0972

Ultramount™ Weigh Modules

Service Manual

15487600A
(5/99).01

Declaration of conformity
Konformitätserklärung
Déclaration de conformité
Declaración de Conformidad
Conformiteitsverklaring
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,
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dichiariamo sotto nostra unica responsabilitá, che il prodotto,

Type: Analog Load Cell
Models: 777
(when used within the technical requirements listed in Mettler Toledo documentation 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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CE Conformity / CE-Konformität / Conformité CE

90/384/EU Nonautomatic Balances and Scales / Nichteselbsttätige Waagen / Balances à Functionnement non automatique
Article 1.2.a.

89/336/EU EMC Directive / EMU-Richtlinie / Directive concernant la CEM

EN55 022, B: 1987	Emissions / Funkstörungen
EN50 082-2: 1995	Immunity

73/23/EU Low Voltage / Niederspannung / basse tension

EN61010-1	el. Safety / el. Sicherheit / sécurité el.

76/117/EEC concerning equipment and protective systems intended for use in potentially explosive atmospheres
EN 50 014 : 1977 + A1…A5, General requirements
EN 50 020 : 1977 + A1…A5, Intrinsic safety “i”

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 / sécurité el. (PTB Nr. Ex-98.D.2155)

Darrell Flocken, Manager - Weights & Measures
Office of Weights and Measures
Worthington, Ohio USA
May, 1999

according to EN45014

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Model 0972 Ultramount Weigh Modules

Mettler Toledo warrants that the equipment covered by this warranty will be free from defects in workmanship and materials for a period of one year from date of installation or eighteen (18) 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 replacement parts and service free of charge to the buyer. For the remainder 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. 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 Model 0972 Ultramount Weigh Modules. 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.

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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.

METTLER TOLEDO

Publication Revision History

An overview of this manual's revision history is compiled below.

Publication Name: 0972 Ultramount Weigh Modules Service Manual

Publication Part Number: 15487600A **Publication Date: 6/98**

Part Number	Date	Revisions
15487600A	(5/99).01	Added Declaration of Conformity.

INTRODUCTION

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

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

METTLER TOLEDO
1900 Polaris Parkway
Columbus, Ohio 43240
phone: (614) 438-4511
fax: (614) 438-4958
www.mt.com

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 to radio communications, in 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 operating or servicing this equipment.

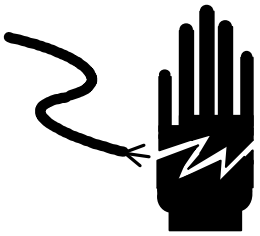
FOLLOW these instructions carefully.

SAVE this manual for future reference.

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

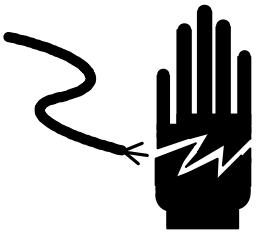
ALWAYS DISCONNECT this equipment from the power source before cleaning or performing maintenance.

CALL METTLER TOLEDO for parts, information, and service.



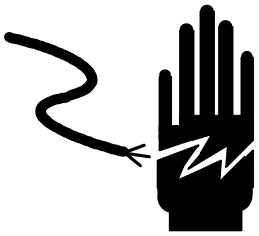
⚠ WARNING

PERMIT ONLY 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.



⚠ WARNING

FOR CONTINUED PROTECTION AGAINST SHOCK HAZARD, CONNECT TO PROPERLY GROUNDED OUTLET ONLY. DO NOT REMOVE THE GROUND PRONG.



⚠ WARNING

DISCONNECT ALL POWER TO THIS UNIT BEFORE INSTALLING, SERVICING, CLEANING, OR REMOVING THE FUSE. FAILURE TO DO SO COULD RESULT IN BODILY HARM AND/OR PROPERTY DAMAGE.

⚠ CAUTION

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

⚠ CAUTION

OBSERVE PRECAUTIONS FOR HANDLING ELECTROSTATIC SENSITIVE DEVICES.

⚠ CAUTION

DO NOT PASS WELDING CURRENT THROUGH THE LOAD CELLS! WHEN WELDING ON A SCALE, ALWAYS GROUND THE WELDING DEVICE AS CLOSE TO THE WORK AS POSSIBLE. NEVER WELD CLOSER THAN WITHIN 4 FEET (1.2 METERS) OF ANY LOAD CELL WITHOUT REMOVING THE LOAD CELL.

⚠ WARNING

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

⚠ CAUTION

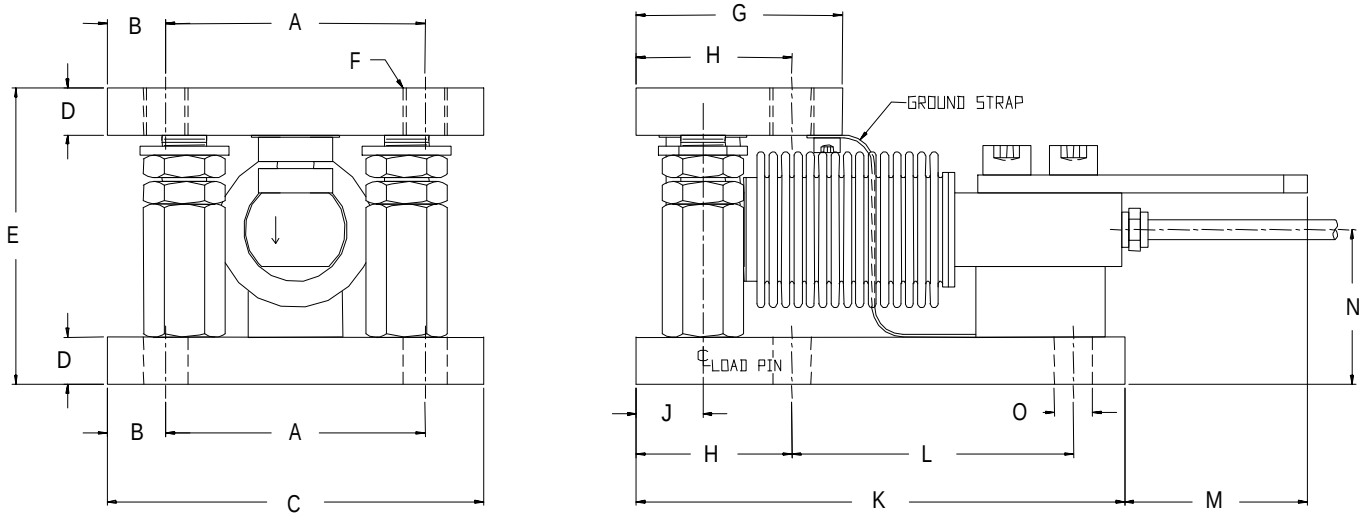
BE SURE TO BLOCK THE SCALE WHEN IT IS IN THE RAISED POSITION. OBSERVE ALL APPROPRIATE SAFETY PROCEDURES WHEN INSTALLING AND SERVICING THE WEIGH MODULES.

Contents

1 Specifications

Ultramount Weigh Modules

Model 0972 Ultramount™ weigh modules are used to convert tanks, hoppers, vessels, blenders, and mixers into weighing instruments. They provide horizontal checking and an anti-tip feature, while still allowing for thermal expansion. Ultramount weigh modules are available in capacities of 5 kg to 100 kg. Dimensions are shown in Figure 1-1.



