HARDY
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HI6501 Single Channel Weight Processor User Guide

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Hardy HI6501 Single Channel Weight Processor User Guide Rev. A
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HOW TO USE THIS GUIDE

Introduction

The Hardy Process Solutions HI6501 Single Channel Weight Processor is a state-of-the-art instrument. It uses advanced microprocessor technology and front-end signal processing of stain-gauge type load sensors to provide fast and accurate weighing coupled with operator-friendly interfaces and reliability. These features make the instrument ideally suited for all types of industrial manufacturing weighing applications.

To benefit from Hardy's entire feature set of WAVESAVER®, C2® Calibration, and INTEGRATED TECHNICIAN™ diagnostics, complete your scale system using all Hardy components.

Do not operate or work on this equipment unless you have read and understand the instructions and warnings in this manual. Failing to follow the instructions or heed the warnings can result in injury or death.

Audience

This guide is intended for use by installers, operators, and service personnel. It provides procedures for installing, configuring, operating, maintaining, and servicing the HI6501 Weight Processor.

Changes in This Revision

This is the first version of this document.

Related Documents

Hardy Process Solutions provides manuals in PDF format that can be downloaded from our website free of charge. Go to http://www.hardysolutions.com/, click the **Support Center** link, and then review the available topics.

User Feedback

Hardy Process Solutions appreciates your business, and welcomes all corrections or suggestions for improving this manual. Please send your comments to hardysupport@hardysolutions.com. Include the document title and refer to specific sections

and paragraphs whenever possible. All comments become the property of Hardy Process Solutions. Thank you!

Organization of the Guide

- **Chapter 1 – Product Description**

  This chapter provides an overview of the HI6501 Weight Processor, along with a theory of operation and product pitch.

- **Chapter 2 – Hardware Overview**

  This chapter describes the HI6501 Weight Processor hardware.

- **Chapter 3 – Installation**

  This chapter describes how to install the HI6501 Weight Processor.

- **Chapter 4 – Initial Setup**

  This chapter describes the different ways to access HI6501 parameters.

- **Chapter 5 – Setting Scale Parameters**

  This chapter describes how to configure the HI6501 Weight Processor.

- **Chapter 6 – Cleaning and Maintenance**

  This chapter describes how to clean and maintain the HI6501 Weight Processor.

- **Chapter 7 – Troubleshooting**

  In the unlikely event you encounter a problem with the HI6501 Weight Processor, see this chapter for suggestions on identifying and resolving the issue.

- **Chapter 8 – Hardy Installation and Commissioning**

  This chapter describes Hardy product installation and commissioning.

- **APPENDIX A - Specifications**

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

Document Conventions

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

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 instrument.
	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:

This chapter provides an overview of the HI6501 Weight Processor. It describes the available models and the instrument's key features.

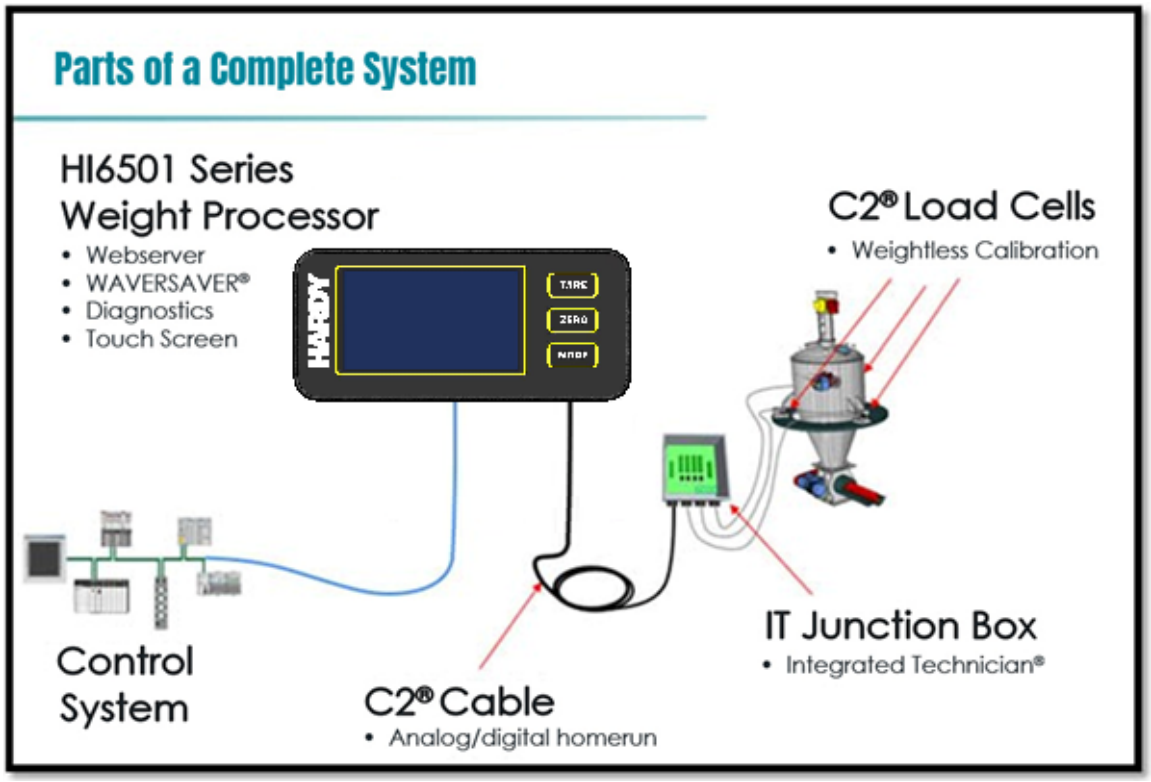
1.1 Overview

The HI6501 series are high-performance, single-channel Weight Processors featuring industrial Ethernet-based communication, Industrial Internet of Things (IIoT) compatibility, remote diagnostics, and a user-friendly touch-screen interface. The HI6501 is ideally suited for industrial weighing applications where fast, accurate and stable weight data is required for successful batching, blending, filling, feeding, and dispensing applications.

Used as a front-end weight processor to a PLC or DCS control system, the instrument features a 24-bit analog-to-digital converter that is capable of sampling sensors and load cells up to 4,800 times per second and updating the control system at 250 times per second with digitally processed weigh data that is accurate and stable. In addition, the 16 million count range of the ADC can be used to tolerate very large “dead” loads or oversizing of load sensors while maintaining high resolution of the signal.

The ultra-thin instrument design creates a low-profile footprint when mounted on an enclosure door while providing a bright 4.3” high-contrast display featuring modern touch-screen navigation for simplified operator use and set-up.

The HI6501 comes standard with Hardy’s Process Toolbox™. The Hardy Process Toolbox is a set of productivity tools that support industrial weighing functions. Each tool saves time, increases accuracy, improves efficiency, or reduces risk in process weighing applications, including WAVERSAVER® to eliminate vibration, C2® electronic calibration and INTEGRATED TECHNICIAN™ diagnostics.



1.2 Models

The HI6501 Weight Processor is available in the following models.

Table 1-1. HI6501 Models

Model	Description
HI6501-P-WP-EIP	Panel Mount Weight Processor with EtherNet/IP, Ethernet TCPIP, Ethernet UDP, Modbus TCP, and Modbus RTU communications
HI6501-P-WP-ANA	Panel Mount Weight Processor with Analog 4-20 and Ethernet TCPIP (Webserver),
HI6501-S-WP-EIP-DC	Swivel Mount Weight Processor with DC Power, EtherNet/IP, Ethernet TCPIP, Ethernet UDP, and Modbus TCP
HI6501-S-WP-ANA-DC	Swivel Mount Weight Processor with DC Power, Analog 4-20 and Ethernet TCPIP
HI6501-S-WP-EIP-AC	Swivel Mount Weight Processor with AC Power, EtherNet/IP, Ethernet TCPIP, Ethernet UDP, and Modbus TCP
HI6501-S-WP-ANA-AC	Swivel Mount Weight Processor with AC Power, Analog 4-20 and Ethernet TCPIP

1.3 Key Features

1.3.1 WAVERSAVER®

Hardy's WAVERSAVER® core technology eliminates the effects of mechanical vibration and signal noise from nearby machinery and other environmental conditions present in factory environments. By eliminating the effects vibration and signal noise, WAVERSAVER delivers fast, accurate and stable weight data to control systems.

WAVERSAVER+ is a superset of WAVERSAVER® available in certain models of the series that uses an adaptive filtering algorithm which can significantly improve the speed and stability the weight reading in excessively noisy environments.

1.3.2 C2® Electronic Calibration

C2®, Second Generation Electronic Calibration allows a scale to be calibrated without the need for test weights. A C2 weighing system consists of up to eight load cell sensors per channel, up to two junction boxes, interconnect cable, and an instrument with C2 capabilities (e.g., the HI 6501 series instrument). Each Hardy Process Solutions C2-certified load sensor outputs digital information used for calculating the calibration. When the HI 6501 series instrument reads the signals from the load sensors, it calibrates the scale based on the load sensor’s output plus a user-supplied reference point value (from 0 to any known weight on the scale).

1.3.3 INTEGRATED TECHNICIAN™ Operator Diagnostics

Hardy's INTEGRATED TECHNICIAN™ core feature helps troubleshoot weighing systems and diagnose problems of the scale system. These tests display system weights, voltages, and pass/fail information that allows isolation of a problem to the instrument, cabling, or sensors, reducing troubleshooting times and maintenance costs.

1.4 Specifications

Specifications for the HI6501 Weight Processor vary depending on configuration and application. Refer to the specifications section found in APPENDIX A - Specifications.

2 HARDWARE OVERVIEW

Topics:

This chapter describes the HI6501 hardware.

2.1 HI6501 Weight Processor Front View

Figure 2-1 shows the front of the HI6501 Weight Processor and Table 2-1 describes the key items.

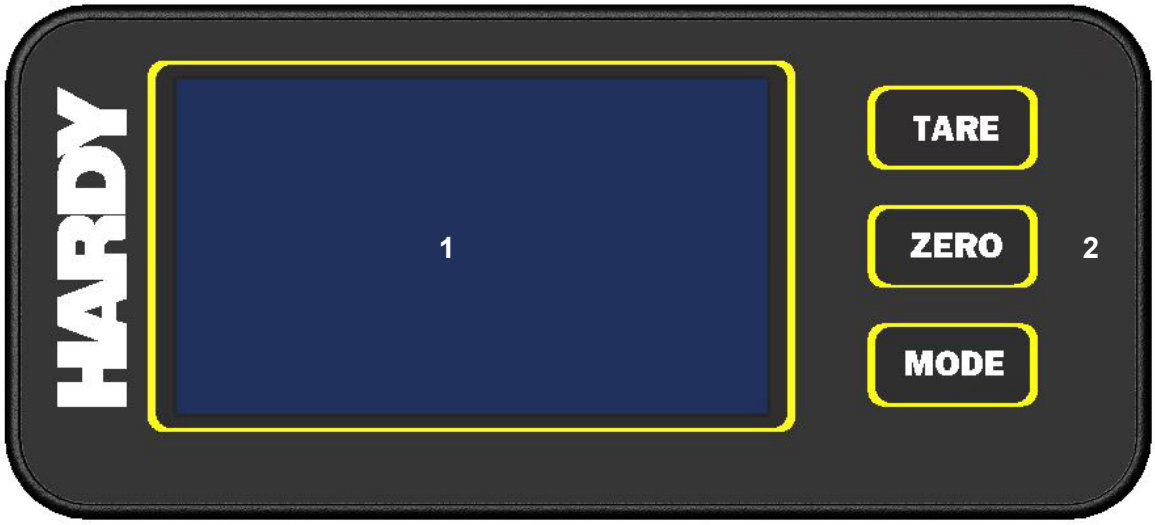


Figure 2-1. Front View of the HI6501 Weight Processor

Table 2-1. Key Items on the Front of the HI6501 Weight Processor

Item		Description
1	Front panel display	Shows the information associated with the items selected using the tactile push-buttons and 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).
Not shown	Status	The upper left of the touchscreen shows the status of the HI6501 Weight Processor.
Not shown	Messages	The bottom right of the touchscreen displays messages and alerts.

2.2 HI6501 Weight Processor Rear View

Figure 2-2 shows the front of the HI6501 Weight Processor and Table 2-2 describes the key items. For more information about an item, refer to the section in the See Section column.

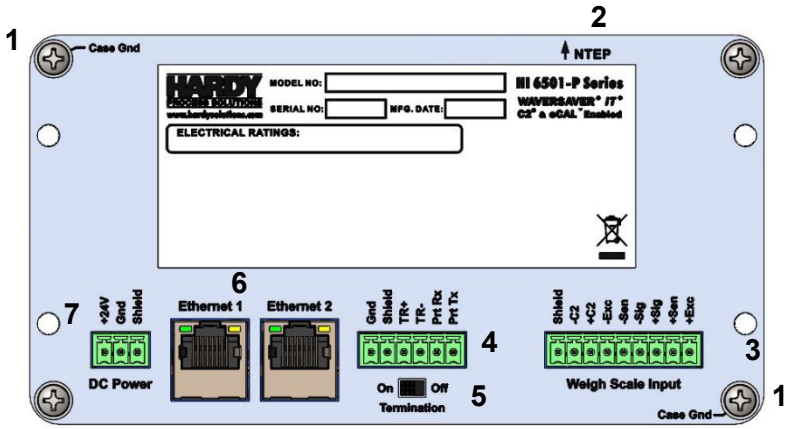


Figure 2-2. Rear View of the HI6501 Weight Processor

Table 2-2. Key Items on the Rear Panel of the HI6501 Weight Processor

Item		Description	See Section
1	Case ground mounting screw	Provides a reliable electrical connection to earth ground.	3.6.1
2	NTEP switch	Two-pin DIP switch for enabling or disabling NTEP.	3.6.2
Not shown	Analog output terminal block	Model HI6501-P-WP-ANA only: Connect to an analog device.	3.6.3
3	Weigh scale input terminal block	Connect to weighing sensor(s), bench and floor scales.	3.6.5
4	Serial communications terminal block	Enables or disables termination for serial communications.	3.6.6
5	Serial port termination switch	Terminates the instrument's serial communications terminal block.	3.6.7
6	Dual 10/100 Mbps Ethernet ports	Models HI6501-P-WP-EIP and HI6501-P-WP-ANA have two Ethernet ports that can connect to your local Intranet, Extranet, VPN, or Internet (World Wide Web).	3.6.8
7	DC power input port	Connect to DC power source.	3.6.9

3 INSTALLATION

Topics:

This chapter describes how to install the HI6501 Weight Processor.

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:

- Installation & Commissioning, Pre-Installation Site Audit
- Onsite Emergency Service
- Product, Service, and PLC Integration Training
- PLC Integration Support

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 HI6501 Weight Processor is part of a larger system, its 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, scales, and so on).

3.1.2 Required Tools

The following tools are required to install the HI6501 Weight Processor.

- 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.

3.1.3 User Responsibilities

When planning and preparing for the installation of a HI6501 Weight Processor, 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 HI6501 Weight Processor.
- Maintain the proper environmental conditions for the HI6501 Weight Processor.
- Provide adequate power facilities for the HI6501 Weight Processor.
- Supply the network connections and external cabling required by the HI6501 Weight Processor.
- 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 personnel to use the HI6501 Weight Processor.
- Allow only qualified technical personnel familiar with local and national wiring code requirements to work on the electric components of the HI6501 Weight Processor 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 HI6501 Weight Processor.

Before installing and commissioning the HI6501 Weight Processor, 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 HI6501 Weight Processor is used only when it is in a safe condition and trouble-free.
- Use the HI6501 Weight Processor only when all protective devices and safety equipment are in the intended locations and operational.
- To ensure that visible damage or faults can be recognized, inspect the HI6501 Weight Processor 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 HI6501 Weight Processor until the reported issues are resolved.

3.1.6 Electrostatic Discharge

Electrostatic discharge (ESD) can harm the electronic components of the HI6501 Weight Processor.

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 HI6501 Weight Processor.

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 HI6501 Weight Processor, 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 HI6501 Weight Processor 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 HI6501 Weight Processor. An electrician can verify whether maintenance outlets are on separate panels.
Lightning	In geographical areas subject to lightning storms, install lightning protection for the HI6501 Weight Processor. The principles of lightning protection and personnel safety are described in the National Fire Protection Association (NFPA) Handbook.
Electromagnetic interference	Electromagnetic interference (EMI) can cause various problems. The HI6501 Weight Processor 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 HI6501 Weight Processor. These controls should be installed at a location with 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 HI6501 Weight Processor 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 HI6501 Weight Processor.
- Ordering third-party equipment to support the HI6501 Weight Processor.

Table 3-1. Pre-installation Planning Checklist

Checklist Question	Yes	No
Safety		
Is the installation 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 HI6501 Weight Processor 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

The HI6501 Weight Processor is shipped directly from Hardy Process Solutions. After receiving the HI6501 Weight Processor, perform the following steps to ensure that it and other contents arrived safely.

1. Before signing the packing slip, 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 HI6501 Weight Processor components and cables from the shipping container.
3. Check the contents against the items referenced on the packing list. If any item is missing or damaged, notify a sales representative and/or the shipping agency.
4. Record the model number and serial number of the HI6501 Weight Processor. Store this information in a convenient, secure location for reference when contacting Customer Service, buying parts, or upgrading firmware.
5. Save the shipping container, foam, and antistatic bags in case the HI6501 Weight Processor must be returned. Returning the HI6501 Weight Processor in any other container is not advised.

A Return Material Authorization (RMA) number is required before returning any damaged product. Use the website to request an RMA at https://www.hardysolutions.com/pages/support/hardy-repair-program. Have the following items ready:

- Your name, company name, shipping address, email address, and telephone number
- Model number and serial number of the instrument
- Brief description of the problem

In case of damage due to shipping, notify the delivering carrier immediately for an inspection.

3.3 Climatization

HI6501 Weight Processors shipped or stored at extreme temperatures require time to adjust to operating temperatures before startup. If the HI6501 Weight Processor 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 HI6501 Weight Processor to warm temperature can cause condensation to occur, which could damage the electronics. If any condensation is noticed, allow the HI6501 Weight Processor to stand unattended for one to two hours, and then unpack it.

3.4 Handling Precautions

Observe the following precautions when handling the HI6501:

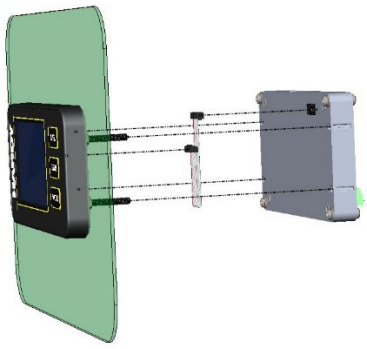
- Exercise all ESD precautions before and during installation.
- Wear an approved wrist-strap grounding device when handling the instrument.
- Touch a grounded object or surface to rid yourself of any electrostatic discharged prior to handling the instrument.
- Handle the instrument from the bezel in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

3.5 Mounting Instructions

Mounting options for HI6501 Weight Processors depend on the model:

- Weight Controllers with a display can be panel mounted.

