Component Maintenance Manual, Cargo Hook Suspension System, Bell 429

Onboard Systems International
13915 NW 3rd Court
Vancouver, WA 98685 United States of America
Cage Code: 1Y921

Toll Free Phone: (800) 275-0883
Phone: (360) 546-3072
Fax: (360) 546-3073

Applicable Equipment Part Numbers

200-304-00
200-427-00
232-255-00
232-255-01
232-219-01
232-315-00
210-095-00

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1.0 Introduction

1.1 **Scope.** This component maintenance manual contains instructions for inspection, maintenance and overhaul of the Bell 429 Cargo Hook Suspension System, P/Ns 200-304-00 and 200-427-00.

1.2 **Capability.** The instructions contained in this document are provided for the benefit of experienced aircraft maintenance personnel and facilities that are capable of carrying out the procedures.

1.3 **Safety Labels**. The following definitions apply to safety labels used in this manual.

Indicates a hazardous situation which, if not avoided, will result in death or serious injury.

Indicates a hazardous situation which, if not avoided, could result in death or serious injury.

Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

Draws the reader's attention to important or unusual information not directly related to safety.

Used to address practices not related to personal injury.

2.0 Referenced Documents

122-015-00 Component Maintenance Manual, Cargo Hook

120-142-00 Owner's Manual, Cargo Hook Suspension System, Bell 429

3.0 Inspection

3.1 Scheduled Inspections

The scheduled inspection intervals noted below are maximums and are not to be exceeded. If the Cargo Hook Suspension System is subjected to unusual circumstances, extreme environmental conditions, etc., it is the responsibility of the operator to perform the inspections more frequently to ensure proper operation.

Annually or 100 hours of external load operations, whichever comes first, perform the following.

NOTICE

*Hours of external load operations should be interpreted to be **(1)** anything is attached to the primary cargo hook (whether or not a useful load is being transported) and **(2)** the aircraft is flying. If these conditions are **NOT** met, time does **NOT** need to be tracked.*

1. Visually inspect for damage and corrosion on the exterior of the Cargo Hook. Refer to the component maintenance manual (CMM) 122-015-00 for the cargo hook for limits on damage and corrosion.
2. Visually inspect the suspension system structural components (forward and aft cross beams, center frame, etc) for damage and corrosion (if damage or corrosion is observed, refer to Table 6.1 for limits).
3. Move the Cargo Hook throughout its range of motion and observe the hydraulic hose and electrical release harness to ensure that they have enough slack. The hydraulic hose and electrical release harness must not be the stops that prevent the Cargo Hook from moving freely in all directions.
4. Rotate the Cargo Hook and Gimbal about their respective pivot points to verify that they rotate freely.
5. Visually inspect the hydraulic hose and its connections for damage and security.
6. Visually inspect the electrical harness(es) and connections for damage and security.
7. Visually inspect for leaks in the hydraulic release system. Some seeping or dampness is acceptable, but if drips or areas cleaned by fluid leaking are present, the cargo hook must not be used until the condition is repaired (see Section 4.2 for repair instructions).
8. Verify calibration of the load cell (if load weigh system is installed) by lifting a load of known weight (see Owner's Manual 120-142-00 for instructions).

4.0 Maintenance

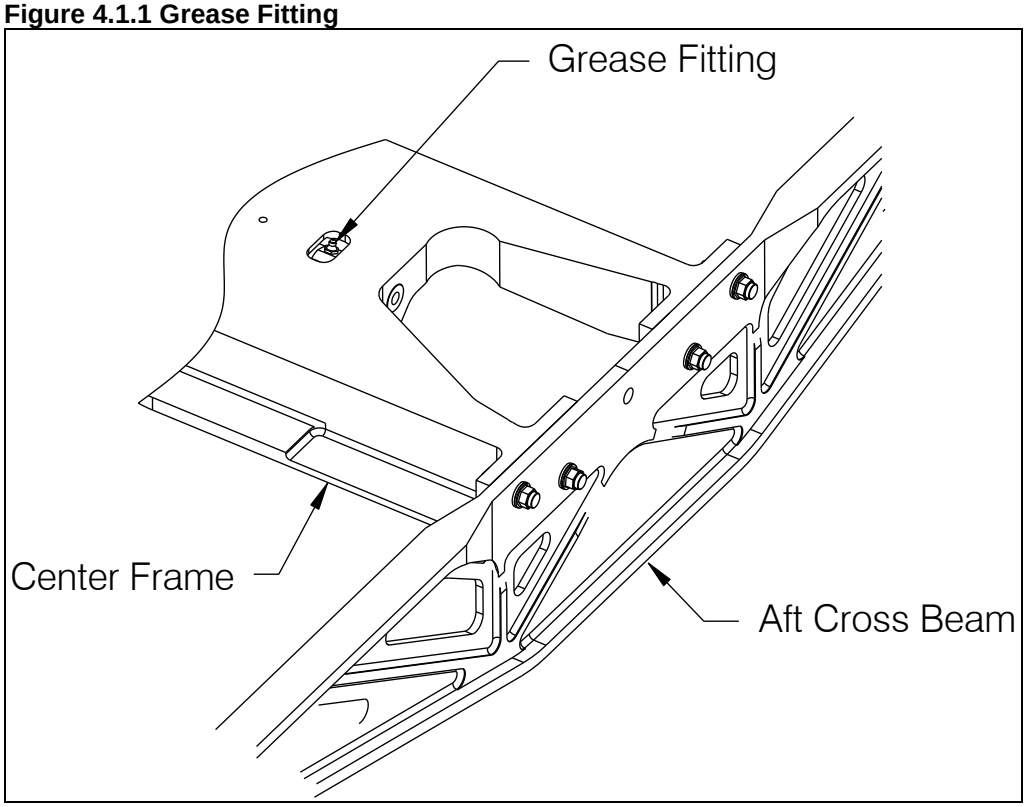
4.1 Lubrication

Lubrication of the system is recommended every 200 hours of external load operation.

Lubricate per the following instructions. Refer to section 6.0 for part identification. Recommended lubricants are Mobilgrease 28 or AeroShell 17.

- Remove the Cargo Hook Attach Bolt (item 38) and lubricate wear surfaces.
- Remove the four (4) quick release pins (item 1) at each attach point of the frame assembly and lubricate wear surfaces.
- Separate Forward Cross Beam from Gimbal Shaft (item 16) and lubricate mating surfaces of Gimbal Shaft and Bearing (item 12).
- Apply grease through the MS15001-1 grease fitting which is accessible through a slot in the top of Center Frame (see Figure 4.1.1).

Figure 4.1.1 Grease Fitting



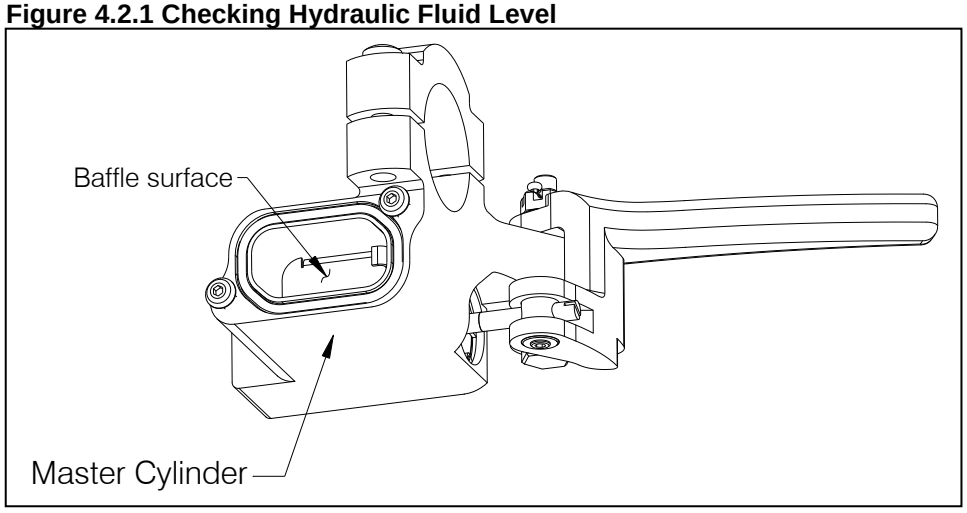
4.2 Hydraulic Release System Maintenance

The hydraulic release system does not require maintenance unless fluid leakage is detected. If any leakage is detected, the fluid level should be immediately checked.

To check the fluid level:

1. Position the collective against the lower stop.
2. The Master Cylinder features a transparent lid through which the fluid level can be checked. Hydraulic fluid must be visible over the baffle surface (see Figure 4.2.1). Do not over fill, fluid level should NOT be within ¼" of top of reservoir.
3. If necessary, remove the lid and add MIL-PRF-87257 hydraulic fluid as required until the baffle surface is partially or fully submerged.

Figure 4.2.1 Checking Hydraulic Fluid Level



4. If leakage is noted around any plumbing fittings, the fittings may be tightened until the leakage quits. If leakage is noted around the pistons in either the master cylinder, slave cylinders, or emergency valve cylinders the leaking cylinder must be repaired. See the instructions for repair. See section 4.3 for bleed instructions.

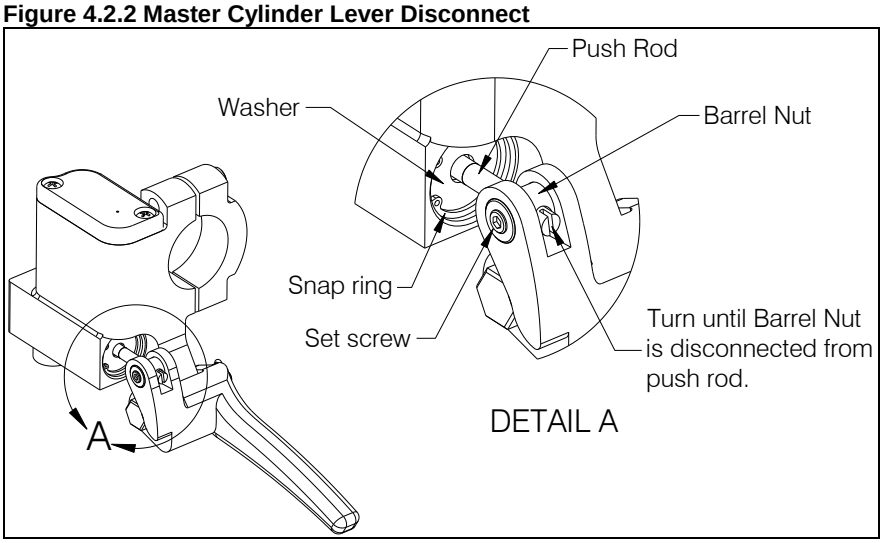
4.2.1 Master Cylinder Repair

If fluid is leaking out from around the master cylinder, the assembly must be disassembled and inspected. The only repair is to remove and replace the cup seal and O-ring.

Disassembly:

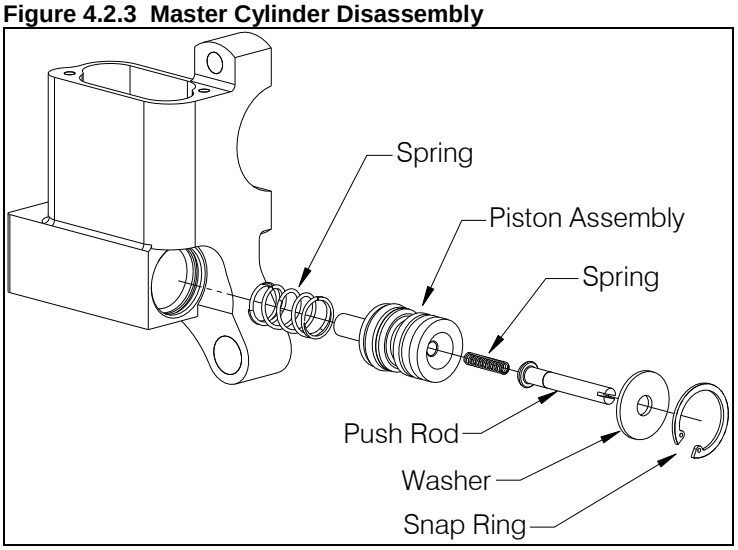
1. Remove snap ring. Use caution when removing the snap ring since the piston is spring loaded against the washer and snap ring. The piston will pop out of the housing when the snap ring is removed. Use the lever to put pressure on the piston while removing snap ring.
2. Loosen the set screw and disconnect barrel nut on lever from the push rod. See Figure 4.2.2.

