

Throttle Control



Installation and Service Instructions

TABLE 1

*Complete Unit Model Number	Complete Unit Repair Kit Number	*Complete Unit Model Number	Complete Unit Repair Kit Number	*Complete Unit Model Number	Complete Unit Repair Kit Number
12-460-065 (BF)	n/a	12-460-175 (BF)	12-400-025	12-460-191 (BF)	12-400-025
12-460-150 (HO)	12-400-024	12-460-176 (HO)	12-400-012	12-460-192 (HO)	12-400-012
12-460-151 (BF)	12-400-023	12-460-184 (HO)	12-400-024	12-460-193 (BF)	n/a
12-460-154 (HO)	12-400-024	12-460-189 (BF)	12-400-023		
12-460-157 (BF)	12-400-009	12-460-190 (HO)	12-400-024		

HO = Hydraulic Oil BF = Brake Fluid

* Complete unit consists of pedal and actuator, slave cylinder, and reservoir. See inside pages for more information on individual components.

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

GENERAL

The customer must use proper installation procedures so as not to create any undue stress or adverse environmental exposure to the Throttle Control components. The customer must also approve, through testing, this device for use and performance on vehicle. This testing and approval must be completed before in-field service use.

MOUNTING

Base Plate and Pedal Assembly

1. Select a convenient mounting location on vehicle floor board, tow board, or firewall. Be sure that the base plate and pedal assembly do not interfere with other vehicle components.
2. Using the base plate as a template, drill two 8.8 mm (11/32 in) diameter holes.

CAUTION

Observe vehicle manufacture recommendations and prohibitions before drilling.

3. Fasten base plate to mounting surface.
4. Attach actuator push rod to one of three threaded holes on pedal using screw and spacer provided. **NOTE: Spacer must fit between push rod and pedal.**

Slave Cylinder

1. Mount slave cylinder in a convenient location close to carburetor, using a 1/4 inch screw or pin. **NOTE: Allow for pivotal movement of cylinder during application.**
2. Attach slave cylinder push rod to carburetor linkage. The push rod has standard 5/16-24 threads to accommodate available ball joints or clevises. **NOTE: Positioning of the slave cylinder will determine the desired maximum stroke of up to 60.3 mm (2.38 in). A bell crank may be used to give pull action if the push action is not suitable for your particular installation.**
3. We recommend 3.2-4.5 kgf (7-10 lb) of return spring force at the slave cylinder push rod. Without return force on the push rod, the control will not be responsive to command and ideal revs may be inconsistent.

Reservoir

1. Mount the reservoir in a convenient location on the firewall.

CAUTION

Be sure the reservoir is higher than the pedal actuator and the slave cylinder so fluid can be gravity fed into them.

PLUMBING

(Refer to Figures 1 and 2)

Hydraulic Connections and Installation Tips

Standard 1/8 inch NPTF to 1/4 inch tube brass adaptor fittings may be used for all tubing connections. Copper, steel, or plastic 1/4 inch tubing may be used for the hydraulic lines.

Mineral Based Hydraulic Oil Systems

When fluid line lengths become excessive, tubing I.D. should increase proportionately. If vehicle is subjected to low temperatures which could restrict the flow of fluid, we recommend the fluid be thinned by using a 50/50 mixture No. 1 fuel oil.

