CLS-420

420 Cargo Lift Scale

Technical Manual

RICE LAKE®
WEIGHING SYSTEMS

Contents

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Contents

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1.0 Introduction

The CLS-420 is a rugged, dependable cargo lift scale that can withstand many years of repeated use. When mounted on a forklift, the CLS-420 saves time and money by allowing loads to be weighed immediately instead of carrying the load to a floor scale.

This manual is intended for use by individuals responsible for installing the cargo lift scale along with the 420 digital weight indicator. This includes information on the installation and maintenance of the scale carriage, signal cable installation (if applicable), and the installation, configuration, and calibration of the 420 digital weight indicator.

> **Note** *While the functionality remains the same for a standard 420 digital weight indicator, there are certain menu choices in the configuration section of this manual specific to this application.*

The CLS-420 Operator Card, PN 96484 included with this manual, provides basic operating instructions. Please leave the operator card when installation and configuration is complete.

Manuals and additional resources are available from the Rice Lake Weighing Systems website at **www.ricelake.com**

Warranty information can be found on the website at **www.ricelake.com/warranties**

1.1 Overview

The scale carriage comes in three different sizes including: 28", 34" and 38".

1.1.1 Scale Carriage Features
- Compatible with Class II (16in H) or III (20in H) forklift cleat type carriages
- Out of level NTEP Certified tolerance at seven degrees pitch and roll, three degrees side to side
- 1 1/2" thick front and back painted steel plates coupled by four flexure's
- Top cleats are welded, pinned and bolted
- Welded centering pin
- Two 5,000 lb s-beam load cells
- Updated iQube$^{2®}$ junction box with inclinometer
- Molded coiled cable, up-to 15' uncoiled (wired model only)

1.1.2 420 Plus Indicator Features
- Stainless steel enclosure
- On/Off switch to conserve forklift battery life
- Front panel calibration
- Full numeric keypad for manual tare entry
- Accumulate weight function using the print key for multiple pallets
- Single RS-232 port transmits time, date and weight for interface to PC or printer
- Two-piece top cage indicator mounting assembly with vibration mounts
- 9-36 VDC power supply for use on propane forklifts or 10-60 VDC power supply for use on electric forklifts

1.1.3 Wireless Load Cell Kit with Rechargeable Smart Lithium Ion Batteries (Wireless Model Only)
- 802.15 wireless load cell kit from scale to indicator
- Eliminates coiled cable from junction box to indicator for use with two and three stage masts
- Reinforced battery box welded onto cover plate to withstand harsh forklift environment
- On/Off switch with LED and antenna mounted on the rear of the enclosure
- Battery life, minimum 24 hours constant use with only eight hours to fully charge
- Battery life indication is located on the battery
- Two batteries and charger included
- Not intended for outdoor use

1.2   Safety

Safety Signal Definitions:

⚠ **DANGER**	*Indicates an imminently hazardous situation that, if not avoided, will result in death or serious injury. Includes hazards that are exposed when guards are removed.*
⚠ **WARNING**	*Indicates a potentially hazardous situation that, if not avoided, could result in serious injury or death. Includes hazards that are exposed when guards are removed.*
⚠ **CAUTION**	*Indicates a potentially hazardous situation that, if not avoided, could result in minor or moderate injury.*
IMPORTANT	*Indicates information about procedures that, if not observed, could result in damage to equipment or corruption to and loss of data.*

General Safety

Do not operate or work on this equipment unless this manual has been read and all instructions are understood. Failure to follow the instructions or heed the warnings could result in injury or death. Contact any Rice Lake Weighing Systems dealer for replacement manuals.

⚠ **WARNING**

Failure to heed could result in serious injury or death.

Some procedures described in this manual require work inside the indicator enclosure. These procedures are to be performed by qualified service personnel only.

Take all necessary safety precautions when installing the scale carriage including wearing safety shoes, protective eye wear, and using the proper tools.

Ensure feet, legs and other body parts are not under the scale when lowering.

Do not allow minors (children) or inexperienced persons to operate this unit.

Do not operate without all shields and guards in place.

Do not jump on the scale.

Do not use for purposes other then weight taking.

Do not place fingers into slots or possible pinch points.

Do not use any load bearing component that is worn beyond 5% of the original dimension.

Do not use this product if any of the components are cracked.

Do not exceed the rated load limit of the unit.

Do not make alterations or modifications to the unit.

Do not remove or obscure warning labels.

Keep hands, feet and loose clothing away from moving parts.

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1.2.1 Battery Disposal

When using Lithium-ion batteries, be sure to observe the following precautions for disposal as stated in the material safety data sheet regarding lithium-ion batteries.

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MSDS
LITHIUM-ION BATTERIES (Li-ion)

> The batteries referenced herein are exempt articles and are <u>not</u> subject to the OSHA Hazard Communication Standard requirement. This sheet is provided as a service to our customers.

MSDS

Material Safety Data Sheets (MSDS) are a sub-requirement of the Occupational Safety and Health Administration (OSHA) Hazard Communication Standard, 29 CFR Subpart 1910.1200. This Hazard Communication Standard does not apply to various subcategories including anything defined by OSHA as an "article". OSHA has defined "article" as a manufactured item other than a fluid or particle; (i) which is formed to a specific shape or design during manufacture; (ii) which has end use function(s) dependent in whole or in part upon its shape or design during end use; and (iii) which under normal conditions of use does not release more than very small quantities, e.g. minute or trace amounts of a hazardous chemical, and does not pose a physical hazard or health risk to employees.

Because all of our batteries are defined as "articles", they are exempt from the requirements of the Hazard Communication Standard; hence a MSDS is not required.

The following components are found in a Lithium Ion battery:

Component	Material	Formula
Positive Electrode	Lithium Cobalt Oxide	$LiCoO_2$
Negative Electrode	Graphite	C
Electrolyte	Ethylene Carbonate – Solvent	$C_3H_4O_3$
	Diethyl Carbonate – Solvent	$C_5H_{10}O_3$
	Lithium Hexaflurophasphate – Salt	$LiPF_6$

The overall reaction is: $Li_xC + Li_{1-x}CoO_2 \leftrightarrow C + LiCoO_2$

Disposal

All Lithium Ion batteries are classified by the federal government as non-hazardous waste and are safe for disposal in the normal municipal waste stream. These batteries, however, do contain recyclable materials and are accepted for recycling by the Rechargeable Battery Recycling Corporation's (RBRC) Battery Recycling Program. Please call 1-800-8-BATTERY for information on recycling your used Lithium Ion battery or go to the RBRC website at www.rbrc.org for additional information.

Transportation

All lithium (primary and rechargeable) batteries are not subject to the requirements of the U.S. Department of Transportation (DOT) Subchapter C, Hazardous Material Regulations because each of our batteries meets the exceptions under 173.185 (b). These regulations will remain in effect until we are advised of new regulations.

All lithium batteries are exempt from the DOT Hazardous Materials Subchapter as long as they are separated to prevent short circuits and packed in strong packing for conditions normally encountered in transportation.

> Notice: The information and recommendations set forth are made in good faith and are believed to be accurate at the date of preparation. We make no warranty expressed or implied.

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www.nationalpower.com

Figure 1-1. Material Safety Data Sheet - Lithium Ion Batteries

1.3   Considerations Before Installation

1.3.1   Forklift Derating

Capacity Reduction Calculation

While the CLS-420 will fit most typical forklifts, there are considerations that must be taken into account prior to installation. Due to the extra weight from the scale, the net lifting capacity of the forklift is reduced by approximately 10%. Use the formula below to calculate the amount to down-rate the lifting capacity and determine the net capacity of the forklift.

$$\text{Net Capacity} = \frac{A(B + C) - D(E - F)}{E + G + H}$$

A = Truck Basic Capacity in pounds	B = Inches from front wheel center line to fork face
C = Inches from face to truck rating point (usually 24)	D = Weight of scale in pounds
E = Inches from front wheel center line to carriage face	F = Inches from carriage face to scale horizontal center of gravity (HCG)
G = J + K (inches from carriage face to rear face of load	H = Inches from fork face to new truck rating point
J = Thickness of fork	K = Thickness of scale

CLS Classes and ID Plates

During the initial sale or installation, remind the customer that they must have an updated ID plate on the forklift stating the new lifting capacity and center of gravity information. This is required per OSHA rules and regulations.

		28 inch	34 inch	38 inch
Vertical enter of gravity (VCG) of scale	=	8.06	8.06	10.15
Horizontal center of gravity (HCG) of scale	=	2.09	2.09	2.83
Effective thickness (ET) of scale	=	4.55	4.55	6.06
Weight of scale	=	392	420	987
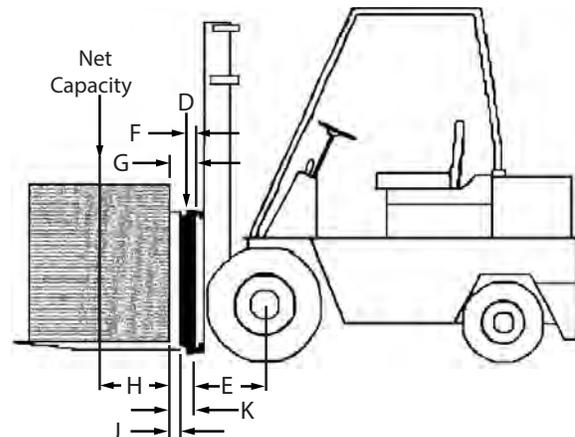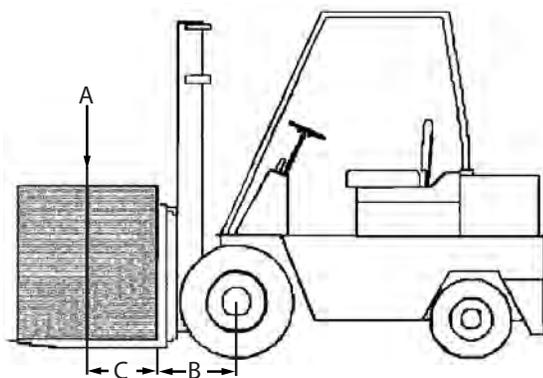
1.3.2   Forklift Battery and CLS Installation

⚠ **CAUTION**   *Take into consideration that the indicator power source will be connected directly to the battery of the forklift. 12 volts is most typical for propane, gas and diesel forklifts.*

Ensure the forklift has a negative ground electrical system; 12 volt systems must have a negative ground. The CLS will not operate on a positive ground forklift. Refer to the forklift users manual to further verify grounding requirements.

Standard CLS scales use a 9-36 V power supply for use on 12 V batteries. For an electric system forklift, make sure to install:

- PN 166162 – DC-DC Converter, CLS, 18-75 VDC 0 12 V output
- PN 166161 – Power Line Filter, CLS (for static protection)

⚠ **CAUTION**   *If a peripheral is connected, consider grounding it directly to the CLS-420 indicator.*

1.4   420 Digital Indicator

The 420 digital indicator is a single-channel serial weight indicator housed in a NEMA Type 4X/IP66-rated stainless steel enclosure. The indicator front panel consists of a large (1.8", 44.5 mm), 6-digit, 7-segment LED display and 21 keys.

Standard features of the CLS-420 include:

- ON/OFF switch to increase battery life and cycle power to the junction box
- Configurable digital inputs (2) and outputs (2)
- Electronic Data Processing (EDP) port dedicated to communication with the two-channel iQube[2] in forklift applications
- A printer port for full duplex RS-232 or active transmit only and 20 mA current loop communications up to 38400 bps
- NTEP certified
- 9-36 VDC input or 10-60 VDC input - VDC range of new power supply

1.4.1   Front Panel

The following illustrates the 420 LED annunciators, keypad, and normal mode key functions.
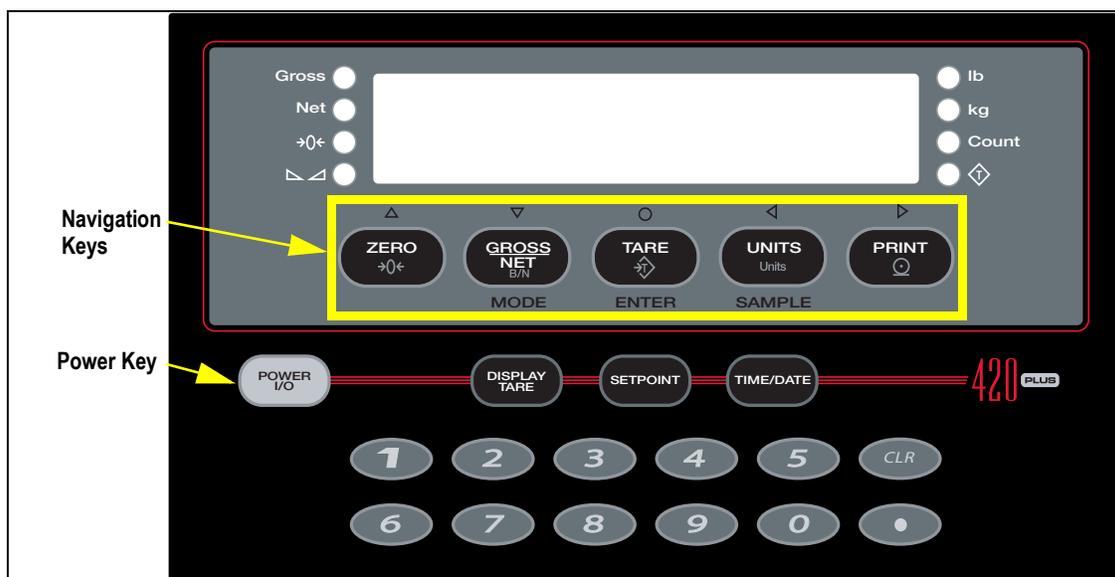
Figure 1-2. 420 Front Panel

There are five symbols shown above the navigation keys (which represent up, down, enter, left, right). In setup mode, the keys are used to navigate through menus, select digits within numeric values and increment/decrement values.

> ⚠ **WARNING**   *The 420 has an on/off switch for the processor functions.*
>
> *Before opening the unit, ensure the 420 is disconnected from the forklift battery power source.*

1.4.2   LED Annunciators

- *Gross/Net* displays whether the weight is gross or net.
- Center of zero (→0←). Lights when the scale is zeroed (gross weight is within 0.25 graduations of zero).
- Standstill (◣◿). Indicates when the scale is at standstill or within the specified motion band. Some operations, including tare functions and printing, can only be done when the standstill symbol is displayed.
- *lb* and *kg* indicate the units associated with the displayed value: lb=pounds, kg=kilograms.
- The displayed units can also be set to short tons (tn), metric tons (t), ounces (oz), grams (g), or NONE (no units information displayed). The *lb* and *kg* LEDs function as primary and secondary units for some combinations of primary and secondary units. If neither primary nor secondary units are lb or kg the *lb* is lit for primary units, the *kg* is lit for secondary units.
- The following table shows which are used for all combinations of configured primary and secondary units.

Examples:

a. *If the primary unit is pounds (lb) and the secondary unit is kilograms (kg), the* **lb** *LED is lit for primary units,* **kg** *for secondary units.*

b. *If the primary unit is pounds (lb) and the secondary unit is short tons (tn), the* **lb** *LED is lit for primary units,* **kg** *for secondary units. There is not an LED for short tons, so the* **kg** *LED is used for secondary units annunciator.*

c. *If the primary unit is short tons (tn) and the secondary unit is pounds (lb), the* **lb** *LED is lit for primary units (tn), and* **kg** *is lit for secondary units (lb). Because there is no LED for short tons, the* **lb** *and* **kg** *LEDs are used as primary and secondary units annunciators.*

Primary Unit	Secondary Unit						
	lb	**kg**	**oz**	**g**	**tn**	**t**	**none**
lb	lb / lb	lb / kg	lb / oz	lb / g	lb / kg		
kg	kg / lb	kg / kg	kg / oz	kg / g	lb / kg		
oz	oz / lb	oz / kg	oz / oz	oz / g	oz / kg		
g	g / lb	g / kg	g / oz	g / g	g / kg		
tn	lb / kg	lb / kg	lb / oz	lb / g	lb / lb	lb / kg	lb / kg
t					lb / kg	lb / lb	lb / kg
none					lb / kg	lb / kg	lb / lb

Table 1-1. Units Annunciators, Showing Primary / Secondary LEDs Used for All Configurations

1.5   Modes of Operation

The 420 has four modes of operation.

Weigh Mode

Weigh mode is the default mode of the indicator. The indicator displays gross or net weights as required, using the LED annunciators described in Section 1.4.2 to indicate the scale status and the type of weight value displayed. Once configuration is complete and a legal seal is affixed to the back of the indicator, this is the primary mode in which the 420 can operate.

Setup Mode

Most of the procedures described in this manual, including configuration and calibration, require the indicator to be in setup mode.

To enter setup mode, remove the setup screw, insert a small screwdriver and press the setup switch once. The indicator display changes to **CONFIG**.

Test Mode

Test mode provides a number of diagnostic functions for the 420 indicator. Like setup mode, test mode is entered using the setup switch. See Section 3.7 on page 38 for more information about entering and using test mode.

Note | *Test mode is intended for factory and technician use only.*

Front Panel Setup Mode

Hold the **UNITS** key for three seconds to enter front panel setup mode. Use front panel setup to change setpoint and to set the time and date.

Note | *Entering the front panel setup mode can be done without breaking the seal.*

1.6   Indicator Operations

Basic 420 operations are summarized below.

Toggle Gross/Net Mode

Press [GROSS NET B/N] to toggle the display mode between gross and net. If a tare value has been entered or acquired, the net value is the gross weight minus the tare.

Toggle Units

Press [UNITS Units] to switch between primary and secondary units.

Zero Scale

1. In gross mode, remove all weight from the scale and wait for ◣ ◢ to light.
2. Press [ZERO →0←]. →0← lights to indicate the scale is zeroed.

Acquire Tare

1. Place a container on the scale and wait for ◣ ◢ to light.
2. Press [TARE] to acquire the tare weight of the container. *Net* weight is displayed and the Net LED is lit.

Remove Stored Tare Value

1. Remove all weight from the scale and wait for ◣ ◢ to light.
2. Press [TARE]. *Gross* weight is displayed and the Gross LED is lit.

Set Date
1. In the front panel setup mode, use the arrow keys to toggle to *DATE*.
2. Press the **Down** arrow or **Enter** to enter the date in the format configured for the indicator.

Set Time
1. In the front panel setup mode, use the arrow keys to toggle to *TIME*.
2. Press the **Down** arrow or **Enter** to enter the time in 24-hour format, then press the **Enter** key to save that value.

Display Accumulator
1. Hold the **(MODE) GROSS/NET** key for three seconds to display the accumulated valued if enabled in configuration. The accumulated value will be displayed for about 10 seconds.
2. To clear the accumulator, press the **CLR** key twice while the accumulated value is being displayed.

1.7   Accepting Weight Data to the Indicator

The 420 indicator accepts data from the iQube^2® junction box using one of the following methods. Use the instructions for the style that was ordered.

- Wired – coil cable, see Section 2.6 on page 15.

Figure 1-3. Wired Signal Coil Cable

- Wireless Communication – attached to the back of the 420 indicator, it collects data from the iQube^2 without the use of a cable. The iQube^2 uses a lithium-ion battery. See Section 2.9 on page 24.

Wireless communication from the indicator to the iQube^2 which is located on the scales angle bracket.

Lithium-Ion battery housed in a battery box.
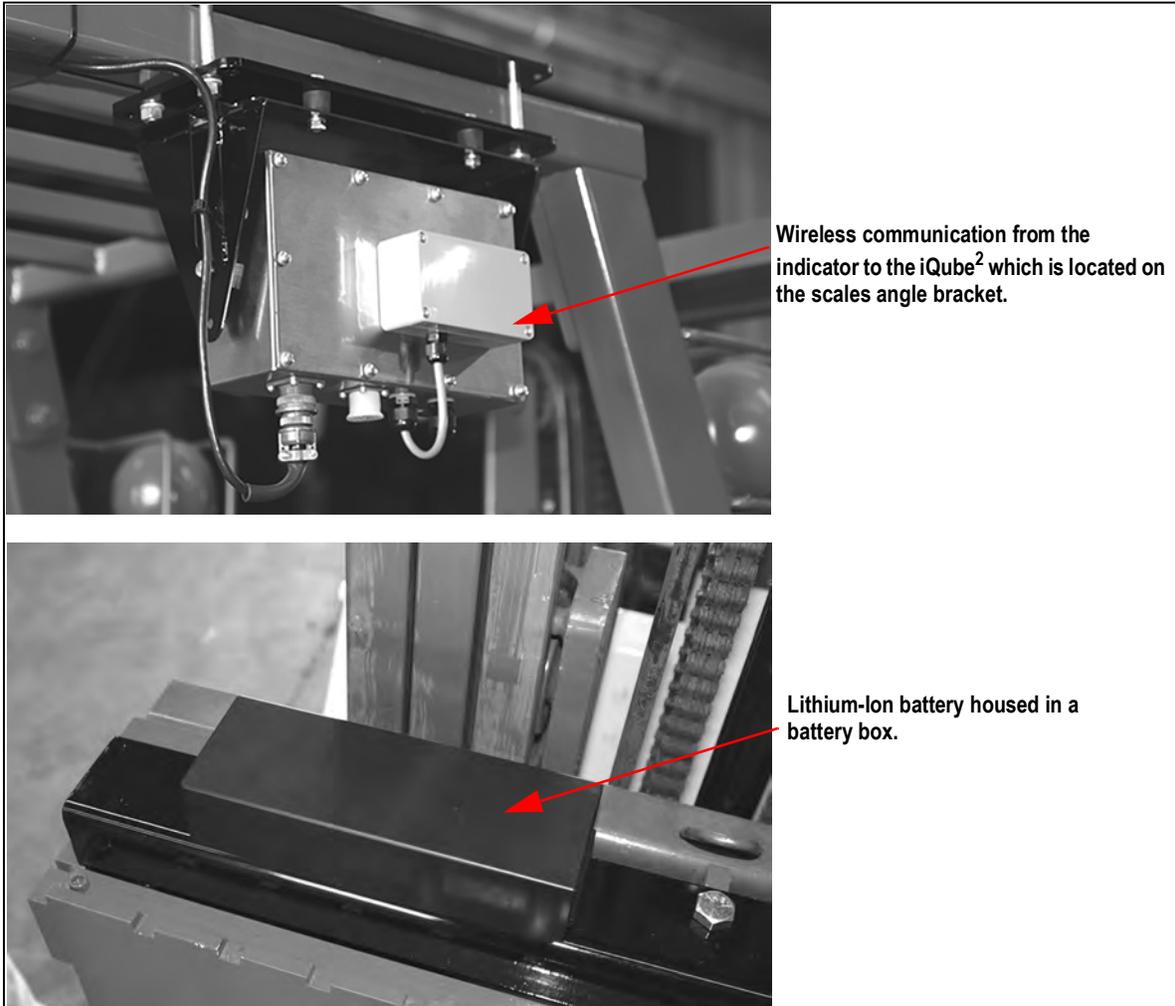
Figure 1-4. Wireless Version of Communication

1.8   iQube^2 Junction Box

The latest CLS-420 includes an updated version of the iQube^2 junction box. This design is built to allow service technicians to easily service the unit in the field. It also replaces the older style j-boxes originally used.

Coiled cable connection

Mild steel construction

Field replaceable load cell connectors
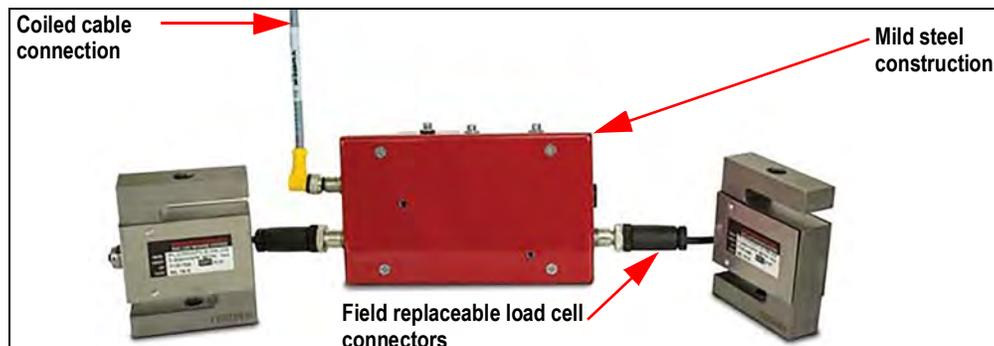
Figure 1-5. iQube^2 Junction Box

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2.0   Installation

This section describes procedures for installing the CLS-420 to a forklift.

> ⚠️ **WARNING** *Take all necessary safety precautions when installing the scale carriage, including wearing safety shoes and protective eyewear, and using the proper tools which are listed in Section 2.3 on page 12.*

The scale is shipped from the factory already calibrated to the indicator. Minimal recalibration and adjustments may be necessary once the scale is installed onto the fork lift. Calibration steps are contained in Section 3.3 on page 28.

2.1   Unpacking

The CLS-420 is shipped upright on a sealed pallet with one or two scales per pallet.
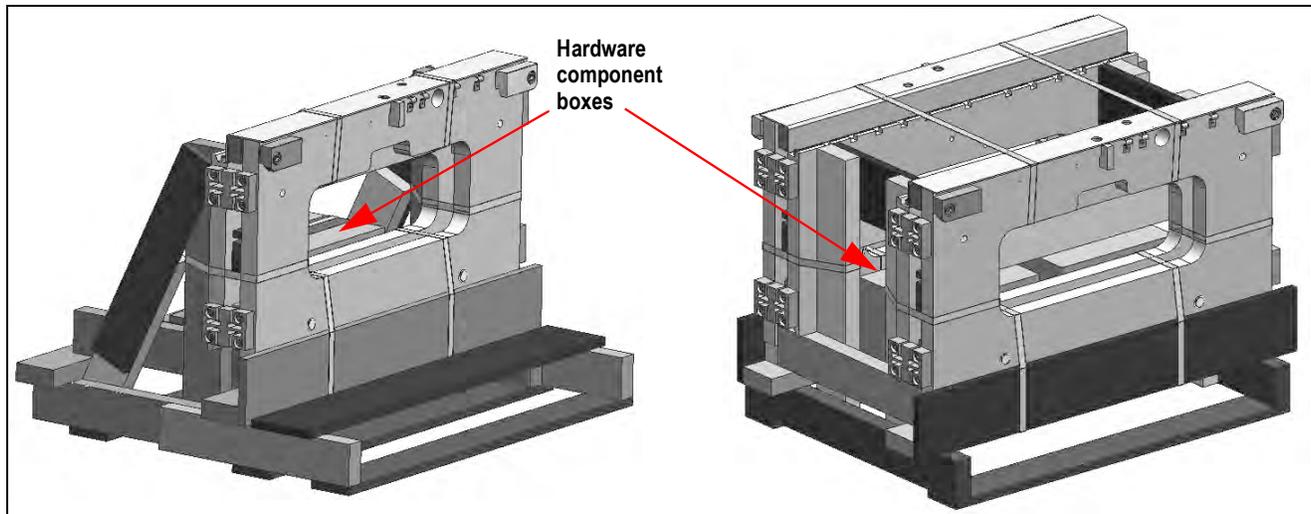
Figure 2-1. CLS-420 Packaging

Upon receipt of the shipping pallet, inspect it for any visible signs of damage. Immediately after unpacking, visually inspect the contents to ensure all components are included and undamaged. The shipping pallet should contain the following:

- One or two scale carriage assembly with cover plate
- Indicator component box which includes:
    - One electronic indicator with mounting bracket and hardware
    - One power cable
- Hardware Component Box which includes:
    - Two cleats with four bolts
    - Cage clamp mounting assembly and hardware
    - One coiled interface cable (wired version)
    - One power cable
    - Hardware for battery connection (wireless version)
    - Two lithium-ion batteries (wireless version)
    - Two-bay battery charger (wireless version)

> 📝 **Note** *To ensure that all products received from the manufacturer are in good shape upon arrival, it is recommended to fully inspect all contents and properly fill out the bill of lading.*

If any parts were damaged in shipment, notify the shipper and Rice Lake Weighing Systems immediately.

The scales are shipped in an upright position, to allow for ease of installation. The indicator and accessories are located in a hardware component box.

2.1.1   Unpacking One Scale Configuration

Follow these instructions to unpack one scale.

Hardware
component box

Scale

Protective wood
covering

Wood shipping pallet

Front pallet support

Exploded view of components

Hardware component box
plastic banding

Protective wood
covering

Front pallet
support

Step 1: Clip plastic band securing hardware component box

Step 2: Remove protective wood covering

Step 3: Remove front pallet support

Plastic banding securing
scale to pallet

Protective wood
covering

Step 4: Clip remaining plastic bands

Step 5: Remove protective wood

Scale is now ready for installation

Figure 2-2. Shipping Pallet for One Scale

2.1.2 Unpacking Two Scale Configuration

Follow these instructions to unpack a two scale configuration.

⚠️ **WARNING** *When installing from a two scale configuration, complete all of steps for scale one before clipping plastic bands securing second scale to the shipping pallet.*

Scale

Hardware component boxes

Protective wood covering

Protective wood covering

Wood shipping pallet

Exploded view of components

Plastic banding

Plastic banding

Protective wood covering

Step 1: Clip top plastic bands

Step 2: Clip plastic band to release hardware component boxes

Step 3: Remove hardware component boxes

Step 4: Clip plastic bands from first scale

Step 5: Remove protective wood covering for first scale

Scale one is ready for installation.

Do not clip the plastic band from scale two until scale one is installed

Step 6: Clip plastic bands from scale two.

Step 7: Remove protective wood covering for second scale.

Scale two is ready for installation.

Figure 2-3. Shipping Pallets for Two Scales

2.2 Before Installation

Before installing the CLS-420, the forklift should be in good operating condition in order to get optimal weighing accuracy. Review following items prior to installing.

- Inspect the forklift tines for damage
- Check the locking pin on the forks for proper function
- Check and adjust the lift chain so the heel of the forks have 1/2" to 1" of clearance from the floor when the carriage is down and the mast is vertical
- The slot for the center pin should be clear of grease and debris
- The top cleats of the forklift rest on the top of the scale and should remain clear of grease and debris that could alter the scale performance
- The forklift carriage should be flat. A bent or bowed carriage will affect the performance of the scale
- Check the width of the forklift carriage and make sure when the scale is installed the flexures have clearance
- Check to ensure the wireless angle bracket on the scale does not interfere with the forklift's load backrest extension

The CLS-420 fits most typical forklifts, however, the following considerations must be noted: the height of the carriage, the width of the carriage inside of the guards (if applicable) and the voltage of the forklift.

