

# RL9000 Series®

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Weigh Module Kit

Models TWM & TWM-HT

## Installation Guide



**RICE LAKE**®  
WEIGHING SYSTEMS

PN 89284 Rev A



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Technical training seminars are available through Rice Lake Weighing Systems. Course descriptions and dates can be viewed at [www.ricelake.com/training](http://www.ricelake.com/training) or obtained by calling 715-234-9171 and asking for the training department.

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# 1.0 Introduction

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Manuals can be viewed or downloaded from the Rice Lake Weighing Systems website at [www.ricelake.com/manuals](http://www.ricelake.com/manuals)

Warranty information can be found on the website at [www.ricelake.com/warranties](http://www.ricelake.com/warranties)

The *RL9000TWM* and *TWM-HT* load cell mount provides an extremely accurate method for weighing medium and large capacity tanks and hoppers that are subject to large thermal expansion/contraction or vibration forces. The design uses a low profile shear web load cell (see Ohms listed below) and transmits the load via a spherical washer on the load-bearing hub of the cell. This design is very effective in providing for thermal expansion/contraction with little friction.

- 350 $\Omega$  bridge for *RL9000TWM*
- 700 $\Omega$  for *RL9000TWM-HT*

In most applications, the assemblies are self-checking and held captive with no need for check or stay rods, making this mount a good choice for most vessel weighing applications. The shear web design eases load cell installation and replacement without the need to raise the weighed vessel a large amount, which could disturb piping and other connections.

The *RL9000TWM* and *TWM-HT* are available in stainless steel, in capacity sizes from 1,000-450,000 lb. *RL9000TWM-HT* is available in stainless steel, in capacity sizes from 1,000-50,000 lb. They utilize a welded-seal stainless steel load cell.

The *RL9000TWM* is rated for temperatures of 0° to 150° F.

The *RL9000TWM-HT* is rated for temperatures of 0° to 400° F.

The *RL9000TWM* and *TWM-HT* are capable of weighing accurately with as much as a 3° non-parallel loading. They module offers 100% sideload, 100% uplift and 300% overload protection.

The installation should be planned by a qualified structural engineer. Each installation is unique, and this manual is meant to serve only as a general guideline for installation.

## 1.1 Safety Section

### 1.1.1 Safety Symbol Definitions:



*Indicates an imminently hazardous situation that, if not avoided, will result in death or serious injury.*



*Indicates a potentially hazardous situation that, if not avoided could result in death or serious injury, and includes hazards that are exposed when guards are removed.*



*Indicates a potentially hazardous situation that, if not avoided may result in minor or moderate injury.*



*Indicates information about procedures that, if not observed, could result in damage to equipment or corruption to and loss of data.*

## 1.1.1 General Safety



*Do not operate or work on this equipment unless you have read and understand the instructions and warnings in the Installation, Operation and Maintenance Manual. Failure to follow the instructions or heed the warnings could result in injury or death. Contact any Rice Lake Weighing System dealer for replacement manuals. Proper care is your responsibility.*



*Before attempting to operate this unit, make sure every individual who operates or works with this unit has read and understands the following safety information.*

*Failure to heed may result in serious injury or death.*

*Do not allow minors (children) or inexperienced persons to operate this unit.*

*Do not operate without all shields and guards in place.*

*Do not jump up and down on the scale.*

*Do not use for purposes other than weight taking.*

*Do not place fingers into slots or possible pinch points.*

*Do not use any load bearing component that is worn beyond 5% of the original dimension.*

*Do not use this product if any of the components are cracked.*

*Do not exceed the rated load limit of the unit.*

*Do not make alterations or modifications to the unit.*

*Do not remove or obscure warning labels.*

*Keep hands, feet and loose clothing away from moving parts.*

## 2.0 Load Cell Wiring

The following section provides information for the proper wiring of load cells.

1. Route the load cell cables so they will not be damaged or cut.



### Important

*Cable should not be routed near heat sources greater than 150°F.*

**Do not shorten any load cell cable.** The load cell is temperature compensated with the supplied length of cable. Cutting the cable will affect temperature compensation.

