LARGE DISPLAYS

The Trusted Source for Innovative Control Solutions

G

QUICK Specs

Large Displays

LED DISPLAY

	LD2	LD4	LPAX	EPAX
				
Description	4, 5 and 6 Digit, 2.25" (57 mm) Red LED	4, 5 and 6 Digit, 4" (101 mm) Red LED	ANALOG INPUTS 5 Digit, 1.5" (38 mm) Red LED DIGITAL INPUTS 6 Digit, 1.5" (38 mm) Red LED	ANALOG INPUTS 5 Digit, 4" (101 mm) Red LED DIGITAL INPUTS 6 Digit, 4" (101 mm) Red LED
Dimensions (Height) x (Width)	4 DIGIT 102 mm (H) x 305 mm (W) 5 and 6 DIGIT 102 mm (H) x 406 mm (W)	4 DIGIT 200 mm (H) x 508 mm (W) 5 and 6 DIGIT 200 mm (H) x 660 mm (W)	121 mm (H) x 254 mm (W)	183 mm (H) x 630 mm (W)
Input	Basic Count Input	Basic Count Input	Via a Plug-in Personality Module	Via a Plug-in Personality Module
Available Inputs	ANALOG INPUTS Process, DC Voltage, DC Current, and Strain Gage DIGITAL INPUTS Count, Count/Rate, Timer, and Serial Slave	ANALOG INPUTS Process, DC Voltage, DC Current, and Strain Gage DIGITAL INPUTS Count, Count/Rate, Timer, and Serial Slave	ANALOG INPUTS Process, Voltage, Current, Temperature, and Strain Gage DIGITAL INPUTS Count, Rate, Count/Rate, Timer, and Real Time Clock	ANALOG INPUTS Process, Voltage, Current, Temperature, and Strain Gage DIGITAL INPUTS Count, Rate, Count/Rate, Timer, and Real Time Clock
Setpoint Capability	Dual Form C (Not Available w/4 Digit Model)	Dual Form C (Not Available w/4 Digit Model)	Dual Form C Quad Form A Quad Sinking Quad Sourcing	Dual Form C Quad Form A Quad Sinking Quad Sourcing
Communications	RS232 RS485 (Not Available w/4 Digit Model)	RS232 RS485 (Not Available w/4 Digit Model)	RS232 RS485 Modbus DeviceNet Profibus Ethernet w/ICM8	RS232 RS485 Modbus DeviceNet Profibus Ethernet w/ICM8
Other Features/ Options	NEMA 4X	NEMA 4X	NEMA 4 Enclosure, Mounting Brackets, Custom Units Label (5 Digit Only)	NEMA 4 Enclosure, Mounting Brackets
Power Source	50 to 250 VAC 21.6 to 250 VDC	50 to 250 VAC 21.6 to 250 VDC	85 to 250 VAC 18 to 36 VDC 24 VAC	85 to 250 VAC
Page Number	Page 657	Page 657	Page 725	Page 737

G

REPLACEMENT Guide

WHAT YOU'RE USING NOW		CURRENT PRODUCT	
MODEL NUMBER	**FEATURES**	**MODEL NUMBER**	**FEATURES**
	■ Display: 4 or 6 Digit, 3.3" (84 mm) Red LED ■ Power Source: 115/230 VAC ■ Input Models: Various Models		■ Display: 5 or 6 Digit, 4" (101 mm) Red LED ■ Power Source: 115/230 VAC ■ Input Models: Various Models **Panel Cut-Out Dimension Differences**
LDD		**EPAX**	

Note: Refer to the current product literature, as some differences may exist.

G

This page intentionally left blank.

MODEL LD - LARGE DISPLAY

c UL US LISTED
IND. CONT. EQ.
51EB

- *2.25" & 4" HIGH RED LED DIGITS*
- *AVAILABLE IN 4 OR 6 DIGIT VERSIONS*
- *SINGLE OR DUAL COUNTER with RATE INDICATOR **
- *PROGRAMMABLE SCALING AND DECIMAL POINTS **
- *BUILT-IN BATCH COUNTING CAPABILITY **
- *PROGRAMMABLE USER INPUT **
- *UNIVERSALLY POWERED*
- *DUAL 5 AMP FORM C RELAY **
- *ALUMINUM NEMA 4X CASE CONSTRUCTION*

** Programmable models only*

CE

GENERAL DESCRIPTION

The Large Display is a versatile display that can be configured as a single or dual counter with rate indication, scaling, serial communications and a dual relay output. There are also basic models that have a single counter with direction control only (no scaling or relay output).

The 4 & 6 digit displays are available in either 2.25" or 4" high red LED digits with adjustable display intensities. The 2.25" high models are readable up to 130 feet. The 4" high models are readable up to 180 feet. All versions are constructed of a NEMA 4X/IP65 enclosure in light weight aluminum.

The 6-digit programmable models have two signal inputs and a choice of eight different count modes. These include bi-directional, quadrature and anti-coincidence counting, as well as a dual counter mode. When programmed as a dual counter, each counter has separate scaling and decimal point selection.

Rate indication is available on the programmable models only. The rate indicator has separate scaling and decimal point selection, along with programmable display update times. The meter display can be toggled either manually or automatically between the count and rate values.

The programmable models also come with a dual Form C relay output and RS232 or RS485 serial communications. The outputs can activate based on either counter or rate setpoint values. An internal batch counter can be used to count setpoint output activations.

SAFETY SUMMARY

All safety regulations, local codes and instructions that appear in this and corresponding 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.

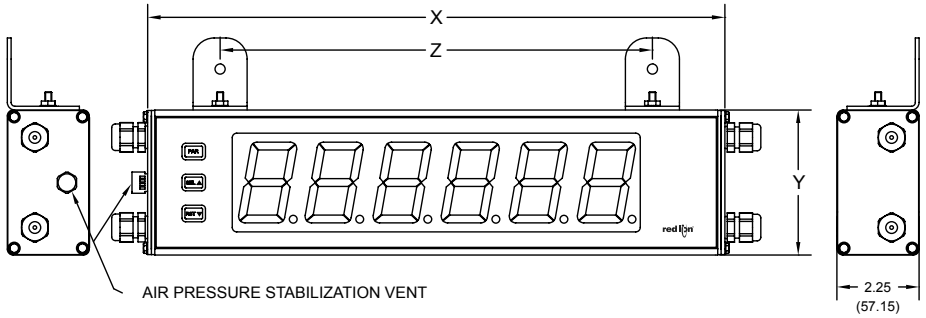
CAUTION: Risk of electric shock.

The protective conductor terminal is bonded to conductive parts of the equipment for safety purposes and must be connected to an external protective earthing system.

SPECIFICATIONS

1. **DISPLAY**: 2.25" (57 mm) or 4" (101 mm) intensity adjustable Red LED
2. **POWER REQUIREMENTS**:
   AC POWER: 50 to 250 VAC 50/60 Hz, 26 VA
   DC POWER: 21.6 to 250 VDC, 11 W
   DC OUT: +24 VDC @ 100 mA if input voltage is greater than 50 VAC/VDC
   +24 VDC @ 50 mA if input voltage is less than 50 VDC
   Isolation: 2300 V_{RMS} for 1 min. to all inputs and outputs
3. **COUNT INPUT(S)**:
   Counter(s) have DIP switch selectable pull-up (7.8 KΩ) or pull-down resistors (3.9 KΩ) that determine active high or active low input logic.
   Counters are DIP switch selectable for high or low frequency (Damping capacitor provided for switch contact bounce. Limits input frequency to 50 Hz and input pulse widths to 10 msec min.)
   Input A Trigger levels: V_{IL} = 1.25 V max; V_{IH} = 2.75 V min; V_{MAX} = 28 VDC
   Input B Trigger levels: V_{IL} = 1.0 V max; V_{IH} = 2.4 V min; V_{MAX} = 28 VDC
   Overflow Indication: Display "OLOL" alternates with overflowed count value.
   LD200400, LD200600, LD400400, & LD400600:
   Count Rate: 25 KHz max. @ 50% duty cycle (no scaling)
   LD2006P0 & LD4006P0:
   Maximum Count Rates: 50% duty cycle, count mode dependent.
   With setpoints disabled: 25 KHz, all modes except Quadrature x4 (23 KHz).
   With setpoint(s) enabled: 20 KHz, all modes except Dual Counter (14 KHz), Quadrature x2 (13 KHz) and Quadrature x4 (12 KHz).
4. **RATE INPUT**: **Models LD2006P0 & LD4006P0 only**
   Display Range: 0 to 99999
   Min Freq.: 0.01 Hz
   Max Freq.: See Count Input specification
   Accuracy: ±0.01%
   Rate Overflow Indication: Display "r OLOL"

DIMENSIONS In inches (mm)



PART NUMBER	X (Length)	Y (Height)	Z (Center)
LD2004xx	12 (304.8)	4 (101.6)	8 (203.2)
LD2006xx	16 (406.4)	4 (101.6)	12 (304.3)
LD4004xx	20 (508)	7.875 (200)	16 (406.4)
LD4006xx	26 (660.4)	7.875 (200)	22 (558.8)

G

5. **RESET/USER INPUT**: Function programmable for LD2006P0 &LD4006P0
   Reset/User Input: DIP switch selectable pull-up (7.8 KΩ) or pull-down resistor (3.9 KΩ) that determines active high or active low input logic.
   Trigger levels: V_{IL} = 1.0 V max; V_{IH} = 2.4 V min; V_{MAX} = 28 VDC
   Response Time: 10 msec typ.; 50 msec debounce (activation and release)
6. **COMMUNICATIONS (LD2006P0 & LD4006P0 only)**:
   RS485 SERIAL COMMUNICATIONS
   Type: RS485 multi-point balanced interface (isolated)
   Baud Rate: 300 to 38.4 k
   Data Format: 7/8 bits; odd, even, or no parity
   Bus Address: 0 to 99; max 32 meters per line
   RS232 SERIAL COMMUNICATIONS
   Type: RS232 half duplex (isolated)
   Baud Rate: 300 to 38.4 k
   Data Format: 7/8 bits; odd, even, or no parity
7. **MEMORY**: Nonvolatile E^2PROM retains all programming parameters and count values when power is removed.
8. **OUTPUT (LD2006P0 & LD4006P0 only)**:
   Type: Dual Form C contacts
   Contact Rating: 5 amps @ 120/240 VAC or 28 VDC (resistive load), 1/8 H.P. @ 120 VAC (inductive load)
   Life Expectancy: 100 K cycles min. at full load rating. External RC snubber extends relay life for operation with inductive loads.
   Response Time: Turn On or Off: 5 msec max.
   Isolation to Input & User/Exc Commons: 2000 Vrms for 1 min. Working Voltage: 240 Vrms
9. **ENVIRONMENTAL CONDITIONS**:
   Operating temperature: 0 to 65 °C
   Storage temperature: -40 to 70 °C
   Operating and storage humidity: 0 to 85% max. RH (non-condensing)
   Vibration According to IEC 68-2-6: Operational 5 to 150 Hz, in X, Y, Z direction for 1.5 hours, 2 g's (1g relay).
   Shock According to IEC 68-2-27: Operational 30 g's (10g relay), 11 msec in 3 directions.
   Altitude: Up to 2,000 meters
10. **CONNECTIONS**:
    Internal removable terminal blocks are used for power and signal wiring. Remove end plates with ¼" nut driver. For LD4 versions, all wiring is on right side of unit. For LD2 versions, power and signal wiring connections are on the right side and the relays and serial options are on the left side.
    Wire Strip Length: 0.4" (10 mm)
    Wire Gage: 24-12 AWG copper wire, 90°C rated insulation only
    Torque: 5.3 inch-lbs (0.6 N-m) max.
    Cable Diameter: Outside diameter must be 0.181" (4.6 mm) to 0.312" (7.9 mm) to maintain NEMA 4 rating of cord grips.
11. **CERTIFICATIONS AND COMPLIANCES**:
    SAFETY
    UL Listed, File # E137808, UL508, CSA C22.2 No. 14-M95
    LISTED by Und. Lab. Inc. to U.S. and Canadian safety standards
    Type 4X Enclosure rating, UL50
    IEC 61010-1, EN 61010-1: Safety requirements for electrical equipment for measurement, control, and laboratory use, Part 1.
    IP65 Enclosure rating, IEC 529
    ELECTROMAGNETIC COMPATIBILITY
    Emissions and Immunity to EN 61326: Electrical Equipment for Measurement, Control and Laboratory use.

Immunity to Industrial Locations:

Electrostatic discharge	EN 61000-4-2	Criterion A 4 kV contact discharge 8 kV air discharge
Electromagnetic RF fields	EN 61000-4-3	Criterion A LD200400 Criterion B LD2006P0 10 V/m
Fast transients (burst)	EN 61000-4-4	Criterion A 2 kV power 1 kV signal
Surge	EN 61000-4-5	Criterion A 1 kV L-L, 2 kV L&N-E power
RF conducted interference	EN 61000-4-6	Criterion A 3 V/rms
Voltage dip/interruptions	EN 61000-4-11	Criterion A 0.5 cycle

Emissions:

Emissions LD200400	EN 55011	Class B
Emissions LD2006P0	EN 55011	Class A

Notes:
1. Criterion A: Normal operation within specified limits.
2. Criterion B: Temporary loss of performance from which the unit self-recovers.

12. **CONSTRUCTION**: Aluminum enclosure, and steel side panels with textured black polyurethane paint for scratch and corrosion resistance protection. Meets NEMA 4X/IP65 specifications. Installation Category II, Pollution Degree 2.
13. **WEIGHT**:
    LD2004XX: 3.5 lbs (1.59 kg)
    LD2006XX: 4.5 lbs (2.04 kg)
    LD4004XX: 8 lbs (3.63 kg)
    LD4006XX: 10.5 lbs (4.76 kg)

ORDERING INFORMATION

TYPE	MODEL NO.	DESCRIPTION	PART NUMBER
Basic (No front panel keys)	LD	2.25" High 4-Digit Red LED Counter	LD200400
		2.25" High 6-Digit Red LED Counter	LD200600
		4" High 4-Digit Red LED Counter	LD400400
		4" High 6-Digit Red LED Counter	LD400600
Programmable (With front panel keys)	LD	2.25" High 6-Digit Red LED Count/Rate Indicator w/ dual Relay Output & RS232/RS485 Serial Communications	LD2006P0
		4" High 6-Digit Red LED Count/Rate Indicator w/ dual Relay Output & RS232/ RS485 Serial Communications	LD4006P0
	LD Plug	Panel Meter Plug for LD models	LDPLUG00

1.0 INSTALLING THE METER

G

INSTALLATION

The meter meets NEMA 4X/IP65 requirements when properly installed.

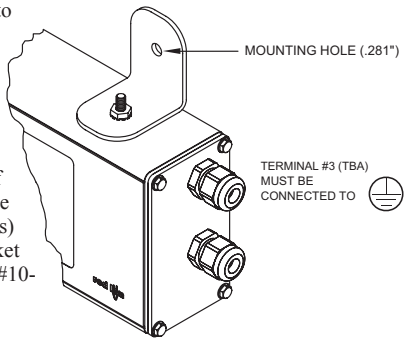
INSTALLATION ENVIRONMENT

The unit should be installed in a location that does not exceed the operating temperature. Placing the unit near devices that generate excessive heat should be avoided. The unit 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 front overlay. Do not use tools of any kind (screwdrivers, pens, pencils, etc.) to operate the keypad of the unit.

MOUNTING INSTRUCTIONS

This display is designed to be wall mounted or suspended from a ceiling truss or other suitable structure capable of supporting the LD. Caution should be exercised when hanging the display to provide for the safety of personnel. If hanging the LD, run the suspension cables (or chains) through the mounting bracket holes. For wall mounting use #10-32 size bolts.



2.0 Setting the DIP Switches

SETTING THE 8 DIP SWITCHES

To access the switches, remove the right side plate of the meter. A bank of eight switches is located inside the unit.

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

SWITCH 1 (Input A)

LOGIC: Input A trigger levels V_{IL} = 1.25 V max.; V_{IH} = 2.75 V min.; V_{MAX} = 28 VDC

MAG: 200 mV peak input sensitivity; 100 mV hysteresis; maximum voltage: 40 V peak (28 Vrms); Must also have SRC switch ON. (Not recommended with counting applications.)

SWITCH 2 (Input A) {See Note 1}

SNK.: Adds internal 7.8 KΩ pull-up resistor to +12 VDC, I_{MAX} = 2.1 mA.
SRC.: Adds internal 3.9 KΩ pull-down resistor, 7.2 mA max. @ 28 VDC max.

SWITCH 3 (Input A)

HI Frequency: Removes damping capacitor and allows max. frequency.
LO Frequency: Adds a damping capacitor for switch contact bounce. Limits input frequency to 50 Hz and input pulse widths to 10 msec.

SWITCH 4 (Input B) {See Note 1}

SNK.: Adds internal 7.8 KΩ pull-up resistor to +12 VDC, I_{MAX} = 2.1 mA.
SRC.: Adds internal 3.9 KΩ pull-down resistor, 7.2 mA max. @ 28 VDC max.

SWITCH 5 (Input B)

HI Frequency: Removes damping capacitor and allows max. frequency.
LO Frequency: Adds a damping capacitor for switch contact bounce. Limits input frequency to 50 Hz and input pulse widths to 10 msec.

SWITCH 6 (RESET/USER INPUT) {See Note 1}

SNK.: Adds internal 7.8 KΩ pull-up resistor to +12VDC, I_{MAX} = 2.1 mA.
SRC.: Adds internal 3.9 KΩ pull-down resistor, 7.2 mA max. @ 28 VDC max.

SWITCH 7 (POWER UP RESET)

ENABLE: In this position, the counter resets to zero at power up.
DISABLE: In this position, the counter does not reset at power up.

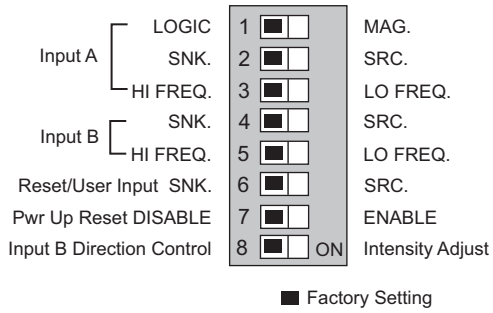
Note: This switch has no function for programmable models. Power-up reset is selected through a programming parameter.

SWITCH 8 (Input B)

DIRECTION CONTROL: In this position Input B is used to control the count direction of Input A when Input A is set to Count with Direction mode (default mode).

INTENSITY ADJUST: In this position Input B is used to adjust the LED intensity. There are five distinct LED levels that can be changed by pulsing Input B. After setting the desired intensity, move switch to OFF position for Direction Control. Units with keypads can program the LED intensity level using Programming Menu 3.

Note 1: When the DIP switch is in the SNK position (OFF), the input is configured as active low. When the switch is in the SRC position (ON), the input is configured as active high.



3.0 Wiring the Meter

EMC INSTALLATION GUIDELINES

Although this meter is designed with a high degree of immunity to Electro-Magnetic 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 the meter may be different for various installations. The meter becomes more immune to EMI with fewer I/O connections. Cable length, routing, and shield termination are very important and can mean the difference between a successful or troublesome installation. Listed below are some EMC guidelines for successful installation in an industrial environment.

1. The meter should be properly connected to protective earth.
2. Use shielded (screened) cables for all Signal and Control inputs. The shield (screen) pigtail 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 only at the panel where the unit is mounted to earth ground (protective earth).
   b. Connect the shield to earth ground at both ends of the cable, usually when the noise source frequency is above 1 MHz.
   c. Connect the shield to common of the meter and leave the other end of the shield unconnected and insulated from earth ground.
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 ran in 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.
4. Signal or Control cables within an enclosure should be routed as far as possible from contactors, control relays, transformers, and other noisy components.
5. In extremely high EMI environments, the use of external EMI suppression devices, such as ferrite suppression cores, is effective. Install them on Signal and Control cables as close to the unit as possible. Loop the cable through the core several times or use multiple cores on each cable for additional protection. Install line filters on the power input cable to the unit to suppress power line interference. Install them near the power entry point of the enclosure. The following EMI suppression devices (or equivalent) are recommended:
   Ferrite Suppression Cores for signal and control cables:
   Fair-Rite # 0443167251 (RLC# FCOR0000)
   TDK # ZCAT3035-1330A
   Steward # 28B2029-0A0
   Line Filters for input power cables:
   Schaffner # FN610-1/07 (RLC# LFIL0000)
   Schaffner # FN670-1.8/07
   Corcom # 1 VR3
   Note: Reference manufacturer's instructions when installing a line filter.
6. Long cable runs are more susceptible to EMI pickup than short cable runs. Therefore, keep cable runs as short as possible.
7. Switching of inductive loads produces high EMI. Use of snubbers across inductive loads suppresses EMI.
   Snubber: RLC# SNUB0000.

G

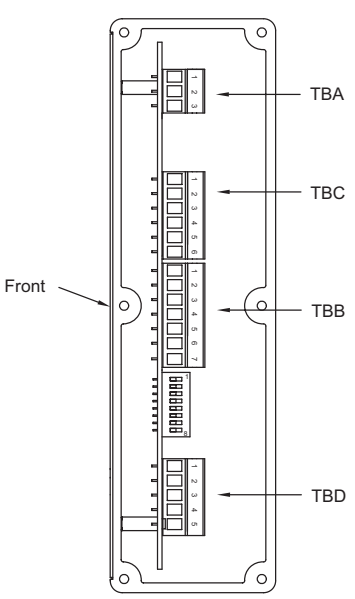
WIRING OVERVIEW

Electrical connections are made via pluggable terminal blocks located inside 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 on the label on the back of the meter case against those shown in wiring drawings for proper wire position. Strip the wire, leaving approximately 0.4" (10 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). Use copper conductors only, with insulation rated at 90°C.

WIRING CONNECTIONS

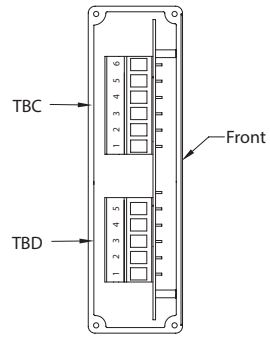
Internal removable terminal blocks are used for power and signal wiring. Access to terminal blocks is through conduit fittings. Remove end plates with ¼" nut driver. For LD4 versions, all wiring is on right side of unit. For LD2 versions, power and input wiring connections are on the right side and the relay and serial options are on the left side.

Connect the drain wire from the shielded cable(s) to the screw on the side plate for proper grounding.

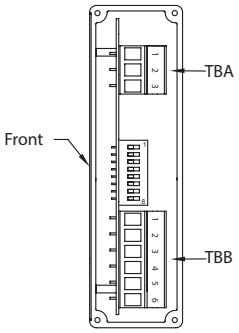


LD4

Only programmable models have terminals TBC and TBD.



LD2 Left Side

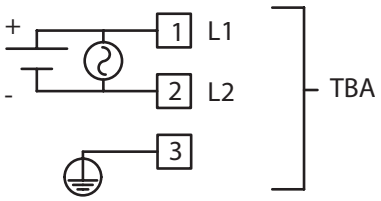


LD2 Right Side

3.1 POWER WIRING

The power wiring is made via the 3 position terminal block (TBA) located inside the unit (right side). The DC out power is located on TBB (right side).

Power
Terminal 1: VAC/DC +
Terminal 2: VAC/DC -
Terminal 3: Protective Conductor Terminal



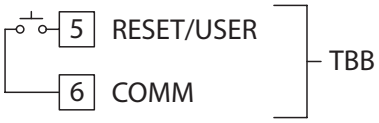
DC Out Power
Terminal 4: + 24 VDC OUT
Terminal 6: User Common

3.2 RESET/USER INPUT WIRING

The Reset/User Input is located on the right side.

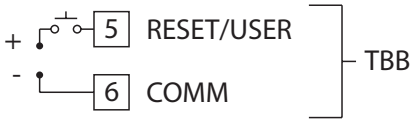
Terminal 5: Reset/User
Terminal 6: Comm

Sinking Logic



DIP switch 6 OFF

Sourcing Logic

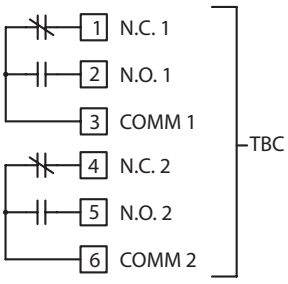


DIP switch 6 ON

3.3 SETPOINT (OUTPUT) WIRING

The setpoint relays use a six position terminal block (TBC) located inside the unit: LD4 (right side) and LD2 (left side).

Terminal 1: NC 1
Terminal 2: NO 1
Terminal 3: Relay 1 Common
Terminal 4: NC 2
Terminal 5: NO 2
Terminal 6: Relay 2 Common



G

3.4 INPUT WIRING

The Large Display has two signal inputs, A and B. These inputs are wired to terminal block TBB located inside the unit on the right side.

Terminal 1: Input A
Terminal 3: Input B
Terminal 2: Input Common

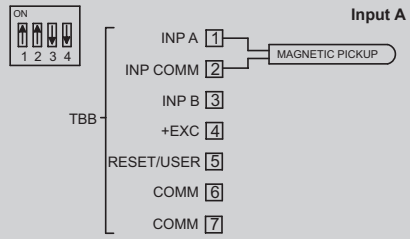
Programmable models LD2006P0 and LD4006P0 provide a choice of eight different Count Modes. The Count Mode selected determines the action of Inputs A and B. Section 5.1, Input Setup Parameters, provides details on count mode selection and input action.

All other models are non-programmable and provide Count with Direction Mode only. Input A accepts the count signal, while Input B controls the count direction (up/down).

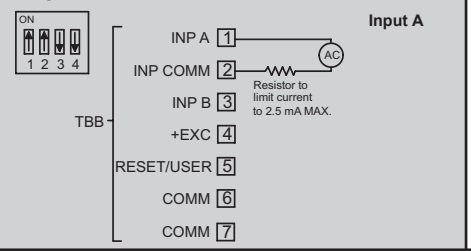
Input B can also be used to adjust the LED display intensity by setting DIP Switch 8 to the ON position (See Section 2.0, Setting the DIP Switches). For programmable models, this only applies in Count with Direction mode.

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

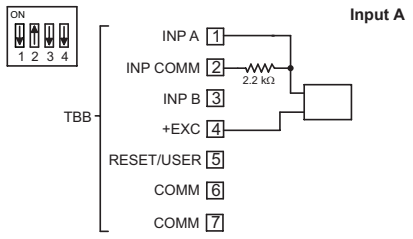
Magnetic Pickup



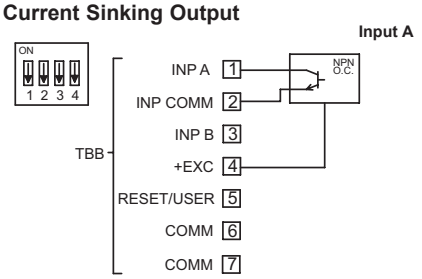
AC Inputs From Tach Generators, Etc.