The indicator connects directly to the battery of the forklift. Ensure the type and style of forklift and the type of power it provides is compatible with the indicator. Most propane, gas, and diesel fueled forklifts provide 12 volts of power. Some diesel models also provide 24 volts and electric forklifts provide 36 to 48 volts of power. The CLS-420 has a 9-36 VDC and a 10-60 VDC power supply option. Refer to the forklift user manual for its grounding specifications. The scale will not operate on a positive ground.

| IMPORTANT | *All systems must have a negative ground.* |

2.3 Tools Required for Installation

The following tools are required to remove the scale from its shipping pallet and install onto the forklift.

Tool	Size	Purpose of Tool
Socket wrench	3/4"	To unbolt the fastening bolts holding the scale to the pallet and to open the top cover plate for wired versions
Allen wrench	1/2"	To bolt and unbolt the bottom cleats of the scale
Wrench - 2" adjustable	1-1/2" 1-5/8"	For adjusting the shim bolts and jam nuts **Note: Use a 2" adjustable wrench. Both the shim bolts and jam nuts are painted and a smaller wrench will not fit.**
Tin snips or band cutters	--	To cut the metal banding surrounding the CLS-420 on the pallet
Torque wrench w/ 1/2" Allen	1/2"	To tighten the cleats to 125 ft-lb
Electric Grinder - if necessary		For grinding the center pin if necessary

Table 2-1. Recommended Tools for Unpacking the CLS-420

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2.4   Scale Base Installation

Use the following steps to install the scale base to the fork lift.
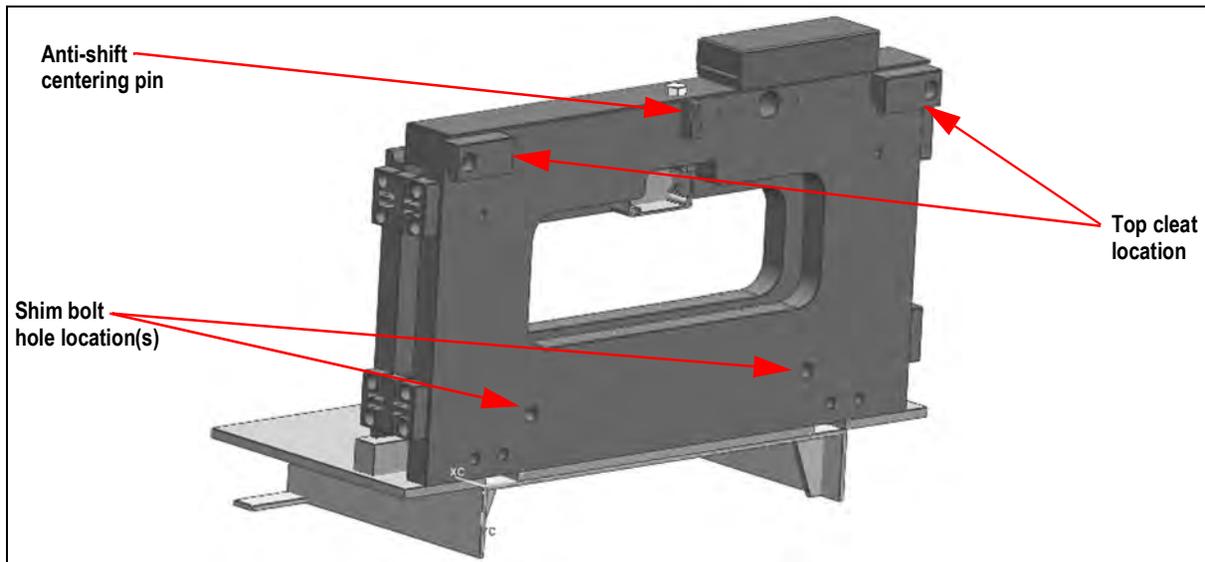
Figure 2-4. Anti-shift Centering Pin, Shim Bolts and Top Cleat Locations

IMPORTANT *Verify that the shim bolts are flush with the back plate of the scale. If they are not flush, the entire scale will be out of alignment when attaching it the forklift. This will make it difficult to make final adjustments once the scale is mounted to the forklift.*

1. Make sure the forklift tines are removed and move the forklift in close to the pallet and scale.

2. Ensure the anti-shift centering pin on the scale assembly is aligned with the center notch on the forklift carriage.

IMPORTANT *Consider the following during installation.*

   * *The scale's centering pin should be aligned with the middle notch of the forklift carriage.*

   * *Verify that the centering pin is adjusted so that the pin is located well within the center notch area of the carriage.*

   * *The centering pin should not touch the bottom of the notch on the original carriage, as this will cause side to side tilting of the scale.*

   * *The outside top cleats provide support to the scale assembly and the centering pin only helps to position the scale on the forklift carriage.*

   * *The centering pin should not bear any weight. If it does, the use of a grinder to grind down the centering pin will be necessary.*

3. Tilt the mast forward slightly to catch the scale assembly.

4. Carefully and slowly raise the scale carriage slightly so the top cleats (Figure 2-4) hook onto the forklift carriage. If they do not hook, carefully push the scale toward the forklift as it is being raised.

⚠ CAUTION *Ensure fingers and hands are away from the top cleats to avoid pinching and bodily harm.*

5. Tilt the mast back to secure the connection and raise the scale to shoulder height.

6. Attach the bottom cleats to the bottom of the scale assembly (Figure 2-5), so the lip of the cleat is behind the scale carriage.

7. Torque the bottom cleat retaining bolts to 125 ft-lb.

⚠ WARNING *Failure to properly torque the bottom plate retaining bolts may result in bodily harm or damage to equipment.*

8. Using the included feeler gauge, adjust the shim bolts so there is a minimal clearance between the bottom cleats and the scale carriage of 0.020" thickness.

> **IMPORTANT** *Failure to adjust shim bolts to proper clearance of 0.020 inches may result in binding, poor accuracy or improper fit of attachment to forklift.*

Illustration shown is with part of the flexure removed to show shim bolt location.

Scale carriage

Shim bolts

Bottom cleat retaining bolts

Insert a feeler gauge to measure a .020 inch thickness between bottom cleat and scale carriage.
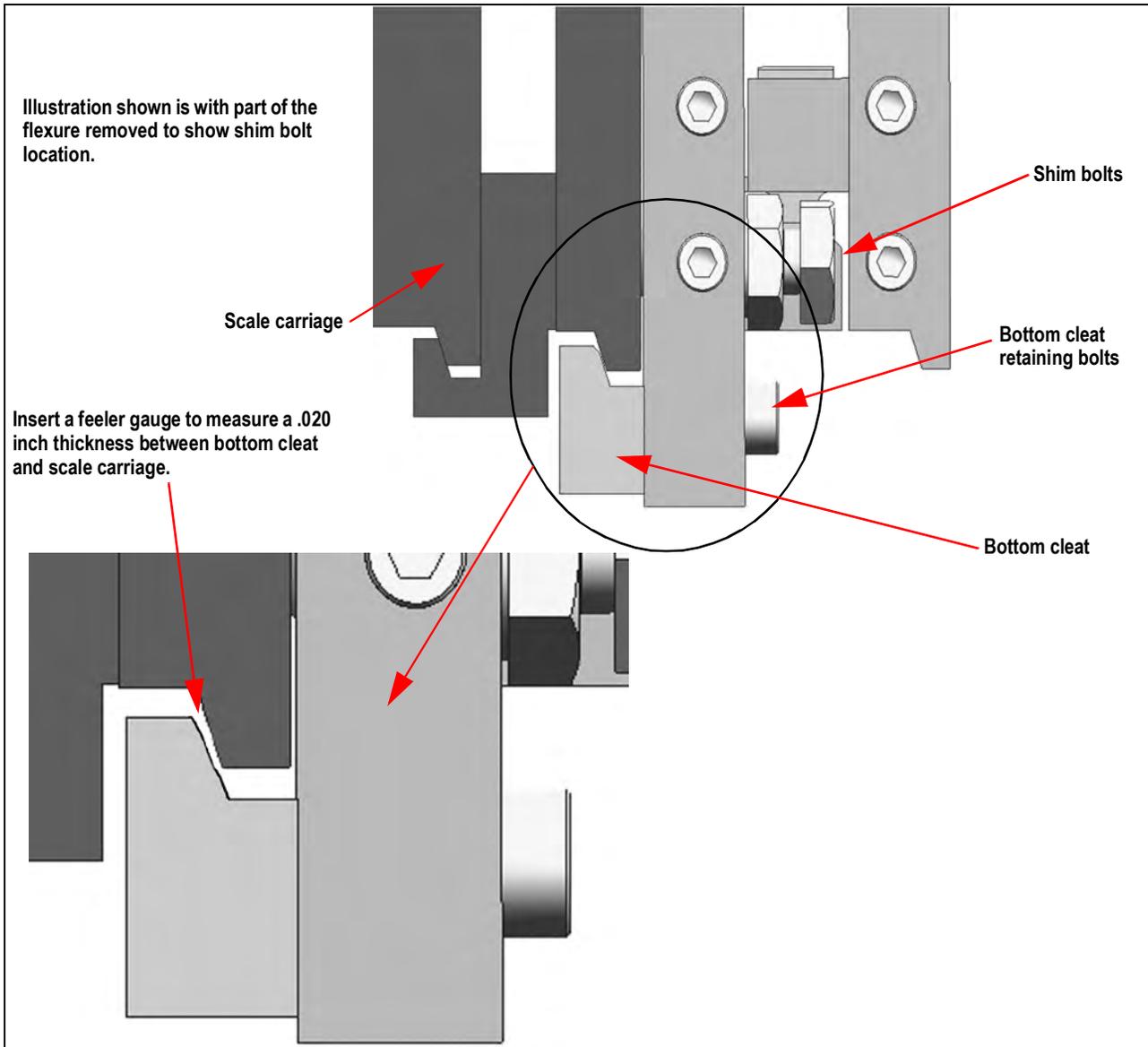
Bottom cleat

Figure 2-5. Bottom Cleat Location and Assembly

9. Upon successful installation and calibration verification, seal the carriage junction box and load cell quick disconnects for Weights and Measurements approval.

2.5   Install Forks

Once the scale is properly installed, the forks need to be installed onto the scale assembly.

1. Align a fork to the center of the scale assembly making sure it is over the top of the assembly.

2. Lift the carriage slightly to set the fork, and then slide the fork to the side of the scale. Let it stop in the 2nd notch from the end and latch it in place.

3. Repeat steps one and two for other fork, sliding it the opposite direction on the scale.

📝 **Note**   *For accurate weighing, it is best to leave the forks at the second notch from the outside edge of the scale.*

Figure 2-6. Fork Attachment

2.6   Connect Coiled Interface Cable to Junction Box
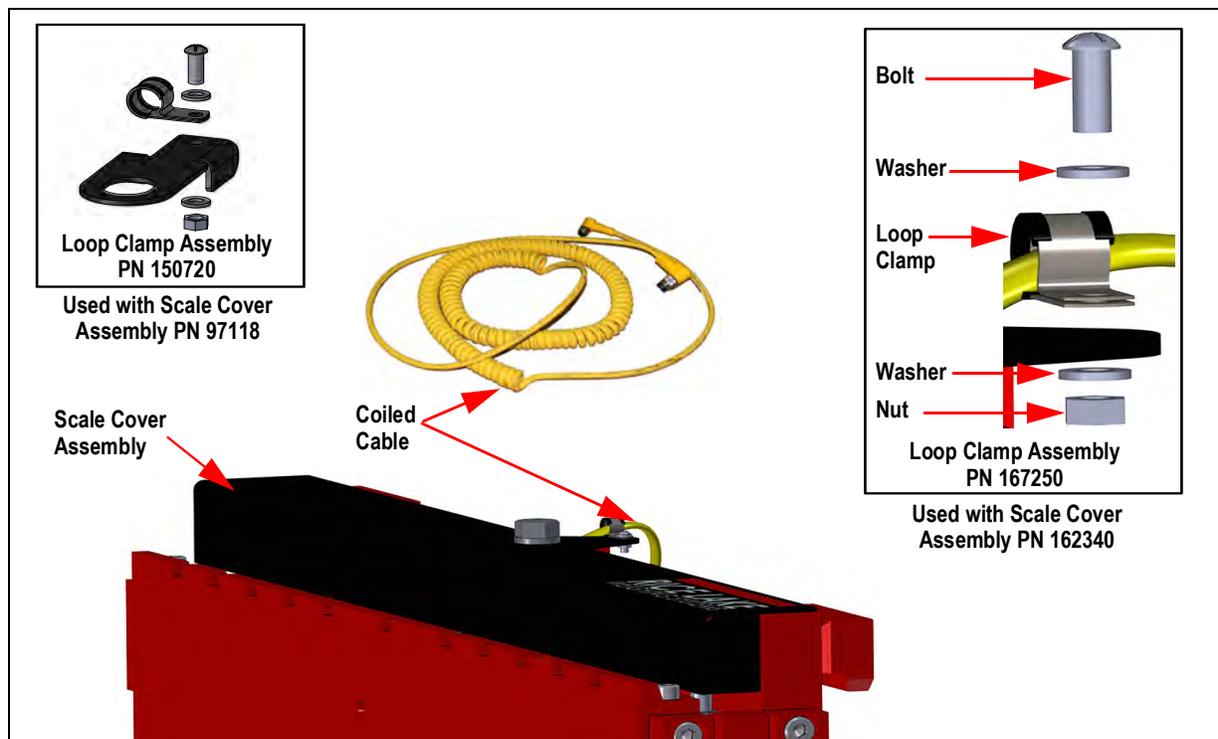
Figure 2-7. Connecting The Coiled Cable

1. Loosen the bolt holding the cover to the scale assembly and remove cover.

2. Assemble loop clamp kit to the coiled interface cable.

3. Route the coiled cable through the clips on backside of carriage toward middle. For proper coiled cable routing, tighten the clips. Set the other end of the cable aside until the power/communication box is installed. See Section 2.8.2 on page 20.

4. Push the coiled interface cable through the hole in the scale and connect it to the j-box (Figure 2-7).

5. Position the scale cover assembly and the loop clamp assembly to the scale and secure with the bolt and washer.

> **Note** *After successful installation and calibration, replace the cover on the scale assembly and secure with bolt and washer.*

2.7 Mounting the Indicator

The 420 indicator should be installed in a location that allows for free visibility.

The universal mounting bracket (included), enables the indicator to be mounted to the safety cage using the supplied hardware.

The indicator can be set to the best viewing angle for the operator by adjusting its tilt position using a wrench.

Vibration isolators protect the indicator from vibration and are included with the mounting bracket hardware.

Figure 2-8. CLS Mounting Bracket

2.7.1 Indicator Dimensions
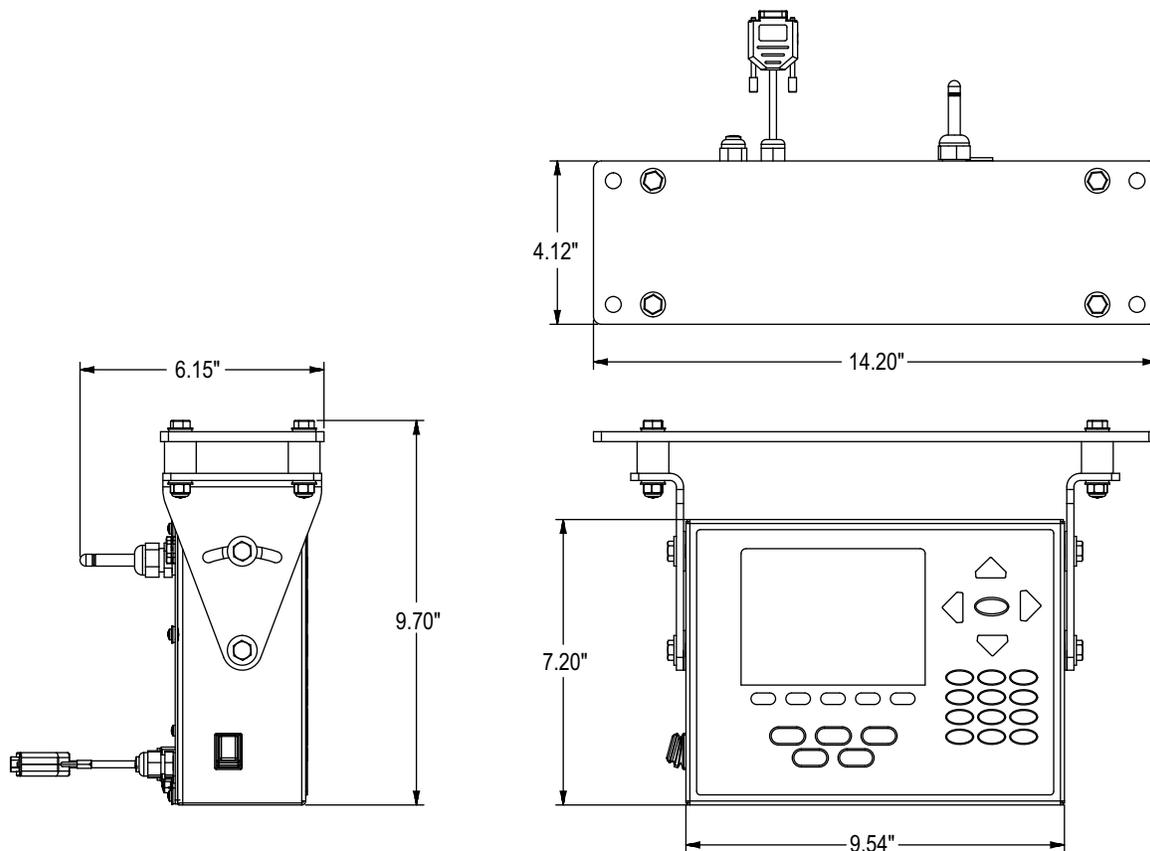
Figure 2-9. Indicator Dimensions with Mounting Kit

2.7.2 Mount Kit and Indicator Installation
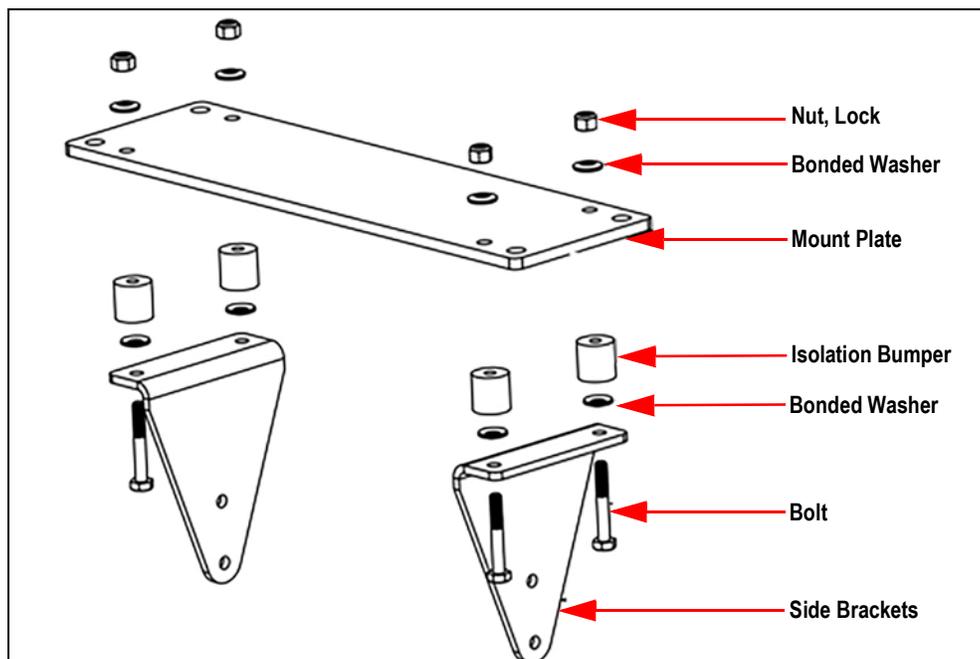
Figure 2-10. Mount Kit (PN 131630)

> **Note** *To permanently lock the indicator mounting bolts, Rice Lake Weighing Systems recommends using Loctite® 262.*

1. Install side brackets to the mount plate, using isolation bumpers and hardware (Figure 2-10).
2. Attach the mount assembly to the forklift frame at the location for the indicator.
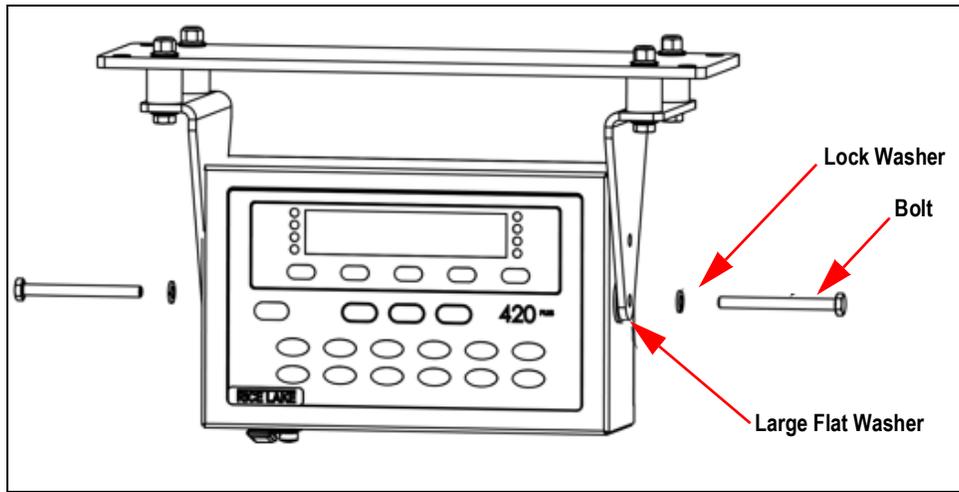
Figure 2-11. Mount Indicator

3. Align the holes in the side of the indicator with the holes in the mount bracket, and place the large flat washer between the indicator and the side brackets.
4. Secure with the lock washer and bolt.

2.8   Cable Connections
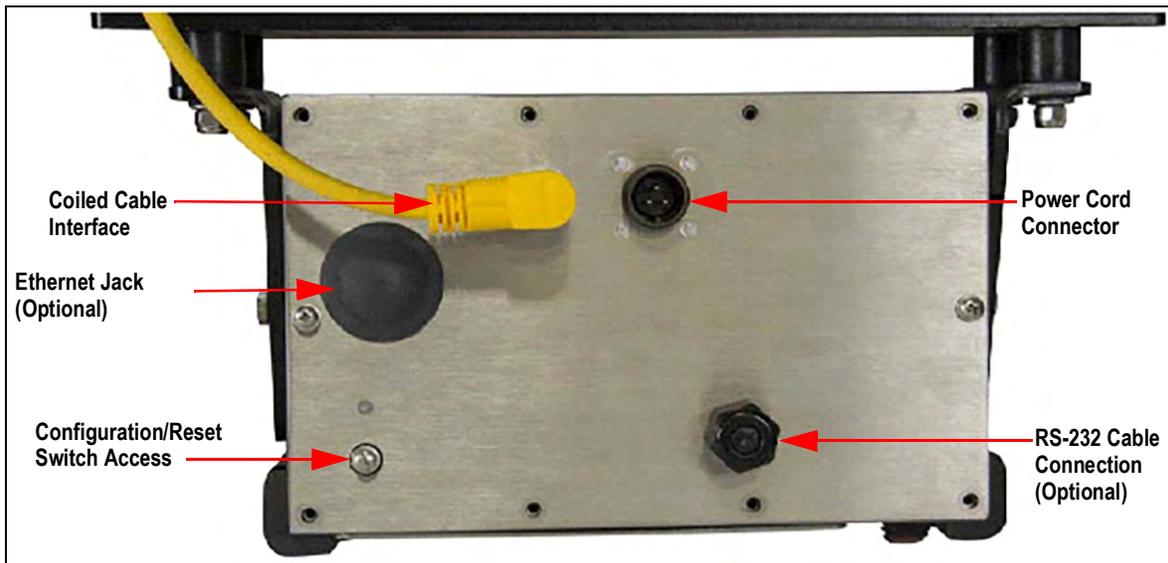
Figure 2-12. Back of Indicator

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2.8.1   Power Indicator with the Forklift Battery

⚠ CAUTION   *The indicator power source is connected directly to the battery of the forklift. Most typical is 12 volts for propane, gas and diesel forklifts, however, some diesel forklifts are 24 volts.*

Ensure the forklift has a negative ground electrical system. 12 and 48 volt systems must have a negative ground. The CLS series cargo lift scale will not operate on a positive ground.

Refer to the forklift user's manual for further verify grounding requirements.

📝 Note   *If using the wireless version, the CLS scale uses a supplied lithium-ion battery to supply power, see Section 2.9 on page 24. The wireless version does not come with a coiled cable.*

Run power cable along the chassis to the forklift scale battery

Figure 2-13. Power Cable

2.8.2   Power Cable Connection

⚠ CAUTION   *Do not connect the power cable into the indicator until battery connection is complete.*
Do not connect coiled interface cable into indicator until power hook-up is complete.

The indicator draws its power from the forklift battery. After the indicator is mounted, run the power cable along the shortest path that provides protection for the cable (away from moving or hot objects and pinch points), to the forklift battery. Secure the cable at several points with cable ties.

Cable is required to run inside the roll cage tubing, provided there are access holes for this purpose, with the use of a fish tape. If the cable is run through a hole in a tube or panel, be sure the cable is protected against chafing.

IMPORTANT   *Each installation is unique, and it will depend on the model and style of the forklift.*

* *Do not obstruct the view of OSHA labels on the forklift when routing cables*

* *Avoid running wires anywhere they could potentially be damaged*

* *Do not let the cable touch or run along anything that gets hot, such as exhaust*

* *Keep the cable away from moving parts, including control linkages and fan blades*

* *Do not place the cable where it will be pinched by the compartment cover when closed*

* *Do not run the cable up against, or directly across the ignition wires*

* *Do not let the cable come in contact with engine fluids*

* *Secure the cable with cable ties at several points to prevent movement or loosening*

* *Inspect the cable often to ensure it has not been damaged*
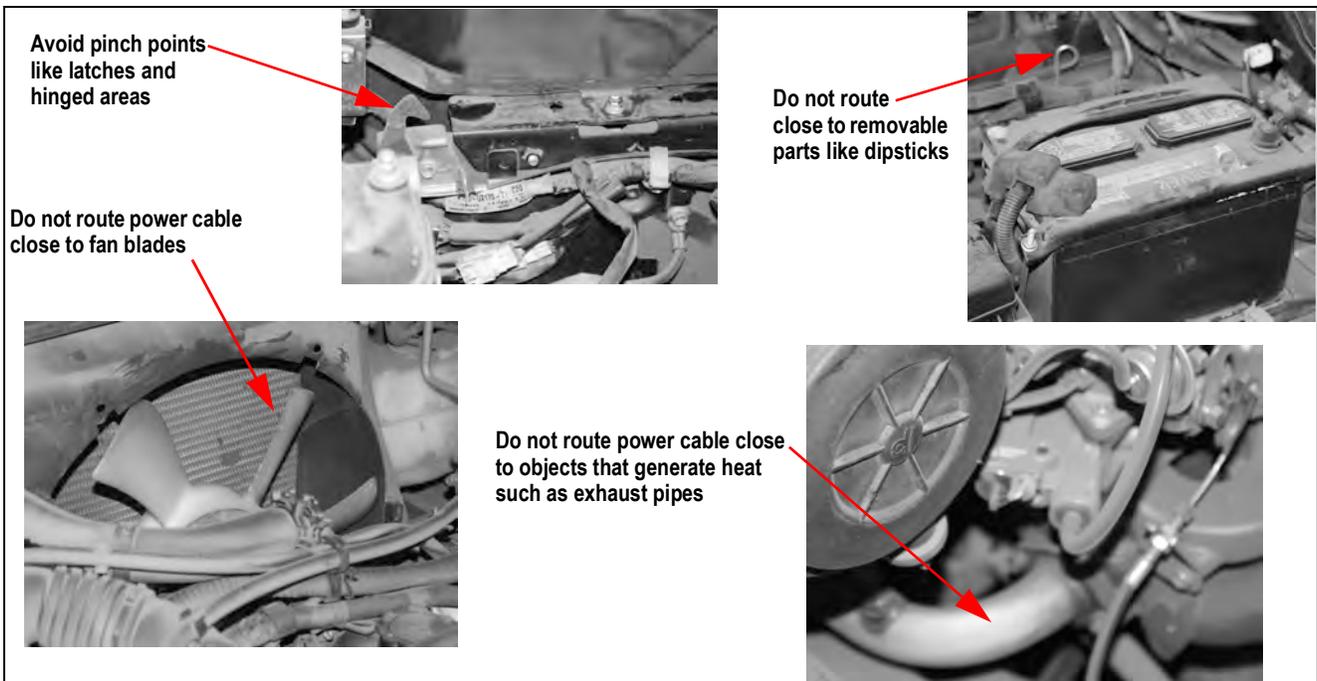
Figure 2-14. Areas to Avoid When Running Power Cable

2.8.3 Power Cable to Battery Connection

1. An in-line fuse is included. The fuse comes enclosed in an in-line fuse holder with a terminal connector. Connect the fuse assembly to the power cable assembly using the terminal connectors.
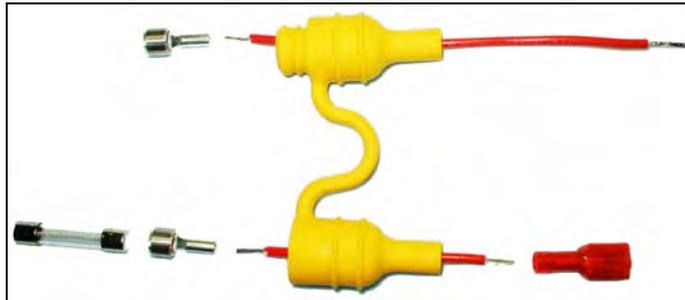
Figure 2-15. In-line Fuse (PN 130129)

2. If required, prepare the battery end of the fuse holder for connection by attaching the terminals to the three wires. Ensure there is enough wire exposed, slip the terminal over the wire and use a crimping tool to secure terminal to the wire.
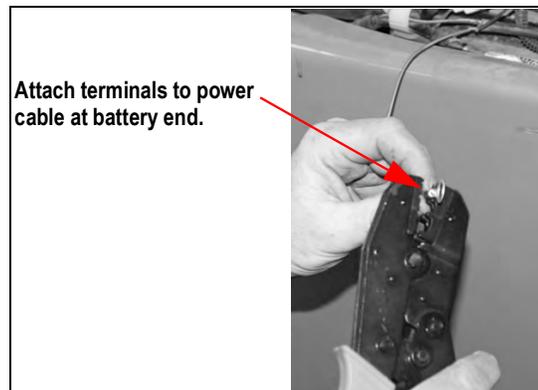
Figure 2-16. Attach Terminals to Power Cable - Battery End

3. Lift the boot from the positive battery cable (if present), and remove the nut from the clamp that connects the cable to the battery post.

