IOM 97-1100-01 Rev. J

KISTLER-MORSE®
Measure of Success

Load Stand® II
Installation & Operation Manual

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Installation & Operation Manual

CONTENTS

SAFETY SYMBOLS

WARNING:

IDENTIFIES CONDITIONS OR PROCEDURES, WHICH IF NOT FOLLOWED, COULD RESULT IN SERIOUS INJURY. RISK OF ELECTRICAL SHOCK.

CAUTION:

IDENTIFIES CONDITIONS OR PROCEDURES, WHICH IF NOT FOLLOWED, COULD RESULT IN SERIOUS DAMAGE OR FAILURE OF THE EQUIPMENT.

Load Stand® II Installation & Operation Manual

I. HANDLING AND STORAGE

SAVE THESE INSTRUCTIONS

INSPECTION AND HANDLING

Do not dispose of the carton or packing materials.

Each package should be inspected upon receipt for damage that may have occurred due to mishandling during shipping. If the unit is received damaged, notify the carrier or the factory for instructions. Failure to do so may void your warranty. If you have any problems or questions, consult Customer Support at 800-426-9010.

DISPOSAL AND RECYCLING

This product can be recycled by specialized companies and must not be disposed of in a municipal collection site. If you do not have the means to dispose of properly, please contact for return and disposal instructions or options.

STORAGE

If the device is not scheduled for immediate installation following delivery, the following steps should be observed:

1. Following inspection, repackage the unit into its original packaging.
2. Select a clean dry site, free of vibration, shock and impact hazards.
3. If storage will be extended longer than 30 days, the unit must be stored at temperatures between 32º and 104º F (0º to 40° C) in non-condensing atmosphere with humidity less than 85%.

CAUTION: DO NOT STORE A NON-POWERED UNIT OUTDOORS FOR A PROLONGED PERIOD.

II. GENERAL SAFETY

AUTHORIZED PERSONNEL

All instructions described in the document must be performed by authorized and qualified service personnel only. Before installing the unit, please read these instructions and familiarize yourself with the requirements and functions of the device. The required personal protective equipment must always be worn when servicing this device.

USE

The device is solely intended for use as described in this manual. Reliable operation is ensured only if the instrument is used according to the specifications described in this document. For safety and warranty reasons, use of accessory equipment not recommended by the manufacturer or modification of this device is explicitly forbidden. All servicing of this equipment must be performed by qualified service personnel only. This device should be mounted in locations where it will not be subject to tampering by unauthorized personnel.

MISUSE

Improper use or installation of this device may cause the following:

- Personal injury or harm
- Application specific hazards such as vessel overfill
- Damage to the device or system

If any questions or problems arise during installation of this equipment, please contact Customer Support at 800-426-9010.

III. PRODUCT DESCRIPTION

FUNCTION

The Kistler-Morse Load Stand® II is a direct vessel-to-foundation structural member designed to be your dependable and accurate continuous inventory monitoring and control solution. The Load Stand II system is ideal for vessels with loads of 100,000 lbs (45,000 kg) or more and is available for loads of 25,000 to 1,000,000 lbs (11,000 to 453,000 kg) per support point.

The monolithic design becomes an integral part of the vessel structure for maintenance free weight measurements. The sensing elements are field replaceable without taking the vessel out of service.

The mechanical design of the Load Stand II lends to simplified design of the mounting, whether by legs or gussets. Simple, rugged, and easy to match end-mounting plates yield minimum design time and easy installations.

FEATURES

- Monolithic Design
- High Output
- Multiple Weight Ranges
- Solid State Strain Sensors
- Limited Down Time

TECHNICAL SPECIFICATIONS

FUNCTIONAL	
Excitation Voltage - Operating Range	12 VDC - 30 VDC
Current Draw	15.52 mA (70º F, 21º C)
Power Consumption	186.4 mW (70º F, 21º C) at 12 VDC excitation
UBC Allowed Frame and Bolt Loads	Refer to Table
Ultimate Frame and Bolt Design Strength	Refer to Table
Sensor Functional Integrity	200% of rated load
PERFORMANCE	
Rated Output	320 mV or 26.6 mV/V @ 12 V Excitation
No Load Output	± 50 mV
Non-Linearity & Hysteresis	± 0.20% of rated output
Repeatability	± 0.10% of rated output
PHYSICAL	
Temperature Range	Operational: -30º to 150º F (-34º to 66º C); Unit remains operational, however, if the temperature exceeds the compensated range, the unit may not perform to specifications Storage: -30º to 150º F (-34º to 66º C) Compensated Std Temperature Range: 0º to 100º F (-18º to 38º C) Compensated Mid Temperature Range: 50º to 150º F (10º to 66º C)
Humidity	100% Non-condensing
Rating	Designed for outdoor applications
Pedestal	ASTM A53 GR B
Flanges	ASTM A36
Junction Box	ABS with UV additive or 304 Stainless Steel
Resilient Pad	Reinforced Rubber
Finish	Polyester Powder Coat
Sensor	Microcell II
Shipping Weight	Refer to Table

IV. MECHANICAL INSTALLATION

WARNING: REMOVE POWER FROM THE UNIT BEFORE INSTALLING, REMOVING, OR MAKING ADJUSTMENTS.

VESSEL PREPARATION

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

- 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 minimize 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 Stand. Install protective barriers or stops to prevent vehicles from hitting the vessel supports.
- Extra holes in the vessel gusset or vessel base plate which bolts to the Load Stand, replace the gusset/plate with one with the correct number of holes for bolting to the Load Stand.

GENERAL REQUIREMENTS

When raising the vessel for Load Stand installation, use proper support to prevent the vessel from tipping or falling.

HARDWARE AND BOLTS

1. Kistler-Morse provides rubber washer assemblies for the Load Stand top mounting hole connections.
2. All other hardware to attach the Load Stand to the vessel and to the foundation is customer-supplied.
3. Use specified hardware and bolt sizes.

CAUTION: USING LARGER THAN SPECIFIED SIZES MAY OVERSTRESS THE LOAD STAND DURING INSTALLATION, DAMAGING THE LOAD STAND AND VOIDING THE WARRANTY.

4. Use bolts with sufficient threaded length to accommodate the thickness of the connecting parts and the specified nuts and washers. The length of the bolts should not be so long that they interfere with other parts of the installation.
   - Kistler-Morse recommends the placement of a base plate beneath the Load Stand. However, the ...... installation procedure and accompanying illustrations do not show a base plate.
   - During installation, do not put the entire vessel load on less than the correct number of Load Stands.
   - If you need to raise the vessel or one vessel leg after installation: Loosen the bolts on all the .... Load Stands to prevent overloading.

INSTALLATION

⚠ WARNING: USE PROPER SUPPORTS TO PREVENT THE VESSEL FROM TIPPING OR FALLING.

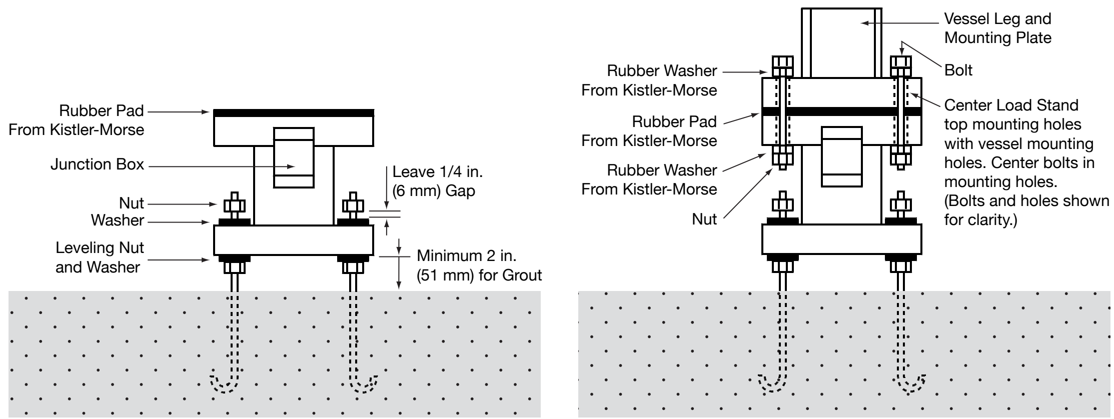
1. Raise the vessel.
2. Inspect the bottom of the vessel mounting surface to ensure it is perfectly flat. Check for angular misalignment. Remove any debris from the mounting surface.
3. Mount the Load Stands on the foundation.
   a. Place the customer-supplied leveling nut and hardened washer on each anchor bolt. Check the .... angular alignment.
   b. Carefully place the Load Stand on the leveling nuts/washers, aligning the mounting holes with the .. foundation anchor bolts.
   c. Place the customer-supplied hardened washer and nut on each anchor bolt. Do not fully tighten the nuts at this time. Leave a 1/4” (6 mm) gap between the nut and washer to allow for positioning the .. Load Stand.
   d. Place only the rubber pad on the top of the Load Stand, aligning the mounting holes.
   e. Repeat Steps A through D for each Load Stand.
   f. Record the no load output.
4. Mount the vessel on the Load Stands:
   a. Slowly lower the vessel until it is resting on the Load Stand assemblies. Alignment pins may be used to help guide and position the vessel.
   b. Center the Load Stand top mounting holes with the vessel mounting holes, using the clearance .... available from the Load Stand bottom mounting holes.

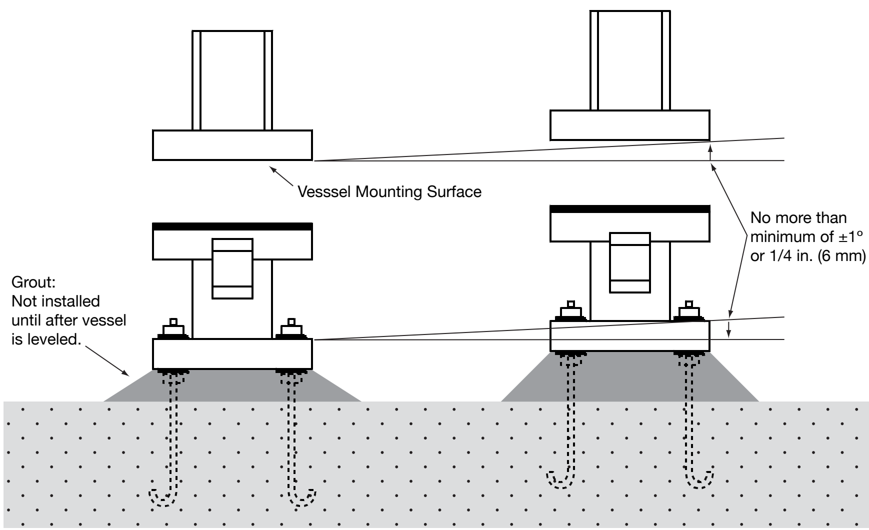
NOTE: On 50,000 lb (22,680 kg) or larger, Load Stands, a pry bar may be used at the base of the Load Stand to gently move it into position.

