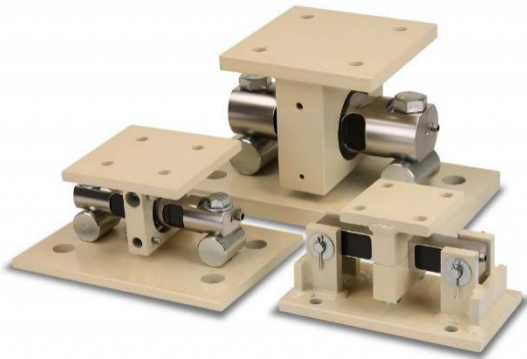




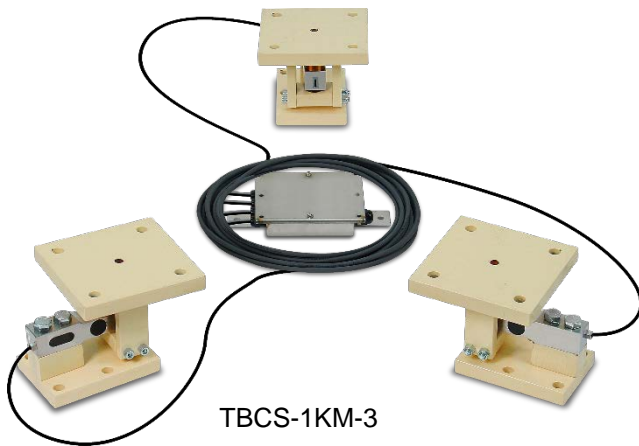
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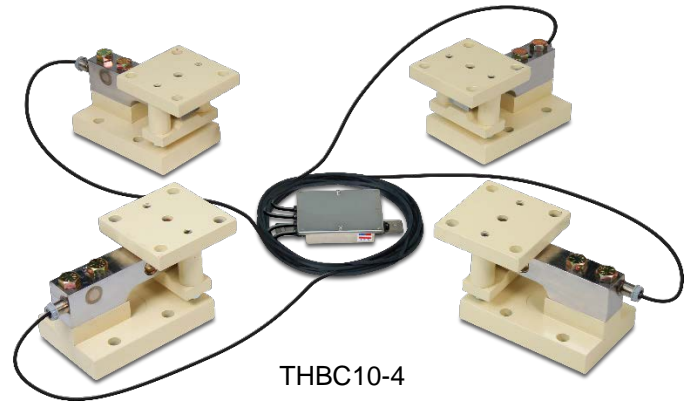
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DB-20000SPS-4



TBCS-1KM-3



THBC10-4

Calibration Instructions and Troubleshooting Guide for Tank Scales

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PRECAUTIONS

Before using the instructions outlined in this manual, read it thoroughly and pay special attention to all "NOTIFICATION" symbols:



DANGER!
WARNING!
CAUTION!

CALIBRATION INSTRUCTIONS

When a tank scale weigh system is installed, it must be calibrated so that the readings on the indicator accurately reflect the amount of weight placed in or removed from the tank. To obtain accurate readings, it is recommended to calibrate a tank scale using test weights equal to 50 to 80 % of the maximum expected working load of the scale. For detailed calibration instructions, refer to the weight indicator installation and technical manual used with the tank scale.

In some applications, the design, size, or capacity of the tank could make it impossible to use test weights equal to 50 to 80 % of the maximum expected working load of the scale. For those applications, calibration can be performed by the optional methods of using less test weight and material substitution, or calibration using material transfer. Refer to those sections for instructions.

Calibration Using Test Weights

The most accurate way to calibrate a scale is by using test weights. For this method, a tank scale needs to be equipped with some means to hang test weights near a weight module (tank leg) or the ability to place test weights on the weight module (tank leg) equal to 50 to 80% of the maximum expected working load of the scale.