4. Place the positive (red) wire terminal-end over the stud from the positive battery clamp and replace the nut to secure the wire to the clamp.
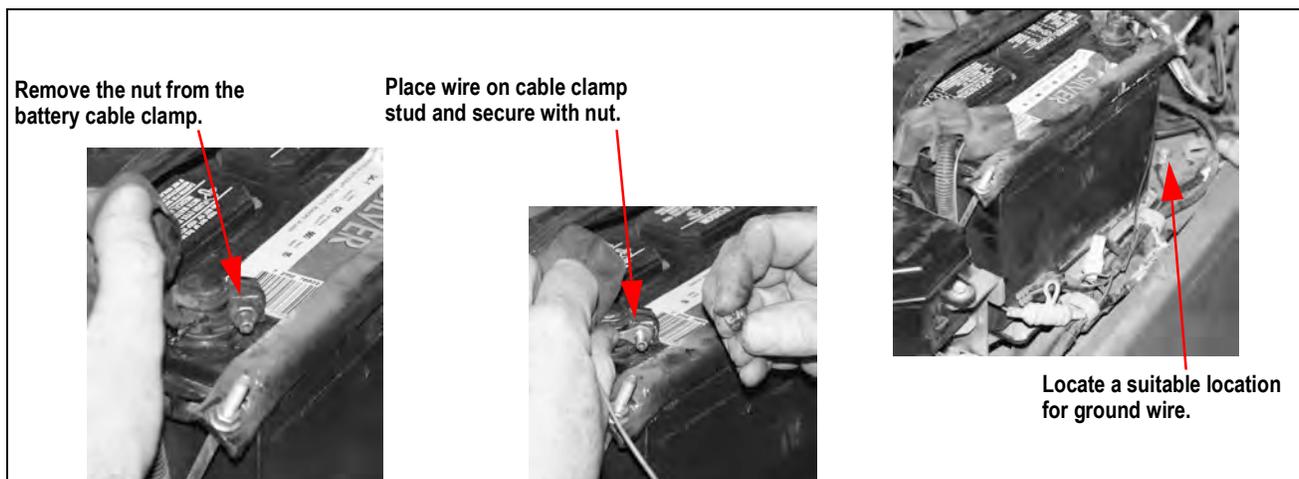
Figure 2-17. Connect Positive Wire to Battery Cable

5. Follow the same procedure to connect the negative (black) wire to the negative battery-cable clamp.

6. Connect the ground (blue) wire to a suitable location on the chassis.

7. After the connections are made at the battery, connect the cable to the power/communication box.

Note | *Supplied termination hardware includes three 1/4" eyelets for 1/4" bolts.*

Wire Color	Signal
Red	Positive on battery
Black	Negative on battery
Blue	Chassis ground

Table 2-2. Power Hookups to Forklift Battery

Note | *If connection to the battery is not available via the battery terminal, consult with a forklift service technician to identify the best source for power connection.*

2.8.4 Route the Load Cell Coiled Interface Cable

⚠ CAUTION | *Do not plug the coiled interface cable into the power/communication box until the power hookup is completed.*

1. Route the cable connected to the load cell j-box to the indicator from the forklift scale. Routing of the cable varies depending on the forklift style. The preferred route for a single stage forklift is through the center of the mast, up the front/right upright, across the top of the overhead guard and down the rear-right pillar to the power/communication box.

Coiled interface cable

Cable tie

Coiled interface cable
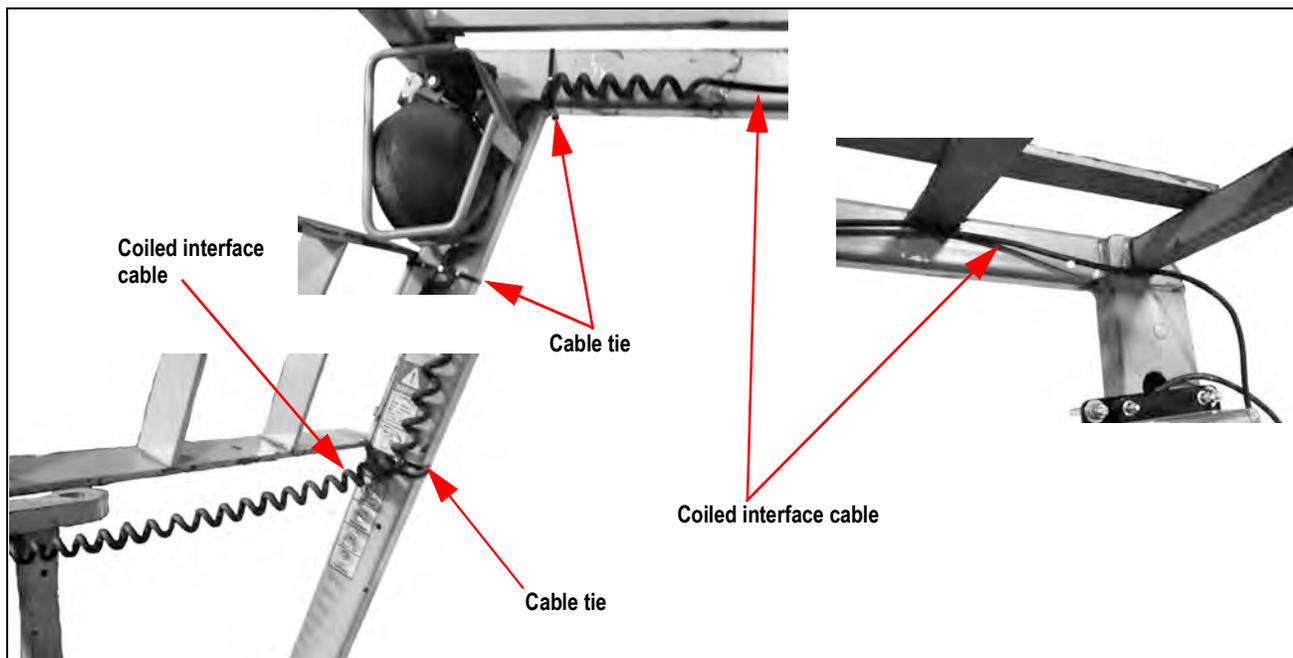
Cable tie

Figure 2-18. Signal Cable Located Between the Scale and the Power/Communication Box

2. Secure with cable ties at the scale, at the top of the mast and several other locations to keep it securely in place.

3. Slowly and carefully extend the mast to all positions to confirm that the cable isn't pulled too tight and that there are no pinch points along the cable route.

4. Check for proper signal cable clearance as the side shifter (if used), is moved back and forth.

5. After the power hook-up is completed, plug the power connector into the power/communication box.

Note | *Do not obstruct the view of OSHA labels on the forklift when routing cables.*

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2.8.5   Grounding

Except for the power cord, all cables routed through the cord grips should be grounded against the indicator enclosure.

1. Install the grounding clamps on the grounding bar, using the ground clamp screws. Do not tighten the screws at this time.
2. Route the cables through the cord grips and the grounding clamps to determine the cable lengths required to reach the cable connectors.
3. Mark the cables to remove insulation and shield. See Stripping Cables below.
4. Route stripped cables through the cord grips and grounding clamps.
5. Ensure the shields contact the grounding clamps and tighten the ground clamp screws.

Stripping Cables

Foil Insulated Cable
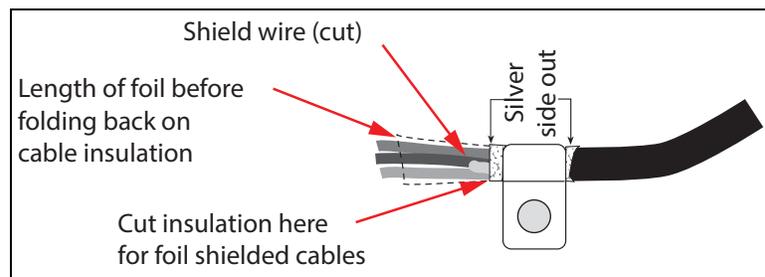
Figure 2-19. Foil Insulated Cable

1. Strip the insulation and foil from the cable 1/2" (15 mm) past the grounding clamp.
2. Fold the foil shield back on the cable where the cable passes through the clamp.
3. Ensure the silver (conductive) side of the foil is turned outward for contact with the grounding clamp.

Braided Shielding
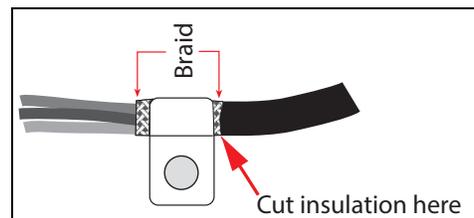
Figure 2-20. Braided Insulated Cable

1. Strip the insulation and braided shield from a point just past the grounding clamp.
2. Strip another 1/2" (15 mm) of the insulation to expose the braid where the cable passes through the clamp.

Load Cell Cables

Cut the shield wire just past the grounding clamp. Shield wire function is provided by contact between the cable shield and the grounding clamp.

2.9   Wireless Battery Option

Wireless technology eliminates the need for the coiled interface cable. The reinforced battery box is welded onto the cover plate. There is an On/Off switch to conserve the life of the battery and an LED to indicate when the battery is on. Battery life is approximately 24 hours of continuous use, with only 8 hours to fully charge.

The wireless technology operates using a paired set of IEEE 802.15.4 wireless modules. It operates in unlicensed bands including 2.4 GHz, 900MHz and 868 MHz. One module is in the battery angle bracket assembly, the other is in the wireless junction box connected to the indicator.

If multiple units are being installed, make a note of the original components supplied on each pallet. They will only operate in combination with each other.
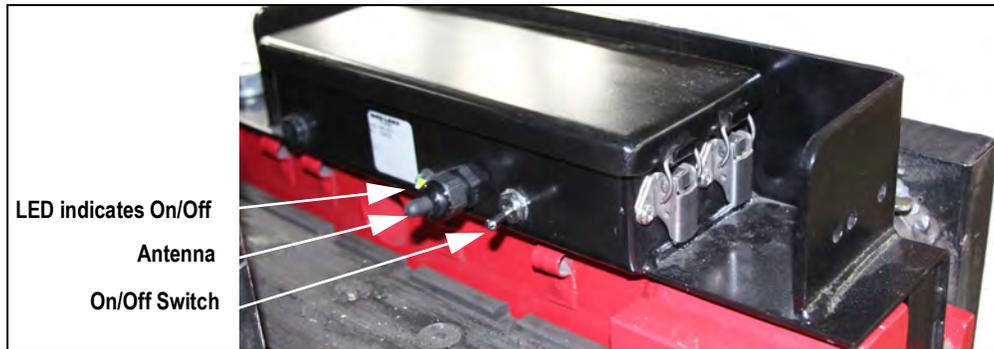
Figure 2-21. Wireless Battery Option

2.10   Battery Removal and Installation
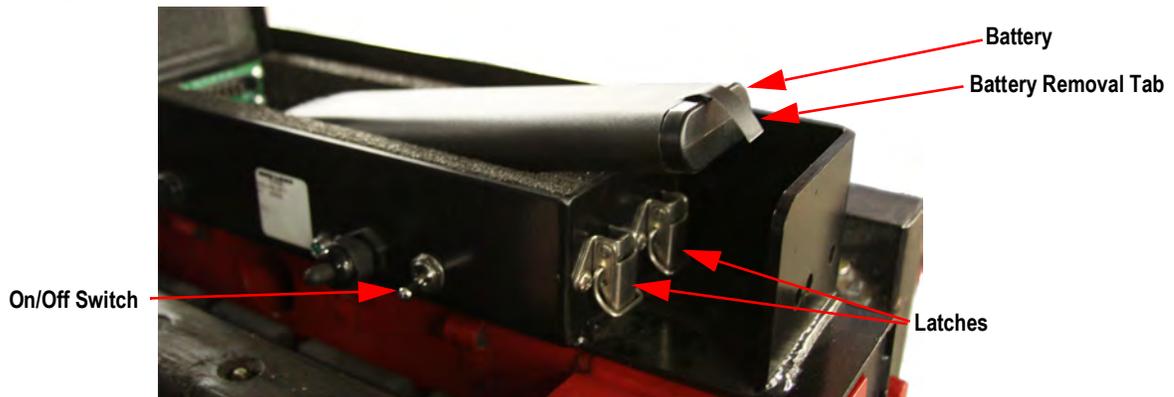
Figure 2-22. Battery Removal and Installation

1. Place the **On/Off** switch in the **Off** position.
2. Release latches and raise the cover.
3. Grasp a tab on the end of the battery and pull up.
4. Insert a new/charged battery into the battery case.
5. Close the cover and engage the latches.

The CLS scale uses a supplied lithium-ion battery to supply power to the indicator when using a wireless version of the CLS-420. The lithium-ion battery is located on the top of the cover plate in a painted enclosure.

Part No.	Description
96343	Lithium-Ion Battery
96344	2-Bay Battery Charger
96345	10-Bay Battery Charger

Table 2-3. Battery Replacement Parts

2.11 Charging the Lithium-Ion Battery

The lithium-ion battery comes with a two-bay, level-3 stand alone smart battery charger, a DC power jack and AC power cord.

To calibrate the battery pack, press the button on front label.

Figure 2-23. Two-Bay Battery Charger and Parts for the Lithium-Ion Battery

The average charge time for the battery is eight hours each.

Use the following steps to charge the battery prior to use:

1. Insert the plug end of the power cable into the DC power jack on the battery charger and the AC plug into an outlet.
2. Insert battery into the bay.
3. There is one LED indicator in front of each bay which will illuminate to indicate the status of the battery as follows:

Signal	Description
Off	No Battery
Green Flashing	Fast Charging
Green Solid	Fully Charged
Yellow Flashing	Recalibrating
Yellow/Green Alternating	Recalibrating
Yellow Solid	Standby
Red Flashing	Error

Table 2-4. Battery Charging LED Signals

2.12 Calibrating the Lithium-Ion Battery

In order to keep the battery fuel gauge as accurate as possible, it is necessary to run the pack through a recalibration cycle on a monthly basis. To do this, place the battery in the left bay of the charger and press the button on the front label (Figure 2-23). This initiates the recalibration sequence in the **left bay** only. The process can take up to nine hours to complete and a recommended recalibration should be done once a month to keep the battery accurate.

2.13 Lithium-Ion Battery Specifications

Nominal Capacity		6600 mAh
Nominal Voltage		11.1 V
Charging Method		Constant Current
		Constant Voltage
Charging Voltage		12.6 V
Charging Current		4.0 A
Charging Time		100% @ 8 hours
Ambient Temperature	Charge	0º - +40ºC (32º -104ºF)
	Discharge	-20º - +60ºC (-4º -140ºF)
	Storage	-20º - +50ºC (-4º -122ºF)
Weight (Maximum)		430 g
Dimensions (Maximum)	Depth	22.80 mm
	Length	214.0 mm
Volumetric Energy Density		466 Wh/l
Gravimetric Energy Density		167 Wh/kg
Maximum Hours of Charge		24 hours
Nominal Capacity		6600 mAh

Table 2-5. Battery Specifications

2.14 General Precautions - Lithium ion Battery

⚠️ **WARNING**   *Below are general precautions that should be taken when handling lithium-ion batteries.*

Handling

- Do not short circuit
- Do not immerse in water
- Do not disassemble or deform battery
- Keep away from excessive heat (+100°C)
- Avoid excessive physical shock or direct vibration
- Keep out of reach of children
- Never use a battery that appears dented, cracked or is deformed in any way
- Do not crush or attempt to disassemble the battery

Charge and Discharge

- The battery must be charged in an appropriate charger only
- Never use a modified or damaged charger
- Use only with the specified products

Storage

Store in a cool, dry and well ventilated area

Disposal

- Regulations vary for different regions.
- Dispose of in accordance with local regulations

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3.0   Calibration and Configuration

The functionality is the same as a standard 420 digital weight indicator. There are certain setup options, found in this section, that need to be changed for the proper functioning of the cargo lift scale.

The 420 indicator can be configured using the front panel keys to navigate through the menus () or by sending commands or configuration data to the EDP port ().

To configure the indicator, it must be placed in Setup Mode.

Figure 3-1. Configuration Switch Location

1. Remove the configuration switch access on the back of the enclosure.
2. Insert a non-conductive tool into the access hole and press the configuration switch. **Config** displays.
3. Use the menus in this section to configure the indicator.
4. When configuration is complete, return to the **Config** menu and press the ZERO →0← key to exit setup mode.
5. Reinstall the configuration switch access screw.

3.1   Navigating Through Menus

Five front panel keys are used to navigate through the menu in Setup Mode. The icon above each key indicates the command performed.

Figure 3-2. Front Panel Menu Navigation

To configure menus:

1. Press ◁ or ▷ in the configuration mode until the desired menu appears on the display.
2. Press ▽ to enter to the sub-menus/parameters for the menu selected. The current parameter displays.
3. Press ◁ or ▷ until the desired parameter/value displays.
4. Press ◯ or △ to save the setting and return to the previous menu.
5. When all settings are complete, press △ until the indicator returns to the weigh mode.

3.1.1   Editing Numerical Values

1. Press ◁ or ▷ to select the digit to be changed.
2. Press △ or ▽ to increment/decrement the value of the digit.
3. When the desired value is displayed, press ◯ to select it and move back to the previous parameter.

3.2   Rezero

On CLS-420 systems shipped and installed November 1, 2017 and later, the **REZERO** function has been added. It allows calibration weight lifting devices to be used during the initial **CMZERO** (zero calibration) step. Perform a **REZERO** once calibration is complete to ensure a calibrated zero has been stored.

3.3   Calibration

The CLS-420 indicator can be calibrated using the front panel calibration procedure as following:

- Zeroing the scale inclinometer
- Zero calibration
- Entering the test weight value
- Calibration of cell #1 (left fork tine)
- Calibration of cell #2 (right fork tine)

LEFT TINE →

FORKLIFT
LOOKING
DOWN
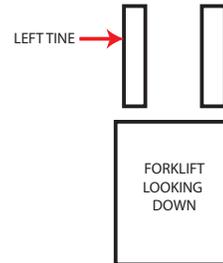
The following sections describe the calibration procedure for each of the calibration methods.

CONFIG	FORMAT	CALIBR	SERIAL	PROGRM	PFORMT	SETPNT	DIGIN	ALGOUT	VERS

ANGLEZ	CMZERO	WVAL	CMCEL1	CMCEL2	REZERO

Display and edit
test weight value
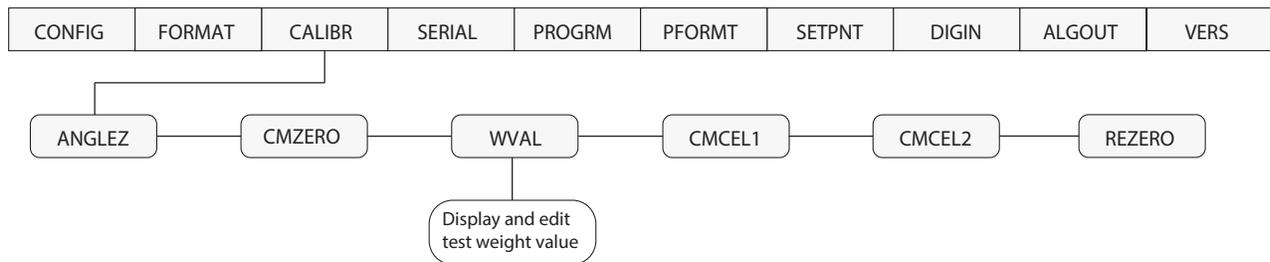
Figure 3-3. Calibration Menu

Calibration Preparation

Review the following important notes prior to the calibration process.

- If enabled, turn off the *Zero Track Band* in the configuration menu for calibration and build up test
- The test weights used to calibrate the scale cannot be greater than 2500 lb.
- Use a level to ensure the forklift tines are level prior to calibration
- Exercise the load cells prior to calibration by lifting weights
- Follow the calibration sequences as defined, otherwise errors will occur
- Once the calibration process has started, make sure the indicator does not lose power
- In the configuration menu, check to ensure **GRADS** are set to 1000; **ZTRKBND** is set to 0 and **ZRANGE** is set to 1.9%
- Determine the best method of calibration based on devices used to lift calibration weights

3.3.1   Devices used for Lifting of Calibration Weights

There are many techniques and devices used for lifting the test weights during the calibration process. For best performance, use the following methods and devices.

Two Straps, Chains, Fork Sleeves with Hooks

The use of two straps (slings), chains or fork sleeves (channel) with hooks are recommended methods used to lift weights during the calibration process. Place the devices on each fork before the **CMZERO** (zero calibration) step. Devices used to lift the weight should be less than 10-20 lb each. After the calibration is completed and prior to testing for accuracy, the display shows a negative weight value. Use the zero key on the 420 indicator to return the scale to zero weight.

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One Strap, Chain, Fork Sleeve with Hook

The use of a single device requires the known weight of the device to be added into the **WVAL** (weight value) entry for the calibration of each fork.

> 📝 **Note** *The use of other apparatuses can cause an error during the calibration process. Shifting of loads between the zero and individual load cell calibration will affect the digital trimming. Do not reconfigure the dead load during the calibration process.*

3.3.2 Front Panel Calibration

To calibrate the indicator, the forklift tines must be in place as test weights are placed upon them.

> 📝 **Note** *Use a level to ensure that the forklift tines are level prior to calibration.*
>
> *The test weight used to calibrate the CLS-420 cannot be greater than 2500 lb.*

To calibrate the indicator using the front panel, do the following:

1. Place the 420 indicator in setup mode (**CONFIG** displays).

2. Press ▷ until **CALIBR** displays.

3. Use a level to ensure the forklift tines are level. Press ▽, **ANGLEZ** displays.

4. With no weight on the forklift tines, press ◯ to zero the scale inclinometer. **-CAL-** briefly displays.

5. Review Section 3.3.1 to determine the method of calibration.

6. When **CMZERO** displays, press ◯ to capture the zero load. **-CAL-** briefly displays.

7. **WVAL** (weight value) displays. Press ◯ and key in the calibration weight value using the numeric keypad.

8. Press ◯. **CMCEL1** displays.

9. Lift the test weight on the left tine of the forklift (centered), allowing the test weight to stabilize.

10. Press ◯. **-CAL-** briefly displays.

11. When **CMCEL2** displays, move test weight to the right tine (centered), allowing the test weight to stabilize.

    LEFT TINE →

12. Press ◯. **-CAL-** briefly displays. Either **-PASS-** or **-FAIL-** displays.
    - If **PASS** displays, it is followed by **CALIBR** and the calibration procedure is complete.
    - If **-FAIL-** displays then the display goes back to **CMZERO** and the calibration procedure must be repeated. Prior to the second calibration, check for mechanical interference like debris, damaged flexures or proper gaps between the bottom cleat and the scale carriage by adjusting the shim bolts.

    FORKLIFT LOOKING DOWN

13. Press ◁ to scroll to CONFIG and then △ to exit and save calibration.
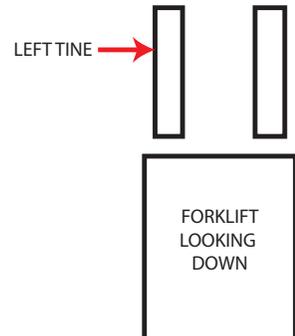
> 📝 **Note** *Perform all calibration steps indicated each time the unit is calibrated. Refer to Section 3.4.3 for calibration menu definitions.*

3.4   Front Panel Configuration

The 420 indicator can be configured using a series of menus accessed through the indicator front panel, when the indicator is in setup mode.

Menu	Menu Function
CONFIG	Configuration – set grads, zero tracking, zero range, motion band, overload, tare function, sample rate and digital filtering parameters
FORMAT	Format – set format of primary and secondary units, display rate
CALIBR	Calibration – calibrate indicator. See Section 5 for calibration procedures
SERIAL	Serial – configuration and printer serial ports. EDP is dedicated to the iQube[2]
PROGRM	Program – set power-up mode, regulatory mode, and consecutive number values
PFORMT	Print Format – used for gross and net tickets
SETPNT	Setpoint – configure setpoints and digital outputs
DIG IN	Digital Input – Not used
ALGOUT	Digital Output – Not used
VERS	Version – display installed software version number

Table 3-1. 420 Menu Summary

3.4.1   Configuration Menu

Parameter	Choices	Description
GRADS	1000 number	Graduations – specifies the number of full scale graduations; value entered must be in the range 1-100000 and should be consistent with legal requirements and environmental limits on system resolution; to calculate GRADS, use the formula: $GRADS = Capacity / Display Divisions$ Display divisions for primary and secondary units are specified in the FORMAT menu
ZTRKBND	**0** number	Zero Track Band – automatically zeros the scale when within the range specified, as long as the input is within the ZRANGE and scale is at standstill; specify the zero tracking band in ± display divisions; maximum legal value varies depending on local regulations ***NOTE: For scales using linear calibration, do not set the zero tracking band to a value greater than that specified for the first linearization point.***
ZRANGE	**1.900000** number	Zero Range – selects the range within which the scale can be zeroed; the 1.900000 default value is ± 1.9% around the calibrated zero point, for a total range of 3.8%. Indicator must be at standstill to zero the scale; use the default value for Legal-for-Trade applications
MOTBAND	**1** number	Motion Band – sets the level, in display divisions, at which scale motion is detected; if motion is not detected for 1 second or more, the standstill symbol lights; some operations, including print, tare, and zero, require the scale to be at standstill; maximum legal value varies depending on local regulations; if this parameter is set to 0, the standstill annunciator is set continuously on, and operations including zero, print, and tare are performed regardless of scale motion; if 0 is selected, ZTRKBND must also be set to 0.
OVRLOA	FS+2% FS+1D FS+9D FS	Overload – determines the point at which the display goes blank and an out-of-range error message is displayed; maximum legal value varies depending on local regulations.
SMPRAT	15HZ 30HZ 60HZ 7.5HZ	Sample Rate – select measurement rate, in samples per second, of the analog-to-digital converter; lower sample rate values provide greater signal noise immunity.
DIGFL 1 DIGFL 2 DIGFL 3	2 4 8 16 32 64 1	Digital Filtering – selects the digital filtering rate used to reduce the effects of mechanical vibration from the immediate area of the scale; selections indicate the number of A/D conversions that are averaged to obtain the displayed reading; a higher number gives a more accurate display by minimizing the effect of a few noisy readings, but slows down the setting rate of the indicator

Table 3-2. Configuration Menu Parameters

Parameter	Choices	Description
DFSENS	8OUT 16OUT 32OUT 64OUT 128OUT 2OUT 4OUT	Digital Filter Cutout Sensitivity – specifies the number of consecutive readings that must fall outside the filter threshold (DFTHRH parameter) before digital filtering is suspended; if NONE is selected, the filter is always enabled
DFTHRH	NONE 2DD 5DD 10DD 20DD 50DD 100DD 200DD 250DD	Digital Filter Cutout Threshold – specifies the filter threshold, in display divisions; when a specified number of consecutive scale readings (DFSENS parameter) fall outside of this threshold, digital filtering is suspended; if NONE is selected, the filter is always enabled
TAREFN	BOTH NOTARE PBTARE KEYED	Tare Function – enables or disables push-button and keyed tares • Both push-button and keyed tares are enabled • No tare allowed (gross mode only) • Push-button tares enabled • Keyed tare enabled

Table 3-2. Configuration Menu Parameters (Continued)

3.4.2   Format Menu

Parameter	Choices	Description
PRIMAR	DECPNT DSPDIV UNITS	Specifies the decimal position, display divisions, and units used for the primary unit; see Table 3-4
SECNDR	DECPNT DSPDIV UNITS MULT	Specifies the decimal position, display division, units , and conversion multiplier used for the secondary units; see Table 3-4
DSPRAT	250MS 500MS 750MS 1SEC 1.5SEC 2SEC 2.5SEC 3SEC 4SEC 6SEC 8SEC	Display rate – set the update rate for displayed values; values are in milliseconds (MS) or seconds (SEC)
Primary and Secondary Units Sub-Menu		

Table 3-3. Format Menu

Parameter	Choices	Description
DECPNT	888888 888880 8.8888 88.8888 888.888 8888.88 8888.8	Decimal Point – determines the location of the decimal point or dummy zeros in the secondary unit display • Primary Default: **888888** • Secondary Default: **88888.8**

Table 3-4. Primary and Secondary Parameters

Parameter	Choices	Description
DISPDIV	1D 2D 5D	Display Divisions – selects the value of minimum division size of the displayed weight Primary Default: **1D** Secondary Default: **5D**
UNITS	LB KG OZ TN T G NONE	Units – specifies primary units for displayed and printed weight; settings: lb=pound; kg=kilogram, oz=ounce, TN=short ton; T=metric ton, g=gram • Primary Default: **lb** • Secondary Default: **kg** ***NOTE: Indicators sold outside North America are configured with KG for both primary and secondary units***
MULT (Secondary Only)	0.453592 Enter other choices via keyboard	Multiplier – specifies the conversion factor by which the primary units are multiplied to obtain the secondary units; the default is 0.453592, which is the conversion factor for changing pounds to kilograms; to toggle between primary and secondary units, press the UNITS key ***NOTE: Multipliers are pre-configured within the indicator. Manual entry is only necessary when NONE is selected under UNITS.***

Table 3-4. Primary and Secondary Parameters

3.4.3 Calibration Menu

The calibration procedures are for the CLS-420 using two load cells. It does not represent the basic calibration menu for the 420 indicator.

> **Note** *Perform all calibration steps indicated below each time the unit is calibrated.*

Parameter	Description
ANGLEZ	Calibrate the inclinometer pitch and roll angles on the iQube^2 when the pitch and roll angles are zero; this operation tells the iQube^2 to use the current readings from the MEMS inclinometer and to store these angle measurements as offsets; these offsets are applied to the current measurement angle used in calculating the correction factor that is applied to the weight
CMZERO	Tells the iQube^2 that the calibration mode is set for Cal-Match; initialize variables for the calibration then do a Zero Calibration (no load)
REZERO	Performs a zero calibration once the calibration weight lifting devices have been removed from the fork tines; Valid on units built November 1, 2017 and later
WVAL	Display and edit the test weight value
CMCEL1 CMCEL2	Used to calibrate a particular load cell with a load with CELL1 being the left side fork and CELL2 being on the right hand side as viewed from the drivers position; instructs the iQube^2 to calibrate a particular load cell; steps must be performed in order, CMCEL1 (left fork) first, CMCEL2 (right fork) second

Table 3-5. Calibration Menu Parameters

SERIAL Menu

The EDP port is dedicated to the iQube^2 communication and is automatically set when the **SSCALE** parameter is set to **2LCELL**. Table 3-6 illustrates the different serial settings used for CLS-420 functionality and a basic 420 indicator.

