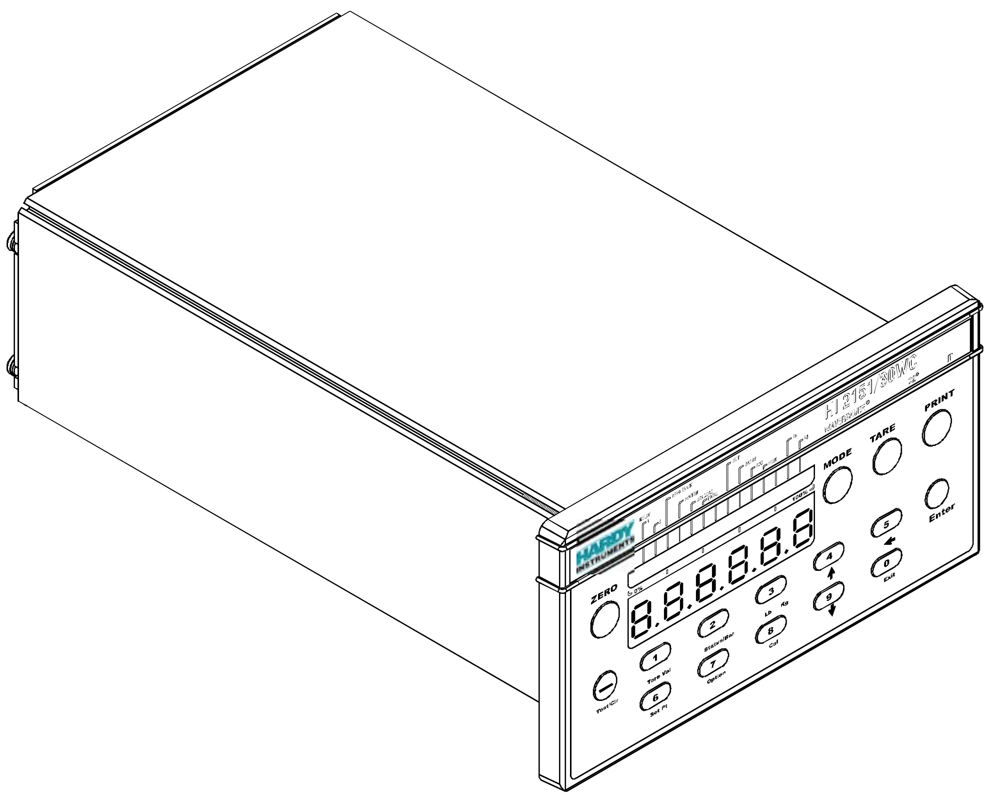
HI 2151/30WC

Weight Controller

Operation and Installation Manual



Hardy Instruments Document Number: 0596-0224 Rev H

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CHAPTER 1 - OVERVIEW

This manual provides users and service personnel with specifications and procedures for installation, setup, configuration, operation, communication, maintenance, and troubleshooting for the **Hardy Instruments HI 2151/30WC Weight Controller**. The HI 2151/30WC is fitted with **WAVERSAVER®** , **C2®** Calibration, and the INTEGRATED TECHNICIAN™ **(IT®)** diagnostic tools.

NOTE: *IT®, WAVERSAVER®, and C2® are Registered Trademarks of Hardy Instruments Inc.*

To ensure the safe operation, before using the weight controller, users and maintenance personnel should read and understand all cautions, warnings, and safety procedures stated or referenced in this manual. To get the maximum service life from this product, follow the instructions described in this manual.

Hardy Instruments appreciates your business. Should you not understand any information in this manual or experience any problems with the product, please contact our Customer Support Department at:

Phone: (858) 278-2900 **FAX:** (858) 278-6700

About Hardy Manuals

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

Chapter One - Provides an introduction to the instrument and an **Overview** of the equipment and its capabilities.

Chapter Two - Provides a list of **Specifications**.

Chapter Three - Contains information needed to **Install** the HI 2151/30WC (both standard equipment and optional equipment) and the HI 215IT series Junction Box.

Chapter Four - Provides **Hardware Configuration** instructions for setting dip switches and jumpers.

Chapter Five - Describes the **Firmware Setup** and preparation procedures to calibrate and operate the instrument.

Chapter Six - Provides **Calibration** instructions.

Chapter Seven - Describes the **Operation** of the HI 2151/30WC.

Chapter Eight - Describes **Troubleshooting** procedures for repair of the instrument.

Description

The **HI 2151/30WC** is a compact, multipurpose, microprocessor-based weight controller (See Fig. 1-1) that is used for a wide variety of process weighing applications, including batching, blending, check weighing, filling/dispensing, force measurement, level by weight, and weight rate monitoring. As a standalone product, the HI 2151/30WC can control as many as eight set point relays, and transmit data via analog, serial and BCD communications. The weight controller can also be used as a front end for a control system, transmitting weight values via a standard operator-selectable serial port (RS-232, RS-422/485) to programmable logic controllers (PLC's), computers, and printers.

Data is displayed alpha-numerically on the six-digit, fourteen segment LED display and graphically on the 30-segment bar-graph display. Weight values can be based on either net, gross, Rate-of-Change (ROC), peak hold or totalized weight values in pounds or kilograms.

An optional Allen Bradley Remote I/O and PROFIBUS interface is available for communication to programmable logic controllers. The weight controller’s 20-bit, analog-to-digital converter updates twenty times per second and is capable of 985,000 counts of display resolution. This provides enough resolution for accurate weight measurement and enough control to tolerate large “dead” loads and over sizing of load cells/sensors. Users can enter commands either from the communication ports or locally from a sixteen-button, front-panel keypad. A portion of the keys can be locked out to limit operator access and protect data. A limited number of commands can be entered through a rear Remote Functions connector.

WAVERSAVER®

Typically, mechanical noise from other machinery in a plant environment exists in all industrial weight control and measurement applications. WAVERSAVER® enables the weight controller to distinguish the actual weight data from the mechanical noise that comes in on the load cell signal. WAVERSAVER® can be configured from the front panel to ignore noise with frequencies as low as 0.25 Hz. Users can select one of four higher additional cut-off frequencies to provide a faster instrument response time. The default factory configuration is 0.50 Hz vibration frequency immunity.

C2® Calibration

C2 second-generation electronic calibration can calibrate a scale system without using certified test weights. A C2 weighing system consists of up to eight load sensors, a junction box, interconnect cable and an instrument with C2 capabilities, such as the HI 2151/30WC. Each Hardy Instruments C2-certified load sensor sends a distinct digital signal that the HI 2151/30WC uses to calculate weight and count the number of sensors in the system. To factor in any known weight on the scale, the user enters a reference value from the front panel. (A zero reference value indicates there is no weight on the scale.)

The instrument is also capable of performing traditional calibration such as with the use of certified test weights.

IT®

INTEGRATED TECHNICIAN™ is a built-in diagnostics utility that continuously monitors the system and allows the operator to rapidly troubleshoot problems from the front panel. Adding an optional an IT junction box extends the diagnostics capability to any load sensor.

Excitation Monitor

Continuously monitors the system excitation current for evidence of open or shorted load sensors or damaged or broken excitation wire(s), including the wires between the instrument and the junction box. If the measured current deviates from a ± 10% tolerance, an "ERRExC" (Error Excitation) displays on the front panel. In a system with C2 load sensors, **IT** computes the correct current and displays alarms if the initial measured current is out of tolerance. Without C2 load sensors, the initial read is assumed to be correct and is used as the standard.

Digital Volt Meter (DVM)

The DVM displays millivolts (mV to one digit to the right of the decimal point) and millivolts per volt (mV/V to four digits to the right of the decimal point) for both the whole system and individual load sensors. The DVM helps enables the user to isolate a faulty component from the front panel. The voltage reading can be used to level a balanced system and to make corner adjustments to platform scales. Accuracy is ± 2% or better of full scale.

Return to Zero Test

This test compares the original voltage reading saved at calibration against the current voltage reading of an empty vessel and displays either a pass (OK) or fail (ERR) message. The test checks for load sensor damage (due to electrical zero shift or abnormal mechanical forces) that causes binding sensors in the system.

- With an **IT** junction box, the test will pass or fail the individual load sensors providing a true fault isolation capability.
- Without an **IT** junction box, the test will pass or fail on the basis of a cumulative reading rather than an individual reading of each load sensor.

Weighing System Tests

(Requires the IT Junction Box) This test does the following analysis to diagnose drifting or unstable weight reading problems:

1. It disconnects the controller and engages an internal reference signal to see if the problem is within the instrument.
2. It disconnects the load sensors and engages an internal (in the junction box) reference signal to see if the cable between the instrument and the Junction Box is causing the problem.
3. It reads the weight of each load sensor to see if a load sensor might be causing the problem.

Weight readings from the individual load sensors makes this test useful for making cornering, leveling, and load-sharing adjustments.

Secure Memory Module (SMM)

The Secure Memory Module stores critical HI 2151/30WC configuration, calibration and setup data (excluding Peak Hold) and protects it from corruption. When a new parameter is entered during system operation, the SMM automatically updates that value in its memory. Since the SMM is conveniently accessible from the instruments rear panel, data stored in one HI 2151/30WC may be restored to the new instrument by physically transferring the SMM.

NOTE: *The SMM is limited to 1,000,000 lift-time write functions. A write is performed after any parameter change to the calibration, zero, and tare functions.*

NOTE: *You cannot transfer the SMM from the HI 2151/30WC to the HI 2151/20WC.*

Set PointRelays

The HI 2151/30WC is fitted with two standard, internal, selectable and mechanical form C (SPDT) relays. Six optional, external, solid-state relays are available and are field configurable as form A or B types. Both types have individual set point, preact, and deadband parameters. Each can be programmed to respond to the standard Net or Gross modes of operation or the optional ROC, Totalizer or Peak Hold modes. These relays can be used to open or close valves or gates or to turn motors, mixers, vibration equipment, heaters, coolers, etc. on or off.

Serial Port

One standard serial port can be configured to receive commands and transmit weight data to a serial device such as a printer output or bi-directional port. By resetting jumpers within the instrument, it can be configured for RS 232 (-A1), RS 422 (-A2) or RS 485 (-A3). Baud rates are user selectable at 600, 1200, 2400, 4800, 9600 or 19,200.

Hardy Link LAN

The Hardy Link Local Area Network (LAN) assigns an address to each instrument and provides the firmware necessary to handle in-coming and out-going communications.

Remote Functions

Rear panel input of a level or momentary grounding that can be used to: Tare the instrument., activate a print sequence, totalize the display, force the Net mode, toggle between pounds or kilograms, initiate the optional ROC (Rate-of-Change) mode, freeze the front panel display or one of the communications ports, and clear the totalizer or peak hold values. This is useful for adding large additional industrialized switches to the control panel.

Auto Zero Tracking

Auto Zero Tracking causes the display to indicate zero as long as any "live weight" on the scale is below the set zero tolerance and the scale is not in motion. This capability allows the instrument to ignore material build-up in the weigh system within the set zero tolerance.

NOTE: *Do not use auto zero tracking to correct a drifting-scale problem. Auto zero tracking will zero and write to the SMM every second if there is a change in weight. A correct graduation size is required to stop excessive weight changes and reduce write commands to the SMM. See Chapter Six for graduation size setup guidelines.*

NOTE: *The amount of weight zeroed off is cumulative. The autozero command will fail if the current gross weight plus any previously zeroed amount exceeds the zero tolerance.*

Auto Zero Tracking is enabled when switch eight of S3 (the configuration dipswitch), labeled Config on the instrument's rear panel is in the on position.

Output Device Options

Analog Output (-B1)

Analog Output is configured from the front panel or the serial port and set up by jumpers on the printed circuit card. The option allows the transmission of Gross, Net, Optional ROC, Peak or Total weight as 0-5V, 0-10V, 0-20mA or 4-20mA (or the reverse of these) and makes it possible to span these ranges over a portion of the weight data. Resolution is either 16,000 counts or the number of display counts available in the range selected, whichever is less. Two analog optional boards can be installed in each instrument. Both voltage and current data are available simultaneously.

Binary Coded Decimal (BCD) Output (-B2)

This BCD Option provides six digits of parallel weight data representing Net, Gross, Tare and the present front panel display. If all types of output data are requested, they appear one after the other, ten milliseconds apart. The BCD option provides a 37-pin, D-subminiature connector on a 6-inch cable.

Binary Coded Decimal (BCD) Output (-B5)

This BCD option provides six digits of parallel weight data representing Net, Gross, Tare and The Present Front Panel Display. If all types of output data are requested, they appear one after the other, ten milliseconds apart. The BCD option provides a 40-pin connector on a 60-inch cable for use with either the optional -B6 or -B7 external termination boards.

BCD Single Termination Card (-B6)

The BCD Single Termination Card is an optional external interface point for a single BCD port signal line. The card is designed for use with a single HI-2151/30WC-B5 instrument.

BCD Quad Termination Card (-B7)

The BCD Quad Termination Card is an optional external interface point for up to four sets of BCD port signal lines. All terminal positions accept 20- to 26-gauge cable sizes. Additional terminal boards may be interconnected to allow multiple BCD ports to exist in a tri-state arrangement.

Remote I/O (RIO) Interface to the Allen-Bradley Network (-B8)

The RIO port allows bi-directional communications with Allen-Bradley Programmable Logic Controllers (PLC) and Small Logic Controllers (SLC). Supporting up to 230.4 Kbaud transfer rates and both discrete and block data transfers, the HI 2151/30WC represents a quarter rack of discrete I/O (32 bits in the Logic Controllers output and input image files) to the Logic Controller.

Binary Coded Decimal (BCD) Output (-B9)

This option provides six digits of parallel weight data representing Net, Gross, Tare and the present front panel display. If all types of output data are requested, they appear one after the other, ten milliseconds apart. This option provides a 24-inch cable for use with the HI 2151/30WC-WS wall mount controller.

PROFIBUS Interface Option (-B12)	Allows bi-directional communications to Profibus (Process Fieldbus) products including those made by Siemens, GE Fanuc and Texas Instruments. This interface supports PROFIBUS-DP (Decentralized Periphery) and processes both Selectable Predetermined and Block transfer commands. It supports up to 12 Mbaud transfer rates.
Dynamic Data Exchange (DDE) (-B14)	Allows bi-directional communications with a PC over the serial port using Windows® 3.x, Windows® 95, or Windows® NT. The DDE links the HI 2151 series weight controllers to a Windows-based application software such as: Wonderware®, Visual Basic®, Excel®, Lotus 1-2-3®, or Quattro Pro®.

NOTE: *Windows, Visual Basic and Excel are all registered Trademarks of the Microsoft Corporation. Wonderware is a registered trademark of the Wonderware Corporation. Lotus 1-2-3 is a registered trademark of I.B.M. Quattro Pro is a registered trademark of the Corel Corporation. All terms mentioned in this manual that are known to be trademarks or service marks have been appropriately capitalized. Hardy Instruments cannot attest to the accuracy of this information. Use of a term in this manual should not be regarded as affecting the validity of any trademark or service mark.*

Control Options

Peak Hold (-C1)	This option is generally used in testing to determine peak forces a product or material can withstand. It can also be used to track the highest force applied to the scale. It displays and stores the highest gross weight value measured until that value is cleared by a command from the front panel key pad or a remote source.
Rate-of-Change (ROC) (-C2)	The ROC option measures and displays the rate at which a material enters or is dispensed from the scale over a period of time. The register for ROC holds 21 entries. New weight values are input to the register at the rate of 1/20th of the time base. The first register is subtracted from the 21st Register, which is one time base older than the 1st register. The time frame can be set to units per second, minute or hour. A time base of discrete values is selectable from 1 to 1800.

Set Point Options

TTL(Transistor - Transistor Logic) Level Output (-D1)	Provides six TTL level outputs rated at 500 milliamps per line. A mating connector with eight 24-gauge, unterminated wires, 60 inches long is also provided.
External Setpoint Relays Card (-D2)	This externally mounted card is equipped with six solid-state triac relays. (See Chapter Two for Specifications) Individual relays can be configured as form A or form B by an on-board dip switch. Each can be programmed to respond to the standard Net or Gross modes of operation or the optional ROC, Totalizer or peak hold modes. Each have individual setpoint, preact, and deadband parameters. A 60-inch interface cable is provided. This option should not be used with the wall-mount enclosure.

External Setpoint Relays Card (-D3)
The same as the -D2 option except that the length of the cable provided is six inches. This is designed to mount in the HI 2151/30WC-WS-D3 wall mount enclosure.

Miscellaneous Options

240 VAC 50/60 Hz Input Voltage (-E2)
This is a factory configuration only.

NIST/NTEP Certification Mode Kit (-E3 except for -F4 wall mount)
The HI 21251/30WC is approved for National Institute of Standards and Technology (NIST) applications formally called the National Bureau of Standards (NBS). It is certified under the National Type Evaluation Program (NTEP) for up to 10,000 counts when the NIST mode is activated. This option is required when products are to be directly sold based on weight readings of the scale. This kit includes special screws for sealing the instrument, a label plate, a NEMA 4 gasket and a NIST label.

Portable Display and Keypad (-E4)
The HI 2151/30XX-E4 option is used for local set-up, calibration and display of the blind remote version instrument, modelHI 2151/30WC-BR.

Intrinsic Barrier Assembly (-F8)
The Intrinsic Barrier Assembly Option is used with the Model HI 2151/30WC. The option provides safety for Class I, II and III, Division I Applications. Only the front face panel is rated for Class I and II Division II areas. The remaining portion of the HI 2151/30WC controller must be installed in a NEMA4 enclosure for an intrinsically safe area. See 2151/30 FM drawings (0584-0034) for information. Contact Hardy Technical Support for questions:

Phone: 1-800-821-5831.

Web Address://www.hardyinstruments.com

Interpreting the Model Code Number

Model Code Breakdown
The model code number can be found on a label that is attached to the HI 2151/30WC. It starts with the base model number (HI2151/30WC).

Fig. 1-1 shows dash alphanumeric code designations that indicate the capabilities of the weight controller. For example: A model HI2151/30WC-A1-C2-D1-E3 is a Panel Mount Instrument with a factory-configured RS 232 serial port, rate-of-change, six TTL level outputs, and an NTEP Certification Kit.

HI 2151/30WC - B3 - C2 - D1 - E3

MOUNTING OPTIONS
WC - Panel Mount
WC -WS - Wall Mount
WC - RM - Remote Mount
WC - BR - Blind Remote

OUTPUT OPTIONS
B1 - Analog Output
B2 - BCD Data Output Tri-Stated
(37 pin conn. w/6"Cable)
B5 - BCD Data Output Tri-Stated
(60" Cable)
B6 - BCD Single Termination Board
(Used w/B5)
B7 - BCD Quad Termination
(Used w/B5)
B8 - Remote I/O Interface for
Allen Bradley Network
B9 - BCD 24" cable
(wall mount version only)
B12 - PROFIBUS Interface Option
B14 - Dynamic Data Exchange (DDE)
I/O Server

CONTROL OPTIONS
C1 - Peak Hold
C2 - Rate-of-Change
C6 - Weight Totalization

SETPOINT OPTIONS
D1 - Six TTL level outputs w/60" unterminated cable
D2 - D1 + a solid state relay card w/60" cable

HARDWARE OPTIONS
E2 - 240 VAC 50/60 Hz Operation
E3 - NTEP Certification Kit
E4 - Portable Display (Blind Remote Only)
F2 - NTEP Option
F8 - Used with Advantage load sensors and
hazardous area-approved load cells

FIG. 1-1 MODEL NUMBER BREAKDOWN

CHAPTER 2 - SPECIFICATIONS

Chapter Two covers the specifications for the HI 2151/30WC weight controller and optional equipment. The specifications listed are designed to assist in the installation, operation, and troubleshooting.

HI 2151/30WC Specifications for a Standard Instrument

Conversion Rate

- 20 updates per second

Resolution

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

Excitation Voltage

- 0-5 VDC

Averages

- 1 to 200 User Selectable in single Increments

Input

- Up to eight (8) 350 ohm Full Wheatstone Bridge, Strain Gauge Load Sensors/Cells (5 volt excitation) on one vessel.
- Signal Voltage Range0-15mV

Display

- 6 digit, 14 segment red LED, 0.6" alpha-numeric
- Bar-Graph 30 segment LED

Display Increments (Graduations)

- 1,2,5,10,20,50,100,200,500 user selectable via the front panel key pad.
- Corresponding weight is dependent on the decimal point location.

Key Pad

- 16 tactile keys
- 6 dedicated functions
- 10 dual numeric and function

Standard Setpoint Relays

- 2 Standard SPDT (Form C) Relays
- Wire Size: 12 AWG Maximum
- Maximum Switch Current: 5 Amps
- Maximum Switch Power: 150 Watts or 1250 Volt/Amps
- Maximum Switch Voltage: 5 Amps @ 3 VDC or 125 VAC

Non-Linearity

- 0.0015% of Full Scale

Maximum Zero Tolerance

- 32766

WAVERSAVER®

- 7.5 Hz
- 3.5 Hz
- 1.0 Hz
- 0.5 Hz
- 0.25 Hz

Excitation Monitor
- Current less than 10%

Digital Voltmeter
- Accuracy ± 2% of full scale
- Resolution
  - mV/V4 digits to the right of the decimal
  - mV 1 digit to the right of the decimal

Power and Utility Requirements

Voltage
- 120 VAC ± 10% Standard
- 240 VAC ± 10% (-E2 Factory Option)

Frequency
- 47/63 Hz

Power
- 10 Watts maximum with options

Common Mode Voltage Range
- ± 2.5 VDC

Common Mode Rejection
- 100dB @ 50-60Hz

Environmental Requirements

Operating Temperature Range
- -10 to 50 C (14 to 122 F)

Storage Temperature Range
- -20 to 85 C (-4 to 185 F)

Temperature Coefficient
- Less than 0.005% of full scale per degree C for zero and span.

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

Physical Characteristics

Panel Mount (Model # HI 2151/30WC)
- Depth

  11.35" (288.29mm) Back of the Bezel to rear cable clearance

- Case Dimensions

  2.99"H x 5.65"W x 9.02"D (75.9mmH x 143.51mmW x 229.11mmD)

- Front Panel Dimensions

  3.74"H x 7.00"W x 0.42"D (95mmH x 177.80mmW x 10.67mmD)

- Panel Cutout Dimensions

  3.09"H x 5.75"W (78.5mmH x 146mmW)

- Case Material

  Aluminum alloy (6063-T5), Chem. Film (MIL-C-541)

- Weight

  4.6 pounds (2.1 Kilograms)

- Rating

  Front Panel NEMA 4 Seal

Wall Mount Model HI 2151/30WC-WS

- Case Dimensions

  15.5"H x 12.94"W x 6.42"D (393.7mmH x 328.68mmW x 173.07mmD)

- Case Material

  304 Stainless Steel Body (14 gauge) Cover (16 gauge)

- Weight

  19.8 pounds (9 Kilograms)

- Enclosure Rating

  NEMA 4 & 4X

Remote Mount Model HI 2151/30WC-RM

- Case Dimensions

  3.23"H x 5.74"W x 10.40"D (82.04mmH x 145.8mmW x 264.2mmD)

- Front Panel Dimensions

  3.74"H x 7.00"W x 0.42"D (95mmH x 177.8mmW x 10.67mmD)

- Panel Cutout Dimensions

  3.09"H x 5.75"W (78.4mmH x 146mmW)

- Weight

  4.6 pounds (2.1 Kilograms)

NEMA Ratings

- Case

  None

- Font Panel

  NEMA 4 seal

- Cable

  5 foot flat ribbon

Blind Remote Mount HI 2151/30WC-BR

- Case Dimensions

  3.23"H x 5.74"W x 10.40"D (82.04mmH x 145.8mmW x 264.2mmD)

- Weight

  4.5 pounds (2.04 Kilograms)

- Enclosure Rating

  None

Portable Display HI 2151/30XX-E4 (use with HI 2151/30WC-BR)

- Case Dimensions

  4.72"H x 7.39"W x 2.06"D (11.89mmH x 187.71mmW x 52.32mmD)

- Weight

  1.08 pounds (0.49 Kilograms)

- Enclosure Rating

  None

- Cable

  72"L

IT® Junction Box HI 215IT-SS or PS Series

- Case Dimensions

  6.25"H x 6.25"W x 4.50D (158.75mmH x 158.75mmW x 114.3mmD)

- Weight

  5 pounds (2.27 Kilograms)

- Enclosure Ratings
  - -SSStainless Steel NEMA 4 & 4X
  - -PSPainted Carbon Steel NEMA 4

IT® Junction Box HI 215IT-FG Series

- Case Dimensions

  6.50"H x 8.0"W x 4.46D (165.1mmH x 203.2mmW x 113.28mmD)

- Weight

5 pounds (2.27 Kilograms)

- Enclosure Rating

  Fiberglass - NEMA 4

Approvals

- UL Certification
- CSA Certification
- Factory Mutual (FM) Class I, II, III Div. 2 Groups A-G
- CE Approval
- NTEP Approval
- MC (Measurement Canada) Approval

Serial Communications

- Baud Rates:600, 1200, 2400, 4800, 9600, 19200
- RS 232 (-A1):Full Duplex
- RS 422 (-A2): Full Duplex, 4 wire
- RS 485 (-A3): Half Duplex, 2 wire

Bi-Directional Communications

1. RS-232C SPECIFICATIONS

SPECIFICATION	DESCRIPTION
High Level Output	+11V at 5 mA
Low Level Output	-11V at -5 mA

SPECIFICATION	DESCRIPTION
High Level Input	+4V to +15V
Low Level Input	+1.6V to -15V (Schmit trigger input disallows logic changes with voltages between these ranges.)
Slew Rate	15V per microsecond maximum
Input Impedance	20K ohms
GND	SIGNAL GND
Update Time	10 updates/sec.

Serial port connections are made to J3, located on the rear panel, through the mating plug P3.

2. RS-422/485 Specifications

   Interface specifications per EIA (Electronic Industries Association) Standards RS-422 and RS-485.

Optional Equipment

Analog Output (-B1)

- Resolution

  16,000 counts

- Linearity

  0.01% (with 1 average selected)

- Response Time

  1 millisecond after update

- Isolation from Main Board

  300 VAC or 450 VDC

- Update

  50 milliseconds (20 times/sec.)

- Voltage Out
  - Range

    0 - 5 VDC, 0-10 VDC (or reverse of these)
  - Max Current

    5 ma (2 K ohm load @ 10 V)
  - Temp. Stability

    10 ppm/C or 4 mV total from 30 to 120 degrees F

- Current Out
  - Range
    0 - 20 mA, 4-20 mA (or reverse of these)

  - Max Voltage
    12 V allowing 0 - 600 ohm load at 20 mA

  - Mating Connector
    6 pin Phoenix

Binary Coded Decimal (BCD) (-B2)

- Resolution

  6 digits

- Data Drive

  15 LSTTL loads (6 mA total)

- Print/Not Print Drive

  10 LSTTL loads (4 mA)

- Transmit Distance

  50 feet (15.24 meters)

- Cable

  6" 40 pin right angle to 37 pin Dshell Connector. Use with -B6 and -B7 Options

Binary Coded Decimal (BCD) (-B5)

- Resolution

  6 digits

- Data Drive

  15 LSTTL loads (6 mA total)

- Print/Not Print Drive

  10 LSTTL loads (4 mA)

- Transmit Distance

  50 feet (15.24 meters)

- Cable

  60"- 40 pin right angle to 40 pin right angle. Use with -B6 and -B7 Options

BCD Single Termination Board (-B6)

- Overall Dimensions

  7.75L" x 5.0W" (196.85mmL x 127.00mmW)

- TB Wire Gauge

  20 to 26 AWG

BCD Quad Termination Board (-B7)

- Overall Dimensions

  7.75L" x 5.0W" (196.85mmL x 127.00mmW)

- TB Wire Gauge

  20 to 26 AWG

Allen-Bradley Remote I/O Interface (-B8)

- Resolution

  986,000 counts

- Represents

  1/4 Rack of Discrete I/O

- Type Transfers

  Discrete and Block (Read & Write)

- Baud Rate

  57.6 Kbaud
  115.2 Kbaud
  234.4 Kbaud

Binary Coded Decimal (BCD) (-B9)

- Resolution

6 digits

- Data Drive

  15 LSTTL Loads (6mA Total)

- Print/Not Print Drive

  10 LSTTL Loads (4mA)

- Transmit Distance

  50 feet (15.24 meters)

- Cable

  24" For use with -WS Wall Mount Instrument

Profibus I/O Interface (-B12)

- Protocol

  DP (Decentralized Periphery)

- Data Configuration

  16 words or 32 bytes

- Standard Reference

  Process Fieldbus - DIN 19 245

- Baud Rate

  9,600 Kbaud to 12 Mbaud (Auto-Selectable)

Peak Hold (-C1)

- Display

  Highest Gross Value
  Average Peak Gross Value

Rate of Change (ROC) (-C2)

- Time Units

  Seconds, Minutes and Hours

- Time Base

  1 - 6, 10, 12, 15, 30, 60, 120, 240, 450, 900 or 1800

Totalizer (-C3)

- Display

  Accumulated Net Weight

- Activation Level

  Momentary connection to remove functions ground min. 0.1 seconds

Six TTL Level Outputs (-D1)

- Rating

  300 ma per line

- Cable Length

  5 feet (1.52 meters)

Six External Solid State, Set Point Relays (-D2 & -D3)

- Type

  Solid State individually configurable form A or B

- Rating

  115 VAC, 3 Amperes Continuous
  115VAC, 5 Amperes Momentary

- Board Dimensions

  5.7"L x 2.5"W (144.78mmL x 88.9mmW)

CHAPTER 3 - INSTALLATION

Chapter 3 covers unpacking, cabling, interconnecting and installing the HI 2151/30WC weight controller. Users and service personnel should be familiar with the procedures in this chapter before installing or operating the HI 2151/30WC weight controller.

Unpacking

Step 1. Before signing the packing slip, inspect the packing for damage of any kind.

Step 2. Report any damage to the carrier company immediately.

Step 3. Check to see that everything in the package matches the bill of lading. You should normally have:

1. HI 2151/30WC Panel Mount

   1 HI 2151/30WC instrument with mating connectors and ordered options installed.

   1 Mounting Rail Kit (Prt. # 0551-0287-01)

   - (4) mounting Rails
   - (4) 6-32 UNC phillips pan head machine screws

   1 Installation and Operation Manual

2. HI 2151/30WC-RM Remote Mount

   1 Instrument with mating connectors and ordered options installed.

   1 Remote display/keypad with gasket and mounting hardware attached.

   1 60 inch display to instrument interconnect ribbon cable.

   1 Installation and Operation Manual

3. HI 2151/30WC-WS Wall Mount

   1 Instrument with mating connectors and ordered options installed.

   1 Installation and Operation Manual

4. HI 2151/30WC-BR Blind Remote

   1 Instrument with mating connectors and ordered options installed.

   1 Installation and Operation Manual

5. Dynamic Data Exchange (DDE) I/O Server - B14

   1 DDE Server Software Diskette
   1 6 foot test cable
   1 9 pin to 25 pin adapter
   1 Installation and Operation Manual

6. HI 215IT-SS1/-PS1/-FG1 Integrated Technician Junction Box

   1 Enclosure and circuit card with nine mating connectors installed.
   2 1" diameter push in plugs
   5 1.12" diameter rubber gaskets
   5 0.5" diameter steel locknut fastener
   5 ½ " NPT nylon cord grip strain relief (.375" - .500")

7. HI 215IT-SS2/-PS2/-FG2 Integrated Technician Junction Box No C2

   1 Enclosure and circuit card with nine mating connectors installed.
   2 1" diameter push in plugs
   5 1.12" diameter rubber gaskets
   5 0.5" diameter steel locknut fasteners
   1 ½ NPT nylon cord grip strain relief (.375" - .500" Blue Grip)
   4 ½ NPT nylon cord grip strain relief (.375" - .500" White Grip)

Step 4. If any items are missing, damaged, or there are any questions, please contact Customer Support at:

Hardy Instruments
9440 Carroll Park Drive, Suite 150
San Diego, CA 92121

Phone: (858) 278-4900
FAX: (858) 278-6700
Web Site: http//www.hardyinst.com
E-Mail: hardysupport@hardyinst.com

Step 5. Record the model number and serial number of the Weight Controller. Store in a convenient, secure location for reference when contacting Hardy Instruments Customer Service Department or to buy parts or firmware upgrades.

Mechanical Installation

Installing the HI 2151/30WC in a Panel

Panel Cutout Specifications

1. Enclosure Size Requirements.

- Overall depth of the enclosure must be a minimum of 11.5" to allow for the 2" clearance between the rear panel of the HI 2151/30WC and the inside surface of the rear panel of the enclosure. (See Fig. 3-1)

    - There must be a 1" clearance completely around the bezel and other installed units.

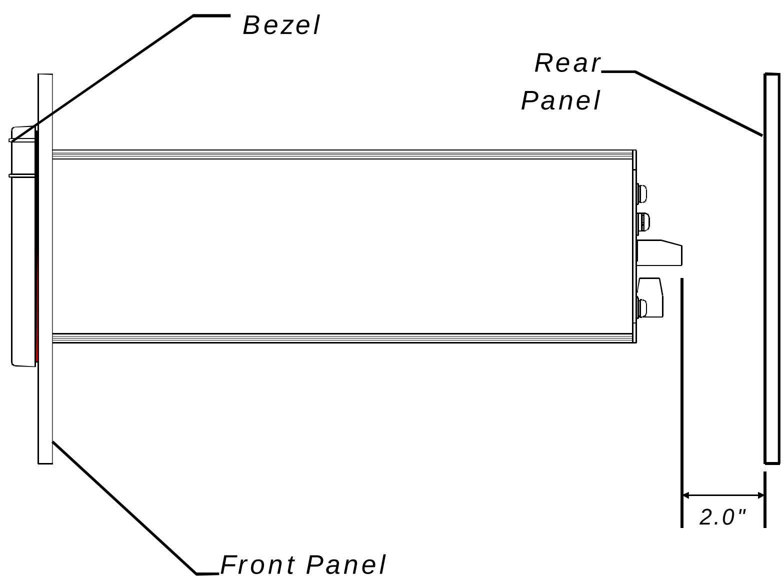


FIG. 3-1 2” REAR PANEL CLEARANCE REQUIREMENT

2. Dimensions of the enclosure cutout (See Fig. 3-2)

    - 5.75" ± .06 (146.05mm ±1.52) Wide
    - 3.09" ± .06 (78.49mm ±1.52) High
    - All cutout surfaces must be deburred before installation of the controller.

WARNING

DO NOT MOUNT THE HI 2151/30WC CONTROLLER NEAR A HIGH MAGNETIC FIELD OR HIGH VAC POWER SOURCE. TO DO SO WILL EFFECT THE PERFORMANCE OF THE CONTROLLER AND MAY RESULT IN PROPERTY DAMAGE.

Installing the HI 2151/30WC Panel Mount

Step 1. Ensure that all Electrostatic Discharge (ESD) precautions have been taken before installation.

Step 2. The controller comes with a NEMA 4 rated compression gasket. Make sure the gasket is properly seated in the bezel before installation.

Step 3. Gently slide the controller into the cutout in the enclosure. Be sure to secure the controller with both hands when installing.

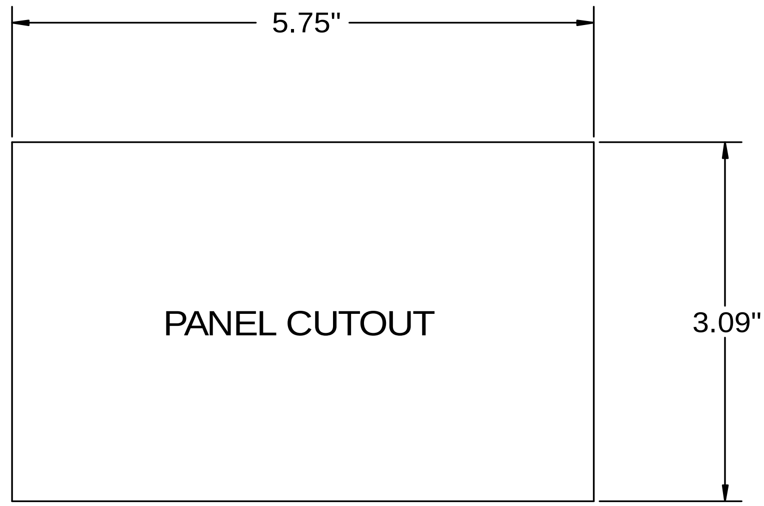


FIG. 3-2 PANEL CUTOUT DIMENSIONS

Step 4. Slide the controller into the panel cutout until the NEMA 4 & 4X gasket is flush against the front panel of the enclosure. (See Fig. 3-3)

CAUTION

ONCE THE GASKET IS COMPRESSED IT SHOULD NOT BE USED AGAIN. WHENEVER THE CONTROLLER IS REMOVED FROM THE PANEL, RE INSTALL WITH A NEW GASKET. (HARDY PRT. # 0524-0011)

Step 5. Install the four mounting bars.

- Slide each of the mounting bars into the slots at the rear of the controller.
- One end of the mounting bar is recessed. Make sure you install the bars from this end.
- Check to be sure the mounting bars are flush against the inside surface of the front panel.

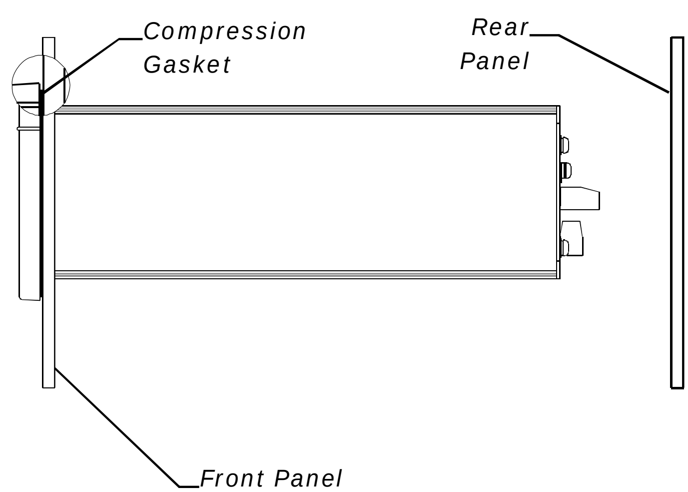


FIG. 3-3 NEMA 4 GASKET FLUSH AGAINST THE FRONT PANEL

- Install the four (4) 6-32 pan head machine screws into the threaded slots at each corner of the controller.
- Hold the controller so that it is aligned and flush against the enclosure front panel throughout the entire tightening process.
- Facing the rear panel of the controller, tighten each screw in a clockwise direction from corner to corner until each screw is finger tight.
- Using a phillips screw driver, continue the clockwise direction and partially tighten each screw until the NEMA 4 bezel gasket is completely compressed and the bezel is flush against the front panel of the enclosure. Do not tighten one screw down completely and then go on to the next screw. Each screw must be tightened a little before going on to the next to maintain the alignment between the controller and the front panel of the enclosure.

CAUTION **DO NOT OVER TIGHTEN THE MACHINE SCREWS. OVER TIGHTENING CAN DEFLECT THE BEZEL SO THAT IT WILL NOT BE WATER TIGHT AND/OR BREAK OFF THE CORNERS OF THE BEZEL.**

Step 6. The Panel Mount installation is complete.

Installing the HI 2151/30 Remote Mount Model

NOTE: *See Figure 3-2 for information about the panel cutout.*

Install the Front Panel

Step 1. Ensure that all Electrostatic Discharge (ESD) precautions have been taken before installation.

Step 2. The controller comes with a NEMA 4-rated compression gasket. Make sure this gasket is properly seated in the bezel before installation.

Step 3. The front panel comes with two mounting brackets mounted on the bezel. Remove the nuts that fasten the brackets to the bezel, and remove the brackets.

Step 4. Gently slide the front panel into the enclosure cutout until the gasket is seated against the front of the enclosure. (See Fig. 3-4)

NOTE: *The nuts on the mounting studs barely clear the cutout. It might take a little adjusting to get the bezel into the cutout.*

Step 5. Place the brackets, #6 flat washer, lock washer and hex nut on the four bezel studs.

Step 6. Make sure that the bezel is centered in the cutout.

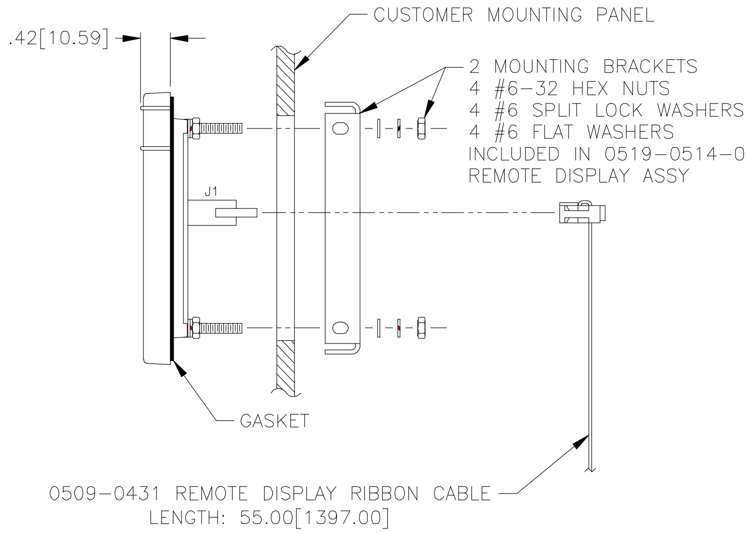


FIG. 3-4 MOUNTING REMOTE DISPLAY TO ENCLOSURE

Step 7. Tighten the #6 hex nuts finger tight in turn.

Step 8. Use a nut driver or box-end wrench to tighten the nuts in turn so that the bezel is flush against the front surface of the enclosure front panel.

CAUTION

DO NOT OVER TIGHTEN. OVER TIGHTENING CAN DEFLECT THE BEZEL SO THAT IT WILL NOT BE WATER TIGHT AND/OR BREAK OFF THE CORNERS OF THE BEZEL.

