2158 Analog
2160 DigiTOL®
2162 IDNet

Vertex® Floor Scales

Service Manual

A14691400A
(11/96)

Declaration of conformity
Konformitätserklärung
Déclaration de conformité
Declaración de Conformidad
Verklaring de overeenstemming
Dichiarazione di conformitá

We/Wir/Nous/WIJ/Noi: **Mettler-Toledo, Inc.**
1150 Dearborn Drive
Worthington, Ohio 43085
USA

declare under our sole responsibility that the product,
erklären, in alleiniger Verantwortung, daß dieses Produkt,
déclarons sous notre seule responsabilité que le produit,
declaramos, bajo nuestra sola responsabilidad, que el producto,
verklaren onder onze verantwoordelijkheid, dat het product,
dichiariamo sotto nostra unica responsabilitá, che il prodotto,

Type: Analog Load Cells

Models: 744 and 745 **(when used within the technical requirements listed in Test certificate TC2154 and installed as a Load receptor as listed in Type approval certificate T2206, Table 4.)**

to which this declaration relates is in conformity with the following standard(s) or other normative document(s).
auf das sich diese Erklärung bezieht, mitder/den folgenden Norm(en) oder Richtlinie(n) übereinstimmt.
Auquel se réfère cette déclaration est conforme à la (aux) norme(s) ou au(x) document(s) normatif(s).
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Waarnaar deze verklaring verwijst, aan de volende norm(en) of richtlijn(en) beantwoordt.
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CE Conformity / CE-Konformität / Conformité CE
90/384/EU Nonautomatic Balances and Scales / Nichteselbsttätige Waagen / Balances à Functionnement non automatique
Article 1.2.a.

Other Directives and Standards / Andere Richtlinien und Normen / Autres documents
corresponding to local requirements / entsprechend lokalen Anforderungen / correspondant aux exigences locales

R60	OIML International Recommendation , Metrological regulation for load cells
EEx ib IIC T4	el. Safety / el. Sicherheit / s , curit , el. (PTB Nr. Ex-95.D.2051)

Darrell Flocken, Manager - Weights & Measures
Office of Weights and Measures
Worthington, Ohio USA
September, 1996

METTLER TOLEDO

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Publication Name: _____

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PROBLEM(S) TYPE:	DESCRIBE PROBLEM(S):	INTERNAL USE ONLY
☐ **Technical Accuracy**	☐ **Text** ☐ **Illustration**	
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Your Name: _____ **Location:** _____

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PROPRIETARY NOTICE

STANDARD WARRANTY

2158, 2160, and 2162 VERTEX® Scales

Mettler Toledo warrants that the equipment covered by this warranty will be free from defects in workmanship and materials for a period of two years from date of installation or twenty six (26) months from date of shipment to the buyer, whichever comes first.

Should any such defects be found and reported during the first thirty (30) days after installation (if installation occurs during the warranty period), Mettler Toledo (herein referred to as the "Company"), will, at its option, refund the purchase price or correct such defects furnishing replacements parts and service free of charge to the buyer. For the remainder of the first 12 months of the warranty term, the Company will furnish necessary replacement parts and on site technician's service free of charge, provided the Buyer agrees to pay reasonable technician's travel time, vehicle mileage, and associated travel expenses to and from the nearest authorized Company service location. For last 12 months or remaining balance of the warranty period, whichever comes first, the Company will furnish the necessary replacement parts to the Buyer free of charge provided that the Buyer agrees to pay reasonable technician's on site labor services, travel time, mileage and expenses to and from the nearest authorized Company service location. The following are NOT covered under any of these warranties:

1) Initial installation and ongoing scale calibration.
2) Damage to scale components by gross abuse, fire, flooding, explosion, water, voltage surges, or civil disturbance.
3) Normal maintenance or consumable items.

This warranty covers only the Models 2158, 2160, and 2162 VERTEX® floor scale understructure. Refer to Mettler Toledo Standard Product Warranty for coverage of other scale system components including scale instrument, printer, and/or other accessories.

THE COMPANY EXPRESSLY WARRANTS THE EQUIPMENT MANUFACTURED BY IT AS SET FORTH HEREIN. THE COMPANY MAKES NO OTHER WARRANTIES EITHER EXPRESSED OR IMPLIED (INCLUDING WITHOUT LIMITATION WARRANTIES AS TO MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE). IN ADDITION, THIS DOCUMENT SHALL CONSTITUTE THE SOLE AND EXCLUSIVE REMEDIES OF THE BUYER FOR ANY BREACH BY THE COMPANY OF ITS WARRANTIES HEREIN.

COMPANY LIABILITY UNDER THIS WARRANTY OR ANOTHER WARRANTY WHETHER EXPRESSED OR IMPLIED IN LAW OR FACT SHALL BE LIMITED TO THE REPAIR OR REPLACEMENT OF DEFECTIVE MATERIAL AND WORKMANSHIP, AND IN NO EVENT SHALL IT BE LIABLE FOR CONSEQUENTIAL OR INDIRECT DAMAGES.

This warranty coverage is only applicable to the United States of America. Consult Mettler Toledo for Export Warranty Terms and Conditions.

APPLICATION GUIDES

The only warranty of Mettler Toledo is for the product it supplies under the Product Warranty Statement listed above. Weighing application guidelines pertain to Mettler Toledo products.

INTRODUCTION

This publication is provided as a guide for the trained technician for installing, calibrating, and servicing the 2158, 2160, and 2162 VERTEX®. Repair or adjustment by unauthorized persons voids the METTLER TOLEDO® warranty.

Information regarding your nearest METTLER TOLEDO Distributor, Sales, and Service location, please contact:

METTLER TOLEDO
6600 Huntley Road
Columbus, Ohio 43229-1012
ph: (614) 841-7300

Information regarding METTLER TOLEDO Technical Training may be obtained by writing, calling, or faxing to:

METTLER TOLEDO
1150 Dearborn Drive
Worthington, Ohio 43085-6712
ph: (614) 438-4400
fax: (614) 438-4444

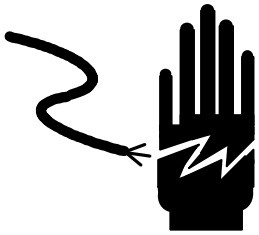
WARNING!

This equipment generates, uses, and can radiate radio frequency energy and if not installed and used properly, i.e., in accordance with the instructions manual, may cause harmful 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 is likely to cause interference which case the user at his own expense will be required to take whatever measures may be required to correct the interference.

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

PRECAUTIONS

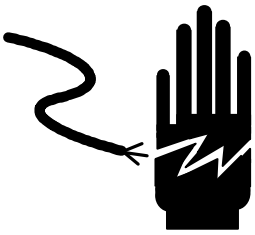
READ this manual BEFORE installing, operating, or servicing this equipment.



WARNING

ONLY PERMIT QUALIFIED PERSONNEL TO SERVICE THIS EQUIPMENT. EXERCISE CARE WHEN MAKING CHECKS, TESTS AND ADJUSTMENTS THAT MUST BE MADE WITH POWER ON. FAILING TO OBSERVE THESE PRECAUTIONS CAN RESULT IN BODILY HARM.

FOLLOW these instructions carefully.

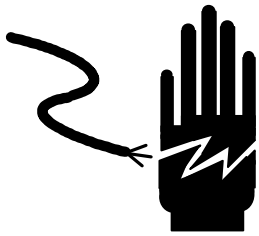


WARNING

FOR CONTINUED PROTECTION AGAINST SHOCK HAZARD CONNECT TO PROPERLY GROUNDED OUTLET ONLY.

DO NOT REMOVE THE GROUND PRONG.

SAVE this manual for future reference.



WARNING

DISCONNECT ALL POWER TO THIS UNIT BEFORE REMOVING THE FUSE OR SERVICING.

DO NOT allow untrained personnel to operate, clean, inspect, maintain, service, or tamper with this equipment.

CAUTION

BEFORE CONNECTING/DISCONNECTING ANY INTERNAL ELECTRONIC COMPONENTS OR INTERCONNECTING WIRING BETWEEN ELECTRONIC EQUIPMENT ALWAYS REMOVE POWER AND WAIT AT LEAST THIRTY (30) SECONDS BEFORE ANY CONNECTIONS OR DISCONNECTIONS ARE MADE. FAILURE TO OBSERVE THESE PRECAUTIONS COULD RESULT IN DAMAGE TO OR DESTRUCTION OF THE EQUIPMENT OR BODILY HARM.

ALWAYS DISCONNECT this equipment from the power source before cleaning or performing maintenance.

CAUTION

OBSERVE PRECAUTIONS FOR HANDLING ELECTROSTATIC SENSITIVE DEVICES.

CALL METTLER TOLEDO for parts, information, and service.

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1 Specifications

Power Supply Requirements

Load cell power supply is provided by the Mettler Toledo Digital Indicator.

Accuracy

Models 2158, and 2160 Vertex floor scales meet or exceed the National Institute of Standards and Technology (NIST) Handbook 44 requirements for Class III scales. Standard Vertex scales meet 5000 division accuracy, a certificate of conformance, No. 91-097 (2158), and 94-010 (2160) were issued under the National Type Evaluation Program (NTEP) of the National Conference of Weights and Measures. The Model 2162 Vertex floor scale has not been submitted for approval.

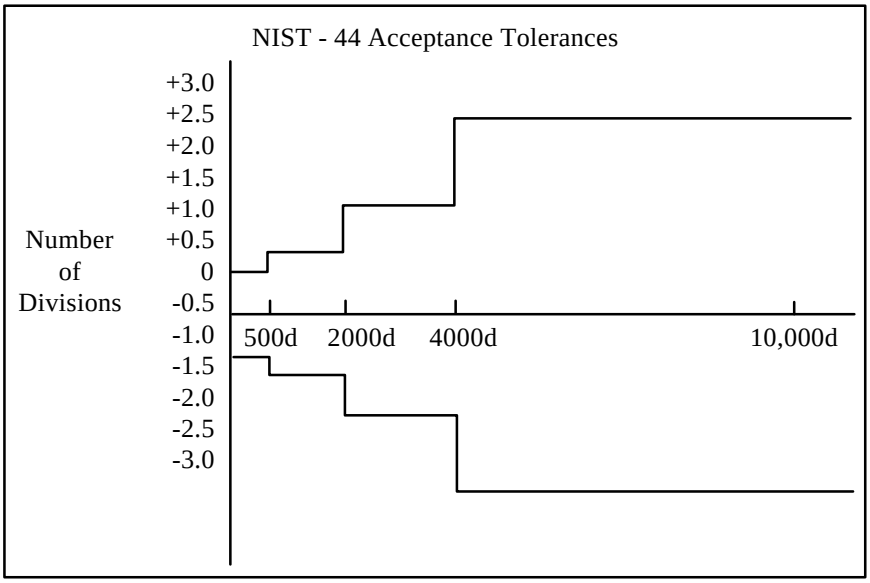


Figure 1-a: Class III Weighing Tolerances

Applied Weight	Allowable Error
0 - 500 Divisions	± 1/2 Division
501 - 2000 Divisions	± 1 Division
2001 - 4000 Divisions	± 1-1/2 Divisions
4001 - 10,000 Divisions	± 2-1/2 Divisions

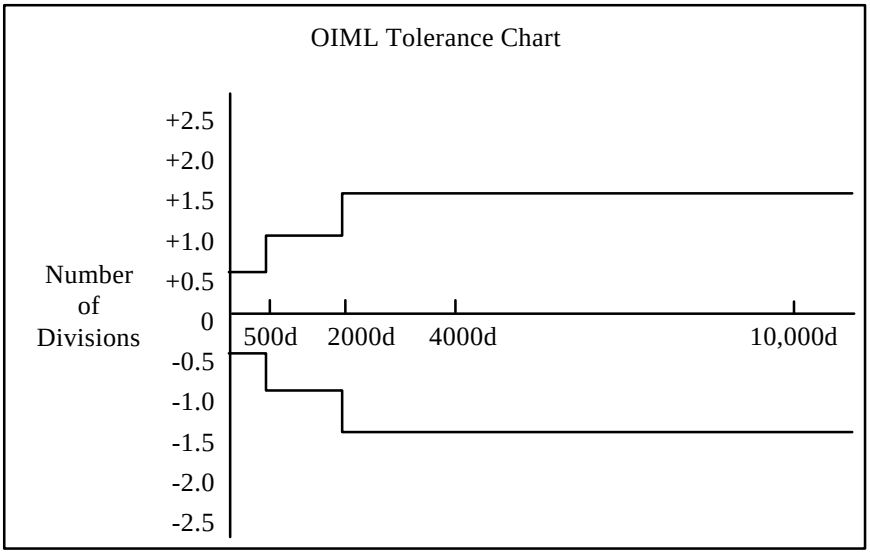


Figure 1-b: OIML Weighing Tolerances (Model 2158 only)

Applied Weight	Allowable Error
0 - 500 Divisions	± 1/2 Division
501 - 2000 Divisions	± 1 Division
2001 - 10000 Divisions	± 1-1/2 Divisions

Load Cells

Stainless steel cantilever beam load cells are provided in all 2158, 2160, and 2162 Vertex floor scales with integral 4-conductor, shielded, color coded cable (See note). All load cells 2,500 lb and less have a built-in overload stop to prevent damage due to accidental overloads. The load cell suspension utilizes a rocker pin inserted between the cell and a fixed receiver in the frame (see Figure 1-c). Individual load cell capacities used in the Models 2158, 2160, and 2162 include:

Note: Scales 4' x 6' and smaller use 7.5' long cables. Scales larger than 4' x 6' and all 20k capacity scales use 15' long cables. Do Not mix cables of different lengths within a platform.

