Owner's Manual
BK117 C-2, D-2, & D-3
Airbus Helicopters
Cargo Hook Sling System

System Part Numbers

200-361-00	***232-439-01***
210-095-00	***232-626-10***
210-243-00	***232-713-00***
210-299-00	***232-713-01***
232-347-00	***232-712-00***
232-347-01	***232-712-01***
232-439-00	

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RECORD OF REVISIONS

Revision	*Date*	*Page(s)*	*Reason for Revision*
0	01/18/10	All	First Issue
1	06/07/10	2-2, 6-3, 6-4	Revised manual release cable installation instructions based on in-house evaluation of prototype. Added spiral wrap P/N 590-013-00 to System Part Numbers section.
2	06/09/15	Extensively Revised	Added BK117 D-2 Cargo Hook Sling P/N's 232-626-10, 232-713-00, 232-712-00, & 210-299-00. Replaced 510-220-00 cotter pin with 510-113-00.
3	10/13/21	5-2, 5-3	Added note that a slight misalignment between 510-704-00 & 291-272-00 is acceptable. Updated definition of "hours of external load operations".
4	01/13/22	Extensively Revised	Added 232-347-01, 232-439-01, 232-712-01 & 232-713-01. Removed redundant P/Ns where a description would suffice.
5	02/11/22	2-9	Updated Figure 2.2.11 (Installing Safety Cable on Screws)

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CONTENTS

Section 1
General Information

Introduction

This manual provides installation, operation, and maintenance instructions for the following sling cargo hook system components as installed on the BK117 C-2 (EC145) and BK117 D-2 & D-3 (EC145T2) model helicopters.

	Part No.	Description
BK117 C-2	232-347-00	Cargo Hook Suspension Assembly w/o Load Weigh
	232-347-01	Cargo Hook Suspension Assembly w/o Load Weigh
	232-439-00	Cargo Hook Suspension Assembly w/ Load Weigh*
	232-439-01	Cargo Hook Suspension Assembly w/ Load Weigh*
	200-361-00	Fixed Manual Release Cable Installation Kit
	210-243-00	Load Cell Assembly*
BK117 D-2 & D3	232-626-10	Master Cylinder with Plumbing - Single
	210-299-00	Load Cell Assembly*
BK117 D-2	232-712-00	Hydraulic Suspension System w/ Load Weigh*
	232-713-00	Hydraulic Suspension System w/o Load Weigh
BK117 D-3	232-712-01	Hydraulic Suspension System w/ Load Weigh*
	232-713-01	Hydraulic Suspension System w/o Load Weigh
Common	210-095-00	C-39 Load Weigh Indicator*

*Optional Equipment

Cargo Hook Suspension Assembly w/o Load Weigh includes the cargo hook, a load-on-hook assembly, the external manual release cable and electrical harness, a ground strap, and four load ropes which attach to the helicopter hard points. The load-on-hook assembly includes a switch which when in the closed position provides for illumination of an advisory light in the cockpit that a load of less than 11 lb (5 kg) is on the hook.

Cargo Hook Suspension Assembly w/ Load Weigh is an optional assembly that can be installed instead. It is the same as the Cargo Hook Suspension Assembly w/o Load Weigh except it includes the load cell assembly in place of a hook link assembly. When installed with the C-39 Load Weigh Indicator and an internal electrical wiring harness (not included in this manual) the system provides the pilot with an indication of the weight of the load being carried on the cargo hook. The 210-243-00 load cell assembly may also be installed as a field retrofit.

The Fixed Manual Release Cable Installation Kit includes the release lever assembly mounted to the collective, the junction fitting to connect to the external manual release cable, and support brackets to mount the junction fitting to the interface plate on the belly of the helicopter.

Hydraulic Suspension System w/o Load Weigh includes the cargo hook, the load-on-hook assembly, the external hydraulic line and electrical harness, a ground strap, and four load ropes which attach to the helicopter hard points.

Hydraulic Suspension System w/ Load Weigh is an optional assembly that can be installed instead. It is the same as the Hydraulic Suspension System w/o Load Weigh except it includes the load cell assembly (210-299-00) in place of a hook link assembly. When installed with the C-39 Load Weigh Indicator (210-095-00) and an internal electrical wiring harness (not included in this manual) the system provides the pilot with an indication of the weight of the load being carried on the cargo hook. The 210-299-00 load cell assembly may also be installed as a field retrofit.

The systems include the removable provisions of the Primary Quick Release System (PQRS) that is electrically operated. These provisions interface with the helicopters existing PQRS fixed provisions including a momentary switch that is operated by the pilot to release the load on the cargo hook. A Backup Quick Release System (BQRS) is available to release the hook should the PQRS fail to operate. The BQRS uses either Bowden cable (BK117 C-2) or a hydraulic system (BK117 D-2/D-3). A lever is mounted on the pilot collective control tube. In the case of the hydraulic system, to prevent unintended release, the system features a Dual Action Device (DAD) in the form of a Lever Lockout mechanism. A tab extending under the port side of the lever must first be moved down; and then the lever may be actuated.

Fixed provisions as provided by Airbus Helicopters are required to complete the installation. These include the internal electrical wiring including the momentary switch, the landing gear modification which installs the hard points for the cable suspension, and other components.

Explanation of Signal Words and Symbols

The following definitions apply to the symbols used throughout this manual to draw the reader's attention to safety instructions as well as other important messages.

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.

Specifications

Table 1.2 Suspension System Specifications (232-347-00, 232-347-01, 232-439-00, 232-439-01, 232-712-00, 232-712-01, 232-713-00, & 232-713-01)

Design load	3,307 lbs. (1,500 kg.)
Design ultimate strength	12,401 lbs. (5,625 kg.)
Load-on-hook actuation force	11 lbs – 13 lbs (5 – 5.9 kg)
Electrical connector	MS3456L14S-7P

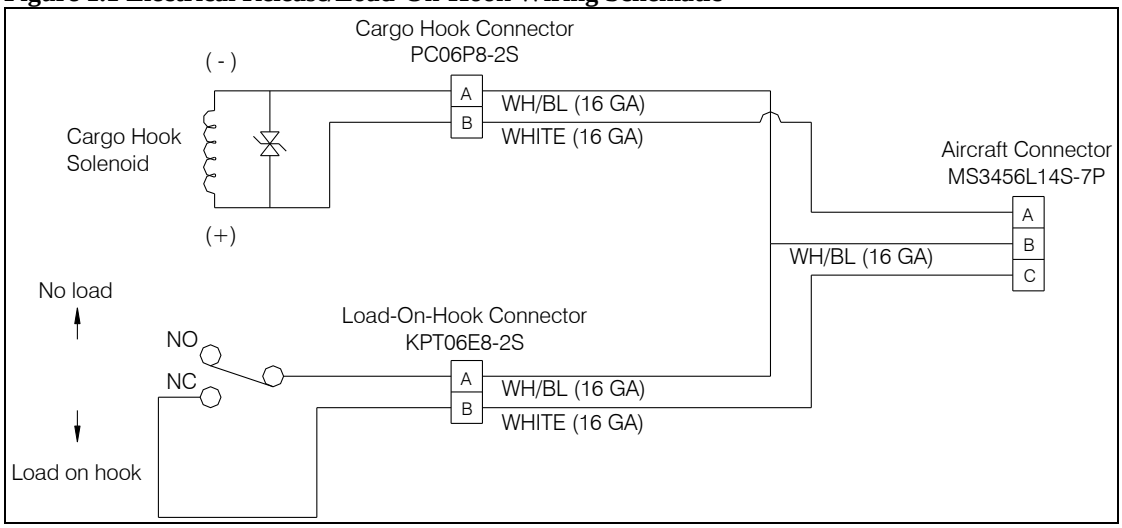
Table 1.3 Cargo Hook Specifications (528-029-60 & 528-028-57)

Design load	3,600 lbs. (1,632 kg.)
Design ultimate strength	13,500 lbs. (6,123 kg.)
Electrical release capacity	9,000 lbs. (4,082 kg.)
Mechanical release capacity	9,000 lbs. (4,082 kg.)
Force required for mechanical release at 3,600 lb.	8 lbs. max. (.60" travel)
Electrical requirements	22-32 VDC 6.9 - 10 amps
Minimum release load	0 lbs.
Unit weight	3.0 lbs (1.35 kg.)
Electrical connector	PC07A-8-2P (528-029-60)
	PC04A-8-2P (528-028-57)

Table 1.4 Indicator Specifications (210-095-00)

Size	Fits standard 2¼" clock hole
Weight	.47 lbs (.21 kg)
Operating Voltage	21 to 31 VDC
Current Consumption	< 25 mA
Accuracy Over Operating Temperature Range	0.1% ± 1 digit
Operating Temperature Range	+70°C to –45°C
Storage Temperature Range	+80°C to –50°C
Scaleable Analog Output	0 to 5VDC ± 0.5%

Figure 1.1 Electrical Release/Load-On-Hook Wiring Schematic



Section 2
Installation Instructions

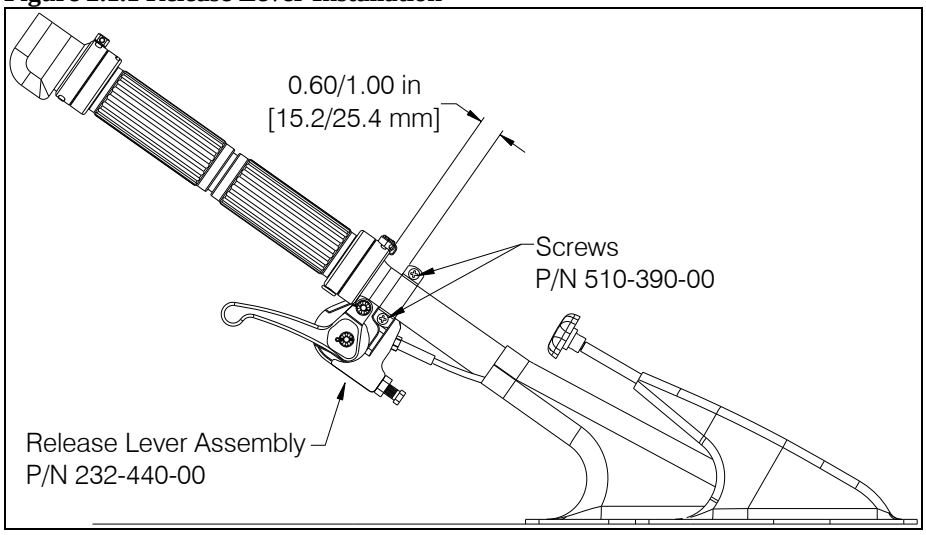
These procedures are provided for the benefit of experienced aircraft maintenance facilities capable of carrying out the procedures. Those lacking the necessary expertise must not attempt them.

2.1 BK117 C-2 Manual Release Cable Installation

The manual release cable installation consists of installing the release lever onto the collective, routing the cable to an existing interface plate on the belly of the helicopter, and securing it to the interface plate with provided brackets.

The release lever (232-440-00) is mounted to the collective shaft using the two screws (510-390-00) provided pre-assembled onto the clamp. Refer to Eurocopter instructions for precautions on the amount of tightening of the clamp onto the collective shaft.

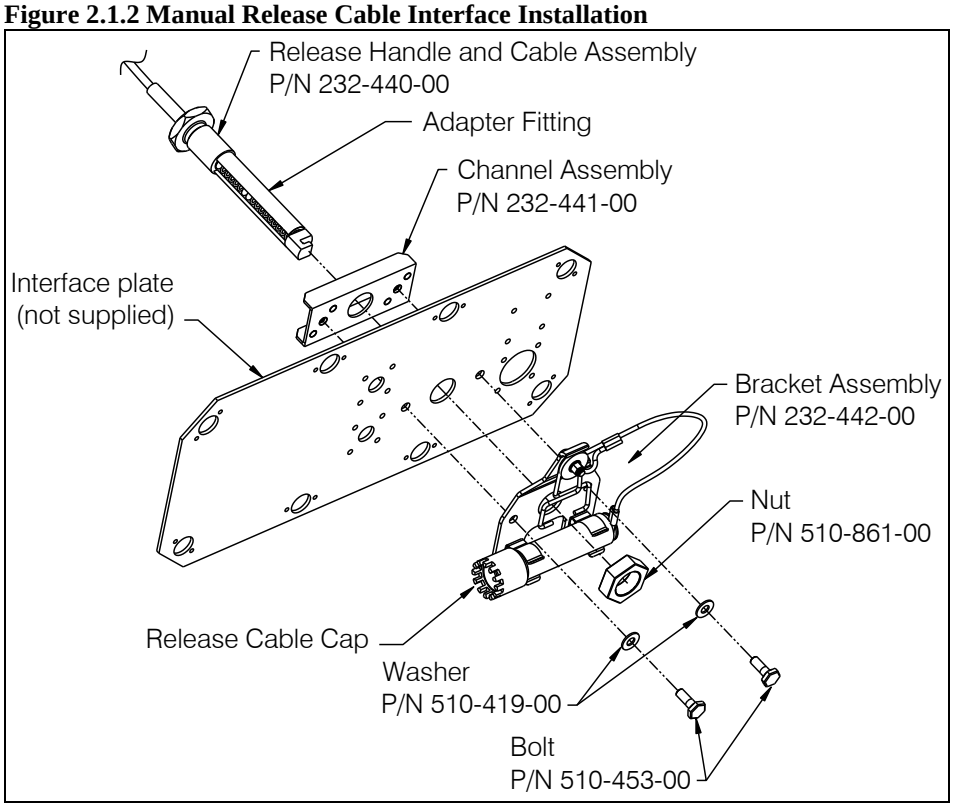
Figure 2.1.1 Release Lever Installation



Route the release cable through the aircraft structure, down to the interface plate at the belly of the helicopter. Secure the release cable as necessary to prevent interference with flight controls and to prevent contact with chafing points.

At the interface plate, insert the end of the manual release cable through the Channel Assembly (232-441-00) and interface plate.

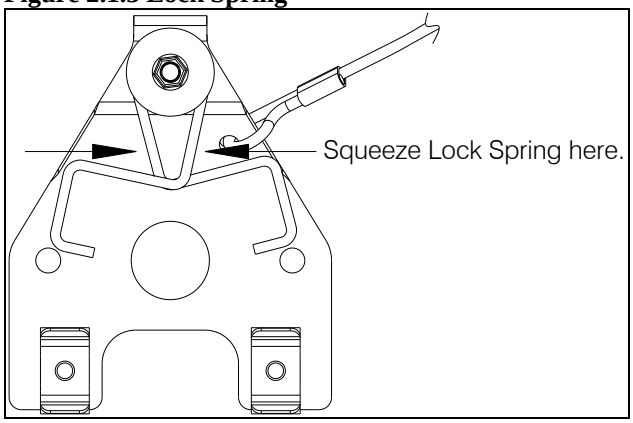
Figure 2.1.2 Manual Release Cable Interface Installation



Place the Bracket Assembly over the end of the manual release cable assembly adapter fitting. Insert adapter fitting through the interface plate and through the hole in the Bracket Assembly. Squeeze the Lock Spring together as shown below with pliers to aid in inserting the adapter fitting through. Secure this assembly with bolts (510-453-00) and washers (510-419-00). Tighten bolts to 20-25 in-lbs (226-282 N-cm).

Remove the Release Cable Cap from its clips to provide improved access and squeeze the Lock Spring to allow 8mm nut (510-861-00) to be threaded on.

Figure 2.1.3 Lock Spring



2.2 BK117 D-2 & D-3 Master Cylinder Assembly w/ Plumbing Installation

Mount the dry break coupler at the end of the master cylinder hydraulic line to the interface plate (on the underside of the fuselage) with the included nut. Torque to 10-13 N m (7-10 ft lb). If line needs to be opened, re-torque to 8-11.5 N m (6-8.5 ft lb).

Secure the hydraulic line to the airframe with cushioned loop clamps below the cockpit floor. Do not secure the line to the collective tube at this time.

Separate the master cylinder assembly and clamp by removing the two socket-head mounting screws holding them together.

Place an absorbent towel in the work area under the master cylinder.

The slave cylinder section from the cargo hook to the dry break coupler is supplied filled with hydraulic fluid and bled. The internal cockpit section including the reservoir at the release lever assembly is supplied empty.

The bleeding process back feeds hydraulic fluid through the system from the interface plate dry break up to the master cylinder. The process will require two people.

To ensure no air is trapped during the bleeding process the hydraulic line must be routed with a gradual upward slope with no high or low spots.

Prepare the master cylinder. Remove the two shoulder screws (511-124-00) retaining the reservoir lid (291-852-00), set the aluminum protective plate aside (this plate is for shipping purposes only), and then re-install the reservoir lid with the shoulder screws. Verify that baffle/fluid level indicator plate is in position. Torque shoulder screws to 0.6 nm (5 in-lb) maximum.

Using bleed kit P/N 212-034-00, fill the syringe with fluid.

Figure 2.2.1 Bleed Kit 212-034-00

Connect the female end of the dry break coupler of the bleed kit to the dry break coupler at the interface plate.

Hold the master cylinder on its side so the head of the banjo bolt (internally relieved bolt) is on the down side as shown in the figure below. Slowly push on the syringe plunger to force fluid up to the master cylinder reservoir. Take care to orient the syringe downward so no air is injected.

There will be some resistance during filling—this is normal. As soon as fluid begins to enter the reservoir turn the master cylinder upright. During the filling operation tap the master cylinder to loosen air bubbles that may be stuck inside the passage ways. Take care not to allow the vent hole to get below the level of the fluid so it doesn't spill. Slowly operate the lever a few times to help the forward portion of the piston chamber to fill. The dowel pin (511-040-00) must be temporarily inserted for this.

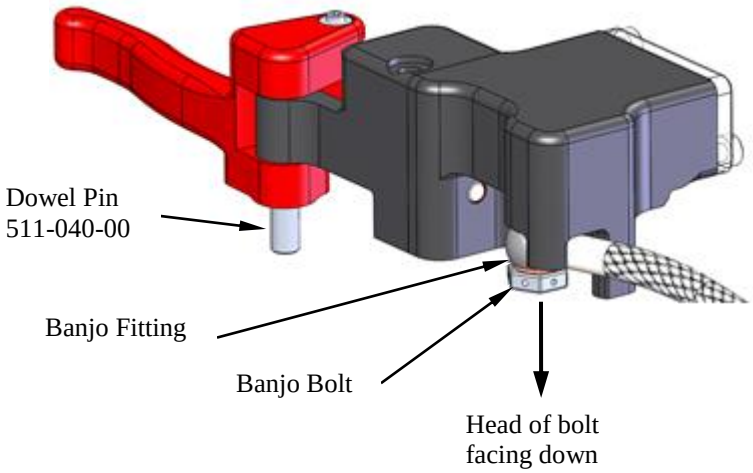


Figure 2.2.2 Master Cylinder Initial Filling Position

Continue filling the reservoir until fluid level is at the min line when the assembly is held at an approximate 20° angle (park position of collective lever). The final fluid level will be adjusted later.