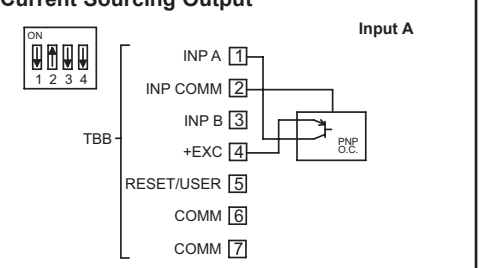
Two Wire Proximity, Current Source



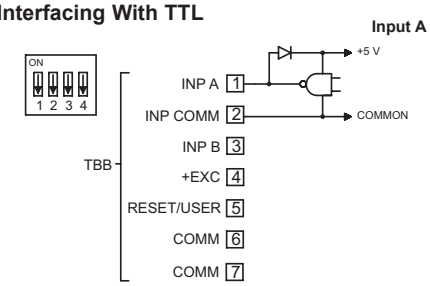
Current Sinking Output



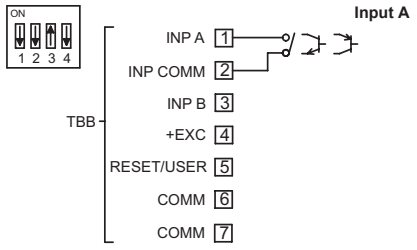
Current Sourcing Output



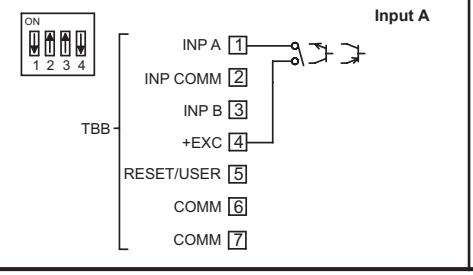
Interfacing With TTL



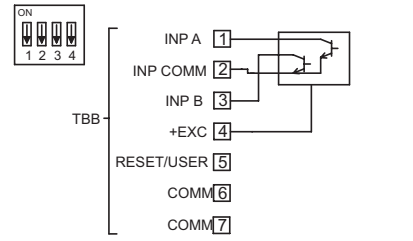
Switch or Isolated Transistor; Current Sink



Switch or Isolated Transistor; Current Source



Current Sink Output; Quad/Direction



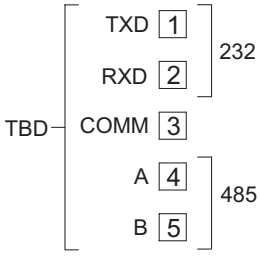
LD2006P0 and LD4006P0 only.

∗ *Switch position is application dependent.*

Shaded areas not recommended for counting applications.

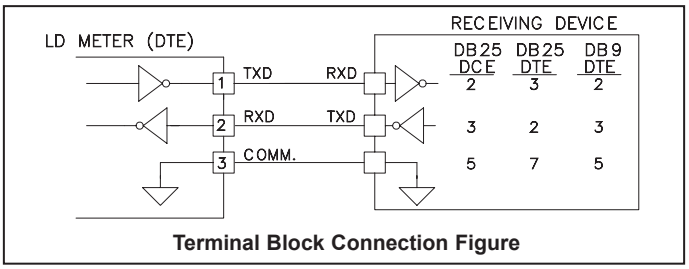
3.5 SERIAL WIRING

The serial connections are made via terminal block TBD located inside the unit on the left side for the LD2 and on the right side for the LD4.



G

RS232 Communications



Terminal Block Connection Figure

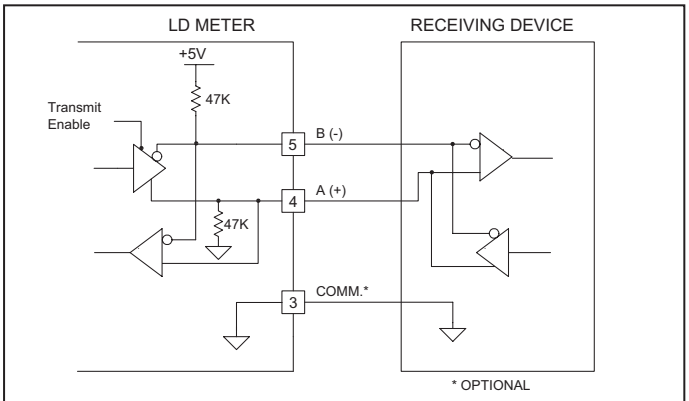
RS232 is intended to allow two devices to communicate over distances up to 50 feet. Data Terminal Equipment (DTE) transmits data on the Transmitted Data (TXD) line and receives data on the Received Data (RXD) line. Data Computer Equipment (DCE) receives data on the TXD line and transmits data on the RXD line. The LD emulates a DTE. If the other device connected to the meter also emulates a DTE, the TXD and RXD lines must be interchanged for communications to take place. This is known as a null modem connection. Most printers emulate a DCE device while most computers emulate a DTE device.

Some devices cannot accept more than two or three characters in succession without a pause in between. In these cases, the meter employs a busy function.

As the meter begins to transmit data, the RXD line (RS232) is monitored to determine if the receiving device is "busy". The receiving device asserts that it is busy by setting the RXD line to a space condition (logic 0). The meter then suspends transmission until the RXD line is released by the receiving device.

RS485 Communications

The RS485 communication standard allows the connection of up to 32 devices on a single pair of wires, distances up to 4,000 ft. and data rates as high as 10M baud (the LD is limited to 38.4k baud). The same pair of wires is used to both transmit and receive data. RS485 is therefore always half-duplex, that is, data cannot be received and transmitted simultaneously.



Terminal Block Connection Figure

Sections 4 and 5 apply to Programmable Models Only

4.0 Reviewing the Front Panel Keys and Display

KEY	DISPLAY MODE OPERATION	PROGRAMMING MODE OPERATION
PAR	Access Programming Mode	Store selected parameter and index to next parameter
SEL▲	Index display through selected displays	Advance through selection list/select digit position in parameter value
RST▼	Resets count display(s) and/or outputs	Increment selected digit position of parameter value

OPERATING MODE DISPLAY DESIGNATORS

"r" - To the left of the display is the rate value.
- Counter A has no designator.

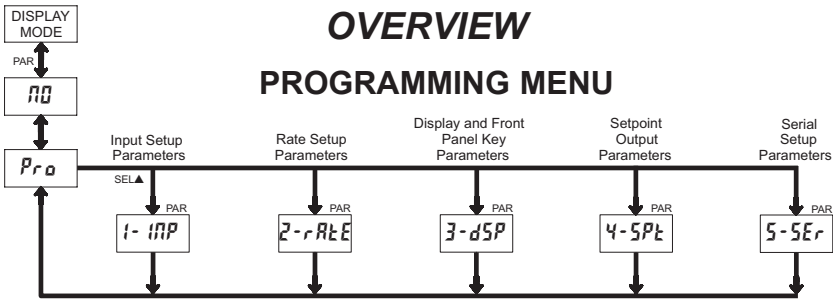
"b" - To the left of the display is the Counter B value (dual count or batch).

" **1** " - To the right of digit 6 indicates setpoint 1 output status.

" **2** " - To the right of digit 1 indicates setpoint 2 output status.

Pressing the **SEL▲** key toggles the meter through the selected displays. If display scroll is enabled, the display will toggle automatically every four seconds between the rate and count values.

5.0 Programming the Meter



OVERVIEW

PROGRAMMING MENU

PROGRAMMING MODE ENTRY (PAR KEY)

It is recommended all programming changes be made off line, or before installation. The meter normally operates in the Display Mode. No parameters can be programmed in this mode. The Programming Mode is entered by pressing the **PAR** key. If it is not accessible, then it is locked by either a security code or a hardware lock.

MODULE ENTRY (SEL▲ & PAR KEYS)

The Programming Menu is organized into five modules. These modules group together parameters that are related in function. The display will alternate between **Pro** and the present module. The **SEL▲** key is used to select the desired module. The displayed module is entered by pressing the **PAR** key.

MODULE MENU (PAR KEY)

Each module has a separate module menu (which is shown at the start of each module discussion). The **PAR** key is pressed to advance to a particular parameter to be changed, without changing the programming of preceding parameters. After completing a module, the display will return to Pro no. Programming may continue by accessing additional modules.

SELECTION / VALUE ENTRY

For each parameter, the display alternates between the present parameter and the selections/value for that parameter. The **SEL▲** and **RST▼** keys are used to move through the selections/values for that parameter. Pressing the **PAR** key, stores and activates the displayed selection/value. This also advances the meter to the next parameter.

For numeric values, the value is displayed with one digit flashing (initially the right most digit). Pressing the **RST▼** key increments the digit by one or the user can hold the **RST▼** key and the digit will automatically scroll. The **SEL▲** key will select the next digit to the left. Pressing the **PAR** key will enter the value and move to the next parameter.

PROGRAMMING MODE EXIT (PAR KEY)

The Programming Mode is exited by pressing the **PAR** key with Pro no displayed. This will commit any stored parameter changes to memory and return the meter to the Display Mode. (If power loss occurs before returning to the Display Mode, verify recent parameter changes.)

PROGRAMMING TIPS

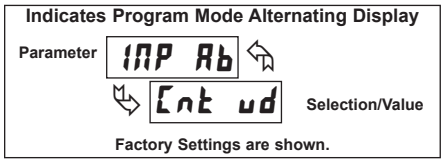
It is recommended to start with Module 1 for counting or Module 2 for rate. When programming is complete, it is recommended to record the parameter programming and lock out parameter programming with the user input or programming security code.

FACTORY SETTINGS

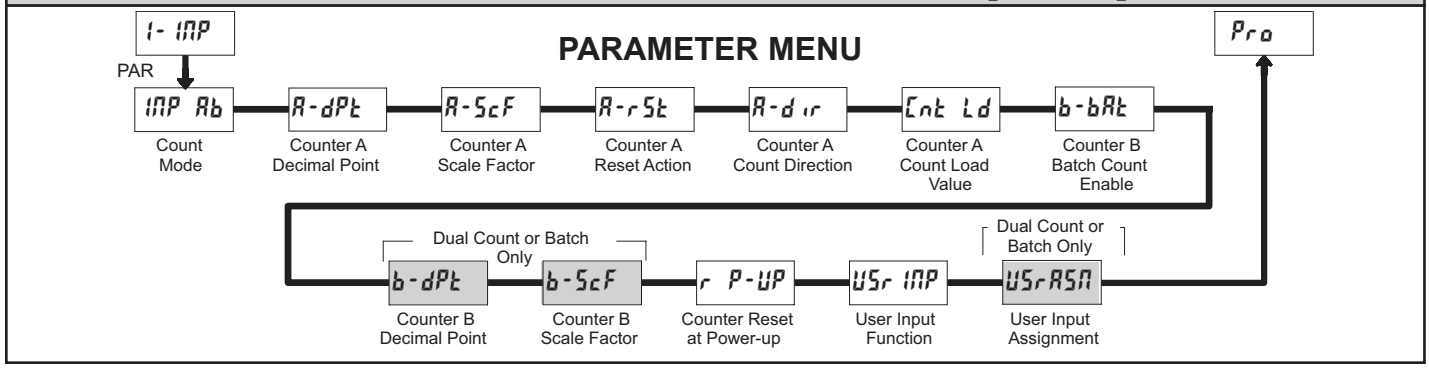
Factory Settings may be completely restored in Module 3. This is useful when encountering programming problems.

ALTERNATING SELECTION DISPLAY

In the explanation of the modules, the following dual display with arrows will appear. This is used to illustrate the display alternating between the parameter on top and the parameter's Factory Setting on the bottom. In most cases, selections and values for the parameter will be listed on the right.

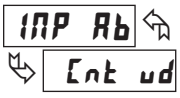


5.1 MODULE 1 - INPUT SETUP PARAMETERS (1- inP)



Shaded area selections only apply when Counter B is enabled (Dual Count mode or batch counter).

COUNT MODE



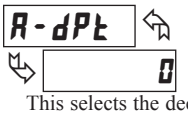
Cnt ud rt-Cnt dUAL QUAd 1 QUAd 2 QUAd 4 AddAdd AddSub

Select the count mode that corresponds with your application. The input actions are shown in the boxes below. For simple counting applications, it is recommended to use Count with Direction for the count mode. Simply leave the direction input unconnected.

DISPLAY	MODE	INPUT A ACTION	INPUT B ACTION
Cnt ud	Count with Direction	Counter A	Counter A Direction
rt-Cnt	Rate/Counter	Rate only	Counter A Add
dUAL	Dual Counter	Counter A Add	Counter B Add
QUAd 1	Quadrature x1	Count A	Quad A
QUAd 2	Quadrature x2	Count A	Quad A
QUAd 4	Quadrature x4	Count A	Quad A
AddAdd	2 Input Add/Add	Counter A Add	Counter A Add
AddSub	2 Input Add/Subtract	Counter A Add	Counter A Subtract

Note: The Rate indicator signal is derived from Input A in all count modes.

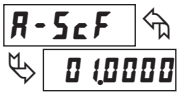
COUNTER A DECIMAL POINT POSITION



0 0.0 0.00 0.000 0.0000

This selects the decimal point position for Counter A and the setpoint value, if assigned to Counter A. The selection will also affect Counter A scale factor calculations.

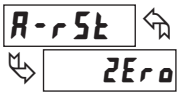
COUNTER A SCALE FACTOR



0.0001 to 9.9999

The number of input counts is multiplied by the scale factor to obtain the desired process value. A scale factor of 1.0000 will result in the display of the actual number of input counts. (Details on scaling calculations are explained at the end of this section.)*

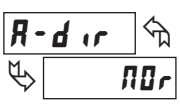
COUNTER A RESET ACTION



2Ero Cnt Ld

When Counter A is reset, it returns to Zero or Counter A Count Load value. This reset action applies to all Counter A resets, except a Setpoint generated Counter Auto Reset programmed in Module 4.

COUNTER A COUNT DIRECTION

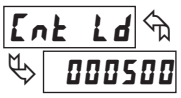


nor rEU

Reverse (rEU) switches the normal Counter A count direction shown in the Count Mode parameter chart.

G

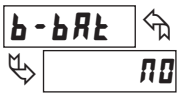
COUNTER A COUNT LOAD VALUE



-99999 to 999999

Counter A resets to this value if Reset to Count Load action is selected. To enter a negative Count Load value, increment digit 6 to display a "-" sign.*

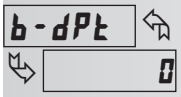
COUNTER B BATCH COUNT ENABLE



no SP-2
SP-1 SP1-2

The Counter B Batch Count function internally counts the number of output activations of the selected setpoint(s). The count source for the batch counter can be SP1, SP2 or both. Batch counting is available in all count modes except Dual Counter, which uses an external input signal for Counter B.

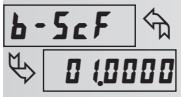
COUNTER B DECIMAL POINT POSITION



0 0.00 0.0000
0.0 0.000

This selects the decimal point position for Counter B. The selection will also affect Counter B scale factor calculations.

COUNTER B SCALE FACTOR



00.0001 to 99.9999

The number of input or batch counts is multiplied by the scale factor to obtain the desired process value. A scale factor of 1.0000 will result in the display of the actual number of input or batch counts. (Details on scaling calculations are explained at the end of this section.)*

COUNTER RESET AT POWER-UP

no no Cnt b
YES Cnt A both

The selected counter(s) will reset at each meter power-up.

SCALING FOR COUNT INDICATION

The counter's scale factor is factory set to 1, to provide one count on the display for each pulse that is input to the unit. In many applications, there will not be a one-to-one correspondence between input pulses and display units. Therefore, it is necessary for the meter to scale or multiply the input pulses by a scale factor to achieve the desired display units (feet, meters, gallons, etc.)

The Count Scale Factor Value can range from 00.0001 to 99.9999. It is important to note that the precision of a counter application cannot be improved by using a scale factor greater than one. To accomplish greater precision, more pulse information must be generated per measuring unit. The following formula is used to calculate the scale factor.

$$\text{Scale Factor} = \frac{\text{Desired Display Units}}{\text{Number of Pulses}} \times \text{Decimal Point Position}$$

WHERE:

Desired Display Units: Count display units acquired after pulses that occurred.

Number of Pulses: Number of pulses required to achieve the desired display units.

Decimal Point Position:

0	=	1
0.0	=	10
0.00	=	100
0.000	=	1000
0.0000	=	10000

EXAMPLE: The counter display is used to indicate the total number of feet used in a process. It is necessary to know the number of pulses for the desired units to be displayed. The decimal point is selected to show the resolution in hundredths.

$$\text{Scale Factor} = \frac{\text{Desired Display Units}}{\text{Number of Pulses}} \times \text{Decimal Point Position}$$

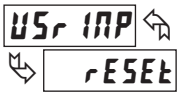
Given that 128 pulses are equal to 1 foot, display total feet with a one-hundredth resolution.

$$\text{Scale Factor} = \frac{1.00}{128} \times 100$$

$$\text{Scale Factor} = 0.007812 \times 100$$

$$\text{Scale Factor} = 0.7812$$

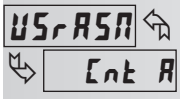
USER INPUT FUNCTION



DISPLAY	MODE	DESCRIPTION
no	No Function	User Input disabled.
ProLoc	Program Mode Lock-out	See Programming Mode Access chart (Module 3).
Inh ibt	Inhibit	Inhibit counting for the selected counter(s).
rESEt	Maintained Reset	Level active reset of the selected counter(s).
StorE	Store	Freeze display for the selected counter(s) while allowing counts to accumulate internally.
St-rSt	Store and Reset	Edge triggered reset of the selected counter(s) after storing the count.
d-SEL	Display Select *	Advance once for each activation.
d-LEU	Display Intensity Level *	Increase intensity one level for each activation.
rSt-1	Setpoint 1 Reset *	Reset setpoint 1 output.
rSt-2	Setpoint 2 Reset *	Reset setpoint 2 output.
rSt-12	Setpoint 1 and 2 Reset *	Reset both setpoint 1 and 2 outputs.
Print	Print Request	Serial transmit of the active parameters selected in the Print Options menu (Module 5).
Pr-rSt	Print and Reset *	Same as Print Request followed by a momentary reset of the selected counter(s).

** Indicates Edge Triggered function. All others are Level Active functions.*

USER INPUT ASSIGNMENT



Cnt A
Cnt b
both

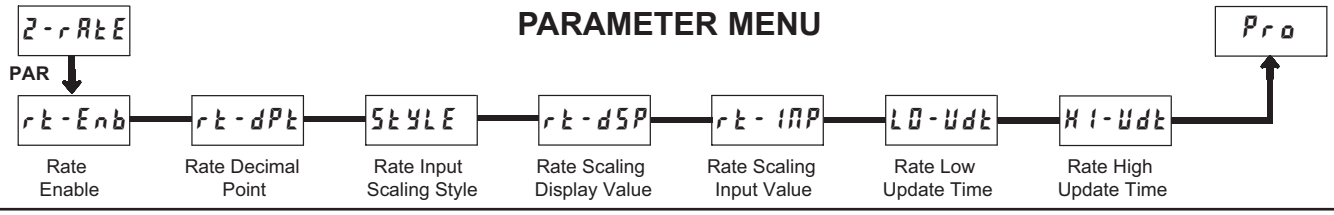
The User Input Assignment is only active when Counter B is enabled and the user input selection perfroms a Reset, Inhibit or Store function on one or both of the counters.

*For value entry instructions, refer to selection/value entry in the Programming The Meter section.

Shaded area selections only apply when Counter B is enabled (Dual Count mode or batch counter).

G

5.2 MODULE 2 - RATE SETUP PARAMETERS (2-rAtE)



RATE ENABLE

rt-Enb
NO
NO YES

This parameter enables the rate display. For maximum input frequency, Rate Enable should be set to NO when not in use. When set to NO, the remaining rate parameters are not accessible.

RATE DECIMAL POINT

rt-dPt
0
0
0.0
0.00
0.000
0.0000

This selects the decimal point position for rate displays and any setpoint value assigned to these displays. This parameter does not affect rate scaling calculations.

RATE INPUT SCALING STYLE

StyLE
KEY
KEY APLY

If a Rate Input value (in Hz) and the corresponding Rate Display value are known, the Key-in (KEY) Scaling Style can be used. This allows rate scaling without the presence of a rate input signal.

If the Rate Input value has to be derived from the actual rate input signal, the Apply (APLY) Scaling Style should be used.

RATE SCALING DISPLAY VALUE

rt-dSP
0 to 999999
00 1000

Enter the desired Rate Display value for the Scaling Point. This value is entered using the front panel buttons for either Scaling Style.*

RATE SCALING INPUT VALUE

rt-InP
0.1 to 99999.9
0 1000.0

Enter the corresponding Rate Input value using the Scaling Style selected. *

Key-in Style:

Enter the Rate Input value using the front panel buttons. This value is always in pulses per second (Hz).*

Apply Style:

The meter initially shows the stored Rate Input value. To retain this value, press **PAR** to advance to the next parameter. To enter a new value, apply the rate input signal to Input A. Press **RST▼** and the applied input frequency (in Hz) will appear on the display. To insure the correct reading, wait several rate sample periods (see Rate Low Update Time) or until a consistent reading is displayed. Press **PAR** to store the displayed value as the new Rate Input value.

*For value entry instructions, refer to selection/value entry in the Programming The Meter section.

RATE LOW UPDATE TIME (DISPLAY UPDATE)

LO-Udt
0 1.0
0.1 to 99.9 seconds

The Low Update Time is the minimum amount of time between display updates for the Rate display. Values of 0.1 and 0.2 seconds will update the display correctly but may cause the display to appear unsteady.

RATE HIGH UPDATE TIME (DISPLAY ZERO)

HI-Udt
02.0
0.2 to 99.9 seconds

The High Update Time is the maximum amount of time before the Rate display is forced to zero. (For more explanation, refer to Rate Value Calculation.) The High Update Time **must** be higher than the Low Update Time and higher than the desired slowest readable speed (one divided by pulses per second). The factory setting of 2.0, will force the display to zero for speeds below 0.5 Hz or a pulse every 2 seconds.

SCALING FOR RATE INDICATION

To scale the Rate, enter a Scaling Display value with a corresponding Scaling Input value. These values are internally plotted to a Display value of 0 and Input value of 0.0 Hz. A linear relationship is formed between these points to yield a rate display value that corresponds to the incoming input signal rate. The meter is capable of showing a rate display value for any positive slope linear process.

SCALING CALCULATION FOR KEY-IN STYLE

If a display value versus input signal (in pulses per second) is known, then those values can be entered into Scaling Display (rt-dSP) and Scaling Input (rt-InP). No further calculations are needed.

If only the number of pulses per 'single' unit (i.e. # of pulses per foot) is known, then it can be entered as the Scaling Input value and the Scaling Display value will be entered as the following:

RATE PER	DISPLAY (rt-dSP)	INPUT (rt-InP)
Second	1	# of pulses per unit
Minute	60	# of pulses per unit
Hour	3600	# of pulses per unit

NOTES:

1. If # of pulses per unit is less than 1, then multiply both Input and Display values by 10 or 100 as needed for greater accuracy.
2. If the Display value is raised or lowered, then Input value must be raised or lowered by the same proportion (i.e. Display value for per hour is entered by a third less (1200) then Input value is a third less of # of pulses per unit). The same is true if the Input value is raised or lowered, then Display value must be raised or lowered by the same proportion.
3. Both values must be greater than 0.

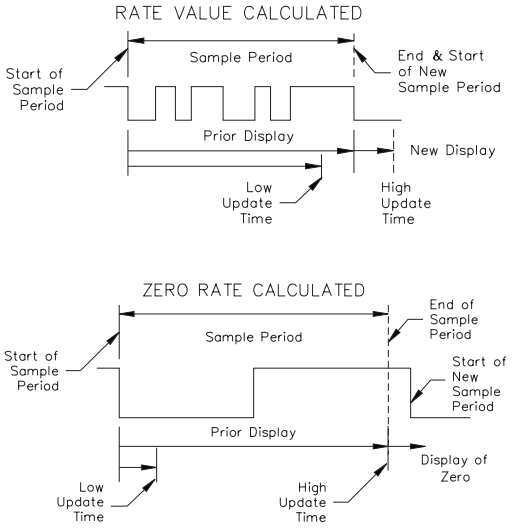
EXAMPLE:

1. With 15.1 pulses per foot, show feet per minute in tenths. Scaling Display = 60.0 Scaling Input = 15.1.
2. With 0.25 pulses per gallon, show whole gallons per hour. (To have greater accuracy, multiply both Input and Display values by 10.) Scaling Display = 36000 Scaling Input = 2.5.

G

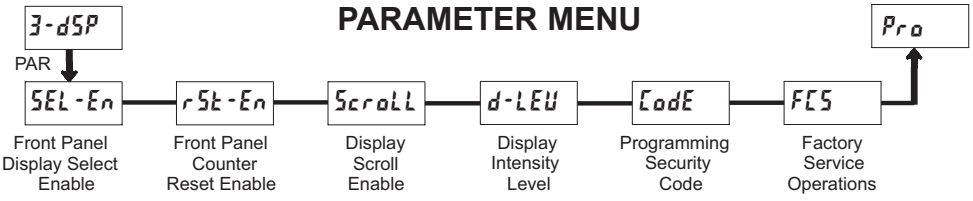
INPUT FREQUENCY CALCULATION

The meter determines the input frequency by summing the number of falling edges received during a sample period of time. The sample period begins on the first falling edge. At this falling edge, the meter starts accumulating time towards Low Update and High Update values. Also, the meter starts accumulating the number of falling edges. When the time reaches the Low Update Time value, the meter looks for one more falling edge to end the sample period. If a falling edge occurs (before the High Update Time value is reached), the Rate display will update to the new value and the next sample period will start on the same edge. If the High Update Time value is reached (without receiving a falling edge after reaching Low Update Time), then the sample period will end but the Rate display will be forced to zero. The High Update Time value must be greater than the Low Update Time value. Both values must be greater than 0.0. The input frequency calculated during the sample period, is then shown as a Rate value determined by the scaling calculation.



5.3 MODULE 3 - DISPLAY AND FRONT PANEL KEY PARAMETERS (3-dSP)

PARAMETER MENU



FRONT PANEL DISPLAY SELECT ENABLE (SEL▲)

SEL-En / YES — nO YES

The YES selection allows the **SEL▲** key to toggle through the enabled displays.

FRONT PANEL COUNTER RESET ENABLE (RST▼)

rSt-En / YES — nO YES

nO	nO	both
YES	Cnt A	dSPLAY
	Cnt b	

The YES selection allows the **RST▼** key to reset the selected counter(s). The shaded selections are only active when Counter B is enabled (Dual Count Mode or batch counter).

DISPLAY SCROLL ENABLE

ScroLL / nO — nO YES

The YES selection allows the display to automatically scroll through the enabled displays. The scroll rate is about every 4 seconds.

DISPLAY INTENSITY LEVEL

d-LEU / 5 — 1 to 5

Enter the desired Display Intensity Level (1-5). The display will actively dim or brighten as levels are changed.

PROGRAMMING SECURITY CODE

CodE / 000 — 0 to 999

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 (ProLoc) in the User Input Function parameter (Module 1).

Two programming modes are available. Full Programming mode allows all unit parameters to be viewed and modified. Quick Programming mode permits only user selected values to be modified, but allows direct access to these values without having to enter Full Programming mode.

Entering a Security Code from 1-99 enables Quick Programming mode, and displays a sublist to select which values appear in the Quick Programming menu. All of the values set to YES in the sublist are accessible in Quick Programming. The values include Setpoints (SP-1, SP-2), Output Time-outs (tOUt-1, tOUt-2), Count Load value (Cnt Ld) and Display Intensity (d-LEU).

Programming any Security Code other than 0, requires this code to be entered at the CodE prompt in order to access Full Programming mode. Quick Programming mode, if enabled, is accessed before the CodE prompt appears.

USER INPUT FUNCTION	USER INPUT STATE	SECURITY CODE	MODE WHEN "PAR" KEY IS PRESSED	FULL PROGRAMMING MODE ACCESS
not ProLoc	———	0	Full Programming	Immediate Access
		1-99	Quick Programming	After Quick Programming with correct code entry at CodE prompt *
		100-999	CodE prompt	With correct code entry at CodE prompt *
ProLoc	Active	0	Programming Lock	No Access
		1-99	Quick Programming	No Access
		100-999	CodE prompt	With correct code entry at CodE prompt *
	Not Active	0-999	Full Programming	Immediate Access

** Entering Code 222 allows access regardless of security code.*

G

FACTORY SERVICE OPERATIONS

FCS / no — no yes

Select **yes** to perform either of the Factory Service Operations shown below.

RESTORE FACTORY DEFAULT SETTINGS

CodE / 66

Entering Code 66 will overwrite all user settings with the factory default settings. The meter will display **rESEt** and then return to **CodE 00**. Press the **PAR** key to exit the module.

