Rate Controller

HI 4060

USER GUIDE
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Chapter 1
Overview

This manual provides users and service personnel with specifications and procedures for installing, configuring, operating, maintaining, and troubleshooting the Hardy Process Solutions HI 4060 Rate Controller with WAVERSAVER®.

NOTE

WAVERSAVER is a registered trademark of Hardy Process Solutions.

To ensure good performance and maximum service life, follow all guidelines described in this manual. Both users and maintenance personnel should understand all cautions, warnings, and safety procedures. If you find that the information in this manual does not provide the help you need, contact the HI Customer Service Department at:

Phone: (858) 278-2900
FAX: (858) 278-6700
Web Site: www.hardysolutions.com
Support e-mail address: support@hardysolutions.com

About Hardy Manuals

An overview of each chapter’s contents is listed below:

• Chapter One - Provides an overview of HI 4060 capabilities and features
• Chapter Two - Provides a overview of HI 4060 specifications
• Chapter Three - Describes the steps for installing both the standard and optional HI 4060 equipment and the HI 215IT series junction box
• Chapter Four - Explains how to configure the HI 4060 for network operation (EtherNet/IP or DeviceNet) using either the front panel or Web interface
• Chapter Five - Provides calibration instructions
• Chapter Six - Provides mapping instructions
• Chapter Seven - Provides procedures for operating the HI 4060
• Chapter Eight - Provides troubleshooting procedures for repair of the HI 4060

HI 4060 Overview

The HI 4060 is a single-ingredient, loss-in-weight controller that measures the flow rate from a feeding device located on a process weighing scale. The user enters the flow parameters, and an HI 4060 algorithm automatically calculates and adjusts the tuning parameters needed to maintain the desired rate. After comparing the actual flow rate
(measured by calculating the loss of weight over short intervals) to the desired flow rate, it computes the adjustments needed to achieve the desired rate and transmits signals to adjust the speed of the feeding device.

**NOTE**

While the system rate calibration is designed to automatically fine tune the flow rate parameters, you can also make manual adjustments.

---

**Typical Applications**

The **HI 4060 provides** closed-loop rate control that can be used in a variety of material-flow applications, such as auger, belt, and vibration-based feeders, converting them from volumetric to gravimetric.

The Rate Controller can be operated in batch, automatic or manual mode. It can control rate controllers or can function as a slave device to a master controller, e.g., a PLC, another HI 4060, or a computer.

**NOTE**

The HI-4060 controls a single ingredient, single feeder, and can transmit control to other feeder controllers using analog out and communications.

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**Features and Capabilities**

**C²® Calibration**

Traditional calibration uses certified test weights. C²® Electronic Calibration allows a scale to be calibrated without the need for test weights. A C²® weighing system consists of up to eight load cell sensors, a junction box, interconnect cable, and an instrument with C²® capabilities (e.g., the HI 4060). Each Hardy C²-certified load sensor outputs digital information used for calculating the calibration. When the HI 4060 reads the signals from the load sensors, it calibrates the scale based on the load sensor’s output plus a user-supplied reference point value (from 0 to any known weight on the scale).
WAVERSAVER®

During the measurement of small weight changes, the affects of mechanical vibration and noise from the feeders and plant environment can introduce substantial interference. WAVERSAVER factors out vibration, noise, and other interference-related signals from the load cell so that the rate controller can better decipher the actual weight data.

WAVERSAVER can be configured from either the front panel or Web interface.

Older WAVERSAVER Card: While WAVERSAVER can factor out noise with frequencies as low as 0.5 Hz, one of three higher cut-off frequencies can be selected to provide a faster response time. The default factory setting is 1 Hz vibration frequency immunity.

New WAVERSAVER Card: While WAVERSAVER can factor out noise with frequencies as low as 0.25 Hz when using the new Weigh Scale card, one of five higher cut-off frequencies can be selected to provide a faster response time. The default factory setting is 1 Hz vibration frequency immunity.

NOTE

WAVERSAVER® and C2® are registered trademarks of Hardy Process Solutions Inc.

Alarms

Two HI 4060 alarms flag deviations from your specified flow rate.

The Rate Tolerance Alarm is used to detect small flow-rate changes. It can be set to trigger either a visual or sound alarm when the flow rate is above or below the tolerance range you select for a time that exceeds a limit you set.

The Rate Exception Control (REC) Alarm is triggered by an out-of-tolerance flow rate using a broader guard band tolerance than the Rate Tolerance Alarm. The REC provides a user-selectable option when a set threshold is reached to either shut down the feeder system or just display an "RE+" or "RE-" on the controller screen. During an REC alarm state that has not resulted in shutdown, the controller will continue to maintain the flow rate while monitoring the loss in weight until the rate is within tolerance.

Connectivity and Ports

For details, see the Available Communications section of this chapter.

Mapped I/O

Mapped I/O saves wiring costs by distributing the I/O where you need it, either at the process, using the instrument’s front keypad, or in the control room through the mapping page on the instrument’s web browser interface.
Integrated Technician™

The HI 4060 INTEGRATED TECHNICIAN™ (IT®) in conjunction with an IT junction box provides built-in system diagnostics that makes it possible to diagnose weighing system problems from the front panel or over the available networks. IT reads individual load sensor voltages and weights and isolates individual system components for quick and easy troubleshooting.

Secure Memory Module (SMM-SD)

A Secure Memory Module (SMM) in the HI 4060 protects critical data from loss and/or corruption while increasing system flexibility. Using a Secure Digital (SD) card that provides non-volatile storage, SMM - SD stores the configuration for hundreds of ingredients, as well as HI 4060 calibration and setup data. This allows a stored configuration to be activated in a matter of minutes without the need for rate recalibration.

The SD card can be read by a PC with an SD card reader. It is conveniently located on the rear panel, where it can be quickly replaced, if necessary.

NOTE

Hardy supports Hardy Branded SD Cards and readers only. Other non Hardy branded products are not supported.

Automatic or Manual Control Modes

Automatic mode corrects for variations in desired flow rates automatically.

Manual Control Mode uses the side-to-side arrows to manually control the flow rate. With the touch of a button, users can convert to automatic mode when proper flow rate is achieved.

Continuous or Batch Modes

User selectable operating modes for continuous or batch processing.

Automatic or Manual Refill

Automatic refill uses user selectable refill points to start and stop the refill process without interrupting the feed process. HI and LO alarms to detect a refill failure.

The Manual Refill option only allows for manual refill at any time.

True Two and Five-Point Automatic Rate Calibration

The 5-point auto rate calibration creates a high feed accuracy for a wide range of feed rates. It either provides the user with automatically calculated parameters, or it lets the user manually enter his own derived values.

Operational and Mode Displays

Single button selection of predefined operating displays such as, Rate, Current Weight, Totalized Weight, Batch data and Output Percentage. This enables the user to view more functions on the Summary Display, allowing the operator to see at a glance the system performance.
Graphics Display Mode
Graphics actual feed rate vs. rate setpoint or operating percentage output.

Front Panel
5" x 7" Waterproof when mounted in a NEMA 4 enclosure.

Reports
The HI 4060 automatically prepares batch performance reports that provide:
• Total weight at the time of the report and at the end of the last batch
• The dates and times for the start and end of the batch
• The date and time for the report.

Available Communications
Hardy Process Solutions provides support for the following network options. See your installation disk or the Hardy Process Solutions website to download the support interface software that best matches your network requirements.

EtherNet/IP®
Ethernet has become the defacto standard for both corporate enterprise and factory networking systems. It enables the user to access device-level data from the Internet. EtherNet/IP, short for Ethernet Industrial Protocol, is an open industrial networking standard. It takes advantage of commercial, off-the-shelf Ethernet communication chips and media and supports both implicit messaging (real-time I/O messaging) and explicit messaging (message exchange). EtherNet/IP is a registered trademark of ODVA.

Modbus/TCP/IP
TCP/IP is a commonly used set of layered protocols that provide a versatile, scalable, and reliable data transport mechanism for networked machines with Internet connectivity. By combining Ethernet with a universal networking standard (TCP/IP) and a vendor-neutral instruction set/data representation (MODBUS®), Modbus/TCP/IP gives a truly open, accessible network for exchange of process data that is easy to implement for any device that supports TCP/IP sockets. If you have a MODBUS® driver and you understand Ethernet and TCP/IP sockets, you can quickly have a driver up and running and talking to a PC. No exotic chip sets are required, and you can use standard PC Ethernet cards to talk to your implemented device.

NOTE  Mod-BUS® is a registered trademark of Schneider Automated Inc.
DeviceNet
The DeviceNet Network is an open, industry-standard communication network protocol designed to provide an interface through a single cable from a programmable controller or PC directly to all HI 4000 series instruments as well as smart devices such as sensors, push buttons, motor starters, simple operator interfaces, drives and other weigh modules.

PROFIBUS
The PROFIBUS-DP (Decentralized Peripherals) communication profile is designed for efficient field-level data exchange. The central automation devices, such as PLC/PC or process control systems, communicate through a fast serial (RS485) connection with distributed field devices, e.g., I/O, drives, valves, and measuring transducers. Data exchange with the distributed devices is based on communication functions defined in the EN 50 170 standard. While these are mostly cyclic functions, DP also offers extended acyclic communication services for the parameterization, operation, monitoring and alarm handling of intelligent field devices. To begin communicating weighing parameters between an HI 4000 Series controller and a PLC, PC or DCS system controller, you need only to load the *.GSD file and set the node address.

RIO
Under license from The Allen-Bradley Corporation, Hardy Process Solutions Inc. has developed a Remote I/O Interface for the HI 4000 Series.
Hardy worked with substantial customer input from Allen-Bradley to ensure that the remote I/O communications network best matched the needs of system integrators and end users for industrial and process applications. The interface is fast, field proven, requires minimal wiring, requires no special software drivers, and is standard on many Allen-Bradley programmable controllers. To communicate parameters to and from the controller, you need only to connect three wires, set the address and baud rate in the controller, and write some ladder logic.
RIO Information contained in this manual is subject to change. Always check the latest version of this manual at our web site (http://www.hardysolutions.com) before beginning system design. While this product incorporates technology licensed by Allen-Bradley Company Inc., Hardy Process Solutions supplies this product and provides all warranty and technical support for it.

Interpreting the Model Code Number

Model Code Breakdown
• The model code number can be found on a label that is attached to the top panel of the HI 4060.
- The model code number starts with the base model number (HI 4060). The dash alphanumeric designations indicate the capabilities of the rate controller. For example: A model HI 4060RC-PM-AC-EIP-DN is a Panel Mount, AC powered, with Ethernet I/P Interface, DeviceNet Communications.

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**INSTRUMENT TYPE**
- DR  DIN Rail (no display) - base model, no additional charge
- PM  Panel/Remote Mount (with display)
- DRWS Wall Mount Stainless Steel Enclosure (no display)
- PMWS Wall Mount Stainless Steel Enclosure (with display)

**POWER SUPPLY**
- AC  AC Power 110-240VAC, 47-63Hz
- DC  DC Power 24 Volts nominal

**INTERNAL OPTIONS**
- N1  No Internal Option
- EIP EtherNet/I/P Communications
- MD  Modbus TCP/IP Communications

**NETWORK OPTION**
- N2  No External Option
- DN  DeviceNet Communications
- 4-ANA  4 Channel Analog
- PB  Profibus Communications
- BIO  Allen-Bradley Remote I/O

**AUXILIARY OPTION**
- N3  No Auxillary Option
- 4-ANB  4 Channel Analog

* Requires one Analog connection.
** May select either -ANA or -ANB, but not both
*** Trim pots must not be used with C2 load cells
**** For more than 4 load cells, use Summing Cards with TB-10 expansion connector

**ENCLOSURE OPTION**
* use only with -DRWS or -PMWS instrument Types
- N4  No Summing Card Includes Glands and Seal
- JT1  Summing Card with Integrated Technician (IT)
- JT2  Summing Card with IT and Trim Pots**
- JB1  Standard Summing Card
- JB2  Summing Card with Trim Pots**
- JB3  Summing Card with TB-10 expansion connector***
- JB4  Summing Card with Trim Pots** and TB-10 connector***
Chapter 2
Specifications

Chapter 2 provides specifications for the HI 4060 rate controller and optional equipment that may come with the package. 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 the instrument.

Basic Specifications

**Number of Channels**
- 1 Channel

**Update Rate**
- 110 Updates per Second

*NOTE*  
Some older HI 4060 models may have a maximum update rate of 15 updates per second.

**Resolution**
- 1 in 30,000

**Excitation Voltage**
- 0-5 VDC

**Averages**
- 1 to 255 User Selectable in Single Increments

*NOTE*  
Older HI 4060 modules use only 1-31 User Selectable Averages

**Input**
- Up to eight (8) 350 ohm Full Wheatstone Bridge, Strain Gauge Load Sensor/Cells (5 volt excitation) on one vessel.
- Weight Signal Voltage Range 0-15 mV

**Display**
- 128 x 64 Backlit LCD Graphic Display
Display Increments (Graduations)
- 1, 2, 5, 10, 20, 50, 100, 200, 500, 1000 user selectable via the front panel key pad and Web Page
- Corresponding weight unit/time unit is dependent on the decimal point location.

Key Pad
- 9 tactile keys
- 4 Soft Keys (Mappable)

Non-Linearity
- 0.0015% of Full Scale

WAVERSAVER®
- 7.5 Hz
- 3.5 Hz
- 1.0 Hz
- 0.50 Hz
- 0.25 HZ

**NOTE**
*Older models of the HI 4060 may have only three WAVERSAVER options: 15 Hz, 1.0 Hz and 0.5 Hz.*

C2® Maximum Cable Length
- 1000’ for C2, Non C2, or JB Card
- 500’ for IT

Digital Voltmeter (IT)
- Accuracy ± 2% of full scale

Power and Utility Requirements

Voltage
- 24 VDC (Standard)
- 100/240 VAC Universal (Optional)

Frequency
- 47/63 Hz
Specifications

Power
• 10 Watts maximum with options

Common Mode Voltage Range
• ± 2.5 VDC

Common Mode Rejection
• 100dB @ 50-60Hz

Environmental Requirements

Operating Temperature Range
• -10 to 40°C (14º to 104º F)

Storage Temperature Range
• DR Type: -40 to 85°C (-40 to 185º F)
• PM Type: -30 to 70°C (-22 to 158º F)

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

Approvals
• UL/CUL
• DeviceNet (ODVA)
• EtherNet/IP (ODVA)
• Allen Bradley Remote I/O

Physical Characteristics

Panel Mount
• Depth: 5.125” (130.175mm) Back of the Bezel to rear cable clearance
• Case Dimensions: 4.00”H x 5.65”W x 3.125”D (101.6mm H x 143.51mm W x 79.37mm D)
• Case Material: Aluminum Alloy (6063-T5)
• Weight: 2.45 pounds (1.11 Kilograms)
• Enclosure Rating: Front Panel NEMA 4, 4X Seal
Din Rail Mount
- Depth: 4.0" (101.6mm) Measured from bottom of the Din Rail Mounting Feet to top of the enclosure
- Case: 4.00"H x 5.65"W x 3.125"D (101.6mm H x 143.51mm W x 79.37mm D)

Analog Card

**NOTE**
On the 4060, the Analog Output Card is required. It may reside in Slot A or Slot B, but an analog card may not be placed in both slots.

Current Outputs
- 0-20 mA and 4-20 mA
- 0- 500Ω load at 20mA

Voltage Output
- 0-5 V and 0-10 V, max current 10mA

Resolution
- 16K counts over 0 to 20mA and 0 to 10V range

Accuracy
- ≤ 1% initial accuracy, ≤ 1% over temp
- Default settings channel 1-4 = motor speed control

Internal Network Options
- EtherNet/IP
- Modbus

Network Option Cards

**Profibus Card**
Connector: 9-pin Serial Connector, female

**RIO Card**
Connector: 9-pin Serial Connector
Chapter 3
Installation

Chapter 3 pertains to unpacking, cabling, interconnecting and installing the HI 4060 Rate Controller. User and service personnel should be familiar with the procedures contained in this chapter before installing or operating the HI 4060 Rate Controller.

NOTICE: This equipment is suitable for use in Class I, Division 2, Groups A,B,C,D, T4A & Class II, Division 2, Groups E,F,G, T4A or Non-Hazardous Locations Only.

WARNING - EXPLOSION HAZARD - SUBSTITUTION OF COMPONENTS MAY IMPAIR SUITABILITY FOR DIVISION 2.

WARNING - EXPLOSION HAZARD - DO NOT DISCONNECT EQUIPMENT UNLESS POWER HAS BEEN SWITCHED OFF OR THE AREA IS KNOWN TO BE NON-HAZARDOUS

Unpacking

Step 1. Before signing the packing slip, inspect the packing for damage of any kind, and report any damage to the carrier company immediately.

Step 2. Verify that everything in the package matches the bill of lading. If any items are missing, damaged, or there are any questions, contact Customer Service at:

Hardy Process Solutions
9440 Carroll Park Drive
San Diego, CA 92121
Phone: (800) 821-5831
FAX: (858) 278-6700
Web Site: http//www.hardysolutions.com
E-Mail: hardysupport@hardysolutions.com

Step 3. Record the model number and serial number of the HI 4060. Store the serial number in a convenient, secure location for reference when contacting Hardy I Customer Service Department or to buy parts or firmware upgrades.

NOTE The HI-4060 front display is optional. Without a front display, a communications IP Setup disk and Web browser are required to setup and operate the Rate Controller.
Disassembly and Reassembly Notes and Cautions

- Installation of this equipment must be in compliance with any and all International, National and Local Electrical and Mechanical codes.
- Any disassembly must be done in a clean, well ventilated, properly controlled static environment.
- Always make sure that the assemblies and sub-assemblies are well supported and insulated when doing any repairs on the instrument.
- Place small fasteners, connectors and electrical parts in closed containers so as not to lose parts during reassembly.
- Read all the disassembly instructions before any disassembly begins. Be sure that you are familiar with the procedures. If any of the instructions for disassembly are unclear, contact Hardy Process Solutions, Technical Support Department for additional information and assistance.
- Do not disconnect any electrical plug, connector or terminal unless an identification tag is present or one is attached. Always note where the connector or plug was attached to the electrical component or wiring harness.
- Always install complete hardware groups (Screws, Washers, Lock Washers, Spacers, Etc.) back to the original point of removal.
- Always replace broken or damaged hardware immediately!
- Always check to be sure that no loose parts are sitting on printed circuit boards or electrical connectors or wires when disassembling or reassembling.
- Always protect printed circuit boards from electrostatic discharge (ESD). Always use approved ESD wrist straps and anti-static pads.

Mechanical Installation

Installing the HI 4060 Rate Controller in a Panel

NOTE

Use a torque screw driver and torque each screw to 10 inch/pounds. DO NOT OVERTIGHTEN!

CAUTION

You must install the HI 4060 in a NEMA 4, 4X or IP 55 rated enclosure or better.

WARNING - YOU MUST INSTALL THE HI 4060 IN A NEMA 4X ENCLOSURE WHEN USING THIS INSTRUMENT IN A CLASS I or CLASS II ENVIRONMENT.

Step 1. Observe all Electrostatic Discharge (ESD) precautions before and during installation.
Panel Hole Dimensions (drawn from the back and not displayed to scale)

A paper template comes with the product. Copies of that template can be printed from the Hardy Website. If you print from Hardy Website be sure to note the print instructions. A photocopied version may not be correctly sized.

Step 2. Use a Phillips-head screwdriver and install the five (5) 6-32 x 1/2 inch screws that fasten the bezel to the panel. Use a torque screw driver to torque each screw to 10 inch/pounds. DO NOT OVERTIGHTEN!
Step 3. Put the Display cable and connector through the 1.25-inch hole in the panel door or cover and plug the display connector into the display header in the bezel.

Step 4. Gently slide the electronic enclosure onto the threaded rods while making sure the display cable glides easily and does not kink.

Step 5. Move the electronic enclosure toward the panel until it stops. Thread the four 6-32 thumb screws onto the threaded rods until tight. Do not use pliers on the thumb screws.

**DIN Rail Installation HI 4060 Rate Controller**

Step 1. Snap the DIN rail mounting feet into any two holes on the mounting panel of the electronic enclosure until you hear a snapping sound. The snap means they are mounted correctly. Use two mounting feet per enclosure.

Two clips are provided with the instrument. This picture shows one unmounted sample clip and five clips mounted in vertical and horizontal arrangements.

Step 2. After installation, tug on each mounting foot to ensure it is seated correctly.
Remote Display Installation

Step 1. Install the Electronic Enclosure on a DIN Rail or in a panel within 100 feet of the Electronic Enclosure.

Step 2. Remember the maximum length of the Display Cable is 100 Ft. (30.48 meters). Use shielded 6 wire cable (Minimum 22 AWG).

Step 3. Use the Template that was shipped with the instrument to cut the five holes required for mounting the display on a wall or on the door of an enclosure.

Step 4. Connect the cable wires to the display and the Electronic Enclosure, as shown.

Step 5. Wire the cable connectors as follows:

<table>
<thead>
<tr>
<th>DISPLAY</th>
<th>ELECTRONIC ENCLOSURE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltage In (Vin)</td>
<td>Voltage Out (Vout)</td>
</tr>
<tr>
<td>D1</td>
<td>D1</td>
</tr>
<tr>
<td>D2</td>
<td>D2</td>
</tr>
<tr>
<td>D3</td>
<td>D3</td>
</tr>
<tr>
<td>D4</td>
<td>D4</td>
</tr>
<tr>
<td>Ground (Gnd)</td>
<td>Ground (Gnd)</td>
</tr>
</tbody>
</table>

Step 6. Plug the cable connector into the remote display header of the electronic enclosure.

Step 7. Put the cable through the 1.25-inch hole you cut in the surface where you are going to mount the display.
Step 8. Use a Phillips-head screwdriver to install the four 6-32 x 1/2 inch screws that fasten the bezel to the panel or wall. Use a torque screw driver and torque each screw to 10 inch/pounds. DO NOT OVERTIGHTEN!

**NOTE**

*If you are mounting the remote panel in a wash-down or hazardous area drill the fifth hole and install with the 6-32 x 1/2 inch screw.*

**Installing a remote display or a second display**

You can connect up to two displays by connecting one display at the front panel and one at the rear panel. However, the display connected to the rear panel will have no keyboard functionality. When connecting the display at the front panel (Panel Mount) use the short cable that comes with the unit.

**NOTE**

*Only one keypad display can be active. With two displays, the ribbon cabled display has the only active keypad. You can still configure and operate the HI 4060 from the Web Browser.*

Step 1. Shielded 4-wire cable (Min 22 AWG) is preferred. If you use 6-wire cable, do not connect to terminals D3 & D4 on either or both ends of the remote display cable.

Step 2. Wire the cable connectors as follows:

<table>
<thead>
<tr>
<th>DISPLAY</th>
<th>ELECTRONIC ENCLOSURE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltage In (Vin)</td>
<td>Voltage Out (Vout)</td>
</tr>
<tr>
<td>D1</td>
<td>D1</td>
</tr>
<tr>
<td>D2</td>
<td>D2</td>
</tr>
<tr>
<td>D3 Not Used do not Connect</td>
<td>D3 Not Used do not Connect</td>
</tr>
<tr>
<td>D4 Not Used do not Connect</td>
<td>D4 Not Used do not Connect</td>
</tr>
<tr>
<td>Ground (Gnd)</td>
<td>Ground (Gnd)</td>
</tr>
</tbody>
</table>

Step 3. Connect the cable to the display connector.

Step 4. Plug the connector into the electronic enclosure rear panel header.
Installing the SMM-SD Memory Card

**NOTE** The HI 4060 supports most brands of SD Cards with a capacity of up to 16 MB and a few brands of up to 32GB capacity. Larger cards may cause loss of data or cause the unit to lock up. Hardy suggests using 16MB or less capacity SD cards in this device.

**NOTE** The rear panel may have plugs mounted above the SMM-SD slot. When removing these plugs, avoid accidently disconnecting the SMM-SD card.

**NOTE** Remove and replace the SMM-SD card only when the power is off.

Step 1. Slide the SMM-SD card into the SMM-SD slot on the rear panel.

Step 2. Push in the SMM-SD card until a snap indicates that the card is seated.

Step 3. To remove the SMM-SD card, gently push the card towards the instrument and release it. The card will pop out a little so you to remove it from the housing.

Step 4. Always store the SMM-SD card in a static-free enclosure and in a secure environment so as not to lose the information stored on the card.
Load Point Installation

Rear panel

C2® Load Point Connection

We suggest that you wire a C2 cable from the instrument to the junction box using the color code for C2 load points (left to right when facing the rear panel) and that you match the load sensor color code to ease trouble shooting. There are many color combinations due to the lack of an industry standard:

- **Shield Ground Wire**
  - C2- Violet
  - C2+ Grey
  - EXC- Black
  - SEN- Brown
  - SIG- White
  - SIG+ Green
  - SEN+ Blue
  - EXC+ Red

**WARNING:** Load Cell Cable Length has been calculated into C2® calibration data. Hardy Process Solutions recommends that you do not cut your ADVANTAGE® or ADVANTAGE® Lite load sensor cables, as your C2® accuracy will be affected and the warranty will be voided.
Step 1. Remove the factory-installed jumpers from the terminal block if you are connecting an 8-wire cable from the junction box.

Step 2. Connect the cable (Recommended load cell cable: Hardy Process Solutions Prt. #6020-0001) wires to the channel terminal block according to the cable color chart.

Step 3. Plug the terminal block into the Channel connector on the rear panel.

**Non-C2 Load Point Connection**

NOTE
Cable Color Codes vary between vendors, check with your supplier for the Color Code for your Non-C2 load point.

Step 1. Remove the factory-installed jumpers from the terminal block if you have 6-wire load cell cable that includes sense wires from the load cell or junction box.

Step 2. Connect the cable (Recommended load cell cable: Hardy Process Solutions Prt. #6020-0001) wires to the channel 1 terminal block according to the cable color chart, or per manufacturer’s specification.

Step 3. Plug the terminal block into the channel connector on the rear panel.

NOTE
If you are using the Integrated Technician summing card, C2 wires are required to communicate commands to the IT junction card and receive load sensor date in return.
Printer/Scoreboard Wiring

Digital Inputs 1-3
The first four pins on the input port, located on the main controller board at J2, are used for general-purpose inputs. These inputs can be mapped to read printer outputs (or switches or buttons to control such functions as tare, or zero scale). Inputs one through three can be used only with devices using 5 volts or less. They are activated by shorting the pins 1, 2, or 3 to the J2 pin 4 COM terminal with a dry contact switch or relay.

These standard inputs cannot interface with 24v logic directly. To activate the input contacts sent from a PLC, it is necessary to install a relay device as the dry contact or install the digital I/O card.

Input Power Wiring

NOTE
When you use external over-current protection devices, mount the switch and/or circuit-breaker near the instrument.

WARNING - Do not plug the power connector into the header with live power. To do so will result in property damage and/or personal injury.
The AC power should be supplied by a “clean” primary line, directly from the power panel. This line should not supply any other equipment, including the feeding unit, and should be supplied with a maximum 20 amp breaker.

**WARNING** - If an automatic disconnect device is used on the AC input wires, the disconnect must act on both the line and neutral wires in a double pole, double throw arrangement i.e. DPDT Relay. Using other automatic disconnect arrangements may cause personal injury and/or property damage.

**WARNING** - Operating with incorrect line voltage can result in property damage and/or personal injury. Make sure that the power source does not exceed 240 VAC.

**WARNING** - If a lithium battery is replaced with an incorrect type it may cause an explosion which will cause property damage or personal injury.

**AC Input Power Wiring (-AC)**

Step 1. The HI 4060 is configured with a universal power supply rated from 120 to 240 VAC. Make sure the VAC power is shut off before installing the wires to the connector.

Step 2. Install a 3-wire, minimum 14 AWG power line to the 3-pin terminal block connector.

**Network: Installation**

The HI 4000 Series Network configurations include:

- DeviceNet
- RIO
- Profibus DP
- Ethernet TCP/IP
- Modbus TCP/IP
- EtherNet/IP

This enables the HI 4000 Series to communicate with virtually every device on the network, including PCs and PLCs. This means that you can map, configure and monitor all the HI 4000 series products from the front panel or your LAN, Internet, DeviceNet, ControlNet and Wireless Servers that are connected to the Network.
**Simple Ethernet Network**

You can manage the HI 4060 from any Ethernet network connected computer. Both devices must be set up for network communication.

All 4000 Series instruments are designed with a selectable 10/100 base T Ethernet connection which links your PC to an embedded server in the instrument. You can connect to an instrument via the Internet, Intranet, Extranet, or VPN (Virtual Private Network). Your computer must have an Ethernet card and cable with an RJ45 connector to connect to the instrument (Either crossover or straight are usable with the 4000 Series). Once connected you can, monitor, map and configure any of the instruments from your web browser from any location in your plant or enterprise. Help Dialogs are also available in the browser to assist when performing setup or troubleshooting of an instrument. In addition the browser connects you to the Hardy Web Site which connects the user to a full range of customer services and support.

Step 1. Connect one of the RJ45 connectors to the Ethernet connection at the rear panel of the HI 4000 Series products.

Step 2. Connect the other RJ45 connector to the Ethernet connection on your laptop Ethernet card or your Ethernet adapter.

Step 3. If the Instrument does not have an IP address, you will need to create one. See Chapter 4 for details.
Installing a Card in the Option Slot (applies to -4ANB and -DIO)

Installing the Cards

Step 1. Plug the Board Stacker into the Option Slot Header (J9) on the Main Controller board, as shown below.

Step 2. Through holes in the bottom of the option card allow you to plug the board stacker into the option slot header (J2) on top of the card. Align the card through holes with the stacker pins.

Step 3. Gently push the card onto the board stacker pins (making sure you align the through holes on the analog board with the two standoffs on the Main Controller board) until the pins are seated. Be careful not to bend the pins when plugging the Analog Board into the board stacker.

Step 4. Slide the board assembly into the chassis until it stops.

Step 5. Use four pan-head screws (6-32 x .1875”) to fasten the rear plate to the chassis.
Installing Labels

Step 1. After removing the protective cover off the label, align the label with the through holes on each side of the Option port.

Step 2. Press the label onto the rear panel making sure that it sticks evenly.

Step 3. Use the two pan-head screws (4-40 x 0.25") flat and split washers to fasten the rear panel to the card assembly, as shown.

The Analog Output Card

The Analog Output card comes standard on the HI 4060. Four independent analog outputs can be configured to any of the instruments parameters over an adjustable 16,000 counts of resolution: two current (0-20 mA) and two voltage (0-10 VDC).

NOTE

The analog output is not isolated. A 4-20ma isolator may be required for stable readings depending on ground conditions.

Analog Wiring

- Channel 1 - Voltage
- Channel 2 - Current
- Channel 3 - Voltage
- Channel 4 - Current

WARNING - The Voltage and Current outputs are not interchangeable. To interchange voltage and current will cause personal injury and/or property damage.

WARNING - The Hardy Analog Card is the Analog Source. Do not connect the Analog card to another internal or external Analog Source. To do so may result in property damage and/or personal injury.

