SURVIVOR® Advantage Series IM-Axle

In-Motion Axle Scale

Technical Manual

RICE LAKE® WEIGHING SYSTEMS

March 27, 2024

PN 203944 Rev B

All information contained within this publication is, to the best of our knowledge, complete and accurate at the time of publication. Rice Lake Weighing Systems reserves the right to make changes to the technology, features, specifications and design of the equipment without notice.

The most current version of this publication, software, firmware and all other product updates can be found on our website:

www.ricelake.com

Revision History

This section tracks and describes manual revisions for awareness of major updates.

Revision	Date	Description
A	October 15, 2020	Initial Release
B	March 27, 2024	Main Screen Change

Table i. Revision Letter History

Contents

Rice Lake continually offers web-based video training on a growing selection of product-related topics at no cost. Visit www.ricelake.com/webinars

1.0 Introduction

This manual is intended for use by technicians responsible for installing, operating and servicing the SURVIVOR Advantage Series IM-Axle scale.

NOTE: This manual includes scale installation. Use these instructions as general installation guidelines. Engineering drawings furnished with the scale always take priority over these general installation guidelines.

Refer to the engineering drawings furnished with the scale for all component numbering sequences.

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

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

The IM-Axle scale system includes:

- IM-Axle scale - PN 201182
- Pit frame support beam (2 - 3 required) - PN 201449
- Speed sensor - PN 207129
- Remote display - PN 179525
- 1280 IM-Axle scale indicator with in-motion software PN 209396

The IM-Axle scale package does not include: approach coping, foundation alignment posts, rebar and mesh for foundation, concrete, freight charges including material handling/crane, transportation permits and fees, and insurance transportation fees.

1.1 FCC Compliance

United States

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Canada

This digital apparatus does not exceed the Class A limits for radio noise emissions from digital apparatus set out in the Radio Interference Regulations of the Canadian Department of Communications.

Le présent appareil numérique n'émet pas de bruits radioélectriques dépassant les limites applicables aux appareils numériques de la Class A prescites dans le Règlement sur le brouillage radioélectrique edicté par le ministère des Communications du Canada.

1.2 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.

2.0 Pre-Installation

When planning the IM-Axle scale installation, the following must be considered prior to scheduling the install.

2.1 Site Preparation

Careful consideration must be taken when preparing a site to install the IM-Axle scale.

Traffic flow is only one way across the scale and must be planned prior to construction of approaches. Figure 2-1 shows a typical site plan for the IM-Axle scale.

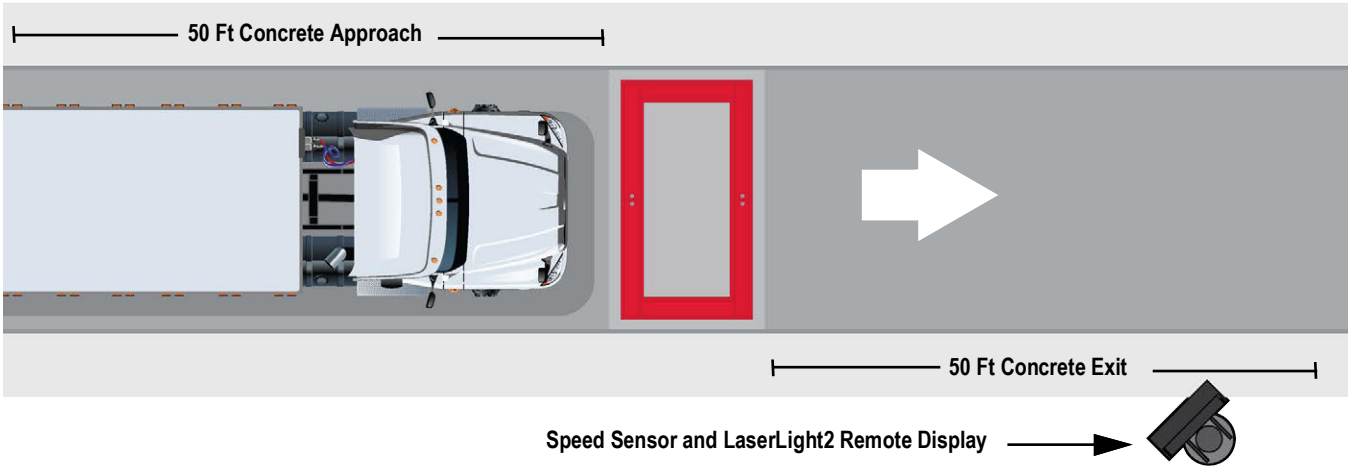

Figure 2-1. Site Plan Example

2.2 Foundation Slab Cure Period

Scale installation must be carefully planned around foundation pour and cure times.

Standard concrete reaches full strength after a 28-day cure. The concrete foundation must cure in a moist state for at least seven days (three days for high early strength concrete). At seven days, standard concrete is approximately 75% of its maximum strength and can handle moderate loads. Loading a slab before it reaches 75% of maximum strength may damage the foundation.

Concrete curing time should be based on the site contractor's recommendations.

2.3 Assembly Time Estimates

The following lists give approximate time estimates when installing the IM-Axle scale:

- Excavation for two approaches takes approximately eight hours
- The IM-Axle scale framing and rebar installation requires approximately eight hours
- The IM-Axle scale concrete pour takes approximately four hours to complete
- When scheduling installation, plan for a two-hour minimum crane rental to position the sections; the crane needs to safely lift at least 5,000 lb capacity loads
- A two-person crew, aided by a crane operator, can unload the module from the truck, separate the deck from the frame, and place the frame in the foundation in one to two hours
- Mount and load cell installation requires approximately two hours
- Normally all electrical wiring and final connections can be completed the same day

NOTE: Actual times may vary.

2.4 Recommended Tools and Equipment

The following is a list of recommended tools and equipment for assembly and installation:

- One heavy-duty crane capable of safely lifting 5,000 lb; equipped with chains or cables for module placement
- Porta-power hydraulic jack with a three-inch RAM
- Socket wrenches for 1-5/8 inch hardware
- Box end wrenches for 1-1/2 inch hardware
- Open end wrench set (7/16 -3/4 inch)
- Four-foot bubble or construction level (transit)
- Small torpedo level
- Spacers for aligning deck frame to pit wall
- Hammers, maul and pry bar
- Hand tools for pulling and connecting electrical wiring and sheet metal cutting and trimming
- PVC cement for connecting PVC conduit pipes

2.5 Installation Notes

The 2.5 x 10 ft IM-Axle scale is shipped ready to be placed into position on temporary setting beams using a crane capable of handling 5,000 lb. The deck is removed from the scale frame and the scale frame is positioned in the pre-poured foundation. The frame is then positioned using the leveling beams included with the shipment. The deck will be added to the scale frame after the concrete has cured.

General assembly order is summarized below and is described in detail in the following sections.

1. Install the foundation approaches.
2. Install the scale frame.
3. Pour concrete for the scale frame.
4. Pour concrete for the weighbridge.
5. Assemble mounts with load cells to the scale deck.
6. Run cabling through conduit; make all electrical connections.
7. Connect indicator and peripheral devices.
8. Calibrate scale.

3.0 Concrete Approach Installation

This section provides instructions for installing the concrete approaches.

IMPORTANT: Standard concrete reaches full strength after a 28-day cure. The concrete foundation must cure in a moist state for at least seven days (three days for high early strength concrete). At seven days, standard concrete is approximately 75% of its maximum strength and can handle moderate loads. Loading a slab before it reaches 75% of maximum strength may damage the foundation.

Concrete curing time should be based on the site contractor's recommendations.

Install the concrete approaches on a flat level surface on either side of the IM-Axle scale equal to or greater than the length of the longest truck that will cross the scale. Typically 50-60 ft on each side of the scale.

The concrete for the scale is completed in three pours.

- Both approaches are completed in the first pour
- The center, scale frame is completed in the second pour
- The weighbridge is completed in the third pour

NOTE: Engineering drawings furnished with the scale always take priority over these general installation guidelines.

Refer to the engineering drawings furnished with the scale for all component numbering sequences.

Rebar schedule requirements will vary based on approach lengths.

Material Requirements				
Rebar Schedule				
Letter	**Qty.**	**Length (ft-in)**	**Description**	**Weight**
A	26	50 ft 4in	#5 @ 12 O.C.	1,365 lb
B	200	12 ft 0 in	#5 @ 12 O.C.	2,503 lb
C	12	12 ft 0 in	#5 @ 4 O.C.	150 lb
D	12	5 ft 8 in	#5 @ 4 O.C.	71 lb
E	26	50 ft 4 in	#5 as shown	1,365 lb
			Total Weight of Rebar (lb)	5,454 lb
			Total Length of Rebar (ft)	5,229 ft
Misc. Steel				
Approach Coping	3 in x3 in x1/4 in		26 LN ft.	127 lb

Table 3-1. Material Requirements Rebar Schedule (Based on 50 ft Approach on Each Side)

Concrete Schedule	
	Volume (Cubic Yards)
Approaches	46.3
Scale Cavity (Approximately)	4.8
Total	51.0

Table 3-2. Material Requirements Concrete Schedule (Based on 50 ft Approach on Each Side)

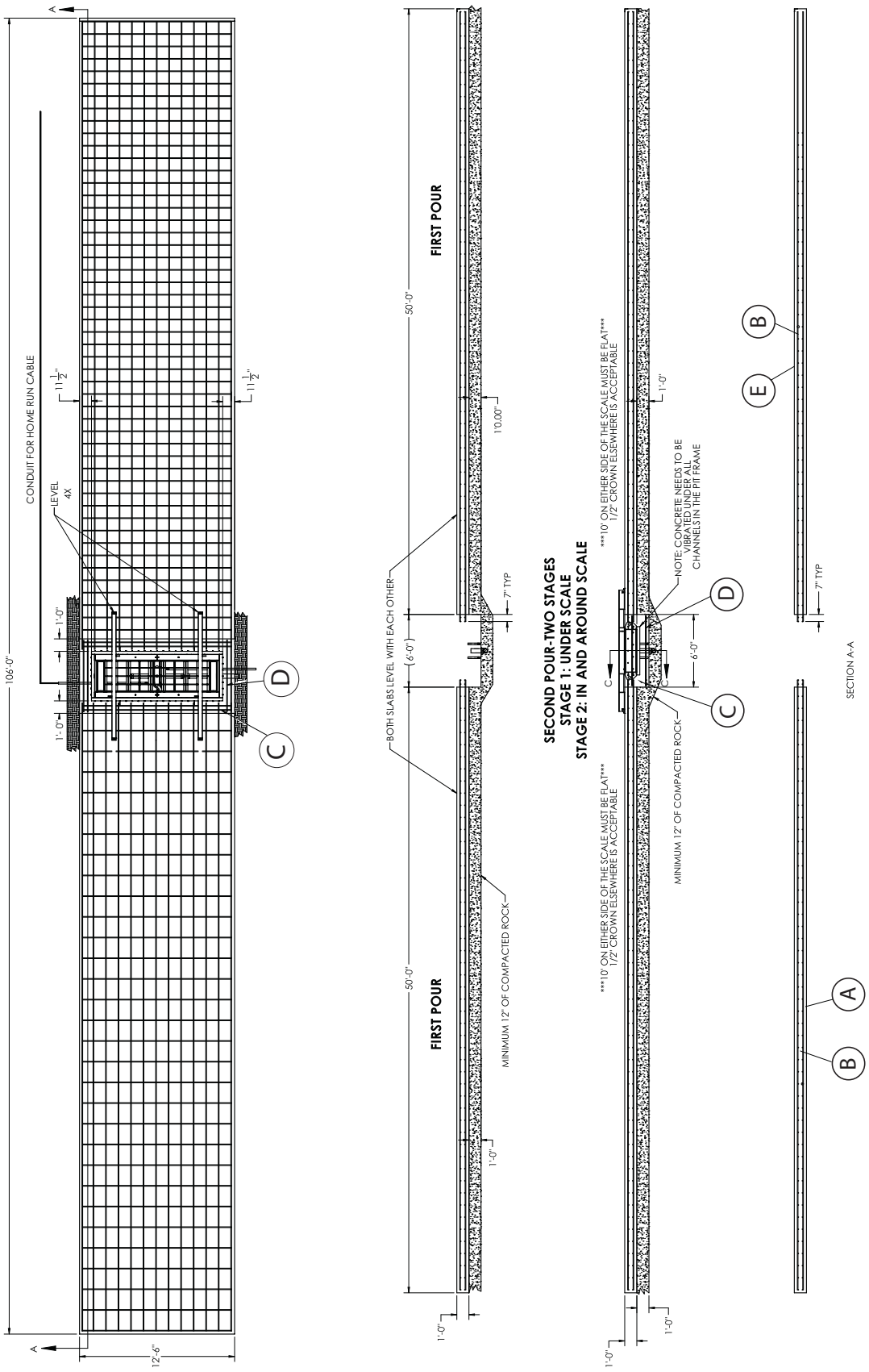

Figure 3-1. 50 Ft Approach Drawing

4.0 Scale Installation

This section provides instructions for installing the scale and pouring the scale deck.

