Component Maintenance Manual

Cargo Hook

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Applicable Equipment Part Numbers

Obsolete P/Ns	Current P/Ns
528-020-00	528-020-08
528-020-01	528-020-10
528-020-02	528-020-11
528-020-03	528-020-12
528-020-04	528-020-14
528-020-05	
528-020-06	
528-020-07	

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for the latest revision of this manual.

RECORD OF REVISIONS

Revision	Date	Page(s)	Reason for Revision
20	12/14/12	All	Added P/N's 528-020-08 and 528-020-11. Added Release Lever Upgrade Kit P/N 232-613-00 and Table 13.2.
21	01/08/13	All	Added Release Lever Upgrade Kit P/N 232-613-01 and updated instructions for installation of 232-613-00. Updated parts list.
22	03/27/14	5, 6, 8, Sections 8, 9, 10, & 13	Added requirement to maintain record of all cargo hook activity (pg 5). Added Storage and Inactivity section. Added Section 6.3. Added 510-210-00 to 212-011-00 (qty 3). Added 215-318-00 to -08, -10, -11, & overhaul kit. Added warning not to alter cam surfaces. Added disassembly & assembly photos.
23	05/16/14	19, 20, 23, & 26	Added Loctite 262, Loctite 598 RTV silicone, & Loctite 242 to assembly process.
24	07/30/15	All	Added P/N's 528-020-12 and 528-020-14. Changed TBO time to 6 years/1500 hours.
25	02/11/19	13, 22	Removed NDT requirement for Cam assembly (4) and Cam roller pin (36). Added camshaft bearing orientation note to section 10.10.
26	06/05/16	6	Changed item 1 of Section 4.5 to perform a functional check per Sections 11.7 through 11.9 after greater than 2 year storage in original packaging.
27	01/04/20	13	Changed NDT inspection of Load Beam Assembly (8) to visual inspection. Moved inspection step to Table 9.1.
28	04/12/23	6, 8, 14, 18, 19, 36	Added cleaning and inspection instructions for cam surfaces. Added cam assembly to overhaul kits. Changed monthly preventative maintenance to "based on visual condition". Added grace period for annual/100 hour and 6 year/1500 hour overhaul intervals.

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1.0 Introduction

1.1 Scope

This component maintenance manual contains instructions for inspection, maintenance and overhaul.

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

180-151-00 Acceptance Test Procedure

3.0 Service Bulletins

3.1 This component is subject to the following service bulletins. Service bulletin documents may be obtained from the Onboard Systems website. Verify compliance with all service bulletins prior to maintenance.

Service Bulletin	Description	P/N Applicability	S/N Applicability
159-010-00	Manual Release Lever	528-020-00 528-020-01 528-020-02 528-020-03	All

4.0 Maintenance

4.1 Maintain a record of ALL cargo hook activities including aircraft installation and removal, inspections, repair and overhaul as well as inactivity and storage events

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

4.2 Cleaning and Preventative Maintenance

1. As needed per visual condition remove accumulated soils from exterior with a soft bristle brush and mild solvent/cleaner.

2. As needed per visual condition, in salt water environments, apply a corrosion preventative compound such as ACF-50 to all exterior surfaces.

4.3 Annual Inspection

1. Annually or 100 hours of external load operations, whichever comes first, remove the Cargo Hook from the aircraft. Thoroughly clean the exterior with a soft bristle brush and mild solvent/cleaner and visually inspect for cracks, gouges, dents, nicks, corrosion, and missing or loose fasteners. A one-month or 10-hour grace period can be applied if needed. No additional extension is allowed beyond this grace period.

4.4 Overhaul

1. Overhaul the Cargo Hook in accordance with the overhaul schedule and instructions contained here-in.

4.5 Storage and Inactivity

1. The cargo hook may be stored in its original factory sealed bag and box for up to 2 years from its date of manufacture or last factory overhaul. If stored in its original factory sealed bag and box for less than 2 years, it may be used without any additional activity. If the period of storage in its original packaging is greater than 2 years the cargo hook must be subjected to a functional check, perform the functional check per instructions in sections 11.7 through 11.9 of the Acceptance Test Procedure (ATP) herein.

2. If the cargo hook has been installed on an aircraft and subsequently removed from service, store it in a reasonably protected indoor, dry, heated storage area for up to 6 months. If stored in this condition for less than 6 months, it may be used without any additional activity. If it is to be stored longer than 6 months perform the following activities. Prepare the cargo hook for storage by thoroughly cleaning and drying the exterior, liberally applying ACF-50 corrosion preventative compound inside and out, sealing it in a plastic bag with a desiccant, and labeling it with the date of storage. If stored in this condition for less than 2 years, it may be placed in service without any additional activity. If the period of storage exceeds 2 years the cargo hook must be subjected to the ATP described herein before being placed in service.

3. If the cargo hook has been installed on the aircraft and subsequently removed from service but not stored in accordance with the instructions above, the cargo hook must be subject to the ATP described herein before being placed in service.

4.6 Repair

1. Repair the Cargo Hook in accordance with the repair instructions contained here-in.

5.0 Repair Instructions

5.1 It is recommended that only minor repairs be attempted by anyone other than the factory. The following procedures and information are provided for the benefit of experienced aircraft maintenance facilities and trained maintenance and inspection personnel capable of carrying out the procedures. They must not be attempted by those lacking the necessary expertise and suitable equipment to acceptance test the cargo hook after maintenance. See Section 14, instructions for returning equipment to the factory.

5.2 Reference numbers throughout this manual shown in parentheses ( ) refer to Table and Figure 13.1.

5.3 Follow these steps to repair the Cargo Hook, referring to the applicable sections in this manual.

1. Disassemble as required.
2. Inspect disassembled parts.
3. Obtain required replacement parts.
4. Re-assemble.
5. Acceptance test.
6. Inspect for return to service.

6.0 Overhaul Schedule

6.1 The Cargo Hook shall be overhauled every 1500 hours of external load operations or 6 years, whichever comes first. A six-month or 150-hour grace period can be applied if needed. No extension to maintenance is allowed beyond this tolerance grace period.

6.2 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.

6.3 The 6 year period is from the initial installation date when the cargo hook is new or newly overhauled, regardless of storage or inactivity periods. If initial installation date is unknown, then 6 year period is from date of manufacture as indicated on the S/N plate or 6 years from date of last overhaul indicated on the overhaul sticker.

7.0 Overhaul Instructions

7.1 It is recommended that only minor repairs be attempted by anyone other than the factory. The following procedures and information are provided for the benefit of experienced aircraft maintenance facilities and trained maintenance and inspection personnel capable of carrying out the procedures. They must not be attempted by those lacking the necessary expertise and suitable equipment to acceptance test the cargo hook after overhaul. See Section 14, instructions for returning equipment to the factory.

7.2 Overhaul kit P/N 212-011-00 is recommended to complete the Cargo Hook overhaul. The overhaul kit contains all recommended items to be replaced at time of overhaul. Table 13.1 lists detail parts contained in the overhaul kit.

7.3 Follow these steps to overhaul the Cargo Hook, referring to the applicable sections in this manual:

1. Obtain Overhaul kit P/N 212-011-00.
2. Completely disassemble.
3. Discard all items that are to be replaced by an item in Overhaul Kit P/N 212-011-00 listed in table 13.1 (springs, bearings, roll pins, cotter pins, bolts, nuts and washers).
4. Inspect disassembled parts.
5. Obtain required replacement parts.
6. Reassemble.
7. Acceptance test.
8. Inspect for return to service.

8.0 Disassembly Instructions

8.1 Cut and remove all lockwire.

8.2 Remove solenoid assembly (7) by removing the four solenoid cover bolts (17 (Qty 2), 21, and 23) and washers (18).

8.3 The solenoid (7.5) may be removed from the solenoid cover (7.3) by unsoldering or cutting the wires at the connector (7.4) or at the Surefire Module (7.12) terminals (-12 and -14 configurations only) and removing the two solenoid nuts (7.9) and wear plate (7.1). To remove the connector, unsolder the wires and remove the four connector screws (7.7).

8.4 The Surefire Module (-12 and -14 only) may be removed by unsoldering all wires from terminals, removing RTV silicone securing wires to cover, and removing the nut (7.13) from screw (7.11). The module is assembled with RTV silicone between it and the solenoid cover so light prying will be necessary to remove it.

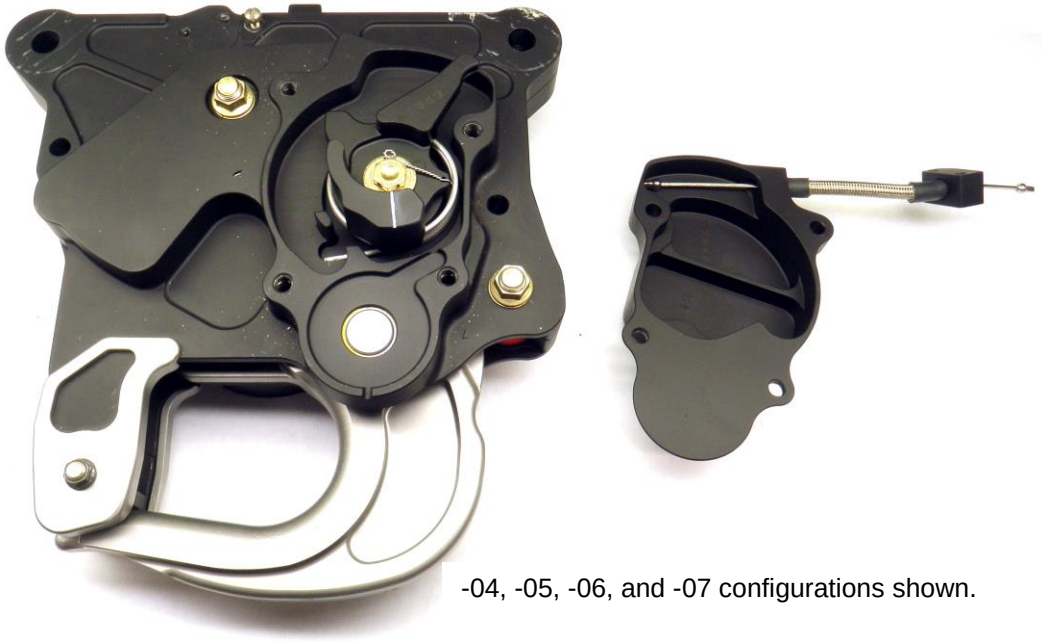
8.5 To remove the solenoid cam (7.2) remove lockwire, three solenoid screws (7.8) and washers (7.6).

8.6 Remove the cam actuator (11) by removing the cam actuator bolt (25) and washer (16).

8.7 To remove the manual release cover (9.2), remove the lockwire and the manual release cover bolts (26 (qty. 2), and 27 (qty. 2)) and washers (18).

