



BLH

**PS-2010W
Weight Indicator/Controller
Operating and Installation
Instructions**

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SECTION 1. General Information

1.1 INSTRUMENT DESCRIPTION

The Model 2010 rail mount weight indicator/transmitter (Figure 1-1) is a microprocessor based device designed to convert the mV/V signal from strain gage type force transducers (load cells) into a high resolution digital signal representing force or weight. Units operate at either 115 or 230 VAC and provide a regulated, fault protected 10 VDC excitation for up to eight 350 ohm transducers. Standard features include an RS-485 serial port with PC interface or simplex output ASCII protocol, a sigma delta type AID converter and dynamic digital filtering. Optionally available is a fourteen bit resolution analog output.

Each unit is housed in a polycarbonate case. Simple entry of calibration data, diagnostic parameters, and filter selections is accomplished using the front panel keypad. All electrical connections are made at the top and bottom terminal strips using screw terminal connectors.

1.1.1 Introducing the Plug-n-Weigh Concept

The BLH Plug-n-Weigh concept takes advantage of technology to minimize start-up time and the operator learning curve. Intuitive configuration menus, self configuration of many set-up parameters, and simple push-button type digital calibration combine together to make the Model 2010 one of the easiest process instruments to configure and operate.

1.1.2 The Safe-Weigh Software System

Safe-Weigh software system benefits include Expert System Diagnostics and Dynamic Digital Filtering. Expert System Diagnostics provide on-line preventative maintenance information which quickly identifies a range of problems. Dynamic Digital Filtering ensures precise, repeatable set point control in 'noisy' process environments.

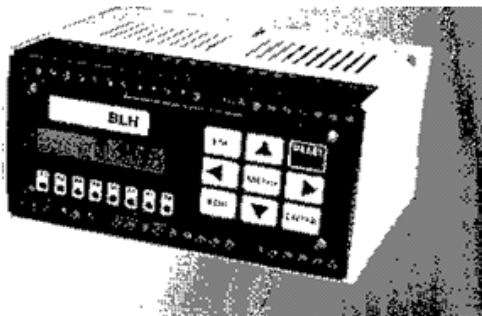


Figure 1-1. The Model 2010

1.1.3 The Model 2010 Front Panel

All configuration and calibration transactions are performed using the front panel keypad and the single line display (Figure 1-2). The LCD alphanumeric display indicates weight data and status while in the operate mode and provides instructions etc. during the configuration mode. The A1 through A8 LED indicators provide visual set point tracking.

1.1.4 Main Configuration Flow Diagram

Model 2010 configuration is performed using the menu driven keypad on the right side of the front panel and follows the flow diagram presented in Figure 1-3. This diagram shows the overall structure and general guidelines of the Model 2010 set-up, calibration, filter, I/O, diagnostic, and security configuration routines. Detailed explanations of sub menu parameter selections are defined in sequential chapters, starting with Section III. To browse through the menus, press MENU and use the arrow keys to move across menu subjects, or up and down within a menu. Parameters are not actually changed until the edit and enter keys are used.

Figure 1-2. The Model 2010 Front Panel

1.1.5 Serial Communication

The standard Model 2010 is equipped with a single RS-485 serial communication port. Protocol selection is made within the keypad menu structure. The standard ASCII communicates with a printer, PC, remote display, or data logger and can be selected for continuous or demand operation. Extensive diagnostics verify transmit and receive, proper parity and framing, and a visualization function allows the user to view the actual serial transmit and receive characters. See Section II for wiring information and Section VI for protocol information.

1.2 OPTIONAL ANALOG OUTPUT

Optionally the Model 2010 is available equipped with a high resolution 16 bit analog output. This output is factory configured for 4-20 mA operation. Set-up and calibration of the analog output is configured via the menu keypad and can be configured to track gross or net weight data. Loop diagnostics are also provided to verify that the analog connection is intact. See Section II for wiring information and Section V for configuration details.

Model 2010 Overall Flow Diagram

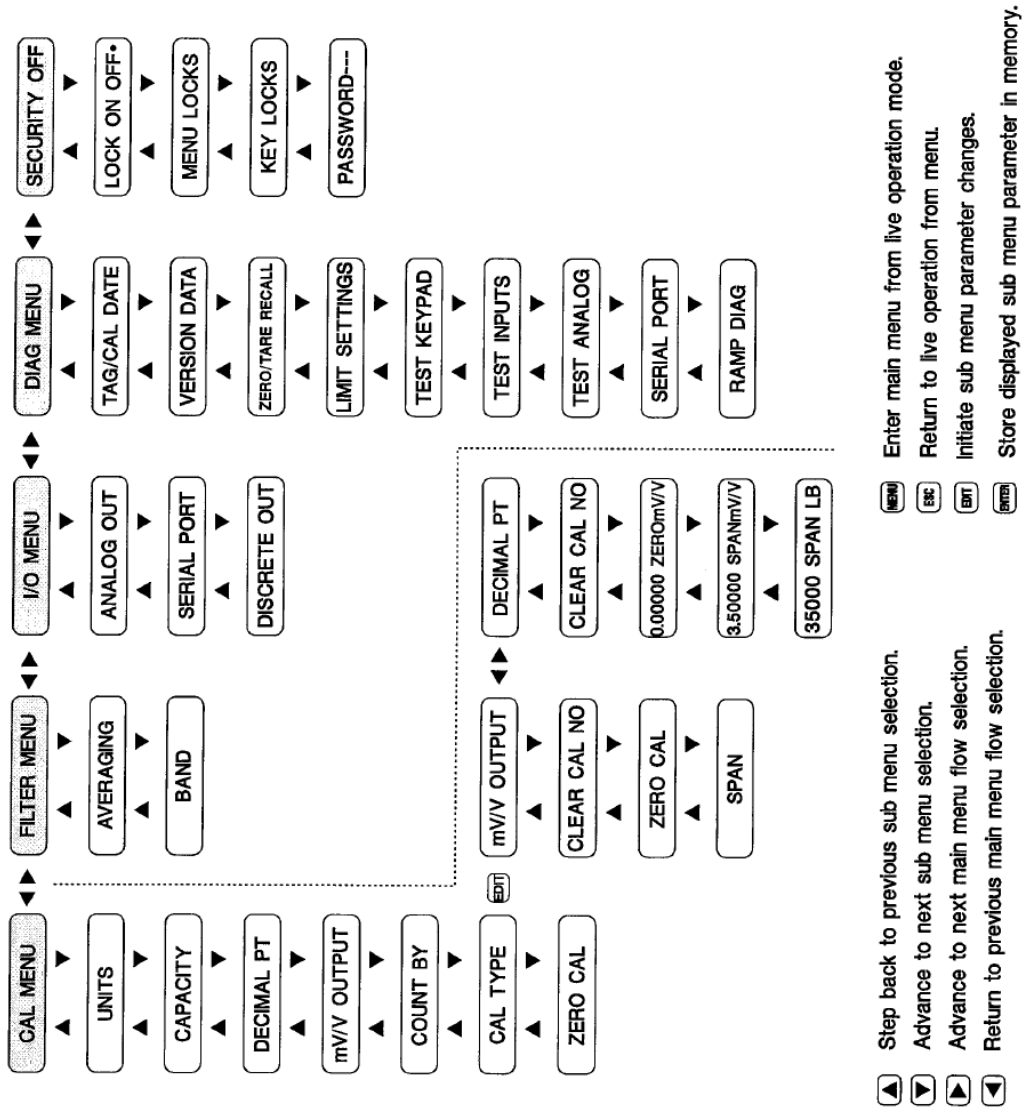


Figure 1-3. Main Flow Diagram.

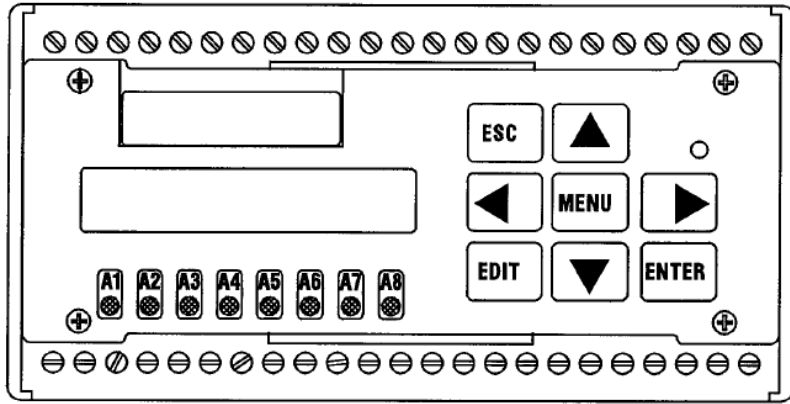


Figure 1-2. The Model 2010 Front Panel.

- ◀ Step back to previous sub menu selection.
- ▶ Advance to next sub menu selection.
- ▶ Advance to next main menu flow selection.
- ◀ Return to previous main menu flow selection.

- Enter main menu from live operation mode.
- Return to live operation from menu.
- Initiate sub menu parameter changes.
- Store displayed sub menu parameter in memory.

1.3 MODEL 2010 SPECIFICATIONS

Performance

Resolution	1,048,576 total counts
Displayed Resolution	700,000 counts
Conversion Speed	50 msec
Displayed Sensitivity	0.05 V per count
Noise	0.4 V per count (min. filt. setting)
Full Scale Range	3.5 mV/V
Dead Load Range	100% full scale
Input Impedance	10 m-ohms min
Excitation Voltage	10 Vdc @ 240 mA
Linearity	0.003% full scale
Step Response	one conversion
Temp Coefficient Zero	2ppm/°C
Temp Coefficient Span	7ppm/°C

Environment

Operating Temperature	-10 to 50° C (15 to 122° F)
Storage Temperature	-25 to 80° C (-10 to 175° F)
Operating Humidity	95% rh non-condensing
Voltage (AC)	117/230 Vac 15% @ 50/60 Hz
Voltage (DC*)	24 Vdc @ 1A
Power	12 watts typical, 18 watts max

Enclosure

Dimensions (std)	5.8 x 3.0 x 4.4 in. LWH
Mounting	two integral mounting holes or DIN rail
Weight	approx. 5 pounds
Single Unit NEMA 4X Enclosure	11.73 x 9.85 x 6.13 in. LWD with single DIN rail mounting strip
Double Unit NEMA 4X Enclosure	13.7 x 11.8 x 6.5 in. LWD with two DIN rail mounting strips

Materials

Enclosure	polycarbonate
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Display

Type	single line LCD
Active Digits	16 digit alpha numeric .24" high

Analog Output; 16 Bit D-A

Current	4-20 mA - 500 ohm max.
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Communications

Serial RS-485	full or half duplex ASCII protocol 7 or 8 data bits- selectable odd, even or no parity- selectable
Baud Rates	300, 1200, 2400, 4800, 9600, or 19200

Remote Inputs - 4

Type	TTL or dry contact closure
Functions	gross/net, tare, zero, and print
Low	0.0 to 0.4 Vdc
High	4.0 to 24 Vdc

Set Point Outputs - 8 (Optional)

Type	open collector (current sinking)
Operating Voltage	5 - 35 Vdc
ON Voltage	1.2 Vdc @ 35 mA 0.8 Vdc @ 1 mA
OFF State Leakage	0.04 A @ 35 Vdc
Power	external supply required

*External power supply required

1.4 ORDERING CODE - PS-2010W - [M] - [V] - [C]

[M]

MOUNTING

- [1] 1 - 2010 SUITABLE FOR DIN RAIL OR WALL MOUNTING
- [2] 1 - 2010 in a NEMA 4X FIBERGLASS SMALL ENCLOSURE (CSA DIV 2 Approval for Class I, Groups ABCD)
- [3] 1 - 2010 in a NEMA 4X FIBERGLASS SMALL ENCLOSURE WITH 1 INTEGRALLY MOUNTED SUMMING BOARD (CSA DIV 2 Approval for Class I, Groups ABCD)
- [4] 2 - 2010 in a NEMA 4X FIBERGLASS LARGE ENCLOSURE (CSA DIV 2 Approval for Class I, Groups ABCD)
- [5] 2 - 2010 in a NEMA 4X FIBERGLASS LARGE ENCLOSURE WITH 2 INTEGRALLY MOUNTED SUMMING BOARDS (CSA DIV 2 Approval for Class I, Groups ABCD)

[M]

VOLTAGE

117/230 VAC
+24VDC

[C]

COMMUNICATION

RS-485/1422 W/ ASCII PROTOCOL
MODBUS RTU

1.5 WARRANTY POLICY

BLH warrants the products covered hereby to be free from defects in material and workmanship. BLH's liability under this guarantee shall be limited to repairing or furnishing parts to replace, f.o.b. point of manufacture, any parts which, within three (3) years from date of shipment of said product(s) from BLH's plant, fail because of defective workmanship or material performed or furnished by BLH. As a condition hereof, such defects must be brought to BLH's attention for verification when first discovered, and the material or parts alleged to be defective shall be returned to BLH if requested.

BLH shall not be liable for transportation or installation charges, for expenses of Buyer for repairs or replacements or for any damages from delay or loss of use for other indirect or consequential damages of any kind. BLH may use improved designs of the parts to be replaced. This guarantee shall not apply to any material which shall have been repaired or altered outside of BLH's plant in any way, so as in BLH's judgment, to affect its strength, performance, or reliability, or to any defect due in any part to misuse, negligence, accident or any cause other than normal and reasonable use, nor shall it apply beyond their normal span of life to any materials whose normal span of life is shorter than the applicable period stated herein.

In consideration of the forgoing guarantees, all implied warranties are waived by the Buyer, BLH does not guarantee quality of material or parts specified or furnished by Buyer, or by other parties designated by buyer, if not manufactured by BLH. If any modifications or repairs are made to this equipment without prior factory approval, the above warranty can become null and void.

1.6 FIELD ENGINEERING

Authorized BLH Field Service Engineers are available around the world to install Model 2010 transmitters and/or train factory personnel to do so. The field service department at BLH is the most important tool to assure the best performance from your application. Field service phone numbers are listed below:

**Factory:
(Main Number)
(781) 298-2200**

**Canada:
(416) 251-2554 or
Toll free (800) 567-6098 in Canada**

SECTION 2. INSTALLATION

2.1 INTRODUCTION

This chapter provides Model 2010 mounting and electrical installation information. Instruments will operate accurately (to specification) in locations with temperatures ranging from -10°C to +55°C (+15°F to + 131°F). The installation location should be free of vibration. Instruments should not be located in areas containing explosive or corrosive vapors. In all installations, ac (mains) power should be supplied from a clean (transient free) instrument power source.

2.2 MOUNTING

Model 2010 controllers have a slotted back panel for standard DIN rail mounting. Two integral mounting holes accommodate surface mounting other than DIN rail. Outline dimensions are depicted in Figure 2-1.

2.3 ELECTRICAL CONNECTIONS

Electrical connections are made at the top, 'Load Cell Side' (Figure 2-2), and bottom, 'Power Side' (Figure 2-3), terminal strips. Both strips are clearly marked and connection points clearly designated on the Model 2010 enclosure.

2.3.1 The Top Terminal Strip

Figure 2-2 (page 2-3) shows the wiring arrangements for the top or load cell side terminal strip. Call outs and notes explain load cell, set point, and reset wiring connections.

2.3.1.1 Transducer Signal Inputs

BLH load cells and junction box cables are shipped with pre-stripped, tinned leads so that leads need only be inserted in the proper terminal location and the screw above tightened securely. Lead designations are clearly labeled for standard six conductor input cables (usually coming from a junction box). For applications which use a four conductor cable (usually coming from a single load cell), jumpers must be installed from +SEN to +EX and -SEN to -EX. To insure good electrical and mechanical connection, BLH recommends that jumper leads be soldered to load cell leads.

NOTE: For many load cells, excitation (EXC) leads are referred to as INPUT, and signal leads (SIG) are referred to as OUTPUT.

NOTE: If tension load cells are used, red (-signal) and white (+signal) leads may need to be reversed.

