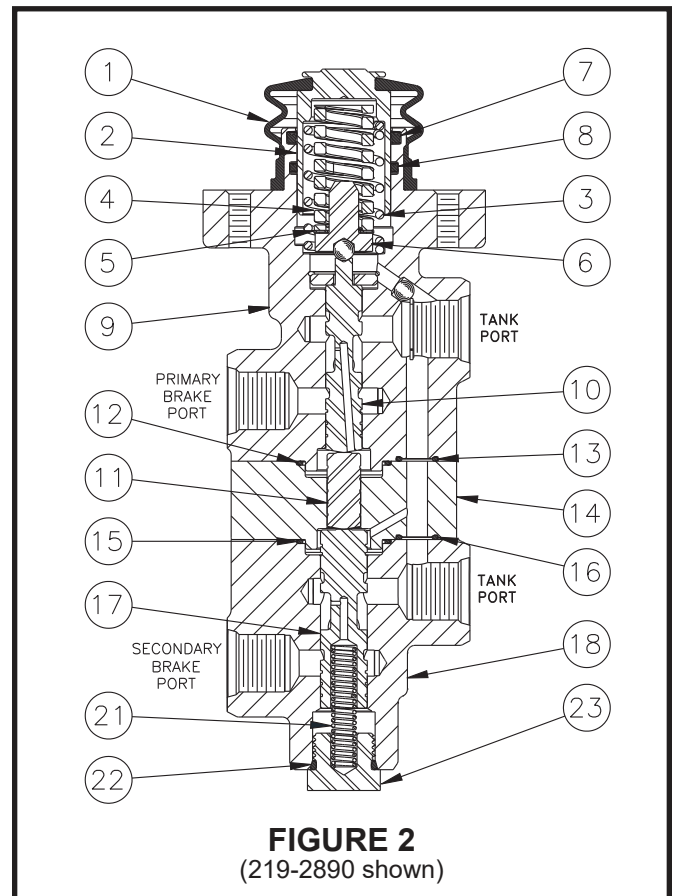
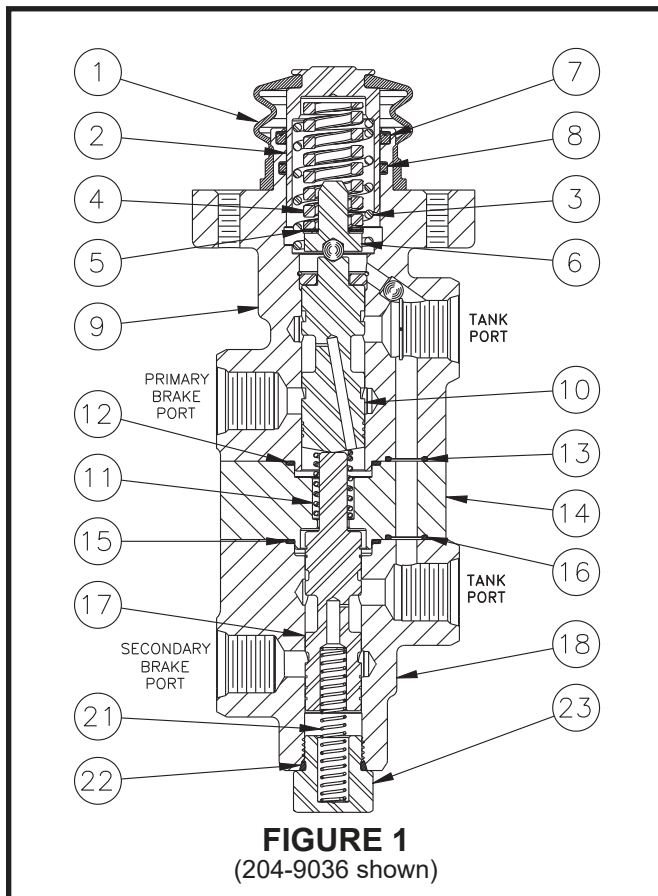


