

SURVIVOR® OTR

Steel or Concrete Deck Truck Scale

Installation Manual



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Revision History

This section tracks and describes the current and previous manual revisions for awareness of major updates and when the updates took place.

Revision	Date	Description
B	May 14, 2013	First documented pdf available in archives
F	May 29, 2020	Revision history established after Rev F
G	July 25, 2024	General enhancements to the manual

Table i. Revision Letter History



Technical training seminars are available through Rice Lake Weighing Systems. Course descriptions and dates can be viewed at www.ricelake.com/training or obtained by calling 715-234-9171 and asking for the training department.

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1.0 Introduction

This manual covers the OTR steel deck and concrete deck flattop truck scale installation procedures and is intended for use by technicians responsible for installing and servicing the SURVIVOR OTR Series Truck Scale. These instructions are general installation guidelines. Refer to the engineering drawings furnished with the scale for component numbering sequences.

The OTR truck scale is designed so that on-site installation time is reduced as much as possible. A well-organized, experienced installation crew should be able to install a standard 70 ft x 11 ft scale in one day.



IMPORTANT: Engineering drawings furnished with the scale always take priority over the general installation guidelines in this manual.



Manuals are available from Rice Lake Weighing Systems at www.ricelake.com/manuals

Warranty information is available at www.ricelake.com/warranties

Standard Package Includes:

- Assembled weighbridge modules and weighbridge fasteners
- Load cells
- Conduit fitting
- Load cell mounts with leveling bolts and anchor bolts
- Copper transient bypass cables at each load cell
- Conduit for load cell cable runs
- Flexible plastic conduit from load cell to metal conduit
- Conduit fittings from flex conduit to metal conduit
- Polycarbonate junction box(es)
- Homerun cable to indicator (6 ft long) and print packages including foundation drawing (pier or floating slab)

Package Does Not Include:

- Approach coping
- Foundation alignment posts
- Rebar and mesh for foundation
- Rebar for deck
- Concrete
- Peripherals
- Freight charges including material handling/crane
- Transportation permits and fees, escort(s) charge, and insurance transportation fees

1.1 Safety

Safety Definitions:



DANGER: Indicates an imminently hazardous situation that, if not avoided, will result in death or serious injury. Includes hazards that are exposed when guards are removed.



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



CAUTION: Indicates a potentially hazardous situation that, if not avoided, could result in minor or moderate injury.



IMPORTANT: Indicates information about procedures that, if not observed, could result in damage to equipment or corruption to and loss of data.

General Safety



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



WARNING

Failure to heed could result in serious injury or death.

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

Do not operate without all shields and guards in place.

Do not use for purposes other than weight measurement.

Do not place fingers into slots or possible pinch points.

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

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

Do not exceed the rated load limit of the unit.

Do not make alterations or modifications to the unit.

Do not remove or obscure warning labels.

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

Do not exceed 7,000 lb of axel load in cross traffic.

2.0 Pre-Installation

The modular sections of the OTR series truck scale are shipped pre-assembled and ready to be placed on temporary setting blocks positioned on a pre-existing foundation using a crane.

The general assembly order is summarized below:

1. Set deck modules into position on setting blocks.
2. Install load cell mounts in pockets and anchor bolts in base plates.
3. Run cabling and connect electrical wiring to junction box.
4. Pour, finish and seal-cure concrete deck. (If used)
5. Connect indicator and peripheral devices.

2.1 Assembly Time Estimate

The below time estimates are for a typical, three-module, 70 ft truck scale. Estimates will vary with scale size and site conditions.

Task	Approx. Time
Set deck modules into position on setting blocks (Crew of two and one crane operator)	1 hour work (2 hour rental)
Install load cell mounts in pockets and anchor bolts in base plates.	3 to 4 hours
Run cabling and connect electrical wiring to junction box.	2-3 hours
Pour, finish, and seal-cure concrete deck surface (Crew of three to four)	2-3 hours
Connect indicator and peripheral devices.	2-3 hours (while concrete cures)

Table 2-1. Steel Deck Assembly Time Estimate



IMPORTANT: Standard concrete reaches full strength after a 28-day curing period. At seven days, standard concrete reaches approximately 75% of its maximum strength and can handle moderate loads.

Refer to ACI318 for additional information regarding concrete curing requirements, and consult the concrete vendor to discuss curing requirements based upon the mix used specifically for the site. Loading of a slab before it reaches 75% of its maximum strength may cause permanent structural damage.

2.2 Equipment and Tools (Steel Deck)

- Crane with capacity to exceed weight of deck module (consult product specifications)
- Four chains or cables (8 ft minimum length each) with hooks or clevises
- 3/4 inch rotary hammer drill
- 3/4 inch x 24 inch carbide masonry bit
- One low-profile 4-ton bottle jack
- 5 1/2 inch setting blocks
- Various thickness shims to level scale
- Torque wrench to 100 ft-lb
- Socket wrenches to 1 1/2 inch (drive com in)
- 4 ft bubble level
- Small torpedo level
- Hammers, maul, pry bar
- Hand tools for pulling and connecting electrical wiring

2.3 Lifting and Handling (Steel Deck)

Lift deck modules from the truck with four chains attached to four yellow lift lugs.



NOTE: A set of lifting lugs are provided with the scale and shipped on the last module loaded on the truck at the factory. Remove the lifting lugs when module has been placed and install lugs on next module for lifting.



Figure 2-1. Lifting Deck Modules



DANGER: Loads may disengage from crane scale hook and shackle or lifting eye if proper procedures are not followed.

A falling load may cause serious injury or death.

Never lift more than the crane scale's assigned Working Load Limit (WLL) rating.

2.4 Temporary Setting Blocks

Place a 5-1/2 in setting block under the deck module, near each load module pocket where load modules will be installed. See Section 3.1 on page 10.



NOTE: Setting blocks are only used in the corners of the modules where the load cell mounts are installed. The corners that do not have load cell mount pockets do not require setting blocks.

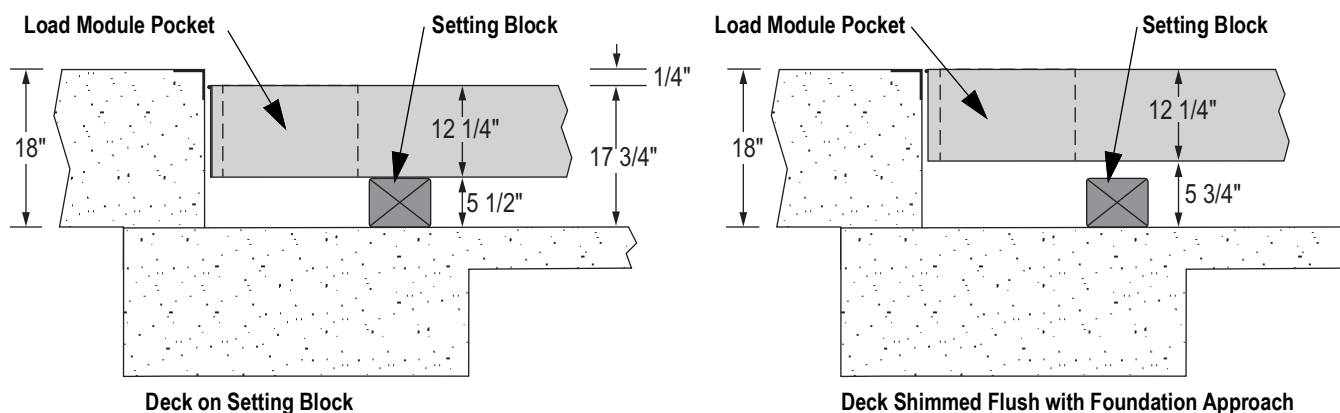


Figure 2-2. Setting Block Measurements (Steel Deck) – 18 inch Foundation Profile



NOTE: When placing modules on setting blocks, place blocks close to the pocket (to allow room for mount).

3.0 Assemble Deck Modules

Deck modules are designated as **A**, **B** or **C**. All two-module scales have an **A** and **C** module, while longer scales with more than two modules have one or more **B** modules.



NOTE: The modules are marked as **A**, **B**, or **C** on the end of each module for identification during placement and assembly.

