



CARDINAL®



2626-80LPRA-120
Low Profile
Railway Track Scale
Installation Manual

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Serial Number _____ Date of Purchase _____ Purchased Form _____ _____ _____ <div style="text-align: center; font-size: small; margin-top: 10px;">RETAIN THIS INFORMATION FOR FUTURE USE</div>



PRECAUTIONS	
Before using this scale, read this manual and pay special attention to all "NOTIFICATION" symbols:	
	
IMPORTANT	ELECTRICAL WARNING

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FCC COMPLIANCE STATEMENT

This equipment generates uses, can radiate radio frequency, and if not installed and used in accordance with the instruction manual, may cause interference to radio communications. It has been tested and found to comply with the limits for a Class A computing device pursuant to Subpart J of Part 15 of FCC rules, which are designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area may cause interference in which case the user will be responsible to take whatever measures necessary to correct the interference.

You may find the booklet “How to Identify and Resolve Radio TV Interference Problems” prepared by the Federal Communications Commission helpful. It is available from the U.S. Government Printing Office, Washington, D.C. 20402. Stock No. 001-000-00315-4.

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IMPORTANT: If your scale is equipped with access ways, such as manholes, it is the user's responsibility to provide proper protection, such as barriers, during the time they are opened or removed.

SECTION I

INTRODUCTION

The Cardinal Low Profile Railway Track Scale is a versatile scale that can be installed in a pit or above ground. This manual will describe an above-ground installation. An in-pit installation is accomplished in a similar manner as as the standard system. All required components may be installed from the top side through the access covers.

This manual must be used in conjunction with certified drawings of the particular Low Profile Railway Track Scale model being installed. *In case of conflict, the certified drawings will govern.*

This manual should be studied thoroughly before attempting to install the Railway Track Scale. Safety should always be the prime consideration during all phases of the installation.

Failure to comply with the instructions in this manual will void all warranty implied or stated.

SITE PREPARATION REQUIREMENTS

Your new Cardinal scale, as with any precision measuring instrument, requires an acceptable environment to operate at its peak performance and reliability. The purpose of this section is to explain how the user can provide such an environment.

Electrical Power

Most Cardinal instrumentation is designed to operate at 115 VAC, 50/60 Hz. Where required, the equipment may be ordered for operation at 230 VAC, 50/60 Hz. Refer to your order confirmation copy or to the equipment nameplate, if you are not certain for which voltage level your scale is configured.

Your weighing system will require one or more power outlets. Refer to Table A to determine the number of power outlets necessary for your system. These outlets should be of the grounded, polarized type as shown in Figure No. 1. One additional outlet is recommended to allow a source of power for test equipment to be used during installation and service.

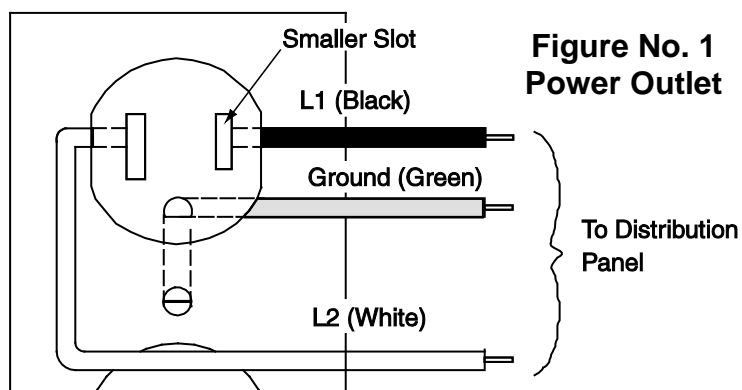


Table A – Power Outlet Requirements

Device	Outlets Required
Weight-Indicating Instrument	1
Printer	1
Fill Control Console	1
Traffic Control Console	1
Regulating Transformer*	1
Computer	1

*This piece of optional equipment eliminates the need for an outlet for the weight-indicating instrument and power supply-section seal J-box, depending on the type of regulating transformer.

Electrical Power, Cont.

Figure No. 2 illustrates typical wiring from the distribution panel to the power outlets used for the weighing system.

Power outlets should be on a separate circuit from the distribution panel. This circuit should be dedicated to the exclusive use of the weighing system. The power wiring should conform to local electrical codes. Services of a qualified contractor and approval by the local building inspector generally will assure compliance with this code.

To prevent electrical noise interference, make certain that all other wall outlets for use with vacuum cleaners, lighting, calculators and other equipment are on circuits separate from that used for the weighing system.

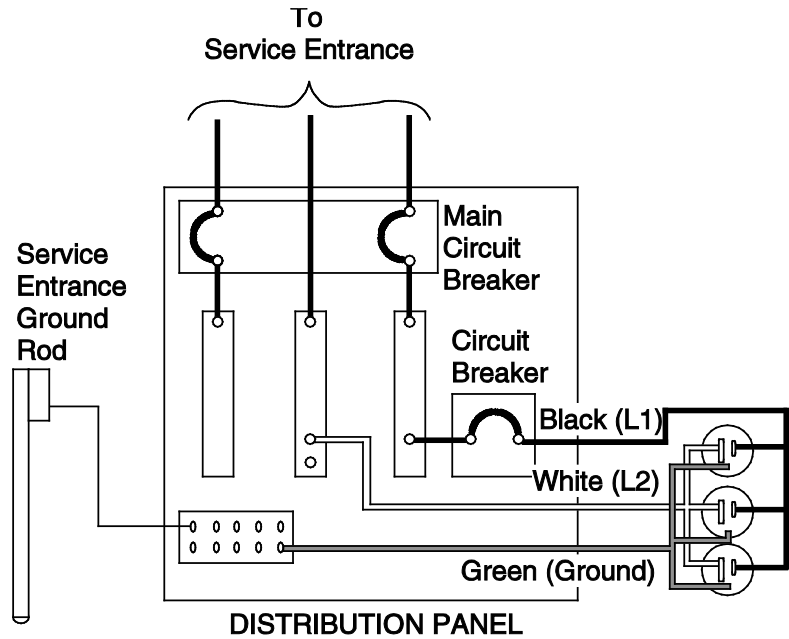


Figure No. 2 – Power Outlet Wiring

AC Power Fluctuations

Your Cardinal Weighing System uses one or more microcomputer systems. Many of the problems associated with computer operations are caused by fluctuations in the AC power system. Electrical noise, power interruptions and lightning effects from the commercial power line may enter the weighing system and cause equipment failures.

Many of the disturbances that can seriously affect the operation of a weighing system originate within the building itself. These disturbances result from switching heavily inductive loads, such as welders, motors and solenoids. These sources of disturbances must be identified and steps taken to prevent possible adverse effects on the operation of the weighing system. Examples of available alternatives include isolation transformers, power regulators, uninterruptible power supplies, or simple line filters.

Power Source

The power source should have sufficient capacity to supply the weighing system load. Consideration should be given to adding extra capacity to provide for the additional loads caused by expansion of your system. Make certain this source is independent of other loads (i.e., air conditioning and heating equipment, convenience outlets, lighting or office equipment, which can cause disturbances). A separate line back to the distribution panel usually provides suitable power. Make certain that a properly sized circuit breaker is installed in this line to safeguard against accidental short circuits.

Table B provides some basic guidelines in selection of a power-conditioning device, should it be necessary to use one. Remember that this is only a guide and that a qualified technician should be consulted for determination of the type of device suited to your application. All of the types listed are available in various sizes from Cardinal Scale or may be purchased locally.