For -00, -01, -02, and -03 configurations: slide the manual release lever (9.1) out of the manual release cover.

For -08, -10, and -11 configurations: remove the manual release lever (9.1) by removing the retaining ring (9.6).



-04, -05, -06, and -07 configurations shown.

8.8 Remove the safety wire on the cable mount block screws and remove the two screws (29). Remove the cable mount block (15) and unscrew the cable assembly (10) from the mount block and the manual release cover.

8.9 Remove grounding screw (24).

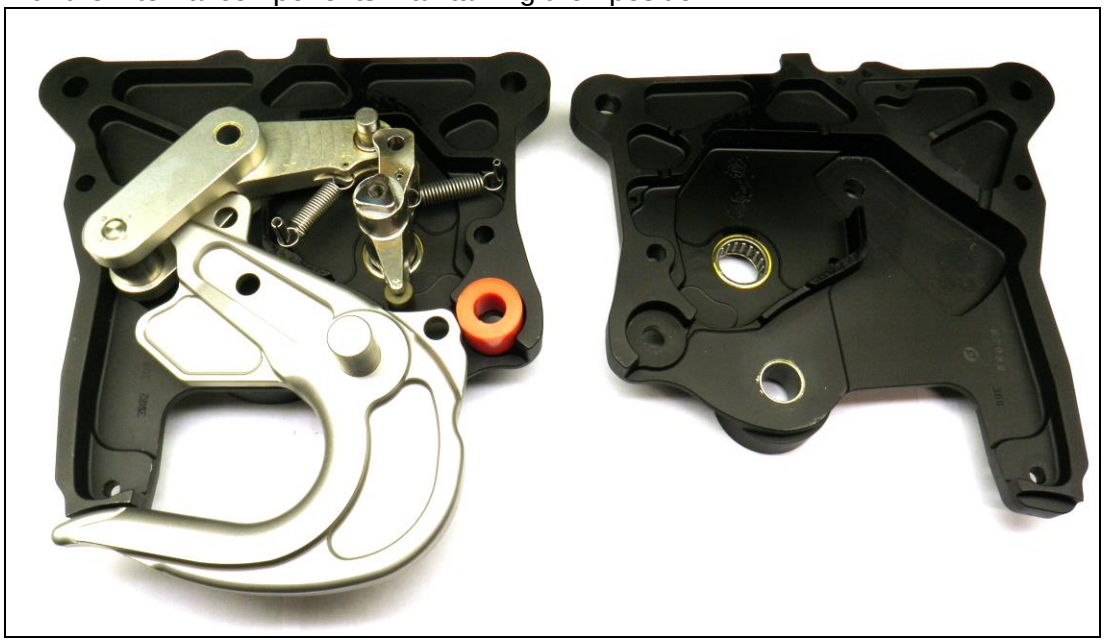
8.10 To remove the cam hub knob (14), remove the safety wire and the cam hub knob bolt (26) and washer (30). Pull the cam hub knob off the cam shaft and remove the cam spring (34).

8.11 Remove the armor plates (12, 13) by removing the armor plate bolt (32) and nut (20).

8.12 Remove the bumper bolt (31), nut (19) and washer (22).

8.13 Remove the toggle pivot nut (19) and washer (22). Leave the bolt (28) in place to hold internal components in position while the frame is being split.

8.14 Split the frame with the toggle bolt head down, which will allow the frame to split with the internal components maintaining their position.



8.15 Slide the cam backup spring (4.5) off the roll pin (5.2).

8.16 Slide the toggle spring (3.5) off its roll pin (5.4).

8.17 To open the load beam, move the cam and pivot the toggle. This will free the load beam. Move the load beam to the open position.

8.18 Slide the toggle assembly (3) off the toggle bolt and remove the cam roller pin (36).

8.19 Remove the load beam assembly (8).

8.20 Remove the load beam bumper (35).

8.21 Remove the cam assembly (4) and for the -00, -01, -04, -05, and -08 configurations remove the O-ring (37).

8.22 Bushings, bearings, and helicoils may be removed from detail parts and assemblies by conventional means.

8.23 Do not typically disassemble the cam assembly (4) or toggle assembly (3).

8.24 Do not typically disassemble the load beam (8.2) from the load beam shaft (8.1).

9.0 Inspection Instructions

9.1 Thoroughly clean all parts to be inspected using a soft bristle brush and mild solvent/cleaner. Parts should be completely free of surface contaminants, soils or grease before beginning inspections.

9.2 If the Cargo Hook is being overhauled, perform nondestructive inspection on the parts below to confirm absence of cracks which may have developed in service. Confirmed cracks of any size are cause for part replacement.

For the **Side Plate, Solenoid (5.1)**, **Side Plate, Manual (6.1)**, and **Toggle Assembly (3)**, inspect using:

- Liquid penetrant inspection per ASTM E1417

Mark all indications from penetrant inspection then interpret each under 10X magnification. Differentiate surface cracks from other non-relevant indications such as machine tool marks, scratches, dents or superficial corrosion.

9.3 Carefully inspect detail parts in accordance with the instructions in Table 9.1. Inspect the parts in a clean, well lighted room using standard dimensional measuring tools and visual methods. Repair parts found within inspection limits. Replace any part found beyond limits.

Table 9.1, Cargo Hook Inspection Criteria

Seq	Component	Inspection Criteria & Limit	Repair Action	Finish	Recommended replacement at overhaul.
1.	Load Beam Assembly (8)	Cracks. Inspect under illuminated magnification (2X power or higher)	None. Cracks of any size are cause for part replacement.	N/A	No
2.	Load Beam Assembly (8), Solenoid Cam (7.2), Cam Actuator (11), Armor Plates (12, 13)	Corrosion – 0.006 in. (0.127 mm) deep	Glass bead blast at less than 30 PSI (2.11 KGF/CM^2) to remove corrosion.	Passivate per AMS-QQ-P-35 or ASTM A967	No
3.	Side Plate (5.1, 6.1)	See Figure 9.1 and 9.2.	Glass bead blast at less than 30 PSI (2.11 KGF/CM^2) to remove corrosion. Blend at 10:1 ratio as required to provide smooth transitions.	Apply conversion coating (MIL-DTL-5541) and zinc chromate primer (MIL-PRF-23377 or similar) to affected surfaces – see Note 1	No

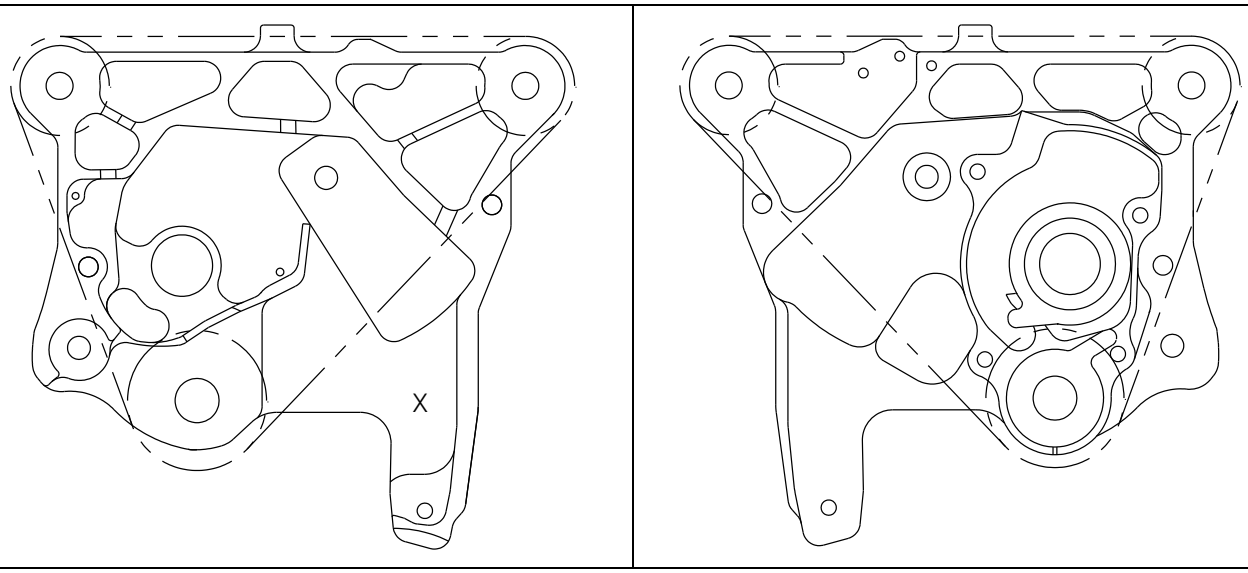
Seq	Component	Inspection Criteria & Limit	Repair Action	Finish	Recommended replacement at overhaul.
4.	Manual Rel. Cover (9.2), Solenoid Cover (7.3)	Dents, nicks, cracks, gouges, scratches and corrosion – 0.020 in. (0.50 mm) deep.	Blend at 10:1 ratio as required to provide smooth transitions.	Apply conversion coating (MIL-DTL-5541) & zinc chromate primer (MIL-PRF-23377 or similar) to affected surfaces – see Note 1.	No
5.	Bushing (3.7, 5.5, 6.4)	Wear – more than 50% copper showing.	None. Replace.	N/A	Yes
6.	Bearing (3.8, 5.6, 6.5)	Roughness, binding, looseness, or corrosion.	None. Replace.	N/A	Yes
7.	Bumper (35)	Denting, cuts or abrasions – 0.060 in. (1.27 mm) deep	None. Replace.	N/A	Yes
8.	Armor Plate (12, 13)	Gouges and nicks – 0.050 in. (1.27 mm) deep. No visible cracks.	Blend at 10:1 ratio as required to provide smooth transitions. Replace if visibly cracked.	Passivate per AMS-QQ-P-35 or ASTM A967	No
9.	Cam Assembly (4)	Visible wear or dents on bearing surface.	None. Replace.	N/A	Yes
10.	Cam Assembly (4)	Roughness, binding or looseness of the Interlock Roller (4.3).	Replace Interlock Pin (4.1), Roller (4.3). Stake ends of pin.	N/A	No
11.	Toggle Assembly (3)	Roughness, binding or looseness of the Load Beam Roller (3.1).	Replace Pin (3.3), Roller (3.1), and Bearings (3.6). Stake ends of pin.	N/A	No
12.	Load Beam (8.2)	Wear, gouges and nicks – 0.050 in. (1.27 mm) deep.	Blend at 10:1 ratio as required to provide smooth transitions and ensure load rings will not hang up on load beam during release.	Passivate per AMS-QQ-P-35 or ASTM A967	No
13.	Serial Number Plate (2)	Damaged or illegible.	None. Replace.	N/A	No
14.	Solenoid (7.5)	Shorted or open electrical circuit. Resistance 1.9 $\pm$ .3 ohms.	None. Replace.	N/A	No