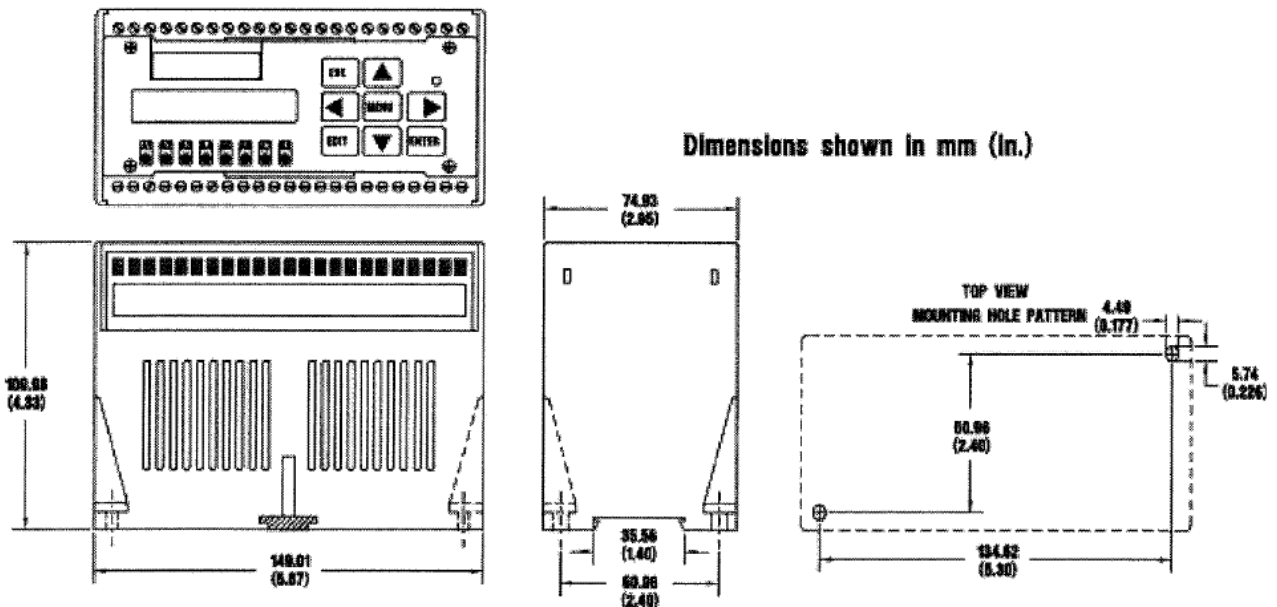


Figure 2-1. Model 2010 Outline Dimensions

2.3.1.2 Open Collector Set Point Outputs

Units are equipped with eight open collector type set-point outputs. Outputs can be configured for dribble or main operation with inflight and hysteresis compensation. Outputs are open collector type, capable of sinking 35 mA at 1.2 VDC.

2.3.1.3 Reset

Reset terminals are provided for an external pushbutton switch. Momentary closure initiates a 2010 software restart. Units should be reset after clearing error conditions or changing wiring configurations.

2.3.2 The Bottom Terminal Strip

Figure 2-3 (page 2-4) shows the wiring arrangements for the bottom or AC power side terminal strip. Call outs and notes explain ac power, remote input, serial communication, and optional analog current loop output wiring connections.

2.3.2.1 Mains Power

Depending upon the power option ordered (see paragraph 1.4 ordering code) PS-2010 instruments ship as 115 VAC ([M] - [1] - [C]) or 24 VDC ([M] - [2] - [C]) units.

In accordance with Figure 2-3, wire AC (mains) power to the N (neutral), L (line), and ground terminals as shown. When ac operation is ordered, Model 2010 instruments are shipped with A-B and C-D jumpers installed for 115 VAC (50 or 60 Hz) operation. For 230 VAC operation, remove the A-B and C-D jumpers and replace them with a single B-C jumper.

For VDC operation connect leads for the external 24 V power supply (customer supplied) as shown in Figure 2-3. The external VDC source must supply 24 volts at 1 amp with peak -to-peak ripple less than 30 mV.

DC powered 2010 units are protected internally by using a PTC.

AC powered instruments are protected with a 1/4 amp, 5x20 mm, 'T' type fuse. To replace a blown fuse, carefully remove the 4 front panel screws and take the front panel off. The fuse is located to the right of the component printed circuit board.

2.3.2.2 Digital (Remote) Inputs

Model 2010 ZERO, TARE, GROSS/NET (GN), and PRINT operating functions are controlled through the isolated input connections. Interconnecting wire/cable length should not exceed 50 feet. Route wires/cable away from ac power lines and other EMI sources to prevent interference. If a device other than a simple push-button switch is used to initiate contact closure, care must be taken to meet proper OPEN and CLOSED voltage level requirements.

2.3.2.3 Serial Communication

Simply connect a twisted pair of wires for RS-485 operation. Positive and negative terminal positions are clearly marked at the terminal strip. If the unit is the last or only device on the RS-485 communication line, a jumper must be added between the terminal (TERM) connectors. Addition of this jumper activates an internal 220 ohm resistor for proper line function.

2.3.2.4 Analog Output

Attach plus and minus signal wires at the appropriate terminals. Route wires away from ac power lines and other EMI sources to prevent interference. Do not exceed the 500 ohm maximum load rating of this port. Section V provides analog output configuration procedures.

2.4 2010 MOUNTING OPTIONS

Two optional NEMA 4X fiberglass enclosures provide mounting for 2010(s) and summing junction circuitry in a fully protected environment. Specifications for both enclosures are given in paragraph 1.3. Figure 2-4 shows enclosure arrangements for single 2010 mounting and Figure 2-5 presents dual 2010 mounting configurations.

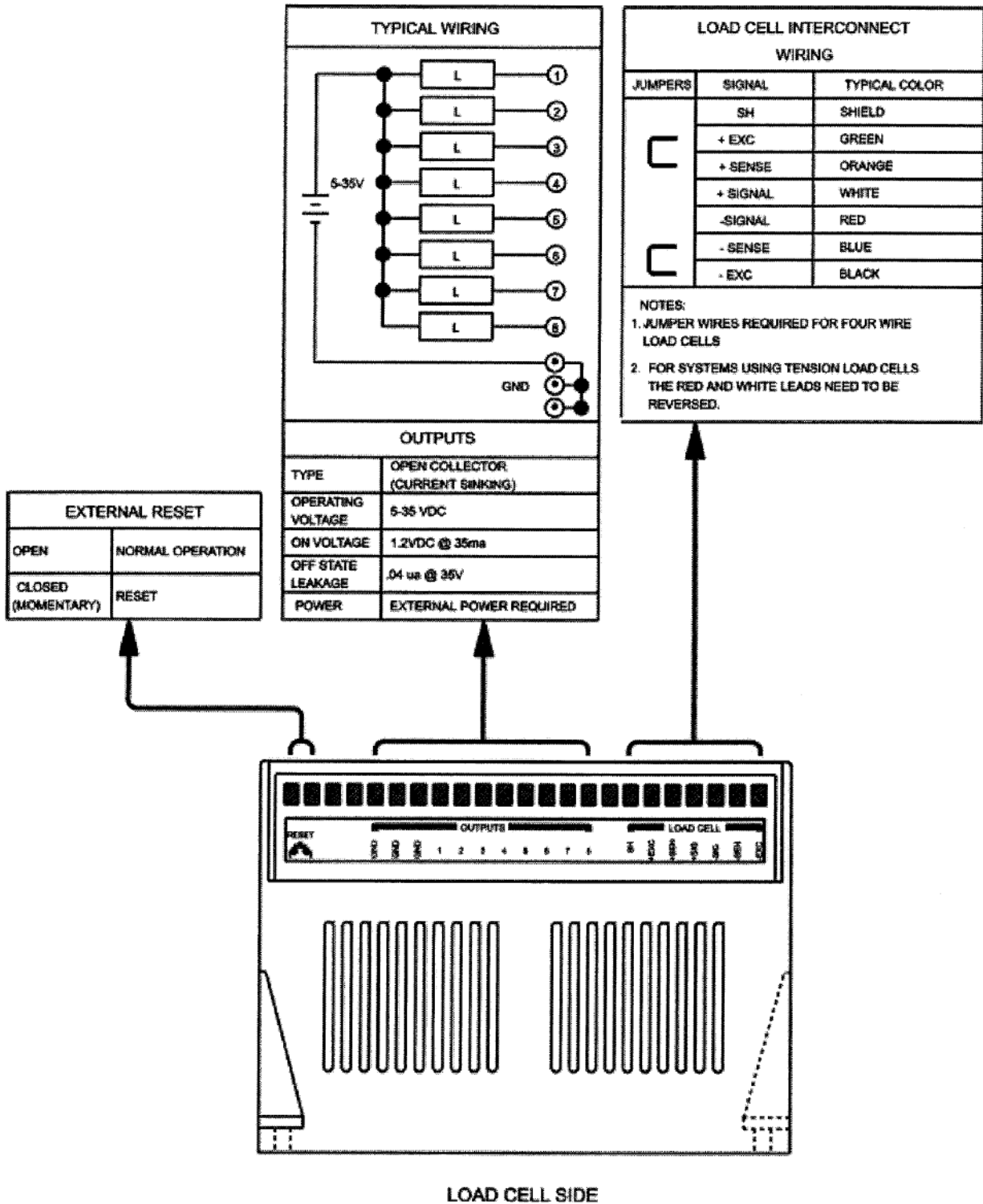


Figure 2-2. Top Terminal Strip Wiring Arrangements.

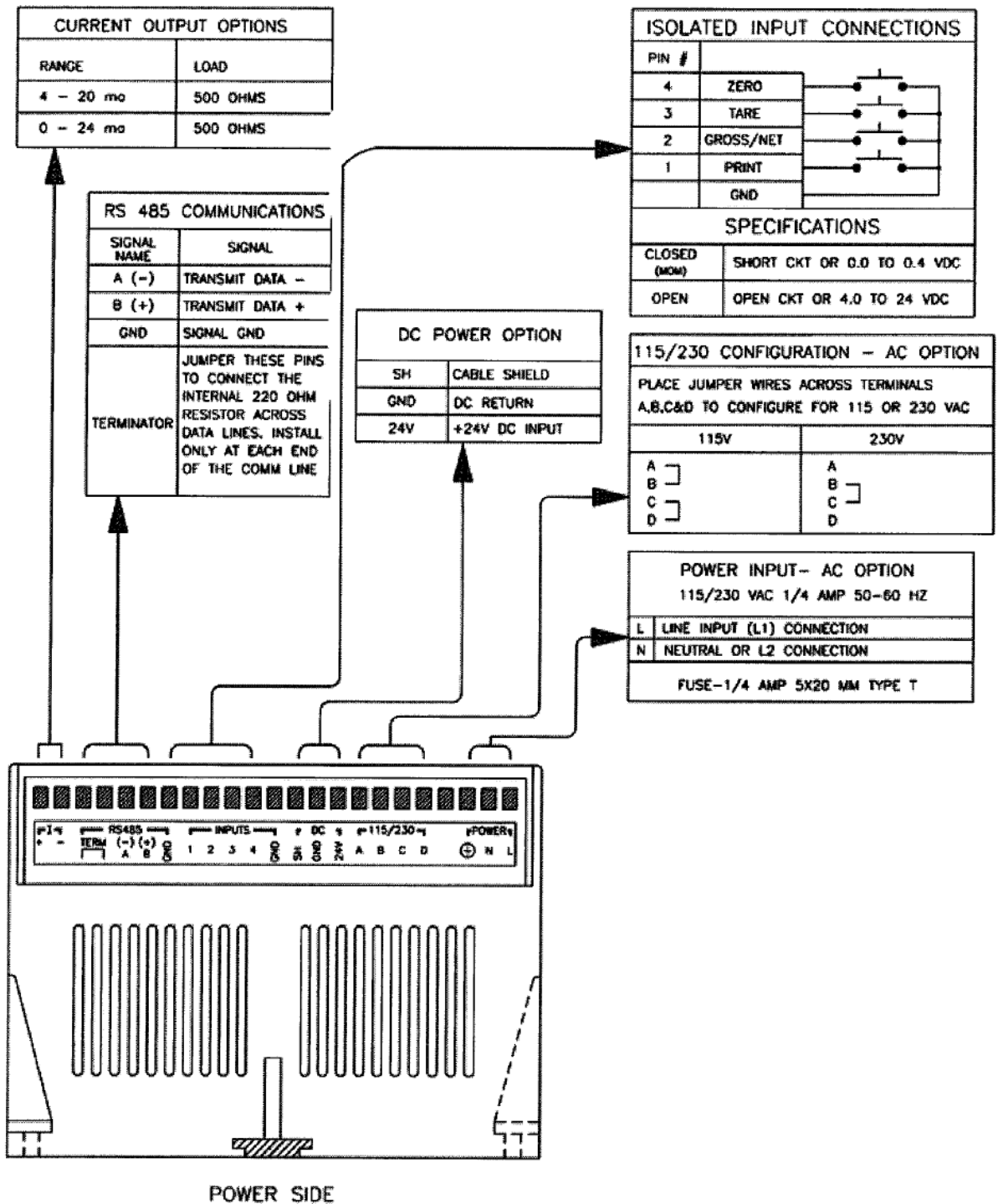


Figure 2-3. Bottom Terminal Strip Wiring Arrangements

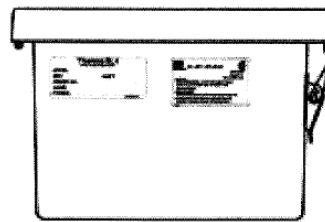
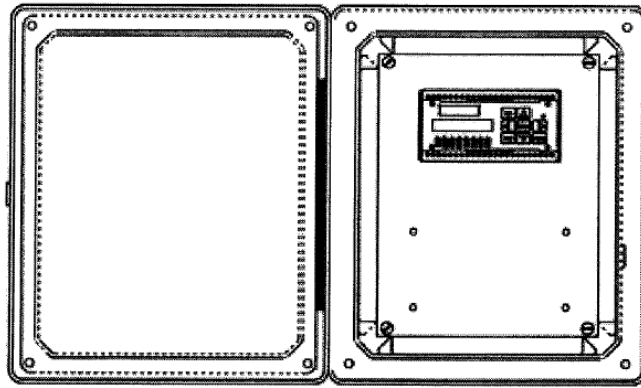


Figure 2-4. Single 2010 Enclosure Mounting Arrangements

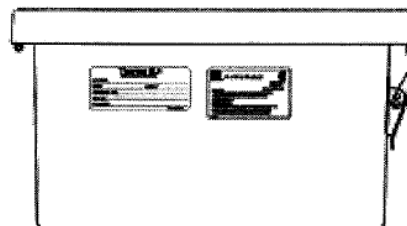
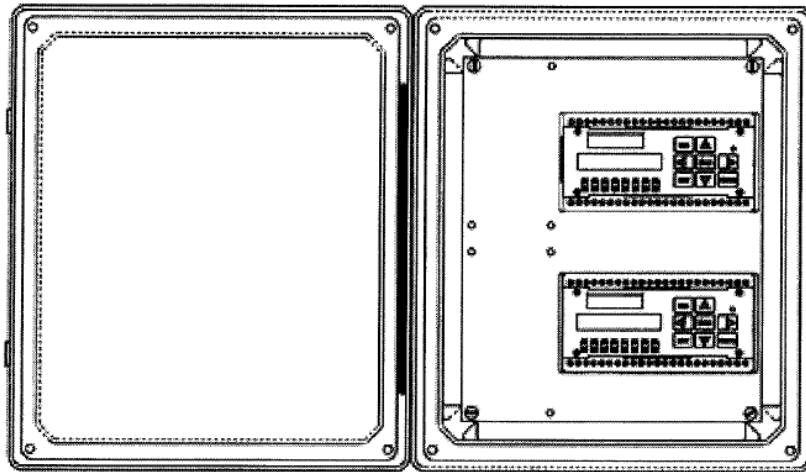


Figure 2-5. Dual 2010 Enclosure Mounting Arrangements

SECTION 3. Set-Up and Calibration

3.1 INTRODUCTION

After installation, set-up and calibration is the next step in preparing the Model 2010 for operation (see main menu diagram, Figure 1-3). Setup and calibration are accomplished easily using the LCD display and eight configuration keys. Figure 3-1 (page 3-2) presents details for set-up parameter entry and Figure 3-2 (page 3-3) shows procedures for each calibration type.

3.2 SET-UP SYSTEM PARAMETERS

Set-up establishes scale operating parameters such as system capacity, decimal point location, display units, count by, etc. Follow the flow diagram presented in Figure 3-1 to enter or alter set-up parameters.

3.2.1 Display Units

Designate the desired display units as pounds, kilograms, tons, ounces, grams, newtons, kilonewtons, liters, or blank (no units displayed). Selection also appears on print-outs and other serial transactions.

3.2.2 Capacity

Enter the full scale system capacity value. (capacity is the rated load of the load cell(s) or platform - not simply live load or gross weight.) A capacity of 10000 can be displayed as 0.010000, 0.10000, 1.0000, 10.000, 100.00, 1000.0, or 10000 depending upon decimal point location.

