
11. Remove plug (24) from housing (15). Remove o-ring (25) from plug (24). **NOTE: Model 224-3209 does not use plug (24) or o-ring (25).**

ASSEMBLY

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

1. Clean all parts thoroughly before assembling.
2. Install one new o-ring (10) on new spacer (14).
3. Install other new o-rings (10) on sleeve (11) and new o-rings (7) on sleeve (8).
4. Install new cup (13) on spool (12) or in spacer (14). Note direction of cup.
5. Carefully insert spool (12) into sleeve (11). Note direction of spool. **NOTE: Spool must slide freely into sleeve. If either part is damaged, a new valve assembly may be required**
6. Insert spacer (14) into housing bore through end plug (4) end. Note direction of spacer.
7. Carefully insert sleeve (11)/spool (12) assembly into housing bore using a wooden dowel. Note direction of assembly.
8. 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. **NOTE: Spool must slide freely into sleeve.**
9. Install spring (6) and retainer (5) into housing bore.
10. Install retainer (5) and end plug (4) into housing (15). Torque end plug (4) 10.9-20.3 N·m (96-180 lb-ft) to seat sleeves. Then loosen end plug 1/4 inch and torque 1.1-6.0 N·m (10-60 lb-in). Install new o-ring (3), washer (2) and nut (1). Hold end plug (4) with a wrench and torque nut 67.8-81.4 N·m (50-60 lb-ft).

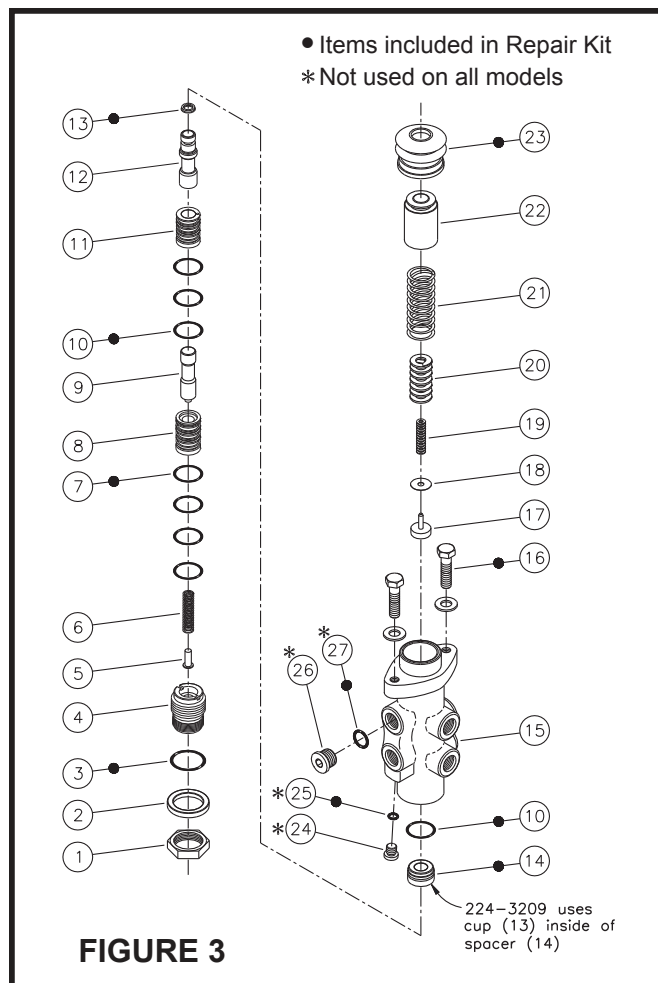


FIGURE 3

11. Install retainer assembly (17) in housing. **NOTE: Depress retainer assembly (17) until it bottoms on spacer (14). Spools (9 & 12) and retainer assembly (17) should return when released. If the spools and retainer assembly do not return when released, the bore of sleeves (8 & 11) may be damaged.**
12. Install shim(s) (18), springs (19, 20 & 21) and piston (22) in housing bore. **NOTE: For proper brake pressure setting, install the same number of shims as were removed during disassembly. If spools (9 & 12), sleeves (8 & 11), or spring (21) were replaced, shim adjustment may be required.**
13. Install new boot (23) on housing (15) and into groove of piston (22).
14. Install new o-ring (27) on end plug (26). Install end plug (26) in housing (15) and torque 27.1-32.5 N·m (20-24 lb-ft). **NOTE: Model 224-3209 does not use plug (26) or o-ring (27).**
15. Install new o-ring (25) on end plug (24). Install end plug (24) in housing (15) and torque 3.4-6.8 N·m (30-60 lb-in). **NOTE: Model 224-3209 does not use plug (24) or o-ring (25).**
16. 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

After service, the brake valve must develop the pressure indicated in the specifications, TABLE 1. Shim(s) (18) are used to obtain the correct pressure setting. Contact the machine manufacture if brake pressure setting is not able to be obtained.

NOTE

Reinstall complete valve on machine. Properly bleed and test performance to be sure of usable operation in accordance with machine manufacture recommendations.