CLS-Series

Cargo Lift Scale

Service Manual

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

96314 Rev A

Contents

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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 upacking, installation and operating procedures as they are covered in the *CLS-920i Installation Manual*, PN 96312, and *CLS-420 Installation Manual*, PN 96483.

Warning

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

Warning

Take all necessary safety precautions when installing or replacing the scale parts including wearing safety shoes, protective eyewear, and using the proper tools.

1.0 Introduction

The CLS Series Cargo Lift scale is a rugged, dependable cargo lift scale that can withstand many years of repeated 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 in this manual include:

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

2.0 Load Cell Replacement

This section describes procedures for replacing the load cell should it need to be changed. The CLS Series Cargo Lift Scale uses Rice Lake's load cell, PN 96198.

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 eyewear, 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.

Rice Lake Part #	Item Description
96196	Modified box wrench
	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.***

2.2 Load Cell Relacement

Figures 2-1 and 2-2 illustrate the parts associated with load cell replacement.

Number	RLWS Part Number	Description
	97883	Complete Replacement Parts Kit which includes all of the components listed below.
1	14671	Hex Nut
2	14671	Hex Nut
3	96249	Spherical Washer Set
4		Upper Block
5	96249	Spherical Washer Set
6	14671	Hex Nut
7	14665	Jam Nut
8	96199	Flexure Rod
9	14665	Jam Nut
10	96198	Load Cell
11	14665	Jam Nut
12	96199	Flexure Rod

Number	RLWS Part Number	Description
13	14665	Jam Nut
14	14671	Hex Nut
15	96249	Spherical Washer Set
16		Lower Block
17	96249	Spherical Washer Set
18	14671	Hex Nut
19	14671	Hex Nut

The following drawing illustrates a side view of the major component parts of the CLS Series Cargo Lift Scale.

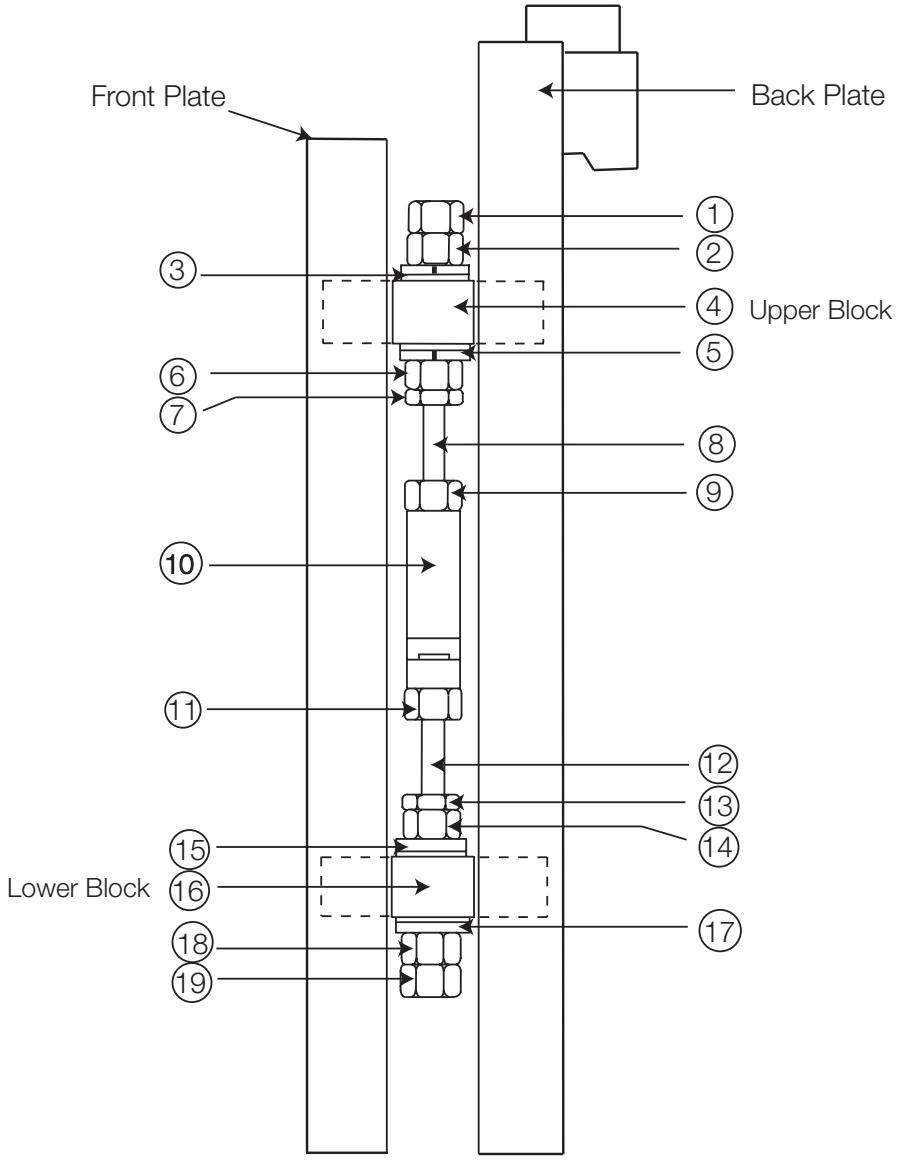

Figure 2-1. CLS Series Parts Breakout

Figure 2-2 also illustrates the parts associated with load cell replacement and a replacement parts kit is available (PN 97883) which contains all of the component parts shown below, in Figure 2-2.

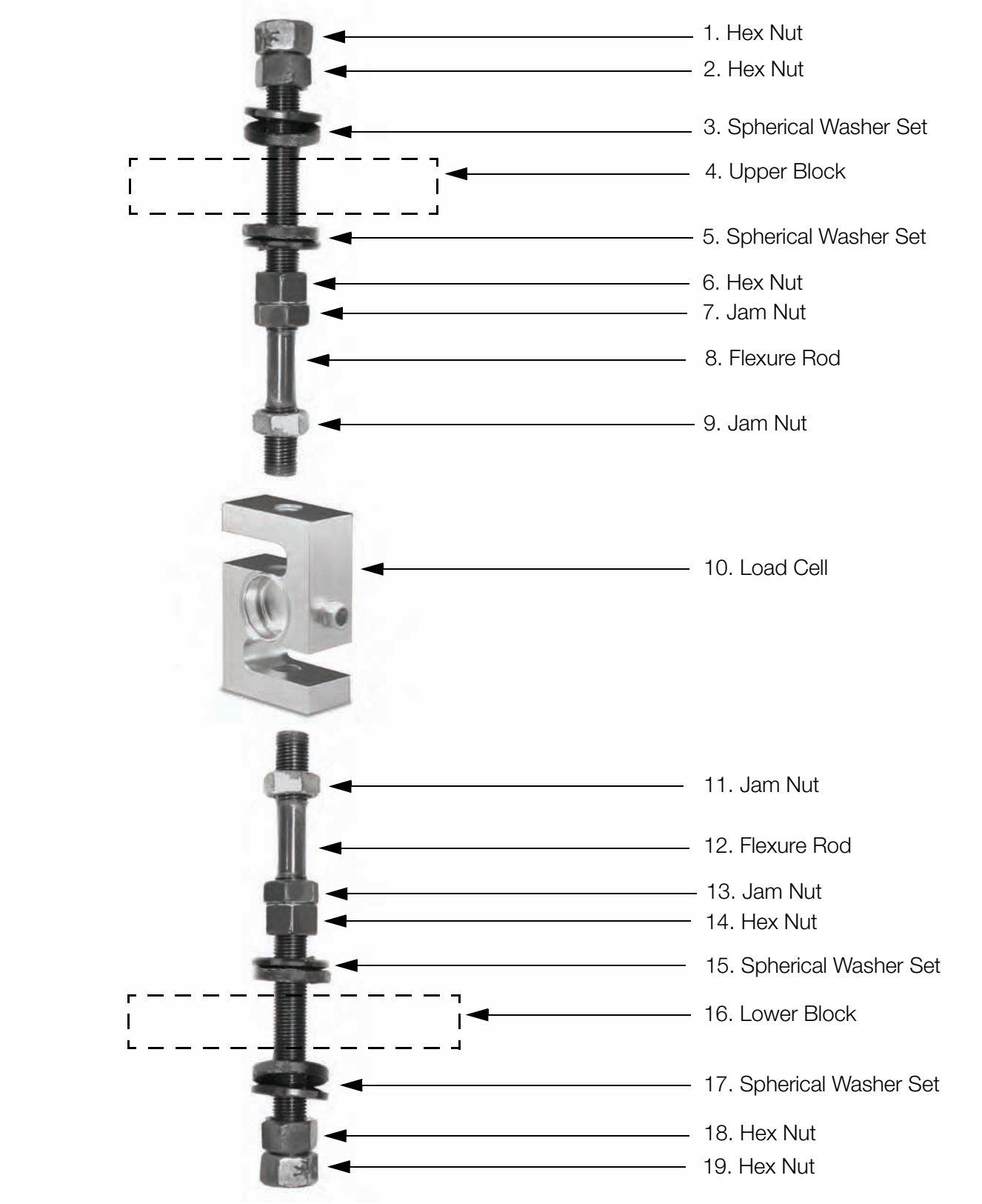

Figure 2-2. Pictoral CLS Series Parts Breakout

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.

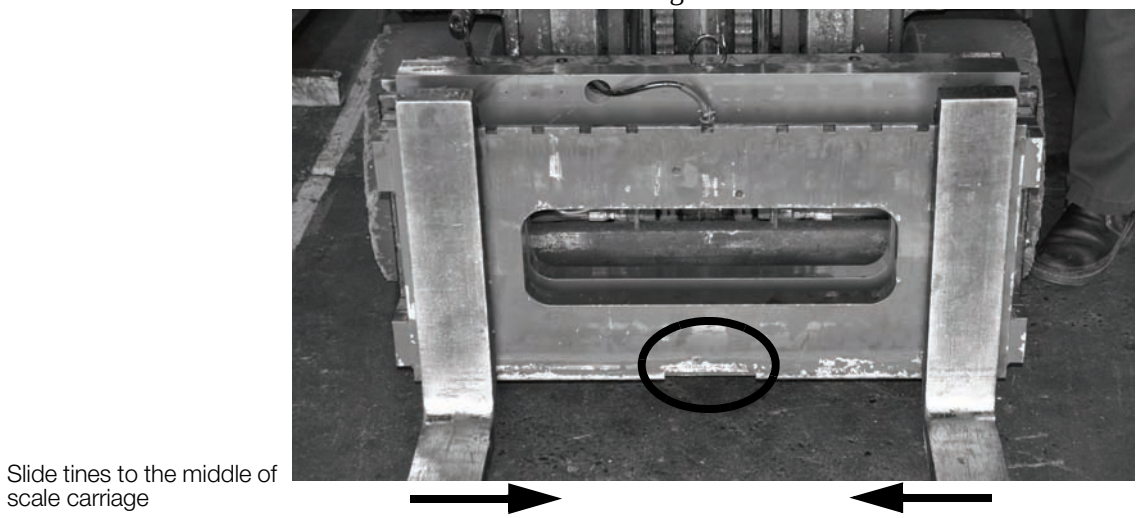

Figure 2-3. Forklift Tine Removal

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 3/4" torque wrench.

