Cardinal®

Cardinal Scale Manufacturing Co.

AC Analog Load Cell Kit

Technical Manual

TABLE OF CONTENTS

Serial Number_____

Date of Purchase _____

Purchased From_____

_____

_____

RETAIN THIS INFORMATION FOR FUTURE USE

PRECAUTIONS

Before using this product, read this manual and pay special attention to all "NOTIFICATION" symbols:

DANGER!
WARNING!
CAUTION!

Copyright

All rights reserved. Reproduction or use, without expressed written permission, of editorial or pictorial content, in any manner, is prohibited. No patent liability is assumed with respect to the use of the information contained herein.

Disclaimer

While every precaution has been taken in the preparation of this manual, the Seller assumes no responsibility for errors or omissions. Neither is any liability assumed for damages resulting from use of the information contained herein. All instructions and diagrams have been checked for accuracy and ease of application; however, success and safety in working with tools depend largely upon the individual accuracy, skill and caution. For this reason, the Seller is not able to guarantee the result of any procedure contained herein. Nor can they assume responsibility for any damage to property or injury to persons occasioned from the procedures. Persons engaging the procedures do so entirely at their own risk.

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 designed within the limits for a Class A computing device pursuant to Subpart J of Part 15 of FCC rules 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. Request stock No. 001-000-00315-4.

INTRODUCTION

The Cardinal AC Load Cell kit provides you with the components necessary for construction of multi-cell applications, including above ground or pit truck scales and tank/hopper weighing systems. The AC Load Cell Kit utilizes Cardinal's AC analog load cells, universal section seal/trim boxes, transient protection boxes, and pull junction box.

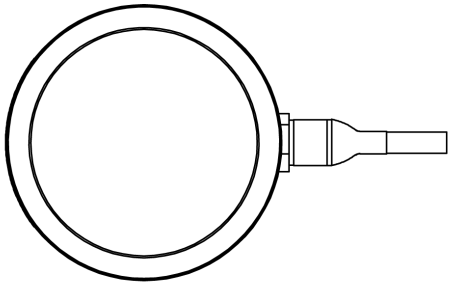
The Cardinal AC Series analog load cells are certified (NTEP #17-123 and OIML #2000-A-GB1-18.03) heavy-capacity compression load cells that are a direct replacement for, and are interchangeable with, the Cardinal 50K-SCA and 100K-SCA load cells. When replacing or upgrading the load cells in a current installation, or when designing a new application, they are the ideal heavy-capacity compression load cells to use.

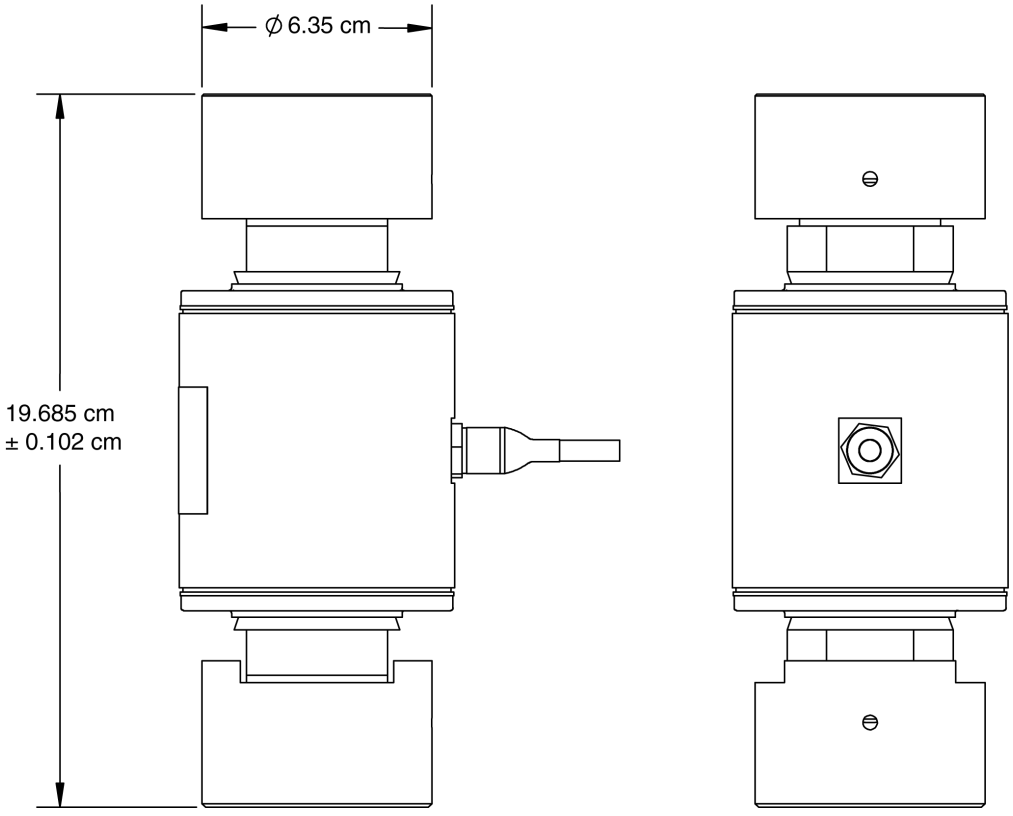
This manual should be studied thoroughly before attempting to install the scale, and must be used in conjunction with certified drawings of the particular scale being installed.
In case of conflict, the certified drawings will govern.

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.

LOAD CELL SPECIFICATIONS

AC-50K Capacity:	50,000 lbs (22,500 kg)
AC-100K Capacity:	100,000 lbs (45,000 kg)
Output:	2 mV/V at Rated Capacity
Output Tolerance:	±0.05% (Current Calibrated)
Output Resistance:	1005 ohms ±5
Input Resistance:	1150 ohms ±50
No Load Output Tolerance:	±2%
Cable Length:	15 m
Safe Load:	200% Rated Capacity
Temperature Compensation:	-10 TO +40 C
Protection Class:	IP68





LOAD CELL WIRING COLOR CODE

The AC Series analog load cells are a direct replacement for, and are interchangeable with, the Cardinal 50K-SCA and 100K-SCA load cells. However, it should be noted that the AC Series load cells have six wires in the load cell cable, whereas the SCA load cells only have four. To allow replacing the 4-wire SCA load cell with the 6-wire AC load cell, the AC load cells are shipped with the (+) Excitation (green) and (+) Sense wires (blue) soldered together and (-) Excitation (black) and (-) Sense wires (yellow) soldered together.

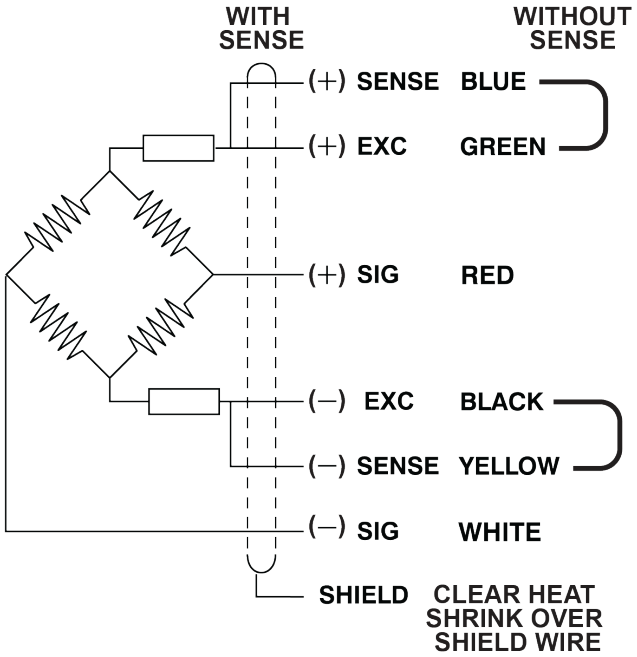
If the installation requires separate (+) Sense and (-) Sense wires (e.g. for some instruments, a constant voltage must be maintained at the load cell) then the sense wires should be separated from the excitation wires and all six wires of the load cell properly prepared for use in the instrument.