*Coil and protect excess cable so it will not be mechanically damaged or be sitting in water.*

2. Provide a drip loop in all cables so that water or other liquids will not run directly down the cables onto either the load cells or the junction box. Attach load cell cable to the dead structure.

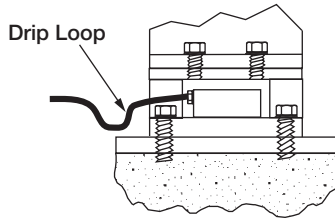


Figure 2-1 Drip Loop

Load Cell Wire Colors (RL9000TWM Only)	
Wire Color	Function Positive Reading
Green	+EXC
Black	- EXC
Red	- SIG
White	+ SIG
Gray or Bare	Shield

Table 2-1. Wire Function

3. If conduit protection is necessary against mechanical or rodent damage to the load cell cables, use flexible conduit and conduit adapters (20K - 450K only) at the load cells.
4. Connect cables for load cells to the summing board in the junction box according to the guide shown below and the labels on the terminal strips of the junction box. To verify the wiring scheme, see the certification shipped with each load cell.

## 3.0 Junction Box Connections, Adjustments and Calibration

- Refer to junction box manual for trimming details.
- Refer to indicator manual for system calibration details.

## 4.0 Troubleshooting

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If the system powers up and gives some type of stable digital readout that varies with the load on the system, any system problems are probably caused by factors other than the load cells. The load cells are often blamed for a malfunctioning system, but 90% of the time, the problem lies elsewhere. Look for mechanical causes for the problem first.

If the system can be calibrated but doesn't return to zero, loses calibration, or demonstrates non-linearity or non-repeatability, see the following chart for possible causes and do the following checks.

Symptom	Probable Cause
No return to zero	Mechanical binding of debris in seals or under the load cells; may have lost system calibration
Non-linearity	Thermal expansion or deflection under load causing binding or side load
Non-repeatability	Loosen load cell mount; drifting caused by moisture, load cell overload or shock damage; mechanical binding
Lost calibration	Out of level or plumb; moisture problem; mechanical binding
Drifting readout	Moisture in junction box, cables or load cell; mechanical binding

*Table 1: Possible Causes*

1. Check the load cell mount for debris restricting load cell movement or debris between scale and structure.
2. Check that tank/vessel and mounts are plumb, level and square at critical areas.
3. Check all piping and conduit for connections which restrict vessel movement.
4. If check rods are used, loosen all connections to finger tight only for testing.
5. Check load cell cables for physical or water damage.
6. Check all electrical connections, especially in the junction box.

If the problem still is not found:

1. Check possible indicator malfunction by using a load cell simulator to input a known, good signal into the indicator.
2. Disconnect each load cell's signal leads at the junction box and check the individual load cell outputs with a multimeter. Then check input/output impedances for comparison with load cell manufacturer's specifications.

If after all these checks the problem still cannot be isolated, reconnect all but one load cell. Replace the load cell with a load cell simulator. Alternate so that each load cell is individually disconnected and replaced with a simulator. If there is a problem with a particular load cell, the symptom should disappear when that load cell is disconnected and replaced with the simulator.



# 5.0 Mechanical Installation

## 5.1 General Installation Guidelines for Tank Mounts

- The mounting surface for base and top plate must be level. After installation, the top and bottom plates must be level within  $\pm 0.5^\circ$ . If the mounting surfaces are not level, then shims and/or grout may be used to level the mount.
- If possible, check that the mount is level when the vessel is fully loaded because excessive deflections in legs and supporting structures may cause additional side forces which greatly affect accuracy. Deflection of the mount top or base plate due to loading should not exceed  $\pm 0.5^\circ$ . Reinforcement of legs or other support structures may be necessary to correct this. Vessels with long legs should have cross bracing applied between adjacent legs to keep them from spreading under load.
- Compression mounting systems use three, four, or more mounts. More than eight-mount systems should be avoided as even weight distribution becomes extremely difficult to achieve. The load on each mount assembly should vary by no more than 20%. Add shims where necessary to achieve correct load distribution.
- Take extreme care to prevent overload damage. A tank or hopper can exert huge forces when dropped only a fraction of an inch.

