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Owner's Manual, Cargo Hook Suspension System, Bell 429

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Applicable Equipment Part Numbers

200-304-00
200-427-00
232-255-00
232-255-01
232-219-01
232-315-00
210-095-05

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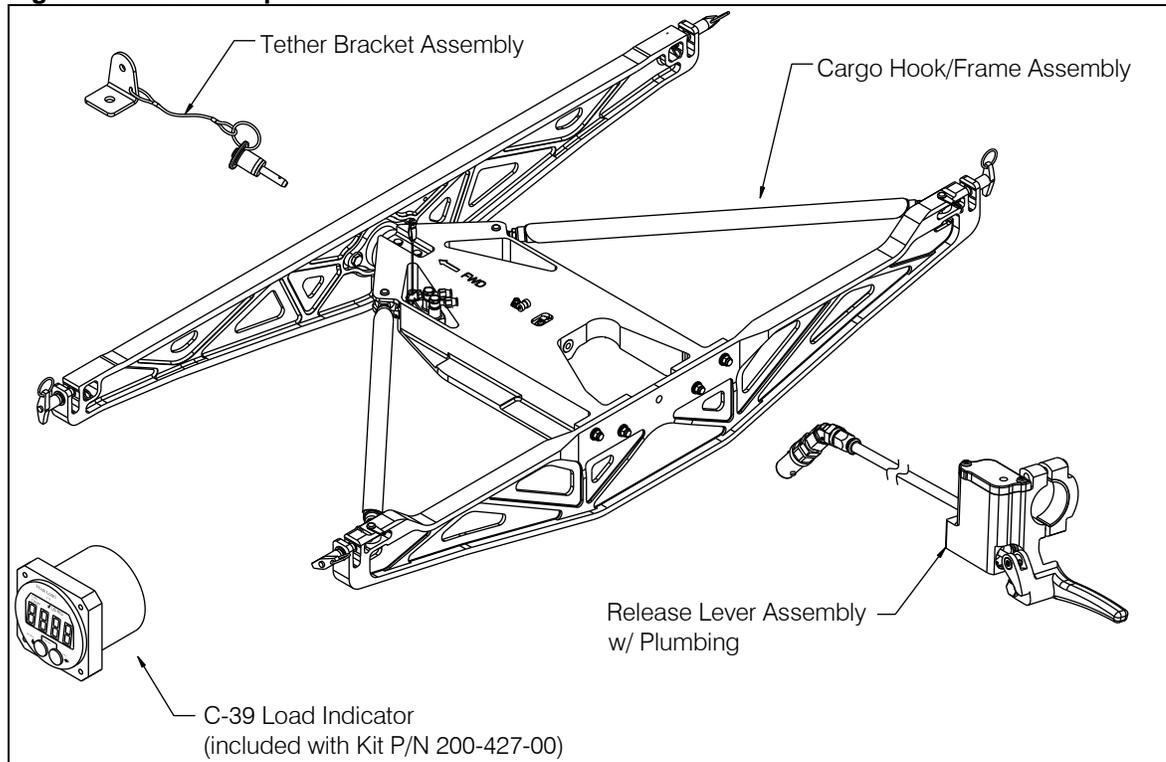
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1.0 Introduction

1.1 Scope. This owner's manual contains instructions for installation and operation of the Bell 429 Cargo Hook Suspension System, Kit P/Ns 200-304-00 and 200-427-00. Kit P/N 200-304-00 includes a cargo hook with hydraulic release system, a structural frame which provides for gimbaling of the cargo hook and transfers the external load on the cargo hook to four hard points on the belly of the aircraft. The hydraulic release system includes a release lever which is mounted to the collective in the cabin and an emergency valve and release lever on the frame which is pulled by a tether in the event of a structural failure which results in the frame falling away.

Kit P/N 200-427-00 is the same as P/N 200-304-00 except it includes a load weigh system. The load weigh system includes a pin load cell which replaces the cargo hook attach bolt in the cargo hook/frame assembly and a load indicator for installation in the cockpit. This system serves to provide the pilot with the weight of the load being carried on the cargo hook.

Figure 1.1.1 Kit Components



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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.

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2.0 Specifications

Table 2.1 Suspension (P/N 232-255-00, 232-255-01) Specifications

Design load	3,000 lbs. (1,361 kgs.)
Design ultimate strength	11,250 lbs. (5,103 kgs.)
Unit weight (232-255-00)	34.0 lbs (15.4 kgs.)
Unit weight (232-255-01)	34.3 lbs (15.6 kgs.)

Table 2.2 Cargo Hook (P/N 528-028-01) Specifications

Design load	3,500 lbs. (1,588 kgs.)
Design ultimate strength	13,125 lbs. (5,953 kgs.)
Electrical release capacity	8,750 lbs. (3,969 kgs.)
Mechanical release capacity	8,750 lbs. (3,969 kgs.)
Force required for mechanical release at 3,500 lb.	12 lbs max. @ Master Cylinder Release Lever
Hydraulic release system – operating temperature rating	-49°F to 158°F (-45°C to 70°C)
Electrical requirements	22-32 VDC, 6.9 – 10 amps
Minimum release load	0 lbs
Unit weight	3.3 lbs (1.5 kgs.)
Electrical connector	D38999/26JD5PN



Load capacities given are for the equipment described only. Loading limits for your particular helicopter model still apply. Consult your flight manual.

3.0 Bill of Materials

The following items are included with the P/N 200-304-00 and P/N 200-427-00 kits. If shortages are found contact the company from whom the system was purchased.

Table 3.1 Bill of Materials – Kit P/N 200-304-00

Part No.	Description	Qty
232-255-00	Cargo Hook/Frame Assembly	1
232-219-01	Release Lever Assembly w/ Plumbing	1
232-315-00	Tether Bracket Assembly	1

Table 3.2 Bill of Materials – Kit P/N 200-427-00

Part No.	Description	Qty
232-255-01	Cargo Hook/Frame Assembly	1
232-219-01	Release Lever Assembly w/ Plumbing	1
232-315-00	Tether Bracket Assembly	1
210-095-05	C-39 Load Indicator w/ 5V NVG Light	1

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4.0 Theory of Operation

A load is attached to the cargo hook by passing a cargo ring into the throat of the load beam and pushing the ring against the upper portion of the load beam throat, which will cause the hook to close. In the closed position, a latch engages the load beam and latches it in this position.

To release the load, the latch is disengaged from the load beam. With the latch disengaged, the weight of the load causes the load beam to swing to its open position, and the cargo ring slides off the load beam.

The electrical release system provides means for load release by pilot actuation of a push-button switch in the cockpit. When the push-button switch is pressed, it energizes the DC solenoid in the cargo hook and the solenoid disengages the latch through the internal mechanism. The kits include an electrical harness from the cargo hook which is connected to a mating connector (not included) at the belly of the helicopter.

The hydraulic release system provides a means of releasing a cargo hook load in the event of an electrical release system failure. A lever mounted to the collective actuates it. The lever, when actuated, moves a piston at the master cylinder which forces fluid through a hose to move a slave cylinder piston on the cargo hook. The slave cylinder piston pushes a lever within the cargo hook which disengages the latch through the internal mechanism.

In the event of a major structural failure at the forward or aft cross beam of the suspension structure, the downward movement of the structure will pull a lever on the emergency valve through the tether bracket. This action moves a piston within the emergency valve body and forces fluid through the hose to move the slave cylinder piston on the cargo hook, releasing the load.

Ground personnel may also release a load by the actuation of a lever located on the side of the cargo hook.

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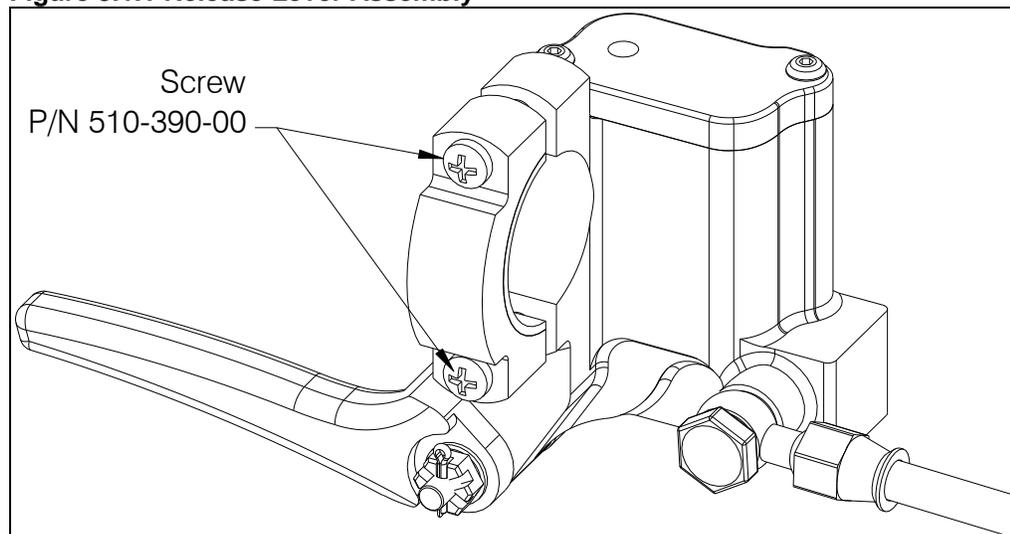
5.0 Installation Instructions

5.1 Hydraulic Release System Installation

The external section (from the cargo hook to the connection at the belly of the helicopter) of the hydraulic release system is supplied filled with MIL-PRF-87257 hydraulic fluid and is bled. The internal section, including the reservoir at the release lever assembly is supplied empty. It is recommended that this section be filled and bled on the bench before installing on the helicopter. Refer to section 6.0 for filling and bleeding instructions.