Installing a Card in the Network Slot

While some cards use a 16-pin board stacker and others use a 40-pin board stacker, the process for installing an optional card in the network slot is basically the same:
Step 1. Plug the 20 mm16-pin or 40-pin board stacker into the network option card header.

Step 2. Align the board stacker pins with the 16 right-side pin holes for the network slot Header (J41) located on the bottom of the Main Controller board.

Step 3. Using two fingers gently push the board stacker pins into the network slot header until the standoffs touch the bottom of the main controller board.

Step 4. Use the two pan-head screws (4-40 x .25”) to fasten the option card to the standoffs attached to the main controller board.

**Installing a Network Card Label**

Step 1. Peel the protective cover off the label.

Step 2. Align the label with the through holes on each side of the Network port.

Step 3. Press the label onto the rear panel making sure that it evenly sticks to the rear panel surface.

Step 4. Use the two pan-head screws (4-40 x .25”) split and flat washers to fasten the rear plate to the board assembly.

Step 5. Slide the board assembly into the chassis until it stops, and use the four pan-head screws (6-32 x .1875”) to fasten the rear plate to the chassis.
Wiring the PROFIBUS Card

Profibus uses the 40-pin board stacker. Follow the procedure above under Installing Network Cards.

Connector Terminations:

1. NO CONNECT
2. NO CONNECT
3. RXD/TXD +
4. RTS
5. GND BUS STATUS
6. +5V BUS
7. NO CONNECT
8. RXD/TXD -
9. NO CONNECT

Wiring the DeviceNet Card

DeviceNet uses the 40-pin board stacker. Follow the procedure above under Installing Network Cards.

Left to Right facing the HI 4060 rear panel:

- V- Black
- CAN- Blue
- Shield Uninsulated
- CAN+ White
- V+ Red

Wiring the Remote I/O Card

See the separate Remote I/O User’s Guide for the HI 4000 Series (PN 0596-0306-01) for setup procedures.

Wiring the Modbus TCP/IP Option

Modbus TCP/IP is a software option that comes pre-installed in the HI4060 upon customer request. A key is required to enable the software. You can purchase the option with the Key by contacting your local Hardy Process Solutions Representative or Hardy Service Center. Chapter 4 describes the activation procedure.

To connect the HI4060 to a Modbus TCP/IP network, plug the network cable into the Ethernet port as you would with any standard Ethernet connection. See the Ethernet sections above for details.
Chapter 4
Configuration

Chapter Four provides stepped instructions for configuring the Hardy Process Solutions HI 4060 Rate Controller and the available network options (e.g., EtherNet/IP, ControlNet, and DeviceNet) from either the front panel or Web interface. Following these procedures will help to ensure trouble-free service.

Front Panel Basics

This section provides an overview of the front panel screen functions used to navigate, make selections, and view and edit the data values displayed.

Display Area

The display area has five lines: At the top is a read-only Summary line that shows the current weight in large print. The next three Operational lines can display either read-only information or selectable options. And the bottom line names the function currently assigned to each of the function keys.
Scroll and Select Buttons

Up/Down Arrow Buttons
The Left/Right arrows move the cursor horizontally left or right. They are normally used to select a character to change.

Left/Right Arrow Buttons
The Up/Down arrows scroll the options for a cursor location. For example, with the cursor on the right-most digit of a five-digit number, you can press the Up or Down arrow to select a number for that digit. Normally, after selecting all of the digits, you must press the Enter button to save the selection.

Enter Button
Press Enter to save the current selection on a menu or a pick list into non-volatile memory.

Function Buttons
The functions associated with each of up to four function keys (buttons) are subject to change when you make a different mode selection. The function name appears on the screen above the button. The function buttons named below are frequently listed options:

START
The Start button typically starts a motor speed control that in turn runs a feeder, pump etc.

Manual (MAN)
The Manual button puts the HI 4060 in manual mode, which allows you to adjust the output percentage (OP) and/or set or reset the setpoint when you are developing new process parameters or adjusting existing processes.

MODE
The Mode button enables you to switch between Gross Weight, Totalized Weight (Total), Amount (Amt) of weight on the scale and Actual Rate (ROC) modes while operating. The display outputs the value for the mode selected. For example: ACT lb/m

HOLD
The Hold Button appears as the left-most button after you press the Start Button. Pressing the Hold Button suspends a process.

STOP
The Stop Button appears as the left-most button after you press the Hold Button. Pressing the Stop Button stops the output to the motor speed control to stop a process or idle state.
EXIT
On a lower level menu, the Exit button allows you to return you to the previous menu.

CLR
CLR appears when you enter a menu. It clears the current value and repositions the cursor for the first entry. To avoid mistakes, you can clear the existing value before entering the new value.

Summary Display
The Summary screen, shown in the example above, displays gross weight, which can be displayed in lb, oz, kg, g, Ton, or t (Metric Ton) per Unit/Unit of time and can be expressed in - m = minutes, hr = hour, s = seconds. It also shows the actual rate of change, total amount, and batch total. The settings can be toggled using the MODE soft key.

The large display area displays:

- The current weight display (large display) shows that the gross weight of the ingredient currently in the feeder or scale is: 0.000 lbs
- OP #% - In our example, 0% indicates that the system is idle. If the system were active, it would show the percentage of the available output signal driving the feeder.

NOTE
The Actual Rate (ACT) is a heavily averaged Rate of Change that represents the over-all ROC feed rate. ROC is the raw, unaveraged feed rate for visualization of your flow rate.

The Up/Down arrows allow you to scroll the six top-level options to appear on the front panel display. They do not always match the order in which they appear on the Web displays.

1. Output percentage (OP)
2. Batch Amount (Amt)
3. Totalized Weight
4. Rate of Change (ROC)
5. Ingredients (This chapter begins with this menu)
6. Gross Weight
Ethernet Network Configuration

**NOTE**  Do not confuse the onboard Ethernet TCP/IP communication with EtherNet/IP®. EtherNet/IP® is an industrial protocol that does not transmit Web traffic and is a purchased option.

An embedded Web server in the HI-4060 allows you to easily configure the parameters via a Web browser. A standard Ethernet network is required to provide the connectivity between the HI-4060 and your desktop or laptop computer.

The HI-4060 Rate Controller is designed with a standard 10/100 BASE-T Ethernet connection for linking to any Windows PC. Once connected, the PC can be used to monitor, configure, or download Hardy software to the HI-4060. A Help function can assist you in setup or trouble-shooting. The browser also links to the Hardy Web Site where the user can find additional services and support.

There are two primary ways to connect the HI-4060 to your computer:

**LAN Connection:** Connect the HI-4060 to an existing Ethernet-based Local Area Network (LAN) that has connectivity to your desktop or laptop computer. See **LAN Connection** below.

**Direct Connection:** Make a direct point-to-point connection between the HI-4060 and your desktop or laptop computer using any standard Ethernet cable. See **Direct Connection** below.

**LAN Connection**

To connect the HI-4060 to a LAN, you simply connect a standard Ethernet cable between the instrument and the common network hub. Every node on the network must have a unique IP address or conflicts will result. Contact your Network Administrator for the IP address to use for the HI-4060.

**Blind Units:** For controllers without a display, the IP address must be setup using the IPSetup program. In Section 8 see **Software Downloads for Your HI 4060**.

The IP address can be set manually (fixed IP), or it can be set automatically by a network service called DHCP. To use fixed IP addresses, refer to the section *Fixed IP Configuration Using the Front Panel*. For automatic IP assignment (DHCP) use the following steps:

**DHCP Configuration Using the Front Panel**

DHCP works only if a DHCP server installed on your network. To enable DHCP on the HI-4060, set the current IP address to ‘0.0.0.0’ at the IP configuration screen.

Step 1. Press Enter to activate the Configuration menu. Use the down arrow to select Instrument Setup and press Enter.
Step 1. From the Setup menu, select Ethernet; then press Enter to display the Ethernet menu.

Step 2. If the display is not already showing 0.0.0.0 for IP, select IP and press the CLR button to erase the current IP value.

Step 3. Starting with the right-most digit, enter the value 0.0.0.0 using the up/down arrows to select each character, and press the left arrow to move to the next digit.

Step 4. Press Enter to save the entry.

Step 5. Press the Exit key four times to exit the IP, Ethernet, Configuration and Setup menus.

Step 6. Power-cycle the instrument to force the unit to enable the DHCP method for setting the IP address. (Step not required for HI 4060 software after version 1.7.0.0.)

Step 7. Recall the Configuration / Instrument Setup / Ethernet / IP menu and view the DHCP page. If the DHCP configuration was successful, the page will include an IP address provided by the network server. This is the IP address to use in your web browser to load the Web Interface (See Displaying the Complete DHCP IP Address). This completes IP setup.

NOTE If the DHCP: line remains 0.0.0.0, allow the instrument another minute to acquire an address from the server and re-enter the IP menu. If this doesn’t work, the DHCP server is not visible to the HI-4060 and you should use a Fixed IP configuration.

Displaying the Complete DHCP IP Address

Read-only screens can display a limited number of characters per line. Follow these steps to see the complete IP address in DHCP:

Step 1. On the Ethernet menu, select DHCP. If, for example, the screen shows 192.168.100.12 for the DHCP address, the actual address could have one more digit, e.g., 192.168.100.128. The “8” is not displayed.

Step 2. Press Enter and the DHCP edit form will show the complete IP address.

NOTE You cannot change the values of the DHCP IP address. Exit returns to the Ethernet Menu.

Fixed IP Configuration Using the Front Panel

The HI-4060 can be configured to use any fixed IP address. Fixed IP addresses must be carefully selected to avoid accidentally configuring two devices to the same address with unpredictable results. Since guessing a value could lead to personal or property damage and/or interrupted network services, your network administrator should provide this address.
Step 1. Press Enter to activate the Configuration menu. Use the down arrow to select Instrument Setup and press Enter.

Step 2. Use the down arrow again to select Ethernet. Finally, select IP to display the IP screen.

Step 3. If the display is not showing the correct IP value, press the CLR button to erase the current value.

Step 4. Starting with the right-most digit, enter the desired IP number using the standard format shown to the right. Use the up/down arrows to select each character, and press the left arrow to move to the next digit.

Step 5. Press Enter to save the entry.

Step 6. Press the Exit key four times to exit the IP, Ethernet, Configuration and Setup menus.

The IP address is now saved and the instrument’s embedded web browser is now available at the entered IP address. This completes IP setup.

**Direct Connection**

This method of interconnect between an HI-4060 and a standard Windows PC allows you to configure the instrument using the embedded web browser, even if an Ethernet network is not part of the normal installation. A desktop or laptop may be used on location as necessary. Both sides of the link require configuration of their IP addresses to establish a working connection. The following steps will walk you through the process of connecting the hardware and configuring the HI-4060 and PC with compatible IP addresses.

**Direct Connect Hardware**

Any standard Ethernet cable with RJ-45 connectors at each end can be used to connect the HI-4060 to your PC. A ‘crossover’ cable is not required. Simply connect the cable between each instrument.
Windows PC configuration

Windows 2000

Step 1. After starting your computer, click Start.

Step 2. Click on Settings > Control Panel to display the Windows Control Panel.

Step 3. Click the Network icon to display the Network dialog.

Step 4. Click on TCP/IP; then click the Properties button to open the TCP/IP Properties dialog.

Step 5. Click the IP Address tab. - If the ‘Use the Following IP Address’ box is already checked, write down the displayed IP Address and jump to the ‘Direct Connect Configuration – HI-4060’ section below.

Step 6. Click the ‘Specify an IP Address’ check box; then enter the following into the TCP/IP Properties dialog.

   IP Address = 192.168.100.100
   Subnet Mask = 255.255.255.000

Step 7. Select OK on the TCP/IP Properties dialog box. The computer is now fully configured. To return the computer to the original network settings, return to the ‘Internet Properties (TCP/IP) dialog and select ‘Obtain an IP address automatically’ and click OK.

Windows XP

Step 1. After starting your computer, click Start.

Step 2. Click on Settings > Network Connections

Step 3. Right-Click on ‘Local Area Connection’ and select Properties.

Step 4. Click on Internet Protocol (TCP/IP) and click on the Properties button to open the Internet Properties (TCP/IP) Properties dialog. - If the ‘Use the Following IP Address’ box is already checked, then write down the displayed IP Address and jump to the ‘Direct Connect Configuration – HI-4060’ section below.

Step 5. Click the ‘Use the Following IP Address’ check box; then enter the following into the TCP/IP Properties dialog.

   IP Address = 192.168.100.100
   Subnet Mask = 255.255.255.000

Step 6. Select OK on the TCP/IP Properties dialog box. The computer is now fully configured. To return the computer to the original network settings, return to the ‘Internet Properties (TCP/IP) dialog and select ‘Obtain an IP address automatically’ and click OK.
Windows 7

Step 1. After starting your computer, click Start.
Step 2. Click on Control Panel to display the Windows Control Panel.
Step 3. Click on Network; then click Internet
Step 4. Click on Network; then click Sharing Center.
Step 5. Click on Change Adaptor Settings in the left-hand column.
Step 6. Right-Click on ‘Local Area Connection’ and select Properties.
Step 7. Click on Internet Protocol Version 4 (TCP/IPV4)
Step 8. Click the Properties button to open the Internet Properties (TCP/IP) Properties dialog. - If the ‘Use the Following IP Address’ box is already checked, then write down the displayed IP Address and jump to the ‘Direct Connect Configuration – HI-4060’ section below.
Step 9. Click on the ‘Use the Following IP Address’ checkbox then enter the following into the TCP/IP Properties dialog.
   IP Address = 192.168.100.100
   Subnet Mask = 255.255.255.000
Step 10. Select OK on the TCP/IP Properties dialog box. The computer is now fully configured. To return the computer to the original network settings, return to the ‘Internet Properties (TCP/IP) dialog and select ‘Obtain an IP address automatically’ and click OK.

Direct Connect Configuration - HI-4060

The HI-4060 must now be assigned a unique IP address that will connect to the Windows PC. There are two simple rules for the IP Address:

It must have the same network identifier as the computer
It must have a different node identifier than the computer.

If your Windows PC already had an IP address assigned, simply increment by one the Node Identifier field of the IP Address you wrote down in the Windows PC configuration steps above. If your Windows PC was originally set to automatically obtain an IP address (DHCP), then use 192.168.100.50 for the HI-4060 IP address in step 3 below.
Setting an IP from the Front Panel

Step 1. Press Enter to activate the Configuration menu. Use the down arrow to select Instrument Setup and press Enter. Use the down arrow again to select Ethernet. Finally, select IP to display the IP screen.

Step 2. Press the CLR button to erase the current IP value.

Step 3. Starting with the right most digit of the new HI-4060 IP address, enter each digit using the up/down arrows including the decimal-points. Press the left arrow to move to the next digit.

Step 4. Press Enter to save the entry.

Step 5. Press the Exit key four times to exit the IP, Ethernet, Configuration and Setup menus.

The HI-4060 is now configured to communicate with the PC. Enter the IP address in any web browser to access the embedded web browser. For example: http://192.168.100.101

Web Interface Basics

Help
To view a description of the various parameters on each of the configuration pages, click “HELP” to display the Help dialog.

Save Parameters
Most Save buttons let you either save entered parameters at any time during the configuration process or wait until you have configured all of the listed parameters.
Network Options Configuration

The HI 4000 Series Network configurations include:

- DeviceNet
- RIO
- Profibus-DP
- Ethernet TCP/IP
- Modbus TCP/IP
- EtherNet/IP

This enables the HI 4000 Series to communicate with many devices on the network, including PCs and PLCs. This means that you can map, configure and monitor all the HI 4000 series products from the front panel or your LAN, Internet, DeviceNet, ControlNet and Wireless Servers that are connected to the Network.

To open the Configuration Options menu from the Web interface, Select Configuration to display the Configuration menu and select Options menu.
What appears on the Options menu depends on the cards installed in your system.

**Configuring DeviceNet**

DeviceNet is an open network designed to connect the Rate Controller to higher-level controllers such as PCs, PLCs or embedded controllers. The DeviceNet Network is an open, global industry-standard communication network designed to provide an interface through a single cable from a programmable controller or PC directly to the HI 4060 Rate Controller as well as smart devices such as sensors, push buttons, motor starters, simple operator interfaces, drives and other modules.

The user can adjust the number of Bytes In and Bytes Out should their process require a different configuration than the default 32 Bytes In and/or Out.

Step 1. From the Home Page, select Configuration; then select Options. The Configuration page appears.

**NOTE**

*The Options Menu varies depending upon what options are installed in the HI 4060.*

**Accessing DeviceNet from the Web Interface**

Select Configuration to display the Configuration menu and select Options menu, select DeviceNet to open the DeviceNet Setup page. Accessing

**DeviceNet from the Front Panel**

From the Configuration Menu, use the Down arrow to select Options and press Enter to open the Options menu. Use the Down arrow to select DeviceNet and press Enter to open the DeviceNet menu.
DeviceNet Baud
See your Network Administrator if you don’t know the correct Baud Rate.

Range: 125k, 250k, 500k (default 125k)

Entering Baud Rate from the Web interface
From the Baud pull-down list, select the Baud rate you need for your DeviceNet network.

Entering Baud Rate from the front panel
From the DeviceNet menu, select DNET Baud and press Enter. Press the right or left arrows to select the Baud Rate you want. Press Enter to save the entry.

DNET Node

Range: 0-63 (default 63)

Entering Node from the Web interface
In the Node text field, type in the Node address of the instrument.

Entering Node from the front panel
Step 1. From the DeviceNet menu, select DNET Node; then press Enter to display the DNET Node edit screen.

Step 2. Use the right or left arrow to position the cursor and use the up or down arrows to select the number of the node address.

Step 3. Press Enter to save the entry.
DNET Bytes Input and Bytes Output

Range: 0-32 (default 32)

Entering DNET Bytes In from the Web interface

Step 1. In the Bytes Input text field, enter the Bytes Input value you need for your application.

Step 2. In the Bytes Output text field, enter the Bytes Output value you need for your application.

Step 3. Click Save Parameters to save the configuration.

Entering DNET Bytes In from the front panel

Step 1. Use the Down arrow to select DNET Bytes In and press Enter to open the DNET Bytes In edit form.

Step 2. Use CLR to clear the current entry and position the cursor on the first value to change; then use the up or down arrow to scroll to the value.

Step 3. Use the left arrow to move the cursor to the next position, and repeat the process above until you have entered all the digits for your DNET Bytes In. Our example shows 16 bytes.

Step 4. Press Enter to save the entry.

Step 5. Use the Down arrow to select DNET Bytes Out and press Enter to open the DNET Bytes Out edit form.

Step 6. Use CLR to clear the current entry and position the cursor on the first value to change; then use the up or down arrow to scroll to the value.

Step 7. Use the left arrow to move the cursor to the next position, and repeat the process above until you have entered all the digits for your DNET Bytes Out. Our example shows 16 bytes.

Step 8. Press Enter to save the entry.
DNET No Connection

The Poll Connection entry is read only, telling you that the instrument is connected and polling. If the HI 4060 is not connected to the DeviceNet Network a “No DNET Connection” message appears.

To resolve the problem and remove the warning, you must reconnect the DeviceNet cable.

From the Web page

The picture to the right shows the Setup form displaying the No DNET Connection message.

When the cable is connected correctly, the “No DNET Connection LED Off” message should then be replaced by “Yes DNET Connection. LED On” message.

From the Front panel

Step 1. If the instrument is not connected to the DeviceNet Network a “No Connection” message appears.

Step 2. Reconnect the DeviceNet cable. The “No Connection” goes away and the Poll Connection reappears.

Step 3. Press Exit to return to the Setup Menu.

EtherNet/IP™

EtherNet/IP, short for EtherNet Industrial Protocol, is an open industrial networking standard that takes advantage of commercial, off-the-shelf Ethernet communication chips and media. Ethernet technology, enables the user to access device-level data from the network. The EtherNet/IP networking standard supports both implicit messaging (real-time I/O messaging) and explicit messaging (message exchange). EtherNet/IP is an open network that takes advantage of commercial technology that already exists.

You will need a key number to enable EtherNet/IP for field upgrades. If the controller was ordered with EIP, the key should be in place. You can purchase a key number by contacting the Hardy Service Center or your local Hardy Representative.

NOTE

EtherNet/IP™ is a trademark of ODVA.
Configuring EtherNet/IP from the Web page

Step 1. Select EtherNet/IP from the Options menu to open the Configuration - Options - EtherNet/IP form.

Step 2. Enter the key number you received when you purchased the EtherNet/IP option in the Key text field.

Step 3. In the Bytes Input field enter the number of bytes you require for your application. Our example shows 4 bytes.

Step 4. In the Bytes Output field enter the number of bytes you require for your application.

Step 5. Click on the Save Parameters button to save the settings.

Configuring EtherNet/IP from the front panel

Step 1. From the Configuration Menu, select Options and press Enter; then select EtherNet/IP and press Enter.

Step 2. On the EtherNet/IP Menu, select EIP Key and press Enter to open the EIP Key edit form.

Step 3. To enter the key number you received from Hardy Process Solutions Service Center, use the left or right arrow to position the cursor and the up or down arrow to enter the value. Repeat the process until you have entered all the digits for your EIP Key.
Note that the number displayed is for illustration only. Keys are based on serial number and do not transfer to other like controllers.

Step 4. Press Enter to save the key entry.

Step 5. You will have to set the following parameters on your PLC in order to communicate with the HI 4060:

- COMM FORMAT: DATA - SINT
- INPUT INSTANCE 100, LENGTH UP TO 256
- OUTPUT INSTANCE 112 - LENGTH UP TO 256
- CONFIGURATION INSTANCE 150 - LENGTH 0

**NOTE**

Minimize the string length to match the application. The input and output ranges must coincide between the host and the HI 4060.

Step 6. Use the down arrow to select EIP Bytes In and press Enter to display the EIP Bytes In edit form.

```
0.000
Ethernet/IP
> EIP Bytes In → 256
EIP Bytes Out 256
EXIT CLR
```

Step 7. Use the left or right arrow to position the cursor and the up or down arrow to enter the value. Repeat the process until you have entered all the digits for your EIP Bytes In. Our example shows 10 bytes.

Step 8. Press Enter to save the entry.

Step 9. Use the down arrow to select EIP Bytes Out and press Enter to display the EIP Bytes Out edit form.

```
0.000
Ethernet/IP
> EIP Bytes Out → Connected
EXIT CLR
```

Step 10. Follow the procedures used in steps 7-10 to set the values for Bytes Out. Our example uses the default value of 10 bytes.

**IP Addresses**

An IP address consists of 32 bits (4 Bytes) that indicate the network and host numbers. Follow the steps below to assign a fixed IP address (without DHCP):
Step 1. From the Setup menu, use the Down arrow to select Ethernet; then press Enter to display the Ethernet menu with the cursor in front of IP.

Step 2. Press Enter to open the IP edit form. If you are configuring the instrument for the first time, the default IP address appears. You must change this address when starting the instrument for the first time.

Step 3. Use the left or right arrow to position the cursor and the up or down arrow to enter the value. Repeat the process above until you have entered a valid IP address. 

Range: 0.0.0.0 to 255.255.255.255.

Step 4. Press Enter to save the entry and return to the Ethernet Menu.

It is recommended that you leave the Mask, Gate and DNS settings alone. They are not listed as options. Contact your Network Administrator if you need to set these parameters.

No Connection

The Connection message is read only, telling you that the instrument is or is not connected. If the HI 4060 is not connected to the network a “No Connection” message appears.

To resolve the problem and remove the warning, you must reconnect the Ethernet cable.

The picture to the right shows the Setup form displaying the No Connection the message. The picture below shows the message from the front panel.
Remote I/O

NOTE
For complete information about the remote I/O interface, see the HI 4000 RIO Manual.

Step 1. To configure the Remote I/O from the Web Browser, from the HI 4060 Home page click Configuration; then click Options to display the Options Menu.

Step 2. Click RIO Card to display the RIO Option Card page.

Step 3. From the Baud pull-down list, select the Baud rate for this application.

Step 4. In the Address text field, enter the address for the HI 4060.

Step 5. From the Rack Size pull down list, select 1/4 or as required. See HI RIO manual for definition.

Step 6. From the Quarter (Starting Quarter) pull-down list, select the Starting Quarter you configured in the PLC to use for this location.

Step 7. The Last Quarter pull-down list is selectable as YES or NO.
Step 8. Click Save Parameters when you finish. Note that you do not have to wait until you have configured all the parameters to save them.

**Blind Unit Operation Setup**

An HI 4060-DR Rate Controller cannot be configured from the front panel as a blind unit. In a blind unit, the Remote I/O parameters are configured from the Web browser.

**Viewing the I/O Card Display**

The I/O Card Menu is not configurable but is read only from the front panel. The menu indicates whether the I/O Card is connected, A/D Count, Number of Inputs and the Number of Outputs currently activated. The values are hexadecimal values. A table is provided below to determine the values listed. The Input and Output values consist of a byte with the least significant bit equal to the first Input or Output.

**Viewing the Controller I/O Card Option from the Web Page**

Select Configuration from the HI 4060 Home Page and select Options to display the Options menu.

Select Controller I/O Card on the Options menu to open the read-only I/O Card page. This page shows the Inputs and Outputs that are currently activated. You may need to refresh your web screen to view any changes to the inputs.

To test the inputs, continuously activate the input and refresh the web page while the input is activated. Confirm and move on to the next input. Be careful not to cause any false actions on the system while testing. When an input is activated you will also see the output percentage of full scale displayed at the bottom of the display.
Viewing the Controller I/O Card Option from the Front Panel

Step 1. From the Options menu, use the down arrow to select I/O Card; then press Enter to display the I/O Card menu.

```
0.000

Options
> I/O Card
> Analog Card
EXIT CLR
```

```
0.000

I/O Card
> I/O Card OK
A/D Counts 1057
EXIT CLR
```

**NOTE**

If the I/O Card Option is not installed the I/O Card Menu does not appear.

Step 2. Select Inputs and press Enter to open the Inputs edit form.

```
0.000

I/O Card
> Inputs 00000
Outputs 00000
EXIT CLR
```

```
0.000

Inputs 00101
EXIT CLR
```

Step 3. The Inputs are displayed as a 5-bit value. (0 0 0 0 0). Note that the least significant (right-most) digit is input 1 and the most significant (left-most) digit is input 5. For example, with Input 1 and Input 3 active, the display reads.

```
0 0 0 0 0
```

Input 5  Input 4  Input 3  Input 2  Input 1

Step 4. The Outputs are displayed as a five-bit value.

```
0 0 0 0 0
```

Relay 5  Relay 4  Relay 3  Relay 2  Relay 1

The relay outputs default settings are Relay 1 ON, Relay 2 SHUTOFF, Relay 3 REC, Relay 4 ALARM, and Relay 5 REFILL. Relay 1 is on the right of the bit value and Relay 5 is on the left. For example, if Relay 4 and Relay 5 are active, the binary value is (1 1 0 0 0). If the relay output defaults are selected, the alarm and refill relays are activated.

```
0.000

Outputs 00000
EXIT CLR
```

```
0.000

Outputs 11000
EXIT CLR
```
Analog Output Card

NOTE

The Analog Output Card comes standard on the 4060.

The analog parameters configure the analog output channels. The channels are hard configured as voltage or current outputs. Channels 1 and 3 are voltage output channels (0-10 VDC). Channels 2 and 4 are current outputs (0-20 mA). Although the analog board comes as standard equipment, it is configured via the Options menu.

Configuring the Analog Output Card from the Web Page

Step 1. From the Home Page, click Configuration to open the Configuration menu. Although the Analog Output Card comes standard, it is accessed under Options, so select Options to open the Options menu; then select Analog Output Card.
Step 2. Click Analog Output Card to open the Configuration - Options - Analog Output page.

NOTES

The Voltage Low and High and Current Low and High are set to the default values. 0-10 Volts Output and 4-20 mA Output. If you don't want to change the values start with the Low and High Weight values for your application.

For assistance in configuring the Analog Output Card you can click on ‘HELP’ at the top of the page.

Analog out channel 1-4 are default mapped as OP% for motor speed control. To change the analog out source, you need only to map it and that will change the default setting.

To change a value, rapidly click in the text field until the entire value is highlighted. It may take a few clicks

You can click on the Set button to save the parameters as you enter values or wait until all the channels are configured.

To Configure Channel 1 (Voltage Output):

Step 1. Type the value for your low voltage output in the Chan 1 V LOW text box.
Step 2. Type the value for your high voltage output in the V HIGH text box.
Step 3. Type the value for your Low Weight Setting.
Step 4. Type in the value you want for your High Weight Setting.
Configuring the Analog Card from the Web Browser

The lower half of the Analog Output configuration form on the Web interface shows read-only outputs. The analog input weight values for the four channels are labeled: HFO28, HFO29, HFO30, and HFO31. The card scales these values for a linear output within the range defined by the high or low weight values you set.

HFI2, HFI3, HFI4, and HFI5 are mapping symbols for the output scaling results.

The Loopback Debug Values are estimates only and may not match the actual outputs.

HI 4060 Analog Output Adjustment

If the output from the analog output card does not match the output levels required for your system, there is now a method of recalibrating the output levels based on your system.

Starting in firmware Version 1.6.0.1, there is a page on the web browser as well as a menu on the front panel for adjusting the analog outputs. These pages require the high security code to access.

On the web browser.

Navigate to Configuration> Options> Analog Output Card.
Click the blue RIGHT arrow at the bottom of the screen.

**NOTE:** If you are asked for a security code, enter the High security code. If you don’t know the password and cannot access this screen, see your system administrator.

Normally, you will not need to manually adjust the gain or offset values.**
**If these are changed, they will affect the output of the associated analog channel.

NOTE

In the following procedure you will use two known inputs and measure the actual output levels received. On the Analog Output Calibration page, shown above, enter the higher input as high and the lower as low.

Procedure to correct the output levels.

Step 1. Verify that the range for input and outputs is set correctly on the Analog Output setup page. The known inputs would normally be equal to the Low and High range limits for the inputs, but they do not need to be. If they are not the Low and High range limits, then the Desired output levels would be the outputs expected based on that input.

Step 2. Select the channel you are testing.

Step 3. Enter the desired output for the first known input (high) for Desired Output High.

Step 4. Enter the actual output for this input for Actual Output High.

Step 5. Enter the desired output for the known low input for Desired Output Low.

Step 6. Enter the actual output for this input for Actual Output Low.

Step 7. Click “Recalibrate.” The unit will recalibrate the outputs from the analog card to Use the left or right arrow to position the cursor and the up or down arrow to select

Step 8. The analog output card's Output Settings are configured in MAPPING via the symbols HFO28, HFO29, HFO30, and HFO3. Use these rules to scale the settings:

- If the setting is less than the Low Weight, the analog output is set to V (or I) Low.
- If the setting is greater than the High Weight, the analog output is set to V (or I) High.
- Otherwise, the output is "V (I) Low" + (Setpoint - "Low Weight")\(^*\)("V(I) High"-"V(I) Low")/("High Weight" - "Low Weight")

NOTE

The Loopback Debug Values are estimates only and may not match the actual outputs.

Configuring the Analog Output Card from the Front Panel
Step 1. From the Options menu, use the down arrow to select Analog Card; then press Enter to display the Analog Card Sub-Menu.