⚠ CAUTION: IF THE VESSEL HOLE PATTERN DOES NOT MATCH UP WITH THE LOAD STAND HOLE PATTERN, MODIFY THE MOUNTING HOLES ON THE VESSEL. DO NOT HAMMER THE LOAD STAND INTO POSITION OR FORCE THE LOAD STAND INTO POSITION BY TIGHTENING THE MOUNTING BOLTS.

   c. Place a rubber washer on each customer-provided top bolt. Place the four top bolts through the .... vessel, rubber pad, and Load Stand mounting holes.
   d. Place a rubber washer and customer provided nut on the end of each bolt. Tighten the nuts finger ... tight. Do not compress the rubber washers at this time.
5. Perform preliminary leveling:
   a. Inspect the installation for gaps between the vessel mounting plate and the Load Stand.
   b. Eliminate gaps by doing one or a combination of the following:
      - Turn the leveling nuts, only to raise the entire load stand.
      - Install one or more full shims above the Load Stand rubber pad. Two shims are provided by .... Kistler-Morse with each Load Stand.
      - Install one or more partial shims above the Load Stand rubber pad. Two shims are provided by .... Kistler-Morse with each Load Stand. Using the Load Stand flange as a guide, mark the required shim ..... shape on a thin piece of cardboard. Use this as a template to cut the required shape from a full shim.

CAUTION: IF INSTALLING SHIMS, LOOSEN THE TOP BOLTS ON ALL THE LOAD STANDS BEFORE RAISING THE VESSEL.





LEVELING THE VESSEL

Leveling the vessel distributes the weight evenly on all the Load Stands, increasing system accuracy. Perform this procedure while the vessel is still empty:

1. Check if Leveling Needed
   a. Remove the junction box cover.
   b. Connect the red, white, and black wires of a 3-conductor cable to the corresponding ....terminals on TB1 of the Load Stand junction box. Connect the other end of the cable to the corresponding terminals of the K-M Test Meter. Turn on the power to the Test Meter and set the Simulate/Test switch to the Test position.

NOTE: If a Kistler-Morse Test Meter is not available, before proceeding refer to Set-Up; Alternate Method for Checking Output.

   c. Verify the dead weight voltage output of the Load Stand from step 3f.
   d. Calculate the change in output, as shown in the example. Output Change = uninstalled .... output - installed output. The change in output must be positive.

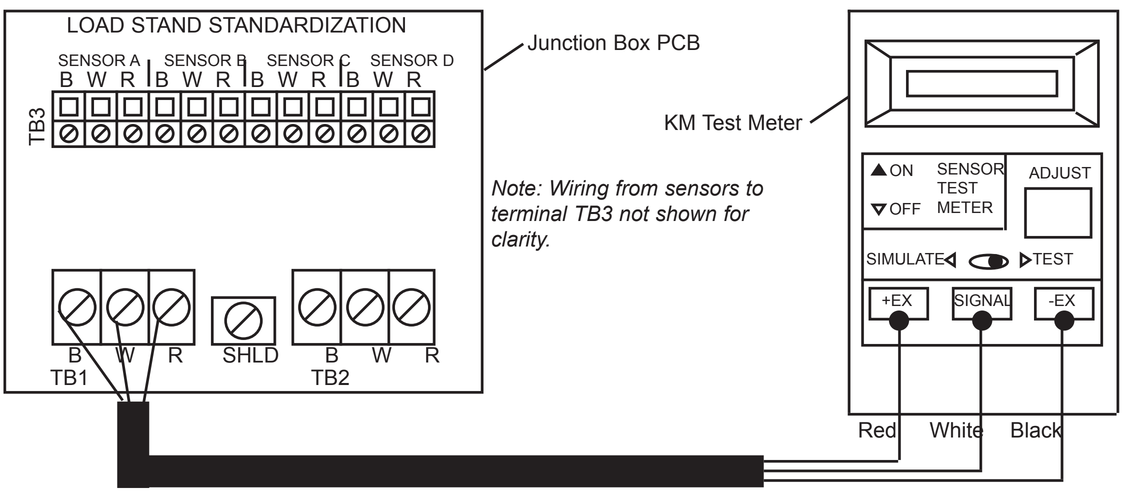
- Check the wiring polarity at the K-M Test Meter. Ensure the red, white, and black wires are connected to the corresponding terminals.
- If the wiring is correct and you still observe a negative output change, the vessel may be tilted. Vessel tilting shifts the load onto some Load Stands while putting other Load Stand(s) in a no load or tension load condition. This can occur in cases of extreme thermal deformation or unequal vessel leg length. Proceed to Step 2 to level the vessel.

e. Repeat Steps A through D for each Load Stand for this vessel.

f. Calculate the average output change for all Load Stands for this vessel. The output increase for each Load Stand must be within ±25% of the average output increase. Load .. Stands 1, 2, and 4 meet this requirement, while Load Stand 3 does not.

g. If the installation meets the criteria described above (change in output is positive and is within ±25% of the average output increase), the vessel is sufficiently level.

- If sufficiently level, proceed to Step 3 to complete the installation.
- If not sufficiently level, level the vessel as described in Step 2.



Checking Output using Kistler-Morse Test Meter

Load Stand #	Not Installed Output (mV)	Installed Dead Weight Output (mV)	Output Change (mV) (Installed - Not Installed)
1	+30	+90	+60
2	-15	+50	+65
3	+17	+30	+13
4	-25	+30	+55

Average Output Change = (60 + 65 + 13 + 55) / 4 = 48.25

Allowable Range for Output Change = Average Output Change ± 25% = 48.25 ± (1/2 x 48.25) = 36.18 to 60.3

All Load Stands meet the requirement that all output changes must be positive (+). Load Stands 1, 2, and 4 meet the requirement that the output change be within ± 25% of the average output change. Load Stand 3 does not meet the requirement, and its small output change indicates it is carrying much less weight than the other supports. The vessel must be leveled to distribute the weight more evenly over all the supports.

Example — Recording and Analysis of Output for Level Check

2. Level the vessel.

CAUTION: LOOSEN THE TOP BOLTS ON ALL THE LOAD STANDS BEFORE RAISING THE VESSEL.

a. Raise the vessel legs for the low output load stands.
b. Raise or lower the leveling nuts or add shim(s) above the rubber pad as required adjusting the .... distribution of weight on the Load Stands. Raising the leveling nuts and/or adding shims increases .. the weight on the Load Stand. Lowering the leveling nuts decreases the weight on the Load Stand.

NOTE: Adjusting leveling nuts and/or shimming on one Load Stand affects the weight distribution on all Load Stands.

c. Slowly lower the vessel leg onto the Load Stand assembly.
d. Repeat Step 1, rechecking the output of all the Load Stands and recalculating the Output Change .... (dead weight output - no-load output).
e. Repeat Steps 2A through 2D until the installation meets the criteria for weight distribution.

3. Complete Installation: Once the vessel is level, complete the installation:
a. Tighten the nuts on the anchor bolts per the local code.
b. Verify readings.
c. Tighten the nuts on the upper bolts 1/2 turns past finger tight. This will compress the rubber washers and rubber pad.
d. Apply threadlocker to the upper bolts and anchor bolts to prevent loosening of the nuts.
e. Pack grout or concrete under the Load Stand. Do not grout above the bottom edge of the Load Stand assembly.
f. Replace the junction box cover if not ready to begin wiring the junction boxes together and to the signal processor, to ensure no moisture enters the box.

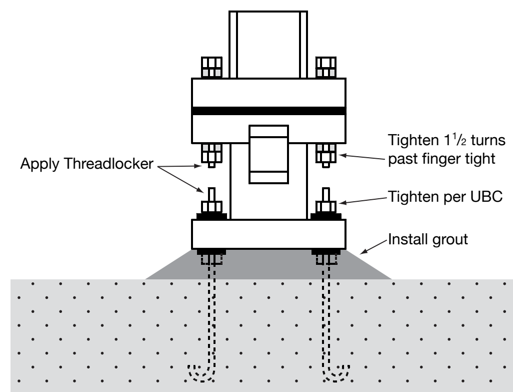


FIGURE 1: LOAD STAND DIMENSION CHART (For any note references, see Figure 2 or 3)