Installation of the Instrument Enclosure

Step 1. Drill four .156- inch tapped or thru holes and use four 6-32 pan-head machine screws to fasten the enclosure to a panel.

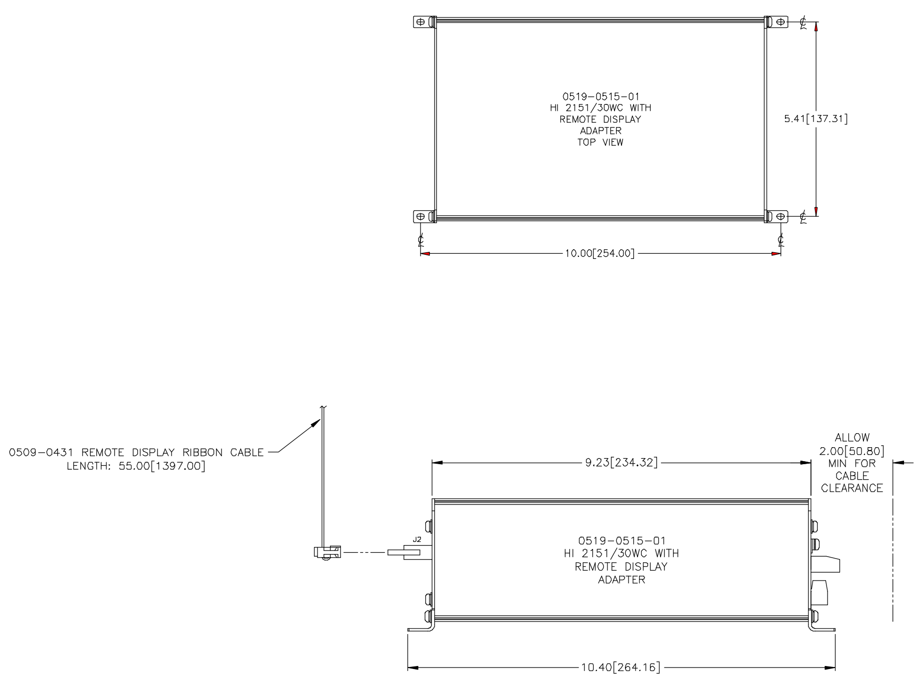


FIG. 3-5 INSTALLING ELECTRONICS ENCLOSURE TO A PLATE

Step 2. Connect the 60-inch, 40-pin ribbon cable to the 40-pin connection J5 on the electronics and the 40-pin connection J4 at the rear of the front panel display.

Step 3. Remote panel mechanical installation is complete.

NOTE: *The electronics can be mounted on any of the four sides.*

Installing the HI 2151/30WC-BR Blind Remote Model

Step 1. Place the instrument in the enclosure so that there is two inches of clearance from the each end of the enclosure.

Step 2. Drill four .156 inch either tapped or thru holes and use four 6-32 pan head machine screws to fasten the instrument to the enclosure. (See Fig. 3-5)

NOTE: *The enclosure can be mounted on any four (4) of the six (6) sides.*

Installing the HI 2151/30 Wall Mount Model

Step 1. Make sure that all Electrostatic Discharge (ESD) precautions have been taken.

Step 2. Mount the Instrument securely using all four mounting points. (See Fig. 3-6)

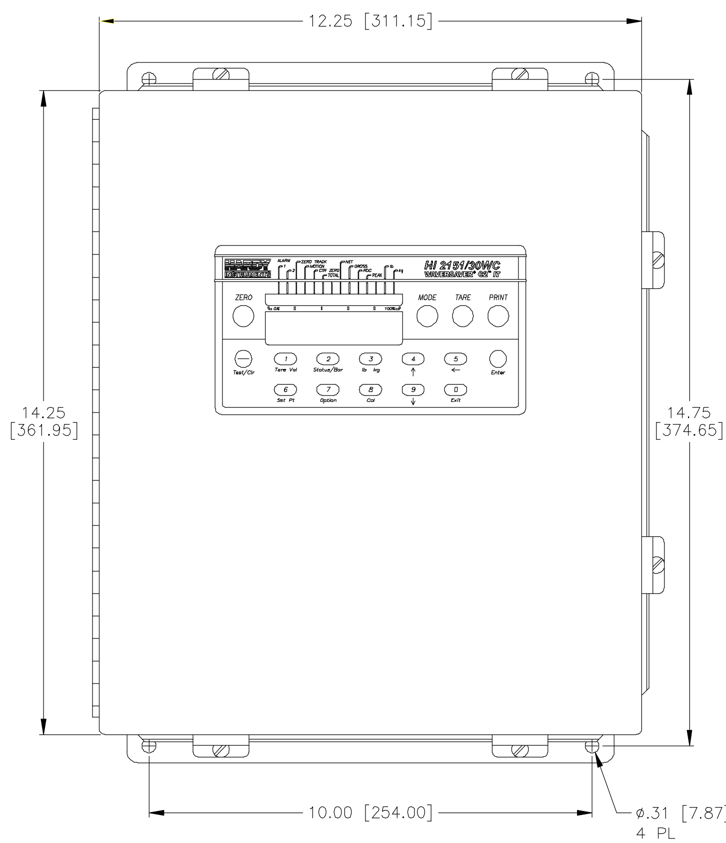


FIG. 3-6 INSTALLATION OF WALL MOUNT MODEL

Step 3. To conform to NEMA 4 or 4X ratings, connections to the enclosure must be made with NEMA 4 or 4X conduit fittings.

Step 4. Do not route any signal, voltage or ground wires under or between printed circuit boards.

Step 5. Route wiring types through enclosure as shown in Fig. 3-7)

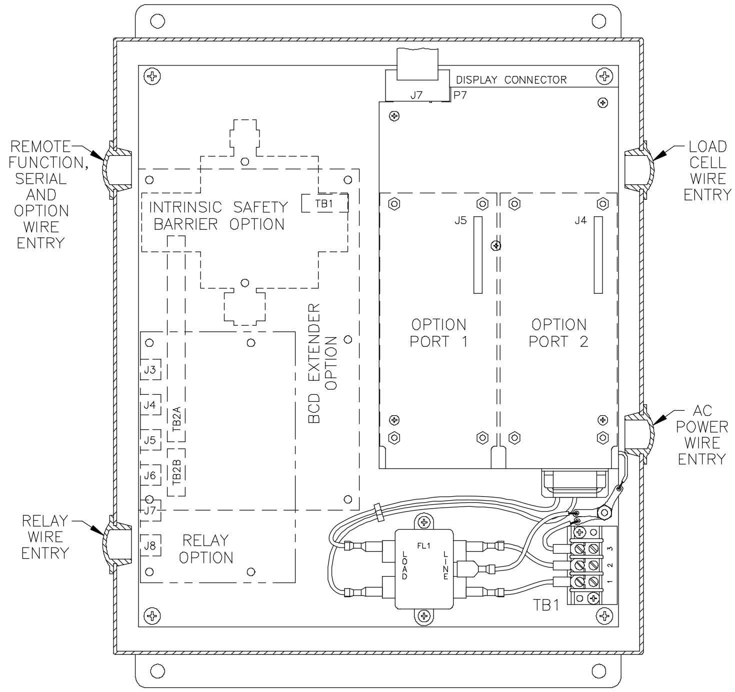


FIG. 3-7 WIRE ROUTING FOR WALL MOUNT MODEL

WARNING

DO NOT MOUNT THE HI 2151/30WC CONTROLLER NEAR A HIGH MAGNETIC FIELD OR 120 VAC POWER SOURCE. ROUTE RIBBON CABLE A MINIMUM OF 3 INCHES FROM ANY AC VOLTAGE CONDUCTING CABLES. TO DO SO WILL EFFECT THE PERFORMANCE OF THE CONTROLLER AND MAY RESULT IN PROPERTY DAMAGE.

Electrical Installation

Cabling and Interconnecting

Recommended Installation Procedures

1. Carefully plan the cable runs and wiring connections before routing, cutting and trimming cables and wires.

CAUTION

INSTRUMENT POWER AND RELAY WIRES SHOULD BE ROUTED AWAY FROM ALL OTHER SIGNAL CABLES TO AVOID ELECTRICAL INTERFERENCE.

2. All cabling should be neatly bundled, tied, and dressed.
3. Use a 6-inch service bend to relieve stress on the connectors and to ease servicing the unit.
4. Make sure that all plugs are firmly in place.
5. Secure the power cord with the two captive screw-on clips.
6. All connections are made at the rear panel of the weight controller.

Input Power Wiring

WARNING **DO NOT OPERATE WITH INCORRECT LINE VOLTAGE. TO DO SO WILL RESULT IN PROPERTY DAMAGE OR PERSONAL INJURY. CHANGING THE INPUT VOLTAGE RATING BETWEEN 120 AND 240 VAC REQUIRES MODIFICATIONS TO THE POWER/RELAY CIRCUIT BOARD AND RELAY OUTPUT BOARD. THIS PROCEDURE SHOULD ONLY BE DONE BY AUTHORIZED PERSONNEL. FOR FURTHER ASSISTANCE CONTACT HARDY INSTRUMENTS, CUSTOMER SUPPORT.**

Step 1. The HI 2151/30WC is factory configured to operate from either 120 or 240 VAC, 50 or 60 Hz power. Check the model number of your unit to verify the voltage. If the unit is configured for 240 VAC, an "E2" will be printed on the name plate.

Step 2. The power and relay circuit card filters and conditions AC power. However, for noisy power lines, external conditioning may be required. Contact Hardy Instruments Customer Support for more information.

Step 3. The AC power should be supplied by a "clean" primary line, directly from the power panel. This line should not supply any other equipment, including the feeding unit, and should be supplied with a minimum 10 amp breaker.

Step 4. To connect power to the controller, install a 3-wire, minimum of a 14 AWG power line to the 3-pin terminal block connector. (See Fig. 3-8)

- Fuse: .5 AMP, 250 VAC Slow-Blow 3AG, located behind J6 on the power relay printed circuit board.

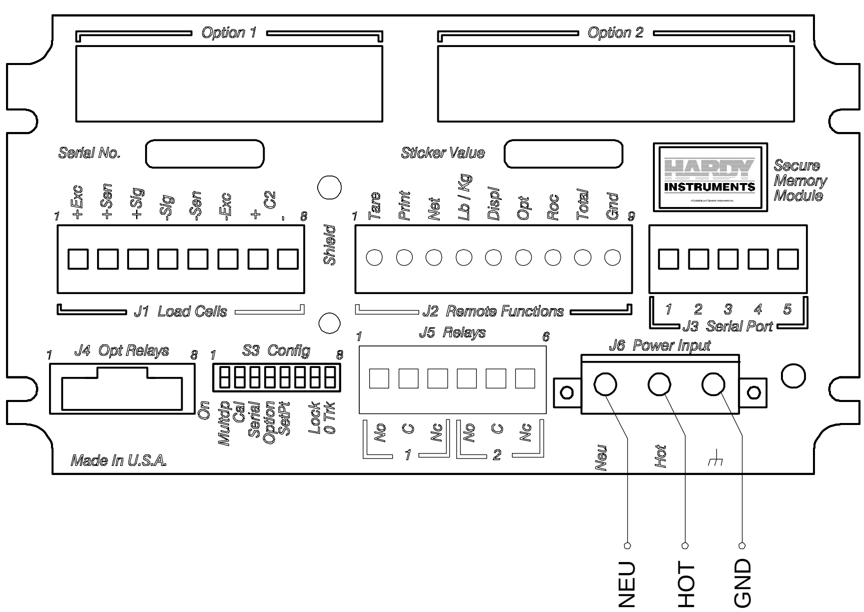


FIG. 3-8 POWER WIRING DIAGRAM

- Power Input J6
  J6 - 1 (Low) Neu
  J6 - 2 (HI) Hot
  J6 - 3 (Ground)

Step 5. For the Wall Mount -WS version, route the 14 AWG (Minimum) wires through the lower right side of the cut out (facing the front of the instrument) to TB1 which is mounted at the lower right hand corner of the back plane.

- HI 2151/30WC-WS Power Connection
  TB1-1 Hot (HI)
  TB1-2 Neu (Low)
  TB1-3 Gnd (Ground)

Output Setpoint Relay Wiring

- (2) Standard SPDT (Form C) Relays
- Wire Size: 12 AWG Maximum
- J5 Relays Connector

  Pin 1NO (Normally Open) Relay 1
  Pin 2C (ARM)Relay 1
  Pin 3NC (Normally Closed)Relay 1
  Pin 4NO (Normally Open)Relay 2
  Pin 5C (ARM)Relay 2
  Pin 6NC (Normally Closed)Relay 2

- For Wall Mount Version (-WS) - Route the wiring through the lower left side of the cutout (When facing the front of the instrument) to the J5 center connector of the lower Printed Circuit Card.

Optional Relays or TTL Level Outputs

- This option supplies six TTL level outputs, rated at 300 mA. It is available as a -D1 option which includes the firmware and a sixty inch, eight wire, 24 gauge customer terminated cable.

A -D2 option includes the following:

- Firmware
- Sixty inch eight wire, 24 gauge customer terminated ribbon cable.
- Six (6) 115 VAC solid state triac relays on an externally mounted option card. Mounting hardware includes:

  4 standoffs
  8 #6 split lock washers
  8 #6 flat washers
  8 #6-32 UNC pan head screws

- -D2 option card contains a 5-amp fuse for each relay.
- Each relay has a two-pin terminal connector

J3	Set Point 3	J4	Set Point 4
	Pin 1 Lo		Pin 1 Lo
	Pin 2 Hi		Pin 2 Hi

J5	Set Point 5 Pin 1 Lo Pin 2 Hi	J6	Set Point 6 Pin 1 Lo Pin 2 Hi
J7	Set Point 7 Pin 1 Lo Pin 2 Hi	J8	Set Point 8 Pin 1 Lo Pin 2 Hi

- Use 22 AWG minimum to 12 AWG maximum wire for J3 through J8.

NOTE: *See Output Option Board Installation for board installation procedures.*

CAUTION **THE CONTACTS ON THE SOLID STATE RELAY WILL OPEN IF A POWER FAILURE OCCURS. A LIT LED INDICATES THAT THE RELAY HAS BEEN ACTIVATED.**

J3 Serial Port Wiring

- The standard serial port J3 is located on the second board inside the instrument and is configured either as an RS-232 or RS-422/485 port. (See Section 4.1 for port configuration instructions)
- The -A model designator in the model number indicates how the instrument was configured from the factory. (See Table 3-1)

	-A1	**-A2**	**-A3**
J3	**RS-232**	**RS-422**	**RS-485**
Pins	**Signal**	**Signal**	**Signal**
1	Cts	Tx+	Tr+
2	Rts	Tx-	Tr-
3	Rxd	Rx+	N/C
4	Txd	Rx-	N/C
5	Gnd	Gnd	Gnd

TABLE 3-1: FACTORY CONFIGURATION

- Wire size: 22 AWG minimum to 12 AWG maximum
- For -WS wall mount models, route the wiring to J3 through the upper left side enclosure access hole when facing the front of the enclosure.

Remote Functions Wiring

- Some functions are level conditions and some are activated by momentary grounding. Both use the remote functions ground found on pin 9.
- Wire Size:

  22 AWG Min. to 12 AWG Max. Shielded

- Momentary Functions require 100 mSEC or greater contact to ground for proper activation. Use remote functions ground only for activating remote functions.
- For the -WS wall-mount version, route the wiring to J2 through the enclosure access hole (upper left side when facing the front).

CAUTION **REMOTE FUNCTIONS ARE NOT ISOLATED. DO NOT BUNDLE WIRING FROM REMOTE FUNCTIONS WITH POWER CABLE, RELAY CABLE OR WITH ANY OTHER HIGH ENERGY CABLES. USE SHIELDED CABLE 50" OR LESS. TO DO SO MAY RESULT IN UNSTABLE PERFORMANCE.**

Load Cell/Point Connections (J1)

About Load Cell Wiring

The unit is capable of powering a maximum of eight 350 ohm load cells/points. If more than eight load cells/points are used, an external power supply is required. Figures 3-9, 3-10, Load cell/point connections (J1) shows how to connect a full six-wire hookup, a four-wire hookup, and an external excitation supply. Load cell/point cables are connected to J1 through a furnished mating plug, P1.

NOTE: *Contact Hardy Customer Support for installation information when using an external power supply.*

To ensure a "clean" signal from the load cells/points, follow these precautions :

- Load cell/point cables MUST be run separate from all other cables and in their own conduit. Load cell/point cable shield should be attached to ground screw on rear panel only.
- Six-wire, shielded load cell/point cable should be used for lengths of 50 feet or more or if intrinsic safety barriers are used. Eight-wire shielded cable, preferably Hardy C2 cable, must be used for C2 calibration.
- Avoid load cell/point cable splices. If cables are longer than needed, coil up and tape excess cable. If cables are short, use an appropriate junction box. When terminal lugs are installed on load cell/point cables, Hardy Instruments recommends the lug be crimped and soldered.
- When connecting the HI 2151/30WC weight controller to the HI 215IT junction box using C2 load cell/point cable (6020-0001), use the following color code:

Model	Exc +	Sen +	Sig +	Sig -	Sen -	Exc -	C2 +	C2 -
J-BOX	RED	BLUE	GRN	WHT	BROWN	BLK	GREY	VIO

TABLE 3-2: C2 CABLE COLOR CODE

WARNING **DO NOT OPERATE AT INCORRECT LINE VOLTAGE; THE UNIT WILL BE DAMAGED. CHANGING THE INPUT VOLTAGE RATING BETWEEN**

120 VAC AND 240 VAC REQUIRES MODIFICATIONS AT THE FACTORY. FOR FURTHER HELP CONTACT CUSTOMER SUPPORT.

C2 Load Cell Connections (J1) (See Fig. 3-9)

Step 1. Attach load cell cable shield under screw near J1 on back of weight controller.

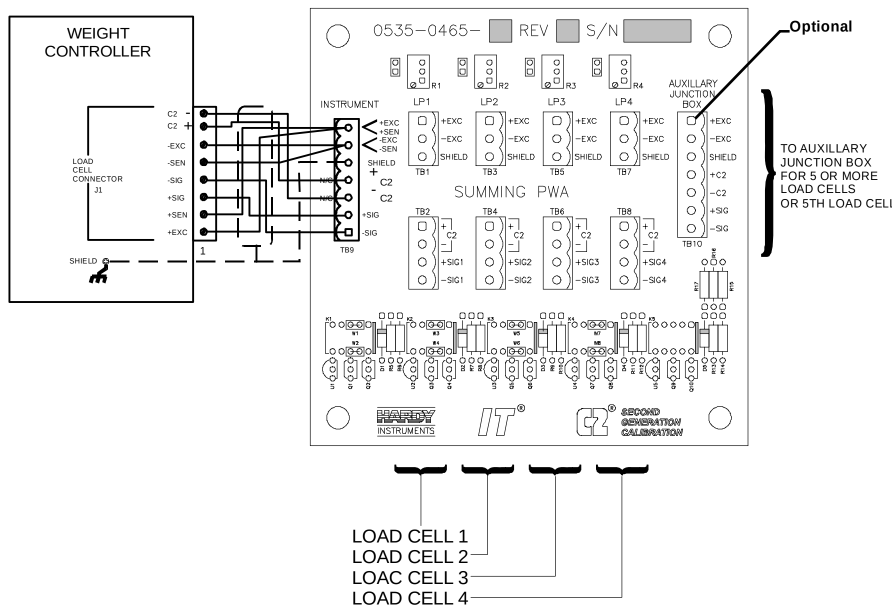


FIG. 3-9 C2 LOAD CELL CONNECTION

Step 2. Remove Factory installed jumpers for C2 wire load cell connection.

- Do not run load cell cable in parallel with or in same conduit with power wiring, relay cables or any other high energy cables.
- Recommend load cell cable, Hardy Instruments (Prt. # 6020-0001)
- IT Summing Card (Prt. # 0535-0465)

Non C2 Load Cell Connections (J1) (See Fig. 3-10)

Step 1. Attach load cell cable shield under screw near J1 on back of weight controller.

Step 2. Factory installed jumpers to remain in place for 4 wire load cell connection.

Step 3. Do not run load cell cable in parallel with or in same conduit with power wiring, relay cables or any other high energy cables.

Step 4. Eight conductor load cell cable required when:

- Cable runs greater than 50 feet.
- With Soft Calibration.
- With INTEGRATED TECHNICIAN "IT®"

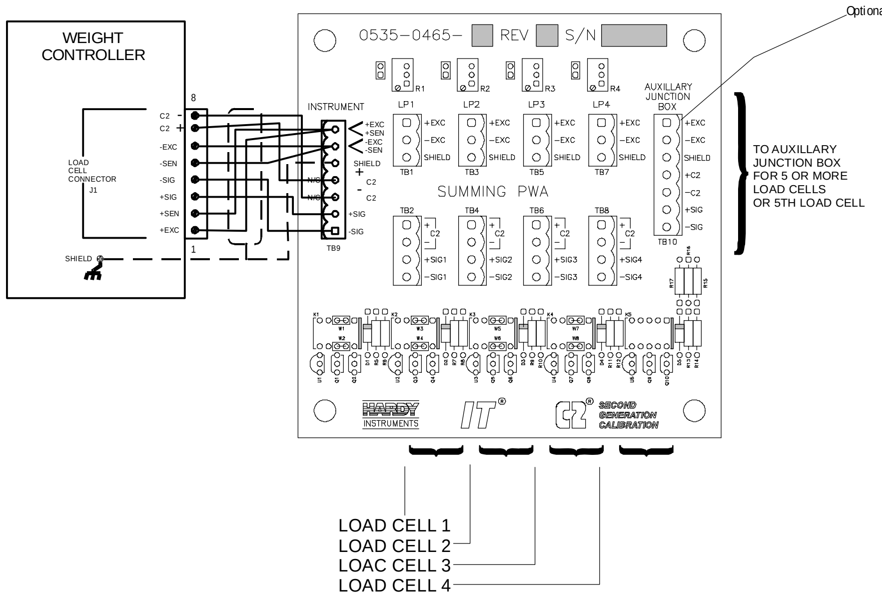


FIG. 3-10 LOAD CELL CONNECTION (NON C2 LOAD CELLS) J1

NOTE: *Contact Hardy Customer Support for installation information when using an external power supply.*

NOTE: *The Auxiliary Junction Box connector is an optional item and must be ordered from the factory.*

NOTE: *Record all load cell serial numbers and location on the label located on the inside cover of the junction box.*

Output Option Board Installation Procedures

WARNING **DANGEROUS VOLTAGE IS PRESENT WITHIN THE ENCLOSURE OF THE INSTRUMENT AND PRESENTS A RISK OF ELECTRICAL SHOCK. ALWAYS UNPLUG THE POWER CORD BEFORE OPENING AND SERVICING THE INSTRUMENT.**

CAUTION **INSTALLATION AND SERVICING OF THIS UNIT SHOULD BE PERFORMED BY AUTHORIZED AND QUALIFIED SERVICE PERSONNEL ONLY. FOLLOW ALL ELECTROSTATIC DISCHARGE (ESD) PROCEDURES WHEN OPENING THE INSTRUMENT.**

Step 1. Disconnect the power cord.

Step 2. Detach all interconnect cabling.

Step 3. Use a phillips screw driver and remove the four pan head machine screws that fasten the rear panel to the extrusion.

Step 4. Gently pull out the rear panel with the printed circuit boards attached. The main board is in clear view

Step 5. Remove the appropriate option cover from the rear panel (Option 1 or Option 2 cover) as required. Option 1 cover has two perforations to allow for installation of different options. (See Fig. 3-11)

Step 6. Each Option Board is furnished with four mounting screws to secure it to the main board. The main board has pre-mounted standoffs which accept any of the Option Boards in either position 1 or position 2. Note however, the BCD board may be installed only in the Option 2 slot which is sized for the BCD connector.

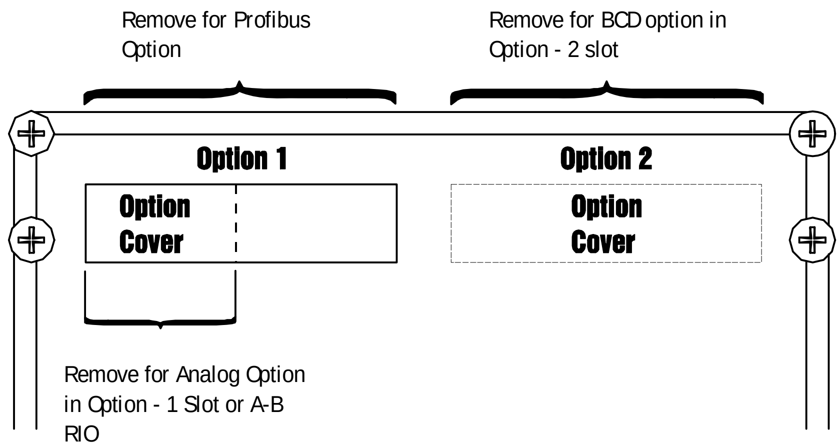


FIG. 3-11 OPTION LABEL COVER

NOTE: *Pin number 1 will always be on the left side of the unit (when facing the rear panel) except for the parallel BCD board.*

Step 7. Position the Option Board over the standoffs and carefully align the mating connector pins of the Option Board with the appropriate socket position, J4 or J5, on the main board. Guide the connector pins straight into the socket.

Step 8. Push down on the option board to seat the option connector pins into the socket on the main board. Visually verify that all of the pins are properly seated into the mating connector.

Step 9. With the option board resting on top of the four standoffs fastened to the main board, install the four screws, lock washers and flat washers.

Step 10. Gently slide the rear panel back into the extrusion

Step 11. Replace the four pan head machine screws that fasten the rear panel to the extrusion.

Step 12. Connect the power cord.

Options Cabling and Interconnect

Analog Output Option -B1 (See Fig. 3-12)

- The Analog Output Option card can be mounted in option slot positions one or two.

- This option has one output connector and uses pins 1 and 2 for + and - voltage outputs and pins 5 and 6 for - and + current outputs.
- One current and voltage range is selected by configuring the two jumpers on jumper block "W" of the analog board.

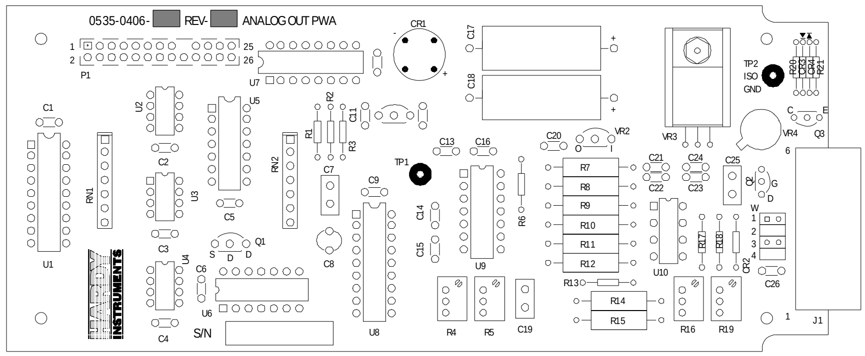


FIG. 3-12 ANALOG OUTPUT BOARD

- Both current and voltage outputs are available simultaneously.
- For Jumper Configurations See Chapter 4.
- Wire Size: 22 AWG Min. To 12 AWG Max
- -B1 Option Connector Wiring:

J1-1	V+
J1-2	V-
J1-3	No Connection
J1-4	No Connection
J1-5	I-
J1-6	i+

BCD Option Board Installation Procedures -B2, -B5, -B9

- The BCD option board. (See Fig. 3-13) is installed in option slot 2 only and will provide parallel output of the sensed gross, net, or tare weight.

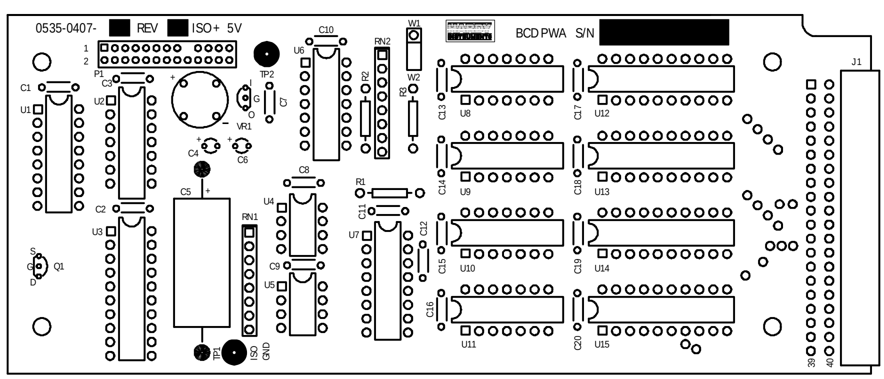


FIG. 3-13 PARALLEL BCD BOARD

Connector Requirements

- The board connector is a 40 pin right angle connector terminating to either a 37 pin D-subminiature assembly (option B-2) a 40 pin connector with a 60-inch cable (option B-5), or a 40 pin connector with a 24" cable (option B-9 used with a Wall Mount Model) The B-5 option provides flexibility of terminating BCD signal lines to the terminal board options B-6 and B-7.
- The pin designations for the BCD output are noted in Cable Pinouts List - Parallel BCD Board Connector to BCD Connector. All data outputs have a drive capability of 15 LSTTL loads (6 mA total) and use positive true logic. PRINT/READY has a drive capability of 10 LSTTL loads (4mA). This option board is electrically and optically isolated from the main board.

Cable Pinouts - Parallel BCD Board Connector to DB Connector

BCD BOARD	**DB CONNECTOR**	**SIGNAL**	**VALUE**
1	1	GND	
3	2	BCD digit 1, bit 0	1 x 10°
5	3	BCD digit 1, bit 1	2 x 10°
7	4	BCD digit 1, bit 2	4 x 10°
9	5	BCD digit 1, bit 3	8 x 10°
11	6	BCD digit 2, bit 0	1 x 10^1
13	7	BCD digit 2, bit 1	2 x 10^1
15	8	BCD digit 2, bit 2	4 x 10^1
17	9	BCD digit 2, bit 3	8 x 10^1
19	10	BCD digit 3, bit 0	1 x 10^2
BCD BOARD	**DB CONNECTOR**	**SIGNAL**	**VALUE**
21	11	BCD digit 3, bit 1	2 x 10^2
23	12	BCD digit 3, bit 2	4 x 10^2
25	13	BCD digit 3, bit 3	8 x 10^2
27	14	BCD digit 4, bit 0	1 x 10^3
29	15	BCD digit 4, bit 1	2 x 10^3
31	16	BCD digit 4, bit 2	4 x 10^3
33	17	BCD digit 4, bit 3	8 x 10^3
35	18	BCD digit 5, bit 0	1 x 10^4
37	19	BCD digit 5, bit 1	2 x 10^4
2	20	BCD digit 5, bit 2	4 x 10^4
4	21	BCD digit 5, bit 3	8 x 10^4

6	22	BCD digit 6, bit 0	1×10^5
8	23	BCD digit 6, bit 1	2×10^5
10	24	BCD digit 6, bit 2	4×10^5
12	25	BCD digit 6, bit 3	8×10^5
14	26	+/- (- = +5V) (+ = OV)	
16	27	OVR	
18	28	WEIGHT SELECT - LSB (SEE CHART 3-3)	
20	29	WEIGHT SELECT - MSB (SEE CHART 3-3)	
22	30	OUTPUT DISABLE	
24	31	not used	
26		not used	
28	33	MOTION (+5V = in motion)	
30	34	PRINT/PRINT	
32		not used	
34	36	LB/KG	
36	37	GND	
38-40		not used	

PIN		MODE
28	**29**	
0	0	GROSS
0	1	NET
1	0	TARE

TABLE 3-3: WEIGHT MODE

BCD Terminator Boards - B6, - B7

BCD Termination Board Installation Procedures (See Fig. 3-14)

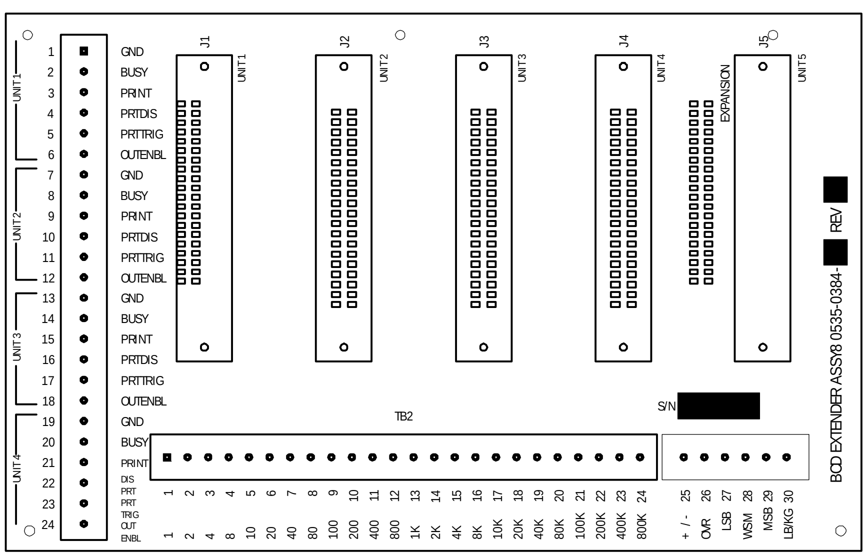


FIG. 3-14 BCD QUAD TERMINATION BOARD OPTION

Step 1. Locate a clear, flat mounting area within five feet of all HI 2151/30WCs.

Step 2. Use the measurements shown in Figure 3-15 BCD Termination Board Installation Drill Template Illustration or P/N 0596-0117 drill template to mark five mounting holes. (See Fig. 3-15)

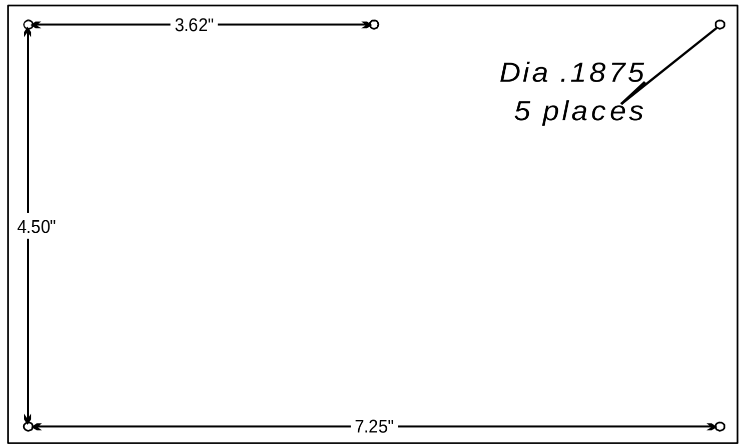


FIG. 3-15 BCD TERMINATION BOARD INSTALLATION DRILL TEMPLATE

Step 3. Drill 3/16-inch holes where marked.

Step 4. Install five P/N 2815-0053 standoffs in the holes.

Step 5. Install BCD terminal board on standoffs.

Step 6. Connect P/N 0509-0389-01 ribbon cables between the BCD output (instrument option slot 2) of up to four HI 2151/30WCs and BCD terminal board jacks J1 through J4.Connect control lines from computer to TB1.

Step 7. For installations with more than four HI 2151/30WCs, proceed as follows:

Step 8. Install a second BCD terminal board within two feet of installed BCD terminal board. Refer to steps 1 through 7.

Step 9. Connect P/N 0509-0389-02 ribbon cable from J5 on one BCD terminal board to J5 on the other BCD terminal board.

Step 10. Connect data/status lines from BCD terminal board to computer. (See Fig. 3-16)

- Wire Size: 26 AWG to 20 AWG

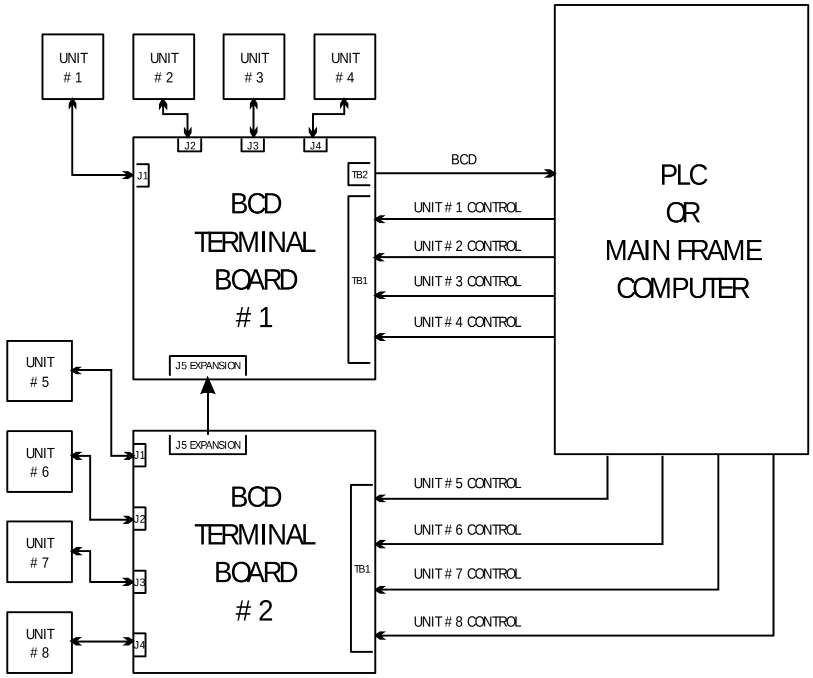


FIG. 3-16 BCD TERMINATION INSTALLATION BLOCK DIAGRAM

Allen-Bradley RIO Interface Option -B8

Refer to Hardy Instruments HI 2151 Series Weight Controllers Remote I/O Installation and Operation Manual, Document Number 0596-0173 for installation instructions.

The Allen-Bradley RIO card can be mounted in either option slot one or two. However, there is a limit of one RIO card per instrument. (See Fig. 3-17)

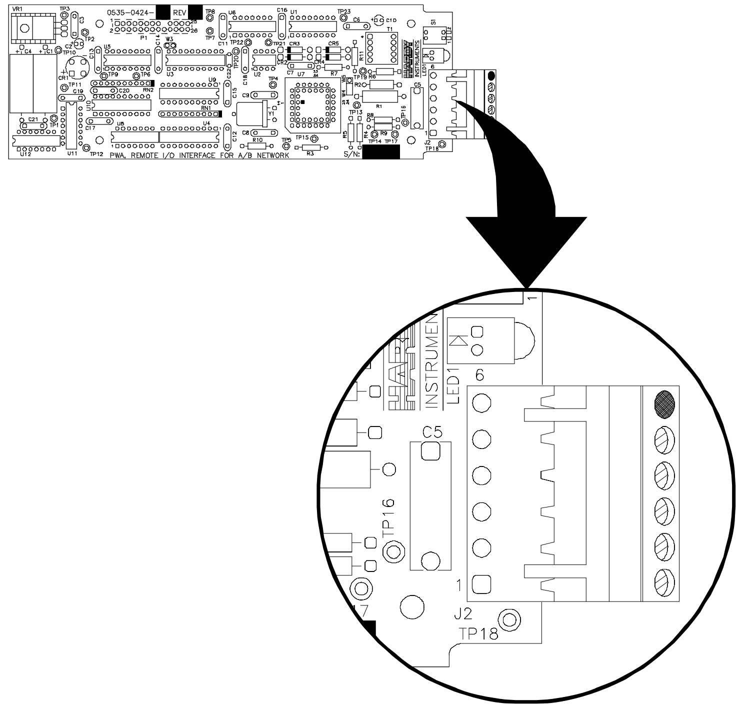


FIG. 3-17 RIO CARD/PIN LAYOUT

Connector Wiring:

1	Blue (1/2 of twisted pair)
2	Shield (outer braided cable shield)
3	Clear (1/2 of twisted pair)
4	No Connection
5	No Connection
6	Wire to instrument chassis ground

Profibus Interface Option -B12

Refer to Hardy Instruments Profibus Interface Option for the HI 2151/30WC Installation and Operation Manual for installation instructions.

The Profibus option card can be mounted in either option slot one or two. However, there is a limit of one Profibus card per instrument.

Connector Cable Wiring:

Top Row Right to Left

J1-1	Ground (outer braided shield)
J1-2	No Connection
J1-3	Transmit (1/2 of twisted pair)
J1-4	No Connection
J1-5	No Connection

Bottom Row Right to Left

J1-6	No Connection
J1-7	No Connection
J1-8	Receive (1/2 of twisted pair)
J1-9	No Connection

Dynamic Data Exchange (DDE) I/O Server -B14

RS-232C- Requires an interface cable with a 9 pin or 25 pin serial port female connector to connect to a computer. Wire the cable to the 5 pin Phoenix connector J3 located on the rear panel of the weight controller.

Refer to Hardy Instruments optional DDE Installation and Operation Manual, document number 0596-0221 for more details.

HI 215IT Series Junction Boxes

Refer to Fig. 3-11 Load Cell/Sensor Connections for specific details.

Wiring to Hardy Instruments Load Points and Load Sensors

TB1, 3, 5,7	**HI LPH** **HI BB01**	**HI LPS** **HI SB01**	**HI LPD** **HI DSB01/2**	**HI LPT** **HI SO1**
+ EXC	Green or Green/Blue	Red	Red	Red
-EXC	Black or Black/Grey	Black	Black	Black
Shield	Orange or Yellow	Orange or Clear	Orange or Clear	Orange or Clear

TB2, 4, 6, 8	HI LPH HI BB01	HI LPS HI SB01	HI LPD HI DSBO1/2	HI LPT HI SO1
C2+	Grey	Grey	Grey	Grey
C2 -	Violet	Violet	Violet	Violet
Sig +	White	Green	Green	Green
Sig -	Red	White	White	White

TB9	J1 HI 2151/30WC
+EXC	Red
+SEN	Blue
-EXC	Black
-SEN	Brown
Shield	
C2+	Grey
C2-	Violet
+SIG	Green
-SIG	White

Set Point Relay Option Board Installation -D2

The setpoint relay option board must be installed outside of the HI 2151/30WC. (See Fig. 3-18).