Seq	Component	Inspection Criteria & Limit	Repair Action	Finish	Recommended replacement at overhaul.
15.	Electrical connector (7.4)	Loose, missing, or mutilated contact pins, cracked case, or worn insulator.	None. Replace.	N/A	No
16.	Surefire Module (7.12)	Bent or corroded terminals.	None. Replace	N/A	No
17.	Rigging warning decal (1)	Damage or illegible.	None. Replace.	N/A	Yes
18.	Springs (3.5, 4.5, 9.5, 34)	Cracks or deformation.	None. Replace.	N/A	Yes
19.	Electrical wiring	Deterioration.	None. Replace.	N/A	No
20.	Cable Assembly (10)	Deterioration.	None. Replace.	N/A	No
21.	All remaining nuts, bolts, roll pins, cotter pins, washers, heli-coils	Wear, corrosion or deterioration.	None. Replace.	N/A	Yes

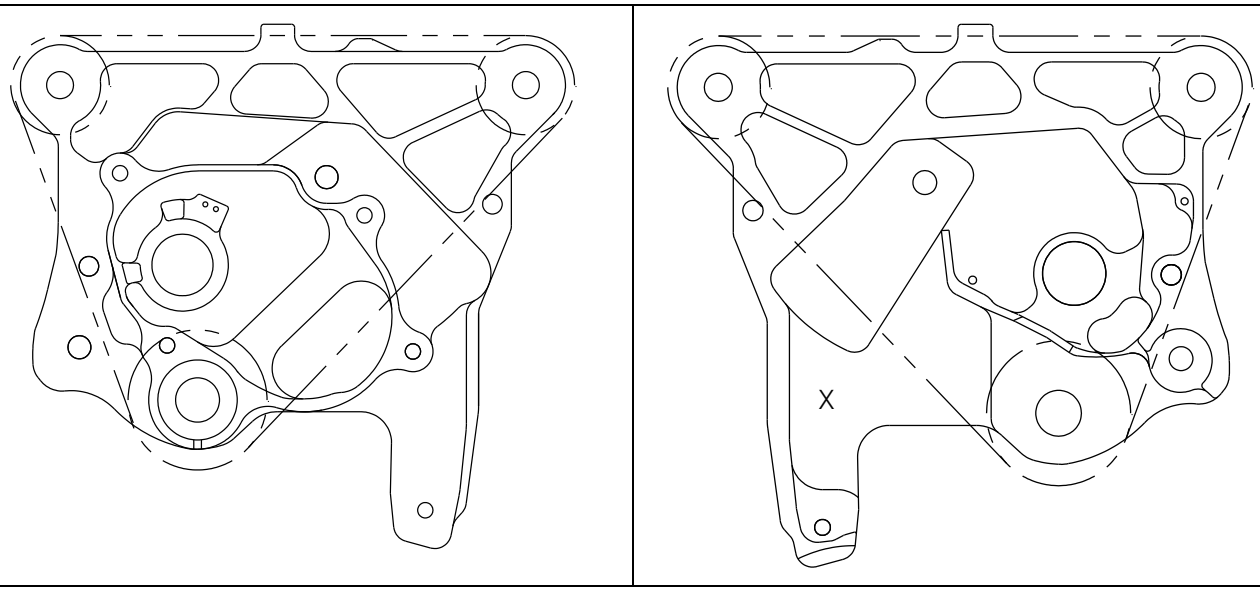
Note 1 – For service at Onboard Systems, optional finish: anodize per MIL-A-8625 Type II, Class 2 after nondestructive inspection. Prepare for anodize by using standard methods.

Figure 9.1, Side Plate, Additional Inspection Criteria

Side Plate, Solenoid (5.1)



Side Plate, Manual (6.1)



Inspection Criteria and Limits

Inside dashed circles – NO corrosion allowed.
Inside dashed circles – Dents, nicks, gouges, and scratches – 0.005 in (0.13 mm) deep.
Inside dashed lines – Dents, nicks, gouges, scratches, and corrosion – 0.010 in (0.25 mm) deep.
Outside dashed lines– Dents, nicks, gouges, scratches, and corrosion – 0.020 in (0.50 mm) deep.

(X) Approved metal stamp locations

Figure 9.2, Acceptable Wear Areas

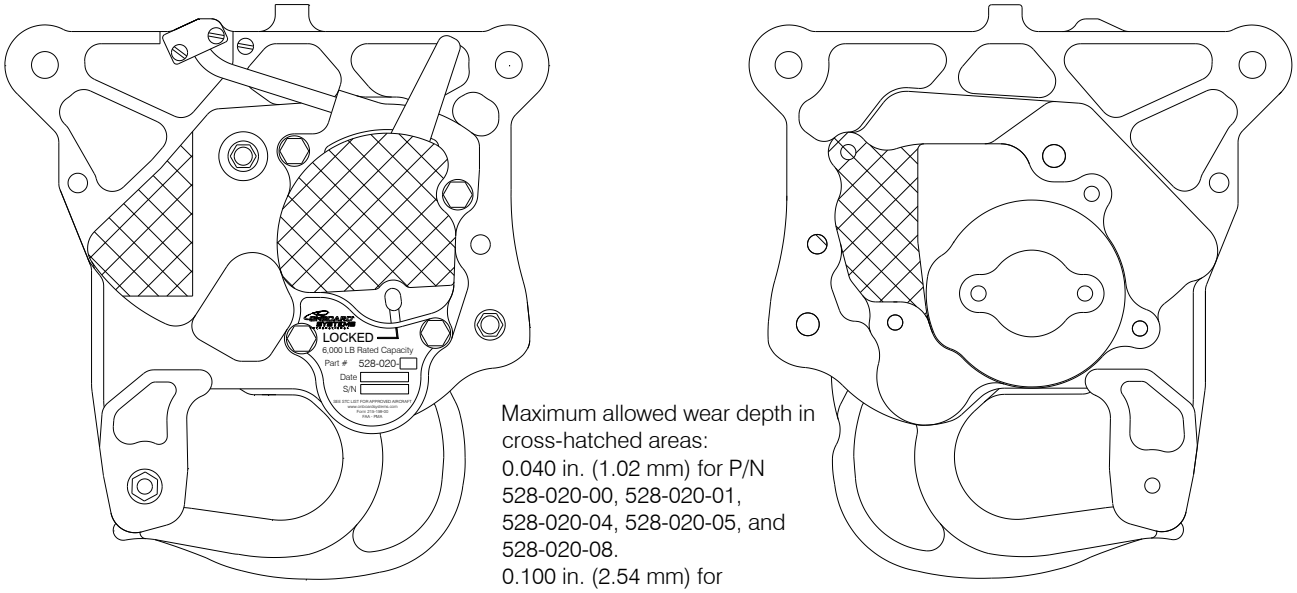


Figure 9.3, Cam Assembly (4) Inspection Criteria

WARNING

Thoroughly inspect surfaces inside lines for signs of visible wear, dents, corrosion, gouges or nicks. Continued use of a damaged cam *may cause inadvertent load release.*

WARNING

Repair (including filing, deburring and buffing) is prohibited on all surfaces shown inside lines. Alterations of these surfaces may cause inadvertent load release.

Figure 9.3.1

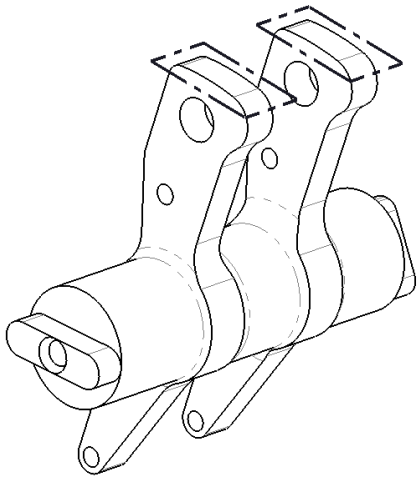


Figure 9.3.2

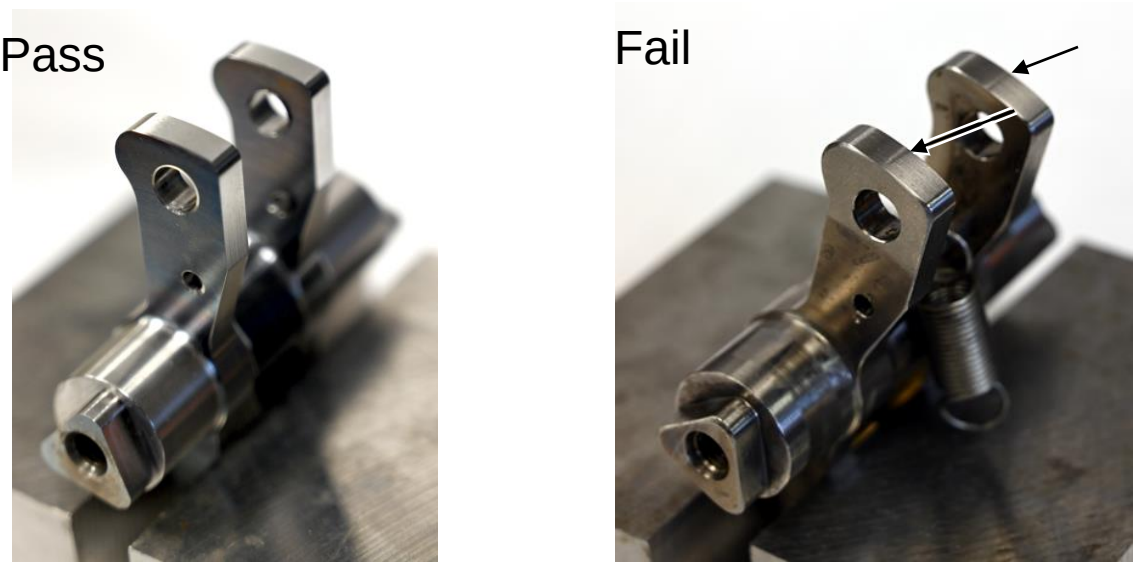


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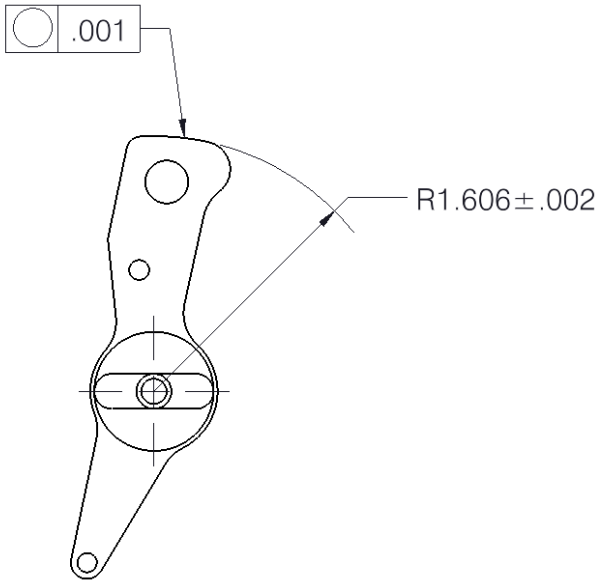
Figure 9.3.3



Inspection Criteria and Limits

Inside lines, see figure 9.3.1, gently clean surface by hand using Scotch-Brite (MFR: 3M, MFR P/N: 7447).