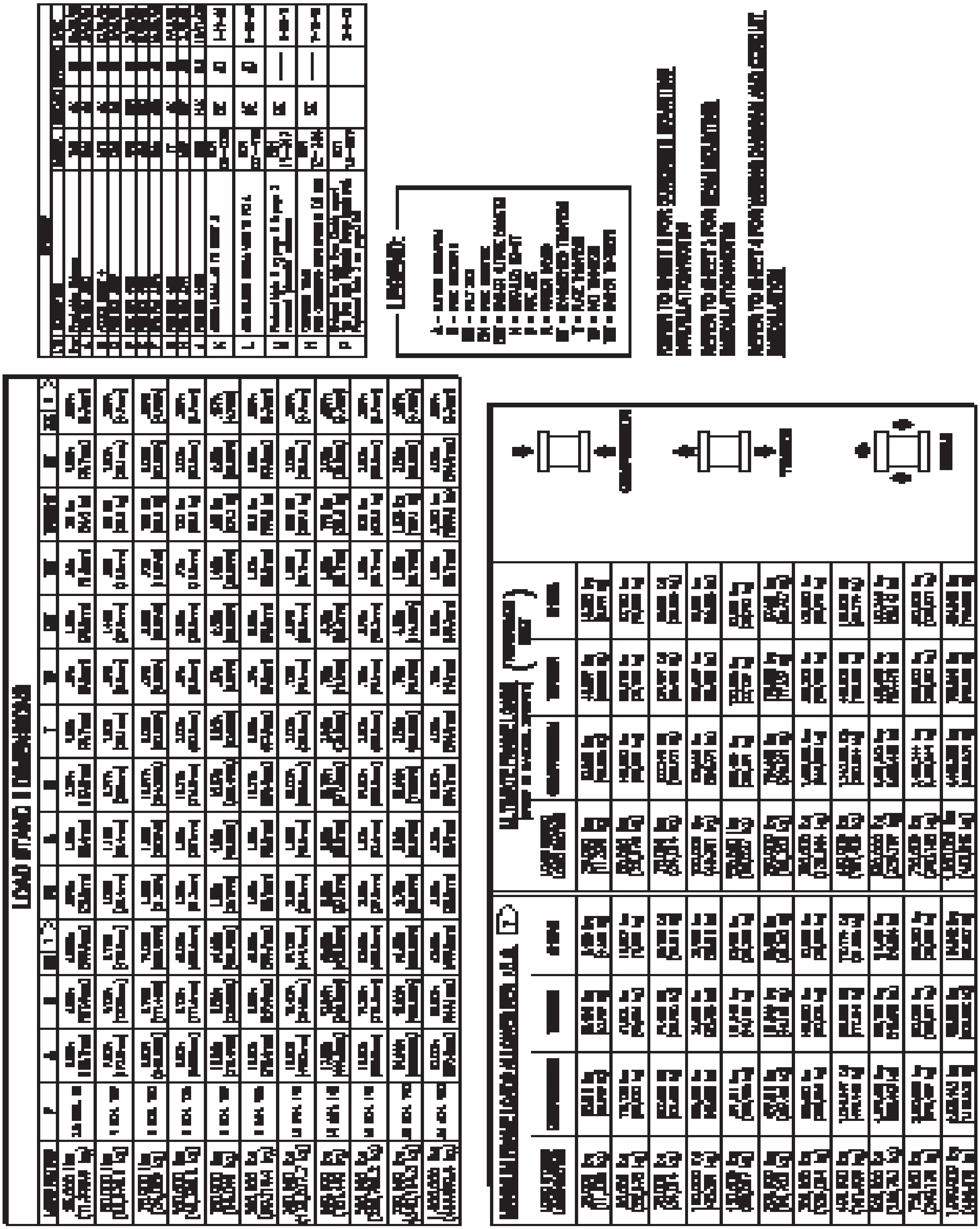
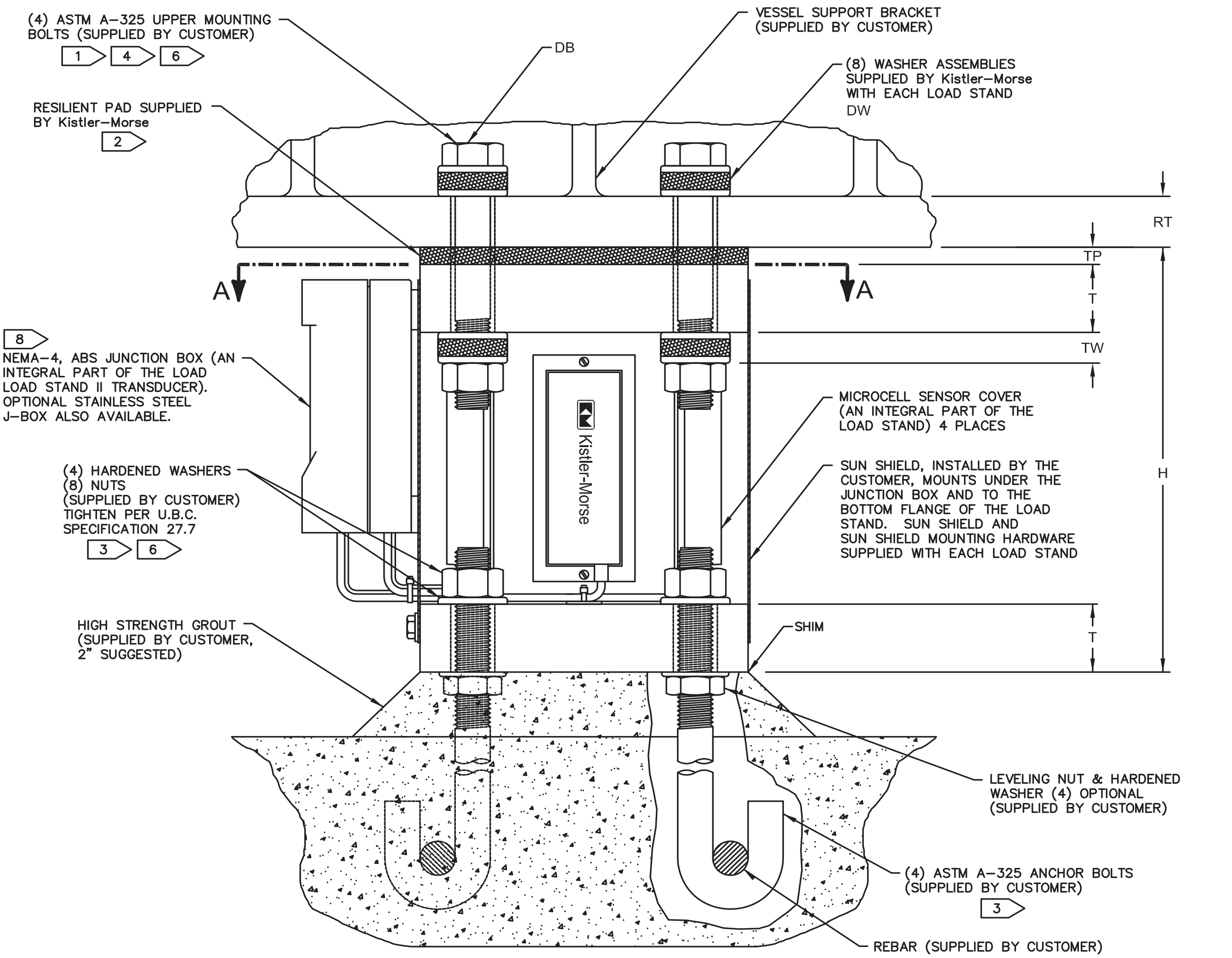
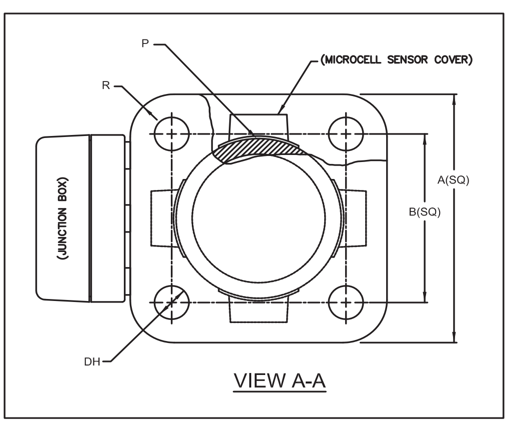


FIGURE 2: CONCRETE MOUNTING





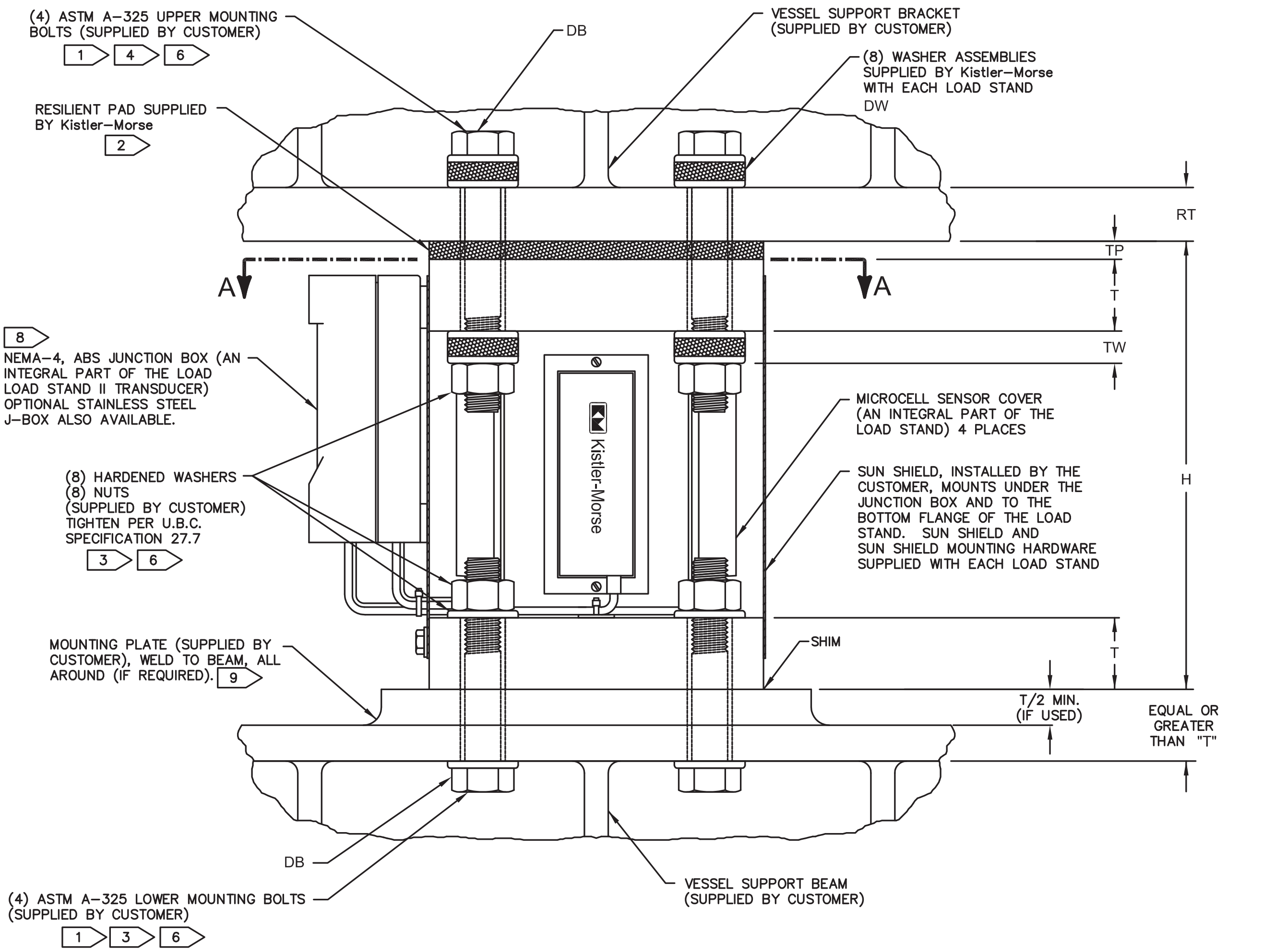
NOTES: (UNLESS OTHERWISE SPECIFIED)

