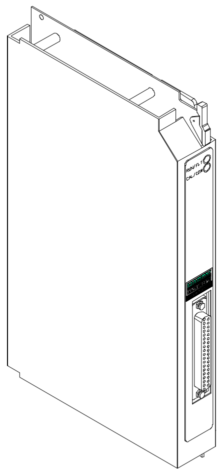
# HI 1771-WS
# WEIGH SCALE MODULE

# OPERATION AND INSTALLATION MANUAL

## Series B



HARDY INSTRUMENTS

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# CHAPTER 1 - OVERVIEW

## A Brief Description of the HI 1771 WS Weigh Scale Module

This chapter provides an overview of the Weigh Scale module.The Weigh Scale module (1771-WS) is an intelligent I/O module that reads values from industry-standard strain-gage load cells. The module accepts analog weight values directly from a single load cell or the sum of the values from two, three, or four load cells connected through a junction box.

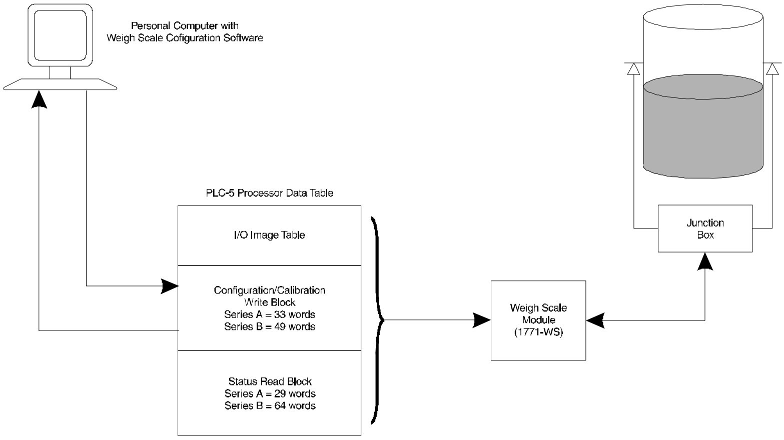
You can use as many as eight load cells with the module. You will need an external power supply for five or more load cells.

The module receives block-transferred configuration and calibration values from the PLC-5® data table. The module block-transfers the weight values and other status values to a PLC-5® processor.

**NOTE:** *PLC-5® is a registered trademark of the Allen-Bradley Corporation Inc*.

The Weigh Scale module can work without Weigh Scale Configuration software (interacting directly with the PLC processor). However, we recommend that you use the software to set up and maintain the module.

You install Weigh Scale software on a personal computer in a DH+ network with the PLC-5 processor. If you are using RSLinx software as a man-machine-interface (MMI), you can connect the personal computer to the PLC processor with an Ethernet link. You can then enter configuration and calibration values on easy-to-use screens.




## About Hardy Manuals

Every Hardy Installation and Operation manual is organized into easily referenced chapters, that are almost always the same:

- **Chapter 1** - Provides an introduction to the instrument and an **Overview** of the equipment and its capabilities.
- **Chapter 2** - Provides a complete list of **Specifications.**
- **Chapter 3** - Contains information needed to **Install** the HI 1771-WS. (both standard and optional equipment)
- **Chapter 4** - Provides complete hardware **Configuration** instructions for setting dip switches and jumpers.
- **Chapter 5** - Pertains to the firmware/software **Setup** and preparation procedures to calibrate and operate the instrument.
- **Chapter 6** - Provides all **Calibration** instructions.

- **Chapter 7** - Pertains to the **Operating Procedures** of the DI-803 TTS.
- **Chapter 8** - Pertains to the **Troubleshooting** procedures for repair of the instrument.

Hardy Instruments hopes that this manual meets your needs for information and operation. All corrections or suggestions for improvements of this manual are welcome and can be sent to the Technical Publications Department or Customer Support Department at Hardy Instruments Inc.

## Compatibility Issues

Compatibility involves previous releases of the module, data table use as well as compatibility with I/O chassis, remote termination panels, and processors.

### Compatibility with Earlier Versions of the Module

A jumper setting (J1) you can change lets you configure the module for Series A (single density) or Series B (double density) operation. Functional modifications made to the Weigh Scale Module for Series B do not affect how the module operates in Series A mode. You can complete any tasks you performed using earlier versions of the module.

To configure the jumper, see Chapter 3 of this manual.

If you set the jumper for Series B (double density) operation:

- You can now download setpoint, preact, and deadband values to the module .
- The module compares weight data to the setpoint and preact values. When the weight data reaches the preact value, the module sets a discrete bit in the PLC input image table without a block-transfer read.
- We now return rate-of-change data in the block-transfer-read data block.
- We also return all configuration data in the block-transfer-read data block.

A separate change to the real-time sampling period affects both new and old versions of the Weigh Scale Module:

- When the PLC processor requests a block-transfer read, the Weigh Scale Module responds only if the real-time sampling period value has elapsed since the last block-transfer read.
- When the data transfer occurs, the data in the PLC data table is the most recent information processed by the module.

## Data Table Use

Communication between the module and the processor is bi-directional, using both block transfer reads (BTRs) and block transfer writes (BTWs). The module uses a byte in the output image table and a byte in the input image table. The module also requires an area in the data table to store the block-transfer read and write data.

I/O image table use is an important factor in module placement and addressing selection. We show the module's data table use in the following table.

| | | Use of Data Table | | | Compatibility | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Catalog Number | Series | Input Image Bits | Output Image Bits | Read-Block Words | Write-Block Words | Addressing | | | Chassis |
| | | | | | | 1/2-slot | 1-slot | 2-slot | |
| 1771-WS | A (Single density) | 8 | 8 | 29 | 33 | Yes[1] | R1[2] | R2[3] | B[4] |
| | B (Double density) | 8 | 8 | 64 | 49 | Yes[1] | R1[2] | No | B[4] |

1 Yes = Compatible without restriction
2 R1 = Restricted Compatibility; it cannot be in the same even/odd pair of slots with a 32-bit module
3 R2 = Restricted Compatibility; it cannot be in the same even/odd pair of slots (I/O group) with a 16 -bit Module
4 B = Compatible with 1771-A1B, A2B, A3B, A3b1, A4B, 1771-AM1, -AM2 Chassis

You can place your 1771-WS module into any I/O module slot of the I/O chassis.

### I/O Chassis

This module can only be used in 1771-A1B, A2B, A3B, A3B1, A4B, -AM1, and -AM2 chassis.

### Remote Termination Panel

The 1771-WS module is compatible with the 1771-RT remote termination panel, which you must purchase separately.

### Processor

The HI 1771-WS module is compatible with 1785 PLC-5® processors.

## Capabilities of the Weigh Scale Module

- Weight values in either pounds or kilograms
- Weight values in both 16-bit integer and 32-bit floating-point format
- The ability to tare or zero the scale
- Compatibility with 3mV/V and 2mV/V industry-standard load cells and C2 Second-Generation-Calibration load points
- 20-bit A/D conversion — providing 985,000 counts of displayed resolution over the 0-30mV range
- 50ms A/D conversion period
- A “weight-in-motion” status indication
- WAVERSAVER® technology to filter out mechanical vibrations and noise from the weight values

**NOTE:** *WAVERSAVER® is a registered trademark of Hardy Instruments Inc.*

- 3 ways to calibrate the module:
    - Hard Calibration
    - soft calibration — to minimize the need for test weights when used with load cells of known sensitivity and range
    - C2® calibration — to minimize the need for test weights and eliminate the need for manual entry of values when used with C2 Sec-

ond-Generation-Calibration load points

**NOTE:** *C2® is a registered trademark of Hardy Instruments Inc.*

- Non-volatile on-board flash memory — to store calibration values
- Restoration of calibration values from PLC data table to non-volatile on-board memory — lets you to quickly switch the calibration values to those of another scale, or to restore them after replacing a module
- Windows®-based (NT, 95, 98, Millennium and 2000) Weigh Scale Configuration software — to provide configuration and calibration without ladder logic programming software
- On-board diagnostics
- Setpoints, deadbands, and preacts — let you download values to the module so that the module can compare the scale to the setpoints without waiting for the PLC processor to cycle through Ladder logic that depends on block transfers
- Rate-of-change in weight data — based on user-defined time units, evaluation period, and unit of measure
- Configuration data — lets you view configuration data in the block-transfer read data block

**NOTE:** *Windows® is a registered trademark of the Microsoft Corporation.*

# CHAPTER 2 - SPECIFICATIONS

**A Brief Description of Chapter 2**

Chapter 2 lists the specifications for the HI 1771-WS Weigh Scale Module. 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. All service personnel should be familiar with this section before attempting an installation or repair of this instrument.

## Specifications for a Standard HI 1771-WS Weigh Scale Module

**Modes of Operation**

Local and Remote

**Conversion Rate**

20 updates per second

**Averages**

1-200 User Selectable in single increments

**Resolution**

Displayed: 1:985,000 (@ 3 mV/V)
1:656,000 (@ 2 mV/V)
Internal: 1:1,048,576

**Input**

Up to eight (4) 350 ohm Full Wheatstone Bridge, Strain Gauge Load Sensors/Cells (5 volt excitation) on one vessel.

**Non-Linearity**

0.0040% of Full Scale

**Maximum Zero Tolerance**

32766

**WAVERSAVER®**

User Selectable

- 7.50 Hz
- 3.50 Hz
- 1.00 Hz (Default)
- 0.50 Hz
- 0.25 Hz

**Common-Mode Rejection**

100dB at or below 60 Hz

| | |
|---|---|
| **Common-Mode Voltage Range** | 2.5VDC maximum (with respect to earth ground) |
| **Backplane Input Voltage** | Continuous 40.0 VDC Maximum |
| **Backplane Current Load** | 1.50 Amps at 5 VDC Maximum |
| **Power** | +5 VDC +/- 5% |
| **C2 Calibration Input** | Isolation from digital section 1000 VDC minimum. |
| **Cable lengths** | 1000 feet maximum of C2 authorized cable |
| **Load Cell Excitation** | 10 VDC (+/- 5%) 1.5 W maximum.<br>Isolation from digital section 1000 VDC minimum |
| **C2 Calibration Output** | Isolation from digital section 1000 VDC minimum |

**Software and Operating System Requirements**

- Windows® 95/98/Millennium, NT/2000
- RSLogix™
- RSLinx™

**NOTE:** *Windows® is a registered trademark of the Microsoft Corporation. RSLogix™ and RSLinx™ are trademarks of Rockwell Automation.*

**Environmental Requirements**

| | |
|---|---|
| **Temperature Coefficient** | Less than 0.005% of full scale per degree C for Cal-LO and Cal-HI reference points |
| **Operating Temperature Range** | $0^o$ C to $60^o$ C ($32^o$ F to $140^o$ F) |
| **Storage Temperature Range** | $-20^o$ C to $85^o$ C ($-4^o$ F to $185^o$ F) |

**Humidity Range** 0-90% (non-condensing)

**Approvals** UL Certification
CSA Certification
CE Approval

**Configuration Software for Windows** User selectable from RS Logix 5 Software.

## Default Parameters

**Table 2-1:**

| Parameter | Default | Setting |
|---|---|---|
| Tare Weight | 0.0 lbs | |
| WAVERSAVER® | .25 Hz | 4 |
| Weight Units | lbs | 0 |
| Span Weight | -1 | |
| Averages | 100 | |
| Auto Zero Tracking Enabled | NO | 0 |
| Tare Enabled | YES | 1 |
| Auto Zero Disabled | YES | 1 |
| Calibration Type | HARD | |
| Setpoint Mode 1&2 | Net (fixed) | |
| Setpoint Value 1&2 | 1.0 lbs | |
| Setpoint Deadband 1&2 | 0.0 lbs | |
| Setpoint Preact 1&2 | 0.5 lbs | |
| Auto-zero Tolerance | 10.0 lbs | |
| Motion Tolerance | 3.0 lbs | |
| Zero Tolerance | 1000 lbs | |
| Rate of Change Time Base | 10 | |
| Cal Year | 0 | |

**Table 2-1:**

| Parameter | Default | Setting |
|---|---|---|
| Cal Month | 0 | |
| Cal Day | 0 | |
| Cal ID | 0 | |

# CHAPTER 3 - INSTALLATION

## Installing the HI 1771-WS Module

This chapter tells you how to install the Weigh Scale module.

### Preventing Electrostatic Discharge

Electrostatic discharge can damage semiconductor devices inside this module if you touch backplane connector pins or jumper pins. Guard against electrostatic damage by observing the following warning:

**WARNING**

**ELECTROSTATIC DISCHARGE CAN DEGRADE PERFORMANCE OR CAUSE PERMANENT DAMAGE. HANDLE THE MODULE AS STATED BELOW:**

- Wear an approved wrist-strap grounding device when handling the module
- Touch a grounded object to rid yourself of electrostatic charge before handling the module
- Handle the module from the front, away from the backplane connector. Do not touch the backplane connector pins

### Preparing to Install the Module

#### Set the Jumper for Single Density or Double Density Mode

When you received the module, the J1 jumper was configured for Series B or double density mode. (The Series B modules have a label on their side.) You can set the jumper for single density (Series A) or double density (Series B) mode.

Step 1. Remove the four pan head screws that fasten the module cover and module printed circuit board to the module enclosure.
Step 2. Carefully lift the cover for the board.
Step 3. Lift the printed circuit board out of the enclosure.
Step 4. Turn the printed circuit board over so that the component side is facing up.
Step 5. Locate the J1 Jumper. (See Fig. 3-1)

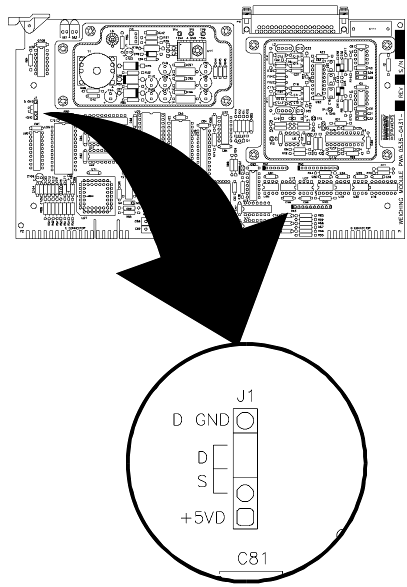



**FIG. 3-1 J1 JUMPER LOCATION/SERIES B**

Step 6. Set the J1 Jumper for either Single Density (Series A) or Double Density (Series B). (See Fig. 3-2)

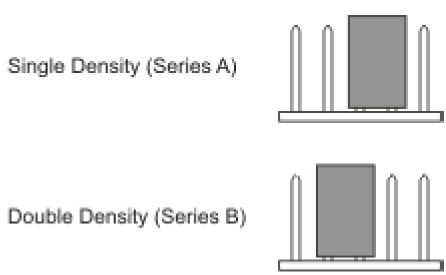



**FIG. 3-2 SINGLE DENSITY & DOUBLE DENSITY JUMPER SETTINGS**

| SELECTION | FUNCTIONS |
|---|---|
| Single Density (Series A) | Series A Functionality |

| SELECTION | FUNCTIONS |
|---|---|
| Double Density (Series B) | Series A Functionality plus:<br>• Use Setpoint Parameters<br>• Retrieve Rate-of-Change values<br>• Verify Configuration Data |

## Calculate the Backplane Current Load for the I/O Chassis

Your module receives its power through the 1771 I/O chassis backplane from the chassis power supply. The maximum backplane current load of the module is 1.5A.

Add this load to the loads of all other modules in the I/O chassis. This total must not exceed the chassis backplane or backplane power supply load specification.

## Determine I/O Chassis Addressing Mode

Your J1 jumper selection determines the addressing mode of the Weigh Scale Module:

| If the jumper is set for those mode:* | The module is compatible with this addressing: | | |
|---|---|---|---|
| | 1/2-slot | 1-slot | 2-slot |
| Single Density | Yes | Rack 1 | Yes |
| Double Density | Yes | Yes | No |
| * If the jumper is not present, the module is compatible with 1/2-slot, and 2-slot addressing and defaults to Series A functionality | | | |

When the J1 jumper is set for double density (Series B & C) operation, the module is not compatible with two-slot addressing.

## Determine the Module Location in the I/O Chassis

The extreme left slot is not an I/O module slot; it is reserved for processors or adapter modules:

- If you are using -slot addressing, you can place your module into any I/O module slot of the I/O chassis.
- If you are using 1-slot addressing, do not place the 1771-WS module into the same even/odd

module-slot pair with a 32-bit-density module. This module uses the input image table and the output image table.

- To minimize electrical noise interference, group analog and low-voltage dc digital modules away from AC modules or high voltage DC digital modules.

**NOTE:** *When using earlier versions of the module, if you are using a version of the module earlier than Series B (or a Series B module set for Series A mode) and are using 2-slot addressing, do not place the 1771-WS module into the same I/O group (even/odd module-slot pair) with a 16-bit density module. this module uses a byte in the input image table and a byte in the output image table.*

### Determine Remote Termination Panel Location

Place your 1771-RT remote termination panel in close proximity to the module so that the distance is within the length of the interconnect cables you choose:

- The length of the 1771-C6 cable is 1.8m (6 feet)
- The length of the 1771-C15 cable is 3.05m (10 feet)

### Plan for Sufficient Enclosure Depth

The cable connector sticks out from the front of the module. The enclosure must provide room for a total of 254 mm (10.0 inches) from the back-panel to the connector.

