Load Disc 3xi/LD3xiC
Installation Manual

CAUTION

It is essential that all instructions in this manual be followed precisely to ensure proper operation of the equipment.

KM

97-1137-02
Rev F
July 2003

NOTICE

CAUTION

Follow these rules if welding is done on the vessel after installation of the Load Disc.
The electrical current of the welder may pass through the Load Disc, causing damage to the transducer and possibly to the signal processor. To avoid damage, follow these precautions:

1. Disconnect the Load Disc cables from the signal processor.
2. Ground the welder as close to the welding joint as possible. The welding ground must be between the Load Disc and the weld joint to prevent the welding current from going through the Load Disc to earth ground.

Note

High temperatures can damage the Load Disc. If you are welding in the vicinity of a Load Disc, monitor the temperature of the metal adjacent to the Load Disc. If it becomes too hot to touch, stop welding immediately and remove the Load Disc before continuing. Prior to reinstalling the Load Disc, verify that no damage has occurred by referring to the measurement procedures in Troubleshooting, Appendix C.

Table of Contents

Introduction

This chapter describes the organization, manual conventions, and provides specification information .

Welcome

This manual describes the installation of the Load Disc 3xi/3xiC load cell and its various hardware options. It includes procedures for leveling and shimming of the vessel if it is neccessary. Instructions for wiring the load cell to the junction boxes and wiring the junction boxes together and to the signal processor are also included. Refer to the signal processor manual for specific information on wiring the junction boxes to the signal processor.

Contact KM at 1-800-426-9010 if you have any questions regarding the installation. For outside the USA and Canada, call 425-486-6600.

About this manual

The chapters are organized in the following way:

Chapter 1: Description of the Load Disc 3xi/3xiC
Chapter 2: Preparing the Load Disc 3xi/3xiC for Installation
Chapter 3: Mounting the Load Disc 3xi/3xiC

Appendix A through D include contact info, system calibration, troubleshooting charts and technical drawings (TI's).

Manual Conventions

Three kinds of special explanations appear throughout the manual — *Warning , Caution and Note*. The format and significance of each is defined below:

WARNING

Possible danger to people. Injury may result if this information is ignored.

CAUTION

Possible risk to the product. The Load Disc or other equipment may be damaged if this information is ignored.

Note

Contains additional information about a step or feature critical to the installation or operation of the Load Disc.

Specifications

LD3xi

Mechanical

Compression: 3 x rated load

Tension: 1 x rated load

Shear (capacity 220 lbs -2200 lbs): 0.5 x rated load

(capacity 5500 lbs): 0.25 x rated load

Functional Integrity: 1.5x rated load (compression)

Electrical

Excitation Voltage - Operating Range: 5-15 VDC
Recommended Supply Voltage: 10 VDC
Maximum Current: 16mA @ 10 VDC excitation (0° F)
Output Resistance: 700 ohms +/- 2%

Output

Non-linearity/Hysteresis combined: 0.03% standardized output
Return to Zero over 30 min: 0.026% standardized output
Creep over 30 min: 0.028% standardized output
Creep over 20 and 30 min: 0.008% standardized output

Zero Balance: 1% standardized output
Rated Output: 2 mV/V +/-0.1%

Environmental

Temperature Range - Standard: 14° to 104° F (-10° to 40° C)

Temperature Zero Shift: 0.0013%/ °F (0.0024%/°C)

Temperature Sensitivity Change: 0.00094% /° F (0.0017% /° C)

Storage Temp Range: -4° to 176° F (-20° C to 80°C)

Humidity: 100%

Physical

Construction: 17-4 PH 900 stainless steel

Connector (optional): 6P rated sealed 5-conductor,
12mm male receptacle

Cable Length: 16ft. (5 m) with tinned pigtail termination

Rating: IP68 (100h at 1m water column)

Shipping Weight: 5 lbs (2.3 kg)

LD3xiC/LD3xiMJ

Mechanical

Compression: 3 x rated load

Tension: 1 x rated load

Shear: 0.5 x rated load

Functional Integrity: 1.5x rated load (compression)

Electrical

Excitation Voltage - Operating Range: 5-15 VDC
Recommended Supply Voltage: 10 VDC
Maximum Current: 16mA @ 10 VDC excitation (0° F)
Output Resistance: 700 ohms +/- 2%

Output

Non-linearity/Hysteresis combined: 0.03% rated output
Return to Zero over 30 min: 0.026% rated output
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Temperature Sensitivity Change: 0.00094% /° F (0.0017% /° C)

Storage Temp Range: -4° to 176° F (-20° C to 80°C)

Humidity: 100%

Physical

Construction:
sensor: 17-4 PH 900 stainless steel
cage: 304 stainless steel

Cable Length: 16ft. (5 m) with tinned pigtail termination

Rating: IP68 (100h at 1m water column)

Shipping Weight: 18.7 lbs (8.5 kg)

Approvals: CE, OIML R60

Chapter 1:
Description of the Load Disc

This chapter describes the Load Disc 3xi/3xiC/3xiMJ Compression Load Cell and its installation options.

Figure 1-1:
LD3xi Compression Load Cell with optional NEMA-6P cable system

Introduction

The Load Disc 3xi/3xiC/3xiMJ is a low profile load cell that is bolted to both the support surface and the vessel supports, and is used to measure the weight of materials in vessels and tanks. The sealed, stainless steel construction--IP68 rated unit with an optional NEMA-6P watertight cable system and cable entry–makes the LD3xi/3xiC/3xiMJ ideal for use in high-pressure wash down and occasionally submerged environments. The LD3xi/LD3xiC/3xiMJ offers system performance accuracy of 0.03%.

The low-profile design for low clearance installations also keeps the vessel's center of gravity low and stable. Vessel tipping, walking or overturning while agitating is eliminated. Installation and setup is simplified with less hardware. No external vessel hold-downs are necessary, even in areas of high wind or seismic activity. There are no moving parts that can wear out or require replacement.

In bakery, pasta, confectionary and spice processing to resins, concrete/ aggregate, sand, pulp, minerals and other dry-to-wet operating conditions, the LD3xiC offers very specific advantages not available in most higher priced load cells. Standards include a tough "cage" mounting fixture into which the 17-4 stainless steel LD3xiC cell securely locks in place. Since the LD3xiC cell can be loaded before or after the tank is installed onto the "cage" fixture, you have more flexibility in mounting procedures. If ever the cell needs to be replaced, it can be unloaded without having to remove the "cage" fixture itself. The LD3xiC is available in virtually all popular weight capacities from 220 lbs to 22,000 lbs. and is easy to specify due to identical dimensions and price.

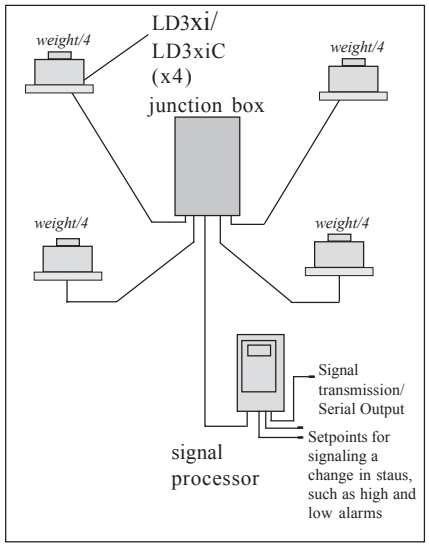


Figure 1-2:
General installation layout for LD3xi/ LD3xiC using a junction box.