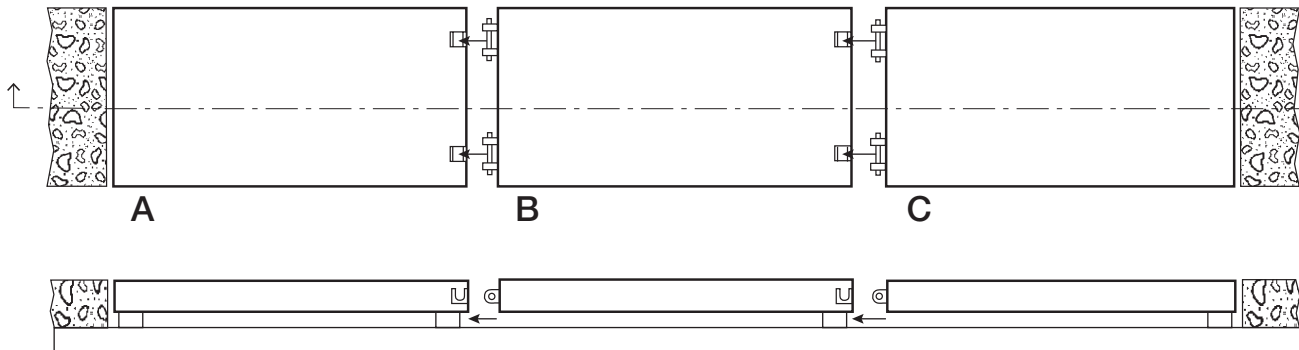


Figure 3-1. Deck Modules

A Module

The **A** module is an end module and is the first to be placed on setting blocks. The left end is a straight end which is positioned next to the vertical wall of the concrete approach. The right end of the **A** module contains two pin-connection receptacles that are used to accept the two module-support pins located on the **B** module.

B Module

The **B** module is a center module, it has two module-support pins on the left end and two pin-connection receptacles on the right end. The two module-support pins of module **B** are inserted into the two pin-connection receptacles of module **A**. The pin-connection receptacles of module **B** accept the module-support pins from another **B** module or a **C** module.

C Module

The **C** module is an end module and the last one placed on setting blocks. The two module-support pins are designed to attach to either an **A** module for a two-module installation or to a **B** module for an installation that has more than two modules. The opposite end of the **C** module is a straight end and is positioned next to the vertical wall of the concrete approach.



Figure 3-2. Weigh Modules Ready for Removal and Installation

Modules have been stacked on the truck for shipping in the order that they are installed. The **A** module is the top module, followed by **B** modules and the **C** module is the bottom module.

3.1 Place End Module A

Before lifting the **A** module from the truck, place four 5 1/2 inch temporary setting blocks on the concrete foundation at each of the four corners. Also re-measure the overall distance between approaches. The OTR is undersized 1 1/2 inch. When installed in a 70 ft opening, there will be a 3/4 inch gap between the approaches and the scale. Minor adjustments can be made when setting the first module to equally space the scale between approaches.



NOTE: Depending on foundation and clean out requirements, a different size of setting blocks may be required. Assembly instruction references an 18 inch approach profile for a 5 3/4 inch clean out. Adjust as needed for specific application needs.



Figure 3-3. Module Positioned on Temporary Setting Blocks



NOTE: Position each setting block so that it does not interfere with installation of the load cell mounts.

Place module **A** with the straight end 3/4 inch from the concrete bulkhead. With 5 1/2 inch setting blocks, the deck surface is 1/4 inch - 3/8 inch from the top of the concrete approach. Square this module with the approach and check that the side-to-side dimensions are the same.



Figure 3-4. Setting Modules in Place



NOTE: Before installing the **B** module, check that no debris has fallen into the two pin-connection receptacles.

3.2 Place and Attach Adjoining Modules B and C

In a scale with more than two modules, the next module is a **B** module (Figure 3-5). If the scale has only two modules, it is a **C** module. Place two 5 1/2 inch setting blocks at the corners opposite of the module support pins (load cell mount locations) to support the **B** module.



Figure 3-5. Module B Installation

Place the **B** module so the module-support pins engage with the pin-connection receptacles of the **A** module and the opposite end rests on the two setting blocks.

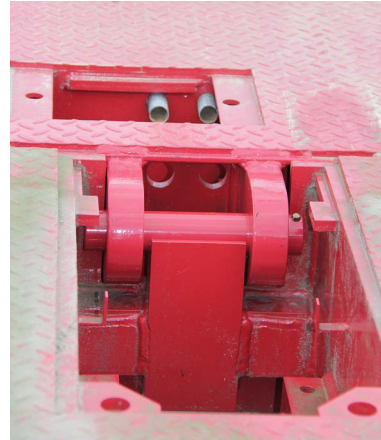


Figure 3-6. Pin and Receptacle Interface



NOTE: If the pins do not seat squarely in the receptacles, raise the module slightly and reset the module again.

When the **B** module is in place, remove the cables or chains from the module and install any other **B** modules or the **C** module in a similar manner.

The **C** module is installed in the same way that the **B** module was installed. The end of the **C** module should be approximately 3/4 inch from the approach bulkhead.

The weigh module setup is now complete and the scale is ready to be leveled.

3.3 Raise Deck and Level with Approaches

Use the following steps to raise and level the weigh modules with the concrete approach:

1. Beginning at the approach (left) end of the **A** module, raise the scale deck using low-profile hydraulic jacks.
2. Add shims on the setting blocks until the deck surface is level with the approach.
3. Move to the opposite end of the **A** module and raise and level this end.



Figure 3-7. Leveling Deck with Approaches

4. When all four corners of the **A** module are leveled, ensure the module is square with the approach and that it has a 3/4 inch end clearance from the concrete bulkhead.
5. Move to the **B** module and continue leveling the weighbridge by leveling the load cell mount end of the **B** module.
6. Raise, level, and shim any other **B** modules if they are installed.
7. When the **B** module or modules are done, continue by leveling the **C** module in the same manner.



Figure 3-8. Check Weighbridge for Level

8. When all modules are leveled and shimmed, check the edge alignment with a string line or a level along one side of the main beam.
9. Check the module support pins to ensure they are firmly seated in the pin-connection receptacles.
10. Ensure the weighbridge end clearance is within specified requirements.
11. The deck is now at its final position and ready for load cell mount installation.



NOTE: This procedure could be accomplished while installing the shims if transit is used to level scale (Section 3.3).

4.0 Load Cell Mount Installation

Load cell mount components (baseplate, mount blocks, anchor bolts, link, load cell, flexcable, and upper mount blocks) are shipped in the hardware box and need to be assembled while in the load cell pocket. Remove the printed load cell Certificate of Conformance (CC) forms (included with load cells) and store them in a safe place for future reference.

The following sections contain step-by-step instructions on mount installation, including the baseplate, load cells, upper mount blocks (shim and grout), ground straps, and anchor bolts.

4.1 Install Baseplate and Load Cell

Use the following steps for installing the mount baseplate and load cell in the load cell mount pockets.

1. Remove load cell mount components from the packing box and position one set at each mount location.



Figure 4-1. Baseplate

2. Lower baseplate through pocket opening and onto concrete foundation.
3. Remove cover plate from the 90° fitting included with conduit assembly.
4. Insert the load cell cable through the exposed 90° fitting.



Figure 4-2. Insert Load Cell Cable Through 90° Fitting

5. Thread the exposed 90° fitting to the load cell, making sure the cable does not twist.



Figure 4-3. Installing 90° Fitting to Load Cell

6. Insert cable through second half of fitting and conduit, then re-install cover plate to 90° fitting.
 - This method prevents connections from being twisted off inside the load cell



Figure 4-4. Installing 90° Fitting to Load Cell

7. Place the load cell link over the end of the cell and install the assembly onto the top of the baseplate.

8. Apply anti-seize compound to threads of load cell bolts before installing. Torque load cell bolts 50 – 75 ft-lb.



Figure 4-5. Load cell Access

9. Position flex cable with the fitting facing down so that a loop can be made in it and the end can be attached to the rigid conduit.

4.2 Mount Block and Shim (Groutless) Installation (Option 1)

Use the following procedure for installing mount blocks and shims for leveling:



NOTE: RLWS has a shim plate (PN 67292) available to level the scale. Do not exceed over 3/4 inch of shims combined. If more is necessary, contact Rice Lake Weighing Systems for other options.

1. Apply anti-seize compound to threads of mount block bolts.

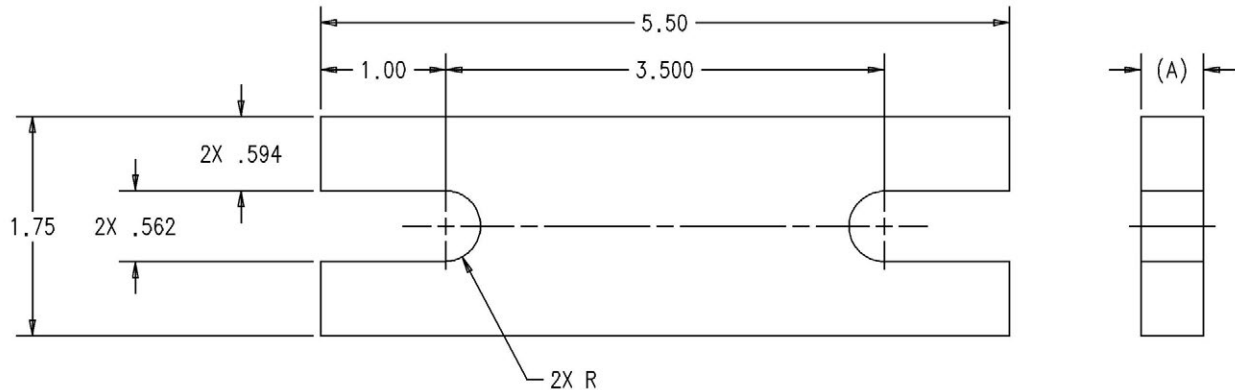


Figure 4-6. Example Shim Dimensions

2. Apply grease to link contact points where the link touches the load cell and both radius blocks.
3. Install one bolt through welded block into upper mount block.
4. Add or remove shims until radius of block comes in contact with rocker link radius.