### Keying the I/O Chassis for your Module

For information about using the plastic keying clips see your PLC 5 Users Guide.

## Installing the Module

Step 1. Turn off the power to the I/O Chassis.

**WARNING**

**REMOVE POWER FROM THE HI 1771-WS I/O CHASSIS BACKPLANE AND DISCONNECT THE CABLE FROM THE MODULE BEFORE REMOVING OR INSTALLING AN I/O MODULE. FAILURE TO REMOVE POWER FROM THE BACKPLANE COULD CAUSE INJURY OR EQUIPMENT DAMAGE DUE TO POSSIBLE UNEXPECTED OPERATION.**

**FAILURE TO REMOVE POWER FROM THE BACKPLANE COULD CAUSE MODULE DAMAGE, DEGRADATION OF PERFORMANCE, OR INJURY.**

Step 2. Place the module in the plastic tracks on the top and bottom of the slot that guides the module into position.

Step 3. Do not force the module into its backplane connector. Apply firm, even pressure on the module to seat it properly.

Step 4. Snap the chassis latch over the top of the module to secure it.

## European Union Directive Compliance

If this product is installed within the European Union or EEA regions and has the CE mark, the following regulations apply.

### EMC Directive

The Series B module is tested to meet Council Directive 89/336
Electromagnetic Compatibility (EMC) using a technical construction file and the following standards, in whole or in part:

- EN 50081-2 EMC – Generic Emission Standard, Part 2 – Industrial Environment
- EN 50082-2 EMC – Generic Immunity Standard, Part 2 – Industrial Environment

The product described in this manual is intended for use in an industrial environment.

### Low Voltage Directive

The Series B module is also designed to meet Council Directive 73/23 Low Voltage, by applying the safety requirements of EN 61131–2 Programmable Controllers, Part 2 – Equipment Requirements and Tests.

For specific information that the above norm requires, see the appropriate sections in this manual, as well as the following Allen-Bradley publications:

- Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1
- Guidelines for Handling Lithium Batteries, publication AG-5.4

- Automation Systems Catalog, publication B112

## Installing the Remote Termination Panel (RTP)

For the Weigh Scale Module, you must use the HI 1771-RT remote termination panel. The remote termination panels are designed for mounting on standard DIN 1 or DIN 3 mounting rails. For mounting dimensions see Fig. 3-3 & 3-4.

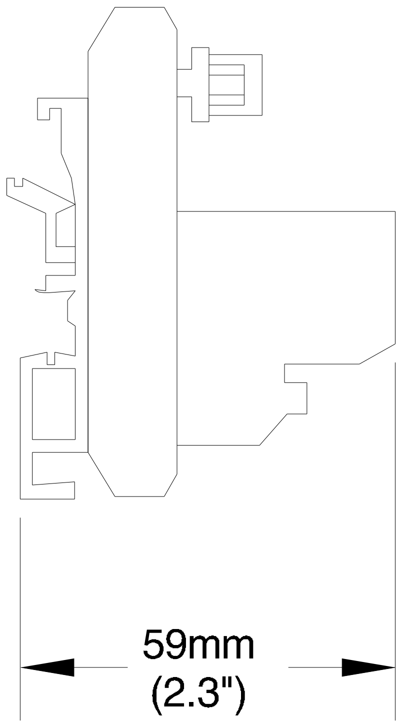



**FIG. 3-3 MOUNTING DIMENSIONS FOR 1771-RT REMOTE TERMINATION PANELS**

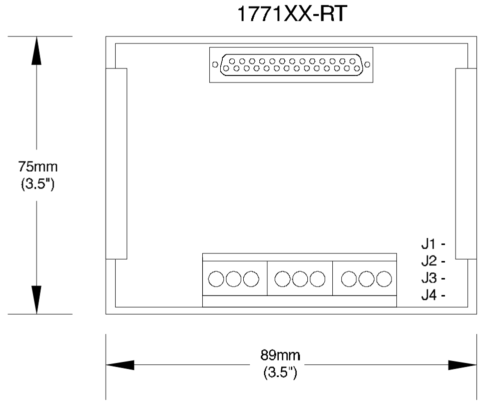



**FIG. 3-4 MOUNTING DIMENSIONS FOR 1771XX-RT REMOTE TERMINATION PANELS**

### Connecting the Module to the Remote Termination Panel

Use the HI 1771XX-C6 or HI 1771XX-C10 cable to connect the HI 1771-WS module to the RT.

### Connecting the Junction Box to the Remote Termination Panel

You must provide a cable from the 1771 RT to the Junction box. You must connect the conductors and the shield to terminals as shown in Fig. 3-5.

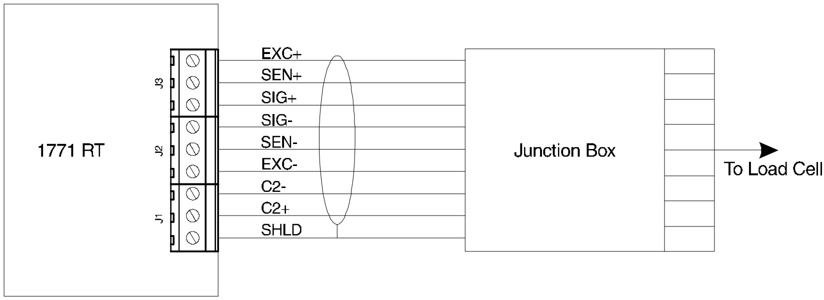



**FIG. 3-5 WIRING DIAGRAM FROM 1771 RT TO JUNCTION BOX**

### Grounding the Shield

On the cable from the junction box to the1771 RT, connect the shield drain wire to the shield terminal on the RT. All shield connections are internally connected together in the RT so that only one wire is

required to ground the entire remote termination panel.
Ground the shield at only one end of the cable. Because we don't know whether you have the ability to provide a good ground at the other end, we recommend that you ground the RT by connecting a wire from the "**SH**" terminal on the RT to a ground bus in the metal enclosure in which the remote termination panel is mounted.

## Indicator Lights

The front panel of the 1771-WS module contains two bi-color indicators: a red/green RUN/FLT (fault) indicator and a red/green CAL/COM indicator. (See Fig. 3-6)

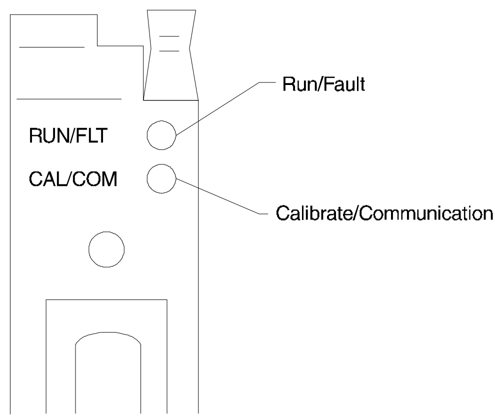



**FIG. 3-6 DIAGNOSTIC INDICATORS**

- Run/Fault - flashes green until the module has passed its self check and has been successfully calibrated and turns a steady green. If a fault is found initially or occurs later, it turns red.
- Calibrate/Communication - Flashes green when doing block-transfers. The light flashes red in 1 - second intervals during calibration. If EEPROM fails, the light flashes red at intervals shorter than 1 second.

At power-up, the module runs through an initial self-diagnostic check. During this check, the RUN/FAULT indicator flashes green at a rate of 5 to 10 times a second. This self-diagnostic check lasts from 2 to 30 seconds, depending on the WAVERSAVER selection; the lower the frequency, the longer the time. When it completes this check satisfactorily, the RUN/FAULT indicator becomes a steady green. However, if the module does not have valid calibration data, the RUN/FAULT indicator will flash green at a rate of once a second.

If a fault is found initially or occurs later, the RUN/FLT indicator turns red.

The bottom indicator is the calibrate/communication indicator.

This indicator flashes green when doing block-transfers; it flashes red during calibration.

# CHAPTER 4 - SETUP

## A Brief Description of Chapter 4

All information contained in Chapter 4 pertains to software settings (Local and Remote modes of operation) to prepare the module controller for calibration and operation. Alternatives to these procedures explicit or implied, contained in this section are not recommended. It is very important that the user and service personnel be familiar with the procedures contained in this chapter, before going through the setup procedures. The Setup procedures require, Rockwell Automation RSLogix 5™ and Rockwell Automation RSLinx™ or RSLinx™ Lite. The Local Mode of Operation means the Module is installed in a PLC Chassis and Remote Mode of Operation means the Module is installed in a Remote Chassis.

**NOTE:** *RSLogix 5™ and RSLinx™ are trademarks of Rockwell Automation.*

## Requirements

Before installing the HI 1771-AD Configuration Software or doing any setup of the module the following requirements must be met:

- The module must be installed in the proper slot depending on the series selected (A or B). (See Chapter 3, “Determine the Module Location in the I/O Chassis”.)
- RS Logix & RSLinx must be installed on your PC.
- All cables and connectors are installed correctly with the connectors tightly fastened.
- A steady green Run/Fault light on the HI 1771-WS Module.

**NOTE:** *In the event you should encounter any problems with the operation of the PLC or problems installing or operating RSLogix or RSLinx, please consult your Allen Bradley manual or contact your Allen Bradley Customer Service representative for assistance.*

## Installation of HI 1771-AD Configuration Software

Step 1. The SETUP program copies the required files to your hard disk.

Step 2. Run Windows NT/95/98/2000 and insert the HI 1771-AD Configuration Software Disk into your 3.5” floppy drive.
Step 3. Click on START.
Step 4. Click on Run.
Step 5. In the Run field type the command: a:setup. If your floppy drive is drive b enter: b:setup.
Step 6. Press the Enter key.
Step 7. You can also use the Add/Remove Function in the Control Panel dialogue box.

- Click on Start
- Move the cursor to Settings.
- Select Control Panel.
- Double click on the Add/Remove Programs icon.
- Click on the Install button.

Step 8. The SETUP program will lead you through the installation process.

**NOTE:** *You can download a copy of the HI 1771-AD Configuration Software from our Web Site: http://www.hardyinst.com. Follow the instructions furnished on the web site to install the software.*

## Power Check

Step 1. Check to see that there is power to the PLC and the module.
Step 2. If there is power to the module, the Run/Fault LED should be lit. (See Fig. 4-1) The CAL/COM LED should be off.

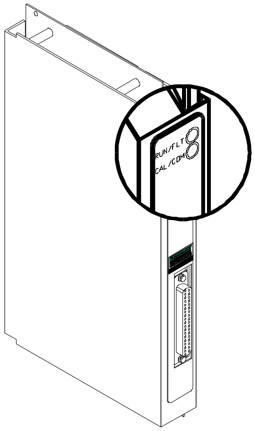



**FIG. 4-1 LED'S**

## Selecting the HI 1771-WS Module

### Adding the Module to an Existing System

Step 1. Load the RSLogix 5 application by clicking on the RSLogix Icon on the Windows desktop or clicking on Start/Programs/ Rockwell Software/RSLogix.

Step 2. Click on the arrow to the right of the Offline pull down menu. (See Fig. 4-2) A pull down menu appears.


**FIG. 4-2 OFFLINE PULL DOWN MENU/ CLICK ON UPLOAD**

Step 3. Click on Upload. The Upload display appears. (See Fig. 4-3)

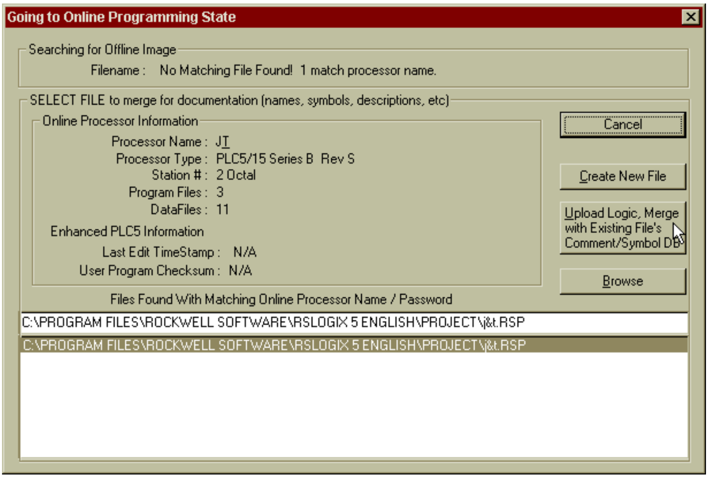



**FIG. 4-3 UPLOAD DISPLAY/UPLOAD EXISTING LOGIC**

Step 4. Click on the “Upload Logic, Merge with Existing . . . . . .” button. The Uploading Processor Image display appears. (See Fig. 4-4) Then a prompt appears asking if you want to go online. (See Fig. 4-5)

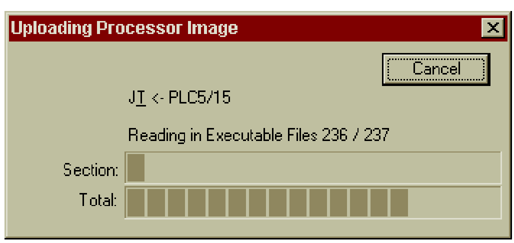



**FIG. 4-4 UPLOADING PROCESSOR IMAGE**

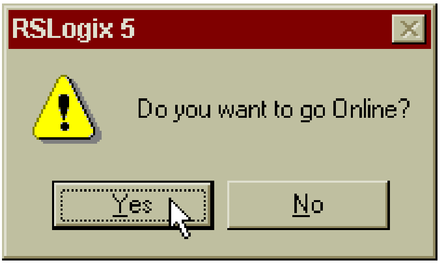



**FIG. 4-5 PROMPT TO GO ONLINE**

Step 5. Click on No if you do not want to go Online. Click on Yes if you want to go Online. After clicking Yes the project is loaded into RSLogix. (See Fig. 4-6)

Step 6. Click on I/O Configuration and continue to select the HI 1771-WS Module. Go to Step 2 in the Setting up a New Project.

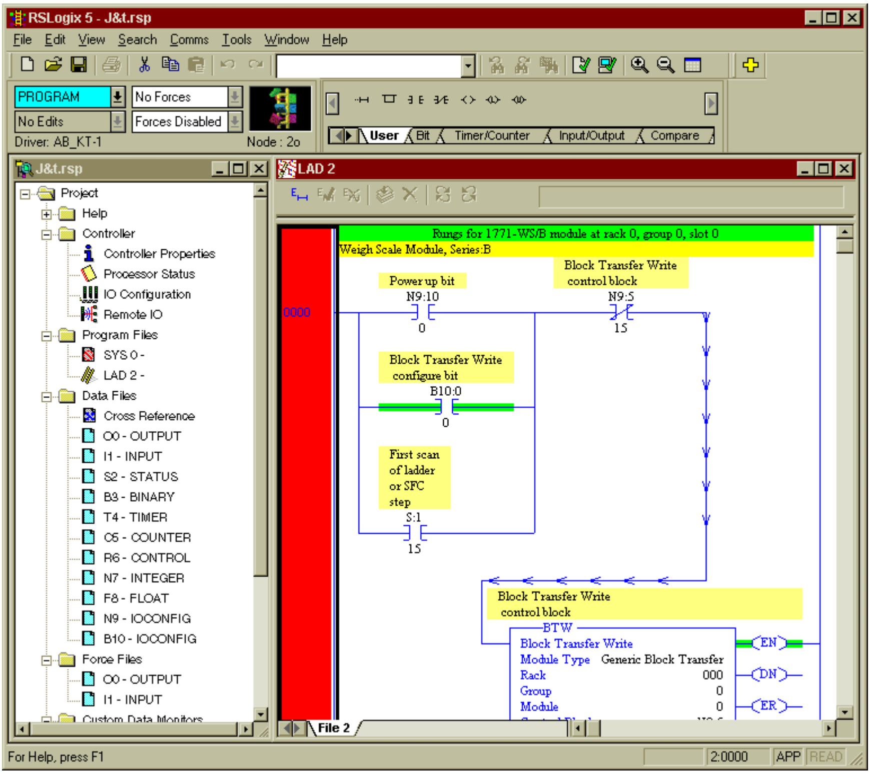


FIG. 4-6 UPLOADED PROJECT

## Setting up a New Project

Step 1. Click on the File pull down menu, and select New or click on the New Icon on the Tool Bar. (See Fig. 4-7) The Select Processor Type display appears. (See Fig. 4-8)

Step 2. Configure the Processor. For configuration information check your RSLogix 5 "Getting Results Guide".

