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Cargo Hook Suspension System

for

Agusta A-109 Series

System Part Numbers

200-216-01, 200-216-02

Owner's Manual

Owner's Manual Number 120-071-00
Revision 15
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ONBOARD™ SYSTEMS INTERNATIONAL

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RECORD OF REVISIONS

Revision	*Date*	*Page(s)*	*Reason for Revision*
7	03/23/07	1-1, 1-5, 2-4, 5-1, 5-11	Replaced kit part number 200-216-00 with 200-216-01 and 200-216-02. Added ground strap 270-146-00.
8	06/25/07	1-5, 5-11, 5-13, 5-14, 5-15	Added cargo hook part number 528-010-08.
9	09/11/07	1-5, 5-2, 5-7, 5-11	Updated part numbers where applicable to reflect current kit configuration. Added note regarding magnetic particle inspection of load cell link (page 5-7).
10	03/05/08	1-5 & 5-11	Updated part numbers where applicable to reflect current kit configuration.
11	04/04/08	1-5, 5-2 & 5-11	Updated C-39 indicator part number from 210-095-04 to 210-095-05.
12	01/04/10	Section 5	Changed overhaul criteria, removed cargo hook maintenance information and replaced with references to manual 122-001-00, added annual inspection.
13	04/13/15	1-5, Section 5	Incorporated 232-289-00 and 232-290-00 assemblies into manual, updated definition of external load operations.
14	07/09/15	Section 5	Revised Table 5-3 to include wear limits and additional parts inspection criteria.
15	04/13/18	5-2, 5-6	Updated Table 5-1. Removed NDT requirements, added instruction to return the load cell to the factory.

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Section 1
General Information

Introduction

The Cargo Hook Suspension System, P/Ns 200-216-01 and 200-216-02, consists of four primary components: Gimbal Assembly, Load Cell, Cargo Hook, and C-39 Indicator. A description of each is listed below. The 200-216-02 system is the same as the 200-216-01 system except it includes a ground strap and cargo hook P/N 528-010-08 (instead of P/N 528-010-05 used under 200-216-01). Cargo hook P/N 528-010-08 is the same as the P/N 528-010-05 cargo hook included with the 200-216-01 system except for a washer change to accommodate the ground strap.

The **Gimbal Assembly** is the means to attach the Load Cell and Cargo Hook to the aircraft and to provide the necessary gimbaling.

The **Load Cell** is the means of attaching the Cargo Hook to the Gimbal Assembly. It functions as part of the gimbal and it outputs a signal proportional to the load on the Cargo Hook.

The **Cargo Hook** is the means used to attach an external load to the aircraft. It features an electrical and a mechanical operated means of releasing the load.

The C-39 **Indicator** is a panel mounted instrument that supplies the precision excitation voltage to the Load Cell, conditions the return signal, displays the weight of the load, outputs a proportional analog and digital signal and provides the means to calibrate the system. The Load Cell and the Indicator are known as the Load Weigh System.

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.

Inspection

Inspect all of the items for evidence of damage, corrosion and security of lock wire and fasteners. If damage is evident, do not use the items until they are repaired.

Specifications

Table 1-1 Cargo Hook Specifications

Cargo Hook Specifications	
Characteristic	**Specification**
Cargo Hook Weight	3 lb. (1.36 kg.)
Rated Load	3,500 lb. (1,587 kg.)
Limit Load	8,750 lb. (3,968 kg.)
Ultimate Load	15,750 lb. (7,140 kg.)
Force required for mechanical release at 3,500 pounds	8 lb. Max. (.400" travel)
Electrical requirements	22-32 VDC
Current required for electrical release at 3,500 pounds	< 9 amps
Minimum release load	10 pounds
Operating temperature range	+158 to -40° F (+70 to -40 ° C)
Storage temperature range	+194 to -67° F (+90 to -55 ° C)
Duty Cycle Cargo Hook, manual release Cargo Hook, electrical release	 Continuous 20 seconds

Table 1-2 Load Cell Specifications

Load Cell Specifications	
Characteristic	**Specification**
Load Cell Weight	0.65 lb. (0.30 kg.)
Total error over linearity range	± 1% of full scale
Linearity range	300 to 3,000 lb. (136 to 1,360 kg.)
Operating temperature range	+158 to -40° F (+70 to -40 ° C)

Table 1-3 Indicator Specifications

Indicator Specifications	
Characteristic	**Specification**
Indicator Weight	0.5 lb. (0.22 kg.)
Linearity error over range	± .01% of full scale
Operating voltage range	18 to 32 VDC
Current consumption	< 0.200 amps
Analog signal output	Proportional signal with weight
Digital signal output	Proprietary synchronous serial data stream. Format available upon request.
Operating temperature range	+158 to -40° F (+70 to -40 ° C)

Cargo Hook Connector Pin-out

Table 1-4 Cargo Hook Connector Pinout

Pin Letter	Function
A	Release Solenoid Ground
B	+ Release Solenoid Positive
C	Switch Common
D	Switch NC

Load Cell Connector Pin-out

Table 1-5 Load Cell Connector Pin-out

Pin Letter	Function
A	+ L/C Excitation, Red
B	+ L/C Signal, Green
C	- L/C Signal, White
D	- L/C Excitation, Black
E	Shield

C-39 Indicator Connector Pin-out

Table 1-6 C-39 Indicator Connector Pin-out

Pin Letter	Function
A	+ 28 VDC In
B	- Load Cell Signal
C	+ Load Cell Signal
D	+ Load Cell Excitation
E	Load Cell Common
F	Analog Out Common
G	+ Analog Out
H	Hook Open
J	Data Recorder Clock
K	Data Recorder Data
L	Shield
M	Back Light Common
N	Back Light Source 28 VDC
P	Aircraft Ground
R	Not Used

Bill of Materials

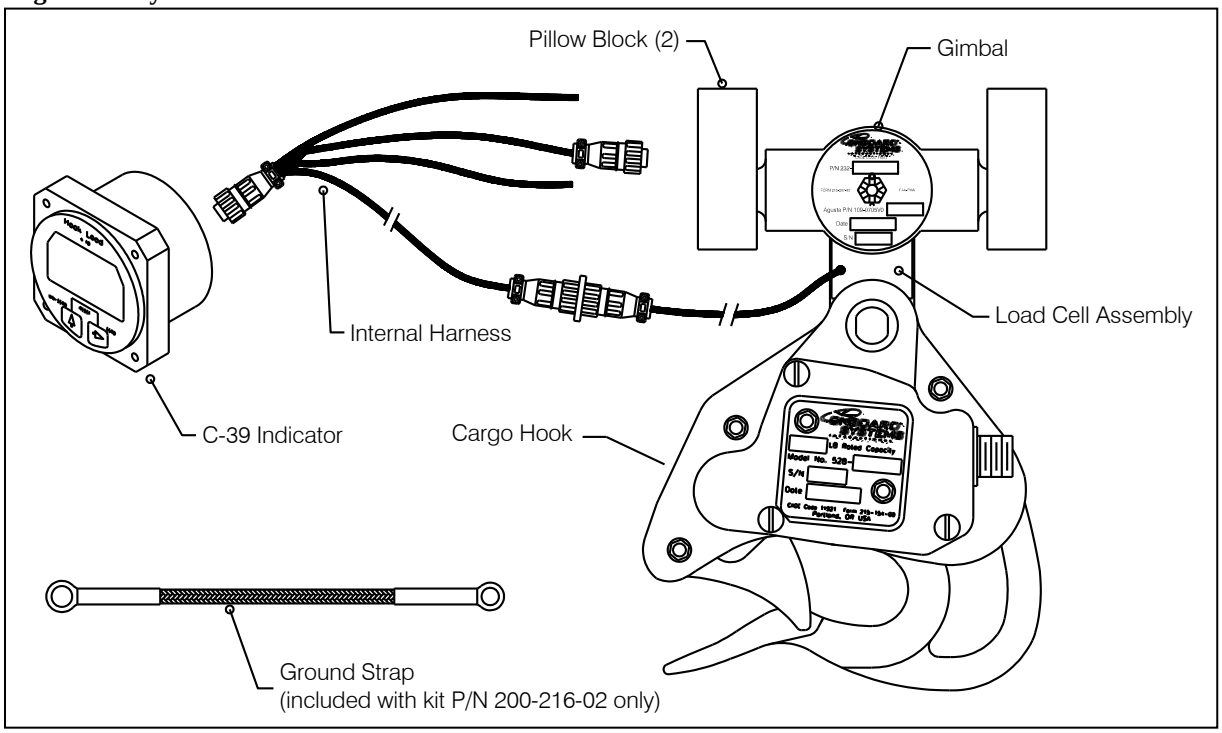
The following items are included with each system, if shortages are found contact the distributor from whom the system was purchased.