TANDEM MODULATING VALVE

Service Instructions

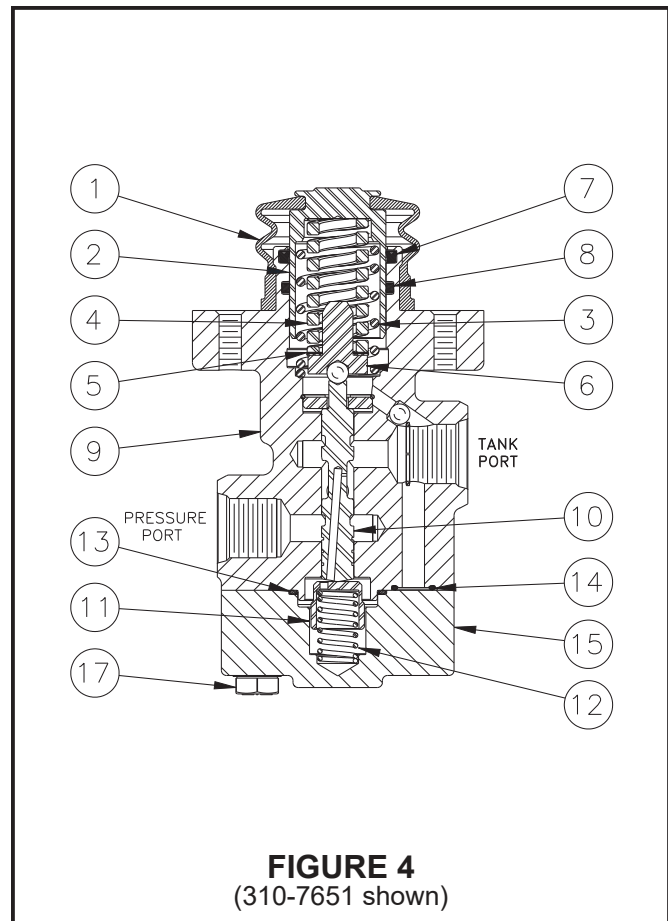
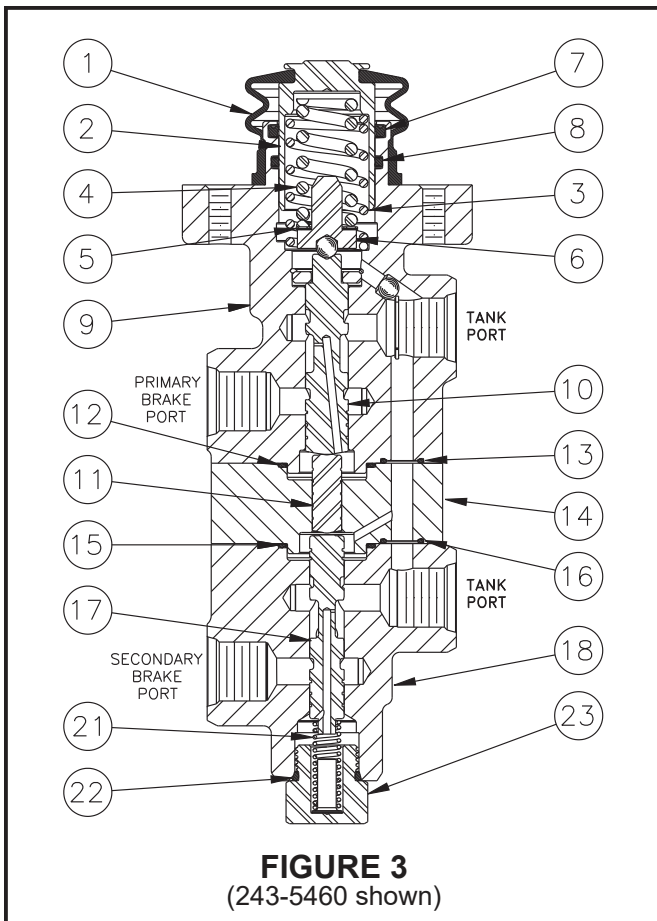
TABLE 1 (Specifications)

