0991

MONORAIL HC

Overhead Track Scale

Technical Manual

14615200A
02/95

INTRODUCTION

This publication is provided solely as a guide for individuals who have received Technical Training in servicing the Mettler Toledo product.

Information regarding Mettler Toledo Technical Training may be obtained by writing to:

METTLER TOLEDO
Training Center
1150 Dearborn Drive
Worthington, Ohio 43085-6712
(614) 438-4400

IMPORTANT!

It is most important that the correct part number is used when ordering parts. Parts orders are machine processed, using only the part number and quantity as shown on the order. Orders are not edited to determine if the part number and description agree.

METTLER TOLEDO RESERVES THE RIGHT TO MAKE REFINEMENTS OR CHANGES WITHOUT NOTICE.

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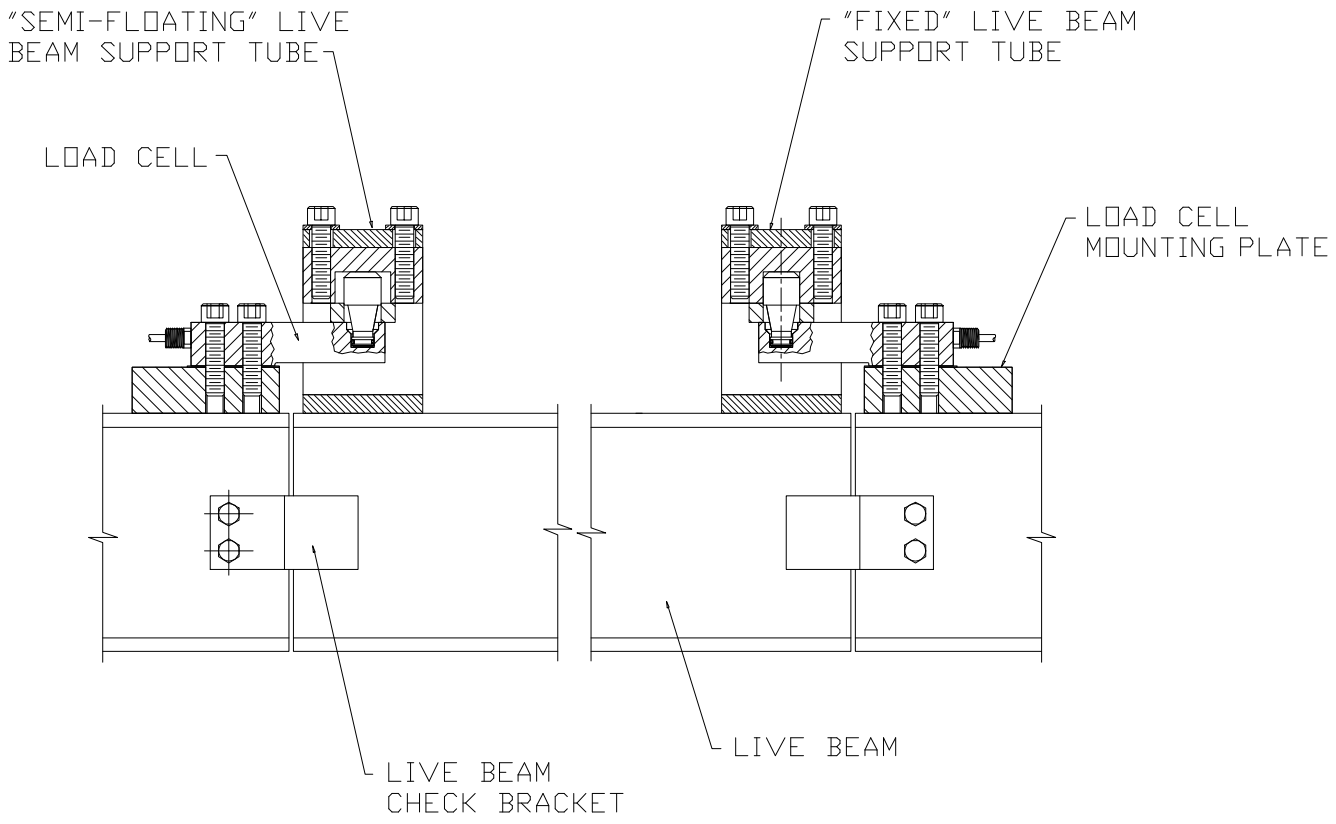
1. GENERAL DESCRIPTION

Monorail HC scales are used to turn existing overhead track systems into scales. Applications include manufacturing and assembly lines as well as overhead gantry cranes. The Monorail HC package includes two weigh module assemblies and a junction box that are incorporated into an existing section of rail**Mettler Toledo does not provide the beam or track with the Monorail HC assembly.**

The weigh modules are welded into position atop the customer's beam. A "live" section of the beam is cut-out and suspended by the weigh modules. This "live" beam is where the weighing takes place. The Monorail HC is offered in capacities ranging from 1250 lb to 10000 lb (550 kg to 4400 kg). The capacity rating is based upon the size of one weigh module load cell. **NOTE: The capacity of the rail or beam (by others) must equal or exceed the Monorail HC Scale capacity.**

Monorail HC scales are available with an Analog Junction Box or Mettler Toledo's exclusive Enhanced DigiTOL Junction Box. This feature allows the Monorail HC to be used with the entire line of Mettler Toledo Indicators and accessories.



2. MODEL / RAM NUMBERS

Ram Number	Description	Capacity	J-Box
09910011104	MS/Analog/5kd THC/ 15'/1250 lb	1250 lb	Analog
09910011105	MS/Analog/5kd THC/ 15'/2500 lb	2500 lb	Analog
09910011106	MS/Analog/5kd THC/ 15'/5000 lb	5000 lb	Analog
09910011107	MS/Analog/5kd THC/ 15'/10000 lb	10000 lb	Analog
09910021104	MS/DigiTOL/5kd THC/ 15'/1250 lb	1250 lb	DigiTOL
09910021105	MS/DigiTOL/5kd THC/ 15'/2500 lb	2500 lb	DigiTOL
09910021106	MS/DigiTOL/5kd THC/ 15'/5000 lb	5000 lb	DigiTOL
09910021107	MS/DigiTOL/5kd THC/ 15'/10000 lb	10000 lb	DigiTOL
09910012114	MS/Analog/3kd OIML THC/ 15'/550 kg	550 kg	Analog
09910012115	MS/Analog/3kd OIML THC/ 15'/1100 kg	1100 kg	Analog
09910012116	MS/Analog/3kd OIML THC/ 15'/2200 kg	2200 kg	Analog
09910012117	MS/Analog/3kd OIML THC/ 15'/4400 kg	4400 kg	Analog
09910022114	MS/DigiTOL/3kd OIML TCH/ 15'/550 kg	550 kg	DigiTOL
09910022115	MS/DigiTOL/3kd OIML TCH/ 15'/1100 kg	1100 kg	DigiTOL
09910022116	MS/DigiTOL/3kd OIML TCH/ 15'/2200 kg	2200 kg	DigiTOL
09910022117	MS/DigiTOL/3kd OIML TCH/ 15'/4400 kg	4400 kg	DigiTOL

3. SPECIFICATIONS

3.1 LOAD CELL SPECIFICATION

Rated Output: 2 mV/V **Zero Balance:** +/- .02 mV/V

Input Resistance: 385 Ohm Minimum **Output Resistance:** 350 Ohm +/- 2 Ohm

Wiring Color Code: -Excitation (Black)
+Excitation (Green)
-Signal (Red)
+Signal (White)
Shield (Yellow)

Excitation Voltage: 15 VDC or VAC rms Maximum

Accuracy: (Avouridupois Capacities) NIST H-44/Class III/5000 divisions/NTEP Certified

(Metric Capacities) OIML C3 R60/3000 divisions

Features: Hermetically Sealed Gage Cavity
1/4"-18 NPT conduit fitting at rear cable entry

3.2 POWER SUPPLY REQUIREMENTS

The Monorail HC load cells require 15 VDC maximum excitation voltage. All Mettler Toledo Digital Indicators can provide proper excitation voltage to the load cells. Mettler Toledo Indicators operate on the following line voltages: 120 VAC (+10%, -15%) at 60 Hz or 220/240 VAC (+10%, -15%) at 50/60 Hz.