Table B – Power Conditioning Device

Type	PROVIDES PROTECTION AGAINST			Cost
	Outages	Transients	Fluctuations	
Uninterruptible Power Supply	✓	✓	✓	High to Moderate
Voltage Regulator		✓	✓	Moderate
Isolation Transformer		✓		Low to Moderate
Line Filters		✓		Low

Voltage

Voltage (steady state) variations shall not exceed plus (+) 10 percent or minus (-) 15 percent of the nominal value 115 VAC (plus or minus 8 percent for 230 VAC).

Transient variation (step or slope) changes of plus (+) or minus (-) 20 percent on the nominal value shall exist no longer than 0.1 second and occur no more than once every 10 seconds.

Frequency

The equipment is designed to operate at a nominal 50/60 Hertz unless specified otherwise on the equipment nameplate. The steady state harmonic distortion should be equal to, or less than, 6 percent of the fundamental frequency amplitude.

Grounding

A ground wire must be included with the power conductors (phase or L1 and neutral or L2 wires) in the run from the distribution panel to the weighing system power outlets. The size of the ground wire must comply with The National Electrical Code or local electrical code. The ground conductor must be securely bonded to the building's grounding electrode conductor. Refer to Grounding Installation Instructions for the scale and instrument.



DANGER! A broken or high resistance safety ground is a potentially lethal situation. Because of line-to-chassis voltage potential, it is possible to receive a shock by touching the equipment if the green wire ground is not intact. Please be sure proper grounding is connected!

AC Neutral

The AC neutral must not be confused with protective (equipment chassis) ground. As protection for personnel, the protective equipment ground (the green wire in power line wiring) prevents the build-up of dangerous voltages on equipment. It ensures that a short circuit between L1 and the enclosure draws enough current to trip the circuit breaker immediately, rather than raising the voltage on the enclosure to a dangerous level. Do not substitute the neutral wire for the protective ground.

Safety Considerations

Safety must be a consideration in the selection of a location for your weighing system. DO NOT locate your system in an area where flammable or explosive materials are stored or processed unless your equipment is furnished in special explosive-proof enclosures. The equipment should be placed where it does not interfere with entry to or exit from the room. Periodic reviews should be made to make certain that the installation remains safe.

Lightning Protection

In areas subject to lightning strikes, certain steps must be taken by the customer to minimize the potential for lightning damage. These steps consist of the installation of lightning arresters as required by Article 280 of The National Electrical Code, the installation of a scale grounding system as described in Grounding Installation Instructions, and other surge arresting devices.

Heating and Cooling

Most standard Cardinal weighing system instrumentations are designed for the office environment. Such an environment is free of excessive dust and moisture and provides a comfortable temperature. In general, weighing equipment will perform well over a temperature range of 14° to 104° F. Some types of instruments and special systems will perform over a much wider range of temperatures.

In order to keep equipment cooling requirements to a minimum, the equipment should be placed out of direct sunlight and in an area where air is free to flow around all sides of the system enclosure(s). Make certain that the enclosure is not in line with a heating or cooling vent. Such a location will subject the instrument to sudden temperature excursions and may result in an unstable weight reading.

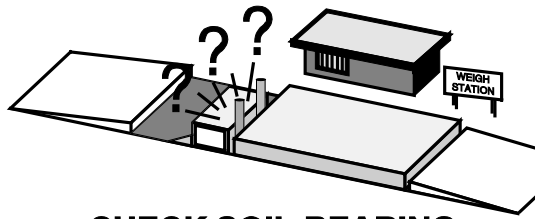
Care should be exercised by providing a relatively dust-free environment for operation of the printer. Accumulations of dust and dirt within the printer act as abrasives; also as insulators that reduce the dissipation of heat from internal components. Accumulated dust and dirt can result in premature failure.

Scale Site

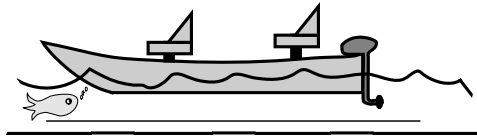
The site selected for installation of the scale should provide easy access, satisfactory soil bearing capacities, adequate drainage, and be within sight of the system operator. Refer to the foundation or pit drawings furnished for soil bearing requirements.

A common source of problems is the accumulation of water under and around the scale. In spite of the best water proofing techniques, prolonged exposure to water will result in erratic weight readings and may permanently damage the scale. In areas subject to water accumulation, an inexpensive alternative is to install a sump pump to remove excess water. Remember that power wiring for the sump pump must be contained in a conduit apart from the load cell conduit and separated from it a minimum of 24 inches.

Scale Site, Cont.



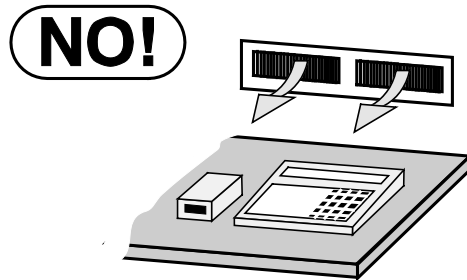
CHECK SOIL BEARING CAPABILITY



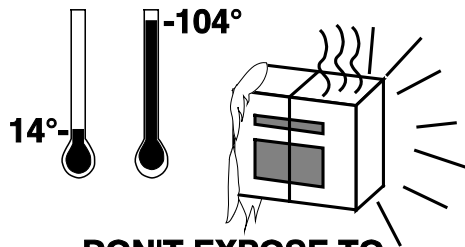
PROVIDE ADEQUATE DRAINAGE



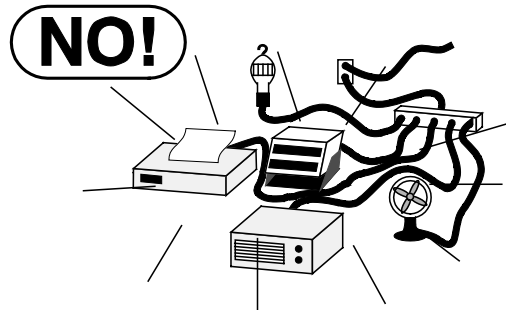
NO!
DON'T EXPOSE TO DIRECT SUNLIGHT



NO!
DON'T PLACE IN FRONT OF HEATING/COOLING VENTS



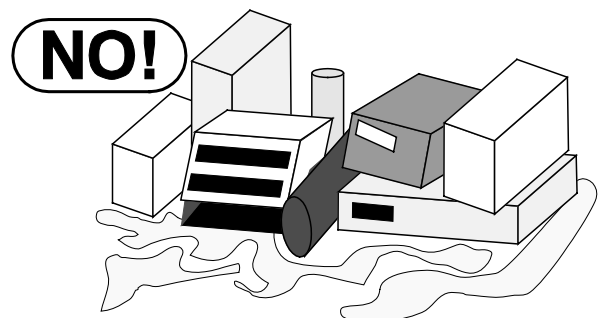
DON'T EXPOSE TO TEMPERATURE EXTREMES



NO!
PROVIDE GOOD, SAFE GROUND AND CLEAN AC POWER



PROVIDE ADEQUATE PROTECTION TO MINIMIZE LIGHTNING DAMAGE



NO!
KEEP THE AREA AROUND THE SCALE CLEAR TO PROVIDE ADEQUATE AIR CIRCULATION

SECTION II

RAILWAY TRACK SCALE INSTALLATION

At this point, the foundation should be in place as specified on the certified foundation drawing.

FOUNDATION VERIFICATION

Begin the installation procedure by verifying that the following items have been cast in the concrete foundation and have been properly located per the certified foundation drawing: Anchor bolts, Coping angles, Transmission cable conduit, and Restraint assembly.