Step 1. Locate a clear, flat mounting area within five feet cable distance of the HI 2151/30WC.

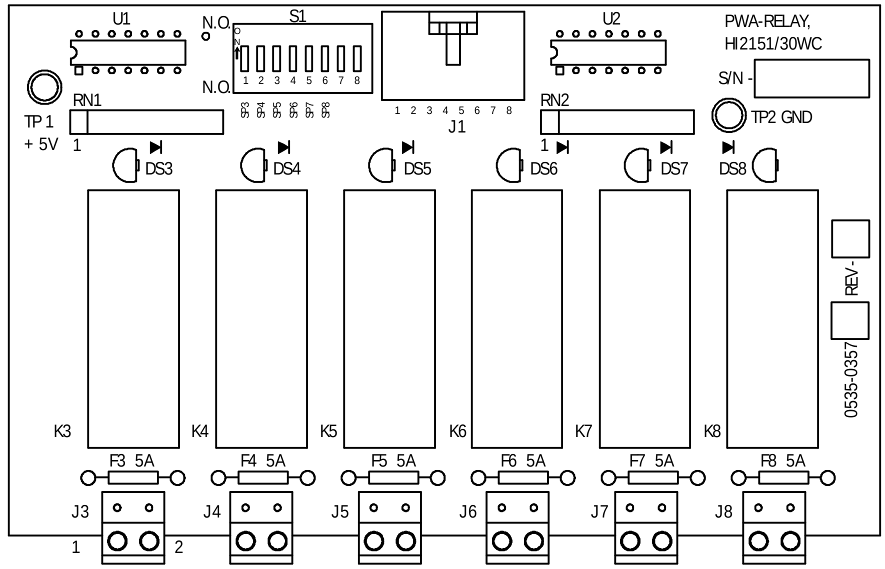


FIG. 3-18 SET POINT RELAY OPTION BOARD

Step 1. Use the measurements shown in HI 2151/30WC Installation-Details (See Fig. 3-19) to make four mounting holes.

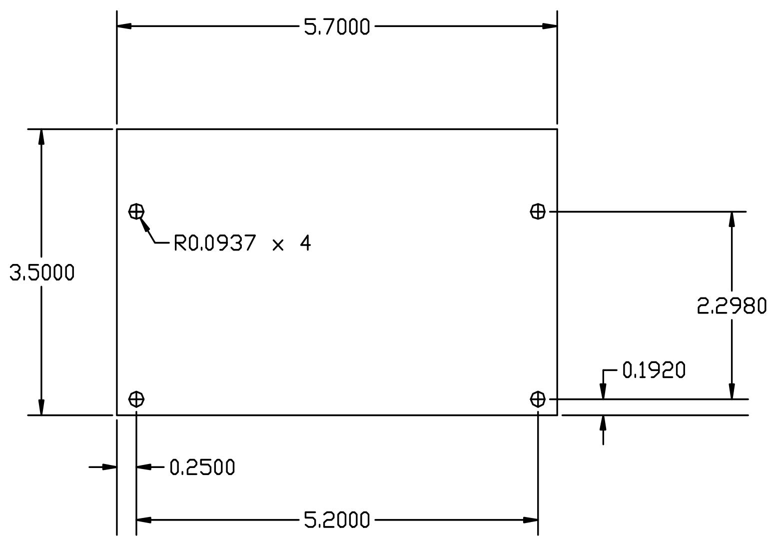


FIG. 3-19 INSTALLATION DETAILS

Step 2. Drill 3/16-inch diameter holes where marked. (See Fig. 3-19)

Step 3. Install four P/N 2815-0063 standoffs in the drilled holes.

Step 4. Install the relay option board on the standoffs. (Fig. 3-20)

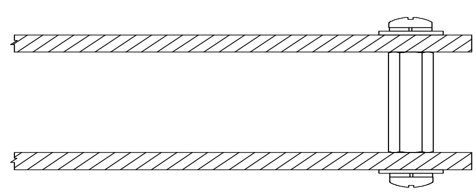


FIG. 3-20 STANDOFF ASSEMBLY

Profibus Interface Card Option Wiring Diagram

Step 1. Connect P/N 0509-0390 ribbon cable between relay option board jack J1 and J4 on the rear panel of the HI 2151/30WC. (See Fig. 2-12)

Step 2. For -WS wall mount versions the card can be mounted within the enclosure. Route the wiring to J3 thru J8 via the lower left side of the access hole.

For more complete instructions, see the Profibus Interface Option, Card Operation and Installation Manual #0596-0211.

Installation of the Secure Memory Module

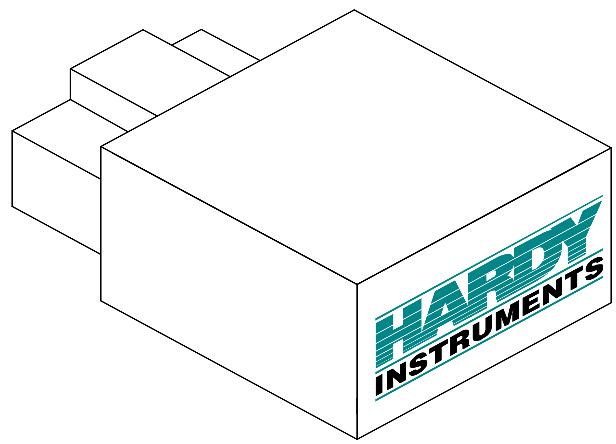


FIG. 3-21 SECURE MEMORY MODULE

Step 1. Make sure that the module has the notch facing up. (Fig. 3-21)

Step 2. Slide the module with the notch up into the module housing.

Step 3. Press the module in until it stops.

Step 4. To remove the module pull the module straight out of the housing. (See Fig. 3-22)

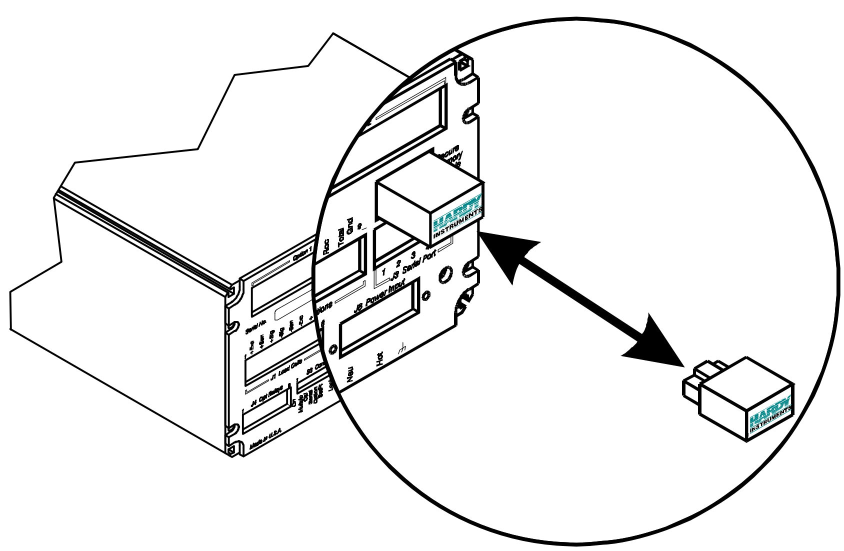


FIG. 3-22 INSTALLING AND REMOVING THE SECURE MEMORY MODULE

CHAPTER 4 - SYSTEM CONFIGURATION

Chapter Four covers procedures for configuring the HI 2151/30WC Weight Controller. System Configuration includes only hardware adjustments such as Jumper and Dip Switch settings. We recommend that maintenance personnel be familiar with this chapter before configuring the weight controller. Alternative configuration procedures are not recommended.

Standard RS-232C/RS422/485 Configuration Procedures.

About RS 232/RS422/485 Bi-directional Serial Ports (See Chapter 5, for Setup Procedures)

The RS 232/RS422/485 Bi-directional serial ports are configured by setting jumpers, dip switches and are also setup from the front panel. The setup instructions are located in Chapter 5- System Setup Bi-directional Serial Ports. The jumpers and dip switches are located on the Main board. (See Fig. 4-1)

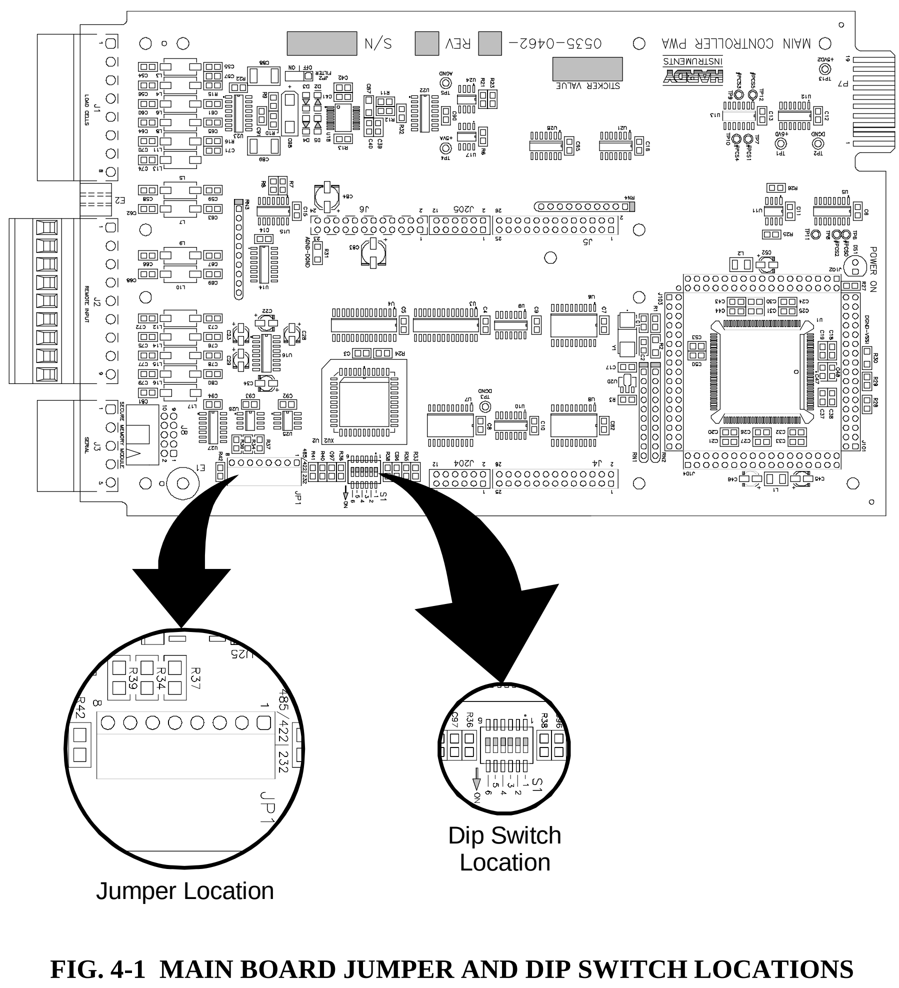


FIG. 4-1 MAIN BOARD JUMPER AND DIP SWITCH LOCATIONS

Setting the Jumpers

WARNING

DANGEROUS VOLTAGE IS PRESENT WITHIN THE ENCLOSURE OF THE INSTRUMENT AND PRESENTS A RISK OF ELECTRICAL SHOCK. ALWAYS UNPLUG THE POWER CORD BEFORE OPENING AND SERVICING THE INSTRUMENT.

CAUTION

SERVICING OF THIS UNIT SHOULD BE PERFORMED BY AUTHORIZED AND QUALIFIED SERVICE PERSONNEL ONLY. FOLLOW ALL ELECTROSTATIC DISCHARGE (ESD) PROCEDURES WHEN OPENING THE INSTRUMENT.

NOTE: *Remove jumpers with all barriers.*

Step 1. Disconnect the power cord.

Step 2. Use a phillips screw driver and remove the four (4) pan-head machine screws that fasten the rear panel to the extrusion. (See Fig. 4-2)

Step 3. Gently pull out the rear panel with the printed circuit boards attached. The main board is in clear view.

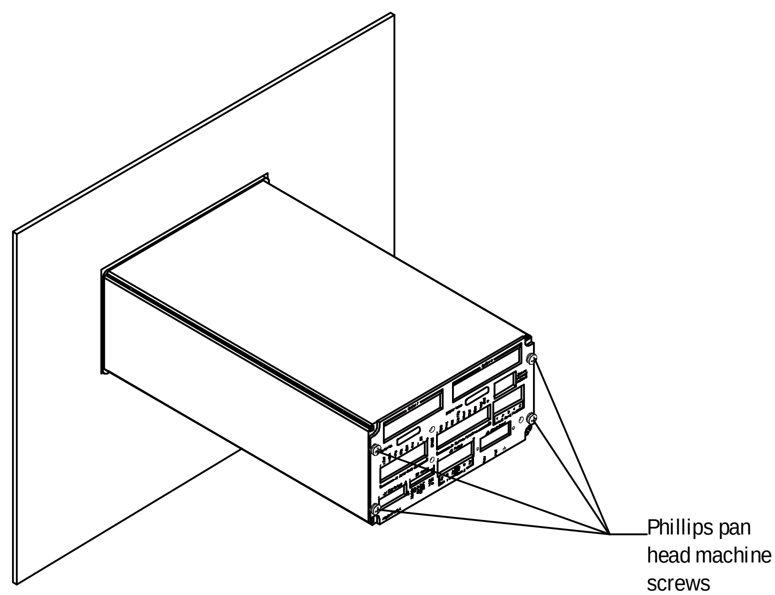


FIG. 4-2 REMOVING THE REAR PANEL

CAUTION

WHEN OPENING THE BACK OF THE HI 2151\30 WC, MAKE SURE THAT YOU USE PROPER ELECTROSTATIC DISCHARGE PROCEDURES TO PREVENT DAMAGE TO THE INSTRUMENT.

Step 4. If an option board is installed above jumpers, remove the option board.

Step 5. The factory default position is for the RS-232 setting. (See Fig. 4-3) The dip switches do not function when in the RS-232 configuration.

Step 6. To select the RS 422/485 ports, move the jumper to the RS 422/485 position. (See Fig. 4-3)

NOTE: *The selection for the RS 422 or the RS 485 is done from the front panel.*

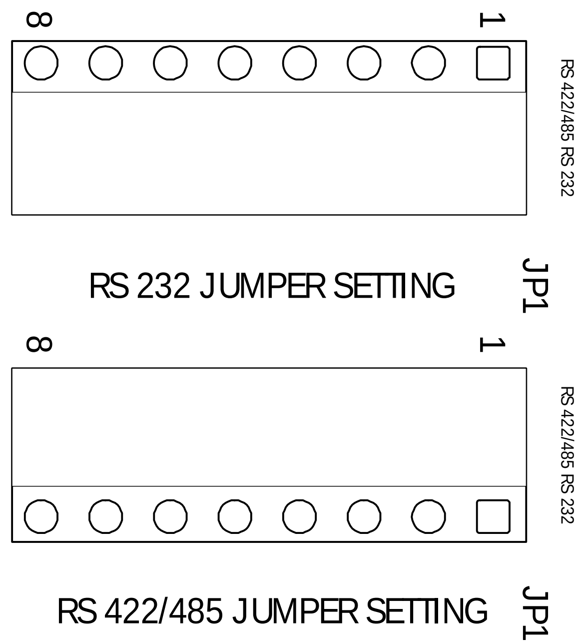


FIG. 4-3 RS-232 (DEFAULT), S422/485 JUMPER SETTINGS

Step 7. If the controller is not in a termination position, set all the dip switches to the OFF position. (See Fig. 4-4)

Step 8. If the controller is in a termination position (i.e. at the end of the communication line) set all the dip switches to the ON position. (See Fig. 4-5)

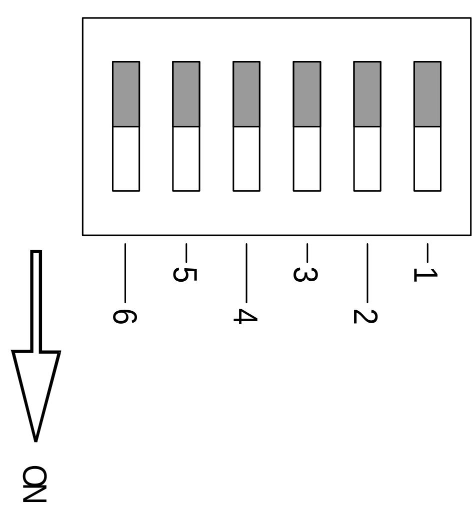


FIG. 4-4 NON TERMINATING CONTROLLER, ALL DIP SWITCHES SET IN THE OFF POSITION

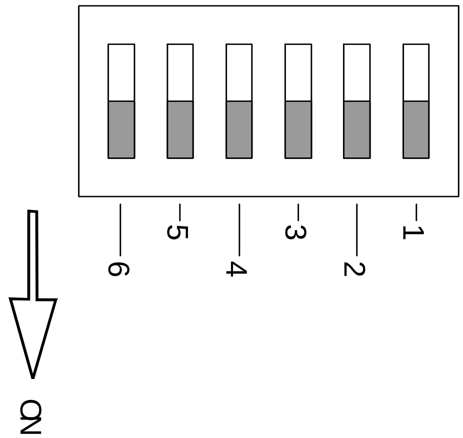


FIG. 4-5 TERMINATING CONTROLLER, ALL DIP SWITCHES SET IN THE ON POSITION

Step 9. Replace the option board.

Step 10. Gently slide the rear panel back into the extrusion

Step 11. Replace the four pan-head machine screws that fasten the rear panel to the extrusion.

Step 12. Connect the power cord.

Analog Output Option Card Configuration Procedures -B1

About the Analog Output Card Option

The analog transmitter outputs to a receiving device (PLC, Computer etc.). The transmitter outputs a user selectable Gross, Net, Rate of Change (ROC), Peak or Total Weight as 0-5V, 0-10V, 0-20mA, or 4-20mA (via the front panel you can reverse the voltage and current ranges, See Chapter 5 for procedures). **When configuring the Analog Output Card, both the receiver and the HI 2151\30WC must be in the same mode (e.g. Gross, Net, Rate of Change (ROC) Peak or Total Weight)**. The analog card can also span the voltage or milliamp ranges over a portion of the weight data. The outputs are electrically and optically isolated from the main board. The Analog Output Card is adjusted at the factory. (See Chapter 5, Section 5.6 for Setup Instructions)

Setting the Jumpers

Disassembling the rear panel and setting jumpers

Step 1. Repeat steps 1-4 above. (See Fig. 4-2)

Step 2. Set the jumper that matches the system's feedback voltage or current configuration. (See Table 4-1)

JUMPER CONFIGURATION CHART	
CURRENT VOLTAGE	JUMPER
0-20 mA/0-5V	W1 & W3
0-20mA/0-10V (Factory Default)	W1 & W4
4-20mA/0-5V	W2 & W3
4-20mA/0-10V	W2 & W4

TABLE 4-1: ANALOG OUTPUT JUMPER SETTINGS

NOTE: *W1 & W4 are factory default settings.*

Reassembling Rear Panel

Step 1. Gently slide the rear panel back into the extrusion.

Step 2. Replace the four pan-head machine screws that fasten the rear panel to the extrusion.

Step 3. Connect the power cord.

Front Panel Setup Procedures

To complete the Analog Option Card installation, you must complete the Setup procedures before operating the system. (See Chapter 5 for instructions)

Analog Card Adjustment

Step 1. Slight adjustments may be necessary to insure that the display on your Programmable Logic Controller reads precisely with the display on your weight controller. Use the procedure below which corresponds to the input card in your PLC.

Step 2. Make sure the Analog Option card is programmed correctly prior to performing any adjustments.

Voltage

Step 1. If 0 volts represents other than empty put weight on your load cells equal to your 0 volt selection.

Step 2. Otherwise, with the hopper empty adjust R4 for the correct reading

Step 3. Put weight on your load cells equal to your 10 volt selection. Adjust R16 for the correct reading.

Current

Step 1. Put weight on your load cells equal to your 4 ma selection, if 4 ma represents other than empty. Adjust R19 for the correct reading.

Step 2. Put weight on your load cells equal to your 20 ma selection. Adjust R5 for the correct reading.

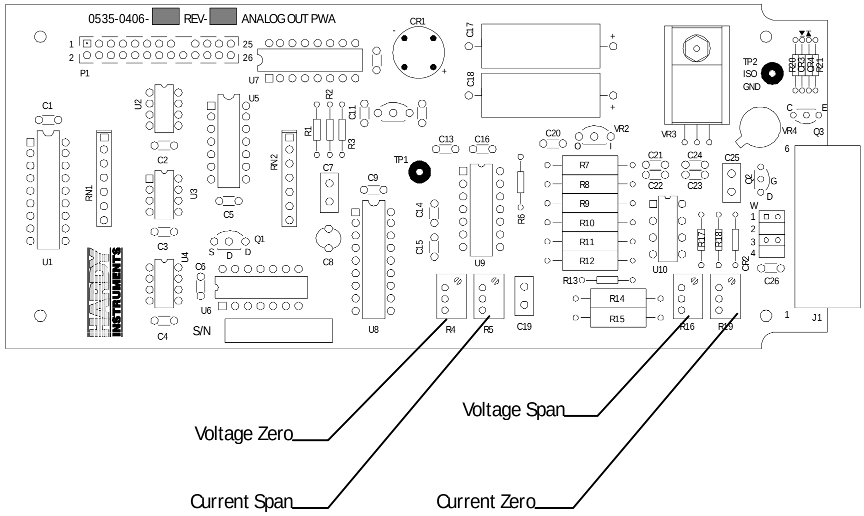


FIG. 4-6 ANALOG OUTPUT BOARD

Parallel BCD Board Print Configuration Procedures - B2, -B5, -B9

About the BCD Board Print Output Signal

Some receivers require either a positive (high) pulse or a negative (low) when printing. Select the jumper that meets the receiver input signal requirements.

Jumper Location

The switch is marked W1 W2 in the top center of the board.

Jumper Settings (See Fig. 4-7 and 4-8)

- Positive Pulse = W1
- Negative Pulse = W2 (Default)

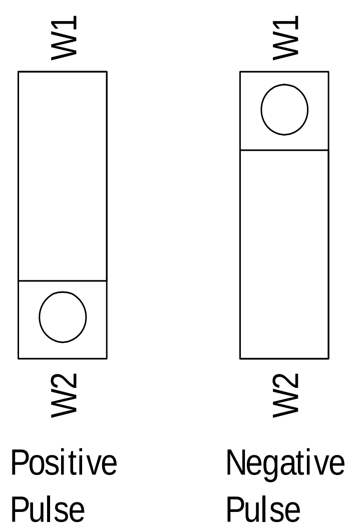


FIG. 4-7 BCD CARD JUMPER SETTING FOR POSITVE PULSE
FIG. 4-8 BCD JUMPER SETTING FOR NEGATIVE PULSE

Calibration Configuration Procedures When Security Code is not Available

When the security code is not available, the config dip CAL switch (S3) on the rear panel can be toggled to enter the CAL menu. (See Chapter 5, Section 5.2, sub paragraph 9 for setup instructions) When you press the CAL button at the front panel, and the CAL switch (S3) is not toggled, the display will read ERR 8. Simply perform the following procedures to enter the Calibration Menu.

Dip Switch Location (See Fig. 4-9)

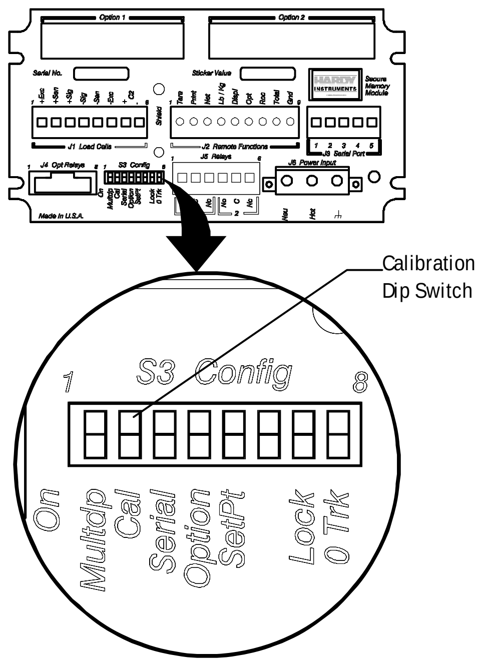


FIG. 4-9 CAL TOGGLE SWITCH LOCATION

Step 1. Change the position of the toggle switch (#2). (For Calibration procedures See Chapter 5, Section 5.4)

Step 2. Check to see if the CTR ZERO, MOTION, and ZERO TRACK leds are flashing.

Auto Zero Tolerancing Configuration Procedures

About Auto Zero Tolerancing

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

NOTE

The amount of weight zeroed off is cumulative. The zero command will fail if the current gross weight plus any previously zeroed amount exceeds the zero tolerance.

Dip Switch Location
(See Fig. 4-10)

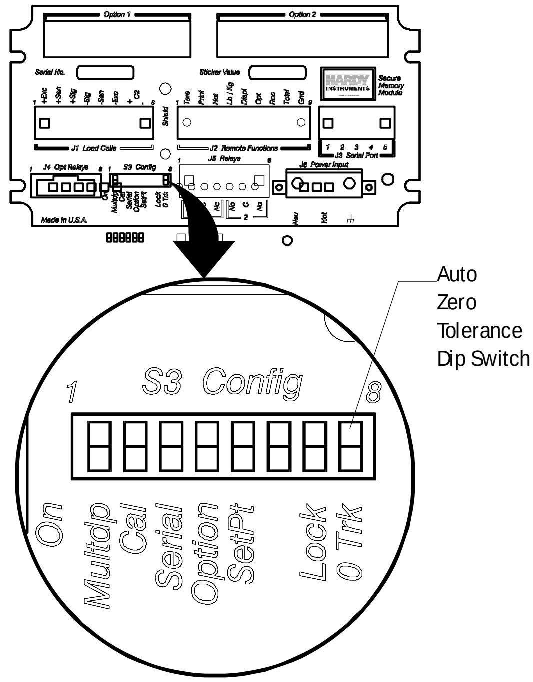


FIG. 4-10 AUTO ZERO DIP SWITCH SETTING

Dip Switch Setting

Step 1. To enable the Auto Zero Tolerancing, set dip switch #8 to ON.

Step 2. To disable the Auto Zero Tolerancing, set dip switch #8 to OFF.

Configuring Peak Hold Mode

About Configuring Peak Hold

Highest gross or averaged gross is selectable on dip switch S2 position number 2, located internally on the Main Controller board. (See Fig. 4-11)

NOTE: *Dip Switches S2 on the Power Relay Board are all normally in the OFF position. Contact Hardy Instrument Customer Support Department before changing any of these switch positions.*

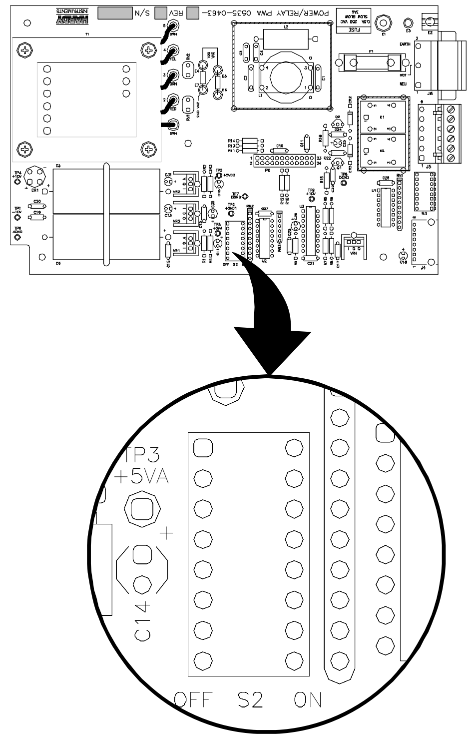


FIG. 4-11 PEAK HOLD MODE DIP SWITCH LOCATION

Configuring Multidrop S3-1

When the switch is ON it enables communication to more than one controller on the same line. To use the Multidrop function the Hardy Link software option must be installed. Multidrop is only available when using the RS-422/485 serial port setting.

Configuring Serial S3-3

1. Serial Port Lockout. When the switch is ON, the following commands cannot be executed over the serial interface:

   Format
   Set Setpoints

2. When the Serial switch is OFF it enables these commands. OFF is the default position.

Configuring Option S3-4

1. When the switch is ON, there is no access to the Option Menu.
2. When the switch is OFF, the full Option menu is available.

Configuring Set Point S3-5

1. When the switch is ON, there is no access to the Set Point Menu.
2. When the switch is OFF the Set Point Menu is available.

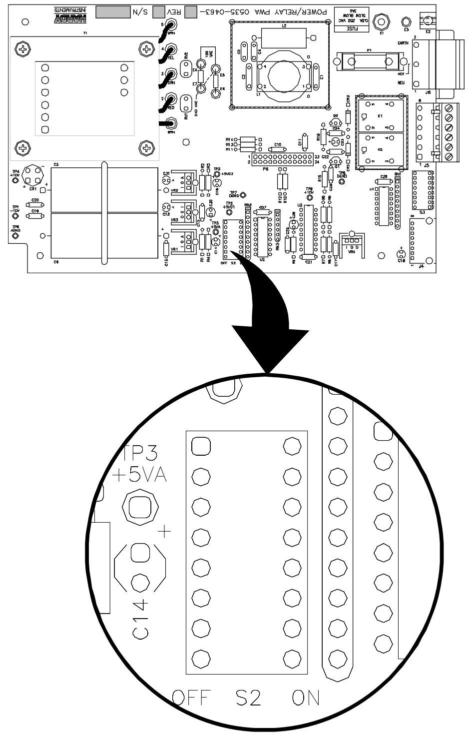
Set Point S3-6

Not Used.

Configuring Lock S3-7

1. When the switch is ON, the Tare, Mode, Zero, and lb/kg keys are locked out or not available.

2. When the switch is OFF, Tare, Mode, Zero, and lb/kg keys are available.



Configuring the Power & Relay Board Dip Switches S2 (See Fig. 4-12)

FIG. 4-12 POWER & RELAY BOARD DIP SWITCH LOCATION

1. When the switch is ON, incoming checksums are ignored. When the switch is OFF incoming checksums are read.
2. S2-2 - When the switch is ON, the Peak Hold signal read is averaged. When the switch is OFF, the Peak Hold signal is instantaneous.
3. S2-3 - When the switch is ON, the instrument is in the NBS mode of operation. Resolution is limited to 1:10,000 counts. When the switch is OFF, the resolution is 1:985,000.
4. S2-4 - This switch must be toggled (position changed) to enter NBS calibration from the front panel CAL button.
5. S2-5 - Turns Off > character on print output serial port.
6. S2-6 - Puts unit in Blind Remote Mode.
7. S2-7 - is not used.
8. S2-8 - is used for resetting Calibration & Configuration to the Factory Defaults

CHAPTER 5 - SETUP

Chapter 5 covers firmware settings to prepare the controller for calibration and operation. User and service personnel should be familiar with the information in this chapter before going through the setup procedures. Alternatives to these procedures are not recommended.

Keypad Functions (See Fig. 5-1)

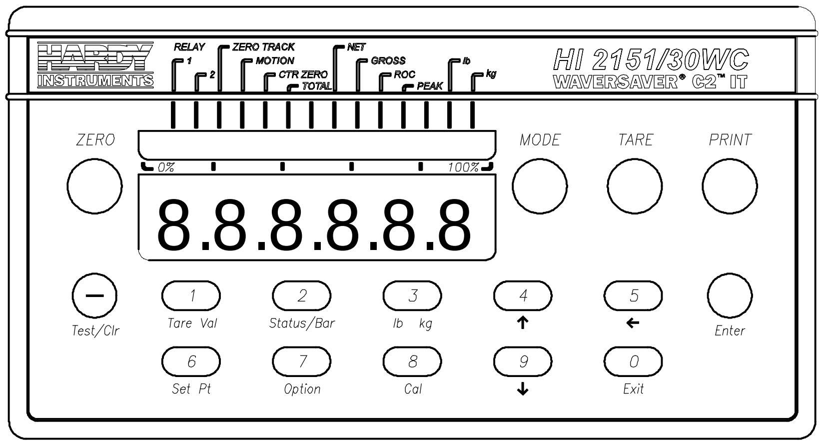


FIG. 5-1 FRONT PANEL

Zero

- Used in Gross mode to zero the display to within the tolerance level.
- This function can be used as many times as desired as long as the total does not exceed the value entered as the zero tolerance.
- The zero key is also used to exit a menu after entering number(s) without changing the original number. For example - when entering a Span value (18), the user decides that the original number (15) is OK. By pressing the Zero Key you can exit the menu without changing the original number (15), even though you have typed new numbers and they appear on the display.

Mode

- In standard controllers, the mode key toggles between gross and net weight.
- In controllers with any one or all of the mode options (Total Mode, Peak Hold Mode, or Rate of Change Mode) installed the mode key toggles between gross/net weight and the option(s).

NOTE: *To order Total, Peak or ROC options, contact your local Hardy Representative or call/FAX/E-mail Hardy Instruments, Sales Department.*

Tare

- The Tare button captures the current Gross weight at the instant the Tare button is pressed and places it in the tare register setting the Tare Value. The tare value is the difference between the Net (e.g. Vessel weight) and Gross weight (e.g. vessel weight + material weight). You can also type in the Tare Value by using the 1/Tare Val key.

- The Tare function can also be actuated by activating the appropriate remote function pin. See Remote Function Configuration in Chapter 4.

Print

Transmits data to the printer.

NOTE: *The serial port must be configured as a printer. If the serial port is not configured as a printer port, the print key is not going to respond, and you cannot print.*

NOTE: *The print function cannot print data if the weight is in motion or exceeds the capacity of the scale.*

—/Test/Clr

- The Test/Clr function Initiates one of the selected tests
  - Self Test - "SLFTST" on the display.
  - Integrated Technician - "IT SEC" on the display.
- This (—) key is used to enter a minus sign (-) for a negative number. This function can be used only when the display reads the number 0.
- The clear "CLR" function is operable when the controller is a menu requiring a numeric input. Use CLR to clear the display before entering a new value.

1/Tare Val

- This function displays the current Tare value stored in the Tare Register. (See paragraph 5.1.3)
- This function allows the user, after pressing the "Clr" button, to enter a Tare Value using the numeric keys. To exit the Tare Val menu press the Zero button.
- The key also enters the digit "1."

2/Status/Bar

- The Status/Bar toggles between the mode settings and the bar graph.
- The Status function indicates the following:
  - Selected Mode
  - Selected Engineering Unit: lbs/kg
  - Status of Relays 1 & 2
- The Bar Graph function displays in graphical form the value of the mode (Total, Gross, Net, ROC, Peak) selected in the bar graph setup menu. (See Fig. 5-2)

NOTE: *The bar graph mode and the display mode are totally independent. Make sure you know what mode each are in before reading.*

- The key also enters the digit "2."

3/Lb Kg

- Toggles between read pounds (Lb.) or kilograms (Kg.).
- The key also enters the digit "3."

4/↑

- This key moves forward through a menu, step by step and will wrap to the beginning of the menu.
- The key also enters the digit "4"
- Resumes the Self Test

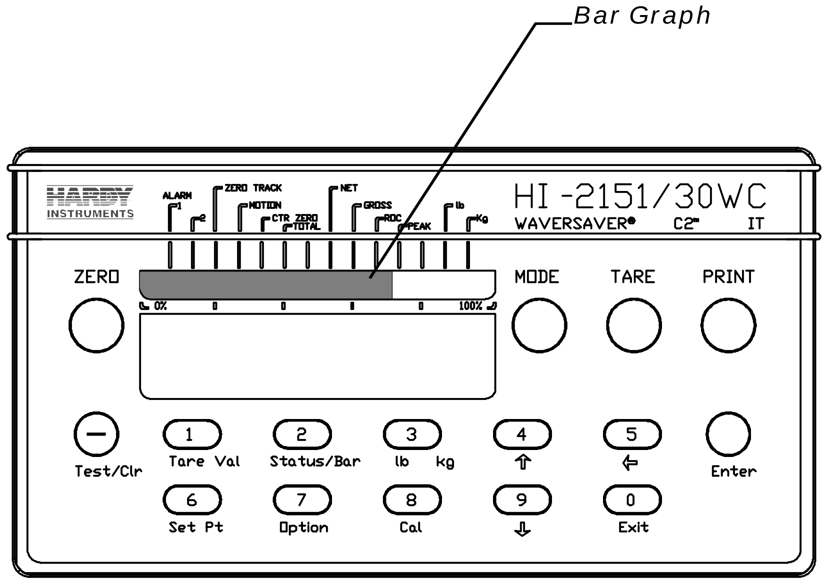


FIG. 5-2 FRONT PANEL, BAR GRAPH DISPLAYED

5/←

- Moves the decimal point position to the left when in Calibration Mode.
- Selects user selectable formats in the serial and optional BCD menus.
- The key also enters the digit "5".

6/Set Pt

- This key is used to enter the Set point Menu
    - Values for standard and optional Relays.

        Set point Values
        Deadband Values
        Preact Values

- The key also enters the digit "6".

7/Option

- This key selects the standard serial ports and available option menus:
    - Rate of Change

- Analog Transmitter(s)
- BCD Port
- Remote I/O
- PROFIBUS

- The key also enters the digit "7".

8/Cal

- This key opens the Calibration set up menu.
- The key also enters the digit "8".

9/↓

- This key moves backward through a menu, step by step and will wrap to the beginning of the menu.
- Selects user selectable formats in the Serial and optional BCD menus.
- Pauses the Self-Tests.
- The key also enters the digit "9".

0/Exit

- This key Exits a menu/sub-menu back to the normal operating mode when text is on the screen

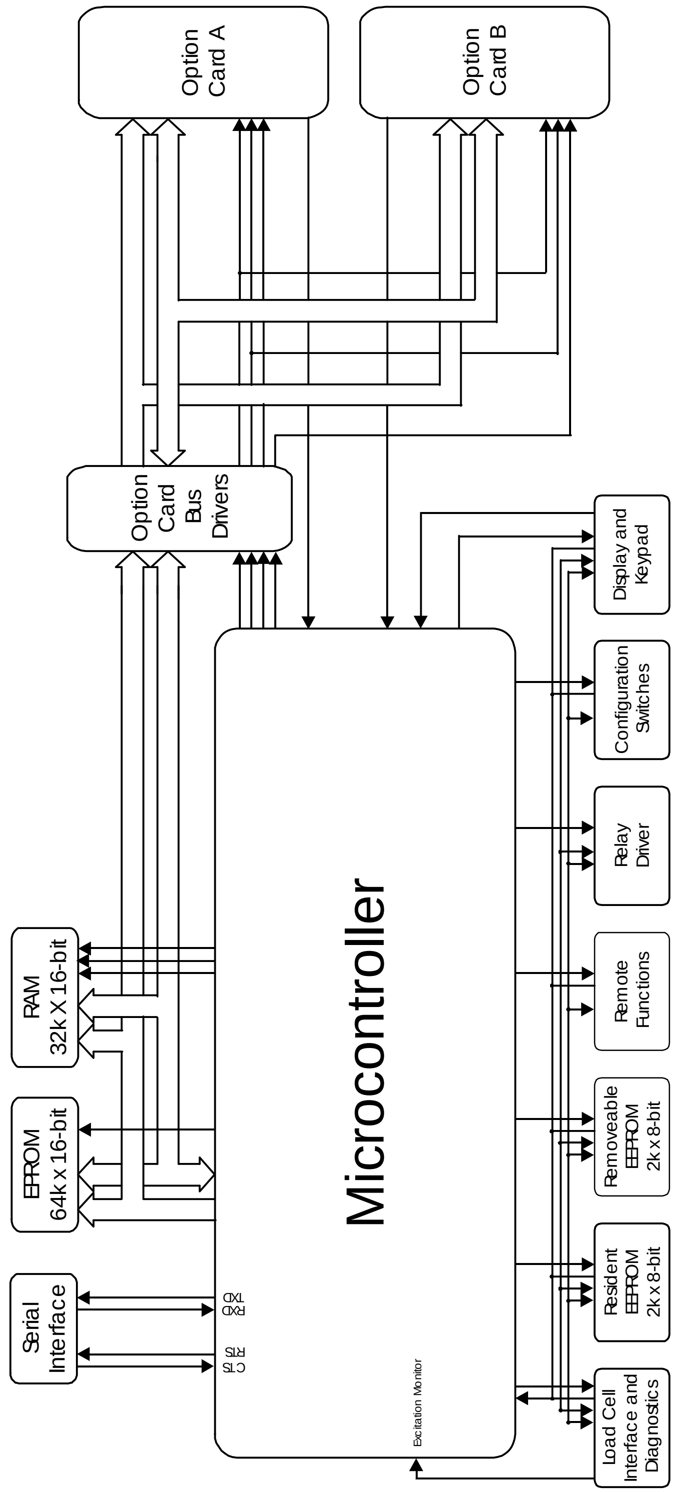
NOTE: *The zero key is used to exit a menu when numbers are entered (See Zero).*

- The key also enters the digit "0".

Enter

- When changing numerical values in a sub-menu, this key accepts or rejects the value.
- When a value is accepted a "GOOD" message will appear on the display and step forward to the next item on the menu.
- When a value is rejected, an "ERR" message appears on the display along with the entered value, allowing the user to change the value. For a list of error messages see Chapter 7, Troubleshooting.

Block Diagram



RS-232C, RS 422/485 Bi-directional Serial Port Setup Procedures

Step 1. Check the jumpers and dip switches to see that they are in the correct position. (See Chapter 4)

NOTE: *Remove jumpers with all barriers.*

Step 2. Press the Options button.

Step 3. Select the Serial Port (SERPRT) sub-menu.