Step 2. Press the right or left arrow to select the channel you want to view and/or configure.

**Range:** 1-4 (default 1)

**Setting Channel 1 & 3 Output Voltage Parameters**

Keep in mind that Channel 1 and Channel 3 are 0-10 Voltage Channels.

Step 1. Use the down arrow to select V/I Out Low and press Enter to open the V/I Out Low edit screen.

**Range:** 0-10V (default 0-10V)

Step 2. Use the left arrow to position the cursor and the up and down arrow to set the value. Our example shows 0.00 as out Low Output voltage value.

If you want to narrow the total range from 0-10 V to 0-5, change the V/I Out Low value to 5.00. You can adjust the low output voltage to any value to fit your application requirements.

Step 3. Press Enter to save the setting. A brief message “Entry Accepted” appears if the value is between 0-10 Volts. If the value is not between 0-10 Volts, the V/I value reverts to 0.00

**Setting Current Channel 2 & 4 Parameters**

The process for configuring Channel 4 is the same.

**NOTES**

*When you finish with the configuration from the front panel, if you selected the defaults and want a signal other than motor control you will need to map that input signal to the Analog Channel, as described in Chapter 6.*

*To set the Analog Card Parameters, see Configuring the Analog Output Card from the Web Page.*

**Analog Card Help Menu**
The Help Menu provides a description of all the Analog Card parameters.

Step 1. Press the down arrow until the cursor is in front of Help.
Step 2. Press Enter to view the Help Menu.
Step 3. To read the complete descriptions and see other parameters press the down arrow.
Step 4. Press the Exit button once to return to the Help menu or twice to return to the Options menu.

Configuring ModBus - TCP/IP Over Ethernet (10 socket max.)

ModBus is an application layer messaging protocol, positioned at level 7 of the OSI model and enabled to communicate with up to ten different hosts. It provides client/server communication between devices connected on different types of buses or networks. Support for the simple and elegant structure of ModBus continues to grow. The Internet community can access ModBus at a reserved system port 502 on the TCP/IP stack.

ModBus is a request/reply protocol and offers services specified by function codes. ModBus function codes are elements of ModBus request/reply PDUs. The objective of this document is to describe the function codes used within the framework of ModBus transactions.

ModBus is an application layer messaging protocol for client/server communication between devices connected on different types of buses or networks. It is currently implemented for the HI 4060 product line using: TCP/IP over Ethernet.
Enabling ModBus in the HI 4060 Module

ModBus is an optional network communication protocol and requires a Key to enable. If it was not ordered with your system, you can purchase the option with the Key by contacting your local Hardy Process Solutions Representative or Hardy Service Center.

Enabling ModBus TCP/IP from the Web page

Step 1. From the HI 4060 home page, click Configuration to open the Configuration menu, select Options to open the Options menu.

Step 2. Select ModBus TCP/IP. On the ModBus-Options page, enter the ModBus Key in the ModBus Key text field.

Step 3. Click Set Parameter.

Step 4. This procedure activates the ModBus option in the instrument.

Step 5. The HI 4060 module is ModBus enabled.

Step 6. You can now map from your client (PLC) to the HI 4060 module via ModBus.

Installing Hardy ModBus-Link

If you do not have a PLC or other client, Hardy has provided the Hardy ModBus-Link Client to communicate with the HI 4060 module. For the sake of clarity the Client/Server definitions are as follows:

- Client - The module asking for data.
- Server - The module providing the data.
- 1-10 host socket connections available on link
This Hardy ModBus software is used to setup and test the link and is not a full protocol packaged software.

Step 1. On the Documentation CD you received with your HI 4060 Instrument you will find a copy of the Hardy ModBus-Link Software. If you do not have the CD that came with your instrument you can go to the HI 4060 Resources Web page and download the application from there.

Step 2. Double click on the Hardy ModBus-Link .exe file to install the software on your PC. Once the Installation is complete a Hardy ModBus-Link icon appears on your Desktop.

Step 3. Double click the Hardy ModBus-Link icon to open the display shown below.

Step 4. From the Connection pull down menu, click “Connect” to display the TCP/IP Connection page.
Instrument Setup / Entering scale capacity

Step 5. To verify that you have two-way communication, on the Mapping web page of the HI 4060 instrument you want to ping, select “ModBus Float Out” (MFO) on the Destination Network pull down menu.

Step 6. For Float Variable under Scratchpad, use the default word 0. “MFO0=” appears in the Map: text field.

Step 7. From the Select Source Scratchpad pull down list, select the Float Variable 0 (HFO0), as shown below. Keep the default word 0.

Step 8. A Select button appears. Click this button.

The Destination and Source appear in the Map: text field. (MFO0=HFO0). Click the Map button to open the HFO - Float Variables form, shown below. Thus far we have mapped the Float Variable 0, word 0 to ModBus Float Out, Word 0).
Step 9. The HFO - Float Variables form, type in a value. For our example we used the value “555.0000.” Double click in the HFO (Hardy Float Out) text field 0 and click Enter.

Step 10. Go to the Hardy ModBus-Link Display. Minimize the Web Page, but do not close the browser. On the Display pull down, select Float Inverse.

Step 11. The value we entered from the Mapping page appears to the right of the 00000 = which is 555.0000. Click button 23, as shown below to open the Read/Write Multiple Registers page.

Step 12. Double click on “555.0000.”
Step 13. The Enter Value display appears with the value 555 which was sent from the HI 4060 module (In our example 555). Enter a new number. We entered 999.

![Enter Value Display](image1)

Step 14. Click OK. The Write Multiple Registers display appears with 999.0000 in place of 555.0000. Click the Send button.

Step 15. A Response pop up appears indicating that the Response from the HI 4060 module was received. Click on OK.

![Write Multiple Registers](image2)

Step 16. Should you get an error message, check the following:

- Function Not Supported - You cannot use the selected function. Use a different function.
- Address Error - Wrong IP address of the register you want to send the data to. Get and enter the correct IP address. See your Network Administrator.
- Byte Count Error - The Byte count is incorrect. Enter the correct byte count.
- Value Error - The Value entered does not match the variable type. Enter the correct a value that is equal to or less than the variable type.
- Request Error - Your want to Read and you select Write. Make sure you select the correct Request Error.

**ProfiBus® Configuration**

ProfiBus-DP operates using a cyclic transfer of data between master(s) and slave(s) on an RS485 network. An assigned master periodically requests (polls) each node (slave) on the network. The HI 4060 is a slave device. All data communication exchanges between a master and the HI 4060 originate from the master device. Each HI 4060 is assigned to one master and only that master may write output data to that HI 4060. Other masters may read information from any slave, but can only write output data to their own assigned slaves.
Because ProfiBus uses a cyclic (periodic) polling mechanism between masters and slaves, it is also deterministic. Therefore behavior of a ProfiBus system can be reliably predicted over time. ProfiBus is designed to guarantee a deterministic response.

The length (and timing) of the I/O data to be transferred from a single slave to a master is predefined in the slave's device data base or GSD file. The GSD files of each device connected via the network (slaves and class 1 masters only) are compiled into a master parameter record which contains parameterization and configuration data, an address allocation list, and the bus parameters for all connected stations. A master uses this information to set up communication with each slave during startup. Slaves can only acknowledge the messages they receive or transfer messages to a master when the latter requests a slave to do so. Slaves are also designated as passive nodes.

**Configuring ProfiBus From the Web Interface**

Step 1. From the Configuration menu select Options to open the Options menu; then Click on ProfiBus Card. to open the Click on ProfiBus Card form.

Double click in the Node text field to highlight the current entry. Type in the HI 4060 Node address. **Range:** 1-125 (default 5) Our example uses the default address #5.

**NOTE**  
ProfiBus Node Address #5 is the lowest number that can be used by a slave device.

Step 2. Click Save Parameters to save the entry.

Step 3. You can also read the communication status of the instrument.

Step 4. Click Home to return to the Home Page.

**Initialization Process**

To be able to add an HI 4060 to a ProfiBus-DP network, you need a PC and software such as Siemens Step 7™, Simatic Manager or equal, that allows the ProfiBus-DP PLC and the HI 4060 to exchange data.
ProfiBus-DP .GSD File

All devices connected to a ProfiBus-DP network require a *.gsd file. The *.gsd file contains all the parameters including the baud rate, table formats and necessary data required by the network PLC when an HI 4060 is connected to the network.

A copy of the *.gsd file can be found on the CD that comes with the instrument or at the Hardy Website or at http://www.ProfiBus.com/libraries.html.

Whichever Simatic Manager you select, you must go through these three steps:

Step 1. Connect the HI 4000 Series Instrument to the ProfiBus DP network and verify the address. (See the Installation Section for Installation and Cabling Instructions.)

Step 2. Connect the PC to the Trunk Line. Load the configuration properties to the initialization software on the PC and transfer them to the PLC.

Step 3. Install the *.gsd file, and map I/O data table properties to the instrument.

Pre-Initialization Procedures

Step 1. Inspect the network cables and make sure that the cables have been installed correctly and satisfy the ProfiBus-DP guidelines for the data transmission baud rate(s) required. (See the Cabling Chapter/ProfiBus Installation in this manual for ProfiBus-DP cable specifications and cabling guidelines.)

Step 2. Select the Node address for the HI 4060. (See below) This can be done before or after Initialization.

Step 3. Cycle power, or perform the two previous steps before powering up your network. Address selection can only occur after cycling the power. Make sure that the software you use will detect the values as you have set them.

Caution: The address should never be changed during operation. If the address is modified while on line, an internal error could be generated and the module disconnected from the network.

NOTE ProfiBus-DP provides a very flexible network solution. In addition to the basic guideline provided in this manual, your installation could require procedures that are beyond the scope of this manual. For more information and to locate lists of links to other sources of ProfiBus-DP information, check the ProfiBus website at http://www.ProfiBus.com.

Step 4. Complete any additional configuration that is required by your PLC for initialization. Our initialization example is for a Siemens PLC. Your PLC initialization requirements may differ.

Step 5. Install the *.GSD file for the instrument you connected to the ProfiBus Network.
Initialization Procedures

NOTE
The examples come from the Siemens Step 7™ Simatic Manager Software. Your software will vary from these procedures. Step 7™ is a trademark of the Siemens Corporation.

Step 1. In the Siemens Step 7™ Simatic Manager open the Hardware Catalog.

Step 2. Click on the “+” to expand the Additional Field Devices Folder.

Step 3. Click + to expand the General Folder.

Step 4. Highlight the CPU you selected in the UR dialog box.

Step 5. Double Click on “HI4000” or drag and drop the “HI4000” folder to the Profibus-DP Network.

Step 6. This opens the HI 4000 PDP Parameters dialog box where you can set the address of the instrument, if necessary.

NOTE
The HI 4060 Series Input and Output Sizes are expressed in words. 16 words input and 16 words output.
Chapter 4

Step 7. Click OK to set the Node Address.

Step 8. The HI 4000 Series module appears in the Profibus Network.

Step 9. Click the Download Icon to download the configuration to the PLC and open the Select Destination Module dialog box.

Step 10. Click OK to open the Select Station Address Dialog box; then click OK again. A status box will show the progress of configuration download to the PLC.

Step 11. When the download is complete the HW Config dialog box should look something like this.

Step 12. Initialization is complete.

Configuring Profibus from the Front Panel

Step 1. Select Options from the Configuration menu, then Profibus from the Options menu.
Step 2. Select Profibus Node to open the Profibus Node edit screen.

Step 3. Press CLR to clear the current entry and position the cursor, then use the up or down arrow to select the number for the right-most digit.

Step 4. Press the left arrow to move the cursor to the next digit, and use the up or down arrow to select the number for the left digit. Our example sets the Node Address at #7.

Step 5. Press Enter to save the entry.

Step 6. The other parameters are status indicators and are read only. The status indicators indicate the state of communications between the Master and the HI 4060.

**DP State (Read Only)**
- 00 = Status “Wait Prm” (HI 4060 waiting for communications from the Master Device.)
- 01 = Status “Wait_Cfg” (HI 4060 configuring for Data Exchange)
- 10 = Status “DATA_EX” (HI 4060 Exchanging Data with Master)

**WD State (Read Only)**
- 00 = Status “Baud_Search”. (HI 4060 searching for baud rate.)
- 01 = Status “Baud_Control”. (HI 4060 found the baud rate.)
- 10 = Status “DP_Control”. (HI 4060 communicating at the current baud rate.)

**Baud Rate**
Reads the baud rate at which the HI 4060 communicates with the Master Device. If “Error” appears it means that no data is being exchanged between the HI 4060 and a Master device.
Press the Exit button until you return to the Summary display.

**Configuring Rate of Change (ROC)**
ROC measures and displays the rate at which a material enters or is dispensed from the scale over a period of time. The 4060 uses a minimum of one second’s worth of updates to calculate the change. The register used for ROC data holds 15 entries. New weight values are written to the register at the rate of 1/15th of the time base; then the first register is subtracted from the 16th Register. Thus, the 16th register is one-time base older than the 1st register.
Time Units and Time Base

The HI 4060 calculates and optimizes the flow rate. However, you enter values within an appropriate range to use as a starting point for auto rate calculation.

ROC Time Units

ROC time units are the units of time (seconds, minutes or hours) you want for the Rate of Change. The ROC display on the summary display will read in these units. Auto rate calibration uses a minimum of 10 ROC Time periods to make the rate calculation.

Units: SEC, MIN, HR (default SEC)
Range = 1 - 1800

ROC Time Base

The Time Base is the length of time in seconds between two weight readings that are subtracted to determine the initial flow rate. By increasing the time base, you increase the time between weight readings. This allows more material to be dispensed during the time base period. Low flow rates require a longer time base than high flow rates. The HI 4060 measures weight to about 1 part in 10,000. The formula below provides a minimum.

\[
\text{TIME BASE} > \frac{\text{SCALE CAPACITY}}{5000}/\text{LOW SETPOINT} \text{ (units per sec.)}
\]

SCALE CAPACITY/5000 = determines minimum weight increment
Example: (440/5000) = 0.088 lb
lowest setpoint in units per second @ 3 lb per min is: 3 lb/60 sec = 0.05 lb/sec
Thus:
TIME BASE = 0.088/0.05
TIME BASE = 1.76 (rounded to 2)
MINIMUM TIME BASE = 2 seconds

Configuring ROC (Time Units and Time Base) from the Web interface

To display the ROC page, click the right green arrowhead at the bottom or the ROC link at the top of the Configuration - Ingredient or Refill form. Sample screens are displayed below under Configuring the Time Base from the Web interface.

Step 1. From on the Time Measure pull down, select the Time Measure to use for this ingredient. Our example uses minutes.
Step 2. In the time base field, enter the Timebase you want for the interval between weight readings.

Step 3. Click Save Parameters to save the parameter settings.

Configuring ROC (Time Units and Time Base) from the Front Panel

Step 1. From the Ingredient menu, select ROC and press Enter to display the ROC sub-menu.

Step 2. Select Time Units; then press Enter to display the Time Unit edit page.

Step 3. Press the left or right arrow to toggle between seconds, minutes, or hours.

Step 4. Press Enter to save the entry and return to the ROC Menu.

Graphing ROC (Front Panel)

You can graph the Actual Rate of Change (ACT) compared to the Rate Setpoint or the Control Output Percentage on the front panel display. ACT is a heavily averaged ROC used for over-all performance. During setup, you can make the plot easier to see by adjusting the Max and Min parameters. The default values for the Actual ROC graph include the Max Rate that was set during a rate calibration and zeroing. For the Control Output Percentage, the max is 100 and the min is 0.
Step 1. From the Configuration menu, select Graph and press Enter to open the Graph menu.

Step 2. Press the up or down arrows to toggle between OFF and ON, and press Enter to save the setting.

Step 3. Select Graph var and use the up or down arrows to toggle between ACT and OP (Control Output Percentage).

Step 4. Press Enter to save the selection.

Step 5. Use the down arrow to select Max.

Step 6. If you selected the Actual (ACT) option, the default Max rate is whatever the Max rate.

Configuring Security

The security system can be used to:

- Protect the entire Web interface and front panel from unauthorized access
- (front panel only) Limit access to selected functions by those who have basic access

To gain access to protected interfaces and functions, the user must enter a security code.

NOTE

Web page security can be assigned to require either the medium or high level code for access, but not both, while security for the front panel can be set to one level and access to specific functions via the front panel can be set to a different level.

Restricting access to the Web interface and front panel

If security is currently in place and you want to change any security settings, logon using the high security code.
Restricting access to the Web interface and front panel from the Front Panel

Step 1. If you want to require a high-level password to access the Configuration Menu, use the down arrow to select Security and press Enter to open the Security menu; then select High Password and press Enter to open the High Password edit form.

Step 2. The field defaults to 0, which indicates that no password protection is required. Use the up or down arrow to change to a value for your High security code (Allowed Range 0-65535). Our example (for illustration only) shows 123.

Step 3. Press Enter to save the password and return to the Security Menu.

Step 4. To set up a medium-level password, use the same process described in steps 1-3.

Step 5. To apply security for the front panel, from the Configuration menu select Security and press Enter to open the Security menu.

Step 6. Select FPSecurity, and press the Right or Left arrows to select NONE, MEDIUM, or HIGH. Using the same procedures, you can setup a NONE, MEDIUM, or HIGH password requirement for the Calibration Section and to the Web Page.

Step 7. Press the Exit button to return to the Summary Display.
Restricting access to the Web interface and front panel from the Web Page

Step 1. From the Configuration menu, click Security to open the Security page.

![Configuration menu](image)

**NOTE**
The field allows only numbers in any combination. Be sure to write down the codes you use and store them in a secure location in case you need to refer to them again.

Step 2. In the High and/or Medium Security Code text fields, type in the number codes you want (Allowed Range 0-65535).

![Security page](image)

Step 3. Our example shows 123 for High and 456 for Medium. To not set a code, enter 0.

![Security page](image)

Step 4. On the “Front Panel Security pull-down list, select the level of security you want for the front panel.

If other than NONE, there must be a security code for that level or the security system will not require a code to be entered.

![Security page](image)
Step 5. From the “Front Panel Calibration Security pull-down list, select the level of security you want for calibrating the instrument. If other than NONE, there must be a security code for that level or the security system will not require a code to be entered.

Step 6. From the “Web Page Security” pull down list, select the level of security you want for the Web Pages. If other than NONE, there must be a security code for that level or the security system will not require a code to be entered.

Step 7. Click Save Code to save the security settings.

NOTE
You can save your settings at any time during the Security setup process.

Verifying a password from the front panel

For front panel access, the user’s password is used to derive the user’s ID. Users who must enter passwords to operate or configure the instrument from the front panel should follow these steps:

Step 1. Select Verify Password and press Enter to open the edit page.

Step 2. Use the left or right arrow to position the cursor and the up or down arrow to enter the value.

Step 3. Repeat the process until you have entered the whole password; then press Enter to open the window.
Setting Parameter Security

The setup for High and Medium security code can be applied to functions accessed through the front panel. Three security levels apply to parameters: NONE, MEDIUM, and HIGH. The security level for a parameter is indicated by the addition of dollar signs or zero to the parameter name, as described below:

- **None**: A security code of 0 disables all security, whether the $ sign is present on a parameter or not.
- **Medium**: If a parameter has medium security, insert a $ before its name.
- **High**: If a parameter has medium security, insert $$ before its name.

For example, this Decimal Point parameter has a medium security level:

00000002 $Decimal Point=1 [1]

This manual system allows a system administrator to selectively set security restrictions for selected parameters.

Setting Parameter Security from the Web Interface

You can access the parameters by editing the Parameter Dump. Select Operation from the Home page to open the Operation menu; then select Diagnostics to open the Operation- Diagnostics form.

Click the Parameters link to display a list of parameters.

For each function you want to protect, enter the $ (medium security) or $$ (high security) in front of the parameter name.

For example, if you want a high security code for Units, enter the following: 00000001 $$Unit=0 (lb)
Our examples show two dollar signs, High Security for the Weight Decimal Pt and one dollar sign for Rate Decimal Pt.

**NOTE**

*You must first enter a High or Medium security password or both in order for the Parameter Security to work.*

Click the Save button to save the security changes.

**NOTES**

*The Mode and Operational Display on the Summary display work even if a HIGH or MEDIUM password has been assigned.*

*Pressing Enter makes the Configuration Menu reappear so you can proceed. This is true for all Sections that are assigned a password.*

**Instrument Setup**

This section describes how to setup values such as Instrument ID, Operator ID, Unit of Measure and other values that are basic to HI 4060 operation. The outline will follow the Configuration - Instrument Setup form on the Web interface, but the procedure for using the front panel display will also be explained for each value.

The configuration process sets up the instrument to operate as a scale. This includes configuring WAVESAVER®, Scale Capacity, Units of Measure, Motion tolerance and
other instrument parameters required for your process. Here is where the global parameters are entered. All of the configured parameters and mappings except the IP Address are stored in the Secure Memory Module (SMM-SD).

**Accessing Instrument setup from the Web Interface**

Step 1. From the HI 4060 Home Page click on Configuration to open the Configuration Menu.

Step 2. Select Instrument Setup to open the Configuration - Instrument Setup form.

**Accessing the Instrument Setup menu from the Front Panel**

Step 1. Configuration is a top-level menu which can be accessed from any lower level menu by clicking the Exit button one or more times, or press Enter from the Summary display.

Step 2. Use the down arrow to select Instrument setup, and press Enter to open the setup menu.

**nit (of Measure)**

The Unit parameter sets the scale and related displays to one of the following options:

- Pounds (lb) - Default
- Ounces (oz)
- Ton (Ton) short ton
- Kilograms (Kg)
- Grams (G)
- Metric Tonnes (t) long ton

**Range:** LB, OZ, LB/OZ, TON, KG, G, T (default LB)

**Configuring Unit from the Web interface**

Step 1. Select a weight type from the Unit pull-down selection list.
Step 2. Click on the Change Unit button to make the change. You must click Save Parameters to save any value set from this form.

**Configuring Unit from the front panel**

Step 1. From the Setup menu, use the down arrow to select Unit.
Step 2. Press the left or right arrows to select the Unit of measure you want.
Step 3. Press Enter to save the selection.

**Instrument ID**

The Instrument ID parameter provides a specific identification for a Rate Controller. This is important when using several HI 4060's for different applications. A unique Instrument ID allows you to distinguish one HI 4060 from another.

**Range:** 19 characters (default HI 4060)

**Configuring the Instrument ID from the Web interface**

Enter an instrument ID from the keyboard. You must click Save Parameters to save any value set from this form.
Configuring the Instrument ID from the Front Panel

Step 1. From the Setup menu, select Inst. ID; then press Enter to open the Inst. ID edit form.

Step 2. Use the right or left arrow to position the cursor and the up or down arrow to change the value for your instrument ID. Our example changes the default value to Cake Mix, which makes this instrument easy to recognize by its application.

Step 3. Press Enter to save the entry and return to the Setup Menu.

Operator ID

The Operator ID is the ID of the user logged into the system using security. Select three letters or numbers or any combination of the two that adequately identifies the user. We have provided some examples for your assistance.

Range: 3 characters (default none)

Some examples of Operator IDs are Joe, 312, J15, or JD7

Viewing the Operator ID from the Web interface

Enter an operator ID from the keyboard. Use Save Parameters to save any value set from this form.

Configuring the Operator ID from the Front Panel

Step 1. To open the Operator ID edit form from the Setup menu, use the down arrow to select Operator ID; then press Enter.

Step 2. Use CLR to clear the current entry and position the cursor on the first value to change. Use the up or down arrow to scroll to the value, first from 1-10 and then from A-Z.

Step 3. Use the right or left arrow to move the cursor to the next position, and repeat the process until you have entered all of the characters (up to 3) for your operator ID.

Step 4. Press Enter to save the entry and return to the Setup Menu.
**Weight Decimal Point**

Set the Weight Decimal Point parameter to indicate the location of the decimal point within the weight values, which are based on the selected unit of measure. The higher the number, the farther to the left the decimal point moves and the more precisely the rate is displayed. However, setting the decimal point far to the left does not ensure that the weight value will be accurate enough to distinguish the requested level of precision from interference factors.

**Range:** 0-5 (default 2)

**Setting the decimal point from the Web interface**

Step 1. From the Decimal Point pull-down list, select the number of digits from the right edge of the displayed number before which the decimal point should appear.

Step 2. You must click Save Parameters to save any value set from this form.

**Setting decimal point from the front panel**

Step 1. From the Setup menu, use the down arrow to select Weight Decimal Pt.

Step 2. Press the Right or Left arrows to select the number of digits from the right side of the displayed number before which you want the decimal point inserted.

Step 3. Press Enter to save the selection.

**Rate Decimal Point**

The Rate Decimal Point Parameter sets the location of the decimal point within the Flow Rate value. If there is a limit on the totalizer, the decimal point can determine its range. The higher the number, the farther to the left the decimal point moves and the more precisely the rate is displayed. However, setting the decimal point far to the left does not ensure that the total weight measurement will be accurate enough to distinguish the requested level of resolution. Adding decimals does not increase the precision. Maximum precision is 1:10,000. Increasing the decimal point beyond that only produces unstable readings.

**Range:** 0-5
Setting the Rate decimal point from the Web interface

Step 1. From the Rate Decimal Point pull-down list, select the number of digits from the right edge of the displayed number before which the decimal point should appear.

Step 2. You must click Save Parameters to save any value set from this form.

Setting Rate decimal point from the front panel

Step 1. From the Setup menu, use the Down arrow to select Rate Decimal Pt.

Step 2. Press the Right or Left arrows to select the number of digits from the right side of the displayed number before which you want the decimal point inserted.

Step 3. Press Enter to save the selection.

Total Decimal Point

The Total Decimal Point parameter sets the location of the decimal point within the Total weight value, which is based on the selected unit of measure. For example, with a six-digit range (e.g., 999,999), the totalizer would start over at one million, but with three decimal points (e.g., 999.999), it would start over at one thousand. (See note in specification.)

Range: 0-5 (default 1) In most applications a decimal setting of 0 or 1 is recommended.

Setting the Total decimal point from the Web interface

Step 1. From the Total Decimal Point pull-down list, select the number of digits from the right edge of the displayed number in front of which the decimal point should appear.

Step 2. You must click Save Parameters to save any value set from this form.

Setting Total decimal point from the front panel

Step 1. From the Setup menu, use the Down arrow to select Total Decimal Pt.

Step 2. Press the Right or Left arrows to select the number of digits from the right side of the displayed number before which you want the decimal point inserted.

Step 3. Press Enter to save the selection.
**Batch Decimal Point**

The Batch Decimal Point parameter sets the location of the decimal point within the batch weight value, which is based on the selected unit of measure. The higher the number, the farther to the left the decimal point moves. However, setting the decimal point far to the left cannot ensure that the scale is accurate enough to distinguish the requested level of precision.

**Range:** 0-5 (default 1)

**Configuring the Batch Decimal Point from the Web interface**

Step 1. From the Batch Decimal Point pull-down list, select the number of digits from the right edge of the displayed number in front of which the decimal point should appear.

Step 2. You must click Save Parameters to save any value set from this form.

**Configuring the Batch decimal point from the front panel**

Step 1. From the Setup menu, use the Down arrow to select Batch Decimal Pt.

Step 2. Press the Right or Left arrows to select the number of digits from the right side of the displayed number before which you want the decimal point inserted.

Step 3. Press Enter to save the selection.

**Grads (Graduation Size)**

The Graduation Size is the minimum increment or decrement used in the display of HI 4060 weight values. The HI 4060 can repeatedly distinguish changes of up to one ten thousandth of the total load cell capacity, so graduation values set smaller than that would probably reflect noise variations rather than accurate weight readings. The value applies to the right-most digit(s), which may be at the sub-decimal level. For example, with a graduation size of two applied to the final digit of 10,000.00, the minimum change allowed to the displayed number would be .02, allowing for values of 9999.98, 10,000 or 10,000.02.

**Range:** 1, 2, 5, 10, 20, 50, 100, 200, 500, 1000 (default 1)
Configuring Grads from the Web interface

Step 1. From the Grads pull-down list, select the minimum increment or decrement to use in the display of HI 4060 weight values.

Step 2. You must click Save Parameters to save any value set from this form.

Configuring Grads from the front panel

Step 1. From the Setup menu, select Grads.

Step 2. Use the Right or Left arrows to select the minimum increase or decrease to allow in the display of HI 4060 weight values; then press Enter to save.

Num Averages

A number of weight readings are averaged to reduce the affect of material impact and/or vibration as material moves on and off the scale. The Rate Controller takes 110 readings per second. If you average enough weight readings, the weight loss or gain remains smooth and the displayed value shows little or no fluctuation, although it is actually recalculated (by sliding average) with each reading. If a weight reading fluctuates too much, increase the number of readings in the average, but for applications that require a very quick weight reading, do not set this value too high. See also WAVERSAVER for information on filtering unstable weight readings.

Range: 1-255 (default 20)

NOTE

Older models of the HI 4060 have a Num Averages range of 1-31.

Configuring Number of Averages from the Web interface

Step 1. In the Number of Averages edit box, enter the number of weight readings to average in the display of HI 4060 weight values.

Step 2. You must click Save Parameters to save any value set from this form.

Configuring Number of Averages from the front panel

Step 1. From the Setup menu, select Num Averages and press Enter to open the Num Averages edit form.
Step 2. To enter the number of weight readings to average in the display of HI 4060 weight values, use CLR to clear the current entry and position the cursor on the first value to change, and use the up or down arrow to scroll to the value.

Step 3. Use the left arrow to move the cursor to the next position, and repeat the process above until you have entered all the digits for your Num Averages value.

Step 4. Press Enter to save.

**NOTE**
The number entered in Figure above is for illustration purposes only. Yours will vary depending on your application.

**WAVERSAVER®**
Chapter One provides a detailed description of WAVERSAVER’s function and purpose. In short, WAVERSAVER helps to mitigate the effects of vibratory forces, allowing the HI 4060 to distinguish between actual weight data and mechanical noise in the signals the load cell sends it. WAVERSAVER can be configured to ignore noise with frequencies as low as 0.5 Hz. Two higher frequencies may be selected to provide a faster instrument response time.

High values allow faster readings, while the lower values raise the degree of filtration. The function is user selectable and can be turned off.

**Range:** 7.5, 3.5, 1.0, 0.5, 0.25 Hz. (default 1.00 Hz)

**NOTE**
Some older models of the HI 4060 may have only three WAVERSAVER options: 15 Hz, 1.0 Hz and 0.5 Hz.

Configuring WAVERSAVER from the Web interface

Step 1. From the WAVERSAVER pull-down list, select the number of Hz to use for the filter.

Step 2. You must click Save Parameters to save any value set from this form.

Configuring WAVERSAVER from the front panel

Step 1. Select WAVERSAVER with the Down arrow.

Step 2. Use the Right or Left arrows to select the number of Hz to use for the filter.

Step 3. Press Enter to save the selection.

**Low Pass Filter Range:** ON/OFF (default ON)

**NOTE**
The Low Pass Filter is only used with older HI 4060 Models. Newer models do not use Low Pass Filter and instead use WAVERSAVER+ (see below)
The Low Pass (LP) filter can be toggled on or off. It provides a more stable weight reading, but at the expense of some reaction time. For an application that requires very stable weight readings and the reaction time poses no problem, the Low Pass filter allows for a more precise adjustment. High-speed weight readings will be better with the low-pass filter off.