Load Cell Wiring Color Code Table

AC Series	
(-) SIGNAL	WHITE
(+) SIGNAL	RED
(+) SENSE	BLUE
(+) EXCITATION	GREEN
(-) SENSE	YELLOW
(-) EXCITATION	BLACK
SHIELD	Clear Heat Shrink Over Shield Wire

SCA Series	
(-) SIGNAL	WHITE
(+) SIGNAL	RED
(+) SENSE	n/a
(+) EXCITATION	GREEN
(-) SENSE	n/a
(-) EXCITATION	BLACK
SHIELD	Yellow Heat Shrink Over Shield Wire

ELECTRICAL CONNECTION

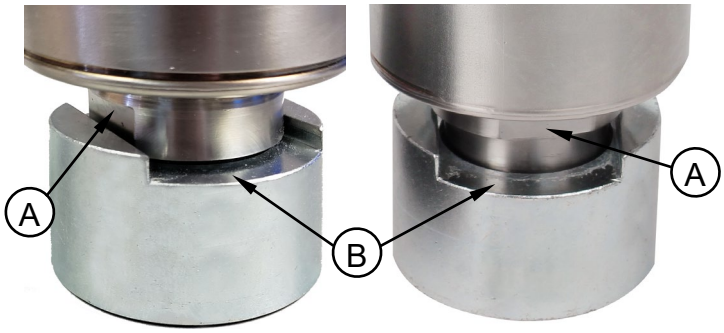


LOAD CELL INSTALLATION

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.

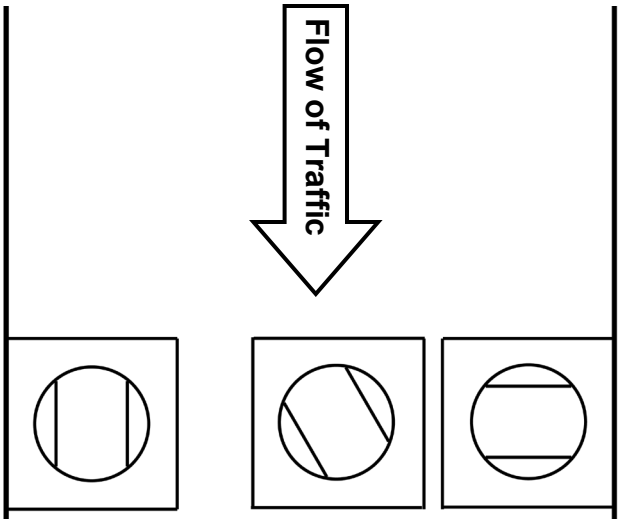
CAUTION! Be sure all restraint systems are loosened before jacking up scale.

1. At each section, jack up the weighbridge and remove the load cell spacers.
2. Verify that the recess in the lower Locating Plate is clean and free of dirt and debris.
3. Place the load cells in the lower Locating Plate, following these guidelines:
   - Ensure the flat surface (A) of load cell is aligned with the notch (B) in the load cell bearing cup.
   - Make sure you place the load cell bearing cup with the notch in the lower locating plate.
   - Additionally, the load cell must be correctly oriented in the scale. The notch in the load cell bearing cup must be placed in the lower locating plate in the direction of longitudinal scale movement (with the flow of traffic).



Flat surface (A) of load cell correctly installed in notch (B) of load cell bearing cup.

Flat surface (A) of load cell *incorrectly* installed in notch (B) of load cell bearing cup.



Correctly installed load cell bearing cup.

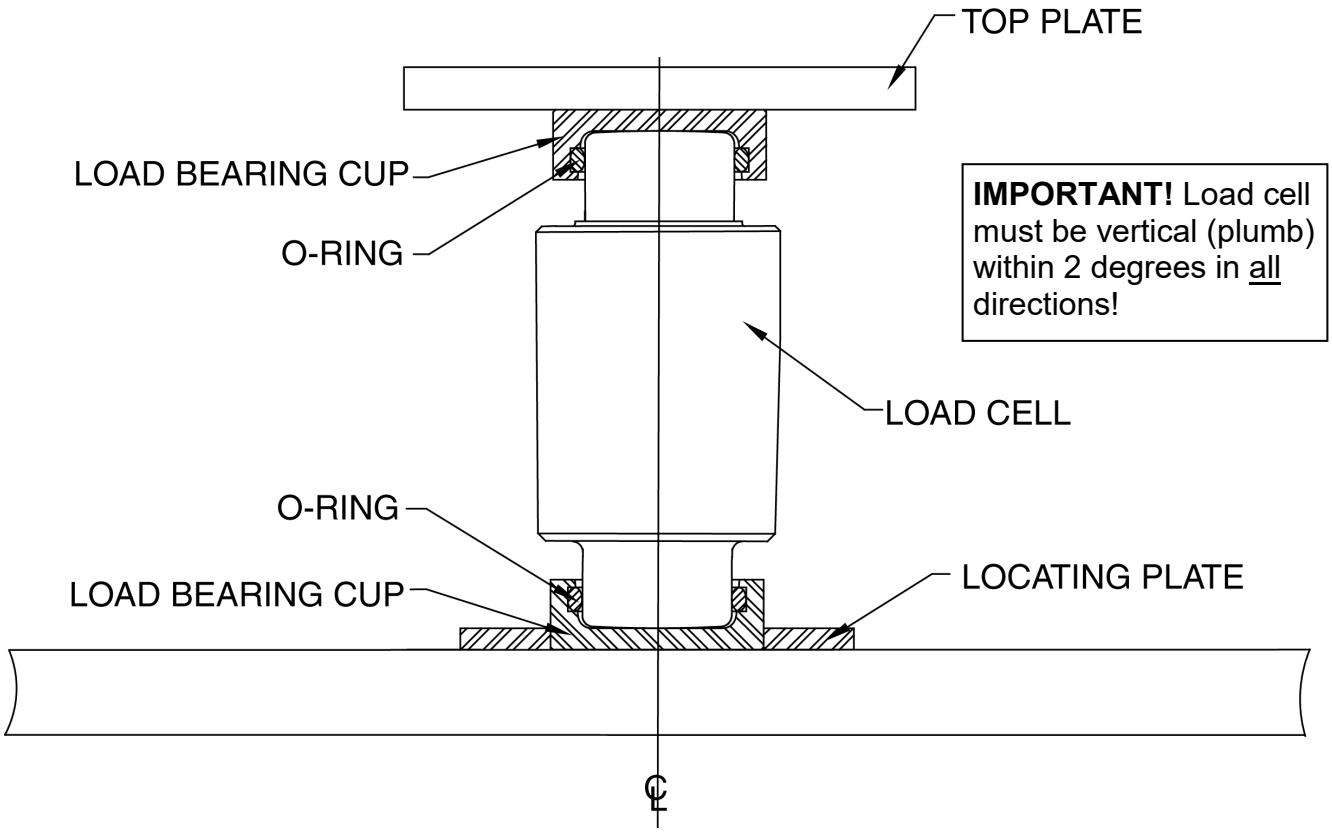
Incorrectly installed load cell bearing cup.

WARNING! Failure to install the load cell correctly in the load cell bearing cup, and the notched load cell bearing cup properly oriented in the lower locating plate will result in damage to the load cell and void the warranty!

NOTE: The load cell 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 then using a small wire to break the air seal on the O-ring, press the load cell bearing button back into the load cell bearing cup, and then remove the wire.

LOAD CELL INSTALLATION, CONT.

4. 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 (within 2 degrees in all directions).