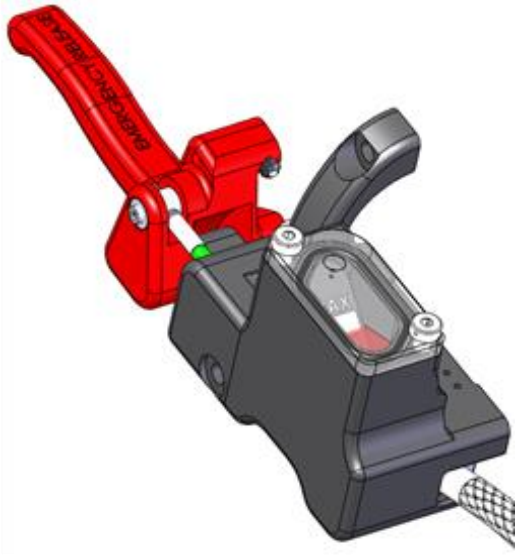


Figure 2.2.3 Filling Reservoir

Install the Master Cylinder Assembly on the collective tube. Line up the holes in the Lever and the pivot hole in the Clamp and Insert the lever pivot dowel pin (511-040-00).

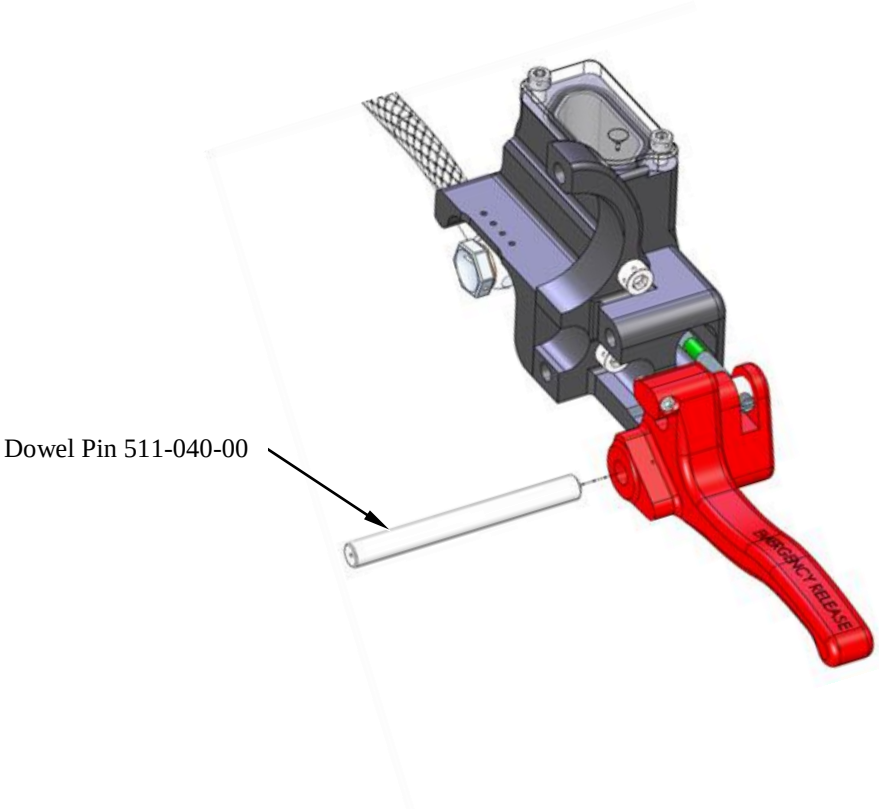


Figure 2.2.4 Lever Pivot Dowel Pin Installation

Insert the Lockout Lever Assembly (232-640-00) into the pivot hole in the Dual Cylinder Clamp (291-831-00).

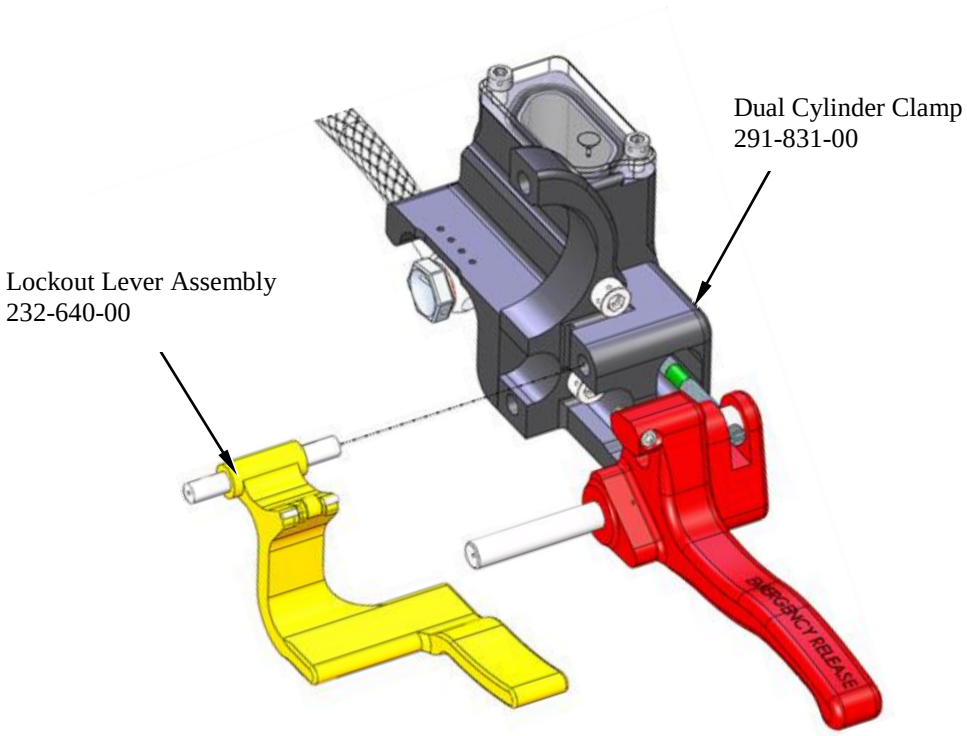


Figure 2.2.5 Lockout Installation

Position the Master Cylinder Clamp (232-642-10) on the collective tube while lining up the anti-rotation pin in the hole.

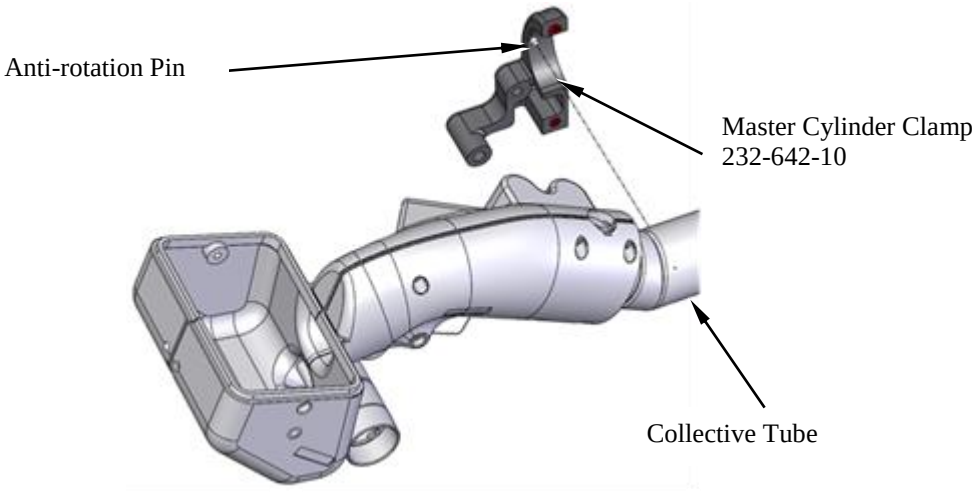


Figure 2.2.6 Positioning the Clamp to the Collective

Position the port half of the Master Cylinder Subassembly (232-641-10) on the collective tube while aligning the lever pivot and lockout pivot shafts.

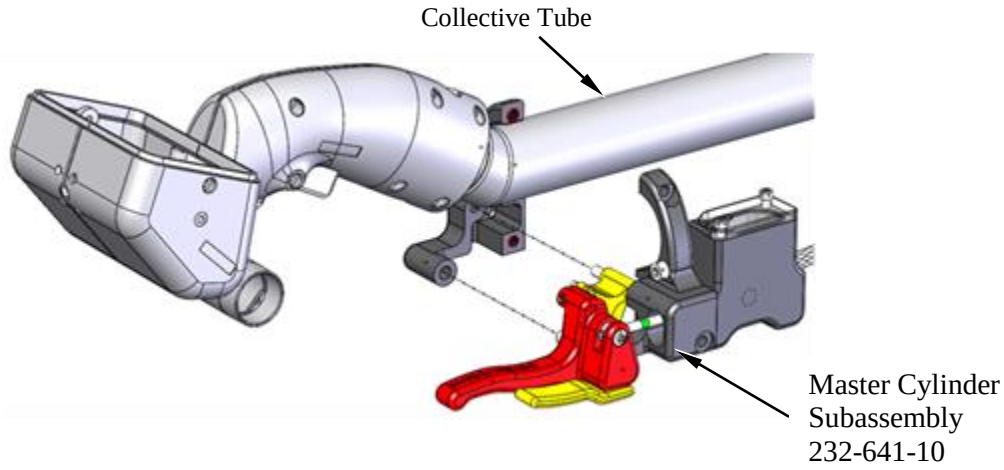


Figure 2.2.7 Installing the Master Cylinder Assembly

Install the lower socket head screw (511-081-00) to hold the two halves together. Torque to 2.3-2.8 N m (20-25 in lb)

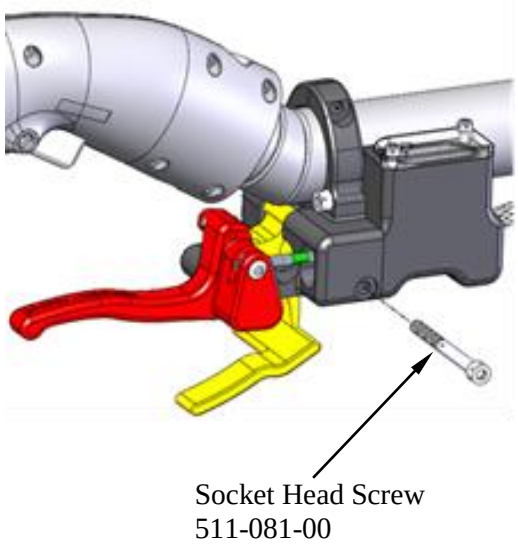


Figure 2.2.8 Socket Head Screw Installation

Install the upper socket head screw (511-080-00) and tighten until assembly is secure. Do not exceed 4.0 Nm (35 in lb).

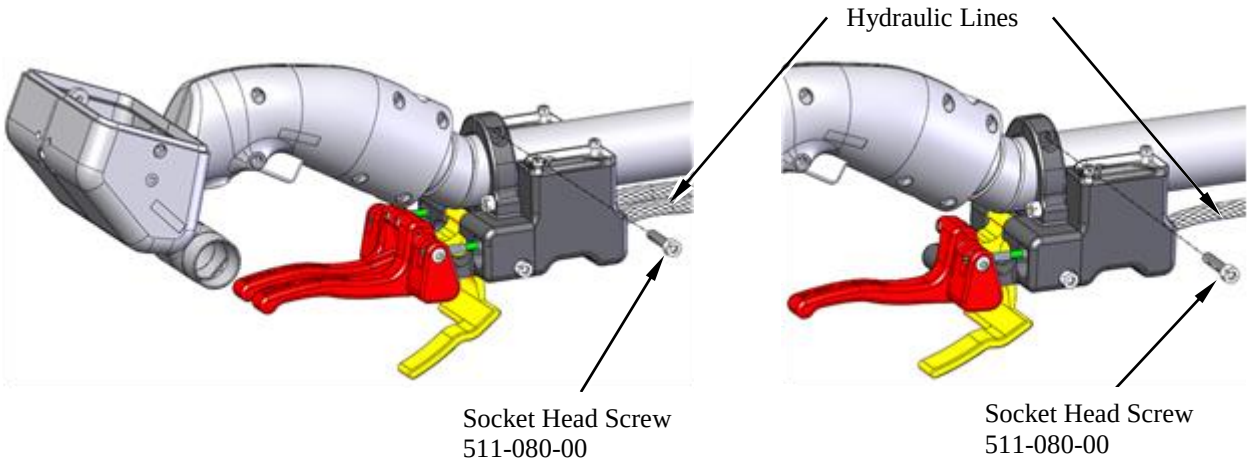


Figure 2.2.9 Socket Head Clamp Screw Installation

Secure the hydraulic lines to the collective tube.

Hydraulic System Operation Check:

Very slowly cycle each of the release levers in order to move the piston a small amount (approximately 1.5mm) back and forth and watch for bubbles. 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.

Check the system for air by actuating the lever firmly until it bottoms out. (Note, the cargo hook must be connected during this test). Check the push rod position as shown in Figure 2.2.10. If the green area on the push rod is visible above the reference surface, proceed to following page.

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, set the collective in its lowest position, remove the reservoir lid, remove some fluid, and replace the lid, then repeat bleeding procedure in section 2.2. Fluid may need to be pumped through the system faster in order to ensure trapped air is forced through. Take care not to over fill the reservoir and cause fluid to leak out of the vent hole.

To help isolate where the air is, the dry break coupling at the interface plate may be disconnected and the levers re-checked for firmness. If the lever feels stiffer then the air is probably not in the master cylinder line. Reconnect that coupling and disconnect the slave cylinder coupling and test the feel of the lever again to see if the air is in the intermediate line.

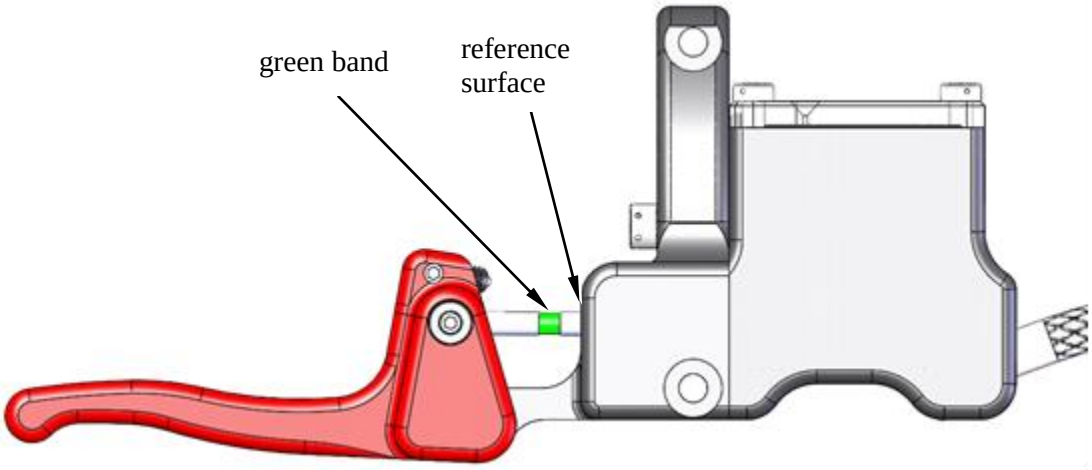


Figure 2.2.10 Checking System for Air

After the system is properly bled, verify that the fluid level is still in range with the collective control in the 20° park position. Adjust as necessary.

Check the release system for proper operation. Fully actuate the release lever. The hook must open and the lever must have a solid feel.

Disassemble and thoroughly clean the syringes with isopropyl alcohol. Allow to dry. Not cleaning the syringes will render them unusable. Reassemble and store for next use.

Install safety wire or cable to the mounting and reservoir lid screws as shown in Figure 2.2.11.

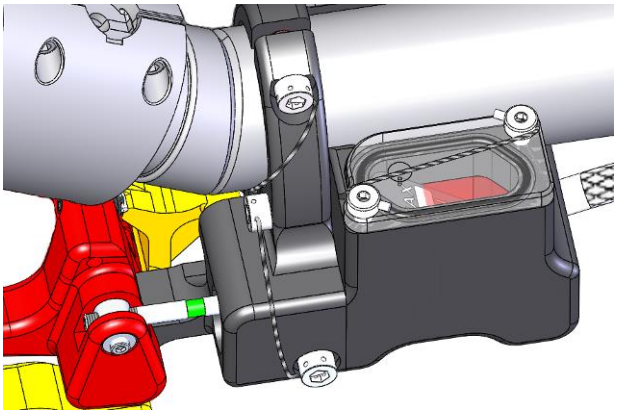


Figure 2.2.11 Installing Safety Cable on Screws

2.3 Suspension Installation

When installing the Suspension Assembly, it is important to note the orientation of the load ropes. The two longer load ropes, labeled with a forward indication, must be attached to the forward aircraft landing gear cross tube as shown below.

