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CLS-Series

Cargo Lift Scale

Service Manual



RICE LAKE®
WEIGHING SYSTEMS
To be the best by every measure®

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About This Manual

This manual is intended for use by individuals responsible for servicing the CLS-920i and the CLS-420 Cargo Lift scale.

This manual contains technical instructions and procedures for servicing the CLS Series scales and covers information on load cell replacement, junction box replacement, replacement parts and troubleshooting procedures. Any repairs to the indicator include instructions on CPU board and fuse replacement.

This manual does not attempt to cover actual unpacking, installation and operating procedures as they are covered in the *CLS-920i Installation Manual*, PN 96312, and *CLS-420 Installation Manual*, PN 96483.

1.0 Introduction

The CLS Series Cargo Lift scale is a rugged, dependable cargo lift scale that can withstand many years of use. When mounted on a forklift, the CLS Series can weigh, transfer and collect data in one efficient operation. It saves operator time, equipment costs and eliminates the middle step.

The CLS Series is used with either Rice Lake's 920i® HMI digital weight indicator or the 420 digital weight indicator.



Figure 1-1. CLS Series Cargo Lift Scale

The following sections of this manual deal with any servicing issues that might arise with this product.

Areas described include:

- Load cell replacement
- Junction box/board replacement
- CPU board replacement
- Troubleshooting

1.1 Safety

Safety Signals

Safety Symbol Definitions:



Indicates an imminently hazardous situation that, if not avoided, will result in death or serious injury.



Indicates a potentially hazardous situation that, if not avoided could result in death or serious injury, and includes hazards that are exposed when guards are removed.



Indicates a potentially hazardous situation that, if not avoided may 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 you have read and understand the instructions and warnings in this manual. 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. Proper care is your responsibility.



Failure to heed may result in serious injury or death.

Some procedures described in this manual require work inside the power/communication box. 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.

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 than 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.

DO NOT use near water.

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

2.0 Load Cell Replacement

This section describes procedures for replacing the load cell should it need to be changed. A replacement parts kit is available (PN 97883), see Section 6.1 for parts included.

Following the instructions below for a 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.

2.1 Required Tools for Replacing a Load Cell

The following list of tools is necessary for replacing a load cell on the CLS Series Scale. Ensure that you have these necessary tools handy.

Part #	Item Description
96196	Modified box wrench (included in kit PN 97883)
	Crescent wrench
	3/4" Socket wrench, with extensions
	Hammer
	1-1/8" wrench for overload stop
	Chisel
	Allen wrench for overload stops
	Digital voltmeter (capable of reading millivolts)
	Torque wrench
	Pry bar

Table 2-1. Required Tools for Replacing a Load Cell

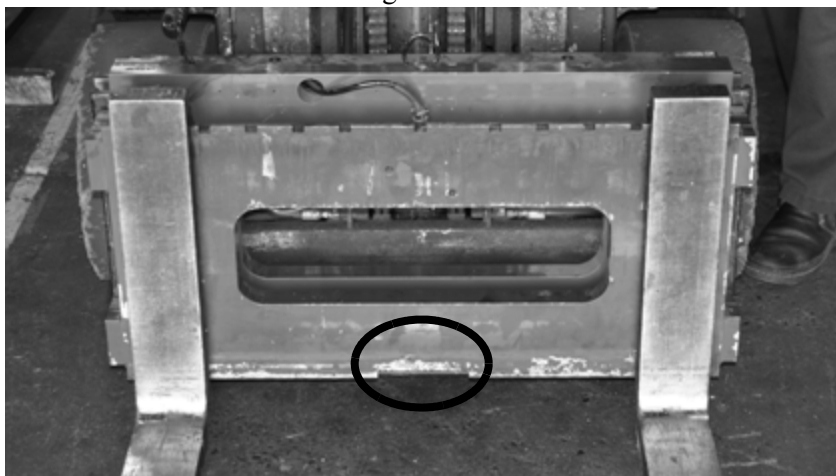


Note

Adequate light is necessary to change the load cell. Try to position the forklift close to a good source of natural light or if not possible, have a good source of lighting available.

Use the following steps to replace a load cell.

1. Raise the forklift carriage just slightly for forklift tine removal.
2. Slide the fork lift tines to the middle of the carriage to allow for removal of tines and set tines aside.



Slide tines to the middle of scale carriage

Figure 2-1. Forklift Tine Removal

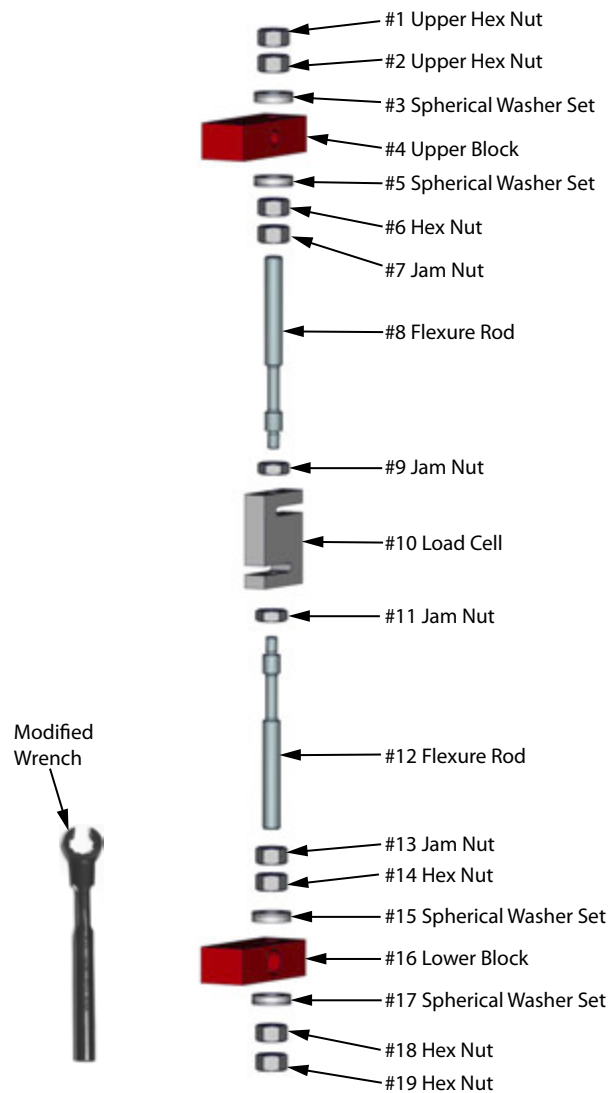


Figure 2-2. Load Cell Assembly Reference Parts

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



Note It's okay if the load cell slightly rotates up against the front or back plate of the scale.



Figure 2-3. Removal of Hex Nut (Item #1 in Figure 2-2)

5. Loosen jam nut from the upper block using the special modified box wrench (PN 96196 - supplied with load cell replacement kit) shown in Figure 2-2.
6. Loosen jam nut (#13) from the lower block.
7. Remove the top hex nut (#2) and the top spherical washer set (#3).
8. Loosen the two bottom hex nuts (#18 and #19) with a socket wrench.

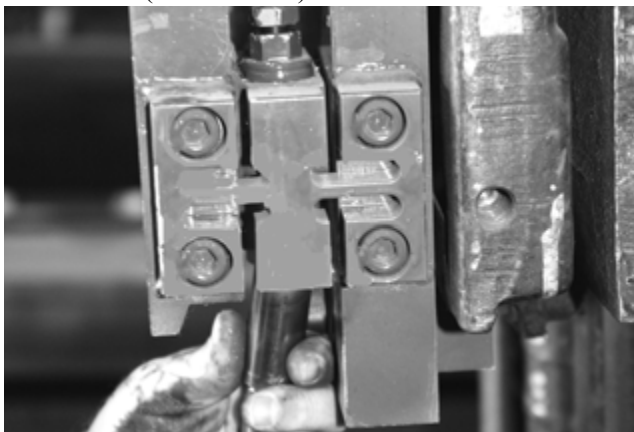


Figure 2-4. Loosen and Remove Bottom Hex Nut (#18 and #19 in Figure 2-2)



Note It's okay if the load cell slightly rotates up against the front or back plate of the scale.

9. Remove the bottom hex nuts (#18 and #19) and the bottom spherical washer set (#17).
10. Loosen the hex nut located under the upper block (#6).
11. Loosen the jam nut located on top of the load cell (#9).
12. Loosen the hex nut (#14) located on top of the lower block.
13. Loosen the hex nut (#11) on the lower side of the load cell.
14. Remove the bottom flexure rod (#12) and the top flexure rod (#8) sliding the remaining washer sets (#5 and #15) with it.
15. Disconnect the load cell cable from the junction box. Refer to Section 3 for steps.
16. Loosen cable clips and remove the load cell.

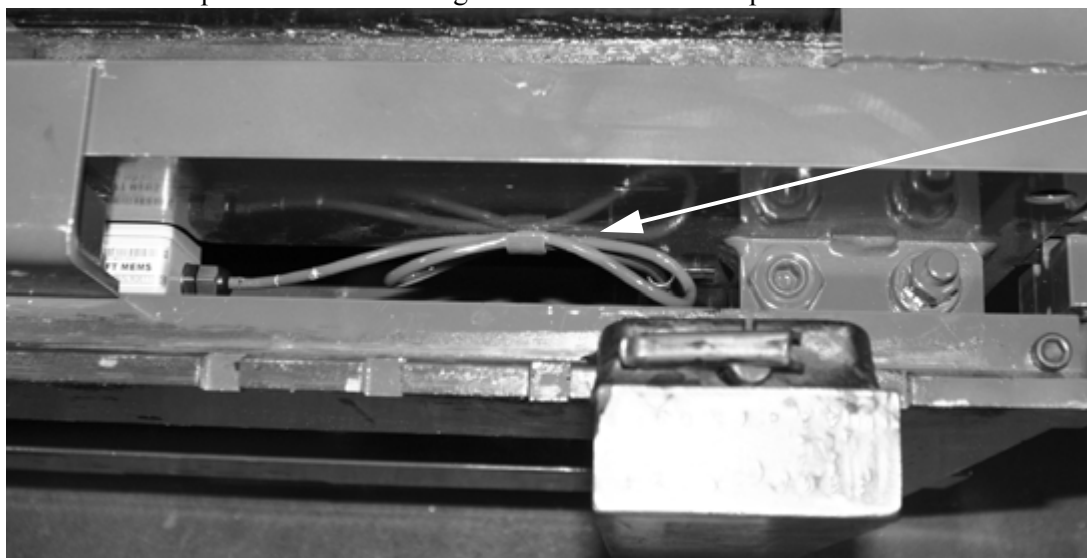


Ensure flexure rod threads are free of debris and paint by running a nut the full distance of the rod.

Figure 2-5. Remove Flexure Rod with Nuts and Washers

17. 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. If so, clean off any paint using a wire brush and oil.

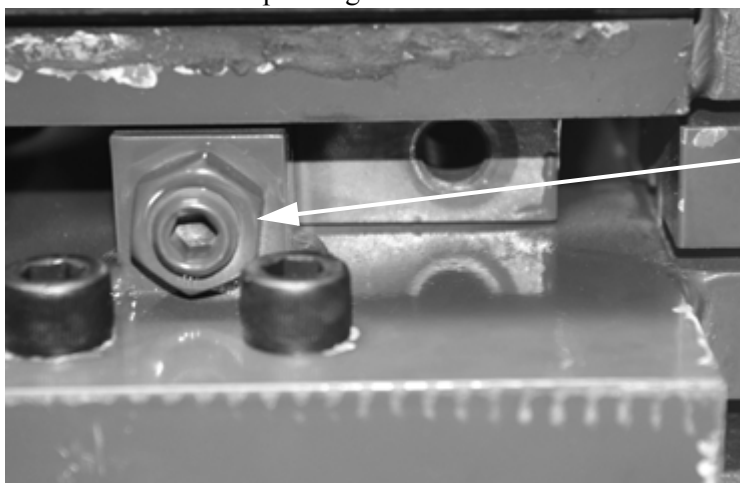
18. Oil the spherical washers using a standard machine shop oil.



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

Figure 2-6. Load Cell Cable Clips

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



Overload stops looking at top view.

Figure 2-7. Overload Stops Illustrated on a 34" Carriage

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



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

21. Install the top and bottom flexure rod with hardware ensuring that the flexure rod be oriented with the short thread of rod facing nearest the load cell.