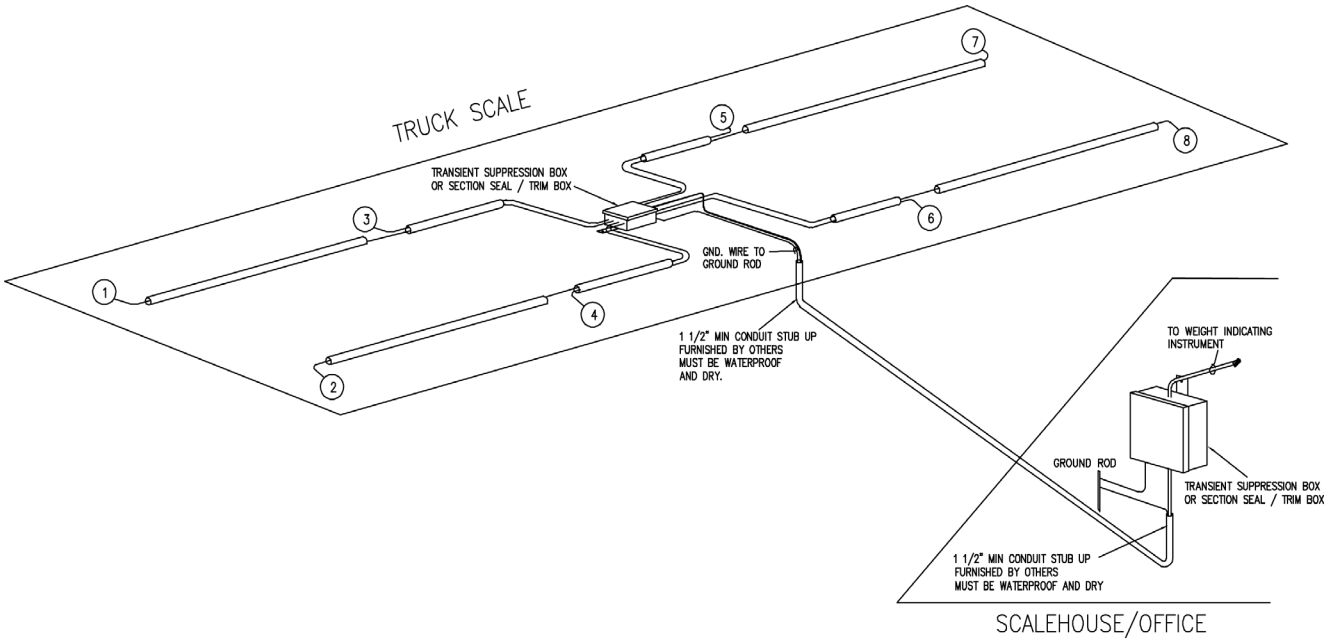
5. When all load cells are in place, verify that the scale weighbridge is properly located laterally and longitudinally. Verify that all load cells are vertical (plumb, within 2 degrees in all directions). If any are not plumb, jack up the scale at that cell, and reposition the cell. Care should be exercised to ensure that when the process is complete, all load cells are vertical (plumb).
6. After repositioning the load cells, again verify that they are vertical (plumb, within 2 degrees in all directions), and that the weighbridge is seated on each load cell.
7. Next, 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 3 1/2-digit DVM. If necessary, install one or more shims between the upper loading bearing cup and weighbridge.

Checking

The check stand brackets should be set on smooth and level concrete and securely fixed to the concrete to prevent damage to the load cells and/or the scale from excessive movement of the scale weighbridge.

IMPORTANT! Cardinal Scale Mfg. Co. recommends that lateral and longitudinal checking limits be adjusted to ± 1/8-inch clearance.

8 CELL INTERCONNECTIONS
(TYPICAL SCALE LAYOUT)



Notes:

1. The scale-to-scale house cable to be furnished by others, or ordered from Cardinal Scale.
2. Refer to drawing No. 3502-C435-GS and the GROUNDING INSTALLATION INSTRUCTIONS section of this manual for grounding instructions.
3. 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.
4. When installing cables into junction box terminals, twist the stranded wire to prevent stray conductors from shorting to adjacent terminals.
5. On section seal/trim board, insert two “enable” jumpers for each scale section used. Leave jumpers disconnected on section positions not used.
6. The +SENS and –SENS jumpers must be IN on the box at the scale and OUT on the box at the scale house for proper sense operation.

Load Cell Wiring Color Code without Sense

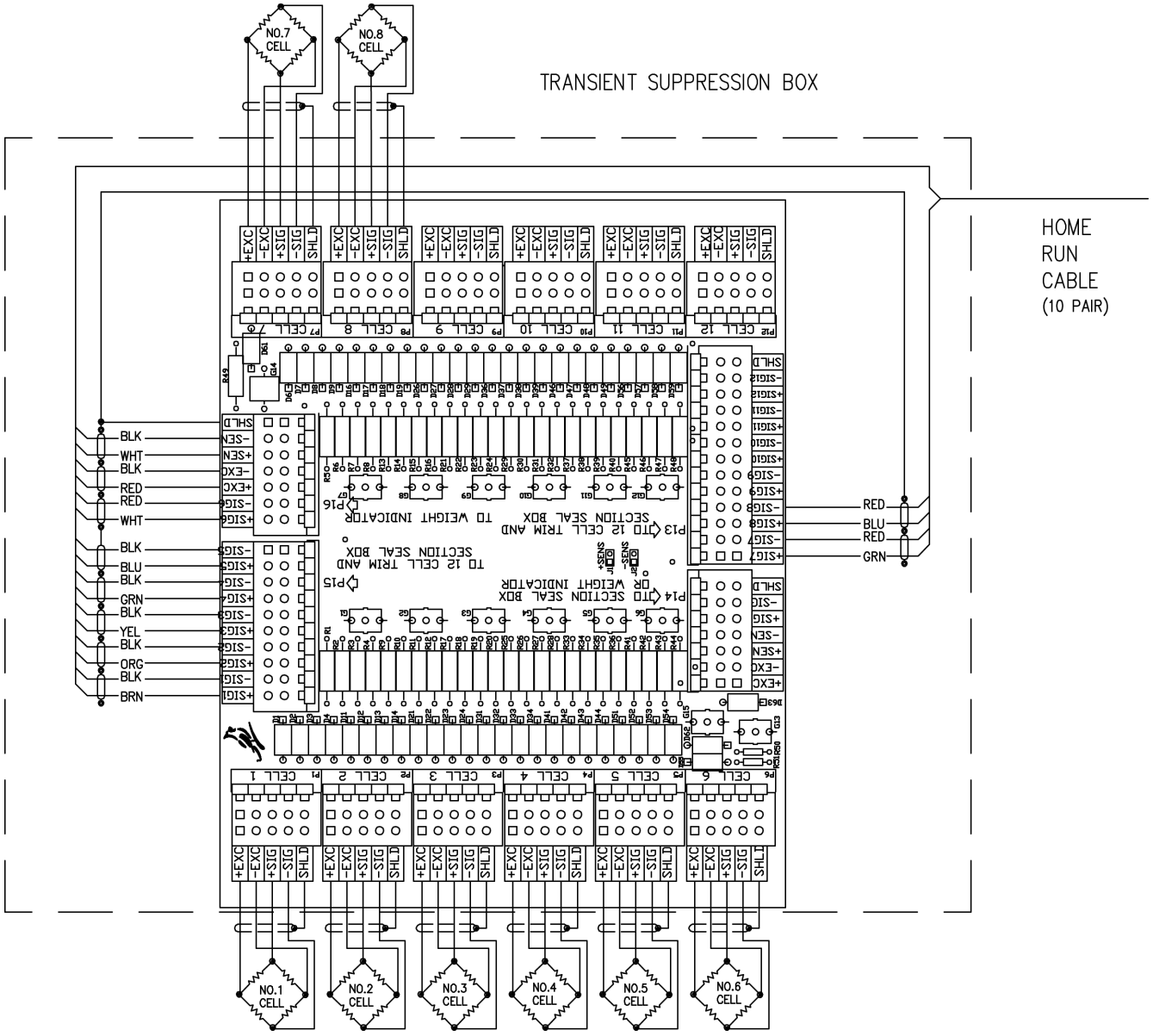
-SIG	+SIG	-EXC	+EXC	SHIELD
WHITE	RED	BLACK & YELLOW Soldered Together	GREEN & BLUE Soldered Together	Clear Heat Shrink Over Shield Wire

Load Cell Wiring Color Code with Sense

-SIG	+SIG	-EXC	+EXC	-SENSE	+SENSE	SHIELD
WHITE	RED	BLACK	GREEN	YELLOW	BLUE	Clear Heat Shrink Over Shield Wire