3.2.3 Decimal Point Location

Position the decimal point as desired for weight display and serial communication.

3.2.4 Output

Enter the rated mV/V output of the system. (The electrical output at rated capacity independent of excitation) The rated output of a multi-cell system is the average of the rated output of all the cells. For example: In a three cell system with load cell rated outputs of 2.01, 2.05, and 1.95 mV/V, the average rated output is 2.003 mV/V.

3.2.3 Display Counts

Define the count value of each display increment by selecting 1, 2, 5, 10, 20, 50, or 100 (note that decimal selection still applies). The Model 2010 will automatically default to the best possible resolution.

3.3 SYSTEM CALIBRATION

The Model 2010 offers three types of calibration; quick, deadload, and keypad. Both quick and keypad calibration use an internal mV/V reference within the Model 2010 to perform an electrical only type calibration.

The deadload type calibration is a method that is used when known amounts of weight are applied to the vessel or scale to achieve calibration. Figure 3-2 provides flow diagrams for each calibration type. For a more detailed discussion of the most appropriate calibration method refer to BLH Pub. FSD 001, 'An Overview of Calibration Methods and Procedures for Process and Inventory Weigh Systems'.

3.3.1 Quick Type Calibration

Quick calibration is the fastest and least complex method of calibration. Based upon entries of scale capacity and mV/V output, the Model 2010 will automatically establish a calibration. This method is generally suitable on any linear system that has minimal piping or other load shunting structures.

3.3.2 Deadload Calibration

Deadload calibration is potentially the most complex method but results in the highest system accuracy. Deadload calibration requires that known quantities of weight be added incrementally to the scale/vessel, preferably to full capacity. This method is preferred on systems that have attached pipes or other load shunting structures.

3.3.3 Keypad Calibration

The Model 2010 is factory calibrated as a very precise mV/V measurement device. The keypad calibration method establishes a relationship between force and mV/V, resulting in a very accurate electrical type of calibration. Keypad calibration requires a calibration sheet (Figure 3-3, page 3-4) for each weigh system load cell. The cal. sheet presents the load cell mV/V output reading for either 3 or 10 known weight/force values. Sheets also include a zero balance (no load) mV/V reading. The keypad calibration method allows for the entry for the keypad entry of zero and full span points. On multi-cell systems, each point is an average of all the load cells at that specific capacity. This method is applicable on systems with minimal piping or other load shunting structures and can be used to correct for load cell non-linearities.

Enter/Alter Set-Up Parameters

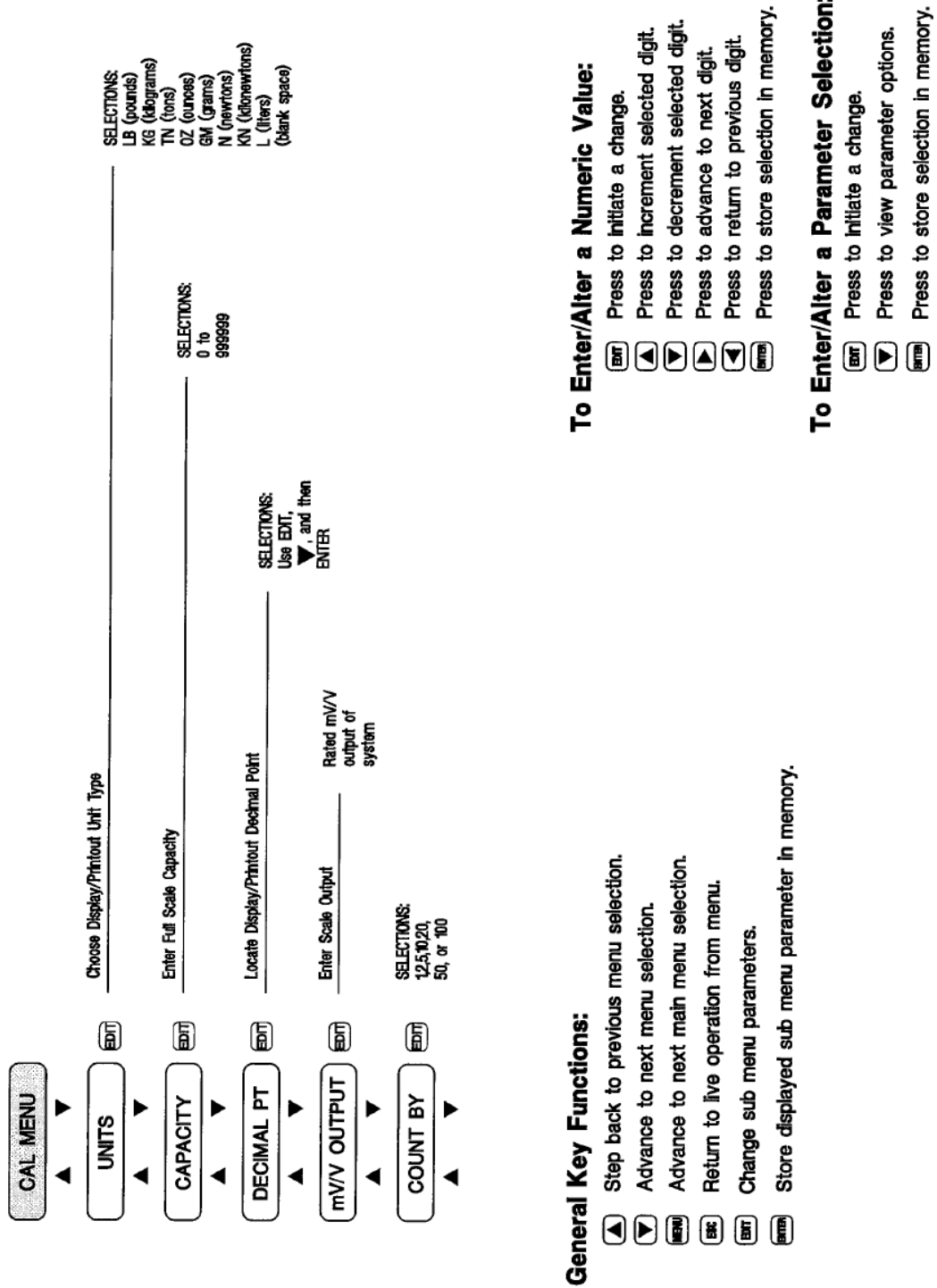
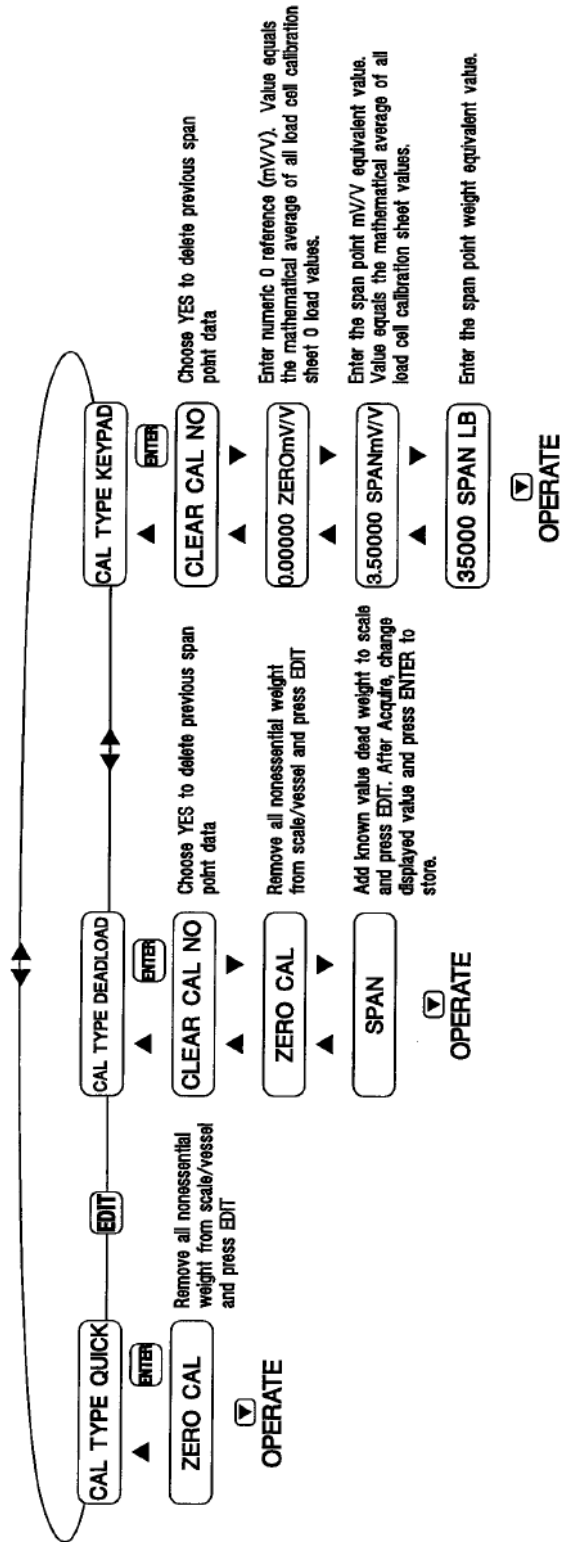


Figure 3-1. Set-up Parameter Entry.

Calibration Type - Flow Diagrams



General Key Functions:

- ▲ Step back to previous menu selection.
- ▼ Advance to next menu selection.
- ESC** Advance to next main menu selection.
- ESC** Return to live operation from menu.
- ENTER** Change sub menu parameters.
- ENTER** Store displayed sub menu parameter in memory.

To Enter/Alter a Numeric Value:

- ENTER** Press to initiate a change.
- ▲ Press to increment selected digit.
- ▼ Press to decrement selected digit.
- ▶ Press to advance to next digit.
- ◀ Press to return to previous digit.
- ENTER** Press to store selection in memory.

To Enter/Alter a Parameter Selection:

- ENTER** Press to initiate a change.
- ▼ Press to view parameter options.
- ENTER** Press to store selection in memory.

Figure 3-2. Calibration Types and Parameters.



Calibration Chart

Customer: ABC Co. P.O : 28523004D

Capacity 50000 lb Type C2P1 Serial No. 71258

Mode Tension Bridge A Test Report No. C37-8500

Indicator N.A. Serial No. N.A.

Date Of Calibration 4/45/98 Temperature : 70 F

Calibrated By: M. Houston Humidity : 58 %

Applied Load [lb]	Response Run 1 mv/V	Response Run 2 mv/V	Response Run 3 mv/V
0	0.0000	0.0000	0.0000
5,000	0.2000	0.2000	0.2000
10,000	0.4001	0.4001	0.4001
15,000	0.6001	0.6001	0.6001
20,000	0.8002	0.8002	0.8002
25,000	1.0003	1.0003	1.0003
30,000	1.2003	1.2003	1.2003
35,000	1.4003	1.4003	1.4003
40,000	1.6003	1.6003	1.6003
45,000	1.8003	1.8003	1.8003
50,000	2.0003	2.0003	2.0003
25,000	1.0000	1.0000	1.0000
0	0.0000	0.0000	0.0000

Applied Load [lb]	Output Average lb	Ideal Output lb	Output Error lb	Output Error % FS	Hysteresis Error % FS
0	0.0000	0.0000	0.0000	.000%	
5,000	0.2000	0.2000	0.0000	-.001%	
10,000	0.4001	0.4001	0.0000	.002%	
15,000	0.6001	0.6001	0.0000	.000%	
20,000	0.8002	0.8001	0.0001	.004%	
25,000	1.0003	1.0002	0.0001	.007%	
30,000	1.2003	1.2002	0.0001	.006%	
35,000	1.4003	1.4002	0.0001	.004%	
40,000	1.6003	1.6002	0.0001	.003%	
45,000	1.8003	1.8003	0.0000	.001%	
50,000	2.0003	2.0003	0.0000	.000%	
25,000	1.0000	1.0002	-0.0002	-.007%	-.015%
0	0.0000	0.0000	0.0000	.000%	.000%

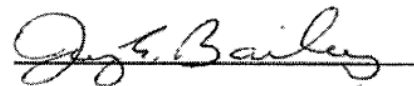

 J. C. Manager 4/21/98

Figure 3-3. Sample Load Cell Calibration Certificate

SECTION 4. Dynamic Digital Filter

4.1 GENERAL

The Model 2010 uses a two stage digital filter. Each stage requires parameter entries as shown in Figure 4-1 (next page). Make parameter entries while viewing live weight value on the front panel display.

4.1.1 Digital Averaging

The filter first stage calculates a running average of weight input readings. Available selections are 1, 2, 4, 8, 16, 32, 64, and 128 conversions (see Figure 4-1). Using a 'first in - first out' algorithm, running averaging provides display updates every 50 msec regardless of the number of readings averaged. However, since each conversion averaged adds 50 msec to the filter length, the larger the averaging selection, the longer the filter length becomes. Table 4-1 shows the time relationship between conversions averaged and filter length.

Table 4-1. Averaging Selections and Filter Length

Average	Response
1	0.05 sec
2	0.10 sec
4	0.20 sec
8	0.40 sec
16	0.80 sec
32	1.60 sec
64	3.20 sec
128	6.40 sec

4.1.2 Band Selection

The second stage of the filter, BAND, is applied after averaging is selected. A BAND value between 0 and 100 must be entered as shown in Figure 4-1. Dynamic Digital Filtering constantly compares the amount of input signal change between consecutive conversions. If the difference falls within the BAND setting, a mathematical filter attenuates the conversion to conversion variation. Once the difference between conversions exceeds the BAND selection, the BAND filter is canceled and the display tracks live weight with maximum

response. To achieve the best overall filter response, keep the BAND selection as low as possible without hindering system performance (see next paragraph for set-up instructions). If the BAND setting is higher than necessary, sensitivity to small weight changes will be reduced.

4.1.3 Filter Set-Up Procedures

Setting filter parameters requires a balance between achieving maximum noise reduction and maintaining quick response and good sensitivity to real weight changes. The goal of filter set-up is to use the lowest averaging and BAND selections needed for smooth system display/operation. If selections are higher than necessary, accurate detection of small weight changes may be hindered. Using the six steps presented in Table 4-2, tune the system to its maximum performance level.

4.2 CONVERSION SPEEDS

Selectable conversion speeds allow 2010 units to respond at ultra high speed for time critical set point operation. Two conversion selections, CONVERT and DISPLAY (Figure 4-1) must be determined prior to system operation.

4.2.1 A/D Conversion Selections

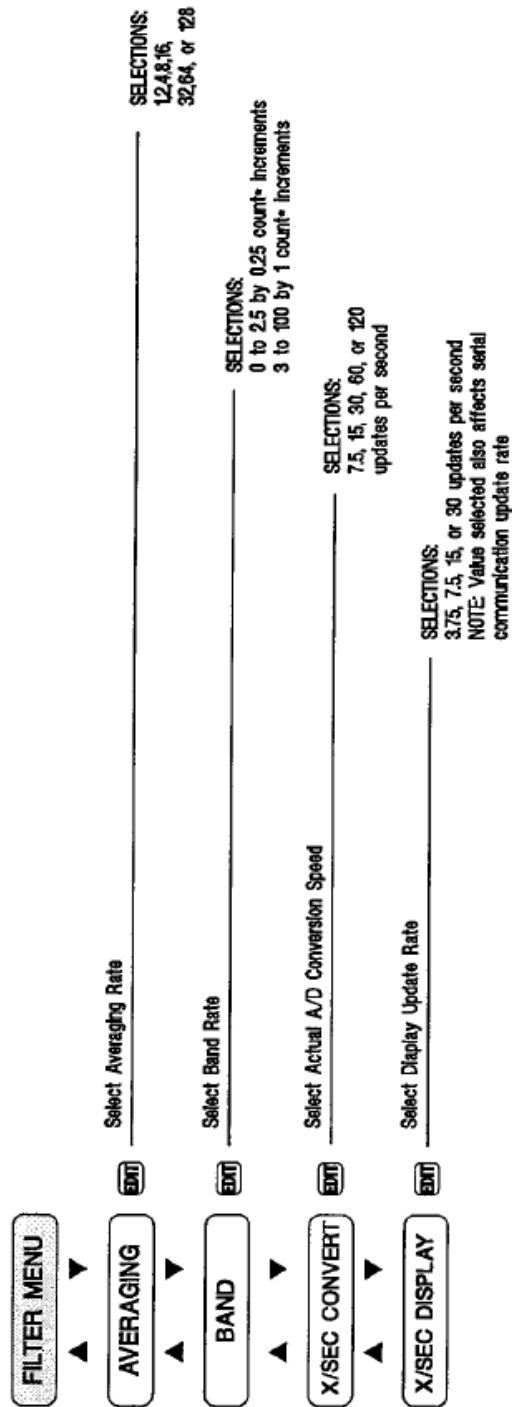
Conversion defines the actual speed of the internal AID converter. Selections range from 7.5 (slower) to 120 (high speed) updates per second. Enter selection according to Figure 4-1.