**Configuring Low Pass Filter from the Web interface**

From the Low Pass Filter pull-down list, select ON or OFF. You must click Save Parameters to save any value set from this form.

**Configuring Low Pass Filter from the front panel**

We recommend setting the low-pass filter to ON mode for most applications. Off is used for the control of liquids.

Step 1. Use the Down arrow to select Low Pass Filter and press Enter.

Step 2. Press the Right or Left arrows to toggle between ON or OFF.

Press Enter to save the selection.

**WAVERSAVER+ Variation_thd and Motion_thd:**

WAVERSAVER+ is a superset of WAVERSAVER that uses two entirely new parameters, Variation_thd (Variation Threshold) and Motion_thd (Motion Threshold). These two parameters add a patent-pending adaptive filtering algorithm to the WAVERSAVER output that provides stability to weight readings of up to 1:30,000.

**NOTE**  
WAVERSAVER+ is only available in newer HI 4060 models. Models with WAVERSAVER+ do not use the Low Pass Filter described above.

To configure WAVERSAVER+, set the WAVERSAVER and Numaverages parameters to establish the speed and required accuracy for dynamic weighing. Set the variation_thd to 0.0 and observe the peak to peak variation of the weight value. Then set the variation threshold parameter to be 1.5 times larger than the observed weight variation. Set the motion threshold to 1/3 of the observed peak to peak weight variation.

For example, if the observed weight change is 6, set the variation_thd should be set to 9 (1.5X) and the motion_thd parameter set to 2 (1/3X). Note the weight changes will settle to a 2 increment level. Weight changes smaller than 1:40,000 will need considerations for environmental protections from air movement forces and additional WAVERSAVER and NumAverages settings.

The default factory setting is 0.0; which turns WAVERSAVER+ OFF.
On the 4060 display:

Step 1. In the Instrument Setup menu, use the Down arrow to select the Variation Threshold and press Enter.

Step 2. To enter the number in the display of HI 4060, use CLR to clear the current entry and position the cursor on the first value to change, and use the up or down arrow to scroll to the value.

Step 3. Use the left arrow to move the cursor to the next position, and repeat the process above until you have entered all the digits for your value.

Step 4. Press Enter to save.

Step 5. In the Instrument Setup menu, use the Down arrow to select the Motion Threshold and press Enter.

Step 6. To enter the number in the display of HI 4060, use CLR to clear the current entry and position the cursor on the first value to change, and use the up or down arrow to scroll to the value.

Step 7. Use the left arrow to move the cursor to the next position, and repeat the process above until you have entered all the digits for your value.

Step 8. Press Enter to save.

On the HI 4060 Web page:

Enter the value in the text box provided in the Instrument Setup menu.

Configuring the Capacity Parameter

For optional use in noting the scale capacity.

Configuring Capacity from the Web interface

Step 1. In the Capacity edit box, enter the total capacity of the scale system.

Step 2. You must click Save Parameters to save any value set from this form.

Configuring Capacity from the front panel
Step 1. Use the Down arrow to select Capacity; then press Enter to open the edit form.

Step 2. Use the right or left arrow to position the cursor on the first value to change and the up or down arrow to change to the Capacity value. Our example shows 1,500.0 lbs. Press Enter to save the entry and return to the Setup Menu.

Use Default I/O?

Use Default I/O refers your choice to use or not use the factory-set defaults of five switch inputs. Deselecting the defaults requires you to map any control function to the inputs and analog outputs.

**Range:** YES/NO (default YES)

**NOTE**

The Switch Input defaults are:
- Input 1 = START
- Input 2 = STOP
- Input 3 = ESTOP
- Input 4 = FORCE REFILL
- Input 5 = CLEAR TOTAL

The Relay Output defaults are:
- Relay 1 = MOTOR ON
- Relay 2 = SHUTOFF
- Relay 3 = REC
- Relay 4 = ALARM
- Relay 5 = REFILL

Analog Output channels 1-4 are set by default for motor speed control OP%:

**Configuring Use Default I/O? from the Web interface**

Step 1. Select YES or NO from the Use Default I/O? pull-down list.

Step 2. You must click Save Parameters to save any value set from this form.

**Configuring Use Default I/O? from the front panel**
Step 1. From the Setup menu, use the down arrow to select Use Default I/O? and press Enter.

Step 2. Press the right or left arrow to toggle between YES and NO.

Step 3. Press Enter to save the entry.

**Instrument Usage Help**

Help provides descriptions of all the parameters in the Instrument Setup Menu.

Step 1. Use the down arrow to select Help, and press Enter to display the help screen.

Step 2. The Help Display appears with a description for *Units* of Measure.

Step 3. To view a parameter, press the down arrow until the parameter appears with the description. To read the entire Parameter description continue to press the down arrow until the next parameter appears.

Step 4. Press Exit to return to the Instrument Setup Menu.

Step 5. Press Exit to return to the Configuration Menu.

**LCD Contrast**

Use the LCD Contrast or CONTRAST option to increase or decrease the contrast of the display.

**Adjusting contrast from the Web interface**

Step 1. To make the display lighter, click Lighter, or to make the display darker, click Darker.

**Adjusting the Front Panel LCD Display**

Step 1. Select CONTRAST from the Setup menu.

Step 2. Press the right arrow to increase the contrast. Press the left arrow to decrease the contrast. This completes the Instrument Configuration.
Configuring a Printer or Scoreboard

The Printer Parameters are set to operate a Printer or Scoreboard which can print out or display on a Scoreboard whatever appears in the front panel display. The Printer parameters also include a Batch Report (Batch Rep) which prints out the following:

- Current Date and Time
- The Date and Time the last batch started.
- The Date and Time the last batch ended.
- The Total Weight.
- The Batch Total Weight

NOTE

If the Scoreboard is configured, the Print button does not function.

Opening Configuring - Printer from the Web interface

To display the Configuration - Printer form from the Configuration - Instrument Setup page, click the Printer link at the top of the page or one of the green arrows at the bottom.

If you are using a scoreboard, the scoreboard will display similar screens to those pictured in Chapter 7 under Mode Displays (without the function key names). The content of each display depends on the operating mode.

Configuring Printer Setup from the front panel

From the Setup menu, use the down arrow to select Printer Setup and press Enter to open the Printer Setup menu.

Print Mode

Range: Batch Rep - Scoreboard (default Batch Rep - i.e., Batch Report)

Configuring Mode from the Web interface

Step 1. From the Print Mode pull-down menu, select the mode you want, either a Batch Report or printing to a Scoreboard.
Configuring Mode from the front panel

Step 1. From the Printer Setup menu, select Print Mode and press Enter.

Step 2. To select the Print Mode use the Left or Right arrows to toggle between Batch Report or printing to a Scoreboard.

Step 3. Press Enter to save the entry.

Baud Rate

See your Network Administrator if you don’t know the correct Baud Rate.

Range: 300, 1200, 2400, 4800, 9600, 19200 (default 19200)

Configuring Baud Rate from the Web interface

Step 1. Click on the Baud Rate pull down list.

Step 2. Click on the Baud rate for the printer connected to this instrument.

Configuring Parity from the front panel

Step 1. From the Printer Setup menu, select Baud Rate and press Enter.

Step 2. To select the Baud Rate, press the left or right arrow until the baud rate you want appears.

Step 3. Press Enter to save the entry.

Parity

See your Network Administrator if you don’t know the correct parity.

Range: NONE, ODD, EVEN (default NONE)

Configuring Parity from the Web interface

From the Parity pull down list, select the Parity required for the printer connected to this instrument.
Configuring Parity from the front panel

Step 1. From the Printer Setup menu, select Parity and press Enter. The current Parity value is displayed.

Step 2. To select the Parity option you want, press the Left or Right arrows until it appears.

Step 3. Press Enter to save the entry.

Data Bits

Most printers are set for eight bits. A seven-bit option is also available. See your printer manual if you think your printer could might require a seven-bit setting.

Range: 7 or 8 (default 8)

Resetting the Data Bits default from the Web interface

Step 1. From the Data Bits pull-down menu, select the Data Bits required for the printer connected to this instrument.

Step 2. Click on Save Parameters to save the entries.

Resetting Data Bits default from the front panel

Step 1. From the Printer Setup menu, select Data Bits and press Enter. The current Data Bits value is displayed.

Step 2. To select the Data Bits press the Left or Right Arrow to toggle between 8 and 7.

Step 3. Press Enter to save the entry.

Step 4. Press the Exit button to return to the Setup Menu.

Configuring Date and Time

HI 4060s are set with a default time, which you will need to change to the time in your area.

NOTE

To set up Greenwich Mean Time (GMT), see Appendix A.

Configuring Date and Time Setup from the Web interface

Step 1. To display the Configuration - Date and Time page from the Instrument Setup page, click the Time link at the top of the or an arrow at the bottom.
Step 2. In the Minute field, enter the current minute in the format shown (leading 0 not required).

Step 3. In the Hour field, enter the current hour (1-24) in the format shown (leading 0 not required).

Step 4. In the Day field, enter the current Day of the month in the format shown (leading 0 not required).

Step 5. In the Month field, enter the number of the current month (leading 0 not required).

Step 6. In the Year field, enter the current year in the format shown.

Step 7. From the time zone pop-up menu, select the time zone in your area. GMT = Greenwich Mean Time

Step 8. Click Save Parameters to save the Date and Time settings.

**Configuring Date and Time Setup from the front panel**

Step 1. From the Setup menu, select Time and press Enter to display the Time menu with the cursor in front of Zone. Press Enter to select Zone.
Step 2. Press the Left or Right arrows to select the time zone in your location. Press Enter to save and return to the Time menu.

Step 3. Use the down arrow to scroll to Time-year and press Enter to open the Time-Year edit page.

Step 4. Use the left arrow to position the cursor and the up or down arrow to select the value. Repeat the process above until you have entered all the numbers for Time-year. Note: Use only four numbers. Other options cannot be saved.

Step 5. Press Enter to save the entry and return to the Time Menu.

Step 6. Use the Down arrow to select Time-Month and press Enter to display the Time-Month edit page.

Step 7. Use the left arrow to position the cursor and the up or down arrow to select the value. Note: Use only up to two numbers. Other options cannot be saved.

Step 8. Press Enter to save the entry and return to the Time Menu.

Step 9. Use the Down arrow to select Time-Day and press Enter to open the Time-Day Menu edit page.

Step 10. Use the left arrow to position the cursor and the up or down arrow to select the value. Note: Use only up to two numbers. Other options cannot be saved.

Step 11. Press Enter to save the entry and return to the Setup Menu.

Step 12. Use the Down arrow to select Time-Hours and press Enter to display the Time-Hours Menu.

Step 13. Use the left arrow to position the cursor and the up or down arrow to select the value. Note: Use only up to two numbers. Other options cannot be saved.

Step 14. Press Enter to save the entry and return to the Setup Menu.
Step 15. Use the Down arrow to select Time - Minutes; then press Enter to display the Time - Minutes edit page.

Step 16. Use the left arrow to position the cursor and the up or down arrow to select the value. **Note:** Use only up to two numbers. Other options cannot be saved.

Step 17. Press Enter to save the entry and return to the Time Menu.

Step 18. Press Exit to return to the Setup Menu.

**Rate Calibration Configuration**

This section describes how to set the parameters for Rate Calibration. It begins with information that applies to entries made from either the Web interface or front panel. See Chapter 5 for additional instructions on running Rate Calibration.

Use Rate Calibration to calibrate the system starting flow rate, either manually or using Auto Rate Cal calculator. Rate calibration establishes the feeder maximum rate, PI settings, and the starting OP% for a given rate setpoint. From that starting point, the controller adjusts the OP% to maintain an optimized setpoint. Environment and product conditions require monitoring and adjustment to meet the requested setpoint target.

**NOTE**

*You must calibrate the scale prior to rate calibration.*

**The P and I values**

The PI controller calculates an output percentage based on the parameters P - Proportional, and I - Integral. The rate calibration process can set the values for P and I automatically. D (Derivative) is set to 0 and cannot be changed.

The output percent is determined by the formula:

\[ P \times \left( \frac{\text{Setpoint - ActualRate}}{\text{MaxRate}} + I \times \text{integral of the proportional term} \right). \]

**Cal Type**

There are three types of calibrations to determine the rate per output percentage:

- Two-point rate calibration (default) for Auto RateCal, where two flow rates are selected (points 2 and 4).
- Five-point rate calibration for Auto RateCal, select starting % point 1 where five flow rates are performed.
- Advanced Cal, used when you cannot do an Auto RateCal and you know the flow rate for 2 output percentage selections (points 2 and 4).
The known flow rates can come from experience with the material, often through trial and error. When these known values have been entered, the HI 4060 RC calculates the rates for seven output points: Minimum %, projected maximum rate at 100%, and five linear percentage points.

If a two-point Auto Rate Calibration is selected, the unit will go to the high rate output percent for a period of feed time plus prime time. When this period is complete, it will save the actual rate as the high cal rate and will then pause for a period of pause time before going to the low rate output percent for a period of feed time. When this period is complete, it will save the actual rate as the low cal rate.

After doing the auto rate calibration at the low and high rates, the unit will estimate the zero rate output percent and the Max rate cal rate and will fill values for the first, third, and fifth five-point calibration rate pairs.

Five-point measurement provides tighter flow rate control. Enter the point one output percent, which must be between 10.0 and 30.0 percent. The next four calibration output percents are fixed at cal point 1 + 10.0, cal point 1 + 20.0, cal point 1 + 30.0, and cal point 1 + 60.0. The unit will then run at each of these output percents, starting with the highest one, for a period of feed time or feed time plus prime time on the first run. It saves the actual rates it observes into the cal rates and estimates the MaxRate and zero output rates.

We recommend that you select output percentage points where your control set point falls between pt 2 and pt 4.

If an Advanced calibration is selected, you must enter calibration pairs for the low rate and the high rate. The unit will fill in the other calibration pairs based on linear extrapolation from the two entered points.

**Prime Time**

The time in seconds it takes to get the system up to full flow for the first calibration point. (The feeder must prime the feeding system and the feeding system must smoothly feed product at an OP % selected rate.) This only occurs on the first test OP% run of the rate calibration.

**Range:** 1-999 (default 5 sec)

**Pause Time**

This is the time you want the feeder to wait between Auto Rate Calibration cycles. If necessary, more material may be added to the feeder. Note that this parameter should be set long enough to allow the operator to press the "hold" button in between feed runs.

We recommend that you make the Pause Time equal to or greater than the Timebase value you entered for the ROC.

**NOTE**

*If a feeder is manually paused before a cycle starts, or during a cycle, when the test is restarted it will run from the beginning.*
Feed Time

Feed Time is the test duration at each rate. Set this to a minimum of 10 X ROC time base.

Range: 1-999 (default 0)

Configuring Rate Calibration from the Web interface

**NOTE**

The information in the section above defines and explains the fields on this form.

To open the Rate Calibration form, click the green right arrow at the base of the Configuration - Ingredient form or click on the Rate Calibration link at the top of the form.

Configuring P, I, Values

The Rate Calibration process automatically sets the values for P and I of the PI algorithm, but you can adjust them on this screen.

Selecting Cal Type

On the Cal Type pull-down menu, select the Cal type for this ingredient. Our example uses five-point Cal Type.

Setting Pause Time

Step 1. Use the down arrow to select Pause time; then press Enter to display the Pause Time edit form.
Step 2. To enter the numeric value you want for the Pause Time: Press the left arrow until the cursor is at the first character entry for the Pause Time, and use the up or down arrow to select the number or punctuation you want.

Step 3. Press the right arrow to move the cursor one place to the right, and repeat the above process until you have entered all the numbers for your Pause Time value. In our example we selected 10 seconds.

Step 4. Press Enter to save the entry and return to the RateCal Menu.

**Setting Feed Time**

Step 1. Press the down arrow to select Feed Time; then press Enter to display the Feed Time edit form.

Step 2. To enter the numeric value you want for the Feed Time: Press the left arrow until the cursor is at the first character entry for the Feed Time, and use the up or down arrow to select the number or punctuation you want.

Step 3. Press the right arrow to move the cursor one place to the right, and repeat the above process until you have entered all the numbers for your Feed Time value. In our example we selected 30 seconds.

Step 4. Press Enter to save the entry and return to the RateCal Menu.

**NOTE**

Make sure you have enough material to do a Rate Cal at the highest OP%. If, for example, 30 seconds at 90% would empty the hopper, reduce the Rate Cal to a lower rate.

**RateCal Percents**

RateCal Percents sets the output percentage for the three cal types.

- For the 2 pt Cal Type (%Lo & % Hi), make sure that the Hi % is higher than the Lo % and that there is a separation of at least 10%. You enter Pt2 and Pt4.
- For the 5 pt Cal Type (Pt1, Pt2, Pt3, Pt4, Pt5), you select only Pt1, the first RateCal percentage, and the HI 4060 will select the remaining percentages, which are read only and cannot be changed except by changing the first output value.
- For the Advanced Cal Type, you need to know the flow rates for two output percentage setpoints. You enter the output percentages and the known flow rates and the instrument does the rest.

**Range:** 0-100

**RateCal Percents from the Web Page**
Use the seven rate calibration pairs of output percent and output rate to set the initial output percent when the unit starts. The zero output rate is fixed at 0.0, and the "max output percent" is fixed at 100%. You can edit the other parameters.

You can change the values in the highlighted OP% (and/or Cal Rate) fields. With 5 pt Cal Type, the OP% number for Pt 1 is highlighted. With 2 pt Cal Type, the OP% values for pt 2 and pt 4 are highlighted. With Advanced, both the OP% values for pt 2 and pt 4 and Cal Rates are highlighted.

Example: A calibration pair Output percent of 25% and a cal rate 250 means that a rate of 250 weight units per unit time will be obtained when the output percent is 25%.

**NOTE**

*Internet Explorer is a registered trademark of the Microsoft Corporation*

**RateCal Percents from the Front Panel**

Step 1. Select RateCal Percents and press Enter to display the RateCal Percents edit screen for the Cal Type you selected. For our example we selected 2pt Cal Type. Select the 2PtLo (OP2) and press Enter to open the 2PtLo (OP2) edit page.

Step 2. Press the right arrow to position the cursor and the up or down arrow to change the number. Repeat the process until you have entered all the numbers for your 2PtLo %OP2 value. Our example shows 40 percent.

Step 3. Press Enter to save the entry and return to the RateCal Menu.

Step 4. Use the down arrow to select 2PtHi %OP4 and press Enter to display the 2PtHi %OP4 edit page.
Step 5. To change the 2PtHi %(OP4) value, use the left or right arrow to position the
cursor and the up or down arrow to change the number or punctuation. Our
example shows 60 percent.

Step 6. Press Enter to save the entry and return to the RateCal Menu.

**Running Rate Cal**

The Auto Rate Cal will prime the system, then run for the selected feed time based on the
calibration type, pause time, and RateCal Percents you selected. In each case, the display
will show the flow rates for five output percentage points plus the MIN and MAX OP%
rates to give you the calibration performance curve.

- For the 2 pt Cal Type (Pt2 and Pt4) the two flow rates for the percentages you
  selected are the actual flow rates. The instrument calculates the remaining three flow
  rates.
- For the 5 pt Cal Type, where you provide Pt1, the first RateCal percentage, the
display will show the actual flow rates for 5 output percentage points between the
  Low and High output percentages.
- For the Advanced Cal Type, where you provide known flow rates for two output
  percentage setpoints (Pt2 and Pt4) and the output percentages, the HI 4060
calculates the remaining three output percentage points. The feeder does not operate
during this process.

**Running Rate Cal from the Web interface**

Step 1. In the Feed Time field, enter the amount of
time you want for each feed run.

Step 2. Click the Do Rate Calibration button.

The result depends on the Cal Type you selected. With five-point, the instrument cycles
through each of the OP% listed for the 5 pt calibration. With two-point, it cycles through
each of the OP% listed for the 2 pt calibration.

As the calculation runs, the instrument will cycle
through the feed time and display the OP% RCAL
percent remaining below the STOP button at the base
of the form. (e.g. 80%, 50%, 40%, 30%, 20%). 80%
represents the point 5 OP %, which is the first stage of the cycle.

The new values will appear
in the display.
Running Rate Cal from the Front Panel

Step 1. From the Rate Cal menu, use the down arrow to select Do Auto Rate Cal, then press Enter to display the Do Auto Rate Cal form.

Step 2. To start the Auto Rate Cal press the Start button.

Step 3. After the display says RCAL, you are exited to the main display screen.

Reading Rate Cal Results

Step 1. To read the results of the Rate Cal, use the down arrow to select Rate Cal Results and Press Enter to display the Rate Cal menu listing the OP stages.

Step 2. Select an OP stage number and press Enter to view the Rate and units.

Step 3. Press Exit to return to the Rate Cal Results menu.

Step 4. You can continue to read the results for all 5 points on the curve.

Step 5. Select OP 100%, and press Enter to see the read-only details.

Step 6. Press Exit until you return to the Ingredients sub-menu.

Refills

Refilling during calibration

If you need to refill the feeder hopper to complete a rate calibration, you can do this during the pause between cycles.

Step 1. After one cycle the instrument will pause and the OP% goes to 0%.
Step 2. Click the STOP button.
Step 3. The RCAL changes to RHOLD.
Step 4. Complete your refill at this time.
Step 5. Click on the Do Rate Calibration button and the Calibration process begins again.

Auto Refills

Automatic refill uses user selectable refill points to start and stop the refill process without interrupting the feed process. HI and LO alarms to detect a refill failure. Manual Refill allows for manual refill at any time.

Configuring Auto Refill from the Web page

Set Auto Refill to YES on the Configuration - Refill page.

Configuring Auto Refill from the front panel

Step 1. Use the down arrow to select Auto Refill. The left / right arrows toggle from Yes to No.

Step 2. To Select Auto Refill select Yes. The Initial Refill parameter appears.

Initial Refill

Initial Refill ensures that the filler contains enough material to safely begin operation. It can help to decrease the number of refills during a run. Review how the initial refill works before you make this selection.
After selecting Initial Refill, when you press the start button the feeder starts to run, and the instrument checks to see if the material in the hopper is below the HI Setpoint weight. If it is, the instrument fills the hopper until the HI Weight Setpoint is reached.

Range YES or NO (default NO)

NOTE

If Initial Refill is on with Auto Refill off, Initial Refill still activates the refill relay and fills the hopper to the stop high amount. If you wish to prevent this, turn off Initial Refill when you turn off Auto Refill.

Configuring Initial Refill from the Web interface

From the Initial Refill pull-down list, select YES or NO. You must click Save Parameters to save any value set from this form.

Configuring Initial Refill from the front panel

Step 1. From the Ingredient menu, use the down arrow to select Refill and press Enter.

Step 2. Use the down arrow to select Initial Refill.

Step 3. Use the right or left arrow to use (YES) or not use (NO) this function and Press Enter to save. Initial Refill begins when you press the Start button.

Refill Start (lo) and Stop (hi)

The Start (lo), which is set in mass units (actual weight), triggers a signal to begin the refill process. You need to determine when you want the refill to automatically begin (or an alarm to trigger so an operator can refill the feeder). The Start (lo) value must be higher than the Lo Shutoff value. Stop(Hi) signals when the weight in a hopper goes above the high setpoint.

Range Lo >0.0 (default 10.0) . . Range Hi >0.0 (default 110.0)
Configuring Start (Lo) Stop (Hi) from the Web interface

Enter the low and high values in the named fields. You must click Save Parameters to save any value set from this form.

Configuring Start (Lo) and Stop (Hi) from the front panel

To set the weights you want to trigger the start and stop refill signals.

Step 1. From the Refill menu, use the down arrow to select Start (lo), and press Enter to open the Start (lo) edit page.

Step 2. Use the right or left arrow to move position the cursor and the up or down arrow to select the value.

Step 3. When you have selected all the values, press Enter to save the Start Lo value. Our example shows 10 pounds.

Step 4. Press Enter to save the entry and return to the Refills sub-menu.

Step 5. Use the same procedure to set the Stop (Hi) weight that, when reached, will signal to stop the refill process.

Low Shutoff and High Alarm Weight

The Low Shutoff setting stops the process when there is insufficient or no material in the hopper. This setting can be 0 weight indicating nothing in the hopper or a weight setting somewhat above the 0 weight and the Start (lo) value. The Low Shutoff value must be below the Start (lo) value. The weight you enter for High Alarm will trigger an alarm should the flow rate go above this value while refilling.

Low Shutoff Range >0 (default 0)

High Alarm Range >0 (default none)

Configuring HI Alarm from the front panel

Step 1. From the Refill submenu, use the down arrow to select Hi Alarm, and press Enter to display the HI Alarm edit page.

Step 2. To enter the weight you want to trigger an alarm should the flow rate go above this value while refilling, use the right or left arrow to move the cursor and the up or down arrow to change the value.
Step 3. Repeat the process until you have entered all the numbers or punctuation for your High Alarm value. Our example shows 120 lbs. Press Enter to save.

Step 4. In the Low Shutoff Weight field, use the same process to enter the weight at which you want to stop the flow should the flow rate go below this value while refilling.

Step 5. Press Enter to save the entry.

**OP Adjust %/wgt**

OP (Output Percentage) Adjust % per unit of wgt. The weight of an ingredient in a hopper can affect the rate of feed. For example, a liquid at the base of a full hopper is under greater pressure than a liquid at the base of a near empty hopper. If no adjustment is made, the liquid flows out faster when the hopper is full than when it is low. When the OP Adjust parameter is ON (i.e., not set to OFF), the OP Adjust %/wgt value will adjust the refill rate to compensate for any change in weight of the ingredient in the hopper. OP Adjust On Learn is used to calculate this value.

Range: -100 to +100 up to six decimal places   (Default 0.0)

**OP Adjust %/wgt from the front panel**

Step 1. OP Adjust %/wgt is described above. Select it with the down arrow.

Step 2. Press Enter to display the OP Adjust %/wgt edit form.

Step 3. Use the right or left arrow to move the cursor and the up or down arrow to change the value.

Step 4. Repeat the process until you have entered all the numbers or punctuation for your OP Adjust %/wgt value. Our example shows a typical calculated value in a machine-readable format.

Step 5. Press Enter to save and return to the Refill Menu.

Step 6. Pressing the Exit button returns to the Ingredient Sub-Menu.

**OP Adjust and OP Adjust %/wgt during refill**

OP = Output Percentage. If you use OP Adjust, it uses the OP Adjust %/wgt value to allocate the refill. There are three options:

**OFF:** (default) Turns off the function.
ON-LEARN: (works only with Auto Refill) The HI 4060 saves the % output and change in weight values from previous refills and continuously calculates the optimal Output % based on these values. This allows the instrument to adjust as conditions and the material or refill characteristics change over time.

ON-FIXED: With Auto Refill, you can use ON-FIXED to either lock in an effective learned value or enter a noted value that has worked well on previous applications.

Configuring OP Adjust and OP Adjust %/wgt from the Web interface

Select one of the three options (explained above) from the OP Adjust pull-down. You must click Save Parameters to save any value set from this form.

Configuring OP Adjust and OP Adjust %/wgt from the front panel

Step 1. From the Refill menu, select OP Adjust. The left and right arrows toggle between ON, LEARN, ON, FIXED and OFF, which are described above.

Remote Setpoint

The standard Remote (Rate) Setpoint can be set up as 0-5 VDC, 0-10 VDC, 0-20 mA or 4-20 mA. We will refer to these as the “signals.” A signal can come from a variety of Host Controllers (PLC, computer, a flow meter, etc.). The Remote Setpoint function gets its input from an Analog I/O Card installed in the HI 4060.

Ingredient #1 is the Master ingredient where the actual flow is measured and transmitted. Other ingredients may be Slave ingredients with flow rates that are proportional to the flow rate of Ingredient #1. For example, if ingredient #1’s flow rate is 10 gallons/minute and ingredient #2 must be fed at 10% of the flow rate of ingredient #1; ingredient #2 must be fed at a flow rate of 1 gallon/minute (a 10/1 ratio). To maintain a flow rate for ingredient #2 that is 10% of Ingredient #1, the HI 4060 uses the flow rate signal for ingredient #1 to adjust its output signal to the feeder motor for ingredient #2. Even if ingredient #1’s flow rate varies, the rate controller must maintain the 10% proportional feed rate.

SP HI/LO wgt/time

When configuring, the user can scale the input signal by entering flow rates that are represented by the Low and Hi inputs. This allows tight rate scaling for precise control. Noise can be d out by selecting from an averaging range of 1-20.
The SP HI wgt/time setting is the input signal referenced as the maximum rate setpoint, depending on the signal range selected, and the SP LO wgt/time setting is the minimum signal input to be referenced as the minimum rate setpoint depending on the signal range selected (i.e., 0-20 milliamps, 4-20 milliamps, 0-5 volts, 0-10 volts). The SP HI wgt/time setting corresponds to 20 milliamps or 5 or 10 volts input. For example, if you set the SP HI to be 100 lbs/min at the max input of 20 milliamps and 5 or 10 VDC, the controller will request 100 lbs/min (assuming that the feeder can achieve that rate).

The SP LO wgt/time setting corresponds to 0 milliamps or 0 volts input; so if you want the min rate to be 0.00 lbs/min, the min input needs to be 0 milliamps 0VDC. Your minimum rate may not be zero. You may set the lowest rate for the application by raising the SP LO to reflect the minimum ratio.

Range: 0-99999 (default High 100.0 Low 0.0)

Configuring the Remote Setpoint from the Web interface

Step 1. To open the Configuration - Remote Setpoint form from any form in the Configuration - Ingredient series, click the Remote Setpoint link (top of form) or the green right arrow (base of form).

Step 2. In the SP HI weight/time (lb/m) field, enter the High Setpoint for this ingredient. Our example uses 100 lb/m.

Step 3. In the SP LO weight/time (lb/m) field, enter the Low Setpoint for the ingredient. Our example uses 0.000 lb/m.

Configuring the Remote Setpoint from the front panel

Step 1. To open the Remote Setpoint menu, select Remote Setpoint from the Ingredient menu and press Enter.

Step 2. Select SP HI wgt/ time and press Enter to open the SP HI wgt/ time edit page.

Step 3. Use the left or right arrow to position the cursor and the up or down arrow to change the number or punctuation. Repeat the process until you have entered all the numbers for your SP HI wgt/time value. Our example shows 80 lbs/min.
Step 4. Select SP LO wgt/time from the Remote Setpoint menu, then press Enter to open the edit page.

Step 5. Use the left or right arrow to position the cursor and the up or down arrow to change the number or punctuation for your SP HI wgt/time value. Our example shows 80 lbs/min. In our example we selected 0.000 lbs/min. Setting the Setpoint LO to 0.0 provides a ratio of 00% to 80% of the master flow rate.

**Input HI% and Input LO%**

The HI 4060 Input HI% parameter allows the operator to quickly change the input signal in order to reduce the flow rate, without changing the HI and LO Output Signal parameters. The master flow rate and the slaves can have the same SP HI and SP LO parameter settings. By setting percentage you can control the ratio.