Table 1-7 System Bill of Materials

Item	Part No.	Description	Qty 200-216-01	Qty 200-216-02
1	210-177-00	C-39 Indicator w/ 5V Lights	1	-
2	210-095-05	C-39 Indicator, NVG	-	1
3	270-049-00	Load Weigh Internal Harness	1	1
4	232-289-00	A109 Suspension Assembly	1	-
5	232-290-00	A109 Suspension Assembly	-	1
6	215-010-00	Load Weigh Placard	1	1
7	215-012-00	Load Weigh Placard	2	2
8	400-048-00	Switch	1	1
9	120-071-00	Owner's Manual	1	1
10	512-001-00	Ty Wrap	10	10

System Overview

Figure 1-1 System Overview



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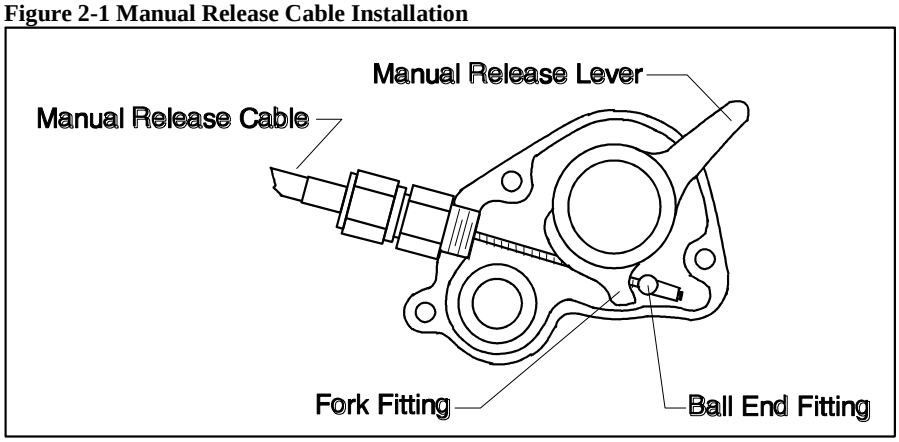
Section 2
Installation

Installation of the Cargo Hook Suspension System is to be in accordance with approved Agusta procedures.

Cargo Hook Manual Release Cable Rigging

Remove the cargo hook manual release cover and connect the Manual Release Cable. Place the cable ball end fitting into the hook manual release fork fitting as illustrated. Adjust the cable to give .125" (3.2 mm) free play with the cockpit manual release handle in the full down position.

Figure 2-1 Manual Release Cable Installation

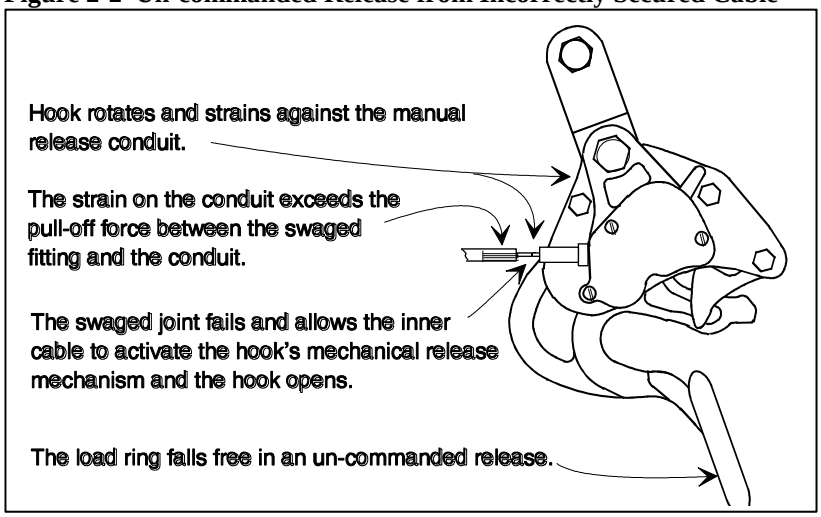


WARNING

An un-commanded Cargo Hook release will happen if the manual release cable is improperly restrained. The cable must not be the stops that prevent the Cargo Hook from swinging freely in all directions. If the Cargo Hook loads cause the hook to strain against the manual release cable the swaged end of the cable may separate allowing the inner cable to activate the cargo hook manual release mechanism. The result is an un-commanded release. Ensure that no combination of cyclic stick or Cargo Hook position is restrained by the manual release cable.

Cargo Hook Manual Release Cable Rigging, continued

Figure 2-2 Un-commanded Release from Incorrectly Secured Cable



Internal Harness Installation

The Internal Harness is made up of four cables terminated to one large connector. The connector is plugged into the back of the Indicator. One of the cables is marked "LOAD CELL" and is fitted with a bulkhead fitting.

Another cable is marked "POWER" and is connected to the aircraft electrical power. Another cable is marked "LIGHT", refer to the *Indicator Internal Back Light* section for installation instructions. The last cable is marked "DATA" and is connected to the optional Data Recorder or Analog Slave Meter.

Route the cables in the most convenient manner. Secure the cables to the existing wiring bundles with the Ty-wraps. Secure the cables clear of flight control rods. If it is necessary to remove the load cell bulkhead connector to ease cable routing, reconnect using the color code in Table 1-5.

C-39 Cockpit Indicator Installation

The Indicator, P/N 210-177-00, should be mounted in a position that is convenient, accessible and visible to the pilot. It can be mounted in a standard 2¼" instrument hole. Connect the Indicator to its Internal Harness, refer to *Internal Harness Installation*.

Indicator Internal Back Light

The Indicator is equipped with an Internal Back Lighting System that can be connected to the aircraft 5 VDC light dimming circuit. Use a 22 gauge, twisted pair, shielded cable to connect the aircraft dimming circuit to the Internal Harness. The cable shield wire is not grounded at this end of the cable and may be cut off.

Indicator Hook-Open Warning

The Indicator is equipped with a Hook-Open Warning feature that can be connected to the cargo hook open switch. The Indicator will display "HOOK OPEN" when the cargo hook load beam is open. The cargo hook switch must be normally open when the cargo hook load beam is in the closed position. When the load beam is open, one side of the switch must be grounded and the other side of the switch should be connected to the Indicator. Use a 22 gauge, shielded wire to connect the cargo hook switch to the Indicator. Disassemble the Indicator mating connector and carefully solder the wire, from the cargo hook switch, to pin H. Connect the cable shield wire to airframe ground as close to the Cargo Hook as possible, at the Cargo Hook end of the cable **ONLY**.

Electrical Connections

Connect the Internal Harness to the Indicator and route the other end to a convenient location for the Indicator power switch part number 400-048-00. The cable is supplied extra long, cut off the excess cable and use as needed to connect the switch and circuit breaker. Connect the red wire in the power cable to one side of the power switch, connect another piece of suitable red wire to the other side of the switch and then to an available 1 or 2 amp circuit breaker. Connect the black wire to the ground bus. The cable shield wire is not grounded at this end of the cable and may be cut off. Install the placard 215-010-00 “ELECTRONIC WEIGHING SYSTEM” next to the power switch and circuit breaker. Install the placard 215-012-00 “TURN THE WEIGHING SYSTEM OFF WHEN NAVIGATION EQUIPMENT IN USE” “NO AIRCRAFT OPERATION SHOULD BE PREDICATED ON THE READING OF THE ONBOARD WEIGHING SYSTEM” next to the Indicator.

NOTICE

If the C-23 Printer is being utilized with the C-30 Data Recorder, a 5 amp circuit breaker should be used.

Installation Check-Out

After installing the Cargo Hook Suspension System, perform the following functional checks.

1. Swing the installed Cargo Hook to ensure that the manual release cable, the electrical harnesses, and the ground strap (if installed) have enough slack to allow full swing of the suspension assembly without straining or damaging the cables. The manual release cable, harnesses and ground strap must not be the stops that prevent the Cargo Hook from swinging freely in all directions.
2. Apply 10-20 pounds to the cargo hook load beam and pull the handle operated cargo hook mechanical release, the Cargo Hook should release.
3. Close the cargo hook release circuit breaker and position the battery switch to the ON position. Apply 10-20 pounds to the cargo hook load beam and depress the cargo hook electrical release button, the Cargo Hook should release.