General Description of Measurement System

The deflection of the load cell by the vessel weight is measured by the foil gage sensor, which is entirely sealed within the watertight cavity of the transducer. The sensor converts the deflection into an electrical signal which is directly proportional to the increase or decrease of the vessel contents. Material movement and changes in material repose will not affect the accuracy of the system. Accurate weight information is then sent to a signal processor for display, information transmission and storage (See Figure 1-2).

Applications Description

The watertight design of the load cell makes it ideal for measuring bulk material in the sanitary and clean-in-place environments. It is particularly suitable for use on mixing and blending vessels, surge hoppers, and agitated vessels. Rugged, solid, bolt-in-place mounting assures vessel stability in outdoor storage vessels with gussets or legs used in all process industries.

Installation Option Descriptions

This section will briefly describe the following hardware options: **Universal Top Plate Adapter, Leveling Top Plate Adapter, Anyadapter Plate and Leveling Base Adapter Plate.**

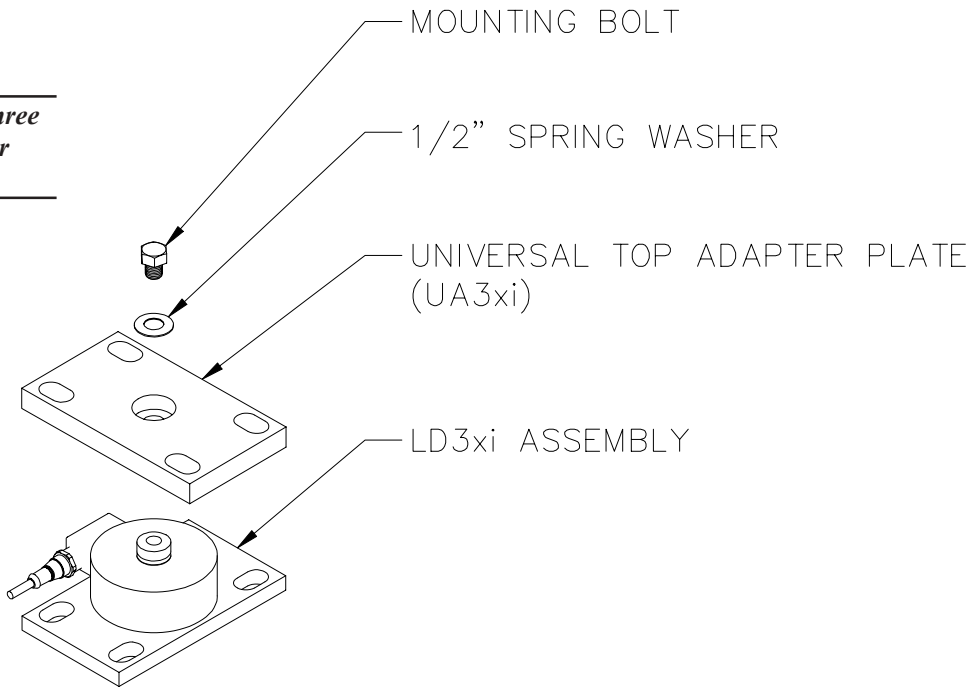
As well as the LD3xiC Load Cell configuration.

See Chapter 2 and 3 for more specific installation instructions and refer to the TI drawings located in Appendix D.

Universal Top Adapter Plate

This option consists of the **Universal Top Adapter Plate**, **spring washer** and a **hex head bolt**. The adapter plate attaches to the load disc with the bolt and washer. The adapter plate then bolts to a vessel gusset or a flat plate welded to the vessel leg, using customer-supplied hardware.

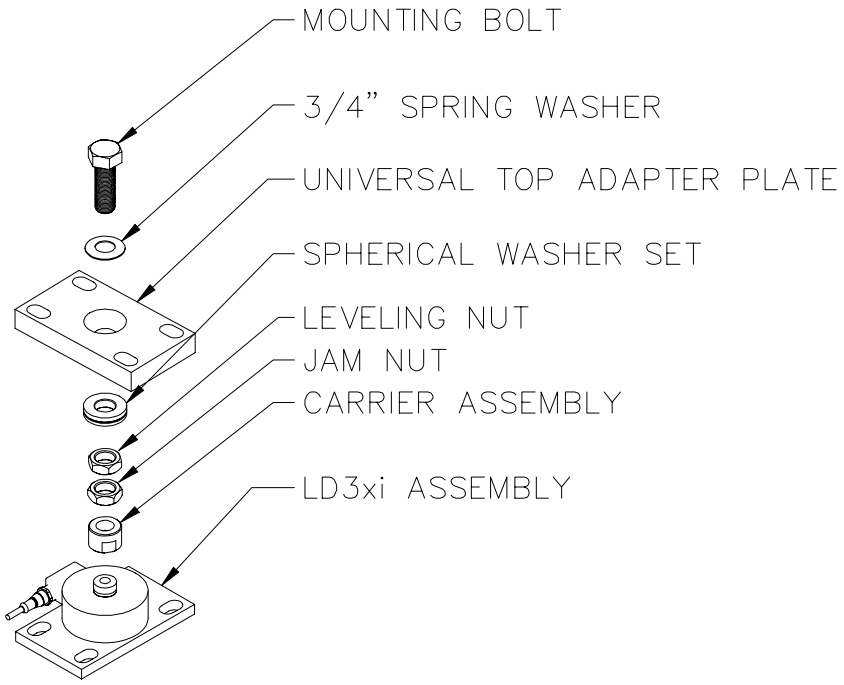
Note: Accomodates up to three degrees of tilt in the floor or vessel legs.



Leveling Top Plate Adapter

This option consists of the **Universal Top Adapter Plate**, a **hex head bolt, spherical washer set** and **jam nuts.** The adapter plate attaches to the load disc with the hex bolt and hardware. The adapter plate then bolts to a vessel gusset or a flat plate welded to the vessel leg, using customer-supplied hardware.

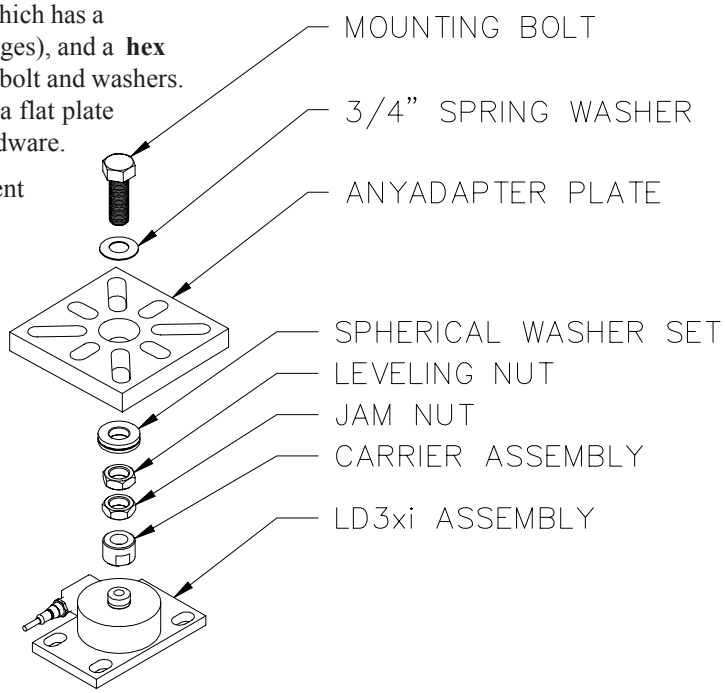
This hardware arrangement allows 360 degree movement of the top plate and angular misalignment of up to 3 degrees. Additionally, there is a leveling feature that allows vertical height adjustments. This arrangement also incorporates a locking-jam nut to insure the height remains unchanged.