1. Begin by taking a weight reading for the empty tank (the dead load of the scale). Adjust the indicator so that it reads zero when the tank is empty.
2. Check each load cell to make sure it is working properly.
3. Hang or place a test weight near one weigh module (tank leg) and take a reading. Move the test weight to a second weigh module (tank leg) and take a reading. Repeat for each weigh module (tank leg) to make sure that all load cells indicate the same weight.
4. Check for repeatability to make sure there are no mechanical binding or support issues.
5. When adding test weights to the scale, it is recommended, if possible, to take readings at 25%, 50%, 75%, and the total test weight (equal to 50 to 80 % of the maximum expected working load of the scale) to check the performance of the scale over its entire weight range.
6. If the tank scale is used to weigh its contents as they are being discharged, it is a good idea to take and record the weight readings as the test weights are removed.

CALIBRATION INSTRUCTIONS, CONT.

Calibration with Test Weights and Material Substitution

For large tank scales, it is often physically impossible to hang or place test weights equal to 50 to 80 % of the maximum expected working load of the scale. In those cases, you can use a combination of test weights and a material (e.g., the material to be used in the scale) to calibrate the scale.

1. Begin by taking a weight reading for the empty tank (the dead load of the scale). Adjust the indicator so that it reads zero when the tank is empty.
2. Check each load cell to make sure it is working properly.
3. Hang or place test weights near one weigh module (tank leg) and take a reading.
4. Next, remove the test weights and add the material to the tank until the weight reading is the same as that obtained with the test weights.
5. With the material still in the tank, hang or place the same test weights near a second weigh module (tank leg) and take a reading.
6. Continue substituting the material for the test weights and taking readings until the total test weight is equal to 50 to 80 % of the maximum expected working load of the scale.
7. When adding weight to the scale, it is recommended, if possible, to take readings at 25%, 50%, 75%, and the total test weight (equal to 50 to 80 % of the maximum expected working load of the scale) to check the performance of the scale over its entire weight range.
8. If the tank scale is used to weigh its contents as they are being discharged, it is a good idea to take and record the weight readings as the test weights are removed.

Calibration Using Material Transfer

When test weights of any amount cannot be used, a tank scale can be calibrated by using the material transfer method.

1. First, weigh a material equal to 50 to 80 % of the maximum expected working load of the scale on another known accurate scale.
2. Next, transfer the material to the tank scale to be calibrated. This can be done in a single transfer or multiple transfers until the total weight equal to 50 to 80 % of the maximum expected working load of the scale is reached.



IMPORTANT! Calibration using the material transfer method will depend on the accuracy of the existing scale the material was weighed on and the ability to prevent loss of material during the transfer process.

TROUBLESHOOTING GUIDE

This troubleshooting guide applies to tank scales with three or four weigh modules (tank legs) using the following: CBCS Load Cell Kits, CLDB and CLDBR Load Cell Kits, DB-SP Load Cell Kits, TBCS Load Cell Kits, and THBC Load Cell Kits.

- Symptom:** The weight indicator is displaying the error message:
OERRP, OC, OL (without any weight on the scale)
- Cause:** *OERRP, OC, or OL* indicates an overload condition. These error messages will be displayed when the scale weight is greater than the set capacity entered during the setup of the weight indicator, if the data cable from the scale junction box to the weight indicator is damaged or shorted, the trim PC board is damaged, and/or there is damaged to a load cell or multiple load cells. Additionally, if a weight indicator that has lost setup, or setup and calibration is corrupted could also be displayed as *OERRP, OC, or OL*.
- Diagnosis:** Inspect the data cable from the scale junction box to the weight indicator for damage.

One of the most common problems is a broken wire in the data cable. Complete a visual inspection of the data cable. Look for cut insulation, a crimped cable, broken wires, or a loose connector in the scale J-Box.
- Solution:**
1. Replace the data cable from the scale J-Box to the weight indicator.
 2. Confirm the scale setup.
Enter the Setup & Calibration mode of the scale and confirm the correct values are saved for items such as *CAPZ* and *INBZ*. These values cannot be 0. If values are incorrect, enter the correct values and calibrate the scale.
-

- Symptom:** The weight indicator is displaying the error message:
ERRAL or *ERRAH*
- Cause:** *ERRAL* and *ERRAH* indicate an error due to the +/- Signal input (DC mV) from the load cells in the weigh modules exceeding the input range of the weight indicator. A low mV input is indicated by *ERRAL*, and a high mV input is indicated by *ERRAH*. Possible reasons for one of these messages to be displayed would be due to a damaged load cell (or more than one), or the data cable from the weight indicator to the scale junction box is damaged.
- Diagnosis:** Follow the instructions on pages 6 and 7 for testing the load cells.
- Solution:** Repair or replace the damaged component as required, perform the trim adjustment (see page 8 for instructions), and then calibrate the scale.
-

TROUBLESHOOTING GUIDE, CONT.