Figure 2.3.1 BK117 C-2 Suspension Orientation

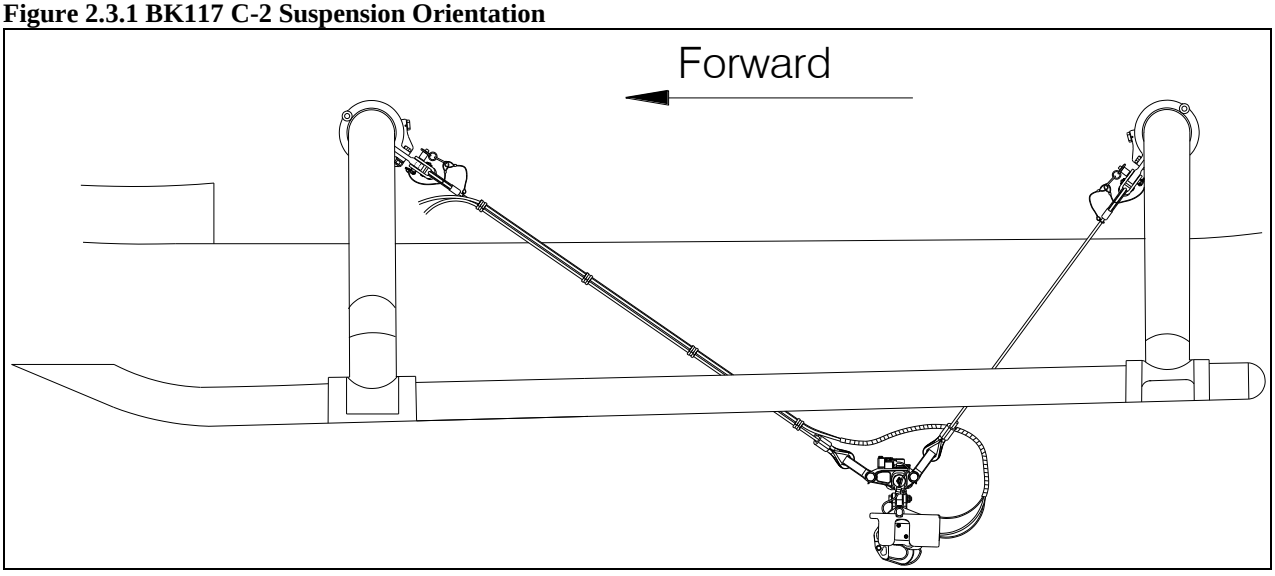
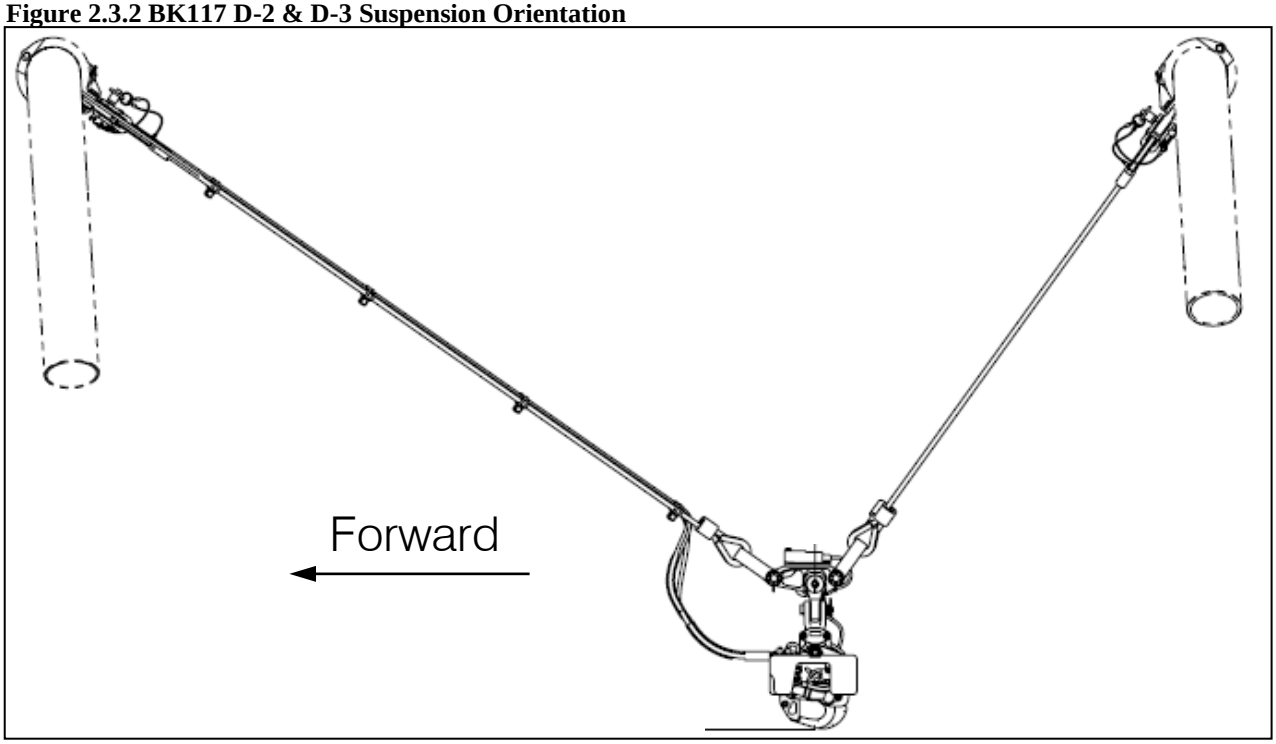


Figure 2.3.2 BK117 D-2 & D-3 Suspension Orientation

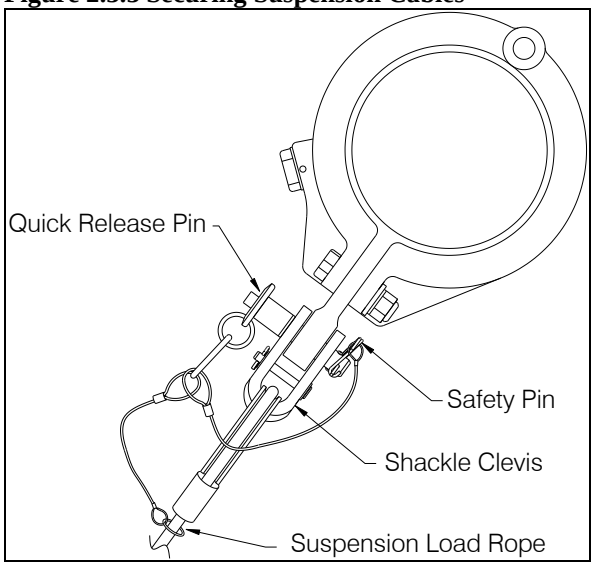


To install the four suspension load ropes to the helicopter, remove the safety pins and quick release pins pre-installed on each shackle clevis.

Position the shackle clevis's over the helicopter's hard points, align holes and re-install the quick release pins (see Figure 2.3.3).

Secure the quick release pins by attaching the safety pins through the end of the quick release pins.

Figure 2.3.3 Securing Suspension Cables

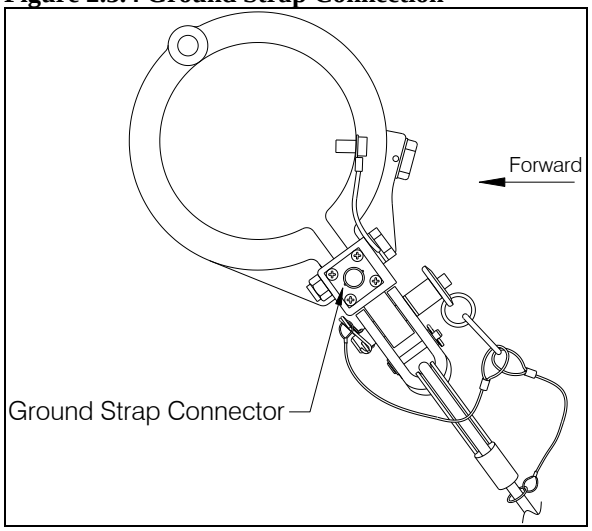


Connect the electrical release connector to the mating connector on the interface plate at the belly of the aircraft.

Connect the load cell connector (if installing suspension system with load weigh) to the mating connector on the interface plate at the belly of the aircraft.

Connect the ground strap to the connector near to and inboard of the forward right hard point (see Figure 2.3.4).

Figure 2.3.4 Ground Strap Connection



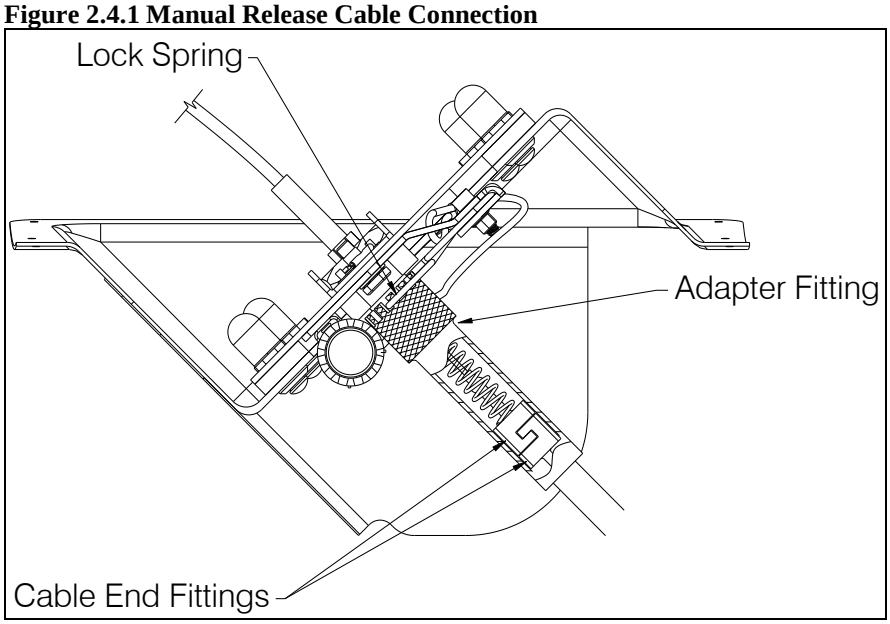
Connect the manual release cable per the following section.

2.4 BK117 C-2 Manual Release Cable Connection and Adjustment

Connect the two sections of the manual release cable system and verify its adjustment per the following.

- Retract the adapter fitting of the external manual release cable (268-037-01) to expose the cable end fitting.
- Engage the identical cable end fitting on the fixed manual release cable at the belly of the helicopter
- Squeeze the Lock Spring and thread the Adapter Fitting on (see Figure 2.4.1) and lock it in place by engaging a pair castellations with the Lock Spring.

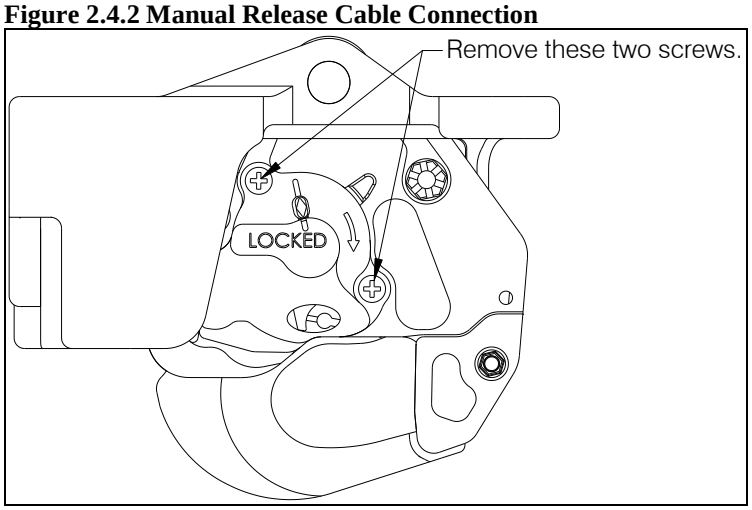
Figure 2.4.1 Manual Release Cable Connection



Check and if necessary adjust the manual release cable rigging per the following.

- Remove the manual release cover from the cargo hook by removing two screws.

Figure 2.4.2 Manual Release Cable Connection



2.4 Manual Release Cable Connection and Adjustment continued

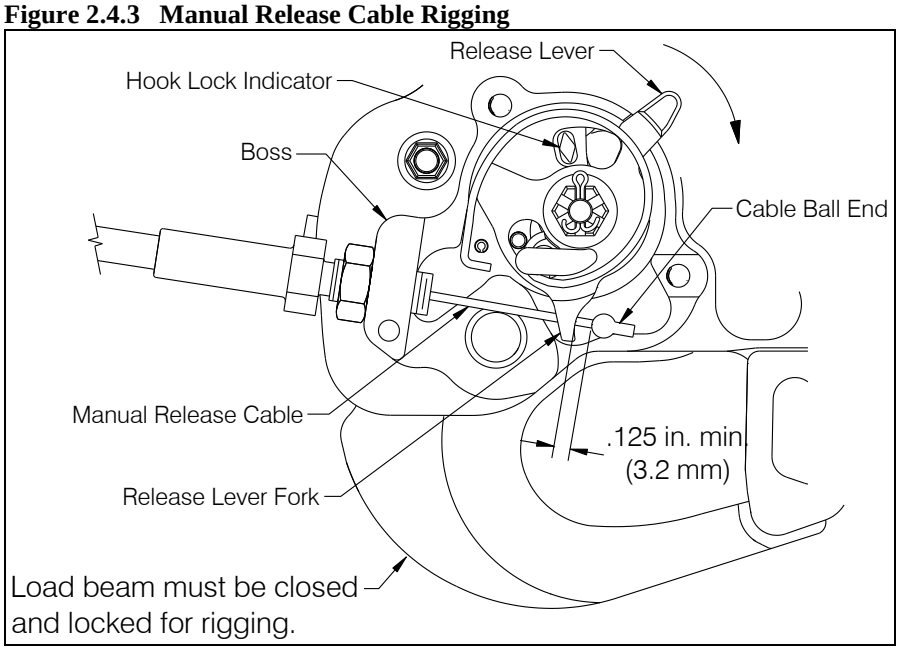
- At the cargo hook, ensure the manual release cable is between the two prongs of the release lever fork as illustrated in Figure 2.4.3.

⚠ CAUTION

Manual release cable rigging must be done with the cargo hook in the closed and locked position.

- With the cargo hook closed and locked, rotate the release lever in the clockwise direction to remove free play (the free play is taken up when the hook lock indicator begins to move, this is also felt as the lever rotates relatively easily for several degrees as the free play is taken up) and measure the gap between the cable ball end and the release lever fork with the manual release lever in the cockpit in the non-release position. This gap should be a minimum of .125 inches (3.2 mm) as shown in Figure 2.4.3.

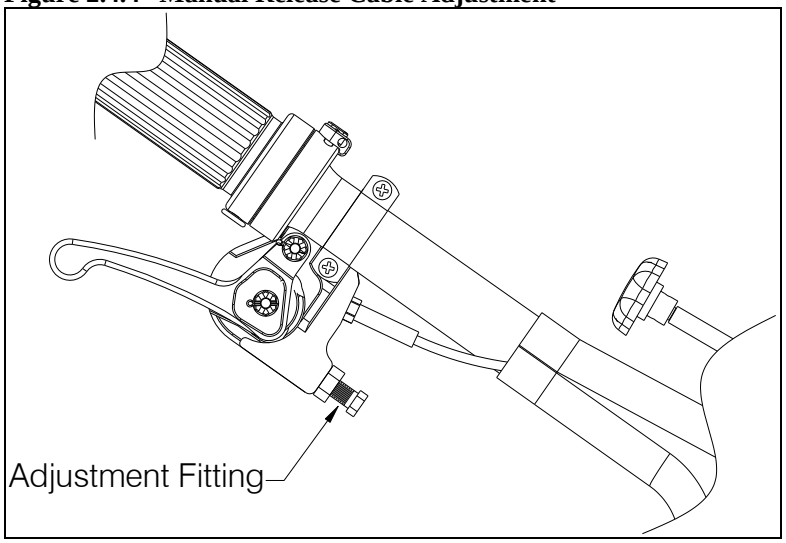
Figure 2.4.3 Manual Release Cable Rigging



2.4 Manual Release Cable Connection and Adjustment continued

- If necessary adjust the system to obtain the minimum gap of .125 inches at the release lever fork as shown in Figure 2.4.3 (the maximum gap is limited by the manual release cover, i.e.- the release cable must fit within the cover when it is installed). The system can be adjusted at the manual release lever on the collective by loosening the jam nut and turning the adjustment fitting (see Figure 2.4.4) in the required direction. Turning the adjustment fitting counterclockwise will reduce the gap between the cable ball end and release lever fork, turning it clockwise will increase the gap.

Figure 2.4.4 Manual Release Cable Adjustment



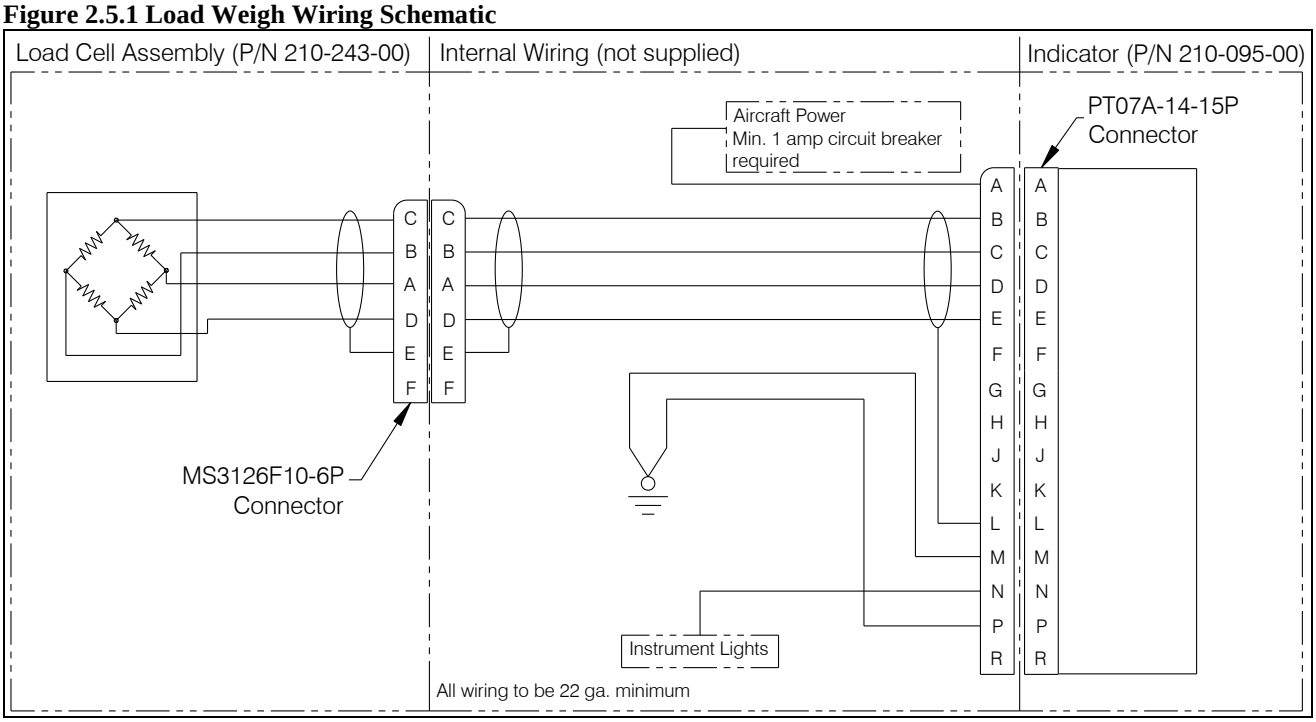
- After adjustment tighten the jam nut on the adjustment fitting and re-install the manual release cover on the cargo hook with the two screws.

2.5 Load Weigh System Installation

The C-39 indicator (210-095-00) can be mounted in a standard 2 ¼" instrument panel hole. It should be mounted in a position that is convenient, accessible and visible to the pilot.

An internal load weigh wiring harness is not supplied with this kit. An electrical schematic for the load weigh system is shown in Figure 2.5.1 including a typical internal wiring schematic.

Figure 2.5.1 Load Weigh Wiring Schematic



2.6 Installation Check-out

After installation of the cargo hook sling system, perform the following:

1. Swing the installed Cargo Hook and check that the electrical release harness and the release cable or hydraulic line have enough slack to allow full movement of the cargo hook and suspension assembly. The harness or cables must not be a stop that prevents the cargo hook from moving freely in all directions.

2. Verify that all harnesses and cables do not have kinks and are clear of chafing points and flight controls.

3. Pull the BQRS release lever on the collective. The mechanism should operate smoothly and the Cargo Hook must release. Reset the load beam.

4. Activate the PQRS electrical system and press the Cargo Hook release button to ensure the cargo hook electrical release is operating correctly. The Cargo Hook must release. Reset the load beam.

5. Pull down on the cargo hook with a load of 12-15 lbs and verify that the load-on-hook indicator light in the cockpit extinguishes.

6. Position the cargo hook in the stowed position using the helicopter's designated cargo hook stowage bracket. Verify that all harnesses and cables are free from kinking, chafing, rubbing, etc.

2.7 Component Weights

The weights of the Cargo Hook Sling System components are listed below.