Install the release lever assembly with plumbing (P/N 232-219-01) onto the collective using the two screws provided pre-assembled onto the assembly.

Figure 5.1.1 Release Lever Assembly

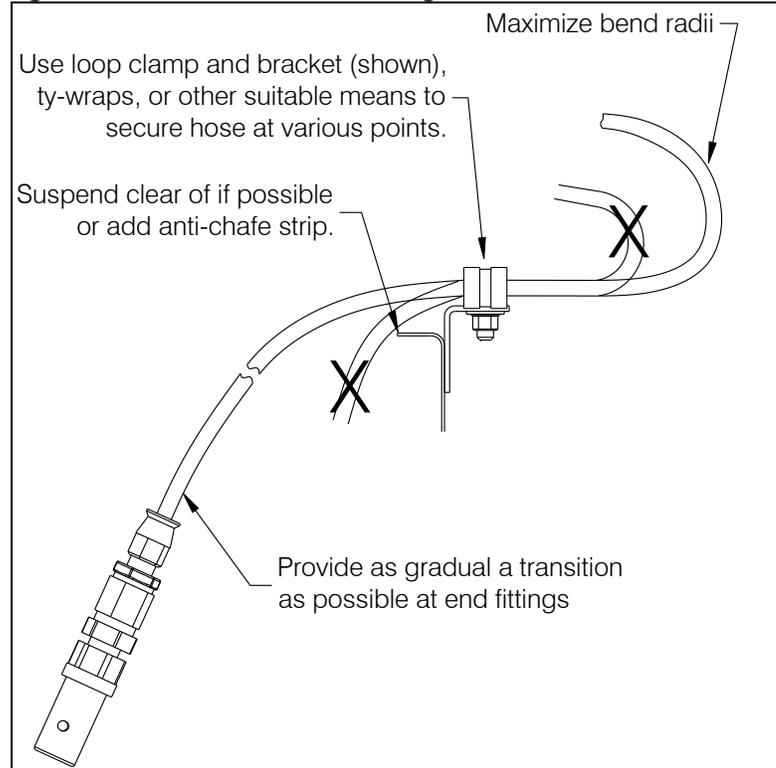


Route the hydraulic hose through the aircraft to the disconnect point with the external section of hose. Observe the following precautions (ref. Figure 5.1.2) when routing the hose.

- Use care to avoid kinking the hose.
- Avoid abrupt change in direction of the hose just outside the end fittings.
- Provide smooth transitions where possible. Recommended minimum hose bend radius is 1.5 inches.
- Verify that the hose routing is clear of and cannot be deflected into chafe points.

5.1 Hydraulic Release System Installation continued

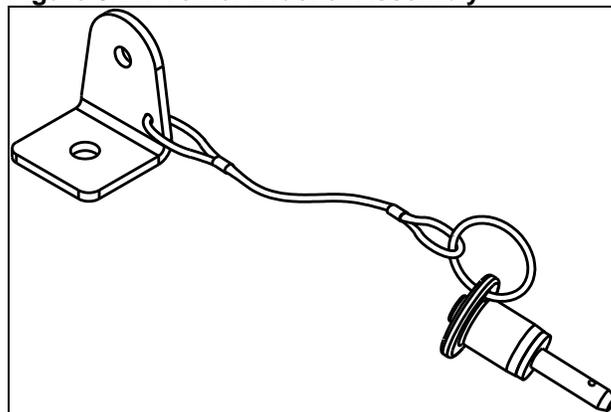
Figure 5.1.2 General Hose Routing Practices



5.2 Tether Bracket Installation

1. Install the Tether Bracket Assembly (P/N 232-315-00) at the designated insert location on the belly of the aircraft (refer to Bell Helicopter documentation for location and hardware).

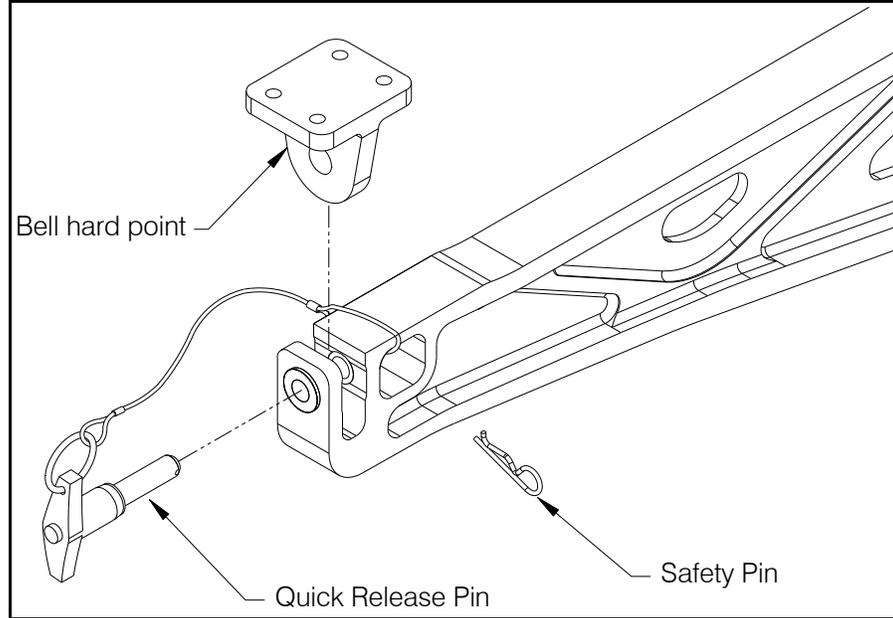
Figure 5.2.1 Tether Bracket Assembly



5.3 Cargo Hook Frame Installation

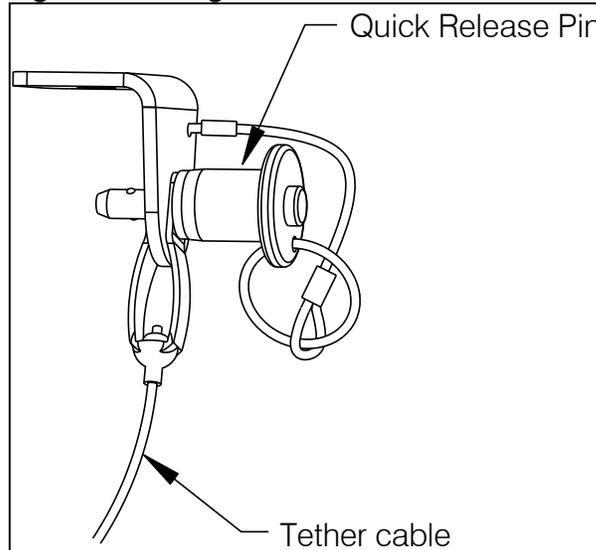
1. Align the clevis holes at each end of the Forward and Aft Beam with the aircraft's hard points and insert the quick release pins through.
2. Insert the safety pins through the holes in the end of the quick release pin shaft.

Figure 5.3.1 Cargo Hook Frame Installation Hardware



3. Connect the tether cable from the emergency release valve to the tether bracket using the quick release pin that is attached by lanyard to the bracket.

Figure 5.3.2 Cargo Hook Frame Installation Hardware



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4. Connect the hydraulic hose, cargo hook electrical release harness, and load cell harness (if load weigh system is being installed) to their respective mating connectors on the belly of the aircraft. See Table 5.3.1 for cargo hook electrical connector pin out information.