NOTE: Engineering drawings furnished with the scale always take priority over these general installation guidelines.

Refer to the engineering drawings furnished with the scale for all component numbering sequences.

4.1 Unpacking

1. Securely lift the pit frame from the truck and lower it on a solid, level surface. Ensure all parts are undamaged. If any parts are damaged, contact Rice Lake Weighing Systems.

DANGER: Loads may disengage from the crane 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's assigned Working Load Limit (WLL) rating.

2. Securely lift the hardware kit and place it on a solid, level surface.
3. Ensure all hardware is undamaged. If any parts are damaged, contact Rice lake Weighing Systems.

See Section 9.2 on page 42 for a list of replacement parts and drawings.

4.2 Frame Installation

1. Prior to lifting the frame into place, fasten the installation beams to the pit frame using the hardware provided in Table 4-1 on page 14.

Figure 4-1. Fasten Installation Beams to Pit Frame

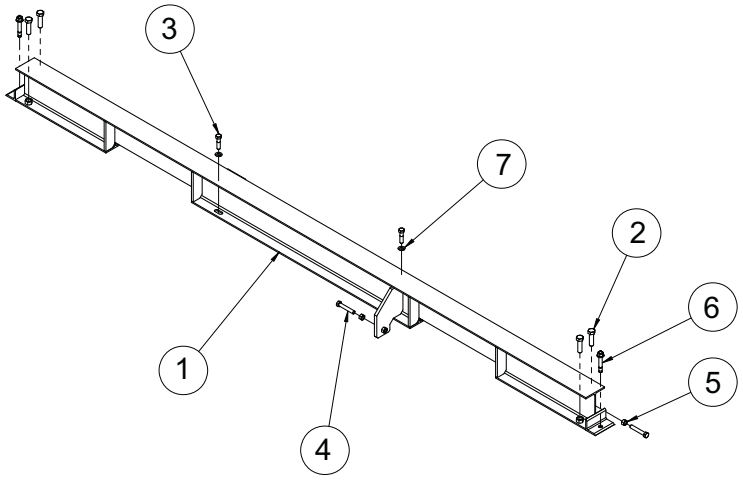

Figure 4-2. Pit Frame Support Beam (PN 201449)

Item No.	Part No.	Description	Qty.
1	201390	Pit frame support beam	1
2	44382	Screw, cap 5/8-11 x 2-1/4 hex head fully threaded, zinc plated	4
3	99056	Bolt, 1/2-13NC x 2 hex head partially threaded, zinc plated	2
4	15083	Screw, cap 1/2-13NC hex head full thread, zinc plated	2
5	14672	Nut, 1/2-13NC hex steel clear zinc plated	2
6	187401	Anchor, concrete wedge 1/2-13NC x 3-3/4 carbon steel	2
7	15173	Washer, plain 1/2 type B series	2

Table 4-1. Pit Frame Support Beam Parts List

2. Lower the pit frame into the center of the approaches.

Figure 4-3. Lower Pit Frame

3. Ensure the pit frame is level to both approaches.

NOTE: The pit frame must be flush, squared up with the opening and level/squared with approaches.

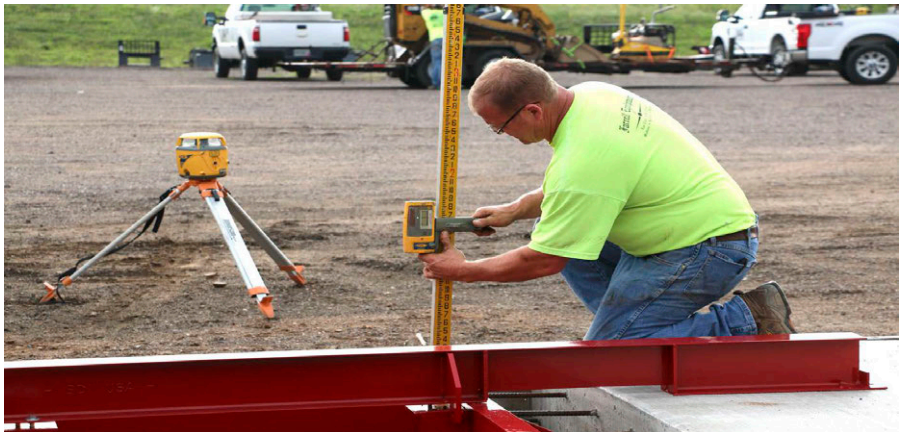

Figure 4-4. Ensure Pit Frame Is Level

4.3 PVC and Drain Installation

1. Cut an opening into the deck foundation frame for the PVC drain and cabling conduits.The size of the space varies depending on location and size of the foundation and approaches. Tools used for cutting the space into the foundation are not provided.

Figure 4-5. Prepare Opening for Drains and Cabling Conduits

2. Insert the PVC drain and cabling conduits into the cutout space. See Section 9.1 on page 41 for PVC drains and cabling conduit specifications.
3. Secure the PVC drain and cabling conduits. All PVC conduits are glued together to ensure secure connections. The PVC conduits must be securely connected and correctly pitched to properly drain excess fluids and drainage from the pit.

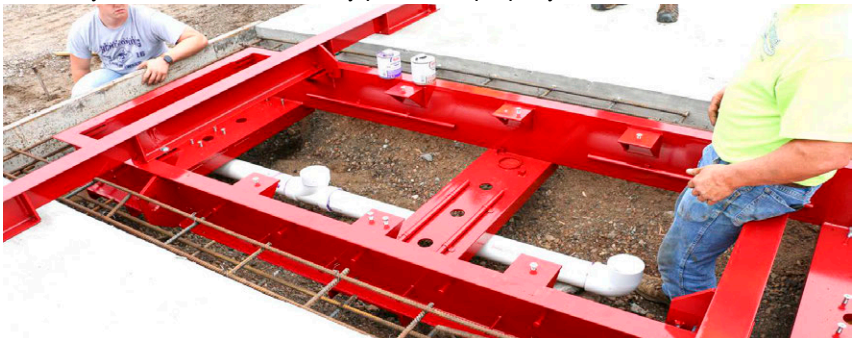

Figure 4-6. Secure PVC Drain Conduits

4.3.1 Scale Frame Concrete Pour

1. Ensure the pit frame is centered within the pit. Use wood blocks to hold the frame centered while pouring the concrete.

Figure 4-7. Ensure Pit Frame is Centered

2. Once the PVC drains and cabling conduits are secure, seal off openings with caps or duct tape so debris cannot get inside while finishing scale installation. Also seal off all bolt holes.
3. Pour concrete for the scale frame.

Figure 4-8. Scale Frame Concrete Pour

4. Properly vibrate all around the scale frame channels.

IMPORTANT: Utilize the three holes located in the channel of the pit frame to vibrate the concrete while being poured. This will ensure there are no gaps underneath the pit frame and ensure concrete is the correct height.

It is critical for the concrete to also be vibrated underneath the load cell mounting holes located in each corner.

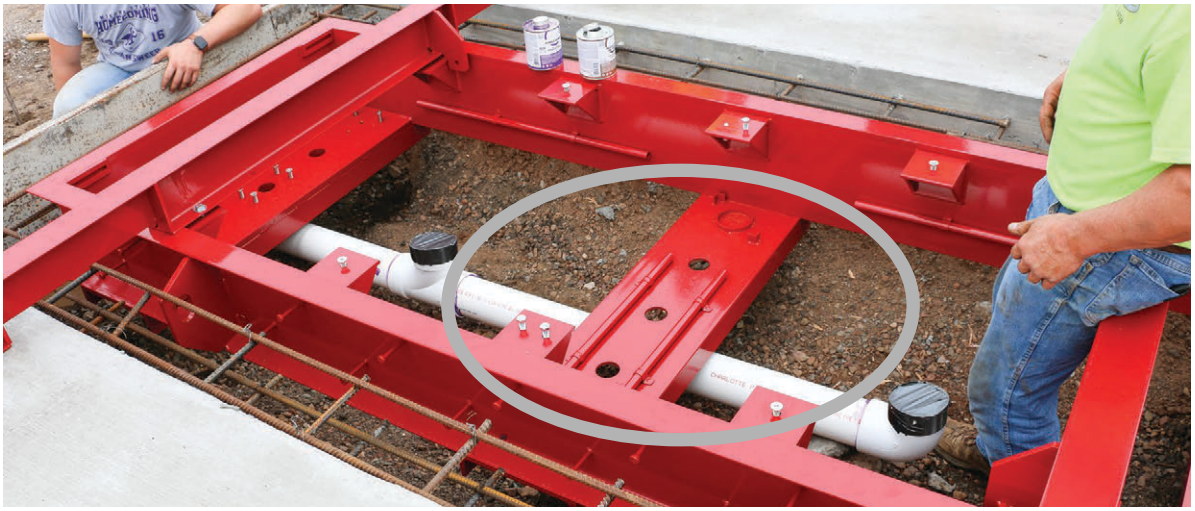

Figure 4-9. Access Holes for Vibrating Concrete

5. Form the concrete around the PVC drains with proper pitch. See Figure 9-2 on page 41 for reference.

NOTE: Ensure the concrete floor is tapered towards the drain for proper drainage.

Figure 4-10. Taper Concrete

6. Use a scraper to remove all excess concrete and debris from the load cell mounting areas and the tapped holes.
7. After the recommended foundation slab cure time (see Section 2.2 on page 9) unbolt the installation beams from the pit frame and lift off. The pit is now ready to install electronics.

Figure 4-11. Pit Frame is Ready for Scale Deck

4.4 Weighbridge Deck Concrete Pour

Use the following steps to pour concrete for the weighbridge deck.

IMPORTANT: Vibrate the concrete to ensure there are no gaps in the concrete.

1. Ensure the weighbridge is sitting level on blocks under mounting pockets.

Figure 4-12. Scale Deck Concrete Pour

2. Finish leveling and smoothing out the concrete deck.

5.0 Load Cell and Cable Installation

This section provides an overview of IM-Axle scale load cells, junction box and cabling.

5.1 Load Cell Installation

Use the following steps to install the load cell.