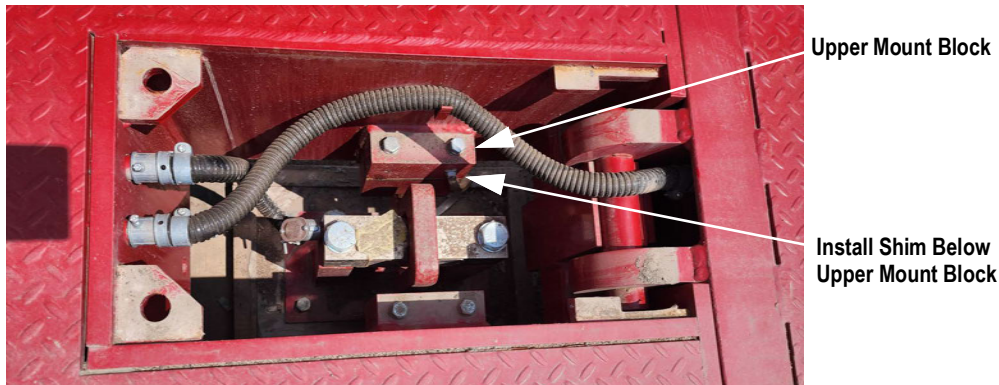


Figure 4-7. Shim Installation (Option 1)

5. Install second bolt assembly through blocks and shims, then torque to 40 ft-lb.
 - Repeat process on all load cell pockets



NOTE: Position the slotted end of shim towards shorter end of load cell pocket. This allows more room to work when adding or removing shims.

6. Ensure the link for any binding or misalignment and the link is plumb in respect to the upper blocks.
 - Check that the link is centered between the side of the link and the upper blocks using a mount location setting jig.



NOTE: If needed, tap the edge of the baseplate with a hammer to make minor adjustments in alignment.



Figure 4-8. Recheck Link for Binding

7. Jack the weigh module and remove the setting blocks.
8. Slowly lower the weigh module until it rests on the load cell links.
9. Use a torpedo level to set rocker plumb.
10. Use an industrial hammer drill to drill a 3/4 inch hole into the concrete at least 6 inch deep on one side of the baseplate.



Figure 4-9. Drill Anchor Bolt Holes

11. Drill a second anchor bolt hole on the opposite side of the baseplate. Each mount requires two anchor bolts to prevent longitudinal motion of the baseplate.
 - Anchor bolts (7 inch x 3/4 inch) with expansion heads are supplied with the scale.



Figure 4-10. Anchor Bolts with Washers

12. Insert bolts into holes drilled in the foundation.
13. Install one washer and one nut on each anchor bolt. Place a driver pipe on top of the bolt and use the long punch to seat the anchor bolts against the baseplate. Tighten anchor bolt nuts.
14. Attach one end of the ground strap to the upper block.
15. Insert a bolt through the wire terminal on the loose end and thread the bolt into the hole on the baseplate.
16. Tighten the bolt securely with a wrench.

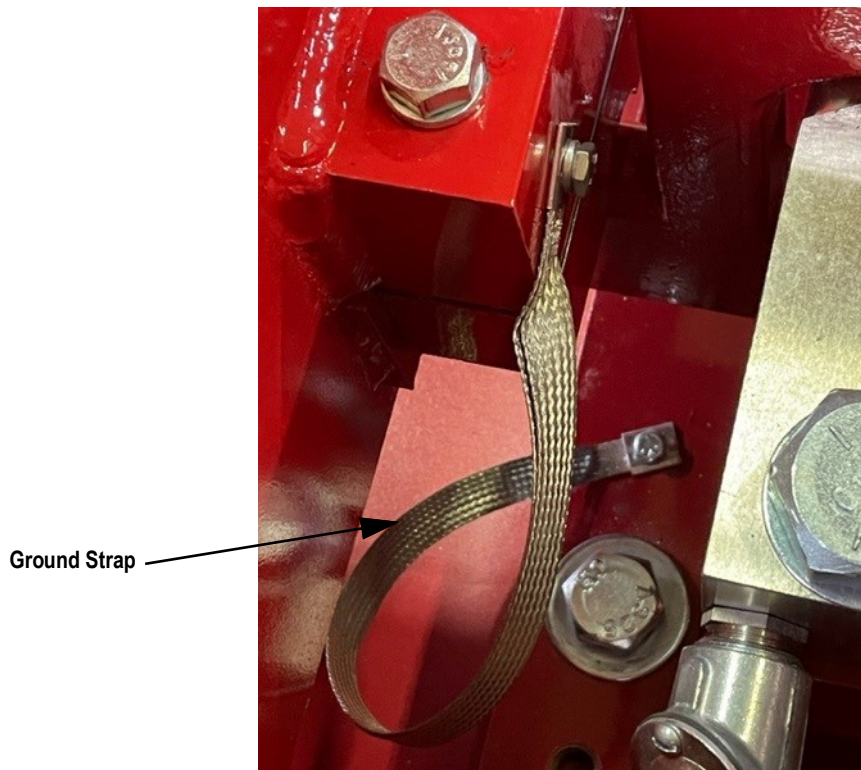


Figure 4-11. Ground Strap

4.3 Mount Block and Grout Installation (Option 2)

Use the following steps to install mount blocks and baseplate grout:

- Adjust leveling bolts until radius of block comes in contact with rocker link radius
- Jack the weigh module and remove setting blocks
- Slowly lower the weigh module until it rests on the load cell links
- Use torpedo level to set the rocker plumb.



NOTE: After the weigh module is lowered into final position, check each load cell mount assembly to ensure that the link is plumb and that there is no binding or misalignment.

1. Use an industrial hammer drill to drill a 3/4 inch hole into the concrete at least 6 inch deep on one side of the mount frame (Figure 4-9 on page 17).
2. Drill a second anchor bolt hole on the opposite side of the baseplate. Each mount requires two anchor bolts to prevent longitudinal motion of the baseplate (Figure 4-10 on page 18).
 - Anchor bolts (7 inch x 3/4 inch) with expansion heads are supplied with the scale
3. Insert bolts into holes drilled in foundation.
4. Install one washer and one nut on each anchor bolt. Place a driver pipe on top of the anchor bolt and use the long punch to seat anchor bolts against baseplate.



NOTE: Do not apply excessive force to the anchor bolts-- bending of the baseplate could occur. When installing anchor bolts, make sure that there is adequate bolt length to extend into the concrete foundation.



Wooden form looking down into load cell pocket

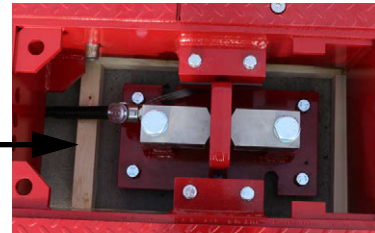


Figure 4-12. Temporary Wooden Forms Around Baseplate

5. Attach one end of the ground strap to the upper block.
6. Insert a bolt through the wire terminal on the loose end and thread the bolt into the hole on the baseplate.
7. Tighten the bolt securely with a wrench (Figure 4-11 on page 18).
8. Erect temporary wooden forms around each baseplate and pour 9000 PSI, non-shrinking, epoxy or cement grout into the forms beneath the baseplate (Figure 4-12). A funnel with a long tube can be used to pour grout into the forms while working from above the access hole.



Figure 4-13. Framed and Grouted Baseplate

9. After pouring the grout, tap the form several times with a hammer to remove any air voids beneath the baseplate.
 - It must have even support from continuous grout contact
10. Remove the temporary wooden forms when the grout is set (Figure 4-13).
 - Grout should be allowed to set for at least 24-hours before removing the wooden forms
11. Tighten anchor bolt nuts after the grout has hardened.

5.0 Load Cell Wiring

Electrical conduit is pre-installed at the factory and only needs to be connected between the modules and from the modules to the junction box. Following conduit work, load cell cables are routed through each conduit from the load cells to the junction box. All load cell cabling used for this installation comes in the shipping container. The layout pattern for the electrical conduit on a three module truck scale installation is shown in Figure 5-1.

