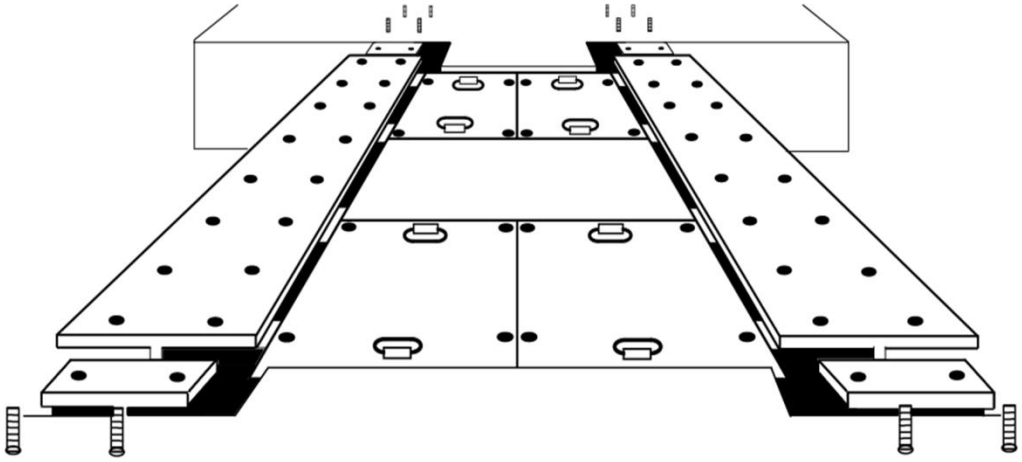
Installation Manual

THURMAN SCALE

Model 8760 Railroad Scale



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8760 Steel Deck
Railroad Track Scale

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Disclaimer

Every effort has been made to provide complete and accurate information in this manual. However, although this manual may include a specifically identified warranty notice for the product, Thurman Scale makes no representations or warranties with respect to the contents of this manual, and reserves the right to make changes to this manual without notice when and as improvements are made.

Thurman Scale shall not be liable for any loss, damage, cost of repairs, incidental or consequential damages of any kind, whether or not based on express or implied warranty, contract, negligence, or strict liability arising in connection with the design, development, installation, or use of the scale.

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Section 1: Introduction

1.1. INTRODUCTION & GENERAL DESCRIPTION

The 8760 Steel Deck Railroad Track Scale is a factory assembled, fully electronic scale available in single 12’ 6” long, and double 25’ long welded steel modules. The 8760 is designed for above ground or shallow pit insulation, and is configured to accept a 115# A.A.R. rail. The scale can be configured to accept other sizes of rail as a special order.

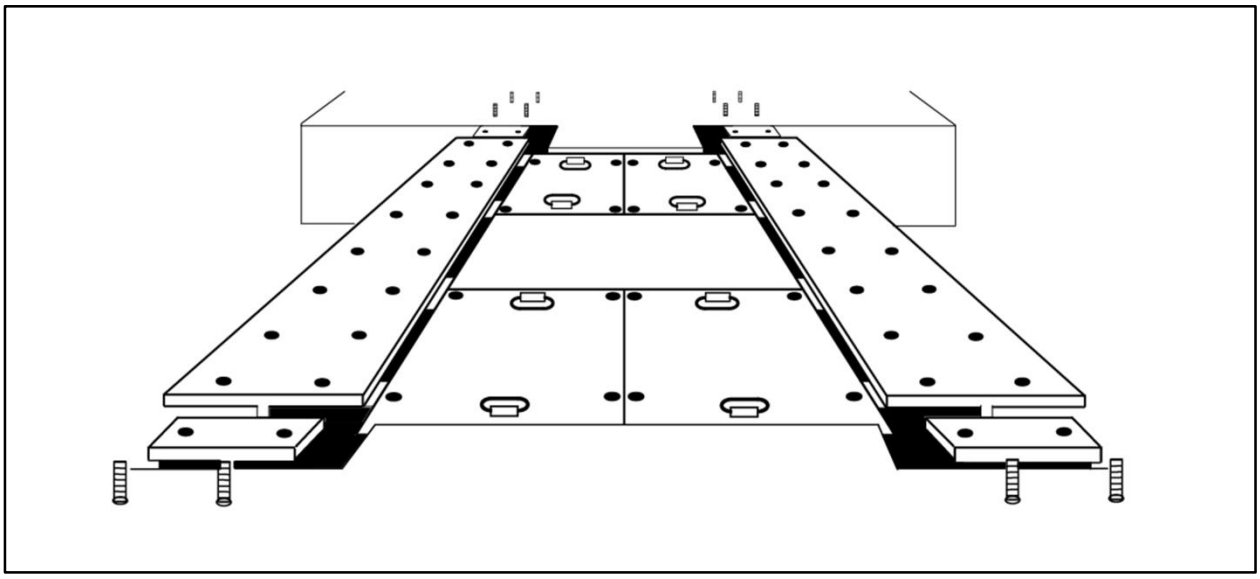

Figure 1-1: 8760 Steel Deck Railroad Track Scale

The design of the 8760 Railroad Track Scale incorporates hermetically-sealed, stainless steel torsion ring load cells, each with a capacity of 100,000 lbs. Using self-checking rocker pins, the 8760 eliminates required maintenance of external checking systems.

Each module features four removable panels for service access. The purchased scale will include the modules, scale anchor bolts, loadcells, rail hardware, rail clips, anti-creep weldments, grout plates and surge voltage kit.

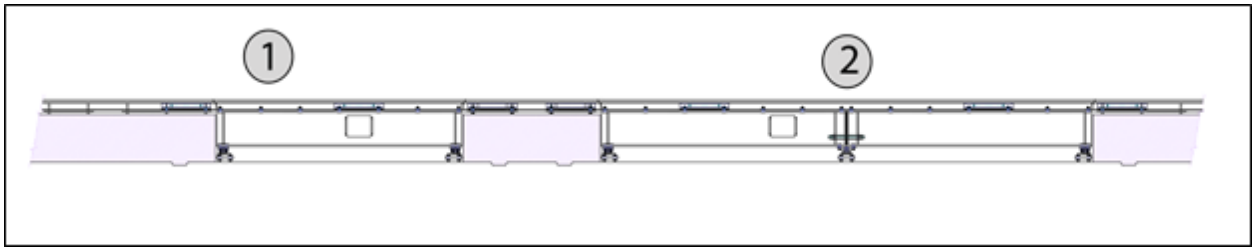

Figure 1-2: 8760 Steel Deck RR Track Scale showing single/double options

1. A single consists of one 12’ 6” long pre-assembled module.
2. A double consists of two 12’ 6” long modules that are configured to assemble together. The double is supported by three sections, and is 25’ long.

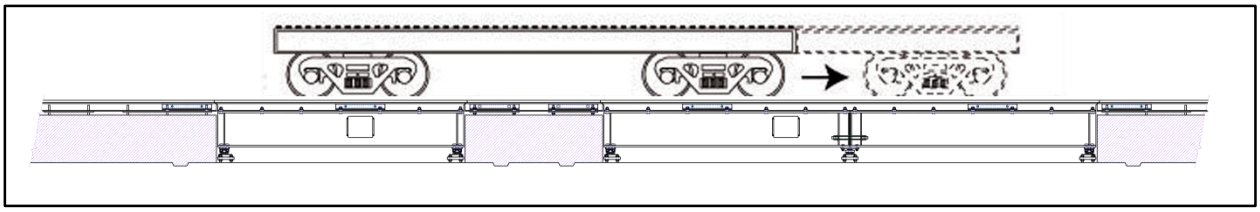

Figure 1-3: 8760 Steel Deck RR Track Scale showing rail cars with varying wheelbase lengths

Both the combination and placement of the scale modules will accommodate rail cars with different wheelbase lengths. A single **12’ 6”** Module weighs **5,500 lbs** and has a Sectional Capacity of **85** tons.

1.2. SPECIFICATIONS

Product #	Type	Length(s)	Nominal Capacity (Lbs.)	# of Sections	Ship Weight (Lbs.)	# of Load Cells	# of Ground Rods
92721	Single	12’6”	170,000	2	6,400	4	2
92722	Double	25’	340,000	3	12,600	6	2
92723	Single/ Single	12’6” + 12’6”	340,000	4	12,800	8	3
92724	Single/ Double	12’6” + 25’	340,000	5	19,000	10	3
92725	Double/ Double	25’ + 25’	340,000	6	25,100	12	3

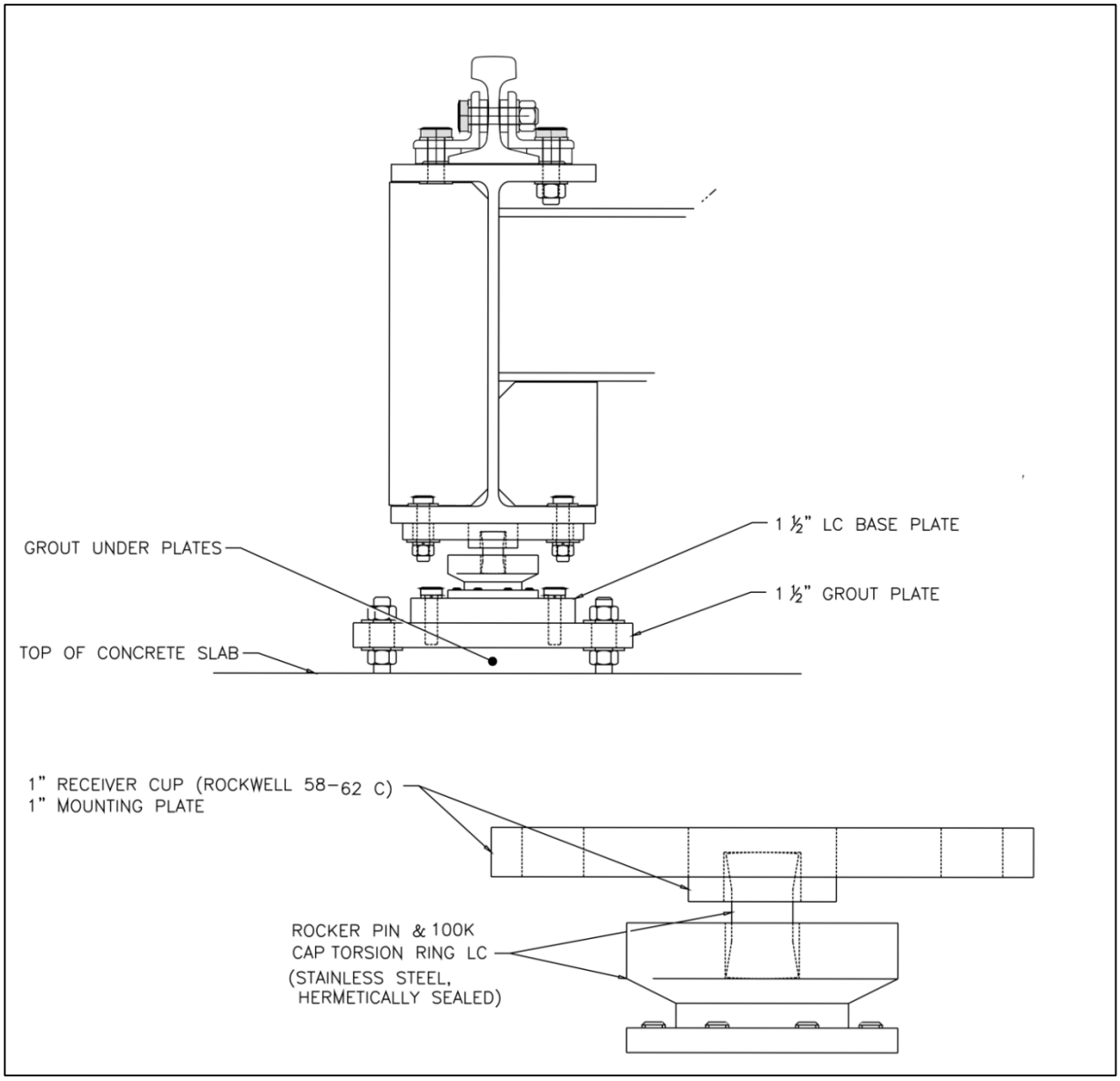

Figure 1-4: 8760 Steel Deck RR Track Scale Load Cell Assembly Detail

1.3. REGULATIONS: EXCERPTS FROM THE AAR SCALE HANDBOOK

This Scale is designed and manufactured in accordance with regulations established by Handbook 44 as adopted by the National Conference of Weights and Measures (NCWM), the American Association of Railroads (AAR), and the National Institute of Standards and Technology (NIST). If the Scale is intended to provide weights to the serving railroad for the purpose of revenue, it shall be installed, repaired, tested, and maintained in accordance with the Association of American Railroads Scale Handbook, which contains the rules and specifications for the construction and maintenance of track scales for the weighing of railroad vehicles.

The following excerpt is from the Association of American Railroads Scale Handbook:

Location: *Scale shall be so located that an adequate foundation and at least 75 feet of tangent track at each approach to the weighrails can be provided.*

Elevation: *In areas with poor drainage, the scale shall be raised to such an elevation that drainage of the surface water shall be away from it. Means shall be provided to prevent accumulation of water at the scale site. Solutions for saturated areas with poor drainage shall be determined by a competent soils engineer.*

Drainage: *The pit floor shall be pitched to a common point for drainage and shall be smooth and free from pockets in which water may stand. If the pit floor is below substrate water level, the pit shall be drained from its lowest point into a sump adequately equipped with automatic means for removal of water as it collects.*

Footing or Piers for loadcells: *Concrete footings or piers supporting loadcell base plates shall not be less than 18 inches thick. Their tops shall be above the floor a sufficient distance to prevent the accumulation of water around or under the base plates.*

Pit floor: *The floor of the pit may be a mat of concrete approximately as thick as that required to support the loadcell base plates or, if local conditions permit, the thickness may be reduced to no less than 6 inches.*

Ventilation: *All scale pits shall be ventilated to meet the needs of each particular case to minimize the relative humidity in the pit and to retard corrosion of scale parts and structural steel.*

Entrance to the Scale Pit: *Suitable access to the Scale pit shall be provided. The entrance shall be closed by a suitable closure fastened to prevent the entry of unauthorized persons.*

Bearing Pressures Under Foundations: *The bearing areas of the foundation footings shall be such that the pressure under the footings will not exceed:*

For fine sand and clay .....4,000 lb. per square foot
For coarse sand or hard clay.....6,000 LB per square foot
For boulders or solid rock.....20,000 LB per square foot

If the soil does not have a bearing capacity of at least 4,000 lbs. per square foot, and its bearing capacity cannot be increased by drainage, stabilization, or other means, pile foundations shall be provided. Careful soil exploration, including borings, is always desirable.