Table 2.7.1 Component Weights

	Part No.	Description	Weight
BK117 C-2	232-347-00 232-347-01	Cargo Hook Suspension Assembly w/o Load Weigh	17.0 lb (7.7 kg)
	232-439-00 232-439-01	Cargo Hook Suspension Assembly w/ Load Weigh	18.4 lb (8.35 kg)
	200-361-00	Fixed Manual Release Cable Installation Kit	1.2 lb (.59 kg)
	210-243-00	Load Cell Assembly	1.0 lb (.45 kg)
BK117 D-2 & D-3	232-626-10	Master Cylinder with Plumbing - Single	1.2 lb (.5 kg)
	232-713-00 232-713-01	Hydraulic System w/o Load Weigh	16.6 lb (7.5 kg)
	232-712-00 232-712-01	Hydraulic System w/ Load Weigh	17.2 lb (7.8 kg)
	210-299-00	Load Cell Assembly	1.0 lb (.45 kg)
Common	210-095-00	C-39 Load Weigh Indicator	.47 lb (.21 kg)

Section 3
Operation Instructions

3.1 Pre-flight Check

Prior to any flight involving external load operations, perform the following.

1. Activate the PQRS electrical system and press the Cargo Hook release button to ensure the cargo hook electrical release is operating correctly. The Cargo Hook must release. Reset the hook by hand after the release. If the hook does not release or re-latch, do not use the unit until the difficulty is resolved.

⚠ CAUTION

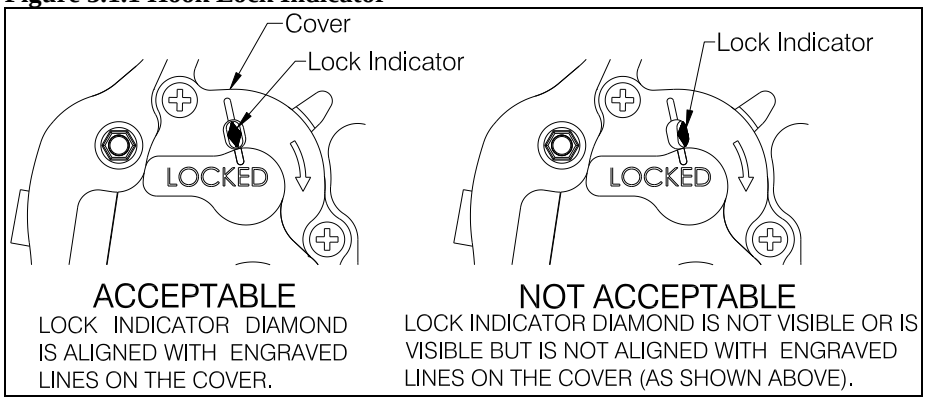
The cargo hook release solenoid is intended to be energized only intermittently. Depressing the electrical release button continuously in excess of 20 seconds will cause the release solenoid to overheat, possibly causing permanent damage.

2. Actuate the BQRS manual release lever on the collective to test the Cargo Hook manual release system. The mechanism should operate smoothly and the Cargo Hook must release. Reset the load beam by hand after release. Verify that the hook lock indicator on the side of the hook returns to the fully locked position. If the hook does not release or re-latch, do not use the unit until the problem is resolved.

⚠ CAUTION

In the fully locked position the hook lock indicator must align with the lines on the manual release cover (see Figure 3.1.1).

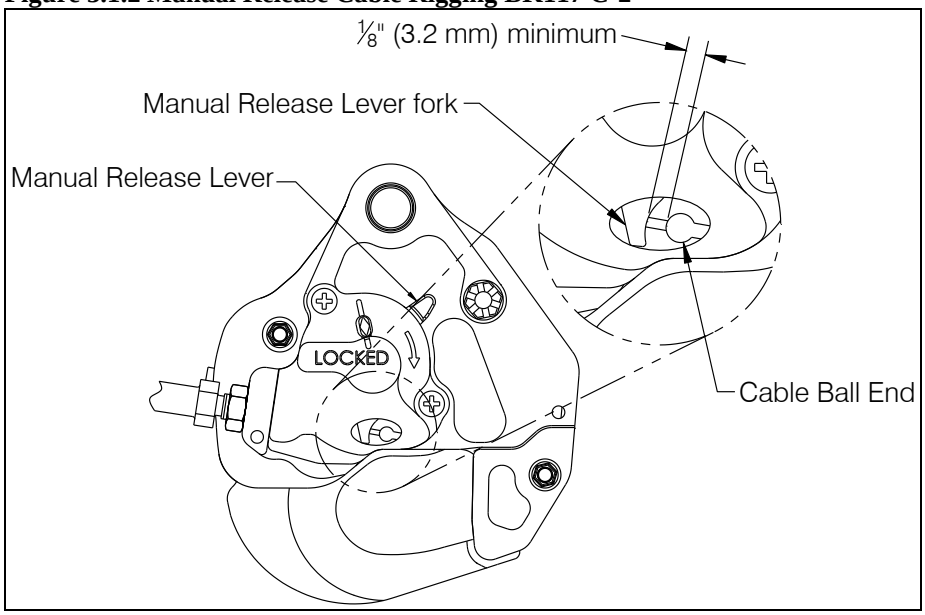
Figure 3.1.1 Hook Lock Indicator



3.1 Pre-flight Check continued

3. **BK117 C-2 Specifically:** Check the manual release cable rigging through the window in the cargo hook manual release cover. With the cargo hook closed and locked, rotate the manual release lever clockwise to remove the free play (the free play is taken up when the hook lock indicator begins to move, this is also readily felt as the lever rotates relatively easily for several degrees as the free play is taken up) and hold it in this position while checking the gap between the release lever fork and the cable ball end as shown below. Visually check that there is approximately a minimum gap of 1/8" (3.2 mm) as shown in Figure 3.1.2.

Figure 3.1.2 Manual Release Cable Rigging BK117 C-2

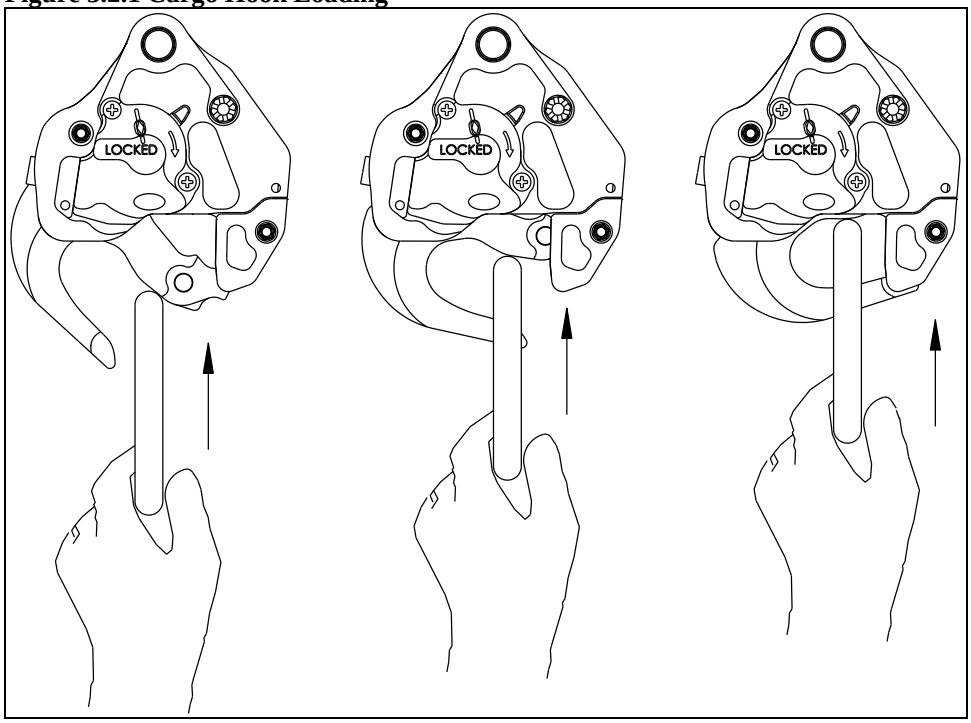


4. Pull down on the cargo hook and verify that the load-on-hook light in the cockpit extinguishes. Note: The light should extinguish at a load of 11 to 15 lbs.
5. Visually check the electrical harnesses and their connections (including the strain relief at the load cell, if installed) for damage and security.
6. **BK117 C-2:** Visually check the manual release cable and its connection to the cargo hook for damage and security.
7. **BK117 D-2 & D-3:** Visually check the hydraulic hose and its connection to the cargo hook for damage and security.
8. Visually check the suspension load ropes for damage and corrosion.
9. Visually check all suspension components for damage.
10. Visually check all fasteners for security.

3.2 Cargo Hook Loading

The cargo hook can easily be loaded with one hand. A load is attached to the hook by pushing the ring upward against the upper portion of the load beam throat, as illustrated in Figure 3.2.1, until an internal latch engages the load beam and latches it in the closed position.

Figure 3.2.1 Cargo Hook Loading



3.3 Cargo Hook Rigging

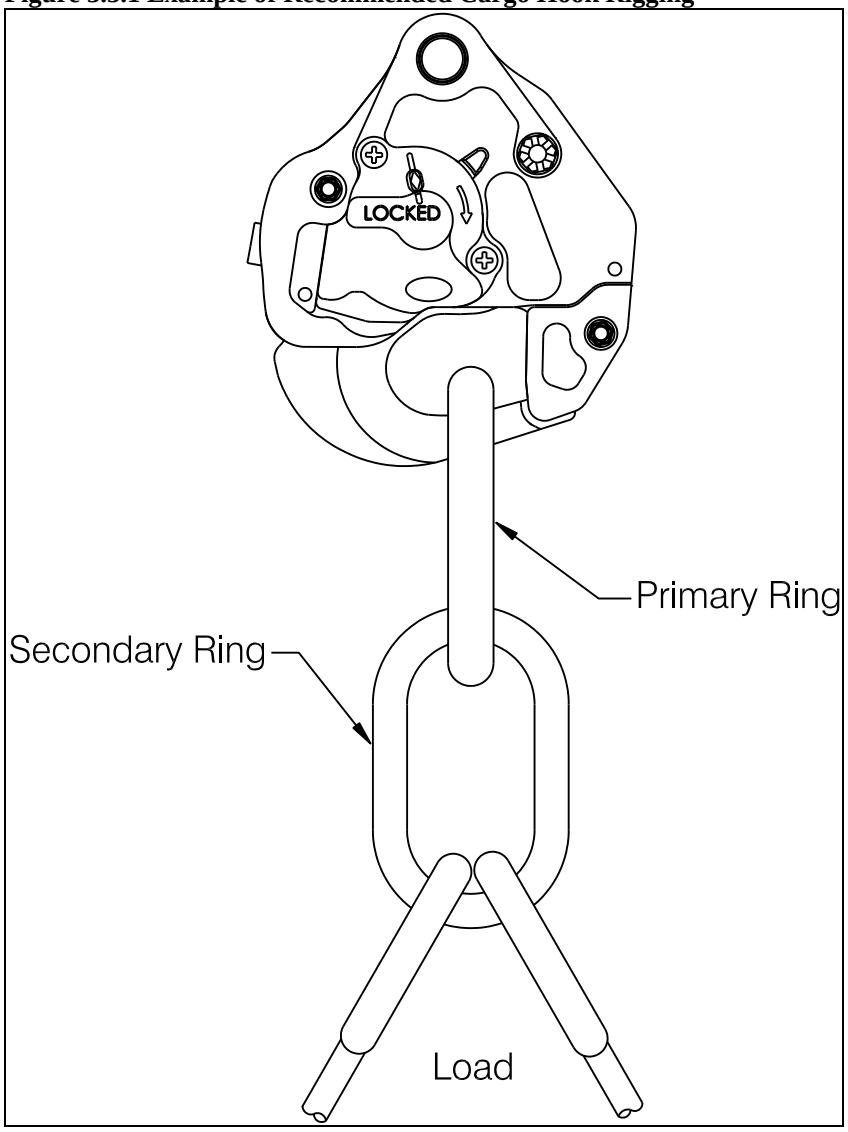
Extreme care must be exercised when rigging a load to the Cargo Hook. Steel load rings are recommended to provide consistent release performance and resistance to fouling. The following illustration shows the recommended rigging, but is not intended to represent all rigging possibilities.

Some combinations of small primary rings and large secondary rings could cause fouling during release. It is the responsibility of the operator to assure the cargo hook will function properly with each rigging.

Nylon type straps (or similar material) or rope should not be used directly on the cargo hook load beam. If nylon straps or rope must be used they should be first attached to a steel primary ring. Verify that the ring will freely slide off the load beam when it is opened. Only the primary ring should be in contact with the cargo hook load beam.

3.3 Cargo Hook Rigging continued

Figure 3.3.1 Example of Recommended Cargo Hook Rigging



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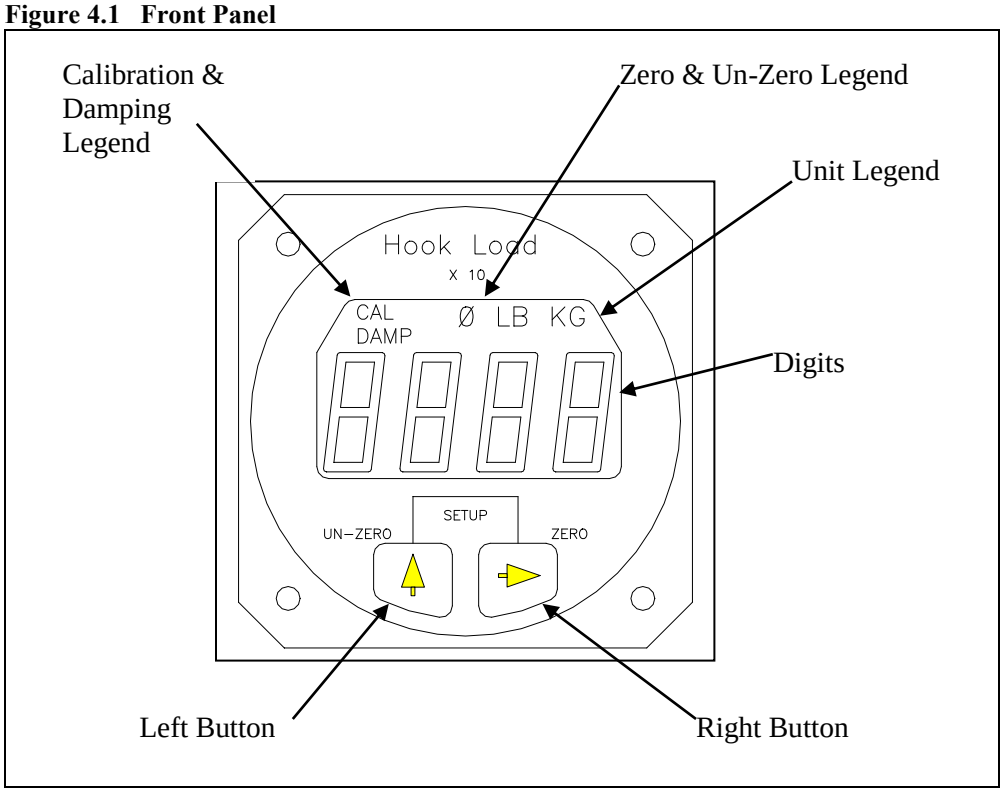
Section 4
Load Weigh System Operation Instructions

Indicator Front Panel

The C-39 Indicator front panel includes the following features.

- The four 7 segment LCD digits show the weight on the Cargo Hook and displays various Setup information.
- The Legends clarify the digital display. i.e. when the LB Legend is turned on, the display will be pounds, etc.
- The Right button is used to Zero the display in the Run Mode and select the digit to be changed in the Setup Mode.
- The Left button is used to Un-Zero the display in the Run Mode and scroll the selected digit in the Setup Mode.

Figure 4.1 Front Panel

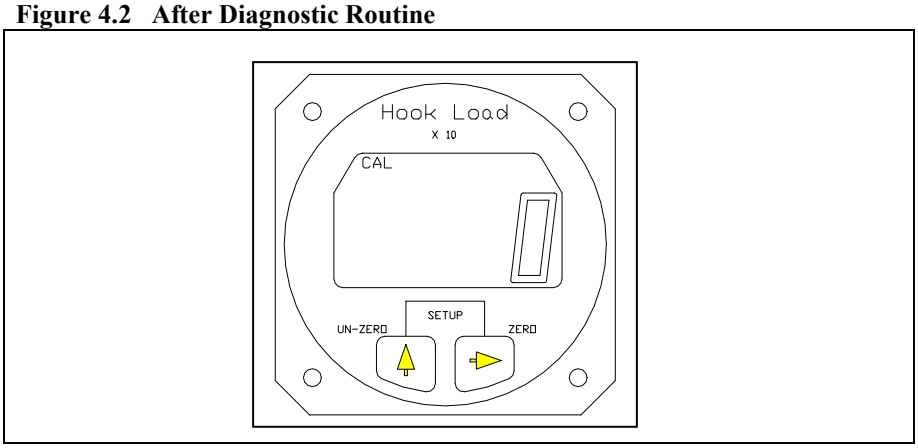


The Run Mode

The C-39 Indicator has two operating modes, Run and Setup. The Run Mode is used to display the cargo hook weight and the Setup Mode is used to setup or configure the Indicator to the helicopter and to the Load Cell. When powered up, the Indicator always comes to life in the Run Mode.

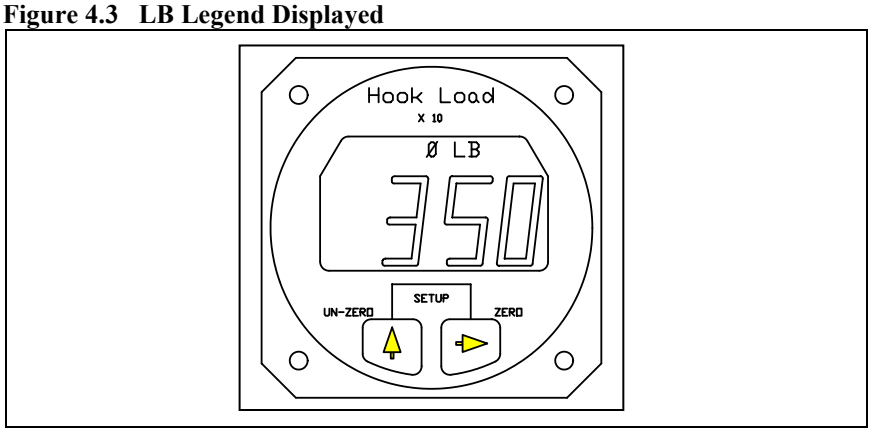
After the Indicator has been correctly installed, power it up by activating the Load Weigh Circuit Breaker. The Indicator will go through a self diagnostic routine. During this routine the display will display all of the digits and legends. If a problem is found during the routine an Error Code will be displayed. For an explanation of Error Codes see the section *Error Codes*. After the diagnostic routine the display should look like this:

Figure 4.2 After Diagnostic Routine



The illustration is of the Indicator in the Run Mode with no load on the hook. Note the LB legend displayed.