WARNING: Permanent damage may occur if the railway track scale is not properly installed.

GROUT PLATE INSTALLATION

The load cell assemblies are to be installed with a nominal 2 inches of grout. Refer to Figure 3.

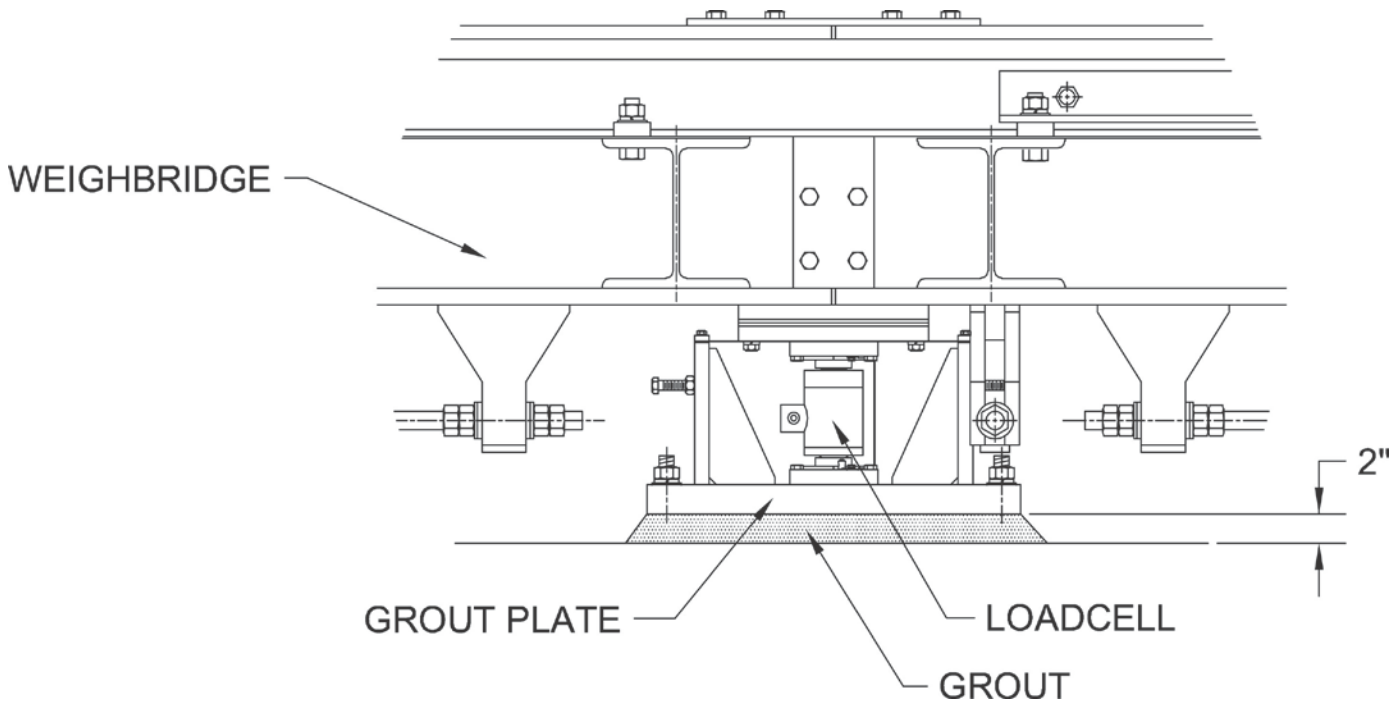


Figure No. 3 – Grout Plate and Load Cell Spacer Installation

GROUT PLATE INSTALLATION, CONT.

The grout plate assemblies should be located as shown on the certified assembly drawings. The top of each grout plate assembly should be level within 1/16 inch across the surface of the plate.

The top surface of each grout plate assembly should be at the same elevation within 1/4 inch from the highest plate to the lowest plate. A transit is recommended to confirm the elevation. The scale is to be completely installed prior to grouting.

NOTE: Place grout plate, to locate the ground lug bolts, toward the inside of the scale.

BRIDGE MODULE INSTALLATION

Place a load cell spacer (load cell substitute) on each of the grout plate assemblies inside the locating plate. If you do not have the load cell spacers, they may be obtained from Cardinal Scale. Load cells should not be used to install the bridge modules. Refer to Figure 4.

NOTE: Place top plate to locate the ground lug toward the inside of the scale.



WARNING: Do not use the load cells to install the bridge modules. Permanent damage to the load cells may result. Personal injury can also result as the load cells do not provide a stable installation platform until all stabilizer assemblies are in place.

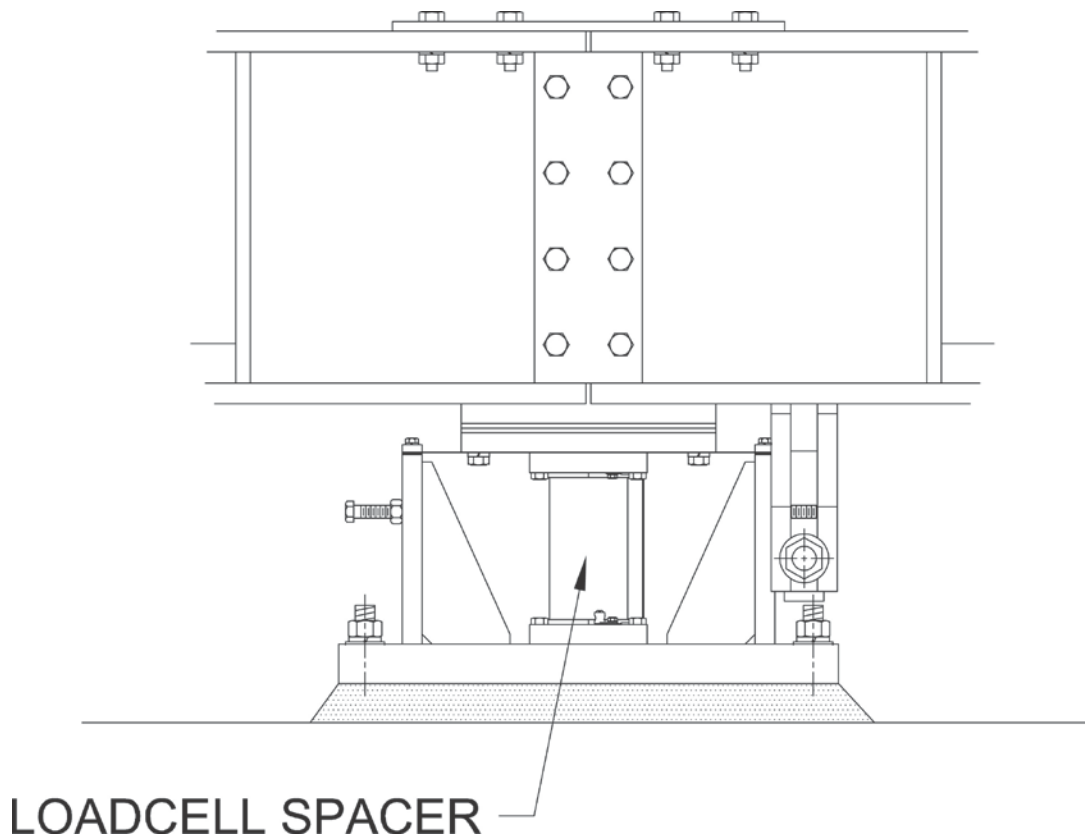


Figure No. 4 – Bridge Module Attaching

LATERAL STABILIZER BRACKET

The lateral stabilizer brackets can now be installed on the preset anchor bolts as shown on the certified foundation drawings. The bolts should be torqued to ensure the permanency of the lateral stabilizer brackets. There should be no grout under the lateral stabilizer brackets. The concrete should be level and in full contact with the base of the lateral stabilizer brackets. Refer to Figure 5.