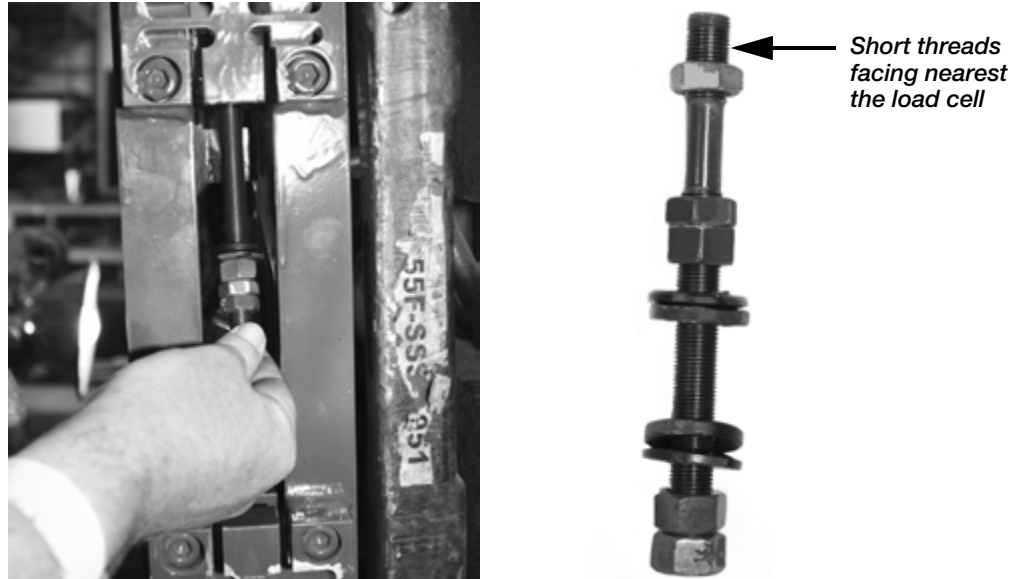


Figure 2-8. Installing Flexure into Scale

22. 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 2-2.
23. Screw in the rod and tighten jam nut but leave approximately two threads exposed outside of the jam nut. Do both the top and bottom of the load cell.
24. Use hex nuts to position the load cell in the center of the mounting blocks with an equal amount of flexure rod on top and bottom of the load cell.
25. Tighten the jam nuts on top and bottom of the load cell. Make sure they are tight and load cell is completely vertical to the scale. To accomplish this, you can use a pry bar or chisel to hold the cell straight as illustrated in Figure 2-9.

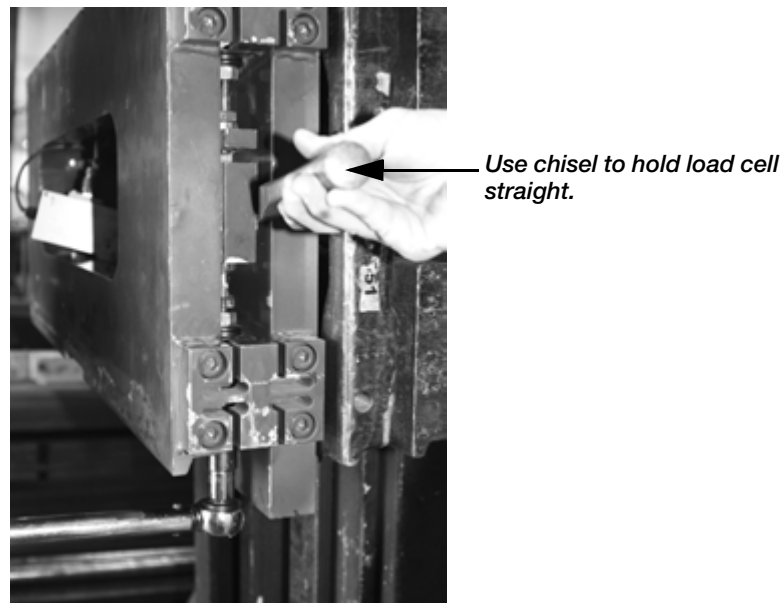


Figure 2-9. Use Chisel to Hold the Load Cell in Straight

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



Figure 2-10. Install Spherical Washer Set

27. Install a flat bladed screwdriver in upper mounting block between the hole and the flexure rod, forcing the flexure rod in the direction of the flexures.

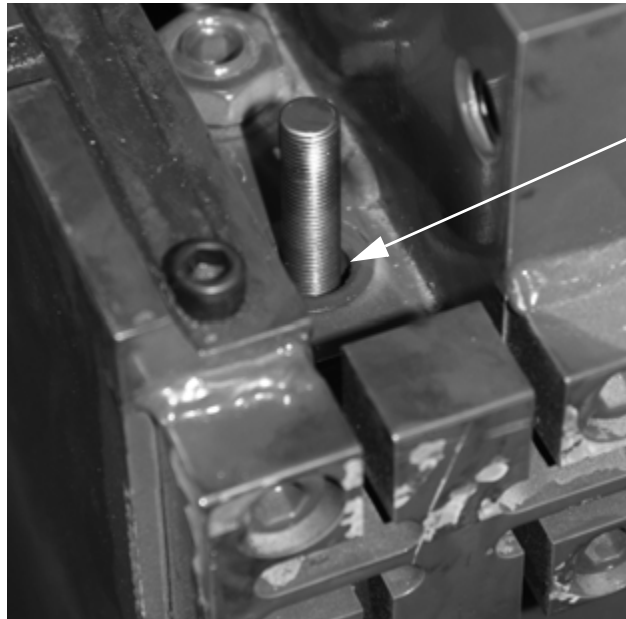


Figure 2-11. Centering the Flexure Rod

28. Use a pry bar or chisel to hold the load cell (bottom half of the 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 2-12. Centering the Load Cell Using a Chisel

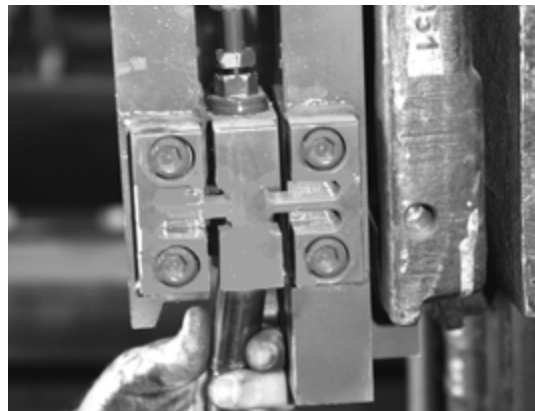


Figure 2-13. Tightening the Lower Hex Nut

29. Use the special modified box wrench to tighten the jam nut (#13) on the lower block.
30. Remove the flat bladed screwdriver as used in Step 25 and inspect the flexure rod. The flexure rod needs to 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 spherical washer set to adjust it to center.
31. Install the spherical washer set (#3) and hex nut (#2) on the top of the upper block.
32. Wire up the load cell cable to the junction box at this time.
33. Make sure that **ZTRKBN** is set to **Off** on the indicator.
34. Torque the hex nut (#2) on the upper mounting block until you see 100 lb on the indicator display. Tighten the lower hex nut (#6) below the upper mounting block using the modified box wrench and try to get the display as close to zero as possible.
35. 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 plate
36. 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.
37. Tighten the jam nut on the lower mounting block assembly.
38. Zero out the indicator display.
39. 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.
40. Place a weight in the center of the fork and check side to side values. If they are equal, you are done.
41. Tighten the overload stops when complete.
42. Make sure to set **ZTRKBN** to **On** on the indicator.

3.0 Junction Box Replacement

The CLS Series scale uses a NEMA 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 Series Cargo Lift Scale.

1. Remove the bolt that holds the top metal cover plate in place which conceals the junction box.

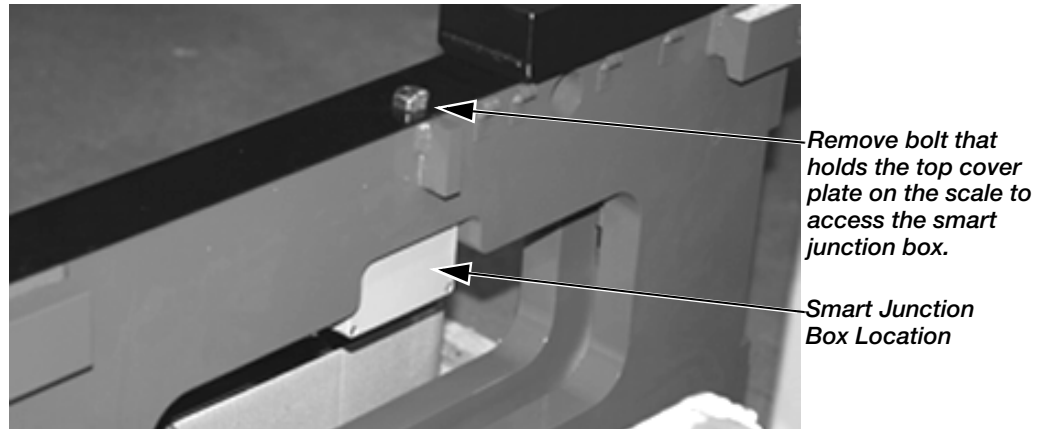


Figure 3-1. Top Cover Plate (scale shown not mounted on the forklift)

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 3-2 for screw location.

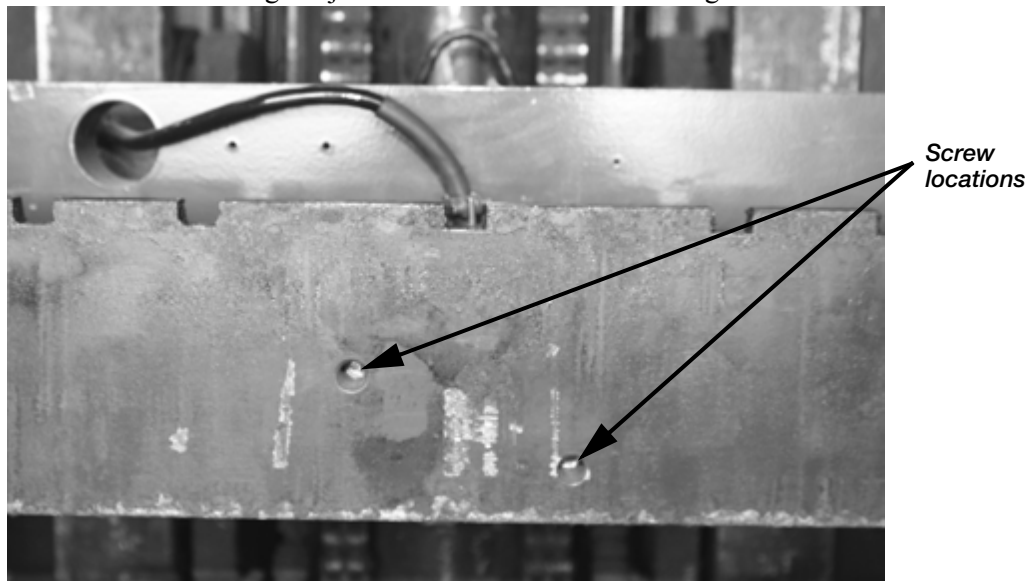


Figure 3-2. Screw Locations

5. Remove the indicator cable from the junction box (not applicable for wireless models).

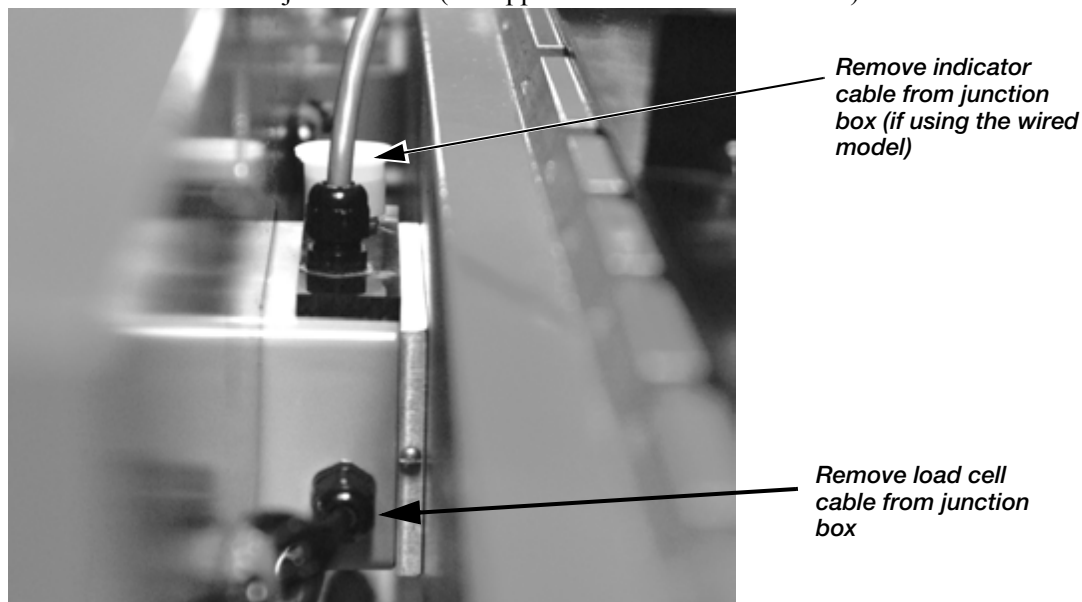


Figure 3-3. Junction Box Location Inside the Scale (wireless version shown above)

6. Loosen the load cell clips that hold the load cell cable to the scale back frame and their general location noted in Figure 2-6 on page 5.
7. Slip the junction box downward out of its current location between the front and back plates of the CLS.
8. Using a phillips head screwdriver, open the junction box cover to expose the inside and set the cover aside.