1. Connect slave to side port of pedal actuator.
2. Connect reservoir to end port of pedal actuator.

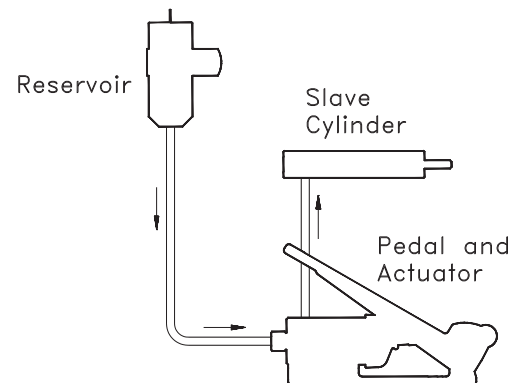


FIGURE 1
1 Unit Hook-up

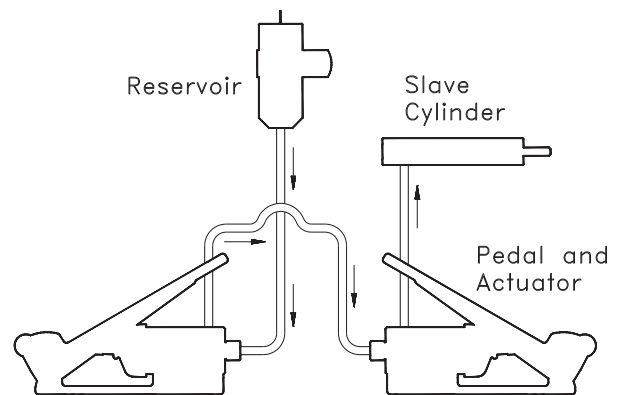


FIGURE 2
2 Unit Hook-up

TABLE 2

Model Number	Repair Kit Number	Model Number	Repair Kit Number	Model Number	Repair Kit Number
*12-460-003 (BF)	12-400-007	12-460-121 (BF)	12-400-021	12-460-170 (HO)	12-400-002
*12-460-006 (HO)	12-400-002	12-460-124 (HO)	12-400-002	12-460-183 (HO)	12-400-002
*12-460-064 (HO)	12-400-002	12-460-125 (BF)	12-400-007	12-460-185 (BF)	12-400-007
*12-460-067 (BF)	12-400-007	12-460-126 (HO)	12-400-002	12-460-186 (HO)	12-400-002

HO = Hydraulic Oil BF = Brake Fluid
 * Actuator assembly only, no pedal or base.

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

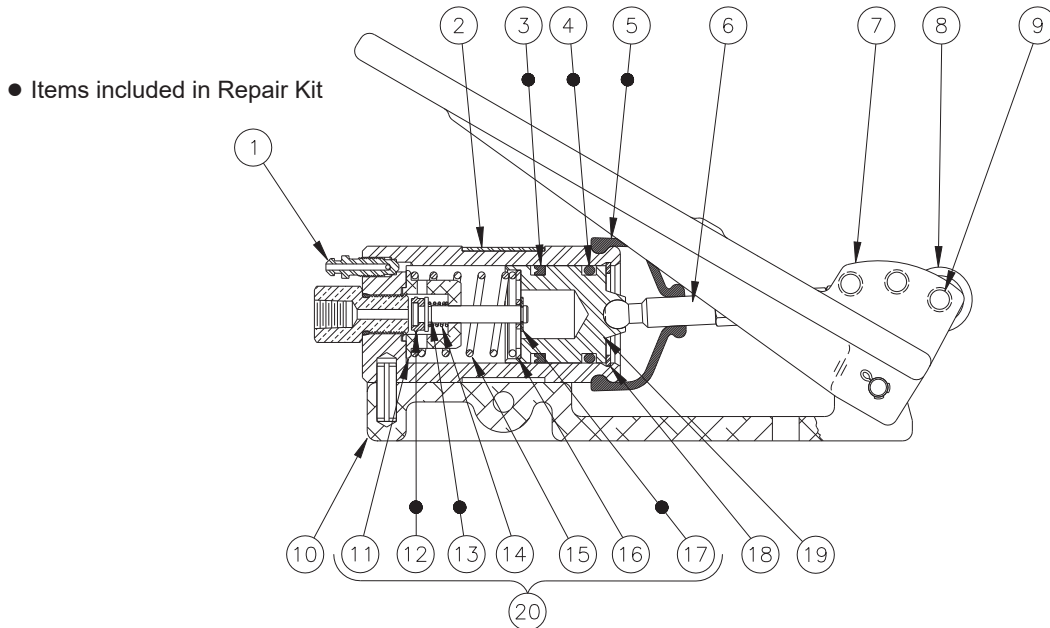


FIGURE 3

PEDAL ACTUATOR DISASSEMBLY

(Refer to Figure 3)

1. Disconnect fluid line from actuator inlet port. Plug line to prevent excess fluid loss.
2. Remove actuator from vehicle by removing two mounting bolts.
3. Remove screw (9) and spacer that attaches pedal (7) to rod end (8).
4. Remove screw that attaches clamp (2) to base (10).
5. Remove bleeder screw (1) and drain fluid before starting disassembly.
6. Remove boot (5). Remove snap ring (18).
7. Pull push rod (6) and piston (19) out of actuator bore.
8. Remove cup (3) and o-ring (4) from piston (19).
9. Remove stem assembly (20) from actuator bore.

⚠ CAUTION

When removing cup and o-ring, be careful not to scratch or mar finished surfaces.