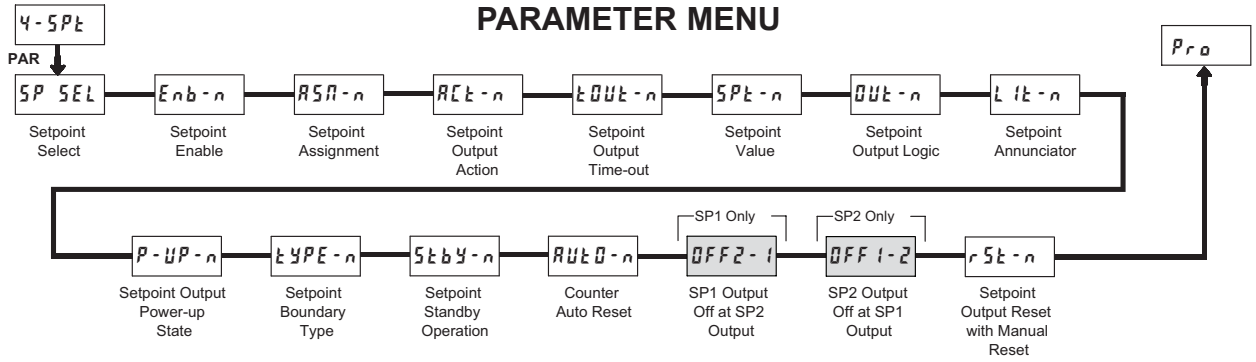
VIEW MODEL AND VERSION DISPLAY

CodE / 50

Entering Code 50 will display the model and version (x.x) of the meter. The display then returns to **CodE 00**. Press the **PAR** key to exit the module.

5.4 MODULE 4 - SETPOINT OUTPUT PARAMETERS (4-SPt)

PARAMETER MENU



Some Setpoint parameters will not appear depending on the Setpoint Assignment and Setpoint Output Action selected. The Setpoint Parameter Availability chart below illustrates this.

PARAMETER	DESCRIPTION	COUNTER ASSIGNMENT (A or B)*			RATE ASSIGNMENT		
		TIMED OUT t-OUt	BOUNDARY bOUnd	LATCH LAtCH	TIMED OUT t-OUt	BOUNDARY bOUnd	LATCH LAtCH
tOUt-n	Setpoint Output Time-out Value	Yes	No	No	Yes	No	No
SPt-n	Setpoint Value	Yes	Yes	Yes	Yes	Yes	Yes
OUt-n	Setpoint Output Logic	Yes	Yes	Yes	Yes	Yes	Yes
Lit-n	Setpoint Annunciator	Yes	Yes	Yes	Yes	Yes	Yes
P-UP-n	Setpoint Output Power-up State	No	No	Yes	No	No	Yes
tYPE-n	Setpoint Boundary Type	No	Yes	No	Yes	Yes	Yes
StbY-n	Standby Operation (Low ActingOnly)	No	Yes	No	Yes	Yes	Yes
AUtO-n	Counter Auto Reset	Yes	No	Yes	No	No	No
OFF2-1	SP1 Output Off at SP2 (SP1 only)	Yes	No	Yes	No	No	No
OFF1-2	SP2 Output Off at SP1 (SP2 only)	Yes	No	Yes	No	No	No
rSt-n	Output Reset with Manual Reset	Yes	No	Yes	Yes	No	Yes

* BOUNDARY Setpoint Action not applicable for Counter B assignment.

SETPOINT SELECT

SP SEL / no — no, SP-1, SP-2

Select the Setpoint Output to be programmed, starting with Setpoint 1. The "n" in the following parameters reflects the chosen Setpoint number. After the selected setpoint is completely programmed, the display returns to **SP SEL**. Repeat steps for Setpoint 2 if both Setpoints are being used. Select **no** to exit the Setpoint programming module.

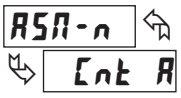
SETPOINT ENABLE

Enb-n / no — no yes

Select **yes** to enable the chosen setpoint and access the setup parameters. If **no** is selected, the unit returns to **SP SEL** and the setpoint is disabled.

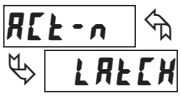
G

SETPOINT ASSIGNMENT



Select the display the Setpoint is to be assigned.

SETPOINT OUTPUT ACTION



This parameter selects the action of the Setpoint output as described in the chart below. Boundary mode is not applicable for Counter B assignment.

SPT ACTION	DESCRIPTION	OUTPUT ACTIVATES	OUTPUT DEACTIVATES
LAtCH	Latched Output Mode	When Count = Setpoint	At Manual Reset (if rSt-n=YES)
t-Out	Timed Output Mode	When Count = Setpoint	After Setpoint Output Time-Out
bOUnd	Boundary Mode (High Acting)	When Count ≥ Setpoint	When Count < Setpoint
	Boundary Mode (Low Acting)	When Count ≤ Setpoint	When Count > Setpoint

SETPOINT OUTPUT TIME-OUT

0.01 to 599.99 seconds

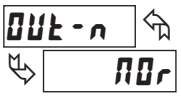
This parameter is only active if the Setpoint Action is set to timed output mode (t-Out). Enter the value in seconds that the output will be active, once the Setpoint Value is reached.

SETPOINT VALUE

Count A: -99999 to 999999
Count B: 0 to 99999
Rate: 0 to 99999

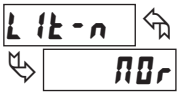
Enter the desired Setpoint value. To enter a negative setpoint value, increment digit 6 to display a "-" sign (Counter A only).

SETPOINT OUTPUT LOGIC



Normal (nOr) turns the output "on" when activated and "off" when deactivated. Reverse (rEU) turns the output "off" when activated and "on" when deactivated.

SETPOINT ANNUNCIATOR



Normal (nOr) displays the setpoint annunciator when the corresponding output is "on". Reverse (rEU) displays the setpoint annunciator when the output is "off".

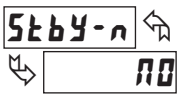
SETPOINT OUTPUT POWER-UP STATE

SAVE will restore the output to the same state it was at before the meter was powered down. On will activate the output at power up. OFF will deactivate the output at power up.

SETPOINT BOUNDARY TYPE

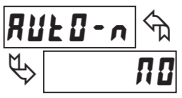
High Acting Boundary Type activates the output when the assigned display value (ASn-n) equals or exceeds the Setpoint value. Low Acting activates the output when the assigned display value is less than or equal to the Setpoint.

SETPOINT STANDBY OPERATION



This parameter only applies to Low Acting Boundary Type setpoints. Select YES to disable a Low Acting Setpoint at power-up, until the assigned display value crosses into the output "off" area. Once in the output "off" area, the Setpoint will then function per the description for Low Acting Boundary Type.

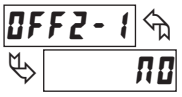
COUNTER AUTO RESET



This parameter automatically resets the Setpoint Assigned Counter (A or B) each time the Setpoint value is reached. The automatic reset can occur at output start, or output end if the Setpoint Output Action is programmed for timed output mode. The Reset-to-Count Load selections ("CLd-") only apply to Counter A assignment. This reset may be different from the Counter A Reset Action selected in Module 1.

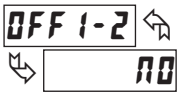
SELECTION	ACTION
no	No Auto Reset
2Er-St	Reset to Zero at the Start of output activation
CLd-St	Reset to Count Load value at the Start of output activation
2Er-En	Reset to Zero at the End of output activation (timed out only)
CLd-En	Reset to Count Load at the End of output activation (timed out only)

SETPOINT 1 OUTPUT OFF AT SETPOINT 2 (SP1 Only)



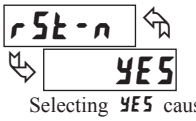
This parameter will deactivate Setpoint 1 output at the Start or End of Setpoint 2 output (O1 off at O2). The "-End" setting only applies if Setpoint 2 Output Action is programmed for timed output.

SETPOINT 2 OUTPUT OFF AT SETPOINT 1 (SP2 Only)



This parameter will deactivate Setpoint 2 output at the Start or End of Setpoint 1 output (O2 off at O1). The "-End" setting only applies if Setpoint 1 Output Action is programmed for timed output.

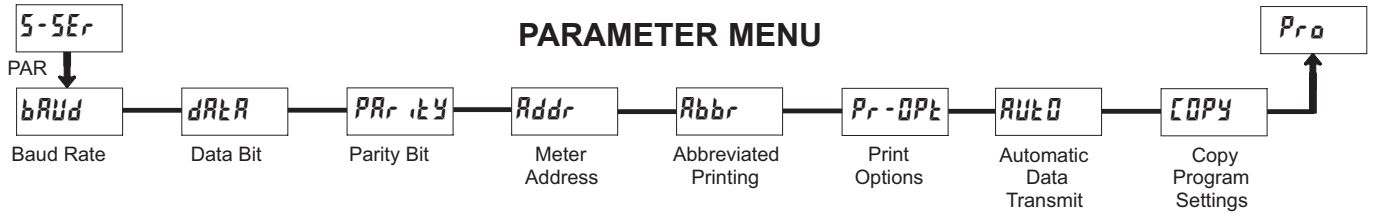
SETPOINT OUTPUT RESET WITH MANUAL RESET



Selecting YES causes the Setpoint output to deactivate (reset) when the Setpoint Assigned Counter is reset. The counter reset can occur by the **RST▼** key, User Input or Counter Reset at Power-up.

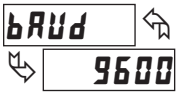
This output reset will not occur when the Assigned Counter is reset by a Setpoint generated Counter Auto Reset.

5.5 MODULE 5 - SERIAL COMMUNICATIONS PARAMETERS (5-SEr)



Module 5 is the programming module for the Serial Communications Parameters. These parameters are used to match the serial settings of the meter with those of the host computer or other serial device.

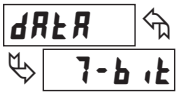
BAUD RATE



300 1200 4800 19200
600 2400 9600 38400

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

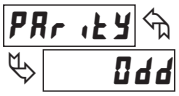
DATA BIT



7-bit 8-bit

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

PARITY BIT



no
Odd
EVEn

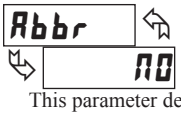
This parameter only appears when the Data Bit parameter is set to a 7-bit data word length. Set the parity bit to match that of the other serial equipment on the serial link. The meter ignores parity when receiving data and sets the parity bit for outgoing data. If parity is set to no, an additional stop bit is used to force the frame size to 10 bits.

METER ADDRESS

0 to 99

Enter the serial node address. With a single unit, an address is not needed and a value of zero can be used (RS232 applications). Otherwise, with multiple bussed units, a unique address number must be assigned to each meter. The node address applies specifically to RS485 applications.

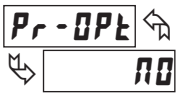
ABBREVIATED PRINTING



no yES

This parameter determines the formatting of data transmitted from the meter in response to a Transmit Value command or a Block Print Request. Select no for a full print transmission, consisting of the meter address, mnemonics, and parameter data. Select yES for abbreviated print transmissions, consisting of the parameter data only. This setting is applied to all the parameters selected in the PRINT OPTIONS. (Note: If the meter address is 0, the address will not be sent during a full transmission.)

PRINT OPTIONS



no yES

This parameter selects the meter values transmitted in response to a Print Request. A print request is also referred to as a block print because more than one parameter can be sent to a printer or computer as a block.

Selecting yES displays a sublist for choosing the meter parameters to appear in the print block. All active parameters entered as yES in the sublist will be transmitted during a block print. Parameters entered as no will not be sent.

The "Print All" (Pr-ALL) option selects all meter values for transmitting (yES), without having to individually select each parameter in the sublist.

Note: Inactive parameters will not be sent regardless of the print option setting. For example, Counter B or Scale Factor B will only be sent if Counter B is enabled (Dual Counter mode or batch count). Likewise, the Rate value will not be sent unless the Rate Display is enabled.

DISPLAY	DESCRIPTION	FACTORY SETTING	MNEMONIC
Cnt A	Counter A	yES	CTA
Cnt b	Counter B	no	CTB
rAtE	Rate Value	no	RTE
ScF A	Scale Factor A	no	SFA
ScF b	Scale Factor B	no	SFB
SP-1	Setpoint 1	no	SP1
SP-2	Setpoint 2	no	SP2
Cnt Ld	Counter A Count Load	no	CLD

AUTOMATIC DATA TRANSMIT

no yES

Selecting yES causes the meter to automatically transmit serial data per the Print Options selection list. This occurs without using the User Input terminal Print Request function (Module 1), and without requiring any serial data request commands. This makes the User Input available to perform other functions, while still allowing the meter to output serial data.

The selected data is transmitted repeatedly every 1.5 seconds during normal operating mode, and pauses during programming mode.

COPY PROGRAM SETTINGS

no yES

This parameter is used to copy all the program settings from one LD meter directly to another LD meter(s), through the serial terminal block connections (RS232 or RS485). No PC connection or additional software is required. Copying program setttings eliminates or greatly reduces programming time when multiple meters use identical, or very similar, settings for an application.

Copy Requirements:

To copy program settings from one meter to another requires the following:

1. Each meter must have the same software version. The version is displayed during the meter power-up sequence, or by entering Code 50 in the Factory Service Operations. (See Module 3 for details)
2. Each meter receiving the program settings (receiver) must have the baud rate

G

set to 9600 baud. This is the factory default setting, so a new meter should arrive ready for copying. The meter sending the program settings (master) should be set to the desired baud rate for the application (if different than 9600). This baud rate setting will then be copied to the receiver(s).

Copy Connections:

To connect the LD meters for copying, refer to section 3.5 Serial Wiring for details. The meter shown in the figures as LD METER will be the master.

1. RS232 - Allows copying from the master meter to a single receiver only.
2. RS485 - Allows copying from the master meter to one or more receivers simultaneously. Up to 31 receiving meters can be connected during copying.

Copy Procedure:

1. Connect the master and receiver(s) using RS232 or RS485 terminals.
2. Apply power to the meters. The receiving meter(s) must be operating in the normal display mode (not programming mode).
3. On the master meter, proceed to the Copy Program Settings parameter and select **YES** to begin copying.
4. During the copy process (~ 2 sec.), the master meter displays an upload message (**UP-Ld**) while the receiver(s) displays a download message (**dn-Ld**). This indicates successful communication between the master and receiver(s).
5. When copying is completed, all receivers display the power-up sequence and return to normal operating mode, programmed with all the same settings as the master meter. The master remains at the **COPY** prompt, ready for another receiver(s) to be connected for copying.

Sending Serial Commands and Data

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

Command String Construction

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

1. The first 2 or 3 characters consist of the Node Address Specifier (N) followed by a 1 or 2 character node address number. The node 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 optional 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 all the active selections chosen in the Print Options menu parameter.
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 in meter response time when using the * and $ terminating characters.

Register Identification Chart

ID	Value Description	MNEMONIC	Applicable Commands	Transmit Details (T and V)
A	Counter A	CTA	T, V, R	6 digit positive/5 digit negative (with minus sign)
B	Counter B	CTB	T, V, R	5 digit, positive only
C	Rate	RTE	T	5 digit, positive only
D	Scale Factor A	SFA	T, V	6 digit, positive only
E	Scale Factor B	SFB	T, V	6 digit, positive only
F	Setpoint 1 (Reset Output 1)	SP1	T, V, R	per setpoint Assignment, same as Counter or Rate
G	Setpoint 2 (Reset Output 2)	SP2	T, V, R	per setpoint Assignment, same as Counter or Rate
H	Counter A Count Load Value	CLD	T, V, R	6 digit positive/5 digit negative (with minus sign)

Command String Examples:

1. Node address = 17, Write 350 to the Setpoint 1 value
   String: N17VF350*
2. Node address = 5, Read Counter A, response time of 50 msec min
   String: N5TA*
3. Node address = 0, Reset Setpoint 1 output
   String: RF*
4. Node address = 31, Request a Block Print Output, response time of 2 msec min
   String: N31P$

Transmitting Data to the Meter

Numeric data sent to the meter must be limited to transmit details listed in the Register Identification Chart. 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 is set for 0.0 and 25 is written to a register. The value of the register is now 2.5. In this case, write a value of 250 to equal 25.0).

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 from the meter in response to either a transmit command (T), a block print request command (P) or a User Input print request. The response from the meter is either a full field transmission or an abbreviated transmission, depending on the selection chosen in Module 5.

Full Field Transmission

Byte	Description
1, 2	2 byte Node Address field [00-99]
3	<SP> (Space)
4-6	3 byte Register Mnemonic field
7-18	12 byte data field; 10 for number, one for sign, one for decimal point
19	<CR> (carriage return)
20	<LF> (line feed)
21	<SP>* (Space)
22	<CR>* (carriage return)
23	<LF>* (line feed)

The first two characters transmitted are the meter address. If the address assigned is 0, two spaces are substituted. A space follows the meter address field. The next three characters are the register mnemonic, as shown in the Register Identification Chart.

The numeric data is transmitted next. The numeric field (bytes 7 to 18) is 12 characters long. When a requested counter or rate value exceeds the meter's display limits, an * (used as an overflow character) replaces a space in byte 7. Byte 8 is always a space.

The remaining ten positions of this field consist of a minus sign (for negative values), a floating decimal point (if applicable), and eight positions for the requested value. The data within bytes 9 to 18 is right-aligned with leading spaces for any unfilled positions.

The end of the response string is terminated with a <CR> and <LF>. After the last line of a block print, an extra <SP>, <CR> and <LF> are added to provide separation between the print blocks.

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

Abbreviated Transmission

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.*

The abbreviated response suppresses the node address and register ID, leaving only the numeric part of the response.

Meter Response Examples:

1. Node address = 17, full field response, Counter A = 875
   17 CTA 875 <CR><LF>
2. Node address = 0, full field response, Setpoint 1 = -250.5
   SP1 -250.5<CR><LF>
3. Node address = 0, abbreviated response, Setpoint 1 = 250, last line of block print
   250<CR><LF><SP><CR><LF>

Command Response Time

The meter can only receive data or transmit data at any one time (half-duplex operation). During RS232 transmissions, the meter ignores commands while transmitting data, but instead uses RXD as a busy signal. 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 (* or $) 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 times the # of characters) / baud rate

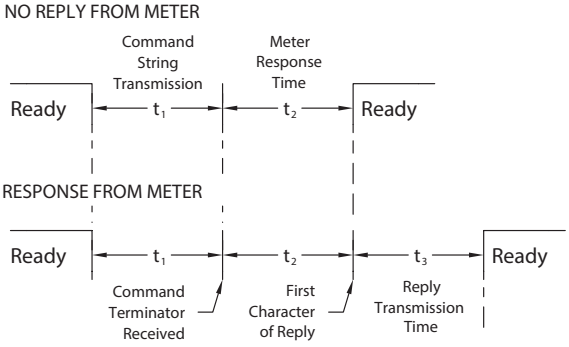
At the start of time interval t_2, the meter starts the interpretation of the command and when complete, performs the command function. This time interval t_2 varies. If no response from the meter is expected, the meter is ready to accept another command.

If the meter is to reply with data, the time interval t_2 is controlled by the use of the command terminating character. The '*' terminating character results in a response time of 50 msec. minimum. This allows sufficient time for the release of the sending driver on the RS485 bus. Terminating the command line with '$' results in a response time (t_2) of 2 msec. minimum. The faster 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. At the end of t_3, the meter is ready to receive the next command.

t_3 = (10 times the # of characters) / baud rate

The maximum serial throughput of the meter is limited to the sum of the times t_1, t_2 and t_3.



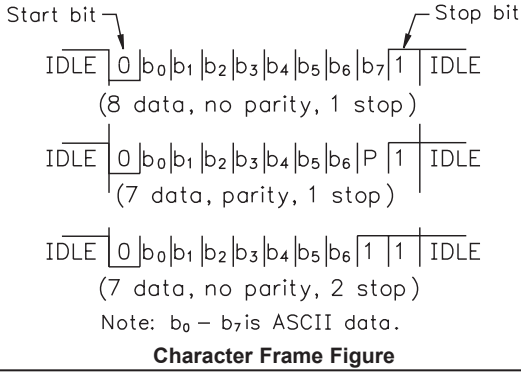
Timing Diagram Figure

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.



Character Frame Figure

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.

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 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 meter.

G

MODEL LD - LARGE DISPLAY TIMER AND CYCLE COUNTER

- *2.25" or 4" HIGH RED LED DIGITS*
- *6-DIGIT BI-DIRECTIONAL TIMING CAPABILITY*
- *5-DIGIT CYCLE COUNTING CAPABILITY*
- *SELECTABLE TIMER RANGES AND OPERATING MODES*
- *ELAPSED TIMER AND PRESET TIMER FUNCTIONALITY*
- *SERIAL COMMUNICATIONS (RS232 or RS485)*
- *PROGRAMMABLE USER INPUT*
- *UNIVERSALLY POWERED*
- *5 AMP FORM C RELAY OUTPUT*
- *ALUMINUM NEMA 4X CASE CONSTRUCTION*

c UL US LISTED IND. CONT. EQ. 51EB

CE

GENERAL DESCRIPTION

The Large Display Timer and Cycle Counter is a versatile display that functions as an Elapsed Timer or Preset Timer, with full-featured user programmability. The meter includes a built-in Cycle Counter, relay output and serial communications capability. The 6 digit displays are available in either 2.25" or 4" high red LED digits with adjustable display intensity. The 2.25" high models are readable up to 130 feet. The 4" high models are readable up to 180 feet. Both versions are constructed of a NEMA 4X/IP65 enclosure in light weight aluminum.

The Timer has two signal inputs and eight input operating modes. These modes provide level active or edge triggered start/stop operation. The Timer features 18 selectable timer ranges to cover a wide variety of timing applications. The built-in Cycle Counter can be linked to timer operation to count timing cycles, or function as a totally independent counter, accepting count speeds up to 500 Hz. The display can be toggled either manually or automatically between the Timer and Counter values.

In addition to the Timer/Counter inputs, a programmable User Input is provided to perform a variety of meter functions. DIP switches are used to configure the inputs for current sinking (active low) or current sourcing (active high) operation.

The Setpoint Output can be assigned to the Timer or Counter value, and configured to suit a variety of control and alarm requirements. The meter also includes RS232 or RS485 serial communications.

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

CAUTION: Risk of electric shock.

SAFETY SUMMARY

All safety regulations, local codes and instructions that appear in this and corresponding 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.

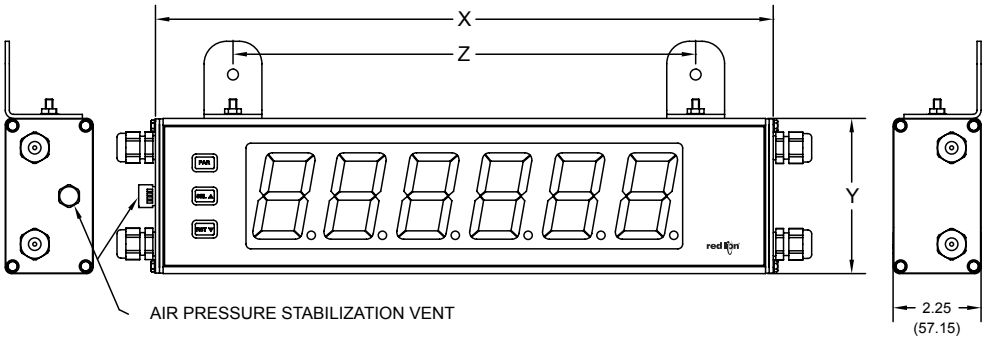
Do not use this unit to directly command motors, valves, or other actuators not equipped with safeguards. To do so can be potentially harmful to persons or equipment in the event of a fault to the unit.

The protective conductor terminal is bonded to conductive parts of the equipment for safety purposes and must be connected to an external protective earthing system.

SPECIFICATIONS

1. **DISPLAY**: 2.25" (57 mm) or 4" (101 mm) intensity adjustable Red LED
2. **POWER REQUIREMENTS**:
   AC POWER: 50 to 250 VAC 50/60 Hz, 26 VA
   DC POWER: 21.6 to 250 VDC, 11 W
   DC Out: +24 VDC @ 100 mA if input voltage is greater than 50 VAC/VDC
   +24 VDC @ 50 mA if input voltage is less than 50 VDC
   Isolation: 2300 V_{RMS} for 1 min. to all inputs and outputs
3. **TIMER DISPLAY**: 6-digits
   Display Range: 0 to 999999
   Overflow/Underflow Indication: Display flashes "t OUEr"
   Minimum Digit Resolution: 0.001 Sec.
   Maximum Single Digit Resolution: 1 Hr.
   Timing Accuracy: ±0.01%
4. **CYCLE COUNTER DISPLAY**: 5-digits, may be disabled if not used
   Display Designator: "C" to the left side of the display
   Display Range: 0 to 99999
   Overflow/Underflow Indication: Display flashes "C OUEr"

DIMENSIONS In inches (mm)



PART NUMBER	X (Length)	Y (Height)	Z (Center)
LD2T06P0	16 (406.4)	4 (101.6)	12 (304.8)
LD4T06P0	26 (660.4)	7.875 (200)	22 (558.8)

Maximum Count Rate:
All Count Sources except Input B: 10 Hz
Input B Count Source:
With Timer Input Filter ON: 10 Hz
With Timer Input Filter OFF: 500 Hz

5. **TIMER SIGNAL INPUTS** (INP A and INP B)
DIP switch selectable pull-up (7.8 KΩ) or pull-down (3.9 KΩ) resistors determine active high or active low input logic.
Input A Trigger levels: V_{IL} = 1.25 V max; V_{IH} = 2.75 V min; V_{MAX} = 28 VDC
Input B: Trigger levels: V_{IL} = 1.0 V max; V_{IH} = 2.4 V min; V_{MAX} = 28 VDC
Inputs A and B:
Timer Input Pulse Width: 1 msec min.
Timer Start/Stop Response Time: 1 msec max.
Filter: Software filtering provided for relay or switch contact debounce. Filter enabled or disabled through programming. If enabled, results in 50 msec start/stop response time for successive pulses applied to the same input terminal.

6. **RESET/USER INPUT** Programmable Function Input:
DIP switch selectable pull-up (7.8 KΩ) or pull-down (3.9 KΩ) resistor that determines active high or active low input logic.
Trigger levels: V_{IL} = 1.0 V max; V_{IH} = 2.4 V min; V_{MAX} = 28 VDC
Response Time: 10 msec typ.; 50 msec debounce (activation and release)

7. **COMMUNICATIONS**:
RS485 SERIAL COMMUNICATIONS
Type: RS485 multi-point balanced interface (isolated)
Baud Rate: 300 to 38400
Data Format: 7/8 bits; odd, even, or no parity
Bus Address: 0 to 99; max 32 meters per line
RS232 SERIAL COMMUNICATIONS
Type: RS232 half duplex (isolated)
Baud Rate: 300 to 38400
Data Format: 7/8 bits; odd, even, or no parity

8. **MEMORY**: Nonvolatile E^2PROM retains all programming parameters and timer/count values when power is removed.

9. **OUTPUT**:
Relay: Form C contacts rated at 5 amps @ 120/240 VAC or 28 VDC (resistive load), 1/8 H.P. @ 120 VAC (inductive load)

10. **CONNECTIONS**:
Internal removable terminal blocks are used for power and signal wiring. Remove end plates with ¼" nut driver. For LD4 versions, all wiring is on right side of unit. For LD2 versions, power and signal wiring connections are on the right side and the relay and serial output options are on left side.
Wire Strip Length: 0.4" (10 mm)
Wire Gage: 24-12 AWG copper wire
Torque: 5.3 inch-lbs (0.6 N-m) max
Cable Diameter: Outside diameter must be 0.181" (4.6 mm) to 0.312" (7.9 mm) to maintain NEMA 4 rating of cord grips.

11. **ENVIRONMENTAL CONDITIONS**:
Operating temperature: 0 to 50 °C
Storage temperature: -40 to 70 °C
Operating and storage humidity: 0 to 85% max. RH (non-condensing)
Vibration According to IEC 68-2-6: Operational 5 to 150 Hz, in X, Y, Z direction for 1.5 hours, 2 g's (1g relay).
Shock According to IEC 68-2-27: Operational 30 g's (10g relay), 11 msec in 3 directions.
Altitude: Up to 2,000 meters

12. **CERTIFICATIONS AND COMPLIANCES**:
SAFETY
UL Listed, File # E137808, UL508, CSA C22.2 No. 14-M95
LISTED by Und. Lab. Inc. to U.S. and Canadian safety standards
Type 4X Enclosure rating, UL50
IEC 61010-1, EN 61010-1: Safety requirements for electrical equipment for measurement, control, and laboratory use, Part 1.
IP65 Enclosure rating, IEC 529
ELECTROMAGNETIC COMPATIBILITY
Emissions and Immunity to EN 61326: Electrical Equipment for Measurement, Control and Laboratory use.