The power line must not be shared with other equipment that generates line noise (motors, relays, heaters, copy machines, etc.). If adverse power conditions exist, a power line conditioner may be required.

3.3 ENVIRONMENT SPECIFICATIONS

The compensated operating temperature range is -10 to 40 degrees C (14 to 104 degrees F). Moisture exposure should be within a range from 10 to 95% relative humidity, non-condensing.

4. SHIPMENT INSPECTION

Check off all items received against the shipping documents. If any items are damaged or missing, contact the carrier immediately.

NOTE: In the shipping packet is a warranty card, fill the card out with the appropriate information and return to Mettler Toledo.

5. INSTALLATION

5.1 SAFETY CONSIDERATIONS

5.1.1 All welding is to be performed by a welder certified per AWS guidelines.

5.1.2 A secondary support system (such as a chain or wire rope) is required to support the live beam in the event of a 0991 weigh module structural failure. **NOTE: The capacity of the secondary support system must equal or exceed the Monorail HC Scale capacity.**

5.1.3 The rated capacity of the 0991 weigh module must be clearly marked on both sides of the live beam.

5.2 INSTALLATION OF WEIGH MODULES

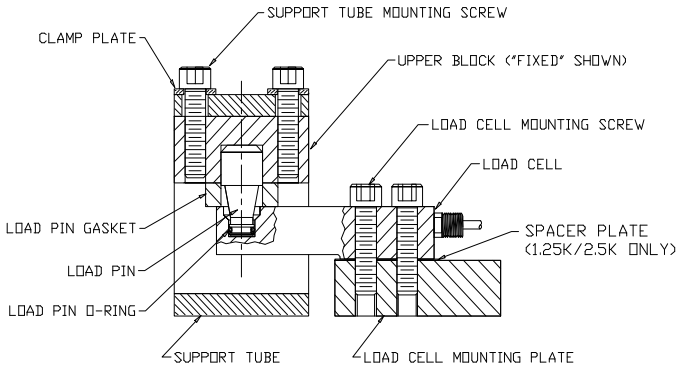
5.2.1 The Monorail HC is shipped as a kit of parts and requires field assembly. Use the following procedure along with Figure 5.1 and Section 9.0 to assemble the weigh modules:

5.2.1.1 Place a load pin with O-ring attached into each load cell. Install a load pin gasket between each load pin and cell.

5.2.1.2 Lower the upper blocks, one fixed and one semi-floating, onto the load pins. Ensure that each load pin is fully engaged into the upper block.

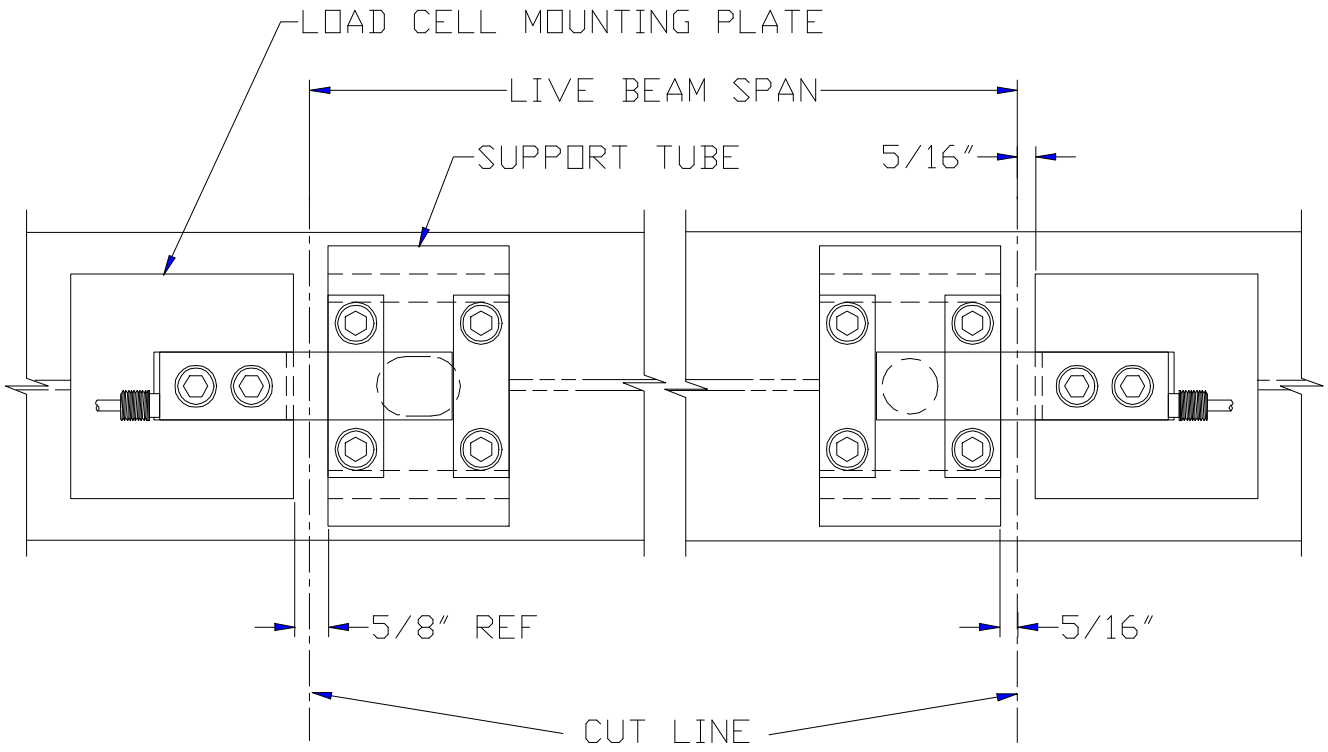
5.2.1.3 Slide a support tube over each upper block. Mount the support tubes to the blocks using the four screws and two clamping plates provided. Tighten the screws with a 3/8" hex bit socket until snug, do not torque screws at this time.

5.2.1.4 Secure each load cell, with support tube attached, to a mounting plate using the two mounting screws provided. Tighten the screws with a socket wrench until snug, do not torque at this time. 1.25K through 5K load cells require a 3/8" hex bit socket while 10K units require a 1-1/8" standard socket.



5.2.2 Place the assembled weigh modules on top of the existing I-Beam in the desired locations (See Figure 5.2).

NOTE: The span of the scale is limited by the amount of deflection in the live beam only. As a general rule, the deflection should not exceed 1/500 of the span. If this deflection is exceeded, inaccuracies may result. The resulting deflection should be calculated for your span and gross load before positioning the weigh modules.



5.2.3 Align the weigh modules both laterally and longitudinally. The alignment of the weigh modules is critical in order for the self checking feature to operate correctly without binding the load cells.

5.2.4 Tack weld the load cell mounting plate and support tube on both modules to the I-Beam **DO NOT** pass any weld current through the load cell; ground as close to the weld bead as possible. Shield the load cell from any weld splatter.