10. Remove snap ring (17) from stem (13).

⚠ CAUTION

Be careful when removing snap ring as it is under tension of spring (15).

11. Disassemble retainer (16), spring (15), retainer (11), stem (13), and spring (14).
12. Remove seat (12) from stem (13).

PEDAL ACTUATOR ASSEMBLY

(Refer to Figure 3)

1. Clean all parts thoroughly and allow to dry before reassembling.
2. Lubricate rubber components from repair kit in clean system fluid.
3. Install new seat (12) on stem (13).
4. Install spring (14) over stem (13) and insert into retainer (11). Note direction of retainer (11) and stem (13).
5. Slide spring (15) and retainer (16) over stem (13). Then install snap ring (17) on stem (13).
6. Install stem assembly (20) into actuator bore.
7. Install new o-ring (4) and new cup (3) on piston (19).
8. Insert piston (19) and push rod (6) into actuator bore, twisting slightly to avoid damaging seals.
9. Install snap ring (18). Install new boot (5).
10. Install actuator clamp (2) and attach with screw.
11. Align rod end (8) with pedal (7) and attach with screw (9) and spacer. **NOTE: Spacer must fit between push rod and pedal.**
12. Install actuator on vehicle. Connect fluid lines. Bleed System of air. Tighten fittings if leaks occur. Make several applications to be sure actuator is working properly

TABLE 3

Model Number	Repair Kit Number
12-120-007 (BF)	12-100-009
12-120-010 (HO)	12-100-010
12-120-013 (BF)	*12-100-011
12-120-123 (BF)	*12-100-020

HO = Hydraulic Oil BF = Brake Fluid

* Also includes new boot and cable tie.

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

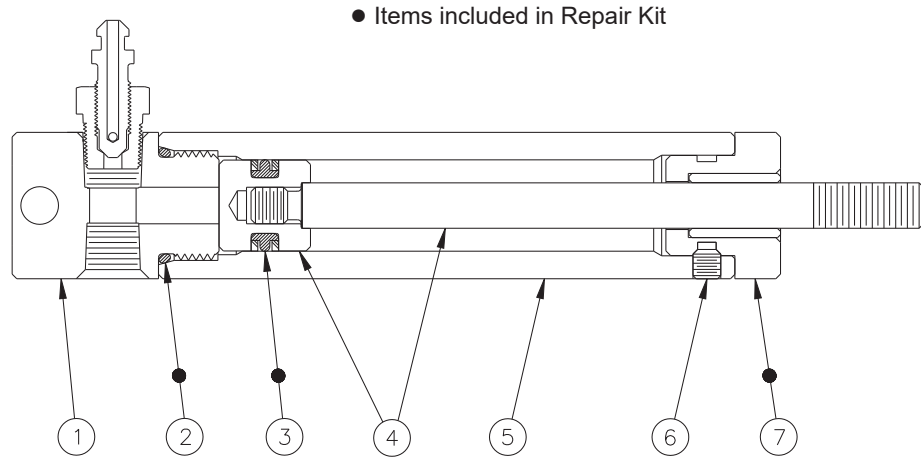


FIGURE 4

SLAVE CYLINDER DISASSEMBLY

(Refer to Figure 4)

1. Disconnect fluid line from slave cylinder inlet port. Plug line to prevent excess fluid loss.
2. Remove slave cylinder from vehicle.
3. Place slave cylinder in a soft jawed vise and remove end cap (1). Remove o-ring (2) from end cap.

⚠ CAUTION

Do not place slave cylinder in vise or any other tool that will damage housing.

4. Remove piston and push rod assembly (4) from housing (5).
5. Remove T-seal assembly (3) from piston end of assembly (4).

⚠ CAUTION

Be careful not to scratch piston when removing T-seal.

6. Remove the three set screws (6) that are holding end cap and bearing assembly (7) in housing (5).
7. Remove end cap and bearing assembly (7) from housing (5).

SLAVE CYLINDER ASSEMBLY

(Refer to Figure 4)

1. Clean all parts thoroughly and allow to dry before reassembling.
2. Lubricate rubber components from repair kit in clean system fluid.
3. Install new T-seal assembly (3) on piston and push rod assembly (4). Install one nylon back-up ring on each side of T-seal.

⚠ CAUTION

Be careful not to scratch piston when installing seal and back-up rings.