Section 3
Cargo Hook Suspension System Operation Instructions

Operating Procedures

Prior to a flight involving external load operations, perform the following:

1. Ensure that the Cargo Hook Suspension System has been properly installed and that the manual release cable and electrical harnesses do not limit the movement of the cargo hook.
2. Be completely familiar with this manual, particularly the section covering the Cargo Hook rigging.
3. Be completely familiar with all Agusta Cargo Hook operating instructions.
4. Activate the electrical system and press the Cargo Hook release button to ensure the cargo hook electrical release is operating correctly.

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.

5. Activate the manual release lever to test the cargo hook manual release mechanism, the mechanism should operate smoothly.

Cargo Hook Rigging

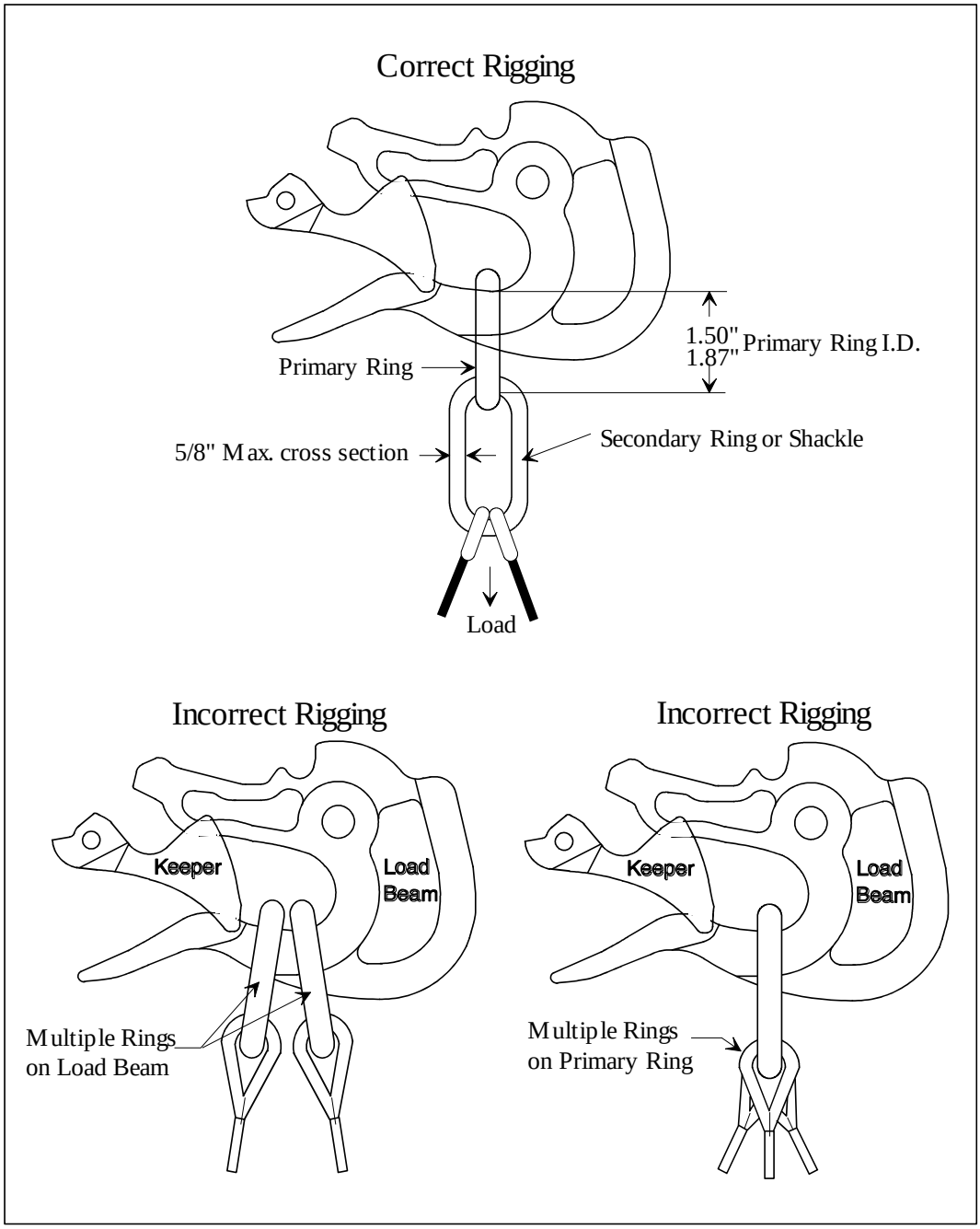
Extreme care must be exercised when rigging a load to the Cargo Hook. If the load ring is too big it may work its way around the end of the load beam and be supported for a time on the keeper and then fall free. If the load ring is too small it may jam itself against the load beam during an attempted release. The following illustrations show recommended configurations and potential difficulties that must be avoided.

Cargo Hook Rigging, continued

WARNING

The examples shown are not intended to represent all problem possibilities. It is the responsibility of the operator to assure the hook will function properly with the rigging.

Figure 3-1 Examples of Correct and Incorrect Cargo Hook Rigging

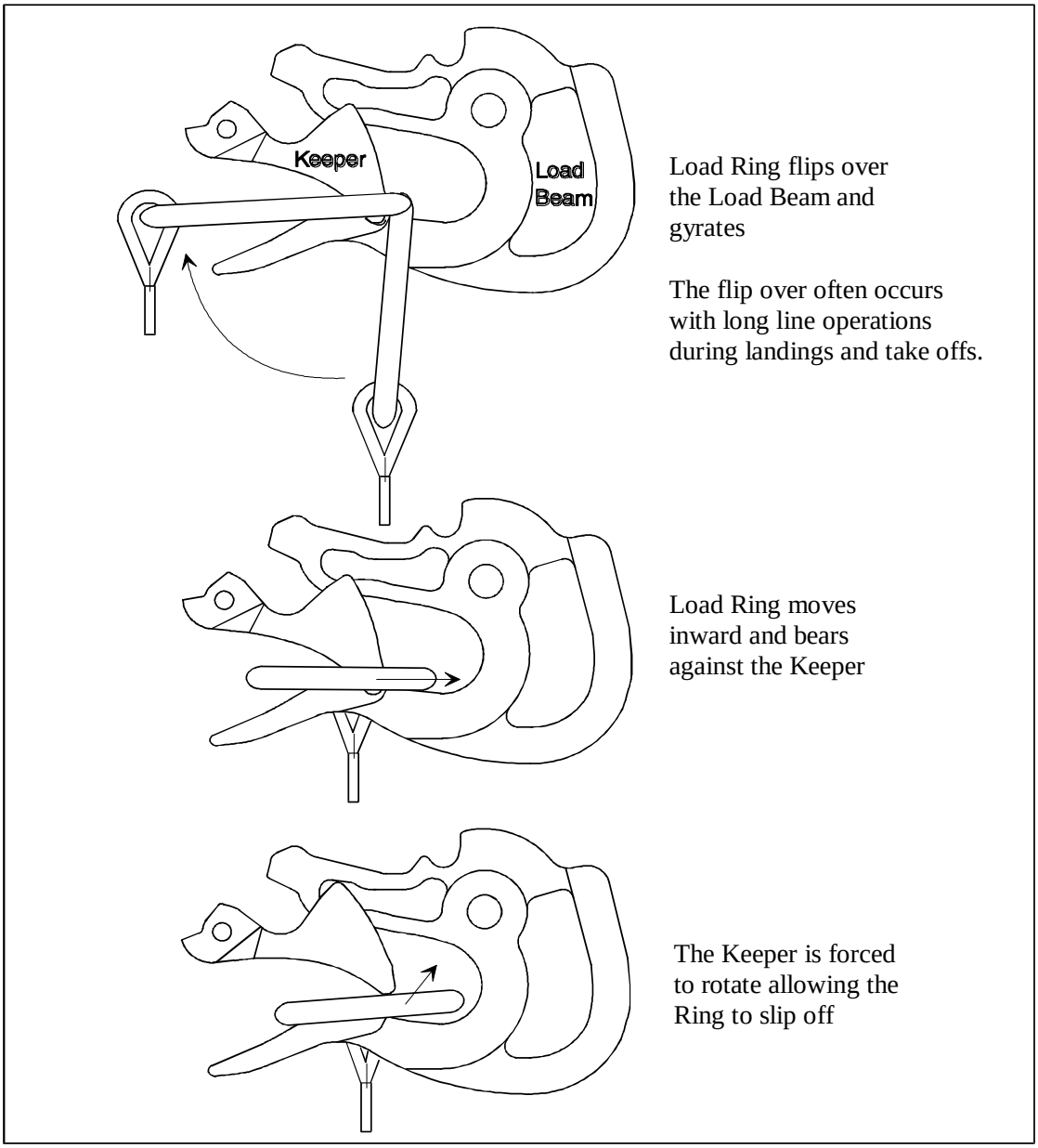


Un-Commanded Release Due to Too Large of a Load Ring

WARNING

Load rings that are too large will cause an un-commanded release. The ring will flip over the end of the load beam and flip the keeper up and then fall free. Only correctly sized load rings must be used. See examples below.