CAUTION: The lateral stabilizer brackets should not be grouted in place. They should set on smooth and level concrete with anchor bolts. Should the lateral stabilizer brackets not be securely fixed to the concrete, damage to the load cells and/or the scale may result from excessive movement of the scale bridge.

LATERAL STABILIZER INSTALLATION

Install the lateral stabilizer as shown on the final assembly drawing. The lateral stabilizer should be level. Verify that all spherical washers are properly located. Refer to Figure 5 for proper orientation of spherical washers.

Place one end of each lateral stabilizer in the weighbridge slotted hole bracket as shown on the certified final assembly drawing, see Figure 5. Secure the other end to the lateral stabilizer bracket. Lock the rod in position by tightening all nuts on the stabilizer washers, but loose enough to allow the special washers to be rotated by hand.

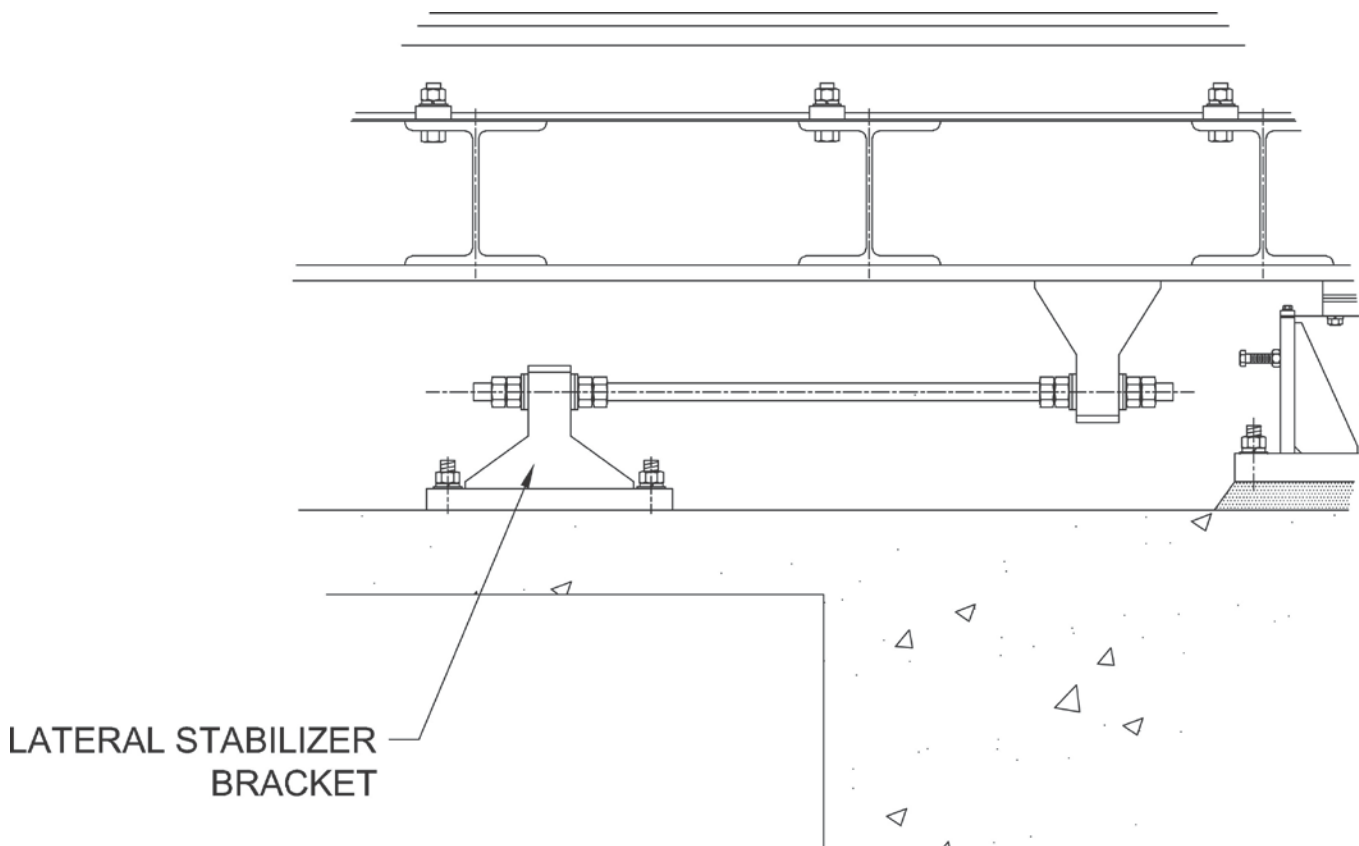


Figure No. 5 – Lateral Stabilizers

LONGITUDINAL STABILIZER INSTALLATION



NOTE: The Longitudinal Stabilizers must be adjusted after the Lateral Stabilizers.

Refer to Figure 4 and the certified assembly drawing. The stabilizer plate is cast in the foundation concrete. The bottom surface of the stabilizer plate is to be flush with the datum line. Install the stabilizer as shown on the certified final assembly drawing.



CAUTION: Do not jack the scale up with the Longitudinal Stabilizers installed, as this will damage the longitudinal stabilizers.



CAUTION: Do not weld on the scale while the load cells are in place.

Referring to Figure 6 and drawing 0862-C001, install the cover plates.