  See sections 3.5.1 and 3.5.1.1.



- If a display is not required, please speak to your Hardy Representative about available models designed for DIN rail installation.

3.5.1 Mounting Using a Front Panel Display

HI6501 Weight Controllers purchased with a display come with a thin plastic template.

- 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.

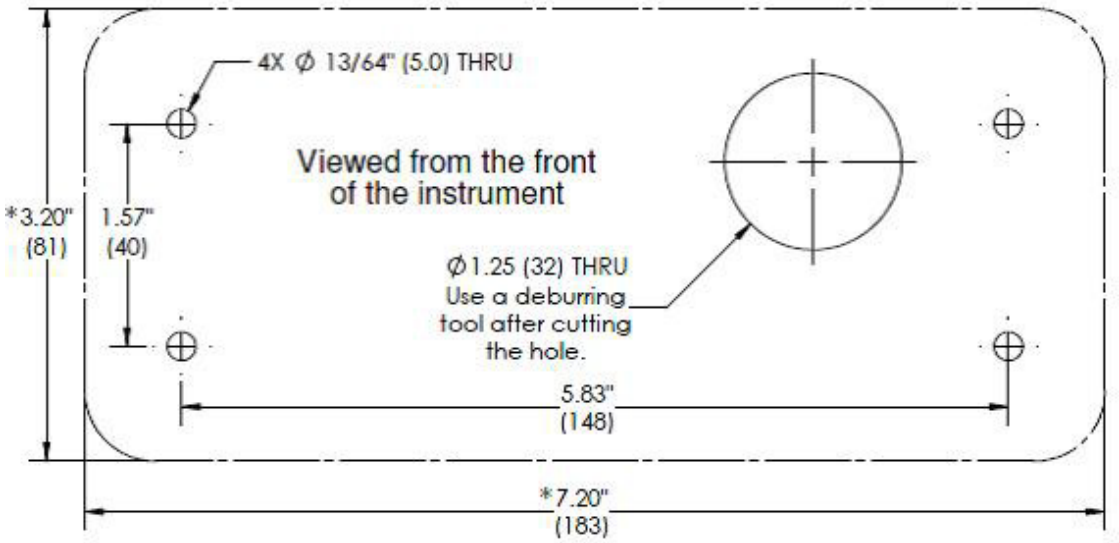


Figure 3-1. Panel Hole Dimensions (Not to Scale)

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 HI6501 Weight Processor in a NEMA 4-, 4X-, or IP 65-rated enclosure or better.

3.5.1.1 Panel Mount Option

To panel-mount the HI6501 Weight Processor:

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).

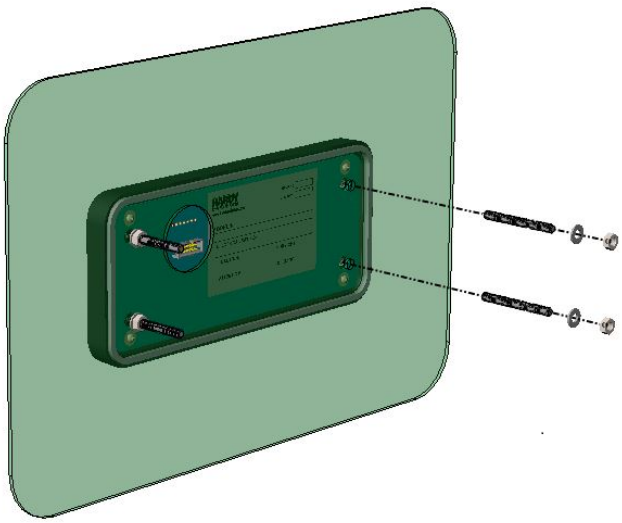


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Figure 3-2. Installing Four Screw Rods into the Front Panel Display

6. 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: For torque specifications see the I/I diagram.

7. Install the display cable to the display, as shown in Figure 3-3.

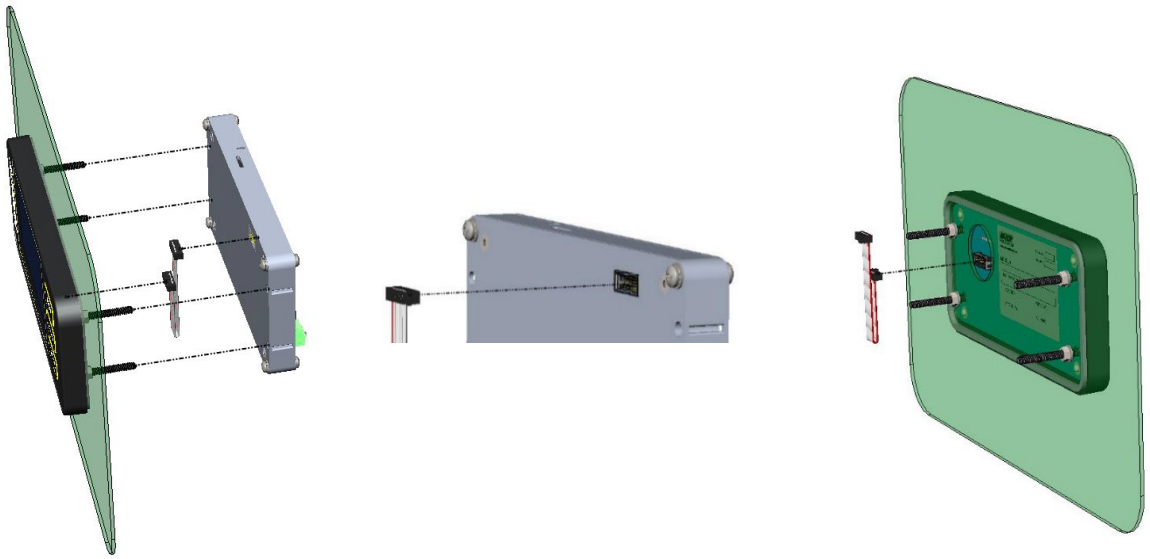


Figure 3-3. Installing the Display Cable

8. Position the instrument enclosure with the display connector pointing toward the panel.
9. Align the screw rods with the slots on the sides of the enclosure, then carefully slide the instrument about half-way onto the rods.

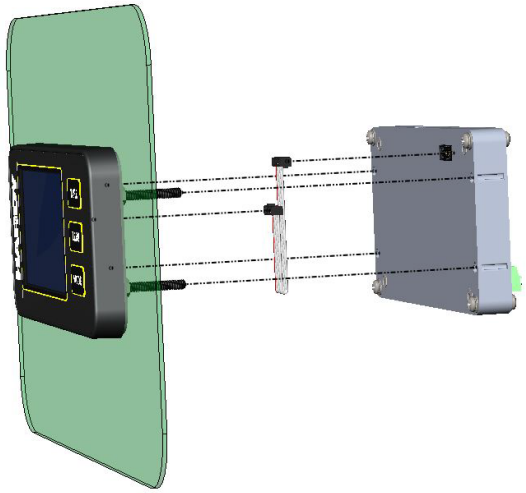


Figure 3-4. Sliding the Instrument Half-way on to the Rods

10. Plug the display cable into the instrument taking care not to introduce twists into the cable.
11. Continue sliding the instrument enclosure onto the screw rods, making sure the display cable remains flat, until the instrument is flush with the panel.

12. 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.

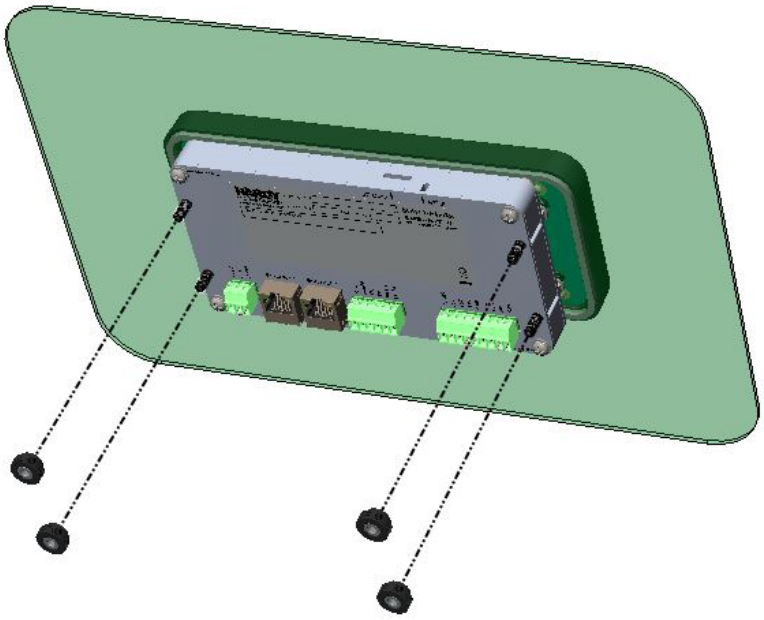


Figure 3-5. Installing and Tightening the Four Keeper Nuts

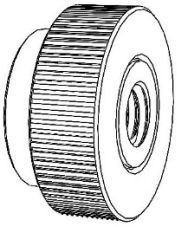


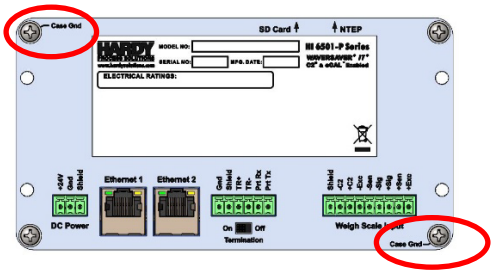
Figure 3-6. Zoomed-in View of Keeper Nut

Note: The HI6501 Weight Processor front panel display is NEMA 4/4X-rated when installed correctly in a panel per instructions above.

3.6 Wiring Instructions

The following sections describe the wiring instructions for the HI6501 Weight Processor.

3.6.1 Using the Grounding Screws



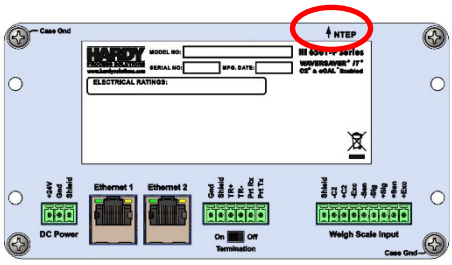
Grounding is an essential safety measure in electrical systems to prevent the buildup of excess voltage and to ensure the safe dissipation of electrical currents.

Grounding can minimize EMI and radio frequency interference (RFI) that may affect the accuracy and performance of sensitive instruments such as the HI6501 Weight Processor. The ground screws help to establish a reference potential and serve as a shield against external electromagnetic fields, reducing noise and ensuring reliable measurements.

In some cases, grounding is crucial to maintain the integrity of the signals being measured from the sensor or transmitted by the instrument by providing a common ground reference. The ground screws help to eliminate ground loops and potential voltage differences that could introduce errors or distortions into the signals.

The rear panel has two grounding screws, labeled **Case Gnd**: one at the top-left and one at the bottom-right. Both screws provide a reliable electrical connection to earth ground.

3.6.2 Enabling or Disabling NTEP



The top-right side of the rear panel has a two-pin DIP switch for enabling or disabling NTEP.

The default position is OFF. Moving the switch to the ON position sets the instrument to meet the selected certification standard by preventing changes to certain parameters. To obtain certification, the appropriate agency must certify the instrument and seal the switch.

The switch is recessed to prevent its setting from being changed accidentally.

TIP: The instrument also provides a **Metrology** screen that sets the scale to meet certain certification standards by preventing changes to certain parameters (see section 5.8 for more information). By default, this parameter on this screen is set to None, which disables NTEP. If you keep this default setting and move the NTEP switch to the ON position, NTEP remains disabled, and all parameters will be accessible.

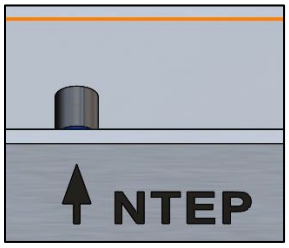
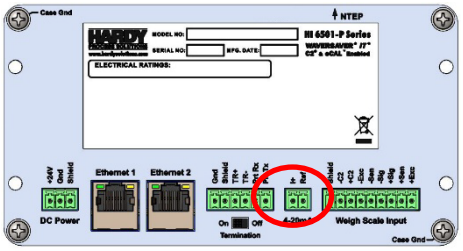


Figure 3-7. NTEP Switch

3.6.3 Analog Output Connections

Model HI6501-P-WP-ANA has a 2-pin 4-20mA analog output terminal block on the rear panel.



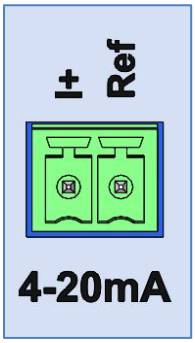


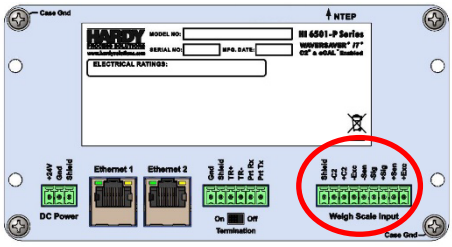
Figure 3-8. Analog Output Terminal Block

Table 3-2. Pin Numbering on the Analog Output Terminal Block

Pin	Signal Name	Properties
1	I+	
2	Ref	

3.6.5 Weigh Scale Input Connection

The rear panel has a single weigh scale input terminal block that features Hardy's WAVERSAVER®, a technology capable of 250 updates/second post signal processing. It also features Hardy's C2® technology, but can be used with most 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.



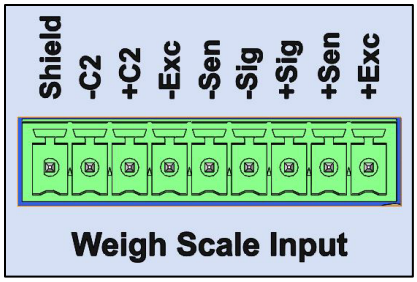


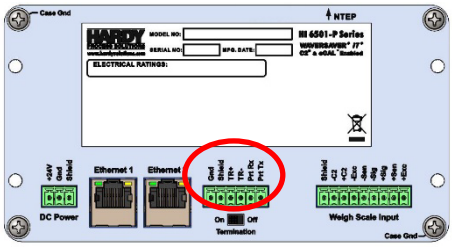
Figure 3-9. Weigh Scale Input Terminal Block

Table 3-3. Pin Numbering on the Weigh Scale Input Terminal Block

Pin	Signal Name	Properties
1	Shield	
2	C2−	
3	C2+	
4	Exc−	
5	Sen−	
6	Sig−	
7	Sig+	
8	Sen+	
9	Exc+	

3.6.6 Serial Communications

The rear panel has a 6-pin terminal block for connecting a serial device, such as a serial printer, to the HI6501 Weight Processor.



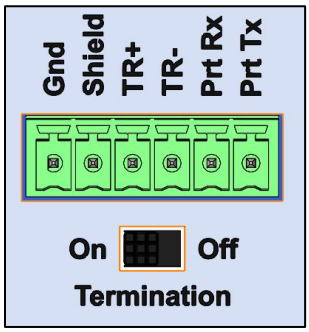


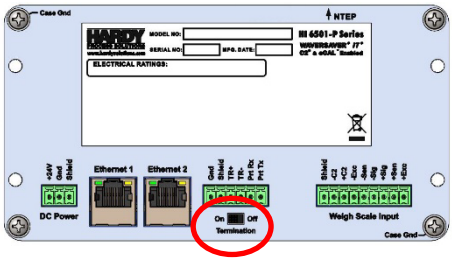
Figure 3-10. Serial Communications Terminal Block

Table 3-4. Pin Numbering on the Serial Communications Terminal Block

Pin	Signal Name	Properties
1	Ground	
2	Shield	
3	TR+	
4	TR−	
5	Ptr Rx	
6	Ptr Tx	

3.6.7 Enabling or Disabling Serial Port Termination

Below the serial communications terminal block is a serial port termination switch. If your application requires you to configure termination of the data transmission lines to prevent the reflection of serial signals, set this switch to the On position. By default, the switch is set to Off.

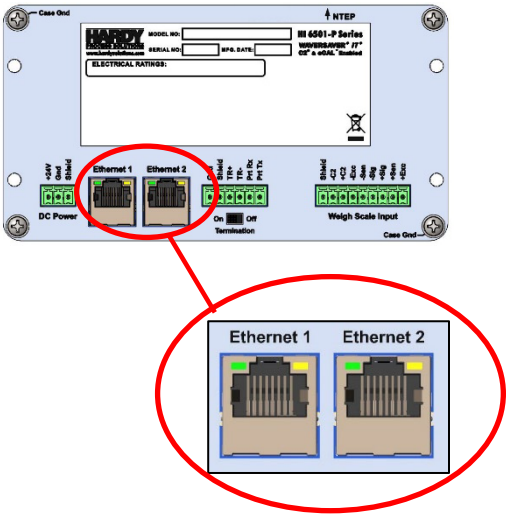


3.6.8 Ethernet/PROFINET Communications

The rear panel has dual RJ-45 ports. Depending on the model, either both ports can be used for TCP/IP communications, or one port can be used for TCP/IP communications and the other port can be used for PROFINET communications.

Both ports have the same pin assignments, regardless of whether they support TCP/IP or PROFINET connectivity.

- Models HI6501-P-WP-EIP and HI6501-P-WP-ANA have two Ethernet ports that can be used for TCP/IP communications. EIP models support Ethernet/IP and Modbus TCPIP protocols, and connect to your local Intranet, Extranet, VPN, or Internet (World Wide Web).



- Model HI6501-P-WP-PFN have one Ethernet port that can be used for TCP/IP communications and a second port that supports PROFINET communications. Facing the rear of the instrument, the left port supports Ethernet TCPIP and connects to your local Intranet, Extranet, VPN, or Internet. The right port connects to a PROFINET interface card.

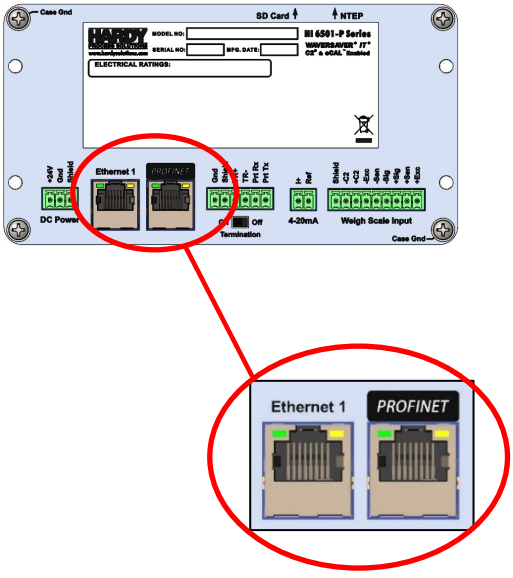
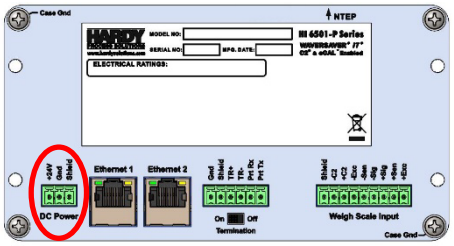


Table 3-5. Pin Numbering on the Ethernet and PROFINET Ports

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

3.6.9 Power

The HI6501 Weight Processor requires 24 VDC power from a Class II power supply. 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.