A	B	C	D	E*	F Thread	G
2.76 inches	0.62 inch	4.00 inches	0.50 inch	3.15 inches	--	2.19 inches
70 mm	16 mm	102 mm	13 mm	80 mm	M12 x 1.75	56 mm

H	J	K	L	M	N	O Dia.
1.65 inches	0.71 inch	5.19 inches	2.99 inches	1.94 inches	1.64 inches	0.41 inch
42 mm	18 mm	132 mm	76 mm	49 mm	42 mm	10 mm

Figure 1-1: Model 0972 Ultramount Weigh Module Dimensions

*Dimension shown is in weighing configuration. Shipping height is 3.23 inches (82 mm) with top plate in raised position.

Model Number

Table 1-1 shows how to use the model number to determine the proper load cell configuration for Ultramount weigh modules.

Model Number Configuration						
XXXX	X	X	X	X	XX	-X
Model	Weigh Module Type	Cell Type	# Load Cells	# of Modules	Cell Capacity	Junction Box
0972	0 = None	0 = Pin (Static) 1 = Ball & Cup (Dynamic)	0 = Dummy Load Cell 1 = 5kd NIST H44 2 = 3kd OIML	1, 3, or 4	X5 = 5 kg 01 = 10 kg 02 = 20 kg 05 = 50 kg 10 = 100 kg	1 = Analog J-Box 2 = No J-Box

Table 1-1: Load Cell Configuration

Load Cells and Suspension

Model number:	777 Load Cells, 5 kg, 10 kg, 20 kg, 50 kg, 100 kg
Maximum excitation voltage:	18 VDC maximum
Recommended excitation voltage:	10 VDC
Full-scale output:	2 mV/V
Input terminal resistance:	350 to 480 ohms minimum
Output terminal resistance:	356 ± 0.12 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

Ball-and-cup module suspension is provided by upper and lower cups with a ball bearing between the cell and the receiver in the upper assembly (see Figure 1-2).

Load-pin module suspension uses a load pin between the cell and receiver in the upper assembly (see Figure 1-3).

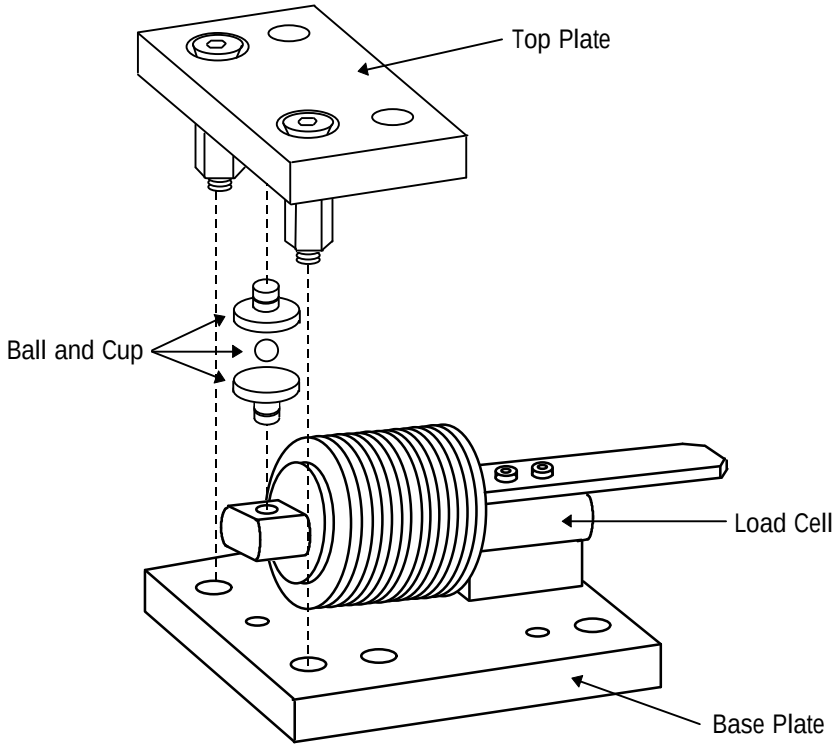


Figure 1-2: Ball-and-Cup Assembly

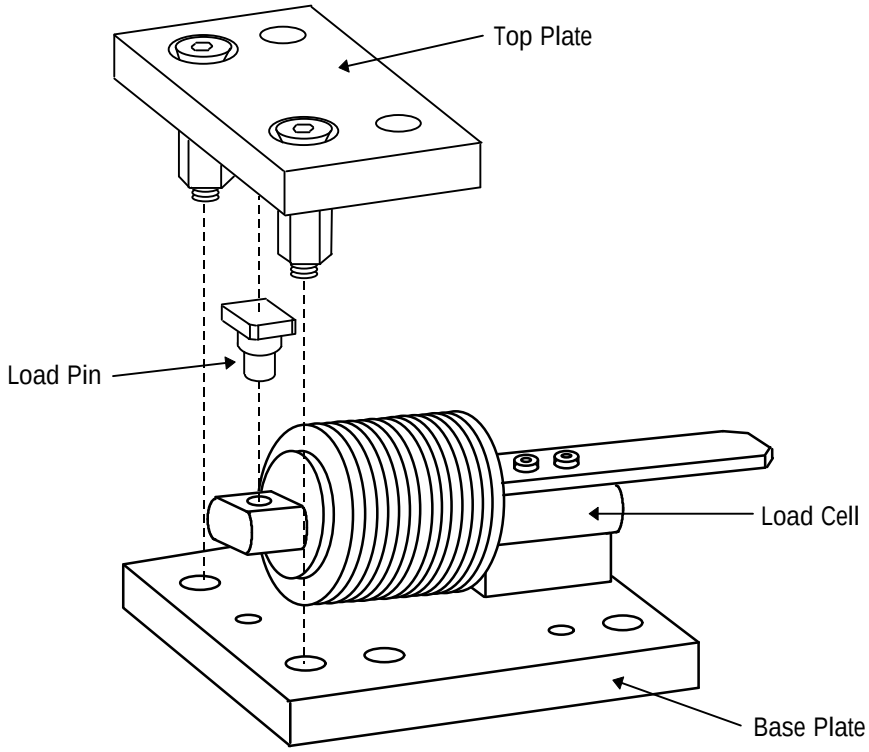


Figure 1-3: Load-Pin Assembly

Power Supply Requirements

A METTLER TOLEDO digital indicator is used to power the analog load cells in Model 0972 Ultramount weigh modules. The type of digital indicator that is used determines which type of junction box (Analog, DigiTOL, or IDNet) is required for the weigh modules.

Refer to the digital indicator's service manual for the indicator's power requirements.

Accuracy

Scale accuracy depends on:

- The design of the support steel for the module and of the receiving structure (tank, hopper, conveyor, etc.) mounted to the modules
- The design and number of dead-to-live connections attached to the scale
- The total load cell capacity
- Environmental factors: wind, vibration, temperature variations, etc.

Refer to METTLER TOLEDO *Weigh Module Systems Handbook* *15598500A for assistance.

* May have an alphabetical prefix.

2 Inspection and Site Selection

Inspection

When you receive your weigh modules, visually inspect the packing containers and modules for freight damage. Inspect:

1. Load cell and suspension assemblies
2. Load cell cables and summing junction box
3. Overall assembly

If you find damage, contact your freight carrier immediately. Fill out the enclosed warranty card and return the weigh module to the address indicated.