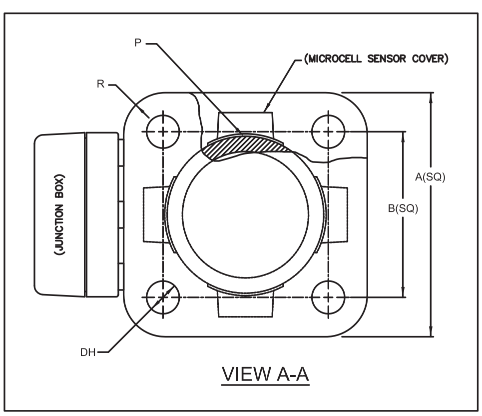
1. BOLTS: ASTM A-325, BOLT LENGTH DETERMINED BY AND SUPPLIED BY THE CUSTOMER.
2. PADS: SUPPLIED BY Kistler-Morse.
3. INSTALL ANCHOR BOLTS PER UNIFORM BUILDING CODE (UBC) SECTION 27-7.
4. INSTALL UPPER MOUNTING BOLTS IN OVERSIZED HOLES ('DH') AND TIGHTEN NUTS ONE HALF to ONE TURN PAST "FINGER TIGHT".
5. 'XX' = MAXIMUM THERMAL DEFORMATION ALLOWED. COMPUTED AS SHOWN HERE: X = DH - DB - 1/16" (1.5mm)
6. APPLY LOCKNUT, ADHESIVE OR SPOIL BOLT THREADS TO PREVENT LOOSENING.
7. THE LOADS LISTED ARE THE MAXIMUM ASD LOADS FOR THE CONDITION LISTED AND ARE BASED ON AISC 13TH EDITION. SHEAR AND TENSION VALUES ASSUME MOUNTING HARDWARE IS A325 MINIMUM (PROVIDED BY CUSTOMER). HIGHER STRENGTH HARDWARE CAN BE USED IF DESIRED. ALL LOAD STANDS MUST BE SELECTED TO RESIST THE COMBINED LOADING EFFECTS FOR THE SPECIFIC JOBSITE AND BUILDING CODE REQUIREMENTS ASCE 7-05 OR OTHER BUILDING CODE.
8. CONDUIT ENTRY SIZED FOR 3/4-INCH NPT FITTING. USE SEALING WASHERS AND FLEXIBLE CONDUIT (LIQUID TIGHT RECOMMENDED) TO MAINTAIN NEMA-4 RATING AND TO DE-COUPLE CONDUIT RUN FROM THE WEIGHING SYSTEM.

OPERATION & INSTALLATION:

THE LOAD STAND II IS DESIGNED TO ACCOMMODATE THERMAL DEFORMATION BY PERMITTING THE TOP BOLTS TO TILT SLIGHTLY IN OVERSIZED HOLES. MOUNTING HOLES SHOULD BE THE SAME SIZE AS THE LOAD STAND MOUNTING HOLES ("DH") & LOCATED WITHIN ±.06in (1.5mm) OF THEIR THEORETICAL POSITION. LEVEL & GROUT SO THAT NO GAP EXISTS BETWEEN THE VESSEL SUPPORT & THE LOAD STAND ASSEMBLY, WITH THE VESSEL INSTALLED & UNLADEN, THIS IS MANDATORY TO ASSURE PROPER OPERATION. THE CUSTOMER SHOULD ANALYZE THE LOADS & THERMAL DEFORMATIONS IMPOSED ON THE LOAD STAND, TAKING INTO ACCOUNT LOCAL CODES & LOADING CONDITIONS, TO ASSURE THAT THE DESIGN WILL PROVIDE ADEQUATE STRENGTH THE LOAD STAND IS DESIGNED & FABRICATED PER THE UNIFORM BUILDING CODE, 1988 EDITION. DESIGN LOADS & TEST RESULTS ARE AVAILABLE UPON REQUEST.

FIGURE 3: SUPPORT BEAM MOUNTING





OPERATION & INSTALLATION:

THE LOAD STAND II IS DESIGNED TO ACCOMMODATE THERMAL DEFORMATION BY PERMITTING THE TOP BOLTS TO TILT SLIGHTLY IN OVERSIZED HOLES. MOUNTING HOLES SHOULD BE THE SAME SIZE AS THE LOAD STAND MOUNTING HOLES ("DH") & LOCATED WITHIN ±.06in (1.5mm) OF THEIR THEORETICAL POSITION. LEVEL & SHIM SO THAT NO GAP EXISTS BETWEEN THE VESSEL SUPPORT & THE LOAD STAND ASSEMBLY, WITH THE VESSEL INSTALLED & UNLADEN, THIS IS MANDATORY TO ASSURE PROPER OPERATION. THE CUSTOMER SHOULD ANALYZE THE LOADS & THERMAL DEFORMATIONS IMPOSED ON THE LOAD STAND, TAKING INTO ACCOUNT LOCAL CODES & LOADING CONDITIONS, TO ASSURE THAT THE DESIGN WILL PROVIDE ADEQUATE STRENGTH THE LOAD STAND IS DESIGNED & FABRICATED PER THE UNIFORM BUILDING CODE, 1988 EDITION. DESIGN LOADS & TEST RESULTS ARE AVAILABLE UPON REQUEST.

NOTES: (UNLESS OTHERWISE SPECIFIED)

1. BOLTS: ASTM A-325, BOLT LENGTH DETERMINED BY AND SUPPLIED BY THE CUSTOMER.
2. PADS: SUPPLIED BY Kistler-Morse.
3. INSTALL LOWER MOUNTING BOLTS PER UNIFORM BUILDING CODE (UBC) SECTION 27-7.
4. INSTALL UPPER MOUNTING BOLTS IN OVERSIZED HOLES ('DH') AND TIGHTEN NUTS ONE HALF to ONE TURN PAST "FINGER TIGHT".
5. 'XX' = MAXIMUM THERMAL DEFORMATION ALLOWED. COMPUTED AS SHOWN HERE: X = DH - DB - 1/16" (1.5mm)
6. APPLY LOCKNUT, ADHESIVE OR SPOIL BOLT THREADS TO PREVENT LOOSENING.
7. THE LOADS LISTED ARE THE MAXIMUM ASD LOADS FOR THE CONDITION LISTED AND ARE BASED ON AISC 13TH EDITION. SHEAR AND TENSION VALUES ASSUME MOUNTING HARDWARE IS A325 MINIMUM (PROVIDED BY CUSTOMER). HIGHER STRENGTH HARDWARE CAN BE USED IF DESIRED. ALL LOAD STANDS MUST BE SELECTED TO RESIST THE COMBINED LOADING EFFECTS FOR THE SPECIFIC JOBSITE AND BUILDING CODE REQUIREMENTS ASCE 7-05 OR OTHER BUILDING CODE.
8. CONDUIT ENTRY SIZED FOR 3/4-INCH NPT FITTING. USE SEALING WASHERS AND FLEXIBLE CONDUIT (LIQUID TIGHT RECOMMENDED) TO MAINTAIN NEMA-4 RATING AND TO DE-COUPLE CONDUIT RUN FROM THE WEIGHING SYSTEM.
9. Kistler-Morse RECOMMENDS THE USE OF A MOUNTING PLATE APPROXIMATELY TWICE DIMENSION 'A' LONG AND THE SAME WIDTH AS THE FLANGE, AND MINIMUM ONE HALF DIMENSION 'T' THICK.
TO INSURE SYSTEM PERFORMANCE AND MAXIMUM LOADING CAPACITY A RIGID, FLAT MOUNTING SURFACE APPROXIMATELY TWICE DIMENSION 'A' LONG, THE SAME WIDTH AS THE FLANGE, AND A MINIMUM OF ONE HALF DIMENSION 'T' THICK. IF THE EXISTING BEAM FLANGE DOES NOT MEET THESE REQUIREMENTS PLATE CAN BE WELDED TO THE BEAM AS SHOWN. HOWEVER THIS PLATE SHOULD BE A MINIMUM ONE HALF DIMENSION 'T' THICK.

V. ELECTRICAL INSTALLATION

WARNING: VERY HIGH VOLTAGE IS PRESENT. REMOVE POWER FROM THE UNIT BEFORE INSTALLING, REMOVING, OR MAKING ADJUSTMENTS

GENERAL SAFETY

When using electrical equipment, you should always follow basic safety precautions, including the following:

- The installation and wiring of this product must comply with all national, federal, state, municipal, and local codes that apply.
- Properly ground the enclosure to an adequate earth ground.
- Do not modify any factory wiring. Connections should only be made to the terminals described in this section.
- All connections to the unit must use conductors with an insulation rating of 300 V minimum, rated for 212° F (105° C), a minimum flammability rating of VW-1, and be of appropriate gauge for the voltage and current required (see specifications).
- Do not allow moisture to enter the electronics enclosure. Conduit should slope downward from the unit housing. Install drip loops and seal conduit with silicone rubber product.

DISCONNECT REQUIREMENTS FOR PERMANENTLY INSTALLED EQUIPMENT

A dedicated disconnecting device (circuit breaker) must be provided for the proper installation of the unit. If independent circuits are used for power input and main relay outputs, individual disconnects are required.

Disconnects must meet the following requirements:

- Located in close proximity to the device
- Easily accessible to the operator
- Appropriately marked as the disconnect for the device and associated circuit
- Sized appropriately to the requirements of the protected circuit (See specifications)

INSTALLATION

There are two versions of the junction box enclosure. Both versions have four small holes, which were used for factory-wiring the sensors to the junction box. In addition, the junction box has one or two large holes for wiring the junction box to other junction boxes and the signal processor:

- One large hole (conduit installation); the large hole accommodates a 3/4" conduit fitting.
- Two large holes (non-conduit installation); the two large holes are equipped with PG13.5 cable fittings. K-M requires the use of cable trays for non-conduit installations.

GUIDELINES

- The procedure below assumes the conduit/cable tray has been installed.
- Seal all conduit fittings against water entry. Install drain holes at conduit/cable tray lowest elevation(s) to allow condensation to drain.