Anyadapter Plate

This option consists of the unique **Anydapter Plate** which has a universal bolt pattern (to fit a variety of vessel leg flanges), and a **hex head bolt.** The plate attaches to the load disc with the bolt and washers. The Anyadapter plate then bolts to a vessel gusset or a flat plate welded to the vessel leg, using customer-supplied hardware.

This hardware arrangement allows 360 degree movement of the top plate and angular misalignment of up to 3 degrees. Additionally, there is a leveling feature that allows vertical height adjustments. This arrangement also incorporates a locking-jam nut to insure that the height remains unchanged.

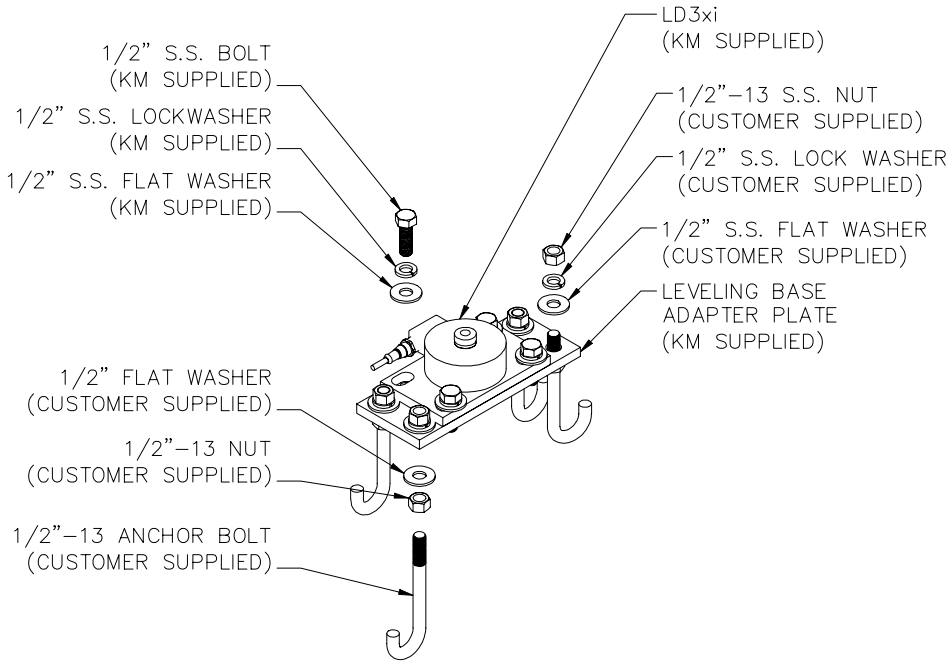


Leveling Base Adapter Plate

This kit consists of a **Leveling Base Adapter Plate** and **four hex bolts**, **four flat washers**, and **four lock washers**. The LD360S bolts onto the leveling base adapter plate. This plate rests on four leveling nuts and washers screwed onto anchor bolts installed in the foundation. By turning the leveling nuts, the height of the load discs and thus the vessel, can be adjusted for proper load distribution.

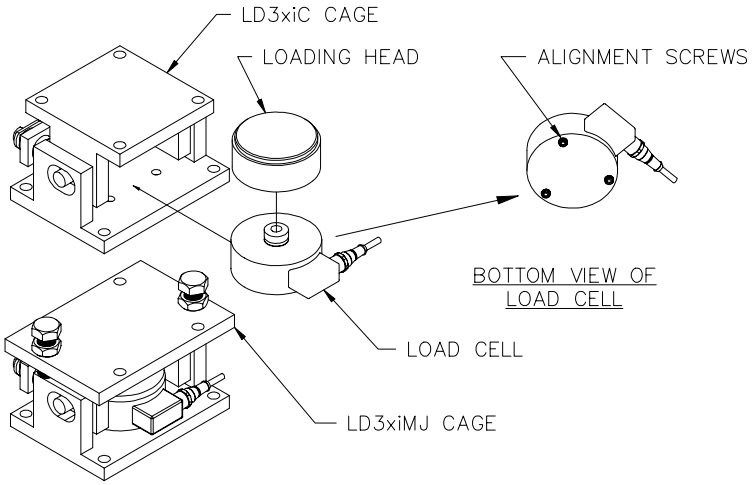
Note:
Adapter plate not shown in illustrationat right.

This kit requires an adapter plate for proper installation.



LD3xiC/3xiMJ Load Cell Assembly

This unit consists of the LD3xiC/3xiMJ load cell assembly (load cell and installed set screws) and a cage assembly. The load cell has the loading head on top and they both slide into the cage assembly. They are held in place with three set screws. The set screws are pre-installed into the load cell at the factory. The load cell assembly slips down into the holes of the cage assembly. (The LD3xiC assembly does not include jacking bolts, the LD3xiMJ does include jacking bolts.)



Chapter 2:
Preparing for the Load Disc Installation

This chapter describes the pre-check procedures for the LD3xi/LD3xiC. *Checking the load discs before installation will ensure properly working equipment that will provide accurate monitoring of vessel contents.*

Check Shipment

Perform the following prior to installing the Load Disc:

Check Load Disc Order Items

The following items are included with a typical order for each vessel (quantities dependent on application):

LD3xi/LD3xiC Load Cell

Junction Boxes or molded junctions

Top or Bottom Hardware (LD3xi only)

If any items are needed, contact KM before proceeding. Substituting parts without KM approval may cause system problems and will void the warranty.

Visual Check

Visually inspect all equipment in the order — including Load Discs, junction boxes, and signal processors — to verify they have not been damaged during shipment. If any item has been damaged, contact KM for a replacement.

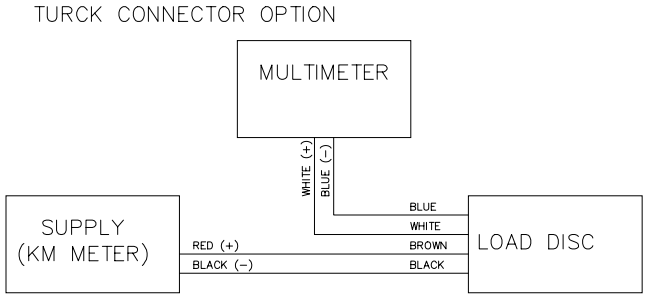
Measuring Sensor Output

To measure the output of the LD3xi/LD3xiC, the sensor needs to have an excitation voltage applied to it from a signal processor, a DC voltage generator, or a KM test meter.

To use the excitation from the KM Test Meter, put the switch in the simulate position and wire the positive to the red position and the negative to the black position.

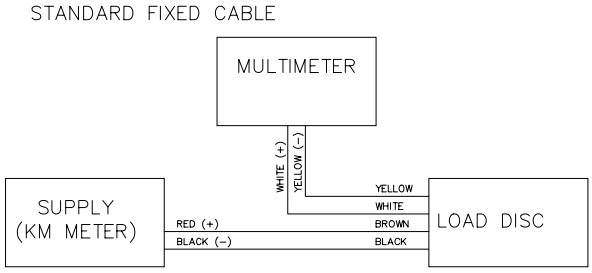
Turck Option

The excitation would be applied to the excitation wires or the quick disconnect cable, brown (positive) and black (negative). The millivolt signal would be measured with a multimeter on the output wires, white (positive) and blue (negative).