Step 4. Press the Enter button. RS-232 appears. RS-232 is the default setting from the factory.

Step 5. To select RS-232, press on the Enter button.

Step 6. To select another port use the up or down arrows to select another serial option.

Step 7. Select either RS-422, or RS-485.

Step 8. Press the Enter button to set the port setting. If the jumpers are in the correct position the unit accepts the setting. Press exit to return to the main menu.

Step 9. If the jumpers are not in the correct position or there are no jumpers installed, a jumper error (JMPERR) will appear.

- Go through the configuration again to select the correct jumper position or install a jumper in the correct position. (See Chapter 4 for instructions.)
- Repeat steps 2 - 8.
- Press the Enter button to set the port setting.
- Press the Exit button to return to the main menu.

Bar Graph Setup Procedures

About Bar Graph Setup

The user can set the bar graph parameters by entering the lowest weight (value) and the highest weight (value) of the scale or any portion of the scale. When the user selects the Bar Graph function, the bar graph displays the current reading as a percentage of the selected scale range (e.g. 60 pounds on a scale from 0-100 lbs will read 60%). The bar graph can be setup to indicate Net Weight, Gross Weight and the options Totalizer, Rate-of-Change and Peak. Keep in mind that the bar graph can be totally independent of the displayed values.

Step 1. Press the Options button. The Options (OPTINS) sub-menu appears.

Step 2. Press the up arrow until BAR GR appears.

Step 3. Press the Enter button. BAR LO appears. This is the sub-menu to select the lowest weight in the selected scale range.

Step 4. Press the Enter button.

Step 5. If a value is present, press the test/clear button to clear the value. Use the numeric key pad to enter the new low value.

Step 6. Press Enter to select the new value. A GOOD will appear briefly if the setting is correct.

Step 7. BAR HI appears This is the sub-menu to select the highest weight in the selected scale range.

Step 8. Press the Enter button.

Step 9. If a value is present, press the test/clear button to clear it. Use the numeric key pad to enter the new high value.

NOTE: *It is important to know that the high setting can be a lower value than the low setting, which is necessary for some applications such as dispensing. The high setting value can also be a negative number.*

Step 10. Press the Enter button.

- A GOOD will appear briefly if the setting is a value other than the value for the low setting.
- An ERR will appear if the value is equal to the LO value.
- To correct the error, simply set the high value to a value other than the low value.

BCD Menu Setup Procedures

About BCD Communication (See Section 4 for Configuration Procedures)

The BCD option board provides parallel output of a sensed gross, net, or tare weight. The BCD option is setup by first entering the Option Menu and selecting the FORMAT menu.

The menu display shows a combination of **GNTDP** (G = gross, n = net, T = tare, D = display, P = print).

BCD Print

- The weight select mode tells the output device which type of data is present.
- The user selects which type of data is desired by toggling "GNT" under the Option/BCD sub-menu.
- If all three types of data are requested, then all three will appear on the output one after the other, 10 milliseconds apart.
- If "D" is selected, the output will follow the mode being displayed.

Setup Procedures

Step 1. Press the 7/Option key. This gives the user access to the Setup Sub-Menu. ROC or another option displays.

NOTE: *The display may show an option other than "ROC", depending upon which options were installed. The HI 2151/30WC will show the first available option, in our example, ROC.*

Step 2. Press the up or down arrow until the sub-menu BCD P1 appears.

Step 3. Press the Enter Button, the FORMAT sub menu appears.

Step 4. Press Enter. A series of letters (GNTDP) and spaces appear. For example: G N _ _ D P. Note that in our example the “T” is not displayed and that there are 6 spaces total. The sixth value is used in other communication protocols.

Print Output Options

If you want to print mode value(s) selected, such as G (Gross weight), N (Net weight) or T (Tare) on demand, select "P."

a. Press the up or down arrow until the letter "P" appears.

b. Now when the Print button is pressed it will print the Gross, Net, or Tare weights, whichever one is selected.

c. If you select all three, "GNT", it will print all three in sequential order.

NOTE: *If your input device cannot handle rapid input of data, do not select more than one mode.*

- If you don't want this function, press the up or down arrow until a space "_" appears.
- To output what appears on the display, select "D".

a. Press the left arrow one time to select "D" (BCD).

b. Press the up or down arrow until the "D" appears.

c. Now whatever mode appears on the display it is output.

- If you do not want output, press the up or down arrow until a space appears "_".

Step 5. Output Mode Options

- Tare Mode

a. Press the left arrow two times to select "T".

b. Press the up or down arrow until the "T" appears.

c. Now when the Output is triggered by the BCD Controller, the Tare Weight is sent.

d. If you do not want to select the Tare mode, press the up or down arrow until a space appears "_".

- Net Mode

a. Press the left arrow one time to select "N".

b. Press the up or down arrow to until the N appears.

c. Now when the BCD Controller triggers the output, the Net Weight is sent.

d. If you do not want to select Net mode, press the up or down arrow until a space appears "_".

- Gross Mode

a. Press the left arrow on time to select "G".

b. Press the up or down arrow until the G appears.

c. Now when the BCD Controller triggers the output, the Gross Weight is sent.

d. If you do not want to select Gross mode, press the up or down arrow until a space appears "_".

Step 6. Press the Exit button three times to return to the Main Menu

Serial Port Menu Setup Procedure (See Chapter 4 for Configuration Procedures)

- The standard serial port is setup through the option menu and is identified as **SER P1**.
- The following is a brief description of each parameter, followed by details on menu operation.

DISPLAY	**MEANING**
SERCON	Serial port configuration. The port can be used as either a print output port or as a bi-directional communication port.
BAUD	Baud rate selection. The baud rates that can be selected are: 1200, 2400, 9600, or 19,200.
PARITY	Parity selection for transmission error detection. Allows parity to be set at even, odd, or no parity.
STOPS	Stop bit selection. Sets number of bits used to indicate end of a transmission frame. The number of stop bits can be set to 1 or 2.
LENGTH	Word length selection. Sets the number bits for each data word. Word length can be set to 7 or 8 bits.
FORMAT	Formats the serial data output. To configure the output use the left arrow button to select the code letter corresponding to the specific parameter(s). When the letter is flashing use the **up** or **down** arrow buttons to toggle the code letter on the display. To enable a specific parameter, the code letter must be shown on the display. Pressing the **-/Test/Clr** button will restore all code letters. The codes are:

G	Gross Weight
N	Net Weight
T	Tare Value
R	Rate of Change (ROC)
S	Set point, Deadband, Preact Values

DISPLAY	MEANING
PRINT	Selects print mode. P sets print trigger and "-" sets continuous output.
BI-DIR	Selects bi-directional mode. The bi-directional codes are: A Altered print (removes checksums) P Bi-directional with print trigger - Bi-directional without print trigger.
ADDRESS	Selects the instrument address. This is a two digit value, being 01 to 99.
ECHO	Selects whether instrument commands are returned or displayed. Echo can be turned on or off. If the (bi-directional only) Echo is turned on, commands sent to the instrument are returned. If turned off, only data transmitted from the instrument will be displayed.
CONTRL	Selects hardware and software handshaking control. The hardware mode controls Request to Send (RTS) lines. In this mode the receiving device must set Clear to Send (CTS) lines to high to enable transmission. The software mode controls the transmission by the following control codes: XOFF - (CTRL-S) halt transmission XON - (CTRL-Q) resume transmission When a serial port is configured for bi-directional communication with a Print Trigger format, the control port will respond to the remote function print or serial print command just like a print port.

Serial Procedures

NOTE: *If you have a problem with weight readings not changing or not being able to exit from a menu, check to see that the instrument has not been set in the Display Hold mode by a serial command. A **C H** (change hold) command will toggle between **Hold** and **Unhold**. There is no visual indication showing the present mode.*

Step 1. Enter the Option Setup Menu by pressing the 7/Option button. The Rate of Change Sub-Menu ROC appears.

NOTE: *Display may show an option other than "ROC", depending upon the options installed. The HI 2151/30WC will show the first available option, in the example, ROC.*

Step 2. Press the up arrow ↑ until the Serial Port 1 SER P1 is displayed on the screen.

Step 3. Press the Enter button twice. First the Serial Connect display SERCON appears; then the Bi-directional or Print appears. BI - DIR or PRINT

Step 4. Use the up or down arrows ↑↓ to choose between bi-directional BI - DIR or PRINT. We used bi-directional for the example below.

Step 5. Press the Enter button twice. First the Serial Type Sub-Menu SERTYP appears; then the Configured Serial Protocol appears. For Example RS-232. (See Chapter 4 for Configuration Information)

NOTE: *If the Serial Protocol number displayed is not the one you want, STOP the setup process. Reconfigure the serial protocol (See Chapter 4) and begin the setup procedures again.*

Step 6. Press the Enter button twice. First the Baud Rate Sub-Menu BAUD appears; then the current preset BAUD rate is displayed.

Step 7. Use the up or down arrow ↑↓ buttons to select 1200, 2400, 4800, 9600, or 19,200. The example uses 19,200 BAUD.

Step 8. Press Enter twice. First the Frame sub-menu FRAME appears; then 8-N-1 appears.

Step 9. Press the down arrow ↓ button five times. First 7-0-1 appears, then 7-E-1 appears, then 8-N-2 appears, then 8-0-1 appears, and finally A-E-1 appears.

Step 10. The down arrow ↓ is used to select the Frame you want. When the frame selection you want appears press the Enter button. FORMAT appears.

Step 11. Press the Enter button. Gross, Net, Tare, Rate of Change, Set Point, Print, either one G-----, or any combination such as G-T--- or all GNTRSP may appear.

Step 12. Use up arrow ↑ to select "P" (to output on demand), or "_" (to output continuously).

- Use the left arrow ← to move cursor one space to the left to highlight the letter "S". The "S" starts flashing.
- Use the up arrow ↑ to select "S" (to output set points) or "_" (will not output set points).
- Use the left arrow ← to move the cursor one space to the left to highlight the letter "R". The letter "R" starts flashing.
- Use the up arrow ↑ to select "R" (to output the rate of change), or "_" (will not output rate of change)

- Use left arrow ← to move cursor one space to the left. The letter "T" starts flashing.
- Use the up arrow ↑ to select "T" (to output the tare value), or "_" (tare value will not be output).
- Use left arrow ← to move the cursor one space to the left. The letter "N" starts flashing.
- Use up arrow ↑ to select "N" (to output net weight) or "_" (will not output net weight).
- Use the left arrow ← to move the cursor one space to the left. The letter "G" starts flashing.
- Use up arrow ↑ to select "G" (to output gross weight), or "_" (will not output gross weight).

NOTE: *At least one of the letters "G", "N", "T", "R", or "S" must be selected or Error 54 will be displayed.*

Step 13. Press the Enter button twice. First the control Sub-Menu CONTRL appears; then SOFTRE or HARDRE appears.

Step 14. Use the up or down arrows ↑↓ to select either option.

Step 15. Press the Enter button twice. First the Echo Sub-Menu ECHO appears; then ON or OFF will be displayed).

Step 16. Use the up or down arrows ↑↓ to select either parameter. For our example select OFF.

Step 17. Press the Enter button twice. First the Address Sub-Menu ADDRES appears; then the current two-digit address appears.

Step 18. Press the -/Test/Clr button to clear the display.

Step 19. Enter the desired instrument address, 99 maximum. 10 (unit 10 is used for this example).

Step 20. Press the Enter button three times to return to the weight display and normal operation.

NOTE: ** Available only when "BI-DIR" mode is selected*

Analog Output Setup Procedures (Option)

About Analog Output (See Chapter 4 for Configuration Procedures)

The analog output option allows the user not only to output gross, net, ROC, Peak, or total weight as 0-5V, 0-10V, 0-20 mA or 4-20 mA (or the reverse of these via the front panel), but makes it possible to span these ranges over a portion of the weight data. A full analog output is obtained over the range desired. Resolution of the analog out is 16,000 counts, or the number of display counts available in the range selected, whichever is less. All of this is accomplished via the front panel or the serial port. Two analog option boards may be installed in each unit.

Analog Output Menu Setup Procedures

Step 1. Press the 7/Option button. ROC appears.

Step 2. Press the up arrow until Analog Output 1 ANAOUT1 or Analog Output 2 ANAOUT2 is displayed.

Step 3. Press the Enter button. ANLO appears.

Step 4. Press Enter button.

Step 5. Press -/Test/Clr button to clear the entry.

Step 6. Use the numerical keypad to enter the value desired. (Enter (-) for loss-in-weight systems.)

Step 7. The value displayed will equal 4 milliamps, 0 milliamps, or0 volts, depending on which output and configuration is used.

Step 8. Press the Enter button. A GOOD will momentarily appear and AN HI appears.

Step 9. Press the Enter button.

Step 10. Press -/Test/Clr button to clear the entry.

Step 11. Use the numerical key pad to enter the numerical value desired. (Enter (-) for loss-in-weight systems.)

Step 12. The value displayed will equal 20 milliamps, 10 volts, or 5 volts, depending on which output and configuration is used.

Step 13. Set mode by pressing the MODE button until the cursor is flashing under the desired option. Select from total, gross, net, ROC, or peak. The default is gross.

Step 14. Press the Enter button. AN - LO re-appears.

Step 15. Press the Exit button. ANOUT re-appears.

Step 16. Press the Exit button again to return to the weight display.

NOTE: *Display may show an option other than "ROC", depending upon the option boards installed.*

NOTE: *Previously set numerical value will be displayed. "0" is the default.*

NOTE: *Display momentarily flashes GOOD if value is a valid entry.*

Setting the Rate of Change Procedures

Step 1. To select Rate of Change Mode: Push the MODE button until the ROC LED indicator is lit

Step 2. Press the 7/Option button. ROC appears.

Step 3. Press the Enter button. UNITS appears.

Step 4. Press the Enter button. U-SEC appears.

NOTE: *Previously set time value will be displayed. For this example, the time value will be set to seconds.*

Step 5. Use the up ↑ or down arrows ↓ to select the appropriate measurement of time (seconds U-SEC, minutes U-MIN, or hours U-HR).

Step 6. Press Enter button. BASE appears.

Step 7. Press the Enter button.

Step 8. Use the up or down arrows to select time base from one of the following: 1, 2, 3, 4, 5, 6, 10, 12, 15, 30, 60, 120,240, 450, 900, or 1800.

Step 9. Press the Enter button. The UNITS re-appears.

Step 10. Press the Exit button twice to return to the weight display.

NOTE: *Display may vary depending on which options were installed in your instrument. The HI 2151/30WC will show the first available option, in this case, ROC.*

TOTAL Setup Procedures

Step 1. Via the Calibration Menu, select the desired decimal point position.

Step 2. To add weight value to the Total Register: The current net weight displayed will be added to the net weight accumulated in the total register when the total remote function input is detected (this is accomplished by providing a momentary switch to the remote function connector between J2, Pin 8 and J2, Pin 9 or 10.

Set Up for Profibus Interface Card Option -B12

See the Profibus Interface Option, Card Operation and Installation Manual #0596-0231 for complete instructions.

Allen-Bradley Remote I/O Option -B8

See the Allen-Bradley Remote I/O Installation and Operation Manual # 0596-0173 for complete instructions.

CHAPTER 6 - CALIBRATION

Chapter 6 covers calibration procedures for the HI 2151/30WC weight controller. Users and service personnel should be familiar with these procedures before installing or operating the HI2151/30WC.

For the weight controller to work properly, it must be calibrated prior to operation. We also recommend that the instrument be re-calibrated periodically or when not in use for extended periods. Be sure to follow the procedures completely to ensure that the weights read by the controller are accurate.

All calibration should be done in the Gross mode.

Pre-Calibration Procedures

Mechanical Check Procedures

Step 1. Check to determine if the load cells have been installed properly.

- Refer to your load cell I&M manual for proper installation instructions.
- On some single and double ended shear beam load cells there is an arrow (↓) that indicates the direction of the applied load. If the arrow is pointing in the wrong direction, change the position of the load cell so that it is mounted in the direction of the applied load.

Step 2. Check for Binding on the Load Cell or other parts of the system.

CAUTION

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

- A load cell must be mounted in such a way that 100% of the load (Vessel w/Contents) is vertically passed through a load cell. (See Fig. 6-1)
- Check to see that nothing is binding the load cell. This means that nothing is draped across the scale/vessel or the load cell, such as a hose, electrical cord, tubes, or other objects.

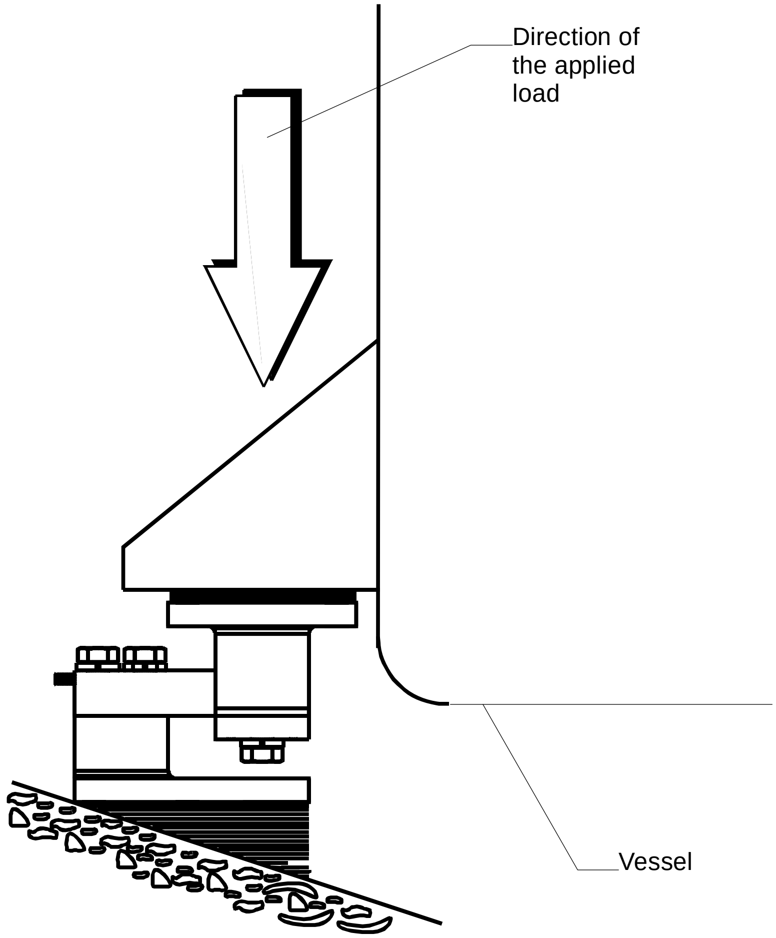


FIG. 6-1 PROPERLY INSTALLED LOAD CELL W/NO BINDING

Step 3. Check to see that nothing is coming in contact with the scale/vessel other than service wires and piping that have been properly mounted with flexible connectors.

Electrical Check Procedures

Step 1. Check to see that there is power to the controller.

- If there is power to the controller The front panel display should be lit.
- If an error message (ERREXC) appears in the display, it means there is a problem in the system. See Troubleshooting Chapter 8 for corrective action.
- If the display appears with a value the unit is ready for calibration.

Step 2. Typical Load Cell/Point Input/Output Measurements (EXC & SIG Outputs)

- The HI 2151/30WC is designed to supply 5 vdc excitation to as many as eight 350 ohm load cells/points.

- The expected output from each load cell/point depends on the mV/V rating of the load cell/point and weight.
- For example, a 2 mV/V load cell/point will respond with a maximum of 10 mVDC at full weight capacity of the system which includes the weight of the vessel and the weight of the product as measured by the load cell/point.
- If the load cell/point weight capacity is rated at 1000 pounds, the load cell/point output will be 10 mVdc at 1000 pounds, 7.5 mVdc at 750 pounds, 5 mVdc at 500 pounds and so on.
- A zero reference point will vary from system to system depending on the "Dead Load" of the vessel. "Dead Load" is the weight of the vessel and appurtenances only, with no product loaded. In our example we will assume the dead load to be 500 lbs. (See Fig. 6-2)

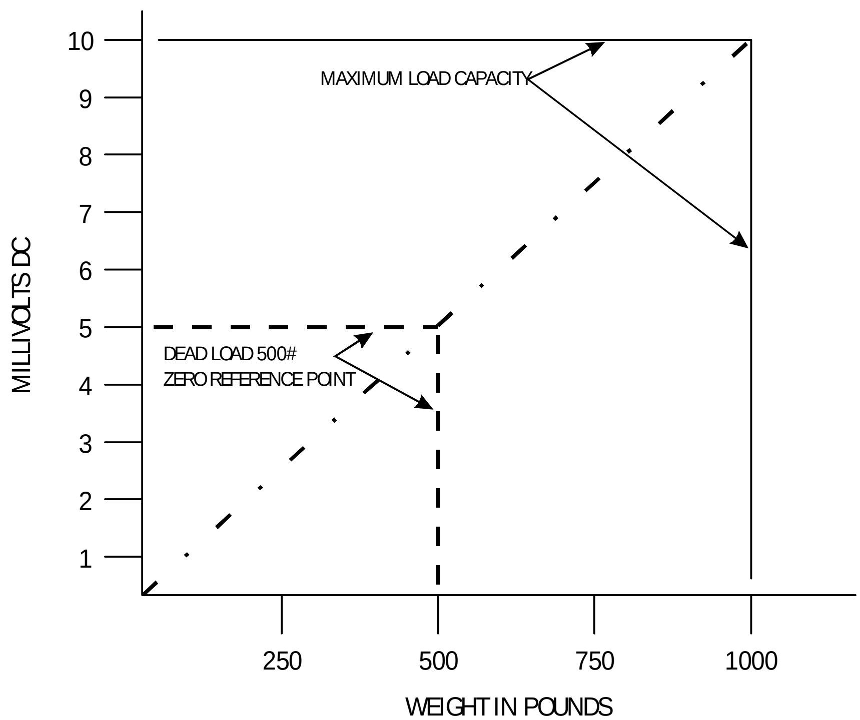


FIG. 6-2 MILLIVOLTS/WEIGHT SCALE

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

NOTE: *Load cell/point measurements are checked with a digital volt meter at the summing junction box or the J1 connector on the rear panel of the HI 2151/30WC or use Integrated Technician. if using the IT Junction Box.*

Step 3. Allow the controller to warm up for about 15 minutes before doing the calibration procedures.

Fourteen Segment Display

The display is a six-digit, fourteen segment display with selectable decimal placement. The display can show positive values up to 999999 and negative values down to -99999. The LED display shows operational status messages as well as actual numeric values. (See Figs. 6-3 & 6-4)

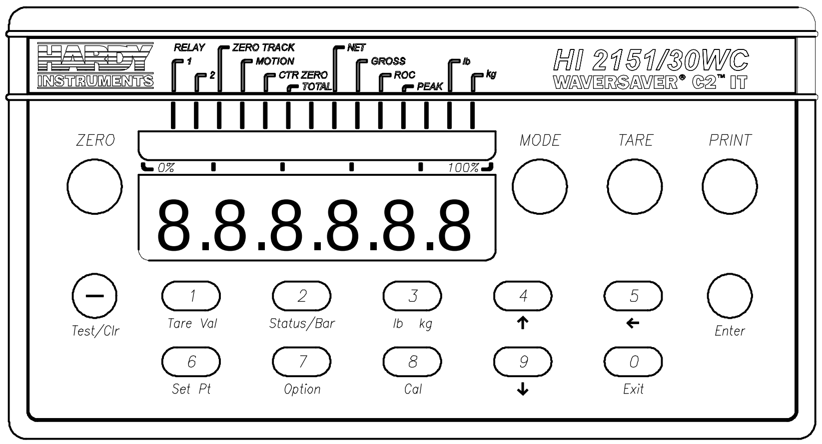


FIG. 6-3 FRONT PANEL DISPLAY WITH NUMBERS

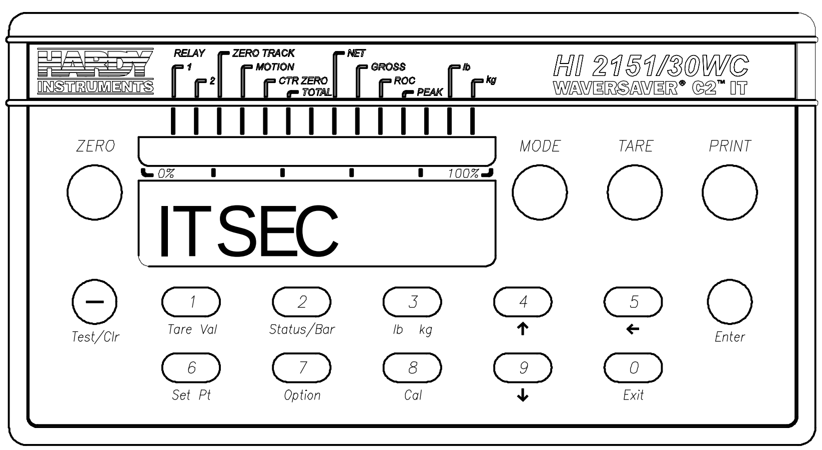


FIG. 6-4 FRONT PANEL DISPLAY WITH TEXT

Combination Status Indicator/Bar-Graph LEDs

- There are 30 discrete LEDs above the fourteen segment display, that function as status indicators and a bar-graph display. (See Fig. 6-5)

NOTE: *The status indicators use every other led whereas the bar graph uses all thirty when displayed.*

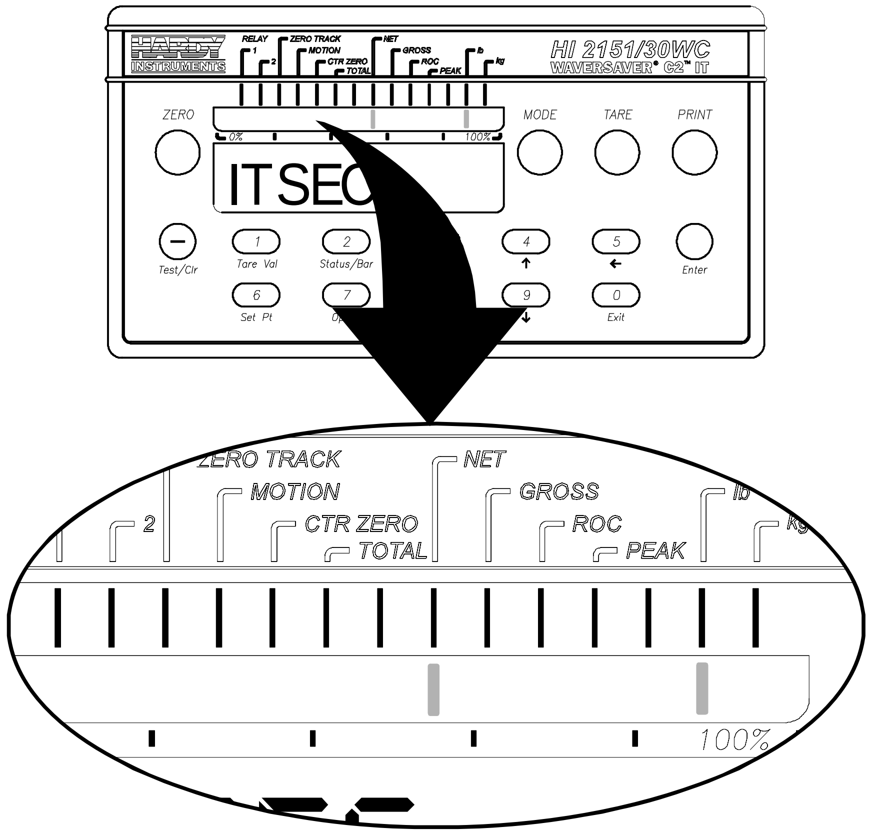


FIG. 6-5 FRONT PANEL STATUS LEDS DISPLAYED

- To switch between status and bar graph display, press the **Status/ Bar** button. In the status mode, LEDs will light to indicate the following weight controller conditions:

DISPLAY	MEANING
CTR ZERO	Indicates when the sensed weight is within 1/4 of a display grad of calibrated zero.
MOTION	Indicates when the variation in consecutive weight readings exceeds the calibrated motion tolerance.
ZERO TRACK	Indicates when the zero track function is activated. Zero track is toggled on or off by the 0 Trk dipswitch (S3) on the rear panel.
RELAY 1	The status relay LED flashes when the respective set point value has been reached. Indication is only for the standard, internal set points.

DISPLAY	MEANING
RELAY 2	The status relay LED flashes when the respective set point value has been reached. Indication is only for the standard, internal set points.
GROSS/NET	Indicates the mode of the measured value on the display. All calibration should be done in Gross mode.
TOTAL/ROC	Indicates the mode of operation currently PEAK configured.

NOTE: *Total, Rate-of-change, and Peak are options that must be installed before these led indicators will function.*

Lb/Kg	Indicates U.S. or metric unit-of-measure of the weight parameter on the display.
Bar Graph	The Bar Graph function displays in graphical form the value of the mode (Total, Gross, Net, ROC, Peak) selected in the bar graph setup menu.

NOTE: *The bar graph mode and the display mode are totally independent. Make sure you know what mode each are in before reading.*

Load Check

Step 1. Place a load (weight) on the scale or vessel.

Step 2. Check to see if the weight reading changes on the display in the proper direction.

- e.g. if the display reads 100 pounds and a 20 pound load is placed on the vessel or scale, the display should read 120 or some value over 100.
- If the display reads 80 pounds and a 20 pound load is placed on the vessel or scale, the reading is going in the wrong direction and indicates a problem. (See the Chapter 8, Troubleshooting for corrective action.)
- If the display is reading improperly or shows no change, something is wrong either with the setup or configuration.

Step 3. If the display changes in the proper direction, remove the weight and proceed to calibrate the controller.

Calibration Setup Procedures

The Calibration Menu

NOTE: *When calibrating the instrument for the first time, go from one sub-menu to the next in sequence. If you want to change one of the sub-menus, continue to press the Up Arrow button until you reach the sub-menu you want to change.*

NOTE: *After entering a value in each sub-menu the display will flash a GOOD if the value is accepted. If the value is not accepted the display will flash an ERR # statement.*

NOTE: *The example settings provided below depict a typical system and are for illustration only, your setting requirements may vary.*

Step 1. Make sure the controller is in Gross Mode.

Step 2. Press the Cal button. Security Code (SEC CD) is displayed.

Step 3. Press the Enter button. A flashing zero (0) appears.

Step 4. Enter the security code number (5321).

Step 5. Press Enter. The word UNIT appears. Note the three leds (Zero Track, Motion, and CTR Zero) start to flash on the left side of the status display.

Setting the Unit of Measure. (UNIT) Pounds (Lb) or Kilograms (Gr)

Step 1. Press the Enter button. LB appears.

Step 2. To select pounds (LB) press the enter button.

Step 3. To select kilograms, press either the up or down arrow button until GR is displayed. Press the enter button.

Step 4. The unit of measure is selected and will be the basis for all set points.

Step 5. "DECPNT" appears on the display.

NOTE: *The displayed unit of measure can be changed during normal operation. However, all internal calculations use the unit of measure selected during calibration.*

Setting the Standard Decimal Point (DECPNT)

This parameter sets the number of decimal places to use in weight values (Total weight may be set to a different number of decimal places).

Step 1. To determine the highest recommended decimal point, divide the total load cell capacity by 10,000, and use the number of decimal places in your answer as a reference. For example: 10,000 EU scale divided by 10,000 = 1, no decimal point is recommended. 100 EU load cell capacity divided by 10,000 = .01, requiring two decimal points or less is recommended.

Step 2. Press the Enter button. Six number eights (88888.8) are displayed.

Step 3. To select the decimal point location, push the left arrow ← until the decimal point is in the correct position. The decimal point will wrap from left to right.

NOTE: *There is no right arrow (→).*

Step 4. Press the Enter button to accept the decimal location.

Setting the Total Decimal Point (Option -C6) (TOT DP)

This parameter sets the number of decimal places to use in total weight values.

NOTE: *The Total Decimal Point must be less than or equal to the standard decimal point position. For example: A Decimal Point that equals 88888.8, the Total Decimal Point should equal 88888.8 or 88888.*

Step 1. If the optional weight totalizer is installed, TOT DP appears on the display.

Step 2. Press the Enter button. There are six number eights 888888 displayed.

Step 3. To select the decimal point location, push the left arrow ← until the decimal point is in the correct position. The decimal point will wrap from left to right.

Step 4. Press the Enter button to accept the decimal location, The Motion Tolerance sub-menu MOTION appears on the display.

Setting the Motion Tolerance Value (MOTION)

Step 1. The base motion number can be calculated by using the following formula:

Base Motion Number = Total Load Cell Capacity/10,000 x 3

NOTE: *Motion Tolerance must be greater than or equal to the Graduation Sizes. Recommendation would be three graduation sizes.*

Step 2. The motion tolerance is the tolerance value used to determine if the scale is in motion.

Step 3. The controller displays the MOTION LED when a change in the displayed (averaged) reading is outside the value entered.

Step 4. Default value is 3 units of measure.

Step 5. Press the -/Test/Clr button to clear the current value.

Step 6. Use the numeric keys to type in the new tolerance value.

Step 7. Press Enter. The Graduation Size GRAD is displayed.

Setting the Graduation Size (GRAD)

The graduation size sets the minimum increment the instrument will compute and display. The Base Graduation Number is calculated by dividing the total load cell capacity by 10,000. For example: With two decimal points selected, the graduation size 10 will display increments of .10 engineering units. With two decimals points selected, the graduation size 50 will display increments of .50 engineering units.

NOTE: *If you undersize your graduation setting to increase display resolution, do not use auto zero tracking. This combination will damage the SMM due to excessive write operations.*

Step 1. Press the Enter button. The graduation size 20 appears on the display with the zero flashing.

Step 2. There are nine graduation size selection options:

1	50
2	100
5	200
10	500
20	

Step 3. To select one of the sizes, use the up arrow ↑ or down arrow ↓ keys to scroll through the selections.

Step 4. The graduation size is recalculated each time the instrument is calibrated for span.

Step 5. Press Enter to accept the selection. The Zero Tolerance (OTOL) sub-menu appears on the display.

Setting the Zero Tolerance (0 TOL)

This sets a weight limit for an operator adjusting the weight of an empty scale using the upper left ZERO push button. This value is the zero tracking window and reflects an amount of weight differential of an empty scale. Normally, a Zero Tolerance amount equal to 2% of the total load cell capacity is acceptable. The default zero tolerance is 10 units of measure (10 is displayed). The maximum Zero Tolerance number that can be entered is 32766.

NOTE *The amount of weight zeroed off is cumulative. The zero command will fail if the current gross weight plus any previously zeroed amount exceeds the zero tolerance.*

Step 1. Press the Enter button. The default display will appear (10) or the previous set value (10).

Step 2. Press the -/Test/Clr button to clear the current value

Step 3. Use the numeric keys to enter the new value.

Step 4. Press the Enter button to accept the new value. Zero Tolerance sub-menu (O TOT) appears on the display.

Setting The Auto Zero Tolerance (A0 TOT)

This parameter sets a weight limit that applies when the Auto Zero Tracking feature (0 TRK) or a communication command adjusts an empty scale. When 0 TRK is enabled, the display is reset to zero when the weight is within the set limits and not in motion.When the Auto Zero Tolerance (0 TOT) is enabled (Set Dip Switch #8, See Chapter 4), any weight within the set zero tolerance limit will cause the display to automatically read zero when the scale is not in motion.

Normally an acceptable Zero Tolerance amount is less than or equal to 1.5% of the total load cell capacity. The default auto zero tolerance is 10 units of measure, and the maximum number you can enter is 32766.

NOTES: *Incorrect graduation size or a drifting scale with auto zero tracking enabled can damage the SMM.*

The amount of weight zeroed off is cumulative. The autozero command will fail if the current gross weight plus any previously zeroed amount exceeds the zero tolerance.

Step 1. Press the Enter button. The default display will appear (10) or the previous set value.

Step 2. Press the -/Test/Clr button to clear the current value

Step 3. Use the numeric keys to enter the new value.

Step 4. Press the Enter button to accept the new value.

Step 5. If the value does not exceed the maximum zero tolerance value or is not a negative value, the screen will accept the new value.

Step 6. If the value exceeds the maximum zero tolerance value or is a negative number, an ERR 15 is displayed. You need to change the value to meet the requirements in step "3". Go to step 4 and repeat steps 4, 5 & 6 to enter new values until the value meets the requirements in Step 3.

Step 7. Press the Enter button to accept the new value. "AVRAGE" sub-menu appears.

NOTE: *Weight can accumulate up to the value entered for the Auto Zero Tolerance and the instrument will automatically display a 0.*

Setting the Number of Readings Averaged (AVRAGE)

Step 1. This setting is to aid in ignoring the effects of material impact. If material is not entering or exiting the scale evenly, necessary weight fluctuations can be seen. Averages also contribute 50 ms each to the overall time to calculate the scale weight. Applications requiring very quick weight readings should reduce this setting to it's minimum. If the weight is unstable due to material impacting, increase the averages. This sets the number of weight readings that will be used to compute the displayed weight. The average is a sliding average so that a new average is available for display at every reading.

Step 2. This sets the number of weight readings which will be used to compute the displayed weight.

Step 3. The average is a sliding average so that a new average is available for display at every reading.

Step 4. The default number of readings per average is 10.

Step 5. Press the Enter button.

Step 6. Use the numeric keys to enter the new value in the range of 1 to 200. (If you enter a number greater than 200 or a negative number, the ERR 3 statement will appear.) Press the -/Test/Clr button. Enter a new number.

Step 7. Press the Enter button. The Scale Capacity (SC CAP) sub-menu appears.

Setting the Scale Capacity (SC CAP)

Step 1. If this value is exceeded by 5% an HI indication appears on the front display. Communications to and from optional devices are not effected. This value is the nominal operating capacity of the scale. The value you set should be the small value between the capacity of the vessel (volume in Gallons or Liters converted to weight in Lbs or Kgs) and the combined weight capacity of the load cells (Lbs or Kgs).

Step 2. The value you set should be the smaller value between the capacity of the vessel (volume in gallons or Liters converted to weight in Lbs or Kgs) and the combined weight capacity of the load cells (Lbs or Kgs).

For example: A vessel's capacity in volume is 2,000 gallons, in this case water. (One gallon of water weighs approximately 8.54 lbs.) The weight will be 17,080 lbs. The combined live load capacity of the load cells is 20,000 lbs. Select the lesser of the two values which in our example is 17,080 lbs. Enter 17,080.

Step 3. Press the Enter button. The WAVERSAVER® (WVRSVR) sub-menu appears.

WAVERSAVER® (WVRSVR)

Step 1. The lower the vibration the more steps and time required to calculate the vibration frequency. Adjust the Average and WAVERSAVER settings to establish minimal weighing time. Use WAVERSAVER settings 1-3 for low amplitude high frequency vibrations. Use WAVERSAVER settings 3-5 for high amplitude low frequency vibrations.

Step 2. Press the Enter button.

Step 3. A value appears. The Default setting is 4.

Step 4. There are 5 selectable levels. 1 provides the least vibration immunity with the fastest response time, and 5 provides the most vibration immunity with the slowest response time.

Step 5. Press the up arrow ↑ to select the setting (1-5).

Step 6. 6.Press Enter to accept the value. The Calibration (CAL) sub-menu appears.

This ends the Calibration Setup Process

Calibration Procedures

Step 1. Press the Enter button. The Hard Calibration HD CAL Sub-Menu appears.

Step 2. Use the Up or Down arrows ↑↓ to select one of the Calibration procedures:

- C2™ Calibration (C2 CAL)
- Hard Calibration (HD CAL)
- Soft Calibration (S CAL)

NOTE: *Select one calibration process only. C2 and Hard Calibration are used most often. C2 Calibration is only possible with Hardy Instruments Load Cells/Sensors or Points.*

C2® Second Generation Calibration Procedures

Step 1. From the CAL menu, press the down arrow button. The C2 CAL sub-menu appears.

Step 2. Press the Enter button. The Load Cell Count LC CNT sub-menu appears.

Step 3. Verify that the load cells detected by C2 calibration equal the actual number of load cells installed in the system. If the load cells detected do not match the load cells installed in the system do the following:

1. Press the Enter button.
2. Press the Exit button three times.
3. Press the -/Tst/Clr button. The Self Test (SLFTST) menu appears.
4. Press the Enter button to perform the Self Test. The Self Test will give the serial numbers of the load cells that are found by the instrument. If one of the serial numbers is not found it means that a load cell is not communicating with the instrument. Verify that the load cell wires are properly connected. See the Load Cell certificates for color code information.

NOTE: *The controller can detect up to 8 C2 load point/cells on one vessel. The load points/cells are detected during power-up.*

5. Press the Enter button. The Reference Point REF PT sub-menu appears.

Step 4. Setting the Reference Point (REF PT)

- Press the Enter button.
- Press the -/Tst/Clr button to clear the current entry.
- Use the numeric keys to enter the reference weight or use the default reference weight "0" by pressing the Enter button. Any known weight within the scale range can be used as the reference weight. The recommended and default value is zero (0).
- Make sure that there is no vibration on or around the scale/vessel or is as low as possible.
- Press the Enter button. The RETURN display appears.

Step 5. Using the Return button. (RETURN)

1. If you want to change any setting(s) in the C2 Calibration procedures, push the up arrow which takes you back to the load cell count LC CNT sub-menu. Press the up arrow until the sub-menu you want to change appears then press the Enter button. Follow the procedures above for the menu.

2. If you want to accept the C2 Calibration parameters press the Enter button. The End Calibration END CAL message is displayed.
3. Press the Enter button again. This seals all calibration settings and exits the C2 Calibration Menu.
4. The instrument returns to the normal weight display.

NOTE: *If the Enter button is not pushed after End Cal appears, three leds will flash indicating that the settings are not sealed in memory.*

End of C2 Calibration

NOTE: *To correct mistakes during calibration, or to return to a previous calibration parameter, press the down arrow to bypass parameters, press the up arrow ↑.*

Hard Calibration Procedures (HDCAL)

NOTE: *Hard Calibration is the traditional method of calibration that uses test weights. We recommend that the test weights total 80 to 100% of the scale weight.*

NOTE: *Hard Calibration must be performed with the instrument in GROSS MODE.*

Selecting the Hard Calibration Sub-Menu

Step 1. Make sure that the instrument is in Gross Mode.