4.2.2 Display Conversion Speed

Sometimes, when high conversion speeds are selected, the display may appear to jitter. Selection of a lower display speed will smooth out display readings without affecting the actual conversion speed. Choose from 3.75 to 30 display updates per second according to Figure 4-1.

NOTE: For proper display function, do not select a conversion speed greater in value than the ND conversion selection

Enter/Alter Filter Parameters



* Note: Counts are multiplied by display resolution

General Key Functions:

- Step back to previous menu selection.
- Advance to next menu selection.
- Advance to next main menu selection.
- Return to live operation from menu.
- Change sub menu parameters.
- Store displayed sub menu parameter in memory.

To Enter/Alter a Parameter Selection:

- Press to initiate a change.
- Press to view parameter options.
- Press to store selection in memory.

Figure 4-1. Dynamic Digital Filter Parameter Entry

SECTION 5. Analog Output, Serial Communication, & Set Points

5.1 ANALOG OUTPUT CONFIGURATION (Optional)

5.1.1 Output Definition

Model 2010 indicators provide a high resolution analog current output, representing either gross or net weight, for driving external process equipment/recorders. This output is based upon a 14 bit digital to analog (D-A) conversion which represents up to one part in 16384 of analog precision. The scaling of the output is accomplished after the Model 2010 is calibrated and can be ranged for any portion of the gross or net weight output curve.

Systems using the analog output for level control usually configure the output to track gross weight (live product weight). Batch control systems that use weight as a variable to determine set point cutoffs can be configured to operate in the net weighing mode while using a discrete remote input to activate the tare function.

5.1.2 Set-Up Procedure

Connect a current meter to the rear panel analog output points (see Figure 2-3 for +, - designations) and proceed with ANALOG I/O configuration as shown in Figure 5-1 (page 5-2, 5-3).

5.1.3 4 To 20 mA Operation

The standard output range of 0-24 mA corresponds to an internal digital count range of 0-65535, counting by 4. To obtain an output range of 4-20 mA, the low span value must be elevated and the high span value must be reduced. The digital values corresponding to 4 and 20 mA are 10922 counts (4 mA) and 54612 counts (20 mA) respectively. Enter these values as the LOW ADJ and HIGH ADJ menu parameters for proper 4-20 mA operation.

5.2 SERIAL COMMUNICATION

Model 2010 units come with a versatile, bi-directional, serial communication port. Electronically, this is configured for RS-485 operation. Enter the port operating parameters using the flow diagram presented in Figure 5-1. Figure 5-2 (page 5-4) provides a full description of each (serial communication) parameter block depicted in Figure 5-1. Note that certain parameter entries are dependent upon the print

format selection (accessed by pressing edit when SERIAL I/O is displayed). Model 2010 indicators offer 3 formats; PRINT for output to a printer, CON'T (continuous) for constant output to a data logger, PLC, etc., and PC for full duplex interfacing with a more sophisticated host device, industry standard Modbus RTU, and LCp-400 Network communication.

5.2.1 Transmit Only Output Formats (ASCII)

Both the PRINT and CON'T ASCII output formats are transmit only. The print format is designed for use in conjunction with the PRINT isolated input. Activating the PRINT input transmits all data strings that are selected 'YES' in Figure 5-1 (DISPLAY, GROSS, NET, ZERO, and TARE) to the printer. Table 5-1 shows the printer output format used for each transmitted data string.

The CON'T output string is defined in Table 5-2 (page 5-5). Continuous output transmissions occur at the time rate configure in Figure 5-1. Continuous outputs 'feed' weight data, status, and address information to a remote data logger or PLC type device without operator intervention.

Table 5-1. Printer Output Transmission String

Printout string:	
<code>stx/adr/data/units/status/sp/crif</code>	
Defined:	
<code>stx....</code>	start of text character, hex 02
<code>adr....</code>	address, 3 ASCII chars: first two are '01'-99' followed by an ASCII space
<code>data...</code>	weigh data 8 characters: 7 digits with decimal point or leading space; if msd is an ASCII minus '-' the data is negative
<code>abbreviated..</code>	two characters; first character is 'L','K','T','Z', or 'G' for pounds, kilograms, tons, ounces, or grams. second character is 'G','N','Z', or 'T' for gross, net, zero, or tare
<code>units (default)</code>	ten characters; first three characters are a space plus a two character units abbreviation 'lb','kg','tn','oz', or 'gm' for pounds, kilograms, tons, ounces, or grams.
<code>expanded ..</code>	the last seven characters are a space plus the data type spelled out with added spaces 'GROSS ',' NET ',' ZERO ', or ' TARE '
<code>stat...</code>	one status character: ' ' = everything ok, 'M' = motion, 'U' = a/d underload (signal below instrument capability), 'V' = above overload limit, 'O' = a/d overload (signal beyond instrument capability), 'E' = load cell connect fault
<code>space...</code>	ASCII space, hex 20
<code>CRLF...</code>	carriage return linefeed two characters ODH 0AH

Bits per character = 1 start, 1 even parity, 7 data, 1 stop

Analog, Serial, and Setpoint Output Flow Diagram (page 1)

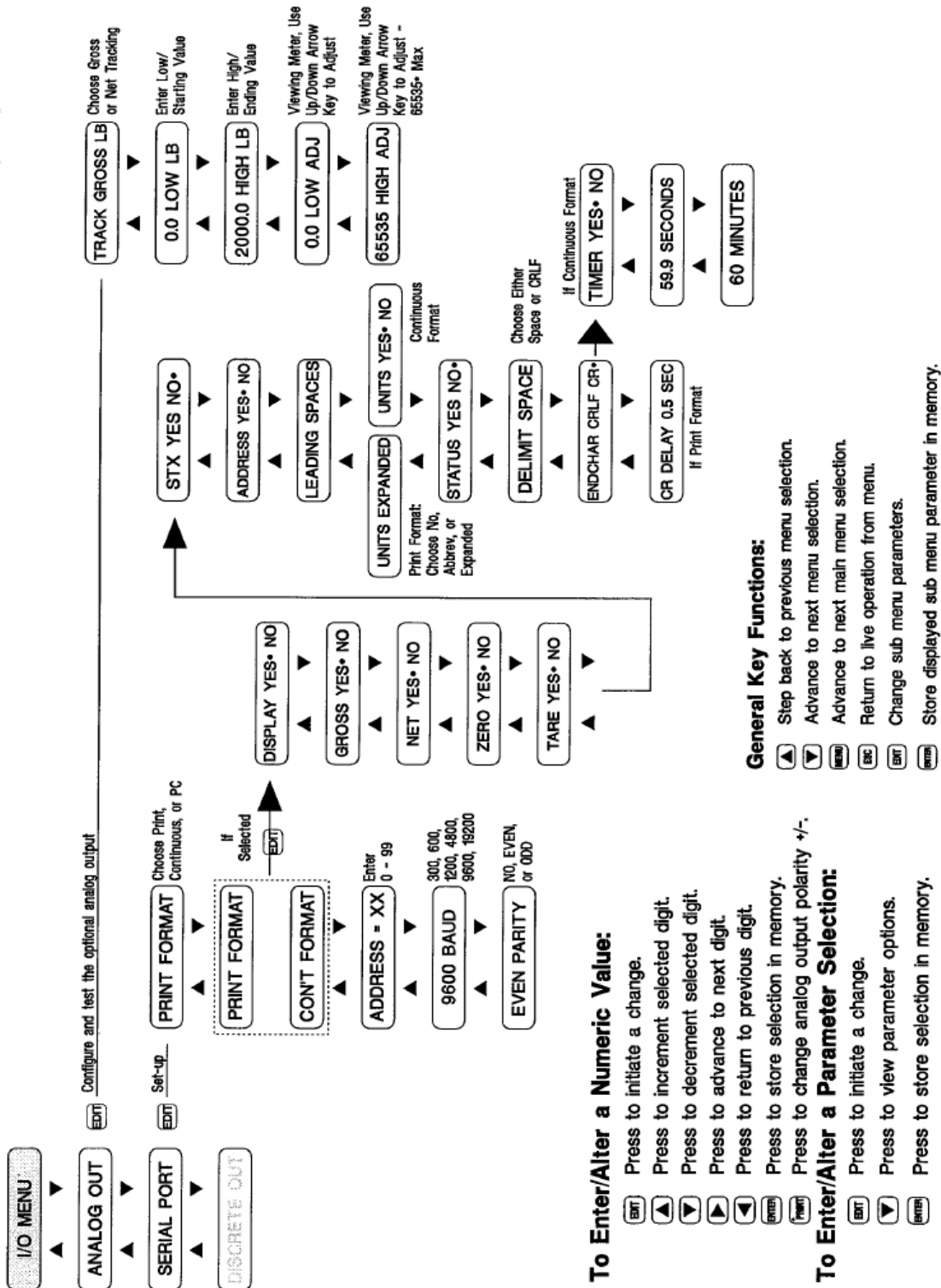
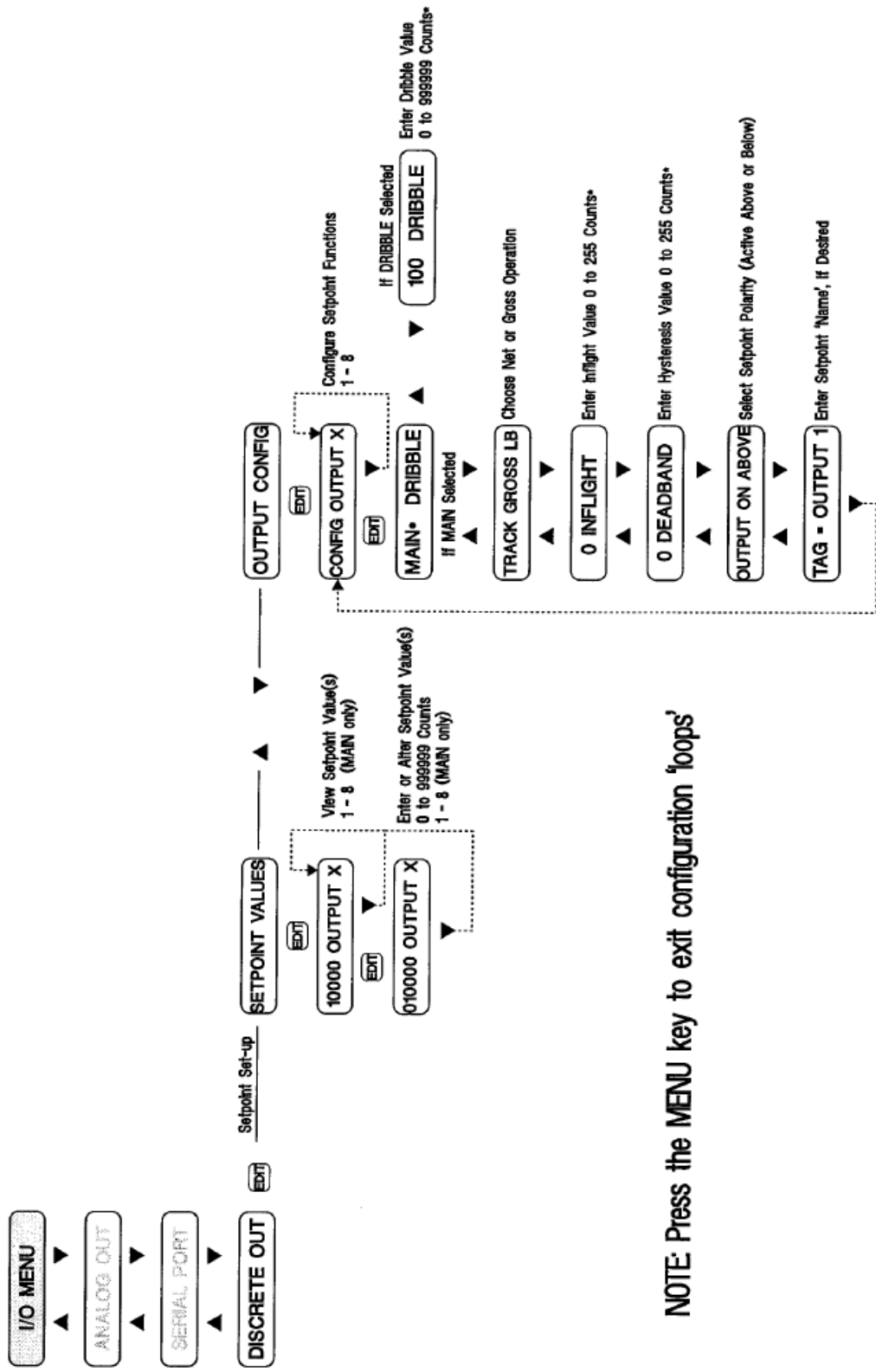


Figure 5-1. Analog and Serial Communication Menu.

Analog, Serial, and Setpoint Output Flow Diagram (page 2)



NOTE: Press the MENU key to exit configuration 'loops'

* Entry multiplied by count by

Figure 5-1 con't. Set Point Configuration.

Serial Output Flow Diagram Block Explanations

DISPLAY YES• NO	Transmit current weight display (gross or net)
GROSS YES• NO	Transmit current gross weight value
NET YES• NO	Transmit current net weight value
ZERO YES• NO	Transmit current manual zero value
TARE YES• NO	Transmit current manual tare value
STX YES NO•	Typical leading character of any ASCII output data string
ADDRESS YES• NO	Include designated address in output data string
LEADING SPACES	Choose either leading spaces or leading zeros in output string
UNITS EXPANDED	Choose either no units, abbreviated units (2 characters), or expanded (10 characters) units in printout
UNITS YES• NO	Include units in transmit string; string units are abbreviated (2 characters)
STATUS YES NO•	Include status character in output string
DELIMIT SPACE	If more than 1 data selection (i.e. gross/net/tare) is requested, choose a space or carriage return line feed (CRLF) to separate them
ENDCHAR CRLF CR•	Choose a carriage return (CR) or a carriage return line feed (CRLF) to end the output string
CR DELAY 0.5 SEC	If the printer does not have a character buffer, prevent data loss by selecting a delay time between carriage returns
TIMER YES• NO	Choose whether or not to use a timed interval between continuous transmissions
59.9 SECONDS	If YES chosen, select seconds portion of the time interval
60 MINUTES	If YES chosen, select minutes portion of the time interval

Legend

Both Formats

Printer Output

Continuous Output

Figure 5-2. Parameter Definitions.

Table 5-2. Continuous Output String Format.

Tx string:

```
stx/adr/data/units/status/sp/crlf
```

Defined:

stx....	start of text character, hex 02
adr....	address, 3 ASCII chars: first two are '01'-'99' followed by an ASCII space
data...	weigh data 8 characters: 7 digits with decimal point or leading space; if msd is an ASCII minus '-' the data is negative
units..	two characters; first character is 'L','K','T','Z', or 'G' for pounds, kilograms, tons, ounces, or grams. second character is 'G','N','Z', or 'T' for gross, net, zero, or tare
stat..	one status character: '' = everything ok, 'M' = motion, 'U' = a/d underload (signal below instrument capability), 'V' = above overload limit, 'O' = a/d overload (signal beyond instrument capability), 'E' = load cell connect fault
space...	ASCII space, hex 20
CRLF...	carriage return linefeed two characters 0DH 0AH

Bits per character = 1 start, 1 even parity, 7 data, 1 stop

Output string formats can be modified to accommodate custom interface requirements (Figure 5-1). Leading zeros can be replaced with ASCII spaces. SIX (start of text), address, and instrument status can be omitted by selecting 'NO'. Units can be expanded or abbreviated in the print format and dropped altogether from the continuous format. Line feed can be deleted from the CRLF output or both characters can be replaced by an ASCII space. Figure 5-2 provides definitions for each parameter to assist in formatting custom output strings.

5.2.2 The PC Interface

If PC output format is selected, units are capable of transmitting and receiving ASCII data strings. Table 5-3 (page 5-6) presents digit for digit data and syntax information for this interface.