> **Note** *The SSCALE parameter on the serial menu must be set to 2LCELL for use with the CLS-420 Cargo Lift Scale. If it is set to OFF, then the 420 indicator will function with a standard 420 calibration menu.*

Parameter	OFF	If set to 2LCELL
Baud	9600	19200
Bits	8 None	8 None
Termin	CR/LF	CR
EOLDLY	000	000
Echo	On	Off

Table 3-6. SSCALE Parameter Settings

Parameter	Choices	Description
EDP	BAUD BITS TERMIN EOLDLY ECHO	Specifies settings for baud rate, data bits, termination characters, end-of-line delay and echo used by the EDP port. See sub-menu below; see Table 3-8 and Section 3.5.1 **NOTE: Dedicated to the iQube[2]**
PRINT	BAUD BITS TERMIN EOLDLY ECHO	Specifies settings for baud rate, data bits, termination characters, end-of-line delay and echo used by the printer port; see Table 3-8
STREAM	OFF EDP **PRN**	Selects the serial port used for continuous transmission
STRRTE	INDUST LFT	Specifies Stream Rate – stream rate can be set to industrial or Legal for Trade
PRNDES	EDP PRN	Print Destination – selects the port for data transmission when the print key is pressed or the KPRINT EDP command is sent
PRNMSG	**ON** OFF	Print Message – when the print key is pressed and data is sent out, the word PRINT is momentarily displayed on the remote display
SSCALE	OFF 2LCELL 4LCELL	SScale – by selecting this option, it enables the scale to be used by the CLS series cargo lift scale
SS-LFT	ON OFF	SS-LFT – turns off the LFT 3° tilt warning

Table 3-7. Serial Menu Parameters

BAUD	**9600- Printer** 19200 - EDP 28800 38400 57600 115200 300 600 1200 2400 4800	Baud Rate – selects the transmission speed for the port
BITS	**8NONE** 7EVEN 7ODD	Bits – selects number of data bits and parity of data transmitted or received by the port
TERMIN	**CR/LF - Printer** CR - EDP	Termination Character – selects termination character for data sent from the port
EOLDLY	**000000** **0–255**	End-of-Line Delay – sets the delay period, in 0.1-second intervals, from when a formatted line is terminated to the beginning of the next formatted serial output; Value specified must be in the range 0-255, in tenths of a second (10 = 1 second)
ECHO	OFF - EDP ON - Printer	Echo – enables or disables echoing of the serial commands sent to the indicator

Table 3-8. EDP Port and Printer Port Parameters

Program Menu

Parameter	Choices	Description
PWRUPM		Power up mode
	GO	Indicator goes into operation immediately after a brief power up display test
	DELAY	Indicator performs a power up display test, then enters a 30-second warm up period; if no motion is detected during the warm up period, the indicator becomes operational when the warm up period ends; if motion is detected, the delay timer is reset and the warm up period repeated
COUNT		Specifies whether the operator has access to piece count mode and the default sample size used for parts counting
	ACCESS	Access to Piece Count Mode – *DISABLE* (default) restricts access, pressing the **GROSS/NET** key toggles between gross and net only
	SPLSIZ	Sample Size – specifies the default size used for counting scale operations; sample size can be changed in counting mode during sample acquisition; Settings: **10** (default), 20, 50, 100, 5, PCWGT
REGULA	NTEP OIML CANADA NONE	Regulatory mode – specifies the regulatory agency having jurisdiction over the scale site OIML, NTEP, and CANADA modes allow a tare to be acquired at any weight greater than zero, NONE allows tares to be acquired at any weight value OIML, NTEP, and CANADA modes allow a tare to be cleared only if the gross weight is at no load. NONE allows tares to be cleared at any weight value NTEP and OIML modes allow a new tare to be acquired even if a tare is already present. In CANADA mode, the previous tare must be cleared before a new tare can be acquired NONE, NTEP, and CANADA modes allow the scale to be zeroed in either gross or net mode as long as the current weight is within the specified ZRANGE; in OIML mode, the scale must be in gross mode before it can be zeroed; pressing the ZERO key in net mode clears the tare.
CONSNU	000000 number	Consecutive Numbering – allows sequential numbering for print operations; the consecutive number value is incremented following each print operation; initial value of this parameter is set to the start up value specified in CONSTU parameter; changing either CONSTU or CONSNU resets the consecutive number used for printing
CONSTU	000000 number	Consecutive Number Start Up – specifies the initial consecutive number (CONSNU) value used when the indicator is powered on
UID	1	Unit Identification – value specified can be any numeric value, maximum six digits
ACCUM	ON OFF	Accumulator – stores the count, date & time of last accumulation; returns to zero grads to re-arm the accumulator; see Section 3.4.4 on page 34
	RTZGRD	Number of grads from 0 that it has to return to re-arm the accumulator between weighments.
DATE		Allows selection of date format and date separator
	DATFMT	Date Format – specifies the format used to display or print the date; formats: MMDDYY, DDMMYY, YYMMDD
	DATSEP	Date Separator – specifies the date separator character; formats: SLASH, DASH, SEMI
TIME		Allows selection of time format and separator
	TIMFMT	Time Format – specifies the format used to display or print the time; formats: 24HOUR or 12HOUR
	TIMSEP	Time Separator – specifies the time separator character; formats: COLON or COMMA

Table 3-9. Feature Menu Parameters

3.4.4 Accumulate Function

The accumulate function is used to add weight data to a register for later access by the user. The accumulator can keep a running total of weights entered by manually pressing the **PRINT** key when the accumulate function is enabled (**ON**). The accumulator will accumulate displayed weight values as long as the accumulate function is enabled and the user keeps pressing the **PRINT** key.

To display the accumulated weight, press and hold the **(MODE) GROSS/NET** key for three seconds. The value will be displayed for about 10 seconds. To clear the accumulator, press the **CLR** key twice while the accumulated value is being displayed.

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Print Format Menu

See for information about continuous print formatting.
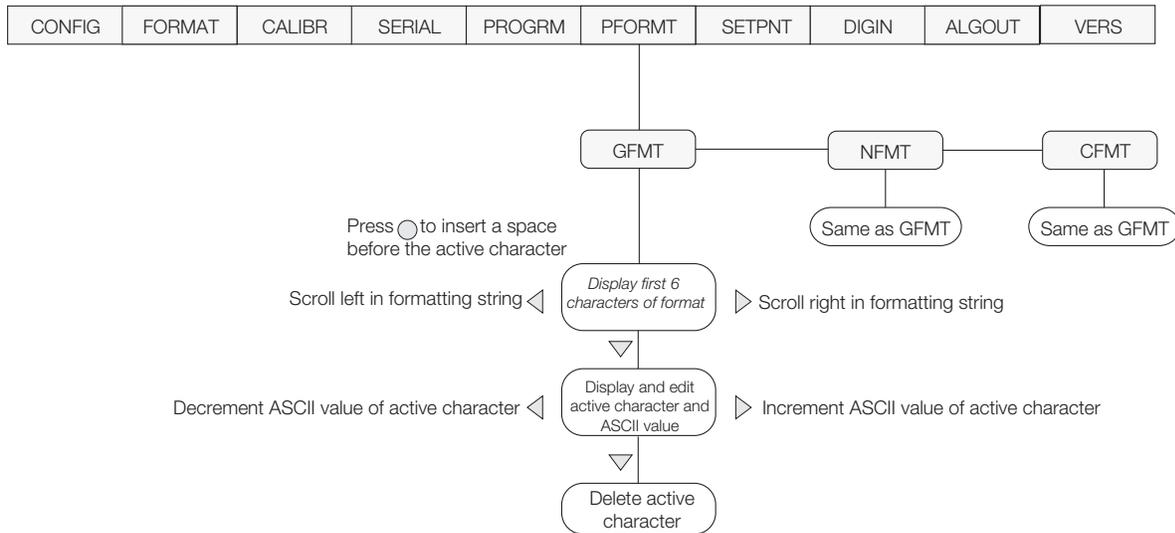
Figure 3-4. Print Format Menu

Setpoint Menu

Parameter	Settings	Description
SETPT1 SETPT2		Specify settings for setpoint
	ENABLE	Turns setpoint on or off
	KIND	Determines whether function is based on gross or net weight; settings: GROSS or NET
	VALUE	Display and edit the setpoint value
	TRIP	Trips the setpoint when the weight is higher or lower than the setpoint value, or is within or outside of the band value • LOWER indicates the output is active until weight is reached • HIGHER indicates the output is active when the setpoint is met or exceeded • INBAND indicates the output is active if the weight is within the band value • OUTBND indicates the output is active when the weight is outside of the band value
	BNDVAL	The band value for either INBAND or OUTBND trip setpoints; BNDVAL is ignored unless trip is set to INBAND or OUTBND
	HYSTER	Specifies a band around the setpoint value that must be exceeded before the setpoint, once off, can trip on ***NOTE: Only available if TRIP is set to HIGHER or LOWER***
ACCESS	OFF ON	Front panel access to setpoints; specify OFF if setpoints will not be tested; ON enables operator to turn setpoints on/off, change value or change BANDVAL using front panel entry during weigh mode

Table 3-10. Setpoint Menu Parameters

3.5 EDP Configuration

3.5.1 EDP Command Configuration

The serial command set can be used to configure the 420 indicator using either a personal computer, terminal, or remote keyboard. Serial command configuration sends commands to the indicator serial port; serial commands can be sent using any external device capable of sending ASCII characters over a serial connection.

EDP commands duplicate the functions available using the indicator front panel and provide some functions not otherwise available. Serial commands can be used to simulate pressing front panel keys, to configure the indicator, or to dump lists of parameter settings.

Using the XE EDP Command

The XE EDP command can be used to remotely query the 420 for the error conditions shown on the front panel. The XE command returns two 5-digit numbers in the format:

xxxxx yyyyy

where **xxxxx** contains a decimal representation of any existing error conditions as described in Table 3-11.

If more than one error condition exists, the number returned is the sum of the values representing the error conditions. For example, if the XE command returns the number 1040, this value represents the sum of an A/D reference error (1024) and an A/D calibration checksum error (16).

The second number returned (**yyyyy**) uses the same bit assignments to indicate whether the test for the error condition was run.

Example:

> The value **yyyyy = 50815** represents the decimal equivalent of the binary value 1100 0110 0111 1111. Using the bit assignments, this value indicates all tests were run.

Error Code	Description	Binary Value
0x0001	EEPROM Error	0000 0000 0000 0001
0x0002	Virgin EEPROM	0000 0000 0000 0010
0x0004	Config Parameter Checksum	0000 0000 0000 0100
0x0008	Load Cell Checksum	0000 0000 0000 1000
0x0010	A/D Calibration Checksum	0000 0000 0001 0000
0x0020	Print Formats Checksum	0000 0000 0010 0000
0x0040	XA Internal RAM Error	0000 0000 0100 0000
0x0080	**External RAM Error**	0000 0000 1000 0000
0x0100	**Reserved**	0000 0001 0000 0000
0x0200	ADC Physical Error	0000 0010 0000 0000
0x0400	ADC Reference	0000 0100 0000 0000
0x0800	Count Error	0000 1000 0000 0000
0x1000	Reserved	0001 0000 0000 0000
0x2000	Display Range	0010 0000 0000 0000
0x4000	ADC Range	0100 0000 0000 0000
0x8000	Gross Limit	1000 0000 0000 0000
0x10000 - 0x80000000		Reserved

Table 3-11. Error Codes Returned on XE Command

3.5.2 Status Messages

Two EDP commands, **P** and **ZZ**, can be used to provide status about the indicator. These commands are described in the following sections.

Using the P EDP Command

The **P** EDP command returns the current displayed weight value to the EDP port, along with the units identifier. If the indicator is in an under-range or overload condition, the weight value is replaced with **&&&&&&** (overload) or **::::::** (under-range).

Using the ZZ EDP Command

The **ZZ** EDP command can be used to remotely query which annunciators are currently displayed on the indicator front panel. The **ZZ** command returns the currently displayed weight and a decimal number representing the LED annunciators currently lit. The format of the returned data is:

wwwwww uu   zzz

where **wwwww uu** is the current displayed weight and units, **zzz** is the annunciator status value. If more than one annunciator is lit, the second number returned is the sum of the values representing the active annunciators.

Example:

If the annunciator status value returned on the ZZ command is 145, the gross, standstill, and lb annunciators are lit. 145 represents the sum of the values for the standstill annunciator (128), gross mode annunciator (16), and the lb/primary units annunciator (1).

Decimal Value	Annunciator
1	lb/primary units
2	kg/secondary units
16	Gross
32	Net
64	Center of zero
128	Standstill

Table 3-12. Status Codes Returned on the ZZ Command

3.6   Continuous Output (Stream) Format

Figure 3-5 shows the continuous output format sent to the 420 printer port when the STREAM parameter (SERIAL menu) is set to either EDP or PRN.
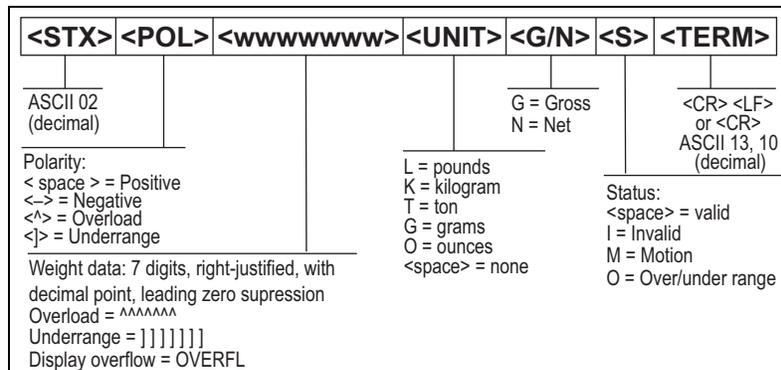
Figure 3-5. Continuous Output Data Format

3.7 Test Mode

📝 **Note** | *Test mode is intended for factory use only.*

In addition to normal and setup modes, test mode provides a number of diagnostic functions for the CLS-420, including:

- Display raw A/D count
- Reset configuration parameters to default values
- A/D internal calibration

To enter test mode, press and hold the setup switch until the front panel display shows the word *TEST*. After about three seconds, the test mode display automatically shifts to the first test menu function: *A/DTST*.

△	▽	○	◁	▷
ZERO →0←	GROSS NET B/N	TARE	UNITS Units	PRINT ⊙
Exit	**Not Used**	**Enter**	**Move Left**	**Move Right**

Figure 3-6. Front Panel Key Functions in Test Mode

Function	Description
A/DTST	Display A/D test – press and hold **Enter** key to display raw count from A/D converter
DEFLT	Default parameters – press setup switch and Enter key at the same time to reset configuration and calibration parameters to factory default values; load cells must be re-calibrated before using the indicator

Table 3-13. Test Mode Menu Functions

3.8 Regulatory Mode Functions

REGULAT Parameter Value	Weight on Scale	Tare in System	Front Panel Key Function	
			TARE	**ZERO**
NTEP	zero or negative	no	no action	ZERO
		yes	CLEAR TARE	
	positive	no	TARE	
		yes	TARE	
CANADA	zero or negative	no	no action	TARE
		yes	CLEAR TARE	
	positive	no	TARE	
		yes	no action	
OIML	zero or negative	no	no action	ZERO
		yes	CLEAR TARE	ZERO and CLEAR TARE
	positive	no	TARE	ZERO
		yes	TARE	ZERO and CLEAR TARE
NONE	zero or negative	no	TARE	ZERO
		yes	CLEAR TARE	
	positive	no	TARE	
		yes	CLEAR TARE	

Table 3-14. TARE and ZERO Key Functions for REGULAT Parameter Settings

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3.9   Serial Communications

Using on of the six-position connectors, provided in the parts kit, wire the serial communications cables to J4. Connector J3 provides connections for the EDP/RS-232 port. Connect communications cables to connectors J3 and J4.

With cables attached, reconnect J3 and J4 to the headers on the board. Use cable ties to secure serial cables to the inside of the enclosure.

The EDP port supports full duplex RS-232 communications only; the serial port provides either active 20 mA output or duplex RS-232 transmission. Both ports are configured using the *SERIAL* menu. See Section 3.4.1 on page 30 for configuration.

Port	Connector	Pin	Label
EDP/RS-232 (J-Box connector)	J3	1	TxD
		2	RxD
		3	Gnd
Serial Port	J4	1	TxD
		2	RxD
		3	Gnd
		4	20mA+
		5	20mA–
		6	Gnd

Table 3-15. J3 and J4 Pin Assignments

Digital inputs can be set to provide several indicator functions, including all keypad functions. The inputs are active (on) with low voltage (0 VDC) and can be driven by TTL or 5V logic without additional hardware. Use the DIG IN menu to configure the digital inputs. LED's on the CPU board light when digital inputs are active.

Digital outputs are typically used to control relays that drive other equipment. Outputs are designed to sink not source, switching current. Each output is a normally open connector circuit, capable of sinking 250 mA when active. Digital outputs are wired to switch relays when the digital output is active (low, 0 VDC) with reference to 5 VDC supply. LEDs on the CPU board light when the digital outputs are active.

Port	Connector	Pin	Label
Digital Input	J2	1	DI 1
		2	DI 2
		3	Gnd
Digital Output	J6	1	Gnd
		2	DO 1
		3	DO 2
		4	+5V

Table 3-16. J2 and J6 Pin Assignments

3.10 CLS-420 ABF Version
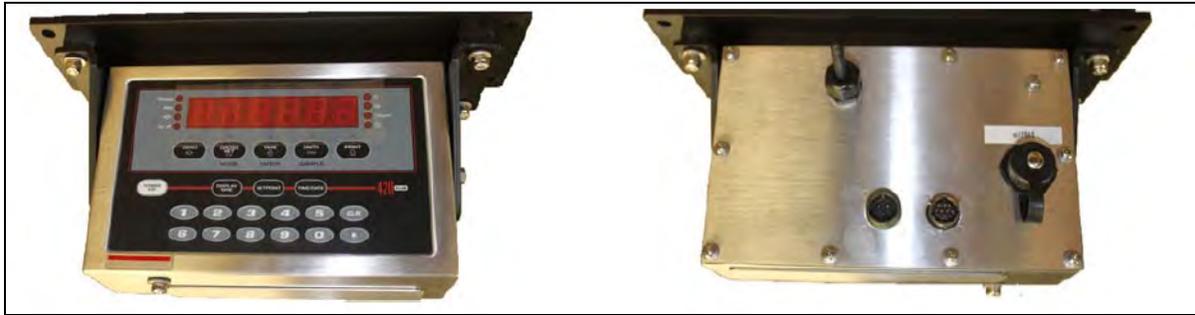
Figure 3-7. ABF Version Indicator

3.10.1 Wi-Fi Connectors

All cable connections are into the back of the indicator. See Figure 2-12 on page 18.

There is a single cord grip with a WLAN antenna mounted in it. Loosen the cord grip to adjust the antenna position if needed. The antenna can be pulled out far enough to expose the joint and adjust the angle, however, with the joint exposed the enclosure will not be as environmentally protected.

An additional connector is included to allow a wired Ethernet connection to the internal WLAN board.

If an Ethernet connection is made before the unit is powered on, the WLAN board will revert to a wired mode. This allows configuration via DeviceInstaller over an Ethernet network before placing it in service on a wireless network. See Section 3.10.5 on page 43.

There is a small slotted screw located in the upper right corner above the Ethernet jack. Remove this screw and press the reset switch to reset the WLAN module to factory defaults. See Section 3.10.3 on page 41.

> **Note** *For sealing purposes, this screw does not need to be sealed.*

Power Connection	
Pin	**Connection**
A	Battery Positive 10-36V
B	Battery Negative
C	Chassis Ground

Coiled Cable Connection	
Pin	**Connection**
A	+V (7.5v)
B	GND
D	RXD
E	TXD
F	GND

Table 3-17. Cable Pin Outs

Figure 3-8. Inside the Indicator

3.10.2 Installed WLAN Interface

For use with ABF CLS-420 and Mega 8 indicators only.

- The board is mounted to the 420 CPU board in place of the Analog Output module
- The WLAN Port 1 serial connection connects to the Printer port on the 420 CPU board
- The power connections to the to the WLAN board go directly to the power supply
- Power for the WLAN option board is controlled by a connection between the +5V digital output connection on the CPU board to the REM connection on the WLAN option board

> 📝 **Note** | *The WLAN option board power jumper must be in REM position.*

- The wired Ethernet jack on the WLAN board is connected to a jack on the back panel for use with initial configuration

Run the Lantronix DeviceInstaller program on the company network

When the indicator arrives, it is connected to the Ethernet network and turned on.

The WLAN card recognizes the Ethernet connection and changes automatically to ***Wired Ethernet Mode***.

The board receives a DHCP-assigned IP address, with a DHCP name that is ***sclxxxx*** where the ***xxxx*** is the last four digits of the MAC address of the Matchport module. The indicator has a small sticker on the back with the DHCP name on it.

> 📝 **Note** | *The DHCP name can be changed during configuration.*

Use DeviceInstaller to configure the module's WLAN settings (SSID and security) so it will attach to the wireless network. After configuration, remove the Ethernet connection, then cycle power on the indicator. The WLAN module should attach to a wireless network and be available for communications.

3.10.3 Reset Switch

If the module setting corrupts or the indicator is moved to a new facility, and there is a problem connecting to the wired or wireless network, a factory default switch is provided to wipe all configuration settings in the Matchport to default.

This function will reset all settings, including the Wireless and IP settings and will set the module up for wired connections only.

1. Ensure the indicator is off.
2. Remove the small screw from the upper right corner of the back panel.
3. Insert a small non-conductive tool into the hole to press and hold the switch.
4. Turn the indicator on and wait 10 seconds.
5. Turn the indicator off and release the switch.

The module is now set to factory defaults and in wired mode only.

> 📝 **Note** | *Reconfigure by connecting the indicator to a wired Ethernet network using the DeviceInstaller or browser. When complete, set the network mode back to Wireless Only.*

3.10.4 Power the Carriage Junction Box
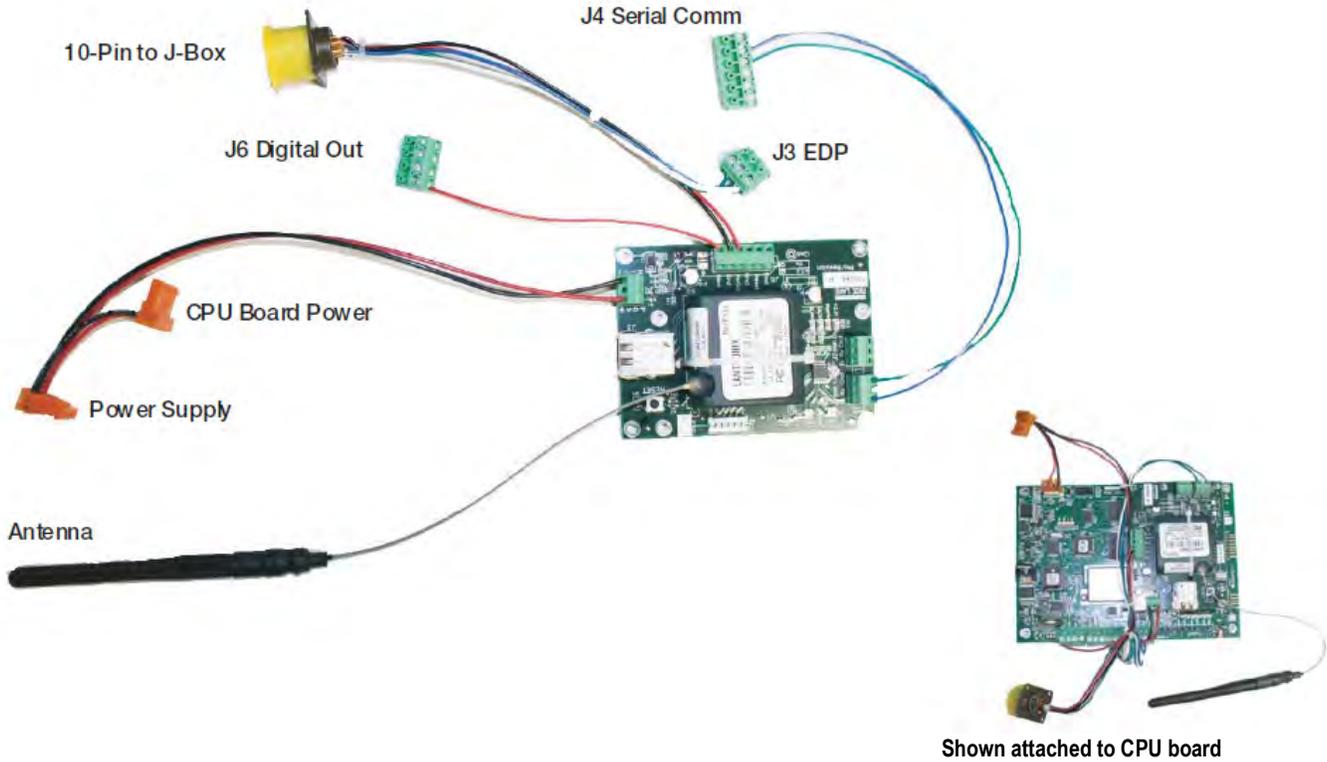
Figure 3-9. Ind Opt, WLAN 420-CLS

The WLAN CLS-420 indicator option can be ordered as an assembly or individual parts.

Part No.	Description
109266	Board Assembly, Universal
112226	Module, Wi-Fi Matchport, Custom Firmware
112228	Cable RF UFL to RSMA 6"
115509	Glue, Jet-Melt
118877	Cable Assembly, Power Supply
120998	Cable Assembly, Serial Input
15422	Wire, 22 AWG Red Stranded
15425	Wire, 22 AWG Green Stranded
15426	Wire, 22 AWG Blue Stranded

Part No.	Description
15429	Wire, 22 AWG White Stranded
15631	Cable Tie, 3in Nylon
15642	Tubing, Heat Shrink 3/8
21896	Label, Anti-Static Warning
58579	Strap, Tie 8 in Length
70599	Conn, 6 Pos Screw Terminal
71126	Conn, 4 Pos Screw Terminal
98357	Antenna, 2.4GHz 802.11B/G

Table 3-18. Indicator Option, WLAN 420-CLS (PN 121045) Parts List

3.10.5   Special Matchport Firmware

The Matchport module (PN 112226) used by ABF version have a modifications in the firmware.

- With the card set to *Wireless Only*, if it detects an Ethernet connection during boot-up, it reverts to Ethernet for that session only
- When the cable is removed and power cycled, it will go back to a wireless mode. This was done for ease of configuration using DeviceInstaller

> **Note** *Power MUST be cycled for it to switch back to wireless mode - just removing the cable does not switch it back to a wireless connection.*

- The module creates a unique DHCP name from its MAC address.
- The baud rate of both serial channels is set to 19200 to match the settings of the Mega 8 indicators
- The input and output buffers are always flushed
- Two of the general purpose inputs are set to allow the module to be set to factory defaults
- The first GPIO is to set the module to *Default* and *Wireless Mode Only*

    The TCP Port Numbers are for the two serial channels

- This firmware uses 8023 and 8024. Record any error messages for troubleshooting

3.10.6   420 Core Firmware

EDP command and defaults.

- Default baud rate for the printer port is now 19200. Do not change this
- Zero Track Band default is 1D
- Zero range default is 100%
- EDP command, *P* (no carriage return or line feed). If talking to the indicator, simply send *P* and it will respond with a single frame of stream data, no matter the status. *SENT* displays on the screen for a couple seconds after the 420 is successful in sending the response to the *P* command

This does not mean the hand-held device received the data, just that the 420 sent it. The 420 does not know if there is a good network connection, but if it received the P from the network, then the downstream data is working. If the indicator displays SENT, but the data is not getting back on the network, check the TX line from the 420 CPU to the RX of the WLAN card, and the RX LED on the WLAN card to make sure it blinks.

- In weigh mode, all the keys on the keypad are disabled except the **ZERO**. The **ZERO** key is like a tare - zeroing before taking weighments
- Messages in error conditions:

    Angle displays when the angle is over 3°

    Over or *Under* displays to indicate an overload or under load

> **Note** *Reset the indicator if any settings become corrupt to return to default settings. See .*

3.11 ASCII Character Chart

Use the decimal values for ASCII characters listed in Tables 3-19 and 3-20 when specifying print format strings on the 420 PFORMT menu. The actual character printed depends on the character mapping used by the output device.

The 420 can send or receive any ASCII character value (decimal 0–255), however the indicator display is limited to numbers, upper-case letters, unaccented letters, and a few special characters. See Section 3.12 on page 46 for information about the 420 LED display.

Control	ASCII	Dec	Hex	ASCII	Dec	Hex	ASCII	Dec	Hex	ASCII	Dec	Hex
Ctrl-@	NUL	00	00	space	32	20	@	64	40	`	96	60
Ctrl-A	SOH	01	01	!	33	21	A	65	41	a	97	61
Ctrl-B	STX	02	02	"	34	22	B	66	42	b	98	62
Ctrl-C	ETX	03	03	#	35	23	C	67	43	c	99	63
Ctrl-D	EOT	04	04	$	36	24	D	68	44	d	100	64
Ctrl-E	ENQ	05	05	%	37	25	E	69	45	e	101	65
Ctrl-F	ACK	06	06	&	38	26	F	70	46	f	102	66
Ctrl-G	BEL	07	07	'	39	27	G	71	47	g	103	67
Ctrl-H	BS	08	08	(	40	28	H	72	48	h	104	68
Ctrl-I	HT	09	09	)	41	29	I	73	49	i	105	69
Ctrl-J	LF	10	0A	*	42	2A	J	74	4A	j	106	6A
Ctrl-K	VT	11	0B	+	43	2B	K	75	4B	k	107	6B
Ctrl-L	FF	12	0C	,	44	2C	L	76	4C	l	108	6C
Ctrl-M	CR	13	0D	-	45	2D	M	77	4D	m	109	6D
Ctrl-N	SO	14	0E	.	46	2E	N	78	4E	n	110	6E
Ctrl-O	SI	15	0F	/	47	2F	O	79	4F	o	111	6F
Ctrl-P	DLE	16	10	0	48	30	P	80	50	p	112	70
Ctrl-Q	DC1	17	11	1	49	31	Q	81	51	q	113	71
Ctrl-R	DC2	18	12	2	50	32	R	82	52	r	114	72
Ctrl-S	DC3	19	13	3	51	33	S	83	53	s	115	73
Ctrl-T	DC4	20	14	4	52	34	T	84	54	t	116	74
Ctrl-U	NAK	21	15	5	53	35	U	85	55	u	117	75
Ctrl-V	SYN	22	16	6	54	36	V	86	56	v	118	76
Ctrl-W	ETB	23	17	7	55	37	W	87	57	w	119	77
Ctrl-X	CAN	24	18	8	56	38	X	88	58	x	120	78
Ctrl-Y	EM	25	19	9	57	39	Y	89	59	y	121	79
Ctrl-Z	SUB	26	1A	:	58	3A	Z	90	5A	z	122	7A
Ctrl-[	ESC	27	1B	;	59	3B	[	91	5B	{	123	7B
Ctrl-\	FS	28	1C	<	60	3C	\	92	5C			124	7C
Ctrl-]	GS	29	1D	=	61	3D	]	93	5D	}	125	7D
Ctrl-^	RS	30	1E	>	62	3E	^	94	5E	~	126	7E
Ctrl-_	US	31	1F	?	63	3F	_	95	5F	DEL	127	7F

Table 3-19. ASCII Character Chart (Part 1)

ASCII	Dec	Hex	ASCII	Dec	Hex	ASCII	Dec	Hex	ASCII	Dec	Hex
Ç	128	80	á	160	A0		192	C0	a	224	E0
ü	129	81	í	161	A1		193	C1	ß	225	E1
é	130	82	ó	162	A2		194	C2	G	226	E2
â	131	83	ú	163	A3		195	C3	p	227	E3
ä	132	84	ñ	164	A4		196	C4	S	228	E4
à	133	85	Ñ	165	A5		197	C5	s	229	E5
å	134	86	ª	166	A6		198	C6	µ	230	E6
ç	135	87	º	167	A7		199	C7	t	231	E7
ê	136	88	¿	168	A8		200	C8	F	232	E8
ë	137	89		169	A9		201	C9	Q	233	E9
è	138	8A	¬	170	AA		202	CA	W	234	EA
ï	139	8B	1/2	171	AB		203	CB	d	235	EB
î	140	8C	1/4	172	AC		204	CC	¥	236	EC
ì	141	8D	¡	173	AD		205	CD	f	237	ED
Ä	142	8E	«	174	AE		206	CE	Î	238	EE
Å	143	8F	»	175	AF		207	CF	Ç	239	EF
É	144	90		176	B0		208	D0	º	240	F0
æ	145	91		177	B1		209	D1	±	241	F1
Æ	146	92		178	B2		210	D2	³	242	F2
ô	147	93		179	B3		211	D3	£	243	F3
ö	148	94		180	B4		212	D4	ó	244	F4
ò	149	95		181	B5		213	D5	õ	245	F5
û	150	96		182	B6		214	D6	÷	246	F6
ù	151	97		183	B7		215	D7	˘≈	247	F7
ÿ	152	98		184	B8		216	D8	º	248	F8
Ö	153	99		185	B9		217	D9	•	249	F9
Ü	154	9A		186	BA		218	DA		250	FA
¢	155	9B		187	BB		219	DB		251	FB
£	156	9C		188	BC		220	DC		252	FC
¥	157	9D		189	BD		221	DD	²	253	FD
Pts	158	9E		190	BE		222	DE		254	FE
ƒ	159	9F		191	BF		223	DF		255	FF

Table 3-20. ASCII Character Chart (Part 2)

3.12   Front Panel Display Characters

The 7-segment LED character set used to display alphanumeric characters on the 420 front panel.