Tip: Hardy Process Solutions advises to wire directly to the Class II power supply instead of wiring to a 24 VDC bus that supplies other devices.

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

Unless otherwise prescribed by local regulations or specialized 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 HI6501 Weight Processor through appropriately rated glands and according to National Electrical Code requirements.

To connect the HI6501 Weight Processor to a VDC power source:

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 instrument.

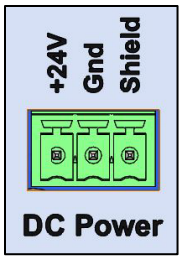


Figure 3-11. DC Input Power Terminal Block

Table 3-6. Pin Numbering on the DC Input Power Terminal Block

Pin	Signal Name	Properties
1	+24V IN	V +
2	GND	V -
3	Shield	Field Ground

Note: When troubleshooting scale stability issues. remove the jumper to isolate shield from ground to prevent the possibility of a “ground loop.” 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.

4 INITIAL SETUP

This chapter describes how to prepare the HI6501 Weight Processor for initial setup.

4.1 Checking 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 the HI6501 Weight Processor, including power, weigh scale input(s), and Ethernet/PROFINET.

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

4.2 Powering on the HI6501 Weight Processor

The instrument powers on as soon as it is connected to the power source. There is no ON/OFF switch to control power to the instrument.

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.

To power on the HI6501 Weight Processor, apply VDC power to the instrument.

4.3 Accessing Scale Parameters

For convenience, the HI6501 Weight Processor provides several ways to access scale parameters:

- Using the touchscreen (see section 4.3.1)
- Using the embedded webserver (see section 4.3.2)
- Using an Ethernet network connection
- Using a direct connection to a PLC, PAC, or DSC control system (see section 4.3.3)

4.3.1 Using the Touchscreen

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

Figure 4-1. Accessing the Set-up Menus

To set up the HI6501 using its front panel touchscreen:

1. At the lower right side of the instrument, press the **Mode** button until the **SETUP** button appears at the lower center side of the touchscreen.
2. Confirm entry into set-up menus by pressing the “Tap here” button on the display’s touch screen.
3. To cancel set-up, cycle thru options by pressing the MODE button.

4. Within the set-up screens, press the appropriate buttons to configure setup, calibration, operation, and other parameters. Additional screens for set-up can be found by swiping the lower portion of the touch screen. For information about configuring instrument parameters, see Chapter 5.
5. After configuring the instrument, swipe from left to right until the **HOME** button appears at the lower right side of the screen and then touch the **HOME** button to exit setup.

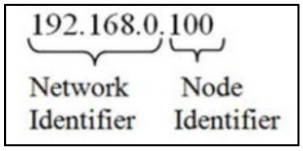
4.3.2 Using the Embedded Webserver

The embedded webserver is a graphical point-and-click interface that can be accessed using a computer that has an Internet connection. Using the embedded webserver, you can access the same instrument settings and parameters available from the front panel touchscreen.

To set up the HI6501 using its embedded webserver:

1. If the HI6501 is powered on, power it off.
2. Connect either end of a straight-through or crossover Ethernet cable to the RJ-45 connector on the HI6501 rear panel. Connect the other end of the cable to a network switch or router.
3. Power up the HI6501. The instrument automatically negotiates settings suitable for a variety of operating systems and network configurations.
4. Wait approximately 15 seconds and then check whether the green light of the Ethernet port is blinking. If it is blinking, the computer can communicate with the HI6501 and you can skip to step 5. Otherwise, perform the following steps for Windows 10 and Windows 7 operating systems. For other operating systems, refer to the instructions on the Internet:

   a. The HI6501's default static IP address is 192.168.0.100. To communicate with the instrument, configure the computer's IP address so the network identifier (first three octets in the IP address) are the same as the HI6501 and the node identifier (last octet) is a number from 0 to 255 other than 100 (for example: 192.168.0.101).



   - In Windows 7, go to **Start > Control Panel > Network and Sharing Center** and click **Local Area Connection**.
   - In Windows 10, click **Start > Settings > Control Panel > Network and Internet > Network and Sharing Center > Change adapter settings**.

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

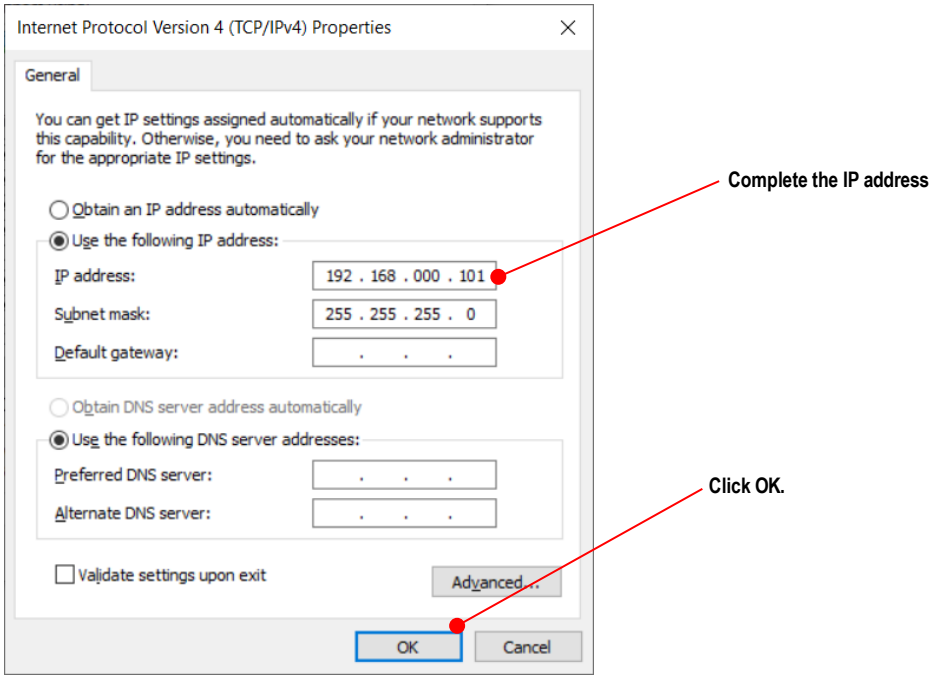
c. In the next window, click the **Properties** button.

d. In the **Networking** tab, check **Internet Protocol Version 4 (TCP/IPv4)**, and then click **Properties**.

e. In the **General** tab, select **Use the following IP address**.

f. In the **IP address** field, enter the same first 3 octets from the instrument, but change the last octet by 1 number. For example, if the fixed IP address for the instrument is 192.168.000.100, enter 192.168.000.101 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.

5. Open a web browser on the computer, enter the static instrument's IP address (192.168.000.100), and press the Enter key. The instrument's home screen appears in the browser.

6. Proceed to Chapter 5 for information about configuring instrument parameters.

4.3.3 Using a PLC

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

Note: The HI 6501 is not compatible with HI 215IT Junction Boxes. Make sure the HI 6501 is installed with the HI6020IT, HI6020JB, HI 6010IT or HI6010JB Junction Boxes. It is compatible with the HI215JB without the IT functions.

Setting Up Communications

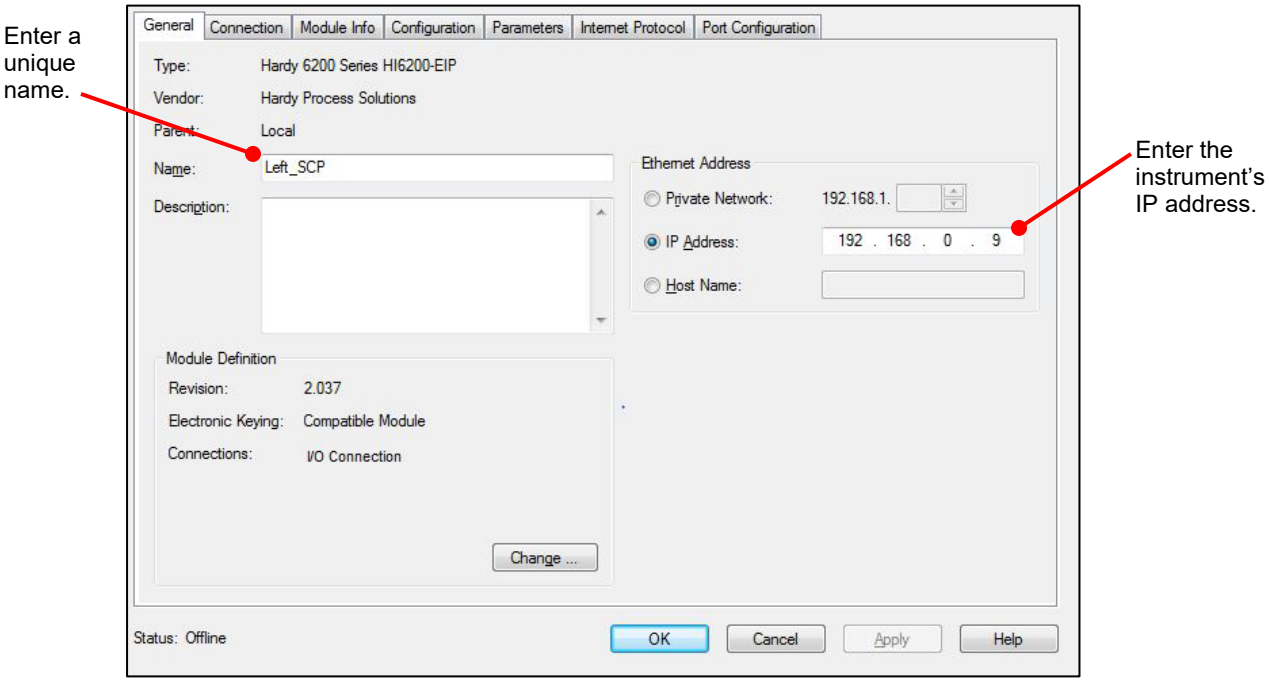
The following procedure describes how to set up communications between the ControlLogix PLC and the HI6501. This procedure requires a new or open RS Logix® 5000 project. For instructions, see your RS LOGIX 5000 manual.

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.

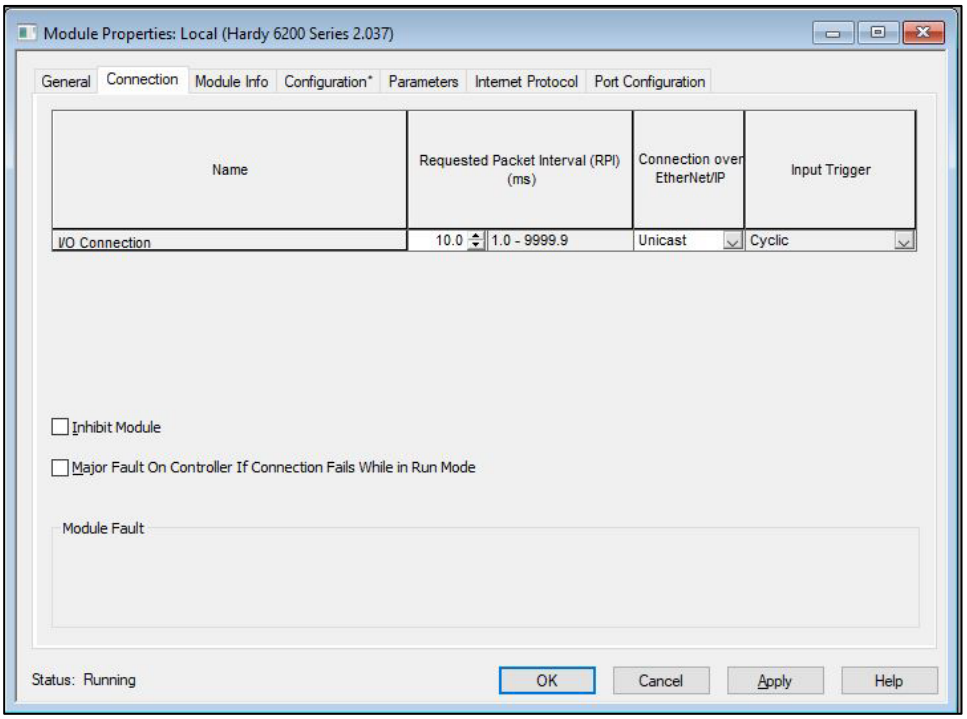
1. In the program Controller Organizer, find the **I/O Configuration** section.
2. Right-click the Ethernet Module under which you will be installing the HI6501-WS module.
3. Select **New Module** to display a list of modules.
4. From the catalog list, select the Hi6501 Series EDS_AOP module.

Catalog Number	Description	Vendor	Category
1734-AENT	1734 Ethernet Adapter, Twisted-Pair Media	Allen-Bradley	Communication
Hardy 4000 Series	HI-4050 Weight Controller/Check Weigh	Hardy Process S...	Generic Device(depr
Hardy 6200 Series	HI6200-EIP	Hardy Process S...	Generic Device(keya
Hardy 6500 Series	HI65x0-EIP	Hardy Process S...	Generic Device(keya
Hardy 6600 Series	HI6600-EIP	Hardy Process S...	Generic Device(keya

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



6. In the **Connection** tab, make sure the **Requested Packet Interval (RPI)** is set no faster than **4ms**.



7. Click **OK**. The module appears in the controller organizer in the I/O configuration under the **Ethernet** section.
8. Repeat this procedure for any additional modules.

Configuration Parameters

Table 8-1 lists the parameters used when configuring the IO.

Table 8-1. IO Parameters

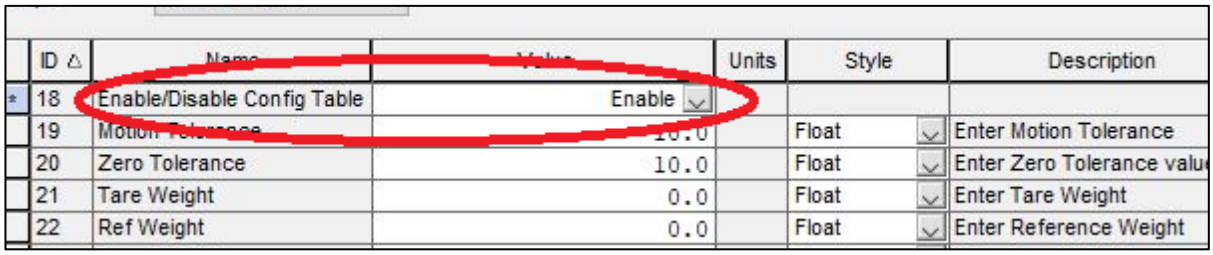
Configuration Parameters	Data Type
Enable/Disable Configuration	INT
Decimal Point	SINT
Grads	SINT
Unit	SINT
WAVERSAVER	SINT
Num Averages	INT
Loadcell Sensitivity	INT
AutoZero	INT
AutoZero Tolerance	FLOAT
Gravity Correction	FLOAT
Motion Tolerance	FLOAT
Zero Tolerance	FLOAT
Tare Weight	FLOAT
Reference Weight	FLOAT
Span Weight	FLOAT
Scale Capacity	FLOAT

Configuration with AOP

Using the `EDS_AOP` file makes configuring the HI 6501 instrument fast and easy.

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

9. Open the `EDS_AOP` file and go to the **Configuration** section.
10. To use the configuration parameters, set the parameter **Enable/Disable Configuration Table** to **Enable**.



	ID △	Name	Value	Units	Style	Description
*	18	Enable/Disable Config Table	Enable			
	19	Motion Tolerance	10.0		Float	Enter Motion Tolerance
	20	Zero Tolerance	10.0		Float	Enter Zero Tolerance valu
	21	Tare Weight	0.0		Float	Enter Tare Weight
	22	Ref Weight	0.0		Float	Enter Reference Weight

11. Make any required changes.
12. Click **Apply**. The configuration table is downloaded to the module. After the table is downloaded, the module is configured automatically.

PLC Commands

The PLC can control the HI 6501 using the commands in **Error! Reference source not found.**. The sections following the table provide detailed descriptions about the commands.

Hardy Commands

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

Command Number	Command
(0x81) 129 dec	Stability Test
(0x82) 130 dec	IT Test (Reduced Voltage) using 2.5VDC
(0x83) 131 dec	C2 Search
(0x92) 146 dec	Write INT Value Command (e.g., number of averages to 50)
(0x93) 147 dec	Write FLOAT Value Command (e.g., motion tolerance to 1.5)
(0x94) 148 dec	Set Default Parameters (all parameters except IP addresses)
(0x95) 149 dec	Set Default Network Parameters (IP addresses only)
(0x96) 150 dec	Write to Non-volatile Memory (*SD card models only)
(0x97) 151 dec	Save Last Good Configuration to Non-volatile Memory*
(0x98) 152 dec	Restore Last Good Configuration from Non-volatile Memory*

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 register (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
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
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

Set 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

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

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

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 6501 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 6501 for Modbus TCP. To understand the data and format for the Modbus-TCP communications, see the I/O tables.

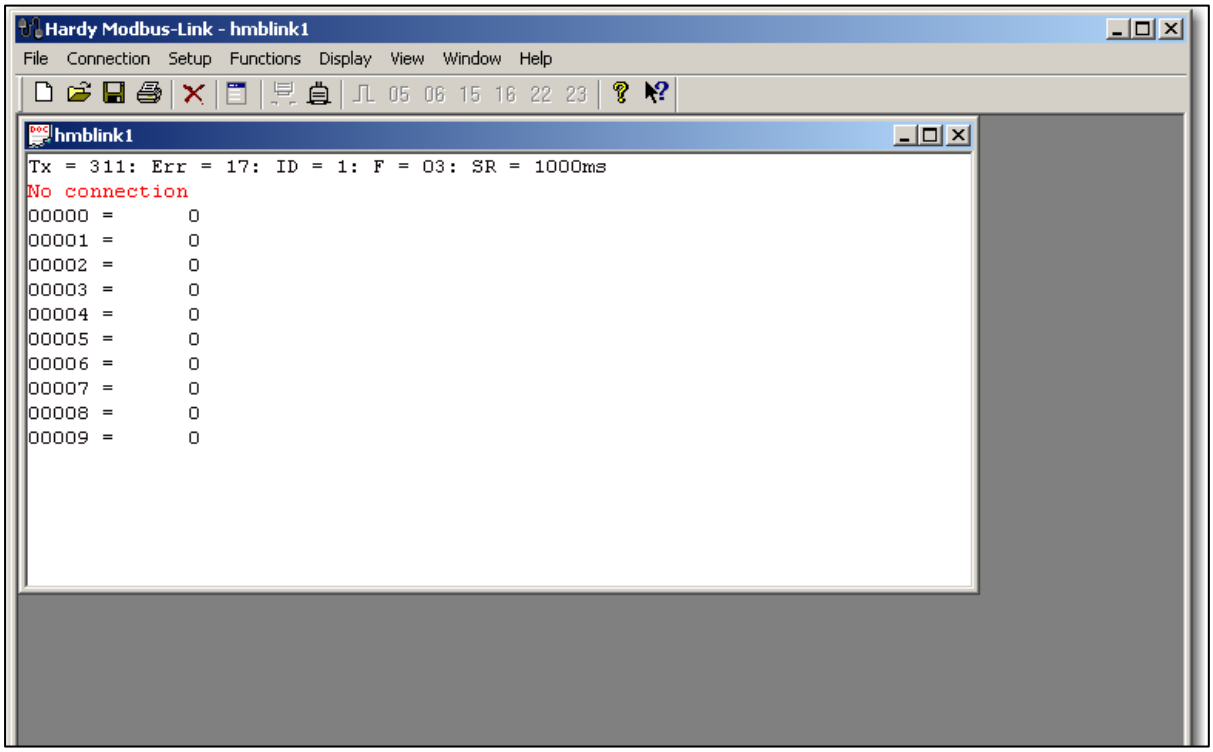
If you do not have a Modbus PLC available to test the Modbus communications, download the Hardy Modbus-Link client software from the Hardy website to test communications with the HI 6501 instrument. The package communicates with the HI6501 only and is not a full communications package. If you encounter 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 6501 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).