- Symptom:** Weight is displayed, but weight readings are inconsistent.
- Cause:** Load cells may not be balanced and require trimming or replacement.
- Diagnosis:** A quick test to check for a damaged load cell(s) is to step on each load cell stand where the tank leg is attached and then record the readings. A scale that is operating properly will have weight readings from each leg that are within a pound or so of each other. Readings greater than ± 10 pounds or so of each other indicate a problem and will require a more detailed test using a Digital Volt Meter (DVM) to locate the problem. Use a DVM to determine the DC mV output of the load cell with an empty tank if possible (or at least the lowest amount of weight possible). Refer to pages 6 and 7 for instructions. This test will determine if a load cell(s) is damaged and will require replacement.
- Solution:** Weight readings of less than ± 5 lbs can usually be balanced using the trim pots of the trim PC board (see page 8 for instructions). Weight readings greater than this usually indicate a damaged load cell(s) that will need to be replaced. Repair or replace the damaged component as required, perform trim adjustment, and then calibrate the scale.
-

- Symptom:** The scale reads accurate weight to a point but will not register beyond that point or becomes inaccurate in the upper weight range.
- Cause:** This usually indicates an obstruction between the load cell stand top plate (where the tank leg is attached) and the base (bottom plate) of the stand.
- Diagnosis:** Visually inspect under each load cell stand top plate (where the tank leg is attached) and the base (bottom plate) of the stand.
- Solution:** Remove any obstructions found.
-

TROUBLESHOOTING GUIDE, CONT.

Symptom: Weight is displayed but unstable.

Causes:

1. An object is touching the tank, tank frame, or a load cell stand top plate.
2. A load cell stand top plate is damaged, touching the base (bottom plate), and/or there is debris between the top plate and base (bottom plate).
3. The Trim PC board has moisture on it or is corroded.
4. A load cell or more than one load cell has been damaged.
5. The load cell mounting bolts or mounting pins are loose.
6. The weight indicator A-D is not working properly.

Diagnosis:

1. Visually inspect the tank scale to verify that nothing is touching the tank, tank frame, or the load cell stand top plate.
2. Inspect the load cell stand for damage. The top plate cannot touch the base (bottom plate) of the load cell stand. Verify that there is no debris between the top plate and the base (bottom plate) of the load cell stand.
3. Remove the cover to gain access to the trim PC board. Check the trim PC board for moisture or corrosion damage.
4. Disconnect one pair of load cell signal wires (Red and White wires) at a time from the trim PC board and look at the weight display. If the displayed weight is unstable, reconnect the wires and disconnect the next pair of load cell signal wires. *Any time the displayed weight stabilizes or improves, leave that load cell disconnected until all load cells have been checked.* If the scale operation improves, this would indicate that the disconnected load cell(s) are problematic and need to be replaced. Otherwise, test using a DVM as per the instructions on pages 6 and 7.
5. Inspect the load cell mounting bolts to ensure they are tight. If mounting pins are used, verify that they are completely in the base (bottom plate) and that the cotter hairpins or cotter pins are not missing or broken.
6. Weight indicator testing will require a known good scale to exchange indicators. When exchanging indicators, see if the problem follows the weight indicator, or stays with the scale. Otherwise, a load cell (weight) simulator (which is a specialized tool and not commonly available) will be required to test the weight indicator.

Solution:

Tighten any loose bolts, secure the mounting pins, and replace damaged parts such as a load cell or (cells) cotter hairpins, cotter pins, or the trim PC board. Perform the trim adjustment and calibrate the scale. Remove any debris, excess load cell cable, or other obstructions from the load cell stands and tank legs. Have the weight indicator tested and repaired or replaced then calibrate the scale.



