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HI6800 Series Application Controllers User Guide



Hardy HI6800 Series Application Controllers User Guide

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HOW TO USE THIS GUIDE

Introduction

Hardy Process Solutions' new HI6800 Series are high-performance application controllers that communicate the weight of the items on a scale to an operator through a front panel display. The weight data can then be used to make a decision or trigger an action as part of a larger process.

Audience

This guide is intended for use by installers, operators, and service personnel. It provides procedures for linking, configuring, operating, maintaining, and troubleshooting HI6800 Series Application Controllers.

Changes in This Revision

This is the first version of this document.

Related Documents

In addition to this guide, the HI6800 Series Application Controller Quick-Start Guide, data sheets, brochures, and other product literature can be found on the Hardy website. Specifications are subject to change without notice.

Organization of the Guide

- **Chapter 1 – Product Description**

  This chapter provides an overview of the HI6800 Series Application Controllers, along with a theory of operation and product pitch.

- **Chapter 2 – Hardware Overview**

  This chapter shows and describes the HI6800 Series Application Controller hardware.

- **Chapter 3 – Installation**

  This chapter describes how to install the HI6800 Series Application Controller.

- **Chapter 4 – Commissioning**

  This chapter describes how to power-on the HI6800 Series Application Controller.

- **Chapter 5 – Configuration**

  This chapter describes how to use the touchscreen to configure the HI6800 Series Application Controller.

- **Chapter 6 – Using a PLC**
  This chapter explains how to connect the HI6800 Series and set-them up in RSLogix 5000® for use in EtherNet/IP®, MODBUS or PROFINET (HI 6850 only)

- **Chapter 7 – Maintenance**

  This chapter describes how to clean and maintain the HI6800 Series Application Controller.

- **Chapter 8 – Troubleshooting**

  This chapter provides information for identifying and resolving HI6800 Series Application Controller problems.

- **APPENDIX A - I/O Setup**

  This appendix describes the programming and communication options common to all Hardy Process Solutions HI6800 Series application controllers.

- **APPENDIX B – Application Specific Programming**

  This appendix describes how to configure application-specific programming options.

- **APPENDIX C - Installing Option Cards (Model HI6850)**

  This appendix describes how to install option cards in the Model HI6850 application controller.

- **APPENDIX D - Instrument Parameters**

  This appendix defines the Parameters Used in Programming the Instruments

- **APPENDIX E - Glossary**

  This appendix defines the technical terms in this guide.

Document Conventions

This document uses the following conventions to draw attention to certain information.

Terminology

In this guide, the terms “HI6800 Series Application Controller” and “system” are used interchangeably to describe the Hardy HI6800 Series Application Controller

Glossary

A glossary at the end of this guide contains definitions of technical terms. The first time the term is used, it appears as a blue hyperlink. Click the link to go to the term’s definition in the glossary. Click the term in the glossary to return to the first instance of the term.

Safety and Warnings

Symbol	Meaning	Description
	Note	Notes emphasize or supplement important points of the main text.
	Tip	Tips provide helpful information, guidelines, or suggestions for performing tasks more effectively.
	Caution	Indicates a potential hazard or unsafe practice, which, if not avoided, could result in minor injury, harm to the operator, or damage to property or the device.
	Warning	Warnings indicate that failure to take a specified action could result in data loss or other serious consequences.

Typographic Conventions

Convention	Description
Bold	Indicates text on a window, other than the window title, including menus, menu options, buttons, fields, and labels.
Italic or < >	Indicates a variable, which is a placeholder for actual text provided by the user or system.
`page/code`	Indicates text that is displayed on a screen or entered by the user.
[ ] square brackets	Indicates optional values.
{ } braces	Indicates required or expected values.
| vertical bar	Indicates a choice between two or more options or arguments.

1 PRODUCT DESCRIPTION

Topics:

- *Models (page 12)*
- *Theory of Operation (page 13)*
- *Specifications (page 14)*

The Hardy Process Solutions HI6800 Series application controller provides an end-to-end solution for all types of industrial weighing applications. The family of instruments feature powerful weight processing, application control, industrial Ethernet-based communications, IIoT compatibility, remote diagnostics, and a user-friendly touchscreen interface. The flexibility of the HI6800 Series platform makes it ideally suited for any weight-based control application required in industrial manufacturing where fast, stable weight data and low-cost of ownership are critical components to successful design.

HI6800 Series Application Controllers can be used for a wide variety of process weighing applications such as batching, blending, filling/dispensing, check weighing, force measurement, level by weight, and weight rate monitoring.

Up to four scale systems can be monitored and controlled from a single instrument using analog-to-digital conversion with over 16 million counts of resolution per channel. Coupled with an ARM core processor, the HI6800 Series provides powerful digital signal processing and application control.

1.1 Models

The HI6800 Series Application Controllers come in two models:

- Model HI6800
- Model HI6850

1.1.1 Model HI6800

The Model HI6800 is designed for weight-based control of applications such as level monitoring, set-point control, static check weighing, and piece/part counting.

The model features an optional HI6130 (4.3-inch color TFT touchscreen) for operation and setup.

The Model HI6800 comes with two Ethernet ports, a micro-SD card slot, USB-C port, 2 digital outputs, 2 digital inputs, and a single analog scale input.

The dual 10/100 Mbps Ethernet ports with integrated network switch are ideal for simultaneously linking the instrument to both control and information networks for monitoring performance, diagnostics, and process statistics. Data from the instrument can be easily served up to the Intranet, Extranet, VPN, and the Internet by utilizing the EtherNet/IP, Ethernet TCIP, Modbus TCP/IP, or PROFINET communication protocols.

The instrument can be configured to accommodate both AC (100 to 240 volts) and DC (16 to 30 volts) power sources.

1.1.2 Model HI6850

The Model HI6850 is designed to accommodate weight-based applications including:

- Feed Weight Control (loss-in-weight / gain-in-weight)
- Feed Rate Control
- Dispensing and Filling
- Multi-Channel Weight Measurement and Control
- Batching Control
- Dynamic Checkweighing
- Belt Scale Control

In addition to features found on the Model HI6800, the modular design of the Model HI6850 allows configuration to accommodate the above applications with the following option cards:

- General Purpose Input/Out (GPIO) option card with 2 digital outputs, 3 digital inputs, 4 analog outputs, 1 analog input, and 1 high-speed pulse counter (digital input 4)
- Relay option card with 8 DC Normally Open relays

- Scale input card; 24-bit ADC with C2 (second-generation calibration) compatibility

The Model HI6850 can be configured with either a HI6130 4.3-inch (67 x 105mm) color TFT touchscreen screen or a HI6150 7-inch (100 x 165mm) color TFT touchscreen for operation, setup, and user-friendly graphics. The larger front panel display is ideal for dynamic checkweighing, batch control, rate control, and belt applications.

1.2 Theory of Operation

A factory control system typically consists of a controller (PLC, PAC, DCS, IACS), process instrumentation and sensors. Figure 1-1 shows the primary components of a control system.

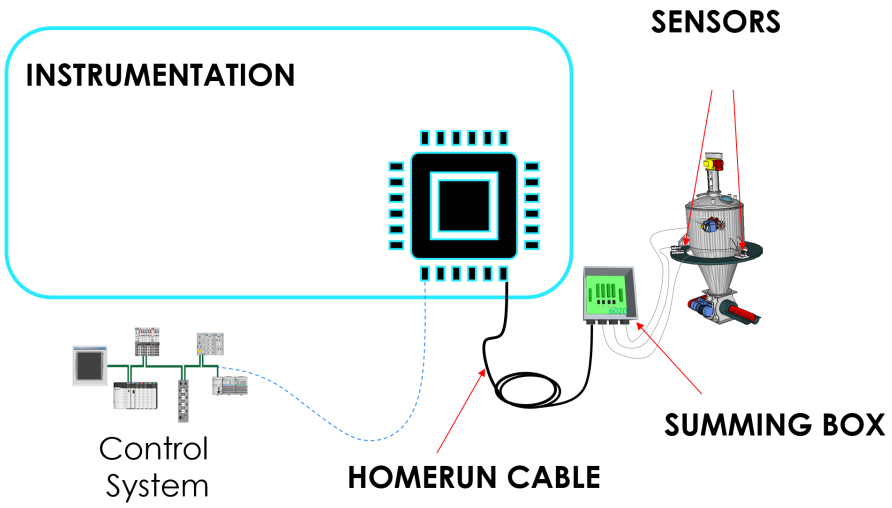


Figure 1-1. Example of a Basic Control System

In a weight-based control system, the weighing instrumentation is at the core of the process. The primary function of the instrument is to generate accurate, stable, and fast weight data and, in many cases, administer the direct control over the process through the actuation of valves and solenoids, controlling motor speeds, and monitoring the state of inputs from sensors such as photo-eyes, flow meters, and tachometers.

Figure 1-2 shows the functionally of the various components of a weight-based control system, with detail on the instrumentation.

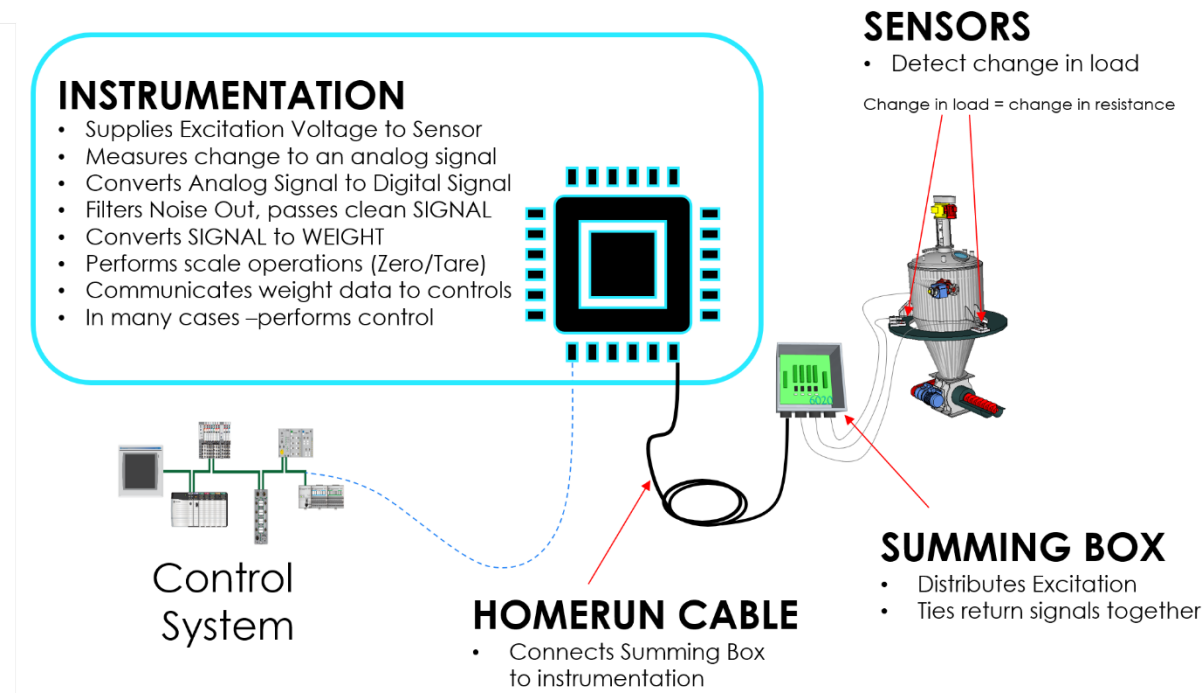


Figure 1-2. Functions of a Weight Controller

1.3 Specifications

Specifications for the HI6800 Series Application Controllers vary depending on configuration and application. Refer to the specifications section found in Appendix C.

2 HARDWARE OVERVIEW

Topics:

- *Model HI6800 Front and Rear Views (page 16)*
- *Model H6850 Front and Rear Views (page 18)*

The HI6800 Series Application Controller is available in two models: HI6800 and HI6850. This chapter describes the key items on the front and rear of both models.

2.1 Model HI6800 Front and Rear Views

Figure 2-1 shows the front of the Model HI6800 using a 4.3-inch display and Table 2-1 describes the key items.

Figure 2-3 shows the rear view of the Model HI6800 and Table 2-2 describes the key items.

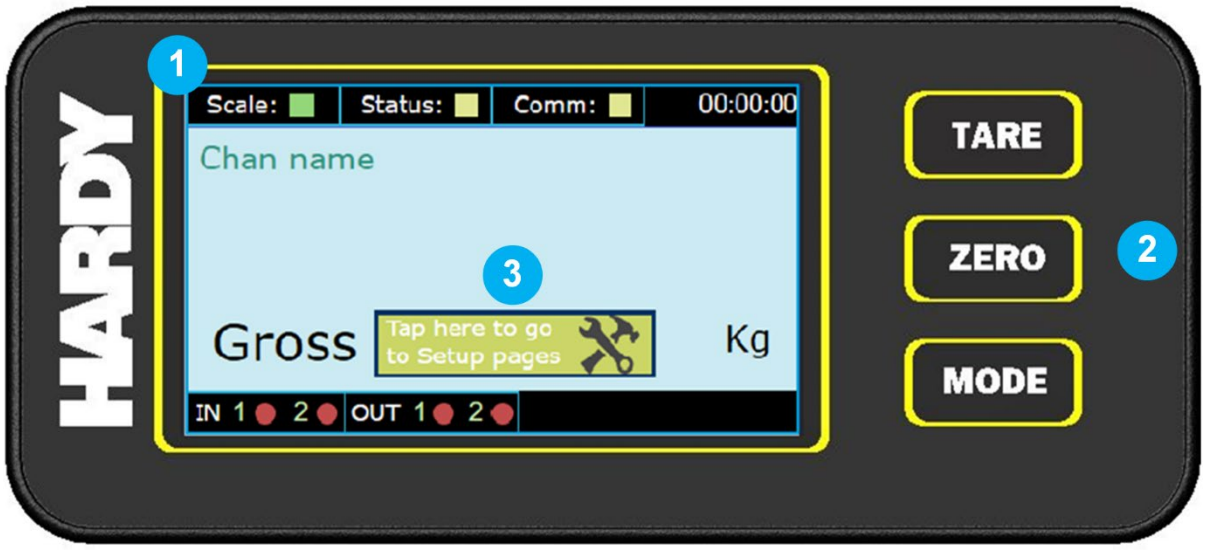


Figure 2-1. Model HI6800 Front View

Table 2-1. Key Items on the Front of the Model HI6800

Item		Description
1	Front panel display	Shows the information associated with the items selected using the tactile push-buttons and using the soft buttons (touchscreen).
2	Push-buttons	From top to bottom: • **TARE** – press to set the current weight as the tare weight. • **ZERO** – press to reset the displayed weight to zero. • **MODE** – press to change modes (Gross / Net / Set-Up)
3	Soft buttons	• **Set-up** – press to access instrument configuration menu.

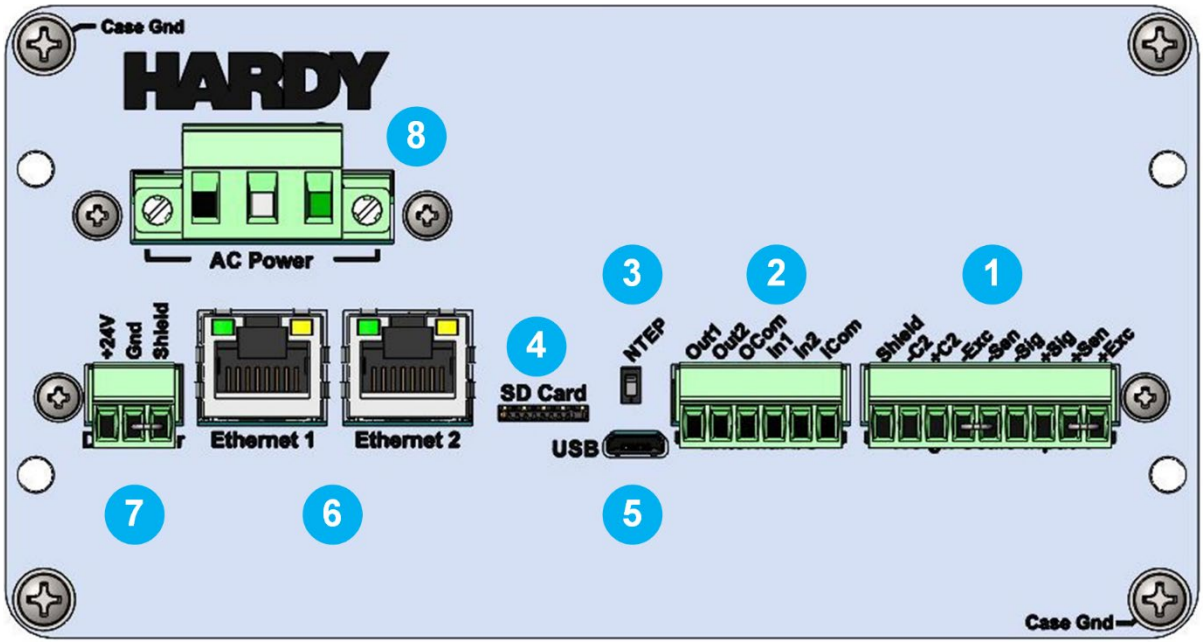


Figure 2-2. Model HI6800 Rear View

Table 2-2. Rear of the Model HI6800

Item		Description
1	Primary scale input terminal block	Connect to load cells or scale with or without a junction box
2	Digital I/O terminal block	Two inputs (isolated) and two outputs.
3	NTEP switch	Two-pin DIP switch for enabling or disabling NTEP.
4	microSD card	Accommodates a microSD module (up to 2 GB of memory).
5	Micro USB port	Connect to a USB device.
6	Dual 10/100 Mbps Ethernet ports	Connect to a network switch or router.
7	24 VDC power	Connect to DC power source.
8	Optional AC power	Connect to a 100-240 VAC power source.

2.2 Model H6850 Front and Rear Views

Figure 2-3 shows the front of the Model H6850 using a HI6150 7-inch display and Table 2-3 describes the key items. Figure 2-4 through Figure 2-8 show the rear view of the Model H6850 with various option cards and Table 2-4 describes the key items.

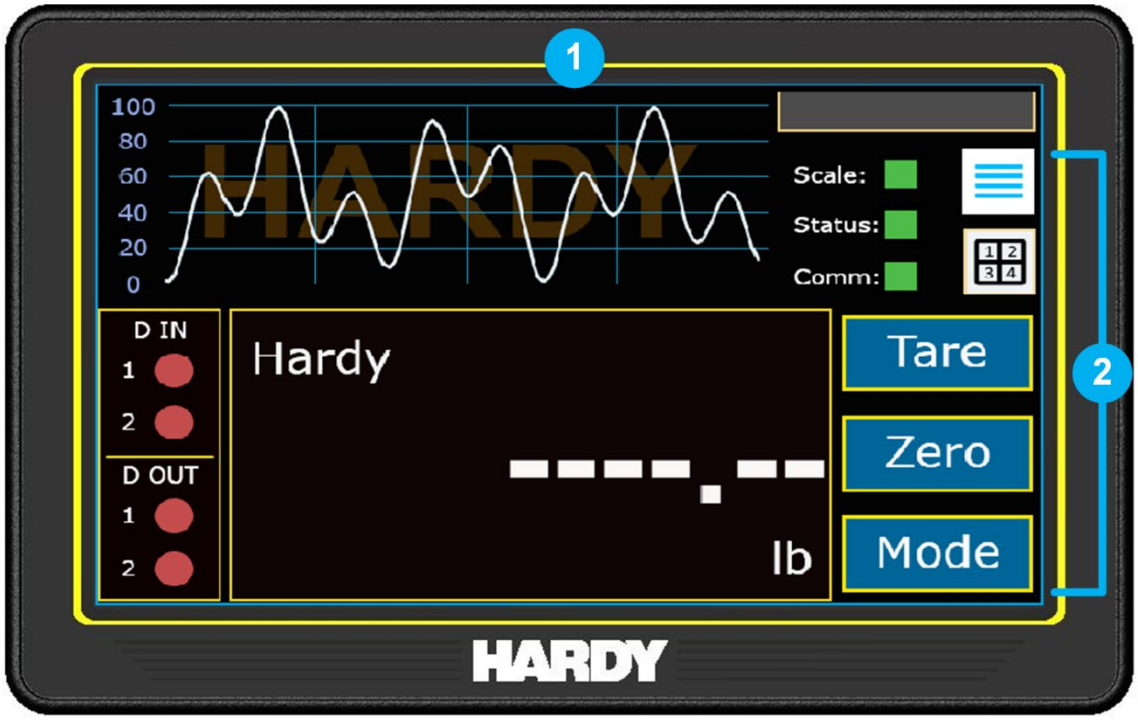


Figure 2-3. Model H6850 Front View

Note: The layout of the display varies with the application. For more information, see **Error! Reference source not found.Error! Reference source not found.**.

Table 2-3. Front of the Model H6850

Item		Description
1	Front panel display	Shows the information associated with the items selected using the soft buttons (touchscreen).

Item		Description
2	Soft buttons	From top right to lower right: • **SET-UP** – press to access instrument configuration menu. • **VIEW** – press for multi-channel or application-specific view. • **TARE** – press to set the current weight as the tare weight. • **ZERO** – press to reset the displayed weight to zero. • **MODE** – press to change modes (Gross / Net / App. Specific). • **CYCLE DISPLAY** – press to increase the font size of the displayed rate and reduce the font size of the displayed weight. When performing check weighing with the last check weight shown, press to display the last 10 check weights in small font; press again to show the product recipe and again to return to the last check weight.

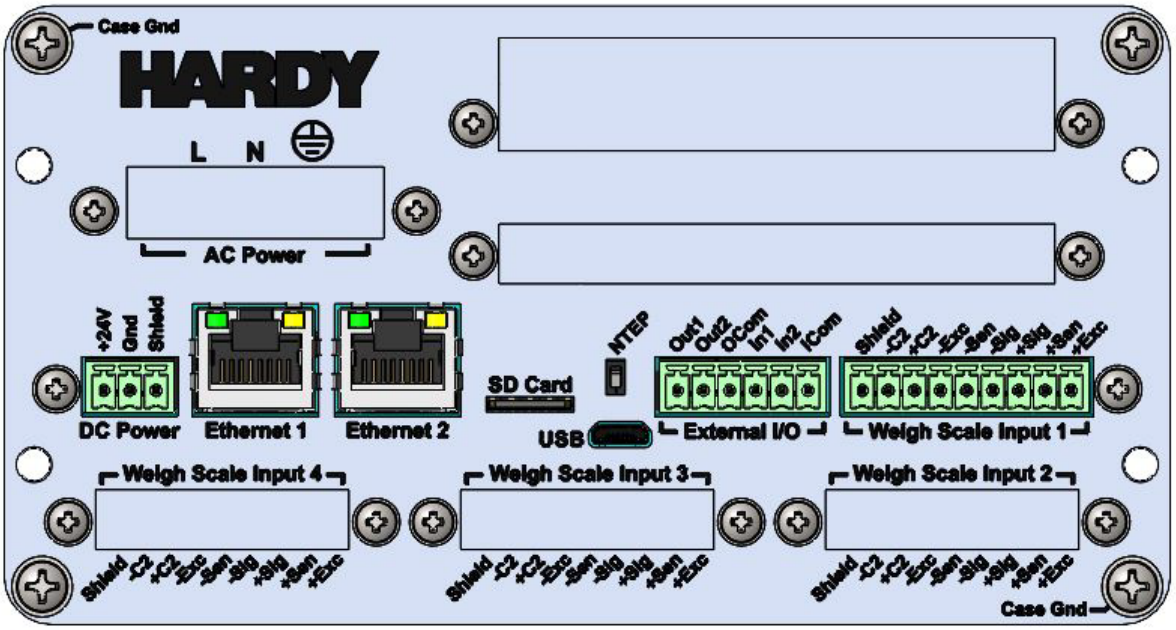


Figure 2-4. Model H6850 Rear View without Option Cards

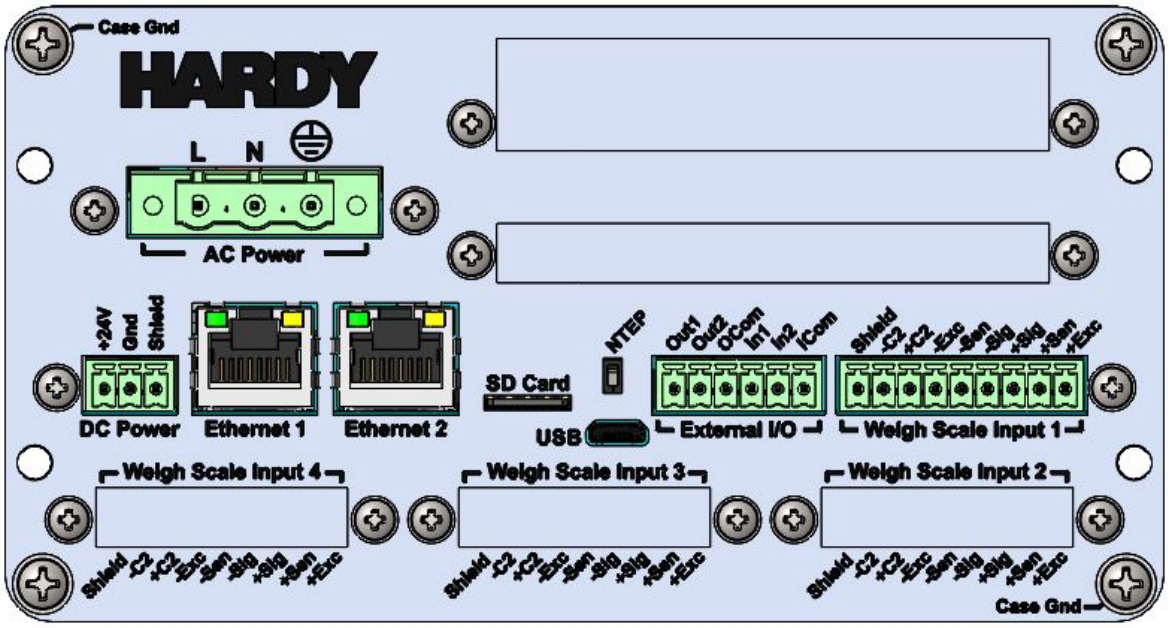


Figure 2-5. Model H6850 Rear View with AC Option Card

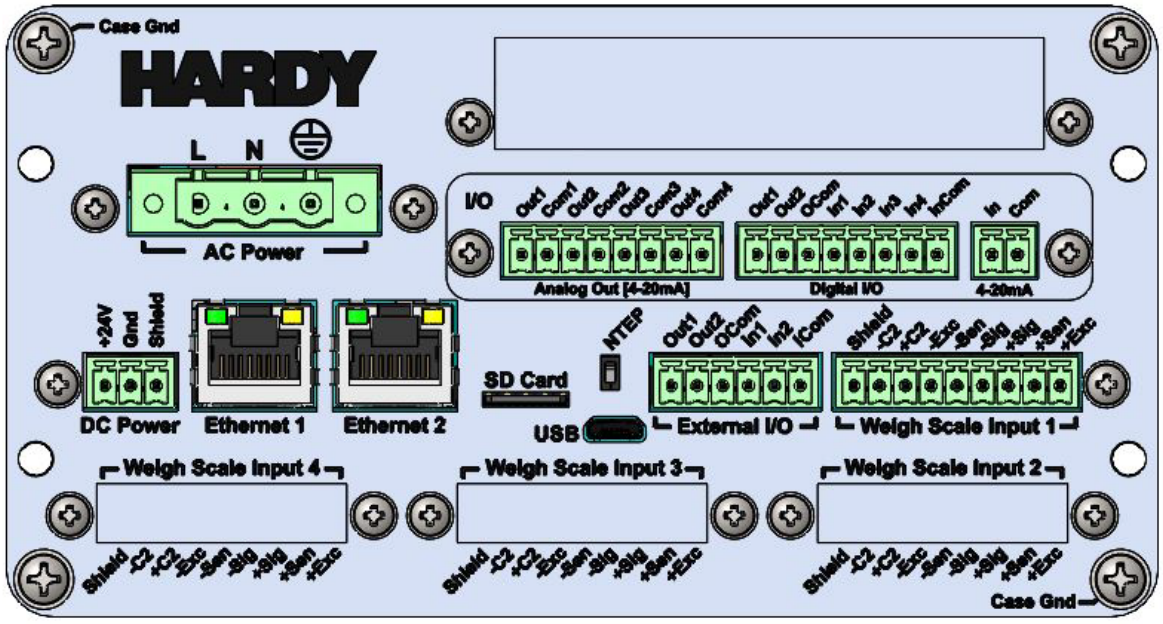


Figure 2-6. Model H6850 Rear View with AC and GPIO Option Cards

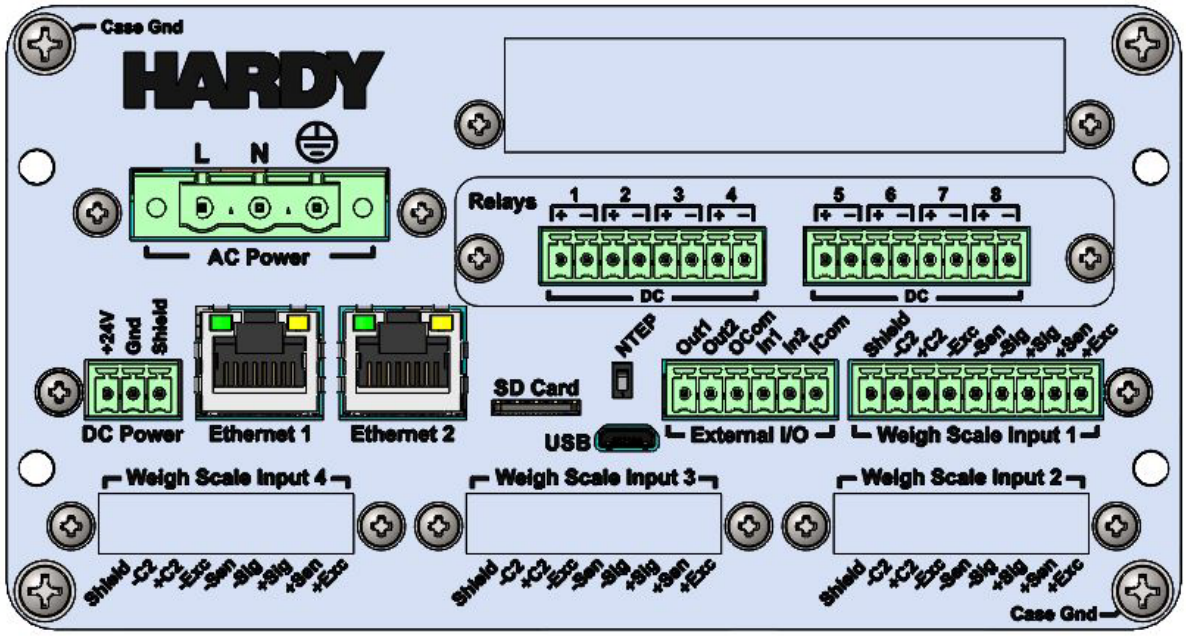


Figure 2-7. Model H6850 Rear View with AC and GPRC Option Cards

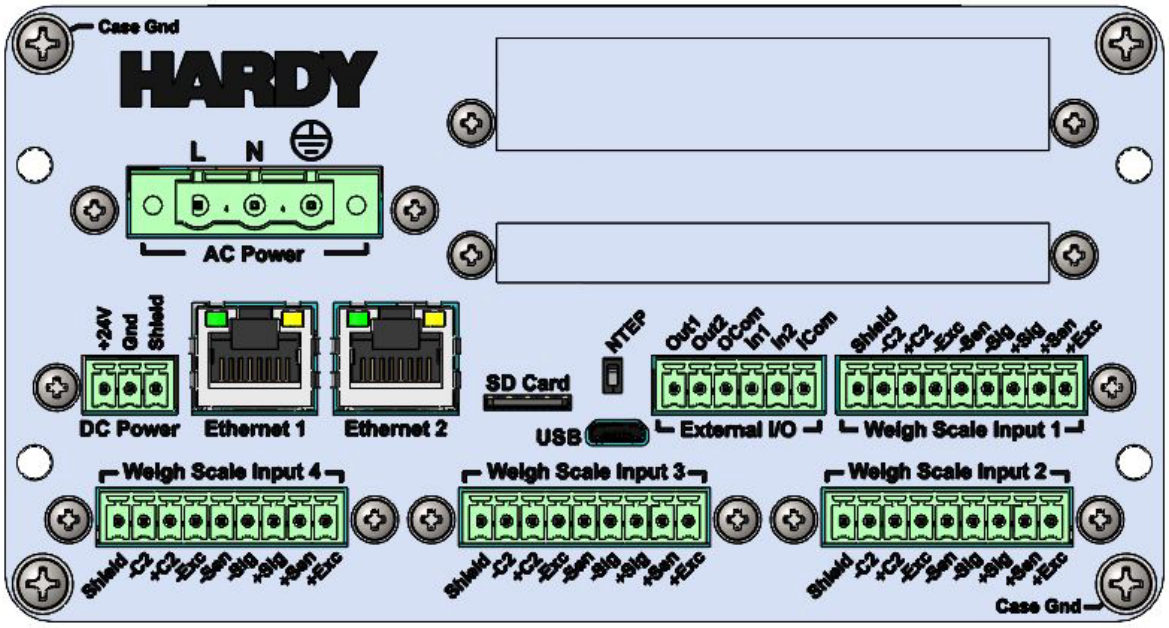


Figure 2-8. Model H6850 Rear View with AC and Scale Input Option Cards

Table 2-4. Rear of the Model HI6850

Item		Description
1	Optional relay module or I/O module	• Relay module: Eight 2A/SPST-NO. • I/O module: – Six digital I/O (4 inputs and 2 outputs) with one high-speed pulse. – Four analog outputs (4 – 20 mA). – One analog input (4 – 20 mA).
2	Primary scale input terminal block	Connect to weighing device.
3	Digital I/O terminal block	Four digital I/O (2 inputs [isolated] and 2 outputs).
4	microSD card	Accommodates a microSD module (up to 2 GB of memory).
5	Micro USB port	Connect to a USB device.
6	Dual 10/100 Mbps Ethernet ports	Connect to a network switch or router.
7	24 VDC power	Connect to DC power source.
8	Optional AC power	Connect to a 100-240 VAC power source.

3 INSTALLATION

Topics:

- *Planning Your Installation (page 24)*
- *Unpacking and Climatization (page 29)*
- *Mounting Instructions (page 30)*
- *Wiring Instructions (page 38)*
- *Option Cards (page 46)*

This chapter describes how to install the HI6800 Series Application Controllers.

3.1 Planning Your Installation

3.1.1 Hardy Field Service

Hardy Process Solutions provides local field service for all scales and weighing equipment. Hardy's factory trained technicians can perform service on all Hardy equipment as well as most other manufacturers' systems. Enabled by the Hardy Process Toolbox, our technicians spend less time onsite, saving money and reducing downtime.

Services include the following (click a service below for more information):

- Installation & Commissioning
- Onsite Field Service
- Product, Service, and Controls Workshop
- Pre-Installation Site Audit
- Calibration & Preventive Maintenance

To request any of these services, or to discuss your needs with a trained Hardy Service Agent, call 800-821-5831 option 4 between 6:30 AM and 5:30 PM PST. For emergency downtime service after hours, leave a message in our emergency mailbox and your call will be returned promptly, or email us at hardysupport@hardysolutions.com.



Note: Because the HI6800 Series Application Controllers are part of a larger system, their installation may depend on other system components. Refer to any additional information furnished by Hardy or vendors of other components used in the system (PLC systems, load cells, scales, etc.).

3.1.2 Required Tools

The following tools are required to install the HI6800 Series Application Controller.

- A small flat blade screwdriver (2 mm) for terminal blocks
- A medium flat blade screwdriver (4mm) when using AC power supply.
- A center punch and a drill with a 13/64-inch (5-mm) bit and a 1.25-inch (32-mm) bit when installing with a display.
- A jeweler's screwdriver if lengthening of the display cable is required for remote-display installations.

3.1.3 User Responsibilities

When planning and preparing for the installation of a HI6800 Series Application Controller, the user assumes the following responsibilities:

- Work with Hardy Field Service, as necessary (see section 3.1).
- Provide the space, people, and tools for unpacking, installing, and operating the HI6800 Series Application Controller.
- Confirm that the path from where the HI6800 Series Application Controller is delivered to the installation site is large enough to support the HI6800 Series Application Controller. Take into account all ramps, walkways, and elevators and possible obstructions.
- Maintain the proper environmental conditions for the HI6800 Series Application Controller.
- Provide adequate power facilities for the HI6800 Series Application Controller.
- Supply the network connections and external cabling required by the HI6800 Series Application Controller.
- Provide adequate power, which is necessary for the reliable functioning of electronic equipment and for the safety of the user's installation. The user is responsible for procuring, installing, and maintaining adequate power to the equipment.
- Allow only trained persons to use the HI6800 Series Application Controller.
- Allow only qualified technical personnel familiar with local and national wiring code requirements to work on the electric components of the HI6800 Series Application Controller and must supervise any auxiliary staff. Work must be performed in accordance with all electrical engineering rules and regulations.

3.1.4 Warning and Safety Labels

Visible warning and safety labels are mounted at potentially dangerous positions of the HI6800 Series Application Controller.

Before installing and commissioning the HI6800 Series Application Controller, installers and operators must become familiar with the potentially dangerous points of the system and understand the meaning of the warning and safety labels.