Figure 4.2.2 Master Cylinder Lever Disconnect



3. Remove the piston and spring. See Figure 4.2.3 for parts breakdown (see section 6 for part numbers).

Figure 4.2.3 Master Cylinder Disassembly

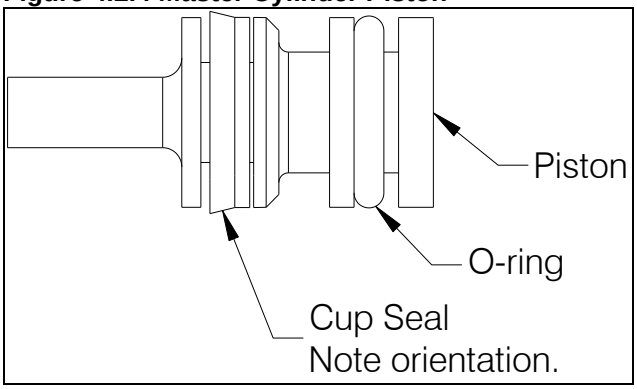


4. Inspect the cylinder bore for scratches. If any scratches or gouges are visible in the bore, the master cylinder must be replaced.

Re-assembly:

1. If the bore condition is acceptable, replace the cup seal and O-ring on the piston assembly. Maintain orientation as shown in Figure 4.2.4. Stretch seals over piston into grooves.

Figure 4.2.4 Master Cylinder Piston



2. To assemble the master cylinder, lubricate the piston seals and cylinder bore generously with MIL-PRF-87257 hydraulic fluid.
3. Place the spring in the cylinder bore.
4. Pass the push rod through the washer.
5. Thread the push rod into the barrel nut until approximately 1/16” of thread is visible through the opposite side of the barrel nut.
6. Insert the small spring into the piston assembly and insert the piston assembly into the master cylinder bore using a firm rocking motion.
7. Use the lever to compress the spring and hold the piston in place.
8. Use snap ring pliers to install the snap ring.
9. Secure push rod threads by tightening set screw.
10. Re-install system and bleed per Section 4.3.

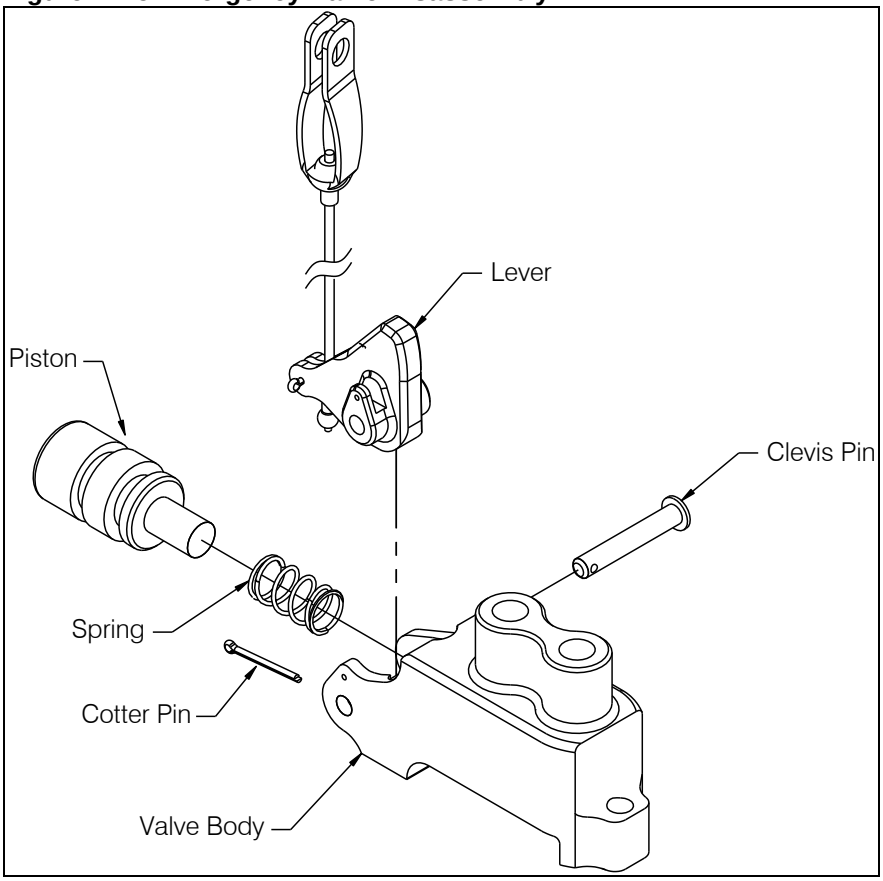
4.2.2 Emergency Valve Repair

If fluid is leaking out from around the emergency valve, the assembly must be disassembled and inspected. The only repair is to remove and replace the cup seal and O-ring.

Disassembly:

1. Remove the bolts, washers and the hydraulic lines from the top of the valve body.
2. Remove the emergency valve from the center frame by cutting safety wire and removing the three bolts and washers which secure it.
3. Cut safety wire between lever and valve body.
4. Remove cotter pin and then clevis pin. Use caution when removing the clevis pin since the piston is spring loaded against the lever which is retained by the clevis pin. Use the lever to put pressure on the piston while removing the clevis pin.
5. Remove the piston and spring. See Figure 4.2.5 for parts breakdown.
6. Inspect the cylinder bore for scratches. If any scratches or gouges are visible in the bore, the valve body must be replaced.

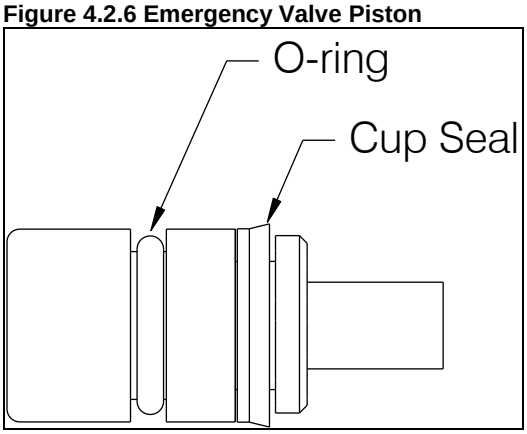
Figure 4.2.5 Emergency Valve Disassembly



Re-assembly:

1. If the bore condition is acceptable, replace the cup seal and O-ring on the piston assembly. Maintain orientation as shown in Figure 4.2.6. Stretch seals over piston into grooves.

Figure 4.2.6 Emergency Valve Piston



2. To assemble the emergency valve, lubricate the piston seals and cylinder bore generously with MIL-PRF-87257 hydraulic fluid.
3. Place the spring in the cylinder bore.
4. Push the piston assembly into the cylinder bore using caution to avoid damaging the cup seal and o-ring.
5. While holding the piston assembly in the cylinder bore, position the lever and insert the clevis pin through. Secure clevis pin with cotter pin.
6. Re-install the hydraulic hoses onto the valve body.
7. Secure the assembly onto the center frame with the bolts and washers removed previously.
8. Safety-wire the bolts together.
9. Bleed system per section 4.3.

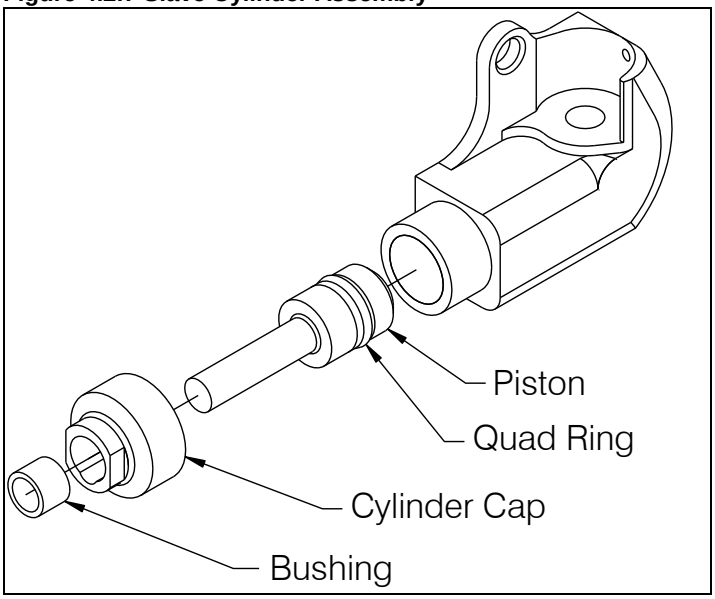
4.2.3 Slave Cylinder Repair

If the slave cylinder is leaking fluid around the piston rod, the only repair possible is to remove and replace the cup seal or quad ring (early production units of the slave cylinder assembly used a cup seal). See section 6 for P/Ns of the slave cylinder assembly parts.

Disassembly:

1. Remove cap, piston, and seal (see Figure 4.2.7).
2. Inspect bore of slave cylinder for scratches or gouges. If any are present the assembly must be replaced.
3. Remove bushing in cap by pressing it out.
4. Remove quad ring (or cup seal) by stretching it over the piston.

Figure 4.2.7 Slave Cylinder Assembly



Re-assembly:

1. Press new bushing into cap.
2. Stretch quad ring over piston into groove.
3. Clean and lubricate cylinder bore and piston seal with MIL-PRF-87257 hydraulic fluid.
4. Insert piston into cylinder taking care not to damage edges of the quad ring.
5. Screw on cap and torque to 50-60 inch pounds.
6. Bleed system per Section 4.3.

4.3 Bleeding Hydraulic Release System

This section provides instructions for:

- Bleeding the fixed section by itself (see section 4.3.1). This method can be used if a repair was done to the master cylinder piston and the removable section is bled.
- Bleeding the entire system (see section 4.3.2). This method can be used after a repair to the removable section of the system or if air is introduced into the system.

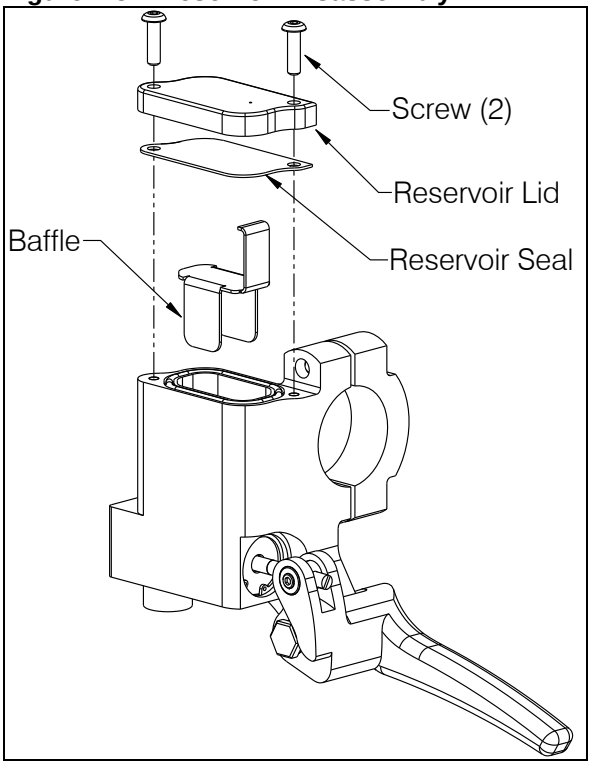
4.3.1 Filling and Bleeding Fixed Section of Hydraulic Release System

1. Remove screws, reservoir lid, reservoir seal (if present), and baffle from the master cylinder reservoir as shown in Figure 4.3.1.

CAUTION

The reservoir seal is for shipping purposes only and must be removed and discarded before bleeding or installation of the hydraulic release system.