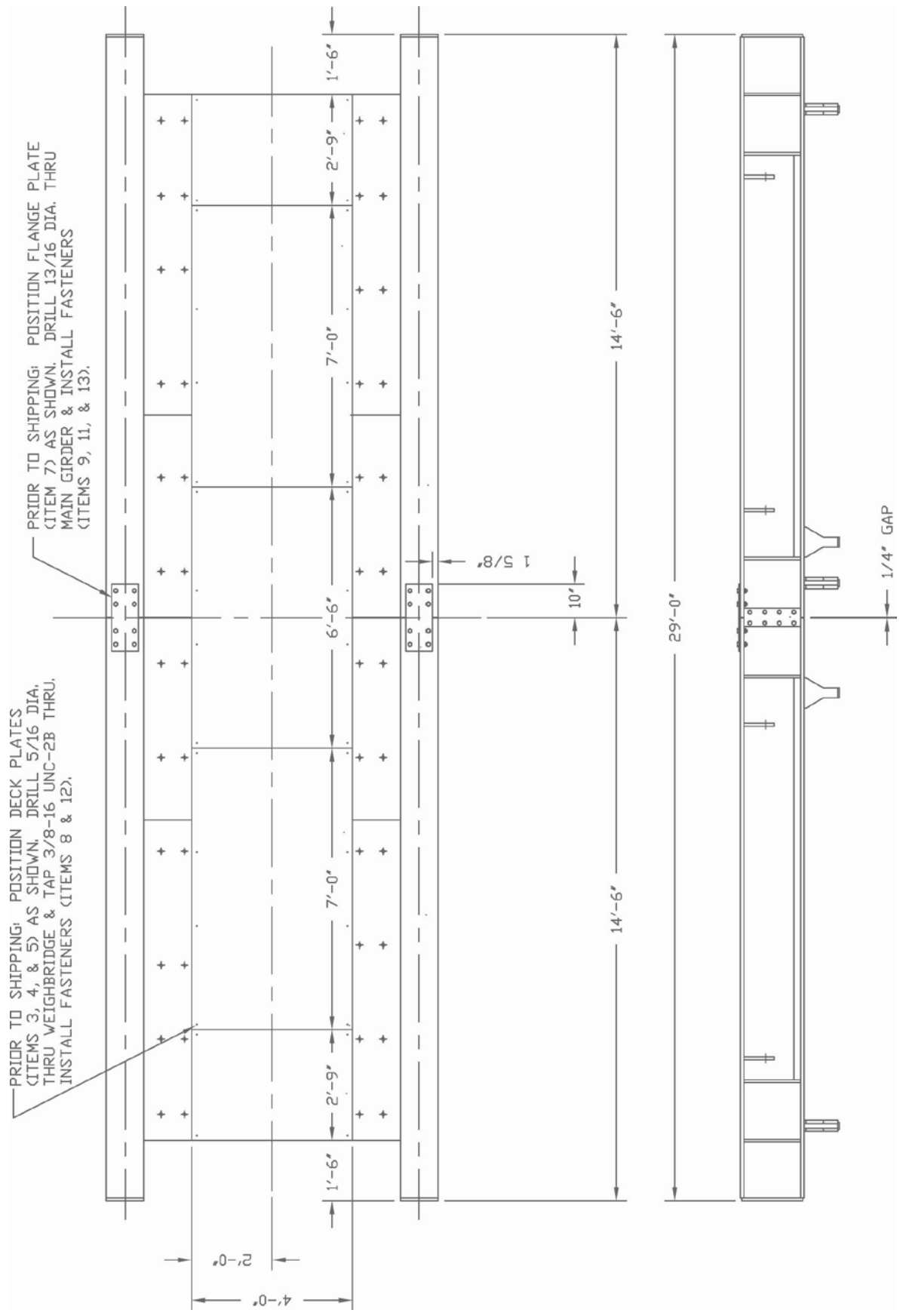


Figure No. 6 – Drawing 0862-C001 Cover Plate Installation

LOAD CELL INSTALLATION

NOTE: Cardinal Scale Mfg Co. recommends that the customer install protective conduit/cover for the load cell cables whenever the condition is present that can result in damage or abrasion to the load cell cables. Protection kits are optionally available through Cardinal Scale Mfg Co.



CAUTION: Be sure all restraint systems are loosened before jacking up scale.

At each section, jack up the weighbridge and remove the load cell spacers. Verify that the recesses in both the lower locating plate is clean and free of dirt and debris. Lower the weighbridge in place and verify that the load cell bearing cup is seated on the top plate and that the load cell is plumb, refer to Figure 7.

NOTE: The load bearing cups are provided with O-ring seals to ensure the cleanliness of the bearing surfaces and that the bearing buttons are properly centered on the bearing surface. Should the cups become separated from the cells, first lubricate the O-ring and use a small wire to break the air seal on the O-ring, press the load cell bearing button back into the load bearing cup then remove the wire. See Figure 7.

When all load cells are in place, verify that the scale is properly located laterally and longitudinally. Verify that all load cells are vertical (plumb). If any are not plumb, jack up the scale at that cell, and reposition the cell. Care should be exercised to ensure that when the process is complete, all load cells are vertical (plumb).

After all load cells are in place and vertical, verify that each load cell is taking its share of the dead load of the scale. This can best be done by measuring the output voltage of each individual load cell using a 4 1/2 digit DVM.

When the load cell wiring is complete, apply power to the system.

Disconnect all RED load cell wires (+SIG) and all WHITE load cell wires (-SIG) on the Transient Suppression PC board 3502-D478-0A. Note that sections 4, 5 and 6 (depending on how many sections are in the scale) are wired with an additional cable that effectively extends the length of the load cell cables. This is a multi-conductor cable made up of shielded pairs of wires. You must refer to the wiring blueprint to correctly wire each end of this cable. Keep the wire pairs separated so they do not get mixed. On the blueprint, a dotted line encircling two wires indicates a wire pair. In all cases, the +SIG and -SIG wires are disconnected to be measured. Touch the +SIG wire to the RED test lead and the -SIG wire to the BLACK test lead when measuring the load cell output voltage.

Check each load cell in turn to determine which cells might be taking too much or too little load. A higher voltage indicates a load cell with a greater load.

LOAD CELL INSTALLATION, CONT.

Adjust the leveling bolts in the appropriate grout plate until all load cell output voltages are within 1 millivolt or less of each other. Typically, you will find a Railway Track Scale with a steel deck to have near 1.5 millivolts dead load voltage for 12V excitation (or .6 millivolts for 8V excitation) from each of the center sections and about half that from each of the two end sections. A concrete deck Railway Track Scale will have near 4.5 millivolts from each center section and about half that from each of the two end sections.

Adjust the two load cells of each section to agree with each other as closely as possible. Within 1/2 millivolt is recommended. A little extra effort here is time well spent since it has a direct bearing on the ease and accuracy of section-sealing the scale, as well as long term satisfaction of the operation of the scale.

Refer to Grout Plate Installation to insure that the scale deck is level - within 1/4 inch.



IMPORTANT: All load cells must be absolutely vertical and sharing a portion of the scale dead load. If this is not true, weighing inaccuracies will occur.

GROUT INSTALLATION

When all of the above installation procedures have been completed and verified, the load cell grout plate should be grouted in place permanently, prior to loading the scale.



IMPORTANT: All load cells must be mounted in a vertical (plumb) position prior to grouting.

A free-flowing, non-shrinking epoxy type grout should be used. The grout should have bearing capabilities in excess of 5000 PSI. Five Star Epoxy Grout or equal is recommended. Follow carefully the manufacturer's recommendations for mixing and cure time of the grout.

A wood or metal frame must be used to contain the grout around the grout plate. The frame should be approximately one inch larger than the grout plate on each side. The free-flowing epoxy grout can then be poured into the frame, allowing it to flow completely under the grout bearing plate. Care should be exercised to ensure that no voids occur under the grout plates. See Figure 7.



IMPORTANT: Do not load the scale until grout is installed under the grout plates and the grout is completely cured. The leveling bolts will not support any load beyond the dead weight of the scale.