Immunity to Industrial Locations:

Electrostatic discharge	EN 61000-4-2	Criterion A 4 kV contact discharge 8 kV air discharge
Electromagnetic RF fields	EN 61000-4-3	Criterion A 10 V/m
Fast transients (burst)	EN 61000-4-4	Criterion A 2 kV power 1 kV signal
Surge	EN 61000-4-5	Criterion A 1 kV L-L, 2 kV L&N-E power
RF conducted interference	EN 61000-4-6	Criterion A 3 V/rms
Voltage dip/interruptions	EN61000-4-11	Criterion A 0.5 cycle

Emissions:

Emissions	EN 55011	Class B

Notes:
1. Criterion A: Normal operation within specified limits.

13. **CONSTRUCTION**: Aluminum enclosure, and steel side panels with textured black polyurethane paint for scratch and corrosion resistance protection. Meets NEMA 4X/IP65 specifications. Installation Category II, Pollution Degree 2.

14. **WEIGHT**:
LD2T06P0 - 4.5 lbs (2.04 kg)
LD4T06P0 - 10.5 lbs (4.76 kg)

ORDERING INFORMATION

MODEL NO.	DESCRIPTION	PART NUMBER
LD	2.25" High 6-Digit Red LED Timer/Cycle Counter w/ Relay Output & RS232/RS485 Serial Communications	LD2T06P0
	4" High 6-Digit Red LED Timer/Cycle Counter w/ Relay Output & RS232/RS485 Serial Communications	LD4T06P0
LD Plug	Panel Meter Plug for LD models (NOT included in LD Product UL File)	LDPLUG00

1.0 INSTALLING THE METER

INSTALLATION

The meter meets NEMA 4X/IP65 requirements when properly installed.

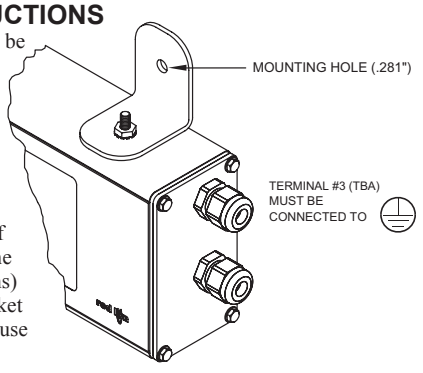
INSTALLATION ENVIRONMENT

The unit should be installed in a location that does not exceed the operating temperature. Placing the unit near devices that generate excessive heat should be avoided. The unit 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 front overlay. Do not use tools of any kind (screwdrivers, pens, pencils, etc.) to operate the keypad of the unit.

MOUNTING INSTRUCTIONS

This display is designed to be wall mounted or suspended from a ceiling truss or other suitable structure capable of supporting the LDT. Caution should be exercised when hanging the display to provide for the safety of personnel. If hanging the LDT, run the suspension cables (or chains) through the mounting bracket holes. For wall mounting use #10-32 size bolts.



G

2.0 Setting the DIP Switches

To access the switches, remove the right side plate of the meter. A bank of eight switches is located inside the unit. *Note: Some switches are not used and should remain in the factory set position.*

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

SWITCH 1 (Unused)
This switch is not used and should remain in the factory set position.

SWITCH 2 (Input A) {See Note 1}
SNK: Adds internal 7.8 KΩ pull-up resistor to +12 VDC, I_{MAX} = 2.1 mA.
SRC: Adds internal 3.9 KΩ pull-down resistor, 7.2 mA max. @ 28 VDC max.

SWITCH 3 (Input A)
FILTER ON: Provides hardware debounce for Input A to allow relay or switch contacts to be used as a signal source. Software debounce for Inputs A and B is provided in the programming menu (Module 1).

SWITCH 4 (Input B) {See Note 1}
SNK: Adds internal 7.8 KΩ pull-up resistor to +12 VDC, I_{MAX} = 2.1 mA.
SRC: Adds internal 3.9 KΩ pull-down resistor, 7.2 mA max. @ 28 VDC max.

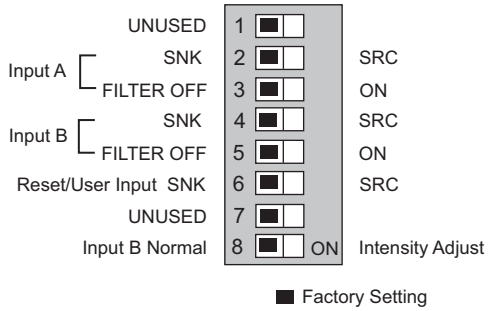
SWITCH 5 (Input B)
FILTER ON: Provides hardware debounce for Input B to allow relay or switch contacts to be used as a signal source. Software debounce for Inputs A and B is provided in the programming menu (Module 1).

SWITCH 6 (RESET/USER INPUT) {See Note 1}
SNK: Adds internal 7.8 KΩ pull-up resistor to +12VDC, I_{MAX} = 2.1 mA.
SRC: Adds internal 3.9 KΩ pull-down resistor, 7.2 mA max. @ 28 VDC max.

SWITCH 7 (Unused)
This switch is not used and should remain in the factory set position.

SWITCH 8 (Input B)
NORMAL: Input B performs the normal functions described in the Timer Input Operation parameter of the programming menu (Module 1).
INTENSITY ADJUST: In this position, Input B is used to adjust the LED display intensity. Five distinct LED levels can be set by pulsing Input B. The display intensity level can also be set in the programming menu (Module 3).

Note 1: When the DIP switch is in the SNK position (OFF), the input is configured as active low. When the switch is in the SRC position (ON), the input is configured as active high.



3.0 Wiring the Meter

EMC INSTALLATION GUIDELINES

Although this meter is designed with a high degree of immunity to Electro-Magnetic 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 the meter may be different for various installations. The meter becomes more immune to EMI with fewer I/O connections. Cable length, routing, and shield termination are very important and can mean the difference between a successful or troublesome installation. Listed below are some EMC guidelines for successful installation in an industrial environment.

1. The meter should be properly connected to protective earth.
2. Use shielded (screened) cables for all Signal and Control inputs. The shield (screen) pigtail 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 only at the panel where the unit is mounted to earth ground (protective earth).
   b. Connect the shield to earth ground at both ends of the cable, usually when the noise source frequency is above 1 MHz.
   c. Connect the shield to common of the meter and leave the other end of the shield unconnected and insulated from earth ground.
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 ran in 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.
4. Signal or Control cables within an enclosure should be routed as far as possible from contactors, control relays, transformers, and other noisy components.
5. In extremely high EMI environments, the use of external EMI suppression devices, such as ferrite suppression cores, is effective. Install them on Signal and Control cables as close to the unit as possible. Loop the cable through the core several times or use multiple cores on each cable for additional protection. Install line filters on the power input cable to the unit to suppress power line interference. Install them near the power entry point of the enclosure. The following EMI suppression devices (or equivalent) are recommended:
   Ferrite Suppression Cores for signal and control cables:
   Fair-Rite # 0443167251 (RLC# FCOR0000)
   TDK # ZCAT3035-1330A
   Steward # 28B2029-0A0
   Line Filters for input power cables:
   Schaffner # FN610-1/07 (RLC# LFIL0000)
   Schaffner # FN670-1.8/07
   Corcom # 1 VR3
   Note: Reference manufacturer's instructions when installing a line filter.
6. Long cable runs are more susceptible to EMI pickup than short cable runs. Therefore, keep cable runs as short as possible.
7. Switching of inductive loads produces high EMI. Use of snubbers across inductive loads suppresses EMI.
   Snubber: RLC# SNUB0000.

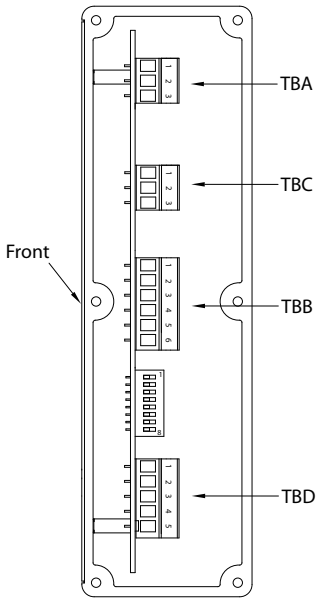
G

WIRING OVERVIEW

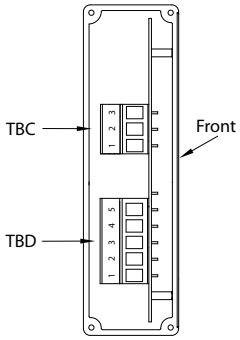
Electrical connections are made via pluggable terminal blocks located inside the meter. All conductors should conform to the meter's voltage and current ratings. All cabling should conform to appropriate standards of good installation, local codes and regulations. It is recommended that the power supplied to the meter (DC or AC) be protected by a fuse or circuit breaker. When wiring the meter, compare the numbers on the label on the back of the meter case against those shown in wiring drawings for proper wire position. Strip the wire, leaving approximately 0.4" (10 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).

WIRING CONNECTIONS

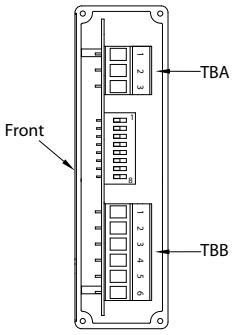
Internal removable terminal blocks are used for power and signal wiring. Access to terminal blocks is through conduit fittings. Remove end plates with ¼" nut driver. For LD4 versions, all wiring is on right side of unit. For LD2 versions, power and input wiring connections are on the right side and the relay and serial connections are on the left side.



LD4



LD2 Left Side

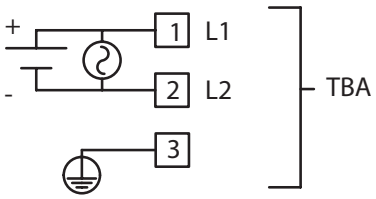


LD2 Right Side

3.1 POWER WIRING

The power wiring is made via the 3 position terminal block (TBA) located inside the unit (right side). The DC out power is located on TBB (right side).

Power
Terminal 1: VAC/DC +
Terminal 2: VAC/DC -
Terminal 3: Protective Conductor Terminal



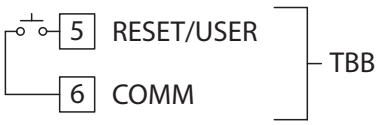
DC Out Power
Terminal 4: + 24 VDC OUT
Terminal 6: User Common

3.2 RESET/USER INPUT WIRING

The Reset/User Input is located on the right side

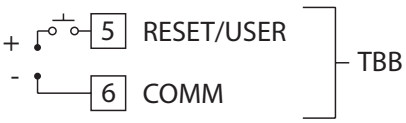
Terminal 5: Reset/User Input
Terminal 6: User Common

Sinking Logic



DIP switch 6 OFF

Sourcing Logic

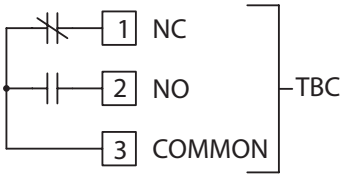


DIP switch 6 ON

3.3 SETPOINT (OUTPUT) WIRING

The setpoint relay uses a three position terminal block (TBC) located on the left side of the LD2 model, and on the right side for the LD4 model.

Terminal 1: Normally Closed
Terminal 2: Normally Open
Terminal 3: Relay Common



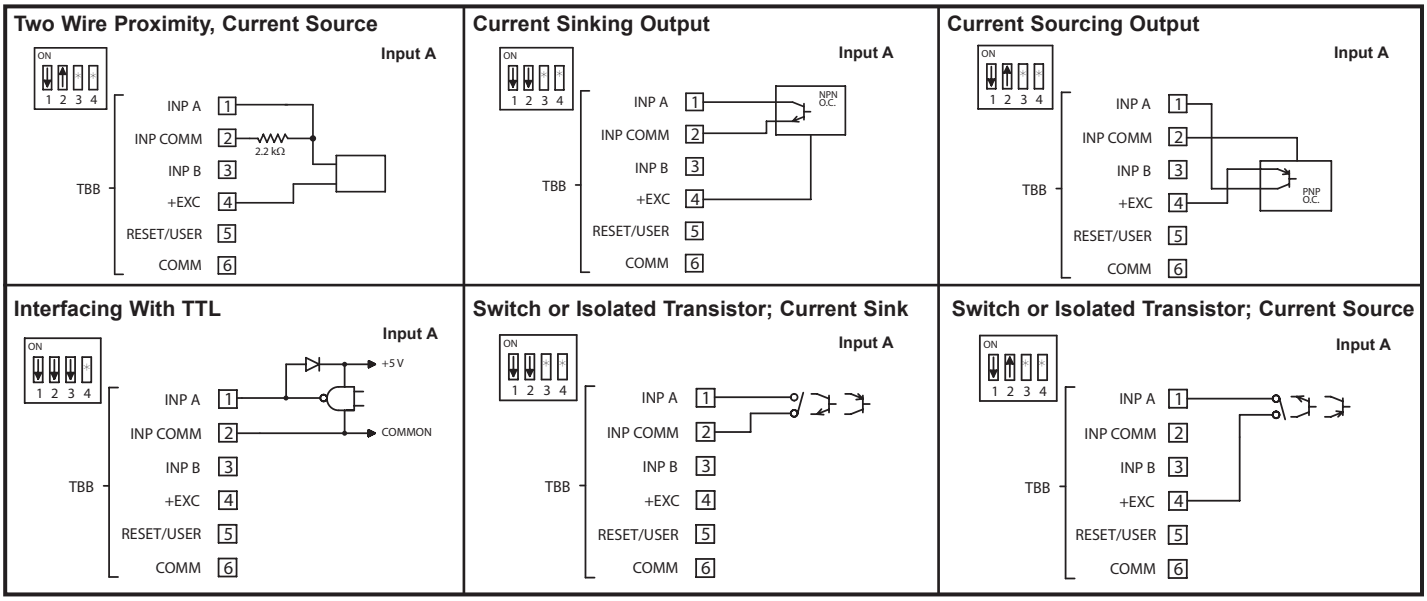
G

3.4 INPUT WIRING

The Large Display Timer is equipped with two signal inputs, A and B. These inputs are wired using the six position terminal block (TBB) located inside the unit on the right side.

Terminal 1: Input A
Terminal 3: Input B
Terminal 2: Input Common

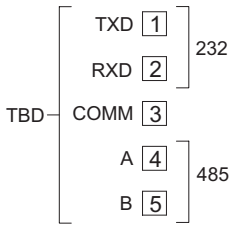
CAUTION: DC common is NOT isolated from input common. In order to preserve the safety of the meter application, the DC common must be suitably isolated from hazardous live earth referenced voltage; or input common must be at protective earth ground potential. If not, hazardous voltage may be present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



∗ *Switch position is application dependent.*

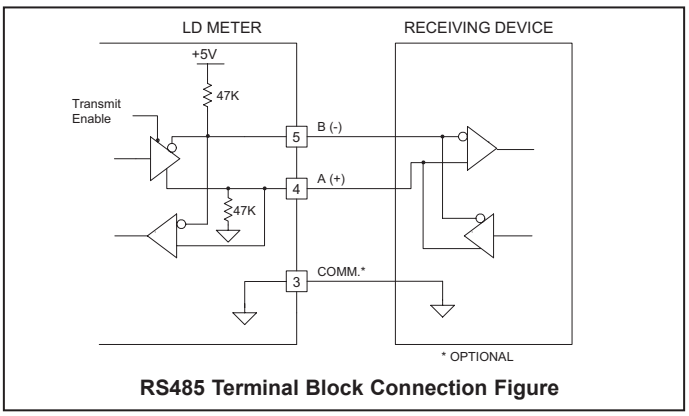
3.5 SERIAL WIRING

The serial connections are made via terminal block TBD located inside the unit on the left side for the LD2 and on the right side for the LD4.



RS485 Communications

The RS485 communication standard allows the connection of up to 32 devices on a single pair of wires, distances up to 4,000 ft. and data rates as high as 10M baud (the LD is limited to 38.4k baud). The same pair of wires is used to both transmit and receive data. RS485 is therefore always half-duplex, that is, data cannot be received and transmitted simultaneously.



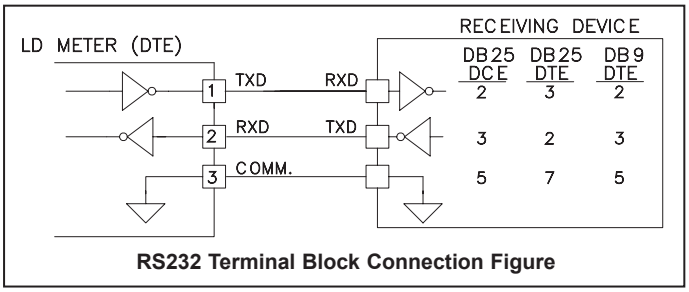
RS485 Terminal Block Connection Figure

RS232 Communications

RS232 is intended to allow two devices to communicate over distances up to 50 feet. Data Terminal Equipment (DTE) transmits data on the Transmitted Data (TXD) line and receives data on the Received Data (RXD) line. Data Computer Equipment (DCE) receives data on the TXD line and transmits data on the RXD line. The LD emulates a DTE. If the other device connected to the meter also emulates a DTE, the TXD and RXD lines must be interchanged for communications to take place. This is known as a null modem connection. Most printers emulate a DCE device while most computers emulate a DTE device.

Some devices cannot accept more than two or three characters in succession without a pause in between. In these cases, the meter employs a busy function.

As the meter begins to transmit data, the RXD line (RS232) is monitored to determine if the receiving device is "busy". The receiving device asserts that it is busy by setting the RXD line to a space condition (logic 0). The meter then suspends transmission until the RXD line is released by the receiving device.



RS232 Terminal Block Connection Figure

G

4.0 Reviewing the Front Panel Keys and Display

KEY	DISPLAY MODE OPERATION	PROGRAMMING MODE OPERATION
PAR	Access Programming Mode	Store selected parameter and index to next parameter
SEL▲	Select display (Timer or Cycle Counter)	Advance through selection list/select digit position in parameter value
RST▼	Reset value(s) per front panel reset setting	Increment selected digit position of parameter value

OPERATING MODE DISPLAY DESIGNATORS

"L" - To the left of the display is the Cycle Counter value.

" 1 " - Between digits 5 and 6 indicates the setpoint status.

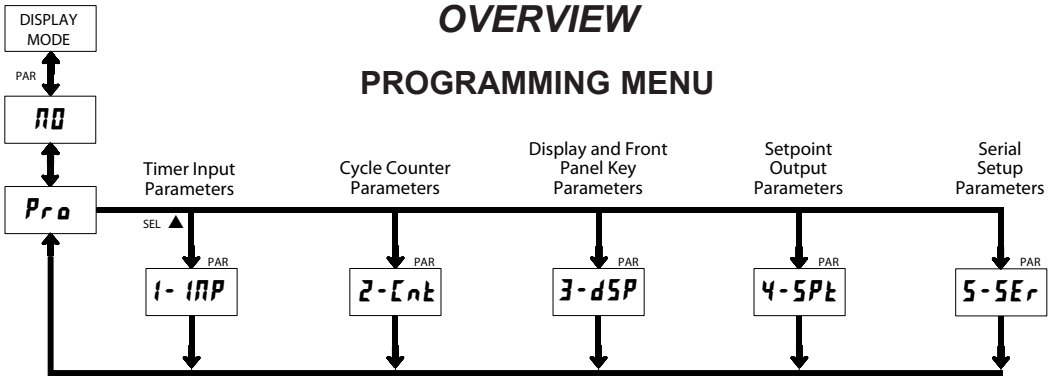
"." - Decimal point to the far right of the display can be programmed to flash when the timer is running, to provide a "Timer Run" indicator.

If display scroll is enabled, the display will toggle automatically every four seconds between the Timer and Cycle Counter values.

5.0 Programming the Meter

OVERVIEW

PROGRAMMING MENU



PROGRAMMING MODE ENTRY (PAR KEY)

It is recommended all programming changes be made off line, or before installation. The meter normally operates in the Display Mode. No parameters can be programmed in this mode. The Programming Mode is entered by pressing the **PAR** key. If it is not accessible, then it is locked by either a security code or a hardware lock (See Module 3).

MODULE ENTRY (SEL▲ & PAR KEYS)

The Programming Menu is organized into five modules. These modules group together parameters that are related in function. The display will alternate between **Pro** and the present module. The **SEL▲** key is used to select the desired module. The displayed module is entered by pressing the **PAR** key.

MODULE MENU (PAR KEY)

Each module has a separate module menu (which is shown at the start of each module discussion). The **PAR** key is pressed to advance to a particular parameter to be changed, without changing the programming of preceding parameters. After completing a module, the display will return to **Pro no**. Programming may continue by accessing additional modules.

SELECTION / VALUE ENTRY

For each parameter, the display alternates between the present parameter and the selections/value for that parameter. The **SEL▲** and **RST▼** keys are used to move through the selections/values for that parameter. Pressing the **PAR** key, stores and activates the displayed selection/value. This also advances the meter to the next parameter.

For numeric values, the value is displayed with one digit flashing (initially the right most digit). Pressing the **RST▼** key increments the digit by one or the user can hold the **RST▼** key and the digit will automatically scroll. The **SEL▲** key will select the next digit to the left. Pressing the **PAR** key will enter the value and move to the next parameter.

PROGRAMMING MODE EXIT (PAR KEY)

The Programming Mode is exited by pressing the **PAR** key with **Pro no** displayed. This will commit any stored parameter changes to memory and return the meter to the Display Mode. (If power loss occurs before returning to the Display Mode, verify recent parameter changes.)

PROGRAMMING TIPS

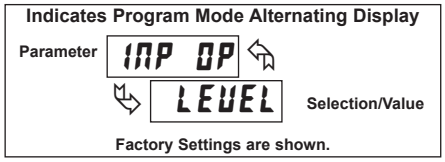
It is recommended to start with Module 1 and proceed through each module in sequence. When programming is complete, it is recommended to record the parameter programming and lock out parameter programming with the user input or programming security code.

FACTORY SETTINGS

Factory Settings may be completely restored in Module 3. This is useful when encountering programming problems.

ALTERNATING SELECTION DISPLAY

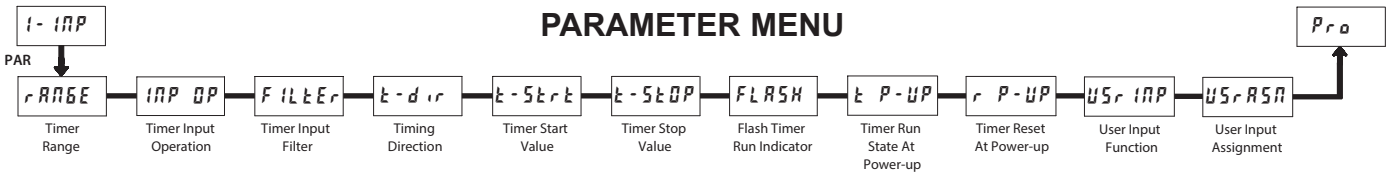
In the explanation of the modules, the following dual display with arrows will appear. This is used to illustrate the display alternating between the parameter on top and the parameter's Factory Setting on the bottom. In most cases, selections and values for the parameter will be listed on the right.



G

5.1 MODULE 1 - TIMER INPUT PARAMETERS (1-INP)

PARAMETER MENU



TIMER RANGE

rANGE
555555

18 TIMER RANGE SELECTIONS
(S = SEC; n = MIN; H = HR; d = DAY)

RANGE SELECTION	MAXIMUM DISPLAY	DISPLAY RESOLUTION
SECONDS		
555555	999999	1 SEC
55555.5	99999.9	0.1 SEC
5555.55	9999.99	0.01 SEC
555.555	999.999	0.001 SEC
MINUTES		
nnnnnn	999999	1 MIN
nnnnn.n	99999.9	0.1 MIN
nnnn.nn	9999.99	0.01 MIN
HOURS		
HHHHHH	999999	1 HR
HHHHH.H	99999.9	0.1 HR
HHHH.HH	9999.99	0.01 HR
MINUTES/SECONDS		
nnnn.SS	9999.59	1 SEC
nnn.S.S	999.5.9	0.1 SEC
nn.SS.SS	99.59.99	0.01 SEC
HOURS/MINUTES		
HHHH.nn	9999.59	1 MIN
HHH.n.n	999.5.9	0.1 MIN
HH.nn.nn	99.59.99	0.01 MIN
HOURS/MINUTES/SECONDS		
HH.nn.SS	99.59.59	1 SEC
DAYS/HOURS/MINUTES		
dd.HH.nn	99.23.59	1 MIN

TIMER INPUT OPERATION

INP OP
LEUEL

LEUEL Ed9E-1 Ed9E-2 HOLd-2
LEUrSt ErSt-1 ErSt-2 HrSt-2

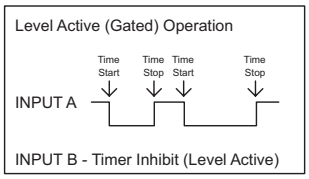
This parameter determines how the Timer Input Signals affect the Run/Stop status of the Timer. Timing diagrams are shown below for level active and edge triggered (1-input or 2-input) operation. For single input modes (Input A only), Input B provides a level active Timer Inhibit function. In the Display Hold mode, the timer display value remains held and only updates when a Timer Start (Input A) or Timer Stop (Input B) edge occurs.

The timer reset (rSt) operating modes are identical to the other modes in the diagrams, except the timer display value is reset at the Time Start edges.

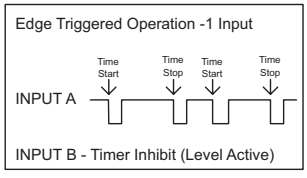
The Timer can also be stopped at a Timer Stop Value or at Setpoint output activation or deactivation. This type of Stop condition is cleared when a Timer Reset occurs, or another start edge is applied on the timer input.

For Reset Modes (rSt), the timer is reset at Time Start edge.

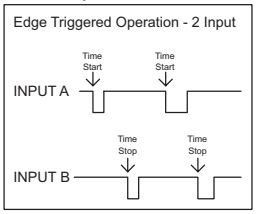
LEUEL, LEUrSt



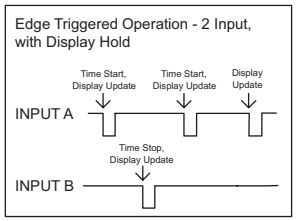
Ed9E-1, ErSt-1



Ed9E-2, ErSt-2



HOLd-2, HrSt-2



TIMER INPUT FILTER

FILtEr
On

On OFF

Provides a 50 msec software debounce for the Timer Inputs (A and B). Select On when using relays or switch contacts as a signal source.

TIMING DIRECTION

t-dir
UP

UP dn

Bi-directional timing capability. Select the timing direction desired for the application.

TIMER START VALUE

t-Strt
000000

000000 to 999999

The Timer returns to this value whenever a Timer Reset occurs. The value is entered in the same display format as the Timer Range selected. Non-zero values are normally used for "timing down" applications, but they can also provide an offset value when timing up.

TIMER STOP VALUE

t-StOP
no

no YES

The Timer stops when this value is reached regardless of the signal levels on the timer inputs. Selecting YES displays a sub-menu where the Stop Value is entered in the same display format as the Timer Range selected. This stop condition is cleared when a Timer Reset occurs or another start edge is applied on the timer input. Select no if a Stop Value is not desired.

VALUE
000000

000000 to 999999

FLASH TIMER RUN INDICATOR

FLASH
YES

no YES

Select YES to have the Timer Run indicator flash when the timer is running.

TIMER RUN STATE AT POWER-UP

t P-UP
StOP

StOP SAVE

Determines the Run/Stop state of the Timer at Power-up. This parameter does not apply to LEUEL Input Operation.

StOP - Timer Stopped at power-up, regardless of prior Run/Stop state
SAVE - Timer assumes the Run/Stop state it was in prior to power-down

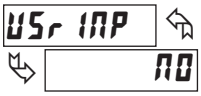
G

TIMER RESET AT POWER-UP

no yes

The Timer can be programmed to Reset at each meter power-up.