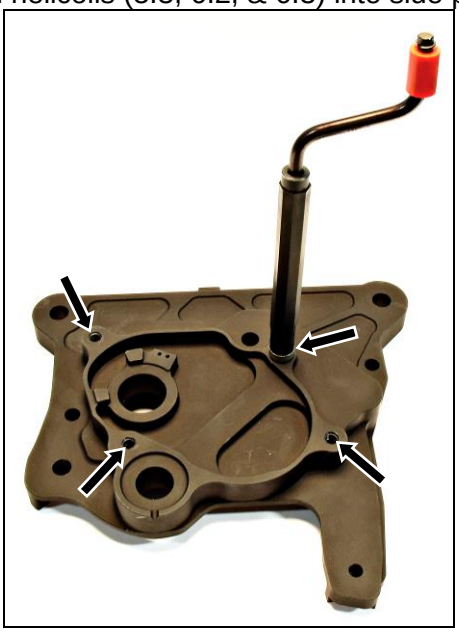
Visually inspect surface. No dents, corrosion, gouges, or nicks may remain after cleaning, see figure 9.3.2.

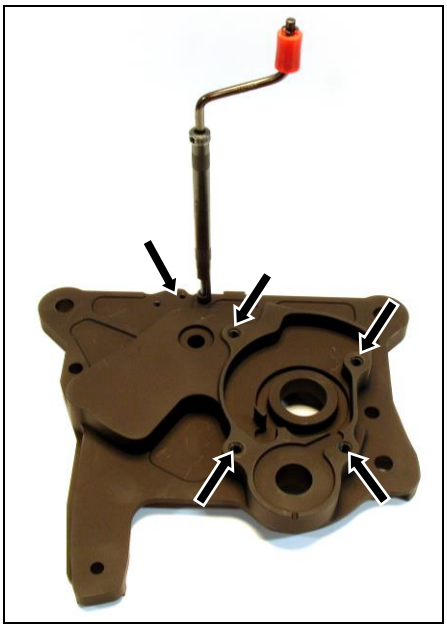
If the cam passes visual inspection, dimensionally inspect per figure 9.3.3.

10.0 Re-assembly Instructions

10.1 Replace all parts found to be unserviceable or beyond limits.

10.2 Install helicoils (5.3, 6.2, & 6.3) into side plates.

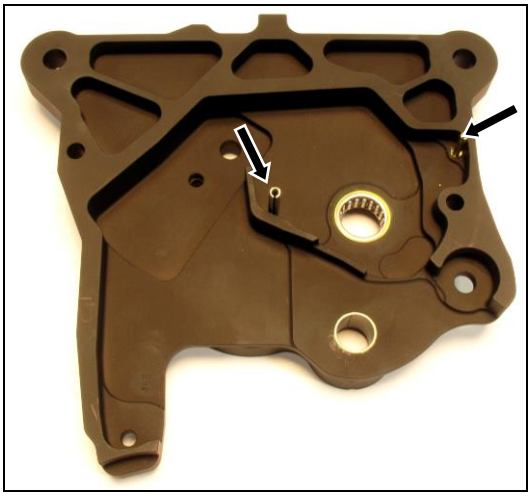




10.3 Install bushings (5.5 & 6.4) and bearings* (5.6 & 6.5) into the side plates. Use wet zinc chromate primer on the outside diameter of the bushings and bearings. Wipe off excess and ensure that the primer does not get onto working surfaces of the bearings and bushings.

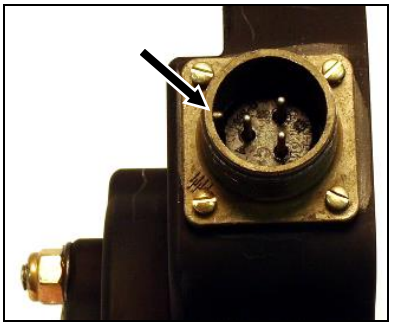
*Install bearings with the MFR P/N facing away from the cam. On the solenoid side plate (5.1), recess the bearing .015”-.030”, measuring from the adjacent inside surface.

10.4 Install roll pins (5.2 & 5.4) into side plate (5.1) using wet zinc chromate primer.

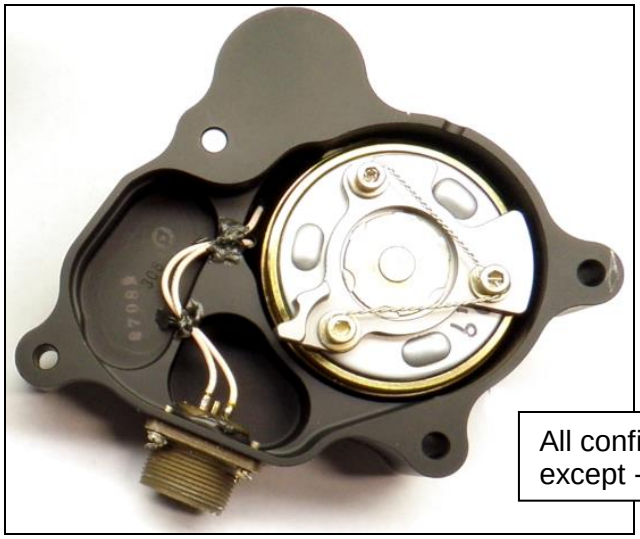


10.5 Install the solenoid cam (7.2) onto the solenoid (7.5) with the three screws (7.8), washers (7.6) and lock-wire using Loctite 262.

10.6 Install the connector (7.4) onto the solenoid cover (7.3) with the four screws (7.7) and lock-wire using Loctite 598 RTV silicone. Note orientation of connector key.

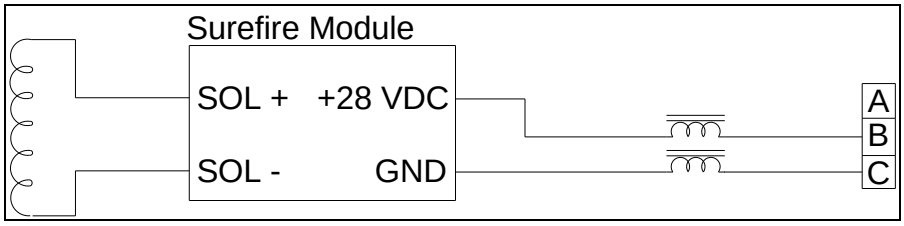


10.7 Install the solenoid (7.5) into the solenoid cover (7.3). Install wear plate (7.1) with the two nuts (7.9). Solder the solenoid wires to the connector pins B and C. Use Loctite 598 RTV silicone to hold the solenoid wires to the solenoid cover (7.3).



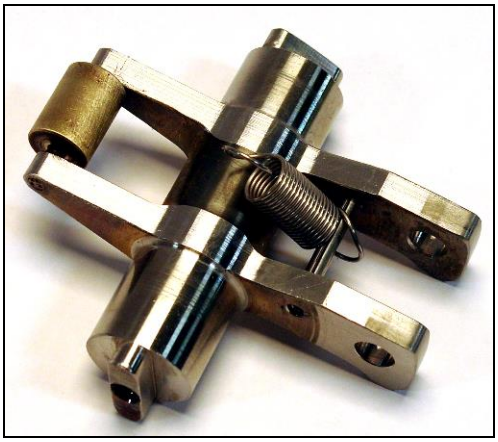
All configurations except -12 and -14

For the -12 and -14 configurations, solder the solenoid wires to the inner two terminals of the Surefire Module (7.12). Solder the wire from pin B of the connector to the INPUT terminal (terminal located farthest from the connector) of the Surefire Module and the wire from pin C to the GND terminal (located closest to the connector), see schematic below. Each wire from the connector to the Surefire Module should be routed through a ferrite cable core (7.14) twice. Use Loctite 598 RTV silicone on the ferrite cable cores to secure them to the cover.

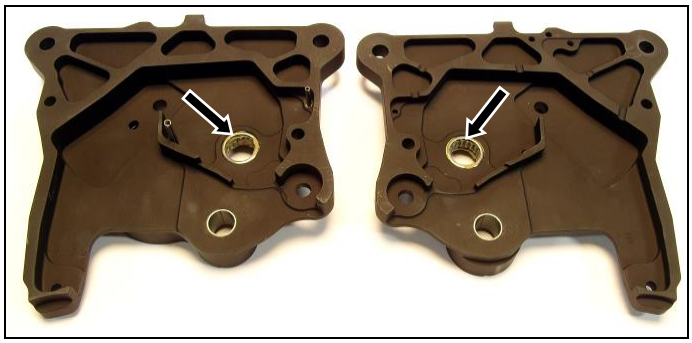


10.8 Press in bushings (3.7), qty. 2, and roller bearing (3.8) into toggle (3.2). Use wet zinc chromate primer on outside diameters of bushings and bearing. Clean off excess. Secure one end of the spring (3.5) to the toggle using roll pin (3.4). Use wet zinc chromate primer on the roll pin. Clean off excess. If roller (3.1) and pin (3.3) were disassembled: Install bushing (3.6) into roller (3.1) with wet zinc chromate primer. Press in pin (3.3) into the toggle to retain the roller. While pressing in pin use a suitable shim between the roller and toggle to prevent the toggle from bending. Stake toggle into pin on both sides to retain pin.

10.9 Attach spring (4.5) to cam (4.2) using roll pin (4.4). Use wet zinc chromate primer on roll pin. Clean off excess. If pin (4.1) and roller (4.3) were removed, reinstall by pressing in the pin (4.1) to capture the roller (4.3). Use suitable anti-seize compound on the pin to ease installation. Stake cam on both sides to retain pin.