3.1.5 Operating Guidelines

- Never work in an unsafe or improper manner.
- Take measures to ensure that the HI6800 Series Application Controller is used only when it is in a safe condition and trouble-free.
- Use the HI6800 Series Application Controller only when all protective devices and safety equipment are in the intended locations and operational.

- To ensure that visible damages or faults can be recognized, inspect the HI6800 Series Application Controller at least once during a shift. Any changes in the operating performance must be reported immediately to the responsible authorities/persons. If necessary, stop and secure the HI6800 Series Application Controller until the reported issues are resolved.
- If a malfunction occurs, stop and secure the HI6800 Series Application Controller immediately, and have the fault eliminated immediately.

3.1.6 Electrostatic Discharge

Electrostatic discharge (ESD) can harm the electronic components of the HI6800 Series Application Controller.

ESD is created when the electrical field surrounding different objects varies and becomes imbalanced. The spark that is created when contact balances the fields can damage the HI6800 Series Application Controller.

To minimize possible ESD-induced failures at the installation location:

- Make sure all equipment and flooring are grounded. Any charge that might build up would be discharged safely through that common ground.
- Maintain recommended humidity level and airflow rates. Relative humidity above 40% reduces the resistance of items that can generate a charge, making it more difficult to generate an ESD.
- Store spare electric parts in antistatic bags until the parts are ready to be installed. These bags are designed to prevent a charge from building.
- When handling the HI6800 Series Application Controller, wear protective devices like wrist straps, sole grounders, and conductive shoes. These items help to prevent electrostatic charge from building.

3.1.6.1 Sources of Electrical Interference

Make sure that the HI6800 Series Application Controller is protected from sources of electrical interference. The following table provides examples of electrical interference.

Potential Source	Description
Wall outlets	Power outlets for building maintenance and janitorial equipment, such as vacuum cleaners and floor buffers, must be wired from circuit breakers on a power panel separate from the computer system panel. The ground wires from these outlets must connect to the normal building distribution panel and not to the system ground. If a separate power source and separate ground are not provided, maintenance and janitorial equipment can induce electrical noise that can affect operation of the HI6800 Series Application Controller. An electrician can verify whether maintenance outlets are on separate panels.

Potential Source	Description
Lightning	In geographical areas subject to lightning storms, install lightning protection for the HI6800 Series Application Controller. The principles of lightning protection and personnel safety are described in the National Fire Protection Association (NFPA) Handbook.
Electromagnetic interference	Electromagnetic interference can cause various problems. The HI6800 Series Application Controller is designed to reduce its susceptibility to radiated and conducted interference. A Hardy Process Systems representative can advise about common causes of electromagnetic interference.

3.1.6.2 Emergency Power Control

For safety purposes, consider installing emergency power-off controls for disconnecting the main power to the HI6800 Series Application Controller. These controls should be installed at a location within easy access to operators, such as next to the exit doors of the computer room. Before installing power controls, check and comply with all local electrical codes.

3.1.7 Pre-installation Planning

Successful installation of the HI6800 Series Application Controller requires careful pre-installation planning. Proper planning will help provide for a more efficient installation and greater reliability, availability, and serviceability.

All pre-installation activities should be scheduled and completed before the equipment is delivered. The pre-installation process includes:

- Working with Hardy Field Service to ensure that all hardware and cables in the specified configuration and all cables of the appropriate length have been ordered.
- Selecting key personnel who will handle the installation.
- Preparing a preliminary layout of the installation.
- Confirming that all electrical service wiring has been installed at the predetermined location.
- Making a final layout of the installation and reviewing the layout with Hardy Field Service.

To assist with pre-installation planning, verify the availability of each item in the following site preparation checklist. The following tasks might require several weeks to complete:

- Acquiring required power sources.
- Arranging for an electrician.
- Making cabinet or enclosure alterations to accommodate the HI6800 Series Application Controller.
- Ordering third-party equipment to support the HI6800 Series Application Controller.

Table 3-1. Pre-installation Planning Checklist

Checklist Question	Yes	No
Safety		
Is the installation location room free of any equipment servicing hazards, such as electrical or data cables that obstruct access?		
Does the installation location have a fire-protection system?		
Space Planning		
Does the floor plan include adequate space for airflow and servicing needs?		
Is the installation location structurally complete (walls, floor, air conditioning system, and so on)?		
Are antistatic flooring or mats installed?		
Are there cutouts or channels to route cables?		
Can the temperature be maintained between 50° to 104°F (10° to 40°C)?		
Can the humidity level be maintained between 8% and 80%?		
Is the installation location protected against vibration and acoustics?		
Is all equipment not supplied by Hardy Process Solutions on site and ready for use?		
Electrical Requirements		
Is there a sufficient number of DC or AC outlets for the equipment?		
Are the DC or AC outlets on different lines?		
Are the input circuit breakers adequate for equipment loads?		
Are uninterruptible power supplies (UPS) in place?		
Have all sources of electrical interferences been addressed?		
Site Access and Security		
Does the site enforce access controls (for example, will Hardy representatives need an escort)?		

3.1.8 Seismic Considerations

In earthquake-prone areas, it is important to restrain the Hardy HI6800 Series Application Controllers adequately to prevent personal injury and limit potential damage to system components. This may include using stabilizing equipment to eliminate the risk of tipping, which could lead to personal injury.

3.2 Unpacking and Climatization

After receiving the HI6800 Series Application Controller, perform the following steps to ensure that it and other contents arrived safely.

1. Inspect the outer shipping container for any damage that may have occurred in shipping. Report any sign of damage to the appropriate shipping agency.
2. Remove the HI6800 Series Application Controller components and cables from the shipping container.
3. Save the shipping container, foam, and antistatic bags in case the HI6800 Series Application Controller must be returned. Returning the HI6800 Series Application Controller in any other container is not advised.
4. Check the contents against the items referenced on the packing list. If any item is missing or damaged, notify a Hardy sales representative and/or the shipping agency.

HI6800 Series Application Controllers shipped or stored at extreme temperatures require time to adjust to operating temperatures before startup. If the HI6800 Series Application Controller arrives in hot or cold weather, do not unpack it until it has been allowed to reach room temperature (one to two hours). Immediately exposing the HI6800 Series Application Controller to warm temperature can cause condensation to occur, which could damage the electronics. If any condensation is noticed, allow the HI6800 Series Application Controller to stand unattended for one to two hours, and then unpack it.

3.3 Mounting Instructions

3.3.1 Mounting the Controller

HI6800 Series Application Controllers can be mounted in the following configurations:

- Panel-mount option, using a 4.3-inch display or 7-inch display (Model HI6850 series only)
- Remote Panel-mount when the instrument is mounted separately from the display.
- DIN rail-mount option, when not using a display

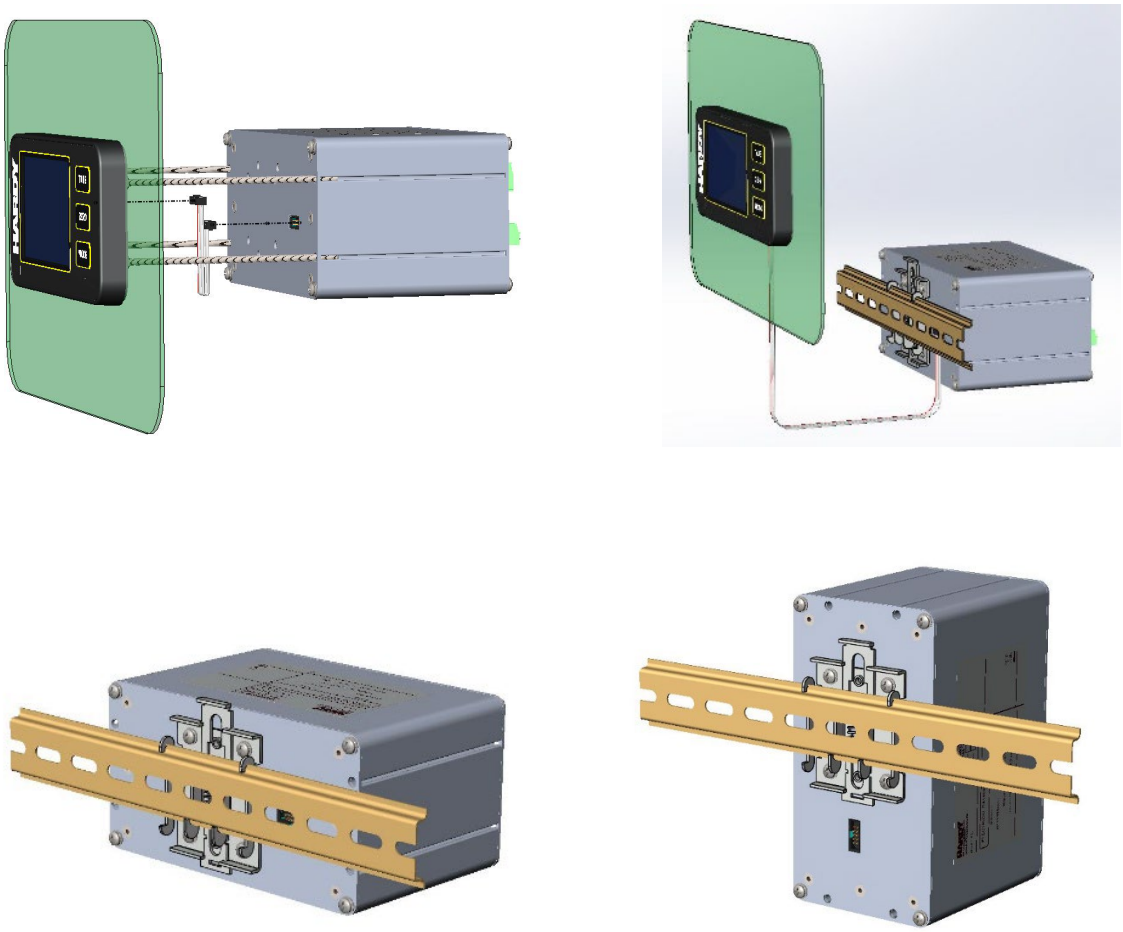


Figure 3-1. Ways to Mount the Controller

3.3.2 Mounting Using a Front Panel Display

Note: Exercise all ESD precautions before and during installation.

A thin plastic template comes with the product when purchased with a display.

- Check at least one dimension on the template for accuracy before use.
- Verify the hole for the display cable is located on the correct side before drilling.

Note: The hole patterns for the 4.3-inch display and the 7-inch display are identical.

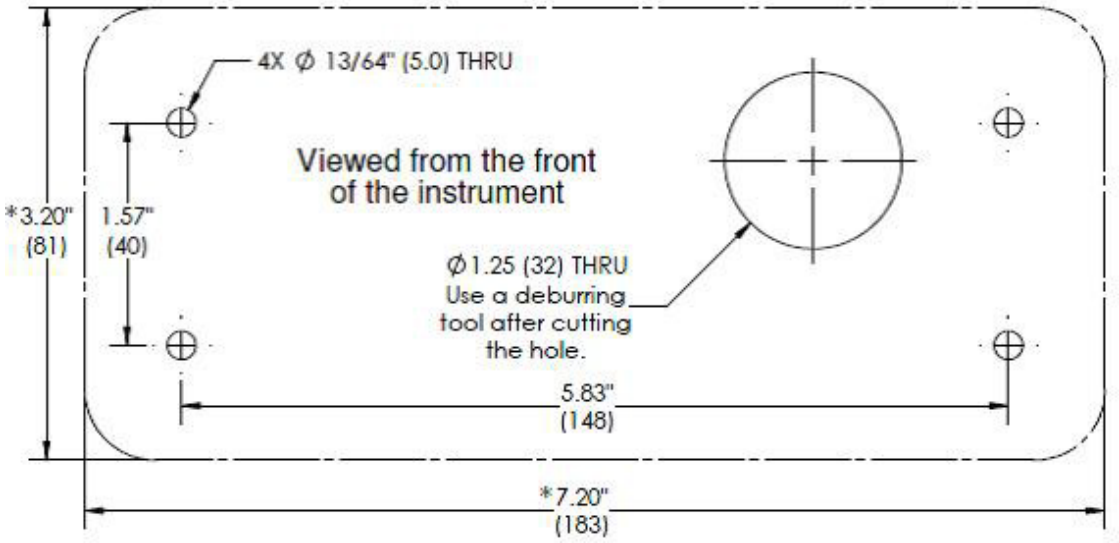


Figure 3-2. Panel Hole Dimensions (Not to Scale)

A printable template is also available on the Hardy website. Printers and copy machines can distort or reduce the template measurements shown above. If you do not use the plastic template supplied with the product, **verify the dimensional accuracy** of any printed paper template before use.

TIP: Measure twice, cut once, and verify dimensional accuracy of any printed material.

Caution: Hardy recommends installing the HI6800 Series Application Controller in a NEMA 4-, 4X-, or IP 55-rated enclosure or better.

3.3.2.1 Panel Mount Option

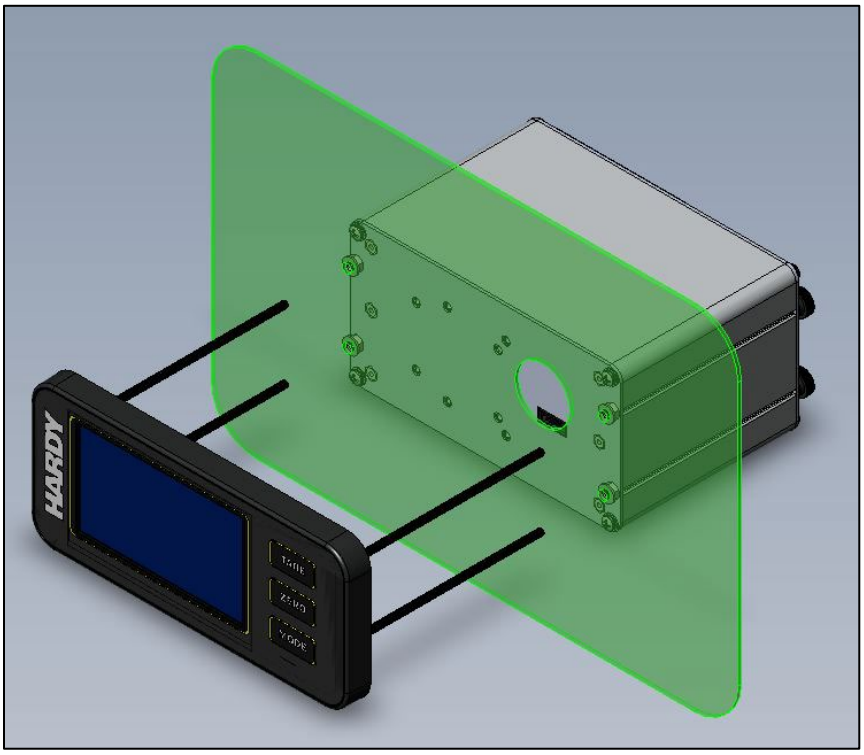


Figure 3-3. 4.3-inch Display Shown in Panel Mount Assembly (Front View)

1. Place the drill template onto the panel and secure in place with tape.
2. Using a center punch, mark the locations of the 5 holes and drill as directed.
3. Hand-tighten the four screw rods into the front panel display.
4. Align screw rods with the four holes drilled in the panel, then gently slide the display assembly until the gasket of the display is flush with the panel.

Note: Rods are designed to accommodate a range of panel thicknesses (see the I/I diagram for detail).

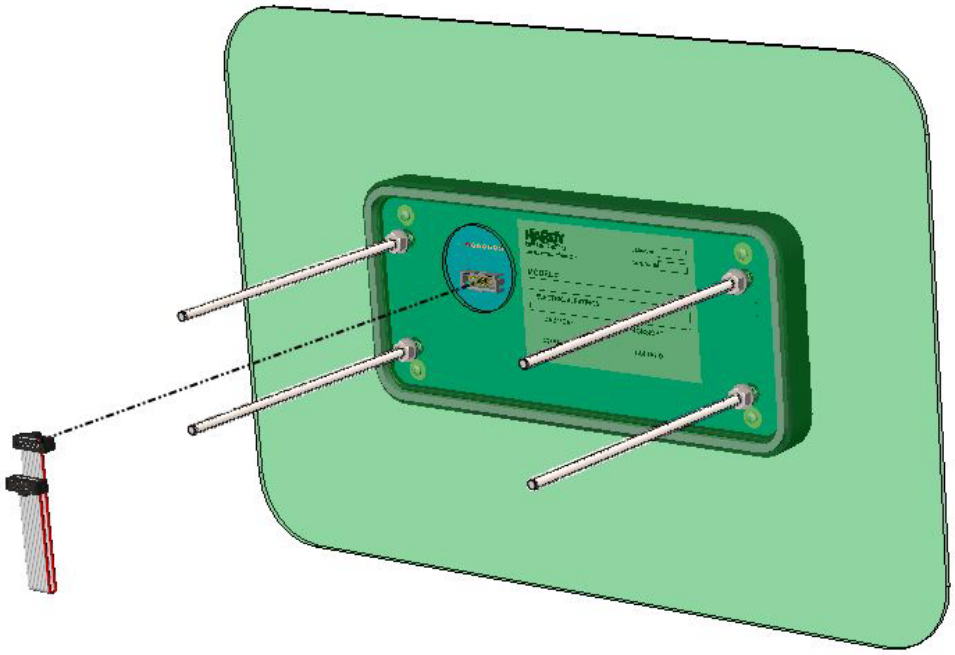


Figure 3-4. Installing Four Screw Rods into the Front Panel Display

5. Place four washers followed by four nuts onto the rods. Tighten the four 4mm nuts to completely and evenly compress the gasket to achieve an IP65 rating.

Note: See I/I diagram for torque specification.

6. Install the display cable to the display as shown above.
7. Position the instrument enclosure with the display connector toward the panel.
8. Align the screw rods with the slots on the sides of the enclosure, then carefully slide the instrument about half-way onto the rods.
9. Plug the display cable into the instrument taking care not to twist the cable.

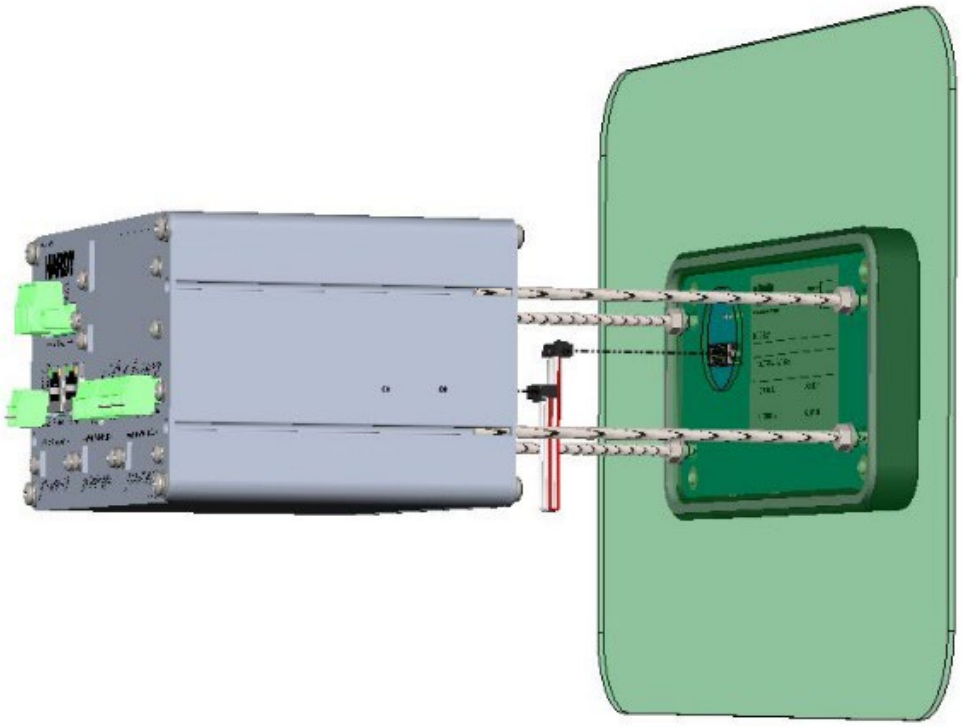


Figure 3-5. Connecting Display Cable

10. Continue sliding the instrument enclosure onto the screw rods, making sure the display cable remains flat, until the instrument is flush with the panel.
11. Install and tighten the four keeper nuts, with the smooth side of the nut against the enclosure and the knurled side of the nut away from the enclosure.

⚠ **Caution:** Do not over-tighten the four keeper nuts.

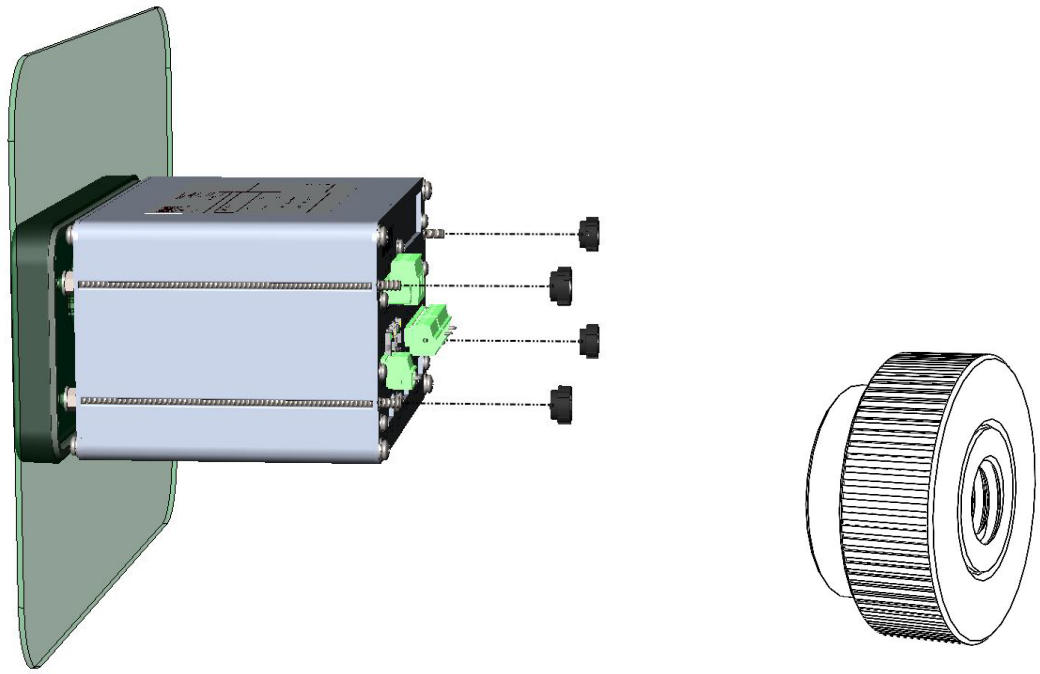


Figure 3-1. Zoomed-in View of Keep Nut

Note: The HI6800 Series Application Controller front panel display is NEMA 4/4X rated when installed correctly in a panel per instructions above.

3.3.2.2 DIN Rail Mount

The HI6800 Series Application Controllers are available in a DIN rail-mount configuration. Use this configuration when mounting the controller with a remote display or to operate the controller as a “blind unit” (without display).

Note: Blind units are controllers that do not have a front panel display (the display is not necessary to monitor and operate the controller). Blind units can be fully configured using a web browser (see Chapter 5).

1. To install, pull down the DIN rail clip to expose both of the DIN rail hooks.
2. First hook the fixed part of DIN rail bracket onto the DIN rail using the groove at the top of the bracket.
3. Push the other side of the DIN rail bracket onto the DIN rail until it locks in place.
4. While holding the HI6800 Series Application Controller, gently pull up away from the DIN rail to verify that it is mounted correctly.



Figure 3-2. Completed DIN Rail Mount Assembly

3.3.2.3 Remote Display Mount

The display for the HI6800 Series Application Controller can be mounted in a remote location. The display cable can be modified to support the desired length of cable (extra cable length is not supplied).

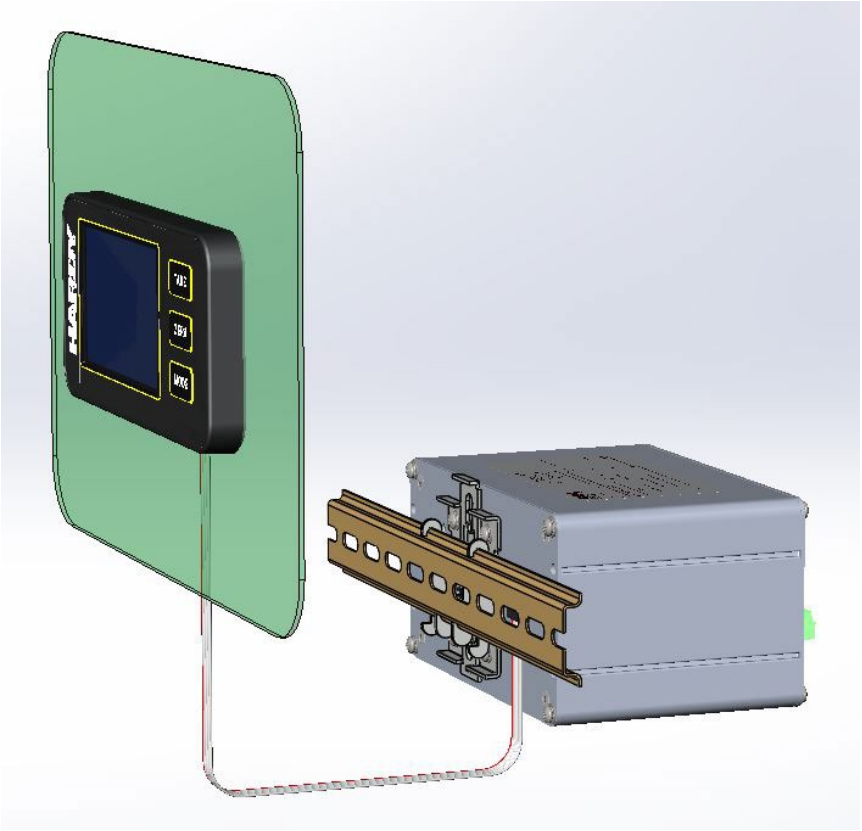


Figure 3-10. View of the Remote Display Mount Assembly

If you need to install the display further away from the controller than is possible with the supplied cable, make a display cable between the panel and the instrument using the following wiring specifications:

- Wire size: 20 AVG maximum / 26 AWG minimum
- Maximum cable length: 100 ft. (30.48 meters)
- Use three twisted pairs with drain wires:
  - Pair wires: +12 and GND, D1 and D2, D3, and D4

The terminal type is a spring cage type contact. There is a slot provided to use an insert/release tool. The tool is a 2.0 mm x 0.4 mm wide flat blade screwdriver. Inserting the tool opens the cage contact and allows one or two bare wires to be inserted. Removing the insertion tool with bare conductor inserted will lock the connection.

Please Note: HI6850 and HI6800 can use either HI6130 or HI6150 displays depending on the configuration. The interface between both controllers and both displays are exactly the same.

3.4 Wiring Instructions

3.4.1 Power Requirements

The HI6800 Series Application Controllers contain power supply cards that require 24VDC power from a Class II power supply. Hardy Process Solutions advises that you wire directly to the Class II power supply instead of wiring to a 24VDC bus that supplies other devices. An optional 90-240VAC power supply is available. The breaker is used to disconnect power from the HI6800 Series Application Controller when performing maintenance.

Unless otherwise prescribed by local regulations or specialized motor requirements, a minimum wire gauge for supply wiring is 14 Ga. stranded conductor, provided with an Earth Ground. Do not use solid conductors. To maintain the environmental rating of the control enclosure, route all wiring to and from the HI6800 Series Application Controller through appropriately rated glands and according to National Electrical Code requirements.

3.4.1.1 AC Power

The optional AC power input is rated from 120 to 240 VAC. Use a clean primary AC power line directly from the power panel. This line should be supplied with a maximum 20-amp breaker and should not supply any other equipment.

Figure 3-11 shows the optional AC power input, and Table 3-2 shows the pin assignments and signal names. Be sure the VAC power source is shut off before connecting the wires to the terminal block. Install a 3-wire, minimum 14 AWG power line to the 3-pin terminal block connector. Using copper wiring is recommended. Consult local rules and electrical codes.

Optional AC Input Power Terminal Block

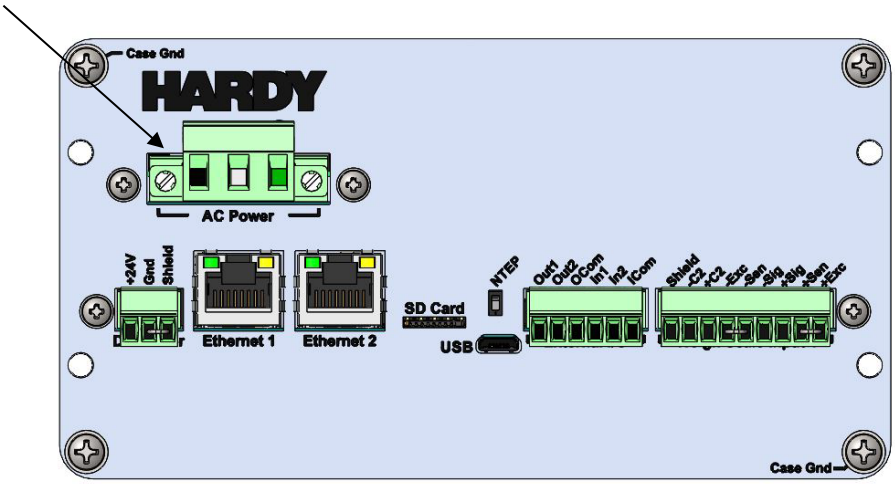
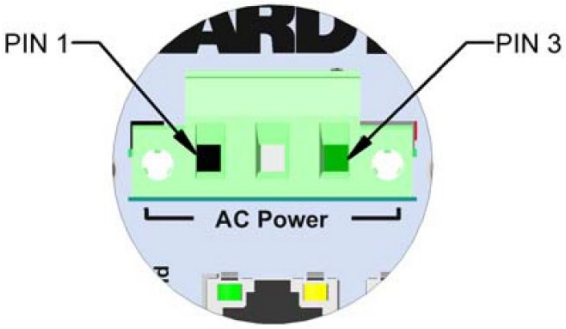


Figure 3-11. HI6800 Series Application Controller AC Input Power Terminal Block



Optional AC Input Power Terminal Block

Table 3-2. Pin Numbering on the Optional AC Input (100 -240VAC) Power Terminal Block

Pin	Signal Name	Properties
1	Line	AC/L
2	Neutral	AC/N
3	Earth	FG ⏚

3.4.1.2 DC Power

Use a power-limited 12-27 VDC power supply (Class 2) on the DC input wiring.

DC power should be supplied by a clean primary line directly from the DC power source.

Warning: Do not operate with incorrect line voltage because it will damage the equipment and/or cause personal injury. Make sure the power source does not exceed 30 VDC.

Do not reverse the ground and hot wires because it can damage the equipment.

1. Make sure the VDC power source is shut off before installing the wires to the connector.
2. Connect the 24 VDC voltage wire and shield wire to the connector that plugs into the DC power terminal block at the rear panel.
3. Apply VDC power to the unit.

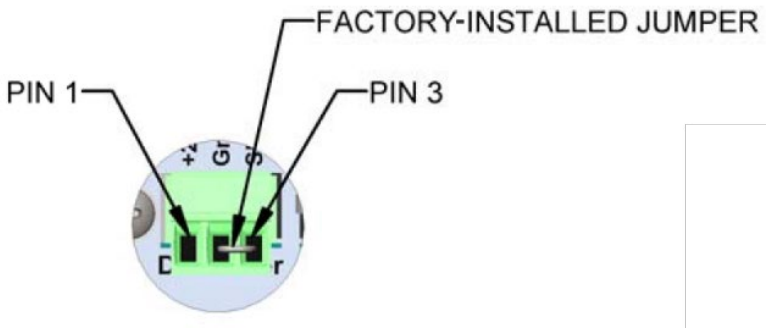


Figure 3-3. DC Input Power Terminal Block

Table 3-3. Pin Numbering on the DC Input Power Terminal Block

Pin	Signal Name	Properties
1	+24V IN	V +
2	GND	V -
3	Shield	FG ⏚

Note: Remove jumper to isolate shield from ground to prevent the possibility of a 'ground loop' when troubleshooting the scale stability issues. Ground loops can be a major source of noise, hum, and interference in sensitive electronic systems caused when two or more devices are connected to a common ground through different paths.

Pin	Signal Name	Properties

Input Power Wiring

NOTE: When you use external over-current protection devices, mount the switch and/or circuit breaker near the instrument. Do not connect AC and DC power at the same time.

3.4.2 Ethernet Communications

The rear panel of HI6800 Application Controllers have dual-port Ethernet interfaces that connect to local Intranet, Extranet, VPN, or Internet (World Wide Web). Both ports support EtherNet/IP and Modbus TCP/IP protocols.

Future support for OPC Unified Architecture (OPC UA) is under development.

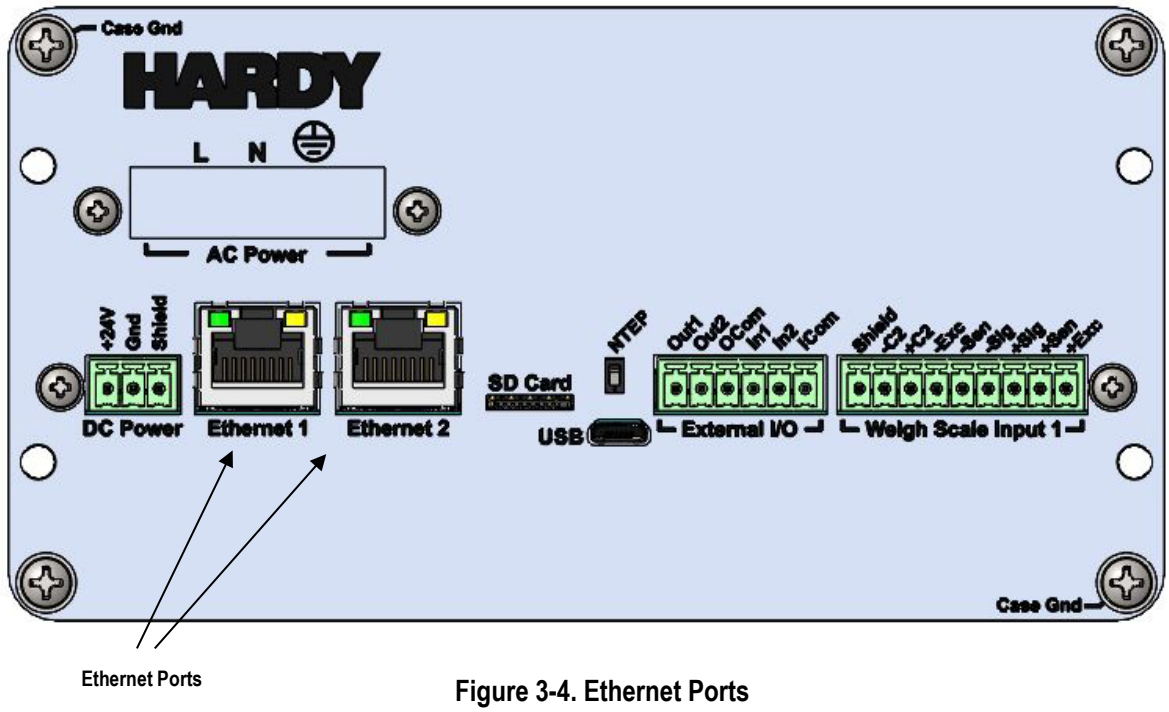


Figure 3-4. Ethernet Ports

Table 3-4. Pin Numbering on the Ethernet Ports

Pin	Signal Name
1	TX+
2	TX−
3	V+
4	GND
5	GND
6	V+
7	RX+
8	RX−

3.4.3 Connecting a Micro USB Device

The rear panel of the HI6800 Application Controller has a Micro USB slot for connecting to the instrument. The connection is reserved for future use for programing the instrument as well as to connect to other USB-enabled devices such as dataloggers or printers.

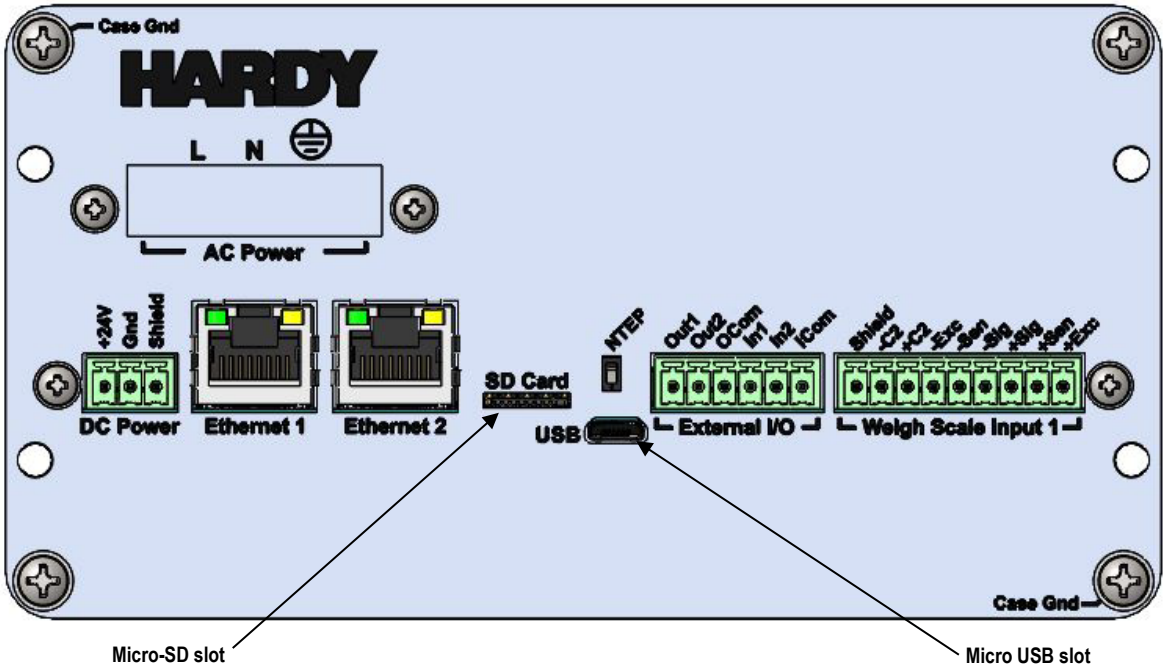


Figure 3-5. Micro USB Slot and SD Card Slot

3.4.4 Inserting a Micro-SD Card

The rear panel of the HI6800 Application Controller has a Micro-SD slot to serve as external memory for the instrument. The memory can be used to transfer parameters from one instrument to another (cloning) or used as back-up memory to restore an instrument in the event of a failure.