Complete Unit Caterpillar Part Number	Valve Assembly Caterpillar Part Number	Primary Brake Port Pressure Setting		Secondary Brake Port Pressure Setting	
		bar	(PSI)	bar	(PSI)
217-9037	204-9036	34.5 ± 1.7	(500 ± 25)	34.5 ± 1.7	(500 ± 25)
196-7296	219-2890	103.4 ± 3.5	(1500 ± 50)	34.5 ± 3.5	(500 ± 50)
n/a	243-5460	58.6 ± 3.5	(850 ± 50)	34.5 ± 3.5	(500 ± 50)
310-7260	310-7651	144.8 ± 5.2	(2100 ± 75)	n/a	n/a
n/a	217-9036	34.5 ± 3.5	(500 ± 50)	34.5 ± 3.5	(500 ± 50)
303-2289	323-3605	34.5 ± 1.7	(500 ± 25)	34.5 ± 1.7	(500 ± 25)
329-1521	321-8318	37.9 ± 1.7	(550 ± 25)	37.9 ± 1.7	(550 ± 25)
332-1876	321-8318	37.9 ± 1.7	(550 ± 25)	37.9 ± 1.7	(550 ± 25)
351-0628	321-8318	37.9 ± 1.7	(550 ± 25)	37.9 ± 1.7	(550 ± 25)
396-2095	416-5427	116.6 ± 5.2	(1690 ± 75)	62.2 ± 3.8	(985 ± 55)



⚠ WARNING

Installation and test note: Piston (2) 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 can result in serious injury or death.



⚠ WARNING

Installation and test note: Piston (2) 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 can result in serious injury or death.

Complete Unit Caterpillar Part Number	Valve Assembly Caterpillar Part Number
217-9037	204-9036
n/a	217-9036
303-2289	323-3605
329-1521	321-8318
332-1876	321-8318
351-0628	321-8318

NOTE

Housings (10 & 19) and spools (11 & 18) are manufactured as matched sets. These sets must not be intermixed with other parts.

DISASSEMBLY

(Refer to Figures 1 and 5)

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

CAUTION

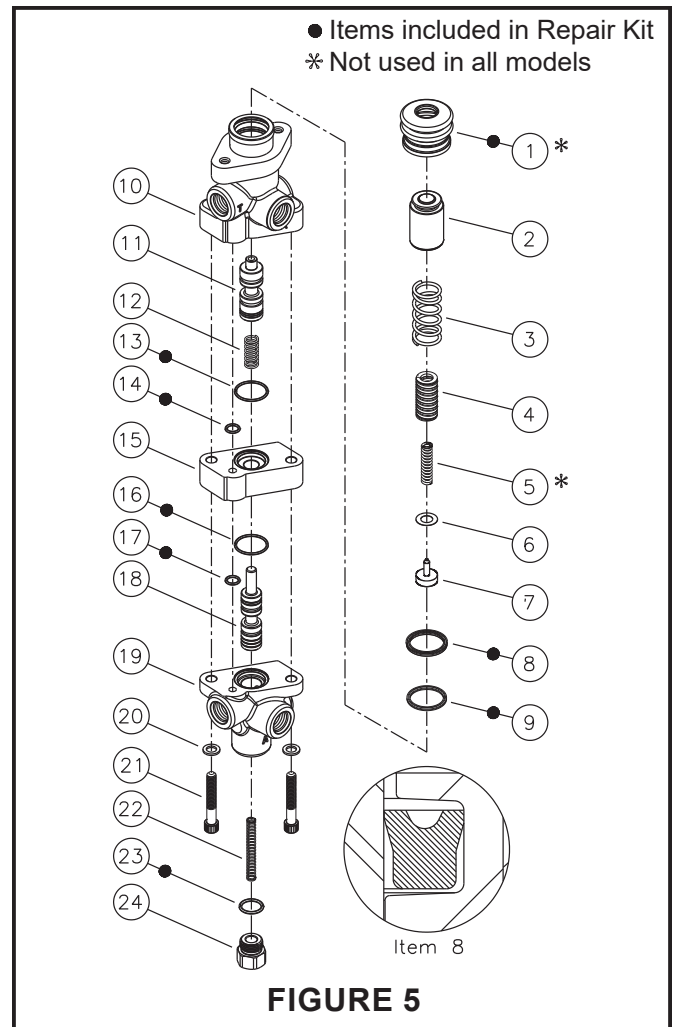
Do not intermix spools and housings. Spool (11) and housing (10) are a matched set, as well as spool (18) and housing (19).