Scale Platform Capacity (lb)	Capacity of Each Load Cell (lb)	Minimum Approved Graduation Size (lb)
1000	500	0.2
2500	1250	0.5
5000	2500	1.0
10000	5000	2.0
20000	10000	5.0

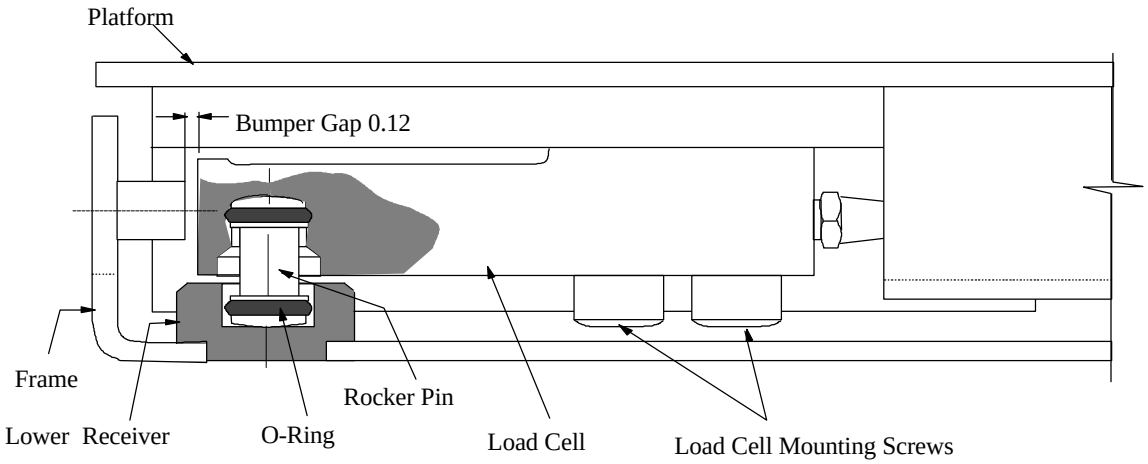


Figure 1-c: Load Cell/ Suspension Details

End Loading

Models 2158, 2160, and 2162 may be loaded up to 100% of the platform's full rated capacity or two times the individual load cell rating (whichever is less) across any end of the scale.

Platform Assembly

Vertex scales utilize a single channel reinforced platform design with removable plate to access the junction box assembly. Standard mild steel units have a safety tread plate deck surface. Stainless steel scales utilize a platform structure very similar to the mild steel unit. Standard stainless steel units have a smooth deck surface with a glass bead blast finish. Threaded holes are provided in all platform structures for lifting eyebolts to ease platform installation and removal.

Support Frames

"Standard" Above-Floor Frame

Standard Vertex platforms utilize a formed angle frame with all sides turned under the scale for a fully captured assembly (see Figure 1-d). Vertex scales are primarily used for top-of-floor installations and can be used with optional ramps with access to all four sides of the scale. In addition, optional scale guards can be mounted around the perimeter of the standard frame to provide protection in high-traffic areas. Standard Vertex frames may be used for in-floor applications, however, a Quick-Pit frame is recommended.

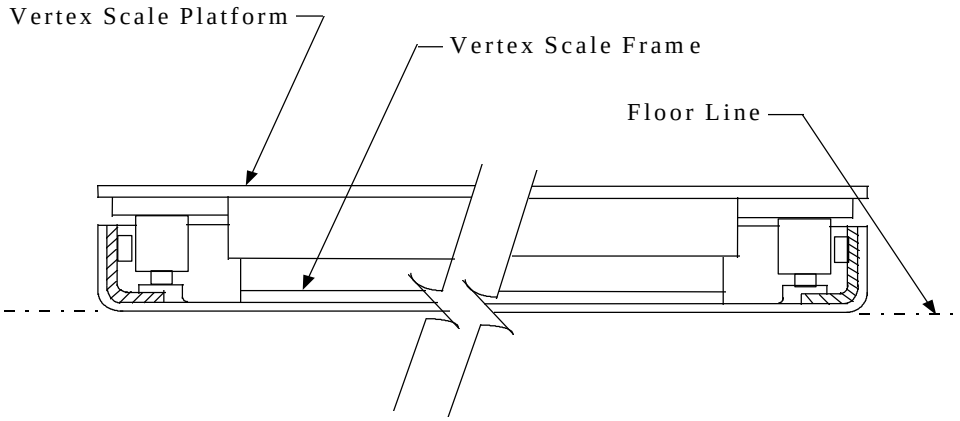


Figure 1-d: Vertex Frame

"Quick-Pit" In-Floor Frame

The Quick-Pit frame option provides a unitized scale assembly eliminating the need for additional pit coping when in-floor installations are required. The upper flange of the rugged C-channel frame acts as the pit coping around the perimeter of the weigh platform.

- Pits are correct depth
- Pits are always square
- No field assembly or welding of coping
- Ease of construction, no pit forming required
- Ability to move the scale in the future

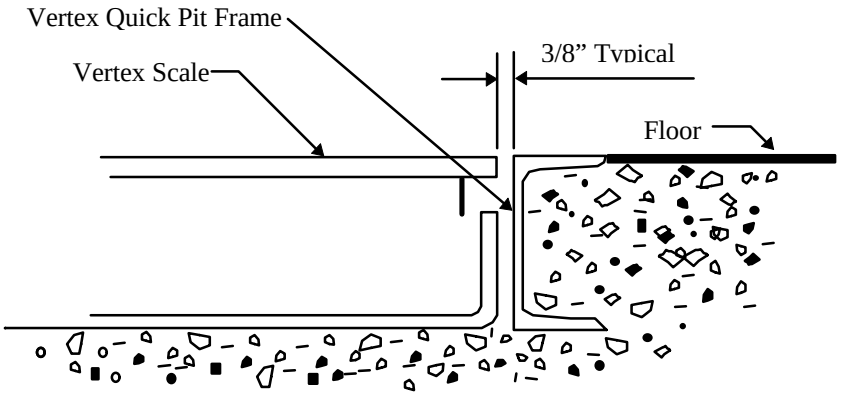


Figure 1-e: Quick Pit Frame

Forklift Channel Frame

The Forklift Channel frame is used when scale portability is required. The rugged C-channel construction and fork blade guides ensure safe lifting and transport.

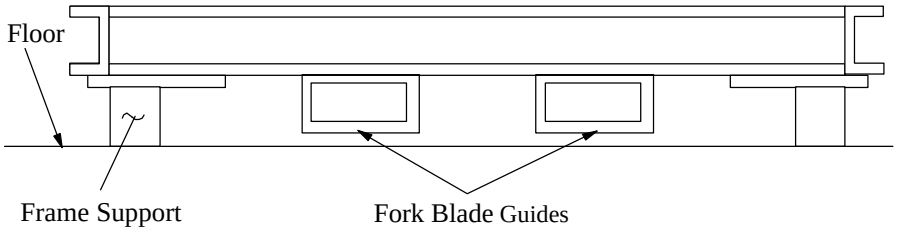


Figure 1-f: Forklift Channel Frame

Truck Dock Frame

The Truck Dock frame option offers maximum scale protection in high-traffic above-floor applications. The heavy duty C-channel frame is compatible with all standard ramps to allow access to any side of the scale.

Access Ramps

Access ramps are available for all styles of 2158, 2160, and 2162 Vertex floor scales. Vertex ramps can accommodate single or multi-directional traffic. Ramps are available in 36" or 60” lengths by the width of the scale. The maximum ramp angles are:

Capacity	Ramp Length	Ramp Angle
1k-5k	36"	4.4°
1k-5k	60"	2.6°
10k	36"	4.9°
20k	36”	5.9°

2 Inspection and Site Selection

Inspection

Upon delivery of the 2158, 2160, or 2162 Vertex scale, visually inspect the scale for any damage which may have occurred during shipment and handling. Inspect the following areas:

1. Frame assembly for any warpage or bent angles
2. Load cell and suspension assemblies
3. Load cell cables
4. Load cell summing junction box
5. Overall platform assembly

If any damage is noted, contact your freight carrier immediately.

Site Selection

Many problems associated with floor scale installations are caused by improper site conditions. Before installing the scale, check the proposed location for the following conditions:

1. Is the area level to within 1/ 4" from the highest to the lowest corner?
2. Is the floor/support at each corner of the scale area able to maintain support throughout the entire weighing capacity of the scale?
3. Is there proper drainage away from the scale area?
4. Are there any heavy vibrations or wind currents present at or near the scale?
5. Will the scale be subjected to excessive or unusual loading due to the location or type of equipment used? If the site passes, proceed with installation. If not, choose a new location or select another scale.

3 Installation (Top-of-Floor)

Locate

Place the 2158, 2160, or 2162 Vertex in the desired location after inspecting the site per Chapter 2 of this manual.

Remove Platform

Remove scale platform from the frame by using lifting eye bolts in the holes provided in the deck (a quantity of two 3/4"-10 UNC eye bolts required). Ensure that the eye bolts are snug and fully threaded into the deck before lifting.

Anchor Frame

Locate the anchor holes in all four corners of the frame. There are a total of 8 anchor holes (2 per corner). (see Figure 3-a).

Drill the anchor holes using the frame as a guide. Eight 1/2"-13 UNC x 1-1/2" long flat head socket cap screws are provided with each Vertex scale for securing frame to floor. The 1/2" anchors themselves are to be provided by others or can be purchased from Mettler Toledo. Drill anchor holes to a diameter and depth per the supplier's instructions.

All corners of the frame must be in contact with the floor and be level within plus or minus 1/16". If the scale is out-of-level or gaps exist between the frame and floor, shimming is required.

Corner shims (1/16" thick) can be purchased from Mettler Toledo (Part No. 58-030025) or fabricated using Figure 3-b as a guide.

Secure the frame to the floor using the eight flat head anchor bolts provided.