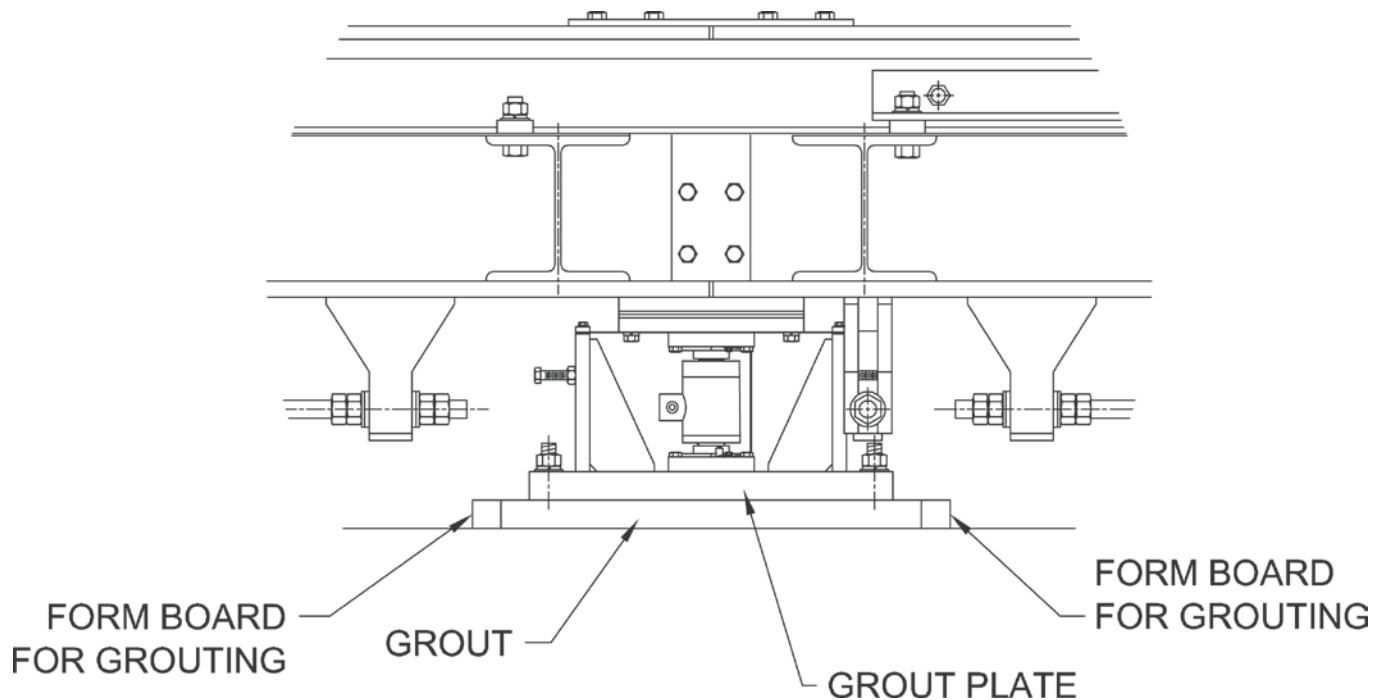


Figure No 7 – Grout Placement

GROUNDING INSTALLATION INSTRUCTION

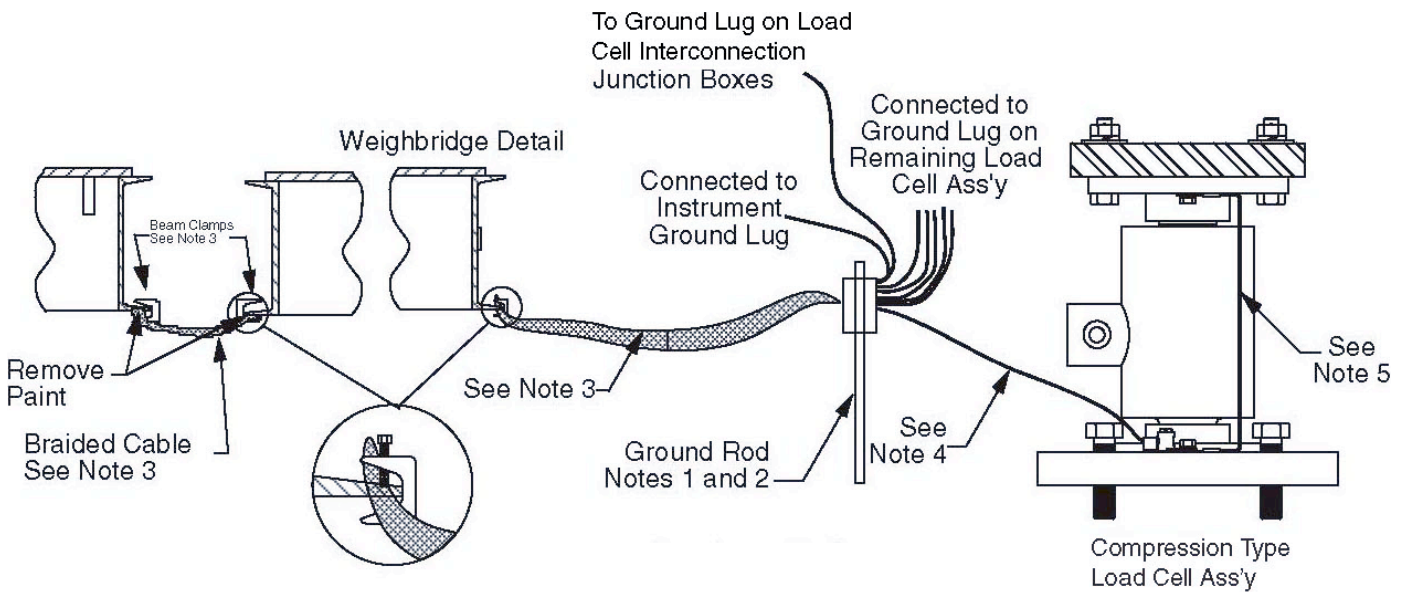


Figure No 8 – Grounding Installation Instructions

1. The ground rod shall be copper plated 0.5 inch (1.27 cm) minimum diameter with clean exterior surfaces, and shall not be covered with paint, enamel, or other materials which are poor conductors.
2. The ground rod shall be imbedded below permanent moisture level at least 8 feet (2.44 m) where practicable. Where rock bottom is encountered at a depth of less than 4 feet (1.22 M), the ground rod shall be buried in a horizontal trench.
3. Connect weighbridge to ground rod with 1" x 0.25" (2.54 cm x .635 cm) braided cable minimum. Connect braided cable to weighbridge using beam clamp, locate clamp towards the center of the weighbridge. Fold the braided cable over (lengthwise) and clamp between the weighbridge channel and the beam clamp. Similarly, connect the modules together as shown in the Weighbridge Detail in Figure 8. After installation of the braided cable, check for continuity between the weighbridge modules and the grounding rod.



NOTE: To insure proper grounding, grind the paint off the weighbridge where the braided cable and clamp contact.

4. Connect load cell mounting stand and weight indicating instrument ground lug to ground rod with No. 10 AWG insulated stranded copper wire.
5. Install ground wire 2970-B013-0A.

SECTION III

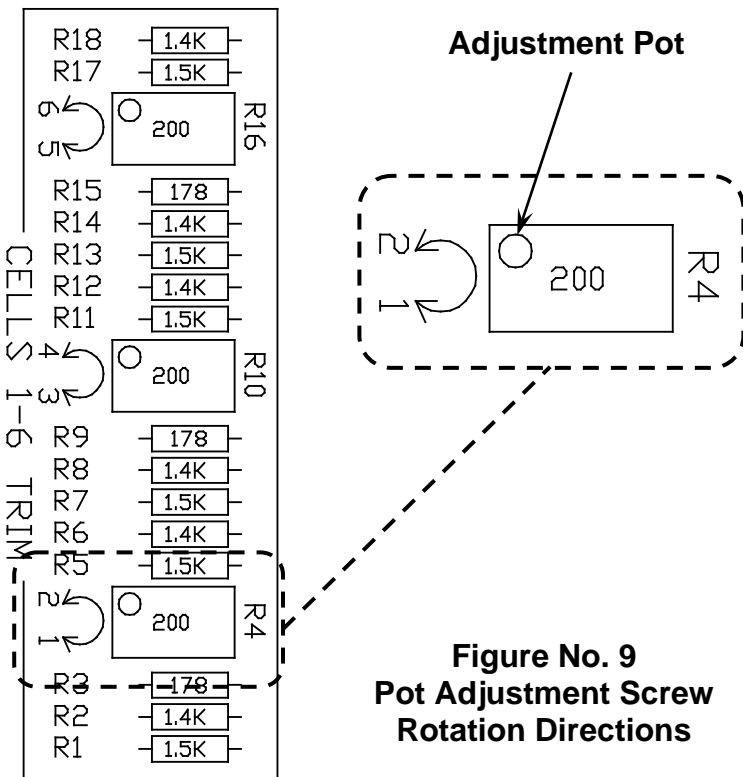
CALIBRATION

If, after test loading the scale, it is determined that adjustments are required, follow the procedure below. This section describes the procedure necessary to calibrate a Cardinal Railway Track Scale. This information DOES NOT apply to digital load cells, hydraulic load cells, or digital Junction Boxes (iCan). Refer to the applicable manuals for calibration instructions.