Figure 3-2 Un-Commanded Release Due to Too Large of a Load Ring

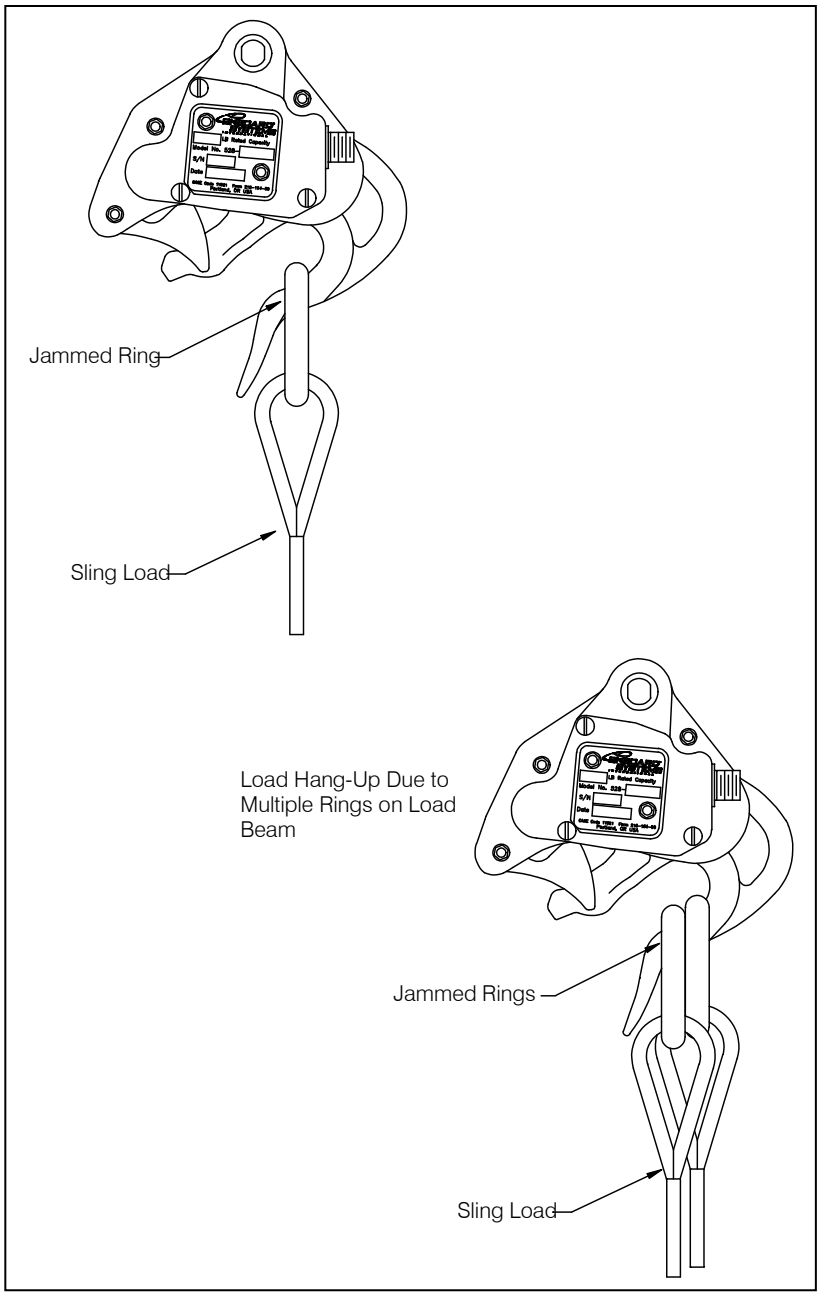


Load Hang-up Due to Too Small of a Load Ring or Multiple Load Rings

WARNING

Load rings that are too small or multiple load rings will hang on the load beam when the load is released. Only correctly sized load rings must be used. See examples below.

Figure 3-3 Load Hang-Up Due to Too Small of a Load Ring or Multiple Load Rings

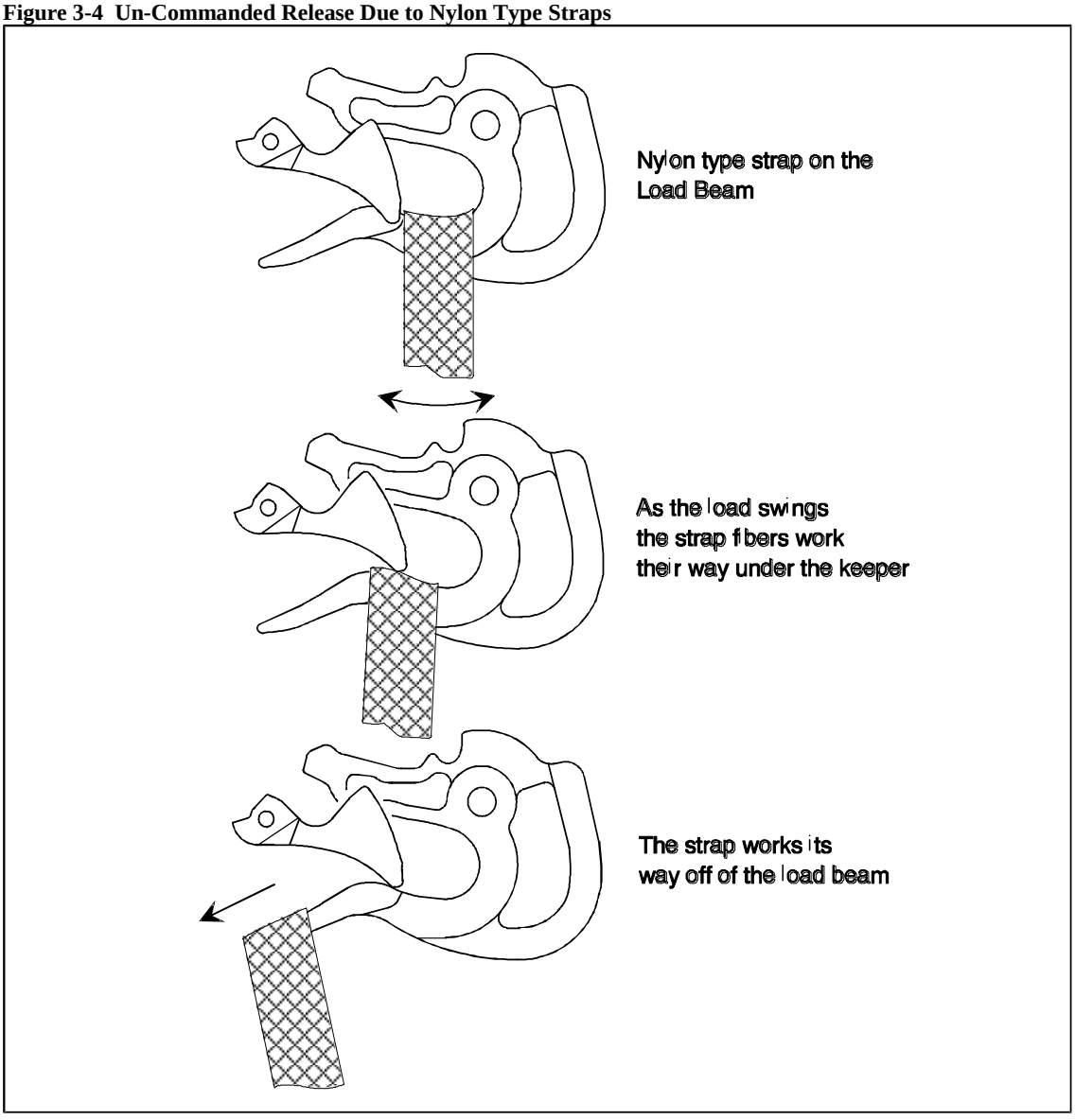


Un-Commanded Release Due to Nylon Type Straps

WARNING

Nylon type straps (or similar material) must not be used directly on the cargo hook load beam as they have a tendency to creep under the keeper and fall free. If nylon straps must be used they should be first attached to a correctly sized primary ring. Only the primary ring should be in contact with the cargo hook load beam. See examples below.