Figure 4.3.1 Reservoir Disassembly



4.3.1 Filling & Bleeding Fixed Section of Hydraulic Release System continued

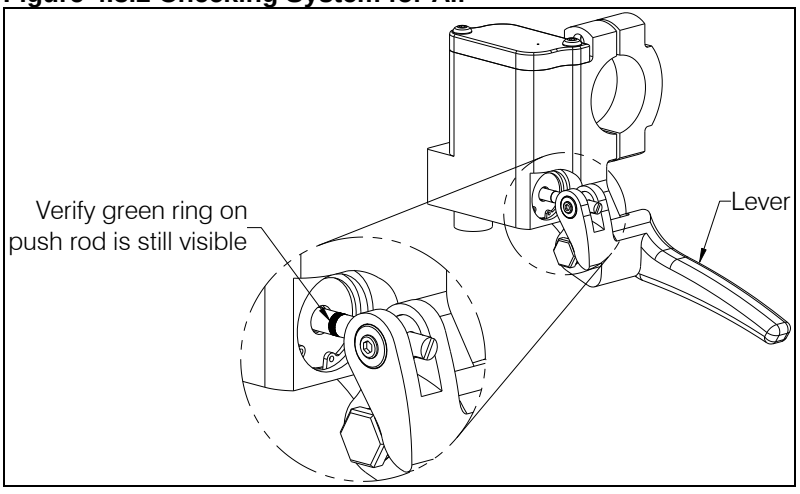
1. If possible, arrange the hose so that it rises towards the reservoir to facilitate air movement up and out of the system.
2. Connect a quick disconnect fitting (Onboard Systems P/N 560-006-00) to the mating end fitting at the end of the fixed plumbing line. This fitting has a 3/8-24 JIC interface for connecting a supply line.
3. Pump fluid through this fitting while monitoring the master cylinder reservoir fluid level and for air rising up out of the line.

⚠ CAUTION

Pumping the fluid into the system too rapidly may cause the fluid to spray up and out of the master cylinder reservoir. Wear safety glasses when observing fluid reservoir while filling.

4. Fill the master cylinder reservoir to approximately half full.
5. While observing the reservoir fluid, shake the lever and hose to entice any trapped air bubbles to exit the system.
6. Re-install the baffle (the fluid level should be above the baffle surface) and reservoir lid and secure with the two screws removed previously.
7. Disconnect supply line at the quick disconnect fitting. The fitting design ensures no air inclusion into the system when connecting or leakage when disconnecting.
8. Check lever feel, it should have a firm stop with very little travel.
9. Connect the fixed section to the removable section with the cargo hook and actuate the lever. The cargo hook must release.
10. Check the system for air by actuating the lever firmly until it bottoms out. Check the push rod position (see Figure 4.3.2). If some of the green ring on the push rod is visible, the system is ready for use. If none of the green ring is visible, the system needs to be re-bled.

Figure 4.3.2 Checking System for Air

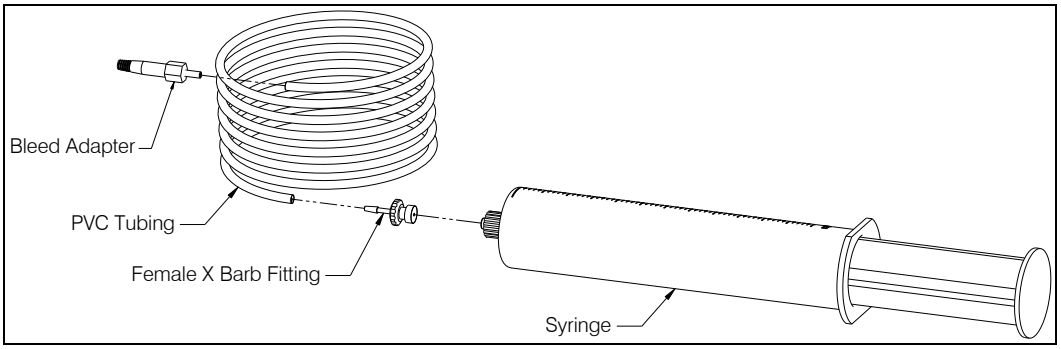


4.3.2 Filling and Bleeding Complete Hydraulic Release System

Following is a procedure for filling and bleeding a complete system. This is an optional method at installation or can be used to bleed a complete system if air is introduced into the system.

1. Obtain bleed kit, 212-014-02. This kit includes 2 ounces of MIL-PRF-87257 fluid, a 35cc syringe, PVC tubing, and several fittings. The bleed kit is included in new hydraulic hook kits. Assemble the kit components as shown below.

Figure 4.3.3 Hydraulic Hook Bleed Kit



2. If the system is already installed on the aircraft, place an absorbent towel under the master cylinder. If the master cylinder is not installed on the aircraft, lightly clamp the master cylinder in a vise to hold it in a vertical position and position the slave cylinder so that its level is below the level of the master cylinder.

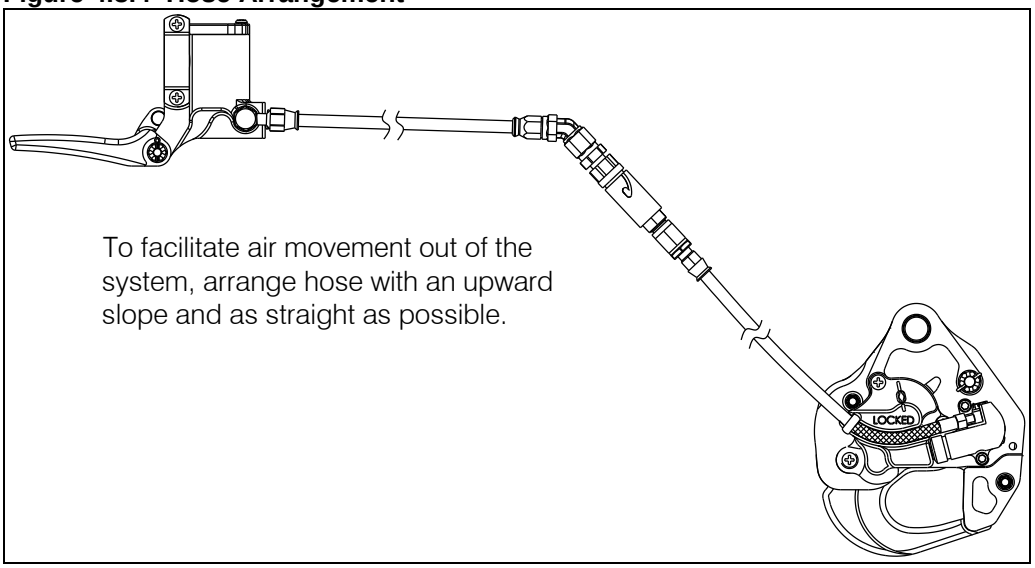
CAUTION

Use best shop practices to keep foreign material out of the hydraulic system. FOD will plug orifices, damage seals and/or scratch sealing surfaces necessitating system rebuild. Use only clean hydraulic fluid from sealed containers.

4.3.2 Filling and Bleeding Complete Hydraulic Release System continued

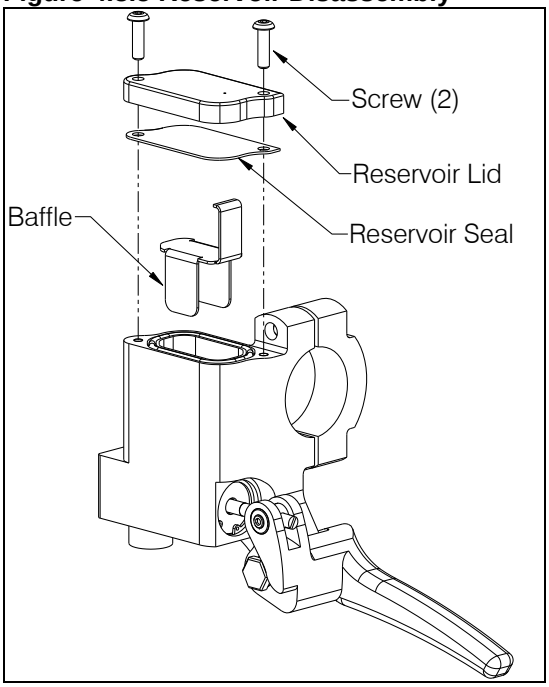
3. Connect the master cylinder assembly to the slave cylinder assembly if not already done. If filling or bleeding on the bench, as much as possible, arrange the hoses uncoiled, straight and running uphill. See Figure 4.3.4.

Figure 4.3.4 Hose Arrangement



4. Remove screws, reservoir lid, reservoir seal (if present), and baffle from the master cylinder reservoir as shown in Figure 4.3.5 (the reservoir seal is supplied for shipping purposes only, after removal discard reservoir seal).

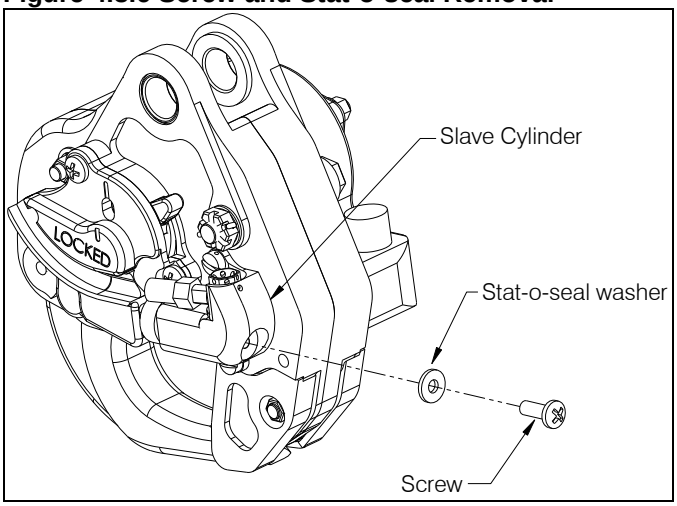
Figure 4.3.5 Reservoir Disassembly



4.3.2 Filling and Bleeding Complete Hydraulic Release System continued

5. Remove the screw and stat-o-seal on the cargo hook slave cylinder, see Figure 4.3.6.

Figure 4.3.6 Screw and Stat-o-seal Removal



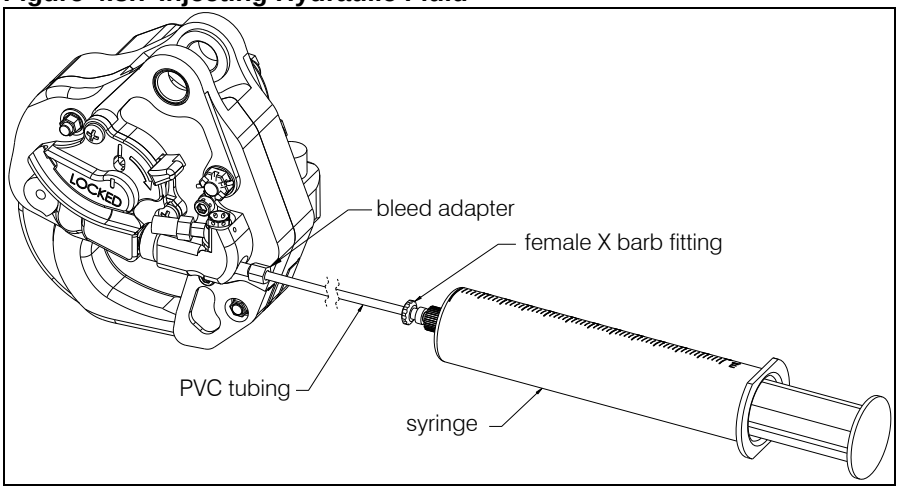
6. Fill a syringe with approximately 35 cc of hydraulic fluid. Screw bleed adapter into the screw hole on the slave cylinder to create a tight seal. See Figure 4.3.7.

7. While observing the reservoir, slowly push on the syringe plunger to force fluid through the slave cylinder, hydraulic hose, and up to the master cylinder reservoir. There will be some resistance during filling—this is normal.

⚠ CAUTION

Injecting the fluid into the system too rapidly may cause the fluid to spray up and out of the master cylinder reservoir. Wear safety glasses when observing fluid reservoir while filling.

Figure 4.3.7 Injecting Hydraulic Fluid



4.3 Filling and Bleeding Complete Hydraulic Release System continued

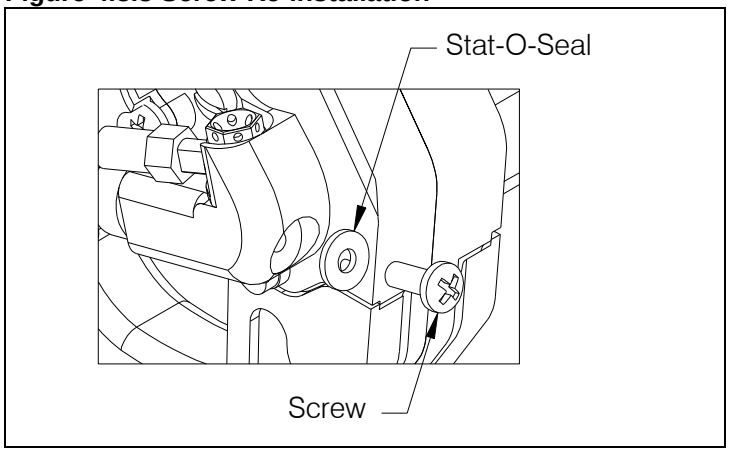
8. Continue to force fluid into the master cylinder reservoir until the reservoir is approximately half full.