-		9		E		Q	
.		:		F		R	
/		;		G		S	
0		<		H		T	
%		1		=		I		U	
&		2		>		J		V	
,		3		?		K		W	
(		4		@		L		X	
)		5		A		M		Y	
*		6		B		N		Z	
+		7		C		O		[	
,		8		D		P		\	

Figure 3-10. 420 Display Characters

3.13 Conversion Factors for Secondary Units

The 420 has the capability to mathematically convert a weight into many different types of units and instantly display those results with a press of the **UNITS** key.

Secondary units can be specified on the *FORMAT* menu using the *SECNDR* parameter, or by using EDP commands, see Section 3.5.1 on page 36 .

Multipliers are pre-configured within the indicator. Manual entry is only necessary when *NONE* is selected under *UNITS*. Long tons and grain units listed in Table 3-21 cannot be directly specified as primary or secondary units. For these or other unlisted units of weight, specify *NONE* under *UNITS*.

Ensure that the secondary decimal point position is set appropriately for the scale capacity in the secondary units. If the converted value requires more digits than are available, the indicator will display an overflow message (*OVERFL*).

Example

If the primary units are short tons, secondary units are pounds, and the secondary decimal point is set to 8888.88, the indicator will overflow if 5 tons or more are applied to the scale. With 5 tons applied, and a conversion factor of 2000, the secondary units display needs five digits to the left of the decimal point to display the 10000 lb secondary units value.

Primary Unit	*x Multiplier*	Secondary Unit
grains	0.064799	grams
	0.002286	ounces
	0.000143	pounds
	0.000065	kilograms
ounces	437.500	grains
	28.3495	**grams**
	0.06250	**pounds**
	0.02835	**kilograms**
pounds	7000.00	grains
	453.592	**grams**
	16.0000	**ounces**
	0.453592	**kilograms**
	0.000500	**short tons**
	0.000446	long tons
	0.000453	**metric tons**
short tons	**2000.00**	**pounds**
	907.185	**kilograms**
	0.892857	long tons
	0.907185	**metric tons**

Primary Unit	*x Multiplier*	Secondary Unit
grams	15.4324	grains
	0.035274	**ounces**
	0.002205	**pounds**
	0.001000	**kilograms**
kilograms	15432.4	grains
	35.2740	**ounces**
	1000.00	**grams**
	2.20462	**pounds**
	0.001102	**short tons**
	0.000984	long tons
	0.001000	**metric tons**
metric tons	**2204.62**	**pounds**
	1000.00	**kilograms**
	1.10231	**short tons**
	0.984207	long tons
long tons	**2240.00**	**pounds**
	1016.05	**kilograms**
	1.12000	**short tons**
	1.01605	**metric tons**
NOTE: Multipliers in italics are preconfigured		

Table 3-21. Conversion Factors

4.0   Parts and Service

4.1   Daily Inspection Checklist

☐ Check scale carriage for loose, worn, bent or broken components

☐ Inspect fork tines for damage

☐ Check locking pins on fork tines

☐ Inspect coiled cable for pinched, rubbed, stretched or damaged areas

☐ Inspect power cable from indicator to battery for nicks or cuts

☐ Make sure power cable is routed out of harms way, fasten periodically to eliminate potential problems

☐ Tighten cable connections at indicator junction box if necessary

☐ Inspect coiled cable clamps and cable ties to ensure all cable attachments are secure

☐ Inspect indicator mounting bracket, isolation mounts and hardware for loose or cracked parts

☐ Tighten bottom clamps on scale carriage if necessary. Raise carriage and visually inspect

☐ Check and adjust the lift chain so the heel of the forks have 1/2" to 1" of clearance from floor when the carriage is down and the mast is vertical
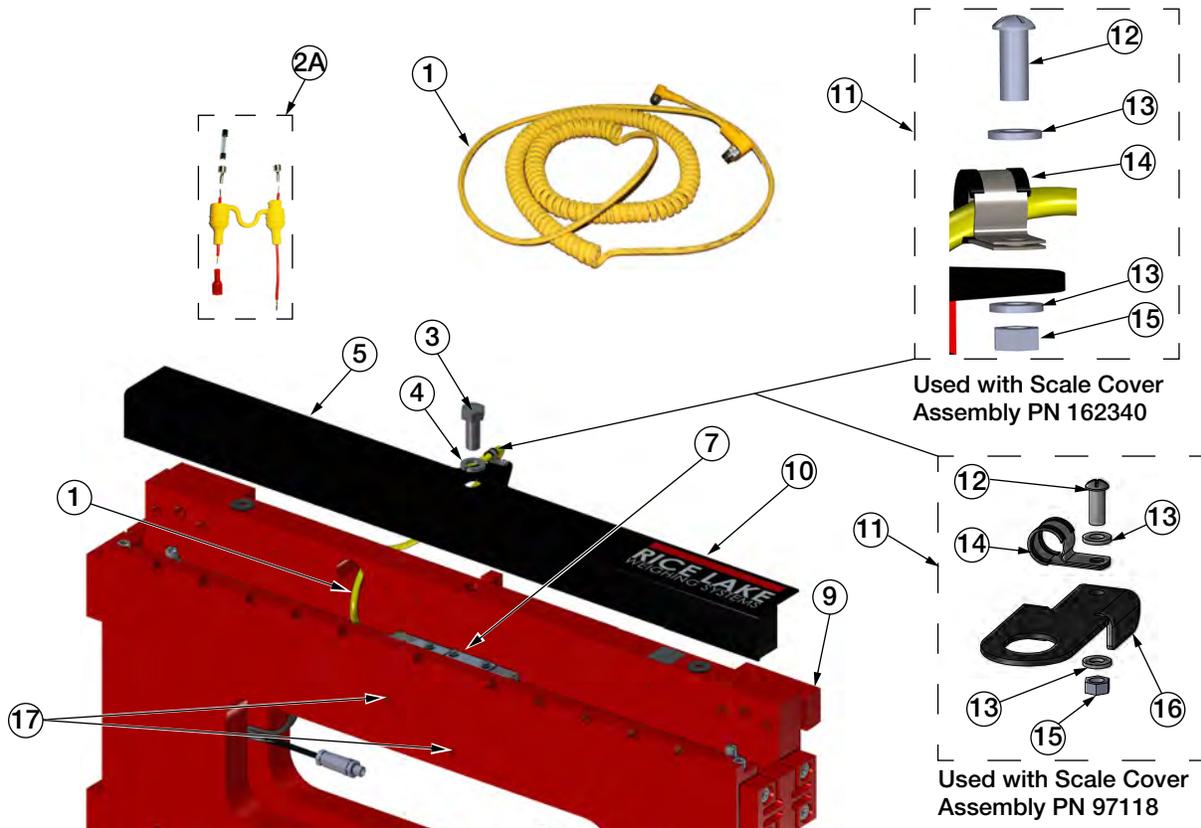
4.2   Cargo Lift Scale Assembly

Figure 4-1. Cargo Lift Scale Assembly Parts Illustration

Item No.	Part No.	Description	Qty
1	125395	Cable Assembly, Coiled 5x18 AWG	1
2	96915	Cable Assembly, Fused Power	1
2A	130129	Fuse Assembly, Power Cable	1
3	127009	Screw, Cap 5/8-11NC	1
4	111731	Washer, Lock 5/8 Regular	1
5	162340	Angle, Protective, 34"	1
	100073	Angle, Protective, 38"	
	114074	Angle, Protective, 28"	
9	167244	Scale, Cargo Lift, 34"	1
	167405	Scale, Cargo Lift, 38"	
	167422	Scale, Cargo Lift, 28"	
10	162340	Scale Cover Assembly	1
	97118	Scale Cover Assembly	1

Item No.	Part No.	Description	Qty
11	167250	Kit, Loop Clamp, Coiled Cable Assembly (Inc 12-15)	1
	150720	Kit, Loop Clamp, Coiled Cable Assembly (Inc 12-16)	1
12	126980	Screw Machine 10-32 x 1/2	1
13	15141	Washer, Plain STD No 10	2
14	150719	Clamp, Loop One Hole 1/4"	1
15	14633	Nut, Lock 10-32NF Hex	1
16	130928	Bracket, CLS-M (inc with PN 150720 only)	1
17	125649	Hex Socket Cap Screw 10-32 x 1 SST	2
NS	126770	Bottom Cleat, 34" and 28"	2
	92810	Screw, Cap	4
NS	109981	Bottom Cleat, 34"	2
	111123	Screw, Cap	4
NS	53308	Label,1.25 x 1.25 8000T	2

Table 4-1. Cargo Lift Scale Assembly Parts List

4.2.1   Load Cell Assembly
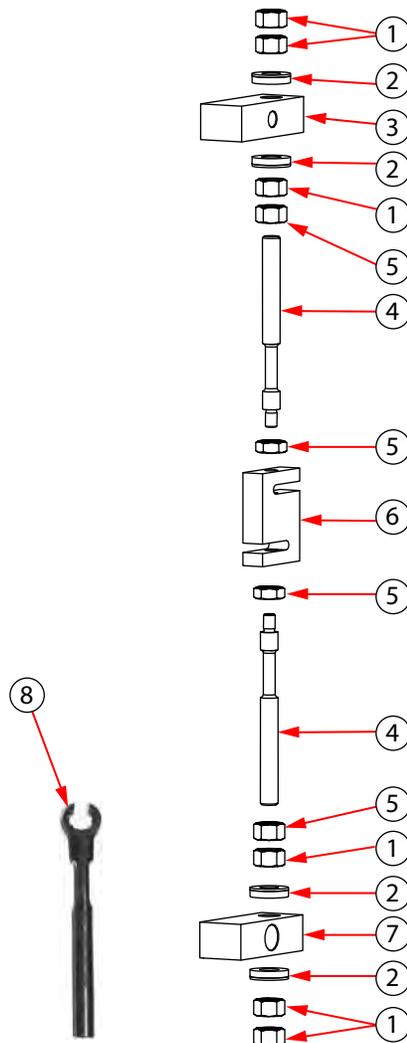
Figure 4-2. Load Cell Replacement Kit Parts Illustration

Item No.	Part No.	Description	Qty
	97883	Load Cell Replacement Kit (inc items 1, 2, 5, 4, 6 & 8)	Ref
1	109958	Hex Nut	6
2	15198	Spherical Washer Set	4
3		Upper Block	Ref
4	92827	Flexure Rod	2
5	14665	Jam Nut	4
6	96198	Load Cell (28 and 38)	1
	125543	Load Cell with Disconnect	1
	166623	Load Cell with Turk Connectors	1
7		Lower Block	Ref
8	96196	Wrench, Box Load Cell	1

Table 4-2. Load Cell Replacement Kit Parts List

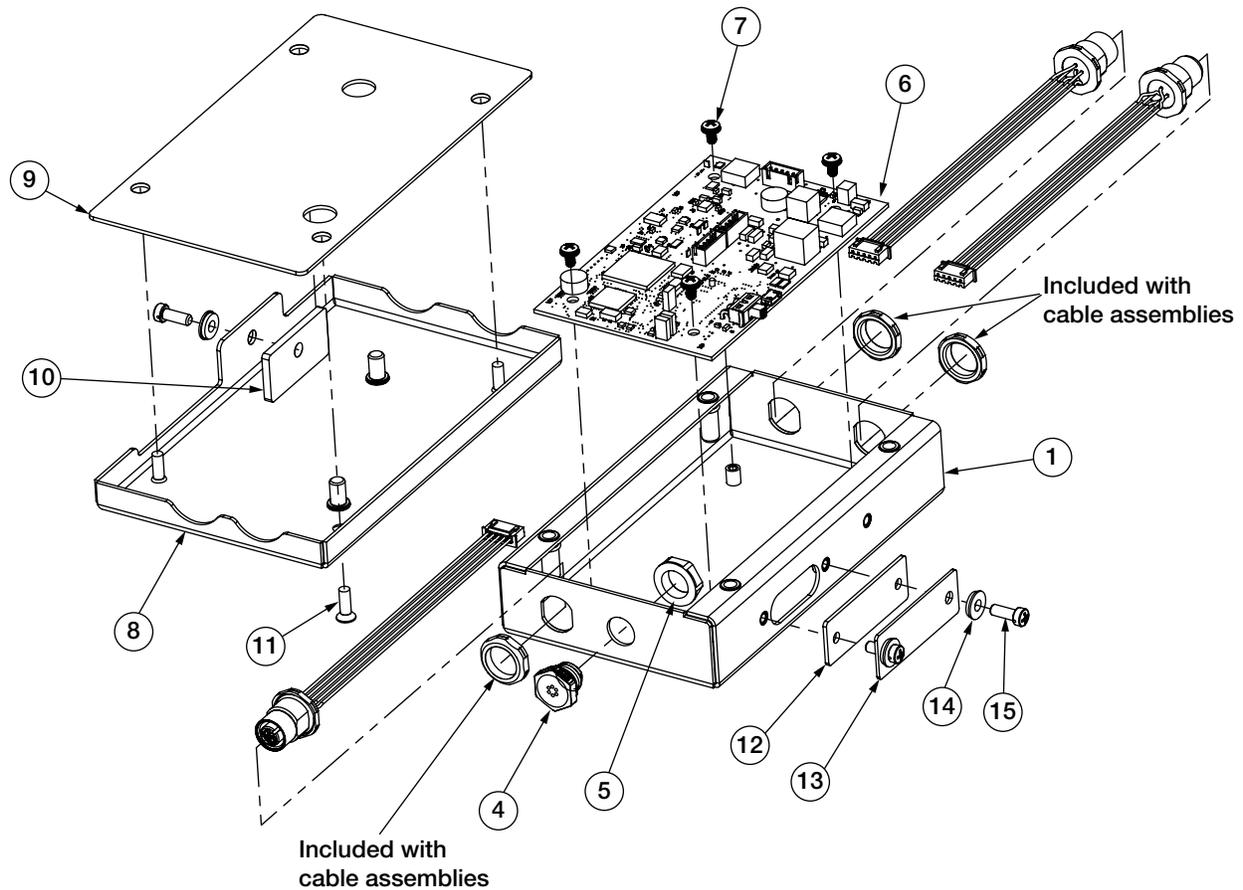### 4.2.2 iQube² Junction Box Assembly (PN 167261), 28" and 34" Models

Included with
cable assemblies

Included with
cable assemblies

Figure 4-3. iQube² Junction Box Assembly (PN 167261), 28" and 34" Models

Item No.	Part No.	Item Description	Qty.
1	162378	Enclosure Assembly	1
4	164598	Breather Vent	1
5	88734	Nut, Breather Vent Thread	1
6	168000	Junction Box PCB Assembly	1
7	14839	Screw, 6-32NC x 1/4	4
8	162383	Cover Assembly	1
9	163764	Gasket, Assembly Cover	1
10	164070	Gasket, Access Cover	1
11	100968	CR-FHMS 0.164-32 x 0.5 x 0.5-N-SST	4
12	163765	Gasket, Access Cover	1
13	162384	Cover Plate, Access Hole	1
14	75062	Sealing Washer, #8	3
15	30623	Screw, 8-32NC x 7/16	3
16	52342	Label	1

Table 4-3. iQube² Junction Box Assembly (PN 167261)

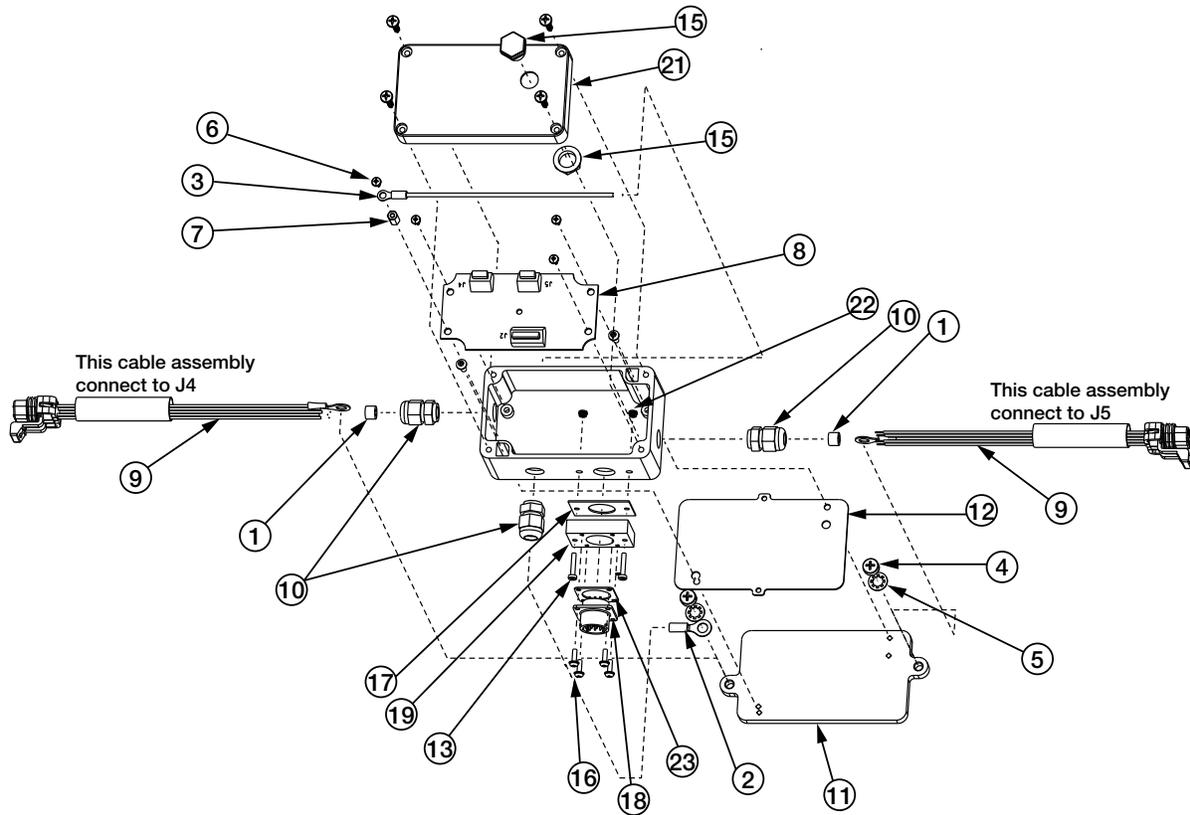### 4.2.3   Junction Box with Quick Disconnects (PN 130826)

Figure 4-4. Junction Box with Quick Disconnects (PN 130826)

Item No	Part No	Description	Qty
1	130000	Bushing, PG7 Cord Grip	2
2	33188	Conn, Ring Terminal 1/4 in	1
3	36719	Wire Assembly, Ground 6"	1
4	42640	Screw, Mach 1/4-28NF x 1/4	2
5	31546	Washer, Lock 1/4 Internal	2
6	50158	Screw, Phillips M3-0.5 x 6 mm	4
7	130470	Standoff, Metric M3x10	1
8	110608	CLS, Junction Box Board	1
9	125559	Cable Assembly, CLS Carriage	2
10	98310	Cord Grip, SL-7 Modified	3
11	130827	Plate, Junction Box Mounting	1
12	130352	Shim, Junction Box Spacer	1
13	105293	Screw, Sealing 4-40NC	2
14	88734	Nut, Breather Vent	1
15	88733	Vent, Breather Sealed	1
16	55708	Screw, Mach 4-40NC x 3/8	4
17	105290	Gasket, Spacer Block	1
18	121011	Cable Assembly, Serial Input	1
19	105289	Spacer Block, Forklift	1
20	14848	Screw, Mach 6-32NC x 3/8	2
21	97130	Machining, Enclosure J-Box	1
22	105291	PEM, Nut Broaching	2
23	97419	Gasket, MS Conn Shell Size	1

Table 4-4. Junction Box with Quick Disconnects Parts List

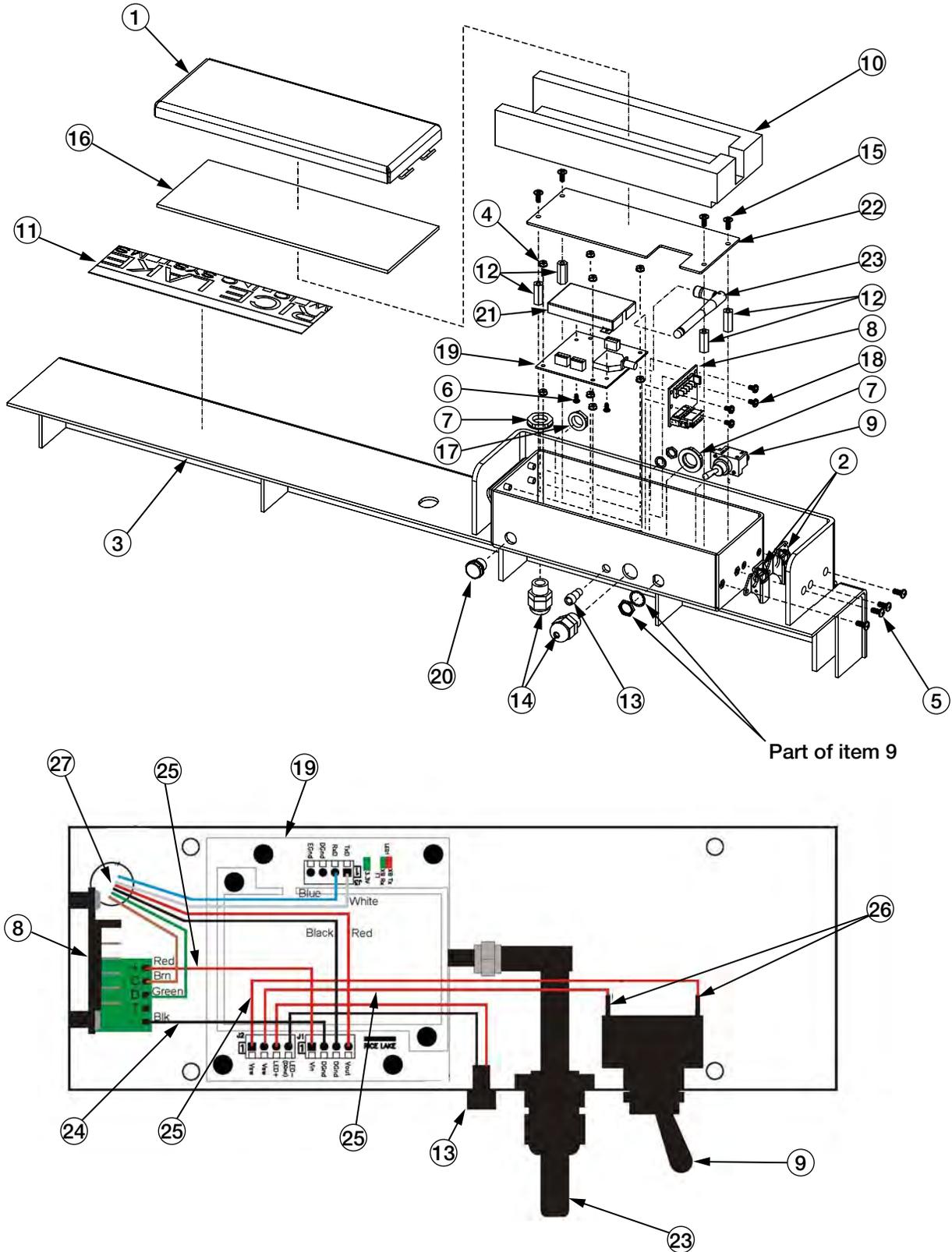### 4.2.4 Protective Angle with Battery Box Assembly

Figure 4-5. Protective Angle with Battery Box Parts Illustration

Item No.	Part No.	Description	Qty
1	126538	Cover, 14GA W/Dual	1
2	112729	Draw Latch, Over Center	2
3	129551	Weldment, Protective Angle 38"	1
	126535	Weldment, Protective Angle 34"	
	152481	Weldment, Protective Angle 28"	
4	14618	Nut, Kep 4-40NC HEX	8
5	14862	Screw, Mach 8-32NC x3 /8	4
6	126762	Screw, 4-40NC X 1/4	2
7	15627	Locknut, Black PCN9	2
8	97462	PCB Assembly, Battery	1
9	97463	Switch, Toggle sealed	1
10	126608	Insert, Foam Battery Box	1
11	99191	Decal, Rice Lake	1
12	15369	Standoff, FEM-FEM 6-32NC	4
13	36036	LED, Panel Mount Green	1
14	15626	Cable, Grip Black PG9	2
15	22087	Screw, Mach 6-32NC x 3/8	4
16	125482	Gasket, Forklift Battery	1
17	88734	Nut, Breather Vent	1
18	14839	Screw, MACH 6-32NC x 1/4	4
19	110788	Board, Zigbee Interface	1
20	88733	Vent, Breather Sealed	1
22	121323	Shield Assembly, Zigbee	1
23	126607	Box, Battery Sub-Floor	1
23	98357	Antenna, 2.4GHz 802.11B/G	1
24	15455	Wire, 20AWG Black Stranded	0.354
25	34181	Wire, 20AWG Red Stranded	1.417
26	15641	Tubing, Heat Shrink 1/8	0.083
27	121327	Cable Assembly, CLS Forklift	1
NS	124892	Module Set, ZigBee,	1

Table 4-5. Protective Angle with Battery Box Parts List

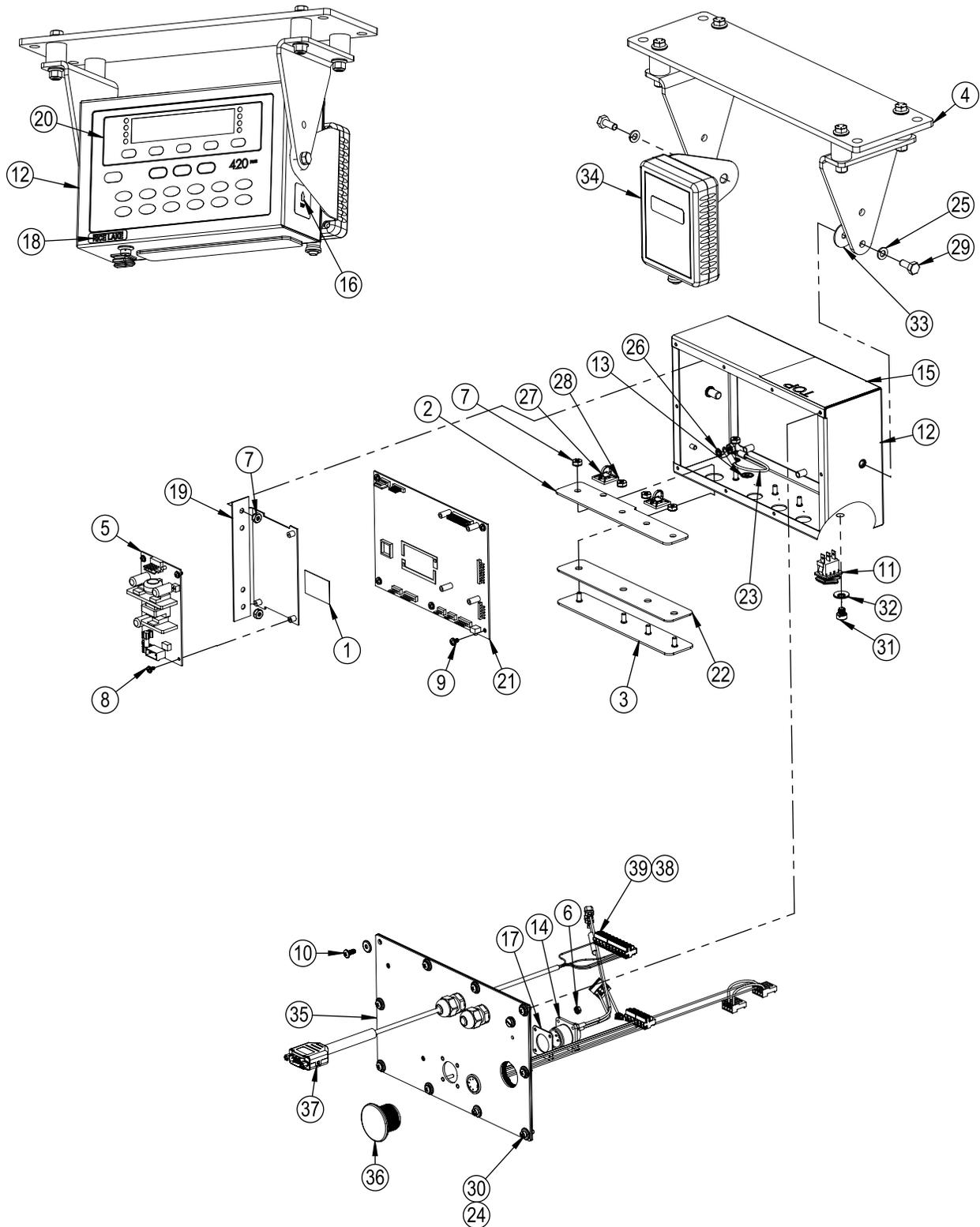## 4.3   CLS-420 Indicator (PN 162310) 5 Pin Wired with Power Switch