USER INPUT FUNCTION



DISPLAY	MODE	DESCRIPTION
no	No Function	User Input disabled.
ProLoc	Program Mode Lock-out	See Programming Mode Access chart (Module 3).
d-SEL	Display Select (Edge triggered)	Toggle display with each activation.
rESEt	Maintained Reset	Level active reset of the selected value(s).
d-HOLd	Display Hold	Freeze display for the selected value(s) while allowing time or counts to accumulate internally.
Hd-rSt	Hold and Reset	Edge triggered reset of the selected value(s) after storing the time or count.

USER INPUT FUNCTION (Cont'd)

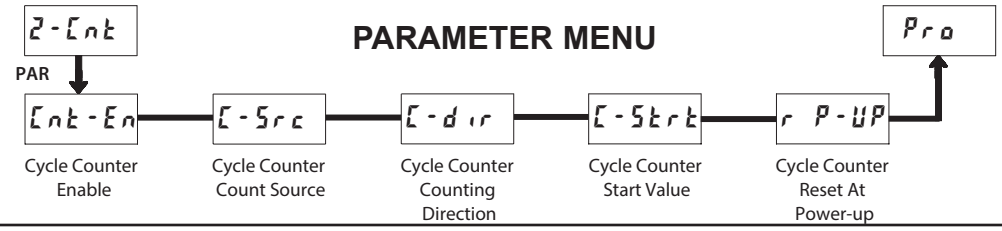
DISPLAY	MODE	DESCRIPTION
Inh ibt	Inhibit	Inhibit timing or counting for the selected value(s).
d-LEU	Display Intensity Level (Edge Triggered)	Increase intensity one level for each activation.
Pr int	Print Request	Serial transmit of the active parameters selected in the Print Options menu (Module 5).
Pr-rSt	Print and Reset	Same as Print Request followed by a momentary reset of the selected value(s).
O-rSt	Reset Output	Edge triggered deactivation of the Setpoint Output.

USER INPUT ASSIGNMENT

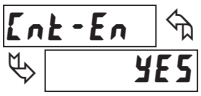
t-UAL
C-UAL
both

The User Input Assignment only applies if the cycle counter is enabled and a selection of reset, display hold, hold and reset, inhibit, or print and reset is selected in the User Input Function menu.

5.2 MODULE 2 - CYCLE COUNTER PARAMETERS (2-Cnt)



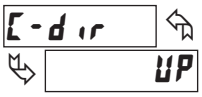
CYCLE COUNTER ENABLE



no yes

When set to no, the remaining Cycle Counter parameters are not accessible.

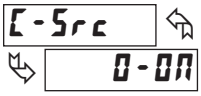
CYCLE COUNTER COUNTING DIRECTION



UP dn

Bi-directional counting capability. Select the counting direction desired for the application.

CYCLE COUNTER COUNT SOURCE



inP b
USr inP
t-rSt
O-on
O-oFF

This parameter selects the source from which the Cycle Counter derives counts. The Timer Reset (t-rSt) selection generates a count when either a manual or automatic timer reset occurs (See Module 4 for programming Automatic Reset). The Input B (inP b) selection generates a count each time Input B is activated. This selection overrides the timer inhibit function of Input B, when the timer is programmed for Level or Edge-1 operating mode (See Module 1 for Timer Input Operating Modes).

The User Input (USr inP) selection generates a count each time the User Input is activated. When selected as the count source, the User Input can still be set to perform a User Function described in Module 1. In this case, the Cycle Counter will count the number of times the selected User Function occurred.

The Output ON/OFF selections generate a count when the Setpoint output either activates or deactivates.

CYCLE COUNTER START VALUE

00000 to 99999

The Cycle Counter returns to this value whenever a Counter Reset occurs. Non-zero values are normally used for "down counting" applications, but can also provide an offset value when counting up.

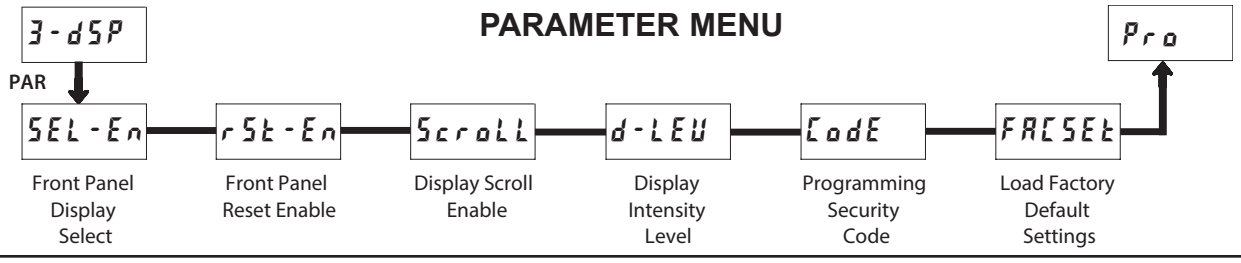
CYCLE COUNTER RESET AT POWER-UP

no yes

The Cycle Counter can be programmed to Reset at each meter power-up.

G

5.3 MODULE 3 - DISPLAY AND FRONT PANEL KEY PARAMETERS (3-dSP)



FRONT PANEL DISPLAY SELECT ENABLE (SEL▲)

SEL-En / YES — YES NO

The **YES** selection allows the **SEL▲** key to toggle between the timer and cycle counter displays.

FRONT PANEL RESET ENABLE (RST▼)

rSt-En / YES — YES, NO, t-UAL, C-UAL, both, dSPLAY

The **YES** selection allows the **RST▼** key to reset the selected value(s). The shaded selections only appear if the cycle counter is enabled.

DISPLAY SCROLL ENABLE

ScroLL / NO — YES NO

The **YES** selection allows the display to automatically scroll between the timer and cycle counter values. The scroll rate is about every 4 seconds.

DISPLAY INTENSITY LEVEL

d-LEU / 5 — 1 to 5

Enter the desired Display Intensity Level (1-5). The display will actively dim or brighten as levels are changed.

PROGRAMMING SECURITY CODE

CodE / 000 — 000 to 999

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 (**ProLoc**) in the User Input Function parameter (Module 1).

Two programming modes are available. Full Programming mode allows all parameters to be viewed and modified. Quick Programming mode permits only the Setpoint values and Timer Stop value to be modified, but allows direct access to these values without having to enter Full Programming mode.

Programming a Security Code other than 0, requires this code to be entered at the **CodE** prompt in order to access Full Programming mode. Depending on the code value, Quick Programming may be accessible before the **CodE** prompt appears (see chart).

USER INPUT FUNCTION	USER INPUT STATE	SECURITY CODE	MODE WHEN "PAR" KEY IS PRESSED	FULL PROGRAMMING MODE ACCESS
not ProLoc	———	0	Full Programming	Immediate Access
		1-99	Quick Programming	After Quick Programming with correct code entry at CodE prompt *
		100-999	CodE prompt	With correct code entry at CodE prompt *
ProLoc	Active	0	Programming Lock	No Access
		1-99	Quick Programming	No Access
		100-999	CodE prompt	With correct code entry at CodE prompt *
	Not Active	0-999	Full Programming	Immediate Access

** Entering Code 222 allows access regardless of security code.*

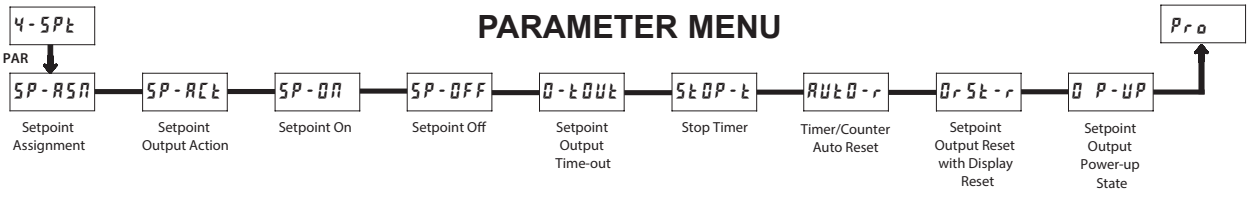
LOAD FACTORY DEFAULT SETTINGS

FACSEt / NO — NO YES

The **YES** selection will return the meter to the factory default settings. The meter will display **rESEt** and then return to **Pro**, at which time all settings have been changed.

G

5.4 MODULE 4 - SETPOINT OUTPUT PARAMETERS (4-SPt)



Module 4 is the programming module for the Setpoint Output parameters. Some parameters will not appear depending on the Setpoint Assignment and Setpoint Output Action selected.

SETPOINT ASSIGNMENT

SP-ASN ↔ t-VAL

t-VAL C-VAL

Select the display for Setpoint assignment.

SETPOINT OUTPUT ACTION

SP-ACt ↔ LAtCH

LAtCH
t-OUt
On-OFF

This parameter selects the action of the Setpoint output as shown below.

SPT ACTION	DESCRIPTION	OUTPUT ACTIVATES	OUTPUT DEACTIVATES
LAtCH	Latched Output Mode	When Time or Count = Setpoint On value	At Manual Reset (if OrSt-r = YES)
t-OUt	Timed Output Mode	When Time or Count = Setpoint On value	After Setpoint Output Time-Out
On-OFF	On-Off Output Mode	When Time or Count = Setpoint On value	When Time or Count = Setpoint Off value

SETPOINT ON

SP-On ↔ VALUE

VALUE
t-Strt
t-StOP

This parameter determines when the Setpoint output will activate. The output can activate at a programmed Setpoint Value or can be set to activate when the Timer starts (t-Strt) or stops (t-StOP).

Selecting VALUE displays a sub-menu where the Setpoint Value is entered. If the Setpoint is assigned to the Timer, the value is entered in the same display format as the selected Timer Range.

On-VAL ↔ 000100 000000 to 999999

SETPOINT OFF

SP-OFF ↔ VALUE

VALUE
t-Strt
t-StOP

The Setpoint Off parameter only appears if the Setpoint Action is set to On-Off Output mode (On-OFF). In this mode, the Setpoint OFF parameter determines when the Setpoint Output will deactivate. The output can be programmed to deactivate at a Setpoint Off Value or can be set to deactivate when the Timer starts (t-Strt) or stops (t-StOP).

Selecting VALUE displays a sub-menu where the Setpoint Off Value is entered. If the Setpoint is assigned to the Timer, the value is entered in the same display format as the selected Timer Range.

OF-VAL ↔ 000200 000000 to 999999

SETPOINT OUTPUT TIME-OUT

O-tOUt ↔ 00.00.01

00.01.00 to 99.59.99

This parameter is only active if the Setpoint Action is set to Timed Output mode (t-OUt). Enter the time duration the Setpoint Output will remain ON once it is activated. This value is always entered in minutes, seconds, and hundredths of seconds format. The maximum value is 99 minutes 59.99 seconds.

STOP TIMER

StOP-t ↔ NO

NO
O-On
O-OFF

Stops the Timer when the Setpoint output activates (O-On) or deactivates (O-OFF). Select NO if the output should not affect the Timer Run/Stop status.

The Timer Stop condition is cleared when a Timer Reset occurs, or a Time Start edge is applied on the Timer input.

TIMER/COUNTER AUTO RESET

AUtO-r ↔ NO

NO
O-On
O-OFF

Automatically resets the Setpoint Assigned display value when the Setpoint Output activates (O-On) or deactivates (O-OFF). Select NO if the output should not cause a display reset.

SETPOINT OUTPUT RESET WITH DISPLAY RESET

OrSt-r ↔ YES

YES NO

Select YES to have the Setpoint Output deactivate (reset) when the Setpoint Assigned display resets. Reset can occur by the **RST▼** key or the User Input, if programmed for that function. Select NO if the Setpoint output should not reset when the display resets.

SETPOINT OUTPUT POWER-UP STATE

O P-UP ↔ OFF

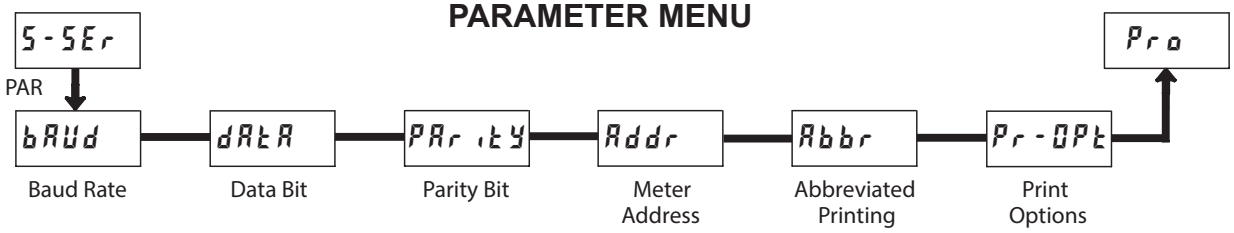
OFF
On
SAVE

SAVE will restore the output to the same state it was at before the meter was powered down. On will activate the output at power up. OFF will deactivate the output at power up. This parameter is not active when the Setpoint Action is selected for timed output mode.

G

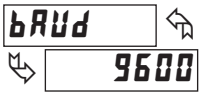
5.5 MODULE 5 - SERIAL COMMUNICATIONS PARAMETERS (5-SEr)

PARAMETER MENU



Module 5 is the programming module for the Serial Communications Parameters. These parameters are used to match the serial settings of the meter with those of the host computer or other serial device.

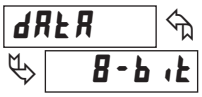
BAUD RATE



300 1200 4800 19200
600 2400 9600 38400

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

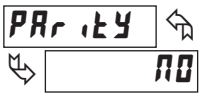
DATA BIT



7-bit 8-bit

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

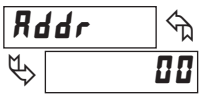
PARITY BIT



nO Odd EUEn

This parameter only appears when the Data Bit parameter is set to a 7-bit data word length. Set the parity bit to match that of the other serial equipment on the serial link. The meter ignores parity when receiving data and sets the parity bit for outgoing data. If parity is set to nO, an additional stop bit is used to force the frame size to 10 bits.

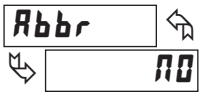
METER ADDRESS



0 to 99

Enter the serial node address. With a single unit, an address is not needed and a value of zero can be used (RS232 applications). Otherwise, with multiple bussed units, a unique address number must be assigned to each meter. The node address applies specifically to RS485 applications.

ABBREVIATED PRINTING



nO YES

This parameter determines the formatting of data transmitted from the meter in response to a Transmit Value command or a Block Print Request. Select nO for a full print transmission, consisting of the meter address, mnemonics, and parameter data. Select YES for abbreviated print transmissions, consisting of the parameter data only. This setting is applied to all the parameters selected in the PRINT OPTIONS. (Note: If the meter address is 0, the address will not be sent during a full transmission.)

PRINT OPTIONS

nO YES

This parameter selects the meter values transmitted in response to a Print Request. A print request is also referred to as a block print because more than one parameter can be sent to a printer or computer as a block.

Selecting YES displays a sublist for choosing the meter parameters to appear in the print block. All active parameters entered as YES in the sublist will be transmitted during a block print. Parameters entered as nO will not be sent.

The "Print All" (Pr-ALL) option selects all meter values for transmitting (YES), without having to individually select each parameter in the sublist.

Note: Inactive parameters will not be sent regardless of the print option setting. For example, the Cycle Counter and Cycle Counter Start values will only be sent when the Cycle Counter is enabled. If disabled, these parameters are inactive and will not be transmitted. Likewise, only the Setpoint parameters that apply to the programmed Setpoint Output Action will be transmitted.

DISPLAY	DESCRIPTION	FACTORY SETTING	MNEMONIC
t-UAL	Timer	YES	TMR
C-UAL	Cycle Counter	nO	CNT
t-Strt	Timer Start	nO	TST
t-StOP	Timer Stop	nO	TSP
C-Strt	Counter Start	nO	CST
SP-On	Setpoint ON	nO	SPT
SP-OFF	Setpoint OFF	nO	SOF
O-tOUt	Setpoint Time-out	nO	STO

G

Sending Serial Commands and Data

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

Command String Construction

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

1. The first 2 or 3 characters consist of the Node Address Specifier (N) followed by a 1 or 2 character node address number. The node 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 optional 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 all the active selections chosen in the Print Options menu parameter.
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 in meter response time when using the * and $ terminating characters.

Register Identification Chart

ID	Value Description	MNEMONIC	Applicable Commands	Transmit Details (T and V)
A	Timer	TMR	T, V, R	6 digit, per Timer Range
B	Cycle Counter	CNT	T, V, R	5 digit
C	Timer Start	TST	T, V	6 digit, per Timer Range
D	Timer Stop	TSP	T, V	6 digit, per Timer Range
E	Counter Start	CST	T, V	5 digit
F	Setpoint ON (Reset Output)	SPT	T, V, R	per Setpoint Assignment, same as Timer or Counter
G	Setpoint OFF	SOF	T, V	per Setpoint Assignment, same as Timer or Counter
H	Setpoint Time-out	STO	T, V	6 digit, mm.ss.ss format

Command String Examples:

1. Node address = 17, Write 350 to the Setpoint On value
   String: N17VF350$
2. Node address = 5, Read Timer value, response time of 50 msec min
   String: N5TA*
3. Node address = 0, Reset Setpoint output
   String: RF*
4. Node address = 31, Request a Block Print Output, response time of 2 msec min
   String: N31P$

Transmitting Data to the Meter

Numeric data sent to the meter must be limited to Transmit Details listed in the Register Identification Chart. Leading zeros are ignored. The meter ignores any decimal point and conforms the number to the appropriate display format. (For example: The Timer range is set for tenths of a second and 25 is written to the Timer Start register. The value of the register is now 2.5 seconds. In this case, write a value of 250 to equal 25.0 seconds).

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 from the meter in response to either a transmit command (T), a block print request command (P) or a User Input print request. The response from the meter is either a full field transmission or an abbreviated transmission, depending on the selection chosen in Module 5.

Full Field Transmission

Byte	Description
1, 2	2 byte Node Address field [00-99]
3	<SP> (Space)
4-6	3 byte Register Mnemonic field
7-18	12 byte data field; 9 bytes for number and three bytes for decimal points
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 meter address. If the address assigned is 0, two spaces are substituted. A space follows the meter address field. The next three characters are the register mnemonic, as shown in the Register Identification Chart.

The numeric data is transmitted next. The numeric field (bytes 7 to 18) is 12 characters long. When a display overflow exists for a requested timer or cycle counter value, an * (used as an overflow character) replaces a space in byte 7. Byte 8 is always a space.

The remaining ten positions of this field consist of seven positions for the requested value with decimal points positioned for the selected timer range. The data within bytes 9 to 18 is right-aligned with leading spaces for any unfilled positions.

The end of the response string is terminated with a <CR> and <LF>. After the last line of a block print, an extra <SP>, <CR> and <LF> are added to provide separation between the print blocks.

Abbreviated Transmission

Byte	Description
1-12	12 byte data field, 9 bytes for number and three bytes for decimal points
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.*

The abbreviated response suppresses the node address and register mnemonic, leaving only the numeric part of the response.

Meter Response Examples:

1. Node address = 17, full field response, Cycle Counter = 875
   17 CNT 875 <CR><LF>
2. Node address = 0, full field response, Setpoint On value = 250.5
   SPT 250.5<CR><LF>
3. Node address = 0, abbreviated response, Setpoint On value= 250, last line of block print
   250<CR><LF><SP><CR><LF>

Command Response Time

The meter can only receive data or transmit data at any one time (half-duplex operation). During RS232 transmissions, the meter ignores commands while transmitting data, but instead uses RXD as a busy signal. 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 (* or $) 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 times the # of characters) / baud rate

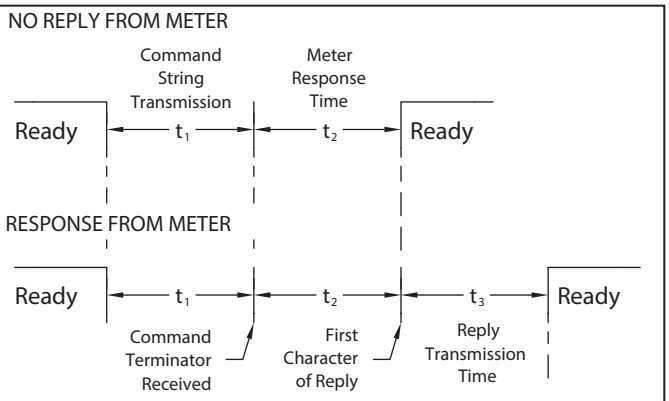
At the start of time interval t_2, the meter starts the interpretation of the command and when complete, performs the command function. This time interval t_2 varies. If no response from the meter is expected, the meter is ready to accept another command.

If the meter is to reply with data, the time interval t_2 is controlled by the use of the command terminating character. The '*' terminating character results in a response time of 50 msec. minimum. This allows sufficient time for the release of the sending driver on the RS485 bus. Terminating the command line with '$' results in a response time (t_2) of 2 msec. minimum. The faster 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. At the end of t_3, the meter is ready to receive the next command.

t_3 = (10 times the # of characters) / baud rate

The maximum serial throughput of the meter is limited to the sum of the times t_1, t_2 and t_3.



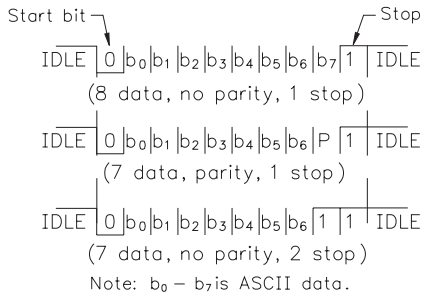
Timing Diagram Figure

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.



Character Frame Figure

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.

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 LD Timer 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 meter.

G

MODEL LD - LARGE DC VOLT/CURRENT/PROCESS DISPLAY

- *2.25" & 4" HIGH RED LED DIGITS*
- *PROGRAMMABLE SCALING AND DECIMAL POINTS*
- *PROGRAMMABLE USER INPUT*
- *DUAL 5 AMP FORM C RELAY*
- *ALUMINUM NEMA 4X/IP65 CASE CONSTRUCTION*
- *RS232/RS485 SERIAL COMMUNICATIONS*
- *UNIVERSALLY POWERED*

c UL US LISTED
IND. CONT. EQ.
51EB

c UL US LISTED
3RSD
PROCESS CONTROL EQUIPMENT

GENERAL DESCRIPTION

The Large Display is a versatile display available as a DC volt, current, or process meter with scaling, serial communications and dual relay outputs. The 5 digit displays are available in either 2.25" or 4" high red LED digits with adjustable display intensities. The 2.25" high models are readable up to 130 feet. The 4" high models are readable up to 180 feet. Both versions are constructed of a NEMA 4X/IP65 enclosure in light weight aluminum.

All models also come with dual Form C relay outputs and RS232 / RS485 serial communications.

SAFETY SUMMARY

All safety regulations, local codes and instructions that appear in this and corresponding 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.

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

CAUTION: Risk of electric shock.

The protective conductor terminal is bonded to conductive parts of the equipment for safety purposes and must be connected to an external protective earthing system.

ORDERING INFORMATION

MODEL NO.	DESCRIPTION	PART NUMBER
LD2A	2.25" High 5 Digit Red LED Volt/Current Meter w/ Relay Output and RS232/RS485 Serial Comms	LD2A05P0
LD4A	4" High 5 Digit Red LED Volt/Current Meter w/ Relay Output and RS232/RS485 Serial Comms	LD4A05P0
LD Plug	Panel Meter Plug for LD models	LDPLUG00

SPECIFICATIONS

1. **DISPLAY**: 5 digit, 2.25" (57 mm) or 4" (101 mm) intensity adjustable Red LED (-99999 to 99999)
2. **POWER REQUIREMENTS**:
   AC POWER: 50 to 250 VAC 50/60 Hz, 26 VA
   DC POWER: 21.6 to 250 VDC, 11 W
   DC Out: +24 VDC @ 100 mA if input voltage is greater than 50 VAC/VDC
   +24 VDC @ 50 mA if input voltage is less than 50 VDC
   Isolation: 2300 Vrms for 1 min. to all inputs and outputs
3. **INPUT RANGES**: Jumper Selectable
   D.C. Voltages: 200 mV, 2 V, 20 V, 200 V, 10 V

INPUT RANGE	ACCURACY @ 23 °C LESS THAN 85% RH	INPUT IMPEDANCE	MAX INPUT SIGNAL	RESOLUTION	TEMP. COEFFICIENT
200 mV	0.1% of span	1.027 MΩ	75 VDC	10 µV	70 ppm /°C
2 V	0.1% of span	1.027 MΩ	75 VDC	0.1 mV	70 ppm /°C
20 V	0.1% of span	1.027 MΩ	250 VDC	1 mV	70 ppm /°C
200 V	0.1% of span	1.027 MΩ	250 VDC	10 mV	70 ppm /°C
10 V	0.1% of span	538 KΩ	30 V	1 mV	70 ppm /°C

D.C. Currents: 200 µA, 2 mA, 20 mA, 200 mA

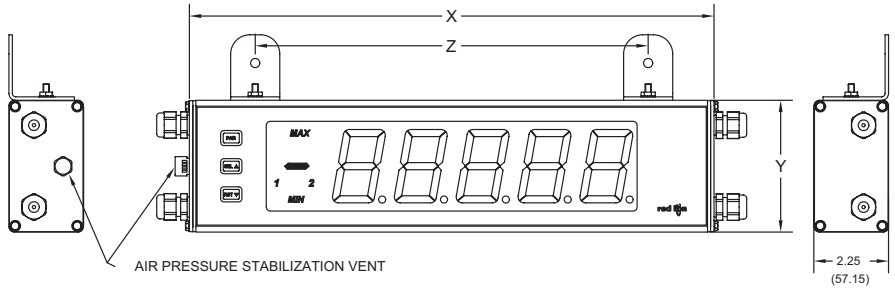
INPUT RANGE	ACCURACY @ 23 °C LESS THAN 85% RH	INPUT IMPEDANCE	MAX INPUT SIGNAL	RESOLUTION	TEMP. COEFFICIENT
200 µA	0.1% of span	1.111 KΩ	15 mA	10 nA	70 ppm /°C
2 mA	0.1% of span	111 Ω	50 mA	0.1 µA	70 ppm /°C
20 mA	0.1% of span	11 Ω	150 mA	1 µA	70 ppm /°C
200 mA	0.1% of span	1 Ω	500 mA	10 µA	70 ppm /°C

INPUT RANGE	SELECT RANGE
4 - 20 mA	Use the 20 mA range
1 - 5 VDC	Use the 10V range
1 - 10 VDC	Use the 10V range

D.C. Process: 4 to 20 mA, 1 to 5 VDC, 0/1 to 10 VDC

4. **OVERRANGE/UNDERRANGE INDICATION:**
   Input Overrange Indication: "OLOL".
   Input Underrange Indication: "ULUL".
   Display Overrange/Underrange Indication: "....."/"-....."