IMPORTANT! After correcting any problems found, perform the trim adjustment on the load cells using the procedure on page 8. Next, calibrate the scale, and then test the scale operation.

TROUBLESHOOTING GUIDE, CONT.

Quick Test

A quick test can be completed by swapping weight indicators with a working scale. This will determine if the problem stays with the scale or goes with the weight indicator.



NOTE: The weight readings will not be accurate. However, this will assist with the diagnostics to isolate the problem between the weight indicator and the scale.

Continuity Test of the Load Cells Internal Circuit

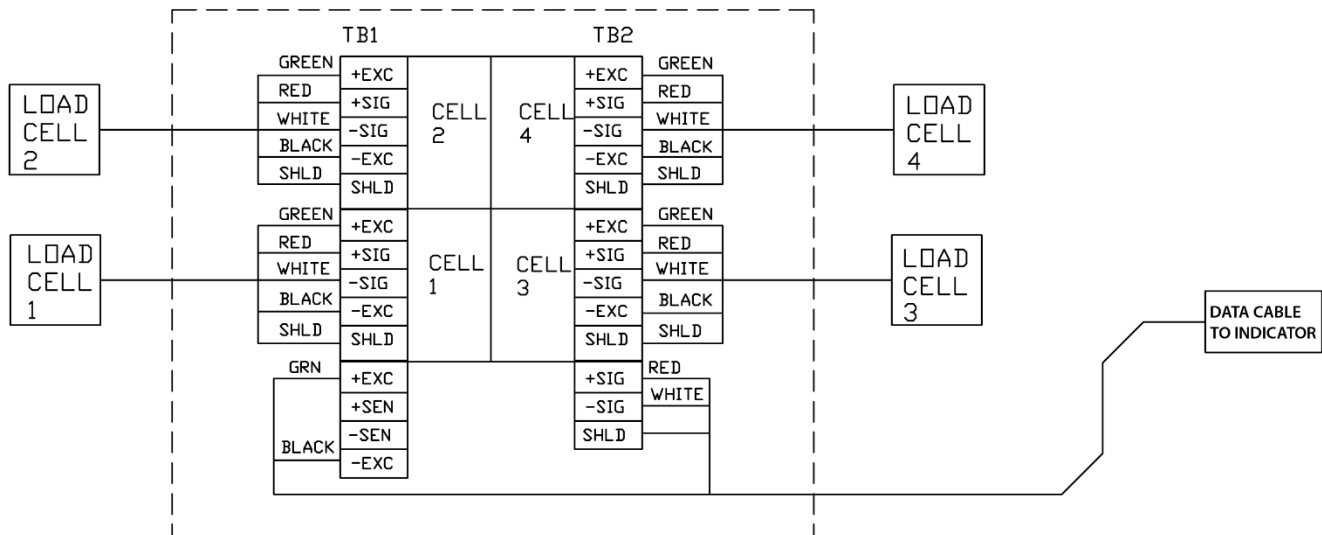
1. Set the DVM to ohms.
2. With the four wires of the load cell cable removed from the terminal strip in the Trim PC board Junction Box:

Measure between the Black and Green wires.

A good reading is 383 to 407 ohms.

Measure between the White and Red wires.

A good reading is 345 to 355 ohms.



Trim PC board Junction Box Wiring Schematic

Excitation and Signal Voltage Test

This test is performed at the Junction Box Trim PC board with the data cable from the weight indicator connected to the scale and the power to the scale and indicator turned on.

1. Set the DVM to DC volts. Measure between the +/-EXC (Green and Black wires) at the data cable connection and each load cell in the junction box.
A good reading is 5V DC when using new batteries or an AC power adapter.
2. Remove one pair of load cell signal wires (Red and White) at a time from the Trim PC board terminal strip. Set the DVM to DC volts and its lowest range. Measure between the signal wires:
With an empty scale, a good reading will be between 0.0 to 0.5 DC mV.



