2200 SERIES

1/8 DIN ANALOG PANEL METER

- *UNIVERSAL PROCESS, VOLTAGE, CURRENT, RESISTANCE AND TEMPERATURE INPUTS*
- *UNIVERSAL AC/DC POWER SUPPLY*
- *6 / 9 DIGIT DUAL LINE/TRI-COLOR DISPLAY WITH 0.71" & 0.35" DIGITS*
- *PROGRAMMABLE UNITS DISPLAY*
- *VARIABLE CONTRAST AND INTENSITY DISPLAY*
- *UP TO 160 SAMPLES PER SECOND CONVERSION RATE*
- *BUILT-IN USB PROGRAMMING PORT ENABLING UNIT CONFIGURATION WITH CRIMSON PROGRAMMING SOFTWARE*
- *NEMA 4X/IP65 SEALED FRONT BEZEL*

DESCRIPTION

The 2200 Analog Panel Meter offers many features and performance capabilities to suit a wide range of industrial applications. The 2200 has a universal input to handle various input signals including DC Voltage/Current, Process, Resistance and Temperature. The optional plug-in output cards allow the opportunity to configure the meter for present applications, while providing easy upgrades for future needs. The 2200 employs a dual line, tri-color display with a large 0.71", tri-color 6 digit top display line and a 0.35", 9 digit green bottom display line.

The meter provides a MAX and MIN reading memory with programmable capture time. The capture time is used to prevent detection of false max or min readings which may occur during start-up or unusual process events.

The signal totalizer (integrator) can be used to compute a time-input product. This can be used to provide a readout of totalized flow or calculate service intervals of motors, pumps, etc. The meter has up to four setpoint outputs, implemented on plug-in option cards. The plug-in cards provide dual FORM-C relays, quad FORM-A, or either quad sinking or quad sourcing open collector logic outputs. The setpoint alarms can be configured to suit a variety of control and alarm requirements.

Communication and bus capabilities are also available as option cards. These include RS232, RS485, DeviceNet, and Profibus-DP. The 2200 can be programmed to utilize ModBus protocol. With ModBus, the user has access to most configuration parameters. Readout values and setpoint alarm values can be controlled through the bus. Additionally, the meter has a feature that allows a remote computer to directly control the outputs of the meter.

A linear DC output signal is available as an optional plug-in card. The card provides either 20 mA or 10 V signals. The output can be scaled independent of the input range and can track either the input, totalizer, max or min readings.

The meter has been specifically designed for harsh industrial environments. With NEMA 4X/IP65 sealed bezel and extensive testing of noise effects and CE requirements, the meter provides a tough reliable application solution.

SAFETY SUMMARY

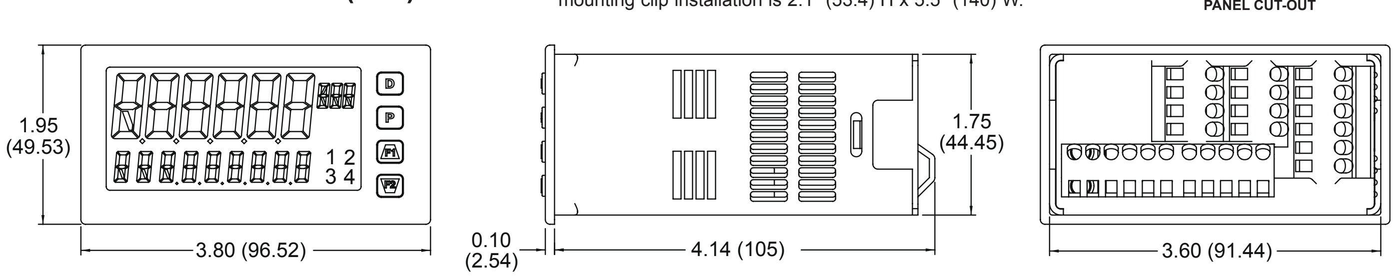
All safety related regulations, local codes and instructions that appear in this literature or on equipment must be observed to ensure personal safety and to prevent damage to either the instrument or equipment connected to it. If equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired. Do not use this unit to directly command motors, valves, or other actuators not equipped with safeguards. To do so can be potentially harmful to persons or equipment in the event of a fault to the unit.

CAUTION: Risk of Danger. Read complete instructions prior to installation and operation of the unit.

CAUTION: Risk of electric shock.

DIMENSIONS In inches (mm)

Note: Recommended minimum clearance (behind the panel) for mounting clip installation is 2.1" (53.4) H x 5.5" (140) W.



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Option Card and Accessories

DESCRIPTION
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Quad Setpoint Relay Output Card
Quad Setpoint Sinking Open Collector Output Card
Quad Setpoint Sourcing Open Collector Output Card
RS485 Serial Communications Card with Terminal Block
Extended RS485 Serial Communications Card with Dual RJ11 Connector
RS232 Serial Communications Card with Terminal Block
Extended RS232 Serial Communications Card with 9 Pin D Connector
DeviceNet Communications Card
Profibus-DP Communications Card
Analog Output Card
Crimson PC Configuration Software for Windows 2000 and XP
USB Programming Cable Type A-Mini B

Notes:
1. For Modbus communications use RS485 Communications Output Card and configure communication (tYPE) parameter for Modbus.

General Meter Specifications

1. **DISPLAY**: Negative image LCD
   Top Line - 6 digit, 0.71" (18 mm), with tri-color backlight (red, green or orange), display range: -199999 to 999999;
   Bottom Line - 9 digit, 0.35" (8.9 mm), with green backlight, display range: - 199,999,999 to 999,999,999
2. **POWER**:
   AC Power: 40 to 250 VAC, 50/60 Hz, 20 VA
   DC Power: 21.6 to 250 VDC, 8 W
   Isolation: 2300 Vrms for 1 min. to all inputs and outputs.
3. **ANNUNCIATORS**: Backlight color: Red
   1 - setpoint alarm 1
   2 - setpoint alarm 2
   3 - setpoint alarm 3
   4 - setpoint alarm 4
   Line 1 Units Display – programmable 3 digit units annunciator with tri-color backlight (red, green or orange)
4. **KEYPAD**: 2 programmable function keys, 4 keys total
5. **A/D CONVERTER**: 24 bit resolution
6. **UPDATE RATES**:
   A/D conversion rate: programmable 5 to 160 readings/sec.
   Step response:

Input Type	Input Update Rate						Readings/ Sec
	5	10	20	40	80	160	
V/I/Resistance	400	200	100	50	30	20	msec response time *
Thermocouple	600	250	100	-	-	-	
RTD	1000	500	250	-	-	-	

   * - max. to within 99% of final readout value (digital filter disabled)
   Display update rate: 1 to 20 updates/sec.
   Setpoint output on/off delay time: 0 to 3275 sec.
   Analog output update rate: 0 to 10 sec
   Max./Min. capture delay time: 0 to 3275 sec.
7. **DISPLAY MESSAGES**:
   "OLOL" - Appears when measurement exceeds + signal range.
   "ULUL" - Appears when measurement exceeds - signal range
   "Short" - Appears when shorted sensor is detected. (RTD range only)
   "OPEN" - Appears when open sensor is detected. (TC/RTD range only)
   ". . . . ." - Appears when display values exceed + display range.
   "- . . . . ." - Appears when display values exceed - display range.
8. **INPUT CAPABILITIES**:

Current Input:

INPUT RANGE	ACCURACY * (18 to 28°C)	ACCURACY * (0 to 50°C)	IMPEDANCE	‡ RESOLUTION
± 250 µADC	0.03% of rdg + 0.03µA	0.12% of rdg + 0.04µA	1.11 KΩ	10nA
± 2.5 mADC	0.03% of rdg + 0.3µA	0.12% of rdg + 0.4µA	111 Ω	0.1µA
± 25 mADC	0.03% of rdg + 3µA	0.12% of rdg + 4µA	11.1 Ω	1µA
± 250 mADC	0.05% of rdg + 30µA	0.12% of rdg + 40µA	1.1 Ω	10µA
± 2 ADC	0.5% of rdg + 0.3mA	0.7% of rdg + 0.4mA	0.1 Ω	0.1mA

‡ Higher resolution can be achieved via input scaling.

Voltage Input:

INPUT RANGE	ACCURACY * (18 to 28°C)	ACCURACY * (0 to 50°C)	IMPEDANCE	‡ RESOLUTION
± 250 mVDC	0.03% of rdg + 30µV	0.12% of rdg + 40µV	451 KΩ	10µV
± 2.0 VDC	0.03% of rdg + 0.3mV	0.12% of rdg + 0.4mV	451 KΩ	0.1mV
± 10 VDC	0.03% of rdg + 3mV	0.12% of rdg + 4mV	451 KΩ	1mV
± 25 VDC	0.03% of rdg + 3mV	0.12% of rdg + 4mV	451 KΩ	1mV
± 100 VDC	0.3% of rdg + 30mV	0.12% of rdg + 40mV	451 KΩ	10mV
± 200 VDC	0.3% of rdg + 30mV	0.12% of rdg + 40mV	451 KΩ	10mV

‡ Higher resolution can be achieved via input scaling.

Temperature Inputs:
READOUT:
Scale: F or C
Offset Range: -199,999 to 999,999 display units.

Thermocouple Inputs:
Input Impedance: 20MΩ
Lead Resisitance Effect: 0.03 µV/Ω
Max Continuous Overvoltage: 30 V

INPUT TYPE	RANGE	ACCURACY* (18 to 28 °C)	ACCURACY* (0 to 50 °C)	STANDARD	WIRE COLOR	
					ANSI	BS 1843
T	-200 to 400°C	1.2°C	2.1°C	ITS-90	(+) blue (-) red	(+) white (-) blue
E	-200 to 750°C	1.0°C	2.4°C	ITS-90	(+) purple (-) red	(+) brown (-) blue
J	-200 to 760°C	1.1°C	2.3°C	ITS-90	(+) white (-) red	(+) yellow (-) blue
K	-200 to 1250°C	1.3°C	3.4°C	ITS-90	(+) yellow (-) red	(+) brown (-) blue
R	0 to 1768°C	1.9°C	4.0°C	ITS-90	no standard	(+) white (-) blue
S	0 to 1768°C	1.9°C	4.0°C	ITS-90	no standard	(+) white (-) blue
B	150 to 300°C 300 to 1820°C	3.9°C 2.8°C	5.7°C 4.4°C	ITS-90	no standard	no standard
N	-200 to 1300°C	1.3°C	3.1°C	ITS-90	(+) orange (-) red	(+) orange (-) blue
C (W5/W26)	0 to 2315°C	1.9°C	6.1°C	ASTM E988-90**	no standard	no standard

RTD Inputs:
Type: 3 or 4 wire, 2 wire can be compensated for lead wire resistance
Excitation current: 100 ohm range: 136.5 µA ±10%
10 ohm range: 2.05 mA ±10%
Lead resistance: 100 ohm range: 10 ohm/lead max.
10 ohm range: 3 ohms/lead max.
Max. continuous overload: 30 V

INPUT TYPE	RANGE	ACCURACY* (18 to 28 °C)	ACCURACY* (0 to 50 °C)	STANDARD **
100 ohm Pt alpha = .00385	-200 to 850°C	0.4°C	1.6°C	IEC 751
100 ohm Pt alpha = .00392	-200 to 850°C	0.4°C	1.6°C	no official standard
120 ohm Nickel alpha = .00672	-80 to 259°C	0.2°C	0.5°C	no official standard
10 ohm Copper alpha = .00427	-110 to 260°C	0.4°C	0.9°C	no official standard

Resistance Inputs:

INPUT RANGE	ACCURACY * (18 to 28°C)	ACCURACY * (0 to 50°C)	COMPLIANCE	MAX CONT. OVERLOAD	‡ RESOLUTION
100 ohm	0.05% of rdg +0.03 ohm	0.2% of rdg +0.04 ohm	0.175 V	30 V	0.01 ohm
1000 ohm	0.05% of rdg +0.3 ohm	0.2% of rdg +0.4 ohm	1.75 V	30 V	0.1 ohm
10 Kohm	0.05% of rdg +1 ohm	0.2% of rdg +1.5 ohm	17.5 V	30 V	0.1 ohm

‡ Higher resolution can be achieved via input scaling.

* After 20 min. warm-up, @ 5 sample per second input rate. Accuracy is specified in two ways: Accuracy over an 18 to 28ºC and 15 to 75% RH environment; and Accuracy over a 0 to 50ºC and 0 to 85% RH (non condensing) environment. The specification includes the A/D conversion errors, linearization conformity, and thermocouple ice point compensation. Total system accuracy is the sum of meter and probe errors. Accuracy may be improved by field calibrating the meter readout at the temperature of interest.

** These curves have been corrected to ITS-90.

9. **EXCITATION POWER**: Jumper selectable
   Transmitter Power: +18 VDC, ± 5% @ 50 mA max.
   Reference Voltage: + 2 VDC, ± 2%
      Compliance: 1KΩ load min (2 mA max)
      Temperature Coefficient: 40 ppm/ºC max.
   Reference Current: 1.05 mADC, ± 2%
      Compliance: 10 KΩ load max.
      Temperature Coefficient: 40 ppm/ºC max.
10. **USER INPUTS**: Two programmable user inputs
   Max. Continuous Input: 30 VDC
   Isolation To Sensor Input Common: Not isolated.
   Response Time: 12 msec. max.
   Logic State: User programmable (USrACt) for sink/source (Lo/Hi)

INPUT STATE (USrACt)	LO/SINK	HI/SOURCE
	20KΩ pull-up to +3.3V	20KΩ pull-down
Active	V_{IN} < 1.1 VDC	V_{IN} > 2.2 VDC
Inactive	V_{IN} > 2.2 VDC	V_{IN} < 1.1 VDC

11. **TOTALIZER**:
   Time Base: second, minute, hour, or day
   Batch: Can accumulate (gate) input display from a user input
   Time Accuracy: 0.01% typical
   Decimal Point: 0 to 0.0000
   Scale Factor: 0.001 to 65.000
   Low Signal Cut-out: -199,999 to 999,999
   Total: 6 digits on Line 1; 9 digits on Line 2
12. **CUSTOM LINEARIZATION**:
   Data Point Pairs: Selectable from 2 to 16
   Display Range: -199,999 to 999,999
   Decimal Point: 0 to 0.0000
13. **MEMORY**: Nonvolatile FRAM memory retains all programmable parameters and display values.
14. **ENVIRONMENTAL CONDITIONS**:
   Operating Temperature Range: 0 to 50 °C
   Storage Temperature Range: -40 to 60 °C
   Vibration to IEC 68-2-6: Operational 5-150 Hz, 2 g
   Shock to IEC 68-2-27: Operational 25 g (10 g relay)
   Operating and Storage Humidity: 0 to 85% max. RH non-condensing
   Altitude: Up to 2000 meters
15. **CERTIFICATIONS AND COMPLIANCES**:
   CE Approved
      EN 61326-1 Immunity to Industrial Locations
      Emission CISPR 11 Class A
      IEC/EN 61010-1
      RoHS Compliant
   Type 4X Indoor Enclosure rating (Face only)
   IP65 Enclosure rating (Face only)
   IP20 Enclosure rating (Rear of unit)
   Refer to EMC Installation Guidelines section of the bulletin for additional information.
16. **CONNECTIONS**: High compression cage-clamp terminal block
   Wire Strip Length: 0.3" (7.5 mm)
   Wire Gauge Capacity: One 14 AWG (2.55 mm) solid, two 18 AWG (1.02 mm) or four 20 AWG (0.61 mm)
17. **CONSTRUCTION**: This unit is rated NEMA 4X/IP65 for indoor use only. IP20 Touch safe. Installation Category II, Pollution Degree 2. One piece bezel/ case. Flame resistant. Synthetic rubber keypad. Panel gasket and mounting clip included.
18. **WEIGHT**: 8 oz. (226.8 g)

OPTIONAL PLUG-IN OUTPUT CARDS

WARNING: Disconnect all power to the unit before installing plug-in cards.

Adding Option Cards

The 2200 meters can be fitted with up to three optional plug-in cards. The details for each plug-in card can be reviewed in the specification section below. Only one card from each function type can be installed at a time. The function types include Setpoint Alarms, Communication, and Analog Output.
The plug-in cards can be installed initially or at a later date.

COMMUNICATION CARDS

A variety of communication protocols are available for the 2200 meter. Only one card can be installed at a time. *Note: For Modbus communications use RS485 Communications Output Card and configure communication (tYPE) parameter for Modbus.*

RS485 Serial (Terminal)	DeviceNet
RS485 Serial (Connector)	Profibus-DP
RS232 Serial (Terminal)	
RS232 Serial (Connector)	

SERIAL COMMUNICATIONS CARD

Type: RS485 or RS232
Communication Type: RLC Protocol (ASCII), Modbus RTU, and Modbus ASCII
Isolation To Sensor & User Input Commons: 500 Vrms for 1 min.
Working Voltage: 50 V. Not Isolated from all other commons.
Data: 7/8 bits
Baud: 1200 to 38,400
Parity: no, odd or even
Bus Address: Selectable 0 to 99 (RLC Protocol), or 1 to 247 (Modbus Protocol), Max. 32 meters per line (RS485)
Transmit Delay: Selectable for 0 to 0.250 sec (+2 msec min)

DEVICENET™ CARD

Compatibility: Group 2 Server Only, not UCMM capable
Baud Rates: 125 Kbaud, 250 Kbaud, and 500 Kbaud
Bus Interface: Phillips 82C250 or equivalent with MIS wiring protection per DeviceNet™ Volume I Section 10.2.2.
Node Isolation: Bus powered, isolated node
Host Isolation: 500 Vrms for 1 minute (50 V working) between DeviceNet™ and meter input common.

PROFIBUS-DP CARD

Fieldbus Type: Profibus-DP as per EN 50170, implemented with Siemens SPC3 ASIC
Conformance: PNO Certified Profibus-DP Slave Device
Baud Rates: Automatic baud rate detection in the range 9.6 Kbaud to 12 Mbaud
Station Address: 0 to 125, set by rotary switches.
Connection: 9-pin Female D-Sub connector
Network Isolation: 500 Vrms for 1 minute (50 V working) between Profibus network and sensor and user input commons. Not isolated from all other commons.

SETPOINT CARDS

The 2200 meter has 4 available setpoint alarm output plug-in cards. Only one card can be installed at a time. (Logic state of the outputs can be reversed in the programming.) These plug-in cards include:

Dual Relay, FORM-C, Normally open & closed
Quad Relay, FORM-A, Normally open only
Isolated quad sinking NPN open collector
Isolated quad sourcing PNP open collector

DUAL RELAY CARD

Type: Two FORM-C relays
Isolation To Sensor & User Input Commons: 2000 Vrms for 1 min.
Working Voltage: 240 Vrms
Contact Rating:
One Relay Energized: 5 amps @ 120/240 VAC or 28 VDC (resistive load).
Total current with both relays energized not to exceed 5 amps
Life Expectancy: 100 K cycles min. at full load rating. External RC snubber extends relay life for operation with inductive loads

QUAD RELAY CARD

Type: Four FORM-A relays
Isolation To Sensor & User Input Commons: 2300 Vrms for 1 min.
Working Voltage: 250 Vrms
Contact Rating:
One Relay Energized: 3 amps @ 240 VAC or 30 VDC (resistive load).
Total current with all four relays energized not to exceed 4 amps
Life Expectancy: 100K cycles min. at full load rating. External RC snubber extends relay life for operation with inductive loads

QUAD SINKING OPEN COLLECTOR CARD

Type: Four isolated sinking NPN transistors.
Isolation To Sensor & User Input Commons: 500 Vrms for 1 min.
Working Voltage: 50 V. Not Isolated from all other commons.
Rating: 100 mA max @ V_{SAT} = 0.7 V max. V_{MAX} = 30 V

QUAD SOURCING OPEN COLLECTOR CARD

Type: Four isolated sourcing PNP transistors.
Isolation To Sensor & User Input Commons: 500 Vrms for 1 min.
Working Voltage: 50 V. Not Isolated from all other commons.
Rating: Internal supply: 18 VDC unregulated, 30 mA max. total
External supply: 30 VDC max., 100 mA max. each output

ALL FOUR SETPOINT CARDS

Response Time: See Update Rates step response specification on page 3; add 6 msec (typical) for relay card

LINEAR DC OUTPUT

Either a 0(4)-20 mA or 0-10 V retransmitted linear DC output is available from the analog output plug-in card. The programmable output low and high scaling can be based on various display values. Reverse slope output is possible by reversing the scaling point positions.

Retransmitted Analog Output Card

ANALOG OUTPUT CARD

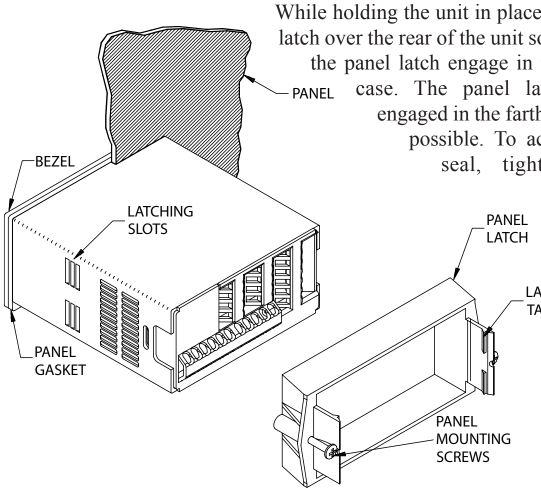
Types: 0 to 20 mA, 4 to 20 mA or 0 to 10 VDC
Isolation To Sensor & User Input Commons: 500 Vrms for 1 min.
Working Voltage: 50 V. Not Isolated from all other commons.
Accuracy: 0.17% of FS (18 to 28 °C); 0.4% of FS (0 to 50 °C)
Resolution: 1/3500
Compliance: 10 VDC: 10 KΩ load min., 20 mA: 500 Ω load max.
Powered: Self-powered
Step Response: See Update Rates step response specification on page 3.
Update time: See ADC Conversion Rate and Update Time parameter

1.0 Installing the Meter

Installation

The 2200 meets NEMA 4X/IP65 requirements when properly installed. The unit is intended to be mounted into an enclosed panel. Prepare the panel cutout to the dimensions shown. Remove the panel latch from the unit. Slide the panel gasket over the rear of the unit to the back of the bezel. The unit should be installed fully assembled. Insert the unit into the panel cutout.