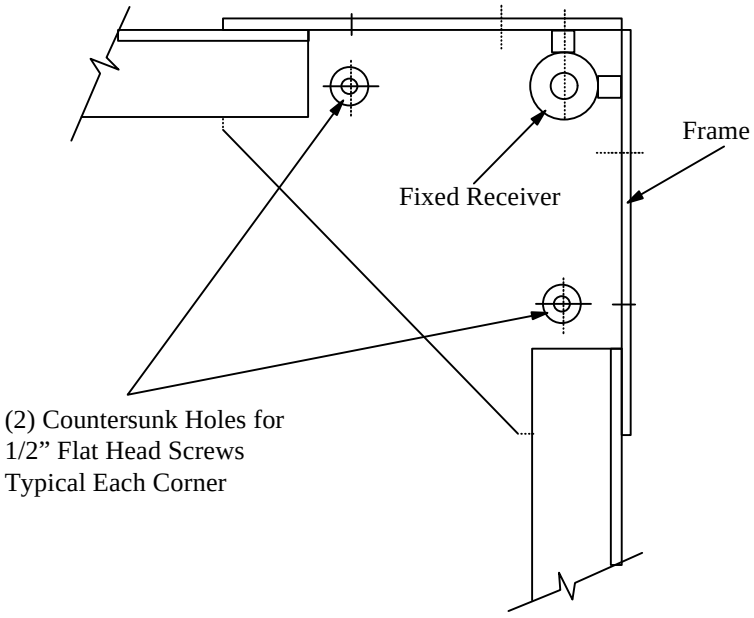


Figure 3-a: Frame Corner Detail (top view)

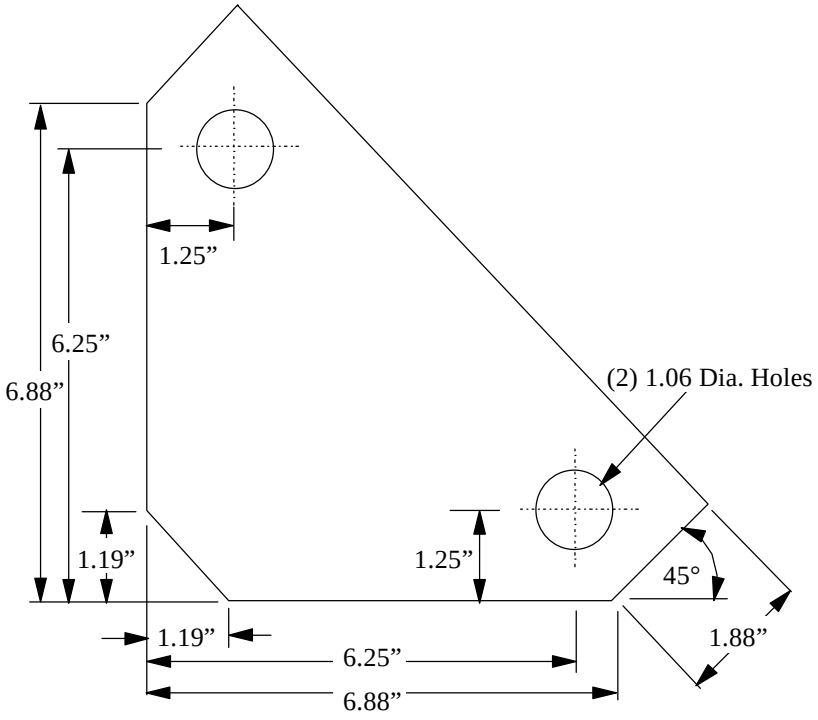


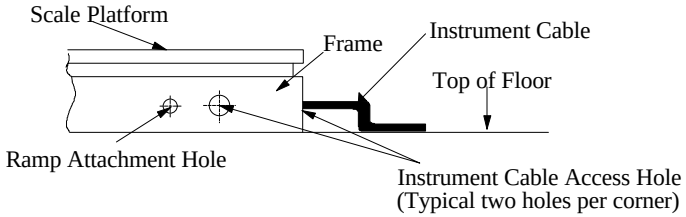
Figure 3-b: Leveling Shim Detail

Route/Attach Instrument Cable

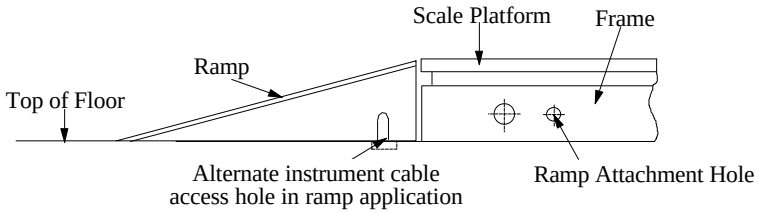
Remove the junction box access cover plate from platform.

A loose coil of instrument cable is located inside the platform channel, on either side of the J-Box assembly.

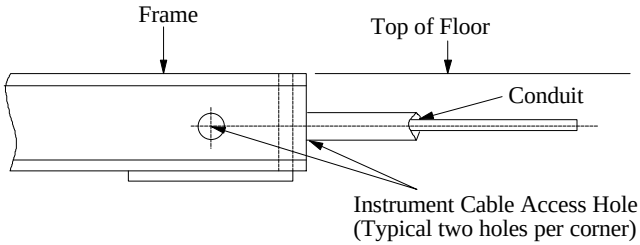
Thread the instrument cable through the hole provided in the scale frame and platform, continuing through the inside of the platform channel, stopping at the junction box (see Figure 3-c).



Vertex (without ramp)



Vertex (with ramp)



Quick-Pit

Figure 3-c: Instrument Cable Access Locations

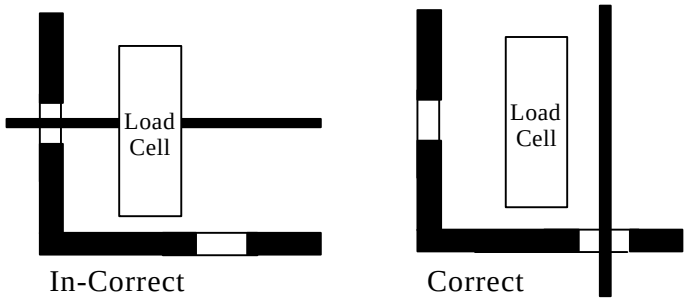


Figure 3-d: Cable Incorrect and Correct

Remove the junction box lid. Loosen the instrument cable connector, thread the cable through the connector (pull enough cable to reach the “input” terminal), reinstall and tighten (see Figure 3-e).

Junction Box Wiring

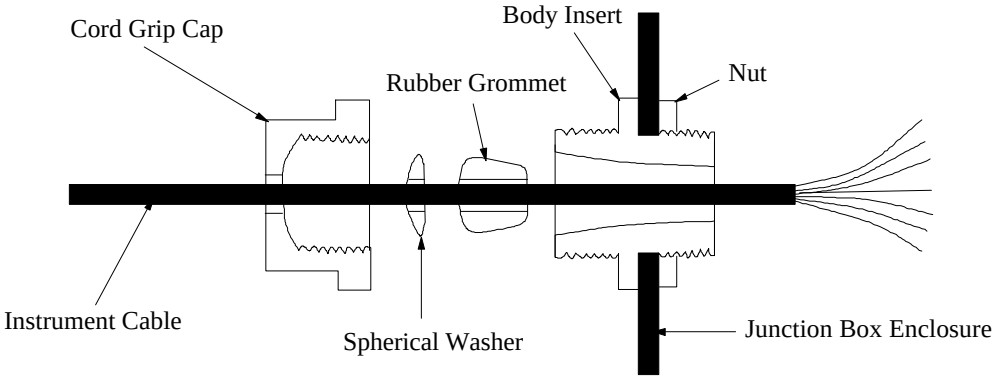


Figure 3-e: Cord Connector Details

Wire the instrument cable to the terminal marked "INPUT" for model 2158 and 2160 (see pages 3-5 through 3-8).

Place desiccant bag inside junction box.

Reinstall junction box lid. Make sure that the rubber gasket is clean and correctly located. Tighten all screws and check that all cord grip caps are tight.

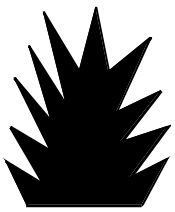
Reinstall the platform access plate.

Modes of Operation

2158 Analog Vertex

The 2158 Vertex uses an analog junction box for summing the load cell outputs. Only analog compatible indicators will work with the 2158 Vertex. The correct cable connection can be seen in Figure 3-f.

2160 DigiTOL Vertex DLC Mode



WARNING

DO NOT USE THE DigiTOL JUNCTION BOX IN LOCATIONS CLASSIFIED HAZARDOUS BY THE NATIONAL ELECTRICAL CODE (NEC) ARTICLE 500.

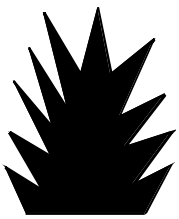
The 2160 uses a DigiTOL junction box for summing the load cell outputs. Only DigiTOL indicators will work with the 2160. In the DLC mode the indicator acts as the host for the DigiTOL junction box allowing the scale parameters to be adjusted via the indicator keypad. Cable connections can be seen in Figure 3-g.

2160 DigiTOL Vertex Smart Mode

Note: Model 2160 is not compatible with the model 8510 panel mount indicator or models 8572 or 8582 counting scales.

When the 2160 is used with the 8505 weight display the junction box provides the "brains" for operation and become the host for the indicator. Cable connections can be seen in Figure 3-h.

***** For detailed information regarding indicator capabilities and operating instructions consult the appropriate Mettler Toledo technical manual.



WARNING

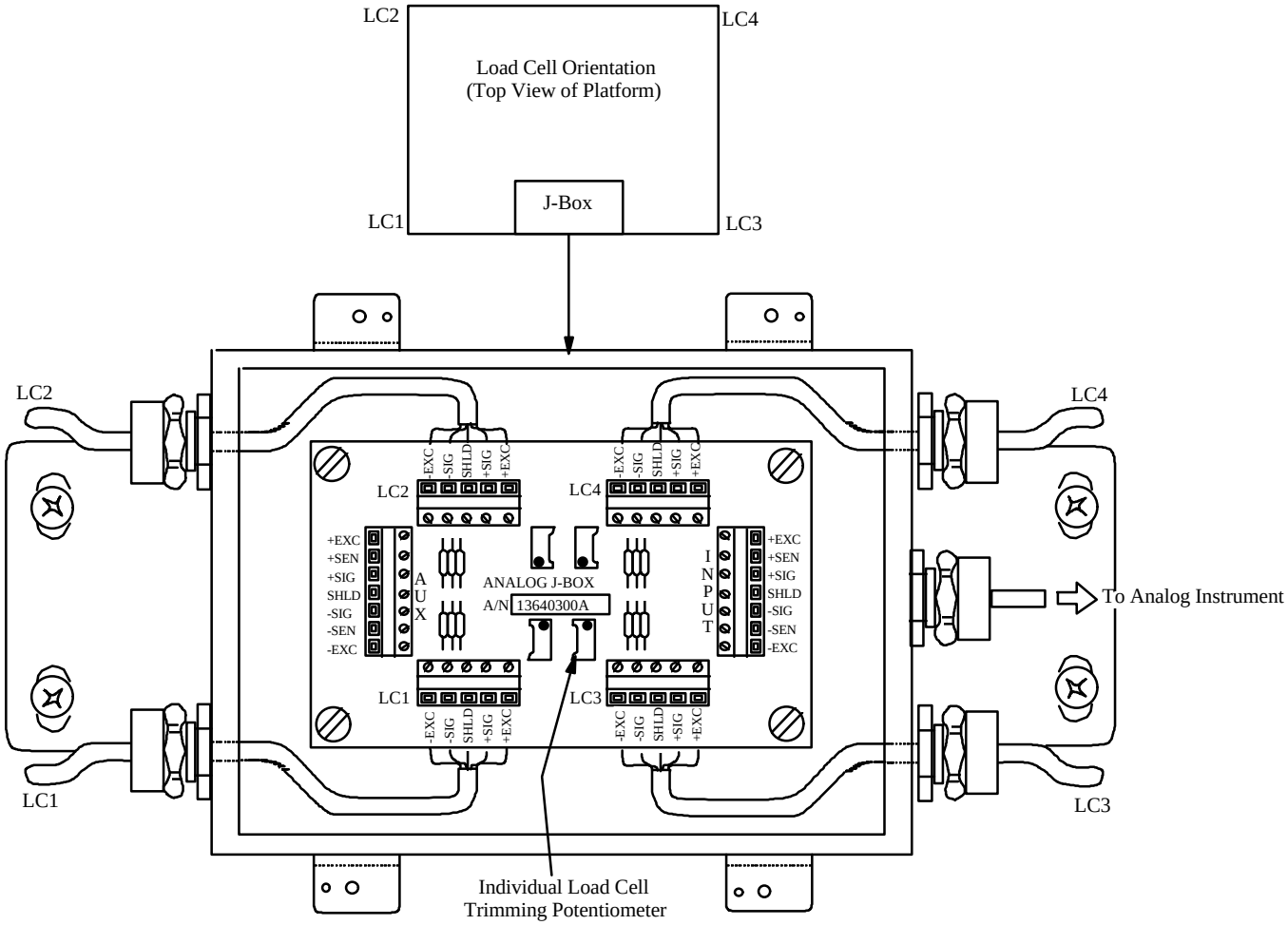
DO NOT USE THE DigiTOL JUNCTION BOX IN LOCATIONS CLASSIFIED HAZARDOUS BY THE NATIONAL ELECTRICAL CODE (NEC) ARTICLE 500.