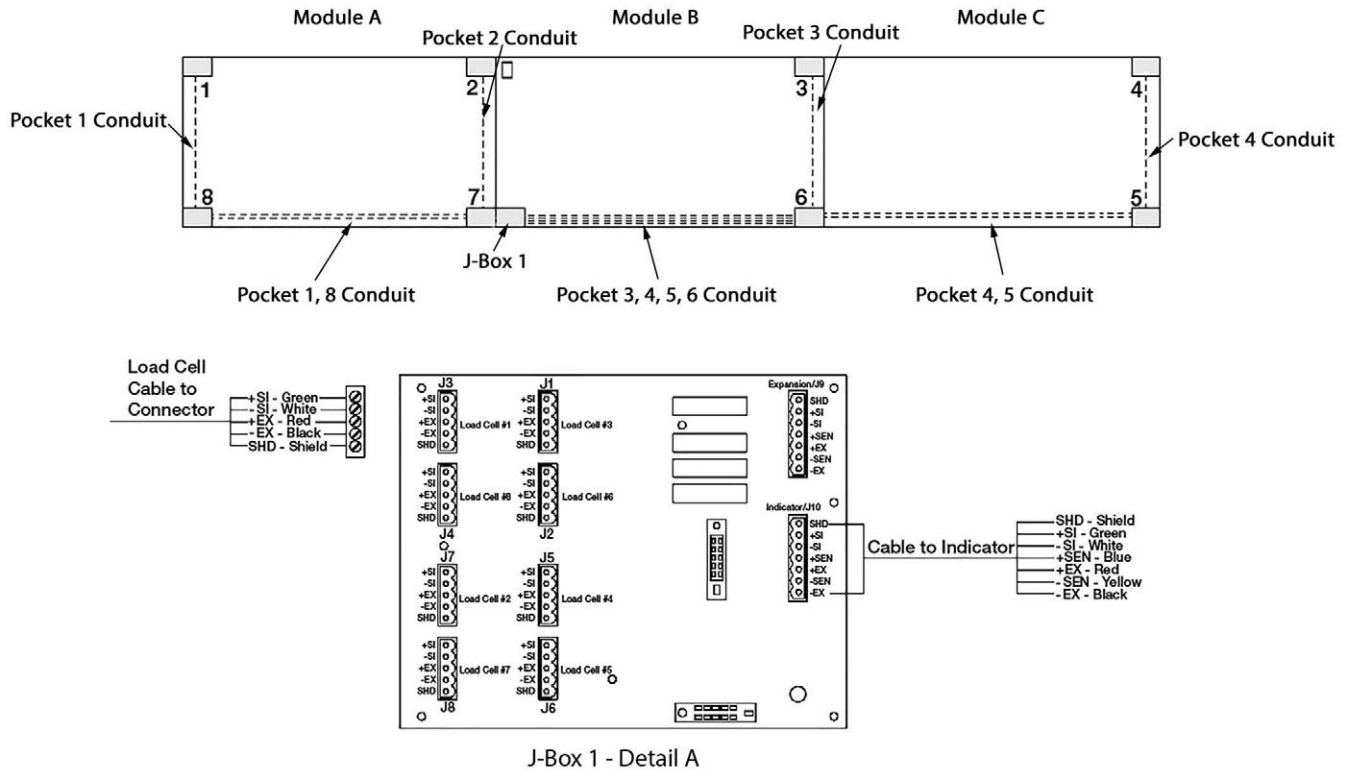


Figure 5-1. Junction Box Wiring and Conduit Runs for a Standard 70 ft x11 ft Four Section/Three Module Scale

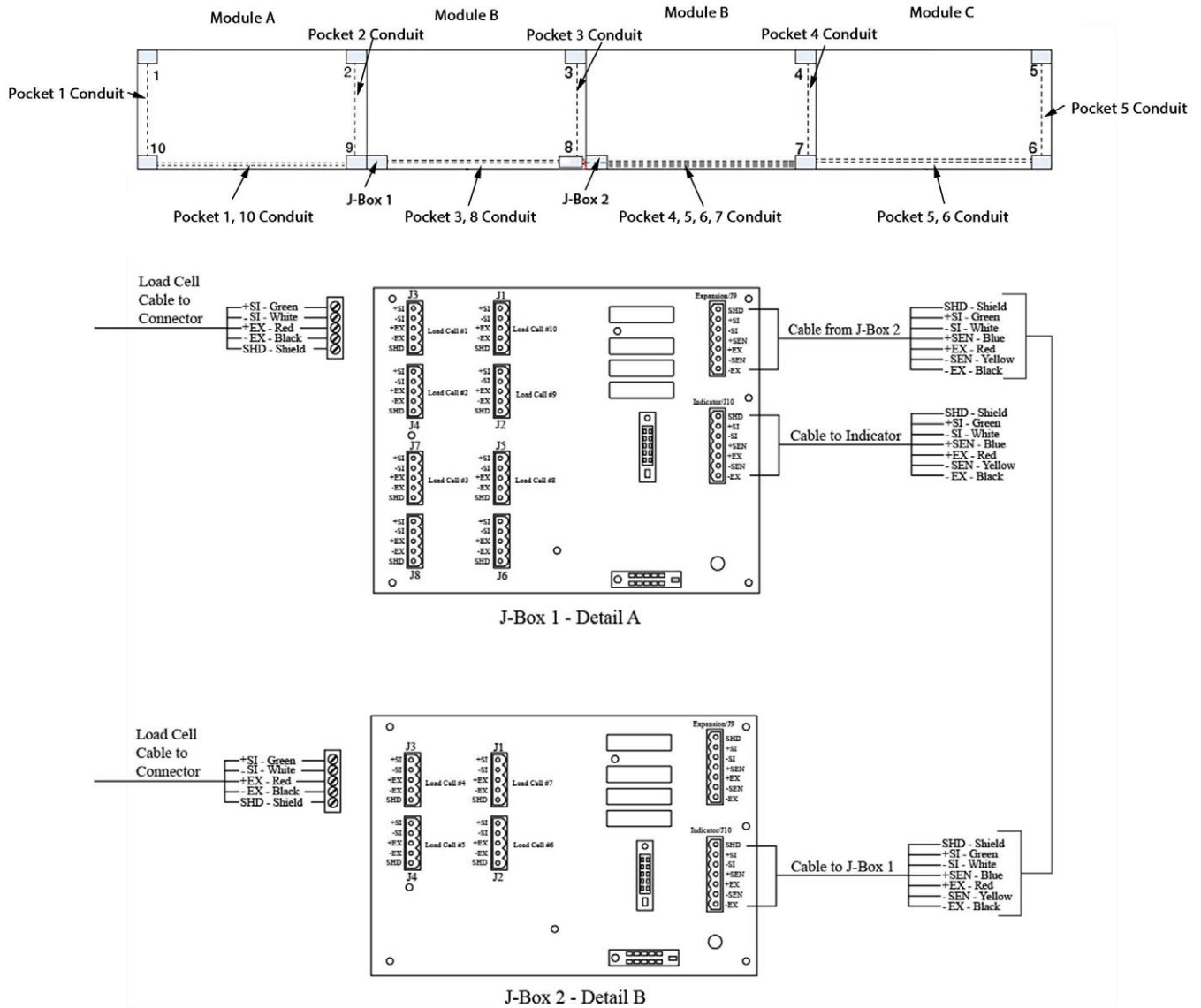


Figure 5-2. Junction Box Wiring and Conduit Runs for a Five Section/Four Module Scale

Before the weigh module wiring can be completed, all load cell cables have to be routed through the conduit beginning at the load cell outlet. Use the following steps to route load cell cables through conduit to the junction box.

1. Mark each load cell cable at the end to help identify each load cell before routing load cell cables.
2. Carefully make a loop in the flex conduit and position the end of the flex conduit close to the end of the rigid conduit.



Figure 5-3. Load Cell Pocket Conduit Installed

3. Working from the junction box end, insert a fish tape or similar tool and pull each load cell cable through the rigid conduit until all excess cable is taken in.
4. When all of the load cell cable is pulled through, insert the end of the flex conduit over the end of the rigid conduit and tighten fitting.
5. Wire each load cell to the junction box terminal strip in accordance with the wiring code contained in the Certificate of Conformance.

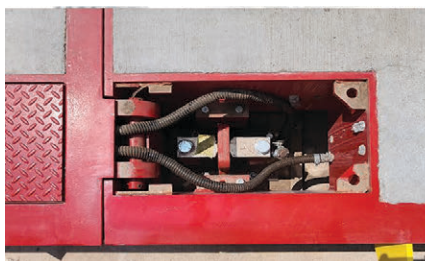


NOTE: Load cell cable may be cut for best fit. Standard warranty will not be affected.



Figure 5-4. Junction Box Pocket

Concrete Deck



Steel Deck



Figure 5-5. Conduit Connection Between Deck Modules

6.0 Recheck Link for Binding

Once the load cell cable is installed and wired, the concrete deck can be poured.

1. Install the access plates over each load cell location to prevent concrete from spilling into the load cell access cavities.
2. Cover the junction box pocket with cardboard or plastic and apply tape along the top of each frame channel to protect it from concrete splatters. In addition, tape off any open holes in the weighbridge to prevent concrete leakage.