While holding the unit in place, push the panel latch over the rear of the unit so that the tabs of the panel latch engage in the slots on the case. The panel latch should be engaged in the farthest forward slot possible. To achieve a proper seal, tighten the latch screws evenly until the unit is snug in the panel (Torque to approximately 7 in-lbs [79N-cm]). Do not over-tighten the screws.



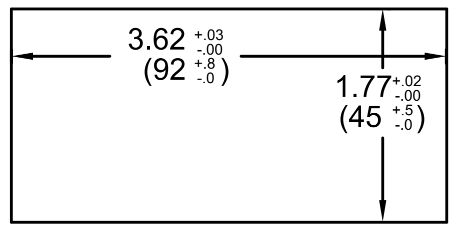
Installation Environment

The unit should be installed in a location that does not exceed the operating temperature and provides good air circulation. Placing the unit near devices that generate excessive heat should be avoided.

The bezel should only be cleaned with a soft cloth and neutral soap product. Do NOT use solvents. Continuous exposure to direct sunlight may accelerate the aging process of the bezel.

Do not use tools of any kind (screwdrivers, pens, pencils, etc.) to operate the keypad of the unit.

PANEL CUT-OUT

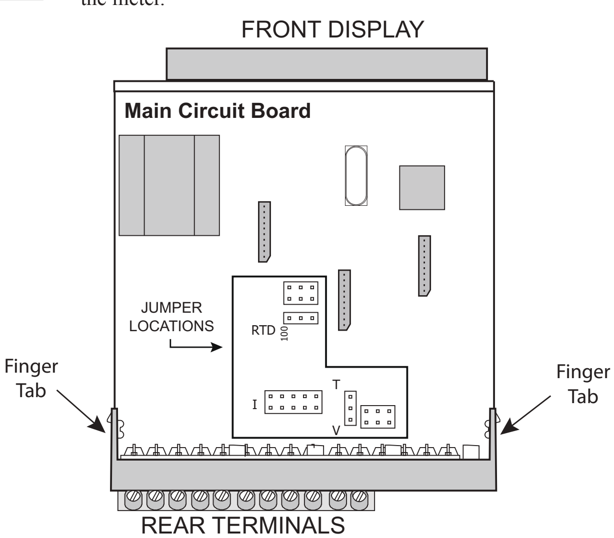


2.0 Setting the Jumpers

The 2200 meter has four jumpers that must be checked and/or changed prior to applying power. The following Jumper Selection Figures show an enlargement of the jumper area.

To access the jumpers, remove the meter base from the case by firmly squeezing and pulling back on the side rear finger tabs. This should lower the latch below the case slot (which is located just in front of the finger tabs). It is recommended to release the latch on one side, then start the other side latch.

Warning: Exposed line voltage exists on the circuit boards. Remove all power to the meter and load circuits before accessing inside of the meter.



INPUT RANGE JUMPERS

Voltage Input

Two jumpers are used in configuring the meter for voltage/resistance. The first jumper, T/V, must be in the V (voltage) position. The second jumper is used to select the proper voltage input range. (This jumper is also used to select the current input range.) Select a range that is high enough to accommodate the maximum signal input to avoid overloads. For proper operation, the input range selected in programming must match the jumper setting.

Current Input

For current input, only one jumper must be configured to select the current range. This jumper is shared with the voltage input range. To avoid overloads, select the jumper position that is high enough to accommodate the maximum signal input level to be applied.

Note: The position of the T/V jumper does not matter when the meter is in the current input mode.

Temperature Input

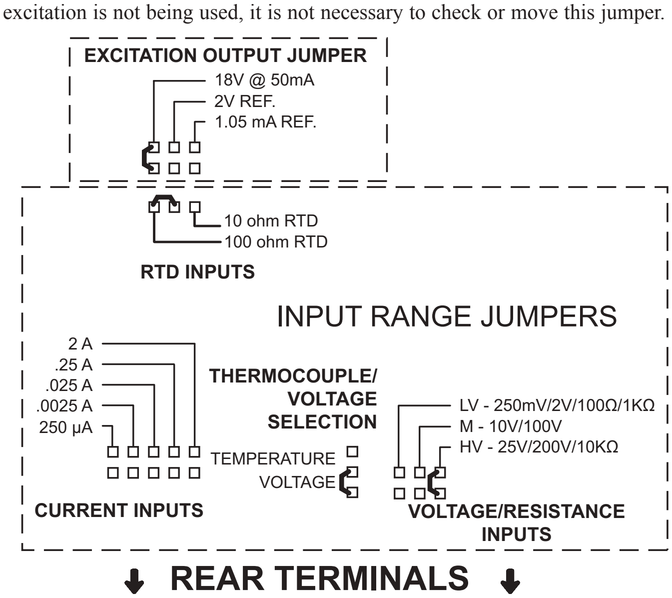
For temperature measurement the T/V jumper must be in the T (temperature) position. For RTD sensors the RTD jumper must also be set.

Resistance Input

Three jumpers are used to configure the resistance input. The T/V jumper must be in the V (voltage) position, and the excitation jumper must be in the 1.05 mA REF position. The voltage/resistance jumper position is determined by the input range.

Excitation Output Jumper

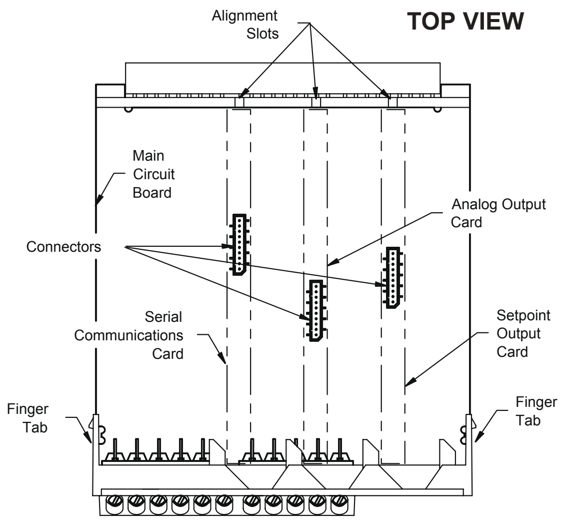
This jumper is used to select the excitation range for the application. If excitation is not being used, it is not necessary to check or move this jumper.



3.0 Installing Plug-In Cards

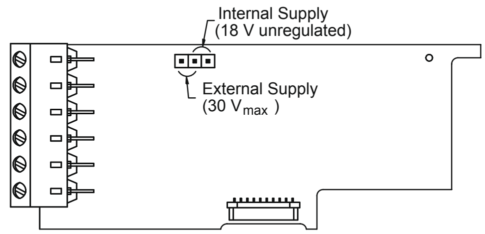
The plug-in cards are separately purchased optional cards that perform specific functions. These cards plug into the main circuit board of the meter. The plug-in cards have many unique functions when used with the 2200.

CAUTION: The plug-in card and main circuit board contain static sensitive components. Before handling the cards, discharge static charges from your body by touching a grounded bare metal object. Ideally, handle the cards at a static controlled clean workstation. Also, only handle the cards by the edges. Dirt, oil or other contaminants that may contact the cards can adversely affect circuit operation.



To Install:

1. With the meter removed from the case, locate the plug-in card connector for the card type to be installed. The types are keyed by position with different main circuit board connector locations. When installing the card, hold the meter by the rear terminals and not by the front display board.
   If installing the Quad sourcing Plug-in Card, set the jumper for internal or external supply operation before continuing.



2. Install the plug-in card by aligning the card terminals with the slot bay in the rear cover. Be sure the connector is fully engaged and the tab on the plug-in card rests in the alignment slot on the display board.
3. Slide the meter base back into the case. Be sure the rear cover latches fully into the case.
4. Apply the plug-in card label to the bottom side of the meter in the designated area. Do Not Cover the vents on the top surface of the meter. The surface of the case must be clean for the label to adhere properly.

4.0 Wiring the Meter

WIRING OVERVIEW

Electrical connections are made via screw-clamp terminals located on the back of the meter. All conductors should conform to the meter's voltage and current ratings. All cabling should conform to appropriate standards of good installation, local codes and regulations. It is recommended that the power supplied to the meter (DC or AC) be protected by a fuse or circuit breaker.

When wiring the meter, compare the numbers embossed on the back of the meter case against those shown in wiring drawings for proper wire position. Strip the wire, leaving approximately 0.3" (7.5 mm) bare lead exposed (stranded wires should be tinned with solder). Insert the lead under the correct screw-clamp terminal and tighten until the wire is secure (Pull wire to verify tightness). Each terminal can accept up to one #14 AWG (2.55 mm) wire, two #18 AWG (1.02 mm), or four #20 AWG (0.61 mm).

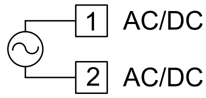
EMC INSTALLATION GUIDELINES

Although NOSHOK, Inc. Products are designed with a high degree of immunity to Electromagnetic Interference (EMI), proper installation and wiring methods must be followed to ensure compatibility in each application. The type of the electrical noise, source or coupling method into a unit may be different for various installations. Cable length, routing, and shield termination are very important and can mean the difference between a successful or troublesome installation. Listed are some EMI guidelines for a successful installation in an industrial environment.

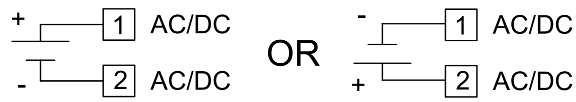
1. A unit should be mounted in a metal enclosure, which is properly connected to protective earth.
2. Use shielded cables for all Signal and Control inputs. The shield connection should be made as short as possible. The connection point for the shield depends somewhat upon the application. Listed below are the recommended methods of connecting the shield, in order of their effectiveness.
   a. Connect the shield to earth ground (protective earth) at one end where the unit is mounted.
   b. Connect the shield to earth ground at both ends of the cable, usually when the noise source frequency is over 1 MHz.
3. Never run Signal or Control cables in the same conduit or raceway with AC power lines, conductors, feeding motors, solenoids, SCR controls, and heaters, etc. The cables should be run through metal conduit that is properly grounded. This is especially useful in applications where cable runs are long and portable two-way radios are used in close proximity or if the installation is near a commercial radio transmitter. Also, Signal or Control cables within an enclosure should be routed as far away as possible from contactors, control relays, transformers, and other noisy components.
4. Long cable runs are more susceptible to EMI pickup than short cable runs.
5. In extremely high EMI environments, the use of external EMI suppression devices such as Ferrite Suppression Cores for signal and control cables is effective. The following EMI suppression devices (or equivalent) are recommended:
   Fair-Rite part number 0443167251
   Line Filters for input power cables:
      Schaffner # FN2010-1/07
6. To protect relay contacts that control inductive loads and to minimize radiated and conducted noise (EMI), some type of contact protection network is normally installed across the load, the contacts or both. The most effective location is across the load.
   a. Using a snubber, which is a resistor-capacitor (RC) network or metal oxide varistor (MOV) across an AC inductive load is very effective at reducing EMI and increasing relay contact life.
   b. If a DC inductive load (such as a DC relay coil) is controlled by a transistor switch, care must be taken not to exceed the breakdown voltage of the transistor when the load is switched. One of the most effective ways is to place a diode across the inductive load. Most NOSHOK products w solid state outputs have internal zener diode protection. However external diode protection at the load is always a good design practice to limit EMI. Although the use of a snubber or varistor could be used.
7. Care should be taken when connecting input and output devices to the instrument. When a separate input and output common is provided, they should not be mixed. Therefore a sensor common should NOT be connected to an output common. This would cause EMI on the sensitive input common, which could affect the instrument's operation.

4.1 POWER WIRING

AC Power



DC Power

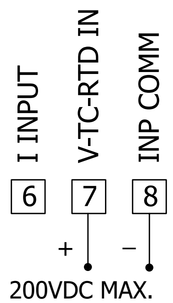


The power supplied to the meter shall employ a 15 Amp UL approved circuit breaker for AC input and a 1 Amp, 250 V UL approved fuse for DC input. It shall be easily accessible and marked as a disconnecting device to the installed unit. This device is not directly intended for connection to the mains without a reliable means to reduce transient over-voltages to 1500 V.

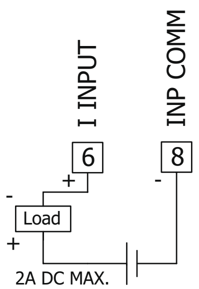
4.2 VOLTAGE/RESISTANCE/CURRENT INPUT SIGNAL WIRING

IMPORTANT: Before connecting signal wires, the Input Range Jumpers and Excitation Jumper should be verified for proper position.

Voltage Signal

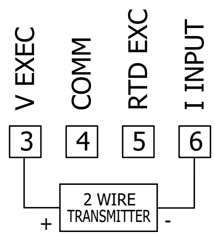


Process/Current Signal (external powered)



Process/Current Signal (2 wire requiring 18V excitation)

Excitation Jumper: 18 V

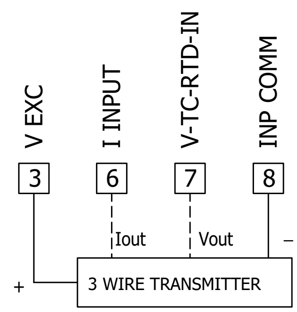


Current Signal (3 wire requiring 18 V excitation)

Terminal 3: +Volt supply
Terminal 6: +ADC (signal)
Terminal 8: -ADC (common)
Excitation Jumper: 18 V

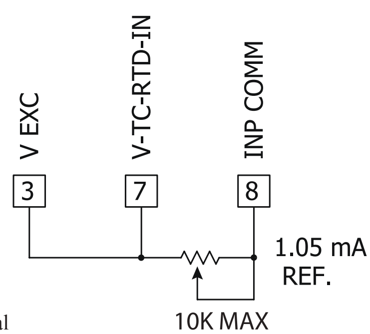
Voltage Signal (3 wire requiring 18 V excitation)

Terminal 3: +Volt supply
Terminal 7: +VDC (signal)
Terminal 8: -VDC (common)
Excitation Jumper: 18 V



Resistance Signal (2 wire requiring excitation)

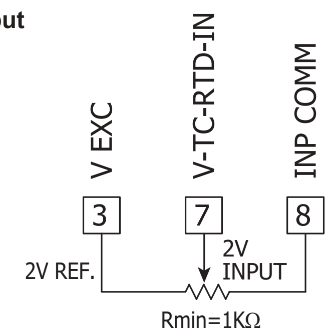
Terminal 3: Jumper to terminal 7
Terminal 7: Resistance
Terminal 8: Resistance
Excitation Jumper: 1.05 mA REF.
T/V Jumper: V position
Voltage/Resistance Input Jumper: Set per input signal



Potentiometer Signal as Voltage Input (3 wire requiring excitation)

Terminal 3: High end of pot.
Terminal 7: Wiper
Terminal 8: Low end of pot.
Excitation Jumper: 2 V REF.
T/V Jumper: V
Voltage/Resistance Input Jumper: 2 Volt
Module 1 Input Range: 2 Volt

Note: The Apply signal scaling style should be used because the signal will be in volts.

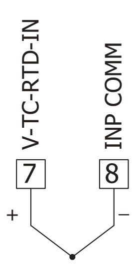


***CAUTION:** Sensor input common is NOT isolated from user input common. In order to preserve the safety of the meter application, the sensor input common must be suitably isolated from hazardous live earth referenced voltages; or input common must be at protective earth ground potential. If not, hazardous live voltage may be present at the User Inputs and User Input Common terminals. Appropriate considerations must then be given to the potential of the user input common with respect to earth common; and the common of the isolated plug-in cards with respect to input common.*

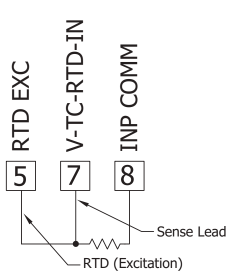
4.3 TEMPERATURE INPUT SIGNAL WIRING

IMPORTANT: Before connecting signal wires, verify the T/V Jumper is in the T position.

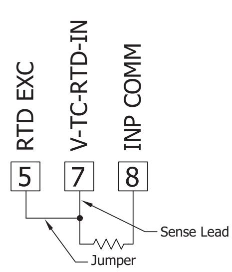
Thermocouple



3-Wire RTD



2-Wire RTD



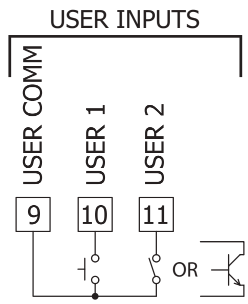
***CAUTION**: Sensor input common is NOT isolated from user input common. In order to preserve the safety of the meter application, the sensor input common must be suitably isolated from hazardous live earth referenced voltages; or input common must be at protective earth ground potential. If not, hazardous live voltage may be present at the User Inputs and User Input Common terminals. Appropriate considerations must then be given to the potential of the user input common with respect to earth common; and the common of the isolated plug-in cards with respect to input common.*

4.4 USER INPUT WIRING

If not using User Inputs, then skip this section. Only the appropriate User Input terminal has to be wired.

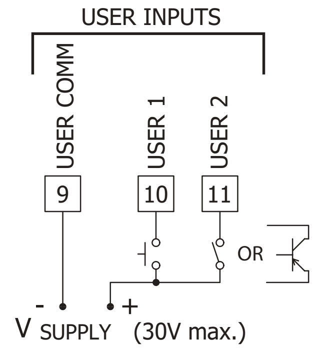
Sinking Logic (USrACt Lo)

When the USrACt parameter is programmed to Lo, the user inputs of the meter are internally pulled up to +3.3 V with 20 KΩ resistance. The input is active when it is pulled low (<1.1 V).



Sourcing Logic (USrACt HI)

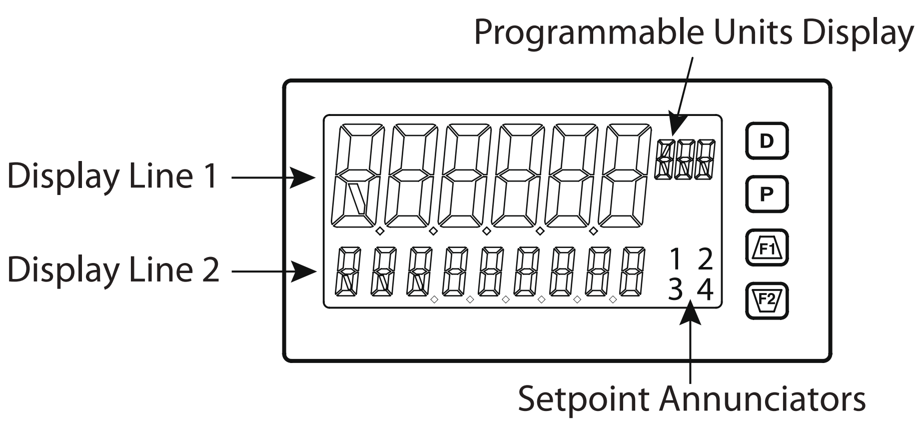
When the USrACt parameter is programmed to HI, the user inputs of the meter are internally pulled down to 0 V with 20 KΩ resistance. The input is active when a voltage greater than 2.2 VDC is applied.



4.5 SETPOINT (ALARMS) WIRING
4.6 SERIAL COMMUNICATION WIRING
4.7 ANALOG OUTPUT WIRING

See appropriate plug-in card bulletin for wiring details.