NOTICE

If bleeding an already filled system, you may need to draw fluid from the master cylinder reservoir during this step to prevent overflow.

9. Remove the syringe from the screw hole. Re-install the Stat-O-Seal (P/N 510-496-00) and screw (P/N 510-493-00), see Figure 4.3.8.

Figure 4.3.8 Screw Re-installation



10. Allow the system to rest for several minutes. This will allow any air to rise through the system.

4.3 Filling and Bleeding Complete Hydraulic Release System continued

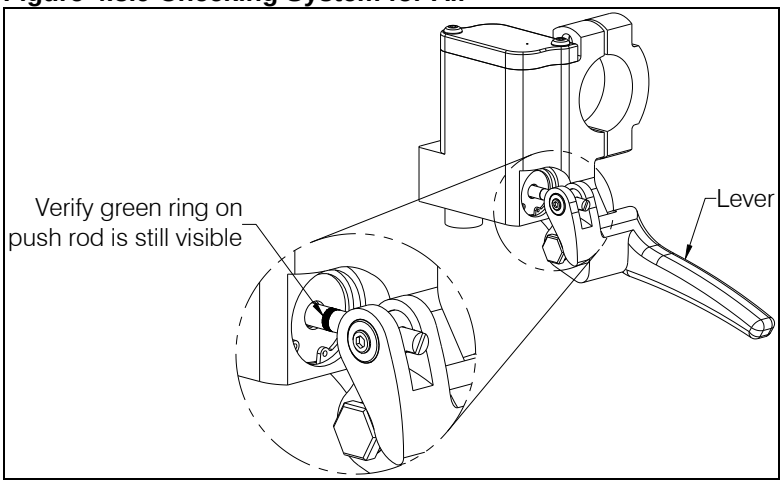
11. Very **slowly** pull the release lever on the master cylinder and watch for bubbles. Very **slowly** cycle the lever on the emergency valve in order to move the piston a small amount (approximately 1/16") back and forth and watch for bubbles in the master cylinder reservoir. If bubbles are observed rising within the reservoir, continue to slowly cycle the levers until there are no more. Actuating the levers releases air trapped within the system.

⚠ CAUTION

Pull the lever very slowly! When the reservoir is not baffled and capped, a hard pull will cause fluid to erupt over the edge of the reservoir.

12. Check the system for air by actuating the lever firmly until it bottoms out. Check the push rod position (see Figure 4.3.9). If the green area on the push rod is visible, proceed to step 13. If the green on the push rod is not visible with the lever completely pulled, the system has too much air in it and needs further bleeding. To do this, repeat steps 5 – 11.

Figure 4.3.9 Checking System for Air



13. After the system is properly bled, verify that the reservoir is approximately half full of hydraulic fluid. Fluid should be visible above the baffle.
14. Re-install the baffle and the reservoir lid.
15. Check the release system for proper operation. Fully actuate the release lever on the collective. The hook must open and the lever must have a firm feel.
16. Check the emergency valve for proper operation. Pull upwards on the tether cable until the cargo hook releases. Safety-wire the emergency valve lever to the valve body.
17. Disassemble and thoroughly clean the syringe with isopropyl alcohol. Allow it to dry. Not cleaning the syringe will render it unusable. Re-assemble and store for next use.

5.0 Overhaul

5.1 Overhaul Frequency

Every 1000 hours of external load operations or 5 years, whichever comes first, overhaul the suspension system per Section 5.2.

NOTICE

*Hours of external load operations should be interpreted to be (1) anything is attached to the primary cargo hook (whether or not a useful load is being transported) and (2) the aircraft is flying. If these conditions are **NOT** met, time does **NOT** need to be tracked.*

⚠ WARNING

Failure to follow all equipment maintenance instructions and component inspection criteria may result in serious injury, death or immediate loss of flight safety.

5.2 Suspension System Overhaul Instructions

Remove the Frame and Cargo Hook Assembly from the helicopter per the following. For item numbers, refer to Figure 6.2 and Table 6.2.

1. Disconnect the cargo hook's electrical release harness connector from its connection at the belly of the helicopter.
2. Disconnect the hydraulic hose (item 23) from its junction fitting at the belly of the helicopter.
3. Remove the quick release pin at the tether bracket.
4. Remove the safety pins and quick release pins at each end of the Forward and Aft Cross Beams and remove the Frame and Cargo Hook Assembly from the helicopter.

Disassemble the Frame and Cargo Hook Assembly per the following instructions (refer to Figure 6.2 and Table 6.2 for no. references in parentheses).

1. Remove cotter pin (6) and nut (9) and separate the Forward Cross Beam Assembly from the remainder of the suspension assembly.
2. Remove the Bearing Carrier Cover (10) and Bearing Carrier (14) from the Forward Cross Beam by removing nuts (7) and washers (8) from Bolts (15).
3. Remove the Pivot Shaft (16) by removing nuts (33), washers (34) from bolts (17).

NOTICE

Pivot Shaft has ProSeal between mating surfaces with Center Frame (32).

4. Remove cotter pins (19) and Clevis Pins (18) at each end of the two Tie Rod Assemblies and remove the Tie Rod Assemblies.
5. Remove four nuts (7) and (4) washers (8) from four bolts (15) and separate the Aft Cross Beam Assembly from the remainder of the suspension assembly.
6. Cut safety wire and remove slave cylinder assembly from cargo hook by removing two screws (45).
7. Remove nut (30) and washer (29) from bolt (37) to remove loop clamp (28) and remove hydraulic hose from clamp. This step also allows the Gimbal Pin (31) and subsequently the Gimbal Assembly (42) to be removed from the Center Frame.
8. Remove the e-valve assembly (20) by removing three screws (35) and washers (36).
9. Separate cargo hook from Gimbal Assembly (42) by removing nut (40), washer (8), washers (39), and Attach Bolt (38) or Pin Load Cell Assembly (56) if load weigh system is installed.

Inspect and repair the detail parts in accordance with the instructions in Table 5.1. Repair or replace parts as outlined.

Perform magnetic particle inspection in accordance with ASTM-E1444 and MIL-STD-1907, Grade A on the parts listed below. No cracks are permitted in any of these parts.

- Gimbal Shaft (16)
- Gimbal (42.1)
- Tie Rod Weldment (25) Qty 2

If the load weigh system is installed perform the following.

1. Return the Pin Load Cell Assembly (56) to the factory for inspection and calibration. The factory will inspect the condition of the load cell and perform acceptance test procedures including calibration and zero balance, repairing as necessary.
2. Inspect for security of attachment of the load weigh indicator.

NOTICE

The load weigh indicator requires no maintenance. Refer to Owner's Manual 120-142-00 for changing settings, calibration, error codes, etc.

Table 5.1 Suspension System Inspection Criteria

Component	Damage Permitted without Repair	Repair	Maximum Damage which Causes Replacement
Fwd Cross Beam, P/N 232-253-00 Item 3	Dents, gouges, scratches, and corrosion less than .010" (.25 mm) deep.	Blend at 20:1 ratio, length to depth, to provide smooth transitions. Protect affected surfaces with MIL-PRF-23377 Type 1 epoxy primer or equivalent and MIL-PRF-85285 Type 1 polyurethane coating or equivalent.	Dents, gouges, scratches, and corrosion greater than .030" (.76 mm) deep. Visual cracks.
Bushing (flanged) P/N 290-936-00 Item 3.2, 44.2	Wear on inside diameter, diameter less than 0.397" (10.1 mm).	None.	Wear on inside diameter, diameter greater than or equal to 0.397" (10.1 mm).
Bushing (flanged) P/N 290-937-00 Item 3.3, 44.3	Wear on inside diameter, diameter less than 0.397" (10.1 mm).	None.	Wear on inside diameter, diameter greater than or equal to 0.397" (10.1 mm).
Aft Cross Beam P/N 232-254-00 Item 44	Dents, gouges, scratches, and corrosion less than .010" (.25 mm) deep.	Blend at 20:1 ratio, length to depth, to provide smooth transitions. Protect affected surfaces with MIL-PRF-23377 Type 1 epoxy primer or equivalent and MIL-PRF-85285 Type 1 polyurethane coating or equivalent.	Dents, gouges, scratches, and corrosion greater than .030" (.76 mm) deep. Visual cracks.
Center Frame P/N 290-926-01 or 290-926-02 Item 32	Dents, gouges, scratches, and corrosion less than .010" (.25 mm) deep.	Blend at 20:1 ratio, length to depth, to provide smooth transitions. Protect affected surfaces with MIL-PRF-23377 Type 1 epoxy primer or equivalent and MIL-PRF-85285 Type 1 polyurethane coating or equivalent.	Dents, gouges, scratches, and corrosion greater than .030" (.76 mm) deep. Visual cracks.
Tie Rod Weldment P/N 235-127-01 Item 25	Dents, gouges, scratches, and corrosion less than .010" (.25 mm) deep.	Blend at 20:1 ratio, length to depth, to provide smooth transitions. Protect affected surfaces with MIL-PRF-23377 Type 1 epoxy primer or equivalent and MIL-PRF-85285 Type 1 polyurethane coating or equivalent.	Dents, gouges, scratches, and corrosion greater than .030" (.76 mm) deep. Visual cracks.
Gimbal Shaft P/N 290-930-00 Item 16	Wear on ¾" nominal shaft diameter, diameter greater than .745" (18.9 mm).	None.	Wear on ¾" nominal shaft diameter, diameter less than or equal to 0.745" (18.9 mm). Visual cracks.

Table 5.1 Suspension System Inspection Criteria continued

Component	Damage Permitted without Repair	Repair	Maximum Damage which Causes Replacement
Gimbal Pin P/N 290-928-00 Item 31	Wear on outside diameter, diameter greater than or equal to .684” (17.4 mm).	None	Wear on outside diameter, diameter less than .684” (17.4 mm). Visual cracks.
Gimbal P/N 290-927-00 Item 42.1	Dents, gouges, scratches, and corrosion less than .010” deep.	Blend at 20:1 ratio, length to depth, to provide smooth transitions. Gimbal material is 15-5PH stainless steel, no touch up finish is required.	Dents, gouges, scratches, and corrosion greater than .030” (.76 mm) deep. Visual cracks.
Bushing (flanged) P/N 290-929-00 Item 42.2	Wear on inside diameter, diameter less than 0.705” (17.9 mm).	None.	Wear on inside diameter, diameter greater than or equal to 0.705” (17.9 mm).
Bushing P/N 290-364-00 Item 42.3	Wear on inside diameter, diameter less than 0.520” (13.2 mm).	None.	Wear on inside diameter, diameter greater than or equal to 0.520” (13.2 mm).
Attach Bolt, P/N 290-332-00 Item 38 Or Pin Load Cell Assembly (item 56)	Wear on outside diameter, diameter greater than or equal to .495” (12.57 mm)	None.	Wear on outside diameter, diameter less than .495” (12.57 mm) Visual cracks.
Rod End P/N 517-055-00 Item 26 Qty 4	Elongation or wear on inside of spherical bearing. Diameter less than or equal to .316” (8.0 mm).	None	Binding of spherical bearing in housing. Elongation or wear on inside of spherical bearing. Diameter greater than.316” (8.0 mm).
Threaded fasteners	None.	None.	It is recommended to replace threaded fasteners at overhaul except 290-332-00 (item 38).

Re-assemble the Frame and Cargo Hook assembly per the following instructions (refer to Figure 6.2 and Table 6.2 for item no. references).