2162 ID Net

The 2162 Vertex uses an ID Net junction box to output an ID Net Data Format compatible with Mettler Toledo ID1 and ID 5 weight display or Jaguar Industrial Terminal. Cable connections can be seen in Figure 3-j.

WARNING

DO NOT USE THE DigiTOL JUNCTION BOX IN LOCATIONS CLASSIFIED HAZARDOUS BY THE NATIONAL ELECTRICAL CODE (NEC) ARTICLE 500.



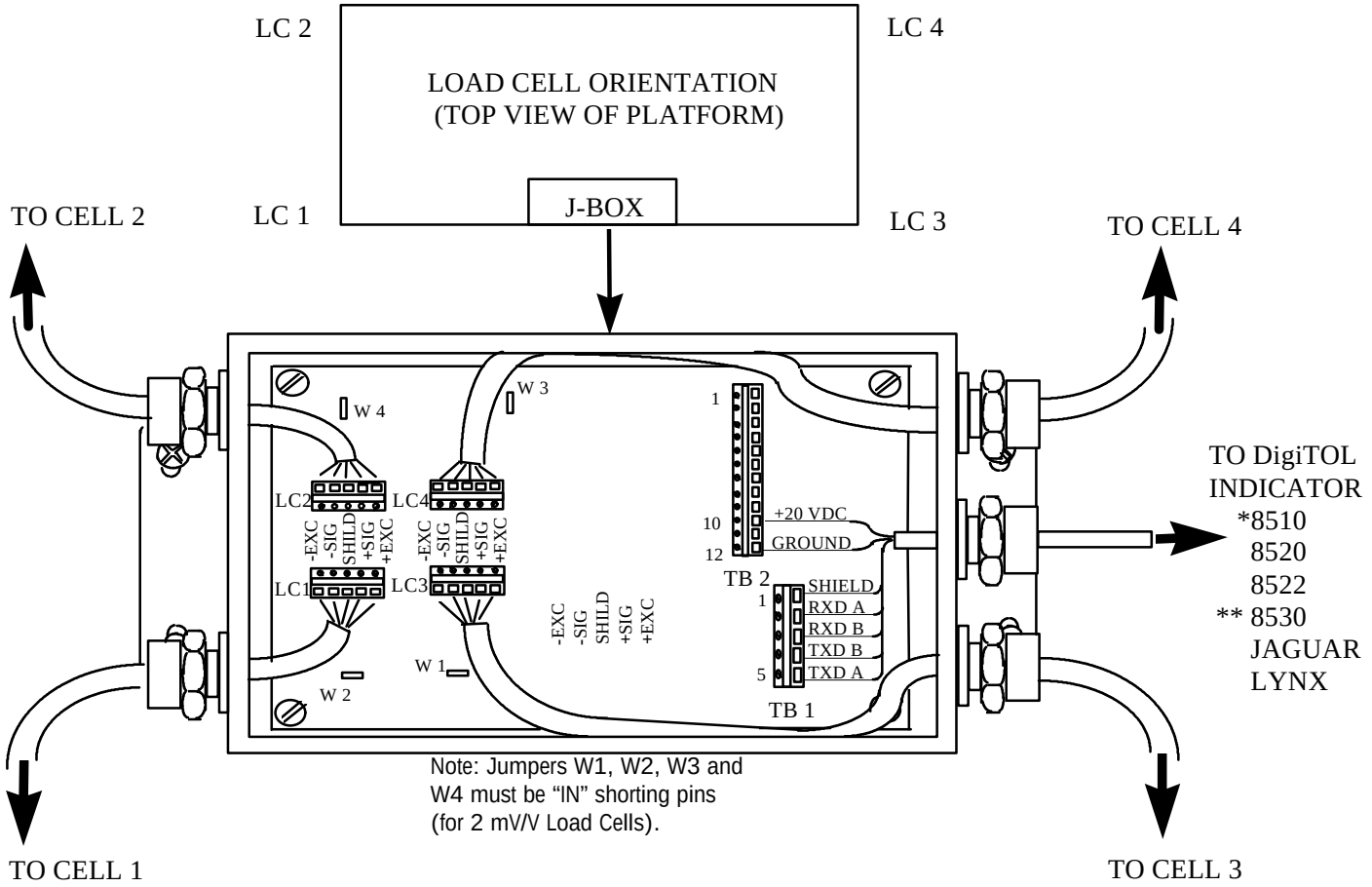
Note: Turn all pots fully clockwise prior to calibration.

LOAD CELL WIRING		INSTRUMENT CABLE WIRING	
Function	**Color**	**Function**	**Color**
+ EXCITATION	GREEN	+EXCITATION	WHITE
+ SENSE	NOT USED	+ SENSE	YELLOW
+ SIGNAL	WHITE	+ SIGNAL	GREEN
SHIELD	YELLOW	SHIELD	ORANGE
–SIGNAL	RED	–SIGNAL	BLACK
–SENSE	NOT USED	–SENSE	RED
–EXCITATION	BLACK	–EXCITATION	BLUE
		(BASED ON METTLER TOLEDO CABLE NUMBER 510624370)	

Figure 3-f: 2158 Analog Junction Box Details and Wiring Codes

WARNING

DO NOT USE THE DigiTOL JUNCTION BOX IN LOCATIONS CLASSIFIED HAZARDOUS BY THE NATIONAL ELECTRICAL CODE (NEC) ARTICLE 500.



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

Figure 3-g: Model 2160 DigiTOL Junction Box Wiring DLC Mode

* (Not compatible with Model 8510 Panel Mount DigiTOL Indicator or Models 8572 and 8582 Counting Scales.)

** (Not compatible with Model 8530VS)

WARNING

DO NOT USE THE DigiTOL JUNCTION BOX IN LOCATIONS CLASSIFIED HAZARDOUS BY THE NATIONAL ELECTRICAL CODE (NEC) ARTICLE 500.

Note: Jumpers W1, W2, W3 and W4 must be "IN" shorting pins (for 2 mV/V Load Cells).

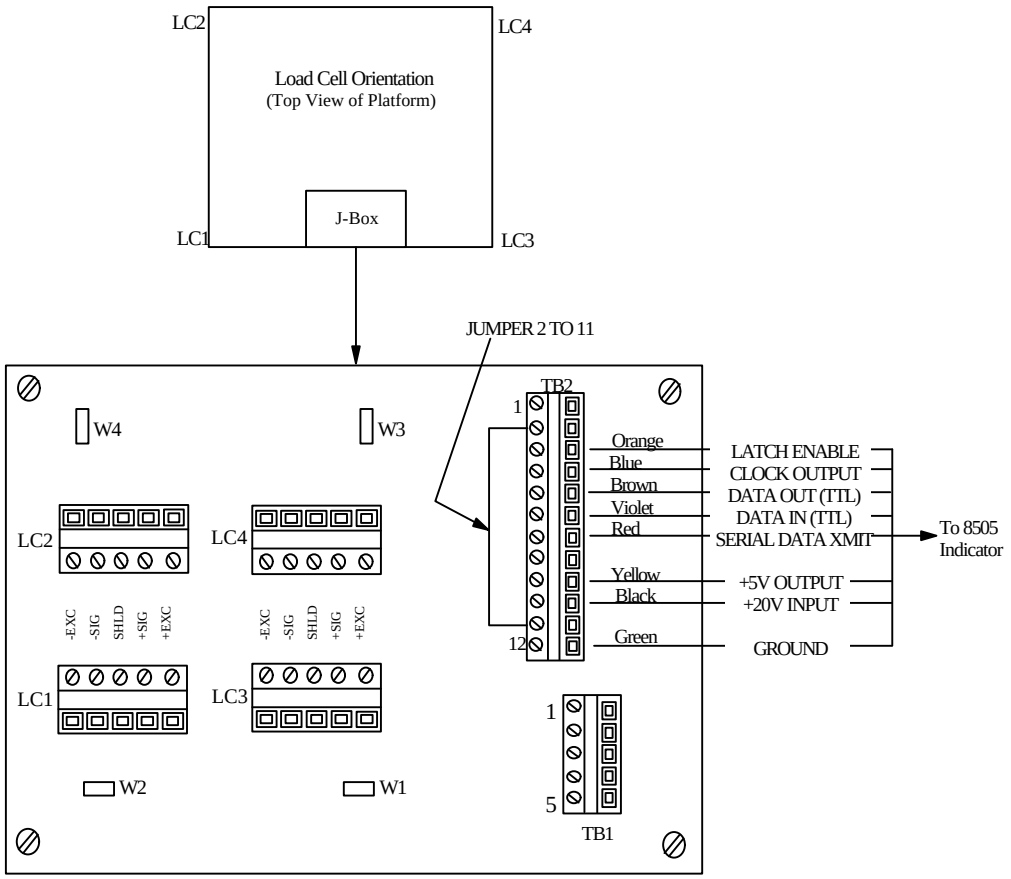
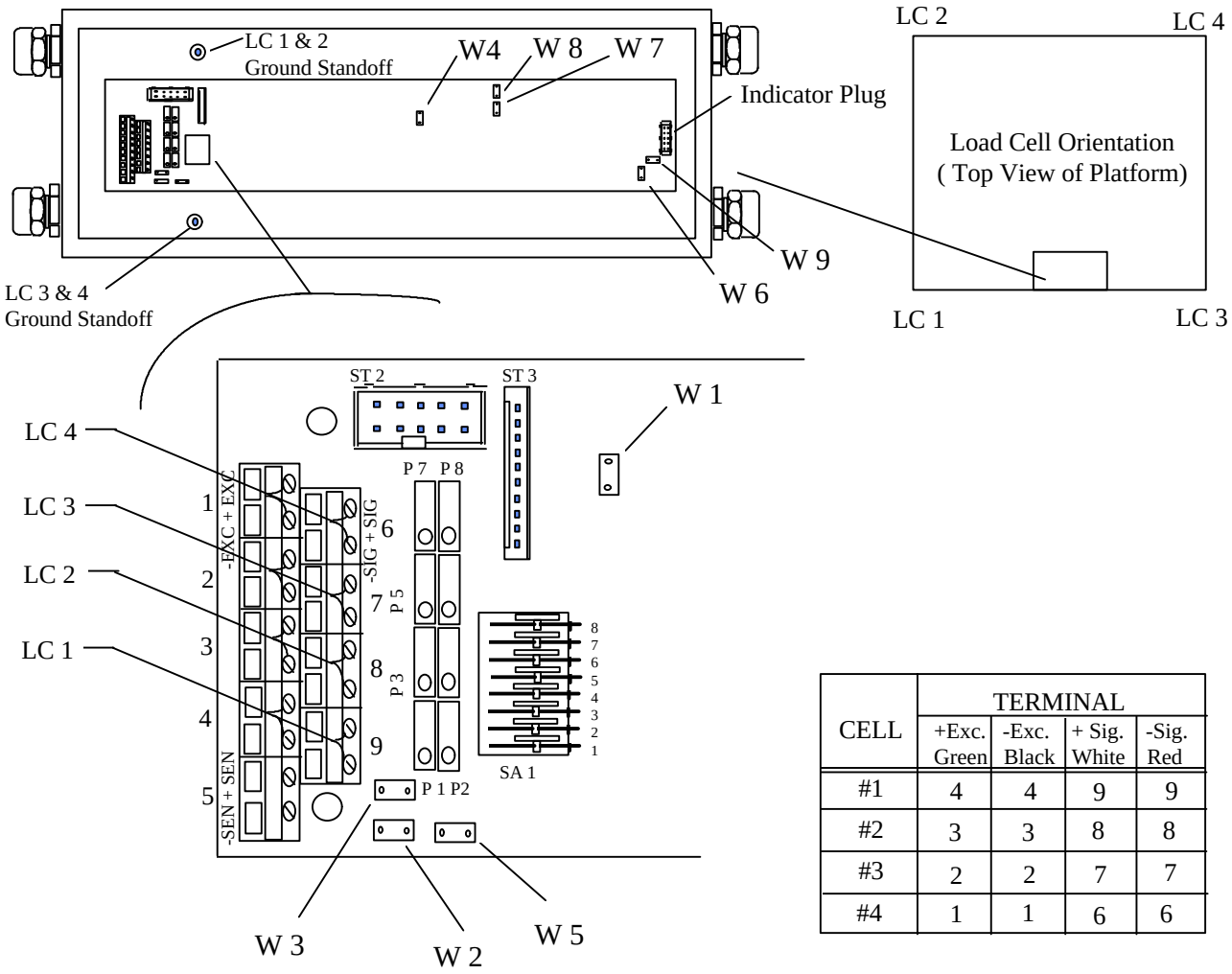