ASSEMBLY

(Refer to Figures 1 and 5)

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 (13, 14, 16, & 17) in proper o-ring pockets on housings (10 & 19).
3. Lubricate spool (11) with clean system fluid and carefully slide into bottom end of housing (10) 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.**
4. Install spring (12) and reassemble housings (10 & 19) and spacer (15) using cap screws (21) and washers (20). Use Loctite 242 on cap screws (21) and torque 29.8-33.9 N·m (22-25 lb·ft). **NOTE: Make sure housings line-up correctly and that o-rings (13, 14, 16, & 17) remain in the pockets during assembly.**



5. Lubricate spool (18) with clean system fluid and carefully slide into housing (19) bore. Note direction of spool (18). **NOTE: Spool must slide freely into bore. If either part is damaged, a new valve assembly may be required.**
6. Install new o-ring (23) on end plug (24).
7. Install spring (22) and end plug (24) into housing (19). Torque end plug (24) 47.5-54.2 N·m (35-40 lb·ft).
8. Carefully install new cup (8) and new seal (9) into housing (10) bore. Note direction and order of cup (8) and seal (9). **NOTE: Be careful not to scratch or mar housing bore.**
9. Install springs (3, 4, & 5), shim(s) (6) and retainer assembly (7) in piston (2). **NOTE: Not all models use spring (5).**
10. Carefully install piston (2) assembly into housing (10) bore.
11. Install new boot (1) on housing (10) and piston (2). **NOTE: Not all valves use boot (1).**

NOTE

After service, the valve must develop primary brake port pressure as indicated in the specifications, TABLE 1 on page 1. Shim(s) (6) are used to obtain the correct pressure setting. Contact manufacturer if brake pressure setting is not able to be obtained.

Complete Unit Caterpillar Part Number	Valve Assembly Caterpillar Part Number
196-7246	219-2890

NOTE

Housings (9 & 18) and spools (10 & 17) are manufactured as matched sets as is spacer (14) and spool (11). These sets must not be intermixed with other parts.

DISASSEMBLY

(Refer to Figures 2 and 6)

1. Remove boot (1) from piston (2) and housing (9).
2. Remove piston (2), springs (3 & 4), shim(s) (5), and retainer assembly (6) from housing (9). **NOTE: Be aware of the number of shim(s) (5) being removed from housing (9).**
3. Carefully remove cup (7) and seal (8) from housing (9) bore. **NOTE: Be careful not to scratch or mar housing bore.**
4. Remove end plug (23) and spring (21) from housing (18). Remove o-ring (22) from end plug (23).
5. Separate housings (9 & 18) and spacer (14) by removing cap screws (20) and washers (19).
6. Remove o-rings (12, 13, 15, & 16) from housings (9 & 18).
7. Carefully remove spool (11) from spacer (14). **NOTE: Be careful not to damage spool or spacer bore.**
8. Carefully remove spools (10 & 17) from housings (9 & 18) **NOTE: Be careful not to damage spools or housing bores.**

CAUTION

Do not intermix spools and housings. Spool (10) and housing (9) are a matched set, as well as spool (17) and housing (18), and spacer (14) and spool (11).