Step 3. Click on OK. The Project Display appears. (See Fig. 4-9)

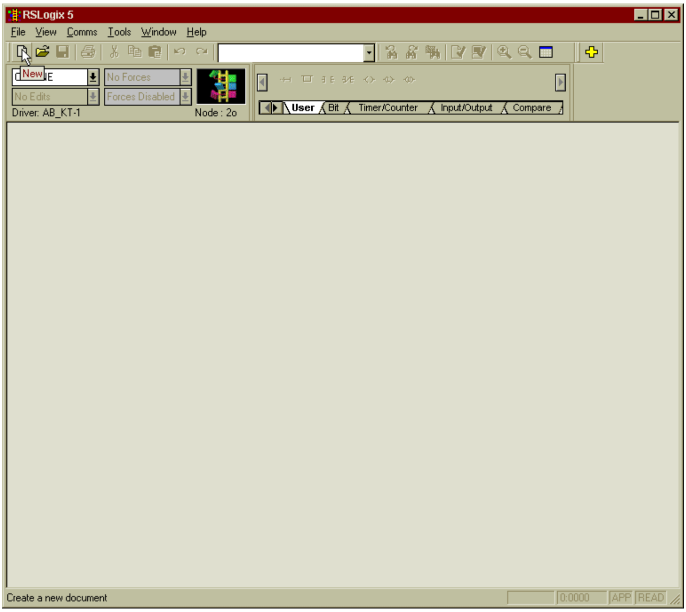



**FIG. 4-7 SELECTING A NEW PROJECT**

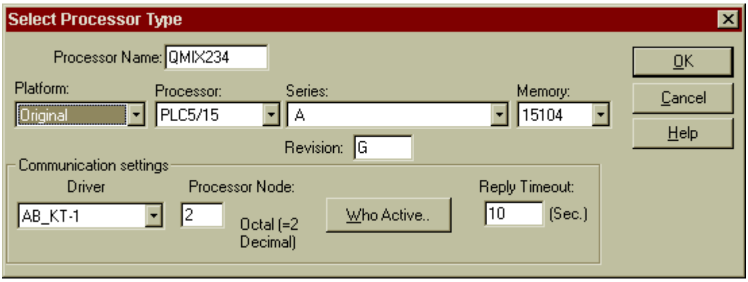



**FIG. 4-8 SELECTING PROCESSING TYPE/NAME**

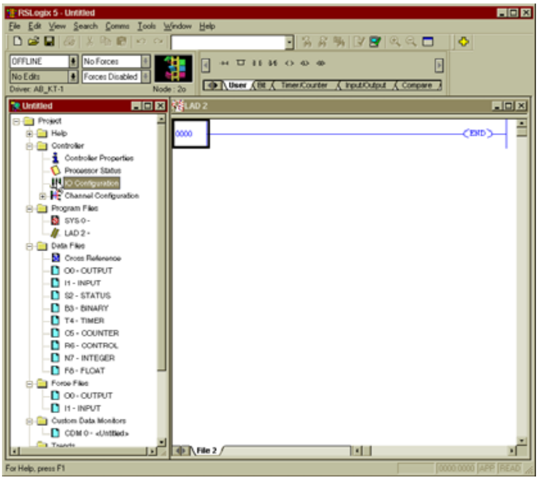



**FIG. 4-9 SELECTING I/O CONFIGURATION**

Step 4. Double Click on the IO Configuration Icon in the left hand screen. The I/O Configuration - Chassis Table appears. (See Fig. 4-10)

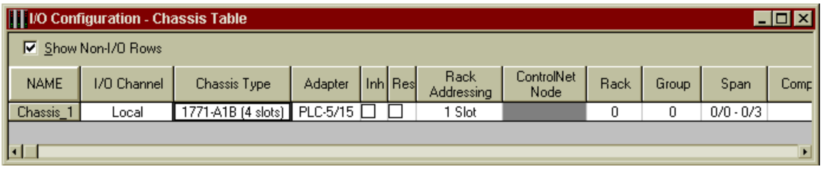



**FIG. 4-10 I/O CONFIGURATION - CHASSIS TABLE**

Step 5. Right click in the Chassis Type Field. A pull down menu appears. (See Fig. 4-11)


**FIG. 4-11 SELECT DISPLAY CHASSIS**

Step 6. Click on Display Chassis. The Chassis Chassis_1 display appears. (See Fig. 4-12)

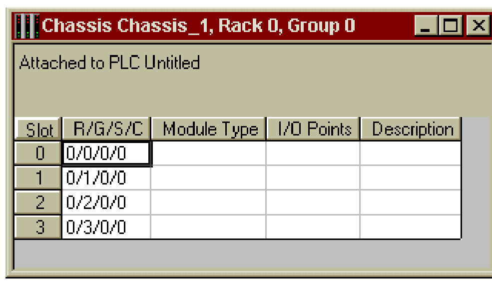



**FIG. 4-12 CHASSIS DISPLAY**

Step 7. Right click in the Module Type cell for the slot containing the HI 1771-WS module. A menu appears. (See Fig. 4-13)


**FIG. 4-13 INSERT MODULE**

Step 8. Click on Insert Module. The Edit Module display appears. (See Fig. 4-14)

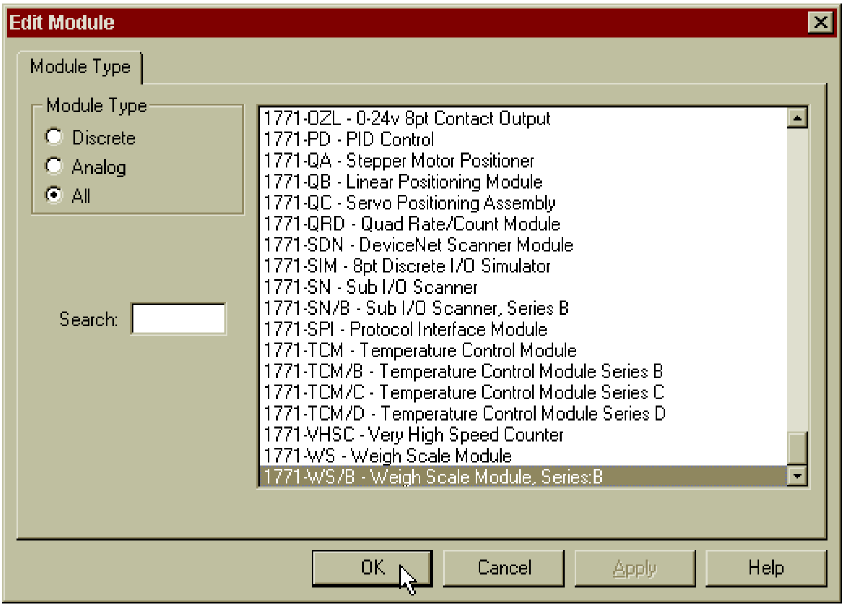



**FIG. 4-14 EDIT MODULE DISPLAY/ALL MODULES DISPLAYED**

Step 9. Scroll down until you find the 1771-WS/B - Weigh Scale Module, Series B (or A). Click on the 1771 Weigh Scale Module to highlight the selection. Click on OK. The module type now appears in the Module type cell you selected. In our example we used Slot 0. (See Fig. 4-15)

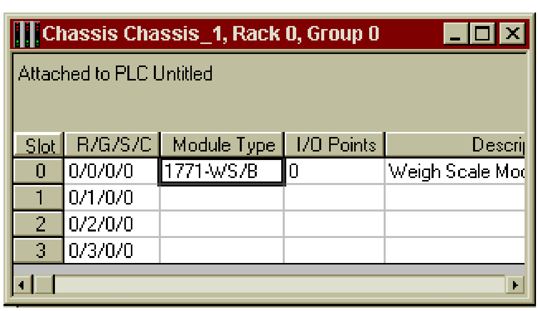



**FIG. 4-15 CHASSIS_1/SELECTED MODULE TYPE DISPLAYED**

Step 10. Right click in the Module Type cell. A menu appears. Click on Display Module. (See Fig. 4-16) The Enter Module Addresses display appears. (See Fig. 4-17)


**FIG. 4-16 SELECT DISPLAY MODULE**

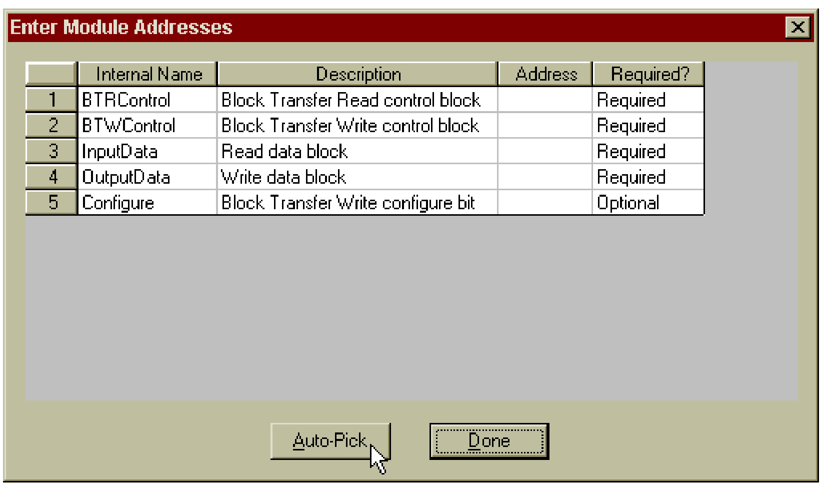



**FIG. 4-17 MODULE ADDRESS DISPLAY/SELECT AUTO-PICK**

Step 11. Click on the Auto-Pick button. The addresses appear in the address column. (See Fig. 4-18)

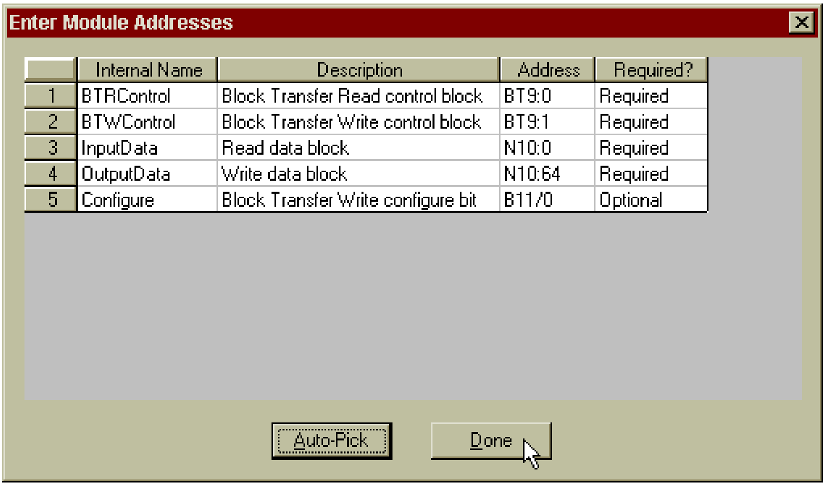



**FIG. 4-18 MODULE ADDRESS DISPLAY WITH ADDRESSES**

Step 12. Click on the Done button to accept the address entries. The HI 1771-WS Weigh Scale Module Main Menu appears. (See Fig. 4-19)

Step 13. Click on the Insert Ladder Rungs button. The Select Program File for Rung Insertion dialog box appears. (See Fig. 4-20)

Step 14. Select where you want the Rungs to go.

**CAUTION:** **WHEN SELECTING WHICH FILE IN WHICH TO INSERT THE RUNGS, MAKE ABSOLUTELY SURE THAT IT IS A FILE THAT RUNS IN A NORMAL SCAN OF THE PROGRAM, OR THAT IN ADDITION TO INSERTING THE RUNGS, THE PROGRAM IS MODIFIED TO INSURE THE FILE WITH THE ADDED RUNGS IS INCLUDED IN THE PROGRAM SCAN. BLOCK TRANSFERS TO THE ASSOCIATED MODULE, ALREADY IN THE PROGRAM, SHOULD BE DISABLED WHILE RUNNING THE CONFIGURATION SOFTWARE. THIS WILL ELIMINATE ANY INTERFERENCE WHILE RUNNING THE CONFIGURATION SOFTWARE.**

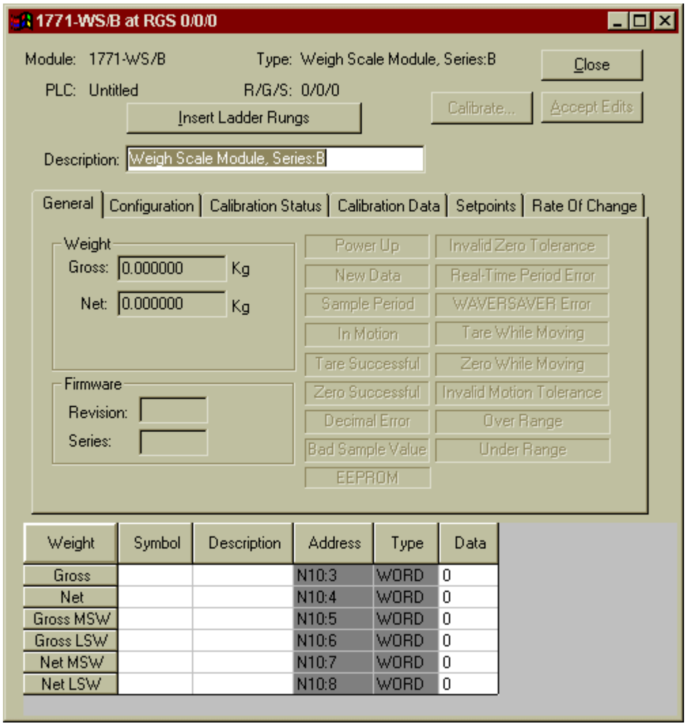



**FIG. 4-19 HI 1771-WS MODULE MAIN MENU**

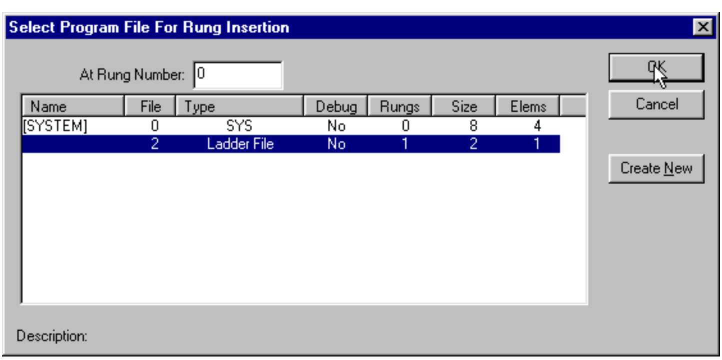



**FIG. 4-20 SELECT PROGRAM FILE FOR RUNG INSERTION**

Step 15. Click on OK. The Main Menu reappears.

Step 16. The Module Setup is complete and the unit is ready to Configure.

# CHAPTER 5 - CONFIGURATION

## General Status

| | |
|---|---|
| **Weight (Gross and Net)** | The gross weight and net weight values are displayed from the last upload. They are not real-time values. |
| **Firmware (Revision and Series)** | The firmware revision and series (ASCII) are displayed in these fields. |
| **Power Up** | If this bit is set, it indicates that the module has gone thru a power-up or reset since it last received a block-transfer write. |
| **New Data** | If this bit is set, it indicates that the status block data has been updated by the module since the last block-transfer read. |
| **Sample Period** | This bit is set if an invalid value was entered for the real-time sample period. |
| **In Motion** | If this bit is set, it indicates that the scale is in motion. This is based on the in-motion tolerance value which is set on the Configuration tabbed dialog. |
| **Tare Successful** | This bit is set when the tare function was successfully completed. If it is not set, either the tare function is not active, the scale is in motion, or the tare function was not successfully completed. |
| **Zero Successful** | This bit is set when the zero function was successfully completed. If this bit is not set, either the zero function is not active, the scale is in motion, or the zero function was not successfully completed. |
| **Decimal Error** | This bit is set if an invalid value was entered for the decimal point location. |

**Bad Sample Value** This bit is set if an invalid value was entered for the number of samples.

**EEPROM** This bit is set if an unsuccessful write to EEPROM is detected.

**Invalid Zero Tolerance** This bit is set if an invalid value was entered for zero tolerance on the Configuration tabbed dialog.

**Real-Time Period Error** If this bit is set, a real-time sample period has passed without a block-transfer read.

**WAVERSAVER Error** This bit is set if multiple WAVERSAVER selection bits are on.

**Tare While Moving** This bit is set if the tare function is active and the scale is in motion.

**Zero While Moving** This bit is set if the zero function is active and the scale is in motion.

**Invalid Motion Tolerance** This bit is set when an invalid value was entered for in-motion tolerance, which is set on the Configuration tabbed dialog.