It is crucial that all piping or conduit be horizontal and flexible. If flexible piping is not used, make sure the distance from vessel to the first pipe support is 20-30 times pipe diameter. In smaller, lower capacity tanks and hoppers, isolating resultant forces becomes extremely critical. For details, see our *Weigh Modules & Vessel Weighing Systems* manual, P/N 43918.

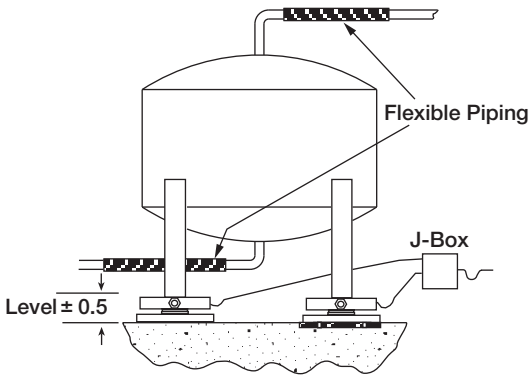


Figure 5-1 Installation

- The weighing assemblies should not be installed until all welding is completed. The heat generated from welding current passing through a load cell can damage the adhesive holding the strain gauge to the body. If possible, use a dummy mount when welding to maintain finished height. If welding is unavoidable after load cell installation, connect the ground in such a way that the current does not flow through the load cell. For example, if welding on the mount top plate, the ground must be connected to the vessel, not to the mount base or support structure. Also, protect the load cell and cable from weld splatter.

- Use only hermetically sealed load cells in wash down applications. environmentally protected load cells are not suitable for such applications and will be damaged. If tanks and surrounding equipment are frequently steam cleaned or if the load cell is subjected to direct wash down, a protective shroud for the weighing assembly is recommended. Proper drainage is necessary so the weighing assembly is not standing in water.
- All support points should be equally stiff so that they deflect by the same amount as the vessel is loaded.

## 5.2 Installing the RL9000TWM and TWM-HT

The type of installation and strength of the mounting surface governs the method of locating, attaching, and installing the *RL9000TWM* and *TWM-HT* assembly. Carefully consider three areas which commonly cause accuracy problems:

- Are the supporting legs adequately braced so they will not spread when the system is fully loaded?
  - Does the supporting structure have the necessary strength to prevent excessive deflection when the system is fully loaded?
  - Is there attached equipment such as skirting, venting, or piping which is likely to cause binding or lack of flexibility?
1. Determine where to position each mount. The *RL9000TWM* and *TWM-HT* are designed to allow for lateral movement in any direction. Sample mounting orientations to accommodate different vessel shapes are as follows:

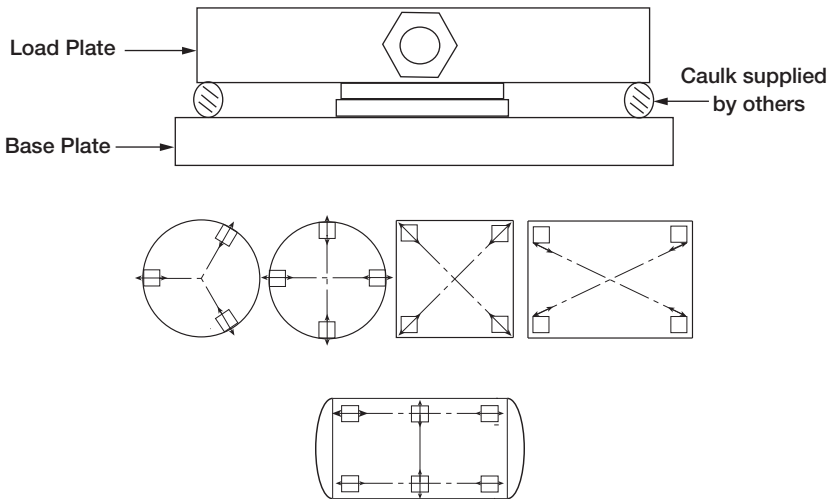


Figure 5-2 Mounting Orientations

2. Make necessary preparations to the mounting surfaces. A one inch sub plate can be used to ensure a good mounting surface.
3. Lift and block the vessel to the same height as the assembled mounts. Slide mount into position.
4. If the mount is being fitted under the leg of a vessel, verify that the leg's center line passes through the center of the top plate (through the center of the load cell).