Table 5.3.1 Cargo Hook Electrical Connector

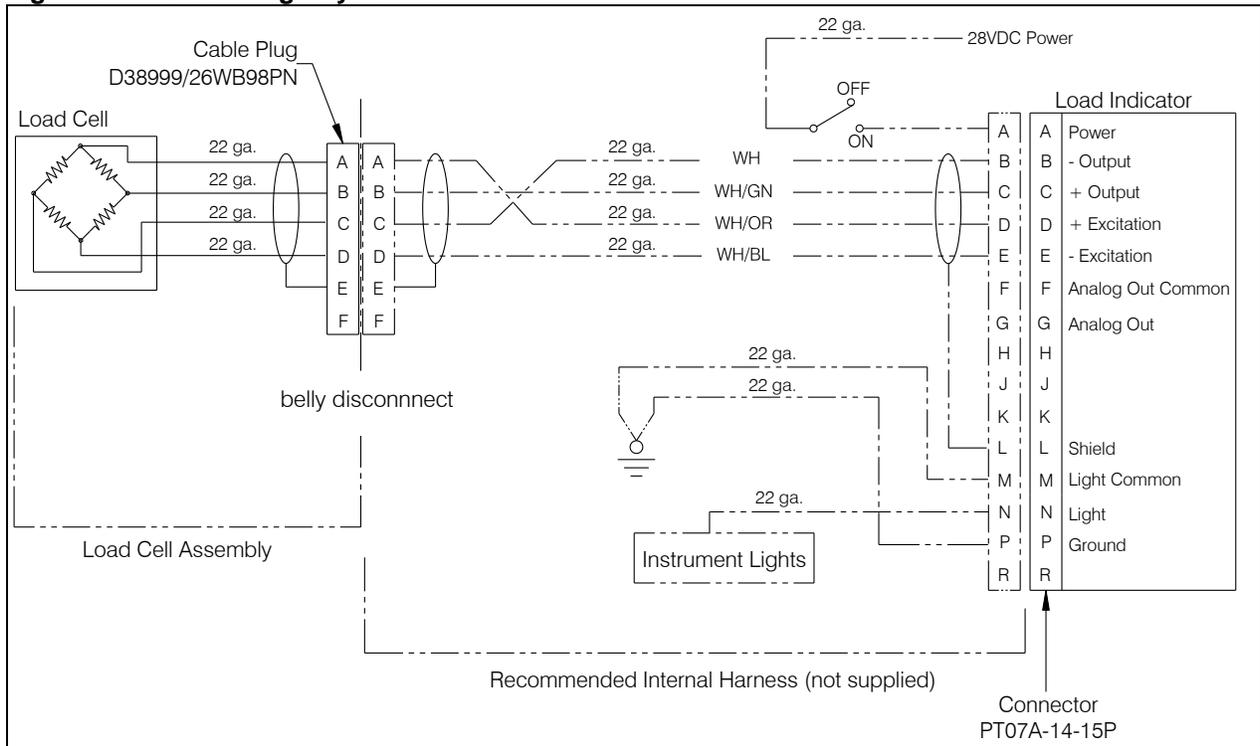
Pin	Function
A	Ground
B	Power
C	Not Used
D	Not Used
E	Not Used

5.4 Load Weigh System Component Installation

The C-39 Load Indicator should be mounted in a position that is convenient, accessible and visible to the pilot. It is designed to be mounted in a standard 2 1/4" instrument panel hole.

An internal load weigh harness is not supplied with kit P/N 200-427-00. The recommended wiring schematic and required pin-outs for the connectors are shown in the overall load weigh system schematic below.

Figure 5.4.1 Load Weigh System Schematic



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6.0 Hydraulic Release System Fill and Bleed Instructions

The external, or removable, section of the hydraulic release system is supplied filled with MIL-PRF-87257 hydraulic fluid and is bled for initial installation (the system is also compatible with MIL-PRF-5606 hydraulic fluid). The internal, or fixed, section of the hydraulic release system is supplied empty and must be filled and bled at installation. This section provides instructions for:

- Bleeding the fixed section by itself (see section 6.1).
- Bleeding the entire system (see section 6.2), which is an optional method at installation or after a repair or if air is introduced into the system.

Filling and bleeding the hydraulic release system is most easily accomplished on the bench, prior to installation on the aircraft.

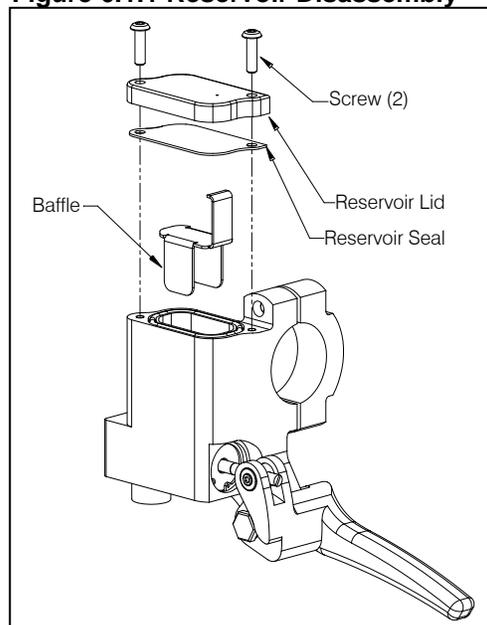
6.1 Filling and Bleeding Fixed Section of Hydraulic Release System

1. Remove screws, reservoir lid, reservoir seal, and baffle from the master cylinder reservoir as shown in Figure 6.1.1.



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

Figure 6.1.1 Reservoir Disassembly



6.1 Filling & Bleeding Fixed Section of Hydraulic Release System continued

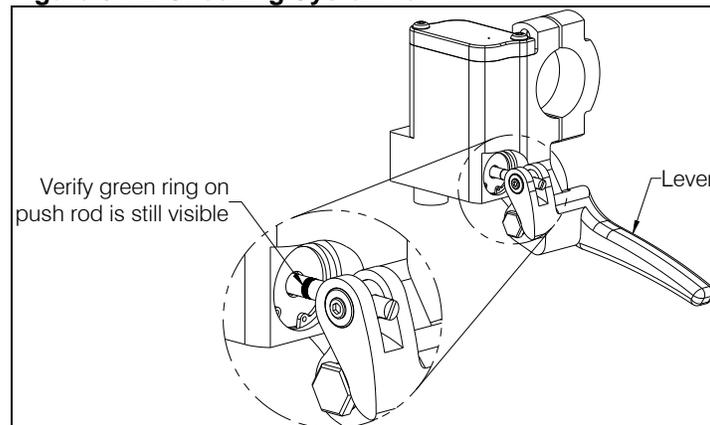
2. Arrange the hose so that it rises towards the reservoir to facilitate air movement up and out of the system.
3. Connect a quick disconnect fitting (also available in bleed kit P/N 212-038-00) to the mating end fitting at the end of the fixed plumbing line. This fitting has a 3/8-24 JIC interface for connecting a supply line.
4. Pump fluid through this fitting while monitoring the master cylinder reservoir fluid level and for air rising up out of the line.

CAUTION

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

5. Fill the master cylinder reservoir to approximately half full.
6. While observing the reservoir fluid, shake the lever and hose to entice any trapped air bubbles to exit the system.
7. Re-install the baffle (the fluid level should be above the baffle surface) and reservoir lid and secure with the two screws removed previously.
8. Disconnect supply line at the quick disconnect fitting. The fitting design ensures no air inclusion into the system when connecting or leakage when disconnecting.
9. Check lever feel, it should have a firm stop with very little travel.
10. Connect the fixed section to the removable section with the cargo hook and actuate the lever. The cargo hook must release.
11. Check the system for air by actuating the lever firmly until it bottoms out. Check the push rod position (see Figure 6.1.2). If some of the green ring on the push rod is visible, the system is ready for use. If none of the green ring is visible, the system needs to be re-bled.

Figure 6.1.2 Checking System for Air

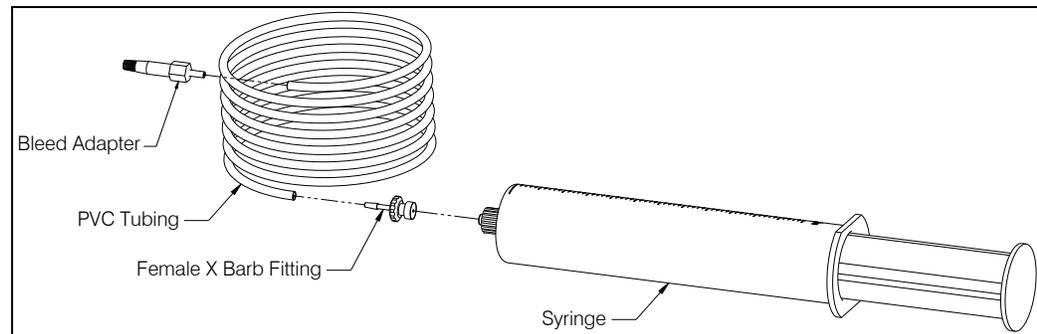


6.2 Filling and Bleeding Complete Hydraulic Release System

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

1. A bleed kit, 212-014-01, is available which includes 2 ounces of MIL-PRF-5606 hydraulic fluid (optionally MIL-PRF-87257 hydraulic fluid may be used), PVC tubing, a bleed adapter to fit the cargo hook slave cylinder, and a 35cc syringe with a fitting to connect to the tubing. If using this kit, press the items together as shown below.