1. Hold the SIMM-SD card with its label facing up.
2. Slide the SMM-SD card into the SMM-SD slot on the rear panel.
3. Push the SMM-SD card until a snap indicates that the card is seated.
4. To remove the SMM-SD card, gently push the card in towards the instrument and quickly release the card, allowing it to be completely removed from the housing.

Note: Always store a SMM-SD card in a static-free enclosure within a secure environment to avoid losing the information stored on the card.

3.4.5 Digital I/O

All versions of the HI6800 Series Application Controllers have Digital I/O, 2 inputs and 2 outputs. The Digital I/O is used to monitor input signals from peripherals such as buttons and switches (commonly used to initiate a print or tare command) or to drive peripherals such as status lights or motor starters.

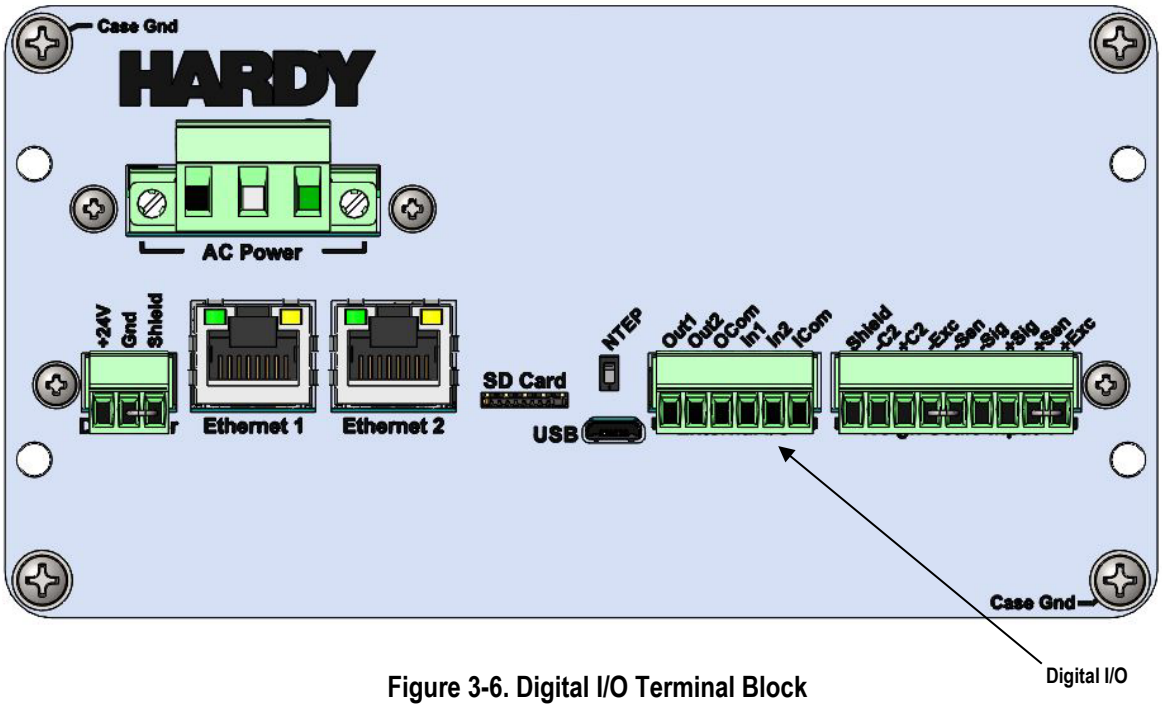


Figure 3-6. Digital I/O Terminal Block

Table 3-5. Pin Numbering on the Digital I/O Terminal Block

Pin	Signal Name	Properties
1	Out 1	Sourcing 0-32VDC @300mA
2	Out 2	Sourcing 0-32VDC @300mA
3	Load voltage input for Out1 & Out2	0-32VDC @300mA
4	In 1	Sinking 0-24 VDC
5	In 2	Sinking 0-24 VDC
6	In Common	Field Ground

3.4.6 Weigh Scale Input Connection

All versions of the HI6800 Application Controllers have at least one weigh scale input connection; however, the Model HI6850 can accommodate up to three additional weigh scale input connections for a total of four. The Primary weigh scale input connection is capable of 250 updates/second. It also features Hardy's exclusive C2® and WAVERSAVER+ technology. This input can be used with almost all industrial load cells, sensors, and scales. Fluting or tinning wire ends is highly recommended to prevent damage to the wire when tightening the terminal block screws.

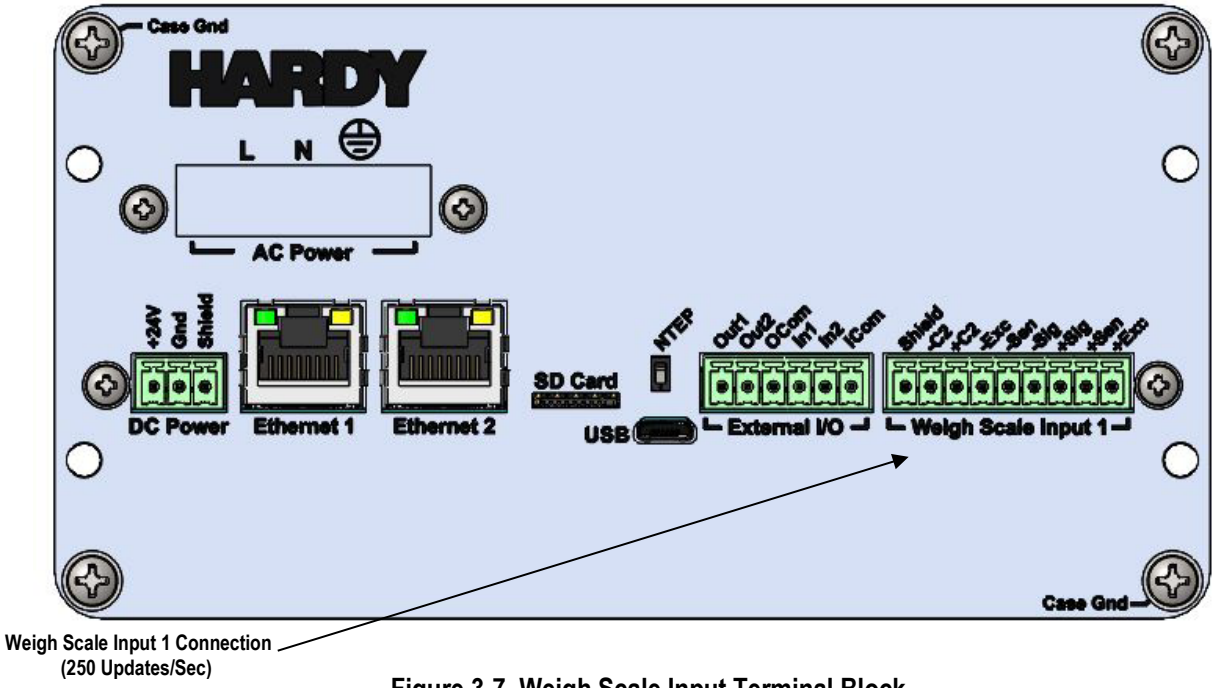


Figure 3-7. Weigh Scale Input Terminal Block

Table 3-6. Pin Numbering on the Weight Scale Terminal Block

Pin	Signal Name
1	SHIELD
2	C2−
3	C2+
4	EXC+
5	SEN−
6	SIG−
7	SIG+
8	SEN+
9	EXC+

3.5 Option Cards

3.5.1 Additional Weigh Scale Input Cards

HI6850 Application Controllers can support up to three additional weigh scale input cards as options, but each of these three optional connections support up to 100 updates/second. They can also be used with almost all industrial load cells, sensors, and scales. These optional weigh scale input connections do feature Hardy's exclusive C2® and WAVERSAVER+ technologies.

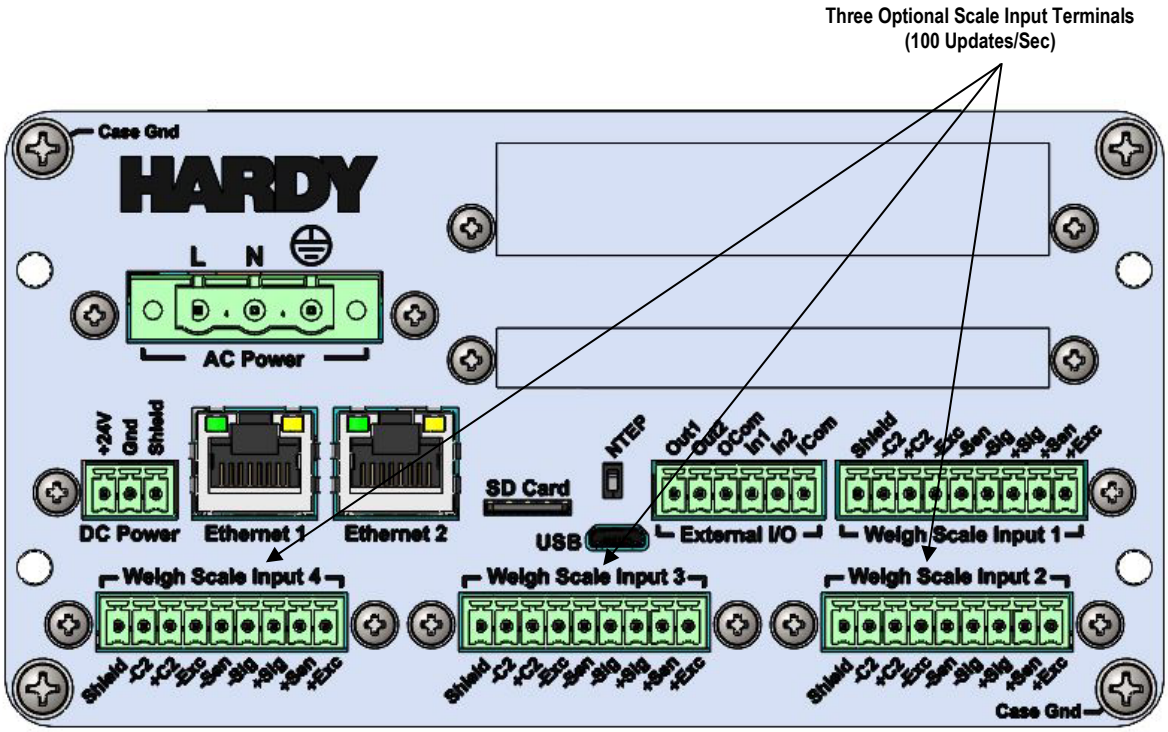


Figure 3-8. HI6850 Series Application Controller with Three Additional Primary Scale Terminal Blocks (See Table 3-5 for Properties)

3.5.2 GPIO Card

The Model HI6850 supports up to two optional GPIO (General Purpose Input/Output) cards. Each card provides the following:

- Six digital I/O pins (4 input and 2 output) with one high-speed pulse counter.
- Four independent 4-20mA analog outputs featuring 16,000 counts of resolution.
- One analog input pin (4-20mA) featuring 16,000 counts of resolution.

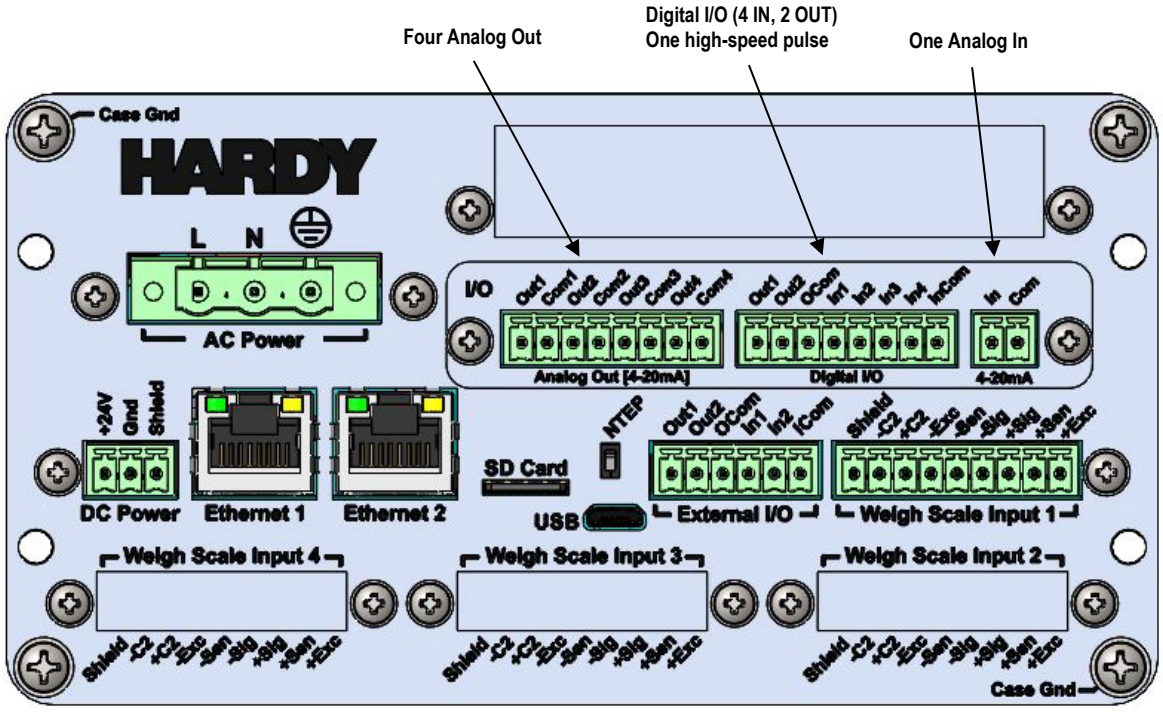


Figure 3-9. HI6850 with One Optional I/O Card Terminal Block

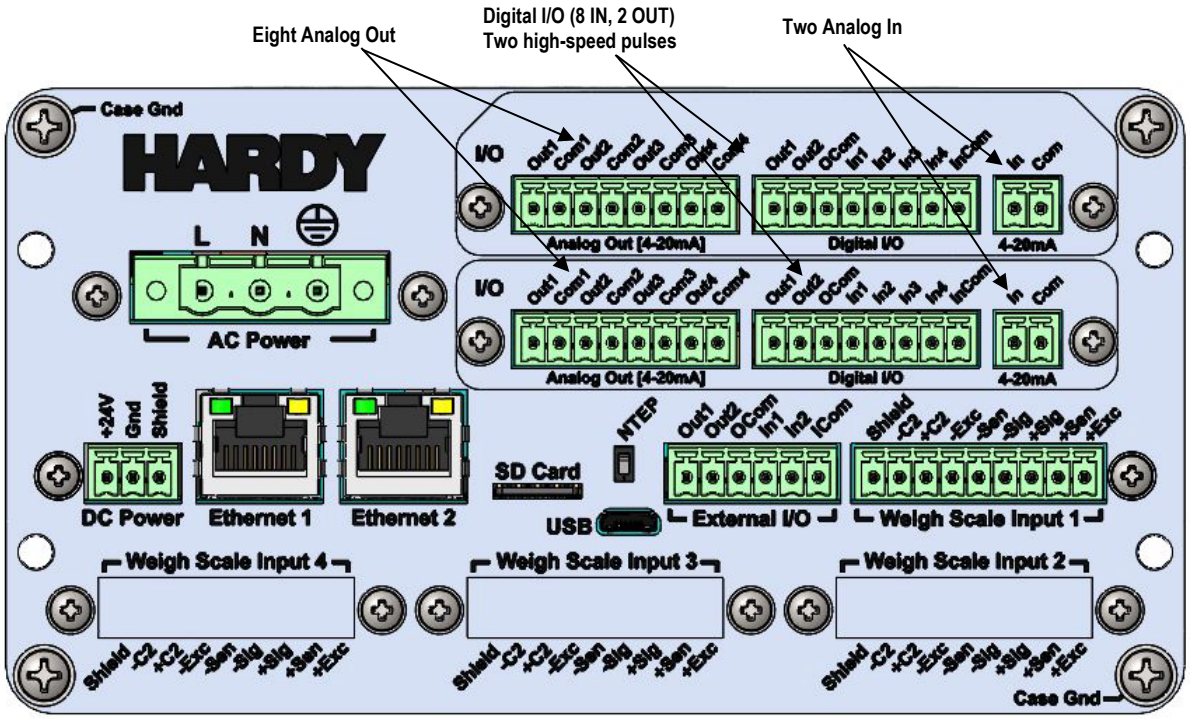


Figure 3-10. HI6850 with Two Optional I/O Card Terminal Blocks

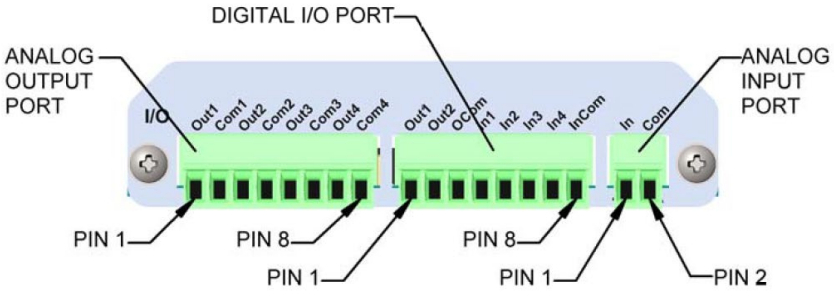


Table 3-7. Pin Numbering on the Optional I/O Card Terminal Block

Table 3-8. Pin Numbering on the Analog Output Port

Pin	Signal Name	Properties
1	ANALOG OUT 1	DC 4-20 mA , Load resistance <= 350 Ohm
2	ANALOG OUT 1 COMMON	Common 1
3	ANALOG OUT 2	DC 4-20 mA , Load resistance <= 350 Ohm
4	ANALOG OUT 2 COMMON	Common 2
5	ANALOG OUT 3	DC 4-20 mA , Load resistance <= 350 Ohm
6	ANALOG OUT 3 COMMON	Common 3
7	ANALOG OUT 4	DC 4-20 mA , Load resistance <= 350 Ohm
8	ANALOG OUT 4 COMMON	Common 4

Table 3-9. Pin Numbering on the Digital Input/Output Port

Pin	Signal Name	Properties
1	DIGITAL OUT 1	Sourcing 0-32VDC @300mA
2	DIGITAL OUT 2	Sourcing 0-32VDC @300mA
3	Load voltage input for Out1 & Out2	0-32VDC @300mA
4	DIGITAL IN 1	Sinking 0-24 VDC
5	DIGITAL IN 2	Sinking 0-24 VDC
6	DIGITAL IN 3	Sinking 0-24 VDC
7	DIGITAL IN 4	Sinking 0-24 VDC
8	DIGITAL IN COMMON	Field-side Ground (In1 & In2)

Table 3-10. Pin Numbering on the Analog Input Port

Pin	Signal Name	Properties
1	4-20MA INPUT	5-32VDC input range
2	COMMON	4-20mA input return (GND)

3.5.3 Relay Card

The Model H6850 supports up to two optional relay cards. Each block provides 8 pins for four DC relay connections, eight total per option card:

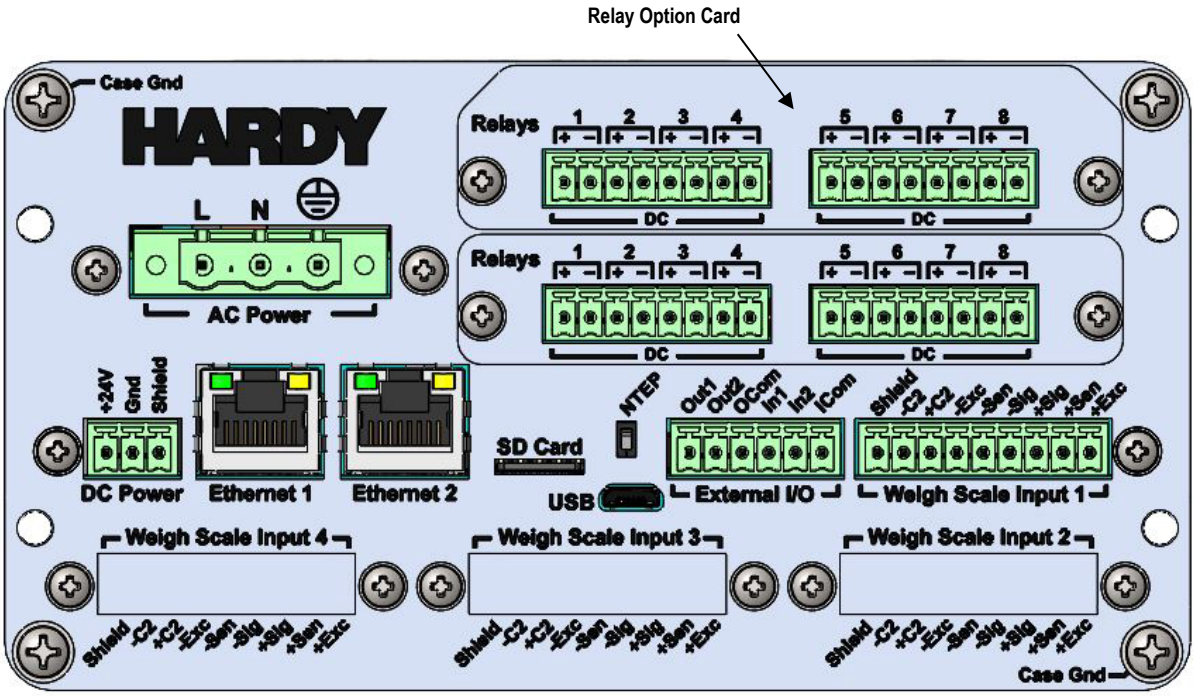


Figure 3-11. HI6850 with Two Relay Option Cards

Figure 3-12 shows the pin numbering on the relay card interface. Table 3-11 lists the signal names.

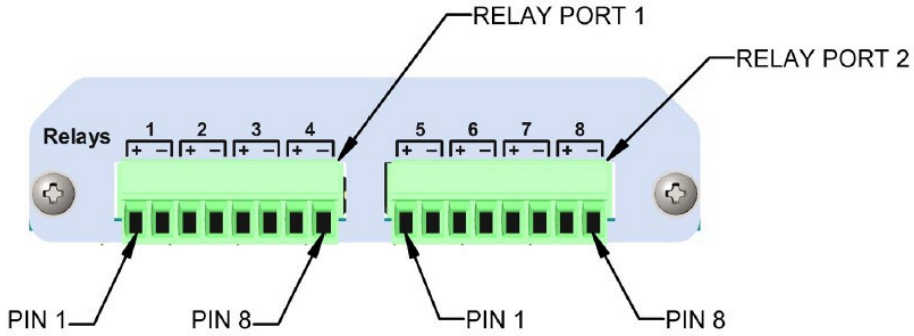


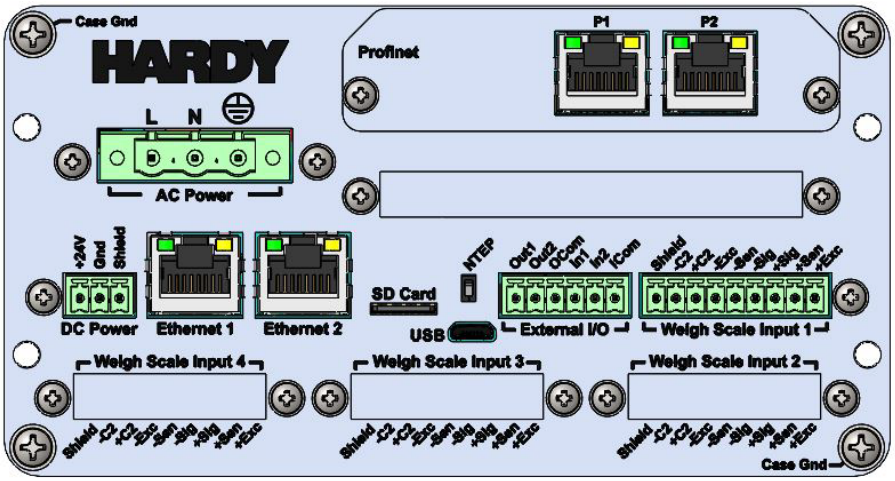
Figure 3-12. Pin Numbering on the Relay Card Terminal Block

Table 3-11. Pin Numbering on the Relay Card Terminal Block (DC Relay Port)

Pin	Signal Name	Properties
1	Line 1	NO, 5-30 VDC, 1A
2	Common 1	Line 1 return (Gnd)
3	Line 2	NO, 5-30 VDC, 1A
4	Common 2	Line 1 return (Gnd)
5	Line 3	NO, 5-30 VDC, 1A
6	Common 3	Line 1 return (Gnd)
7	Line 4	NO, 5-30 VDC, 1A
8	Common 4	Line 1 return (Gnd)

3.5.4 PROFINET Card

Model H6850 Application Controller supports up to one PROFINET interface card. This card must reside in the top option slot. See section **Error! Reference source not found.** for information about configuring the controller for PROFINET communications.



4 COMMISSIONING

- *Connections (page 54)*
- *Powering on the HI6800 Series Application Controller (page 55)*

This chapter describes how to commission the HI6800 Series Application Controllers.

4.1 Connections

Verify the mechanical installation by checking that all fasteners (nuts, washers, and keepers) are in place and tight according to specifications identified in Chapter 3.

When a display is used, pay close attention to the interface between the display bezel and the panel to which it is mounted – NO GAP should be visible and gasket should be completely compressed.

Make all connections to Model HI6800 or Model HI6850 Application controller, including power (AC or DC), weight scale input(s), Ethernet and any option cards that may be utilized.

Check all connections before power-up by gently pulling on the leads to ensure there are no loose wires.

4.2 Powering on the HI6800 Series Application Controller

The HI6800 Series Application Controllers come with a 24-VDC power supply. An optional 90-240 VAC power supply is available. The controller will power on as soon as it is connected to the appropriate power source. There is no ON/OFF switch that control power to the application controller.

Warning: Do not connect AC and DC power at the same time.

4.2.1 DC Input Power

Use a power-limited 12-27 VDC power supply (Class 2) on the DC input wiring.

DC power should be supplied by a clean primary line **directly** from the DC power source.

Warning: Do not operate with incorrect line voltage because it will damage the equipment and/or cause personal injury. Make sure the power source does not exceed 24 VDC. Do not reverse the ground and hot wires because it can damage the equipment.

5. Make sure the VDC power source is shut off before installing the wires to the connector.
6. Connect the 24-VDC voltage wire and shield wire to the connector that plugs into the DC power terminal block at the rear panel.
7. Apply VDC power to the unit.

4.2.2 AC Input Power (Optional)

The optional AC power input is rated from 100 to 240 VAC. Use a clean primary AC power line directly from the power panel. This line should be supplied with a maximum 20-amp breaker and should not supply any other equipment.

Be sure the VAC power source is shut off before connecting the wires to the terminal block. Install a 3-wire, minimum 14 AWG power line to the 3-pin terminal block connector. Using copper wiring is recommended. Consult local rules and electrical codes.

5 CONFIGURATION

Topics:

- *Accessing Configuration Parameters (page 57)*
- *Understanding the Home Screen (page 62)*
- *Understanding the Operation Menu (page 64)*
- *Initial Configuration (page 65)*
- *Configuring Setup Parameters (page 66)*
- *Calibrating the System (page 75)*
- *Option Parameters (page 79)*
- *Metrology (page 79)*
- *Running IT Tests (page 80)*
- *Option Card Setup (page 82)*

This chapter describes the ways to configure the HI6800 Series Application Controllers. It also describes the parameters that can be set.

5.1 Accessing Configuration Parameters

There are several ways to configure HI6800 Series Application Controllers:

- Using the touchscreen (see section 5.1.1)
- Using an Ethernet network connection and embedded webserver (see section 5.1.2)
- Using a direct connection to a PLC, PAC, or DCS control system (see section 5.1.3)

5.1.1 Using the Touchscreen

The touchscreen interface provides quick and simple operation by directly touching the menu items and parameter with a finger. Touch the screen with a finger or blunt object only. Using sharp objects, such as a screwdriver, can harm the touchscreen.

Accessing set-up with a 4.3-inch display:

- Press the MODE button until SETUP appears on the touchscreen.
  - Typical MODE button cycle: Gross / Net / Setup / Gross
- Press the SETUP button on the touchscreen to enter Parameters.
  - Access additional parameter pages by swiping left or right using the touchscreen.



Figure 5-1. Accessing the Set-up Parameters with a 4.3-inch Display

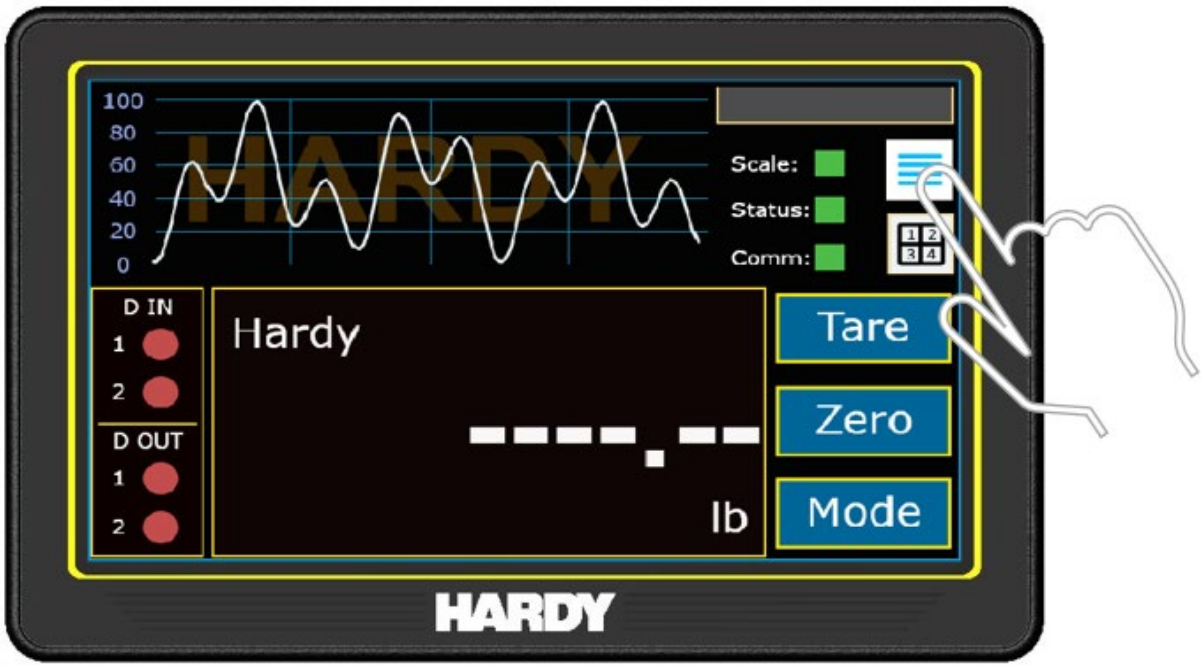


Figure 5-2. Accessing the Set-up Parameters with a 7-inch Display

If the display is not being used, access the embedded Webserver using the default IP address **192.168.0.100** and any browser following the steps for a LAN or Direct Connection below. Parameters can also be accessed and set via a PLC.

5.1.2 Using an Ethernet Connection

The HM6800 Application Controller has an embedded webserver that allows configuration of parameters using a standard web browser. Connection can be made either directly to a PC or through an Ethernet network via a router or switch.

The rear panel of the application controller has two 10/100 BASE-T Ethernet ports for linking to any Windows personal computer. Once connected, Hardy firmware updates can be monitored, controlled, configured, or downloaded. The browser also provides links to the Hardy website, where additional services and support can be found.

To establish a working connection, both sides of the link require their IP addresses to be configured.

8. Use a standard Ethernet cable with RJ-45 connectors at each end to connect the HI6800 Application Controller to a PC, router, or switch. A crossover cable is not required.
9. Find the application controller's fixed IP address:

   a. With the application controller turned on, navigate to the **Communication** menu under **Setup**.

b. Under **Manual IP assignment**, note the fixed IP address, netmask, and gateway shown.

10. Configure a PC to use the same IP address as the application controller. The following steps describe how to do this on Windows 10 and Windows 7. For other operating systems, refer to the instructions found on the Internet:

a. In Windows 7, go to **Start > Control Panel > Network and Sharing Center** and click **Local Area Connection**.

b. In Windows 10, click **Start > Settings > Control Panel > Network and Internet > Network and Sharing Center > Change adapter settings**.

c. In the list of network connections that opens, select the LAN connection being used to connect to the application controller. Double-click the connection.

d. In the next window, click the **Properties** button.

e. Select **IP version 4 (TCP/IPv4)** and click **Properties**. In the Protocol Properties window, select **Use the following IP address**.

f. In the **IP address** field, enter the same first 3 octets from the application controller, but change the last octet by 1 number. For example, if the fixed IP address for the application controller is 192.168.0.100, enter 192.168.0.101 in the **IP address** field.

g. In the **Subnet mask** field, type 255.255.255.0.

h. Back out by clicking **OK** or **HOME** all the way back.

11. Open a browser on the PC.

12. In the address bar at the top of the browser, enter the application controller's fixed IP address (for example, 192.168.0.100) and press Enter. The application controller Home screen appears in the browser.

5.1.3 Using a Direction Connection to a PLC, PAC, or DCS

To connect the HI6800 Application Controller to a control network, connect a standard Ethernet cable between the instrument and the control network hub; then determine the scheme used on the network to assign IP addresses. Every node on the network must have a unique IP address to avoid conflicts. Contact your Network Administrator for the IP address to use for the application controller.

The IP address can be set manually (fixed IP), or it can be set automatically by a network service called DHCP. If a fixed IP addresses must be used, see section 5.1.3.2. For automatic (DHCP) IP address assignment, perform the following procedure.

5.1.3.1 DHCP Configuration Using the Front Panel

Use the following procedure to prepare the application controller to use a DHCP configuration. DHCP works only if a DHCP server is installed on the network.

1. With the application controller turned on and the Home screen displayed on the front panel, press the hamburger menu at the top right of the Home screen.
2. With the Operation Menu displayed, touch **Communication** under **Setup**.
3. Under **Auto IP assignment**, touch **ON** next to **DHCP**.
4. If required, enter a DNS server address in the **DNS** field.
5. Touch the disk icon at the top right to save the settings.

5.1.3.2 Fixed IP Configuration Using the Front Panel

The HM6800 Application Controller can be configured to use any fixed IP address. Fixed IP addresses must be carefully selected to avoid accidentally configuring two devices with the same address. Consult with the network administrator to obtain the fixed IP address to use, and then perform the following procedure.

1. With the application controller turned on and the Home screen displayed on the front panel, press the menu icon at the top right of the Home screen. 
2. With the Operation Menu displayed, touch **Communication** under **Setup**.
3. Under **Manual IP assignment**, enter the fixed IP address, netmask, and gateway in the appropriate fields.
4. Touch the disk icon at the top right to save the settings.

5.1.4 Using a Direct Connection

This configuration method allows the application controller to be configured using an 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.

To establish a working connection, both sides of the link require their IP addresses to be configured.

1. Use a standard Ethernet cable with RJ-45 connectors at each end to connect the HM6800 Application Controller to a PC. A crossover cable is not required.
2. Find the application controller's fixed IP address:
   a. With the application controller turned on and the Home screen displayed on the front panel, press the menu icon at the top right of the Home screen.
   b. With the Operation Menu displayed, touch **Communication** under **Setup**.
   c. Under **Manual IP assignment**, note the fixed IP address, netmask, and gateway shown.

3. Configure the PC to use the same IP address as the application controller. The following steps describe how to do this on Windows 10 and Windows 7. For other operating systems, refer to the instructions found on the Internet:

   a. In Windows 7, go to **Start > Control Panel > Network and Sharing Center** and click **Local Area Connection**.

   b. In Windows 10, click **Start > Settings > Control Panel > Network and Internet > Network and Sharing Center > Change adapter settings**.

   c. In the opened list of network connections, select the correct LAN connection used to connect to the application controller. Double-click the connection.

   d. In the next window, click the **Properties** button.

   e. Select **IP version 4 (TCP/IPv4)** and click **Properties**. In the Protocol Properties window, select **Use the following IP address**.

   f. In the **IP address** field, enter the same first 3 octets from the application controller, but change the last octet by 1 number. For example, if the fixed IP address for the application controller is 192.168.0.100, enter 192.168.0.101, in the **IP address** field.

   g. In the **Subnet mask** field, type 255.255.255.0.

   h. Back out by clicking **OK** all the way back.