Figure 3-4 Un-Commanded Release Due to Nylon Type Straps

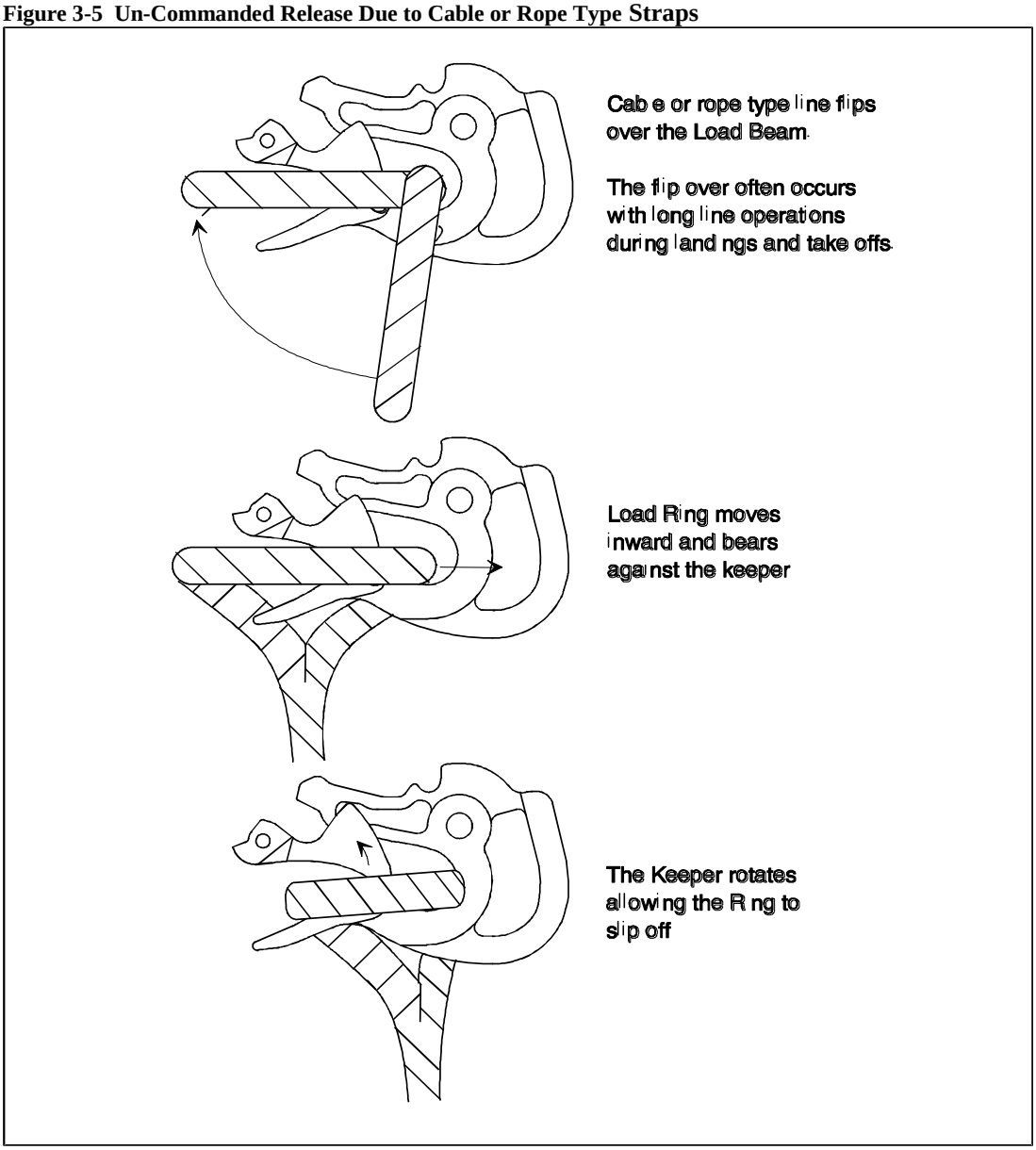


Un-Commanded Release Due to Cable or Rope Type Straps

WARNING

Cable or rope type straps must not be used directly on the cargo hook load beam. Their braided eyes will work around the end of the load beam and fall free. If cable or rope is used they should be first attached to a correctly sized primary ring. Only the primary ring should be in contact with the cargo hook load beam. See examples below.

Figure 3-5 Un-Commanded Release Due to Cable or Rope Type Straps



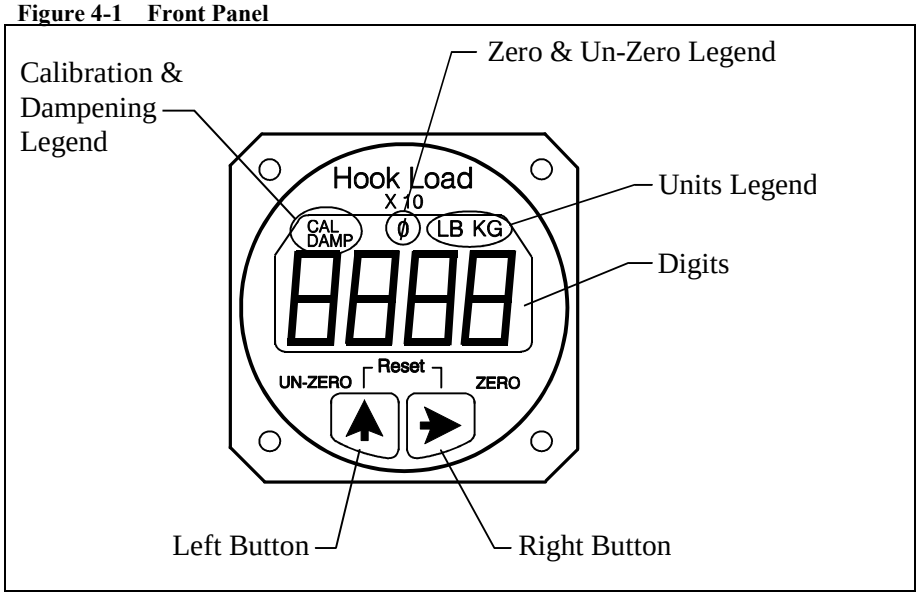
Section 4
Load Weigh System Operation Instructions

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

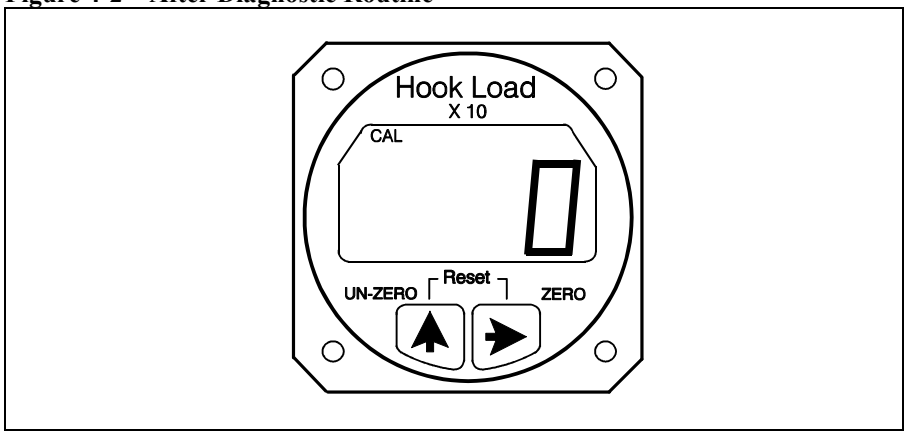


The Run Mode

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.

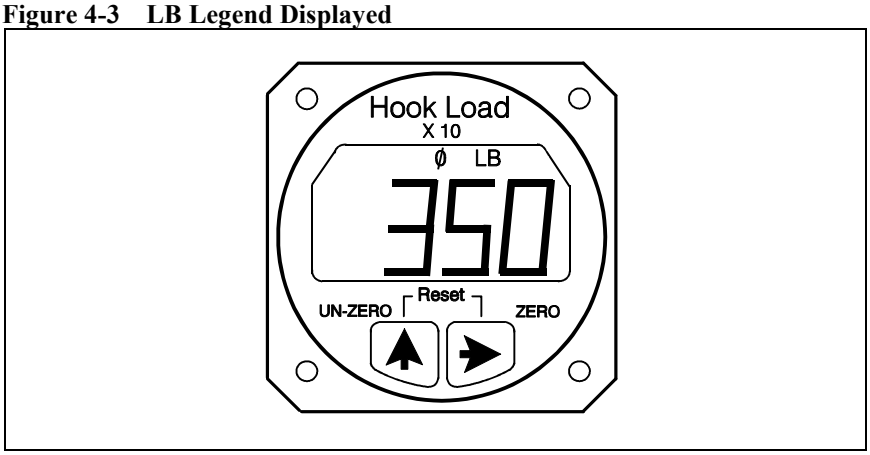
After the Indicator has been correctly installed, power it up by activating the Load Weigh Circuit Breaker. The Indicator will go through a self diagnostic routine. During this routine the display will display all of the digits and legends. If a problem is found during the routine an Error Code will 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 below in Figure 4-3.