Figure 6-1. Load Cell Access Plate Location

6.1 Concrete Specifications

4000 PSI concrete (6 bags/yd³) combined with a rebar grid of #4 rebar, 16 inch on-center each direction is recommended. See assembly drawings furnished with the scale for specifications.

Scale Length	Total (feet)			Total (pounds)			Concrete Required (yards)		
	10' Wide	11' Wide	12' Wide	10' Wide	11' Wide	12' Wide	10' Wide	11' Wide	12' Wide
10 ft	150 ft	168 ft	185 ft	100 lb	112 lb	124 lb	2 yds	2.5 yds	2.5 yds
12 ft	180 ft	218 ft	240 ft	120 lb	146 lb	160 lb	2.75 yds	3 yds	3.25 yds
15 ft	240 ft	267 ft	294 ft	160 lb	178 lb	196 lb	3.25 yds	3.5 yds	4 yds
20 ft	304 ft	340 ft	375 ft	203 lb	227 lb	251 lb	4.5 yds	5 yds	5.5 yds
24 ft	367 ft	405 ft	443 ft	245 lb	270 lb	296 lb	5.5 yds	6 yds	6.5 yds
40 ft	608 ft	679 ft	750 ft	406 lb	454 lb	501 lb	9 yds	10 yds	11 yds
47 ft	733 ft	809 ft	885 ft	490 lb	540 lb	591 lb	11 yds	11.5 yds	12.5 yds
60 ft	912 ft	1019 ft	1125 ft	609 lb	680 lb	752 lb	13.5 yds	15 yds	16 yds
70 ft	1100 ft	1214 ft	1328 ft	734 lb	811 lb	887 lb	16 yds	17.5 yds	19 yds
80 ft	1216 ft	1358 ft	1500 ft	812 lb	907 lb	1002 lb	18 yds	20 yds	21.5 yds
90 ft	1368 ft	1524 ft	1688 ft	914 lb	1021 lb	1128 lb	20.5 yds	22.5 yds	24.5 yds
93 ft	1466 ft	1618 ft	1770 ft	979 lb	1081 lb	1182 lb	21.5 yds	23.5 yds	25 yds
100 ft	1520 ft	1698 ft	1875 ft	1015 lb	1134 lb	1253 lb	22.5 yds	25 yds	27 yds
117 ft	1833 ft	2023 ft	2213 ft	1224 lb	1351 lb	1478 lb	27 yds	29 yds	31.5 yds
120 ft	1880 ft	2075 ft	2270 ft	1256 lb	1386 lb	1516 lb	28 yds	30 yds	32.5 yds
130 ft	2037 ft	2248 ft	2460 ft	1361 lb	1502 lb	1643 lb	30 yds	32.5 yds	35.5 yds
140 ft	2194 ft	2421 ft	2650 ft	1466 lb	1618 lb	1770 lb	32.5 yds	35 yds	38 yds
150 ft	2351 ft	2594 ft	2840 ft	1571 lb	1734 lb	1897 lb	35 yds	37.5 yds	41 yds
160 ft	2508 ft	2767 ft	3030 ft	1676 lb	1850 lb	2027 lb	37 yds	40 yds	44 yds

Table 6-1. Rebar and Concrete Requirements

6.2 Pour and Finish Concrete Deck

1. Mix the concrete no wetter than a standard 3 inch slump. The strength of concrete is largely dependent on the water/cement ratio.



NOTE: Adding extra water to make the concrete easier to pour and work with reduces the strength and increases the size and number of shrinkage cracks.

To increase flow, use an electric concrete vibrator rather than adding extra water to the mix.

2. Begin pouring at one of the end modules, thoroughly vibrating works the concrete into the inside of the main beams and around the shear connectors.
3. Strike off and screed the concrete to further settle the concrete and level the surface.
4. The first module can be bull floated to final level while the second module is being poured. Edge all concrete/metal frame joints.

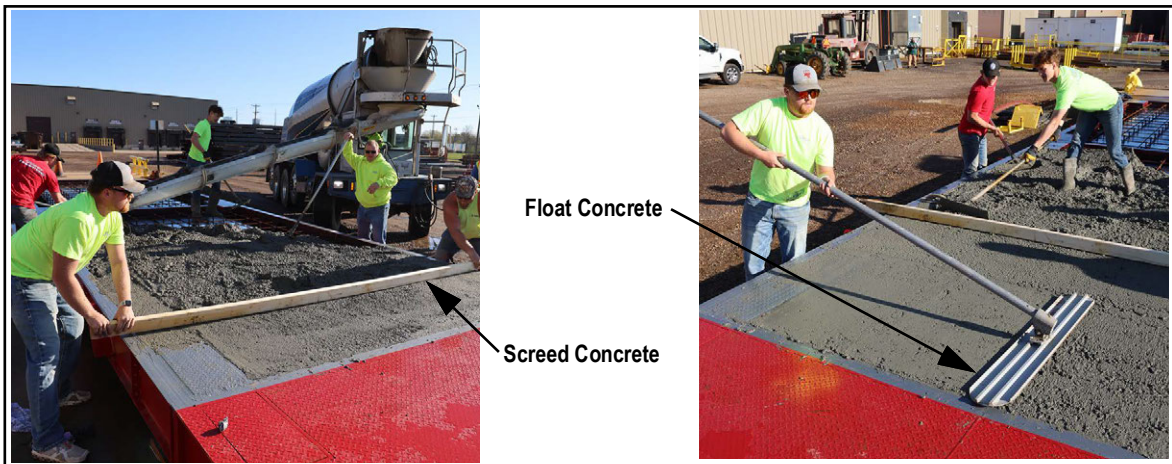


Figure 6-2. Finishing Concrete Deck

5. Pour, screed, float, and edge any remaining modules. After the concrete deck surface has hardened, brush with a broom to provide safe traction.
6. Clean concrete splatters from the painted frame members with a wet sponge before they dry and before applying a liquid curing agent.
7. Apply liquid curing agent to complete concrete pour and finish ([Section 6.3 on page 24](#)).

6.3 Moist-Cure Concrete Deck

For proper curing, the surface must be kept moist for seven days. If the top surface is allowed to dry out during this time, the finished surface is prone to spalling and surface cracking. Hot weather, full sun, and windy conditions all accelerate surface drying.

The easiest way to keep the surface moist for seven days is to roll or spray on an epoxy-based concrete curing solution immediately after final finishing. These epoxy-based curing products are available at contractor-supply companies. They both seal in moisture for slow curing and protect the surface from salt and corrosion.



IMPORTANT: Some curing agents can have adverse effects on steel surfaces.

Please refer to assembly prints for proper curing agents.

Alternately, the surface can be covered with continuous plastic and kept moist by frequent flooding beneath the plastic for the seven-day cure period.

7.0 Connecting Electronic Equipment

60 ft of six-wire homerun cable is supplied for wiring the junction box to the indicator. It is to be run in 3/4 inch galvanized metal or plastic conduit from the junction box to the indicator. Conduit for this purpose is to be obtained locally. A section of flexible conduit with connector is provided where this cable exits the junction box. Do not run any other electrical cables in or near the conduit to the indicator.

7.1 Indicator to Peripherals

All conduit for cabling from the indicator to remote displays and other peripheral devices is to be obtained locally. Conduit runs may be buried in a trench or secured above ground. Use separate conduit runs for AC power and DC data lines to avoid interference. As a general guideline, run AC and DC cables in separate trenches if possible. When DC data cables must run in the same trench as AC power lines, separate cables as much as possible.



Figure 7-1. Conduit Run in Trench

7.2 Single-Point Ground Conductor

A bare 10 gauge solid wire is run from the scale frame to the main AC power earth ground. DC transient protection must be properly grounded to function correctly.

7.3 Junction Box Connections

Each junction box contains a JB8SPT summing board with DC transient protection devices. A desiccant such as the RLWS Industrial Corrosion Inhibitor (PN 16037) should be added to the junction box enclosure before final closure.

In a truck scale up to 70 ft long, a single junction box is located in a junction box pocket in the center or **B** module ([Figure 5-1 on page 20](#)). A summing card mounted within the junction box is used to make all cable terminal connections. All terminal pins are clearly marked as to function.

On scales over 70 ft long with four or more modules, two or more junction boxes are necessary.



NOTE: Refer to assembly print or foundation plan for junction box location and homerun cable output.

7.4 Electrical Ground Connections

! IMPORTANT: *Improper grounding systems on outdoor truck scales often cause corrupted data from ground-loop current flows and costly lightning damage to electronics.*

Always strive for a single-point grounding system (Figure 7-3 on page 27). Do not drive ground rods at the scale location to establish separate earth grounds for the scale. These separate earth grounds do not share the same zero reference as the existing earth ground for the AC power system. This difference in electrical potential invites ground-loop current flow between the separate grounds, often corrupting serial data like RS-232 which depends on a stable zero reference.