1. Before any adjustments are made, turn on power to the digital weight indicator and, when applicable, the power supply section-seal box. The glowing red indicator light on the bottom of the power supply junction box indicates that power is applied.
2. Drive a test truck across the scale at least three times in each direction prior to calibrating the scale.
3. Before any sealing can be done, the weight indicator must be calibrated to the scale. Refer to the Weight Indicator Installation and Technical Manual. This calibration is simply an intermediate step used to program the weight indicator to allow the preliminary test weights to be displayed before the final spanning is done.

TRIMMING INDIVIDUAL LOAD CELLS

The pots are adjusted for balance at the factory before shipment and should never be readjusted unless testing shows the necessity. Due to the consistent quality of the 50K SCA load cells, it is very unlikely that trim adjustment will ever be necessary. Provisions have been made to trim (or balance) the output of the two load cells that make up a section of the scale. A few governing bodies require that a side to side test be made to determine if the two load cells making up a section are within legal tolerance of each other. Do the following BEFORE section-sealing the railway track scale.



**Figure No. 9
Pot Adjustment Screw
Rotation Directions**

1. The adjustment pots for the individual load cell trim are found in the load cell trim junction box. The junction box is located under the section 2 inspection plate.
2. The adjustment pots are placed directly between the terminal strips for the load cell wiring. Adjustment pot R1 is between the terminal strips for load cell 1 and load cell 2 (which make up section 1). Pot R2 is located between the terminal strips for load cell 3 and load cell 4 (section 2). Pots R3, R4, R5 and R6 are similarly located. The pot number corresponds with the section it serves. See Figure No. 9.

TRIMMING INDIVIDUAL LOAD CELLS, CONT.

3. Silkscreened next to each pot is a small diagram that shows the rotation direction of the pot adjustment screw to change the output voltage level of the load cells affected by that particular pot. See Figure No. 9. Counter-Clockwise (CCW) rotation of the adjustment screw on pot R4 will raise the signal level of load cell 2; Clockwise (CW) rotation will raise signal level of load cell 1.

When testing indicates that there is a difference in the displayed weight of the two load cells, the load cell with the lowest weight reading should be adjusted up-scale to agree with the other load cell. Two to four turns of the adjustment screw on the potentiometer in the appropriate direction is a good preliminary adjustment. You may or may not see a change in the displayed weight, but a change has been made.

Remove the test weights from the scale and re-zero the weight indicator. Now place the test weights on each load cell in turn to see how the load cells compare with each other. Continue to do this procedure until the two load cell displays agree.

You must remove test weights (or test cart) from the scale to re-zero the weight indicator each time an adjustment is made. It is important to do this since a zero shift can occur due to the adjustment. This shift can cause the relative displayed weights of both load cells to change.

Ignore any displayed weight changes you see when adjusting the load cell signal (output). In some instances, the displayed weight reading will decrease instead of increase as expected. This is due to a shift of the zero point and is NOT indicative of the true adjustment actually being made. When this occurs, the displayed weight reading from the other load cell will also change (since the zero point has changed) and the weight readings from the two load cells will be moving closer together. When they agree, adjustment is complete.

USING A TEST TRUCK FOR SECTION-SEALING AT TIME OF INSTALLATION

The weight indicator should be calibrated to the scale prior to section-sealing. A division size of 10 pounds should be selected. The auto-zero function should be turned off during section-sealing.

The section-sealing pots are found in the section-sealing J-box located near the weight indicator. Refer to Figure No. 10. Locate the pots labeled Section 1 through Section 6, or Sections 1-3 or 4-6 Trim. Note that they are 23 turn pots.

Drive the test truck across the scale three times in each direction before section-sealing.

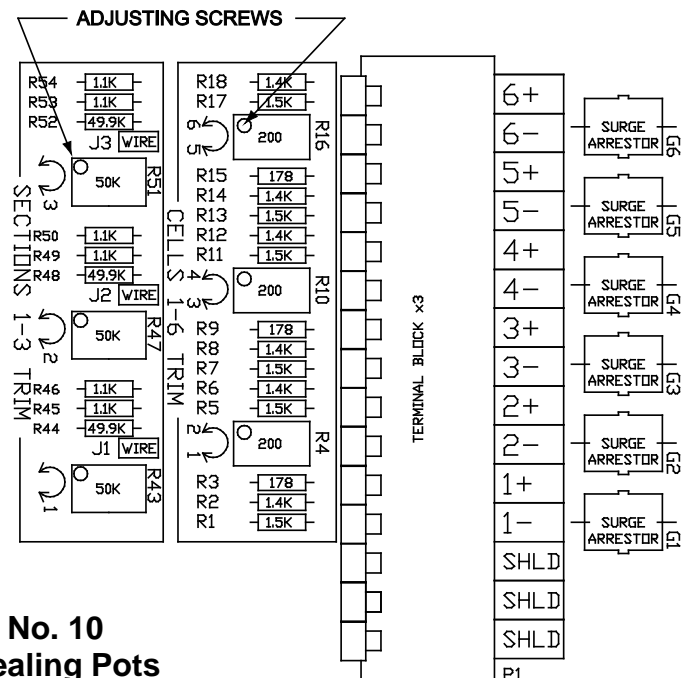


Figure No. 10
Section Sealing Pots

SECTION-SEALING PROCEDURE

1. Drive the loaded test truck across the scale and record the weight obtained with the load centered over each section.
2. The section, which has the smallest displayed weight, will be the reference section and all other sections will be adjusted downscale to six (6) divisions below the reference section displayed weight.
3. Zero the display of the weight indicator before driving the test truck onto the scale.
4. Center the weight of the test truck over the section being sealed.
5. Adjust the appropriate section-sealing pot to make the displayed weight agree with the weight obtained in Step 2.
6. Drive the test truck off the scale.
7. Repeat Steps 3, 4, 5 and 6 until the displayed weight of the section being sealed agrees with the reference weight. When the weights agree without any more adjustment, move to the next section and repeat the procedure.

When the section sealing is completed, the weight indicator must be recalibrated using a division size of 20 lb. This time turn on the auto-zero function. Refer to the Weight Indicator Installation and Technical Manual.

SECTION IV

TROUBLESHOOTING

1. Open all junction boxes and check for moisture, loose connections or damaged wiring. Check all cables for damage.
2. Use a jack to lift the weighbridge off each load cell.



IMPORTANT: Be sure any restraint system is loosened before jacking up scale.

Disconnect the signal leads of the cell and check its output voltage using a meter with a 10 microvolt minimum resolution. Any load cell with a no load output of more than 2 or 3 millivolts should be considered suspect. Record the no load outputs from each cell in Table C, Column 1.

Table C – Load Cell Output Voltage Chart

Cell No.	No Load	Dead Load	
	Col. 1 mV Output	Col. 2 mV Output	Col. 3 mV Output
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			

3. While the weighbridge is off the load cell, physically check the load buttons, load cup, upper load bearing plate and grout plate for any damage. Check to ensure that the grout is still in good condition.
4. With the weighbridge only on the load cells and the signal wires still disconnected, record each load cell output voltage in Table C, Column 2. If there is a difference of more than one millivolt between two lateral cells, then install one or more shims between the upper load bearing plate and weighbridge until the two cells' output are within one millivolt. Keep in mind that the four end cells should be approximately the same and the center cells should be approximately the same. After all shimming is complete, record all outputs for possible future use in Table C, Column 3.