Figure 4-3 LB Legend Displayed

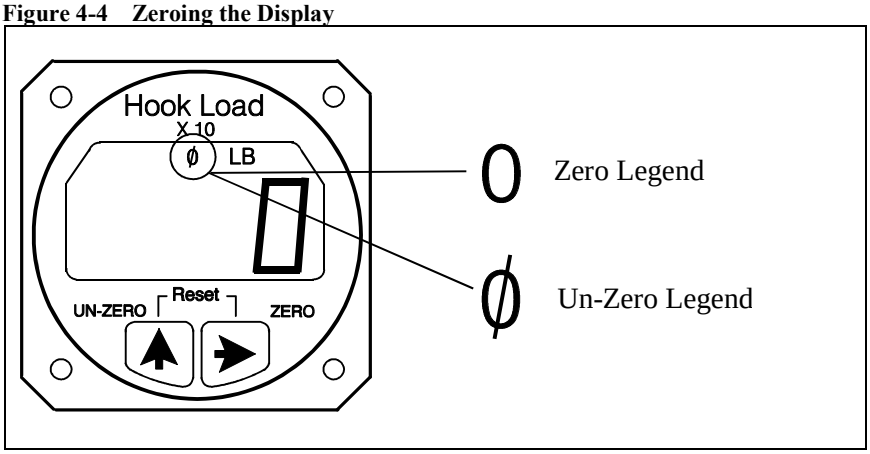


The illustration is a typical hook load reading. The display is 3,500 pounds, note the last digit is not displayed.

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 4-1 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.

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	Dampening Level, 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	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.

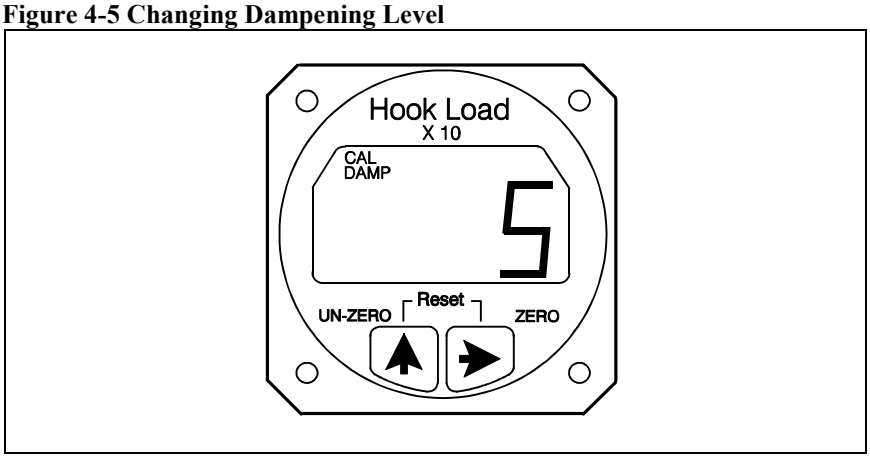
Indicator Dampening

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 4-5 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.

Indicator Calibration

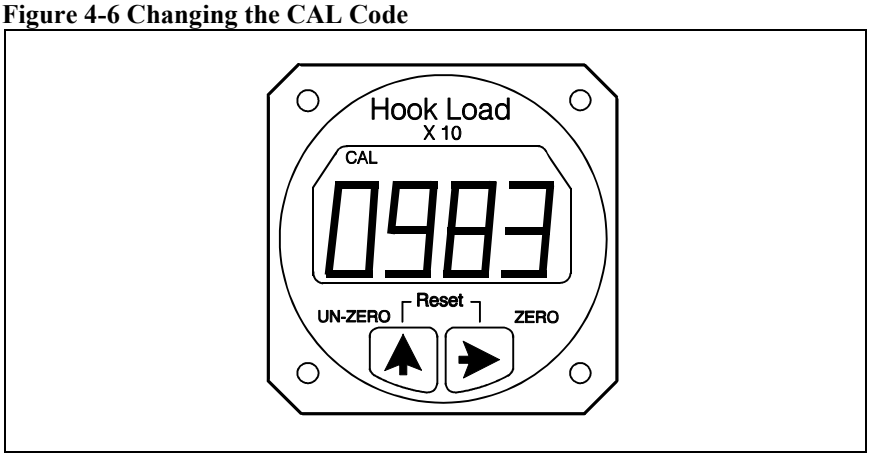
The calibration code, or CAL code, is a mandatory input. The Indicator will not accurately display the load without the correct calibration code. The calibration code scales the signal from the Load Cell.

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 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.

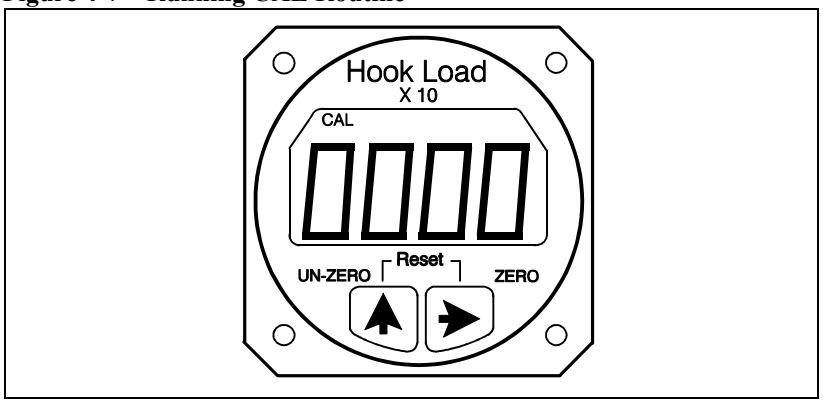
The closer the known load approaches the lifting capacity of the helicopter, the more accurate the calculated calibration code will be.

Calibration by Lifting a Known Weight, continued

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:

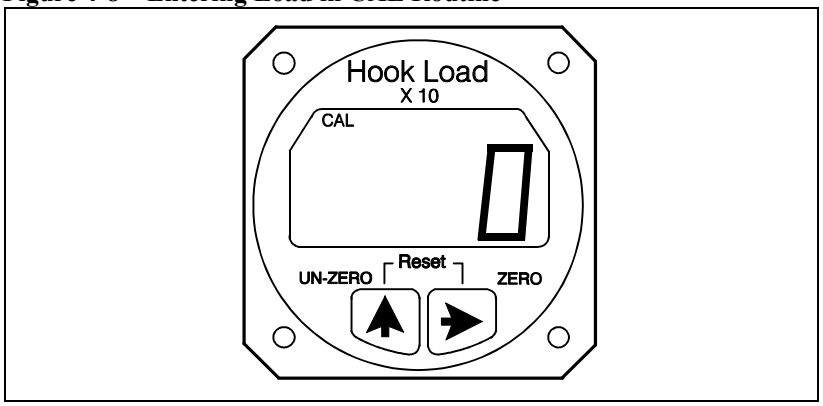
Figure 4-7 Running CAL Routine



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

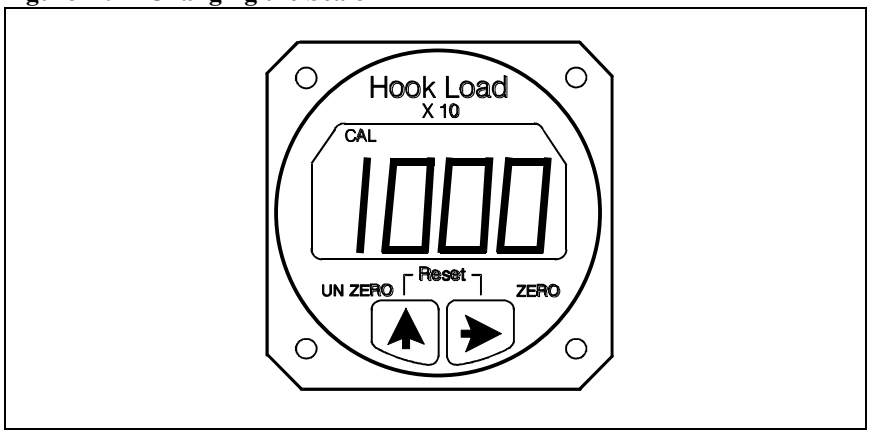
The Scale routine is used when a user supplied analog meter is connected to the Indicator. It is used to match or calibrate the analog meter to the Indicator. The Indicator outputs a 0 to 5 VDC analog signal which is proportional to the load cell load. The Scale number tells the Indicator at what point 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 Systems slave meters P/N 210-106-00 or 210-180-00. This number only affects 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.