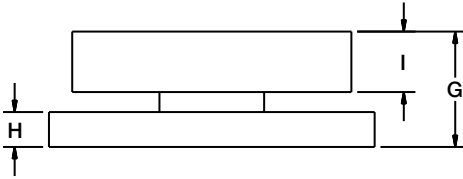
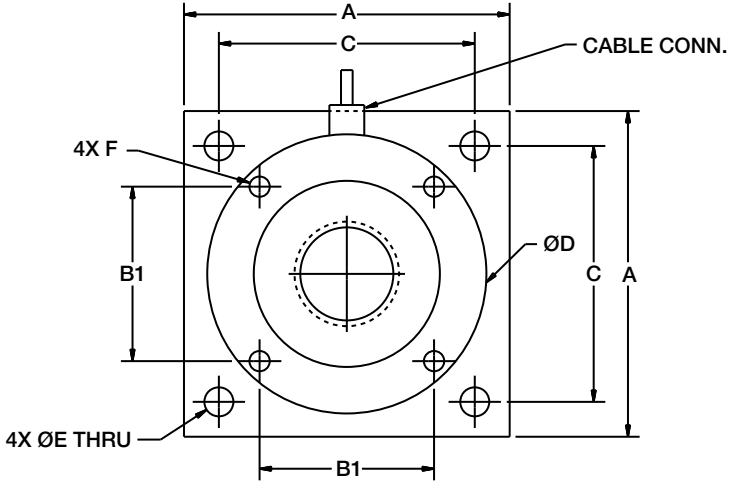
5. Lower the corner or side of the vessel carefully onto the top plate. The force of a vessel weighing several tons can damage a load cell if dropped only a fraction of an inch.
6. With the top plate positioned approximately level, mark holes for attaching the top plate to the vessel's mounting surface. Drill holes and attach top plate loosely to vessel with suitable fasteners.
7. Verify that there is no initial misalignment between the base plate and top plate.
8. Attach the base plates to the foundation using suitable anchors for concrete or by bolting or welding to a steel structure or sub-plate. Verify that the base plates are as level as possible. They should be fully supported. Shimming is not recommended.
9. Check that the top plates are no more than  $\pm 5^\circ$  out of level. Shim if necessary and fully tighten mounting bolts.
10. Repeat steps 4-9 for the mounting assemblies at the remaining corners or sides.
11. To achieve equal load distribution, final height adjustments can be made with shims between the top plate loading bracket and the weighing vessel. The variation in load among the cells should be no more than 20%. The load distribution can be checked accurately by exciting each load cell in turn and measuring the output with a voltmeter.
12. Consider using a bead of flexible caulk between the load cell and the base on lighter capacity assemblies. This will prevent debris from lodging between the load cell and the base and causing repeatability or accuracy problems.
13. *RL9000TWM* and *TWM-HT*'s come directly from the factory correctly assembled with Loctite®<sup>1</sup> and should not require adjustment. If they have been disassembled for any reason, perform the following:
  - a. Remove the large center screw.
  - b. Align the convex load disc and the load cell with the center hole in the base plate.
  - c. Apply Loctite and install the large screw and continue to turn until the rubber o-ring just contacts the convex load disc.
  - d. Back the screw off 1/4 turn. The screw provides lateral restraint and lift off protection. Never remove it or back it off more than the suggested amount.

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1. Loctite® is a registered trademark of Henkel AG & Company KGaA.