Standard Fixed Cable

The excitation would be applied to the excitation wires of the standard fixed cable, red (positive) and black (negative). The millivolt signal can be measured on the output wires, white (positive) and Yellow (negative).



Prepare Installation Equipment *(Customer Supplied)*

The following equipment is needed to install Load Discs:

- Lifting equipment
- Tape measure
- Level
- Pry bar
- Marking pen
- Wrenches
- ASTM A-325 bolts or anchor bolts (or equivalent strength), lock washers, and flat washers to secure Load Disc to vessel support or foundation (if applicable)*
- Signal processor
- Shims (if applicable)
- Grout (if applicable)
- *Digital Multimeter (FLUKE™ or equivalent)*

** See TI drawings in Appendix D for the appropriate bolt size.*

Note: KM recommends the use of a trim box for applications which need to be "certified for trade".

Vessel Preparation

There are two aspects to successful use of Load Discs — properly functioning Load Discs **and** appropriate vessel support characteristics. Review the following list of error sources, and make the recommended corrections before you install the Load Discs:

- An inadequate vessel foundation can allow excessive movement. Ensure the foundation is concrete or steel.
- Hidden load-bearing structures, such as discharge chutes or plumbing supported by the floor, can reduce loads on the vessel supports. Install flexible couplings to minmize this problem.
- Cross-connecting structures, such as catwalks and manifolds, can transfer loads from adjacent vessels. Install slip joint or flex couplings to minimize this problem.
- Shock loads can damage the Load Disc. Install protective barriers or stops to prevent vehicles from hitting the vessel supports.

Factors that affect Performance

An independent, isolated vessel with no connection to any other vessel or adjacent structure provides the most accurate results for a weight measurement system. Examples of this type of application are floor scales and truck scales. Connections to other vessels or structures affect accuracy because the transducers interpret strain changes caused by the connecting structures as being caused by changes in the material weight.

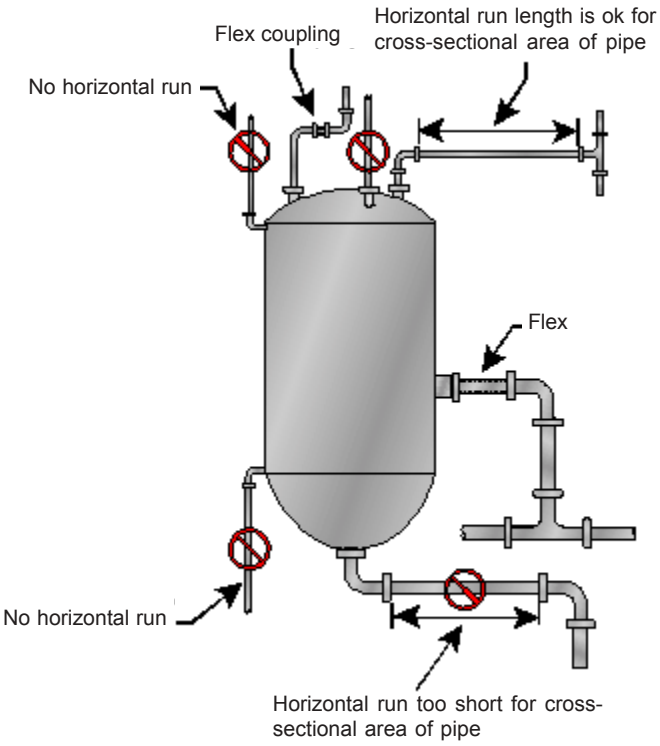


Figure 2-1:
Examples of typical causes of error.

Some typical causes of error related to connecting structures and, where applicable, methods for reducing the errors follow:

- Catwalk
- Hidden load bearing members
- Vessel goes through roof
- Tripper conveyors or deck plating
- Rigid piping connection between vessel and another adjacent structure
- Poor Foundation
- Flexible Structure
- Uneven Loading

Chapter 3: Mounting the Load Disc

This chapter describes installation and wiring of the LD3xi/LD3xiC *and junction boxes. Follow all instructions carefully to ensure proper operation of the system.*

General Information

The load disc has a variety of mounting hardware options that accommodate almost all possible applications. These general requirements apply to all applications:

- Ensure the surfaces where the baseplates bolt down onto are clean, smooth, flat, and level, with less than 1° of slope in any direction.
- Ensure vessel legs/gussets are clean, smooth, flat, and level, with less than 1° of slope in any direction.

CAUTION: If you need to raise the vessel or one vessel leg after installation, loosen the bolts on all Load Discs to prevent overloading.

- Position load disc so the cable cannot be snagged or chafed and can be easily routed to the junction box.
- When raising the vessel for load disc installation, use proper support to prevent the vessel from tipping or falling.
- During installation, carefully distribute the load to ALL load discs evenly. PLACING THE LOAD ON ANY ONE LOAD DISC MAY CAUSE DAMAGE.
- Hardware and Bolts —
  1. All bolts and hardware to attach the Load Disc to the vessel and to the foundation are customer-supplied, ASTM A-325 or equivalent. (See TI drawings Appendix D)
  2. Use specified hardware and bolt sizes. Using other than the specified hardware can either reduce strength or overstress the load disc during installation, voiding the warranty.
  3. All bolts are kept loose until shimming and leveling is complete.
- Securing LD3xi/LD3xiC after Leveling/Shimming —
  Once the weight distribution criteria has been satisfied through leveling and/or shimming, complete the installation by tightening the required bolts for your application.

LD3xi/LD3xiC General Installation

This section describes the installation procedures for the following hardware options:

Universal Top Plate Adapter, Leveling Top Plate Adapter, Anyadapter Plate, Leveling Base Adapter Plate as well as the LD3xiC.

1. Prior to installing the load cell, verify that they are the correct capacity for your application by reviewing the information on the label.

2. Measure the load cell voltage output. With no-load, the meter should read 0mV. (This measurement range is used only to verify the condition of the Load Disc.)
If the reading is significantly outside of this range, consult the factory before continuing the installation.

(If you have the LD3xiC, go to Step 5.)

3. Place bolt through center hole of adapter plate and install hardware for your application (See Appendix D: TI Drawings)

   a. For Universal Top Plate Adapter, install bolt and plate to LD3xi, tightening bolt to 5-10 ft-lbs.

   b. For Leveling and Anyadapter, install washers and nuts to the bolt and plate, making sure the washers/ nuts are loosely tightened against plate. Install the plate assembly to the LD3xi, tightening bolt to 5-10 ft-lbs.

4. For Leveling and Anyadapter applications, adjust plate to lowest position by lowering jam nut to top of LD3xi and tighten. Then lower leveling nut to the jam nut.

Note: Concrete foundation and grouting shown for reference only. The concepts apply to all foundation types.

Anchor bolts supplied by customer.