4. Open a browser on the PC.

5. In the address bar at the top of the browser, enter the application controller's fixed IP address (example 192.168.0.100) and press Enter. The application controller Home screen appears in the browser.

5.2 Understanding the Home Screen

All configuration activities start from the Home screen. The Home screen appears when the HI6800 Series Application Controller receives power. Figure 5-3 shows Home screen and Table 5-1 describes the key areas.

Note: Most parameters are the same for Models HI6800 and HI6850. However, certain specific applications such as checkweighing, batching, or rate control will have additional parameters available only on the Model HI6850.

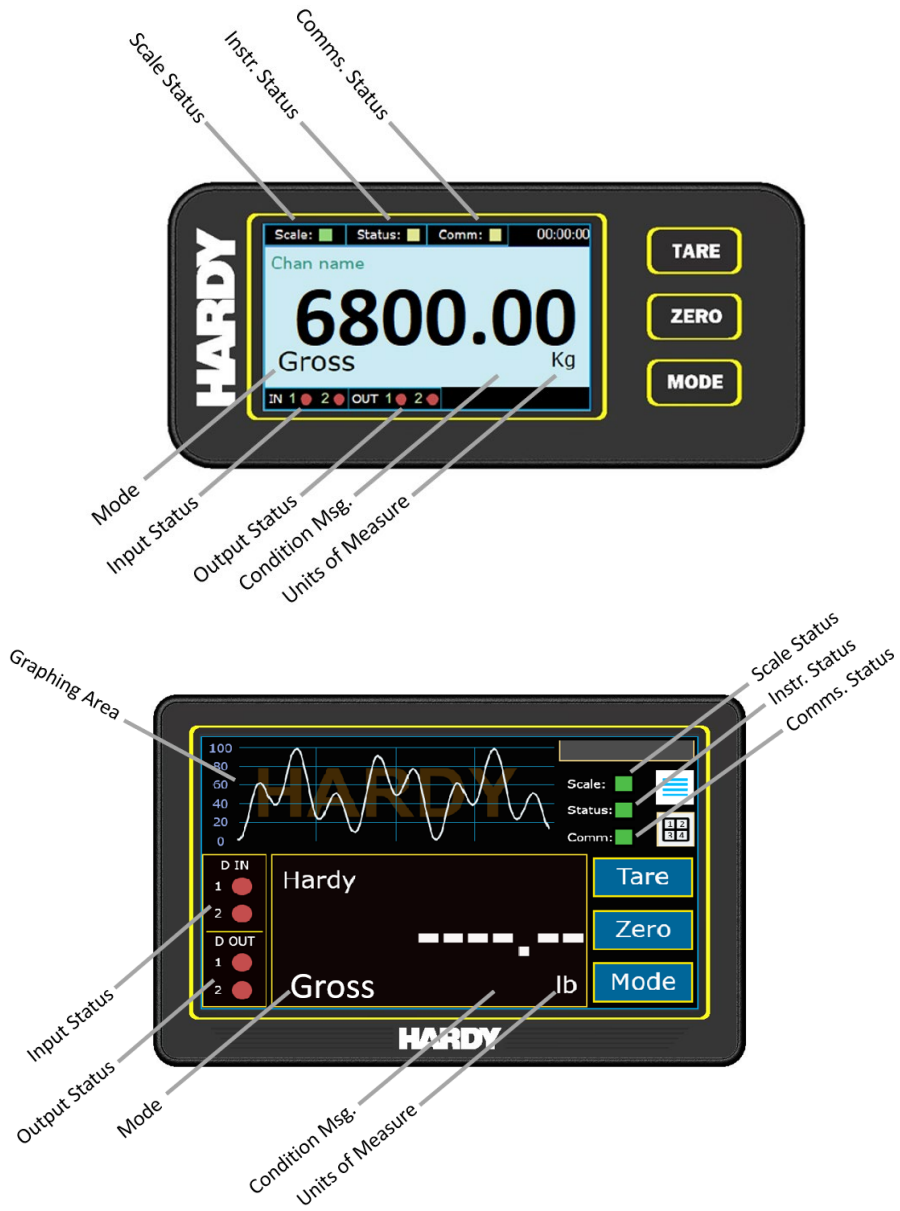


Figure 5-3. Home Screen

Table 5-1. Key Areas of the Home Screen

Item	Description
Scale Status	Whole scale system – instrument, sensor(s), junction box (as applicable). ADC error, overrange, no sensor(s) detected = flashing or steady red
Instr. Status	Instrument faults = yellow, flashing or steady red
Comms. Status	Connection detected = green. No connection detected = red
Mode	Gross, Net, Count, Set-up
Input Status	Digital Input state. High = green, low = red
Output Status	Digital Output state. Latched = green, unlatched = red
Condition Msg.	In motion, center of zero, etc.
Units of Measure	Lbs, Kg, etc.
Graphing Area	Rises and falls as items and loaded onto or removed from the scale.
Mode	Shows whether weights are displayed as gross or net values.
Tare, Zero, and Mode buttons	• Tare = press to set the net (or tare) weight value. • Zero = press to set the gross weight to zero. • Mode = press to toggle the displayed weight between gross and net.

5.3 Understanding the Operation Menu

The HI6800 Series Application Controller parameters are organized into the categories on the Operation Menu. Each screen has a disk and menu icons at the top right of the screen and an information icon at the top left that shows online help for the displayed screen.

- After configuring one or more parameters on a screen, press the disk icon to apply and save the parameters.
- Press the menu icon to return to the Operation Menu. 

Table 5-2. Parameter Categories on the Operation Menu

Category	Description	See Section
Setup	**Parameter**: configures the weight measure unit, graduation size, decimal point load cell capacity, motion tolerance, and instrument and operator IDs.	5.5.1
	Filter: configures the WAVESAVER frequency and number of averages, and WAVESAVER+ variation and motion thresholds.	5.5.2
	Tare/Zero: configures the auto-zero function, zero and auto zero tolerances, and tare weight.	5.5.3
	Communication: configures the network IP address for the application controller connected to the network.	5.5.4
	Security: enables passwords to protect unauthorized access to certain screens.	5.5.5
	Display: configures the display brightness to fit you and your environment, and select which home screens you want to cycle through.	5.5.6
Calibration	**C2 Calibration**: calibrates the scale without using a test weight.	5.6.1
	Traditional Cal: calibrates the scale using two test weights	5.6.2
	Multipoint Cal: calibrates the scale using three-to-five test weights, providing the most accurate method for a non-linear calibration.	5.6.3
Option	**Digital I/O**: shows the baseboard digital input/output.	5.7.1
	Metrology: configures approval options and warmup delay time to meet certification standards.	5.8
	Option Card Setup: configures specific option cards available to the system.	5.10
Diagnostics	**IT Test**: troubleshoots and diagnoses your weighing system.	5.9
App	Configures specific applications for the option cards available to the system.	??
System Info	Shows the hardware information about the application controller, and display, and installed option boards. Swipe horizontally to view wiring diagrams.	—
Manual	Displays an online version of the user manual.	—

5.4 Initial Configuration

When the HI6800 Series Application Controller is received for the first time, we recommend performing the following initial configuration.

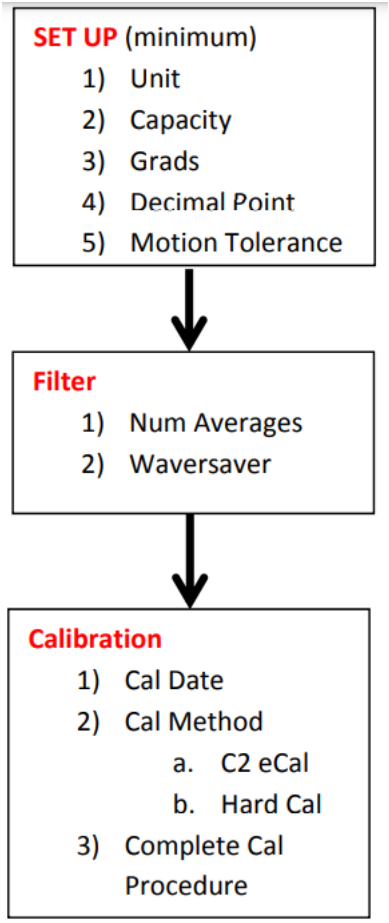


Figure 5-4. Initial Configuration

5.5 Configuring Setup Parameters

5.5.1 Configuring Parameters

Path: **Home screen > Setup > Parameter**

The Parameter screen configures the weight measure unit, graduation size, decimal point load cell capacity, motion tolerance, and instrument and operator IDs.

Parameter	Description
Tare	The value you enter allows you to avoid pushing the Tare button each time you weigh something. Range: .000001 - 999999 Default: 0.0
Zero	Weight unit limit from zero that the application controller accepts as gross zero during the zeroing function (when you push the Zero button). Range: .000001 – 999999 Default: 10.0
Mode	Weight source to use as the set point input. Range: Net, Gross Default: Gross
Capacity	Scale's nominal operating capacity (the total weight capacity of the scale system). If this value is exceeded by eight graduations when configured using one of the certified modes, dashes appear on the front display to show that the certified scale limit has been exceeded. Range: .000001 - 999999 Default: 999999
Motion Tolerance	Amount of deviation to allow for your process. This value must be greater than or equal to the Graduation Sizes. To calculate the base motion number, use the following formula: Base Motion Number = (Total Load Cell Capacity x 0.0003). Motion Tolerance must be greater than or equal to the Graduation Sizes. We recommend three graduation sizes. Range: .000001 – 999999 Default: 10
Instrument ID	Unique identification for the application controller. The ID appears at the top left of the screen. Range: 16 alphanumeric characters
Operator ID	ID of the user who is going to operate or service the application controller. Enter any combination of letters and numbers that adequately identifies the user. Range: 4 alphanumeric characters

Parameter	Description
Unit	Sets the scale to either English or Metric units. The selections are: • oz (ounces) • lb (pounds). (*default*) • ton (short ton) • g (grams) • kg (kilograms) • t (metric ton)
Grads	Graduation size. Minimum increment displayed by the application controller. To calculate the base graduation number, divide the Total Load Cell Capacity by 10,000. For example, with two decimal points selected, the graduation size 10 displays increments of .10 engineering units and the graduation size 50 shows increments of .50 engineering units. For a scale with 10,000 capacity, graduation size = 1 Range: 1, 2, 5,10, 20, 50, 10, 200, 500, 1000 Default: 1
Decimal Point	Location of the decimal point for weight resolution. The higher the number, the farther to the left the decimal point moves and the higher the resolution of the scale. Setting more decimal points does affect the overall accuracy of the application controller. Adding decimal points will not improve a system accuracy beyond the specified ability of the load cell. Ranger: 0 - 5 Default: 2

5.5.2 Configuring Filters

Path: **Home screen > Setup > Filter**

Mechanical noise, such as noise from other machinery in a plant environment, can be present in forces larger than the weight forces being measured. The Filter screen configures WAVERSAVER® and WAVERSAVER+ settings to eliminate the effects of vibratory forces present in all dynamic and static industrial weight control and measurement applications. By factoring out nearly all of the ambient vibratory forces, the HI6800 Series Application Controller can separate out the actual weight data from background noise caused by vibration.

5.5.2.1 WAVERSAVER®

Use the Filter screen to configure WAVERSAVER® to ignore noise with frequencies as low as 0.25 Hz. One of eight higher additional cut off frequencies can be selected to provide a faster instrument response time. The default factory setting is 1Hz vibration frequency immunity.

To determine which WAVERSAVER® setting is right for your application, use the rough guideline that the less vibration to which your scale is exposed, the faster the weighing time.

To reduce the effects of low:

- Amplitude high frequency vibrations, use WAVERSAVER® settings OFF, 7.5 Hz, 3.5 Hz, 1.0 Hz. 0.5 Hz, 0.25Hz
- High amplitude low frequency vibrations, use WAVERSAVER® settings 0.5Hz or 0.25Hz.

The WAVERSAVER® calculation speed is independent of the sample rate.

The approximate timing for WAVERSAVER® calculations are as follows:

- 3.5 Hz = 120 ms
- 7.5 Hz = 60 ms
- 0.5 Hz = 1 seconds
- 1 Hz = 500 ms
- WAVERSAVER OFF = 0 seconds.
- 0.25 Hz = 2 seconds (available at 110 updates per second)

After a change on the scale, the total time to finalize a new weight reading is the WAVERSAVER® plus the Number of Averages. Calculate the amount of time your product will be fully on the scale, and then adjust the Number of Averages setting to add up to less than that time period.

5.5.2.2 WAVERSAVER+

WAVERSAVER+ is a superset of WAVERSAVER® that uses two additional parameters, **Variation Threshold** and **Motion Threshold**, to configure an adaptive-filtering algorithm that significantly improves the stability and accuracy of the weight reading.

Filter Parameters

Parameter	Description
WAVERSAVER	
Preset Cutoff Frequency	Preset frequency and number of averages for easy and quick filter setup. Range: OFF, Fast, Balanced, Stable, Custom Default: Balanced
Custom Cutoff Frequency	Sets a frequency from the list. Range: .25Hz, .5Hz, 1Hz, 3.5Hz, 5Hz, 7.5Hz Default: 1Hz
NUM AVERAGES	If Preset Frequency is set to Custom, enter the desired value. The value you enter sets the number of weight readings used to compute a sliding average of displayed weight. This setting is to aid in ignoring the effects of material impact and/or vibration. For applications requiring very quick weight readings, reduce this setting to its minimum. If the weight is unstable, increase the averages. Do not set the number of Number of Average to exceed the WAVERSAVER® timing. With a WAVERSAVER=7.5hz (60ms) and SPS speed selection of 250sps, this instance would suggest a limit of 60 ms or 15 averages (4ms each). A SPS setting of 110sps provides a 10ms sample rate. Vigorous vibration and impacting require a lower frequency WAVERSAVER® setting or increased Number of Average. Therefore, if you decrease the WAVERSAVER® setting, reduce the Number of Average accordingly. Range: 1 - 255 Default: 10

WAVERSAVER+	
Variation Threshold	These two parameters allow you to manually add a patent-pending adaptive filtering algorithm to the WAVERSAVER® output that provides stability to weight readings of up to 1:30,000. To configure WAVERSAVER+, set the WAVERSAVER® and Number of Averages parameters to establish the speed and required accuracy for dynamic weighing. Set Variation Threshold to 0.0 and observe the peak-to-peak variation of the weight value. Then set Variation Threshold to 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 Threshold to 9 (1.5X) and the Motion Threshold to 2 (1/3X). The weight changes will settle to a 2-increment level. For weight changes smaller than 1:40,000, consider environmental protections from air-movement forces and additional WAVERSAVER® and Number of Averages settings. Default: 0.00 (turns off WAVERSAVER+)
Motion Threshold	
Get it automatically	
Variation	These two parameters allow you to get the desired variation and motion threshold automatically.
Motion	

5.5.3 Setting Tare/Zero Values

Path: **Home screen > Operation Menu > Setup > Tare/Zero**

The Tare/Zero screen configures the auto-zero function, zero and auto zero tolerances, and tare weight.

Parameter	Description
Tare	The value you enter allows you to avoid pushing the Tare button each time you weigh something. Range: .000001 - 999999 Default: 0.0
Zero	Weight unit limit from zero that the application controller accepts as gross zero during the zeroing function (when you push the Zero button). Range: .000001 – 999999 Default: 10.0
Mode	Weight source to use as the set-point input. Range: Net, Gross Default: Gross
Auto Zero Settings	
Auto Zero	Automates the zeroing function by setting the gross weight units to zero, using the current gross zero for reference. When set to ON, and the motion is within tolerance and the value is within the Auto Zero tolerance value, the application controller is automatically zeroed every few seconds until you turn off Auto Zero. This does not override the Zero button. You can still press the Zero button to zero at any time; however, Auto Zero is useful in applications where you zero a scale often and do not want to push the Zero button each time. Range: ON, OFF Default: OFF
Auto Zero Tolerance	Used by the Auto Zero tracking feature. Set this parameter smaller than the Zero Tolerance parameter. If this value is exceeded, you can press the ZERO button and use its tolerance level. This resets the Auto Zero Tolerance and allows Auto Zero to resume. Range: .000001 – 999999 Default 10.0
Tare Settings	
Tare Weight	The value you enter here allows you to avoid pushing the Tare button each time you weigh something. Range: .000001 – 999999 Default 0.00
Motion Threshold	??
Zero Settings	
Zero Tolerance	Sets the weight unit limit from zero the application controller will accept as gross zero during the zeroing function (when you push the Zero button). Range: .000001 – 999999 Default 10.0

Parameter	Description
Zero Amount	Read-only field.

5.5.4 Configuring Communication Parameters

Path: **Home screen > Operation Menu > Setup > Communication**

The Communication Setup screen configures the network IP address for the application controller connected to the network along with the Hardy port.

Parameter	Description
Auto IP Assignment	
DHCP	Turns DHCP ON or OFF at the application controller. Range: ON, OFF Default: OFF
Dyn IP	Read-only field that shows the application controller's IP addresses obtained from the DHCP server.
DNS	IP address of the DNS server that the application controller will use.
User Datagram Protocol	
Hardy Port	If you use the Hardy port, enter the Hardy port number.
Manual IP Assignment	
Fixed IP	If DHCP is OFF, enter the fixed (static) IP address that the application controller will use.
Net Mask	If DHCP is OFF, enter the subnet mask that the application controller will use.
Gateway	If DHCP is OFF, enter the gateway that the application controller will use.

5.5.5 Configuring Security

Path: **Home screen > Operation Menu > Setup > Security**

The Security Setup screen configures settings for the application controller. The security system is organized into two levels:

- Level 1 security protects the Tare, Zero, and Mode buttons on the Home screen.
- Level 2 security protects certain menu items.

To gain access to protected buttons or menu items, you must enter a password, which you also define on the Security Setup screen.

Parameter	Description
Level 1	Enables or disables security for the Tare, Zero, and Mode buttons on the Home screen by pressing the corresponding icon. • Lock icon = security is enabled for the button. • Unlocked icon = security is not enabled for the button.
Level 2	Enables or disables security for certain menu items by pressing the corresponding icon. • Lock icon = security is enabled for the button. • Unlocked icon = security is not enabled for the button.
Set/Change for selected level	
Level 1	Enables or disables level 1 security by pressing this icon.
Level 2	Enables or disables level 2 security by pressing this icon.
Change Password	Press to set or change the password, enter a 4-digit password, and press DONE.

5.5.6 Configuring Display Settings

Path: **Home screen > Operation Menu > Setup > Display**

The Display Settings screen configures the display brightness to fit you and your environment, and then select which home screens you want to cycle through.

Parameter	Description
Startup Home Screen	Sets Home screens you want to add to the Home screen list, so you can cycle through the Home screens by pushing the cycle button. Range: Single Channel Display, Multi-Channel Display, App-Specific Display Default: Single Channel Display
Screen Brightness Adjustment	Sets the brightness of the screen. 1 is the darkest and 100 is the brightest. Range: 1 - 100 Default: 55

5.6 Calibrating the System

The HI6800 Series Application Controller must be calibrated upon installation. For more information about calibration and other system setup parameters, see section 5.3.

Note: Retail scales, used in legal or trade applications, must be verified and sealed by an approved agency per the metrological directives. Please contact Hardy Field Service with any questions.

5.6.1 Performing C2 Calibration

Path: **Home screen > Operation Menu > Calibration > C2 Calibration**

C2 calibration calibrates a scale system electronically without using certified test weights. It uses up to eight load sensors, a junction box, interconnect cable, and an instrument with C2 capabilities, such as the HI6800 Series Application Controller. Digital information within an HI C2-certified load sensor details its unique performance characteristics. The HI6800 Series Application Controller reads the performance characteristics of each load sensor and detects the number of load sensors in the system.

Parameter	Description
Tare	The value you enter allows you to avoid pushing the Tare button each time you weigh something. Range: .000001 - 999999 Default: 0.0
Zero	Weight unit limit from zero that the application controller accepts as gross zero during the zeroing function (when you push the Zero button). Range: .000001 – 999999 Default: 10.0
Mode	Weight source to use as the set point input. Range: Net, Gross Default: Gross
Calibration Date	Date when the calibration is performed.
Num Device	Read-only screen that shows the number of devices participating in the calibration.

Parameter	Description
Gravity	Objects weigh about 0.5% less at the equator than they weigh at each pole because the force of gravity is less at the equator than at the poles. For example, an object weighing 100 pounds at the North Pole on a spring scale would weigh 99.65 pounds at the Equator. Depending on the latitude of your location, your scales measure somewhere in between. Table 5-3 shows the gravitation correction factor for various cities around the world. In general, if your location is between the 45th parallel and the equator, gravity correction is greater than 1.0. For example, at these latitudes, because the gravity is less, you are adding, 1.0006 for an error that is .06%). For locations between the 45th parallel and the North or South Pole your correction factor will be less than 1.0. For example .9994 for an error that is -.06%
Ref Weight	Total live load that is currently on the scale. The calibration process uses a reference weight, which is normally zero (no weight on the scale) but can be any known weight on the scale. With nothing on the scale, the Reference Weight is 0.00. With 5 lbs on the scale, the Reference Weight is 5.00 lbs.
C2 Cal	Press Do C2 Cal to perform the calibration. Wait a few seconds and the results appear. One of the following messages appears briefly: • Cal Completed OK = calibration was successful. • Security Violation = you lack the security level required to perform a calibration. • Cal Failed = calibration failed. This message is accompanied by an error message. For corrective actions, see Chapter 8.

Table 5-3. Gravitation Correction Factor for Cities Around the World

City	Grav. Accel	City	Grav. Accel	City	Grav. Accel
Amsterdam	0.999369	Istanbul	1.000406	Paris	0.999048
Athens	1.000684	Havana	1.001872	Rio de Janeiro	1.001884
Auckland NZ	1.000782	Helsinki	1.001405	Rome	1.000326
Bangkok	1.002392	Kuwait	1.001405	San Francisco	1.000702
Brussels	0.999503	Lisbon	1.000615	Singapore	1.00269
Buenos Aires	1.001004	London	0.999445	Stockholm	0.99877
Calcutta	1.00191	Los Angeles	1.001028	Sydney	1.00104
Cape Town	1.00104	Madrid	1.000461	Taipei	1.001741
Chicago	0.99922	Manila	1.000461	Tokyo	1.000886
Copenhagen	0.999075	Mexico City	1.002102	Vancouver BC	0.999653
Nicosia	1.00093	New York	1.000433	Washington DC	1.000601
Jakarta	1.002631	Oslo	0.998726	Wellington NZ	0.999399
Frankfurt	0.999579	Ottawa	1.000007	Zurich	0.999821

5.6.2 Performing Traditional Calibration

Path: **Home screen > Operation Menu > Calibration > Traditional Calibration**

Traditional calibration uses test weights. We recommend that the span totals 80 to 100% of the scale live load capacity and the weights be distributed uniformly on/in the scale. Traditional calibration requires a zero point and the physical placement of test weights on the scale. To set the Zero value if all “live load” weight is removed from the scale, the Zero value should be 0.00. If any weight is on the scale when setting this value, the weight must be equal to the amount of load on the scale.

Parameter	Description
Tare	The value you enter allows you to avoid pushing the Tare button each time you weigh something. Range: .000001 - 999999 Default: 0.0
Zero	Weight unit limit from zero that the application controller accepts as gross zero during the zeroing function (when you push the Zero button). Range: .000001 – 999999 Default: 10.0
Mode	Weight source to use as the set point input. Range: Net, Gross Default: Gross
Calibration Date	Date when the calibration is performed.
Ref Weight	Set the reference weight equal to the weight on the scale. Normally, you would remove all weight “live load” from the Scale to obtain a Ref Weight of 0.0. Wait 12 seconds or more for the reading to stabilize. Press Do Cal Low to conduct the Cal Low calibration. If the calibration succeeds, the message Cal Completed OK appears briefly; otherwise, an error message appears. For corrective actions, see Chapter 8.
Span Weight	Place a certified test weight on the scale. Use this field to select a value and press Do Cal High to conduct the Cal High calibration. If the calibration succeeds, the message Cal Completed OK appears briefly; otherwise, an error message appears. For corrective actions, see Chapter 8.

5.6.3 Performing MultiPoint Calibration

Path: **Home screen > Operation Menu > Calibration > MultiPoint Cal**

MultiPoint calibration lets you calibrate using three, four, or five points. Compared to a two-point calibration, a multipoint calibration allows you to calibrate non-linearity significantly more accurately.

To achieve the best possible accuracy, multipoint calibration should cover the entire range of the desired measurement values (from zero to the highest possible value). Perform each calibration step by step starting at Cal Point 1 and then going to the next point weight (Cal Point 2) and then Cal Point 3 until you reach your last selected point. The system will be calibrated with multiple points, providing the most accurate method for non-linear calibration.

Parameter	Description
Tare	The value you enter allows you to avoid pushing the Tare button each time you weigh something. Range: .000001 - 999999 Default: 0.0
Zero	Weight unit limit from zero that the application controller accepts as gross zero during the zeroing function (when you push the Zero button). Range: .000001 – 999999 Default: 10.0
Mode	Weight source to use as the set point input. Range: Net, Gross Default: Gross
Calibration Date	Date when the calibration is performed.
Num of Points	Number of Cal Points necessary to accommodate for non-linearity that cannot be mechanically corrected in the system. Users you previously performed a calibration or set the span weight value using traditional or C2 calibration, will see that value populated as the highest number of Cal Points selected.
Point 1 Wt	Set the Cal Point 1 value necessary to accommodate for non-linearity that cannot be mechanically corrected in the system. Press Do Point 1 Cal to conduct the calibration. If the calibration succeeds, the message Cal Completed OK appears briefly; otherwise, an error message appears. For corrective actions, see Chapter 8.
Point 2 Wt	Set the Cal Point 2 value necessary to accommodate for non-linearity that cannot be mechanically corrected in the system. Press Do Point 2 Cal to conduct the calibration. If the calibration succeeds, the message Cal Completed OK appears briefly; otherwise, an error message appears. For corrective actions, see Chapter 8.
Point 3 Wt	Set the Cal Point 3 value necessary to accommodate for non-linearity that cannot be mechanically corrected in the system. Press Do Point 3 Cal to conduct the calibration. If the calibration succeeds, the message Cal Completed OK appears briefly; otherwise, an error message appears. For corrective actions, see Chapter 8.

5.7 Option Parameters

5.7.1 Configuring Digital I/O States

Path: **Home screen > Operation Menu > Option > Digital I/O**

The Digital I/O screen shows the state of the digital input/output on the main board. It also allows you to flip the state of the digital outputs.

Parameter	Description
Base Board Digital Input Output	
Input For Display Only	Read-only LEDs that show the following status indications for the main board's two digital inputs: • 1 or 2 is green = the input is sending a voltage signal to that input. • 1 or 2 is red = there is no voltage signal for that input.
Output Control	Shows the states of the digital outputs. Press the 1 and/or 2 circles to toggle the output between 1 (green) and 0 (red) for digital output. Press the disk icon to send the state(s) to the application controller.

5.8 Metrology

Path: **Home screen > Operation Menu > Option> Metrology**

The Metrology screen configures approval options and warmup delay time to meet certification standards.

Parameter	Description
Approval Options	Select a certificate to apply to the scale. Selecting an approval option sets the scale to meet the certification standard, but it does not generate a certificate. To obtain NTEP or Canada certification, you must have the appropriate agency certify the application controller. If you choose NTEP or a Canadian selection, you can no longer tare with a negative gross weight. Range: None, OIML, CPA, NTEP, MC Default: None
Warmup Delay Time	Amount of time that must pass before weight data is displayed. The time can be up to two decimal points in minutes.

5.9 Running IT Tests

Path: **Home screen > Operation Menu > Diagnostics > IT Test**

The Diagnostics IT screen allows you to perform an IT test and reduced IT test (faster and fewer tests), and then view the results. If your system has an Integrated Technician Summing Junction Box, the IT test can help identify individual load cell problems for up to four load cell selections.

Parameter	Description
Start IT	Press to initiate the IT test.
Start Reduced IT	Press to initiate the reduced IT test.
Show Result	Pres to show the results of the IT or reduced IT test.

INTEGRATED TECHNICIAN (IT®) is an optional diagnostics utility that allows you to troubleshoot individual load cells rapidly. The option requires an HI 6020IT or HI 6010IT Summing Junction Box (see Figure 5-5 below) that provides distinct inputs for each load cell.

Without the HI 6020IT or HI 6010IT Summing Junction Box, there is no way to isolate the signals from different load cells. If any load cell fails, the test outputs a FAIL response without identifying the problem load cell. For numerical values, the system returns an average of all the load cell responses and, in some cases, will return values that cannot be used.

With the HI 6020IT or HI 6010IT Summing Junction Box and IT feature, the application controller can provide both average numerical values and values specific to each load cell, including PASS/FAIL values for each load cell, as shown in Table 5-4 below.

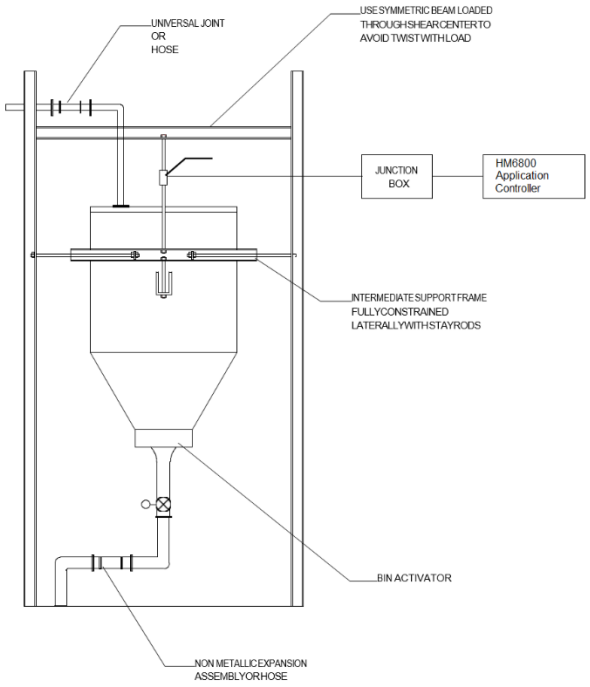


Figure 5-5. Summing Junction Box

Table 5-4. Operation – Diagnostic Integrated Technician

Sensor Number	Weight	mV/V	mV	RTZ	Variation	Stability Test
Sensor 1	1.449430	0.1201	0.6	PASS	3.59	PASS
Sensor 2	-0.993904	0.0336	0.2	PASS	3.88	PASS
Sensor 3	-6.785617	0.0661	0.3	FAIL	2.82	PASS
Sensor 4	8.293720	0.0586	0.3	FAIL	3.33	PASS
Reference	—	1.9867	9.9	—	31.51	FAIL

5.10 Option Card Setup

Path: **Home screen > Operation Menu > Option > Option Card Setup**

The **Option Card Setup** category configures specific option cards available to the system. For more information, see Appendix C.

6 USING A PLC

Topics:

- *Setting UP with an Allen-Bradley® PLC using EtherNet/IP® using RSLogix® 5000 (page 83)*
- *Setting Up MODBUS (page 108)*
- *Spare Parts up PROFINET® (HI 6850 only) (page 108)*
- *Using PLC Commands (page 92)*

This chapter covers setting up the HI 6800 Series instruments with popular PLCs using three different fieldbus communications protocols: EtherNet/IP. MODBUS and PROFINET (HI 6850 only. The EIP section also covers using EDS_AOPs with RSLogix® 5000.

The chapter also includes using PLC commands with the HI 6800 Series.

6.1.1 EIP (EtherNet/IP)

Many of the set-up procedures in this section require an EIP system. In this section, the Allen- Bradley system is used.

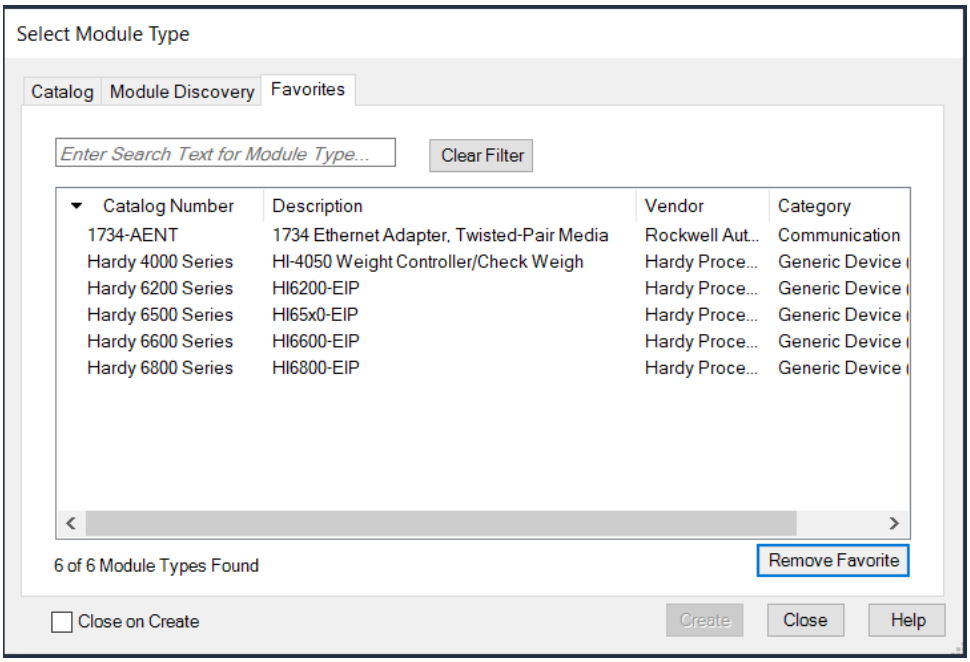
Note: The HI 6800 Series are not compatible with the obsolete HI 215IT Junction Boxes. Make sure the HI 6800 Series are installed with the HI 6020IT, HI 6020JB, HI 6010IT or HI 6010JB Junction Boxes (also compatible with the HI 215JB).

6.1.2 Setting Up Communications

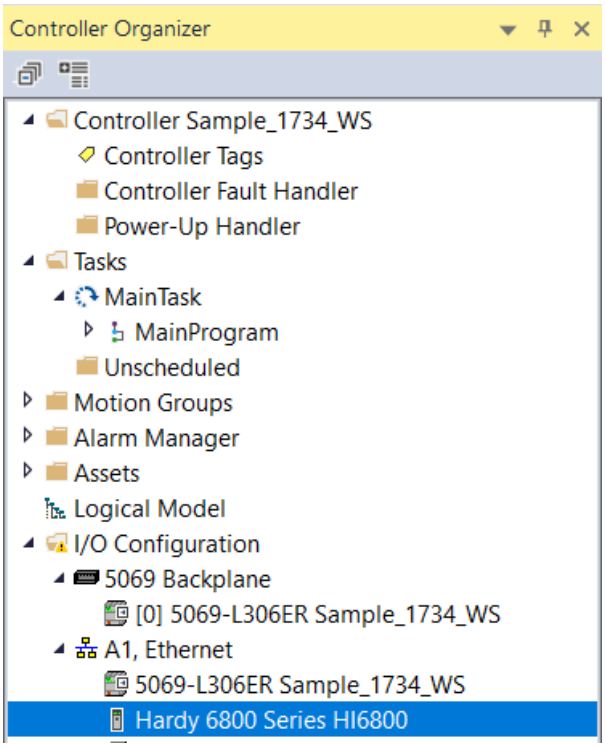
The following procedure describes how to set up communications between the ControlLogix PLC and the HI 6800 Series Instrument. This procedure requires a new or open RS Logix® 5000 project. For instructions, see your RS LOGIX 5000 manual.

For this setup example/instructions, use the `EDS_AOP` file. This file is available as a free download from the Hardy website. For information about how to install EDS files, see the Rockwell instructions.