NOTE: Both positive and negative readings greater than 0.0 to 0.5 DC mV indicate a damaged load cell.

TROUBLESHOOTING GUIDE, CONT.

Excitation and Signal Voltage Test, cont.

3. Next, hang test weights (equal to 50 to 80 % of the capacity of the load cell) near a weigh module (tank leg).

Measure between the load cell signal wires (Red & White). Readings will increase as pressure is applied.

Maximum signal output at the capacity of the load cell is:

10mV with 5V DC excitation.

24mV with 12V DC excitation.

Leave the signal wires loose and repeat steps 2 and 3 for the remaining load cells.

4. Check for clearance between the load cell and the base (bottom plate) of the load cell stand.
Remove any obstruction such as debris or excess load cell cable.
5. Check load cell mounting bolts for proper torque.
Tighten any loose bolts.
6. Check that the load cell mounting pins are secure in the base (bottom plate).
Ensure the mounting pins are completely in the base (bottom plate) and that the cotter hairpins or cotter pins securing them are not missing or broken.
7. Check the Trim PC board for moisture or other damage.
If moisture is found, dry the board, and inspect it for corrosion. If corroded, replace the trim PC board.

TROUBLESHOOTING GUIDE, CONT.

Trim Adjustment after Load Cell(s) Replacement

The purpose of adjusting trim is so the same weight reading will be displayed regardless of where the load is in the tank scale. All tank scales are trimmed before leaving the factory. In the event, a load cell requires replacement, follow the instructions below to trim the weigh module with the new load cell. Note that it is assumed the load cells in the other modules already agree with each other. If not, please refer to the next instruction for additional information.

Single Load Cell Replaced

1. Remove the trim board access cover.
2. Turn the trim potentiometer for the load cell requiring re-calibration clockwise 25 turns. This is the maximum adjustment of the potentiometer in this direction.
3. One at a time, hang test weights near a weigh module (tank leg), and record the displayed weight for each weigh module (tank leg).
4. Hang test weights near the weigh module (tank leg) with the highest reading and adjust the appropriate trim potentiometer until the weight reading agrees with the lowest reading obtained in Step 3.
5. Repeat Step 4 until all weigh modules (tank legs) have the same weight reading.
6. Using calibrated test weights, calibrate the weight indicator following the procedures in the weight indicator installation and technical manual used with the tank scale.

Multiple Load Cells Replaced



IMPORTANT! If two or more load cells must be replaced or the scale needs an overall resealing, the following procedures should be followed.

1. Turn all the trim potentiometers clockwise 25 turns, and then turn all of the potentiometers counterclockwise 1 turn.
2. One at a time, hang test weights of at least 10 % of the maximum expected working load of the scale near a weight module (tank leg) and record the displayed weight on each weigh module.
3. Hang test weights near the weigh module (tank leg) with the highest displayed weight and adjust the appropriate trim potentiometer, counterclockwise until the reading agrees with the lowest weight reading.
4. Repeat Step No. 3 until all weigh module (tank leg) readings are equal.
5. Using calibrated test weights, calibrate the weight indicator following the procedures in the weight indicator installation and technical manual used with the tank scale.

TROUBLESHOOTING GUIDE, CONT.

Trim Adjustment Example

In this example, 1000 pounds of test weight was applied to each weigh module (tank leg) over load cells 1, 2, 3, and 4.

The displayed weight readings were:

Load Cell #1 = 1020.0

Load Cell #2 = 1010.6

Load Cell #3 = 1018.8

Load Cell #4 = 1020.8

2. One at a time, hang test weights near each weigh module (tank leg), and record the displayed weight for each weigh module (tank leg).
3. Hang test weights near weigh module (tank leg) # 1 and then adjust the # 1 trim potentiometer to reduce the displayed weight to match the lowest reading (*load cell #2 in the above example*).
4. Repeat step 2 with weigh modules (tank legs) #3 and #4 until all weigh modules (tank legs) have the same weight reading.
5. Using calibrated test weights, calibrate the weight indicator following the procedures in the weight indicator installation and technical manual used with the tank scale.

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