Figure 3-h: Model 2160 DigiTOL Junction Box Wiring Smart Mode with Model 8505 DigiTOL Indicator



CELL	TERMINAL			
	+Exc. Green	-Exc. Black	+ Sig. White	-Sig. Red
#1	4	4	9	9
#2	3	3	8	8
#3	2	2	7	7
#4	1	1	6	6

Default Factory setting

Jumper	Status	Description
W1	Closed	Matching the gain at 2 mV/V load cells
W2	Closed	No external sensing (– SEN)
W3	Closed	No external sensing (+ SEN)
W4	Closed	Internal reference voltage = 3.5 V
W5	Open	Excitation voltage for load cells = 4.0 Volts
W6	Closed	Internal supply voltage = 7.1 Volts
W7	2-3	Protocol ID Net
W8	1-2	Interface 20 mA
W9	Open	Supply voltage ID Net
SA1	Closed	Trim Potentiometers Circuit Disabled

Figure 3-i: Model 2162 ID Net Junction Box Wiring and Default Factory Setting

Reinstall Platform

Clear all debris from the scale area. Ensure that all four load pin receivers in the frame are clean and free of all foreign material.

Replace the platform into the frame. Make sure there is slack in the cable between the frame and platform and that no cable pinching occurs.

Oscillate the platform to ensure that the rocker load pins are seated in the receivers and no binding exists.

Calibrate the scale per the Mettler Toledo Indicator Manual.

4

Optional Ramp Installation

All standard Model 2158, 2160, and 2162 Vertex floor scales are ramp accessible from all four sides. Select which side(s) of the scale platform is to have a ramp attachment.

Prior to reinstalling the platform and after the frame is anchored to the floor, locate the two holes on the side of the scale frame where the ramp is to be attached (see Figure 3-c).

Each ramp is shipped complete with an attachment kit of parts including (2) ramp attachment lugs and (2) 3/8"-16 UNC x 1" long HHCS with lockwashers for securing lugs to frame.

From the inside of the frame insert the 3/8"-16 UNC x 1” long screws w/lockwashers into the ramp attachment holes.

Thread the ramp attachment lugs onto the screws until the lugs contact the outside surface of the frame. Torque the lug attachment screws to 30 ft-lb.

The front plate of the ramp contains two slots that provide a friction type fit when slid over the attachment lugs. Lift the ramp and align the front plate slots with the attach lugs. Lower the ramp until the slots are fully engaged in the attach lug grooves (Check to make sure that the ramp is stable). Shim under the corners of the ramp if required. Proceed with installation of the platform (see Figure 3-c for instrument cable access through ramp).

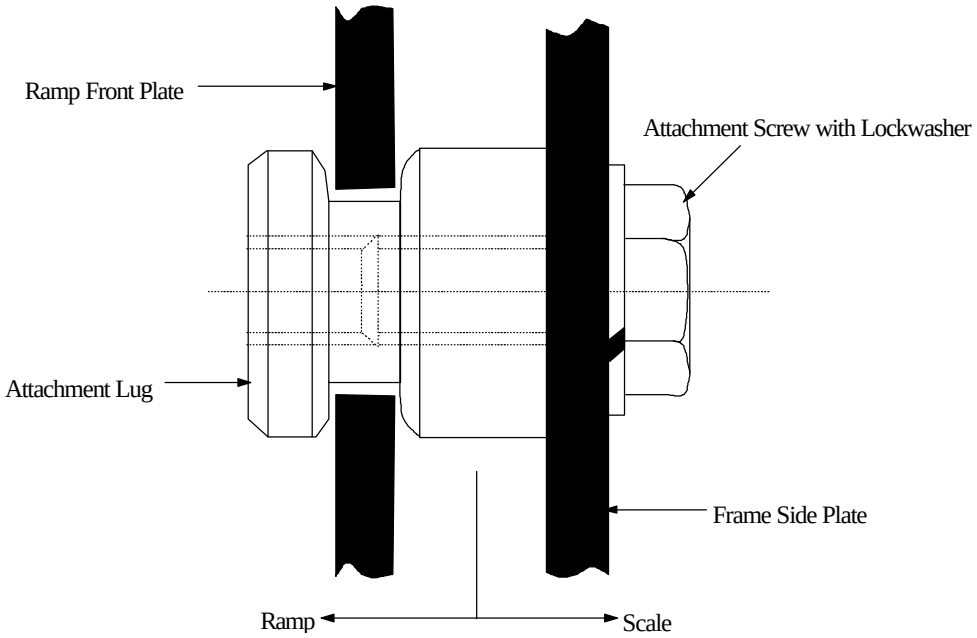


Figure 4-a: Ramp Attach Detail

5

Optional Scale Guard Installation

Scale Guards are used with the standard top-of-floor Vertex frame to provide protection against accidental forklift hits, etc. Scale Guards are available for all sizes and capacities of standard Vertex scales.

Locate the Scale Guard a minimum of 3/8" from the side of the frame. If the scale capacity is 1k-5k the 3" leg of the guard should be vertical. If the scale capacity is 10k then the 3-3/8" leg should be vertical (equal to platform deck height). 20k scales use a 4" tall guard. It is important that the Scale Guard not contact the scale platform.

Two 9/16" diameter holes are provided for anchoring the Scale Guards to the floor. Using the holes as a drill template, install 1/2" anchors into the floor (anchors and anchor bolts by others). Insert the 1/2" anchor bolts and tighten to secure the Scale Guard to the floor (see Figure 5-a).

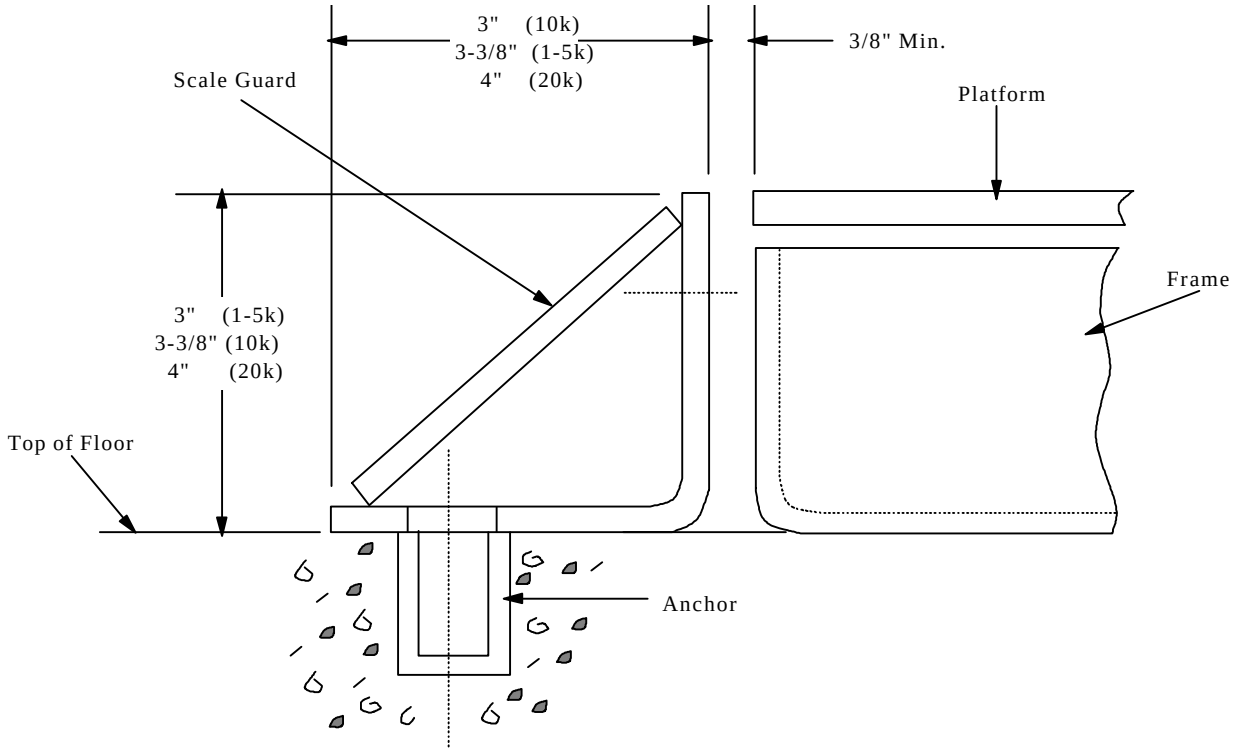


Figure 5-a: Scale Guard Installation Details

6

Optional Forklift Frame Installation

The 2158, 2160, and 2161 Forklift Channel Option is easy to assemble. The standard Vertex scale assembly (platform and frame) is mounted within the separate forklift frame. The assembly sequence is as follows:

Remove the junction box access plate from the platform and withdraw the manual and instrument cable. The eight flat head screws shipped with the scale will not be used.

Inspect the separate forklift frame. Along with the frame there should be (4) clamping bars, (8) 1/ 2-13 flat hd. screw x 1-1/ 2" lg. and (4) 5/ 8" spacer (10,000 lb capacity scale only). Each clamping bar should contain two tapped holes. These parts are used for mounting the scale frame to the forklift frame.

Note: The 10k capacity Vertex uses a 5/8" spacer between the Quick-Pit frame and the Standard frame.

Also included is a level bubble assembly which mounts on the side of the forklift frame as shown in Figure 6-a. The level bubble is used to check the suitability of the chosen location. Mount the level bubble first before beginning assembly of the scale to the forklift frame.

Remove the platform from the standard Vertex frame.

Place the standard Vertex frame into the forklift channel frame. Line-up the eight mounting holes in both frames, two per corner. Insert the eight mounting screws into the holes and through both frames.

Install a clamping bar beneath each frame corner by threading the two projecting screws into the tapped holes provided. Tighten all screws until they are "finger-tight". (See Figure 6-a)

Ensure that an equal gap exists on all sides between the two frames. The oversized mounting holes in the forklift frame allow for any required adjustment. Once an equal gap is attained, finish tightening all mounting screws.

While the platform is removed from the frame, wire the instrument cable to the junction box PCB. Route the cable out the appropriate corner of the platform. Place the rocker pins into the load cells.

Reinstall the platform into the frame, carefully routing the instrument cable out the appropriate corner of both cells.

Continue with the installation and calibration in accordance with the Mettler Toledo Digital Indicator manual.