For Example: The master and this slaves HI output signal setting are 10.00 lbs/min. The slave feed rate required is only 9 lbs/min. You can set this slave Input HI Percentage at 90% and the HI 4060 recalculates the feeder rate to 0 to 9 lbs/min. If the process requires a maximum 5.7 lbs/min, set the percentage for 57%, 6.3 lbs/min, set the percentage for 63%, etc. Your rates probably will not be an even percentage as our example, but a percentage of the HI and LO SP rates can be use for the control, rather than differing SP HI and SP LO setting from controller to controller.

The HI 4060 Input LO% parameter allows the operator to quickly change the input signal in order to meet the new flow rate without changing the LO or HI SP Output Signal.

**Range:** 0-100 (default High 100.0 Low 0.0)

**Configuring the Input HI and Input LO from the Web interface**

Step 1. For Input HI %, enter the High Output Percentage to maintain the SP HI setpoint. Our example uses 100%.

Step 2. For Input LO%, enter the Low Output Percentage to maintain the SP LO setpoint. Our example uses 0.000 percent.

**Configuring the Input HI and Input LO from the front panel**

Step 1. Select Remote Setpoint on the Ingredient menu. Press Enter to open the Remote Setpoint menu. Select Input HI% and press Enter to open the Input HI% edit form.
Step 2. Use the left or right arrow to position the cursor and the up or down arrow to change the number or punctuation for your Input HI% value. Our example shows 90 percent.

Step 3. Press Enter to return to the Remote Setpoint menu and select Input LO% and press Enter to open the Input LO% edit form.

Step 4. Use the left or right arrow to position the cursor and the up or down arrow to change the number or punctuation for your Input LO% value.

Our example shows 0.0 percent. Setting the LO rate to zero provides a ratio of 90% of the master flow.

Remote Average

This is the number of samples for the I/O card to average when determining a value. The averaging parameter is most often set when using any device that outputs an erratic signal (e.g. a flow meter). The averaging function takes a number of input (voltage or amperage) readings and averages the input signal to improve stability. However, this improvement comes at the expense of response time. A setting of one average takes 100 milliseconds. A setting of 100 averages takes 1 second. The averaging function is a running average, where the input signals are totaled and the total is divided by the number of set averages (1-200). The Default setting is 20. The instrument reads one new signal plus the last 99 signals and repeats the averaging process again.

For example, with a setting of 20 the instrument reads 20 of the most current input signals (amps or voltages), totals the signals, divides by 20, drops down one, reads one new signal along with 19 of the old readings, totals the signals, divides by 20, drops down one, etc.

Range: 0-200 (default 20)

NOTE

When setting averaging parameters, set the smallest value that provides stable set point readings.

Remote SP Window:

If the value of a newly calculated remote setpoint differs from the current setpoint by less than this parameter the setpoint value will be set to a heavily averaged value of the analog input. This parameter may be used to keep the setpoint from fluctuating from noise on the analog input.

On the 4060 display:

Step 1. In the Ingredient menu, use the Down arrow to select the Remote Setpoint and press Enter. Use the Down arrow to Remote SP Window and press enter.
Step 2. To enter the number in the display of HI 4060, use CLR to clear the current entry and position the cursor on the first value to change, and use the up or down arrow to scroll to the value.

Step 3. Use the left arrow to move the cursor to the next position, and repeat the process above until you have entered all the digits for your value.

Step 4. Press Enter to save.

**On the Web Page:**

Enter the value in the text box provided in the Ingredient>Remote Setpoint menu.

**NOTE**

*For further questions, please see Chapter 7, Operations: Setting Remote Set Points Analog Input Range Parameter*

The Range parameter selects the input that matches the analog device connected to the analog card on the HI 4060.

**Value Range:** 0-5 V, 0-10 V, 0-20 Milliamps, 0-24 Milliamps (default 0-5 V)

**Remote Setpoint (SP) Enable**

In order to use the Remote Setpoint you have to enable it. This parameter enables you to send signals to the Analog card on the HI 4060.

**Range:** YES/NO (default NO)

**Remote Average, Range, and Remote Setpoint (SP) Enable from the Web interface**

Step 1. In the Remote AVG field, enter the number of samples to average when calculating a value for this ingredient.

Step 2. On the Analog Input range pull-down menu, select the Input Range that matches the Analog input to the HI 4060 I/O Card.

Step 3. Our example shows 0-20 Milliamps range.

Step 4. On the Remote SP Enable pull-down list, click YES to enable or NO to disable Remote SP function.

**NOTE**

*You must select YES if you want to use the Remote SP Function.*

Step 5. Click on the Set Parameter button to save the settings.

**Remote Average, Range, and Remote Setpoint (SP) Enable from the front panel**
Step 1. Select Remote Setpoint on the Ingredient menu to open the Remote Setpoint menu; then select Remote AVG and press Enter to open the Remote AVE edit form.

Step 2. Use the left or right arrow to position the cursor and the up or down arrow to change the number or punctuation for your Remote AVE value. Our example shows 4.

**Configuring REC Parameters**

**REC Level %**

The REC Level % (RECPERCENT or REC LEVEL% parameter) is a percentage of Max Rate. It is the level of error above or below the Setpoint Rate that you can accept before the instrument goes into REC mode. For example: If the rate calibration Max Rate is 5.0 lb/min, and the REC level % is 20%, the allowable deviation is 1.0 lb/min from the Rate Setpoint before a Rate Exception error occurs.

**Range:** 0-100 (default 20%. However, this allows for a very large error. We recommend a setting between 5% and 10% and allowing a RE+ or RE- indication about every five min.)

**REC Time**

The time the unit must remain in the REC mode to get an alarm condition or if the Shutdown parameter is selected to shutdown the operation.

**Range:** 0-999 (default 10)

**REC Shutdown Parameter**

The REC Shutdown enables you to shutdown your operation if the system operates in REC mode beyond the time limit set in REC Time. If you select YES for REC Shutdown and the RE error goes beyond the REC Time, the HI 4060 shuts the system down. If you select NO, once the deviation goes beyond the REC Time, the system only displays an alarm.

**Range:** NO/YES (default NO)

**Configuring Rate Exception Control (REC) from the Web interface**
Step 1. To open the REC page from any form in the Configuration - Ingredient series, click the REC link at the top of the page or the green right arrow at the bottom of the page.

Step 2. In the REC Level % field, set the Max deviation your process can tolerate from the Setpoint Rate for this ingredient. Our example shows 20.0%.

Step 3. In the REC Time (sec) field, enter the amount time you want the deviation to occur before an REC alarm occurs. Our example shows 30 seconds.

Step 4. Select YES or NO for REC Shutdown.

Step 5. Click Save Parameters to save your changes.
Configuring Rate Exception Control (REC) from the Front Panel

Step 1. Select REC on the Ingredient menu and press Enter to open the REC menu; then select REC Level % and press Enter to open the REC Level % edit form.

Step 2. Use the left or right arrow to position the cursor and the up or down arrow to change the number or punctuation. Our example shows 10 % for REC Level %.

Step 3. Press Enter to save the entry and return to the REC menu.

Step 4. Select REC Time; then press Enter to display the REC Time edit page.

Step 5. Use the left or right arrow to position the cursor and the up or down arrow to change the number. Repeat the process until you have entered all the numbers for your REC Time value; then press Enter to save the entry and return to the REC menu. Our example shows 10 seconds.

Step 6. From the REC menu, use the down arrow to select REC Shutdown.

Step 7. Press the right or left arrow to toggle between Yes and No.

Step 8. Press Enter to save the entry, and use Exit to return to the Ingredient menu.

Ingredient Configuration

Each ingredient is configured with a name, rate setpoint, preact and other parameters to deliver the exact amount of material for your process, whether you are working in batch or continuous mode. You can configure and store more than 100 ingredient names from either the front panel or the web interface.
Accessing the ingredients forms from the Web interface

On the HI 4060 Home Page
click Configuration to open the
Configuration menu and select
Ingredient.

This will display the
Configuration - Ingredient form set for the last
selected ingredient.

Several parameters, e.g., ingredient name, unit
(of measure), and time (set on the ROC page) are
set from forms that are accessed via the links
listed at the top of the page.

Ingredient Name

Before you can configure an ingredient, it
must have a name in the database. However,
you cannot select or create ingredient names
from the Configure - Ingredient page. Click
either the Ingredient Name link at the top of
the page or the right arrow at the bottom of
the page to open the Ingredient Name form.

Name of Parameter: INGRED
Range: 1-7 alphanumeric characters (default: none)

Before you configure your first ingredient name, the Configuration - Ingredient form and
other forms accessed from that form, display a set of default values. After the first name has
been configured, these forms will display the values for the last selected ingredient.
Selecting an ingredient to rename

Since the configuration file for that name inherits the existing values of the last selected ingredient, to simplify the task when you create a new ingredient, select an ingredient that is very close to the one you currently want to configure, enter a new name, and modify the inherited values as needed.

NOTE

The ingredient name is a file name for the ingredient configuration file. You must enter DOS file names and follow what is called the 8.3 file naming convention. Make the name descriptive but brief because you have only seven characters. The characters you cannot use in a file name are: */\<>\:.

Cloning and changing an ingredient from the Web interface

Step 1. From the Other Ingredients pull-down list, click the name of the ingredient you want to use as a model for your default parameters. That name will appear in the Ingredient Filename box.

Step 2. Type in the new name you want for this ingredient. Our example uses Cement.

Step 3. Click Change file to save the new Filename with inherited values from the ingredient you first selected. To distinguish the new ingredient, you must change values, as appropriate on one or more of the other Ingredient configuration forms.

Cloning and changing an ingredient from the front panel

Step 1. From the Configuration menu (top level), use the down arrow to select Ingredient and press Enter to open the Ingredient menu.

Step 2. Use the down arrow, if necessary, to choose Select Ingredient and press Enter.
Step 3. On the edit page, press the right or left arrow until the name of the ingredient you want to use as a model for your parameters appears.

Step 4. Our example uses Sugar, so our new ingredient name will inherit the values for sugar when the configuration screens are opened.

**CAUTION** When you enter the Ingredient sub-menu, unless you change the name of the ingredient, the new parameters will be written over the current ingredient parameters. To create a new ingredient you must change the current ingredient name.

Step 5. Press CLR to clear the current name and position the cursor for entering a new name; then enter the first character of the alphanumeric name for the new ingredient by using the up or down arrows to select the letter or number you want.

Step 6. Press the right arrow once to move the cursor to the next character entry position, then use the up or down arrows to select the next letter or number. Repeat this process until you have entered all of up to seven total characters.

Step 7. Press Enter to save the ingredient. The display returns to the Ingredient sub-menu with the new ingredient displayed.

Step 8. To change the parameters for this ingredient, press the down arrow until the cursor is in front of the parameter(s) you want to change. To change to a higher level menu with this ingredient selected, press Exit.

Step 9. When you finish changing parameters, press Exit to overwrite the inherited default parameters. The Ingredient name is not saved until you exit to the summary display.

**NOTE** When you save a configured ingredient, the HI 4060 creates an ingredient file that is stored in non-volatile memory on the SMM SD memory card.
**Setting Ingredient Values**

After selecting an ingredient, as described above, we will next configure the ingredient. This section will explain how to configure the values from either the Web interface or the front panel.

**Rate Setpoint Configuration**

The Rate Setpoint is the ingredient target flow rate (Loss in or Gain Weight) you want to maintain for your process. Either medium or high security should be set for this menu so that non-authorized personnel cannot inadvertently change this parameter.

**CAUTION** Changing the Rate Setpoint changes the currently loaded ingredient setup.

**From the Web interface**

After you select an ingredient as described above, the Configuration - Ingredient page will display the ingredient name. To change the Rate Setpoint for this ingredient, enter the value in the Rate Setpoint field (default 10). Our example shows 2.00 lb/m. To save changes on this page, click Save Parameters.

**From the Front Panel**

Step 1. From the Configuration or Ingredient menu, select Rate Setpoint and press Enter.

Step 2. Use the left or right arrow to position the cursor and the up or down arrow to change the value.

Step 3. When you have selected all the values for rate setpoint, press Enter.

**Selecting Mode**

You can operate either in continuous or batch mode depending on the process.

**Range** continuous/batch (default continuous)
From the Web interface
Select the mode from the Mode pull-down list. To save changes, click Save Parameters. Our example shows CONTINUOUS.

From the front panel
Step 1. Select Mode from the Ingredient menu.
Step 2. Press the left or right arrow to toggle the mode, and press Enter to save.
Step 3. If you select Continuous mode, saving the setting takes you directly to the Totals Menu.

Batch (Amount and Preact)
If there are values for Batch Amount and Batch Preact in continuous mode, the HI 4060 ignores these parameters. But if you select Batch mode, you must enter these parameters. The Batch Amount sets the amount of ingredient in weight units used per batch for the selected ingredient. The preact value is the difference between the batch amount and when you stop feeding. In some cases the feeders coast to a stop so the preact should be set accordingly so that the batch amount is reached when the feeder comes to a complete stop.

Batch Amount Range >0.0 (default 0.0)
Batch Preact Range >0.0 (default 0.0)
It is not necessary to enter 0.00 for these parameters.

From the Web interface
In Batch mode, enter the batch amount for this ingredient in the Batch Amount field. (Our example shows 4.54 kg.), and enter the Batch Preact value for this ingredient in the Batch Preact field. To save changes on this page, click Save Parameters.

From the front panel
Step 1. Select Batch with the down arrow and press Enter to display the Batch menu.
Step 2. Select Batch Amount with the down arrow and press Enter to display the Batch Amount edit form.

Step 3. Use the left or right arrow to position the cursor and the up or down arrow to change the value.

Step 4. When you have selected all the values for your Batch Amount, press Enter to save the entry and return to the Batch sub-menu.

Step 5. Use the down arrow to select Preact and press Enter to open the Preact edit page.

Step 6. Use the left or right arrow to position the cursor and the up or down arrow to change the value.

Step 7. When you have selected all the values for your preact amount, press Enter to save the entry and return to the Batch sub-menu.

**Alarm Delay**

The Alarm Delay is the amount of time you want the instrument to delay before setting off either a HI shutoff or LO shutoff alarm after detecting a flow rate that is out of tolerance. This avoids nuisance alarms and gives the system time to clear a problem.

If a product is easily liquefied, set a very short delay to prevent large spills. If a product tends to plug or bridge set a longer delay.

**Alarm Delay Range** &gt;0.0 (default 10.0sec.)

**From the front panel**

Step 1. From the Configuration menu, use the down arrow and press Enter to select Rate Tolerance. Use the Rate Tolerance menu to set the Alarm parameters: The Alarm Delay and the HI and LO shutoff alarm values notify you of unacceptable rates of flow. When you change the setpoint rate, the alarm tolerance bands follow the new setpoint automatically.
Step 2. Use the down arrow to select Alarm Delay, and press Enter to open the Alarm Delay edit page.

Step 3. Use the left or right arrow to position the cursor and the up or down arrow to change the value.

Step 4. When you have selected all the values for rate setpoint, press Enter to save the entry and return to the Rate Tolerance sub-menu, and use Exit to return to the Ingredient Menu.

**Alarm Delay From the Web interface**

In the Alarm Delay field, enter the delay in seconds you want before the instrument signals an alarm condition. To save changes on this page, click Save Parameters.

**Rate Tolerance / Hi and Lo Shutoff**

If the ACT flow rate is above the setpoint beyond the alarm delay time, the Hi and Lo Shutoff alarms can be configured to signal an alarm condition that can either shut the process down or lower the output to a set percentage (See Shutoff % Out below).

**NOTE**

The Lo Shutoff alarm value must be ≤ the lowest set point value.

**HI Shutoff Range** undefined (default 100)

**Lo Shutoff Range** undefined (default 0.0)

**From the Web interface**

In the Hi Shutoff field enter the high shutoff value you want, and in the Lo Shutoff field enter the low shutoff value you want. To save changes, click Save Parameters.

**From the front panel**

Step 1. From the Ingredient menu, use the down arrow and Enter to select Rate Tolerance; then from the Rate Tolerance submenu, use the down arrow to select Hi Shutoff, and press Enter to open the Hi Shutoff edit form.
Step 2. Use the left or right arrow to position the cursor and the up or down arrow to change the value.

Step 3. When you have selected all the values for rate setpoint, press Enter to save and return to the Rate Tolerance menu. Our example shows 102.0 lb/m. for a setpoint of 100.00 lb/m.

Step 4. Use the same procedure to set the Lo Shutoff. Our example uses 98.0 lb/m assuming a setpoint of 100.00 lb/m.

Shutoff Out %

If the unit shuts down, the output percentage (OP) will be set to the value of the Shutoff Out % parameter. If your process must continue to operate, you can preset the percentage output so that the process does not completely shut down. If the flow rate goes outside the rate tolerance, the system goes into Rate Exception Control. The REC timer starts and, if the REC times out the system output goes to the preset Shutoff Out % until the system problem is corrected, clear the alarms and press the Start button again.

**CAUTION** If you want the system to stop be sure to set the Shutoff Out % to 0.0. Otherwise the controller will go to a preset output and continue operating which may result in a malfunction of the system.

Shutoff Out % Range 0.0> (default 0.0 You cannot set fractions of a second.)

**From the Web interface**

In the Shutoff Out % field enter the percentage. To save changes on this page, click Save Parameters.

**From the front panel**

Step 1. From the Rate Tolerance menu, use the down arrow to select Shutoff Out % and press Enter to open the Shutoff Output % edit form.

Step 2. Use the left or right arrow to position the cursor and the up or down arrow to change the value.

Step 3. When you have selected all the values for rate setpoint, press Enter to save and return to the Rate Tolerance sub-menu. (Exit returns to the Ingredient Sub-Menu.) Our example shows 10.0 %.
Wait Time

Wait Time is the time the controller waits for the material to settle before it calculates the batch total.

**Wait Time Range** 0 - >65,500 seconds (default 0.0 Very high values not recommended)

**From the Web interface**

Enter the wait time in the Wait Time field. To save changes on this page, click Save Parameters.

**From the front panel**

Step 1. From the Ingredient menu, select Wait Time, then press Enter to display the Wait Time edit page.

Step 2. Use the left or right arrow to position the cursor and the up or down arrow to change the value.

Step 3. When you have selected all the values for rate setpoint, press Enter to save and return to the Ingredient Menu. Our example shows 5 seconds.

Totals

The HI 4060 records the total amount dispensed. The Total number displays the amount of material that has been processed from the start of the process until the process completes or is interrupted. For error correction, the Total parameter can be cleared (in either continuous or batch modes) from the Web interface or changed from the front panel. For example, if a power failure shuts the system down during a process, before you resume operation you can re-enter the lost total from the front panel.

**CAUTION** If you change the total or batch total, stop the system.

**Total Range** 0 - >99,999.0 wt units (default 0.0)

**Batch Total (Front Panel only)**

The Batch Total reads the total amount of material for the selected batch that has been processed from the start of a batch process until the batch process ends (by intent or other reason). When the Batch is complete, the Batch Total resets to 0.0 for the next batch. The Batch Total parameter can be changed from the front panel should there be an error in the batch total amount while processing. We recommend that you stop the system when changing this parameter.

**Batch Total Range** 0 - >99,999.0 wt units (default 0.0)
From the Web interface

You may view or clear the total for all batches from the Web interface.

Whether the HI 4060 is in Continuous or Batch mode, the Clear Total button will remove the total weight accumulated in a process and return the value to 0.00. To save the new parameters click the Save Parameters button.

You can clear the Total at anytime during the process even when the system is running.

Changing the total from the front panel

Changing this value is not normally recommended, but if you know the value is wrong and needs changing, start from the Ingredient Menu.

Step 1. Select Totals and press Enter to display the Totals menu, then select Total and press Enter to display the Total edit screen.

Step 2. Use the right or left arrow to move position the cursor and the up or down arrow to select the value.

Step 3. When you have selected all the values for Total, press Enter to save and return to the Totals sub-menu. Our example shows 310.00 pounds.

Changing the Batch Total From the front panel

Changing this value is not normally recommended, but if you know the value is wrong and needs changing, start from the Totals Menu.

Step 1. Select Batch with the down arrow and press Enter to display the Batch edit form.

Step 2. Use the right or left arrow to move position the cursor and the up or down arrow to select the value.

Step 3. When you have selected all the values for Batch Total, press Enter to save and return to the Totals sub-menu. In our example we entered 100.00 pounds.
IP Setup Program (necessary for Blind HI-4060 Units)
The Netburner IP Setup program comes on the installation disk or it can be downloaded or run from the Hardy Process Solutions Web site (See Software Downloads for your HI-4060 above). To run the program, you must be on the same network as the HI-4060 and your firewall must be set to allow the process.

When you run the Netburner IP Setup program from a network computer, it will find the HI-4060 and allow you to set its IP address.
Chapter 5
Calibration

Chapter 5 pertains to the calibration procedures for the HI 4060 Rate Controller. It is important that both users and service personnel know and follow the procedures contained in this chapter before installing or operating the HI 4060 Rate Controller. To ensure that the rates read by the controller are accurate, we recommend that the Rate Controller be re-calibrated periodically or when it has not been in use for extended periods of time. All calibration is done in the Gross mode.

Pre-Calibration Procedures

NOTE FOR NEW INSTALLATIONS
It is recommended to install 80-100% of the load several times to exercise the scale. This settles the mounts and any piping prior to the final calibration.

Mechanical Check Procedures

Step 1. Check to determine if the load cells have been installed properly. Refer to your load cell I&M manual for proper installation instructions.

Step 2. On some load cells an arrow indicates the direction of the applied load. If the arrow points in the wrong direction, change the position of the load cell so that it is mounted in the direction of the applied load.

Step 3. Check for binding on the load cell or other parts of the system. A load cell must be mounted so that 100% of the load (vessel + contents) pass through the load cell vertically.

Step 4. Verify that nothing is binding the load cell or other parts of the weighing system. Nothing should be draped over the scale/vessel or the load cell, such as a hose, electrical cord, tubes, or other objects.

Properly installed load cell/no binding
CAUTION Binding on a Scale/Vessel or Load Cell does not allow the load cell free vertical movement and may prevent the instrument from returning to the original zero reference point.

Step 5. Check to see that nothing comes in contact with the scale/vessel other than service wires and piping that have been properly mounted with flexible connectors.

Electrical Check Procedures

Step 1. Check to see that there is power to the Rate Controller. If there is power, the front panel display should be lit, and if the display appears with a value, the unit is ready for calibration.

Step 2. Typical Load Cell/Point Input/Output Measurements (EXC & SIG outputs)

- The HI 4060 Rate Controller is designed to supply 5 VDC excitation to as many as eight 350 ohm load cells/points.
- The expected output from each load cell/point depends on the mV/V rating of the load cell/point and weight. For example, a 2 mV/V load cell/point will respond with a maximum of 10 mVDC at the system’s full weight capacity, which includes the weight of the vessel and the weight of the product as measured by the load cell/point.
- If the load cell/point weight capacity is rated at 1000 pounds, the load cell/point output will be 10 mVDC at 1000 pounds, 7.5 mVDC at 750 pounds, 5 mVDC at 500 pounds and so on..
A zero reference point will vary on different systems depending on the “Dead Load” of the vessel. Dead Load is the weight of the vessel and appurtenances, with no product loaded. Our example assumes the dead load to be 500 lbs. In this example, the operating range for this scale is 5-10 mVDC with a 500 pound weight. After zeroing the instrument, the 0 reading refers to the zero reference point and not absolute 0 mVDC or absolute 0 weight.

NOTE

Load cell/point measurements can be checked with a digital voltmeter at the J1 connector on the rear panel or at the summing box of the HI 4060 or use Integrated Technician if you are using the IT Junction Box.

Step 3. Allow the instrument to warm up for about 15 minutes before doing the calibration procedures.

Load Check

Step 1. Put a load (weight) on the scale or vessel. For a full load test you can put 80% to 100% of the expected weight you will see in your process on the scale or vessel.

Step 2. Check to see if the weight reading changes on the display in the proper direction.

• For example, if the display reads 100 pounds and a 20 pound load is placed on the vessel or scale, the display should read 120 or some value over 100.

• If the display reads 80 pounds and a 20 pound load is placed on the vessel or scaled, the reading is going in the wrong direction and indicates some problem with the system. (See Chapter 8, Troubleshooting for corrective action)

• If the display is reading improperly or shows no change there is something wrong with the configuration or the load cells.

Step 3. If the display changes in the proper direction, remove the weight and proceed to calibrate the Rate Controller.

Calibration Procedures

NOTES

When calibrating the HI 4060 for the first time, go from one sub-menu to the next in sequence.

Any example settings are for illustration only. Your setting requirements will vary.

Make sure you have configured the instrument for your application. This includes setting the units, decimal point, scale capacity, averages etc. For instructions, please see Chapter 4, Configuration.
C2 Calibration

C2® Electronic Calibration enables a scale system to be calibrated electronically without using certified test weights. A C2® weighing system consists of up to eight load sensors, a junction box, interconnect cable and an instrument with C2® capabilities such as the HI 4060 Rate Controller. The HI 4060 reads the performance characteristics of each load sensor and detects the quantity of load sensors in the system.

Reference Weight is the total live load on the scale. The calibration process uses a reference point that can be entered from either the front panel or the Web page. The reference can be zero (no weight on the scale) or a known weight, such as a container, that will be on the scale. With no weight on the scale, the Reference Weight is 0.00. With 5 lbs on the scale, the Reference Weight is 5.00 lbs.

C2 Calibration Procedures From the Web page

Step 1. Perform all of the pre-calibration procedures listed above.

Step 2. Make sure you have configured the instrument for your application. This includes setting the units, decimal point, scale capacity, averages etc. For instructions please see Chapter 4, Configuration.

Step 3. From the home page select Configuration to display the Configuration menu, then select Scale Calibration to open the Configuration - Scale Calibration page.

Step 4. This step establishes the gross zero reference. Enter the reference weight for your application in the C2"Ref Weight" text field. Our example shows 0.000 lbs.

Step 5. You can enter a gravity correction factor. (For Gravity Correction information see the section About Gravity Correction and the correction factor selection table later in this chapter.

Step 6. Click on the “Do C2 Calibration” button.
Step 7. The results will appear in a few seconds. If the Calibration succeeds, a Cal completed OK appears. If no load points are connected to the instrument, a Cal Failed: A to D Converter Error appears. To correct this error check the cable and connectors of the load point(s) and re-calibrate.

You will also see that the Load Sensor Number reads 0. If no C2 load points are connected to the instrument, a Cal Failed: No C2 sensors found appears. This requires a traditional instrument calibration or connect C2 load sensors to the instrument.

Step 8. Click on “Back” to return to the Calibration page.

C2 Calibration Procedures From the Front Panel

Step 1. From the Configuration Menu, select Calibration and press Enter to open the Calibration menu; then select C2 Cal and press Enter to open the C2 Cal menu with the cursor in front of Num C2.

Step 2. Check the C2 Load Cell count. The read-only Num C2 lists the number of C2 load cells installed on the system that the instrument detected. Verify that the load cells detected match the number of C2 load cells actually installed.

Step 3. If the load cells detected do not match the load cells installed in the system, verify that each load cell/point cable connection is securely fastened and in good condition. Also, on the HI 4060 web page the information concerning Operations/Diagnostics/C2 and Weight and Voltage can help you to determine which load cell/point is malfunctioning.

Step 4. Select Ref Weight (Reference Weight) and press Enter to open the Ref Weight Menu edit screen.
Step 5. This step establishes the gross zero reference. Press the CLR button to clear the current value and position the cursor and use the up or down arrows to scroll the number for the right-most digit.

Step 6. Use the left arrow to select the next position and the up or down arrows to scroll the number or punctuation. Repeat the process to enter the Reference Weight value.

Step 7. Press the Enter button to save the Reference Weight.

About The Gravitation Correction Factor

The table below shows the gravitation correction factor for various cities around the world. Objects weigh about 0.06% less at the equator than they weigh at each pole because the force of gravity is less at the equator than at the poles. For example an object weighing 100 pounds at the North Pole on a spring scale would weigh 99.65 pounds at the equator. Depending on the latitude of your location, your scales would measure somewhere in between. For example, Mexico City is 1.002102 and Oslo is 0.998726.

<table>
<thead>
<tr>
<th>City</th>
<th>Grav. Accel</th>
<th>City</th>
<th>Grav. Accel</th>
<th>City</th>
<th>Grav. Accel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amsterdam</td>
<td>0.999369</td>
<td>Istanbul</td>
<td>1.000406</td>
<td>Paris</td>
<td>0.999048</td>
</tr>
<tr>
<td>Athens</td>
<td>1.000684</td>
<td>Havana</td>
<td>1.001872</td>
<td>Rio de Janeiro</td>
<td>1.001884</td>
</tr>
<tr>
<td>Auckland NZ</td>
<td>1.000782</td>
<td>Helsinki</td>
<td>1.001405</td>
<td>Rome</td>
<td>1.000326</td>
</tr>
<tr>
<td>Bangkok</td>
<td>1.002392</td>
<td>Kuwait</td>
<td>1.001405</td>
<td>San Francisco</td>
<td>1.000702</td>
</tr>
<tr>
<td>Brussels</td>
<td>0.999503</td>
<td>Lisbon</td>
<td>1.000615</td>
<td>Singapore</td>
<td>1.00269</td>
</tr>
<tr>
<td>Buenos Aires</td>
<td>1.001004</td>
<td>London</td>
<td>0.999445</td>
<td>Stockholm</td>
<td>0.99877</td>
</tr>
<tr>
<td>Calcutta</td>
<td>1.00191</td>
<td>Los Angeles</td>
<td>1.001028</td>
<td>Sydney</td>
<td>1.00104</td>
</tr>
<tr>
<td>Cape Town</td>
<td>1.00104</td>
<td>Madrid</td>
<td>1.000461</td>
<td>Taipei</td>
<td>1.001741</td>
</tr>
<tr>
<td>Chicago</td>
<td>0.99922</td>
<td>Manila</td>
<td>1.000461</td>
<td>Tokyo</td>
<td>1.00086</td>
</tr>
<tr>
<td>Copenhagen</td>
<td>0.999075</td>
<td>Mexico City</td>
<td>1.002102</td>
<td>Vancouver BC</td>
<td>0.999653</td>
</tr>
<tr>
<td>Nicosia</td>
<td>1.00093</td>
<td>New York</td>
<td>1.000433</td>
<td>Washington DC</td>
<td>1.000601</td>
</tr>
<tr>
<td>Jakarta</td>
<td>1.002631</td>
<td>Oslo</td>
<td>0.998726</td>
<td>Wellington NZ</td>
<td>0.999399</td>
</tr>
<tr>
<td>Frankfurt</td>
<td>0.999579</td>
<td>Ottawa</td>
<td>1.000007</td>
<td>Zurich</td>
<td>0.999821</td>
</tr>
</tbody>
</table>

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

If you do not want to enter a Gravitation Correction Factor go to Step 16, C2 Cal.

You must calibrate C2 after setting the Gravity Correction for the correction factor to work.

Step 8. Select Gravity Correction from the C2 Cal Menu to display the Gravity Correction edit screen.