Leveling: *Loadcell assemblies shall be raised or lowered, as required, by means of leveling screws, shims, or other methods to bring the weighbridge into level traversely and on grade longitudinally. After leveling the loadcell baseplates, to a tolerance of not more than 0.015 inches per foot, they shall be grouted as required.*

Scale House Design: *Except where the indicating elements are mounted in a separate building, a Scale house large enough to install, observe and service the indicating elements shall be provided. It should have windows of sufficient size and so located as to give the weigher an unobstructed view of the Scale deck and approaching cars or trucks.*

Where a special scale house is required, a suitable and substantial building shall be provided. To insure proper operation of the indicator and/or recorder, the house shall be equipped with proper environmental control.

Scale House Location:

The lateral clearance between the Scale house and centerline of Scale or any track shall not be less than 8 feet, unless otherwise required by law, or the serving railroad.

Indicator - Recorder Shelf: If a shelf is required for mounting the indicator and/or recorder, it shall be so located as to provide for ease of operation without obscuring the weigher's view of the Scale deck and approaching cars or trucks. The shelf must not limit ready access to the instrument for maintenance purposes.

Power Source *The power source of the electronic instrumentation and load cell circuitry shall conform to the following:*

Voltage- 115 v AC +/- 10 v

Frequency - 60 Hz, +/- 0.25 Hz

The power source must be reasonably free from harmonics and electrical transients. Fusing shall be provided at 15 amp unless otherwise specified by the manufacturer. The power source shall be a separate circuit back to the distribution transformer.

One side of the 115 v power source shall be at a ground potential.

Power surge protection shall be provided for load cells and instrumentation circuit.

Adequate protection of shielding should be provided to eliminate radio frequency and electro-magnetic interference. The scale must satisfy the tolerance requirements when the scale equipment is subjected to RFI and EMI influences.

Cabling: *All cabling between loadcells, junction boxes, and electronic instrumentation shall conform to the following:*

All cable shields shall be interconnected and carried to a single ground. This should be a separate ground from the power source ground and be provided for the loadcells and instrumentation circuits only. It should be a copper rod which, when possible, is driven to the depth of the water table.

The connection between the ground rod and the common ground point of the loadcell and instrumentation circuits shall be made with copper wire, or the equivalent, of No. 10 gauge or larger.

All cable shields in the loadcell circuits shall be grounded at one end only.

Loadcell cables shall be physically separate from power cables and never run in the same conduit system.

Note: a 24-inch to 35-inch separation is required by Thurman Scale.

All cable connections, junction boxes, etc., in the loadcell circuits shall be properly protected against the effects of moisture.

All multi- conductor cabling shall be color- coded, or provided with other means of identification of the individual conductors.

Cables from the loadcells to the first junction box shall be in one unspliced length. Junction boxes shall be located near the top of the pit but not on the weighbridge. Cabling from the first junction box to a common master junction box shall be in one length unspliced.

****End of excerpt****

1.4. FOUNDATION CONSTRUCTION INSTALLATION

Note: Use only certified prints that are marked for the particular installation, customer, and scale.

All the dimensions indicated on the certified prints must be rigidly and faithfully followed during all phases of construction. There is very little tolerance for misplacements and mistakes. Pier heights are especially critical as there must be enough space for finishing grout under all stands (per certified drawings) while rails on the scale weighbridge and approach rail must be absolutely level.

Placement of foundation bolts is absolutely critical to the successful installation of the scale. The use of a template or form that matches the design called for can be used. Foundation bolts must **NOT** be installed at an angle, too deep, or too shallow. Very close tolerances must be met on all aspects of pit construction.

1.5. GROUT PLATES

The Grout plates are the foundation upon which the scale structure rests, and their accurate, level position is essential to the structure. Base plates must be installed at the proper height and in the same plane. All grout plates must be level within .015" per foot. All pier bolts must have enough height to allow vertical adjustment of the base plates, but not as high as to interfere or to have insufficient depth into the pier.

1.6. TORSION RING LOADCELLS

The 100,000 lb. capacity compression loadcells are designed to meet the most stringent accuracy requirements. They offer total stainless steel construction and complete hermetic sealing, making them suitable for use in the toughest of environments. They are rated **IP 68**.

The load cell's Torsion Ring design with checking rocker pin permits it to be self-aligning, always returning to its original plumb, square and level position after loading and unloading disturbances.

1.7. GROUND RODS:

Ground rods are essential in providing protection to the electronic components and loadcells from both lightning surges and static discharges. Pit ground rods shall be tied to the foundations steel reinforcement rod (rebar) prior to pouring, and shall protrude 4 inches above the pit floor.

Ground rods for approach rails (supplied by others) shall be tied to the rebar assembly. There are three (3) rods with the locations specified as below:

The following drawing shows correct placement of ground rods.

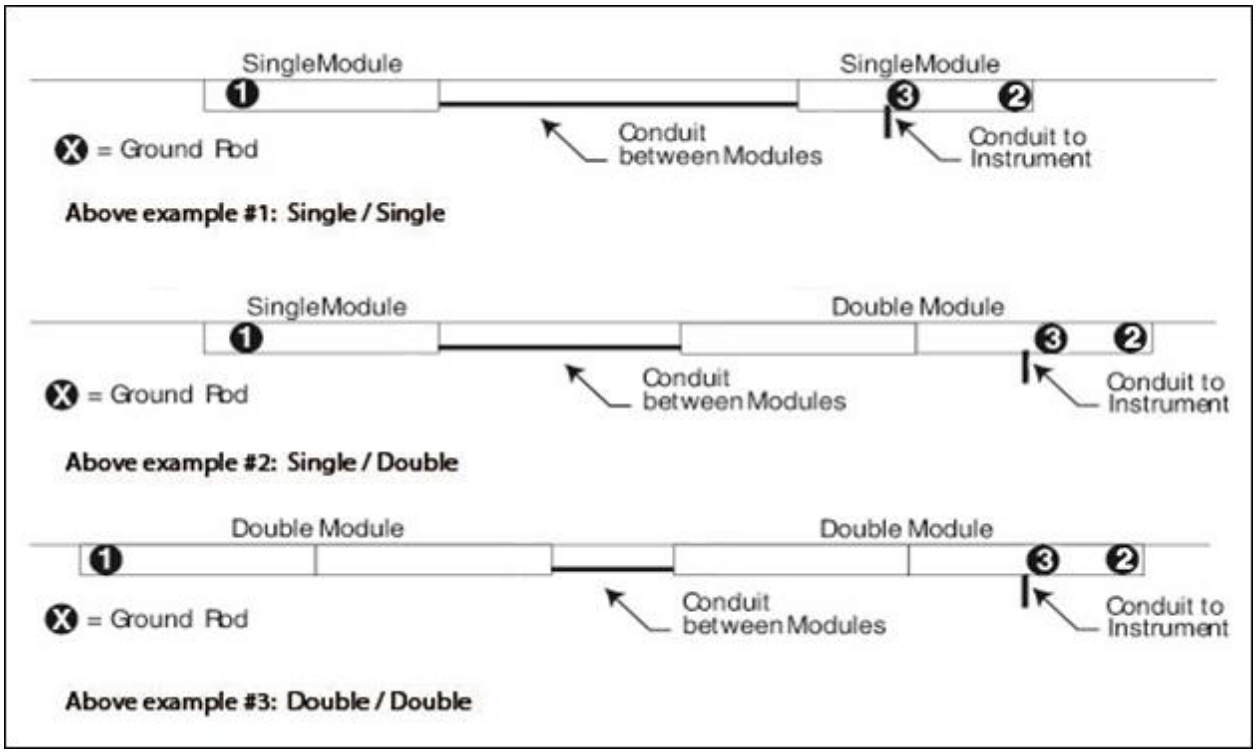

Figure 1-5: Ground rod placements

Instructions for Installing the Ground Rods

1. Clean all ground rod end(s) with abrasive to assure a good electrical connection. Keep all ground straps untwisted, clear of standing water, with a drip loop, and as short as possible. Secure the strap to the ground rods with the provided clamp and coat with grease. Cover the connections to protect from condensation.
2. Ground rod #1 and #2 should be connected to the weighbridge by bolting to the cross beam at the end of each Scale Module. Then, scrape and sand enough paint / coating away to make a good electrical connection, and coat with grease AFTER the connection has been made.
3. Ground rod #3 should be located near the interface conduit. It is used to connect to the isolated ground of the Pit Power Supply (PPS) Ace 2001-1 only.

Approach ground rods supplied by others should be installed and correctly connected with ground braid to the Anti-creep assemblies. See **Figure 2-19** and **Figure 2-20** for further details.

1.8. GROUNDING

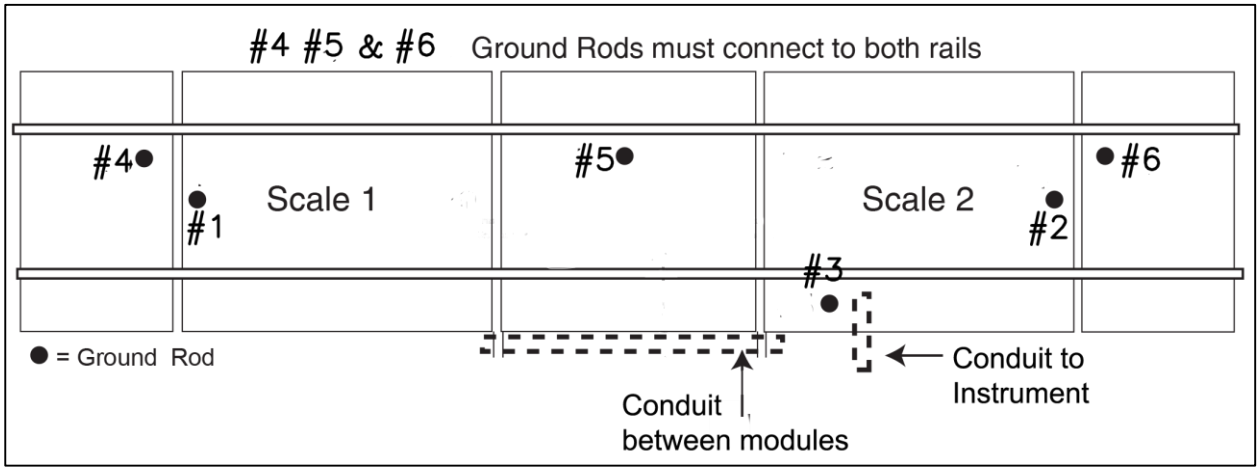

Figure 1-6: Ground Rod Diagram

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Section 2: Installation

2.1. GENERAL SERVICE POLICY

Prior to installation, it must be verified that the equipment will satisfy the customer's requirements as supplied, and as described in this manual. If the equipment cannot satisfy the application and the application cannot be modified to meet the design parameters of the equipment, the installation should not be attempted.

Overview:

- These instructions apply to the **Scale Platform only**; installation procedures for instrumentation, printers and other peripherals are given in manuals specifically provided for those units. The instructions include a pre-installation checkout, which must be performed before the installation.
- All electronic and mechanical calibrations and or adjustments required to make this equipment perform to accuracy and operational specifications are considered to be part of the installation and are included in the installation charge. Only those charges which are incurred as a result of the equipment's inability to be adjusted or calibrated to performance specifications, may be charged to warranty.
- Absolutely no physical or electrical modifications are to be made to this equipment. Electrical connections other than those specified may not be performed and no physical alterations (mounting holes, etc.) are allowed.
- The installing technician is responsible to make certain that personnel are fully trained and familiar with the capabilities and limitations of the equipment before the installation is considered complete.

2.2. PRE-INSTALLATION CHECKLIST:

The following points should be checked and discussed with the customer, if necessary, before the technician goes to the site to install the equipment.

- Has the customer's application been checked to make certain that it is within the capabilities and design parameters of the equipment?
- If the installation will disrupt the customer's normal operations, is he aware and has he made arrangements?
- Is properly-grounded power available at the installation location?
- Will the equipment operator(s) be available for training?

- Has the service technician thoroughly reviewed the installation procedures?

2.3. UNPACKING

- Check that all components and accessories are on hand, and agree with the customer's order.
- Remove all components from their packing material —checking to make certain that all parts are accounted for and no parts are damaged. Advise the shipper immediately, if damage has occurred. Order any parts necessary to replace those which have been damaged. Keep the shipping container and packing material for future use. Check the packing list.
- Collect all necessary installation manuals and prints, including Certified Prints, for the scale being installed.

2.4. SAFETY

As is the case with any material handling equipment, certain safety precautions should be observed during operation:

- Never load the platform beyond its rated capacity. Refer to the rating on the serial number plate if in doubt.
- Ensure that any structure which supports the platform is capable of withstanding the weight of the platform plus its rated capacity load.
- Do not load the platform if there is any evidence of damage to the platform or supporting structure.
- Use safety chains or other suitable restraining devices if there is any possibility of the load shifting, falling, or rolling from its position on the load receiver.
- Do not leave the platform unattended when it is loaded.

2.5. FOUNDATION CONSTRUCTION & INSTALLATION

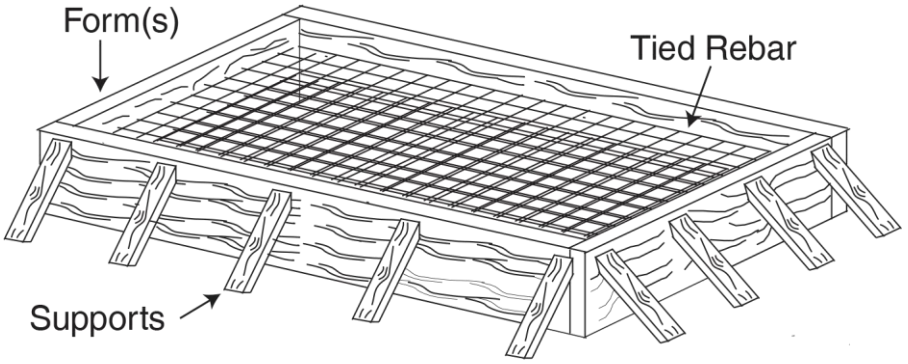


Figure 2-1: Preparing form for the 8760 rail module(s) slab.

- Use only certified prints that are marked for the particular installation, customer, and scale.
- All the dimensions indicated on the certified prints must be rigidly and faithfully followed during all phases of construction. There is very little tolerance for misplacements and mistakes.
- Pier heights are especially critical as there must be enough space for finishing grout under all stands (per certified drawings) while rails on the scale weighbridge and approach rail must be absolutely level.
- Placement of foundation bolts is absolutely critical to the successful installation of the scale. The use of a template or form that matches the design called for can be used. Foundation bolts must **NOT** be installed at an angle, too deep, or too shallow. Very close tolerances must be met on all aspects of pit construction.

NOTE: The installation and finishing of poured concrete is best left to trained, well equipped, and experienced personnel.