5.0 Reviewing the Front Buttons and Display

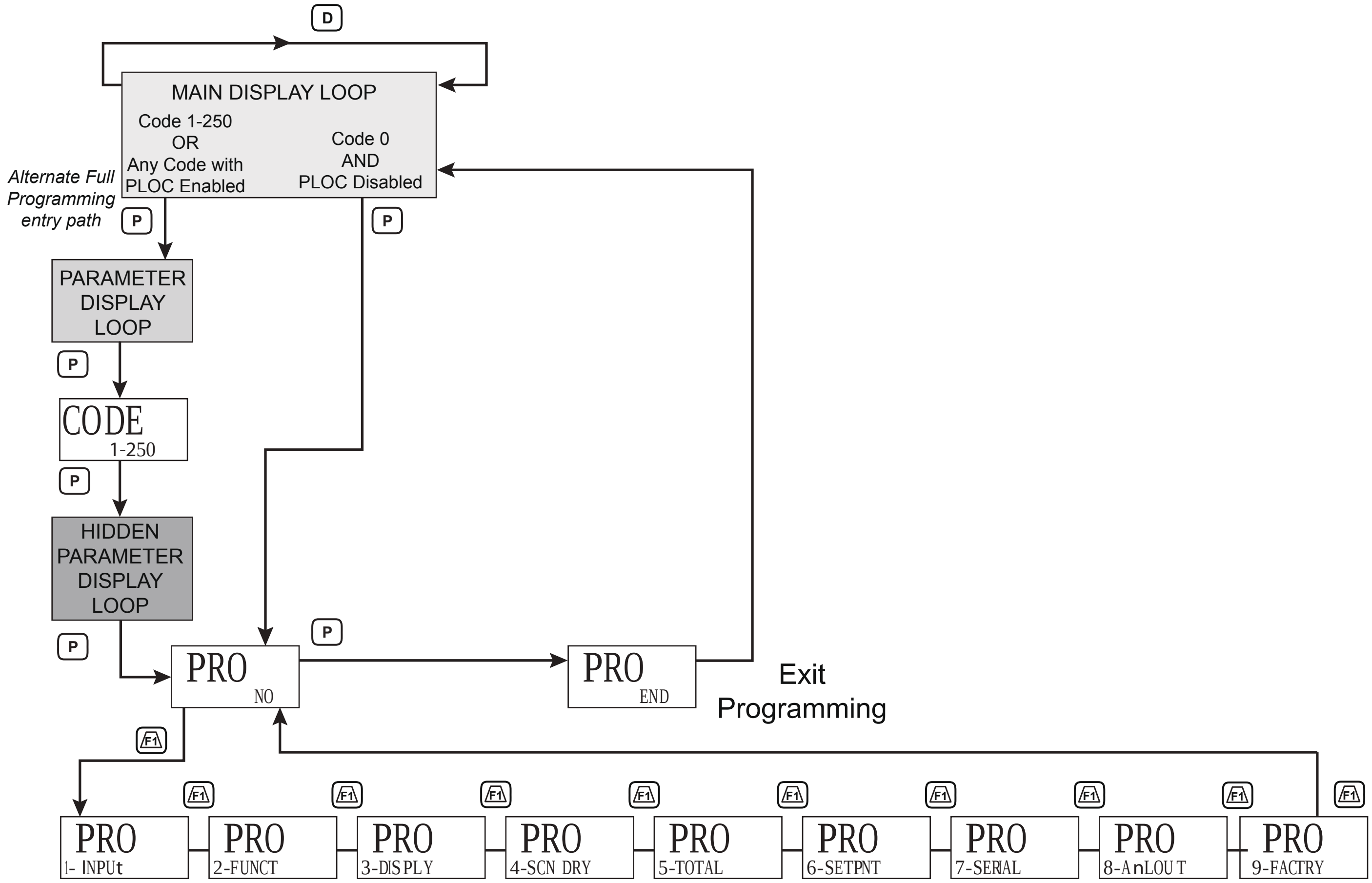


KEY	DISPLAY MODE OPERATION	PROGRAMMING MODE OPERATION
D	Index Line 2 through enabled, max/min/input/total, readouts	Quick exit to display mode
P	Access the parameter and hidden display loops	Access the programming parameter menus, store selected parameter and index to next parameter
F1	Function key 1; hold for 3 seconds for second function 1*	Increment selected parameter value
F2	Function key 2; hold for 3 seconds for second function 2*	Decrement selected parameter value

**Factory setting for F1 and F2 is no mode*

The 2200 display consists of a large, 6-digit upper display referred to as Line 1 and a smaller 9-digit lower display referred to as Line 2. Line 1 can be configured to show one of several values, including the main input reading, min, max, setpoints or total values. Line 2 can be used to display several selectable values including; input value, min, max, total, list, setpoint values, and other values. For these values the mnemonics is shown in the left most digits of Line 2. To the right of Line 1 is a Programmable Units Display. This display consists of 3 programmable digits that are user defined as mnemonics for Line 1.

2200 DISPLAY LOOPS



** Pressing "D" at any time exits back to the Main Display Loop.*

2200 SERIES DISPLAY LOOPS

The 2200 offers three display loops to allow users quick access to needed information. These display loops are available when the meter is in the normal display mode. By pressing the **D** key, the user can view parameters such as the Total, Min, Max or the Input in the Main Display Loop. Display selections are fully programmable and are viewed on the 9 digit line of the meter.

Pressing the **P** key with no security code (COdE0) will put the meter directly into the programming mode. When a security code is programmed (Code 1-250), pressing the **P** key will allow access to the Parameter Display Loop. This loop is where the parameters like setpoint values are normally put for general public access. Parameters in this loop can only be viewed/changed if enabled in the meter programming. After all the parameters in the Parameter Display Loop are viewed, an additional press of the **P** key will bring up the security code (COdE0). Access the Hidden Parameter Display Loop by entering the selected security code. In this loop displayed parameters can be changed. Combining the two parameter loops provides an area for parameters that require general access and/or protected or secure access depending on your application needs.

During programming of the meter you will need to select if a value is to be displayed or not. If the value is not required, select the lock mode (LOC). If you decide to display the value, you will need to assign it to a loop; **D** for the Main Display Loop, **P** for the Parameter Display Loop, and HidE for the Hidden Display Loop. In the case of the parameters, such as the setpoint values you will also need to decide if the value can only be read (rEd) or entered (ENt). The ! and @ key will increment or decrement the value when the edit mode is active. After the change, press the **P** key to save and move to the next value. Any values placed in the Hidden Parameter Loop can be changed as they are protected by the security code. While in the parameter display and hidden parameter loops, pressing the **D** key will return the meter to the main display.

There are selections in the programming that allow for the values to be reset. When the **P** key is pushed on a resettable display, the unit will display the value mnemonic and "NO" (if Line 2 value was set for "d-ENt " in "3-dISPLY). Pressing the F1 and F2 keys will toggle between "NO" and "YES". Pressing the **P** key with "YES" displayed will cause the reset action to be performed.

The **P**, Parameter key is used to scroll among the programmed Line 2 parameter values when at the main display or to step through the parameter loop and hidden parameter loop. It is used as the enter key when the meter is in the programming mode.

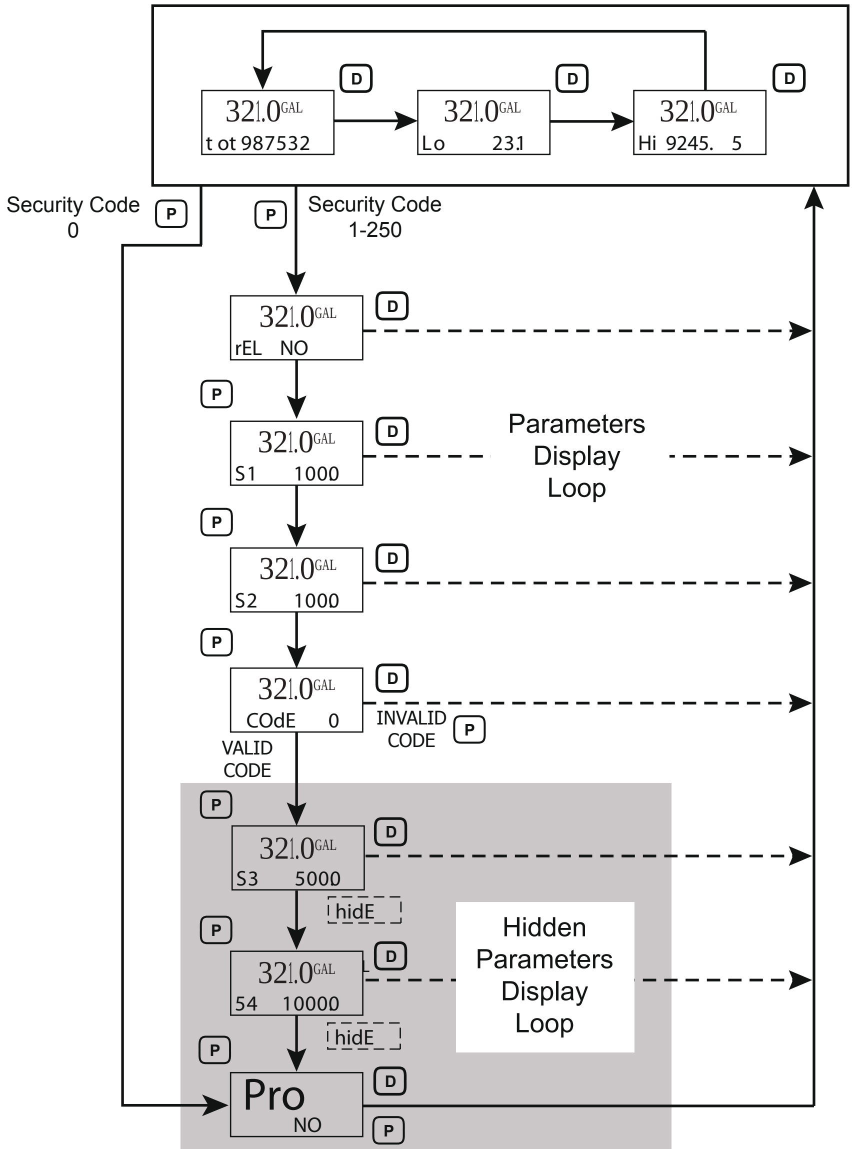
Numerical Value Entry

If the parameter is programmed for enter (ENt), the F1 and F2 keys are used to change the parameter values in any of the display loops.

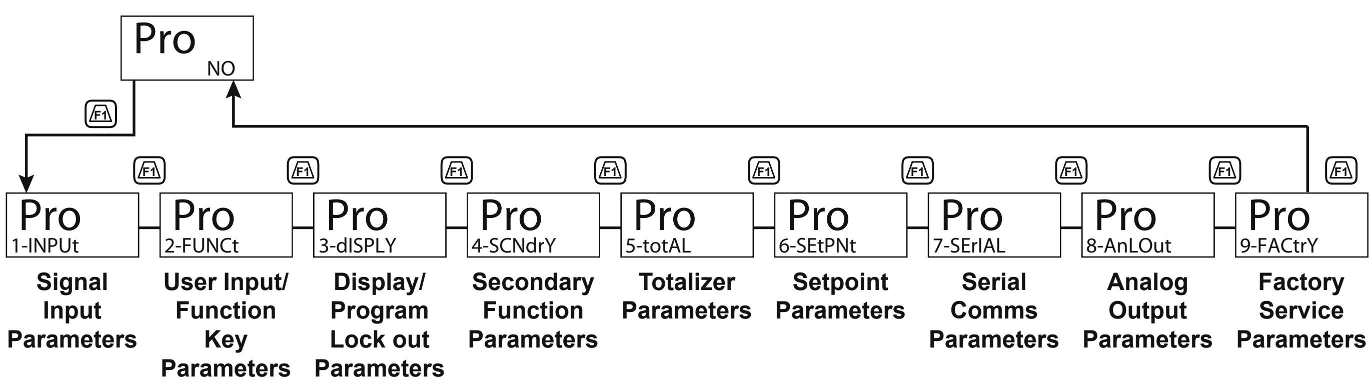
The F1 and F2 keys will increment or decrement the parameter value. When the arrow key is pressed and held, the value automatically scrolls. The longer the arrow key is held the faster the value scrolls.

For large value changes, press and hold the F1 or F2 key. While holding that key, momentarily press the **D** key and the value scrolls by 1000's as the arrow key is held. Releasing the arrow key removes the 1000's scroll feature. The arrow keys can then be used to make small value changes as described above.

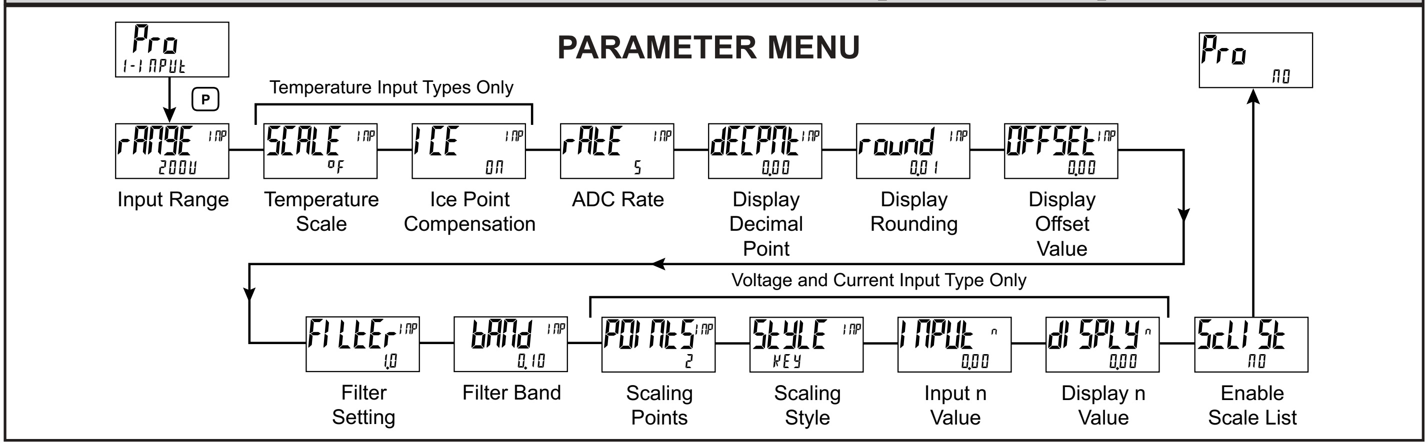
Main Display Loop



6.0 PROGRAMMING THE 2200



MODULE 1 - INPUT SETUP PARAMETERS (1-INPUt)



INPUT RANGE

rANGE INP 200V

250uA	2V	1000Ω	tc-r	r392
0.0025A	10V	10000Ω	tc-S	r672
0.025A	25V	tc-t	tc-b	r427
0.25A	100V	tc-E	tc-n	
2A	200V	tc-J	tc-C	
0.25V	100Ω	tc-K	r385	

Select the desired input range.

TEMPERATURE SCALE

For TC and RTD Input Range Selection only.

SCALE INP °F

°F °C

Select the temperature scale. This selection applies for Input, MAX, MIN, and TOT displays. If changed, those parameters that relate to the temperature scale should be checked.

ICE POINT COMPENSATION

For TC Input Range Selection only.

ICE INP ON

ON OFF

This parameter turns the internal ice point compensation on or off. Normally, the ice point compensation is on. If using external compensation, set this parameter to off. In this case, use copper leads from the external compensation point to the meter.

INPUT UPDATE RATE (/SEC)

rAtE INP 5

5 10 20 40 80 160

Select the ADC conversion rate (conversions per second). Temperature inputs can not be set higher than 20 updates per second. The selection does not affect the display update rate, however it does affect setpoint and analog output response time. The default factory setting of 5 is recommended for most applications. Selecting a fast update rate may cause the display to appear very unstable.

DECIMAL RESOLUTION (Display Units)

dECPNt INP 0.00

0 to 0.0000 (curr/volt)
0 to 0.0 (temp)

Select desired display resolution. The available selections are dependent on the Input Range selected (rANGE).

ROUNDING INCREMENT

round INP 0.01

1 2 5
10 20 50 100

Rounding selections other than one, cause the Input Display to 'round' to the nearest rounding increment selected (ie. rounding of '5' causes 122 to round to 120 and 123 to round to 125). Rounding starts at the least significant digit of the Input Display. Remaining parameter entries (scaling point values, setpoint values, etc.) are not automatically adjusted to this display rounding selection.

DISPLAY OFFSET

OFFSEt INP 0.00

-199999 to 999999

The display can be corrected with an offset value. This can be used to compensate for probe errors, errors due to variances in probe placement or adjusting the readout to a reference thermometer. This value is automatically updated after a Zero Display to show how far the display is offset. A value of zero will remove the affects of offset.

DIGITAL FILTERING

FILtEr INP 1.0

0.0 to 25.0 seconds

The input filter setting is a time constant expressed in tenths of a second. The filter settles to 99% of the final display value within approximately 3 time constants. This is an Adaptive Digital Filter which is designed to steady the Input Display reading. A value of '0' disables filtering.

FILTER BAND

bANd INP 0.10

0 to 250 display units

The digital filter will adapt to variations in the input signal. When the variation exceeds the input filter band value, the digital filter disengages. When the variation becomes less than the band value, the filter engages again. This allows for a stable readout, but permits the display to settle rapidly after a large process change. The value of the band is in display units, independent of the Display Decimal Point position. A band setting of '0' keeps the digital filter permanently engaged.

When the meter is programmed for TC or RTD, the following programming steps are not active.

SCALING POINTS

POINtS INP 2

2 to 16

Linear - Scaling Points (2)

For linear processes, only 2 scaling points are necessary. It is recommended that the 2 scaling points be at opposite ends of the input signal being applied. The points do not have to be the signal limits. Display scaling will be linear between and continue past the entered points up to the limits of the Input Signal Jumper position. Each scaling point has a coordinate-pair of Input Value (INPUt n) and an associated desired Display Value (dISPLY n).

Nonlinear - Scaling Points (Greater than 2)

For non-linear processes, up to 16 scaling points may be used to provide a piece-wise linear approximation. (The greater the number of scaling points used, the greater the conformity accuracy.) The Input Display will be linear between scaling points that are sequential in program order. Each scaling point has a coordinate-pair of Input Value (INPUt n) and an associated desired Display Value (dISPLY n). Data from tables or equations, or empirical data could be used to derive the required number of segments and data values for the coordinate pairs. In the Crimson software, several linearization equations are available.

SCALING STYLE

This parameter does not apply for thermocouple or RTD input ranges.

StYLE INP
KEY

KEY key-in data
APPLY apply signal

If Input Values and corresponding Display Values are known, the Key-in (KEY) scaling style can be used. This allows scaling without the presence of the input signal. If Input Values have to be derived from the actual input signal source or simulator, the Apply (APPLY) scaling style must be used.

INPUT VALUE FOR SCALING POINT 1

INPUt 1
0.00

- 199999 to 999999

For Key-in (KEY), enter the known first Input Value by using the F1 or F2 arrow keys. (The Input Range selection sets up the decimal location for the Input Value). For Apply (APPLY), the existing programmed value will appear. If this is acceptable, press the **P** key to save and continue to the next parameter. To update/program this value, apply the input signal that corresponds to Scaling Point 1, press F2 key and the actual signal value will be displayed. Then press the **P** key to accept this value and continue to the next parameter.

DISPLAY VALUE FOR SCALING POINT 1

dISPLY 1
0.00

- 199999 to 999999

Enter the first coordinating Display Value by using the arrow keys. This is the same for KEY and APPLY scaling styles. The decimal point follows the dECPNt selection.

INPUT VALUE FOR SCALING POINT 2

INPUt 2
100.00

- 199999 to 999999

For Key-in (KEY), enter the known second Input Value by using the F1 or F2 arrow keys. For Apply (APPLY), the existing programmed value will appear. If this is acceptable, press the **P** key to save and continue to the next parameter. To update/program this value, apply the input signal that corresponds to Scaling Point 2, press F2 key and the actual signal value will be displayed. Then press the **P** key to accept this value and continue to the next parameter. (Follow the same procedure if using more than 2 scaling points.)

DISPLAY VALUE FOR SCALING POINT 2

dISPLY 2
100.00

- 199999 to 999999

Enter the second coordinating Display Value by using the F1 or F2 arrow keys. This is the same for KEY and APPLY scaling styles. (Follow the same procedure if using more than 2 scaling points.)

ENABLE SCALE LIST

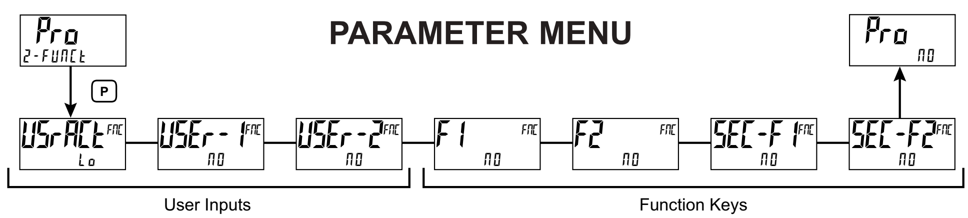
ScLISt
NO

NO YES

When enabled, a second list of scaling points is active in the selected parameter list for List A and List B.

MODULE 2 - USER INPUT/FUNCTION KEY PARAMETERS (2-FUNCt)

PARAMETER MENU



The two user inputs are individually programmable to perform specific meter control functions. While in the Display Mode or Program Mode, the function is executed the instant the user input transitions to the active state. The front panel function keys, F1 and F2, are also individually programmable to perform specific meter control functions. While in the Display Mode, the primary function is executed the instant the key is pressed. Holding the function key for three seconds executes a secondary function. It is possible to program a secondary function without a primary function.

In most cases, if more than one user input and/or function key is programmed for the same function, the maintained (level trigger) actions will be performed while at least one of those user inputs or function keys are activated. The momentary (edge trigger) actions will be performed every time any of those user inputs or function keys transition to the active state.

Note: In the following explanations, not all selections are available for both user inputs and front panel function keys. Displays are shown with each selection. Those selections showing both displays are available for both. If a display is not shown, it is not available for that selection. USEr-n will represent both user inputs. Fn will represent both function keys and second function keys.

USER INPUT ACTIVE STATE

USrACt FNC
Lo

Lo Hi

Select the desired active state for the User Inputs. Select Lo for sink input, active low. Select Hi for source input, active high.

NO FUNCTION

USEr-n FNC
NO

Fn FNC
NO

No function is performed if activated. This is the factory setting for all user inputs and function keys.

PROGRAMMING MODE LOCK-OUT

USEr-n FNC
PLOC

Programming Mode is locked-out, as long as activated (maintained action). A security code can be configured to allow programming access during lock-out.

ZERO (TARE) DISPLAY

USEr-n FNC
rEL

Fn FNC
rEL

The Zero (Tare) Display provides a way to zero the Input Display value at various input levels, causing future Display readings to be offset. This function is useful in weighing applications where the container or material on the scale should not be included in the next measurement value. When activated (momentary action), rESEt flashes and the Display is set to zero. At the same time, the Display value (that was on the display before the Zero Display) is subtracted from the Display Offset Value and is automatically stored as the new Display Offset Value. If another Zero (tare) Display is performed, the display will again change to zero and the Display offset value will shift accordingly.