Step 9. Use the left arrow to position the cursor and the up or down arrows to change the value until you have entered all the characters for the Gravity Correction Factor. Our example shows 1.006.

Step 10. Press the Enter button to save the Gravity Correction Factor.

Step 11. Use the Down Arrow to select C2 Cal. Do Cal and press Enter to perform the C2 Calibration. A “Cal Completed OK” briefly appears on the screen indicating the C2 calibration was successful.

A “Cal Failed” message briefly appears with the error number if the C2 Calibration was not successful. Check Chapter 8, Troubleshooting for corrective action.

A “Security Violation” message briefly appears if the user does not have the security level required to do a calibration.

Step 12. Use the down arrow to select A/D Average. This is a read only display of the Average A/D counts.

Step 13. Press the Exit button to return to the Calibration Menu.

Traditional Calibration

Traditional Calibration is the method of calibration that uses test weights. We recommend that the test weights total 80 to 100% of the scale live load capacity.

Traditional Calibration normally uses a zero point and the physical placement of test weights on the scale. To set the scale value. The scale is normally empty, but not necessarily. The reference weight must be the amount of live load weight on the scale. With no weight on the scale, the Zero Value would be 0.00. Wait 12 seconds or more.
Traditional Calibration from the Web page

Step 1. In the Ref Weight text field enter the reference weight you want. In our example we entered 0 lbs. If you want the reference weight to be 5.0 lbs enter 5.0.

Step 2. Cal low weight is a reference for the weight of any product on the scale that is not removed during calibration (derived from actual measured weight used at cal low or C2 cal). Normally, you would remove all “live load” weight from the scale to obtain a CalLow Weight of 0.0. Click on the Do Cal Low button to do the Trad Cal Zero. A “Cal Completed OK” message appears briefly if the calibration was successful. If not, an Error number appears. See Chapter 8, Troubleshooting for help with error correction.

Step 3. To set the Span Weight, place a certified test weight on the scale.

Step 4. In the Span Weight text field, enter the weight of the certified weight. Our example shows 5 lbs.

When you click the Do Cal High button, a “Cal Completed OK” message appears briefly if the calibration succeeds, or an error message appears if the calibration fails. See the Error list in Chapter 8 for help with error correction.

Traditional Calibration from the Front Panel

Step 1. From the Configuration menu select Calibration and press Enter button to display the Scale Calibration Menu; select Trad Cal and press Enter to display the Trad Cal menu; then press Enter to open the Reference Weight edit screen.

Step 2. Traditional Calibration requires a zero point and the physical placement of test weights on the scale. The Ref Weight would normally be 0.0 (but not necessarily). Enter a reference weight equal to the weight on the scale.

Step 3. Wait 12 seconds or more.
Step 4. Use the Left and Right Arrow buttons to position the cursor. Use the Up or Down Arrow buttons to enter the Reference Weight for this instrument.

Step 5. Press the Enter button to save the entry.

Step 6. Select Cal Low Do Cal with the Down arrow, and press Enter to show the Cal Low value. A “Cal Completed OK” message appears briefly if the calibration succeeded. If not, you will see an Error number. See the Error list in Chapter 8, Troubleshooting for help in correcting the error.

Step 7. From the Scale Calibration menu, select Trad Cal with the Down arrow to view the A/D Averages. This is used to tell when the scale settles.

Step 8. From the Trad Cal menu, use the Down arrow to select Span Weight and press Enter to open the Span Weight Menu edit screen showing the last Span Weight.

Step 9. To set the Span Weight: Place a certified test weight on the scale and use the Left and Right arrows to position the cursor and the Up or Down arrows to enter the value of the test weight; then press Enter to save. For a 10 lb. weight, enter 10.00.

Step 10. Select Do Cal High, and press Enter to do the Cal High. A “Cal Completed OK” message appears briefly if the calibration succeeded. If not, you will see an Error number. See the Error list in Chapter 8, Troubleshooting for help in correcting the error.

Step 11. The scale is now calibrated.
Chapter 6
Mapping

Default mapping predefines the I/O and analog signals. (Default functions for the five I/O card inputs HI5.0-HI5.4 are listed under Control.) If you use these defaults, it is necessary to map only commands sent over the communication links.

Mapping allows you to set up certain monitoring and control activities to meet your process requirements without programming. Whether the input is digital data to be routed to a display or a signal used to trigger a command to a PLC, mapping is often the easiest way to achieve the desired result. HI 4060 mapping is more flexible than the typical I/O addressing used in a PLC. You can either use the predefined I/O default mapping or tailor custom mappings to meet the unique requirements of your application. To prevent unintended action with your inputs when you reset the defaults, be sure to set Use Default I/O to NO on the Configuration - Instrument Setup page.

Glossary of Mapping Terms

Assignment Statement - The assignment statement tells the computer to change the value stored in the memory address named as a variable on the left side of an = sign. (The = sign is called an assignment operator). For example: \( i = a + b \), means get the values stored in memory locations \( a \) and \( b \), add them together, then store the sum in location \( i \).

Destination - This is the destination memory address to which data will be moved. Left side

I/O Interface - The section of the instrument that communicates with the “outside world”.

Input Contact - Inputs interface selector and limit switches, push buttons, and sensors to the HI 4060. An address assigned to each input identifies the location of the input device.

Input Table - Defined in the section Input and Output Tables.

Local Mapping - See the section Local Input.

Network Mapping - This is mapping to and from network devices.

Node Number - This is the physical address of a device in a network.

Output Table - Defined in the section Input and Output Tables.

Source - This is the memory address of the data (Right side of the equation) you want to assign to the destination.

Word - When mapping the value selected for Network on the Mapping page, you can specify a value for Word. Data passed to a table must be formatted to match the allocated space. Words are groups of bit locations that can be identified by a sequence number. The default word 0 indicates that data sent to that memory location will occupy the allocated space starting from the first available bit. Entering a different value in the Word field allows
you to specify a different starting point for storing the data input. This may be done to avoid overriding data that already exists in certain locations. For example, with ControlNet and RIO some tables have assigned word 0 (or both 0 and 1) to other uses, so they should not be used for a new mapping. You may need to track where information is stored. For example, if both weight and Setpoint 1 are assigned to Word zero in the same table, the overlapping input values would override one another. Note too that Int and Float consume two words, so both the word selected and the word to follow must be available for mapping.

**How Mapping Works**

Mapping (Addressing I/O) creates assignment statements. The destination is on the left side of the \(=\) sign and is a memory address (variable). The Source is the data on the right side of the \(=\) sign at a memory address. The \(=\) sign assigns the data on the right side of the assignment statement to the memory address on the left side of the assignment statement. Any reference to the right side of the assignment statement refers to the data only and not the address, even though the address is listed.

\[
\text{Memory Address (Variable)} = \text{Data (Values, states)}
\]

**Input and Output Tables**

To transfer values from node to node during the I/O scan, each node has an **Output** table, that contains the values to be read by other nodes, and an **Input** table, where incoming values from other nodes are received. Generally, the transferred values are current states or other variables. The output tables and input tables are data arrays where data are stored (i.e. a set of memory locations of tailored sizes based on the type assigned to the variable and having an address). Mapping specifies what to do with HI 4060 input.

Often, more than two devices are involved, so separate output tables and input tables having different addresses may be set up for data exchanges with each device.

The HI 4060 scans through the I/O tables 110 times a second and reads any values they contain. If state or other values are stored in the tables, the firmware processes the data and outputs it to an output device or the screen. If nothing is stored to output, no output is sent.

When an I/O scan occurs, the state of each input is transferred from the input point to the input table for the receiving device, as shown in the graphic below.
The left side of an assignment statement is for output table data, and the right side of an assignment statement is for input table data. Memory address (variable) = Data (values, states).

Output variables are also further identified by the first two letters of the variable:

- HO - Hardy output table
- DO - DeviceNet output table
- EO - Ethernet/IP output table

If the items in the table are only permitted on the right side of an Assignment Statement, we call it an input table:

- HI - Hardy input table
- DI - DeviceNet input table
- EI - Ethernet input table

**Local Input**

This is mapping where the input side of the equation is a digital signal entering the HI 4060 via a connector (other than a network connection feeding into an input table). The source of such inputs would be an interface with a limit or selector switch, push button, or some other sensor feeding voltage signals into the HI 4060. The mapping output normally goes to an HI 4060 internal process or one of its output tables.

Remember Local Inputs = User Switches.

**Volatile and Non-Volatile Memory**

The data stored in the output tables and input tables are stored in volatile memory. This means, when you power off the HI 4060 you lose the data. The Addressing I/O (Mapping) is saved in non-volatile memory and is not lost when you power off.

**Mapping to an Output**

In English we might say: Connect Gross Weight to Ethernet/IP Float Out.

- Ethernet/IP Float Out is the Destination.
• Gross Weight is the Source.

In Assignment Statement form this mapping would look like this:
• Destination = Source or
• Ethernet/IP Float Out (EFO) = Gross Weight (HF10)

**Network Input**

Like the HI 4060, PLCs have output tables and input tables. The HI 4060 is a network node that you can assign a node address so the Network scanner can identify the instrument.

**WARNING: YOU CANNOT ASSIGN THE SAME ADDRESS TO TWO DIFFERENT NODES. THE PLC CANNOT DETERMINE WHICH NODE IT IS COMMUNICATING WITH. THIS CAN RESULT IN PROPERTY DAMAGE OR PERSONAL INJURY.**

The Network scanner, scans each node’s output table and reads the values to the PLC’s input table which makes the data available to the PLC for processing.

Here again you can assign the data in the node’s output table to an address in the PLC input table. For example, to display a Gross Weight on the PLC’s output (screen), you assign the Gross Weight value in the HI 4060’s input table to its output table where the PLC Scanner can read it and moves it to its input table (where it can then be output to the PLC screen).

**Network Output**

The Network Scanner writes data in a PLC’s output table to the input table of any network node that is setup to receive it. This data then becomes a source that can be mapped to any destination in the HI 4060.

**Mapping from the Web Browser**

Step 1. From the HI 4060 Home Page, click Configuration to view the Configuration menu.

Step 2. Select Mapping to view the Configuration Mapping Setup form. The pull-down menus list both Destination and Source setup options.
Step 3. For our destination, from the Network pull-down list we select an option based on three factors:

- Type of network, e.g., CNET (Control Net), “Ethernet/IP, Modbus, etc.
- Message data type based on the number of bits to be sent or received, e.g., Int, Float, short Int, or Boolean (see Data Types below).
- Whether the value is an input or an output. Note that the listed options for destination show mainly output options.

In our example, we select “Ethernet/IP Float Out (EFO) as our destination.

Step 4. This causes Ethernet/IP Float Out (EFO) to appear in the text box and a Select button appear to the right of the Network box.
Step 5. When we click Select, an address appears in the text box below. You will have to scroll down to see it. In our example we selected Ethernet/IP Float Out, which has an address of: EFO0. An equal sign also appears.

![Image of Select Address](image1)

Step 6. You have now selected the Destination. Now we want to select the source Gross Weight, which is Process Data.

Step 7. From the Process Data pull down, select “Gross Weight.” A Select button appears to the right of the Process Data box.

Step 8. Click the Select button to select “Gross Weight as the Source.

Step 9. The Assignment Statement is complete. You now see in the Mapping text box: “EFO0=HFI0”

![Image of Mapping](image2)

Step 10. Click the Map button. You have now mapped Gross Weight to Ethernet/IP Float Out. The Gross Weight that is stored in the input table is now assigned to the Ethernet/IP Float Out output table and to the Ethernet/IP Network. Notice that the new mapping is included in the Map list.

![Map Instructions](image3)
Example #2 Mapping an Input

To connect a remote switch for starting a process, you can map “User Switch 1” (1 of 3 inputs to the HI 4060) to the Start (HO3.0) option. The Assignment Statement is:

- Destination = Source
- Start (HO3.0) = User Switch 1 (HI0.4)

Step 1. On the Control pull-down menu under Destination, select Start. A Select button appears.
Step 2. Click the Select button.
Step 3. The Destination address appears in the Mapping text field.
Step 4. Under the Source Section click on the Control pull-down menu. Click on User Switch 1. A Select button appears.
Step 5. Click the Select button. The Source address appears in the Map text field.
Step 6. The Mapping Assignment Statement is complete. Start (HO3.0) = User Switch 1 (HI0.4). Click the Map button. The Input Contact is now mapped to Start.

Simple Network Mapping

Mapping to a Network Output

To send data to a PLC from the HI 4060, you need to map the data to a network output. For example, to map the weight to an Ethernet/IP output, the process is:

Step 1. From the Network pull down, select Ethernet/IP Float Out.
Step 2. In the Word text box, enter the number 2. See Glossary of Mapping Terms for an explanation on how the Word text box is used.

Step 3. Click on the Select button to set the Destination. The “Ethernet/IP Float Out” address appears on the left side of the Assignment Statement.

NOTE

The 2 in Ethernet/IP Float Out address EFO2 refers to Word 2.

Step 4. Click on the Process Data pull-down list.

Step 5. Click on Total (HFI7).

Step 6. Click the Select button to enter Total as the source of the Assignment Statement.

Step 7. The total address appears on the right side of the assignment statement.

Step 8. The total weight is now available to the PLC via the DeviceNet Scanner.
Mapping a Network Input for Control

NOTE

PLC output that is input to the HI 4060 can be mapped for HI 4060 local control.

When the PLC sends information to the HI 4060, this mapping process clears alarms when word 2 bit 0 is set high.

Step 1. Under Destination on the Mapping page, select Clear Alarm (HO3.6) on the Control pull-down list.

Step 2. When you click Select, the Clear Alarm (HO3.6) address appears on the left side of the Assignment Statement.

Step 3. From the Networks pull down, select a Boolean option as the Source for the Assignment Statement.

Step 4. In the Word text box, type in the number 2. See Glossary of Mapping Terms for an explanation on how the Word text box is used.

Step 5. Click on the Select button to assign the source to the right side of the assignment statement; then click the Map button.
Step 6. The new mapping, clears alarms when word 2 bit 0 is set high from the PLC.

More Advanced Mapping

This section is for those who have experience Addressing I/O (mapping) or for those who want more information as to how the mapping works locally and on the network. It includes instructions for Boolean, Analog, Mixed and Special Command mapping procedures.

Unlike the addressing of PLC input and output, you do not map the physical location of an I/O module terminal to a bit location in the processor. HI 4060 mappings are not predefined. Instead, you map values or states in an input table to an output table location. HI 4060 mapping is nothing more than assigning data from an address (Source) to another address (Destination) to be used by the controller in ways that meet your process requirements. The HI 4060 has default mapping for the Addressed I/O.

For each input, e.g., the state of the input device, an associated input table address identifies the physical location for the data. When you map an input to a destination, you assign the input table value to an output table Address. For example: Clear Alarm = Input #3 means assign the state (Open (0) or Closed (1)) of Contact #3, contained in the Contact Closure input #3 input table address, and move it to the Clear Alarm address in the output table.

Boolean Mapping

In a Boolean equation, the destination (left side of the equation) is a Boolean term. A Boolean variable is a variable that can have the value 0 (FALSE) or 1 (TRUE). In the HI 4060 there are 3 Boolean operations supported:

- AND - The symbol for “AND” in a Boolean Assignment Statement is “*”.
- OR - The symbol for “OR” in a Boolean Assignment Statement is “+”.
- NOT - the symbol for “NOT” in a Boolean Assignment Statement is “~”.

The Boolean tables are arrays of short (2 byte) integers. An individual Boolean variable in the table is located by its word offset and its bit offset. Boolean tables are given two letter names as follows:

- DI is the DeviceNet input table.
- DO is the DeviceNet output table.
- HI is the Hardy input table.
- HO is the Hardy output table.

DeviceNet input tables and output tables are mapped to physical external devices using a DeviceNet configuration software like Rockwell Software’s RS NetWorx®.
A Boolean variable is addressed with the syntax below:

`[tablename][word offset].[bit offset]`

Example: DI0.3 is bit #3 in the DeviceNet input table, word #0.

**Analog Mapping**

Analog equation mapping is defined as the destination in an analog term. Analog variables can have different values in different formats: 16-bit integer, 32-bit integer, and 32-bit float. Three analog operations are supported. The symbols are the same as the Boolean operations, but with different meaning.

1: Multiply. The symbol for “multiply” is `*`
2: Add. The symbol for "add" is `+`
3: Negate (logical NOT). The symbol for "NOT" is `~`

Analog tables are given three letter names as follows:

DFI,DFO,DSI,DSO,DII,DIO all refer to network tables, where the item is a float, a short integer, or a 32-bit integer, depending on the second letter in the table name.

- S - 16 bit signed integer
- F - float
- I - 32 bit signed integer

An analog variable is addressed with the syntax below:

`[tablename][offset]`

The offset in DeviceNet tables is measured in words. See Glossary of Mapping Terms for an explanation on how the Word text box is used. The offsets in Hardy tables have various predefined meanings. When an analog equation is evaluated, all terms get converted to float. The final result is then converted to the type of the LHS (destination).

**Mixed Mapping**

An equation is said to be an analog equation if the term on the left side of the equals sign is an analog variable. The equation is said to be a Boolean equation if the term on the left side is a Boolean variable. It is permissible to have analog variables appear in Boolean equations and Boolean variables in analog equations. (We call a mixed equation “Boolean” if its LHS is a Boolean term and “Analog” if its LHS is an analog term).

A Boolean variable in an analog equation is converted to 1.0 or 0.0.

An analog variable in a Boolean equation is TRUE if it is greater than zero and FALSE if it is less than or equal to zero.
**Special (Command) Mapping**

A command interface can be used to read or write a parameter value. The table CMD can appear only on the left side of an equation. The right side has one or two terms. The first one defines (in words) the offset where the command data comes from in the table, and the second term defines the table and offset where the response to a command is written.

**The Command Interface**

A command interface can be used to read or write a parameter value. The HI 4060 may receive commands over any of its network interfaces. A command consists of a four-byte command which it receives through its network input data. The instrument responds with a four-byte response. We need to set the upper two bytes of the parameter ID into the location for this, as described below.

**Setting up the Command Interface Mapping**

Use an equation of the form CMD0 = (in_table)*(out_table)

In_table is an input table defining where the command is written. Out_table defines where the replay data is written.

Example: CMD0=DSI0*DSO0

This equation says the command will be written to the DeviceNet input table at word offset 0 and the reply data is written to the DeviceNet output table at word offset zero.

The upper two bytes of PARAMETER ID (JSO15) and the upper two bytes of the parameter value (JSO14) can also be mapped, which removes the need to do steps 1 and 2 above. Instead, you would write the 0000 and 0001 into JSO15 and JSO14, respectively.

Example: JSO15 = DSI2 and JSO14 = DSI3

By doing this you can set four-byte parameter values using a single command rather than the three commands required above.

To read the value of any parameter, send the four-byte PARAMETER ID. The byte order is LITTLE ENDIAN, that is least significant byte first. Verify that the upper two bytes are set correctly. To verify what they should be, either see the parameter list at the end of this section or look on the OPERATION/DIAGNOSTICS/PARAMETERS web page to find the parameter IDs. Use the special parameter ID (0x4001 or 0xC001 with the upper bit set) to set the upper bytes. The value the instrument returns for the parameter will be either an integer or float.

When writing the value of a parameter, the PARAMETER ID is four bytes long, and the parameter value is also four bytes long if it is a floating-point number. However, each command is only four bytes long, while most integer valued parameters are only two bytes long. Also the most significant two bytes of a PARAMETER ID is usually zero.

To setup a two-byte parameter with a four-byte PARAMETER ID, send these four bytes:

- byte 0: The least significant byte of the PARAMTER ID
- byte 1: The next byte of the PARAMTER ID but with the highest order bit set.
• bytes 2,3: The value you want to set the parameter to.

For example, to set the value of NumAverages to 3, if the first two-bytes are set to 0, send this hex command <0x8007><0x0003>.

Here the <0x0007> is the lowest 2 bytes of the PARAMETER ID or NumAverages which becomes 0x8007 after you set the most significant bit and <0x0003> is the value you want to set the parameter to.

If the parameter is 4 bytes long, as all floating-point values are, first set the upper 2 bytes. A special PARAMETER value (0x4000 or 0xC000 with the upper bit set) does this.

The first two bytes of the response to a write command echo the first two bytes of the command. The next two bytes are either the TWO MOST SIGNIFICANT bytes of the parameter or, if the parameter was in fact a command like CLEAR ALARM or TARE, a status code indicating whether the command succeeded or failed.

If the PARAMETER ID is not valid, the instrument will return four zero bytes.

A parameter writing example: Setting Rate Setpoint Target to 1.0

Rate Setpoint Target has a PARAMETER ID of 0x00010012 (hexadecimal). The number 1.0 in float format is 0x3F800000.

Step 1. Set the upper two bytes of the parameter value with the command <0xC000><0x3F80>
Step 2. Set the upper two bytes of the PARAMETER ID with the command <0xC001><0x0001>
Step 3. Write the Rate Setpoint Target with the command <0x8012><0x0000>

**Parameter List (Dump)**

Step 1. To display the Operation menu from the Home Page, click Operation.
Step 2. Select Diagnostics to display the Diagnostics Page, and click on Parameters to display list of the parameters and their settings.
NOTE

* The dollar signs indicate that the parameters have a security code. One (1) dollar sign for Medium Security and two (2) dollar signs for High Security. 00000001 $Unit=0 [lb]

00000002 SWeight Decimal Pr=3 [3]
00010002 Rate Decimal Pr=3 [3]
00020002 Total Decimal Pr=2 [2]
00030002 Batch Decimal Pr=2 [3]
00000003 Grad=0 [1]
00000004 Operator ID=Mz
00000005 Instrument ID=HI 4060
00000006 WAVESAVER=8=3 [1.00 Hz]
00000007 Num Averages=10
00000009 Low Pass Filter=1 [ON]
0000000A Gain In Weight=1 [NO]
0000000F Capacity=130.000
0000002A Baud Rate:=5 [19200]
0001002A Data bits:=1 [8]
0002002A Parity:=0 [NONE]
0003002A PrintMode=0 [BATCH REP]
000002F2 scratchpad=0.000000
000102F2 scratchpad=30.000000
000202F2 scratchpad=0.000000
000302F2 scratchpad=0.000000
000402F2 scratchpad=0.000000
000502F2 scratchpad=0.000000
000602F2 scratchpad=0.000000
000702F2 scratchpad=0.000000
00000036 DNET Baud=2 [500k]
00010036 DNET Node=6
00020036 DNET Bytes In=32
00030036 DNET Bytes Out=32
00000038 Analog Weight Low=0.000000
00040038 Analog Output Low=0.00
00050038 Analog Weight High=130.000000
00060038 Analog Output High=20.00
00000039 Analog Weight Low=0.000000
00040039 Analog Output Low=0.00
00050039 Analog Weight High=130.000000
00060039 Analog Output High=20.00
00000040 Profibus Node:=5
00000041 RIO Baud Rate=0 [57.6k]
00010041 RIO Address=0
00020041 RIO Rack Size=1 [1/4]
00030041 RIO Quarter=0 [0]
00040041 RIO Last Quarter=0 [NO]
00000208 Calibration Date=C2 Cal 23 Dec 2008
00000203 Cal Low Counts=3033020
00000204 Cal High Counts=3455028
00000205 Cal Span Factor=2.883120214392E-05
00000206 Zero Counts=3033020
0000020A ITECH=0 0 0 0 0 0 0
0000020B Gravity Correction=1.000000
000001D Zone=3[PST(GMT-8h)]
00000324 Graph var=0 [ACT]
Map Dictionary

CMD0 - Specifies input and output locations for the command interface
    e.g. CMD0=ESI25*ESO20

The unit will look for commands starting at EtherNet/IP input word 25 and send
acknowledgements to output word 20

Be careful to distinguish between digit zero "0", and upper-case letter "O".

DFI - DeviceNet Input, regarded as floats
DFO - DeviceNet Output, regarded as floats
DSI - DeviceNet Input, regarded as 16 bit integers
DSO - DeviceNet Output, regarded as 16 bit integers
DII,DIO - DeviceNet Input,Output, regarded as 32 bit integers
DI,DO - DeviceNet Boolean input and output
EFLEFO,ESI,ESO,EII,EIO,ELEO - Ethernet I/P, similar to DeviceNet
PFI,PFO,PSI,PSO,PII,PIO,PI,PO - Profibus
RFI,RFO,RSI,RSO,RII,RIO,RI,RO - RIO. Words 0-63 for block transfer, Words 64-71
for discrete transfer
MFI,MFO,MSI,MSO,MII,MIO,MI,MO - Modbus
HSI - Hardy Short Input Table. This table allows the things in HI to be mapped as 16-bit
words.
    HSI0 - Digital Input
    • HSI0 bit 0 (HI0.0) - Digital Card Input 1
    • HSI0 bit 1 (HI0.1) - Digital Card Input 2
    • HSI0 bit 2 (HI0.2) - Digital Card Input 3
    • HSI0 bit 4 (HI0.4) - User Switch 1
    • HSI0 bit 5 (HI0.5) - User Switch 2
    • HSI0 bit 6 (HI0.6) - User Switch 3
    HSI1 - Status Word
    • HSI1 bit 0 (HI1.0) - A/D Conversion Error
    • HSI1 bit 1 (HI1.1) - A/D Failure
    • HSI1 bit 3 (HI1.3) - Weight Overrange
    • HSI1 bit 7 (HI1.7) - Real Time Clock failure
    • HSI1 bit 8 (HI1.8) - SD memory card read failure
    • HSI1 bit 9 (HI1.9) - Display error
    • HSI1 bit 11 (HI1.11) - SD memory card write failure
    HSI2 - Default Relay Output, as determined by the state machine (can be overridden
by mapping HSO4)
    • HSI2 bit 0 (HI2.0)ON/OFF relay
    • HSI2 bit 1 (HI2.1)Shutoff relay
    • HSI2 bit 2 (HI2.2)REC relay
    • HSI2 bit 3 (HI2.3)Alarm relay
    • HSI2 bit 4 (HI2.4)Refill relay
HSI3 - State machine operating mode
- 0 = IDLE
- 1 = AUTO
- 2 = MANUAL
- 3 = START
- 4 = STOP
- 5 = SHUTOFF
- 6 = PAUSE
- 7 = RATE CAL
- 8 = REFILL
- 9 = REFILL FULL
- 10 = MANUAL HOLD
- 11 = RATE CAL HOLD

HSI4 - Rate Status Word
- HSI4 bit 0 (HI4.0) Low Alarm
- HSI4 bit 1 (HI4.1) High Alarm
- HSI4 bit 2 (HI4.2) Control lost
- HSI4 bit 3 (HI4.3) Refill overflow
- HSI4 bit 4 (HI4.4) Not OK to Feed
- HSI4 bit 5 (HI4.5) ON/OFF
- HSI4 bit 6 (HI4.6) Rate Range Error - Rate is below zero, or above MAX RATE
- HSI4 bit 11 (HI4.11) RE- (rate exception condition, low rate)
- HSI4 bit 12 (HI4.12) Batch Complete
- HSI4 bit 13 (HI4.13) Request Refill
- HSI4 bit 14 (HI4.14) REC (rate exception condition)
- HSI4 bit 15 (HI4.15) Shutoff

HSI5 - Digital input from I/O card. These 5 inputs do not have to be mapped if the parameter Use Default I/O is set to YES. The default functions are listed below.
- H15.0 Start
- H15.1 Stop
- H15.2 Abort
- H15.3 Force Refill
- H15.4 Clear Total

HSI10 - Analog input counts from I/O card

HSO - Hardy Short Output table. This table allows the things in HO to be mapped as 16-bit words.

HSO0 - Digital Output
- HSO0 bits 0-3 (HO0.0-HO0.3) - Digital Card Output 1-4

HSO1 - Command Status - value returned after a command (see HSO2) is done. Non-zero status means the command failed.
- Status 1,2 = Calibration failed due to ADC error, or ADC failure
- Status -8 (0xFFF8) = Hard Calibration failed, not enough ADC counts between high and low steps
• Status -6 (0xFFFA) = C2 Calibration failed, no C2 sensors detected

HSO2 - Command Word. Commands are performed on a 1-shot basis when this word changes from 0 to 1. An error code is returned in the "command status" word HSO1.
• HSO2 bit 0 (HO2.0) - Clear Total
• HSO2 bit 2 (HO2.2) - Hard Cal Low
• HSO2 bit 3 (HO2.3) - Hard Cal High
• HSO2 bit 4 (HO2.4) - C2 Cal
• HSO2 bit 5 (HO2.5) - Write Parameters to SD card
• HSO2 bit 6 (HO2.6) - Print
• HSO2 bit 7 (HO2.7) - Do 2 point Rate Calibration
• HSO2 bit 8 (HO2.8) - Do 5 point Rate Calibration
• HSO2 bit 10 (HO2.10) - Enter Manual Mode
• HSO2 bit 11 (HO2.11) - Exit Manual Mode

HSO3 - Mapped Switch
• HO3.0 Start
• HO3.1 Stop
• HO3.2 Abort
• HO3.3 Force Refill
• HO3.4 Clear Total
• HO3.5 Print
• HO3.6 Clear Alarm
• HO3.7 Clear Hopper
• HO3.8 Not OK to Feed

HSO4 - Relay Output- defaulted to the values below, unless re-mapped
• HO4.0 Relay1-ON
• HO4.1 Relay2-SHUTOFF
• HO4.2 Relay3-REC
• HO4.3 Relay4-ALARM
• HO4.4 Relay5-REFILL

JSO Hardy Short Integer Parameters
JSO0 - WAVERSAVER®
JSO1 - Num Averages
JSO2 - Unit
JSO3 - Weight Decimal Point
JSO4 - Wait Time
JSO5 - Grad Size
JSO6 - Remote Key
JSO7 - Auto Refill
JSO8 - Initial Refill
JSO9 - Alarm Delay
JSO10 - REC Time
JSO11 - REC Shutdown
JSO13 - Rate Decimal Point
JSO14 - Param Value MSW
JSO15 - Param ID MSW
JSO16 - Remote Setpoint Averages
JSO17 - Remote Setpoint Enabled
JSO18 - Remote Setpoint Analog Input Range
JSO19 - Total Decimal Point
JSO20 - Gain in Weight
JSO21 - PrintMode
JSO22 - Batch Decimal Point

**HFO** Hardy Float Parameters

HFO0..HFO7 - Scratchpad variables
HFO8 - Max Rate
HFO12 - Span Weight
HFO13 - Cal Low Weight
HFO14 - Scale Capacity
HFO15 - Remote Setpoint in
HFO16-19 - Remote Setpoint configuration: RateLow, RateHigh, InputPercentLow, InputPercentHigh
HFO20-23 - Input to one of 4 channels of analog output card
HFO24-27 - Analog output channel 1 configuration: Low Value, High Value, OutputVoltsLow, OutputVoltsHigh
HFO28-31 - Analog output channel 2 configuration: Low Value, High Value, OutputMilliampsLow, OutputMilliampsHigh
HFO32-35 - Analog output channel 3 configuration: Low Value, High Value, OutputVoltsLow, OutputVoltsHigh
HFO36-39 - Analog output channel 4 configuration: Low Value, High Value, OutputMilliampsLow, OutputMilliampsHigh
HFO41-42 - Initial and Final gross weights of a run
HFO43 - ROC noise

**HFI** Hardy Float Parameters (read only)

HFI0 - Gross weight
HFI1 - OP Output Percent
HFI2-5 - Analog Output setpoints, calculated from scaling HFO28-31
HFI6 - Rate of Change, not averaged
HFI7 - Total
HFI8 - Batch Total
HFI9 - Remote Setpoint Value
HFI10 - ACT (Rate of Change, heavily averaged)
**IFO** Rate parameters
- IFO0 - Controlled variable, usually rate of change (ROC)
- IFO1 - Rate Setpoint
- IFO2 - PID P
- IFO3 - PID I
- IFO5 - RefillStartWgt
- IFO6 - RefillStopWgt
- IFO7 - RefillOverloadWgt
- IFO8 - RefillLowShutoff
- IFO9 - LowAlarmShutDownRate
- IFO10 - HighAlarmShutDownRate
- IFO11 - Batch Amount
- IFO12 - Batch Preact
- IFO13 - Manual Mode OP

**WSI**
- WSI0 - A/D convertor raw counts
- WSI1 - A/D convertor average counts
- WSI2 - A/D running count
Chapter 7
Operation

Chapter 7 pertains to the operation of the HI 4060. This section includes instructions for selecting Operational displays, ratio control, setting operating parameters. We recommend that maintenance personnel and operators read and understand this chapter before operating the controller. Make sure that all configuration and setup procedures are completed before operating the controller.