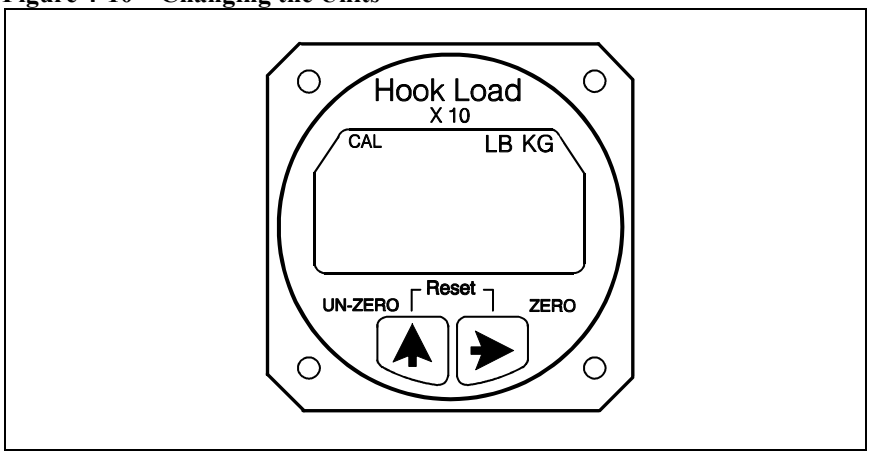
Select KG or LB Units

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.

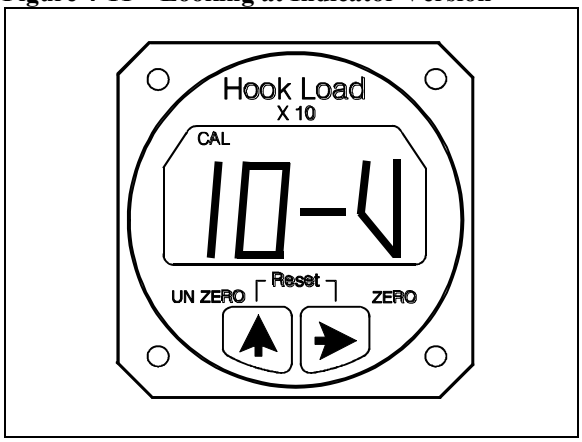
NOTICE

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

Maintenance instructions for the suspension system components including the gimbal assembly, pillow blocks, and load cell assembly are contained within this section. Refer to Component Maintenance Manual (CMM) 122-001-00 for detailed maintenance instructions for the cargo hook.

Storage Instructions

Refer to CMM 122-001-00 for storage instructions for the cargo hook. Clean the Cargo Hook Suspension System components thoroughly before packaging. Pack the items in a heat-sealable package. If the items are to be stored for long periods in a tropical climate they should be packed in a reliable manner to suit local conditions. Refer to relevant MIL specifications.

Package the components in a suitable fiberboard box and cushion them to prevent shifting. Seal the fiberboard box with tape and mark the box with the contents and date of packaging.

Preventive Maintenance

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

In highly corrosive environments such as salt water, monthly application of a corrosion preventative compound such as ACF-50 is required. Spray exterior of cargo hook and suspension system components with corrosion preventative compound and wipe off excess.

Inspection

The inspection of the Cargo Hook Suspension System shall be in accordance with the table below. Refer to CMM 122-001-00 for maintenance of cargo hook P/N 528-010-05 and P/N 528-010-08.

Table 5-1 Inspection

Seq.	Part No.	Daily Check	Inspection – Annually or 100 hours of external load operations, whichever comes first.	At overhaul interval*
1	200-216-01 200-216-02 System	1. Visually check all items for cracks, wear and corrosion. 2. Visually check all mounting fasteners to ensure that they are tight. 3. Visually check the electrical harnesses and ground strap for damage and security. 4. Visually check the manual release cable for damage and security. 5. Visually check the load cell strain relief for damage. 6. Pivot the Cargo Hook, load cell and gimbal back and forth to ensure that each pivot point rotates freely. 7. Cycle the electrical and manual release mechanisms to ensure proper Cargo Hook operation.	Same as Daily Check	In addition to the daily check, disassemble and inspect the detail components to the requirements outlined in this Manual.
2	210-177-00 210-095-05 C-39 Indicator	Ensure that the Indicator has been correctly calibrated and the correct calibration code has been entered into the Indicator.	Check the Indicator for damage and security. If damage is found return the Indicator to the factory.	Calibrate the system by lifting a known weight.
3	270-049-00 Internal Harness	N/A	N/A	Inspect for security of attachment, chafed or otherwise damaged wires, and loose or damaged connectors.
4	All fasteners	N/A	Check for cracks, excessive wear and security of attachment. If worn excessively or cracked, replace part.	Recommend replacement of fasteners.

*** See Cargo Hook Suspension System Overhaul Frequency section.**

Trouble Shooting

Table 5-2 Trouble Shooting

DIFFICULTY	PROBABLE CAUSE	CORRECTIVE ACTION
The beam will not pivot on pillow block bearings.	Obstructions or bad bearings in the beam	Remove obstructions, replace bearings and associated parts as required.
Circuit breaker opens when the circuit to Load Weigh System is energized.	Short in the system, faulty wiring, circuit breaker or switch	Repair or replace defective wiring, circuit breaker and switch.
Load Weigh Indicator does not light up.	Faulty wiring, circuit breaker or switch	Check the power switch, circuit breaker and wiring. If this doesn't help, return the unit to the factory.
Where Am I? (Lost when programming the Indicator)		Turn the Indicator power off for a few moments. When it comes to life it will be in the Run Mode.
Indicator displayed load is incorrect.	Incorrect calibration code	Insure the correct calibration code has been entered.
Indicator displayed load is not stable.	Dampening level is too small	Adjust the Dampening level to a larger number.
Indicator displayed load takes too long to change the reading when the load is changed.	Dampening level is too large	Adjust the Dampening level to a smaller number.
Do not recognize the Indicator displayed numbers.	NV Ram failure, A/D or D/A circuit failure	Refer to *Error Codes* in Section 4.
Indicator does not change with changing hook loads.	Defective Load Cell or damaged internal harness	Check for damaged internal harness, replace Load Cell.

Cargo Hook Suspension System Overhaul Frequency

The overhaul schedule of the suspension system components shall be in accordance with the following:

Normal Maintenance Schedule

TBO: 1000 hours of external load operations or 5 years, whichever comes first.

*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.*

Overhaul

It is recommended that only minor repairs be attempted by anyone other than the factory. It is recommended that the Cargo Hook Suspension System be returned to the factory at overhaul or when any of the components are in need of major repair.

Overhaul instructions for the suspension system are contained within this section. Refer to CMM 122-001-00 for overhaul instructions for the cargo hook.

Cargo Hook Suspension System Disassembly Procedure

These procedures are provided for the benefit of experienced aircraft maintenance facilities capable of carrying out the procedures. They must not be attempted by those lacking the necessary expertise.

1. With the Cargo Hook Suspension System removed from the aircraft separate the Pillow Blocks (items 7 and 14) (see Figure 5-1), Radius Filler (11), and washers (12) from the Gimbal (10).
2. Separate the cargo hook (15) from the load cell (13). Refer to Component Maintenance Manual 122-001-00 for hardware breakdown.
3. Separate the Load Cell (13) from the Gimbal (10) by removing the cotter pin (9) and nut (8) from bolt (4). Remove bolt and pin (5).
4. Remove the Bearings (14) from the Pillow Blocks (7) by conventional means.

Cargo Hook Suspension System Inspection

Return the Load Cell Assembly (P/N 210-222-00) to the factory for inspection and calibration. The factory will inspect the condition of the load cell and perform acceptance test procedures including calibration and zero balance, repairing as necessary.