Figure 4-6. CLS-420 Indicator Parts Illustration (PN 163866 and 168259)

ITEM NO.	PART NO.	DESCRIPTION	QTY.
1	110388	Tape, Kapton 1 inch 2 mil	1
2	121001	Cover Plate, 420-CLS Inside Bottom Enclosure Holes	1
3	121002	Cover Plate, 420-CLS	1
4	131630	Mount Plate Assembly, Indicator, Forklift Scale, see Figure 4-8 on page 59	1
5	132750	Power Supply, DC/DC +7.5V 9-36VDC	1
6	14618	Nut, Kep 4-40NC Hex External Tooth Lock Washer	4
7	14626	Nut, Kep #8-32NC Hex Ext. Tooth Lock Washer ST-ZP	8
8	14822	Screw, Mach 4-40NC X 1/4 SEMS STL-ZP	4
9	14839	Screw, Mach 6-32NC X 1/4 SEMS STL-ZP	5
10	14862	Screw, Mach 8-32NCx3/8 Phillips Pan Head	8
11	156613	Switch, Rocker Illuminated	1
12	162073	Enclosure, 420 Indicator Modified For Power Switch	1
13	16892	Label, Ground Protective Earth Adhesive IEC 60417-5019	1
14	169095	Cable, MS 3 Pin Conn. Lead Wires, 3 Terminal Conn. 9-36V Configuration	1
15	53307	Label, 4.000x2.875	1
16	53308	Label,1.25x1.25 8000T	1
17	57241	Gasket, MS Conn Shell Size 14, Square	1
18	68216	Nameplate, Rice Lake	1
19	84389	Bracket, Power Supply 420 Indicator	1
20	84397	Overlay, 420 Indicator Membrane Switch-Panel	1
21	99151	Board Assembly, CPU Display CLS-420 With Software	1
22	174435	Gasket, 420 Cover Plate	1
23	45043	Wire, Ground 4" w/ No.8 Eyelet Connector	1
24	45042	Bonded Sealing Washer, #8	10
25	15148	Washer, Lock 1/4 Regular Helical Spring SST	2
26	15134	Washer, Lock NO 8 Type A Internal Tooth Steel Zinc Plated	2
27	15631	Cable Tie, 3" Nylon	4
28	15650	Mount, Cable Tie 3/4"	2
29	21948	Screw, Cap 1/4-20NCx5/8 Hex Head SST	2
30	30623	Screw, 8-32NC x 7/16	2
31	42640	Screw, Mach 1/4-28NF x 1/4 Phillips, Drilled Fillister Head, 18-8 SST	1
32	44676	Washer, Bonded Sealing SST 1/4 ID x 5/8 OD	1
33	15144	Washer, Nylon 1/4 x 1 x 1/16	1
34	163580	Bluetooth Module Assembly	1
35	172678	Backplate Assembly, CLS-420 Universal	1
	172784	Receptacle Assembly	1
36	124695	Plug, Panel Mount Receptacle Hole	1
37	163605	Cable, DB9, RS232, 420 CLS Bluetooth Option	1
38	70599	Conn, 6 Pos Screw Terminal	1
39	71126	Conn, 4 Pos Screw Terminal	1

Table 4-6. CLS-420 Indicator Parts List

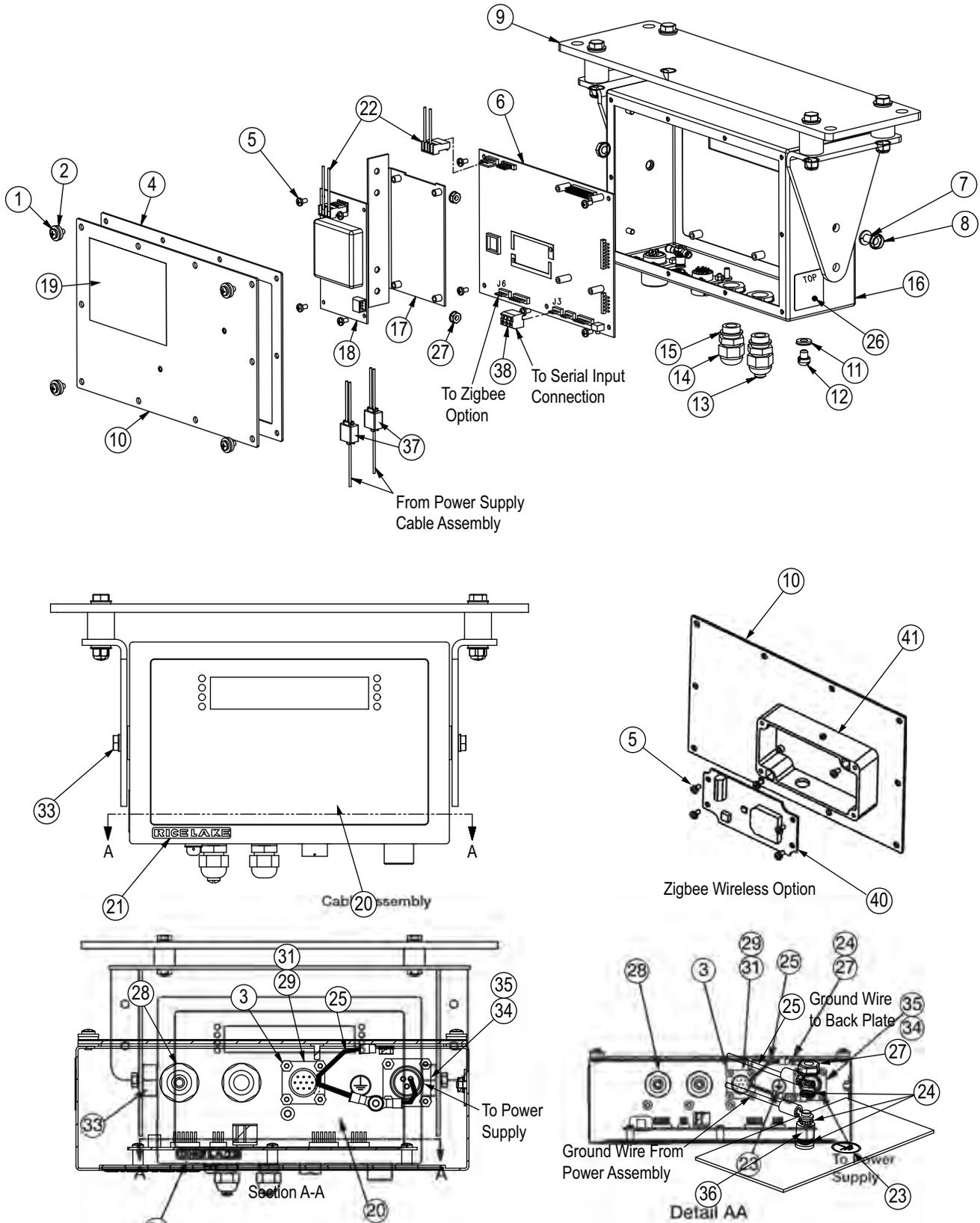### 4.3.1 CLS 420 Indicator, 10 Pin Connector, Used With iQube (98413)

To Zigbee Option

To Serial Input Connection

From Power Supply Cable Assembly

Cable Assembly

Section A-A

To Power Supply

Zigbee Wireless Option

Ground Wire to Back Plate

Ground Wire From Power Assembly

To Power Supply

Detail AA

Figure 4-7. CLS-420 Indicator Parts Illustration

Item No.	Part No.	Description	QTY
--	98413	Indicator, 420 Plus Wired	
1	14862	Screw, MACH 8-32NC x 3/8	4
2	45042	Washer, Bonded Sealing SST	4
3	14618	Nut, Kep 4-40NC HEX	8
4	84388	Gasket, Backplate 420	1
5	14839	Screw, MACH 6-32NC x 1/4	5
6	99151	Board Assembly, CPU Display	1
7	15148	Washer, Lock 1/4 Regular	2
8	21948	Screw, Cap 1/4-20NC x 5/8 HEX	2
9	131630	CLS-420 Mounting Bracket (see Figure 4-9 on page 60)	1
10	97078	Backplate, 420 wireless	1
11	44676	Washer, Bonded Sealing	1
12	42640	Screw, Mach 1/4-28NF x 1/4	1
13	19538	Post, Slotted Black Seal	2
14	15626	Cable, Grip Black PG9	2
15	30375	Seal Ring, Nylon PG9	2
16	97079	Enclosure, 420 Wireless	1
17	84389	Bracket, Power Supply 420	1
18	99479	Power Supply, 25W DC/DC	1
19	53307	Label,4.000x2.875	1
20	84397	Overlay, 420 Indicator	1
21	68216	Nameplate, Rice Lake	1
22	85151	Cable Assembly, Power Supply	1
23	16892	Label, Earth Ground	1
24	15134	Washer, Lock NO 8 Type A	4
25	45043	Wire, Ground 4 in W/No.8	1
26	53308	Label,1.25x1.25 8000T	1
27	14626	Nut, Kep 8-32NC Hex	4
28	15627	Locknut, Black PCN9	2
29	97394	Cable Assembly, Serial Input	1
31	97419	Gasket, MS CONN Shell Size	1
33	97391	Spacer, Indicator Hex	2
34	96914	Cable Assembly, DC Power	1
35	57241	Gasket, MS Conn Shell Size	1
36	67755	Spacer, Brass I.D. #8	1
37	80331	Connector, Tap and Run	2
38	71125	Conn, 3 Pos Screw Terminal	1
NS	110388	Tape, Kapton 1" 2 mil	2

Table 4-7. CLS-420 Indicator Parts List

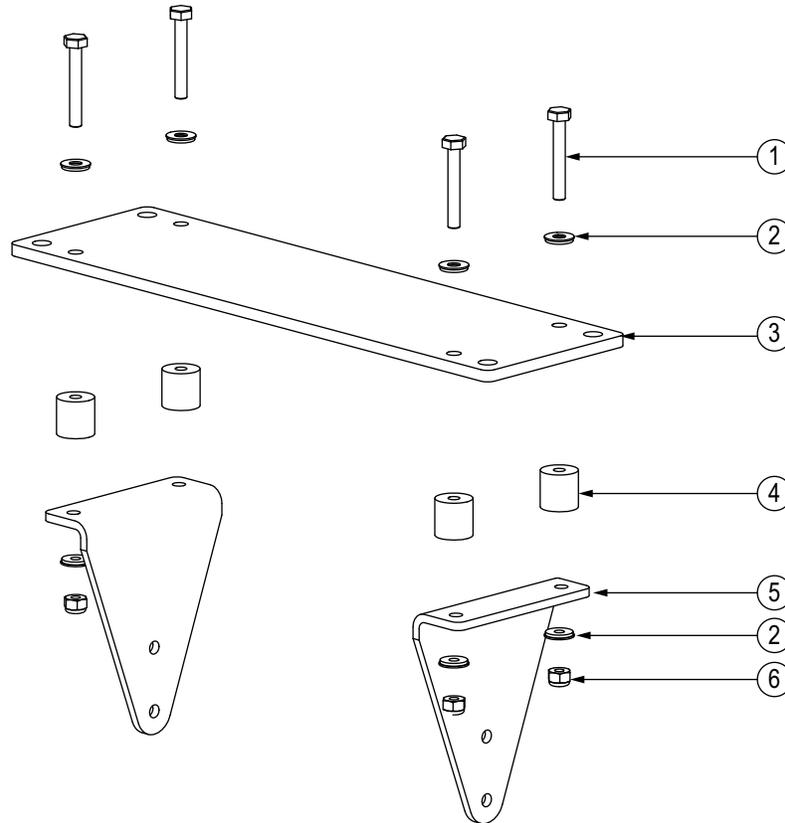### 4.3.2   Mount Assembly for CLS-420 Indicator (PN 162310)

Figure 4-8. Mount Assembly (PN 131630)

Item No.	Part No.	Description	QTY
1	14984	Screw, Cap 1/4-20NC x 1-3/4	4
2	44676	Washer, Bonded Sealing	8
3	121003	Mounting Plate, 420-CLS	1
4	98537	Bumper, Recessed Rubber	4
5	121004	Bracket, Side Angled	2
6	14634	Nut, Lock 1/4-20NC HEX	4

Table 4-8. Mount Assembly Parts List

4.3.3 Mount Assembly for CLS-420 Indicator
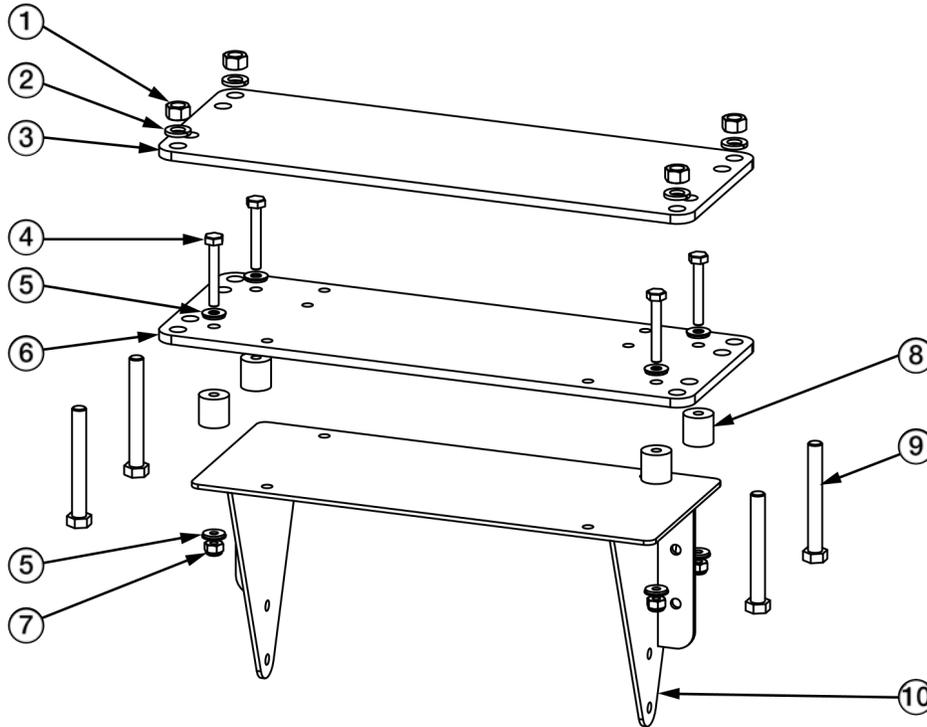
Figure 4-9. Mount Assembly Parts Illustration (PN 98413)

Item No.	Part No.	Description	QTY
1	14656	Nut, 3/8-16NC Hex	4
2	15159	Washer, Lock, 3/8 Regular	4
3	96929	Clamp Plate, Indicator	1
4	14984	Screw, Cap 1/4-20NC x 1-3/4	4
5	44676	Washer, Bonded Sealing	8
6	96928	Mount Plate, Indicator	1
7	14634	Nut, Lock 1/4-20NC Hex	4
8	98537	Bumper, Recessed Flat Top	4
9	69987	Bolt, 3/8-16NC 3 3 Hex	4
10	97128	Indicator Stand, Forklift CLS-420	1

Table 4-9. Mount Assembly Parts List

RICE LAKE
W E I G H I N G   S Y S T E M S

4.4   CLS-420 Indicator CPU Board Replacement

The indicator enclosure must be opened to connect cables for load cells, communications, digital inputs, and analog output.

⚠️ **WARNING**   ***The 420 has an on/off switch for the load cells and processor functions. Before opening the unit, ensure the power cord is disconnected from the forklift battery power source.***
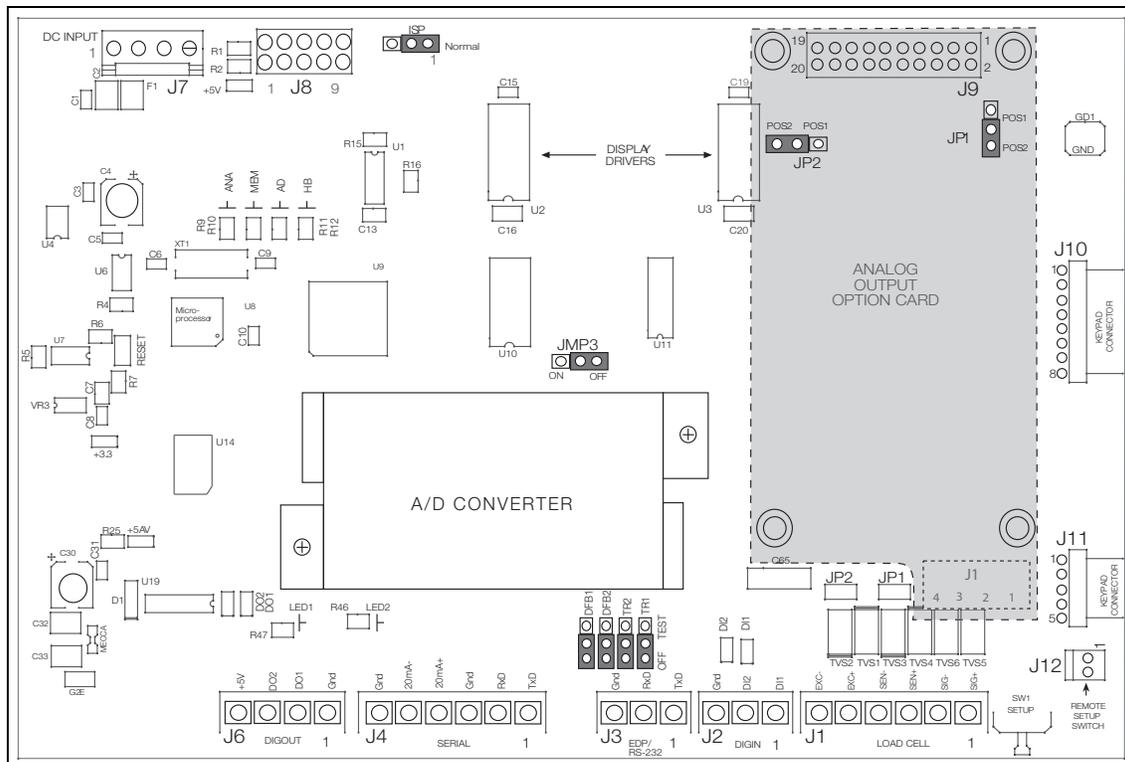
Figure 4-10. CPU and Power Supply Board with Analog Output Option Card
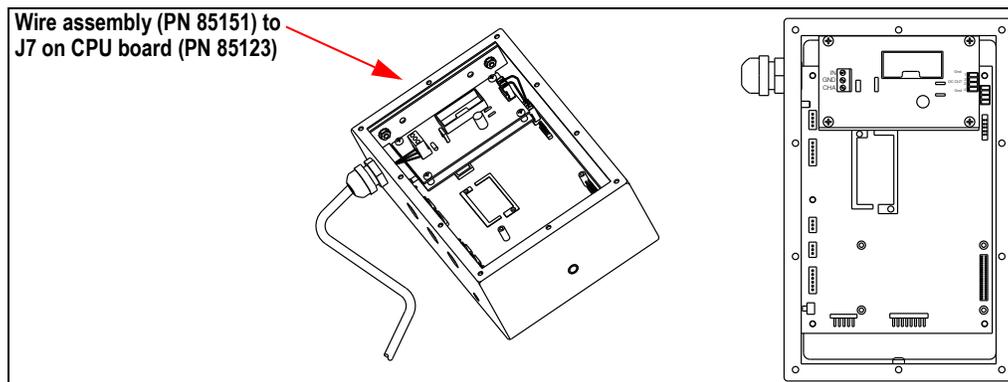
Figure 4-11. 420 DC Power Supply

4.4.1   Board Removal

If the 420 CPU board must be removed, use the following procedure:

1. Disconnect power to the indicator.

2. Remove the screws that hold the backplate to the enclosure body, then lift the backplate away from the enclosure and set aside.

3. Disconnect the power supply cable from connector J7 on the 420 CPU board.

4. Unplug connectors J1 (load cell cable), J2 (digital inputs), J3 (EDP/RS-232), J4 (serial communications), J6 (digital outputs), and J10 & J11 (keypad ribbon cables). If an analog output board is installed, disconnect the analog output cable. See Figure 4-10 for connector locations.

5. Remove the five screws from the CPU board, then lift the board out of the enclosure.

To replace the CPU board, reverse the above procedure. Be sure to reinstall cable ties to secure all cables inside the indicator enclosure.

4.5 NEMA 4X Polycarbonate Junction Box Maintenance

The CLS-420 scale can use a NEMA Type 4X polycarbonate junction box. The junction box is located between the front and back panel of the scale and is covered by a metal cover plate on the top of the scale. Use the following procedures for replacing a junction box on the CLS-420.

1. Remove the bolt and washer holding the top metal cover plate which conceals the junction box.
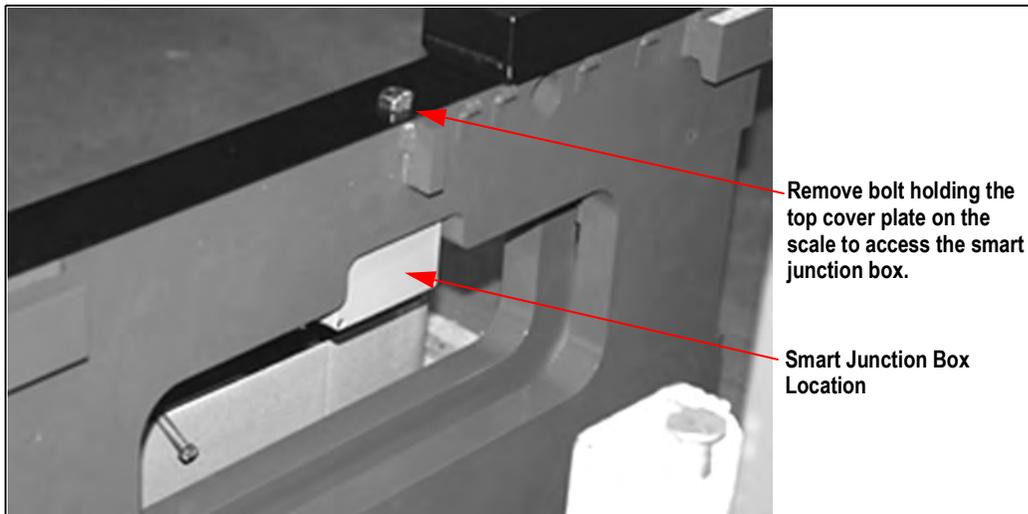
Figure 4-12. Top Cover Plate (scale shown not mounted on the forklift)

2. Remove the top cover plate and set aside.

3. Lift the fork lift to a comfortable working height.

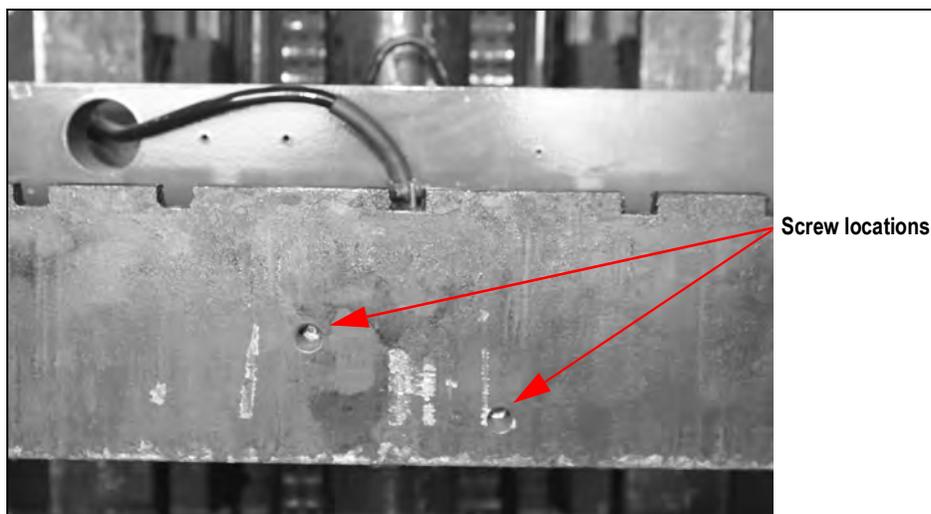4. Remove the two screws securing the junction box to the scale. See Figure 4-13 for screw location.

Figure 4-13. Screw Locations

Note *Use a 10 mm Allen wrench for old style junction box and a 9 mm Allen wrench for the new style junction box.*

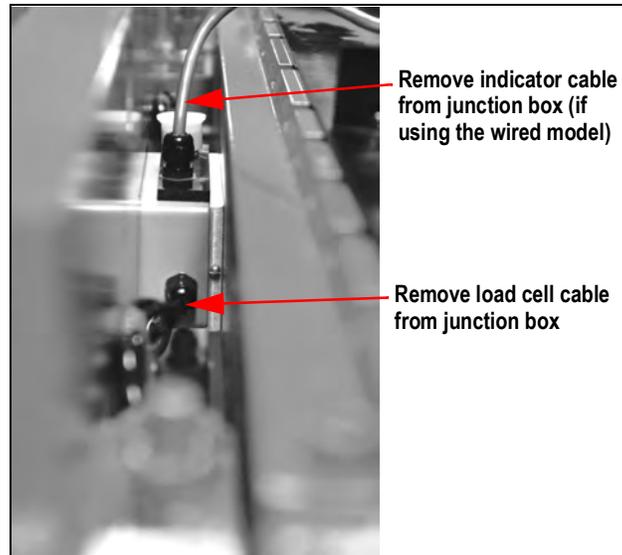5. Disconnect the coiled cable from the junction box to indicator or wireless battery box.

Figure 4-14. Junction Box Location Inside the Scale (wireless version shown above)

6. Loosen the load cell clips holding the load cell cable to the scale frame.
7. Slip the junction box downward out of its current location between the front and back plates of the CLS.

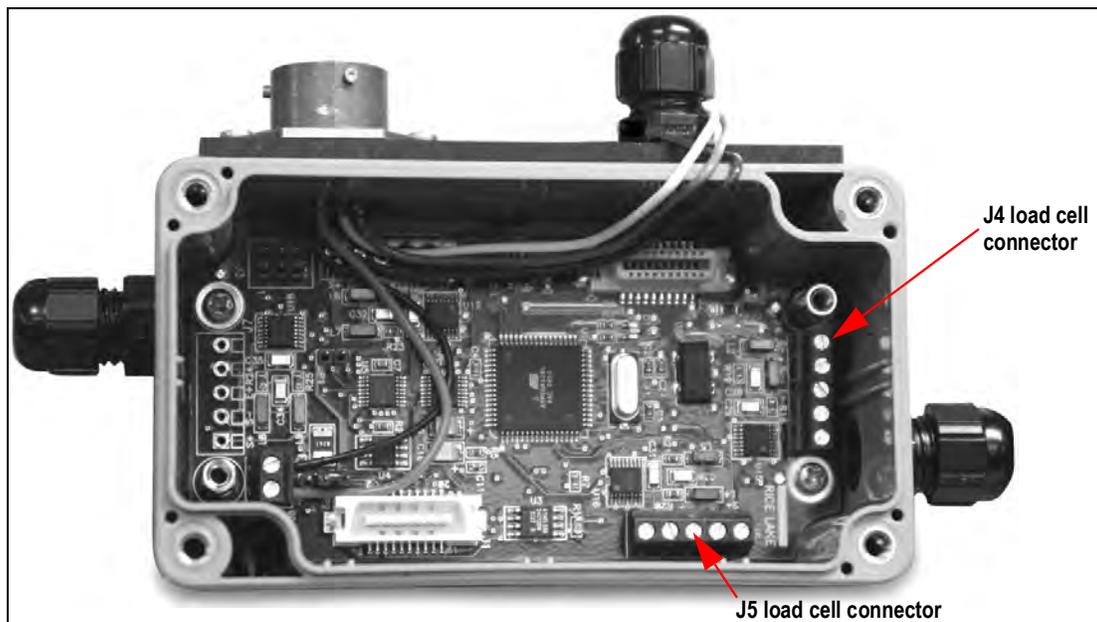### 4.5.1 Junction Box Board Replacement – Two Board Style (Prior to December 2010)

Bottom Board

Figure 4-15. Inside of Junction Box - Bottom Board

To access the bottom board:

1. Using a Phillips head screwdriver, loosen the junction box cover and set the cover aside.
2. Remove the screws holding the top board in place.
3. Flip the top board up and back out of the way. The wires connecting the top and bottom boards are long enough to accommodate this.
4. Disconnect the wiring from the bottom board.
5. Loosen the screws and standoffs to remove bottom board and replace with new board.

6. Tighten the screws and standoff to secure the new board.

Note *The bottom board which is shown in Figure 4-16 connects the wiring for both load cells one and two. Table 4-10 lists the wiring assignments for the bottom board.*

7. Reconnect the wires to the bottom board per Figure 4-16 and Table 4-10.

J4 Wiring Connector (Cell #1 - the left cell as viewed from the forklift drivers seat)	J4 Function
1	+ SIGNAL
2	- SIGNAL
3	+ EXCITATION
4	- EXCITATION
5	SHIELD
J5 Wiring Connector **(Cell #2 - the right cell as viewed from the forklift drivers seat)**	**J5 Function**
1	+ SIGNAL
2	- SIGNAL
3	+ EXCITATION
4	- EXCITATION
5	SHIELD
J8 Wiring Connector **(From the MS Connector)**	**J8 Function**
1	+ V (Red)
2	- V (Black)

Table 4-10. Load Cell Wiring

Figure 4-16. Bottom Board Wiring

J4 - Wiring for the right load cell #2 as viewed from the driver's seat

Exits out to right cell #2

Exits out to left cell #1

J5 - Wiring for the left load cell #1 as viewed from the driver's seat

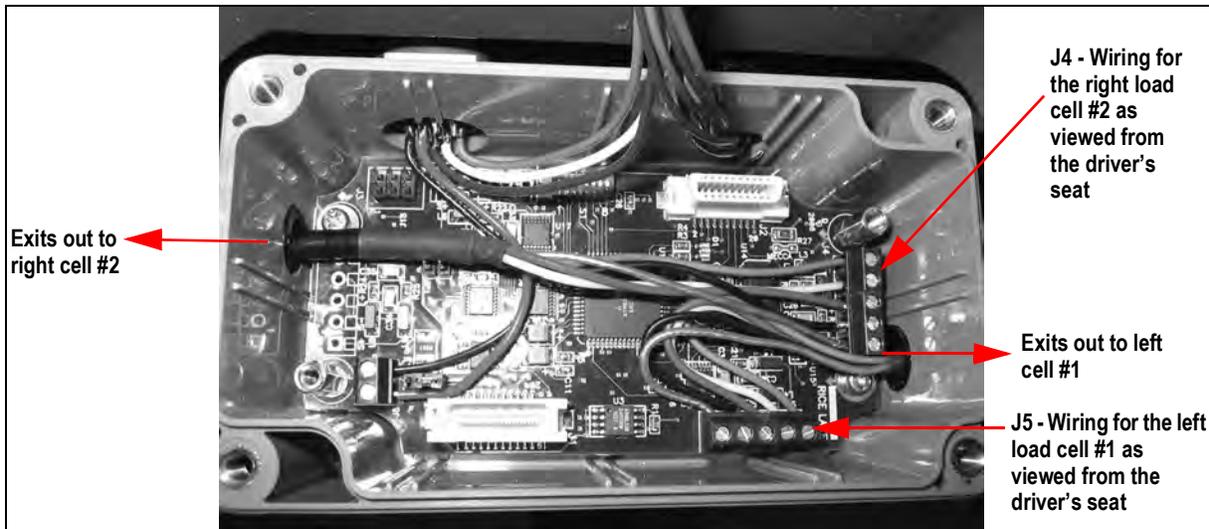8. Once wiring is complete, place the upper board back and secure screws holding the upper board.