Figure 6.2.1 Hydraulic Hook Bleed Kit 212-014-01



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

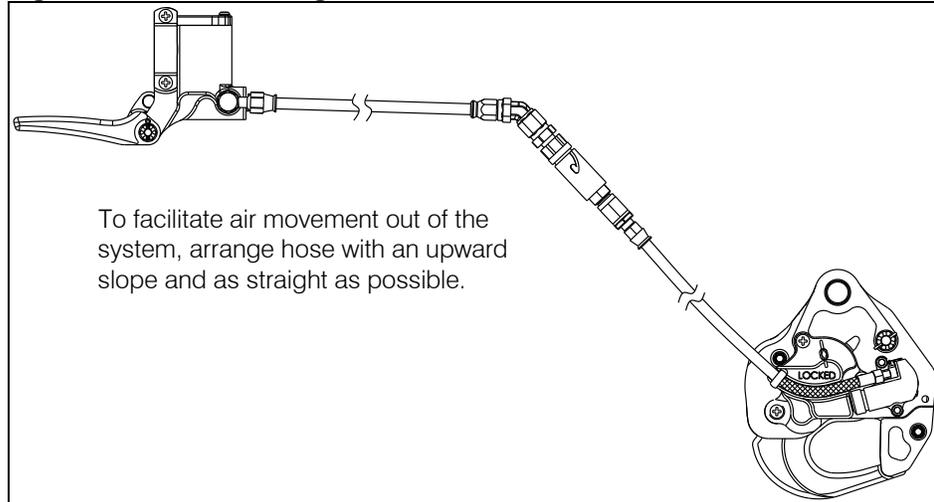
NOTICE

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

6.2 Filling and Bleeding Complete Hydraulic Release System continued

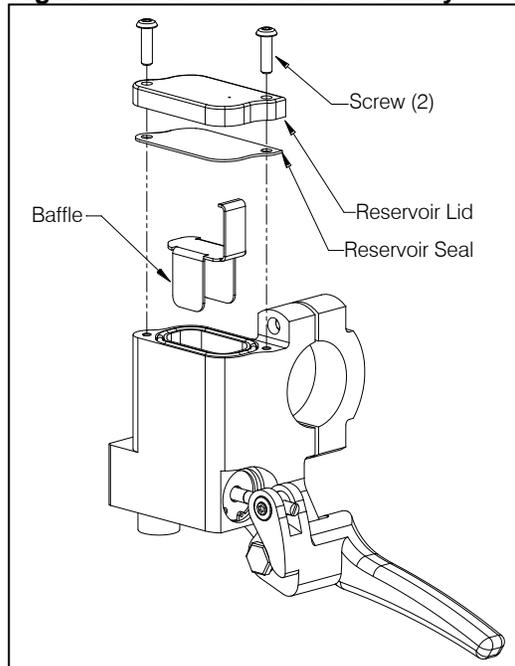
3. Connect the master cylinder assembly to the slave cylinder assembly if not already done. If filling or bleeding on the bench, as much as possible, arrange the hoses uncoiled, straight and running uphill. See Figure 6.2.2.

Figure 6.2.2 Hose Arrangement



4. Remove screws, reservoir lid, reservoir seal, and baffle from the master cylinder reservoir as shown in Figure 6.2.3 (the reservoir seal is supplied for shipping purposes only, after removal discard reservoir seal).

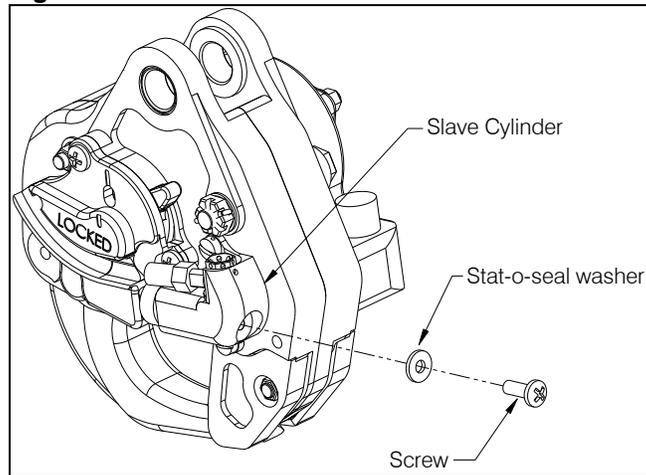
Figure 6.2.3 Reservoir Disassembly



6.2 Filling and Bleeding Complete Hydraulic Release System continued

5. Remove the screw and stat-o-seal on the cargo hook slave cylinder, see Figure 6.2.4.

Figure 6.2.4 Screw and Stat-o-seal Removal



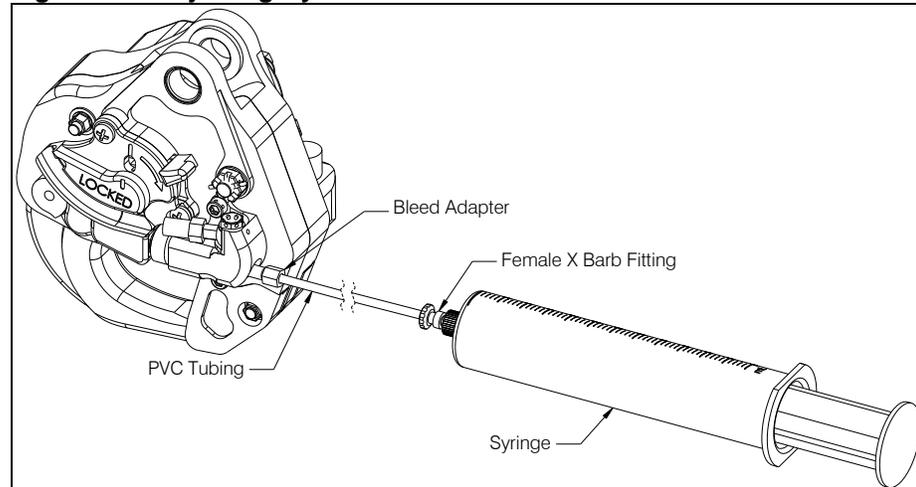
6.2 Filling and Bleeding Complete Hydraulic Release System continued

6. Fill a syringe with approximately 35 cc of hydraulic fluid. Screw the bleed adapter into the screw hole on the slave cylinder to create a tight seal. See Figure 6.2.5.
7. While observing the reservoir, slowly push on the syringe plunger to force fluid through the slave cylinder, hydraulic hose, and up to the master cylinder reservoir. There will be some resistance during filling—this is normal.



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

Figure 6.2.5 Injecting Hydraulic Fluid



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6.2 Filling and Bleeding Complete Hydraulic Release System continued

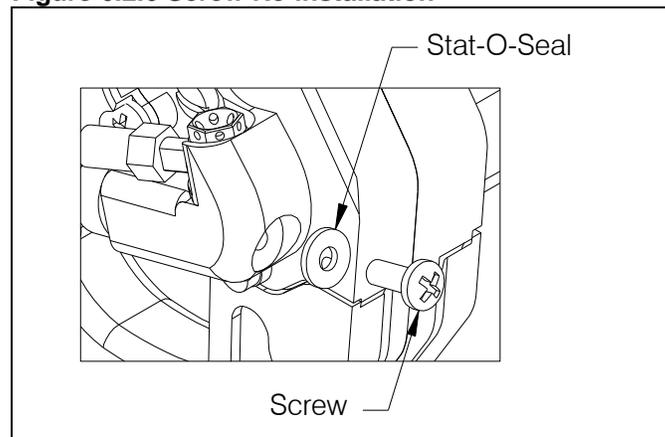
8. Continue to force fluid into the master cylinder reservoir until the reservoir is approximately half full.

NOTICE

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

9. Remove the syringe from the screw hole. Re-install the Stat-O-Seal (P/N 510-496-00) and screw (P/N 510-493-00), see Figure 6.2.6.