NOTE: ***It's okay if the load cell slightly rotates up against the side of the front or back plate of the scale.***

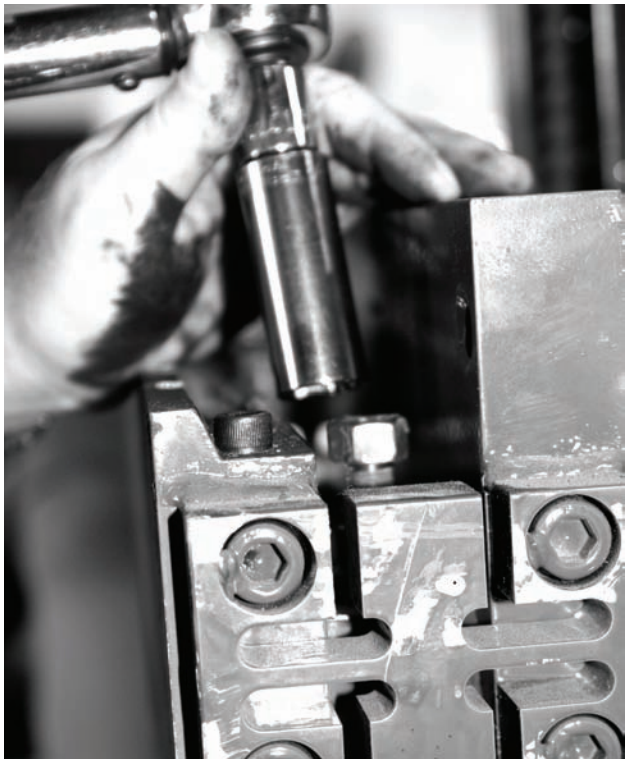

Figure 2-4. Removal of Hex Nut (#1 of Parts Breakdown)

5. Loosen jam nut (#7) from the upper block using the special modified box wrench (PN 96196 - supplied with scale) shown in Figure 2-5 on the following page.

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Figure 2-5. Modified Box Wrench

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 torque wrench.

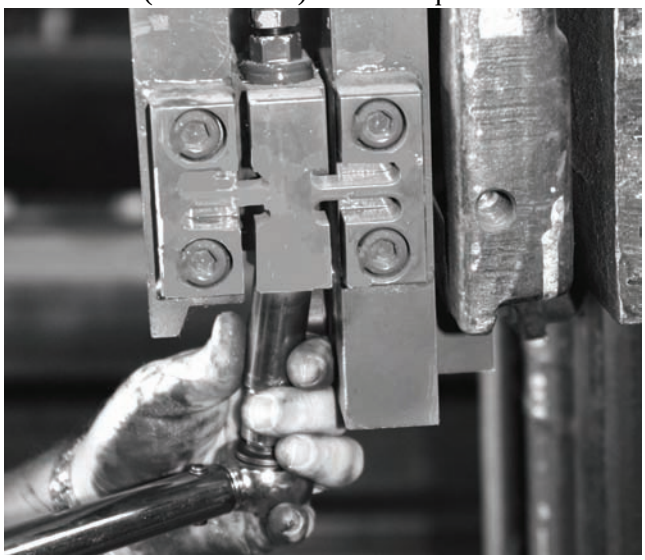

Figure 2-6. Loosen and Remove Bottom Hex Nut (#18 and #19 on Parts Breakdown)

NOTE: ***It's okay if the load cell slightly rotates up against the side of 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.

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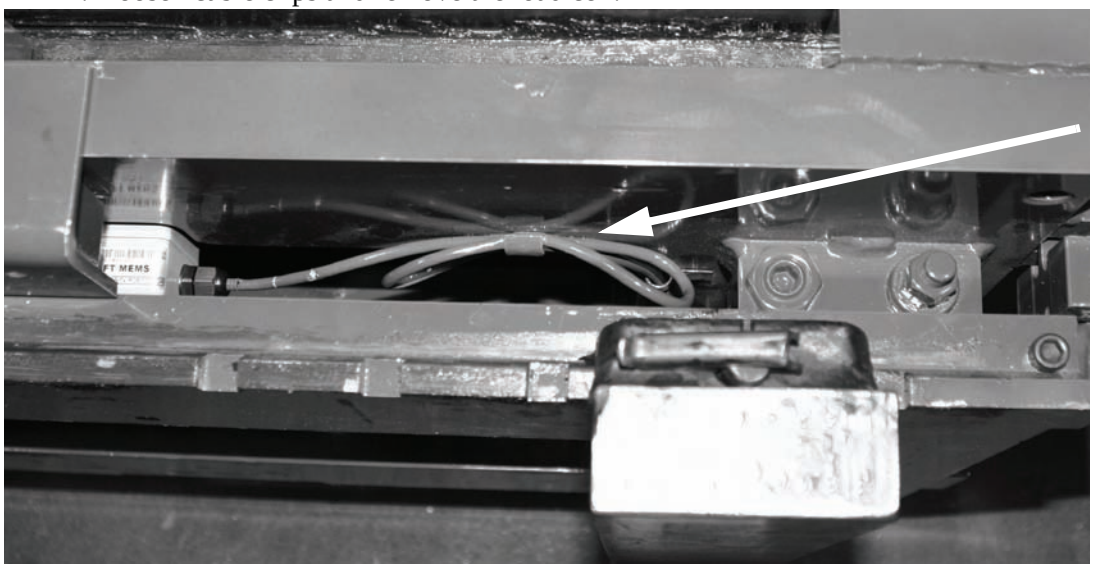
Ensure flexure rod threads are free of debris and paint by running a nut the full distance of the rod.

Figure 2-7. Remove Flexure Rod with Nuts and Washers

15. 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.
16. Oil the spherical washers using a standard machine shop oil.
17. Loosen cable clips and remove the load cell.



Detach load cell clip away from back plate of scale.

Figure 2-8. Load Cell Cable Clips

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

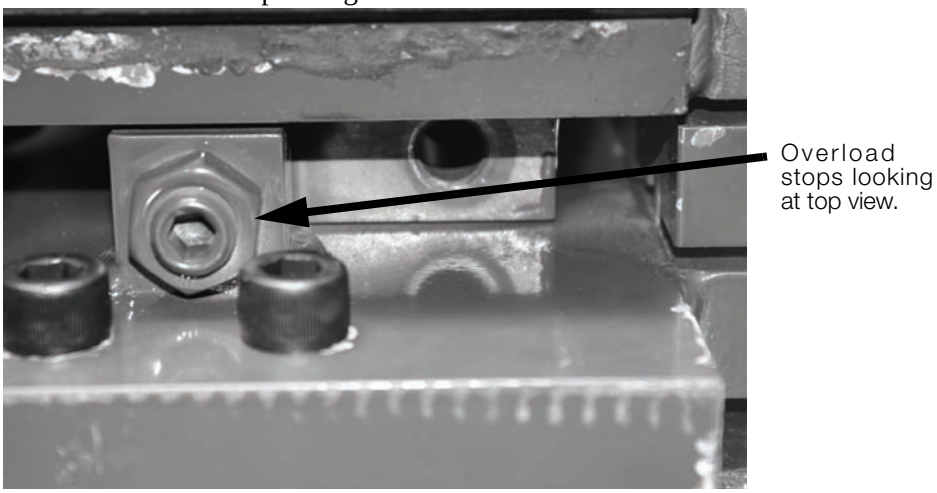
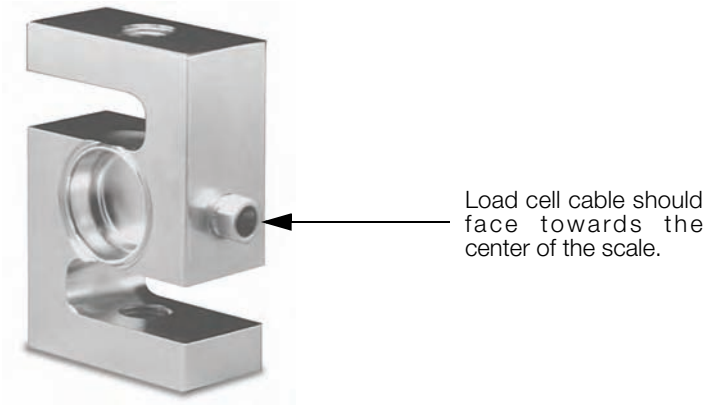


Figure 2-9. Overload Stops

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



20. 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.

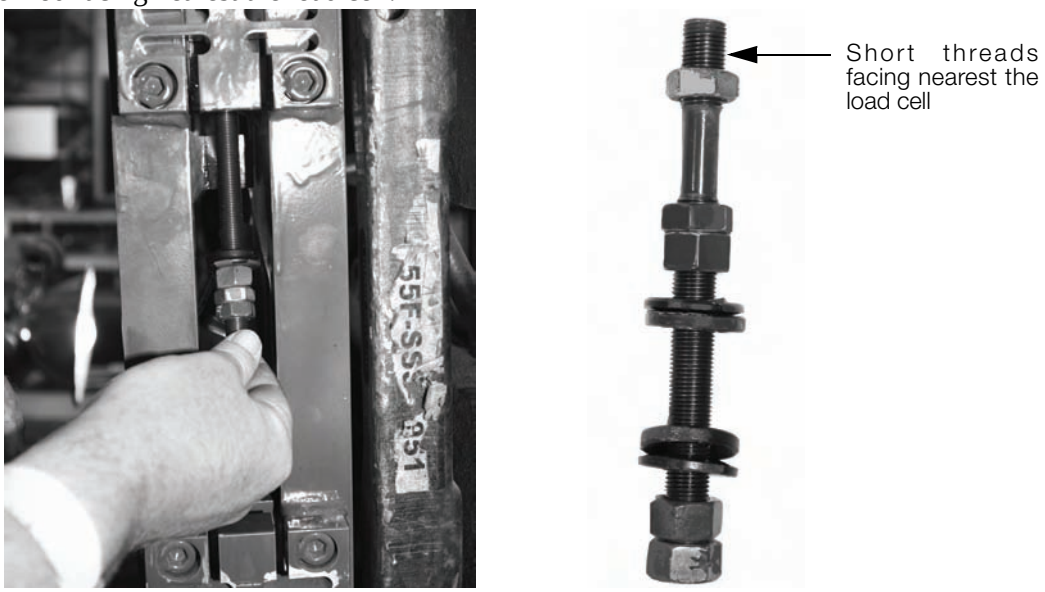


Figure 2-10. Installing Flexure into Scale

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 2-2 on page 4.
22. 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.
23. 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.
24. Tighten the jam nuts on top and bottom of the load cell. Make sure they are tight and 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 2-11.