Carefully inspect the suspension system detail parts in accordance with the instructions in Table 5-3. Inspect the parts in a clean, well-lighted room.

Inspect bearings and the shafts they run on for wear and corrosion. Pitting, corrosion, or roller dents on shafts is cause for rejection.

Cargo Hook Suspension System Inspection continued

Table 5-3 Cargo Hook Suspension System Inspection

Seq	Component	Inspection Criteria & Limit	Repair Action	Finish
1.	Pin (5)	Wear on OD - .490 in. (12.4 mm)	None.	NA
2.	Pillow Blocks (7)	Dents, nicks, cracks, gouges, scratches and corrosion – 0.020 in. (0.50 mm) deep	Blend at 10:1 ratio as required to provide smooth transitions.	Apply alodine (MIL-DTL-5541) and zinc chromate primer (MIL-PRF-23377 or similar) to affected surfaces.
3.	Gimbal (10)	Wear on shaft ODs – 0.618 in (15.7 mm) Wear on hole ID - .512 in. (13.0 mm)	None	N/A
4.	Gimbal (10)	Dents, nicks, cracks, gouges, scratches and corrosion – 0.020 in. (0.50 mm) deep	Blend at 10:1 ratio as required to provide smooth transitions.	Apply zinc chromate primer (MIL-PRF-23377 or similar) to affected surfaces.
5.	Radius Filler (11)	Dents, nicks, cracks, gouges, scratches and corrosion – 0.030 in. (0.76 mm) deep	Blend at 10:1 ratio as required to provide smooth transitions.	Apply alodine (MIL-DTL-5541) and zinc chromate primer (MIL-PRF-23377 or similar) to affected surfaces.
6.	Radius Filler (11)	Wear on ID - .675 in. (17.1 mm)	None	N/A
7.	Shims (12)	Wear, corrosion or deterioration	None	N/A
8.	Load Cell Assembly (13) bushings	Wear on ID – 0.520 in. (13.2 mm)	None	N/A
9.	Bearings (14)	Roughness, binding, looseness, or corrosion	None	N/A
10.	Electrical wiring	Deterioration	None	N/A
11.	Serial No. Plate (18)	Damaged or illegible	None	N/A
12.	All remaining nuts, bolts, cotter pins, washers	Wear, corrosion, or deterioration	Replacement of all fasteners is recommended at 5 year/1000 hour interval.	N/A

Cargo Hook Suspension System Assembly Procedures

Re-assemble the Gimbal and Pillow Block Assembly in reverse order of disassembly.

1. Assemble the cargo hook (15) onto the load cell (13). Refer to Component Maintenance Manual 122-001-00 for hardware breakdown. If installing the ground strap (item 17, included in kit P/N 200-216-02), assemble the ring terminal under the nut. Tighten nut to finger tight and then rotate to next castellation to insert cotter pin.
2. Assemble the Load Cell (13) onto the Gimbal (10) with pin (5) bolt (4), washer (3), two washers (6) within the Gimbal slot (see Figure 5-1), Serial Number Plate (item 18), washer (16), and nut (8). Tighten nut to finger tight and then rotate to next castellation to insert cotter pin (9).
3. Press Bearings (14) into Pillow Blocks (7).
4. Place a Radius Filler (11) and two washers (12) over each shaft end of the Gimbal (10).
5. Position the Pillow Blocks over each Gimbal (10) shaft end and secure the assembly to the aircraft hard point.

Cargo Hook Suspension System Parts

Figure 5-1 Cargo Hook Suspension System Parts

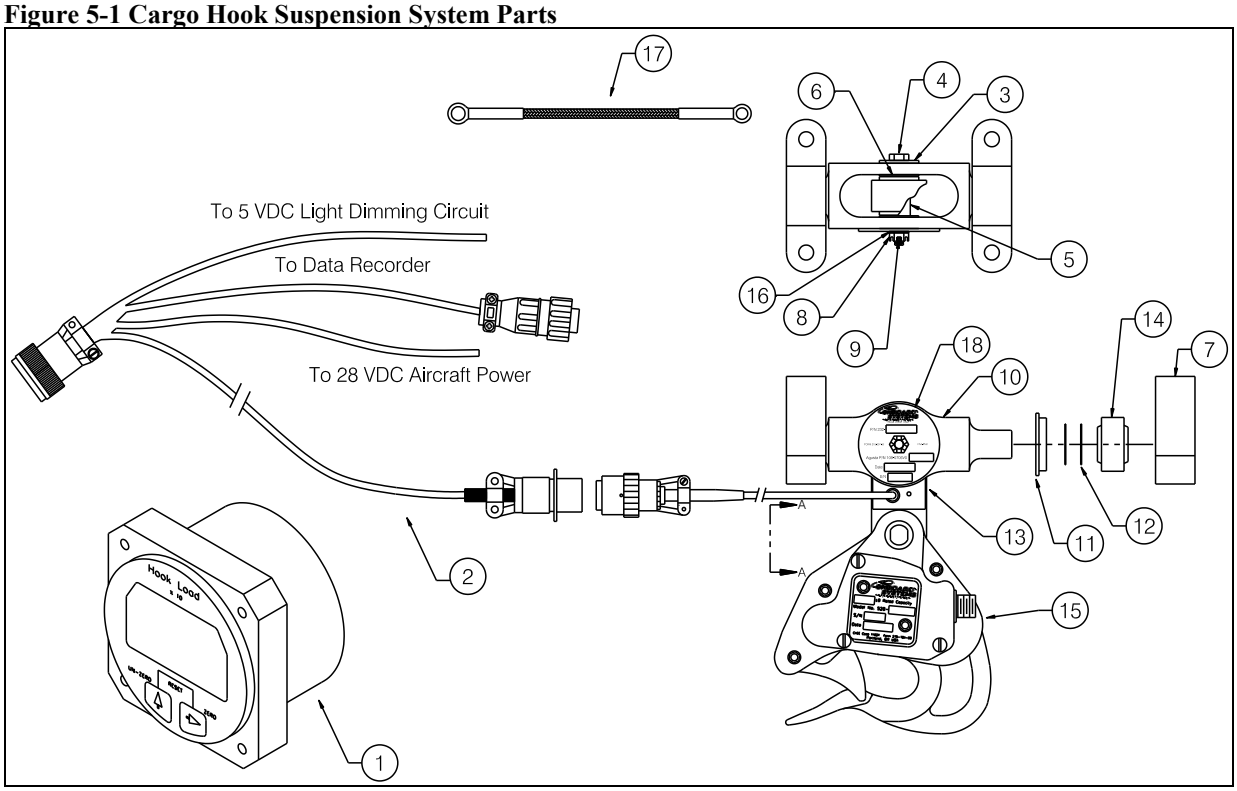

Table 5-4 Cargo Hook Suspension System Parts

ITEM	PART NO.	DESCRIPTION	Qty 200-216-01	Qty 200-216-02
1	210-177-00	C-39 Indicator	1	-
	210-095-05	C-39 Indicator, NVG	-	1
2	270-049-00	Internal Harness	1	1
*	232-289-00	A109 Suspension Assembly	1	-
*	232-290-00	A109 Suspension Assembly	-	1
3	510-085-00	Washer	1	1
4	510-084-00	Bolt	1	1
5	290-095-00	Pin	1	1
6	510-183-00	Washer	2	2
7	290-091-00	Pillow Block	2	2
8	510-082-00	Nut	1	1
9	510-081-00	Cotter Pin	1	1
10	290-092-00	Gimbal	1	1
11	290-094-00	Radius Filler	2	2
12	290-096-00	Shim	4	4
13	210-122-00	Load Cell Assembly	1	1
14	517-001-00	Bearing	2	2
15	528-010-05	Cargo Hook	1	-
	528-010-08	Cargo Hook	-	1

continued

Cargo Hook Suspension System Parts continued

Table 5-4 Cargo Hook Suspension System Parts continued

ITEM	PART NO.	DESCRIPTION	Qty 200-216-01	Qty 200-216-02
16	510-095-00	Washer	1	1
17	270-146-00	Ground Strap	-	1
18	215-207-00	Serial Number Plate	1	1
19**	120-071-00	Owner's Manual	1	1
20**	400-048-00	Power Switch	1	1
21**	215-010-00	Placard	2	2
22**	215-012-00	Placard	1	1
23**	512-001-00	Ty-rap	10	10

* Suspension Assembly P/N 232-289-00 consists of the assembly of items 3 through 18 minus item 17. Suspension Assembly P/N 232-290-00 consists of the assembly of item 3 through 18.

** Item not illustrated in Figure 5-1.

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