RELATIVE/ABSOLUTE DISPLAY

USEr-n FNC
d-rEL

Fn FNC
d-rEL

This function will switch the Input Display between Relative and Absolute. The Relative is a net value that includes the Display Offset Value. The Input Display will normally show the Relative unless switched by this function. Regardless of the display selected, all meter functions continue to operate based on relative values. The Absolute is a gross value (based on Module 1 DSP and INP entries) without the Display Offset Value. The Absolute display is selected as long as the user input is activated (maintained action) or at the transition of the function key (momentary action). When the user input is released, or the function key is pressed again, the input display switches back to Relative display. (Abs) or (rEL) is momentarily displayed at transition to indicate which display is active.

HOLD DISPLAY

USEr-n FNC
d-HLd

The active display is held but all other meter functions continue as long as activated (maintained action).

HOLD ALL FUNCTIONS

USEr-n FNC
A-HLd

The meter disables processing the input, holds all display contents, and locks the state of all outputs as long as activated (maintained action). The serial port continues data transfer.

SYNCHRONIZE METER READING

USEr-n FNC
SYNC

The meter suspends all functions as long as activated (maintained action). When the user input is released, the meter synchronizes the restart of the A/D with other processes or timing events.

STORE BATCH READING IN TOTALIZER

USEr-n FNC
bAt

Fn FNC
bAt

The Input Display value is added (batched) to the Totalizer at transition to activate (momentary action) and Line 2 flashes bAtCh. The Totalizer retains a running sum of each batch operation until the Totalizer is reset. When this function is selected, the normal operation of the Totalizer is overridden and only batched Input Display values accumulate in the Totalizer.

SELECT TOTALIZER DISPLAY

USEr-n FNC
d-tot

The Totalizer display appears on Line 2 as long as activated (maintained action). When the user input is released, the previously selected display is returned. The **D** or **P** keys override and disable the active user input. The Totalizer continues to function including associated outputs independent of being displayed.

RESET TOTALIZER

USEr-n FNC
r-tot1

Fn FNC
r-tot

When activated (momentary action), rESEt flashes and the Totalizer resets to zero. The Totalizer then continues to operate as it is configured. This selection functions independent of the selected display.

RESET AND ENABLE TOTALIZER

USEr-n FNC
r-tot2

When activated (momentary action), rESEt flashes and the Totalizer resets to zero. The Totalizer continues to operate while active (maintained action). When the user input is released, the Totalizer stops and holds its value. This selection functions independent of the selected display.

ENABLE TOTALIZER

USEr-n FNC
E-tot

The Totalizer continues to operate while active (maintained action). When the user input is released, the Totalizer stops and holds its value. This selection functions independent of the selected display.

SELECT MAXIMUM DISPLAY

USEr-n FNC
d-HI

The Maximum display appears on Line 2 as long as activated (maintained). When the user input is released, the previously selected display is returned. The **D** or **P** keys override and disable the active user input. The Maximum continues to function independent of being displayed.

RESET MAXIMUM DISPLAY

USEr-n FNC
r-HI

Fn FNC
r-HI

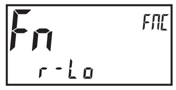
When activated (momentary action), rESEt flashes and the Maximum resets to the present Input Display value. The Maximum function then continues from that value. This selection functions independent of the selected display.

SELECT MINIMUM DISPLAY

USEr-n FNC
d-Lo

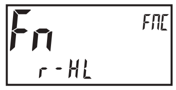
The Minimum display appears on Line 2 as long as activated (maintained). When the user input is released, the previously selected display is returned. The **D** or **P** keys override and disable the active user input. The Minimum continues to function independent of being displayed.

RESET MINIMUM DISPLAY



When activated (momentary action), rESEt flashes and the Minimum resets to the present Input Display value. The Minimum function then continues from that value. This selection functions independent of the selected display.

RESET MAXIMUM AND MINIMUM DISPLAY



When activated (momentary action), rESEt flashes and the Maximum and Minimum readings are set to the present Input Display value. The Maximum and Minimum function then continues from that value. This selection functions independent of the selected display.

DISPLAY SELECT

When activated (momentary action), Line 2 advances to the next display that is not locked out from the Display Mode.

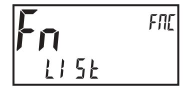
ADJUST DISPLAY INTENSITY

When activated (momentary action), the display intensity changes to the next intensity level.

CHANGE DISPLAY COLOR

When activated (momentary action), Line 1 will change color.

SELECT PARAMETER LIST



Two lists of input scaling points and setpoint values (including band and deviation) are available. The two lists are named LISt-A and LISt-b. If a user input is used to select the list then LISt-A is selected when the user input is not active and LISt-b is selected when the user input is active (maintained action). If a front panel key is used to select the list then the list will toggle for each key press (momentary action). The display will only indicate which list is active when the list is changed. To program the values for LISt-A and LISt-b, first complete the programming of all the parameters. Exit programming and switch to the other list. Re-enter programming and enter the desired values for the input scaling points, setpoints, band, and deviation if used.

SETPOINT SELECTIONS

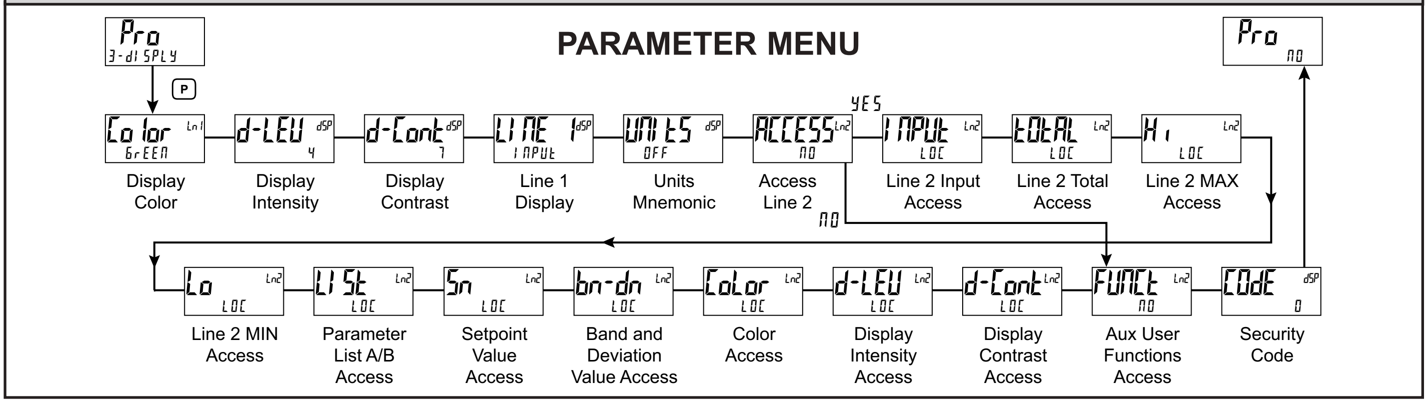
The following selections are functional only with a Setpoint plug-in card installed.

r-1 - Reset Setpoint 1 (Alarm 1)
r-2 - Reset Setpoint 2 (Alarm 2)
r-3 - Reset Setpoint 3 (Alarm 3)
r-4 - Reset Setpoint 4 (Alarm 4)
r-34 - Reset Setpoint 3 & 4 (Alarm 3 & 4)
r-234 - Reset Setpoint 2, 3 & 4 (Alarm 2, 3 & 4)
r-ALL - Reset All Setpoints (Alarms 1-4)

PRINT REQUEST

The meter issues a block print through the serial port when activated, and the serial type is set to rLC. The data transmitted during a print request and the serial type is programmed in Module 7. If the user input is still active after the transmission is complete (about 100 msec), an additional transmission occurs. As long as the user input is held active, continuous transmissions occur.

MODULE 3 - DISPLAY PARAMETERS (3-dISPLY)



Module 3 is the programming of the Main Display Loop, Parameter Display Loop, Hidden Parameter Loop, and Full Programming lock-out. The large upper display line value is configured by the "LINE 1" parameter. The Units mnemonic can be used to assign a custom display mnemonic to the upper display value. When in the Main Display Loop, the available Line 2 displays (items configured for d-rEd or d-ENt) can be consecutively read on lower display by repeatedly pressing the **D** key. A left justified 3 character mnemonic indicates which parameter value is being shown on the lower display. When in the Main Display Loop the User keys F1 and F2 function as programmed in Module 2.

The Parameter display loop items can be accessed by pressing the **P** key. To edit a main display line item, that is configured as d-ENt , the **P** key is pushed and the unit enters a parameter edit mode in which the F1 and F2 key increments or decrements the value.

Full Programming Mode permits all parameters to be viewed and modified. This Programming Mode can be locked with a security code and/or user input.

LINE 1 DISPLAY COLOR

Color Ln1 GrEEn

GrEEn rEd OrANGE

Enter the desired Display Line 1 and programmable Units Display color.

DISPLAY INTENSITY LEVEL

d-LEU dSP 4

0 to 4

Enter the desired Display Intensity Level (0-4) by using the arrow keys. The display will actively dim or brighten as the levels are changed. This parameter also appears in the Parameter Display Loop when enabled.

DISPLAY CONTRAST LEVEL

d-Cont dSP 7

0 to 15

Enter the desired Display Contrast Level (0-15) by using the arrow keys. The display contrast / viewing angle will actively move up or down as the levels are changed. This parameter also appears in the Parameter Display Loop when enabled.

LINE 1 DISPLAY

LINE 1 dSP INPUt

INPUt tOtAL HI Lo
S1 S2 S3 S4 NONE

Select the value to be assigned to the primary or top line of the meter display.

UNITS MNEMONIC

UNItS dSP OFF

OFF LISt

This parameter allows programming of the display mnemonics characters. Three individual characters may be selected from a preprogrammed list. The list includes:

_ A b C d E F G H I J K L N O P Q R S t U V Y Z 0 1 2
3 4 5 6 7 8 9 c e g h i n o q r u - ° blank

LINE 2 MAIN, SECONDARY & HIDDEN DISPLAY LOOP ACCESSIBLE ITEMS

ACCESS Ln2 NO

NO YES

Select YES to program the display Line 2 accessible values. The default setting of NO bypasses the programming of these values to shorten the module.

All of the individual Line 2 settings are retained.

The following values can be made accessible on Line 2 of the Main (**D** key), Parameter (**P** key) and Hidden (**P** key following code entry) Display Loops.

Each of the following parameters can be configured for one of the following settings. Not all selections are available for each parameter.

SELECTION	DESCRIPTION
LOC	Not viewed on display line
d-rEd	View in Main Display Loop. Cannot change or reset.
d-ENt	View and change (reset) in Main Display Loop
P-rEd	View in Parameter Display Loop. Cannot change or reset.
P-ENt	View and change (reset) in Parameter Display Loop
HidE	View and change in Hidden Parameter Display Loop

LINE 2 INPUT ACCESS

INPUt Ln2 LOC

LOC d-rEd d-ENt

When configured for d-ENt , the Input value can be reset (tare) using a front keypad sequence. To reset (tare), push the **P** key while viewing the Input value on Line 2. The display will show rEL NO. Press the F1 key to select YES and then press **P** key. The display will indicate rESEt and then advance to Parameter Display.

LINE 2 TOTAL ACCESS

tOtAL Ln2 LOC

LOC d-rEd d-ENt

When configured for d-ENt , the Total value can be reset using a front keypad sequence. To reset, push the **P** key while viewing the Total value on Line 2. The display will show r-tot NO. Press the F1 key to select YES and then press **P** key. The display will indicate rESEt and then advance to Parameter Display.

LINE 2 MAX ACCESS

Hi Ln2 LOC

LOC d-rEd d-Ent

When configured for d-Ent, the Max Display value can be reset using a front keypad sequence. To reset, push the **P** key while viewing the Hi value on Line 2. The display will show r-Hi nO. Press the F1 key to select YES and then press **P** key. The display will indicate rESEt and then advance to Parameter Display.

LINE 2 MIN ACCESS

Lo Ln2 LOC

LOC d-rEd d-Ent

When configured for d-Ent, the Min Display value can be reset using a front keypad sequence. To reset, push the **P** key while viewing the Lo value on Line 2. The display will show r-Lo nO. Press the F1 key to select YES and then press **P** key. The display will indicate rESEt and then advance to Parameter Display.

LINE 2 PARAMETER LIST A/B ACCESS

LiSt Ln2 LOC

LOC d-rEd d-Ent
P-rEd P-Ent HidE

When configured for d-Ent, the Parameter list can be selected using a front keypad sequence. To select, push the **P** key while viewing LiSt x". "x" will begin to flash, press the F1 key to select "A" or "B" and then press **P** key. The selected Parameter List will become active and the display will advance to Parameter Display. See User Functions "Select Parameter List" for a description of the list function. The Line 2 Parameter List provides a means of setting or viewing the active parameter list.

LINE 2 SETPOINTS ACCESS

Sn Ln2 LOC

LOC d-rEd d-Ent
P-rEd P-Ent HidE

When configured for d-Ent, the **P** key must be pressed to select the item for change before the F1 and F2 keys will increment or decrement the value.

LINE 2 BAND/DEVIATION ACCESS

bn-dn Ln2 LOC

LOC d-rEd d-Ent
P-rEd P-Ent HidE

When configured for d-Ent, the **P** key must be pressed to select the item for change before the F1 and F2 keys will increment or decrement the value.

LINE 1 DISPLAY COLOR ACCESS

Color Ln2 LOC

LOC P-rEd P-Ent HidE

When configured for P-Ent, Line 1 Color can be selected in the Parameter Display by using the F1 and F2 keys while viewing Color.

DISPLAY INTENSITY ACCESS

d-LEV Ln2 LOC

LOC P-rEd P-Ent HidE

When configured for P-Ent, the display intensity can be selected in the Parameter Display by using the F1 and F2 keys while viewing d-LEV.

DISPLAY CONTRAST ACCESS

d-Cont Ln2 LOC

LOC P-rEd P-Ent HidE

When configured for P-Ent, the display contrast can be selected in the Parameter Display by using the F1 and F2 keys while viewing d-Cont.

LINE 2 USER FUNCTIONS ACCESSIBLE ITEMS

FUnCt Ln2 nO

YES nO

Select YES to display the following list of User functions that can be made available at the end of the Parameter (P-Ent) or Hidden (HidE) display loops. The more critical and frequently used Functions should be first assigned to the User Inputs and User Function keys. If more functions are needed than what can be obtained with User Inputs, this feature will provide a means to provide that access. Refer to module 2, 2-FUnCt for a description of the function.

rEL bAt r-tot r-HI r-Lo
r-HL r-1 r-2 r-3 r-4
r-34 r-234 r-ALL Print

PROGRAMMING SECURITY CODE

COdE dSP 0

000 to 250

To activate either the Parameter or Hidden Parameter Display Loops, a security code (1-250) must be entered. If a "0" security code is programmed, pressing the **P** key takes you directly to the Full Programming Mode.

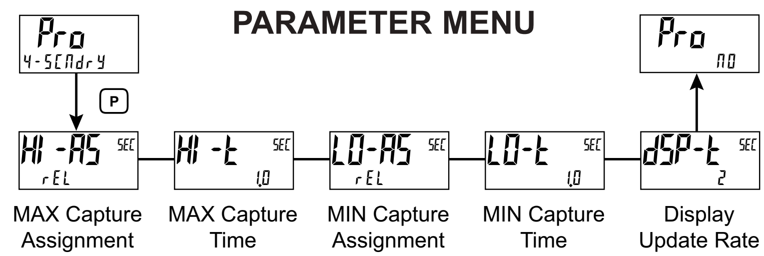
The Security Code determines the programming mode and the accessibility of programming parameters. This code can be used along with the Program Mode Lock-out (PLOC) in the User Input Function parameter (Module 2).

Two programming modes are available. Full Programming Mode allows all parameters to be viewed and modified. Parameter Display Loop mode provides access to those selected parameters, that can be viewed and/or modified without entering the Full programming mode.

The following chart indicates the levels of access based on various CodE and User Input PLOC settings.

SECURITY CODE	USER INPUT CONFIGURED	USER INPUT STATE	WHEN P KEY IS PRESSED	FULL PROGRAMMING MODE ACCESS
0	not PLOC	———	Full Programming	Immediate Access
>0	not PLOC	———	Enter Parameter Display Loop	After Parameter Display Loop with correct code # at COdE prompt.
>0	PLOC	Active	Enter Parameter Display Loop	After Parameter Display Loop with correct code # at COdE prompt.
>0	PLOC	Not Active	Full Programming	Immediate Access
0	PLOC	Active	Enter Parameter Display Loop	No Access
0	PLOC	Not Active	Full Programming	Immediate Access

MODULE 4 - SECONDARY FUNCTION PARAMETERS (4-SCndrY)



MAX CAPTURE ASSIGNMENT

HI-AS SEC rEL

rEL AbS

Select the desired parameter that will be assigned to the Max Capture.

MAX CAPTURE DELAY TIME

HI-t SEC 1.0

0.0 to 3275.0 seconds

When the Input Display is above the present MAX value for the entered delay time, the meter will capture that display value as the new MAX reading. A delay time helps to avoid false captures of sudden short spikes.

MIN CAPTURE ASSIGNMENT

LO-AS SEC rEL

rEL AbS

Select the desired parameter that will be assigned to the Min Capture.

MIN CAPTURE TIME

LO-t SEC 1.0

0.0 to 3275.0 seconds

When the Input Display is below the present MIN value for the entered delay time, the meter will capture that display value as the new MIN reading. A delay time helps to avoid false captures of sudden short spikes.

DISPLAY UPDATE RATE

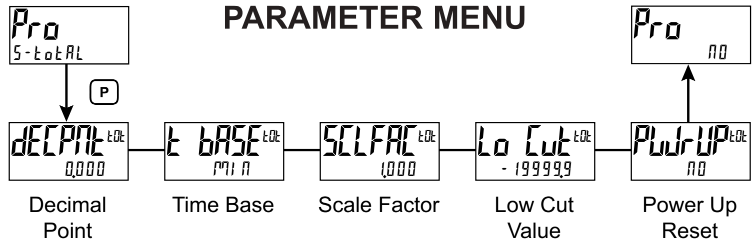
dSP-t SEC 2

1 2 5 10 20 updates/second

This parameter configures the display update rate. It does not affect the response time of the setpoint output or analog output option cards.

MODULE 5 - TOTALIZER (INTEGRATOR) PARAMETERS (5-totAL)

PARAMETER MENU



The totalizer accumulates (integrates) the Input Display value using one of two modes. The first is using a time base. This can be used to compute a time temperature product. The second is through a user input or function key programmed for Batch (one time add on demand). This can be used to provide a readout of temperature integration, useful in curing and sterilization applications. If the Totalizer is not needed, its display can be locked-out and this module can be skipped during programming.

TOTALIZER DECIMAL POINT

dECPNt tOt 0.000

0 0.0 0.00 0.000 0.0000

For most applications, this matches the Input Display Decimal Point (dECPNt). If a different location is desired, refer to Totalizer Scale Factor.

TOTALIZER TIME BASE

t bASE tOt min

SEC -seconds (/1) min -minutes (/60)
hour -hours (/3600) dAY -days (/86400)

This is the time base used in Totalizer accumulations. If the Totalizer is being accumulated through a user input programmed for Batch, then this parameter does not apply.

TOTALIZER SCALE FACTOR

SCLFAC tOt 1.000

0.001 to 65.000

For most applications, the Totalizer reflects the same decimal point location and engineering units as the Input Display. In this case, the Totalizer Scale Factor is 1.000. The Totalizer Scale Factor can be used to scale the Totalizer to a value that is different than the Input Display. Common possibilities are:

1. Changing decimal point location (example tenths to whole)
2. Average over a controlled time frame.

Details on calculating the scale factor are shown later.

If the Totalizer is being accumulated through a user input programmed for Batch, then this parameter does not apply.

TOTALIZER LOW CUT VALUE

Lo Cut tOt -1999.99

-199999 to 999999

A low cut value disables Totalizer when the Input Display value falls below the value programmed.

TOTALIZER POWER UP RESET

PWrUP tOt NO

NO - do not reset buffer
YES - reset buffer

The Totalizer can be reset to zero on each meter power-up by setting this parameter to YES.

TOTALIZER BATCHING

The Totalizer Time Base and scale factor are overridden when a user input or function key is programmed for store batch (bAt). In this mode, when the user input or function key is activated, the Input Display reading is one time added to the Totalizer (batch). The Totalizer retains a running sum of each batch operation until the Totalizer is reset. This is useful in weighing operations, when the value to be added is not based on time but after a filling event.

TOTALIZER USING TIME BASE

Totalizer accumulates as defined by:

$$\frac{\text{Input Display x Totalizer Scale Factor}}{\text{Totalizer Time Base}}$$

Where:
Input Display - the present input reading
Totalizer Scale Factor - 0.001 to 65.000
Totalizer Time Base - (the division factor of tbASE)

Example: The input reading is at a constant rate of 10.0 gallons per minute. The Totalizer is used to determine how many gallons in tenths has flowed. Because the Input Display and Totalizer are both in tenths of gallons, the Totalizer Scale Factor is 1. With gallons per minute, the Totalizer Time Base is minutes (60). By placing these values in the equation, the Totalizer will accumulate every second as follows:

$\frac{10.0 \text{ x } 1.000}{60}$ = 0.1667 gallon accumulates each second

This results in:
10.0 gallons accumulates each minute
600.0 gallons accumulates each hour

TOTALIZER SCALE FACTOR CALCULATION EXAMPLES

1. When changing the Totalizer Decimal Point (dECPNt) location from the Input Display Decimal Point (dECPNt), the required Totalizer Scale Factor is multiplied by a power of ten.