In addition, a separate earth ground system at the scale can actually invite lightning or power surge damage:

- A minor power-line surge in the scale house electrical supply should immediately be shunted to ground; if a separate ground system exists at the scale with a lower potential than the main ground, the surge may travel out to the scale ground rod, damaging load cells on its way
- A nearby lightning ground strike may instantly raise the zero potential of a ground rod at the scale location, while leaving the scale house ground rod unaffected less; that lightning surge now takes the easiest path to the lower-potential ground—through the scale wiring and back to the scale house ground, possibly damaging the indicator on its way

Therefore, the best grounding system for the scale is the same grounding system used for the incoming AC power system. The 120 VAC power source used to power the indicator is connected to an existing earth grounded rod system at the scale house or other building where the indicator is located. This should consist of a double ground rod system of two 5/8 inch x 8 ft copper rods driven 8 ft deep at the service entrance where the local utility company brings their lines into the building.

The local utility company can test the resistance of the existing ground rods with a clamp-on megohmmeter that measures zero resistance. A reading of $3\frac{3}{4}$ or less is acceptable as a ground. If the test determines that the grounding system is inadequate, the utility company can suggest methods to improve the system. It is crucial that the scale owner authorize and make the recommended improvements to ensure an adequate electrical ground. Do not connect the scale to the AC power supply until the grounding system is adequate.

Ensure each load cell grounding strap is securely connected to the top plate and bottom plate of each load cell mount. Some models have ground straps included to install between modules (Figure 7-2). These inter-module straps ensure that the entire scale is connected to the same single point ground. There should be metal-to-metal contact with no presence of paint or grout. This strap is designed to channel power surges on the deck around—rather than through—the load cell to ground. These, and all, ground connections must be torqued to a specified value and re-torqued at regular service intervals. A thick coating of antioxidant grease should be maintained on all ground connection.

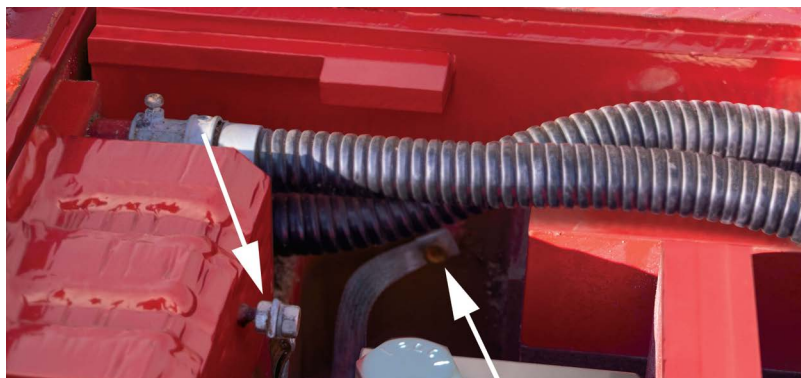


Figure 7-2. Inter-Module Ground Strap

A separate grounding system conductor must extend uninterrupted from the main service panel ground to the scale to protect load cells and scale wiring from lightning and other transient damage. This ground wire conductor must be an unsheathed #10 copper wire or larger. Run the bare ground wire conductor intact from the AC power ground rod to the scale in a separate trench. Bring the wire up from the trench near the junction box and attach it to the ground lug located in the junction box pocket. This grounds the scale frame to the same single-point ground as the AC power for the indicator.

A ground wire is included to attach the junction box ground lug to the ground lug located in the junction box pocket. Grounding of the junction box is essential for operation of the DC transient protection incorporated into the junction box.

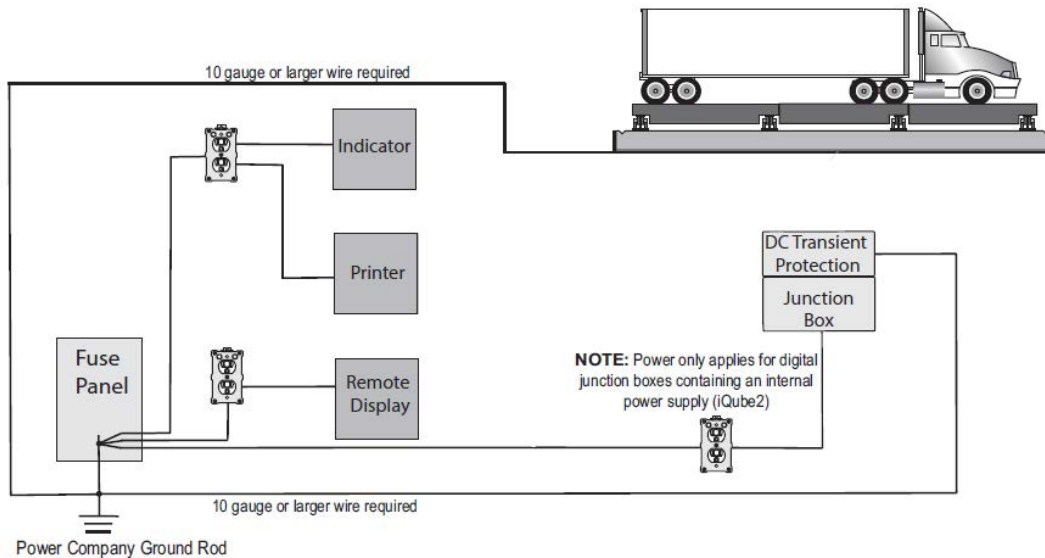


Figure 7-3. Single-Point Grounding Diagram

 **NOTE: Always verify that installed wiring is properly grounded.**

7.5 Installing Transient Protection

A lightning protection package comes standard on all truck scales. The individual components of this comprehensive package are designed to protect AC and DC portions of the system. The lightning protection package includes:

- DC transient protection included with standard junction box board(s); this DC transient protection handles up to eight load cells; scales with more than eight load cells require additional junction boxes
- Self-contained DC transient protection unit in the homerun cable at the indicator
- 115 VAC uninterrupted power supply/surge protector in the AC line before the indicator
- Number 10 bare ground conductor cable buried in earth from scale frame to DC transient board at indicator and finally to the AC power ground lug

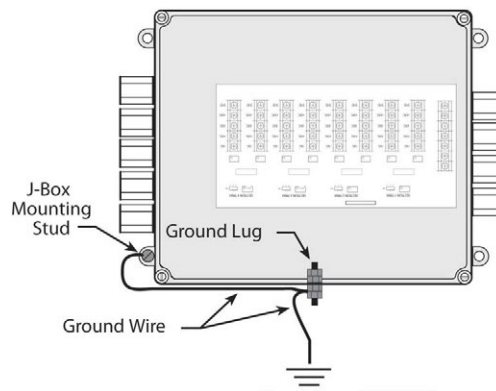




Figure 7-4. Inter-Module Ground Strap

 **NOTE: Scale frame must be connected with 10 gauge wire to the ground lug of transient protection board inside the junction box. Scales with more than one junction box require ground straps to be installed between modules. In addition, all junction boxes need to be connected to the scale frame.**

Final ground wire connection must be at AC power-supply ground terminal or ground rod that serves the power supply breaker box.

 **NOTE: Serial communications may also require transient protection to fully protect entire system. A TP-232 DC Transient Protection is suitable protection for serial communications lines. In addition, printers, remote displays, and other devices connected to serial communications should be protected with AC transient protection.**

8.0 Trimming and Calibration

The following section provides descriptions and procedures for load cell trimming, scale calibration and serial tag placement.

8.1 Overview and Equipment Required

Load Cell Trimming

Individual load cell signal trimming (equalizing the signal output from each load cell) must be done first along each side of the scale so all cells on a side have equal signal output. Adjustments are somewhat interactive, so each side should be done at least twice.

Once that is done, load cell pairs - one from each side - are trimmed as paired sections until each sectional output is equal. Adjustments to each section should also be done at least twice.

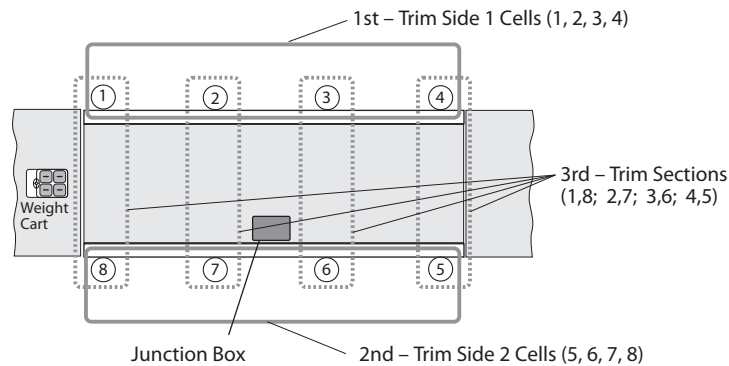


Figure 8-1. Load Cell Trimming Diagram

Equipment Required

Both of these trimming operations can be done using a weight cart parked in various locations on the scale. Final verification of equal output trimming, however, requires test weights to be placed on the deck in various locations.

8.2 Trimming Individual Cells

Connect all load cells to the summing board terminals in the junction box. Connect the main interface cable from the junction box to the indicator. Power up the indicator.