Bottom Board Information

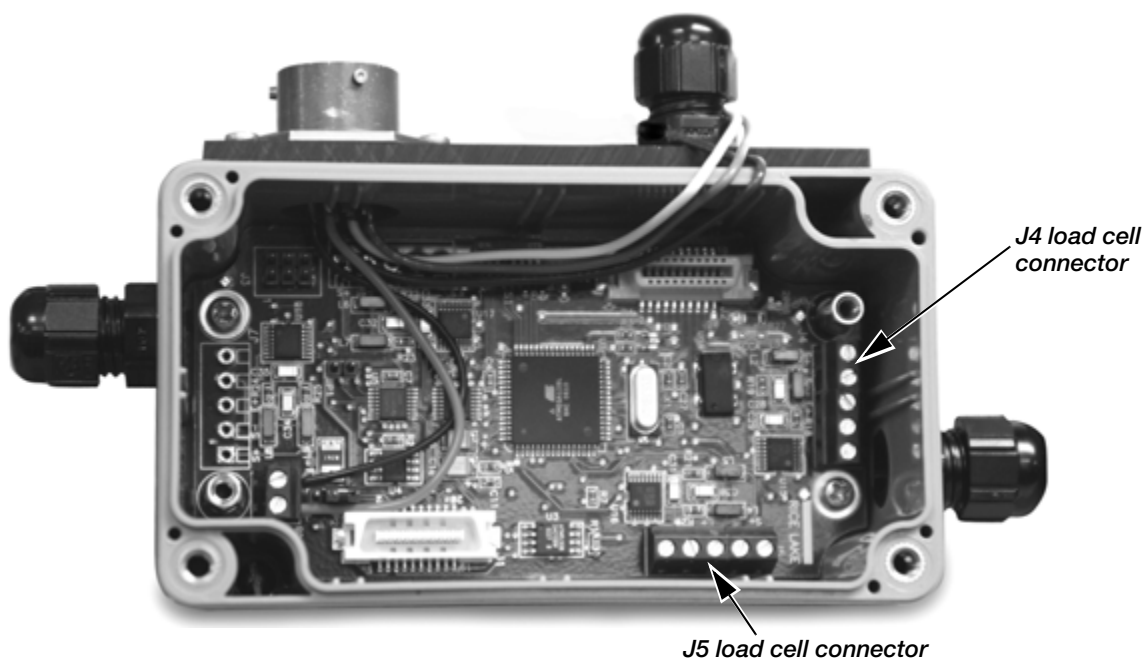


Figure 3-4. Inside of Junction Box - Bottom Board

The junction box has two boards within the box. To access the bottom board, remove the screws that hold the top board in place and flip the top board up and back out of the way as the wires that connect the top and bottom boards are long enough to accommodate this. The bottom board which is shown in Figure 3-4 connects the wiring for both load cells one and two. Table 3-1 lists the wiring assignments for the bottom board.

9. Reconnect the wires to the bottom board per Figure 3-4, Figure 3-5, and Table 3-1 listed below.

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 3-1. Load Cell Wiring

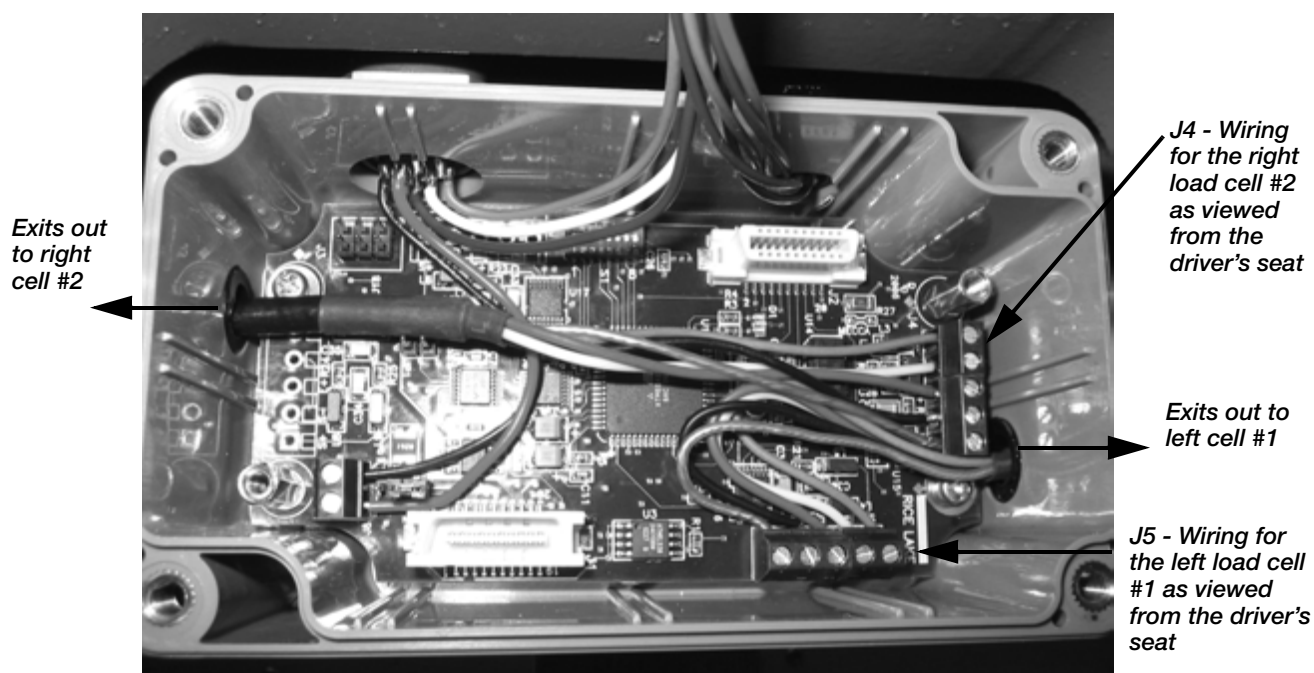


Figure 3-5. Bottom Board Wiring

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

Upper/Top Board Information

The second board, or the upper board is pictured in Figure 3-6.

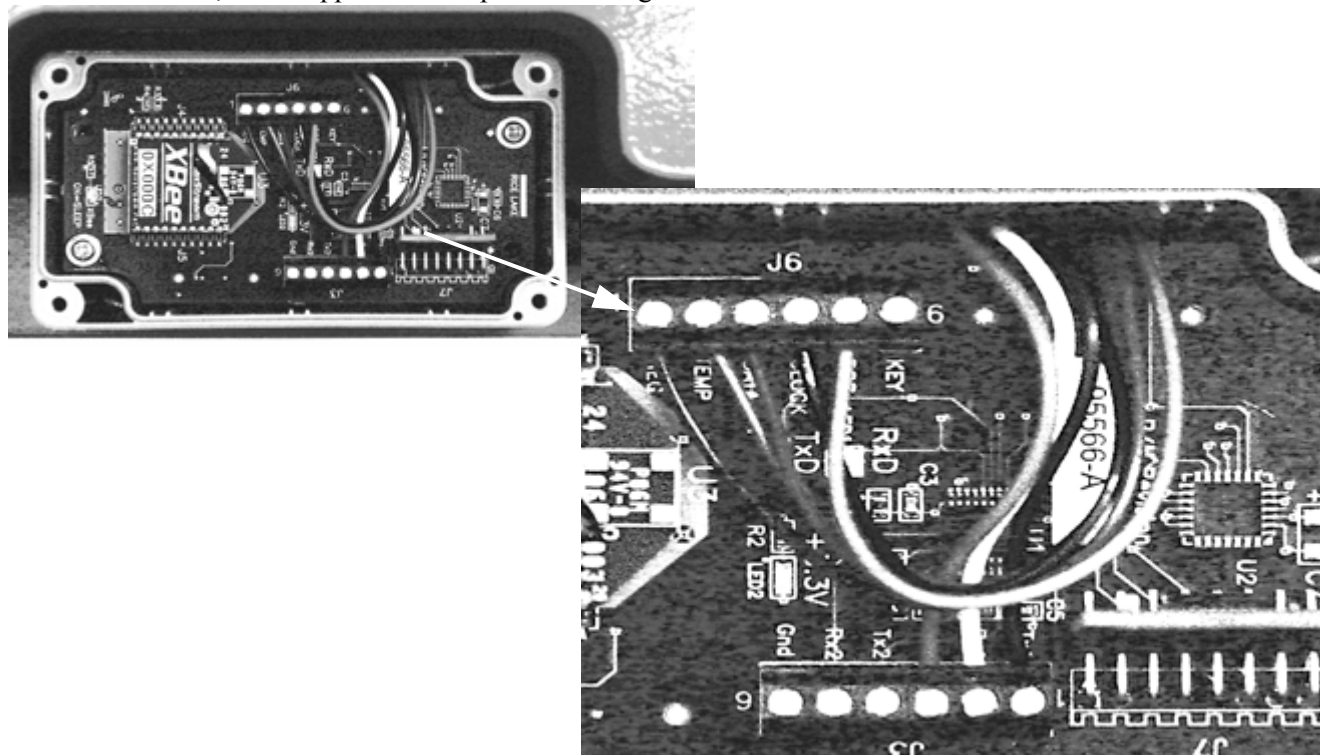


Figure 3-6. Inside of Junction Box - Top Board

The wiring from the bottom board is then brought up to be wired into the top board as shown in Figure 3-6, connecting into J3 and J6 connectors.

Table 3-2 shows the wiring to the top board connections.

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 3-2. 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.

4.0 Lithium-Ion Battery Charge and Replacement

If using a wireless version of the CLS Series Cargo Lift Scale, the CLS scale uses a supplied lithium-ion battery to supply power to the indicator. The lithium-ion battery is located on the top of the cover plate in a painted enclosure.

Replacement part numbers are as follows:

RLWS Part Number	Description
96343	Lithium-Ion Battery
96344	2-Bay Battery Charger
96345	10-Bay Battery Charger

Table 4-1. Battery Replacement Parts

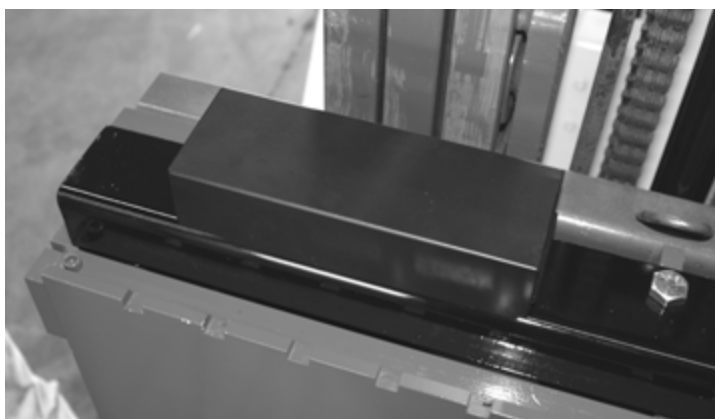


Figure 4-1. Lithium-Ion Battery Location

4.0.1 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	0° - +40°C (32° -104°F)
	Discharge	-20° - +60°C (-4° -140°F)
	Storage	-20° - +50°C (-4° -122°F)
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 4-2. Battery Specifications

4.0.2 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 a AC power cord as shown in Figure 4-2.



Figure 4-2. 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 4-3. Battery Charging LED Signals

4.0.3 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 quarterly basis. To do this, place the battery in the left bay of the charger and press the button on the front label (see Figure 4-2). This will initiate 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.