**Over Range** This bit is set if the input signal differential is greater than can be measured accurately.

**Under Range** This bit is set if the input signal differential is more negative than can be measured accurately.

**Configuration** On the configuration dialog, you are given several configuration selections to establish. However, the selections do not take effect until you download the selections to the PLC-5 data table. They do not control the PLC-5 data table values in real-time. (See Fig. 5-1)

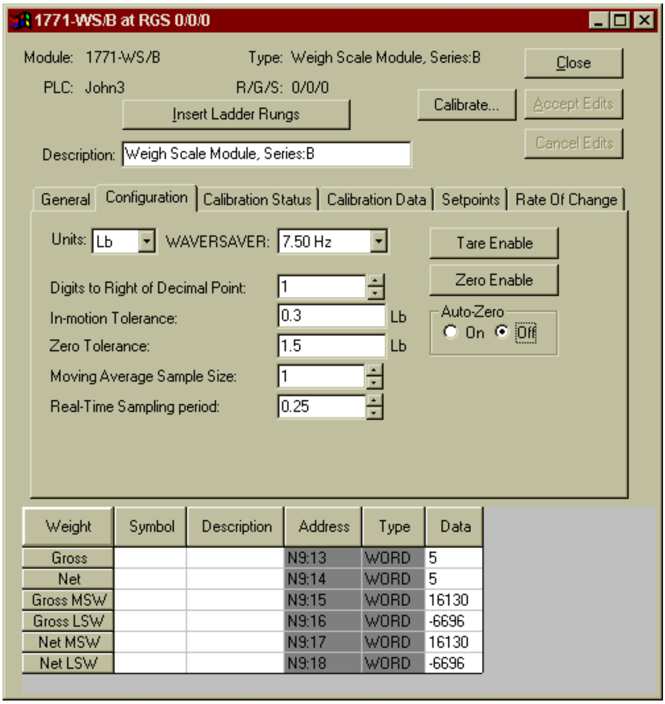



**FIG. 5-1 CONFIGURE DISPLAY**

**NOTE:** *All values in the fields are for illustration only and do not reflect a real project. Your values will vary from this example.*

**Units**

Select either Lb. or Kg. to configure the unit of weight. This selection must match the units of the calibration weight at the time of calibration.

**WAVERSAVER**

The Weigh Scale module includes a proprietary technology called WAVERSAVER that reduces the effect of noise or excess vibration in the weight signal. WAVERSAVER rejects all variations in the weight signal above the minimum (or cutoff) noise frequency you set for your application. Select the minimum noise frequency (or frequency rejection level) for your application. Only changes of weight at frequencies below the level you select will be reflected in the value passed on in the status block as the weight value. This frequency rejection eliminates process noise and causes a more stable reading. However, a lower frequency rejection level causes a longer delay in updating the weight values.

**Digits to the Right of Decimal Point**

Select the number of digits to the right of the decimal point (0 thru 6). This value will apply to all weight integer values. When you enter calibration or setpoint weights, you can enter only as many digits to the right of the decimal point as this setting specifies.

**CAUTION:**

**WHEN YOU CHANGE THE DECIMAL POINT LOCATION, CALIBRATION WEIGHT VALUES ARE NOT AUTOMATICALLY ADJUSTED. YOU MUST RECALIBRATE THE SCALE. FAILURE TO RECALIBRATE THE SCALE WILL RESULT IN GROSS AND NET WEIGHT DISPLAYS BEING INCORRECT BY A FACTOR OF WHATEVER YOU CHANGED THE DECIMAL LOCATION TO.**

**In-motion Tolerance**

Select the in-motion tolerance value (0 thru 999999). This value is weighted by your selections for unit of weight (Lb. or Kg.) and the number of digits to the right of the decimal place. The in-motion tolerance value defines the weight change that will trigger the in-motion flag to be set. As the module operates, it repeatedly reads the signals from the load cell(s) and calculates the weight value. When you change the weight on the scale, the scale requires a little time to stabilize at the new reading, since changing a weight can cause the scale to swing or vibrate slightly. If you tried to zero (or tare) the scale while it was still moving, the zero or tare value would be inaccurate.

The module determines when the scale is in motion, and will not allow you to zero or tare the scale while the scale is moving. You can specify the amount of weight change the module uses to decide if the scale is moving. When the module senses scale motion, it disregards certain functions when scale motion exceeds the parameters you set.

**Zero Tolerance**

Select the zero tolerance value (0 thru 999999). This value is weighted by your selections for weight (Lb. or Kg.) and the number of digits to the right of the decimal point. The zero tolerance value defines a range of weights over which a manual or auto-zero is permitted. The zero point of a scale may vary slightly from what it was when the scale was calibrated (the calibrated zero point) due to causes such as:

- ·Mechanical wear
- ·Material buildup

·Temperature variations

You can use auto-zero and manual zero to compensate for normal variations without recalibrating the scale.

**CAUTION:**

**IF THE VARIATION FROM THE CALIBRATION ZERO POINT GROWS TOO LARGE, IT MAY BE AN INDICATION OF A SERIOUS PROBLEM WITH THE SCALE. UNLESS YOU IDENTIFY AND CORRECT THE PROBLEM, YOU MAY NOT BE ABLE TO OBTAIN ACCURATE WEIGHT MEASUREMENTS.**

**Moving Average Sample Size**

Select the number of samples used in calculating the moving average of the current weight value (1 thru 200). Since the A/D conversion takes 50ms, the weight is sampled every 50ms. After each sample, the average is calculated based on the last number of samples as you have specified. For example, if you set the moving average sample size to 10, each reading is added to the previous 9 readings and the sum divided by 10 to determine the current weight.

Moving Average Sample Size settingScale Response

Larger sample sizeSlower response to weight changes.More accurate reading (noise and variation may be reduced when more samples are averaged)
Smaller sample sizeFaster response to weight changes.Less accurate reading (noise and variation may increase when less samples are averaged)
Real-Time Sampling Period

Select the real-time sampling period for controlling the period at which the module places new weight values into the read block. Enter the period value in seconds, between 0.05 and 10.00 in increments of 0.05 seconds. If a block-transfer read is not executed within a real-time sampling period, the real-time sample period BTR time-out bit in the status block is turned on. If a second BTR is executed within a real-time sample period, you will see that the new-data bit in the status block turned off. This tells you that the values you just read in that block transfer have not been updated since the previous block transfer read.

**Tare Enable**

Use the tare-enable selection if you want to set the tare value equal to the gross weight, resulting in a zero value for the net weight. This can only happen when the scale is not in motion. If the scale is in motion while attempting to set tare, the “attempt to set tare while in motion” error bit in the status block is turned on.

**Zero Enable**

Use the zero-enable selection if you want to set the gross weight value to zero. This can only happen when the scale is not in motion and the gross weight (the absolute value of the zero offset from the calibration zero point) is within zero tolerance. If the scale is in motion while attempting to zero the gross weight, the “attempt to zero while in motion” error bit in the status block is turned on.

**Auto-Zero**

Auto-zero tracking lets a scale automatically compensate for small variations at the zero point of the scale. These variations may be caused by slight material buildup on the scale platform or vessel, or by temperature fluctuations near the scale. If you select auto-zero "on", whenever the weight on the scale (the absolute value of the zero offset from the calibration zero point) is within zero tolerance and the scale is not in motion, the gross weight will be set to zero.

For the scale to be considered not in motion, it must be motionless for:
1s + (moving average sample size + 1)(0.05s)

> For example, if:
> Zero tolerance = 5 lb.
> Moving average sample size = 10
> Auto-zero tracking = ON
> Weight is between –5 lb. and +5 lb.
> Scale is motionless for 1.55 seconds
> Then gross weight = zero

## Configuring Rate-of-Change

The rate-of-change represents the rate-of-change in weight as measured by the module. This calculation is based on three parameters:

- **Weight Description—**defines the unit of measure for weight in rate-of-change calculations. Valid values for weight descriptions are:
    - – 0 = kilograms
    - – 1 = pounds
- **Time units—**unit of measure for time in rate-of-change calculations. Valid values for time units are:
    - – 0 = seconds
    - – 1 = minutes
    - – 2 = hours
- **Evaluation Period—**the time over which a rate-of-change calculations are made. Valid values for evaluation periods are 1 millisecond-32.767 seconds.

## Saving Configuration Changes

Configuration changes that are made when the module is not in calibration mode are saved to non-volatile memory when the save flag in the block transfer is set. If this flag is not set, the values reside in volatile, run-time memory until you reset or power up the module. At this time, the values are initialized to their previously stored values. To set the save flag, you must edit your ladder logic code.

## Verifying Configuration Data

If you have configured the module for double density mode, the module returns configuration parameters in the block transfer read data block. To configure the module for double density mode, see Chapter 3 of this manual. Words 48-63 store the configuration parameter values. For a complete list of the block-transfer read data block, see Chapter 7 of this manual.

# CHAPTER 6 - CALIBRATION

## Module Calibration

The Weigh Scale module uses three different types of calibration. Select the type of calibration that is best suited for your application.

| Calibration Type | Method |
|---|---|
| Hard CAL | Traditional Calibration physically measuring low and high weights |
| Soft CAL | Entering sensitivity and resistance values for each load cell |
| C2® CAL | Automatically uploading sensitivity and resistance values from Hardy Instruments C2 Load sensors. |

Before you can calibrate the HI 1771-WS module, you must configure the module. You will also need the material and information as show in the table below:

| To perform this type of | You will need |
|---|---|
| Hard CAL | An accurate, known weight that is => 80% of the maximum scale capacity to use as the high weight. |
| Soft CAL | The actual sensitivity and output resistance values for each load cell in your scale (from the manufacturer’s specifications or the load cell certificate)<br>***Note****: Normalized or averaged data will result in an inaccurate calibration. Contact the load cell manufacturer for exact data.* |
| C2 CAL | Hardy Instruments’ C2 load sensors. |

### Which type of calibration is best for your application?

**C2 Calibration**

C2 calibration is the easiest of the three calibration types, since only one test weight (which can be zero) is required. C2 calibration requires that you use Hardy Instruments', certified load sensors.

**Hard Calibration**

Hard calibration requires two or three accurate, known test weights. You can use hard calibration on any manufacturer's load cells. You do not need to know the sensitivity and output resistance for your load cells.

**Soft Calibration**

Soft calibration requires only one test weight. You can use soft calibration on some manufacturer's load cells. You need to know the sensitivity and output resistance for all your load cells. Contact the Load Cell manufacturer for actual values.

**WARNING**

**IF ACTUAL TESTED VALUES ARE NOT USED THE CALIBRATION WILL BE INCORRECT.**

**Achieving the Best Calibration Accuracy**

If you are using only a portion of your scale's range, you can achieve the greatest calibration accuracy by:

- Performing a hard calibration
- Choosing low, middle, and high test weights that cover the operating portion of your scale's range.

For example, if you are using a 10,000 lb. scale, but use it in the range of 2000 to 5000 lb., you could use test weights of 2000, 3500, and 5000 lb.

### C2 Calibration Procedures

Step 1. On the HI 1771-WS Module display, click on the Configuration tab. (See Fig. 6-1) The configuration display appears. (See Fig. 6-2)

Step 2. Click on the Calibrate Button. The Calibration Display appears. (See Fig. 6-3)

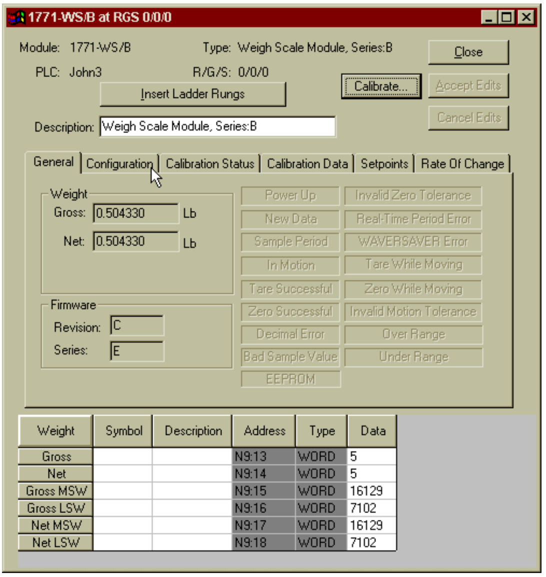



**FIG. 6-1 HI 1771-WS MODULE DISPLAY/SELECTING CONFIGURE TAB**

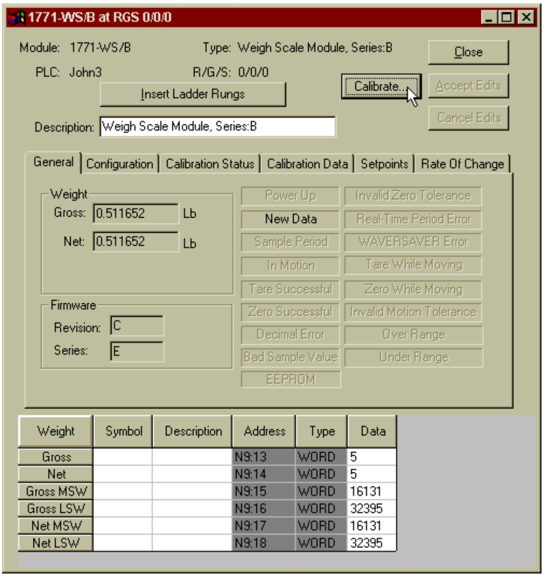



**FIG. 6-2 SELECTING CALIBRATE BUTTON**

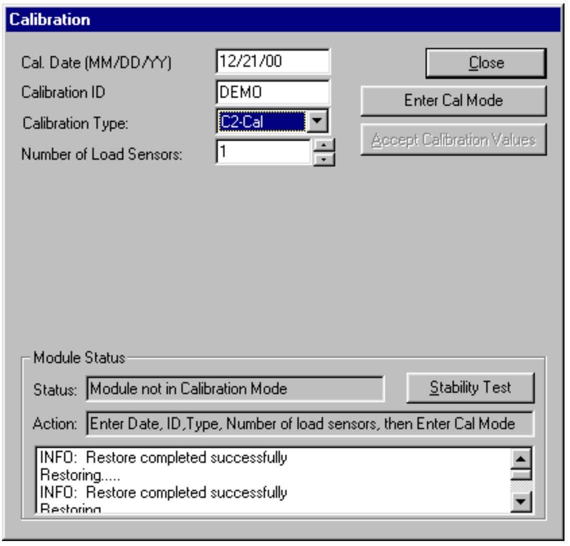



**FIG. 6-3 CALIBRATION DISPLAY/SELECTING ENTER CALIBRATE MODE**

Step 3. Enter the calibration date (MM/DD/YY) in the Cal Date field.

Step 4. In the Calibration ID field, enter an ID that you have selected to indicate who performed the calibration. The ID can be as many as four alpha-numeric characters or spaces.

Step 5. In the Calibration Type field, use the pull-down list and select “C2”. The C2 Calibration display appears. (See Fig. 6-5)


**FIG. 6-4 C2 CALIBRATION DISPLAY**

Step 6. In the Number of Load Cells field, enter the number of load cells that you are using.

Step 7. Click the Enter Cal Mode button. This enables the parameter fields for C2 calibration and triggers the "Read load point data in C2 Cal Mode" command, which should be indicated in the information window.

Step 8. Place a calibration weight (the weight can be zero) on the scale. Enter the value of this calibration weight in the Reference weight field.

Step 9. This is the only calibration weight used. This weight could be any weight from 0 thru the maximum. If the exact weight on the scale is not known, you can enter an approximation. Even if the total weight is incorrect, net changes in weight should be within the tolerances of C2 calibration if the weighing system is installed properly. Entering an approximation can minimize downtime when a load cell must be replaced and the scale tank is not empty. However, if you do enter an approximation, you should recalibrate later when you have the opportunity to use a known weight.

Step 10. Click the Accept button for the Reference weight. After 12 to 15 seconds, you will see a message telling you the Reference weight has been accepted.

Step 11. Click the Accept Values button to store the values in the module's non-volatile memory.

## Hard Calibration Procedures

Step 1. On the HI 1771-WS Module display, click on the Configuration tab. (See Fig. 6-1) The configuration display appears. (See Fig. 6-2)

Step 2. Click on the Calibrate Button. The Calibration Display appears. (See Fig. 6-3)

Step 3. Enter the calibration date (MM/DD/YY) in the Cal Date field.

Step 4. In the Calibration ID field, enter an ID that you have selected to indicate who performed the calibration. The ID can be as many as four alpha-numeric characters or spaces.

Step 5. In the Calibration Type field, use the pull-down list and select "Hard".

Step 6. Click the Enter Cal Mode button. This enables the parameter fields for hard calibration. (See Fig. 6-3) The Hard Calibration display appears. (See Fig. 6-4)

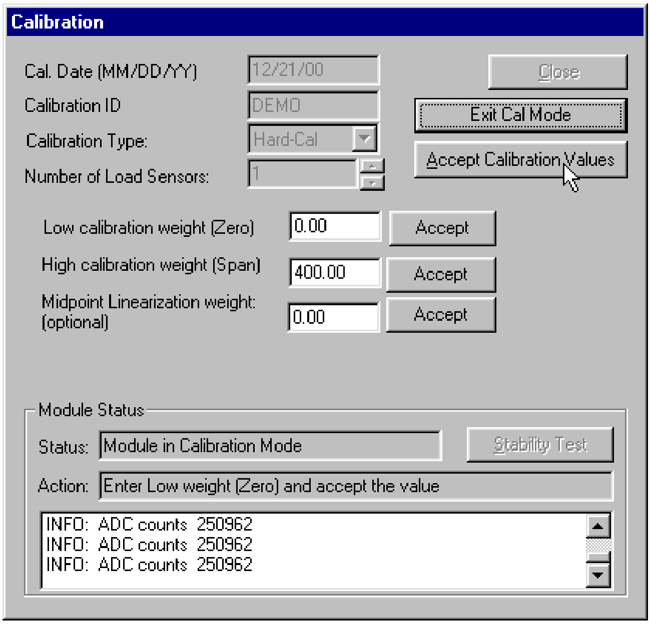



**FIG. 6-5 HARD CALIBRATION DISPLAY**

Step 7. Place a low calibration weight (the weight can be zero) on the scale. Enter the value of this calibration weight in the Low calibration weight field.