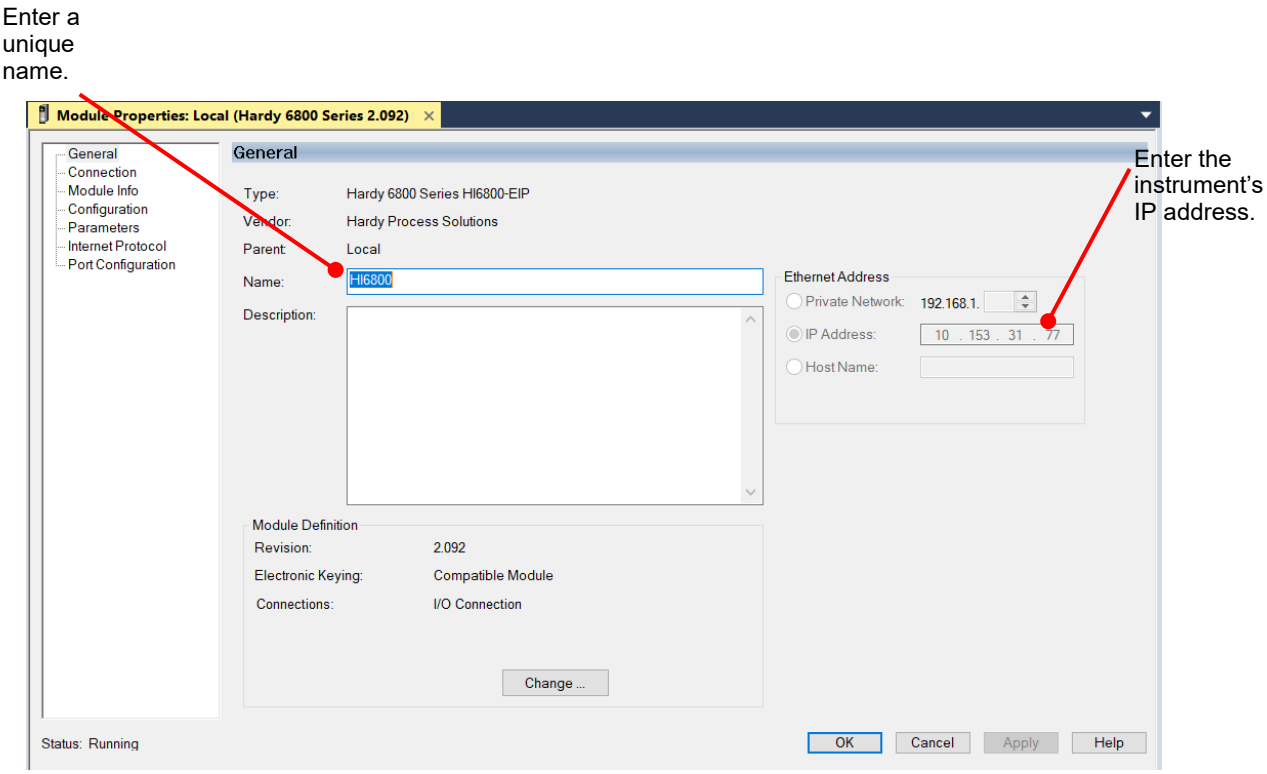
1. In the program Controller Organizer, find the **I/O Configuration** section.
2. Right-click the Ethernet Module under which you will be installing the HI6800-WS module.
3. Select **New Module** to display a list of modules.
4. From the catalog list, select the HI 6800 Series EDS_AOP module.



5. Save the HI6800 Series instrument as an Ethernet device as shown below.



6. Configure the module by entering a unique name and entering the instrument's IP address.



7. In the **Connection** tab, make sure the **Requested Packet Interval (RPI)** is set to **10ms**.
8. Click **OK**. The module appears in the controller organizer in the I/O configuration under the **Ethernet** section.
9. Repeat this procedure for any additional instruments.

6.1.3 Configuration Parameters

The

Table below lists the parameters used when configuring the IO. (See an explanation of Parameters in Chapter 5.)

Table 6-2 IO Parameters

Configuration Parameters	Data Type
Enable/Disable Configuration	INT
Decimal Point	SINT
Grads	SINT
Unit	SINT
WAVERSAVER	SINT

Configuration Parameters	Data Type
Num Averages	INT
Loadcell Sensitivity	INT
AutoZero	INT
AutoZero Tolerance	FLOAT
Gravity Correction	FLOAT
Motion Tolerance	FLOAT
Zero Tolerance	FLOAT
Tare Weight	FLOAT
Reference Weight	FLOAT
Span Weight	FLOAT
Scale Capacity	FLOAT

6.1.4 Configuration with AOP

Using the `EDS_AOP` file makes configuring HI 6800 instruments fast and easy.

Note: If the configuration is “enabled” in the AOP or configuration table, the configuration table downloads into the instrument every time the connection is established.

1. Open the `Properties of the Module` and go to the **Configuration** section.
2. To use the configuration parameters, set the parameter **Enable/Disable Configuration Table** to **Enable**. Otherwise any changes done through the configuration tab will not be applied to the instrument.
3. Make any required changes.
4. Click **Apply**. The configuration table is downloaded to the instrument. The instrument then uses the information in the table to set parameters automatically.

6.1.5 Modbus

Modbus is an application-layer messaging protocol that supports client/server communications between devices connected on different types of buses or networks. All HI 6800 series units have Modbus TCP built-in. To have the instrument communicate through Modbus-TCP, use the touch screen or web browser to configure the HI 6800 instrument for Modbus TCP.

To test the Modbus communications with a Modbus PLC, download the Hardy Modbus-Link client software from the Hardy website to test communications with the instrument. The package communicates with the HI 6800 Series instruments only and is not a full communications package. If you encounter problems with this test, contact Hardy Customer Service.

Modbus services are specified by function codes that are elements of MODBUS request/reply PDUs. MODBUS is implemented for the HI 6800 Series using TCP/IP over Ethernet. In this client/server configuration, the client is the module requesting data and the server is the module providing the data.

Note: MODBUS is located at level 7 of the OSI model and accessed at a reserved system port 502 on the TCP/IP stack. It supports communication with up to 10 different hosts (sockets).

6.1.5.1 Configuring MODBUS

1. Download the Hardy Modbus-Link client software:
   i. Open a web browser on your computer.
   j. Go to the Hardy website: http://www.hardysolutions.com
   k. Click **Products>Weighing Instruments>Weight Processors>HI 6800**
   l. Click the **Docs & Programs** tab. Download the Modbus Link Test Program EXE
2. After downloading the client software, double-click the `Hardy Modbus-Link .exe` file to install the software on your computer. When the installation completes, a Hardy Modbus-Link icon appears on your Desktop.
3. Double-click the Hardy Modbus-Link icon to open the Hardy Modbus-Link display (see Figure 6-1).

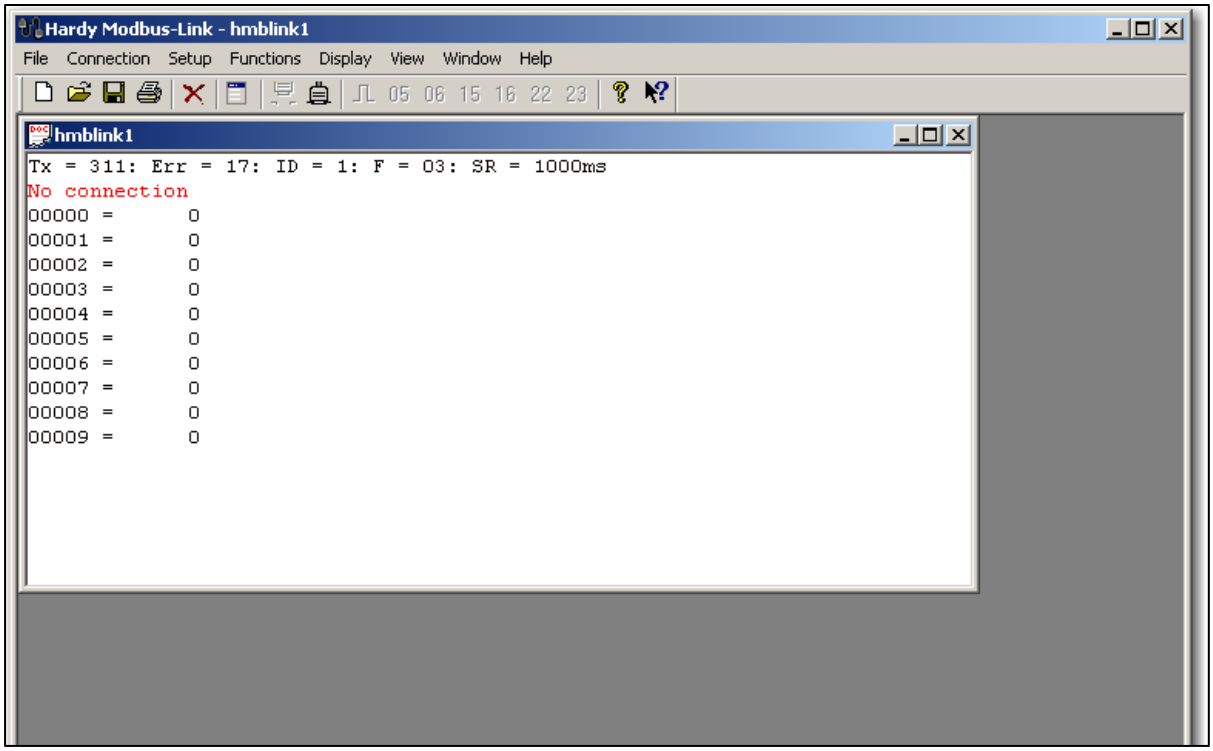
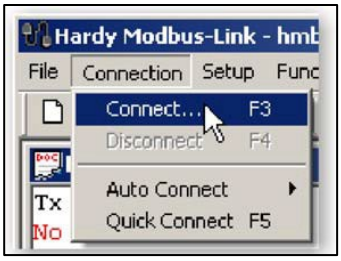
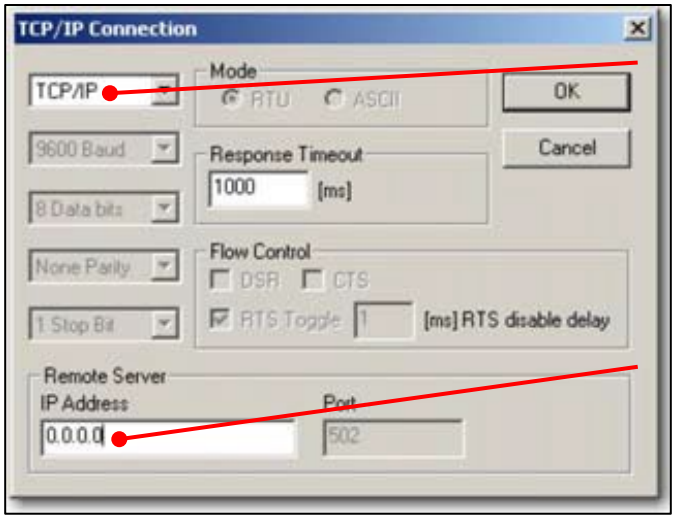


Figure 6-1. Hardy Modbus-Link Display

4. From the **Connection** menu, click **Connect**. The TCP/IP Connection dialog box appears.



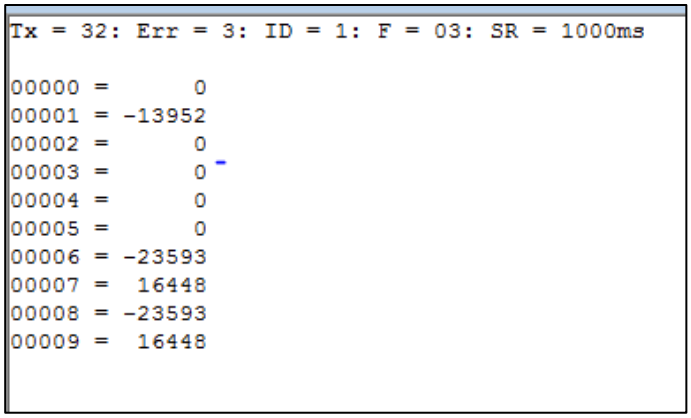
5. If **TCP/IP** is not selected in the top-right field, select it from the pull-down list.
6. In the **IP Address** field at the bottom left, type the address of the HI 6800 instrument with which you want to communicate.



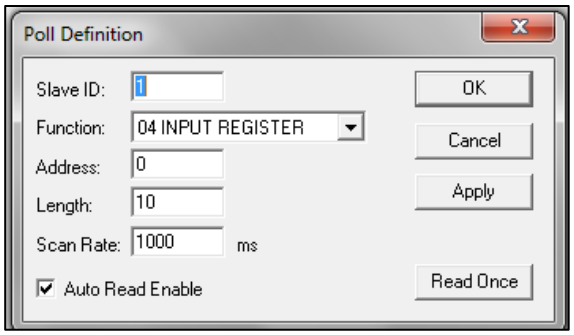
Select **TCP/IP**.

Type the address of the HI 6800 instrument.

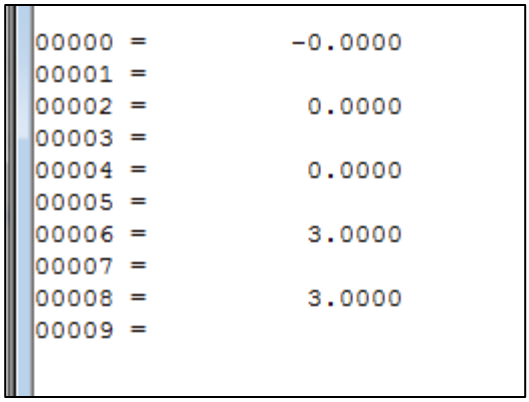
7. Click **OK**. The red **No Connection** message disappears and the values at the top of the page change. Your computer is now connected to the HI 6800 Series instrument.



8. From the **Setup** menu, click **Poll Definition**. In the Poll definition dialog box, select the following settings, and then click **OK**:
   - **Function** = 04 INPUT REGISTER
   - **Address** = 0
   - **Length** = 10



9. On the Hardy Modbus-Link page, from the **Display** menu, click **Float**. The Weight value appears in register 6 (net) or register 8 (gross). Other registers are not float values, so be aware of random numbers in other registers.

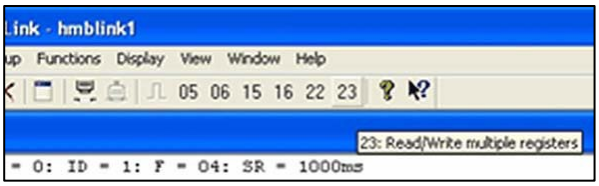


10. From the **Display** menu, click **Long**. This allows you to write an integer value into the non-float registers.
11. From the **Functions** menu, select **Read/Write Registers**:

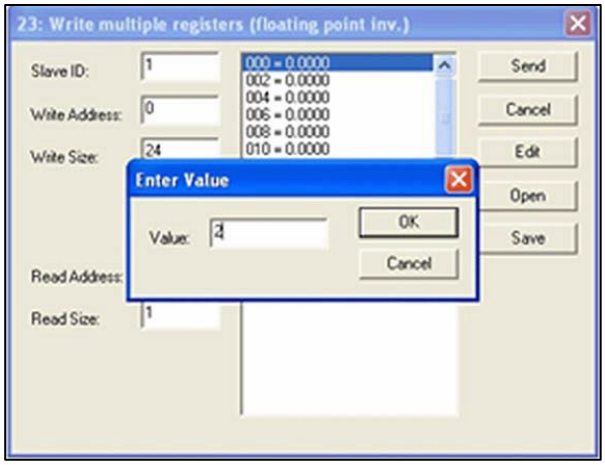


OR

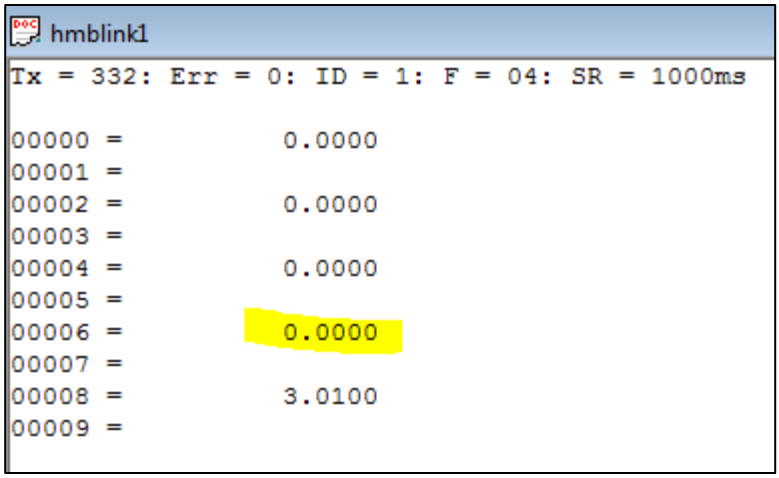
Click button 23 to open the Write multiple registers dialog box



12. Double-click the top register. When the Enter Value box appears, enter the new value you want to write to this register. The following figure shows writing a value of **2**, which is the Tare command number.



13. Click **OK** to accept the value, and then click the **Send** button to send the values to the HI 6800 Series instrument.
14. When the Response OK message appears, click **OK**.
15. Change the display back to Float and confirm that the Tare command changed the Net weight to zero.



6.1.6 PROFINET (6850 only).

PROFINET is an industrial network protocol that is used to exchange data between control device and field devices. This protocol is based on Ethernet and it integrates into existing fieldbus systems like PROFIBUS. Use the touch screen or web browser to configure.

PROFINET is only available on the HI 6850 instrument as an option. It must be used with a PROFINET supported PLC and configured using the Siemens TIA Portal (or a functionally equivalent tool). Hardy supplies a .GSD file for use that can be downloaded from the HI 6800 product page on the Hardy Website

6.1.6.1 Configuring PROFINET

- Download the GSD file from Hardy website.

Once the PROFINET controller is configured, use the following steps to configure the HI 6850 as a device in the PROFINET network. Using Siemens TIA Portal, add the HI 6850 as a PROFINET device on the network.

1. Go to menu item “Options”, then “Manage General Station Description files (GSD)”
2. Browse or type in the directory where the HI 6850 PROFINET GSDML file is located

3. Place a check mark in the check box of the HI 6850 GSDML file, if the status shows “Not yet installed”
4. Click “install” and confirm pop up dialog box. This process may take some time
5. Go to the Hardware catalog by clicking the tab on the right side of the window
6. Click on “Other field devices” then:
    a. “PROFINET IO”
    b. “I/O”,
    c. “Hardy Instrument”
    d. “HI 6850”
    e. “Hardy 6850 IO”
    f. Click and drag Hardy 6850 IO device into the network view where the controller is located
7. Click on the blue “Not assigned” text in the Hardy 6850 network object, and select the name of the “PROFINET PLC NAME” given to the network from the drop down.
8. Once added to the network, TIA Portal assigns DCP station names and IP addresses. This could make the PROFINET network run with those default values. To change them, refer to the Siemens manual on how to assign DCP station name and IP address.
9. Click on “Save project” or CTRL+S to save the project
10. From the Device View or Network View, click on the HI 6850 device, then click on Compile button in the main menu bar underneath “Window.”
11. Setup is now complete.

See Section 6.1.7 PLC Commands for the commands used for weighing functions.

6.1.7 PLC Commands

The PLC can control the HI 6800 Series using the commands in Table 6-1. The sections following the table provide detailed descriptions about the commands.

Table 6-1. Hardy Commands

Command Number	Command
(0x00)0	Read Parameter
(0x01)1	Zero Cmd

Command Number	Command
(0x02)2	Tare Cmd
(0x64) 100 dec	Cal Low Cmd
(0x65) 101 dec	Cal High Cmd
(0x66) 102 dec	C2 Cal Cmd
(0x80) 128 dec	IT Test
(0x81) 129 dec	Stability Test
(0x82) 130 dec	IT Test (Reduced Voltage)
(0x83) 131 dec	C2 Search
(0x92) 146 dec	Write Value Command
(0x94) 148 dec	Set Default Parameters (all parameters except IP addresses)
(0x95) 149 dec	Set Default Network Parameters (IP addresses only)

READ PARAM CMD

Hex value: 0x00

Decimal value: 0

To read a parameter, write the hexadecimal value 0x00 to the CMD register (register #0), and write the parameter number in the `ParameterID` register of the output table. The parameter value may then be read from the `ParameterValue` register in the input table. This value can be in integer or floating-point format, depending on the parameter. The Command status register in the reply contains the lower 16 bits of the system Command status word.

Status word bit 0:	A/D error
Status word bit 7 (0x80):	Not Found - the requested parameter number does not exist
Status word bit 6 (0x40):	Motion status

ZERO CMD

Hex value: 0x01

Decimal value: 1

Write the hexadecimal value 0x01 to the command register to zero the gross weight. If this command succeeds, the status register reads 0.

Status Error code 1	Fail
Status Error code 2	ADC Failure
Status Error code 3	Out of tolerance

Status Error code 4	Motion
Status code FF	cmd in progress

TARE CMD

Hex value: 0x02

Decimal value: 2

Performing a tare command changes the net weight to “0” and moves the tared value into the “tare weight” parameter. Write the hexadecimal value 0x02 to the command register to zero the net weight. If this command succeeds, the Cmd Status (lower 8 bits of `CmdStatusNCount`) reads 0.

Status Error code 1	Fail
Status Error code 2	ADC Failure
Status Error code 4	Motion
Status code FF	cmd in progress

CAL LOW CMD

Hex value: 0x64

Decimal value: 100

Write the hexadecimal value 0x64 to the command register to perform the low step of a traditional calibration. If this command succeeds, the status register reads 0.

Status Error code 1	Fail
Status Error code 2	ADC Failure
Status Error code 4	Motion
Status code FF	cmd in progress

CAL HIGH CMD

Hex value: 0x65

Decimal value: 101

Write the hexadecimal value 0x65 to the command register to perform the high step of a traditional calibration.

Status Error code 1	Fail
Status Error code 2	ADC Failure

Status Error code 4	Motion
HardcalFailCounts 8	Insufficient number of counts between hard cal hi and hard cal lo
Status code FF	cmd in progress

C2 CAL CMD

Hex value: 0x66

Decimal value: 102

Write the hexadecimal value 0x66 to the command register to perform a C2 calibration.

Status Error code 1	Fail
Status Error code 2	ADC Failure
Status Error code 4	Motion
Status Error code 5	no C2 cells
Status Error code 6	C2 capacities not equal
Status Error code 7	Non-Hardy C2 load sensor
Status code FF	cmd in progress

IT Test

Hex value: 0x80

Decimal value: 128

Write the hexadecimal value 0x80 to the command register to perform an Integrated Technician test. This test requires an IT summing card.

Status Error code 1	Fail or no IT Summing Card Found
Status code FF	cmd in progress

Stability Test

Hex value: 0x81

Decimal value: 129

Write the hexadecimal value 0x81 to the command register to perform the stability test.

Status Error code 1	Fail
Status code FF	cmd in progress

IT Test Reduced

Hex value: 0x82

Decimal value: 130

Write the hexadecimal value 0x82 to the command register to perform an Integrated Technician test with reduced voltage. This test requires an IT summing card.

Status Error code 1	Fail or No IT Summing Card Found
Status code FF	cmd in progress

C2 Search

Hex value: 0x83

Decimal value: 131

Write the hexadecimal value 0x83 to the command register to force the module to search for and read/update C2 data.

Status Error code 1	Fail
Status code FF	cmd in progress

WRITE CMD

Hex value: 0x92

Decimal value: 146

Set the value of a parameter. Write the hexadecimal value 0x92 in the command register 0, the parameter ID number in the `ParameterID` register, and the desired value in the `ParameterValue` register of the output table.

Status Error code 1	Fail
Status Error code 0x0B	Value out of range too high
Status Error code 0x0C	Value out of range too low
Status Error code 0x0D	Not allowed

Status Error code 0x80	Invalid parameter ID

Setting Default Parameters

Hex value: 0x94

Decimal value: 148

Write the hexadecimal value 0x94 to the command register to set all parameters and calibration back to default settings.

Status Error code 1	Fail

Setting Default Network Parameters

Hex value: 0x95

Write to NVM (non-volatile memory)

Hex value: 0x96

Save Last Good Configuration

Hex value: 0x97

Table 6-2. Instrument Status Word Bits

Bit	Description
0	A/D converter error - bad input from the load sensor.
1	A/D converter failure - no output from the converter to the processor.
2	Motion - indicates weight is in motion (changing).
3	Center of Zero
6	Calibration in Progress
7	Error parameter ID Not Found

Table 6-3. Command Status Return Value

Return Value	Description
0	Success
1	Fail
2	Fail - ADC error and ADC failure
3	Fail - out of tolerance
4	Fail - motion
5	Fail - no C2 load cells found
6	Fail - C2 capacities not equal
7	Fail - non-Hardy C2 load sensor
8	Fail - not enough counts between Cal low and Cal high weights
11	Fail – param value too high
12	Fail – param value too low
13	Fail – not allowed
128	Fail – Parameter ID not found

6.1.7.1 I/O Tables for Communications to PLC

Table 6-4 and Table 6-5 are common for the EtherNet/IP, PROFINET, and Modbus – TCP communication protocols.

Table 6-4. Output Tables

HI6800 Output Table

Output Table	Type
command	int
auxCommandInfo	int
paramid	int
parameter value	DINT
reserved words	int * 5
Total	**10**

HI6850 Output Table

Output Table	Type
channel	INT
command	int
auxCommandInfo	int
paramid	int
parameter value	DINT
reserved words	int * 122
Total	**128**

`Command`, `AuxCommandInfo`, `ParameterID`, and `Parameter Value` are used to send commands to the instrument, write new parameter values, read existing parameter values, and read data values. The command is a 16-bit value used for the command string, as shown above in the command section.

The reserved words are for future use and are currently not used. This register is ignored if doing a read.

Table 6-5. Input Tables

HI6800 Input Table

Input Table	Type
command	int
command status and Number count	int
parameter value	DINT
parameter id	int
instrument status	int
net weight ch1	real
gross weight ch1	real
roca ch1	real
Total	**12**

HI6850 Input Table

Input Table	Type
channel	int
command	int

Input Table	Type
command status and Number count	int
parameter id	int
parameter value	DINT
reserved	int
instrument status	int
net weight ch1	real
gross weight ch1	real
reserved	int
ch2 status	int
net weight ch2	real
gross weight ch2	real
reserved	int
ch3 status	int
net weight ch3	real
gross weight ch3	real
reserved	int
ch4 status	int
net weight ch4	real
gross weight ch4	real
option slot1 status	int
option slot2 status	int
roca ch1	real
roca ch2	real
roca ch3	real
roca ch4	real
roca reserved	8 * int
rate controller	16 * int
rate controller reserved	8 * int
dosing and filling	8 * int
dosing and filling reserved	8 *int
check weight	8 * int
check weight reserved	8 * int
setpoint controller	int

Input Table	Type
setpoint controller reserved	8 * int
sequential batch	7 * int
sequential batch	8* int
Total	**128**

The first four variables in the input table in Table 6-5 — Co`mmand, Command Status`, `Parameter ID`, and `Parameter Value` — match closely the first four variables in the output table in Table 6-4.

`Command Status and Number Counts` returns the command status of the command being run and a continuous counter that increments to provide a “heartbeat. It counts from 0 – 255 and then repeats. The value returned in the lower byte of the register is the status code for the command. This code is one of the following values:

- A zero indicating the command passed
- A value of 0xFF indicating the command is in process

An error code indicating the reason the command failed (see

- Table 6-3).

The upper 8 bits of the register are a cyclic “measurement update count,” which increment by 1 (one) each time a new measurement value is taken, following a 0 to 255 then repeat cycle. If this value remains the same in two consecutive reads from the instrument, the communication or the measurement function has failed and appropriate action must be taken.

`Parameter ID` is an echo of the value sent in the output table. `Parameter Value` is the current value for the specified Parameter ID. This parameter value may ether be an integer or in floating point format depending on which Parameter ID is specified.

`Instrument Status` is a 16-bit value that provides the current state of all the major functions within the instrument. They reflect the status of all the major functions and should be used with the “measurement update count” to determine the health of the instrument.

The `Net Weight` and `Gross Weight` values are always provided.

6.1.7.2 Default Parameter Values

Table 6-6 shows the default parameters values.

Table 6-6. Default Parameters Values

Configuration Table	Data Type	Default	Range	Values
Gravity Correction	FLOAT	1.0	0.9-1.1	
Decimal Point	BYTE	2	0-5	
Grad Size	BYTE	0	0-9	0 = 1 1 = 2 2 = 5 3 = 10 4 = 20 5 = 50 6 = 100 7 = 200 8 = 500 9 = 1000
Motion Tolerance	FLOAT	10.0	.00001-999999.99	
Zero Tolerance	FLOAT	10.0	.00001-999999.99	
Tare Weight	FLOAT	0.0		
Reference Weight	FLOAT	0.0	.00001-999999.99	
Scale Cap	FLOAT	999999.0	.00001-999999.99	
Span Weight	FLOAT	1000.0	.00001-999999.99	
AutoZero Tolerance	FLOAT	10.0	0 -999999.99	
Enable AutoZero Tracking	BYTE	0	0-1	0 = off 1 = on
Unit	BYTE	1	0-5	0 = oz 1 = lb 2 = ton 3 = g 4 = kg 5 = t
Load Cell Sensitivity	BYTE	4	0-8	0 = 1.0 mV/V 1 = 1.5 mV/V 2 = 2.0 mV/V 3 = 2.5 mV/V 4 = 3.0 mV/V 5 = 3.5 mV/V 6 = 4.0 mV/V 7 = 4.5 mV/V 8 = 5.0 mV/V
Waversaver	BYTE	3	0-5	0 = Off 1 = 7Hz 2 = 3.5 Hz 3 = 1Hz 4 = 0.5Hz 5 = 0.25Hz

Configuration Table	Data Type	Default	Range	Values
Num Averages	INT	10	1-255	

6.1.7.3 HI6850 Config Table Values

Only the HI6850 has a configuration table .

Config Table	Type
cfg enable/disable	int
decimal point	byte
grad	byte
metric	byte
waversaver	byte
num average	int
load cell sensitivity	int
auto zero enable	int
auto zero tolerance	real
gravity correction	real
motion tolerance	real
zero tolerance	real
tare weight	real
reference weight	real
span weight	real
scale capacity	real
Total	**22**

7 CLEANING AND MAINTENANCE

Topics:

- *Preventive Maintenance Schedule (page 107)*
- *Cleaning the Unit (page 108)*
- *Spare Parts (page 108)*

A preventive maintenance program will maximize the lifetime of the HI6800 Series Application Controller and minimize the risk of unscheduled down-time. Optimal performance will be achieved by regular cleaning of system components.

Only qualified personnel should perform maintenance procedures in accordance with the instructions in this chapter.



Warning: Prior to any cleaning or maintenance, always unplug the HI6800 Series Application Controller power connection from the power source.

7.1 Preventive Maintenance Schedule

Table 7-1 summarizes frequent maintenance tasks.

Table 7-1. Preventive Maintenance Schedule

Frequency	Task
All time	**General** Keep all the components clean. Prevent any accumulation that might cause heat buildup, resistance or binding of movement.
As needed.	Calibrate the system whenever mechanical changes have been made to ***any*** part of the scale system.
Daily	Check for alarms and warnings in the touchscreen.
As needed	**Clean the touchscreen.** Use a soft cloth moistened with a mild solution of soapy water and a nonabrasive detergent such as a household detergent for plastic. Never use caustic chemicals (e.g., strong solvents, pure alcohol, concentrated acids, or bases), sharp/metal objects, or high pressure to clean the touchscreens.

7.2 Cleaning the Unit

Dry environment units are often wiped down with a dry or light moisturized cloth only, or 50 psi air pressure. Avoid aggressive cleaning.

If hosing is needed, wash with low-pressure water from an open hose whose water pressure is between 2.5 atm and 35 psi max and whose water temperature does not exceed 149 °F (65 °C). Using a high-pressure hose or nozzle is not recommended.

Follow these precautions when cleaning the system.

- Clean the HI6800 Series Application Controller with dry or light moisturized cloth only. Avoid aggressive cleaning.
- Do not use high-pressure air lines, high-pressure water jets, or high-pressure steam cleaners to remove debris from any part of the HI6800 Series Application Controllers electronics.
- If adjacent machines are cleaned using high-pressure water hoses or steam, protect the HI6800 Series Application Controllers appropriately.
- Do not use solvents to clean the HI6800 Series Application Controller because of the possibility of damage.

7.3 Spare Parts

Keeping spare parts in stock — especially parts that are subject to wear or used in critical areas— can reduce downtime in the case of a failure. For more information, contact Hardy.

8 TROUBLESHOOTING

Topics:

- *Disassembly and Reassembly (page 110)*
- *Error Messages (page 111)*
- *Troubleshooting Using Integrated Technician (page 112)*
- *General Troubleshooting (page 112)*

This appendix describes procedures tests that can shorten the time for troubleshooting. In the unlikely event of a problem with the HI6800 Series Application Controller, use the information in this chapter to identify and resolve the problem.

If you are in doubt about how to resolve a problem or need assistance, visit Hardy Process Solutions Web-tech at http://www.hardysolutions.com. Web-tech is updated frequently and available 365 days a year 24/7. It contains frequently asked questions to assist you in troubleshooting and, provides a form for requesting additional information and answers to questions, with no waiting on hold.

Customer Service is available from 6:30AM to 5:30 PM Pacific Standard Time. For direct factory support, call Hardy Process Solutions Customer Service at:

- Factory Technical Support in the US and Canada:1-800-821-5831, Ext.9550
- Technical Support outside the US and Canada:1-858-278-2900 Ext.9550

8.1 Disassembly and Reassembly



Warning: EXPLOSION HAZARDS. Do not replace components unless power has been switched off or area is known to be nonhazardous. 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.

- Make sure that any disassembly is done in a clean, well ventilated, properly controlled static environment.
- Make sure that the assemblies and sub-assemblies are well supported and insulated when doing any repairs on HI6800 Series Application Controllers.
- 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 Services 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 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 application controller.
- Always follow proper safety procedures when working on or around the application controller.

8.2 Error Messages

Table 8-1 lists error messages for the application controller.

Table 8-1. Application Controller Error Messages

Message	Description
A/D Convert Error!	Load cells input out of range.
A/D Failure Error!	Internal electronics error, retry.
C2 Cal Error!	Error occurred during calibration, re-calibrate.
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 by removing the uneven load cell and replacing it with a load cell that is equal to the others' capacity.
CAL Failed!	Too few counts between Zero and Span.
Function Error!	Pressed a function button and the Function did not work. Try again. Cycle power.
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.
Motion Error!	Check motion tolerance settings and retry.
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.
No C2 Sensor!	Application controller did not detect a C2® load sensor.
Not Allowed!	Value entered is outside the range allowed. Try another value.
Over-range	Weight over the setpoint target.
Too Hi Error!	Verify that the load cell signal level is 0-15mV. Verify that there is enough weight on the scale. Perform Span, then go back and Zero.
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.
Trad Cal Error!	Error occurred during calibration, re-calibrate.
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 is too low for the menu or function.

Note: 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 appear to be the problem.

8.3 Troubleshooting Using Integrated Technician

Integrated Technician, along with an IT Summing Junction Box, provides built-in diagnostics that allow you to troubleshoot and diagnose your weighing system. You can read individual load sensor voltages and weights, make comparisons, and isolate individual system components for quick and easy troubleshooting.

For more information, see section 5.9.

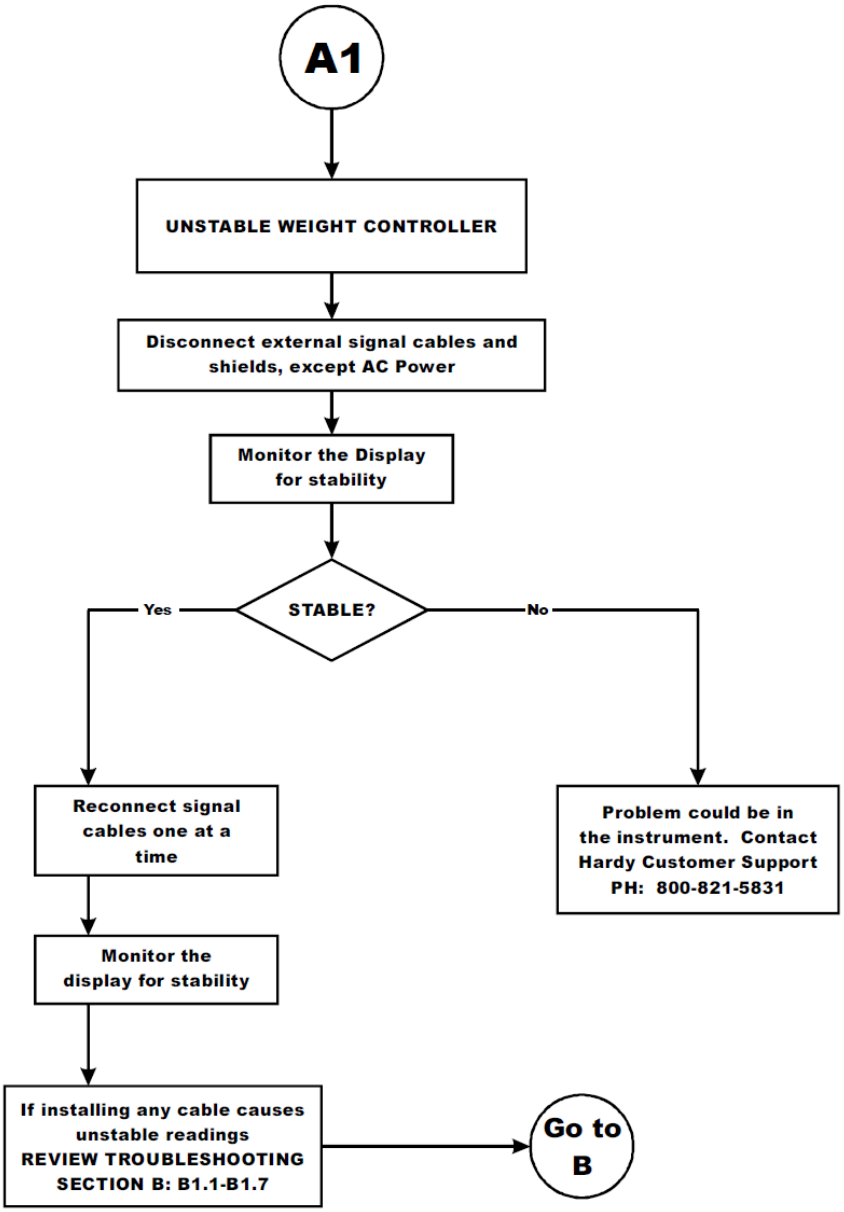
8.4 General Troubleshooting

The following sections describe general troubleshooting procedure. Refer to Table 8-2 for an overview of the troubleshooting topics described in the following sections.