4.0.4 Battery Removal

The lithium-ion battery itself is housed inside of the battery box which is located on the top plate of the scale and is encased in a foam core protecting it from vibration.

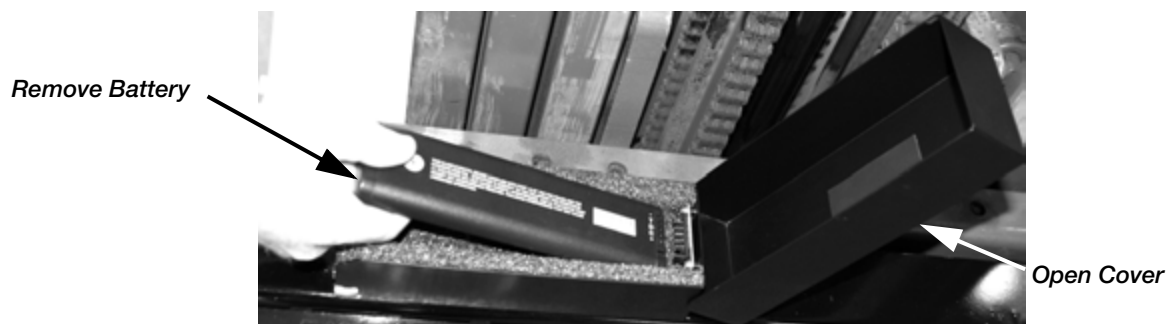


Figure 4-3. Lithium-ion Battery Removal

Figure 4-3 shows how to pull the lithium-ion battery out of the battery box.

4.1 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 a minimum of 24 hours continuous use, with only 8 hours to fully charge.

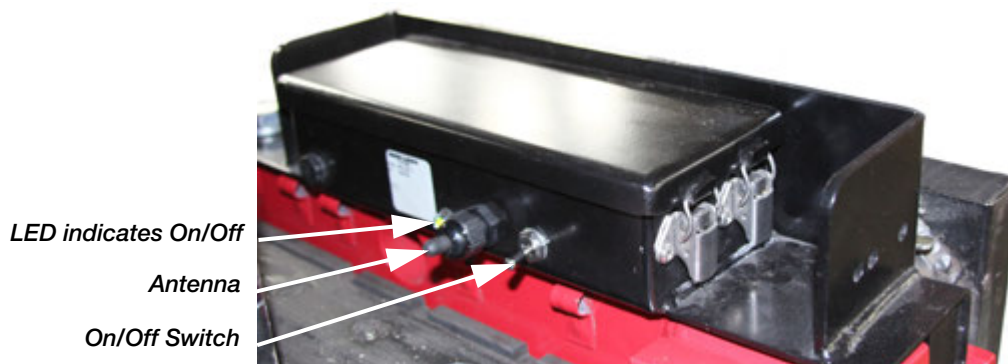
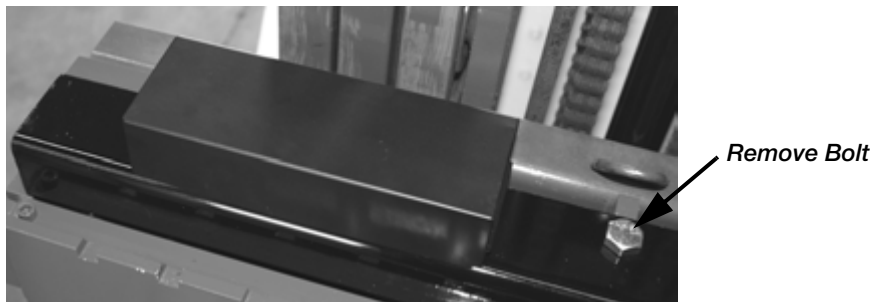


Figure 4-4. Wireless Battery Option

4.1.1 Installing Wireless Option on Existing Unit



Disconnect wiring??

Loosen the top bolt to remove the existing cover.

Place the Wireless Option cover on the scale and secure with the bolt.

what else needs to be done to connect to the indicator??

4.1.2 Battery Removal and Installation

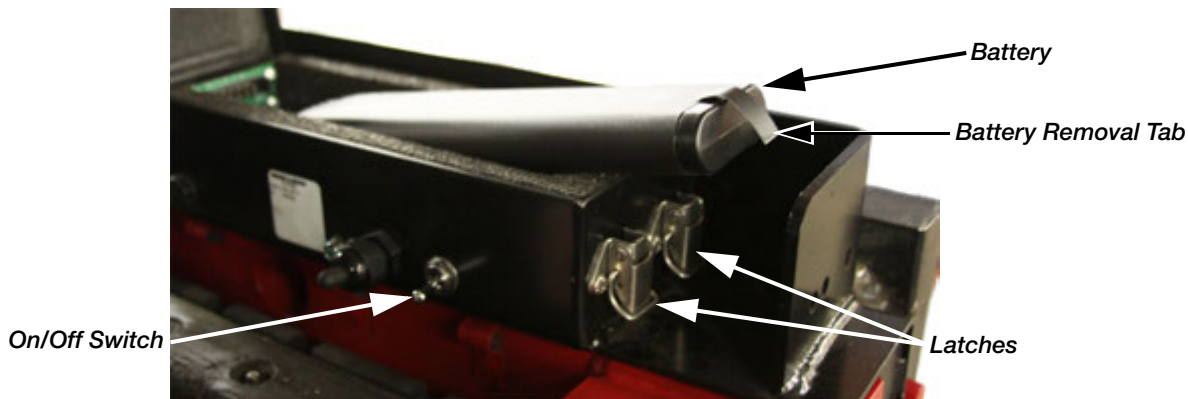


Figure 4-5. Battery Removal and Installation

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

4.2 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.



MSDS LITHIUM-ION BATTERIES (Li-ion)

The batteries referenced herein are exempt articles and are **not** 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 ₃ H ₄ O ₃
	Diethyl Carbonate – Solvent	C ₅ H ₁₀ O ₃
	Lithium Hexafluorophosphate – Salt	LiPF ₆

The overall reaction is: $\text{Li}_x\text{C} + \text{Li}_{1-x}\text{CoO}_2 \leftrightarrow \text{C} + \text{LiCoO}_2$

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.

5.0 Board Replacement

Use the following procedures in the event that the CPU board on either the 420 or the 920i need to be replaced. Board replacement for the 420 indicator is covered in Section 5.1 and board replacement for the 920i indicator is covered in Section 5.2.

5.1 CLS-420 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.

5.1.1 Cable Grounding

Except for the power cord, all cables routed through the cord grips should be grounded against the indicator enclosure. Do the following to ground shielded cables:

- Use the lockwashers, clamps, and kep nuts provided in the parts kit to install grounding clamps on the enclosure studs adjacent to cord grips. Install grounding clamps only for cord grips that will be used; do not tighten nuts.
- Route cables through cord grips and grounding clamps to determine cable lengths required to reach cable connectors. Mark cables to remove insulation and shield as described below:
- For cables with foil shielding, strip insulation and foil from the cable half an inch (15 mm) past the grounding clamp (see Figure 5-1). Fold the foil shield back on the cable where the cable passes through the clamp. Ensure silver (conductive) side of foil is turned outward for contact with the grounding clamp.
- For cables with braided shielding, strip cable insulation and braided shield from a point just past the grounding clamp. Strip another half inch (15 mm) of insulation *only* to expose the braid where the cable passes through the clamp (see Figure 5-1).
- For 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.
- Route stripped cables through cord grips and clamps. Ensure shields contact grounding clamps as shown in Figure 5-1. Tighten grounding clamp nuts.
- Finish installation using cable mounts and ties to secure cables inside of indicator enclosure.

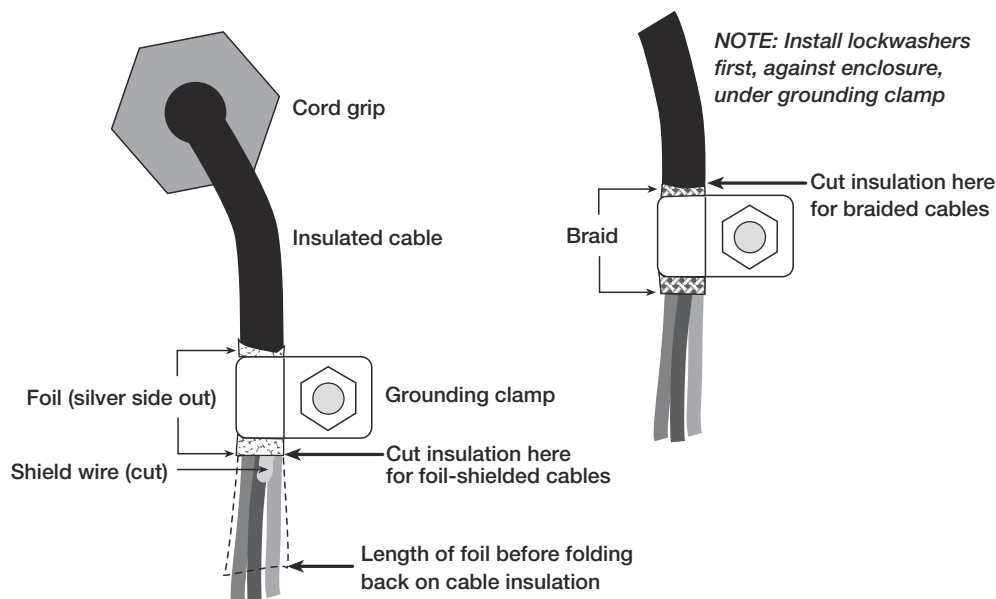


Figure 5-1. Grounding Clamp Attachment for Foil-Shielded and Braided Cabling

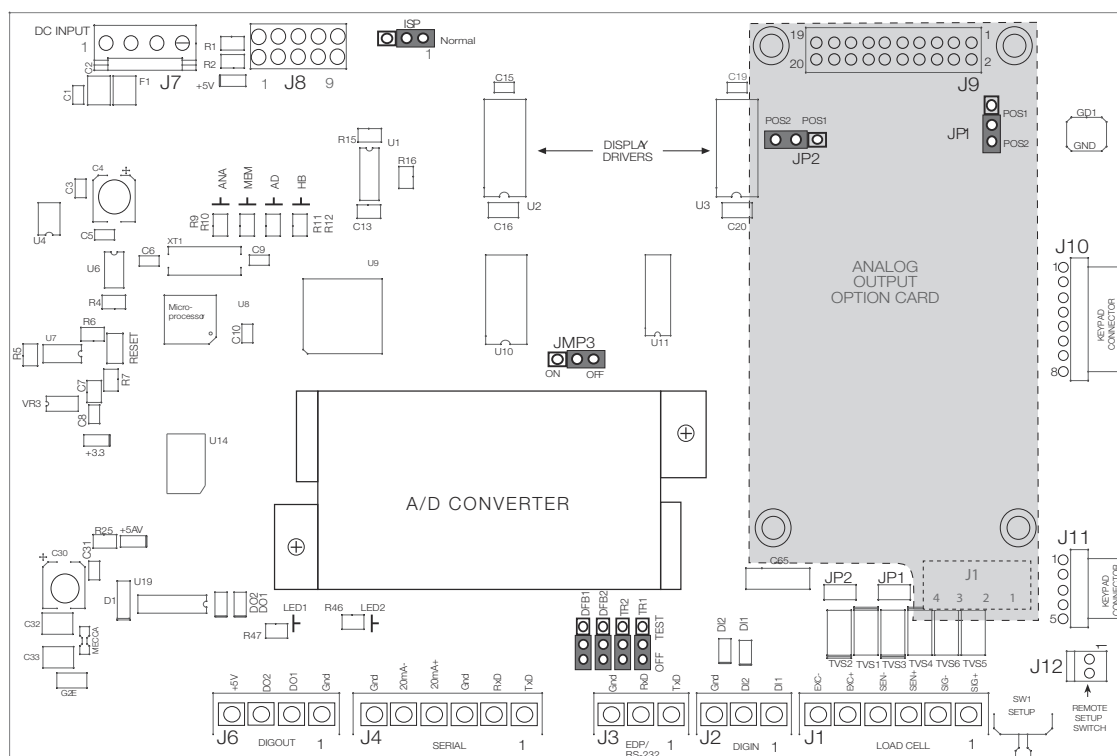


Figure 5-2. 420 CPU and Power Supply Board with Analog Output Option Card

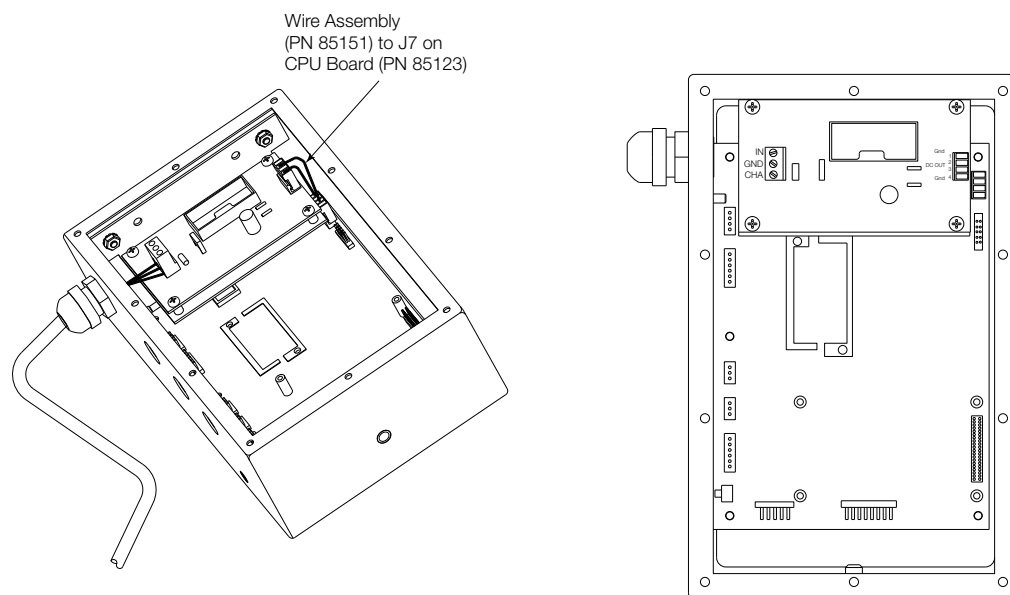


Figure 5-3. 420 DC Power Supply

5.1.2 DC Power Wiring Guidelines

Based on:

- 8 x 350Ω
- Analog output installed
- Digital outputs sourcing 20mA each
- Drawing maximum current at 7.5 VDC from the DC/DC power supply



Note

DC power wiring to the indicator should be 18 AWG to 14 AWG for DC+, DC-, and earth ground conductors.

The indicator will be connected directly to the battery of the forklift. Ensure the type and style of forklift and the type of power it provides will be 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-Series scales work best with 12-36 VDC power source.

In longer power cable runs, voltage drop over the power conductor needs to be considered. See table and formula below to compute voltage drop.

$$V_{\text{DROP}} = (2.85\text{A})(x\Omega / 1000\text{ft})(\text{length of run in ft.})$$

2.85A = maximum current draw from DC/DC power supply

$x\Omega$ = Ohms from Table 5-1

Wire Gauge (AWG)	Cable Impedance (OHMS/1000ft)
14	2.252Ω
15	3.184Ω
16	4.016Ω
17	5.064Ω
18	6.385Ω

Table 5-1. Cable Impedance



Note

DC voltage supplied to DC/DC power supply should not be less than 9VDC. Using larger gauge wire will result in less voltage drop.

Example:

100ft run with 18 AWG wire

$$V_{\text{DROP}} = (2.85\text{A})(6.385\Omega / 1000\text{ft})(100 \text{ ft})$$

$$V_{\text{DROP}} = 1.82\text{V}$$

12VDC will drop to 10.18V after 100ft run.

5.1.3 Serial Communications

Using one 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 as shown in Table 5-2.

Once cables are attached, reconnect J3 and J4 to the headers on the board (see Figure 5-2). 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 3.0 on page 15 for configuration information.

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 5-2. 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 5-3. J2 and J6 Pin Assignments

5.1.4 Board Removal

If you must remove the 420 CPU board, 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 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 5-2 on page 22 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.

5.2 CLS-920i CPU Board Replacement

5.2.1 Enclosure Disassembly

The 920i indicator enclosure must be opened to install option cards and to connect cables for installed option cards.



WARNING The 920i has no on/off switch. Before opening the unit, ensure the power cord is disconnected from the forklift power source.

1. Place the indicator face-down on an antistatic work mat.
2. Remove the screws that hold the backplate to the enclosure body, then lift the backplate away from the enclosure and set it aside.

5.2.2 Cable Connections

The universal model of the 920i provides six cord grips for cabling into the indicator: one for the power cord, five to accommodate cabling for option cards. Install plugs in all unused cord grips to prevent moisture from entering the enclosure.

5.2.3 Cable Grounding

Except for the power cord, all cables routed through the cord grips should be grounded against the indicator enclosure. Do the following to ground shielded cables:

- Use the lockwashers, clamps, and keps provided in the parts kit to install grounding clamps on the enclosure studs adjacent to cord grips. Install grounding clamps only for cord grips that will be used; do not tighten nuts.
- Route cables through cord grips and grounding clamps to determine cable lengths required to reach cable connectors. Mark cables to remove insulation and shield as described below:
- For cables with foil shielding, strip insulation and foil from the cable half an inch (15 mm) past the grounding clamp (see Figure 5-4). Fold the foil shield back on the cable where the cable passes through the clamp. Ensure silver (conductive) side of foil is turned outward for contact with the grounding clamp.
- For cables with braided shielding, strip cable insulation and braided shield from a point just past the grounding clamp. Strip another half inch (15 mm) of insulation *only* to expose the braid where the cable passes through the clamp (see Figure 5-4).

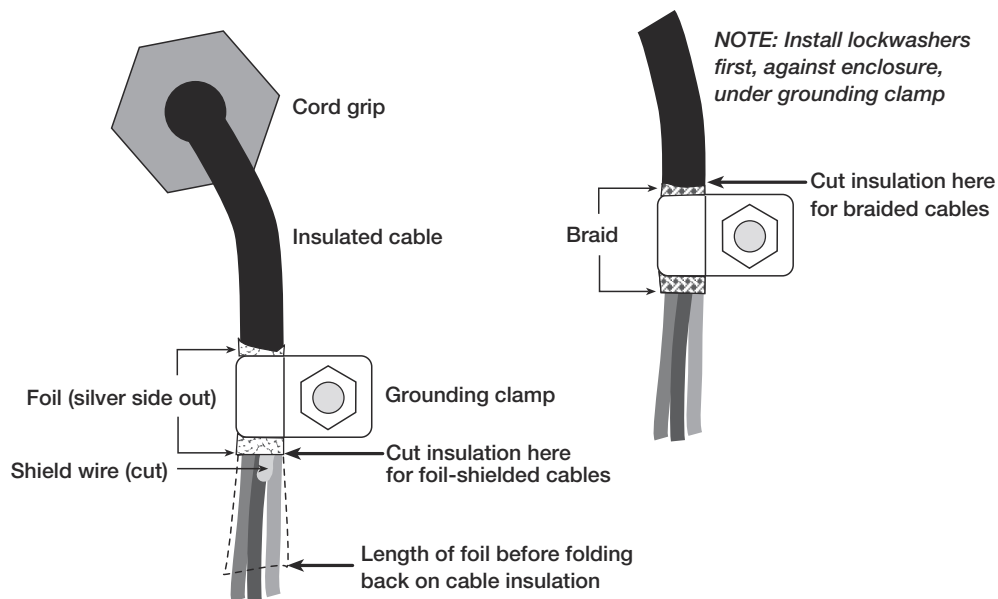


Figure 5-4. Grounding Clamp Attachment for Foil-Shielded and Braided Cabling

- For 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.
- Route stripped cables through cord grips and clamps. Ensure shields contact grounding clamps as shown in Figure 5-4. Tighten grounding clamp nuts.
- Finish installation using cable ties to secure cables inside of indicator enclosure.

5.2.4 Serial Communications

The four communications ports on the 920i CPU board support full duplex RS-232, 20 mA output, or RS-485 communications at up to 115200 bps.

To attach serial communications cables, route the cable through the cord grip and ground the shield wire as described in Section 5.2.3 on page 25. Remove the serial connector from the CPU board and wire to the connector. Once cables are attached, plug the connector into the header on the board. Use cable ties to secure serial cables to the inside of the enclosure.

Table 5-4 shows the pin assignments for Ports 1, 3, and 4. Port 2 provides DIN-8 and DB-9 connectors for remote keyboard attachment of PS/2-type personal computer keyboards (see Figure 5-5). The DB-9 connector pin assignments for Port 2 are shown in Table 5-5; see Section 10.3 on page 107 for information about the PS/2 keyboard interface.

Connector	Pin	Signal	Port
J11	1	GND	1 for Scanner
	2	RS-232 RxD	
	3	RS-232 TxD	
J9	1	GND / -20mA OUT	3
	2	RS-232 RxD	
	3	RS-232 TxD	
	4	+20mA OUT	
J10	1	GND / -20mA OUT	4 for Junction Box
	2	RS-232 RxD	
	3	RS-232 TxD	
	4	+20mA OUT	
	5	RS-485 A	
	6	RS-485 B	

Table 5-4. Serial Port Pin Assignments

Serial ports are configured using the SERIAL menu. See Section 3.2.2 on page 34 for configuration information.

An optional dual-channel serial communications expansion card, PN 67604, is also available. Each serial expansion card provides two additional serial ports, including one port that supports RS-485 communications. Both ports on the expansion card can support RS-232 or 20mA connections.