1. Insert the alignment pin. The alignment pin assists with installation by providing proper alignment.

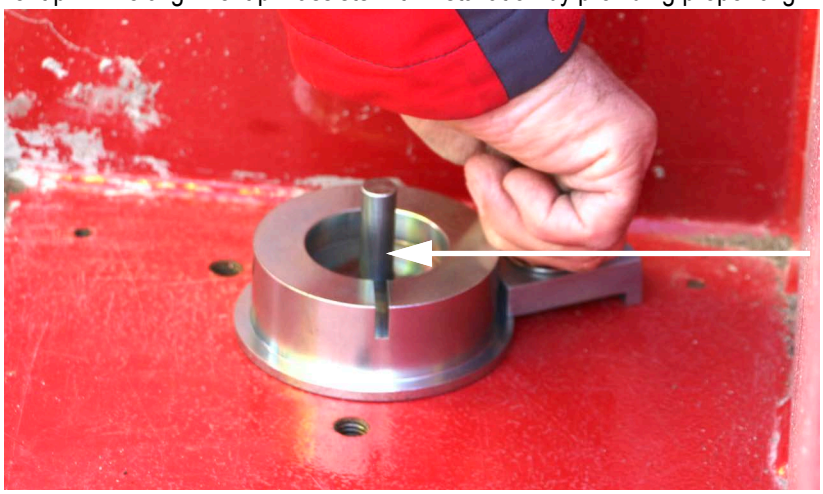

Figure 5-1. Insert Alignment Pin

2. Secure the load cell plate to the IM-Axle scale pit frame torquing bolts to 30 ft-lb.

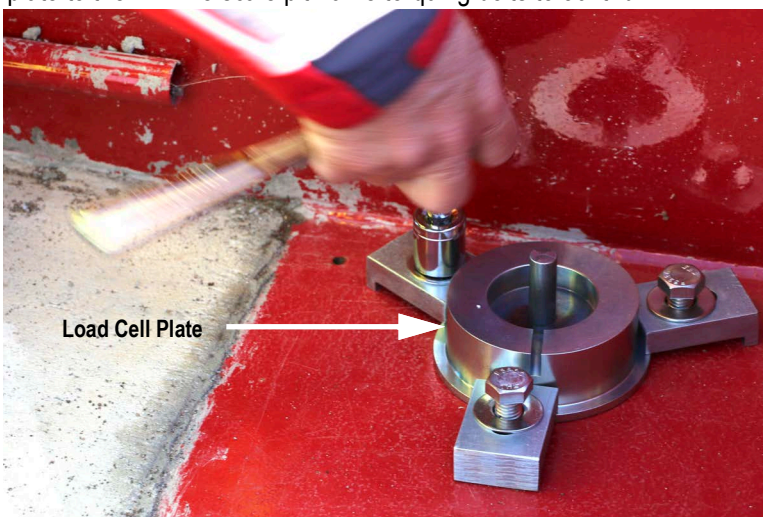

Figure 5-2. Secure Load Cell Plate

NOTE: It is recommended to apply anti-seize compound to all bolts.

3. Remove the alignment pin.

4. Assemble the load cell.

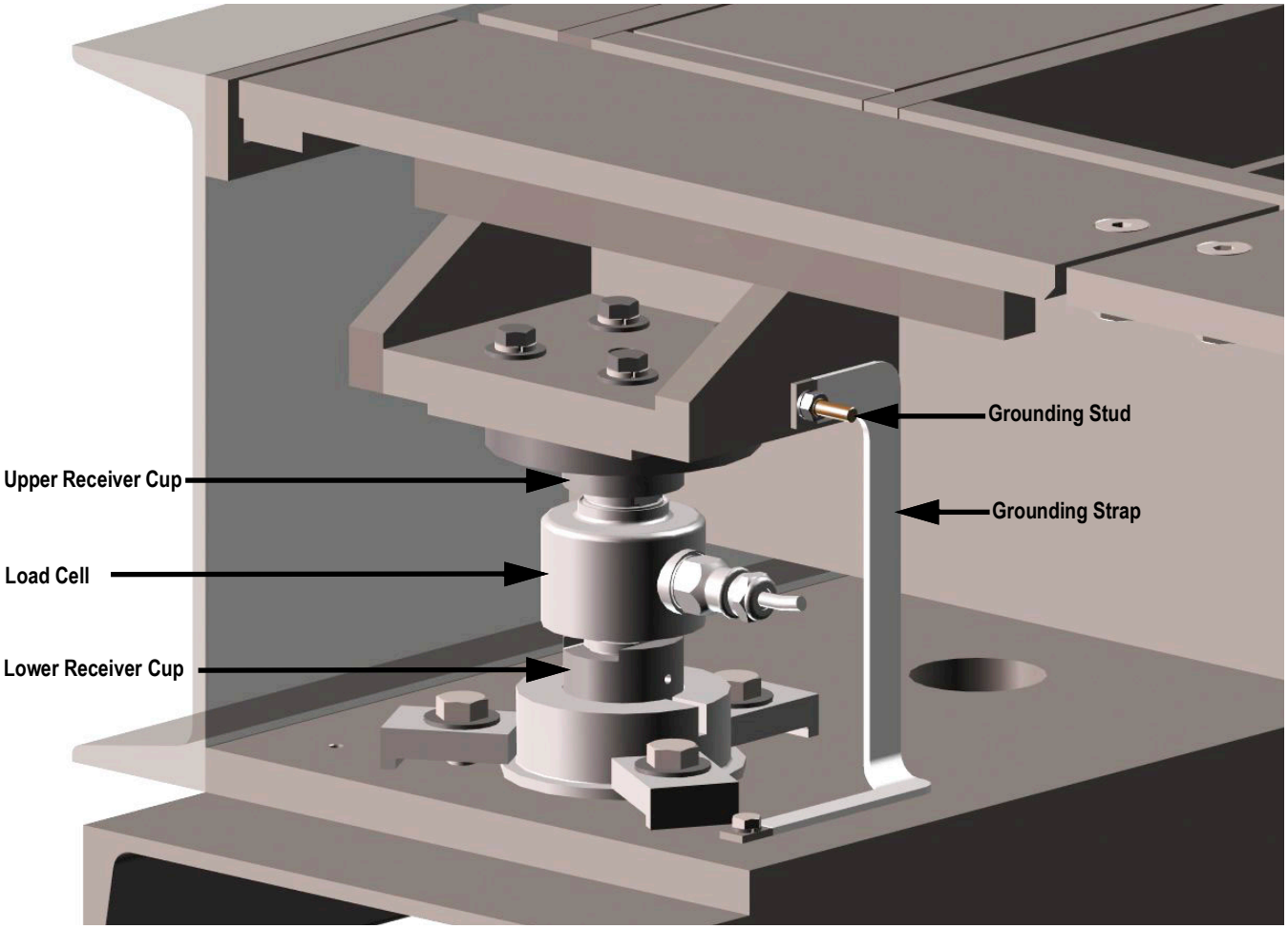

Figure 5-3. Load Cell Components and Grounding Strap Location

5. Place the load cell, upper receiver cup and lower receiver cup together.

NOTE: Arrow on the load cell should point down.

6. Place the load cell, upper receiver cup (PN 201337) and lower receiver cup (PN 201338) in the load cell foot plate.

NOTE: Orient the load cell so that the connector on the load cell is perpendicular to the length of the scale and facing toward the center. Run the load cell wire through cabling conduit and attach flexible conduit.

7. Install grounding strap by attaching it to the pit frame and secure it to the load cell plate (Figure 5-3).

5.2 Self-Checking System

A self-checking system protects the scale from binding and damaging side-load shocks. Use the following steps to install the self-checking system.

NOTE: It is recommended to apply anti-seize compound to all bolts.

1. Bolt in the self-checking bumper (PN 201226) as shown in Figure 5-4 torquing bolts to 75 ft-lb.

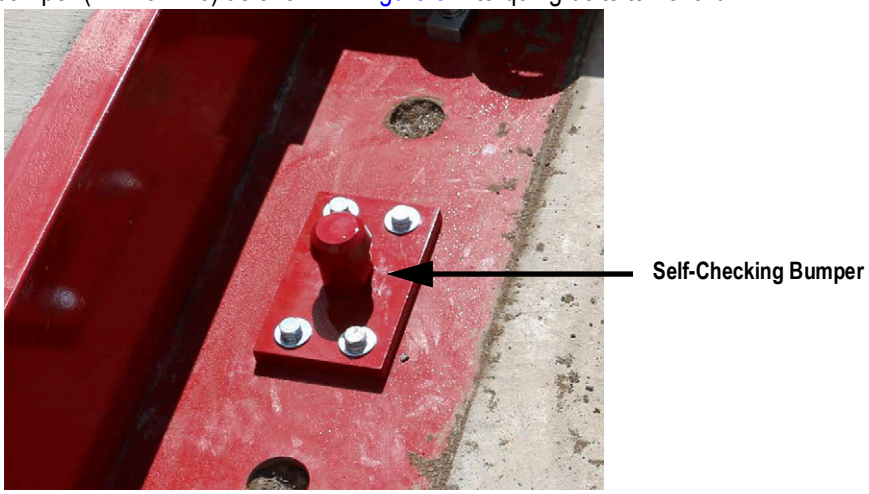

Figure 5-4. Self Checking Bumper

2. Lower the weighbridge into the pit frame ensuring it is centered. See Section 5.9 on page 28 for steps on lowering the scale.
3. Place the self-checking bumper top plate (PN 201225) on ensuring it is centered. Bolt it in place.

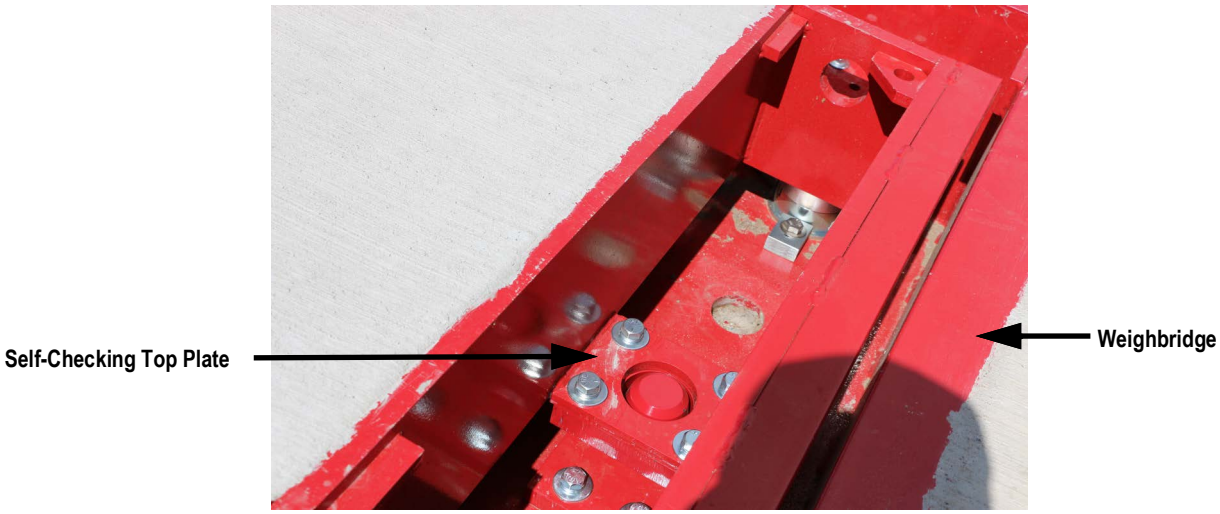

Figure 5-5. Self-Checking Top Plate

5.3 Junction Box to Indicator

A 40 foot section of 6-wire home run cable is supplied with the IM-Axle scale. It is to be run in 3/4 inch galvanized metal conduit from the junction box to the indicator. A 30 inch flexible conduit section and watertight conduit connector is provided where this cable exits the junction box. Galvanized metal conduit must be obtained locally.

1. Install the junction box mounting plate into the pit frame. The IM-Axle scale uses Rice Lake's TuffSeal junction box.
2. Position the junction box onto the junction box mounting plate.
3. Feed the cables through the flexible conduits then connect the flexible conduits to the junction box, ensuring the flexible conduits are properly secured.