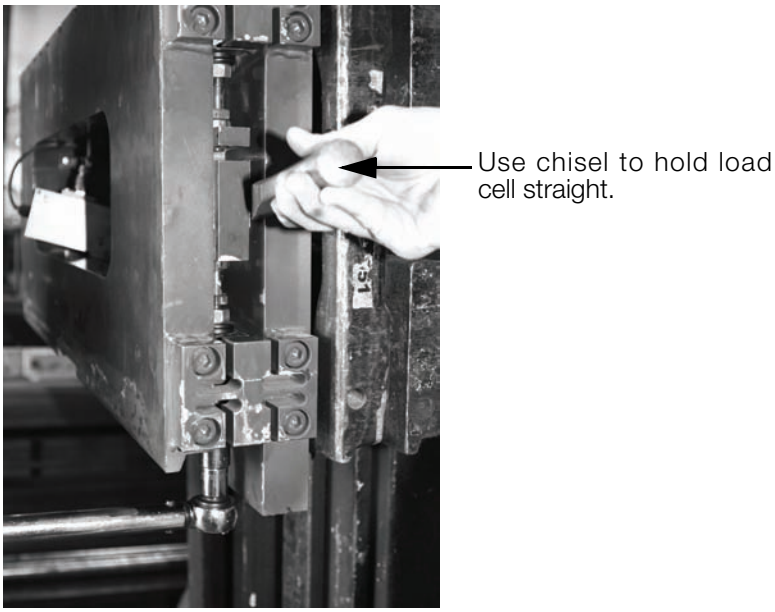


Figure 2-11. Use Chisel to Hold the Load Cell in Straight

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

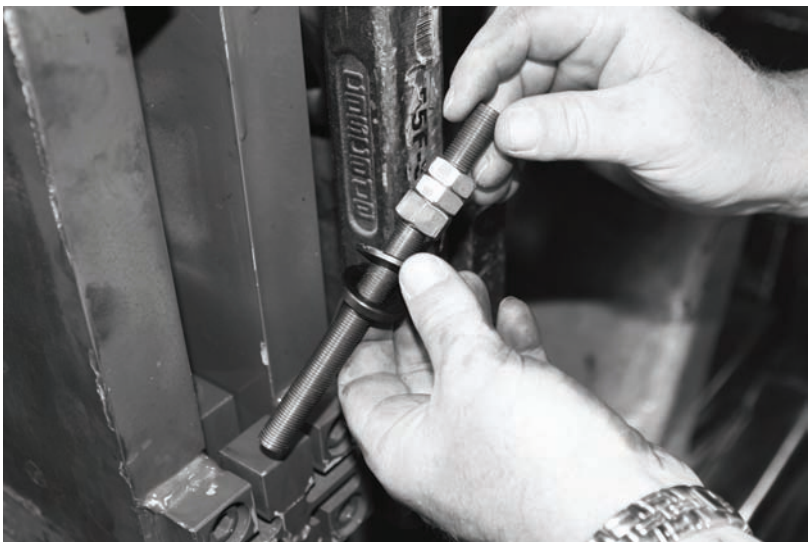


Figure 2-12. Install Spherical Washer Set

26. 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.

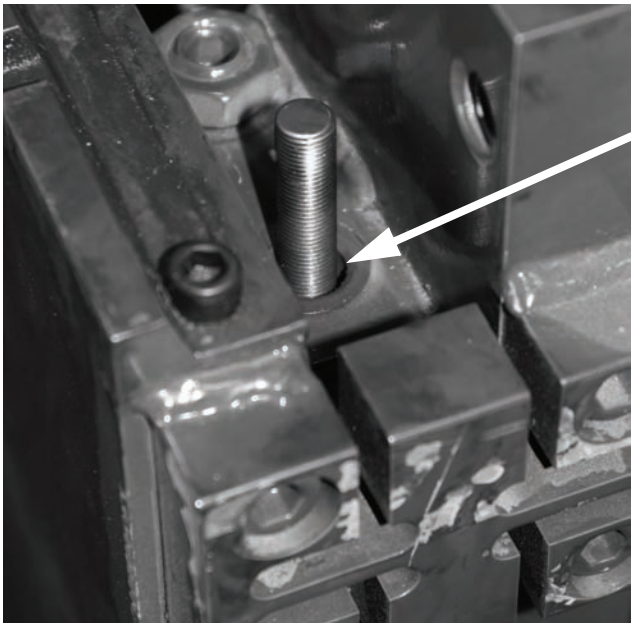


Figure 2-13. Centering the Flexure Rod

27. 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 2-14. Centering the Load Cell Using a Chisel

Figure 2-15. Tightening the Lower Hex Nut

28. Use the special modified box wrench to tighten the jam nut (#13) on the lower block.
29. 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.
30. Install the spherical washer set (#3) and hex nut (#2) on the top of the upper block.
31. Wire up the load cell cable to the junction box at this time.
32. Make sure that *ZTRKBN* is set to *Off* on the indicator.
33. 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.
34. Torque the top hex nut (#1) with a torque wrench to 110 ft/lbs. 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
35. Install the final hex nut on the top mounting plate and torque to 110 ft/lbs. Use a pry bar or chisel to keep the load cell centered.
36. Tighten the jam nut on the lower mounting block assembly.
37. Zero out the indicator display.
38. Exercise the scale heel to toe by placing a weight (1000 lbs) 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.
39. Place a weight in the center of the fork and check side to side values. If they are equal, you are done.
40. Tighten the overload stops when complete.
41. Make sure to turn *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.

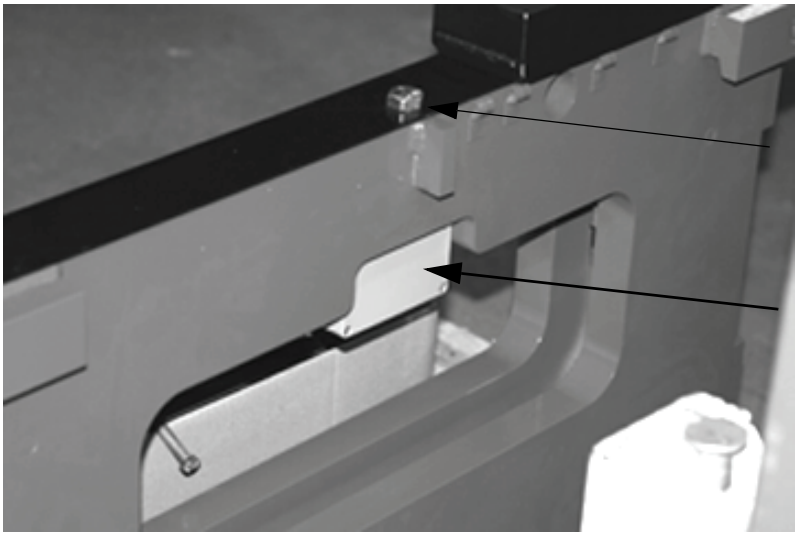


Figure 3-1. Top Cover Plate (scale shown not mounted on the forklift)

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.

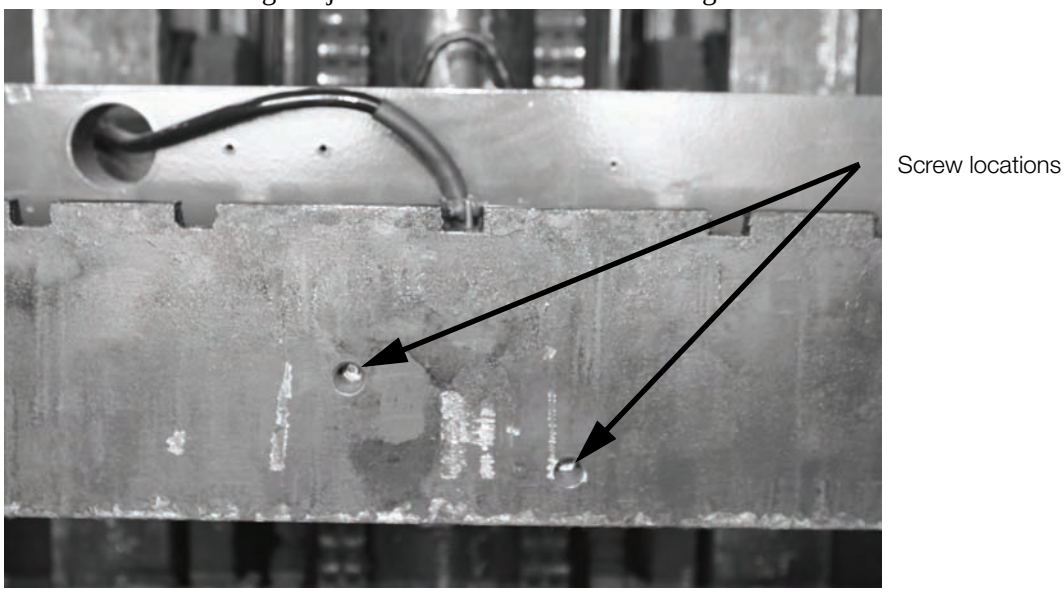


Figure 3-2. Screw Locations

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

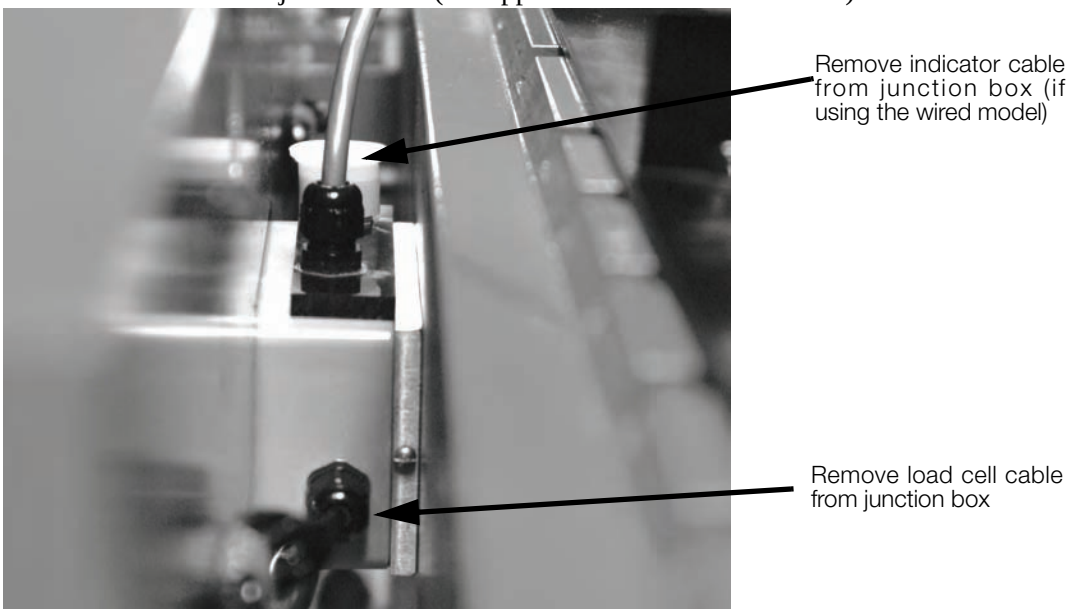


Figure 3-3. Junction Box Location Inside the Scale (wireless version shown above)

6. Loosen the load cell clips that hold the load cell cable to the scale back frame and their general location noted in Figure 2-8 on page 7.
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