Site Selection

Problems installing weigh modules are often caused by inappropriate site conditions. Before installing the weigh modules, check the site for:

- Level support surfaces to within 1/8 inch (3.2 mm), highest to lowest location
- Adequate support, where each module meets the floor or structure, throughout the scale's weighing capacity
- Uniform deflection of the weigh module supports (top and bottom), maintaining less than one-half degree out of level at gross capacity
- Proper drainage away from each of the weigh modules
- Heavy vibrations or wind currents at or near the scale
- Access around each weigh module for installation and service
- Locations on the scale to add test weights for calibration
- Access to the scale for moving test weights to the scale's loading locations
- A position near the proposed scale location to mount the junction box (Do not mount the junction box on the live portion of the scale.)
- Excessive or unusual loading caused by the site or type of equipment mounted to the weigh modules
- Shared foundation: Does the vessel to be weighed have an exclusive, isolated support foundation? Does it share supports with other vessels? Interaction may occur if the vessel is on a shared foundation

If the site is appropriate based on the criteria above, proceed with the installation. Otherwise, make necessary adjustments before installing the modules.

3 Installation

Installation

Model 0972 Ultramount weigh modules can be oriented for tangential or radial mounting (see Figure 3-1).

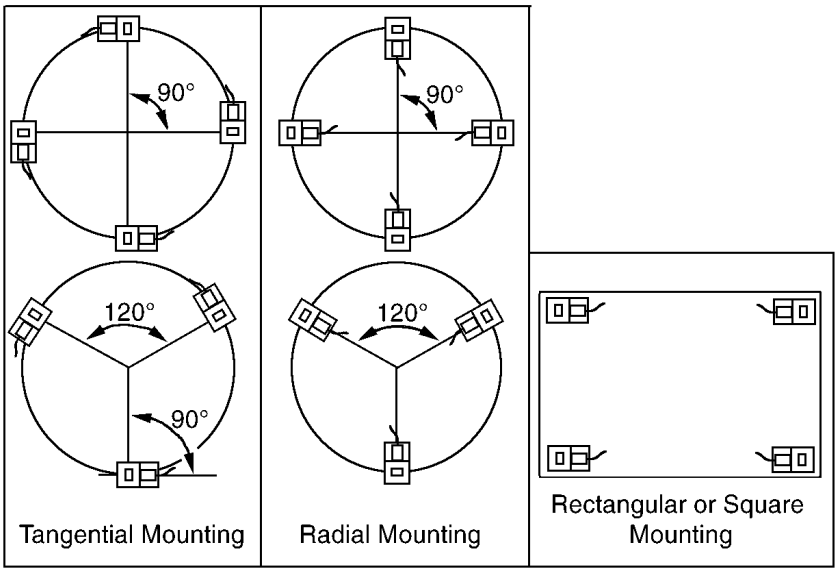


Figure 3-1: Plan View of Mounting Arrangements for Ultramount Weigh Modules

Install the weigh modules according to the following instructions. Make provisions for required adjustments on the weigh structure to maintain correct module alignment:

1. Level each module's base plate to within ±1/32 inch (0.8 mm). All base plates must be on the same level plane within ±1/16 inch (1.6 mm).
2. Slowly lower the weigh structure onto the weigh modules.
3. Make sure that each load point on the weigh structure is well supported by the module's top plate, and that all top plates are level within ±1/32 inch (0.8 mm). Otherwise, shim until each load point is supported and the top plate is level.
4. Bolt or weld the top plates of the weigh modules to the weigh structure supports, using two M12 x 1.75 screws or 3/8-16 UNC bolts and nuts. Bolt or weld the base plates of the weigh modules to the foundation or support steel, using four M10 or 3/8-16 UNC anchor bolts.

Note: Mounting plate bolts are not supplied by METTLER TOLEDO.

5. If the top plates are to be welded to the weigh structure or the base plates are to be welded to a structural steel support, the weld should be 3/16 inch (4.8 mm) fillet, 1 inch long (25.4 mm), and 3 inches (76.2 mm) pitch with 2 inches (50.8 mm) between welds.

Note: Always remove load cells when welding top or base plates.

⚠ CAUTION

DO NOT PASS WELDING CURRENT THROUGH THE LOAD CELLS! WHEN WELDING ON A SCALE, ALWAYS GROUND THE WELDING DEVICE AS CLOSE TO THE WORK AS POSSIBLE. NEVER WELD CLOSER THAN WITHIN 4 FEET (1.2 METERS) OF ANY LOAD CELL WITHOUT REMOVING THE LOAD CELL.

6. After securing all the top plates and base plates, slowly back out the nut and centering washer on the hold-down bolt, carefully lowering the top plate and weigh structure onto the load cells.
7. After all the top plates are down, apply load to the load cells and make sure there is adequate clearance between the hold-down bolts and retaining holes. See Figure 3-2 and Figure 3-3.

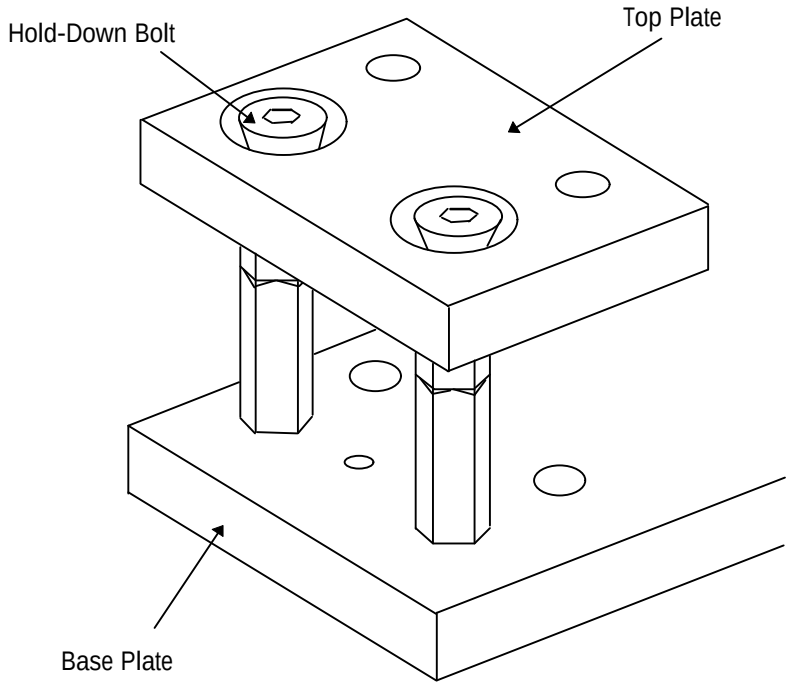


Figure 3-2: Hold-Down Bolt Assembly

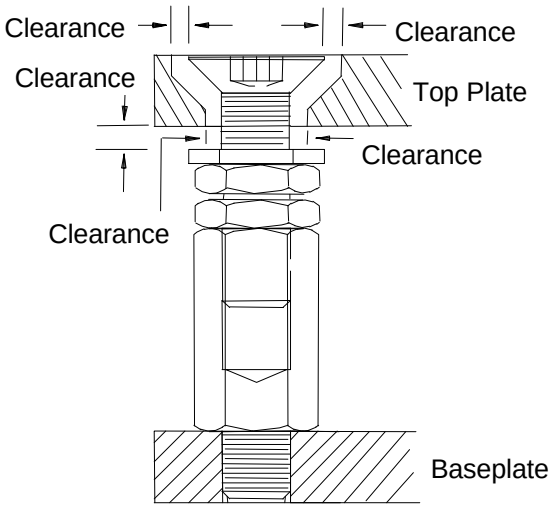


Figure 3-3: Hold-Down Bolt Assembly - Cross Section

Note: Consider calibrating the scale before connecting any piping to the scale. The scale can then be used as a meter to determine if a proper live-to-dead connection was made.