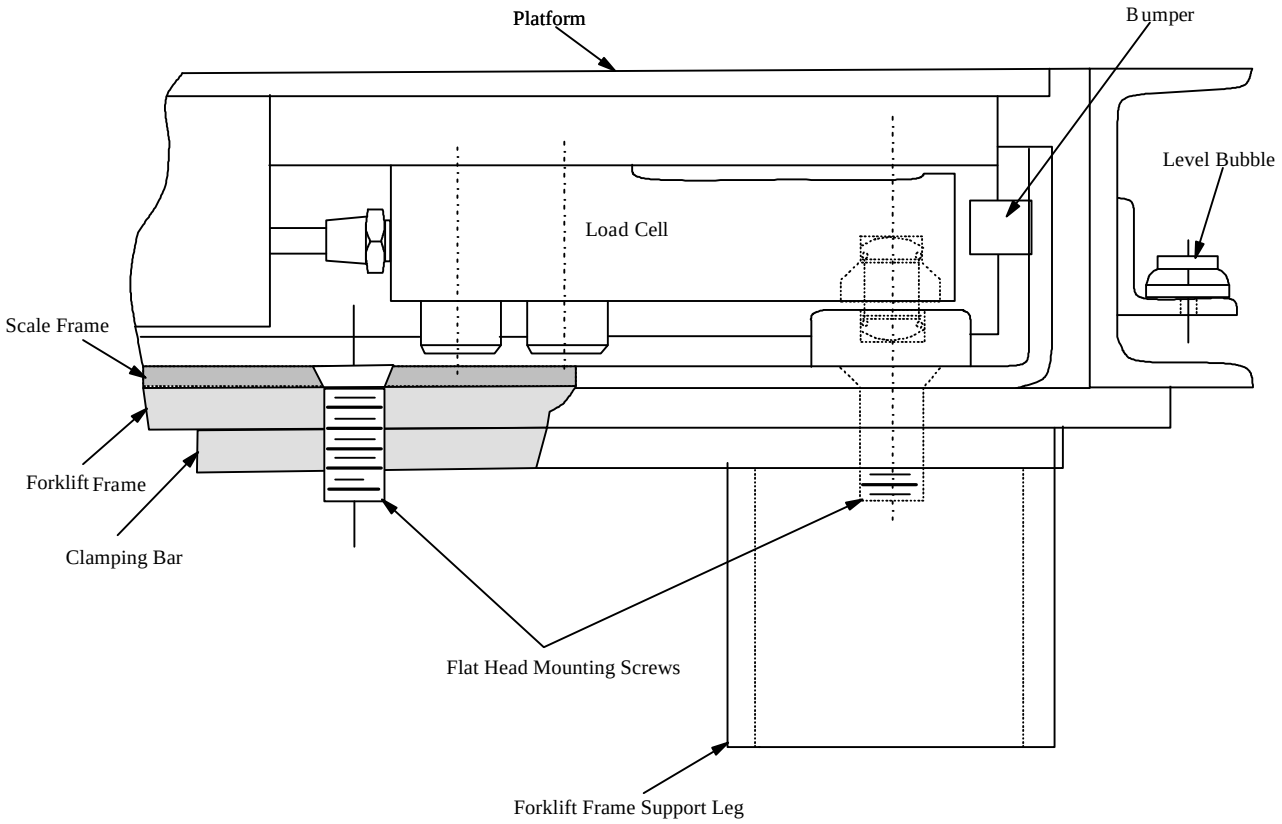


Figure 6-a: Forklift Frame Assembly Detail

7

Quick-Pit Installation (In-Floor)

The Quick-Pit frame provides a means of placing a standard above-floor 2158, 2162,and 2162 Vertex floor scale in a pit for flush mount applications. The Quick-Pit frame can be installed in the floor prior to receiving your Vertex scale assembly. When the Vertex assembly is received, simply lower the standard frame into the Quick-Pit and anchor. Insert the Vertex weighing platform to complete the installation.

Contact Mettler Toledo for latest pit construction drawings.

Prior to pit construction, contact Mettler Toledo or an authorized Mettler Toledo Distributor to obtain the latest applicable pit construction drawings.

The Quick-Pit frame requires an opening that allows a 3" gap around the perimeter of the frame. The pit depth will vary from 8" (1k-5k capacity) to 10" (10k capacity). Remove the existing floor to meet the dimensional requirements or your specific frame.

Position the instrument cable conduit. Use a high grade steel conduit (3/4" EMT thin wall conduit minimum, supplied by others). Do not secure until the frame is in the correct position.

Reverse the shipping brackets on the Quick-Pit frame so they extend outward from the frame. Remove the Vertex scale assembly at this time (if assembly was shipped within the Quick-Pit frame). See Figure 7-a for details.

Place the frame into the pit, with the shipping brackets resting on the existing floor (see Figure 7-a).

Center the frame in the pit opening. Check the frame for a level condition. If the frame is not level, shim between the shipping brackets and existing floor as required.

Secure the instrument cable conduit to the frame.

Mask-off the four corner plates and the top flange of the frame to prevent concrete from adhering to these surfaces.

Pour concrete around perimeter of frame. Work the concrete until it is level with the top frame flange and ensure the underside of all corner base plates are completely covered. Slope the floor at least 1/2" per foot to a suitable drain at the center of the pit.

USE A MINIMUM OF 3000 PSI STRENGTH CONCRETE AT 28 DAYS WITH 5 TO 7% AIR ENTRAINMENT

Note: The 10k capacity Vertex uses a 5/8" spacer between the Quick-Pit frame and the Standard frame.

Once the concrete has properly cured, the standard Vertex frame can be mounted within the Quick-Pit frame. Lower the standard frame into the Quick-Pit frame, center it, then locate the eight anchor holes in the corners. Mettler Toledo supplies eight 1/2"-13 UNC x 1-1/2" long (2" long for 10k cap) flat head socket cap screws with each Vertex for securing the frame. The 1/2" anchors are to be supplied by others or can be purchased from Mettler Toledo. Using the frame as a guide, drill anchor holes to a diameter and depth per the suppliers instructions. Install the anchors into the concrete then secure the frame using the eight flat head screws provided (see Figure 7-b).

Install the Vertex platform and have the scale calibrated by an authorized Mettler Toledo Service Technician.

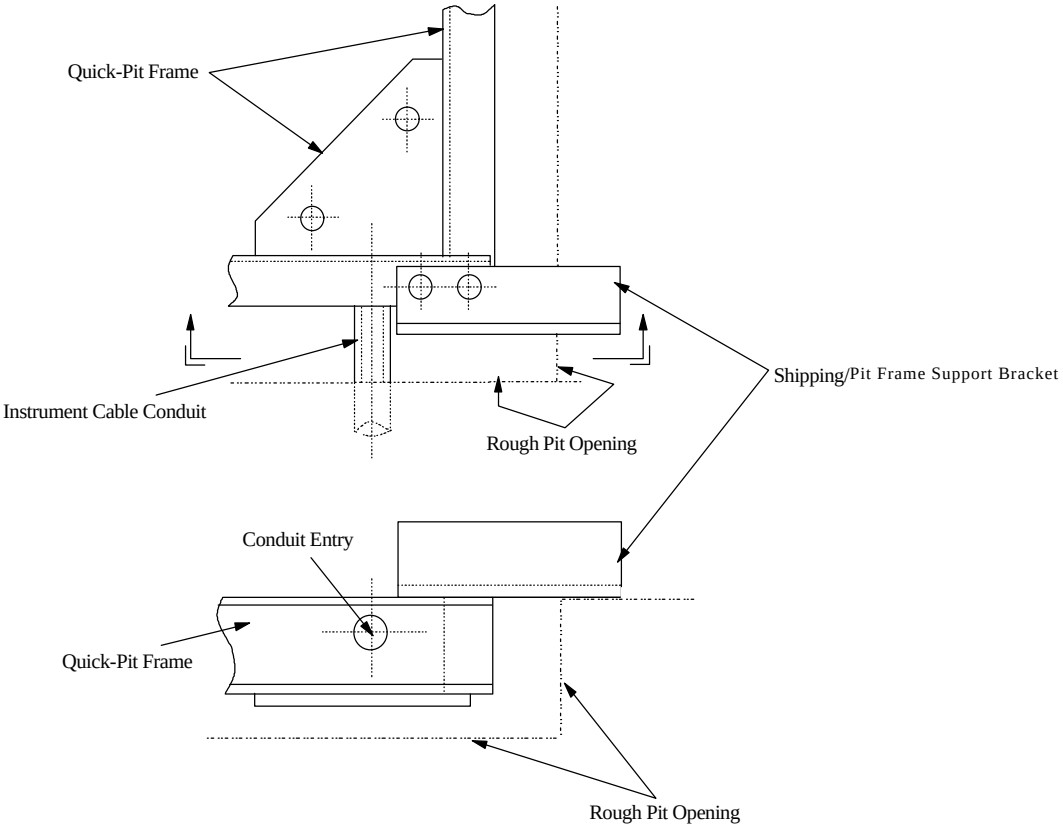


Figure 7-a: Shipping/Pit Frame Support Bracket Detail

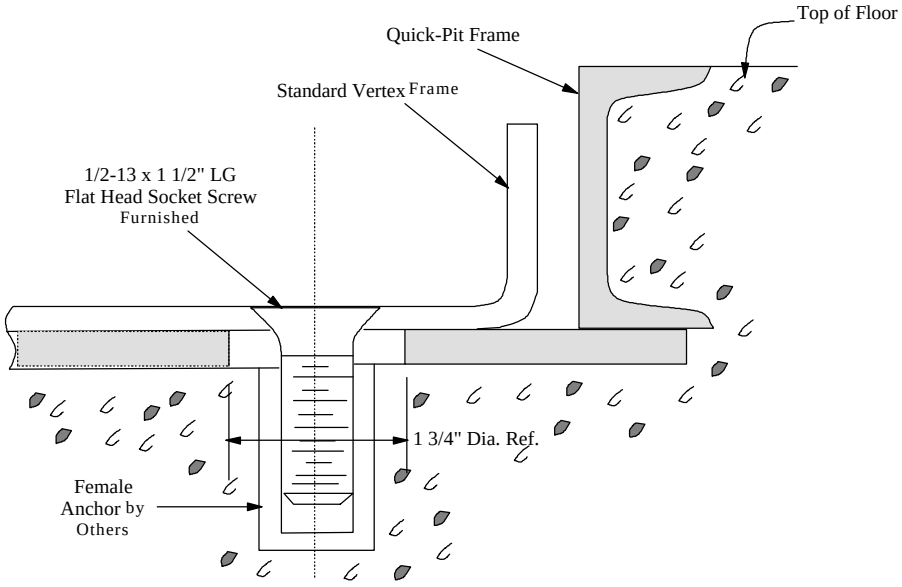


Figure 7-b: Frame Anchoring Detail

8 Calibration

Shift Adjust

Note: The scale has been roughly shift adjusted at the factory. Before proceeding, check the shift characteristics to determine if any shift trimming is required. In a new installation, shift adjustment to a properly shimmed scale should be minor.

This adjustment should be made only after all mechanical parts are checked, and the scale has proven repeatable. Repeatability is checked by repeatedly placing a test weight on the same position of the platform and checking for repeatable weight reading. Shift adjust is then done to make the weight reading for each corner of the platform the same for the same test weight.

The amount of test weight used for the shift test should equal 1/2 of the rated scale capacity. Test weights should be concentrated at the center of each quadrant of the scale platform.

Shift Adjustment for Model 2158

The shift adjustment is made by adjusting load cell trim potentiometers mounted on the junction box PCB.

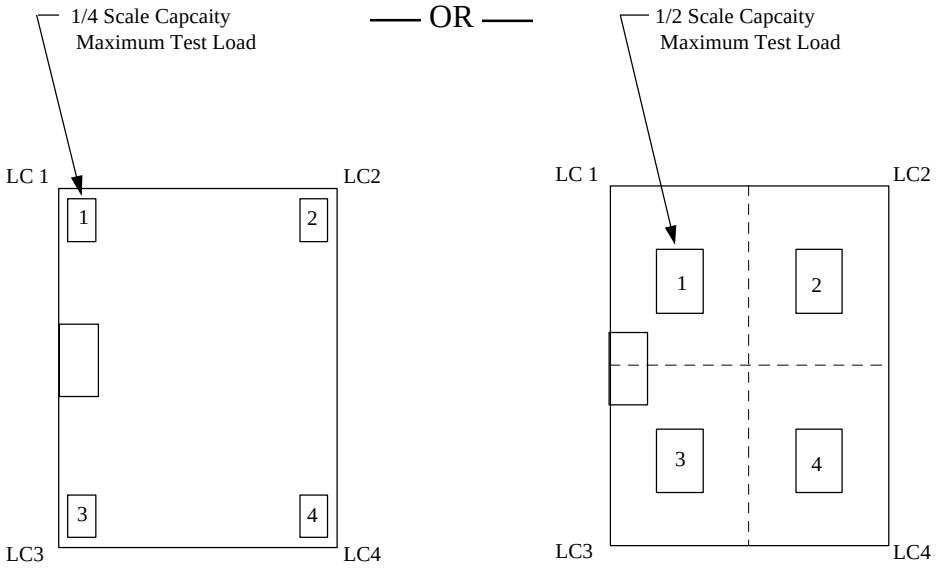


Figure 8-a: Test Load Recommendations

1. Successively place the test weight at each of the four designated locations (center of each scale quadrant). Note and record the displayed indications.
2. Determine the location with the lowest indication. The corresponding load cell is NOT trimmed.
3. Place the test weight at the location with the lowest indication. Note and record the indication.