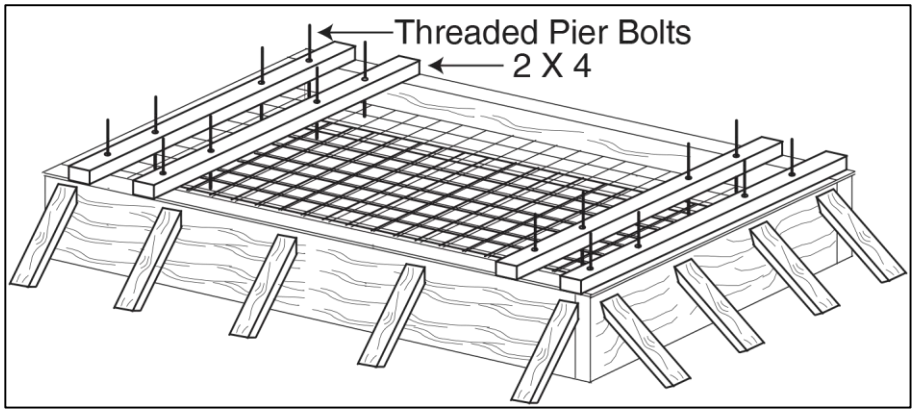


Figure 2-2: Form showing threaded pier bolts support

The use of a form to securely hold the threaded pier bolts in the correct position is highly recommended.

For exact dimensions, refer to the CERTIFIED PRINT.

When the poured slab/foundation has cured, remove 2x4's and forms.

2.6. RECOMMENDED INSTALLATION SEQUENCE

After pit is completed, follow this sequence:

Measure pit for square, depth, width, and length against certified prints. Measure cast-in anchors, pier elevation on all piers against certified prints. Dimensions MUST be correct before installing scale hardware.

Using packing list, be sure all scale elements/parts have arrived intact and undamaged. Then, install the following:

- Set grout plates
- Scale modules and associated hardware
- Loadcells and associated hardware
- Adjustments and leveling
- Forming and grouting grout plates
- Grounding
- Rail and anti-creep devices
- Complete wiring of load cells
- Instrumentation and any peripheral equipment
- Calibration and testing

2.7. FOUNDATION INSPECTION

A Foundation Inspection should ALWAYS be performed prior to Scale installation, to confirm the Foundation is constructed correctly and is ready for installation. If possible, this should be done prior to the scale shipment.

Tools Required

- Certified drawings and site plan
- 25' & 100' steel tape measures
- Hacksaw
- String line (construction string)
- Construction Spray Paint (upside down type, for marking concrete)
- 2' to 4' level
- Hammer and concrete nails
- laser or builders level (if possible)
- straight edge for pit foundations

Perform the following Foundation checks. It is recommended to keep a copy of the check list with the job file. ALWAYS familiarize yourself with the CERTIFIED FOUNDATION PRINTS for the job you are working on as model numbers and their specifications are subject to change.

1. Site Plan and Certified Prints should be thoroughly reviewed to confirm accurate locations to the scale and all extra items (scoreboards, lights, poles, etc.) that are included.
2. Check for truck and crane access, overhead wires, fences, green concrete, etc.
3. Dimensional length and width check; check all four sides and record on chart.
4. Diagonal measurements check to verify that the Foundation is square and record on chart. These measurements should be equal, or within ½ inch. Greater error could result in the scale not fitting in the foundation.
5. Check ALL pier heights to make sure they are at the correct elevation and record on chart.
6. Check the pit walls to verify they are straight.
7. Verify Ground Rod locations.
8. Verify conduit locations and pull strings.

9. Verify that drains and sump openings are piped correctly are clear of debris.
10. Verify location(s) of any and all required embeds.

Record all measurements and observations. Physically mark any discrepancies with the marking paint.

Note: Do not proceed with Installation until corrections have been made.

2.8. FOUNDATION INSPECTION CHECK LIST

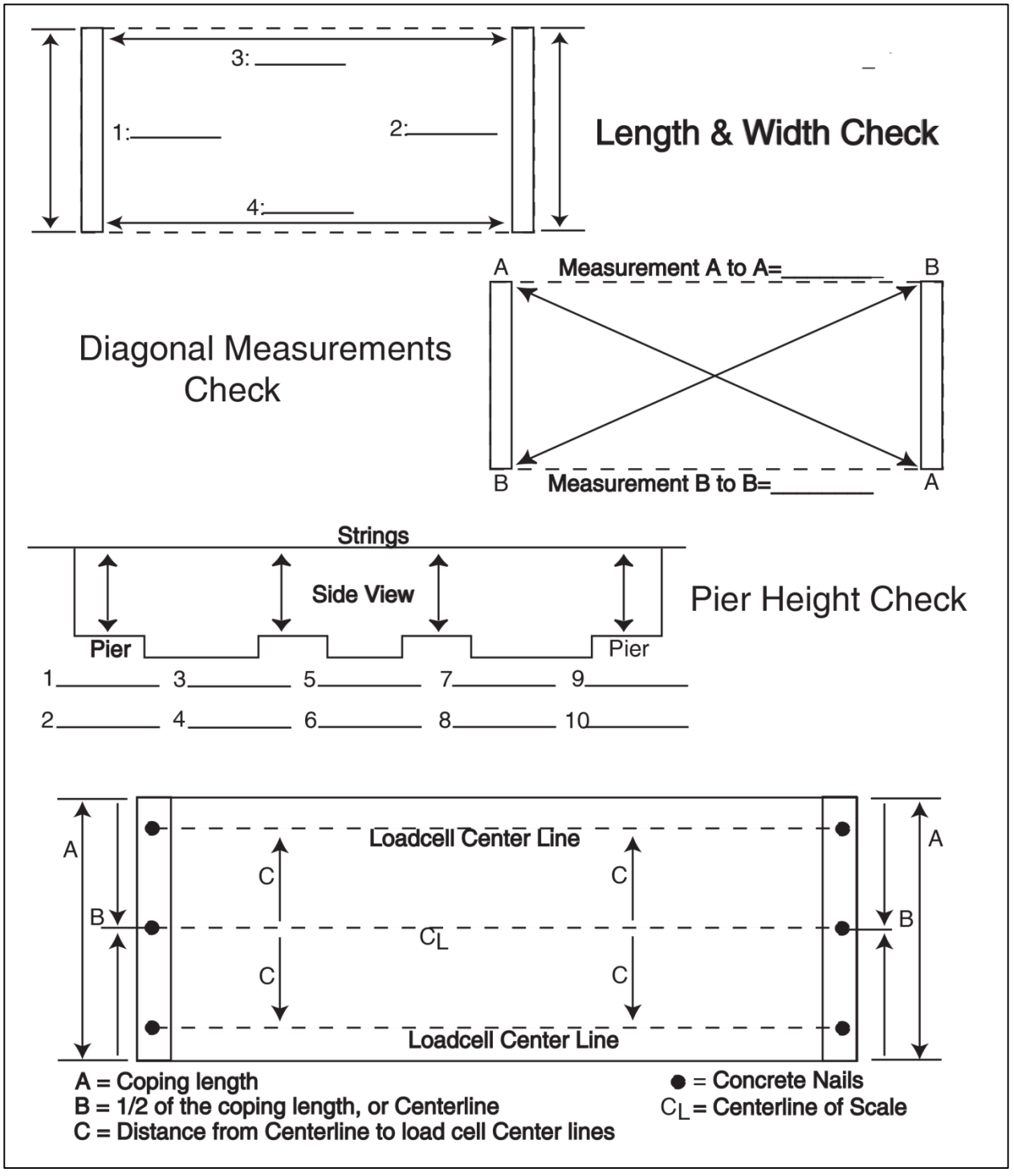


Figure 2-3: Foundation Inspection Checklist

2.9. GROUT PLATE ASSEMBLIES

Caution: **Grout plates weigh approximately 60 lbs. apiece. Work Safely!**

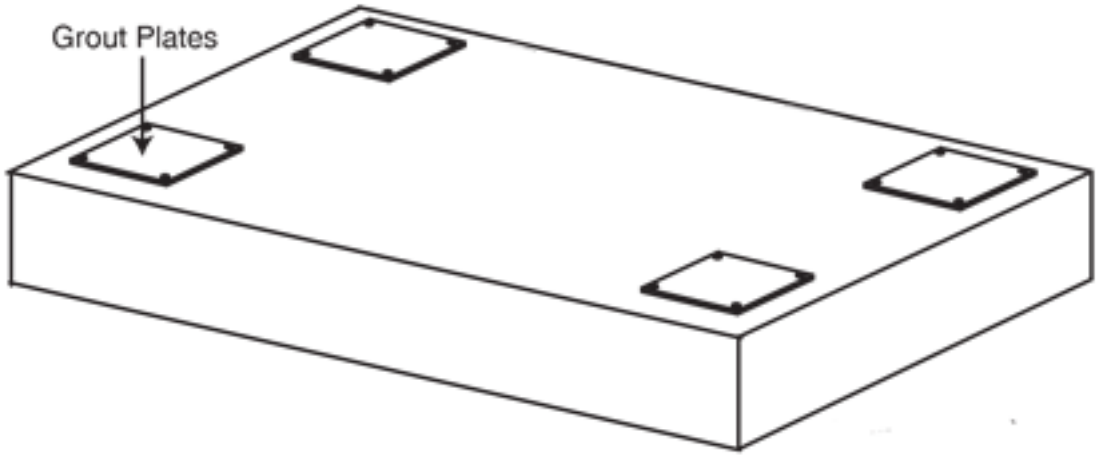
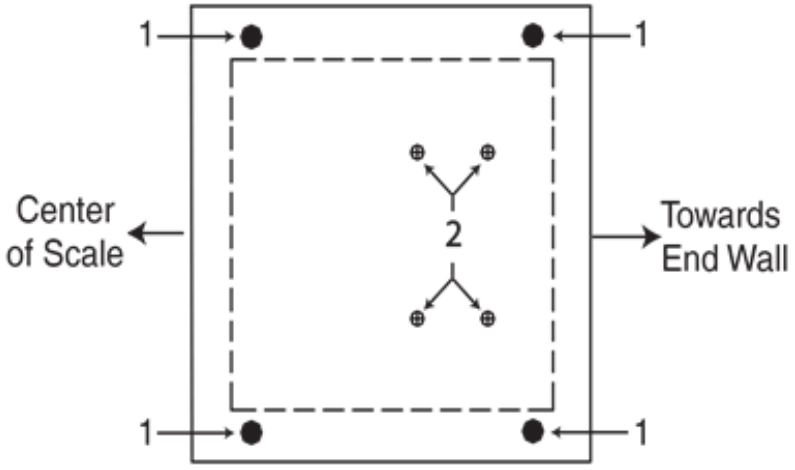


Figure 2-4: Foundation with grout plates diagram

1. Clean the top of the piers thoroughly, and ensure they are free of any oil or grease deposits. Clean the threads of all base plate pier bolts with a wire brush, using a thread file to restore any damaged threads. Lightly oil the threads and ensure the threads are clean and in good condition by running a threaded nut down and up the threads of the bolt.



1. Anchor Bolt Mounting Holes
2. Load Cell Base Plate Bolts

Figure 2-5: Diagram showing the end grout plate

2. Per the Certified Prints, identify and locate each Grout Plate. Place the Grout Plate onto the nuts, guiding the four anchor bolts into the four corner holes of the grout plate.

NOTE: Double Module (25') Scales are three (3) Section Scales that use six (6) Grout Plates. The Center Section Grout Plates are arranged differently than the ends. Locate and install these plates per the Certified Print.

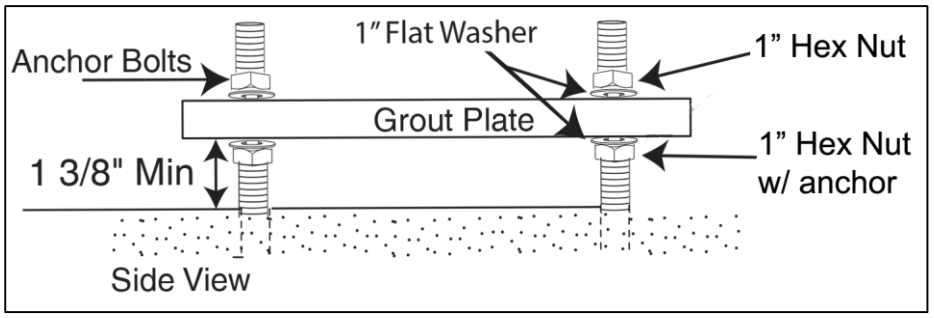


Figure 2-6: Grout plate layout diagram

3. Set all grout plates to the proper height per the Certified Print and level them by turning the nuts below the plates. Tighten the grout plate anchor bolts tight enough to ensure they do not shift.

2.10. SET MODULES IN PLACE

1. Place wooden blocking and cribbing material suitable for supporting each module into position near each pier and grout plate. Each section will require four points of support, therefore, arrange the placement of these supports accordingly. It is recommended to set blocking to support the module 1 to 2 inches higher (than the certified prints indicate its final elevation should be) at this time.
2. With a crane and rigging (4 leg drop) of suitable capacity, install each module onto the supporting blocking.

Note: On pit installations, remove the access panels on the module(s) before setting.

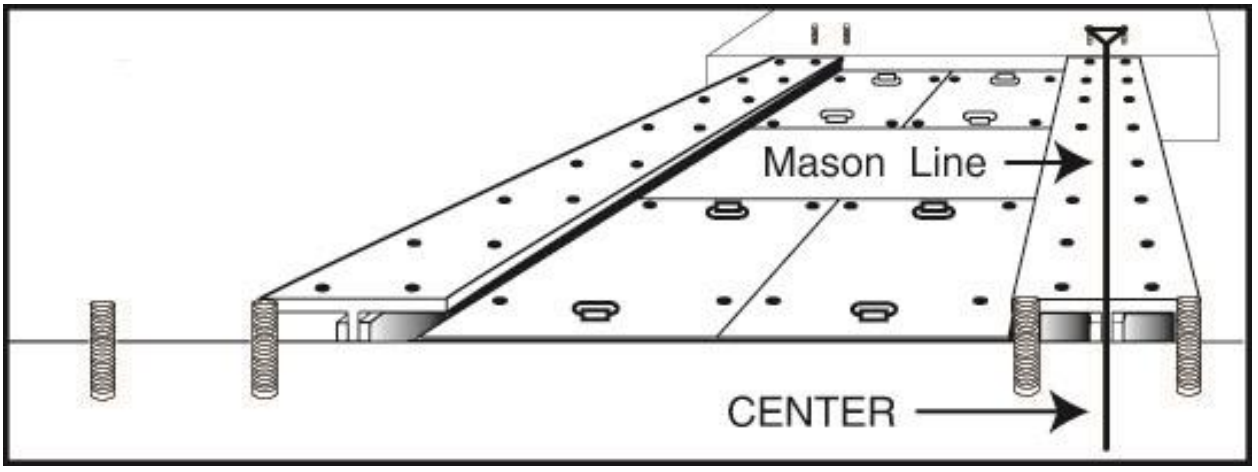


Figure 2-7: Diagram showing mason line to check centering

3. Set up a mason line to check and ensure that the centers of the main beams are centered on the approach anchors in the concrete approaches for the entire section. Ensure that the scale module(s) are centered both laterally and longitudinally on the foundation and approaches.