4. Slightly lubricate all of piston and push rod assembly (4) with clean system fluid and install into housing (5).
NOTE: To avoid damaging new T-seal assembly (3) install piston and push rod assembly (4) into housing through end cap (1) end.
5. Install new o-ring (2) on end cap (1) and install end cap in housing (5). Torque 20.3 N·m (15 lb·ft).
6. Install new end cap and bearing assembly (7) over push rod (4) and into housing (5). Install and tighten three set screws (6).
7. Install slave cylinder on vehicle. Connect linkage and fluid lines.
8. Fill system reservoir with clean system fluid and bleed system until all air is removed. Tighten fittings if leaks occur.
9. Make several applications to be sure slave cylinder is working properly.

TABLE 4

Model Number	Repair Kit Number
12-120-015 (BF)	12-100-013
12-120-016 (HO)	12-100-014
12-120-017 (BF)	12-100-013
12-120-020 (BF)	12-100-012
20-120-003 (BF)	12-100-015
20-120-004 (HO)	12-100-016

HO = Hydraulic Oil BF = Brake Fluid

* Also includes new boot and clamp.

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

● Items included in Repair Kit

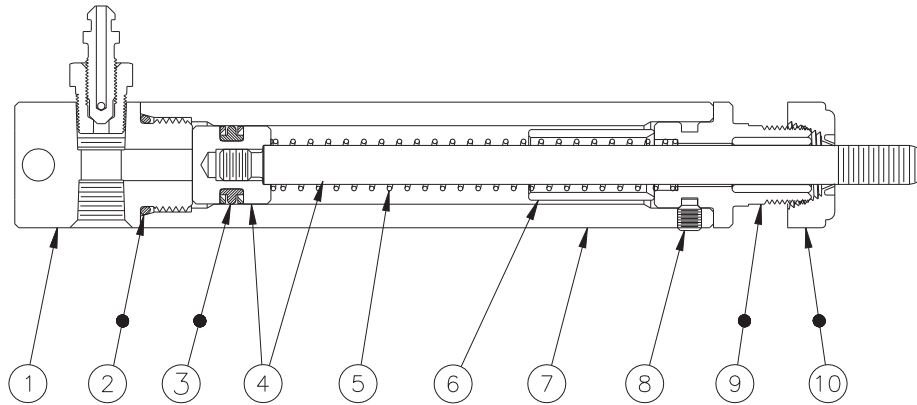


FIGURE 5

SLAVE CYLINDER DISASSEMBLY

(Refer to Figure 5)

1. Disconnect fluid line from slave cylinder inlet port. Plug line to prevent excess fluid loss.
2. Remove slave cylinder from vehicle.
3. Place slave cylinder in a soft jawed vise and remove end cap (1). Remove o-ring (2) from end cap.

⚠ CAUTION

Do not place slave cylinder in vise or any other tool that will damage housing.

4. Remove piston and push rod assembly (4), spring (5) and sleeve (6) from housing (5).
5. Remove T-seal assembly (3) from piston end of assembly (4).

⚠ CAUTION

Be careful not to scratch piston when installing T-seal.

6. Remove the three set screws (8) that are holding end cap and bearing assembly (9) in housing (7).
7. Remove end cap and bearing assembly (9)/wiper seal (10) from housing (7).

SLAVE CYLINDER ASSEMBLY

(Refer to Figure 5)

1. Clean all parts thoroughly and allow to dry before reassembling.
2. Lubricate rubber components from repair kit in clean system fluid.
3. Install new T-seal assembly (3) on piston and push rod assembly (4). Install one nylon back-up ring on each side of T-seal.

⚠ CAUTION

Be careful not to scratch piston when installing seal and back-up rings.

4. Slightly lubricate all of piston and push rod assembly (4) with clean system fluid and install into housing (7). **NOTE: To avoid damaging new T-seal assembly (3) install piston and push rod assembly (4) into housing through end cap (1) end.**
5. Install spring (5) and sleeve (6) over push rod end of assembly (4) and slide into housing (7).
6. Install new o-ring (2) on end cap (1) and install end cap in housing (7). Torque 20.3 N·m (15 lb·ft).
7. Install new end cap and bearing assembly (9) over push rod (4) and into housing (7). Install and tighten three set screws (6).
8. Carefully install new wiper seal (10) by sliding over end of push rod (4) and then threading onto end cap (9). Note, not all cylinders use wiper seal (10).
9. Install slave cylinder on vehicle. Connect linkage and fluid lines.
10. Fill system reservoir with clean system fluid and bleed system until all air is removed. Tighten fittings if leaks occur.
11. Make several applications to be sure slave cylinder is working properly.