Operational Displays on the Front Panel

There are two types of displays: Summary and Operational. The Summary display is the large weight readout that the user can see from a distance. The Operational Displays appears at the bottom of the front display.

You can select the display to show what is useful during an operation. For example you might want to select the Gross Mode Display and the Rate of Change Operational Display.

Selecting Mode Displays from the Front Panel

Step 1. Any mode can be selected at any time. Selecting mode or operational displays will not effect the a currently running process.

Step 2. From the Summary display press the Mode button to select the mode you want.

Mode Displays

There are five modes that can appear in the mode display area.

• The Gross Weight Mode display shows the gross weight which includes anything put on the permanent scale structure.
• Amount (AMT) of weight that has been processed since the last start when in Continuous operation mode. When you completely stop the process this value goes to 0.00 and begins again when you press Start.

• Batch lists the amount of weight that has been processed since the last start when in Batch operation mode. When you completely stop the batch process, this value goes to 0.00 and begins again when you press Start.

• Actual (ACT) feed rate in weights units per unit of time (lb/m) whether in Continuous or Batch mode. This is a heavily averaged ROC and is indicative of your current run rate.

• Total weight accumulated during a continuous or batching process.

Operational displays

NOTE

Selecting operational displays will not effect the a currently running process.

There are six options for what can appear in the operations display area.

• Ingredient display lists the current selected ingredient.

• Rate of Change (ROC) display shows the change rate in weight units/time units. This is the lightly averaged or Raw rate of change.

• Total display shows the total amount of an ingredient processed.
In batching mode, the Batch display shows the actual weight processed on the left and the rate setpoint for the current batch on the right. In continuous mode, the Batch amount shows the total material fed since the last idle mode.

Output display shows the output in percentage with one decimal point for a finer definition of the control activities.

Gross weight display shows the gross weight which includes anything put on the permanent scale structure.

Setting the Rate Setpoint

Setting the Rate Setpoint from the Front Panel

Step 1. Press the down arrow until the cursor is in front of “Rate Setpoint.”

Step 2. Press Enter. The Rate Setpoint sub-menu appears.

Step 3. Press CLR to clear the current entry and position the cursor on the first digit to change.

Step 4. Use the up or down arrow to select the number you want, then use the left arrow to move to the next character, and repeat the process until you have entered all the characters for your rate setpoint.

Step 5. Press Enter to save the new rate setpoint.

Step 6. Press the Exit button to return to the Configuration Menu.

NOTE

You can change the active setpoint from the front panel in the active state, but you cannot change the remote setpoint from the Ingredient menu while in the Remote Setpoint state.
Setting the Rate Setpoint from the Web Page in Idle Mode

Step 1. To open the Ingredient Configuration page from the HI 4060 Home page, click Configuration to display the Configuration menu; then click Ingredient.

Step 2. In the Rate Setpoint field, enter the new Rate Setpoint.

Step 3. Press the Save Parameters button.

Ratio Control (Master/Slave)

Description of a Ratio Controlled System

The Host Controller monitors and/or controls the flow rate of the main ingredient (Ingredient #1). The process requires that ingredient #2, #3, #4 etc. be fed into the main ingredient or vessel at a certain percentage (proportion) of the flow rate of ingredient #1.

For example, if ingredient #1’s flow rate is 10 gallons/minute and the process requires that ingredient #2 be fed at 10% of the flow rate of ingredient #1; ingredient #2 must be fed at a flow rate of 1 gallon/minute (a 10/1 ratio). However, ingredient #1’s flow rate is not constant. The rate controller for ingredient #2, must maintain the 10% proportional feed rate no matter what the flow rate of ingredient #1 may be.

Ratio Process Control System

The Host Controller is fitted with an Analog Output Option card that generates a 0-5 VDC, 0-10 VDC, 0-20 milliamp or 4 to 20 milliamp output signal that is proportional to the actual flow rate of ingredient #1.

The Slave Controller is fitted with a Remote Set Point Analog Input Option card to receive a 0-5 VDC, 0-10 VDC, or 4 to 20 milliamp signal. The slave controller receives the signal from the host and adjusts the output signal to the feeder motor to maintain a ratio of ingredient #2.

The flow rates of all ingredients can be monitored by Host (PLC or Computer).

New desired flow rates should not be continuously transferred to the Rate Controllers over communications. When new rate information is received, existing rate information in memory is written over and the instrument will not enter closed loop control for a minimum of one Time base periods plus the averages (20 averages per second).

The Timebase default is four seconds.
• The Master Ingredient is where the actual flow is measured and transmitted. A signal can come from a variety of Host Controllers including a flow meter.
• Different Slave ingredients can track the flow of the master ingredient. The remote set points for slave ingredients is proportionally calculated from the rate of the master ingredient.

Remote Set Points for Ratio Control Applications
The Remote Set Point Input enables the user to set a range that is used to receive rate set point values from another unit's analog outputs. The Set Point parameters can be set remotely from the Remote I/O and PROFIBUS Interface Card, but cannot be remotely set via the serial communication.

Setting Remote Set Points for Ingredient B from the Front Panel

Selecting the Ingredient
This is an example. Your setpoint number may be different.
Step 1. To open the SP HI wgt/time edit from the Configuration menu, use the down arrow to select Ingrd.
Step 2. Press the right arrow to scroll through the listed ingredient names, and press Enter

Setting the SP HI wgt/time
Step 1. From the Ingredient menu, select Remote Setpoint, and press Enter to display the Remote Setpoint menu.
Step 2. Use the down arrow to select SP HI wgt/time, then press Enter.
Step 3. Press the left or right arrow to position the cursor and the up or down arrow to select the number. Our example shows 25 lb/m you want for the SP HI wgt/time.
Step 4. Press Enter to save the entry and return to the Remote Setpoint menu.
Setting SP LO wgt/time

Step 1. To display the SP LO wgt/time edit form for Ingredient B, use the down arrow to select SP LO wgt/time and press Enter; then select SP LO wgt/time and press Enter.

Step 2. Press CLR to clear the current entry and position the cursor on the first digit.

Step 3. To enter 1.0 pound for the SP LO wgt/time: use the up or down arrow to select the number; then press the left arrow until the cursor is at the next character and select the number or punctuation you want. Repeat the process above until you have entered all the numbers for your SP LO wgt/time value. In our example we selected 1.000 lbs/min.

Step 4. Press Enter to save the entry and return to the Remote Setpoint menu.

Setting Input HI%

Step 1. To display the Input HI % edit form, use the down arrow to select Input HI %, then press Enter.

Step 2. Press CLR to clear the current entry and position the cursor on the first digit to enter, then use the up or down arrow to select the number you want.

Step 3. Press the left arrow to move the cursor to the next character, and use the up or down arrow to select the number or punctuation you want. Repeat the process above until you have entered all the numbers for your Input HI% value. In our example we selected 100 percent.

Step 4. Press Enter to save the entry and return to the Remote Setpoint menu.

Setting Input LO%

Step 1. To display the Input LO % edit form from the Remote Setpoint menu, select Input LO % and press Enter.

Step 2. Press CLR to clear the current entry and position the cursor on the first digit to change.

Step 3. To enter 0 for the Input LO%: Use the up or down arrow to select the number.
Step 4. Use the left arrow to move the cursor one place to the left, and use the up or down arrow to select the number or punctuation you want. Repeat the process until you have entered all the numbers for your Input LO% value.

Step 5. Press Enter to save the entry and return to the Remote Setpoint menu.

**Setting Range**

Step 1. From the Remote Setpoint menu, use the down arrow to select Range.

Step 2. Press the right or left arrow to toggle between the range selections.

Step 3. The range options are 0-5V, 0-10V, 0-20mA, or 4-20 mA. Our example uses 4-20 mA.

Step 4. Press Enter to save the entry.

Step 5. This completes the configuration process for Ingredient B.

Step 6. Repeat to Set the Remote Setpoint for the Next Ingredient

**Setting the Remote Setpoints for Ration Control from the Web Page**

Step 1. On the HI 4060 Home Page, click Configuration to display the Configuration page.

Step 2. Click Ingredient to display the Configuration Ingredient page.

Step 3. At the top of the page click on Ingredient Name.

Step 4. If you have not created an ingredient name for Ingredient B, enter the name in the Ingredient Filename field.

Step 5. Click on Change File to save the ingredient name.
Step 6. If you have selected an ingredient name for Ingredient B, click on the “Other ingredients” pull down list.

Step 7. Click on the name you gave for Ingredient B. In our example we selected INGRDB.

Step 8. At the top of the page click on Remote Setpoint to display the Remote Setpoint page.

Step 9. Enter the values we selected for Ingredient B.

Step 10. Click on the Set Parameter button to save the Remote Setpoint parameters for Ingredient B.
Step 11. Click on Ingredient Name to open the displayed screen.

Step 12. On the Ingredient Name pull down list, select the name you gave for Ingredient B. In our example we selected INGRDB.

Step 13. Click on Remote Setpoint to display the Remote Setpoint Page.

Step 14. Enter the Remote Setpoint parameters for Ingredient C.

Step 15. Press the Set Parameter button to save the settings.

Step 16. Your Ratio Control settings are complete.

Setting the Averaging Parameter from the Front Panel

When using any device that output an erratic signal (e.g. a flow meter). The averaging function takes a number of input (voltage or amperage) readings and averages the input signal to improve stability. The improvement in stability however, is at the expense of the response time. A setting of 1 average takes 100 milliseconds. A setting of 100 averages takes 1 second.

Step 1. When in the Remote Setpoint sub-menu press the up or down arrow until the cursor is in front of Remote AVG.

Step 2. Press Enter to display the Remote Setpoint (AVG) sub-menu appears.

Step 3. Press CLR to clear the current entry.

Step 4. Press the left arrow until the cursor is at the first character entry for the Remote Setupoint, and use the up or down arrow to select the number or punctuation you want.
Step 5. Press the right arrow to move the cursor one place to the right, and repeat the process above until you have entered all the numbers for your averaging value. In our example we selected 4 averages.


Step 7. Press the Exit button to return to the Summary Display.

**Setting the Averages from the Web Page**

Step 1. From the HI 4060 Home Page, click Configuration to display the Configuration page.

Step 2. Click on Ingredient to display the Ingredient Page.

Step 3. At the top of the page click on Remote Setpoint. The Remote Setpoint appears.

Step 4. Click in the Remote AVE field until the value is highlighted.

Step 5. Enter the Average value you want for the selected ingredient. In our example we selected 1.

Step 6. Press Set Parameter to save the settings.
Chapter 8
Troubleshooting

Chapter 8 provides procedures for troubleshooting the electrical, mechanical and firmware elements of the HI 4060 and for using Hardy’s Integrated Technician (IT®) software utility to isolate problems. Flow charts provide troubleshooting steps for the rate controller, load cells, and cabling. Chapter Eight also provides

**Disassembly and Reassembly Notes, Warnings and Cautions**

**WARNING - EXPLOSION HAZARD - DO NOT REPLACE COMPONENTS UNLESS POWER HAS BEEN SWITCHED OFF OR AREA IS KNOWN TO BE NON-HAZARDOUS.**

**WARNING - EXPLOSION HAZARD - DO NOT DISCONNECT EQUIPMENT UNLESS POWER HAS BEEN SWITCHED OFF OR THE AREA IS KNOWN TO BE NON-HAZARDOUS**

- Always disconnect the power cord before disassembling.
- Ensure that any disassembly is done in a clean, well ventilated, properly controlled static environment.
- Ensure that the assemblies and sub-assemblies are well supported and insulated when doing any repairs on the HI 4060.
- Place small fasteners, connectors and electrical parts in closed containers so as not to lose parts during reassembly.
- Read the disassembly instructions before any disassembly begins. If any of the instructions for disassembly are unclear, contact Hardy Process Solutions, Technical Support Department for additional information and assistance.
- Do not disconnect any electrical plug, connector or terminal unless an identification tag is present or one is attached. Always note where the connector or plug was attached to the electrical component or wiring harness.
- Always install complete hardware groups (Screws, Washers, Lock Washers, Spacers, Etc.) back to the original point of removal.
- Always replace broken or damaged modules or hardware immediately!
- Always check to be sure that no loose parts are sitting on printed circuit boards or electrical connectors or wires when disassembling or reassembling.
- Always protect printed circuit boards from electrostatic discharge (ESD). Always use approved ESD wrist straps and anti-static pads.
• Always perform a final inspection after completing any reassembly to be sure that all fasteners are tight, all connectors are secure and there are no loose parts on any of the printed circuit boards in the Rate Controller.
• Always follow proper safety procedures when working on or around the Rate Controller.

This chapter describes several tests that can shorten the time for troubleshooting. Most problems require the use of two or more tests to determine the cause.

If a problem is isolated to a load cell, it may not mean the load cell is the damaged component. Mechanical imbalances and system piping stress (lack of piping vibration isolators, cables draped over pipes etc.) can make a load cell seem to be the problem.

If you are in doubt as to how to resolve a problem or if you need assistance, look for Hardy Process Solutions Web-tech at http://www.hardyinst.com. Web-tech is updated often and is available 365 days a year 24/7. It contains several frequently asked questions to aid you in troubleshooting, and it provides a form for requesting additional information and answers to questions, with no waiting on hold.

Customer Service is available from 6 AM to 5:30 PM Pacific Standard Time. For direct factory support call Hardy Process Solutions Customer Service at:

2 Technical Support outside the US and Canada: 1-858-278-2900 Ext. 1757.

Error Messages

Error Messages on the Webpage
• A/D Failure Error! - Internal Electronics Error, Retry.
• A/D Convert Error! - Load Cells input out of range.
• Motion Error! - Check Motion Tolerance Settings and Retry
• Trad Cal Error! - Error occurred during calibration, re-calibrate.
• C2 Cal Error! - Error occurred during calibration, re-calibrate.
• Too Lo Error! - Verify that the load cell signal level is 0-15 mV. Verify that there is enough weight on the scale. Perform Span than go back and Zero.
• Too Hi Error! - Verify that the load cell signal level is 0-15mV. Verify that there is enough weight on the scale. Perform Span than go back and Zero.
• No C2 Sensor! - Instrument did not detect a C2 Load Sensor
• CAL Failed! - Too few counts between Zero and Span.
• C2 Caps Unequal! - Different load cell capacities (For example 50 lbs capacity load cell and 100 lbs capacity load cell on one system. Make the load cells even be removing the uneven load cell and replacing it with a load cell that is equal to the others capacity.
• HI/LO Too Close! - Zero and Span are not more than 1,000 counts from each other or there is no change or negative change. Reset either so the counts are more than 1,000 counts of each other.
• Function Error! - Pressed a function button and the Function did not work. Try again.
  Cycle power.
• Not Allowed! - Value entered is outside the range allowed. Try another value.
• Security Violation! - User signed in with a password that does not allow performance
  of a certain function or entry to certain menus. Security level of the user identified in
  the User ID, too low for the menu or function.
• Overrange - Weight over the setpoint target.
• Need Cal with ITJBOX - IT summing card is not installed. Install an IT summing card
  then do a Calibration with the card installed to access the IT information.

Error Messages on the Optional Display

NOTE
Some error messages are duplicated on the web page and on the display, but others are not.

• ADF - A/D Failure Error! - Internal Electronics Error. This is an indication the analog
to digital converter in the unit is no longer sending an output to the processor. This
would normally indicate a hardware failure in the unit.
• ADE - A/D Convert Error! - Load Cells input out of range. This is an indication the
signal from the load sensors to the analog to digital converter is out of range. This can
be caused by: a) Broken wire(s); b) miswire of sensor(s); c) improper installation of
sensor(s); d) overloaded sensor(s); e) damaged sensor(s).
• Trad Cal Error! - Error occurred during calibration, re-calibrate.
• C2 Cal Error! - Error occurred during calibration, re-calibrate.
• No C2 Sensor! - Instrument did not detect a C2 Load Sensor
• CAL Failed! - Too few counts between Zero and Span. Traditional cal and the load
cells are bad or no test weights were applied for Span step.
• C2 Caps Unequal! - Different load cell capacities (For example 50 lbs capacity load
cell and 100 lbs capacity load cell on one system. Make the load cells even be
removing the uneven load cell and replacing it with a load cell that is equal to the
others capacity.
• Not Allowed! - Value entered is outside the range allowed. Try another value.
• Security Violation! - User signed in with a password that does not allow performance
of a certain function or entry to certain menus. Security level of the user identified in
the User ID, too low for the menu or function.
• Need Cal with ITJBOX! - IT summing card is not installed. Install an IT
  summing card then do a Calibration with the card installed to access the IT
  information.
• LoA – Low Rate Alarm - Rate is running below the Low Shutoff rate
temporarily, if it stays low for the set alarm duration the controller will shut down.
Adjusted under ingredient menu.
• HiA – High Rate Alarm - Rate is running above the High Shutoff rate temporarily, if
  it stays high for the set alarm duration the controller will shut down. Adjusted under
ingredient menu.
• **REC +/-** - Rate Exception Alarm - The rate exception control display indicates whether the controller is running within the requested range. If an out-of-range rate does not correct itself in the REC time allowed, the RE+ is displayed to indicate the direction. Measured against the rate look up table rates set during the rate calibration routine. Helps set limits for automatic compensation for bulk density changes.

• **Los** – Lost Control - Current ROC conditions are not within the defined control parameters. Falling back to the basic rate look up table and attempting to regain control.

• **RFL** – Refill - The defined start refill weight level and with auto refill set to yes has been reached, or a force refill command was delivered. Refill continues until the stop high weight is reached or the force refill command is again activated.

• **Ovr** - Refill overflow – Refill action did not stop or exceeded the maximum refill setting. Alarm only and the feeding will continue. Signifies the auto refill valve did not close. This condition will remain until alarm is cleared or the unit is put back to the Idle mode.

• **NOK** - Not OK to Feed! – Abort signal bit or input is active. Works like an E-STOP.

• **Rate Range Error** - Rate is below zero, or above MAX RATE. Reference the rate look up table and review defined minimum and maximum rates.

• **Shutoff SDw** - Shut off - where a condition is out of tolerance longer than the preset limit. This can be several alarms, low gross weight in hopper, low/high rate, or rate exception (REC).
Trouble Shooting Using Integrated Technician (IT®)

A more detailed explanation of each section of the test follows below:
Stability Test ALL

PASS/FAIL and Variance Test
This test computes the variation of the A/D counts. The results show the variance and indicate pass or fail. The test is valid to help break down the problem into smaller divisions. Unstable test results can be caused by an internal A/D processor fault, grounding, power connection EMI/RFI above specified CE limits or noise to load cell input.

Raw A/D Count
These numbers reflect a weight change at the smallest measurement, the internal analog-to-digital converter computer register.

Raw A/D Average Counts
These numbers also reflect weight change at the smallest measurement, the internal analog-to-digital converter computer register - except that this reading is averaged using the AVERAGES setting parameter from the controller’s configuration. Using the maximum number of internal averages and the 10ms update equals a maximum delay of 2.55 seconds.

Weight and Voltage ALL
This test section looks at the readings from ALL the load cells to test overall system performance and signal voltage readings. This test works for all varieties of load cell connection systems.

Further investigation to isolate system problems requires the use of hand tools and multi-meters or the Integrated Technician Summing Junction Box and using the IT© Test section.

NOTE
IT® is a registered trademark of Hardy Process Solutions.

Weight  This displays the amount of force seen by all load cells installed in the summing junction box. Further investigation to isolate system problems will require the use of hand tools and Multi-meters or the Integrated Summing Junction box and using the IT test section.
**mV/V and mV** DC voltage signals are between 0-15 millivolts. Overloads and negative millivolt readings are not shown as actual readings but 15.3 for over voltage and 0.0 for negative voltage. You will need to use a multimeter with a 200 or 300mVDC range to view the out of range voltages. Millivolt/Volt equals the output from a load cell per each volt of excitation. The HI 4060 reads the load cell output in mV/V which is a higher resolution (4 decimal places) reading than a mV reading, thereby providing more sensitivity to enable you to troubleshoot the condition of the load cell in question under certain conditions. Load Cells are rated in Millivolts/Volts.

**RTZ (Return to Zero) Test**

Run this test only when the scale is empty. When the scale is calibrated at the ZERO or Reference zero, there is a **WAIT** period during which the **WEIGHT** readings are collected. After a valid calibration has been completed, the test compares the original weight reading with collected and current readings. If the difference is more than the combined Motion and the Zero Tolerance parameters the test will fail.

**IT Test**

If your system has an Integrated Technician Summing Junction box, the IT test can help identify individual load cell problems up to a maximum of four load cell selections.

**Sensor Number** Indicates which sensor is under test. Using the up or down arrow selects the target sensor to be tested.

**Weight** Displays the force seen by a selected load cell. This force can show an imbalance or weight distribution problem. Review your system to insure proper balance. Motors can account for this problem. Piping should not apply any appreciable force on the scale.

**Mv/V and MV** DC voltage signals are between 0 and 15 millivolts. Overloads and negative millivolt readings are not shown as actual readings, but 15.3 for over voltage and 0.0 for negative voltage. You need to use a multi-meter with a 200 or 300mV range to view the out of range voltages.

**RTZ (Return to Zero) Test**

Run this test only when the scale is empty. When the scale is calibrated at the ZERO or Reference zero there is a **WAIT** period. During this **WAIT** period the **WEIGHT** readings are collected for each load point. When this test is run, after a valid calibration has been
completed, there is a comparison of the original weight reading collected and current. If the
difference exceeds the combined Motion and the Zero Tolerance parameters the test fails.
Use this test to determine which load cell is malfunctioning in a drifting weight problem.

NOTE

Warning: Do not install your HI 215IT summing board in areas susceptible to high
vibrations. The relays on the board can chatter and affect your weight readings.

Audit Trail

A list of parameters and successful calibration
events is logged into the audit trail section. Event
listings are formatted with a time and date stamp.
Log entries cannot be erased and are stored in the
Secure Memory Module.
General Troubleshooting Flow Chart Index

- Drifting or unstable weight readings
- Electrical, Mechanical and Configuration reviews
- Drifting or unstable weight readings
- Weight indication will not return to zero
- Verify individual load sensor operation
- Trad. Cal - A/D Failure Error
- Mechanical Inspection
- Electrical Inspection
- Load Sensor Installation
- Exceeds the Millivolt range. Out of range condition.
- Blank Display
- SD Card Diagnostics and losing memory at power cycles
A - Guidelines for Instabilities on Formerly Operating Systems

A

Press the ENTER Button and arrow to the TEST prompt and press ENTER.

Select the Stability Test and press ENTER

Monitor the Test results

PASS?

Yes

EXIT to the Summary Display

No

STABLE?

Yes

Verify wiring and connectors are solid and clean

No

STABLE?

Yes

Replace IT summing card

No

Cont. C

Yes

STABLE?

No

B1

This is a Pass or Fail test with the Variance displayed. The variance is the difference between the low and high counts over 100 readings.
A1 - Guidelines for Instabilities on Formerly Operating System (Cont’d)

A1

UNSTABLE RATE CONTROLLER

Disconnect external signal cables and shields, except AC Power

Monitor the Display for stability

STABLE?

Yes

Reconnect signal cables one at a time

Monitor the display for stability

No

Problem could be in the instrument. Contact Hardy Customer Support
PH: 800-821-5831

If installing any cable causes unstable readings
REVIEW TROUBLESHOOTING SECTION B: B1.1-B1.7

Go to B
B - Guidelines for Instabilities on Formerly Operating Systems (Cont’d)

B

Check for Electrical Stability

OK?

No → B1

Yes → Check for Mechanical Stability

OK?

No → B2

Yes → Check Configuration settings for stability

OK?

No → B3

Yes → Go To A Stability
B1 - Guidelines for Instabilities on Formerly Operating Systems (Cont’d)

**Physical Grounding**
- All common equipment share a common ground point.
- Keep the ground cable length to earth ground as short as possible.
- Install a new ground rod if the cable length is excessive.

**Cable**
- Cuts or breaks in the load cell insulation allow moisture to wick into the cable and load points. This can setup stray capacitance charges and allow ground currents to exist. This could create a highly intermittent situation.

**Vessel, Fill and discharge piping**
- Ground all to a common point to eliminate electrical differences in potential and static build-up.

**Load Cells**
- Ground straps must be installed to provide a direct discharge path to ground around the load points.

**Cable Routing**
- Separate high voltage sources and cables from low voltage signal cables.
- Stay a minimum of 14 inches from magnetic fields and SCR controls.
- Avoid parallel high voltage and signal cable runs.

**Cable Shielding**
- Ground low voltage cable shields only at the controller end.
- Grounding both cable ends produce ground currents.
- Disconnect each shield at the controller and check for an open circuit between ground and shield. Reconnect the shield to ground and confirm a proper ground path from the IT Junction box to the controller.
- Verify the shield is not connected to ground at the IT Junction Box.
- Load cell shields only pass thru the IT Junction boxes and are not connected ground at that point.

**Rate Controller**
- Common AC ground and Chassis grounds.

Go to B
B1 - Guidelines for Instabilities on Formerly Operating Systems (Cont’d)

Vessel -
When inspecting a vessel, keep in mind the Center of Gravity (COG) should be low and centered equally over all the load cells. Insure the load is directly over or under the load point to avoid side-loading. Make sure there isn’t any side loading from piping or external forces. Install flexures on all piping to insure a free floating vessel. Make sure the vessel and load cell mounts are mechanically stable and fixed. Large changes in individual load cells indicate a shift in the COG or faulty load cells.

Piping and motors can effect the individual load cell readings. Allow for a higher reading on load cells that support motors and piping. Insure pneumatic lines are not applying pressure to the vessel when energized. Use check (stay) rods to minimize vessel movement. Make sure the check rods are loose and not interacting with the vessel. Power down all vibration, vacuum and pressurization equipment during the test process.

Configuration Settings
Incorrect Waversaver settings can cause unstable weight readings. Adjust to the lowest WS setting that gives you a stable reading. Higher frequencies with low amplitude vibrations - Use WS settings 1 or 2. Lower frequencies with high amplitude vibrations - Use WS setting 3 or higher.

Incorrect number of decimal places. Reading weight increments beyond the equipment applications level. (See Guideline Calculations below)

Repeatability - Divide the total load cell capacity, including decimal points by 10,000. (Expected stable weight reading)

Resolution - Divide the total load cell capacity, including decimals points by 30,000. (The amount you can expect to see but not necessarily stable

Return to A STABILITY
C - Guidelines for Instabilities on Formerly Operating Systems

If you are unable to isolate the instability:
Compare your results by testing the vessel when empty and then re-testing under load.

Go to B for additional system checks
Or
Contact Hardy Instruments
Customer Support
PH: 800-821-5831
E - Non-Return to Zero (Must be connected to an IT® Summing Box)

NOTE  Return to Zero is run during the Weight and Voltage tests.

F - Verify Individual Load Cell Millivolt Readings

Testing an individual load cell signal output requires an IT Summing Junction box or millivolt meter.

Use the load cell certificate to verify the millivolt per volt (mV/V) rating:

**Example:** 3mV/V load cells produce approximately 15mV at full load. That is 5 volts excitation x 3 mV/V. A scale capacity of 1,000 lbs. with 100 lbs. of deadload when empty, the load point mV reading should measure 1.5mV.
Press ENTER and arrow to TEST menu and run ITECH TEST Program

Select IT TEST MV

IT TEST Checks individual load sensor output mV readings

Press ENTER to check load sensor

Record load sensor mV output level for comparison

Repeat for all load sensors

mV readings acceptable?

Yes

TEST COMPLETE

No

Zero mV reading

1) No dead load
   Apply load and re-test.
2) Wiring error
   Verify color code using the load cell certificate
3) Open bridge circuit
   Disconnect power and verify load point bridge resistance reading with an Ohmmeter

High mV reading

1) Stressed load cell, remove all load and re-test.
2) Excessive loading
   For additional testing go to: H

High mV reading

Unstable reading

Defective load cell
   Replace and repeat TEST F

K

A
G - Calibration Failed: Not Enough Counts Between ZERO and SPAN

- This error only occurs at the SPAN parameter. You may ZERO out chains and temporary calibration equipment to hold or hoist test weights. Zeroing the temporary weight does not effect the calibration.

The difference between zero and span is less than 1000 counts

Using the IT Test or a millivolt meter:
- Verify the Signal Millivolt reading is positive and within the acceptable range of 0 to 15mV.
- Verify when weight is applied there is a positive increase in the signal millivolt readings.
- Compression load cells can be installed upside down refer to the load cell installation guide for proper installation.
- Check mechanical binding that restricts the vessel movement under load.
- Verify the load cell wiring is correct.
- Check that each load cell signal changes under load. A single load cell installed upside down or wired backwards can algebraically reduce the total signal.

SPAN WEIGHT to Small
- 1000 counts out of 985,000 is very small.
- (100,000 lb. Scale would require a minimum of 101 lbs.)

Contact Hardy Instruments
Customer Service
800-321-5831
Ext. 1757

ERROR?  yes  no

PROCEED WITH CALIBRATION
H - Mechanical Inspection

H1
All pipes and conduits flexible
1) Keep flexures on the horizontal
2) Vertical flexures should be avoided
3) Do not use flexures to correct for misaligned piping
4) Do not use hose flexures to make right angle bends
5) Non-flexed piping should have an unsupported horizontal run using a ratio of 36 times it’s diameter
6) Pipe flexure lengths should be a ratio of 6 times it’s diameter
7) Feed and discharge piping flexed
8) Are the flex joints on the correct side of the valve?
   (a) You weigh the output valve, not the input valve
   (b) Does the weight scale see all the product to be weighed?
   (c) If the product applies a force to a valve or pipe, that pipe or valve must be included in the weight vessel.
   (d) Proper position of the flexures are key
   (e) Your vessel must seem to float.