Example:

Input (dECPNt) = 0

Totalizer dECPNt	Scale Factor
0.0	10
0	1
x10	0.1
x100	0.01
x1000	0.001

Input (dECPNt) = 0.0

Totalizer dECPNt	Scale Factor
0.00	10
0.0	1
0	0.1
x10	0.01
x100	0.001

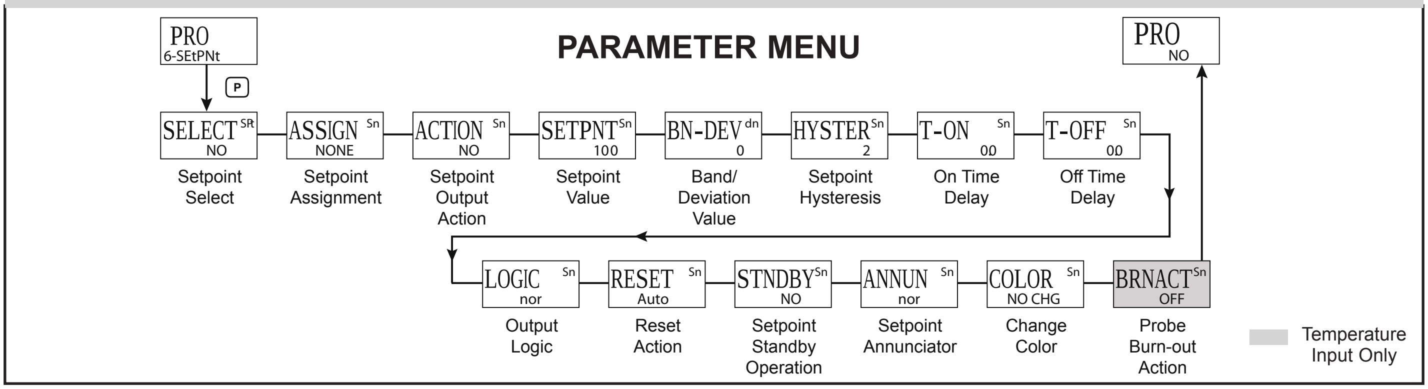
Input (dECPNt) = 0.00

Totalizer dECPNt	Scale Factor
0.000	10
0.00	1
0.0	0.1
0	0.01
x10	0.001

2. To obtain an average reading within a controlled time frame, the selected Totalizer Time Base is divided by the given time period expressed in the same timing units.

Example: Average temperature per hour in a 4 hour period, the scale factor would be 0.250. To achieve a controlled time frame, connect an external timer to a user input programmed for r-tot. The timer will control the start (reset) and the stopping (hold) of the totalizer.

MODULE 6 - SETPOINT OUTPUT PARAMETERS (6-SEtPNt)



SETPOINT SELECT

SELECT SPt NO — NO S1 S2 S3 S4

Enter the setpoint (alarm output) to be programmed. The "n" in the following parameters will reflect the chosen setpoint number. After the chosen setpoint is completely programmed, the display will return to NO. Repeat step for each setpoint to be programmed. The NO chosen at SELECt SPt, will return to Pro NO. The number of setpoints available is setpoint output card dependent.

SETPOINT ASSIGNMENT

ASSIGN Sn NONE — NONE REL ABS TOTAL

Selects the meter value to be used to trigger the Setpoint Alarm. The rEL setting will cause the setpoint to trigger off of the relative (net) input value. The relative input value is the absolute input value that includes the Display Offset Value. The AbS setting will cause the setpoint to trigger off of the absolute (gross) input value. The absolute input value is based on Module 1 dISPLY and INPUt entries.

SETPOINT ACTION

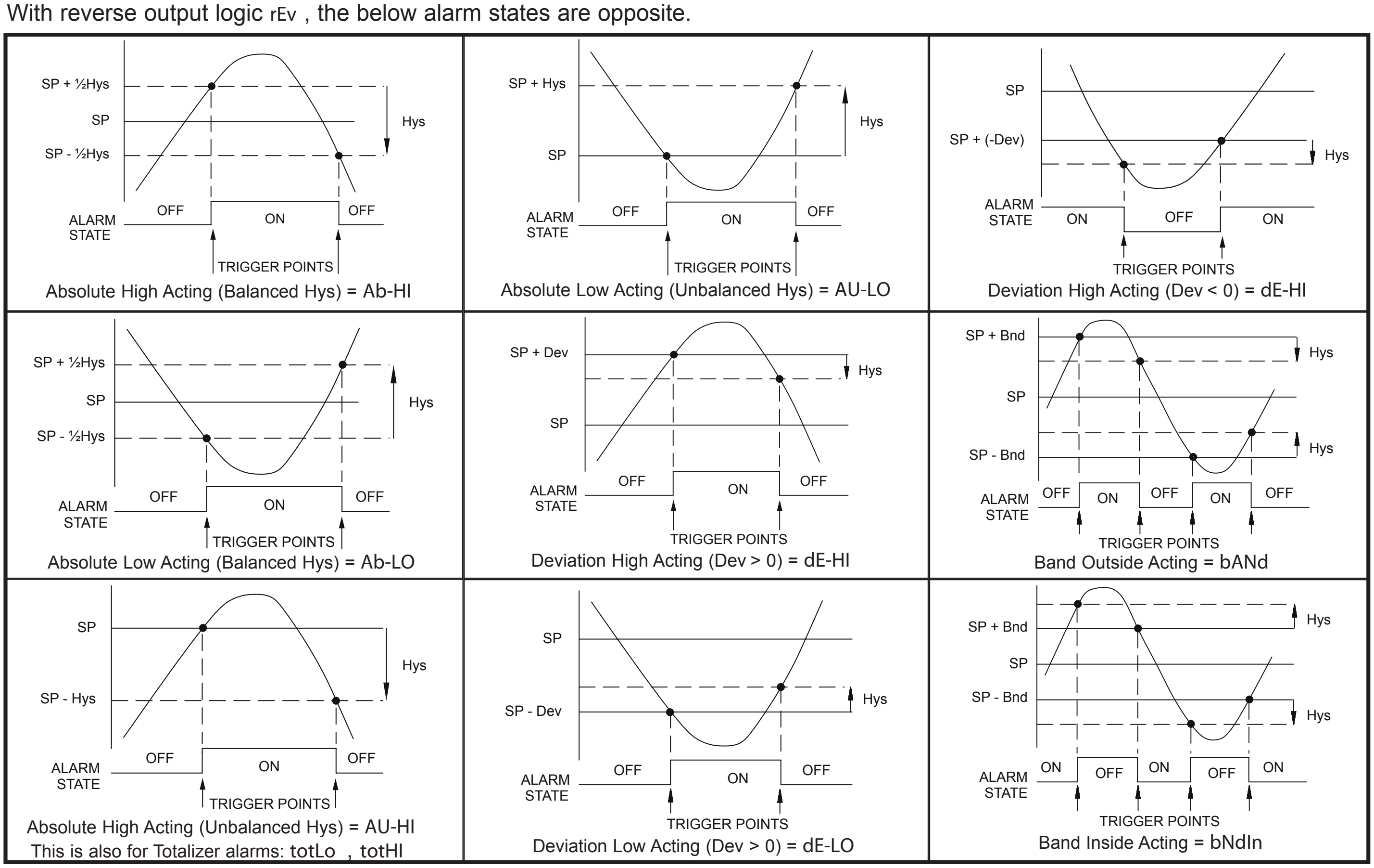
ACTION Sn NO — NO AB-HI AB-LO AU-HI AU-LO DE-HI DE-LO BAND BNDIN TOTLO TOTHI

Enter the action for the selected setpoint (alarm output). See Setpoint Alarm Figures for a visual detail of each action. The Setpoint Actions that pertains to the total is only active when the Setpoint Assignment is set to totAL .

NO	= No Setpoint Action
AB-HI	= Absolute high, with balanced hysteresis
AB-LO	= Absolute low, with balanced hysteresis
AU-HI	= Absolute high, with unbalanced hysteresis
AU-LO	= Absolute low, with unbalanced hysteresis
DE-HI	= deviation high, with unbalanced hysteresis
DE-LO	= deviation low, with unbalanced hysteresis
BAND	= Outside band, with unbalanced hysteresis
BNDIN	= Inside band, with unbalanced hysteresis
TOTLO	= Lower 6 digits of 9 digit Totalizer, with unbalanced hysteresis
TOTHI	= Upper 6 digits of 9 digit Totalizer, with unbalanced hysteresis

Setpoint Alarm Figures

With reverse output logic rEv , the below alarm states are opposite.



SETPOINT VALUE

SEtPNt Sn
100

-199999 to 999999

Enter desired setpoint alarm value. Setpoint values can also be entered in the Display Mode during Program Lockout when the setpoint is programmed as ENt in Parameter Module 3. The decimal point position is determined by the Setpoint Assignment value.

BAND/DEVIATION VALUE

bn-dEV dn
0

-199999 to 999999

This parameter is only available in band and deviation setpoint actions. Enter desired setpoint band or deviation value. When the Setpoint Action is programmed for Band, this value can only be a positive value.

HYSTERESIS VALUE

HYStEr Sn
2

1 to 65000

Enter desired hysteresis value. See Setpoint Alarm Figures for visual explanation of how setpoint alarm actions (balanced and unbalanced) are affected by the hysteresis. When the setpoint is a control output, usually balanced hysteresis is used. For alarm applications, usually unbalanced hysteresis is used. For unbalanced hysteresis modes, the hysteresis functions on the low side for high acting setpoints and functions on the high side for low acting setpoints. Note: Hysteresis eliminates output chatter at the switch point, while time delay can be used to prevent false triggering during process transient events.

ON TIME DELAY

t-ON Sn
0.0

0.0 to 3275.0 seconds

Enter the time value in seconds that the alarm is delayed from turning on after the trigger point is reached. A value of 0.0 allows the meter to update the alarm status per the response time listed in the Specifications. When the output logic is rEv, this becomes off time delay. Any time accumulated at power-off resets during power-up.

OFF TIME DELAY

t-OFF Sn
0.0

0.0 to 3275.0 seconds

Enter the time value in seconds that the alarm is delayed from turning off after the trigger point is reached. A value of 0.0 allows the meter to update the alarm status per the response time listed in the Specifications. When the output logic is rEv, this becomes on time delay. Any time accumulated at power-off resets during power-up.

OUTPUT LOGIC

LOGIC Sn
nor

nor rEv

Enter the output logic of the alarm output. The nor logic leaves the output operation as normal. The rEv logic reverses the output logic. In rEv, the alarm states in the Setpoint Alarm Figures are reversed.

RESET ACTION

rESEt Sn
Auto

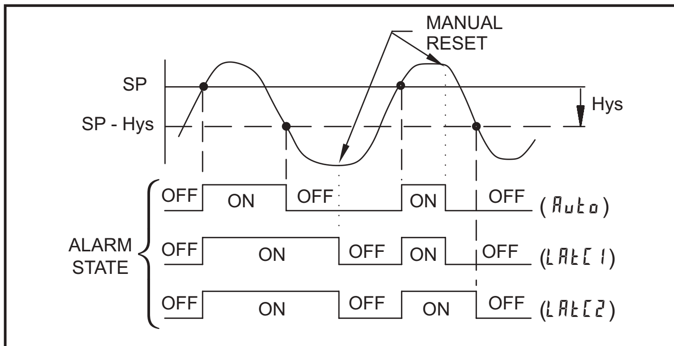
Auto LAtCh1 LAtCh2

Enter the reset action of the alarm output.

Auto = Automatic action; This action allows the alarm output to automatically reset off at the trigger points per the Setpoint Action shown in Setpoint Alarm Figures. The "on" alarm may be manually reset (off) immediately by a front panel function key or user input.The alarm remains reset off until the trigger point is crossed again.

LAtCh1 = Latch with immediate reset action; This action latches the alarm output on at the trigger point per the Setpoint Action shown in Setpoint Alarm Figures. Latch means that the alarm output can only be turned off by front panel function key or user input manual reset, serial reset command or meter power cycle. When the user input or function key is activated (momentary or maintained), the corresponding "on" alarm output is reset immediately and remains off until the trigger point is crossed again. (Previously latched alarms will be off if power up Display Value is lower than setpoint value.)

LAtCh2 = Latch with delay reset action; This action latches the alarm output on at the trigger point per the Setpoint Action shown in Setpoint Alarm Figures. Latch means that the alarm output can only be turned off by front panel function key or user input manual reset, serial reset command or meter power cycle. When the user input or function key is activated (momentary or maintained), the meter delays the event until the corresponding "on" alarm output crosses the trigger off point. (Previously latched alarms are off if power up Display Value is lower than setpoint value. During a power cycle, the meter erases a previous Latch 2 reset if it is not activated at power up.)



Setpoint Alarm Reset Actions

SETPOINT STANDBY OPERATION

Stndby Sn
NO

NO YES

When YES, the alarm is disabled (after a power up) until the trigger point is crossed. Once the alarm is on, the alarm operates normally per the Setpoint Action and Reset Mode.

SETPOINT ANNUNCIATOR

Annun Sn
nor

nor rEv FLASh OFF

The OFF mode disables display setpoint annunciators. The nor mode displays the corresponding setpoint annunciators of "on" alarm outputs. The rEv mode displays the corresponding setpoint annunciators of "off" alarms outputs. The FLASh mode flashes the corresponding setpoint annunciators of "on" alarm outputs.

LINE 1 CHANGE COLOR

Color Sn
NO CHG

NO CHG GrEEN OrANGE rEd
GrnOrG rEdOrG rEdGrn LINE 1

This parameter allows the Line 1 Display to change color, or alternate between two colors, when the alarm is activated. When multiple alarms are programmed to change color, the highest numbered active alarm (S4-S1) determines the display color.

The NO CHG selection will maintain the color displayed prior to the alarm activation. The LINE 1 selection sets the display to the Line 1 Display Color (Color), programmed in Module 3.

The following programming step is only available when Input Range in Module 1 is set for a temperature input (TC/RTD).

PROBE BURN-OUT ACTION

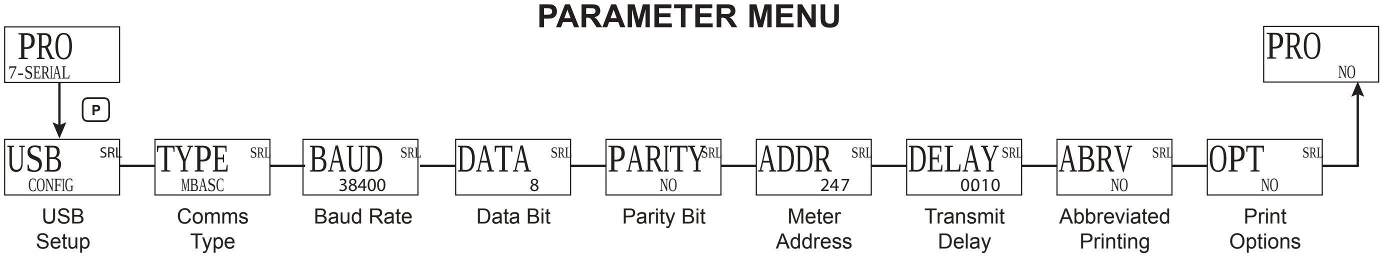
brnAct Sn
OFF

OFF ON

Enter the probe burn-out action. In the event of a temperature probe failure (TC open; RTD open or short), the output can be programmed to be on or off.

MODULE 7 - SERIAL COMMUNICATIONS PARAMETERS (7-SERIAL)

PARAMETER MENU



USB SETUP

USB SRL CONFIG — CONFIG PORT

CONFIG – Configures USB with settings required to operate with Crimson configuration software. This will automatically internally configure the 2200 to use ModBus RTU protocol, 38400 baud, 8 bits, and unit address of 247 when a USB cable is attached to 2200 and PC. The serial port settings shown in 7-SERIAL (this module) will not change, or show this.

Port – Configures USB to utilize serial settings and protocol as configured in "7-SERIAL" (this module).

COMMUNICATIONS TYPE

TYPE SRL MBASC

- MBASC - ModBus ASCII
- RLC - RLC Protocol (ASCII)
- MBRTU - ModBus RTU

Select the desired communications protocol. Modbus is preferred as it provides access to all meter values and parameters. Since the Modbus protocol is included within the 2200, the Modbus option card, should not be used. The RS485, or RS232 card should be used instead.

BAUD RATE

BAUD SRL 38400

1200 4800 19200
2400 9600 38400

Set the baud rate to match the other serial communications equipment on the serial link. Normally, the baud rate is set to the highest value that all the serial equipment are capable of transmitting and receiving.

DATA BIT

DATA SRL 8 — 7 8

Select either 7 or 8 bit data word lengths. Set the word length to match the other serial communications equipment on the serial link.

PARITY BIT

PARITY SRL NO — NO EUEN ODD

Set the parity bit to match that of the other serial communications equipment on the serial link. The meter ignores the parity when receiving data and sets the parity bit for outgoing data. If no parity is selected with 7 bit word length, an additional stop bit is used to force the frame size to 10 bits.

METER UNIT ADDRESS

ADDR SRL 247

- 0 TO 99 - RLC Protocol
- 1 TO 247 - ModBus

Select a Unit Address that does not match an address number of any other equipment on the serial link.

TRANSMIT DELAY

DELAY SRL 0.010 — 0.000 TO 0.250 SECONDS

Following a transmit value ("*" terminator) or Modbus command, the 2200 will wait this minimum amount of time in seconds before issuing a serial response

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The following programming steps are only available when Communications Type (TYPE) is programmed for RLC.

ABBREVIATED PRINTING

ABRV SRL NO — NO YES

Select YES for full print or Command T transmissions (meter address, mnemonics and parameter data) or NO for abbreviated print transmissions (parameter data only). This will affect all the parameters selected in the print options. If the meter address is 00, it will not be sent during a full transmission.

PRINT OPTIONS

OPT SRL NO — NO YES

YES - Enters the sub-menu to select the meter parameters to appear during a print request. For each parameter in the sub-menu, select YES for that parameter information to be sent during a print request or NO for that parameter information not to be sent. A print request is sometimes referred to as a block print because more than one parameter information (meter address, mnemonics and parameter data) can be sent to a printer or computer as a block.

DISPLAY	DESCRIPTION	FACTORY SETTING	MNEMONIC
INPUT	Signal Input	YES	INP
TOTAL	Total Value	NO	TOT
HILO	Max & Min	NO	MAX, MIN
SPNT	Setpoint Values	NO	SP1-SP4

SERIAL COMMUNICATIONS

The 2200 supports serial communications using the optional serial communication cards or via the USB programming port located on the side of the unit. When USB is being used (connected), the serial communication card is disabled. When using the standard RS232 and RS485 option cards, the 2200 supports both the NOSHOK protocol and also supports ModBus communications. The ModBus option card should not be used with the 2200, as the 2200 internal ModBus protocol supports complete unit configuration, and is much more responsive.

USB

The USB programming port is primarily intended to be used to configure the 2200 with the Crimson programming software. It can also, be used as a virtual serial communications port following installation of the 2200 USB drivers that are supplied with the Crimson software. When the USB port is being used, i.e. the USB cable is connected between 2200 and PC, all serial communications with the serial option card (if used) is disabled.

USB Cable type required: USB A to Mini-B (not supplied)

PAX2A CONFIGURATION USING CRIMSON AND USB

1. Install Crimson software.
2. Supply power to 2200
3. Insure "USB" parameter in module 7-SERIAL is set to "CONFIG" (factory default setting).
4. Attach USB A – MiniB cable between PC and 2200
5. Create a new (File, New) or open an existing 2200 database within Crimson.
6. Configure Crimson 2 Link, Options to the serial port the communication cable is attached (in Step 4).

SERIAL MODBUS COMMUNICATIONS

Modbus Communications requires that the Serial Communication Type Parameter (tYPE) be set to "Mbrtu" or "MbASC".

2200 CONFIGURATION USING CRIMSON AND SERIAL COMMUNICATIONS CARD

1. Install Crimson software.
2. Install RS232 or RS485 card and connect communications cable from 2200 to PC.
3. Supply power to 2200
4. Configure serial parameters in 7-SERIAL to Mbrtu, 38,400 baud, address 247.
5. Create a new (File, New) or open an existing 2200 database within Crimson.
6. Configure Crimson 2 Link, Options to the serial port the comunication cable is attached (in step 2).

SUPPORTED FUNCTION CODES

FC03: Read Holding Registers

1. Up to 32 registers can be requested at one time.
2. HEX <8000> is returned for non-used registers.

FC04: Read Input Registers

1. Up to 32 registers can be requested at one time.
2. Block starting point can not exceed register boundaries.
3. HEX <8000> is returned in registers beyond the boundaries.
4. Input registers are a mirror of Holding registers.

FC06: Preset Single Register

1. HEX <8001> is echoed back when attempting to write to a read only register.
2. If the write value exceeds the register limit (see Register Table), then that register value changes to its high or low limit. It is also returned in the response.

FC16: Preset Multiple Registers

1. No response is given with an attempt to write to more than 32 registers at a time.
2. Block starting point cannot exceed the read and write boundaries (40001-41280).
3. If a multiple write includes read only registers, then only the write registers will change.
4. If the write value exceeds the register limit (see Register Table), then that register value changes to its high or low limit.

FC08: Diagnostics

The following is sent upon FC08 request:

Module Address, 08 (FC code), 04 (byte count), "Total Comms" 2 byte count, "Total Good Comms" 2 byte count, checksum of the string

"Total Comms" is the total number of messages received that were addressed to the 2200. "Total Good Comms" is the total messages received by the 2200 with good address, parity and checksum. Both counters are reset to 0 upon response to FC08 and at power-up.

FC17: Report Slave ID

The following is sent upon FC17 request:

2200 ab<0100h><20h><20h><10h>
a = SP Card, "0"-No SP, "2" or "4" SP
b = Linear Card "0" = None, "1" = Yes
<0100> Software Version Number (1.00)
<20h>Max Register Reads (32)
<20h>Max Register Writes (32)
<10h> Number Guid/Scratch Pad Regs (16)

SUPPORTED EXCEPTION CODES

01: Illegal Function

Issued whenever the requested function is not implemented in the meter.