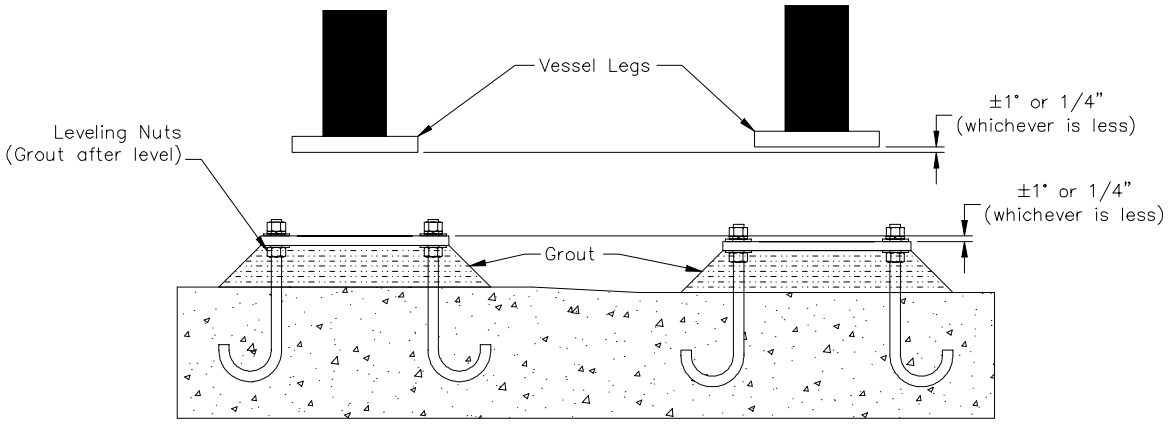


Figure 3-1: Angular misalignment

5. Raise the vessel.

6. Inspect the foundation and vessel mounting surfaces that will mate to the LD3xi/LD3xiC plates.

   a. Check the mounting hole locations and size on both the foundation base and the vessel foot pad. (Refer to the TI drawings, Appendix D.)

   b. Also check the surfaces for flatness and angular misalignment. *A baseplate with leveling nuts is recommended.* (See Figure 3-1)

7. Mount the LD3xi/LD3xiC assembly to the foundation. (See TI drawings, Appendix D)

   a. Lower the LD3xi/LD3xiC to the foundation. Take care to align the mounting holes with the foundation mounting holes/studs.

   b. Install the bolts and nuts as required. **DO NOT fully tighten the bolts at this time. Leave a 1/4-inch gap between the nut and the washer to allow for positioning of the Load Discs.** (See Figure 3-2.)

   c. Repeat Steps **7a** and **7b** for the remaining Load Discs.

8. Record the voltage output at "no-load"condition now that it is in position.

   a. Assign a number (1, 2, 3, etc.) to the load disc and make a note of it.

   b. Measure the output of load cell..

   c. Repeat steps a and b for all the Load Discs.

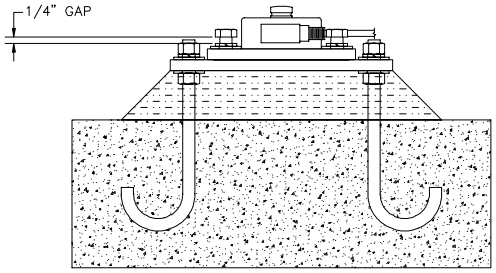


Figure 3-2: Leave 1/4-inch gap for positioning

Load Disc #	No-Load Output (mV)	Dead Weight Output (mV)	Output Change (mV) (Dead Weight Output - No-Load Output)
1			
2			
3			
4			

Figure 3-3: Weight Distribution Chart: Record YOUR system's Load Outputs

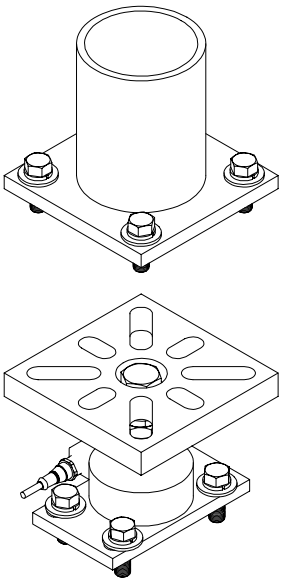


Figure 3-4: Lower vessel onto top plate.

Note: All output changes should be positive! If you observe a negative output change, check wiring polarity and vessel load shifting.

9. Mount the vessel to the LD3xi/LD3xiC.

   a. Lower the vessel gently onto the Load Discs. (Alignment pins may be used to help guide and position the vessel.) (See Figure 3-4)

   b. Center the Load Disc top mounting holes with the vessel mounting holes, using the clearance available from the bottom mounting holes.

Note: If the vessel hole pattern does NOT match up with the Load Disc hole pattern, modify the mounting holes on the vessel. DO NOT hammer or force the Load Disc into position by tightening the mounting bolts. The vessel holes will need to be resized or relocated.

   c. Place the four top bolts (customer supplied) through the vessel and the Load Disc mounting holes. The bolts must be able to pass freely through the holes without interference.

   d. Tighten the bolts, leaving a 1/4-inch gap for positioning. (See Figure 3-2)

11. Check dead weight output.

   a. Record the dead weight output on your Weight Distribution Chart that was started on page 3-3.

   b. Calculate the Output Change. (Change should be positive.)

Leveling and Shimming

The main objective of leveling/shimming the vessel is to distribute the weight evenly on all of the Load Discs. Uneven weight distribution will reduce the accuracy of the weight measurement system as a whole and in extreme cases may cause Load Disc damage.

Once the general instructions have been completed (page 3-2 through 3-4), begin the leveling and shimming instructions in this section.

Note: For installations where leveling nuts are not used, load balancing on the Load Discs must be achieved by adding or removing shims. Adjusting the Load Discs to distribute the vessel weight evenly may require adding shims (supplied by customer) systematically to all disc locations.

Note: The Universal Top Plate will accomodate angular misalignment up to three degrees maximum. (Figure 3-5) Ideally, the load is distributed evenly across the top plate.

Note: Shimming the plates of one Load Disc will probably affect the weight distribution on the Load Disc located on the opposite side. Keep this in mind while shimming.

Note: Shims are typically applied between the LD3xi's Top Plate and mating vessel plate, but the gap condition may exist at either the top or bottom plates.

CAUTION: If you need to raise the vessel or one vessel leg after installation, loosen the bolts on all Load Discs to prevent overloading.

Leveling/Shimming for the Universal Top Adapter Plate

1. Based on the Weight Distribution Chart (Figure 3-3) and visual inspection, raise the vessel and cut/place shims as required to adjust the distribution of weight on the Load Discs. *Begin with the "lowest output" support first!* **(Objects and support members may cause the weight to be distributed unevenly. Shimming will involve some judgement.)**

2. Gently lower the vessel and measure the dead weight output and the output change of all of the Load Discs to see how they are affected. Record again into the Weight Distribution Chart on page 3-3.

3. Repeat Steps 1 and 2 until you have achieved the desired output change of all of the Load Discs.

   (Since the output of each load cell may vary, the change from 'no load' to 'dead weight' being equal is more important than the absolute value.)

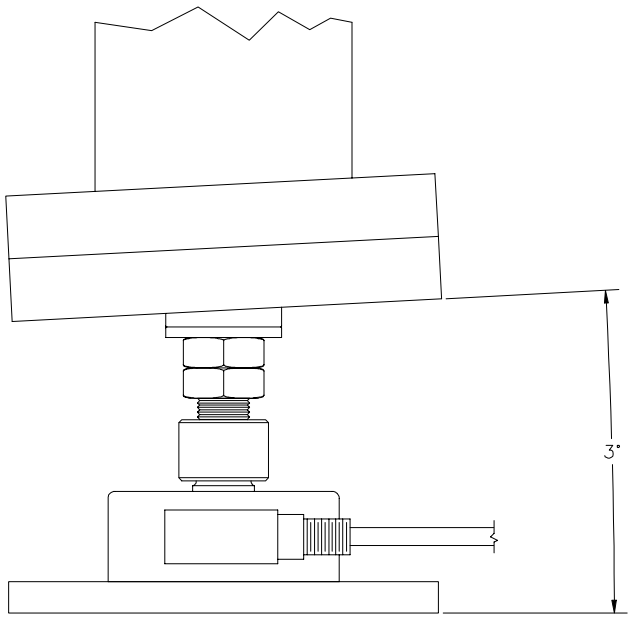


Figure 3-5: Angular misalignment up to 3 degrees.