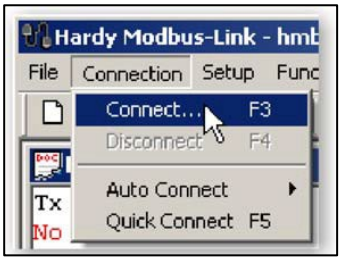
4.3.3.1 Configuring MODBUS

13. Download the Hardy Modbus-Link client software:
    a. Open a web browser on your computer.
    b. Go to the Hardy website: http://www.hardysolutions.com
    c. Click the **Support Center** link, hover over **Doc & Program Downloads**, and click **HI 4000 Series Support Page**. Then download the client software from the HI 4050 Weight Controller page.
14. 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.
15. Double-click the Hardy Modbus-Link icon to open the Hardy Modbus-Link display.

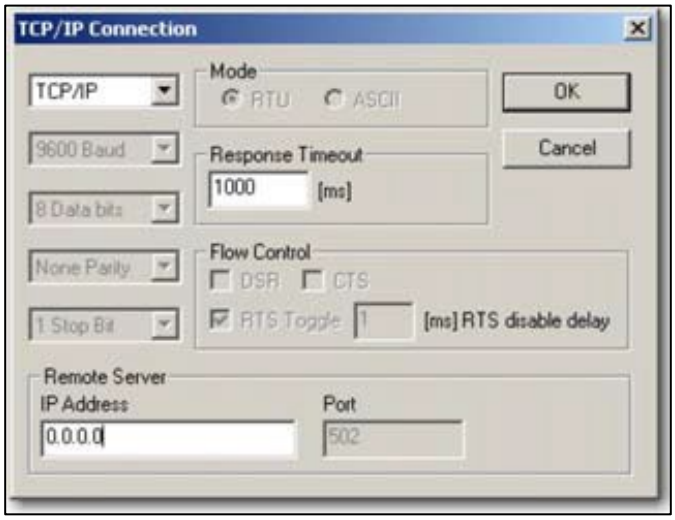


Hardy Modbus-Link Display

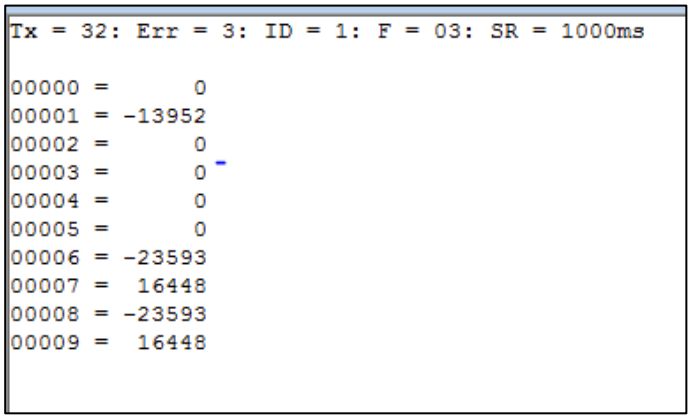
16. From the **Connection** menu, click **Connect**. The TCP/IP Connection dialog box appears.



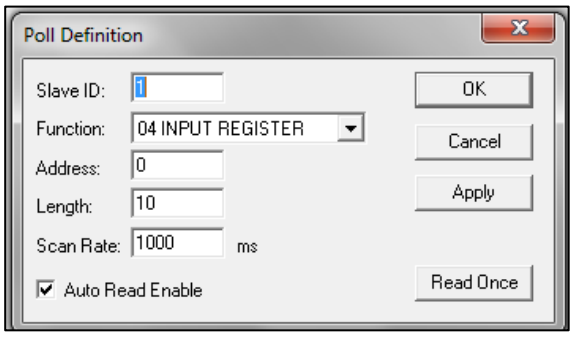
17. If **TCP/IP** is not selected in the top-right field, select it from the pull-down list.
18. In the **IP Address** field at the bottom right, type the address of the HI 6501 instrument with which you want to communicate.



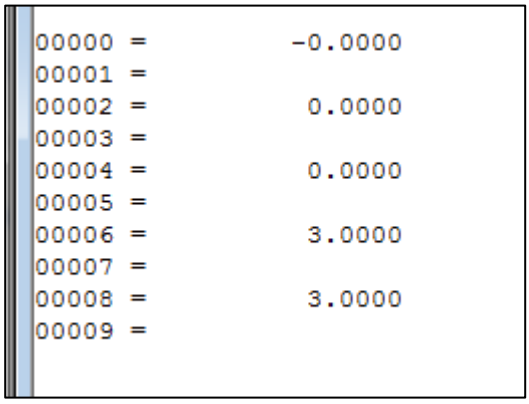
19. Click **OK**. The red **No Connection** message disappears and the values at the top of the page change. Your computer is now connected to the HI 6501.



20. 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



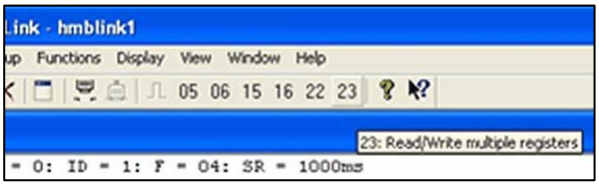
21. On the Hardy Modbus-Link page, from the **Display** menu, click **Float**. The Weight value appears in register 6 (net) or register 8 (gross). Other registers are not float values, so be aware of random numbers in other registers.



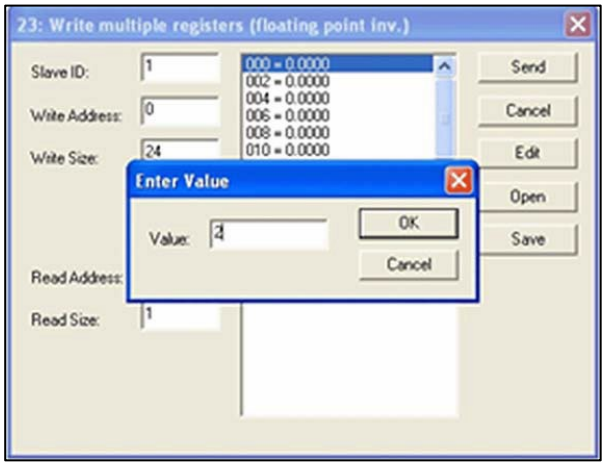
22. From the **Display** menu, click **Long**. This allows you to write an integer value into the non-float registers.
23. From the **Functions** menu, select **Read/Write Registers**:

OR

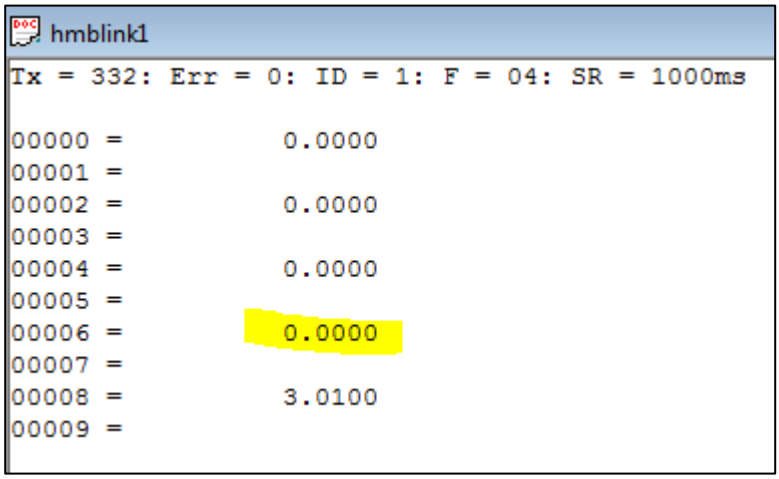
Click button 23 to open the Write multiple registers dialog box



24. 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.



25. Click **OK** to accept the value, and then click the **Send** button to send the values to the HI 6501.
26. When the Response OK message appears, click **OK**.
27. Change the display back to Float and confirm that the Tare command changed the Net weight to zero.



I/O Tables for Communications to PLC

Tables are common for the EtherNet/IP and Modbus – TCP communication protocols.

Output Table

Output Table	Type
Command	INT
Aux Command Information	INT
Parameter Value	DINT
Parameter ID	INT
Reserved 1	INT
Reserved 2	INT
Reserved 3	INT
Reserved 4	INT
Reserved 5	INT
Total	**10**

Command, Aux Command Information, Parameter ID, 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 16-bit Aux Command Information is used for specific information required for special commands. To select which parameter is being read or written, set the predefined number into the Parameter ID. If the value is being read, the Parameter Value is ignored or set to the required value if the value is being written.

The following values are reserved to provide padding, so the user-selectable read-only parameters are aligned between the output and input tables:

- Reserved 1
- Reserved 2
- Reserved 3
- Reserved 4
- Reserved 5
- Reserved 6
- Reserved 7

Input Table

Input Table	Type
Command Echo	INT
Command Status and Sample Counts	INT
Parameter Value	DINT
Parameter ID	INT
Instrument Status	INT
Net Weight	REAL
Gross Weight	REAL
Total	**10**

The first four variables in the input table in — Command Echo, Command Status, Parameter ID, and Parameter Value — match closely the first four variables in the output table.

Command Echo echoes the command from the output table. This allows the PLC to ensure that the correct command has been executed and that the command status value is valid.

Command Status and Sample Counts returns the command status of the command being run and the Weight Sample Counts from 0 – 255 repeat. 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.
- The upper 8 bits of the register are a cyclic “measurement update count,” which increment by 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 value for the specified Parameter ID.

`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.

LIST OF PARAMETER IDS

Read/Write Parameters

Parameter	Hex Value
Units	0x2881
Waversaver	0x2081
NumAverages	0x2082
ZeroTolerance	0x2886
AutoZeroTolerance	0x6302
AutoZeroState	0x6301
MotionTolerance	0x2887
SpanWeight	0x4182
RefWeight	0x4101
Gravity Correction	0x4102
Tare Weight	0x6183
Cal Year	0x4202

Parameter	Hex Value
Cal Month	0x4203
Cal Day	0x4204

Diagnostic Write Parameters

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

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

Parameter	Hex Value
IT RAW VARIATION CHANNEL 2	0x49B2
IT RAW VARIATION CHANNEL 3	0x49B3
IT RAW VARIATION REF 1	0x49B8
IT RAW VARIATION CHANNEL 4	0x49B4
IT RAW VARIATION CHANNEL 5	0x49B5
IT RAW VARIATION CHANNEL 6	0x49B6
IT RAW VARIATION CHANNEL 7	0x49B7
IT RAW VARIATION REF 2	0x49B9
IT WAVERSAVER VARIATION CHANNEL 0	0x49C0
IT WAVERSAVER VARIATION CHANNEL 1	0x49C1
IT WAVERSAVER VARIATION CHANNEL 2	0x49C2
IT WAVERSAVER VARIATION CHANNEL 3	0x49C3
IT WAVERSAVER VARIATION REF 1	0x49C8
IT WAVERSAVER VARIATION CHANNEL 4	0x49C4
IT WAVERSAVER VARIATION CHANNEL 5	0x49C5
IT WAVERSAVER VARIATION CHANNEL 6	0x49C6
IT WAVERSAVER VARIATION CHANNEL 7	0x49C7
IT WAVERSAVER VARIATION REF 2	0x49C9
IT RAW VARIATION RESULT CHANNEL 0	0x49D0
IT RAW VARIATION RESULT CHANNEL 1	0x49D1
IT RAW VARIATION RESULT CHANNEL 2	0x49D2
IT RAW VARIATION RESULT CHANNEL 3	0x49D3
IT RAW VARIATION RESULT REF 1	0x49D8
IT RAW VARIATION RESULT CHANNEL 4	0x49D4
IT RAW VARIATION RESULT CHANNEL 5	0x49D5
IT RAW VARIATION RESULT CHANNEL 6	0x49D6
IT RAW VARIATION RESULT CHANNEL 7	0x49D7
IT RAW VARIATION RESULT REF 2	0x49D9
IT WAVERSAVER VARIATION RESULT CHANNEL 0	0x49E0
IT WAVERSAVER VARIATION RESULT CHANNEL 1	0x49E1
IT WAVERSAVER VARIATION RESULT CHANNEL 2	0x49E2
IT WAVERSAVER VARIATION RESULT CHANNEL 3	0x49E3

Parameter	Hex Value
IT WAVERSAVER VARIATION RESULT REF 1	0x49E8
IT WAVERSAVER VARIATION RESULT CHANNEL 4	0x49E4
IT WAVERSAVER VARIATION RESULT CHANNEL 5	0x49E5
IT WAVERSAVER VARIATION RESULT CHANNEL 6	0x49E6
IT WAVERSAVER VARIATION RESULT CHANNEL 7	0x49E7
IT WAVERSAVER VARIATION RESULT REF 2	0x49E9
IT RTZ CHANNEL 0	0x49F0
IT RTZ CHANNEL 1	0x49F1
IT RTZ CHANNEL 2	0x49F2
IT RTZ CHANNEL 3	0x49F3
IT RTZ CHANNEL 4	0x49F4
IT RTZ CHANNEL 5	0x49F5
IT RTZ CHANNEL 6	0x49F6
IT RTZ CHANNEL 7	0x49F7
IT RTZ COMBINED	0x498C

Stability Test Parameters

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

Read-Only Parameters

Parameter	Hex Value
GrossWeight	0x6081
NetWeight	0x6082
ADC_Counts	0x4907

Parameter	Hex Value
ADC_CountsRaw	0x4908
CalLowCounts	0x4085
CalHighCounts	0x4087
ZeroCounts	0x2889
CalZeroCounts	0x4084
Cal Type	0x4001
NUMBER C2 SENSORS	0x4103
NUMBER IT J-BOXES	0x4881
FirmwareRevision	0x7985

5 SETTING SCALE PARAMETERS

Topics:

This chapter describes how to configure the HI6501 Weight Processor parameters. This chapter assumes you are prepared to access the parameters using one of the methods described in section 4.3.

5.1 Accessing Configuration Parameters

The HI6501 Weight Processor parameters are organized by screens that appear on various pages. To move from one page to the next, swipe the icon shown on the left side of Figure 5-1 from right to left across the touchscreen. To move to previous pages, swipe the icon shown on the right side of Figure 5-1 from left to right across on the touchscreen.

Moving to the Next Page

Moving to a Previous Page

Figure 5-1. Icons Used to Move to Pages

Table 5-1 shows the organization of the pages and screens.

Table 5-1. Touchscreen Pages and Screens

Page	Screen	Parameters	See Section
Home (first)	Setup	Capacity Motion tolerance Unit Decimal point Grads Instrument ID Operator ID	5.3
	Calibration	Sensitivity Gravity Reference weight Cal tolerance Number of devices Cd cal Cal date Traditional calibration	5.4

Page	Screen	Parameters	See Section
	Operation	Auto mode Warmup time Auto zero Zero tolerance Zero amount Tare offset Tare amount Piece count: Count enable Unit weight Sample size Use display weight	5.5
Page 2	Filter	WaverSaver Number of average	5.6
	Communication	Fixed IP Net mask Gateway DHCP enable DNS server Dynamic IP Ethernet UDP Hardy port More settings: ModBus RTU SD Card Printer	5.7
	Metrology	Approval options	5.8
	Display	Backlight brightness Home screen color settings	5.9
	Diagnostics	Stability (IT) Modbus-TCP Power Modbus-RTU POFINET	5.10
	Security	Sec level Password Lock after __ minutes	5.11
Page 3	Information	Product ID Main firmware Display model Display firmware	5.12
	Online manual	QR code for viewing the online manual	

5.2 Initial Configuration

When the HI6501 Weight Processor is received for the first time, we recommend performing the following initial configuration.

1. First use the **Parameter** menu to set the units, motion tolerance, decimal point, and grads. See section 5.3.
2. Next, use the **Filter** menu to set the number of averages and WAVERSAVER® settings. See section 5.6.
3. Final step, use the **Calibration** menu to set calibration parameters and calibrate the scale. See section 5.4.

5.3 Configuring Setup Parameters

Path: Home screen > Setup

The Setup screen contains the parameters in Table 5-2. After setting the **Unit**, **Decimal Point**, and **Grads**, click the **Set** button. After configuring the parameters, click the **Done** button.

Table 5-2. Setup Parameters

Parameter	Description
Capacity	Sets the 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. If you enter a capacity value that conflicts with either the decimal point value or the graduation value, the decimal point and/or graduation values change automatically to match the programmed capacity. For this reason, we recommended you enter the Capacity parameter before setting the Decimal Point and Grad parameters. Range: .000001 - 999999 Default: 11.00
Motion Tol	Motion tolerance. Defines the amount of deviation to allow for your process. This value must be greater than or equal to the Grad value. We recommend you enter a value that is 3 times the Grad size. To calculate the base motion number, use the following formula: Base Motion Number = (Total Load Cell Capacity x 0.0003). Range: .000001 – 999999 Default: 10.00
Unit	Unit of measure. Sets the scale to either English or Metric units. You can set the unit of measure at any time, not just when calibrating the instrument. The instrument does not need to be calibrated again after changing the unit of measure. Choices are: – oz (ounces) – lb (pounds). (*default*) – ton (short ton) – g (grams) – kg (kilograms) – t (metric ton)
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 instrument. Adding decimal points does not improve system accuracy beyond the specified ability of the load cell. Range: 0 - 5 Default: 2
Grads	Graduation. Defines the minimum increment displayed by the instrument. To calculate the base graduation number, divide the Total Load Cell Capacity by 10,000. For example, if two decimal points are selected, a graduation size of 10 displays increments of .10 engineering units and the graduation size of 50 shows increments of .50 engineering units. For a scale with a 10,000 capacity, graduation size equals 1. Range: 1, 2, 5,10, 20, 50, 10, 200, 500, 1000 Default: 1

Parameter	Description
Instrument ID	Unique identification for the instrument. Range: 16 alphanumeric characters
Operator ID	ID of the user who operates or services the instrument. Enter any combination of letters and numbers that adequately identifies the user. Range: 4 alphanumeric characters

5.4 Configuring Calibration Parameters

Path: Home screen > Calibration

The Calibration screen contains the parameters in Table 5-3. The **Traditional Cal** button allows you to configure the instrument for a hard calibration using the parameters in Table 5-5. After configuring the calibration and Hard Cal calibration parameters, click the **Done** button on the respective screens.