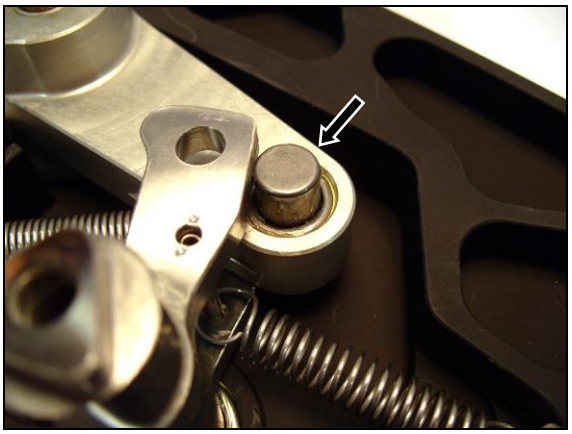


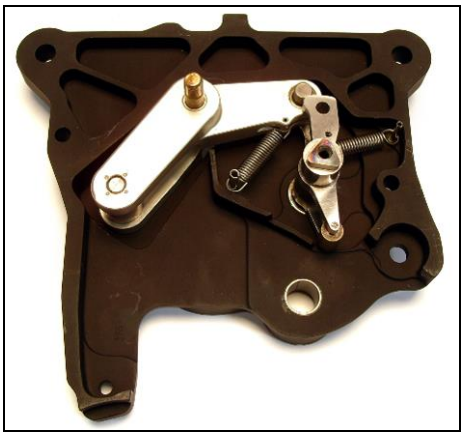
10.10 Pack the two camshaft bearings (5.6, 6.5) and the toggle cam roller bearing (3.8) with MIL-PRF-23827 type II grease (Aeroshell 7).



10.11 Place the cam assembly into the side plate. Install spring over the roll pin. Note cam assembly orientation. Triangular key should be pointing up as shown below

10.12 Place toggle assembly (3) into the side plate. Stretch toggle assembly spring over roll pin and insert toggle pivot bolt (28). Insert the cam roller pin (36) into the toggle assembly.

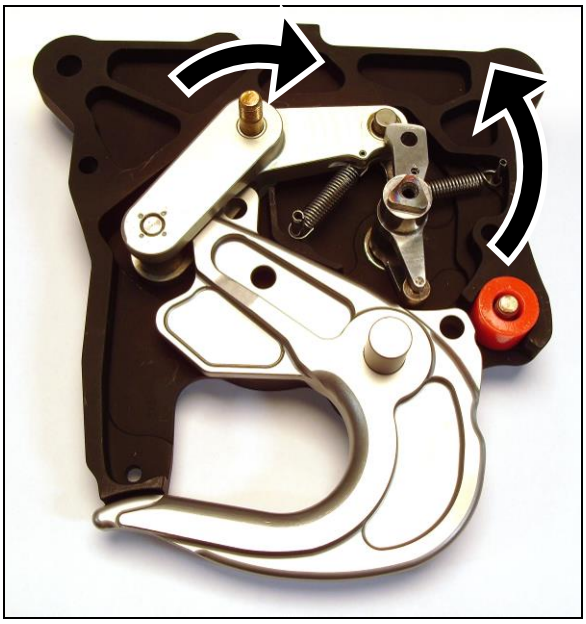




WARNING

Verify that the cam roller pin (36) is installed in the toggle assembly roller bearing, if the cam roller pin is not installed the Cargo hook will be damaged and not function.

10.13 Move the cam by hand to release the toggle as shown in the picture above. Holding the cam in this position, insert the load beam assembly (8) shaft into the solenoid side plate load beam pivot bearing (5.5).



10.14 Insert the bumper (35) into the solenoid side plate (5.1).

10.15 Check for and remove FOD, if present.

10.16 Install the manual side plate assembly (6) onto the solenoid side plate assembly (5).

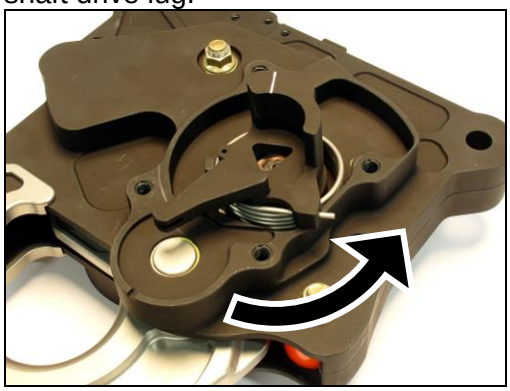
10.17 Install the toggle pivot bolt nut (19) and washer (22). Do not torque at this time.

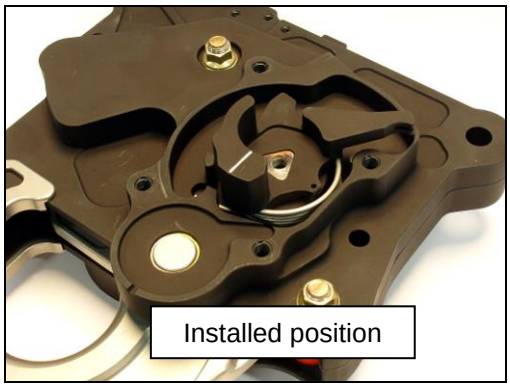
10.18 Install the bumper bolt (31), washer (22) and nut (19). Do not torque at this time.

10.19 Temporarily install two 7/16” bolts into the attachment holes for alignment. (Alignment bolts will be removed after torqueing all of the fasteners.)

10.20 Install the armor plates (12, 13) with bolt (32) and nut (20). Do not torque at this time.

10.21 Place the cam hub spring (34) onto the outside of the manual release side plate and install the cam hub knob (14) over it. One end of the spring is captured by a hole in the cam hub knob. You will need to clock the spring approximately 90 degrees by engaging it with the cam hub knob and rotating it to align with the cam shaft drive lug.





10.22 Install the cam hub knob bolt (26) and washer (30) using Loctite 242. Torque to 50-70 in-lbs. (5.6-7.9 N-M). Install lock wire between the bolt and the hole in the cam hub knob (14).

10.23 Thread the manual release cable assembly (10) into the manual release cable mount block (15) and the manual release cover (9.2).

10.24 Check for and remove FOD, if present.

10.25 For -00, -01, -02 & -03 configurations: Insert the manual release lever (9.1) into the manual release cover (9.2) and engage the release cable end ball shank with the release lever fork.

10.26 For -04, -05, -06, & -07 configurations: Position the manual release cover on the side plate while inserting the cable ball end of the manual release cable assembly into the fork on cam hub knob (14).

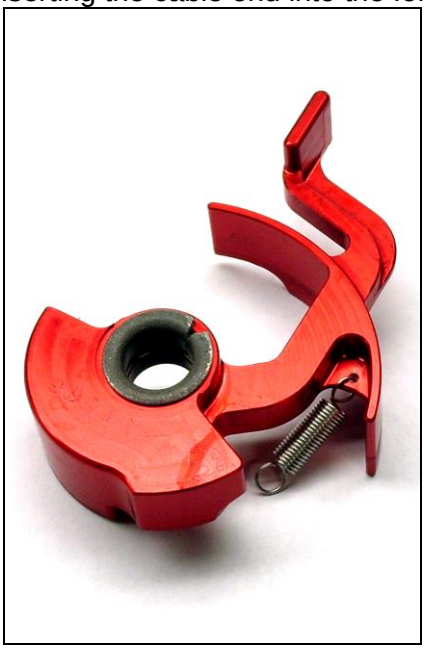
10.27 For -08, -10, -11, -12 and -14 configurations:

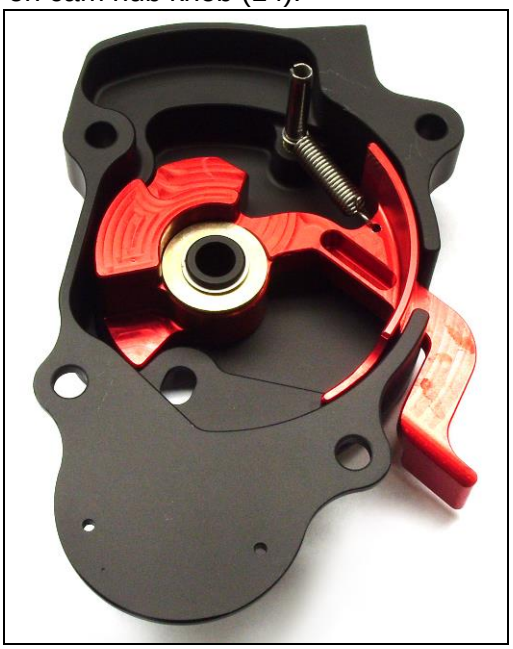
Install bushings (9.7) into manual release lever (9.1) using wet zinc chromate primer.

Attach spring (9.5) to the lever. Place the manual release lever into the cover (9.2) and secure with washer (9.3) and retaining ring (9.6).

Install roll pin (9.4) into the cover using wet zinc chromate primer and slip free end of spring over the roll pin.

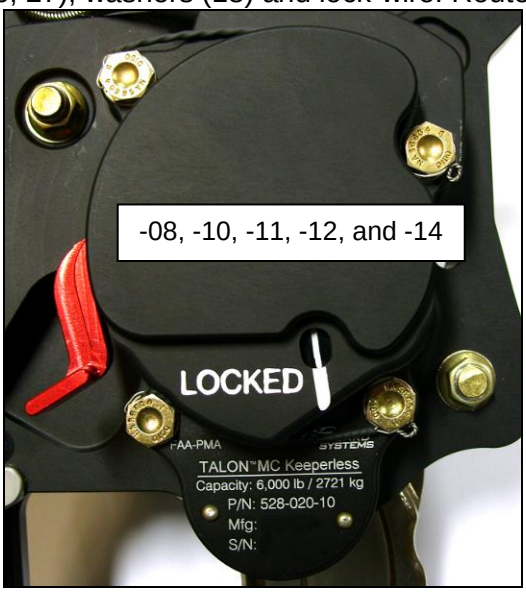
Then position the manual release assembly on the side plate while inserting the cable end into the fork on cam hub knob (14).

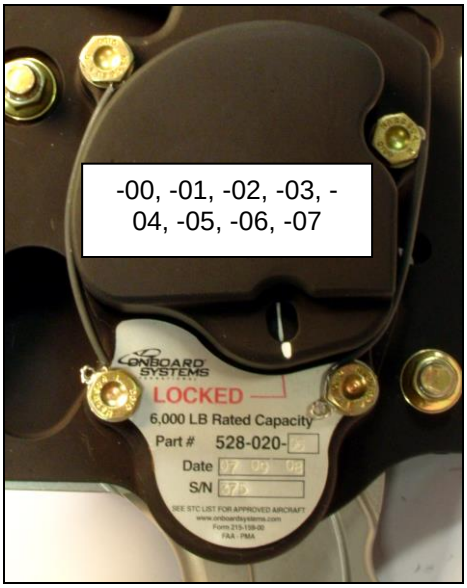




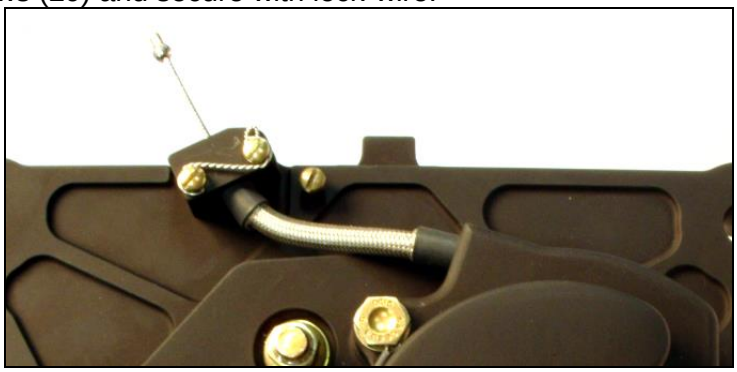
10.28 For configurations -08, -10, & -11: Install the S/N tag (2) onto the manual release cover (9.2) using two drive screws (33). For other configurations install serial plate without drive screws.