02: Illegal Data Address

Issued whenever an attempt is made to access a single register that does not exist (outside the implemented space) or to access a block of registers that falls completely outside the implemented space.

03: Illegal Data Value

Issued when an attempt is made to read or write more registers than the meter can handle in one request.

07: Negative Acknowledge

Issued when a write to a register is attempted with an invalid string length.

2200 MODBUS REGISTER TABLE

The below limits are shown as Integers or HEX < > values. Read and write functions can be performed in either Integers or Hex as long as the conversion was done correctly. Negative numbers are represented by two's complement.

Note 1: The 2200 should not be powered down while parameters are being changed. Doing so may corrupt the non-volatile memory resulting in checksum errors.

REGISTER ADDRESS		REGISTER NAME	LOW LIMIT	HIGH LIMIT	FACTORY SETTING	ACCESS	COMMENTS
		FREQUENTLY USED REGISTERS					
40001		Input Relative Value (Hi word)	N/A	N/A	N/A	Read Only	Process value of present input level. This value is affected by Input Type, Resolution, Scaling, & Offset Value. (Relative Value = Absolute Input Value + Offset Value)
40002		Input Relative Value (Lo word)					
40003		Maximum Value (Hi word)	-199999	999999	N/A	Read/Write	
40004		Maximum Value (Lo word)					
40005		Minimum Value (Hi word)	-199999	999999	N/A	Read/Write	
40006		Minimum Value (Lo word)					
40007		Total Value (Hi word)	-199999999	999999999	N/A	Read/Write	
40008		Total Value (Lo word)					
40009		Setpoint 1 Value (Hi word)	-199999	999999	100	Read/Write	Active List (A or B)
40010		Setpoint 1 Value (Lo word)					
40011		Setpoint 2 Value (Hi word)	-199999	999999	200	Read/Write	Active List (A or B)
40012		Setpoint 2 Value (Lo word)					
40013		Setpoint 3 Value (Hi word)	-199999	999999	300	Read/Write	Active List (A or B)
40014		Setpoint 3 Value (Lo word)					
40015		Setpoint 4 Value (Hi word)	-199999	999999	400	Read/Write	Active List (A or B)
40016		Setpoint 4 Value (Lo word)					
40017		Setpoint 1 Band/Dev. Value (Hi word)	-199999	999999	0	Read/Write	Active List (A or B). Applicable only for Band or Deviation Setpoint Action.
40018		Setpoint 1 Band/Dev. Value (Lo word)					
40019		Setpoint 2 Band/Dev. Value (Hi word)	-199999	999999	0	Read/Write	Active List (A or B). Applicable only for Band or Deviation Setpoint Action.
40020		Setpoint 2 Band/Dev. Value (Lo word)					
40021		Setpoint 3 Band/Dev. Value (Hi word)	-199999	999999	0	Read/Write	Active List (A or B). Applicable only for Band or Deviation Setpoint Action.
40022		Setpoint 3 Band/Dev. Value (Lo word)					
40023		Setpoint 4 Band/Dev. Value (Hi word)	-199999	999999	0	Read/Write	Active List (A or B). Applicable only for Band or Deviation Setpoint Action.
40024		Setpoint 4 Band/Dev. Value (Lo word)					
40025		Setpoint Output Register (SOR)	0	15	N/A	Read/Write	Status of Setpoint Outputs. Bit State: 0 = Off, 1 = On. Bit 3 = S1, Bit 2 = S2, Bit 1 = S3, Bit 0 = S4. Outputs can only be activated/reset with this register when the respective bits in the Manual Mode Register (MMR) are set.
40026		Manual Mode Register (MMR)	0	31	0	Read/Write	Bit State: 0 = Auto Mode, 1 = Manual Mode Bit 4 = S1, Bit 3 = S2, Bit 2 = S3, Bit 1 = S4, Bit 0 = Linear Output
40027		Reset Output Register	0	15	0	Read/Write	Bit State: 1 = Reset Output, bit is returned to zero following reset processing; Bit 3 = S1, Bit 2 = S2, Bit 1 = S3, Bit 0 = S4
40028		Analog Output Register (AOR)	0	4095	0	Read/Write	Linear Output Card written to only if Linear Output is in Manual Mode.(MMR bit 0 = 1)
40029		Input Absolute Value (Hi word)	N/A	N/A	N/A	Read Only	Gross value of present Input level. This value is affected by Input Type, Resolution, Scaling, but not affected by Offset Value
40030		Input Absolute Value (Lo word)					
40031		Input Offset Value (Hi word)	-199999	999999	0	Read/Write	Input Offset Value plus the Input Absolute Value equals the Relative Input Value (standard meter value).
40032		Input Offset Value (Lo word)					
		INPUT PARAMETERS					**SEE MODULE 1 FOR PARAMETER DESCRIPTIONS**
40081		Input Range	0	26	10	Read/Write	0 = 250µA 5 = 250mV 11 = 100Ω 17 = TC-K 23 = RTD 385 1 = 2.5mA 6 = 2V 12 = 1KΩ 18 = TC-R 24 = RTD 392 2 = 25mA 7 = 10V 13 = 10KΩ 19 = TC-S 25 = RTD 672 3 = 250mA 8 = 25V 14 = TC-T 20 = TC-B 26 = RTD 427 4 = 2A 9 = 100V 15 = TC-E 21 = TC-N 10 = 200V 16 = TC-J 22 = TC-C
40082		Temperature Scale (TC or RTD only)	0	1	1	Read/Write	0 = °C, 1 = °F
40083		Ice Point Compensation (TC only)	0	1	1	Read/Write	0 = Off, 1 = On
40084		ADC Conversion Rate (samples/sec)	0	5	0	Read/Write	0 = 5, 1 = 10, 2 = 20, 3 = 40, 4 = 80, 5 = 160
40085		Decimal Point	0	4	2	Read/Write	0 = 0, 1 = 0.0, 2 = 0.00, 3 = 0.000, 4 = 0.0000
40086		Rounding Factor	0	6	0	Read/Write	0 = 1, 1 = 2, 2 = 5, 3 = 10, 4 = 20, 5 = 50, 6 = 100
40087		Digital Input Filter	0	250	10	Read/Write	1 = 0.1 Second
40088		Filter Band	0	250	10	Read/Write	1 = 1 display unit
40089		Input Scaling Points in List Function	0	1	0	Read/Write	0 = No, 1 = Yes
List A	List B	**Input Scaling Points Parameters**					
40101	40201	Number of Scaling Points	2	16	2	Read/Write	Number of Linearization Scaling Points
40102	40202	Reserved	N/A	N/A	N/A	N/A	
40103	40203	Scaling Pt.1 Input Value (Hi word)	-199999	999999	0	Read/Write	1 = 1 in least significant digit (Input Range dependant)
40104	40204	Scaling Pt.1 Input Value (Lo word)					

REGISTER ADDRESS		REGISTER NAME	LOW LIMIT	HIGH LIMIT	FACTORY SETTING	ACCESS	COMMENTS
40105	40205	Scaling Pt.1 Display Value (Hi word)	-199999	999999	0	Read/Write	1 = 1 display unit (disregard decimal point)
40106	40206	Scaling Pt.1 Display Value (Lo word)					
thru	thru	Scaling Pts. 2 thru 15 Values	…	…	…	…	Registers 40107-40162 and 40207-40262 hold values for Scaling Points 2 thru 15, and follow the same ordering as Scaling Point 1.
40163	40263	Scaling Pt.16 Input Value (Hi word)	-199999	999999	0	Read/Write	1 = 1 in least significant digit (Input Range dependant)
40164	40264	Scaling Pt.16 Input Value (Lo word)					
40165	40265	Scaling Pt.16 Display Value (Hi word)	-199999	999999	0	Read/Write	1 = 1 display unit (disregard decimal point)
40166	40266	Scaling Pt.16 Display Value (Lo word)					
List A	List B	**Setpoint Values**					
40167	40267	Setpoint 1 Value (Hi word)	-199999	999999	100	Read/Write	1 = 1 display unit (disregard decimal point)
40168	40268	Setpoint 1 Value (Lo word)					
40169	40269	Setpoint 2 Value (Hi word)	-199999	999999	200	Read/Write	1 = 1 display unit (disregard decimal point)
40170	40270	Setpoint 2 Value (Lo word)					
40171	40271	Setpoint 3 Value (Hi word)	-199999	999999	300	Read/Write	1 = 1 display unit (disregard decimal point)
40172	40272	Setpoint 3 Value (Lo word)					
40173	40273	Setpoint 4 Value (Hi word)	-199999	999999	400	Read/Write	1 = 1 display unit (disregard decimal point)
40174	40274	Setpoint 4 Value (Lo word)					
40175	40275	Setpoint 1 Band/Dev. Value (Hi word)	-199999	999999	0	Read/Write	Applicable only for Band or Deviation Setpoint Action.
40176	40276	Setpoint 1 Band/Dev. Value (Lo word)					
40177	40277	Setpoint 2 Band/Dev. Value (Hi word)	-199999	999999	0	Read/Write	Applicable only for Band or Deviation Setpoint Action.
40178	40278	Setpoint 2 Band/Dev. Value (Lo word)					
40179	40279	Setpoint 3 Band/Dev. Value (Hi word)	-199999	999999	0	Read/Write	Applicable only for Band or Deviation Setpoint Action.
40180	40280	Setpoint 3 Band/Dev. Value (Lo word)					
40181	40281	Setpoint 4 Band/Dev. Value (Hi word)	-199999	999999	0	Read/Write	Applicable only for Band or Deviation Setpoint Action.
40182	40282	Setpoint 4 Band/Dev. Value (Lo word)					
		USER INPUT / FUNCTION KEYS					SEE MODULE 2 FOR PARAMETER DESCRIPTIONS
40301		User Input Active State	0	1	0	Read/Write	0 = Active Low, 1 = Active High
40302		User Input 1 Action	0	28	0	Read/Write	0 = NO, 1 = PLOC, 2 = rEL, 3 = d-rEL, 4 = d-HLd, 5 = A-HLd, 6 = SYNC, 7 = bAt, 8 = d-tot, 9 = r-tot1, 10 = r-tot2, 11 = E-tot, 12 = d-HI, 13 = r-HI, 14 = d-Lo, 15 = r-Lo, 16 = r-HL, 17 = dISP, 18 = d-LEV, 19 = Color, 20 = LISt, 21 = r-1, 22 = r-2, 23 = r-3, 24 = r-4, 25 = r-34, 26 = r-234, 27 = r-ALL, 28 = Print
40303		User Input 2 Action	0	28	0	Read/Write	Same as User Input 1 Action
40304		User F1 Key Action	0	17	0	Read/Write	0 = NO, 1 = rEL, 2 = d-rEL, 3 = bAt, 4 = r-tot, 5 = r-HI, 6 = r-Lo, 7 = r-HL, 8 = d-LEV, 9 = LISt, 10 = r-1, 11 = r-2, 12 = r-3, 13 = r-4, 14 = r-34, 15 = r-234, 16 = r-ALL, 17 = Print
40305		User F2 Key Action	0	17	0	Read/Write	Same as User F1 Key Action
40306		User F1 Second Action	0	17	0	Read/Write	Same as User F1 Key Action
40307		User F2 Second Action	0	17	0	Read/Write	Same as User F1 Key Action
		DISPLAY PARAMETERS					SEE MODULE 3 FOR PARAMETER DESCRIPTIONS
40331		Line 1 Display Color	0	2	0	Read/Write	0 = Green, 1 = Red, 2 = Orange
40332		Display Intensity Level	0	4	4	Read/Write	0 = Min.(off), 4 = Max.
40333		Display Contrast Level	0	15	7	Read/Write	
40334		Line 1 Display	0	8	1	Read/Write	0 = None, 1 = Input, 2 = Total, 3 = Hi, 4 = Lo, 5 = S1, 6 = S2, 7 = S3, 8 = S4
40335		Units Mnemonic	0	1	0	Read/Write	0 = Off, 1 = List
40336		Units Digit 1 (Left)	0	46	0	Read/Write	0 = _, 1 = A, 2 = b, 3 = C, 4 = d, 5 = E, 6 = F, 7 = G, 8 = H, 9 = I, 10 = J, 11 = K, 12 = L, 13 = M, 14 = O, 15 = P, 16 = Q, 17 = R, 18 = S, 19 = t, 20 = U, 21 = V, 22 = Y, 23 = Z, 24 = 0, 25 = 1, 26 = 2, 27 = 3, 28 = 4, 29 = 5, 30 = 6, 31 = 7, 32 = 8, 33 = 9, 34 = c, 35 = e, 36 = g, 37 = h, 38 = i, 39 = n, 40 = o, 41 = q, 42 = r, 43 = u, 44 = -, 45 = °, 46 =
40337		Units Digit 2 (Center)	0	46	0	Read/Write	Same selections as Digit 1
40338		Units Digit 3 (Right)	0	46	0	Read/Write	Same selections as Digit 1
40339		Line 2 Input Display Access	0	2	0	Read/Write	0=LOC, 1=d-rEd, 2=d-Ent
40340		Line 2 Totalizer Display Access	0	2	0	Read/Write	0=LOC, 1=d-rEd, 2=d-Ent
40341		Line 2 Maximum (Hi) Value Access	0	2	0	Read/Write	0=LOC, 1=d-rEd, 2=d-Ent
40342		Line 2 Minimum (Lo) Value Access	0	2	0	Read/Write	0=LOC, 1=d-rEd, 2=d-Ent
40343		Line 2 List Selection Access	0	5	0	Read/Write	0=LOC, 1=d-rEd, 2=d-ENt, 3=P-rEd, 4=P-ENt, 5=HidE
40344		Line 2 Setpoint 1 Value Access	0	5	0	Read/Write	0=LOC, 1=d-rEd, 2=d-ENt, 3=P-rEd, 4=P-ENt, 5=HidE
40345		Line 2 S1 Band/Dev. Value Access	0	5	0	Read/Write	0=LOC, 1=d-rEd, 2=d-ENt, 3=P-rEd, 4=P-ENt, 5=HidE
40346		Line 2 Setpoint 2 Value Access	0	5	0	Read/Write	0=LOC, 1=d-rEd, 2=d-ENt, 3=P-rEd, 4=P-ENt, 5=HidE
40347		Line 2 S2 Band/Dev.Value Access	0	5	0	Read/Write	0=LOC, 1=d-rEd, 2=d-ENt, 3=P-rEd, 4=P-ENt, 5=HidE

REGISTER ADDRESS	REGISTER NAME	LOW LIMIT	HIGH LIMIT	FACTORY SETTING	ACCESS	COMMENTS
40348	Line 2 Setpoint 3 Value Access	0	5	0	Read/Write	0=LOC, 1=d-rEd, 2=d-ENt, 3=P-rEd, 4=P-ENt, 5=HidE
40349	Line 2 S3 Band/Dev.Value Access	0	5	0	Read/Write	0=LOC, 1=d-rEd, 2=d-ENt, 3=P-rEd, 4=P-ENt, 5=HidE
40350	Line 2 Setpoint 4 Value Access	0	5	0	Read/Write	0=LOC, 1=d-rEd, 2=d-ENt, 3=P-rEd, 4=P-ENt, 5=HidE
40351	Line 2 S4 Band/Dev.Value Access	0	5	0	Read/Write	0=LOC, 1=d-rEd, 2=d-ENt, 3=P-rEd, 4=P-ENt, 5=HidE
40352	Reserved	N/A	N/A	N/A	N/A	
40353	Reserved	N/A	N/A	N/A	N/A	
40354	Reserved	N/A	N/A	N/A	N/A	
40355	Reserved	N/A	N/A	N/A	N/A	
40356	Line 2 Display Color Access	0	3	0	Read/Write	0=LOC, 1=P-rEd, 2=P-ENt, 3=HidE
40357	Line 2 Display Intensity Level Access	0	3	0	Read/Write	0=LOC, 1=P-rEd, 2=P-ENt, 3=HidE
40358	Line 2 Display Contrast Level Access	0	3	0	Read/Write	0=LOC, 1=P-rEd, 2=P-ENt, 3=HidE
40359	Line 2 Zero (Tare) Display Access	0	2	0	Read/Write	0=LOC, 1=P-ENt, 2=HidE
40360	Line 2 Batch Input to Totalizer Access	0	2	0	Read/Write	0=LOC, 1=P-ENt, 2=HidE
40361	Line 2 Reset Totalizer Access	0	2	0	Read/Write	0=LOC, 1=P-ENt, 2=HidE
40362	Line 2 Reset Max (Hi) Display Access	0	2	0	Read/Write	0=LOC, 1=P-ENt, 2=HidE
40363	Line 2 Reset Min (Lo) Display Access	0	2	0	Read/Write	0=LOC, 1=P-ENt, 2=HidE
40364	Line 2 Reset Max and Min Access	0	2	0	Read/Write	0=LOC, 1=P-ENt, 2=HidE
40365	Line 2 Reset Alarm 1 Access	0	2	0	Read/Write	0=LOC, 1=P-ENt, 2=HidE
40366	Line 2 Reset Alarm 2 Access	0	2	0	Read/Write	0=LOC, 1=P-ENt, 2=HidE
40367	Line 2 Reset Alarm 3 Access	0	2	0	Read/Write	0=LOC, 1=P-ENt, 2=HidE
40368	Line 2 Reset Alarm 4 Access	0	2	0	Read/Write	0=LOC, 1=P-ENt, 2=HidE
40369	Line 2 Reset Alarm 3 and 4 Access	0	2	0	Read/Write	0=LOC, 1=P-ENt, 2=HidE
40370	Line 2 Reset Alarm 2, 3 and 4 Access	0	2	0	Read/Write	0=LOC, 1=P-ENt, 2=HidE
40371	Line 2 Reset All Alarms (1-4) Access	0	2	0	Read/Write	0=LOC, 1=P-ENt, 2=HidE
40372	Line 2 Print Request Access	0	2	0	Read/Write	0=LOC, 1=P-ENt, 2=HidE
40373	Line 2 Security Code Value	0	250	0	Read/Write	
	SECONDARY PARAMETERS					SEE MODULE 4 FOR PARAMETER DESCRIPTIONS
40381	Max (Hi) Capture Value Assignment	0	1	0	Read/Write	0 = Relative, 1 = Absolute
40382	Max (Hi) Capture Delay Time	0	32750	10	Read/Write	0 = Max Update Rate, 1 = 0.1Sec
40383	Min (Lo) Capture Value Assignment	0	1	0	Read/Write	0 = Relative, 1 = Absolute
40384	Min (Lo) Capture Delay Time	0	32750	10	Read/Write	0 = Max Update Rate, 1 = 0.1Sec
40385	Display Update (readings per second)	0	4	0	Read/Write	0 = 1, 1 = 2, 2 = 5, 3 = 10, 4 = 20
	TOTALIZER PARAMETERS					SEE MODULE 5 FOR PARAMETER DESCRIPTIONS
40391	Totalizer Decimal Point	0	4	3	Read/Write	0 = 0, 1 = 0.0, 2 = 0.00, 3 = 0.000, 4 = 0.0000
40392	Totalizer Time Base	0	3	1	Read/Write	0 = Second, 1 = Minute, 2 = Hour, 3 = Day
40393	Totalizer Scale Factor	1	65000	1000	Read/Write	1 = 0.001
40394	Totalizer Reset at Power Up	0	1	0	Read/Write	0 = No, 1 = Yes
40395	Totalizer Low Cut Value (Hi word)	-199999	999999	-199999	Read/Write	
40396	Totalizer Low Cut Value (Lo word)					
	SETPOINT PARAMETERS					SEE MODULE 6 FOR PARAMETER DESCRIPTIONS
	Setpoint 1					
40401	Assignment	0	3	0	Read/Write	0 = None, 1 = Rel, 2 = Abs, 3 = Total
40402	Action	0	10	0	Read/Write	0=No, 1=Ab-HI, 2=Ab-LO, 3=AU-HI, 4=AU-LO, 5=dE-HI, 6=dE-LO, 7=bANd, 8=bNdIn, 9=totLo, 10=totHI
40403	Hysteresis Value	1	65000	2	Read/Write	1 = 1 Display Unit
40404	On Time Delay	0	32750	0	Read/Write	1 = 0.1 Second
40405	Off Time Delay	0	32750	0	Read/Write	1 = 0.1 Second
40406	Output Logic	0	1	0	Read/Write	0 = Normal, 1 = Reverse
40407	Reset Action	0	2	0	Read/Write	0 = Auto, 1 = Latch1, 2 = Latch2
40408	Standby Operation	0	1	0	Read/Write	0 = No, 1 = Yes
40409	Annunciator	0	3	1	Read/Write	0 = Off, 1 = Normal, 2 = Reverse, 3 = Flash
40410	Color	0	7	0	Read/Write	0 = No Change, 1 = Green, 2 = Orange, 3 = Red, 4 = Grn/Org, 5 = Red/Org, 6 = Red/Grn, 7 = Line 1 Color
40411	Probe Failure Action (TC or RTD only)	0	1	0	Read/Write	0 = Off, 1 = On (only applies for TC or RTD input)
	Setpoint 2					
40421	Assignment	0	3	0	Read/Write	0 = None, 1 = Rel, 2 = Abs, 3 = Total
40422	Action	0	10	0	Read/Write	0=No, 1=Ab-HI, 2=Ab-LO, 3=AU-HI, 4=AU-LO, 5=dE-HI, 6=dE-LO, 7=bANd, 8=bNdIn, 9=totLo, 10=totHI
40423	Hysteresis Value	1	65000	2	Read/Write	1 = 1 Display Unit
40424	On Time Delay	0	32750	0	Read/Write	1 = 0.1 Second
40425	Off Time Delay	0	32750	0	Read/Write	1 = 0.1 Second
40426	Output Logic	0	1	0	Read/Write	0 = Normal, 1 = Reverse
40427	Reset Action	0	2	0	Read/Write	0 = Auto, 1 = Latch1, 2 = Latch2