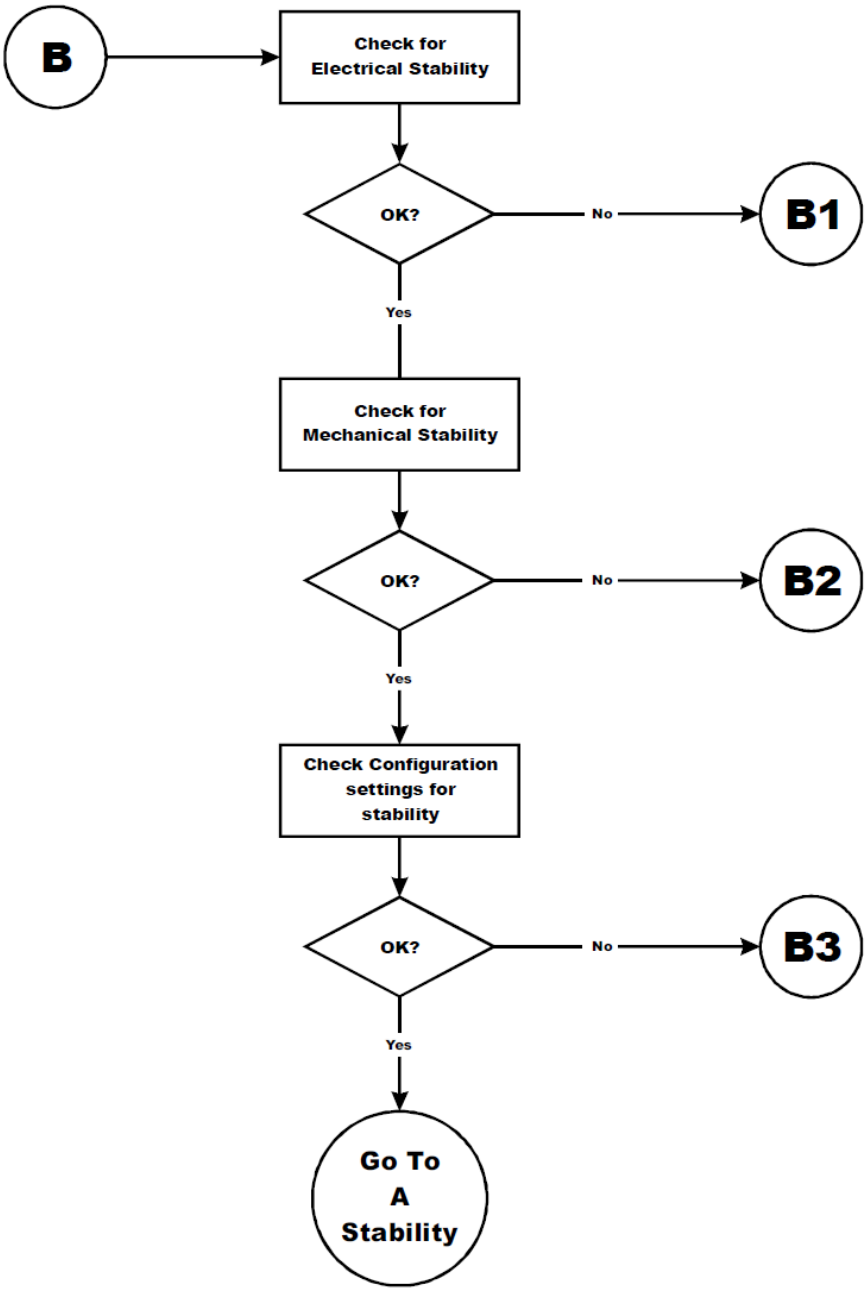
Table 8-2. General Troubleshooting

Problem	See
Drifting or unstable weight reading	Section 8.4.1
Electrical, mechanical, and configuration reviews	Section 8.4.2
Drifting or unstable weight reading	Section 8.4.3
Weight indication will not return to zero	Section 8.4.4
Verify individual load sensor operation	Section 8.4.5
Traditional calibration - A/D Failure Error	Section 8.4.6
Mechanical inspection	Section 8.4.7
Electrical inspection	Section 8.4.8
Load sensor installation	Section 8.4.9
Exceeds the Millivolt range. Out-of-range condition.	Section 8.4.10
Blank display	Section 8.4.11
SD card diagnostics and losing memory at power cycles	Section 8.4.12

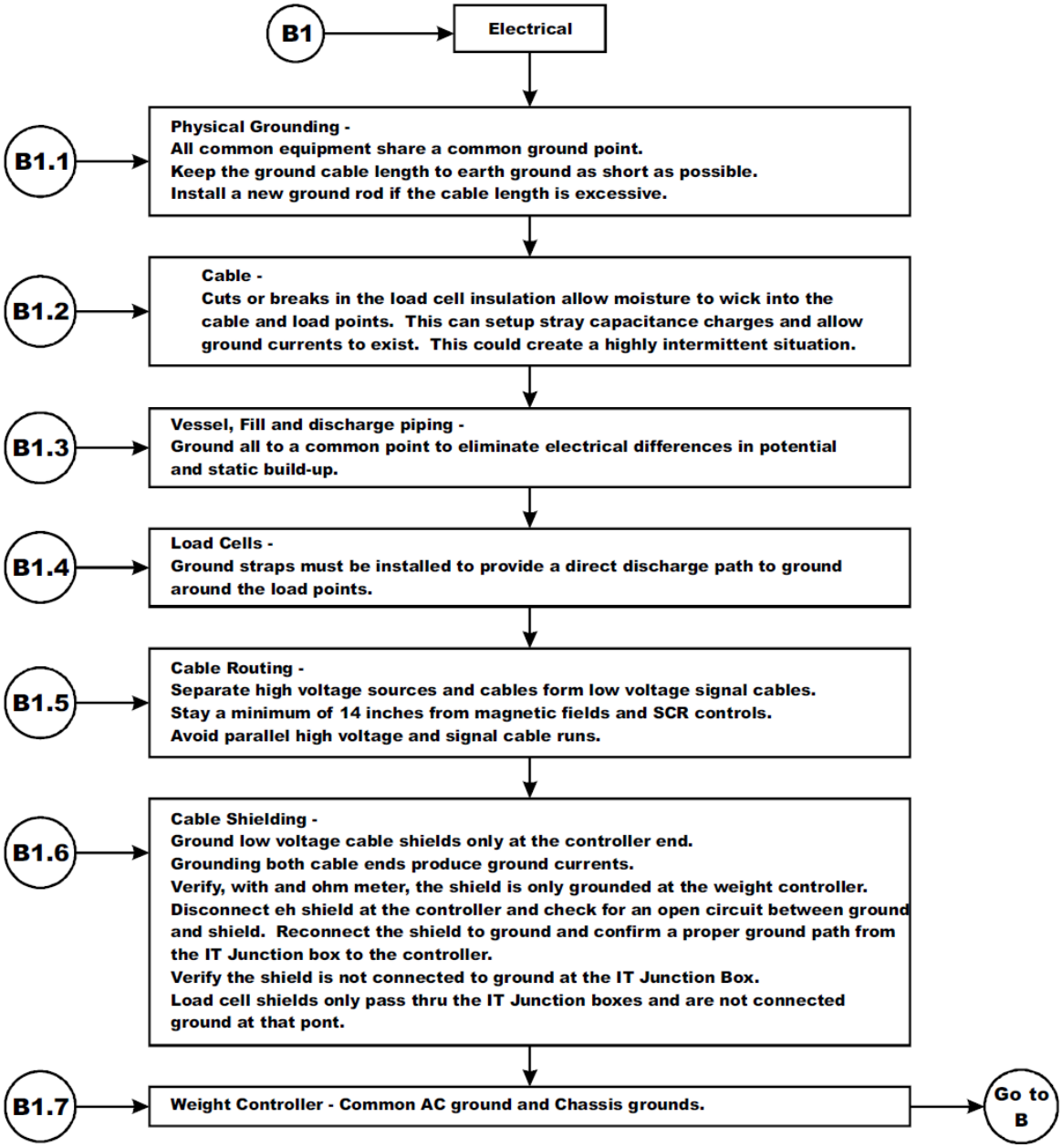
8.4.1 A1: Troubleshooting Instabilities on a Formerly Operating System



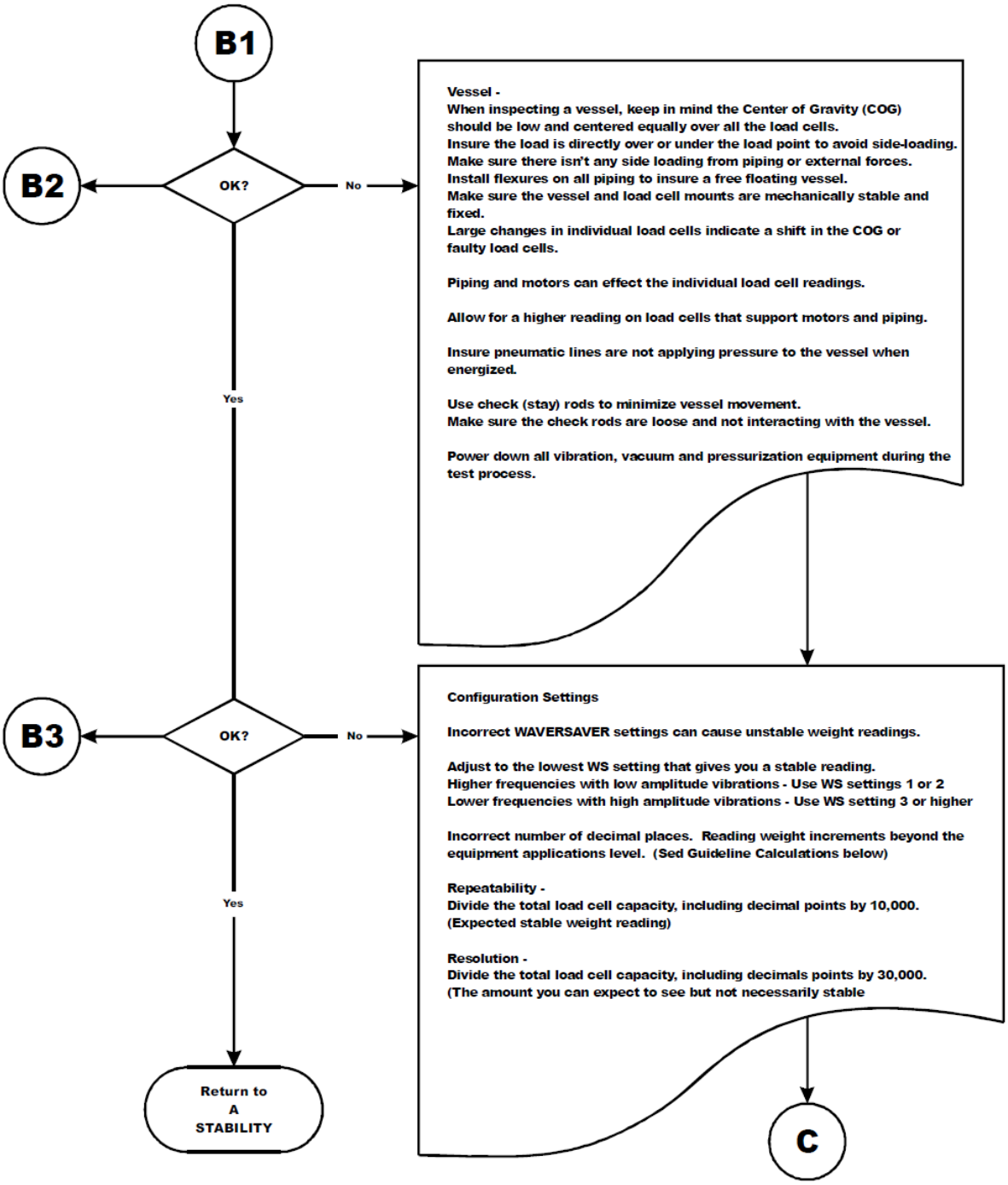
8.4.2 B: Troubleshooting Instabilities on a Formerly Operating System



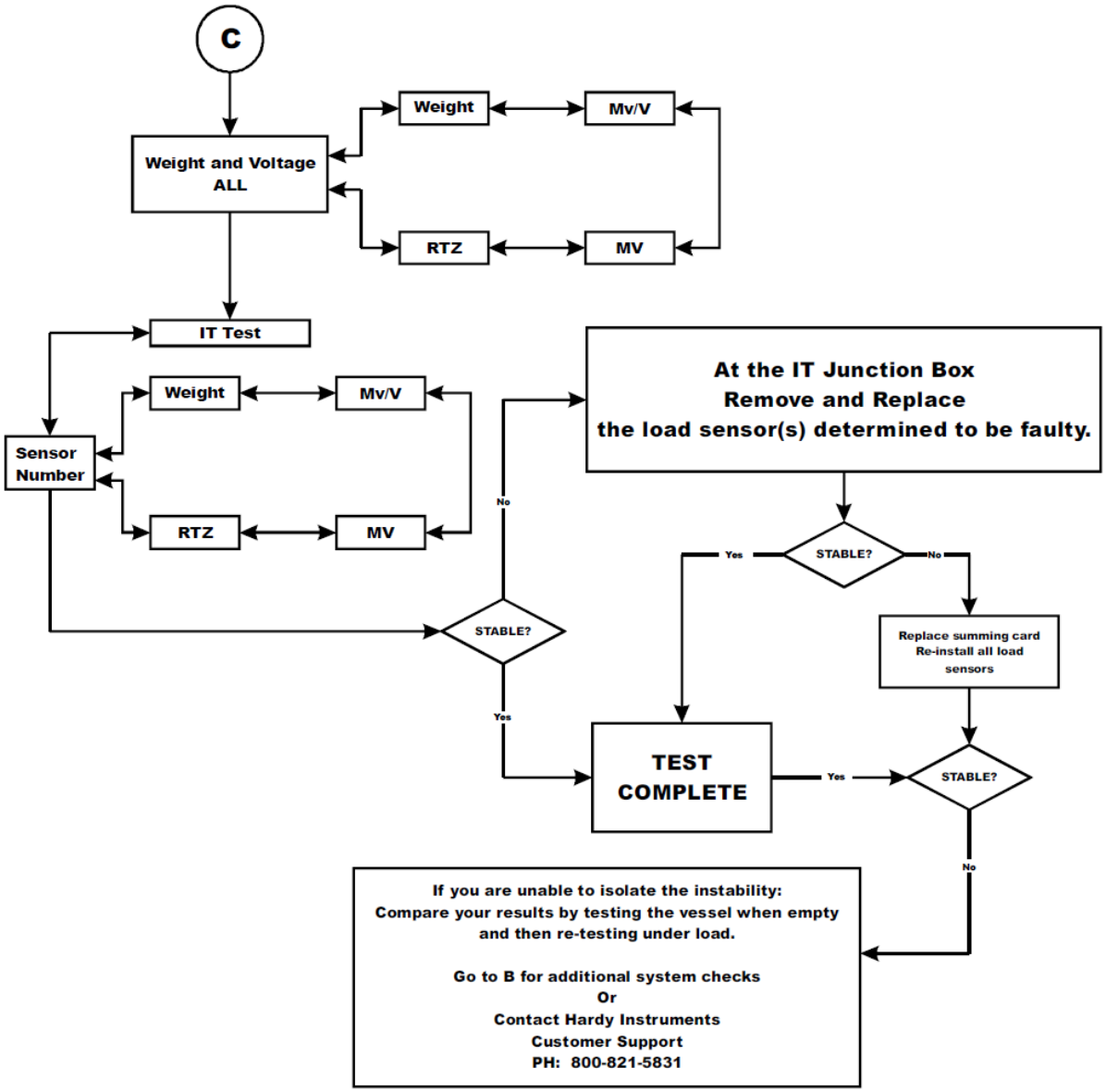
8.4.2.1 B1: Troubleshooting Instabilities on a Formerly Operating System



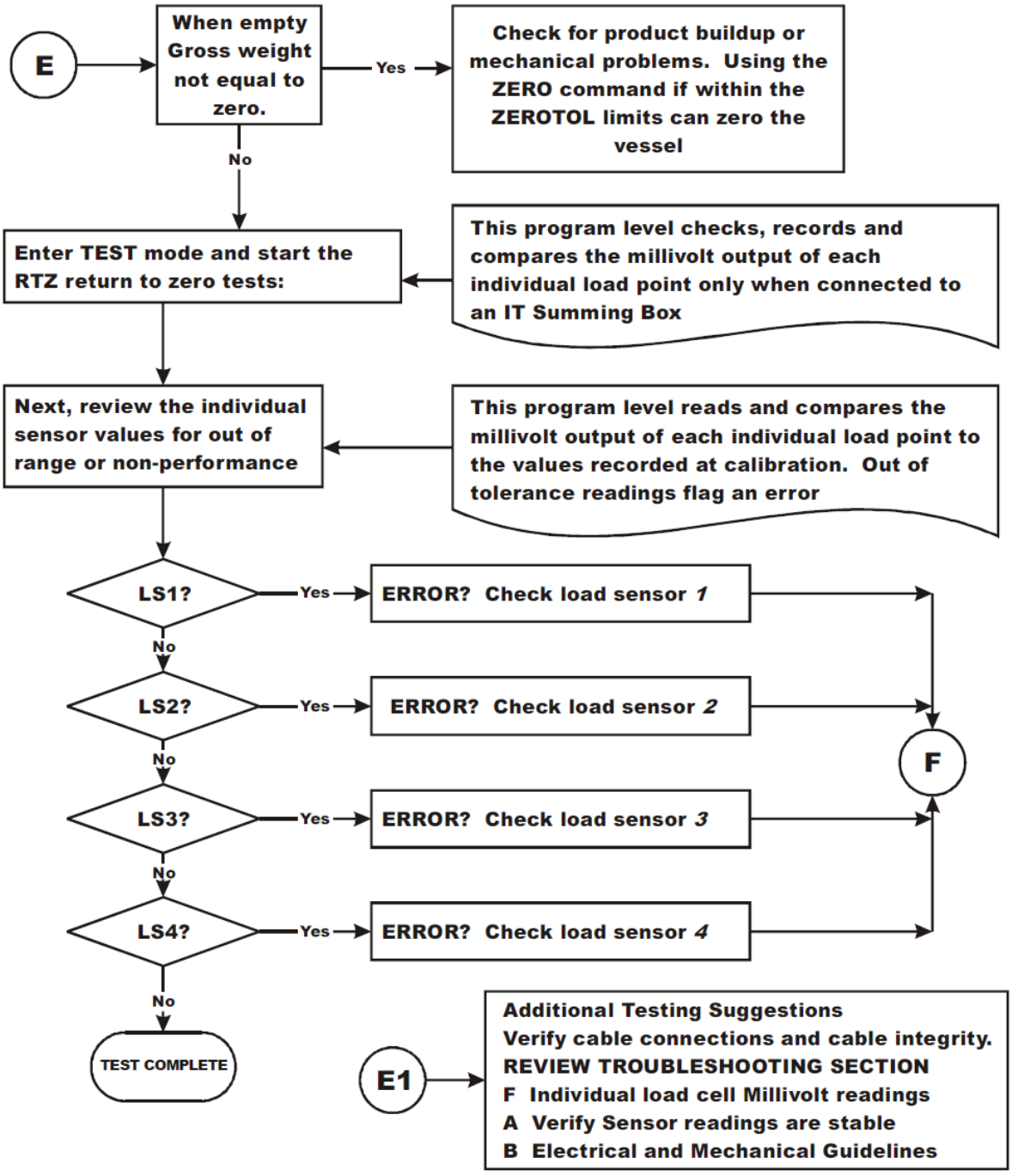
8.4.2.2 B1 (continued): Troubleshooting Instabilities on a Formerly Operating System



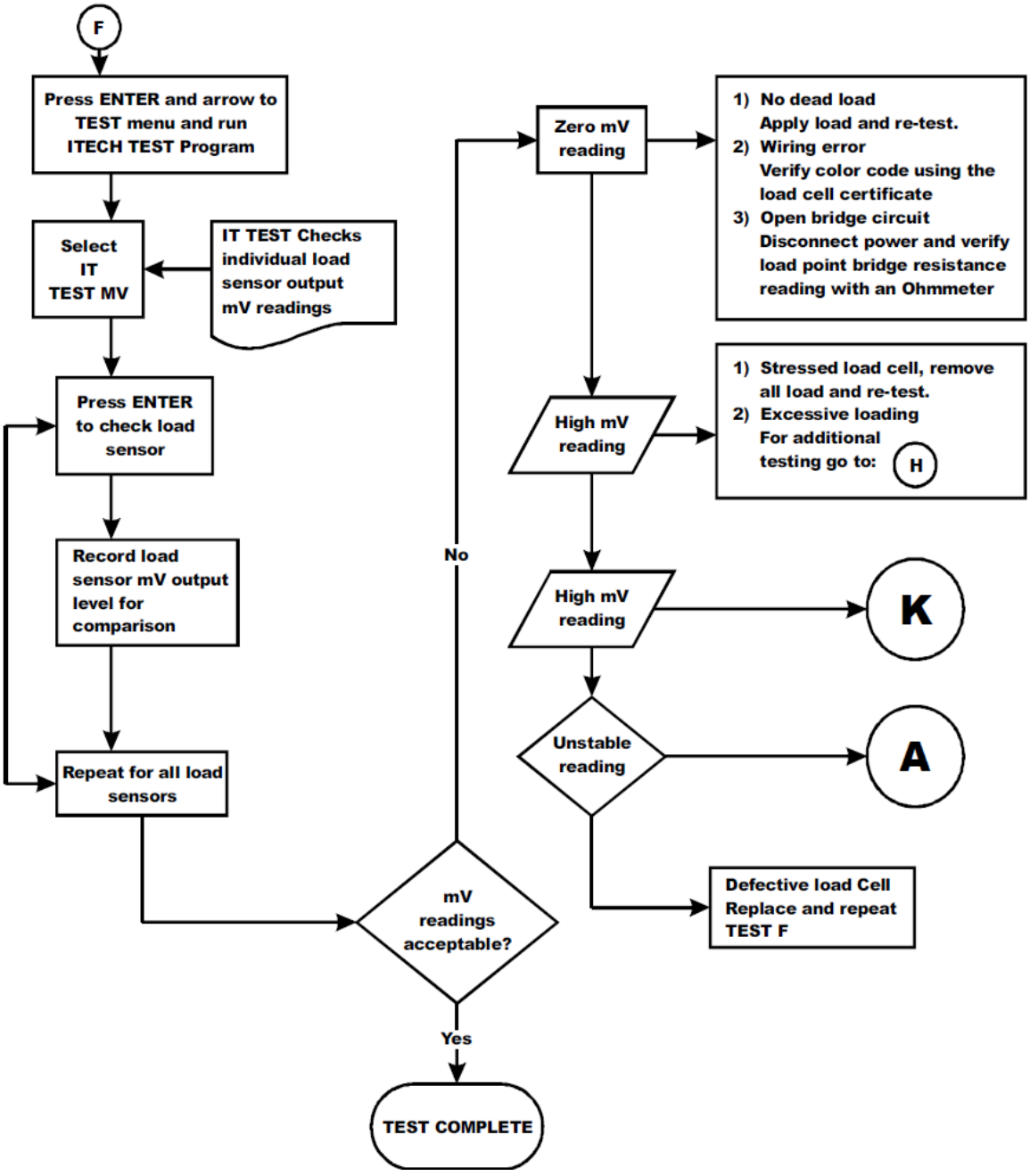
8.4.3 C: Troubleshooting Instabilities on a Formerly Operating System



8.4.4 E: Troubleshooting Non-Return to Zero (Must be Connected to an IT® Summing Box)

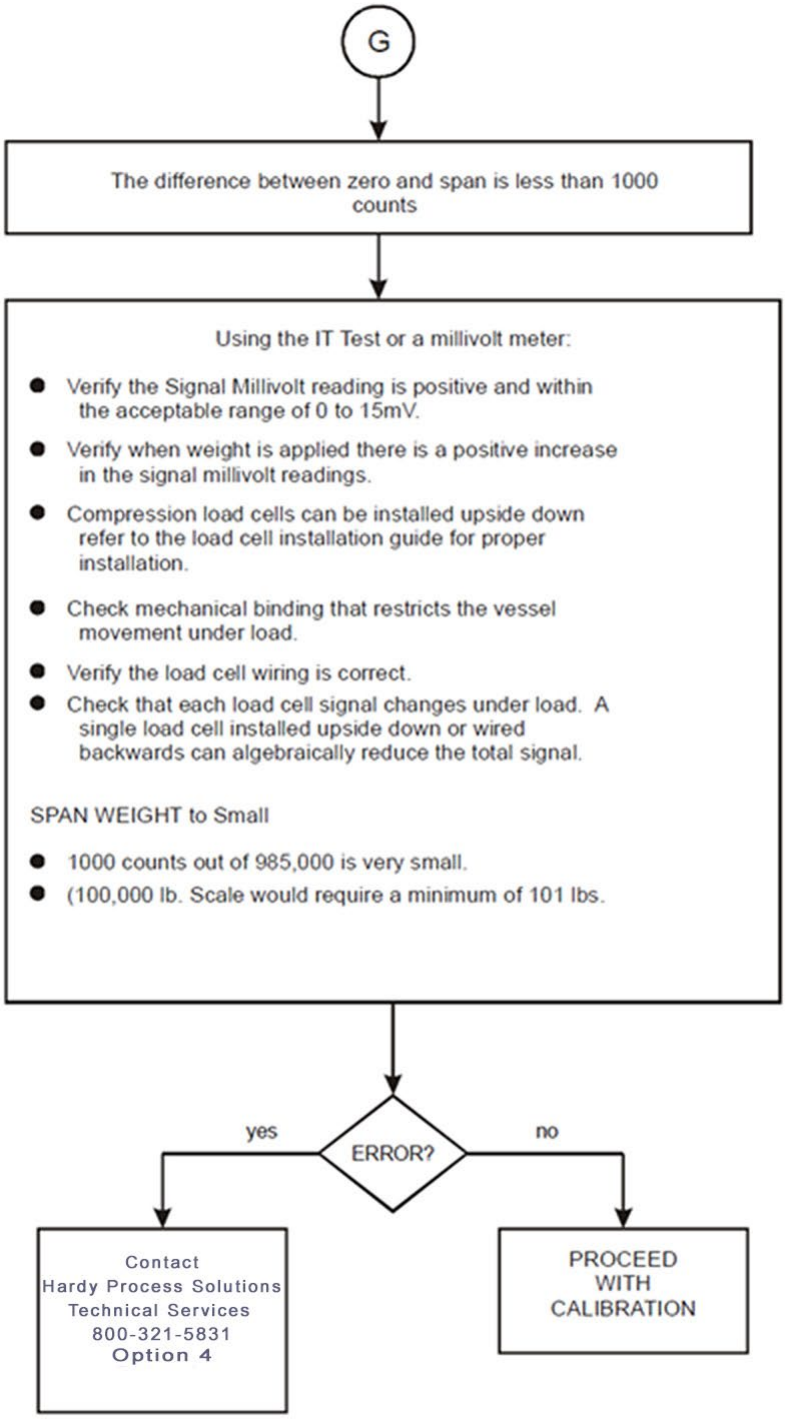


8.4.5 F: Troubleshooting Individual Load Cell Millivolt Readings

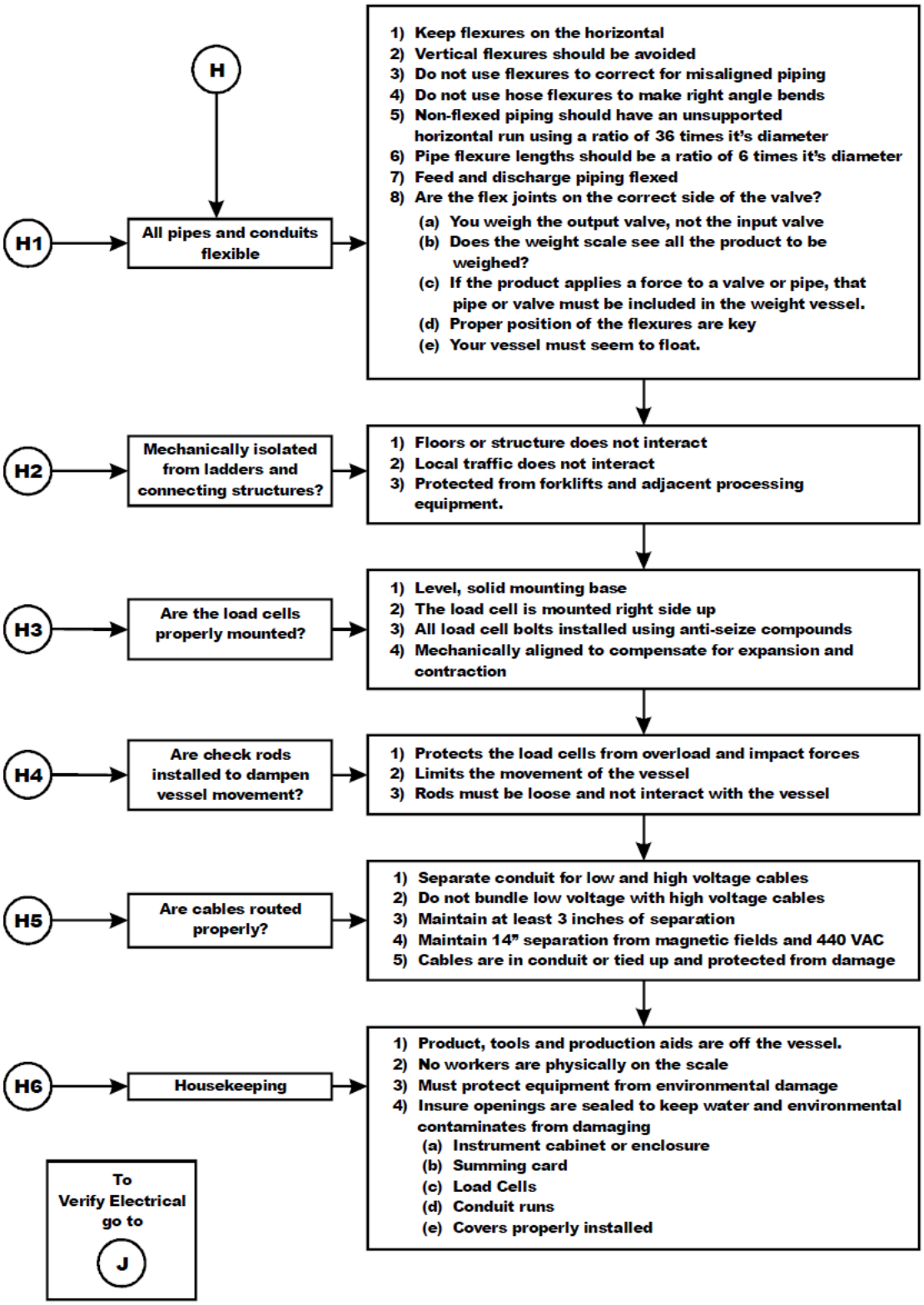


8.4.6 G: Calibration Failed: Not Enough Counts Between Zero Weight and Span Weight

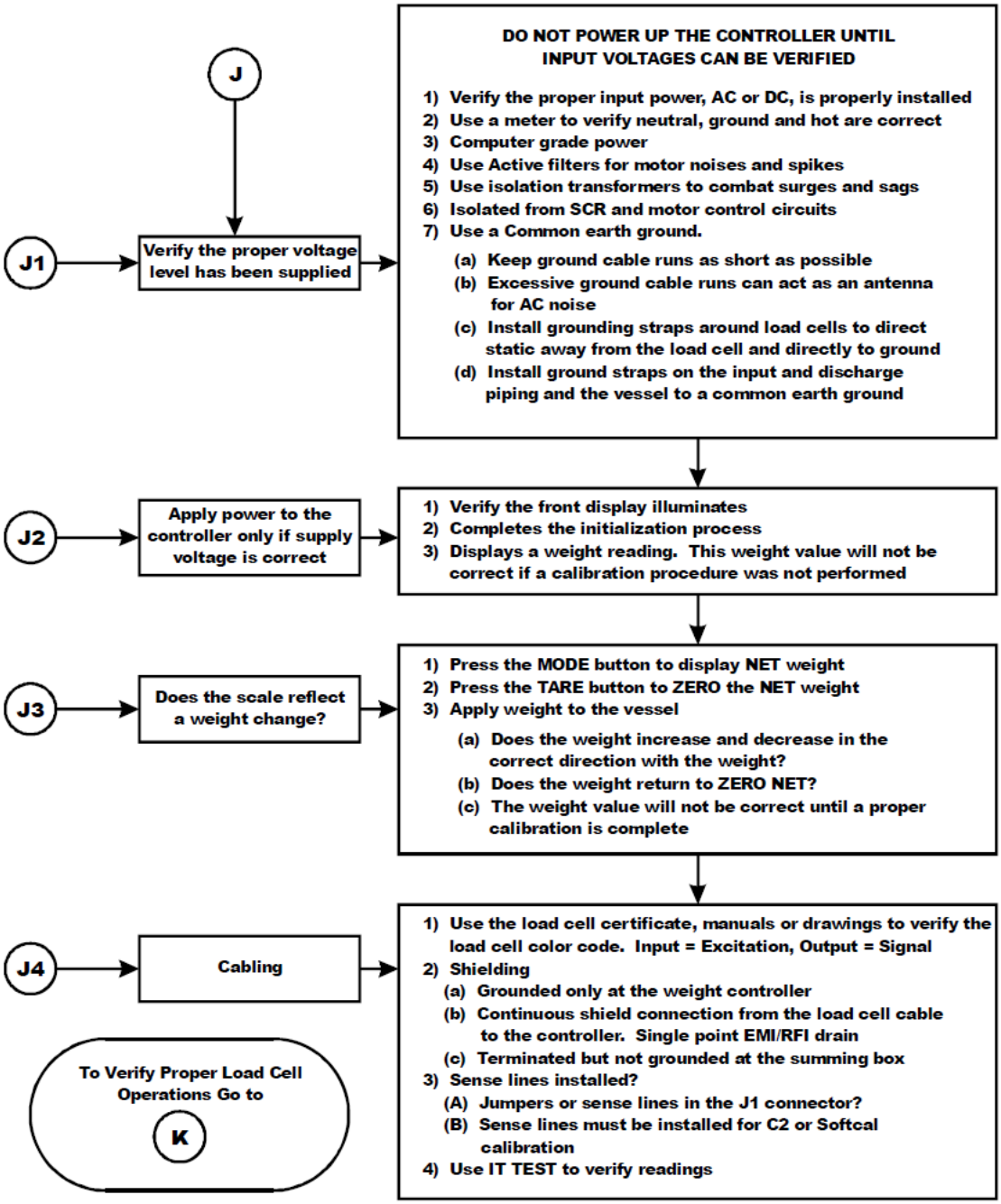
This error occurs at the Span Weight parameter.