ASSEMBLY

(Refer to Figures 2 and 6)

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 (12, 13, 15, & 16) in proper o-ring pockets on housings (9 & 18).
3. Lubricate spool (10) with clean system fluid and carefully slide into bottom end of housing (9) 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.**
4. Install spool (11) in spacer (14) and reassemble housings (9 & 18) and spacer (14) using cap screws (20) and washers (19). Use Loctite 242 on cap screws (20) and torque 29.8-33.9 N·m (22-25 lb·ft). **NOTE: Spool must slide freely into bore. If either part is damaged, a new valve assembly may be required. Make sure housings line-up correctly and that o-rings (12, 13, 15, & 16) remain in the pockets during assembly.**

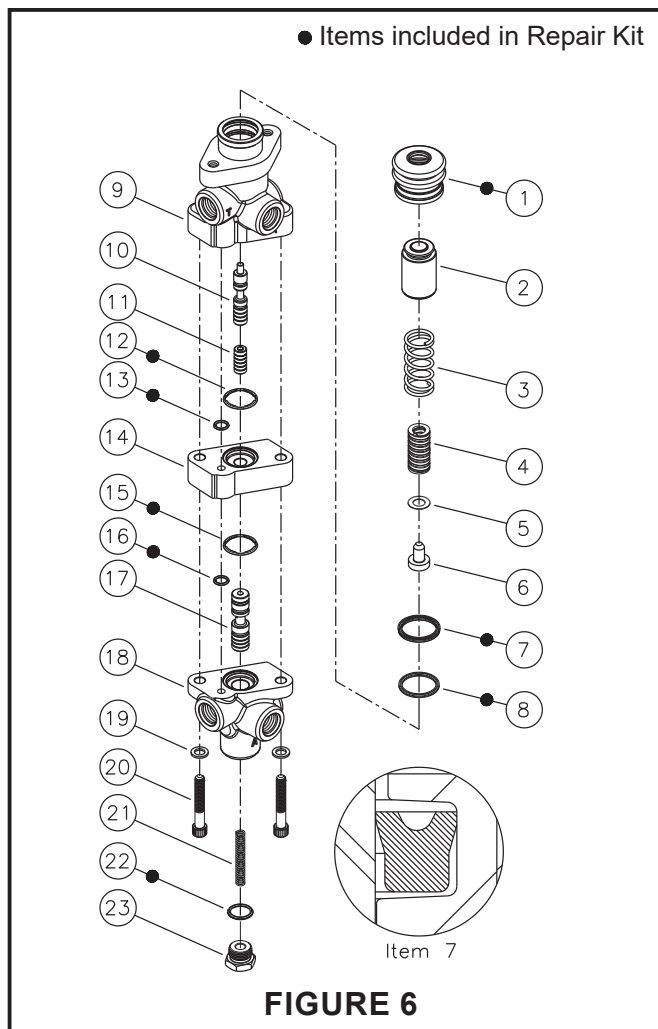


FIGURE 6

5. Lubricate spool (17) with clean system fluid and carefully slide into housing (18) bore. Note direction of spool (17). **NOTE: Spool must slide freely into bore. If either part is damaged, a new valve assembly may be required.**
6. Install new o-ring (22) on end plug (23).
7. Install spring (21) and end plug (23) into housing (18). Torque end plug (23) 47.5-54.2 N·m (35-40 lb·ft).
8. Carefully install new cup (7) and new seal (8) into housing (9) bore. Note direction and order of cup (7) and seal (8). **NOTE: Be careful not to scratch or mar housing bore.**
9. Install springs (3 & 4), shim(s) (5), and retainer assembly (6) in piston (2).
10. Carefully install piston (2) assembly into housing (9) bore.
11. Install new boot (1) on housing (9) and piston (2).