8. Mount the junction box in a location where the load cell cables can be properly terminated in the junction box. Do not mount the junction box on the scale.
9. Connect the load cell cables to the junction box and terminate wires according to the wiring and color code decal on the underside of the junction box lid.
10. Connect the home run cable from the scale indicator to the junction box.
11. Confirm that all live-to-dead connections are flexible and securely anchored at both the scale and the dead connection point.

Modes of Operation

Analog Mode

Ultramount weigh modules can be used with an analog junction box for summing the load cell outputs. Only analog-compatible indicators work with an analog junction box. See Figure 3-4 and Table 3-1 for cable connections.

Note: Turn all potentiometers fully clockwise prior to calibration.

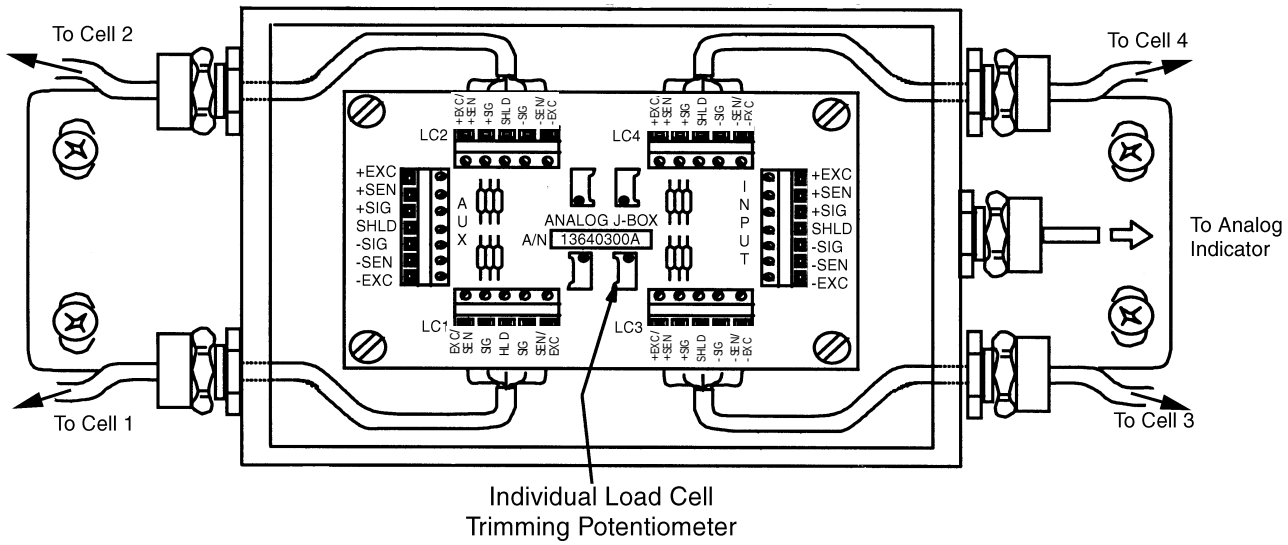


Figure 3-4: Analog Junction Box Detail

*For load cell connections, the +Excitation and +Sense wires should be connected to the same terminal; the -Excitation and -Sense wires should be connected to the same terminal.

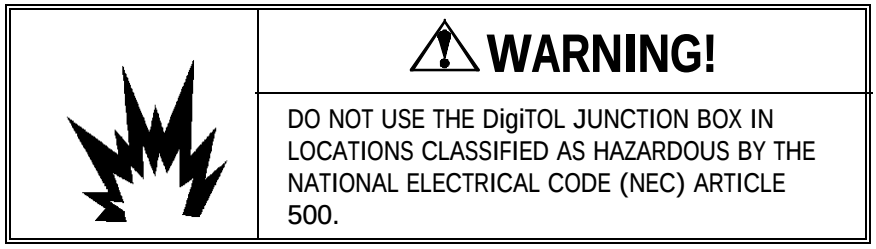
Load Cell Wiring		Instrument Cable Wiring	
Function	Wire Color	Function	Color
+ Excitation	Blue	+ Excitation	White
+ Sense	Green*	+ Sense	Yellow
+ Signal	White	+ Signal	Green
Shield	Yellow	Shield	Orange
- Signal	Red	- Signal	Black
- Sense	Gray*	- Sense	Red
- Excitation	Black	- Excitation	Blue
		Based on METTLER TOLEDO cable no. 510624370	

Table 3-1: Analog Junction Box Wiring Codes

DigiTOL DLC Mode

Note: The DigiTOL junction box is not compatible with the Model 8510 panel mount indicator, Models 8572 and 8582 counting scales, or Model 8530VS.

Ultramount weigh modules can be used with a DigiTOL junction box for summing load cell outputs. Only DigiTOL indicators work with a DigiTOL junction box. In the DLC mode, the indicator serves as the host for the DigiTOL junction box, allowing you to use the indicator's keypad to adjust scale parameters. See Figure 3-5 and Table 3-2 for cable connections. Load cell wiring for DigiTOL DLC mode is the same as for analog mode.



Note: For load cell connections, the +Excitation and +Sense wires should be connected to the same terminal; the -Excitation and -Sense wires should be connected to the same terminal.

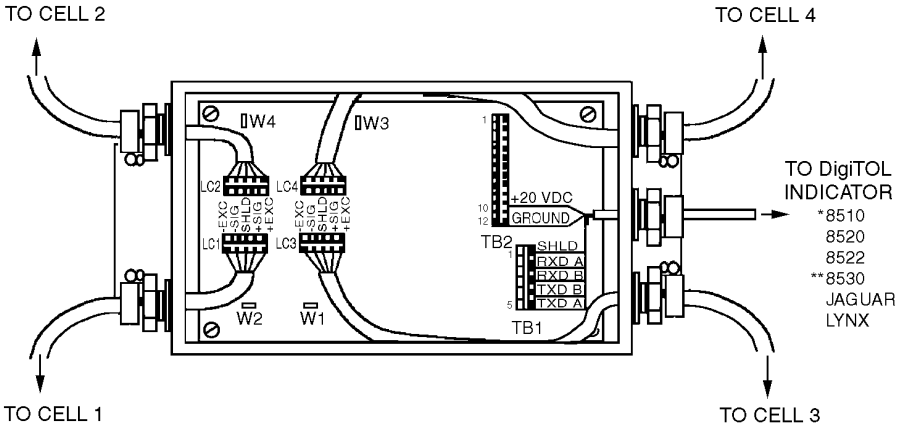


Figure 3-5: DigiTOL Junction Box Detail

Note: For 2 mV/V load cells, jumpers W1, W2, W3, and W4 must be ON (shorting the pins).

Terminal No.	Position	Function	Wire Colors
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

Table 3-2: DigiTOL Junction Box Wiring DLC Mode

IDNet Mode

The IDNet junction box can output an IDNet data format compatible with the METTLER TOLEDO ID1 and ID5 weight displays or the Jaguar Industrial Terminal. See Figure 3-6, Table 3-3, and Table 3-4 for cable connections. For detailed information about the indicator capabilities and operating instructions, refer to the appropriate service manual.

⚠ WARNING!