Basically, the Model 2010 has 86 internal (EEPROM) registers which store all calibration, configuration, operation, and live weight data parameters. The PC format allows data in these registers to be read or re-written. By re-writing calibration span points (keypad type calibration) and operating parameters, the Model 2010 can be quickly and completely re-configured by a remote host device.

Several additional tables are provided to explain PC interfacing. Table 5-4 (page 5-8) provides

examples of EEPROM reading/writing, and error code exchanges. Table 5-5 (page 5-9) demonstrates live weight transactions. Table 5-6 (page 5-11) gives set point communication formats and examples.

5.2.3 MODBUS RTU Protocol (Future Option)

Refer to Section IX for details concerning Modbus RTU protocol formatting.

5.2.4 The LCp-400 Network Interface

The serial port NETWORK selection functions only with an LCp-400 Network Controller. For full details regarding this interface, see the LCp-400 Operator's Manual, supplied with the LCp-400 unit.

5.3 SETPOINT CONFIGURATION

2010 controllers provide eight outputs for set point operation. Standard units offer open collector/TTL signals at the top terminal strip. Follow the flow diagram in Figure 5-1, page 2 to select main or dribble function for each output used. Also, select the polarity (valve 'ON' above or below set point) and a tag description (name) for each main set point.

5.3.1 Main Function

Main corresponds to a fast (coarse) or high speed in-put. To avoid overfilling in fast mode, enter an inflight value which corresponds to ingredient weight that will fall into the process vessel after valve closure. To make sure the valve does not reopen, enter a dead-band (hysteresis) value. After vessel motion ceases, the Model 2010 checks vessel weight against the main set point value (entered via the front panel STPNT key). If vessel weight is less than the set point value minus the total inflight and deadband values, the unit will signal the valve to reopen, otherwise the main set point is complete.

5.3.2 Dribble Function

Many high resolution process systems have two speeds (or two valves) for ingredient filling. Dribble represents the slow, (fine) precision, fill mode. Select a value that allows ample time for the system to switch from main to dribble (dribble value is subtracted from the main value) and achieve a highly accurate final fill.

5.3.3 Set Point Status Display

Eight LED indicators (A1-A8) are provided on the front panel to display set point output status. Illuminated diodes indicate active set points.

Table 5-3. Bi-Directional PC Interface Register Assignments

Note - This is an ASCII interface. Requesting data from the Model 2010 is done mainly by sending a 3 character command followed by a carriage return (ODH). These 3 character commands are listed under CODE in the following chart. The Model 2010's response to these commands is listed under RESPONSE. The response data is followed by a carriage return line feed (ODH,0AH). There are also ways of stringing the commands together as shown in examples immediately following this chart.

Note - <00000000> represents weight data: # of zeros = number of digits. If there is a decimal point there will be one less digit. If the number is negative the most significant digit will be an ASCII minus '-' i.e. -500 will be '-<00000000>0500', -0.5 will be '-<00000000>00.5' is numeric data,<x.xxxxx> is mV/V data; if negative leading x = '-'.

CODE	DEFINITION	RESPONSE	EXPLANATION
00;	A/D REV	00<1A>	1-9 = A/D TYPE, A-Z = REV
01;	SERIAL #	01<1234567>	1 = YEAR, 2-3 = WEEK, 4-7 = instrument number
02;	REF DATE	02<MMDDYY>	Month Day Year of mV/V cal
03;	mV/V ZERO CAL	03<x.xxxxx>	instrument mV/V zero cal point
04;	mV/V SPAN CAL	04<x.xxxxx>	instrument mV/V span cal point
05;	ZERO mV/V	05<x.xxxxx>	zero in mV/V
06;	SPAN1 mV/V	06<x.xxxxx>	span1 in mV/V
07;	SPAN1 units	07<00000000*>	span1 in units
08 - 25;			spare, not presently used
26;	SPAN POINT	26<x>	1
27;	CAL TYPE	27<x>	0 = QUICK, 1 = DEADLOAD, 2 = KEYPAD
28;	ENG UNITS	28<x>	0 = LB, 1 = KG, 2 = TN, 3 = OZ, 4 = GM
29;	CAPACITY	29<000000>	sum of rated capacity of load cells
30;	DECIMAL POINT	30<x>	0 - 6 decimal point position 0 = none, 3 = 0.000
31;	RATED OUTPUT mV/V	31<x.xxxxx>	average of load cells rated output in mV/V
32;	UNIT COUNT BY	32<x>	0 - 5 = 1,2,5,10,20,50,100
33;	ZERO LIMIT	33<00000000*>	keypad push to zero limit from cal zero, 0 = no limit
34;	OVERLOAD	34<00000000*>	overload limit, 0 = no limit
35 - 48;			spare, not presently used
49;	ZERO KEY CONFIG	49<x>	0 = auto, 1 = manual
50;	TARE KEY CONFIG	50<x>	0 = auto, 1 = manual
51;	ANALOG CONFIG	51<x>	0 = gross, 1 = net
52;	ANALOG LOW	52<000000>	low output weight setting
53;	ANALOG HIGH	53<000000>	high output weight setting
54;	ANALOG LOW ADJUST	54<xxxx>	low analog output adjustment
55;	ANALOG HIGH ADJUST	55<xxxx>	high analog output adjustment
56;	MANUAL ZERO	56<00000000*>	manual zero
57;	MANUAL TARE	57<00000000*>	manual tare
58;	FILTER AVERAGING	58<x>	0 - 7 = 1,2,4,8,16,32,64,128
59;	FILTER BAND	59<xxxx>	0, 0.25 - 2.50, 3 - 100
60;	MOTION	60<xxxx>	0, 0.25 - 2.50, 3 - 50
61;	MOTION TIMER	61<x>	0 - 3 = 0.5, 1.0, 1.5, 2.0
62;	SECURITY LOCK	62,X	0 = off, 1 = on
63;	PASSWORD	63<AAAAAA >	security password 1-0,'-',',A-Z
64;	MENU LOCKS	64<xxxx>	0 = off, 1 = on; msd - lsd =diag,i/0,spare,filter,cal
65;	KEY LOCKS	65 <xxxx>	0 = off, 1 = on; msd =edit
66;	SERIAL 1 FORMAT	66<x>	0 = print, 1 = continuous, 2 = pc, 3 = MODBUS, 4 = Provox
67;	SERIAL 1 ADDRESS	67<x>	0 - 99
68;	SERIAL 1 BAUD RATE	68<x>	0 = 9600, 1 = 19200, 2 = 300, 3 = 600, 4 = 1200, 5 = 2400, 6 = 4800
69;	SERIAL 1 PARITY	69<x>	0 = none, 1 = even, 2 = odd
70;	PRINT DATA	70<xxxx>	0 = no, 1 = yes; msd - lsd = tare,zero,net,gross,display
71;	PRINT DATA FORMAT	71<xxxxxx>	lsd = stx: 0/1 = no/yes 2sd = address: 0/1 = no/yes 3sd = leading 0s: 0 = spaces, 1 = zeros 4sd = units: 0 = no, 1 = abbreviated, 2 = expanded 5sd = status: 0/1 = no/yes 6sd = delimiter: 0 = space, 1 = crlf 7sd = endchr character:, 0 = crlf, 1 = cr 0.0 - 9.9 seconds
72;	PRINT CRLF DELAY	72<x,x>	

73;	CON'T DATA	73<xxxxx>	0 = no, 1 = yes; lsd - msd =display,gross,net,zero,tare
74;	CON'T DATA FORMAT	74<xxxxxxxx>	lsd = stx: 0/1 = no/yes 2sd = address: 0/1 = no/yes 3sd = leading 0s: 0 = spaces, 1 = zeros 4sd = units: 0/1 = no/yes 5sd = status: 0/1 = no/yes 6sd = delimiter: 0 = space, 1 = crlf 7sd = endchar character:0 = crlf, 1 = cr 8sd = timer: 0/1 = no/yes
75;	CON'T TX TIMER	75<xx.x>	00.0 - 59.9 seconds
76;	CON'T TX TIMER	76<xxx>	0 - 240 minutes
77;	TAG NO.	77<AAAAAAA>	cust tag no. 1-0,'-', ' ,A-Z
78;	CAL DATE	78<MMDDYY>	Month Day Year of calibration
79;	NEXT CAL	79<MMDDYY>	Month Day Year of next cal
80-83;	SPARE		
84;	INSTRUMENT	84<xxxx>	instrument type (2010) for Model 2010
85;	FIRMWARE VERSION	85<xxxx>	firmware version (1.00, 9020 etc.)
86;	OPTIONS	86<xxxxxx>	[M]-[A]-[P]-[C]-[B]-[M]

CLR	CLEAR	CALCLR	clear calibration
CAL	CALIBRATE		used to precede CLEAR command

Table 5-4. Read/Write and Error Code Examples

EEPROM data request examples:

note - CRLF = carriage return = two ASCII characters 0D, 0A Hex
 note - CR = carriage return = one ASCII character 0D Hex
 note - using a dash between command numbers facilitates retrieving multiple parameters (see example #3).

1. to get span 1 mV/V value (code 06;)

sent	received
06;CR	06<x.xxxxx>CRLF
2. to get span 1 mV/V and units values (code 06; and 07;)

sent	received
06;07;CR	06<x.xxxxx>07<00000000>CRLF
3. to get complete analog output setup (codes 51; through 55;)

sent	received
51-55;CR	5152<00000000>53<00000000>54<xxxx>55<xxxx>CRLF

EEPROM data write examples:

Note - Downloading data to the Model 2010 is done by sending a 3 character command, the data enclosed in brackets <>, and a carriage return as shown in the examples below. The response will be staggered depending upon the time it takes to store the data. First the command will be returned and then after the data is stored the CRLF or next command will be returned.

1. to download capacity setting (code 29;), send (if capacity is 50000):
 29<00050000>CR or 29<50000>CR
 response will be: 29<00050000>CRLF
 2. to download zero and span 1 settings (codes 05; 06; 07;), send (if zero mV/V = 0.500000, span1 mV/V = 1.500000, span1 units = 20000):
 05<0.500000>06<1.500000>07<20000>CR
 response will be: 05<0.500000>06<1.500000>07<00020000>CRLF
 3. to acquire a new system zero (not download) (code 05;), send CAL05<0>CR:
 The Model 2010 will store the current mV/V value as a new system zero
 response will be: immediately CAL then after zero is acquired: 05<x.xxxxx>CRLF
 4. to acquire a live deadload span 1 (code 07;), send (if span 1 = 2000.0) CAL07<2000.0>CR:
 the Model 2010 will store the current live (above system zero) mV/V level as span 1 mV/V value (code 06;) and store 2000.0 as the units value
 response will be: immediately CAL, then after span is acquired: 07<0002000.0>CRLF
 5. to clear existing calibration send CALCLR CR:
 If the Model 2010 is in deadload or keypad cal all spans will be cleared, # of span points will be set to 0 and digital output will be based on system capacity and load cell mV/v output settings.
 response will be: immediately CALCLR then after cal is cleared, CRLF.
- Note:** cal zero is not cleared by this command. If the Model 2010 is in quick cal, response will be: CALCLR<NA>,CRLF.

INTERFACE ERROR CODES

NA = not allowed
 NT = no terminator
 LM = limit
 BF = input buffer overflow (too many characters sent, max is 255)
 AD = a/d error
 ? = unknown command

ERROR CODE EXAMPLES

sent	received	description
99,CR	99,?CRLF	unknown command
CR	?CRLF	unknown command
00<A1>CR	00<NA>CRLF	not allowed value for a/d rev
00<000>CR	00<NA>CRLF	not allowed value for a/d rev
28<5>CR	28<LM>CRLF	value limit for eng units
07<000050000>CR	07<NT>CRLF	no terminator (too many digits)

LIVE DATA

Note: - live weight data uses {} and not [] as a frame, this is because the numerical part of the live weight data and stored eeprom

Table 5-5. Live Data Transactions and Default Settings

data codes are the same number sequence 00 01 etc.

CODE	DEFINITION	RESPONSE	EXPLANATION
00,	GROSS	00(000000)	current gross weight
01,	NET	01(000000)	current net weight
02,	mV/V	02(x.xxxxxx)	current mV/V data
03,	LIVE mV/V	03(x.xxxxxx)	current live mV/V data
04,	WEIGHT STATUS	04(A)	A = a/d status () = normal (M) = motion (U) = signal underload (V) = above overload limit (O) = signal overload (E) = load cell connect fault
05,	ANALOG STATUS	05(A)	A = analog output status () = normal (U) = analog underrange (O) = analog overrange (E) = analog open circuit
06,	ANALOG	06(xxxxx)	0 - 65537 analog output
07,	DISPLAY	07(ABCDEFGH IJKLMNOP)	display - alpha numeric
		R	spare
		S	spare
		TU	annunciators -
		(Setpoint LEDs, 1= LED ON)	A1,A2,A3,A4 = low 4 bits of T T = 1 0 0 0 0 0 0 A1 A2 A3 A4 for A1-A4 off T = @ (40 hex) if A3 is on T = B (42 hex)
			A5,A6,A7,A8 = low 4 bits of U U = 1 0 0 0 0 0 0 A5 A6 A7 A8 for A5-A8 off U = @ (40 Hex) if A6,A7 are on U = F (46 hex)

LIVE DATA REQUEST EXAMPLES

1. to get gross weight (code 00,) if current gross weight is -10.1 lb

sent	received
00,CR	00(-000010.1)CRLF
2. to get gross & net weights and status (codes 00, 01, 04,) if current gross weight is 440.05, tare value is 200.1 and scale is in motion:

sent	received
00,01,04,CR	00(000440.05)01(000240.04)04(M)CRLF
3. to get live data codes 00 - 05 (data values used as example only):

sent	received
00-05,CR	00(000440.05)01(000240.04)02(1.200505)03(0.800400)04(M)05()CRLF

Table 5-5. Continued

LIVE DATA CONVENIENCE COMMAND CODES

code	definition	response	explanation
G	SWITCH TO GROSS	(per print format)	switch to gross and return current gross weight
N	SWITCH TO NET	(per print format)	switch to net and return current net weight
T	SWITCH TO NET & TARE	(per print format)	switch to net, tare, return current net weight
Z	SWITCH TO GROSS & ZERO	(per print format)	switch to gross, zero, return current gross weight

LIVE DATA CONVENIENCE COMMANDS (examples)

1. to switch Model 2010 to gross mode and get gross weight (code G), if current gross weight is -10.1 lb, unit # is 01, and scale is in motion:

sent	received (according to print format setup)
G, CR (carriage ret)	01 -000010.1LGMCRLF

2. to switch Model 2010 to net mode, tare and get net weight (code T), if current gross weight is -10.1 lb, unit # is 01:

sent	received (according to print format setup)
T, CR (carriage ret)	01 000000.0LN CRLF

Table 5-6. Setpoint Data Communication Format

SETPOINT DATA for Discrete outputs 1-8.

Note - setpoint data uses [] and not or () as a frame, this is because the numerical part of the live weight data and stored eeprom data codes are the same number sequence 00 01 etc.