10.29 Secure the manual release cover onto the manual release side plate with the bolts (26, 27), washers (18) and lock-wire. Route lock-wire as shown below.





10.30 Install the manual release mount block (15) onto the manual side plate assembly (6) with screws (29) and secure with lock-wire.

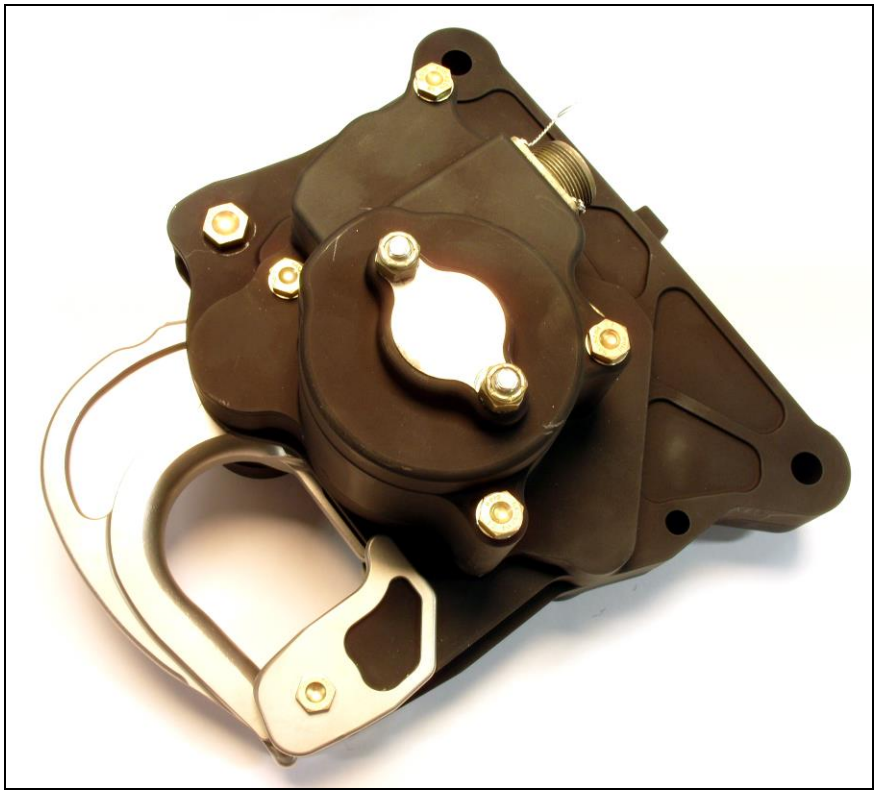


10.31 Install grounding screw (24).

10.32 On the solenoid side plate assembly (5), install the cam actuator (11) onto the end of the cam assembly with the cam actuator bolt (25), washer (16) using Loctite 242. Torque to 20-25 in-lbs (2.3-2.8 N-M) and lockwire bolt (25) to hole in cam actuator (11).

10.33 Check for and remove FOD, if present.

10.34 Install solenoid assembly (7) onto solenoid side plate assembly (5) with bolts (17, 21, and 23) and washers (18). Torque bolts to 50-70 in-lbs (5.6-7.9 N-M). The bolts on the solenoid cover are not lock-wired.



10.35 Install rigging warning decal (1). Burnish in place.

10.36 For -08, -10, & -11 configurations: Affix manual release warning label (39) and burnish in place.

10.37 Torque load beam bumper bolt (31) to 10-15 ft-lbs. (13-20 Nm).

10.38 Torque toggle pivot bolt (28) to 10-15 ft-lbs. (13-20 Nm).

10.39 Torque the armor plate bolt (32) to 50-70 in-lbs. (5.6-7.9 Nm).

10.40 Remove the 7/16” bolts temporarily installed for alignment purposes.

10.41 Actuate the cargo hook and check for free movement of the load beam assembly (8) when opening and closing.

10.42 If applicable, fill out and affix overhaul label (38). Burnish in place.

11.0 Acceptance Test Procedure

11.1 When the Cargo Hook is overhauled or the side plates (5 and 6) are separated, the Cargo Hook must be subjected to the following acceptance test procedure (ATP) before being returned to service.

11.2 Examine the cargo hook externally for security of the lock wire, cotter pins and fasteners.

11.3 Use an appropriate insulation resistance tester to test the resistance between each pin and the base of the connector. The readings should not be less than 2 mega-ohms.

11.4 For all configurations except 528-020-12 and -14 use a multi-meter to check resistance between pins B and C of the electrical connector. The reading should be 1.9 ± .3 ohms.

11.5 Suspend the cargo hook from a test rig that has a loading capacity of 15,000 pounds (6804 KG).

11.6 Ensure that the unit is correctly locked by observing that the hook-locked indicator inside the manual release cover is aligned or is to the right of the locked line.

11.7 With no load on the cargo hook, rotate the manual release lever (not present in -04, -05, or -06 configurations) or pull the manual release cable (-04, -05 or -06 configuration). The load beam should unlatch and fall open. Push the load beam closed and ensure that it is locked.

11.8 Connect an adjustable 22 – 28 VDC supply, with a momentary release switch wired into the positive wire, to the connector located on top of the solenoid housing. Connect the negative lead to pin C and the positive lead to pin B.

11.9 Check the electrical release function of the cargo hook.

For all configurations except -12 and -14 perform the following.

Press the release switch. The load beam should fall open and stay in the open position.

CAUTION

Damage to the cargo hook release solenoid can occur if the release switch is operated for more than 20 seconds continuously.

For only the -12 and -14 configurations perform the following.

NOTICE

The 528-020-12 and -14 cargo hooks include an electronic delay of approximately ½ second. It is necessary to press and hold the release switch.

Actuate the release switch very briefly without holding it down (less than ½ second). The load beam should remain closed and the mechanism should not audibly cycle.

Actuate and hold the release switch for a few seconds. The load beam should fall to the open position after approximately ½ second and then should continue to audibly cycle repeatedly.

11.10 Load a suitable load ring onto the load beam. Gradually proof-load the cargo hook with the test rig to 15,000 pounds (6804 KG). Hold the load for 1 minute. The load beam should hold the load without unlatching. Reduce the load to zero.

⚠ WARNING

Do not release the proof test load electrically or manually. Decrease the load gradually, using the test machine, after completion of the proof load test.

11.11 Load the cargo hook with a steel ring that is free to drop clear of the load beam. Use a spring scale or equivalent to measure the mechanical release cable force required to release the load on the cargo hook at 0, 500, 2000, 4000, and 6000 pounds (0, 227, 907, 1814, and 2721 KG). The mechanical release cable force shall be between 4 and 18 pounds (17.8 – 80 N).

CAUTION

Use of a nylon sling is not recommended for load release tests as recoil may cause damage to the cargo hook.

11.12 Set the power supply operating voltage to 22 VDC. Use a multi-meter to measure the current draw to release the load on the cargo hook at 0, 500, 2000, 4000, and 6000 pounds (0, 227, 907, 1814, and 2721 KG). The current draw shall be between 9 and 12 amps. For the -12 and -14 configurations hold the release switch for several seconds and verify the current is 1.6 to 2.6 amps.

11.13 End of acceptance test procedure.

11.14 For service at Onboard Systems, optionally use the following Onboard Systems factory acceptance test procedure(s):

Acceptance Test Procedure	**Applicable P/Ns**		
180-151-00	528-020-00	528-020-05	528-020-11
	528-020-01	528-020-06	528-020-12
	528-020-02	528-020-07	528-020-14
	528-020-03	528-020-08	
	528-020-04	528-020-10	

12.0 Troubleshooting

12.1 The following section lists symptoms and probable causes to aid in equipment troubleshooting.

Symptom	Probable Cause	Remedy
Failure to operate electrically.	Damaged or defective solenoid (7.5).	Check for proper resistance across connector pins B and C per section 11.3. Replace solenoid (7.5) as necessary.
	Damaged or loose wiring.	Check for proper continuity across connector pins B and C per section 11.3. Remove the Solenoid Assembly (7) and repair wiring.
	Release switch not held down long enough (-12 and -14 only).	Hold the release switch for a longer time. The -12 and -14 cargo hooks include a Surefire Module (7.12) which incorporates an electronic delay of approximately ½ second after which time the hook solenoid will activate repeatedly. If the release switch is not held down long enough the hook solenoid will not activate.
During the Acceptance Test Procedure, the manual release cable force exceeds requirements.	Friction in internal mechanism.	Check operation of unit using the manual release lever. Disassemble and inspect internal mechanism. Check all bearing joints for free movement. Check cam assembly (4) for denting/ damage. Check toggle roller and pin for denting/ damage. See figure 9.3. Replace as necessary.