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

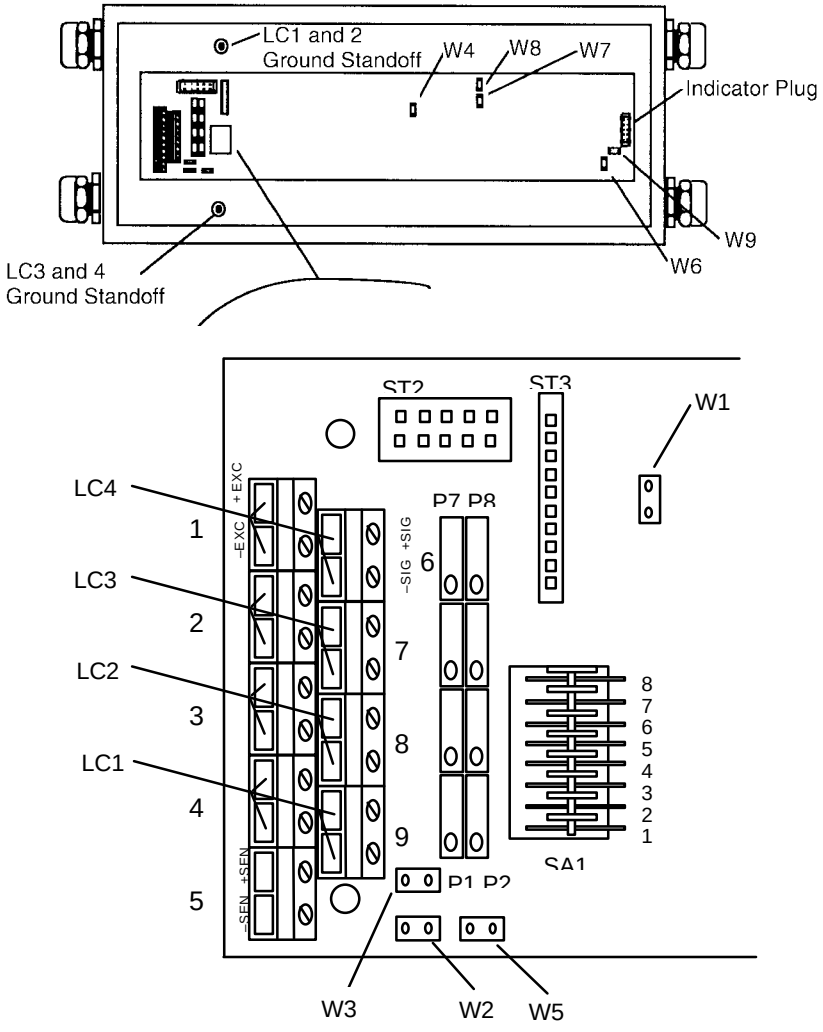


Figure 3-6: IDNet Junction Box Detail

Note: For load cell connections, the +Excitation and +Sense wires should be connected to the same terminal; the -Excitation and -Sense wires should be connected to the same terminal.

Load Cell	Terminal					
	+EXC Blue	+SEN Green	-EXC Black	-SEN Gray	+SIG White	-SIG Red
1	4		4		9	9
2	3		3		8	8
3	2		2		7	7
4	1		1		6	6

Table 3-3: IDNet Junction Box Wiring

Note: For 2 mV/V load cells, jumpers W1, W2, W3, and W4 must be ON (shorting the pins).

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

Table 3-4: IDNet Default Factory Settings

Home Run Cable Connection

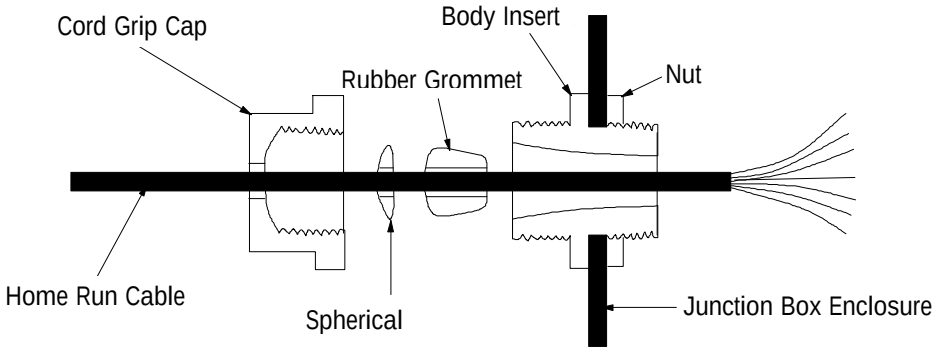


Figure 3-7: Cord Connection Details

Connect the home run cable from the scale indicator to the junction box (refer to Figure 3-7):

1. Wire the home run cable to the PCB according to Figure 3-4 for Analog, Figure 3-5 for DigiTOL, or Figure 3-6 for IDNet.
2. Place the desiccant bag inside the junction box.
3. Reinstall the junction box lid. Make sure that the rubber gasket is clean and correctly positioned. Tighten all screws and make sure all cord grip caps are secure.

4 Calibration

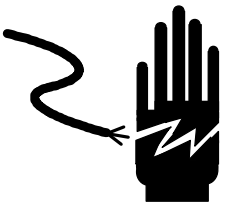
Shift Adjust

Calibration adjustments should be made only after checking all mechanical parts and after proving that the scale activity is repeatable. To check repeatability, repeatedly place a test weight in the same position on the scale to make sure that the scale gives the same weight reading each time.

Then perform a shift adjustment to make the weight reading at or near each weigh module the same for the same test weight.

The amount of test weight used for the shift test should equal 10 percent of the rated scale capacity. Test weights should be concentrated directly (or as close as possible) over the weigh modules.

Analog Junction Box Shift Adjustment



⚠ WARNING

PERMIT ONLY 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.

Perform a shift adjust using the load cell trim potentiometers mounted on the junction box PCB.

1. Successively place the test weight at each of the designated locations (at or near the weigh modules). Record the displayed weight readings.
2. Determine the location with the lowest weight reading.
3. Proceeding clockwise, place the test weight at each designated location. If necessary, adjust the trim potentiometer corresponding to that location to obtain the weight reading recorded in Step 2.
4. Repeat this procedure until all weight readings at the designated locations are the same or within the tolerances specified by the local weights and measures authority.
5. Make sure all cable connectors and cord grip caps are tight, place the desiccant bag in the box, and reinstall the junction box lid.

DigiTOL Junction Box Shift Adjustment

Perform the shift adjustment at the indicator, with the indicator in Setup mode. For shift adjustment instructions, refer to the manual for the weight indicator you are using.

IDNet Junction Box Shift Adjustment

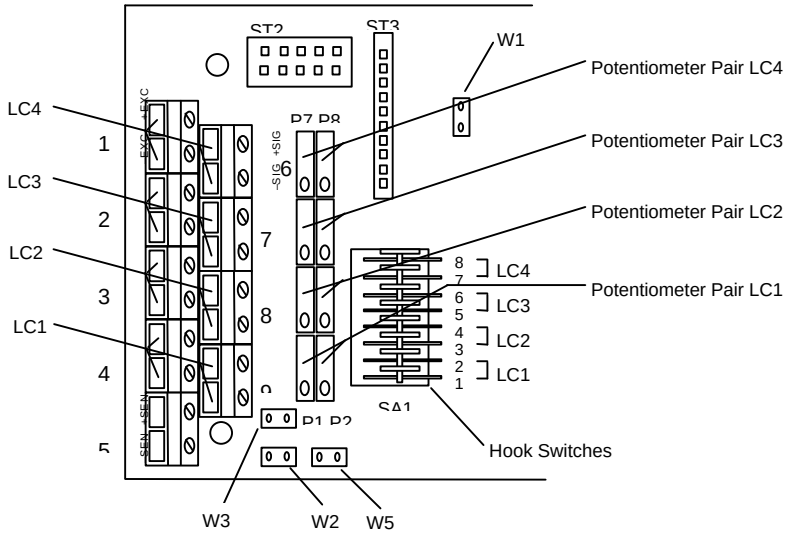


Figure 4-1: IDNet Potentiometer Adjustment

Perform the shift adjustment using the load cell trim potentiometers mounted on the IDNet junction box PCB (see Figure 4-1).