- Use Belden 3-conductor shielded interconnect cable or equivalent to wire junction boxes together and to the signal processor, for lengths up to 2,000’ (305 m)
- When wiring cable to junction box terminals, strip back 3” (76 mm) of cable sheathing to expose the three conductor wires and shield wire inside. Strip 1/4” (6 mm) of insulation from the end of each of the conductor wires. Figure 3-7. Spread a generous bead of sealant around the sides of the PG 13.5 cable fittings. Install the fittings in the two large holes.

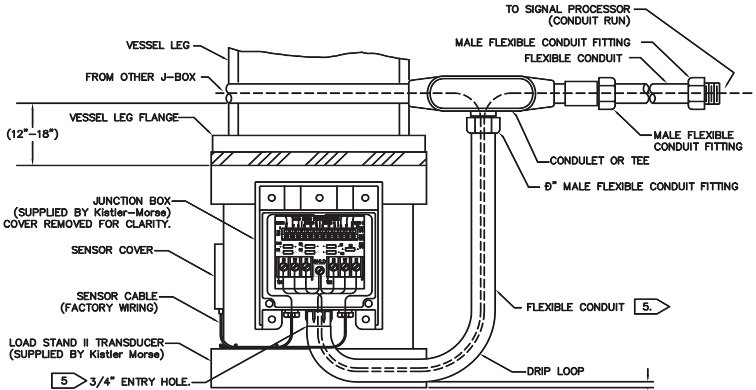
CAUTION: ONLY USE SIKAFLEX 1A POLYURETHANE SEALANT OR DOW CORNING RTV 739 OR RTV 738. OTHER SEALANTS MAY CONTAIN ACETIC ACID, WHICH IS HARMFUL TO SENSORS AND ELECTRONICS.

1. See Figure 3-8 (conduit installation) or Figure 3-9 (non-conduit installation). Route the 3-conductor cable through the fitting into the junction box farthest from the signal processor. Connect wires from the cable to the TB2 terminal in the junction box: black wire to B, white wire to W, and red wire to R. Connect the cable shield wire to the Shield terminal between TB1 and TB2.
2. Route the cable through conduit/cable tray 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: black wire to B, white wire to W, and red wire to R. Connect the cable shield wire to the Shield terminal between TB1 and TB2.
3. Route another 3-conductor cable through the fitting into this junction box, and attach wires to the TB2 terminal: black wire to B, white wire to W, and red wire

CAUTION: ALL WIRING ROUTED BETWEEN JUNCTION BOXES AND SIGNAL PROCESSOR MUST BE CONTINUOUS (NO SPLICES).

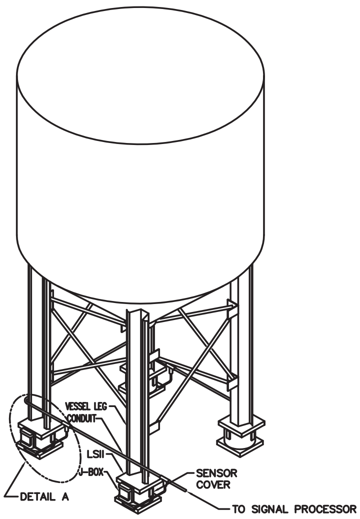
4. Repeat Steps 2 and 3 until all junction boxes for the vessel are wired together.
5. Route the cable from the last junction box through conduit to the signal processor. Refer to the signal processor manual for wiring the junction box to the signal processor. One vessel takes up one channel in the signal processor — the channel shows the average value from all the Load Stands supporting the vessel.

FIGURE 4: SIGNAL CABLE LAYOUT

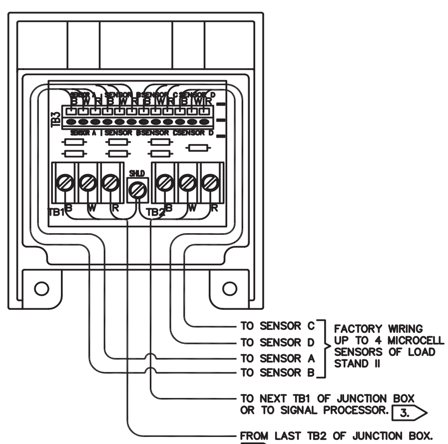


DETAIL A

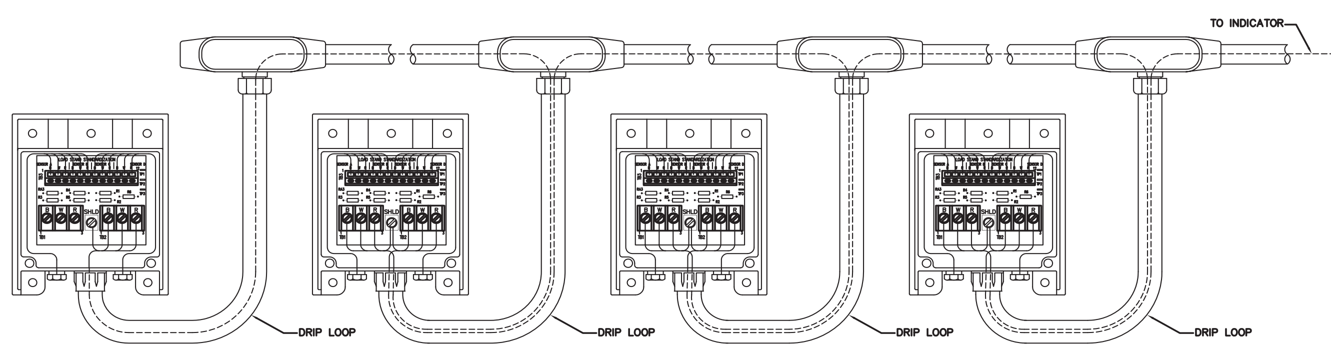
PREFERRED METHOD CONDUIT INSTALLATION



TYPICAL SIGNAL CABLE ROUTING AND CONDUIT RUNNING



TYPICAL TRANSDUCER/JUNCTION BOX INTERCONNECT DIAGRAM



TYPICAL SENSOR WIRING

NOTES: (PERTAIN TO THIS SHEET ONLY)

1. ALL PARTS SUPPLIED BY CUSTOMER UNLESS OTHERWISE NOTED.

2. THIS DRAWING IS FOR GENERAL LAYOUT ASSISTANCE ONLY. LOCAL ELECTRICAL CODES AND PRACTICES SHOULD BE OBSERVED.

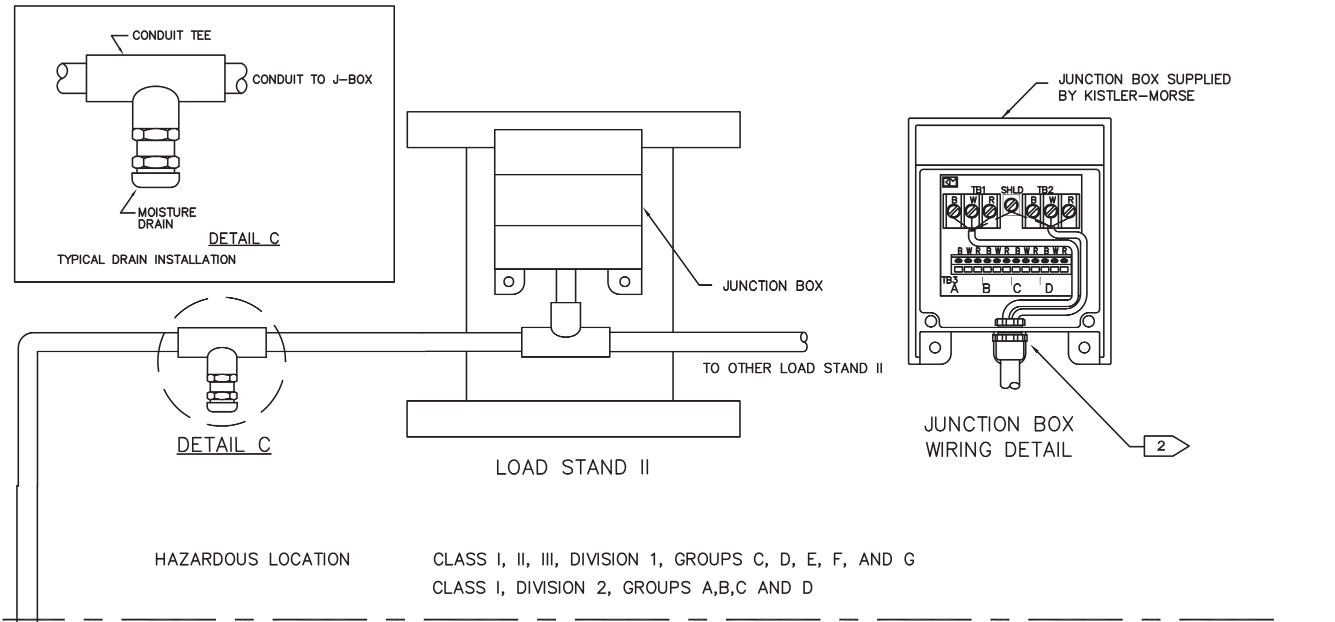
3. TRANSDUCER/SIGNAL PROCESSOR SEPARATION DISTANCES UP TO 1,000 FEET, USE 18-AWG, THREE-CONDUCTOR SHIELDED CABLE (BELDEN 8791 OR EQUIVALENT) TO INTERCONNECT JUNCTION BOXES AND THE SIGNAL PROCESSOR. FOR DISTANCES UP TO 2,000 FEET, USE 16-AWG, THREE CONDUCTOR SHIELDED CABLE (BELDEN 8618 OR EQUIVALENT) AS THE INTERCONNECT SIGNAL CABLE.