8 CELL INTERCONNECTIONS, CONT.
(CONTROLS IN SCALE HOUSE)

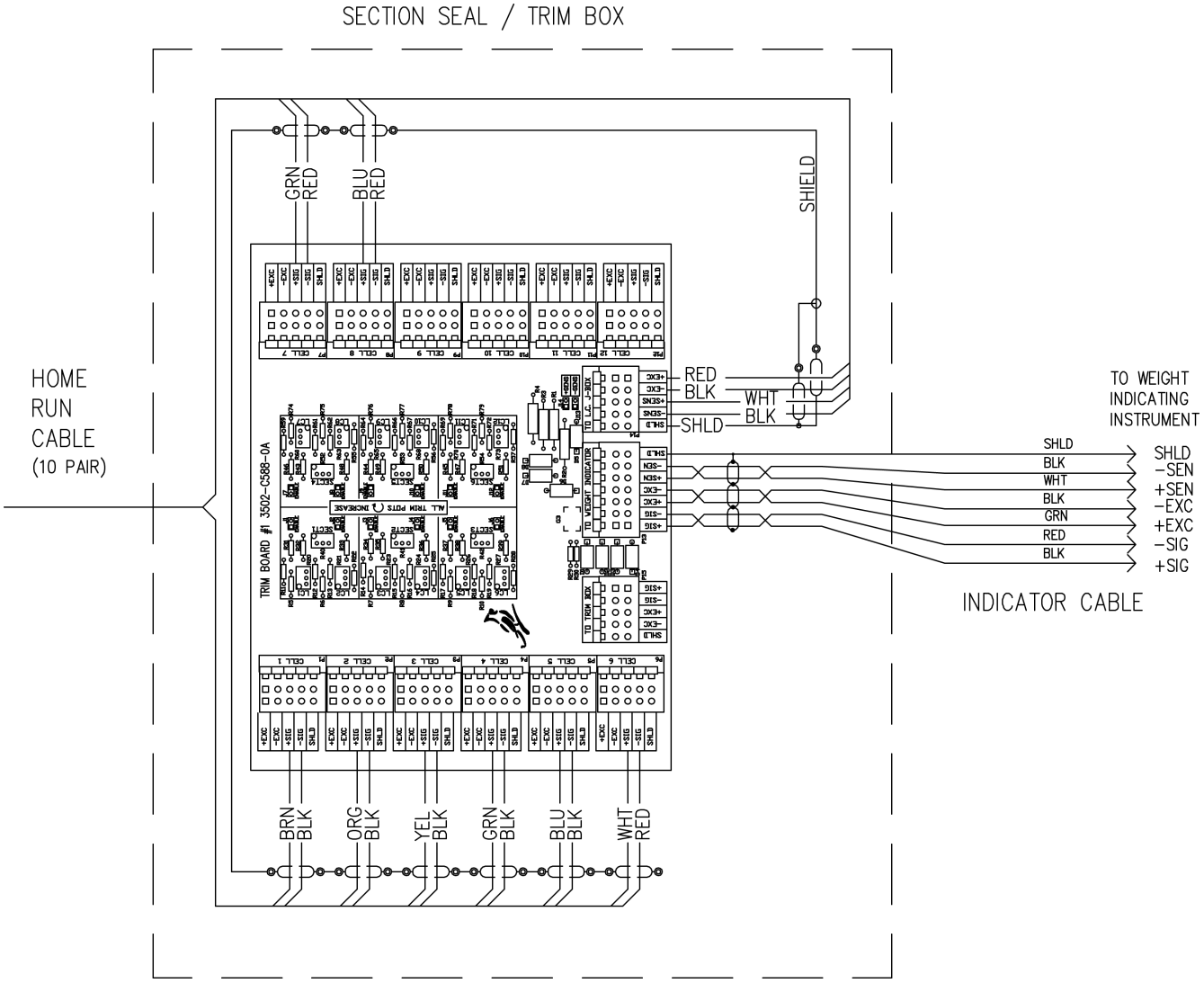
3502-D617-1A, 8 Cell Transient Suppression Box (On Scale)



8 CELL INTERCONNECTIONS, CONT.

(CONTROLS IN SCALE HOUSE)

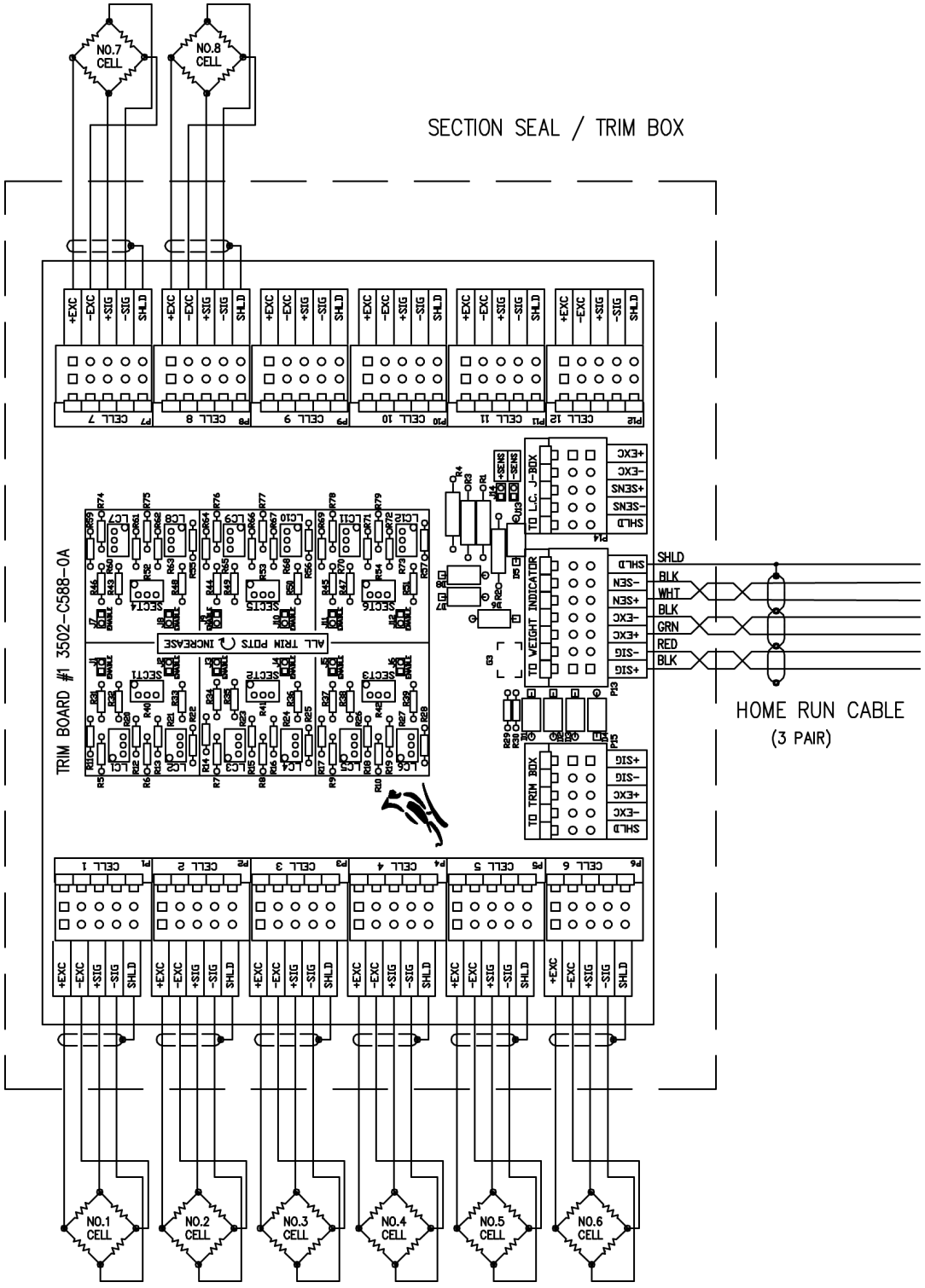
3502-D596-1A, 8 Cell Universal Section Seal Trim Box (At Scale House)



8 CELL INTERCONNECTIONS, CONT.

(CONTROLS AT SCALE)