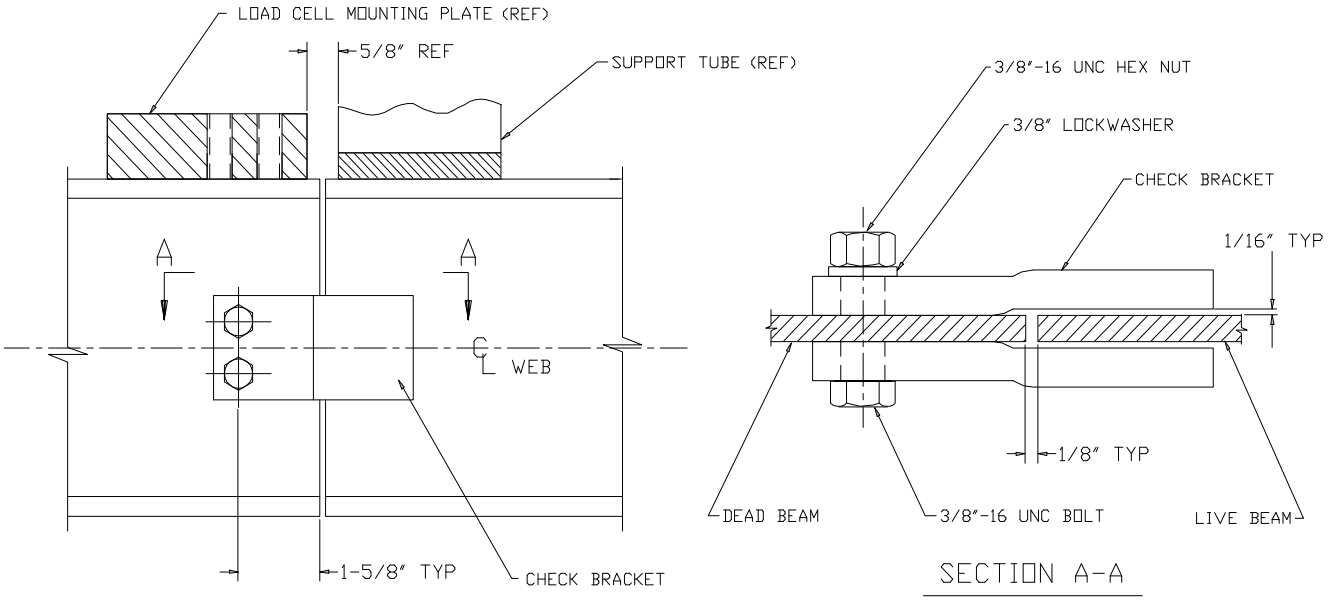
5.2.5 Unbolt and remove the load cells from the weigh module assemblies.

5.2.6 Cut the I-Beam between the mounting plates and support tubes to create the "live" beam section (See Figure 5.2).

5.2.7 After the live section has been cut out, place it back into approximate position and reinstall the load cells.

5.2.8 The gap between the live and dead beams should be _", if the clearance is less than this remove the live section and grind the ends until the proper clearance is reached.

5.2.9 Bolt the check brackets about the centerline of the dead beam web. The brackets are flared out and provide a nominal 1/16" gap on both sides of the live beam allowing it to oscillate slightly. Ensure that the brackets do not contact the live beam during weighing operations (See Figure 5.3).

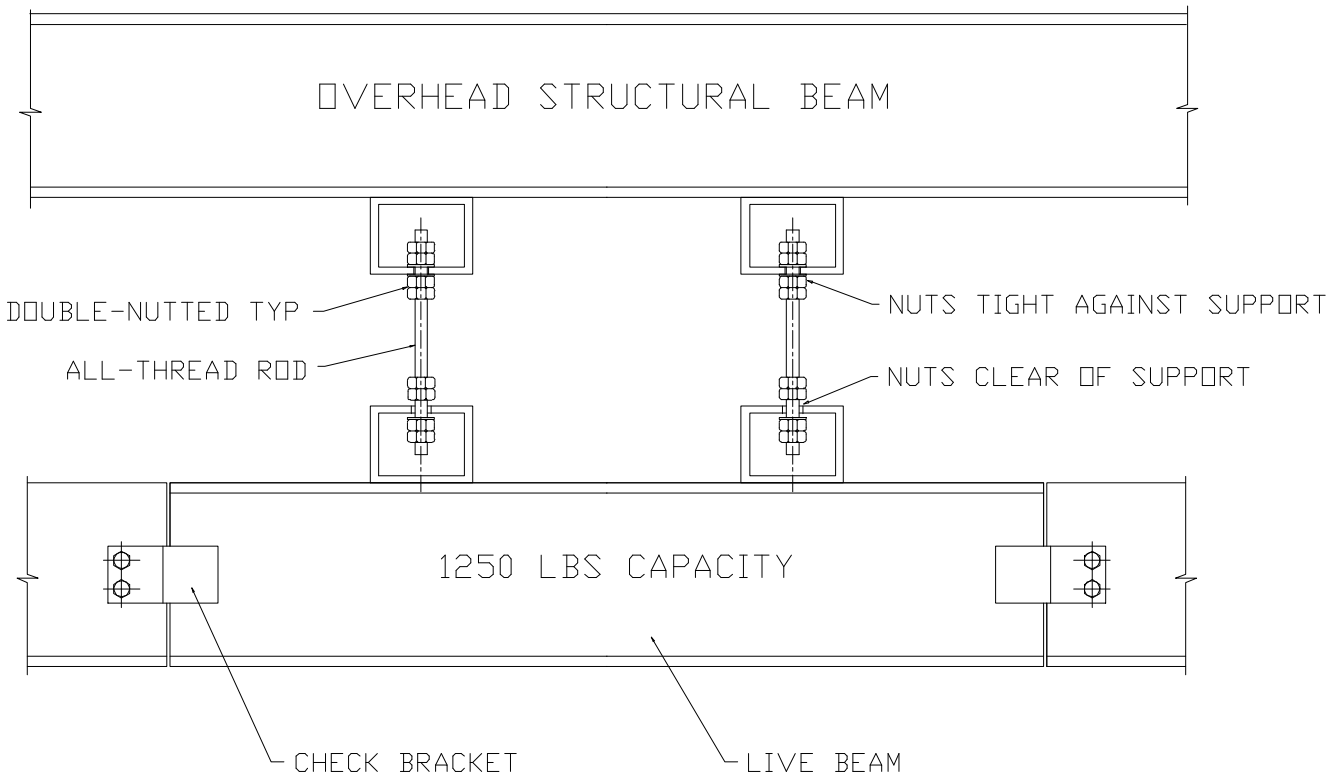


5.2.10 When you are confident the weigh modules are correctly positioned, run a continuous 1/4" fillet weld between the support tube and live beam and the load cell mounting plate and dead beam. Make sure the load cells have been removed before welding! **Use a certified welder to ensure a strong and safe weld.**

5.2.11 Install a secondary safety support system for the live beam to prevent it from falling due to a mechanical failure. This secondary support must not contact the live beam during normal weighing operations. See Figure 5.4 for an example of a safety support system

NOTE: Mettler-Toledo, Inc. is not responsible for proper specification or installation of safety support components. The capacity of the safety support system must equal or exceed the Monorail HC scale capacity.

5.2.12When all welding is complete, reinstall the load cells and clearly mark the scale capacity on both sides of the live beam (capacity of one weigh module load cell).

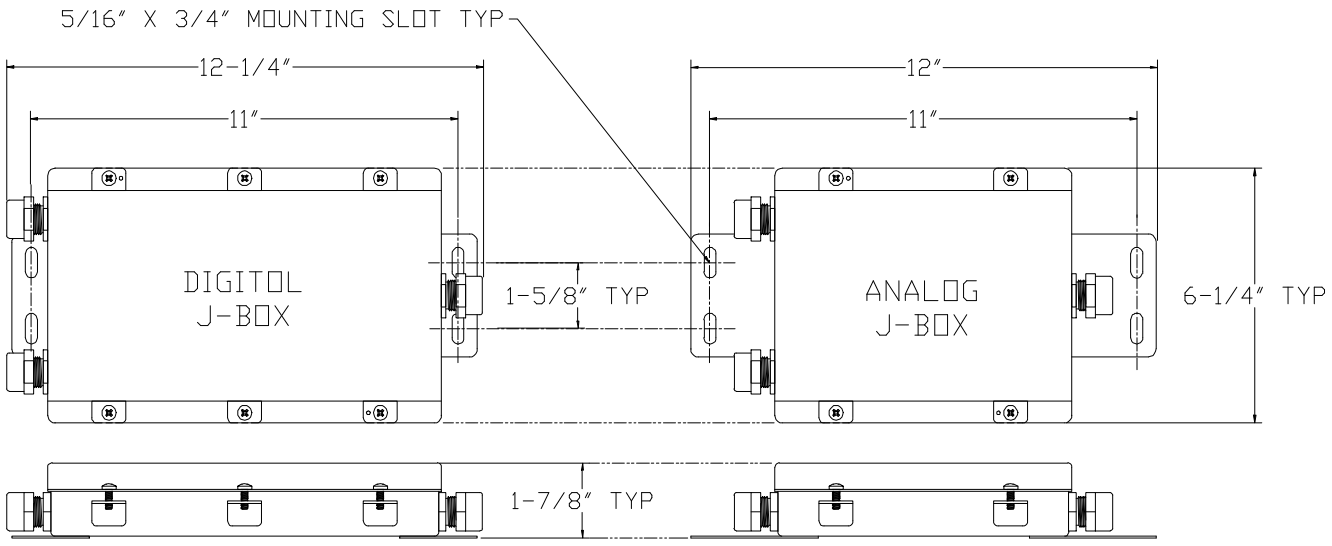


5.2.13 Torque all the mounting screws and bolts using a calibrated torque wrench. Torque each mounting screw per the following:

1.25K - 5K (550 kg - 2200 kg) load cell mounting screws:**100 ft-lb**
10K (4400 kg) load cell mounting screws: **200 ft-lb**
Support tube mounting screws: **100 ft-lb**
Live beam check bracket bolts: **40 ft-lb**

5.2.14 Mount the junction box in a location between both load cells. Four slots are provided on the j-box enclosure for 1/4" screws (See Figure 5.5). **DO NOT attach the junction box to the "live" beam.** Wire the weigh module load cells to the designated terminal strips (See Appendix A2). Trim potentiometers are provided with the analog junction box for fine trimming the load cell ouputs. Refer to the appropriate DigiTOL Indicator manual for adjusting load cells attached to an Enhanced DigiTOL Junction Box.

NOTE: 1.25K through 5K Monorail HC Weigh Modules come with 15 foot of load cell cable standard. 10K Weigh Modules have 30 foot load cell cables. Ensure that the junction box is located within reach of both weigh module load cell cables.



6. CALIBRATION

The scale should be calibrated using test weights which are traceable to the National Institute of Standards and Technology. Proceed with the calibration according to the appropriate indicator manual.

6.2 ANALOG JUNCTION BOX

A weight equal to a minimum of 20% capacity should be applied to the scale using hangers of the type which are to be used to convey product across the scale. Before proceeding with calibration, remove the cover from the junction box and turn the load cell trim potentiometers fully clockwise. Refer to A2 in Appendix for wiring details.

Apply power to the indicator and calibrate the scale. Span the scale by placing the weight in the center of the live rail. After calibration is completed, place the test weight alternately at each end of the scale. Note each of these readings. Place the weight over the end which records the highest reading and turn the potentiometer associated with this load cell counter- clockwise until the readings agree.

Repeat this procedure until the readings at both ends of the scale are equal.

Recheck the calibration. If the span is off, adjust the span using the appropriate indicator calibration procedure.

Place a dessicant in the junction box and reinstall the cover.

6.3 ENHANCED DIGITOL JUNCTION BOX

Calibration with the Enhanced DigiTOL Junction Box follows the Analog Junction Box Section 6.2 with the exception of load cell trimming/shift adjust. There are no trim pots in the DigiTOL junction box. Differences in load cell output are corrected by software in the junction box itself (Smart Mode/8505) or by the attached DigiTOL Indicator (DLC Mode). Refer to A4 in Appendix for Model 8505 Indicator wiring and A3 for all other DigiTOL Indicators.

Another feature of the Enhanced DigiTOL Junction Box is the ability to look at the raw count data from each individual load cell. After calibration is complete, record the raw count values from each load cell for future reference.

Follow the set-up and calibration procedures for the specific DigiTOL Indicator used at each installation site.

7. ROUTINE CARE AND MAINTENANCE

7.1 GENERAL

Once the scale is installed, it is recommended that the assembly be periodically inspected and calibrated. If the scale is used for legal-for-trade purposes, consult the local Weights and Measures Officials for minimum inspection requirements. Contact your authorized Mettler Toledo Representative for information on periodic inspection and calibration services.

7.2 SCALE INSPECTION

Use the following list as a guide during periodic scale inspections.

- Is the live beam properly aligned with the dead beam at both approach and exit ends?
- Is there clearance between the live beam and check brackets?
- Check the torque on all mounting bolts (See Section 5.2.13).
- Are the secondary safety support devices in proper working order and clear of the live beam?
- Is the junction box lid properly sealed and all cable connectors tight against the enclosure?
- Is there any moisture or foreign material present in or around the junction box assembly?
- Are the load cell and instrument cables free from damage?
- Perform shift adjustments and final calibration per the appropriate Mettler Toledo Indicator manual.

7.3 LOAD CELL REPLACEMENT PROCEDURE

7.3.1 Ensure that the live beam is empty.

7.3.2 Jack-up the live beam slightly to take weight off the load cell. Support the live beam to prevent it from falling during load cell removal.

WARNING!
SAFELY SUPPORT THE LIVE BEAM DURING THE LOAD CELL REPLACMENT PROCESS. FAILURE TO DO SO MAY RESULT IN BODILY INJURY.

7.3.3 Disconnect the load cell cable at the junction box terminal strip. Loosen the box connector and pull the load cell cable out of the box.

7.3.4 Remove the load cell and support tube mounting screws. Be sure to retain the screws, clamping plates, and load cell spacer (1.25K-2.5K/550kg-1100kg only).

7.3.5 Pull the load cell with upper block still attached to one side until the support tube is cleared. Remove the upper block and load pin from the load cell. Inspect the load pin and O-ring for any signs of wear or damage. Lay the load pin and upper block aside and retrieve the replacement cell.

7.3.6 Install the load pin and upper block onto the replacement load cell.

7.3.7 Slide the assembly into position and reinstall all mounting hardware. Be sure to install support tube clamping plates as well as the load cell spacer if required.

7.3.8 Retorque all mounting screws per Section 5.2.13.

7.3.9 Terminate the replacement load cell cable in the junction box. Be sure to retighten the box connector around the load cell cable.

7.3.10 Lower the live beam onto the load cell. Make sure the load pin is properly engaged between the load cell and upper block and that the live beam has freedom of movement.

7.3.11 Recheck calibration and shift adjust with a certified test weight. Make any adjustments required. If an Enhanced DigiTOL Junction Box is used, record the load cell raw counts before leaving the site.

8. TROUBLESHOOTING

8.1 ISOLATE THE PROBLEM

CAUTION!

ALWAYS REMOVE POWER AND WAIT AT LEAST THIRTY (30) SECONDS BEFORE CONNECTING OR DISCONNECTING ANY ELECTRONIC OR INTERCONNECTING WIRING BETWEEN ELECTRONIC EQUIPMENT. FAILURE TO OBSERVE THESE PRECAUTIONS COULD RESULT IN DAMAGE TO OR DESTRUCTION OF THE EQUIPMENT.

First, determine if the problem is in the scale or in the digital indicator.After removing power, disconnect the digital indicator from the Monorail HC. Connect a load cell simulator to the indicator (**NOTE:** If using an Enhanced DigiTOL Junction Box a "DigiTOL" load cell simulator must be used). Reapply power. If the problem still exists, consult the appropriate indicator manual for further troubleshooting information.

8.2 CHECK WIRING

8.2.1 Remove power from the system. Remove the lid from the junction box and check the interior for moisture or any foreign material.

8.2.2 Ensure that all wiring connections on the PCB are tight and that no insulation material is touching the terminal contacts. Check all cable connections for correct wiring (See Appendix).

8.2.3 Check all cable connectors on the junction box. Tighten any that are loose.

8.2.4 Make sure a working dessicant is placed inside the junction box before reinstalling the lid.

8.3 CHECK LOAD CELLS

8.3.1 Check each load cell for proper input and output resistances (See Section 3.1).

8.3.2 If the input and output resistances are within specification, perform a "shorted signal" symmetry check. Short the signal wires together and place one multimeter lead on the shorted signal wires and one lead on the + excitation wire. Record the indicated resistance value. Next, remove the lead from + excitation wire and place it on the - excitation wire. Both resistance values should be equal within 10 ohms.