Turn all load cell potentiometers (individual and section) in the junction box clockwise so all signals are at full strength. Refer to the junction box instruction manual for proper setup of jumpers and dip switches prior to trimming, then proceed to individual cell trimming.

Side 1

The first objective is to adjust individual load cells along one side of the scale for equal signal output when equal weight is put on those cells. For convenience, that side of the scale is referred to as Side 1. Trimming weight used is the loaded weight cart.

1. Park the cart as close as possible to Side 1 (being trimmed) with the wheels centered over the end load cell mount (Number 1 in [Figure 8-2](#)). Record this indicator reading.
 - The scale is still uncalibrated, so the indicator readings are raw counts rather than weight units

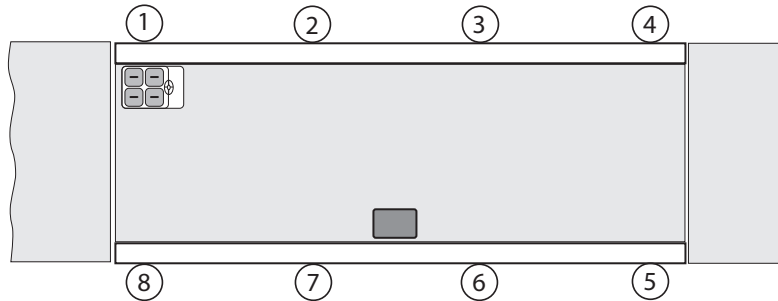


Figure 8-2. Trimming Load Cell Number One

2. Move the cart directly over mount Number 2 then record the reading.
3. Move the cart directly over mount Number 3 then record the reading.
4. Move the cart so the wheels are centered directly over mount Number 4 then record the reading.
 - If needed, turn the weight cart around so all wheels remain on the scale

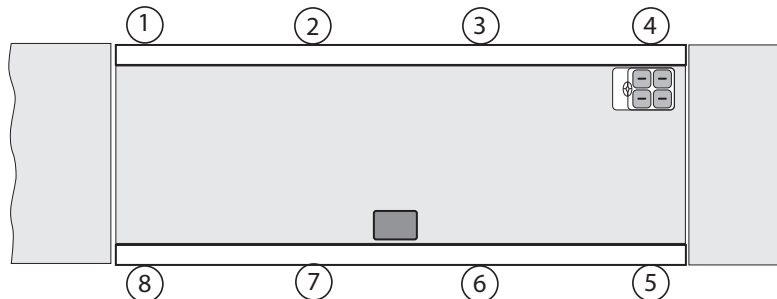


Figure 8-3. Trimming Load Cell Numbers Two, Three, and Four



NOTE: The lowest reading of the four is the reference cell. Do not change that cell's signal. Instead, use the individual cell potentiometers for the other three cells to reduce those signals to match the reference cell. Remember that all potentiometers were turned to full signal before starting, so the signal cannot be increased from any cell. Only decrease signal by trimming with the potentiometers.

The best trim is always the least trim. If one of the four readings differs from the others by more than 5% of the displayed counts, mechanical problem with that load cell mount may be causing the large difference. Correct the issue before continuing. Check for binding, an out-of-level or misaligned link, or similar problems with the load cell and mount. Do not try to trim down large signal differences with resistance pots - that only adds larger problems later because of interaction between mounts.

5. Park the loaded weight cart over one of the high-reading cells on Side 1.
6. Turn the cell's individual potentiometer until the displayed reading equals the recorded reference cell reading.
7. Repeat for the other two high-reading cells on Side 1.
8. As adjustments are somewhat interactive, repeat the process in [Step 1 – Step 5](#) until all four cells on Side 1 read within 0.1% of each other.
9. Repeat [Step 1 – Step 8](#) for load cells 5-8 on Side 2 of the scale.

8.3 Trimming Paired Sections

Now that all individual load cells are trimmed for equal output, pairs of load cells on opposite sides of the scale must be trimmed for equal sectional output. This process is called section trimming.

1. Park the loaded weight cart in the middle of the scale and directly over an imaginary line connecting an end pair of cells (1 and 8 in [Figure 8-4](#)). Record the indicator reading.

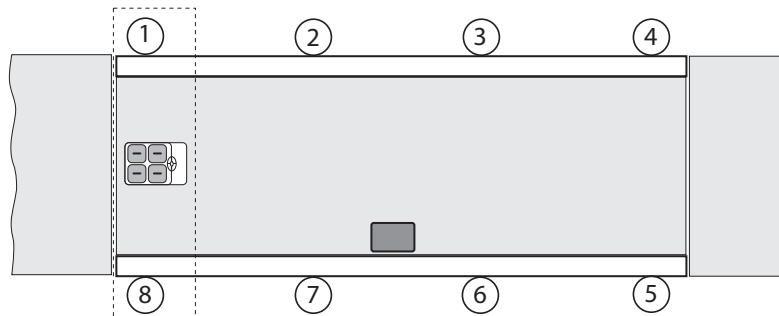


Figure 8-4. Trimming Paired Section 1:8

2. Move the weight cart directly over the next paired cell section (2, 7 in [Figure 8-5](#)) then record the indicator reading.
 - Repeat this for the last two paired sections (cells 3, 6, and 4, 5 in [Figure 8-5](#))

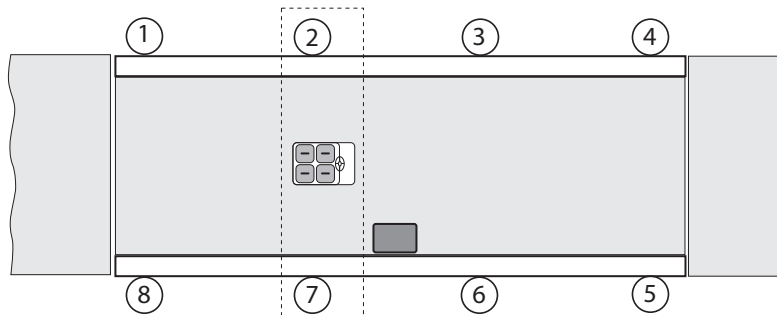


Figure 8-5. Trimming Paired Sections 2:7, 3:6 and 4:5

3. Choose the lowest reading of the four as the reference section, which is not adjusted.
 - Using the section potentiometers, reload the other three sections in turn and trim the sections to match the reading of the reference section
 - Recheck section readings a second time as the adjustment is made can be somewhat interactive
4. As a final verification of the load cell trimming, do a final corner check. Place a 1000 lb weight on one corner of the platform and record the raw-count reading on the indicator.
5. Move the weight to all of the other corners in turn and record those readings.
 - The readings should be within 0.1% of each other

8.4 Calibration with Test Weights

The calibration procedure can only be done after all trimming as described in the previous page has been completed. A scale technician with a test weight truck and the expertise to access the scale indicator's setup or calibration mode must perform the calibration procedure.

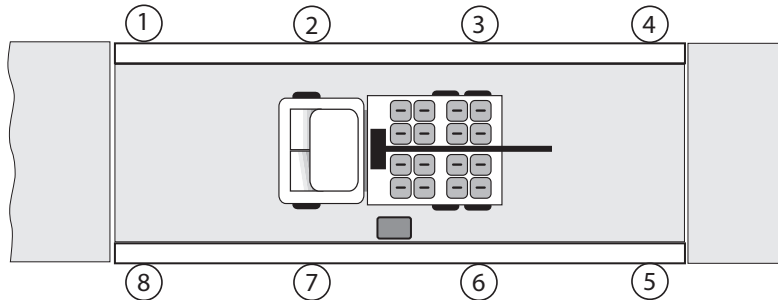


Figure 8-6. Calibration With Test Weights

Equipment Required

Truck scales are routinely calibrated using 25% of the capacity weight of the scale. Certified Class F test weights equaling at least 12.5% of the scale's capacity are required for calibrating a commercial legal-for-trade truck scale. In addition, some type of weight for a substitution test of an additional 12.5% of the capacity is required. This can be the test-weight truck, bags of sand, or any convenient items easy to load onto the scale. This total calibration weight of 25% of scale capacity (12.5% test weights, 12.5% substitution weight) is required by weights and measures officials for commercial truck scales in most states. Check with weights and measures officials for the requirements in the local jurisdiction.

Industrial scales not used for legal-for-trade transactions do not require certified test weights. Weight equal to 25% of scale capacity is recommended for calibrating such scales.

See NIST Handbook 44 for detailed calibration requirements and procedures.

8.5 Serial Tag

The serial tag on an OTR truck scale is found at the end of the scale near the SURVIVOR logo. A duplicate tag is placed inside of the junction box pocket.