REGISTER ADDRESS	REGISTER NAME	LOW LIMIT	HIGH LIMIT	FACTORY SETTING	ACCESS	COMMENTS
40428	Standby Operation	0	1	0	Read/Write	0 = No, 1 = Yes
40429	Annunciator	0	3	1	Read/Write	0 = Off, 1 = Normal, 2 = Reverse, 3 = Flash
40430	Color	0	7	0	Read/Write	0 = No Change, 1 = Green, 2 = Orange, 3 = Red, 4 = Grn/Org, 5 = Red/Org, 6 = Red/Grn, 7 = Line 1 Color
40431	Probe Failure Action (TC or RTD only)	0	1	0	Read/Write	0 = Off, 1 = On (only applies for TC or RTD input)
	Setpoint 3					
40441	Assignment	0	3	0	Read/Write	0 = None, 1 = Rel, 2 = Abs, 3 = Total
40442	Action	0	10	0	Read/Write	0=No, 1=Ab-HI, 2=Ab-LO, 3=AU-HI, 4=AU-LO, 5=dE-HI, 6=dE-LO, 7=bANd, 8=bNdIn, 9=totLo, 10=totHI
40443	Hysteresis Value	1	65000	2	Read/Write	1 = 1 Display Unit
40444	On Time Delay	0	32750	0	Read/Write	1 = 0.1 Second
40445	Off Time Delay	0	32750	0	Read/Write	1 = 0.1 Second
40446	Output Logic	0	1	0	Read/Write	0 = Normal, 1 = Reverse
40447	Reset Action	0	2	0	Read/Write	0 = Auto, 1 = Latch1, 2 = Latch2
40448	Standby Operation	0	1	0	Read/Write	0 = No, 1 = Yes
40449	Annunciator	0	3	1	Read/Write	0 = Off, 1 = Normal, 2 = Reverse, 3 = Flash
40450	Color	0	7	0	Read/Write	0 = No Change, 1 = Green, 2 = Orange, 3 = Red, 4 = Grn/Org, 5 = Red/Org, 6 = Red/Grn, 7 = Line 1 Color
40451	Probe Failure Action (TC or RTD only)	0	1	0	Read/Write	0 = Off, 1 = On (only applies for TC or RTD input)
	Setpoint 4					
40461	Assignment	0	3	0	Read/Write	0 = None, 1 = Rel, 2 = Abs, 3 = Total
40462	Action	0	10	0	Read/Write	0=No, 1=Ab-HI, 2=Ab-LO, 3=AU-HI, 4=AU-LO, 5=dE-HI, 6=dE-LO, 7=bANd, 8=bNdIn, 9=totLo, 10=totHI
40463	Hysteresis Value	1	65000	2	Read/Write	1 = 1 Display Unit
40464	On Time Delay	0	32750	0	Read/Write	1 = 0.1 Second
40465	Off Time Delay	0	32750	0	Read/Write	1 = 0.1 Second
40466	Output Logic	0	1	0	Read/Write	0 = Normal, 1 = Reverse
40467	Reset Action	0	2	0	Read/Write	0 = Auto, 1 = Latch1, 2 = Latch2
40468	Standby Operation	0	1	0	Read/Write	0 = No, 1 = Yes
40469	Annunciator	0	3	1	Read/Write	0 = Off, 1 = Normal, 2 = Reverse, 3 = Flash
40470	Color	0	7	0	Read/Write	0 = No Change, 1 = Green, 2 = Orange, 3 = Red, 4 = Grn/Org, 5 = Red/Org, 6 = Red/Grn, 7 = Line 1 Color
40471	Probe Failure Action (TC or RTD only)	0	1	0	Read/Write	0 = Off, 1 = On (only applies for TC or RTD input)
	SERIAL COMMUNICATIONS PARAMETERS					SEE MODULE 7 FOR PARAMETER DESCRIPTIONS
40481	USB Mode	0	1	0	Read/Write	0 = Configuration, 1 = Port
40482	Type	0	2	2	Read/Write	0 = Protocol (ASCII), 1 = Modbus RTU, 2 = Modbus ASCII
40483	Baud Rate	0	5	5	Read/Write	0=1200, 1=2400, 2=4800, 3=9600, 4=19200, 5=38400
40484	Data Bits	0	1	1	Read/Write	0 = 7 Bits, 1 = 8 Bits
40485	Parity	0	2	0	Read/Write	0 = None, 1 = Even, 2 = Odd
40486	Address	0	99	247	Read/Write	Protocol: 0-99
		1	247			Modbus: 1-247
40487	Transmit Delay	0	250	10	Read/Write	1 = 0.001 Second
40488	Abbreviated Transmission (RLC only)	0	1	0	Read/Write	0 = No, 1 = Yes (Not used when communications type is Modbus)
40489	Print Options (RLC only)	0	15	1	Read/Write	0 = No, 1 = Yes (Not used when communications type is Modbus) Bit 0 – Print Input Value, Bit 1 – Print Total Value, Bit 2 – Print Max & Min Values, Bit 3 – Print Setpoint Values
40490	Load Serial Settings	0	1	0	Read/Write	Changing 40481-40487 will not update the PAX2A until this register is written with a 1. After the write, the communicating device must be changed to new PAX2A settings and this register returns to 0.
	ANALOG OUTPUT PARAMETERS					SEE MODULE 8 FOR PARAMETER DESCRIPTIONS
40491	Type	0	2	1	Read/Write	0 = 0-20 mA, 1 = 4-20 mA, 2 = 0-10 V
40492	Assignment	0	9	0	Read/Write	0=NONE, 1=rEL, 2=AbS, 3=tOtAL, 4=HI, 5=LO, 6=S1, 7=S2, 8=S3, 9=S4
40493	Analog Low Scale Value (Hi word)	-199999	999999	0	Read/Write	Display value that corresponds with 0 V, 0 mA or 4 mA output
40494	Analog Low Scale Value (Lo word)					
40495	Analog High Scale Value (Hi word)	-199999	999999	10000	Read/Write	Display value that corresponds with 10 V or 20 mA output
40496	Analog High Scale Value (Lo word)					
40497	Update time	0	100	0	Read/Write	0 = Max update rate, 1 = 0.1 Second
40498	Probe Failure Action (TC or RTD only)	0	1	0	Read/Write	0 = Low Scale, 1 = High Scale (only applies for TC or RTD input)

REGISTER ADDRESS	REGISTER NAME	LOW LIMIT	HIGH LIMIT	FACTORY SETTING	ACCESS	COMMENTS
	FACTORY SERVICE					
40501-40506	Factory Service Registers	N/A	N/A	N/A	Read/Write	Factory Use Only - Do Not Modify
41001-41010	Slave ID	N/A	N/A	N/A	Read Only	RLC-PAX2A <a><b><0100h><0020h><0020h><0010h> <a> = SP Card Status. “0”-No Card, “2”-Dual SP, “4”-Quad SP <b> = Linear Card Status. “0”-Not Installled, “1”-Installed <0100h> = Version Number (1.00 or higher) <0020h><0020h> = 32 Register Writes, 32 Register Reads (Max.) <0010h> = 16 Register GUID/Scratch
41101-41116	GUID/Scratch	N/A	N/A	N/A	Read/Write	Reserved

SERIAL PROTOCOL COMMUNICATIONS

Protocol requires the Serial Communications Type Parameter (tYPE) be set to “rLC ”.

SENDING SERIAL COMMANDS AND DATA TO THE METER

When sending commands to the meter, a string containing at least one command character must be constructed. A command string consists of a command character, a value identifier, numerical data (if writing data to the meter) followed by a command terminator character * or $.

Command Chart

COMMAND	DESCRIPTION	NOTES
N	Node Address Specifier	Address a specific meter. Must be followed by a one or two digit node address. Not required when address = 0.
T	Transmit Value (read)	Read a register from the meter. Must be followed by register ID character
V	Value Change (write)	Write to register or output. Must be followed by register ID character and numeric data.
R	Reset	Reset a register or output. Must be followed by register ID character.
P	Block Print Request	Initiates a block print output. Registers are defined in programming.

Command String Construction

The command string must be constructed in a specific sequence. The meter does not respond with an error message to invalid commands. The following procedure details construction of a command string:

1. The first characters consist of the Node Address Specifier (N) followed by a 1 or 2 character address number. The address number of the meter is programmable. If the node address is 0, this command and the node address itself may be omitted. This is the only command that may be used in conjunction with other commands.
2. After the address specifier, the next character is the command character.
3. The next character is the Register ID. This identifies the register that the command affects. The P command does not require a Register ID character. It prints according to the selections made in print options.
4. If constructing a value change command (writing data), the numeric data is sent next.
5. All command strings must be terminated with the string termination characters * or $. The meter does not begin processing the command string until this character is received. See Timing Diagram figure for differences between terminating characters.

Register Identification Chart

ID	VALUE DESCRIPTION	MNEMONIC	APPLICABLE COMMANDS/COMMENTS
A	Input (relative value)	INP	T, P, R (Reset command resets input to zero; tares)
B	Total	TOT	T, P, R (Reset command resets total to zero)
C	Max Input	MAX	T, P, R (Reset command resets Max to current reading)
D	Min Input	MIN	T, P, R (Reset command resets Min to current reading)
E	Setpoint 1	SP1	T, P, V, R (Reset command resets the setpoint output)
F	Setpoint 2	SP2	
G	Setpoint 3	SP3	
H	Setpoint 4	SP4	
I	Band/Deviation 1	BD1	T, V
J	Band/Deviation 2	BD2	T, V
K	Band/Deviation 3	BD3	T, V
L	Band/Deviation 4	BD4	T, V
M	Absolute Input value	ABS	T
O	Offset	OFS	T, V
U	Auto/Manual Register	MMR	T, V
W	Analog Output Register	AOR	T, V
X	Setpoint Register	SOR	T, V

Command String Examples:

1. Node address = 17, Write 350 to Setpoint 1.
   String: N17VE350$
2. Node address = 5, Read Input value.
   String: N5TA*
3. Node address = 0, Reset Setpoint 4 output.
   String: RH*

Sending Numeric Data

Numeric data sent to the meter must be limited to 6 digits (-199999 to 999999). Leading zeros are ignored. Negative numbers must have a minus sign. The meter ignores any decimal point and conforms the number to the scaled resolution. (For example: the meter’s scaled decimal point position = 0.0 and 25 is written to a register. The value of the register is now 2.5.

Note: Since the meter does not issue a reply to value change commands, follow with a transmit value command for readback verification.

RECEIVING DATA FROM THE METER

Data is transmitted by the meter in response to either a transmit command (T), a print block command (P) or User Function print request. The response from the meter is either a full field transmission or an abbreviated transmission. The meter response mode is selected in program Module 7 (Abru).

Full Field Transmission (Address, Mnemonic, Numeric data)

Byte	Description
1, 2	2 byte Node Address field [00-99]
3	<SP> (Space)
4-6	3 byte Register Mnemonic field
7-18	2 byte data field, 10 bytes for number, one byte for sign, one byte for decimal point
19	<CR> carriage return
20	<LF> line feed
21	<SP>* (Space)
22	<CR>* carriage return
23	<LF>* line feed

** These characters only appear in the last line of a block print.*

The first two characters transmitted are the node address, unless the node address assigned = 0, in which case spaces are substituted. A space follows the node address field. The next three characters are the register mnemonic.

The numeric data is transmitted next. The numeric field is 12 characters long (to accommodate the 10 digit totalizer), with the decimal point position floating within the data field. Negative values have a leading minus sign. The data field is right justified with leading spaces.

The end of the response string is terminated with a carriage return <CR> and <LF>. When block print is finished, an extra <SP><CR> <LF> is used to provide separation between the blocks.

Abbreviated Transmission (Numeric data only)

Byte	Description
1-12	12 byte data field, 10 bytes for number, one byte for sign, one byte for decimal point
13	<CR> carriage return
14	<LF> line feed
15	<SP>* (Space)
16	<CR>* carriage return
17	<LF>* line feed

** These characters only appear in the last line of a block print.*

Meter Response Examples:

1. Node address = 17, full field response, Input = 875
   17 INP 875 <CR><LF>
2. Node address = 0, full field response, Setpoint 2 = -250.5
   SP2 -250.5<CR><LF>
3. Node address = 0, abbreviated response, Setpoint 2 = 250, last line of block print
   250<CR><LF><SP><CR><LF>

Auto/Manual Mode Register (MMR) ID: U

This register sets the controlling mode for the outputs. In Auto Mode (0) the meter controls the setpoint and analog output. In Manual Mode (1) the outputs are defined by the registers SOR and AOR. When transferring from auto mode to manual mode, the meter holds the last output value (until the register is changed by a write). Each output may be independently changed to auto or manual. In a write command string (VU), any character besides 0 or 1 in a field will not change the corresponding output mode.

```
U abcde
  ││││└─e = Analog Output
  │││└──d = SP4
  ││└───c = SP3
  │└────b = SP2
  └─────a = SP1
```

Example: VU00011 places SP4 and Analog in manual.

Analog Output Register (AOR) ID: W

This register stores the present signal value of the analog output. The range of values of this register is 0 to 4095, which corresponds to the analog output range per the following chart:

Register Value	Output Signal*		
	0-20 mA	4-20 mA	0-10 V
0	0.00	4.00	0.000
1	0.005	4.004	0.0025
2047	10.000	12.000	5.000
4094	19.995	19.996	9.9975
4095	20.000	20.000	10.000

**Due to the absolute accuracy rating and resolution of the output card, the actual output signal may differ 0.15% FS from the table values. The output signal corresponds to the range selected (0-20 mA, 4-20 mA or 0-10 V).*

Writing to this register (VW) while the analog output is in the Manual Mode causes the output signal level to update immediately to the value sent. While in the Automatic Mode, this register may be written to, but it has no effect until the analog output is placed in the manual mode. When in the Automatic Mode, the meter controls the analog output signal level. Reading from this register (TW) will show the present value of the analog output signal.

Example: VW2047 will result in an output of 10.000 mA, 12.000 mA or 5.000V depending on the range selected.

Setpoint Output Register (SOR) ID: X

This register stores the states of the setpoint outputs. Reading from this register (TX) will show the present state of all the setpoint outputs. A "0" in the setpoint location means the output is off and a "1" means the output is on.

```
X abcd
  │││└─ d = SP4
  ││└── c = SP3
  │└─── b = SP2
  └──── a = SP1
```

In Automatic Mode, the meter controls the setpoint output state. In Manual Mode, writing to this register (VX) will change the output state. Sending any character besides 0 or 1 in a field or if the corresponding output was not first in manual mode, the corresponding output value will not change. (It is not necessary to send least significant 0s.)

Example: VX10 will result in output 1 on and output 2 off.

COMMAND RESPONSE TIME

The meter can only receive data or transmit data at any one time (half-duplex operation). When sending commands and data to the meter, a delay must be imposed before sending another command. This allows enough time for the meter to process the command and prepare for the next command.

At the start of the time interval t_1, the computer program prints or writes the string to the com port, thus initiating a transmission. During t_1, the command characters are under transmission and at the end of this period, the command terminating character (*) is received by the meter. The time duration of t_1 is dependent on the number of characters and baud rate of the channel.

$$t_1 = (10 * \# \text{ of characters}) / \text{baud rate}$$

At the start of time interval t_2, the meter starts the interpretation of the command and when complete, performs the command function. This time interval t_2 varies from 2 msec to 15 msec. If no response from the meter is expected, the meter is ready to accept another command.

If the meter is to reply with data, the time interval t_2 is controlled by the use of the command terminating character and the (Serial Transmit Delay parameter (dELAY)). The standard command line terminating character is "*". This terminating character results in a response time window of the Serial Transmit Delay time (dELAY) plus 15 msec. maximum. The dELAY parameter should be programmed to a value that allows sufficient time for the release of the sending driver on the RS485 bus. Terminating the command line with "$" results in a response time window (t_2) of 2 msec minimum and 15 msec maximum. The response time of this terminating character requires that sending drivers release within 2 msec after the terminating character is received.

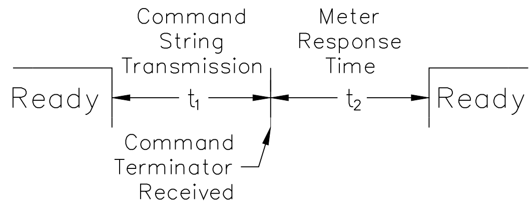
At the beginning of time interval t_3, the meter responds with the first character of the reply. As with t_1, the time duration of t_3 is dependent on the number of characters and baud rate of the channel.

$$t_3 = (10 * \# \text{ of characters}) / \text{baud rate}.$$

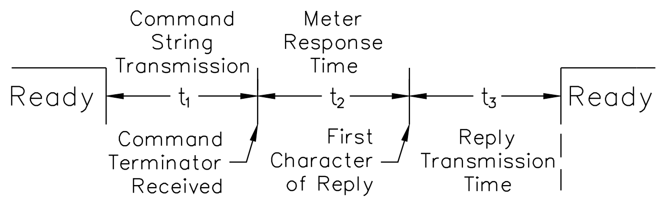
At the end of t_3, the meter is ready to receive the next command. The maximum serial throughput of the meter is limited to the sum of the times t_1, t_2 and t_3.

Timing Diagrams

NO REPLY FROM METER



RESPONSE FROM METER



COMMUNICATION FORMAT

Data is transferred from the meter through a serial communication channel. In serial communications, the voltage is switched between a high and low level at a predetermined rate (baud rate) using ASCII encoding. The receiving device reads the voltage levels at the same intervals and then translates the switched levels back to a character.

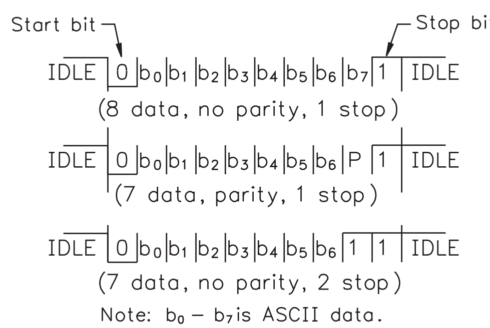
The voltage level conventions depend on the interface standard. The table lists the voltage levels for each standard.

LOGIC	INTERFACE STATE	RS232*	RS485*
1	mark (idle)	TXD,RXD; -3 to -15 V	a-b < -200 mV
0	space (active)	TXD,RXD; +3 to +15 V	a-b > +200 mV
* Voltage levels at the Receiver			

Data is transmitted one byte at a time with a variable idle period between characters (0 to ∞). Each ASCII character is "framed" with a beginning start bit, an optional parity bit and one or more ending stop bits. The data format and baud rate must match that of other equipment in order for communication to take place. The figures list the data formats employed by the meter.

Start bit and Data bits

Data transmission always begins with the start bit. The start bit signals the receiving device to prepare for reception of data. One bit period later, the least significant bit of the ASCII encoded character is transmitted, followed by the remaining data bits. The receiving device then reads each bit position as they are transmitted. Since the sending and receiving devices operate at the same transmission speed (baud rate), the data is read without timing errors.



Character Frame Figure

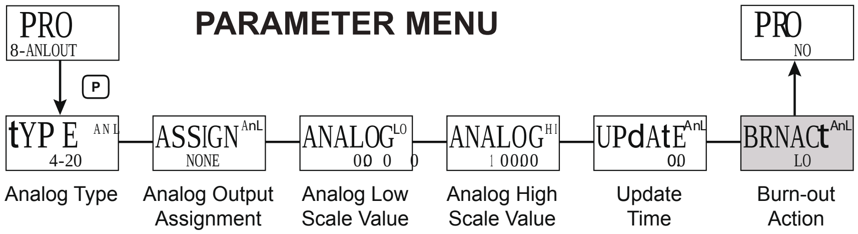
Parity bit

After the data bits, the parity bit is sent. The transmitter sets the parity bit to a zero or a one, so that the total number of ones contained in the transmission (including the parity bit) is either even or odd. This bit is used by the receiver to detect errors that may occur to an odd number of bits in the transmission. However, a single parity bit cannot detect errors that may occur to an even number of bits. Given this limitation, the parity bit is often ignored by the receiving device. The 2200 meter ignores the parity bit of incoming data and sets the parity bit to odd, even or none (mark parity) for outgoing data.

Stop bit

The last character transmitted is the stop bit. The stop bit provides a single bit period pause to allow the receiver to prepare to re-synchronize to the start of a new transmission (start bit of next byte). The receiver then continuously looks for the occurrence of the start bit. If 7 data bits and no parity is selected, then 2 stop bits are sent from the 2200 meter.

MODULE 8 - ANALOG OUTPUT PARAMETERS (8-AnLOut)



This module is only accessible with the optional Analog card installed.

Programming information contained in this manual supercedes all programming information included with the card.

ANALOG OUTPUT TYPE

tYPE ANL 4-20

4-20   0-10   0-20

Enter the analog output type. For 0-20 mA or 4-20 mA use terminals 18 and 19. For 0-10 V use terminals 16 and 17. Only one range can be used at a time.

ANALOG OUTPUT ASSIGNMENT

ASSIGN ANL NONE

NONE   REL   ABS   TOTAL   HI   LO
S1   S2   S3   S4

Enter the source for the analog output to retransmit:

NONE = Manual Mode operation. (See Module 7, Serial Protocol).
REL = Relative (net) Input Value. The Relative Input Value is the Absolute Input Value including the Display Offset Value.
ABS = Absolute (gross) Input Value. The Absolute Input Value is the scaled input value. It does not include the Display Offset Value.
TOTAL = Totalizer Value
HI = Maximum Display Value
LO = Minimum Display Value
S1 -S4 = Setpoint Values

ANALOG LOW SCALE VALUE

ANALOG LO 0

-199999 TO 999999

Enter the Display Value that corresponds to 0 mA (0-20 mA) , 4 mA (4-20 mA) or 0 VDC (0-10 VDC).