8.3.3 If the cells pass the above tests, reapply power to the scale. Confirm that proper excitation voltage is reaching the load cells by placing the multimeter leads across + excitation and - excitation at each load cell terminal. If an analog junction box is used the voltage will range from 5 VDC to 15 VDC depending on the attached indicator. If an Enhanced DigiTOL Junction Box is used the excitation voltage should be approxmately 4 VDC at each load cell terminal.

8.3.4 If proper excitation voltage is reaching the load cells, check the output signal form each cell. If one cell has a particularly high or low dead-load output it is suspect. The maximum output possible from any one load cell is 30 millivolts at 15 VDC excitation voltage at rated capacity.

8.3.5 If either load cell has an unusual signal level, remove all load from the suspect cell by jacking up the live beam. With the power still on, measure the "no load" signal ouput. The "no load" or zero balance output should be within + or - 1% of the full scale output at rated capacity. In other words, if the excitation voltage is 15 VDC then the zero balance reading should be within + or - 1% of 30 millivolts or + or - 0.3 millivolts. Replace the load cell if the zero balance is significantly out of specification.

8.3.6 If a load cell fails any of the above tests, replace it per Section 7.3 of this manual.

8.4 CHECK FOR MECHANICAL/ENVIRONMENTAL INFLUENCES

8.4.1 Make sure that the live beam is not binding and is in proper alignment with the dead beam at approach and exit ends. Check for a gap between the check brackets and the live beam.

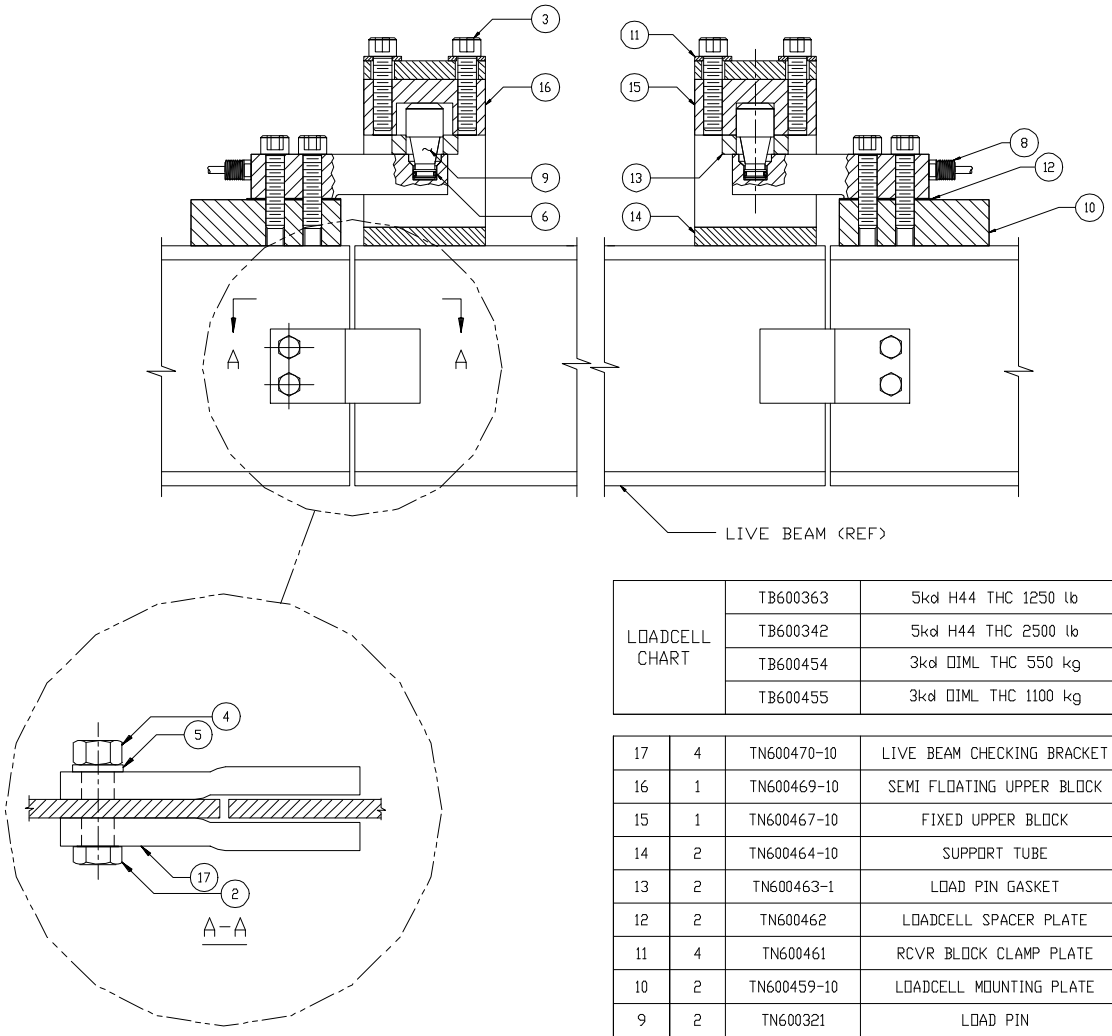
8.4.2 Inspect the load pins for excessive or off-center wear. Check the load pin O-rings for damage.

8.4.3 Make sure that all mounting screws and bolts are properly torqued (See Section 5.2.13).

8.4.4 Exposure to wind gusts, vibration, or temperature extremes may also contribute to weighing errors. Indicator filtering may lessen the effects of wind and vibration but adverse conditions should be avoided if possible.

9. PARTS

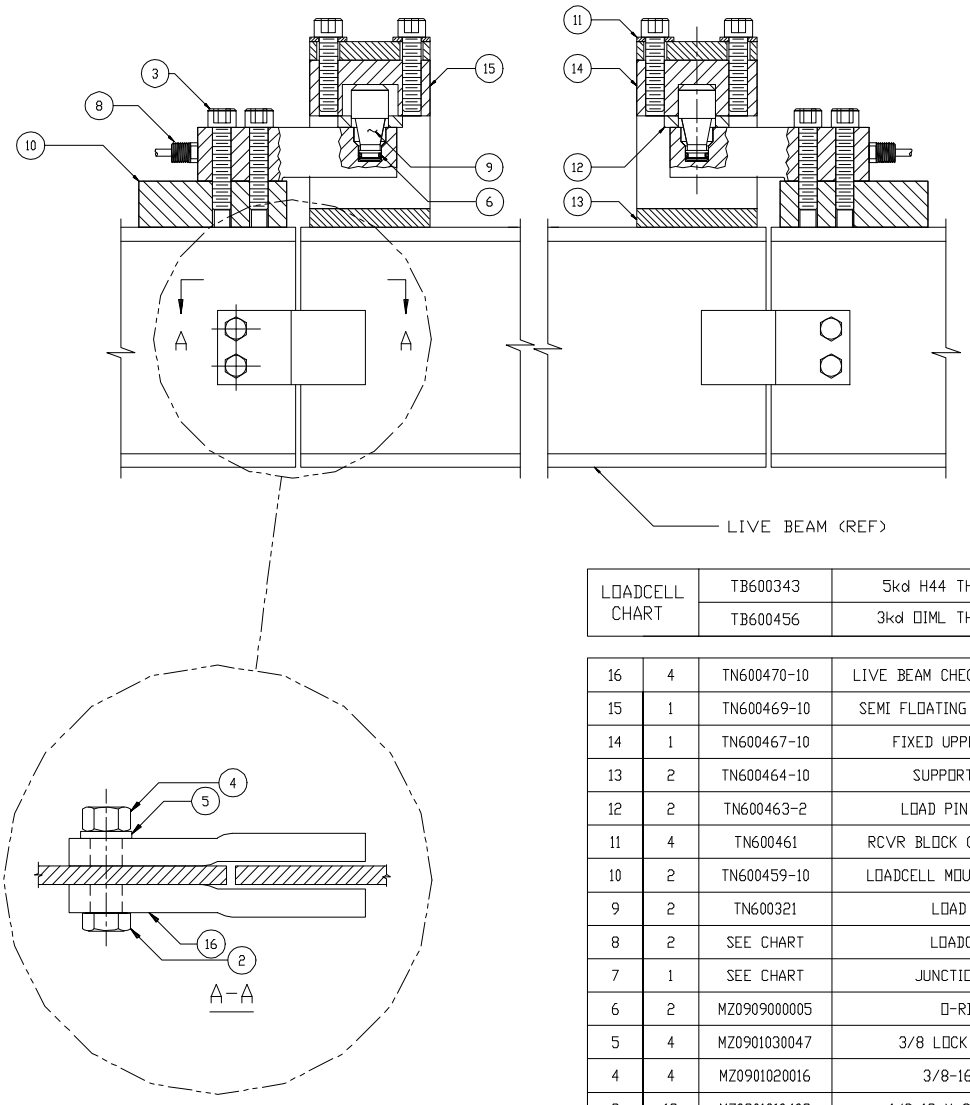
9.1 MONORAIL HC ASSEMBLY 1.25K (550 kg) - 2.5K (1100 kg)