To configure the calibration parameters for your requirements, see section 5.4.1.1 if you will be performing a C2® calibration or section 5.4.1.2 if you will be performing a hard calibration.

Table 5-3. Calibration Parameters

Parameter	Description
Sensitivity	Load cell sensitivity defined in mV/V. This parameter sets the expected change in analog signal over the full-scale range of an analog strain gage load cell. For example, if a 5 Volt excitation is applied to a load cell with a sensitivity of 2 mV/V, the full-scale signal will be 10mV. To ensure that the HI6501 optimizes the processing of the analog signal from the load cell, set the load sensitivity parameter to match that of the load cell.
Gravity	Compensates for an object weighing less at the equator than at the North or South Pole. 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 5-4 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	Reference weight. Defines the total live load currently on the scale. Normally, the calibration process uses a reference weight of zero (no weight on the scale), however, this value 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.
Cal Tolerance	Sets the amount of deviation the instrument allows during the calibration process. This value must be greater than or equal to the base motion value and/or the Grad value. To calculate the base motion value, use the following formula: Base Motion value = (Total Load Cell Capacity x 0.0003). We recommend three graduation sizes. Range: 000001 – 999999 Default: 10
NumDevice	Number of devices. Read-only screen that shows the number of devices participating in the calibration.
Do C2® Cal	Click **Do C2® Cal** to perform the calibration. Wait a few seconds for the results to appear. If the calibration succeeds, the message **Command Succeed** appears; otherwise, an error message appears. C2® sensors are detected only upon power-up. Use the C2 Search button to detect sensors that were connected after power-up
Cal Date	Date when the calibration is performed.

Parameter	Description
Traditional Cal	Traditional calibration. Click this button to display a screen for configuring parameters for performing a traditional (or "hard") calibration (see Table 5-5). Traditional calibration requires low and high reference weights 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. We recommend that the span between the low and high weights total 80% to 100% of the scale live load capacity and that the weights be distributed uniformly on/in the scale.

Table 5-4. 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

Table 5-5. Hard Cal Parameters

Parameter	Description
Sensitivity	Same as the Sensitivity parameter described in Table 5-3.
Cal Tolerance	Same as the Cal Tolerance parameter described in Table 5-3.
Reference Weight – Do Cal Low	Sets the low weight value to be used when calibrating the system. Normally, the Do Cal Lo value is zero (no weight on the scale), but can be set to any known weight on the scale. With nothing (zero) on the scale, the Cal Lo Weight is 0.00. With 5 lbs on the scale, the Cal Lo Weight is 5.00 lbs. Normally, you would remove all weight "live load" from the scale to obtain a reference weight of 0.0. Wait 12 seconds or more for the reading to stabilize. Click **Do Cal Low** to conduct the Cal Low calibration. If the calibration succeeds, the message **Command Succeed** appears; otherwise, an error message appears, and you should see Chapter 7 for corrective action.
Span Weight – Do Cal High	Sets the high weight value to be used when calibrating the system. Place a certified test weight on the scale. 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. Use this field to enter a value and click **Do Cal High** to conduct the Cal High calibration. If the calibration succeeds, the message **Command Succeed** appears; otherwise, an error message appears, and you should see Chapter 7 for corrective action.
Calibration Date	Date when the calibration is performed, formatted as MONTH-DAY-YEAR.

5.4.1 Performing C2® and Traditional Calibrations

The following sections describe how to perform C2® and hard calibrations using the parameters described in section 5.4. Before proceeding, be sure you have completed the setting of calibrated parameters.

5.4.1.1 Performing a C2® Calibration

C2® calibration calibrates a scale system electronically without using certified test weights. It uses up to eight load sensors, two junction boxes, interconnect cable, and an instrument with C2® capabilities, such as the HI6501 Weight Processor. Digital information within an HI C2®-certified load sensor details its unique performance characteristics. The HI6501 Weight Processor reads the performance characteristics of each load sensor and detects the number of load sensors in the system.

To perform a C2® calibration

1. Go to the **Calibration** screen.
2. Make sure the number of load cells in the **NumDevice** field corresponds to the actual number of C2® devices installed. If the number varies, either press **C2 SEARCH** or check that each load cell/point cable connection is fastened securely and that each load cell/point cable is not broken. Only Hardy Process Solutions load sensors are capable of C2® (or eCal) calibration.
3. In the **Ref Weight** text, enter the reference weight for your application. An empty scale uses a 0.00 reference weight setting.
4. Identify the Gravity Correction Factor from Table 5-4, and then enter the corresponding Correction Factor number in the **Gravity** field.
5. Remove all live weight from the scale. Leave all dead load weight, like vessels, mixers, etc. on the scale
6. Click the **Do C2® Cal** button and wait for the results to appear.
7. Place a verification weight on the scale to ensure the weight reading matches and that calibration is successful. If the calibration succeeds, the message **Command Succeed** appears; otherwise, an error message appears. If calibration fails, make sure C2® load cells are being used and are connected properly. If the system uses one or more non-C2® load cells, calibrate using a traditional calibration process (see section 5.4.1.2). For more information, see Chapter 7 for troubleshooting suggestions.
8. Click **Done** to navigate back to the **Home** page.

5.4.1.2 Performing a Traditional Calibration

A traditional (or “hard”) calibration refers to the calibration method that uses a reference weight and test weights. We recommend that the span total 80 to 100% of the scale live load capacity and the weights be distributed uniformly on/in the scale. Put a load (weight) on the scale or vessel. For a full load test, you can put 80% to 100% of the expected weight you will see in your process on the scale or vessel.

To set the reference weight if all “live load” weight is removed from the scale, the reference weight 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.

To perform a traditional calibration:

1. Go to the **Operation** screen and make sure the **Zero Amount** field is set to the default value of 0.00. If a different value appears in this field, change it to 0.00 and click **Done**.

1. Go to the **Calibration** screen, and then click the **Traditional Cal** menu.
2. Click in the **Ref Weight** field and enter the reference weight you want. For example, if you want the reference weight to be 5.0 lbs., enter **5.0**.
3. Click the **Do C2® Cal** button. If the calibration succeeds, a **Command Succeed** message appears (click **OK** to remove the message). Otherwise, an error number appears, and you should refer to Chapter 7 for assistance in correcting the error.
4. Click the **Traditional Cal** button.
5. In the **Do Cal Low** field, 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 reference 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, a **Command Succeed** message appears (click **OK** to remove the message). Otherwise, an error number appears, and you should refer to Chapter 7 for assistance in correcting the error.
6. Place the test weight(s) on the scale.
7. In the **Do Cal High** field, enter the amount of live load weight placed on the scale.
8. Click the **Do Cal High** button. If the calibration succeeds, a **Command Succeed** message appears (click **OK** to remove the message). Otherwise, an error number appears, and you should refer to Chapter 7 for assistance in correcting the error.

5.5 Configuring Operation Parameters

Path: Home screen > Operation

The Operation screen contains the parameters in Table 5-6.

Table 5-6. Operation Parameters

Parameter	Description
Auto mode	Enables one-button functionality when performing zero and tare operations. Choices are: – ON = enables auto mode. – OFF = disables auto mode. (*default*)
Warmup time	Amount of time that must pass before weight data is displayed. Default is 0 minutes.
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 Zero Tolerance value, the instrument 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
Zero Tolerance	Sets the weight unit limit from zero that the instrument accepts as gross zero during the zeroing function (when you push the **Zero** button). Range: .000001 – 999999 Default 10.00
Zero Amount	Read-only field that shows the amount that has been “zeroed” from the scale..
Tare offset	The value you enter here allows you to avoid pushing the **Tare** button each time you place an empty container on the scale. Range: .000001 – 999999 Default: 0.00
Tare amount	Total amount that has been "tared" from the scale minus the Tare offset. This value resets to zero when net and gross are the same weight, and totalizes the differences each time the Tare command is run. This value excludes the initial Tare offset value, which is a constant value subtracted from the net weight value without the operator running the Tare command. Range: .000001 - 999999 Default: 0.00

5.6 Configuring Filter Parameters

Path: Home screen >  > Filter

The Filter screen has two parameters:

- WAVERSAVER®
- Number of Average

5.6.1 Configuring WAVERSAVER®

Typically, mechanical noise from other machinery in a plant environment is present in forces larger than the weight variations you want to detect. WAVERSAVER® reduces the effects of the vibratory forces that exist in all industrial weight control and measurement applications so the instrument can better calculate the actual weight by separating weight data from background noise caused by vibration.

WAVERSAVER® enables the HI6501 Weight Processor to distinguish between actual weight data and mechanical noise, both of which typically are conveyed in the load cell signal. You can configure WAVERSAVER® to ignore noise with frequencies as low as 0.25 Hz. One of three higher additional cut-off frequencies can be selected to provide faster instrument response times. This function is user-selectable and can be turned off.

Range: 0.25 Hz, 0.5 Hz, 1.0 Hz, 3.50 Hz, 7.50 Hz, OFF

Default: 1.0 Hz

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® setting OFF, 25.0 Hz, 15.0 Hz, 10.0 Hz, 7.5 Hz, 3.5 Hz, or 1.0Hz.
- High-amplitude low-frequency vibrations: use WAVERSAVER® setting 0.5Hz or 0.25Hz.

After configuring the **WAVERSAVER®** parameter, click the **Set** button.

> Certain models in the 6501 Series feature WAVERSAVER+, an adaptive filtering algorithm which can significantly improve the speed and stability the weight reading in excessively noisy environments.
>
> Accessible thru the Webserver only, the filter uses two additional parameters, Variation Threshold and Motion Threshold. Proper configuration will provide stable weight readings at the fastest possible rate.

Be sure to configure your original WAVERSAVER and Averaging first (if applicable), as WAVERSAVER+ is dependent upon those baseline settings to further improve weight stability. Anytime the original WAVERSAVER or Averaging values are changed, WAVERSAVER+ must also be reconfigured for the best results.

1. Set the original WAVERSAVER to 1.0 Hz and Averages to 20. (Your instrument settings may vary).

2. Set the Variation and Motion Threshold to 0 and record the peak-to-peak variation of the weight reading while under normal operation.

3. Set the Variation Threshold to 1.5 times larger than the peak-to-peak weight variation.

4. Set the Motion Threshold to 1/3 of the peak-to-peak weight variation. For example, if the observed weight change is 6, the Variation Threshold should be set to 9 (1.5X) and the Motion Threshold parameter set to 2 (1/3X).

5.6.2 Configuring the Number of Average Parameter

The **Number of Average** parameter sets the number of weight readings used to compute a sliding average of displayed weight. This setting helps the instrument ignore the effects of material impact and/or vibration if material does not enter or exit the scale evenly. The average is a sliding average so that a new average reading is available for display at every reading. Setting a very high value here and for WAVERSAVER® may slow system performance.

For applications requiring very quick weight readings, reduce this setting to its minimum. If the weight is unstable, increase the averages. Do not set this value to exceed the WAVERSAVER® value. If WAVERSAVER® equals 7.5 Hz (60 ms), this instance would suggest a limit of 60 ms or 15 averages (4 ms each).

Vigorous vibration and impacting require a lower frequency WAVERSAVER® setting or increased **Number of Average** value. Therefore, if you decrease the WAVERSAVER® setting, reduce the **Number of Average** accordingly.

Range: 1 - 255

Default: 10

5.7 Configuring Communication Parameters

Path: Home screen >  > Communication

The Communication screen contains the parameters in Table 5-7.

Serial Communication settings, including Printer and Modbus RTU are only accessible via the Web browser.

Table 5-7. Communication Parameters

Parameter	Description
Fixed IP	If **DHCP enable** is OFF, enter the fixed (static) IP address that the instrument will use. To avoid using an IP address that is already being used by another device, obtain the fixed IP address from your network administrator.
Net mask	If **DHCP enable** is OFF, enter the subnet mask that the instrument will use. The Net Mask parameter, or subnet address, is used by the TCP/IP network to determine whether the host is on a local subnet or remote network.
Gateway	If **DHCP enable** is OFF, enter the gateway that the instrument will use to communicate with a remote host.
DHCP enable	Turns DHCP ON or OFF at the instrument. If you turn on DHCP, you must have a DHCP server on your network for DHCP to work. If you do not have a DHCP server, if DHCP is disabled, or if the network is unable to assign an IP address, the Fixed IP address is used. Choices are: – ON = instrument will use DHCP. (*default*) – OFF = instrument will not use DHCP.
DNS Server	IP address of the DNS server with which the instrument will communicate.
Dynamic IP	Read-only field that shows the instrument's IP addresses obtained from the DHCP server.
EtherNet UDP Hardy Port	Ethernet UDP allows the HI6501 Weight Processor to send messages (datagrams) to other hosts on the IP network. Range: any 16-bit value between 0 and 65,535 Default: 1024

Table 5-8. More Settings Parameters accessible via the Web browser

Parameter	Description
ModBus RTU	If using a Modbus RTU with the HI6501 Weight Processor, configure the parity, baud rate, termination, and slave address for the attached Modbus RTU. Click **Done** when finished.
Printer	If using a printer with the HI6501 Weight Processor, configure the printer mode, parity, and baud rate for the attached printer. Click **Done** when finished.

5.8 Configuring Metrology Parameters

Path: Home screen >  > Metrology

The Metrology screen allows you to select an approval option that sets the scale to meet certain certification standards; however, it does not generate a certificate.

Choices are:

- None = no approval option is set. (*default*)
- NTEP

Depending on the specific model of instrument, additional Agency Approvals modes (OIML, CPA and MC) may be available via the Web browser.

Note: To obtain NTEP or Canada certification, you must have the appropriate agency certify the instrument. If you choose NTEP or a Canadian selection, you can no longer tare with a negative gross weight.

TIP: The instrument also provides an NTEP switch that sets the scale to meet certain certification standards by preventing changes to certain parameters (see section 3.6.2). By default, this switch is set to OFF, which disables NTEP. If you move the switch to the ON position with this parameter set to None, NTEP remains disabled and all parameters will be accessible.

5.9 Configuring Display Parameters

Path: Home screen >  > Display

The Display screen contains the parameters in Table 5-9. After configuring the parameters, click the **Done** button.

Table 5-9. Display Parameters

Parameter	Description
Backlight Brightness	Brightens or dims the display. Moving the slider to the right increases the brightness while moving it to the left decreases the brightness. 1 is the darkest and 100 is the brightest. Default is 50. The selected brightness level appears to the left of the slider.

5.10 Running Diagnostics

Path: Home screen >  > Diagnostics

The Diagnostics screen allows you to run various tests that allow you to perform preventive maintenance as well as identify problems with the HI6501 Weight Processor. After running diagnostics, click the **Done** button.

For more troubleshooting information, see Chapter 7.

Table 5-10. Diagnostics Parameters

Parameter	Description
Stability (IT)	This test checks the A/D Raw count by testing and reporting each load cell. The test sends the load cell data to the analog-to-digital converter and calculates the mean squared variation from the average reading, using 100 samples. The test passes if the mean squared variation is less than 5.0. If the weighing system passes the stability test, the results show **Pass** and the variation and mean results are posted. **Fail** indicates that the Mean Squared Variation is greater than 5.0 so the system is considered unstable. In that case, see the Troubleshooting Flow Charts in Chapter 7. Do not perform the stability test during production because the test activities can cause incorrect readings.
Power	This test shows the voltage, amps, watts, and load cell information for the HI6501 Weight Processor.
Modbus – TCP	The HI6501 Weight Processor detects and connects to any available Modbus TCP connection automatically. This test counts the number of frames received by the instrument and how many of them are valid compared to error frames.
Modbus – RTU	The HI6501 Weight Processor detects and connects to any available Modbus RTU connection automatically. This test counts the number of frames received by the instrument and how many of them are valid compared to error frames.
POFINET	This test shows whether the instrument has a POFINET connection and, if it does, the IP address and rate being used.

5.11 Configuring Security Parameters

Path: Home screen >  > Security

The Security screen contains the parameters in Table 5-11. The security system is organized into two levels:

- Medium security protects the **Tare**, **Zero**, and **Mode** buttons on the instrument.
- High security protects certain menu items.

After configuring the parameters, click the **Done** button.

Table 5-11. Security Parameters

Parameter	Description
Sec Level	Enables or disables security. Choices are: – Disable = security is disabled. (*default*) – Medium = medium security is enabled. This level prevents changes to parameters but allows Calibration, Zero and Tare Functions. – High = high security is enabled. This level prevents all changes to the instrument, including Calibration, Zero and Tare
Password	Use the four roller controls to specify a 4-digit password. After setting a password, click the **Set** button. By default, the password is set to 0000, which corresponds to no password.

5.12 Viewing Product, Firmware, and Model Information

Path: Home screen >  >  > Information

The Information screen shows the product ID, main firmware version, display model, and display firmware version. After viewing this information, click the **Done** button.

5.13 Static Checkweighing Feature

Path: Home screen >  > Check Weight

The Static Checkweighing feature allows an operator to set a target weight that will turn the screen green when within the range and red if over or under the range. The feature is a display-only function, in that no data is collected or sent to a controller such as a PLC or DCS.

There are three settings –

Trigger – this is the minimum threshold for the check weighing mode to activate. A setting of zero will cause the display to remain red until the target range is reached.

Under – this is the lower range of ACCEPT

Over – this is the upper range of ACCEPT

To return to the Home page and exit out of the Static Check weigh page, press the Mode button three times, then tap the Set-up button that appears on the touchscreen.

6 CLEANING AND MAINTENANCE

Topics:

A preventive maintenance program will maximize the lifetime of the HI6501 Weight Processor and minimize the risk of unscheduled down-time. Optimal performance will be achieved by regular cleaning of system components and replacement of wear parts with genuine parts.

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

Warning: Prior to any cleaning or maintenance, always unplug the HI6501 Weight Processor power connection from the power source.

6.1 Preventive Maintenance Schedule

Table 6-1 summarizes frequent maintenance tasks.

Table 6-1. 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.

6.2 Cleaning the Instrument

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 HI6501 Weight Processor 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 HI6501 Weight Processor electronics.
- If adjacent machines are cleaned using high-pressure water hoses or steam, protect the HI6501 Weight Processor appropriately.
- Do not use solvents to clean the HI6501 Weight Processor because of the possibility of damage.

6.3 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.