ANALOG HIGH SCALE VALUE

ANALOG HI 10000

-199999 TO 999999

Enter the Display Value that corresponds to 20 mA (0-20 mA) , 20 mA (4-20 mA) or 10 VDC (0-10 VDC).

ANALOG UPDATE TIME

UPDATE ANL 0.0

0.0 TO 0.0 1

Enter the analog output update rate in seconds. A value of 0.0 allows the meter to update the analog output at the ADC Conversion Rate.

The following programming step is only available when Input Range in Module 1 is set for a temperature input (TC/RTD).

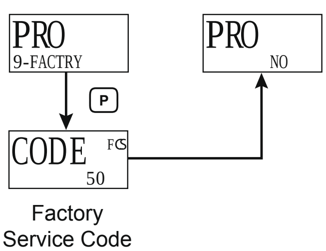
PROBE BURN-OUT ACTION

BRNACT ANL LO

HI   LO

Enter the probe burn-out action. In the event of a temperature probe failure, the analog output can be programmed for low or high scale.

MODULE 9 - FACTORY SERVICE OPERATIONS (9-FACtrY)



PARAMETER MENU

RESTORE FACTORY DEFAULTS

CODE FCS 66 — P — RESET — CODE FCS 50

Use the ! and @ keys to display COdE 66 and press **P**. The meter will flash rESEt and then return to COdE 50. Press the **P** key to return to Display Mode. This will overwrite all user settings with the factory settings.

MODEL AND CODE VERSION

CODE FCS 51 — P — P2A FCS VER X.XX — CODE FCS 50

The meter will briefly display the model (P2A) on Line 1, and the current firmware version (UEr x.xx) on Line 2, and then return to COdE50.

CALIBRATION

CODE FCS 48 — P — CAL FCS NO

NO   CURR   UOLT
OHMS   TC   ICE
RTD   ANLOUT

The meter has been fully calibrated at the factory. Scaling to convert the input signal to a desired display value is performed in Module 1. If the meter appears to be indicating incorrectly or inaccurately, refer to Troubleshooting before attempting to calibrate the meter. When recalibration is required (generally every 2 years), it should only be performed by qualified technicians using appropriate equipment. Calibration does not change any user programmed parameters. However, it will affect the accuracy of the input signal and the values previously stored using the Apply (APPLY) Scaling Style.

Preparation for Current, Volt, and Ohm Input Calibration

Warning: Input Calibration of this meter requires a signal source capable of producing a signal greater than or equal to the range being calibrated with an accuracy of 0.01% or better.

Before starting, verify that the Input Range, T/V, and Excitation Jumper is set for the range to be calibrated. Verify that the precision signal source is connected and ready. Allow a 30 minute warm-up period before calibrating the meter. Selecting NO at any calibration step, will cause the unit to maintain the existing calibration parameters for that step. Selecting YES and pressing the **P** key will cause the unit to store new calibration settings for the range selected. Pressing **D** at any time will exit programming mode, but any range that has been calibrated will maintain the new settings.

Current, Volt and Ohm Calibration Procedure

1. After entering CodE 48, in Module 9, select the input signal type (Curr, VoLt, OhMS) to be calibrated.
2. Press the **P** key until the desired range along with ZER is indicated on Line 1 of the meter.
3. Apply the zero input limit of the range indicated on Line 1 of the meter.
4. Press F1 to select YES.
5. Press **P**. Display will indicate - - - - on Line 2 as the unit reads and stores the new calibration parameter.
6. Display will indicate the desired range along with FUL on Line 1 of the meter.
7. Apply the signal level indicated on Line 1 of the meter.
8. Press F1 to select YES.
9. Press **P**. Display will indicate - - - - on Line 2 as the unit reads and stores the new calibration parameter.
10. Repeat Preparation and Calibration Procedure for each Input Range to be calibrated.

Preparation for TC calibration

TC calibration parameters will affect RTD calibration. If using an RTD, it is recommended that the RTD calibration be performed after completing the TC calibration.

Warning: TC Input Calibration of this meter requires a signal source capable of producing a 60 mV signal with an accuracy of 0.01% or better.

Before starting, verify the T/V jumper is in the T position. Verify the precision signal source is connected and ready. Allow a 30 minute warm-up period before calibrating the meter. Selecting NO at any calibration step, will cause the unit to maintain the existing calibration parameters for that step. Selecting YES and pressing **P** key will cause the unit to store new calibration settings for the range selected. Pressing **D** at any time will exit programming mode, but any range that has been calibrated will maintain the new settings.

TC Calibration Procedure

1. After entering CodE 48, in Module 9, select the tc.
2. Press the **P** key. Display will indicate 0.060V with ZER in upper right.
3. Apply 0 mV to input.
4. Press F1 to select YES.
5. Press **P**. Display will indicate - - - - on Line 2 as the unit reads and stores the new calibration parameter.
6. Display will indicate 0.060V with FUL in upper right.
7. Apply 60 mV to input.
8. Press F1 to select YES.
9. Press **P**. Display will indicate - - - - on Line 2 as the unit reads and stores the new calibration parameter.
10. TC Calibration complete.

Preparation for RTD Input Calibration

RTD calibration is dependent on TC calibration parameters. Therefore, the TC calibration should be performed prior to attempting the RTD calibration.

Warning: RTD Input Calibration of this meter requires a signal source capable of producing a 300 ohm resistance with an accuracy of 0.01% or better.

Before starting, verify that the T/V Jumper is in the T position. Verify the RTD jumper is in the proper range. Verify the precision signal source is connected and ready. Allow a 30 minute warm-up period before calibrating the meter. Selecting NO at any calibration step, will cause the unit to maintain the existing calibration parameters for that step. Selecting YES and pressing **P** key will cause the unit to store new calibration settings for the range selected. Pressing **D** at any time will exit programming mode, but any range that has been calibrated will maintain the new settings.

RTD Calibration Procedure

1. After entering Code 48, in Module 9, select rtd.
2. Press the **P** key until the desired range along with 0 in upper right corner is indicated on Line 1 of the meter.
3. Apply zero ohms to the input of the meter.
4. Press F1 to select YES.
5. Press **P**. Display will indicate - - - - on Line 2 as the unit reads and stores the new calibration parameter.
6. Display will indicate the desired range along with a value in the upper right corner, in ohms, to be applied in the next step on Line 1 of the meter.
7. Apply the signal level, in ohms, indicated in the upper right corner of Line 1 on the meter.
8. Press F1 to select YES.
9. Press **P**. Display will indicate - - - - on Line 2 as the unit reads and stores the new calibration parameter.
10. Repeat Preparation and Calibration Procedure for each Input Range to be calibrated.

Ice Point Calibration Procedure

1. Remove all option cards.
2. Verify ambient temperature of meter environment is between 20°C and 30°C.
3. Set T/V jumper in the T position.
4. Connect a thermocouple with an accuracy of 1°C or better to the meter.
5. In Module 1 of unit programming, verify Input Range (rANGE) is set to the type thermocouple connected in step 4, Temperature Scale (SCALE) is °C, Ice Point Compensation (ICE) is turned ON, Decimal Resolution (dECPNt) is 0.0, Rounding Increment (round) is 0.1 and Display Offset (OFFSEt) is set to 0.
6. Place the thermocouple in close thermal contact to a reference thermometer probe. (Use a reference thermometer with an accuracy of 0.25% °C or better.) The two probes should be shielded from air movement and allowed sufficient time to equalize in temperature. (A calibration bath could be used in place of the thermometer.)
7. If a difference exits between 2200 display and reference thermometer, continue calibration.
8. Note the 2200 display reading as the "Display Mode" reading to be used in Step 12.
9. Enter Module 9, select CodE 48 and press **P**.
10. Select ICE and press **P**.
11. Display will indicate the Existing ICE Point Value.
12. Calculate a new ICE Point Value using: Existing ICE Point Value + (reference temperature – Display Mode reading). All values are in °C.
13. Using F1 and F2 change Existing ICE Point Value to indicate the new ICE Point Value calculated in Step 12.
14. Press **P** and return to Display Mode. Verify the Display Mode reading (with 0 Display Offset) matches the reference temperature. If not, repeat steps 8 thru 14.

Preparation for Analog Output Card Calibration

Warning: Calibration of this meter requires an external meter with an accuracy of 0.005% or better.

Before starting, verify that the precision voltmeter (voltage output) or current meter (current output) is connected and ready. Perform the following procedure.

1. After entering CodE 48, in Module 9, select AnLOut.
2. Using the chart below, step through the five selections to be calibrated. At each prompt, use the 2200 F1 and F2 keys to adjust the external meter display to match the selection being calibrated. When the external reading matches, or if the particular range is not in need of calibration, press the **P** key to advance to the next range.

2200 DISPLAY	EXTERNAL METER	ACTION
0.000A	0.00 mA	F1 and F2 to adjust External Meter
0.004A	4.00 mA	F1 and F2 to adjust External Meter
0.020A	20.00 mA	F1 and F2 to adjust External Meter
0.0v	0.00 V	F1 and F2 to adjust External Meter
10.0v	10.00 V	F1 and F2 to adjust External Meter

3. Calibration Complete.

TROUBLESHOOTING

PROBLEM	REMEDIES
No Display At Power-Up	Check power level and power connections
No Display After Power-Up	Check Module 3: d-LEV, d-Cont and LINE 1 program settings.
Program Locked-Out	Check for Active User Input, programmed for PLOC. Deactivate User Input.
	Enter proper access code at COdE 0 prompt.
No Line 1 Display	Check Module 3: LINE 1 program setting.
No Line 2 Display	Check Module 3: ACCESS program settings.
No Programmable Units Display	Check Module 3: UNItS Mnemonic program settings.
Incorrect Input Display Value	Check Input Jumper Setting, Input Level, and Input Connections.
	Verify Module 1 program settings.
	Contact factory
Display of OLOL, ULUL, Short, OPEN, or " . . . ."	See General Meter Specifications, Display Messages.
Modules or Parameters Not Accessible	Check for corresponding plug-in option card.
	Verify parameter is valid in regard to previous program settings.
Error Code: ErrKEY	Keypad is active at power up. Check for depressed or stuck keypad. Press any key to clear Error Code.
Error Code: EE PAr Error Code: EE Pdn	Parameter Data Checksum Error. Press any key to clear Error Code, verify all program settings and cycle power. Contact factory if Error Code returns at next power-up.
Error Code: ErrPro	Parameter Data Validation Error. Press any key to clear Error Code, verify all program settings and cycle power. Contact factory if Error Code returns at next power-up.
Error Code: EE CAL	Calibration Data Validation Error. Contact factory.
Error Code: EE Lin	Linear Output Card Data Validation Error. Press any key to clear Error Code and cycle power. If Error Code returns at next power-up, replace Linear Option Card or contact factory.

PARAMETER VALUE CHART 2200

Programmer ________________ Date ________

Meter# ______________ Security Code ________

1-InPUt INPUT SETUP PARAMETERS

DISPLAY	PARAMETER	USER SETTING
rANgE	INPUT RANGE	
SCALE	TEMPERATURE SCALE	
ICE	ICE POINT CONPENSATION	
rAtE	ADC CONVERSION RATE	
dECPNt	SCALING DECIMAL POINT	
round	DISPLAY ROUNDING	
OFFSEt	DISPLAY OFFSET	
FILtEr	DIGITAL FILTER	
bANd	DIGITAL FILTER BAND	
POINtS	SCALING POINTS	
StYLE	SCALING STYLE	
INPUt 1	INPUT 1 SCALING VALUE	
dISPLY 1	DISPLAY 1 VALUE	
INPUt 2	INPUT 2 SCALING VALUE	
dISPLY 2	DISPLAY 2 VALUE	
INPUt 3	INPUT 3 SCALING VALUE	
dISPLY 3	DISPLAY 3 VALUE	
INPUt 4	INPUT 4 SCALING VALUE	
dISPLY 4	DISPLAY 4 VALUE	
INPUt 5	INPUT 5 SCALING VALUE	
dISPLY 5	DISPLAY 5 VALUE	
INPUt 6	INPUT 6 SCALING VALUE	
dISPLY 6	DISPLAY 6 VALUE	

DISPLAY	PARAMETER	USER SETTING
INPUt 7	INPUT 7 SCALING VALUE	
dISPLY 7	DISPLAY 7 VALUE	
INPUt 8	INPUT 8 SCALING VALUE	
dISPLY 8	DISPLAY 8 VALUE	
INPUt 9	INPUT 9 SCALING VALUE	
dISPLY 9	DISPLAY 9 VALUE	
INPUt 10	INPUT 10 SCALING VALUE	
dISPLY 10	DISPLAY 10 VALUE	
INPUt 11	INPUT 11 SCALING VALUE	
dISPLY 11	DISPLAY 11 VALUE	
INPUt 12	INPUT 12 SCALING VALUE	
dISPLY 12	DISPLAY 12 VALUE	
INPUt 13	INPUT 13 SCALING VALUE	
dISPLY 13	DISPLAY 13 VALUE	
INPUt 14	INPUT 14 SCALING VALUE	
dISPLY 14	DISPLAY 14 VALUE	
INPUt 15	INPUT 15 SCALING VALUE	
dISPLY 15	DISPLAY 15 VALUE	
INPUt 16	INPUT 16 SCALING VALUE	
dISPLY 16	DISPLAY 16 VALUE	
ScLISt	ENABLE SCALE LIST	

2-FUNCt USER INPUT/FUNCTION KEY PARAMETERS

DISPLAY	PARAMETER	USER SETTING
USrACt	USER ACTIVE STATE	
USEr-1	USER INPUT 1	
USEr-2	USER INPUT 2	
F1	FUNCTION KEY 1	
F2	FUNCTION KEY 2	
SEC-F1	2nd FUNCTION KEY 1	
SEC-F2	2nd FUNCTION KEY 2	

3-dISPLY DISPLAY PARAMETERS

DISPLAY	PARAMETER	USER SETTING
CoLor	LINE 1 DISPLAY COLOR	
d-LEU	DISPLAY LEVEL	
d-Cont	DISPLAY CONTRAST LEVEL	
LInE 1	LINE 1 DISPLAY	
UnItS	UNITS MNEMONIC	OFF LISt
UnItS1	SEGMENT 1	
UnItS2	SEGMENT 2	
UnItS3	SEGMENT 3	
ACCESS	LINE 2 LOOP ACCESSIBILE ITEMS	nO YES

INPUt		b2-d2	
totAL		S3	
Hi		b3-d3	
Lo		S4	
LISt		b4-d4	
S1		CoLor	
b1-d1		d-LEU	
S2		d-Cont	

DISPLAY	PARAMETER	USER SETTING
FUNCt	LINE 2 USER FUNC. ACCESS. ITEMS	nO YES

rEL		r-2	
bAt		r-3	
r-tot		r-4	
r-HI		r-34	
r-Lo		r-234	
r-HL		r-ALL	
r-1		Print	

DISPLAY	PARAMETER	USER SETTING
CodE	SECURITY CODE	

4-SCndrY SECONDARY FUNCTION PARAMETERS

DISPLAY	PARAMETER	USER SETTING
HI-AS	MAX ASSIGNMENT	
HI-t	MAX CAPTURE DELAY TIME	
LO-AS	MIN ASSIGNMENT	
LO-t	MIN CAPTURE DELAY TIME	
dSP-t	DISPLAY UPDATE TIME	

5-totAL TOTALIZER PARAMETERS

DISPLAY	PARAMETER	USER SETTING
dECPnt	TOTALIZER DECIMAL POINT	
t bASE	TOTALIZER TIME BASE	
SCLFAC	TOTALIZER SCALE FACTOR	
Lo Cut	TOTALIZER LOW CUT VALUE	
PWrUP	TOTALIZER POWER-UP RESET	

7-SErIAL SERIAL COMMUNICATIONS PARAMETERS

DISPLAY	PARAMETER	USER SETTING
USb	USB PORT	
tYPE	TYPE	
bAUd	BAUD RATE	
dAtA	WORD LENGTH	
PArItY	PARITY	
Addr	ADDRESS	
dELAY	TRANSMIT DELAY	
Abru	ABBREVIATED	
OPt	PRINT OPTION	nO YES
INPUt	Signal Input	
totAL	Total Value	
HILO	Max & Min	
SPnt	Setpoint Values	

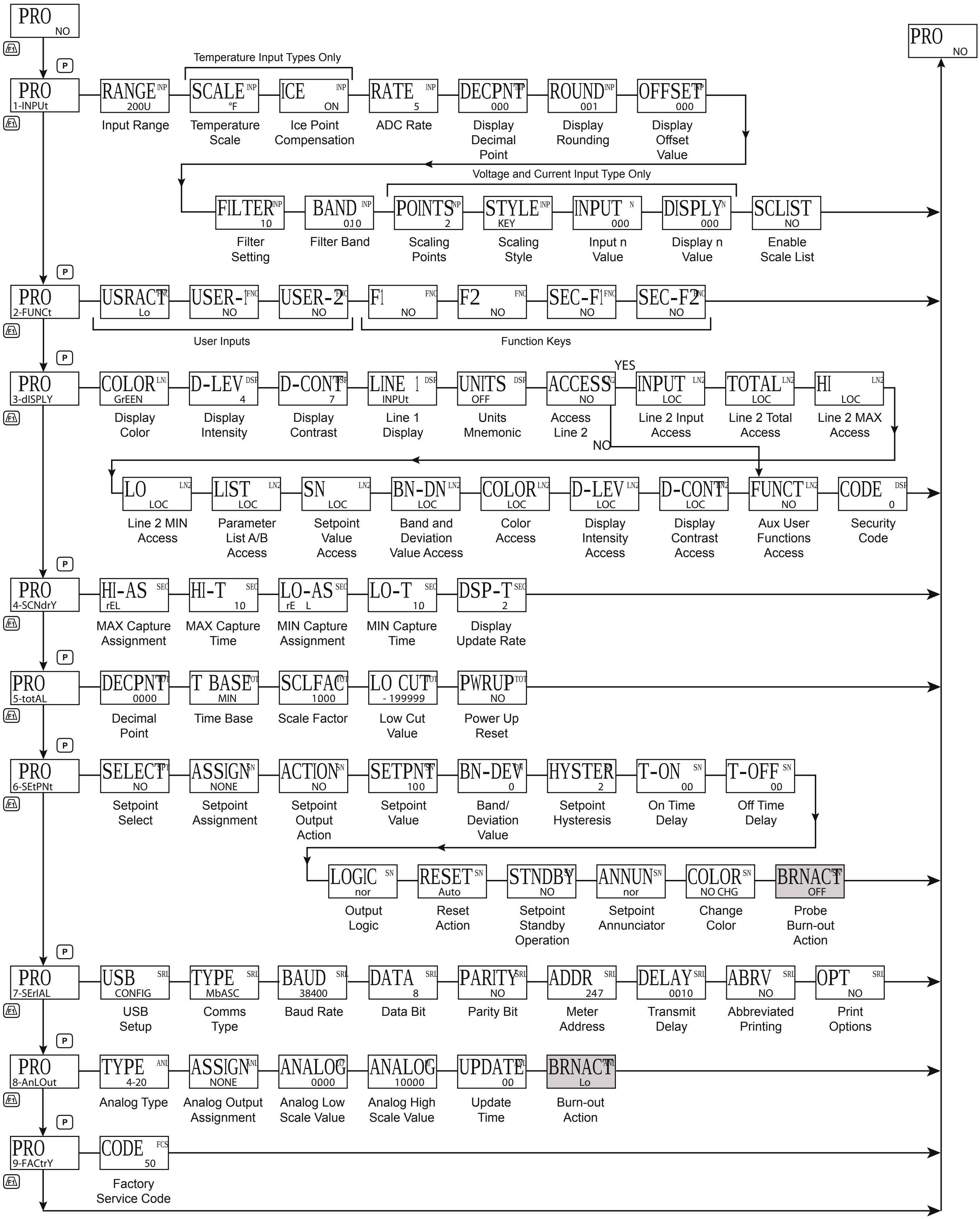
8-AnLOut ANALOG OUTPUT PARAMETERS

DISPLAY	PARAMETER	USER SETTING
tYPE	ANALOG TYPE	
ASSIGn	ANALOG ASSIGNMENT	
AnALOG LO	ANALOG LOW	
AnALOG HI	ANALOG HIGH	
UPdAtE	ANALOG UPDATE TIME	
brnAct	PROBE BURN-OUT ACTION	

6-SEtPnt SETPOINT OUTPUT PARAMETERS

DISPLAY	PARAMETER	USER SETTING S1	USER SETTING S2	USER SETTING S3	USER SETTING S4
SELECt	SETPOINT SELECTION				
ASSIGn	SETPOINT SOURCE				
ACtIOn	ACTION FOR SETPOINT				
SEtPnt	SETPOINT VALUE				
bn-dEU	SETPOINT BAND/DEVIATION VALUE				
HYStEr	HYSTERESIS FOR SETPOINT				
t-On	ON TIME DELAY SETPOINT				
t-OFF	OFF TIME DELAY SETPOINT				
LOGIC	OUTPUT LOGIC				
rESEt	RESET ACTION				
Stndby	STANDYBY OPERATION				
Annun	OUTPUT ANNUNCIATOR LIGHT				
CoLor	CHANGE COLOR				
brnAct	PROBE BURN-OUT ACTION				

2200 PROGRAMMING QUICK OVERVIEW



Temperature Input Only

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