13.0 Illustrated Parts List

Figure 13.1, Cargo Hook Parts

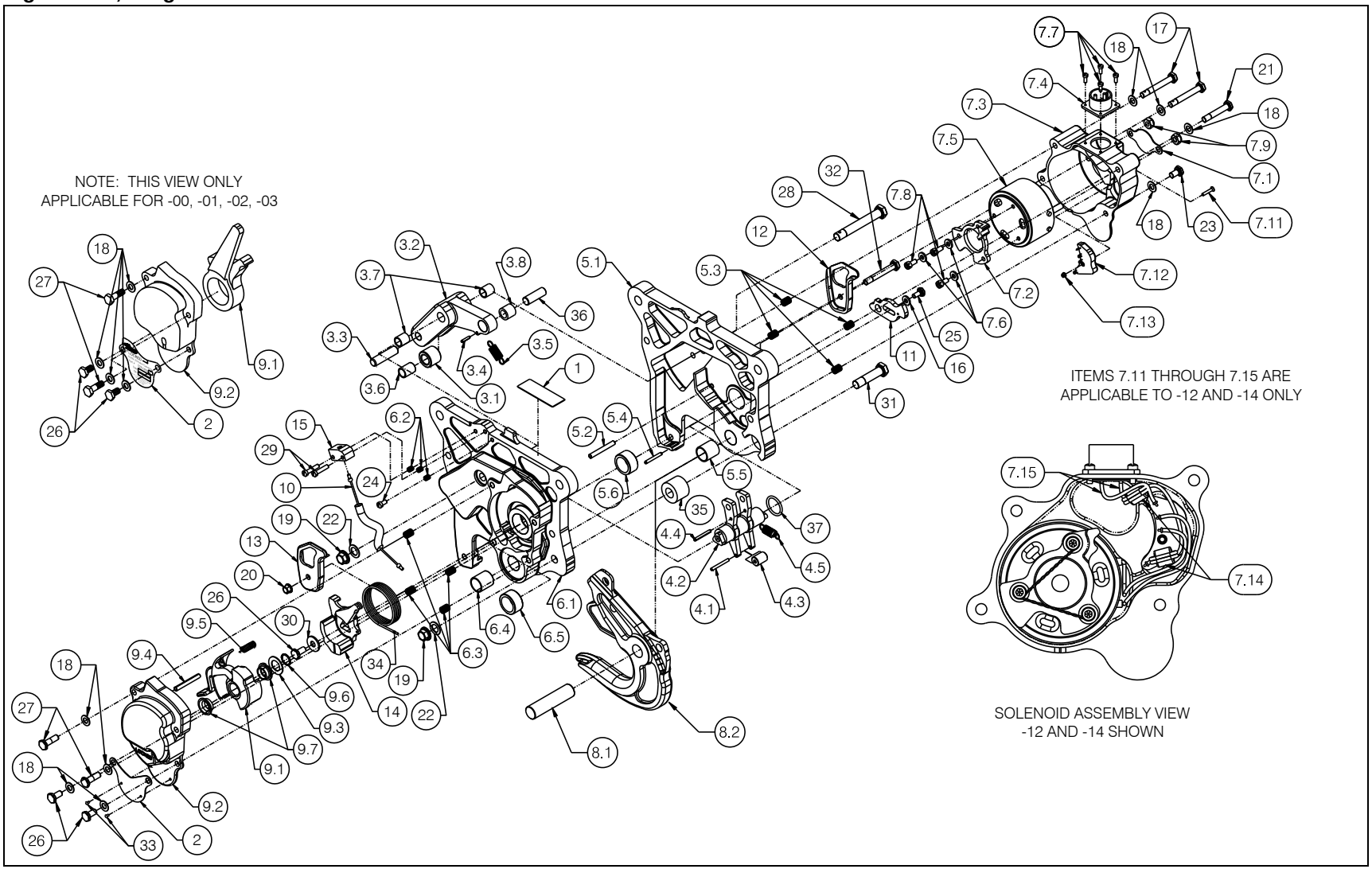


Table 13.1, Cargo Hook Parts

Item	Part No.	Description	QTY in 528-020-XX													Qty in O/H Kit P/N 212-011-00
			-00	-01	-02	-03	-04	-05	-06	-07	-08	-10	-11	-12	-14	
1	215-240-00	Rigging Warning Decal	1	1	1	1	1	1	1	1	1	1	1	1	1	1
2	215-159-00	Serial Number Plate	1	1	1	1	1	1	1	1	1	-	-	-	-	-
2	215-282-00	Serial Number Plate	-	-	-	-	-	-	-	-	-	1	-	1	-	-
2	215-283-00	Serial Number Plate	-	-	-	-	-	-	-	-	-	-	1	-	1	-
3[1]	232-064-01	Toggle Assembly	1	1	1	1	1	1	1	1	1	1	1	1	1	-
3.1	290-379-00	Load Beam Roller	1	1	1	1	1	1	1	1	1	1	1	1	1	-
3.2	290-509-01	Toggle	1	1	1	1	1	1	1	1	1	1	1	1	1	-
3.3	290-520-00	Load Beam Roller Pin	1	1	1	1	1	1	1	1	1	1	1	1	1	-
3.4	510-203-00	Roll Pin	1	1	1	1	1	1	1	1	1	1	1	1	1	1
3.5	514-021-00	Spring	1	1	1	1	1	1	1	1	1	1	1	1	1	1
3.6	517-015-00	Bushing	1	1	1	1	1	1	1	1	1	1	1	1	1	-
3.7	517-016-00	Bushing	2	2	2	2	2	2	2	2	2	2	2	2	2	2
3.8	517-028-00	Bearing	1	1	1	1	1	1	1	1	1	1	1	1	1	1
4[1]	232-066-00	Cam Assembly	1	1	1	1	1	1	1	1	1	1	1	1	1	1
4.1	290-392-00	Interlock Pin	1	1	1	1	1	1	1	1	1	1	1	1	1	-
4.2	290-510-00	Cam	1	1	1	1	1	1	1	1	1	1	1	1	1	-
4.3	290-533-01	Interlock Roller	1	1	1	1	1	1	1	1	1	1	1	1	1	-
4.4	510-249-00	Roll Pin	1	1	1	1	1	1	1	1	1	1	1	1	1	-
4.5	514-008-00	Spring	1	1	1	1	1	1	1	1	1	1	1	1	1	-
5[1]	232-067-02	Side Plate Assembly, Solenoid	1	-	-	-	1	-	-	-	-	-	-	-	-	-
5[1]	232-067-03	Side Plate Assembly, Solenoid, Narrow Mount	-	1	-	-	-	1	-	-	-	-	-	-	-	-
5[1]	232-067-04	Side Plate Assembly, Solenoid	-	-	1	-	-	-	1	-	1	1	-	1	-	-
5[1]	232-067-05	Side Plate Assembly, Solenoid, Narrow Mount	-	-	-	1	-	-	-	1	-	-	1	-	1	-
5.1	290-514-03	Side Plate, Solenoid	1	-	-	-	1	-	-	-	-	-	-	-	-	-
5.1	290-514-04	Side Plate, Solenoid	-	-	1	-	-	-	1	-	1	1	-	1	-	-
5.1	290-608-01	Side Plate, Solenoid, Narrow	-	1	-	-	-	1	-	-	-	-	-	-	-	-
5.1	290-608-02	Side Plate, Solenoid, Narrow	-	-	-	1	-	-	-	1	-	-	1	-	1	-
5.2	510-250-00	Roll Pin	1	-	1	-	1	-	1	-	1	1	-	1	-	1

Item	Part No.	Description	QTY in 528-020-XX													Qty in O/H Kit P/N 212-011-00
			-00	-01	-02	-03	-04	-05	-06	-07	-08	-10	-11	-12	-14	
5.3	510-307-00	Helicoil	4	4	4	4	4	4	4	4	4	4	4	4	4	4
5.4	510-310-00	Roll Pin	1	-	1	-	1	-	1	-	1	1	-	1	-	1
5.5	517-017-00	Bushing	1	1	1	1	1	1	1	1	1	1	1	1	1	1
5.6	517-026-00	Bearing	1	1	1	1	1	1	1	1	1	1	1	1	1	1
6[1]	232-068-02	Side Plate Assembly, Manual	1	-	-	-	1	-	-	-	-	-	-	-	-	-
6[1]	232-068-03	Side Plate Assembly, Manual, Narrow Mount	-	1	-	-	-	1	-	-	-	-	-	-	-	-
6[1]	232-068-04	Side Plate Assembly, Manual	-	-	1	-	-	-	1	-	1	1	-	1	-	-
6[1]	232-068-05	Side Plate Assembly, Manual, Narrow Mount	-	-	-	1	-	-	-	1	-	-	1	-	1	-
6.1	290-515-03	Side Plate, Manual	1	-	-	-	1	-	-	-	1	-	-	-	-	-
6.1	290-515-04	Side Plate, Manual	-	-	1	-	-	-	1	-	-	1	-	1	-	-
6.1	290-609-01	Side Plate, Manual, Narrow Mount	-	1	-	-	-	1	-	-	-	-	-	-	-	-
6.1	290-609-02	Side Plate, Manual, Narrow Mount	-	-	-	1	-	-	-	1	-	-	1	-	1	-
6.2	510-210-00	Helicoil	3	3	3	3	3	3	3	3	3	3	3	3	3	3
6.3	510-307-00	Helicoil	4	4	4	4	4	4	4	4	4	4	4	4	4	4
6.4	517-017-00	Bushing	1	1	1	1	1	1	1	1	1	1	1	1	1	1
6.5	517-026-00	Bearing	1	1	1	1	1	1	1	1	1	1	1	1	1	1
7[1]	232-076-01	Solenoid Assembly	1	1	-	-	1	1	-	-	1	-	-	-	-	-
7[1]	232-076-02	Solenoid Assembly	OPT	OPT	1	1	OPT	OPT	1	1	OPT	1	1	-	-	-
7[1]	232-076-03	Solenoid Assembly	-	-	-	-	-	-	-	-	-	-	-	1	1	-
7.1	235-094-00	Wear Plate	1	1	1	1	1	1	1	1	1	1	1	1	1	-
7.2	290-512-01	Solenoid Actuator	1	1	1	1	1	1	1	1	1	1	1	1	1	-
7.3	290-513-01	Solenoid Cover	1	1	-	-	1	1	-	-	1	-	-	-	-	-
7.3	290-513-02	Solenoid Cover	-	-	1	1	-	-	1	1	-	1	1	-	-	-
7.3	290-513-03	Solenoid Cover	-	-	-	-	-	-	-	-	-	-	-	1	1	-
7.4	410-132-00	Connector	1	1	1	1	1	1	1	1	1	1	1	1	1	-
7.5	455-004-00	Solenoid	1	1	1	1	1	1	1	1	1	1	1	1	1	-
7.6	510-042-00	Washer	3	3	3	3	3	3	3	3	3	3	3	3	3	3
7.7	510-132-00	Screw	4	4	4	4	4	4	4	4	4	4	4	4	4	4