9. Place cover on the junction box enclosure and secure with screws.

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Upper/Top Board

The second board, or upper board is pictured in Figure 4-17.

1. Using a Phillips head screwdriver, loosen the junction box cover and set the cover aside.
2. Disconnect wiring connecting the top board to the bottom board, J3 and J6 connectors.
3. Remove the screws that hold the top board in place.
4. Place the new board in the junction box and secure with screws.
5. Connect wires from the bottom board as shown in Figure 4-17 and Table 4-11 connecting into J3 and J6 connectors.
6. Place cover on junction box enclosure and secure with screws.
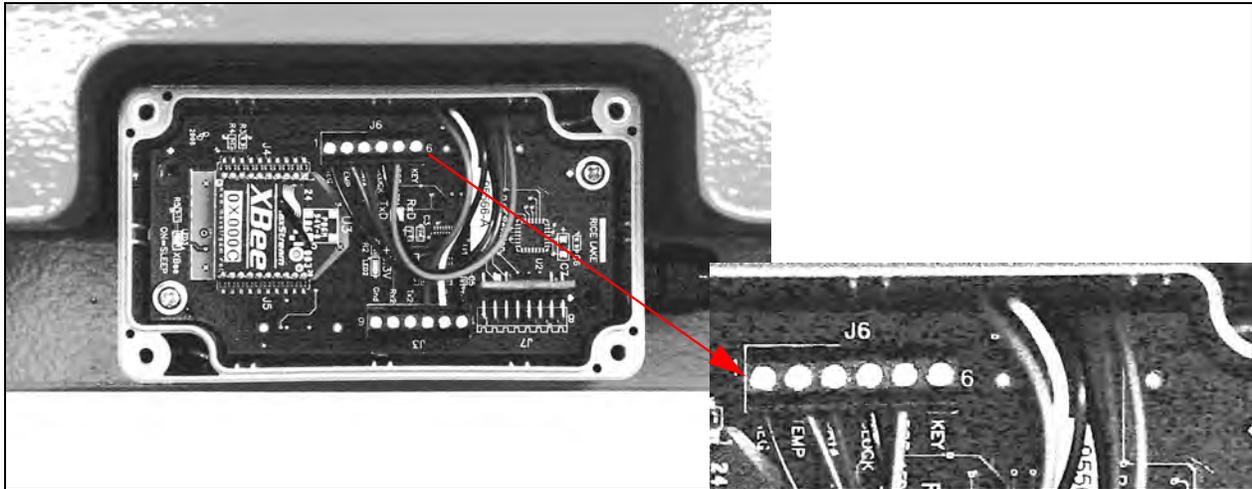
Figure 4-17. Inside of Junction Box - Top Board

J3 Wiring Connector (From the MS connector)	Function and (Wire Color)
1	TX1 (blue)
2	RX1 (white)
3	GND (green)
4	TX2 (N/C)
5	RX2 (N/C)
6	GND (N/C)
J6 Wiring Connector **(From the battery - wireless version only)**	**Function and (Wire Color)**
1	KEY (N/C)
2	POS (red)
3	CLOCK (blue)
4	DATA (brown)
5	TEMP (green)
6	NEG (black)

Table 4-11. Top Board Wiring Connections

Note *J6 wiring is only used in the wireless version of the CLS series and goes directly to the battery box.*

4.5.2 Junction Box Board Replacement and Wiring – One Board Style (December 2010 and Later)

To access the board:

1. Using a Phillips head screwdriver, loosen screws and remove the junction box cover.
2. Disconnect the wiring from the board.
3. Loosen the screws to remove the board and replace with new board.
4. Tighten the screws to the secure board.
5. Reconnect the wires to the board. See Figure 4-18.
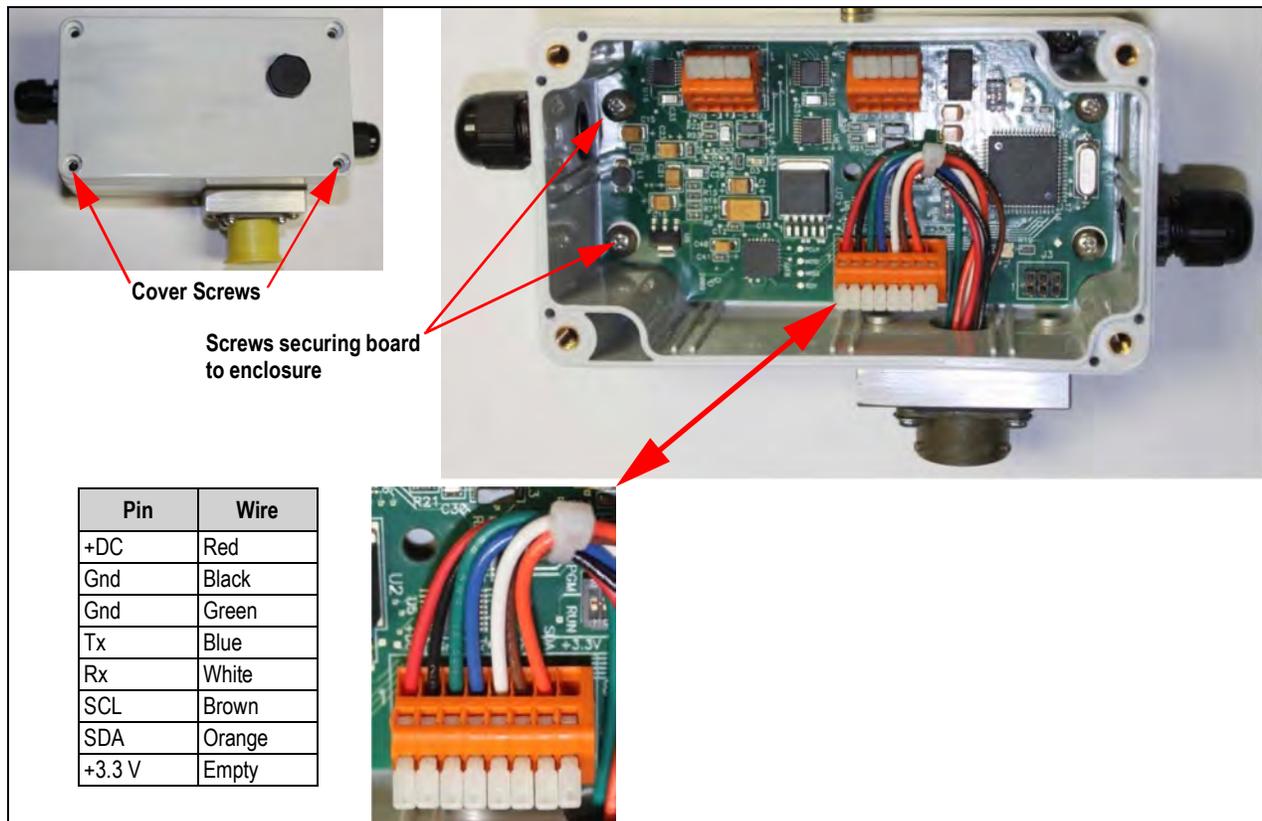6. Place the cover on the junction box enclosure and secure with screws.

Cover Screws

Screws securing board
to enclosure

Pin	Wire
+DC	Red
Gnd	Black
Gnd	Green
Tx	Blue
Rx	White
SCL	Brown
SDA	Orange
+3.3 V	Empty

Figure 4-18. Board Removal and Wiring – One Board Style

4.5.3 Junction Box Board Replacement and Wiring – Quick Connect Style (34" scale only)

To access the board:

1. Using a Phillips head screwdriver, loosen the enclosure screws and remove the junction box cover.
2. Disconnect the wiring from the board.
3. Loosen the screw holding the ground wire and remove ground wire.
4. Loosen the remaining screws and the standoff to remove the board and replace with new board.
5. Tighten the three screws and standoff for the ground wire to secure board.
6. Install the ground wire and secure with remaining screw.
7. Reconnect the wires to the board. See Figure 4-18 and Table 4-12.
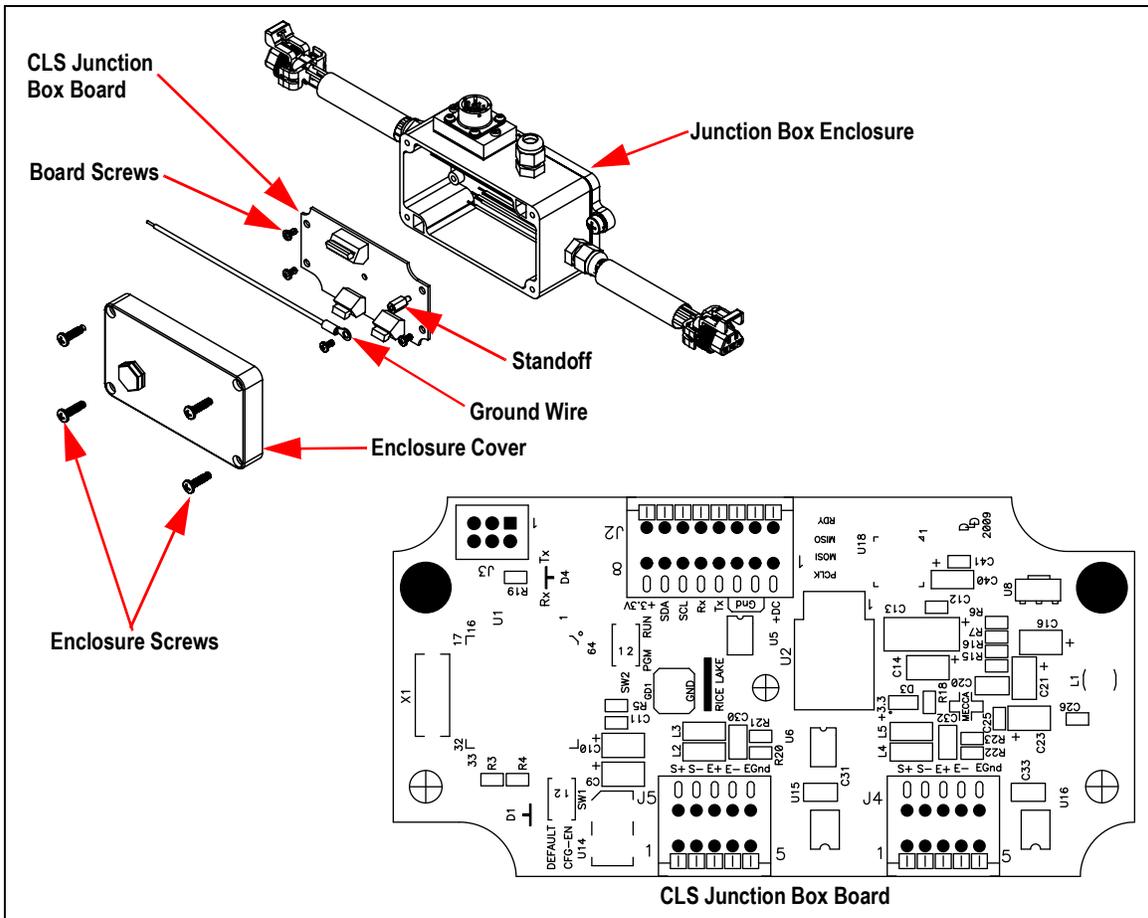8. Place the cover on the junction box enclosure and secure with screws.

Figure 4-19. Board Removal and Wiring – Quick Connect Style

10 Pin Receptacle (18)		Quick Connect Cable Assembly	
Wire Color	Position on J2	Wire Color	Position on J4 and J5
Red	+DC	Green	S+
Black	Gnd	White	S-
Green	Gnd	Red	E+
Blue	Tx	Black	E-
White	Rx	Empty	Gnd
Brown	SCL		
Orange	SDA		
Empty	+3.3V		

Table 4-12. Wiring Connections

4.6 iQube² Junction Box Maintenance/Upgrade

The iQube² junction box is designed for use with the Rice Lake CLS-420 forklift scales and is a replacement for the junction box used on early models of the scale. The load cell connectors have been updated to improve serviceability.

4.6.1 iQube² Replacement

The junction box is located between the front and back panels of the scale and is covered by the metal cover plate on the top of the scale.
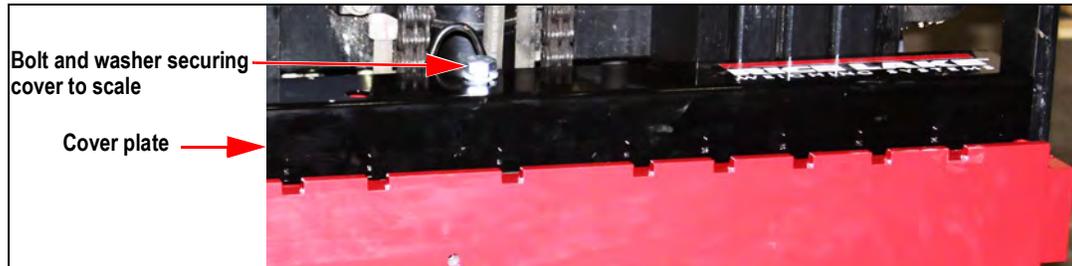

Figure 4-20. Remove Cover Plate

1. Turn scale power off on the indicator.
2. Remove the bolt holding the cover plate in place.
3. Remove the cover plate and set aside.
4. Unplug the power cable.
5. Lift the forklift to a comfortable working height.
6. Use a #4 metric Allen wrench, remove the two screws securing the junction box to the scale.
7. Remove the coiled interface cable from the junction box.
8. Disconnect the load cell cables.

> **Note** *Steps 9-14 are required only when upgrading the original junction box to an iQube². If replacing an iQube² with another iQube² skip to step 15.*
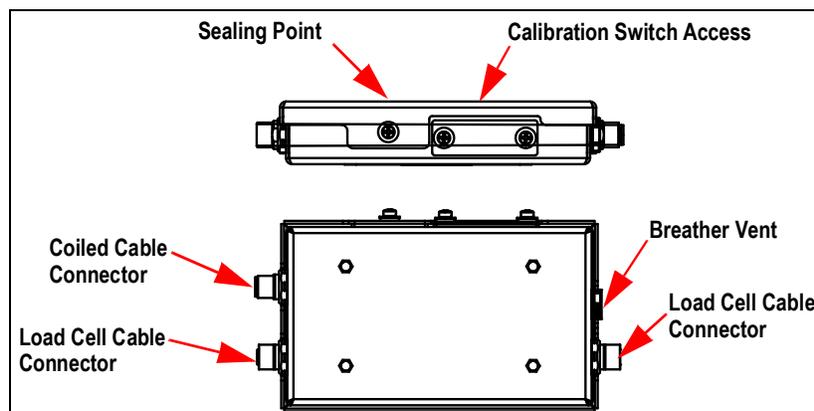

Figure 4-21. iQube² J-Box

9. Remove automotive quick connects from load cell cables.
10. Strip the wires for connection to the new load cell connectors. See Figure 4-22.
11. Follow the instructions on the packaging for Turk connector, PN BS-8157-0/P69, for inserting wires.
12. Wire the load cell 5-pin male connector to the following color codes Table 4-12 and Figure 4-22. Note the orientation of the raised diamond in Figure 4-22. Use the supplied tool in the rectangular tool slot to lock wires down.
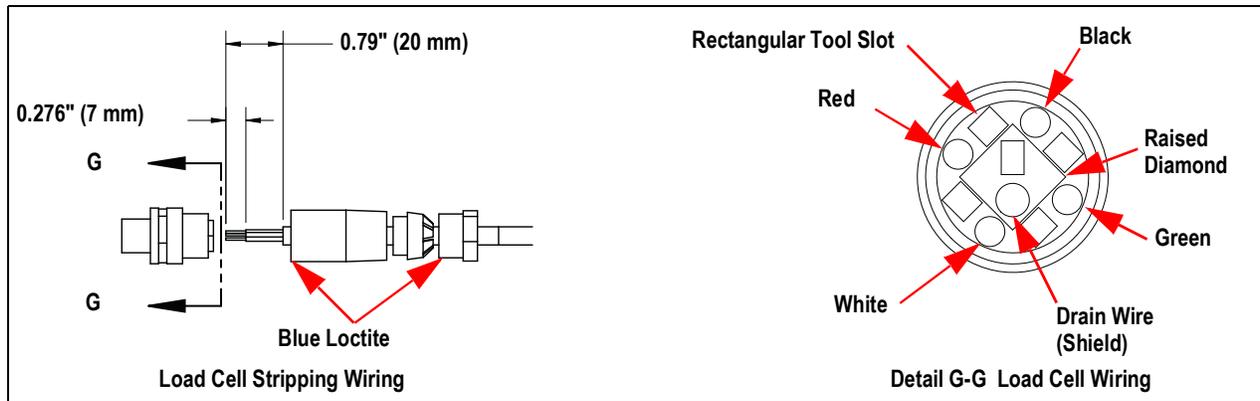
Figure 4-22. Load Cell Wiring

13. Add blue Loctite® 425 to the two contact points as indicated in Figure 4-22.
14. Attach the load cell cables to the bottom two connectors on the junction box.
    • Apply Loctite.
    • Hand tighten until the connection is snug, plus another 1/4 turn. Only two threads should be visible.
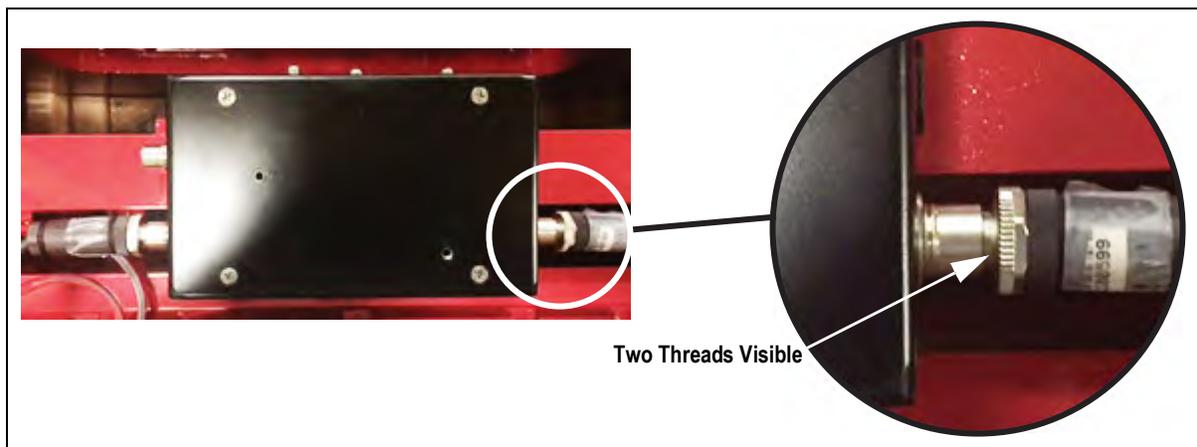

Figure 4-23. Connect Load Cell Cable to Junction Box

15. Attach the home run cable to the top side connector.
16. Install the iQube^2 junction box into the forklift scale, using Loctite on the mounting screws.
17. Open the calibration access switch cover on the junction box, set switch to the *On* position.
18. Plug in the power cable, and turn on the indicator.
19. Calibrate the unit using Revolution software.
20. Connect the load cell cables to each side.
21. Connect the coiled interface cable to the top of the junction box.
22. Align the iQube^2 junction box with the bolt holes in the scale and use an Allen wrench to tighten.
23. Place the cover plate in place and secure with a bolt and washer, and seal the unit.

4.6.2 iQube^2 PCB Board Assembly Replacement

1. Remove junction box from the scale carriage. See Section 4.6.1.
2. Disconnect load cell and coiled cable connectors.
3. Loosen four screws to remove front cover of j-box.
4. Disconnect JST connectors for load cells and coiled cable.
5. Remove PCB board assembly.

6. Install new PCB board assembly and install screws using blue Loctite.

7. Connect coiled cable JST connector to J1.

8. Connect left load cell cable JST connector to J2.

9. Connect right load cell cable JST connector to J3.

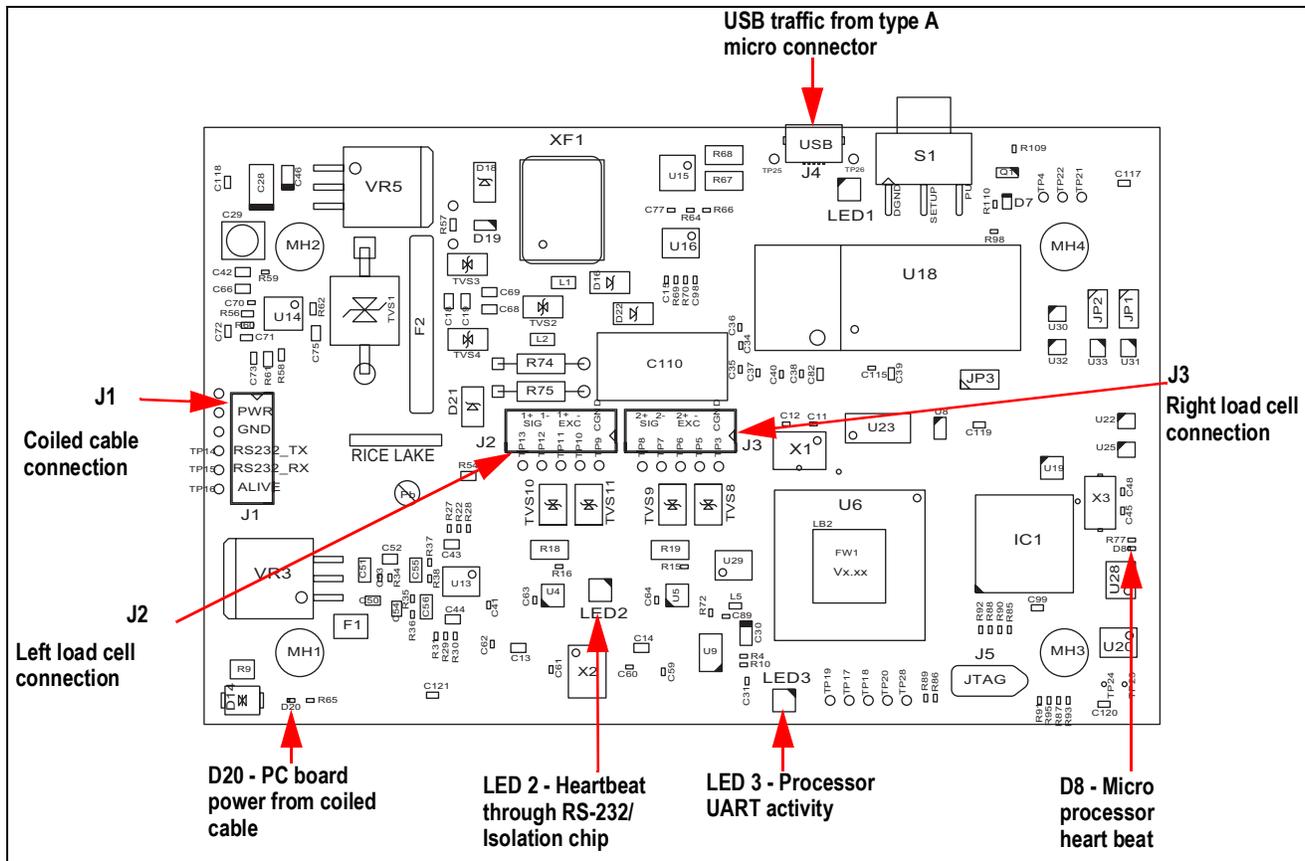10. Replace cover and secure with four screws, Loctite not required.

Figure 4-24. Troubleshooting iQube^2 PCB Assembly LEDs (PN 162508)

4.6.3 iQube 2.3 Cross References

When identifying the correct junction box cross referenced part number, please provide the serial number of the scale so the Rice Lake Weighing Systems sales and service departments can track it to the correct top level part number sold.

To verify the correct junction box has been received, use Table 4-13, the iQube 2.3 junction box part number reference table.

The kit part number includes the appropriate load cell and cable adapters required to upgrade the unit.

Note *This manual references the part numbers 125277 and 153539 only.*

28" Forklift Carriage			
Top Level Fork Lift PN	Indicator	iQube 2.3 Kit PN	iQube 2.3 junction box PN
111033	420 Wired	167345	167344
111034	420 Wireless		167416, 167344
34" Forklift Carriage			
Top Level Fork Lift PN	Indicator	iQube 2.3 Kit PN	iQube 2.3 junction box PN
96339	420 Wired	167345	167344
96340	420 Wireless		167344

Table 4-13. iQube 2.3 Cross References

28" Forklift Carriage			
Top Level Fork Lift PN	Indicator	iQube 2.3 Kit PN	iQube 2.3 junction box PN
130822	420 Wired	167356	167261
130823	420 Wireless		167261
SPX or SO WO	420 ABF	167345	167344
120911	420 ABF	167356	167261
161964	420 ABF	167341	167261
151803	CLS-420	167356	167261
164649	CLS-420	167341	167261
162279	CLS-420	167341	167261
38" Forklift Carriage			
Top Level Fork Lift PN	Indicator	iQube 2.3 Kit PN	iQube 2.3 junction box PN
111038	420 Wired		167407
111039	420 Wireless		167407
151506	420 Wireless		167407

Table 4-13. iQube 2.3 Cross References

4.7   Load Cell Maintenance

This section describes procedures for replacing a load cell. The CLS-420 uses Rice Lake's load cell, PN 125543.

The following instructions must be followed exactly to allow for seamless and easy load cell replacement.

> ⚠️ **WARNING** *Take all necessary safety precautions when installing or replacing the scale parts including wearing safety shoes, protective eye wear, and using the proper tools.*

4.7.1   Required Tools for Replacing a Load Cell

The following list of tools is required for replacing a load cell on the CLS-420.

- Modified box wrench (PN 96196 - supplied with load cell replacement kit)
- Crescent wrench
- 3/4" socket wrench, with extensions
- Ball-peen hammer
- 1 1/8" wrench for overload stop
- Chisel
- Allen wrench for overload stops
- Torque wrench
- Pry bar

> 📝 **Note** *Adequate light is necessary to change the load cell. Position the forklift close to a good source of natural light, or have a good source of lighting available.*
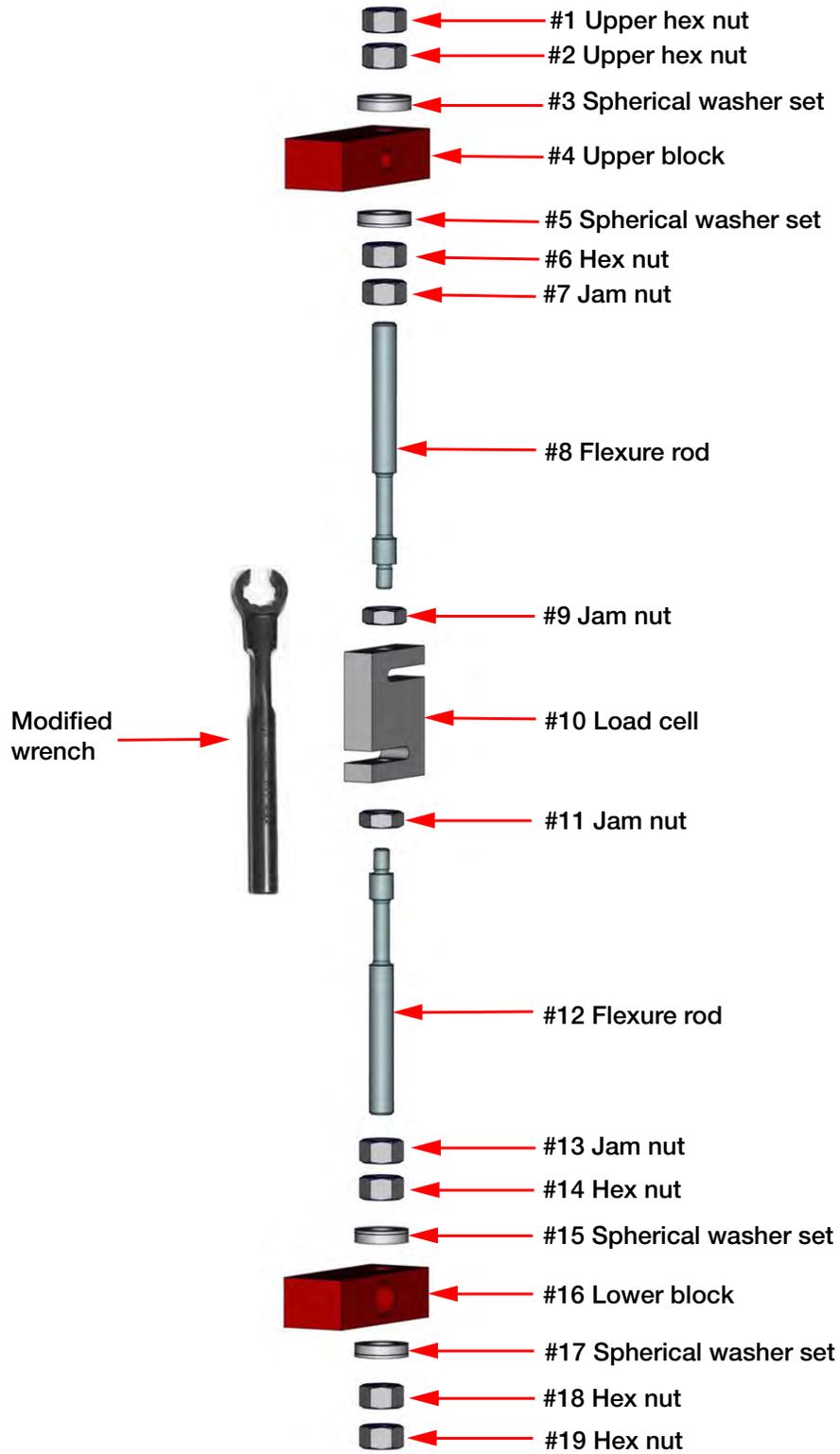
4.7.2   Load Cell Replacement

#1 Upper hex nut

#2 Upper hex nut

#3 Spherical washer set

#4 Upper block

#5 Spherical washer set

#6 Hex nut

#7 Jam nut

#8 Flexure rod

Modified wrench

#9 Jam nut

#10 Load cell

#11 Jam nut

#12 Flexure rod

#13 Jam nut

#14 Hex nut

#15 Spherical washer set

#16 Lower block

#17 Spherical washer set

#18 Hex nut

#19 Hex nut

Figure 4-25. CLS-M Load Cell Assembly Parts Breakout

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Use the following steps to replace a load cell.