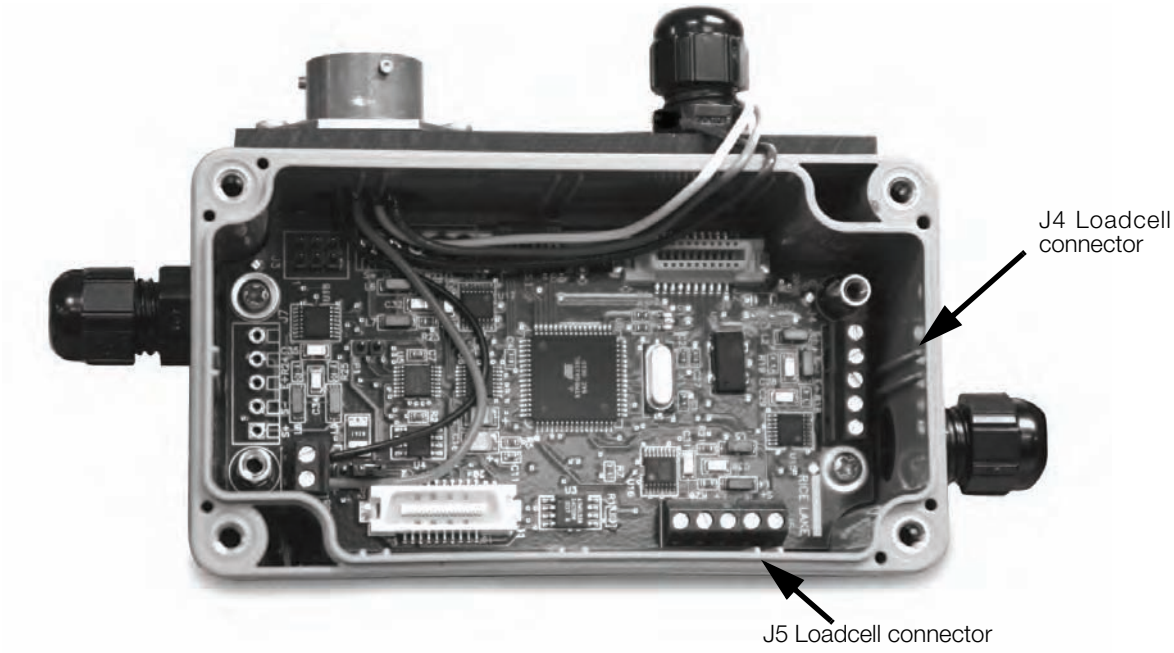


Figure 3-4. Inside of Junction Box - Bottom Board

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 acommodate 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

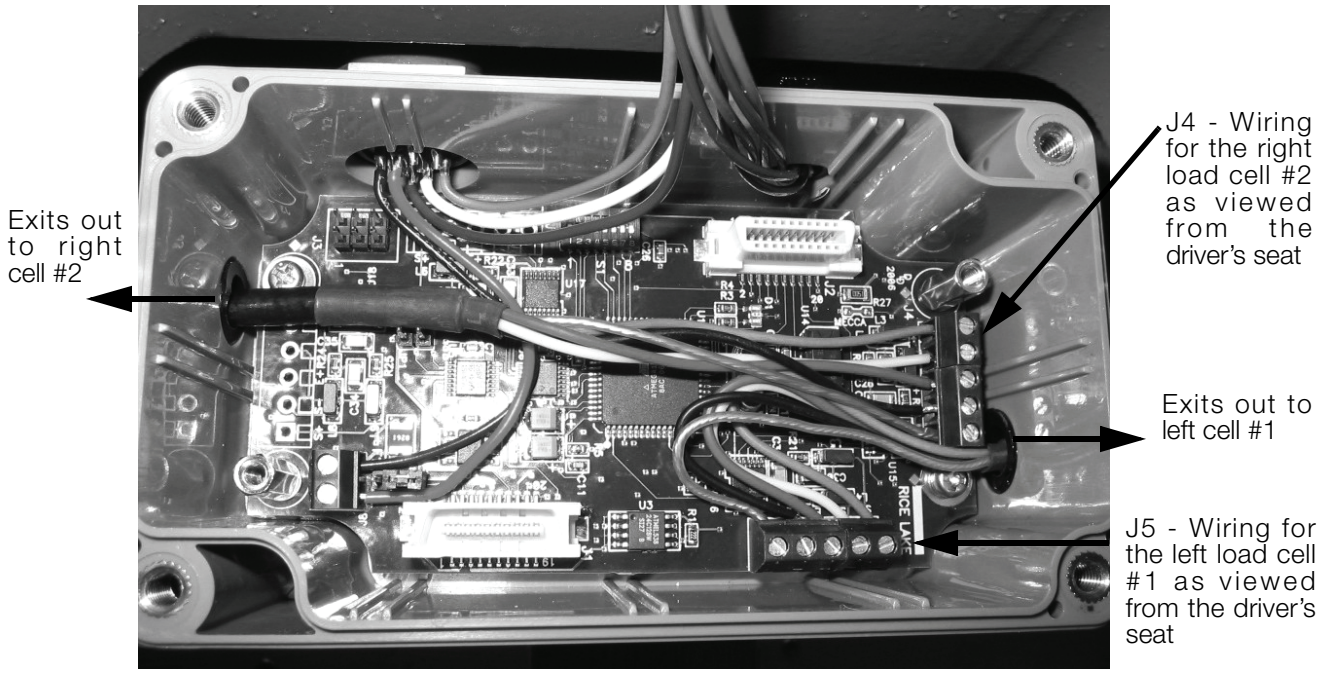


Figure 3-5. Bottom Board Wiring

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.

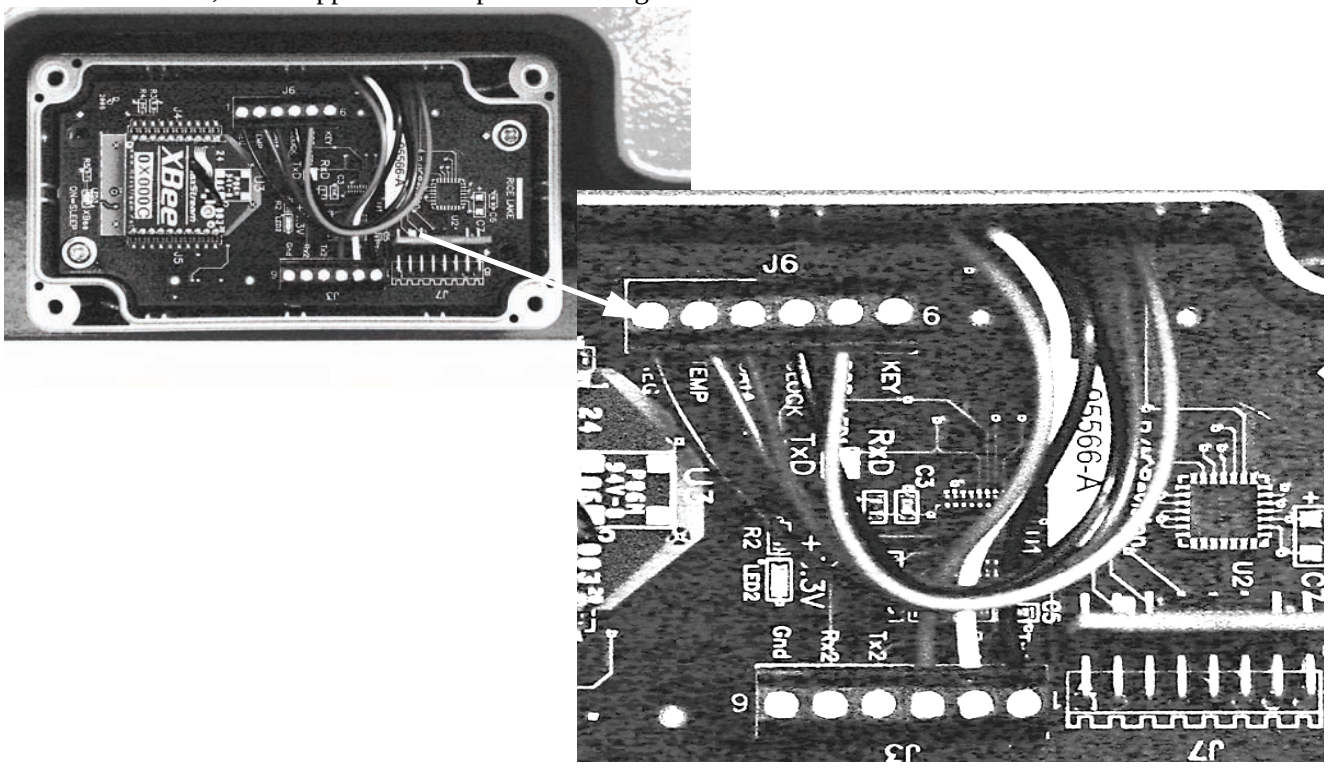


Figure 3-6. Inside of Junction Box - Top Board

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 - wirless 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 Replacment

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

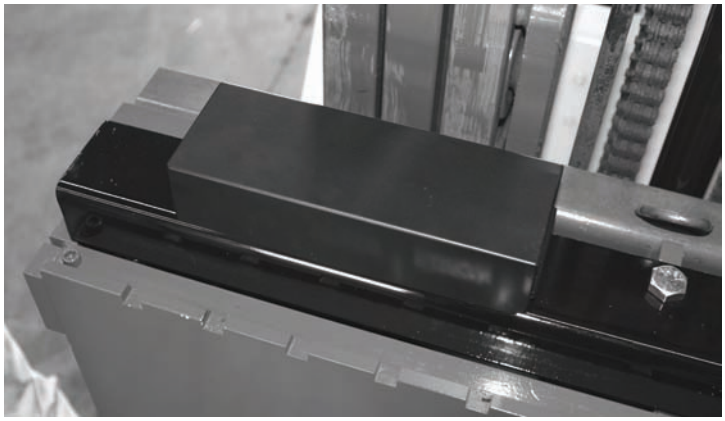


Figure 4-1. Lithium-Ion Battery Location

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	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 4-2. Battery Specifications

4.1 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

4.2 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.

4.3 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.

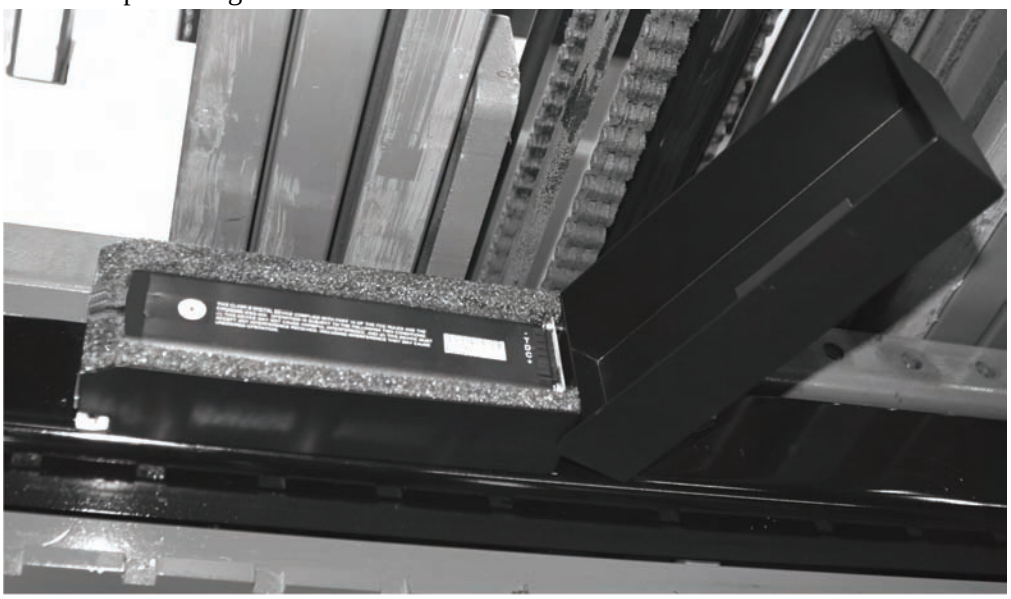


Figure 4-3. Lithium-ion Battery Box Opened

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

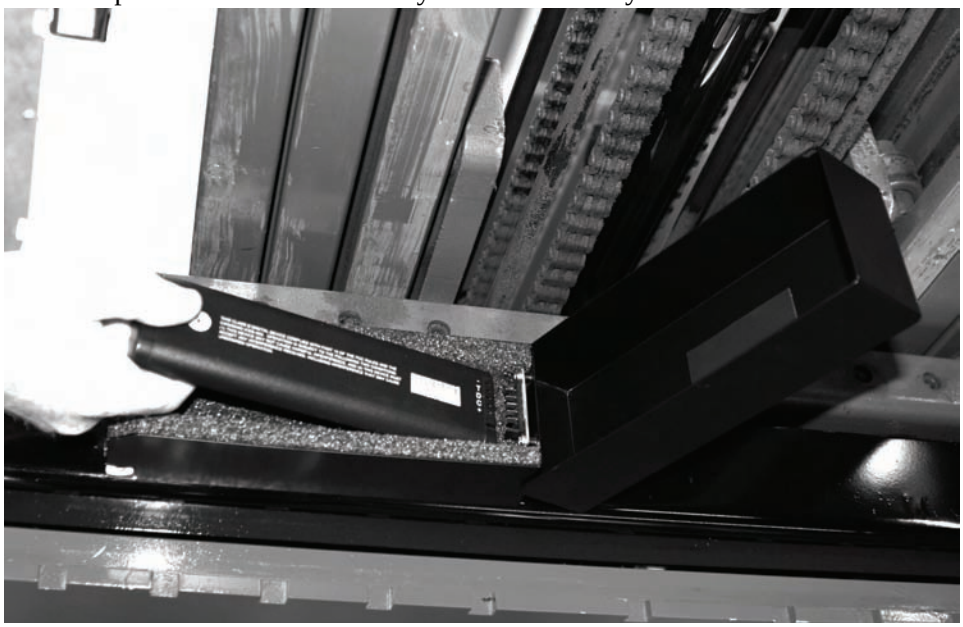


Figure 4-4. Pulling the Lithium-Ion Battery Out

4.4 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.