# 6.0 Dimensional Drawings

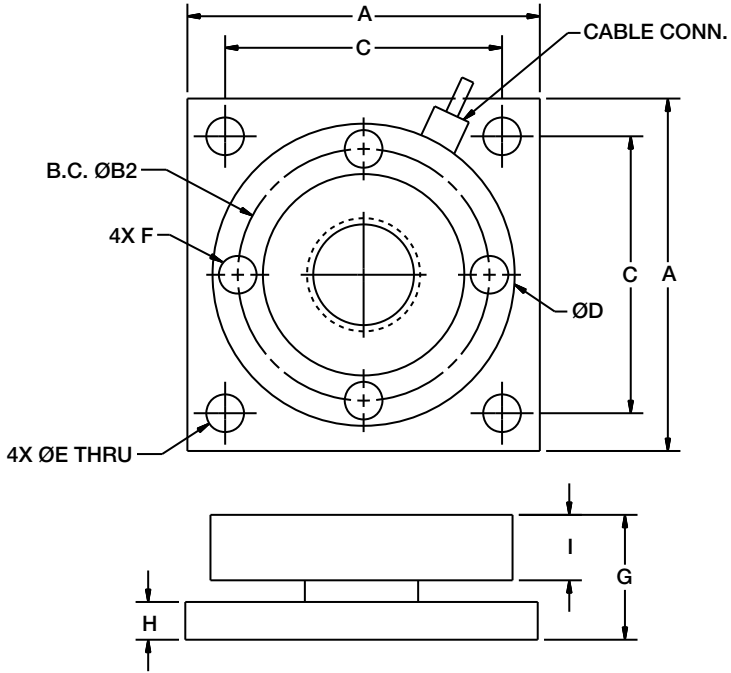
## 6.1 1K to 100K Assembly



Dimensions (Inches)										
Rated Capacity	A	B1	C	D	E	F	G	H	I	Conduit Adaptor
1K-10K	4.0	2.0	3.25	3.5	0.4	3/8-16	1.35	.375	.75	N/A
15K	4.0	2.0	3.25	3.5	0.4	3/8-16	1.60	.625	.75	N/A
20-50K	7.0	3.75	5.50	6.0	.63	1/2-13	2.48	.75	1.3	1/2-14 NPT
60K-100K	8.0	4.25	6.50	7.0	.81	3/4-16	2.50	1.0	1.3	1/2-14 NPT

Table 6-1. 1-100K Assembly

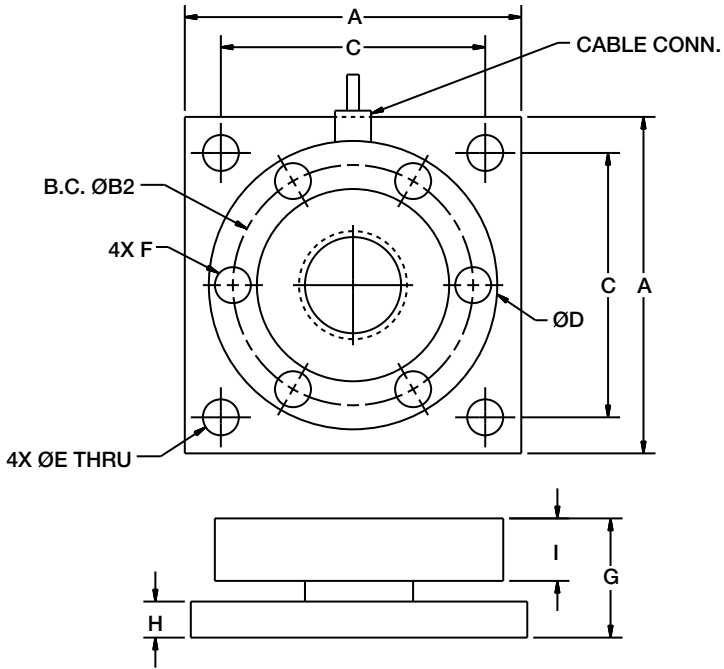
## 6.2 150K to 200K Assembly



Dimensions (Inches)										
Rated Capacity	A	B2	C	D	E	F	G	H	I	Conduit Adaptor
150K-200K	10.0	7.82 5	8.0	9.0	1.1	1-14	4.75	2.0	1.7	1/2-14 NPT

Table 6-2. 150-200K Assembly

## 6.3 250K to 450K Assembly



Dimensions (Inches)										
Rated Capacity	A	B2	C	D	E	F	G	H	I	Conduit Adaptor
250K-450K	11.0	7.75	9.0	9.0	1.3	7/8-14	6.42	3.0	2.25	1/2-14 NPT

Table 6-3. 250-450K Assembly





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