1. Apply ProSeal (AMS-S-8802 Type 1 Class B-1/2) to mating surfaces of Center Frame and Gimbal Shaft and secure Gimbal Shaft (16) with two bolts (17), washers (34) and nuts (33). Torque nuts to 50-70 in-lbs.
2. Attach the Center Frame (32) to the Aft Cross Beam (44) with four bolts (15), washers (8), and nuts (7). Torque nuts to 95-110 in-lbs.
3. Position the Tie Rod Assemblies between the holes in the Center Frame (32) and the Aft Cross Beam (44) and secure each end with Clevis Pins (18) and Cotter Pins (19).
4. Attach the e-valve assembly to the Center Frame with three screws (35) and washers (36). Secure screws with safety .025” safety wire.
5. Place Aft Bearing Spacer (13) over the end of the Gimbal Shaft. Orient the spacer so that its chamfer fits over the radius on the Gimbal Shaft shoulder.
6. Assemble Bearing Carrier (14) with Bearing (12) onto Forward Cross Beam (3) with Bearing Cover (10). Loosely secure these items with two bolts (15), washers (8), and nuts (7). Center the Bearing Carrier on the Forward Cross Beam and tighten nuts to 95-110 in-lbs.
7. Insert the Gimbal Shaft through the Bearing Carrier and place Fwd Bearing Spacer over end of shaft. Install nut (9) over shaft, tighten until finger tight and rotate to nearest castellation to install cotter pin.
8. Assemble Slave Cylinder Assembly onto cargo hook with two screws (45).
9. Assemble cargo hook to Gimbal Assembly (42) with Attach Bolt (38) and washer (39). Assemble additional washer (39), washer (38) and nut over Attach Bolt end. Tighten nut to finger tight until fully seated and rotate to previous castellation if necessary to insert and install cotter pin (41).

   If installing the Pin Load Cell Assembly (56), the Attach Bolt (38) and washer (39) under its head are replaced by the Pin Load Cell Assembly.

CAUTION

Do NOT tighten nut on pin load cell more than finger tight. Over-tightening will damage load cell.

10. Position the Gimbal Assembly within the pocket on the underside of the Center Frame with the cargo hook load beam pointing forward. Align the holes and insert the Gimbal Pin (31). The end of the Gimbal Pin with the #10 holes should be inserted first.
11. Rotate the Gimbal Pin to align its holes with the holes in the Center Frame and insert bolt (37) from the underside of the Center Frame.
12. Place the hydraulic hose and electrical harness within the loop clamp (28) and assemble the loop clamp, washer (29) and nut (30) over the bolt end. Do not fully tighten nut until hose and harness are routed.

6.0 Illustrated Parts Lists

Figure 6.1 Cargo Hook Suspension System Parts

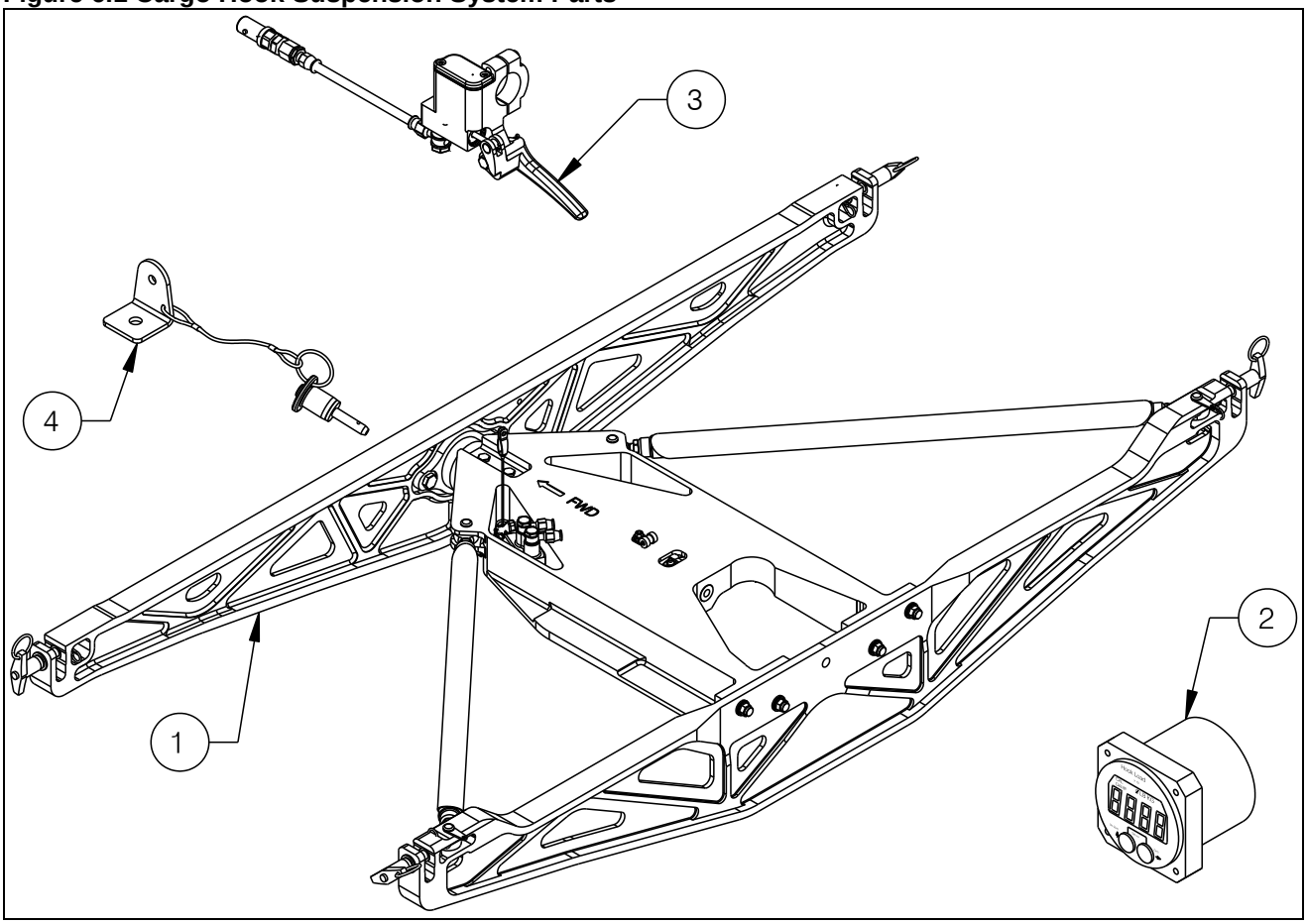


Table 6.1 Cargo Hook Suspension System Parts (Refer to Figure 6.1)

Item	Part No.	Description	Qty 200-304-00	Qty 200-427-00	Notes
1	232-255-00	Frame and Cargo Hook Assembly	1	-	See Figure 6.2
	232-255-01	Frame and Cargo Hook Assembly w/ Load Cell	-	1	See Figure 6.2
2	210-095-00	C-39 Indicator	-	1	
3	232-219-01	Master Cylinder Assembly w/ Plumbing	1	1	See Figure 6.10
4	232-315-00	Bracket w/ Pin Assembly	1	1	

Figure 6.2 Frame and Cargo Hook Assembly (P/N 232-255-00 and 232-255-01) Parts

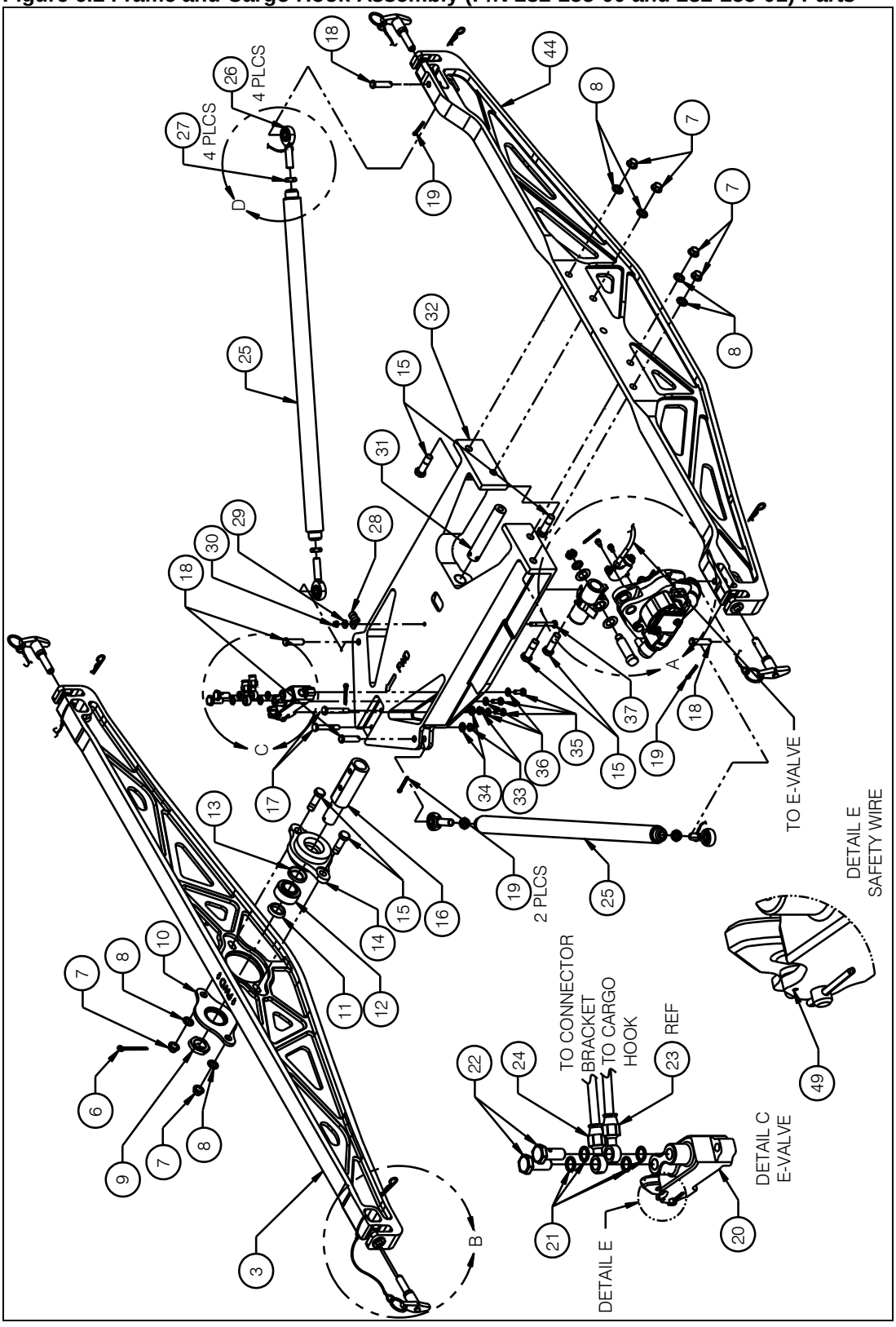


Figure 6.2 Frame and Cargo Hook Assembly (P/N 232-255-00 and 232-255-01) Parts *continued*