Step 8. Click the Accept button for the Low calibration weight. After 12 to 15 seconds, you will see a message telling you the low calibration weight has been accepted.

Step 9. **This step is optional since you are not required to enter a midpoint linearization weight.** Place a midpoint linearization calibration weight on the scale, and enter its value in the appropriate field on the dialog.

Step 10. Click Accept for the Midpoint linearization weight. You will see a message in 12 to 15 seconds telling you that this weight has been accepted.

Step 11. Place the high calibration weight on the scale. We recommend that you select a high calibration weight value that is 80 to 100% of the scale capacity. Enter the value of the weight in the appropriate field on the dialog.

Step 12. Click Accept for the High calibration weight. You will see a message in 12 to 15 seconds telling you that this weight has been accepted.

Step 13. Click the Accept Values button to store the values in the module's non-volatile memory.

**Restore Calibration Procedures**

The WS module always saves the last successful calibration to its non-volatile memory. When you want to replace an existing WS module with a new one without calibrating the module, you can restore a previously saved calibration. You can also restore a calibration when you want to use the previously saved calibration instead of one you are currently working on, or to replace calibration data from a failed module.

**CAUTION:**

**YOU SHOULD ONLY RESTORE A CALIBRATION AS A SHORT-TERM SOLUTION FOR REPLACING A FAILED MODULE. WEIGHT READINGS OBTAINED FROM A MODULE WHOSE CALIBRATION WAS RESTORED FROM ANOTHER MODULE MAY NOT BE AS ACCURATE AS READINGS FROM THE ORIGINAL MODULE. AFTER YOU HAVE REPLACED THE FAILED MODULE, RECALIBRATE IT AS SOON AS POSSIBLE.**

Step 1. On the HI 1771-WS Module display, click on the Configuration tab. (See Fig. 6-1) The configuration display appears. (See Fig. 6-2)

Step 2. Click on the Calibrate Button. The Calibration Display appears. (See Fig. 6-3)

Step 3. Enter the calibration date (MM/DD/YY) in the Cal Date field.

Step 4. In the Calibration ID field, enter an ID that you have selected to indicate who performed the calibration. The ID can be as many as four alpha-numeric characters or spaces.

Step 5. In the Calibration Type field, use the pull-down list and select Restore.

Step 6. Click Accept and then Accept Values to restore the values of the last successful calibration to the module's non-volatile memory.

## Read the Internal Resistance Value

To isolate problems with the module, or with the external load cells or wiring, you can read the WS module's internal resistance. During factory testing and calibration, the module is set to read the value of an internal resistor. This resistance is stored in the module's non-volatile RAM.

Step 1. On the HI 1771-WS Module display, click on the Configuration tab. (See Fig. 6-1) The configuration display appears. (See Fig. 6-2)

Step 2. Click on the Calibrate Button. The Calibration Display appears. (See Fig. 6-3)

Step 3. Click the Calibrate button on the module configuration screen. The calibration dialog will appear.

Step 4. Enter the calibration date (MM/DD/YY) in the Cal Date field.

Step 5. In the Calibration ID field, enter an ID that you have selected to indicate who performed the calibration. The ID can be as many as four alpha-numeric characters or spaces.

Step 6. Click the Stability Test button. As the internal resistor is read, the software displays the ADC counts.

Step 7. Verify that the count stabilizes after 10-15 seconds.

Step 8. If the ADC counts is within acceptable tolerance of the stored value (count stabilizes after 10-15 seconds), and a test resistance failure does not occur (as indicated on the Calibration Status screen by the Stability Test Failure bit not set)The module is operating properly.

Step 9. If you still experience problems, the load cells or wiring may be bad, and may need to be replaced. A test resistance value failure occurs (the Stability Test Failure bit is set on the Calibration Status screen)The value is out of tolerance. You see an error message in the status window on the screen. The module is not operating properly. Contact your local Hardy Instruments Customer Support.

Step 10. When you are finished reading resistance, click Close to exit the calibration screen.

# CHAPTER 7 - OPERATING PROCEDURES

## A Brief Description of Chapter 7

All information contained in Chapter 7 pertains to the operation of the HI 1771-WS Weigh Scale Module. The Operating Procedures include Writing and Reading data transferred between the PLC and the weigh scale module. The data is defined as either Read Data (including Module Status words indicating the current state of the module) from the weigh scale module or Write Data sent to the module. It is very important that the user be familiar with this chapter before operating the weight scale module.

## Block Transfer, Read

### Monitoring Status Data

This section shows you how to monitor status data by reading information directly from the data table.

#### Reading Floating-Point Values

The gross weight and net weight values are available in 32-bit floating-point format in words 5 through 8. Since the status block must be in an integer file, each 32-bit floating-point value takes up two 16-bit integer words. To copy floating-point values into a floating-point file, use a COPY FILE instruction:

| For this Value: | Enter the: |
|---|---|
| source | Address of the first integer word (containing the 16 most-significant bits of the floating-point value). |
| Destination | Address of the floating-point word. |
| Length | Length of the destination block being written to in 32-bit floating-point words.<br>To copy the gross and net weight values together, enter a length of 2. |

#### Reading 6-Digit Integer Values

The status block contains 6-digit integer values. However, a 16-bit integer word has limits of –32,768 and +32,767. Therefore, 2 words are used for each 6-digit integer value. The 3 most-significant decimal digits are placed in natural binary format in one word, and the 3 least-significant decimal digits are placed in natural binary format in the other word.

For example, if the most-significant word has a value of 783 and the least-significant word has a value of 26, the total value is 783026. Unless the most-significant word has a value of zero, its sign must match that of the least-significant word or the value is invalid.

**Implied Decimal Point**

For all weight integer values, the decimal-point location is implied by the decimal-point-location value you select:

| if you have selected decimal-point location value of | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|---|
| the implied decimal point location would be | xxxxxx. | xxxxx.x | xxxx.xx | xxx.xxx | xx.xxxx | x.xxxxx | 0.xxxxxx |

**Status Block**

Read the status block from the Weigh Scale Module using a block-transfer read instruction. The status block contains 64 words (listed below).

| Word | Bits | Description - Read |
|---|---|---|
| **0** | | **General Status and Error Bits** |
| | 0 | Just Up<br>0 = The module has received a block-transfer write since the last power-up or reset.<br>1 = The module has gone through a power-up or reset since it last received a block-transfer write. |
| | 1 | Real-Time Sample Period BTR Time-out<br>0 = A block-transfer read had been executed during the last real-time sample period.<br>1 = A real-time sample period has passed without a block-transfer read. |
| | 2 | In-Motion<br>0 = The scale is not in motion.<br>1 = The scale is in motion. |
| | 3 | Input Over Range<br>0 = The input signal is not over range.<br>1 = The input signal differential is greater than can be measured accurately. |

| Word | Bits | Description - Read |
|---|---|---|
| **0 cont'd** | 4 | Input Under Range<br>0 = The input signal is not under range<br>1 = The input signal differential is more negative than can be measured accurately. |
| | 5 | Attempt to Set Tare While in Motion<br>0 = Either the tare function is not active or the scale is not in motion.<br>1 = The tare function is active and the scale is in motion. |
| | 6 | Attempt to Zero While in Motion<br>0 = Either the zero function is not active or the scale is not in motion.<br>1 = The zero function is active and the scale is in motion. |
| | 7 | Tare Successful<br>0 = Either the tare function is not active, the scale is in motion, or the tare function was not successfully completed.<br>1 = The tare function was successfully completed. |
| | 8 | Zero Successful<br>0 = Either the zero function is not active, the scale is in motion, or the zero function was not successfully completed.<br>1 = The zero function was successfully completed. |
| | 9 | New Data<br>0 = The status-block data has not been updated by the module since the last block-transfer read.<br>1 = The status-block data has been updated by the module since the last block-transfer read. |
| | 10 | Decimal-Point Location Error<br>0 = The decimal-point location value is valid.<br>1 = An invalid value was entered for the decimal-point location.k-transfer read. |
| | 11 | #Samples Entry Error<br>0 = The #Samples value is valid.<br>1 = An invalid value was entered for the number of samples. |
| | 12 | Motion-Tolerance Entry Error<br>0 = The motion-tolerance value is valid.<br>1 = An invalid value was entered for motion tolerance. |
| | 13 | Zero-Tolerance Entry Error<br>0 = The zero-tolerance value is valid.<br>1 = An invalid value was entered for zero tolerance. |
| | 14 | Real-Time Sample Period Entry Error<br>0 = The real-time sample period value is valid.<br>1 = An invalid value was entered for the real-time sample period. |
| | 15 | WAVERSAVER Selection Error<br>0 = Only one WAVERSAVER selection bit is on.<br>1 = Multiple WAVERSAVER selection bits are on. |

| Word | Bits | Description - Read |
|---|---|---|
| **1** | | **General and Soft Calibration Bits** |
| | 0 | Not Calibrated<br>0 = The current values in the non-volatile memory are valid calibration values.<br>1 = The current values in the non-volatile memory are not valid calibration values — the module is new (uncalibrated) or has bad non-volatile memory. |
| | 1 | Calibration Mode<br>0 = Not in a calibration mode.<br>1 = In a calibration mode. |
| | 2 | Last Calibration Mode<br>0 = Module was last Cal'd in Hard-Cal Mode.<br>1 = Module was last Cal'd in Soft-Cal Mode. |
| | 3 | Last Soft-Cal/C2-Cal Mode — This bit is only valid if bit 2 is on.<br>0 = The module was last calibrated in Hard-Cal mode.<br>1 = The module was last calibrated in either Soft-Cal or C2-Cal mode. |
| | 4 | 4 Write Successful<br>0 = Write not successful.<br>1 = Write to non-volatile memory successful. |
| | 5 | Current Calibration Mode<br>0 = Set for Hard-Cal.<br>1 = Set for Soft-Cal or C2-Cal. |
| | 6 | Current Soft-Cal/C2-Cal Mode — This bit is only valid if bit 5 is on.<br>0 = Set for Soft-Cal mode.<br>1 = Set for C2-Cal mode. |
| | 7 | Calibration Date or ID Error<br>0 = No error<br>1 = An invalid value was entered for the calibration year, month, day, or identification. |
| | 8 | Sensitivity Error<br>0 = Sensitivity value is valid.<br>1 = Sensitivity value entered is invalid. |
| | 9 | Range Error<br>0 = Range value is valid.<br>1 = Range value entered is invalid.d is invalid. |
| | 10 | Incorrect Load-Point Count in C2-Cal<br>0 = The number of load points found during the read matched the number specified.<br>1 = The number of load points found during the read did not match the number specified. |
| | 11 | Load-Point Error in C2-Cal<br>0 = No load-cell error.<br>1 = Either no load points were found, or there was a communication error. |
| | 12 | C2-Cal Read Complete<br>0 = The load-point data has not yet been read, or errors were reported.<br>1 = The load-point data was read successfully, and no errors were reported. |

| Word | Bits | Description - Read |
|---|---|---|
| **1 Cont'd** | 13 | Test-Resistance Value Failure<br>0 = Test-resistance value is within tolerance of the test-resistance value taken at the-factory.<br>1 = Test-resistance value is not within tolerance of the test-resistance value taken at the factory. |
| | 14 | Restore Data Complete<br>0 = Processing of values block-transferred to the module for restoring calibration data is not complete.<br>1 = Processing of values block-transferred to the module for restoring calibration data is complete. If no errors were found, the values have been loaded into the module's non-volatile memory. If errors were found, they have been reported with the error bits. |
| | 15 | EEPROM Failure<br>0 = Successful write to EEPROM detected<br>1 = Unsuccessful write to EEPROM detected<br><br>Available for Series B mode only |

| Word | Bits | Description - Read |
|---|---|---|
| **2** | | **Hardware Calibration Bits** |
| | 0 | Calibration Low-Weight Error<br>0 = The CAL-LO reference weight value entered was OK.<br>1 = The CAL-LO reference weight value entered was invalid. |
| | 1 | Midpoint Linearization Weight Error<br>0 = The MID-LIN reference weight value entered was OK.<br>1 = The MID-LIN reference weight value entered was invalid. |
| | 2 | Calibration High-Weight Error<br>0 = The CAL-HI reference weight value entered was OK.<br>1 = The CAL-HI reference weight value entered was invalid.lid. |
| | 3 | Calibration Low Attempted with Scale in Motion<br>0 = Scale not in motion during calibration low attempt.<br>1 = The calibration control "Calibration-Low-Read" bit was set on, and the scale wa emotion. |
| | 4 | Midpoint Linearization Attempted with Scale in Motion<br>0 = Scale not in motion during midpoint linearization attempt.<br>1 = The calibration control "Midpoint-Linearization-Read" bit was set on, and the scale was in motion. |
| | 5 | Calibration High Attempted with Scale in Motion<br>0 = Scale not in motion during calibration high attempt.<br>1 = The calibration control "Calibration-High-Read" bit was set on, and the scale was in motion. |

| Word | Bits | Description - Read |
|---|---|---|
| **2 Cont'd** | 6 | Midpoint Linearization to Low Difference Error<br>0 = The difference between the CAL-LO and MID-LIN reference points is OK (greater than 100).<br>1 = The difference between the CAL-LO and MID-LIN reference points is not greater than100. |
| | 7 | Calibration High-to-Low Difference Error<br>0 = The difference between the CAL-LO and CAL-HI reference points is OK (greater than 100).<br>1 = The difference between the CAL-LO and CAL-HI reference points is not greater than 100. |
| | 8 | CAL-LO Successful<br>0 = The calibration-low read bit is off, or the scale is in motion.<br>1 = The values for the CAL-LO reference point have been successfully recorded. |
| | 9 | MID-LIN Successful<br>0 = The midpoint-linearization read bit is off, or the scale is in motion.<br>1 = The values for the MID-LIN reference point have been successfully recorded. |
| | 10 | CAL-HI Successful<br>0 = The calibration-high read bit is off, or the scale is in motion.<br>1 = The values for the CAL-HI reference point have been successfully recorded. |
| | 11 | Calibration-Low Volts Error<br>0 = A calibration-low value was entered within the range of –1.0mV/V through +5.0V/V.<br>1 = A calibration-low value of less than –1.0mV/V or greater than +5.0V/V was entered. |
| | 12 | Midpoint-linearization Volts Error<br>0 = A midpoint-linearization value was entered within the range of –1.0mV/V through +5.0V/V.<br>1 = A midpoint-linearization value of less than –1.0mV/V or greater than +5.0V/V was entered. |
| | 13 | Calibration-High Volts Error<br>0 = A calibration-low value was entered within the range of –1.0mV/V through +5.0V/V.<br>1 = A calibration-low value of less than –1.0mV/V or greater than +5.0V/V was entered. |
| | 14 | Reserved for future use |
| | 15 | Configuration-in-Change — For the first seven seconds after the module is powered up, or when you change WAVERSAVER settings, the module reports a busy state. Do not attempt BTRs, BTWs, or try to access values.<br><br>Available for Series B mode only |

| Word | Bits | Description - Read |
|---|---|---|
| **3** | 0-15 | **Gross Weight (16-bit Integer Format)** — This is the current average gross weight value. It can be in the range of –32,768 through +32, 767. Use this value in applications for which 16-bit resolution is adequate. |
| **4** | 0-15 | **Net Weight (16-bit Integer Format)** — This is the current average gross weight value. It can be in the range of –32,768 through +32, 767. Use this value in applications for which 16-bit resolution is adequate. |
| **5** | 0-15 | **Gross Weight (32-bit Floating-Point Format) (MSW)** — This is the most-significant 16 bits of the current average gross weight value in 32-bit floating-point format. |
| **6** | 0-15 | **Gross Weight (32-bit Floating-Point Format) (LSW**) — This is the least-significant 16 bits of the current average gross weight value in 32-bit floating-point format. |
| **7** | 0-15 | **Net Weight (32-bit Floating-Point Format) (MSW)** — This is the most-significant 16 bits of the current average net weight value in 32-bit floating-point format.t. |
| **8** | 0-15 | **Net Weight (32-bit Floating-Point Format) (LSW)** — This is the least-significant 16 bits of the current average net weight value in 32-bit floating-point format. |
| **9** | 0-15 | **Calibration Year** — This is the year in which the module was calibrated. (1994–2100) |
| **10** | 0-15 | **Calibration Month** — This is the month of the year in which the module was calibrated. (1–12) |
| **11** | 0-15 | **Calibration Day** — This is the day of the month in which the module was calibrated. (1–31) |
| **12** | 0-15 | **Calibration Identification (MSW**) — The two most-significant alpha-numeric (ASCII) characters representing the ID of the person who last calibrated this module. |
| **13** | 0-15 | **Calibration Identification (LSW)** — The two least-significant alpha-numeric (ASCII) characters representing the ID of the person who last calibrated this module. |
| **14** | 0-15 | **Calibration Low Weight (MSW)** — This word contains the 3 most-significant decimal digits (stored in natural binary format) of the 6-digit weight value used for the CAL-LO reference point. |
| **15** | 0-15 | **Calibration Low Weight (LSW**) — This word contains the 3 least-significant decimal digits (stored in natural binary format) of the 6-digit weight value used for the CAL-LO reference point. |
| **16** | 0-15 | **Calibration High Weight (MSW**) — This word contains the 3 most-significant decimal digits (stored in natural binary format) of the 6-digit weight value used for the CAL-HI reference point. |
| **17** | 0-15 | **Calibration HIgh Weight (LSW)** — This word contains the 3 least-significant decimal digits (stored in natural binary format) of the 6-digit weight value used for the CAL-HI reference point. |
| **18** | 0-15 | **Calibration Midpoint-Linearization Weigh (MSW)** — This word contains the 3 most-significant decimal digits (stored in natural binary format) of the 6-digit weight value used for the MOD-LIN reference point. (Optional) |