DIMENSIONS In inches (mm)



PART NUMBER	X (Length)	Y (Height)	Z (Center)
LD2A05P0	16 (406.4)	4 (101.6)	12 (304.3)
LD4A05P0	26 (660.4)	7.875 (200)	22 (558.8)

G

5. **A/D CONVERTER:** 16 bit resolution
   A/D Conversion Rate: 6 readings/sec.
6. **DISPLAY RESPONSE TIME**: 500 msec min.
7. **USER INPUT**:
   Software selectable pull-up (8.6 KΩ) or pull-down resistor (3.9 KΩ) that determines active high or active low input logic.
   Trigger levels: V_{IL} = 1.0 V max; V_{IH} = 2.4 V min; V_{MAX} = 28 VDC
   Response Time: 5 msec typ.; 50 msec debounce (activation and release)
8. **COMMUNICATIONS**:
   Type: RS485 or RS232
   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
   Parity: no, odd or even
   Baud Rate: 300 to 38.4 K
   Bus Address: Selectable 0 to 99, Max. 32 meters per line (RS485)
9. **MEMORY**: Nonvolatile E^2PROM retains all programming parameters and max/min values when power is removed.
10. **OUTPUT**:
    Type: Single FORM-C relay
    Isolation To Sensor & User Input Commons: 1400 Vrms for 1 min.
    Working Voltage: 150 Vrms
    Contact Rating: 5 amps @ 120/240 VAC or 28 VDC (resistive load), 1/8 H.P. @ 120 VAC (inductive load)
    Life Expectancy: 100,000 minimum operations
    Response Time:
    Turn On Time: 4 msec max.
    Turn Off Time: 4 msec max.
11. **ENVIRONMENTAL CONDITIONS**:
    Operating temperature: 0 to 65 °C
    Storage temperature: -40 to 70 °C
    Operating and storage humidity: 0 to 85% max. RH (non-condensing)
    Vibration According to IEC 68-2-6: Operational 5 to 150 Hz, in X, Y, Z direction for 1.5 hours, 2 g's (1 g relay).
    Shock According to IEC 68-2-27: Operational 30 g's (10 g relay), 11 msec in 3 directions.
    Altitude: Up to 2,000 meters
12. **CONNECTIONS**:Internal removable terminal blocks
    Wire Strip Length: 0.4" (10 mm)
    Wire Gage: 24-12 AWG copper wire, 90°C rated insulation only
    Torque: 5.3 inch-lbs (0.6 N-m) max.
    Cable Diameter: Outside diameter must be 0.181" (4.6 mm) to 0.312" (7.9 mm) to maintain NEMA 4 rating of cord grips.
13. **CONSTRUCTION**: Aluminum enclosure, and steel side panels with textured black polyurethane paint for scratch and corrosion resistance protection. Meets NEMA 4X/IP65 specifications. Installation Category II, Pollution Degree 2.
14. **CERTIFICATIONS AND COMPLIANCES**:
    SAFETY
    UL Listed, File # E137808, UL508, CSA C22.2 No. 14-M95
    File # E179259, UL61010-1, CAN/CSA C22.2 No. 61010-1
    LISTED by Und. Lab. Inc. to U.S. and Canadian safety standards
    Type 4X Enclosure rating, UL50
    IECEE CB Scheme Test Report #E179259-A3-CB-1
    Issued by Underwriters Laboratories, Inc.
    IEC 61010-1, EN 61010-1: Safety requirements for electrical equipment for measurement, control, and laboratory use, Part 1.
    IP65 Enclosure rating, IEC 529
    ELECTROMAGNETIC COMPATIBILITY
    Emissions and Immunity to EN 61326: Electrical Equipment for Measurement, Control and Laboratory use.

Immunity to Industrial Locations:

Electrostatic discharge	EN 61000-4-2	Criterion B 4 kV contact discharge 8 kV air discharge
Electromagnetic RF fields	EN 61000-4-3	Criterion B 10 V/m
Fast transients (burst)	EN 61000-4-4	Criterion B 2 kV power 1 kV signal
Surge	EN 61000-4-5	Criterion A 1 kV L-L, 2 kV L&N-E power
RF conducted interference	EN 61000-4-6	Criterion B 3 V/rms
Voltage dip/interruptions	EN 61000-4-11	Criterion A 0.5 cycle

Emissions:

Emissions	EN 55011	Class A

Notes:
1. Criterion A: Normal operation within specified limits.
2. Criterion B: Temporary loss of performance from which the unit self-recovers.

15. **WEIGHT**:
    LD2A05XX - 4.5 lbs (2.04 kg)
    LD4A05XX - 10.5 lbs (4.76 kg)

1.0 Installing the Meter

INSTALLATION

The meter meets NEMA 4X/IP65 requirements when properly installed.

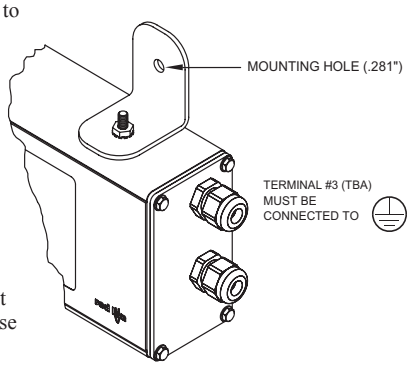
INSTALLATION ENVIRONMENT

The unit should be installed in a location that does not exceed the operating temperature. Placing the unit near devices that generate excessive heat should be avoided. The unit 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 front overlay. Do not use tools of any kind (screwdrivers, pens, pencils, etc.) to operate the keypad of the unit.

MOUNTING INSTRUCTIONS

This display is designed to be wall mounted or suspended from a ceiling truss or other suitable structure capable of supporting the LDA. Caution should be exercised when hanging the display to provide for the safety of personnel. If hanging the LDA, run the suspension cables (or chains) through the mounting bracket holes. For wall mounting use #10-32 size bolts.



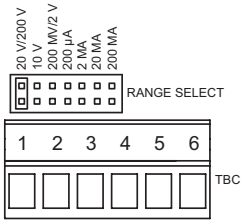
G

2.0 Setting the Jumpers

INPUT RANGE JUMPER

This jumper is used to select the proper input range. The input range selected in programming must match the jumper setting. Select a range that is high enough to accommodate the maximum signal input to avoid overloads. To access the jumper, remove the side cover of the meter.

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



3.0 WIRING THE METER

EMC INSTALLATION GUIDELINES

Although this meter is designed with a high degree of immunity to Electro-Magnetic 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 the meter may be different for various installations. The meter becomes more immune to EMI with fewer I/O connections. Cable length, routing, and shield termination are very important and can mean the difference between a successful or troublesome installation. Listed below are some EMC guidelines for successful installation in an industrial environment.

1. The meter should be properly connected to protective earth.
2. Use shielded (screened) cables for all Signal and Control inputs. The shield (screen) pigtail 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 only at the panel where the unit is mounted to earth ground (protective earth).
   b. Connect the shield to earth ground at both ends of the cable, usually when the noise source frequency is above 1 MHz.
   c. Connect the shield to common of the meter and leave the other end of the shield unconnected and insulated from earth ground.
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 ran in 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.
4. Signal or Control cables within an enclosure should be routed as far as possible from contactors, control relays, transformers, and other noisy components.
5. In extremely high EMI environments, the use of external EMI suppression devices, such as ferrite suppression cores, is effective. Install them on Signal and Control cables as close to the unit as possible. Loop the cable through the core several times or use multiple cores on each cable for additional protection. Install line filters on the power input cable to the unit to suppress power line interference. Install them near the power entry point of the enclosure. The following EMI suppression devices (or equivalent) are recommended:
   Ferrite Suppression Cores for signal and control cables:
   Fair-Rite # 0443167251 (RLC# FCOR0000)
   TDK # ZCAT3035-1330A
   Steward # 28B2029-0A0
   Line Filters for input power cables:
   Schaffner # FN610-1/07 (RLC# LFIL0000)
   Schaffner # FN670-1.8/07
   Corcom # 1 VR3
   Note: Reference manufacturer's instructions when installing a line filter.
6. Long cable runs are more susceptible to EMI pickup than short cable runs. Therefore, keep cable runs as short as possible.
7. Switching of inductive loads produces high EMI. Use of snubbers across inductive loads suppresses EMI.
   Snubber: RLC# SNUB0000.

WIRING OVERVIEW

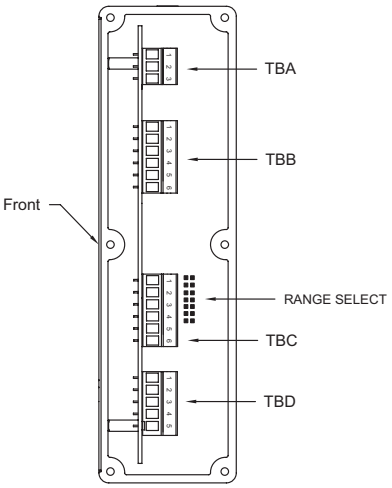
Electrical connections are made via pluggable terminal blocks located inside the meter. All conductors should conform to the meter's voltage and current ratings. All cabling should conform to appropriate standards of good installation, local codes and regulations. It is recommended that the power supplied to the meter (DC or AC) be protected by a fuse or circuit breaker. When wiring the meter, compare the numbers on the label on the back of the meter case against those shown in wiring drawings for proper wire position. Strip the wire, leaving approximately 0.4" (10 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). Use copper conductors only, with insulation rated at 90°C.

WIRING CONNECTIONS

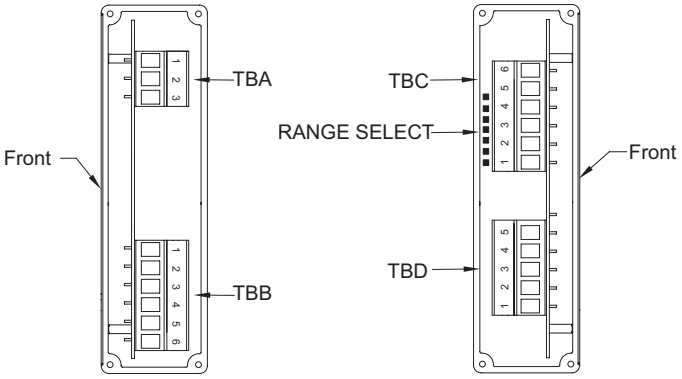
Internal removable terminal blocks are used for power and signal wiring. Access to terminal blocks is through conduit fittings. Remove end plates with ¼" nut driver. For LD4 versions, all wiring is on right side of unit. For LD2 versions, power and relay wiring is on the right side and the input, serial, DC out and user input is on the left side.

Connect drain wire from shielded cable(s) to screw on side plate for proper grounding.

LD4



LD2

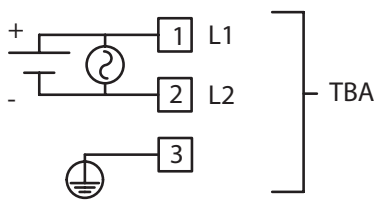


RIGHT SIDE VIEW **LEFT SIDE VIEW**

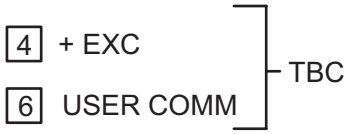
3.1 POWER WIRING

The power wiring is made via the 3 position terminal block (TBA) located inside the unit (right side). The DC out power is located: LD2 - left side, LD4 - right side

Power
Terminal 1: VAC/DC +
Terminal 2: VAC/DC -
Terminal 3: Protective Conductor Terminal



DC Out Power
Terminal 4: + 24 VDC OUT
Terminal 6: User Common



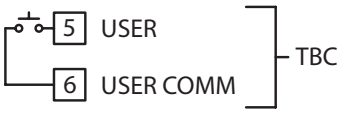
G

3.2 USER INPUT WIRING

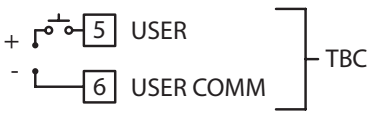
The User Input is located: LD2 - left side, LD4 - right side

Terminal 5: User Input
Terminal 6: User Comm

Sinking Logic



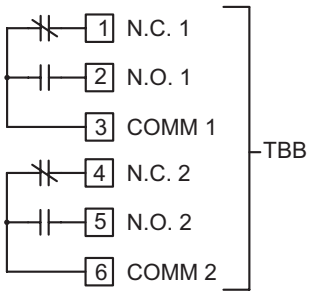
Sourcing Logic



3.3 SETPOINT (OUTPUT) WIRING

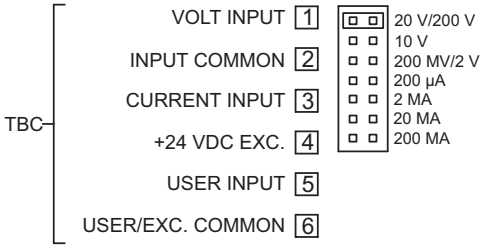
The setpoint relays use a six position terminal block (TBB) located inside the (right side).

Terminal 1: NC 1
Terminal 2: NO 2
Terminal 3: Relay 1 Common
Terminal 4: NC 1
Terminal 5: NO 2
Terminal 6: Relay 2 Common



3.4 INPUT WIRING

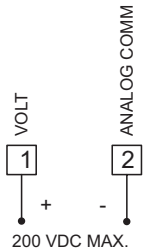
Before connecting signal wires, the Input Range Jumper should be verified for proper position.



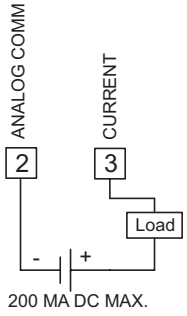
CAUTION: Analog common is NOT isolated from user input common. In order to preserve the safety of the meter application, the DC common must be suitably isolated from hazardous live earth referenced voltage; or input common must be at protective earth ground potential. If not, hazardous voltage may be present at the User Input and Input Common terminals. Appropriate considerations must then be given to the potential of the input common with respect to earth ground. Always connect the analog signal common to terminal 2.

3.5 INPUT SIGNAL WIRING

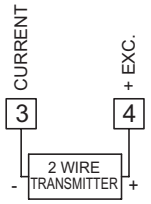
Voltage Signal (self powered)
Terminal 1: +VDC
Terminal 2: -VDC



Current Signal (self powered)
Terminal 3: +ADC
Terminal 2: -ADC

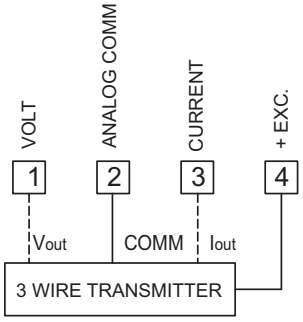


Current Signal (2 wire requiring excitation)
Terminal 4: +EXC
Terminal 3: +ADC



Current Signal (3 wire requiring excitation)
Terminal 3: +ADC (signal)
Terminal 2: -ADC (common)
Terminal 4: +EXC

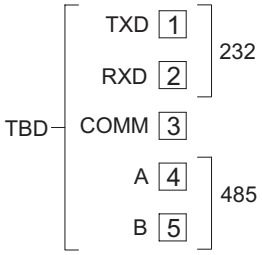
Voltage Signal (3 wire requiring excitation)
Terminal 1: +VDC (signal)
Terminal 2: -VDC (common)
Terminal 4: +EXC

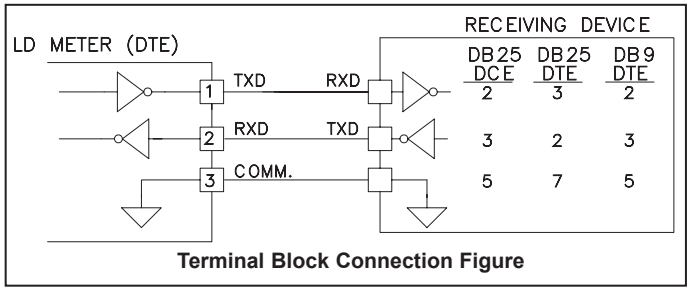


G

3.6 SERIAL WIRING

The serial connections are made via terminal block TBD located inside the unit on the left side for the LD2 and on the right side for the LD4.





Terminal Block Connection Figure

RS485 Communications

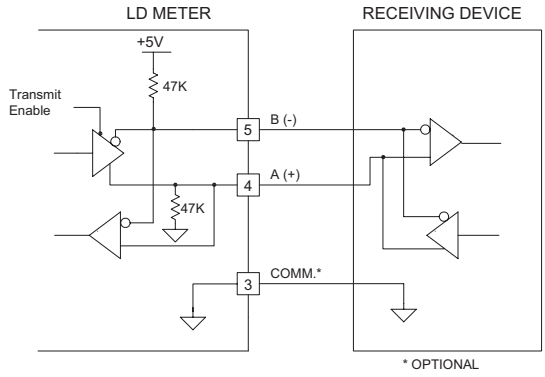
The RS485 communication standard allows the connection of up to 32 devices on a single pair of wires, distances up to 4,000 ft. and data rates as high as 10M baud (the LDA is limited to 38.4k baud). The same pair of wires is used to both transmit and receive data. RS485 is therefore always half-duplex, that is, data cannot be received and transmitted simultaneously.

RS232 Communications

RS232 is intended to allow two devices to communicate over distances up to 50 feet. Data Terminal Equipment (DTE) transmits data on the Transmitted Data (TXD) line and receives data on the Received Data (RXD) line. Data Computer Equipment (DCE) receives data on the TXD line and transmits data on the RXD line. The LD emulates a DTE. If the other device connected to the meter also emulates a DTE, the TXD and RXD lines must be interchanged for communications to take place. This is known as a null modem connection. Most printers emulate a DCE device while most computers emulate a DTE device.

Some devices cannot accept more than two or three characters in succession without a pause in between. In these cases, the meter employs a busy function.

As the meter begins to transmit data, the RXD line (RS232) is monitored to determine if the receiving device is "busy". The receiving device asserts that it is busy by setting the RXD line to a space condition (logic 0). The meter then suspends transmission until the RXD line is released by the receiving device.



Terminal Block Connection Figure

4.0 REVIEWING THE FRONT BUTTONS AND DISPLAY

BUTTON	DISPLAY MODE OPERATION	PROGRAMMING MODE OPERATION
PAR	Access Programming Mode	Store selected parameter and index to next parameter
SEL▲	Index display through selected displays	Advance through selection list/select digit position in parameter value
RST▼	Resets display	Increment selected digit of parameter value

OPERATING MODE DISPLAY DESIGNATORS

MAX - Maximum display capture value
MIN - Minimum display capture value

"1" - To the left of the display indicates setpoint 1 output activated.
"2" - To the left of the display indicates setpoint 2 output activated.

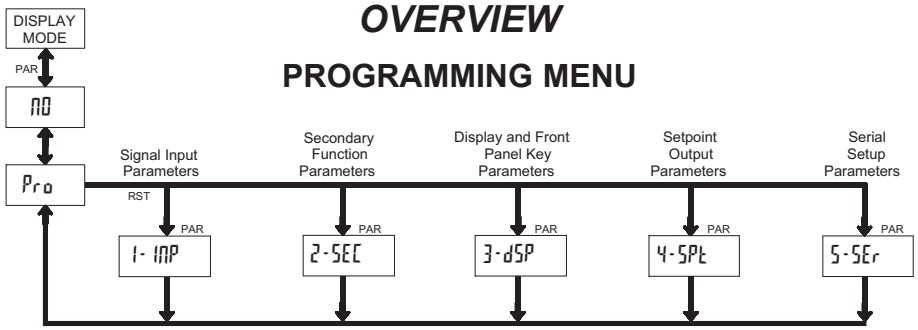
Pressing the **SEL▲** button toggles the meter through the selected displays. If display scroll is enabled, the display will toggle automatically every four seconds between the enabled display values.

G

5.0 Programming the Meter

OVERVIEW

PROGRAMMING MENU



PROGRAMMING MODE ENTRY (PAR BUTTON)

It is recommended all programming changes be made off line, or before installation. The meter normally operates in the Display Mode. No parameters can be programmed in this mode. The Programming Mode is entered by pressing the **PAR** button. If it is not accessible, then it is locked by either a security code or a hardware lock.

MODULE ENTRY (SEL▲ & PAR BUTTONS)

The Programming Menu is organized into five modules. These modules group together parameters that are related in function. The display will alternate between Pro and the present module. The **SEL▲** button is used to select the desired module. The displayed module is entered by pressing the **PAR** button.

MODULE MENU (PAR BUTTON)

Each module has a separate module menu (which is shown at the start of each module discussion). The **PAR** button is pressed to advance to a particular parameter to be changed, without changing the programming of preceding parameters. After completing a module, the display will return to Pro no. Programming may continue by accessing additional modules.

SELECTION / VALUE ENTRY

For each parameter, the display alternates between the present parameter and the selections/value for that parameter. The **SEL▲** and **RST▼** buttons are used to move through the selections/values for that parameter. Pressing the **PAR** button, stores and activates the displayed selection/value. This also advances the meter to the next parameter.

For numeric values, the value is displayed with one digit flashing (initially the right most digit). Pressing the **RST▼** button increments the digit by one or the user can hold the **RST▼** button and the digit will automatically scroll. The **SEL▲** button will select the next digit to the left. Pressing the **PAR** button will enter the value and move to the next parameter.

PROGRAMMING MODE EXIT (PAR BUTTON)

The Programming Mode is exited by pressing the **PAR** button with Pro no displayed. This will commit any stored parameter changes to memory and return the meter to the Display Mode. (If power loss occurs before returning to the Display Mode, verify recent parameter changes.)

PROGRAMMING TIPS

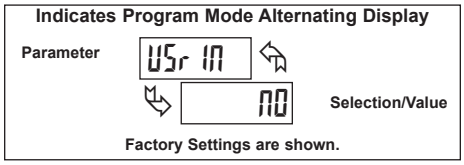
It is recommended to start with Module 1 and proceed through each module in sequence. When programming is complete, it is recommended to record the parameter programming and lock out parameter programming with the user input or programming security code.

FACTORY SETTINGS

Factory Settings may be completely restored in Module 2. This is useful when encountering programming problems.

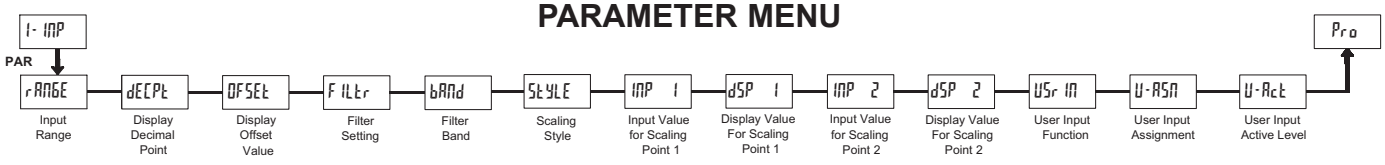
ALTERNATING SELECTION DISPLAY

In the explanation of the modules, the following dual display with arrows will appear. This is used to illustrate the display alternating between the parameter on top and the parameter's Factory Setting on the bottom. In most cases, selections and values for the parameter will be listed on the right.



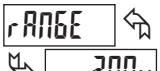
5.1 MODULE 1 - Signal Input Parameters (1-INP)

PARAMETER MENU



G

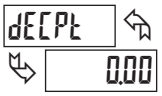
INPUT RANGE



SELECTION	RANGE RESOLUTION	SELECTION	RANGE RESOLUTION
200uA	200.00 µA	0.02A	20.000 mA
0.002A	2.0000 mA	0.2A	200.00 mA
0.2u	200.00 mV	20u	20.000 V
2u	2.0000 V	200u	200.00 V
10u	10.000 V		

Select the input range that corresponds to the external signal. This selection should be high enough to avoid input signal overload but low enough for the desired input resolution. This selection and the position of the Input Range Jumper must match.

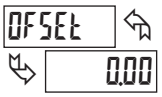
DISPLAY DECIMAL POINT



0 0.0 0.00 0.000 0.0000

Select the decimal point location for the Input, MIN and MAX displays. This selection also affects the dSP1 and dSP2 parameters and setpoint values and offset value.

DISPLAY OFFSET VALUE

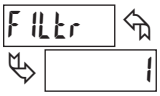


-19999 to 19999

The display can be corrected with an offset value. This can be used to compensate for signal variations or sensor errors. This value is automatically

updated after a Zero Display to show how far the display is offset. A value of zero removes the effects of offset. The decimal point follows the dECPt selection.

FILTER SETTING

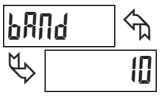


0 1 2 3

If the displayed value is difficult to read due to small process variations or noise, increased levels of filtering will help to stabilize the display. Software filtering effectively combines a fraction of the current input reading with a fraction of the previous displayed reading to generate the new display.

Filter values represent no filtering (0), up to heavy filtering (3). A value of 1 for the filter uses 1/4 of the new input and 3/4 of the previous display to generate the new display. A filter value of 2 uses 1/8 new and 7/8 previous. A filter value of 3 uses 1/16 new and 15/16 previous.

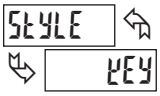
FILTER BAND



0 to 199

The filter will adapt to variations in the input signal. When the variation exceeds the input filter band value, the 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 filter permanently engaged at the filter level selected above.

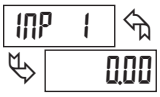
SCALING STYLE



KEY APLY

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

INPUT VALUE FOR SCALING POINT 1

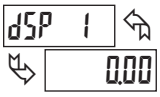


0 to 29999

For Key-in (KEY) style, enter the first Input Value using the front panel buttons. (The Input Range selection sets the decimal location for the Input Value).

For Apply (APLY) style, the meter shows the previously stored Input Value. To retain this value, press the **SEL▲** button to advance to the next parameter. To change the Input Value, press the **RST▼** button and apply the input signal to the meter. Adjust the signal source externally until the desired Input Value appears. Press the **SEL▲** button to enter the value being displayed.

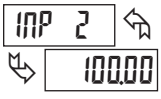
DISPLAY VALUE FOR SCALING POINT 1



- 19999 to 99999

Enter the first Display Value by using the front panel buttons. This is the same for KEY and APLY scaling styles. The decimal point follows the dECPt selection.

INPUT VALUE FOR SCALING POINT 2

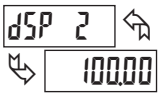


0 to 29999

For Key-in (KEY) style, enter the known second Input Value using the front panel buttons.

For Apply (APLY) style, the meter shows the previously stored Input Value for Scaling Point 2. To retain this value, press the **SEL▲** button to advance to the next parameter. To change the Input Value, press the **RST▼** button and apply the input signal to the meter. Adjust the signal source externally until the desired Input Value appears. Press the **SEL▲** button to enter the value being displayed.

DISPLAY VALUE FOR SCALING POINT 2



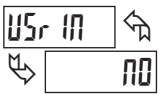
- 19999 to 99999

Enter the second Display Value by using the front panel buttons. This is the same for KEY and APLY scaling styles. The decimal point follows the dECPt selection.

General Notes on Scaling

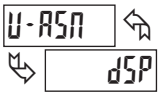
1. When using the Apply (APLY) scaling style, input values for scaling points must be confined to the range limits shown.
2. The same Input Value should not correspond to more than one Display Value. (Example: 20 mA can not equal 0 and 20.)
3. For input levels beyond the programmed Input Values, the meter extends the Display Value by calculating the slope from the two coordinate pairs (InP1 / dSP1 & InP2 / dSP2).

USER INPUT FUNCTION



DISPLAY	MODE	DESCRIPTION
no	No Function	User Input disabled.
P-Loc	Program Mode Lock-out	See Programming Mode Access chart (Module 3).
2Er0	Zero Input (Edge triggered)	Zero the Input Display value causing Display Reading to be Offset.
rESEt	Reset (Edge triggered)	Resets the assigned value(s) to the current input value.
d-Hld	Display Hold	Holds the assigned display, but all other meter functions continue as long as activated (maintained action).
d-SEL	Display Select (Edge Triggered)	Advance once for each activation.
d-LEU	Display Intensity Level (Edge Triggered)	Increase intensity one level for each activation.
Print	Print Request	Serial transmit of the active parameters selected in the Print Options menu (Module 5).
P-rSt	Print and Reset	Same as Print Request followed by a momentary reset of the assigned value(s).
rSt-1	Setpoint 1 Reset	Resets setpoint 1 output.
rSt-2	Setpoint 2 Reset	Resets setpoint 2 output.
rSt 12	Setpoint 1 and 2 Reset	Reset both setpoint 1 and 2 outputs.

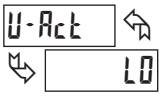
USER INPUT ASSIGNMENT



In1 In1-Lo
Lo dSP

Select the value(s) to which the User Input Function is assigned. The User Input Assignment only applies if a selection of reset, display hold, or print and reset is selected in the User Input Function menu.

USER INPUT ACTIVE LEVEL

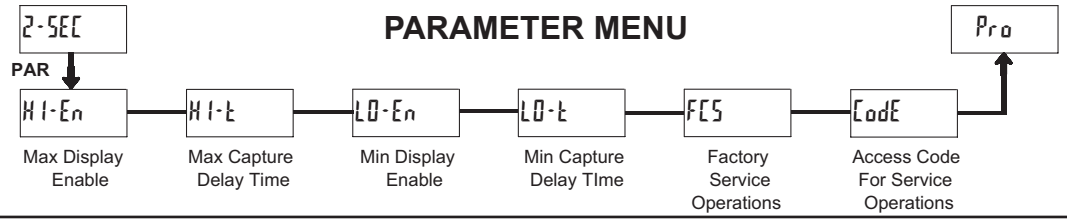


In Lo

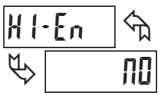
Select whether the user input is configured as active low or active high.