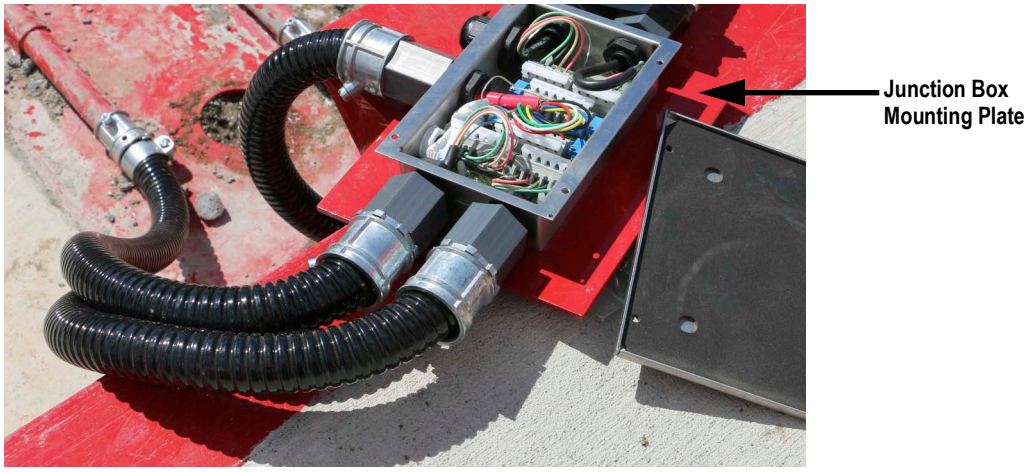

Figure 5-6. Connect Cabling to Junction Box

4. Connect cabling to the PVC cabling conduit.

NOTE: Elbows and adapters supplied by the installer.

Figure 5-7. Connect Cabling to PVC Cabling Conduit

5. Ensure the junction box is properly grounded.

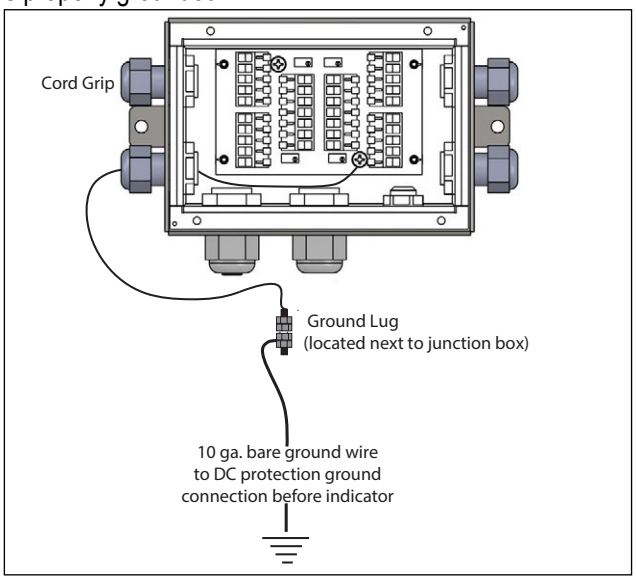

Figure 5-8. Junction Box Grounding

6. Determine the wiring pattern to be used per indicator and junction box manual.

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

7. Route the load cell cables through the cord grips, do not tighten the grips.
8. Strip the wire insulation back 1/4 inch to expose the wire.
9. Push and hold the quick-connect lever with a small screwdriver.
10. Insert the appropriate wire into the exposed wire opening.
11. Release the screwdriver to allow the spring-loaded gate to close and lock the wire in place.

NOTE: The spring-loaded terminals will accommodate 12-28 gauge wire.

If cables could be exposed to water or other liquids, bend a short downward loop in all cables near the cord grips so any fluids draining down the the cables will drip off before reaching the junction box.

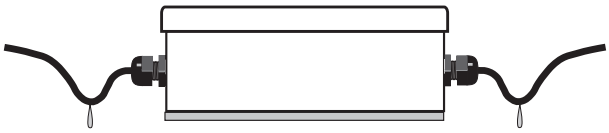

Figure 5-9. Cabling Drip Bend

A 10-gauge bare ground wire is run from one of the junction box mounting studs to the ground lug of the junction box. The ground lug on the bottom of the junction box is connected to a buried ground cable from the AC power ground terminal or ground rod, thus grounding the scale frame to the same single-point ground point as the AC power for the indicator.
Before final closure, add an industrial corrosion inhibitor and desiccant (RLWS Industrial Corrosion Inhibitor, PN 16037) to the junction box enclosure. This desiccant protects an enclosure up to 5 ft^3 from internal corrosion for approximately one year.

NOTE: Make sure that the 10-gauge ground wire makes connection to bare metal.

5.4 Indicator to Peripherals

All 3/4 inch metal conduit for cabling from the indicator to remote displays, speed sensor and other peripheral devices must 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 5-10. Trenched Cables

5.5 Speed Sensor Installation

The speed sensor is mounted in a location away from the approach ramps but close enough to pick up the speed of the truck as it crosses the IM-Axle scale. It can be pole mounted and is connected to a LaserLight2 Remote Display which displays the speed of the truck in real time.

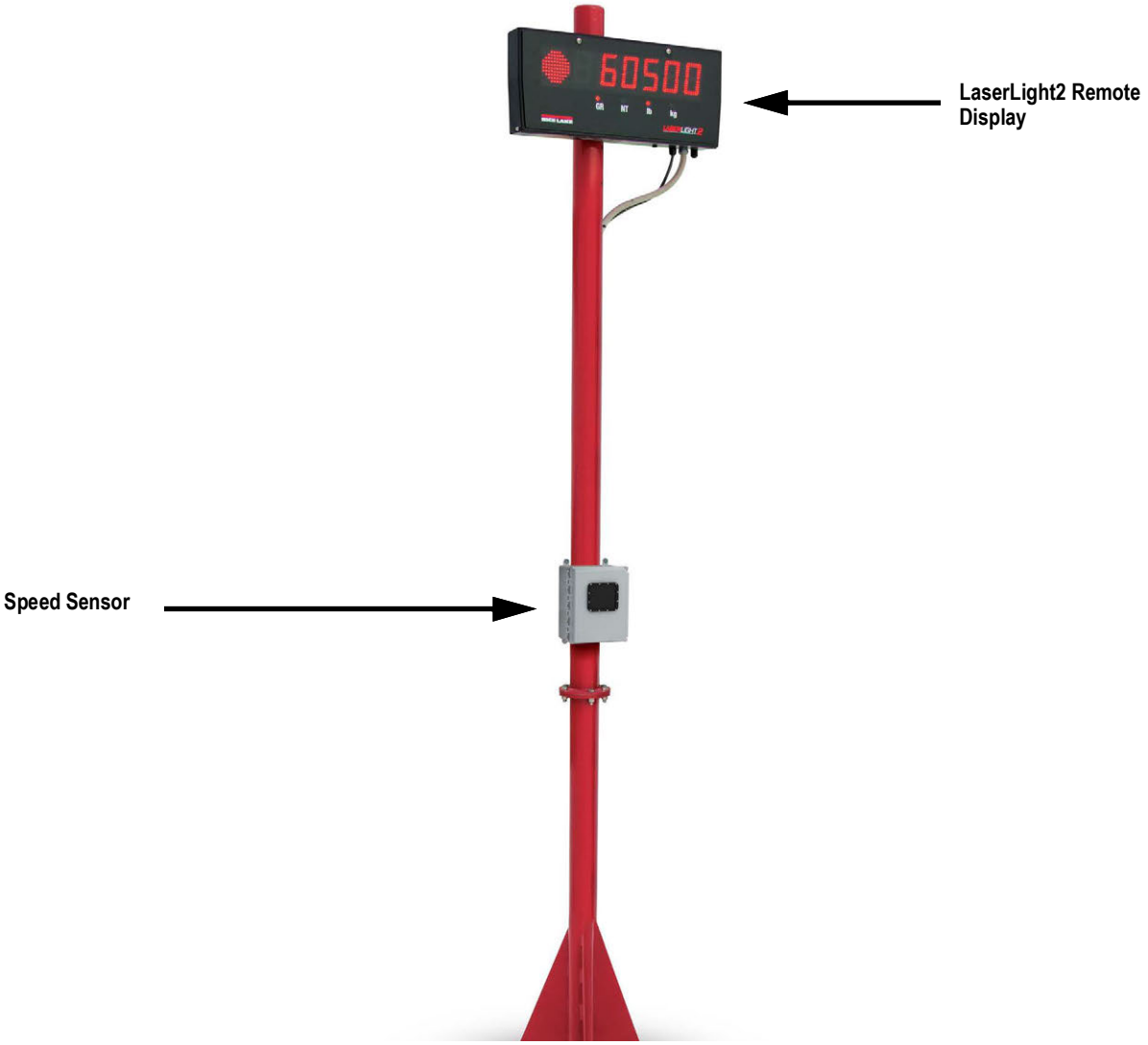

Figure 5-11. Speed Sensor and Remote Display

.

5.6 Single-Point Ground Conductor

A bare 10-gauge wire is run from the scale frame to the grounding lug on the junction box, then underground to the main AC power earth ground. If the optional DC transient protection board is installed, the ground conductor should also be connected to the transient protection board's ground lug. Consult with the local power utility for restrictions or requirements for utility ground rod connections.

5.7 Electrical Ground Connections

IMPORTANT: Improper grounding systems on outdoor scales can cause corrupted data as a result from ground-loop current flows. Improper grounding systems may also invite possible lightning strikes and cause damage to costly electronic systems. Always attempt to establish a single-point grounding system.

Figure 5-12 on page 27 illustrates an example ground system for the IM-Axle scale.

The best grounding system for the scale is the same grounding system used for an incoming AC power system. The 120 VAC power source used to power the indicator is connected to an existing earth ground system at the scale house or other building where the indicator is located. A reading of 3 - 3/4 inch 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 assure an adequate electrical ground. Do not connect the scale to the AC power supply until the grounding system is adequate.

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 to the scale, damaging load cells on its way.
- A lightning ground strike may instantly raise the zero potential of a ground rod at the scale location while leaving the scale house ground unaffected. A lightning surge takes the easiest path to the lower-potential ground: through the scale wiring and back to the scale house ground, therefore possibly damaging the indicator on its way.

Each load cell grounding strap is securely fastened to the bottom plates of each load cell mount. The grounding strap is designed to channel power surges on the deck around—rather than through—the load cell to ground. All ground connections must be properly torqued and rechecked at regular service intervals. After connecting to bare metal apply a thick coating of anti-oxidant grease on all ground connections to prevent corrosion.

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. As a minimum requirement for ground wire installation, the conductor must be at least a 10-gauge unsheathed copper wire. 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 of the junction box. Use a short piece of 10-gauge wire to ground the scale frame by running a ground wire from the junction box ground lug to a junction box mounting bolt on the scale frame.

5.8 Install Transient Protection

This package is designed to protect the AC and DC portions of the system. The package includes:

- A DC transient protection board mounted within the junction box. This DC transient protector can accommodate up to eight load cells and will help protect serial communication lines. Scales with more than eight load cells require a DC transient protection board in each junction box.
- A self-contained DC transient protection unit in the home run cable at the indicator.
- A 10-gauge bare ground conductor cable. This conductor cable, to be buried underground, runs from the scale frame to the junction box DC transient board, to the indicator DC transient board, and finally to the AC power ground lug.
- A 120 VAC un-interruptable power supply/surge protector in the AC line before the indicator.

NOTE: Transient protection for additional peripheral devices (except some boards) is not included in the standard transient protection package. Call the Rice Lake Weighing Systems Sales Department at (715) 234-9171 for additional transient protection for these devices.