2.11. LOAD CELL ASSEMBLY

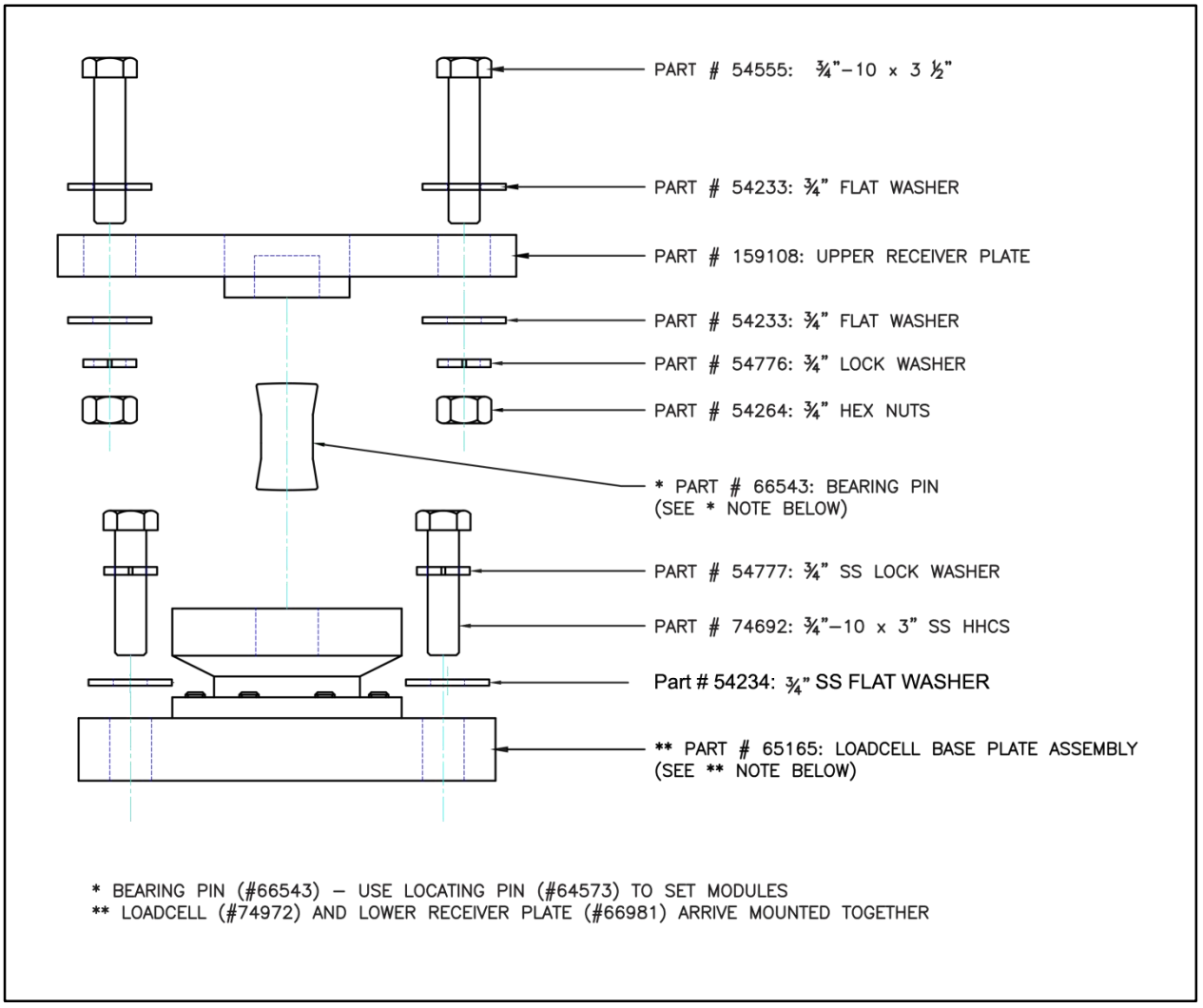


Figure 2-8: Loadcell assembly diagram

4. Locate the above listed parts, and place them at each Grout Plate's location. When assembling, care should be taken to apply grease to the upper and lower cups and bolts to enable future disassembly and to minimize wear.

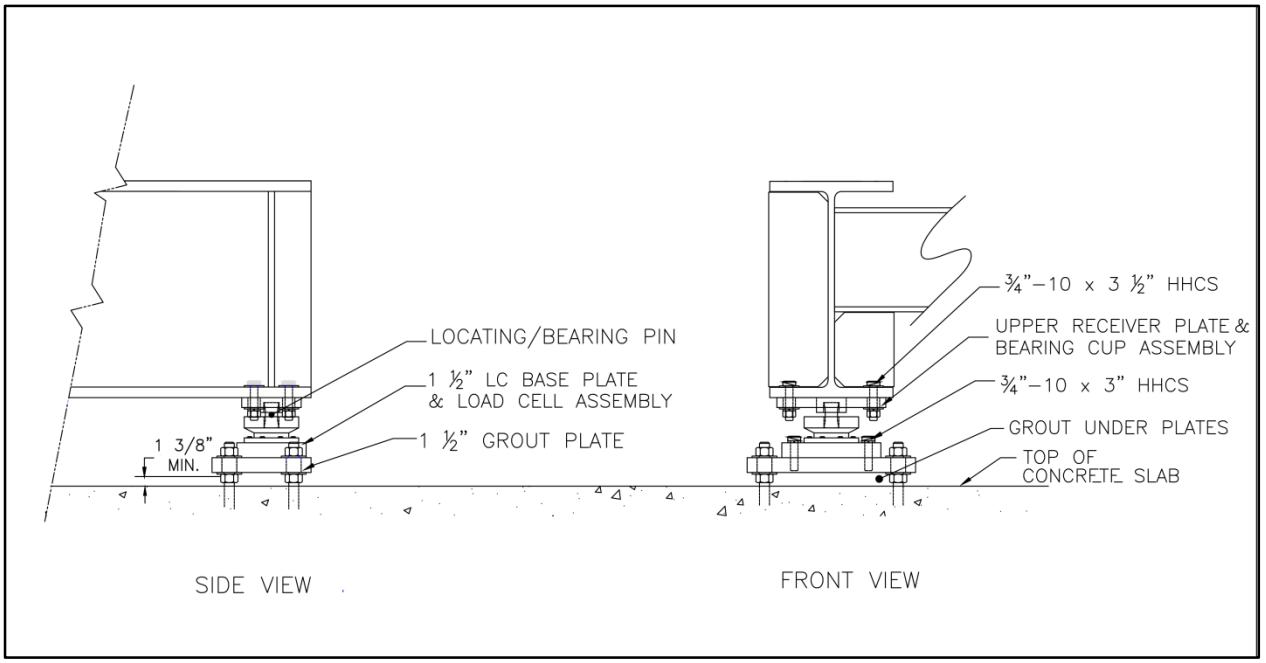


Figure 2-9: 8760 Parts layout instructional diagram

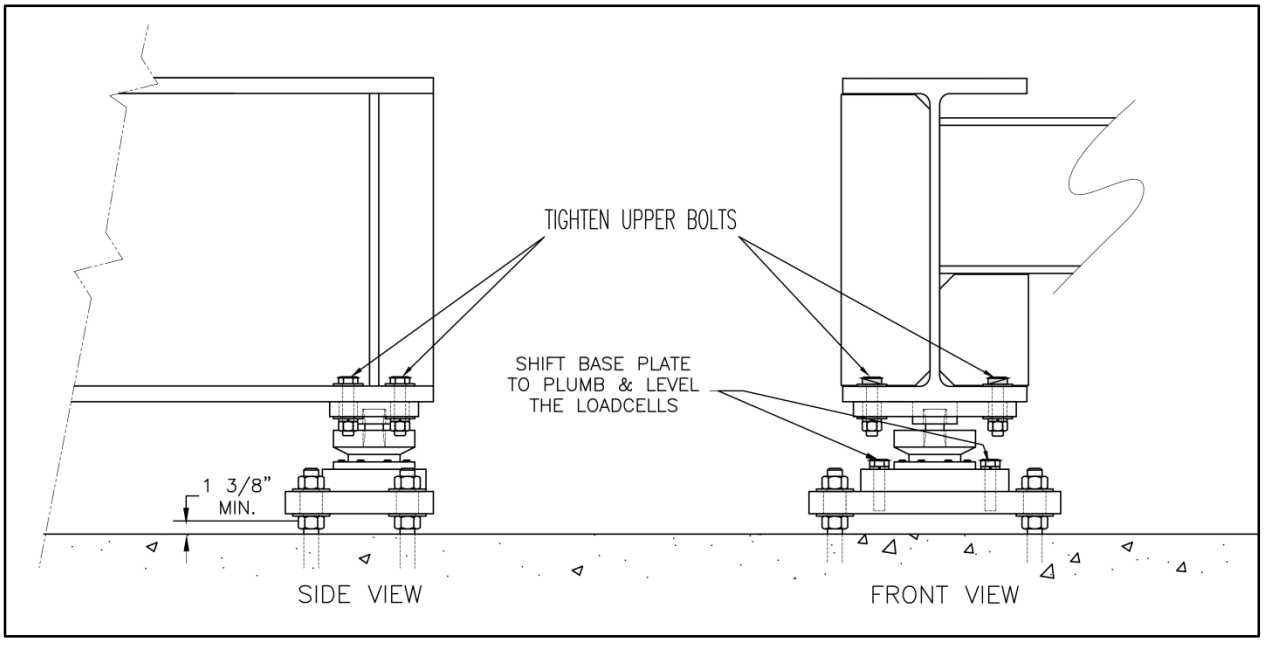


Figure 2-10: 8760 Installation diagram

5. Beginning with an end Section, position a suitable capacity jack to raise and lower the module corner as needed. Install and tighten the upper receiver plate to its final torque value. Grease and install the upper bearing, the lower receiver plate, clamp plates, and bolts, leaving the bolts loose. Install the load cell by inserting the locating pin then slowly lowering the module and guiding the

bottom of the load cell into the top of the load cell. Reset the blocking so the load cell supports the corner, but **do not remove the blocking at this time**.

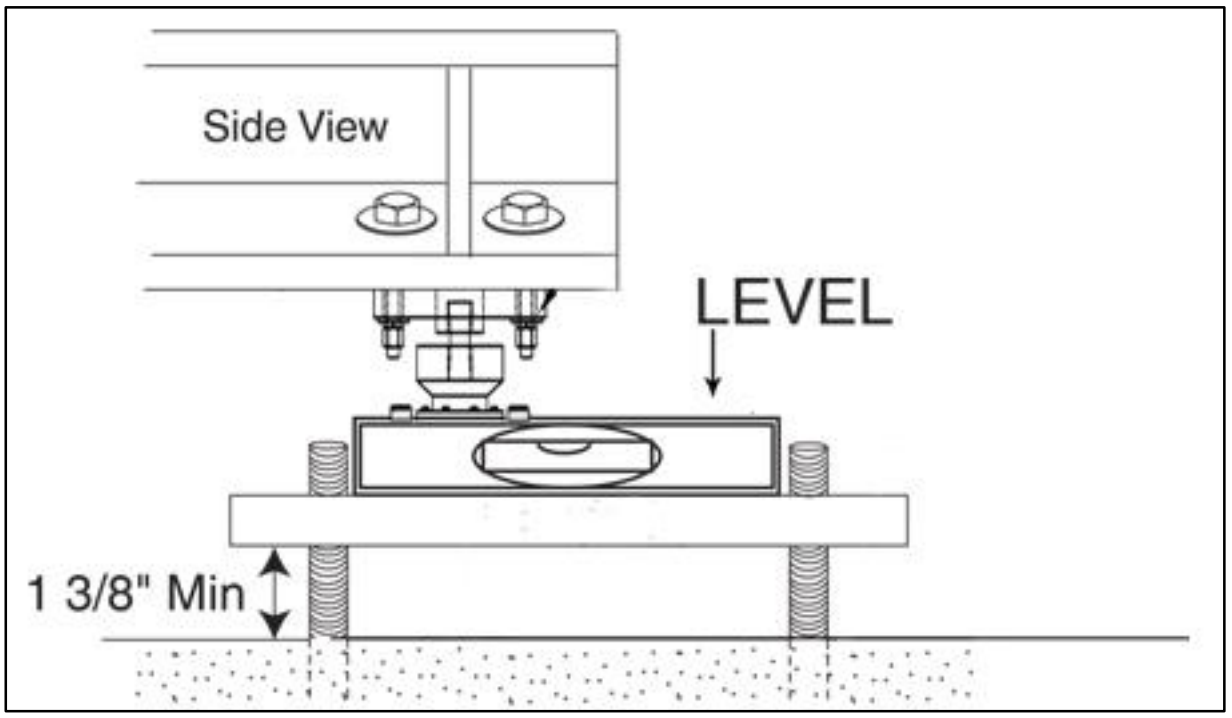


Figure 2-11: Leveling of the baseplate and grout plate

6. Plumb the load cells by lifting the weighbridge up slightly and shifting the load cell base plate on the grout plate. Use a machinist's level to align and ensure a plumb and level condition.
7. When load cell is plumb and level, tighten the lower receiver plate bolts to their final torque value. Repeat for all load cells in the scale.

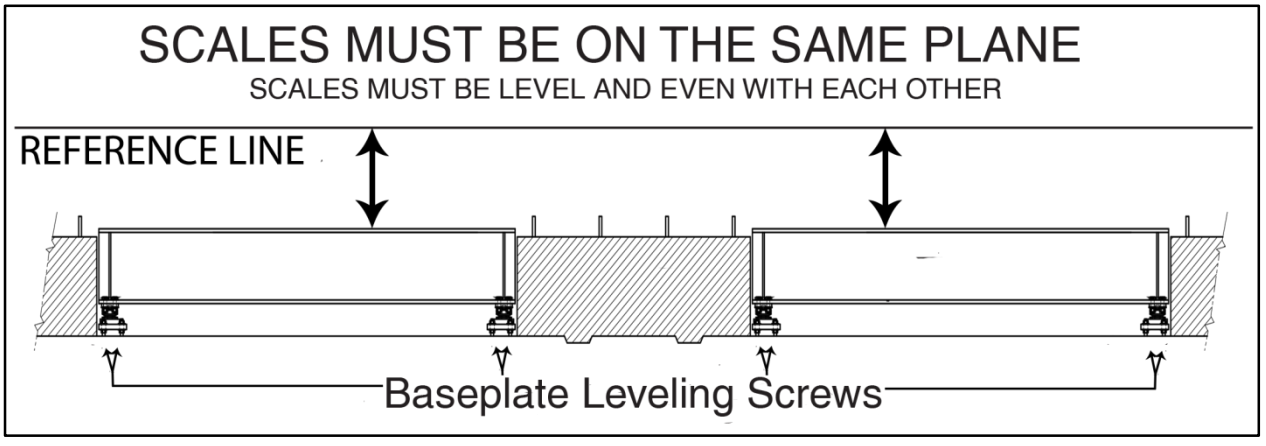


Figure 2-12: Two single module weigh scales showing all platforms must be level

8. When the weighbridge is completely set on plumb load cells, ensure ALL modules are on the same plane. If necessary, loosen the grout plate pier bolts and adjust the three (3) leveling screws in each grout plate. When complete, re-tighten the grout plate anchor bolts tight enough to ensure they do not shift.