5. Check to ensure that the end lateral stabilizers are level, square and tight. If there is any kind of gap filler on the ends of the scale, ensure that it is not causing any force on the scale.
6. Check and adjust section and calibrate scale.
7. If the problem should occur again, check the load cell outputs against the values recorded in Step 4. Any appreciable change could indicate a possible defective load cell. If the load cells check OK, install a different indicator to eliminate the possibility of an indicator problem.

MAINTENANCE INSTRUCTIONS FOR HIGH USAGE WEIGHMENTS

1. A High Usage Weighment Scale is one with 150 *or more* weighments per day.
2. A **weekly** maintenance inspection should be performed.
 - A. Inspect all longitudinal and lateral restraints.
 - B. Check all load cells for vertical alignment and debris around cells.
3. Check grouting of the load cell plates. Grout deterioration will cause inaccuracies and introduce stress on the weighbridge.
4. Check beneath the bridge for debris build-up between the foundation and the bridge. Remove debris from each end of the scale.
5. Test the scale with a truck carrying a typical load (i.e., a typical scale weighment).
 - A. Place the truck on the scale and take a reading.
 - B. Remove the truck, turn around and re-enter the scale.
 - C. The readings must repeat within ± 0.2 percent of the applied load. Example: 80,000 lb truck, the readings should be within ± 8 Grads (160 lb).
6. Structural Bridge Inspection
 - A. Drive a loaded truck slowly across the scale.
 - B. Observe the deck plate at the tandem axles.
 - C. Excessive deflection, under the tandem axle loads, will readily reveal structural damage (i.e., a broken weld, stringer or cross member).

The above inspection procedure will require less than one hour, but will insure that the scale is well maintained and accurate. On a quarterly basis, have the scale checked with known weights (i.e., a routine scale company test).

STATEMENT OF LIMITED WARRANTY

WARRANTY TERMS

Cardinal Scale Manufacturing Company warrants the equipment we manufacture against defects in material and workmanship. The length and terms and conditions of these warranties vary with the type of product and are summarized below:

PRODUCT TYPE	TERM	MATERIAL AND WORKMANSHIP	LIGHTNING DAMAGE See note 9	WATER DAMAGE See note 7	CORROSION See note 4	ON-SITE LABOR	LIMITATIONS AND REQUIREMENTS
WEIGHT INDICATORS	90 DAY REPLACEMENT ----- 1 YEAR PARTS	YES	YES	YES	YES	NO	1, 2, 3, 5, 6 A, B, C, D
LOAD CELLS (Excluding Hydraulic)	1 YEAR	YES	YES	YES	YES	NO	1, 2, 3, 5, 6 A, B, C, D
HYDRAULIC LOAD CELLS (When purchased with Guardian Vehicle Scale)	LIFETIME	YES	YES	YES	YES	90 DAYS	1, 5, 6, 8 A, B, C, D
HYDRAULIC LOAD CELLS (When purchased separately)	10 YEARS	YES	YES	YES	YES	NO	1, 5, 6, 8, 9 A, B, C, D
VEHICLE SCALE (Deck and Below Excl. PSC Series)	5 YEARS	YES	YES	YES	YES	90 DAYS	1, 2, 3, 5, 6 A, B, C, D, E
LSC SCALE (Deck and Below)	3 YEARS	YES	YES	YES	YES	90 DAYS	1, 2, 3, 5, 6, 11 A, B, C, D
GUARDIAN FLOOR SCALES	10 YEARS	YES	YES	YES	YES	NO	1, 2, 3, 5, 6, 9, 10 A, B, C, D
ALL OTHER CARDINAL PRODUCTS	1 YEAR	YES	YES	YES	YES	NO	1, 2, 5, 6 A, B, C, D, E
REPLACEMENT PARTS	90 DAYS	YES	YES	YES	YES	NO	1, 2, 4, 5, 6 A, B, C, D
SWIM AND 760 SERIES VEHICLE SCALES	1 YEAR	YES	YES	YES	YES	90 DAYS	1, 2, 5, 6 A, B, C, D
SOFTWARE	90 DAYS	YES	N/A	N/A	N/A	NO	1, 6 B, C, D
CONVEYOR BELT SCALES (including Belt-Way)	1 YEAR	YES	YES	YES	YES	NO	1, 2, 3, 5, 6 A, B, C, D, E, F



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APPLICABLE LIMITATIONS AND REQUIREMENTS

1. This warranty applies only to the original purchaser. The warranty does not apply to equipment that has been tampered with, defaced, damaged, or had repairs or modifications not authorized by Cardinal or has had the serial number altered, defaced or removed.
2. This warranty is not applicable to equipment that has not been grounded in accordance with Cardinal's recommendations.
3. This equipment must be installed and continuously maintained by an authorized Cardinal / Belt-Way dealer.
4. Applies only to components constructed from stainless steel.
5. This warranty does not apply to equipment damaged in transit. Claims for such damage must be made with the responsible freight carrier in accordance with freight carrier regulations.
6. Warranty term begins with date of shipment from Cardinal.
7. Only if device is rated NEMA 4 or better or IP equivalent.
8. Lifetime warranty applies to damages resulting from water, lightning, and voltage transients and applies only to the hydraulic load cell structure itself (does not include pressure transducers, rubber seals, o-rings, and associated wiring).
9. 10-Year prorated warranty on hydraulic load cells.
10. 1-Year warranty for scale structure.
11. PSC models' warranty coverage applies only to agricultural installations on farms up to 3,000 acres (LSC models not limited in this manner).
12. Load cell kits MUST be installed in accordance with Cardinal Scale instructions. Failure to follow these instructions will void the warranty.

EXCLUSIONS

- A.) This warranty does not include replacement of consumable or expendable parts. The warranty does not apply to any item that has been damaged due to unusual wear, abuse, improper line voltage, overloading, theft, fire, water, prolonged storage or exposure while in purchaser's possession or acts of God unless otherwise stated herein.
- B.) This warranty does not apply to peripheral equipment not manufactured by Cardinal. This equipment will normally be covered by the equipment manufacturer's warranty.
- C.) This warranty sets forth the extent of our liability for breach of any warranty or deficiency in connection with the sale or use of our product. Cardinal will not be liable for consequential damages of any nature, including but not limited to loss of profit, delays or expenses, whether based on tort or contract. Cardinal reserves the right to incorporate improvements in material and design without notice and is not obligated to incorporate said improvements in equipment previously manufactured.
- D.) This warranty is in lieu of all other warranties expressed or implied including any warranty that extends beyond the description of the product including any warranty of merchantability or fitness for a particular purpose. This warranty covers only those Cardinal products installed in the forty-eight contiguous United States and Canada.
- E.) This warranty does not cover paint coatings due to the variety of environmental conditions.
- F.) Do not cut load cell cables on load cells returned for credit or warranty replacement. Cutting the cable will void the warranty.
- G.) Software is warranted only for performance of the functions listed in the software manual and/or the Cardinal proposal.
- H.) The software warranty does not cover hardware. Warranties on hardware are provided from the hardware vendor only.
- I.) The software warranty does not cover interfacing issues to non-Cardinal supplied hardware.
- J.) The software warranty does not include automatic software upgrades unless purchased separately.



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