| Word | Bits | Description - Read |
|---|---|---|
| **19** | 0-15 | **Calibration Midpoint-Linearization Weigh (LSW)** — This word contains the 3 least-significant decimal digits (stored in natural binary format) of the 6-digit weight value used for the MOD-LIN reference point. (Optional) |
| **20** | 0-15 | **Calibration Low Volts (MSW)** — This is the most-significant 16 bits of the 32-bit floating-point format volts value calculated for the CAL-LO reference point. |
| **21** | 0-15 | **Calibration Low Volts (LSW)** — This is the least-significant 16 bits of the 32-bit floating-point format volts value calculated for the CAL-LO reference point. |
| **22** | 0-15 | **Calibration High Volts (MSW)** — This is the most-significant 16 bits of the 32-bit floating-point format volts value calculated for the CAL-HI reference point. |
| **23** | 0-15 | **Calibration High Volts (LSW)** — This is the least-significant 16 bits of the 32-bit floating-point format volts value calculated for the CAL-HI reference point. |
| **24** | 0-15 | **Calibration Midpoint Linearization Volts (MSW)** — This is the most-significant 16 bits of the 32-bit floating-point format volts value calculated for the MID-LIN reference point. (Optional) |
| **25** | 0-15 | **Calibration Midpoint Linearization Volts (LSW)** — This is the least-significant 16 bits of the 32-bit floating-point format volts value calculated for the MID-LIN reference point. (Optional) |
| **26** | 0-15 | **Test Resistance Values (MSW)** — This word contains the 3 most-significant decimal digits (stored in natural binary format) of a 6-digit raw input value for testing the module and troubleshooting the system. |
| **27** | 0-15 | **Test Resistance Values (LSW)** — This word contains the 3 least-significant decimal digits (stored in natural binary format) of a 6-digit raw input value for testing the module and troubleshooting the system. |
| **28** | 0-7 | **Firmware Revision** — In ASCII. (A through Z) |
| | 8-15 | **Firmware Series** — In ASCII. (A through Z) |

| Word | Bits | Description - Read |
|---|---|---|
| **29** | 0 | **Double Density Mode** — This word stores the jumper (J1) location:<br>0 = The module is in single-density (Series A) mode.<br>1 = The module is in double-density (Series B) mode. |
| | 1 | **Setpoint Weight Descriptor Error**<br>0 = Valid value entered for setpoint weight description.<br>1 = Value entered for setpoint weight description is invalid. Valid values are 0 (kilograms) and 1 (pounds). |
| | 2 | **Setpoint Value Error**<br>0 = Valid value entered for setpoint.<br>1 = Value entered for setpoint is invalid. Valid values are -999999 through 999999. |
| | 3 | **Deadband Value Error**<br>0 = Valid value entered for deadband.<br>1 = Value entered for deadband is invalid. Valid values are -999999 through 999999. |

| Word | Bits | Description - Read |
|---|---|---|
| **29 Cont'd** | 4 | Preact Value Error<br>0 = Valid value entered for preact.<br>1 = Value entered for preact is invalid. Valid values are -999999 through 999999.999. |
| | 5 | **Setpoint Setup Error**<br>0 = Valid setpoint setup.<br>1 = Improper configuration of setpoint, preact, and deadband. |
| | 6 | **RoC Weight Descriptor Error**<br>0 = Valid value entered for RoC weight description.<br>1 = Value entered for RoC weight description is invalid. Valid values are 0 (kilo-grams) and 1 (pounds). |
| | 7 | **RoC Evaluation Period Error**<br>0 = Valid value entered for RoC evaluation period.<br>1 = Value entered for RoC evaluation period is invalid. Valid values are 1 millisecond through 32.767 seconds. |
| | 8 | **RoC Units Error**<br>0 = Valid value entered for RoC units.<br>1 = Value entered for RoC unit is invalid. Valid values are 0 (seconds), 1 (minutes), and 2 (hours). |
| | 9-15 | Reserved for future use |

| Word | Bits | Description - Read |
|---|---|---|
| **30** | 0-15 | **Setpoint 1 (MSW)** — This is the most-significant 16 bits of the 32-bit floating-point format<br>setpoint 1 value. This data is used only when bit 0 of word 29 is on. (hours).lid. |
| **12** | 0-15 | **Setpoint 1 (LSW)** — This is the least-significant 16 bits of the 32-bit floating-point format<br>setpoint 1 value. This data is used only when bit 0 of word 29 is on. |
| **32** | 0-15 | **Setpoint 2 (MSW**) — This is the most-significant 16 bits of the 32-bit floating-point format<br>setpoint 2 value. This data is used only when bit 0 of word 29 is on. |
| **33** | 0-15 | **Setpoint 2 (LSW)** — This is the least-significant 16 bits of the 32-bit floating-point format<br>setpoint 2 value. This data is used only when bit 0 of word 29 is on. |
| **34** | 0-15 | **Deadband 1 (MSW)** – This is the most-significant 16 bits of the 32-bit floating-point format<br>deadband 1 value. This data is used only when bit 0 of word 29 is on. |
| **35** | 0-15 | **Deadband 1 (LSW)** — This is the least-significant 16 bits of the 32-bit floating-point format<br>deadband 1 value. This data is used only when bit 0 of word 29 is on. |

| Word | Bits | Description - Read |
|---|---|---|
| **36** | 0-15 | **Deadband 2 (MSW)** — This is the most-significant 16 bits of the 32-bit floating-point format<br>deadband 2 value. This data is used only when bit 0 of word 29 is on. |
| **37** | 0-15 | **Deadband 2 (LSW)** — This is the least-significant 16 bits of the 32-bit floating-point format<br>deadband 2 value. This data is used only when bit 0 of word 29 is on. |
| **38** | 0-15 | **Preact 1 (MSW)** – This is the most-significant 16 bits of the 32-bit floating-point format preact<br>1 value. This data is used only when bit 0 of word 29 is on. |
| **39** | 0-15 | **Preact 1 (LSW)** — This is the least-significant 16 bits of the 32-bit floating-point format<br>preact 1 value. This data is used only when bit 0 of word 29 is on. |
| **40** | 0-15 | **Preact 2 (MSW**) — This is the most-significant 16 bits of the 32-bit floating-point format<br>preact 2 value. This data is used only when bit 0 of word 29 is on. |
| **41** | 0-15 | **Preact 2 (LSW)** — This is the least-significant 16 bits of the 32-bit floating-point format<br>preact 2 value. This data is used only when bit 0 of word 29 is on. |
| **42** | 0-15 | **SP Weight Descriptio**n – This word stores the unit of measure for weight in setpoint calculations:<br>0 = kilograms<br>1 = pounds |
| **43** | 0-15 | **RoC Time Units** – This word stores the rate-of-change in time units:<br>0 = seconds<br>1 = minutes<br>2 = hours |
| **44** | 0-15 | **RoC Evaluation Period** — This word stores the value for time over which a rate-of-change<br>calculation is made. (1 millisecond - 32.767 seconds) |
| **45** | 0-15 | **RoC Weight Description** – This word stores the unit of measure for weight in rate-of-change calculations:<br>0 = kilograms<br>1 = pounds |
| **46** | 0-15 | **RoC Calculation (MSW)** — This is the most-significant 16 bits of the 32-bit floating-point format RoC value. This data is used only when bit 0 of word 29 is on. |
| **47** | 0-15 | **RoC Calibration (LSW) -**This is the least-significant 16 bits of the 32-bit floating-point format RoC value. This data is used only when bit 0 of word 29 is on. |
| **48** | 0-15 | **Calibration/Diagnostics Control** — This word stores calibration and diagnostic information that you view on the active window for configuration verification. |
| **49** | 0-15 | **Decimal Point Location** - This word stores the number of digits to the right of the decimal point for all weight integer values. |
| **50** | 0-15 | **Motion Tolerance (MSW)** — This word stores the 3 most-significant decimal digits (stored in natural binary format) of the 6-digit value that defines the weight change that will trigger the in-motion flag to be set. You entered this value on the Configuration screen. |

| Word | Bits | Description - Read |
|---|---|---|
| **51** | 0-15 | **Motion Tolerance (LSW)** — This word stores the 3 least-significant decimal digits (stored in natural binary format) of the 6-digit value that defines the weight change that will trigger the in-motion flag to be set. You entered this value on the Configuration screen. |
| **52** | 0-15 | **Number of Averages** — This word stores the number of weight samples used to calculate the average current weight that you entered on the Configuration screen. |
| **53** | 0-15 | **Number of Load Cells** — This word stores the number of load cells that you entered on the Calibration screen. |
| **54** | 0-15 | Reserved for future use |
| **55** | 0-15 | Reserved for future use |
| **56** | 0-15 | **Real-time Sample Period** — This word stores the period at which the module puts a new average weight value into the read block and turns on the new-data bit. You entered this value on the Configuration screen. |
| **57** | 0-15 | Reserved for future use |
| **58** | 0-15 | Reserved for future use |
| **59** | 0-15 | **WAVERSAVER Selection** — This word stores the lowest frequency you want to reject. You entered this value on the Configuration screen. |
| **60** | 0-15 | **Weight Functions** — This word stores the tare-enable and zero-enable values you selected on the Configuration screen. |
| **61** | 0-15 | Weight Modes — This word stores the value (lb. or kg.) that you selected on the Configuration screen. |
| **62** | 0-15 | **Zero Tolerance (MSW**) — This word stores the 3 most-significant decimal digits (stored in natural binary format) of the 6-digit value that defines the acceptable tolerance for zero weight. You entered this value on the Configuration screen. |
| **63** | 0-15 | **Zero Tolerance (LSW)** — This word contains the 3 least-significant decimal digits (stored in natural binary format) of the 6-digit value that defines the acceptable tolerance for zero weight. You entered this value on the Configuration screen. |

## Saving the Tare and Zero Values in Non-Volatile Memory

By default, the Weigh Scale module typically stores the tare and zero values in internal memory. These values are not included in read or write block transfer data, so they are not stored in the PLC processor data table. This means that any time the module loses power, the tare and zero values are reset. You must repeat the tare and zero functions to restore the tare and zero values in use before power to the module was lost.

To avoid having to repeat the tare and zero functions, you can store the current tare and zero values in non-volatile memory. These values are restored automatically when power is restored to the module. To store tare and zero values in non-volatile memory:

Step 1. In write block word 32, set bit 7 (accept data) to 1.

Step 2. Wait until the module sets read block word 1, bit 4 (write successful) to 1.

Step 3. In write block word 32, reset bit 7 to 0.

## Block Transfer, Write

### Editing the Configuration/ Calibration Block

This appendix shows you how to calibrate the module by directly manipulating the configuration/calibration block.

#### Performing a C2 Calibration

To perform a C2 calibration by editing the configuration/calibration block, you must:

- enter the appropriate values for these words in the configuration/calibration block
- perform the C2 calibration

#### Enter Values in the Block

Before performing a C2 calibration, enter the appropriate values for these words in the configuration/calibration block:

| Word | Description |
|---|---|
| **0** | WAVERSAVER setting |
| 1 | weight units & auto-zero status |
| 3 | decimal point location |
| 4 | motion tolerance (MSW) |
| 5 | motion tolerance (LSW) |
| 6 | zero tolerance (MSW |
| 7 | zero tolerance (LSW) |
| 8 | number of samples used for averaging (1-200) |
| 9 | real-time sample period (50-10,000ms) |
| 14 | calibration low weight (MSW) |

| Word | Description |
|---|---|
| 15 | calibration low weight (LSW) |

## Perform the C2 Calibration

Step 1. To place the module in calibration mode, in write-block word 32,set bit 0 and bits 2 & 3 to **1**. In read-block word 1, bit 1 and bits 5 & 6 are set to **1**. If the module has not previously been calibrated, in read-block word 1, bit 0 is set to **1**.

**NOTE:** *Bits 0, 2 and 3 are to remain on during the entire Calibration process.*

Step 2. Set word 32, bit 8 ON to read load point data in C2-Cal mode. If successful, this will turn on read block word 1, bit 12 (C2 read complete.)

Step 3. Perform a CAL-LO:

- With the low calibration weight (or no weight) on the scale, in write-block word 32, set bit 4 to **1**. If no errors occur, in approximately 12 seconds, read-block word 2, bit 8 is set to **1**. (CAL-LO successful)
- In write-block word 32, reset bit 4 to **0**.

Step 4. Accept the calibration data:

- In write-block word 32, set bit 7 to **1**. If no errors occur, in read-block word 1, bit 4 is set to **1**. (write successful)
- In write-block word 32, reset bit 7 to **0**.

Step 5. To exit calibration mode, in write-block word 32, reset bit 0 to **0**. In read-block word 1, bit 1 and bit 5 & 6 are set to **0**.

## Performing a Hard Calibration

To perform a hard calibration by editing the configuration block, you must:

- Enter the configuration values for the appropriate words in the configuration/calibration block, then
- perform the hard calibration

## Enter Values in the Block

Before performing a hard calibration, enter the appropriate values for these words in the configuration/calibration block:

| Word | Description - Write |
|---|---|
| **0** | WAVERSAVER setting |
| 1 | weight units & auto-zero status |
| 3 | decimal point location |
| 4 | motion tolerance (MSW) |
| 5 | motion tolerance (LSW) |
| 6 | zero tolerance (MSW |
| 7 | zero tolerance (LSW) |
| 8 | number of samples used for averaging (1-200) |
| 9 | real-time sample period (50-10,000ms) |
| 14 | calibration low weight (MSW) |
| 15 | calibration low weight (LSW) |
| 16 | calibration mid weight (MSW) |
| 17 | calibration mid weight (LSW) |
| 18 | calibration high weight (MSW) |
| 19 | calibration high weight (LSW) |

## Perform the Hard Calibration

Step 1. To place the module in calibration mode, in write-block word 32, set bit 0 to **1**. In read-block word 1, bit 1 is set to **1** to indicate the calibration mode. If the module has not previously been calibrated, in read-block word 1, bit 0 is set to **1**.

Step 2. Perform a CAL-LO:

- Place the calibration low weight value in words 14 and 15. Be sure to observe the correct decimal point location. (CAL–LO weight)

- With the low calibration weight (or no weight) on the scale, in write-block word 32, set bit 4 to **1**. If no errors occur, in approximately 12 seconds, read-block word 2, bit 8 is set to **1**. (CAL-LO successful)
- In write-block word 32, reset bit 4 to **0**.

Step 3. Optionally, perform a MID-LIN:

- Place the calibration mid weight value in words 16 and 17. Be sure to observe the correct decimal point location.
- With the midpoint linearization calibration weight on the scale, in write-block word 32, set bit 5 to **1**. If no errors occur, in approximately 12 seconds, in read-block word 2, bit 9 is set to **1**. (MID-LIN successful)
- In write-block word 32, reset bit 5 to **0**.

Step 4. Perform a CAL-HI:

- Place the calibration high weight value in words 18 and 19. Be sure to observe the correct decimal point location.
- With the high calibration weight on the scale, in write-block word 32, set bit 6 to **1**. If no errors occur, in approximately 12 seconds, in read-block word 2, bit 10 is set to **1**. (CAL-HI successful)
- In write-block word 32, reset bit 6 to **0**.

Step 5. Accept the calibration data:

- In write-block word 32, set bit 7 to **1**. If no errors occur, in read-block word 1, bit 4 is set to **1**. (write successful)
- In write-block word 32, reset bit 7 to **0**.

Step 6. To exit calibration mode, in write-block word 32, reset bit 0 to **0**. In read-block word 1, bit 1 and bit 5 & 6 are set to **0**.

## Restoring the Module

After you have calibrated the module, you must copy the voltage values in the read block words 20, 21, 22, 23, 24, and 25 into the write block words 20, 21, 22, 23, 24, and 25.