Figure 4.3 LB Legend Displayed

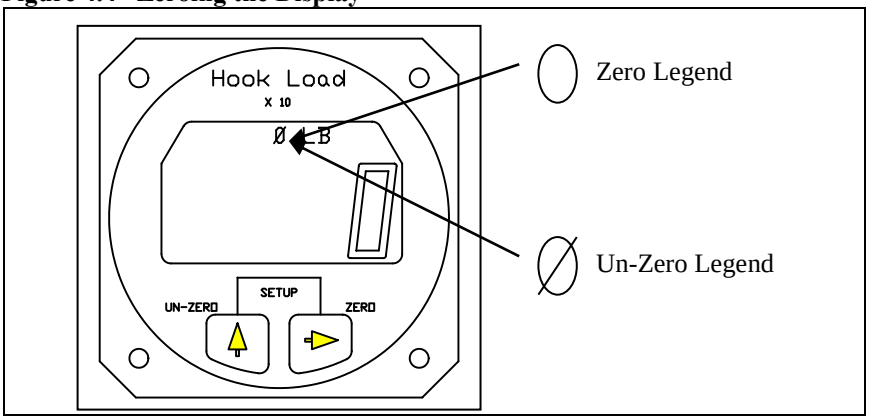


The illustration is a typical hook load reading. The display is 3,500 lb note the last digit is not displayed.

To Zero or Tare the Display

The zero feature is used to zero or tare the weight on the Cargo Hook that is not wanted, such as the weight of a cargo net or long line. The Right button is used to zero the Indicator reading. When the Right button is pressed the display is zeroed. The zero legend is turned on and the zeroed number is stored in memory. If the Right button is pressed again, before the Un-zero button is pressed, the display blinks in response to the button closure. Zero is only available in the Run Mode.

Figure 4.4 Zeroing the Display



To Un-Zero the Display

The Left button is used to add the zeroed value back into the current Indicator reading or Un-zero the display. When the Left button is pressed, the number previously zeroed is added to the current display and the Un-zero legend is turned on. If the Left button is again pressed before the zero button is pressed, the display blinks in response to the button closure. Un-Zero is only available in the Run Mode.

Error Codes

Error Codes are the result of difficulties discovered during the Indicator diagnostic tests. Diagnostic tests occur at power up and during the execution of certain routines. Listed below is a matrix of the Error Code displays, their meaning and possible corrective action. Pressing either button will usually bypass the error code, however, the displayed information may be suspect.

Table 4.5 Indicator Error Codes

DISPLAY	CAUSE	POSSIBLE CORRECTIVE ACTION
Err 1	A/D or D/A circuit failure	Potential short in the optional analog meter cable. Clear short and power cycle the Indicator by turning the power to the Indicator off for a few moments. If Error Code continues, return the Indicator to the factory.
Err 2	NV Ram failure	Power cycle the Indicator; if Error Code continues, return the Indicator to the factory.
Err 3	NV Ram write failure	Re-enter data, if Error Code continues, return the Indicator to the factory.
Err 4	NV Ram busy failure	Power cycle the Indicator, if Error Code continues return the Indicator to the factory.

The Setup Mode

The C-39 Indicator can be used with a wide range of helicopters and load cells. The Setup Mode on the Indicator matches the Indicator to the Load Cell and to the helicopter. This is done by entering data into the Indicator. Entered data includes the load cell Calibration Code, the units that the Indicator should read-out (pounds or kilograms), and several other items.

The Indicator has a group of Setup routines, arranged in menu form, that are used to configure the Indicator. Shown on the next page is a matrix of the Setup routines and a brief discussion of their function and how they are programmed. A complete discussion of each setup item is presented later in this section.

To enter the Setup Mode press both the Right and Left buttons at the same time while the Indicator is powered up and in the Run Mode. To exit the Setup Mode and return to the Run Mode, press both the buttons at the same time. If you are in a Setup routine and have started to change an entry, but you change your mind before completing the procedure, power cycle the Indicator to exit the Setup Mode and then go to the Run Mode without changing the item. The Indicator is power cycled by turning the Indicator power off for a few moments.

The Setup Mode, continued

Table 4.2 Indicator Setup Routines

MENU	FUNCTION	DISPLAY
Press the Left button to scroll through the menu	Press the Right button to view or change the menu item.	To return to the Run Mode press both the Right and Left buttons at the same time.
DAMP	Damping Level, sets the pilots preference for display damping.	Blinking display is previously entered Damping Level. Select the desired damping level by pressing the Left button.
CODE	Calibration Code, matches the Indicator to the Load Cell.	Display is previously entered CAL Code. The Code is changed by selecting the digit to be changed with the Right button. The selected digit will blink. Change the blinking digit by pressing the Left button.
0 in	Installation ZERO, matches the Indicator to the installed Load Cell and to the helicopter. After this procedure the display will be zero when no load is on the Cargo Hook.	Display is a combination of load on the Load Cell, and normal load cell zero offset. Remove all weight from the installed Load Cell except the Cargo Hook, and press any button to complete the procedure and return to the Run Mode.
LOAD	Load, is used to calibrate the system by lifting a known load.	No previous display is shown. Enter the known load using the Right button to select the digit to be changed and Left button to enter the number. Known load is entered "X 10" i.e.; 5000 kilograms is entered as 500. After the known load is entered, press both buttons at the same time and lift the known load. When the load is stabilized press either button. A new Calibration Code will be calculated and the known load will be displayed. This completes the procedure.
Scale	Scale, matches the analog output of the Indicator to an optional remote analog meter.	Display is previously entered number. To change the number use the Right button to select a digit, use the Left button to scroll the digit to the desired number. Entry is times 10.
LB KG	Units, selects the Indicator units (pounds or kilograms).	Display is previously selected unit. To change the unit, use the Left button.
XX - V	Version, is the revision level of the Indicator hardware and software.	Version is for information only, it cannot be changed.

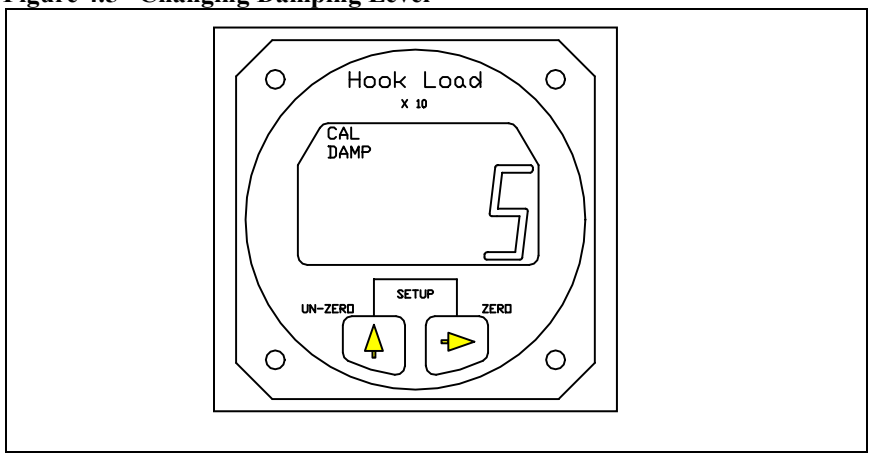
Indicator Damping

The Damp or damping routine allows the pilot to adjust the Indicator damping level to his preference. The damping routine is a program that stabilizes the Indicator reading. It offers a trade-off between Indicator responsiveness and stability. Ten damping levels are available, from 0 through 9. At level 0 the display responds to the slightest change in weight. However, if the load bounced even slightly, the display digits would respond instantly, making the display look unstable. With a damping level of 9, the display would be stable under the most turbulent conditions; however, it would take several seconds for the display to respond to a change in weight. The ideal damping level will depend on the flying conditions. A mid range setting of 5 or 6 is usually adequate.

To Look at or Change the Damping Level

With the Indicator powered up and in the Run Mode, press both buttons at the same time to go to Setup. Scroll through the menu, using the Left button, until the word DAMP is displayed. To look at or change the Damping Level press the Right button. The display should look like this:

Figure 4.5 Changing Damping Level



The CAL and the DAMP legend is turned on and the previously set damping level is displayed. To return to Run without changing the current damping level press both the Right and Left buttons at the same time. To change the damping number, use the Left button to scroll the blinking digit to the desired number. After the selection has been made press both the Right and Left buttons at the same time to return to Run.

Indicator Calibration

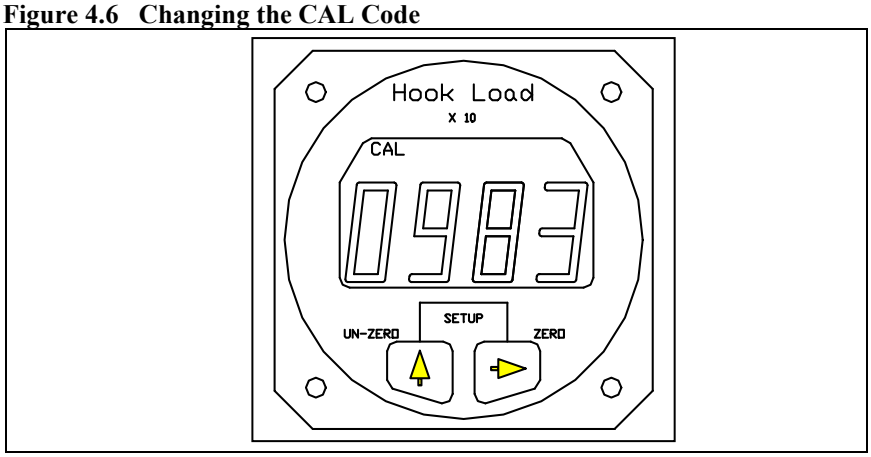
The Calibration Code, or CAL code, is a mandatory input. The Indicator will not accurately display the load without the correct Calibration Code. The Calibration Code scales the signal from the Load Cell.

If the C-39 Indicator was supplied as part of a Load Weigh System, the Calibration Code will have been entered into the Indicator by the factory, however, it should be confirmed. If the Indicator is to be mated to a different Load Cell, it must be calibrated before use. Calibration can be done by entering a known Calibration Code or by lifting a known load and having the Indicator calibrate itself. Both options are discussed below.

To Look at or Change the Calibration Code

With the Indicator powered up and in the Run Mode, press both buttons at the same time to go to Setup. Scroll through the menu until the word CODE is displayed, then press the Right button. The display should look like this:

Figure 4.6 Changing the CAL Code



The CAL legend is turned on and the previously entered or computed Calibration Code is displayed. To return to Run without changing the CAL Code, press both the Right and Left buttons at the same time. To change the Calibration Code, use the Right button to select the digit to be changed, then use the Left button to scroll the blinking digit to the desired number. When the Calibration Code has been entered, press both the Right and Left button at the same time to return to Run.

NOTICE

Depending on the type of Load Cell, the Calibration code could be a 3 or 4 digit number. If the Calibration Code is a 3 digit number a leading zero (0) must be used. For example if a Load Cell had a CAL Code of 395 it would be entered as 0395.

To Look at or Change the Calibration Code, continued

If the load cell Calibration Code is not known or as a cross check, the Indicator can generate the Calibration Code. This is done by entering the weight of a known load into the Indicator LOAD routine and then lifting the load. See the section Calibration by Lifting a Known Load.

Installation Zero

Installation zero is a routine that matches the Indicator to the ***INSTALLED*** Load Cell. It adjusts the Indicator reading to compensate for the weight of the Cargo Hook on the Load Cell and whatever zero offset is built into the Load Cell. The Installation Zero procedure is not mandatory. If done the Indicator will read zero when the Un-Zero button is pressed and there is no weight on the Cargo Hook. If the Installation Zero is not done, the Indicator will show the weight of the Cargo Hook plus the value of the Load Cell zero offset.

To Run the Installation Zero Routine

With the Indicator powered up and in the Run Mode, press both buttons at the same time to go to Setup. Scroll through the menu until the symbol "0 in" is displayed, then press the Right button. The CAL legend will be turned on and the current weight on the Cargo Hook will be displayed and blinking. Remove any weight that is not to be zeroed out and press either button to complete the procedure and return to the Run Mode.

Calibration by Lifting a Known Weight

Calibration by lifting a known weight is a Setup routine that calculates the Calibration Code for the Load Cell attached to the Indicator. It is useful if the load cell Calibration Code is not known or as a cross check to the accuracy of a known Calibration Code. The procedure is done by entering the known weight into the Indicator and then lifting the weight. This procedure can be done in the shop or on the helicopter. The accuracy of the procedure is directly related to the weight of the known load. If for example the procedure was done with a 1,000 pound load that was assumed to weigh only 900 pounds, all subsequent lifts would be displayed 10% light.

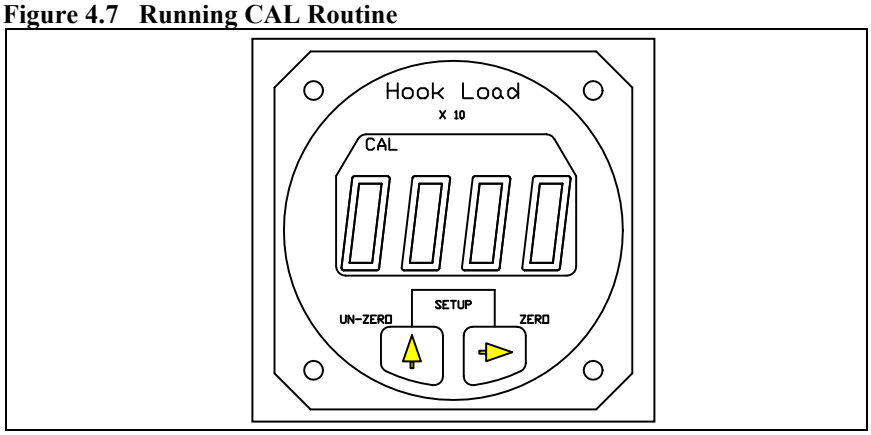
Be sure to include the weight of everything between the Cargo Hook and the load, i.e. the cable, net, dirt, etc.

The closer the known load approaches the lifting capacity of the helicopter, the more accurate the calculated Calibration Code will be.

Calibration by Lifting a Known Weight, continued

With the Indicator powered up and in the Run Mode, press both buttons at the same time to go to Setup. Scroll through the menu until the word LOAD is displayed, then press the Right button. The display should look like this:

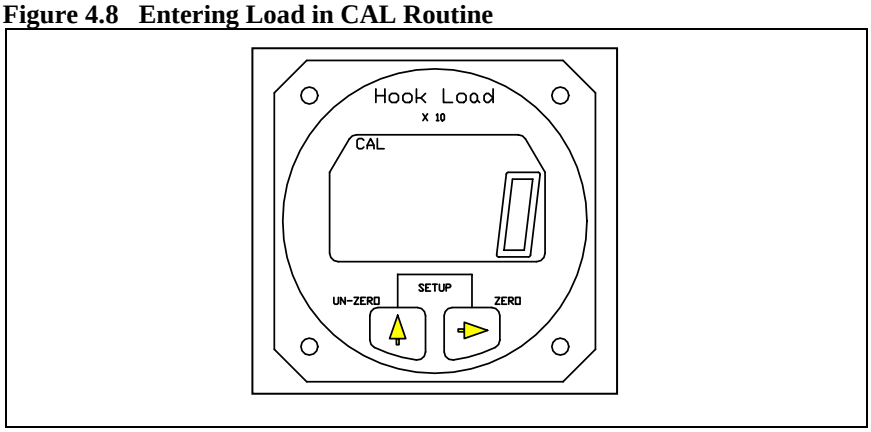
Figure 4.7 Running CAL Routine



The CAL legend is turned on and the first digit is blinking. The previous load is not displayed. At this point if you wish to return to the Run Mode without changing the Calibration Code, power cycle the Indicator. At this point it is not possible to return to the Run Mode without changing the Calibration Code by using the buttons on the Indicator front panel.

To proceed with the procedure, use the Right button to select the digit to be changed, then use the Left button to scroll the blinking digit to the desired number. Note that the known weight is entered "X 10"; a 1000 pound load is entered as 100. When the known load has been entered, press both the Right and Left button at the same time. The display will look like this:

Figure 4.8 Entering Load in CAL Routine



Calibration by Lifting a Known Weight, continued

The CAL legend and the digits will be blinking. Again, at this point if you wish to return to the Run Mode without changing the Calibration Code, power cycle the Indicator. It is not possible to return to the Run Mode by using the buttons on the Indicator front panel without changing the Calibration Code. If you wish to proceed, lift the known load and when it is stabilized, press either button to complete the procedure. The Indicator will display the load. This ends the procedure. The Indicator is now calibrated to the Load Cell. It is a good practice to go to the Code routine and record the new Calibration code for later reference.

Setting the Scale for a remote analog meter

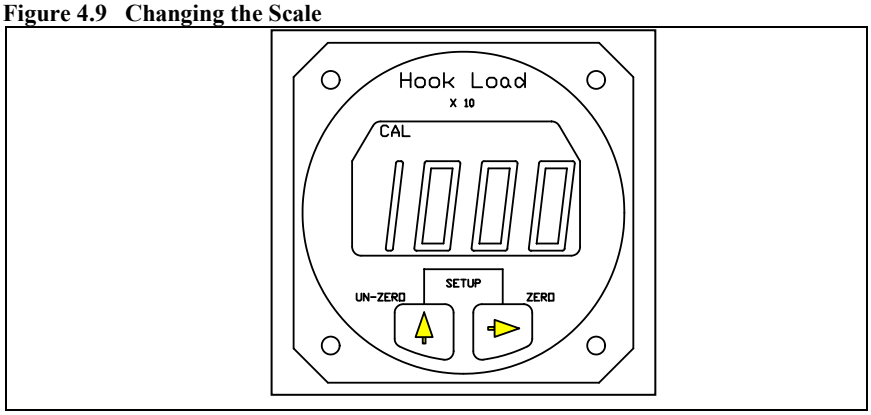
The Scale routine is used when a user supplied analog meter is connected to the Indicator. It is used to match or calibrate the analog meter to the Indicator. The Indicator outputs a 0 to 5 VDC analog signal which is proportional to the Load Cell load. The Scale number tells the Indicator at what point in pounds or kilograms it should reach the 5 VDC output. If for example a 5 volt analog meter is used and its full scale reading is 10,000 pounds, the number entered into the Indicator Scale routine would be 1000 (the number is entered X 10). This number tells the Indicator that it should output the proportional 0 to 5 VDC signal between zero pounds and 10,000 pounds.

The Scale number does not affect Onboard Slave Meters, P/N 210-106-00 or 210-180-00. This number only affects user supplied instruments connected to the analog out signal.

To Look at or Change the Scale

With the Indicator powered up and in the Run Mode, press both buttons at the same time to go to Setup. Scroll through the menu until the word SCALE is displayed, then press the Right button. The display should look like this:

Figure 4.9 Changing the Scale



To Look at or Change the Scale, continued

The CAL legend is turned on and the previously set Scale number is displayed. To return to Run without changing the Scale, press both the Right and Left button at the same time. To change the Scale number, use the Right button to select a digit to be changed, then use the Left button to scroll the blinking digit to the desired number. When the complete Scale number has been entered, press both the Right and Left button at the same time to return to Run.