1. Successively place the test weight(s) at the designated locations and record each weight reading. If the readings are within the desired tolerance, no shift adjustment is needed. If the readings are not within the desired tolerance, perform Steps 2 to 7.
2. Activate the trim potentiometers by opening the eight hook switches (if they are not already open) on the PCB. Once activated, the switches remain open. Do not close the latches, even after completing the shift adjustment.
3. Start the adjustment at the load cell having the highest positive reading. This process trims the load cells to match the value of the lowest recorded value.
4. To make minor adjustments, turn the trim potentiometers (each load cell has two) clockwise for an increase or counterclockwise for a decrease.
5. If the scale needs further adjustment, turn all potentiometers counterclockwise. Stop turning the potentiometers when the indication on the instrument or meter stabilizes.
6. Reapply the test weight(s) to the location that has the highest recorded weight reading. Then adjust the load cell potentiometers to match the reading of the location that has the lowest recorded value. Repeat this step until all location

readings are the same or within the specified scale tolerances. Repeat Step 1 to verify shift tolerances.

7. Make sure all cable connectors and cord grip caps are tight. Then place the desiccant bag in the box, leave all hook latches open, and reinstall the junction box lid.

Scale Calibration (Span)

Options for Calibration

Calibration with Test Weights

The most accurate, reliable way to calibrate a scale is to use test weights. Calibrate the scale using test weights equal to the scale capacity. With the proper test weight, continue calibrating the weighing system according to the instructions provided in your digital indicator manual.

Calibration with Test Weights and Material Substitution

The substitution method is recommended for larger installations where it is physically impossible to hang test weights equal to the tank's maximum capacity. When performed correctly, this method provides weight readings for plotting a reliable performance graph.

1. For example, you might hang 300 kg of test weights, take a weight reading, and then remove the test weights.
2. Add enough water to the tank to equal the weight reading obtained with the test weights.
3. Leave the water in the tank. Hang the same test weights again, take a second weight reading, and then remove the test weights.
4. Add enough additional water to the tank to equal the second test weight reading.
5. Repeat this procedure until the tank is full.

Calibration with Material Transfer

When calibrating with material transfer, weigh a material (usually water) on an existing scale and transfer it to the tank scale being calibrated. Do this in a single transfer or in stages until you reach the tank's maximum capacity. This method provides only a rough calibration. It is only as accurate as the existing scale and the transfer process. Even under the best circumstances, you cannot tell if allowable errors are cumulative or compensating.

Electronic Calibration

When using the electronic calibration method, replace the load cell cables with leads from a load cell simulator. The simulator sends out a signal equal to the signal the load cells should produce. Electronic calibration is noted for its speed and simplicity; however, it calibrates only the electronics. It does not verify the scale performance

because it assumes that the tank and all mechanical connections are in perfect working order.

1. With the simulator adjusted to zero output, set the indicator to zero.
2. Adjust the simulator to full output, a signal that all the load cells should produce at their rated capacity.
3. Adjust the indicator to show the total capacity of all load cells in the system.
4. Attach the load cell input to the indicator.
5. “Zero off” the empty weight of the tank.

5 Routine Care and Maintenance

General

Once you have installed your weighing equipment, you should have an authorized METTLER TOLEDO representative periodically inspect and calibrate it. 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

Make sure that the scale site remains in good condition. Check for alterations in the dead-to-live connections, alterations in support for the weigh modules, overloading and excessive vibration conditions, and debris or material build-up under or around the scale that could inhibit freedom of movement.

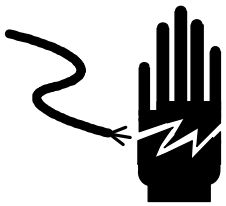
Weigh Module and Junction Box Inspection

During periodic inspections of the weigh modules, check:

- Load cells and ball-and-cup or load-pin assemblies for signs of unusual wear
- Clearance between the hold-down bolt and the top plate
- Floor drain for adequate drainage away from the weigh modules
- Junction box lid: Is it properly sealed? Are all cord grips tight?
- Moisture or foreign material present around or inside the junction box assembly
- Instrument cable: Is it damaged? Does it bind the scale?
- Repeatability and shift of the scale

6 Troubleshooting

General



⚠ WARNING

PERMIT ONLY 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 a scale is not working properly, find out as much about the problem as possible. Try to determine whether the problem is constant or intermittent. Mechanical and electrical influences can cause malfunctions.

When troubleshooting Ultramount weigh modules, check the instrument cable for damage and check all connections for any loose/incorrect wiring. Examine the physical location of the scale, checking for the following:

- Water
- Corrosive materials
- Unlevel floors
- High vibrations
- Air currents
- Physical damage to the scale platform or frame

⚠ CAUTION

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

Isolate the Problem

To determine whether the problem is in the scale or the digital indicator:

1. Remove power from the system.
2. Disconnect the digital indicator from the scale, and connect the indicator to a load cell simulator (analog load cell simulators are available from METTLER TOLEDO).
3. Reapply power. If the problem persists, consult the digital indicator manual for further troubleshooting assistance.
4. If the problem is NOT present with the load cell simulator attached to the indicator, remove power. Disconnect the simulator and reconnect the scale. If the problem persists, continue troubleshooting the scale.

Check Wiring

The wiring color codes are:

*See Figure 3-5 and Table 3-2 for DigiTOL instrument cable wiring.

Load Cells		Analog Instrument Cable*	
Function	Wire Color	Function	Wire Color
+ Excitation	Blue	+ Excitation	White
+ Sense	Green	+ Sense	Yellow
+ Signal	White	+ Signal	Green
Shield	Yellow	Shield	Orange
- Signal	Red	- Signal	Black
- Sense	Gray	- Sense	Red
- Excitation	Black	- Excitation	Blue
		Instrument cable color code based on METTLER TOLEDO cable no. 51062037	

Table 6-1: Load Cell Wiring Color Codes

1. Remove power from the system.
2. Remove the lid from the junction box and check the interior for moisture and foreign material.
3. Make sure that all wiring connections are tight and that no insulation material is touching the terminal contacts.
4. Check all cable connections for correct wiring. Check all cable connectors and cord grip caps on the junction box. Tighten any loose connectors.

Check Load Cells

Check each load cell for proper bridge resistances.

Measuring Points	Resistance
Any lead to shield or ground	Infinity
+Exc (Blue) to -Exc (Black)	350 to 480 ohms
+Sig (White) to -Sig (Red)	356 ± 0.12 ohms

Table 6-2: Load Cell Measuring Points

If bridge resistances are within specification, perform a shorted-signal symmetry check.

1. Short the signal leads together and place one multimeter lead on the shorted signal and one lead on the +Excitation wire.
2. Note the resistance value.
3. Remove the lead from the +Excitation wire and place it on the –Excitation wire.
4. Both resistance values should be approximately equal.

