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DI-100

16-Bit Digital Load Cell Interface

User's Guide

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Notes

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WARRANTY

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SAFETY INFORMATION**General**

Do not use this product in any manner not specified by the manufacturer. The protective features of this product may be impaired if it is used in a manner not specified in the operating instructions.

Do not install substitute parts or perform any unauthorized modification to the product. Return the product to a Loadstar Sensors office for any required service and repair to ensure that safety features are maintained.

Instrument Grounding

If your product is provided with a grounding type power plug, the instrument chassis and cover must be connected to an electrical ground to minimize shock hazard. The ground pin must be firmly connected to an electrical ground (safety ground) terminal at the power outlet. Any interruption of the protective (grounding) conductor or disconnection of the protective earth terminal will cause a potential shock hazard that could result in personal injury.

Cleaning

Clean the outside of the instrument with a soft lint-free, slightly dampened cloth. Do not use detergent or chemical solvents. Doing so may void your warranty.

WARNING

1. **Do not use the DI-100 with the cover, or part of the cover removed or loose, as a hazardous condition may result. Inspect the case for cracks or missing plastic. Do not use if the unit is damaged.**
2. **Do not operate the unit in an explosive atmosphere, or in the presence of flammable gases or fumes.**
3. **Do not immerse the unit in liquid, the housing is not fluid-tight. Humidity specifications are specified as non-condensing only.**
4. **Do not substitute parts or modify the unit to avoid the introduction of additional hazards. Return the unit to Loadstar Sensors office for service and repair to insure all safety features are maintained.**

ROHS/WEEE COMPLIANCE STATEMENT**EUROPE**

Directive 2002/95/EC. Restriction of the Use of Certain Hazardous Substances in Electrical & Electronic Equipment, as amended by EU Commission Decision 2005/95/EC.

This product is RoHS Compliant 2005/95/EC.

"RoHS Compliant 2005/95/EC" means that the product or part ("Product") does not contain any of the substances in excess of the maximum concentration values in EU Directive 2002/95/EC, as amended by Commission Decision 2005/618/EC, unless the substance is in an application that is exempt under EU RoHS. Unless otherwise stated by Loadstar sensors in writing, this information represents Loadstar Sensors best knowledge and belief based upon information provided by third party suppliers to Loadstar Sensors.

In the event any product is proven not to conform with Loadstar Sensors Regulatory Information Appendix, then Loadstar Sensors entire liability and Buyer's exclusive remedy will be in accordance with the Warranty stated below.

WEEE Directive (2002/96/EC)

The Waste Electrical and Electronic Equipment Directive (WEEE) applies to companies that manufacture, sell, and distribute electrical and electronic equipment in the E.U. It covers a wide range of large and small household appliances, IT equipment, radio and audio equipment, electrical tools, telecommunications equipment, electrical toys, etc.

The Directive aims to reduce the waste arising from electrical and electronic equipment, and improve the environmental performance of everything involved in the life cycle of electrical and electronic equipment. This is translated into the following requirements:

* Producers (manufacturers or importers) of electrical and electronic equipment will be required to register in their countries.

* Private households will be able to return their WEEE to collection facilities free of charge and producers will be responsible for financing these facilities.

* Producers will be required to achieve a series of demanding recycling and recovery targets.

* Wheeled bin emblem Producers will be required to mark their products with the 'crossed out wheeled bin'. This symbol indicates that the equipment carrying this mark must NOT be thrown into general waste but should be collected separately and properly processed under local regulations.

The WEEE directive has been transposed into each EU member state's legislation and so the exact timing and details will vary slightly from country to country, but the above principles will apply. In particular, the arrangements for the separate collection of WEEE will vary in each country but might include for example: public collection points, retailers take back schemes, collection from households, etc. The Directive encourages reuse, recycling and other forms of recovery in order to prevent WEEE. Users of electrical and electronic equipment in the E.U. can therefore play an important role in reducing WEEE and helping the environment by separating out WEEE and disposing of it properly. Consumers can ask the supplier from whom they purchased the Electronic & Electrical equipment from about local arrangements for the disposal of WEEE.

Business users are advised to ensure that WEEE, which is not suitable for reuse or recycling, be disposed of properly via approved authorized treatment facilities. The Producer in your country may be able to assist you.

Loadstar Sensors is dedicated to minimizing the impact our products have on the environment and to comply with the WEEE Directive.

ROHS in China



Electronic Industry Standard of the People's Republic of China, SJ/T11363-2006. Requirements for Concentration Limits for Certain Hazardous Substances in Electronic Information Products.

This symbol, per Marking for the Control of Pollution Caused by Electronic Information Products SJ/T11364-2006, means that the product or part **does not** contain any of the following substances in excess of the following maximum concentration values in any homogenous material: (a) 0.1% (by weight) for cadmium. Unless otherwise stated by LoadStar Sensors in writing, this information represents LoadStar Sensors best knowledge and belief based upon information provided by third party suppliers to LoadStar Sensors.

In the event any product is proven not to conform with Loadstar Sensors Regulatory Information, as provided herein, then Loadstar Sensors entire liability and Buyer's exclusive remedy will be in accordance with the Warranty stated below.

China RoHS is a two-step process that identifies concentration limits of certain hazardous substances in electronic information products that are sold into China. Per the deadline set by the Chinese government, March 1, 2007, Loadstar Sensors has implemented step one of China RoHS, self declaration of hazardous materials and marking of the product. Loadstar Sensors display modules that are sold into the China market have the required marking on the product designating that the product meets the China RoHS requirements.

The second step involving a testing obligation is currently under development. Full compliance will follow once it has been finalized.

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1 INTRODUCTION

The DI-100 is a 16-Bit Analog-to-Digital Load Cell Interface. It converts millivolt-per-volt rated output of an analog strain-gauge load cell into a USB digital load cell.

Attach the load cell wiring to the 5-position terminal block, enter the mV/V setting, plug the DI-100 to an available USB port on your PC, and you've got a Windows PC friendly weighing module.

Standard Features:

- USB Powered. The DI-100 and the load cell are powered entirely by your PC's USB port.
- Built-in power conditioning with internally regulated excitation voltage.
- Supports load cells with 300 ohms or greater resistance.
- Supports load cells with up to 3mV-per-Volt rated output.
- Supports 4-wire or 6-wire load cell connections.
- 16-Bit analog-to-digital conversion.
- Calibration data and program parameters are stored permanently on the DI-100.
- Small industrial case with built-in mounting ears.

2 MODULE DETAILS

2.1 External DI-100 Connection

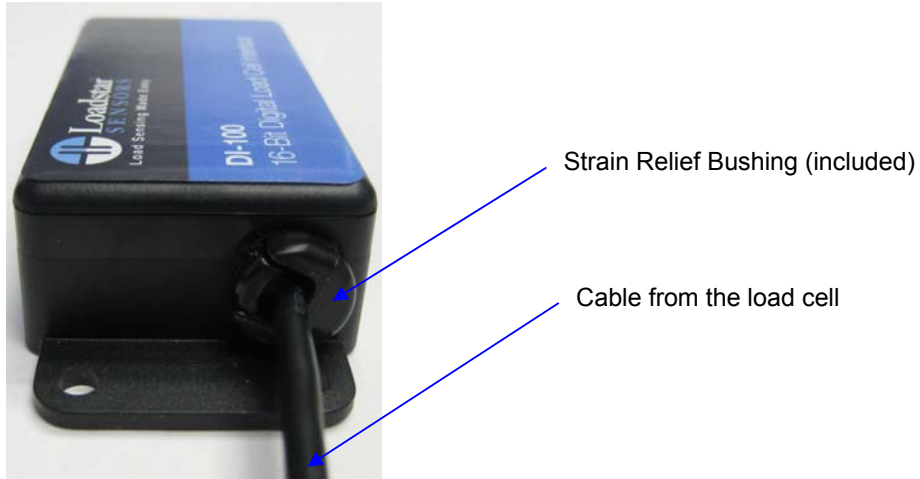


Figure 1: Load Cell Input Port

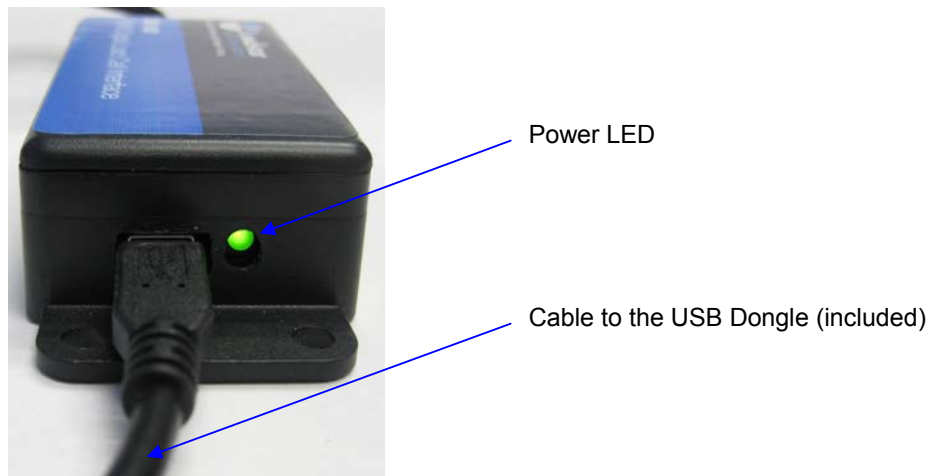


Figure 2: Power LED & USB Host Connection

2.2 DI-100 Mechanical Dimensions

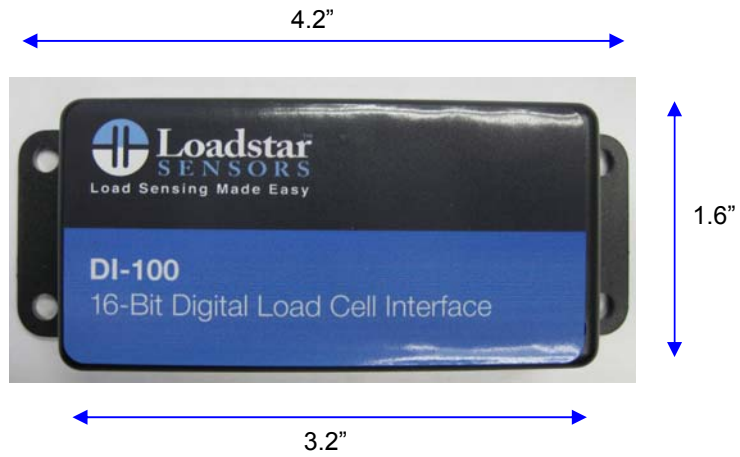


Figure 3: Mechanical Top View



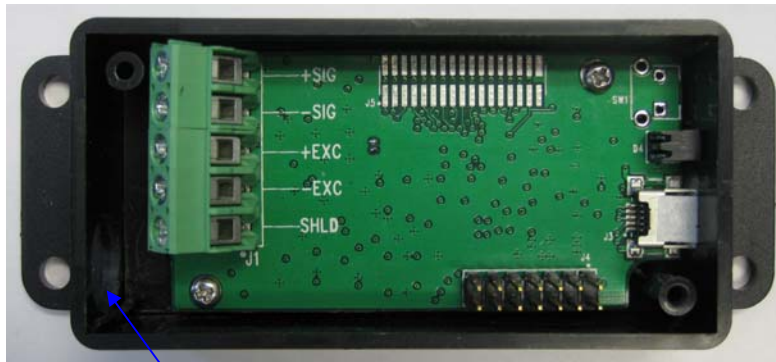
Figure 4: Mechanical Front View

3 STEP BY STEP OPERATING GUIDE

3.1 Attach the Load Cell to the DI-100

If you have ordered a load cell with the DI-100, we would have made the load cell attachment to the DI-100 for you. Please skip the following steps and go directly to next section (Install Virtual COM Port Drivers).

Figure 5: DI-100 (before assembly)



Opening for Strain Relief Bushing

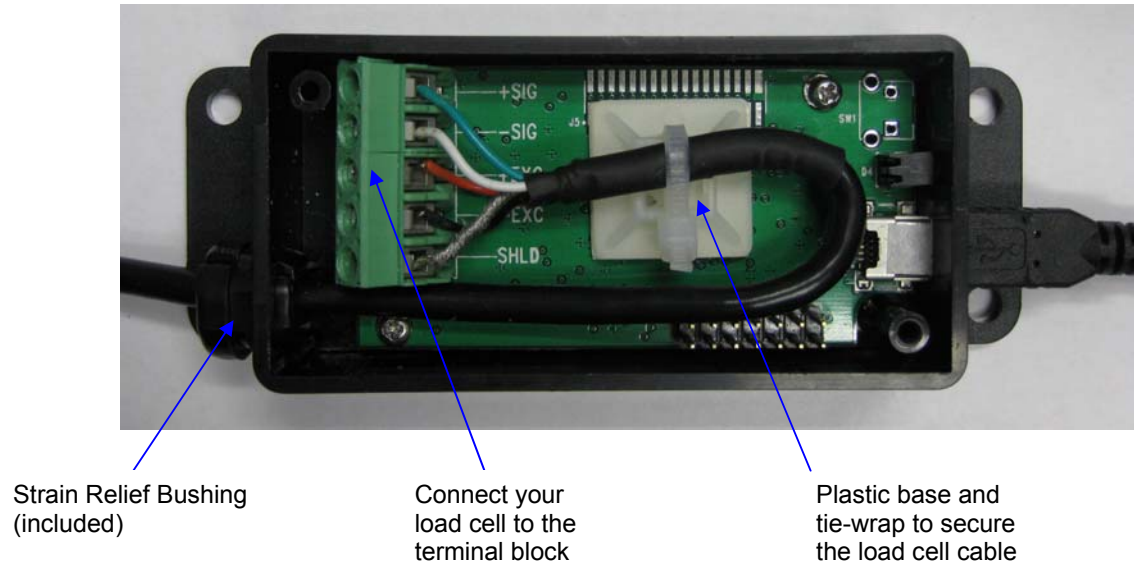
- Route the load cell cable through the opening of the strain relief bushing.
- Connect the wires per the wiring table as shown below.

Name	Color Code	Description
+SIG	Green	Output Signal Positive
-SIG	White	Output Signal Negative
+EXC	Red	Excitation Positive
-EXC	Black	Excitation Negative
SHLD	Bare wire	Shield

The color code as shown above is commonly used by many load cell manufacturers. If your load cell manufacturer uses a different color scheme, please match the signal descriptions with your load cell's documentation. For 6-Wire load cells, connect the "Sense Positive" to +EXC, and "Sense Negative" to -EXC respectively.

- Attach the plastic base and use the tie-wrap to secure the load cell cable.
- Attach the strain relief bushing to the load cell cable and push it securely into the bushing opening.
- The picture below shows the completed assembly.

Figure 6: DI-100 (after assembly)



3.2 Install Virtual COM Port Drivers

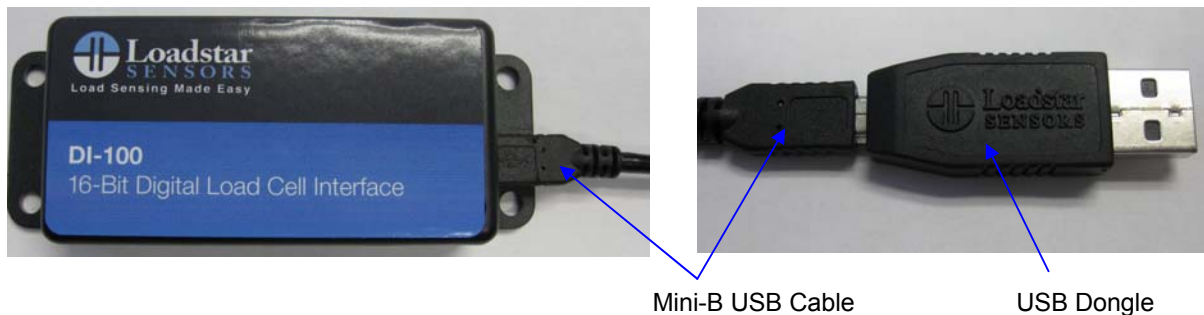
The DI-100 may be accessed either through PC's virtual COM port interface or through the optional LoadVUE program. This document will focus on the virtual COM port interface.

Before connecting the DI-100 to your PC, please install the drivers first using the included iLoad Digital USB Driver CD.

Once you have connected the DI-100 to the PC, use the steps as outlined in the document entitled "*Driver Installation and HyperTerminal Operation of iLoad Digital USB Sensors and Interface Devices*" to determine the COM port assignment and to connect using Windows HyperTerminal terminal emulation program.

3.3 Connecting DI-100 to Host PC

Figure 7: USB connection to host PC



A USB Mini-B to Mini-B cable and a USB dongle are included with your DI-100. Please make the following connections:

- Connect one end of the cable to the DI-100's USB Mini-B.
- Connect the other end of the cable to the included USB Dongle.
- Plug the USB Dongle to an available USB port on your PC.

3.4 Terminal Command Line Operation

After you have connected to the DI-100 via HyperTerminal (or another terminal emulator), press **<Enter>** key a few times. DI-100 should respond with a character ("A") for each **<Enter>** key pressed. You may type: ? **<Enter>** to review the command list.

3.5 DI-100 Initial Setup

DI-100 purchased with a load cell

If you have purchased a load cell together with the DI-100, we would have performed the calibration at our factory for you. No further setup is required. You may start to use your load cell now:

- Type: **? <Enter>** to view the command list.
- To tare (i.e., reset the zero) the load cell, type: **TARE <Enter>**
- To view the weight once, type: **W <Enter>**
- To view the weight continuously, type: **WC <Enter>**
- Press **<Enter>** to stop the scrolling.

Please skip the rest of this chapter and the next chapter (Calibrating the DI-100). Go directly to the “DI-100 Command Summary” chapter to review the command set.

DI-100 to be used with your own load cells

If you plan to use DI-100 with your own load cell, you would need to enter the UNIT, LC (load capacity), and ID commands; then follow the calibration procedure:

- Type: **? <Enter>** to view the command list.
- Enter desired units (e.g., pounds): **UNIT LB <Enter>**
- Enter total load capacity of your load cell (e.g., 100 lb): **LC 100.0 <Enter>**
- Enter an identification name (e.g., MY_SENSOR): **ID MY_SENSOR <Enter>**
- Follow the calibration procedure in the next chapter.

4 CALIBRATING THE DI-100

Please ensure the UNIT and LC (load capacity) commands are entered accordingly, prior to performing the calibration.

4.1 Calibration Mode

The DI-100 supports two calibration modes: The mV/V calibration or the 2-Point Linear Calibration.

You may perform the calibration for either mode independently and select the actual calibration mode in use.

4.2 Millivolt-per-Volt (mV/V) Calibration

Obtain the Rated Output (in millivolt-per-volt, mV/V) from your load cell's calibration certificate or from the label attached on the load cell. This number is the best fit mV/V value determined during the factory calibration procedure.

- To select the mV/V mode, type: **CAL m <Enter>**
- To enter mVolt calibration, type: **MVOLT x.yyyy <Enter>**

Where: **x.yyyy** is the mV/V rated output. The parameters are saved permanently on the DI-100 until you perform another millivolt calibration. You may start to use your load cell now:

- Type: **? <Enter>** to view the command list.
- To tare (i.e., reset the zero) the load cell, type: **TARE <Enter>**
- To view weight once, type: **W <Enter>**
- To view weight continuously, type: **WC <Enter>**
- Pull or push on the load cell, the weights should change accordingly.
- Press **<Enter>** to stop the scrolling.

4.3 2-Point Calibration

Two-Point Calibration is recommended if calibrated weights are available to perform the calibration. Point 1 is with no load and Point 2 is with load. You could calibrate Point 2 at full load or at the maximum weight range you would be using.

- Ensure **UNIT** and **LC** commands have been setup prior to starting the calibration.
- To select the 2 point calibration mode, type: **CAL 2 <Enter>**
- Remove all loads, type: **2PCAL xyz <Enter>**. (Note: **xyz** is the weight to be loaded for Point 2.)
- DI-100 responds with "**Apply Point 1 Load of 0, LB Press C when ready or Q to quit**". Ensure no load is applied to the load cell and type: **C**
- DI-100 responds with "**Apply Point 2 Load of xyz, LB Press C when ready or Q to quit**". Load the calibrated weights, stabilize the load, wait 10 seconds, and type: **C**
- DI-100 responds with a **number** and "**Calibration complete!**" message. The number reported represents the computed mV/V rated output.

Please note both **UNIT** and **LC** have to be correctly configured for DI-100 to properly compute the mV/V. The calibration data and parameters are saved permanently on the DI-100 until you perform another 2-point calibration. You may start to use your load cell now:

- To tare (i.e., reset the zero) the load cell, type: **TARE <Enter>**
- To view current weight once, type: **W <Enter>**
- To view current weight continuous, type: **WC <Enter>**
- Pull or push on the load cell, the weights should change accordingly.
- Press **<Enter>** to stop the scrolling.

5 DI-100 COMMAND SUMMARY

Please note the commands are **not** case sensitive. All alphabets are converted and stored as uppercase letters, including the ID string name.

5.1.1 UNIT ↵

Function:	Set (returns) currently selected units
Summary:	Sets or returns the unit types: mLB (milli pounds), LB (pounds), KG (kilograms) or N (Newtons)
Example:	UNIT LB ← (sets units to pounds) UNIT ← (displays currently set units)

5.1.2 LC ↵

Function:	Sets (returns) the load capacity of the attached load-cell
Summary:	Sets or returns the total load capacity of the load-cell as a floating point number. Should be entered in the currently selected value of UNIT.
Example:	UNIT ← (displays currently set units; ensure to match LC to the UNIT) LC 500 ← (sets total load capacity to 500 LB or the UNIT set) LC← (displays currently set load capacity)

5.1.3 ID ↵

Function:	Sets (Returns) a unique identification string for this device
Summary:	Sets or returns a unique identification string for this device. The total string should not exceed 12 characters. The string value is retained between power cycles.
Example:	ID MY_SENSOR ← (sets the ID to MY_SENSOR) (Note that we typically enter the unit serial number as the ID at the factory)

5.1.4 TARE ↵

Function:	<i>Tares, or sets the display ZERO value.</i>
Summary:	When this command is issued, the current A/D converter value is retained as ZERO output value. All subsequently output values are referenced to this value.
Example:	TARE ←

5.1.5 CAL ↵

Function:	<i>Sets (returns) calibration type</i>
Summary:	Sets or returns the currently selected calibration type. Acceptable parameters are: m for milliVolt calibration 2 for 2 point calibration
Example:	CAL m ← (sets mV calibration mode)

5.1.6 mVOLT ↵

Function:	<i>Sets (returns) the current mV calibration parameter</i>
Summary:	Sets (returns) the current sensor mV calibration parameter. This may be the parameter listed on the sensor, the manufacturers data sheet, or may have been derived through the calibration procedure.
Example:	MVOLT 2.123 ←

5.1.7 2PCAL ↵

Function:	<i>Runs the 2 point calibration procedure</i>
Summary:	Begins the 2 point calibration procedure. Follow the prompts from the DI-100 to complete the calibration as described in the section on calibration above.
Example	2PCAL 250←

5.1.8 W ↵

Function:	<i>Displays the current weight</i>
Summary:	Displays the measured weight in the currently selected units
Example	W ←

5.1.9 WC ↵

Function:	<i>Continuously outputs current weight</i>
Summary:	Displays the measured weight continuously. Press <Enter> key to stop.
Example	WC ←

5.1.10 R ↵

Function:	<i>Return RAW ADC value</i>
Summary:	Display raw A/D values
Example	R ←

5.1.11 RC ↵

Function:	<i>Continuously outputs current weight</i>
Summary:	Displays raw A/D values continuously. Press <Enter> key to stop.
Example	RC ←

5.1.12 SETTINGS ↵

Function:	<i>Returns all current setting values</i>
Summary:	Displays all settings stored in the DI-100 non-volatile memory
Example	SETTINGS ↵

5.1.13 ? ↵

Function:	<i>Returns the command summary</i>
Summary:	Return a command list
Example	? ↵

6 DI-100 TECHNICAL SPECIFICATIONS

Performance

Resolution	16-Bit A/D
Update Speed	Approx. 7.5 sample per second
Rated Input	Up to 3mV/V (3mv per volt)

Environment

Operating Temperature	-10 to 55C (15 to 131F)
Storage Temperature	-20 to 85C (-5 to 185F)
Humidity	5 to 85% RH Non Condensing
Voltage	Powered by USB port
Power	5Vdc @ 30mA
Vibration	Not to exceed 4 mm displacement at 16.7 Hz, for > 60 minutes
Shock	Not greater than a 20 cm drop onto a hard wooden surface

Enclosure

Construction Material	ABS Plastic
Dimensions	Approx. 4.20"(L) x 1.62"(W) x 0.90"(H)

Maximum Remote Load Cell Cable Length

Cable Length	10 feet, 20 AWG wire
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Special Interfaces

PC Interface	USB 2.0
Device Manager Interface	Virtual COM Port