**NOTE:** *The values in the read block are not in the same order as those in the write block. If these values are not in the write block, the restore function does not work. All of these parameters must have valid values before the restore function can be completed.*

- low weight
- mid weight
- high weight
- low volts
- mid volts
- high volts

To restore the module:

Step 1. To place the module in calibration mode, in write-block word 32, set bit 0 to **1.**

Step 2. Wait for the module to enter calibration mode (read block word 1, bit 1 is set to **1,** if the module has not previously been calibrated, in read-block word 1, bit 0 is set to **1** and the Cal/Com LED flashes red).

Step 3. Set word 32, bit 1 (the restore bit) to **1**. When the restore is complete, in read-block word 1, bit 14 is set to **1** (restore data complete).

Step 4. In write block word 32, set bit 7 to **1**.

Step 5. Wait for read block word 1, bit 4 to be set to **0**.

Step 6. To exit calibration mode, in write-block word 32, reset bit 0, bit 1, and bit 7 to **0**. In read-block word 1, bit 1 and bit 14 are set to **0**.

## Configuration/ Calibration Block

| Word | Bits | Description - Write |
|---|---|---|
| **0** | | **WAVERSAVER Selection** — Use one of these bits to select the lowest frequency to reject. Only changes of weight at frequencies below this value is reflected in the input value passed on in the status block as the weight value. This frequency-rejection action eliminates process noise and causes a more stable weight reading. These selections are mutually exclusive. If you turn on more than one bit, the WAVERSAVER selection error is reported in bit 15 of word 0 in the status block. |
| | 0 | 1 = Reject all frequencies of 7.50 Hz and above. |
| | 1 | 1 = Reject all frequencies of 3.50 Hz and above. |
| | 2 | 1 = Reject all frequencies of 1.00 Hz and above. |
| | 3 | 1 = Reject all frequencies of 0.50 Hz and above. (Default selection.) |
| | 4 | 1 = Reject all frequencies of 0.25 Hz and above. |

| Word | Bits | Description - Write |
|---|---|---|
| **1** | | Weight Modes — These are modes that can be changed at any time. If you save the data to non-volatile memory, these mode selections are saved. |
| | 0 | Unit of Weight (Lb/Kg) — Set this bit to reflect the units of the calibration weight at the time of calibration.<br>0 = The weight unit is Kg.<br>1 = The weight unit is Lb. (Default selection.) |
| | 1 | **Auto-Zero** — With auto-zero enabled, whenever the weight on the scale (the absolute value of the zero offset from the calibration zero point) is within zero tolerance and the scale is not in motion for 1s + (#samples + 1)(0.05s), the gross weight is set to zero. Where #samples is the number of weight samples used to calculate the average current weight. You enter the #samples value in word 8. You enter the motion-tolerance value in words 4 and 5. You enter the zero-tolerance value in words 6 and 7.<br>0 = Auto-Zero disabled. (Default selection.)<br>1 = Auto-Zero enabled. |
| **2** | | **Weight Functions** — Use these functions to modify the module reference points. |
| | 0 | **Set Tare** — If this bit is on while the scale is in motion, the “attempt to set tare while in motion” error bit is turned on.<br>0 = Leave the tare value unchanged.<br>1 = If the scale is not in motion, continually set the tare value equal to the gross weight, resulting in a zero value for the net weight. |

| Word | Bits | Description - Write |
|---|---|---|
| | 1 | **Zero** — If this bit is on while the scale is in motion, the "attempt to zero while in motion" error bit is turned on.<br>0 = Leave the gross weight value unchanged.<br>1 = If the scale is not in motion and the gross weight (the absolute value of the zero offset from the calibration zero point) is within zero tolerance, continually set the gross weight value to zero. |
| **3** | 0-15 | **Decimal-Point Location** — Enter this value to set the number of digits to the right of the decimal point for all weight integer values. (0 through 6) |
| **4** | 0-15 | **Motion Tolerance (MSW)** — This word contains the 3 most-significant decimal digits (stored in natural binary format) of the 6-digit value that defines the weight change that will trigger the in-motion flag to be set. The weight change is measured as the difference between the current average weight value and the average weight value sampled one second earlier. (0 through 999) |
| **5** | 0-15 | **Motion Tolerance (LSW)** — This word contains the 3 least-significant decimal digits (stored in natural binary format) of the 6-digit value that defines the weight change that will trigger the in-motion flag to be set. (0 through 999) |
| **6** | 0-15 | **Zero Tolerance (MSW)** — This word contains the 3 most-significant decimal digits (stored in natural binary format) of the 6-digit value that defines the acceptable tolerance for zero weight. (0 through 999) |
| **7** | 0-15 | **Zero Tolerance (LSW)** — This word contains the 3 least-significant decimal digits (stored in natural binary format) of the 6-digit value that defines the acceptable tolerance for zero weight. (0 through 999) |
| **8** | 0-15 | **#Samples** — The number of weight samples used to calculate the average current weight. Since an A/D conversion takes 50ms, the weight is sampled every 50ms. After each sample, the average is calculated based on the last number of samples as specified. (1 through 200) |
| **9** | 0-15 | **Real-Time Sampling Period** — This value sets the period at which the module puts a new average weight value into the read block and turns on the new-data bit (bit 9 of word 0). If a real-time sample period has passed without a block-transfer read, the real-time sample period read-block time-out bit (bit 1 of word 0) in the status block is turned on.<br>Enter the period value in milliseconds. (50 through 10,000 in increment of 50) |
| **10** | 0-15 | **Sensitivity (MSW) (Soft-Cal Only)** — This word contains the 3 most-significant decimal digits (stored in natural binary format) of the 6-digit full-scale voltage value as taken from the load-cell calibration data sheet for the load cell being used. |
| **11** | 0-15 | **Sensitivity (LSW) (Soft-Cal Only)** — This word contains the 3 least-significant decimal digits (stored in natural binary format) of the 6-digit full-scale voltage value as taken from the load-cell calibration data sheet for the load cell being used. |
| **12** | 0-15 | **Range (MSW) (Soft-Cal Only)** — This word contains the 3 most-significant decimal digits (stored in natural binary format) of the 6-digit weight-capacity value as taken from the load-cell calibration data sheet for the load cell being used. For multiple load cells, this is the range value generated by the calibration program. |
| **13** | 0-15 | **Range (LSW) (Soft-Cal Only)** — This word contains the 3 least-significant decimal digits (stored in natural binary format) of the 6-digit weight-capacity value as taken from the load-cell calibration data sheet for the load cell being used. For multiple load cells, this is the range value generated by the calibration program. |

| Word | Bits | Description - Write |
|---|---|---|
| **14** | 0-15 | **Calibration Low Weight (MSW)** — This word contains the 3 most-significant decimal digits (stored in natural binary format) of the 6-digit weight value used for the CAL-LO reference point. |
| **15** | 0-15 | **Calibration Low Weight (LSW)** — This word contains the 3 least-significant decimal digits (stored in natural binary format) of the 6-digit weight value used for the CAL-LO reference point. |
| **16** | 0-15 | **Calibration Midpoint-Linearization Weight (MSW)** — This word contains the 3 most-significant decimal digits (stored in natural binary format) of the 6-digit weight value used for the MID-LIN reference point. (Optional. Set to 0 if not used.) |
| **17** | 0-15 | **Calibration Midpoint-Linearization Weight (LSW)** — This word contains the 3 least-significant decimal digits (stored in natural binary format) of the 6-digit weight value used for the MID-LIN reference point. (Optional. Set to 0 if not used.) |
| **18** | 0-15 | **Calibration High Weight (MSW)** — This word contains the 3 most-significant decimal digits (stored in natural binary format) of the 6-digit weight value used for the CAL-HI reference point. |
| **19** | 0-15 | **Calibration High Weight (LSW)** — This word contains the 3 least-significant decimal digits (stored in natural binary format) of the 6-digit weight value used for the CAL-HI reference point. |
| **20** | 0-15 | **Calibration Low Volts (MSW)** — This is the most-significant 16 bits of the 32-bit floating-point format volts value calculated for the CAL-LO reference point. This data is used only when bit 1 of word 32 is on. |
| **21** | 0-15 | **Calibration Low Volts (LSW)** — This is the least-significant 16 bits of the 32-bit floating-point format volts value calculated for the CAL-LO reference point. This data is used only when bit 1 of word 32 is on. |
| **22** | 0-15 | **Calibration Midpoint Linearization Volts (MSW)** — This is the most-significant 16 bits of the 32-bit floating-point format volts value calculated for the MID-LIN reference point. This data is used only when bit 1 of word 32 is on. (Optional. Set to 0 if not used.) |
| **23** | 0-15 | **Calibration Midpoint Linearization Volts (LSW**) — This is the least-significant 16 bits of the 32-bit floating-point format volts value calculated for the MID-LIN reference point.<br>This data is used only when bit 1 of word 32 is on. (Optional. Set to 0 if not used.) |
| **24** | 0-15 | **Calibration High Volts (MSW**) — This is the most-significant 16 bits of the 32-bit floating-point format volts value calculated for the CAL-HI reference point. This data is used only when bit 1 of word 32 is on.MID-LIN reference point. |
| **25** | 0-15 | **Calibration High Volts (LSW)** — This is the least-significant 16 bits of the 32-bit floating-point format volts value calculated for the CAL-HI reference point. This data is used only when bit 1 of word 32 is on.MID-LIN reference point. |
| **26** | 0-15 | **Calibration Year** — This is the year in which the module was calibrated. (1994–2100) |
| **27** | 0-15 | **Calibration Month** — This is the month of the year in which the module was calibrated. (1–12) |
| **28** | 0-15 | **Calibration Day** — This is the day of the month in which the module was calibrated. (1–31) |

| Word | Bits | Description - Write |
|---|---|---|
| **29** | 0-15 | **Calibration Identification (MSW)** — The two most-significant upper-case alphanumeric (ASCII) characters representing the ID of the person who last calibrated this module. |
| **30** | 0-15 | **Calibration Identification (LSW)** — The two least-significant upper-case alphanumeric (ASCII) characters representing the ID of the person who last calibrated this module. |
| **31** | 0-15 | **Number of Load points in C2-Cal** — This is the number of load points connected. It is used to verify that all of the load points were found during the automatic search for calibration data. (0 through 8) |

| Word | Bits | Description - Write |
|---|---|---|
| **32** | | **Calibration/Diagnostic Control** — Use these bits to calibrate the module, run diagnostics on the module, and control data storage in the non-volatile memory on the module. |
| | 0 | **Calibration Mode** — If you turn off this bit before you turn off the accept data bit (bit 7 of word 32) the new calibration is lost.<br>0 = Disable calibration mode.<br>1 = Enable calibration mode. |
| | 1 | **Restore Calibration Data** — This bit determines whether to use the calibration data in this block to restore calibration values regardless of the state of the accept data bit (bit 7 of word 32). Calibration data here refers to all calibration data including calibration-volts reference points. Using calibration data here refers to using old calibration data stored in the PLC data table to restore the calibration data on the module.<br>0 = Disable the writing of calibration restoration data into non-volatile memory.<br>1 = Enable the writing of calibration restoration data into non-volatile memory. |
| | 2 | **Hard/Soft Calibration** — This bit is relevant only if bit 1 is off.<br>0 = Hard calibration mode.<br>1 = Soft calibration or C2 calibration mode.n the module. |
| | 3 | **Soft-CalC2-Cal Mode** — This bit is relevant only if bit 1 is off and bit 2 is on.<br>0 = Set Soft-Cal mode.<br>1 = Set C2-Cal mode. The module will ignore the configuration block values for sensitivity and range. |
| | 4 | **Calibration-Low Read**<br>0 = Disable calibration-low read.<br>1 = Enable calibration-low read. The module sets the averages to 200, waits 12 seconds, reads the value from the scale, stores it as the calibration-low value, and uses it in conjunction with the calibration-low weight for the CAL-LO reference point. As long as this bit is on and the scale is not in motion, the module will read the calibration-low value continually. |

| Word | Bits | Description - Write |
|---|---|---|
| **32 Cont'd** | 5 | **Midpoint-Linearization Read (Optional)**<br>0 = Disable midpoint linearization read.<br>1 = Enable midpoint linearization read. The module sets the averages to 200, waits 12 seconds, reads the value from the scale, stores it as the midpoint linearization value, and uses it in conjunction with the midpoint linearization weight for the MID-LIN reference point. As long as this bit is on and the scale is not in motion, the module will read the midpoint linearization value continually. |
| | 6 | **Calibration-High Read**<br>0 = Disable calibration-high read.<br>1 = Enable calibration high read. The module sets the averages to 200, waits 12 seconds, reads the value from the scale, stores it as the calibration-high value, and uses it in conjunction with the calibration-high weight for the CAL-HI reference point. As long as this bit is on and the scale is not in motion, the module will read the calibration-high value continually. |
| | 7 | **Accept Data** — For accepting new calibration data.<br>0 = Disable accept data.<br>1 = Enable accept data. If in calibration mode (bit 0), write CAL-LO, MID-LIN, and CAL-HI reference-point data to the module's non-volatile memory. |
| | 8 | **Read Load-Point Data in C2-Cal**<br>0 = Disable read load-point data.<br>1 = Enable read load-point data. Read the calibration data from all load-points found on the C2-Cal 2-wire bus and is used to automatically calculate the information for sensitivity and range for C2-Cal. |
| | 9 | **Read On-Board Resistance (Diagnostics Use Only)** — Use this bit to connect resistance across the sense and signal lines to isolate weight-reading problems. If the weight reading with this resistance connected is stable and repeatable, the input section of the module is functioning correctly.<br>0 = Disconnect on-board resistance.<br>1 = Connect on-board resistance. |
| | 10 | **Run Diagnostics**<br>0 = Disable on-board diagnostics.<br>1 = Run the module's on-board diagnostics. The module does not block-transfer while this is running. |
| **33** | 0-15 | **Setpoint 1 (MSW)** — This is the most-significant 16 bits of the 32-bit floating-point format setpoint 1 value. |
| **34** | 0-15 | **Setpoint 1 (LSW)** — This is the least-significant 16 bits of the 32-bit floating-point format setpoint 1 value. |
| **35** | 0-15 | **Setpoint 2 (MSW)** — This is the most-significant 16 bits of the 32-bit floating-point format setpoint 2 value. |
| **36** | 0-15 | **Setpoint 2 (LSW)** — This is the least-significant 16 bits of the 32-bit floating-point format setpoint 2 value. |
| **37** | 0-15 | **Deadband 1 (MSW)** — This is the most-significant 16 bits of the 32-bit floating-point format deadband 1 value. |
| **38** | 0-15 | **Deadband 1 (LSW)** — This is the least-significant 16 bits of the 32-bit floating-point format deadband 1 value. |

| Word | Bits | Description - Write |
|---|---|---|
| **39** | 0-15 | **Deadband 2 (MSW)** — This is the most-significant 16 bits of the 32-bit floating-point format deadband 2 value. |
| **40** | 0-15 | **Deadband 2 (LSW)** — This is the least-significant 16 bits of the 32-bit floating-point format deadband 2 value. |
| **41** | 0-15 | **Preact 1 (MSW)** — This is the most-significant 16 bits of the 32-bit floating-point format preact 1 value. |
| **42** | 0-15 | **Preact 1 (LSW)** — This is the least-significant 16 bits of the 32-bit floating-point format preact 1 value. |
| **43** | 0-15 | **Preact 2 (MSW)** — This is the most-significant 16 bits of the 32-bit floating-point format preact 2 value. |
| **44** | 0-15 | **Preact 2 (LSW)** — This is the least-significant 16 bits of the 32-bit floating-point format preact 2 value. |
| **45** | 0-15 | **SP Weight Description** — This word stores the unit of measure for weight in set-point calculations:<br>0 = kilograms<br>1 = pounds |
| **46** | 0-15 | **RoC Time Units** — This word stores the unit of measure for time in rate-of-change calculations:<br>0 = seconds<br>1 = minutes<br>2 = hours |
| **47** | 0-15 | **RoC Evaluation Period** — This word stores the value for time over which a rate-of-change calculation is made. (1 millisecond - 32.767 seconds) |
| **48** | 0-15 | **RoC Weight Description** — This word stores the unit of measure for weight in rate-of-change calculations:<br>0 = kilograms<br>1 = pounds |

## Creating Setpoints

If you set the module for double density (Series B) mode, it supports two setpoints. Each setpoint is made up of:

- **Weight Description —** defines the unit of measure for weight in setpoint calculations. Valid values for weight descriptions are:

  – 0 = kilograms
  – 1 = pounds

- **Setpoint Value —** target weight value. Valid values for setpoint values are -999999 through 999999

- **Deadband —** used to separate the "turn-off" weight. At the actual switching point, the deadband prevents switching "chatter." Valid values for deadband values are -999999 through 999999
- **Preact Value —** accounts for delay in the weighing system due to mechanical delays, material in flight, or other system delays. Valid values for deadband values are -999999 through 999999

Example values are shown below:

Weight Description = pounds
Setpoint = 100 lb.
Preact = -10 lb.
Deadband = -15 lb.