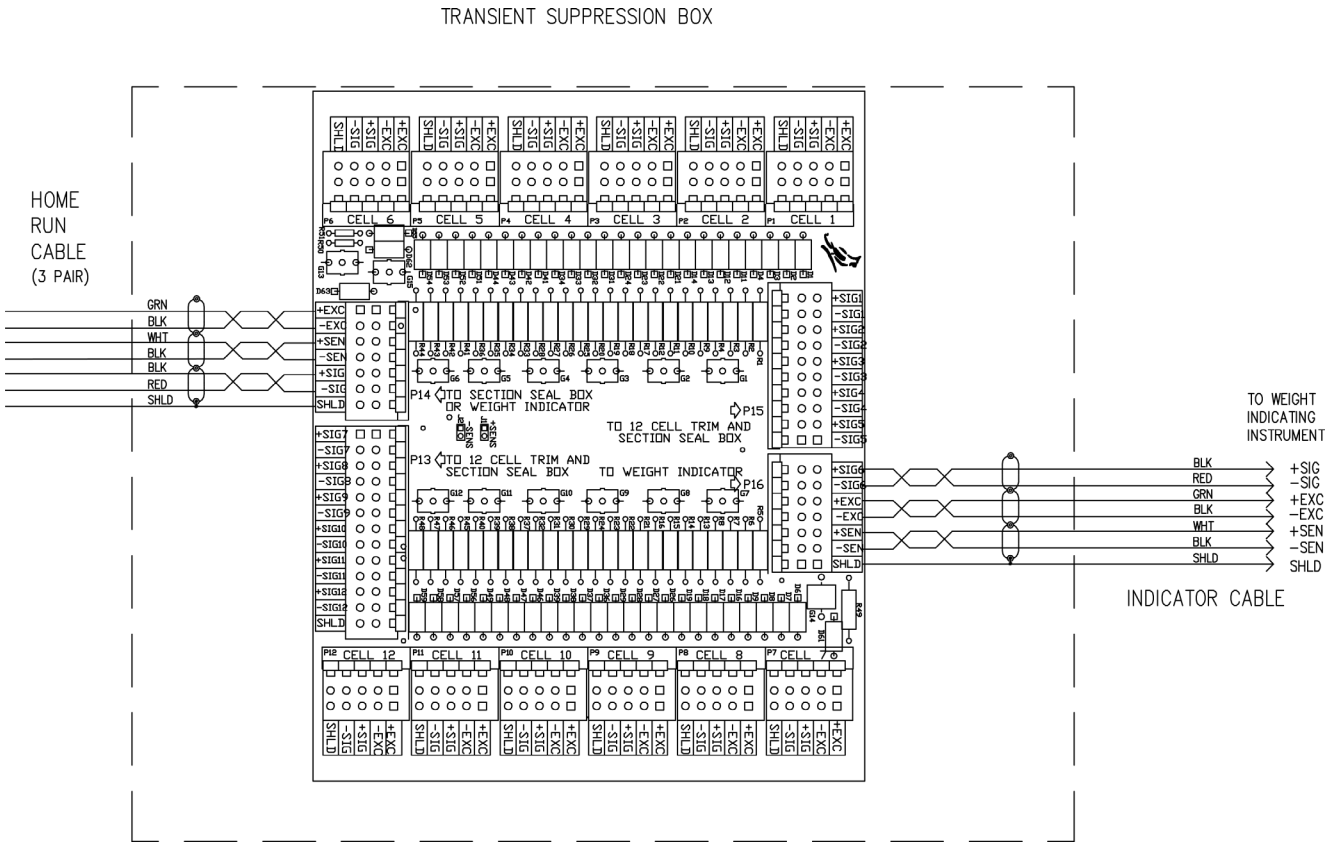
3502-D596-1A, 8 Cell Universal Section Seal Trim Box (On Scale)



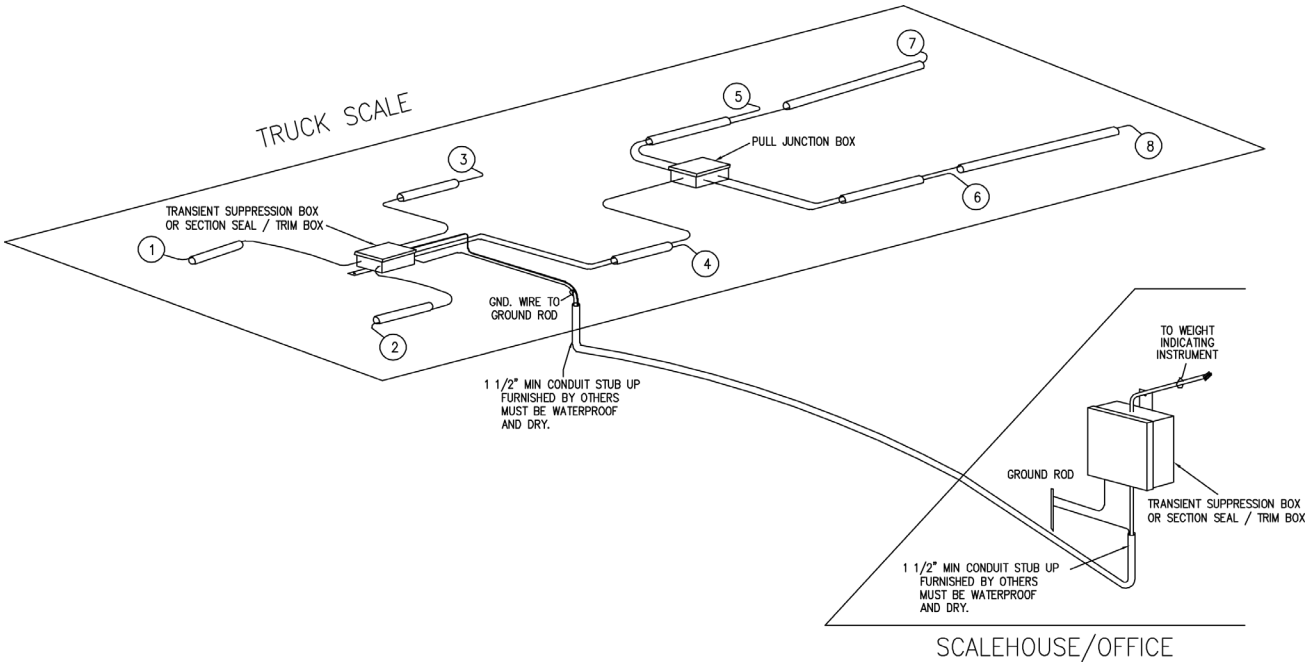
8 CELL INTERCONNECTIONS, CONT.

(CONTROLS AT SCALE)

3502-D617-1A, 8 Cell Transient Suppression Box (At Scale House)



8 CELL (WITH PULL BOX) INTERCONNECTIONS
(TYPICAL SCALE LAYOUT)



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4. When installing cables into junction box terminals, twist the stranded wire to prevent stray conductors from shorting to adjacent terminals.
5. On section seal/trim board, insert two “enable” jumpers for each scale section used. Leave jumpers disconnected on section positions not used.
6. The +SENS and –SENS jumpers must be IN on the box at the scale and OUT on the box at the scale house for proper sense operation.

Load Cell Wiring Color Code without Sense

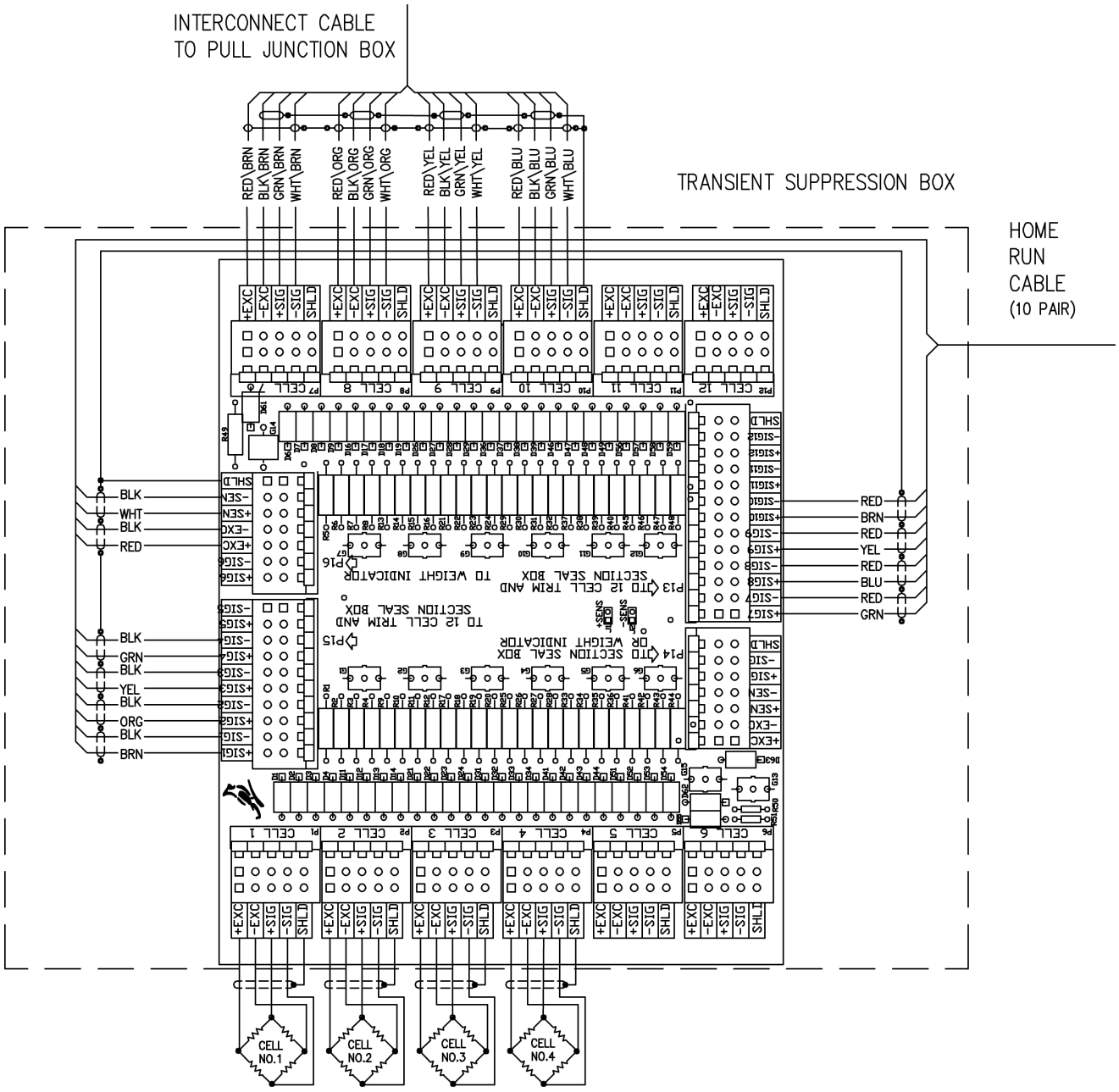
-SIG	+SIG	-EXC	+EXC	SHIELD
WHITE	RED	BLACK & YELLOW Soldered Together	GREEN & BLUE Soldered Together	Clear Heat Shrink Over Shield Wire