H2
Mechanically isolated from ladders and connecting structures?
1) Floors or structure does not interact
2) Local traffic does not interact
3) Protected from forklifts and adjacent processing equipment.

H3
Are the load cells properly mounted?
1) Level, solid mounting base
2) The load cell is mounted right side up
3) All load cell bolts installed using anti-seize compounds
4) Mechanically aligned to compensate for expansion and contraction

H4
Are check rods installed to dampen vessel movement?
1) Protects the load cells from overload and impact forces
2) Limits the movement of the vessel
3) Rods must be loose and not interact with the vessel

H5
Are cables routed properly?
1) Separate conduit for low and high voltage cables
2) Do not bundle low voltage with high voltage cables
3) Maintain at least 3 inches of separation
4) Maintain 14” separation from magnetic fields and 440 VAC
5) Cables are in conduit or tied up and protected from damage

H6
Housekeeping
1) Product, tools and production aids are off the vessel.
2) No workers are physically on the scale
3) Must protect equipment from environmental damage
4) Insure openings are sealed to keep water and environmental contaminates from damaging
   (a) Instrument cabinet or enclosure
   (b) Summing card
   (c) Load Cells
   (d) Conduit runs
   (e) Covers properly installed

To Verify Electrical, go to J
**J - Electrical Inspection**

**DO NOT POWER UP THE CONTROLLER UNTIL INPUT VOLTAGES CAN BE VERIFIED**

1) Verify the proper input power, AC or DC, is properly installed
2) Use a meter to verify neutral, ground and hot are correct
3) Computer grade power
4) Use Active filters for motor noises and spikes
5) Use isolation transformers to combat surges and sags
6) Isolated from SCR and motor control circuits
7) Use a Common earth ground.
   - (a) Keep ground cable runs as short as possible
   - (b) Excessive ground cable runs can act as an antenna for AC noise
   - (c) Install grounding straps around load cells to direct static away from the load cell and directly to ground
   - (d) Install ground straps on the input and discharge piping and the vessel to a common earth ground

**J1**
- Verify the proper voltage level has been supplied

**J2**
- Apply power to the controller only if supply voltage is correct
  1) Verify the front display illuminates
  2) Completes the initialization process
  3) Displays a weight reading. This weight value will not be correct if a calibration procedure was not performed

**J3**
- Does the scale reflect a weight change?
  1) Press the MODE button to display NET weight
  2) Press the TARE button to ZERO the NET weight
  3) Apply weight to the vessel
    - (a) Does the weight increase and decrease in the correct direction with the weight?
    - (b) Does the weight return to ZERO NET?
    - (c) The weight value will not be correct until a proper calibration is complete

**J4**
- Cabling
  1) Use the load cell certificate, manuals or drawings to verify the load cell color code. Input = Excitation, Output = Signal
  2) Shielding
    - (a) Grounded only at the rate controller
    - (b) Continuous shield connection from the load cell cable to the controller. Single point EMI/RFI drain
    - (c) Terminated but not grounded at the summing box
  3) Sense lines installed?
    - (A) Jumpers or sense lines in the J1 connector?
    - (B) Sense lines must be installed for C2 or Softcal calibration
  4) Use IT TEST to verify readings

To Verify Proper Load Cell Operations Go to **K**
K - Load Sharing and Load Sensor Checkout

1) Does the mV signal increase in a positive direction
2) If you receive a negative result, check if load cell is mounted correctly.
   (a) The arrow goes with the direction of force
   (b) If there isn't an arrow, you must manually verify the correct direction. A negative reading indicates the load cell is upside down
   (c) Load cells in tension will not reflect a negative reading if installed upside down. If upside down, only the force applied by the cable will be included in the weight reading
   (d) If you are still receiving a negative signal, verify load cell wire color code

**K1**

Load Cell wiring is complete and correct?

1) Verify a positive mV reading from each load sensor using IT TEST, mV
2) Record the mV reading and compare each corner for proper load sharing
   (a) For proper load sharing you should see only a difference of +/- .5mV
   (b) Larger differences due to motors and piping should not exceed +/- 2mV
   (c) If there aren't any motors, valves or piping to explain the mV difference, adjust the corners and balance the mV readings
   (d) Use shims or if equipped adjusting bolts on the load cell mounting hardware
   (e) Drawing a load cell map helps determine the correct leg to adjust and in which direction

Three load cells balance like a three legged chair
1) Using a spirit level, verify the vessel is vertically and horizontally correct
2) Verify if any height change effects the attitude of adjacent vessels or piping
3) Adjust each leg to dynamically match mV outputs
4) Verify the mV readings and physical level when complete

Four or more load cells present a challenge
1) Use the Weight and Voltage test to determine the sum of the load cell signals to set your target mV reading for each load cell
2) Read the output of individual load cells
3) Adjust the load cell with the lowest reading to dynamically match the target mV readings obtained in Step 1
4) Read the mV readings from each load cell to verify a proper correction
5) Repeat steps 3 and 4 to achieve a proper load sharing vessel
6) Verify the mV readings and vessel level when complete

**K2**

Multiple load cells MAP the mV reading. Balance the load

Monitor system for proper operation
Check out completely
M - (*******) or (- - - - - -) ERROR

1) Verify the signal wires are properly connected
   (a) Verify load cell cable color code
       (1) Load Cell Certificate
       (2) Installation Manual
       (3) Cable marking strips
   (b) Broken signal wires act as antenna for EMI/RFI
   (c) Load cell cable shields must be grounded only at the
       Weight controller to dampen EMI/RFI signals
2) The load cell output signal voltage has exceeded 15mVDC or
   is negative
   (a) Use IT Test to verify mV levels
       (1) Verify total millivolt signal level
       (2) Verify individual load cell millivolt signals
           a) An individual load cell may be over-ranged
              and exhibit high millivolt readings
           b) Possible physical damage to the load cell
           c) Internal strain gauge bond broken
           d) Moisture in the load cell cable or body
3) Weight in the hopper exceeds the configured Scale Capacity setting
   (a) Under configuration verify the Scale Capacity setting
   (b) 9 divisions with division size based on the certification mode selected
       NTEP MODE: 1 DIV Scale capacity/10,000
       CANADIAN MODE: 1 DIV Scale capacity/3,000
   (c) This is used only as a warning and does not effect calibration
   (d) Optional communication signals are unaffected by this indication
4) Weight in the hopper exceeds the load cell capacity
   (a) Mechanical forces or product acting on the scale
       overloads the load cells
   (b) Use IT TEST to verify Millivolt levels
5) Review Mechanical and Electrical Flow charts for additional
   tips. B1

Contact
Hardy Instruments
Customer Service
800-321-5831

PROCEED WITH WEIGHING PROCESS

yes

no

ERROR?
N - Rate Controller’s Front Display is Blank

1) Check for proper power and the source connection
2) Check the circuit breaker at the source

Measure excitation voltage, 5 VDC?

No

Yes

Contact Hardy Instruments Customer Service 800-821-5831

Yes

Disconnect all the connectors from the back panel except power

Measure excitation voltage, 5 VDC?

No

Yes

1) Reconnect the jacks one at a time checking the 5VDC excitation.
2) If reconnecting any jack effects the 5VDC, check for wiring errors.

Contact Hardy Instruments Customer Service 800-821-5831

Display OK

Monitor system for proper operation
Check out completely
Chapter 8

P - SD Card Diagnostics and Losing Memory at Power Cycles

1. Power Down then Power Up
2. Able to Change Screen? 
   - Yes
   - No
   - Remove all Connectors Other than Power Connector
     - Able to Change Screen? 
       - Yes
       - No
       - Remove the SD card, cycle power. Without the SD card, the instrument should boot with factory default configuration
         - Able to Change Screen? 
           - Yes
           - No
           - With SD Card installed Use the EtherNet I/P port and a computer, to enter the Operations Diagnostics, SD CARD read Params selection
             - Parameters intact? 
               - Yes
               - No
               - Contact Hardy Instruments Customer Service for additional instructions and possible return for repair
                 - Select: SAVE and EXIT, then cycle power

PROBLEM SOLVED
Erratic Weight or Rate Control

This section explains how to resolve problems relating to rate and Rate of Change (ROC) calculation, Rate Exception Control (REC), motor speed control, and weight calibration.

1 Rate calculations
   a Rate calculations are no better than the scale’s calibration accuracy. Verify the scale calibration using test weights.
   b Follow the weight troubleshooting flow charts and correct any equipment binding, rubbing, and piping problems.
   c After an initial rate calibration on a new system, repeat the calibration several times to ensure consistency, and verify that calibration using the posted weight loss over time.
   d If the rate displayed does not match your test samples:
      (1) Re-calibrate the weight and then the rate.
      (2) Review the troubleshooting tips for mechanical influences relating to the feeder mechanism
      (3) Look for leaks in the delivery system or refill gate.
   e If the system is slow to change rate (or weight) readings.
      (1) Adjust the number of averages setting.
      (2) Adjust the WAVERSAVER setting.
      (3) See 4 below.
   f Look for a systematic and consistent weight loss. Determine what a stable rate should be. If the weight displayed on the monitor continuously falls and rises and you never get a stable rate or symmetrical weight loss pattern:
      (1) The rate may be too slow for the load call capacity.
      (2) The material may be bridging or liquefying and basically inconsistent.
      (3) The feeder motor may be feeding too fast, mechanisms may be damaged, or working conditions may not be right.

2 ROC calculation

The ROC reading does not necessarily indicate a smooth weight loss. The amount of ROC control required depends on the material currently being fed.

   a Since ROC calculations are developed from the weight reading, the weight reading must be correct.
   b The Loss In Weight (LIW) ratio is calculated from the total scale load cell capacity. If an LIW rate error greatly exceeds the weighing error:
(1) Add decimal points up to 1 part in 50,000 to help determine the ROC.
(2) Balance the Waversaver setting and averages.

3 Motor speed control output signal

a If the motor speed control output signal indicates a problem, but the voltage and current levels measured on the terminals is correct:

(1) Adjust the OP% out in manual mode.
(2) In the ON condition, verify that the output signal matches the percentage of full range. For example: 50% of a 0-10V signal should read 5 VDC at the analog out terminal.
(3) Adjust the Waversaver setting and averages.

b If the output is properly wired back to the motor speed controller, verify that the Option parameters for that analog out are set correctly and that the HI 4060 analog signal is reaching the corrected controller terminals.

NOTE
Hardy Process Solutions Inc. does not provide motor speed control converters. Consult the motor speed controller manufacturer’s manual for troubleshooting and settings.

4 REC +/- settings

a The rate exception control display indicates whether the controller is running within the requested range. If an out-of-range rate does not correct itself in the REC time allowed, the RE+ is displayed to indicate the direction. While this may indicate that the rate is too small for the scale’s accuracy or resolution, the reading can be used to determine the effect of parameter and mechanical adjustments on improving the material flow control.

b The visual indicator does not activate corrective action, but during auto rate calibration the PI settings are adjusted to optimize the flow rate for your feeder settings and material. The display shows the speed of oscillation and can be used to view the effect of correction or adjustments to the PI settings.

(1) P = 0-100% correction factor. P determines the amount of action or reaction that is made in response to an out-of-range rate indication

(2) I = the speed of that action/reaction. This value normally requires only a small adjustment. (0.2 increments) If the rate is always high, reduce the I. If it is always low, increase I.

5 The feeder fails to stop in HOLD, STOP or IDLE

a Determine whether the motor speed control goes to the low setting.

(1) Verify with a multimeter.
Follow the speed control manufacturer’s troubleshooting guide(s) to determine the malfunction.

Verify that the Analog out is returning to the low parameter setting as set in the Options menu for that analog out channel.

NOTE Send a Stop or Hold signal when a stop condition occurs. Do not rely on the analog signal to stop the feeder.

Tests and Diagnostics

The Test and Diagnostics menus provide an expanded view of how the rate controller and scale are working. For example, for the last calibration, you can see the type of calibration and when it was done. You can also check the graduation size, operator ID, and other configuration information.

You can run several tests from either the test links on the Web Diagnostic page or the front panel Test menu. Each test is described in its own subsection below. You can also learn the serial number, model number, firmware revision number, and other information you may want to record. A Hardy representative may ask for this information if you make a request to Technical Support.

Diagnostic testing from the Web page

Select Operation on the Home Page to open the Operation - Choose One menu.

Select Diagnostics to open the Operation - Diagnostics page.

While the page provides serial number, model number, firmware revision number, etc., the tests and related options are listed as hypertext links at the bottom of the page.
Front panel test menu

From the Configuration menu, use the down arrow to select Test and press Enter to open the Test Menu.

The test menu not only lists the tests you can run, it also lists the same read-only options as the Web-interface Operation-Diagnostics page, including serial, model, and firmware revision numbers, etc.

Use the down arrow to read the information. If an arrow follows the options, press Enter to see the display.

NOTES

The values entered in the Test Menu are for illustration purposes only. Your values will vary.

To download the latest firmware version, see the HI 4060/Downloads site at: http://www.hardyinst.com/4000_support/downloads/4000downloads.php.

Parameters

Parameters is the first listed hyperlink at the base of the Operation-Diagnostics page. Click that link to display the Parameters page. Note the scroll bar on the right of the list.

The steps below explain how you can duplicate the configuration of one HI 4060 either to use in configuring another HI 4060 or for sending a copy of your parameters to support@hardyinst.com.

To copy the parameters:

Step 1. Right click in the parameter list.
Step 2. Click Select All.
Step 3. Right click again.
Step 4. Click Copy.

To paste the parameter configuration into the instrument you want to configure:

Step 1. Enter the IP address of that instrument into a Web browser to display its Home page.
Step 2. Select Operation, then Diagnostics, then Parameters, as described above.
Step 3. Right Click in the Parameter list.
Step 4. Click Select All.
Step 5. Right click again in the Parameter List.
Step 6. Click on Paste to replace the existing or default parameter settings with the parameters settings of the instrument you copied.
Step 7. Click the Save button. You now have an exact duplicate of the pre configured instrument.

If you need to make any modifications to the parameter settings go to Chapter 4 - Configuration for more instructions.

Note the Other Parameter IDs hyperlink at the top of the parameters list. To view all the other parameter settings, click that link.
System and Load Cell Tests

Overview of Typical Load Cell System

The typical load cell system consists of one or more load cells/points, a summing junction box, and an HI 4060 Rate Controller.

Load Cell/Sensor/Point - is a strain gauge based force transducer that generates an electrical signal proportional to the load applied to the scale. Tension or compression type load cells/points can be used to measure pressure, load, or torque.

The load cell/point takes as an input the 5 volts DC Excitation Voltage generated by the HI 4060. It generates a millivolt output proportional to the weight on the scale (0-10mv DC for 2mv/V load cells/points or 0-15mv DC for 3mv/V load cells/points).

Rate Controller - is the part of the HI 4060 instrument that, among other functions:

- Powers the load cell(s)/point(s)
- Reads the millivolt signal output from the load cell(s)/point(s)
- Digitizes, interprets, communicates and displays the results in terms of weight
INTEGRATED TECHNICIAN (IT®)

INTEGRATED TECHNICIAN (IT®) is an optional diagnostics utility that enables the operator to rapidly troubleshoot the individual load cells in a weighing system from either the front panel or Web interface. The option requires an HI 215IT Summing junction box, which provides separate inputs for each load cell.

If you have more than one load cell without the HI 215IT Summing junction box, there is no way to isolate the load cell signals. The system can return either an average numerical value or a PASS/FAIL value for the test. If any load cell fails, the test will fail without identifying the problem load cell.

If you have more than one load cell with the HI 215IT Summing junction box, the system can provide both the average numerical values and values specific to each load cell, with PASS/FAIL values by load cell. The number for a load sensor is based on the connections in the IT junction box.

Check the installation sequence in the box to determine which load sensor is number 1, 2 and so on.

If you do not have the optional IT junction box, some of the options described below will not appear on either interface.

**NOTE**

*Warning:* Do not install your HI 215IT summing board in areas that are susceptible to high vibrations since the relays on the summing board can “chatter” and affect your weight readings.

Running the IT test from the Web interface

The IT Web page shows all the weight and voltage values at once, so it is the preferred way to view the test results. If the IT option is installed on your system, click “Do IT Test” on the Operation - Diagnostics page. If more than one load sensor is connected, the display will show them all, as shown above.

Running the IT test from the front panel

Step 1. From the Test menu, select Weights and Voltages.
Step 2. Select IT Test and press Enter to list the sensors, then select the sensor to test.

Step 3. Press Enter to display that sensor’s test readings.

Step 4. To read the test results press the down arrow.

Step 5. Press Exit to return to the Sensor Menu. If you want to test other load sensors select the sensor and repeat steps 1 through 5 above. Otherwise press Exit again to return to the IT Test Menu, and press Exit again to return to the Test Menu.

Understanding the Tests

To determine if an instrument or cabling problem exists, verify the basic operation of the system by performing the following system checks.

Stability Test

The Stability test lets you check the A/D Raw count and average. With the IT option, it tests and reports for each load cell. The Stability test switches a fixed signal into the analog-to-digital convertor and calculates the mean squared variation from the average reading, using 100 samples. The test passes if the mean squared variation is less than 5.0.

If the weighing system passes the stability test, the results show OK and the variation and mean results are posted.

FAIL indicates that the Mean Squared Variation is greater than 5.0, so the instrument is considered unstable. In that case, see the Troubleshooting Flow Charts Section.

CAUTION Do not perform the Stability Test during production. The test activities can cause incorrect readings.

Running the Stability Test from the front panel

Step 1. From the Test menu, select Stability Test with use the down arrow and press Enter. The HI 4060 runs the test and shows the results.
Step 2. To see the AD/Raw Count and the A/D Average select them from the menu.

Step 3. Press Exit to return to the Test Menu.

Running the Stability Test from the Web Interface

Select Stability Test at the bottom of the Operation-Diagnostics page. The instrument will run the test and post the results after a few seconds.

Weight and Voltage Test

The Weight and Voltage tests are used to diagnose a weighing system and, if certain types of problems are indicated, determine their source. It provides the total scale input to the instrument such as mV, mV/V and Weight in the units selected (i.e. lbs, kg, oz, g).

Running the IT test will show the weight and voltage results for each load sensor, including the following values:

Weight: Weight value recorded on the sensor

mV and mV/V: mV is a coarser reading than the mV/V or Weight readings. The mV reading is sufficient to balance the corners of your scale or vessel. These readings allow you to determine if the problem is in the instrument (internal) or in a load sensor(s) (external). The normal specification range for the Rate Controller is 0-15 mV. Readings outside this range (15.5 mV, 3.1 mV/V Maximum or any negative values), indicate an external problem. (most likely improper wiring).

When you check the results, if all the load sensors read 0.00, something is probably wrong between the HI 4060 and the HI 215IT junction box, e.g., the cable may be disconnected. Something could also be causing the box to not transmit the readings to the HI 4060.

If you get no reading for one or possibly two or more load sensors (e.g., Sensor 3 reads 0.00 or the reading is larger or smaller than it should be) and you know that the sensors are connected to the junction box, either the load sensor is malfunctioning or its cable to the junction box is loose or miswired.
Running the Weight and Voltage Test from the Web interface

Click on Weight and Voltage to open the Operation/Diagnostics - Weight & Voltage page, shown below.

![Weight and Voltage Test Web Interface](image)

Running the Weight and Voltage Test from the front panel

Step 4. Select Weight and Voltage and press Enter to run the test and view results.

Step 5. To read the rest of the results, press the down arrow. The weight and voltage/reading raw counts and average are shown to the right.

Directory

The Directory contains the list of the ingredient files saved to non-volatile memory. The filenames of ingredient files have .ing extensions. Files with other extensions may be listed, but only the .ing files are ingredient files.

Step 1. From the Test menu, select Directory and press Enter to list the ingredient filenames.

Step 2. Press the right or left arrow to see the entire list.

Step 3. Press Exit to return to the Test Menu.
Checking Inputs and (Optional) Outputs

The I/O test option, listed on the bottom of the Operations - Diagnostics page, allows you to see which inputs (user switches) or outputs are operating by clicking on I/O.

Click I/O to display the Input and Output page.

If an input or output is in use, the I/O reads 1.

If an Input or Output is not in use, the I/O reads 0. In our example none of the inputs are being used so they all read 0. (To return to the Diagnostics page click on the back arrow.)

Viewing System C2 Load Sensors

This test tells you how many C2 load cells are in use. You can also learn the version, serial number, output resistance, output voltage, and capacity for a selected C2 load sensor. The serial number is important if you need to contact Hardy Process Solutions Technical Support. You do not need an IT summing box.

Step 1. Click C2 at the bottom of the Operation - Diagnostics page to open the Operation - Diagnostics C2 Data page. This page shows the number of C2 load sensors that are found in the weighing system. The default sensor information is for the first load sensor to respond.

NOTE

The information on this page is C2 load sensor data only. It does not refer to any position on the IT Junction box, nor does it tell you the operating condition of the load sensor. To determine the load sensor’s condition and position, use the Weight and Voltage/IT Test.

Step 2. On the Read Data from pull-down list, select the C2 load sensor to view; then click Read Sensor to display for that sensor. Our example shows only one C2 sensor found. If no C2 load sensors are installed, “C2 Sensors Found” will read 0.
Step 3. Click on the back arrow to return to the Diagnostics page.

**Viewing the SMM-SD Card**

If your computer has an SD card reader you can read and modify the contents of the base (PARAMS.TXT) files on the SD Card page. Click the SD Card link to open the page.

![SD Card Directory](image)

It shows the Write Protect status and lists the base directory with the files where the non-volatile memory is located for the HI 4060.

The Read Param File button invokes a reading of the parameters file, which updates the system based on the current content of that file.

If you type in a filename, including the suffix, and click the Delete File? button, the file will be deleted.

**NOTE**

*Warning:* Random file deletion from the SD Card Directory can result in lost audit logs or damage to your system configuration. Do not use the Delete function unless you know that the file you want to delete currently has no vital system function. There is storage for more than 100 ingredient files.

**Event Log**

The event log lists the time and date of power-up events.

Click the Event Log link at the bottom of the Operation - Diagnostics page to display the read-only log.
Using the Ping Tool to Test the Network Connections and Configuration

The Ping Tool is used from the Start > Run of the PC.

Selecting the module by number for ping testing

**NOTE**

*You can only ping from the PC you cannot ping from an instrument.*

Step 1. Type PING <space>IP address of the instrument you want to test. For Example:

```
PING 192.168.110.99
```

Step 2. In our example we used the default address for all HI4060 Series Instruments. The IP address you are testing will be different.

Step 3. Press the Enter key on the PC.

Step 4. The PING utility starts sending out a packet to a specified address and gets a reply if the unit is functioning correctly. If the instrument or network are configured incorrectly and cables are loose or not connected correctly, nothing prints out after the first line, check the Network cables and connectors to be sure they are tightly fastened and the correct cables for this application. Also, check the configuration to be sure that the instrument is configured correctly. (See Configuration IP Address in Chapter 4)

If the unit is configured correctly and Ethernet functioning correctly and the cables are the correct ones for this application and are securely fastened, 64 signals should be returned and the print out will reflect this fact.

General Policies and Information

Hardy Process Solutions provides world-wide support for its products. The following paragraphs describe Hardy's customer support services and equipment warranty. When returning a product, call the Technical Service Department listed below for a Return Authorization Number. You will need to provide your company name, address, telephone number, equipment model number, S/N, and a brief description of the problem.

**NOTE**

*For all non-warranty repairs a purchase order or credit card information is required. You can also go to the Hardy web site and request a Return Authorization number. An RA# will be e-mailed to you.*  http://www.hardyinst.com/service/repair.php
Warranty

A warranty problem may be handled by returning the product to the factory for repair or replacement under warranty. In the event you experience a problem with this instrument contact your local Hardy Representative or the Hardy Process Solutions Service Center to determine if the problem is covered under warranty.

Web Address: http://www.hardyinst.com/Service/term.php

Ordering Replacement Parts

Contact the Hardy Sales Department to order replacement parts and option boards. Have your equipment model number and serial number ready.

System Support (Requires Purchase Order or Credit Card)

Technical Service is provided as follows:

- New system start-up: Ensure that the installation is checked and correct; instruments are calibrated, and operators trained.
- Service: Engineers are trained and qualified to provide on-site installation, calibration, and maintenance.
- On-site training: A Hardy Support Representative can be scheduled to train your operations and maintenance personnel. This can be as simple as basic load cell theory or as complete as troubleshooting techniques which allow you to service your equipment.

Software Downloads for Your HI 4060

To access the software, drawings and documentation that Hardy Process Solutions has made available for downloads:

Step 1. In a web browser, go to www.hardysolutions.com Site, and click Products, Weighing Instruments, Rate Controller, HI 4060.
Step 2.  Click the tab Documents & Downloads. Downloads are divided into categories.

Step 3.  This will display the screen shown below which can be used to download software for HI 4060 Rate Controller
Downloading and Installing Firmware Updates (S-19 Files)

In the procedure below, you will download both the Hardy Auto Update program and the latest HI-4060 rate controller firmware to a common directory on the same network as the rate controller.

Step 1. On the Hardy HI 4060 Downloads page (shown above), right click on the Update link and use the Save Target As menu option to save the file.

Step 2. Under HI 4060 Rate Controller Firmware, right click on the Latest Firmware link and use the Save Target As menu option to save this file to the same directory. You would then open the Zip file, which contains several files. You can rename the firmware, but the name must always include _APP.s19 for the AutoUpdate program to recognize it.

Step 3. Find and start the Auto Update.exe program.

Step 4. Click Find to search for and list the units that are online on this network.

Step 5. Select the IP address of the unit you want to upgrade.

Step 6. Click Browse to find and select the firmware file you downloaded.

Step 7. Once you have the IP address and the file selected, click on the Update button.

Step 8. You should now be asked for a User Name and Password. Username is hardy and password is updatepass (all one word in lowercase letters). If Update does not give you the Password screen, the path to your program file may be too long. Try moving your files up to your root directory and run again.
Step 9. After you log on, a percent complete bar will show the progress of the upgrade. Once it completes the download, it should show the screen indicating the programming is complete without error.

Step 10. Cycle power on the HI 4060 unit.

**FOR FURTHER INFORMATION CONTACT:**

Technical Service Manager  
Hardy Process Solutions  
9440 Carroll Park Drive, San Diego, CA 92121  
Telephone: +1 (858) 278-2900  
FAX: +1 (858) 278-6700  
Web Site: http://www.hardysolutions.com  
E-Mail: hardysupport@hardysolutions.com
About Time Zones

Greenwich Mean Time

There are 25 integer World Time Zones from -12 through 0 (GMT) to +12. Each one is 15° of longitude as measured East and West from the Prime Meridian of the World which is at Greenwich, England. Some countries have adopted non-standard time zones, usually a 30 minute offset.

Each Time Zone is measured relative to Greenwich, England. Civilian designations are typically three letter abbreviations (e.g. EST) for most time zones. Below is a list of the abbreviated time zones with the GMT time adjustment.

<table>
<thead>
<tr>
<th>GMT</th>
<th>Civilian Time Zones</th>
<th>Cities</th>
</tr>
</thead>
<tbody>
<tr>
<td>GMT</td>
<td>GMT: Greenwich Mean</td>
<td>London, England</td>
</tr>
<tr>
<td></td>
<td>UT: Universal</td>
<td>Dublin, Ireland</td>
</tr>
<tr>
<td></td>
<td>UTC: Universal Co-ordinated</td>
<td>Edinburgh, Scotland</td>
</tr>
<tr>
<td></td>
<td>WET: Western Europe</td>
<td>Reykjavík, Iceland</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Casablanca, Morocco</td>
</tr>
<tr>
<td>+1</td>
<td>CET: Central Europe</td>
<td>Paris, France</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Berlin, Germany</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Amsterdam, Holland</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Brussels, Belgium</td>
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<tr>
<td></td>
<td></td>
<td>Vienna, Austria</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Madrid, Spain</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Rome, Italy</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bern, Switzerland</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Oslo, Norway</td>
</tr>
<tr>
<td>+2</td>
<td>EET: Eastern Europe</td>
<td>Athens, Greece</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Helsinki, Finland</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Istanbul, Turkey</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Jerusalem, Israel</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Harare, Zimbabwe</td>
</tr>
<tr>
<td>+3</td>
<td>BT: Baghdad</td>
<td>Kuwait</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Nairobi, Kenya</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Riyadh, Saudi Arabia</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Moscow, Russia</td>
</tr>
</tbody>
</table>

GREENWICH TIME ZONES (GMT)
<table>
<thead>
<tr>
<th>GMT</th>
<th>Civilian Time Zones</th>
<th>Cities</th>
</tr>
</thead>
<tbody>
<tr>
<td>+3:30</td>
<td></td>
<td>Tehran, Iran</td>
</tr>
<tr>
<td>+4</td>
<td></td>
<td>Abu Dhabi, UAE</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Muscat</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Tbilisi</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Volgograd</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Kabul</td>
</tr>
<tr>
<td>+4:30</td>
<td></td>
<td>Afghanistan</td>
</tr>
<tr>
<td>+5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>+5:30</td>
<td></td>
<td>India</td>
</tr>
<tr>
<td>+6</td>
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<td></td>
</tr>
<tr>
<td>+6:30</td>
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<td>Cocos Islands</td>
</tr>
<tr>
<td>+7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>+8</td>
<td>CCT: China Coast</td>
<td>Shanghai, China</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Hong Kong, China</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Beijing, China</td>
</tr>
<tr>
<td>+9</td>
<td>JST: Japan Standard</td>
<td>Tokyo, Japan</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Osaka, Japan</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Taipei, Taiwan</td>
</tr>
<tr>
<td>+9:30</td>
<td>Australian Central Standard</td>
<td>Darwin, Australia</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Adelaide, Australia</td>
</tr>
<tr>
<td>+10</td>
<td>GST: Guam Standard</td>
<td></td>
</tr>
<tr>
<td>+10:30</td>
<td></td>
<td>Lord Howe Island</td>
</tr>
<tr>
<td>+11</td>
<td></td>
<td></td>
</tr>
<tr>
<td>+11:30</td>
<td></td>
<td>Norfolk Island</td>
</tr>
<tr>
<td>+12</td>
<td>IDLE: International Date Line East</td>
<td>Wellington, NZ</td>
</tr>
<tr>
<td></td>
<td>NZST: New Zealand Standard</td>
<td>Fiji</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Marshall Islands</td>
</tr>
<tr>
<td>+13</td>
<td></td>
<td>Rawaki Islands</td>
</tr>
<tr>
<td>+14</td>
<td></td>
<td>Line Islands</td>
</tr>
<tr>
<td></td>
<td>WEST OF GREENWICH</td>
<td></td>
</tr>
<tr>
<td>-1</td>
<td>WAT: West Africa</td>
<td>Azores</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Cape Verde Islands</td>
</tr>
<tr>
<td>-2</td>
<td>AT: Azores</td>
<td></td>
</tr>
</tbody>
</table>

**GREENWICH TIME ZONES (GMT)**
Step 11. Check the Greenwich Time Zones Table for the time zone you are in.

Step 12. Press the right or left arrow until the correct time zone appears. For example Pacific Standard Time is -8.

Step 13. Press the Enter button to save the entry.

Step 14. Press the Down arrow until the cursor is in front of Time-Year.
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