If the cells pass the above test:

1. Reapply power to the scale platform.
2. 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 on the application and digital indicator.
3. If proper excitation voltage is reaching the load cells, check the output signal from each cell.
4. If one cell has a particularly high or low dead-load output, it is suspect. The maximum output from any cell is 30 mV at 15 VDC excitation and loaded to gross capacity.
5. If any cell has an unusual signal, remove all load from that cell by raising the platform.
6. With the power still on, measure the output from the suspect load cell. The “no-load” zero output should be ±1.5% of the full scale output. For example, if the excitation voltage is 15 VDC, then the full scale output is 30 mV and the load zero output should be within ±0.45 mV.
7. If the load cell is out of specification, replace it.

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

Check Mechanical Components

Because the Ultramount weigh module design is so simple, only a few mechanical components require troubleshooting.

Make sure that the scale can move freely. Check new or modified dead-to-live connections on the scale. Also, check the following:

- Is the scale rocking? Reshimming may be required.
- Are the pins worn? Replace unevenly worn pins or pins with flattened bearing surfaces.
- Does rigid piping or poor structural support result in mechanical binds?

Load Cell Replacement Procedure

Remove Load Cell

1. Remove power from the digital indicator and disconnect the instrument cable.
2. Remove the junction box cover and locate the defective load cell terminal.
3. Disconnect the defective load cell cable from its terminal on the summing PCB.
4. Loosen the watertight cable connector on the junction box and remove the cable from the enclosure.
5. Carefully use the jacking bolt to raise the empty vessel off the cell. Raise the top plate of the weigh module for access to the defective cell.
6. If the load cell cable runs through a conduit, attach a string to the end of the defective load cell cable. The string should be both strong enough and long enough to pull the new load cell cable through the conduit.
7. Remove the load cell mounting screws, and keep them for reinstallation. Lift the load cell from the mounting surface. See Table 6.3 for bolt sizes and torques.

⚠ CAUTION

BE SURE TO BLOCK THE SCALE WHEN IT IS IN THE RAISED POSITION. OBSERVE ALL APPROPRIATE SAFETY PROCEDURES WHEN INSTALLING AND SERVICING THE WEIGH MODULES.

8. Carefully pull the defective load cell cable through the conduit while feeding the string through the junction box opening. Once the string is at the load cell location, detach it from the load cell cable.
9. Remove the suspension from the defective load cell.

Install New Load Cell

1. Reinstall the suspension in the new load cell.
2. Attach the new load cell cable to the pulling string and carefully thread it through the conduit into the junction box opening.
3. Secure the new load cell to the base plate. Apply an anti-seize compound such as Never-Seez to the mounting screw threads and tighten to the torque specifications outlined in Table 6.3

Ultramount Weigh Module	S.S. Load Cell Bolt & Torque in ft-lb (Nm)
5 kg, 10 kg, 20 kg, 50 kg, 100 kg	13 ft-lb (17.6 Nm)

Table 6.3: Torque Specifications

4. Make sure there is adequate clearance under the load end of the load cell.
5. 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.
6. Wire the new load cell cable to the proper terminal on the PCB, according to the wiring code.
7. Make sure that the suspension is properly aligned with the receiver in the top plate. Then, slowly lower the top plate until the suspension is properly seated.
8. Reattach the instrument cable and power-up the indicator. Perform a shift adjust if required, and recalibrate the scale.

7 Service Parts

Refer to the following drawings and tables when ordering parts for Model 0972 Ultramount weigh modules.