Note: Shimming the plates of one Load Disc will probably affect the weight distribution on the Load Disc located on the opposite side. Keep this in mind while shimming.

CAUTION: If you need to raise the vessel or one vessel leg after installation, loosen the bolts on all Load Discs to prevent overloading.

Leveling/Shimming for the Leveling Top plate Adapter, Leveling Base Adapter Plate, and the Anyadapter Plate

1. Based on the Weight Distribution Chart and visual inspection, raise the leveling nut to adjust the top plate until the weight distribution falls within the weight distribution guidelines (See page 3-4). Check for gaps and use shims as required.

   (Objects and support members may cause the weight to be distributed unevenly. Shimming will involve some judgement.)

2. Gently lower the vessel and measure the dead weight output and the output change of all of the Load Discs to see how they are affected. (See Weight Distribution Chart page 3-3.)

3. Repeat Steps 1and 2 until you have achieved the desired output change of all of the Load Discs.

   (Since the output of each load cell may vary, the change from 'no load' to 'dead weight' being equal is more important than the absolute value.)

Junction Box Mounting and Wiring

Mounting Junction Box

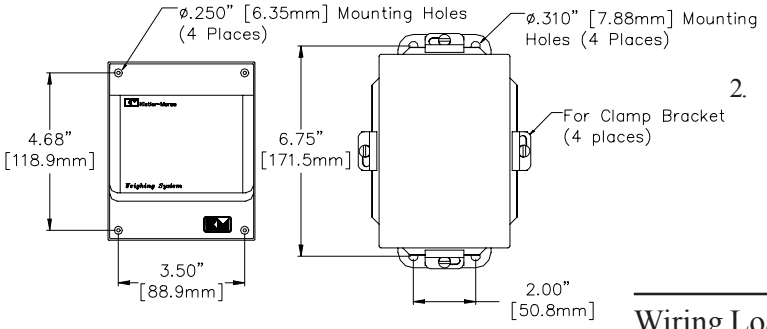


Figure 3-6: Plastic and Stainless Steel Junction Box Mounting

1. See Figure 3-6. Hold the junction box at the desired mounting location. Mark the four mounting holes.
2. Mount the junction box with #8-32 socket head cap screws and flat washers per your application. Tighten the screws until snug.

Wiring Load Discs to Junction Box

See Figure 3-7. The stainless steel junction box accommodates up to eight Load Discs, with up to two Load Disc wires at each terminal. Note that the junction box has no pre-cut holes for conduit or fittings. Follow this procedure:

CAUTION: Only use Sikaflex™ 1A polyurethane sealant or Dow Corning™ RTV 739 or RTV 738. Other sealants may contain acetic acid, which is harmful to sensors and electronics.

1. Install liquid tight fittings.
2. Seal fittings with Sikaflex™ or electrical grade sealant.
3. Thread the Load Disc cable through the desired conduit fitting. (See Figure 3-7).
4. Estimate the required length of cable to the terminal strip, allowing a little extra for strain relief. Cut the excess cable.
5. Strip back 3" (76mm) of the cable sheathing to expose the four wires and the shield inside. Strip back 1/4" (6mm) of insulation from the end of each of the wires.
6. **Connect the Load Disc wires to the selected TB2-5 terminals on the left side of the junction box: red or brown wire to +EX, white wire to +SIG, and black wire to -EX, and blue or yellow wire to -SIG.**

Note: If you have a 61-6036-01 Stainless Steel J-Box with trimming pots, refer to page 3-10.

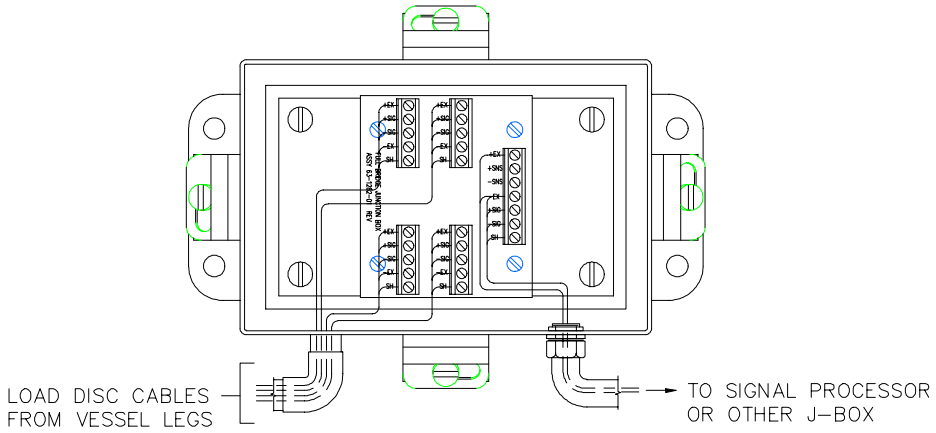


Figure 3-7: Wiring Load Discs to Stainless Steel Junction Box

7. Perform Steps 3 through 6 for each Load Disc you wire to this junction box.

8. Replace the junction box cover if not ready to begin wiring the junction boxes together.

Wiring Junction Boxes Together and to Signal Processor

Notes:

1. ***The procedure below assumes the conduit fitting and conduit for wiring the junction box to the other junction boxes and to the signal processor has been installed.***
2. ***Seal all conduit fittings against water entry. Install drain holes at conduit's lowest elevation(s) to allow condensation to drain.***
3. ***Use Belden™ 4-conductor shielded interconnect cable or equivalent to wire junction boxes together and to the signal processor. For lengths up to 50 feet (15.2 m), use Belden 8723.***
4. ***For 6-wire cable of distances up to 100 feet, use Belden 9773.***
5. ***All spliced wiring routed between junction boxes and signal processor must be soldered and encapsulated in waterproof heatshrink.***

1. Remove the junction box cover.
2. **See Figure 3-8. Route the 4-conductor cable through the fitting into the junction box farthest from the signal processor. Connect wires from the cable to the TB1 terminal in the junction box: red or brown wire to +EX, white wire to +SIG, and black wire to -EX, and blue or yellow wire to -SIG.**
3. **Route the cable through conduit to the next junction box. Estimate the required length of cable to the terminal strip, allowing a little extra for strain relief. Cut the excess cable. Connect wires from the cable to the TB1 terminal in the junction box: red or brown wire to +EX, white wire to +SIG, and black wire to -EX, and blue or yellow wire to -SIG.**
4. Route another cable through the fitting into this junction box, and attach wires to the TB1 terminal: **red or brown wire to +EX, white wire to +SIG, and black wire to -EX, and blue or yellow wire to -SIG.**
5. Repeat Steps 3 and 4 until all junction boxes on the vessel are wired together.

CAUTION: Only use Sikaflex™ 1A polyurethane sealant or Dow Corning™ RTV 739 or RTV 738. Other sealants may contain acetic acid, which is harmful to sensors and electronics.

6. Route the cable from the last junction box through conduit to the signal processor. Refer to the signal processor manual for wiring the junction box to the signal processor. One vessel takes up one channel in the signal processor — the channel shows the average value from all the load discs under the vessel.