7 TROUBLESHOOTING

Topics:

This appendix describes procedures tests that can shorten the time for troubleshooting. In the unlikely event of a problem with the HI6501 Weight Processor, 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

7.1 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 the HI6501 Weight Processor.
- Place small fasteners, connectors, and electrical parts in closed containers so as not to lose parts during reassembly.
- Read the disassembly instructions before any disassembly begins. If any of the instructions for disassembly are unclear, contact Hardy Process Solutions, Technical Support Department for additional information and assistance.
- Do not disconnect any electrical plug, connector, or terminal unless an identification tag is present or one is attached. Always note where the connector or plug was attached to the electrical component or wiring harness.
- Always install complete hardware groups (screws, washers, lock washers, spacers, etc.) back to the original point of removal.
- Always replace broken or damaged modules or hardware immediately.
- Always check to be sure that no loose parts are sitting on printed circuit boards or electrical connectors or wires when disassembling or reassembling.
- Always protect printed circuit boards from 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 instrument.
- Always follow proper safety procedures when working on or around the instrument.

7.2 Error Messages

Table 7-1 lists error messages for the instrument.

Table 7-1. Weight Processor 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 other 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 perform a calibration with the card installed to access the IT information.
No C2® Sensor!	Instrument 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, and then 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, 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.

7.3 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. The option requires an HI 6020IT or HI 6010IT Summing Junction Box that provides distinct inputs for each load cell.

Example of 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

For more information, contact Hardy Process Solutions.

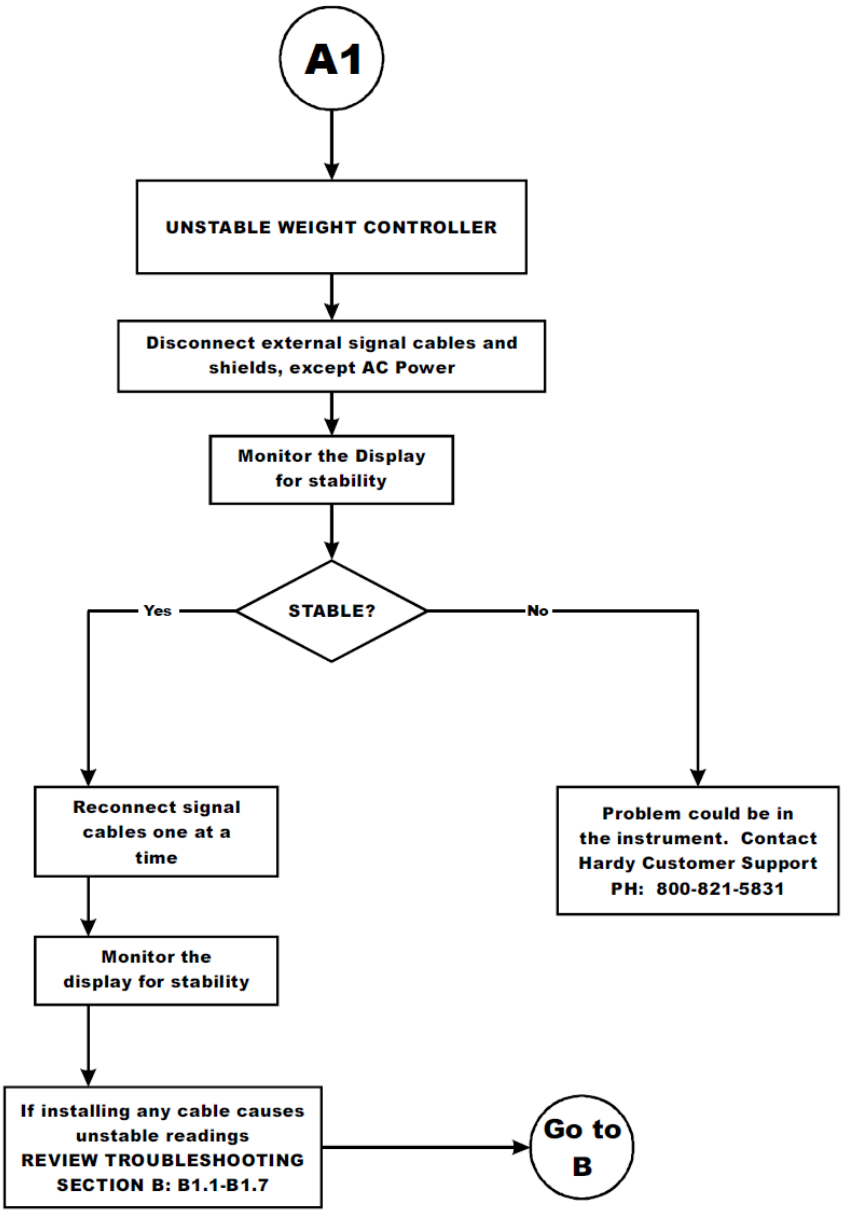
7.4 General Troubleshooting

The following sections describe general troubleshooting procedure. Refer to Table 7-2 for an overview of the troubleshooting topics described in the following sections.

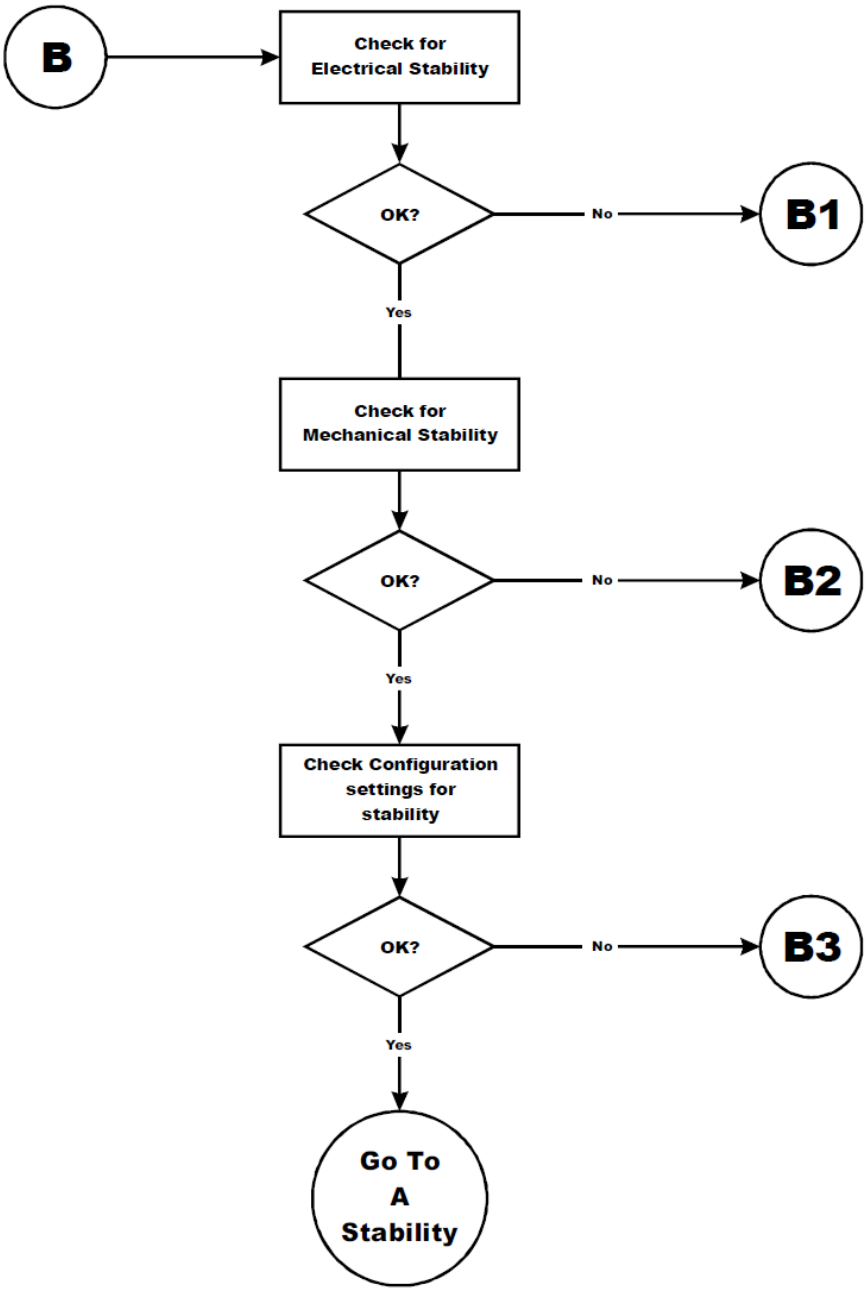
Table 7-2. General Troubleshooting

Problem	See
Drifting weight reading	Section 7.4.1
Electrical, mechanical, and configuration reviews	Section 7.4.2
Unstable weight reading	Section 7.4.3
Weight indication will not return to zero	Section 7.4.4
Verify individual load sensor operation	Section 7.4.5
Traditional calibration - A/D Failure Error	Section 7.4.6
Mechanical inspection	Section 7.4.7
Electrical inspection	Section 7.4.8
Load sensor installation	Section 7.4.9
Exceeds the Millivolt range, out-of-range condition	Section 7.4.10
Blank display	Section 7.4.11
SD card diagnostics and losing memory at power cycles	Section 7.4.12

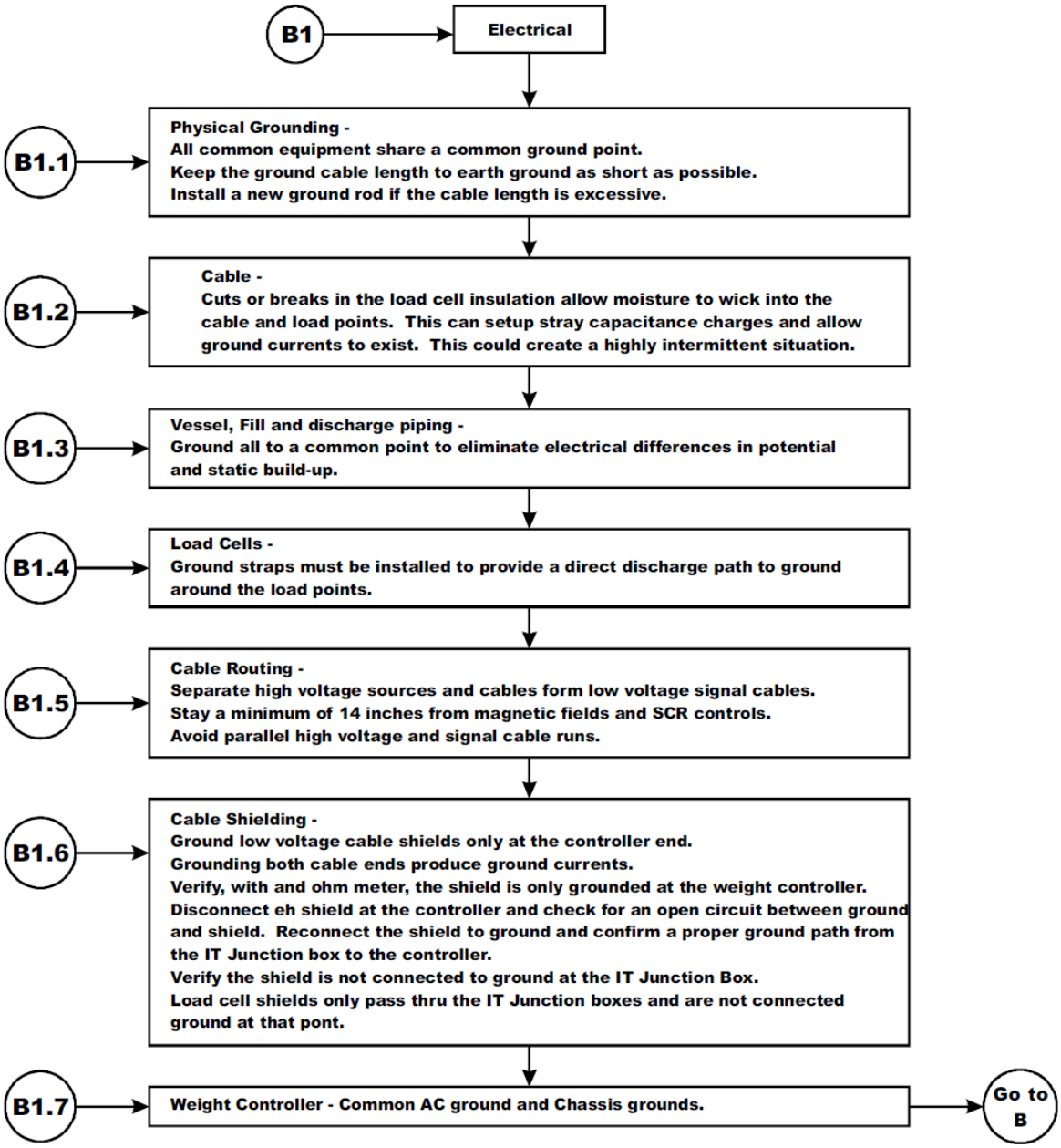
7.4.1 A1: Troubleshooting Instabilities on a Formerly Operating System



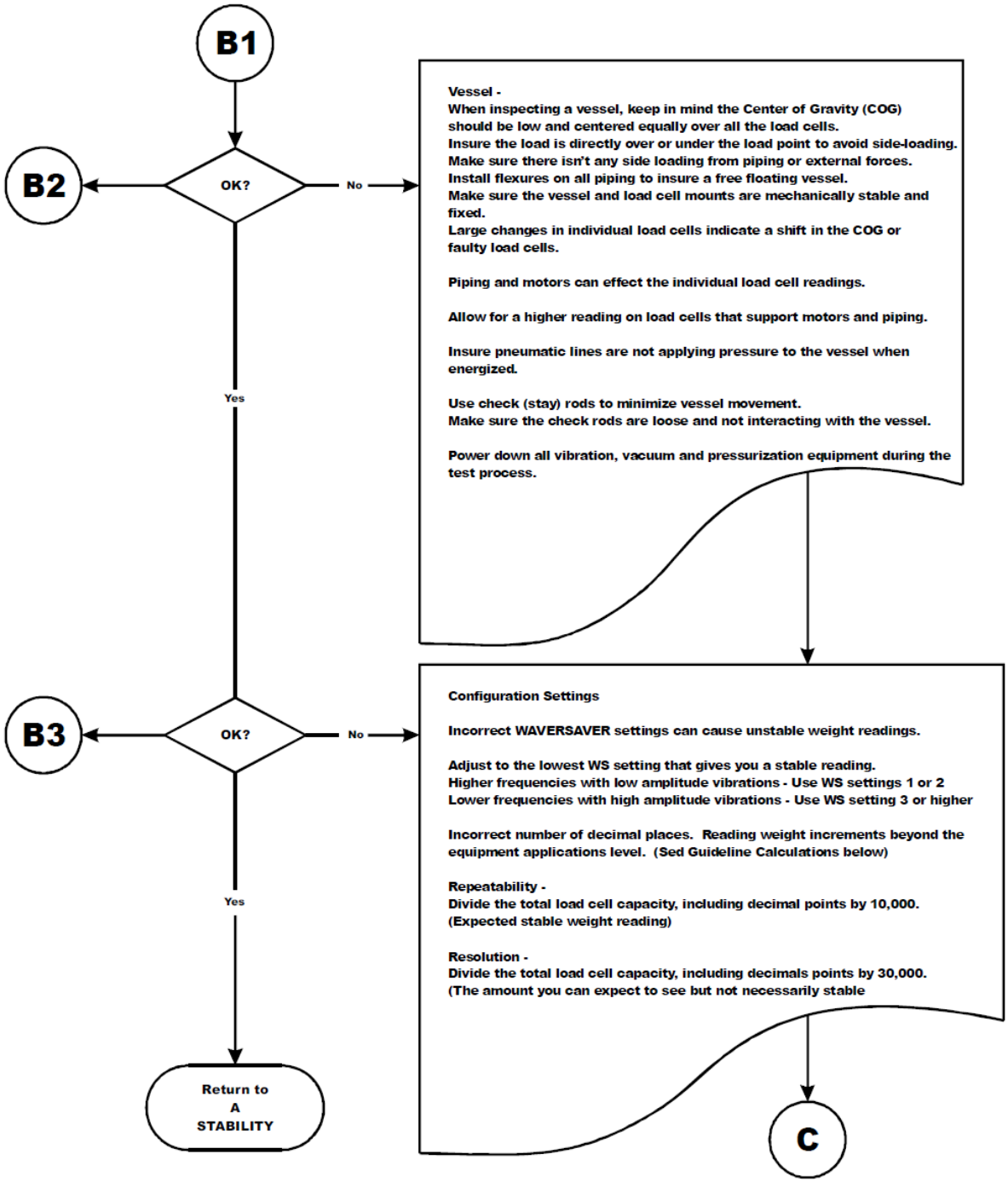
7.4.2 B: Troubleshooting Instabilities on a Formerly Operating System



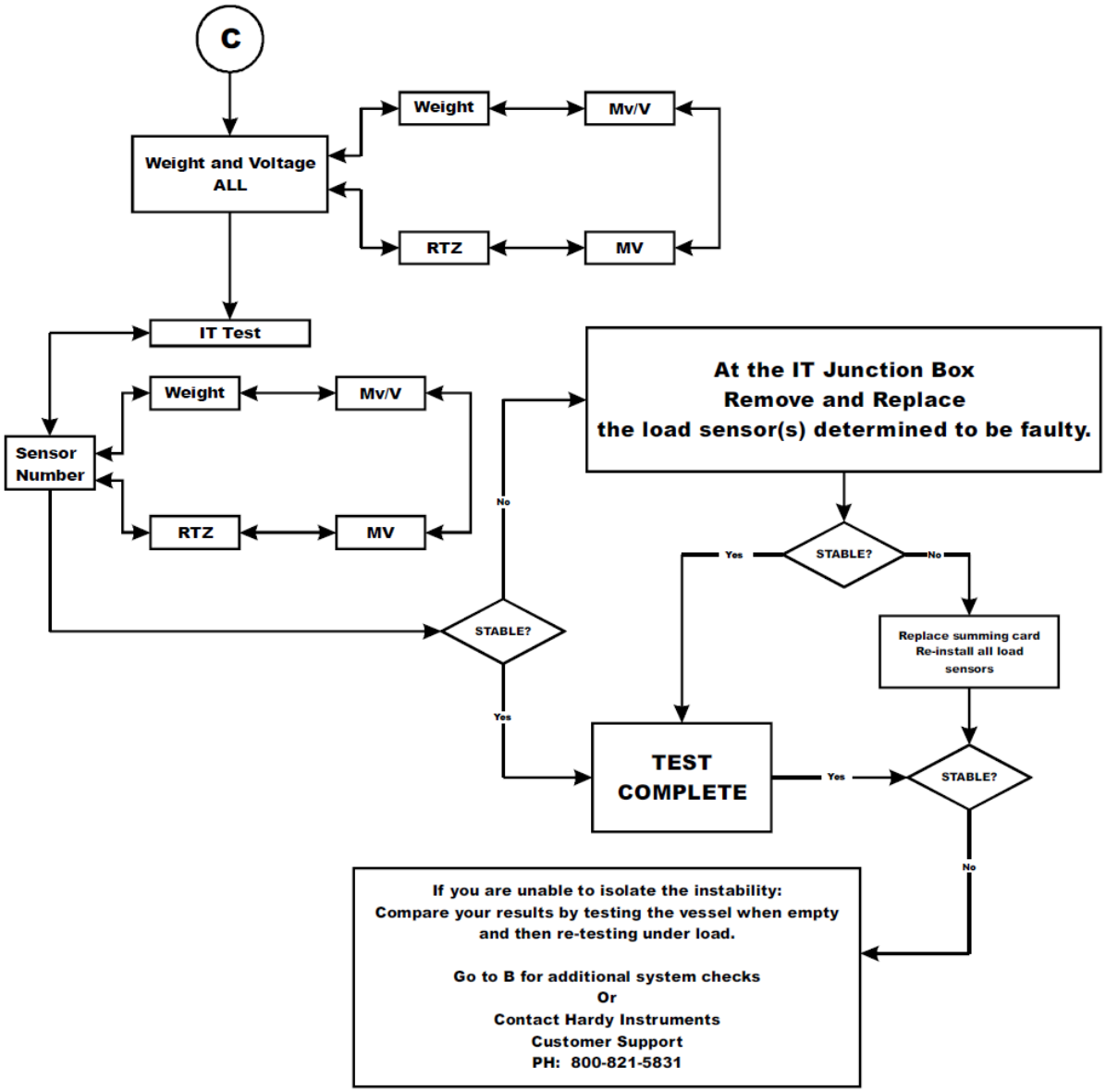
7.4.2.1 B1: Troubleshooting Instabilities on a Formerly Operating System