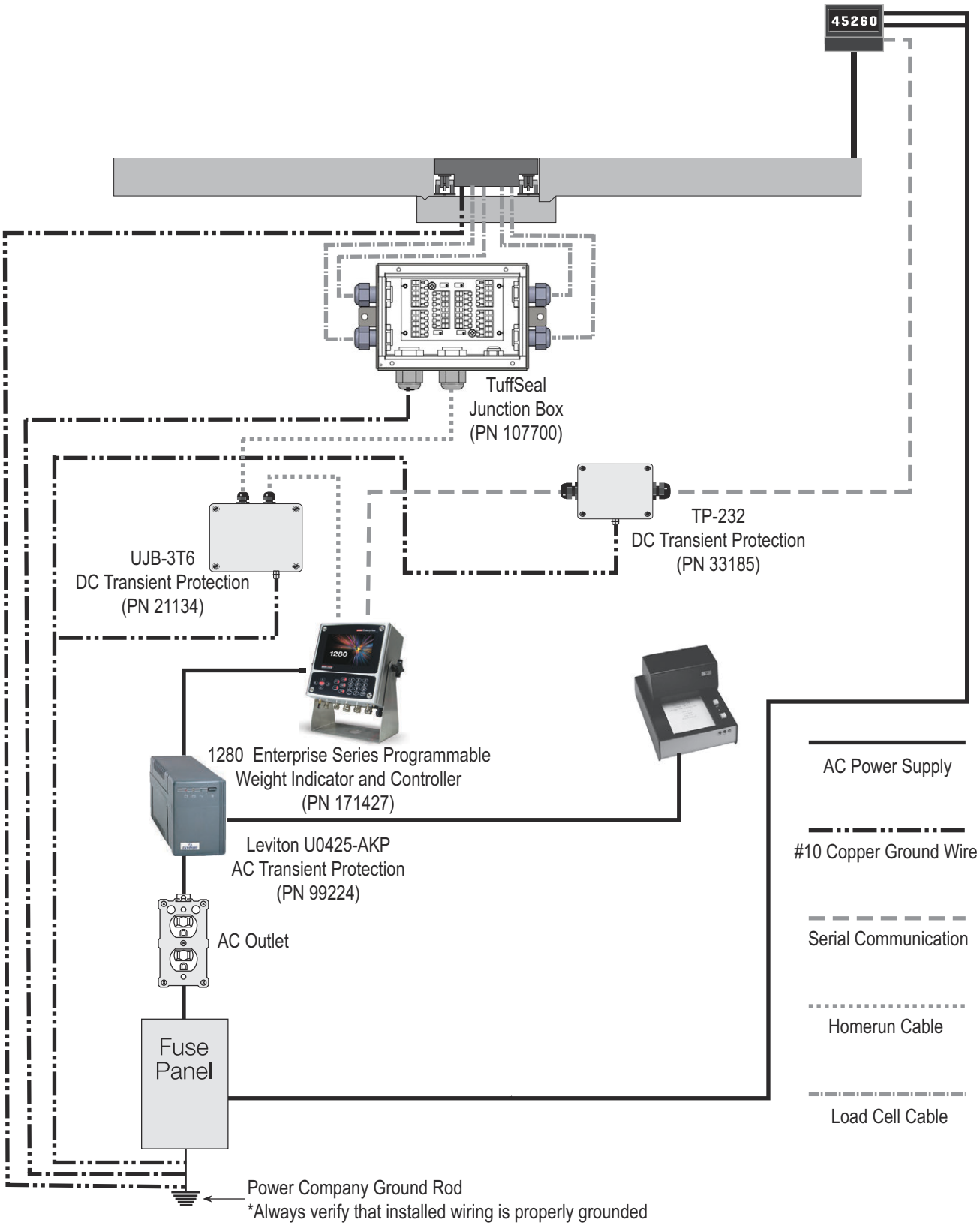

Figure 5-12. Single-Point Grounding Diagram

5.9 Lowering Weighbridge

Use the following steps to lower the weighbridge into the pit frame.

1. Using the proper lifting equipment, place the weighbridge into the pit frame. Ensure the weighbridge is centered within the pit frame.

Figure 5-13. Lower Weighbridge Into Pit Frame

NOTE: Retaining rings on the scale deck should line up with the upper cups on the load cells.

2. If adjustments to the load cells are required, use step 1 to raise the scale base and make any adjustments as necessary.
3. Install cover plates around the weighbridge.

IMPORTANT: Concrete must cure for up to 28 days before a vehicle can access the scale.

Figure 5-14. Weighbridge Installed in Pit Frame

6.0 Trimming and Calibration

This section provides an overview of IM-Axle scale trimming and calibration instructions.

6.1 Load Cell Trimming Overview

Load Cell Trimming

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

Once individual load cell trimming is complete, 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.

Trimming operations must be done using only certified test weights being placed in various locations on the scale deck.

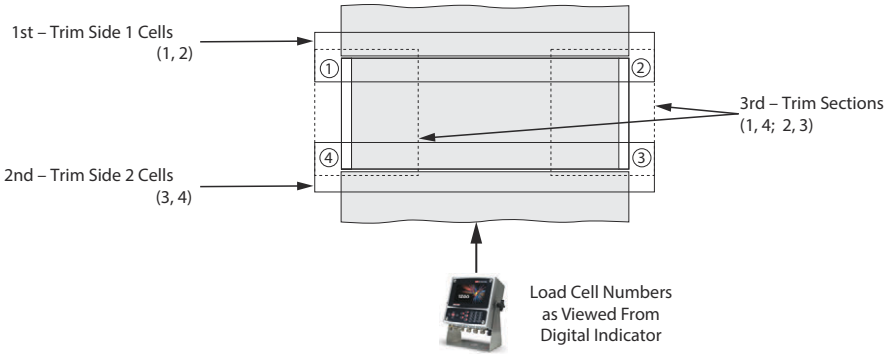

Figure 6-1. Load Cell Trimming Diagram

Both of these trimming operations can be done using only certified test weights placed in various locations on the scale.

Final verification of equal output trimming, will also require test weights to be placed on the deck in various locations.

6.2 Trimming Individual Cells

1. Remove scale plates from the IM-Axle scale to access the junction box.
2. Connect all load cells to the summing board terminals in the junction box.
3. Connect the main interface cable from the junction box to the indicator.
4. Power up the indicator.
5. Turn all load cell potentiometers (individual and section) in the junction box clockwise until a clicking noise is heard while turning. This eliminates any initial resistance so all signals are at full strength. Individual signal trimming may now be done.

Side 1

The first objective is to adjust individual load cells along each side of the scale for equal signal output when equal weight is put on those cells. For convenience, that side of the scale will be referred to as Side 1. The trimming weight used is the load of the certified test weights.

1. Place the certified test weights as close as possible to Side 1 being trimmed with the weights centered over the end load cell mount (number 1 in Figure 6-2). Record the indicator reading. Remember that the scale is still uncalibrated, so the indicator readings are simply raw counts rather than weight units.

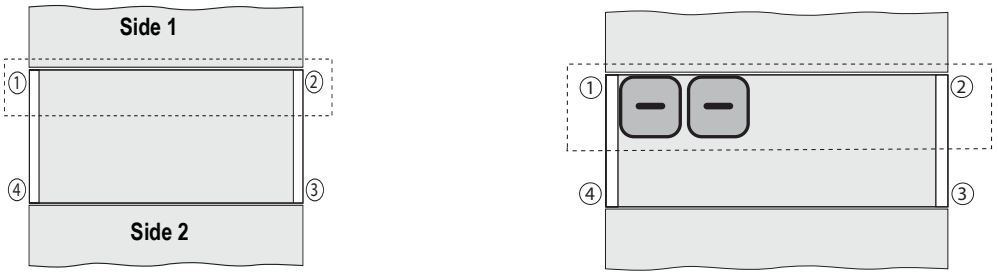

Figure 6-2. Trimming Load Cell Side One

Side 2

2. Place the certified test weights as close as possible to Side 2 being trimmed with the weight centered over the end load cell mount (number 3 in Figure 6-3). Record the indicator reading. Remember that the scale is still uncalibrated, so the indicator readings are simply raw counts rather than weight units.

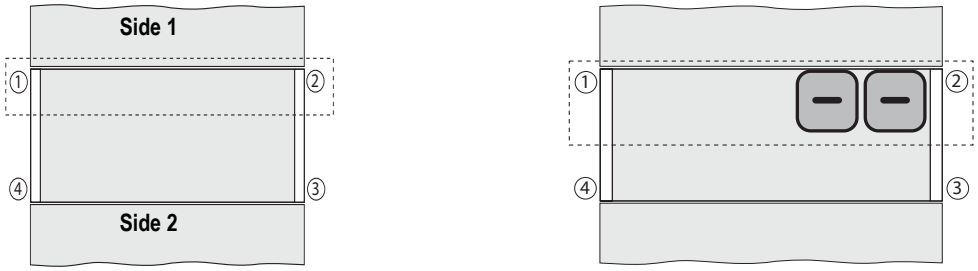

Figure 6-3. Trimming Load Cell Side Two

3. Move certified test weights to over the end of load cell mount 3 and record that reading.
4. Move certified test weights to over the end of load cell mount 4 and record that reading.

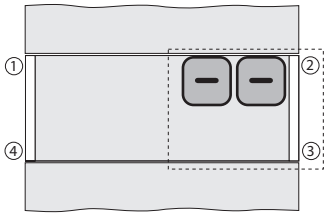

Figure 6-4. Trimming Load Cell Number Two

The lowest reading of the four will be the reference cell. This does not change the cell's signal. Use the individual cell potentiometers for the other three load cells to reduce those signals to match the reference cell.

NOTE: Previously, all pots have been turned to full signal (0 resistance) before starting. The signal cannot increase from any cell—the signal can only decrease by trimming with the pots. Keep trim to a minimum.

5. If one of the four readings differs from the others by more than 5% of the displayed counts, there is probably a mechanical problem with that load cell mount causing the large difference. Find it and correct it before going on. Check for binding, an out-of-level or misaligned link, or similar problems with the load cell and mount. Do not trim down large signal differences with resistance pots—this adds larger problems later due to interaction between mounts.

6. Place certified test weights over one of the high-reading load cell on Side 1. Turn the load cell's individual potentiometer until the displayed reading equals recorded reference load cell reading. Repeat for the other high-reading load cell on side 1.
7. As adjustments are somewhat interactive, repeat the process in Step 1 – Step 2 until the two load cells on Side 1 read within 1% of each other.
8. Move to the Side 2 of the scale. Load the next load cell in turn with the certified test weights and record readings. The load cell which is the closest to the Side 1 reference cell will be used as the reference load cell for trimming the other load cell on Side 2.

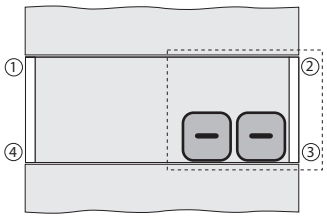

Figure 6-5. Trimming Load Cell Number Three

NOTE: The reference load cell on Side 2 should be the same as the Side 1 readings. Move the certified test weights over the cell chosen for the Side 2 reference cell. Adjust the load cell's individual pot to equal the final Side 1 readings. In the example at left, load cell 4 has been chosen as the Side 2 reference cell.

9. Reload the other Side 2 load cells in turn with the certified test weights and adjust their individual pots so their readings are equal to the Side 2 reference cell (4 in the example).

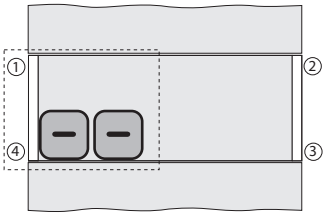

Figure 6-6. Trimming Load Cell Number Four.

10. Repeat Step 6–Step 8 if needed to get all Side 2 load cell reading within 1% of each other and within 1% of the Side 1 reference cell.