CODE	DEFINITION	RESPONSE	EXPLANATION
00/	OUTPT 1 MAIN	00[00000000]	output 1 main value
01/	OUTPT 1 INFLIGHT	01[0000000]	output 1 insight
02/	OUTPT 1 DEADBAND	02[0000000]	output 1 deadband
03/	OUTPT 1 CONFIG	03[000]	output 1 config; msd on below(0)/above 2sd gross(0)/net, lsd main(0)/dribble
04/	OUTPT 1 TAG	04[AAAAAA]	output 1 tag; space,1-0, '-',A-Z
05/	OUTPT2 MAIN/DRIB	05[00000000]	output 2 main or drib value
06/	OUTPT 2 INFLIGHT	06[0000000]	output 2 insight if config is main
07/	OUTPT 2 DEADBAND	07[0000000]	output 2 deadband if config is main
08/	OUTPT2 CONFIG	08[000]	output 2 config; msd on below(0)/above 2sd gross(0)/net, lsd main(0)/dribble
09/	OUTPT 2 TAG	09[AAAAAA]	output 2 tag; space,1-0, '-',A-Z
10/	OUTPT 3 MAIN/DRIB	10[00000000]	output 3 main or drib value
11/	OUTPT 3 INFLIGHT	11[0000000]	output 3 inflight if config is main
12/	OUTPT 3 DEADBAND	12[0000000]	output 3 deadband if config is main
13/	OUTPT 3 CONFIG	13[000]	output 3 config; msd on below(0)/above 2sd gross(0)/net, lsd main(0)/dribble
14/	OUTPT 3 TAG	14[AAAAAA]	output 3 tag; space,1-0, '-',A-Z
15/	OUTPT 4 MAIN/DRIB	15[00000000]	output 4 main or drib value
16/	OUTPT 4 INFLIGHT	16[0000000]	output 4 inflight if config is main
17/	OUTPT 4 DEADBAND	17[0000000]	output 4 deadband if config is main
18/	OUTPT 4 CONFIG	18[000]	output 4 config; msd on below(0)/above 2sd gross(0)/net, lsd main(0)/dribble
19/	OUTPT 4 TAG	19[AAAAAA]	output 4 tag; space,1-0, '-',A-Z
20/	OUTPT 5 MAIN/DRIB	20[00000000]	output 5 main or drib value
21/	OUTPT 5 INFLIGHT	21[0000000]	output 5 inflight if config is main
22/	OUTPT 5 DEADBAND	22[0000000]	output 5 deadband if config is main
23/	OUTPT 5 CONFIG	23[000]	output 5 config; msd on below(0)/above 2sd gross(0)/net, lsd main(0)/dribble
24/	OUTPT 5 TAG	24[AAAAAA]	output 5 tag; space,1-0, '-',A-Z
25/	OUTPT 6 MAIN/DRIB	24[0000000]	output 6 main or drib value
26/	OUTPT 6 INFLIGHT	26[0000000]	output 6 inflight if config is main
27/	OUTPT 6 DEADBAND	27[0000000]	output 6 deadband if config is main
28/	OUTPT 6 CONFIG	28[000]	output 6 config; msd on below(0)/above 2sd gross(0)/net, lsd main(0)/dribble
29/	OUTPT 6 TAG	29[AAAAAA]	output 6 tag; space,1-0, '-',A-Z
30/	OUTPT 7 MAIN/DRIB	30[00000000]	output 7 main or drib value
31/	OUTPT 7 INFLIGHT	31[0000000]	output 7 inflight if config is main
32/	OUTPT 7 DEADBAND	32[0000000]	output 7 deadband if config is main
33/	OUTPT 7 CONFIG	33[000]	output 7 config; msd on below(0)/above 2sd gross(0)/net, lsd main(0)/dribble
34/	OUTPT 7 TAG	34[AAAAAA]	output 7 tag; space,1-0, '-',A-Z
35/	OUTPT 8 MAIN/DRIB	35[00000000]	output 8 main or drib value
36/	OUTPT 8 INFLIGHT	36[0000000]	output 8 config; msd on below(0)/above 2sd gross(0)/net, lsd main(0)/dribble
39/	OUTPT 8 TAG	39[AAAAAA]	output 8 tag; space,1-0, '-',A-Z
40/	SETPOINT ON/OFF STATUS	40[xxxxxxx] [87654321]	SETPOINTS 8-1, ON=1, OFF=0

SETPOINT DATA request examples

1. to get output 1 main (code 00/) if main = 2000

```
sent
received
00/CR
00[0002000]CRLF
```

2. to get output 1 main, inflight, deadband, status, tag, and output 2 is configured as dribble to output 1; if main = 2000, inflight = 10, deadband = 5, status = on below tracking net weight, tag = SLURRY, dribble = 35:

```
sent received
00-09/CR 00[00002000]01[000010]02[000005]03[010] 04[SLURRY ]
05[00000035]06[000000]07[000000]08[001]09[OUTPUT 2]
CRLF
```

3. to get outputs 1 - 4 main values: if 2000, 4000, 6000, and 8000

```
sent received
00/05/10/15/CR 00[00002000]05[00004000]10[00006000]15[00008000]CRLF
```

SECTION 6. System Diagnostics

6.1 OVERVIEW

Model 2010 diagnostics provide easy access to critical operating system data, and test/verification procedures for many indicator functions. Unique to Model 2010 diagnostics is the simulated weight or ramp feature.

Figure 6-1 (following pages) presents the diagnostic flow diagram. Follow the procedures in this diagram to view values, set function limitations, test the front panel keypad, verify I/O functions, and run a simulated weight.

6.1.1 Tag/Cal Date

Tag and Cal date provides three registers for storage of customer tag and calibration records. Users may enter a tag number, current calibration date, and projected date of next calibration, if desired.

6.1.2 Diagnostic Version

Diagnostic version provides the software version, the installed option code derived from the ordering specification, the serial number, the ND converter revision level, and the date of the factory calibration.

6.1.3 Zero/Tare Recall

Recall allows the operator to view current tare and zero values. This menu also allows selection of auto/manual zero and tare operation. When auto is selected, tare or zero is activated by the remote pushbutton. With manual selected, push-button activation prompts for a numeric value entry. Values entered become permanent tare/zero (stored in EEPROM) until the button is pressed again to prompt a new entry.

6.1.4 Selecting Limits

LIMIT SETTINGS is accessed to enter/alter zero, overload, and motion limits and motion timer. The value entered for zero will limit the range of the front panel zero key (recommended 2-20%). Overload sets the alarm annunciator activate point. Motion determines how many counts must be exceeded before the 'in motion' alarm annunciator is activated. The motion timer determines how long the motion alarm remains activated after the motion condition is cleared.

6.1.5 Front Panel Key Test

TEST KEYPAD allows an operator to functionally test any/all front panel keys. Press any two keys simultaneously to exit.

6.1.6 Check Remote Inputs

TEST INPUTS is a check of all remote inputs. If inputs are inactive, their respective numbers will appear (54321). Once activated, the input number will change to a dash.

6.1.7 Test/Verify the Analog Output

TEST ANALOG tests the analog output. Test should be performed with a current meter attached. Testing firstly shows the actual analog count value being transmitted. Since the analog output is based on a 14 bit D-A conversion, the percent of span can be calculated by dividing the displayed counts by 16384. Secondly, any value may be entered to test the analog output. Enter a known value such as 16384 (max setting) and check current meter for appropriate output. Exiting this menu will automatically discontinue the test mode.

6.1.8 Test/Troubleshoot the Serial Output

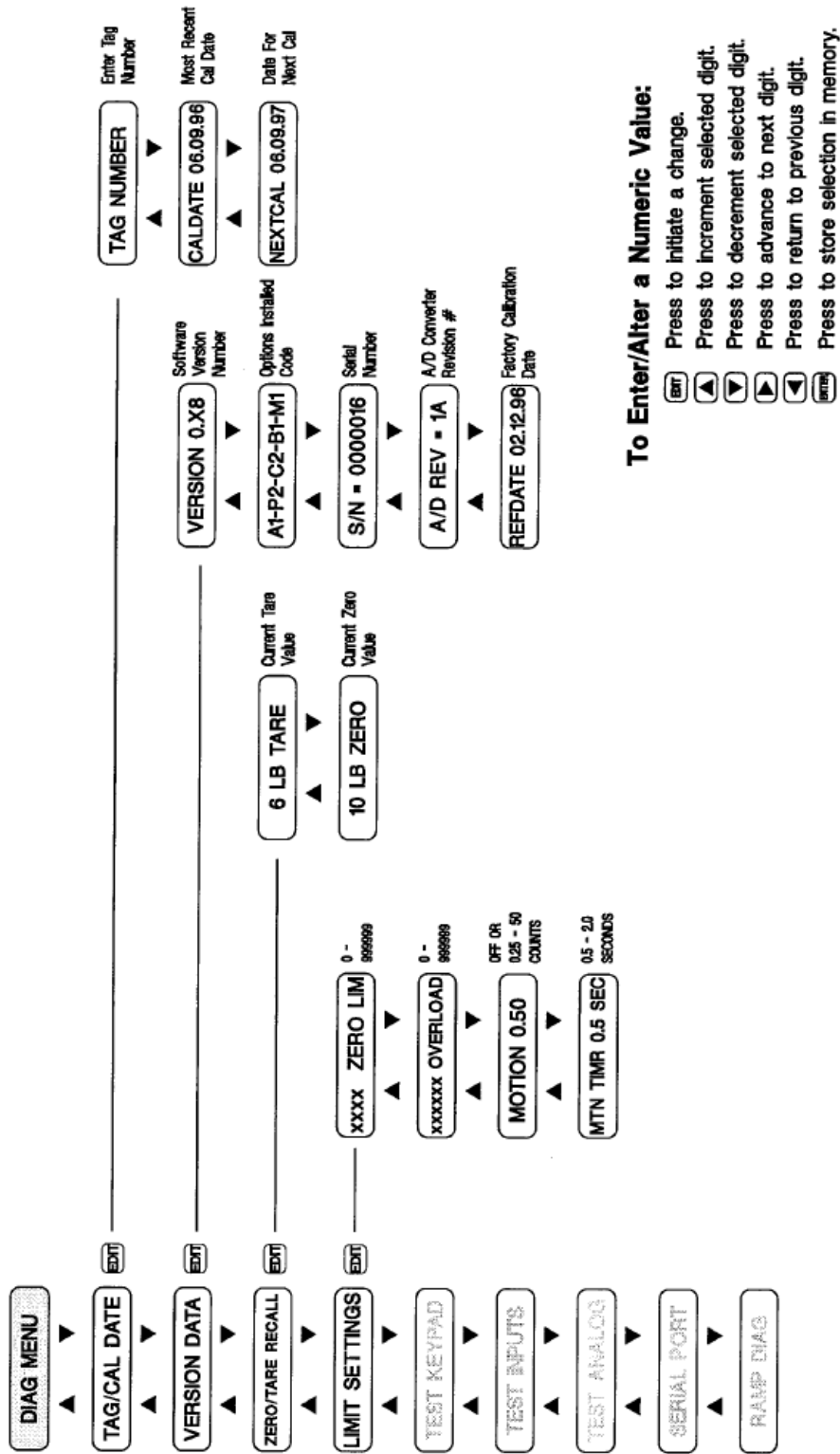
SERIAL PORT provides the means to view both the transmit and receive buffers. After pressing EDIT, use the left/right arrow keys to increment forward or decrement backward through the selected buffer and view the hexadecimal value of each character. Using this procedure, incoming data requests can be checked for protocol/syntax accuracy and compared to Model 2010 output responses.

6.2 SIMULATING A WEIGHMENT

'Ramping' allows entry of starting and ending gross weight values, and then simulates a live weight addition without adding actual product/ingredients to the vessel. During the ramping exercise all outputs function as if an actual weight change were in progress.

RAMP DIAG allows entry of simulated starting (typically 0) and ending (typically full scale system capacity) weight points. Time for a complete ramp 'up' cycle (starting point up to ending point) can be selected from 1 to 240 seconds. Once ramp 'up' is complete, a ramp 'down' (ending point down to starting point) sequence automatically begins. At the BEGIN display, press EDIT to start ramping. Ramping will continue until ESC is pressed.

Diagnostic Menu Flow Diagram (page 1)



To Enter/Alter a Numeric Value:

- [EXIT] Press to initiate a change.
- [▲] Press to increment selected digit.
- [▼] Press to decrement selected digit.
- [▶] Press to advance to next digit.
- [◀] Press to return to previous digit.
- [ENTER] Press to store selection in memory.

To Enter/Alter a Parameter Selection:

- [EXIT] Press to initiate a change.
- [▼] Press to view parameter options.
- [ENTER] Press to store selection in memory.

Figure 6-1. Diagnostic Menu Flow Diagram.

Diagnostic Menu Flow Diagram (page 2)

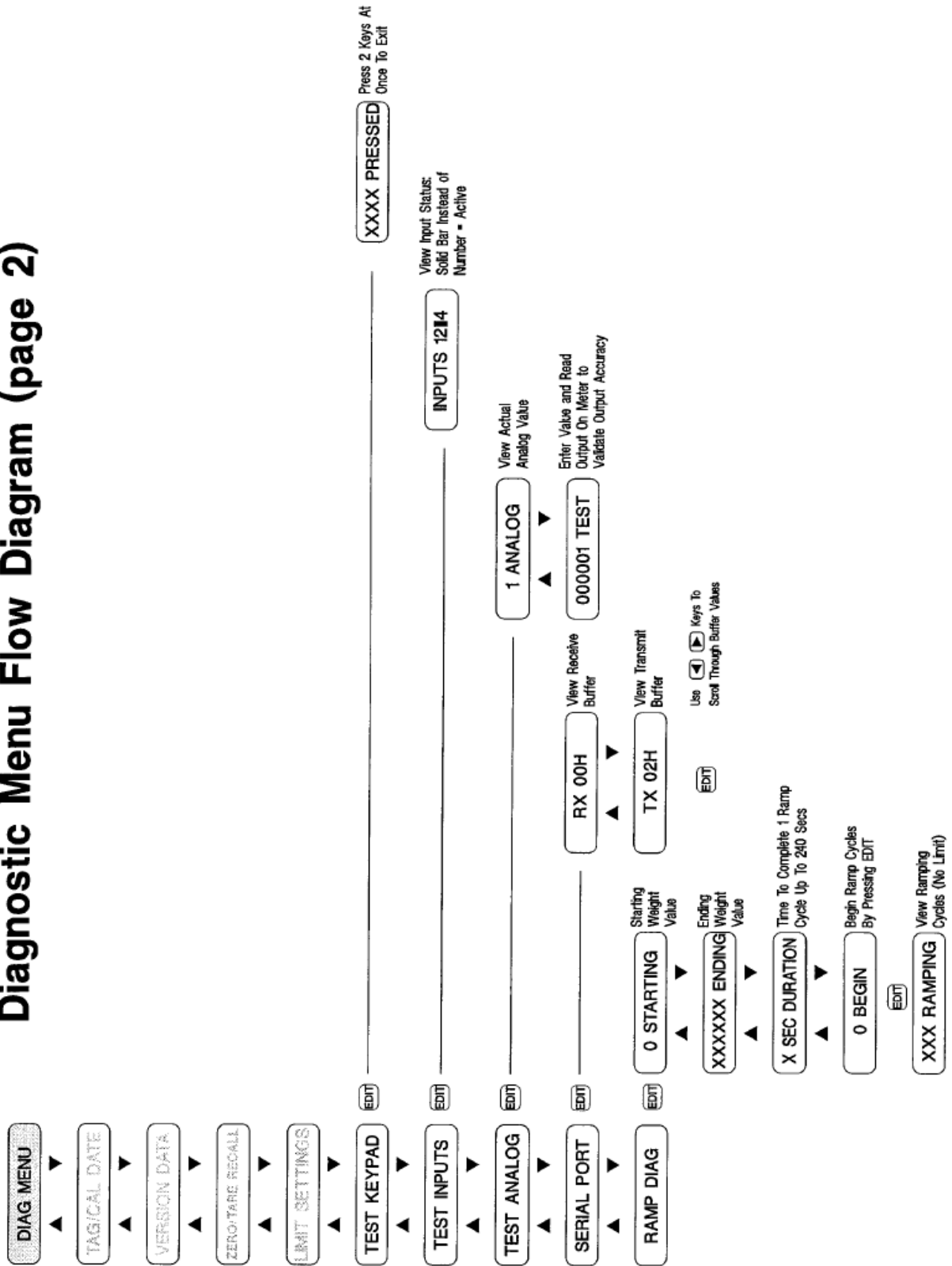


Figure 6-1 con't. Diagnostic Mode Configuration.

SECTION 7. Security System

7.1 INTRODUCTION

From password access to individually selectable menu and key 'locks', Safe-Weigh Software protects the entire weigh system from overt tampering or accidental data/configuration/calibration alterations. Figure 7-1 (next page) presents the security menu flow diagram. Follow the procedures designated to secure as many parameters as desired.

7.1.1 Lock On/Off

Lock 'On' restricts access to the security menu and all other menus/keys designated as 'locked'. If locked, the designated password (see paragraph 7.2) must be entered to gain access to the security menu. Units are shipped with the lock 'Off to allow initial configuration without a password.

7.1.2 Menu Locks

The calibration, filter, I/O, and diagnostic main menus can be 'locked' to prevent parameter changes. To lock menus, choose ON by pressing the EDIT and RIGHT arrow keys in sequence. Then press ENTER to store. Once a menu is designated as locked access to that menu is barred. To 'unlock' a locked menu, return to the security menu, enter the correct password, and change the status to OFF.

7.1.3 EDIT Key Lock

The front panel EDIT key can be 'locked' to prohibit parameter changes. To lock this key, choose ON by pressing the EDIT and RIGHT arrow keys in sequence. Then press ENTER to store. Once designated as locked, EDIT will not function when pressed. To 'unlock' this key, return to the security menu, enter the correct password, and change the status to OFF.