Step 2. From the Weight Display, Press the 8/Cal button. The Security Code (SEC CD) displays.

Step 3. Press the Enter Button. A flashing zero (0) appears.

Step 4. Enter the security code number (5321), then press the Enter button. The Unit of Measure UNIT Sub-menu appears.

Step 5. Press the down arrow ↓ until the CALSub-Menu appears.

Step 6. Press the Enter button. The Hard Calibration HD CAL Sub-Menu appears.

Step 7. Hard Calibration requires a zero point and the physical placement of test weights on the scale.

Step 8. Press the Enter button. The ZERO sub-menu appears.

Setting the Zero Calibration Value

Step 1. Remove all weight "live load" from the scale.

Step 2. Press the Enter button. A dash "--" appears.

Step 3. Press the -/Test/Clr button. A "0" appears.

Step 4. Wait 12 seconds.

Step 5. Press the Enter button.

Step 6. Either a GOOD or ERR# appears.

Step 7. If an ERR number appears go to Chapter 8, Troubleshooting for more information.

Step 8. If a GOOD appears the Span (SPAN) display appears.

NOTE: *The resistance baseline for non C2 load cells, is also set when the Zero Calibration Value is entered. (See Section 5 for more information)*

Setting the Span Calibration Value

Step 1. Place a certified test weight on the scale.

Step 2. Press the Enter button. A dash "--" appears.

Step 3. Press the -/Test/Clr button. The previous span value appears.

Step 4. Press the -/Test/Clr button. A "0" appears.

Step 5. Use the numeric keys to enter the value of the test weight. (If a 50 lb weight is used, enter 50).

NOTE: *Ideally the test weight used for the dead load should be the typical weight that will be measured in the application.*

Step 6. Wait 12 seconds.

Step 7. Press the Enter button to set the span. The Linear Correction (LINCOR) Sub-Menu appears. Press the -/Test/Clr button two times. The Return (RETURN) Sub-Menu appears.

The Return (RETURN) Display

The RETURN Display allows the user to change any setting(s) entered in the Hard Calibration Sub-Menu.

Step 1. Push the up arrow ↑ which takes you back to the Zero Sub-Menu.

Step 2. Press the up ↑ arrow until you reach the sub-menu you want to change and press enter.

Step 3. Follow the procedures for each Sub-Menu you want to change.

Step 4. If you want to accept the Hard Calibration parameters entered, press the Enter button. The End Calibration END CAL message is displayed.

Step 5. Press the Enter button. This seals all calibration settings and exits the Hard Calibration Menu.

Checking for Mechanical Problems

Step 1. Place a test weight on the scale.

Step 2. Check the displayed weight value.

Step 3. Remove the test weight from the scale. If the displayed value is zero the hard calibration is complete. If some value other than zero is displayed, check for mechanical problems, most likely binding in the system. (See Chapter 8, Flow Chart H for details) Correct the problems and perform the Hard Calibration Process again.

NOTE: *To correct mistakes during calibration, or to return to a previous calibration parameter, press the down arrow ↓ to bypass parameters, press the up arrow ↑.*

Hard Calibration Self Test Procedures (Traditional Method Using Test Weights)

Perform the Hard Calibration Self Test

Step 1. Press the -/Test/Clr button. The Self Test SLFTST Sub-Menu appears.

Step 2. Write down all the Hard Calibration self test parameters on the Self-Test, Calibration Results form. (See Appendix C, HI Document # 0570-0016-01 for single controllers or 0575-0016-02 for multiple controllers) Please photocopy as many copies of the form(s) as you need.

Step 3. Press the down arrow ↓ button to pause the test.

Step 4. To review the test results, Slot 1 for example. Press the down arrow to pause the Self Test. Press the up arrow one time and the value for Slot 1 appears for example "none". Write "none" down in the results column for Slot 1 on the Self Test - Calibration form. The user can continue to push the up arrow to review more results, or let the controller resume the self test until the tests are completed.

Step 5. There are two tests which are Pass/Fail. The Check Sum and the RAM test. If the controller fails either one of these tests, contact your local representative or Hardy Instruments, Customer Support Department.

Soft Calibration Procedures for Single Load Cell/Point Systems

NOTE: *Soft Calibration for systems with more than one load cell/point contact: Hardy Instruments Inc., Customer Support Department.*

About Soft Calibration

- Soft-Cal is a procedure that quickly calibrates a scale system, on-site, without test weights, material substitution or forced calibration.
- The process uses the certified, full scale mV/V output (sensitivity and range) of each load cell.
- The full scale mV/V output of each load cell is mathematically combined with a measured reference point, usually but not always zero, to calibrate the scale.
- The full scale mV/V data is on the calibration certificate which is shipped with every Hardy load cell.
- The process assumes a consistent center of gravity on the scale with even distribution.

- All load cells must be correctly installed with no binding of any kind on the scale.
- You must use the same length cable as supplied with the load cell. **DO NOT CUT THE CABLE!!!**
- A multiple load cell system, using a junction box, all balance potentiometer and resistors must be zero.

NOTE: *For multiple load cell systems contact your local dealer or Hardy Instruments, Customer Support Department.*

- The Soft-Cal menu cannot be entered while in the National Bureau of Standards (NBS) mode.

Selecting the Soft Calibration Sub-Menu

Step 1. From the Weight Display, Press the 8/Cal button. The Unit of Measure UNIT Sub-menu appears.

Step 2. Press the down arrow ↓ until the CAL Sub-Menu appears.

Step 3. Press the Enter button. The Hard Calibration HD CAL Sub-Menu appears.

Step 4. Press the down arrow ↓ until the Soft Calibration S CAL Sub-Menu displays.

Step 5. Press Enter. The Sensitivity Sub-Menu SNSTVY appears.

Setting Sensitivity Values

Step 1. Use the numeric keys and enter the load cell full scale output in mV/V found on the load cell calibration certificate.

Step 2. You must enter five digits. If a load cell is listed at less than five digits, add 0's to make up the five digit number. For example: When the full scale output in mV/V is "2.99". You need to enter the number as "29900". The least significant numbers are on the right when looking at the display.

Step 3. When multiple load cells are used, contact Hardy Instruments Customer Service Department to compute the system total full scale output sensitivity.

Step 4. Press Enter. The Scale Range sub-menu RANGE appears.

Setting the Scale Range (RANGE)

Step 1. Press the Enter button.

Step 2. Use the numeric keys and enter the sum of the rated capacities of all load cells being used. An example: There are 3 load cells rated at 1,000 lbs capacity each. The value to enter is 3000.

Step 3. Press the Enter button. The Reference Point Sub-Menu REF PT appears.

NOTE: *For HI 2151/20WC users the next setting would normally be the sticker value. The sticker value for the HI 2151/30WC is entered at the factory and cannot be changed. Therefore it is not necessary to set the sticker value in Soft Cal.*

Setting the Reference Point

- The reference point = the current live load on the scale platform.
- Any known weight within the scale range can be used as the reference point. The zero point (no material load) is recommended.

Step 1. Press the Enter button. A dash "--" appears.

Step 2. Press the -/Test/Clr button to clear the entry and enter a value.

Step 3. Use the numeric keys and enter the reference point. For example: 0.00

Step 4. Wait 12 seconds.

Step 5. Press the Enter button. A WAIT prompt appears, then either a GOOD or an ERR 4 or ERR 18 appear.

Step 6. If the GOOD appears. Press the Enter button. The RETURN Sub-Menu appears.

Step 7. If either of the two ERR statements occur, go to Chapter 8, Troubleshooting for more details.

Using the Return (RETURN) Function

Step 1. If you want to accept the Soft Calibration parameters press the Enter button. The End Calibration ENDCAL message is displayed.

Step 2. Press the Enter button. (DO NOT PRESS THE EXIT BUTTON) This updates all the calibration parameters in the Calibration Menu and saves the parameters to the Secure Memory Module. The Weight Display appears.

End of the Soft Calibration Process

Soft Calibration Self Test Process

Performing the Self Test

Step 1. Press the -/Test/Clr button. The Self Test SLFTST Sub-Menu appears.

Step 2. Write down all the Soft Calibration Self Test parameters on the Self-Test, Calibration Results form. (See Appendix A, HI Document # 0570-0016-01 for single controllers or 0575-0016-02 for multiple controllers) Please photocopy as many copies of the form(s) as you need.

Step 3. The down arrow pauses the test and the up arrow scrolls through the tests one at a time.

Step 4. To review the test results, Slot 1 for example. Press the down arrow   to pause the Self Test. Press the up arrow   one time and the value for Slot 1 appears for example "none". Write "none" down in the results column for Slot 1 on the Self Test - Calibration form. The user can continue to push the up arrow to review more results, or let the controller resume the self test until the tests are completed.

Step 5. There are two tests which are Pass/Fail. The Check Sum and the RAM test. If the controller fails either one of these tests, contact your local representative or Hardy Instruments, Customer Support Department.

NOTE: *To correct mistakes during calibration, or to return to a previous calibration parameter, press the down arrow to bypass parameters, press the up arrow ↑.*

INTEGRATED TECHNICIAN (IT®)

Setting Resistance Baseline for Excitation Monitor

1. C2 Load Cells

If C2 load cells are used in the weight control system, the controller calculates the resistance value during power up and turns on the excitation monitor.

2. Non C2 Load Cells

If Non C2 Load Cells are used in the weight control system, the controller will capture the resistance value when performing the Hard Calibration when setting the Zero Calibration Value.

Quick C2® Calibration Procedures

About Quick C2 Calibration

The quick C2 calibration should be used when the controller has already been properly calibrated and when the system is determined to be slightly out of specification, for a scheduled periodic calibration.

- The Quick C2 calibration procedures do not replace the regular C2 calibration procedures.

Step 1. From the CAL menu press the Enter button. The HD CAL menu appears.

Step 2. Press the down arrow. The C2 Calibration sub- menu C2 CAL appears.

Step 3. Press the Enter button. The Load Cell Count LC CNT appears.

Step 4. Press the up arrow. The Reference Point sub-menu appears.

Step 5. Press the Enter button.

Step 6. Enter the weight of the current "live load" that is on the scale.

Step 7. Press the Enter button. The RETURN display appears.

Step 8. Press the Enter button. The END CAL display appears

Step 9. Press the Enter button to set the changes.

Procedures to Restore Calibration Parameters

Before Clearing Memory

- If the parameters for the controller are on the Self Test - Calibration Form (Prt. # 0575-0016) enter the values from the form.
- If the user does not have the parameters from Self Test - Calibration Form handy, go through the Self Test again and write them the parameters.

CAUTION

IF CONTROLLER MEMORY IS CLEARED, ALL OPERATING SETTINGS ARE RETURNED TO THE ORIGINAL FACTORY DEFAULT PARAMETERS. ALL CALIBRATION, OPTION AND SET POINT VALUES SHOULD BE RECORDED BEFORE CLEARING MEMORY OR THE CONTROLLER WILL HAVE TO BE RE-CALIBRATED.

Clear Controller Memory

Step 1. Contact Hardy Instruments, Customer Support Department for instructions to clear controller memory.

Step 2. Re-enter the original Set point and Option parameters on the Self Test - Calibration form.

Step 3. Re-enter the Calibration parameters.

Step 4. From the CAL menu press the Enter button. The Hard Calibration Sub-Menu HD CAL appears.

Step 5. Press the Mode button. The Zero Count sub-menu ZR CNT appears.

Step 6. Press the Enter button.

Step 7. Enter the ZR CNT self test parameter from the Self Test - Calibration form.

Step 8. Press the Enter button. The Span Sub-Menu SPAN appears.

Step 9. Press the Enter button.

Step 10. Enter the SPAN self test parameter from the Self Test - Calibration form.

Step 11. Press the Enter button. The Full Scale Count FS CNT Sub-Menu appears.

Step 12. Press the Enter button.

Step 13. Enter the FS CNT self test parameter from the Self Test - Calibration form.

Step 14. Press the Enter button. The RETURN display appears.

Step 15. Press the Enter button to set the parameters, the END CAL display appears.

Step 16. Press the Enter button to save the updated parameters to the SMM and return to the weight display.

Restoring Calibration When Changing Decimal Points

Restoring Decimal Points

Step 1. If you wrote down the parameters for this controller on the Self Test - Calibration Form (Prt. # 0575-0016) enter the values from the form.

Step 2. If you didn't write down the parameters on the Self Test - Calibration Form, get the form and write them down.

Step 3. Check all Set point, Option and Calibration entries for the correct decimal position.

NOTE: *You must complete procedures "c" before moving to procedure "d" to be sure that the decimal points in the correct position. If you don't check the decimal positions the calibration will be incorrect.*

Step 4. From the CAL menu press the Enter button. The Hard Calibration Sub-Menu HD CAL appears.

Step 5. Press the Mode button. The Zero Count Sub-Menu ZR CNT appears.

Step 6. Press the Enter button. The current value is displayed.

Step 7. Press -/Test/Clr button and enter the correct ZRCNT or Press the Enter button to accept the current value. The Span Sub-Menu SPAN Sub-Menu appears.

Step 8. Press the Enter button. The current value is displayed.

Step 9. The new decimal point will be displayed in the SPAN Sub-Menu but it might be in the wrong place and displaying the wrong span value.

Step 10. If the Span Value should be 2000.00 and the current display shows 200.00, add a zero (0) by pressing the 0 button. Now the value is correct.

Step 11. If the Span Value should be 200.00 and the current display shows 2000.00, press -/Test/Clr button and enter 200.00.

Step 12. Press the Enter button twice. First the Full Scale Count Sub-Menu FS CNT appears, then the current value is displayed.

Step 13. Press the -/Test/Clr button, enter the correct FSCNT then press the Enter button or press the Enter button to accept the current value.

Step 14. The RETURN display appears.

Step 15. Press the Enter button twice. First the END CAL display appears, then the Secured Memory Module is updated and the system returns to the weight display.

CHAPTER 7 - OPERATION

Chapter 7 covers operation of the HI 2151/30WC weight controller. Follow the procedures in this chapter to ensure maximum quality performance.

Description of Front Panel (See Fig. 7-1)

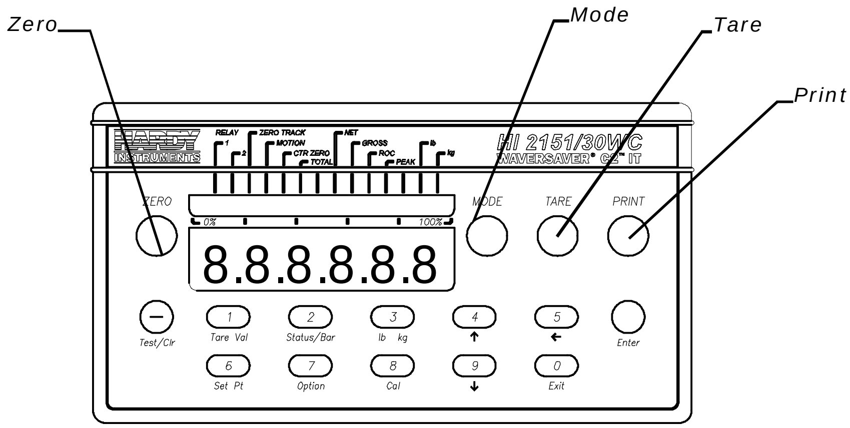


FIG. 7-1 FRONT PANEL, PROCESS WEIGHING FUNCTION BUTTONS

Process Weighing Function Buttons

ITEM	LABEL	BRIEF DESCRIPTION
ZERO	ZERO	Sets current count as new gross zero reference point. The ZERO button will only zero up to the zero tolerance value entered in the calibration menu. (See Chapter 6) The user can zero the instrument as many times as desired as long as the total does not exceed the value entered as the zero tolerance. Exits a numeric entry in a menu without changing the original value.
MODE	MODE	<u>Standard mode</u> Selects Standard Net, Gross modes and any installed optional modes. Optional Modes **Peak Hold Mode** (-C1) - The PEAK mode displays the highest measured average gross weight. The peak value is continuously monitored and stored in any mode of operation. The user can reset the peak hold mode by pressing the clear button while the Peak Value is displayed. The peak value is stored in memory but will not be retained in the event of a power failure.

ITEM	LABEL	BRIEF DESCRIPTION
		Rate-Of-Change Mode (-C2) - The ROC mode displays the rate-of-change of the input with respect to a pre-selected time base. **Total** (-C6) - The TOTAL mode displays the accumulated total weight. The instrument adds the current net weight to the total net weight when a remote function is entered. The value is available for displaying, clearing or printing.
TARE	TARE	Captures current displayed gross weight and places value in the tare register. Sets display to zero in net mode.
PRINT	PRINT	Outputs to RS232C serial port (NOT used with multidrop).

Operator Displays

ITEM	LABEL	BRIEF DESCRIPTION
LEDs		30 discrete LEDs that displays either weight controller status or a bar-graph representation of the selected weight display mode.
Display		Fourteen-segment LED display for displaying menus, operator inputs and selected weight displays.

Instrument Operation Overview

There are two main operating menus - Set Point and Option. To enter these menus, press the proper button. Once in a particular menu, use the up and down arrow buttons to scroll through the choices of that menu. Some of the menus have sub-menus. To select an item for viewing and/or changing, press the Enter button when the menu item displays; the current value or status of the menu item is displayed.

To change values, use the numeric keypad, or press the Exit button if no changes are made. Use the -/Test/Clr button when a value is shown on the display to clear the display to all zeros. When clearing the display, the unit will always keep the decimal location intact by putting zeros to the right and one zero to the left of the decimal point.

Some menu selections can be toggled using the ← and → buttons. Pressing the arrow buttons will display all available selections for the menu item. Whether altering a value or not, when you are ready to stop viewing this parameter and go on to the next, press the Enter button to accept the value or press the exit button to keep the original value. This will save the parameter as shown on the display.

The instrument will also verify that the value entered is a logical choice. If a parameter has been entered correctly, a GOOD will briefly appear and the display advances to the next item in the menu. If a parameter has been entered incorrectly, an error ERR statement appears. A list of error statements are provided in Chapter 7 - Trouble-shooting. After checking the error statement, correct the error.

To simply view a parameter value without changing the value, push the Enter button. If when changing a value you decide to retain the original value, press the ZERO button instead of the Enter button. This will save the original value and advance to the next parameter.

Option Menus and Option Parameters

Option menus are used to set parameters for the various option boards. All option parameters except for Peak Hold are automatically saved and updated in the Secure Memory Module. The following sections describe menu operation.

NOTE: *Do not modify ANY Sub menus, while the serial interface or A-B RIO are attempting to modify information.*

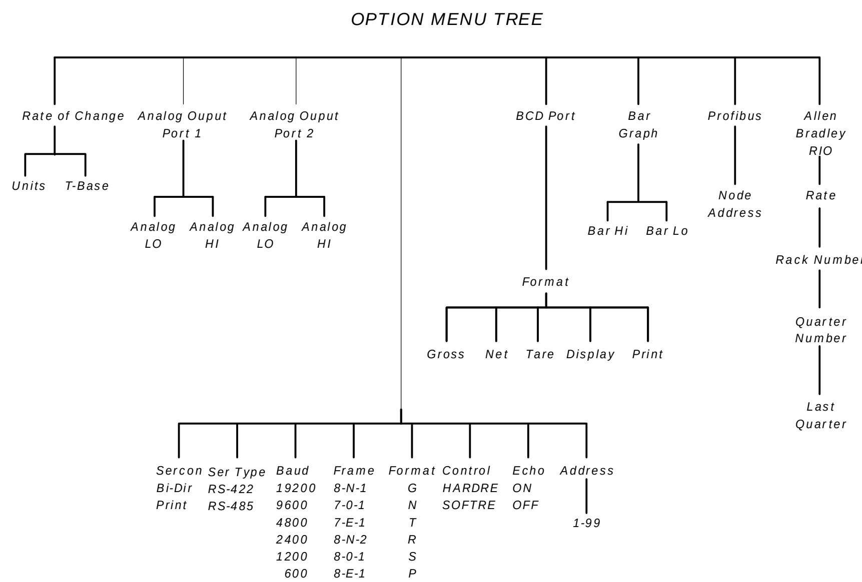


FIG. 7-2 OPTION MENU TREE

Option Boards

The Hardy Instrument option boards provide added capabilities. They are easily installed into the option board slots, labeled Option 1 and Option 2 on the rear panel of the instrument.

General Information

NOTE: *If your options have already been installed at the factory, move on to Set points.*

The options are implemented by installing the appropriate optional circuit board onto the main analog/digital board in the instrument. (See Chapter 3 for installation instructions)

The following option boards are available for the HI 2151/30WC:

- Analog Output board (voltage and current outputs: Net, Gross, Total*, ROC*, or Peak Hold*). Prt. # 0551-0326, model HI2151/30X-B1.

(* if ordered)

- Parallel BCD board, tri-stated. With 6" cable P/N 0551-0327, model HI2151/20XX-B2. With 24" cable Prt. # 0509-0389-02, model HI 2151/30XX-B9. With 60" cable Prt. # 0551-0330, model HI2151/30XX-B5.
- Allen-Bradley RIO. Prt. # 0551-0351, model HI2151/30XX-B8.
- PROFIBUS Field Bus Interface. Prt. # 0535-0439, model HI2151/30XX-B12.
- DDE I/O Server, Prt. 0551-0419-01, HI2151/30XX-B14
- Setpoint Option Card Prt. # 0551-0288, model HI2151/30XX-D2

Option slots are labeled on the top circuit board as follows:

READ PANEL LABEL	26 PIN CONN NUMBER
Option 1	J5
Option 2	J4

Output Option Boards may be ordered and installed into these slots as follows:

BOARD	QUANTITY	OPTION SLOT
Analog	2	1 and/or 2 (When using only 1 board, position 1 is preferred due to option cover compatibility)
BCD	1 only	1
A-B RIO	1 only	1 or 2
PROFIBUS	1 only	1 or 2

NOTE: *You can install either the A_B RIO or the Profibus option but you cannot install both at the same time.*

Set Points

About Set Points

The set point value is the target weight or level. It may be set in either net, gross, ROC*, Total*, or Peak* hold weight units. When entering this value, the corresponding LED flag will appear on the display. The operator may toggle this flag to the desired mode by pressing the MODE button. Refer to the Set point Limits section following installation for a description of set point limits.

NOTE: *Only works when the ROC, Total, or Peak options are installed in the controller.*

Set Point Limits

Dead Band Limits

The dead band value can be set as a positive or negative value. It is used to prevent relay chatter once the set point is reached.

For example: if a set point value was 1000 pounds and the dead band was set to -5 pounds, the relay would close at a 1000 pounds but not open until the weight dropped to 995 pounds. This would be used if a set point is a high trip limit. A positive dead band would be used for a low trip limit. Examples are shown for Low and High Trip Limits. (See Fig. 7-3) Using a set point of 1,000 pounds and a dead band of -800 pounds will cause the level to remain between 200 and 1,000 pounds.

Three General Rules for Setpoints

1. Set points activate at the set point plus the preact.
2. Set points deactivate at the set point plus the deadband.
3. The deadband should be numerically larger than the preact to prevent relay chatter.

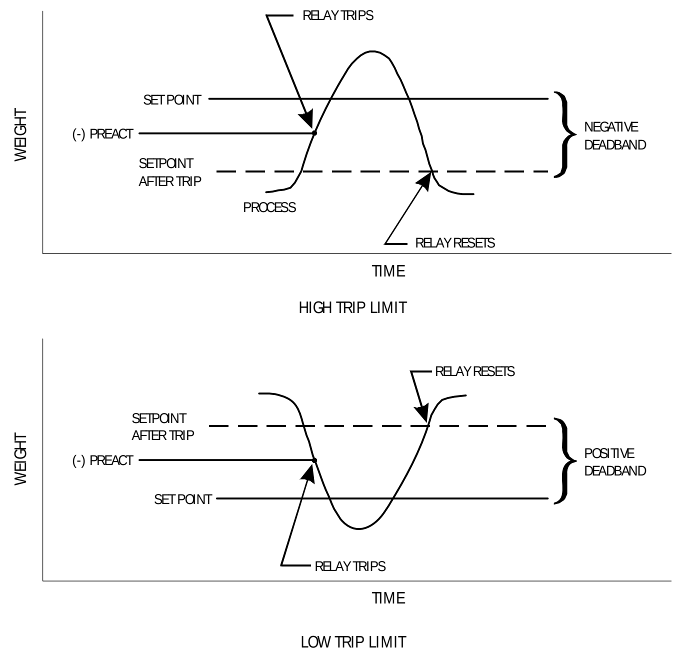


FIG. 7-3 LOW AND HIGH PREACT TRIP LIMITS

Preact Limits (See Fig. 7-3)

- The preact value is the number of units below (negative value) or above (positive value) the set point value at which the relay will trip.
- It is used as an "in-flight" compensation value when filling a vessel. If set to zero, there will be no compensation.

Entering Set Points

About the Set Point Menu

- Used to enter the set point, dead band, and preact values for the two standard internal relays.
- Used to enter the associated values for the six optional, external relays when installed.

NOTE: *To scroll forward or backward through the Set Point Menus, press the Up or Down arrow ↑↓ buttons.*

Entering Set Point Procedures

NOTE: *A previously assigned set point value will be displayed. For this example, the set point value will be set to 500.*

Step 1. Press the 6/SetPt button to select set point menu, RLY -- 1 appears with the 1 flashing.

Step 2. Press the Enter button. Set Point #1 appears SPNT - 1.

NOTE: *The mode status display indicator flashes on the present set point mode. To change modes, press the round mode button until the desired mode display flashes.*

Step 3. To enter a new set point value, press the -/Test/Clr button.

Step 4. Use the numeric buttons to enter a desired set point value; in our example 500.00.

Step 5. Press the Enter button. The controller indicates that the value was valid by briefly displaying GOOD. The Dead Band Sub-Menu DBND-1 appears.

Entering Dead Band Tolerance Procedures

Step 1. Press the Enter button. The Dead Band Sub-Menu DBND-1 appears.

Step 2. Press the -/Test/Clr button to clear the existing value.

Step 3. Press the -/Test/Clr button again to enter a negative value if desired.

Step 4. Use the numeric buttons to enter dead band value (e.g. -125.00 value).

Step 5. Press the Enter button. The controller indicates that the value was valid by briefly displaying GOOD. The Preact Sub-Menu PRE - 1 appears.

Entering Preact Values Procedures

Step 1. Press the Enter button.

NOTE: *Previously set preact value will be displayed. For this example, the preact value will be set to 20.*

Step 2. To enter a new value, press -/Test/Clr button.

Step 3. Press the -/Test/Clr button for a negative value if desired.

Step 4. Use the numeric buttons to enter a new preact value.

Step 5. Press the Enter button. The controller indicates that the value was valid by briefly displaying GOOD. Set Point 1 Sub-Menu SPNT - 1 appears.

Step 6. Press 0/Exit button to advance to Relay 2 RLY-2

Step 7. Repeat above procedure to enter set point parameters for relay 2

Step 8. If the option for 8 relays is active, enter set point parameters for relay 3-8 at this time.

Step 9. When the last set point parameter is entered, press Exit button to return to the weight display and resume normal operations.

Serial Communications

The standard serial ports are user selectable RS-232C, and RS-422/485 which may be configured as a printer output port or as a bi-directional communication port. Transmission speed is selectable from 600 to 19.2K baud and may be configured for a continuous data output mode. The port allows host computer control using ASCII character commands and RS 422/485 ports support multiple weight controllers via a multidrop configuration.

Bi-directional Communications

RS-232C

One RS-232C allows serial communication from one weight controller to one peripheral device. The RS-232C is user-selectable as a print-output only port or as a bi-directional control port through the Menu and jumper settings on the main board. (See Chapter 4 for configuration information)

Operation

The operation consists of properly executing commands over the serial port.

RS-422/485

The RS-422/485 meet RS-422 or RS-485 requirements providing drive over long distances. With the Hardy Link two way multidrop, communication can take place between any of the Hardy Instruments series 2100 controllers and a host computer.

Operation

Operation of the RS-422/485 consist of properly configuring the board (See Chapter 4, Section 4.1 for configuration information) and executing commands over the port. Commands available and their actions are identical to the commands for the RS-232C.

Description of 422/485 Transmission Modes Available

Many devices available today are called RS-422/485 because their electrical signals meet or exceed both specifications. This does not necessarily mean they both meet the strict intent of RS-485 to provide for two wire multidrop networks. They are instead multidrop RS-422 or four wire RS-485 networks.

RS-485

The RS-485 mode when configured as two wire (2 wire jumper) with the transmitter enabled.

RS-422

If the unit is in the four wire (4 wire jumper) mode with the transmitter always enabled, then the board operates in a true RS-422 mode. This flexibility allows compatibility between the host computer and the HI 2151/30WC.

Additional Non-standard Transmission Mode

- Used most frequently. Only one "host" permitted.
- Four wire RS-485 or multidrop RS-422 mode
- When configured in four wire mode with the transmitter selectively tri-stated, the board is operating in a four wire RS-485 or multidrop RS-422 mode. This configuration doesn't meet either specification but can be easier to program than either true specification.

RS-422/485 Wiring and Electrical Specifications

Serial communication signal configuration and wiring is dependent on how the board is configured. The following notes are typical methods of connection. It should be realized that these methods vary and are only furnished to offer a starting point for configuration:

- Signal Grounds

  A direct connection between signal grounds of the different devices is not desirable, rather a connection with approximately 100 ohms of resistance is recommended. Signal ground should NOT be used as a shield.

- Earth Ground Cable Shield

  Typically, cable shields are tied to the ("frame") ground at the end that is the best earth ground.

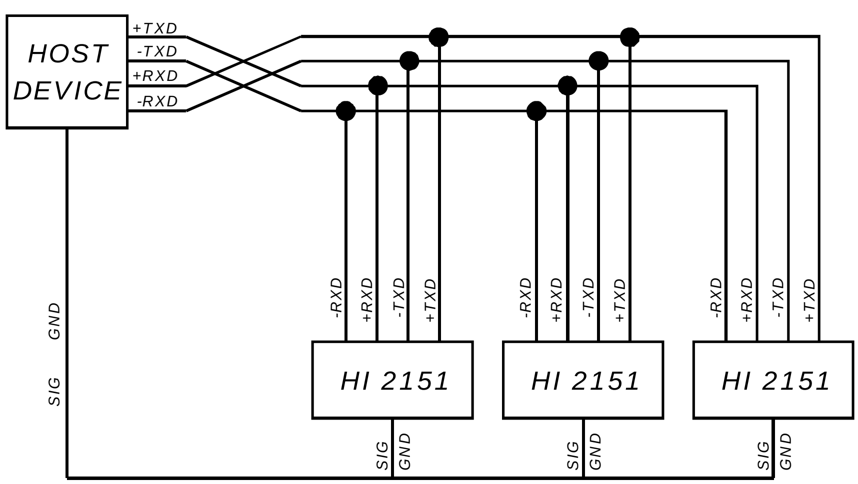
  Pick up frame ground on the HI 2151/30WC with the phillips head screw on the rear of the instrument labeled Shield.

- Cable Type

  The Tx+/Tx- and Rx+/Rx- wires are twisted pair (with outer shield).

- Serial Connector

  Each function is wired to two pins to allow only one wire to be put in each terminal position. (The same electrical signal is routed to pins one and two on the board.)



RS-422/485 Configuration Wiring

FIG. 7-4 WIRING DIAGRAM SERIAL COMMUNICATIONS

RS-422/485 Electrical Specifications

Description	Specification
Receiver Impedance	12 k ohm

Description	Specification
Receiver Common Mode Range	+12 to -7 V
Maximum Input Threshold	+200 mv
Minimum Input Hysteresis	50 mv
Driver Output Capability	+60 ma at 2 V differential
Driver Short Circuit Limit	250 ma to +12 or -7 V
Bus Loading By Unpowered Board	One Receiver Load

Instrument Serial Communications

About Instrument Serial Communications

The HI 2151/30WC's serial options provide the user with a full complement of RS-232C, RS-422, and RS-485 communications. There is a standard RS-232C/422/485 serial port on the main board. Each port can be an output only port to drive a printer or similar device, or as a bi-directional port for both status and control.

Printer Output

Below is an example of the printout with the weight controller formatted for Gross, Net and Tare.

```
>
GROSS    1.430 LB
NET      0.430 LB
TARE     1.000 LB
```

Serial Protocol - Multidrop Mode

About Serial Protocol Multidrop Mode

Hardy Instruments HI 2151/30 WC weight controller employs an ASCII command protocol and accompanying command set, described in the following paragraphs. The protocol is via RS-232 or RS-422 with the network being called Hardy Link. Hardy Link supports a multidrop configuration.

- Serial Protocol - Multidrop Mode

  Multidrop is a configuration denoting that there are multiple HI 2151/30WC units connected to a host computer whereby each HI 2151/30WC receives and sends data through a unique address. The fastest possible instrument response will be from the multidrop configuration. The multidrop configuration also lends itself well to host computer control of multiple weight controllers. RS-422/485 is utilized and provides excellent noise immunity and drive capability supporting long cable runs.

NOTE: *The 2151/30WC weight controller contain intelligent front ends to a distributed system, therefore network speed is not usually critical.*

Data Formats

Relays, dip switches and LED data along with weight data have their own special format for transmission. These formats are described in the following two sections.

Data Formats - Binary Representation

1. Relay, dipswitch and LED numbers are represented by the binary bit position. In the case of a relay, 0 disables the relay and a 1 enables the relay.

2. Binary bit position:

   7 6 5 4 3 2 1 0

3. Relay(binary bit position +1):

   7 6 8 2 1 3 4 5

4. Example:

   To enable relays 4 and 8, the following would be the binary representation:

   0 0 1 0 0 0 1 0

   This would be 22 hex, hence the command to enable relays 4 and 8 would be E 22.

Data Formats - Weight Data Format

1. Weights are transmitted according to the following rules:

   - Positive numbers:

     Maximum of 6 numeric + decimal point.

   - Negative numbers:

     Maximum of 5 numeric + minus sign + decimal point.

   - Examples:

Transmitted	Correct?	Received	Reason
-123.45	Y	-123.45	5 numerics + minus sign + decimal point (B above).
1234.56	Y	1234.56	6 numerics + decimal point (A above).

Transmitted	Correct?	Received	Reason
-12345	Y	-12345	5 numerics + minus sign (B above)
-123456	N	-12345	The "6" would be truncated since only 5 numerics + the minus sign is legal (B above).
12345.67	N	12345.6	The "7" would be truncated since only a maximum of 6 numerics + decimal points is legal (A above).

Serial Commands

Serial commands are transmitted to the instrument in ASCII format. Each command has a single letter corresponding to the command. The instrument will accept command strings up to 40 characters (the 40th will internally default to a carriage return).The front panel serial port menu allows setup of serial communication parameters, i.e. BAUD, parity, etc.

Serial Commands - Data Transmission Format

The following table uses the mnemonics corresponding to the outgoing command format (some of which are optional):

Mnemonic	Meaning	Number of ASCII Bytes
CMD	Command	1
SUB-CMD	Subcommand	1 to 3
DATA-n	Data byte **n**	1 to 7
MODE	Mode	1
CR	Carriage return	1

1. Serial commands are transmitted from the host to the instrument (in ASCII bytes) in the format:
2. Control characters are transmitted in HEX. (See the ASCII to HEX table in Appendix A)
3. An example using the "x" transmit command with Hardy Link and an address of 10 is:

START CHAR	INSTRUMENT ADDRESS	CMD	SUB-CMD	CR	2 BYTE CHECKSUM		EOT
					CHK-1	CHK-2	
>	10	X	G	CR	CHK-1	CHK-2	EOT

NOTE: *The example uses decimal and mnemonic abbreviation format for clarity, however, the actual data would be in ASCII format. A leading zero (i.e. 01) is required for single digit addresses for serial port #2.*

4. There is one space (20 hex) required between each type of data following the INSTRUMENT ADDRESS, hence, the outgoing command represented in hex format would be:

3E	31	30	20	58	20	47	0D	34	44	04
>	1	0		X		G	CR	4	D	EOT

An example using the "x" transmit command without Hardy Link is:

START CHAR	CMD	SUB-CMD	CR	2 BYTE CHECKSUM		EOT
				CHK-1	CHK-2	
>	X	G	CR	CHK-1	CHK-2	EOT

Serial Commands, Command Set

The checksum is computed by totaling the bytes in the command stream starting with the **INSTRUMENT ADDRESS** through (and including) the **CR** and then subtract 256 from the total until the remainder is less than 256 (to achieve a one byte maximum). The result is then represented as two ASCII bytes and appended to the command, followed by an **EOT** (04).

Value	Description
31	address - instrument number 10 - ASCII "1"
30	address - instrument number 10 - ASCII "0"
20	space
58	X
20	space
47	G
0D	CR

=	14d

Value	Description
-	100

=	4d

Serial commands are transmitted from the instrument back to the host in the format they were received from the host with the return data (and units) added to the message and an LF added to the CR.

Using the above example, the return data would be:

START CHAR	INSTRUMENT ADDRESS	CMD	SUB CMD	7 BYTE DATA D-7 . . . D-1	MODE	CR	2 BYTE CHECKSUM		EOT
							CHK-1	CHK-2	
>	10	X	G	D-7 . . . D-1	Lb or Kg	CR**LF**	CHK-1	CHK-2	EOT

* Lb or Kg follow data.

In the case where return data is appropriate for the command, an A is returned by the instrument in the form of:

START CHAR	**INSTRUMENT ADDRESS**	**CMD**	**SUB-CMD**	**CR**	**2 BYTE CHECKSUM**		**EOT**
					CHK-1	**CHK-2**	
>	10	A		CRLF	CHK-1	CHK-2	EOT

In the case of an error, the message returned would be:

START CHAR	**INSTR. ADDRESS**	**CMD**	**CMD**	**SUB**	**CR**	**2 BYTE CHECKSUM**		**EOT**
						CHK-1	**CHK-2**	
>	10	N	9	9	CRLF	CHK-1	CHK-2	EOT

where 99 is the error number (See Chapter 8, Troubleshooting, Error Codes and Definitions for a breakdown of error codes)

NOTE: *The example uses decimal and mnemonic abbreviation format for clarity, however, the actual data would be in ASCII format.*

Command Meaning

1. **X** **Xmit**. When this command is issued without a sub command, the type of data specified in the format command will be transmitted to the port issuing the request. When this command is issued with a subcommand only, the subcommand data will be transmitted. Only one subcommand per command is allowed.

2. Transmit data specified in SUB-CMD as follows:

SUB-CMD	**Meaning**
none	Default to data setup by the format command
A	Accumulated total
G	Gross
N	Net
T	Tare
DE	Deadband
P	Preact

S	Set point
DI	Dipswitch
L	LED Status
REL	Relay
REM	Remote
C	ROC
E	Excitation Monitor

SUB-CMD	**Meaning**
REL	Relay

Bit	RELAY
01	5
02	4
04	3
08	1
10	2
20	8
40	7
80	6

SUB-CMD **Meaning**

The L command returns a two-byte status, each bit describing the LED status.

The values returned are the hex values of the two bytes.

Byte 1: LED STATUS, BYTE 1	**Byte 2: LED STATUS, BYTE 2**
Bit 0 - Pounds led	Bit 0 - Rate of change led.
Bit 1 - Zero track led	Bit 1 - Alarm #2 led.
Bit 2 - Not used	Bit 2 - Alarm #1 led.
Bit 3 - Center zero led	Bit 3 - Peak led.
Bit 4 - Motion led	Bit 4 - Total led.

Byte 1: LED STATUS, BYTE 1	**Byte 2: LED STATUS, BYTE 2**
Bit 5 - Gross led	Bit 5 - Not used
Bit 6 - Net led	Bit 6 - Not used
Bit 7 - Kilograms led	Bit 7 - Not used

SUB-CMD	**Meaning**
DI	The HI 2151/30WC will return two bytes for the dip switches. Dip switch #1 is the one on the rear panel and Dip Switch #2 is internal to the unit located on the bottom power relay board.

Dip Switch #1 (S3)

Position	Bit	Function ("ON" position)
1	80	Multi-drop
2	01	Calibrate toggle (Non NBS applications)
3	40	Serial command lockout (Requests OK)
4	02	Option menu lockout
5	04	Set point menu lockout
6	20	Spare
7	08	Lb/Kg, N/G, Tare and Zero lockout
8	10	Zero track

SUB-CMD **Meaning**

Dip Switch #2 (S2)

Position	Bit	Function ("ON" position)
1	08	Ignore incoming checksums
2	10	On is averaged peak hold, Off is instantaneous peak hold
3	20	NBS
4	04	NBS Re-Cal toggle switch
5	40	Spare
6	80	Spare
7	02	Spare
8	01	Spare

SUB-CMD	**Meaning**
E	Excitation Monitor
	ERR
	OKK
	OFF

3. E *IT*® serial command

Results	**Description**
OKK	No Errors Detected
ERR	Error Detected
OFF	*IT* is Not Turned On

4. I Load cell input command. Used primarily to check the analog input section of the unit. The command will return the number of averaged counts that is currently being read from the load cell input.

SUB-CMD	**Meaning**
REM	Level status of the Remote Input connector (J2) pins.