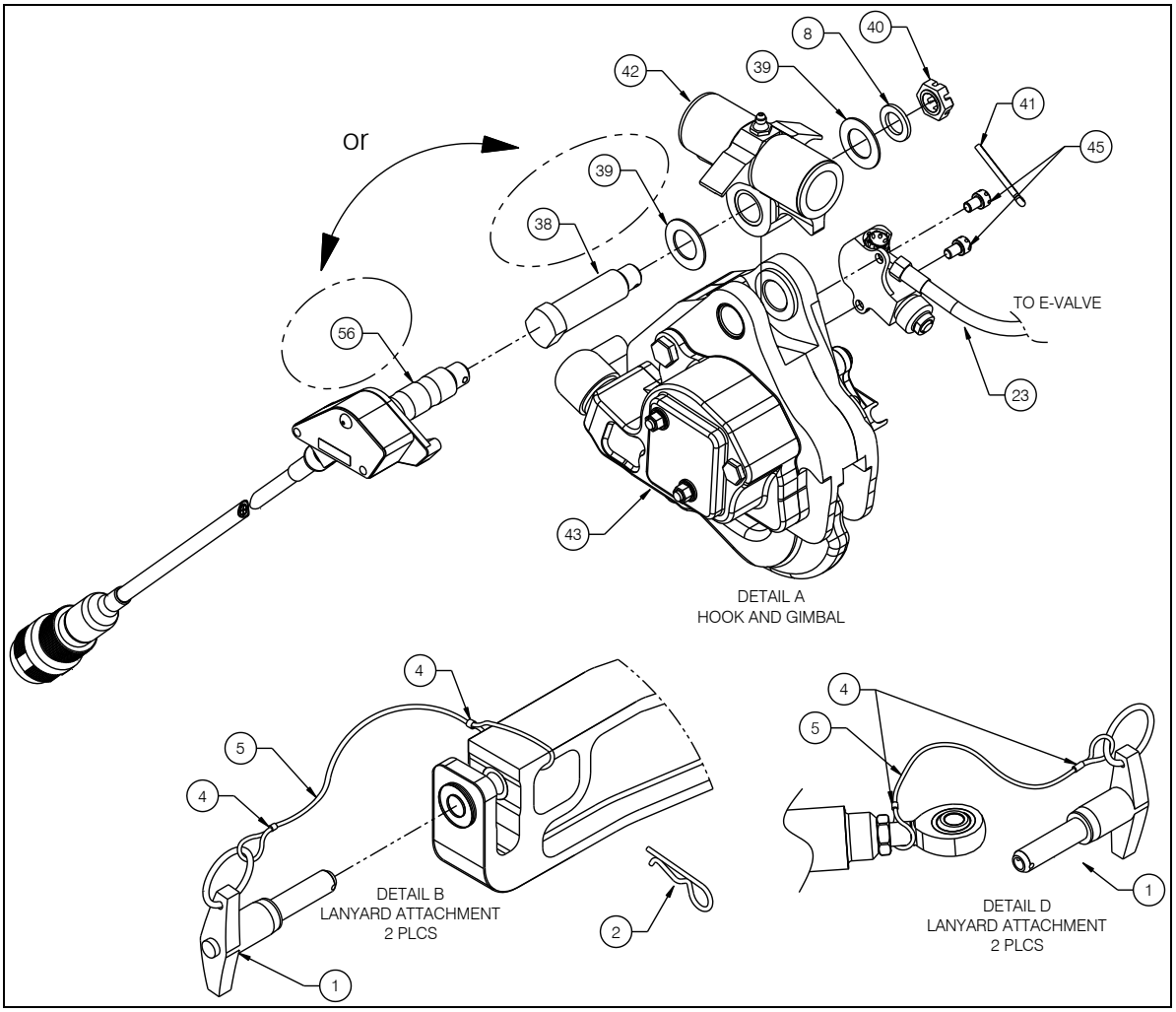


***Figure 6.2 Frame and Cargo Hook Assembly (P/N 232-255-00 and 232-255-01) Parts* continued**

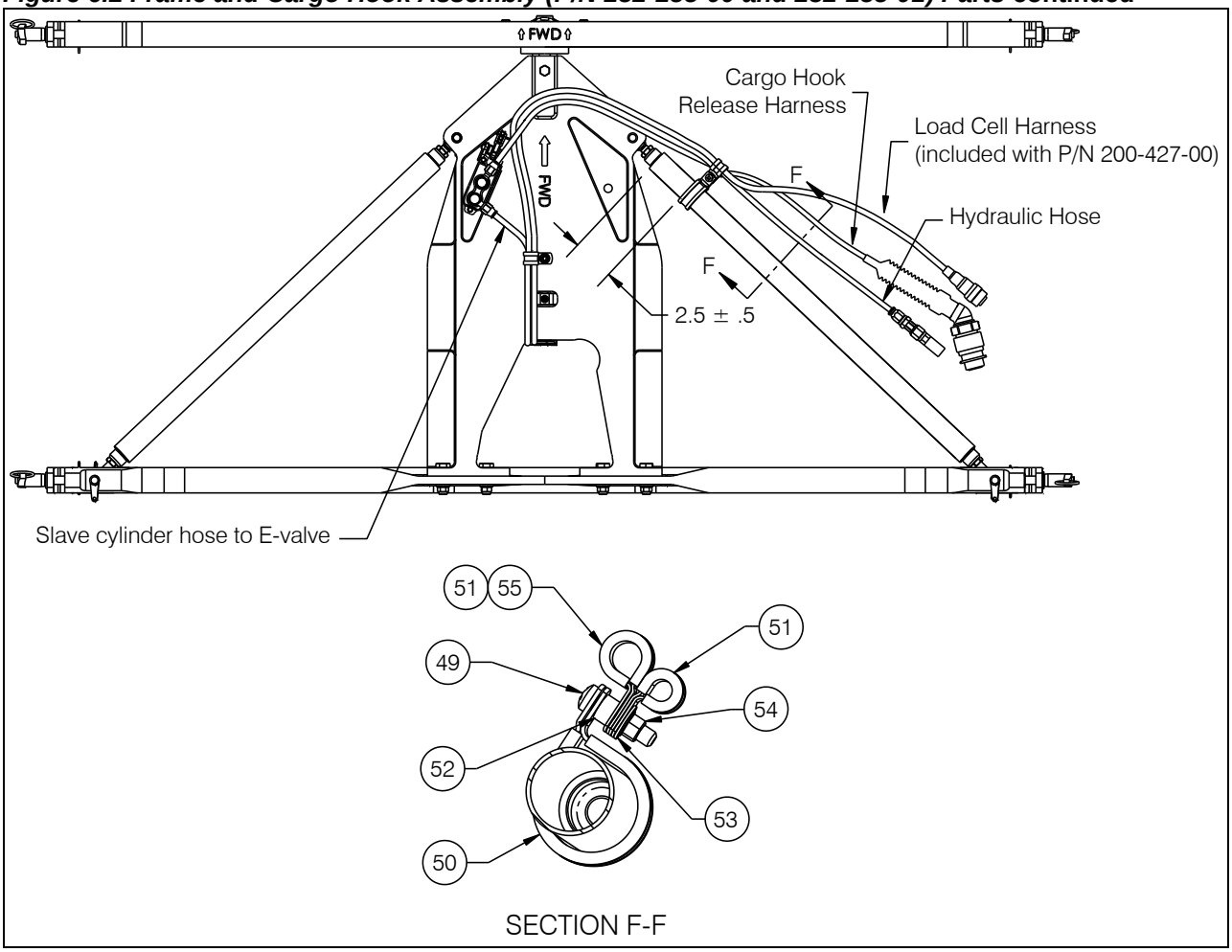


Table 6.2 ***Frame and Cargo Hook Assembly (P/N 232-255-00 and 232-255-01) Parts***

Item	Part No.	Description	Qty 232-255-00	Qty 232-255-01	Overhaul Kit 212-041-00 Qty	Notes
1	290-939-00	Quick Release Pin	4	4	-	
2	510-464-00	Safety Pin	4	4	4	
3	232-253-00	Fwd Cross Beam Assembly	1	1	-	See Figure 6.3
4	531-016-00	Crimp Sleeve	8	8	-	
5	531-015-00	Lanyard Cable – Nylon Covered	25”	25”	-	
6	510-605-00	Cotter Pin	1	1	1	
7	510-129-00	Nut	6	6	6	
8	510-174-00	Washer	7	7	7	
9	510-409-00	Nut	1	1	1	
10	290-935-00	Bearing Carrier Cover	1	1	-	
11	290-933-00	Bearing Spacer Forward	1	1	-	
12	291-415-00	Main Bearing	1	1	-	
13	290-932-00	Bearing Spacer Aft	1	1	-	
14	290-934-00	Bearing Carrier	1	1	-	
15	510-536-00	Bolt	6	6	6	
16	290-930-00	Gimbal Shaft	1	1	-	
17	510-328-00	Bolt	2	2	2	
18	510-611-00	Clevis Pin	4	4	4	
19	510-067-00	Cotter Pin	4	4	4	
20	232-280-00	E-Valve Assembly	1	1	-	See Figure 6.6
21	556-040-00	Crush Washer	4	4	4	
22	558-021-00	Banjo Bolt	2	2	-	
23	232-257-00	Slave Cylinder W/ Plumbing	1	1	-	See Figure 6.7
24	232-281-00	Hydraulic Adapter Hose	1	1	-	
25	235-127-01	Tie Rod Assembly	2	2	-	
26	517-055-00	Spherical Bearing, Rod End	4	4	4	
27	510-510-00	Jam Nut	4	4	4	
28	512-007-00	Loop Clamp	1	1	1	
29	510-042-00	Washer	1	1	1	
30	510-102-00	Nut	1	1	1	
31	290-928-00	Gimbal Pin	1	1	-	
32	290-926-01	Center Frame	1	-	-	
	290-926-02	Center Frame	-	1	-	
33	510-114-00	Nut	2	2	2	
34	510-219-00	Washer	2	2	2	
35	510-552-00	Bolt	3	3	3	

continued

Table 6.2 *Frame and Cargo Hook Assembly (P/N 232-255-00 and 232-255-01) Parts* continued

Item	Part No.	Description	Qty 232-255-00	Qty 232-255-01	Overhaul Kit 212-041-00 Qty	Notes
36	510-095-00	Washer	3	3	3	
37	510-283-00	Bolt	1	1	1	
38	290-332-00	Attach Bolt	1	-	-	
39	510-183-00	Washer	2	1	2	
40	510-170-00	Nut	1	1	1	
41	510-178-00	Cotter Pin	1	1	1	
42	232-252-00	Gimbal Assembly	1	1	-	See Figure 6.5
43	528-028-01	Hydraulic Cargo Hook W/ Pigtail	1	1	-	
44	232-254-00	Aft Cross Beam	1	1	-	See Figure 6.4
45	510-531-00	Bolt	2	2	2	
46	590-017-00	Spiral Wrap	AR	AR	-	
47	512-003-00	Ty-Wrap	1	1	1	
48	512-001-00	Ty-Wrap	1	1	1	
49	510-985-00	Screw	1	1	1	
50	512-057-00	Loop Clamp	1	1	1	
51	512-053-00	Loop Clamp	2	1	2	
52	510-984-00	Spacer	1	1	1	
53	510-467-00	Washer	1	1	1	
54	510-500-00	Nut	1	1	1	
55	512-026-00	Loop Clamp	-	1	1	
56	210-298-00	Pin Load Cell Assembly	-	1	-	

Figure 6.3 Fwd Cross Beam Assembly (P/N 232-253-00) Parts

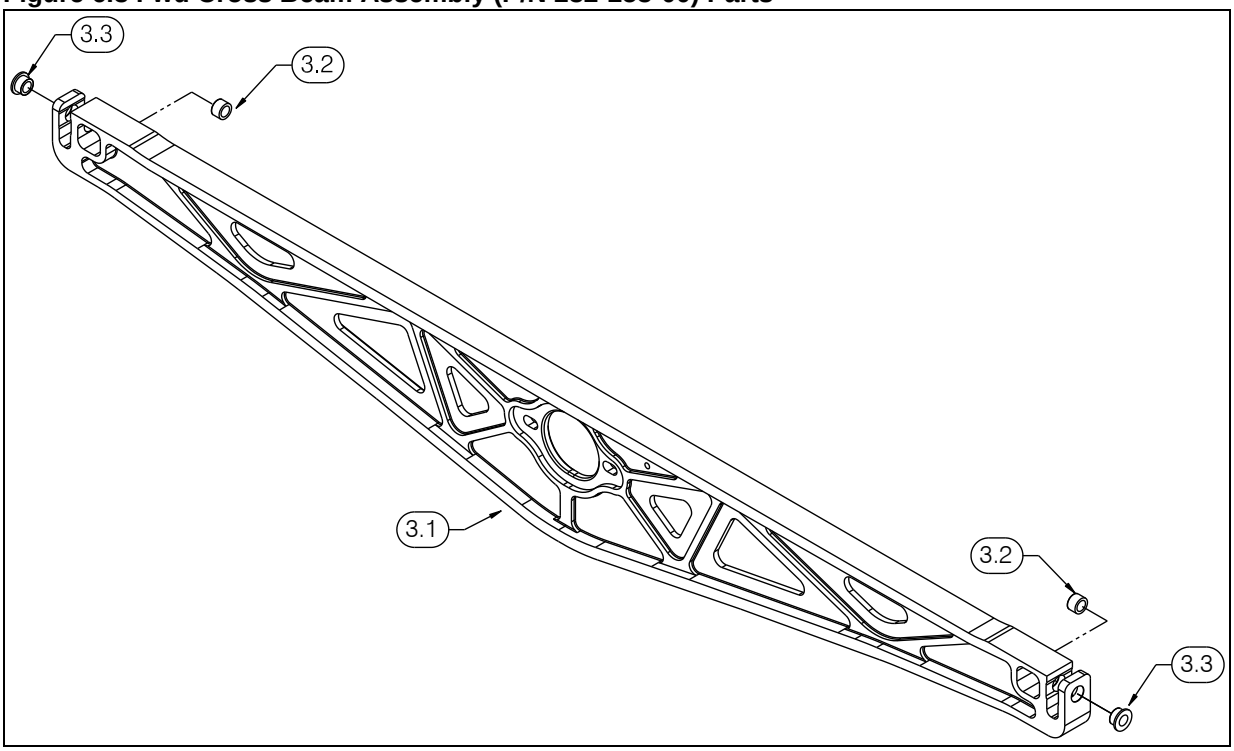


Table 6.3 Fwd Cross Beam Assembly Parts

Item	Part No.	Description	Qty	Notes
3.1	290-931-01	Forward Cross Beam	1	
3.2	290-936-00	Inner Bushing	2	
3.3	290-937-00	Hat Bushing	2	