Load Cell Wiring Color Code with Sense

-SIG	+SIG	-EXC	+EXC	-SENSE	+SENSE	SHIELD
WHITE	RED	BLACK	GREEN	YELLOW	BLUE	Clear Heat Shrink Over Shield Wire

8 CELL (WITH PULL BOX) INTERCONNECTIONS, CONT.
(CONTROLS IN SCALE HOUSE)

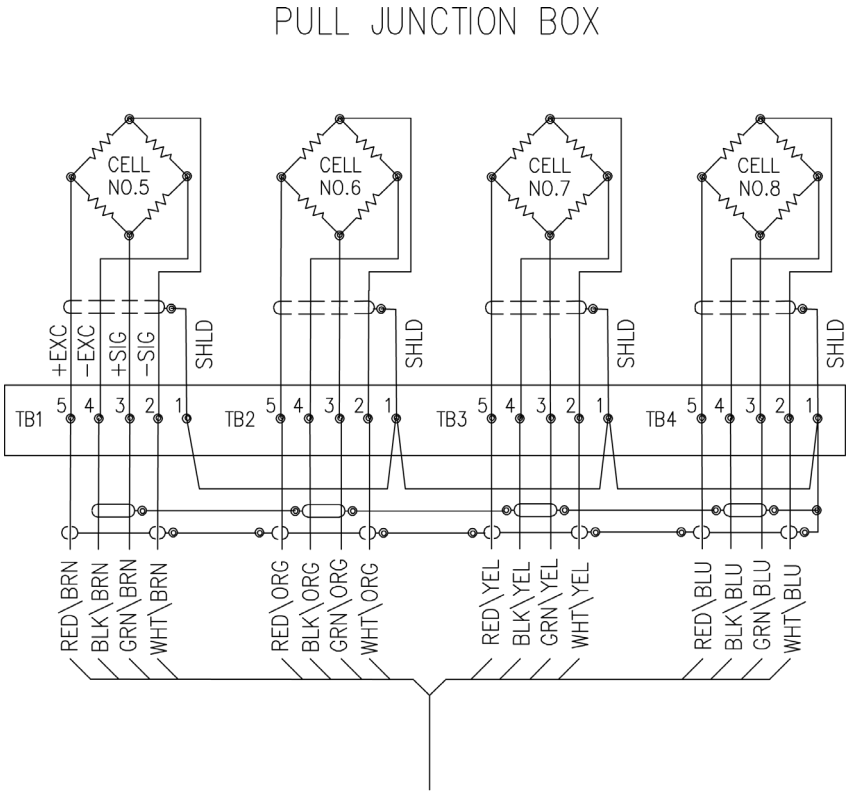
3502-D617-0A, 12 Cell Transient Suppression Box (On Scale)



8 CELL (WITH PULL BOX) INTERCONNECTIONS, CONT.

(CONTROLS IN SCALE HOUSE)

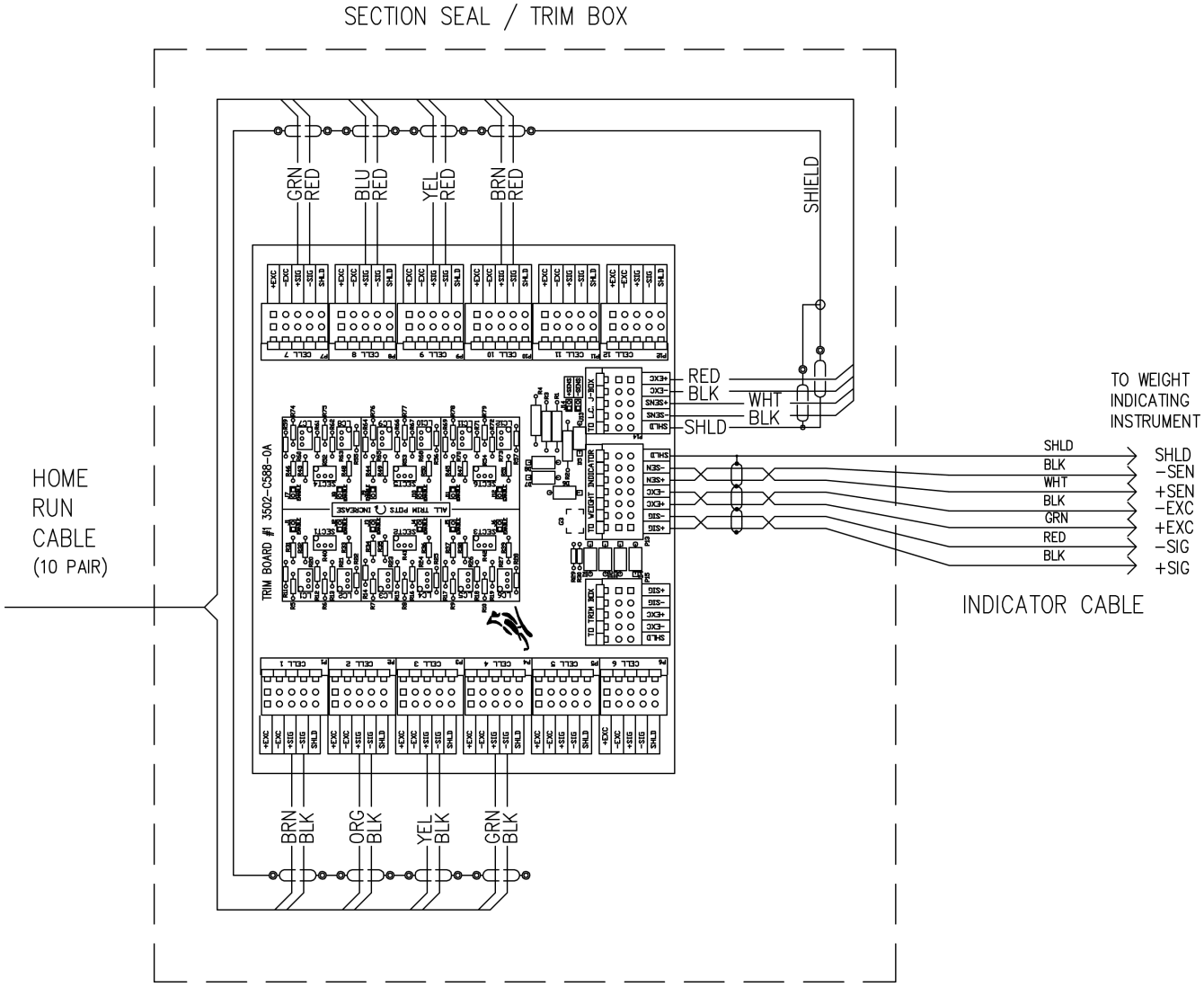
3502-D429-0A, Pull Junction Box (On Scale)