Bit	Remote Function	Bit	Remote Function
01	Rate of change	10	Net
02	Totalizer	20	Lbs/Kgs
04	Display Hold	40	Tare
08	Option Hold	80	Print

5. Q The query command obtains a block of information as follows:

SUB-CMD	**Meaning**
A.	Gross weight (6 bytes plus label)
B.	Net weight (6 bytes plus label)
C.	Peak gross value reached (6 bytes plus label)
D.	Internal counts (6 bytes)
E.	Total net accumulation (6 bytes plus label)
F.	Rate of change value (6 bytes plus label)
G.	Not Used (6 bytes set to 000000)
H.	Not Used (6 bytes set to 000000)
I.	LED status (4 bytes)
J.	Relay status (2 bytes)

Command	**Meaning**
F	Format the output data. Used to configure data to be sent on a TRANSMIT or PRINT request. The SUB-CMD letters can be issued in any combination or order and are as follows:

SUB-CMD	**Meaning**
G	Gross
N	Net
T	Tare
R	ROC
S	Set point, Deadband, Preact

NOTE: *The last (6th) position is one of the following (must be accompanied by at least one of the above SUB-CMDs):*

- *- Continuous printing.*
- *P Button on front panel "triggers" output.*

NOTE: *The default FORMAT is GNTRSP.*

M Monitors the specified SUB-CMD data as follows by requesting a report whenever a change in the type of status occurs.

<u>**CAUTION**</u> **DO NOT USE THIS MCOMMAND IF THE SYSTEM IS CONFIGURED IN RING OR MULTIDROP MODES. IF USED IN MULTIDROP MODE, IT WILL CAUSE DATA TRANSMISSION PROBLEMS. IT IS INTENDED ONLY FOR SINGLE UNITS.**

SUB-CMD	Meaning
R xx	**Relay** number where xx is a two ASCII digit value.
D xx	**Dipswitch** number where xx is a two ASCII digit value.
L xx	**LED** number where xx is a two ASCII digit value.

Use this command to request a report when a change in status occurs in the subcommand selected. You may request the status of the Relays, Dipswitches, or LED's. Only one MONITOR subcommand may be issued per command. After the command is received, the instrument immediately sends back the present status of the subcommand requested followed by a # sign and a bell character (cntrl G). This can be used to mark the beginning of the MONITOR command. To select which particular relays, dipswitches, or LED's you want to monitor, enter the appropriate 2-byte Hexadecimal number after the subcommand. To shut off a MONITOR command, enter the MONITOR command, subcommand, and Hex 00.

SUB-CMD	Meaning
S	Set specified SUB-CMD data as follows:

SUB-CMD	Meaning
S y xxxxxxx	**Set point** value.
D y xxxxxxx	**Deadband** value.
P y xxxxxxx	**Preact** value.

xxxxxxx is up to a seven digit ASCII value.
y is the Set point Relay number.

NOTE: *The above xxxxxx data may be followed by a MODE as follows:*

Mode	Meaning	Mode	Meaning
N	**Net**	**T**	**Total**
G	**Gross**	**P**	**Peak**
R	**ROC**		

For example, to set point one to 1000 Lbs gross on instrument number 10, the outgoing command would be as follows:

START CHAR	INSTRUMENT ADDRESS	CMD	SUB CMD	CMD	7 BYTE DATA D-7 . . . D-1	MODE	CR	2 BYTE CHECKSUM		EOT
								CHK-1	CHK-2	
>	10	S	S	1	1000	G	CR	CHK-1	CHK-2	EOT

NOTE: *The example uses decimal and mnemonic abbreviation format for clarity, however, the actual data would be in ASCII format.*

Command	Meaning
C	Allows you to change modes between Net/Gross, lb/kg, or Hold/Unhold Display.

SUB-CMD	Meaning
M	Toggles between Net and Gross weight **mode**.
U	**Unit** (toggles between Lbs. and Kg.)
H	Toggles between display **hold** and unhold.

Command	Meaning
A	Used to auto tare or auto zero the instrument.

SUB-CMD	Meaning
T	Auto **tare** the instrument. (Scale must not be in motion.)
Z	Auto **zero** the instrument.(Scale must not be in motion and mode must be set to Gross)
P	**Print** command. Functionally the same as the print button on the key board. The data setup through the **format** command will be sent to the port configured as a printer.

Command	Meaning
P1 or **P2**	**Print** to either ports 1 or 2.

An optional "subcommand" of up to 37 ASCII characters may be entered and will be printed before the formatted data.

SUB-CMD	Meaning

37 ASCII characters maximum.

H	The ASCII characters supplied in the subcommand (maximum of 20 characters) will be printed as a **heading** and saved for each subsequent **X** - transmit

or **P** - print command requested. Heading is not stored in the Secure Memory Module.

To remove the heading, transmit H with no subcommand.

H1 or **H2** — The ASCII characters supplied in the subcommand (maximum of 20 characters) will be printed as a **heading** and saved for each subsequent **X** - transmit or **P** - print command requested.

To remove the heading, transmit H1 or H2 with no subcommand.

N — Adds the current **net** weight to the accumulated total.

E — A two ASCII digit hex number is transmitted with this command to **enable** a relay to be under the control of it's set point value. The power-on default is all relays enabled.

! — This command is used to **reset** instrument communication. It is typically used when an error or unintelligible response is received from the instrument and should used sparingly. It is recommended that it not be used during "normal" communication retries (i.e. unintelligible response), but instead be used as a last resort (no response after retries are exhausted). Internally, it performs the same operations as done on instrument power-up. Refer to the REL Sub-Command under the X (Xmit) Serial Commands Command Set.

Parallel BCD Communication

Operating Procedures

Step 1. The BCD option is setup by first entering the Option Menu and selecting the BCD menu. The menu display shows a combination of GNTDP (G = gross, n = net, T = tare, D = display, P = print). (See Chapter 5 for setup instructions)

Step 2. The user may select which data will be present at the output. If the "P" or print flag is selected, the data will only change at the output once the PRINT button is pressed or the remote functions print has been activated. Otherwise, the output will be continuous.

Step 3. You can trigger the output by any of the following methods:

- By pressing the PRINT button.
- By sending a command over the serial port.

- By connecting the remote functions print to the remote functions ground.

Step 4. The output can be tri-stated if the OUTPUT DISABLE is brought low. This is useful for multiple parallel outputs to be connected to the same device. Once this input is brought high, the latched data will be accessible again. The PRINT output is normally low and goes high for 25 milliseconds. If the opposite polarity (normally high, pulsed low) is desired, move jumper from W1 to W2.

BCD Print

Step 1. The weight select mode tells the output device which type of data is present.
Step 2. The user selects which type of data is desired by toggling "GNT" under the option BCD sub-menu.
Step 3. If all three types of data are requested, then all three will appear on the output one after the other, 10 milliseconds apart.
Step 4. If "d" is selected, the output will follow the mode being displayed.

Output Disable

Data output is discontinued if the OUTPUT DISABLE, pin 22 on the PWA (pin 30 on the D-Subminiature connector), is low. The data pins will be tri-stated even though print pulses will be sent.

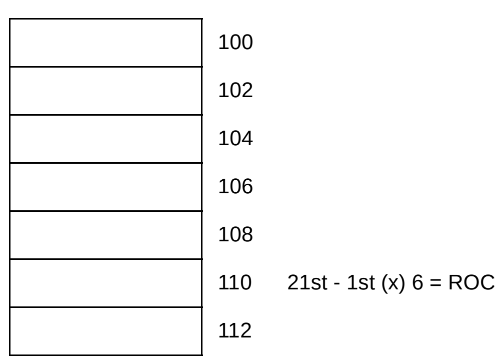
Rate of Change (ROC)

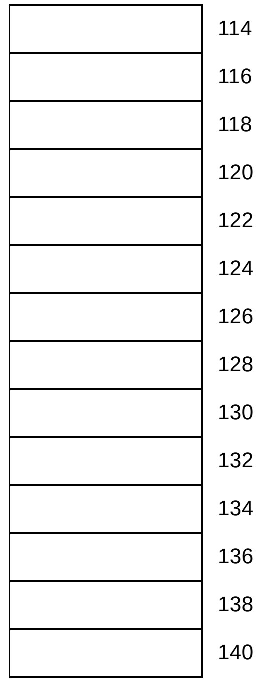
(See Chapter 5 for Setup Procedures) The Rate of Change Option is used to measure the rate at which a material enters or is dispensed from a vessel over a given period of time.

To develop ROC data, a Register is used that is 21 entries in length. New weight is input to the register at the rate of 1/20th of the Time Base. The 1st register is subtracted from the 21st register. The 21st register is one Time Base older than the 1st register. The results of this subtraction are divided or multiplied, as necessary, to equal the appropriate measurement time for display, U-SEC, U-MIN, U-HOUR.

Example

In this example the units of display are units per minute (U-Min) with a Time Base of 10 seconds. Every ½ second new data is inserted into the 1st register and old data is shifted down one register. The 1st register is subtracted from the 21st register and the results are multiplied by 6 so the Time Base results of 10 seconds corresponds to Units per Minute.





140 - 100 = 40 (x) 6 = 240

At time one there is 100 lbs on the scale. One half second later there is 102 lbs on the scale. At time twenty one, 10 seconds later- there is 140 lbs on the scale. A 40 lb change in 10 seconds converts to 240 lbs per minute.

Rate of Change Data

- Rate of change data can be transmitted through the standard or optional serial ports or the analog output. It can also be displayed numerically or as a bar graph.

Peak Hold Mode Option

The Peak Hold Option, when selected, will display the highest gross value that has been measured or the averaged peak gross value. Peak does not need to be displayed in order to capture the peak value. (See Chapter 4, Section 4.6 for Configuration Information)

To display PEAK HOLD:

Step 1. Press the MODE button until the "PEAK" LED indicator is lit.

Step 2. The value now displayed is the highest gross value that has been measured since last RESET.

To reset the Peak Value to zero:

With the Peak Value displayed, press the -/TEST/CLR button.

To exit Peak Hold mode:

Press the MODE button until desired mode is indicated.

Totalizer Mode Option

When Total Option is selected, the display will indicate the accumulated total net weight stored in the total register. To Setup the Totalizer Mode Option See Chapter 5.

To display the Total Value:

Press MODE button until the "TOTAL" indicator is illuminated. The value displayed is the total accumulated net weight.

To print the Total Value:

With the Total displayed, press the PRINT button.

To clear the Total: With the Total displayed, press the TEST/CLR button. The Total Register will now be reset to zero.

To exit the Total Mode: Press the MODE button until the desired mode is indicated.

NOTE: *The Peak Hold and Totalizer modes do not support the LB/KG button or LB/KG remote input. They will display and transmit only the mode the instrument was calibrated in.*

Allen-Bradley Remote I/O Option -B8

See the Allen-Bradley Remote I/O Installation and Operation Manual (P/N 0596-0173) for complete Operating Instructions.

Profibus Interface Option -B12

See the Profibus Installation and Operation Manual (Prt. # 0596-0211) for complete Operating Instructions.

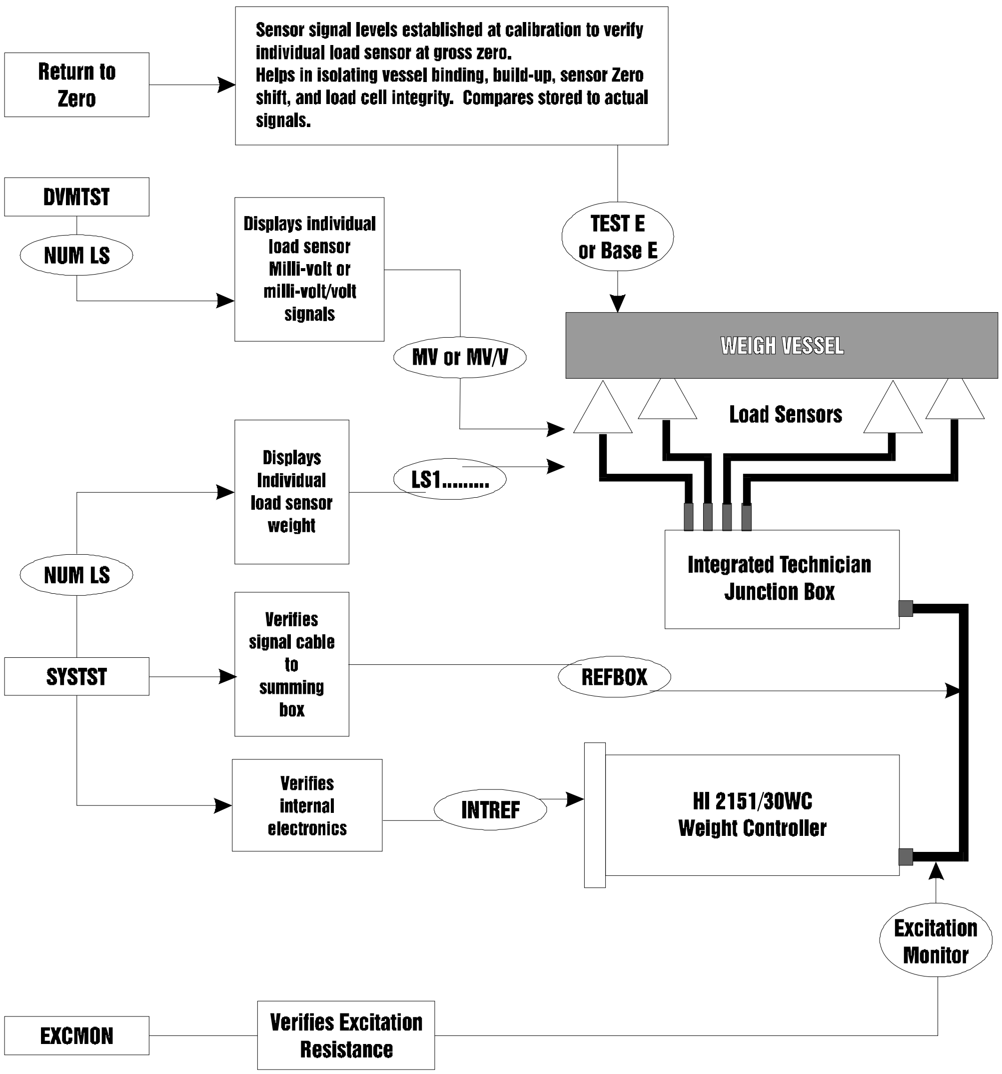
CHAPTER 8 - TROUBLESHOOTING PROCEDURES

Chapter Eight covers the procedures for troubleshooting the electrical, mechanical and firmware elements of the HI 2151/30WC Weight Controller in the event of a malfunction. A flow chart provides a road map for troubleshooting a weight control system, including load cells, weight controller and cabling. Chapter Eight also provides instructions for using Hardy's INTEGRATED TECHNICIAN™ software utility to isolate problems that may occur in a weight system.

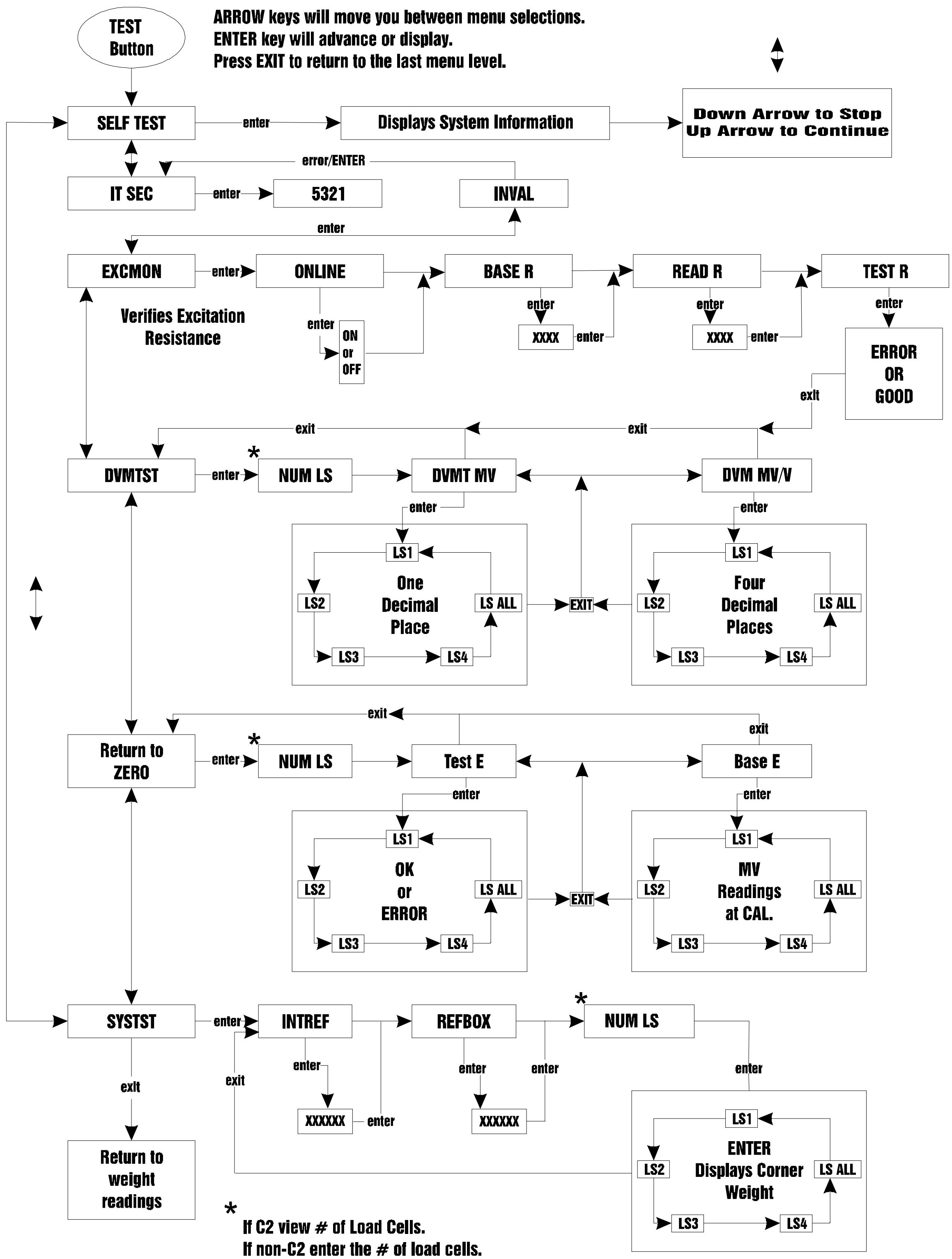
Disassembly and Reassembly Notes and Cautions

- Always disconnect the power cord before disassembling.
- Make sure that any disassembly is done in a clean, well ventilated, properly controlled static environment.
- Always make sure that the assemblies and sub-assemblies are well supported and insulated when doing any repairs on the HI 2151/30WC Weight Controller.
- Place small fasteners, connectors and electrical parts in closed containers so as not to lose parts during reassembly.
- Read all the disassembly instructions before any disassembly begins. Be sure that you are familiar with the procedures. If any of the instructions for disassembly are unclear, contact Hardy Instruments, Customer Support Department for additional information and assistance.
- Do not disconnect any electrical plug, connector or terminal unless an identification tag is present or one is attached. Always note where the connector or plug was attached to the electrical component or wiring harness.
- Always install complete hardware groups (Screws, Washers, Lock Washers, Spacers, Etc.) back to the original point of removal.
- Always replace broken or damaged modules or hardware immediately!
- Always check to be sure that no loose parts are sitting on printed circuit boards or electrical connectors or wires when disassembling or reassembling.
- Always protect printed circuit boards from electrostatic discharge (ESD). Always use approved ESD wrist straps and anti-static pads when working on the PROFIBUS Interface Card.
- 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 HI 2151/30WC.
- Always follow proper safety procedures when working on or around the HI 2151/30WC Weight Controller.

Trouble Shooting Using Integrated Technician



NOTE: *Systems using the Integrated Technician features relating to the isolation or measurement of the instrument-junction box cable, the junction box and individual load sensors or the measurement of weight or voltage of the individual load sensors, require an HI 215T series junction box.*



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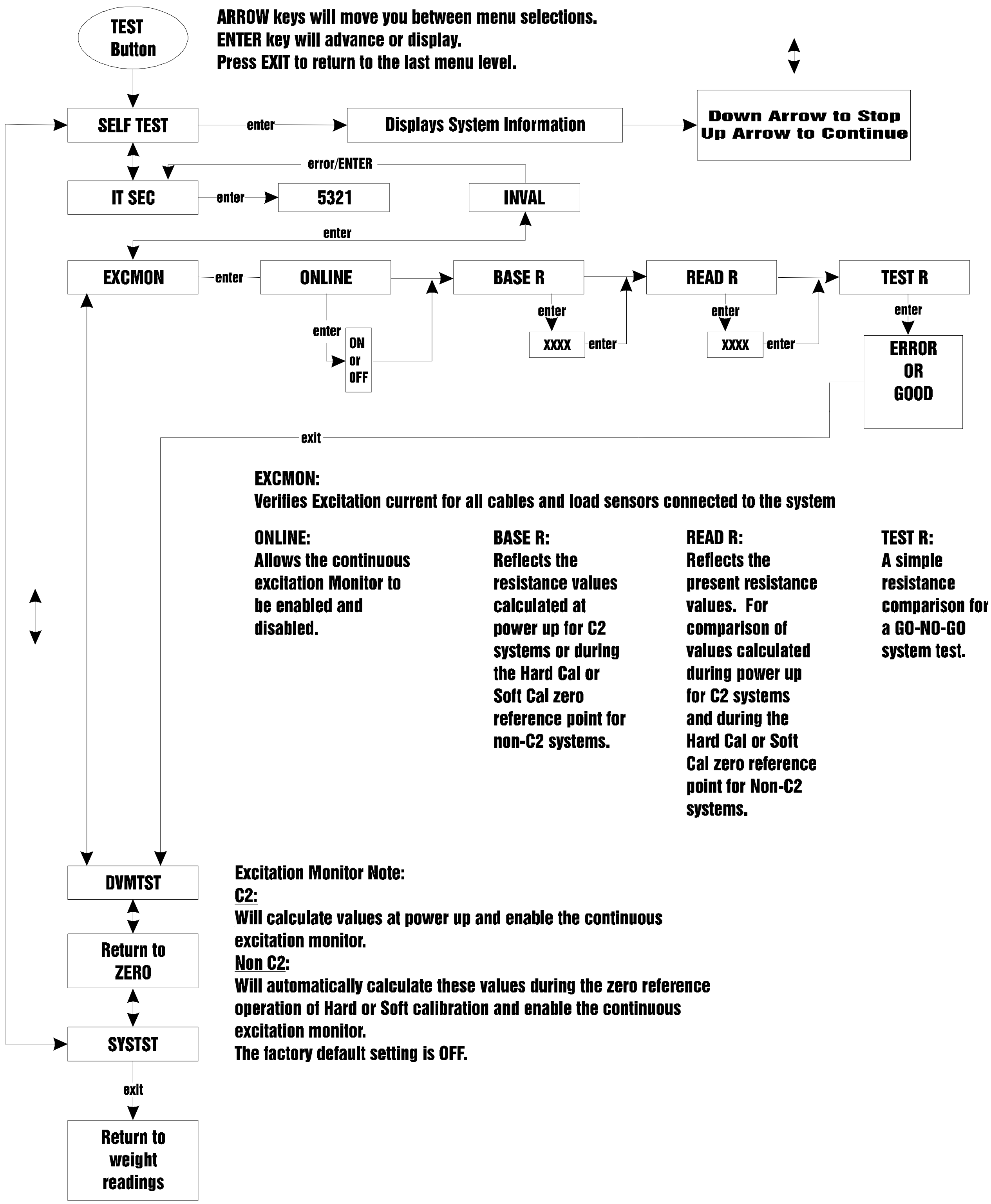

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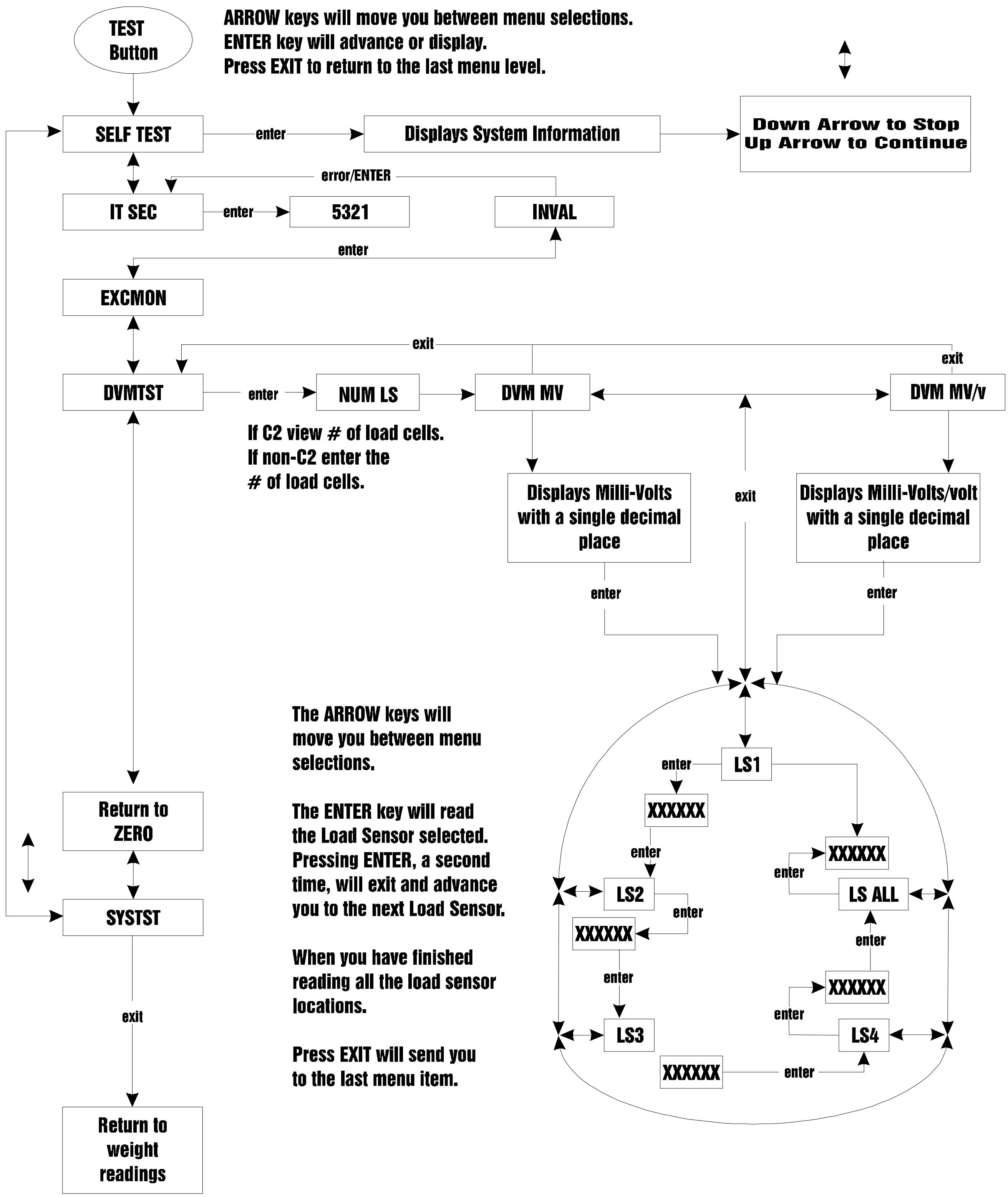

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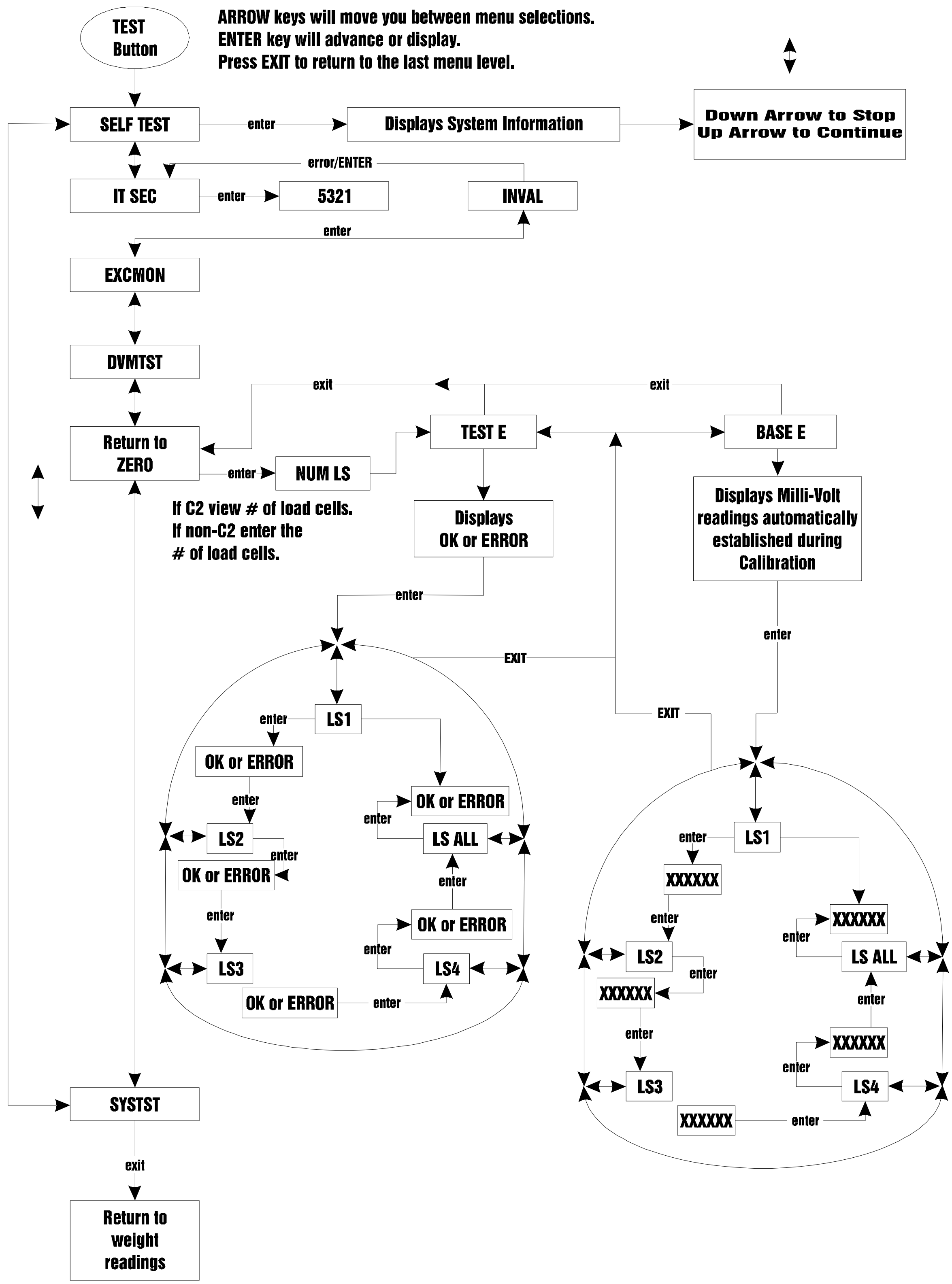

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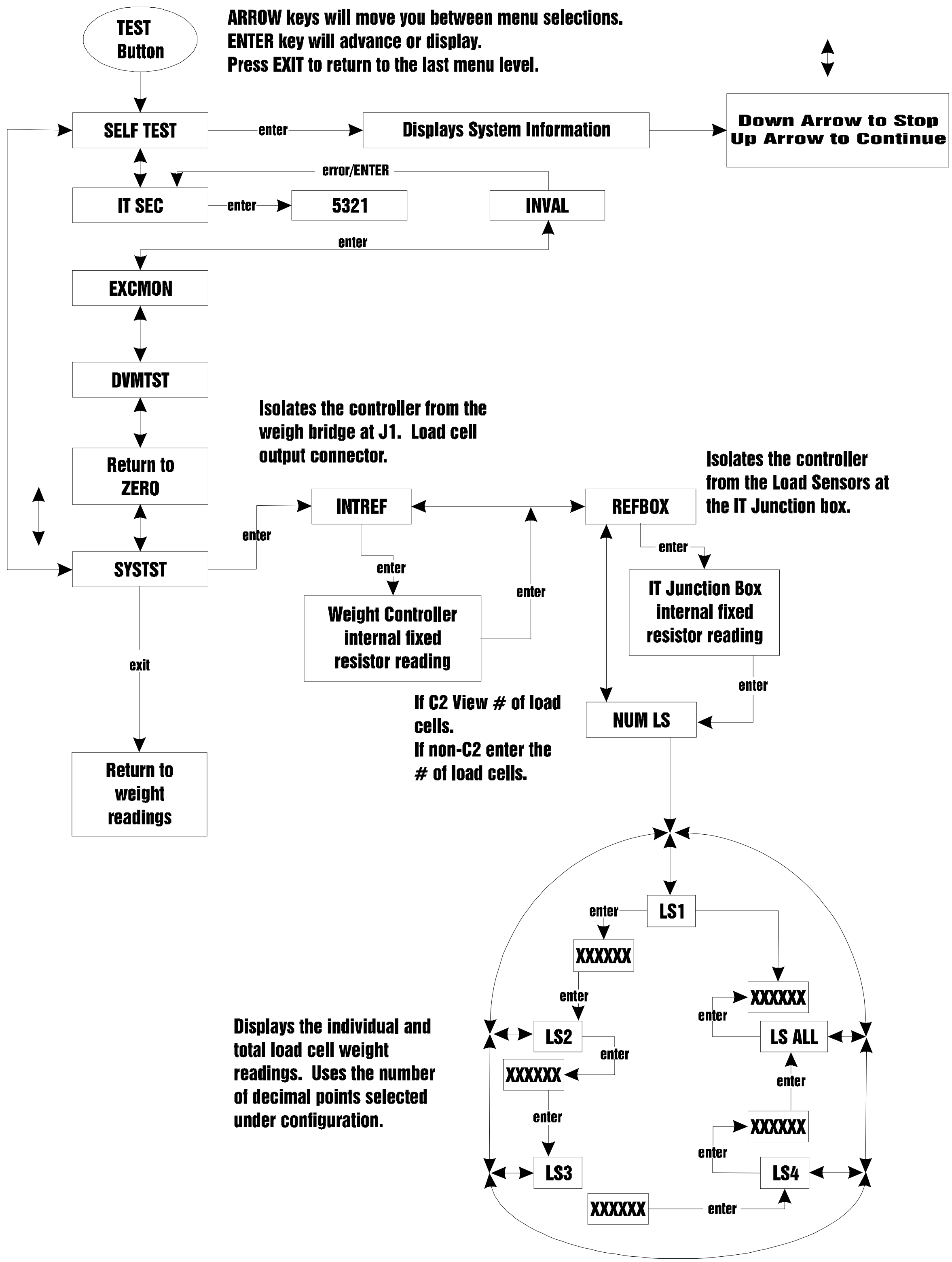
TEST Button
ARROW keys will move you between menu selections.
ENTER key will advance or display.
Press EXIT to return to the last menu level.
SELF TEST
enter
Displays System Information
Down Arrow to Stop
Up Arrow to Continue
error/ENTER
IT SEC
enter
5321
INVAL
enter
EXCMON
DVMTST
Isolates the controller from the weigh bridge at J1. Load cell output connector.
Return to ZERO
Isolates the controller from the Load Sensors at the IT Junction box.
INTREF
REFBOX
enter
SYSTST
enter
enter
enter
IT Junction Box internal fixed resistor reading
Weight Controller internal fixed resistor reading
exit
enter
If C2 View # of load cells.
If non-C2 enter the # of load cells.
NUM LS
Return to weight readings
LS1
enter
XXXXXX
enter
XXXXXX
enter
Displays the individual and total load cell weight readings. Uses the number of decimal points selected under configuration.
LS2
LS ALL
enter
XXXXXX
enter
enter
XXXXXX
enter
LS3
LS4
XXXXXX
enter

General Troubleshooting Flow Chart Index

Drifting or unstable weight readings	A
Electrical, Mechanical and Configuration reviews	B
Weight indication will not return to zero	E
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Error 18	G
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Load Sensor Installation	K
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Blank Display	N
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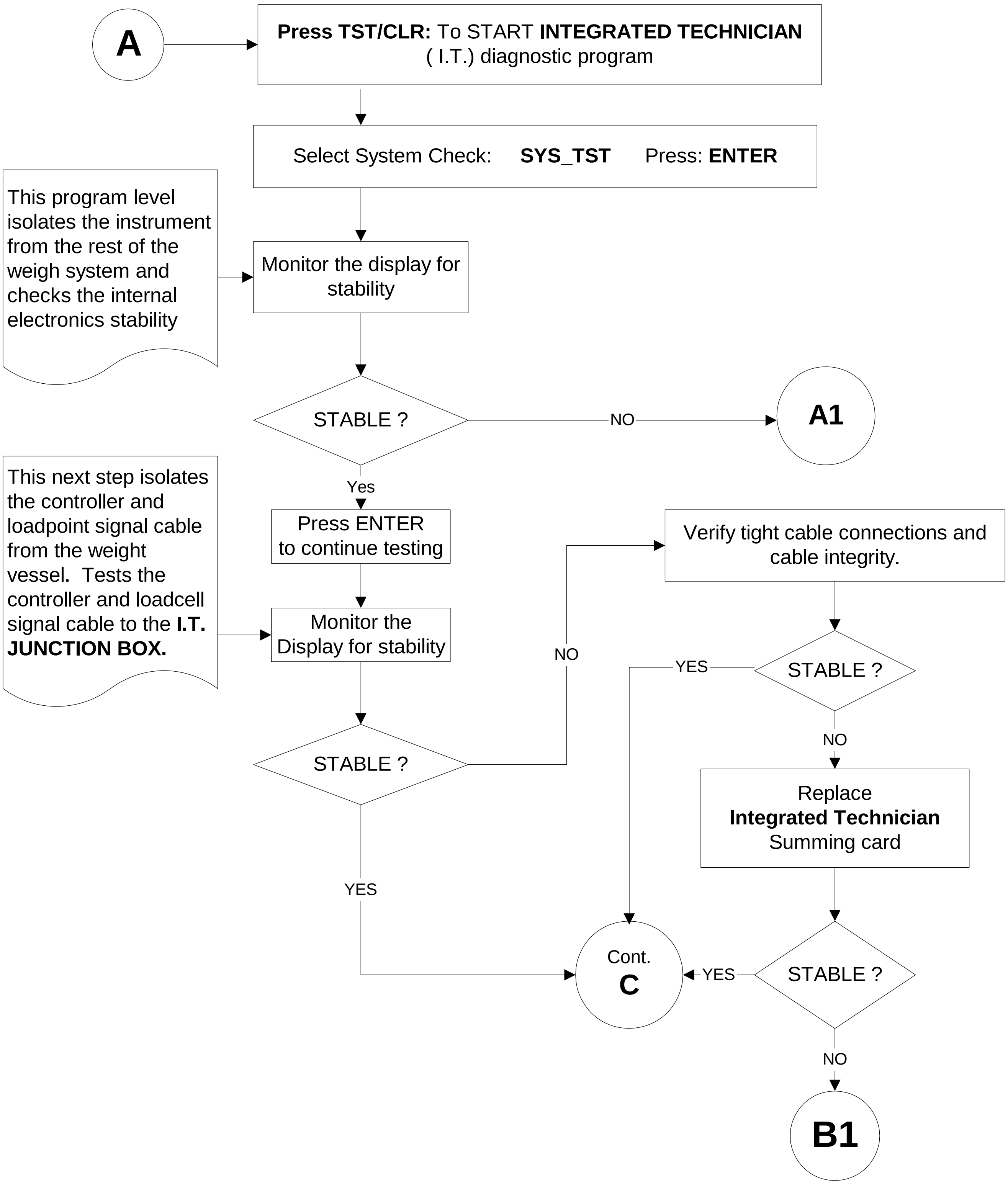
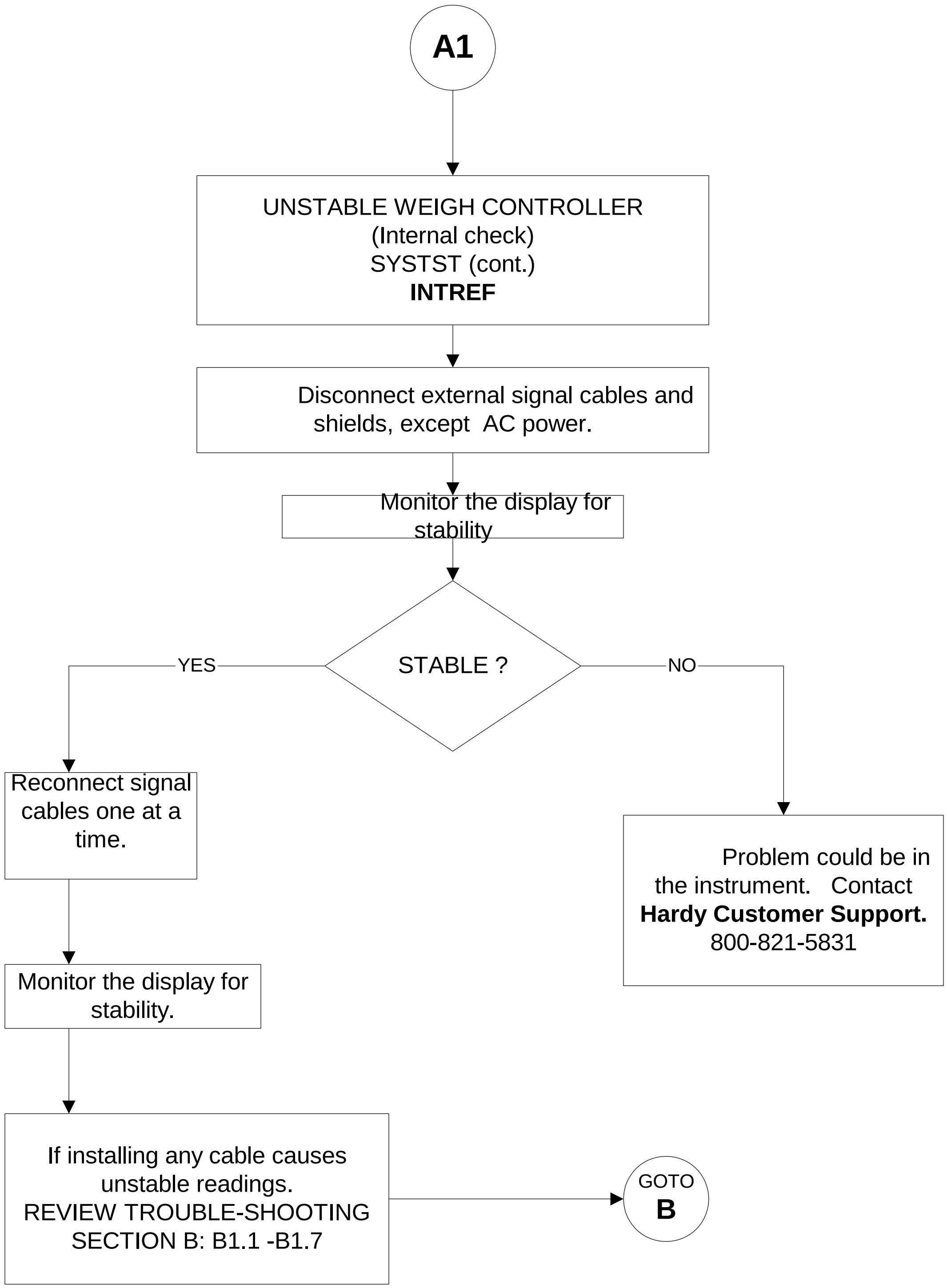
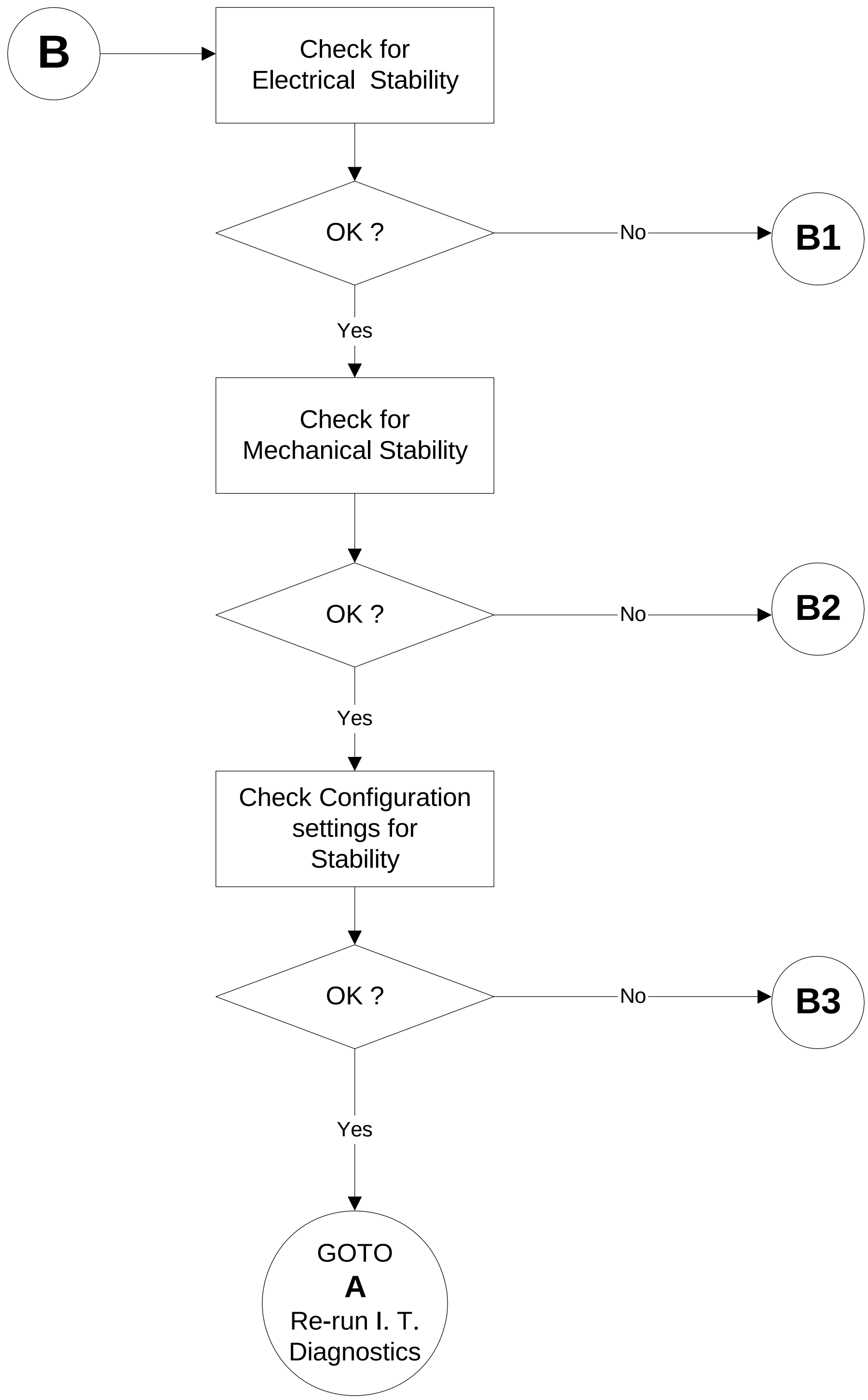
A - Guidelines for Instabilities on Formerly Operating Systems



A1 - Guidelines for Instabilities on Formerly Operating System (Cont'd)



B - Guidelines for Instabilities on Formerly Operating Systems (Cont'd)



B1 - Guidelines for Instabilities on Formerly Operating Systems (Cont'd)

B1 → **Electrical**

B1.1 → **Physical Grounding** -
All common equipment share a common ground point.
Keep the ground cable length to earth ground as short as possible.
Install a new ground rod if the cable length is excessive.