Figure 6.4 Aft Cross Beam Assembly (P/N 232-254-00) Parts

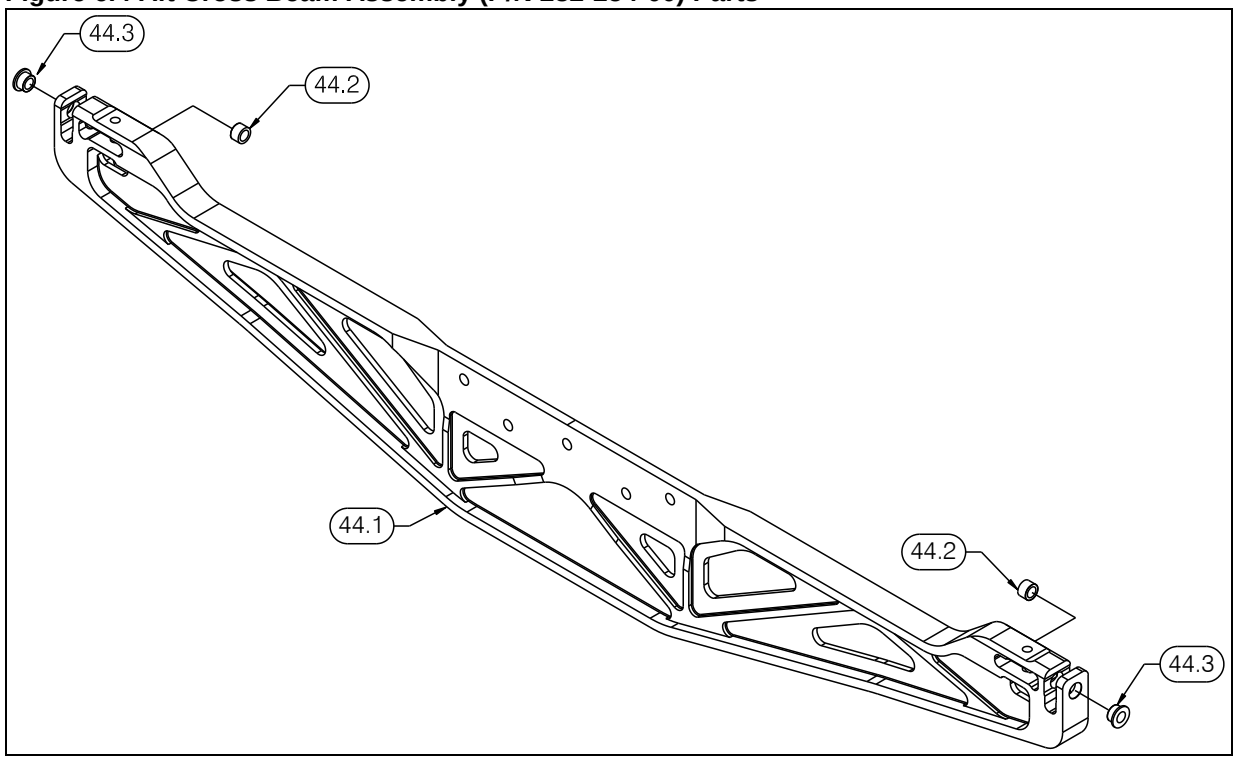


Table 6.4 Aft Cross Beam Assembly Parts

Item	Part No.	Description	Qty	Notes
44.1	290-938-01	Aft Cross Beam	1	
44.2	290-936-00	Inner Bushing	2	
44.3	290-937-00	Hat Bushing	2	

Figure 6.5 Gimbal Assembly (P/N 232-252-00) Parts

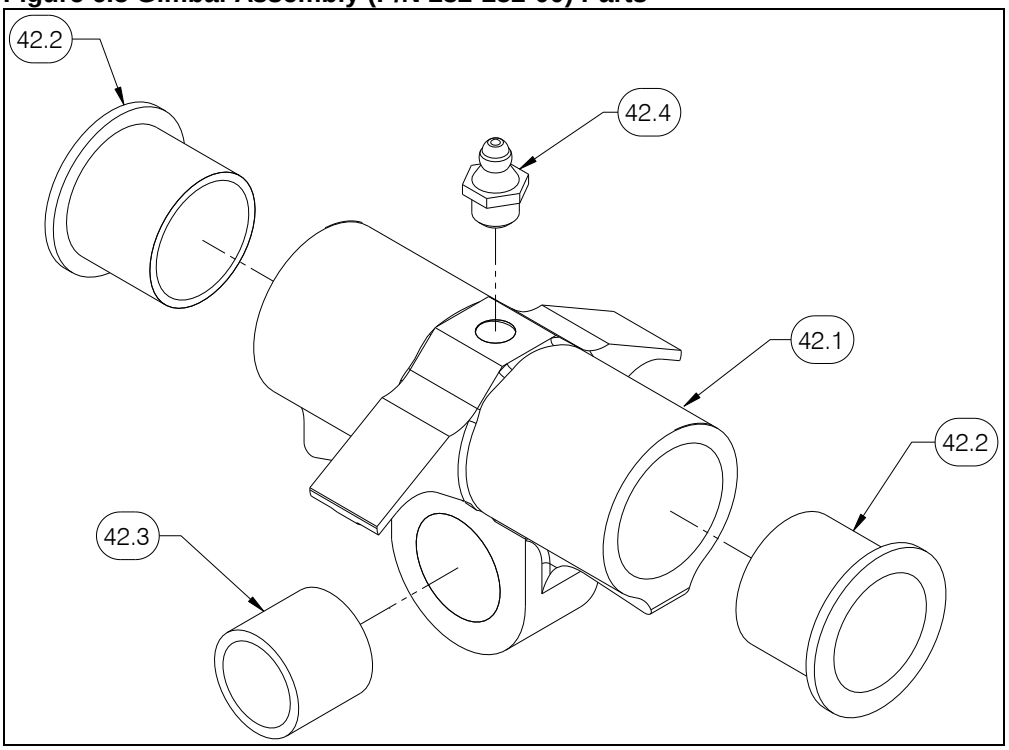


Table 6.5 Gimbal Assembly Parts

Item	Part No.	Description	Qty	Notes
42.1	290-927-00	Gimbal	1	
42.2	290-929-00	Bushing	2	
42.3	290-364-00	Bushing	1	
42.4	518-004-00	Grease Fitting	1	

Figure 6.6 Emergency Valve Assembly (P/N 232-280-00) Parts

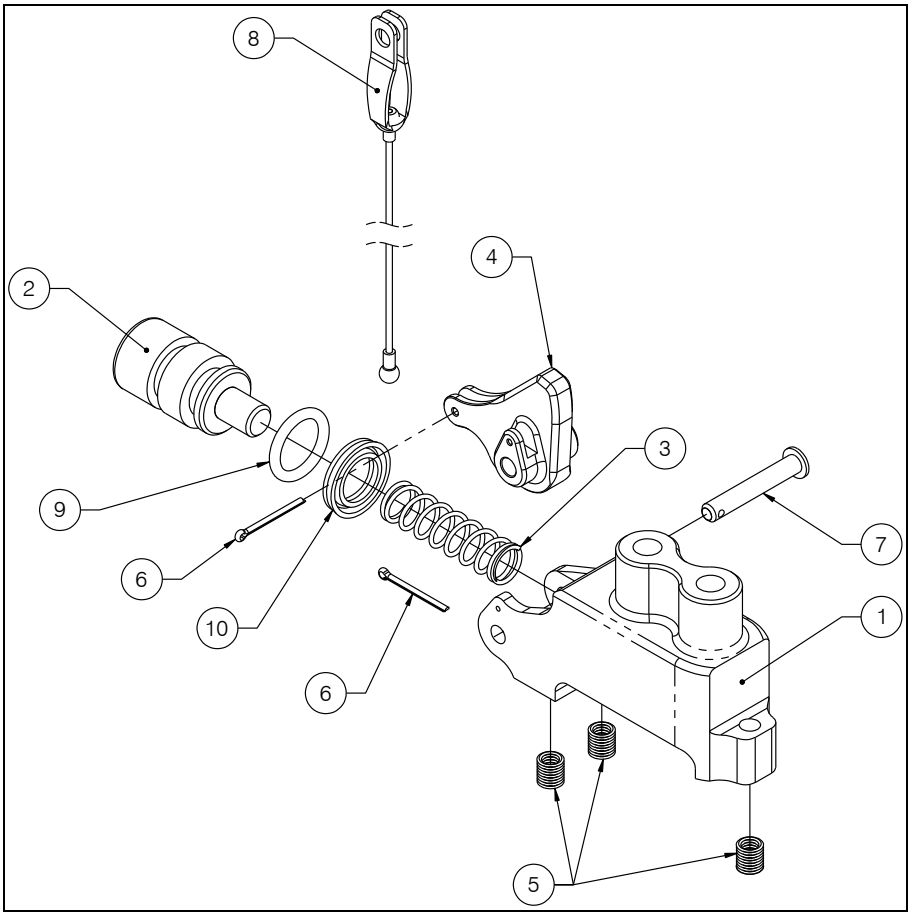


Table 6.6 Emergency Valve Assembly Parts

Item	Part No.	Description	Qty	Notes
1	291-077-00	Valve Body	1	
2	291-076-00	Piston	1	
3	514-088-00	Spring	1	
4	291-075-00	Lever	1	
5	510-248-00	Helicoil	3	
6	510-081-00	Cotter Pin	2	
7	510-683-00	Clevis Pin	1	
8	232-314-00	Tether Cable Assembly	1	
9	556-056-00	O-ring	1	
10	556-055-00	Cup Seal	1	

Figure 6.7 Slave Cylinder with Plumbing Assembly (P/N 232-257-00) Parts

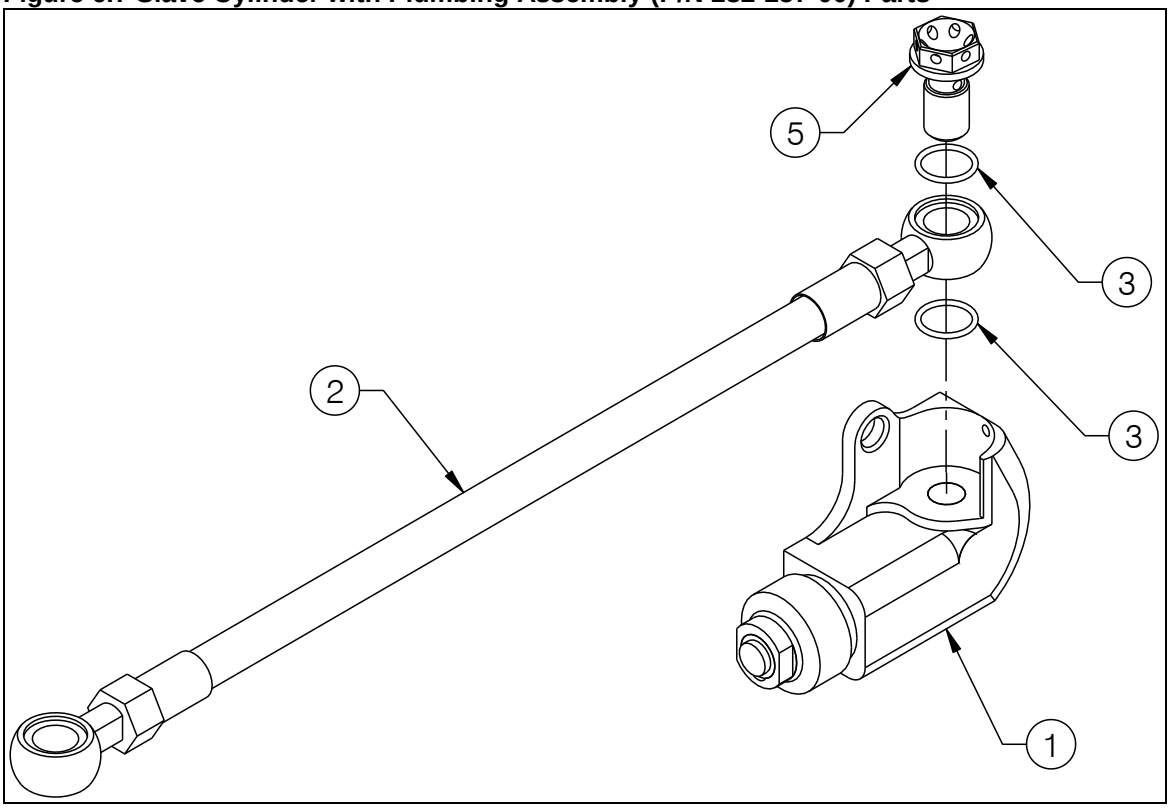


Table 6.7 Slave Cylinder with Plumbing Assembly Parts

Item	Part No.	Description	Qty	Notes
1	232-169-00	Slave Cylinder Assembly	1	See Figure 6.8
2	232-258-00	Slave Cylinder Plumbing Assembly	1	
3	556-041-00	O-ring	2	
4	420-033-00	Safety wire	AR	Not shown
5	558-031-00	Banjo Bolt	1	