national power™
CORPORATION

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	$C_3H_4O_3$
	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.

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.

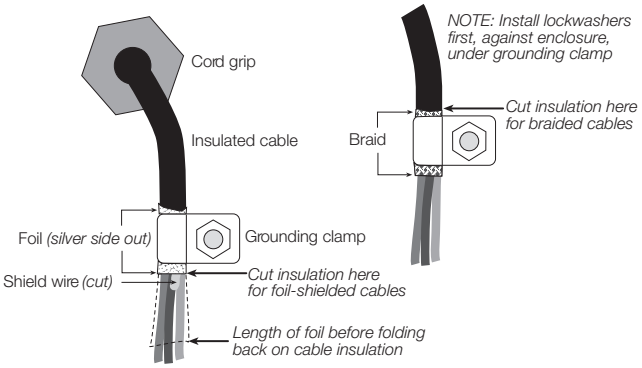


Figure 5-1. Grounding Clamp Attachment for Foil-Shielded and Braided Cabling

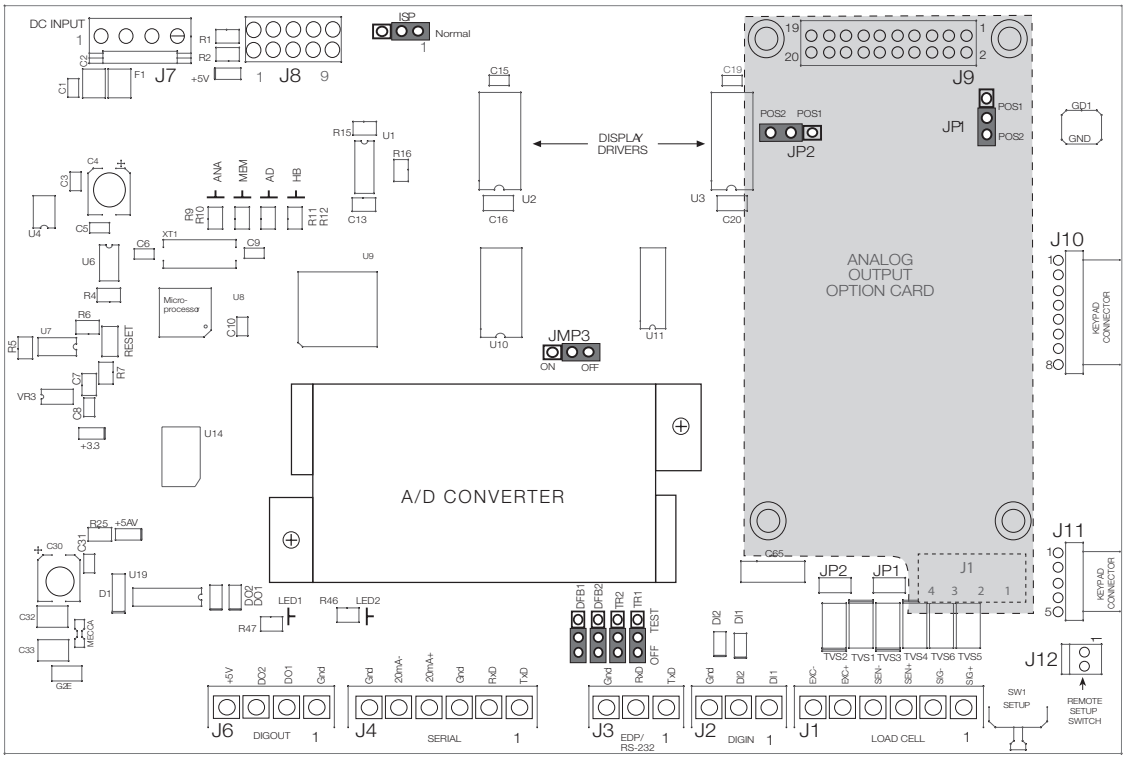


Figure 5-2. 420 CPU and Power Supply Board with Analog Output Option Card

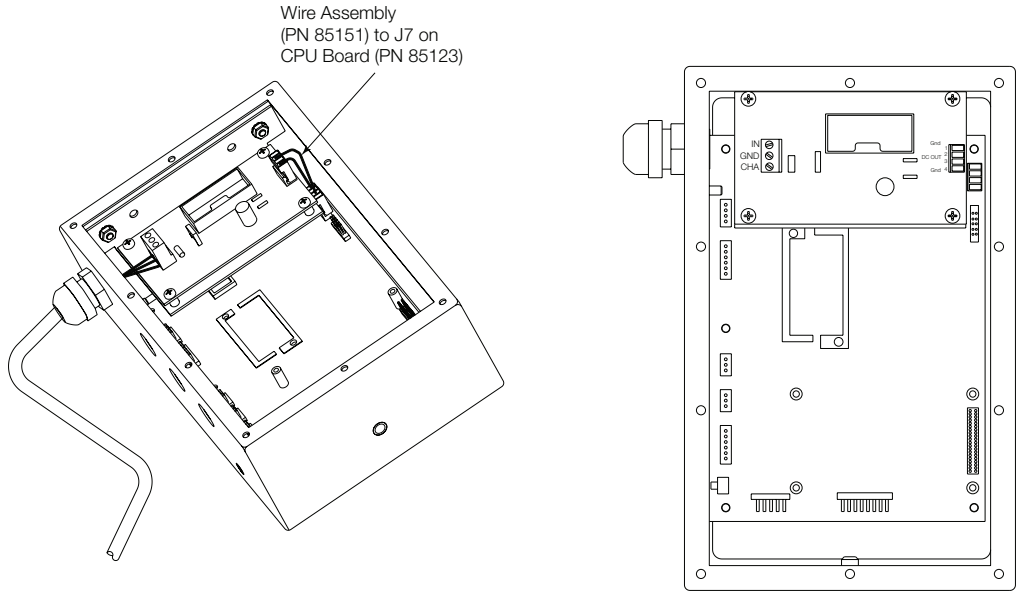


Figure 5-3. 420 DC Power Supply

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

NOTES:

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_{DROP} = (2.85A)(*x*Ω / 1000ft)(length of run in ft.)

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

*x*Ω = 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_{DROP} = (2.85A)(6.385Ω / 1000ft)(100 ft)

V_{DROP} = 1.82V

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

5.1.3 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 as shown in Table 2-3.

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 13 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. Remove the screws that hold the backplate to the enclosure body, then lift the backplate away from the enclosure and set aside.
2. Disconnect power supply cable from connector J7 on the 420 CPU board.
3. 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.
4. 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.

5.1.5 Replacement Parts

Table 5-4 lists replacement parts for the 420, including all parts referenced in Figures 5-4 and 5-5.

Ref Number	PN	Description (Quantity)	Figure
1	14862	Screws 8-32NC x 3/8 (4)	Figure 5-5 on page 27
2	45042	Sealing washers (4)	
3	84387	Backplate (1)	
4	84388	backplate gasket (1)	
5	14839	Screws 6-32NC x 1/4 (9)	
6	85123	CPU and display board assembly (1)	
7	84386	Enclosure (1)	
8	15148	1/4-20 lockwashers, spacers	
9	68403	Four-cornered wing knobs for tilt stand (2)	
10		Mounting stand (1)	
11	44676	Sealing washer (1)	
12	42640	Screws 1/4-28NF X 1/4 (2)	
13	19538	Cable grip plugs (2)	
14	15626	Cable grips (2)	
15	30375	Nylon seal rings for cable grips (2)	
17	84389	Power supply bracket (1)	
18	76556	Power supply switch (1)	
	85554	Power supply, DC/DC converter	
20	84397	Overlay panel (1)	Figure 5-4 on page 26
21	68216	Rice Lake nameplate (1)	
22	85151	Power supply ribbon cable (1)	
23	16892	Earth ground label (1)	
24	15134	Lock washer, No 8, Type A (3)	
25	45043	Ground wire 4 in, No. 8 (1)	
27	14626	Kep nuts, 8-32NC Hex (5)	
28	15627	Locknuts (3)	
30	85494	Protective cover (1)	Figure 5-5 on page 27
32	15376	Standoffs, male - female (2)	
	85791	Fuse, 2.5 Amp 5x20mm	
	96915	Power cable assembly	
	35287	Fuse, Slo-blo, 5 Amp 3AG for power cable assy.	