Item	Part No.	Description	QTY in 528-020-XX													Qty in O/H Kit P/N 212-011-00
			-00	-01	-02	-03	-04	-05	-06	-07	-08	-10	-11	-12	-14	
7.8	510-156-00	Screw	3	3	3	3	3	3	3	3	3	3	3	3	3	3
7.9	510-246-00	Nut	2	2	2	2	2	2	2	2	2	2	2	2	2	2
7.10[3]	510-100-00	Washer	2	2	-	-	2	2	-	-	2	-	-	-	-	-
7.11	511-118-00	Screw	-	-	-	-	-	-	-	-	-	-	-	1	1	1
7.12	232-727-00	Surefire Module	-	-	-	-	-	-	-	-	-	-	-	1	1	-
7.13	510-922-00	Nut	-	-	-	-	-	-	-	-	-	-	-	1	1	1
7.14	420-088-00	22 Ga. Wire	-	-	-	-	-	-	-	-	-	-	-	AR	AR	-
7.15	320-028-00	Ferrite Cable Core	-	-	-	-	-	-	-	-	-	-	-	2	2	-
8[1]	232-069-00	Load Beam Assembly	1	1	1	1	1	1	OPT	OPT	1	-	OPT	-	OPT	-
8[1]	232-447-00	Load Beam Assembly	OPT	OPT	OPT	OPT	OPT	OPT	1	1	OPT	1	1	1	1	-
8.1	290-538-00	Load Beam Shaft	1	1	1	1	1	1	1	1	1	1	1	1	1	-
8.2	290-534-02	Load Beam	1	1	1	1	1	1	OPT	OPT	1	-	OPT	-	OPT	-
8.2	291-474-00	Load Beam	OPT	OPT	OPT	OPT	OPT	OPT	1	1	OPT	1	1	1	1	-
9[1,4]	232-506-00	Cover and Lever Assembly	-	-	-	-	-	-	-	-	1	1	1	1	1	-
9.1	290-536-01	Lever	1	1	1	1	-	-	-	-	-	-	-	-	-	-
9.1	291-658-00	Lever	-	-	-	-	-	-	-	-	-	1	-	1	-	-
9.2	290-537-01	Manual Release Cover	1	1	-	-	-	-	-	-	-	-	-	-	-	-
9.2	290-537-02	Manual Release Cover	OPT	OPT	1	1	-	-	-	-	-	-	-	-	-	-
9.2	290-537-03	Manual Release Cover	-	-	-	-	1	1	1	1	-	-	-	-	-	-
9.2	291-659-00	Manual Release Cover	-	-	-	-	-	-	-	-	1	1	1	1	1	-
9.3	510-183-00	Washer	-	-	-	-	-	-	-	-	1	1	1	1	1	-
9.4	510-250-00	Roll Pin	-	-	-	-	-	-	-	-	1	1	1	1	1	-
9.5	514-076-00	Spring	-	-	-	-	-	-	-	-	1	1	1	1	1	-
9.6	515-010-00	Spiral Retaining Ring	-	-	-	-	-	-	-	-	1	1	1	1	1	-
9.7	517-036-00	Flanged Bearing	-	-	-	-	-	-	-	-	2	2	2	2	2	-
10	268-016-00	Cable Assembly	1	1	1	1	1	1	1	1	1	1	1	1	1	1
11	290-511-01	Cam Actuator	1	1	1	1	1	1	1	1	1	1	1	1	1	-
12	290-516-00	Armor Plate, Solenoid	1	1	1	1	1	1	1	1	1	1	1	1	1	-
13	290-517-00	Armor Plate, Manual	1	1	1	1	1	1	1	1	1	1	1	1	1	-
14	290-521-02	Cam Hub Knob	1	1	1	1	-	-	-	-	-	-	-	-	-	-
14	290-521-03	Cam Hub Knob	-	-	-	-	1	1	1	1	1	1	1	1	1	-
15	290-539-00	Cable Mount Block	1	1	1	1	1	1	1	1	1	1	1	1	1	-
16	510-042-00	Washer	1	1	1	1	1	1	1	1	1	1	1	1	1	1

Item	Part No.	Description	QTY in 528-020-XX													Qty in O/H Kit P/N 212-011-00
			-00	-01	-02	-03	-04	-05	-06	-07	-08	-10	-11	-12	-14	
17	510-099-00	Bolt	2	2	2	2	2	2	2	2	2	2	2	2	2	2
18	510-100-00	Washer	8	8	8	8	8	8	8	8	8	8	8	8	8	8
19	510-129-00	Nut	2	2	2	2	2	2	2	2	2	2	2	2	2	2
20	510-227-00	Nut	1	1	1	1	1	1	1	1	1	1	1	1	1	1
21	510-230-00	Bolt	1	1	1	1	1	1	1	1	1	1	1	1	1	1
22	510-238-00	Washer	2	2	2	2	2	2	2	2	2	2	2	2	2	2
23	510-244-00	Bolt	1	1	1	1	1	1	1	1	1	1	1	1	1	1
24	510-251-00	Screw	1	1	1	1	1	1	1	1	1	1	1	1	1	1
25	510-257-00	Bolt	1	1	1	1	1	1	1	1	1	1	1	1	1	1
26	510-258-00	Bolt	3	3	3	3	3	3	3	3	3	3	3	3	3	3
27	510-290-00	Bolt	2	2	2	2	2	2	2	2	2	2	2	2	2	2
28	510-306-00	Bolt	1	1	1	1	1	1	1	1	1	1	1	1	1	1
29	510-311-00	Screw	2	2	2	2	2	2	2	2	2	2	2	2	2	2
30	510-312-00	Washer	1	1	1	1	1	1	1	1	1	1	1	1	1	1
31	510-313-00	Bolt	1	1	1	1	1	1	1	1	1	1	1	1	1	1
32	510-322-00	Bolt	1	1	1	1	1	1	1	1	1	1	1	1	1	1
33	510-940-00	Drive Screw	-	-	-	-	-	-	-	-	2	2	2	2	2	-
34	514-019-00	Spring	1	1	1	1	1	1	1	1	1	1	1	1	1	1
35	514-022-00	Bumper	1	1	1	1	1	1	1	1	1	1	1	1	1	1
36	517-027-00	Cam Roller Pin	1	1	1	1	1	1	1	1	1	1	1	1	1	1
37	556-032-00	O-Ring	1	1	-	-	1	1	-	-	1	-	-	-	-	-
38[2]	215-260-00	Overhaul Label	-	-	-	-	-	-	-	-	-	-	-	-	-	1
39[2]	215-318-00	Warning Label – Manual Release	-	-	-	-	-	-	-	-	1	1	1	1	1	1

[1] Items not illustrated as assemblies

[2] Item not shown.

[3] Used in place of Wear Plate (7.1) on hook configurations indicated. Do not use if Wear Plate (7.1) is present.

[4] The Release Lever Assembly (P/N 232-506-00) design of cargo hook P/N 528-020-10 can be retrofitted to other eligible cargo hook P/Ns (see tables below for eligible P/Ns) by removing the existing Manual Release Cover (9.2) and Cable Assembly (10) and installing a Release Lever Upgrade Kit (includes Release Lever Assembly P/N 232-506-00, Cable Assembly (10), and serial plate installed with drive screws) per the instructions below. Refer to applicable kit Owner's Manual for instructions for removal of the cargo hook from the suspension system

- Remove the Cable Assembly (10), Mount Block (15) and the Manual Release Cover (9.2) from the hook. Unthread the Mount Block from the Cable Assembly. Thread the mount block onto the end of the new Cable Assembly.
- Re-assemble the components onto the hook per Section 10.0.
- Stamp the new P/N (per the table below), the original manufacture date and S/N of the hook in the spaces provided on the Serial Number plate.
- Refer to applicable kit Owner's Manual for instructions for re-installation on the suspension and for Cable Assembly rigging and adjustment.

Eligible P/N	Upgrade Kit P/N	Cargo Hook P/N after upgrade
528-020-04	232-613-00	528-020-08
528-020-06	232-613-00	528-020-10
528-020-07	232-613-01	528-020-11

For cargo hook P/Ns 528-020-00, 528-020-02, and 528-020-03 the P/N 290-521-03 cam hub knob must be installed with the Release Lever Upgrade Kit.

- Remove the existing manual release cover (9.2), lever (9.1) and cam hub knob (14) and install the cam hub knob P/N 290-521-03 and Release Lever Upgrade Kit P/N 232-613-00 per the instructions above and Section 10.0.
- Stamp the new P/N (per the table below), the original manufacture date and S/N of the hook in the spaces provided on the Serial Number plate.
- Refer to applicable kit Owner's Manual for instructions for re-installation on the suspension system and manual release cable adjustment.

Eligible P/N	P/N's Req'd for Lever Upgrade	Cargo Hook P/N after upgrade
528-020-00	232-613-00, 290-521-03	528-020-08
528-020-02	232-613-00, 290-521-03	528-020-10
528-020-03	232-613-01, 290-521-03	528-020-11

Table 13.2 provides an overview and history of the cargo hook part numbers listed in Table 13.1.

Table 13.2 Cargo Hook Configurations and History

Cargo Hook P/N	Year Mfg. Started	Release Lever	Narrow Mount	New Side Plate	STC	Comments
528-020-00	1999	Yes	No	No	Yes	Out of production (refer to Service Bulletin 159-010-00), see -04.
528-020-01	1999	Yes	Yes	No	No	Out of production (refer to Service Bulletin 159-010-00), see -05.
528-020-02	2002	Yes	No	Yes	Yes	Out of production (refer to Service Bulletin 159-010-00), see -06.
528-020-03	2002	Yes	Yes	Yes	No	Out of production (refer to Service Bulletin 159-010-00), see -07.
528-020-04	2003	No	No	No	Yes	Reconfigured -00. Can update to -08 with 232-613-00.
528-020-05	2003	No	Yes	No	No	Reconfigured -01.
528-020-06	2003	No	No	Yes	Yes	Can update to -10 with 232-613-00.
528-020-07	2003	No	Yes	Yes	No	Can update to -11 with 232-613-01.
528-020-08	2012	Yes	No	No	Yes	Updated -04.
528-020-10	2011	Yes	No	Yes	Yes	New sales or updated -06.
528-020-11	2012	Yes	Yes	Yes	No	New sales or updated -07.
528-020-12	2015	Yes	No	Yes	Yes	Same as -10 except with Surefire electrical release option.
528-020-14	2015	Yes	Yes	Yes	No	Same as -11 except with Surefire electrical release option.

Configuration History:

-00 & -01 were replaced by -02 & -03. Revised Side plates.

-00, -01, -02 & -03 were replaced by -04, -05, -06 & -07. No manual release lever (Service Bulletin 159-010-00).

-04, -06 & -07 were replaced by -08, -10 & -11. New manual release lever.

14.0 Instructions for Returning Equipment to the Factory

14.1 If an Onboard Systems product must be returned to the factory for any reason (including returns, service, repairs, overhaul, etc.) obtain an RMA number before shipping your return.

NOTICE

An RMA number is required for all equipment returns.

- To obtain an RMA, please use one of the listed methods.
    - Contact Technical Support by phone or e-mail (Techhelp@OnboardSystems.com).
    - Generate an RMA number at our website: http://www.onboardsystems.com/rma.php
- After you have obtained the RMA number, please be sure to:
    - Package the component carefully to ensure safe transit.
    - Write the RMA number on the outside of the box or on the mailing label.
    - Include the RMA number and reason for the return on your purchase or work order.
    - Include your name, address, phone and fax number and email (as applicable).
    - Return the components freight, cartage, insurance and customs prepaid to:

      Onboard Systems International
      13915 NW 3rd Court
      Vancouver, Washington 98685
      USA
      Phone: 360-546-3072