6.3 Trimming Paired Sections

After trimming all individual load cells 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 signal trimming.

1. Place the certified test weights in the middle of the scale and directly over an imaginary line connecting an end pair of cells (1 and 4 in the example). Record the indicator reading.

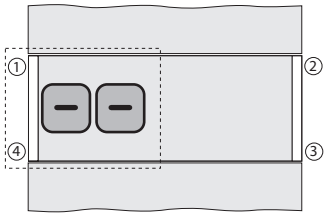

Figure 6-7. Trimming Paired Section 1:4

2. Move the certified test weights directly over the next paired cell section (two and three in Figure 6-8) and record the indicator reading.

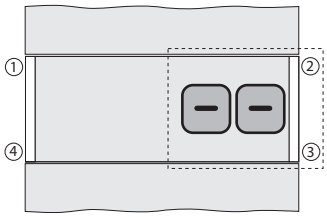

Figure 6-8. Trimming Paired Section 2:3

3. Choose the lowest reading of the four as the reference section, which will not be adjusted. Using the section potentiometers, reload the each section in turn and trim the sections to match the reading of the reference section. Recheck section readings a second time as the adjustment made may 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. Move the weight to all the other corners in turn and record those readings. The readings should be within 1% of each other.

6.4 Calibration with Test Weights

The calibration procedure can only be done after all trimming as described above has been completed. A qualified 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.

6.5 Equipment Required

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 will be required for calibrating the IM-Axle scale. In addition, some type of weight for a substitution test of an additional 12.5% of the capacity will be required. This can be the test-weight truck, bags of sand, or any convenient items easy to load onto the scale.

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 Handbook 44 for detailed calibration requirements and procedures.

7.0 Software Operation

The IM-Axle scale is paired with the 1280 Enterprise™ Series indicator with software designed specifically for in-motion axle weighing. ***Weigh Screen*** displays on startup or after exiting configuration.

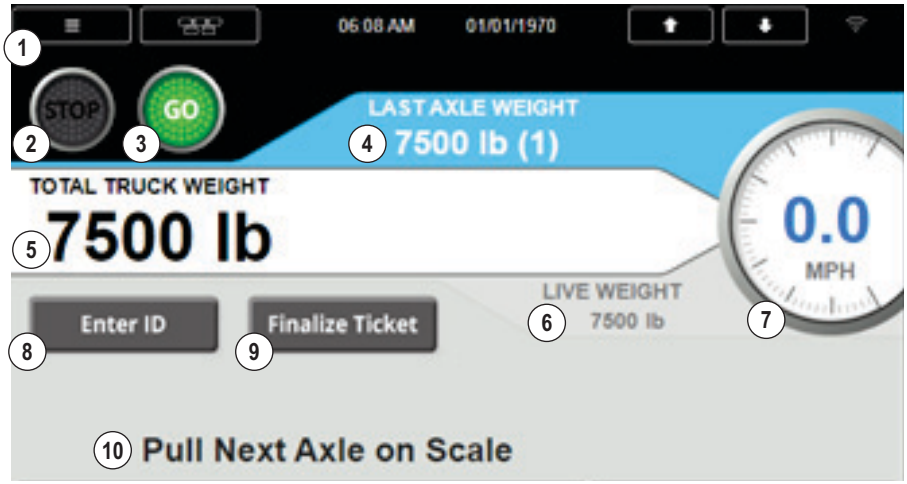

Figure 7-1. Weigh Screen

Item	Name	Description
1	Setup	Password protected widget for access to Setup Menu
2	Red STOP	Displays if speed is greater than Max Speed ***NOTE: Lights cannot be manually controlled in automatic axle weigh mode***
3	Green GO	Displays if speed is less than Max Speed
4	Last Axle Weight	Total stable calculated weight of the last axle weighed
5	Total Truck Weight	Sum total of all axles weighed
6	Live Weight	Live unstable weight measured by the scale
7	Live Speed	Current live speed
8	Enter ID	When selected, widget prompts user to enter truck ID; ID can be entered at any time during the process ***NOTE: If Weigh In/Weigh out is enabled, ID must be entered.***
9	Finalize Ticket	
10	Status Message	Displays instructions for next steps of

Table 7-1. Weigh Screen

7.1 Axle Weighing

The in-motion axle weighing procedure is performed as in Section 7.1.1. If Weigh In/Out is disabled, the transaction is recorded in the database as a single transaction. If Weigh In/Out is enabled, the system proceeds to Section 7.1.2 and records the inbound and outbound weight for each ID.

7.1.1 Axle Weighing Procedure

Use the following steps to initiate automatic axle weighing:

1. Ensure the scale is empty and the display reads zero.
2. Press Enter ID and enter truck identification.
3. Drive at or less than the Maximum Speed across the scale.
4. While an axle is crossing the scale, the system performs the following actions:
   - Captures weights while the scale is stable
   - Averages all stable weights to give one weight
5. After the axle has crossed the scale and the weight returns to below the Axle Threshold, the system performs the following actions:
   - Starts or restarts the last axle timer (defaulted to 10.0 seconds)
   - Updates the 1280 display with the last axle weight and adds the total truck weight.

NOTE: The weight measured by the scale must go below the Axle Threshold for the system to measure the next axle.

If the scale did not capture a stable weight:

The Red light strobes for the total weight remote display time

The system clears, and all existing axle weights revert to 0

The screen displays 'Invalid Weight'

Restart Axle Weighing Procedure at Step 1

6. The system repeats Steps 4 and 5 for each axle until one of the following occurs:
   - Last Axle Timer expires
   - Maximum axle number is reached
   - Finalize Ticket touch widget is selected

NOTE: If the Weigh In/Out option is enabled, the system proceeds to Section 7.1.2.

7. The system stores a record of the transaction in the database, and if Weigh In/Out is disabled, the transaction is complete.

7.1.2 Axle Weighing With Weigh In/Out Option Enabled

If the Weigh In/Out option is enabled, the system searches the Inbound database for the entered ID.

NOTE: If ID has not yet been entered, the system prompts "ID Required to Complete - Enter ID." Enter ID to proceed

If the ID is not found, the system stores a record of the total truck weight in the Inbound database.

If the ID is found, the system performs the following actions:

- Performs value swapping if necessary
- Calculates the Net difference between the inbound total truck weight and the outbound total truck weight
- Enters that Net value into the transaction database
- Deletes the inbound weight
- Transaction is complete

7.2 Serial Communications - Tickets, PC

7.2.1 Weigh Ticket (AuxFmt1, 2, 3)

```
Truck ID 333

Axle # 1    4400 lb
Axle # 2    5160 lb
Axle # 3   10560 lb

Total      20120 lb

10:34PM MM/DD/YYYY
```

Figure 7-2. Weigh Ticket - AuxFmt1, 2, 3

7.2.2 Weigh Out Ticket (AuxFmt1, 2, 4) - If Weigh In/Out Enabled

```
Truck ID 999

Axle # 1    2770 lb
Axle # 2    4190 lb
Axle # 3    4320 lb

Total      11280 lb

Gross      11280 lb
Tare        6120 lb
Net         5160 lb

10:34PM MM/DD/YYYY
```

Figure 7-3. Weigh Out Ticket - AuxFmt1, 2, 4

7.2.3 User Strings

User strings can be added to any print format in Revolution to print that data on the ticket or transaction string. Add <US***n***> to any print format where ***n*** represents the user string number.

User Strings	
User String 1 <US1>	Axle Number
User String 2 <US2>	Axle Weight
User String 3 <US3>	Scale Units
User String 4 <US4>	Truck ID
User String 5 <US5>	Total Weight
User String 6 <US6>	Time
User String 7 <US7>	Date

Table 7-2. User Strings

7.2.4 Print Weight Data

F#1= Sends the current axle weight data at setpoint trip with gross weight data.

F2= AXLEX where X equals axle number up to 6. Sends out the weight data for that axle.

F2= CLEAR clears the axle weight data.

7.2.5 Rice Lake Stop/Go Green LaserLight2 (AuxFmt19)

The message is transmitted (defaulted to Port 2). The format can be modified through the 1280 front panel or using Revolution.

7.2.6 Rice Lake Stop/Go Red LaserLight2 (AuxFmt20)

The message is transmitted (defaulted to Port 2). The format can be modified through the 1280 front panel or using Revolution.

7.3 Application Setup and Configuration

The setup menu can be password protected and offers access to the following:

Figure 7-4. Setup Menu

Parameter	Default	Touch Widget	Description
System Password	" "	Setup Password	Change the password that is required for entry into the setup menu. If setting is left blank, system does not prompt for a password when the Setup touch widget is pressed
Clear Transactions or Inbound Database	-	Clear Databases	Clear transaction or weigh in database; Prompts a yes/no option
Import/Export	-	Import/Export	Export database to micro SD or USB drive
Restore Settings	N/A	Restore Setup Menu	Restores all setup menu parameters from a database that has been loaded into the indicator via Revolution or Interchange. ***NOTE: A backup is automatically generated every time the operator exits the setup menu. The setup database can be exported and/or imported using the export/import function listed above. Press the Restore Settings to overwrite all menu parameters once the database has been imported or downloaded. This data is not verified upon restore. It is verified when changed here within the setup menu but any alteration to the backed-up database is not verified.***
Last Axle Time	10.0 sec	Last Axle Time	Maximum length of time the system waits for another axle. If the time is satisfied, the transaction completes.
Total Display Time	10.0 sec	Total Display Time	Length of time the total axle weight displays after the transaction has been finalized
Threshold Weight	1000 lb	Threshold Weight	The amount of weight the scale must exceed to trigger a weighment
Number of Tickets	1	Number of Tickets	Configures the number of tickets printed with each transaction
Print Delay	3.0 sec	Print Delay	Seconds between ticket prints when Number of Tickets parameter is greater than one
Toggle Auto/Manual	**Auto**/Manual	Auto/Manual	Toggles between: • automatic weighing — utilizes thresholds and timers • manual weighing — stores axle weight at the press of a touch widget; no traffic lights or in/out features available
Toggle In/Out Enabled	**Disabled**/ Enabled	Weigh In/Out	Allows the user to weigh twice per ID for Gross and Net weighments per axle. Toggles between: • Disabled — system stores one transaction per weighment (no ID required) • Enabled — system stores two transactions per unique ID First Load — system calculates first load to find Gross and stores transaction Second Load — system calculates second load and performs Tare; system calculates Net weight; system prints Gross, Tare, and Net weights on Weigh Out Ticket ***NOTE: Toggle In/Out is not available in Manual Mode***
Max Speed	5.0 mph	Max Speed	Maximum speed allowed before light turns RED to tell driver to slow down

Table 7-3. Setup and Configuration

7.4 Database Tables

Report database is used for reporting in the iRite program.

NOTE: Inbound and Transaction databases auto deletes 25% when full.