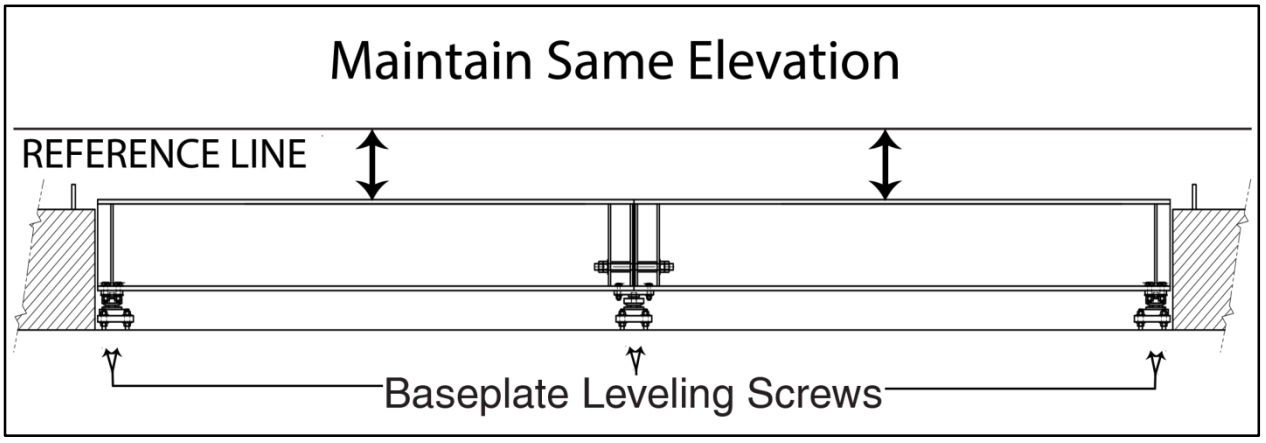


Figure 2-13: Double module weigh scale – level all platforms

9. Double module installations contain a middle section. For the middle sections, the elevation reference is both the absolute level of the main beams with respect to the end sections, and the equal loading of the loadcells that support the middle of the scale. A transit can be used to compare and maintain elevation, and a tightly stretched mason line.
10. View the outputs of each individual load cell. The resulting readings will indicate the current weight distribution of the scale's deadload among the six (6) points of support. The outputs will be greater for numbers 3 and 4 because there is physically more deadload weight upon them.

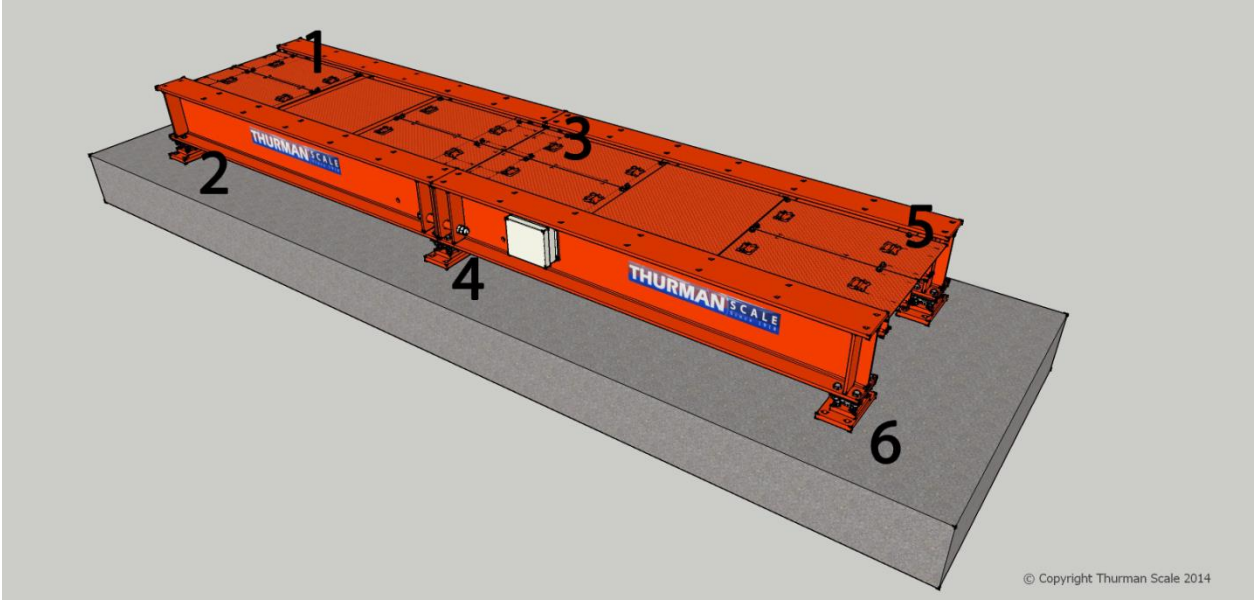


Figure 2-14: Grout plate elevation adjustment diagram

Adjacent load cells should be checked for matching outputs. Adjust the nuts beneath the grout plates (equally) to match loadcells (1 – 2), (5 – 6) and then adjust to match loadcells (3 – 4). When this has been completed, ensure each load- cell grout plate is level to within .015" per foot.

NOTE: The loadcell numbering sequence shown is designed for interfacing Thurman INTA- LOGIX technology instrumentation.

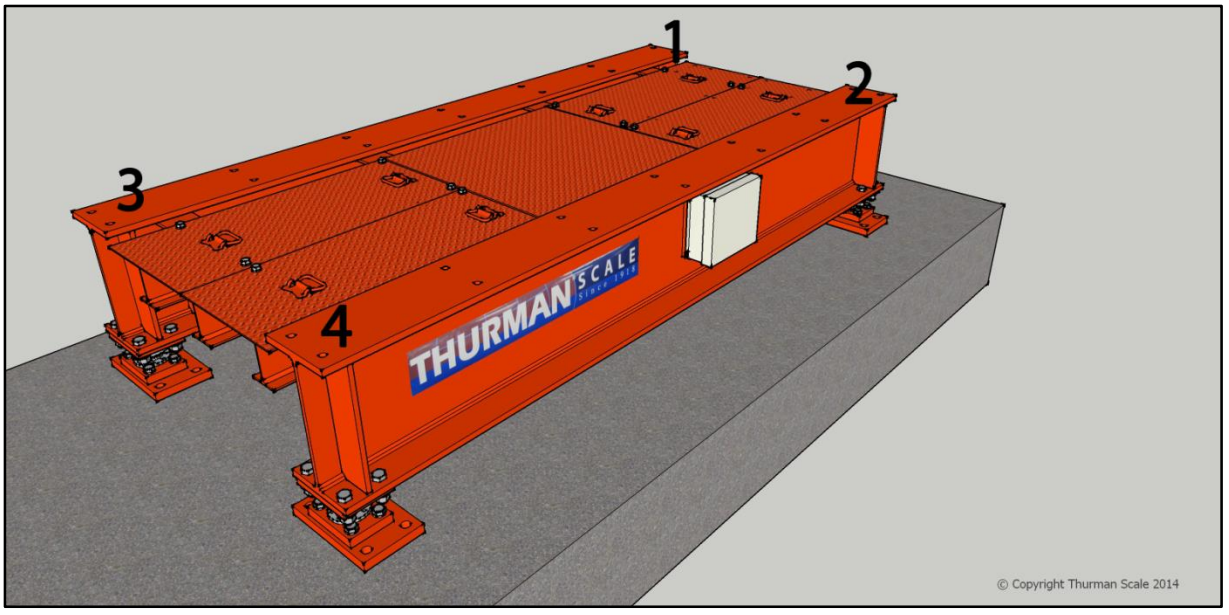


Figure 2-15: Diagram showing load call distribution

Single modules are supported by two sections, or four load cells. A final grout plate elevation adjustment should be made to match the outputs of the load cells to assure correct distribution of the scale's deadload among the four (4) points of support. When this has been completed, ensure each load cell grout plate is level to within .015" per foot.

11. Perform a final check to all:
    - Loadcell grout plates are level to within .015" per foot.
    - All Load cells are vertical and plumb
    - Top flanges of the main beams are absolutely level and on the same plane as the end sections.
    - There is correct distribution of the scale's deadload among the loadcells.
    - All assembly hardware is secure and tight.
    - When complete, recheck to ensure all Grout Plates and Loadcells are plumb and level.

2.12. GROUTING THE GROUT PLATES

Grout becomes the base which supports the entire structure. Grout MUST be fully supporting the grout plates with NO gaps or spaces. A good method is to build the forms slightly bigger than the plate to permit the pouring and the rising of the grout mixture. The pier should be thoroughly saturated with clean water for a minimum of 4 hours. This will both prevent the dry pier concrete from absorbing water from the mix as it is poured, and greatly enhance the ability for the grout mix to bond with the pier.

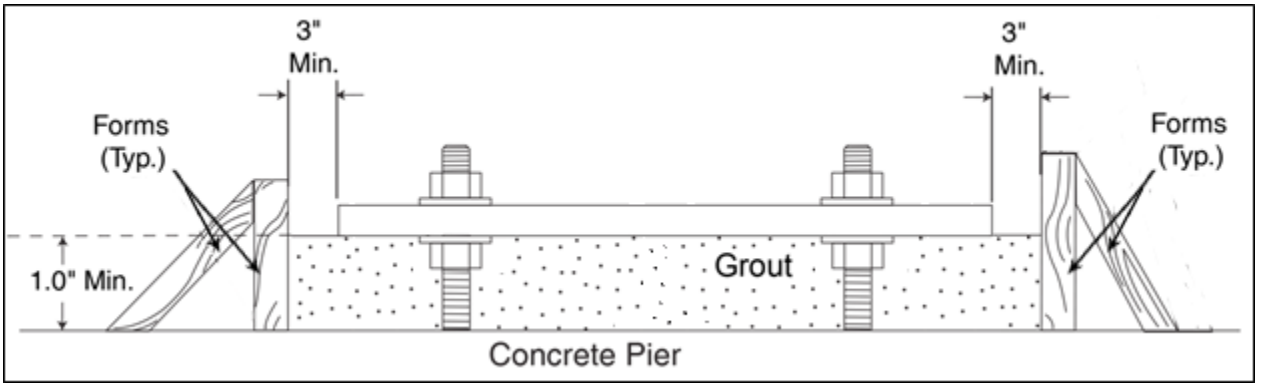


Figure 2-16: Grouting specifications diagram

Grout Selection

- Grout shall be precision, packaged dry, non-metallic, hydraulic, non-shrink, and non-gaseous.
- Grout shall meet or exceed ASTM C-1107 and Corps of Engineers CRD-C621.
- Grout shall be bleed free.
- Grout MUST be mixed to a flowable consistency as specified by the grout manufacturer.
- Do not permit any loads upon the scale until the grout has reached the compressive strength of 2500 psi per the grout manufacturers instruction.

Surface Preparation

- Surfaces to be grouted shall be free of loose debris, grease, oil and other contaminants.
- Contaminants shall be removed using caustic soda or other approved concrete cleaners.
- All surfaces shall be flushed with clean water.
- Prior to pouring, all surfaces should be saturated with clean water for a minimum of 4 hours.

Forming

- Forming must be completed and installed before starting to pour grout.
- Forms shall be slightly larger (three to four inches) than the dimension of the grout plates.
- Forms shall be of sufficient strength, anchored properly, and sealed. Seal with caulk and use a form release agent on forms if required. Leave access for pouring grout in a convenient place.

Mixing and Pouring

- Mix grout per instructions on bag until a very smooth, pourable mix is obtained. Be sure you mix enough quantity for the form you are filling.
- If necessary, use a large funnel or cone to direct mix into form and under stands.
- Pour the grout mix from one end until it fully reaches the other side and rises to fill the form completely. By using this method, there will be no gaps or air pockets. Vibrators are not recommended due to the danger of disturbing the placement of the loadcell base plate(s). Ensure the grout mixture totally fills all voids.

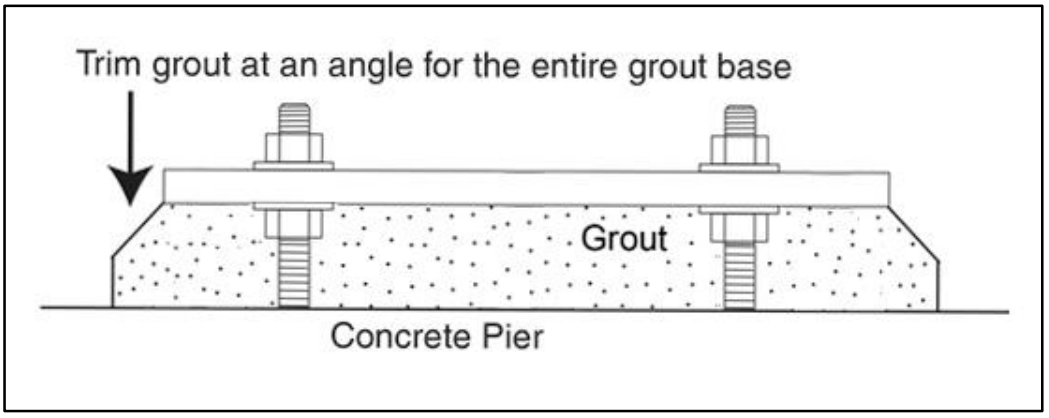


Figure 2-17: Grout finishing illustration

- The A.A.R. requires that if grout extends beyond the base plate it be sloped away from the base plates and stands so that water will not pool and saturate the metal, thereby rusting it. The form may be larger than the base or stand by about 3" on all sides.
- When grout is firm but can still be shaped, remove forms and angle all four sides of pour down and away from the base plate or stand. **DO NOT remove the forms prematurely!**
- Tighten all grout plate nuts and bolts.
- When the grout has cured per the grout manufacturer's instruction, the scale is ready for testing and service!