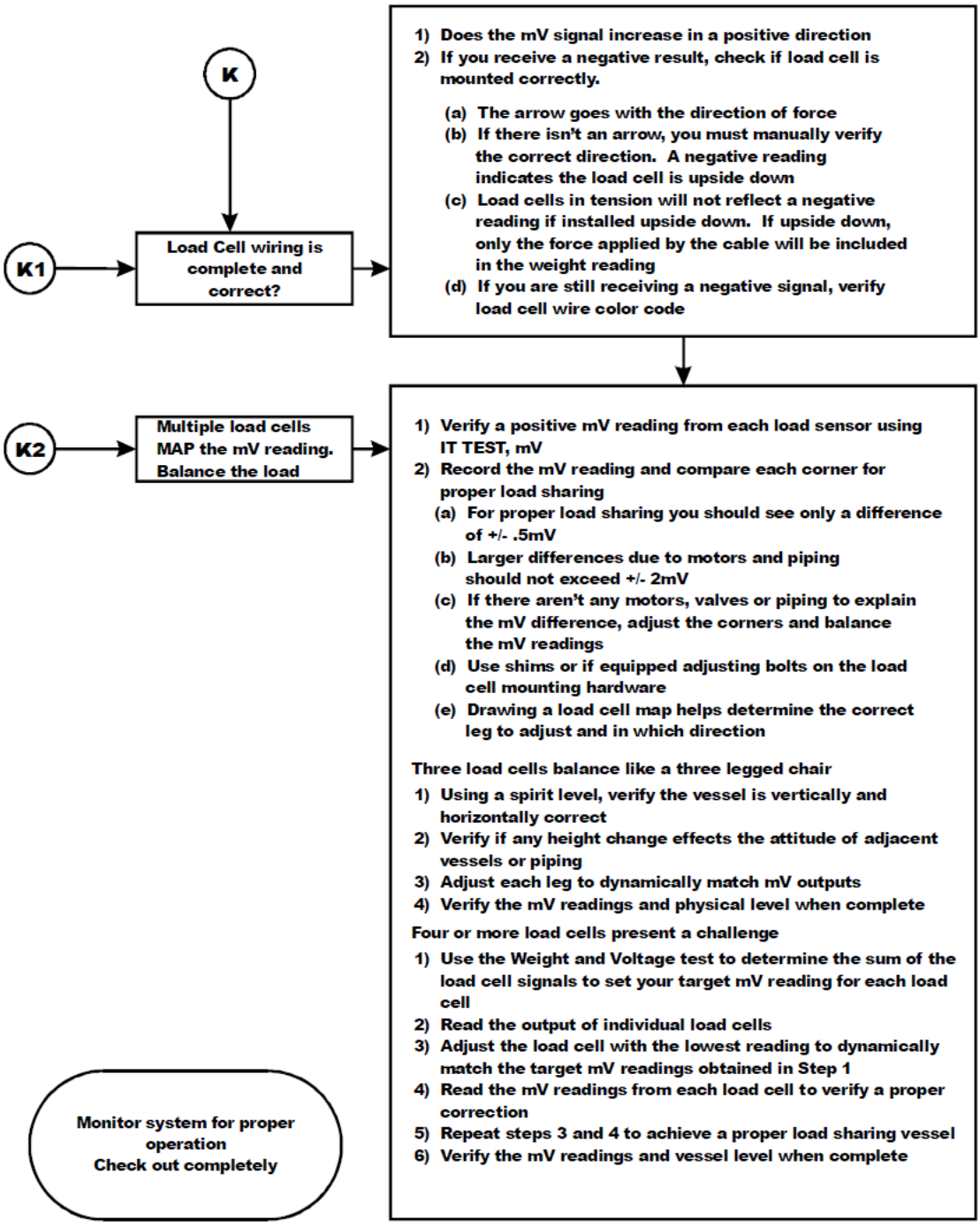
8.4.7 H: Mechanical Inspection



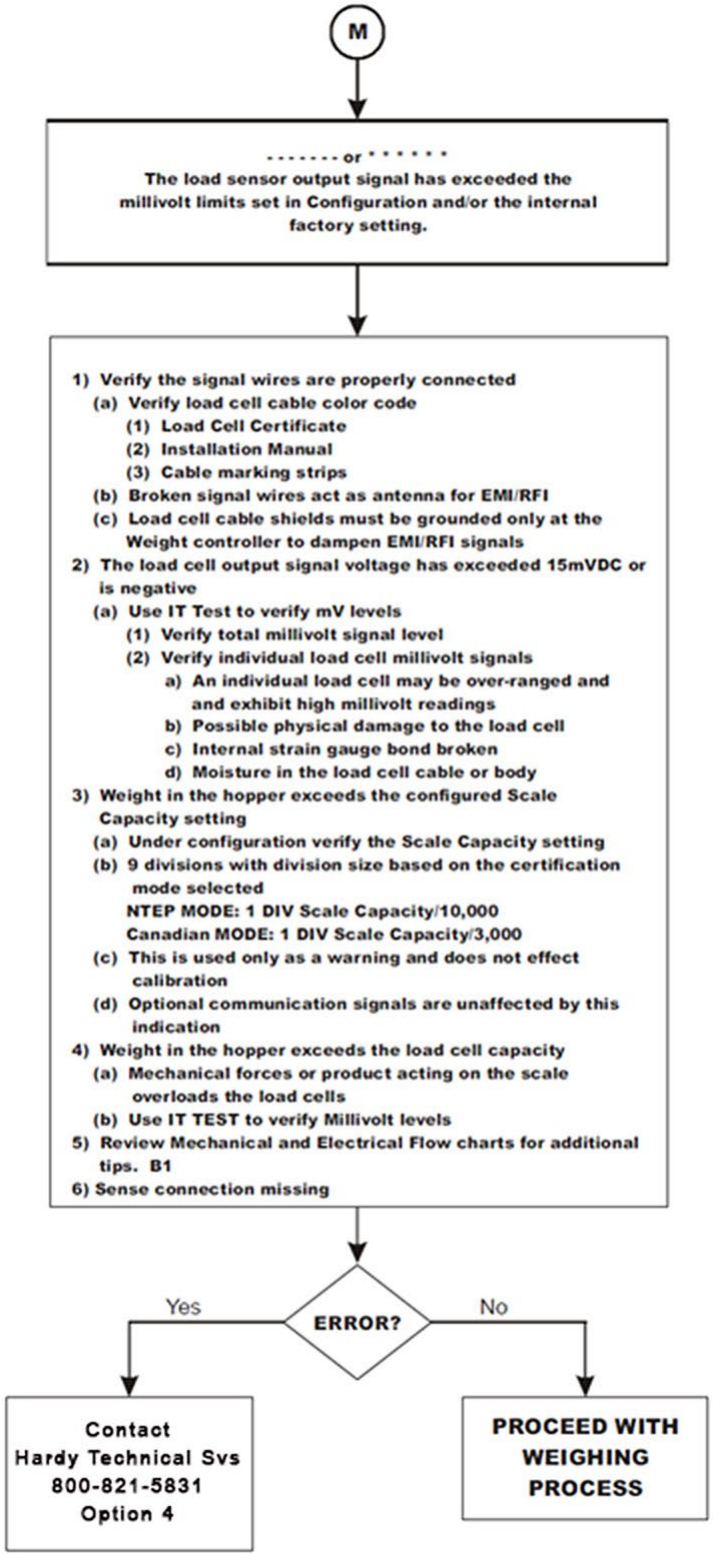
8.4.8 J: Electrical Inspection



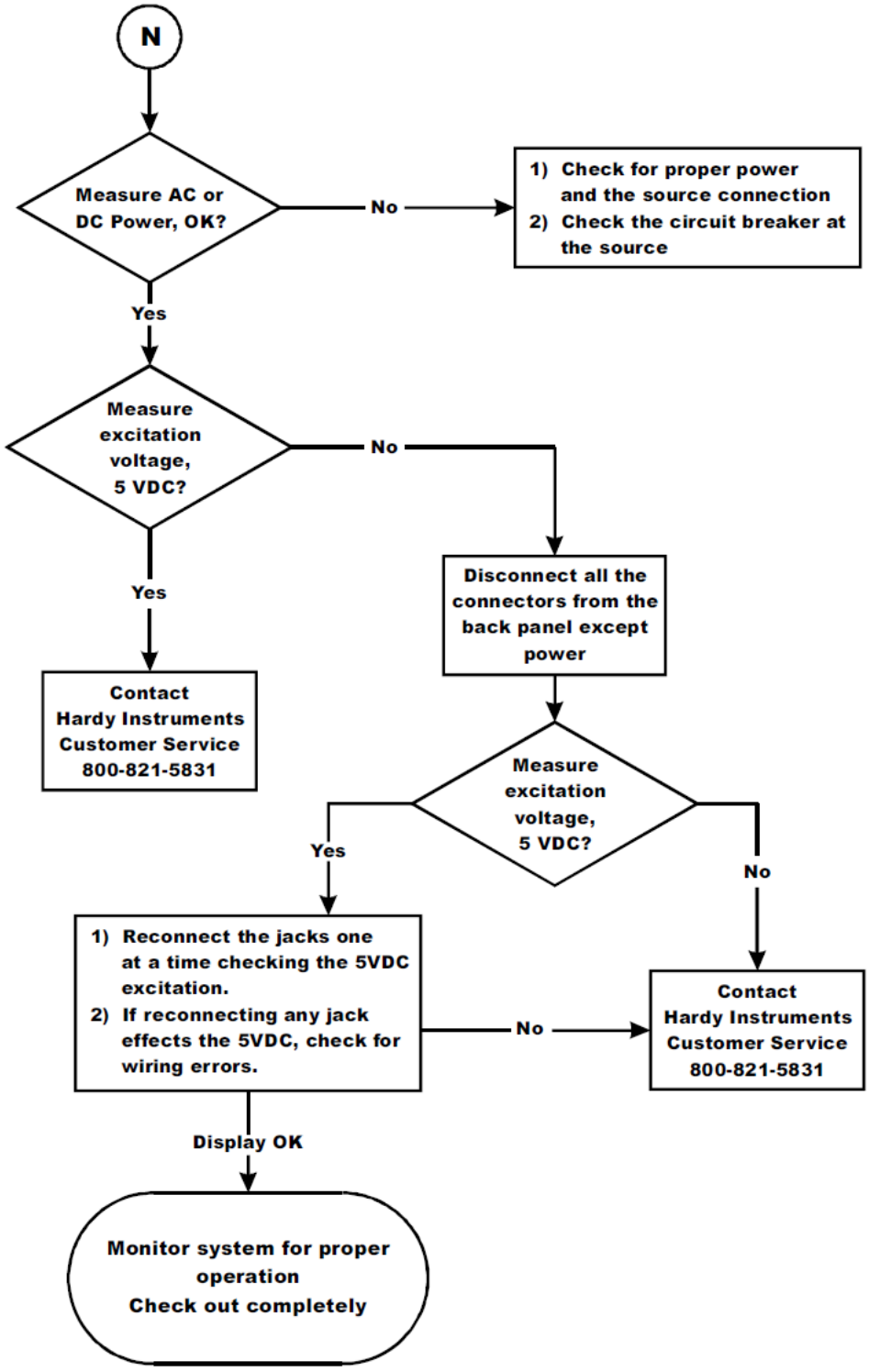
8.4.9 K: Load Sharing and Load Sensor Checkout



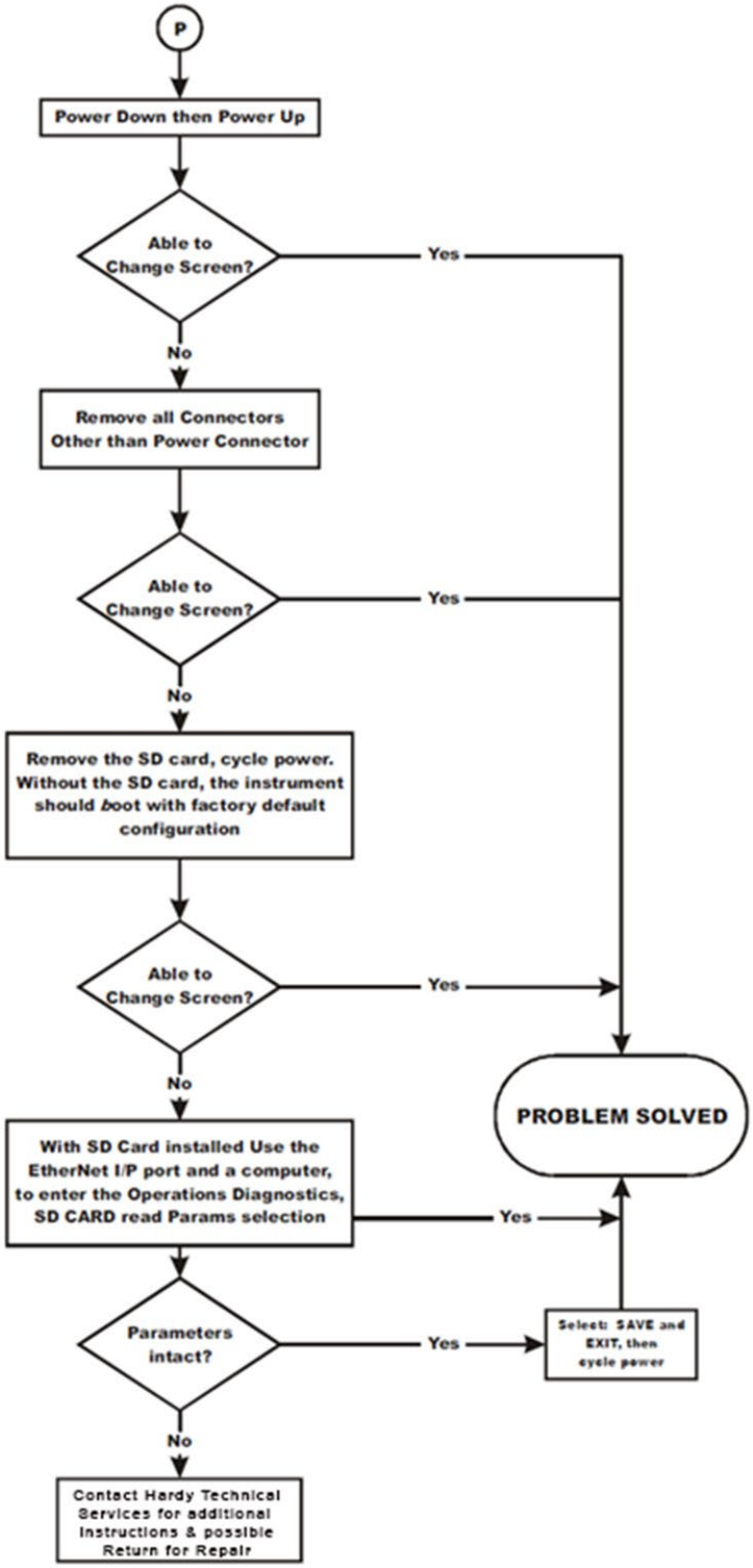
8.4.10 M: (*******) or (- - - - - - -) Error



8.4.11 N: Application Controller Front Panel Display is Blank



8.4.12 P: SD Card Diagnostics



APPENDIX A - I/O SETUP

A.1 Set-Point Configuration

A set point value is a threshold or level based on the Unit (of Measure) that is selected during system configuration (lb, kg, ton, etc). It may be set in either Gross, Net or in ROC units when the option is present. Multiple Set-Points can be configured for a process.

Gain in Weight (High Trip Limit):	The set point turns on when the weight is greater or equal to the setpoint target minus the preact.
	The set point turns off when the weight is less than the target minus the deadband.
Loss in Weight (Low Trip Limit):	The set point turns on when the weight is less than the setpoint target plus the preact.
	The set point turns off when the weight is greater than the setpoint plus the preact.

The preact value is the difference between the set point and the trip point (or Target). It is used to compensate for in-flight material or delayed reaction times when filling or dispensing from a vessel. If set to zero, there is no compensation.

Example: In a Gain-in-Weight application with a Setpoint of 20 lbs and a preact of 0.5 lbs, the setpoint will activate at 19.5 lbs.

The Deadband limit is the difference between the set point and the reset. It is used to prevent rapidly fluctuating setpoint states once the set point is reached.

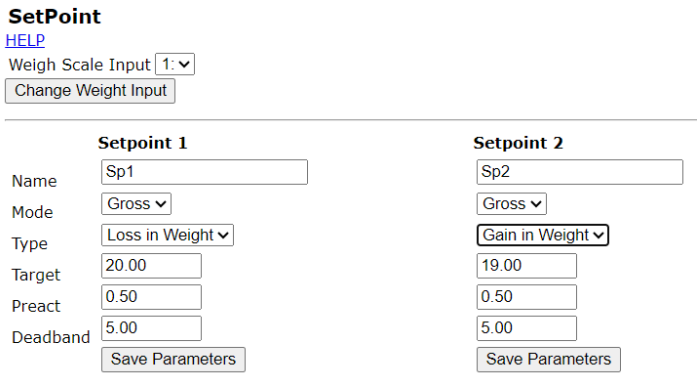
Example: For example, with a setpoint value of 20 pounds and a deadband set to 5 pounds, the setpoint would trigger at 20 pounds and would remain on until the weight dropped to 15 pounds and below.

To establish a setpoint:

1)	Assign a Nickname:	Nicknames can only be assigned using the web browser.
2)	Select a Mode:	Gross Weight or Net Weight (or Rate of Change when option is present)
3)	Select the Type:	Gain-in-Weight is used for a high trip limit.
		Loss-in-Weight is used for a low trip limit.

Enter Target: The setpoint status ON/OFF changes based on this value combined with the effect of implementing Deadband and Preact limits.

4) Enter Parameters: Enter the pre-act and deadband values as required.



EXAMPLE of using a reverse logic setpoint:

These are two ways to fill a vessel to 350 and reset the output when near empty.

Method 1- Gain-in-Weight mode, Target=350, Preact=0, Deadband=345.

The setpoint is triggered when weight reaches 350 and stays on until the vessel is at or below 5.

Method 2: Loss-in-Weight, Target=5, Preact=0, Deadband=345.

The setpoint is triggered until 350, then turns off when the weight is at or below 5.

Note: A complete list of Instrument parameters can be found in Appendix D.

AN EXAMPLE of reverse logic relay usage. These are two settings to fill a vessel to 350 and reset the output when near empty.

With a setpoint setting normal relay logic:

Setting Gross, Gain in Weight, Target=350, Pre=0, Deadband=345.

When the Gross Weight reaches 350 lbs, the output goes on and stays on until a Loss of 345 lbs is detected.

With a setpoint setting using reverse relay logic:

Settings Gross, Loss in Weight, Target=5, Pre=0, Deadband=345.

The Output is on until 350, then the output turns off and stays off until weight is below 5.

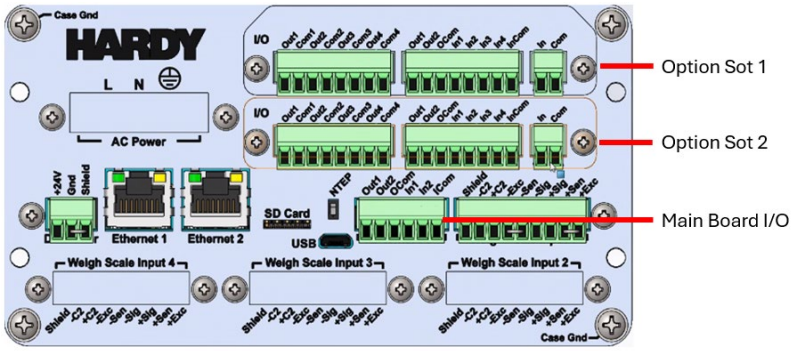
Set Point Controller Parameters:

Parameter	Description
Name	Assigns a nickname to the Set Point (optional)
Mode	Range: Gross, Net, Rate of Change Default: Gross
Type	Range: Gain in Weight, Loss in Weight Default: Gain in Weight
Target	The level at or above (Gain in Weight), or at or below (Loss in Weight) that triggers a setpoint status change. Range: User input value Default: 0
Preact	Used to compensate for in-flight material or delayed reaction times when filling or dispensing material. Range: User input value Default: 0
Deadband	Used to prevent rapidly fluctuating setpoint states once the set point is reached. Range: User input value Default: 0

A.2 I/O Monitoring

Monitoring of main-board I/O state changes can be found on the home screen of the instrument, in the Digital I/O screen of the instrument's display, or via the embedded web server.

Monitoring of option card I/O (6850 only) can be found in the Option Card Set Up of the display or via the embedded web server by navigating to Setup > IO Setup and selecting either IO Monitor to view all installed option card IO or by selecting individual IO cards.



A.3 Main Board I/O Configuration (6800 and 6850)

Main board I/O configuration is separated into two sections: Digital Inputs and Digital Outputs.

Outputs are typically used to control a device such as an indicator light or alarm, but they can also be used to command a function such as Zero or Tare.

Inputs are used to monitor the state change of an external device or an internal event.

Digital Inputs and Outputs can be configured in their respective sections or similarly mapped in the Programming Section (A.5) of this manual.

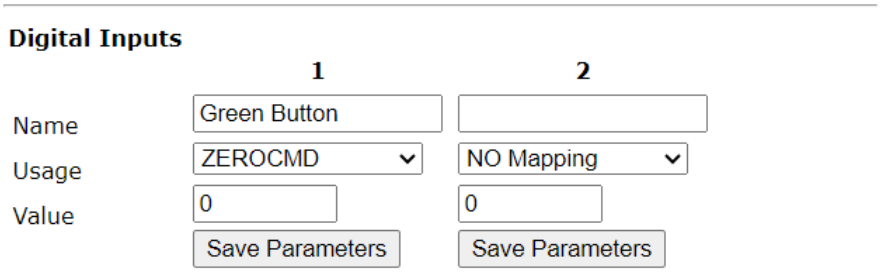
Digital Inputs (Sinking)

Name: Provides the option to assign a nickname to the input, for example: Green Button or Interlock.

Usage: Assigns an action when the input changes state, for example: perform a ZERO command, a TARE command, or C2 calibration command.

Value: Indicates the current state of the input, 0 for low and 1 for high (also shown as red or green on the display and web browser monitor page).

In the web browser click “Save Parameters” to store changes, in the display simply press the checkmark to store changes.



In the example above, Digital Input one has been given a name of 'Green Button' and assigned to a ZERO command when the state goes high. Current state (value) shown is low.

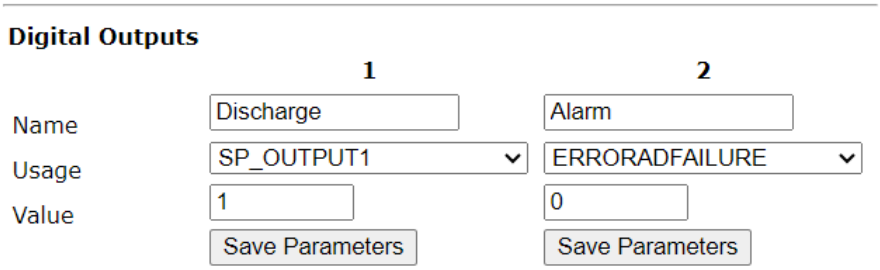
Digital Outputs

Name: Provides the option to assign a name to the output, for example: Discharge Valve or Alarm.

Usage: Assigns a condition that triggers a state change for the output, for example: set-point target reached or a Digital Input 1 high.

Value: Indicates the current state of the input, 0 for low and 1 for high.

Press or click Save Parameters once a nickname and Usage have been assigned.



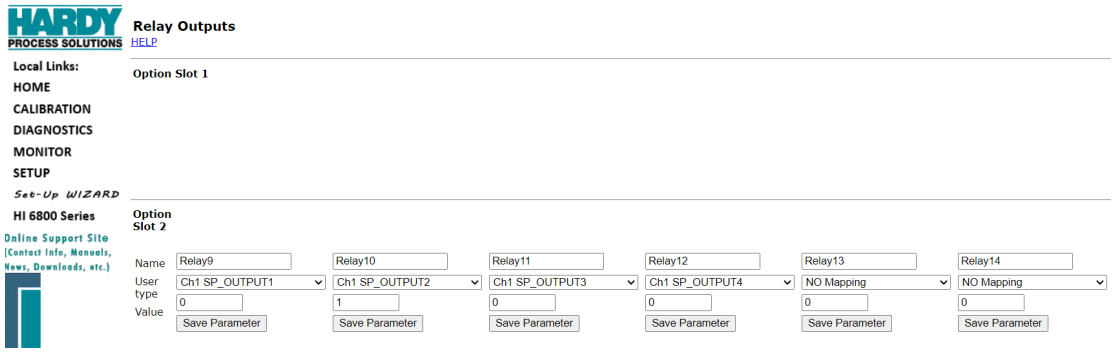
In the example above, Digital Output 1 has been given a name of 'Discharge' and will trigger (go high) when Setpoint 1 is reached. Current state (value) shown is high.

Digital Output 2 has been given a name of 'Alarm' and will trigger (go high) if an ADC failure is detected (for example an open circuit between instrument and sensor caused by a broken sensor cable).

A.4 Option card I/O (6850 models only)

In addition to Main Board I/O, the 6850 may be configured with option cards that provide additional Digital I/O, as well as Analog I/O, and DC Relays. Option cards are automatically detected when installed. To access the Setup of an installed option card, either navigate to Option Card Setup on the display or to Setup > IO Setup in the web browser, then select the I/O to be configured.

Note: Dimmed (display) or blank selections (web browser) indicate an option card was NOT detected.



Example: The above instrument does not have an Option Card present in Slot 1 (upper slot).

A.4.1 Digital Inputs

Name: Provides the option to assign a name to the input, for example: Green Button or Interlock.

Usage: Assigns an action when the input changes state, for example: perform a ZERO command, a TARE command or C2 calibration command.

Value: Indicates the current state of the input, 0 for low and 1 for high (shown as red or green on the display).

Press BACK on the display or click Save Parameters in the web browser once a Nickname and Usage have been assigned.

A.4.2 Digital Outputs

Name: Provides the option to assign a name to the output, for example: Discharge Valve or Alarm.

Usage: Assigns a condition that triggers a state change for the output, for example: set-point target reached or a Digital Input 1 high.

Value: Indicates the current state of the output, 0 for low and 1 for high.

In the web browser click “Save Parameters” to store changes, in the display simply press the checkmark to store changes.

Note: Digital Outputs (as well as Relays described in the next section) cannot be manually triggered when Usage has been assigned (ie: instrument has control).

To manually trigger, first set the Usage to No Mapping.

A.4.3 Relay Outputs

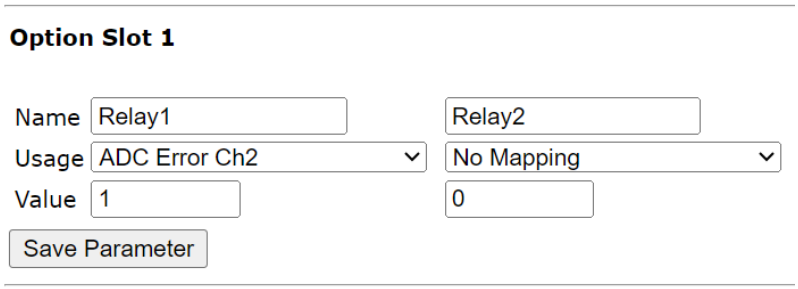
Name: Provides the option to assign a nickname to a relay, for example: Discharge Valve or Alarm.

Usage: Assigns a condition that triggers a state change of the relay, for example: when a set-point target has been reached, close the relay.

Value: Indicates the current state of the relay, 0 for open (unlatched) and 1 for closed (latched).

Press BACK on the display or click Save Parameters in the web browser once a Nickname and Usage have been assigned.

Note: Relays cannot be manually triggered when Usage has been assigned. In the display this is indicated by a lock icon over the relay icon. To manually trigger, set the Usage to No Mapping then click on the Relay Icon (display) or change the Value to 0 or 1 in the web browser then click Save Parameter.



In the example above, Relay 1 cannot be manually toggled because a Usage has been assigned (instrument has control); whereas, the Value for Relay 2 can be manually

A.4.4 Analog Input

Name: Provides the option to assign a nickname.

Weight at 4mA: Value assigned at 4mA.

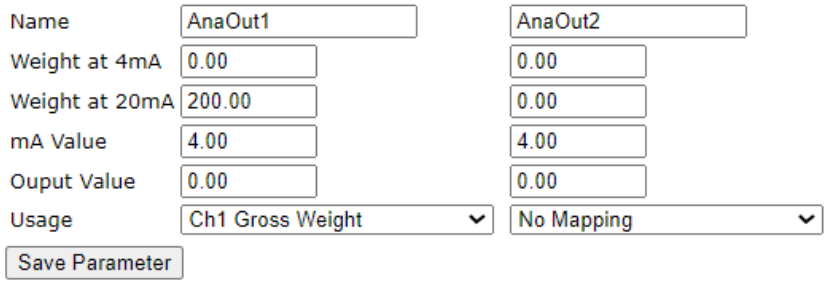
Weight at 20mA: Value assigned at 20mA

mA Value: Current value of mA signal

Output Value: Scaled value based on current mA value.

Usage: Assigns mA valve to selected type (gross, net, or ROC).

Name: Provides the option to assign a nickname to analog input, for example: Pressure or Temperature Sensor.



In the example above, when Gross Weight from Channel 1 is 200 lbs, the output value of Analog 1 will be 20mA (when the gross weight is 100 lbs, the mA value will be 12)

In the web browser click “Save Parameters” to store changes, in the display simply press the checkmark to store changes.

Press BACK on the display or click Save Parameters in the web browser once a Nickname, been assigned.

A.4.5 Analog Output

Name: Provides the option to assign a nickname.

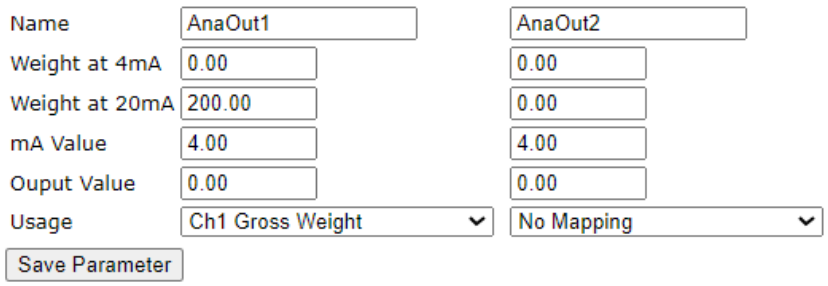
Weight at 4mA: Value assigned at 4mA.

Weight at 20mA: Value assigned at 20mA

mA_Value: Current value of mA signal

Output Value: Current calculated weight value based on mA value.

Usage: Assigns Channel number (if more than one channel is used) and weight data type (Gross, Net or ROC) to scale analog output values.



In the example above, when Gross Weight from Channel 1 is 200 lbs, the output value of Analog 1 will be 20mA (when the gross weight is 100 lbs, the mA value will be 12)

Press BACK on the display or click Save Parameters in the web browser once a Nickname, Values and Usage have been assigned.

A.5 HI6850 Programming

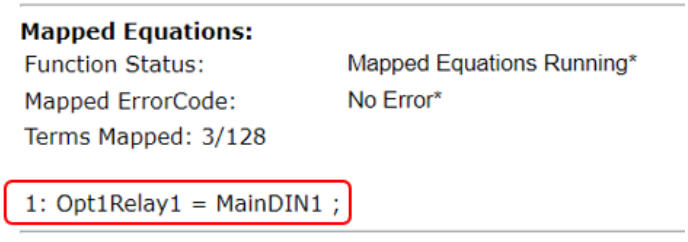
Overview: Advanced Mapping combines basic instrument configuration with both logic and arithmetic that allows a user to set up certain monitoring and control activities to meet a wide variety of process weighing requirements.

A.5.1 Mapping Basics

1) Expressions are a single line of code created from terms, for example:

Opt1Relay2 = MainDIN1 AND Opt2DIN2;

A total of 128 terms are available to write a program. A term is a destination (output), a source (input), logic, arithmetic, and an end statement represented by a semicolon In the example above, 5 terms are used (Opt1Relay2, MainDIN1, AND, Opt2DIN2, ;)



Note: The instrument generates the semicolon automatically to end the expression and to go to the next expression.

2) Expressions are always read from left to right and must begin with a Destination that is selected from the Output list.

3) The output on the left of the expression will be active (on) when the condition (or combination of conditions) on the right of the expression are true.

   Scroll to select an output and either click Select (web browser) or press the checkmark (display) to load the selection into the map. Once the output is loaded into the map, sources (inputs) will become available to select.

   MainDOUT1 = Ch1GrossWt >= 20

   In the example above, Digital Output 1 located on the mainboard will change state from low to high (active) when the Gross Weight on Channel 1 is greater than or equal to 20.

   Destinations can also be Commands. In the example below, the controller will preform a zero command once the gross weight on channel one falls below 5.

   Ch1Zero = Ch1GrossWt > 5;

4) Expressions are processed from top to bottom, once the last expression is processed; the controller returns to expression 1 and cycles through all mapped expressions again.

   In the example below, Relay 1 will remain closed until the condition is no longer true or is it forced open by an ensuing expression that is not true.

   Opt1 Relay1 = Ch1GrossWt > (2)
   Opt1 Relay1 = Ch1GrossWt != (2) **X**

   Relay 1 will close (output active) when the gross weight is greater than 2, then a moment later (approximately 1 millisecond) will open (output inactive) again if the gross weight is less than 10.

   Warning: The above expression will cause rapid latching and unlatching of relays, and may shorten the lifecycle of the component.

5) Multiple arithmetic and logic operations may appear in one expression.

   Opt1Relay2 = MainDIN1 **AND** Opt2DIN2 **AND** Opt2DIN3 **AND** Opt2DIN4

6) When using Arithmetic Operators, a Value may be required. Input the value then click the Value button (or checkmark) to load the value into the expression (the value will appear in the mapping equation between a set of parenthesis).

Opt1 Relay1 = Ch1GrossWt + (10)

7) When using Logic Operators (AND, OR, NOT) all conditions on the left must be met for the Output on the right to become active.

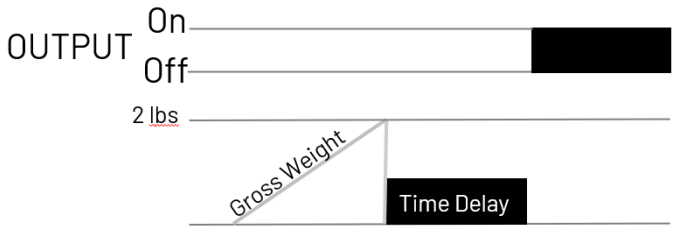
Out1Relay2 = Ch1SP1 AND MainDIN1

In the example above, Relay 2 will close when Channel 1 SetPoint 1 is reached AND the state of Digital Input 1 located on the main controller is high (ON).

8) Timers must be placed at the end of the mapping expression and represent a delay before the expression is considered true.

In the example below, Relay 1 will close when the Gross Weight is greater than 2 AND after 60 milliseconds have elapsed.

Opt1 Relay1 = Ch1GrossWt > (2) TMR (60)



9) Avoid mapping invalid expressions. The following is an example of an invalid expression:

MainDOUT1 = GrossWt + NetWt X

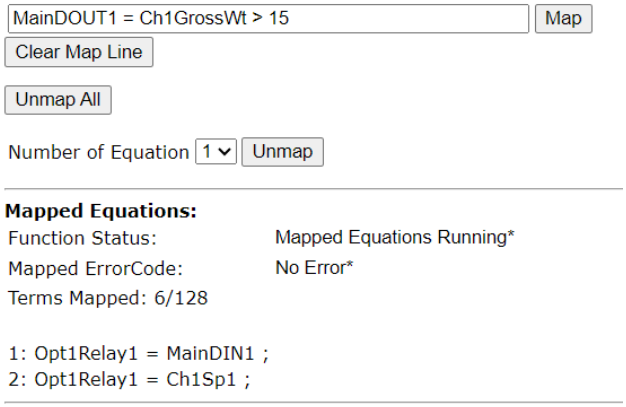
In the example above, the expression would be processed by the controller as:

Main Digital Out 1 = Gross Weight PLUS Net Weight. It is an invalid expression because there is no condition to be met, simply adding 2 values is not a condition.

10) Saving Expressions and Maps.

a. Once an expression is created, it must be added to the map by clicking Add to Map.
b. Once a Map is created, it must be saved into the controller's memory by selecting Save Map.

Note: Creating and saving a new map will overwrite any pre-existing map.



Note: A user can delete one expression at a time from the Map by selecting the expression number and clicking Delete.

Note: The controller has error checking for invalid expression. Invalid expressions must be removed from the program in order to save (shown as No Error).

A 5.2 Use of Registers

Eight Floating Points and eight Boolean Logic registers are available to expand the capabilities of mapping and programming. Floating Point registers are used to store values while the Boolean Logic registers are used to store True or False (1 or 0).

In the example below, a floating point register is used to store the gross weight divided by 10.

FRegOUT1 = Ch3GrossWt / 10

In the next example, a floating point register is used to create a value for the total net weight of three channels.

FRegOUT1 = Ch1NetWt + Ch2NetWt + Ch3NetWt

In the final example, when floating point register 1 from the previous example is greater than 1000, relay 1 on option card 1 will close.

Opt1Relay1 = FRegIN1 > 1000

Boolean registers are used in a similar way as floating point registers, only they represent logic versus a value. In the example below Boolean register 1 will be true only if digital inputs one and two on the main are high (on).

BRegOUT1 = MainDIN1 AND MainDIN2

In another example, the Boolean register will be TRUE only after all three channels of weigh have reached their target weights and will trigger an alarm collected to relay 4 (second expression).

BRegOUT1 = Ch1Sp1 AND Ch2Sp1 AND Ch3Sp1

Opt1Relay2 = BRegIN1

Note: Booleans must be used to assign a value to logic conditions.

To turn on Relay 2 when the Gross Weight is greater than 10 and after 60 milliseconds have elapsed, expressions must be written as follows:

BRegOut1 = Ch1GrossWt > 10

Opt1Relay2 = BRegOut1 TMR(60)

Writing the expression: Opt1Relay2 = Ch1GrossWt > 10 TMR(60) will result in the relay latching if the gross weigh is not exactly zero and after 60 milliseconds have elapsed.

A 5.3 Advanced Mapping Examples

To cause Relay 1 to close when the gross weight is greater than or equal to 200 units and Digital Input 1 is detected high (ON) and 100 milliseconds have elapsed; the expressions should be written as:

BRegOut1 = ch1 gross wt >= 200

Opt1Relay= BRegOut1 AND DIN 1 TMR (100)

When channel 2's net weight is greater than channel 1's net weight, and digital input 3 is high (ON) or digital input 2 is low (OFF); then Relay 8 will close (latch).

1: BRegOUT1 = Ch2NetWt > Ch1NetWt

2: BRegOUT2 = DIN3 OR NOT DIN2

3: Opt1Relay8 = BRegIN1 AND BRegIN2

A 5.4 Logic Operators, Timers and Arithmetic.

The following tables define Logic Operators, Timers and Arithmetic.

AND	Conjunction, it returns true only if both operands are true, otherwise, it returns false
OR	Disjunction, it returns true if at least one of the operands is true
NOR	Negation, it returns the opposite value of the operand. If the operand is true, it returns false; if the operand is false, it returns true.
TMR	Delay timer, expressed in milliseconds.