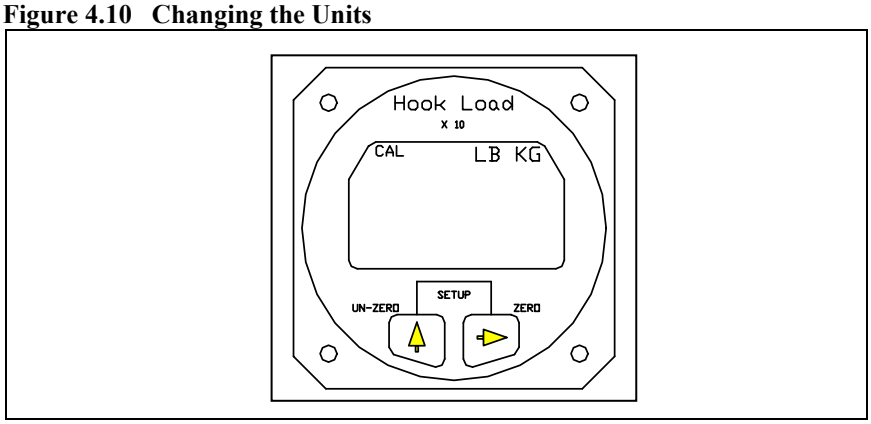
Select KG or LB Units

The units routine sets the display to read in pounds (LB) or kilograms (KG).

To look at or change the Units

With the Indicator powered up and in the Run Mode, press both buttons at the same time to go to Setup. Scroll through the menu until the word LB or KG is displayed, then press the Right button. The display should look like this:

Figure 4.10 Changing the Units



The CAL legend is turned on and the previously set unit is displayed. To return to Run without changing the units, press both the Right and Left button at the same time. To change the units press the Left button. When the selection has been made, press both the Right and Left button at the same time to return to Run.

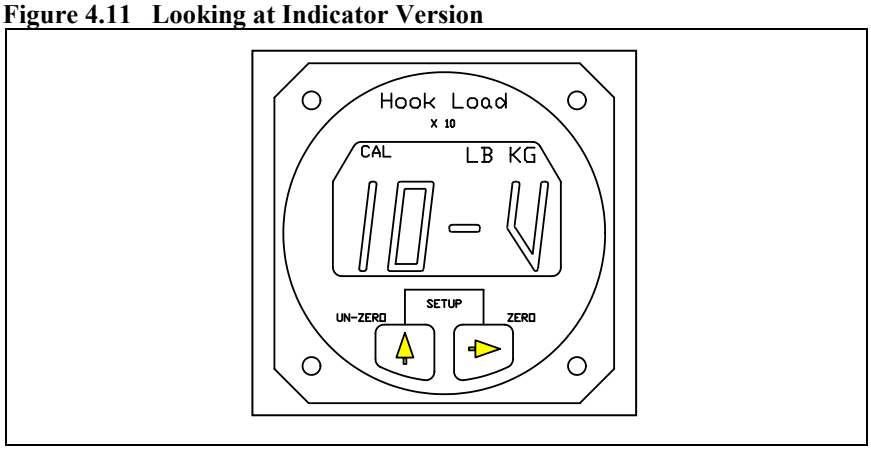
NOTICE

The selected units are displayed when in the Run Mode.

Indicator Version

The Version routine displays the Indicator's hardware and software revision levels. Version is set at the factory and cannot be changed.

Figure 4.11 Looking at Indicator Version



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Section 5
Maintenance

Storage Instructions

Clean the Cargo Hook Suspension System components thoroughly before packaging. Pack the unit in a heat-sealable package. If the unit is to be stored for long periods in a tropical climate it should be packed in a reliable manner to suit local conditions. Package the unit in a suitable fiberboard box and cushion the unit to prevent shifting. Seal the fiberboard box with tape and mark the box with the contents and date of packaging. Refer to MIL-PRF-23199 and MIL-STD-2073 for additional guidance.

After the Cargo Hook has been repaired or stored for an extended period of time it must be subjected to the Acceptance Test Procedure per its Component Maintenance Manual (CMM) 122-017-00 (BK117 C-2) or 122-015-00 (BK117 D-2 & D-3).

Preventive Maintenance

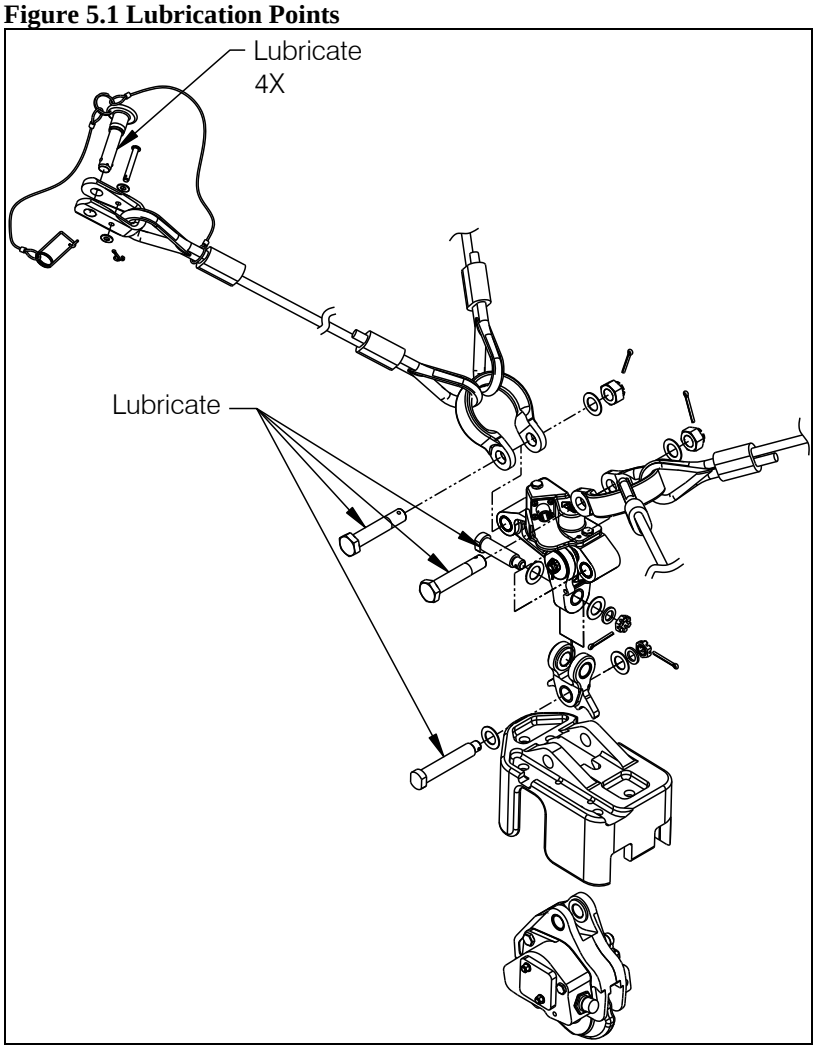
Remove caked-on dirt from the Sling Cargo Hook System components with a brush and clean exposed surfaces with a mild solvent. Thoroughly dry all surfaces.

Lubrication

- Annually, thoroughly clean and lubricate the Cargo Hook Sling System load ropes with an anti-corrosion lubricant compound such as ACF-50.
- Lubrication of the pivoting joints within Cargo Hook Sling System is recommended every 500 hours of external load operation. Refer to the following instructions.

  Disassemble and lubricate the Sling Cargo Hook System at points noted in Figure 5.1. Recommended lubricants are Mobilgrease 28 (MIL-G-81322) or AeroShell 17 (MIL-G-21164).

Figure 5.1 Lubrication Points



For re-assembly after lubrication, tighten each nut until seated and rotate to next castellation to insert cotter pin.

Slight mis-alignment of the clevis is normal. If necessary, after lubrication gently tap the head of the bolt with soft faced hammer to insert bolt through.

Inspection

The scheduled inspection intervals noted below are maximums and are not to be exceeded. If the cargo hook 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, inspect the cargo hook and suspension per the following.

*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 corrosion on the exterior of cargo hook. Corrosion on the cargo hook side plates is cause for immediate overhaul. Additionally, any exfoliation corrosion in the upper attach lug area of the cargo hook is cause for immediate replacement of the side plate.
2. Move the cargo hook and suspension throughout their full ranges of motion and observe the manual release cable and electrical harnesses to ensure that they have enough slack. The manual release cable or harnesses must not be the stops that prevent the cargo hook or suspension from moving freely in all directions.
3. Inspect all pivoting joints to ensure that they rotate freely.
4. Perform an electrical and mechanical release operation of the cargo hook per Section 3.1.
5. Using force gauge, pull down on the cargo hook and verify that the load-on-hook light in the cockpit extinguishes at a load of 11 to 15 lbs (5.0 to 6.8 kgs).
6. Visually inspect for presence and security of fasteners.
7. Visually inspect the electrical harnesses and their connections (including the strain relief at the load cell, if installed) for damage and security.

Inspection continued

8. Visually inspect the manual release cable and its connection to the cargo hook for damage and security.
9. Visually inspect the cargo hook bumper for damage.
10. Inspect suspension load ropes for broken strands, paying close attention to the sections around the thimbles at each end. Pass a cloth over the cables. This will clean the load ropes for a visual inspection and detect broken wires if the cloth snags on the rope. Ten randomly distributed broken wires in one rope lay (one complete rotation around the wire) or five broken wires in one strand in one rope lay is considered unacceptable. One rope lay is the length along the rope which a single strand requires to make one complete spiral around the core.
11. Visually inspect the suspension load ropes for crushing, unraveling, kinking, loss of rope diameter in short lengths, unevenness of outer strands or other damage.
12. Visually inspect the suspension load ropes for corrosion.
13. Visually inspect for security of C-39 indicator mounting (if installed).
14. Verify calibration of the load cell by lifting a load of known weight (see applicable Owner's Manual for instructions).

Overhaul

There is no specific overhaul schedule of the Cargo Hook Suspension System except for the cargo hook. Refer to service manual 122-017-00 (BK117 C-2) or 122-015-00 (BK117 D-2 & D-3) for overhaul schedule and instructions for the cargo hook. The remaining system components are to be repaired on condition. It is recommended that, at the cargo hook overhaul intervals, the rest of the system be disassembled to check for bushing wear at pivoting joints and damage or cracks in any of the structural components (see Table 5.1 for inspection criteria).

Table 5.1 provides inspection criteria for the suspension system components. Refer to Section 6 for identification of item numbers.

Table 5.1 Suspension System Inspection Criteria

Component	Damage Permitted without Repair	Repair	Maximum Damage which Causes Replacement
Clevis P/N 291-272-00 Item 3, Figure 6.1.1	Dents, gouges, and scratches less than .010" deep.	Blend at 20:1 ratio, length to depth, to provide smooth transitions. Apply ACF-50 or similar anti-corrosion lubricant compound to bare surfaces.	Dents, gouges and scratches greater than .030". Wear on inside radius interface with load ropes wear greater then .030". Visible cracks.
Attach Bolt P/N 290-332-00 Item 10, Figure 6.1.1	Wear on outside diameter, diameter greater than .490".	None.	Wear on outside diameter, diameter less than or equal to .490". Visible cracks.
Attach Bolt P/N 290-775-00 Item 11, Figure 6.1.1	Wear on outside diameter, diameter greater than .490".	None.	Wear on outside diameter, diameter less than or equal to .490". Visible cracks.
Bumper P/N 291-069-01 (BK117 C-2) or 290-940-00 (BK117 D-2 & D-3). Item 17, Figure 6.1.1	Gouges and scratches less than .060" deep.	None.	Gouges and scratches greater than .060" deep. Splitting.
Shackle Clevis P/N 291-009-01 Item 18, Figure 6.1.1 (Qty 4)	Dents, gouges, and scratches less than .030" deep.	Blend at 20:1 ratio, length to depth, to provide smooth transitions. Material is 15-5PH stainless steel. No touch-up finish is required.	Dents, gouges and scratches greater than .060" deep. Visible cracks.
Quick Release Pin, P/N 291-275-00 Item 25, Figure 6.1.1 (Qty 4)	Wear on outside diameter, diameter greater than .424".	None.	Wear on outside diameter, diameter less than or equal to .424". Visible cracks.

Table 5.1 Suspension System Inspection Criteria continued

Component	Damage Permitted without Repair	Repair	Maximum Damage which Causes Replacement
Hook Link, P/N 291-271-01 Item 3, Figure 6.1.4	Dents, gouges, and scratches less than .030" deep.	Blend at 20:1 ratio, length to depth, to provide smooth transitions. Material is 15-5PH stainless steel. No touch-up finish is required.	Dents, gouges and scratches greater than .060" deep. Visible cracks.
Bushing P/N 290-364-00 Item 2, Figure 6.1.4 Item 1, Figure 6.1.7	Wear on inside diameter, diameter less than or equal to .520".	None.	Wear on inside diameter, diameter greater than .520".
Bushing P/N 517-022-00 Item 2, Figure 6.1.6	Teflon film still covers more than 50% of the bushing wear area.	None.	If copper is visible over more than 50% of the bushing wear area, remove and replace the bushing.
Housing, Load on Hook P/N 291-264-00 Item 3, Figure 6.1.6	Dents, gouges, and scratches less than .010" deep.	Blend at 20:1 ratio, length to depth, to provide smooth transitions. Material is 15-5PH stainless steel. No touch-up finish is required.	Dents, gouges and scratches greater than .030". Visible cracks.
Shift Link P/N 291-269-00 Item 2, Figure 6.1.7	Dents, gouges, and scratches less than .010" deep.	Blend at 20:1 ratio, length to depth, to provide smooth transitions. Material is 15-5PH stainless steel. No touch-up finish is required.	Dents, gouges and scratches greater than .030". Visible cracks.
Bushing P/N 291-270-00 Item 3, Figure 6.1.7	Wear on inside diameter, diameter less than or equal to .636".	None.	Wear on inside diameter, diameter greater than .636".

Instructions for Returning Equipment to the Factory

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.

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

Section 6

System Part Numbers

Figure 6.1.1 BK117 C-2 Cargo Hook Suspension Assembly (232-347-00/-01 shown)

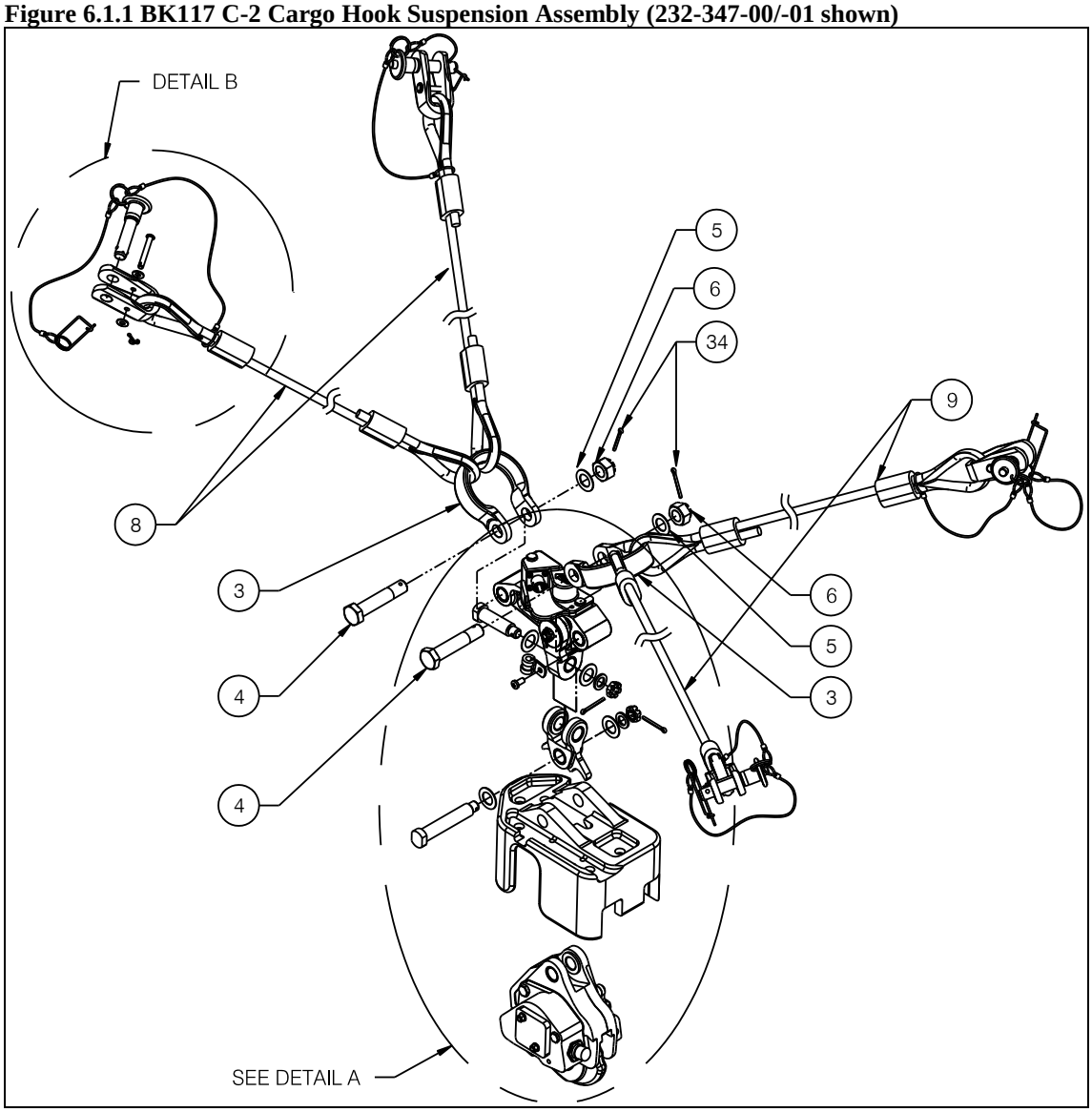


Figure 6.1.1 BK117 C-2 Cargo Hook Suspension Assembly (232-347-00/-01 shown) continued