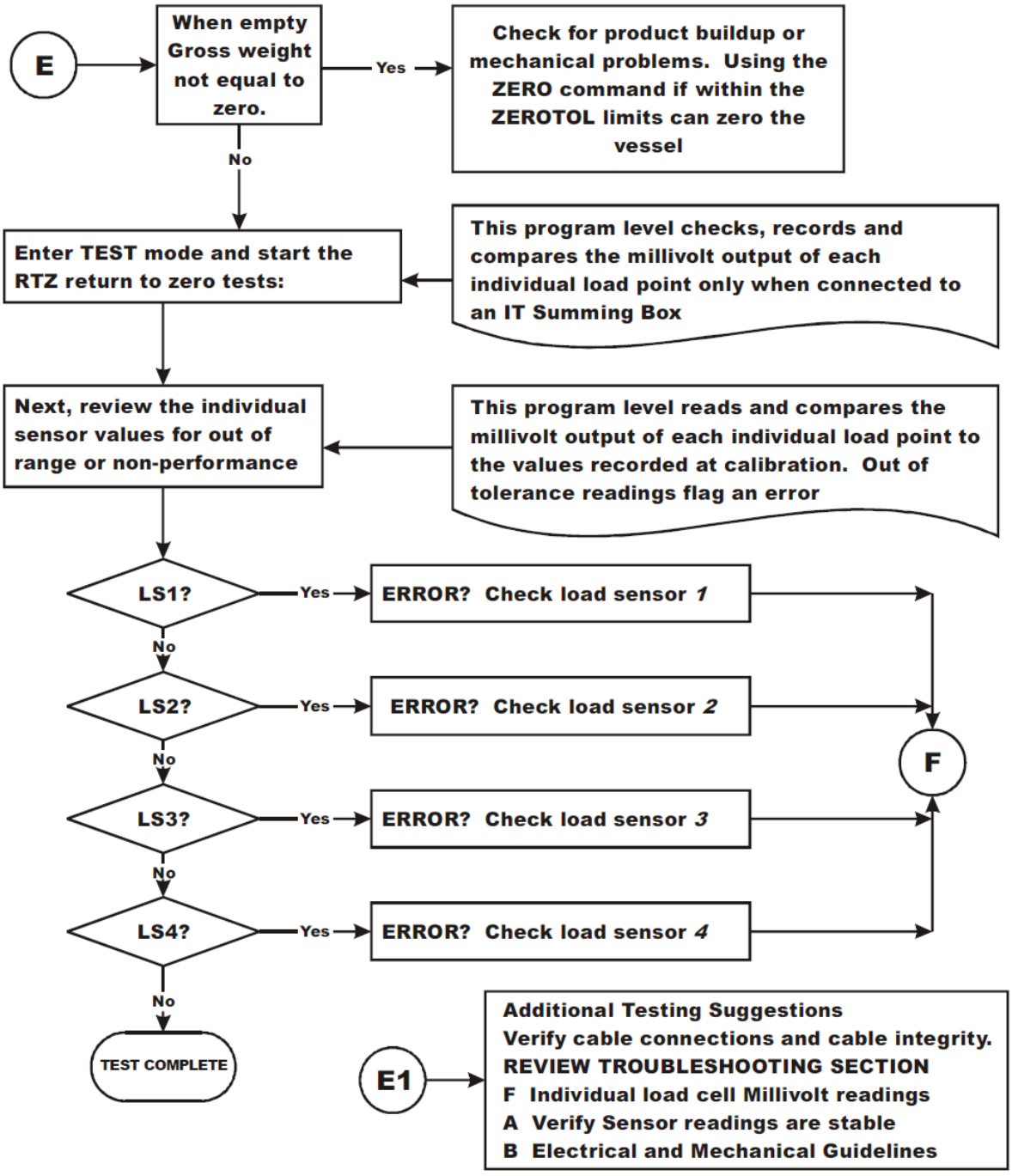
7.4.2.2 B1 (continued): Troubleshooting Instabilities on a Formerly Operating System



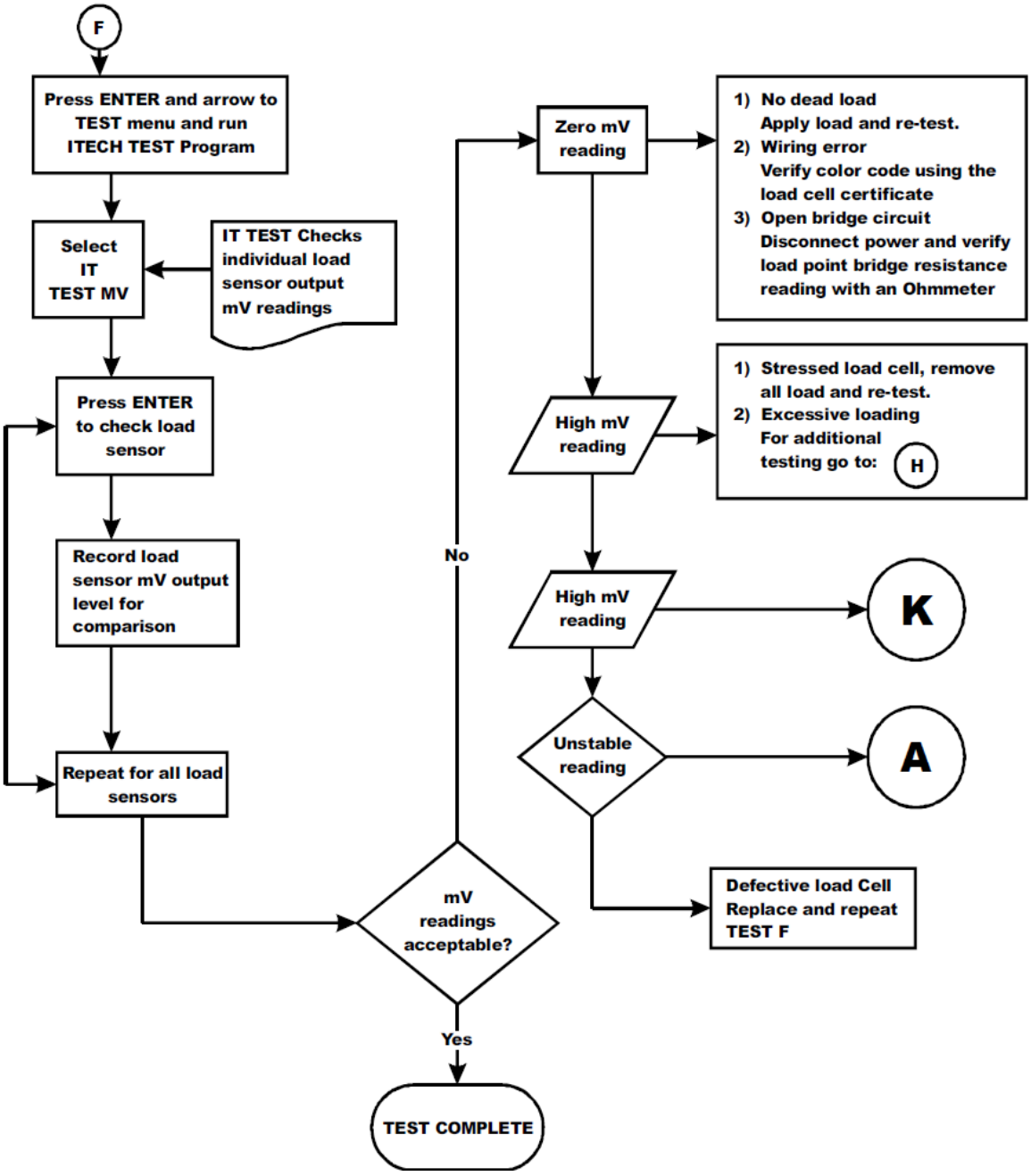
7.4.3 C: Troubleshooting Instabilities on a Formerly Operating System



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

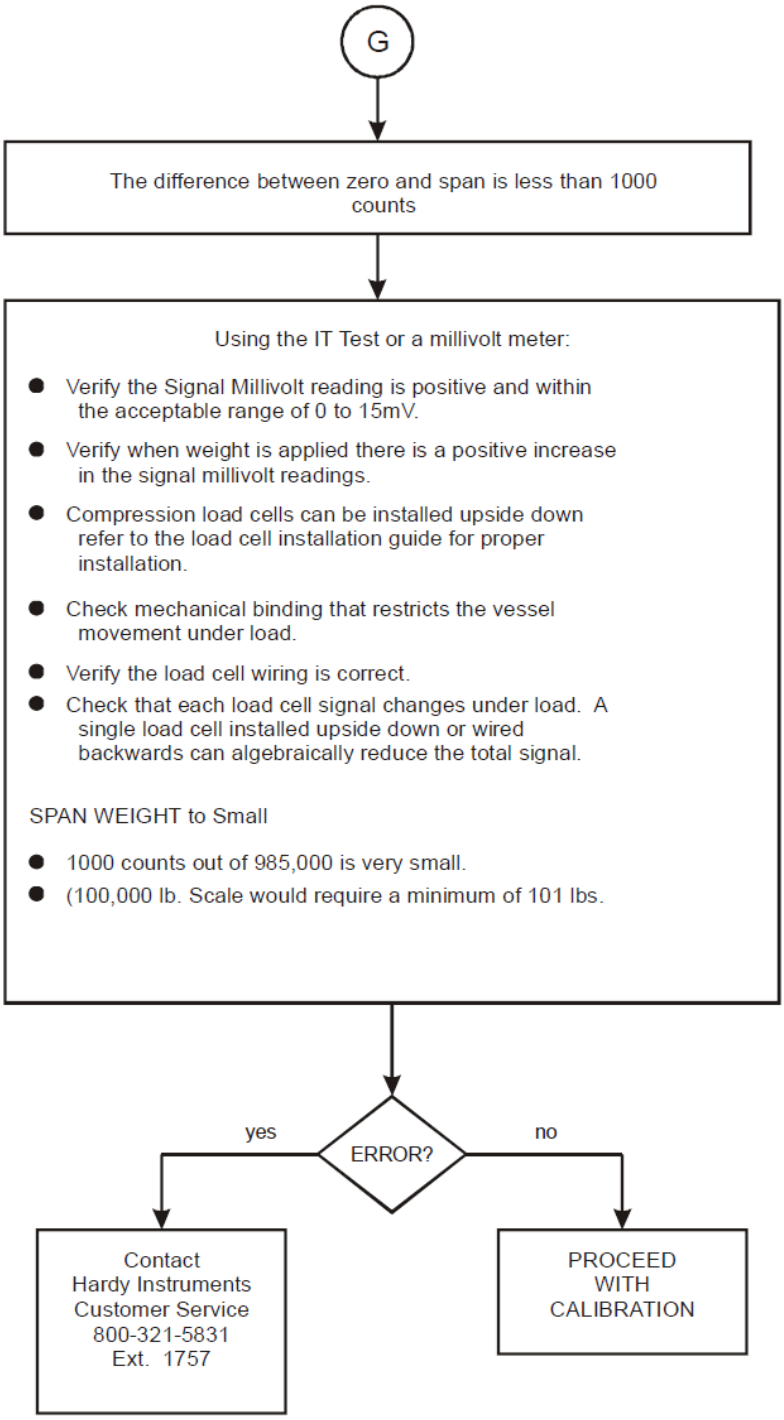


7.4.5 F: Troubleshooting Individual Load Cell Millivolt Readings

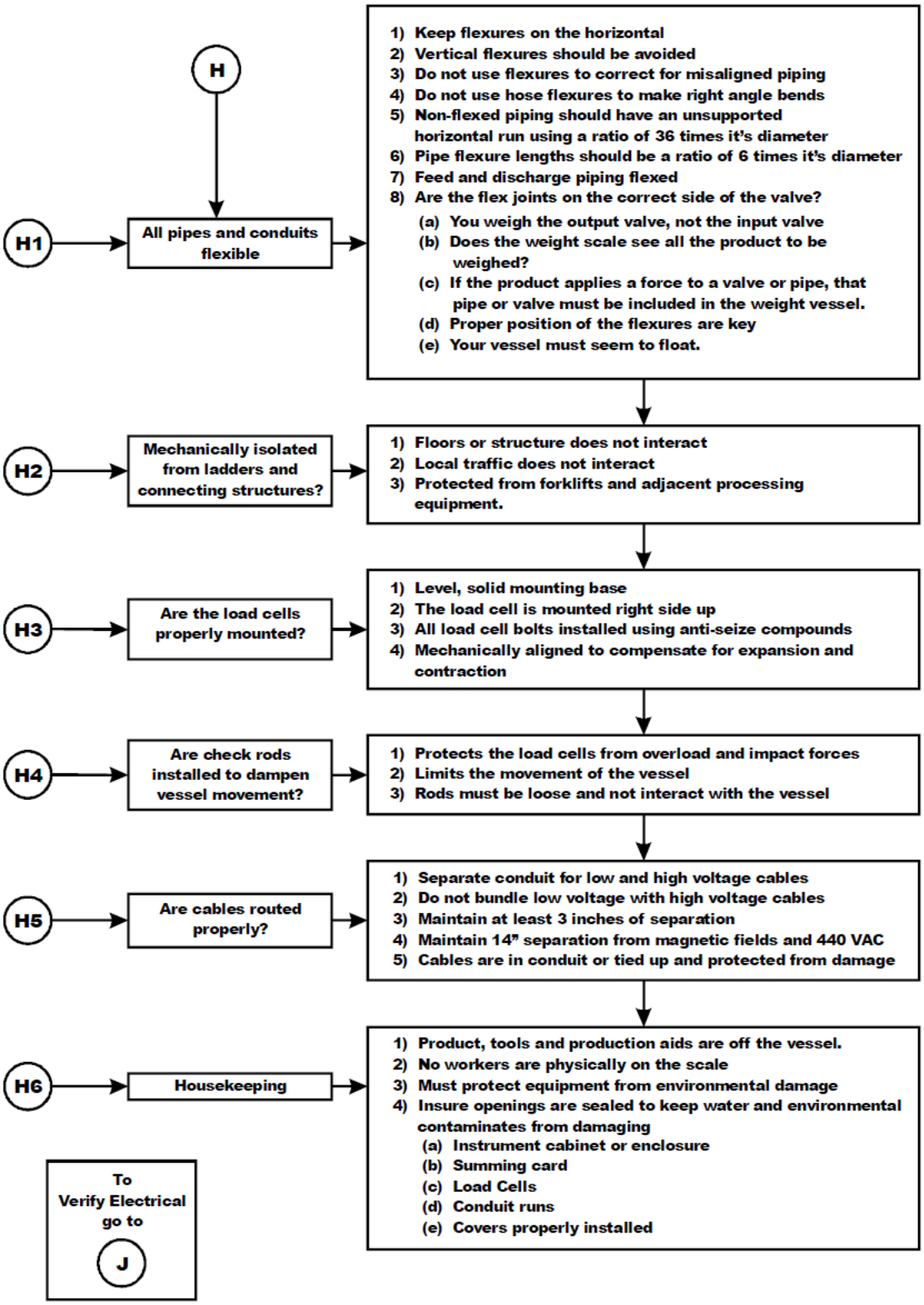


7.4.6 G: Calibration Failed: Not Enough Counts Between Zero Weight and Span Weight

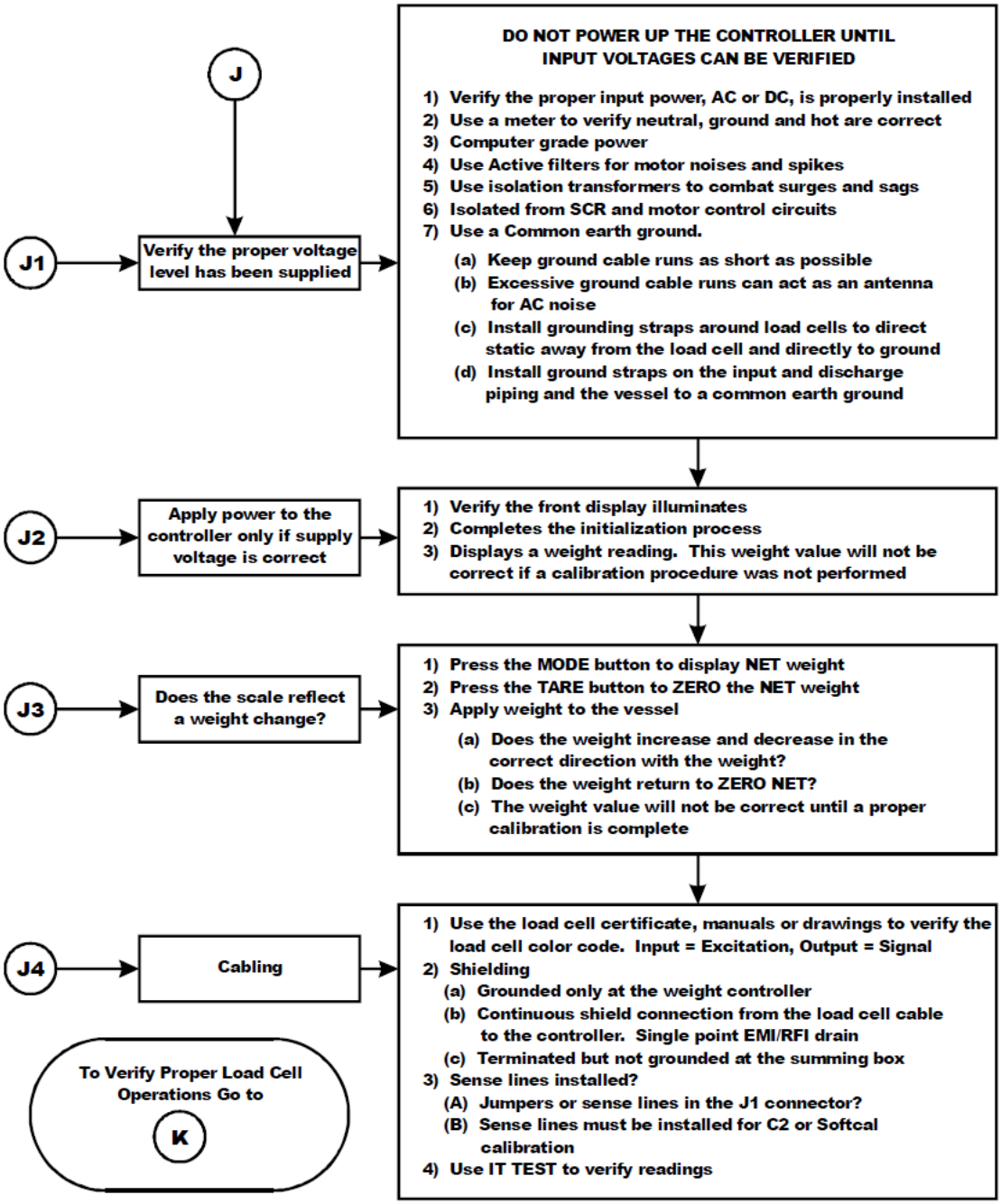
This error occurs at the Span Weight parameter.