Value	Assigns a numeric value		**==**	Exactly Equals
+	Addition		**!=**	Does not equal
-	Subtraction		**>**	Greater than
*****	Multiply		**<**	Less than
/	Divide		**>=**	Greater than or equal to
			<+	Less than or equal to

A.5.6 Terms in the Output List (Destination)

Term	Description		Term	Description
Main DOut1	Digital Out 1 on Main Board		Flt Reg1	Floating Point Value in Register 1
Main Dout2	Digital Out 2 on Main Board		Flt Reg2	Floating Point Value in Register 2
Opt1 Relay1	Relay 1 on Option Board 1		Flt Reg3	Floating Point Value in Register 3
Opt1 Relay2	Relay 2 on Option Board 1		Flt Reg4	Floating Point Value in Register 4
Opt1 Relay3	Relay 3 on Option Board 1		Flt Reg5	Floating Point Value in Register 5
Opt1 Relay4	Relay 4 on Option Board 1		Flt Reg6	Floating Point Value in Register 6
Opt1 Relay5	Relay 5 on Option Board 1		Flt Reg7	Floating Point Value in Register 7
Opt1 Relay6	Relay 6 on Option Board 1		Flt Reg8	Floating Point Value in Register 8
Opt2 Relay7	Relay 7 on Option Board 1		Bool Reg1	Boolean Value in Register 1
Opt2 Relay8	Relay 8 on Option Board 1		Bool Reg2	Boolean Value in Register 2
Opt2 Relay1	Relay 1 on Option Board 2		Bool Reg3	Boolean Value in Register 3
Opt2 Relay2	Relay 2 on Option Board 2		Bool Reg4	Boolean Value in Register 4
Opt2 Relay3	Relay 3 on Option Board 2		Bool Reg5	Boolean Value in Register 5
Opt2 Relay4	Relay 4 on Option Board 2		Bool Reg6	Boolean Value in Register 6
Opt2 Relay5	Relay 5 on Option Board 2		Bool Reg7	Boolean Value in Register 7
Opt2 Relay6	Relay 6 on Option Board 2		Bool Reg8	Boolean Value in Register 8
Opt2 Relay7	Relay 7 on Option Board 2		Flt Reg1	Floating Point Value in Register 1
Opt2 Relay8	Relay 8 on Option Board 2		Flt Reg1	Floating Point Value in Register 2
Opt1 DOut1	Digital Out 1 Option Board 1		Flt Reg1	Floating Point Value in Register 3
Opt1 DOut2	Digital Out 2 Option Board 1		Flt Reg1	Floating Point Value in Register 4
Opt2 DOut1	Digital Out 1 Option Board 2		Flt Reg1	Floating Point Value in Register 5
Opt2 DOut2	Digital Out 2 Option Board 2		Flt Reg1	Floating Point Value in Register 6
Opt1 DOut1	Digital Out 1 Option Board 1		Flt Reg1	Floating Point Value in Register 7
Ch1Zero	Zero command for Channel 1		Flt Reg1	Floating Point Value in Register 8
Ch1Tare	Tare command for Channel 1			
Ch1 C2 Cal	C2 Calibration for Channel 1			
Ch2Zero	Zero command for Channel 2			
Ch2Tare	Tare command for Channel 2			
Ch2 C2 Cal	C2 Calibration for Channel 2			
Ch3Zero	Zero command for Channel 3			
Ch3Tare	Tare command for Channel 3			
Ch3 C2 Cal	C2 Calibration for Channel 3			
Ch4Zero	Zero command for Channel 4			
Ch4Tare	Tare command for Channel 4			
Ch4 C2 Cal	C2 Calibration for Channel 4			

A.5.7 Terms in the Input List (Source)

Term	Description		Term	Description
Ch1Setpoint1	Setpoint 1 for Channel 1		Ch3Setpoint1	Setpoint 1 for Channel 3
Ch1Setpoint2	Setpoint 2 for Channel 1		Ch3Setpoint2	Setpoint 2 for Channel 3
Ch1Setpoint3	Setpoint 2 for Channel 1		Ch3Setpoint3	Setpoint 3 for Channel 3
Ch1Setpoint4	Setpoint 2 for Channel 1		Ch3Setpoint4	Setpoint 4 for Channel 3
Ch1 Gross	Gross Weight value for Channel 1		Ch3 Gross	Gross Weight value for Channel 3
Ch1 Net	Net Weight value for Channel 1		Ch3 Net	Net Weight value for Channel 3
Ch1 ADC Er	ADC Error on Channel 1		Ch3 ADC Er	ADC Error on Channel 3
Ch1 ADC Fail	ADC Failure on Channel 1		Ch3 ADC Fail	ADC Failure on Channel 3
Ch1 Motion	Channel 1 in Motion detected		Ch3 Motion	Channel 3 in motion detected
Ch1 CoZ	Channel 1 Center of Zero		Ch3 CoZ	Channel 3 Center of Zero
Ch1 OverRng	Channel 1 Overrange detected		Ch3 OverRng	Channel 3 Overrange detected
Ch1Diag	Channel 1 Diagnostics in progress		Ch3Diag	Channel 3 Diagnostics in progress
Ch2Setpoint1	Setpoint 1 for Channel 2		Ch4Setpoint1	Setpoint 1 for Channel 4
Ch2Setpoint2	Setpoint 2 for Channel 2		Ch4Setpoint2	Setpoint 2 for Channel 4
Ch2Setpoint3	Setpoint 3 for Channel 2		Ch4Setpoint3	Setpoint 3 for Channel 4
Ch2Setpoint4	Setpoint 4 for Channel 2		Ch4Setpoint4	Setpoint 4 for Channel 4
Ch2 Gross	Gross Weight value for Channel 2		Ch4 Gross	Gross Weight value for Channel 4
Ch2 Net	Net Weight value for Channel 2		Ch4 Net	Net Weight value for Channel 4
Ch2 ADC Er	ADC Error on Channel 2		Ch4 ADC Er	ADC Error on Channel 4
Ch2 ADC Fail	ADC Failure on Channel 2		Ch4 ADC Fail	ADC Failure on Channel 4
Ch2 Motion	Channel 2 in motion detected		Ch4 Motion	Channel 4 in motion detected
Ch2 CoZ	Channel 2 Center of Zero		Ch4 CoZ	Channel 4 Center of Zero
Ch2 OverRng	Channel 2 Overrange detected		Ch4 OverRng	Channel 4 Overrange detected
Ch2Diag	Channel 2 Diagnostics in progress		Ch4Diag	Channel 4 Diagnostics in progress
Main DIn1	Digital Input 1 on Main Board		Flt Reg1	Floating Point Value in Register 1
Main DIn2	Digital Input 2 on Main Board		Flt Reg2	Floating Point Value in Register 2
Opt1 Din1	Digital Input 1 on Option Board 1		Flt Reg3	Floating Point Value in Register 3
Opt1 Din2	Digital Input 2 on Option Board 1		Flt Reg4	Floating Point Value in Register 4
Opt1 Din3	Digital Input 3 on Option Board 1		Flt Reg5	Floating Point Value in Register 5
Opt1 Din4	Digital Input 4 on Option Board 1		Flt Reg6	Floating Point Value in Register 6
Opt1 Anl1	Analog Input 1 on Option Board 1		Flt Reg7	Floating Point Value in Register 7
Opt2 Din1	Digital Input 1 on Option Board 2		Flt Reg8	Floating Point Value in Register 8
Opt2 Din2	Digital Input 2 on Option Board 2		Bool Reg1	Boolean Value in Register 1
Opt2 Din3	Digital Input 3 on Option Board 2		Bool Reg2	Boolean Value in Register 2
Opt2 Din4	Digital Input 4 on Option Board 2		Bool Reg3	Boolean Value in Register 3
Opt1 Anl1	Analog Input 1 on Option Board 2		Bool Reg4	Boolean Value in Register 4
			Bool Reg5	Boolean Value in Register 5
			Bool Reg6	Boolean Value in Register 6
			Bool Reg7	Boolean Value in Register 7
			Bool Reg8	Boolean Value in Register 8

APPENDIX B - APPLICATION-SPECIFIC PROGRAMMING OPTIONS

This appendix describes how to configure application-specific programming options. When these application options become available, instructions will be added here.

B.1 Level Measurement

B.2 Rate of Change

B.2.1 Rate of Change Application (ROCA)

The ROC option measures and displays the rate at which a material enters (Gain in Weight) or is dispensed (Loss in Weight) from the scale over a specified ***period of time.***

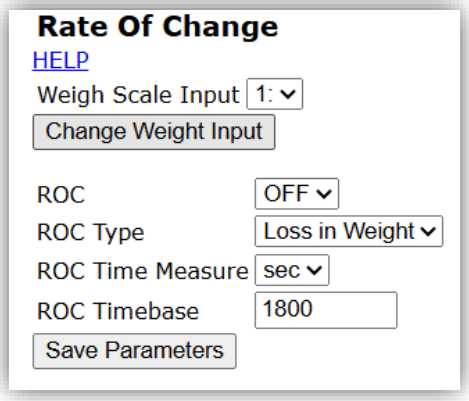
Time Units and Auto Rate Calculation

The 6800 Series uses a minimum of one second's worth of updates to calculate the change. The instrument automatically calculates and optimizes the flow rate; however, initial values within an appropriate range must be set as a starting point for auto rate calculation to take place. Auto rate calibration uses a minimum of 10 ROC Time periods to make the rate calculation.

To access ROC settings-

In the display, navigate to setting and press the Rate of Change button.

In the webserver, navigate to settings and then click the ROC link.



ROC data uses a 110-entry register, new weight values are written to the register at the rate of 1/110th of the time base. The first register is subtracted from the 250th register, which is one time base older than the first register. The time frame can be set to units per second, minute, or hour and is selectable from 1 to 1800.

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, the time between weight readings is also increased; this allows more material to be received or dispensed during the time base period. To improve accuracy, low flow rates require a longer time base than high flow rates.

The instrument measures weight to about 1 part in 10,000. The formula below provides a suggested starting point for auto rate calculation to take place:

TIME BASE **>** (SCALE CAPACITY/5000) / LOW SETPOINT (units per sec).

SCALE CAPACITY/5000 = determines minimum weight increment.

Example of a 440 lbs capacity scale with desired flow rate of 3 lbs./minute:

(440/5000) = 0.088 lb

The lowest setpoint in units per second @ 3 lb per min is:

3 lb/60 sec = 0.05 lb/sec

Therefore:

TIME BASE = 0.088/0.05

TIME BASE = 1.76 (rounded to 2)

MINIMUM TIME BASE = 2 seconds

B.3 Setpoint Weight Control

B.3.1 Introduction

The Setpoint Weight Control application enhances the basic setpoint control covered in Appendix A and is preconfigured to drive relays on the GPRC option card in slot 2 of the instrument.

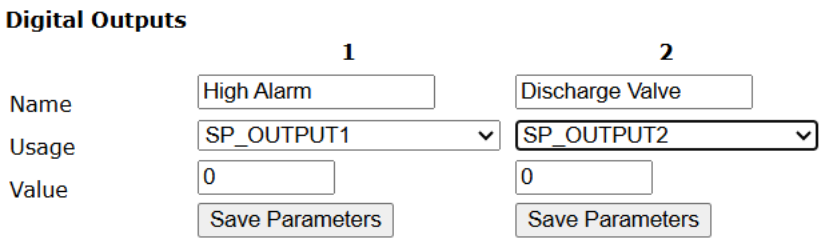
Before proceeding, please review the basic setpoint configuration in Appendix A.

A setpoint represents a threshold value in the selected unit of measure (e.g., lb, kg, ton). This application supports two operating modes—**MANUAL** and **AUTO**—in addition to **OFF**.

Modes Overview

- **OFF**

  - Disables the application, giving the user full access to configuration and programming settings, allowing a user to build a custom application.
  - Outputs (digital and relay) must be manually assigned.



Example: Setpoint 1 has been assigned to Digital Output 1 (High Alarm), Setpoint 2 to Digital Output 2 (Discharge Valve).

- **MANUAL**

  Allows a user to manually start/stop the setpoint control cycle via **START** and **STOP** buttons.

- **AUTO**

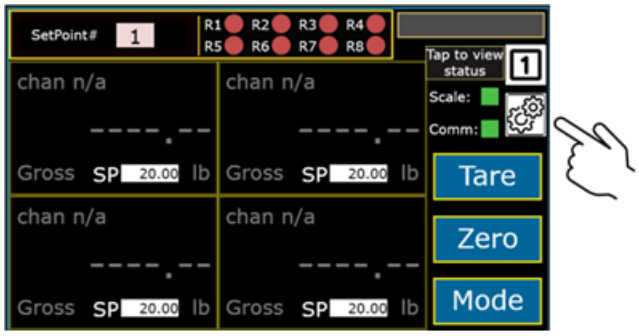
  Automatically runs setpoint control without operator input; relays switch states when target conditions are met.

WARNING: When enabled, relays respond immediately to current conditions. For instance, if a Loss-in-Weight setpoint is 100 lb and the scale reads 120 lb, the relay will close (latch) until the weight drops below 100 lb.

B.3.2 Setup & Configuration

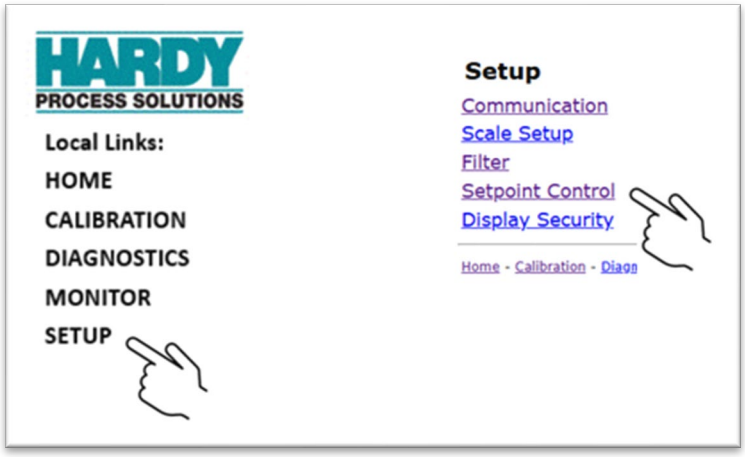
B.3.2.1 Setup via Instrument Display

- Tap the **settings icon** (gear icon, upper right).
- Select **Setpoint** under the Operations section.



B.3.2.2 Setup via Web Server

- Open the sidebar and click **SETUP**, then select **Setpoint Control**.



B.3.2.3 Default Setpoint Assignments

- Two setpoints per weight channel are preassigned to relays (see Table B.3.1).
- Instruments with four weight channels can support up to eight setpoints (two per channel).
- Common applications include fast/slow fill in a Gain-in-Weight application or fast/slow dispense in a Loss-in-Weight application. Other applications may

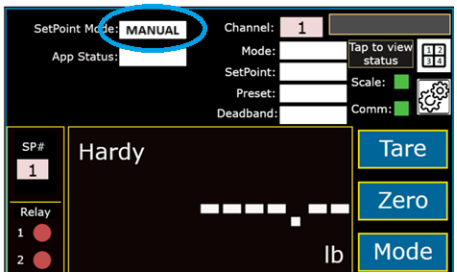
include using one setpoint to control a valve and another setpoint to control an indicator light.

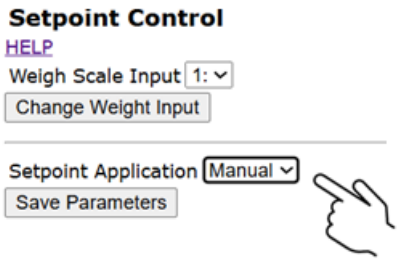
Ch1/SP1	Ch1/SP2	Ch2/SP1	Ch2/SP2	Ch3/SP1	Ch3/SP2	Ch4/SP1	CH4/SP2
Relay 1	Relay 2	Relay 3	Relay 4	Relay 5	Relay 6	Relay 7	Relay 8

Table B.3.1

B.3.2.4 Configuration Steps

1. Choose the application **Mode** (OFF, MANUAL, AUTO) and confirm (display) or save parameters (web).





WARNING: Enabling **AUTO** activates relays immediately based on setpoint conditions established during set-up.

2. Select **Channel** by taping the numeric text box next to Channel #. When using the web browser confirm clicking **Change Weight Input**.
3. Choose **Setpoint #** (1 or 2).

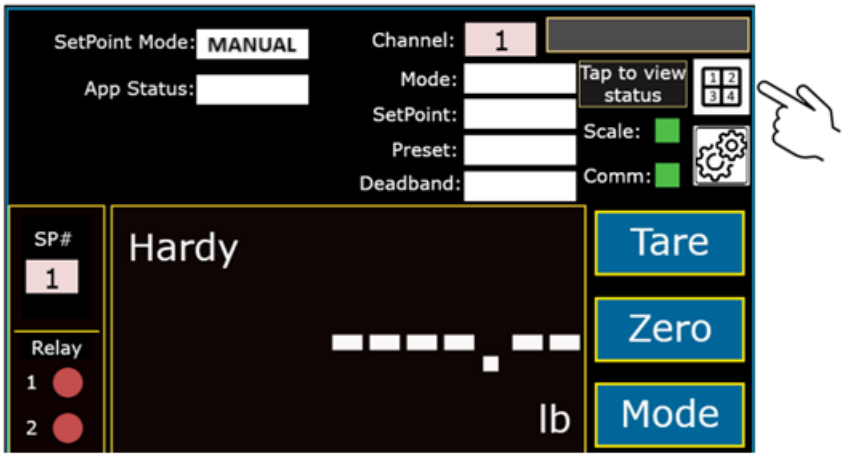
- To configure more than two setpoints or assign to different outputs, switch Mode to **OFF**, confirm, and adjust settings per Appendix A.1 and A.5.

4. Choose **Mode Type**: *Gross* or *Net*.
5. Choose **Type**: *Loss-in-Weight* or *Gain-in-Weight*.
6. Configure **Setpoint**, **Pre-act**, and **Deadband** settings (see Appendix A.1). On display, tap the thresholds to open the numeric keypad.
7. *(Web only)* Optionally rename setpoints (default: SP1, SP2).

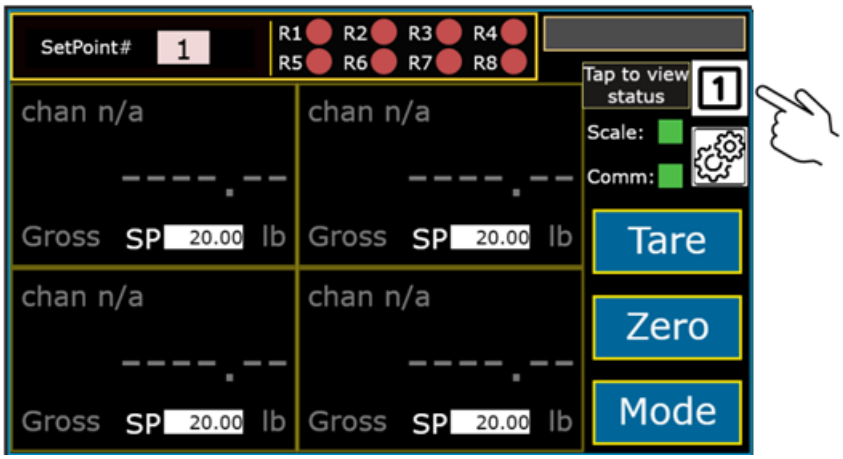
B.3.3 Operating the Setpoint Weight Controller

B.3.3.1 Navigation

- To navigate between **Single-Channel** and **Multi-Channel** views: tap the number grid (upper right).

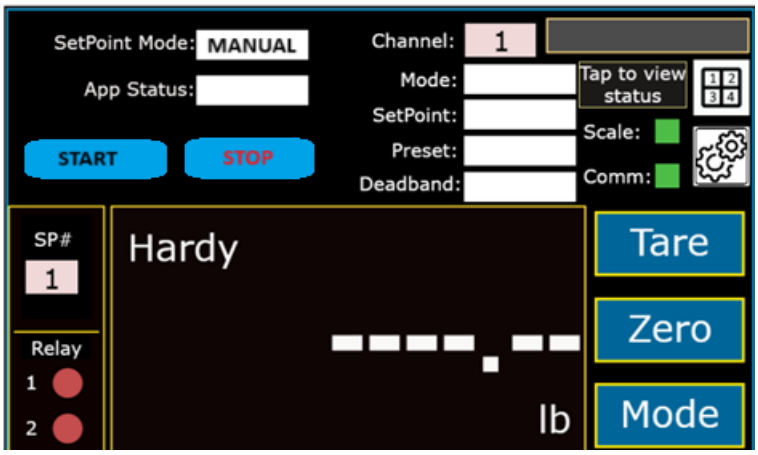


- In the **Multi-Channel** view:
  - View weights, setpoint thresholds, and relay status for all channels.
  - Select **Setpoint #** (applies across all channels).
  - Zero/tare a channel: tap the channel (blue highlight) → tap **Zero** or **Tare** (lower right).



- In the **Single-Channel** view:
    - Control START/STOP and view current weight, mode, setpoint, pre-act, deadband, and relay status.
    - Change channels by tapping the channel number (display) or clicking **Change Weight Input** (web).
    - Change which setpoint's values are visible by tapping the SP# box.

  Note: To edit pre-act and threshold values, navigate back to the configuration screen.



B.3.3.2 OFF Mode

- Disables preassigned settings and unlocks full programming flexibility.
- In the example below, setpoint application defaults have been reassigned. Channel 1 Setpoint 1 now controls multiple outputs via custom scripting:
    - Out1Relay1 = Ch1SP1
    - Out1Relay2 = Ch1SP1
    - Out1Relay3 = Ch1SP1
- Reassignments are retained only in OFF mode; in MANUAL/AUTO modes, setpoints revert to defaults (per Table B.3.1).

B.3.3.3 MANUAL Mode

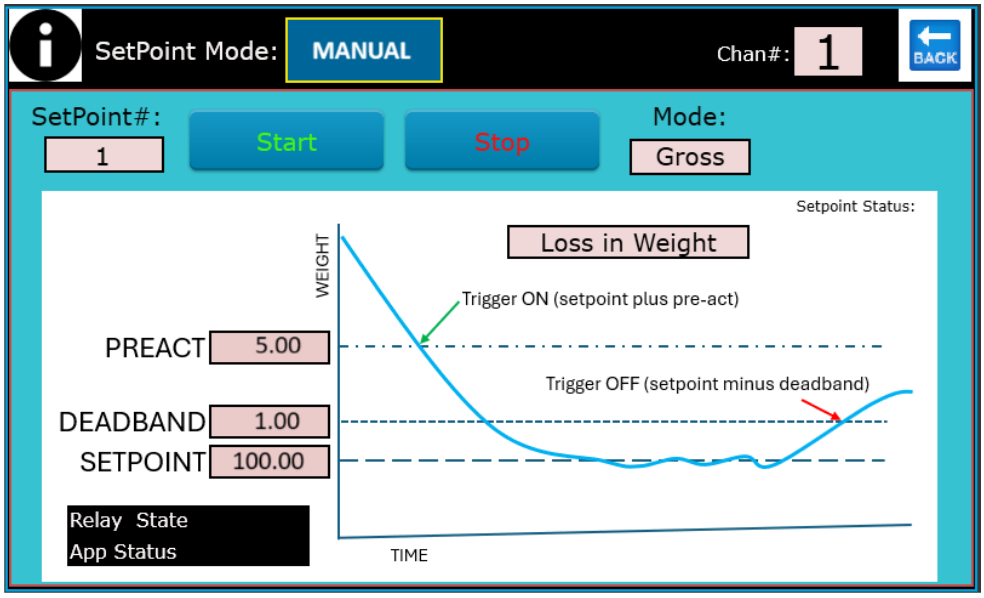
- Allows a user to manually initiate a Setpoint control cycle by pressing START or terminating the cycle by pressing STOP. Access to START and STOP control is found in either the single channel screen of the display, the setpoint configuration page or the web browser setpoint control page.

WARNING: Enabling MANUAL mode and pressing START will immediately cause relays to change state based on setpoint conditions established during set-up

- Setup Procedure:

1. Define setpoints (per this section or Appendix A.1).
2. Select **Manual** mode, confirm (display) or click save parameter (web).
3. Press **START** to initiate control, **STOP** to pause/terminate.

Note: While operating in MANAUL mode, the single channel screen allows a user to START and STOP the application, as well as view or control different channels. Once START is pressed, the application associated with the channel will continue running until Stop is pressed or the setpoint condition is met, even if the user toggles to view or operate another channel or setpoint.

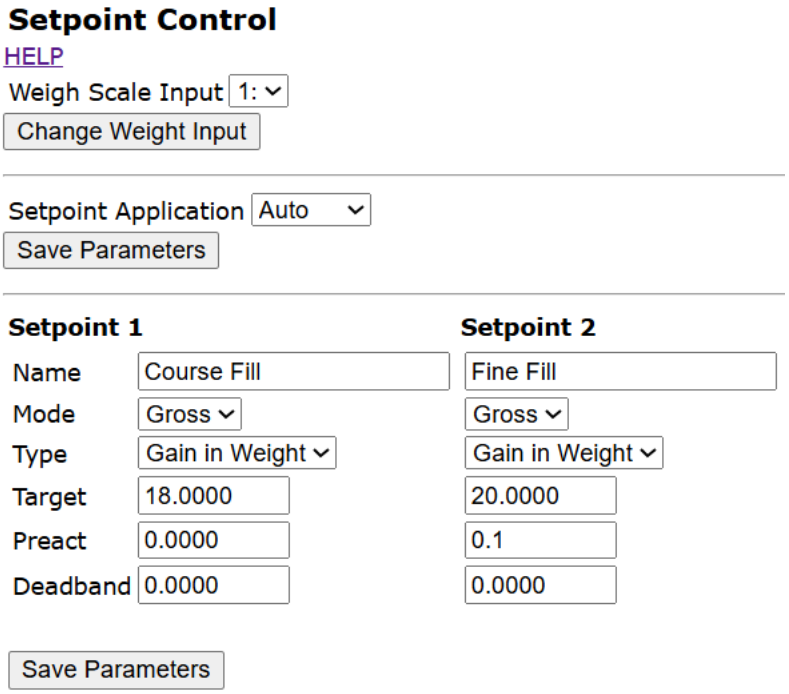


Example: Vessel initially weighs 250 lb. Pressing START closes Relay 1, draining until the weight reaches 105 lb (100 lb setpoint + 5 lb pre-act). STOP may be pressed at any time to pause or terminate the application from running. Pressing START again resumes the application until the threshold is reached.

B.3.3.4 AUTO Mode

- Automatically controls all channels and setpoints (“free-running”).
- Relays switch on/off based on real-time weight measurements and setpoint conditions being met or unmet.

WARNING: Enabling AUTO mode will immediately cause relays to change state based on setpoint conditions established during set-up.



Example:

An empty receiving vessel is positioned below a large feed stock vessel with a course-fill valve and a fine fill valve. Auto mode is selected. Once Confirm (on the display) or Save Parameters (in the web browser) is selected, the application will automatically start.

Both the course fill relay and fine fill relay will close until the respective setpoint conditions are met, then the relays will open:

Relay 1 will automatically close causing the course-fill valve to open until 18 pounds is measured in the receiving vessel. Once 18 pounds is measured, relay 1 will open and the valve will close.

Relay 2 will automatically close causing the fine-fill valve to open until 19.9 pounds is measured in the receiving vessel. Once 19.9 pounds is measured, relay 2 will open and the valve will close. Note – the 0.1 pound preact setting is to allow for in-flight material to fall into the receiving vessel after the valve has been closed.

B.4 Feed Weight Control

B.4.1 Loss in Weight

B.4.2 Gain in Weight

B.5 Feed Rate Control Parameters

B.6 Weight Monitoring

B.6.1 Static Checkweighing

B.6.2 Dynamic Checkweighing Parameters

B.7 Sequential Batch Control

B.8 I/I Diagrams and Drawings

Interconnect and Installation I/I Diagrams are on the Hardy Process Solutions Website, under the respective product pages in the Tab Documents & Programs.

https://www.hardysolutions.com/hi6800

https://www.hardysolutions.com/hi6850

APPENDIX C - USING SD CARDS (MODEL HI6850)

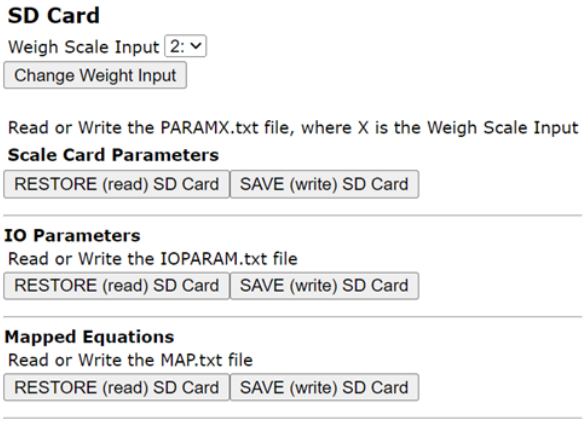
The micro-SD card dramatically increases the instrument's non-volatile storage capacity and flexibility. The card can be used to store critical instrument configuration, calibration, and setup data, thereby protecting this information from loss and/or corruption in the event of an instrument failure. Furthermore, the SD card can be used to transfer parameters from one instrument to another; effectively serving to clone the instrument configuration.

Reading or writing to the micro-SD is only available through the instrument's built-in webserver. To access the micro-SD card, type in the instrument's IP address, select DIAGNOSTICS from the left-hand column, then click the hyper-link for the SD Card located near the bottom right hand of the page.



Depending on the instrument configuration, users may select one or more weigh scale channels to restore or save, including IO parameters settings and Mapped Equations.
Scale channel parameters must be saved individually as they may not be configured the same – for example, one scale channel could be configured in pounds while another in grams.

IO Parameters and Mapped Equations are universally applied to the instrument. For example, saved at once in a single file.



There are two options in each section: RESTORE and SAVE.

Clicking Restore will cause the instrument to read data from the SD card and upload configuration data into volatile memory with the parameters that were formally saved.

Note: A Read Error is caused by no SD card present, or no file detected on the card.

Clicking SAVE will cause the instrument to back-up data from volatile memory to the SD card.

APPENDIX D – INSTRUMENT PARAMETERS

D.1 Read/Write Parameters

Parameter	Hex Value
Units	0x2881
Waversaver	0x2081
NumAverages	0x2082
ZeroTolerance	0x2886
AutoZeroTolerance	0x6302
AutoZeroState	0x6301
MotionTolerance	0x2887
SpanWeight	0x4182
RefWeight	0x4101
GradSize	0x2883
Decimal Point	0x2882
Scale Capacity	0x2888
Sensitivity	0x4081
Gravity Correction	0x4102
Tare Weight	0x6183
Cal Year	0x4202
Cal Month	0x4203
Cal Day	0x4204
Multi-Point Calibration: Number of Cal Points Point 1 Point 2 Point 3 Point 4 Point 5	0x4183 0x4184 0x4185 0x4186 0x4187 0x4188

D.2 Diagnostic Write Parameters

Parameter	Hex Value
IT_NUMSENSORS JBOX 1	0x498D
IT_NUMSENSORS JBOX 2	0x498E

D.3 IT Test Diagnostic Parameters

Parameter	Hex Value
IT WEIGHT CHANNEL 0	0x4990
IT WEIGHT CHANNEL 1	0x4991
IT WEIGHT CHANNEL 2	0x4992
IT WEIGHT CHANNEL 3	0x4993
IT WEIGHT CHANNEL 4	0x4994
IT WEIGHT CHANNEL 5	0x4995
IT WEIGHT CHANNEL 6	0x4996
IT WEIGHT CHANNEL 7	0x4997
IT MV/V CHANNEL 0	0x49A0
IT MV/V CHANNEL 1	0x49A1
IT MV/V CHANNEL 2	0x49A2
IT MV/V CHANNEL 3	0x49A3
IT MV/V REF 1	0x49A8
IT MV/V CHANNEL 4	0x49A4
IT MV/V CHANNEL 5	0x49A5
IT MV/V CHANNEL 6	0x49A6
IT MV/V CHANNEL 7	0x49A7
IT MV/V REF 2	0x49A9
IT RAW VARIATION CHANNEL 0	0x49B0
IT RAW VARIATION CHANNEL 1	0x49B1
IT RAW VARIATION CHANNEL 2	0x49B2
IT RAW VARIATION CHANNEL 3	0x49B3
IT RAW VARIATION REF 1	0x49B8
IT RAW VARIATION CHANNEL 4	0x49B4

Parameter	Hex Value
IT RAW VARIATION CHANNEL 5	0x49B5
IT RAW VARIATION CHANNEL 6	0x49B6
IT RAW VARIATION CHANNEL 7	0x49B7
IT RAW VARIATION REF 2	0x49B9
IT WAVERSAVER VARIATION CHANNEL 0	0x49C0
IT WAVERSAVER VARIATION CHANNEL 1	0x49C1
IT WAVERSAVER VARIATION CHANNEL 2	0x49C2
IT WAVERSAVER VARIATION CHANNEL 3	0x49C3
IT WAVERSAVER VARIATION REF 1	0x49C8
IT WAVERSAVER VARIATION CHANNEL 4	0x49C4
IT WAVERSAVER VARIATION CHANNEL 5	0x49C5
IT WAVERSAVER VARIATION CHANNEL 6	0x49C6
IT WAVERSAVER VARIATION CHANNEL 7	0x49C7
IT WAVERSAVER VARIATION REF 2	0x49C9
IT RAW VARIATION RESULT CHANNEL 0	0x49D0
IT RAW VARIATION RESULT CHANNEL 1	0x49D1
IT RAW VARIATION RESULT CHANNEL 2	0x49D2
IT RAW VARIATION RESULT CHANNEL 3	0x49D3
IT RAW VARIATION RESULT REF 1	0x49D8
IT RAW VARIATION RESULT CHANNEL 4	0x49D4
IT RAW VARIATION RESULT CHANNEL 5	0x49D5
IT RAW VARIATION RESULT CHANNEL 6	0x49D6
IT RAW VARIATION RESULT CHANNEL 7	0x49D7
IT RAW VARIATION RESULT REF 2	0x49D9
IT WAVERSAVER VARIATION RESULT CHANNEL 0	0x49E0
IT WAVERSAVER VARIATION RESULT CHANNEL 1	0x49E1
IT WAVERSAVER VARIATION RESULT CHANNEL 2	0x49E2
IT WAVERSAVER VARIATION RESULT CHANNEL 3	0x49E3
IT WAVERSAVER VARIATION RESULT REF 1	0x49E8
IT WAVERSAVER VARIATION RESULT CHANNEL 4	0x49E4
IT WAVERSAVER VARIATION RESULT CHANNEL 5	0x49E5
IT WAVERSAVER VARIATION RESULT CHANNEL 6	0x49E6
IT WAVERSAVER VARIATION RESULT CHANNEL 7	0x49E7

Parameter	Hex Value
IT WAVERSAVER VARIATION RESULT REF 2	0x49E9
IT RTZ CHANNEL 0	0x49F0
IT RTZ CHANNEL 1	0x49F1
IT RTZ CHANNEL 2	0x49F2
IT RTZ CHANNEL 3	0x49F3
IT RTZ CHANNEL 4	0x49F4
IT RTZ CHANNEL 5	0x49F5
IT RTZ CHANNEL 6	0x49F6
IT RTZ CHANNEL 7	0x49F7
IT RTZ COMBINED	0x498C

D.4 Stability Test Parameters

Parameter	Hex Value
STABILITY RAW MEAN	0x4901
STABILITY WAVERSAVER MEAN	0x4903
STABILITY RAW VARIATION	0x4902
STABILITY WAVERSAVER VARIATION	0x4904
STABILITY RAW VARIATION RESULT	0x4905
STABILITY WAVERSAVER VAR IATION RESULT	0x4906

D.5 Read-Only Parameters

Parameter	Hex Value
GrossWeight	0x6081
NetWeight	0x6082
ADC_Counts	0x4907
ADC_CountsRaw	0x4908
CalLowCounts	0x4085
CalHighCounts	0x4087
ZeroCounts	0x2889
CalZeroCounts	0x4084
Cal Type	0x4001
NUMBER C2 SENSORS	0x4103

Parameter	Hex Value
NUMBER IT J-BOXES	0x4881
FirmwareRevision	0x7985

APPENDIX E - GLOSSARY

Term	Definition
Certificate	A document that provides information on the accuracy of a scale when last serviced. The certificate will provide details such as the scale's serial number, the model of the scale, and the date and location where it was tested.
DHCP	Dynamic Host Configuration Protocol. A protocol that automatically assigns a unique IP address to each device that connects to a network, eliminating the to manually assign IP addresses to new devices.
DNS	Converts internet names to IP addresses so you don't have to know the IP address of a server you're trying to reach.
EtherNet/IP	An industrial network protocol that adapts the Common Industrial Protocol (CIP) to standard Ethernet.
Extranet	A private network that can be partially accessed by authorized outside users, enabling businesses to exchange information over the internet securely.
Gateway	Connects local devices such as your application controller to other networks.
Human-Machine Interface (HMI)	A user interface or touchscreen that allows operators to interact with the HI6800 Series Application Controllers.
IIoT	Industrial Internet of Things. An extension and use of the Internet of Things (IoT) designed for industrial sectors and applications.
Modbus TCP/IP	Modbus RTU protocol with a TCP interface that runs on Ethernet.
OPC UA	An extensible, platform-independent standard that enables the secure exchange of information in industrial systems.
PROFINET	An Ethernet-based automation standard for the implementation of an integrated and consistent automation solution based on Industrial Ethernet.
Programmable logic controller (PLC)	A programmable device for I/O and calculations.
Subnet mask	Splits an IP address into host and network addresses, defining which part of the IP address belongs to the application network and which part belongs to the network.
Tare weight	The tare weight is the weight of an empty container. By subtracting it from the gross weight, the weight of the goods carried (the net weight) can be determined.
WAVERSAVER®	Mechanical noise from other machinery in a plant environment can be present in forces larger than the weight forces being measured. To address this noise, WAVERSAVER® eliminates the effects of vibratory forces present in all industrial weight control and measurement applications. By factoring out almost all of the ambient vibratory forces, the HI6800 Series Application Controller separates the actual weight data.

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