G

5.2 MODULE 2 - SECONDARY FUNCTION PARAMETERS (2-SEC)



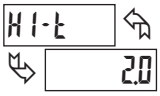
MAX DISPLAY ENABLE



NO YES

Enables the Maximum Display Capture capability.

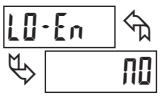
MAX CAPTURE DELAY TIME



0.0 to 999.9 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.

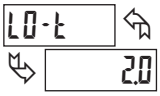
MIN DISPLAY ENABLE



NO YES

Enables the Minimum Display Capture capability.

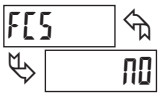
MIN CAPTURE DELAY TIME



0.0 to 999.9 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.

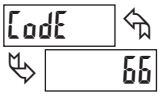
FACTORY SERVICE OPERATIONS



NO YES

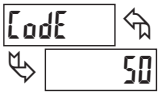
Select YES to perform either of the Factory Service Operations shown below.

RESTORE FACTORY DEFAULT SETTINGS



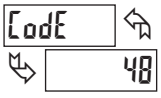
Entering Code 66 will overwrite all user settings with the factory settings. The meter will display rESEt and then return to CodE 00. Press the **PAR** button to exit the module.

VIEW MODEL AND VERSION DISPLAY



Entering Code 50 will display the model (LDA) and version (x.x) of the meter. The display then returns to CodE 00. Press the **PAR** button to exit the module.

CALIBRATION



The LD uses stored calibration values to provide accurate measurements. Over time, the electrical characteristics of the components inside the LD will slowly change with the result that the stored calibration values no longer accurately define the input circuit. For most applications, recalibration every 1 to 2 years should be sufficient.

Calibration of the LD involves a calibration which should only be performed by individuals experienced in calibrating electronic equipment. Allow 30 minute warm up before performing any calibration related procedure. The following procedures should be performed at an ambient temperature of 15 to 35 °C (59 to 95 °F).

CAUTION: The accuracy of the calibration equipment will directly affect the accuracy of the LD.

Current Calibration

1. Connect the negative lead of a precision DC current source with an accuracy of 0.01% or better to the COMM terminal. Leave the positive lead of the DC current source unconnected.
2. With the display at CodE 48, press the **PAR** button. Unit will display CAL NO
3. Press the **RST** button to select the range to be calibrated.
4. Press the **PAR** button. Display reads 0.0A
5. With the positive lead of the DC current source unconnected, press **PAR**. Display reads CALC for about 8 seconds.
6. When the display reads the selected range, connect the positive lead of the DC current source to the current input and apply full-scale input signal for the range. (Note: For 200 mA range, apply 100 mA as indicated on the display.) Press **PAR**. Display reads CALC for about 8 seconds.
7. Repeat steps 3 through 6 for each input range to be calibrated. When display reads CAL NO, press the **PAR** button to exit calibration.

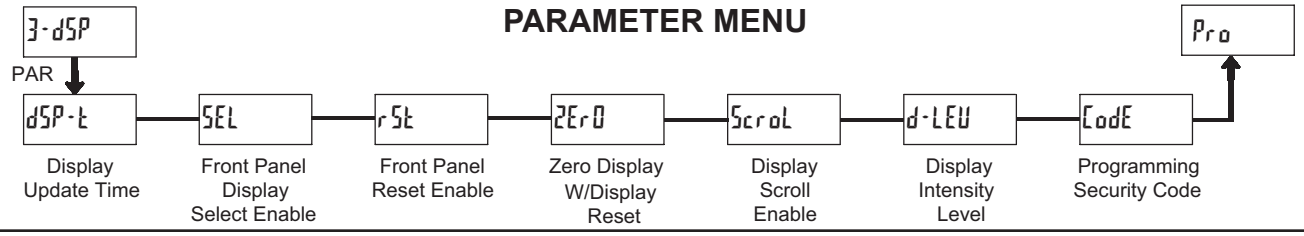
Voltage Calibration

1. Connect a precision DC voltage source with an accuracy of 0.01% or better to the volt input and COMM terminals of the LD. Set the output of the voltage source to zero.
2. With the display at CodE 48, press the **PAR** button. Unit will display CAL NO.
3. Press the **RST** button to select the range to be calibrated.
4. Press the **PAR** button. Display reads 0.0u.
5. With the voltage source set to zero (or a dead short applied to the input), press **PAR**. Display reads CALC for about 8 seconds.
6. When the display reads the selected range, apply full-scale input signal for the range. (Note: For 200V range, apply 100V as indicated on the display.) Press **PAR**. Display reads CALC for about 8 seconds.
7. Repeat steps 3 through 6 for each input range to be calibrated. When display reads CAL NO, press the **PAR** button to exit calibration

G

5.3 MODULE 3 - DISPLAY AND FRONT PANEL BUTTON PARAMETERS (3-dSP)

PARAMETER MENU



DISPLAY UPDATE TIME

dSP-t / 1

0.5 1 2 seconds

This parameter sets the display update time in seconds.

FRONT PANEL DISPLAY SELECT ENABLE (SEL)

SEL / YES

YES NO

The YES selection allows the **SEL** button to toggle through the enabled displays.

FRONT PANEL RESET ENABLE (RST)

rSt / dSP

NO LO dSP
HI HI-LO

This selection allows the **RST** button to reset the selected value(s).

ZERO DISPLAY WITH DISPLAY RESET

2Er0 / NO

YES NO

This parameter enables the **RST** button or user input to zero the input display value, causing the display reading to be offset.

Note: For this parameter to operate, the **RST** button or User Input being used must be set to dSP and the Input value must be displayed. If these conditions are not met, the display will not zero.

DISPLAY SCROLL ENABLE

ScroL / NO

YES NO

The YES selection allows the display to automatically scroll through the enabled displays. The scroll rate is every 4 seconds. This parameter only appears when the MAX or MIN displays are enabled.

DISPLAY INTENSITY LEVEL

d-LEU / 5

1 to 5

Enter the desired Display Intensity Level (1-5). The display will actively dim or brighten as levels are changed.

PROGRAMMING SECURITY CODE

CodE / 000

000 to 999

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 (P-Loc) in the User Input Function parameter (Module 1).

Two programming modes are available. Full Programming mode allows all parameters to be viewed and modified. Quick Programming mode permits only the Setpoint values to be modified, but allows direct access to these values without having to enter Full Programming mode.

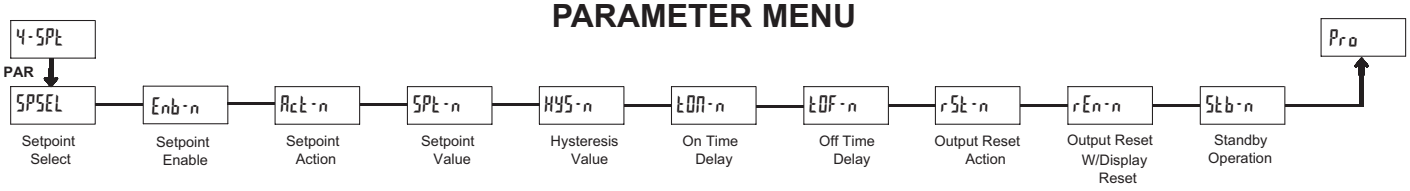
Programming a Security Code other than 0, requires this code to be entered at the CodE prompt in order to access Full Programming mode. Depending on the code value, Quick Programming may be accessible before the CodE prompt appears (see chart).

USER INPUT FUNCTION	USER INPUT STATE	SECURITY CODE	MODE WHEN "SEL" BUTTON IS PRESSED	FULL PROGRAMMING MODE ACCESS
not P-Loc	_____	0	Full Programming	Immediate Access
		1-99	Quick Programming	After Quick Programming with correct code entry at CodE prompt *
		100-999	CodE prompt	With correct code entry at CodE prompt *
P-Loc	Active	0	Programming Lock	No Access
		1-99	Quick Programming	No Access
		100-999	CodE prompt	With correct code entry at CodE prompt *
	Not Active	0-999	Full Programming	Immediate Access

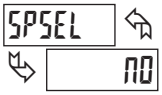
G

5.4 MODULE 4 - SETPOINT OUTPUT PARAMETERS (4-SPt)

PARAMETER MENU



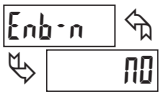
SETPOINT SELECT



no SP-1 SP-2

Enter the setpoint (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 SPSEL. Repeat steps for each setpoint to be programmed. Select no to exit the module.

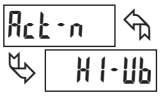
SETPOINT ENABLE



YES no

Select YES to enable Setpoint n and access the setup parameters. If no is selected, the unit returns to SPSEL and Setpoint n is disabled.

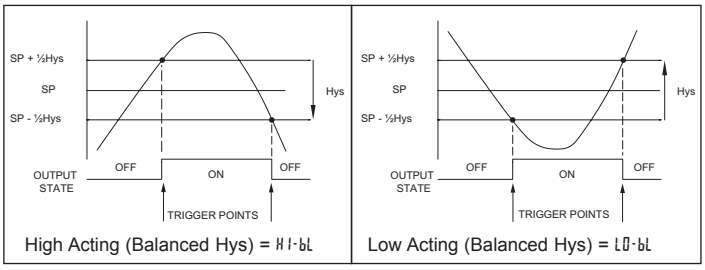
SETPOINT ACTION

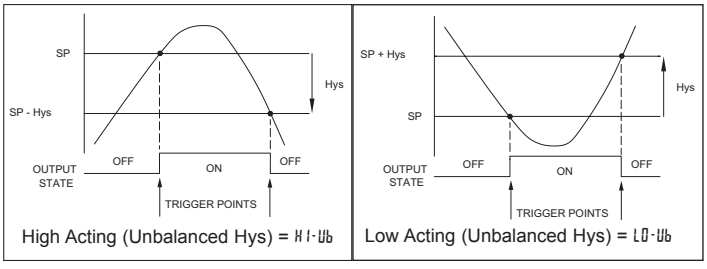


HI-bL LO-bL HI-Ub LO-Ub

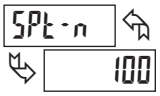
Enter the action for the selected setpoint (output). See Setpoint Output Figures for a visual detail of each action.

HI-bL = High Acting, with balanced hysteresis
LO-bL = Low Acting, with balanced hysteresis
HI-Ub = High Acting, with unbalanced hysteresis
LO-Ub = Low Acting, with unbalanced hysteresis





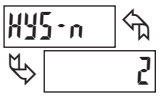
SETPOINT VALUE



-19999 to 99999

Enter the desired setpoint value. The decimal point position for the setpoint and hysteresis values follow the selection set in Module 1.

HYSTERESIS VALUE

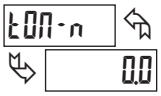


1 to 59999

Enter desired hysteresis value. See Setpoint Output Figures for visual explanation of how setpoint output 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.

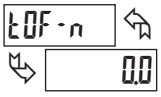
ON TIME DELAY



0.0 to 599.9 seconds

Enter the time value in seconds that the output is delayed from turning on after the trigger point is reached. A value of 0.0 allows the meter to update the output status per the response time listed in the Specifications.

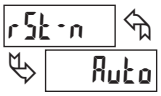
OFF TIME DELAY



0.0 to 599.9 seconds

Enter the time value in seconds that the output is delayed from turning off after the trigger point is reached. A value of 0.0 allows the meter to update the output status per the response time listed in the Specifications.

OUTPUT RESET ACTION



Auto LATCH L-dLY

Enter the reset action of the output. See figure for details.

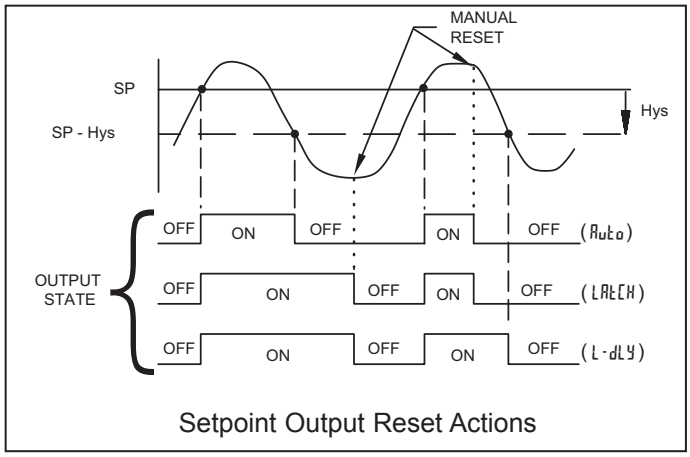
Auto = Automatic action; This action allows the output to automatically reset off at the trigger points per the Setpoint Action shown in Setpoint Output Figures. The "on" output may be manually reset (off) immediately by the front panel **RST** button or user input.The output remains off until the trigger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

LATCH = Latch with immediate reset action; This action latches the output on at the trigger point per the Setpoint Action shown in Setpoint Output Figures. Latch means that the output can only be turned off by the front panel **RST** button or user input manual reset, serial reset command or meter power cycle. When the user input or **RST** button is activated (momentary action), the

G

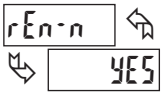
corresponding "on" output is reset immediately and remains off until the trigger point is crossed again. (Previously latched alarms will be off if power up Display Value is lower than setpoint value.)

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



Setpoint Output Reset Actions

OUTPUT RESET WITH DISPLAY RESET

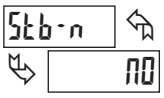


NO YES

This parameter enables the **RST** button or user input to reset the output when the display is reset.

Note: For this parameter to operate, the **RST** button or User Input being used must be set to dSP and the Input value must be displayed. If these conditions are not met, the output will not reset.

STANDBY OPERATION

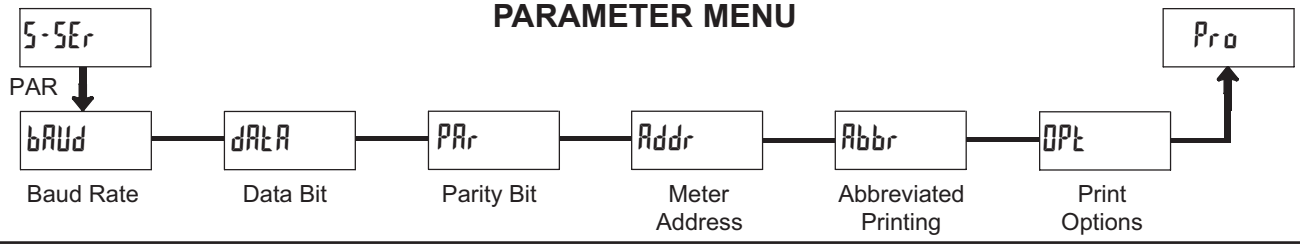


NO YES

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

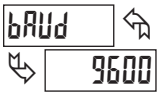
5.5 MODULE 5 - SERIAL SETUP PARAMETERS (5-SEr)

PARAMETER MENU



Module 5 is the programming module for the Serial Communications Parameters. These parameters are used to match the serial settings of the LD with those of the host computer or other serial device.

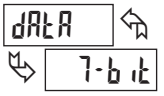
BAUD RATE



300 1200 4800 19200
600 2400 9600 38400

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

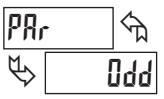
DATA BIT



7-bit 8-bit

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

PARITY BIT



NO Odd EVEN

This parameter only appears when the Data Bit parameter is set to a 7-bit data word length. Set the parity bit to match that of the other serial equipment on the serial link. The meter ignores parity when receiving data and sets the parity bit for outgoing data. If parity is set to NO, an additional stop bit is used to force the frame size to 10 bits.

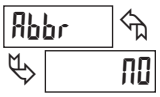
G

METER ADDRESS

0 to 99

Enter the serial node address. With a single unit, an address is not needed and a value of zero can be used (RS232 applications). Otherwise, with multiple bussed units, a unique address number must be assigned to each meter. The node address applies specifically to RS485 applications.

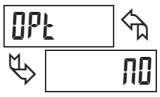
ABBREVIATED PRINTING



no YES

This parameter determines the formatting of data transmitted from the meter in response to a Transmit Value command or a Block Print Request. Select no for a full print transmission, consisting of the meter address, mnemonics, and parameter data. Select YES for abbreviated print transmissions, consisting of the parameter data only. This setting is applied to all the parameters selected in the PRINT OPTIONS. (Note: If the meter address is 0, the address will not be sent during a full transmission.)

PRINT OPTIONS



no YES

This parameter selects the meter values transmitted in response to a Print Request. A print request is also referred to as a block print because more than one parameter can be sent to a printer or computer as a block.

Selecting YES displays a sublist for choosing the meter parameters to appear in the print block. All active parameters entered as YES in the sublist will be transmitted during a block print. Parameters entered as no will not be sent.

The "Print All" (P ALL) option selects all meter values for transmitting (YES), without having to individually select each parameter in the sublist.

Note: Inactive parameters will not be sent regardless of the print option setting. The Setpoint value will not be sent unless the setpoint is enabled

DISPLAY	DESCRIPTION	FACTORY SETTING	MNEMONIC
inP	Input	YES	INP
HI	Maximum	no	MAX
LO	Minimum	no	MIN
SPt-1	Setpoint 1	no	SP1
SPt-2	Setpoint 2	no	SP2

Sending Serial Commands and Data

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

Command String Construction

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

1. The first 2 or 3 characters consist of the Node Address Specifier (N) followed by a 1 or 2 character node address number. The node 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 optional 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 all the active selections chosen in the Print Options menu parameter.
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

Register Identification Chart

ID	Value Description	MNEMONIC	Applicable Commands	Transmit Details (T and V)
A	Input	INP	T, R	5 digit
B	Maximum	MAX	T, R	5 digit
C	Minimum	MIN	T, R	5 digit
D	Setpoint 1	SP1	T, R, V	5 digit positive/4 digit negative
E	Setpoint 2	SP2	T, R, V	5 digit positive/4 digit negative

Command String Examples:

1. Node address = 17, Write 350 to the Setpoint 1 value
   String: N17VD350$
2. Node address = 5, Read Input, response time of 50 msec min
   String: N5TA*
3. Node address = 31, Request a Block Print Output, response time of 2 msec min
   String: N31P$

Transmitting Data to the Meter

Numeric data sent to the meter must be limited to transmit details listed in the Register Identification Chart. 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 is set for 0.0 and 25 is written to a register. The value of the register is now 2.5. In this case, write a value of 250 to equal 25.0).

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

G

Receiving Data From The Meter

Data is transmitted from the meter in response to either a transmit command (T), a block print request command (P) or a User Input print request. The response from the meter is either a full field transmission or an abbreviated transmission, depending on the selection chosen in Module 5.

Full Field Transmission

Byte	Description
1, 2	2 byte Node Address field [00-99]
3	<SP> (Space)
4-6	3 byte Register Mnemonic field
7-15	9 byte data field; 7 bytes for number, one byte for sign, one byte for decimal point
16	<CR> (carriage return)
17	<LF> (line feed)
18	<SP>* (Space)
19	<CR>* (carriage return)
20	<LF>* (line feed)

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

The first two characters transmitted are the meter address. If the address assigned is 0, two spaces are substituted. A space follows the meter address field. The next three characters are the register mnemonic, as shown in the Register Identification Chart.

The numeric data is transmitted next. The numeric field (bytes 7 to 15) is 9 characters long. This field consists of a minus sign (for negative values), a floating decimal point (if applicable), and five positions for the requested value. The data within bytes 9 to 15 is right-aligned with leading spaces for any unfilled positions. When a requested value exceeds the meter's display limits, decimal points are transmitted instead of a numeric value.

The end of the response string is terminated with a <CR> and <LF>. After the last line of a block print, an extra <SP>, <CR> and <LF> are added to provide separation between the print blocks.

Abbreviated Transmission

Byte	Description
1-9	9 byte data field, 7 bytes for number, one byte for sign, one byte for decimal point
10	<CR> (carriage return)
11	<LF> (line feed)
12	<SP>* (Space)
13	<CR>* (carriage return)
14	<LF>* (line feed)

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

The abbreviated response suppresses the node address and register ID, leaving only the numeric part of the response.

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 1 = -250.5
   SP1 -250.5<CR><LF>
3. Node address = 0, abbreviated response, Setpoint 2 = 250, last line of block print 250<CR><LF><SP><CR><LF>

Command Response Time

The meter can only receive data or transmit data at any one time (half-duplex operation). During RS232 transmissions, the meter ignores commands while transmitting data, but instead uses RXD as a busy signal. 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 (* or $) 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 times the # of characters) / baud rate

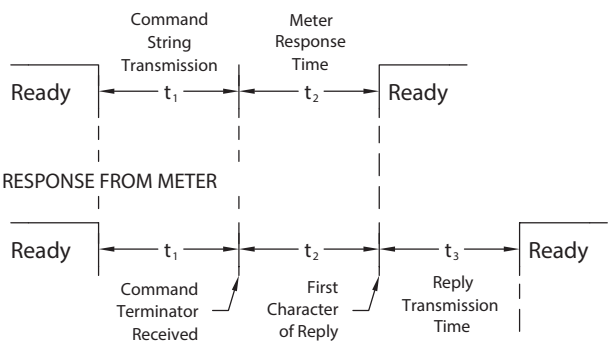
At the start of time interval t_2, the meter starts the interpretation of the command and when complete, performs the command function. This time interval t_2 varies. If no response from the meter is expected, the meter is ready to accept another command.

If the meter is to reply with data, the time interval t_2 is controlled by the use of the command terminating character. The '*' terminating character results in a response time of 50 msec. minimum. This allows sufficient time for the release of the sending driver on the RS485 bus. Terminating the command line with '$' results in a response time (t_2) of 2 msec. minimum. The faster 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. At the end of t_3, the meter is ready to receive the next command.

t_3 = (10 times the # of characters) / baud rate

The maximum serial throughput of the meter is limited to the sum of the times t_1, t_2 and t_3.



Timing Diagram Figure

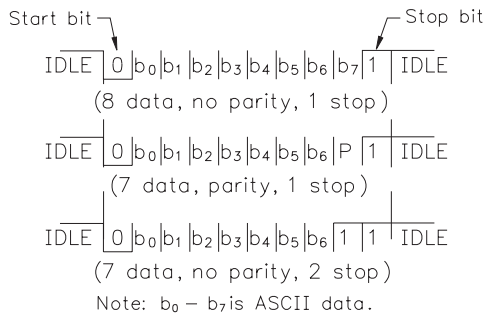
G

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.



Character Frame Figure

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.

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 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 meter.

MODEL LD - LARGE STRAIN GAGE DISPLAY

- *2.25" & 4" HIGH RED LED DIGITS*
- *PROGRAMMABLE SCALING AND DECIMAL POINTS*
- *PROGRAMMABLE USER INPUT*
- *DUAL 5 AMP FORM C RELAY*
- *ALUMINUM TYPE 4X/IP65 CASE CONSTRUCTION*
- *RS232/RS485 SERIAL COMMUNICATIONS*
- *CRIMSON® PROGRAMMING SOFTWARE*
- *UNIVERSALLY POWERED*

CE

GENERAL DESCRIPTION

The Large Display is a versatile display available as a strain gage meter with scaling, serial communications and dual relay outputs. The 5 digit displays are available in either 2.25" or 4" high red LED digits with adjustable display intensities. The 2.25" high models are readable up to 130 feet. The 4" high models are readable up to 180 feet. Both versions are constructed of a Type 4X/IP65 enclosure in light weight aluminum.

All models also come with dual Form C relay outputs and RS232 / RS485 serial communications.

The Crimson software is a Windows based program that allows configuration of the LD meter from a PC. Crimson offers standard drop-down menu commands, that make it easy to program the meter. The meter's program can then be saved in a PC file for future use. Crimson software can be downloaded at www.redlion.net.

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

CAUTION:
Hot Surface

CAUTION:
Risk of electric shock.

The protective conductor terminal is bonded to conductive parts of the equipment for safety purposes and must be connected to an external protective earthing system.

ORDERING INFORMATION

MODEL NO.	DESCRIPTION	PART NUMBER
LD	2 Preset Strain Gage Input; 2.25" High 5 Digit Red LED	LD2SG5P0
LD	2 Preset Strain Gage Input; 4" High 5 Digit Red LED	LD4SG5P0
LD Plug	Panel Meter Plug for LD models	LDPLUG00

SAFETY SUMMARY

All safety regulations, local codes and instructions that appear in this and corresponding 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.

SPECIFICATIONS

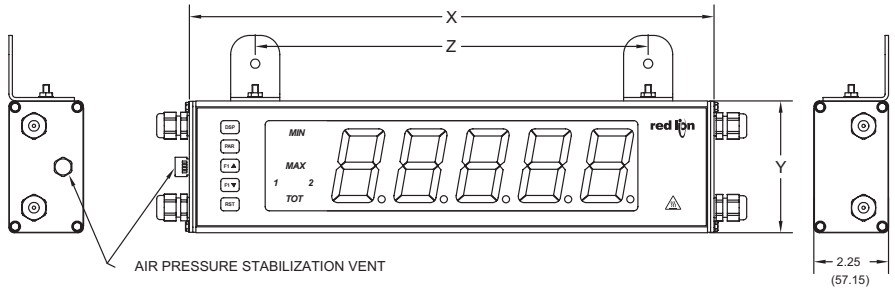
1. **DISPLAY**: 5 digit, 2.25" (57 mm) or 4" (101 mm) intensity adjustable Red LED (-99999 to 99999)
2. **POWER REQUIREMENTS**:
   AC POWER: 40 to 250 VAC 50/60 Hz, 27 VA
   DC POWER: 21.6 to 250 VDC, 12 W
   Isolation: 2300 Vrms for 1 min.; Power IN to all inputs and outputs
3. **INPUT RANGES**:

INPUT RANGE	ACCURACY* (18 to 28 °C)	ACCURACY* (0 to 65 °C)	IMPEDANCE	MAX CONTINUOUS OVERLOAD	RESOLUTION
±24 mVDC	0.02% of reading +3 μV	0.07% of reading +4 μV	100 Mohm	30 V	1 μV
±240 mVDC	0.02% of reading +30 μV	0.07% of reading +40 μV	100 Mohm	30 V	10 μV

* After 20 minute warm-up. Accuracy is specified in two ways: Accuracy over an 18 to 28 °C and 10 to 75% RH environment; and accuracy over a 0 to 65 °C and 0 to 85% RH (non-condensing environment). Accuracy over the 0 to 65 °C range includes the temperature coefficient effect of the meter.

4. **CONNECTION TYPE**: 4-wire bridge (differential)
   2-wire (single-ended)
5. **COMMON MODE RANGE** (w.r.t. input common): 0 to +5 VDC
   Rejection: 80 dB (DC to 120 Hz)
6. **BRIDGE EXCITATION** :
   Jumper Selectable: 5 VDC @ 65 mA max., ±2%
   10 VDC @ 125 mA max., ±2%
   Temperature coefficient (ratio metric): 20 ppm/°C max.
7. **A/D CONVERTER**: 16 bit resolution
8. **UPDATE RATES**:
   A/D conversion rate: 20 readings/sec.
   Step response: 200 msec. max. to within 99% of final readout value (digital filter and internal zero correction disabled)
   700 msec. max. (digital filter disabled, internal zero correction enabled)
   Display update rate: 1 to 20 updates/sec.
   Setpoint output on/off delay time: 0 to 3275 sec.

DIMENSIONS In inches (mm)



PART NUMBER	X (Length)	Y (Height)	Z (Center)
LD2	16 (406.4)	4 (101.6)	12 (304.3)
LD4	26 (660.4)	7.875 (200)	22 (558.8)

G

Max./Min. capture delay time: 0 to 3275 sec.