Note: Because of the trim pots interaction with each other, any adjustment will affect all corner indications.

4. Proceeding clockwise, place the test weight at each designated location; if necessary, adjust the trimming potentiometer corresponding to that location to obtain the indication recorded in step 3.
5. Repeat this procedure until all indications at the designated locations are the same or within the tolerances as specified by local weights and measures.
6. Reinstall junction box lid and platform access plate.

Shift Adjustment for Model 2160

The shift adjust is made at the indicator in the setup mode. Shift adjustment procedure for model 2160, refer to manual for weight indicator used with 2160 Vertex scale.

Shift Adjustment for Model 2162

The shift adjustment is made by adjusting load cell trim potentiometers mounted on the ID Net junction box PCB.

1. Successively place the test weight(s) at the designated locations and record each reading. If the readings are within the tolerances desired, shift adjustment will not be required. However if the readings are not within the desired tolerances continue with the Steps 2 - 8.
2. Activate the trim potentiometers by opening all eight (8) of the hook switches (if they are not already open) located on the PCB (see Figure 8-b), once activated they will remain open, DO NOT close the latches, even after the shift adjustment procedure is complete.
3. Start the adjustment at the load cell with the highest positive reading, this process will trim the load cells to match the value of the lowest value recorded.
4. For minor adjustments the trim potentiometers (each load cell has two) may be turned clockwise which will result in a positive increase, or counter-clockwise for negative results. Should the scale require more adjustment turn all potentiometers counter-clockwise, you will know when to stop when the indication on the instrument or meter stabilizes.

Reapply the test weight(s) to the location with the highest recorded reading, adjust that load cell pair of potentiometers to match the reading of the location with the lowest recorded value.

5. Repeat the procedure until all location readings are the same, or within the scale tolerances specified.
6. Repeat Step 1, to verify shift tolerances.
7. Leaving all hook latches open, reinstall junction box lid and access cover plate.

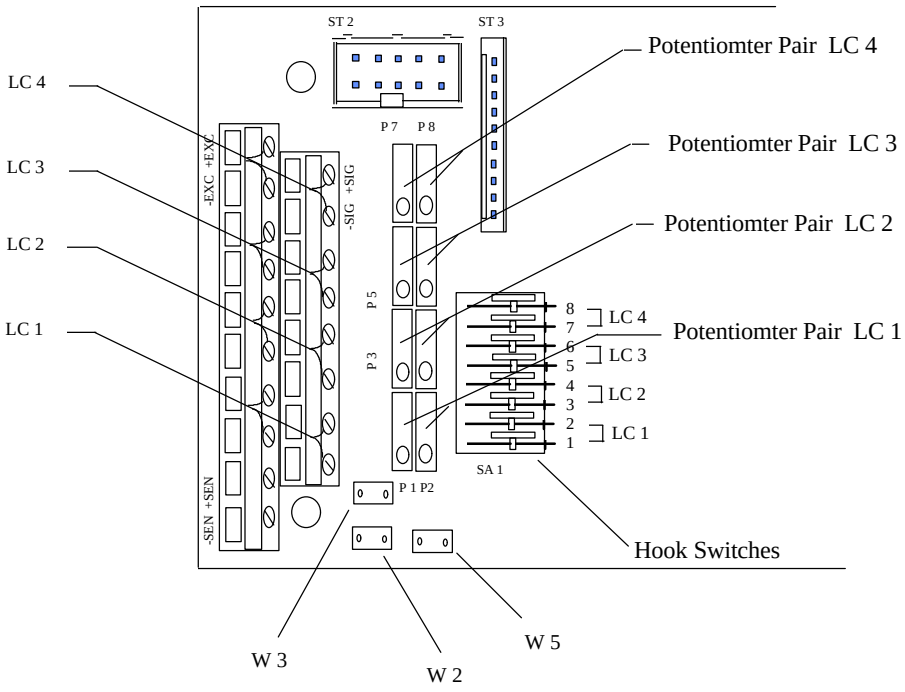


Figure 8-b: 2162 ID Net Potentiometer Adjust

Scale Calibration

It is recommended to calibrate the scale using a test weight equal to the scale capacity. With the proper test weight, continue with the calibration of the weighing system in accordance with the instructions provided in the manual of your digital indicator.

9 Routine Care and Maintenance

General

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

Site Inspection

Ensure that the scale site remains in good condition. Check for alterations in the surrounding floor, excessive vibrations, and possible overloading conditions.

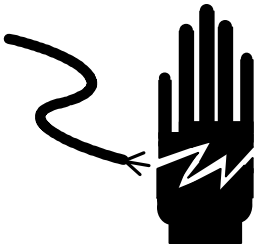
Platform Inspection

During periodic inspections of the scale assembly, check the following:

1. Is there any unusual wear points, paths, or marks on the weighing surface?
2. Is the scale frame bent or damaged?
3. Is the junction box lid properly sealed and all cable connectors tight against the enclosure?
4. Is there any moisture or foreign material present around or inside the junction box assembly?
5. Is the instrument cable free from damage or binding the scale?
6. Is there any debris or material build-up under or around the platform which could inhibit freedom of movement?
7. If a pit installation, is the floor drain clear and providing adequate drainage?
8. Visually inspect the load cells, rocker pins, and fixed bumpers for signs of unusual wear.
9. Check repeatability and shift of the scale.

10 Troubleshooting

General



WARNING

ONLY PERMIT QUALIFIED PERSONNEL TO SERVICE THIS EQUIPMENT. EXERCISE CARE WHEN MAKING CHECKS, TESTS AND ADJUSTMENTS THAT MUST BE MADE WITH POWER ON. FAILING TO OBSERVE THESE PRECAUTIONS CAN RESULT IN BODILY HARM.

If operational difficulties are encountered, obtain as much information about the problem as possible. Is the problem constant or intermittent? Malfunctions can be caused by mechanical or electrical influences so be patient and use sound logic when troubleshooting. When troubleshooting a 2158, 2160, or 2162 Vertex scale, examine the physical location of the scale, checking for the presence of the following: water, corrosive materials, unlevel floors, high vibrations, or air currents, physical damage to the scale platform or frame. Also check the instrument cable for damage and all connections for any loose/incorrect wiring.

CAUTION

BEFORE CONNECTING/DISCONNECTING ANY INTERNAL ELECTRONIC COMPONENTS OR INTERCONNECTING WIRING BETWEEN ELECTRONIC EQUIPMENT ALWAYS REMOVE POWER AND WAIT AT LEAST THIRTY (30) SECONDS BEFORE ANY CONNECTIONS OR DISCONNECTIONS ARE MADE. FAILURE TO OBSERVE THESE PRECAUTIONS COULD RESULT IN DAMAGE TO OR DESTRUCTION OF THE EQUIPMENT OR BODILY HARM.

Isolate the Problem

First, determine if the problem is in the scale platform or the digital indicator. After removing power from the system, disconnect the digital

indicator from the Vertex scale assembly and connect a load cell simulator to the indicator (analog simulator available from Mettler Toledo). Reapply power. If the problem is still present, consult the digital indicator manual for further troubleshooting assistance.

If the problem is NOT present with the load cell simulator attached to the indicator, remove power, disconnect the simulator and reconnect the platform. If the problem reoccurs, further scale platform troubleshooting is required.

Check Wiring

Remove power from the system. Remove the access cover plate from the platform. Remove the lid from the junction box and check the interior for moisture or any foreign material.

Ensure that all wiring connections are tight and that no insulation material is touching the terminal contacts. Check all cable connections for correct wiring, the wiring color code are as follows:

Load Cells		Instrument Cable (Model 2158)	
+Excitation	Green	+Excitation	White
+Signal	White	+Signal	Green
Shield	Yellow	Shield	Orange
-Signal	Red	-Signal	Black
-Sense	Not Used	-Sense	Red
-Excitation	Black	-Excitation	Blue

(Instrument cable color code based upon Mettler Toledo cable no. 510620370)

Note: Model 2160 - Check that jumpers W1, W2, W3 and W4 are in the “IN” position.

Check all cable connectors on the junction box. Tighten any connectors found to be loose.

Check Load Cells

Check each load cell for proper bridge resistances.

Measuring Points	Resistance
Any lead to shield or ground	Infinity
+Exc (Green) to -Exc (Black)	350 Ohm minimum
+Sig (White) to -Sig (Red)	348 to 352 Ohms

If bridge resistances are within specification, perform a "shorted signal" symmetry check. Short the signal leads together and place one multimeter lead on the shorted signals and one lead on the +excitation wire. Note the resistance value indicated. Next, remove the lead from the +excitation wire and place it on the -excitation wire. Both resistance values should be equal within 1 Ohm.

If the cells pass the above test, reapply power to the scale platform. Confirm that proper excitation voltage is reaching the load cells by placing multimeter leads on the excitation positions of each load cell terminal (excitation voltage can vary from 5 VDC to 15 VDC depending upon the application and digital indicator used).

If proper excitation voltage is reaching the load cells, check the output signal from each cell. If one cell has a particularly high or low dead-load output it is suspect (the maximum output possible from any cell is 30 mV at 15 VDC excitation and loaded to gross capacity).

Note: Remove signal leads from terminals to measure output.

If any cell has an unusual signal, remove all load from that cell by raising the platform. With the power still on, measure the output from the suspect load cell. The "no load" zero output should be $\pm$ 1.5% of the full scale output. For example, if the excitation voltage is 15 VDC then the full scale output is 30 mV. Therefore, the no load zero output should be within $\pm$ 0.45 mV. If the load cell is out of specification, replace it.

If a load cell fails any of the above test, replace it.

Check Mechanical Components

Due to the simplicity of the Vertex design, there are a few mechanical components to troubleshoot. Ensure that the platform has freedom of movement and that the load cells are not resting against the fixed bumpers. If the load cells are contacting the fixed bumpers with no motion in the scale platform, check the following:

1. Is the platform level or rocking? Reshimming may be required.
2. Check the rocker pins for unusual wear. Replace any rocker pins that are unevenly worn or have flattened bearing surfaces.
3. Examine the rocker pin receivers sin the frame. If the bearing surface is sunken, depressed, or unevenly worn, replace the frame.
4. If the fixed bumpers on the frame are excessively worn or damaged, the entire frame will need to be replaced.
5. Inspect the platform and frame for any apparent physical damage. Replace any platform or frame that is bent or contains broken welds.
6. Verify that the load cell overload gap is proper.

Note: 5,000 # load cell does not have an overload stop.

500 # - .009” to .015”
1250 # - .012” to .018”
2500 # - .017” to 023”

Load Cell Replacement Procedure

Remove power to the digital indicator and disconnect the instrument cable.

Remove the access plate from the platform to gain access to the load cell cable junction box. Remove the junction box cover and locate the defective load cell terminal.

Disconnect the defective load cell cable from it’s terminal on the summing PCB.

Loosen the water tight cable connector on the junction box and remove the cable from the enclosure.

Note: The instrument cable may need to be removed from the junction box to allow the platform to be removed.

Carefully remove the platform from the frame assembly using eye bolts in the holes provided. Position the platform onto a stable supporting surface that allows access to the defective cell and cable as well as offering protection to the other cells during disassembly.

Affix a string to the end of the defective load cell’s cable. The string

should be of sufficient strength and length to pull the new load cell's cable through the platform structure.

1k through 5k load cells are fastened to the platform using two 1/2"-13 UNC high strength socket head cap screws. Remove the two load cell mounting screws with a 3/8" hex allen socket, retaining the screws for reinstallation. 10k load cells are mounted with 3/4"-10 hex head screws requiring a 1-1/8" socket or wrench. Lift the load cell from the mounting surface .

Carefully pull the defective load cell's cable through the platform while feeding the string in at the junction box opening. Once the string is at the load cell location, unattach it from the load cell cable.

Remove the rocker pin with o-rings from the defective load cell and reinstall it in the new load cell.

Attach the new load cell's cable to the pulling string and carefully thread the new cable through the platform into the junction box opening. Coil and store any excess cable within the platform side channel.