Figure 6.2.6 Screw Re-installation



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

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6.2 Filling and Bleeding Complete Hydraulic Release System continued

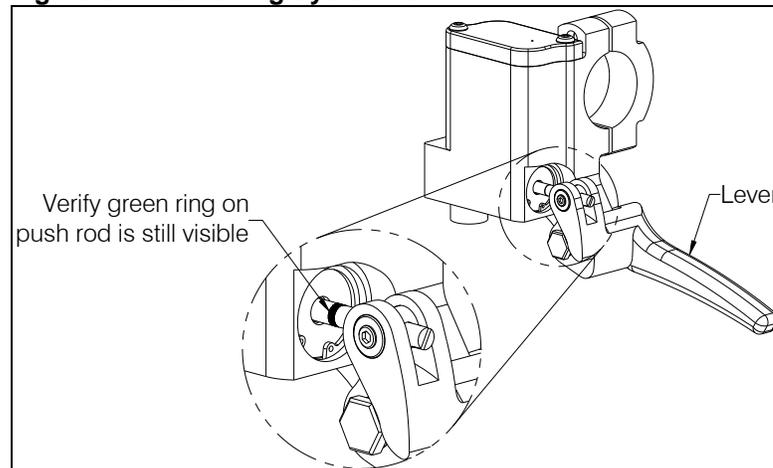
11. Very **slowly** pull the release lever on the master cylinder and watch for bubbles. Very **slowly** cycle the lever on the emergency valve in order to move the piston a small amount (approximately 1/16") back and forth and watch for bubbles. If bubbles are observed rising within the reservoir, continue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



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

12. Check the system for air by actuating the lever firmly until it bottoms out. Check the push rod position (see Figure 6.2.6). If the green area on the push rod is visible, proceed to step 13. If the green on the push rod is not visible with the lever completely pulled, the system has too much air in it and needs further bleeding. To do this, repeat steps 5 – 11.

Figure 6.2.7 Checking System for Air



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

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6.3 Installation Check-out

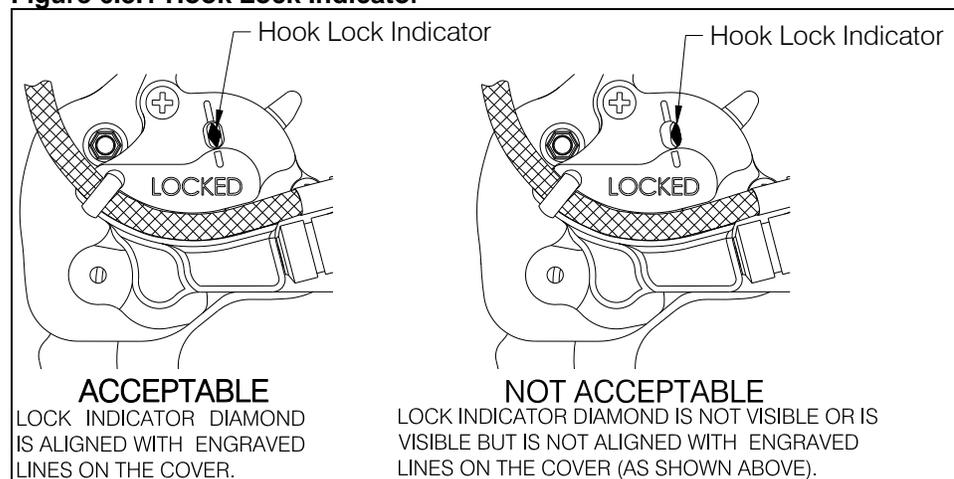
1. With no load on the cargo hook, activate the electrical release system by actuating the electrical release switch in the cockpit. The cargo hook must release. Return the load beam to its closed and locked position by hand after release.



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

2. With no load on the cargo hook, activate the hydraulic release system by pulling the release lever on the collective in the cockpit. The mechanism should operate smoothly and the cargo hook must release. Return the load beam to its closed and locked position by hand after release. Verify that the hook lock indicator on the side of the hook returns to the fully locked position. In the fully locked position the hook lock indicator should align with the lines on the manual release cover (see Figure 6.3.1). If the hook does not release or re-latch, do not use the unit until the problem is resolved.

Figure 6.3.1 Hook Lock Indicator



3. If the load weigh system was installed, power on the load weigh system and attach a weight to the cargo hook or pull downward on the load beam. The C-39 indicator display should show a load on the cargo hook.

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7.0 Operating Instructions

7.1 Pre-flight Check

Prior to a flight involving external load operations perform the following.

1. Visually check for damage and/or corrosion on the exterior of the Cargo Hook and suspension system components.
2. Move the Cargo Hook throughout its range of motion and observe the hydraulic hose and electrical harness(es) to ensure that they have enough slack. The hydraulic hose and electrical harness(es) must not be the stops that prevent the cargo hook from moving freely in all directions.
3. Rotate the cargo hook and gimbal assembly about their pivot points to verify that they rotate freely.
4. Visually check the hydraulic hose and its connections for damage and security.
5. Visually check the electrical release harness and its connections for damage and security.
6. Activate the electrical system and press the cargo electrical release button to ensure the cargo hook electrical release system is operating correctly. The cargo hook must release. Reset the hook by hand after release. If the hook does not release or re-latch, do not use the unit until the problem is fixed.

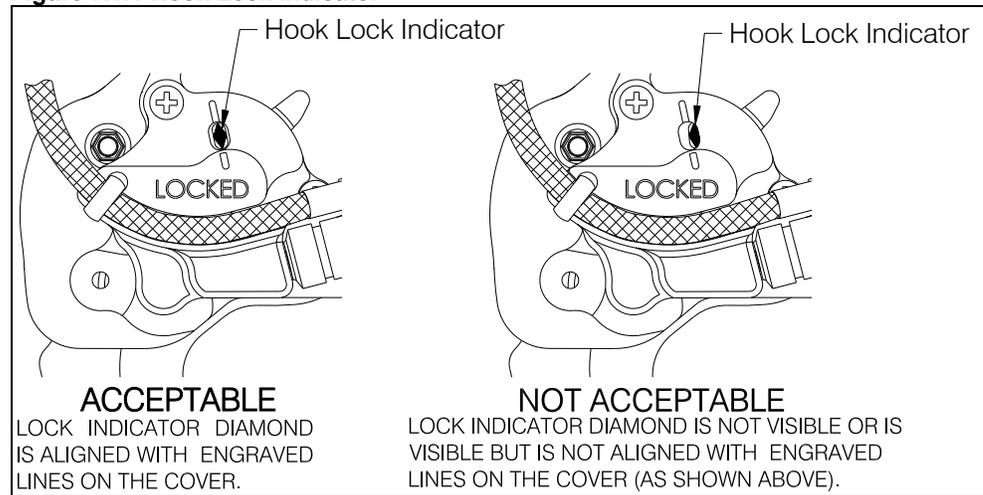
CAUTION

Depressing the electrical release button continuously in excess of 20 seconds will cause the cargo hook solenoid to overheat, possibly causing permanent damage.

7.2 Pre-flight Check continued

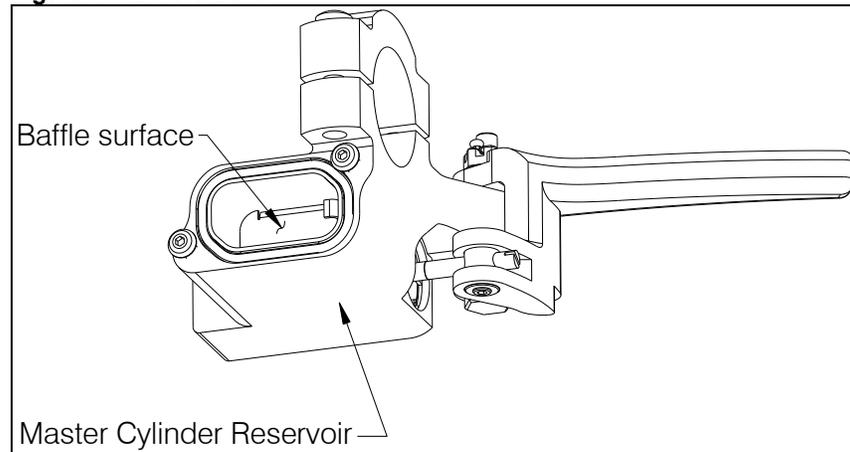
7. Activate the hydraulic release system by pulling the release lever on the collective in the cockpit. The mechanism should operate smoothly and the cargo hook must release. Return the load beam to its closed and locked position by hand after release. Verify that the hook lock indicator on the side of the hook returns to the fully locked position. In the fully locked position the hook lock indicator should align with the lines on the manual release cover (see Figure 7.1.1). If the hook does not release or re-latch, do not use the unit until the problem is resolved.