TABLE 5

Model Number	Repair Kit Number
12-120-115 (BF)	12-100-001
12-120-116 (HO)	12-100-004

HO = Hydraulic Oil BF = Brake Fluid

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

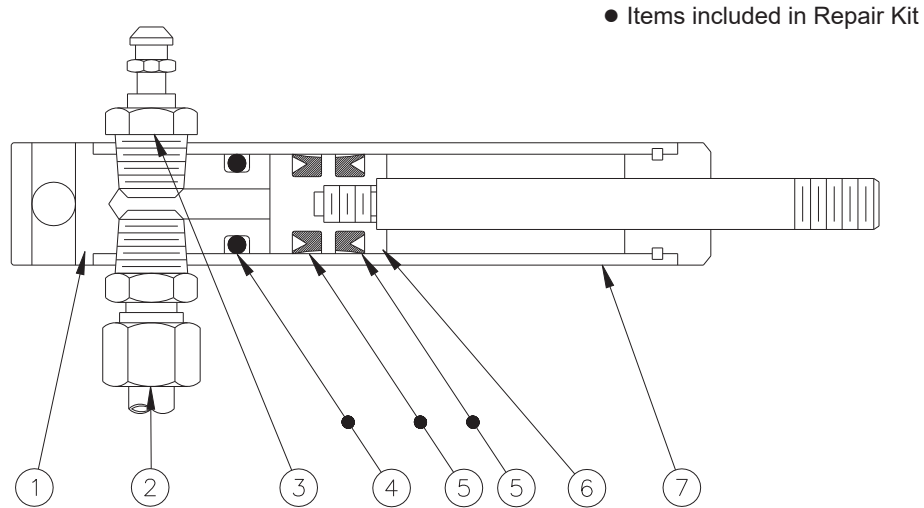


FIGURE 6

SLAVE CYLINDER DISASSEMBLY

(Refer to Figure 6)

1. Disconnect necessary fluid lines.
2. Remove tubing from inlet fitting (2). Plug line to prevent excess fluid loss.
3. Remove slave cylinder from vehicle.
4. Remove bleeder screw assembly(3) and inlet fitting (2) from housing (7).
5. Place slave cylinder in a soft jawed vise and remove end cap (1). Remove o-ring (4) from end cap

⚠ CAUTION

Do not place slave cylinder in vise or any other tool that will damage housing.

6. Remove push rod and piston assembly (6) from housing (7).
7. Remove cups (5) from push rod and piston assembly (6).

SLAVE CYLINDER ASSEMBLY

(Refer to Figure 6)

1. Clean all parts thoroughly and allow to dry before reassembling.
2. Lubricate rubber components from repair kit in clean system fluid.
3. Install new cups (5) on push rod and piston assembly (6). Note direction of cups (5).
4. Slightly lubricate all of piston and push rod assembly (6) with clean system fluid and install into housing (7).

⚠ CAUTION

Do not allow cups to extrude up into the two 1/8-27 ports.

5. Install new o-ring (4) on end cap (1). Insert end end (1) into housing (7) and align bleeder screw hole and fitting hole.
6. Install bleeder screw assembly (3). Install inlet fitting (2).
7. Install slave cylinder on vehicle. Connect linkage and fluid lines.
8. Fill system reservoir with clean system fluid and bleed system until all air is removed. Tighten fittings if leaks occur.
9. Make several applications to be sure slave cylinder is working properly.

BLEEDING

Gravity Bleeding

1. Fill system with proper fluid.

⚠ CAUTION

Never use mineral based hydraulic oil in a brake fluid system or brake fluid in a mineral based hydraulic oil system. If the wrong fluid is used, it will damage the seals in the system.

2. Bleed pedal actuator at bleeder screw, then bleed slave cylinder at bleeder screw making sure all air is eliminated from the system.

Pressure Bleeding

Depending on the routing of the connecting tubing, gravity bleeding may not be adequate. Therefore, pressure bleeding would be recommended.

1. Actuator must be at full pedal return position
2. Set the pressure bleeder at approximately 1.38 bar (20 PSI).
3. Attach the bleeder hose connector to the reservoir.
4. Open both actuator and slave cylinder bleeder screws.
5. Open the bleeder valve.
6. When all air has been removed and clear system fluid is observed, close the actuator bleeder and then the slave cylinder bleeder.
7. Close pressure bleeder valve.
8. Remove bleeder.

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