NOTE

After service, the valve must develop primary brake port pressure as indicated in the specifications, TABLE 1 on page 1. Shim(s) (5) are used to obtain the correct pressure setting. Contact manufacturer if brake pressure setting is not able to be obtained.

Complete Unit Caterpillar Part Number	Valve Assembly Caterpillar Part Number
n/a 396-2095	243-5460 416-5427

NOTE

Housings (9 & 18) and spools (10 & 17) are manufactured as matched sets as is spacer (14) and spool (11). These sets must not be intermixed with other parts.

DISASSEMBLY

(Refer to Figures 3 and 7)

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

CAUTION

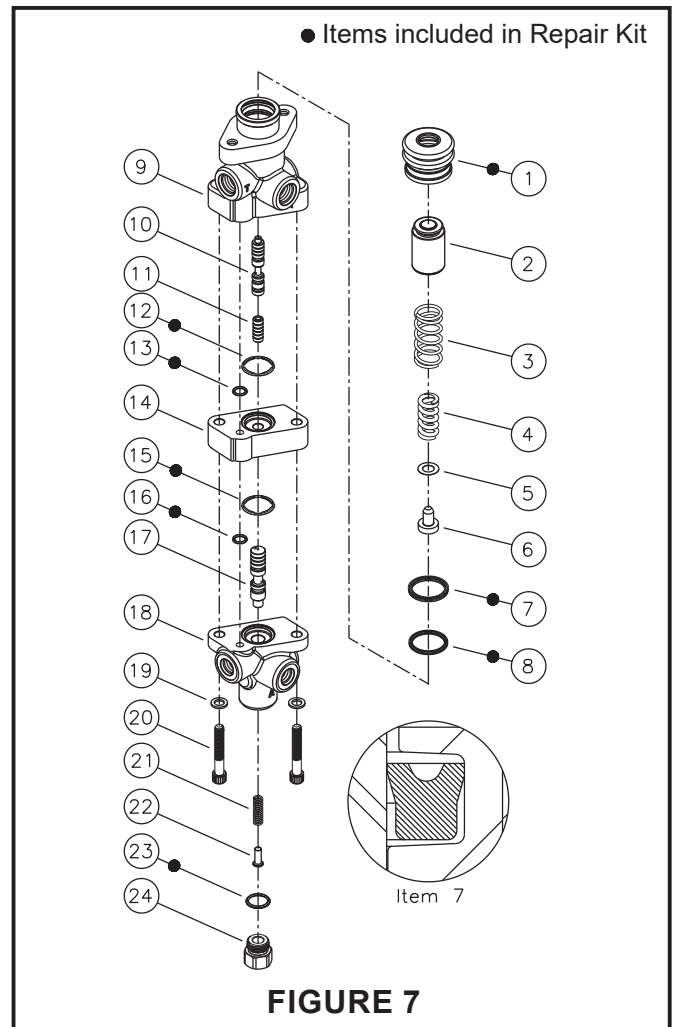
Do not intermix spools and housings. Spool (10) and housing (9) are a matched set, as well as spool (17) and housing (18), and spacer (14) and spool (11).

ASSEMBLY

(Refer to Figures 3 and 7)

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 (12, 13, 15, & 16) in proper o-ring pockets on housings (9 & 18).
3. Lubricate spool (10) with clean system fluid and carefully slide into bottom end of housing (9) 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.**
4. Install spool (11) in spacer (14) and reassemble housings (9 & 18) and spacer (14) using cap screws (20) and washers (19). Use Loctite 242 on cap screws (20) and torque 29.8-33.9 N·m (22-25 lb·ft). **NOTE: Spool must slide freely into bore. If either part is damaged, a new valve assembly may be required. Make sure housings line-up correctly and that o-rings (12, 13, 15, & 16) remain in the pockets during assembly.**



5. Lubricate spool (17) with clean system fluid and carefully slide into housing (18) bore. Note direction of spool (17). **NOTE: Spool must slide freely into bore. If either part is damaged, a new valve assembly may be required.**
6. Install new o-ring (23) on end plug (24).
7. Install spring (21), retainer (22), and end plug (24) into housing (18). Torque end plug (24) 47.5-54.2 N·m (35-40 lb·ft).
8. Carefully install new cup (7) and new seal (8) into housing (9) bore. Note direction and order of cup (7) and seal (8). **NOTE: Be careful not to scratch or mar housing bore.**
9. Install springs (3 & 4), shim(s) (5), and retainer assembly (6) in piston (2).
10. Carefully install piston (2) assembly into housing (9) bore.
11. Install new boot (1) on housing (9) and piston (2).