Table 5-4. CLS-420 Indicator Replacement Parts

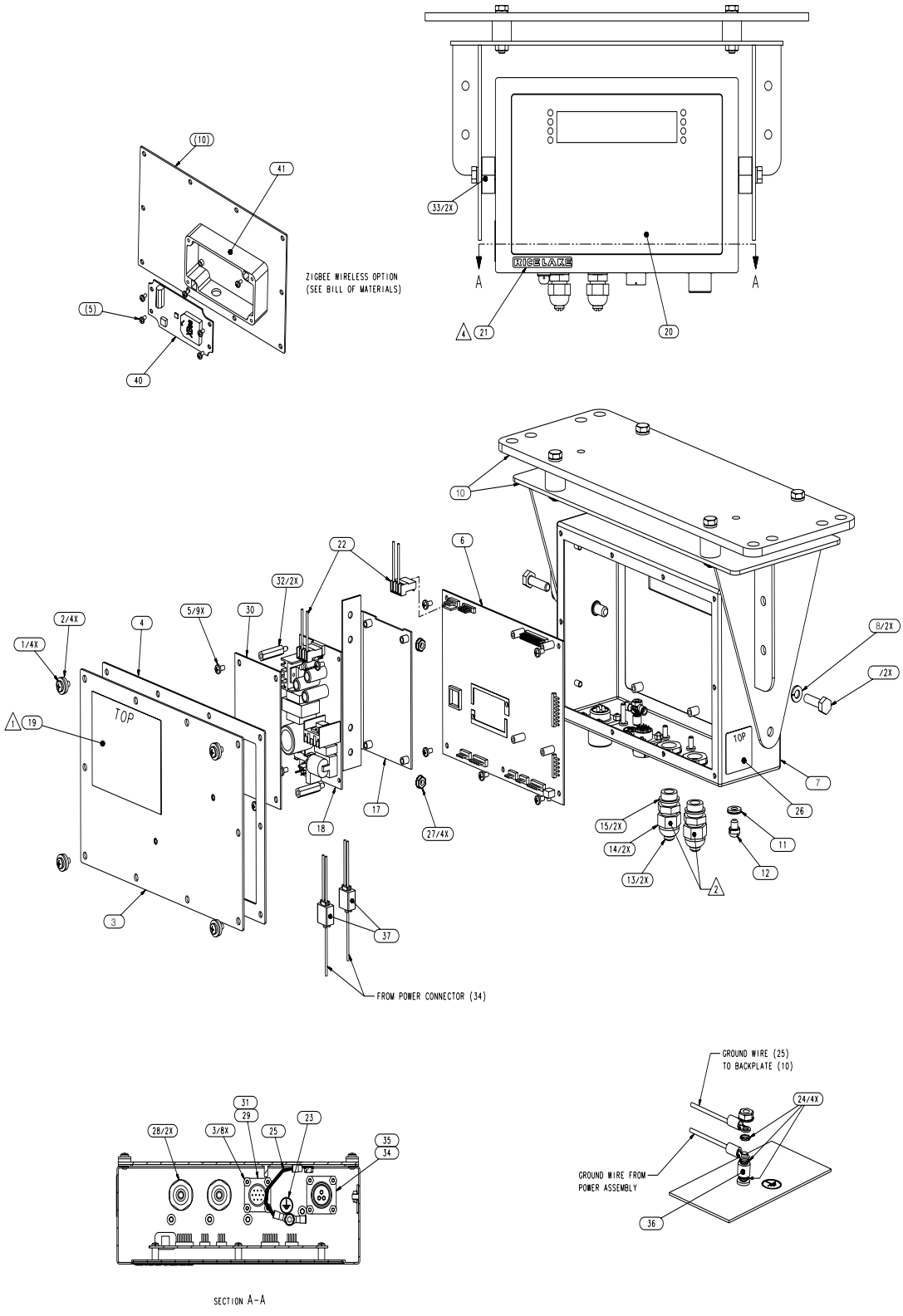


Figure 5-4. 420 Assembly Drawing

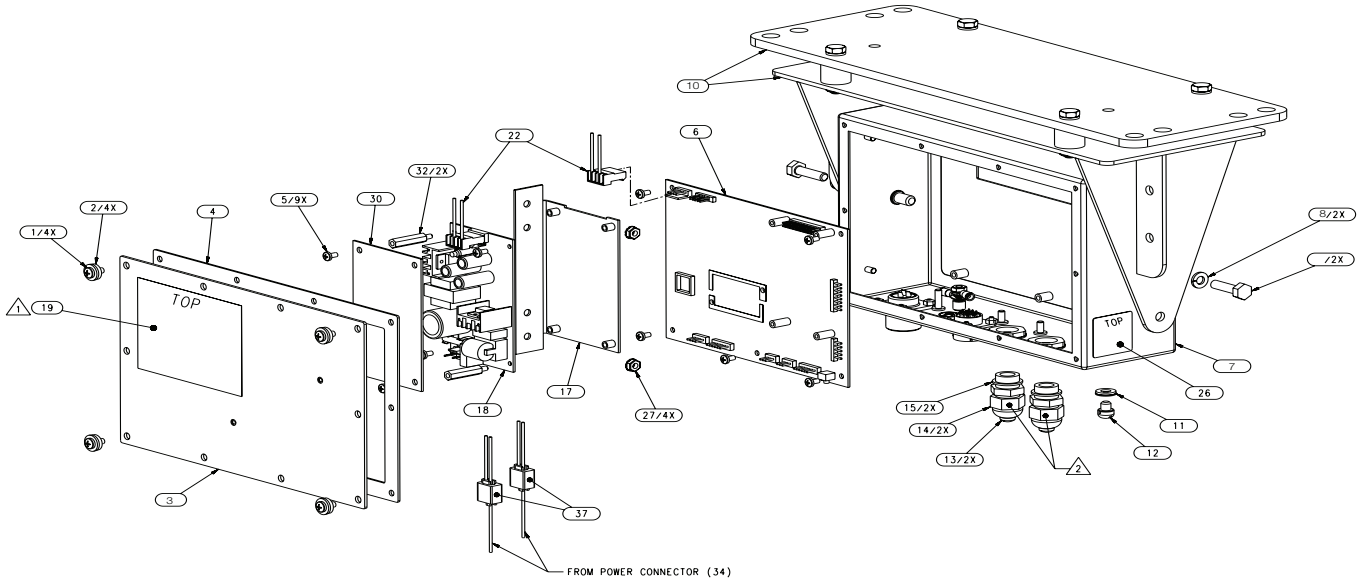


Figure 5-5. 420 Enclosure, Backplate and CPU Board

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.*

Ensure power to the indicator is disconnected, then place the indicator face-down on an antistatic work mat. 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 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 5-6). 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 5-6).

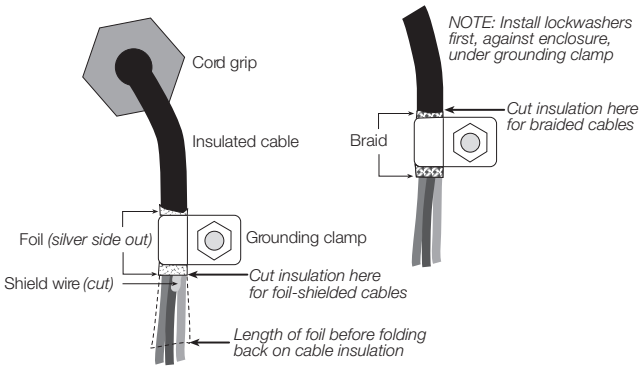


Figure 5-6. Grounding Clamp Attachment for Foil-Shielded and Braided Cabling

- 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 5-6. 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 28. 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 5-5 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 5-7). The DB-9 connector pin assignments for Port 2 are shown in Table 5-6; see Section 10.3 on page 109 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 5-5. Serial Port Pin Assignments

Serial ports are configured using the SERIAL menu. See Section 3.2.2 on page 33 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.

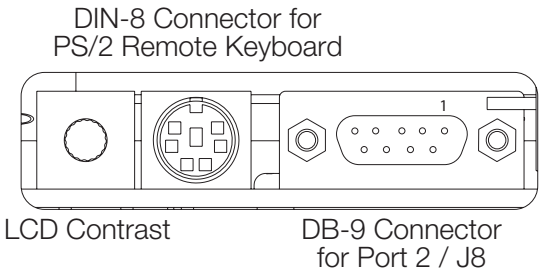


Figure 5-7. Interface Board Connections

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

Table 5-6. DB-9 Connector Pin Assignments

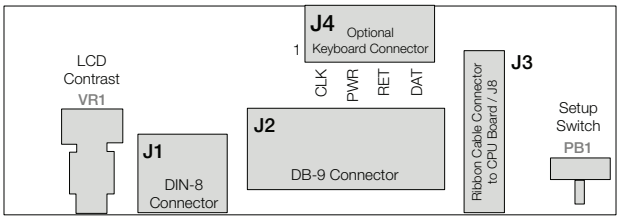


Figure 5-8. Interface Board, Top View

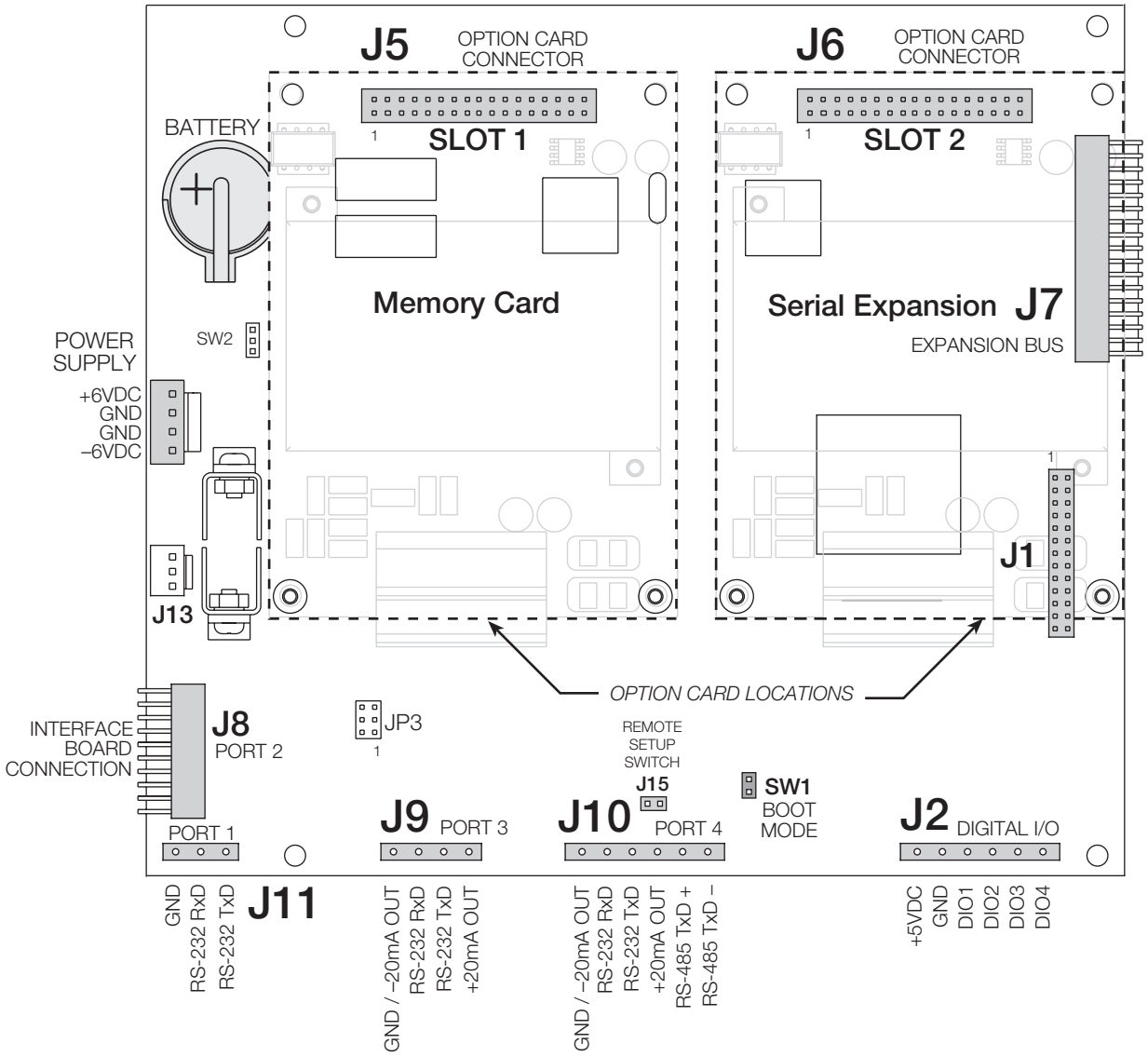


Figure 5-9. *920i CPU Board, Showing Option Card Locations*

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 5-7 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 5-7. 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 46 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. Remove backplate as described in Section 2.2 on page 6.
2. Carefully align the large option card connector with connector J5 or J6 on the CPU board (see Figure 5-10). Press down to seat the option card in the CPU board connector.
3. 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 5-10).
4. Make connections to the option card as required. Use cable ties to secure loose cables inside the enclosure as shown in Figure 5-11. When installation is complete, reassemble the enclosure as described in Section 5.2.7 on page 32.