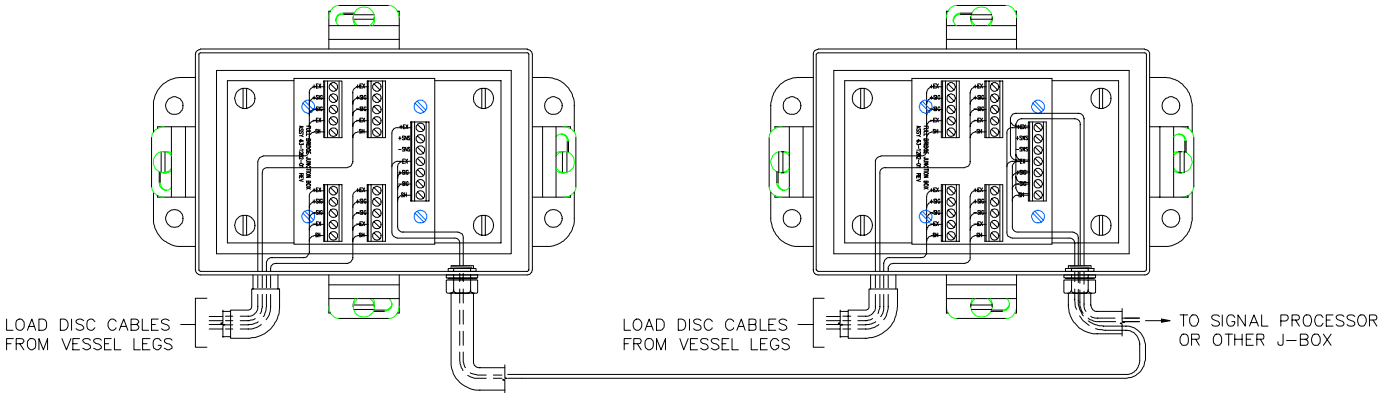


Figure 3-8: Wiring Stainless Steel Junction Boxes Together and to Signal Processor

Trim Box Mounting and Wiring

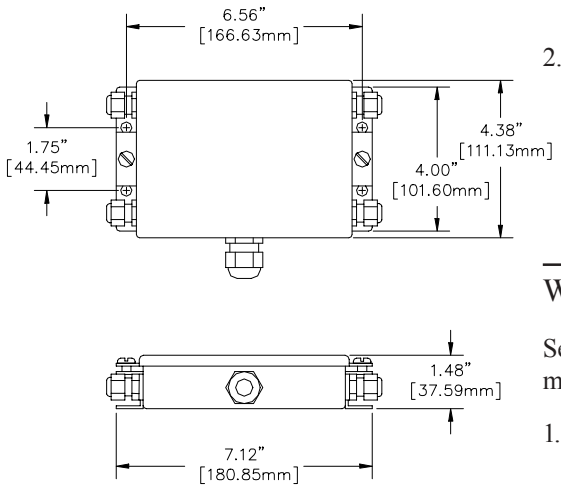


Figure 3-9: Summing Stainless Steel Junction Box Mounting

Mounting Trim Box

1. See Figure 3-9. Hold the junction box at the desired mounting location. Mark the four mounting holes.
2. Mount the junction box with #8-32 socket head cap screws and flat washers. Tighten the screws until snug.

Wiring Load Discs to Trim Box

See Figure 3-10. The summing stainless steel junction box accommodates up to eight Load Discs. Follow this procedure:

1. Thread the Load Disc cable through the desired conduit fitting. (See Figure 3-10).
2. Seal fittings with Sikaflex™ or electrical grade sealant.
3. Estimate the required length of cable to the terminal strip, allowing a little extra for strain relief. Do not cut the excess cable.
4. Strip back 3" (76mm) of the cable sheathing to expose the four wires and the shield inside. Strip back 1/4" (6mm) of insulation from the end of each of the wires.
5. The trim box is designed for two, three or four load cells. Determine the number of load discs that will be wired to the trim box, and cut the JU jumpers for any unused inputs. **The wire coding for the load disc:**

   Red or Brown = +EX
   Black = -EX
   White = +SI
   Blue or Yellow = -SI

6. Wire each load disc to the terminals, leaving the cord grips loose until the trimming has been complete. The terminals have quick connect levers that open when pushed. A screwdriver or ballpoint pen can be used to open or close jaws. The terminals can accommodate wire gauges #14 through #26.
7. Set all the potentiometers fully clockwise for inputs being used. This will give the maximum output from each load disc.

8. A calibration of the electronic indicator is needed before before trimming functions can be done. Refer to the electronic indicator manual for the calibration procedure.

9. Place test weights above each load cell and record the weight value displayed on the electronic indicator. The test weights should be directly above each load cell and not overhanging.

10. The cell that has the *lowest* weight displayed will not be adjusted; it will be the reference load cell. Place the weights above a load cell and adjust the potentiometer to match the displayed weight from the reference load cell.

11. After each potentiometer adjustment, the zero (no test weights applied) should be checked.

12. Repeat for each load cell. Do not adjust the reference load cell potentiometer.

13. When all of the cells are trimmed, a final calibration is required.

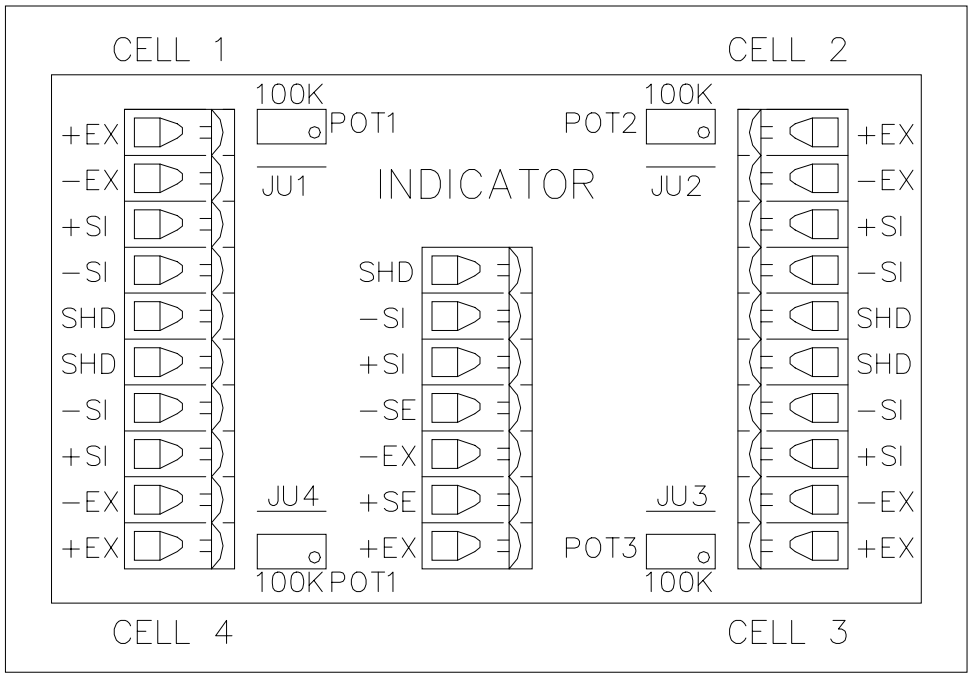


Figure 3-10: Wiring Load Discs to Junction Box

Appendix A: Contact Information

Contact Information

You may reach Kistler-Morse corporate headquarters at the following:

Mail: Kistler-Morse
19021 120th Ave NE Suite 101
Bothell, Washington USA 98011-9513

Telephone: 1-800-426-9010
(425) 486-6600

Fax: (425) 402-1500

E-mail: sales@kistlermorse.com

Website: http://www.kistlermorse.com

European Office

Mail: Kistler-Morse
Rucaplein 531
B-2610 Wilrijk-Belgium

Telephone: 32.3.218.99.99
Fax: 32.3.230.78.76

E-mail: kistler.morse@skynet.be

Technical Service

A complete, unabridged copy of our product warranty is available upon request from KM. A summary of the warranty, *subject to the terms and conditions listed fully in the warranty*, follows:

KM warrants the equipment to be free from defects in material and workmanship for one year from date of shipment to original user. KM will replace or repair, at our option, any part found to be defective. Buyer must return any part claimed defective to KM, transportation prepaid.