Figure 7.1.1 Hook Lock Indicator



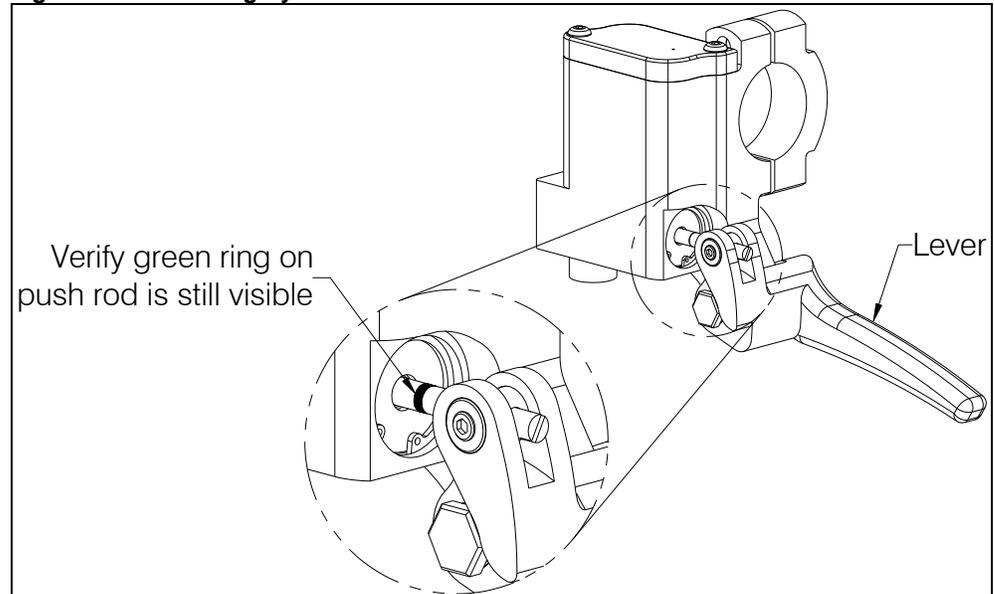
8. Check the fluid level in the master cylinder reservoir. The master cylinder reservoir features a transparent lid through which the fluid level can be checked. Hydraulic fluid must be visible over the baffle surface.

Figure 7.1.2 Fluid Level



9. Check the hydraulic release system for excess air in the lines by pulling the release lever firmly until it bottoms out. Check the push rod position (see Figure 7.1.3). If some of the green ring on the push rod is visible, the system is ready for use. If none of the green ring is visible, the system needs to be bled.

Figure 7.1.3 Checking System for Excess Air



10. If load weigh system is installed (included with kit P/N 200-427-00), power on the load indicator and allow it to warm up for 5 minutes (with no load on the hook). Press both indicator buttons at the same time to go to the setup mode. Scroll through the menu, using the left button, until "0 IN" is displayed, then press the right button. Remove any weight from the cargo hook that is not to be zeroed out and press either button to complete the procedure.

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7.2 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. Figure 7.2.1 shows the recommended rigging and rigging to avoid, but is not intended to represent all rigging possibilities.



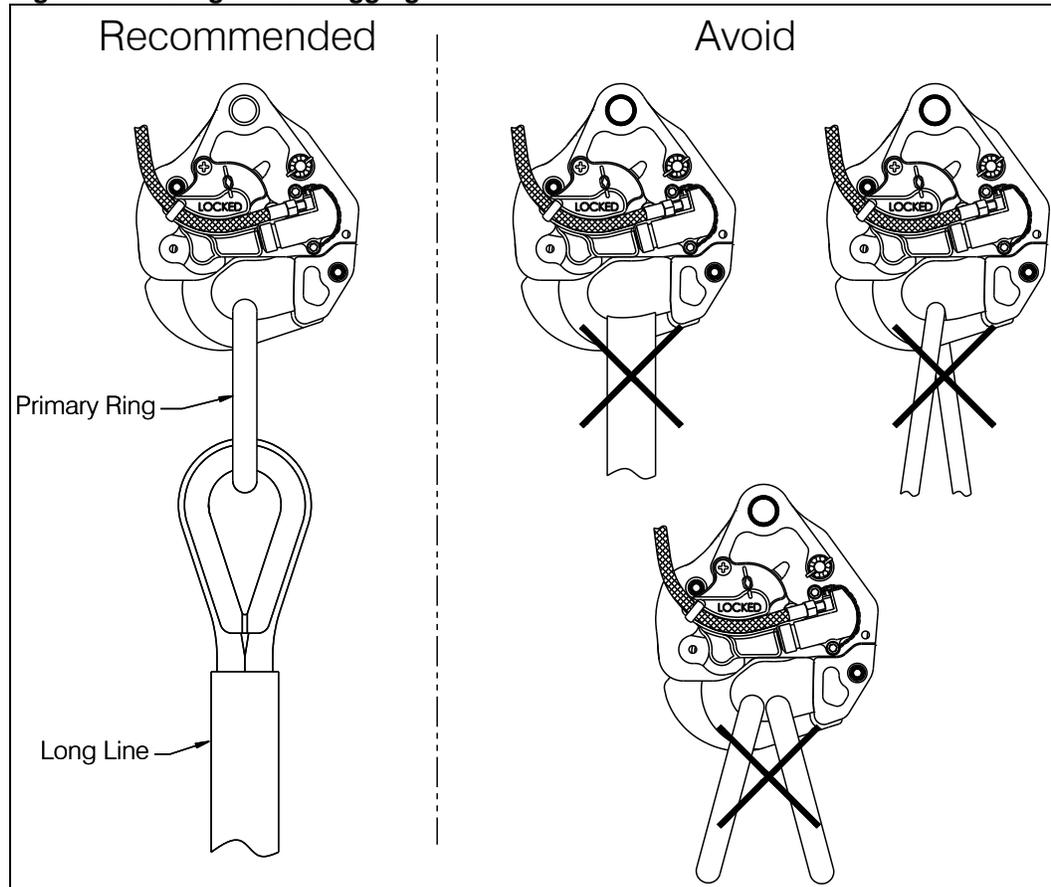
Some combinations of small primary rings and large secondary rings could cause fouling during release. It is the responsibility of the operator to ensure that the cargo hook will function properly with each rigging.



Nylon type straps (or similar material) or rope must 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.

7.2 Cargo Hook Rigging continued

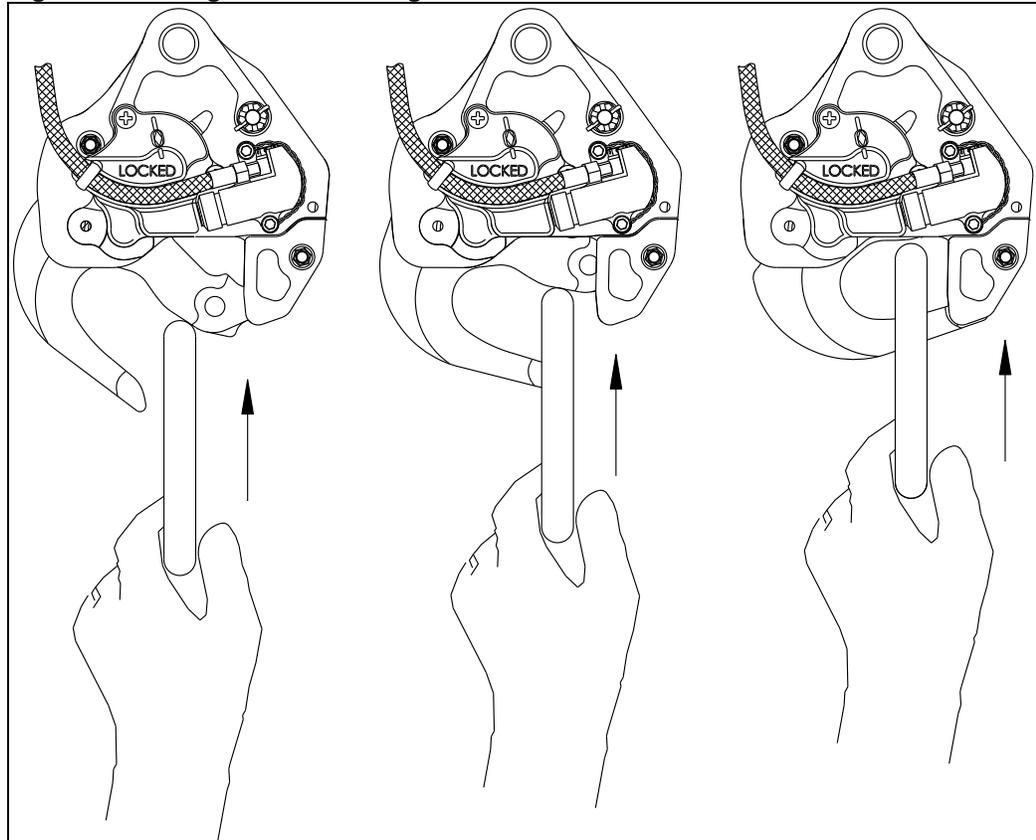
Figure 7.2.1 Cargo Hook Rigging



7.3 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 7.3.1, until an internal latch engages the load beam and latches it in the closed position.

Figure 7.3.1 Cargo Hook Loading



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8.0 Component Weights

The weights of the kit components are listed below.