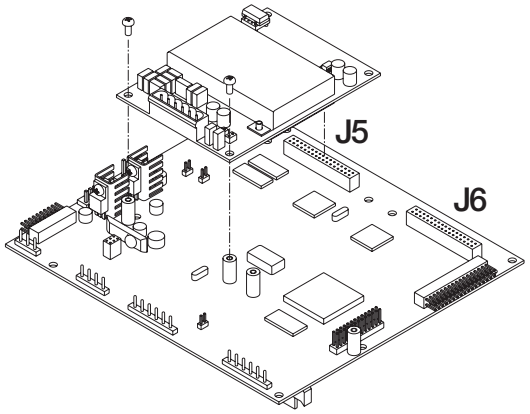


Figure 5-10. Installing Option Card Onto CPU Board

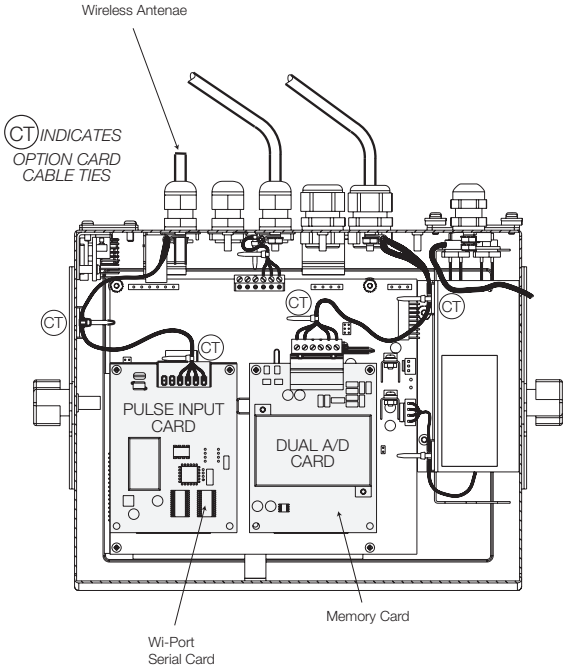


Figure 5-11. Installed Option Cards, Showing Secured Cables

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 5-8 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 5-8. 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 2-12 to prevent distorting the backplate gasket. Torque screws to 15 in-lb (1.7 N-m).

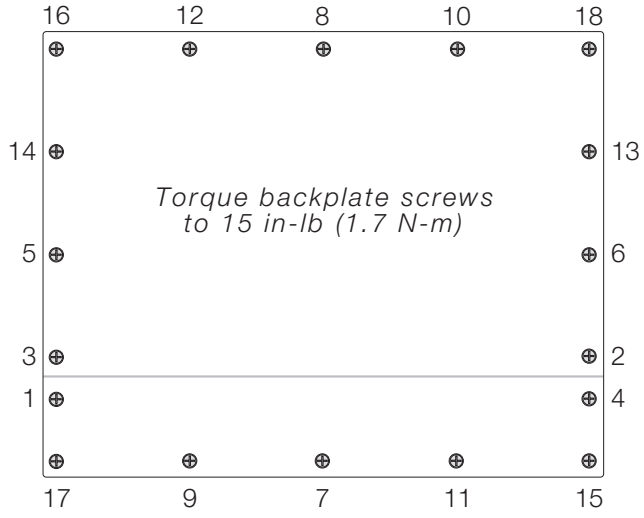


Figure 5-12.

5.2.8 CPU Board Removal

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

1. Disconnect power to the indicator. Remove backplate as described in Section 2.2 on page 6.
2. Unplug connectors J9, J10, and J11 (serial communications), J2 (digital I/O), P1 (power supply), and connectors to any installed option cards.
3. Remove any installed option cards.
4. Remove the five phillips head screws and two kep nuts from the CPU board.
5. 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).
6. 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 5-13).

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

See Section 10.14 on page 126 for complete fuse specifications.

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

I

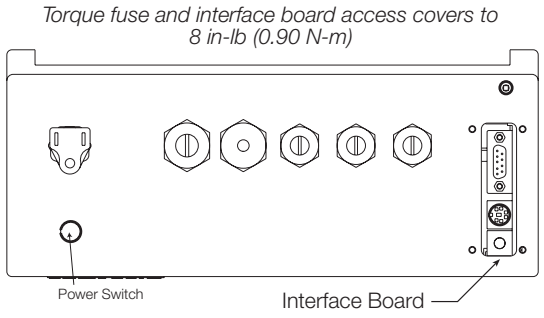


Figure 5-13. Interface Board and Fuse Locations, Universal Model

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 5-9 on page 30 for CPU board battery location and orientation (positive side up).

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

5.2.11 Parts Kit Contents

Table 5-9 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)
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)

Table 5-9. Parts Kit Contents

PN	Description
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 5-9. Parts Kit Contents (Continued)

5.2.12 Downloading CLS Configuration and User Program Software

5.2.13 Replacement Parts and Assembly Drawings

Table 5-10 lists replacement parts for the *920i* universal enclosure model, including all parts referenced in Figures 2-14 through 2-16.

Ref Number	PN	Description (Quantity)	See Figure
1	66502	Overlay (1)	2-14
2	14956	Cap screw, 1/4-NCx1/2 (2)	
3	15148	Lock washer, 1/4 regular (2)	
4	68598	Protective lense (1)	
5	67614	LCD display (1)	
6	67886	Standoffs, short (4)	
7	68661	Standoffs, long (2)	
8	67612	CPU board (1)	
9	14618	Kep nuts, 4-40NC (10)	
10	94392	Power supply, bracket (1)	
11	97468	Mounting plate assembly (1)	
12	94392	Backplate (1)	
13	14624	Lock nuts, 6-32NC, nylon (2)	
14	14822	Machine screws, 4-40NC x 1/4 (13)	
15	67530	Interface board connector plate (1)	
16	67535	Interface board gasket (1)	
17	14862	Machine screws, 8-32NC x 3/8 (4)*	
18	75062	Sealing washers (12)*	
19	32365	Setup switch access screw, 1/4 x 20NC x 1/4 (1)	
20	42640	Machine screw 1/4-28NF x 1/4 (1)	
21	15626	Cable grips, PG9 (3)	
22	15627	Lock nuts, PCN9 (3)	
23	30375	Nylon seal rings for PG9 cord grips (3)	
24	97081	920i Enclosure (1)	
25	15134	Lock washers, No. 8, Type A (3)	2-15
26	14626	Kep nuts, 8-32NC (3)*	
27	45043	Ground wire, 4 in w/ No. 8 eye connector (1)	
28	97464	Cover plate (1)	2-14
29	97476	Cable assembly DC power input DC/DC +/-6V supply(1)	2-14
30	15631	Cable tie, 3-in nylon (1)*	2-16
31	97474	Power cord assembly, 115 VAC and 230 VAC North American units (1)	2-14
	69998	Power cord assembly, 230 VAC European units (1)	—
32	67796	Power supply cable assembly, to CPU board (1)	2-15
33	68662	Ribbon cable to interface board, universal (1)	2-15

Table 5-10. Replacement Parts

Ref Number	PN	Description (Quantity)	See Figure
34	16892	Ground/Earth label (1)	2-15
35	15650	Cable tie mounts, 3/4 in. (1)	
36	68216	Rice Lake nameplate (1)	
37	67755	Brass spacer (1)	
38	57241	Gasket, size 14 (1)	
39	67532	Backplate gasket (1)	
40	53308	Model/serial number label (1)	
41	68532	Single-channel A/D card (1, can be single- or dual-channel A/D)	—
	68533	Dual-channel A/D card (1, can be single- or dual-channel A/D)	2-15
42	67609	Memory card	
43	71027	Fuses (115 VAC models), 2 A Time-Lag TR5 (2)	2-14
	71026	Fuses (230 VAC models), 2 A Time-Lag TR5 (2)	
44			
45	67869	Interface board (1)	2-15
46	14832	Machine screws, 4-40NC x 3/8 (2)	
47	14845	Machine screws, 6-32NC x 1/4 (8)	2-14
48			
50	15628	Cord grips, 1/2 NPT (1)	
52	30376	Nylon seal rings for 1/2 NPT cord grips (1)	
53	15630	Lock nuts for 1/2 NPT cord grips (1)	
54	70069	3V Lithium coin battery	2-16
55	69898	Nylon spacers (4)	2-14
—	66502	Switch panel membrane (1)	
57	70599	6-position screw terminal connector (2)	
	96915	Power cable assembly, fused power	
	35287	Fuse, Slo-blo, 5 Amp, 3AG	

Table 5-10. Replacement Parts (Continued)