Notes:
1) Make sure load cell and platform mounting surfaces are free of grease and other foreign materials.
2) The 5,000 # load cell does not have an overload stop.

Secure the new load cell to the platform. Apply an anti-seize compound such as "Never-Seez" to the threads of the mounting screws and tighten with a calibrated torque wrench to 100 ft-lb (1-5k) or 250 ft-lb (10k cell).

Verify that the load cell has proper overload gap:

500 #	-	.009" to .015"
1250 #	-	.012" to .018"
2500 #	-	.017" to 023"

Thread the load cell cable through the connector on the junction box. When the cable length inside the box is sufficient, tighten the box connector.

Wire the new load cell cable to the proper terminal on the PCB per the wiring code shown.

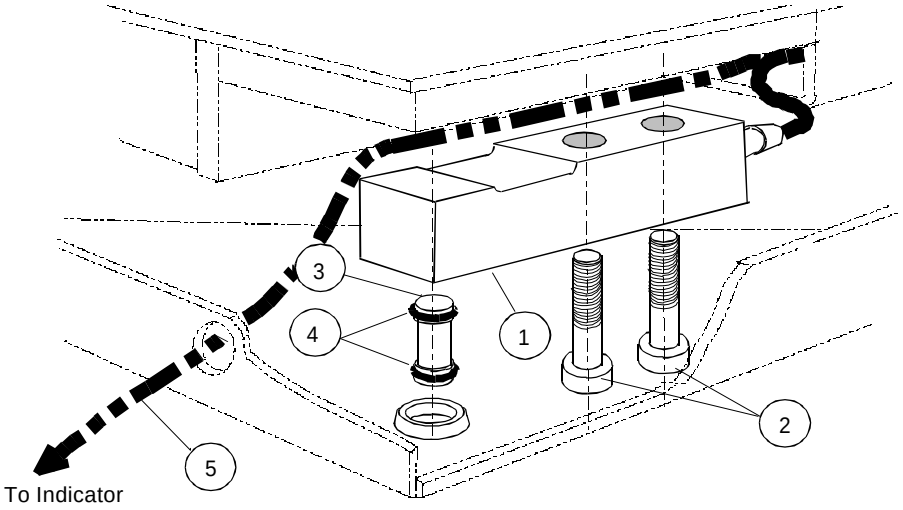
Reinstall the platform into the frame. Ensure that the rocker pins are properly seated and aligned with the receivers in the frame.

Reattach the instrument cable and power-up the indicator. Perform shift adjust and recalibrate the scale.

11 Service Parts

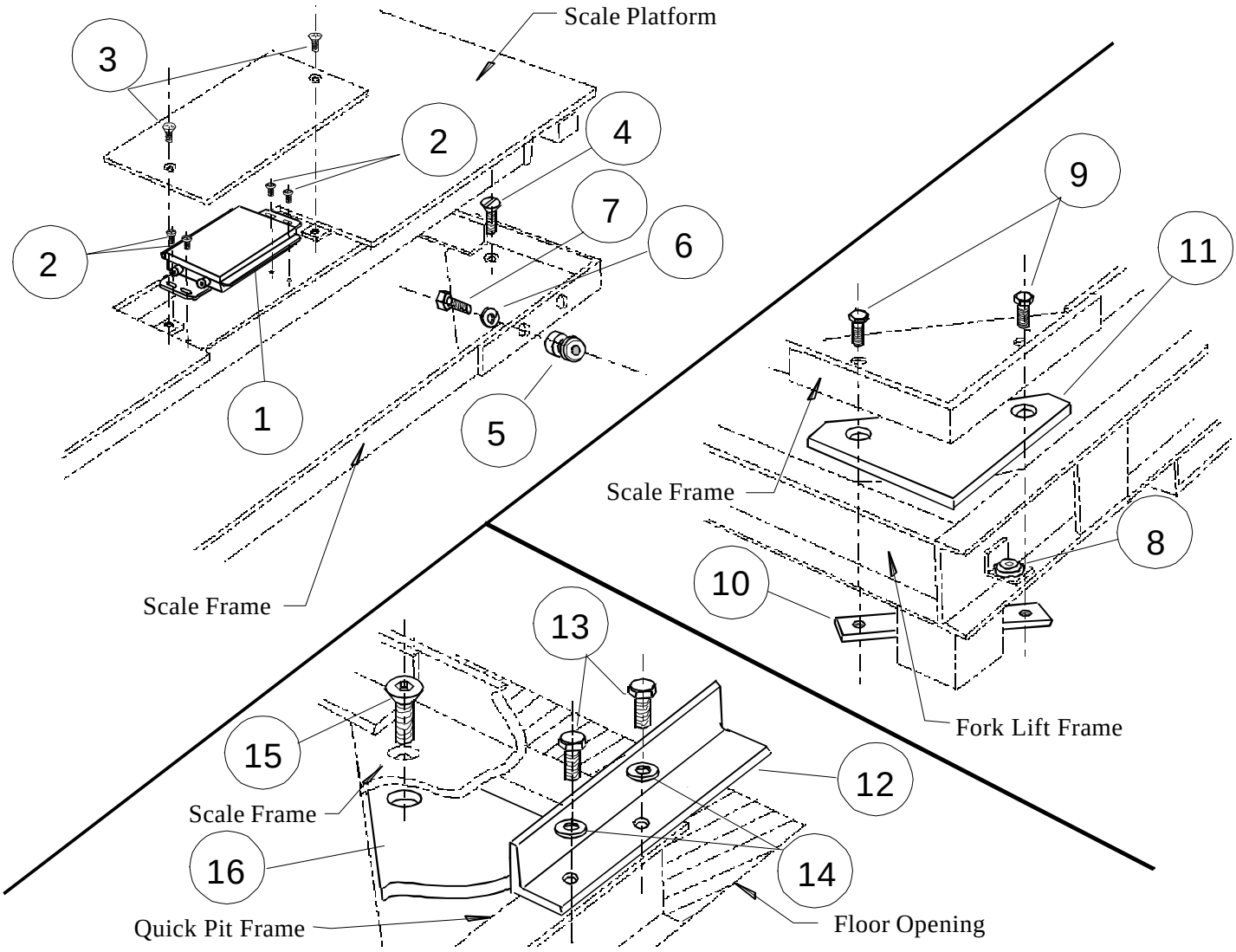
Note: Proper overload gap:
500 lb cell - .009" to .015"
1250 lb cell - .012" to .018"
2500 lb cell - .017" to .023"

*Note: Torque load cell bolts to 100 ft-lb (1-5 cell) or 250 ft-lb (10k cell)



Load Cell and Rocker Pin Assembly

Ref. #	Part Number	Description	Qty.
1	TB600529-2	500 lb load cell (5000d) with 7.5 ft. cable	4
	TB600529-3	500 lb load cell (5000d) with 15 ft. cable 5 x 7 platform ONLY	
	TB600363-1	1250 lb hermetic load cell (5000d) with 7.5 ft. cable	
	TB600363	1250 lb hermetic load cell (5000d) with 15 ft. cable 5 x 7 platform ONLY	
	TB600342	2500 lb load cell (5000d) with 15 ft. cable 5 x 7 platform ONLY	
	TB600342-1	2500 lb hermetic load cell (5000d) with 7.5 ft. cable	
	TB600343	5000 lb load cell (5000d) with 15 ft. cable 5 x 7 platform ONLY	
	TB600343-1	5000 lb hermetic load cell (5000d) with 7.5 ft. cable	
	TB600364-1	10000 lb hermetic load cell (5000d) with 15 ft. cable	
	TB600454-2	550 kg C3 R60 OIML with 7.5 ft. cable	
	TB600454	550 kg C3 R60 OIML with 15 ft. cable 5 x 7 platform ONLY	
	TB600455-2	1100 kg C3 R60 OIML with 7.5 ft. cable	
	TB600455	1100 kg C3 R60 OIML with 15 ft. cable 5 x 7 platform ONLY	
	TB600456-2	2200 kg C3 R60 OIML with7.5 ft. cable	
	TB600456	2200 kg C3 R60 OIML with 15 ft. cable 5 x 7 platform ONLY	
	TB600457-2	4400 kg C3 R60 OIML with 7.5 ft. cable	
	TB600457	4400 kg C3 R60 OIML with 15 ft. cable 5 x 7 platform ONLY	
2	MZ0901010333	1/2-13 bolt x 1 3/4" Lg. (.5 - 2.5k load cell)	8
	MZ0901010409	1/2-13 bolt x 2" Lg. (5k load cell)	
	MZ0901010430	3/4-10 bolt x 2 1/2" Lg. (10k load cell)	
3	TN200050	Rocker pin (.5 - 5k load cell)	4
	MN21018	Rocker pin (5k load cell)	
	TN201975	Rocker pin (10k load cell)	
4	MZ0909000005	O-ring (.5 - 5k load cell)	8
	MZ0090000050	O-ring (10k load cell)	
5	510624370	24 ga., 6 conductor, shielded home run cable	Varies



Junction Box and Option Hardware

Junction Box

Ref. #	Part Number	Description	Qty.
1	TB100395	Analog junction box assembly (model 2158) Consists of: *13640300A Analog PCB TA800218 Desiccant Bag	1
	TB100515-5	DigiTOL junction box assembly (model 2160) Consists of: *13839900A DigiTOL PCB TA800218 Desiccant Bag	
	TB100569-4	ID Net junction box assembly (model 2162) Consists of: ME207751 IDNet PCB ME200308 Lock Nut ME209911 Washer TA800218 Desiccant Bag	
2	MZ0901010379	1/4-20 phillips head screw x 1/4" lg.	4
3	MZ0901010035	3/8 flat head screw x 3/4" lg.	2
4	MZ0901010298	1/2-13 flat head screw x 1 1/2" lg.	8
NS	ME504235	Cable, IDNet x 5 m Lg.	-

- May have an alpha prefix.

NS = Not Shown

Ramp Option Hardware

5	TA201611	Lug, ramp (per ramp)	2
6	MZ0901030076	3/8 lock washer (per ramp)	2
7	MZ0901010124	3/8-16 hex head bolt x 1" lg. (per ramp)	2

Fork Lift Frame Option Hardware

8	TN201817	Level bubble	1
9	MZ0901010298 MZ0901010451	1/2-13 flat head screw, hex socket x 1 1/2" lg. 1/2-13 flat head screw, hex socket x 1 1/2" lg. S.S.	8
10	TN201631 TN202231	Hold down strap Hold down strap S. S.	4
11	TN201705	**5/8" spacer plate (UHMW poly)	4

Quick Pit Option Hardware

12	TN202623	Shipping angle	4
13	MZ0901010033	3/8-16 hex head screw x 3/4" lg.	8
14	MZ09011030011	3/8" zinc washer	8
15	MZ0901010249	**1/2-13 flat head screw, hex socket x 2 1/4" lg.	8
16	TN201705	**5/8" spacer plate (UHMW poly)	4

** Parts for 10k capacity ONLY.

12 Reference Material

Reference Drawings

Scale	General Dimensions	Quick Pit Assembly	Fork Lift Frame
1000 - 5000 lb	TC201789	TB201773	TC201787
10000 lb	TC201789	TC201774	TC201787
20000 lb	TC202033	TC201774	- -

Recommended Spare Parts

For part number refer to service parts.

Qty.	Description
1	Load cell (capacity of cell required is per scale capacity)
1	Junction box circuit board (type of board is per model of scale)
1	Junction box desiccant bag
1	Rocker pin (by capacity of load cell)
2	Rocker pin o-ring (by capacity of load cell)

Load Cell Data

Model number: 745

NTEP certificate of conformance number: 92-108

EC test certificate: T2154 EC Type Approval: T2206

Maximum excitation voltage: 15 VDC or VAC rms

Recommended excitation voltage: 15 VDC

Full scale output: 2 mV/V

Input terminal resistance: 350 Ohm minimum

Output terminal resistance: 350 $\pm$ 2 Ohms

Temperature range compensation: -10°C to +40°C (+14°F to +104°F)

Safe side load: 100% of full load cell rating

Safe overload: 150% of full load cell rating

METTLER TOLEDO
Scales & Systems
6600 Huntley Road
Columbus, Ohio 43229-1012

P/N: A14691400A

(11/96)

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