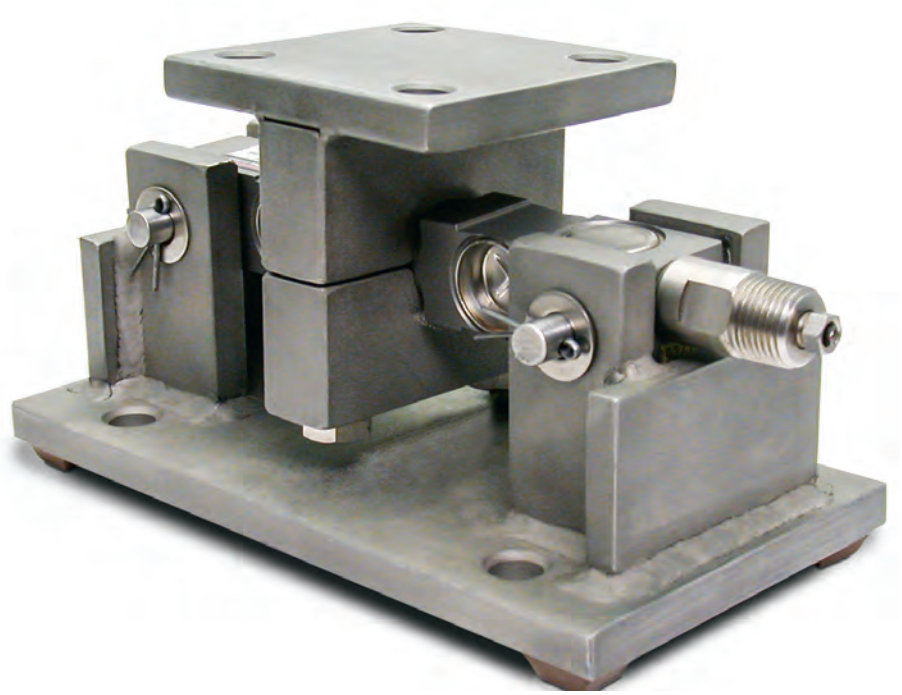
RL1600 Series

Weigh Module Kit

Installation Manual



RICE LAKE®
WEIGHING SYSTEMS

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www.ricelake.com

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1.0 Introduction

The RL1600 Weigh Module Kit provides an extremely accurate method for weighing medium and large capacity tanks, hoppers, bins and reactors. The design uses a double-ended shear beam load cell (700Ω bridge) and transmits the load through a clamping load plate to the center of the load cell. This design is very effective in providing for thermal expansion/contraction with little friction.

In the majority of applications, the modules are self-checking and held captive with no need for check or stay rods. This makes the RL1600 mount a good choice for areas with frequent seismic activity.

The RL1600 is available in cast iron, mild steel or stainless steel in sizes from 1,000-75,000lb. The module is compatible with RL75016, RL75016 Stainless Steel, RL75016HE, Sensortronics 65016 and Sensortronics 65016W Stainless Steel load cells i n capacities from 1,000 lb to 75,000 lb.

Manuals and additional resources are available from the Rice Lake Weighing Systems website at www.ricelake.com
Warranty information can be found on the website at www.ricelake.com/warranties

1.1 Safety

Safety Signal Definitions:

DANGER — ***Indicates an imminently hazardous situation that, if not avoided, will result in death or serious injury. Includes hazards that are exposed when guards are removed.***

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

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

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

General Safety

Do not operate or work on this equipment unless this manual has been read and all instructions are understood. Failure to follow the instructions or heed the warnings could result in injury or death. Contact any Rice Lake Weighing Systems dealer for replacement manuals.

WARNING

Failure to heed could result in serious injury or death.

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

DO NOT use for purposes other than weight measurement.

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.

Contact Rice Lake Weighing Systems for replacement manuals. Proper care is your responsibility.

2.0 Installation

2.1 Dimensions

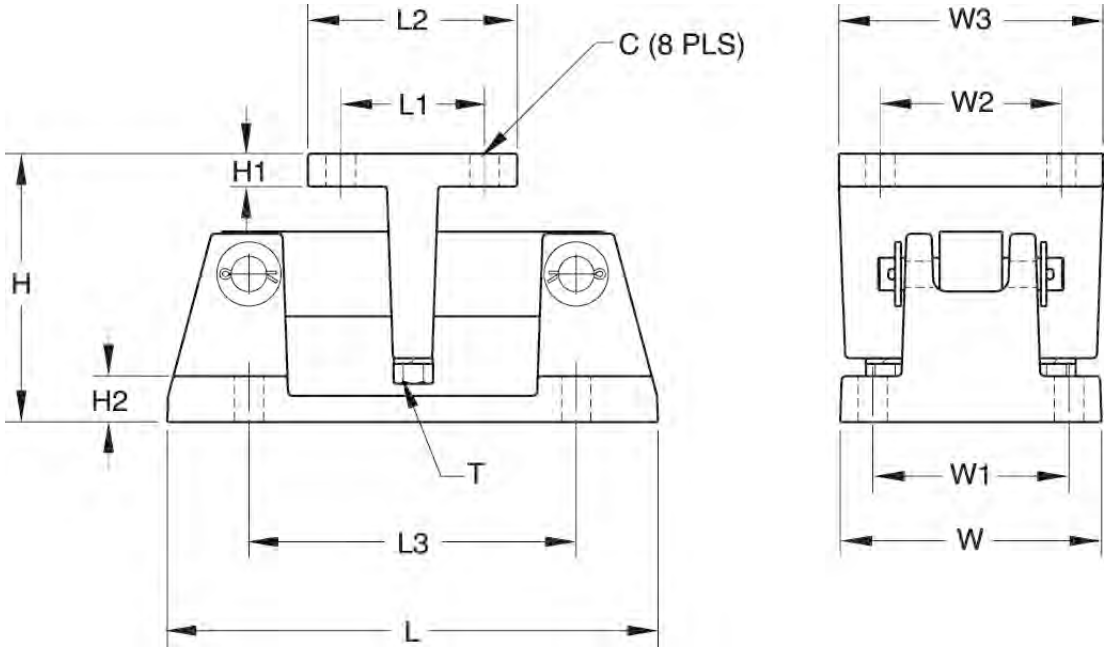

Figure 2-1. RL1600 Series Weigh Module Dimension Diagram

Rated Capacity	C	H	H1	H2	L	L1	L2	L3	T	W	W1	W2	W3
lb/in													
1,000-5,000	0.56	5.00	0.50	0.50	9.25	2.75	4.00	6.25	1/2-13 UNC	5.00	3.75	2.75	4.00
10,000-25,000	0.78	7.87	0.75	0.75	12.00	6.00	8.00	7.50	3/4-10 UNC	8.00	6.00	6.00	8.00
50,000-75,000	0.78	9.25	1.00	1.00	16.25	6.50	9.00	11.50	1 1/4-7 UNC	12.00	9.50	6.50	9.00
kg/mm													
453.6-2,268.0	14.2	127.0	12.7	12.7	235.0	69.9	101.6	158.8	1/2-13 UNC	127.0	95.3	69.9	101.6
4,535.9-11,339.8	19.8	199.9	19.1	19.1	304.8	152.4	203.2	190.5	3/4-10 UNC	203.2	152.4	152.4	203.2
22,679.7-64,019.5	19.8	234.9	25.4	25.4	412.8	135.1	228.6	292.1	1 1/4-7 UNC	304.8	241.3	165.1	228.6

Table 2-1. RL1600 Series Weigh Module Dimensions (HE, Mild Steel, and Stainless Steel)

Rated Capacity	C	H	H1	H2	L	L1	L2	L3	T	W	W1	W2	W3
lb/in													
1,000-5,000	0.56	5.00	0.50	0.50	9.61	2.75	4.00	6.25	1/2-13 UNC	5.00	3.75	2.75	4.00
10,000-25,000	0.78	7.89	0.75	0.75	12.00	6.00	8.00	7.50	3/4-10 UNC	8.00	6.00	6.00	8.00
kg/mm													
453.6-2,268.0	14.2	127.0	12.7	12.7	236.5	69.9	101.6	158.8	1/2-13 UNC	127.0	95.3	69.9	101.6
4,535.9-11,339.8	19.8	200.4	19.1	19.1	304.8	152.4	203.2	190.5	3/4-10 UNC	203.2	152.4	152.4	203.2

Table 2-2. RL1600 Series Cast Iron Weigh Module Dimensions

2.2 General Installation Guidelines for Weigh Modules

1. The mounting surface for the base and top plate must be level. After installation, the top and bottom plates must be level within ±0.5°. If the mounting surfaces are not level, shims and/or grout may be used to level the mount.
2. If possible, check that the module is level when the vessel is fully loaded. Excessive deflections in legs and supporting structures may cause additional side forces which can greatly affect accuracy.
3. Compression mounting systems use three, four or more mounts. More than eight-module systems should be avoided as even weight distribution becomes extremely difficult to achieve. The load on each module should vary by no more than 10%. During installation, add shims where necessary to achieve correct load distribution.
4. If the actual load cells are used during installation of the weigh module, extreme care must be taken to prevent overload damage. A tank or hopper weighing several tons can exert huge forces when dropped only a fraction of an inch. Dummy load cells can be used during installation.
5. It is crucial that all piping or conduit be horizontal and flexible. If flexible piping is not used, make sure the distance from the vessel to the first pipe support is 20-30 times the pipe diameter. In smaller, lower capacity tanks and hoppers, isolating the resultant forces becomes extremely critical. For details, see the Weigh Modules & Vessel Weighing Systems manual, PN 43918.
6. Load cells should not be installed in the modules 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 load cell 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 module 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.
7. When possible, only use 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 weigh module is recommended. Proper drainage is necessary so the weighing assembly is not standing in water.
8. All support points should be equally stiff so that they deflect by the same amount as the vessel is loaded.

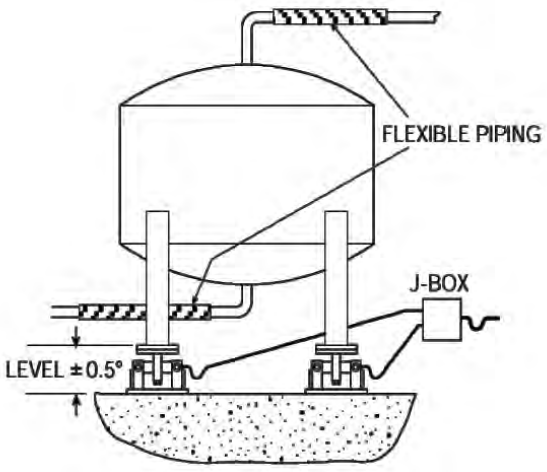

Figure 2-2. Flexible Piping

2.3 Installation Procedule

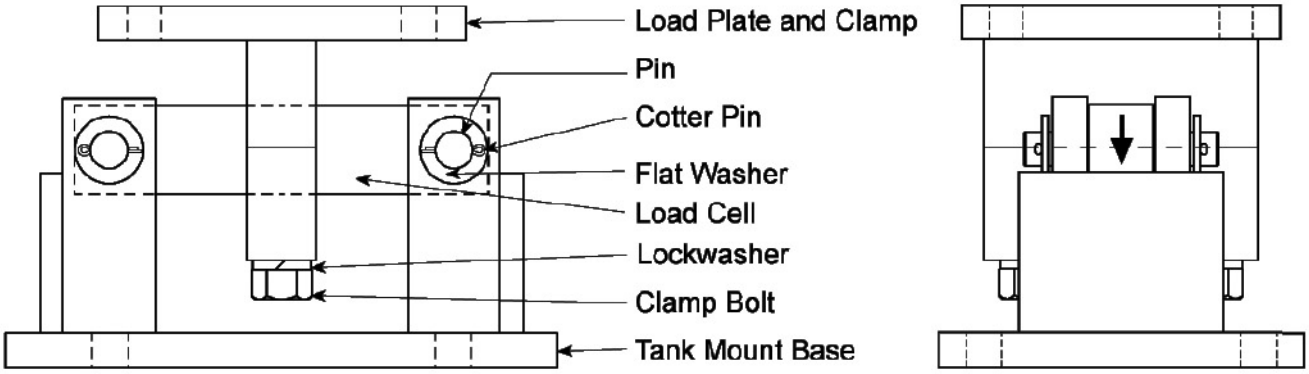

Figure 2-3. RL1600 Series Weigh Module Part Callout

1. The type of installation and strength of the mounting surface governs the method of locating, attaching and assembling the RL1600 assembly. Carefully consider three areas that 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 might cause binding or lack of flexibility?
2. Determine where to position the module and in which direction it should be oriented. The RL1600 is designed to allow for lateral movement in the direction perpendicular to the longitudinal axis of the load cell. These weigh modules should be oriented so that the movement due to thermal expansion/contraction is perpendicular to the longitudinal axis. Sample mounting orientations to accommodate expansion for different vessel shapes are as follows:

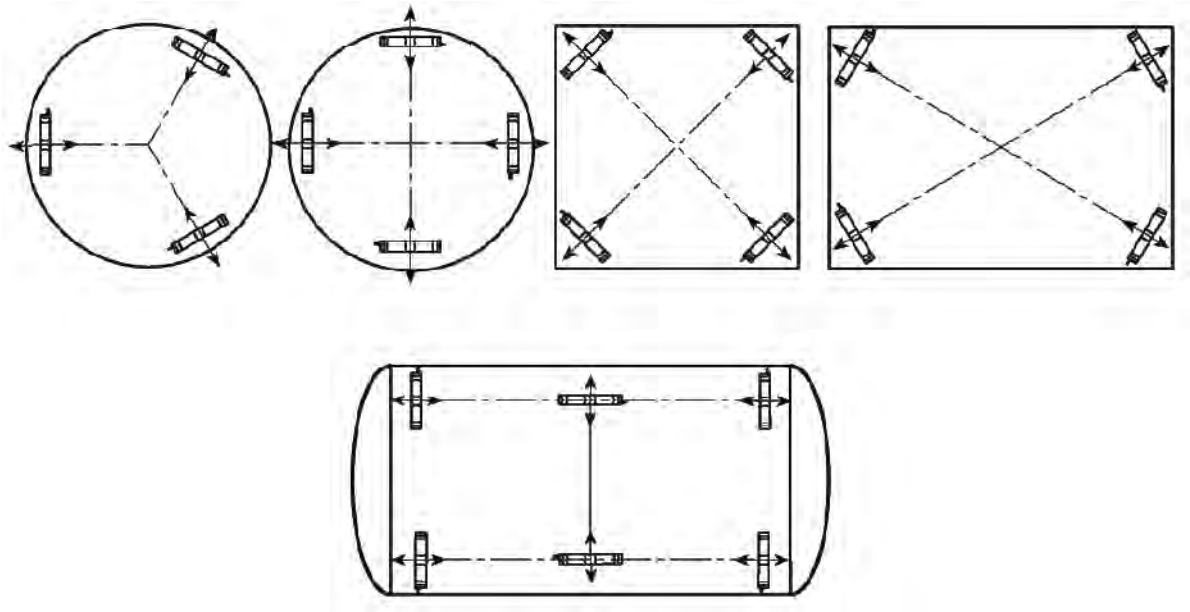

Figure 2-4. Vessel Shapes

3. Assemble the modules by attaching the load cell to the load plate and clamp using the lock washers and clamp screws. Then, insert the load pins through the base plate and load cell. Secure the load pins with washers and cotter pins.

Note ***The arrow on the load cell should point in the direction of the load.***

4. Lift and block the vessel to the same height as the assembled modules.

5. Remove the block from one support point and slide that module into position.
6. As the module is being fitted under the leg of the vessel, verify that the leg's center line passes through the center of the load plate (through the center of the load cell).
7. Lower the corner or side of the vessel carefully onto the load plate.

CAUTION ***Use extreme care when lowering the vessel. The force of a vessel weighing several tons can damage a load cell if dropped only a fraction of an inch.***

8. With the load plate positioned approximately level, mark holes for attaching the load plate to the vessel's mounting surface. Make holes and attach the load plate loosely to the vessel with suitable fasteners.
9. Repeat steps 5-8 for the weigh modules at the remaining corners or sides.
10. Verify that there is no initial misalignment between the tank mount base, load plate and clamp. The load plate and clamp should be centered with respect to the load cell. The load cell, clamp and load cell assembly should be centered in the base plate. Relocate if necessary.
11. 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 no more than ±.5 ° out of level. Shim as necessary.
12. Check that the top plates are no more than ±.5 ° out of level. Shim if necessary.
13. Fully tighten mounting bolts to the following torques:

Capacity	Material	Torque
1,000-5,000 lb	Mild Steel	55 ft lb
	Stainless Steel	517 in lb
10,000-25,000 lb	Mild Steel	200 ft lb
	Stainless Steel	1530 in lb

Table 2-3. Torque Specifications

IMPORTANT ***Check that each pin of each module has approximately equal weight applied. If a pin is loose, shim between the base plate and foundation as necessary.***

14. If dummy cells were used, replace with the load cells. Refer to step 3.
15. To achieve equal load distribution, final height adjustments can be made with shims between the load plate, clamp and 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.

2.4 Load Cell Wiring

1. Route the load cell cables so they will not be damaged or cut. Cable should not be routed near heat sources greater than 150 °F.

IMPORTANT ***Do not shorten any load cell cable. The load cell is temperature compensated with the supplied length of 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. This will prevent water and other liquids from running down the cables onto load cells or the junction box. Attach the load cell cable to the dead structure, not the vessel.
3. If conduit protection is necessary, to protect load cell cables from mechanical or rodent damage, use flexible conduit and conduit adapters at the load cells.
4. Connect cables for standard RL75016, RL75016 Stainless Steel, RL75016HE, Sensortronics 65016 and Sensortronics 65016W Stainless Steel 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.
5. For better performance, use positive and negative remote sense lines if the wiring running from the junction box to the indicator is longer than 25 feet.

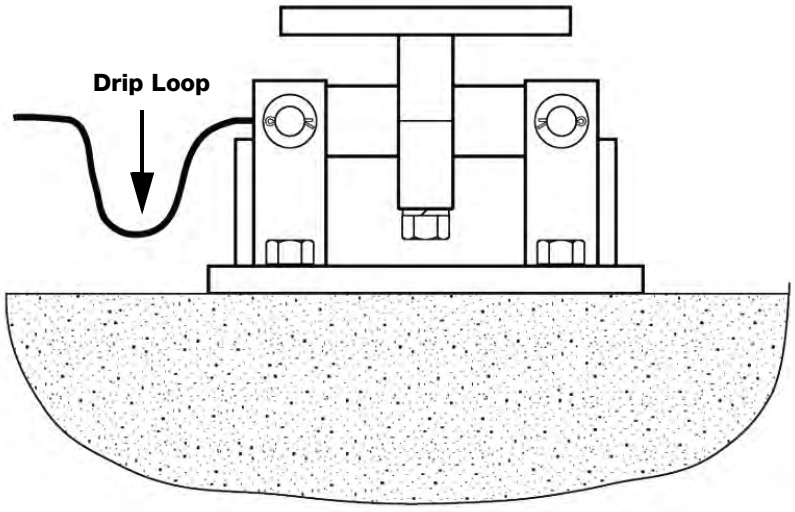

Figure 2-5. Wiring Scheme

Load Cell Wire Color	Function
Red	+EXC
Black	-EXC
Green	+SIG
White	-SIG
Gray or Bare	SHIELD

Table 2-4. Load Cell Wiring

2.5 Junction Box Connections, Adjustments and Calibration

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

3.0 Maintenance

3.1 Troubleshooting

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 your 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	Possible Cause
No return to zero	• Mechanical binding or debris in seals or under load cells • May have lost system calibration
Non-linearity	• Thermal expansion or deflection under load causing binding or side load
Non-repeatability	• Loose 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 3-1. Troubleshooting

1. Check weigh module for debris restricting load cell movement or debris between scale and structure.
2. Check that tank/vessel and modules are plumb, level and square at the 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.
7. Check possible indicator malfunction by using a load cell simulator to input a known good signal into the indicator.
8. Disconnect each load cell's signal leads at the junction box and check 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 can not 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.

3.2 Replacement Parts

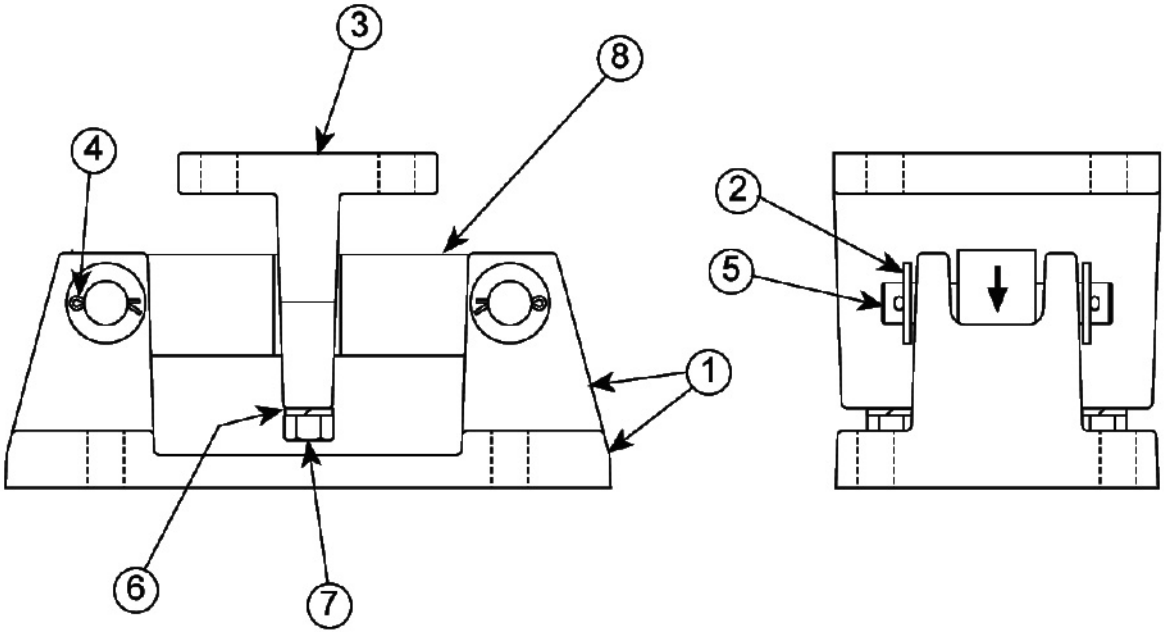

Figure 3-1. RL1600 Cast Iron Modules

Number	Description	QTY	Replacement Part Numbers	
			1,000-5,000 lb Capacity	10,000-25,000 lb Capacity
1	Weigh Module Base	1	18439	18441
2	Washer	4	15165	15179
3	Load Plate and Clamp	1	18443	18445
4	Cotter Pin	4	15232	15237
5	Pin	2	18449	18448
6	Lock Washer	2	15167	15181
7	Clamp Bolt	2	15080	15099
8	Load Cell	See Load Cell Product Selection Guide		

Table 3-2. RL1600 Cast Iron Modules Replacement Parts

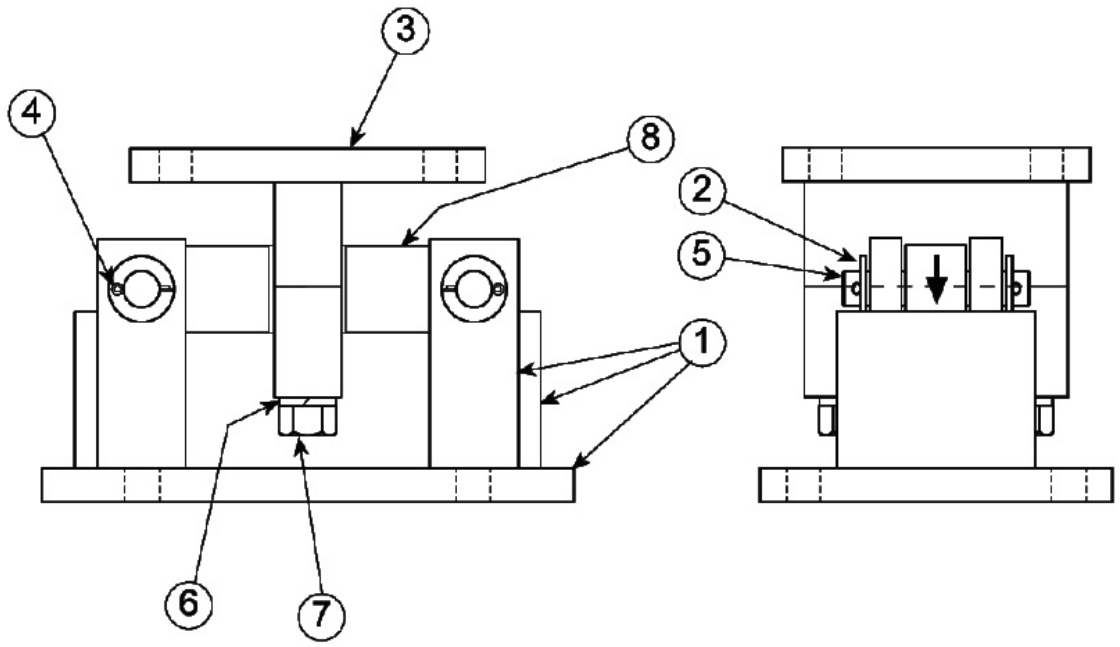

Figure 3-2. RL1600 Mild Steel Modules

Number	Description	QTY	Replacement Part Numbers			
			1,000-5,000 lb Capacity	10,000-25,000 lb Capacity	50,000-75,000 lb Capacity	75,000 lb Capacity
1	Weigh Module Base	1	22745	22748	22751	22751
2	Washer	4	15165	15179	15188	15188
3	Load Plate and Clamp	1	22746	22749	22752	25364
4	Cotter Pin	4	15232	15237	15257	15257
5	Pin	2	22747	22750	22753	22753
6	Lock Washer	2	15167	15181	15189	15189
7	Clamp Bolt	2	14757	15097	14799	14799
8	Load Cell	See Load Cell Product Selection Guide				

Table 3-3. RL1600 Mild Steel Modules

Number	Description	QTY	Replacement Part Numbers			
			1,000-5,000 lb Capacity	10,000-25,000 lb Capacity	50,000-75,000 lb Capacity	75,000 lb Capacity
1	Weigh Module Base	1	22745	22756	10124	10124
2	Washer	4	15166	15180	15188	15188
3	Load Plate and Clamp	1	22755	22757	10128	25365
4	Cotter Pin	4	15233	15238	15258	15258
5	Pin	2	22747	22750	22753	22753
6	Lock Washer	2	15168	15182	15189	15189
7	Clamp Bolt	2	14758	15098	14800	14800
8	Load Cell	See Load Cell Product Selection Guide				

Table 3-4. RL1600 Stainless Steel Modules

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230 W. Coleman St. • Rice Lake, WI 54868 • USA
U.S. 800-472-6703 • Canada/Mexico 800-321-6703 • International 715-234-9171 • Europe +31 (0)26 472 1319