8 CELL (WITH PULL BOX) INTERCONNECTIONS, CONT.

(CONTROLS IN SCALE HOUSE)

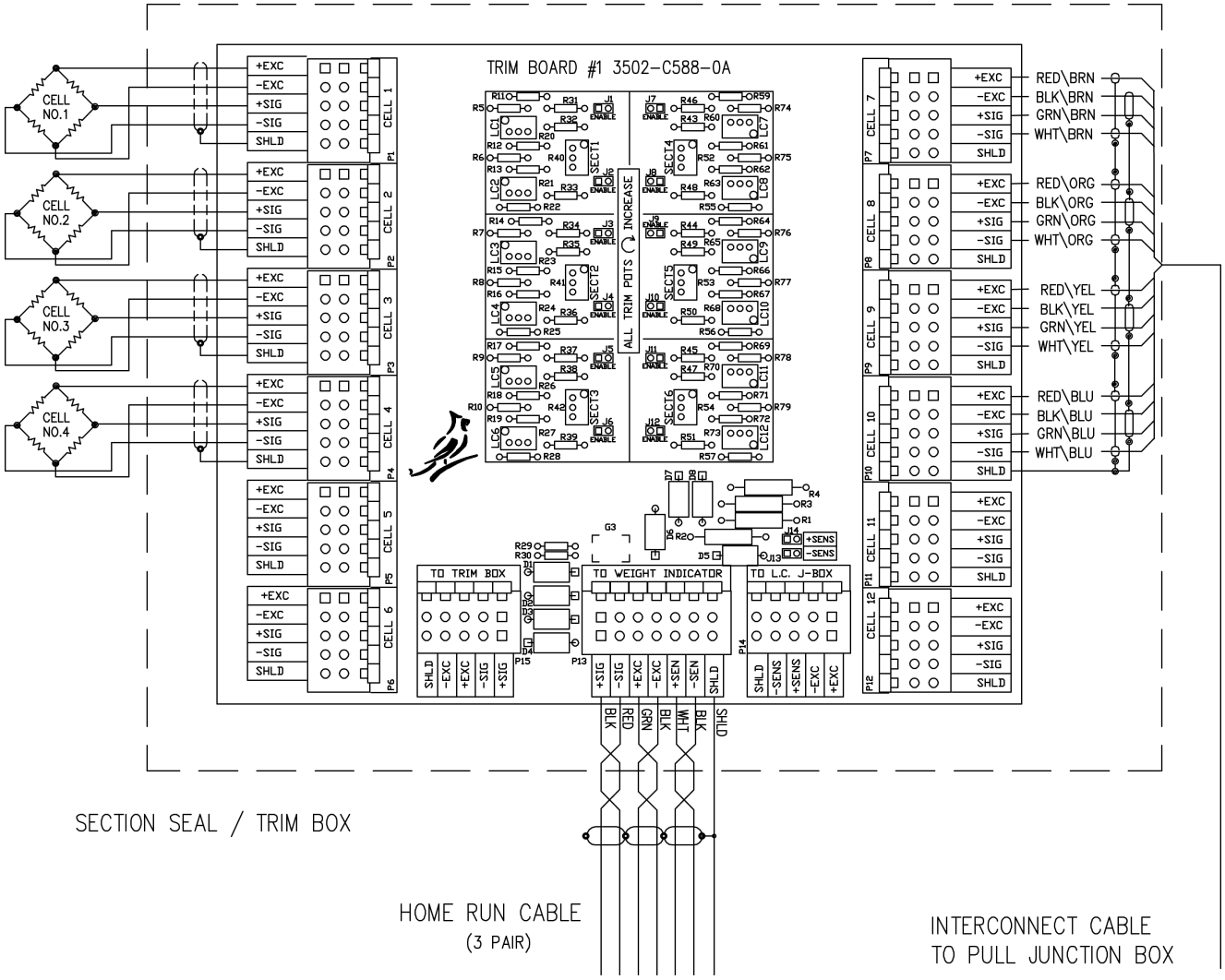
3502-D596-0A, 12 Cell Universal Section Seal Trim Box (At Scale House)



8 CELL (WITH PULL BOX) INTERCONNECTIONS, CONT.

(CONTROLS AT SCALE)

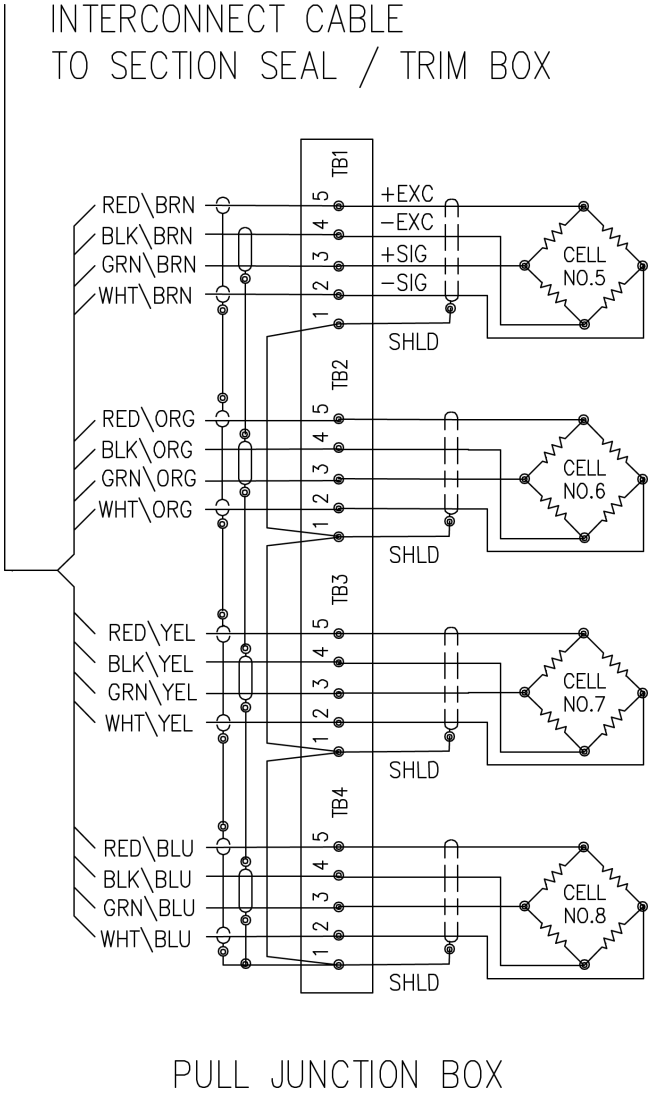
3502-D596-0A, 12 Cell Universal Section Seal Trim Box (On Scale)



8 CELL (WITH PULL BOX) INTERCONNECTIONS, CONT.

(CONTROLS AT SCALE)