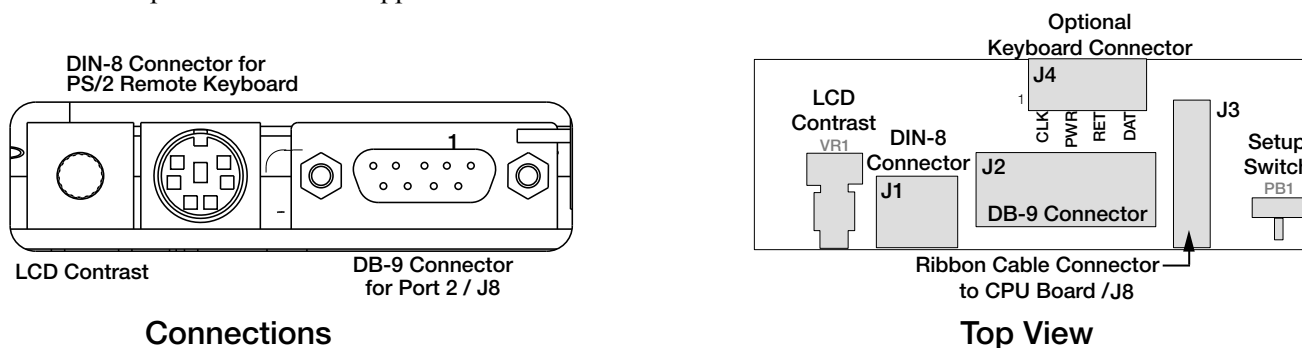


Figure 5-5. Interface Board

DB-9 Pin	Signal
2	TxD
3	RxD
5	GND
7	CTS
8	RTS

Table 5-5. DB-9 Connector Pin Assignments

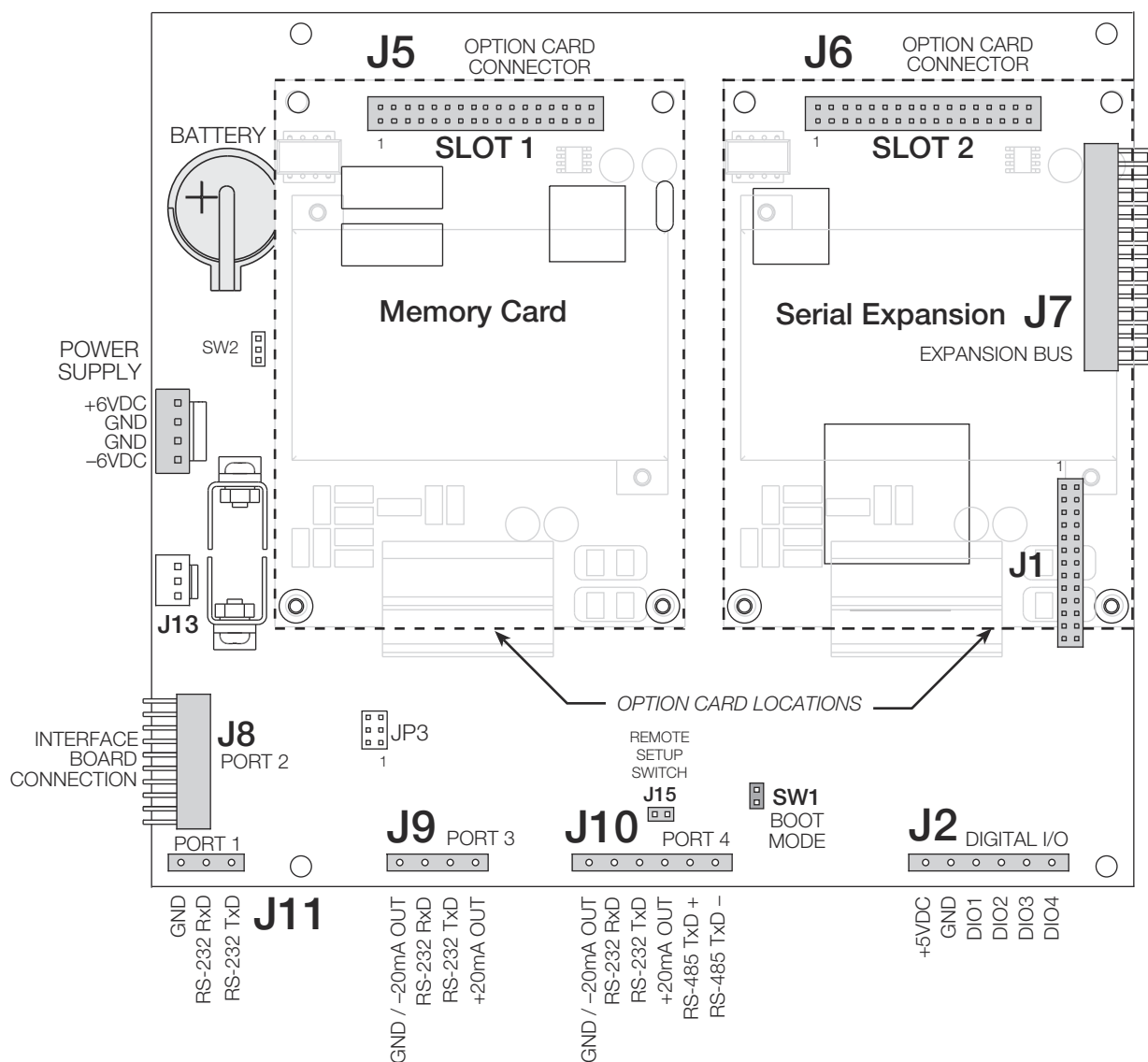


Figure 5-6. 920i CPU Board, Showing Option Card Locations

5.2.5 Digital I/O

Digital inputs can be set to provide many indicator functions, including all keypad functions. Digital inputs are active low (0 VDC), inactive high (5 VDC).

Digital outputs are typically used to control relays that drive other equipment. Outputs are designed to sink, rather than source, switching current. Each output is a normally open collector circuit, capable of sinking 24 mA when active. Digital outputs are wired to switch relays when the digital output is active (low, 0 VDC) with reference to a 5 VDC supply.

Table 5-6 shows the pin assignments for connector J2.

J2 Pin	J2 Signal
1	+5 VDC
2	GND
3	DIO 1
4	DIO 2
5	DIO 3
6	DIO 4

Table 5-6. J2 Pin Assignments (Digital I/O)

Digital inputs and outputs are configured using the DIG I/O menu. See Section 3.2.6 on page 47 for configuration information.

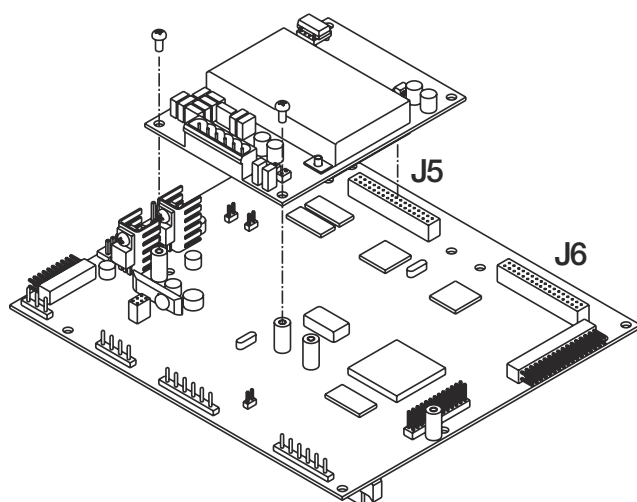
An optional 24-channel digital I/O expansion card, PN 67601, is available for applications requiring more digital I/O channels.

5.2.6 Installing Option Cards

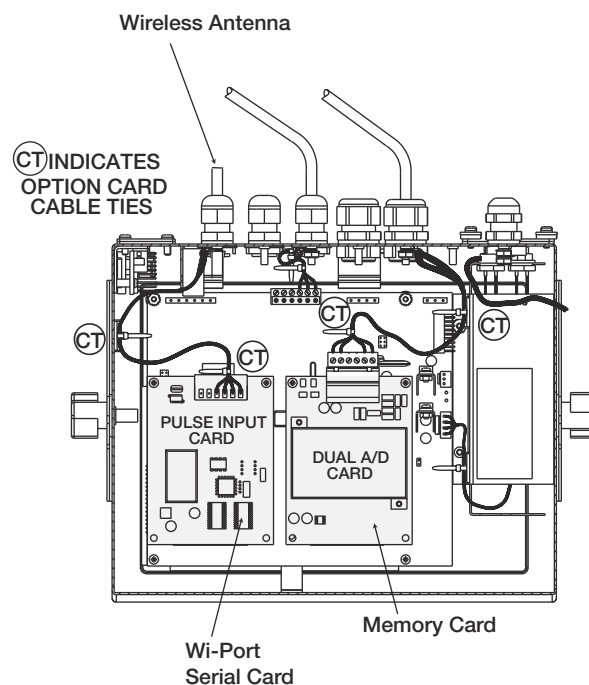
Each option card is shipped with installation instructions specific to that card. The general procedure for all option cards is as follows:

 **CAUTION** Option cards are not hot-pluggable. Disconnect power to the 920i before installing option cards.

1. Disconnect power to the indicator.
2. Remove backplate as described in Section 5.2.1.
3. Carefully align the large option card connector with connector J5 or J6 on the CPU board (see Figure 5-7).
4. Press down to seat the option card in the CPU board connector.
5. Use the screws provided in the option kit to secure the other end of the option card to the threaded standoffs on the CPU board (see Figure 5-7).
6. Make connections to the option card as required. Use cable ties to secure loose cables inside the enclosure as shown in Figure 5-7.
7. When installation is complete, reassemble the enclosure as described in Section 5.2.7.



Installing on CPU Board



Installed Showing Secured Cables

Figure 5-7. Installing Option Cards

The 920i automatically recognizes all installed option cards when the unit is powered on. No hardware-specific configuration is required to identify the newly-installed card to the system.

Expansion Board Serial Port Assignments

Serial port numbers are reserved for each option card slot, regardless of the type of cards actually installed. Two port numbers are reserved for each slot that could contain a dual-channel serial expansion card. Table 5-7 shows the port numbers assigned to each slot.

Slot Number	Serial Port Assignments
CPU board	1–4
1	5–6
2	7–8
3	9–10
4	11–12
5	13–14
6	15–16
7	17–18
8	19–20
9	21–22
10	23–24
11	25–26
12	27–28
13	29–30
14	31–32

Table 5-7. Expansion Board Serial Port Assignments

5.2.7 Enclosure Reassembly

Once cabling is complete, position the backplate over the enclosure and reinstall the backplate screws. Use the torque pattern shown in Figure 5-8 to prevent distorting the backplate gasket. Torque screws to 15 in-lb (1.7 N-m).

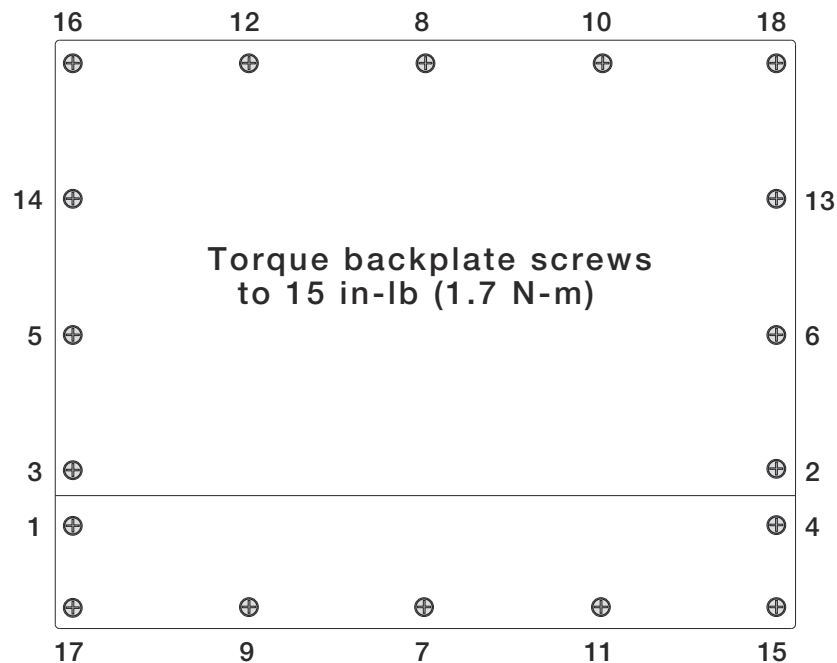


Figure 5-8. Torque Pattern

5.2.8 CPU Board Removal

If you must remove the 920i CPU board, use the following procedure:

1. Disconnect power to the indicator.
2. Remove backplate as described in Section 5.2.1.
3. Unplug connectors J9, J10, and J11 (serial communications), J2 (digital I/O), P1 (power supply), and connectors to any installed option cards.
4. Remove any installed option cards.
5. Remove the five Phillips head screws and two key nuts from the CPU board.
6. Gently lift up the CPU board, then disconnect connectors J12 (power to display), J4 (ribbon cable, J3 (keypad connector), then the cable J8 (Port 2 serial port).
7. Remove CPU board from the enclosure. If necessary, cut cable ties to shift cables out of the way.

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

5.2.9 Fuse Replacement

Fuses for the universal and deep enclosure models of the 920i are located under a cover plate on the outside of the enclosure. Remove the cover plate, replace the fuses, and reinstall the cover plate (see Figure 5-9).



CAUTION To protect against the risk of fire, replace fuses only with same type and rating fuse.

See 920i Operators Manual (PN 67887) for complete fuse specifications.



Important Interface board and fuse access cover plates must be in place for use in NEMA 4X/IP66 applications.

1

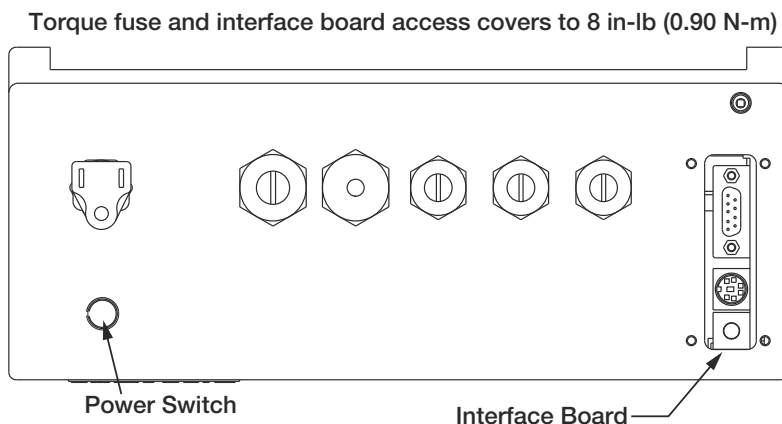


Figure 5-9. Interface Board and Fuse Locations, Universal Model

5.2.10 Battery Replacement

The lithium battery on the CPU board maintains the real-time clock and protects data stored in the system RAM when the indicator is not connected to AC power.

Data protected by the CPU board battery includes time and date, truck and tare memory, onboard database information, and setpoint configuration.

Use *iRev* to store a copy of the indicator configuration on a PC before attempting battery replacement. If any data is lost, the indicator configuration can be restored from the PC.

NOTE: Memory option card data is also protected by a lithium battery. All database information stored on a memory card is lost if the memory card battery fails.

Watch for the low battery warning on the LCD display and periodically check the battery voltage on both the CPU board and on any installed memory option cards. Batteries should be replaced when the indicator low battery warning comes on, or when battery voltage falls to 2.2 VDC. Life expectancy of the battery is ten years.

See Figure 5-6 on page 27 for CPU board battery location and orientation (positive side up).



WARNING Risk of explosion if battery is replaced with incorrect type. Dispose of batteries per manufacturer instruction.

5.2.11 Parts Kit Contents

Table 5-8 lists the parts kit contents for the universal model of the 920i.