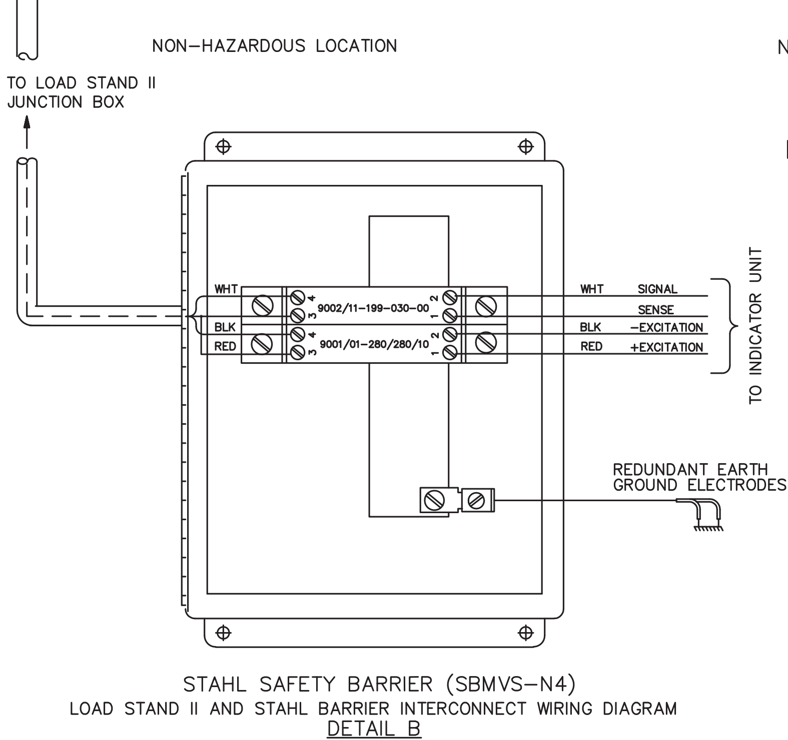
4. UP TO FOUR LOAD STAND TRANSDUCER SIGNAL CABLES CAN BE ACCOMMODATED IN ONE INTERCONNECT JUNCTION BOX. JUNCTION BOXES CAN BE INTERCONNECTED TOGETHER AS REQUIRED.

5. THE CONDUIT ENTRY ON THIS JUNCTION BOX IS SIZED FOR Õ" NPS FITTINGS. A Ð" TO Õ" REDUCER/BUSHINGS WILL BE NEEDED IN THE CONDUIT RUN TO MATE THE TRANSDUCER JUNCTION BOX WITH THE INTERCONNECT JUNCTION BOX.

6. INTERCONNECT JUNCTION BOX COVER MUST BE ON TIGHT AT ALL TIMES AND UNUSED OPENINGS SEALED WITH THE PLUGS PROVIDED.

FIGURE 5: INTERCONNECT DIAGRAM





NOTES: (UNLESS OTHERWISE SPECIFIED)

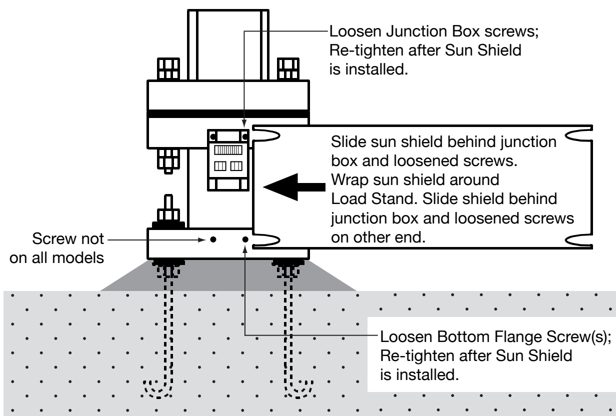
1. ALL INTERCONNECT CABLE SHOWN IS PROVIDED AND INSTALLED BY THE CUSTOMER. WHEN USING CONDUIT FOR THE INTERCONNECT CABLE RUN TO THE NON-HAZARDOUS AREA, ROUTE ONLY THE INTERCONNECT CABLE THROUGH THIS CONDUIT.
2. INSTALL LIQUID-TIGHT, NEMA-4 RATED CONDUIT HUB.
3. CAUTION: DO NOT APPLY IN EXCESS OF 8 POIUND-INCHES OF TORQUE TO JUNCTION BOX COVER SCREWS.
4. TO PREVENT MOISTURE ACCUMULATION IN JUNCTION BOX, A DRAIN MUST BE INSTALLED AT A LOWER POINT IN THE CONDUIT (SEE DETAIL C). USE CROUSE-HINDS ECD17 DRAIN OR EQUIVALENT.
5. THE FOLLOWING MAXIMUM SERIES INDUCTANCES AND SHUNT CAPACITANCES APPLY TO THE INSTRINSICALLY SAFE WIRING CONNECTED TO THE ISI-100: GP. C – 0.75uF, 2.2mH; GP. D – 2.0uF, 4.0mH.
6. THE FOLLOWING MAXIMUM SERIES INDUCTANCES AND SHUNT CAPACITANCES APPLY TO THE INSTRINSICALLY SAFE WIRING CONNECTED TO THE STAHL BARRIERS: GP. C,E – 0.41uF, 1.9mH; GP. D,F,G – 1.11uF, 3.41mH.

VI. SET-UP

INSTALLING A SUN SHIELD

The sun shield reduces sun-induced stresses in the Load Stand sensors and provides additional protection for the sensors.

1. With the junction box cover off, slightly loosen the screws attaching the junction box to the Load Stand.
2. Slightly loosen the horizontal screw(s) on the bottom flange of the Load Stand.
3. Wrap the sun shield around the Load Stand, slipping the cutout slots behind the loosened screws.
4. Tighten the junction box screws and the horizontal screw(s) on the bottom flange.
5. Replace the junction box cover.



CALIBRATION

There are two calibration methods:

- Live Load calibration — set low span and high 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.

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 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 Load Stands 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 sensor sensitivity, 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. The following sections provide procedures for performing Live Load and Manual calibrations.

LIVE LOAD CALIBRATION

Live Load calibration can be performed by adding or removing a known quantity of material from the vessel. The quantity of material moved must be at least 25% of the vessel's total capacity. The procedures for both Live Load calibrations methods follow.

Note: Refer to the signal processor manual to input Low Span and High Span.

ADDING MATERIAL

1. Record the current live load.
2. Input Lo Span: Lo Span = current live load
3. Add known quantity of material to the vessel. Ensure all material has stopped moving before proceeding.
4. Input Hi Span: Hi Span = Lo Span + Added Weight

Example: You are using Load Stands to monitor a vessel.

The vessel currently contains 50,000 lbs of material. The vessel can hold a maximum of 200,000 lbs. You plan to add 60,000 lbs of material (>25% of 200,000 lbs) to the vessel. Following the Live Load calibration procedure:

1. Current live load = 50,000 lbs
2. Lo Span = current live load = 50,000 lbs
3. Add 60,000 lbs of material.
4. Hi Span = Lo Span + Added Weight = 50,000 lbs + 60,000 lbs = 110,000 lbs

REMOVING MATERIAL

1. Record the current live load.
2. Input Hi Span: Hi Span = current live load
3. Remove a known quantity of material from the vessel. Ensure all material has stopped moving before proceeding.
4. Input Lo Span: Lo Span = Hi Span – Removed Weight

Example: You are using Load Stands to monitor a vessel.

The vessel currently contains 110,000 lbs of material. The vessel can hold a maximum of 200,000 lbs. You plan to remove 60,000 lbs of material (>25% of 200,000 lbs) from the vessel. Following the Live Load calibration procedure:

1. Current live load = 110,000 lbs
2. Hi Span = current live load = 110,000 lbs
3. Remove 60,000 lbs of material.
4. Lo Span = Hi Span – Removed Weight = 110,000 lbs – 60,000 lbs = 50,000 lbs

MANUAL CALIBRATION

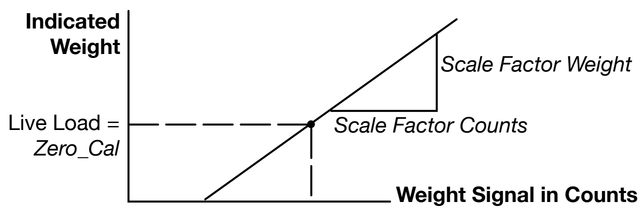
Note: Kistler-Morse SVS 2000™ signal processor performs a manual calibration automatically, with Quick Config.

1. Refer to the signal processor manual to determine how to obtain the A/D converter sensitivity, expressed in Counts/mV. Record this value.
2. Record the Rated Load for one Load Stand.
3. Record the sensitivity (S) for your Load Stand.

Load Stand II	Sensitivity
S2-025K, -075K, -150K, -200K, -300K, -400K, -500K, -750K, -1M, S2-050K, -100K	26.67 mV/V

4. Record the excitation voltage for the system (typically 12 V).
5. Record the current live load in the vessel.
6. Calculate the Manual calibration values:

Scale Factor Weight= Rated Load (lbs or kg) x Number of supports Scale Factor Counts = S (mV/V) x excitation Voltage (V) x Counts/mV Zero_Cal = current live load (lbs or kg)



Note: *Scale Factor Counts* and *Scale Factor Weight* establish the slope of the Manual Calibration Line. *Zero_Cal* establishes the location of the line.

$$\textbf{Slope} = \frac{\textit{Scale Factor Weight}}{\textit{Scale Factor Counts}}$$

Example: You are using four S2-100K (100,000 lb) Load Stand IIs to monitor a vessel.