2.13. GROUNDING

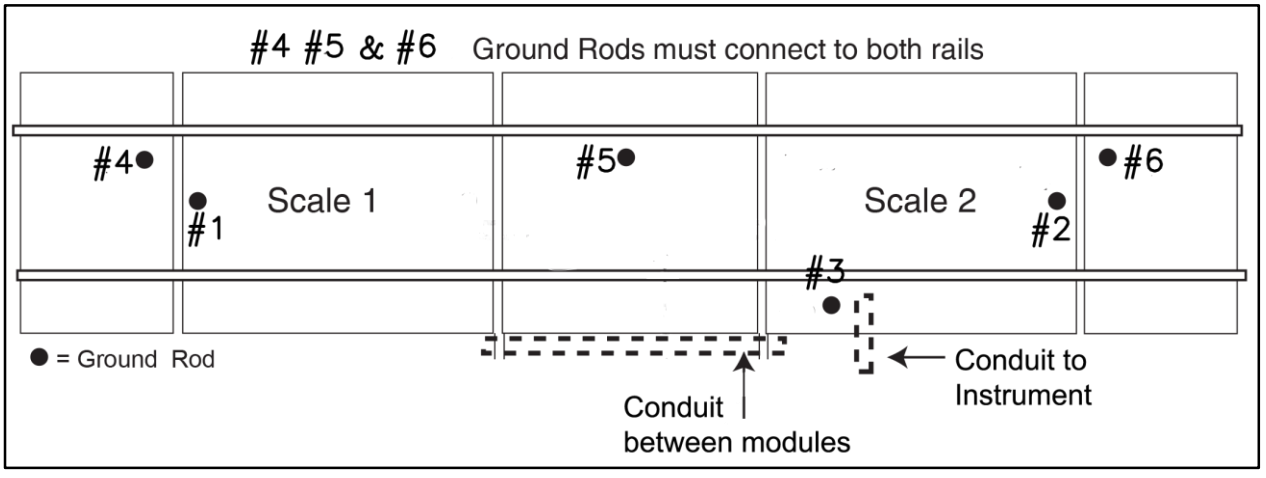


Figure 2-18: Ground Rod Diagram

Instructions for Installing the Ground Rods

1. Clean all ground rod end(s) with abrasive to assure a good electrical connection. Keep all ground straps untwisted, clear of standing water, with a drip loop, and as short as possible. Secure the strap to the ground rods with the provided clamp and coat with grease. Cover the connections to protect from condensation.
2. Ground rod #1 and #2 should be connected to the weighbridge by bolting to the cross beam at the end of each Scale Module. Then, scrape and sand enough paint / coating away to make a good electrical connection, and coat with grease AFTER the connection has been made.
3. Ground rod #3 should be located near the interface conduit. It is used to connect to the isolated ground of the Pit Power Supply (PPS) Ace 2001-1 only.

   Approach ground rods supplied by others should be installed and correctly connected with ground braid to the Anti-creep assemblies. See **Figure 2-19** and **Figure 2-20** for further details.

2.14. RAILS & ANTI-CREEP DEVICES

The scale is designed to accept a **115 lb. rail** with **Foster #62 rail clip**. The approach rails and Scale Weigh Rail should be the same weight. The approach anchor bolts, rail plates, approach rail clips and approach anti-creep devices are optional. They can be supplied by Thurman Scale when ordered as accessories, otherwise they are not supplied.

Positive means must be provided to prevent the creeping of the approach rails and to maintain a clearance which shall be not less than 1/8 inches or more than 5/8 inches between the approach rails and the weigh rails. The AAR Scale Specifications state that the rail on the approach and the weighbridge shall be properly anchored to prevent creeping of the rails. This is done in order to maintain the proper gap between the approach rail and the weighrail.

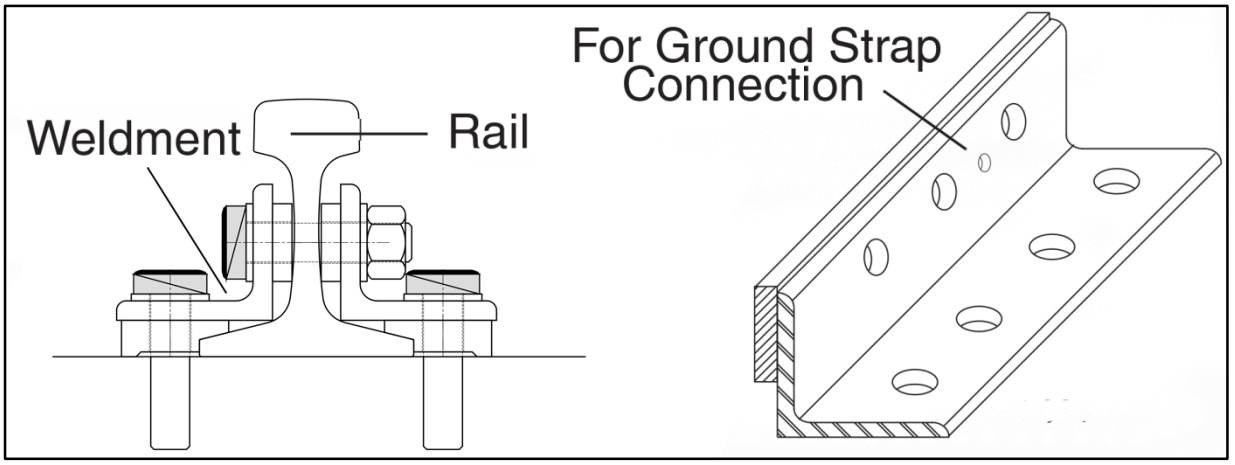


Figure 2-19: 8760 Rail and anti-creep devices diagram

Anti-creep devices are constructed of angle iron with a flat iron weldment to fit to the rail as shown above. The rail is side drilled through its web and bolted to the anti-creep device, effectively securing it from any movement.

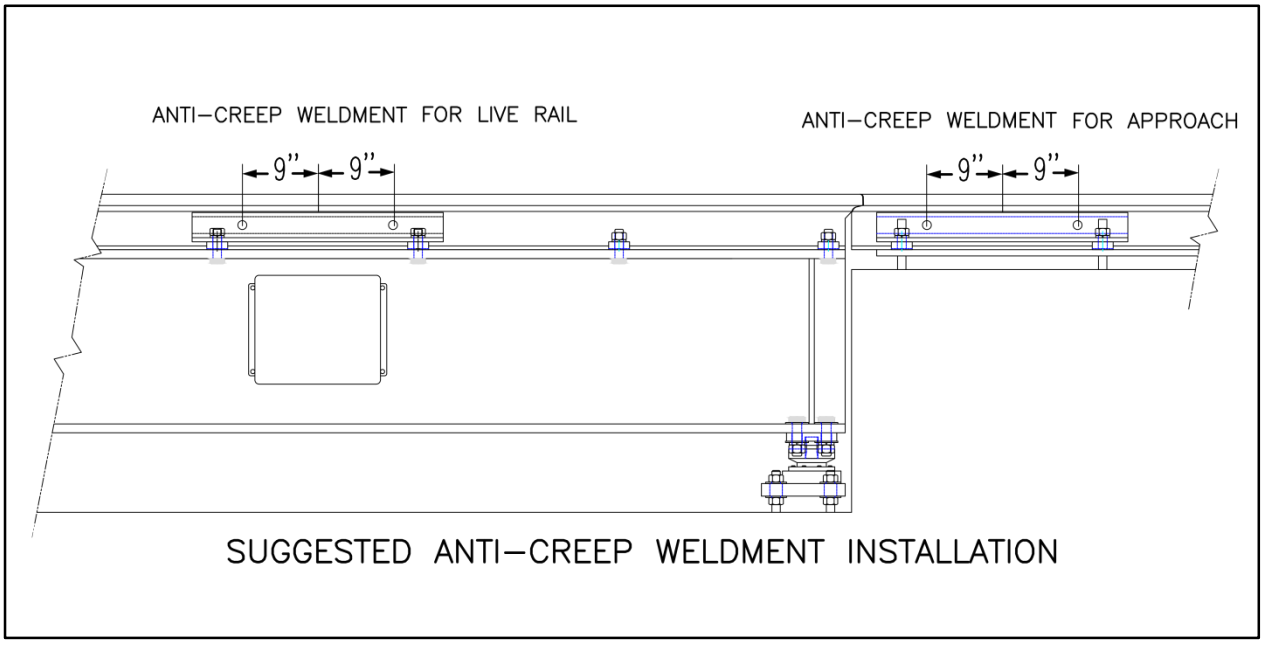


Figure 2-20: Suggested anti-creep weldment installation

Rails should be miter cut at the ends of the weighrails and approach rails to assure a smooth transfer of wheels in order to reduce impact loading to the scale.

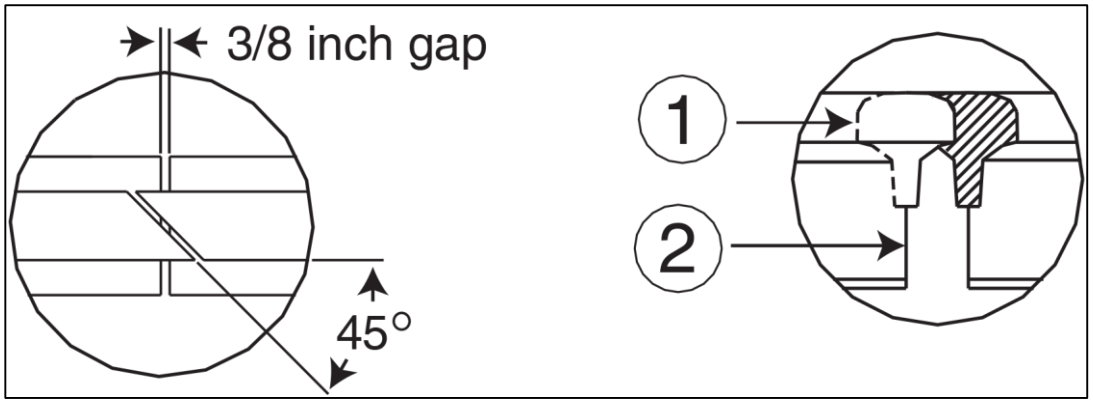


Figure 2-21: Top and side view of miter cut rail

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Section 3: Wiring for Analog System Indicators

3.1. WIRING STEPS

WIRE LOAD CELLS INTO THE JUNCTION BOXES.

✓ ***Important steps!***

1. Mount the Junction Boxes to the outside of the panels OR to the optional floor mount bracket.
2. Open the Junction Box lid.

— *Keep out all dirt, dust, moisture or other debris from the Junction Box as damage to the Summing Board may occur.*

3. Route the Load Cell Cables into the Junction Box cavity.

a. Identify Load Cell Numbers
b. Wire to the proper terminals using the following chart:

Load Cell Wire Color	Function
Red	(-) Signal
White	(+) Signal
Black	(-) Excitation
Green	(+) Excitation
Bare/Orange/Yellow	Shield

Load Cell-to-Junction Box Wiring Table

WIRE THE "J" BOXES TO EACH OTHER

✓ ***Important steps!***

4. If there is more than one platform, route the **Module Interconnect Cable** into the Junction Box mounting areas of the other platform.
5. Pass the cable through the Sealing Hub, located at the end of the Junction Box, directly over the Terminal Strip marked "**Indicator**" (**TB2**) or "**Expansion**" (**TB1**).
6. Connect the cable to the terminals of the strip marked "**Indicator**" (**TB2**) or "**Expansion**" (**TB1**).

✓ The wires ***must be*** connected so that the terminals match between the summing boards of the different platforms.

Weighbridge Module Interconnecting Cable Wiring Table

Wire Color (Cable #17204)	**Function**
Red	(-) Signal
White	(+) Signal
Brown	(-) Sense
Blue	(+) Sense
Green	(+) Excitation
Black	(-) Excitation

7. Tighten the cable glands until the O-ring Clamps further around the wire.

— If not tightened properly, moisture damage may occur.

8. Route the Indicator Interconnect Cable through the Sealing Hub on the Junction Box, located near the **Ground Rod**.

Wiring THE "J" BOX TO THE INDICATOR

✓ ***Important steps!***

9. Attach the indicator cable to the terminal strip marked "**Indicator**"

— Match functions of the Digital Indicator to those marked on the Summing Board.

— Using instruments with sense lines is strongly recommended for vehicle scale applications.

Wiring Steps, Continued

Junction Box-to-Analog Indicator Wiring Table

(*Thurman Model TS-3200, as an example*).

Junction Box terminal Strip Marked 'Indicators'	Terminal Number (TB1)	Wire Color
(-) Excitation	1	Black
(+) Excitation	2	Green
(+) Sense	3	Blue
(-) Sense	4	Brown
No connection	5	-
Shield	6	-
(+) Signal	7	White
(-) Signal	8	Red

Note: *Thurman Scale Model TS-3200 Indicator designations are shown as **Terminal Locations** on the Load Cell Connector, TB-1, located on the PCB.*

Grounding for Analog Indicator

Proper grounding is important in any electronic system.

- Using a quality ohm meter, verify that a good connection exists between all of the following points:
- Each Load Cell Case to the Weighbridge.
- Each Load Cell Shield to the Junction Box Board Shield.
- Junction Box Board Shield to the Weighbridge.
- Module Interconnecting Cable Shield to each Junction Box Board Shield.
- Indicator Connecting Cable Shield to the Junction Box Board Shield.
- Indicator Connecting Cable Shield to the Indicator Case ground.
- Weighbridge to a single properly placed Ground Rod.

Wiring Steps, Continued

Data Recording

- Record scale serial number from the tag.
- Record instrument, junction box and load cell serial numbers.
- Keep a copy of the sheet in the customer file.

Moisture Protection

Full Electronic Scales have been designed to provide protection from the effects of moisture.

- The load cells are calibrated with the cable attached.
- The cable *MUST NOT* be cut.
- The cable is connected directly to the Junction Box through a sealed bushing which ***MUST BE TIGHTENED WITH PLIERS*** to keep moisture out of the box.
- All cabling should have a **Drip Loop** at the cell or box entry location to help prevent water entry.
- On **all** boxes, the black plastic fittings have O-rings that can be forced out of position if the bushing itself is not tight.
    - To prevent this, first tighten the inner nut securing the bushing in the hole.
    - Then insert the cable and carefully tighten gland with pliers until it is very snug.
    - ***DO NOT over-tighten*** where bushing 'turns'.
    - All box covers ***MUST BE SECURED*** with ***ALL*** screws tightened properly (**18 to 20 lbs/in**) for protection against moisture

.

Section 4: Wiring for Intalogix™ Systems

4.1. INTRODUCTION

Intalogix™ systems use Smart Sectional Controllers (SSCs) and Pit Power Supplies (PPSs) for load cell excitation and signal processing. All PCBs are mounted and pre-wired to each other inside one or two junction boxes.

4.2. DESCRIPTION

- One (1) SSC per section.
- One (1) PPS per scale unless the number and resistance of the cells require a second Pit Power Supply.
- All cell/section/scale adjustments are made via the Intalogix™ Technology instrument.

4.3. INSTALLATION

- Boxes

  The box has tabs for bolting to mounting bars located on one side of each module OR to the floor mounted remote bracket.

  - On junction boxes, attach the Ground Wire Lug-to-one of the Mounting Bolt Studs.
  - Secure the isolated Ground Wire to the separate Ground Rod, as noted on the *Certified Print*.
  - Tighten all connections securely to provide a good electrical ground.

- SSCs

1. Wire the load cells to the SSCs.
2. Connect the interconnect cabling between junction boxes if applicable.
3. Set the address switches in the SSCs.

4.4. LOAD CELL WIRING

Intalogix™ installations use a different numbering system for load cells because of the digital addressing of the SSCs.

Cell Numbering

- With respect to the following starting position, face the platform from where the indicator is located.
- The cell at the upper left (far side) of the platform is **Cell One (1)**.
- The cell positions along the **far side are odd cell numbers**,
- The near side locations are even cell numbers.