7.2 PASSWORD ACCESS

If lock ON is selected (paragraph 7.1.1), a password must be entered to regain access to the security menu. The following paragraphs explain how to select and enter a password. Once a password is chosen, it should be written down and stored in a confidential area.

7.2.1 Selecting/Storing a Password

A password can be any combination of alpha-numeric characters up to seven digits long. It is not necessary to use all seven digits.

At the PASSWORD display, key in the designated characters using the arrow keys (LEFT/RIGHT to change digits, UP/DOWN to select character). When the password is correctly displayed, press ENTER to store.

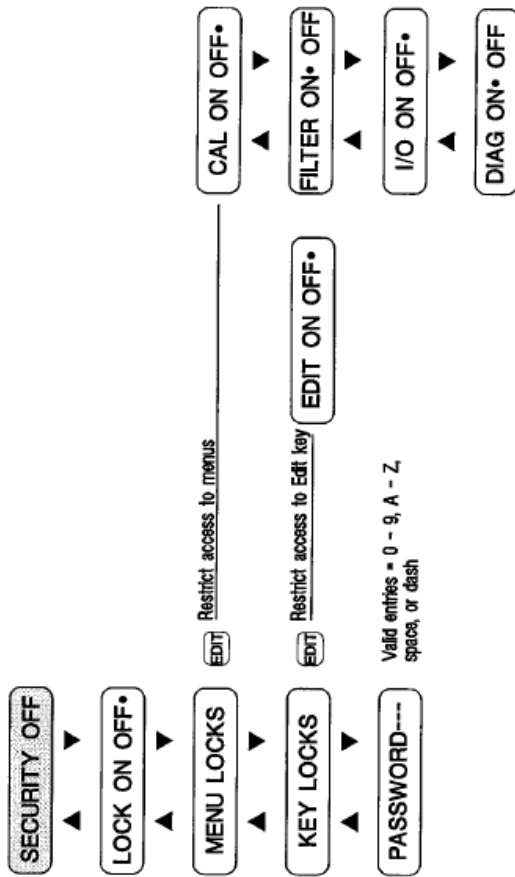
7.2.2 Entering the Password

If the lock is 'ON', the password must be entered to access the security menu. With the display reading SECURITY (a row of dashes above), press EDIT. Use the arrow keys to enter the complete password, as it was stored, on the row above SECURITY. When the correct password is displayed, press ENTER. Note that entering the password does not turn the lock off; it simply allows access to the security menu. If the lock is left ON, the password must be entered each time the security menu is accessed.

Master Password:

In addition to the user selected password there is also factory installed master password. If the user selected password is lost, contact any BLH service location for the master password.

Security Menu Flow Diagram



General Key Functions:

- ▲ Step back to previous menu selection.
- ▼ Advance to next menu selection.
- Ⓜ Advance to next main menu selection.
- Ⓜ Return to live operation from menu.
- Ⓜ Change sub menu parameters.
- Ⓜ Store displayed sub menu parameter in memory.

To Enter/Alter a Numeric Value:

- Ⓜ Press to initiate a change.
- ▲ Press to increment selected digit.
- ▼ Press to decrement selected digit.
- ▶ Press to advance to next digit.
- ◀ Press to return to previous digit.
- Ⓜ Press to store selection in memory.

To Enter/Alter a Parameter Selection:

- Ⓜ Press to initiate a change.
- ▼ Press to view parameter options.
- Ⓜ Press to store selection in memory.

Figure 7-1. Security Menu Options.

SECTION 8. Operation

8.1 GENERAL

Model 2010 indicator/transmitters power up in the gross weight weighing mode. If no system errors are detected, the front panel display will show the system live gross weight value. Note: For initial system power up, units are factory pre-calibrated with default values. Calibration (SECTION 3), however, should be performed before attempting system operation.

Figure 8-1 presents the isolated input switch functions for the operating mode. G/N toggles the operating mode from gross to net or net to gross. ZERO performs push to zero (gross mode) and TARE initiates the tare function in the net mode. PRINT transmits the current weight status data to a printer if print format is selected. If the Model 2010 is connected to a host computer or PLC, gross, net, zero, tare, and print functions can be initiated remotely using these same inputs.

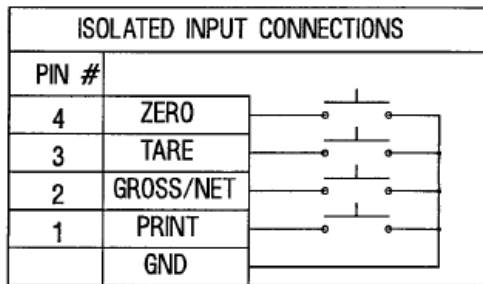


Figure 8-1. Remote Input Operating Connections.

8.2 GROSS WEIGHT WEIGHING

In the gross mode, all of the live weight of the system is displayed on the front panel. Live weight does not include the dead weight of a vessel or other mechanical equipment that is factored out during calibration.

8.3 ZERO OPERATION

A new zero can be acquired to compensate for the changes in the dead load of the system due to heel build-up, etc. Acquiring a new zero reference value does not affect the slope of the

calibration. The push to zero range in the Model 2010 can be configured from OFF to 100% of system capacity (or 999999). To prevent system overload, the zero selection limit usually does not exceed 20% of system capacity. Zero may be acquired only if the system is not in motion and the zero limit has not been exceeded.

If manual zero operation is selected (Figure 6-1, paragraph 6.1.3), pressing the zero push-button prompts the operator for a numeric entry (use the EDIT and arrow keys then press ENTER to store). Enter the desired zero value for use in all subsequent weighments.

8.4 NET WEIGHT WEIGHING

Net weight weighing is used when the operator wants to reset zero to compensate for the addition of live weight, or a container, before adding a specific amount of material. Tare is used to establish a zero reference in net mode.

8.5 TARE OPERATION

With the Model 2010 in net weighing mode, the tare function resets the output to zero. Push button taring allows the operator to achieve a new zero reference before addition of each ingredient so that errors do not become cumulative. If manual tare is selected, a tare value must be bettered using the EDIT and arrow keys (press ENTER to store). Manual tare values typically represent the known weight of empty containers placed upon the scale/platform.

8.6 ERROR DETECTION AND CORRECTION

Should an error condition occur, a scrolling message will appear on the bottom line of the front panel display. As much as possible, messages define the exact error and suggest a remedy. Once the error is cleared, the scrolling message will stop and normal operation will resume. Table 8-1 represents all error messages with recommended solutions.

Table 8-1. Error Messages and Explanations

POWER-UP FAULT MESSAGES

<u>FAULT CONDITION</u>	<u>DISPLAY</u>	<u>REMEDY</u>
The a/d module does not have a revision number	NO A/D REV	Factory procedure
The a/d module does not have a mv/V calibration date	NO CAL DATE	Factory procedure
The a/d module does not have a temperature compensation reference	NO TMP COMP	Factory procedure
The a/d module does not have a mv/V calibration	NO mv/V CAL	Factory procedure
The instrument serial number has not been downloaded	NO SER NUMBER	Factory procedure
The instrument has not been calibrated for weight	NO ENG CAL	Set to quick cal or Acquire deadload cal or Enter keypad cal
The instrument does not have a manual zero value	NO MANUAL ZERO	Acquire zero using zero key or enter manual zero
The instrument does not have a manual tare value	NO MAN TARE	Acquire tare using tare key of enter manual tare

OPERATE MODE FAULT DISPLAYS

Load cell excitation short, or no excitation	FAULT LOAD CELL scrolling message = "EXCITATION FAULT CHECK CONNECTIONS"	Check connections
Load cell excitation fault cleared	FAULT CLEARED	
A/D reference values out of limit	A/D FAULT followed by RESTART, followed by reset of instrument	Check connections, possible sense line open
Eeprom read/write failure when storing parameters	EEPROM ERROR	Contact field service
A/d output has reached maximum value	OVER RANGE	Check connections, excitation to signal short
A/d output has reached minimum value	UNDER RANGE	Check connections, excitation to signal short

OPERATE MODE SPECIAL DISPLAYS

Gross weight is equal to or greater than overload setting	5000 OVER LB (over is blinking)	
Attempt to enter locked menu or perform locked function	LOCKED	Go to security menu to unlock
Attempt to zero gross weight when in net mode	SWITCH TO GROSS	Switch to gross mode
Attempt to tare net weight when in gross mode	SWITCH TO NET	Switch to net mode
Attempt to zero gross weight at or above zero limit	ZERO LIMIT	
Attempt to zero gross weight	IN	Wait for stable

SECTION 9. Modbus RTU Protocol Option

9.1 GENERAL

Section IX provides information for Model 2010 Modbus RTU protocol.

9.2 Modbus RTU PROTOCOL

This interface method is applicable to virtually any PC or other process control computer with Modbus RTU Master communication capability. The interface provides weight and diagnostic information and allows for remote control of tare, zero, and grossnet functions. New calibration data also may be downloaded via this interface. Information is transmitted in blocks of data, thereby minimizing polling and response time delays. The interface operates with the Model 2010 configured as the slave device and the host computer as the master. To initiate Modbus RTU protocol, simply select the Modbus print format as shown in Figure 5-1 (page 5-2). Modbus RTU uses the standard Model 2010 RS-485/422 communication port and requires no hardware alterations.

9.2.1 Data Format

Table 9-1 presents a complete overview of Modbus register and bit allocations. In addition to Table 9-1 information, the following data formats and definitions apply to Modbus RTU protocol:

Weight Data - Two 16 bit signed integers, the first (high) integer must be multiplied by 32768 and then added to the second (low) integer.

Status and setup parameters - Two 16 bit unsigned integer - see Table 9-2.

Alpha data - For each register: high byte is first character, low byte is second character.

NOTE: If a decimal point is required the resulting value must be multiplied by the appropriate fraction, i.e., 0.01 for hundreds of a unit. In the case of mV/V values the multiplier is 0.000001. The Model 2010 range is (999999/+9999999).

NOTE: Counts refers to displayed counts. If displayed weight is counting by 2 lb increments then presetting a register to 9 would mean 18 lbs.

9.2.2 Modbus RTU Functions Supported

02 Read Input Status

03 Read Holding Registers

06 Preset Single Register

16 (10 Hex) Preset Multiple Registers

9.2.3 Setup

Modbus RTU format, Device address, baud rate, and parity are all selectable under the SERIAL 1 section of the I/O MENU.

Table 9-1. MODBUS Register Allocations

REGISTER ADDRESSES

Registers 1 - 18 are read only, 20 - 238 are read/write, 242 is read only and 256 is write only

REG#	DATA	REGS	DESCRIPTION
40001	SERIAL #	4	7 ASCII digits 0-9 starting with high byte of reg 40001 to high byte of reg 40004; reg 40004 low byte = 0
40005	SOFTWARE VER	1	number with 2 decimal places
40006	A/D REV	1	2 ASCII chars starting with high byte
40007	REF DATE	3	MMDDYY Month Day Year of internal cal; 6 ASCII digits 0-9 starting with high byte of reg 40007 to low byte of reg 40009
40010	STAT1	1	status register 1 (see page 9-5, Table 9-3 for def)
40011	STAT2	1	status register 2 (see page 9-5, Table 9-3 for def)
40012	GROSS WEIGHT	2	
40014	NET WEIGHT	2	
40016	mV/V ACTUAL	2	
40018	mV/V LIVE	2	
40020	ZERO	2	
40022	TARE	2	
40024	ZERO mV/V	2	zero cal point in mV/V
40026	SPAN1 mV/V	2	span1 cal point in mV/V
40028	SPAN1 units	2	span1 cal point in units
40030	SPARE		
40032	SPARE		
40034	SPARE		
40036	SPARE		
40038	SPARE		
40040	SPARE		
40042	SPARE		
40044	SPARE		
40046	SPARE		
40048	SPARE		
40050	SPARE		
40052	SPARE		
40054	SPARE		
40056	SPARE		
40058	SPARE		
40060	SPARE		
40062	SPARE		
40064	SPARE		
40066	# SPAN POINTS	1	0-1 (0 if no deadload or keypad cal)
40067	CAL TYPE	1	0 = QUICK, 1 = DEADLOAD, 2 = KEYPAD
40068	ENG UNITS	1	0 = LB, 1 = KG, 2 = TN, 3 = OZ, 4 = GM, 5 = N, 6 = KN, 7 = L
40069	CAPACITY	2	sum of rated capacity of load
40071	DECIMAL POINT	1	0-6 decimal point position: 0=none, 3=0.000
40072	RATED OUTPUT	2	average of load cells rated output in mV/V
40074	UNIT COUNT BY	1	0-6 = 1,2,5,10,20,50,100
40075	ZERO LIMIT	2	keypad push to zero limit
40077	OVERLOAD	2	overload limit, 0 = no limit
40079	SPARE		
40080	SPARE		
40082	SPARE		
40084	SPARE		
40085	SPARE		
40087	SPARE		
40089	SPARE		
40090	SPARE		
40091	SPARE		
40092	SPARE		
40093	SPARE		
40094	SPARE		
40095	SPARE		
40096	SPARE		
40097	ZERO KEY CONFIG	1	0 = auto, 1 = manual
40098	TARE KEY CONFIG	1	0 = auto, 1 = manual
40099	ANALOG CONFIG	1	0 = gross, 1 = net, 2 = rate
40100	ANALOG LOW	2	low analog output weight setting
40102	ANALOG HIGH	2	high analog output weight setting
40104	ANALOG LOW ADJ	2	low analog output adjustment
40106	ANALOG HIGH ADJ	2	high analog output adjustment
40108	FILTER AVERAGING	1	0-7 = 1,2,4,8,16,32,64,128 conversions
40109	FILTER BAND	1	0-10 = 0-2.5 counts, 11-108 = 3-100 counts
40110	MOTION	1	0 = off, 1-10 = 0-2.5 counts, 11-58 = 3-50 counts

Table 9-1 con't. MODBUS Register Allocations

40111	MOTION TIMER	1	0 - 3 = 0.5, 1.0, 1.5, 2.0 seconds
40112	PASSWORD	4	allowable ASCII chars are 0-9,A-Z, minus, space. Reg 40112 high byte is first char, reg 40115 high byte is last char; reg 40115, low byte set to 0
40116	KEY/SECY LOCKS	1	bits 0-4 = zero,tare,g/n,print,edit keys bit 5 = security lock; 0 = off, 1 = on
40117	MENU LOCKS	1	bits 0-5 = cal,filter,display,i/o,diag, rate; 0 = unlock, 1 = lock
40118	SERIAL 1 FORMAT	1	0 = print, 1 = continuous, 2 = pc, 3 = Modbus, 4 = Provox
40119	SERIAL 1 ADDRESS	1	0 - 99
40120	SERIAL 1 BAUD RATE	1	0 = 9600, 1 = 19200, 2 = 300, 3 = 600, 4 = 1200, 5 = 2400, 6 = 4800
40121	SERIAL 1 PARITY	1	0 = none, 1 = even, 2 = odd
40122	PRINT DATA SELECT	1	bits 0-5 = display,gross,net,zero,tare, rate; 0 = no, 1 = yes
40123	PRINT DATA FRMAT	1	bits 0-1 = stx,address; 0 = no, 1 = yes bit 2 = leading 0s; 0 = spaces, 1 = zeros bit 4 = status; 0 = no, 1 = yes bit 5 = delimiter; 0 = space, 1 = crlf bit 6 = terminating char; 0 = crlf, 1 = cr bits 7,3 = units; 00 = no, 01 = abbreviated
40124	PRINT CRLF DELAY	1	0-99 = 0.0 - 9.9 seconds
40125	CON'T DATA SELECT	1	bits 0-5 = display,gross,net,zero,tare, rate; 0 = no, 1 = yes
40126	CON'T DATA FRMAT	1	bits 0-1 = stx,address; 0 = no, 1 = yes bit 2 = leading 0s; 0 = spaces, 1 = zeros bit 3-4 = units,status; 0/1 = no/yes bit 5 = delimiter 0 = space, 1 = crlf bit 6 = terminating char; 0 = crlf, 1 = cr bit 7 = timer; 0 = no, 1 = yes
40127	CON'T TX TIMER	1	0-599 = 00.0 - 59.9 seconds
40128	CON'T TX TIMER	1	0-240 = 0 - 240 minutes
40129	TAG NO.	4	allowable ASCII chars are 0-9,A-Z, minus, space. Reg 40129 high byte is first char, reg 40132 high byte is last char, reg 40132 low byte set to 0.
40133	CAL DATE	3	MMDDYY Month Day Year of customer cal 6 ASCII digits 0-9 starting with high byte of reg 40133 to low byte of reg 40135.
40136	NEXT CAL	3	MMDDYY Month Day Year of customer next cal. 6 ASCII digits 0-9 starting with high byte of reg 40136 to low byte of reg 40138
40139	SPARE		
40140	SPARE		
40141	SPARE		
40142	SPARE		
40143	INSTRUMENT	1	instrument type: 200 for LCp-200
40144	OPTIONS	3	[M]-[A]-[P]-[C]-[B]-[M] 6 ASCII digits 0-9 starting with high byte of reg 40144 to low byte of reg 40146 bit 3 = mV/V bit 7 = spare
40147 - 40169	SPARE		
40170	OUTPT 1 MAIN	2	output 1 main value
40172	OUTPT 1 INFLIGHT	1	output 1 inflight
40173	OUTPT 1 DEADBAND	1	output 1 deadband
40174	OUTPT 1 CONFIG	1	output 1 configuration; bit 0 = main(0)/drib(1), bit 1 = track gross(0)/net(1), bit 2 = 0, bit 3 = on below (0)/above (1)
40175	OUTPT 1 TAG	4	output 1 tag; 8 ASCII characters (space,1-0,-,A-Z) starting with high byte of reg 40175 to low byte of reg 40178
40179	OUTPT 2 MAIN/DRIB	2	output 2 main (or output 1 dribble) value
40181	OUTPT 2 INFLIGHT	1	output 2 inflight
40182	OUTPT 2 DEADBAND	1	output 2 deadband
40183	OUTPT 2 CONFIG	1	output 2 config; see definition for output 1 config
40184	OUTPT 2 TAG	4	output 2 tag; see definition for output 1 tag
40188	OUTPT 3 MAIN/DRIB	2	output 3 main (or output 2 dribble) value
40190	OUTPT 3 INFLIGHT	1	output 3 inflight
40191	OUTPT 3 DEADBAND	1	output 3 deadband
40192	OUTPT 3 CONFIG	1	output 3 config; see definition for output 1 config
40193	OUTPT 3 TAG	4	output 3 tag; see definition for output 1 tag
40197	OUTPT 4 MAIN/DRIB	2	output 4 main (or output 3 dribble) value
40199	OUTPT 4 INFLIGHT	1	output 4 inflight
40200	OUTPT 4 DEADBAND	1	output 4 deadband
40201	OUTPT 4 CONFIG	1	output 4 config; see definition for output 1 config
40202	OUTPT 4 TAG	4	output 4 tag; see definition for output 1 tag