The vessel currently contains 50,000 lbs of material. The vessel can hold a maximum of 350,000 lbs. Following the Manual calibration procedure:

1. Counts/mV = 699.05 (from signal processor)
2. Rated load for one Load Stand is 100,000 lbs.
3. S = 26.7 mV/V (from Table 4-1)
4. Excitation voltage = 12 V (from signal processor)
5. Current live load = 50,000 lbs
6. Calculate the calibration values:

Scale Factor Weight

= Rated Load x Number of supports

= 100,000 lbs x 4 legs = 400,000 lbs

Scale Factor Counts

= S x Excitation Voltage (V) x Counts/mV

= 26.7 mV/V x 12 V x 699.05 Cnts/mV

= 223,975 Counts

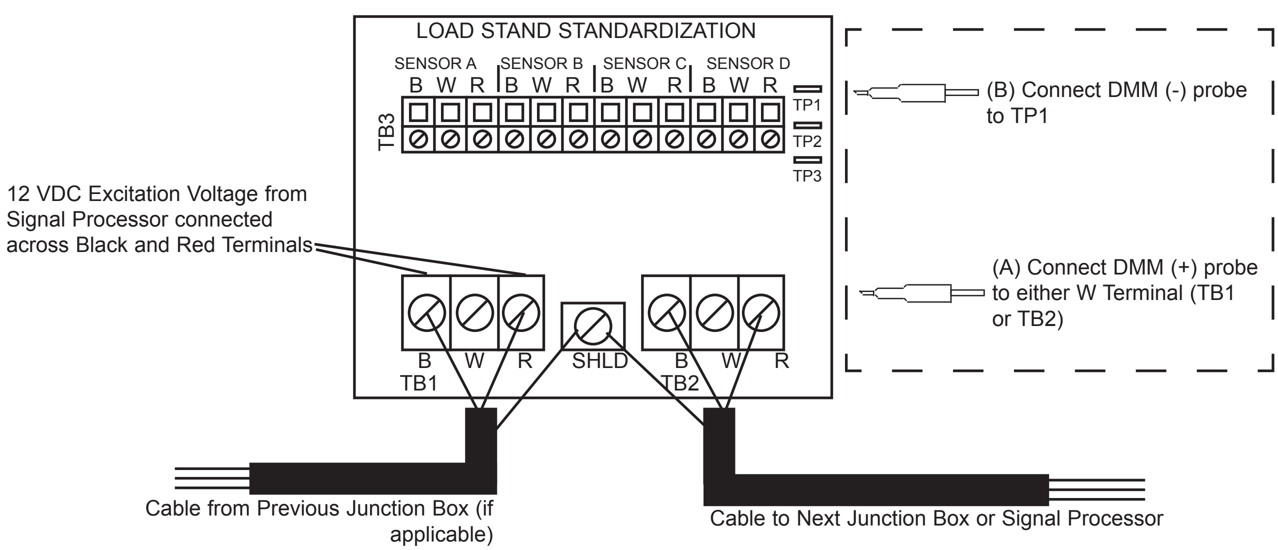
Zero_Cal = current live load = 50,000 lbs

Note: Some installations have 'dummy' Load Stands under one or more legs. This does not affect the manual calibration parameter calculation. Use the total number of supports, not the total number of Load Stands, in the calculation.

ALTERNATE METHOD FOR CHECKING OUTPUT

If you do not have a Kistler-Morse Test Meter, use a Digital Multimeter (DMM) and the Load Stand II junction box to monitor the voltage output of each Load Stand before and during installation. Set up the DMM as described below.

1. Disconnect the white wires from the W terminals on TB1 and TB2 in the junction box, see Figure below.
2. Connect the DMM (+) probe to the W terminal on either TB1 or TB2 (See A).
3. Connect the DMM (-) probe to TP1 in the junction box (See B).
4. Set a voltage range on the DMM that will accommodate a measured range of ± 1 volt.
5. See Pre-Check Procedures, for details on checking the voltage output before installation. See Leveling Vessel, Hardware Installation, for details on monitoring the voltage output to determine if the vessel weight is evenly distributed among the Load Stands.
6. Once output is verified, reconnect the white wires on the W Terminals on TB1 and TB2 in the junction box.



Using DMM and Junction Box to Monitor Voltage Output

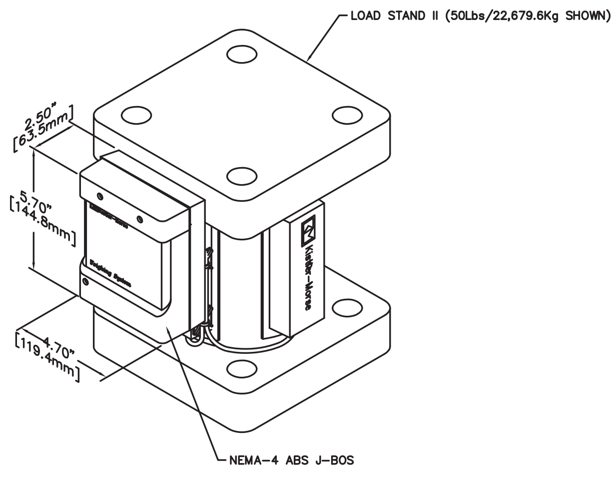
VII. TROUBLESHOOTING

SYMPTOM	POSSIBLE CAUSE	SOLUTION
Small Amplitude Changes or Erratic Fluctuations in Display Readings	Fluctuations can be caused by small amplitude drift or oscillation, with peak-to-peak disturbance of 0.1% to 0.5% of full scale, is normal. Problem likely to be noticed shortly after initial installation.	Reduce drift or oscillation by setting 'count by' and 'averaging' appropriately on signal processor (refer to signal processor manual).
	Fluctuations can be caused by moisture in the cable conduit, junction boxes, or PCBs. Problem likely to be noticed on system that previously functioned correctly.	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 sensors and electronics.
	Fluctuations can be caused by jammed bolts or heat radiation/conduction. Problem likely to be noticed shortly after initial installation or on system that previously functioned correctly in cool or overcast weather.	Loosen nuts on top bolts and inspect top bolts. • Top bolts free to move in holes: If vessel is heated, it may be radiating or conducting heat through vessel legs and affecting Load Stand sensors. • To reduce head radiation/conduction: a. Insulate vessel. b. Contact K-M to discuss adding a high temperature insulating pad. • Top bolts jammed: Jammed top bolts indicate undersized bolt holes on vessel mounting flange and/or vessel support movement beyond limits of Load Stand clearance holes. Resulting side loads affect Load Stand sensors. • To reduce side loads: a. Enlarge vessel mounting flange bolt holes to provide additional clearance.
	Fluctuations can be caused by damaged Load Stand sensor. Problem likely to be noticed shortly after initial installation or on system that previously functioned correctly.	Using Digital Multimeter (DMM), check resistance for individual Load Stands: 1. Set meter resistance scale to accommodate measured range up to 20,000 ohms. 2. At the suspect Load Stand junction box, remove wiring at TB1 and TB2, which connects to other Load Stands and signal processors. 3. Put one DMM lead on W and other lead on R terminal on TB1 of Load Stand junction box. Record resistance, and verify it is 7,660 ± 200 ohms. If reading is outside this range, one or more Load Stand sensors are damaged and must be replaced— go to Step 7 to identify which sensor is damaged. 4. Put one DMM lead on W and other lead on B terminal on TB1 of Load Stand junction box. Record resistance, and verify it is 7,660 ± 200 ohms. If reading is outside this range, one or more Load Stand sensors are damaged and must be replaced — go to Step 7 to identify which sensor is damaged. 5. Verify readings from Steps 3 and 4 are within 200 ohms of each other. If not, one or more Load Stand sensors are damaged and must be replaced — go to Step 7 to identify which sensor is damaged. 6. Repeat Steps 2 through 5 for each suspect Load Stand, until Load Stand with damaged sensor is located. 7. Continued on next page.

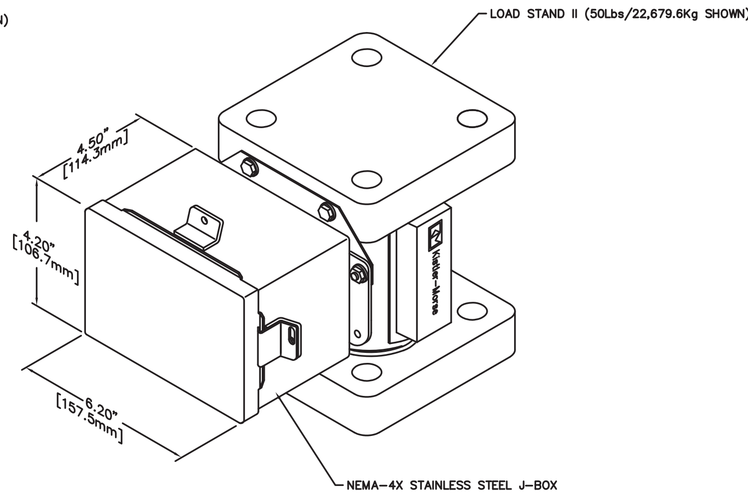
SYMPTOM	POSSIBLE CAUSE	SOLUTION
(Continued from previous page) Small Amplitude Changes or Erratic Fluctuations in Display Readings	(Continued from previous page) Fluctuations can be caused by damaged Load Stand sensor. Problem likely to be noticed shortly after initial installation or on system that previously functioned correctly.	7. Identify damaged sensor at Load Stand identified in Step 3, 4, or 5: a. Remove one sensors's wires from junction box terminal TB3. b. Put one DMM lead on sensor's white wire and other lead on red wire. Record resistance, and verify it is 1.45K ± 200 ohms. If resistance is outside this range, sensor is damaged and must be replaced. c. Put one DMM lead on sensor's white wire and other lead on black wire. Record resistance, and verify it is 1.45K ± 200 ohms. If resistance is outside this range, sensor is damaged and must be replaced. d. Verify readings from Steps B and C are within 200 ohms of each other. If not, sensor is damaged and must be replaced. e. Repeat Steps A through D for each sensor, until damaged sensor is located and replaced.
	Fluctuations in readings can be caused by short to ground. Problem likely to be noticed shortly after initial installation or on system that previously functioned correctly.	Using a Digital Multimeter (DMM) or ohmmeter, check for shorts to ground as follows: 1. Set meter resistance scale to accommodate maximum measured range. 2. Disconnect junction box wires of suspect vessel from signal processor. 3. With one lead to earth ground and other lead to white wire, check resistance on disconnected wires: • If reading is less than infinite (i.e., there is resistance), a short is indicated; proceed to Step 4 to identify location. • If no short is indicated, investigate other explanations for problem. 4. Starting with junction box closest to signal processor in daisy chain, disconnect wires connecting junction box to other junction boxes. With one lead to earth ground and other lead to white terminal on TB3, check resistance on wires leading from junction box: • If the reading is less than infinite (i.e., there is resistance), short is indicated; proceed to Step 5 to identify location. • If no short is indicated, proceed to next junction box in daisy chain, disconnecting wires connecting it to other junction boxes and checking resistance. Perform for each junction box down chain until short is located; proceed to Step 5 to identify location. Note: Sun shield or junction box mounting bolts are good locations for connecting probe to ground. 5. Disconnect wires for one sensor from above-identified junction box. With one lead to earth ground and other lead to white wire, check resistance on disconnected sensor wires: • If reading is less than infinite (i.e.,there is resistance), short is indicated. Replace shorted sensor. • If no short is indicated, disconnect next sensor's wires from junction box and check resistances. Repeat for each sensor wired to junction box until short is located. Replace shorted sensor.
	Fluctuations in readings can be caused by problems with signal processor. Problem likely to be noticed shortly after initial installation or on system that previously functioned correctly.	Check signal processor excitation voltage and incoming AC voltage for accuracy and stability (refer to signal processor manual).