NOTE

After service, the valve must develop primary brake port pressure as indicated in the specifications, TABLE 1 on page 1. Shim(s) (5) are used to obtain the correct pressure setting. Contact manufacturer if brake pressure setting is not able to be obtained.

Complete Unit Caterpillar Part Number	Valve Assembly Caterpillar Part Number
310-7260	310-7651

NOTE

Housing (9) and spool (10) are manufactured as a matched set. This set must not be intermixed with other parts.

DISASSEMBLY

(Refer to Figures 4 and 8)

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

⚠ CAUTION

Do not intermix spools and housings. Spool (10) and housing (9) are a matched set.

ASSEMBLY

(Refer to Figures 4 and 8)

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 (13 & 14) in proper o-ring pockets on housing (9).
3. Lubricate spool (10) with clean system fluid and carefully slide into bottom end of housing (9) 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.**
4. Install spring (12) and retainer (11) in end cap (15) and reassemble housing (9) to end cap (15) using cap screws (17) and washers (16). Use Loctite 242 on cap screws (17) and torque 29.8-33.9 N·m (22-25 lb·ft). **NOTE: Be sure o-rings (13 & 14) remain in the pockets during assembly.**
5. Carefully install new cup (7) and new seal (8) into housing (9) bore. Note direction and order of cup (7) and seal (8). **NOTE: Be careful not to scratch or mar housing bore.**
6. Install springs (3 & 4), shim(s) (5), and retainer assembly (6) in piston (2).

● Items included in Repair Kit

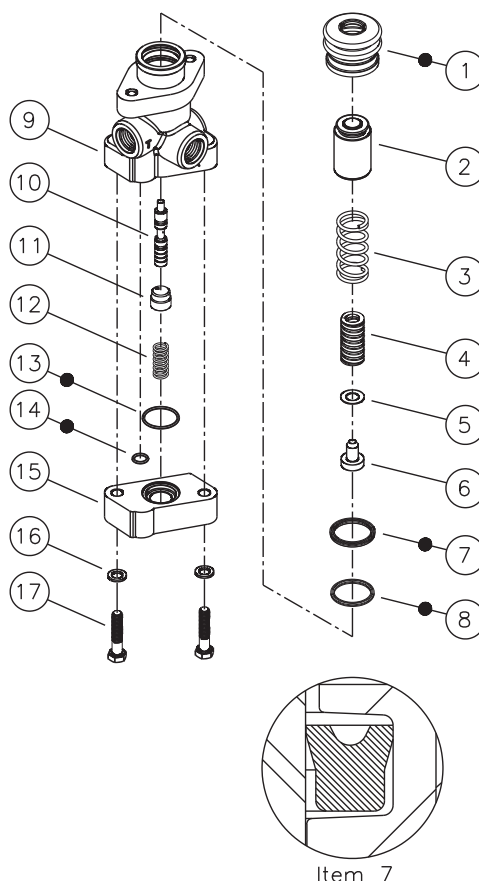


FIGURE 8

7. Carefully install piston (2) assembly into housing (9) bore.
8. Install new boot (1) on housing (9) and piston (2).

NOTE

After service, the valve must develop primary brake port pressure as indicated in the specifications, TABLE 1 on page 1. Shim(s) (5) are used to obtain the correct pressure setting. Contact manufacturer if brake pressure setting is not able to be obtained.