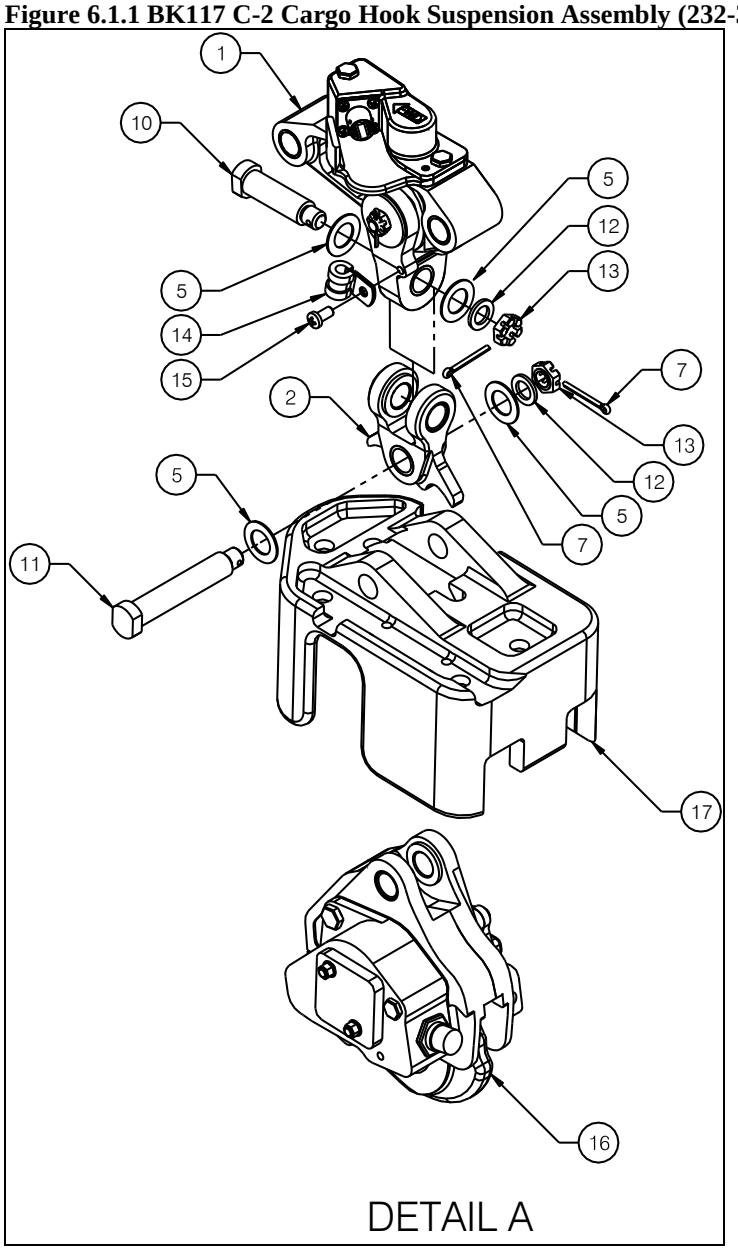


Figure 6.1.2 Typical Shackle Clevis Attachment

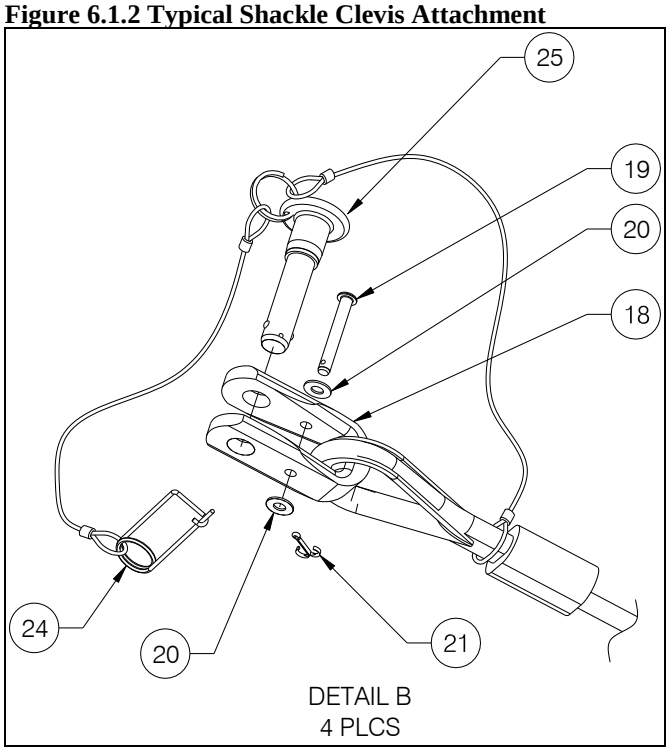


Figure 6.1.3 Routing of Release Cable, Ground Strap, and Harness (232-347, 232-439)

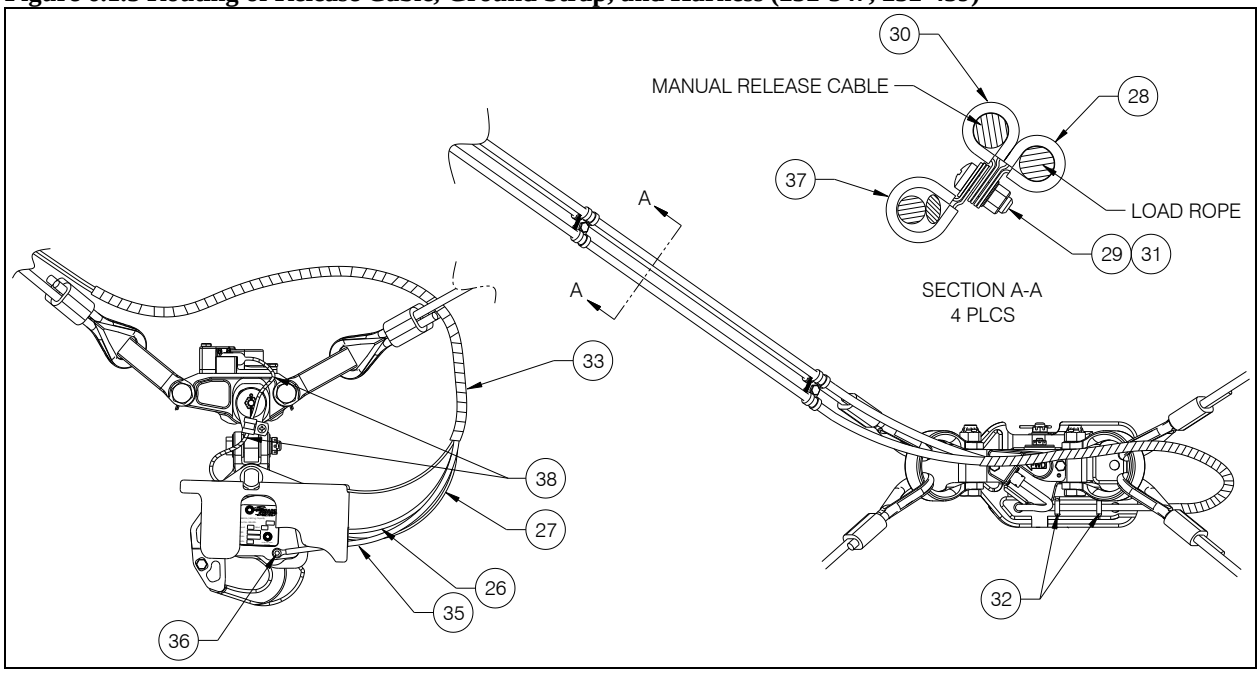


Figure 6.1.4 Routing of Hydraulic Hose, Ground Strap, and Harness (232-712, 232-713)

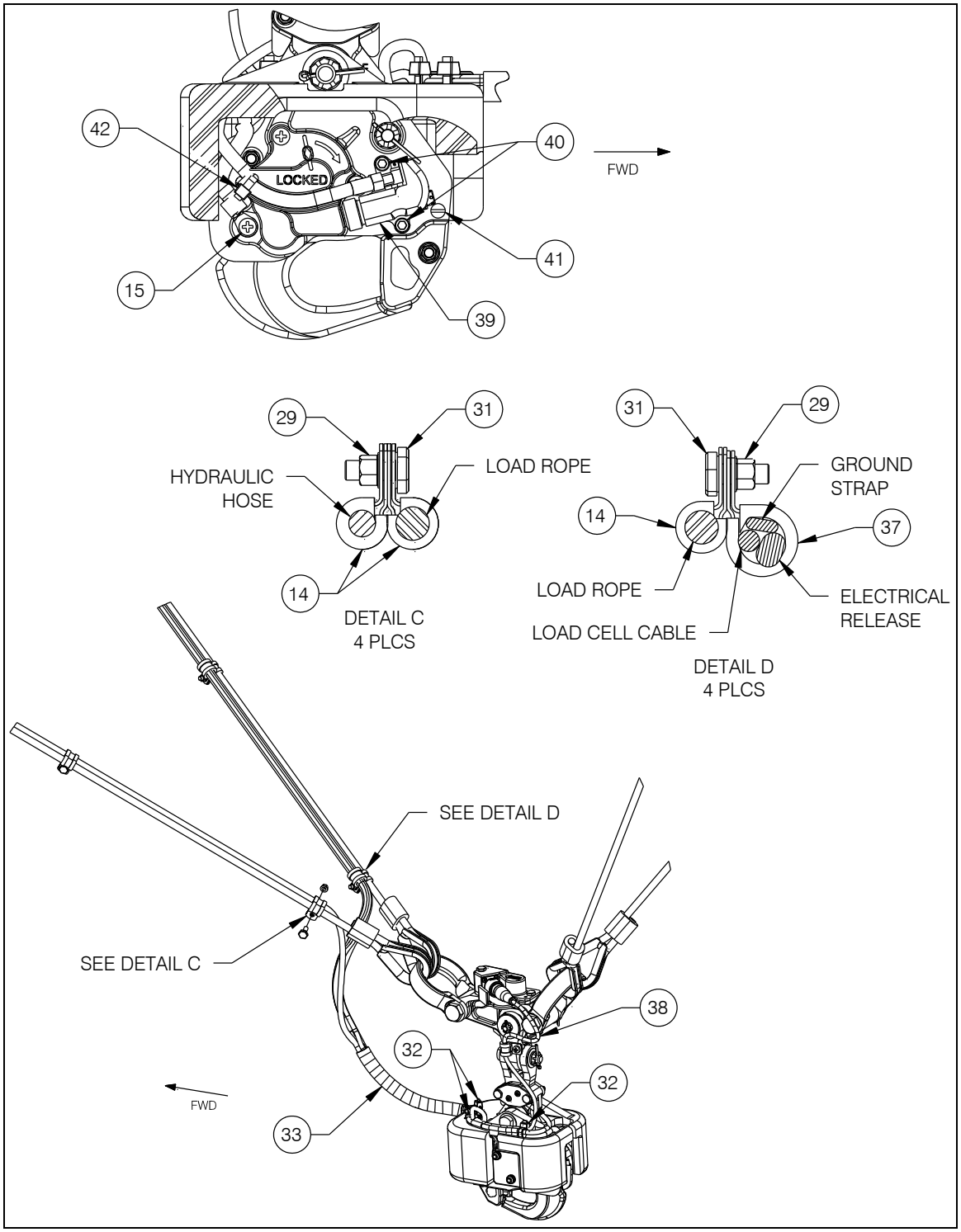


Table 6.1.1 Cargo Hook Suspension Assembly Parts

Item	Part No.	Description	232-347-00	232-347-01	232-439-00	232-439-01	232-712-00	232-712-01	232-713-00	232-713-01
1	232-352-00	Load-On Hook Assembly	1	-	1	-	1	-	1	-
	232-352-01	Load-On Hook Assembly	-	1	-	1	-	1	-	1
2	232-350-00	Hook Link Assembly	1	1	-	-	-	-	1	1
	210-243-00	Load Cell Assembly	-	-	1	1	-	-	-	-
	210-299-00	Load Cell Assembly	-	-	-	-	1	1	-	-
3	291-272-00	Clevis	2	2	2	2	2	2	2	2
4	510-704-00	Bolt	2	-	2	-	2	-	2	-
	509-001-00	Bolt (Qualified Fastener)	-	2	-	2	-	2	-	2
5	510-183-00	Washer	6	6	6	6	6	6	6	6
6	510-442-00	Nut	2	-	2	-	2	-	2	-
	510-728-00	Locking Castellated Nut	-	2	-	2	-	2	-	2
7	510-178-00	Cotter Pin	2	2	2	2	2	2	2	2
8	232-226-01	Suspension Cable, Forward	2	2	2	2	2	2	2	2
9	232-227-01	Suspension Cable, Aft	2	2	2	2	2	2	2	2
10	290-332-00	Attach Bolt	1	1	1	1	1	1	1	1
11	290-775-00	Long Attach Bolt	1	1	1	1	1	1	1	1
12	510-174-00	Washer	2	2	2	2	2	2	2	2
13	510-170-00	Nut	2	-	2	-	2	-	2	-
	510-780-00	Locking Castellated Nut	-	2	-	2	-	2	-	2
14	512-037-00	Loop Clamp	1	1	1	1	13	13	13	13
15	510-580-00	Screw	1	1	1	1	2	2	2	2
16	528-029-60	Cargo Hook	1	1	1	1	-	-	-	-
	528-028-57	Cargo Hook	-	-	-	-	1	1	1	1
17	291-069-01	Bumper	1	1	1	1	-	-	-	-
	290-940-00	Hook Bumper	-	-	-	-	1	1	1	1
18	291-009-01	Shackle Clevis	4	4	4	4	4	4	4	4
19	510-566-00	Clevis Pin	4	4	4	4	4	4	4	4
20	510-467-00	Washer	8	8	8	8	8	8	8	8
21	510-417-00	Cotter Pin	4	4	4	4	4	4	4	4
22	531-015-00	Lanyard Cable	8 @ 11.5”	8 @ 11.5”	8 @ 11.5”	8 @ 11.5”	8 @ 11.5”	8 @ 11.5”	8 @ 11.5”	8 @ 11.5”
23	531-016-00	Crimp Sleeve	16	16	16	16	16	16	16	16
24	510-606-00	Safety Pin	4	4	4	4	4	4	4	4
25	291-275-00	Quick Release Pin, Modified	4	4	4	4	4	4	4	4
26	268-037-01	Manual Release Cable	1	1	1	1	-	-	-	-
27	270-162-00	Electrical Release Harness	1	1	1	1	-	-	-	-
	270-277-00	Electrical Release Harness	-	-	-	-	1	1	1	1

Item	Part No.	Description	232-347-00	232-347-01	232-439-00	232-439-01	232-712-00	232-712-01	232-713-00	232-713-01
28	512-005-00	Loop Clamp	4	4	4	4	4	4	4	4
29	510-102-00	Nut	4	4	4	4	8	8	8	8
30	512-027-00	Loop Clamp	4	4	4	4	4	4	4	4
31	510-453-00	Bolt	4	4	4	4	-	-	-	-
	510-712-00	Bolt	-	-	-	-	8	8	8	8
32	512-011-00	Cable tie	2	2	2	2	3	3	3	3
33	590-011-00	Spiral Wrap	24”	24”	24”	24”	15”	15”	15”	15”
34	510-113-00	Cotter Pin	2	2	2	2	2	2	2	2
35	270-175-00	Ground Strap, Removable	1	1	1	1	-	-	-	-
	270-228-00	Ground Strap, Removable	-	-	-	-	1	1	1	1
36	510-156-00	Screw	1	1	1	1	-	-	-	-
37	512-006-00	Loop Clamp	4	4	-	-	4	4	4	4
	512-007-00	Loop Clamp	-	-	4	4	-	-	-	-
38	590-013-00	Spiral Wrap	12”	12”	12”	12”	10”	10”	10”	10”
39	232-733-00	Slave Cylinder with Plumbing	-	-	-	-	1	1	1	1
40	510-531-00	Screw	-	-	-	-	2	2	2	2
41	510-755-00	Screw	-	-	-	-	1	1	1	1
42	512-003-00	Cable Tie	-	-	-	-	1	1	1	1

Figure 6.1.5 200-361-00 BK117 C-2 BQRS Cable Kit

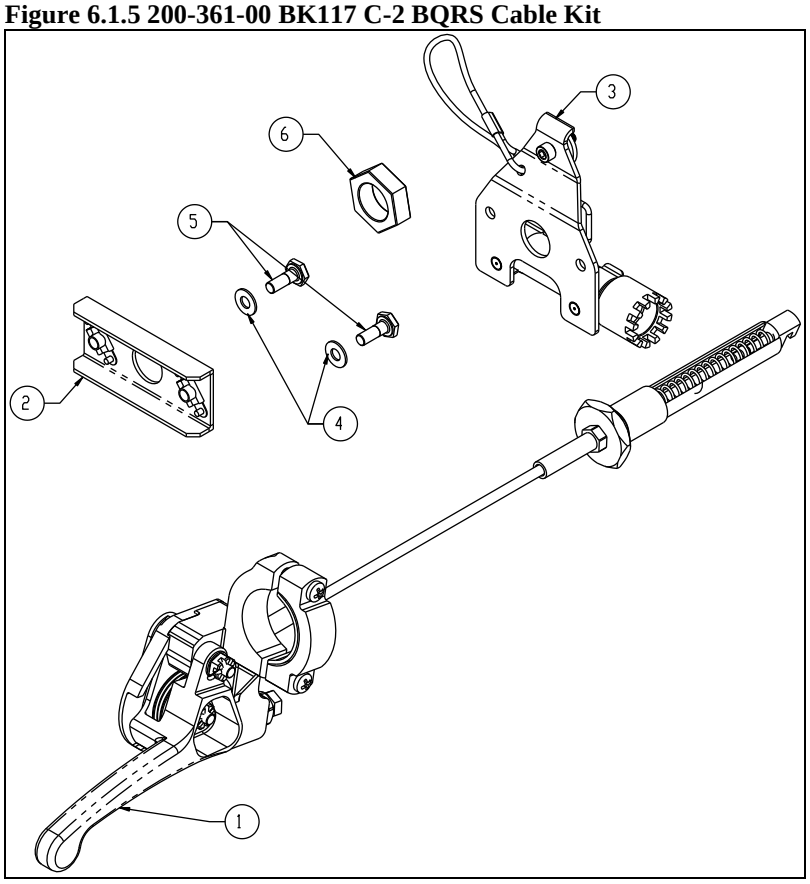


Table 6.1.2 BK117 C-2 BQRS Cable Kit Parts

Item	Part No.	Description	Qty
1	232-440-00	Release Handle Assembly	1
2	232-441-00	Channel Assembly	1
3	232-442-00	Bracket Assembly	1
4	510-419-00	Washer	2
5	510-453-00	Bolt	2
6	510-861-00	Nut	1