Table 8.1 Component Weights (200-304-00)

Item	Weight
Cargo Hook/Frame Assembly (P/N 232-255-00)	34.0 lbs (15.4 kgs)
Release Lever Assembly w/ Plumbing (P/N 232-219-01)	1.2 lbs (0.54 kgs)
Tether Bracket w/ Pin (P/N 232-315-00)	0.08 lbs (0.04 kgs)
Total	35.3 lbs (16.0 kgs)

Table 8.2 Component Weights (200-427-00)

Item	Weight
Cargo Hook/Frame Assembly (P/N 232-255-01)	34.3 lbs (15.6 kgs)
Release Lever Assembly w/ Plumbing (P/N 232-219-01)	1.2 lbs (0.54 kgs)
Tether Bracket w/ Pin (P/N 232-315-00)	0.08 lbs (0.04 kgs)
C-39 Load Indicator (P/N 210-095-05)	0.47 lbs (0.21 kgs)
Total	36.1 lbs (16.4 kgs)

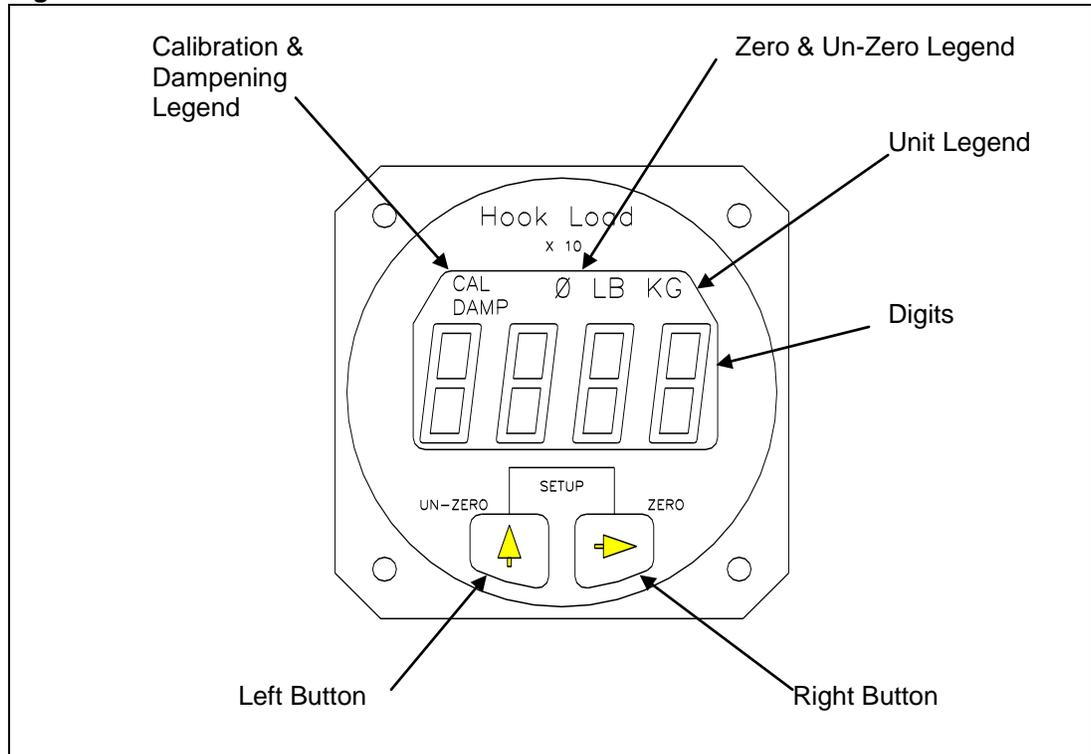
9.0 Load Weigh System Operation Instructions

9.1 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 display 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 9.1 Front Panel



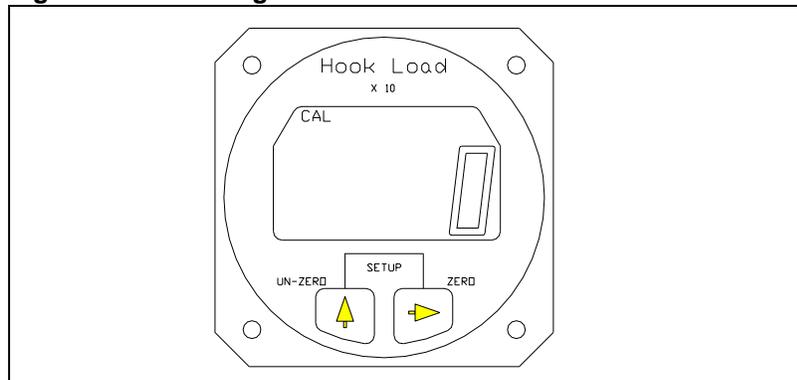
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9.2 The Run Mode

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 on in the Run Mode.

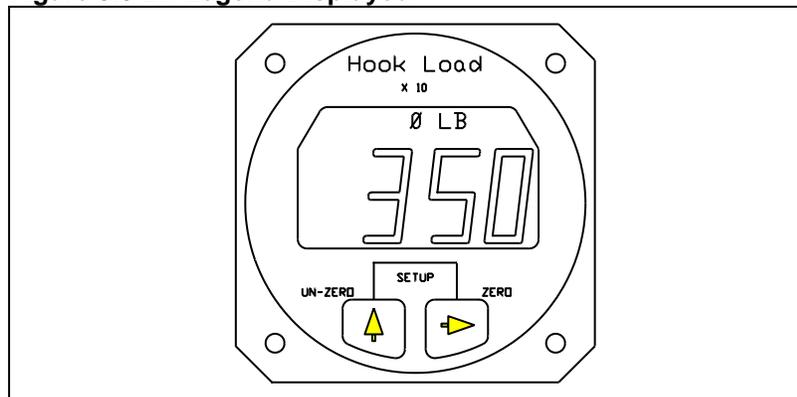
After the Indicator has been correctly installed, power it up by activating the aircraft electrical system. The Indicator will go through a self-diagnostic routine. During this routine the display will display all of the digits and legends. If a problem is found during the routine an Error Code will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

Figure 9.2 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 9.3 LB Legend Displayed



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

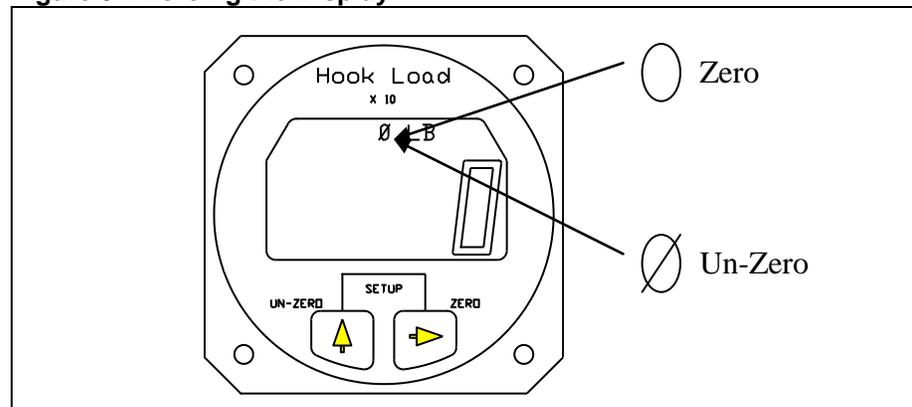
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9.2 The Run Mode continued

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 9.4 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.

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9.2 The Run Mode continued

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 9.1 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.

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9.3 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.

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9.3 The Setup Mode continued

Table 9.2 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	<u>Dampening Level</u> , sets the pilots preference for display dampening.	Blinking display is previously entered Dampening Level. Select the desired dampening level by pressing the Left button.
CODE	<u>Calibration Code</u> , 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	<u>Installation ZERO</u> , 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	<u>Load</u> , 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	<u>Scale</u> , 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	<u>Units</u> , selects the Indicator units (pounds or kilograms).	Display is previously selected unit. To change the unit, use the Left button.
XX - V	<u>Version</u> , is the revision level of the Indicator hardware and software.	Version is for information only, it cannot be changed.

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9.3 The Setup Mode continued

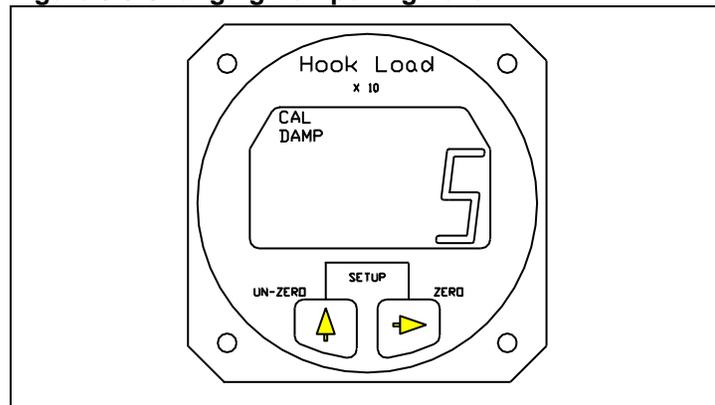
Indicator Dampening

The Damp or dampening routine allows the pilot to adjust the Indicator dampening level to his preference. The dampening routine is a program that stabilizes the Indicator reading. It offers a trade-off between Indicator responsiveness and stability. Ten dampening 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 dampening 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 dampening level will depend on the flying conditions. A mid-range setting of 5 or 6 is usually adequate.