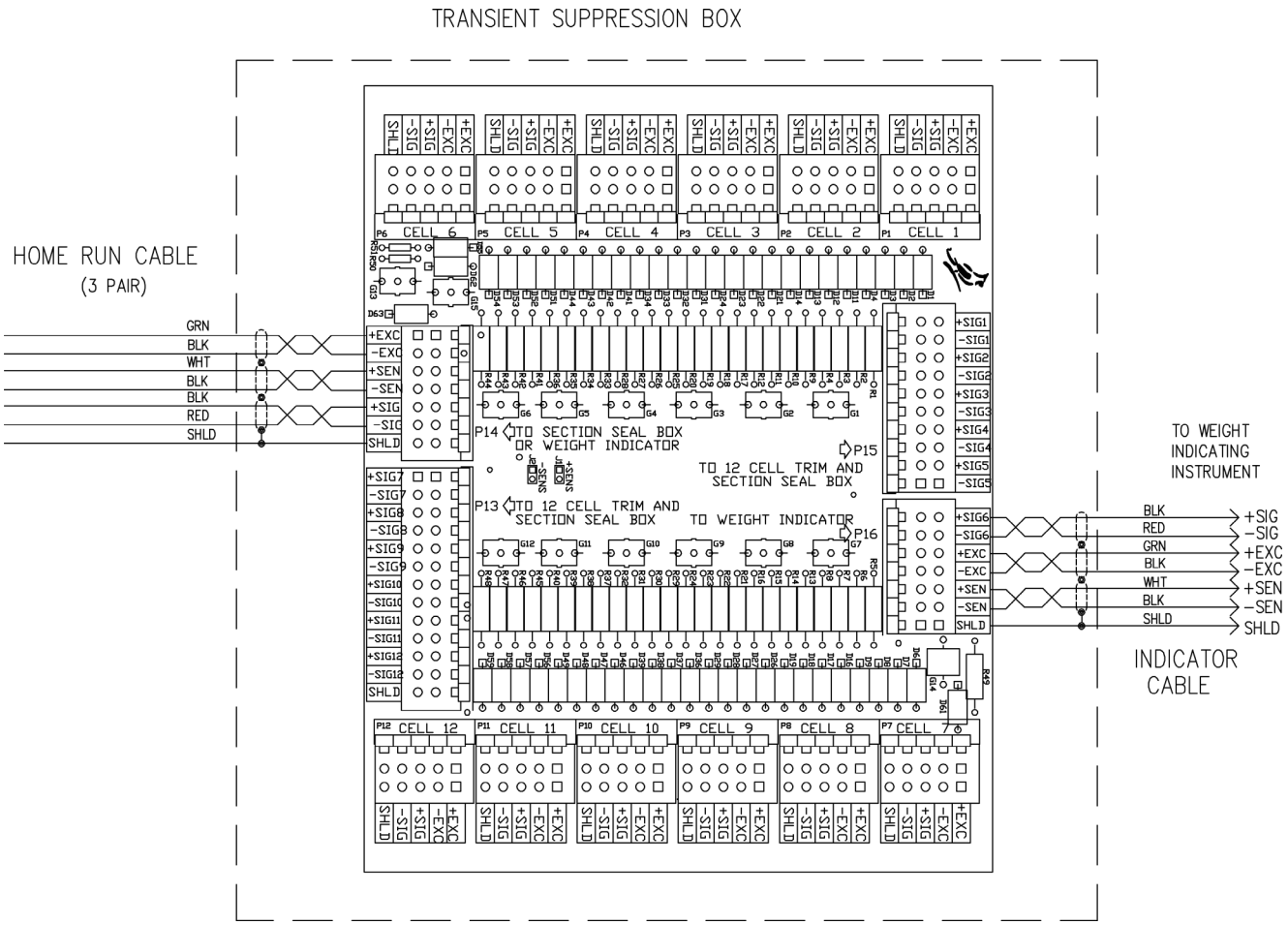
3502-D429-0A, Pull Junction Box (On Scale)



8 CELL (WITH PULL BOX) INTERCONNECTIONS, CONT.

(CONTROLS AT SCALE)

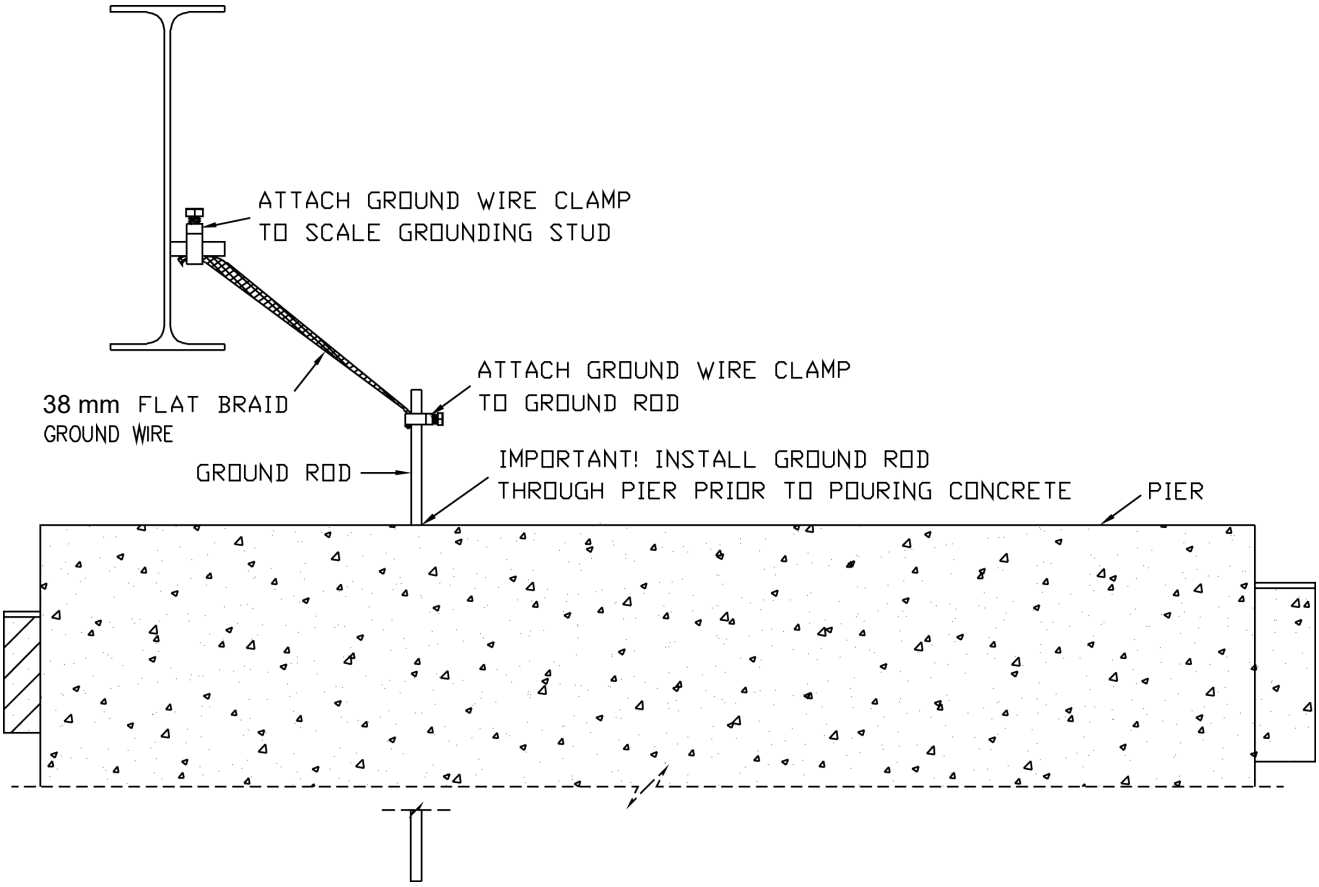
3502-D617-0A, 12 Cell Transient Suppression Box (At Scale House)



GROUNDING INSTALLATION INSTRUCTIONS

1. The ground rod shall be copper plated 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 embedded below permanent moisture level at least 2.44 m where practicable. Where rock bottom is encountered, at depth of less than 1.22 m, the ground rod shall be buried in a horizontal trench.

IMPORTANT! Install the ground rod through the pier, prior to pouring the concrete.



Grounding Installation Diagram

3. Clamp a minimum 38 mm braided cable to the ground stud on the weighbridge.
4. Clamp the braided cable to the ground rod to connect the weighbridge ground stud to the ground rod.
5. After installation of the braided cable, check for continuity between the conductive scale components and the ground rod.

PARTS IDENTIFICATION

AC-50K

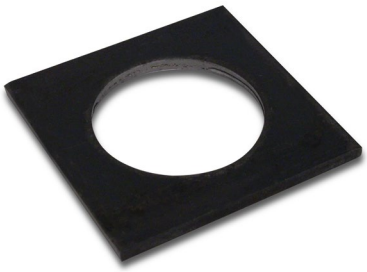
50K Stainless Steel, Compression, Load Cell

AC-100K

100K Stainless Steel, Compression, Load Cell

RC3-KIT

Two Load Cell Cups and Mounting Hardware to adapt AC Load Cell into existing RC3 installation



0146-B020-08

Load Cell Cup Retainer Plate (non-painted)

3502-D596-0A

12 Cell Universal Section Seal Trim Box

3502-D596-1A

8 Cell Universal Section Seal Trim Box

3502-D617-0A

12 Cell Transient Protection Box

3502-D617-1A

8 Cell Transient Protection Box

3502-D429-0A

Pull Junction Box

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)	LIFE	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
PSC and LSC SCALE STRUCTURES (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
IN-MOTION 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

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06/13
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315-WARRANTY-CAR-K

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 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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