Figure 6.1.6 232-440-00 Release Handle Assembly

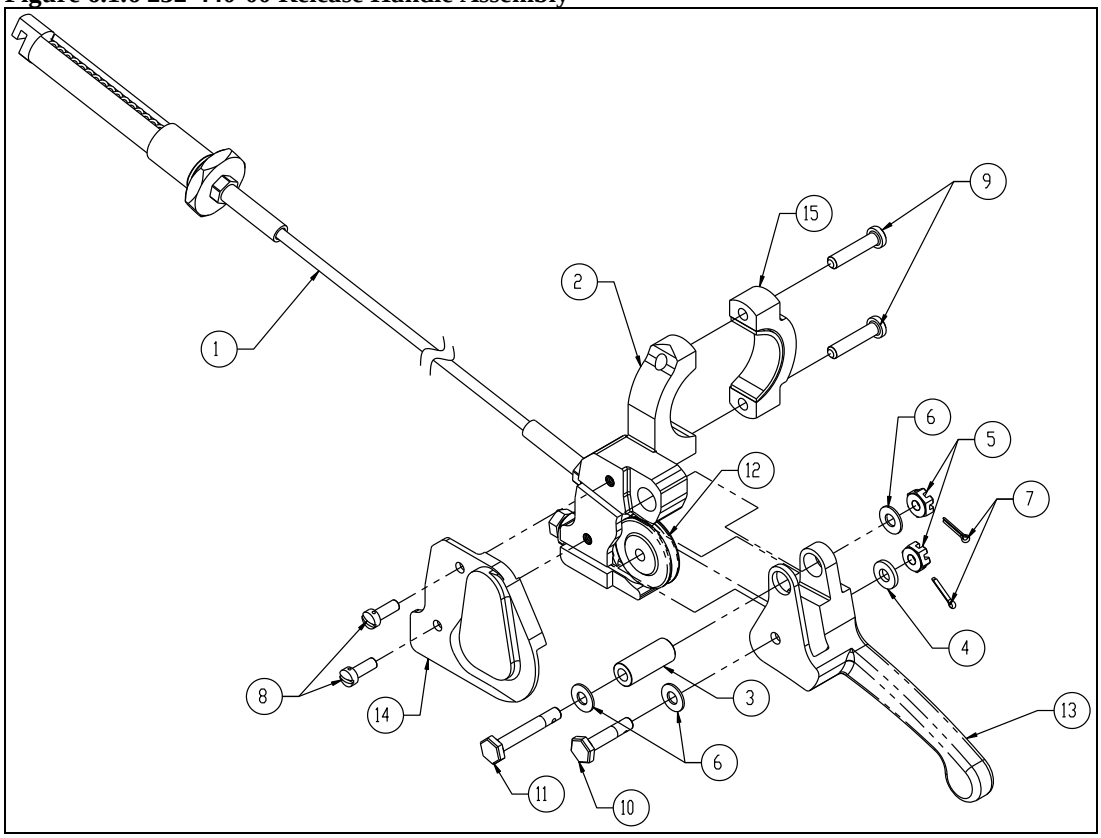


Table 6.1.3 Release Handle Assembly Parts

Item	Part No.	Description	Qty
1	268-052-00	Manual Release Cable Assembly	1
2	232-417-00	Lever Support Assembly	1
3	290-759-00	Shaft	1
4	510-042-00	Washer	1
5	510-082-00	Nut	2
6	510-095-00	Washer	3
7	510-125-00	Cotter Pin	2
8	510-317-00	Screw	2
9	510-390-00	Screw	2
10	510-449-00	Bolt	1
11	510-450-00	Bolt	1
12	517-049-00	Pulley	1
13	291-512-00	Manual Release Lever	1
14	291-510-00	Lever Cover	1
15	232-443-00	Clamp Half Assembly	1

Figure 6.1.7 BK117 D-2 & D-3 Hydraulic BQRS kit

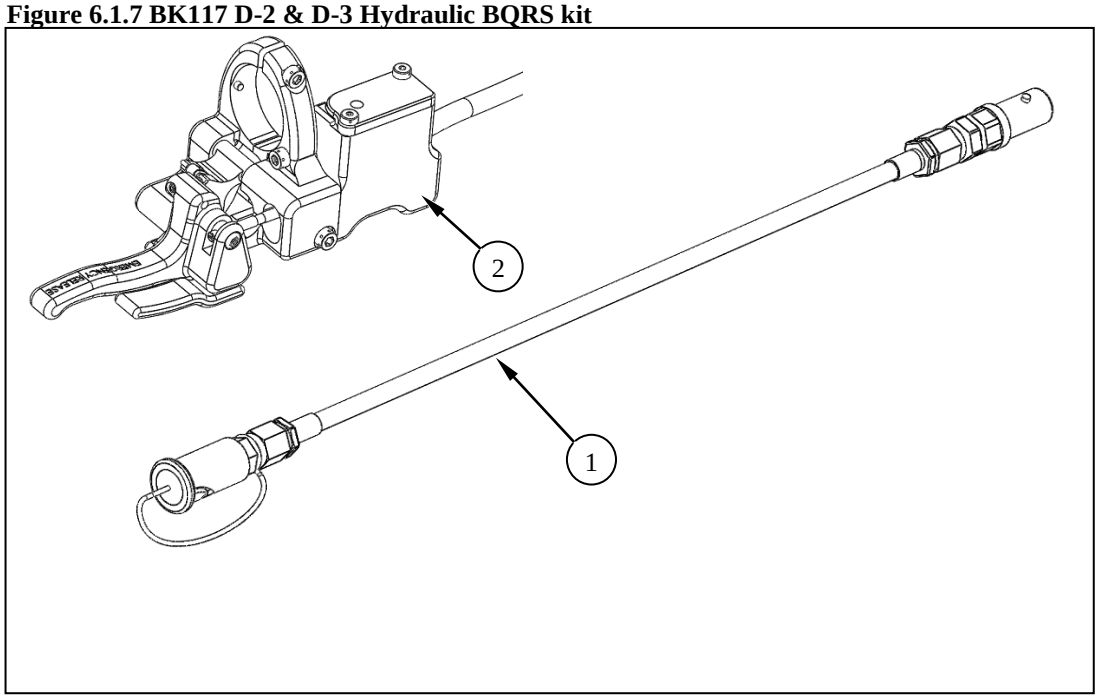


Table 6.1.4 BK117 D-2 Hydraulic BQRS kit

Item	Part Number	Description	Qty
1	232-639-00	Intermediate Plumbing Assembly Hook 1	1
2	232-626-10	Single Master Cylinder Assembly	1
3	560-012-00	Dust Cap*	1
4	560-013-00	Dust Cap*	1

*Not illustrated

Figure 6.1.8 BK117 D-2 & D-3 Hydraulic BQRS Parts

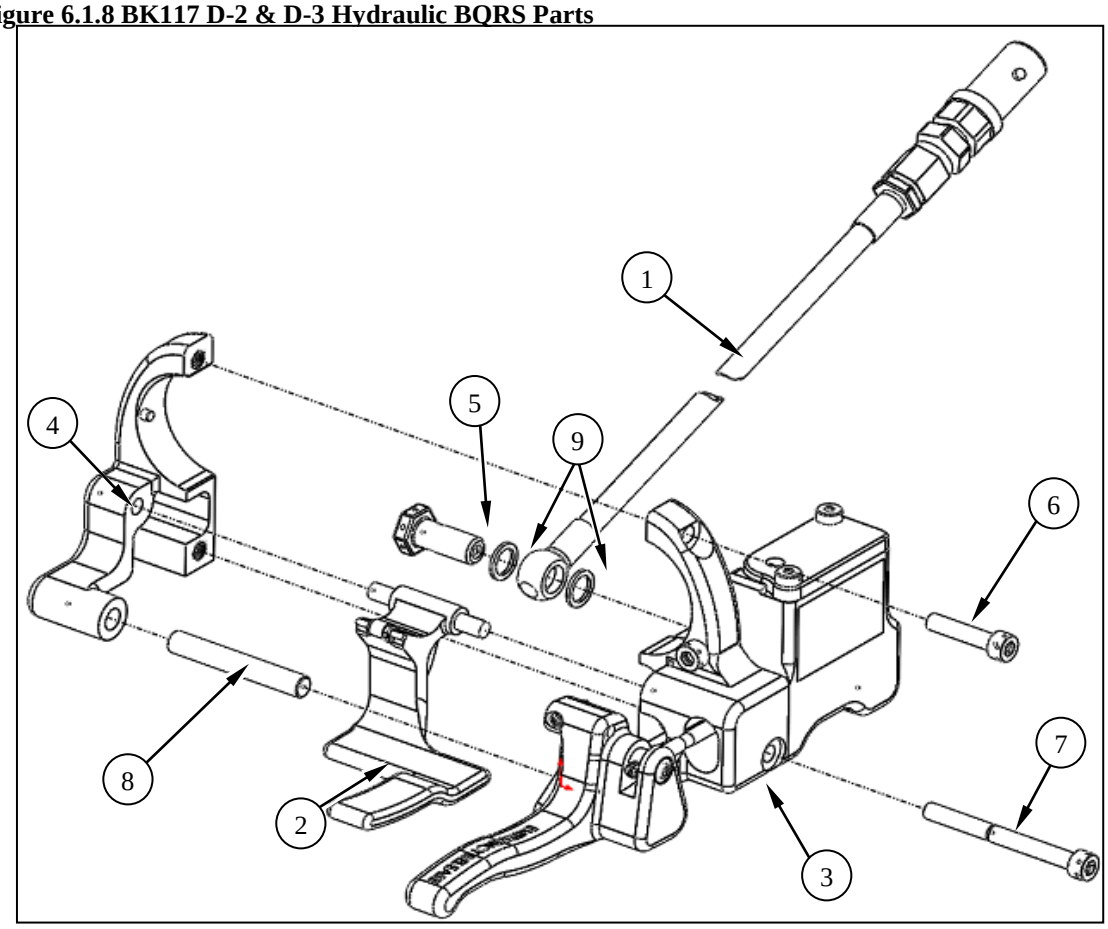


Table 6.1.5 BK117 D-2 Hydraulic BQRS Parts

Item	P/N	Description	Qty
1	232-632-00	Master Cylinder Plumbing Assembly Hook 1 & 2	1
2	232-640-00	Lockout Lever Assembly	1
3	232-641-10	Master Cylinder Subassembly (Port)	1
4	232-642-10	Master Cylinder Clamp	1
5	291-665-00	Banjo Bolt, Drilled Head	1
6	511-080-00	Socket Head Screw	1
7	511-081-00	Socket Head Screw	1
8	511-086-00	Dowel Pin	1
9	556-040-00	Crush Washer	2

Figure 6.1.9 232-350-00 Hook Link Assembly

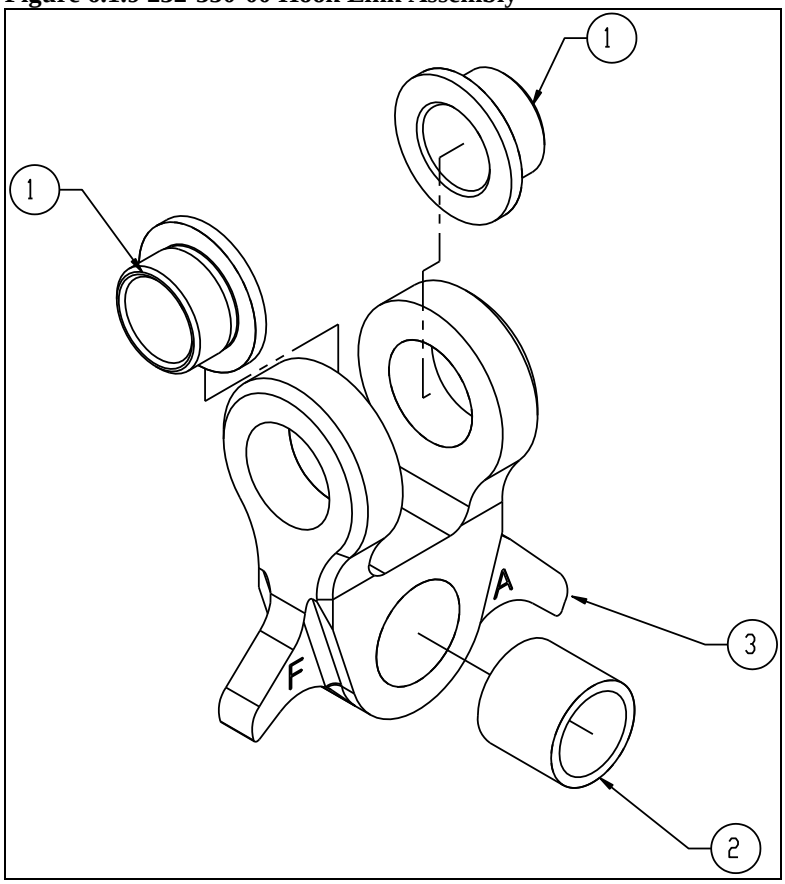


Table 6.1.4 Hook Link Assembly Parts

Item	Part No.	Description	Qty
1	290-294-00	Attach Bushing	2
2	290-364-00	Bushing	1
3	291-271-00	Hook Link	1

Figure 6.1.10 232-352-00 & 232-352-01 Load-on-Hook Assembly

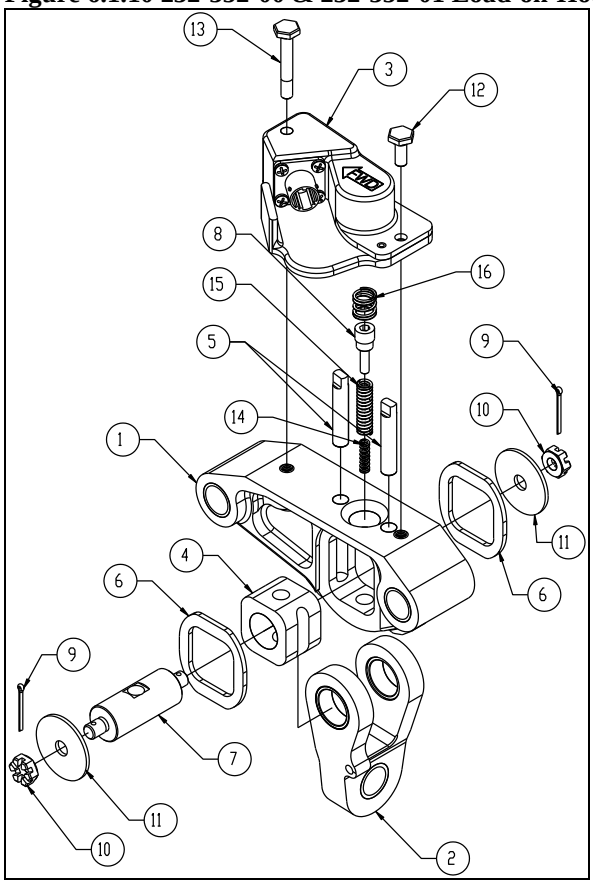


Table 6.1.5 Load-on-Hook Assembly Parts

Item	Part No.	Description	232-352-00	232-352-01
1	232-348-00	Housing Assembly	1	1
2	232-349-00	Shift Link Assembly	1	1
3	232-351-00	Electrical Assembly	1	1
4	291-265-00	Shift Block	1	1
5	291-266-00	Alignment Pin	2	2
6	291-267-00	Shift Block Cover	2	2
7	291-268-00	Pivot Shaft	1	1
8	291-276-00	Set Screw	1	1
9	510-081-00	Cotter Pin	2	2
10	510-259-00	Nut	2	-
	510-796-00	Locking Castellated Nut	-	2
11	510-336-00	Washer	2	2
12	510-342-00	Bolt	1	1
13	510-711-00	Bolt	1	1
14	514-077-00	Spring	1	1
15	514-078-00	Spring	1	1
16	514-079-00	Spring	1	1

Figure 6.1.11 232-348-00 Housing Assembly

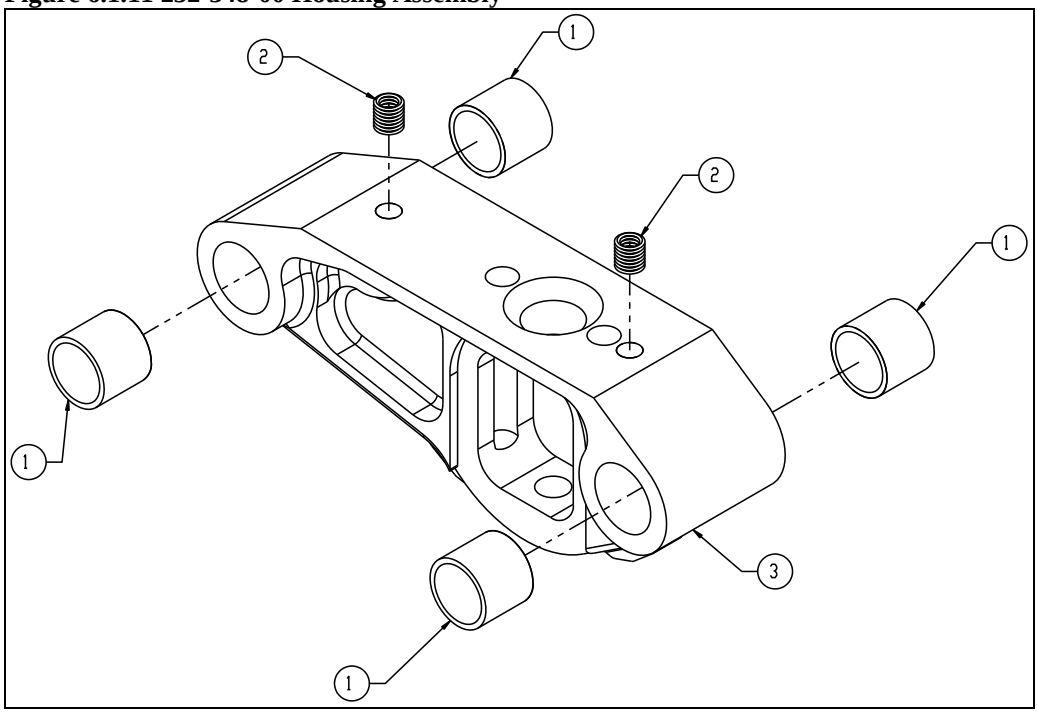


Table 6.1.6 Housing Assembly Parts

Item	Part No.	Description	Qty
1	517-022-00	Bushing	4
2	510-248-00	Helicoil	2
3	291-264-00	Housing	1

Figure 6.1.12 232-349-00 Shift Link Assembly

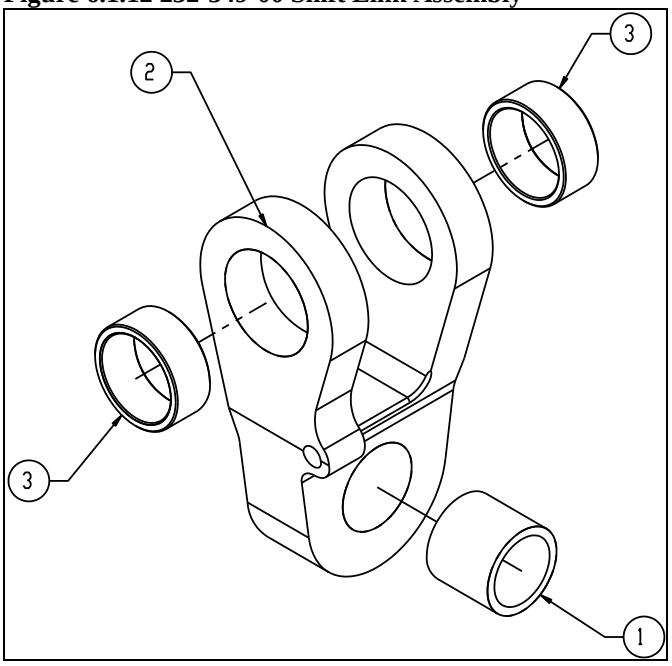


Table 6.1.7 232-349-00 Shift Link Assembly Parts

Item	Part No.	Description	Qty
1	290-364-00	Bushing	1
2	291-269-00	Shift Link	1
3	291-270-00	Bushing	2