7.4.1 Inbound Database 1,000

Field	Type	Description
ID	String	Truck ID - 15 alphanumeric
Gross1	Real	Axle 1 weight
Gross2	Real	Axle 2 weight (if applicable)
Gross3	Real	Axle 3 weight (if applicable)
Gross4	Real	Axle 4 weight (if applicable)
Gross5	Real	Axle 5 weight (if applicable)
Gross6	Real	Axle 6 weight (if applicable)
Gross7	Real	Axle 7 weight (if applicable)
TotalG	Real	Total gross weight
DT	Datetime	Time/date of weighment

Table 7-4. Inbound Database (1000 Records)

7.4.2 Transaction Database 10,000

Field	Type	Description
ID	String	Truck ID - 15 alphanumeric
Gross1	Real	Axle 1 weight
Gross2	Real	Axle 2 weight (if applicable)
Gross3	Real	Axle 3 weight (if applicable)
Gross4	Real	Axle 4 weight (if applicable)
Gross5	Real	Axle 5 weight (if applicable)
Gross6	Real	Axle 6 weight (if applicable)
Gross7	Real	Axle 7 weight (if applicable)
TotalG	Real	Total gross weight
Net1	Real	Net weight of Axle 1 (not populated until second time the Truck ID is weighed) Weigh In Out Enabled difference between the first and second weighment
Net2	Real	Net weight of Axle 2 (if applicable)
Net3	Real	Net weight of Axle 3 (if applicable)
Net4	Real	Net weight of Axle 4 (if applicable)
Net5	Real	Net weight of Axle 5 (if applicable)
Net6	Real	Net weight of Axle 6 (if applicable)
Net7	Real	Net weight of Axle 7 (if applicable)
TotalN	Real	Total of all axle's net weight (not populated until the second time the Truck ID is weighed)
DT	Datetime	Time/Date of weighment

Table 7-5. Transaction Database (10,000 Records)

7.5 Hardware Setup

7.5.1 1280 Screen Size/Type

NIT	1280 Screen Size/Type (7.5 inch)
500	7.5 inch

Table 7-6. 1280 Screen Size/Type

7.5.2 Option Card Location

Slot	Type
1	Single Channel A/D Card
2	Dual Serial
3	Dual Serial (optional for bi-directional)
4-6	Currently not used

Table 7-7. Option Card Locations

7.5.3 Digital I/O

Slot	Bit	Type	Function
0	1	Output	Green Light
0	2	Output	Red Light
0	3-8	Off	Currently not used

Table 7-8. Digital I/O

7.5.4 Serial Ports

Port	Type	Description	Setup
1	CMD	Printer	9600, 8, N, 1
2	CMD	Stop N Go Laser Light	9600, 8, N, 1
7	PROG	Speed Sensor	115200, 8, N, 1
8	CMD	Stop N Go Laser Light (used for bi-directional)	9600, 8, N, 1
9	PROG	Speed Sensor (used for bi-directional)	115200, 8, N, 1
10	PROG	HID Reader	9600, 8, N, 1

Table 7-9. Serial Ports

7.5.5 EtherNet TCP/IP Port

Port	Type	Description	Setup
10001	CMD	Waits for connection from software device ie: Revolution or iNterchange	TCP Server
10001	CMD	Currently not used	TCP Client 1
10002	CMD	Currently not used	TCP Client 2
3000	CMD	Web Server	Web Server

Table 7-10. EtherNet TCP/IP Ports

7.5.6 USB Device Port

Port	Type	Description	Setup
3	CMD	Currently not used	--

Table 7-11. USB Device Port

7.5.7 SD Card Slot

Port	Type	Description	Setup
--	CMD	8 Gb Micro SD Card	Images1280

Table 7-12. SD Card Slot

8.0 Load Cell Replacement

This section provides an overview of IM-Axle scale load cell replacement instructions.

8.1 Overview

Load cells are replaced on the IM-Axle scale by raising the scale deck, replacing the load cell and reassembling in the reverse order. See Section 8.2 on page 40 for load cell replacement.

NOTE: Removing any additional hardware could result in the load cell to not sit plumb in the load cell pocket.

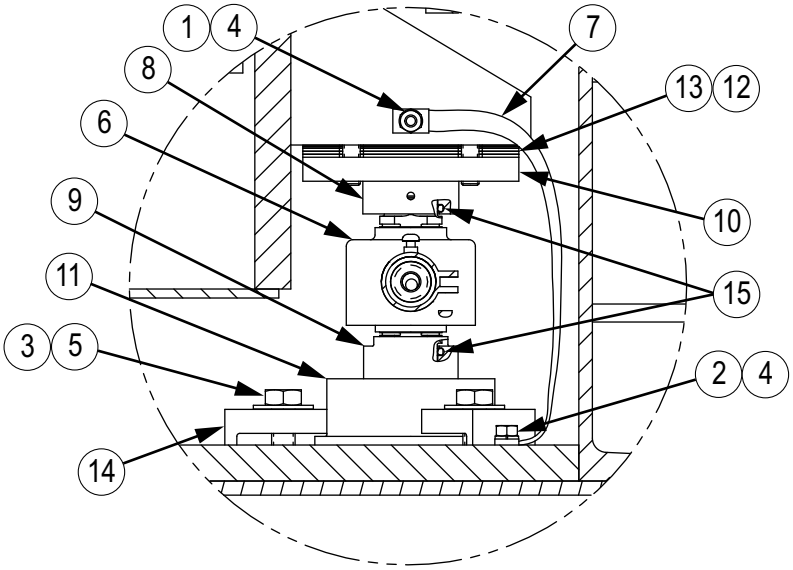

Figure 8-1. Load Cell Mount Parts

Item No.	Part No.	Description	Qty.
1	14641	Nut, 1/4-20NC Hex Steel Clear Zinc Plated	4
2	14886	Screw, MACH 1/4-28NFx1/2 Hex Head Fully Threaded SAE J429 Grade 5 Steel Clear Zinc Plated	4
3	15060	Screw, Cap 1/2-13NCx1-1/2 Hex Head ASTM F593 Alloy Group 1 Cold Worked SST	12
4	15147	Washer, Lock 1/4 Regular Helical Spring Steel Zinc Plated	8
5	15174	Washer, Flat STD 1/2 SST	12
6	168947	Load Cell, CSR RC3-22.5t C3 22.5t 40' Flintec 2mv/v 1000 Ohm EW SST	4
7	17780	Ground Strap, 16 in Tinned Copper Braid	4
8	201337	Load Cup, Upper 2 in DIA x 1-3/16	4
9	201338	Load Cup, Lower 2 in DIA x 1-3/8	4
10	201356	Centering Ring, 4-1/2 DIA x 1/2 Thick	4
11	201357	Load Cell Foot Plate, 7.5t-22.5t Flintec RC3 Load Cell	4
12	201358	Shim, 1/16 x 4-1/2 x 4-1/2	12
13	201359	Shim, 1/32 x 4-1/2 x 4-1/2	8
14	201598	Clamp, 3/4 x 1-1/2 x 2-1/8	12
15	201600	O-Ring, Dash 216 .139 DIA 1.109 ID X 1.387 OD BUNA-N Durometer 70A	8

Table 8-1. Load Cell Mount Replacement Parts

8.2 Replacement Procedure

1. Remove the upper bolt and washer holding the ground strap to the scale module if necessary.
2. Disconnect the load cell terminal connections from the junction box.
3. Attach a pull cord to the end of the load cell cable.
4. Use a jack to lift the scale deck not less than one inch at the load cell location. Install blocking for safety.
5. Remove the upper cup, load cell and lower cup assembly as one assembly
6. Carefully pull the load cell cable through conduit.
7. Remove the two O-rings from old load cell and put on new load cell.
8. Remove the upper cup and lower cup and place on new load cell.
9. Place the upper cup, load cell and lower cup back in position in the scale.

NOTE: Orient the load cell so that the connector on the load cell is perpendicular to the length of the scale and facing toward the center.

10. Use the pull cord to get the new load cell cable back into the summing box for connection and remove excess load cell cable.
11. Reconnect load cell terminal connections to the junction box and trim the cable per junction box manual instructions.
12. Carefully lower the scale deck using the jack.

9.0 Appendix

9.1 PVC Conduits

For PVC drain and cabling conduit specifications, see the following details. See Section 4.3 on page 15 for information regarding PVC conduit installation.