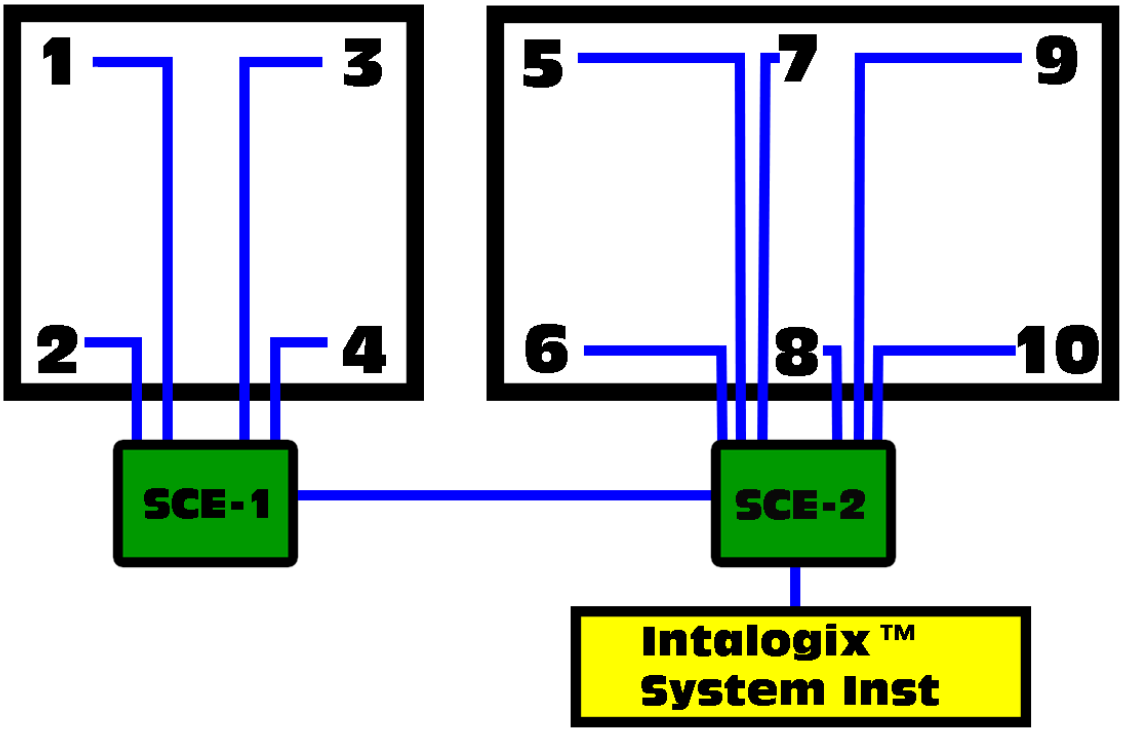


Figure 4-1: Example of five (5) section cell numbering using SSCs.

Note: *SSCs have connections for two (2) Load Cells, labeled* **TB1** *and* **TB2**.

- *The odd numbered cell goes to* **TB1**.
- *The even numbered cell goes to* **TB2**.

4.5. LOAD CELL WIRING, CONTINUED

Installation Information

- The cable used in *all* wiring (other than load cells) must be a **minimum of 18 AWG** (**Cable 17245**).
- Wire the Load Cells into each sections' SSC.

1. Wire the load cells into the SSC boxes.

Load Cell Connections at the junction box

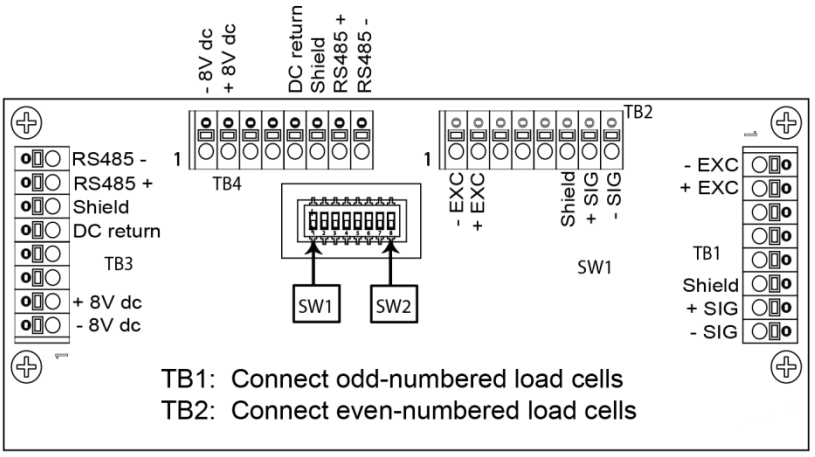
TB1 or TB2 in SSC PCB	Terminal Description	DE Shear Beam L/C Wire Color
1	(-) Excitation	Black
2	(+) Excitation	Green
6	Shield	Yellow (bare)
7	(+) Signal	White
8	(-) Signal	Red

2. Wire the junction boxes to each other.

Interconnect Connections

TB3 or TB4 in SSC	Function	17245 Cable
1	(-) 8.0 volts	Black
2	(+) 8.0 volts	Green
5	DC Return	Blue
6	Shield	Shield
7	RS-485 (+)	White
8	RS-485 (-)	Red

NOTE: *On the* **17245 Cable** *daisy chain connections, the* **Orange** *wire* is not used.



Smart Sectional Controller Wiring - PCB 26080

Section Number	Switch Settings				
	4	5	6	7	8
1	**ON**	OFF	OFF	OFF	OFF
2	OFF	**ON**	OFF	OFF	OFF
3	**ON**	**ON**	OFF	OFF	OFF
4	OFF	OFF	**ON**	OFF	OFF
5	**ON**	OFF	**ON**	OFF	OFF
6	OFF	**ON**	**ON**	OFF	OFF
7	**ON**	**ON**	**ON**	OFF	OFF
8	OFF	OFF	OFF	**ON**	OFF
9	**ON**	OFF	OFF	**ON**	OFF
10	OFF	**ON**	OFF	**ON**	OFF
11	**ON**	**ON**	OFF	**ON**	OFF
12	OFF	OFF	**ON**	**ON**	OFF
13	**ON**	OFF	**ON**	**ON**	OFF
14	OFF	**ON**	**ON**	**ON**	OFF
15	**ON**	**ON**	**ON**	**ON**	OFF
16	OFF	OFF	OFF	OFF	**ON**

3. Set the Switches

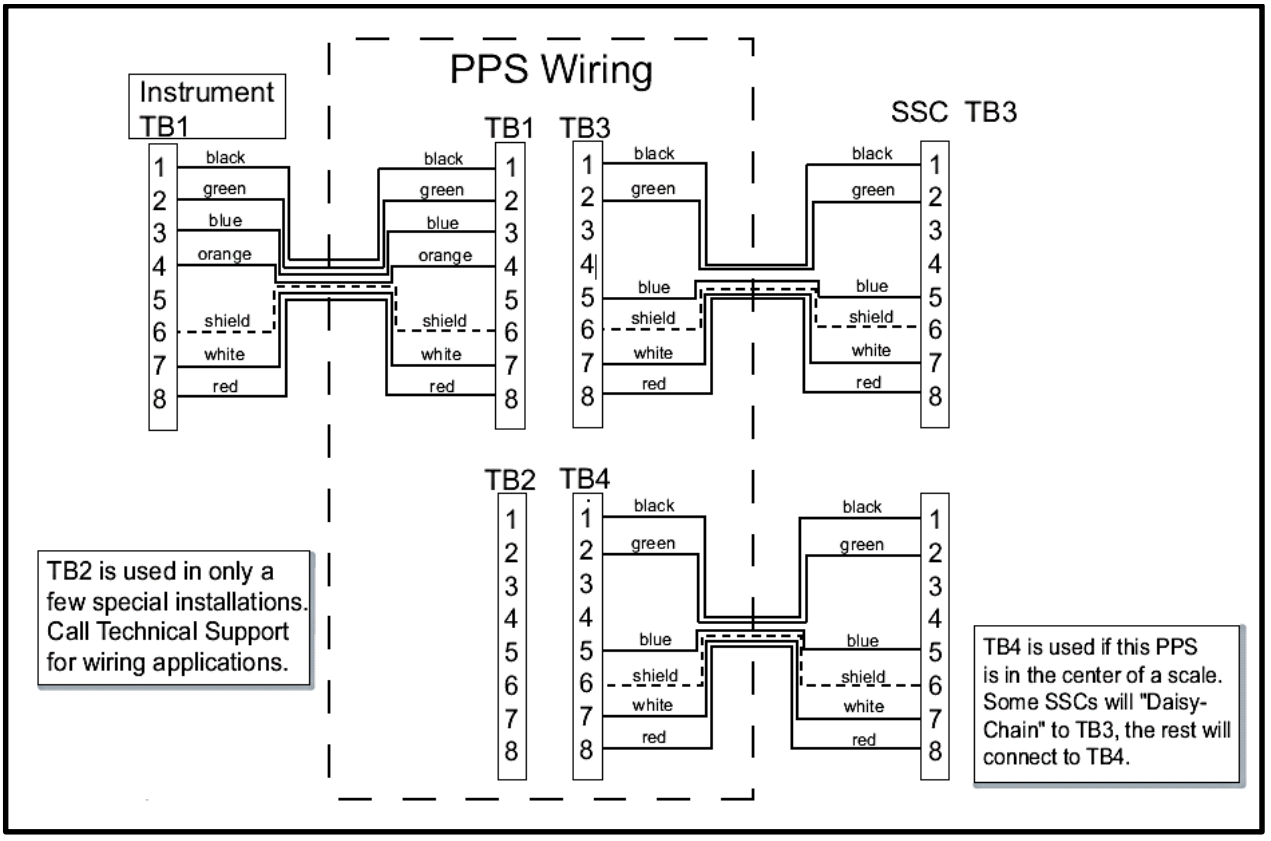
Dip (Address) Switch Setup, SSCs

- In each of the smart SSC boards there is an 8 position dip switch labeled **S1**.
- This switch is used to identify the section in a binary code.
- The switches must be set properly for the scale to operate.

Note: ***Switches 1, 2, 3, and 4*** *are* **always OFF**.
Switch 1 position ***5*** ***ON****= 700/1000 ohm load cells*
OFF *= 350 ohm load cells*

- Switches 6 thru 10 are used to set the section (section address) numbers.
- Set the section number according to the following chart.
- Continue in this manner until each SSC board has a unique section number entered on the dip switches.

4.6. POWER SUPPLY



Wire the PPS to the Instrument.

- Run the 'Home-Run' cable from the PPS, TB1 to the Instrument's TB1, wire as follows:

TB1 PPS	TB1 Inst	17245 Cable	Description
1	1	Black	28 volts, AC
2	2	Green	AC Return
3	3	Blue	20 Volts, DC
4	4	Orange	Enable
6	6	Shield	Shield/DC Return
7	7	White	Transmit
8	8	Red	Receive

Note: *Shields are used for DC Return and MUST be connected.*

4.7. DATA RECORDING

- Record the scale serial numbers from the tag.
- Record the instrument, SSC, PPS, and load cell serial numbers.
- Keep a copy of the sheet in the customer file.
- Use Appendix II for additional information.

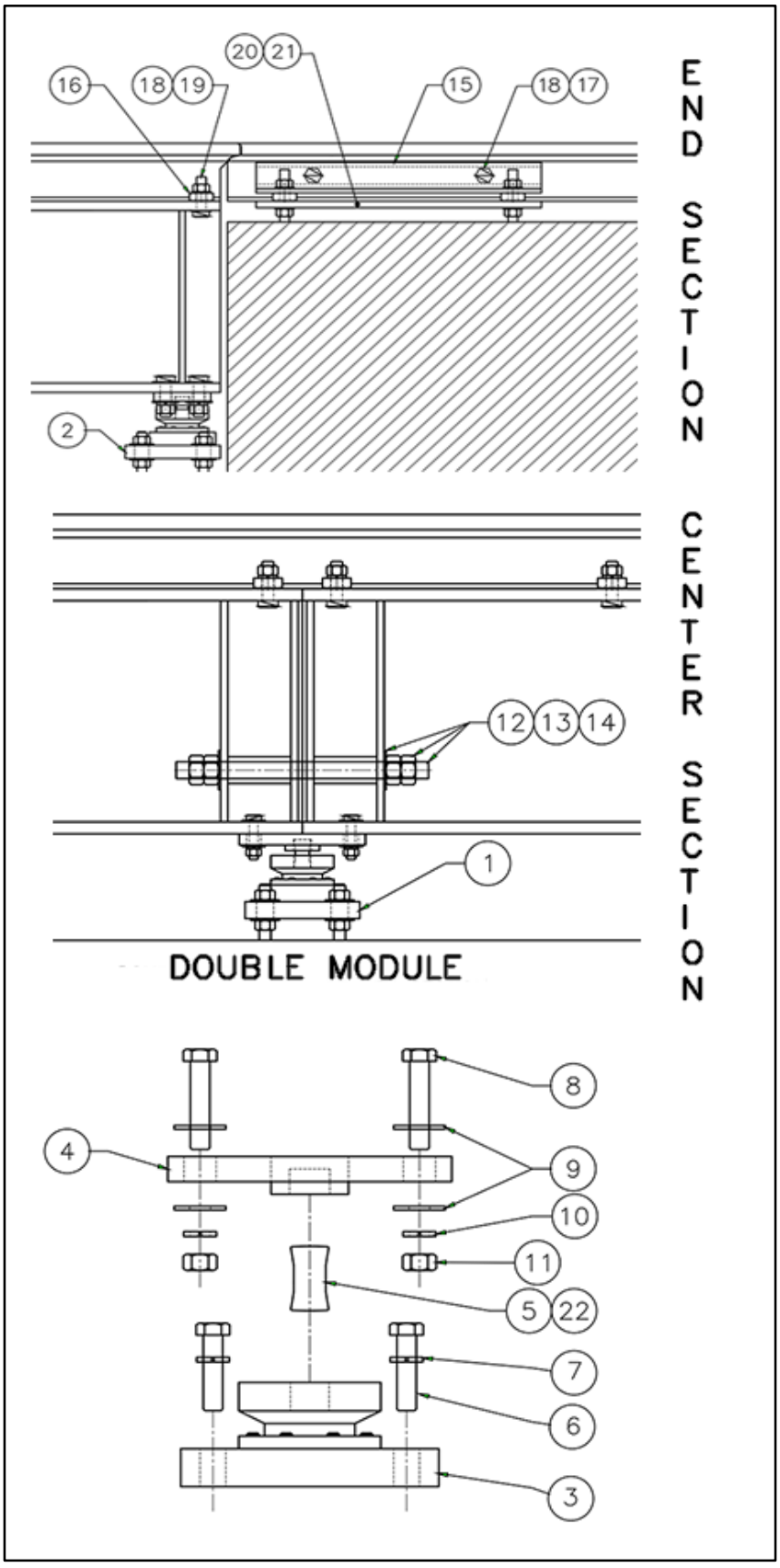
Full Electronic Scales are designed to provide protection from moisture.