B1.2 → **Cable -**
Cuts or breaks in the loadcell cable insulation allow moisture to wick into the cable and loadpoints. This can setup stray capacitance charges and allow ground currents to exist. This could create a highly intermittent situation.

B1.3 → **Vessel, Fill and discharge piping** -
Ground all to a common point to eliminate electrical differences in potential, and static build-up.

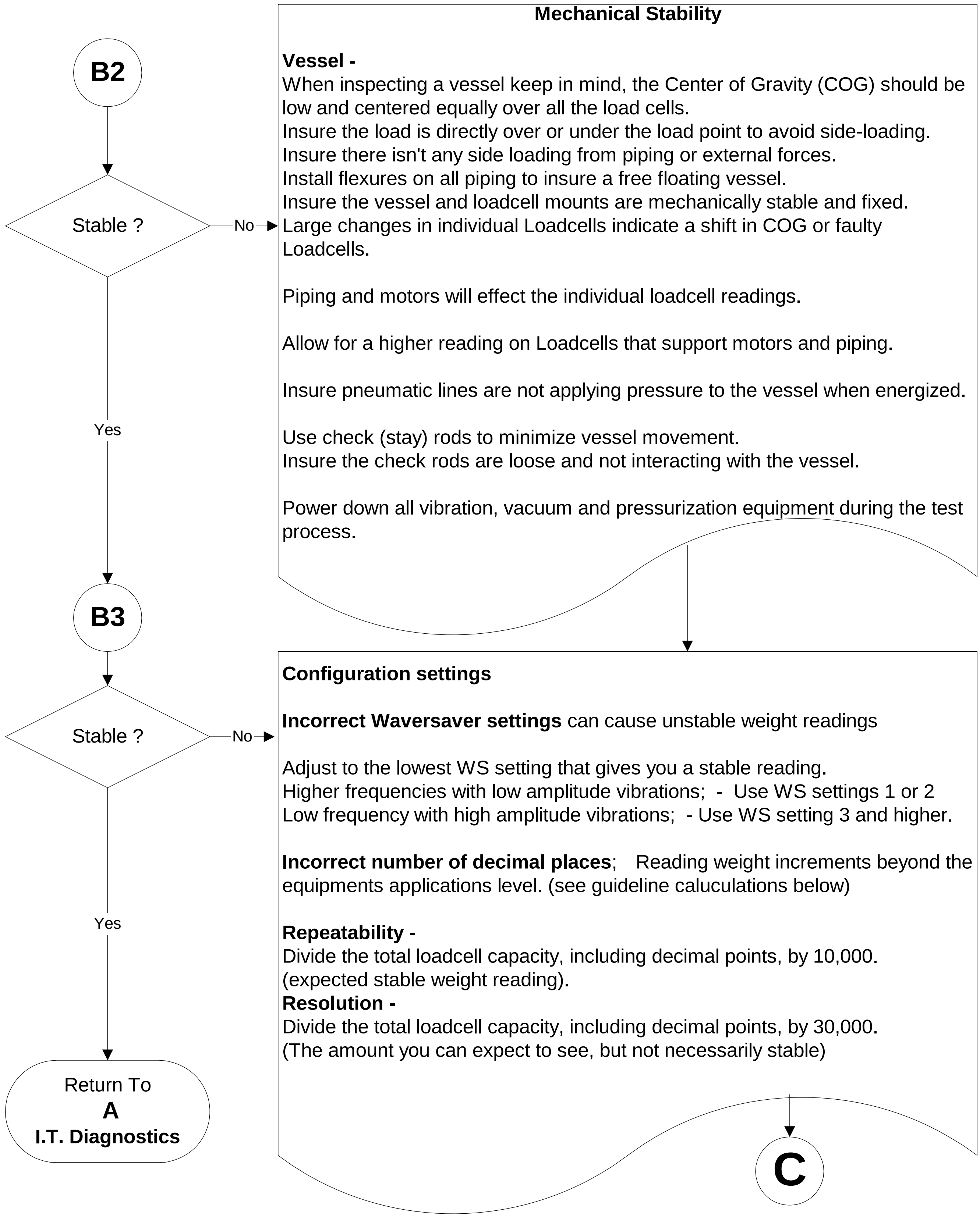
B1.4 → **Loadcells** -
Ground straps must be installed to provide a direct discharge path to ground around the loadpoints.

B1.5 → **Cable Routing** -
Seperate high voltage sources and cables from low voltage signal cables.
Stay a minimum of 14 inches from Magnetic fields and SCR controls.
Avoid parallel high voltage and signal cable runs.

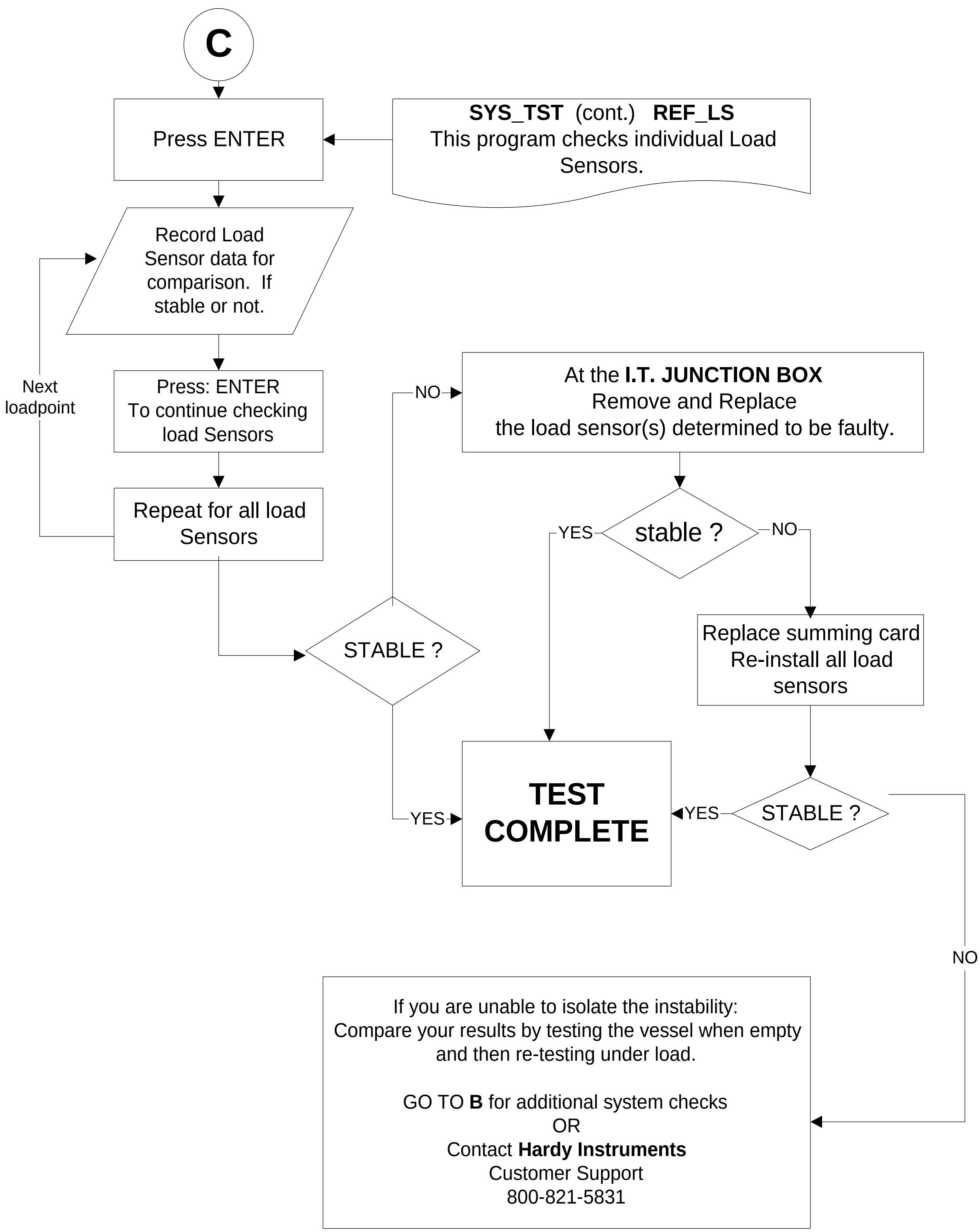
B1.6 → **Cable Shielding -**
Ground low voltage cable shields only at the controller end.
Grounding both cable ends will produce ground currents.
Verify, with an ohm meter, the shield is only grounded at the weight controller.
Disconnect the shield at the controller and check for an open circuit between ground and shield. Reconnect the shield to ground and confirm a proper ground path from the I.T. Junction box to the controller.
Verify the shield is not connect to ground at the I.T. Junction Box.
Loadcell cable shields only pass thru the I.T. Junction Boxes and are not connected to ground at that point.

B1.7 → **Weight Controller** - Common AC ground and Chassis grounds. → GOTO **B**

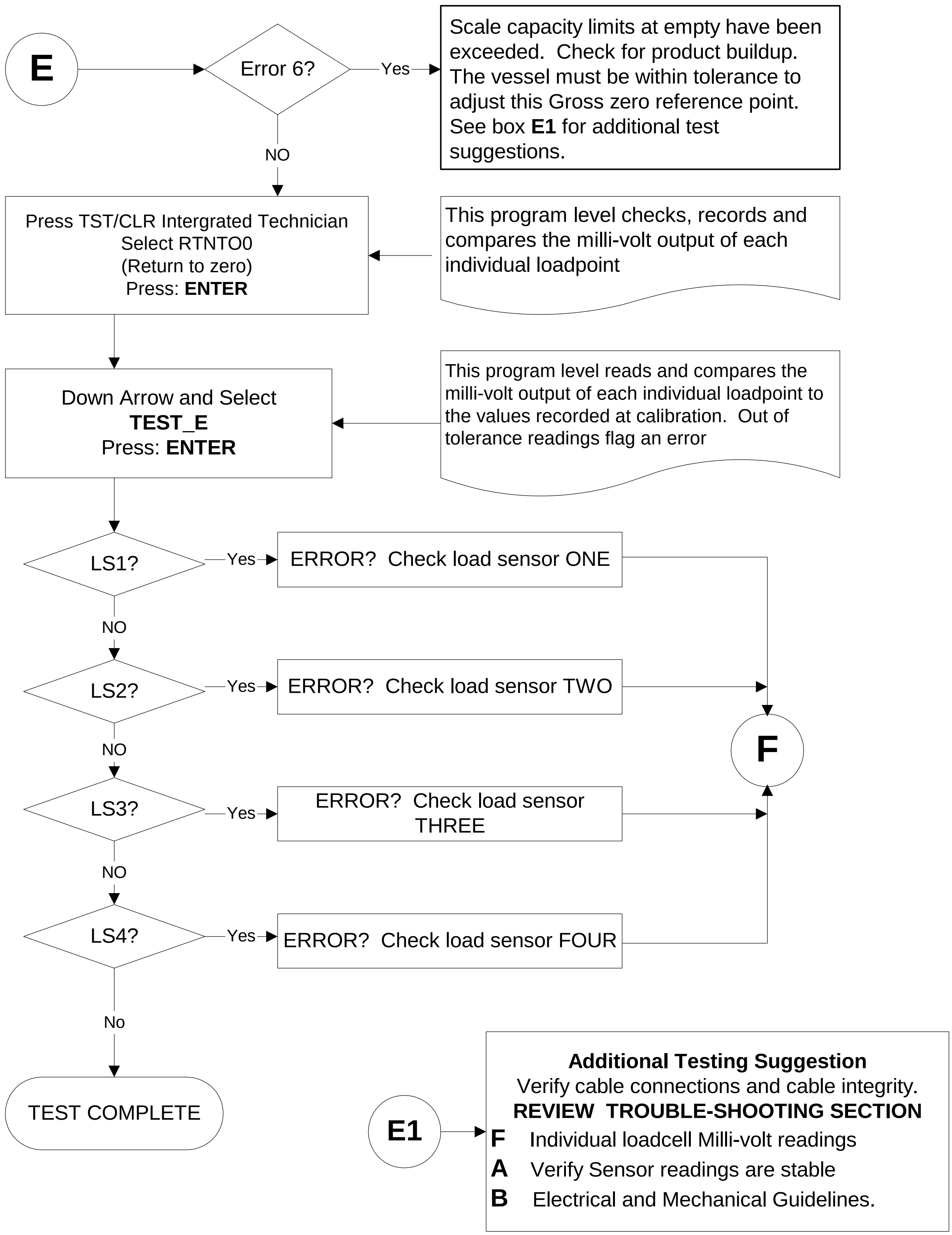
B1 - Guidelines for Instabilities on Formerly Operating Systems (Cont'd)



C - Guidelines for Instabilities on Formerly Operating Systems

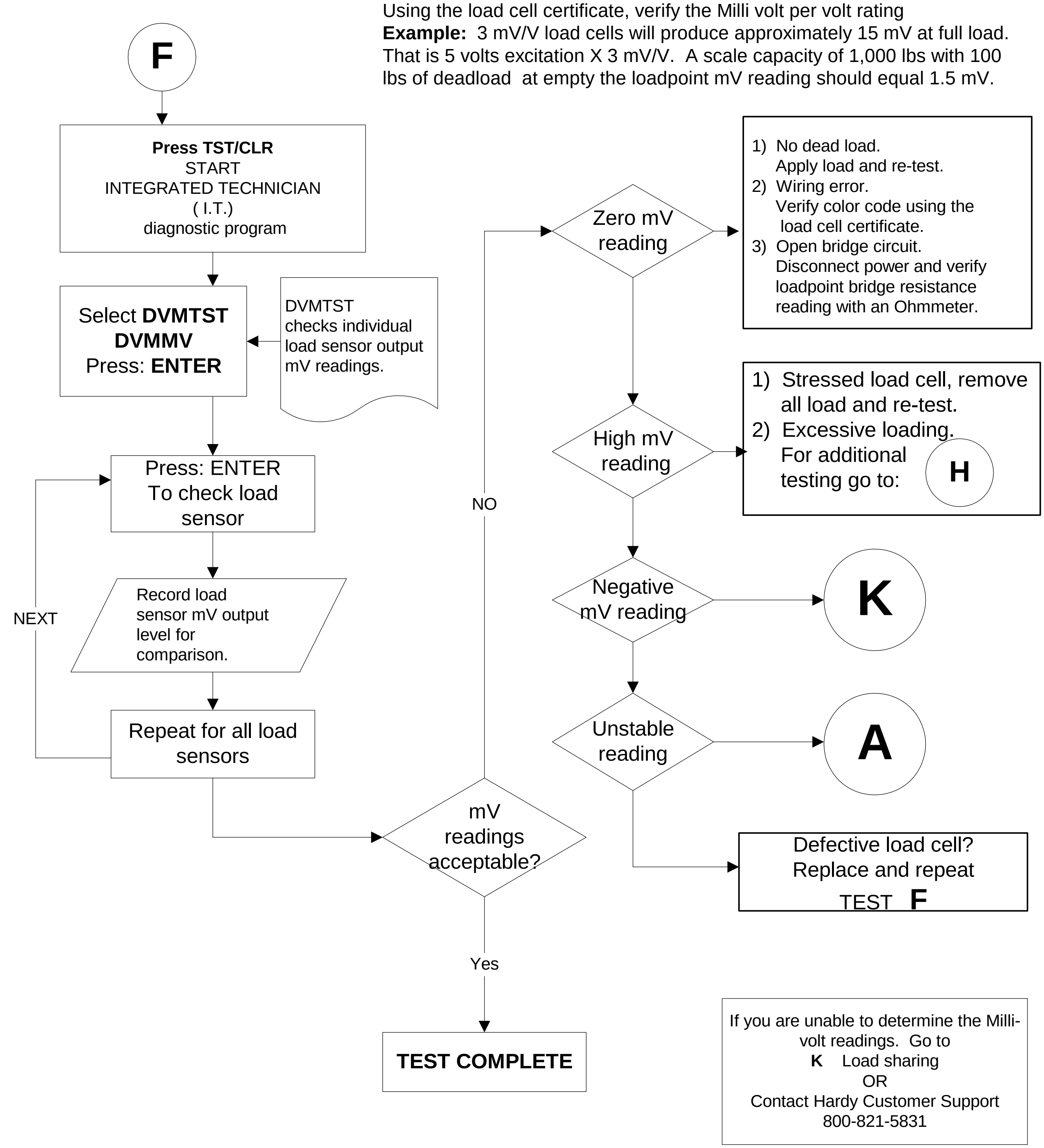


E - Non-Return to ZERO

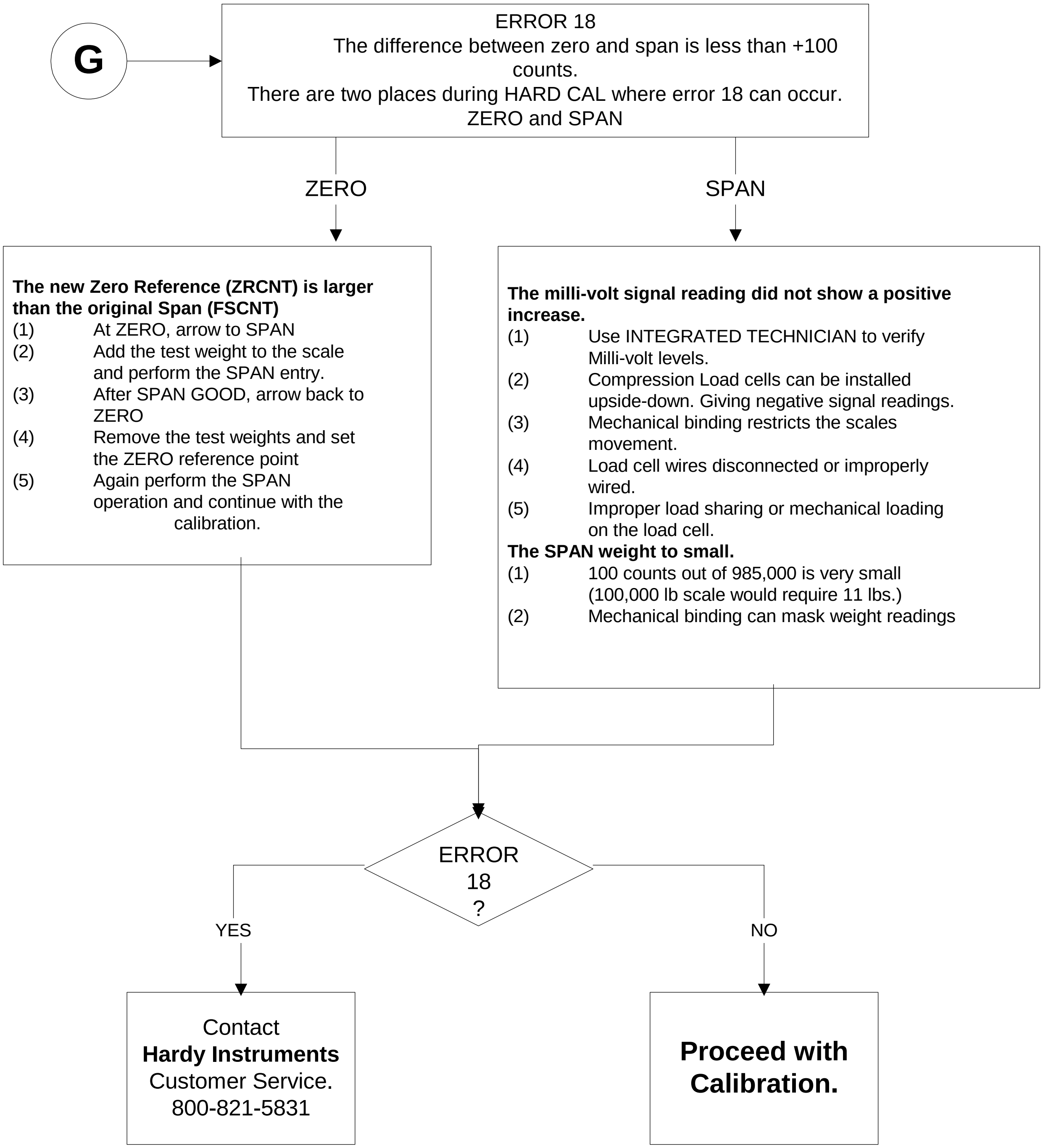


F - Verify Individual Load Cell Milli-volt Readings

Using the load cell certificate, verify the Milli volt per volt rating
Example: 3 mV/V load cells will produce approximately 15 mV at full load. That is 5 volts excitation X 3 mV/V. A scale capacity of 1,000 lbs with 100 lbs of deadload at empty the loadpoint mV reading should equal 1.5 mV.



G - Error 18 During Hard Calibration



H - Mechanical Inspection

H

H 1 All pipes and conduits flexible?

1) Keep flexures on the horizontal
2) Vertical flexures should be avoided
3) Do not use flexures to correct for misaligned piping
4) Do not use hose flexures to make right angle bends
5) Non-flexed piping should have an unsupported horizontal run using a ratio of 36 times it's diameter.
6) Pipe flexure lengths should be a ratio of 6 times it's diameter
7) Feed and discharge piping flexed
8) Are the flex joints on the correct side of the valve ?
   (a) You weigh the output valve, not the input valve
   (b) Does the weigh scale see all the product to be weighed?
   (c) If the product applies a force to a valve or pipe, that . pipe or valve must be included in the weigh vessel.
   (d) Proper positioning of the flexures are key.
   (e) Your vessel must seem to float.

H 2 Mechanically isolated from ladders and connecting structures?

1) Floors or structure does not interact.
2) Local traffic does not interact
3) Protected from forklifts and adjacent processing equipment

H 3 Are the load cells properly mounted?

1) Level, solid mounting base
2) The load cell is mounted right side up.
3) All load cell bolts installed using anti-seize compounds.
4) Mechanically aligned to compensate for expansion and contraction.

H 4 Are Check rods installed to dampen vessel movement?

1) Protects the load cells from overload and impact forces
2) Limits the movement of the vessel
3) Rods must be loose and not interacting with the vessel.

H 5 Are cables routed properly?

1) Separate conduit for low and high voltage cables.
2) Do not bundle Low voltage with High voltage cables
3) Maintain at least 3 inches of seperation.
4) Maintain 14"seperation from magnetic fields and 440 vac.
5) Cables are in conduit or tied up and protected from damage.

H 6 Housekeeping

1) Product, tools and production aids are off the vessel.
2) No workers are physically on the scale
3) Must protect equipment from environmental damage
4) Insure openings are sealed to keep water and environmental contaminates from damaging:
   (a) Instrument cabinet or enclosure
   (b) Summing card
   (c) Load Cells
   (d) Conduit runs
   (e) covers are properly installed

To Verify Electrical Go to **J**

J - Electrical Inspection

J

J 1 → Verify the proper voltage level has been supplied. →

DO NOT POWER UP THE CONTROLLER UNTIL INPUT VOLTAGES CAN BE VERIFIED.

1) Check the specification label attached to the weight controller chassis. (110 vac or 220 vac?)
2) Use a meter to verify neutral, ground and Hot are proper.
3) Computer grade power
4) Use Active filters for motor noises and spikes.
5) Use Isolation transformers to combat surges and sags.
6) Isolated from SCR and motor control circuits
7) Use a Common earth ground.
   a. Keep ground cable runs as short as possible
   b. Excessive ground cable runs can act as an antenna for AC noise
   c. Install grounding straps around load cells to direct static away from the load cell and directly to ground.
   d. Install ground straps on the input and discharge piping, and the vessel to a common earth ground.

J 2 → Apply power to the controller only if supply voltage is correct. →

1) Verify the front display illuminates.
2) Completes the initialization process
3) Displays a weight reading. This weight value will not be correct if a calibration procedures was not performed.

J 3 → Does the scale reflect a weight change? →

1) Press the MODE Button to display NET weight.
2) Press the TARE button to ZERO the NET weight.
3) Apply weight to the vessel
   (a) Does the weight increase and decrease in the correct direction with the weight?
   (b) Does the weight return to ZERO NET?
   (c) The weight value will not be correct until a proper calibration is complete.

J4 → Cabling →

1) Use the load cell certificates to verify color code Input is excitation, Output is signal.
2) Shielding
   a) Grounded only at the weigh controller
   b) Continuous shield connection from the Load cell cable to the controller. Single point EMI/RFI drain.
   c) Terminated, but not grounded, at the summing box.
3) Sense lines installed?
   a) Jumpers or sense lines in the J1 connector ?
   b) Sense lines must be installed for C2 of Softcal calibration
4) Using **Integrated Technician SYSTST** verify readings.

To Verify Proper Load Cell Operations Go to

K

K - Load Sharing and Load Sensor Checkout

K

K1 → Load cell wiring is complete and correct? →

1) Does the mV signal increase in a positive direction.
2) If you receive a negative results, check if load cell is mounted correctly.
   a) The arrow goes with the direction of force.
   b) If there isn't an arrow, you must manually verify the correct direction. A negative reading indicates the load cell is upside down.
   c) Load cells in tension will not reflect a negative reading if install upside down. If upside down, only the force applied by the cable would be included in the weight readings.
   d) If you are still receiving a negative signal, verify load cell wire color code

K 2 → Multiple load cells? MAP the mV reading. Balance the load →

1) Verify a positive reading from each load cell, using **Intergrated Technician's DVMTST, DVM MV**.
2) Record the mV reading and compare each corner for proper load sharing.
   a) Proper load sharing should see only a difference of +/- .5 mV.
   b) Larger differences due to motors and piping, should not exceed +/- 2 mV.
   c) If there isn't any motors, valves, or piping to explain the mV difference, adjust the corners and balance the mV readings.
   d) Use shims, or if equipped adjusting bolts on the load cell mounting hardware.
   e) Drawing a load cell map will help determine the correct leg to adjust and in which direction.

Three load cells balance like a three legged chair.

1) Using a sprit level, verify the vessel is vertically and horizontally correct.
2) Verify if any height change will effect the attitude of adjacent vessels or piping.
3) Adjust each legs to dynamically match mV outputs
4) Verify the mV readings and physical level when complete.

Four load cells or more present a challenge.

1) Use **Integrated Technician DVMTST, DVM MV** Determine the sum of the load cell signals and your target mV setting for each load cell.
2) Read the output of individual load cells.
3) Adjust the load cell with the lowest reading to dynamically match the target mV readings obtained in step 1.
4) Read the mV readings from each load cell to verify a proper correction.
5) Repeat step 3 and 4 to achieve a proper load sharing vessel.
6) Verify the mV readings and vessel level when complete.

Monitor system for proper operation.
Check out complete

M - HI Error

M →

HI

The Load sensor output Signal has exceeded the millivolt limits set in Configuration and/or the Internal factory setting.

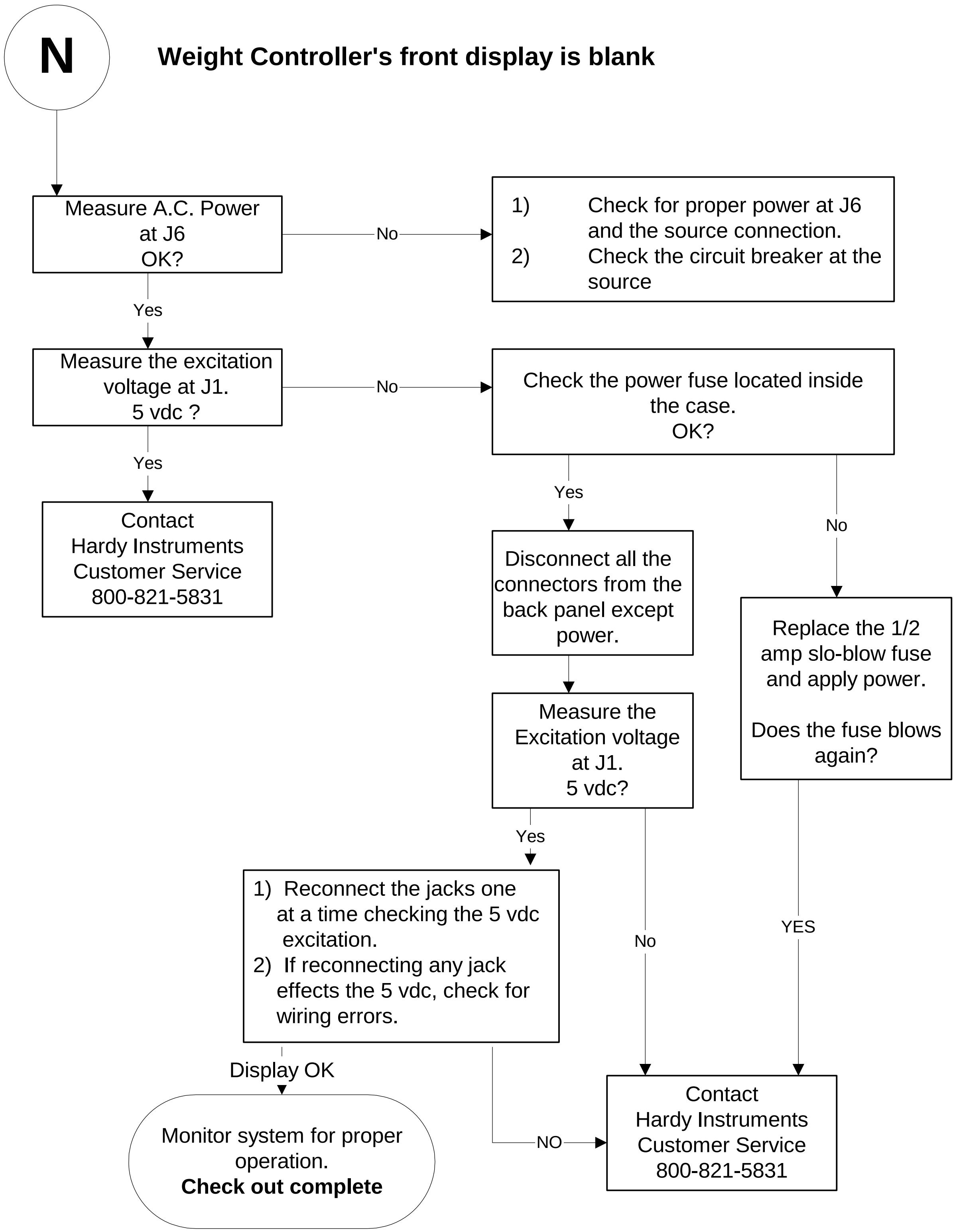
1) Verify the signal wires are properly connected.
   a. Verify load cell cable color code
      (1) Load Cell Certificate.
      (2) Installation manual.
      (3) Cable marking strips.
   b. Broken signal wires act as antenna for EMI/RFI.
   c. Load cell cable shields must be grounded only at the Weight controller to dampen EMI/RFI signals.
2) The load cell output Signal voltage has exceeded 15 mV dc
   a. Use **INTEGRATED TECHNICIAN** to verify mV levels.
      (1) Verify total milli-volt signal level.
      (2) Verify individual load cell milli-volt signals.
         (a) An individual load cells may be over-ranged and exhibit high milli-volt readings.
         (b) Possible physical damage to the load cell.
         (c) Internal Strain gauge bond broken.
         (d) Moisture in the load cell cable or body.
3) Weight in the hopper exceeds the configuration Scale Capacity setting.
   a. Under configuration verify the Scale Capacity setting.
   b. 105% of the Scale Capacity setting will cause a HI indication.
   c. This is used only as a warning and does not effect calibration.
   d. Optional communication signals are unaffected by this indication.
4) Weight in the hopper exceeds the load cell capacity
   a. Mechanical forces or product acting on the scale overloads the load cells.
   b. Use **INTEGRATED TECHNICIAN** to verify Milli-volt levels.
5) Review Mechanical and Electrical Flow charts for additional tips. **B1**

HI ERROR ?

YES → Contact **Hardy Instruments** Customer Service. 800-821-5831

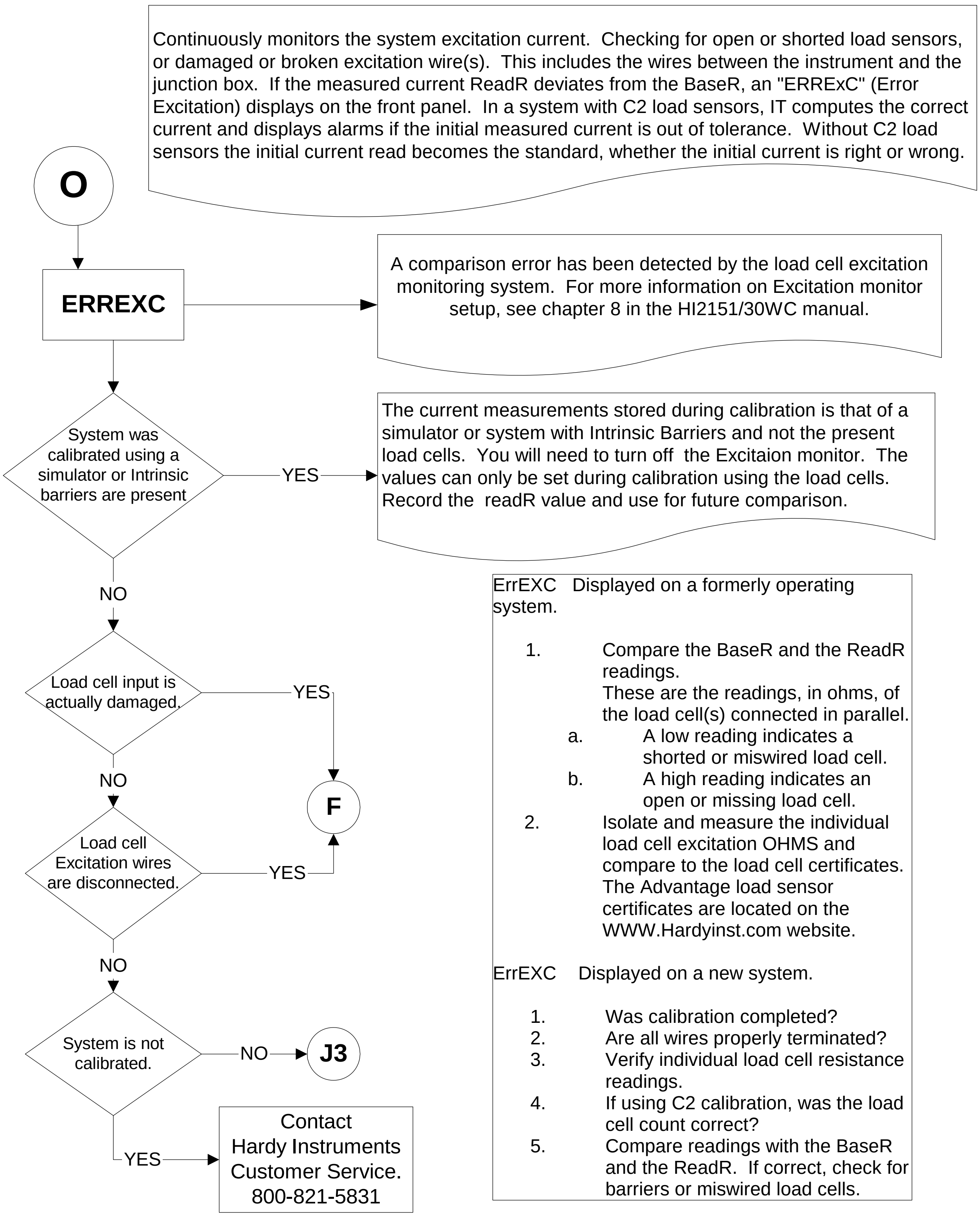
NO → **Proceed with Weighing Process**

N - Blank Screen

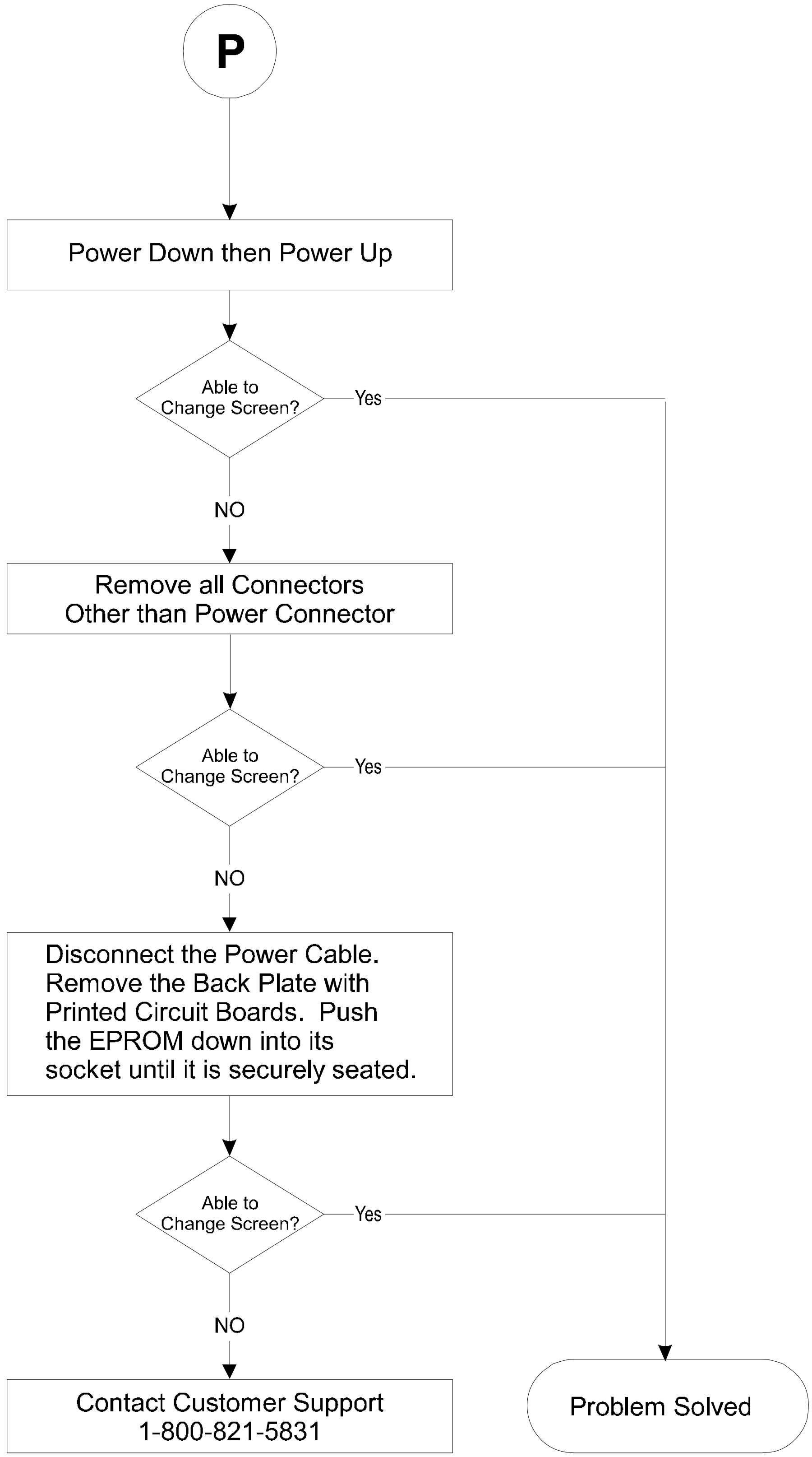


O - Excitation Monitor

Excitation Monitor



P - Stuck on
"HARDY" Screen



System Integrity Check and Fault Determination

To determine if an instrument or cabling problem exists, verify the basic operation of the system by performing the following system checks.