PN	Description
14626	Kep nuts, 8-32NC (4)
14862	Machine screws, 8-32NC x 3/8 (12)
75068	Sealing washers (14)
15133	Lock washers, No. 8, Type A (4)
30623	Machine screws, 8-32NC x 7/16 (2)
15631	Cable ties (4–single A/D, 6–dual A/D)

Table 5-8. Parts Kit Contents

PN	Description
15665	Reducing glands for 1/2 NPT cord grips (2)
15887	6-position screw terminal for load cell connection (1–single A/D, 2–dual A/D)
19538	Cord grip plugs (4–single A/D, 3–dual A/D)
42350	Capacity label (1–single A/D, 2–dual A/D)
53075	Cable shield ground clamps (4)
70599	6-position screw terminals for J2 and J10 (2)
71126	4-position screw terminal for J9 and optional keyboard connection (2)
71125	3-position screw terminal for J11 (1)
42149	Rubber feet for tilt stand (4)
15144	Nylon washers for tilt stand, 1/4 x 1 x 1/16 (2, universal model only)
68403	Wing knobs for tilt stand (2)

Table 5-8. Parts Kit Contents (Continued)

5.2.12 Downloading CLS Configuration and User Program Software

6.0 Replacement Parts

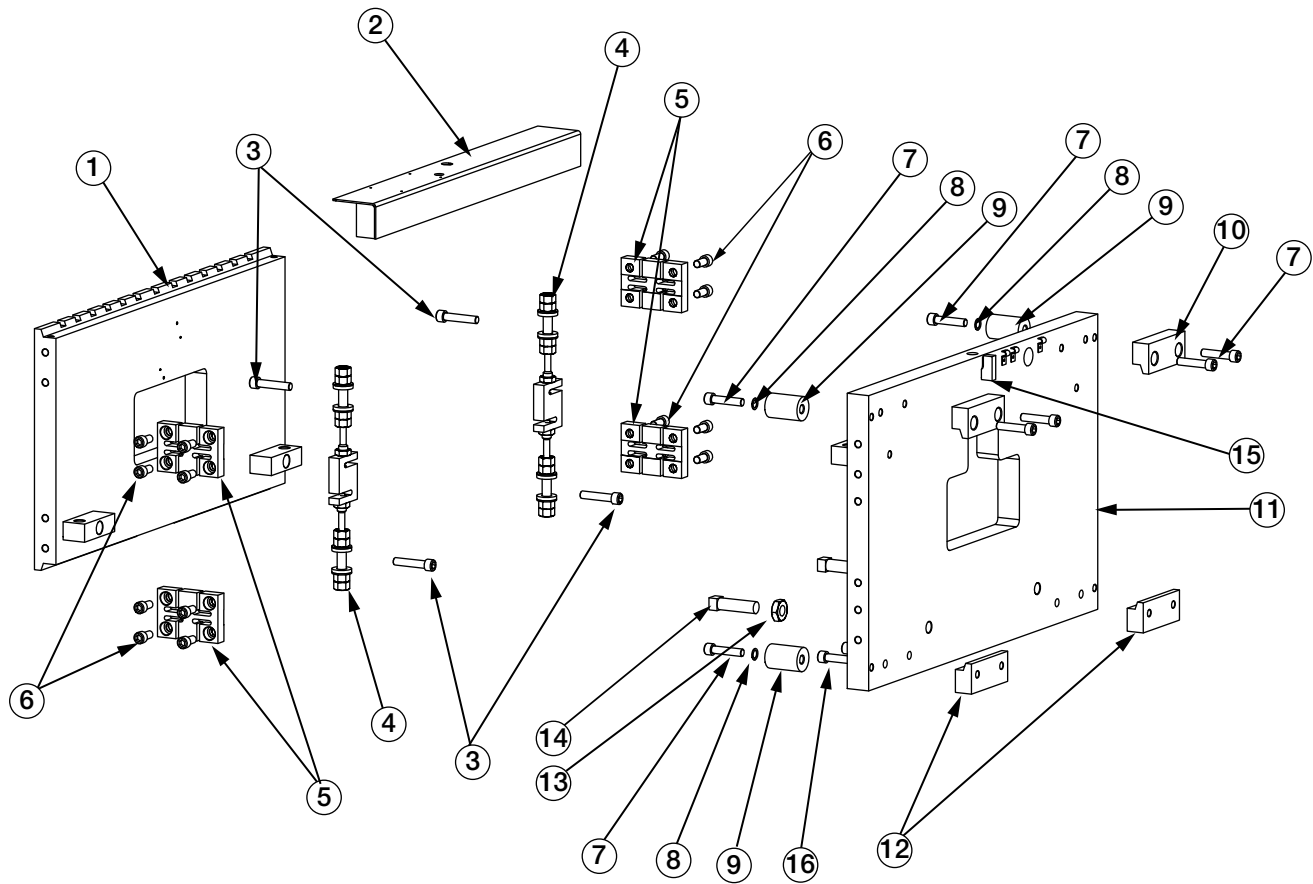


Figure 6-1. CLS Forklift Scale Parts Illustration

Item No.	Part No.	Description	Qty
1	111234	Front Plate	1
2	100073	Angle Protective WLDT	1
3	109953	Screw, Cap 5/8-11NCx3	4
4	97883	Load Cell Replacement Kit (see Figure 6-2)	2
5	109976	Flexure	4
6	92829	Screw Cap 5/8-11NCx1-1/4	16
7	109952	Screw, Cap 5/8-11NCx2-1/2	8
8	109961	Washer Black Steel 5/8	4
9	109967	Overload Stop	4
10	109980	Cleat, Top	2
11	111233	Back Plate	1
12	109981	Cleat, Bottom	2
13	14701	Nut, Jam 1-8 NC Hex Steel	2
14	109992	Shim Bolt	2
15	92831	Index Pin	1
16	111123	Screw, Cap 5/8-11NCx3-1/2	4

Table 6-1. CLS Forklift Scale Parts List

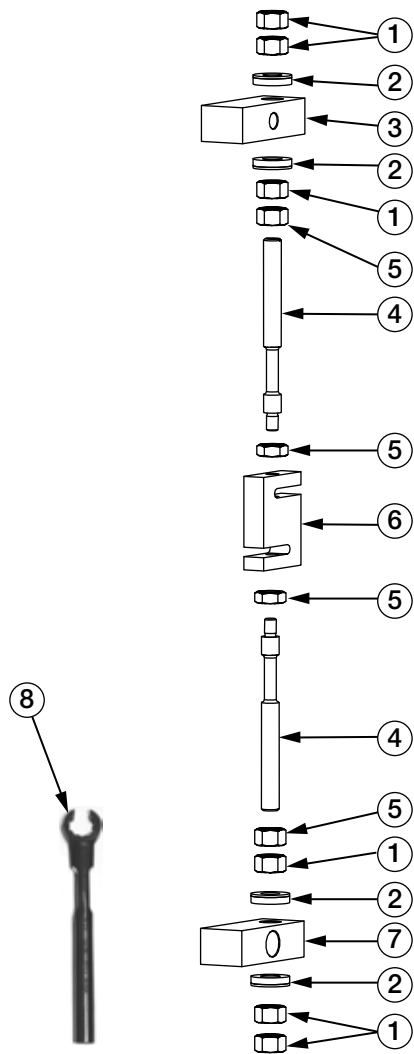


Figure 6-2. Load Cell Replacement Kit Parts Illustration

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	1
7		Lower Block	Ref
8	96196	Wrench, Box Load Cell	1

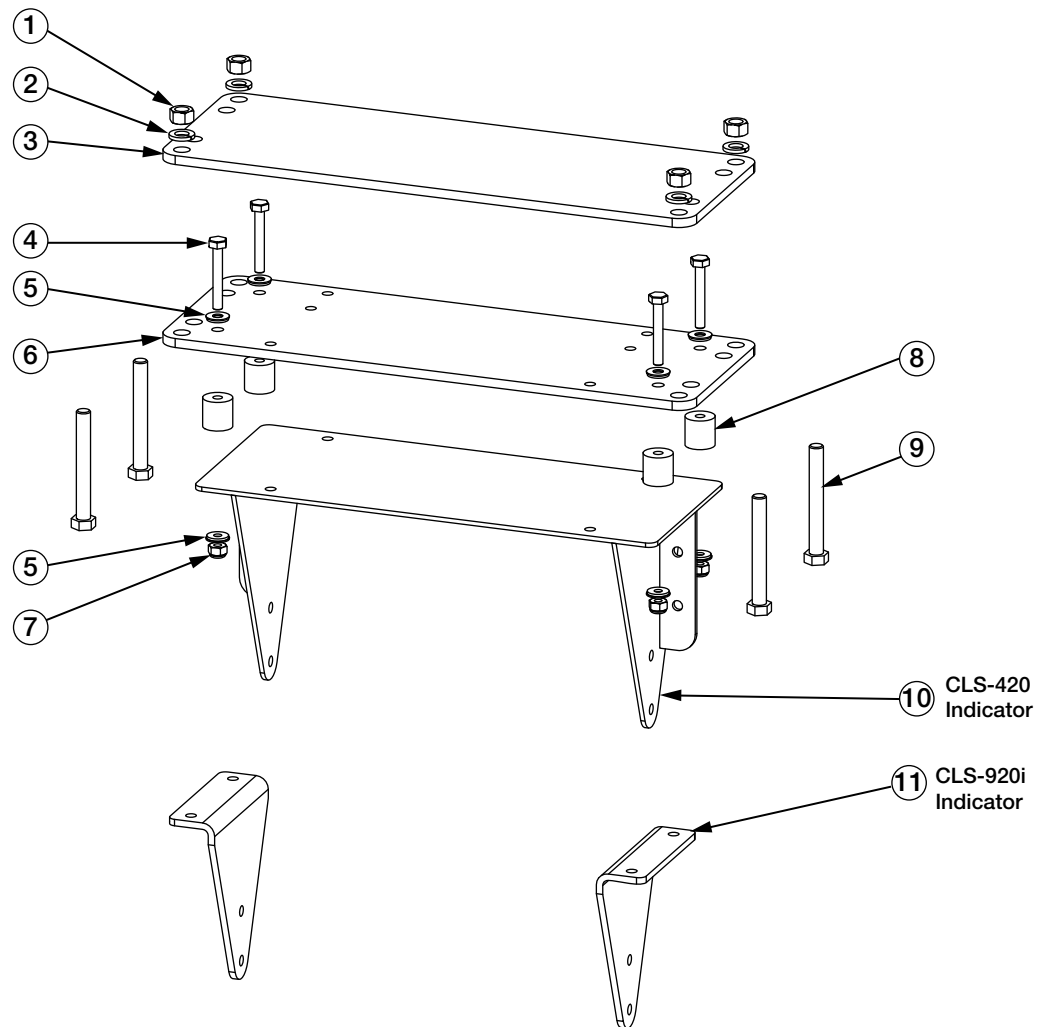


Figure 6-3. Indicator Mounting Bracket Parts Illustration

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 1/4-20NCx1-3/4	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
11	121004	Bracket, Side Angled CLS920i	2