Figure 6.8 Slave Cylinder Assembly Parts

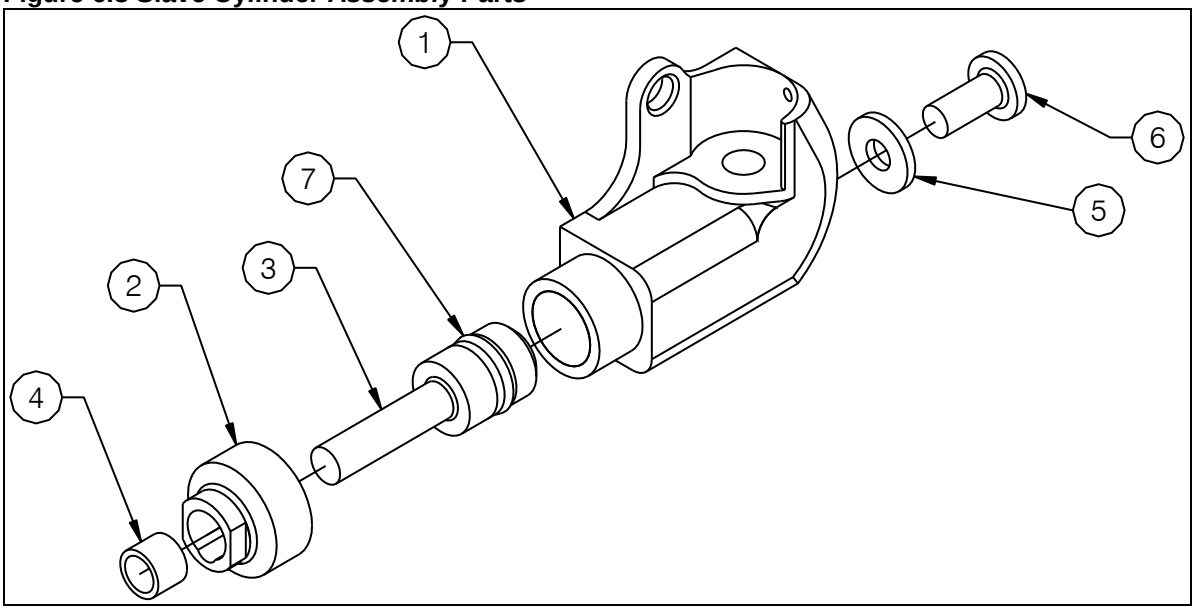


Table 6.8 Slave Cylinder Assembly Parts

Item	Part No.	Description	Qty	Notes
1	290-803-00	Slave Cylinder	1	
2	290-802-00	Cylinder Cap	1	
3	290-805-00	Piston	1	
4	517-040-00	Bushing	1	
5	510-496-00	Stat-o-Seal	1	
6	510-525-00	Screw	1	
7	556-097-00	Quad Ring	1	

Figure 6.9 Master Cylinder Assembly w/ Plumbing (P/N 232-219-01) Parts

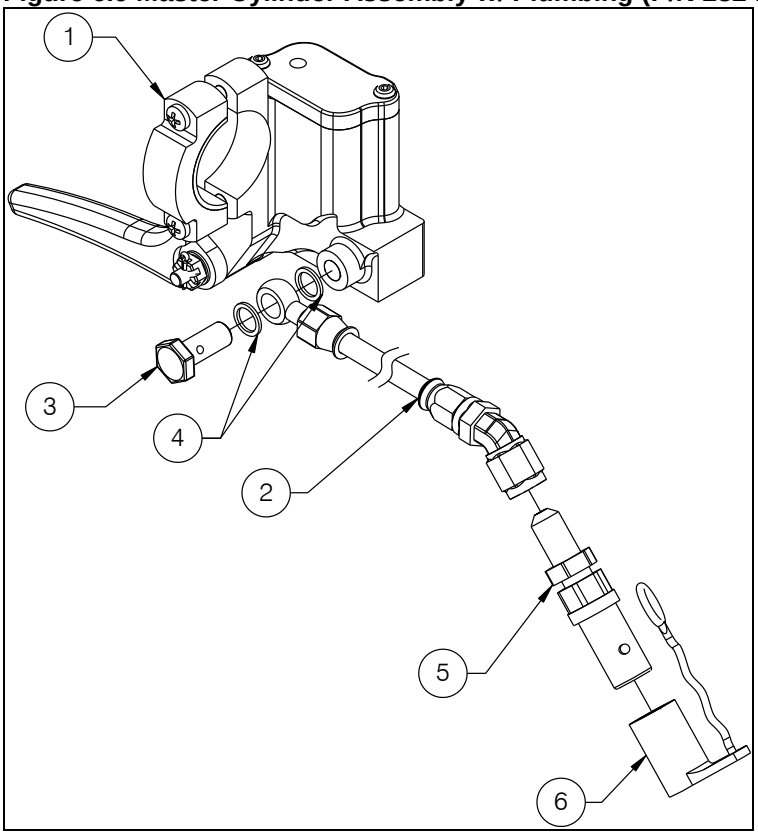


Table 6.9 Master Cylinder Assembly w/ Plumbing Parts

Item	Part No.	Description	Qty	Notes
1	232-373-00	Master Cylinder Assembly	1	See Figure 6.10
2	232-220-01	Master Cylinder Plumbing Assembly	1	
3	558-021-00	Banjo Bolt	1	
4	556-040-00	Crush Washer	2	
5	560-005-00	Quick Disconnect	1	
6	560-007-00	Quick Disconnect Cap	1	

Figure 6.10 Master Cylinder Assembly (P/N 232-373-00) Parts

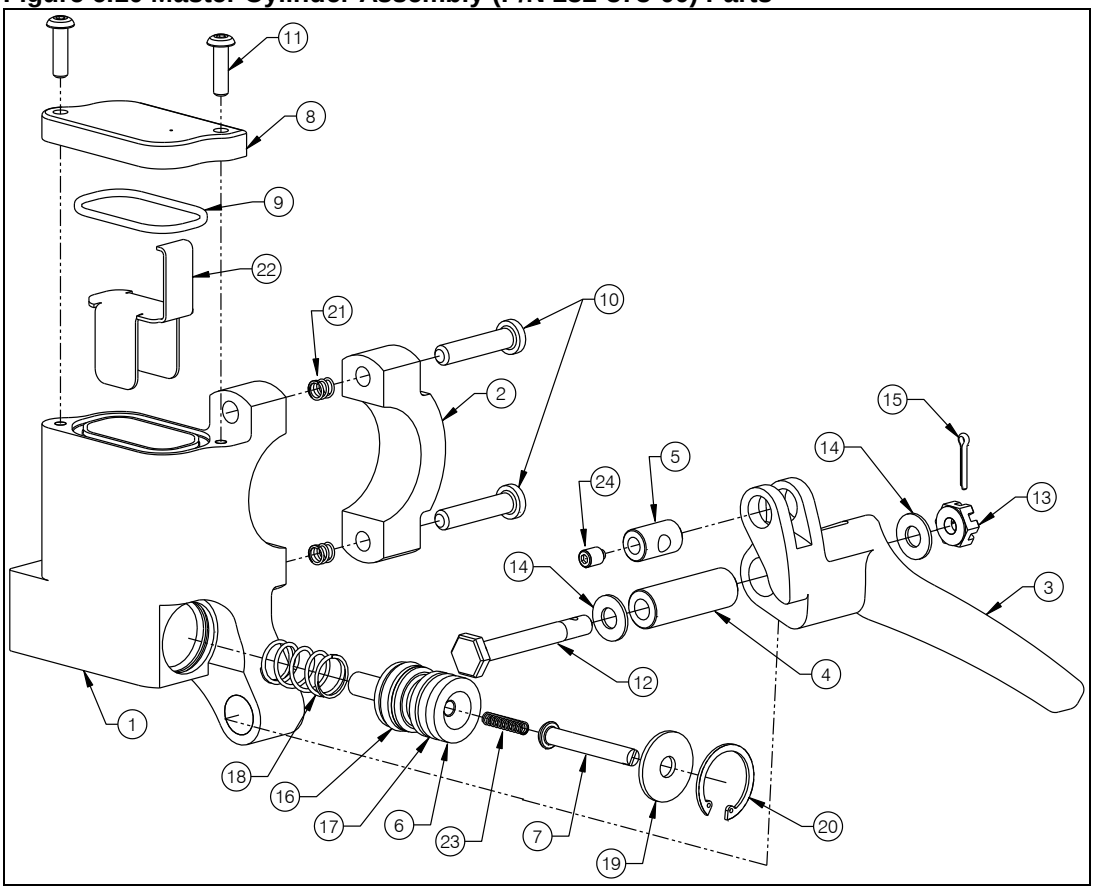


Table 6.10 Master Cylinder Assembly Parts

Item	Part No.	Description	Qty	Notes
1	291-326-00	Master Cylinder	1	
2	232-307-00	Clamp Half Assembly	1	
3	290-811-00	Lever	1	
4	290-816-00	Shaft	1	
5	290-812-00	Barrel Nut	1	
6	290-814-01	Piston	1	
7	290-813-00	Push Rod	1	
8	290-921-00	Reservoir Lid	1	
9	556-044-00	O-ring	1	
10	510-965-00	Screw	2	
11	510-157-00	Screw	2	
12	510-487-00	Bolt	1	
13	510-082-00	Nut	1	
14	510-095-00	Washer	2	

continued

Table 6.10 Master Cylinder Assembly Parts continued

Item	Part No.	Description	Qty	Notes
15	510-125-00	Cotter Pin	1	
16	556-048-00	Cup Seal	1	
17	556-047-00	O-ring	1	
18	514-055-00	Compression Spring	1	
19	510-532-00	Washer – Piston Stop	1	
20	515-008-00	Snap Ring	1	
21	510-248-00	Helicoil	2	
22	235-118-00	Master Cylinder Baffle	1	
23	514-060-00	Compression Spring	1	
24	510-530-00	#8-32 x 3/16” Nylon Tip Set Screw	1	

APPENDIX A-1 Revision History

Revision Number	Date	Description of Change
0	12/17/09	New Issue
1	12/16/12	Updated definition of “external load operations”. Updated format of safety labels to ANSI standard.
2	08/05/15	Added 232-255-01 configuration which includes pin load cell assembly and 290-926-02 center frame.
3	08/11/15	Replaced clamp 512-052-00 with 512-026-00. Added overhaul kit 212-041-00. Changed pin load cell to P/N 210-298-00.
4	10/06/16	Added figure and parts list for kit P/Ns 200-304-00 and 200-427-00 and clarified configurations of 232-255-00 and 232-255-01. Minor corrections and updates throughout. Added Figure 6.9 and Figure 6.10 and accompanying tables.
5	01/14/19	Added instructions for pin load cell and load weigh indicator at 1000 hour/5 year interval.
6	6/10/20	Table 6.6, page 35: removed PN 510-115-00, Helicoil was 510-604-00 is 510-248-00, 510-081-00 was qty 1 is qty 2.