- The load cells are calibrated with the cable attached, and therefore ***the cable* should *NOT* be cut.**
- The cable is connected directly to the SSC through a gland fitting which ***MUST* be tightened** with pliers to keep water/moisture out of the box.
- All cabling should have a drip loop at the cell or box entry location to help prevent water entry.
- On all boxes, the gland fittings have O-rings that can be forced out of position if the bushing itself is not tight.
    - To prevent this, first tighten the inner nut securing the bushing in the hole, then insert cable and carefully tighten gland with pliers until it is very snug.
    - Do not over-tighten where bushing 'turns.

Section 5: Maintenance

Inspect the Scale and its understructure on a regular basis to ensure:

- The approach rails and Scale rails remain securely in position and are properly fastened in place.
- The space between the deck edge, pit coping, and rails is clear and free of material which could jam the deck and cause inaccurate weights.
- The Scale Foundation and understructure is clean and dry. Keep the foundation and the understructure of the Scale as clean and as dry as possible. Any moisture problems should be addressed immediately to prevent steel deterioration. Structural steel should be wire brushed and painted as soon as rust appears.
- All Loadcells and grout plates are clean and free of debris. All bolts are tight. Loadcell is plumb, square, and level.
- Drains for the foundation are clear and unblocked. Any installed automatic sump pump and discharge piping shall be in good working condition.
- All junction box wire gland nuts are securely tightened, and that nylon plugs are in place in any unused gland fittings.
- Junction box cover screws are properly tightened with a torque wrench to their correct torque specification.
- All excess cable is neatly coiled and tied up out of any possible accumulations of standing water.
- All cable entry and exiting points are finished with a drip loop.
- All ground rod connections are clean, tight, and greased to protect against corrosion.


END SECTION
CENTER SECTION
DOUBLE MODULE
16
18
19
20
21
15
18
17
2
12
13
14
1
8
4
9
10
11
5
22
7
6
3

Item	Part No.	Description
1	159106	GROUT PLATE, INTERIOR
2	159105	GROUT PLATE, END
3	65165	LOADCELL & BASE PLATE ASSEMBLY (74972-LC & 66981-BASE PLATE)
4	159108	UPPER RECEIVER PLATE
5	66543	BEARING PIN
6	74692	¾” – 10 X 3” SS HEX HEAD BOLT
7	54777	¾” SS LOCK WASHER
8	54555	¾” – 10 X 3 ½ HEX HEAD BOLT
9	54233	¾” – FLAT WASHER
10	54776	¾” – LOCK WASHER
11	54264	¾” – 10 HEX NUT
12	159116	THREADED ROD, 1 ½” – 6 X 22”
13	54272	1 ½” FLAT WASHER
14	54342	1 ½” – 6 HEX NUT
15	159104	ANTI-CREEP WELDMENT
16	54294	RAIL CLIP, FOSTER #62
17	54435	1” X4 ¼” HEX HEAD BOLT, A325, W/NUT
18	54898	1” A325 FLAT WASHER
19	54417	1” X 4” HEX HEAD BOLT, A325, W/NUT
20	66587	115# RAIL PLATE, 6-HOLE
21	66544	115# RAIL PLATE, 4-HOLE
22	64573	LOCATING PIN

Appendix I: Recommended Tools & Equipment

Local RailRoad Approval
Certified Prints
Service manuals for ALL equipment being installed.
Lifting Device capable of safely lifting 5000 lbs or more
Laser or Contractor's level (Transit)
Hand Tools
Mason Line
25 Foot tape measure
100 Foot tape measure
Precision Level (Starrette Model 98 Mechanics Level, 6 inch long model) Torque wrench of suitable capacity
Thread file; Standard thread sizes of 10, 8, 7, 6. Electric drill / with bits / variable / ½" Chuck size Wood hand saw
Claw hammer
5 Gallon buckets with handles
Large and small trowels
¾" Socket set
36" Crow bar
24" Crow bar
Long handled sledge hammer
2 Foot level, general purpose
20 Ton Capacity Port a Power Style Jack. Ram no higher than 6". Wire brushes
5 pounds of grease NLGI #2, Water resistant, Anti-wear Grease such as CRC Super White.
Anti-Seize
Caulk gun w/caulking

Appendix II: Required at the Jobsite:

- 117 VAC Electric Power (Extension cords as needed)
- Water
- Suitable crane(s)
- Rigging (I.E. Straps, 4 leg drops, etc.)

NOTE: The weight capacity of all lifting and rigging equipment must be suitable for their intended use.

Appendix III: Materials:

Grout shall be precision, packaged dry, non-metallic, hydraulic, non-shrink, and non-gaseous. Grout shall meet or exceed ASTM C-1107 and Corps of Engineers CRD-C621.

Grout shall be bleed free and attain a minimum of 8000 psi compressive strength in 28 days at flowable consistency.

a) Grout MUST be mixed to a flowable consistency as specified by the grout manufacturer.

Quantity required will vary according to pier heights. Projected amount is 3 bags per load-cell base plate, and 2 bags per checking stand at 401b per bag.

NOTE: Pier heights other that those indicated on the certified prints will affect the quantity required.

Wood for forming base plates and checking stands. Select unfinished pine, 1 ½ to 2" wide.x 12' long. Project quantity is one stick per base plate, and one stick per check stand. Drywall screws suitable for constructing and securing wood forms.

Wood blocking and cribbing material, suitable for supporting the weighbridge. Sufficient quantity to provide a safe, stable support from the pit floor to the bottom of the main I-beams. Shipping weights for these scales range from 36,500 lbs to 50,000 lbs.

Materials and equipment for mixing the grout and water to a suitable consistency, and delivering it to each grout plate.

Grease: NLGI #2, Water resistant, Anti-wear Grease such as CRC Super White.

Appendix IV: Torgue Values Chart

All Values are Foot Pounds (FT - LB).

SIZE	GRADE 2 LUBED	GRADE 2 DRY	GRADE 5 LUBED	GRADE5 DRY	GRADE 8 LUBED	GRADE 8 DRY
1/4-20	49 in	65 in	75 in	100 in	107 in	143 in
5/16-18	101 in	134 in	157 in	210 in	220in	305 in
3/8-16	15 FT	20 FT	23 FT	31 FT	2.5 FT	44 FT
7/16-14	24 FT	30 FT	37 FT	50 FT	53 FT	70 FT
1/2-13	36.5 FT	49 FT	57 FT	75 FT	80 FT	107 FT
9/16-12	53 FT	70 FT	82 FT	109 FT	115 FT	154 FT
5/8-11	73 FT	97 FT	113 FT	151 FT	159 FT	211 FT
3/4-10	129 FT	173 FT	200 FT	266 FT	282 FT	376 FT
7/8-9	125 FT	166 FT	321 FT	430 FT	454 FT	606 FT
1-8	187.5 FT	250 FT	482.5 FT	640 FT	680 FT	900 FT

Appendix V: Loadcell Specifications:

Type:	JRT – 100k - 75599
COC:	91-036 Class Ill L, Single: 10,000 d
Safe Load Limit:	150% of Rated Capacity
Capacity:	100,000 LB.
Height:	1.5” Effective (2.63” Overall)
Input Resistance:	750 ohms
Output Resistance:	750 ohms
Insulation Resistance:	Ohms (5000 meg ohms)
Rated Output:	2 mV/V
Cable Length	75 feet
Min. Verification Interval (Vmin)	100k lbs. – 6.0 lbs.

Loadcell Wiring	
Excitation (+)	Green
Excitation (–)	Black
Signal (+)	White
Signal (–)	Red
Shield	Yellow

Appendix VI: Concrete & Slump Testing:

Concrete is produced from the mixing of sand (fine aggregate), stone (coarse - aggregate), cement and water. The water combines with the cement to form a fluid paste often referred to as "plastic". The paste is combined with the sand and stone to make a workable "plastic" concrete that can be poured, shaped, smoothed, and molded. The plastic concrete then hardens around the sand and stone forming a solid mass. Concrete in its plastic state can be formed into structures such as pavements, walls, or footings. When the plastic concrete hardens, the structures formed can then support the anticipated loads.

The reaction of water with cement is called hydration. The water to cement ratio is an important factor in the ultimate strength of the concrete and its subsequent load carrying ability. The lower this ratio is, the tighter the microscopic crystals of concrete, and the stronger the concrete will be. Fewer shrinkage cracks from excess water will also result from this low ratio.

For a given amount of cement, a smaller quantity of water will produce a higher strength concrete. Too small a quantity of water, however, will not allow for adequate mixing of the sand and stone, and will also make the concrete difficult to "work" and to form. This also will produce a lower strength concrete.

The amount of water in a particular concrete mixture is thus carefully selected to balance the desired strength of the concrete. Whether a "soupy" mix, or "firm" mix, the ability of the concrete to be shaped, worked, and placed is called fluidity. The slump test is a quality control measure of the fluidity of the concrete mixture.

The procedure for the slump test is covered in ASTM (American Society for Testing & Materials) Document C-143 from a sample of concrete obtained per ASTM C-172. The slump is measured in inches. The measured slump is then compared to the desired specifications.

The equipment for the slump test is usually a metal cone, a metal base plate and a metal rod. The "cone" is 12 inches in height, 4 inches in diameter at the top, and 8 inches in diameter at the bottom. The slump test must be performed within 2 1/2 minutes after obtaining the sample.

1. The cone, base plate, and rod are moistened with water.
2. The cone is placed on the base plate with the 8" opening at the bottom.
3. The cone is filled in three (3) equal layers.

4. Each layer is rodded 25 times to settle the concrete, before the next layer is added.
5. The cone is then pulled straight up and off of the sample. The cone must come off within 3-7 seconds for an accurate test, per ASTM standards.
6. When the cone is removed, the concrete mixture "slumps" down. It is then measured to determine how far down it has slumped, and compared to specification.

The slump test is a direct measure of the amount of water in the mixture, unless ADMIXTURES are added. Admixtures are liquid chemicals added to concrete to make it easier to place without the reduction in strength adding water would cause. Admixtures of this type are known as "plasticizers" or "water reducers", and adding them to the mixture will either make the concrete mix more "plastic" with the same amount of water, or allow the concrete to have the same "plasticity" with a smaller amount of water (increasing strength). Testing and ensuring the slump specification for concrete is correct will enable the concrete mixture to have the strength and pliability the designer requires it to have.

Appendix VII: About the AAR:

The Association of American Railroads (AAR) is one of the nation's oldest and most respected trade associations and represents the major freight railroads in the United States, Canada and Mexico. Amtrak and some commuter railroads also are members of the AAR. In addition, the AAR has two categories of associate members, one for smaller railroads and a second for railway suppliers and others with an interest in railroads. The AAR serves as the joint repre-sentative of its individual members in matters requiring cooperative handling to better enable railroads to be an efficient, safe, inter-linked system. It is governed by a board of directors that includes the CEO of each Class I railroad in the United States. Amtrak, smaller railroads, Mexican railroads and the Railway Association of Canada are also represented on the AAR Board. One CEO serves as AAR Chairman for a one-year term which rotates among the Class I railroads.

About AREMA

The American Railway Engineering and Maintenance-of-Way Association (AREMA) was formed on October 1, 1997, as the result of a merger of three engineering support associations, namely the American Railway Bridge and Building Association, the American Railway Engineering Association and the Roadmasters and Maintenance of Way Association, along with functions of the Communications and Signal Division of the Association of American Railroads. The rich history of the

predecessor organizations, each having over 100 years of service to the rail industry, is the legacy of AREMA.

About the American Railway Engineering Association

At the suggestion of Railway Age magazine, a meeting was held in Chicago on October 21, 1898, to organize a forum for the development and study of recommended practices for the newly-integrated standard-gauge North American railway network. This led to a meeting in1899 in Buffalo, New York, to adopt a constitution and establish a permanent organization named the American Railway Engineering Association (AREA). From its inception, the AREA dealt with the many engineering challenges through standing technical committees. Five of those committees; ties, rail, track, buildings and yards & terminals continued intact continuously from 1899 until the merger and still continue under AREMA functional groups. In 1905, AREA issued its first Manual of Recommended Practices. Its name was changed to the Manual of Railway Engineering in 1970 and is updated annually by the technical committees. The manual, which is now also available on CD-ROM, will continue under AREMA.

Appendix VIII: 8760 Series J-Box Bracket Accessory

This accessory provides a means to mount the smart sectional controllers, pit power supplies, and analog junction boxes away from the scale frame. Each bracket can accommodate a maximum of two boxes. The illustration below shows a typical installation of these brackets.

The part number of the bracket is 106314

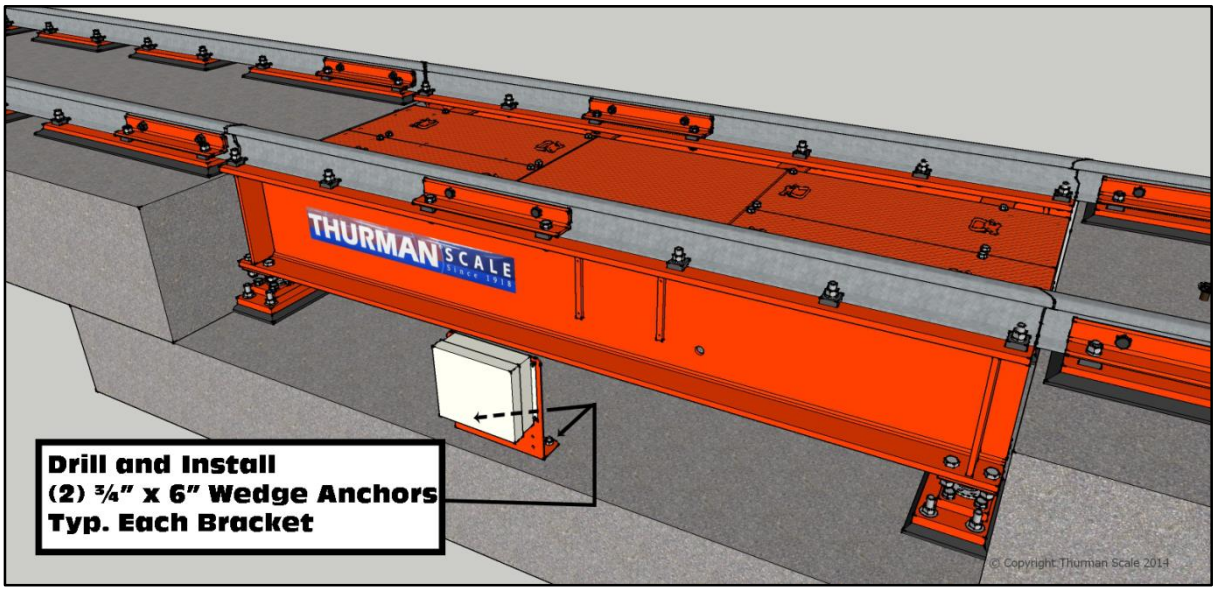


Figure 5-1: J-Box Bracket Accessory diagram

Manufactured by Thurman Scale, Inc.
821 Locust
Kansas City, MO 64106

www.Thurman.com