Table 9-1 con't. MODBUS Register Allocations

40206	OUTPT 5 MAIN/DRIB	2	output 5 main (or output 4 dribble) value
40208	OUTPT 5 INFLIGHT	1	output 5 inflight
40209	OUTPT 5 DEADBAND	1	output 5 deadband
40210	OUTPT 5 CONFIG	1	output 5 config; see definition for output 1 config
40211	OUTPT 5 TAG	4	output 5 tag; see definition for output 1 tag
40215	OUTPT 6 MAIN/DRIB	2	output 6 main (or output 5 dribble) value
40217	OUTPT 6 INFLIGHT	1	output 6 inflight
40218	OUTPT 6 DEADBAND	1	output 6 deadband
40219	OUTPT 6 CONFIG	1	output 6 config; see definition for output 1 config
40220	OUTPT 6 TAG	4	output 6 tag; see definition for output 1 tag
40224	OUTPT 7 MAIN/DRIB	2	output 7 main (or output 6 dribble) value
40226	OUTPT 7 INFLIGHT	1	output 7 inflight
40227	OUTPT 7 DEADBAND	1	output 7 deadband
40228	OUTPT 7 CONFIG	1	output 7 config; see definition for output 1 config
40229	OUTPT 7 TAG	4	output 7 tag; see definition for output 1 tag
40233	OUTPT 8 MAIN/DRIB	2	output 8 main (or output 7 dribble) value
40235	OUTPT 8 INFLIGHT	1	output 8 inflight
40236	OUTPT 8 DEADBAND	1	output 8 deadband
40237	OUTPT 8 CONFIG	1	output 8 config; see definition for output 1 config
40238	OUTPT 8 TAG	4	output 8 tag; see definition for output 1 tag
40242	SETPOINT ON/OFF STATUS	1	bits 0-7 = setpoints 87654321; 0=off, 1 = on
40243-40255	SPARE		
40256	COMMAND	1	Write only register. 1 = tare net weight 2 = push to zero gross weight 3 = clear status register 1

Table 9-2. Status Byte Bit Allocations

STATUS REGISTERS

Note: Status registers 1 & 2 are read only (function 03) registers. The bits in these registers can also be read as inputs 1 - 32 using function 02.

Note: In status register 1 the bits latch on if the condition is true. To clear status register 1, a 3 must be sent to command register 40256. In status register 2 the bits do not latch but follow the current status of the condition.

(INPUT) STAT1 STATUS REGISTER 1

(1)	BIT	0 - POWERUP
(2)	BIT	1 - UNABLE TO TARE/ZERO BECAUSE OF MOTION
(3)	BIT	2 - UNABLE TO ZERO BECAUSE OF LIMIT
(4)	BIT	3 - LOAD CELL SIGNAL UNDERRANGE
(5)	BIT	4 - LOAD CELL SIGNAL OVERRANGE
(6)	BIT	5 - LOAD CELL CONNECT FAULT
(7)	BIT	6 - ANALOG OUTPUT UNDERRANGE
(8)	BIT	7 - ANALOG OUTPUT OVERRANGE
(9)	BIT	8 - ANALOG OUTPUT OPEN CIRCUIT
(10)	BIT	9 - NO mV/V CAL
(11)	BIT	10 - NO ENGINEERING CAL
(12)	BIT	11 - NO TEMPERATURE COMPENSATION
(13)	BIT	12 - NO MANUAL ZERO
(14)	BIT	13 - NO MANUAL TARE
(15)	BIT	14 - EEPROM ERROR
(16)	BIT	15 - SPARE

(INPUT) STAT2 STATUS REGISTER 2

(17)	BIT	0 - POWERUP (on for 5 seconds after power up)
(18)	BIT	1 - UNABLE TO TARE/ZERO BECAUSE OF MOTION (on for 2 sec if true)
(19)	BIT	2 - UNABLE TO ZERO BECAUSE OF LIMIT (on for 2 sec if true)
(20)	BIT	3 - LOAD CELL SIGNAL UNDERRANGE
(21)	BIT	4 - LOAD CELL SIGNAL OVERRANGE
(22)	BIT	5 - LOAD CELL CONNECT FAULT
(23)	BIT	6 - ANALOG OUTPUT UNDERRANGE
(24)	BIT	7 - ANALOG OUTPUT OVERRANGE
(25)	BIT	8 - ANALOG OUTPUT OPEN CIRCUIT
(26)	BIT	9 -
(27)	BIT	10 -
(28)	BIT	11 -
(29)	BIT	12 - MOTION
(30)	BIT	13 - FAULT (on if any bits on in status register 1)
(31)	BIT	14 - ZERO LIMIT
(32)	BIT	15 - OVERLOAD

PS-2010T Software

PS-2010T units are tension measurement versions of the 2010B weight indicator. As such, all **net** and **tare** weight values and functions have been removed. References to **gross weight** should be interpreted as total tension.

After making these distinctions, selection menus and general information presented in manual TM028 Rev.C remains valid for 2010T units with the following exceptions:

(1) Interconnect Wiring

Make all wiring connections to the 2010T unit as shown in Figure 1. Note that two web tension transducers are typically wired in parallel to the same input terminals (Table 1).

(2) Engineering Display Units

PLI (pounds per linear inch) and N/M (Newton meters) display units have been added to the selection table on Page 3-3. Systems using these selections must be calibrated accordingly.

NOTE: Blank UNITS is not a selection option for PS-2010T software.

Table - 1. PS-2010T Transducer Connections

PS-2010T Transducer Connections	
Terminal Designation	Wire Color (Typical)
SH	Shield
+EXC	Green
+ SENSE	No Wire/ Connection
+SIGNAL	White
-SIGNAL	Red
-SENSE	No Wire/ Connection
-EXC	Black

Notes:

- (1). +/- SENSE and +/- EXC are connected internally
- (2). Reverse Red and White lead connections to read negative tension

(addendum continued on next page)

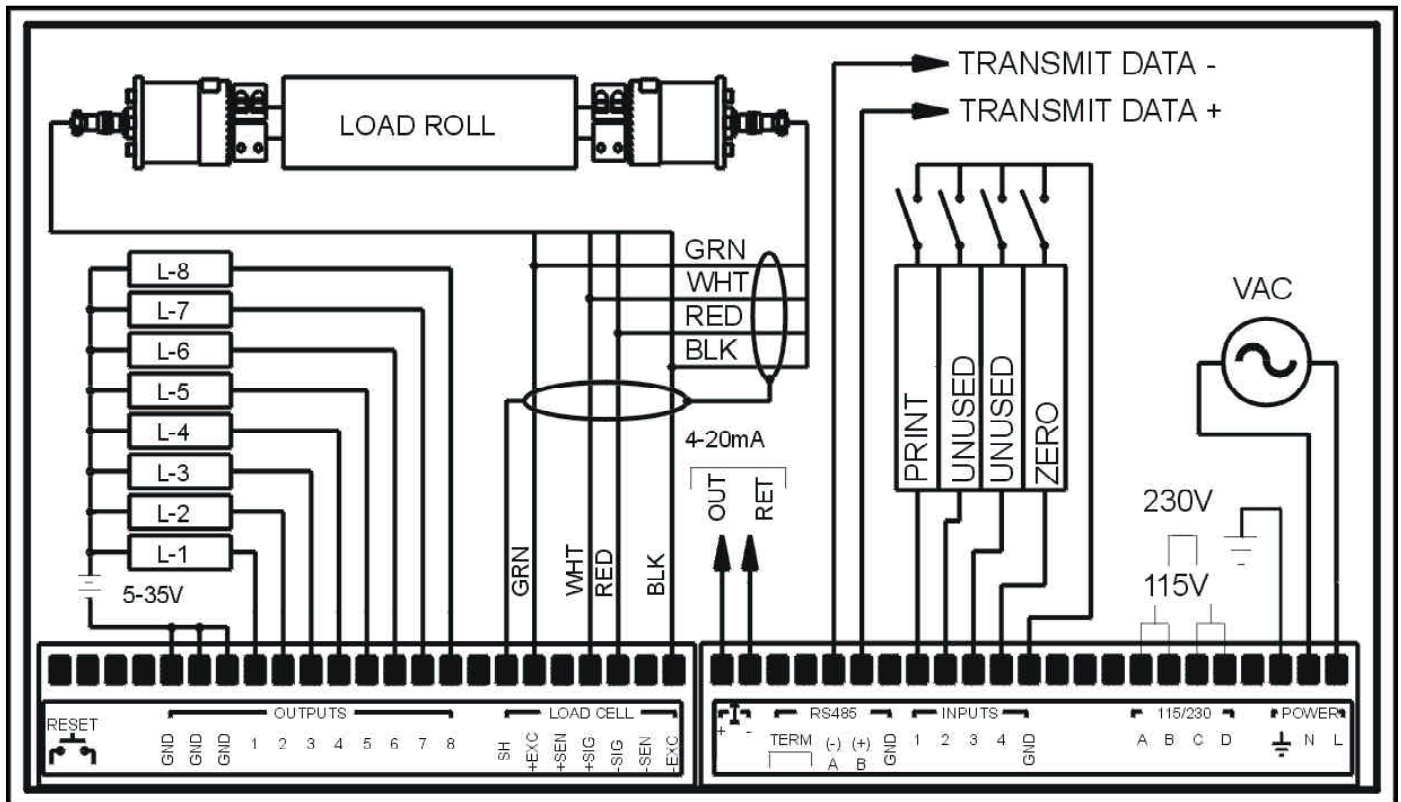


Figure - 1. PS-2010T Wiring Diagram

(3) Setpoint Function Changes

Main, Dribble, Track, and Inflight setpoint functions and designations have been removed from PS-2010T software. Substitute the flow menu in Figure 2 for the menu shown on Page 5-3.

(4) Remote Input Operation

Remote input functions 2 (GROSS/NET) and 3 (TARE) have been removed from this software. Figure 3 presents the new remote input configuration. This Figure should be substituted for Figure 8-1 on Page 8-1. Remaining inputs ZERO and PRINT remain functional as designated.

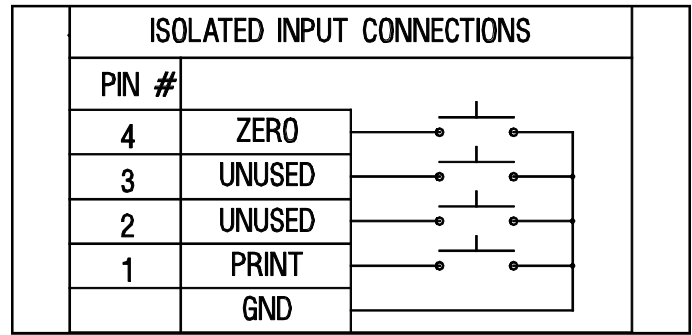
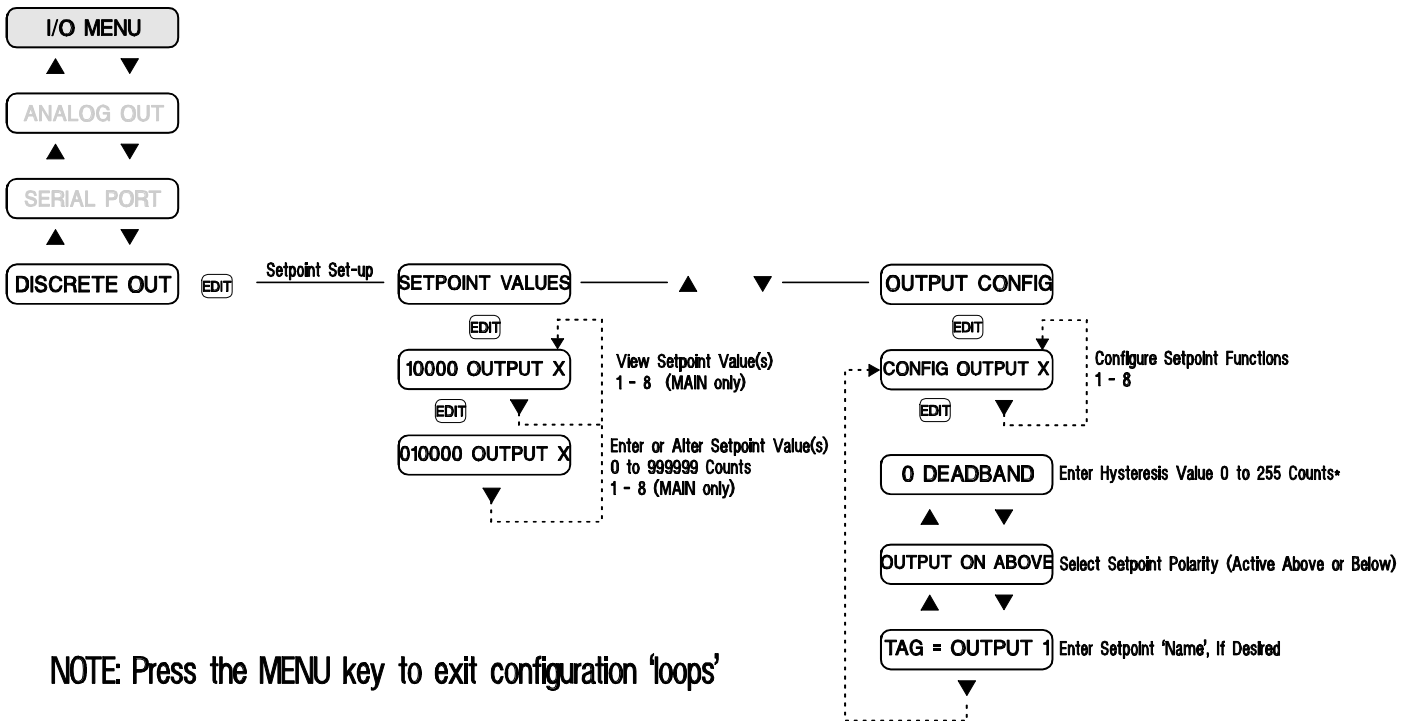


Figure 3. Remote Input Designations

Analog, Serial, and Setpoint Output Flow Diagram (page 2)



NOTE: Press the MENU key to exit configuration 'loops'

Figure 2. PS-2010T Setpoint Configuration



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