LOADCELL CHART		
TB600363	5kd H44 THC 1250 lb	
TB600342	5kd H44 THC 2500 lb	
TB600454	3kd OIML THC 550 kg	
TB600455	3kd OIML THC 1100 kg	

ITEM	QTY	PART NUMBER	DESCRIPTION
17	4	TN600470-10	LIVE BEAM CHECKING BRACKET
16	1	TN600469-10	SEMI FLOATING UPPER BLOCK
15	1	TN600467-10	FIXED UPPER BLOCK
14	2	TN600464-10	SUPPORT TUBE
13	2	TN600463-1	LOAD PIN GASKET
12	2	TN600462	LOADCELL SPACER PLATE
11	4	TN600461	RCVR BLOCK CLAMP PLATE
10	2	TN600459-10	LOADCELL MOUNTING PLATE
9	2	TN600321	LOAD PIN
8	2	SEE CHART	LOADCELL
7	1	SEE CHART	JUNCTION BOX (NOT SHOWN)
6	2	MZ0909000005	O-RING
5	4	MZ0901030047	3/8 LOCK WASHER
4	4	MZ0901020016	3/8-16 NUT
3	12	MZ0901010409	1/2-13 X 2 LG SHCS
2	4	MZ0901010076	3/8-16x1-1/4 HHCS
1	1	MN31004	DATA PLATE (NOT SHOWN)

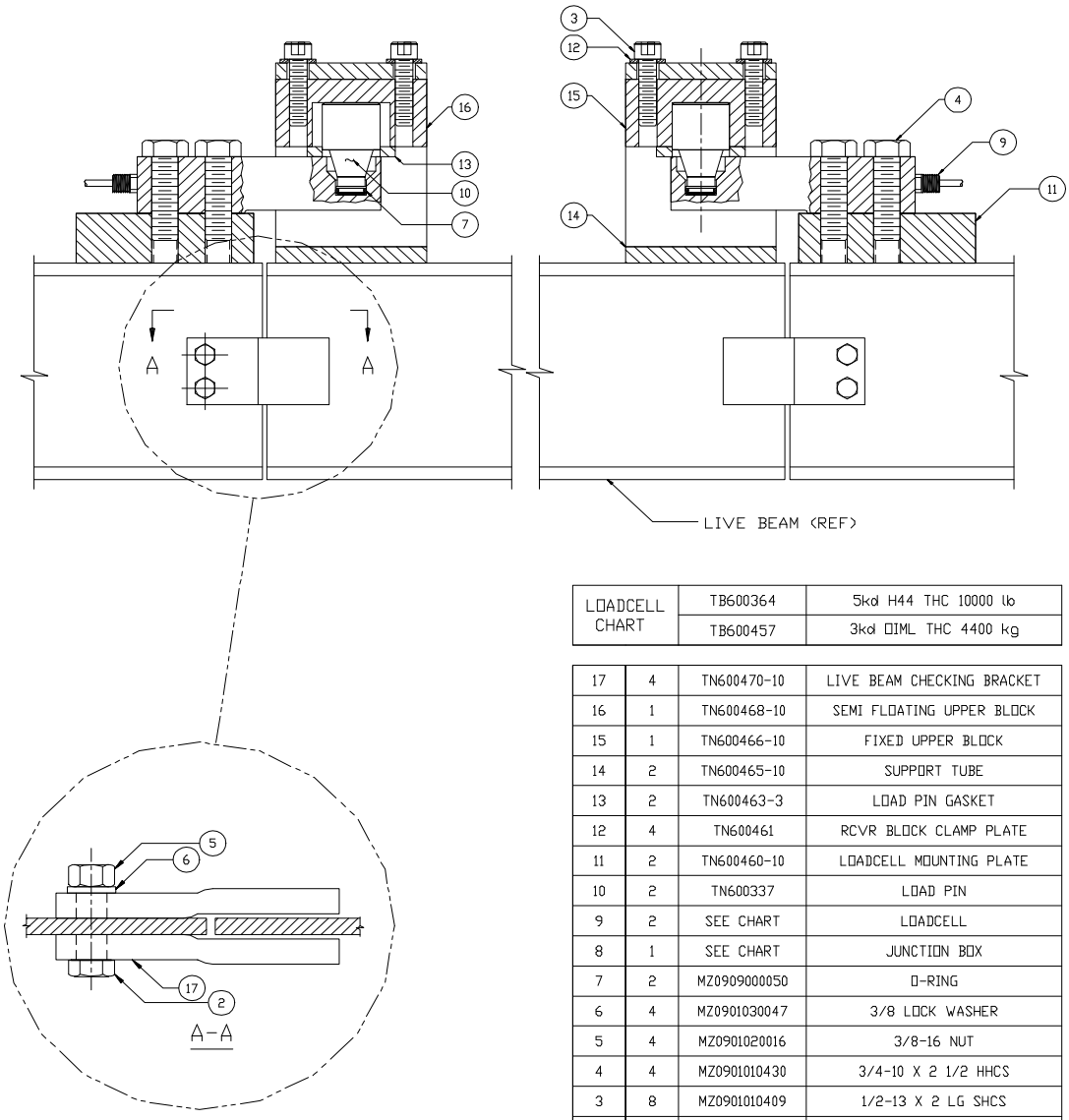
9.2 MONORAIL HC ASSEMBLY 5K (2200 kg)



LOADCELL CHART	TB600343	5kd H44 THC 5000 lb
	TB600456	3kd OIML THC 2200 kg

ITEM	QTY	PART NUMBER	DESCRIPTION
16	4	TN600470-10	LIVE BEAM CHECKING BRACKET
15	1	TN600469-10	SEMI FLOATING UPPER BLOCK
14	1	TN600467-10	FIXED UPPER BLOCK
13	2	TN600464-10	SUPPORT TUBE
12	2	TN600463-2	LOAD PIN GASKET
11	4	TN600461	RCVR BLOCK CLAMP PLATE
10	2	TN600459-10	LOADCELL MOUNTING PLATE
9	2	TN600321	LOAD PIN
8	2	SEE CHART	LOADCELL
7	1	SEE CHART	JUNCTION BOX
6	2	MZ0909000005	O-RING
5	4	MZ0901030047	3/8 LOCK WASHER
4	4	MZ0901020016	3/8-16 NUT
3	12	MZ0901010409	1/2-13 X 2 LG SHCS
2	4	MZ0901010076	3/8-16x1-1/4 HHCS
1	1	MN31004	DATA PLATE