The module sets the comparison result bit to ON when the weight value is _ (greater than or equal to) 90 lb., i.e.,

(100 lb. + (-10 lb.))_ 90 lb. (preact)

When the weight value is (less than or equal to) 85 lb., i.e.,

(100 lb. + (-15 lb.)) 85 lb. (deadband)

then the module sets the comparison result bit to OFF. In addition, taring the module, zeroing the module, emptying the vessel, or reducing the weight below the deadband value resets these bits to OFF

## Setpoint Status Bits

The comparison result bits are single transferred to bits 10 and 11 (octal) to the input image word that corresponds to the module's physical location in the chassis. When the weight value is to the sum of (setpoint1 + preact1), then bit 10 is set to ON. Bit 11 is set to ON when the weight value _ to the sum of (setpoint2 + preact2). These bits are set to OFF when the weight value is (setpoint + deadband); for example, when we tare or zero the scale.

# CHAPTER 8 - TROUBLESHOOTING

## A Brief Description of Chapter 8

This chapter gives you information for troubleshooting your system. We list these in order of ease of performing and likelihood of helping you isolate the problem.

## Diagnostics Reported by the Module

At power-up, the module checks for:

- Correct RAM operation
- EPROM operation
- EEPROM operation

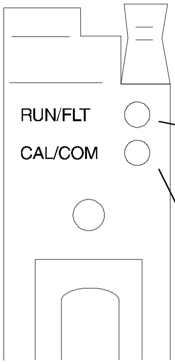
During this self-diagnostic check, the RUN/FLT (fault) indicator flashes green at a rate of 5 to 10 times a second. (We show the indicators in Figure 12.1.) This self-diagnostic check lasts from 2 to 30 seconds, depending on the WAVERSAVER selection; the lower the frequency, the longer the time.

When it completes this check satisfactorily, the RUN/FAULT indicator stops this rapid flashing. However, if the module does not
have valid calibration data, the RUN/FAULT indicator flashes green at a rate of once a second.

When it completes this check satisfactorily and the module has valid calibration data, the RUN/FAULT indicator becomes a steady green. If a fault is found initially or occurs later, the RUN/FAULT indicator turns red.

The bottom indicator is the calibrate/communication indicator:

- This indicator flashes green when doing block-transfers
- It flashes red during calibration




| Indicator | When Green | When Red |
|---|---|---|
| RUN/FAULT | **Flashes 5Hz** - during self check at power-up.<br><br>**Flashes 1HZ** - after self check until valid calibration<br><br>**Solid** - after self check and valid calibration | solid - a fault is found |
| CAL/COM | **Flashes** - during block-transfer | Flashes - during calibration |

## Troubleshooting with the Indicators

This table shows indications, probable causes and recommended actions to correct common faults which may occur.

| Indication | Probable Cause | Recommended Action |
|---|---|---|
| Both indicators are OFF | No power to module | Check power to I/O chassis. Recycle as necessary. |
| | Possible short on the module<br>LED driver failure | Replace module. |
| RUN/FLT indicator ON red RUN/FLT indicator ON red | Microprocessor, oscillator or EPROM failure | Replace module. |
| | If immediately after power-up, indicates RAM or EPROM failure. | Replace module. |
| | If during operation, indicates possible microprocessor or backplane interface failure. | Replace module. |
| RUN/FLT indicator is flashing green at 5-10HZ | Power-up diagnostics in progress | Normal operation for the first 2 to 30 seconds |

| Indication | Probable Cause | Recommended Action |
|---|---|---|
| RUN/FLT indicator is flashing green at 1 HZ but CAL/COM indicator is off | Power-up diagnostics successfully completed, but no valid calibration data. | Calibrate the Module |
| RUN/FLT indicator is solid green | Power-up diagnostics successfully completed, and valid calibration data on board. | Normal Operation |
| CAL/COM indicator is flashing green | Block transfer in progress. | Normal Operation |
| CAL/COM indicator is flashing red | Calibration in Progress. | Normal Operation |

## Reading On-board Resistance

To read on-board resistance, using either Weigh Scale software, or bit 9 of word 32 in the write block, select to connect the on-board resistance across the sense and signal lines:

| If the weight reading with this resistance connected is | Then |
|---|---|
| Not stable and repeatable | replace the module with a spare |
| Stable and repeatable | The input section of the module is functioning correctly; try connecting a simulator |

## Checking Resistance with a Simulator Connected

To perform resistance checks with a simulator connected:

Step 1. Remove all power from the remote termination panel by disconnecting the cable from the module.

Step 2. Disconnect the load cell cable or junction box cable from the remote termination panel.

Step 3. Connect a load-cell simulator to the remote termination panel. Follow the color code of the simulator, and if possible, connect it in the same configuration you used for the load cell. If the simulator cannot be connected in the same configuration as the load cell, connect it in the configuration for which it is intended.

Step 4. With all power removed and the cable from the module disconnected, –signal.

Step 5. Compare these values with the resistance ratings of your simulator.

Step 6. If the resistance values you read don't match the ratings of your simulator, recheck your wiring.

Step 7. If you are satisfied that your wiring is OK and the resistance values you read don't match the ratings of your simulator, replace the simulator.

Step 8. If the resistance values you read match the ratings of your simulator, reconnect the cable from the module to the remote termination panel and check the block-transfer communication with the PLC processor.

## Checking Block-Transfer Communication

To check the block-transfer communication with the PLC processor:

Step 1. Check to see that the block-transfer addressing is consistent with the addressing mode (-slot, 1-slot, or 2-slot) on the I/O chassis containing the Weigh Scale Module.

Step 2. Ensure that the words in the block-transfer control structures and read and write blocks in the data table are not being written over by some other ladder logic.

Step 3. Check for errors reported in the block-transfer control structures. If you are addressing the module correctly and are receiving block-transfer error indications, replace the Weigh Scale Module with a spare.

Step 4. Read the value in read-block words 26 and 27 as you change the output of the simulator. If this value does not change, check the status of bits 3 and 4 in word 0 of the read block. If either of these bits is on (indicating over range of under range), recheck the wiring to the simulator. If the counts in words 26 and 27 changes as you change the output of the simulator, the block-transfer communication is OK:

| For this Simulator | You will see a change of approximately |
|---|---|
| 0-20mV/V | 656,000 counts as you adjust the simulator from 0 to 100% |
| 0-30mV/V | 985,000 counts as you adjust the simulator from 0 to 100% |

## Calibrating the Module to the Simulator

Once you have established communication between the PLC processor and the Weigh Scale Module, calibrate the module to the simulator. If you use the Weigh Scale software to configure the module, check the status messages displayed on the calibration screen. If you use ladder logic to directly manipulate the write block to configure the module, check the status values in the read block. If you cannot calibrate the module at this point, replace the Weigh Scale Module with a spare. If you can calibrate the module, the module is probably OK; reconnect the load cell.

## Checking Resistance of the Scale System

To perform resistance checks of the scale system:

Step 1. Remove all power from the remote termination panel by disconnecting the cable from the module.

Step 2. Disconnect the simulator from the remote termination panel.

Step 3. Reconnect the load cell or junction box to the remote termination panel.

Step 4. With all power removed and the cable from the module disconnected, at the remote termination panel and the junction-box, check the resistance from +excitation to –excitation and from +signal to –signal.

Step 5. Compare these values with the resistance ratings of your load cells. Remember that if you have multiple load cells connected through a junction box, they are connected in parallel; therefore the total resistance would be:

$$R_T = \frac{R_L}{N}$$

Where:
$R_T$ = the total resistance
$R_L$ = the resistance per load cell
$N$ = the number of load cells

For example, if 4 load cells are each rated at 350.0, the total resistance would be 87.5 at the junction box. If the distance between the junction box and the remote termination panel is significant, the resistance measured at the remote termination panel because of resistance in the wiring. If the resistance doesn't match the rating and the wiring is OK, replace load cells until you find the one that is faulty. If the resistance does match, check the load-cell mounting.

## Checking Load-cell Mounting

Check to see that none of the load cells are mounted upside down. By load cell, we mean specifically the device in which the strain gage is mounted — not the mounting assembly. Also check to see that the load cells are free from any binding. If the mounting seems to be OK, try disconnecting the piping.

## Calibrating with Piping Disconnected

Try calibrating the module with piping disconnected:

Step 1. Disconnect all piping from your vessel.

Step 2. Try to calibrate the module and test your calibration with weights:
- If you are still unable to calibrate your module, recheck the load-cell mounting
- If you are able to calibrate the module, continue

Step 3. Reconnect one pipe.

Step 4. Try to calibrate the module and test your calibration with weights.

Step 5. Continue reconnecting one pipe at a time and trying to recalibrate each time until you find any point that may be binding on your vessel.

## Troubleshooting Load Cells

Inspect each load cell for physical damage. Look for distortion or cracks in all metal parts. Excessive rippling of the diaphragm on a canister may indicate damage. All welds should be free of cracks and deep pox marks. Cables should also be free of cuts, crimps, and excessive abrasion. Make note of anything that looks out of the ordinary.

The following three electrical tests can be useful in troubleshooting potential load-cell problems.

### Zero Balance Test

Changes in zero balance can be caused by overloading the load cell. Some changes may be tolerated in some applications.

With a milli-voltmeter, measure the load cell output under no-load conditions. It should be less than 1% (the typical tolerance for zero balance) of the full scale output. (Check the specification for zero balance tolerance and output sensitivity.) Cells can shift as much as approximately 10% of full scale and still be correctly functioning. Re-gaging may be recommended if the output has shifted more than 10%. A typical value for a 1% shift in zero balance is 0.3mV. This assumes 10V excitation on a load cell with 3mV/V output sensitivity. Full scale output with these conditions is 30mV. One percent of 30mV is 0.3mV.

### Bridge Resistance

Changes in bridge resistance are most often caused by a failure of a compensating element or by a broken or burned bridge wire, usually caused by an electrical transient such as lightning. Either type of failure must be repaired.

With an ohmmeter, measure the resistance across each pair of input and output leads. The values are the input and output resistance of the bridge. The resistance is normally approximately 350 for single-ended beams and canisters, 700 for double-ended beams and 1,000 for most Hardy Advantage load sensors. Refer to the load-cell drawing or data sheet for actual specified values. Readings should be within 1.0% of specified values. Reading outside of this tolerance suggest damage; thoroughly inspect the load cell.ditions is 30mV.

### Resistance to Ground

Electrical leakage is usually caused by water contamination within the load cell or cables. Whether the leakage can be tolerated depends on the application and the electronic instrumentation being used. An unstable output is most often caused by contamination.

With a megohmmeter, measure the resistance between all 5 leads tied together (4 live leads plus the ground lead) and the metal body of the load cell. The reading should be 500 megohms or more. If the cell fails this test, remove the ground wire and test with only the 4 live leads. If it tests OK with the ground wire removed after failing with the ground wire included, the cable probably has an insulation problem.

#### Repairing Failed Load Cells

If the load cell needs to be returned to the factory for further examination or repair, be as detailed in the description of the failure as possible. As an example, if the load cell has drifted, mention the circumstances. Does it drift with load, without load, under temperature variation, etc.? Only factory technicians should perform any additional tests and make repairs.

# APPENDIX A - GLOSSARY

## Understanding HI 1771-WS Terminology

**Auto Zero**

Tells the module to set the gross weight value equal to zero when the weight on the scale is within zero tolerance and the scale is not in motion. This resets the zero weight of the scale.
*See also gross weight display, net weight display, zero tolerance.*

**Block Transfer**

The main means of communication between the PLC processor and the module. Transfers a block (64 words maximum) of data to and from an I/O module.

**Block Transfer Read Address**

Starting address of the data table file where status data is stored after being block transferred from the module. This address is assigned by the user and read by Weigh Scale Configuration software during calibration.

**Block Transfer Write Address**

Starting address of the data table file where configuration and calibration data is stored before being block transferred to the module. This address is assigned by the user and read by Weigh Scale Configuration software during calibration.

**C2 Calibration**

A calibration technique that uploads calibration data from Hardy Instruments' C2 second-generation load sensors. This calibration data lets the software automatically calibrate the module.
*See also calibration, hard calibration, soft calibration*

**Calibration**

Sets gain/range data in the module for a given load cell to convert input information to a weight. You must configure the module before you can calibrate or use it. The Weigh Scale module supports the three basic types of calibration:

- Hard – expects you to manually put weights on the scale to calibrate it.
- Soft – expects you to enter the actual scale sensitivity and output resistance for each load cell.

- C2 – uploads calibration data from Hardy Instruments’ C2 second-generation load cells.

*See also C2 calibration, hard calibration, soft calibration.*

**Calibration Screen** Use this Weigh Scale Configuration software screen to interact with the module to calibrate your scale.

**Configuration** Establishes basic module operation. You must configure the module before you can calibrate or use it. Your selections do not take effect until you download them to the PLC data table.
*See also download/upload.*

**Configuration Screen** Use this Weigh Scale Configuration software screen to interact with the module to configure your module. deadband Used to separate the “turn-off” weight from the setpoint, preventing switching “chatter.”

**Download/Upload** Refers to the reading and writing of blocks of data from one device to another. When data is transferred to a device, it’s considered an upload; when data is transferred from a device, it’s considered a download.

**Gross Weight Display** Tells you the total weight of the vessel being measured.
*See also net weight display.*

**Hard Calibration** Expects you to manually put weights on the scale to calibrate it. Traditional way of calibration.
*See also C2 calibration soft calibration.*

**High Calibration Weight** High reference point for hard calibration. Equal to the high weight being placed on a scale. Should be equal to 80 – 90% of scale capacity.
*See also hard calibration.*

**In-motion Tolerance** Tells the module what amount of weight change will indicate that there has been a change in the weight value.

**Low Calibration Weight** Low reference point for hard, soft, and C2 calibration. Equal to the low weight being placed on the scale.

*See also C2 calibration, hard calibration, soft calibration.*

**Midpoint Linearization Weight**

Middle reference point for hard calibration, if the scale needs to be calibrated for linear operation.
*See also hard calibration.*

**Module List Screen**

This Weigh Scale Configuration software screen displays the modules in the project and lets you modify already existing modules or add new modules to the list.

**Net Weight Display**

Tells you the difference between the gross weight and the tare value. See also gross weight display, tare value.

**Number-of-Digits Selection**

Number of digits displayed to the right of the decimal point.

**Number-of-Samples Selection**

Number of weight samples module uses to calculate the average current weight.

**On-board Resistance**

Disconnects the module input (i.e., stops the module from reading weight values from the scale) and forces the internal millivolt signal to 0 millivolts. This is used to detect drift in the module.

**Preact**

Used to account for delay in shutting of feeders in the weighing system due to mechanical delays, material in flight, or other system delays.

**PLC Address**

Node number on the DH+ link of the PLC-5 processor for the module.

**Rate-of-Change Value**

The rate-of-change represents the rate-of-change in weight as measured by the module over a defined time period. Can be used to
track material flow. This calculation is based on three parameters:

- **Weight Description —** defines the unit of measure for weight in rate-of-change calculations
- **Time Units —** unit of measure for time in rate-of-change calculations

- **Evaluation period —** the time over which a rate-of-change calculations are made

**Real-time Sampling Period**

Tells the PLC processor how often to read the weight value from the module. Used to provide a consistent change over time ( /T) n the weight sample.

**Scale Sensitivity**

Voltage value. You get this value from the load cell supplier (typically from the load cell certificate). This value is used to calibrate the module.

**Setpoint**

The value or target value for turning feeders on and off. The Weigh Scale Module supports two setpoints. Each setpoint is made up of:

- **Weight description —** defines the unit of measure for weight in setpoint calculations
- **Setpoint value —** target weight value
- **Deadband —** used to separate the "turn-off" weight. At the actual switching point, the deadband also prevents switching "chatter".
- **Preact value —** accounts for delay in the weighing system due to mechanical delays, material in flight, or other system delays.

**Soft Calibration**

A method of calibration that eliminates the use of weights. This method expects you to enter the actual scale sensitivity and output resistance for each load cell. You get these values from the load cell supplier. For an accurate calibration, the scale sensitivity value must be to four digits to the right of the decimal point, and the output resistance value must be to digit to the right of the decimal point.
*See also calibration, C2 calibration, hard calibration.*

**Tare**

Equal to the gross weight when you tare the scale. See also gross weight display, tare enable selection.

**Tare Enable Selection**

Sets or resets the net weight equal to zero.
*See also net weight display.*

**Unit-of-Weight Selection**

Tells you whether the weight is currently displayed in pounds or kilograms.

**WAVERSAVER Setting**

Sets the input noise frequencies to reject. Only noise at frequencies below this value will be rejected. This helps minimize process noise and give you a more stable weight reading.

**Zero-Enable Selection**

Sets the gross and net weight values to zero.
See also gross weight display, net weight display.
zero-tolerance selection If the current weight is less than this value and the in-motion tolerance is turned off, you can set the gross weight and net weight to zero using the auto-zero function or the zero-enable function.
*See also auto-zero, gross weight display, net weight display, zero-enable selection.*™