Table 6-2. Indicator Mounting Bracket Parts List

6.0.1 CLS 420 Indicator Replacement Parts

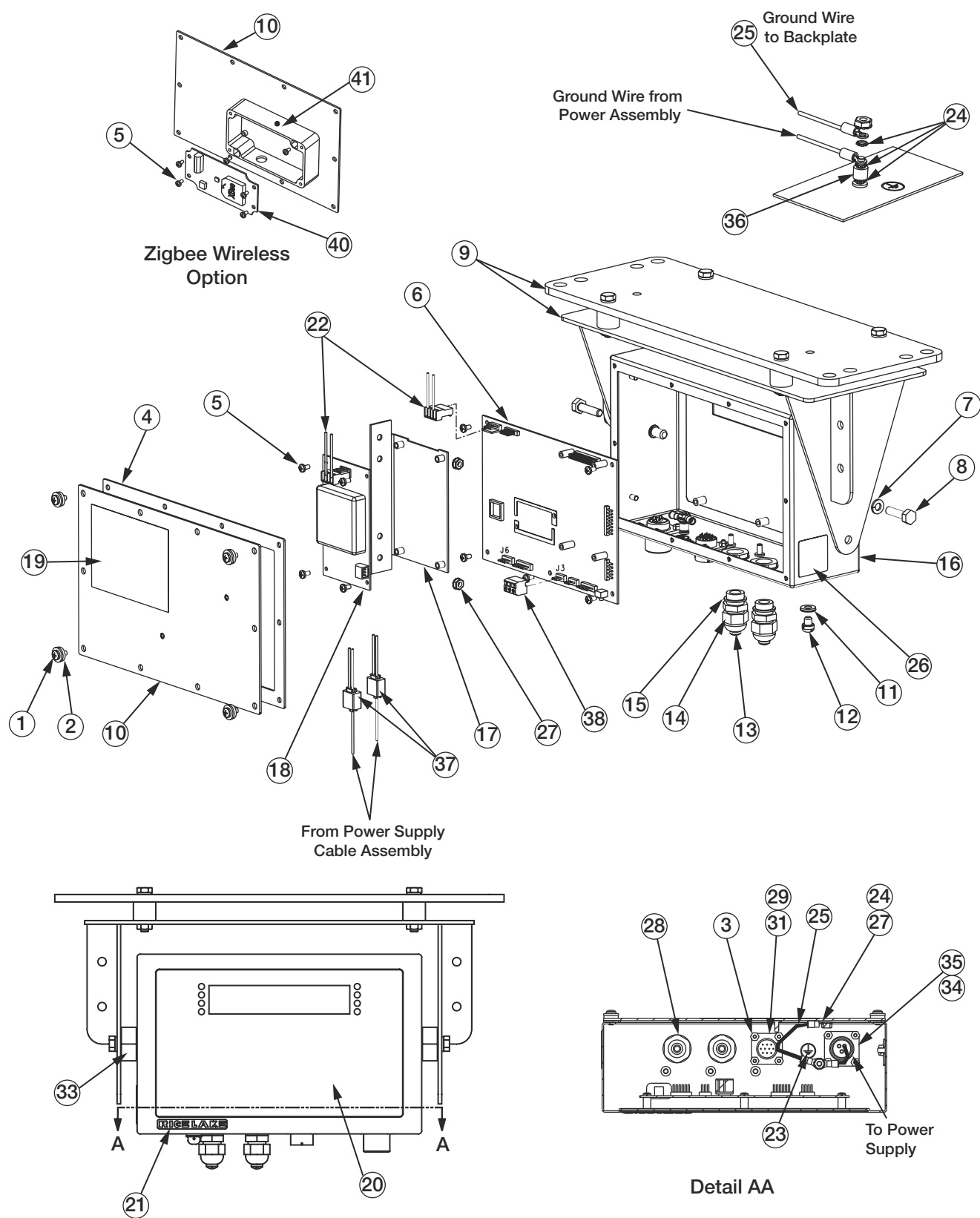


Figure 6-4. CLS-420 Indicator Parts Illustration

Item No.	Part No.	Description	QTY
	98413	Indicator,420 Plus Wired	
1	14862	Screw, MACH 8-32NCx3/8	4
2	45042	Washer, Bonded Sealing SST	4
3	14618	Nut, Kep 4-40NC HEX	8
4	84388	Gasket, Backplate 420 and	1
5	14839	Screw, MACH 6-32NCx1/4	5
6	99151	Board ASSY,CPU Display	1
7	15148	Washer, Lock 1/4 Regular	2
8	35088	Screw, Cap 1/4-20NCX1 HEX	2
9	96930	CLS-420 Mounting Bracket (see Figure 6-3)	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 Assy, Power Supply	1
23	16892	Label, Earth Ground	1
24	15134	Washer, Lock NO 8 Type A	4
25	45043	Wire, Ground 4in 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 Assy, Serial Input	1
31	97419	Gasket, MS CONN Shell Size	1
33	97391	Spacer, Indicator Hex	2
34	96914	Cable Assy,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
	110388	Tape, Kapton 1 inch 2 mil	2
	14822	Screw, MACH 4-40NCx1/4	4

Table 6-3. CLS-420 Indicator Parts List

6.0.2 CLS-920 Replacement Parts

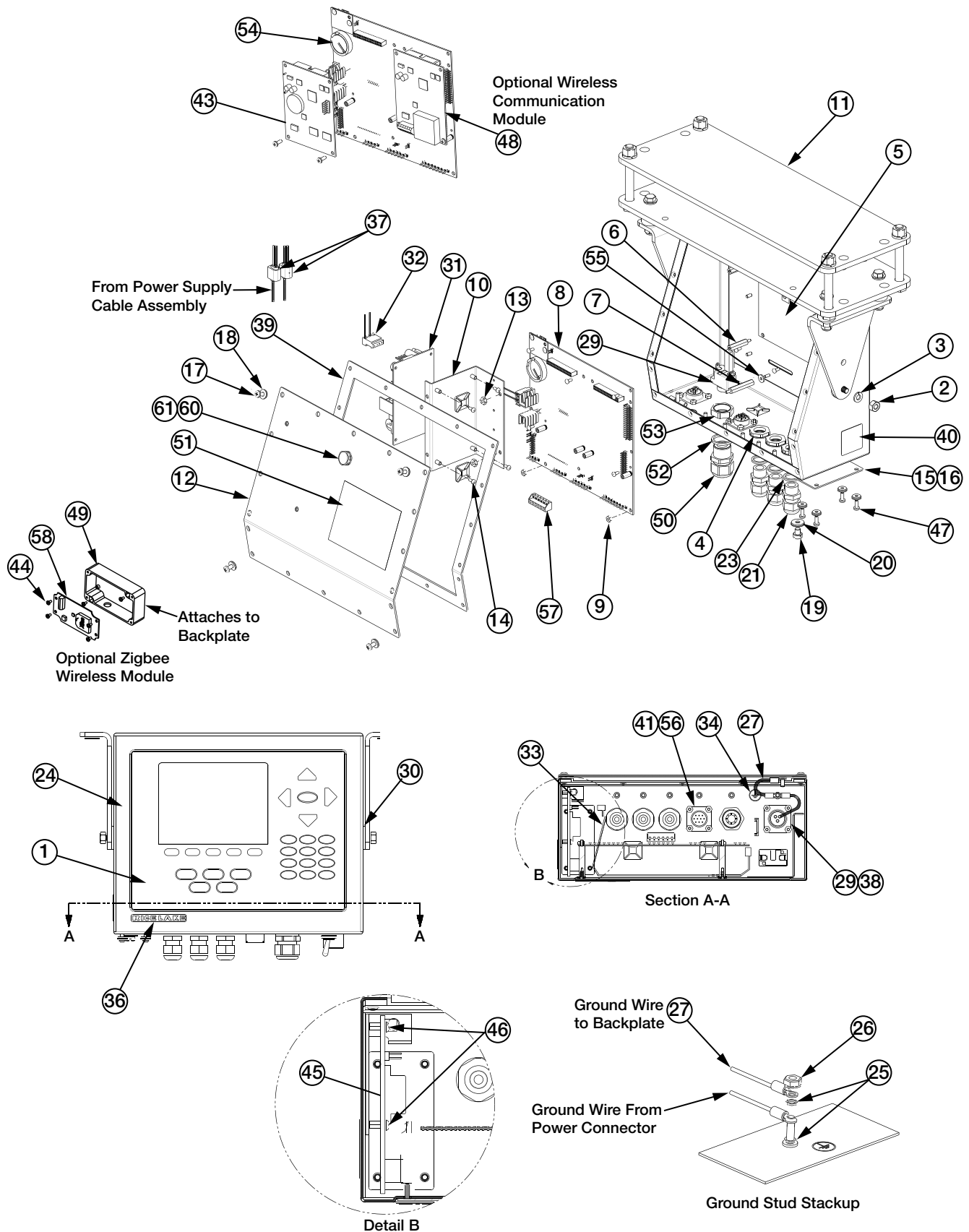


Figure 6-5. CLS-920 Indicator Parts Illustration

Item No.	Part No.	Description	QTY
	97468	CLS-920 Indicator Assembly	Ref
1	66502	Overlay, Membrane Switch	1
2	14641	Nut, 1/4-20NC HEX Steel	2
3	15148	Washer, Lock 1/4 Regular	2
4	15627	Locknut, Black PCN9	3
5	67614	Display, LCD Module 920i	1
6	67886	Standoff, Male-FEM 4-40NC	4
7	68661	Standoff, Male-FEM 4-40NC	2
8	109549	Board Assy, CPU 920i	1
9	14618	Nut, Kep 4-40NC HEX	10
10	94392	Bracket, 25W Power Supply	1
11	126563	Plate, Mount Assy	1
12	97080	Backplate, 920 Wireless	1
13	58248	Nut, Lock 6-32NC Hex Nylon	2
14	14822	Screw, Mach 4-40NCx1/4	11
15	67530	Plate, Interface Board	1
16	67535	Gasket, Interface Board	1
17	14862	Screw, MACH 8-32NCx3/8	4
18	75062	Washer, Bonded Sealing SST	8
19	42640	Screw, Mach 1/4-28NF x 1/4	1
20	44676	Washer, Bonded Sealing	1
21	15626	Cable, Grip Black PG9	3
23	30375	Seal Ring, Nylon Pg9	3
24	97081	Enclosure, 920 Wireless	1
25	15134	Washer, Lock NO 8 Type A	3
26	14626	Nut, Kep 8-32NC HEX	3

Item No.	Part No.	Description	QTY
27	45043	Wire, Ground 4in	1
29	97476	Cable Assy, DC Power Input	1
30	103988	Washer, Nylon .52 ID	2
31	99480	Power Supply, DC/DC	1
32	67796	Wire Harness, Power Supply	1
33	68662	Cable, Ribbon Interface	1
34	16892	Label, Earth Ground	1
36	68216	Nameplate, Rice Lake	1
37	80331	Connector,T ap and Run	2
38	57241	Gasket, MS Conn Shell Size	1
39	67532	Gasket, Back Plate 920i	1
40	53308	Label,1.25x1.25 8000T	1
41	97419	Gasket, MS Conn Shell Size	1
43	67609	Card, Memory Module	1
45	67869	Board, Interface 920i	1
46	55708	Screw, Mach 4-40NCx3/8	2
47	14845	Screw, Mach 6-32NCx3/8	4
50	15628	Cord Grip, 1/2 NPT Black	1
51	53307	Label, 4.000x2.875	1
52	30376	Seal Ring, Nylon 1/2 NPT	1
53	15630	Locknut, 1/2 NPT Black	1
54	69290	Battery, 3V Coin Lithium	1
55	69898	Washer, Nylon ID=.112	2
56	97394	Cable Assy, Serial Input	1
57	70599	Conn, 6 Pos Screw Terminal	1
60	88733	Vent, Breather Sealed	1
61	88734	Nut, Breather Vent	1

6.1 CLS-Series Specifications

Cargo Lift Scale

Scale Capacity:	5,000 lb
Safe Overload:	200%
Ultimate Overload:	5:1 capacity
Scale Power:	Wired Version: supplied by coiled interface cable from indicator Wireless Version: supplied by one lithium-ion Smart battery (SMBus revision 1.1 fully compliant)
Material/Finish:	Painted mild steel
Scale Warranty:	Two-year limited warranty
Scale Approval:	NTEP-certified at 1,000 divisions, Class III, COC#06-074

420 Indicator

Display:	0.8" (20 mm), 6-digit red Light Emitting Diode (LED) display, 7-segment digits
Power - DC:	Line voltages: 10-60 VDC DC input Power consumption: 0.75 amp Max Fused at 5.0 amps

Rating/Material: 304 stainless steel

Status annunciators: Designators for: center of zero, stand still, gross, net, lb, kg, count, tare

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

Zigbee Connection: Contains FCC ID: OUR-XBEE/OUR-XBEEPRO
Contains Model XBee-PRO Radio, IC: 4214A-XBEEPRO
Operating frequency: ISM 2.4 GHz

Warranty: Two-year limited warranty

Approvals: NTEP-certified at 10,000 divisions, Class III/IIIL, CC#04-074

920i Indicator

Display: 4.6" W x 3.4" H (116 mm W x 86 mm H), 320 x 240 pixel VGA Liquid Crystal Display (LCD) module with adjustable contrast

Power - DC: Line voltages: 10-60 VDC DC input
Power Consumption: 1.5 amp Max
Fused at 5.0 amps

Material: 304 stainless steel

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

WLAN Option: Contains FCC ID: R68WIPORATG
Range: Up to 328 feet indoors
Operating Frequency: ISM 2.4 GHz

Zigbee connection: Contains FCC ID: OUR-XBEE/OUR-BXEEPRO
Contains model XBee PRO radio, IC: 4214A XBEEPRO
Operating frequency: ISM 2.4 GHz

Warranty: Two-year limited warranty

Approvals: NTEP-certified at 10,000 divisions, Class III/IIIL, CC# 01-088

Approvals





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U.S. 800-472-6703 • Canada/Mexico 800-321-6703
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