9.3 MONORAIL HC ASSEMBLY 10K (4400 kg)



LOADCELL CHART	TB600364	5kd H44 THC 10000 lb
	TB600457	3kd OIML THC 4400 kg

ITEM	QTY	PART NUMBER	DESCRIPTION
17	4	TN600470-10	LIVE BEAM CHECKING BRACKET
16	1	TN600468-10	SEMI FLOATING UPPER BLOCK
15	1	TN600466-10	FIXED UPPER BLOCK
14	2	TN600465-10	SUPPORT TUBE
13	2	TN600463-3	LOAD PIN GASKET
12	4	TN600461	RCVR BLOCK CLAMP PLATE
11	2	TN600460-10	LOADCELL MOUNTING PLATE
10	2	TN600337	LOAD PIN
9	2	SEE CHART	LOADCELL
8	1	SEE CHART	JUNCTION BOX
7	2	MZ0909000050	O-RING
6	4	MZ0901030047	3/8 LOCK WASHER
5	4	MZ0901020016	3/8-16 NUT
4	4	MZ0901010430	3/4-10 X 2 1/2 HHCS
3	8	MZ0901010409	1/2-13 X 2 LG SHCS
2	4	MZ0901010076	3/8-16x1-1/4 HHCS
1	1	MN31004	DATA PLATE

9.4 JUNCTION BOX ASSEMBLIES

9.4.1 Analog Junction Box Assembly: TB100395

Analog PCB Only: *X13640300A

9.4.2 Enhanced DigiTOL Junction Box Assembly: TB100515-3

Enhanced DigiTOL PCB Only: *X13839900A

9.4.3 Common Junction Box Parts:

Dessicant Bag: TA800218

Cord Grip Bushing Kit: TN100429

3/8" Cord Grip: TN100430

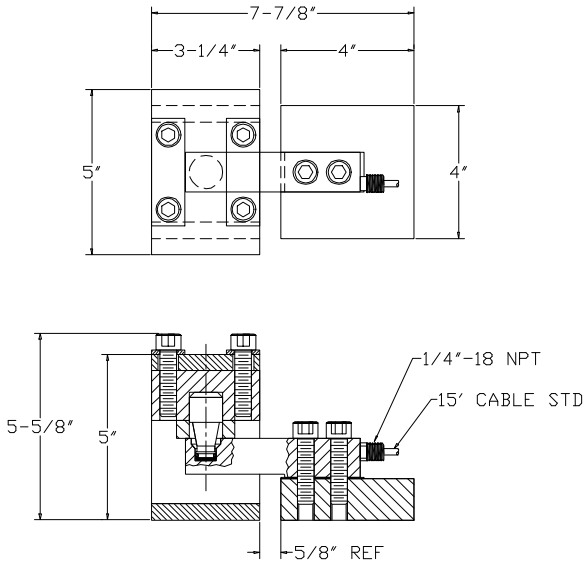
3/8"-18 NPT Locknut: TN100432

*Part number may have a letter prefix

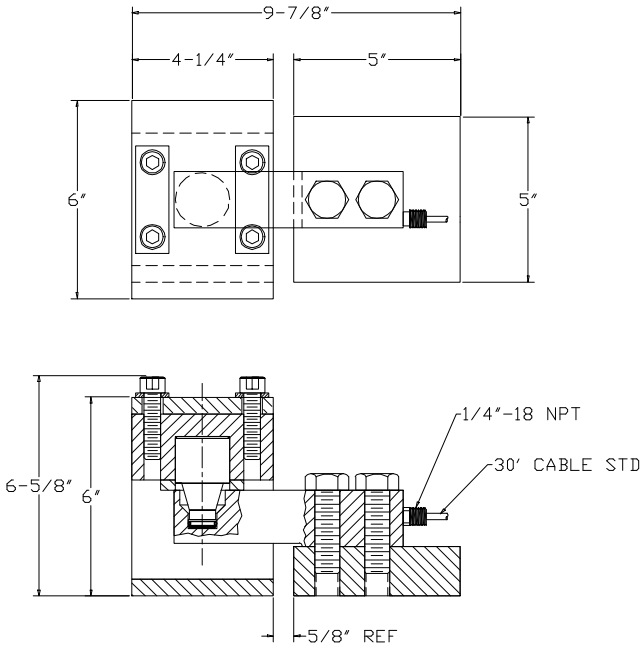
APPENDIX

A1 OUTLINE DIMENSIONS

OUTLINE DIMENSIONS



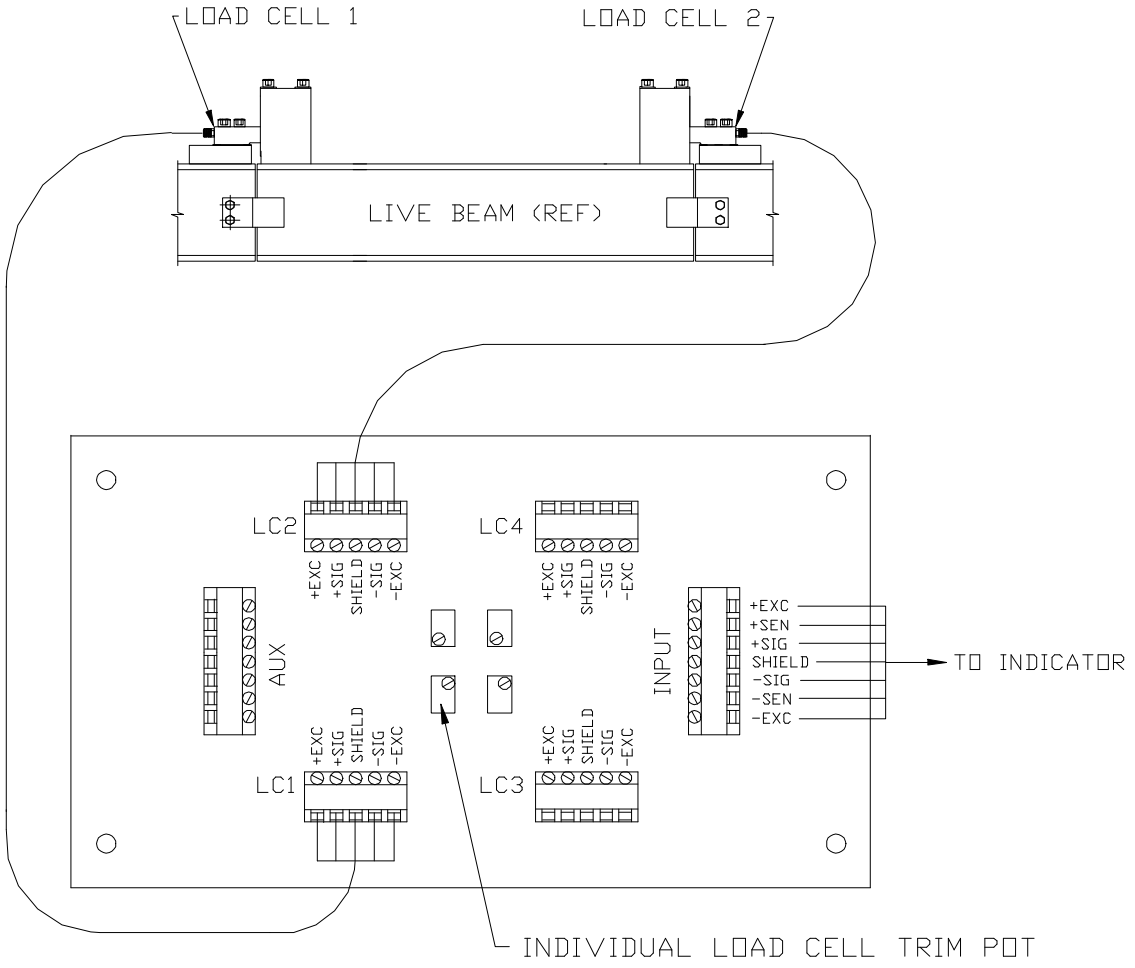
1.25K - 5K (550kg - 2200 kg)



10K (4400 kg)

NOTE: "FIXED" MODULES ARE SHOWN. THE "SEMI-FLOATING" MODULES HAVE THE SAME DIMENSIONS.