To Look at or Change the Dampening 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 Dampening Level press the Right button. The display should look like this:

Figure 9.5 Changing Dampening Level



The CAL and the DAMP legend is turned on and the previously set dampening level is displayed. To return to Run without changing the current dampening level press both the Right and Left buttons at the same time. To change the dampening 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.

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9.3 The Setup Mode continued

Indicator Calibration

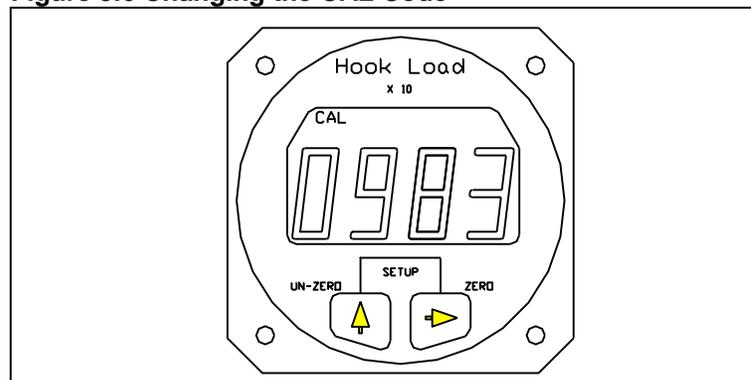
The Calibration Code, or CAL code, is a mandatory input. The Indicator will not accurately display the load without the correct Calibration Code. The Calibration Code scales the signal from the Load Cell.

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 9.6 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.

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9.3 The Setup Mode 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.

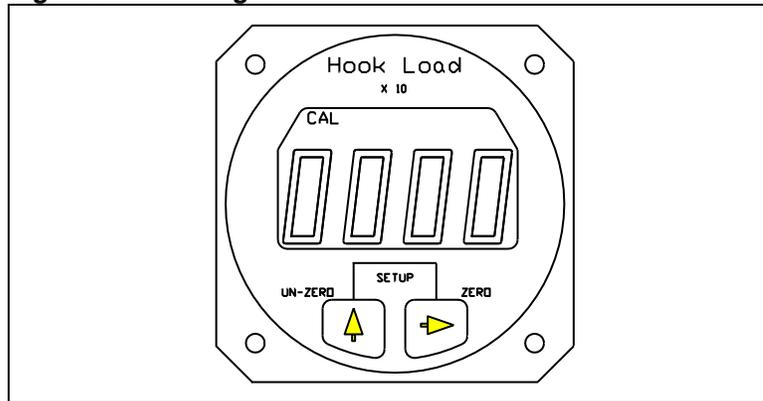
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9.3 The Setup Mode continued

To Run the Calibration by Lifting a Known Weight 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 word LOAD is displayed, then press the Right button. The display should look like this:

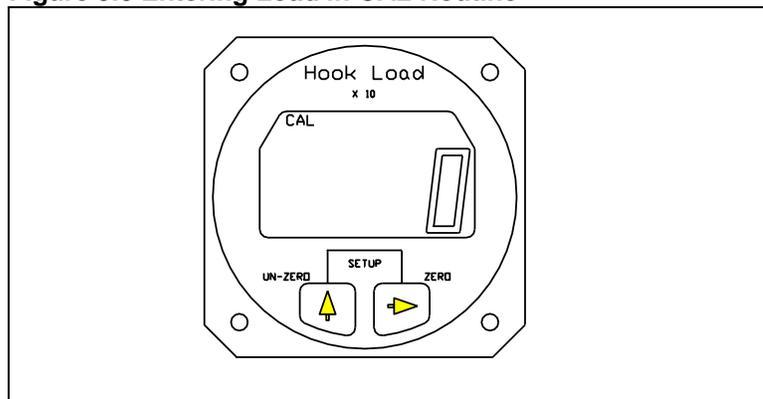
Figure 9.7 Running CAL Routine



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 9.8 Entering Load in CAL Routine



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9.3 The Setup Mode continued

To Run the Calibration by Lifting a Known Weight Routine 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

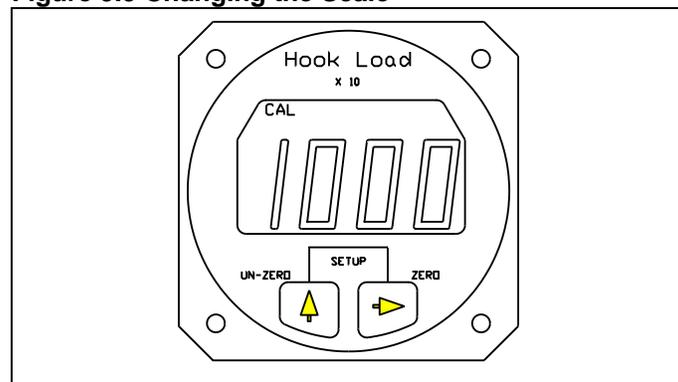
The Scale routine is used when a user supplied analog meter is connected to the Indicator. It is used to match or calibrate the analog meter to the Indicator. The Indicator outputs a 0 to 5 VDC analog signal, which is proportional to the Load Cell load. The Scale number tells the Indicator at what point 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 0 pounds and 10,000 pounds. The number entered into the Indicator Scale routine must be entered in pounds, even if the indicator is set to display kilograms.

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 9.9 Changing the Scale



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9.3 The Setup Mode continued

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.

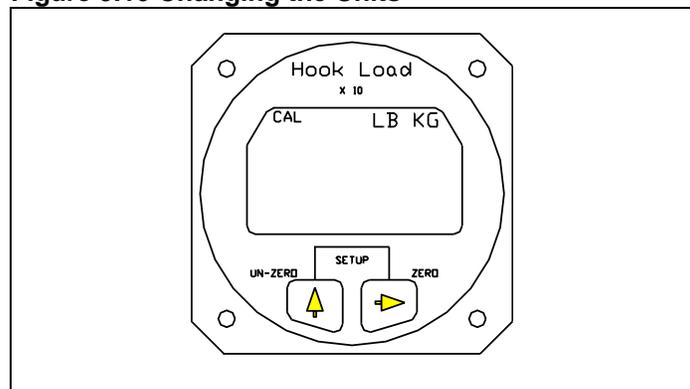
Select KG or LB Units

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 9.10 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.

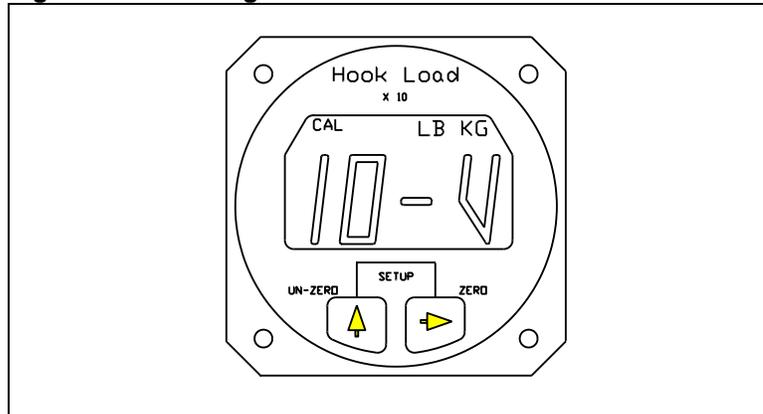
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9.3 The Setup Mode continued

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 9.11 Looking at Indicator Version



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APPENDIX A Revision History

Revision Number	Date	Revised Section / Page	Description of Change
0	December 17, 2009	All	New Issue
1	November 22, 2010	13 & 15	Added optional hydraulic fluid P/N MIL-PRF-87257.
2	March 24, 2011	3/Page 5	Replaced P/N 232-219-00 with 232-219-01 in kit P/N 200-304-00.
3	August 5, 2014	All	Added kit with load weigh system (P/N 200-427-00) and associated instructions.
4	April 13, 2015	All	Clarified hydraulic fluid usage, external hydraulic release system is now filled with MIL-PRF-87257 fluid at factory.
5	August 19, 2015	All	Changed load indicator P/N from 210-095-00 to 210-095-05. Corrected connector call out in load weigh system schematic.