SYMPTOM	POSSIBLE CAUSE	SOLUTION
Repeatable Drift over 24-hour Period	Periodic drift is most likely caused by thermal expansion due to sun's radiation or vessel's response to its own heating cycles. Problem likely to be noticed shortly after initial installation or on system that previously functioned correctly in cool or overcast weather.	Loosen nuts on top bolts and inspect top bolts. • Top bolts free to move in their holes— If vessel is heated, it may be radiating or conducting heat through vessel legs and affecting Load Stand sensors. To reduce head radiation/conduction: a. Insulate vessel. b. Contact K-M to discuss adding a high temperature insulating pad. • Top bolts jammed — Jammed top bolts indicate undersized bolt holes on vessel mounting flange and/or vessel support movement beyond limits of Load Stand clearance holes. Resulting side loads affect Load Stand sensors. To reduce side loads: a. Enlarge vessel mounting flange bolt holes to provide additional clearance. b. Contact K-M to discuss adding a sliding pad if support movement exceeds 0.125" (3mm). If support movement and heat radiation/conduction have been eliminated as source of error and periodic drift still indicates system is not meeting specifications (Appendix A), contact K-M. NOTE: If keeping long-term records, take level readings at same time each day to minimize error.
Sudden Change in Weight Reading or System Requires Frequent Recalibration	Sudden change in weight reading can be caused by a broken Load Stand, causing indicated weight to shift up or down by large amount, up to 100% of full-scale live load. Problem likely to be noticed on system that previously functioned correctly.	Check voltage outputs of individual Load Stands (refer to Chapter 2, Pre-Check Procedures, the section titled Method 1: Measuring Output). Voltage should be between -750 mV and +750 mV on installed Load Stands. If not, check Load Stand resistance as described above in Problem 1.
	Sudden change in weight reading can be caused by problems with signal processor. Problem likely to be noticed shortly after initial installation or on system that previously functioned correctly.	Check signal processor excitation voltage and incoming AC voltage for accuracy and stability (refer to signal processor manual).

VIII. DIMENSIONAL DRAWINGS



LOAD STAND II w/ NEMA-4 ABS J-BOX



LOAD STAND II w/ OPTIONAL NEMA-4X STAINLESS STEEL J-BOX

NOTES

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KISTLER-MORSE®
Measure of Success

150 Venture Boulevard
Spartanburg, SC 29306
Tel: (800) 426-9010
Tel: (864) 574-2763 [Local]
Fax: (864) 574-8063
sales@kistlermorse.com
www.kistlermorse.com

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MEASUREMENT

97-1100-01 Rev. J

PROCEDURES

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Load Stand II Sensor Replacement

SENSOR REMOVAL

1. Remove the load stand sunshield. Retain sunshield and mounting hardware for re-installation later.
2. The removal of the junction box may also be necessary if the defective sensor to be replaced is situated behind the junction box. Retain junction box mounting hardware for re-installation later.
3. Remove the sensor cover. If the cover is damaged during removal, discard. Retain sensor cover mounting hardware for re-use later. The sensor covers are sealed with RTV; a knife may be required to cut this seal to remove the cover.
4. With the cover removed and the sensor exposed, remove the thermal compound that filled the sensor mounting cavity (counter-bored hole).
5. After the removal of the thermal compound, remove the sensor by unscrewing the two mounting screws that hold the sensor in place.
6. Do not disconnect the sensor from the junction box until you are prepared to wire the new sensor.
7. Clean the sensor mounting cavity completely. Verify that it is free of dirt and grease in preparation for the sensor installation.

SENSOR INSTALLATION

1. Take exceptional care to ensure that the sensor mounting surface is free from contamination.
2. Apply a thin layer of thermal compound to the bare metal of the load stand sensor mounting surface.
3. Measure the sensor output using a Kistler-Morse test meter or a digital volt meter. The output at 12VDC must be within +/- 50mV of zero or the sensor may be damaged.
4. Remove the backing from the sensor PCB and adhere the PCB to the load stand.
5. Gently holding the sensor on the load stand mounting surface, align the sensor mounting holes to the load stand's tapped holes and install the mounting screws finger tight only.
6. Using the supplied T-handle driver, tighten the sensor mounting screws until the shaft of the driver flexes in torsion, 1/4 turn past the point that the bolt stops turning. Repeat this several times to ensure that the bolts are tight. The sensor output, in this state must be within +/- 50 mV of zero, as noted above (i.e. as close as possible to the output noted in the uninstalled condition).

NOTE: Carefully monitor the output of the sensor while tightening the sensor screws. Never exceed +/-500mV at any time during this process. Over tightening or excessive force can result in damaged sensors.

7. With the sensor bolted down tight in place, the sensor cover is ready to be installed.

SENSOR COVER INSTALLATION

1. Fill the sensor mounting cavity (counter-bored hole) with the supplied thermal compound.
2. Inspect the mating surface between the sensor cover and the load stand for contaminants. Make sure that the mating surface is clean.
3. Apply a thin coating, 1/16 in., of RTV sealant (supplied) to the cover mounting flange.
4. Position the cover on the weldment, aligning the cover mounting holes to the load stand tapped holes for sensor cover, and install the cover using the two (2) mounting screws (saved earlier) for cover installation.
5. Add a continuous bead of sealant all around the cover.
6. Inspect the installed cover to verify that there is a continuous bead of sealant all around it and no gaps are present.
7. Clean the cover and load stand of any excess RTV sealant.

WIRING THE SENSOR TO THE JUNCTION BOX

1. Disconnect the defective sensor from the junction box and discard. Note how the sensor cable was routed and terminated.
2. Connect the new sensor to the junction box, following the same cable routing and termination of the defective sensor. Refer to Figures 1, 2 and 3.
3. Tighten the cord grip fitting on the junction box to ensure a water-tight seal around the sensor cable.
4. Reinstall load stand sunshield.

Figure 1: Sensor Installation

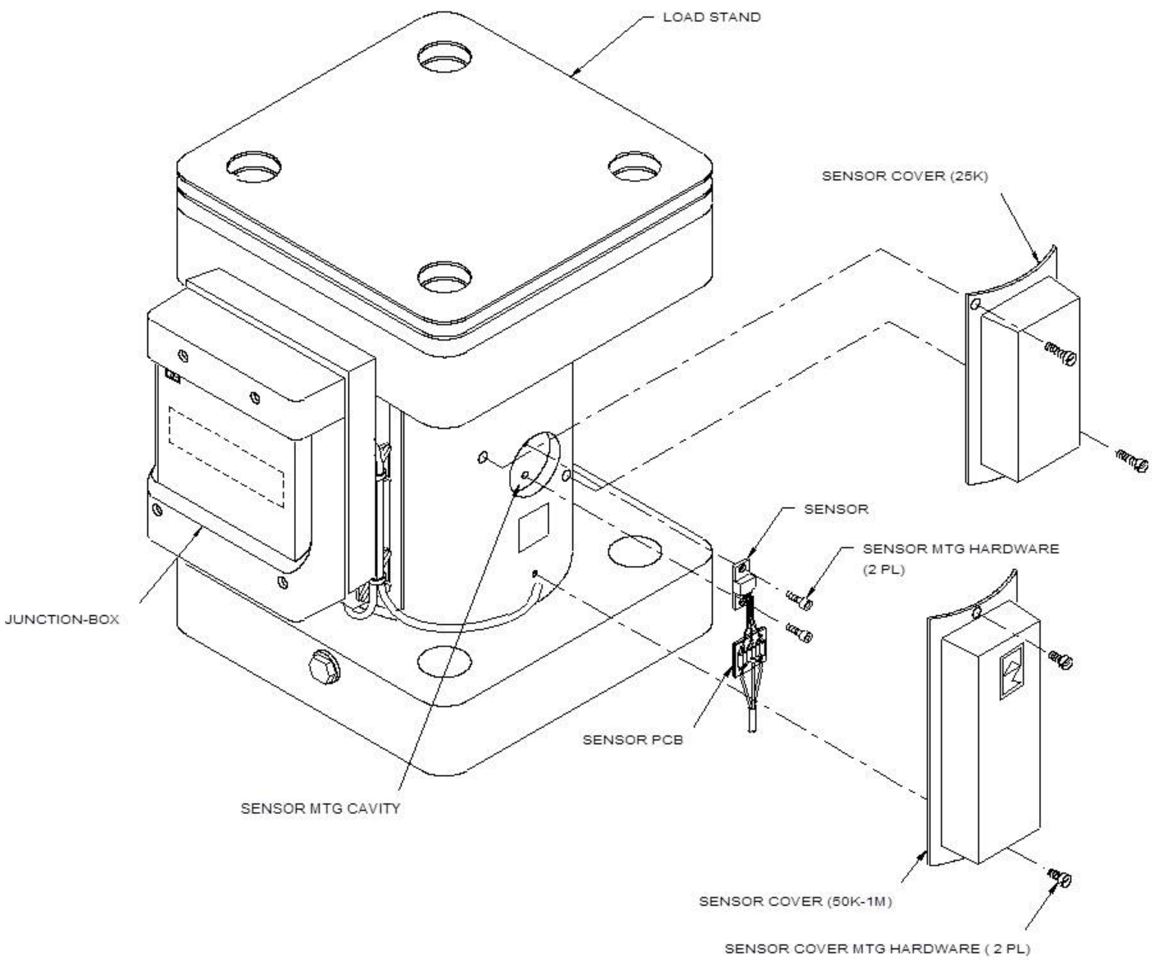

Figure 2: Wiring Detail for Junction Box Board

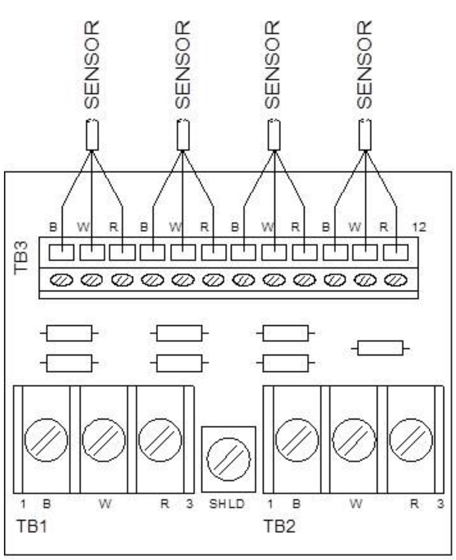

Figure 3: Sensor Locations on Load Stand