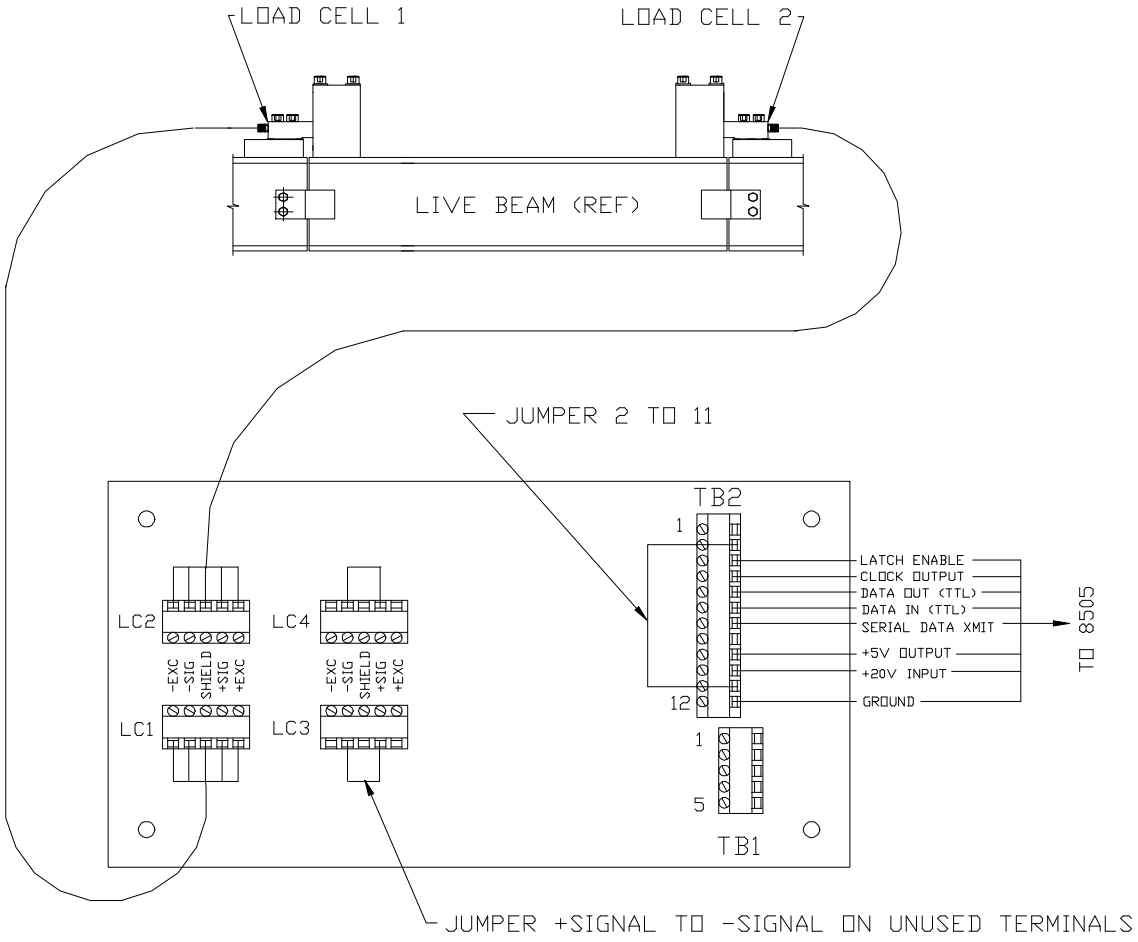
A2 ANALOG JUNCTION BOX WIRING DETAILS



LOAD CELL WIRING	
+EXCITATION	GREEN
+SENSE	NOT USED
+SIGNAL	WHITE
SHIELD	YELLOW
-SIGNAL	RED
-SENSE	NOT USED
-EXCITATION	BLACK

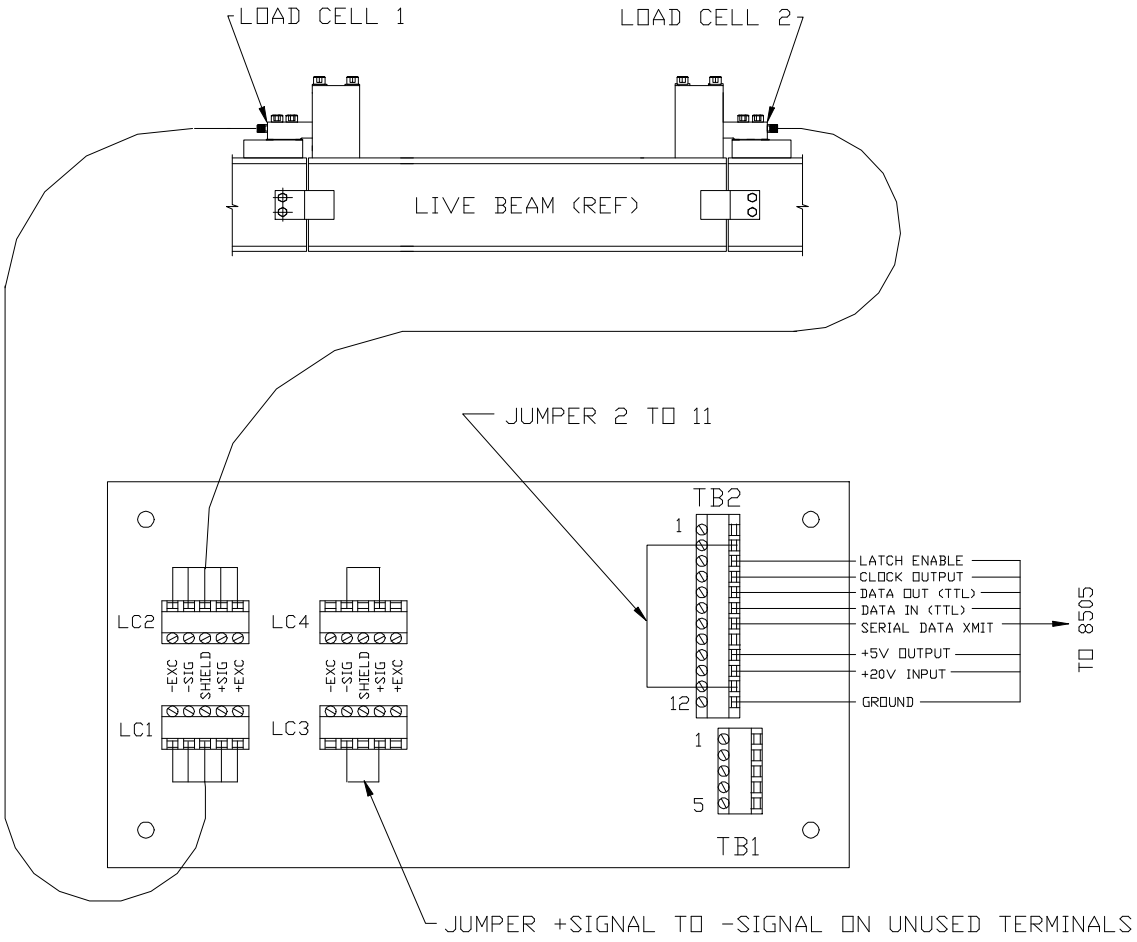
INDICATOR WIRING	
+EXCITATION	WHITE
+SENSE	YELLOW
+SIGNAL	GREEN
SHIELD	ORANGE
-SIGNAL	BLACK
-SENSE	RED
-EXCITATION	BLUE

A3 DigiTOL JUNCTION BOX WIRING DETAILS (DLC MODE)



TERMINAL NO.	POSITION	FUNCTION	WIRE COLOR
TB2	10	+20 VDC	GREEN
TB2	12	GROUND	BLUE
TB1	1	SHIELD	ORANGE
TB1	2	RXD A	RED
TB1	3	RXD B	WHITE
TB1	4	TXD B	YELLOW
TB1	5	TXD A	BLACK

A4 DigiTOL JUNCTION BOX WIRING DETAILS (SMART MODE)



TB2 TERMINAL NO.	FUNCTION	WIRE COLOR
3	LATCH ENABLE	ORANGE
4	CLOCK OUTPUT	BLUE
5	DATA OUT (TTL)	BROWN
6	DATA IN (TTL)	VIOLET
7	SERIAL DATA TRANSMIT	RED
9	+5 VDC OUTPUT	YELLOW
10	+20 VDC INPUT	BLACK
12	GROUND	GREEN

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