1. Raise the forklift carriage slightly for fork removal.
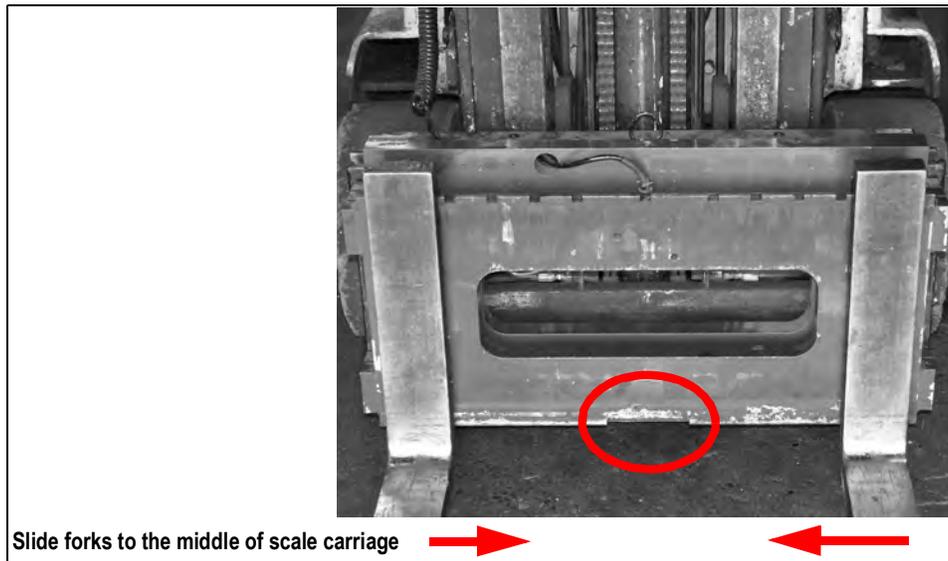2. Slide the forks to the center of the carriage to allow for removal. Set forks aside.

Slide forks to the middle of scale carriage

Figure 4-26. Fork Removal

3. Raise the forklift carriage to a comfortable working height for the load cell replacement.
4. Remove the top hex nut (#1) with a socket wrench.

| Note | *It is acceptable if the load cell slightly rotates up against the front or back plate of the scale.* |

Figure 4-27. Remove Hex Nut

5. Loosen jam nut (#7) from the upper block using the special modified box wrench (PN 96196 - supplied with load cell replacement kit) and shown in Figure 4-25.
6. Loosen jam nut (#13) from the lower block.
7. Remove the top hex nut (#2) and the top spherical washer set (#3).

Figure 4-28. Remove Bottom Nut

> **Note** | *It is acceptable if the load cell slightly rotates up against the front or back plate of the scale.*

8. Remove the bottom hex nuts (#18 and #19) and the bottom spherical washer set (#17).
9. Loosen the hex nut located under the upper block (#6).
10. Loosen the jam nut located on top of the load cell (#9).
11. Loosen the hex nut (#14) located on top of the lower block.
12. Loosen the hex nut (#11) on the lower side of the load cell.
13. Remove the bottom flexure rod (#12) and the top flexure rod (#8) sliding remaining washer sets (#5 and #15) with it.
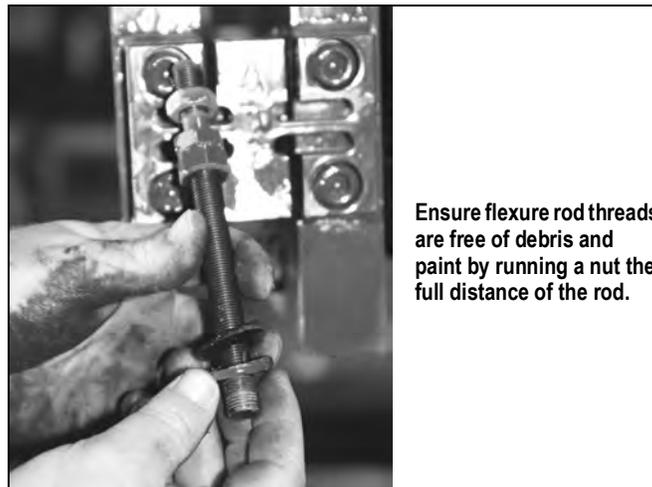
Ensure flexure rod threads are free of debris and paint by running a nut the full distance of the rod.

Figure 4-29. Remove Flexure Rod with Nuts and Washers

14. Check the flexure rod threads for smooth operation by running a nut the full distance of the rod, making sure it does not get stuck anywhere along the way. Clean off any paint using a wire brush and oil.
15. Oil the spherical washers using a standard machine shop oil.
16. Disconnect the load cell cable from the junction box.
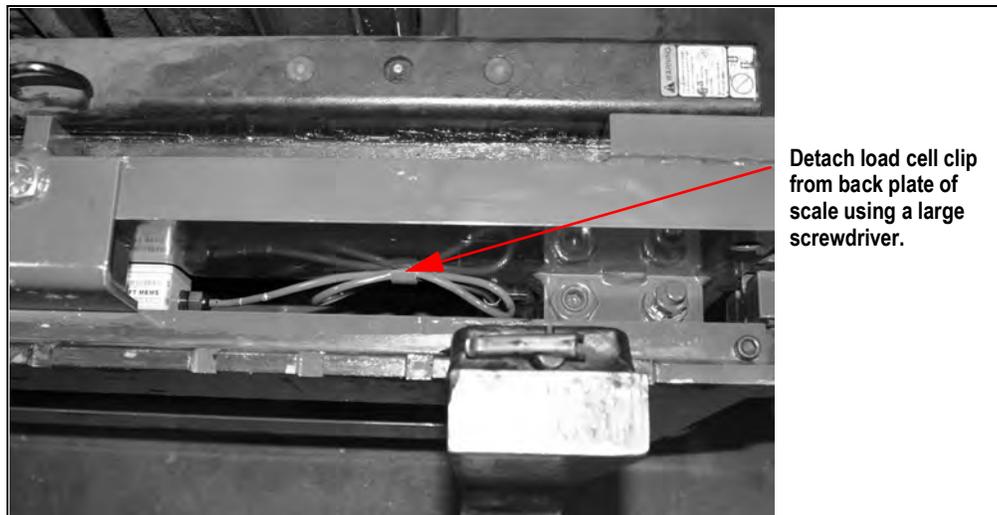17. Loosen cable clips and remove the load cell.

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Detach load cell clip from back plate of scale using a large screwdriver.

Figure 4-30. Load Cell Cable Clips

18. Back off upper and lower overload stops using a 1 1/8" wrench.
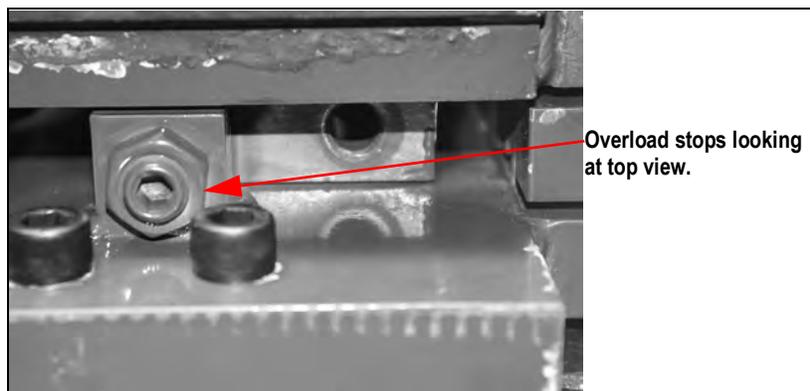

Overload stops looking at top view.

Figure 4-31. Overload Stops

19. Position a new load cell with its cable facing towards the center and opening of the S-beam facing the flexure.

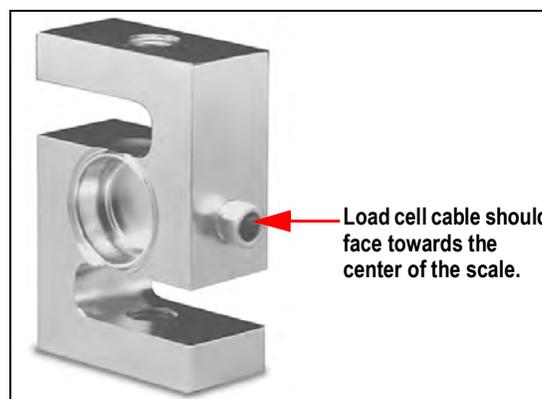Load cell cable should face towards the center of the scale.

Figure 4-32. Load Cell

20. Install the top and bottom flexure rod with hardware, ensuring that the flexure rod is oriented with the short thread of the rod facing nearest the load cell.
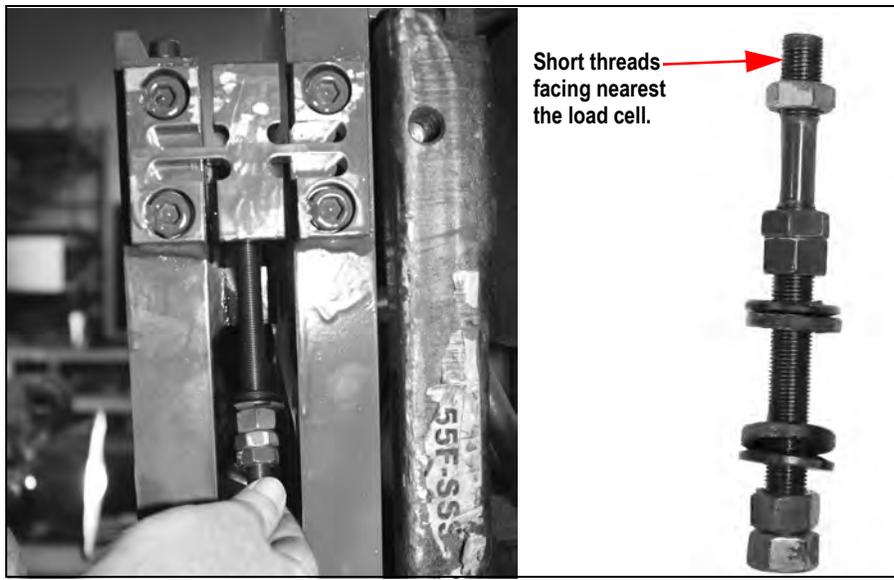
Short threads facing nearest the load cell.

Figure 4-33. Installing Flexure

21. Insert the load cell and thread flexure rods into top and bottom of the load cell making sure the appropriate hex nuts, jam nuts, and spherical washers are in the correct order per Figure 4-25 on page 72.

22. Screw in the rod and tighten jam nut leaving approximately two threads exposed outside of the jam nut. Do both the top and bottom of the load cell.

23. Use hex nuts to position the load cell in the center of the mounting blocks with an equal amount of flexure rod on the top and bottom of the load cell.

24. Tighten the jam nuts on the top and bottom of the load cell, making sure they are tight, and load cell is completely vertical with the scale. Use a pry bar or chisel to hold the load cell straight.
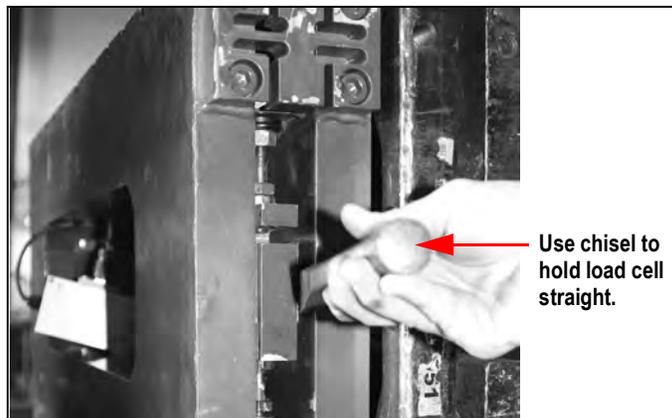

Use chisel to hold load cell straight.

Figure 4-34. Use Chisel to Hold Load Cell Straight

25. Install the spherical washer set and hex nut on the bottom flexure rod, ensuring that the thick washer is mounted towards the mounting block.

Figure 4-35. Install Spherical Washer Set

26. Insert a flat-bladed screwdriver in the upper mounting block between the hole and the flexure rod, forcing the flexure rod in the same direction of the flexure.

Insert the flat-blade screwdriver here to help center the flexure rod.
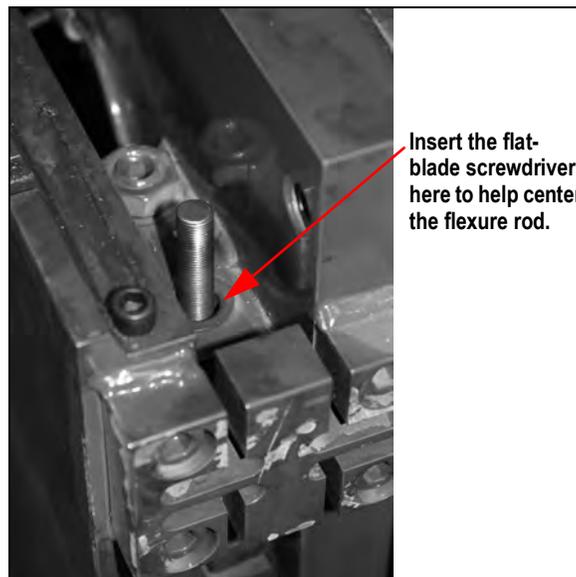
Figure 4-36. Centering the Flexure Rod

27. Use a pry bar or chisel to hold the bottom half of the load cell straight while using a torque wrench to tighten the bottom hex nut on the lower mounting block to 110 ft-lb. Install the other hex nut on the bottom of the flexure rod and torque it to 110 ft-lb.

Figure 4-37. Center Load Cell

Figure 4-38. Tighten Lower Nut

28. Use the special modified box wrench to tighten the jam nut (#13) on the lower block.

29. Remove the flat-bladed screwdriver used in Step 25 and inspect the flexure rod. The flexure rod must be in the center of the hole. If it is not, use a hammer and an angled diamond chisel to hit the bottom mounting plate and spherical washer set to adjust it to center.

30. Install the spherical washer set (#3) and hex nut (#2) on the top of the upper block.

31. Connect the load cell cable to the junction box.

32. Torque the hex nut (#2) on the upper mounting block until 100 lb is displayed on the indicator. Tighten the lower hex nut (#6) below the upper mounting block using the modified box wrench and get the display as close to zero as possible.

33. Torque the top hex nut (#1) with a torque wrench to 110 ft-lb. Use a pry bar or chisel to ensure the load cell stays centered while tightening and doesn't touch the sides of front or back panel.

34. Install the final hex nut on the top mounting plate and torque to 110 ft-lb. Use a pry bar or chisel to keep the load cell centered.

35. Tighten the jam nut on the lower mounting block assembly.

36. Exercise the scale, heel to toe, by placing a weight (1000 lb) on the heel, then the toe to check if the assembly was installed correctly. Do this for both sides. If the weight is off, check assemblies.

37. Place a weight in the center of the fork and check side to side values. The weight values must be equal to complete the load cell replacement.

38. Tighten the overload stops when complete.

39. Calibrate the load cells (See Section 3.3 on page 28).

4.7.3 Forklift Flexure Troubleshooting - 28" and 34" Models

For Part Number 92828

The forklift flexure is designed to protect the load cell from damage in the forklift environment.

Use the following steps if the forklift scale is out of tolerance or unable to return to zero on a consistent basis.

1. Check for debris within the scale or between the scale carriage.
2. Check for proper spacing of the jam nuts at 0.02".
3. Check the dimensions of the flexure for damage. There should be a +/-0.03" tolerance to the drawing shown below for height and width.
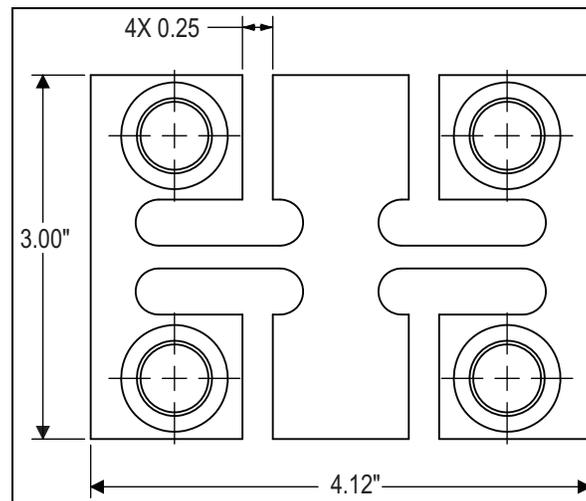

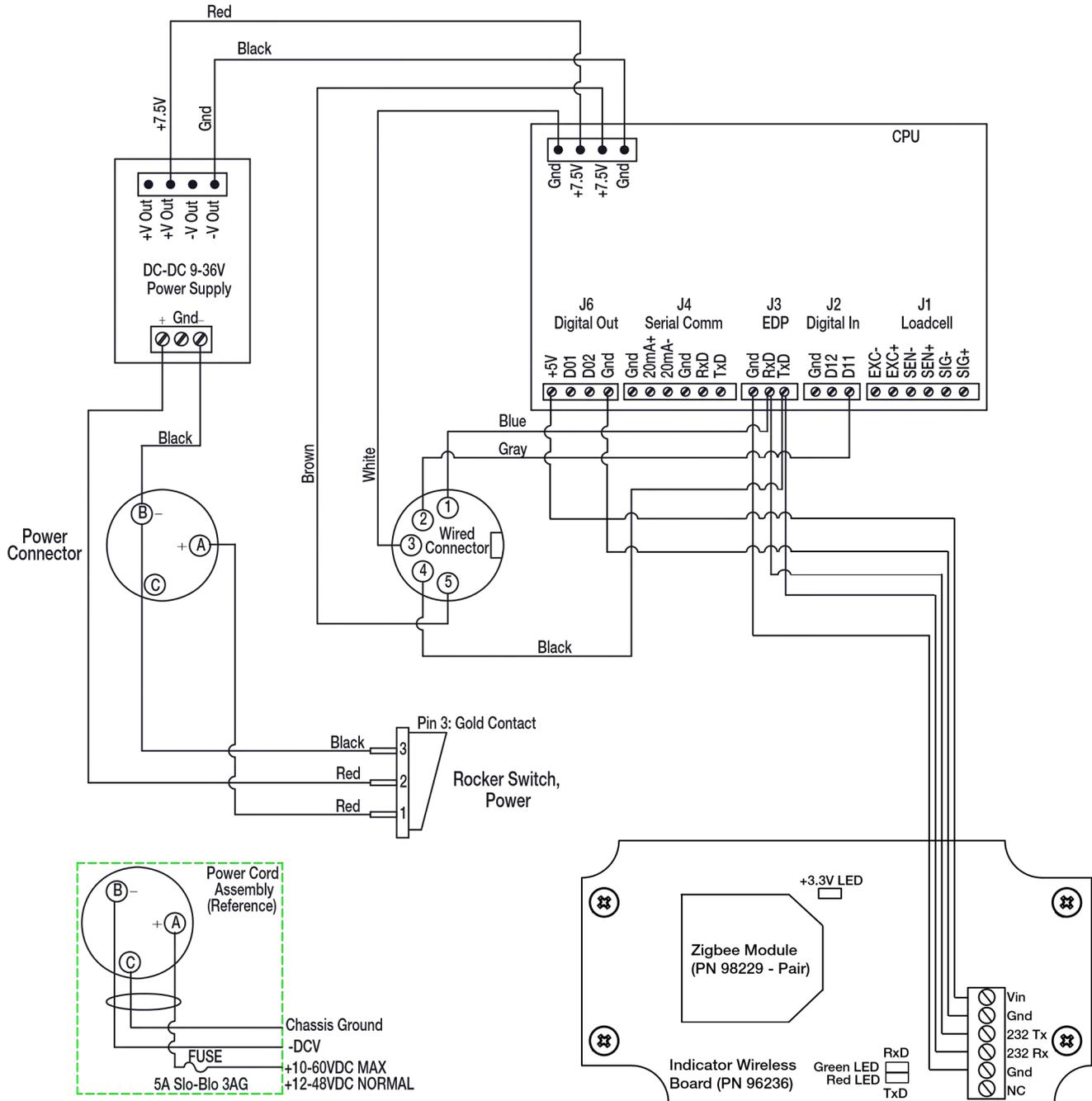*Figure 4-39. Flexure Chassis*

4.7.4   CLS-420 Wiring Diagrams

Figure 4-40. CLS-420 Indicator Wiring Diagram

4.8   LED Functions

Below is a list of diagnostic LEDs for the 420. See Figure 4-10 for locations on the 420 CPU board.

Serial Port Status

LED1 (EDP Port)	Flashing red = TXD activity
	Flashing green = RXD activity
	On steady or off = No activity
LED2 (PRN Port)	Flashing red = TXD activity
	Flashing green = RXD activity
	On steady or off = No activity

Power Supply

LED (+5AV)	Excitation/ADC supply on
LED (+5V & +3.3V)	Digital logic supply on

Operation Status

LEDHB (Microprocessor)	Flashing green = Active
	Red = Fault
LED AD (ADC)	Green = Active
	Red = Fault
LED MEM (Memory Test)	Green = Pass
	Red = Fail
LED ANA	Red = Not Implemented
(Analog Option Card)	

Digital Input/Output Status

DO 1 (Digital Out 1)	On when lit (active low)
DO 2 (Digital Out 2)	On when lit (active low)
DI 1 (Digital In 1)	On when lit (active low)
DI 2 (Digital In 2)	On when lit (active low)

5.0   Troubleshooting

5.1   Troubleshooting Chart

Symptom	Possible Cause	Action
Scale reading high against test weight	Debris between the scale and the forklift carriage	Remove debris
	Debris between the front and back scale plates	Remove debris
	Centering pin touching the forklift carriage, causing it to teeter back and forth	Adjust scale carriage, centering pin should not touch on sides and bottom
	Bottom cleats not adjusted properly or loose	Adjust to proper gap using jam nuts, 0.02"
	If all these steps do not resolve the issue, check the following:	
	J-box error	Open j-box and look for obvious damage
	Load cell errors	Test mV/v levels, at 1.5 mV per 1,000 lb, test at 350 ohms
Scale reading low against test weight	Zero key has been pressed with a negative weight reading, while forks are on the floor	Lift forks off ground, press the Zero key
	Debris between the scale and the forklift carriage	Remove debris
	Debris between the front and back scale plates	Remove debris
	Centering pin touching the forklift carriage, causing it to teeter back and forth	Adjust scale carriage, centering pin should not touch on sides and bottom
	Bottom cleats not adjusted properly or loose	Adjust to proper gap using jam nuts, 0.02"
	If all these steps do not resolve the issue, check the following:	
	J-box error	Open j-box and look for obvious damage
	Load cell errors	Test mV/v levels, at 1.5 mV per 1,000 lb, test at 350 ohms
Weight inaccurate	Tare key has been activated	At a stable zero weight, press the **TARE** key to return scale to normal weighing mode
Scale not returning to zero (0)	Forks are touching the ground	Lift forks off ground, press the Zero key
	Debris between the scale and the forklift carriage	Remove debris
	Debris between the front and back scale plates	Remove debris
	Centering pin touching the forklift carriage, causing it to teeter back and forth	Adjust scale carriage, centering pin should not touch on sides and bottom
	Bottom cleats not adjusted properly or loose	Adjust to proper gap using jam nuts, 0.02"
	If all these steps do not resolve the issue, check the following:	
	J-box error	Open j-box and look for obvious damage
	Load cell errors	Test mV/v levels, at 1.5 mV per 1,000 lb, test at 350 ohms
Will not display small weight values	Digital filter sensitivity is too high	Using Revolution: scales menu/scales #1/filtering change the digital filtering sensitivity to light and change digital filter threshold to 10
Unstable weight	Power connections faulty, low battery	Check battery power cable Check for low battery voltage
No weight being displayed on the hand-held device	Power switch off	Turn on power switch
	Coiled cable has loose connections or wear	Fasten coiled cable connections Replace coiled cable, if damaged
	If all these steps do not resolve the issue, check the following:	
	J-box sealing switch is in calibration mode	Move switch to weighing mode
	J-box load cell connections loose	Securely fasten connections
	J-box error	Open j-box and look for obvious damage
	Load cell errors	Test mV/v levels, at 1.5 mV per 1,000 lb, test ohms

Table 5-1. Troubleshooting

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Symptom	Possible Cause	Action
Intermittent weight readings, weight reading high and low	Debris between the scale and the forklift carriage	Remove debris
	Debris between the front and back scale plates	Remove debris
	Centering pin touching the forklift carriage, causing it to teeter back and forth	Adjust scale carriage, centering pin should not touch on sides and bottom
	Bottom cleats not adjusted properly	Adjust to proper gap using jam nuts, 0.02"
	Check alignment of load cells	Adjust load cells
	Low forklift battery	Charge forklift battery, disconnect power prior to charging.
	Coiled cable has loose connections & wear.	Fasten coiled cable connections Replace coiled cable, if damaged
	If all these steps do not resolve the issue, check the following:	
	Load cell connections on j-box	Securely fasten connections
	J-box error	Open j-box and look for obvious damage
	Load cell errors	Test mV/v levels, at 1.5 mV per 1,000 lb, test ohms using Revolution/Live Weight Data/Cell 1 & 2 MV
Weight on forks, no displayed weight	Debris between the scale and the forklift carriage	Remove debris
	Debris between the front and back scale plates	Remove debris
	Centering pin touching the forklift carriage, causing it to teeter back and forth	Adjust scale carriage, centering pin should not touch on sides and bottom
	Bottom cleats not adjusted properly	Adjust to proper gap using jam nuts, 0.02"
	Low forklift battery	Charge forklift battery
	Coiled cable error	Check coiled cable connections and wear and tear
	If all these steps do not resolve the issue, check the following:	
	Load cell connections on j-box loose	Securely fasten connections
	Junction box error	Open junction box and look for obvious damage
	Load cell errors	Test mV/v levels, at 1.5 mV per 1,000 lb, test ohms
Scale carriage is not fitting securely on forklift during installation	May have to use electric grinder to grind down the centering pin on the forklift scale or center slot on forklift	Discuss with local terminal manager to determine if maintenance group or scale dealer is to perform this chargeable service
	May have to grind or torch down the area where the top cleats of the forklift scale are mounted	
	May have to grind or torch side of forklift carriage due to previously installed side shift protection method	
Scale displaying negative weight	Forks are resting (even slightly) on the floor	Lift forks up off floor

Table 5-1. Troubleshooting

5.2   Error Messages

The CLS-420 provides a number of front panel error messages to assist in problem diagnosis.

Displayed Error Messages

Table 5-2 lists these messages and their meanings.

Error Message	Description	Solution
E A/D	A/D physical error	Call Rice Lake Weighing Systems Service
EEPERR	EEPROM physical error	
VIREE	Virgin EEPROM	Use TEST menu to perform DEFLT (restore defaults) procedure, then calibrate scale
EPCKSM	Parameter checksum error	
ADCHKSUM	A/D calibration checksum error	A/D converter requires calibration. Call Rice Lake Weighing Systems Service
PFCKSUM	Printer format checksum error	Call Rice Lake Weighing Systems Service
LCCKSM	Load cell calibration checksum error	Calibrate scale
EIDATA	Internal RAM checksum error	Call Rice Lake Weighing Systems Service
E REF	A/D reference error	A/D converter requires calibration. Call Rice Lake Weighing Systems Service
Error	Internal program error	Check configuration. Run XE command to determine error type Call Rice Lake Weighing Systems Service if unable to clear error by cycling power or if error recurs
OVER	Gross value setting exceeds overload limit	Check configuration or signal input level. Overload can be caused by input signal > 45 mV or common mode voltage > 950 mV
UNDER	A/D under range	A/D reading is less than –4 mV. Check scale for mechanical interference or damage
NO COM	No communication with j-box	Check coiled cable connections Check coiled cable for damage
ERRSS	Serial Scale Error	Correct wiring - check wiring connections, load cell wires, and excitation on j-box. Change j-box
ANGLE	Forks not level within 7"	Position forks to within level condition
-WAIT-	J-Box is powering up	This message is a normal action of the indicator
ErrCell	J-Box is reporting a generic error	Use test mode to diagnose the problem
LowBat	J-Box low voltage error	Disconnect the coiled homerun cable at the indicator, reconnect to remove the error message Correct wiring – check +excitation wiring connections on the j-box PCB. Check load cell wires for damage Change j-box

Table 5-2. Error Messages

RICE LAKE
WEIGHING SYSTEMS

6.0   CLS-420 Specifications

Scale Capacity:

28" and 34":	5,000 lb x 5 lb NTEP Certified
38":	8,000 lb x 5 lb non-type approved

Scale Power:

Supplied by indicator through coiled interface cable

Scale Material/Finish:

Painted steel

420 Plus Display:

0.8" (20 mm), six-digit super red light emitting diode (LED), seven-segment digits

420 Power - DC:

Line voltages: 9-36 VDC DC input
Power consumption: 0.75 A max fused at 5.0 A
Line voltage 10-60 VDC input
Power consumption: 0.75 A max fused at 5.0 A

420 Status Annunciators:

Designators for: Center of zero, stand still, gross, net, lb, kg, tare

420 Operating Temperature:

Legal: 14° F to 104° F (-10°C to 40°C)
Industrial: 14° F to 122° F (-10°C to 50°C)

Warranty:

Two-year limited warranty

FCC Statement

The *420* complies with Part 15 of the FCC Rules. Operation is subject to the following conditions:

- This device may not cause harmful interference.
- This device must accept any interference received, including interference that may cause undesired operation.

Certifications and Approvals

	CoC Number	06-074 (5,000 lb only) per H-44 at 1,000 divisions
	Accuracy Class	III/III L
	n_{max}: 10 000	