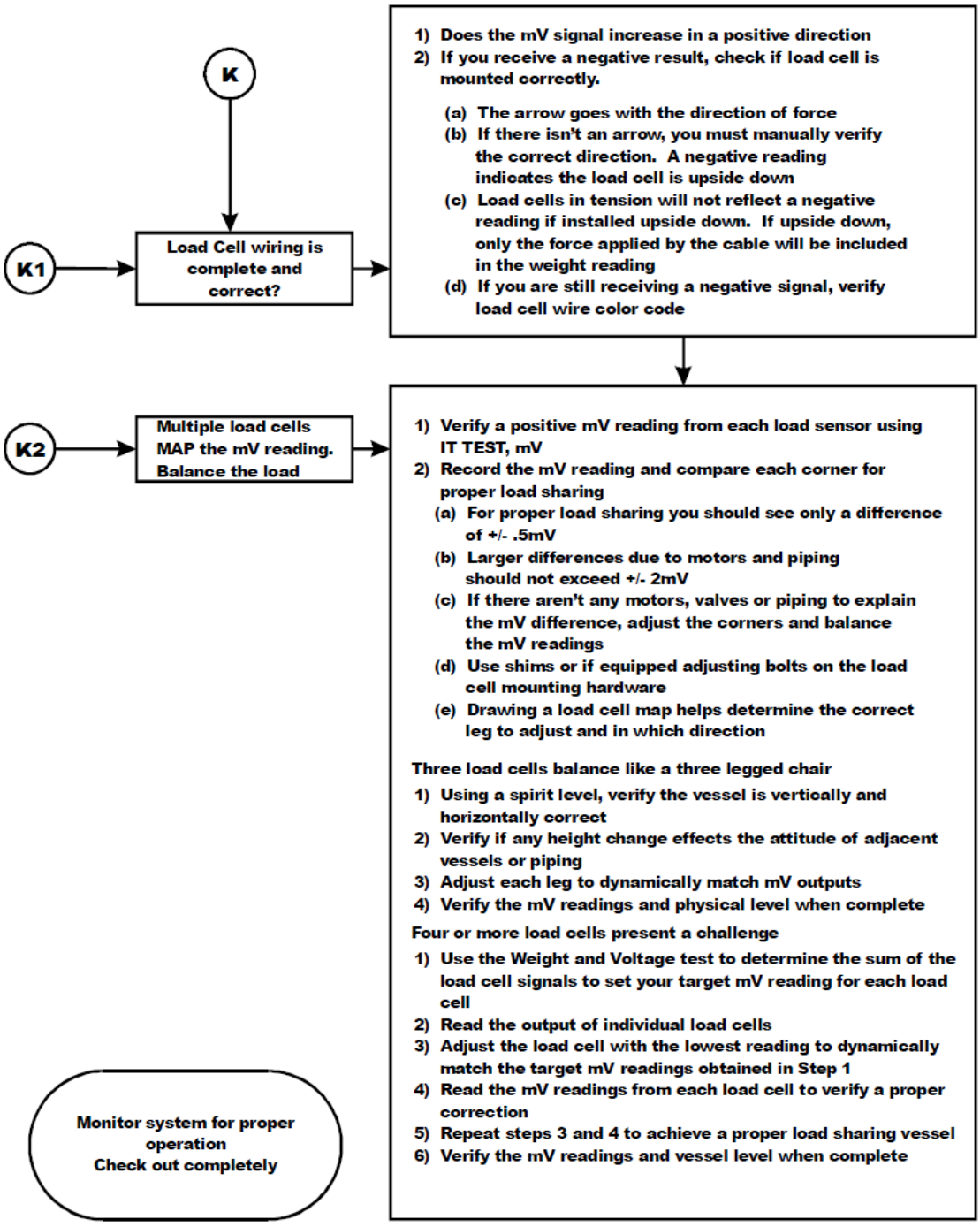
7.4.7 H: Mechanical Inspections



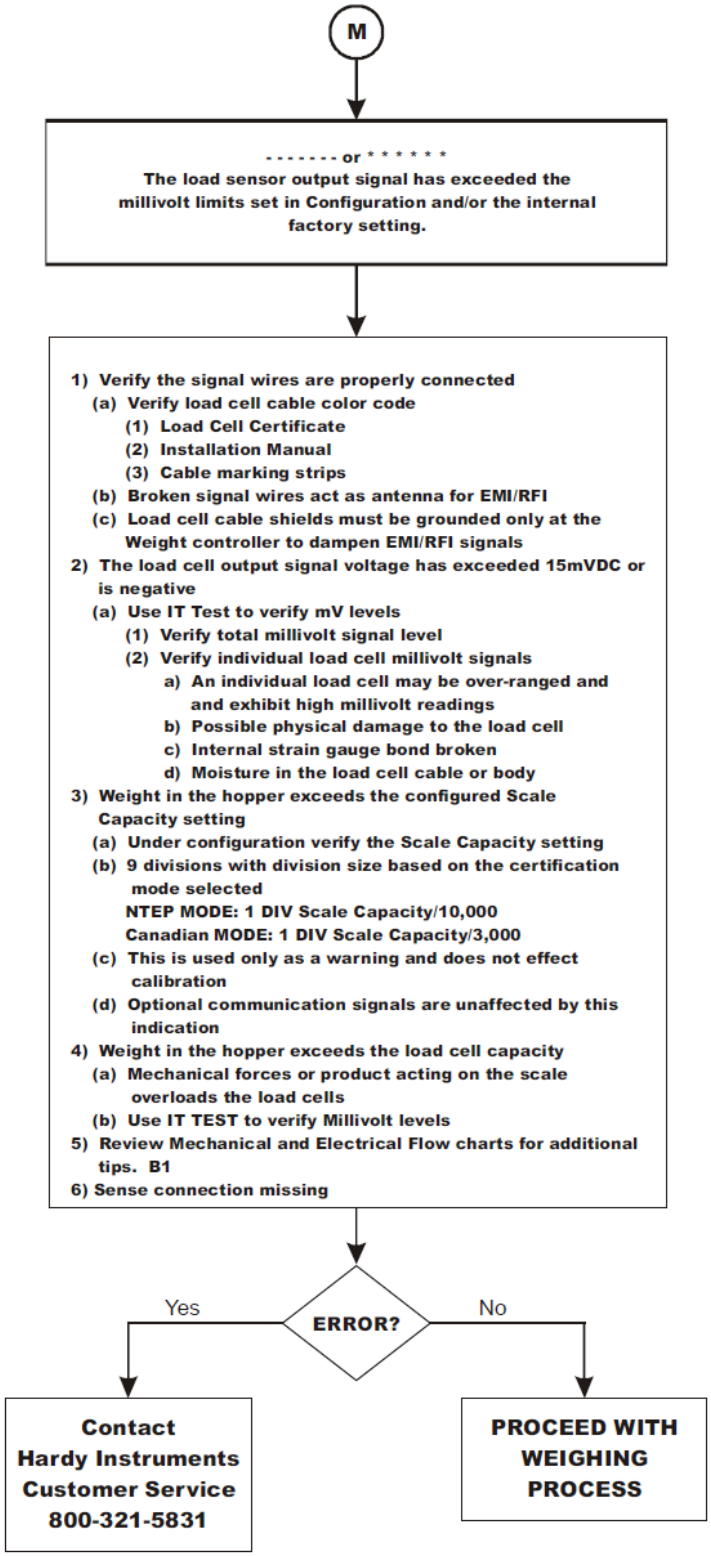
7.4.8 J: Electrical Inspection



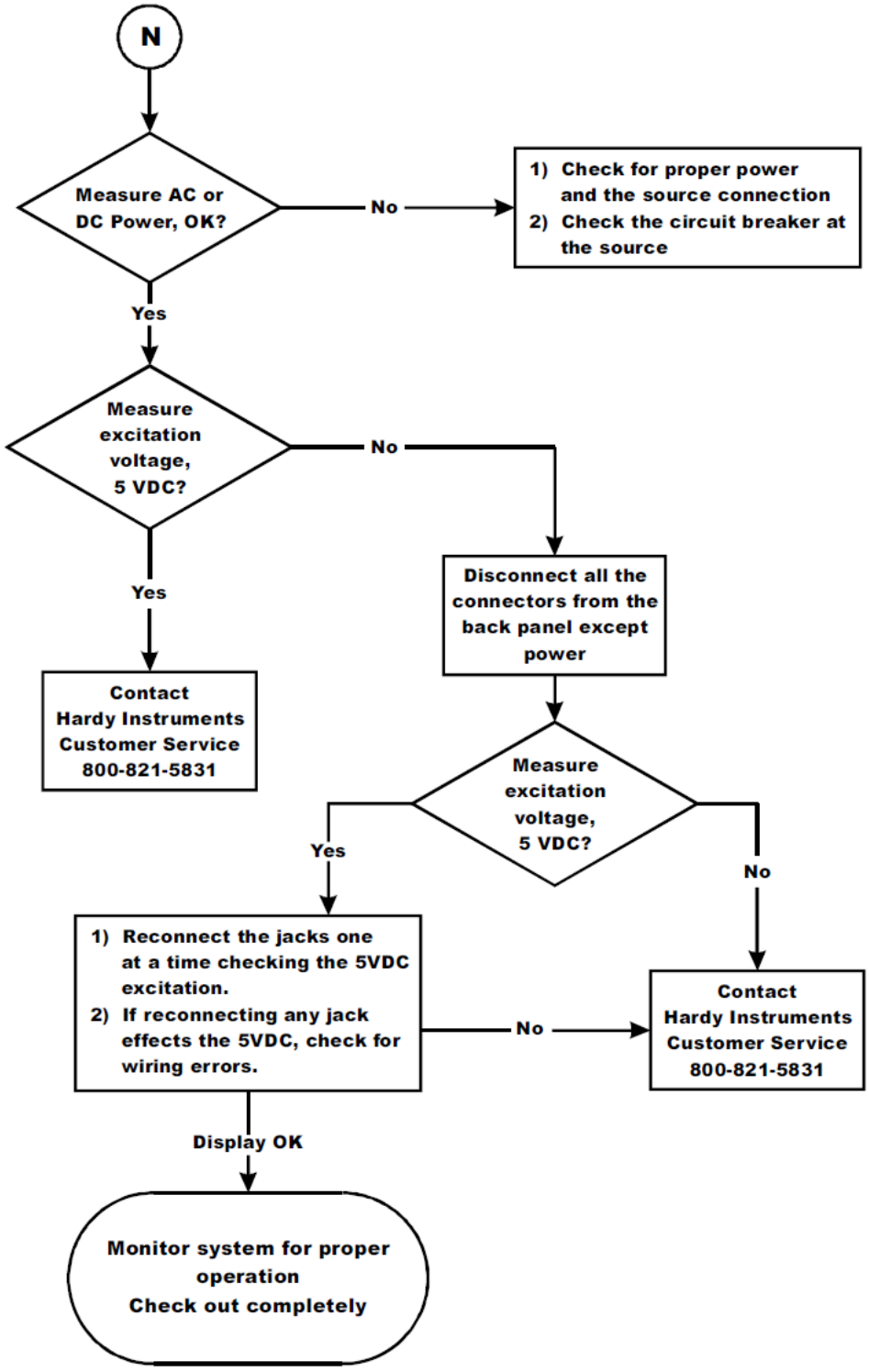
7.4.9 K: Load Sharing and Load Sensor Checkout



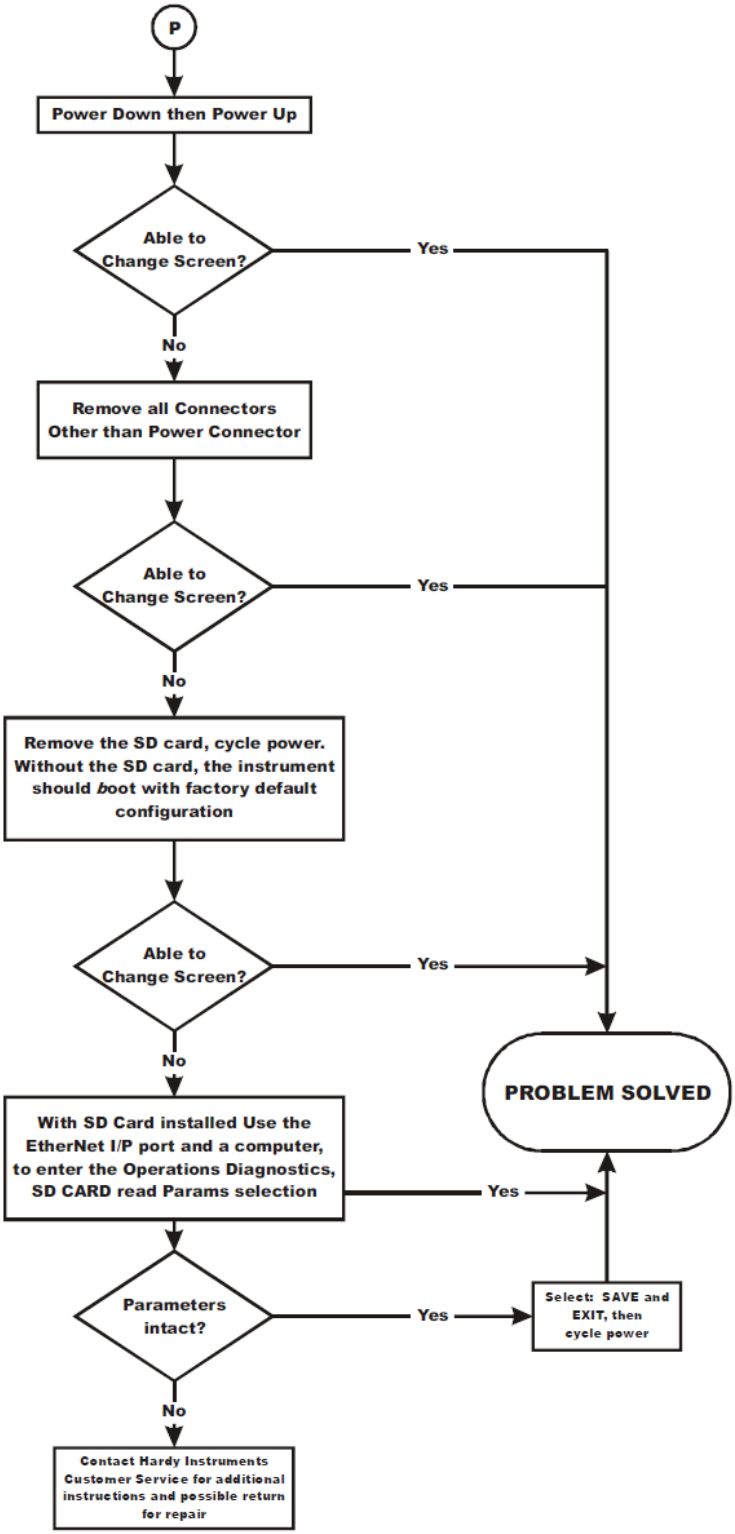
7.4.10 ADC or Overrange Error



7.4.11 N: Weight Processor Front Panel Display is Blank



7.4.12 P: SD Card Diagnostics



8 HARDY INSTALLATION AND COMMISSIONING

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

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

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

For a fast and easy installation quote, please contact one our service specialists at 800-821-5831 option 4, or email us at hardysupport@hardysolutions.com.

8.1 Emergency Service and Support

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

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

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

Figure 8-1. Hardy Support Locations Throughout the United States

APPENDIX A - SPECIFICATIONS

Resolution WP Models:	Stable processed weight 1:10,000 Maximum displayed resolution: 1:999,999 Internal resolution 24 bit 1:16,777,216
Update Rate WP Models:	Processed weight, display, communications: 250 times per sec. Unprocessed weight (A/D conversion): up to 4800 times per second
Modes	Gross, Net
Units of Measure	Ounce, Pound, Ton, Gram, Kg, Metric Ton, Pieces
Weight Processing	WP Models - WAVERSAVER®: .25 Hz to 7.5 Hz WAVERSAVER+® Adaptive Filtering Averaging - 1 to 255 User-selectable in single increments
Mounting	Panel
Display	80:1 contrast ratio with 4.3" effective viewing area 140° viewing angle
	3-Button Tactile / Touch-screen
Calibration Methods	C2® calibration without test weights Traditional calibration with test weights
Excitation	5VDC
Number of Load Cells	Up to 8 at 350 Ω with two IT junction boxes
Communications	EtherNet/IP (-EIP models) Ethernet UDP

	Ethernet TCP/IP(Embedded Webserver)	
	Modbus-TCP (-EIP models)	
	Modbus-RTU (-EIP models)	
	Analog 4-20mA (-ANA models)	
	PROFINET (PFN models)	
Communication Interface	Terminal, 2x RJ-45	
	4-Pin terminal block (serial communications)	
Power	12-27 VDC	
	5 watts nominal with display	
	7 watts max with two Hardy IT junction boxes and 8 load points	
Temperature	-10°C to +60°C (14° F to 160°F)	
Humidity	0-90% non-condensing	
Dimensions cm)	Instrument	6.15” W x 3.25 ”H x 0.9” D (15.6 cm x 8.3 cm x 2.4
cm)	Display	7.25” W x 3.25” H x 0.5” D (18.4 cm x 8.2 cm x 1.4
Certifications	Hazardous: Class I, II.III/Div2	
	Safety: CE, UL & CUL	
	EtherNet/IP ODVA Certification Level 3	
	Profi.org	
	RoHS3 and REACH	
	NTEP	
Warranty	Two-year warranty against defects in workmanship.	

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