KM maintains a fully trained staff of field service personnel who are capable of providing you with complete product assistance. Our field service staff is based in Bothell, Washington USA (corporate headquarters) and Wilrijk- Belgium (European office).

Phone Consultation

Our Customer Service staff provides the following services by telephone, via our regular and toll free number (toll free in U.S.A. and Canada only):

- Technical, application, and troubleshooting assistance
- Spare parts assistance
- Warranty (replacement) assistance

On-Site Consultation

KM's Field Service staff can provide additional services at your request. Contact KM at the closest office for rate and scheduling information for the following services:

- Technical, application, startup, and troubleshooting assistance on-site
- Training on-site or at our corporate office
- Service calls
- Equipment updates to our latest configuration

Note: Load Disc installation, field wiring, conduit installation, and junction box and signal processor mounting must be performed by the customer. The AC power must be connected to the signal processor, but not energized, prior to KM beginning work.

General descriptions of some of these standard services follow. Of course, if your service needs vary from those described, we are available to discuss them with you.

Installation, Startup Assistance, and On-Site Training

The system will be powered up and checked for proper electrical operation. For best results, KM requires moving a known amount of material, such as a truckload, for Live Load calibration. Live Load calibration will be performed if actual material or weight devices can be moved. If it is not possible to move material, a Manual calibration will be performed. Recommendations for the optimal performance of the system will be provided.

On-site training will include simulation of the Live Load calibration process (if Live Load calibration can not be performed while KM is on site) and instruction covering operation and maintenance of the system.

Troubleshooting

KM will troubleshoot systems for mechanical, electrical, calibration, and wiring errors. Normal component repairs will be made and wiring errors will be corrected, including replacement of non-repairable printed circuit boards. (To troubleshoot your own equipment, see Appendix C for Equipment Troubleshooting charts)

Service Calls

KM will perform on-site repair/replacement services.

Return Material Authorization

If a part needs to be sent to the factory for repair, contact KM's corporate office and request a Return Material Authorization (RMA) number. The RMA number identifies the part and the owner and must be included with the part when it is shipped to the factory.

Appendix B: System Calibration for the Load Disc

This chapter describes general procedures for calibrating the Load Disc system.

Calibration Methods

Before calibrating, install a signal processor. Refer to the signal processor manual for the procedures to input calibration parameters.

There are two calibration methods:

- Live Load calibration — set lo span and hi span while moving material into or out of the vessel. This is the preferred method.
- Manual calibration — set scale factor counts, scale factor weight, and zero calibration value without moving material.

For use with Trim Box, refer to *Trim Box Mounting and Wiring* on page 3-10.

Live Load calibration requires you to move a known quantity of material into or out of the vessel while performing the procedure. The quantity of material moved must be *at least* 25% of the vessel's total capacity to provide the best accuracy. Live Load calibration is also based on the material weight currently in the vessel.

Manual calibration allows you to start using the system as soon as the load discs, junction boxes, and signal processor are installed and wired, even if you cannot move any (or enough) material now. Manual calibration values are based on system parameters, including rated load, and signal processor A/D converter sensitivity. These values are known, can be calculated, or can be obtained from the signal processor. Manual calibration is also based on the material weight currently in the vessel.

Note that manual calibration does not take into account the *actual* response to changes in weight. Theoretically, a change in weight results in a proportional change in digital counts. However, the structure's actual response to weight and interaction with piping, catwalks, roof, discharge chutes, etc. prevents the system from achieving theoretical values. Manual calibration is a good start, but to obtain the highest accuracy, perform a Live Load calibration when scheduling permits you to move material into or out of the vessel.

Refer to the indicator manual(s) for detailed calibration instructions.

Appendix C: Troubleshooting the Load Disc System

This section describes an output check and some common problems. For each problem, one or more possible explanations are listed. For each explanation, suggested solutions are provided.

Functional Check: Measuring Output (while wired to Signal Processor)

Note: The "no-load" condition is when the Load Disc stands alone without any weight applied.

1. Mesure the output of the load cell using procedure from page 2-2.
2. Verify the output to be between 0mV and +/- 1mV, stable.
3. Repeat Steps 1 and 2 for each LD3xi.
4. If the load cells are installed under the vessel, verify stability of each load cell.

Functional Check:Measuring Resistance

The following will be true between 0 °F and 100 °F:

1. Measure between the disconnected excitation wires and verify the resistance to be 700 ohms +/- 15 ohms, with a stable reading.
2. Measure between the disconnected output wires and verify the resistance to be 700 ohms +/- 15 ohms, with a stable reading.

Note: When using the 61-6036-01 trim box, and a sensor fails, the sensor must be replaced. When the sensor wires are removed from the junction box, the jumper must be soldered back in place.

Problem	Problem Details	Solution
Small Amplitude Changes or Erratic Fluctuations in display readings	Fluctuations can be caused by moisture in cable conduit, junction boxes, or PCBs.	Check conduit, junction boxes, and PCBs for water contamination. Find water entry source and correct problem. Dry with a hair drier. Remove/replace corroded parts and materials. ***CAUTION*** ***If using sealant to eliminate water entry, use Sikaflex ™ 1A polyurethane sealant or Dow Corning™ RTV 739 or RTV 738. Other sealants may contain acetic acid, which is harmful to electronics.***
	Fluctuations can be caused by damaged Load Disc.	Using Digital Multimeter (DMM), check resistance for individual Load Discs: 1. Measure between the disconnected excitation wires and verify the resistance to be 700 ohms +/- 15 ohms, with a stable reading. 2. Measure between the disconnected output wires and verify the resistance to be 700 ohms +/- 15 ohms, with a stable reading. 3. Place one DMM lead on the LD's shield wire and take four measurements to each of the other wires. The reading should be greater than 5 giga-ohms. 4. Repeat Steps 1 through 3 for each suspect Load Disc, until damaged Load Disc is located.

Problem	Problem Details	Solution
Small Amplitude Changes or Erratic Fluctuations in display readings	Fluctuations can be caused by problems with signal processor.	Check signal processor excitation voltage and incoming AC voltage for accuracy and stability (refer to signal processor manual).
Sudden Change in Weight Reading or System Requires Frequent Recalibration	One broken Load Disc can cause indicated weight to shift up or down by large amount, up to 100% of full-scale live load.	Using Digital Multimeter (DMM), check resistance for individual Load Discs: 1. Measure between the disconnected excitation wires and verify the resistance to be 700 ohms +/- 15 ohms, with a stable reading.. 2. Measure between the disconnected output wires and verify the resistance to be 700 ohms +/- 15 ohms, with a stable reading.. 3. Place one DMM lead on the LD's shield wire and take four measurements to each of the other wires. The reading should be greater than 5 giga-ohms. 4. Repeat Steps 1 through 3 for each suspect Load Disc, until damaged Load Disc is located.
	Sudden change in weight reading can be caused by problems with signal processor.	Check signal processor excitation voltage and incoming AC voltage for accuracy and stability (refer to signal processor manual).

Appendix D. Technical Drawings (TI)

This appendix contains the following technical drawings for the LD3xi: