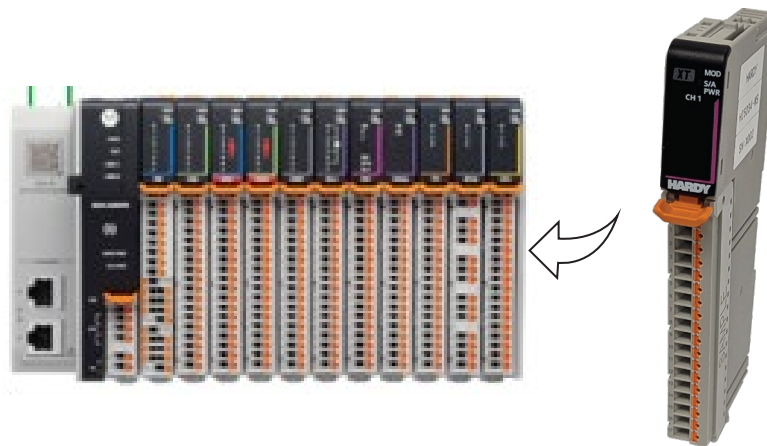


HI5034-WS (Cat# 5034-WS-HI)

Weigh Scale Modules for PointMax I/O Systems



Installation and Operation Manual

10075 Mesa Rim Road
San Diego, CA 92121
Phone: (858) 278-2900
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Chapter 1 - Overview

This manual is designed for use by installers, operators, and service personnel. It provides specifications and procedures for installing, wiring, linking, configuring, operating, maintaining, and troubleshooting the Hardy Process Solutions HI5034-WS Weigh Scale Modules. The system is used for front end signal processing of strain-gage based load cells and load points for all types of industrial manufacturing weighing applications.

Modules feature Waversaver®, C2® Calibration, INTEGRATED TECHNICIAN (IT®) diagnostics, and ladder logic configurability (see note).

Before using the product, be sure you understand all cautions, warnings, and safety procedures stated or referenced in this manual. And, to get the best service from this product, follow the practices recommended in this manual.

Hardy Process Solutions appreciates your business. We welcome all corrections or suggestions for improvement of this manual. Should you not understand any information in this manual or experience any problems with the product, please contact our Customer Support Department at:

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e-mail: hardysupport@hardysolutions.com

Web: www.hardysolutions.com

NOTE: *The Allen-Bradley PointMax manual contains useful information about the Logix platform that is not provided in this manual. This manual assumes that users have a basic understanding of process control and can interpret ladder logic instructions as needed to generate the electronic signals that control their application(s).*

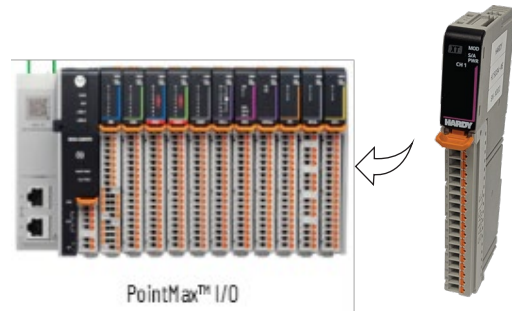


Product Description

Hardy HI5034 Plug-In-Modules are high performance single or dual channel weigh scale modules that feature a powerful 24-bit sigma-delta ($\Sigma\text{-}\Delta$) analog-to-digital converter (ADC), that when combined with Hardy's WaverSaver® filtering technology ensure accurate, fast, and stable weight data in even the most adverse conditions where noise and mechanical vibrations can plague process control.

HI5034-WS Weigh Scale Modules are self-contained, microprocessor-based I/O modules that produce weight data when connected to strain gauge load sensors (load cells, load points, platform scales); and are plugged directly into an AENTR adaptor.

The HI5034-WS Weigh Scale Modules can be used for a wide variety of process weighing applications such as batching, blending, filling/dispensing, check weighing, force measurement, level by weight and weight rate monitoring.



Waversaver®

During the measurement of small weight changes, the effects of mechanical vibration and noise from the operating environment can introduce substantial interference. The combination of the ADC circuit, microprocessor and Waversaver firmware filters out vibration, noise, and other interference-related signals from the load cell signals to produce Accurate, Stable and Fast weight data.

Waversaver® can be configured to ignore noise with frequencies as low as 0.25 Hz. One of five higher additional cut off frequencies may be selected to provide a faster instrument response time. The default factory configuration is 1.0 Hz vibration frequency immunity. The five cutoff frequencies are: 0.25 Hz, 0.5 Hz, 1 Hz, 3.5 Hz and 7.5 Hz.

C2® Calibration

Traditional calibration uses certified test weights. C2® Electronic Calibration allows a scale to be calibrated without the need for test weights.

A C2 weighing system consists of up to eight C2 load sensors, a junction box, interconnect cable, and an instrument with C2 capabilities. Each Hardy C2-certified load sensor outputs digital information used for the calibration. Upon power up, plug-in weigh scale modules read the sensor outputs and detect the number of active sensors. It then calibrates the scale based on the load sensor's output plus a user-supplied reference point value (from 0 to any known weight on the scale).

IT

INTEGRATED TECHNICIAN™ (IT) is a system diagnostics utility which, in conjunction with an HI6020IT series junction box, monitors the excitation circuit for possible malfunctions. IT reads individual load sensor voltages and weights and isolates individual system components for quick and easy troubleshooting.

If the scale system does not have a HI6020IT Junction Box connected to the module, the mV/V readings and weight are displayed as the total for all the load cells on the system.

NOTE: The HI5034-WS IS compatible with the Hardy HI6020IT or HI6020JB. You must use the HI6020IT to run this particular test.

Weighing System Test – Optional

Requires the HI6020IT Series Junction Box for full utilization. This test is used to diagnose drifting or unstable weight reading problems. The Weighing System Test does the following:

- Disconnects the controller and engages an internal reference signal to see if the problem is within the instrument.
- Disconnects the load sensors and engages an internal (in the junction box) reference signal to see if the cable between the instrument and the Junction Box is causing the problem.
- Reads the weight of each load sensor to see if the load sensor might be causing the problem.

The ability to read the weight seen by each individual load sensor allows use of this test to make cornering, leveling and load sharing adjustments to the weighing system.

Auto Zero Tracking

Auto Zero Tracking automatically adjusts for zero weight. This capability allows the module to ignore material build-up in the weighing system within a pre- set auto zero tolerance. For auto zero to work, the current gross weight must be within the auto zero tolerance. The current gross, plus any previously zeroed weight must be within the Zero Tolerance level value and the scale must not be in motion. This is not used on all applications and should be reviewed before use.

NOTE: *The amount of weight zeroed off is cumulative. The Auto Zero command will not run if the current gross weight plus any previously zeroed amount exceeds the zero tolerance value.*

Chapter 2 - Specifications

Chapter 2 lists the specifications for the HI5034-WS Weigh Scale Modules. Specifications are listed for the standard instrument and for optional equipment. The specifications listed are designed to assist in the installation, operation and troubleshooting of the instrument.

Performance	Recommended:	1:10,000
	Internal resolution	1: 16,777,216
	Update Rate to backplane:	125 times per second
	ADC conversion rate:	Up to 4800 times per second
	Number of Load Cells:	Up to 8x 350 Ω /scale channel
	Channels	One
	Non-Linearity:	< 0.001% of Full Scale

Scale Modes:	Gross, Net
Units of Measure:	Ounce, Pound, Ton, Gram, Kg, Metric Ton

Weight Processing	WAVERSAVER®: 0.25 Hz to 7.5 Hz
	Averaging: 1 to 255 User-selectable

Calibration Methods	C2® calibration without test weights
	Traditional calibration with test weights

Output:	Excitation 5 VDC
Inputs:	Signal: -0.3 mV to +25 mV Sense: +5 Vdc C2®, Electronic Calibration
Cable lengths:	250 feet maximum of C2 Cable

Mounting:	Directly to backplane
	Recommended Terminal Block
	Cat# 5034-RTB18 (Terminal Block)
	Cat# 5034-MB (Backplane Adaptor)

Backplane ratings	
MOD Power:	18-32 VDC, 75 mA
SA Passthrough Max:	10-32 VDC 9.95

Environmental Conditions	
Operational Temp	0 °C -+ 60 °C (32 °F - +140 °F)
Storage Temp	-40 °C - +85 °C (-40 °F - +185 °F)
Relative Humidity	5% - 95% (non-condensing)

Certifications	
Safety:	UL & CUL, CE
Environment	RoHS3 and REACH Compliant
Hazardous:	Class I, II, III/Div2

RTB	Name	Desc.	
0	In-0	Signal -	
1	In-1	Signal +	
2	In-2	Excitation +	
3	In-3	Sense +	Jumper
4	In-4	Sense -	
5	In-5	Excitation -	Jumper
6	In-6	C2+ (Cal)	
7	In-7	C2- (Gnd)	
8	In-8	Frame Gnd	
9	In-9		
10	In-10		
11	In-11		
12	In-12		
13	In-13		
14	In-14		
15	In-15		
16	In-16		
17	In-17		

Configuration Table	Data Type	Defaults	Range	
Gravity Correction	FLOAT	1.0	.9-1.2	
Motion Tolerance	FLOAT	10.0	.0001-999999.99	
Zero Tolerance	FLOAT	10.0	.0001-999999.99	
Tare Weight	FLOAT	0.0	.0001-999999.99	
Reference Weight	FLOAT	0.0	.0001-999999.99	
Span Weight	FLOAT	1000.0	.0001-999999.99	
AutoZero Tolerance	FLOAT	10.0	.0001-999999.99	
Enable AutoZero Tracking	BYTE	0	0-1	0 – OFF 1 - ON
Metric	BYTE	1	0-5	0 – oz 1 – lb 2 – ton 3 – g 4 – kg 5 - t
Load Cell Sensitivity	BYTE	4	0-8	0 – 1.0 mV/V 1 – 1.5 mV/V 2 – 2.0 mV/V 3 – 2.5 mV/V 4 – 3.0 mV/V 5 – 3.5 mV/V 6 – 4.0 mV/V 7 – 4.5 mV/V 8 – 5.0 mV/V
Waversaver	BYTE	3	0-5	0 – OFF 1 – 7.5Hz 2 – 3.5 Hz 3 – 1 Hz 4 – 0.5 Hz 5 – 0.25 Hz
Num Averages	INT	10	1-255	

NOTE: Please ensure that the HI5034 is installed with the HI6020IT or HI6020JB Junction Boxes.

Chapter 3 - Installation

Chapter 3 provides the recommended procedures for unpacking, cabling, interconnecting, configuring and installing the Weigh Scale Module. Users and service personnel should be familiar with this information before installing or operating the Weigh Scale module. If you experience any problems installing this equipment, contact Hardy Instruments Inc., Customer Support for assistance.

Installation Overview

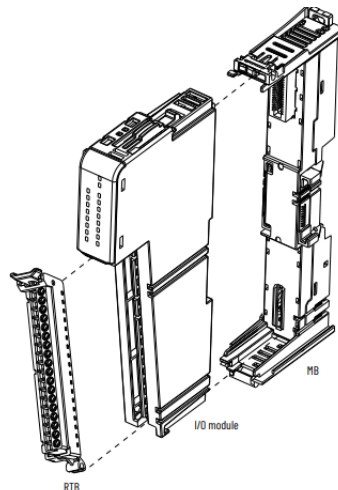
WARNING - ELECTROSTATIC DISCHARGE MAY DAMAGE SEMICONDUCTOR COMPONENTS IN THE MODULE. DO NOT TOUCH THE CONNECTOR PINS.

ATTENTION - UNE DÉCHARGE ÉLECTROSTATIQUE PEUT ENDOMMAGER DES COMPOSANTS SEMI-CONDUCTEURS DANS LE MODULE. NE PAS TOUCHEZ LE CONNECTEUR.

Observe the following handling precautions:

- Wear an approved wrist-strap grounding device when handling the module.
- Touch a grounded object or surface to rid yourself of any electrostatic discharge prior to handling the module.
- Handle the module from the bezel in front away from the connector. Never touch the connector pins.
- Do not install the module right next to an AC or high voltage DC module.
- Route all the low voltage cables away from high voltage cables.

Installation Procedure



Modules are configured as Remote I/O modules, with some restrictions that are based on the module and controller types.

When configured as Local I/O, modules will reside in the same system as the controller and installed to the right of the controller. Data is exchanged with the controller over the system backplane.

When configured as Remote I/O, modules reside in a separate location from the Logix5000 controllers and are accessible over EtherNet/IP via an EtherNet/IP adaptor.

1. Review Rockwell Automation Publication 5034-TD001B-EN-P.
2. Install the module by sliding onto the adaptor.
3. Engage the DIN rail latch.
4. Slide an end cap over the last module of the system.
5. Wire 24 VDC SA Power (Field side).
6. Power up system.

NOTE: *Hardy scale modules require SA power to produce excitation voltage for the sensor.*

Load Sensor and Junction Box Connections

Following the wiring diagram to the right, HI5034-WS weigh scale module will need to be connected to external sensors, whether it's a single load cell connected directly to the module, a group of load cells connected through a Junction Box or a platform scale such as a bench or floor scale. Each has its own wiring configuration.

RTB	Name	Desc.	
0	In-0	Signal -	
1	In-1	Signal +	
2	In-2	Excitation +	Jumper
3	In-3	Sense +	
4	In-4	Sense -	Jumper
5	In-5	Excitation -	
6	In-6	C2+ (Cal)	
7	In-7	C2- (Gnd)	
8	In-8	Frame Gnd	
9	In-9		
10	In-10		
11	In-11		
12	In-12		
13	In-13		
14	In-14		
15	In-15		
16	In-16		
17	In-17		

NOTE: *To avoid damage to the HI5034 weigh scale module, removal of terminal block from module is recommended when connecting external sensors.*

For single channel weigh scale modules – use pins 0 through 8.

- a) Use Screw-Down terminal blocks only*.

Recommended: Rockwell Automation Part# 5034-RTB18

- Maximum wire diameter 0.34...1.5mm² (22...16 AWG).
- Maximum diameter including insulation is 3.5mm (.14 in.)
- Minimum wire conductor and insulation rating: 105° C (221° F)
- Insulation stripping length is 10 +/- 0.4mm (0.39 +/- 0.02in.)
- Torque 0.22...0.25 N-m (1.95...2.21 lb-in).

See Wiring Specifications for Removable Terminal Blocks in the PointMax I/O System Specifications Technical Data, publication 5034-TD001

* SPRING terminal blocks are NOT recommended and should NOT be used.

- b) Non-C2 load cells or scale systems – leave C2 terminals empty.
- c) When four wire load sensors with C2, and four wire load sensors without C2, are directly connected to the terminal block, wire jumpers must be installed in the terminal block where indicated.
- d) Connect either frame ground (pin 8) to the cable shield to reduce the effects of EMI (electromagnetic interference) on the scale system.

NOTE: *If conduit is used, do not run load cell cable parallel to, or in the same conduit with power wiring, relay cable or other high energy cables.*

Chapter 4 – Setup and Operation

Chapter 4 covers the firmware and software settings used to prepare the module controller for calibration and operation. The Setup procedures require Allen Bradley's RS Logix 5000, Allen-Bradley RSLinx™ or RSLinx™ Lite.

General

Use Studio 5000 software (V36 and higher) to configure the HI5034-WS module. The software provides a module-specific Add-On Profile (AOP) to operate the module.

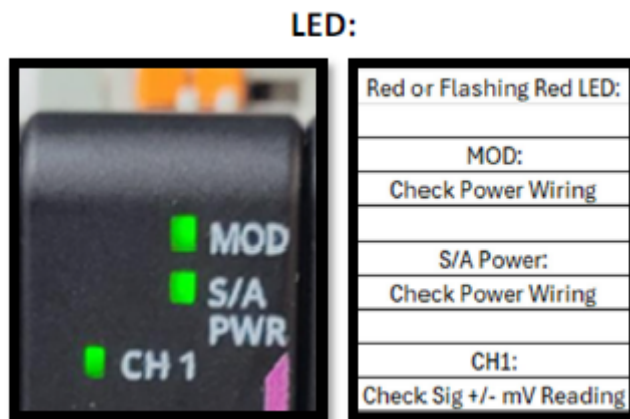
All data exchanged between a controller and the modules is through the backplane bus that these modules may share with other modules. The bus is created when the controller, its modules, and/or a communications adapter are assembled.

See Rockwell documentation for additional details:

Rockwell Automation Publication 5034-TD001B-EN-P.

Power Check

To make or change settings, there must be power to both the PLC and the module. Verify that the LED's are lit for normal operation. (See Figure Below)



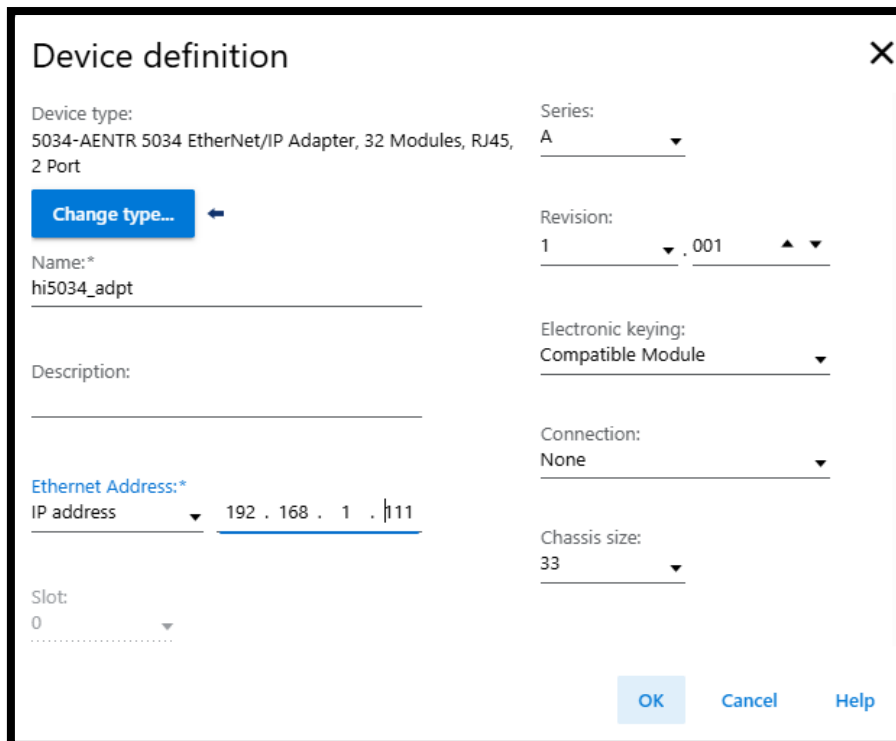
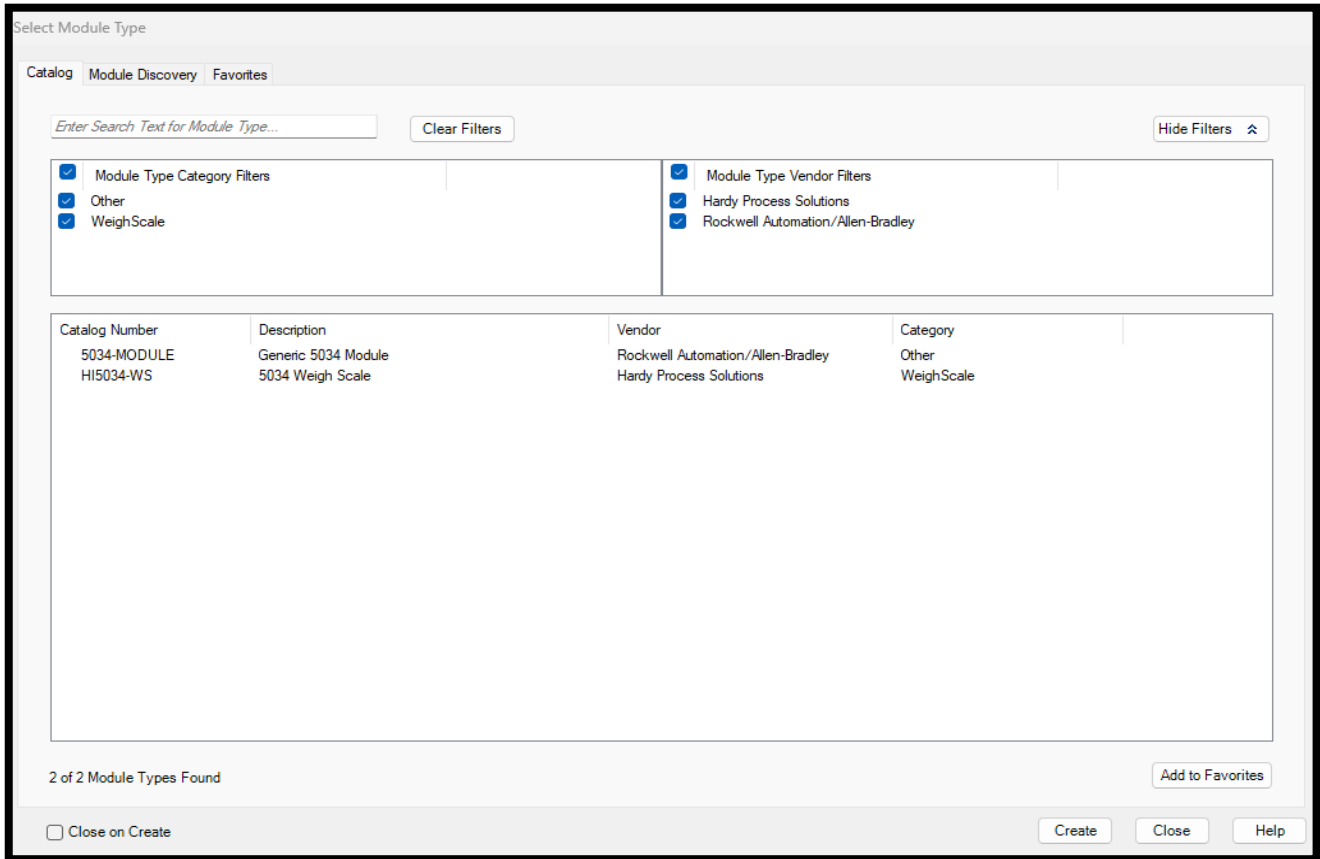
Setting Up Communications between the PLC and HI 5034-WS

Follow these steps to set up communication between the ControlLogix PLC and the Weigh Scale Module. The steps require that you have a new or open RS Logix® 5000 project. For instructions, see your RS LOGIX 5000 manual.

HI5034 WS modules will require a communications adapter module. For this setup example/instructions, a 5034-AENTR was used.

1. In the program Controller Organizer, find the I/O Configuration Section.
2. Right click on the Ethernet Module you will be installing the Point I/O under.
3. Select 'New Module' to display a list of modules.
4. From the Catalog list, select the 5034-AENTR module. Configure the module by:
 - a. Enter a unique name.
 - b. Enter an IP address (Set up the addressing for the 5034-AENTR module according to the instructions in the Rockwell manual.)

- c. In the module definition, set the chassis size to the correct size for the number of modules you have, ***including the adapter***. E.g. 1x AENTR and 1x HI5034 = Chassis Size 2



- d. Click OK to accept.
- e. Right click on the 5034-AENT module and select 'New Module'.
- f. Select the HI 5034-WS (1-Channel Weigh Scale). This will add the new module under the AENT adapter module

The module now shows in the controller Organizer in the I/O configuration under the Point I/O section. Repeat the above steps for any additional modules.

Configuration Parameters

The following parameters are parameters used in the Configuration table

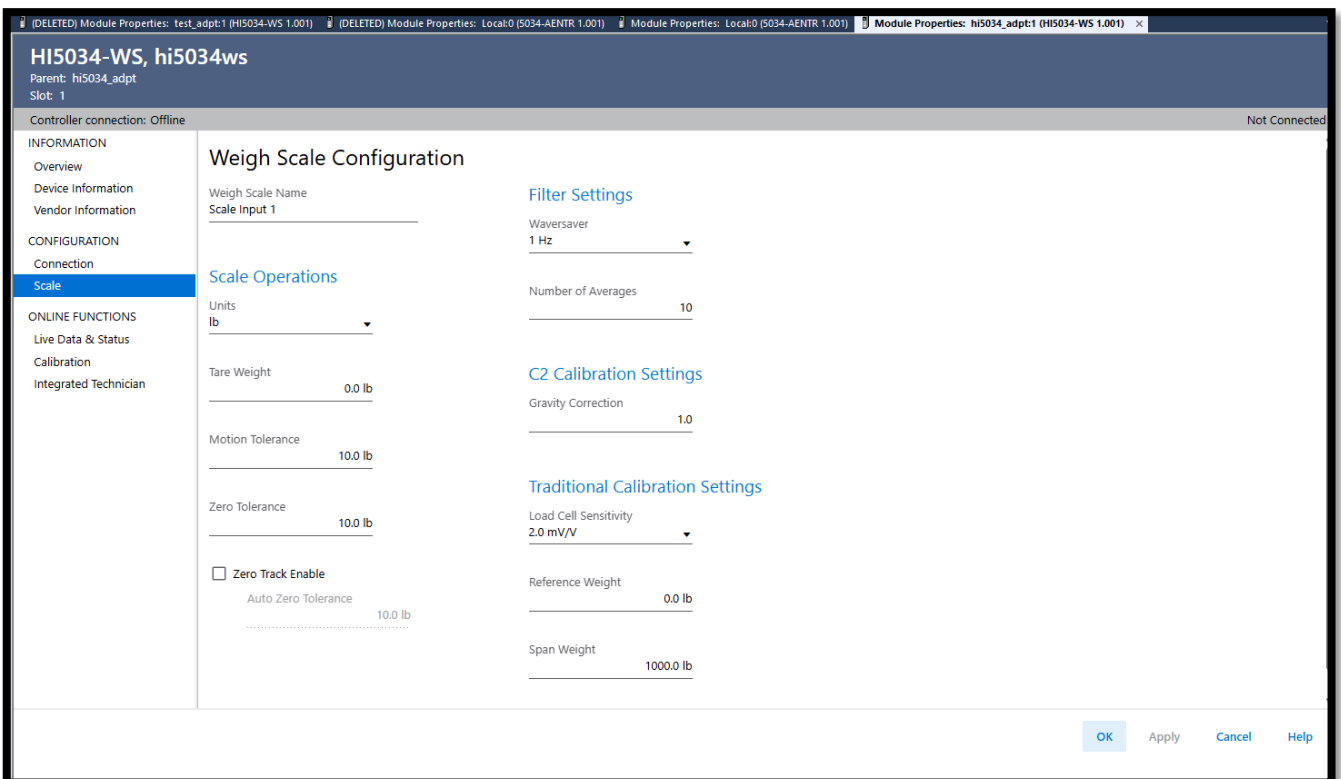
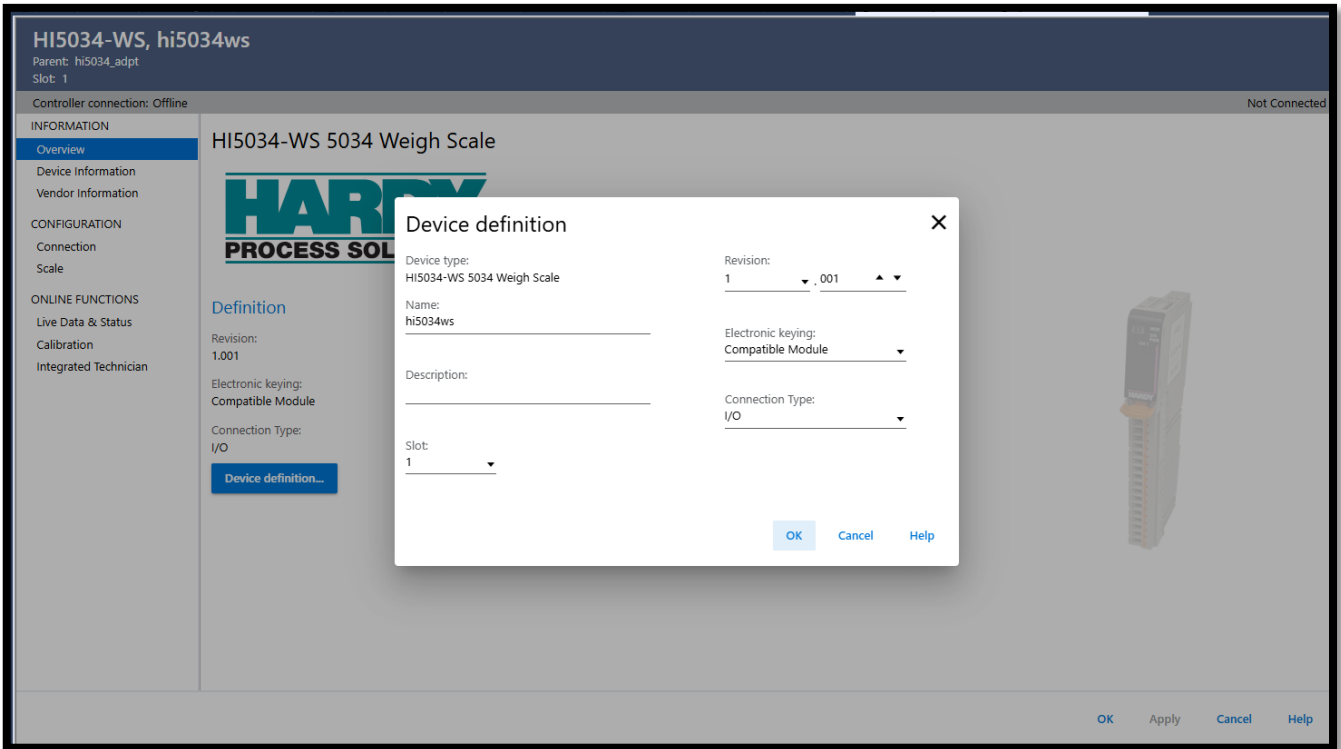
IMPORTANT NOTE: These parameters should only be changed via the AOP, faceplate, or sample programs.

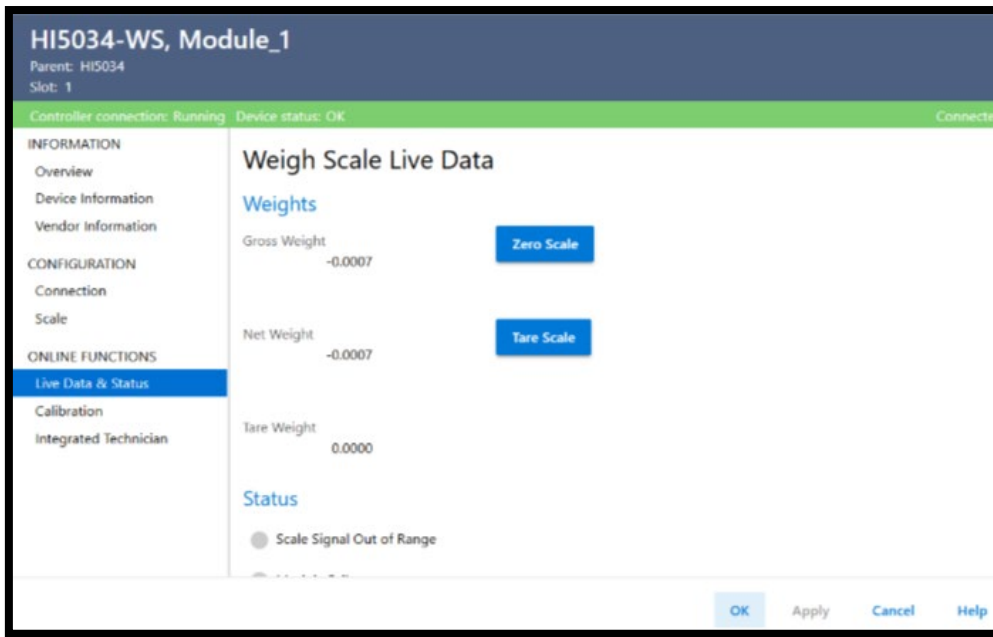
Configuration Parameters	Data Type
Gravity Correction	FLOAT
Motion Tolerance	FLOAT
Zero Tolerance	FLOAT
Tare Weight	FLOAT
Reference Weight	FLOAT
Span Weight	FLOAT
AutoZero Tolerance	FLOAT
Enable AutoZero Tracking	INT
Unit	INT
Load Cell Sensitivity	INT
WaverSaver	INT
Num Averages	INT

HI5034:1:C.Ch0	[...]	HI:5034_WS_Channel:C:0
HI5034:1:C.Ch0.GravityCorrection	1.0 Float	REAL
HI5034:1:C.Ch0.MotionTolerance	1.0 Float	REAL
HI5034:1:C.Ch0.ZeroTolerance	10.0 Float	REAL
HI5034:1:C.Ch0.TareWeight	0.0 Float	REAL
HI5034:1:C.Ch0.RefWeight	0.0 Float	REAL
HI5034:1:C.Ch0.SpanWeight	1000.0 Float	REAL
HI5034:1:C.Ch0.AutoZeroTolerance	10.0 Float	REAL
▶ HI5034:1:C.Ch0.AutoZeroTrackEnabled	0 Decimal	SINT
▶ HI5034:1:C.Ch0.Units	1 Decimal	SINT
▶ HI5034:1:C.Ch0.LoadCellSensitivity	2 Decimal	SINT
▶ HI5034:1:C.Ch0.Waversaver	5 Decimal	SINT
▶ HI5034:1:C.Ch0.NumAverages	10 Decimal	INT

Configuration with AOP

Using the AOP to configure the HI5034-WS module makes it fast and easy. First, open the AOP and navigate to Configuration. Make any required changes. Next, click on Apply. This will download the complete configuration table to the module. Once the table has been downloaded the module is configured.





Scope: [test_5034] Show: All Tags

Name	Value	Force Mask	Style	Data Type
▶ hi5034_adpt:1:C		{...}	{...}	HI:5034_WS:C:0
▶ hi5034_adpt:1:I		{...}	{...}	HI:5034_WS:I:0
▶ hi5034_adpt:1:O		{...}	{...}	HI:5034_WS:O:0

Commands

List Of Hardy Command Numbers:

Command Number	Command
0	Read Parameter
1	Zero Cmd
2	Tare Cmd
(0x64) 100 dec	Cal Low Cmd
(0x65) 101 dec	Cal High Cmd
(0x66) 102 dec	C2 Cal Cmd
(0x80) 128 dec	IT Test
(0x94) 148	Set Default Parameters
(0x200) 512 dec	Stability Test
(0x1000) 4096 dec	Write Parameter Command
(0x10F0) 4336 dec	C2 Search

OUTPUT TABLE (Commands and Values sent from the PLC to the Module)

Name	Value	Force Mask	Style	Data Type
hi5034_adpt:1:C		{...}	{...}	Hi:5034_WS:C:0
hi5034_adpt:1:I		{...}	{...}	Hi:5034_WS:I:0
hi5034_adpt:1:O		{...}	{...}	Hi:5034_WS:O:0
hi5034_adpt:1:O.AuxCMD_Info		16#0000	Hex	INT
hi5034_adpt:1:O.CMD		16#0000	Hex	INT
hi5034_adpt:1:O.ParameterID		16#0000	Hex	INT
hi5034_adpt:1:O.ParameterRD1_ID		16#0000	Hex	INT
hi5034_adpt:1:O.ParameterRD2_ID		16#0000	Hex	INT
hi5034_adpt:1:O.ParameterValue		0	Decimal	DINT

INPUT TABLE (Values Coming from the Module to the PLC)

Name	Value	Force Mask	Style	Data Type
hi5034_adpt:1:C		{...}	{...}	Hi:5034_WS:C:0
hi5034_adpt:1:I		{...}	{...}	Hi:5034_WS:I:0
hi5034_adpt:1:I.Ch0		{...}	{...}	Hi:5034_WS_Channel:I:0
hi5034_adpt:1:I.Ch0.ADConvertError		0	Decimal	BOOL
hi5034_adpt:1:I.Ch0.ADFailure		0	Decimal	BOOL
hi5034_adpt:1:I.Ch0.CalibrationInProgress		0	Decimal	BOOL
hi5034_adpt:1:I.Ch0.CenterOfZero		0	Decimal	BOOL
hi5034_adpt:1:I.Ch0.GrossWeight		0.0	Float	REAL
hi5034_adpt:1:I.Ch0.InMotion		0	Decimal	BOOL
hi5034_adpt:1:I.Ch0.NetWeight		0.0	Float	REAL
hi5034_adpt:1:I.Ch0.NVMWriteError		0	Decimal	BOOL
hi5034_adpt:1:I.Ch0.ParamIDNotFound		0	Decimal	BOOL
hi5034_adpt:1:I.Ch0.SavingToNVM		0	Decimal	BOOL
hi5034_adpt:1:I.Ch0.ScanCounter		0	Decimal	SINT
hi5034_adpt:1:I.Cmd		{...}	{...}	Hi:5034_WS_CmdResponse:I:0
hi5034_adpt:1:I.Cmd.CMD_Echo		16#0000	Hex	INT
hi5034_adpt:1:I.Cmd.CMD_Status		16#0000	Hex	INT
hi5034_adpt:1:I.Cmd.ParameterID		16#0000	Hex	INT
hi5034_adpt:1:I.Cmd.ParameterRD1		0	Decimal	DINT
hi5034_adpt:1:I.Cmd.ParameterRD2		0	Decimal	DINT
hi5034_adpt:1:I.Cmd.ParameterValue		0	Decimal	DINT
hi5034_adpt:1:I.ConnectionFaulted		0	Decimal	BOOL
hi5034_adpt:1:I.DiagnosticActive		0	Decimal	BOOL
hi5034_adpt:1:I.DiagnosticSequenceCount		0	Decimal	SINT
hi5034_adpt:1:I.FieldSidePwrFault		0	Decimal	BOOL
hi5034_adpt:1:I.RunMode		0	Decimal	BOOL

- **0: READ PARAM CMD.** To read a parameter, write a #0 to the CMD register (register #0), and write the parameter number in the ParameterID register of the output table. The parameter value may then be read from ParameterValue register in the input table. This value may be in integer or floating-point format, depending on the parameter. (Use COP instruction to convert INTs to REALs) The command status will be returned in the input table:

HI5034:1:I.Ch0	{...}	HI:5034_WS_Channel:I:0
HI5034:1:I.Ch0.ADCConvertError	0 Decimal	BOOL
HI5034:1:I.Ch0.ADFailure	0 Decimal	BOOL
HI5034:1:I.Ch0.InMotion	0 Decimal	BOOL
HI5034:1:I.Ch0.NVMWriteError	0 Decimal	BOOL
HI5034:1:I.Ch0.CenterOfZero	0 Decimal	BOOL
HI5034:1:I.Ch0.SavingToNVM	0 Decimal	BOOL
HI5034:1:I.Ch0.CalibrationInProgress	0 Decimal	BOOL
HI5034:1:I.Ch0.ParamIDNotFound	1 Decimal	BOOL

- ADC error – Check SIG+/- mV readings or wiring for ~10mV signal.
- In Motion – Check motion tolerance setting.
- ParamIDNotFound – Check for the correct parameter ID. (Also shown by default when a 0 parameterID is entered into the output table)
- For the following commands, the status will appear in the CMD Status word

hi5034_adpt:1:I.Cmd	{...}
▶ hi5034_adpt:1:I.Cmd.CMD_Echo	16#0000
▶ hi5034_adpt:1:I.Cmd.CMD_Status	16#0000

- **1: ZERO CMD.** Write a 1 to the command register to zero the gross weight. The status register will read 0 if this command succeeds.
 - Status Error Code 1 (ADC Error)
 - Status Error Code 2 (ADC Failure)
 - Status Error Code 3 (Out Of Tolerance)
 - Status Error Code 4 (Motion)
 - Status Code FF (Cmd In Progress)
- **2: TARE CMD.** Write a 2 to the command register to zero the net weight. The status register will read 0 if this command succeeds:
 - Status Error Code 1 (ADC Error)
 - Status Error Code 2 (ADC Failure)
 - Status Error Code 4 (Motion)
 - Status Code FF (Cmd In Progress)
- **0x64 (100 decimal): CAL LOW CMD.** Write a 0x64 hex to the command register to perform the low step of a traditional calibration. The status register will read 0 if this command succeeds:
 - Status Error Code 1 (ADC Error)
 - Status Error Code 2 (ADC Failure)
 - Status Error Code 4 (Motion)
 - Status Code FF (Cmd In Progress)

- **0x65 (101 decimal): CAL HIGH CMD.** Write a 0x65 hex to the command register to perform the high step of a traditional calibration.
- Status Error Code 1 (ADC Error)
- Status Error Code 2 (ADC Failure)
- Status Error Code 4 (Motion)
- Hard Cal Fail Counts 8 (Not Enough Counts Between Hard Cal Hi And Hard Cal Lo)
- Status Code FF (Cmd In Progress)

- **0x66 (102 decimal): C2 CAL CMD.** Write a 0x66 hex to the command register to perform a C2 calibration.
- Status Error Code 1 (ADC Error)
- Status Error Code 2 (ADC Failure)
- Status Error Code 4 (Motion)
- Status Error Code 5 (No C2 Cells)
- Status Error Code 6 (C2 Capacities Not Equal)
- Status Error Code 7 (Non-Hardy C2 Load Cells)
- Status Code FF (Cmd in Progress)

- **0x80 (128 decimal): IT test.** Write a 0x80 hex to the command register to perform an Integrated Technician test. (Requires an IT summing card.)
- Status Error Code 1 (ADC Error)
- Status Code FF (Cmd In Progress)

- **0x94 (148 decimal): Set Default Parameters.** Write a 0x94 to the command register to set all parameters and calibration back to default settings.

- **0x100 (256 decimal): IT Test Reduced.** Write a 0x100 hex to the command register to perform an Integrated Technician test with reduced voltage. (Requires an IT summing card.)
- Status Error Code 1 (ADC Error)
- Status Code FF (Cmd In Progress)

- **0x200 (512 decimal): Stability Test.** Write a 0x200 hex to the command register to perform the stability test.
- Status Error Code 1 (ADC Error)
- Status Code FF (Cmd In Progress)

- **0x1000 (4096 decimal): WRITE PARAMETER CMD.** Set the value of a parameter. Write 0x1000 in the command register 0, the parameter ID number in ParameterID register and the desired value in ParameterValue register of the output table.
- Status Error Code 1 (ADC Error)
- Status Error Code 0x0b (Value Out Of Range Too High)
- Status Error Code 0x0c (Value Out Of Range Too Low)
- Status Error Code 0x0d (Not Allowed)
- Status Error Code 0x80 (Invalid Parameter ID)

- **0x10F0 (4336 decimal): C2 Search.** Write 0x10F0 hex to the command register to command the module to read/update C2 data.
- Status Error Code 1 (ADC Error)
- Status Code FF (Cmd In Progress)

Calibration

Chapter 5 provides the recommended calibration procedure for the HI5034-WS Weigh Scale Module. For the module to work properly, it must be calibrated prior to operation, and it should be recalibrated periodically or when not in use for extended periods of time. Be sure to follow all the procedures completely to ensure that the weights read by the module are accurate. Users and service personnel should be familiar with the procedures in this chapter before installing or operating the Weigh Module.

Pre-Calibration Procedures

Verify that the load cells have been properly installed.

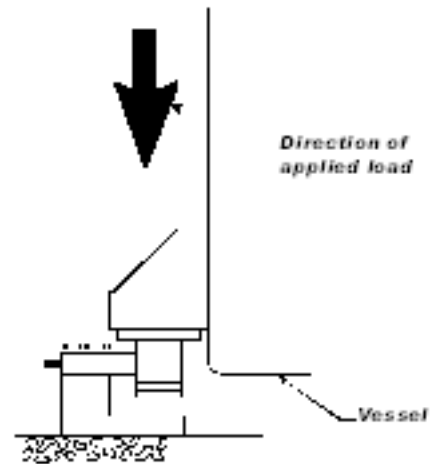
- Step 1. Determine if the load cells have been properly installed. See your load cell I&M manual for proper installation instructions.
- Step 2. An arrow on some sensors and cells indicates the correct direction of the applied load. If the arrow points in the wrong direction, reposition the load cell.
- Step 3. Check for Binding on the Load Cell or other parts of the weighing system.

WARNING - BINDING ON A SCALE/VESSEL OR LOAD CELL DOES NOT ALLOW THE LOAD CELL FREE VERTICAL MOVEMENT AND MAY PREVENT THE INSTRUMENT FROM RETURNING TO THE ORIGINAL

ATTENTION - LIER SUR UNE ÉCHELLE / RÉCIPENT OU CELLULE DE CHARGE NE PERMET PAS LA CELLULE DE CHARGE LIBRE CIRCULATION VERTICALE ET PEUT EMPÊCHER L'APPAREIL DE REVENIR AU POINT DE RÉFÉRENCE ZÉRO D'ORIGINE.

Load cells must be mounted so that 100% of the load (Vessel w/Contents) passes vertically through the sensors in all of the load cells comprising the system.

Verify that nothing is binding the load cells. This means that nothing is draped across the scale/vessel or the load cell, such as a hose, electrical cord, tubes, or other objects. Verify that nothing is in contact with the scale/vessel other than service wires and piping that have been properly mounted with flexible connections. Flexible pipes are not to be used in any other than the horizontal plane and are not to be used to correct pipe alignment problems. Vertical or at angles other than horizontal will have a negative effect on the scales ability to repeat and provide accurate weight readings.



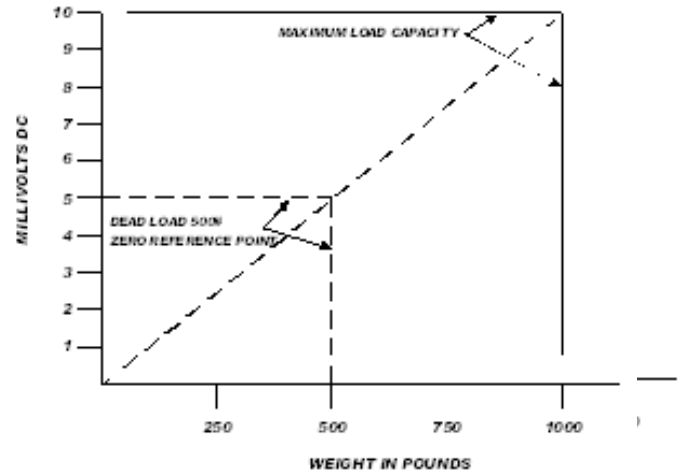
Electrical Check Procedures

Load Cell/Point Input/Output Measurements

The HI 5034 WS module is designed to supply 5 VDC excitation to as many as eight 350-Ohm load cells/points per channel. The expected output from each load cell/point will depend on the mV/V rating of the load cell/point and the weight.

For example, a 2mV/V load cell/point will respond with a maximum of 10 mVDC at the load sensor's full weight capacity, which includes the weight of the vessel and the weight of the product as measured by the load cell/point. Thus, if the load cell/point weight capacity is rated at 1000 pounds, the load cell/point will be 10 mVDC at 1000 pounds, 7.5 mVDC at 750 pounds, 5 mVDC at 500 pounds and so on.

A zero-reference point will vary from system to system depending on the "Dead Load" of the vessel. "Dead Load" is the weight of the vessel and appurtenances only, with no product loaded. In our example we will assume the dead load to be 500 pounds.



NOTE: *The operating range for the scale in this example is 5-10 mVDC with a 500-pound weight range. After zeroing the instrument, the 0 reading refers to the zero reference point and not absolute 0 mVDC or absolute 0 weight.*

Load cell/point measurements are checked with a digital voltmeter at the load cell connector on the front of the module or by using INTEGRATED TECHNICIAN with a Hardy IT Junction Box. The scale calibration must be completed to enable IT to function correctly.

Load Check

Place a load (weight) on the scale or vessel, and check to see if the weight reading on the input table changes in the proper direction.

For example, if the display reads 100 pounds and a 20-pound weight is placed on the vessel or scale, the display should read 120 or some value over 100. With the display reading 100 pounds, if a 20-pound load is placed on the vessel or scale and the reading is 80 pounds, the reading is going in the wrong direction and indicates some problem with the system.

If the display reads improperly or shows no change, something is wrong with the setup. If the display changes weight in the proper direction, remove the weight and proceed to calibrate the instrument. Refer to troubleshooting for additional help to determine the cause of the poor weight reading.

Calibration Setup Procedures

Unit of Measure

The Unit of measure can be set to ounces, pounds, tons, grams, kilograms, or metric tons. Any weight value input to the module (e.g. CAL LOW WEIGHT, SPAN WEIGHT) is in the currently selected units. The unit of measure can be set at any time, not just at calibration. Setting the unit of measure before calibrating reminds the user what unit of measure is being displayed.

It is important to note that the weigh scale module does not need to be calibrated again after changing the unit of measure.

Motion Tolerance

The motion tolerance defines the amount the weight reading needs to change in a 1 sec period of time to make the scale go into MOTION status. If the change over the last 1 sec is less than the Motion Tolerance then the scale will not indicate in motion. "Motion Indicate" means the weight on the scale is currently changing. The scale cannot be calibrated, tared, or zeroed while in motion.

Zero Tolerance

The Zero Tolerance sets the range of weights so that the Zero Command works as an offset of the calibrated Zero. The amount of weight zeroed off is cumulative. The zero command will fail if the current gross weight plus any previously zeroed amount exceeds the zero tolerance.

Auto Zero Tolerance

When the Auto Zero Tolerance is entered and Auto Zero Tracking is enabled, any weight within the entered tolerance of zero and not in motion will cause the display to automatically read zero.

The amount of weight zeroed off is cumulative. The auto zero command will not run if the current gross weight plus any previously zeroed amount exceeds the zero tolerance or if the scale is in motion.

Zero Track Enable

Enables the Auto Zero tracking if on or disables the auto zero when off.

Number of Averages

The Number of Averages sets the number of weight readings which will be used to compute the displayed weight. The average is a sliding average so that a new average reading is available for display at every reading.

Span Weight

The Span Weight is a Calibration high reference point derived from an actual measured weight. This should not be confused with the Scale Capacity. If you have a 100 pound weight and you place it on the scale, the Span Weight would be 100 pounds.

Ref Weight

The Ref Weight is a Calibration low or C2 Cal reference point derived from an actual measured weight, normally zero.

Gravity Correction

Objects weigh about 0.5% less at the equator than they weigh at each pole because the force of gravity is less at the equator than at the poles. For example, an object weighing 100 pounds at the North Pole on a spring scale would weigh 99.65 pounds at the equator.

Depending on the latitude of your location, your scales would measure somewhere in between. The table below shows the gravitation correction factor for a few cities around the world.

NOTE: *Ensure that the scale system is clean and ready to receive product. This step establishes the gross zero reference. You must perform a C2 Calibration after setting the Gravity Correction or the correction factor won't work.*

In general, if your location is between the 45th parallel and the equator, gravity correction is greater than 1.0. For example, at these latitudes, because the gravity is less, you are adding, 1.0006 for an error that is .06%. For locations between the 45th parallel and the North or South Pole your correction factor will be less than 1.0. For example, .9994 for an error that is -.06%.

Gravity Correction compensates for an object weighing less at the equator than at the North or South Pole. This allows the user to enter the correction factory for their location and apply it for their C2 calibration. This is not used for the hard calibration.

City	Grav. Accel	City	Grav. Accel	City	Grav. Accel
Amsterdam	0.999369	Istanbul	1.000406	Paris	0.999048
Athens	1.000684	Havana	1.001872	Rio de Janeiro	1.001884
Auckland NZ	1.000782	Helsinki	1.001405	Rome	1.000328
Bangkok	1.002392	Kuwait	1.001405	San Francisco	1.000702
Brussels	0.999503	Lisbon	1.000615	Singapore	1.00269
Buenos Aires	1.001004	London	0.999445	Stockholm	0.99877
Calcutta	1.00191	Los Angeles	1.001028	Sydney	1.00104
Cape Town	1.00104	Madrid	1.000461	Taipei	1.001741
Chicago	0.99922	Manila	1.000461	Tokyo	1.000886
Copenhagen	0.999075	Mexico City	1.002102	Vancouver BC	0.999653
Nicosia	1.00093	New York	1.000433	Washington DC	1.000601
Jakarta	1.002631	Oslo	0.998726	Wellington NZ	0.999399
Frankfurt	0.999579	Ottawa	1.000007	Zurich	0.999821

Tare Weight

The Tare weight is the amount of weight tared off with the last tare command or the amount entered by the user. The tare weight equals the difference between the net and gross weight readings.

Waversaver®

There are 6 selectable levels. 0 provides NO vibration immunity with the fastest response time. 5 provides the most vibration immunity with the slowest response time. Default setting is 3.

Immunity	Setting
OFF	0
7.5 Hz	1
3.5 Hz	2
1.0 Hz	3
0.50 Hz	4
0.25 Hz	5

WARNING: BINDING ON A SCALE/VESSEL OR LOAD CELL CAN DENY THE LOAD CELL FREE VERTICAL MOVEMENT AND PREVENT THE INSTRUMENT FROM RETURNING TO THE ORIGINAL ZERO REFERENCE POINT.

Electrical Check Procedures

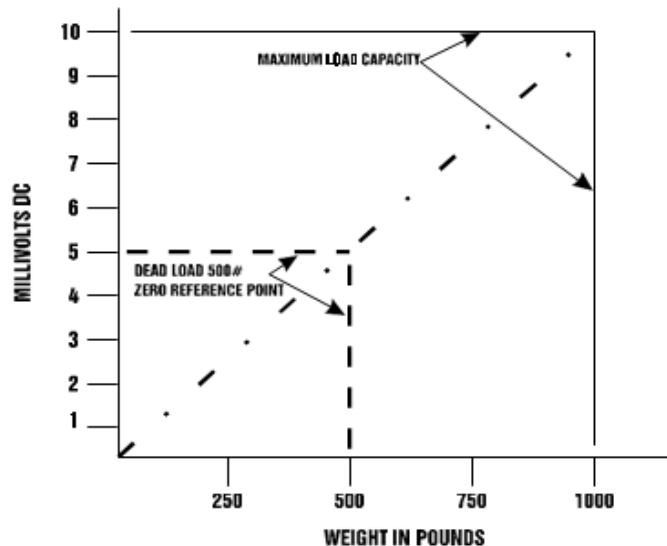
The Weigh Module is designed to supply 5 VDC excitation to as many as eight 350 Ohm load cells/points and two HI6020 Summing Boxes.

The expected output from each load cell/point depends on the mV/V rating of the load cell/point and the weight. For example, a 2mV/V load cell/point will respond with a maximum of 10 mV at full system weight capacity, which includes the weight of the vessel and the weight of the product as measured by the load cell/point. If the load cell/point weight capacity is rated at 1000 pounds, the load cell/point will be 10 mV at 1000 pounds, 7.5 mV at 750 pounds, and 5 mV at 500 pounds.

A zero-reference point will vary from system to system depending on the “Dead Load” of the vessel. “Dead Load” is the weight of the vessel and appurtenances only, with no product loaded. In our example we will assume the dead load to be 500 pounds.

Based on the example, the operating range for this scale is 5-10 mV with a 500-pound weight range. Understand that after zeroing the instrument, the 0 reading refers to the zero reference point and not absolute 0 mV or absolute 0 weight.

NOTE: *Load cell/point measurements are checked with a digital volt meter at the connector on the front of the module or by using INTEGRATED TECHNICIAN with the HI6020IT Junction Box.*



C2 Calibration

C2 calibration requires C2 load sensors. If you do not have C2 load sensors you must perform a traditional calibration with test weights which we call a Hard Calibration. The Weigh Module reads the performance characteristics of each individual load cell and detects the quantity of load cell(s) in the system. C2 Calibration can be performed by via Allen Bradley RS LOGIX 5000.

C2 Calibration Procedure

- Step 1. Place the ref weight on the scale (if not zero).
- Step 2. Send the C2 calibration command (0x66) by placing the command number into the command register in the output table.

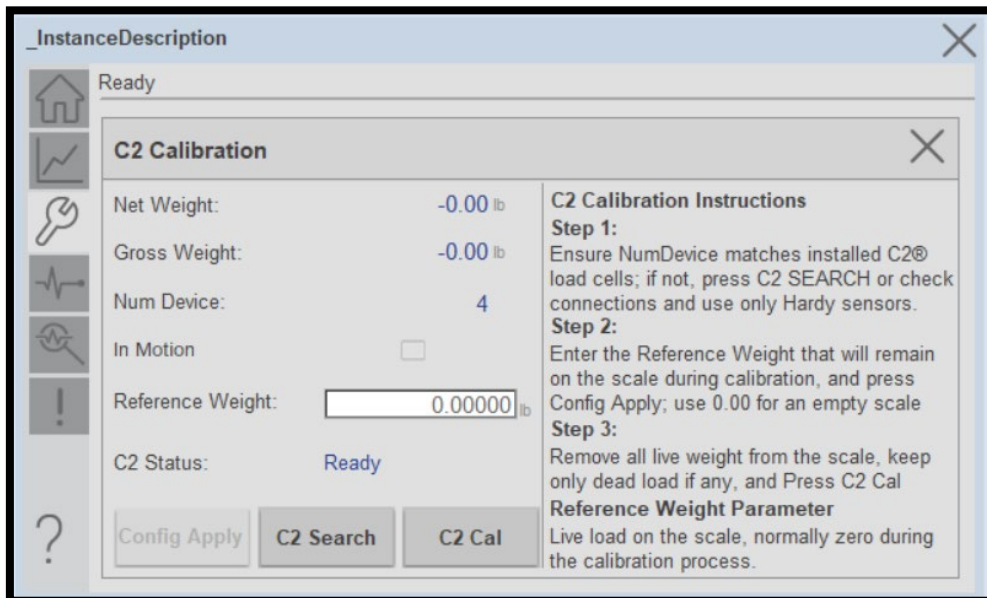
C2 Calibration Using Ladder Logic

1. Check to be sure that the parameters have been setup for your weighting process.
2. We have provided a Ladder Logix example explaining how to perform the C2 calibration. The Ladder Logix example is available on the Hardy Process solutions Web Site:

<http://www.hardysolutions.com> Under HI 5034-WS Docs and Programs

C2 Calibration Using the Faceplate

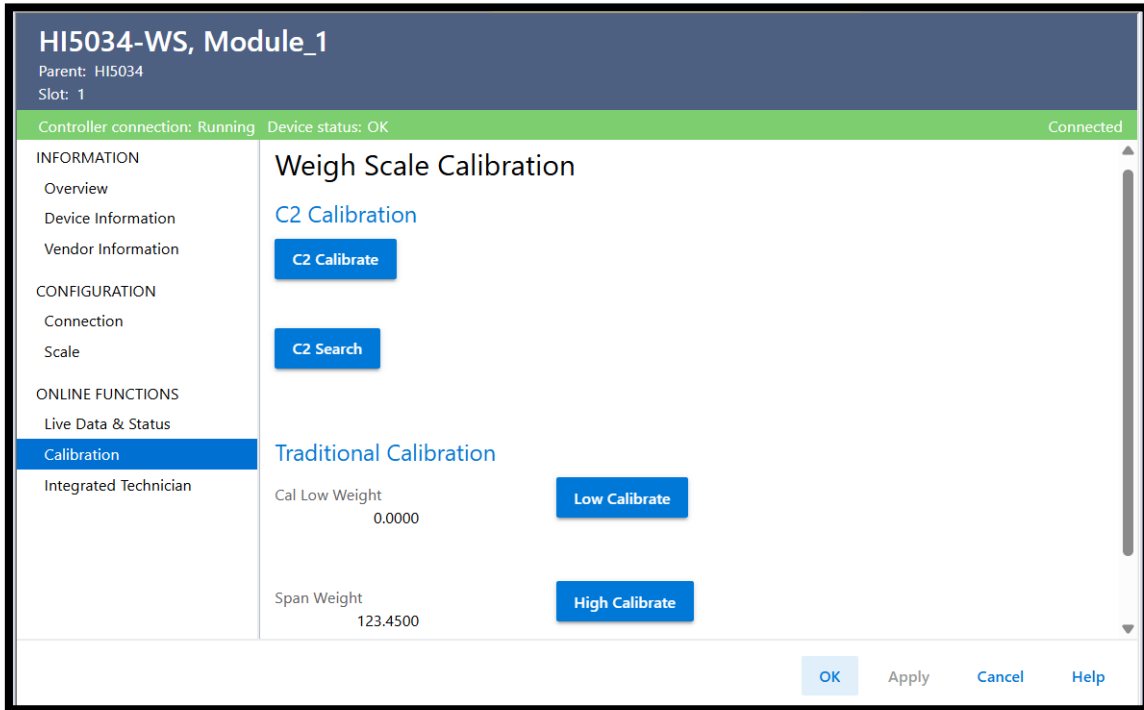
Once the Faceplate is up and running, navigate to the calibration menu of the faceplate. Be sure to set your reference weight to the weight that is on the scale (if there is weight on the scale, otherwise leave it at zero). Once the parameters are set make sure to save them, by clicking on the **Save Parameters** button. Now that the parameters are set you are able to perform a C2 Calibration by clicking on **C2 Cal**. The Calibration status will display once "Calibration Ok" once the calibration is finished.



C2 Calibration Using the AOP

Once the AOP is installed and configured, the AOP can be used to perform a C2 Calibration.

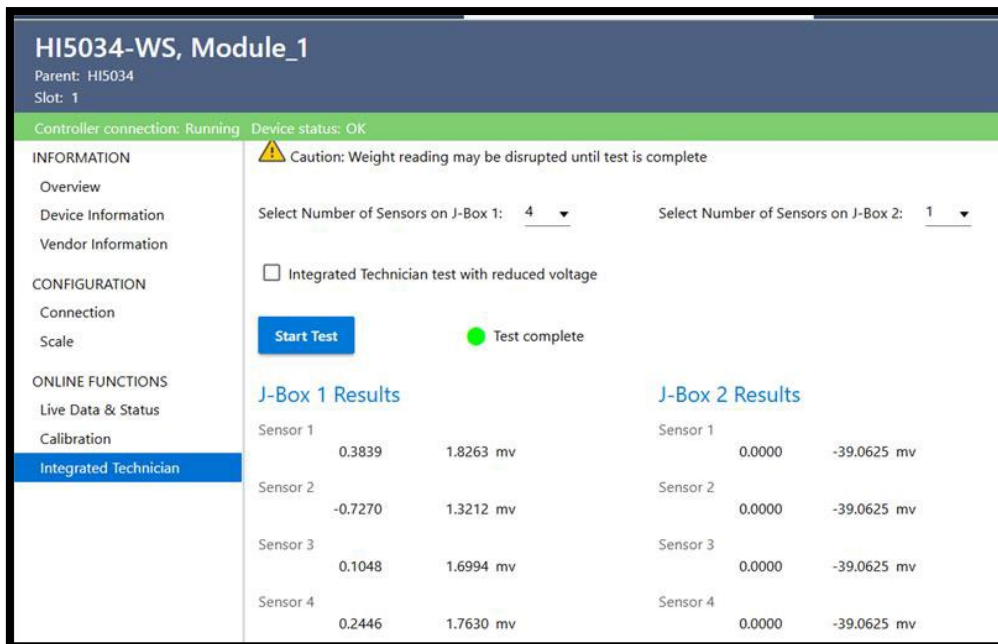
Double click on the HI5034 that is located in the IO tree. The AOP window will pop up, next click on the Calibration – Live Data. From this window you can read the Reference Weight value that is used by the module to do the C2 calibration. When ready to perform C2 calibration just click on C2 Cal. At the bottom of the page, use the Command Status view the feedback on the execution of the command.



IT Test using the AOP

Once the AOP is installed and configured, the AOP can be used to perform an IT test.

Typical values are ~0-10mV. A balanced system values are typically within ~1mV.



Hard Calibration

Hard Calibration is the traditional method of calibration that uses test weights. Hardy recommends that the test weights total 80 to 100% of the scale capacity.

- | | |
|--------|--|
| Step 1 | Place the low calibration ref weight (the weight can be zero) on the scale |
| Step 2 | Send a Cal Low Command (CAL LOW CMD) <ul style="list-style-type: none">• The Cal Low Command - sets the "allow Count" parameter to the current A/D average counts when doing a hard calibration. |
| Step 3 | If you used a weight remove it from the scale |
| Step 4 | Place the high (Span) calibration weight on the scale |
| Step 5 | Send a Cal High Command (CAL HIGH CMD) <ul style="list-style-type: none">• The Cal High Command - Sets the Span Weight parameter to the current A/D average counts when doing Hard CAL |
| Step 6 | Remove the weight from the scale |

Troubleshooting

Name/Code #	Definition	Action
Command Success Command Status 0	Command passed	None
Command Fail Command Status 1	Command Failed. Applies to pass/fail commands like C2 Search	Command specific. Reevaluate the command and conditions.
ADC Convert Error Command Status Error 2 Status Word Bit 0	Load Cell input out of range (i.e., voltage not 0-15 mV and flashing red LED will display). Can result from overloaded or mis mounted load cell. In this state weight readings do not respond to changes.	Check the voltage levels to the module from each load cell. +5 V for excitation and sense lines and 0-15 mV on signal lines. If voltage is bad, to find a problem load cell, disconnect each one at the summing box.
Status Word, Bit 1 AC Convert Failure	Output from the A/D converter to processor is bad. The module shows a solid red LED.	Contact Customer Support to return module for repair.
Status Word Bit 2 Status Motion Command Status Error 4	The rate of scale weight change over 1 second exceeds the motion tolerance setting. If the setting is too low, motion may be indicated when no changes are occurring.	If the weight is actually changing, stabilize it. If not, increase the motion tolerance setting until the motion bit goes off with static weight.
Status Word Bit 3 EEPROM Write Error	Module cannot write (save settings) to non-volatile memory. EEPROM is probably bad.	Contact Customer support to return module for repair.
Status Word Bit 4 Status Center Zero	Indicates the gross weight is reading at the calibration zero point.	None
Status Word Bit 6 In Progress Command Status 0xff	Command is in progress.	None
Status Word Bit 7 Not Found Command Status 0x80	The parameter ID is invalid	Correct the parameter ID
Command Status 5 No C2	When trying to do a C2 calibration, the module cannot read the data from the load cells.	Check the wiring to ensure proper connections and orientation. Find the problem load cell by disconnecting them at the summing box.
Command Status 6 C2 Capacities Not Equal	C2 load cells have unequal capacities due to either the use of mismatched load cells or faulty C2 programming.	Verify each load cell is correct per the spec sheet delivered with the cell.
Command Status 7 C2 Clones	C2 load cell has a non Hardy C2 load cell.	Verify the use of Hardy load cells.
Command Status 8 Hard Cal Fail Counts	Too few A/D counts between zero and span points during hard calibration. Input must change by a minimum amount between the cal low and cal high points.	Add weight to the scale and see if readings increase. Check voltages as in ADC Convert Error.
Command Status 0x0b (11 Dec)	Value being set is too high	Verify the value is within the tolerance for the parameter being written to. Verify the parameter ID is the correct ID for the parameter you wish to write to.

Name/Code #	Definition	Action
Command Status 0x0C (12 dec)	Value being set is too low	Verify the value is within the tolerance for the parameter being written to. Verify the parameter ID is the correct ID for the parameter you wish to write to.
Command Status 0x0D (13 dec)	Value not allowed	

Hardy Installation and Commissioning

Hardy delivers on its reputation as a quality manufacturer of weighing equipment. Hardy solutions are EASY to install, integrate, commission, diagnose and maintain. Our customers find that this simplicity delivers the lowest total cost of ownership.

To ensure the best performance of Hardy products, we recommend that you add Hardy Installation to your product purchase. Great products without a quality installation risk long-term performance and availability, and Hardy has a broad network of trained service agents to perform, inspect, and commission new installations.

Hardy offers preferred rates for new installations and we guarantee that the installation will be done right the first time. Plus, with the use of the Hardy Toolbox features like C2 Electronic calibration, Hardy Technicians spend less time onsite than the competition, saving you cost and downtime.

For a fast and easy installation quote, please contact one our service specialists at:

800-821-5831 option 4, or email us at: hardysupport@hardysolutions.com

Emergency Service and Support

Even with the best quality equipment, failures can happen without warning. The question isn't "if" this will happen, but how prepared you are to rectify the situation "when" the unexpected happens.

Hardy Field Service Technicians are located nationwide to ensure the fastest response to your unplanned downtime, and our emergency after-hours mailbox is checked constantly to prevent customers experiencing a downtime event from having to wait until morning.

For rapid turnaround service, please contact one our service specialists at: **800-821-5831 option 4.**



Hardy Support locations throughout the United States.

Appendix A

List of the Parameter IDs

Read/Write Parameters

Configuration Parameters:

Units	0x2881
Waversaver	0x2081
Num Averages	0x2082
Zero Tolerance	0x2886
Autozero Tolerance	0x6302
Autozero State	0x6301
Motion Tolerance	0x2887
Span Weight	0x4182
Ref Weight	0x4101
Gravity Correction	0x4102
Tare Weight	0x6183
Cal Year	0x4202
Cal Month	0x4203
Cal Day	0x4204

Diagnostic Write Parameters:

IT_NUMSENSORS JBOX 1	0x498D
IT_NUMSENSORS JBOX 2	0x498E

Read-Only Parameters

IT Test Diagnostic Parameters:

IT WEIGHT CHANNEL 0	0x4990
IT WEIGHT CHANNEL 1	0x4991
IT WEIGHT CHANNEL 2	0x4992
IT WEIGHT CHANNEL 3	0x4993
IT WEIGHT CHANNEL 4	0x4994
IT WEIGHT CHANNEL 5	0x4995
IT WEIGHT CHANNEL 6	0x4996
IT WEIGHT CHANNEL 7	0x4997
IT MV/V CHANNEL 0	0x49A0
IT MV/V CHANNEL 1	0x49A1
IT MV/V CHANNEL 2	0x49A2
IT MV/V CHANNEL 3	0x49A3

IT MV/V REF 1	0x49A8
IT MV/V CHANNEL 4	0x49A4
IT MV/V CHANNEL 5	0x49A5
IT MV/V CHANNEL 6	0x49A6
IT MV/V CHANNEL 7	0x49A7
IT MV/V REF 2	0x49A9
IT RAW VARIATION CHANNEL 0	0x49B0
IT RAW VARIATION CHANNEL 1	0x49B1
IT RAW VARIATION CHANNEL 2	0x49B2
IT RAW VARIATION CHANNEL 3	0x49B3
IT RAW VARIATION REF 1	0x49B8
IT RAW VARIATION CHANNEL 4	0x49B4
IT RAW VARIATION CHANNEL 5	0x49B5
IT RAW VARIATION CHANNEL 6	0x49B6
IT RAW VARIATION CHANNEL 7	0x49B7
IT RAW VARIATION REF 2	0x49B9
IT WAVERSAVER VARIATION CHANNEL 0	0x49C0
IT WAVERSAVER VARIATION CHANNEL 1	0x49C1
IT WAVERSAVER VARIATION CHANNEL 2	0x49C2
IT WAVERSAVER VARIATION CHANNEL 3	0x49C3
IT WAVERSAVER VARIATION REF 1	0x49C8
IT WAVERSAVER VARIATION CHANNEL 4	0x49C4
IT WAVERSAVER VARIATION CHANNEL 5	0x49C5
IT WAVERSAVER VARIATION CHANNEL 6	0x49C6
IT WAVERSAVER VARIATION CHANNEL 7	0x49C7
IT WAVERSAVER VARIATION REF 2	0x49C9
IT RAW VARIATION RESULT CHANNEL 0	0x49D0
IT RAW VARIATION RESULT CHANNEL 1	0x49D1
IT RAW VARIATION RESULT CHANNEL 2	0x49D2
IT RAW VARIATION RESULT CHANNEL 3	0x49D3
IT RAW VARIATION RESULT REF 1	0x49D8
IT RAW VARIATION RESULT CHANNEL 4	0x49D4
IT RAW VARIATION RESULT CHANNEL 5	0x49D5
IT RAW VARIATION RESULT CHANNEL 6	0x49D6
IT RAW VARIATION RESULT CHANNEL 7	0x49D7
IT RAW VARIATION RESULT REF 2	0x49D9
IT WAVERSAVER VARIATION RESULT CHANNEL 0	0x49E0
IT WAVERSAVER VARIATION RESULT CHANNEL 1	0x49E1
IT WAVERSAVER VARIATION RESULT CHANNEL 2	0x49E2

IT WAVERSAVER VARIATION RESULT CHANNEL 3	0x49E3
IT WAVERSAVER VARIATION RESULT REF 1	0x49E8
IT WAVERSAVER VARIATION RESULT CHANNEL 4	0x49E4
IT WAVERSAVER VARIATION RESULT CHANNEL 5	0x49E5
IT WAVERSAVER VARIATION RESULT CHANNEL 6	0x49E6
IT WAVERSAVER VARIATION RESULT CHANNEL 7	0x49E7
IT WAVERSAVER VARIATION RESULT REF 2	0x49E9

IT RTZ CHANNEL 0	0x49F0
IT RTZ CHANNEL 1	0x49F1
IT RTZ CHANNEL 2	0x49F2
IT RTZ CHANNEL 3	0x49F3
IT RTZ CHANNEL 4	0x49F4
IT RTZ CHANNEL 5	0x49F5
IT RTZ CHANNEL 6	0x49F6
IT RTZ CHANNEL 7	0x49F7
IT RTZ COMBINED	0x498C

Stability Test Parameters:

STABILITY RAW MEAN	0x4901
STABILITY WAVERSAVER MEAN	0x4903
STABILITY RAW VARIATION	0x4902
STABILITY WAVERSAVER VARIATION	0x4904
STABILITY RAW VARIATION RESULT	0x4905
STABILITY WAVERSAVER VARIATION RESULT	0x4906

Read Only Parameters:

Gross Weight	0x6081
Net Weight	0x6082
ADC Counts	0x4907
ADC Counts Raw	0x4908
Cal Low Counts	0x4085
Cal High Counts	0x4087
Zero Counts	0x2889
Cal Zero Counts	0x4084
Cal Type	0x4001
NUMBER C2 SENSORS	0x4103
NUMBER IT J-BOXES	0x4881
Firmware Revision	0x7985