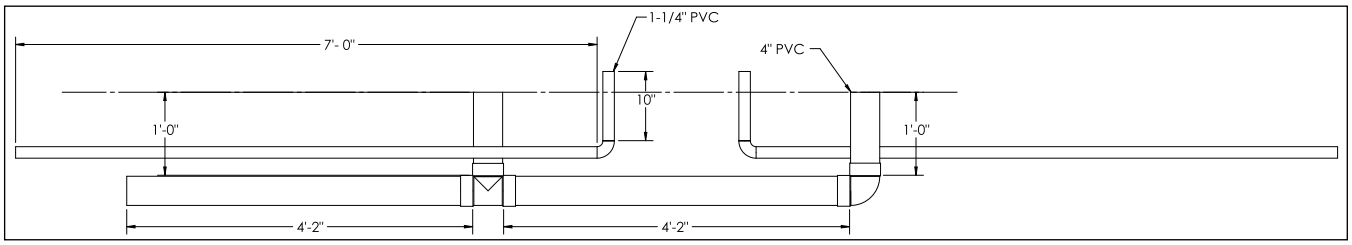

Figure 9-1. PVC Drain and Cabling Conduit Detail

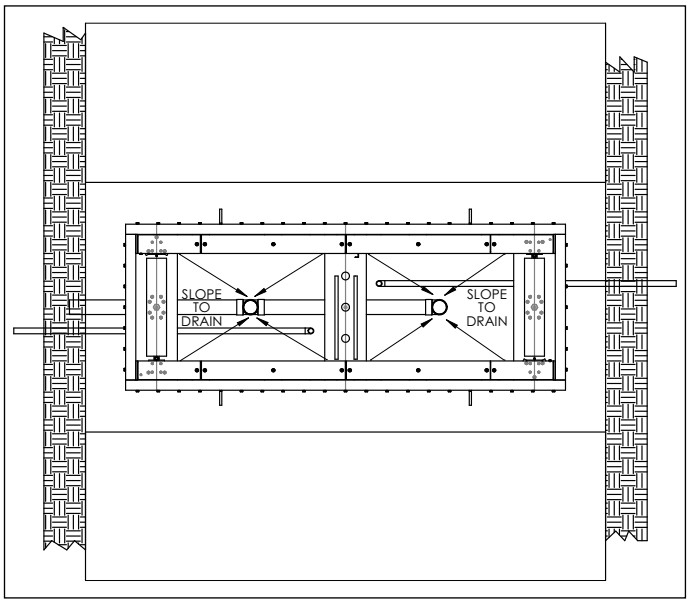

Figure 9-2. Slope to Drain

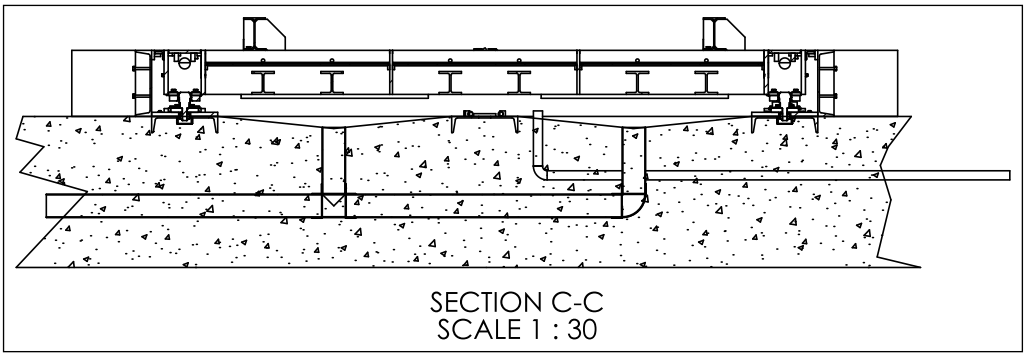

Figure 9-3. PVC Drain and Cabling Conduits

9.2 IM-Axle Scale Replacement Parts

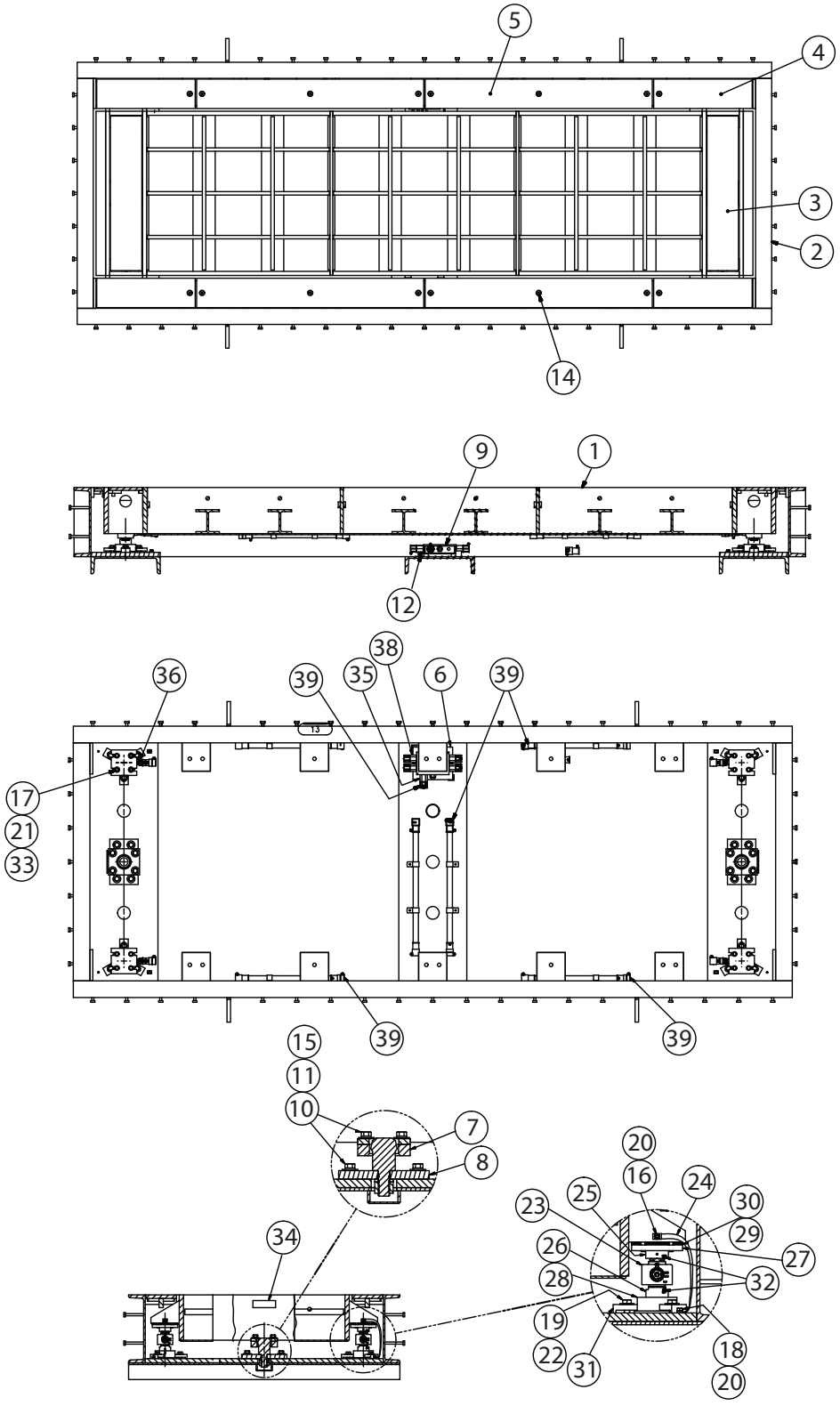

Figure 9-4. IM-Axle Scale Replacement Parts Diagram

Item No.	Part Number	Description	Qty.
1	201185	Weighbridge	1
2	201186	Pit frame	1
3	201213	Cover plate, WLDT	2
4	201216	Cover plate, WLDT, dead corner	4
5	201220	Cover plate WLDT, center dead	4
6	201224	Junction Box mount plate	1
7	201225	Check plate	2
8	201226	Check bumper	2
9	107700	Junction box	1
10	21937	Washer, 1/2 in plain	16
11	69991	Bolt, 1/2-13NC x 1-1/2 grade 5	16
12	95009	Machine screw, 10-24NC x 3/8	2
13	45716	Home run cable	1
14	15058	Cap screw, 1/2-13NC x 1-1/2 SST	16
15	15167	Washer, 1/2 in lock	16
16	14641	Nut, 1/4-20 NC	4
17	14746	Bolt, 3/8-NC x 1-3/4 in	16
18	14886	Machine screw, 1/4-28NF x 1/2 in	4
19	15060	Cap screw, 1/2-NC x 1-1/2 in SST	12
20	15147	Washer, 1/4 in lock	8
21	15179	Washer, 3/8 in lock	16
22	15174	Washer, 12 in lock SST	12
23	168947	Load cell, Flintec RC3-22.5t	4
24	17780	Ground strap, 16 in	4
25	201337	Upper load cup	4
26	201338	Lower load cup	4
27	201356	Centering ring	4
28	201357	Load cell foot plate	4
29	201358	Shim, 1/16 in thick	12
30	201359	Shim, 1/32 in thick	8
31	201598	Clamp	12
32	201600	O-ring	8
33	21938	Washer, 3/8 in, plain	16
34	52342	Serial label	2
35	121087	Coupling and cap, PG11	1
36	17703	Conduit adapter	4
38	201869	Coupling and cap, PG9	4
39	65376	Flexible conduit, 24 in	5
40	75971	Flexible conduit, 24 in, rigid/rigid	6
--	209466	Load cell alignment pin	4

Table 9-1. IM-Axle Scale Replacement Parts List

9.3 Speed Sensor Replacement Parts

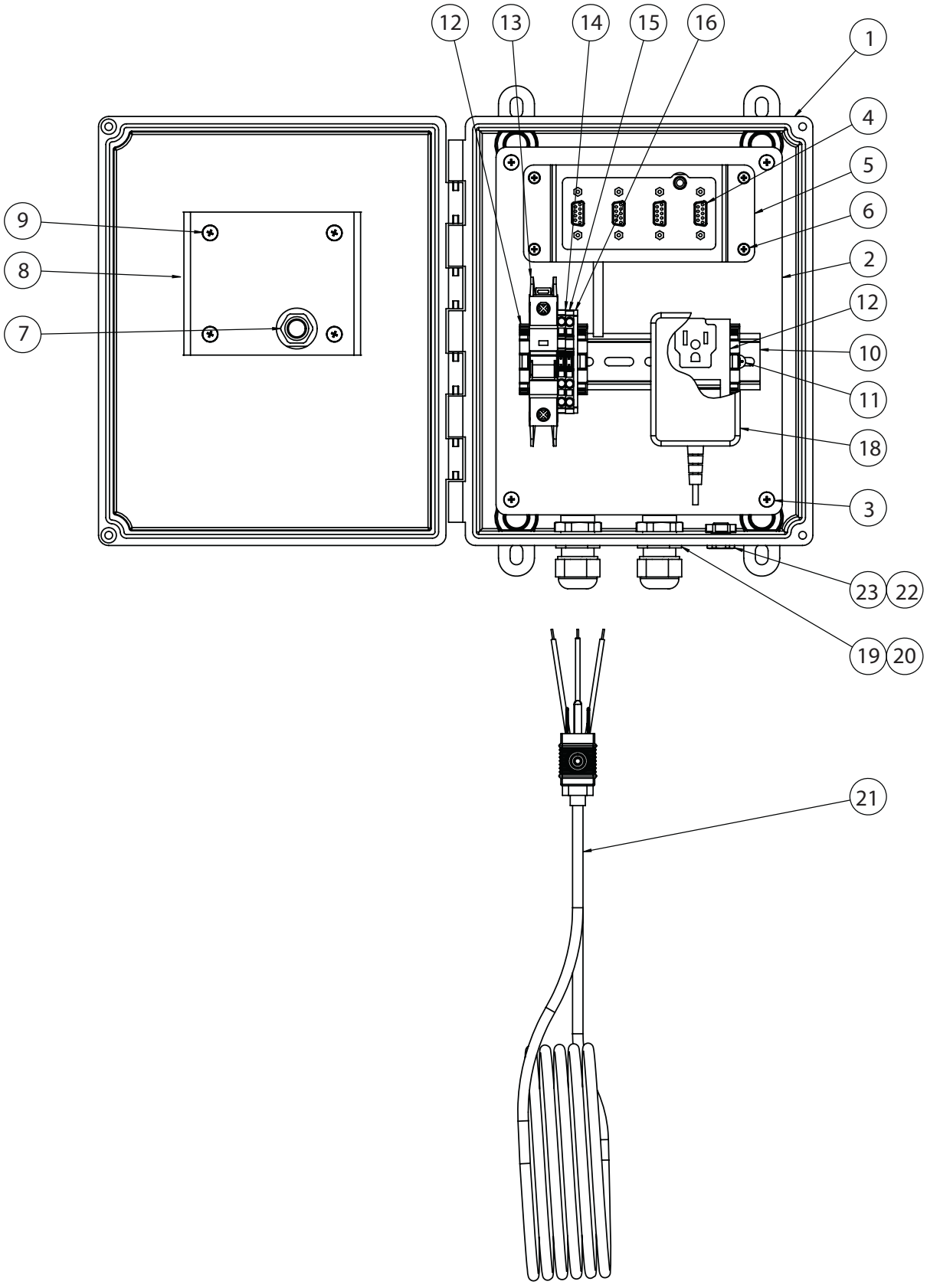

Figure 9-5. Speed Sensor Replacement Parts Diagram

Item No.	Part No.	Description	Qty
1	207130	Enclosure, In-Motion Truck Scale Sensor	1
2	207131	Back Plate Assembly, In-Motion Truck Scale Sensor	1
3	59937	Machine Screw, 10-32 x 3/8 Phillips Head MS51958-62 SST	4
4	Stalker 155-2360-01	Data Adapter, Power Serial Box Stalker 155-2360-01	1
5	207132	Mounting Bracket, Power and Data Adapter In-Motion Truck Scale	1
6	14839	Machine Screw, 6-32NC x 1/4 Phillips Pan Head, Internal Tooth Lock Washer, Zinc Plated	4
7	Stalker 200-0880-60	Speed Sensor, Low Speed Stalker	1
8	207133	Mounting Bracket, Speed Sensor In-Motion Truck Scale	1
9	55718	Machine Screw 10-32NF x 1/4 Phillips Pan Head Internal Tooth Lock Washer, Zinc Plated	4
10	33531	Din Rail, 19 inch Length 35MM Profile	1
11	22087	Machine Screw 6-32NC x 3/8 Phillips Truss Head Steel Zinc Plated	2
12	61141	End Stop, Screw less WAGO	4
13	198624	Breaker, Circuit 4 Amp	1
14	62964	Terminal Block, WAGO 3 Conductor	1
15	62966	Terminal Block, WAGO 3 Conductor	1
16	62968	Plate, End/Intermediate for 3 Conductor WAGO Terminal Blocks	1
17	97861	Outlet, 15Amp Single 120 VAC Din Rail Mount	1
18	Stalker 200-1021-00	Power Supply, 12 V 2.08 A Wall Mount Stalker 200-1021-00	1
19	15628	Cord Grip, 1/2 NPT Black Clamping Range = .197 - .472	2
20	15630	Lock Nut, 1/2-NPT Plastic	2
21	15436	Power Cord, Pigtail 9 foot 10 inch SVT, 18 Gauge/3 Conductor, CEE Color Code	1
22	88734	Nut, Breather Vent M12X1 Thread	1
23	88733	Vent, Breather Sealed Gortex Membrane Black Plastic	1

Table 9-2. Speed Sensor Replacement Parts List

10.0 Specifications

Size:
144 in x 30 in x 11.25 in

Estimated Weight:
2,850 lb (without concrete deck)

Load Cells:
Flintec RC3, 22.5 t

Accuracy:
<1% error at 4 mph

Full Scale Capacity:
70,000 lb

Warranty:
Two years

RICE LAKE®
WEIGHING SYSTEMS

230 W. Coleman St. • Rice Lake, WI 54868 • USA USA: 800-472-6703 • International: +1-715-234-9171