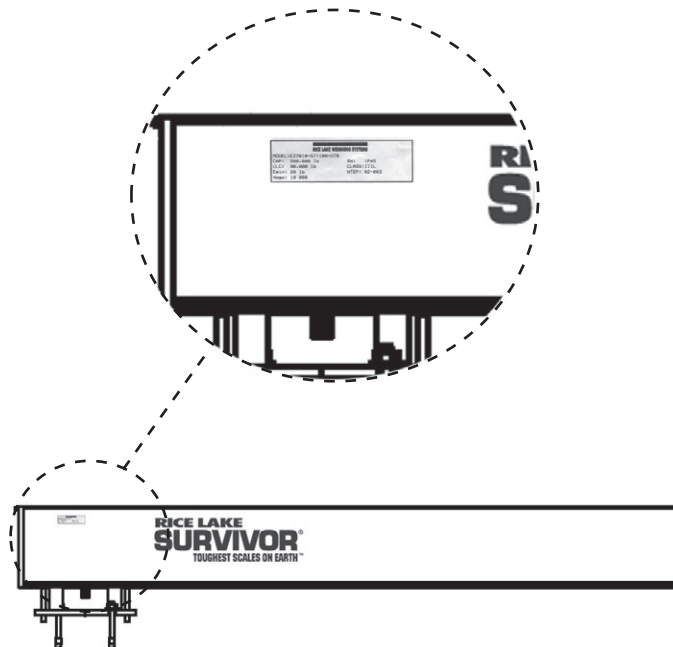


Figure 8-7. Serial Tag Placement

9.0 Load Cell Replacement

Use the following steps to replace load cells in the OTR truck scale:

1. Position jack on the concrete foundation beneath one of the weighbridge main frame members close to the load cell mount. Allow room for load cell removal and installation.
2. Raise jack approximately 1/2 inch and put setting block(s) under the scale deck.

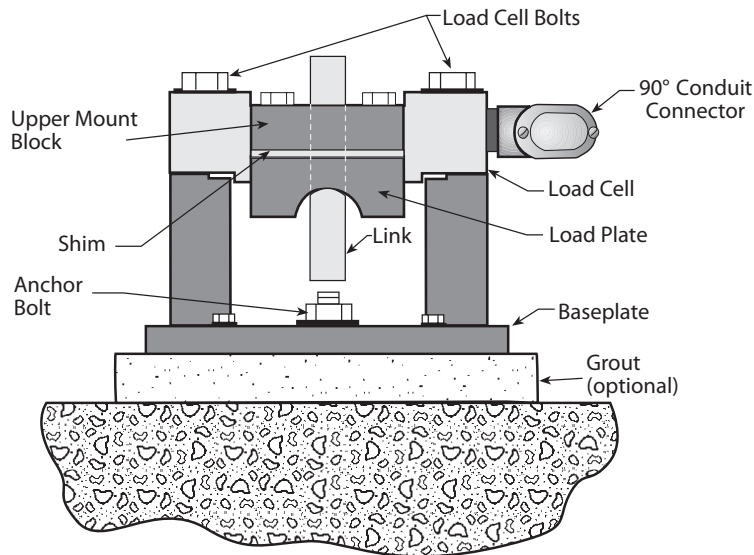


Figure 9-1. Load Cell Mount



NOTE: As a safety precaution, always use setting blocks when jacking scale module.

3. Disconnect the load cell terminal connections in the junction box.
4. Disconnect the flex conduit from the rigid conduit at the frame.
5. Pull the load cell cable out of the conduit.



NOTE: Attach a pull cord to the load cell cable at the junction box before pulling the cable through the conduit.

6. Remove the two load cell bolts and lift out load cell and link assembly.
7. Remove LB connector and flex-cable.
 - Install LB connector and flex conduit on new load cell in the same position as was removed
8. Install link over new load cell.
9. Reinstall load cell and link assembly onto the baseplate.
10. Install load cell mount bolts.
11. Torque bolts to 50 – 75 ft-lb.
12. Pull load cell cable through conduit using pull cord.
13. Make a loop in flex conduit between the load cell and the rigid conduit.
14. Reconnect flex conduit to rigid conduit.
15. Remove setting blocks and lower scale module so that it rests on the link.
 - Check link to verify that it is centered and plum
16. Connect wiring to terminals in junction box.



NOTE: RLWS has 1/4 inch (PN 67293), 1/8 inch (PN 67294) and 1/16 inch (PN 67291) shims are available to level scale. Do not exceed over 3/4 inch of shims combined. If more is necessary contact RLWS for other options.

10.0 Preventative Maintenance

A preventative maintenance program is a key element in maximizing the life, performance and accuracy of truck scales. Maintenance frequency is directly related to the daily truck volume and axle loads of the vehicles being weighed. At a minimum, inspections are recommended every six months depending on equipment usage. A comprehensive program would consist of inspections in the following areas:

- Weighbridge
- Foundation
- Load cells
- Junction box
- Grounding
- Calibration and testing

10.1 Weighbridge

Proper weighbridge inspection is essential to ensure accuracy and consistent performance of a truck scale.

- Visual inspection of the top-deck surface, including welds, should be performed on each maintenance visit
- Areas beneath the bridge should be inspected for potential mechanical bindings as a result of debris accumulation, loose bolts and misalignment of the suspension system
- Debris or ice buildup between the approach bulkhead and the end of the scale, as well as between the scale modules, should also be checked and removed
- Paint coating conditions on the scale should be examined and noted yearly
- Depending on weighbridge design, geographical location, load material and environmental factors, removing the weighbridge from the foundation for sandblasting and paint may be required
- Excessive corrosion could also indicate complete replacement of the weighbridge

10.2 Foundation

A truck scale is only as good as the foundation on which it rests. Keeping the foundation clean and well drained provides more accurate and dependable vehicle weighing.

- A quick visual check of sump pumps and drains should be done at least once a month
- The condition of the concrete piers or slab and concrete approaches are important for maximum equipment performance; approaches to and from the scale should be level to ensure a smooth transition from the approach to the scale; steel coping or trim on the approach head walls and/or pit walls should be checked for proper anchoring or wear
- Areas around the load cells should be inspected for binding due to debris build-up; a minimum clearance of 0.75" should be provided between the weighbridge and the headwall and side walls when applicable
- Any cracks in the concrete or evidence of heaving due to frost or poor soil conditions should be recorded and resolved immediately; foundation issues are common causes for inaccurate scale performance

10.3 Load Cells

Load cells should be inspected for damage to cables, cracked or loose connectors, proper alignment of suspension links and any accumulation of debris around the load cell stand-assembly. All cable connections should be checked and any corrosion and service-related cable splices should be removed from the system.

10.4 Junction Box

The junction box should be opened and checked for any moisture or corrosion on internal circuitry. The PreVent™ filter should be changed on an annual basis. Desiccant packs inside the box should be examined and exchanged on an annual basis. Cable connectors should be inspected and checked for tight fittings.

10.5 Grounding

All ground connections are connected to a single ground point. At minimum, a 10-gauge wire should run from a lug on the scale to the single-point ground. Most ground locations are near the electrical power panel serving the scale equipment.

10.5.1 Grounding Inspections

1. Verify the ground system of the AC power supply (consult with the local power company if necessary).
2. Check the weighbridge grounds.
3. Check bypass cables at each load cell and clean/remove any corrosion if necessary.
4. Check continuity of the single ground wire back to the AC ground.

To avoid the existence of multiple zero references that can create transient issues with both data lines and weighing components, single-point grounding is recommended.

10.5.2 Checking a Single-Point Ground

Verify the Ground System of the AC Power Supply

1. Using a multi-meter, check the resistance of the AC outlet ground to the actual AC power ground rod coming into the building. The multi-meter should read less than 1 ohm.
2. Measure the AC voltage across the ground and neutral of the AC outlet. The result should be 0 volts AC, not to exceed 0.5 volts AC.



IMPORTANT: *Following both of these procedures is recommended; however, completing one of the steps above should allow an evaluation the quality of the ground. If grounding issues with the AC power supply are discovered, notify the building owner and/or the power company.*

Check the Scale Grounding

1. Make sure the scale and all peripherals are connected to a transient protection device such as an uninterruptible power supply to deter voltage distortions.
2. Use a bare, 10-gauge copper wire connected to the frame of the scale platform and the grounding lug on the junction box board, and run the copper wire back to the ground rod provided by the power company. The copper wire can be buried underground from the scale to the AC ground.
3. Make sure a braided transient bypass cable is positioned across each load cell mount to ensure electrical transients pass through the bypass cable instead of the load cells.
4. Measure the resistance between the scale sections and the AC ground, the reading should be less than 1 ohm. Higher readings are typically caused by corroded connections.
5. Check the AC power supplied to peripherals such as remote displays, printers and computers. A remote device may not have the same AC power source as the indicator. Each device may not be grounded to the same point.
6. Measure the resistance between the AC power ground-points. The multi-meter should read less than 1 ohm.

10.6 Calibration and Testing

A truck scale should be calibrated and tested by a state-licensed service agency using no less than 12.5% of the scale's nominal capacity or 25,000 lb of certified test weights. The scale's calibration interval is determined by the frequency of use.

At minimum, truck scales should be calibrated and tested every six months. Each section of the scale should be tested. Detailed test reports should be provided for the customer and government authorities.



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