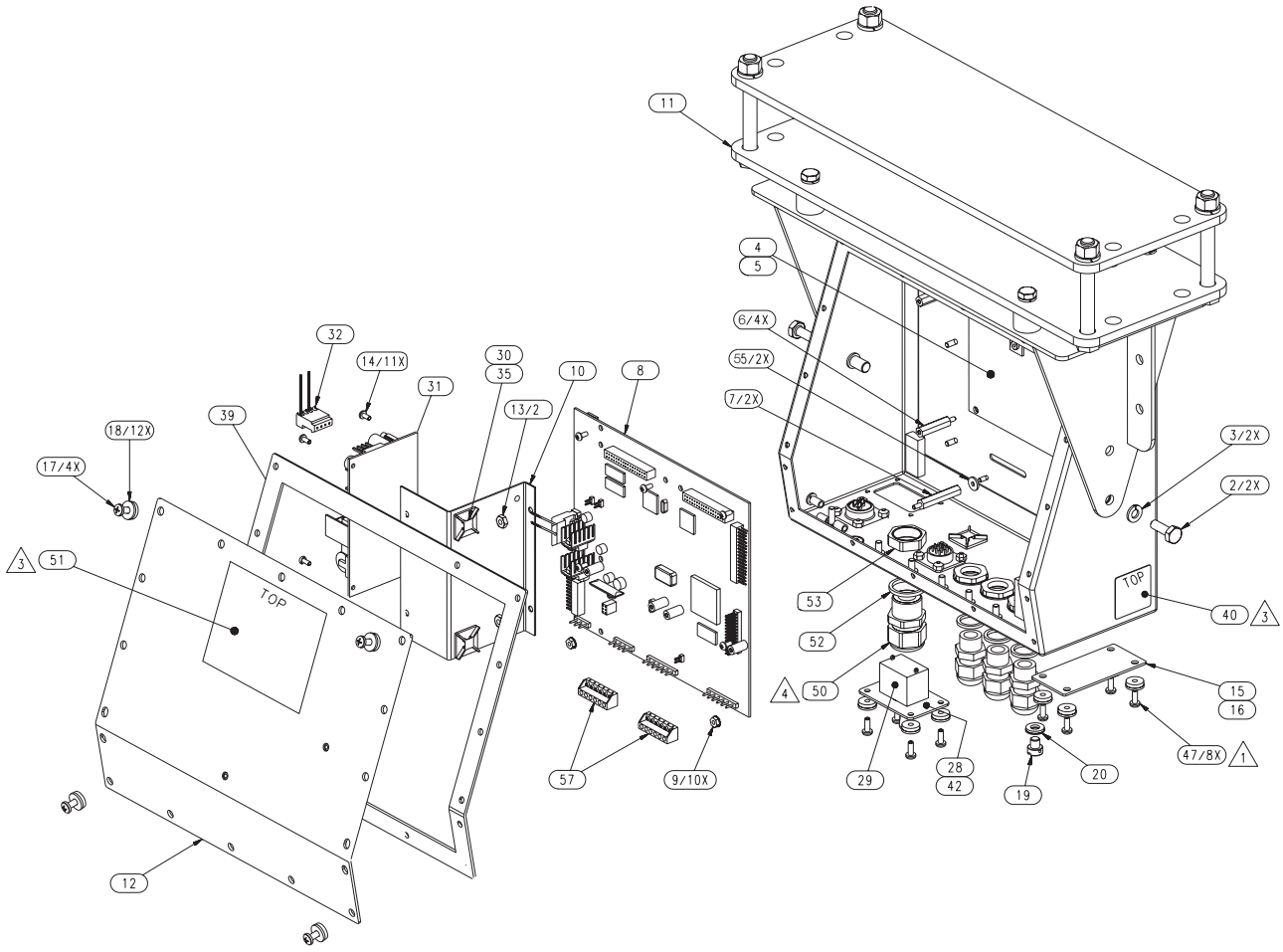


Figure 5-14. 920i Assembly Drawing

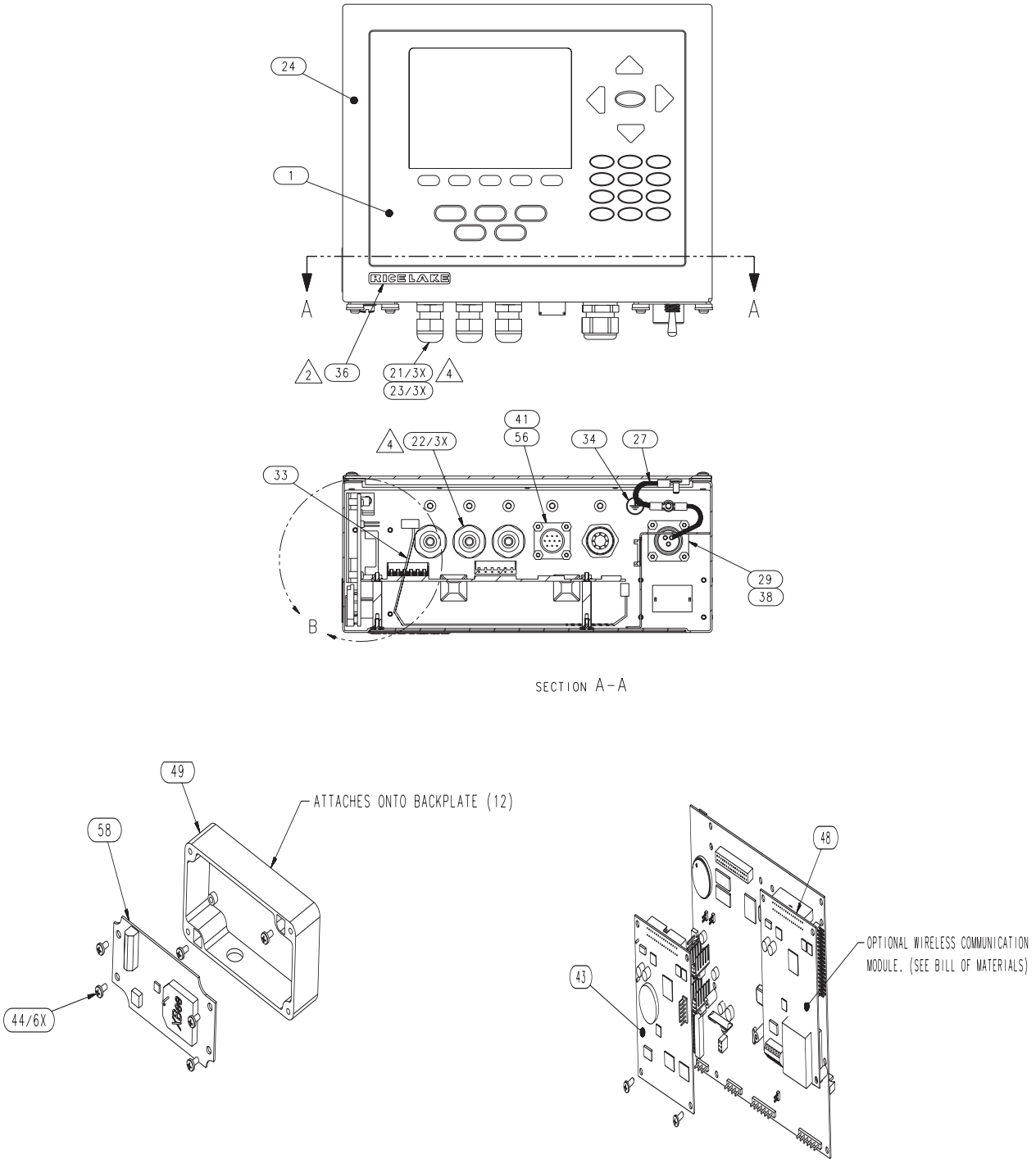


Figure 5-15. 802.15 Wireless Load Cell Kit

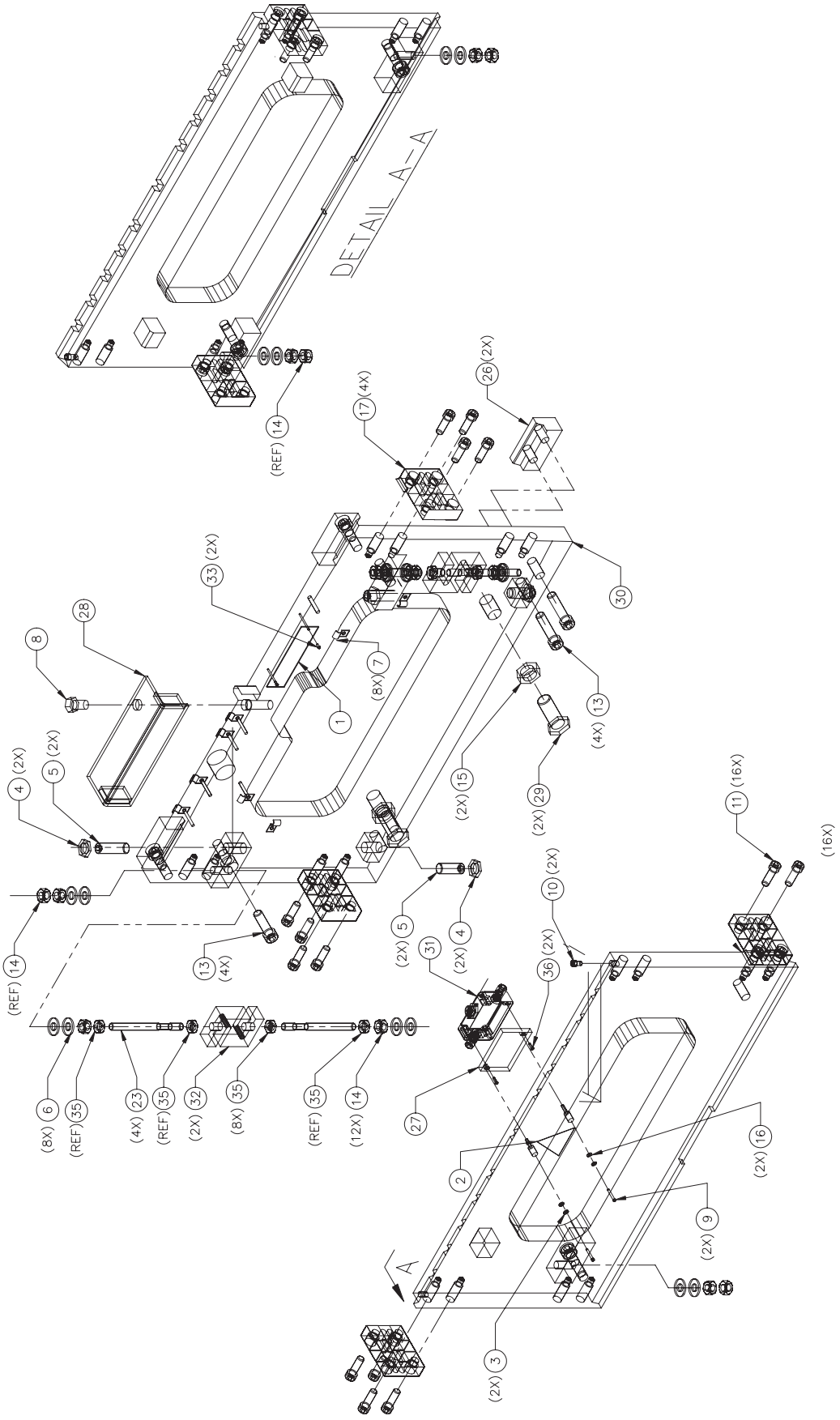
6.0 Appendix

The following table lists the parts available for the CLS-Series scale.

Drawing Number	Rice Lake Part Number	Item Description	Quantity
1		Serial Number Label	1
2		RLWS logo?	1
3		Flat #6 Washer	2
4		Jam Nut 3/4 - 16UNF	4
5		SHCS set 3/4-16 x 2, 1/2” long	4
6	96249	Spherical Washer Set	8
7		Cable clamp	8
8	92813	HHCS, 5/8-11UNC-28 x 1” long, cover plate bolt	1
9		SHCS, #6-32UNC-2A x 1,1/8 long ss	2
10		SHCS, 3/8-16UNC-2A x 1/2 long	2
11		SHCS, 1/2-13UNC-2A x 1,1/2 flexures	16
13	92810	SHCS, 5/8-11UNC-2A x 2.5” long	8
14	14671	Hex Nut, 1/2 - 20UNF-2B	12
15		Jam nut 1-8UNC-2B	2
16		Lock washer #6	2
17		Side flexure	4
23	96199	Flexure rod	4
26	96647	Bottom cleat	2
27		Junction box spacer plate	1
28	97118	Reinforced cover plate	1
29		Shim bolt	2
30		Weld assembly	1
31		Junction box	1
32	96198	Load cell	2
33		Screw, drive #4 x 5/16” SS	2
35	14665	Jam Nut, 1/2 - 20	8
36		SHCS, #6-32UNC x 1-1/8 long SS Low Head	2
	96251	Top Cleat	1
	96252	Expansion Cable from j-box to indicator	1

Table 6-1. CLS Replacement Parts

The following page shows the parts breakout of the CLS-Series Cargo Lift Scale.


DETAIL A-A
A
(REF) 14
17 (4X)
26 (2X)
33 (2X)
28
8
1
7 (8X)
30
13 (4X)
4 (2X)
5 (2X)
15 (2X)
29 (2X)
11 (16X)
(16X)
10 (2X)
36 (2X)
31
(2X) 5
(2X) 4
13 (4X)
(REF) 14
6 (8X)
35 (REF)
23 (4X)
35 (REF)
32 (2X)
35 (8X)
35 (REF)
14 (12X)
27
2
16 (2X)
9 (2X)
3 (2X)

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)
802.15 Wireless	Contains FCC ID: OUR-XBEE/OUR-XBEEPRO
Load Cell Kit:	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
802.15 Wireless	Contains FCC ID: OUR-XBEE/OUR-BXEEPRO
Load Cell Kit:	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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