Self-Test

1. Self-test can be entered only from the net, gross or rate of change operating modes.
2. To initiate self-test, press the -/Test/Clr button.
3. Press the Enter button.
4. The name of each test is displayed for about 2 seconds after which the result is displayed for another 2 seconds. The self-test program automatically steps through each test and continues through any failed tests until all are completed.
5. When the self-test program has completed all tests, the instrument returns to the keyboard test, which can be ended by pressing the 0/ exit button.
6. Speed up the self-test by holding down the UP arrow key. Pause the self-test display by pressing the down arrow key. To resume the self-test, press the up ↑ arrow key. To exit the self-test at any time, press the exit key.
7. Write down the test results and compare them to the System Data Survey Sheet. Determine if any differences are due to system modifications, and update the Survey Sheet.
8. Following are the sequential tests conducted by the self-test program:

DISPLAY	TEST	FAILURE SOLUTIONS
SLFTEST	Indicates beginning of self-test.	None
VER X.XX	Version of EPROM installed.	None
8.8.8.8.8.8	Display Test - All segments and words on display turned on.	1. Main card not seated properly in display board. 2. Contamination on connector pins. 3. LED display not functioning.
ERREXC	Indicates that the measured current is out of tolerance by ± 10%.	1. New System Calibration has not been completed. 2. Load Cell is faulty. 3. Broken or Open excitation wire.

DISPLAY	TEST	FAILURE SOLUTIONS
RAMTST	Ram Test - Writes to each location in RAM & reads back and verifies data. Test is non-destructive.	None
PASSED or	Indicates whether RAM test passed	1. With most RAM failures system will not operate.
FAILED	failed.	1. Check that EPROM (U13) on main board is seated. 2. Contact Hardy Instruments for assistance.
OE OE (example)	Two hex numbers displayed; right one is actual checksum, left one is calculated from test. The two numbers must match. For each revision to EPROM numbers will be different.	Discrepancy between two numbers indicates EPROM faulty.
PASSED or FAILED	If the two numbers matched, test will pass; otherwise fail is indicated. It is possible for EPROM to loose one or more bits & still operate.	If failed, replace EPROM. (If this doesn't eliminate the problem, there could be a BUS problem.)
SLOT 1	Indicates next display is for slot 1.	
NONE or OPTION	Indicates which type of option card is installed in slot 1, if any.	1. Check connector for proper mating. 2. Try card in another slot.
SLOT 2 NONE or OPTION	Indicates next display is for slot 2. Indicates which type of option card is installed in slot 2, if any.	1. Check connector for proper mating. 2. Try card in other slot. 3. Swap with spare option card.
CALTYP	How instrument was calibrated	None

NOTE: *One of the next three messages will be displayed, depending on the type of calibration that was performed*

C2 CAL	C2TM Second Generation Calibration	None
H CAL	Hardware Calibration	None
S CAL	Software Calibration	None
UNITS	Indicates next parameter will be units of measure.	None

DISPLAY	TEST	FAILURE SOLUTIONS
KGS or LBS	Kilograms or pounds.	Default is Lb.
WSVR = 4	Indicates WAVERSAVER that was selected In Calibration	Default is 4.
GRAD	Indicates next parameter will be graduation size.	None
1 or 2 or 5 etc.	Graduation size calibrated in unit (least significant digit on display will change by this amount).	Default is 1.
SPAN	Indicates next parameter will be Span.	None
10000 (example)	Span value calibrated in unit.	Default is 10,000.
ZR CNT	Indicates next parameter will be A to D counts representing the Zero Count.	--
36780 (example)	A to D counts that indicate the calibrated Zero.	Default is 36780.
FS CNT	Indicates next parameter will be Full Scale Count. 0 in most significant digit indicate value >1,000,000.	None
992000 (example)	A to D counts that indicate the Calibrated Span Value.	Default is 992000.
SC CAP	Indicates next parameter will be Scale Capacity.	None
999999 (example)	Scale capacity value calibrated in unit.	Default is 10,000.
0 TOL	Indicates next parameter will be Zero Tolerance.	None
10 (example)	Zero Tolerance value calibrated in unit.	Default is 10.
AO TOL	Indicates next parameter will be Auto Zero Tolerance	None
10	Auto Zero Tolerance set during calibration	None

DISPLAY	TEST			FAILURE SOLUTIONS
MOTION	Indicates next parameter will be motion value.			None
3 (example)	Motion value calibrated in unit.			Default is 3.
AVRAGE	Indicates next display will be number of values set in the running average table (1 - 200).			None
100 (example)	Number of values set up to be averaged.			Default is 100.
LINCOR	Indicates next display will be single point linear correction.			None
0 (example)	If 0, linear correction is not used. Number other than 0 indicates single-point calibrated value.			Default is 0.
AD OFF	Indicates next display will be A to D Off Set.			None
28912	A to D Offset Value.			None
ADGAIN	Indicates next value will be A to D gain.			None
828238	A to D Gain Value			None
DIP 1	Indicates next display will be settings of rear panel Config dipswitch S3 segments. Settings represented by hexadecimal notation.			If value is other than desired, reset dipswitch segment and retest.
00 thru FF	SWITCH POSIT	VALUE	ON	OFF
	2	01	Cal toggle	Cal toggle
	4	02	Opt menu lock	No opt menu lock
	5	04	S.P. menu lock	No S.P. menu lock
	7	08	Tare, lb/kg, N/G, lock	zero Keys not locked
	8	10	Zero track on	Zero trk off
	6	20	Spare	Spare
	3	40	Serial requests only	All serial I/O
	1	80	P2 multidrop	Not multidrop

DIP 2	Indicates next display will be settings of internal dipswitch S2 on power relay board. Settings represented by hexadecimal notation.	If value is other than desired, reset dipswitch segment and retest.

00 thru FF

SWITCH POSIT	VALUE	ON	OFF
8	01	Spare	
7	02	Spare	
4	04	NBS Re-Call toggle switch	
1	08	Ignore incoming checksums	
2	10	On is averaged gross, Off is instantaneous gross	
3	20	NBS	
5	40	Spare	
6	80	Spare	

LC CNT = 0 - 8
SN1 xxxx-xxxx
“ “ “
SN8 xxxx-xxxx

NOTE: *LC CNT SN1 through SN8 is for C2 only.*

TAG 1	Indicates next display will be value of software control options. Settings represented by hexadecimal notation	If options are not as desired, another memory key must be ordered. Contact Hardy Instruments Customer Support Department.

DISPLAY	**TEST**		**FAILURE SOLUTIONS**
00 thru FF	VALUE	ON	OFF
	01	Bar-graph	No bar-graph
	02	Rate of change	No ROC
	04	Peak hold	No peak hold
	08	Hardy link	No Hardy link
	10	Optional relays	No optional relays
	20	Spare	Spare
	40	CAL SW override	Normal CAL mode
	80	Totalizer	No totalizer

TAG 2 — Indicates next display will be value of software control options.

	VALUE	ON	OFF
00 thru FF			
	01	Spare	Spare
	02	Remote clear total	No remote clear total
	04	Remote clear peak	No remote clear peak
	08	Partial Setpoint Lock	

	Out (Only setpoint #1 Is Active.	No partial setpoint lock out
10	Remote CAL (lb/Kg Override for CAL Switch	No remote CAL override
20	Zero Button Enable on Key Lockout	No zero button enable
40	Remote Function Zero	Spare

KEY - BD — Indicates next display will be the keyboard test. Ensure the keyboard operates properly by pressing each key, starting with the ZERO key in the upper left corner of the keypad and moving from left to right. The LED will display each key as it is pressed. Do not press the 0/exit key until you are ready to leave the keyboard test.

IT ®Section appears. Press the Exit key to resume weighing mode of operation.

Interpreting Diagnostic/Error Messages

These techniques are limited to external observations. Checking of internal test points and voltages requires special test equipment and exposure of the circuit cards during normal operation. This should only be done by qualified technicians.

Overview of Typical Load Cell System

1. The typical system consists of one or more load cells/points, a summing junction box, and a weight controller (the HI 2151/30WC). (See Figure 8-1).

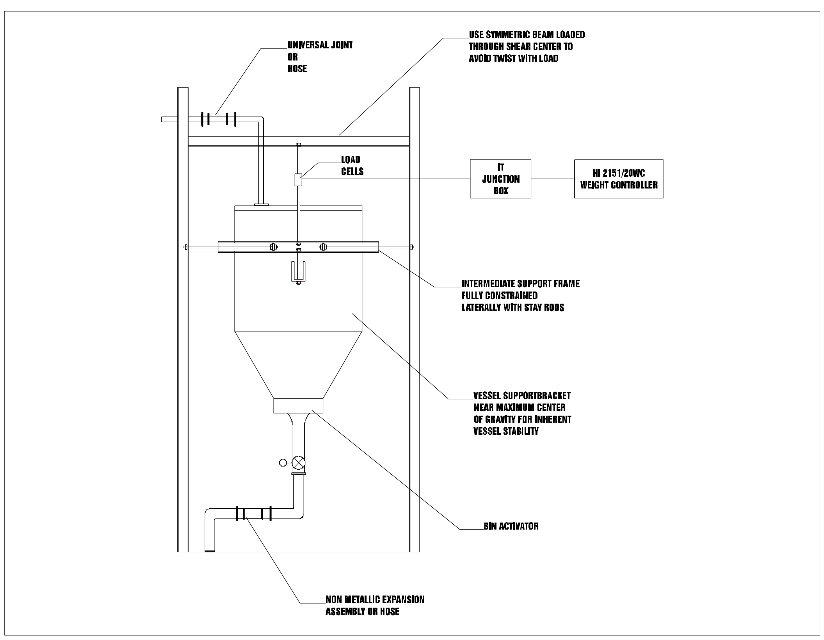


FIG. 8-1 TYPICAL LOAD CELL SYSTEM

a. Load Cell/Sensor/Point - is a strain gauge based force transducer, which generates an electrical signal proportional to the load applied to the scale. Load cells/points can be used any place a person needs to measure pressure, load, or torque. This can be accomplished by either Tension or Compression type load cells/points. The load cell/point takes as an input the 5 volts DC Excitation Voltage generated by the HI 2151/30WC, and depending upon how much weight is applied to the scale, generates a millivolt output (proportional to the weight, 0-10mv DC for 2mv/V load cells/points or 0-15mv DC for 3mv/V load cells/points).

b. IT Junction Box (Prt. # HI-215IT-SS1 - Stainless Steel, HI-215IT-PS1 - Painted, HI-215IT-FG1 - Fiber Glass) - is a system control box used to sum the incoming and outgoing signals of from one to four load sensors or load cells. The Junction Box distributes the excitation voltages to each load sensor/load cell and transfers each load sensor's performance characteristics and weight signals to the weight controller. The IT Junction Box when used with the HI 2151/30WC allows for some automated system diagnostics. It uses connectors for isolation and troubleshooting of the weight system. The IT Junction Box allows an operator to automatically switch in an internal test circuit to perform a system stability test and read the individual load sensor voltages (in millivolts or millivolt/volt) for up to 4 load sensors from the HI 2151/30WC front panel. Bias voltages will come from the load sensor excitation voltage and will not affect calibrated weight readings. Switching commands come over the C2 lines from the weight controller. Nomenclature on the board will identify positions. The user will know where load sensors 1-4 are physically located by filling out a label mounted to the inside top cover of the IT Junction Box.

c. Weight Controller - is an electronic instrument which, among other functions, is used primarily to power the load cell(s)/point(s), take the millivolt signal output from the load cell(s)/point(s), and digitize, interpret, communicate and display the results as a weight indication.

No Keypad Operation

1. Config dipswitch S3 set to keypad lockout; reposition switch.
2. Check for "HI" on display. Whenever "HI" is displayed, the keypad will be disabled except for the Cal Menu and the -/Test/Clr buttons.

Remote Functions Non-operational

1. Check wiring at J2.
2. Ensure correct ground is used (J2 pins 9 or 10).
3. Check for correct setting of Config dipswitch S3, See Chapter 4, Configuration.

NOTE: *The HI 2151/30WC should have a quality power conditioning product installed between the controller and the AC power source to reduce the likelihood of faults caused by poor or intermittent AC power.*

Using Solid State Relays with Light Loads (Optional Set Relays)

About Solid State Relays With Light Loads

There have been installations where solid state relays have been used and failed to shut off a solenoid or relay when de-energized. The actual problem comes from the internal snubbing network in parallel with the Silicon Controlled Rectifier (SCR) which does the actual switching. This network presents an impedance of 30K ohms, which means with 120 volts across, it will pass 4mA of AC current.

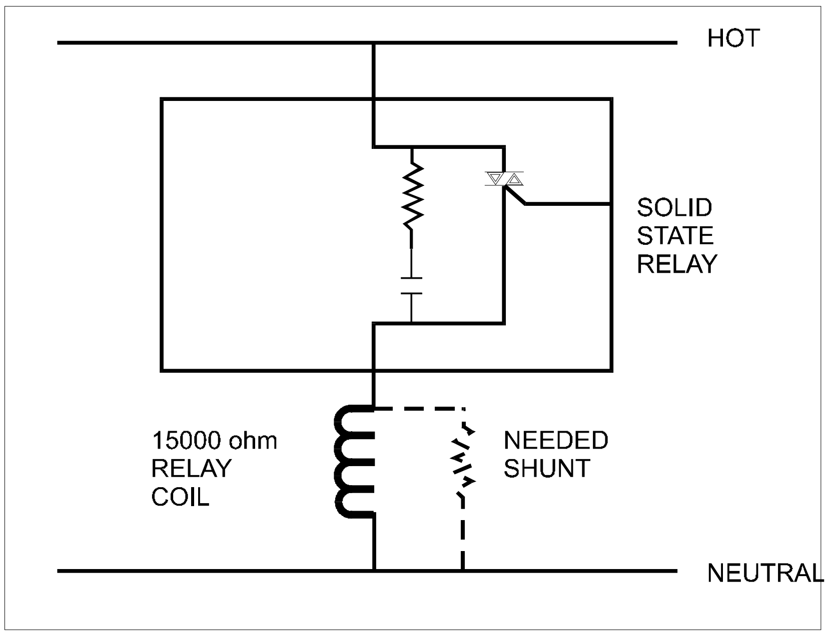
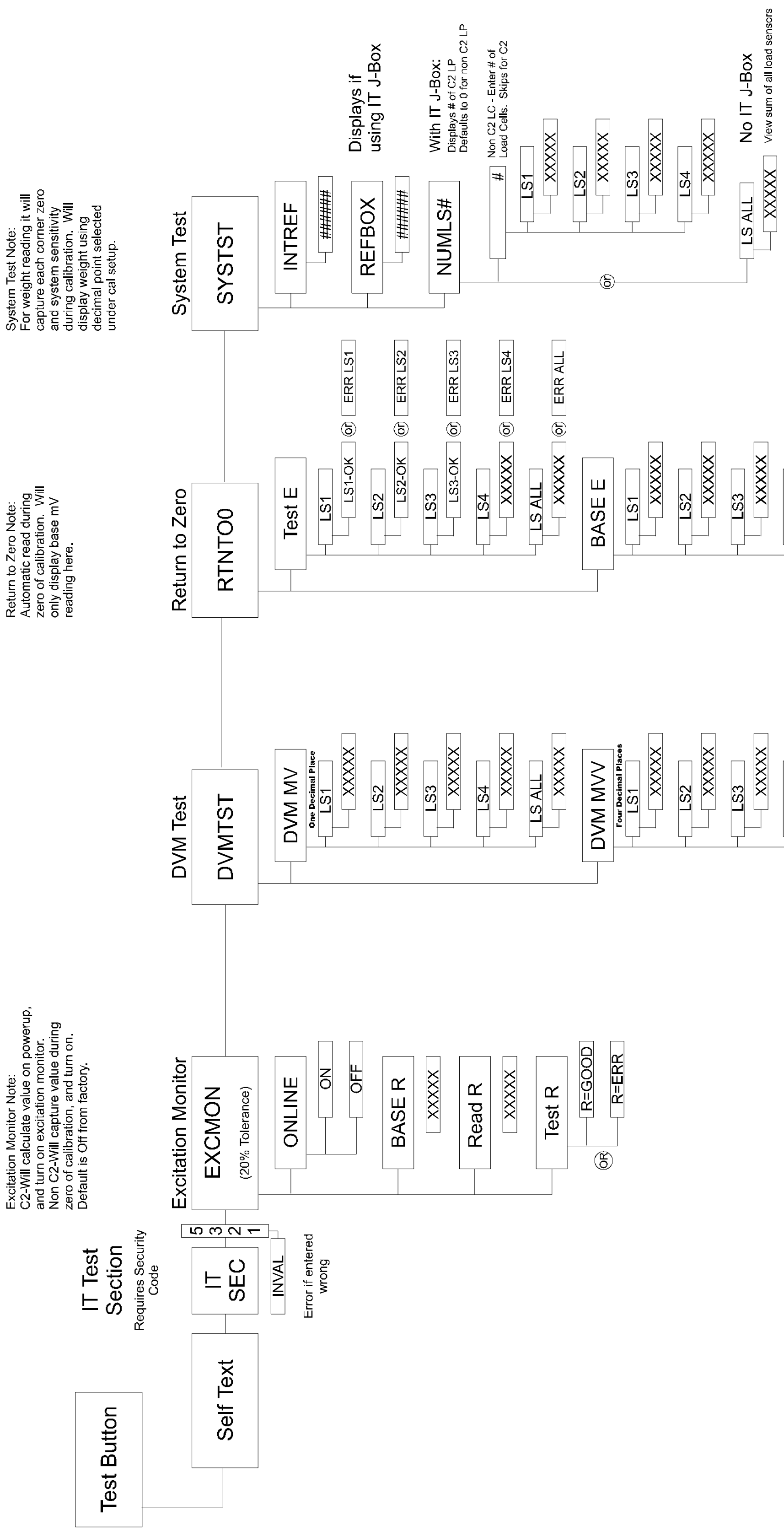


FIG. 8-2 SCR SWITCHING LOAD CIRCUIT

1. The SCR itself presents no leakage current. Some solid state relay manufactures specify 20mA minimum load. This is based on the presumption a relay or solenoid will drop out with only 4mA through it, which is not always true. That may not be true. When switching a light load with a solid state relay across the line, you must look at the rated drop-out current of the load, and if it is less than 4mA it may not turn off. The solution is to put a loading resistor in parallel with the light load, to be sure leakage current is sufficiently shunted away from the coil.
2. Assume a load like a relay with a coil of 15,000 ohms and of 5% of nominal drop-out. When the solid state relay is off, there will still be 1/3 of the line voltages across the relay, so it will not drop out. For the relay to have 5% of the line across it, it and a parallel shunt resistor must be 20 times less resistance than the 30K snubbing network, or 1.5K ohms. Use less than a 1.67K ohm parallel resistor and now total load is below 1.5K ohm or 80mA.

IT Test Menu Breakdown



Excitation Monitor (Current) Setup Menu

1. Press the -\Test\Clr button. SLFTST appears.
2. Use the up or down arrows to toggle between SLFTST and Integrated Technician Security Code Number IT SEC.
3. Press the Enter button with IT SEC displayed.
4. Use the numeric key pad to enter 5321.
5. Press the Enter button.
6. Use the up or down arrows to select one of the following, Excitation Monitor EXCMON, Digital Volt Meter Test DVMTST, Return to Zero Test RTNTO0, System Test SYSTST or Self Test SLFTST. Select the Excitation Monitor EXCMON.
7. Press the Enter button.   The On Line ONLINE Sub-Menu appears.
8. Use the up or down arrows to select one of the following:
   a. ONLINE - Press the Enter button. Use the up or down arrows to toggle between ON and OFF. After a selection is made press the Enter button to turn the online monitor ON or OFF. The BASE R display appears. The Excitation monitor must be ON to enable on line diagnostics. Press the Enter button, the BASE R sub-menu appears.
   b. BASE R - Displays the resistance reading taken at power up for C2 load points or the reading taken at zero of hard or soft calibration for no C2 load sensor. Press the Enter button. The READ R display appears.
   c. READ R - Reads the current resistance and display the value. Press the Enter button, TEST R appears.
   d. TEST R - Test the base reading against the current reading, and displays R=GOOD or R=ERR.
   e. Press the Enter button and ONLINE re-appears.
   f. Press the Exit button. The Digital Volt Meter Test DVMTST appears.

Digital Volt Meter (D.V.M)

NOTE: *The IT Junction Box must be used to display individual load sensors.*

1. Press the Enter button. NUMLS# appears indicating the number of C2 load cells. Press the Enter button. The Digital Volt Meter in Millivolts DVM MV appears.

2. Use the up or down arrows to toggle between Millivolts DVM MV and millivolts per volt DVMMVV.
3. Press the Enter button to select either one. LS1 Load Sensor 1 appears. The display may also show LS1 indicating that the load sensor is a C2 load sensor.
4. Use the up or down arrows to select whichever load sensor you want to check LS1, LS2, LS3, LS4 OR LS ALL or press the Enter button to move onto the next load sensor.
5. Press the Enter button. The controller reads the present value in millivolts or millivolts/volt whichever was selected. The Millivolt scale will display to one decimal place. The Millivolt/volt scale will display to four decimal places.
6. Press the Exit button. The Return to Zero Test RTNTO0 appears.

Return to Zero Test

NOTE: *The IT Junction Box must be used to display individual load sensors.*

1. 1.Press the Enter button. NUMLS# appears indicating the number of C2 cells found. Press the Enter button.
2. 2.Use the up or down arrows to toggle between the test voltage TEST E and to read the base voltage BASE E.

   a. Voltage Test TEST E

      - Press the Enter button.
      - Use the up or down arrows to select LS1, LS2, LS3, L24, or LS ALL.
      - To test, press the Enter button. The controller reads the voltage of the load sensor(s) and compares that value to the stored value.
      - The display may read LS#=OK or ERRLS# for each load sensor if used with the IT Junction Box, ALL=OK or ERRALL. If you get an error statement go to the troubleshooting flow chart Section K to resolve the problem.
      - Press the Exit button to go to view the Base Voltage BASE E.

   b. View Base Voltage BASE E

      - Use the up or down arrows to select LS1, LS2, LS3, L24, or LS ALL.
      - To view the base voltage reading, press the Enter button. The controller displays the base millivolt value taken at zero calibration.
      - Press the Exit button to return to the TEST E Sub-Menu.
      - Press the Exit button. The SYSTST (System Test) appears. Go to step 8.6.4.5.

Weighing System Test

NOTE: *The IT Junction Box must be used to display individual load sensors.*

1. Press the -\Test\Clr button. SLFTST appears.
2. Use the up or down arrows to toggle between SLFTST and Integrated Technician Security Code Number IT SEC.
3. Use the numeric key pad to enter 5321.
4. Use the up or down arrows to select one of the following, Excitation Monitor EXCMON, Digital Volt Meter Test DVMTST, Return to Zero Test RTNTO0, System Test SYSTST or Self Test SLFTST. Select System Test SYSTST.
5. Press the Enter button. The Internal Reference INTREF appears.
6. Use the up or down arrows to select either the Internal Reference INTREF or the IT Junction Box Reference REFBOX.
7. To read the Internal Weight reading of the controller press the Enter button with the INTREF displayed.
    a. This disconnects the instrument from the sense and signal load sensor lines and connects the instrument to an internal resistance. The controller stays in this mode until it is determined if the weight reading with this resistance pulled in is stable and repeatable (the input section of the controller is functioning correctly).
    b. Press the Enter button. The controller goes to the REFBOX if the IT junction box is used. If the IT junction box is not used the display will read NUMLS# or LSALL.
8. To read the internal weight reading of the IT Junction Box press the Enter button
    a. The sense and signal load sensor lines are reconnected in the controller.
    b. Next a switch in the Junction disconnects the IT junction box from the load sensors and connects a resistance in the junction box.
    c. It stays in this mode until the weight reading with this resistance pulled in is stable and repeatable (the input section of the controller along with the cable connecting it to the junction box is functioning correctly).
    d. Press the Enter button. The display will read NUMLS# or LSALL.
    e. Number of Load Sensor NUMLS#
        - The number after the NUMLS# represents the number of C2 load points found.

- Press the Enter button to see the list of C2 load sensors (LS1, LS2, LS3, etc.).
- Use the up or down arrows to select the load sensor that you want to read.
- Press the Enter button to read the weight reading.

f. The IT Junction Box must be used to display individual load sensors.Non C2 Load Points with the IT Junction Box

- The Default is 0 for NUMLS0.
- Press the Enter button.

- Use the numeric key pad to enter the number of load sensors.
- Press the Enter button to view the list of Non C2 load sensor (LS1, LS2, LS3, etc.)
- Use the up or down arrows select the load sensor you want to read.
- Press the Enter button to view the weight reading.

NOTE: *For A&B: The sense and signal load sensor lines are reconnected in the controller. Next a switch in the Junction box disconnects all but one of the load sensors. If the weight reading is stable, the first load sensor is disconnected and the next load sensor is switched in by pressing the Enter button.*

g. LSALL (Without an IT Junction Box) Press the Enter button to view the weight reading for the sum of all the load sensors.

h. Press the Exit button to return the INTREF Menu.

i. Press the Exit button again to return to the Weight Display.

Error Messages and Definitions

Error Message	Definition
- - LO - -	A Load cell(s) is wired backwards and load cell/point signal displays a weight lower than the scale capacity (i.e. negative number)
- - HI - -	Load cell/point signal represents a weight higher than scale capacity.
ERREXC	A ± 10% comparison error has been detected by the load cell excitation monitor.
Error	Invalid character entry.
Err 1	Invalid grad size. Grad size must be 1, 2, 5, 10, 20, 50, 100, 200, 500. Err
Err 2	NTEP grad size error. Grad size must be greater than the full scale divided by the range.
Err 3	Average out of range. Average must be from 1 to 200.
Err 4	Instrument in motion when value entered.

Error Message	Definition
Err 5	Not in Gross mode when trying to enter CAL menu.
Err 6	Invalid zero. Zero must be less than zero tolerance.
Err 7	Invalid grad size. Grad size must be greater than the full scale divided by the range minus one valid grad size.
Err 8	Unable to enter Calibration Menu without toggling ReCal segment on S3 or using the proper security code.
Err 9	Invalid zero. When the instrument is in NTEP mode, the zero must be within the zero tolerance.
Err 10	Invalid motion tolerance. Motion must be greater than 0 and greater then or equal to Grad Size.
Err 11	Negative gross weight during acquire tare. (NTEP only)
Err 12	All decades after decimal point must be active. (NTEP only)
Err 13	Full scale calibration of zero or negative value not allowed.
Err 14	Scale capacity of zero or at negative value not allowed or indicates
Err 15	Zero tolerance of zero or a negative value not allowed or indicates linear correlation value entered is not > 0 or < Span value.
Err 16	Tare greater than span. (NTEP only)
Err 17	Acquire tare cannot be used with zero gross weight. (NTEP only)
Err 18	Difference between zero and span is less then 100 counts in the positive direction or indicates the linear correction point is not 100 counts > 0 or 100 counts < Span point.
Err 19	Occurs when configuring Serial Port 1 and entering a negative address.
Err 20	Option held when a print command was requested. Option hold active on remote functions TB when print command from serial port requested. (Serial Port only)
Err 24	Clock malfunction.
Err 25	Invalid total decimal point.
Err 26	Faulty time or date entry.
Err 40	Software Cal sticker value too small.
Err 41	Software Cal reference point weight out of range.
Err 42	Software Cal load cell overloaded.
Err 43	Software Cal range is zero error.
Err 44	Sensitivity out of range.
Err 45	No Software Cal in NBS range.
Err 50	Too many BCD Options.
Err 52	Too many Serial Options.
Err 54	Invalid serial or BCD format entry. (_ _ _ _ _ _ P or _ _ _ _ _ _)

Error Message	Definition
Err 55	Illegal analog weight span. Analog span weight minus analog zero weight must be larger than 2% of the calibrated span.
Err 60	The number of load points found did not match the number entered.
Err 61	No load points found.
Err 62	Load point capacities or sensitivities do not match.
Err 63	Check Sum Error on 1 or more load points.
Err 64	Too many significant digits, after the decimal point, to be displayed.
Err 65	One or more C2 load cell connections are reversed.
Err 99	Bad command sequence. (Serial Port only)

General Policies and Information

With over 70 years of industrial weighing experience and products in the field, Hardy Instruments continues to design, manufacture, install and support Hardy products worldwide. The following paragraphs describe Hardy's customer support services and equipment warranty.

System Support

Customer support is provided as follows:

1. New system start-up: Ensure that the installation is checked and correct; instruments are calibrated, and operators trained.
2. Service: Engineers are trained and qualified to provide on-site installation, calibration, and maintenance.
3. On-site training: A Hardy Support Representative can be scheduled to train your operations and maintenance personnel. This can be as simple as basic load cell theory or as complete as troubleshooting techniques which allow you to service your equipment.

Warranty

A warranty problem may be handled by returning the product to the factory for repair or replacement under warranty.

NOTE: *Before returning any product to Hardy Instruments, call the Customer Support Department listed below for a Return Authorization Number. Have your company name, address, telephone, equipment model number, S/N, and a brief description of the problem ready for the customer service representative. In addition, please have Appendix A completed and ready to FAX to us before calling.*

FOR FURTHER INFORMATION CONTACT:

Customer Support Manager
Hardy Instruments, Inc.
9440 Carroll Park Drive, Suite 150, San Diego, CA 92121
Telephone: (858) 278-2900
FAX: (858) 278-6700
Web Site: http://www.hardyinst.com
E-Mail: hardysupport@hardyinst.com

Ordering Replacement Parts

Contact the Hardy Instruments Sales Department to order replacement parts and option boards. Have your equipment model number ready, as well as your completed System Data Survey Sheet (Appendix A: Data Survey Sheet).

Index

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SYSTEM DATA SURVEY SHEET

____

TO: Hardy Instruments Inc.

FROM:_______________________________________

ATTN: Customer Support

COMPANY:__________________________________

FAX NO: 858-278-6700

DATE:____

Make a copy of this page and store it in a safe place. This information helps us assist you if, for any reason you need to consult Hardy Instruments Inc.

DATE OF INSTALLATION:____

INSTRUMENT MODEL NUMBER:____

INSTRUMENT SERIAL NUMBER:____
(The serial number is located on the back panel of the instrument)

CORNER FREQUENCY SELECTED:____

LOAD CELLS:____

Model #:____

Rated Capacity:____

Number of Load Cells:____

mv/V Rating:____

Type of Vessel/Hopper:____

Deadload or weight of vessel:____

RESULTS OF SELF-TEST: Press the -/Test/Clr button on the keypad while in the operating mode, and record the results on the following page. Use the down arrow to pause the display, and the up arrow to resume the self-test.

GLOSSARY OF TERMS

Accuracy — Closeness of a reading to the actual value of the quantity being measured. ALARM - Indication of a tolerance deviation.

Analog Shield Can — A metal enclosure placed over the analog section of the electronics to prevent radio frequency interference.

Analog Transmitter — An option card which outputs an analog representation of net, gross, total weight or rate of change data.

Appurtenance — Any added equipment other than the weigh vessel, platform scale or feeder.

Baud Rate — Baud rates are used as a measure of how fast serial data is transmitted, (BIT/SEC).

BCD — Binary Coded Decimal - a type of positional value code in which each decimal digit is binary coded into 4-bit "words".

Bi-Directional — A capability used to transmit data in either direction at the same time, for example: to or from the instrument.

Clear Key — A key used to clear data or formats entered into a menu.

CTS — Clear to send an RS-232C level signaling a readiness to accept data.

Dead Band — A value used to prevent relay chatter once the setpoint is reached.

Dead Load — Weight of hopper assembly or platform assembly sitting on top of load cells.

Decimal Point Position — Menu item used to set the decimal point position for all display readouts.

Dip-Switch — A switch installed in a circuit card with several individual switches built in. Used to set different options in a system.

Display — A device used to show information from the instrument.

Engineering Units — Pounds or Kilograms

Electrostatic Discharge (ESD) — Electrostatic Discharge is an electric charge (static electricity) which occurs when an electrically charged object, such as a person, touches the HI 2151/30WC. To avoid damage to personnel and to the unit, a grounded static control wrist strap should always be worn when opening and/or servicing the HI 2151/30WC.

Enter Key — This key is used to accept user input into the memory.

EPROM — Electrically programmable read-only memory.

Error — A message that indicates an unacceptable input has been entered.

Even — A parity configuration.

Excitation — D.C. voltage supplied to the load cell for power.

Full-Scale — Full scale input as defined by instrument and load cell parameters. Example: 3MV/V load cell @ 10 volts = 30mV full scale.

Graduation Size — Minimum increment displayed by the instrument.

Gross Weight	An overall weight exclusive of tare deductions. Weight of material plus container.
Input Average	The number of readings averaged into a displayed value.
Keypad Lockout	A selectable switch used to prevent input from the keyboard.
Kilograms	A unit of mass in the metric system. Equal to 1000 grams or 2.2046 pounds. "Gr" represents kilograms on the display.
LED	Light Emitting Diode. These are used in the front panel displays and indicators.
Load Cell	A device which produces an output signal proportional to the applied weight or force.
Menu	A set of prompts used to configure the instrument.
Menu Driven	Operational prompts supplied in common language statements via the system display to guide an operator through a procedure.
Microprocessor	A semiconductor device that performs control, input/output, arithmetic, and logical operations by executing instructions obtained from memory sources.
Midpoint Linearity Correction	Allows operator to "BEND" the response of an instrument to match a non-linear input.
Motion	The amount of allowable deviation between consecutive readings before a weighment is accepted as being complete.
NEMA 4	An enclosure that is watertight, dust-tight, and usable both indoors and outdoors. Will protect the enclosed equipment against splashing water, seepage of water, falling or hose-directed water, and severe external condensation.
NEMA 4X	An enclosure that is watertight, dust-tight, and usable both indoors and outdoors. Will protect the enclosed equipment against splashing water, seepage of water, falling or hose-directed water, and severe external condensation. Corrosion Resistant.
Net Weight	Gross Weight minus the Tare value.
Next Key	A key used to step through menus or increase the value of a digit.
Non-Linearity	A deviation of an instrument response from a straight line.
Number Of Readings Per Average	The number of weight readings used to compute the displayed weight.
Odd	A parity configuration.
Option	A device not supplied with a standard instrument.
Option Slot	A location on the main board used to install an option card.
Parity	A binary digit error correction appended to an array of bits to make the sum of all the bits always odd or always even.
Pounds	A unit of mass in the Avoirdupois System. Equal to 16 ounces or 0.4536 kilograms.

Preact — The number of units above or below the set point value of which the relay will trip. Use as an "in flight" compensation value.

Previous Key — A key used to step back through menus.

Prompts — Instructions or options presented, in a menu, by the instrument.

RAM — Random-Access-Memory. Read/write memory out of which the microprocessor can both write and read data.

Rate of Change — A measure of the rate at which weight is changing. For example, if 100 pounds were dispensed in 1 minute the rate of change would be 100 lb/minute.

Relay Sense Selection — Optional procedure which reverses the relay sense from normally energized to normally de-energized, or back again.

Remote Function — A function in the instrument that can be accessed away from the instrument.

Repeatability — The maximum difference between readings for repeated readings under identical conditions.

ROM — Read-Only-Memory. This permanent, non-volatile memory gives the processor instructions and cannot be altered.

RTS — Request to send an RS-232C level, signaling a readiness to send.

RXD — Received data at a serial port. Accepts RS-232C data signals.

Scale Capacity — The maximum amount of weight the scale is capable of supporting, (Live load plus deadload).

Secure Memory Module (SMM) — The Secure Memory Module stores and protects vital information from corruption, including calibration, configuration of setpoints, RS-232C Serial Port, Optional Serial, BCD, Bar-graph, and Rate of Change. Also allows the transference of data from one unit to another, with no re-calibration or re-configuration necessary.

Set Point — Ordered weight of a particular ingredient. Weight reading at which a relay will be actuated.

Span — The total amount of test weights used (placed on the scale) when performing a "Hard Calibration".

Tag — Another name for Secure Memory Module.

Tare — Artificial zeroing of the weight hopper so that a net weight can be displayed. Also, the action of adjusting out the known weight of the container from the total indicated weight, so that the indicator reads net weight directly.

Temperature Coefficient — The change in indication due solely to a change in temperature from a reference temperature. Expressed as a percentage of span value for a specified temperature change.

Time Base — Time in seconds between values subtracted to determine rate of change.

Transmitter Span — Value the transmitter puts out with the maximum weight on the load cell.

Transmitter Zero — Value the transmitter puts out with minimum weight on the load cell.

TTL	Transistor-transistor Logic
TXD	Transmit Data
Update Rate	Number of times per second a new weight reading is taken.
Zero	Weight reading once the dead load has been offset.
Zero Calibration	Offset of the value of the dead load of the weight hopper.
Zero Tolerance	The number of graduations from zero that will be accepted as zero by the instrument.
Zero Track	Logic command used to adjust the instrument automatically from small variances in zero readings.

SELF TEST DISPLAY

SELF-TEST DISPLAYYOUR RESULTS

EPROM#___________________________

VER___________________________

CALDAT:

CALTYP___________________________

UNITS___________________________

WSVR___________________________

GRAD___________________________

SPAN___________________________

ZR CNT___________________________

FS CNT___________________________

0 TOL___________________________

A0 TOL___________________________

MOTION___________________________

AVRAGE___________________________

LINCOR___________________________

DIP 1_______________________________________

DIP 2_______________________________________

TAG 1_______________________________________

TAG 2_______________________________________

OPTIONS: Press the 7/Option key to enter the opti0ns menu and record the results. (The order of parameters may vary from this list, depending on which options were installed.)

OPTIONS

ROC

UNITS____

TBASE____

BARGR

BAR - LO____

BAR - HI____

BCD

FORMAT_____ _____ _____ _____ _____ _____

	AN OUT 1	AN OUT 2
AN LO	______________________	____________________
AN HI	_______________________	____________________

SERIAL PORT

SERCON [ ] Print
[ ] bi-dir

BAUD________________________

PARITY [ ] odd
[ ] even
[ ] none

STOPS [ ] 1 bit
[ ] 2 bits

LENGTH [ ] 7 bits
[ ] 8 bits

FORMAT__ __ __ __ __ __

CONTRL [ ] softre
[ ] hardre

ECHO [ ] On
[ ] off

ADDRES ________________________ _____________________

RIO

RATE____

RAC NO ____

OTR NO ____

L-OTR ____

SETPOINT MENU: Press the 6/Set Pt. key to enter the Setpoint menu and record settings.

SETPOINT MENU

SEtPnt/rLY	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
MODE								
SPNT -								
DBND -								
PRE -								

PRINTER INFORMATION

Make and Model #:____

Baud Rate:____

Parity:____

Stop Bits:____

Length:____

Format:____

MISCELLANEOUS INFORMATION

Format:____

Control:____

* Address:____

* Configured with Hardy-Link____

HARDY INSTRUMENTS

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Web Address: http://www.hardyinstruments.com