Ball-and-Cup Assembly

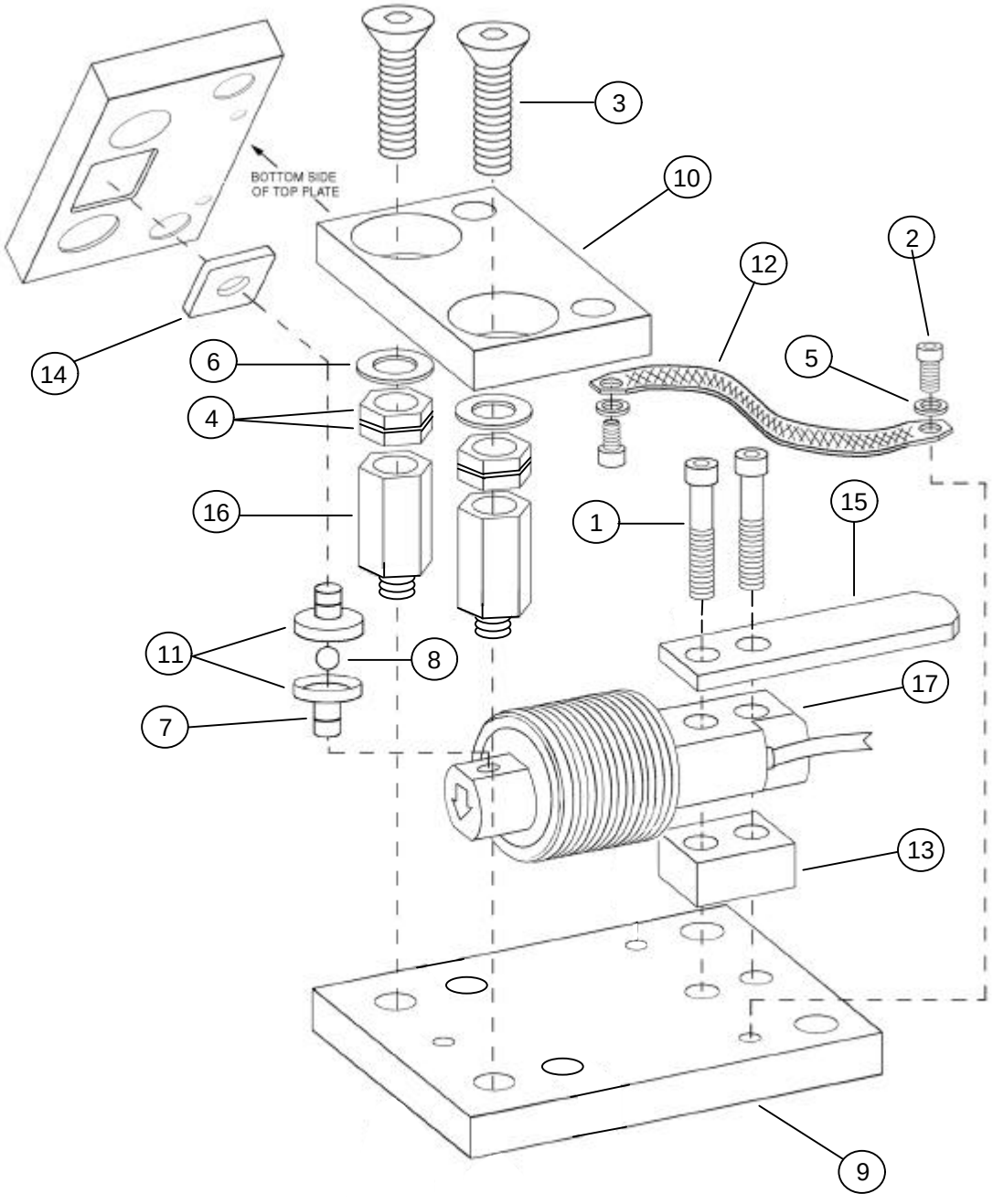


Figure 7-1: Ultramount Ball-and-Cup Assembly

Ref. No.	Part Number	Description	Qty.
1	MZ0901010488	Socket Head Screw, M8 x 1.25 x 55, SS	2
2	MZ0901010489	Socket Head Screw, M4 x 0.7 x 8, SS	2
3	MZ0901010491	Socket Head Screw, M12 x 1.75 x 45, SS	2
4	MZ0901020108	Hex Jam Nut, M12 x 1.75, SS	4
5	MZ0901030104	Plain Washer, M4, SS	2
6	MZ0901030107	Plain Washer, M12, SS	2
7	MZ0909000061	O-Ring, AS-568A-009, Buna-N, 70 Shore A	2
8	MZ1601000019	Ball Bearing, 10 mm diameter, SS, 440C	1
9	TA600616	Base Plate	1
10	TA600617	Top Plate	1
11	TN600611	Cup	2
12	TN600612	Ground Strap	1
13	TN600613	Load Cell Spacer Plate	1
14	TN600614	Bearing Plate	1
15	TN600615	Load Cell Clamp Plate	1
16	TN600619	Standoff, M12 x 36, SS	2
17	TB600654-030 TB600655-030 TB600656-030 TB600657-030 TB600658-030	5-kg Load Cell 10-kg Load Cell 20-kg Load Cell 50-kg Load Cell 100-kg Load Cell	1

Table 7-1: Ultramount Ball-and-Cup Assembly

Load-Pin Assembly

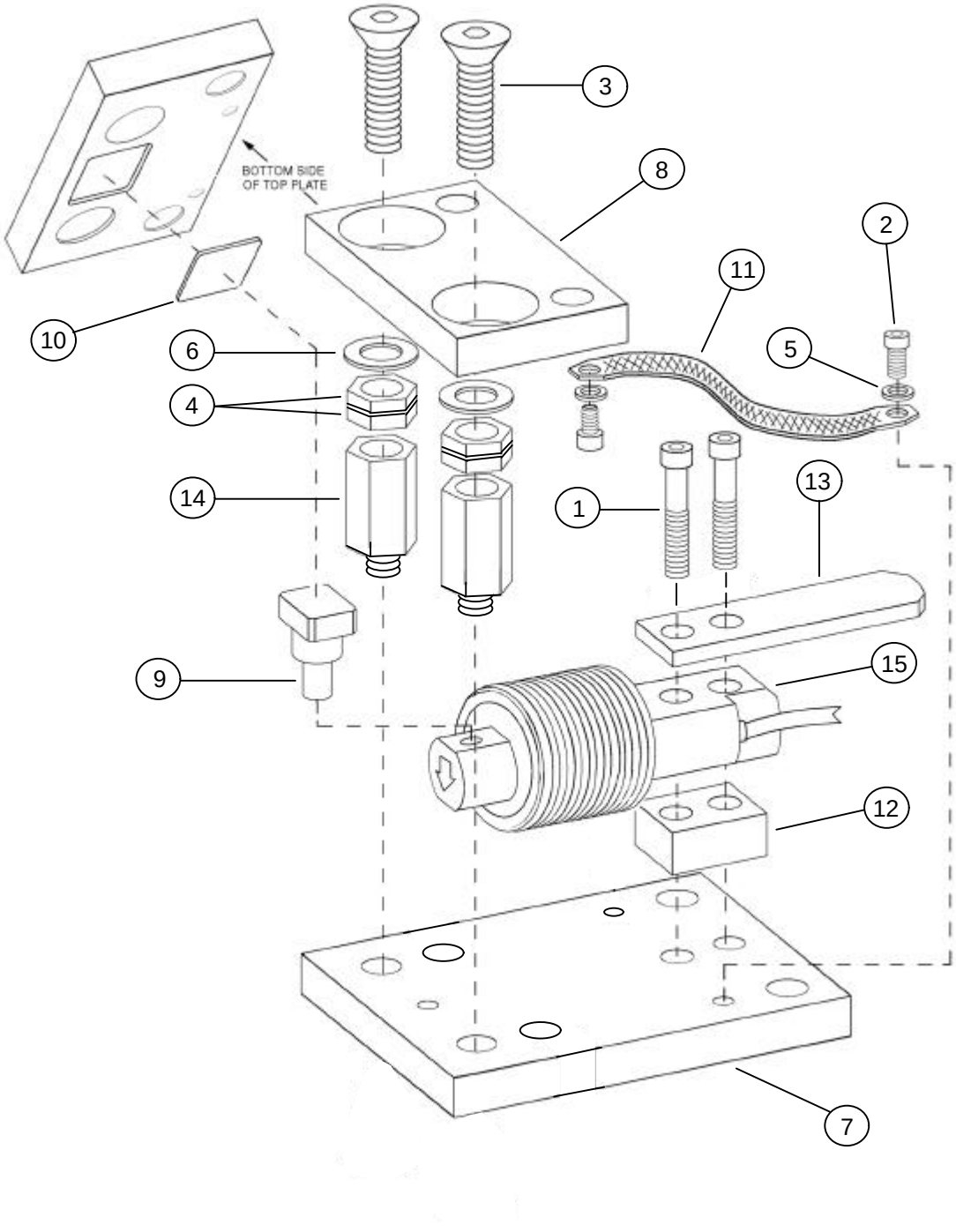


Figure 7-2: Ultramount Load-Pin Assembly

Ref. No.	Part Number	Description	Qty.
1	MZ0901010488	Socket Head Screw, M8 x 1.25 x 55, SS	2
2	MZ0901010489	Socket Head Screw, M4 x 0.7 x 8, SS	2
3	MZ0901010491	Socket Head Screw, M12 x 1.75 x 45, SS	2
4	MZ0901020108	Hex Jam Nut, M12 x 1.75, SS	4
5	MZ0901030104	Plain Washer, M4, SS	2
6	MZ0901030107	Plain Washer, M12, SS	2
7	TA600616	Base Plate	1
8	TA600617	Top Plate	1
9	TA600618	Load Pin	1
10	TN600610	Bearing-Plate Pin	1
11	TN600612	Ground Strap	1
12	TN600613	Load Cell Spacer Plate	1
13	TN600615	Load Cell Clamp Plate	1
14	TN600619	Standoff, M12 x 36, SS	2
15	TB600654-030 TB600655-030 TB600656-030 TB600657-030 TB600658-030	5-kg Load Cell 10-kg Load Cell 20-kg Load Cell 50-kg Load Cell 100-kg Load Cell	1

Table 7-2: Ultramount Load-Pin Assembly

8 Reference Material

Reference Drawings

- *Weigh Module Systems Handbook*, Part Number *15598500A (may have a letter prefix)
- *Do-It-Yourself Guide To Building Tank Scales*, Part Number TH3100.0E

General Dimensions	Analog Wiring Diagram	DigiTOL Wiring Diagram	IDNet Wiring Diagram
TA600732	TB100505	TB100575	TB100600

Table 8-1: Reference Drawings

Recommended Spare Parts

For part numbers, refer to Chapter 7.

Qty.	Description
1	Load cell
1	Junction box circuit board (type of board is per model of scale)
1	Junction box desiccant bag
1	Load pin or ball bearing

Table 8-2: Recommended Spare Parts

METTLER TOLEDO

Publication Suggestion Report

If you have suggestions concerning this publication, please complete this form and fax it to (614) 481-7295

Publication Name: METTLER TOLEDO 0972 Ultramount Service Manual

Publication Part Number: 15487600A **Publication Date: 5/99**

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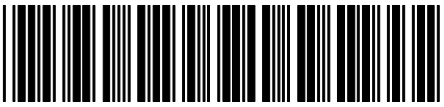

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