9. **USER INPUTS**: Three programmable user inputs
   Max. Continuous Input: 30 VDC
   Isolation To Sensor Input Common: Not isolated.
   Response Time: 50 msec. max.
   Logic State: Jumper selectable for sink/source logic

INPUT STATE	SINKING INPUTS 22 KΩ pull-up to +5 V	SOURCING INPUTS 22 KΩ pull-down
Active	V_{IN} < 0.9 VDC	V_{IN} > 3.6 VDC
Inactive	V_{IN} > 3.6 VDC	V_{IN} < 0.9 VDC

10. **TOTALIZER**:
   Function:
      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: -19,999 to 99,999
   Total: 9 digits, display alternates between high order and low order readouts
11. **DISPLAY MESSAGES**:
   "OLOL" - Appears when measurement exceeds + signal range.
   "ULUL" - Appears when measurement exceeds - signal range
   ". . . ." - Appears when display values exceed + display range.
   "- . . ." - Appears when display values exceed - display range.
   "E . . ." - Appears when Totalizer exceeds 9 digits.
   "h . . ." - Denotes the high order display of the Totalizer.
12. **COMMUNICATIONS**:
   Type: RS485 or RS232
   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
   Parity: no, odd or even
   Baud Rate: 300 to 38.4 K
   Bus Address: Selectable 0 to 99, Max. 32 meters per line (RS485)
13. **MEMORY**: Nonvolatile E^2PROM retains all programming parameters and max/min values when power is removed.
14. **OUTPUT**:
   Type: Dual FORM-C relay
   Isolation To Sensor & User Input Commons: 1400 Vrms for 1 min.
      Working Voltage: 150 Vrms
   Contact Rating: 5 amps @ 120/240 VAC or 28 VDC (resistive load), 1/8 H.P. @ 120 VAC (inductive load)
   Life Expectancy: 100,000 minimum operations
   Response Time:
      Turn On Time: 4 msec max.
      Turn Off Time: 4 msec max.
15. **ENVIRONMENTAL CONDITIONS**:
   Operating temperature: 0 to 65 °C
   Storage temperature: -40 to 70 °C
   Operating and storage humidity: 0 to 85% max. RH (non-condensing)
   Vibration to IEC 68-2-6: Operational 5-150 Hz, 2 g (1g relay)
   Shock to IEC 68-2-27: Operational 30 g (10 g relay)
   Altitude: Up to 2,000 meters
16. **CONNECTIONS**:Internal removable terminal blocks
   Wire Strip Length: 0.4" (10 mm)
   Wire Gage: 24-12 AWG copper wire, 90°C rated insulation only
   Torque: 5.3 inch-lbs (0.6 N-m) max.
   Cable Diameter: Outside diameter must be 0.181" (4.6 mm) to 0.312" (7.9 mm) to maintain Type 4 rating of cord grips.
17. **CONSTRUCTION**: Aluminum enclosure, and steel side panels with textured black polyurethane paint for scratch and corrosion resistance protection. Meets Type 4X/IP65 specifications. Installation Category II, Pollution Degree 2.
18. **CERTIFICATIONS AND COMPLIANCES**:
   CE Approved:
      EN 61326-1 Immunity to Industrial Locations
      Emission CISPR 11 Class A
   Safety requirements for electrical equipment for measurement control, and laboratory use:
      EN 61010-1: General Requirements
      EN 61010-2-030: Particular Requirements for Testing and Measuring Circuits
   Type 4X Enclosure rating (Face only)
   IP65 Enclosure rating (Face only)
   Refer to EMC Installation Guidelines section of the bulletin for additional information.
19. **WEIGHT**:
   LD2 - 4.5 lbs (2.04 kg)
   LD4 - 10.5 lbs (4.76 kg)

1.0 Installing the Meter

INSTALLATION

The meter meets Type 4X/IP65 requirements when properly installed. LDPLUG00 plugs should be installed in open water-tight connectors.

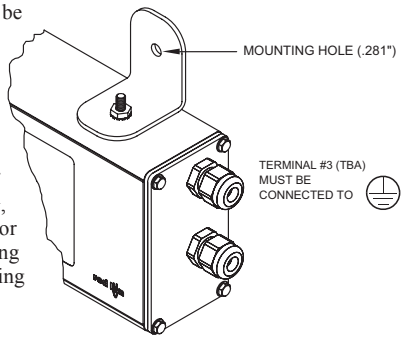
INSTALLATION ENVIRONMENT

The unit should be installed in a location that does not exceed the operating temperature. Placing the unit near devices that generate excessive heat should be avoided. The unit 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 front overlay. Do not use tools of any kind (screwdrivers, pens, pencils, etc.) to operate the keypad of the unit.

MOUNTING INSTRUCTIONS

This display is designed to be wall mounted or suspended from a ceiling truss or other suitable structure capable of supporting the LDSG. Caution should be exercised when hanging the display to provide for the safety of personnel. If hanging the LDSG, run the suspension cables (or chains) through the mounting bracket holes. For wall mounting use #10-32 size bolts.

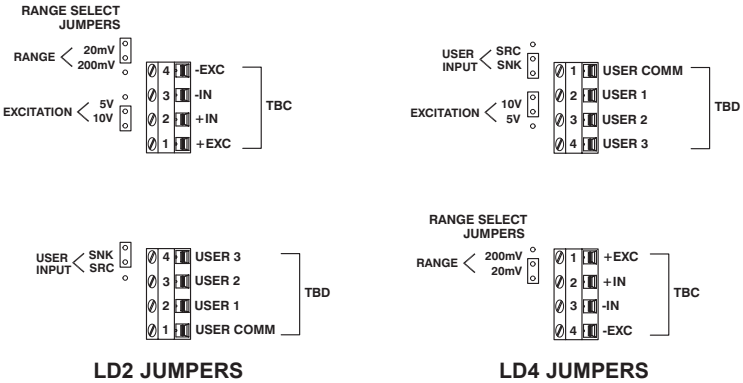


2.0 Setting the Jumpers

INPUT RANGE JUMPER

The jumpers to select input range, excitation, voltage and user input configuration must be selected before wiring the meter. The jumpers for the LD2 model are located on the left side of the unit, and the jumpers for the LD4 model are located on the right side of the unit.

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



LD2 JUMPERS **LD4 JUMPERS**

3.0 WIRING THE METER

EMC INSTALLATION GUIDELINES

Although Red Lion Controls 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 (RLC part number FCOR0000)
   Line Filters for input power cables:
   Schaffner # FN2010-1/07 (Red Lion Controls # LFIL0000)
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 RLC products with 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.
   RLC part numbers: Snubber: SNUB0000
   Varistor: ILS11500 or ILS23000
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.

Visit RLC's web site at http://www.redlion.net/Support/InstallationConsiderations.html for more information on EMI guidelines, Safety and CE issues as they relate to Red Lion Controls products.

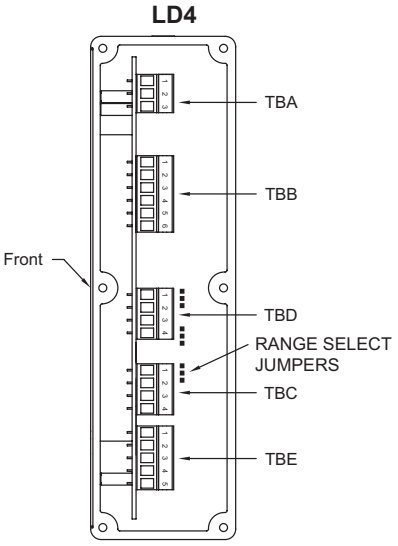
WIRING OVERVIEW

Electrical connections are made via pluggable terminal blocks located inside 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 on the label on the back of the meter case against those shown in wiring drawings for proper wire position. Strip the wire, leaving approximately 0.4" (10 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). Use copper conductors only, with insulation rated at 90°C.

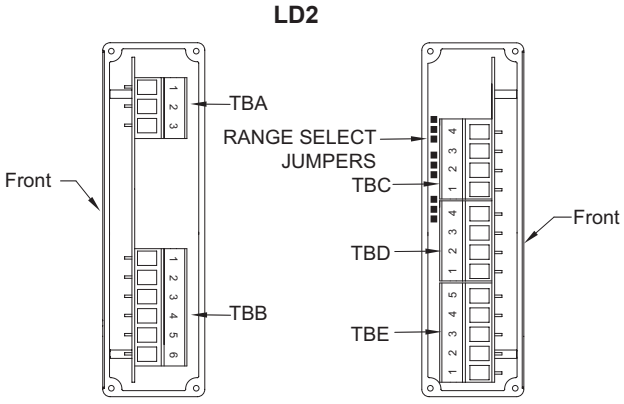
WIRING CONNECTIONS

Internal removable terminal blocks are used for power and signal wiring. Access to terminal blocks is through conduit fittings. Remove end plates with ¼" nut driver. For LD4 versions, all wiring is on right side of unit. For LD2 versions, power and relay wiring is on the right side and the input, serial, and user input is on the left side.

Connect drain wire from shielded cable(s) to screw on side plate for proper grounding.



RIGHT SIDE VIEW



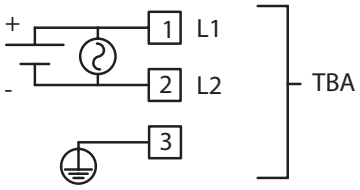
RIGHT SIDE VIEW LEFT SIDE VIEW

G

3.1 POWER WIRING

The power wiring is made via the 3 position terminal block (TBA) located inside the unit (right side).

Power
Terminal 1: VAC/DC +
Terminal 2: VAC/DC -
Terminal 3: Protective Conductor Terminal

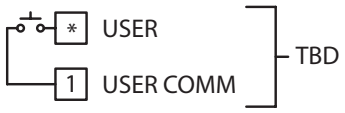


3.2 USER INPUT WIRING

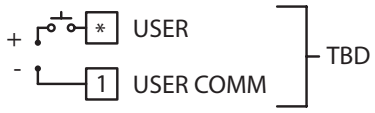
The User Input is located: LD2 - left side, LD4 - right side

Terminal 1: User Comm
Terminal 2: User 1
Terminal 3: User 2
Terminal 4: User 3

Sinking Logic



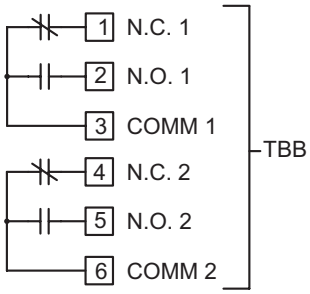
Sourcing Logic



3.3 SETPOINT (OUTPUT) WIRING

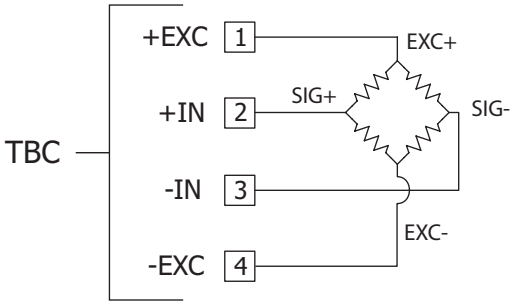
The setpoint relays use a six position terminal block (TBB) located inside the (right side).

Terminal 1: NC 1
Terminal 2: NO 1
Terminal 3: Relay 1 Common
Terminal 4: NC 2
Terminal 5: NO 2
Terminal 6: Relay 2 Common



3.4 INPUT WIRING

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

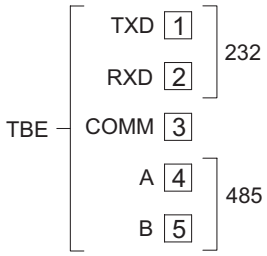


** For single ended input, tie terminal 3 (-IN) to Terminal 4 (-EXC).*

CAUTION: Analog common is NOT isolated from user input common. In order to preserve the safety of the meter application, the DC common must be suitably isolated from hazardous live earth referenced voltage; or input common must be at protective earth ground potential. If not, hazardous voltage may be present at the User Input and Input Common terminals. Appropriate considerations must then be given to the potential of the input common with respect to earth ground. Always connect the analog signal common to terminal 4 (-EXC).

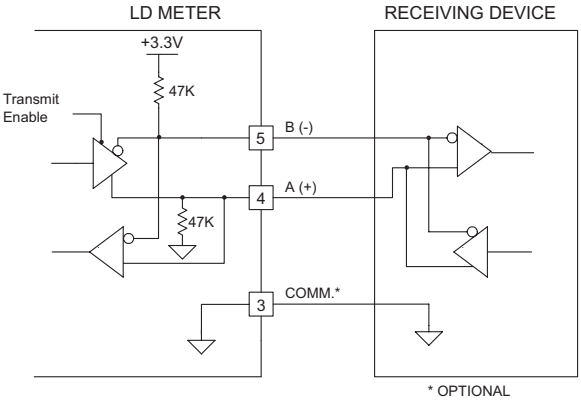
3.5 SERIAL WIRING

The serial connections are made via terminal block TBE located inside the unit on the left side for the LD2 and on the right side for the LD4.



RS485 Communications

The RS485 communication standard allows the connection of up to 32 devices on a single pair of wires, distances up to 4,000 ft. and data rates as high as 19.2K baud. The same pair of wires is used to both transmit and receive data. RS485 is therefore always half-duplex, that is, data cannot be received and transmitted simultaneously.



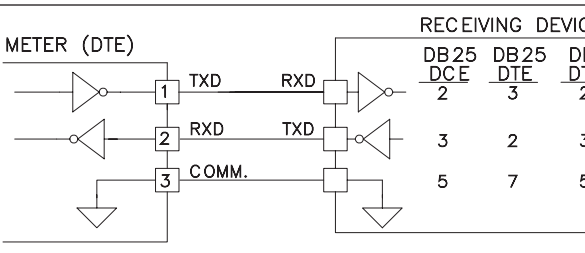
Terminal Block Connection Figure (RS485)

RS232 Communications

RS232 is intended to allow two devices to communicate over distances up to 50 feet. Data Terminal Equipment (DTE) transmits data on the Transmitted Data (TXD) line and receives data on the Received Data (RXD) line. Data Computer Equipment (DCE) receives data on the TXD line and transmits data on the RXD line. The LD emulates a DTE. If the other device connected to the meter also emulates a DTE, the TXD and RXD lines must be interchanged for communications to take place. This is known as a null modem connection. Most printers emulate a DCE device while most computers emulate a DTE device.

Some devices cannot accept more than two or three characters in succession without a pause in between. In these cases, the meter employs a busy function.

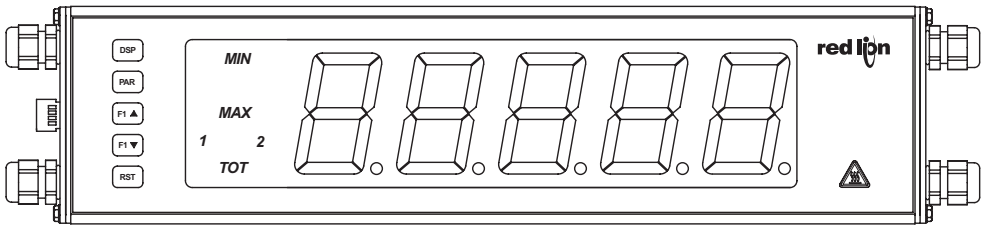
As the meter begins to transmit data, the RXD line (RS232) is monitored to determine if the receiving device is "busy". The receiving device asserts that it is busy by setting the RXD line to a space condition (logic 0). The meter then suspends transmission until the RXD line is released by the receiving device.



Terminal Block Connection Figure (RS232)

G

4.0 Reviewing the Front Buttons and Display



KEY	DISPLAY MODE OPERATION	PROGRAMMING MODE OPERATION
DSP	Index display through max/min/total/input readouts*	Quit programming and return to display mode
PAR	Access parameter list	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
RST	Reset (Function key)**	Hold with F1▲, F2▼ to scroll value by x1000

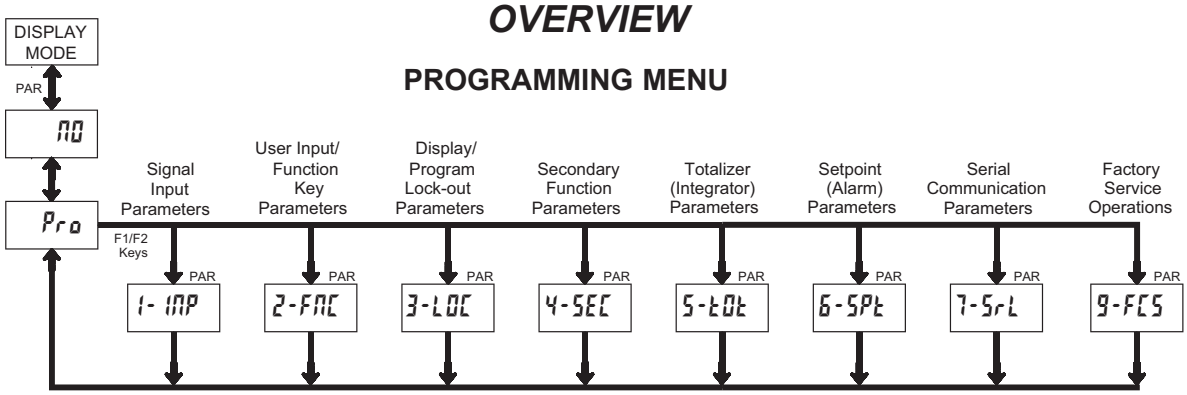
* Display Readout Legends may be locked out in Factory Settings.

** Factory setting for the F1, F2, and RST keys is NO mode.

5.0 Programming the Meter

OVERVIEW

PROGRAMMING MENU



DISPLAY MODE

The meter normally operates in the Display Mode. In this mode, the meter displays can be viewed consecutively by pressing the **DSP** key. The annunciators to the left of the display indicate which display is currently shown; Max Value (MAX), Min Value (MIN), or Totalizer Value (TOT). Each of these displays can be locked from view through programming. (See Module 3) The Input Display Value is shown with no annunciator.

PROGRAMMING MODE

Two programming modes are available.

Full Programming Mode permits all parameters to be viewed and modified. Upon entering this mode, the front panel keys change to Programming Mode operations. This mode should not be entered while a process is running, since the meter functions and User Input response may not operate properly while in Full Programming Mode.

Quick Programming Mode permits only certain parameters to be viewed and/or modified. When entering this mode, the front panel keys change to Programming Mode operations, and all meter functions continue to operate properly. Quick Programming Mode is configured in Module 3. The Display Intensity Level "d-LEv" parameter is available in the Quick Programming Mode only when the security code is non-zero. For a description, see Module 9—Factory Service Operations. Throughout this document, Programming Mode (without Quick in front) always refers to "Full" Programming Mode.

PROGRAMMING TIPS

The Programming Menu is organized into eight modules (See above). These modules group together parameters that are related in function. It is recommended to begin programming with Module 1 and proceed through each module in sequence. If lost or confused while programming, press the **DSP** key to exit programming mode and start over.

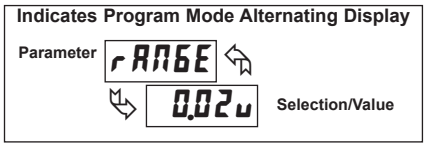
FACTORY SETTINGS

Factory Settings may be completely restored in Module 9. This is a good starting point if encountering programming problems. Throughout the module description sections which follow, the factory setting for each parameter is shown below the parameter display.

G

ALTERNATING SELECTION DISPLAY

In the module description sections which follow, the dual display with arrows appears for each programming parameter. This is used to illustrate the display alternating between the parameter (top display) and the parameter's Factory Setting (bottom display). In most cases, selections or value ranges for the parameter will be listed on the right.



STEP BY STEP PROGRAMMING INSTRUCTIONS:

PROGRAMMING MODE ENTRY (PAR KEY)

The Programming Mode is entered by pressing the **PAR** key. If this mode is not accessible, then meter programming is locked by either a security code or a hardware lock. (See Modules 2 and 3 for programming lock-out details.)

MODULE ENTRY (ARROW & PAR KEYS)

Upon entering the Programming Mode, the display alternates between Pro and the present module (initially 00). The arrow keys (**F1**▲ and **F2**▼) are used to select the desired module, which is then entered by pressing the **PAR** key.

PARAMETER (MODULE) MENU (PAR KEY)

Each module has a separate parameter menu. These menus are shown at the start of each module description section which follows. The **PAR** key is pressed to advance to a particular parameter to be changed, without changing the programming of preceding parameters. After completing a module, the display will return to Pro 00. From this point, programming may continue by selecting and entering additional modules. (See **MODULE ENTRY** above.)

PARAMETER SELECTION ENTRY (ARROW & PAR KEYS)

For each parameter, the display alternates between the parameter and the present selection or value for that parameter. For parameters which have a list of selections, the arrow keys (**F1**▲ and **F2**▼) are used to sequence through the list until the desired selection is displayed. Pressing the **PAR** key stores and activates the displayed selection, and also advances the meter to the next parameter.

NUMERICAL VALUE ENTRY (ARROW, RST & PAR KEYS)

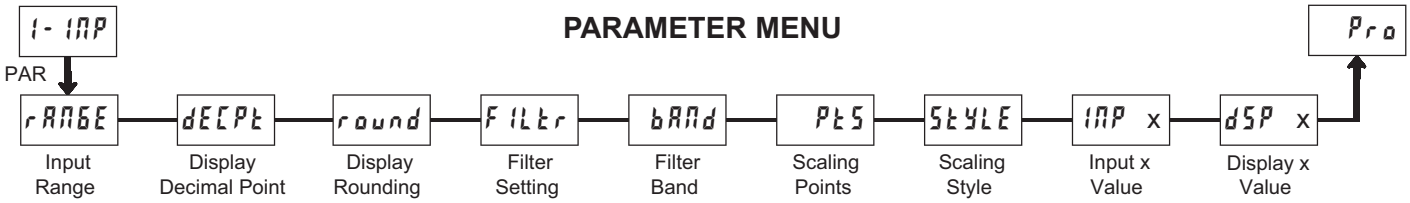
For parameters which require a numerical value entry, the arrow keys can be used to increment or decrement the display to the desired value. When an arrow key is pressed and held, the display automatically scrolls up or scrolls down. The longer the key is held, the faster the display scrolls.

The **RST** key can be used in combination with the arrow keys to enter large numerical values. When the **RST** key is pressed along with an arrow key, the display scrolls by 1000's. Pressing the **PAR** key stores and activates the displayed value, and also advances the meter to the next parameter.

PROGRAMMING MODE EXIT (DSP KEY or PAR KEY at Pro 00)

The Programming Mode is exited by pressing the **DSP** key (from anywhere in the Programming Mode) or the **PAR** key (with Pro 00 displayed). This will commit any stored parameter changes to memory and return the meter to the Display Mode. If a parameter was just changed, the **PAR** key should be pressed to store the change before pressing the **DSP** key. (If power loss occurs before returning to the Display Mode, verify recent parameter changes.)

5.1 MODULE 1 - SIGNAL INPUT PARAMETERS (1- INP)

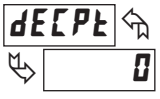


INPUT RANGE

SELECTION	RANGE RESOLUTION
0.02u	±24 mV
0.2u	±240 mV

Select the input range that corresponds to the external signal. This selection should be high enough to avoid input signal overload but low enough for the desired input resolution. This selection and the position of the Input Range Jumper must match.

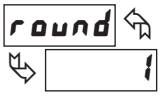
DISPLAY DECIMAL POINT



0 0.0 0.00 0.000 0.0000

Select the decimal point location for the Input, **MAX** and **MIN** displays. (The **TOT** display decimal point is a separate parameter.) This selection also affects round, dSP1 and dSP2 parameters and setpoint values.

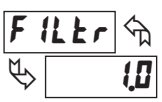
DISPLAY ROUNDING*



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.

FILTER SETTING*

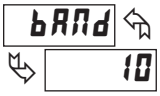


0.0 to 25.0 seconds

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.

G

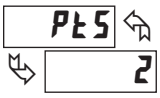
FILTER BAND*



0.0 to 25.0 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. A band setting of '0' keeps the digital filter permanently engaged.

SCALING POINTS*



2 to 16

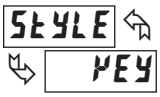
Linear - Scaling Points (2)

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 (InP) and an associated desired Display Value (dSP).

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 (InP) and an associated desired Display Value (dSP). 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.

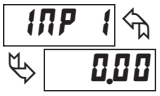
SCALING STYLE



PEY key-in data
APLY apply signal

If Input Values and corresponding Display Values are known, the Key-in (PEY) scaling style can be used. This allows scaling without the presence or changing of the input signal. If Input Values have to be derived from the actual input signal source or simulator, the Apply (APLY) scaling style must be used. After using the Apply (APLY) scaling style, this parameter will default back to PEY but the scaling values will be shown from the previous applied method.

INPUT VALUE FOR SCALING POINT 1

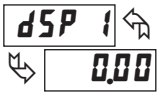


- 19999 to 99999

For Key-in (PEY), enter the known first Input Value by using the arrow keys. The Input Range selection sets up the decimal location for the Input Value. With 0.02 V Input Range, 0 mV would be entered as 0.000. For Apply (APLY), apply the input signal to the meter, adjust the signal source externally until the desired Input Value appears. In either method, press the **PAR** key to enter the value being displayed.

Note: APLY style - Pressing the **RST** *key will advance the display to the next scaling display point without storing the input value.*

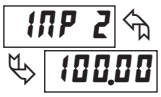
DISPLAY VALUE FOR SCALING POINT 1



- 19999 to 99999

Enter the first coordinating Display Value by using the arrow keys. This is the same for PEY and APLY scaling styles. The decimal point follows the dECPt selection.

INPUT VALUE FOR SCALING POINT 2



- 19999 to 99999

For Key-in (PEY), enter the known second Input Value by using the arrow keys. For Apply (APLY), adjust the signal source externally until the next desired Input Value appears. (Follow the same procedure if using more than 2 scaling points.) With 0.02 V Input Range, 20 mV would be entered as 20.000.

DISPLAY VALUE FOR SCALING POINT 2

- 19999 to 99999

Enter the second coordinating Display Value by using the arrow keys. This is the same for PEY and APLY scaling styles. (Follow the same procedure if using more than 2 scaling points.)

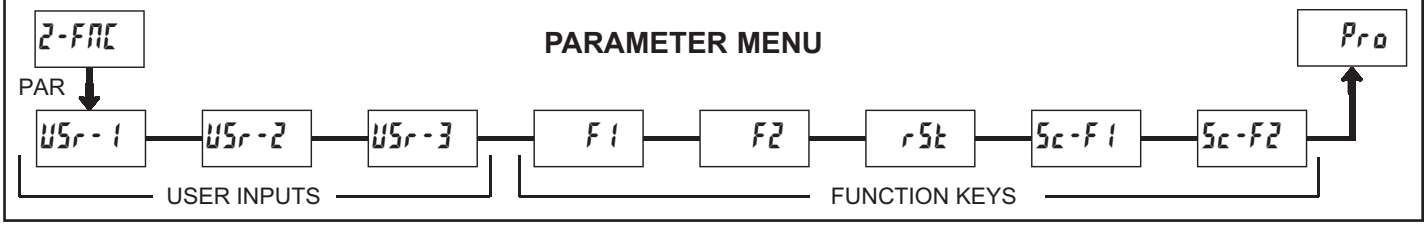
General Notes on Scaling

1. Input Values for scaling points should be confined to the limits of the Input Range Jumper position.
2. The same Input Value should not correspond to more than one Display Value. (Example: 20 mV can not equal 0 and 10.)
   This is referred to as read out jumps (vertical scaled segments).
3. The same Display Value can correspond to more than one Input Value. (Example: 0 mV and 20 mV can equal 10.)
   This is referred to as readout dead zones (horizontal scaled segments).
4. The maximum scaled Display Value spread between range maximum and minimum is limited to 65,535. For example using 20 mV range the maximum +20 mV can be scaled to is 32,767 with 0 mV being 0 and Display Rounding of 1. (Decimal points are ignored.) The other half of 65,535 is for the lower half of the range 0 to -20 mV even if it is not used. With Display Rounding of 2, +20 mV can be scaled for 65,535 (32,767 x 2) but with even Input Display values shown.
5. For input levels beyond the last programmed Input Value, the meter extends the Display Value by calculating the slope from the last two sequential coordinate pairs. If three coordinate pair scaling points were entered, then the Display Value calculation would be between InP2 / dSP2 & InP3 / dSP3. The calculations stop at the limits of the Input Range Jumper position.

G

* *Factory Setting can be used without affecting basic start-up.*

6.2 MODULE 2 - USER INPUT AND FRONT PANEL FUNCTION KEY PARAMETERS (2-FNC)



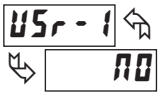
The three user inputs are individually programmable to perform specific meter control functions. While in the Display Mode or Program Mode, the function is executed the instant the user input transitions to the active state.

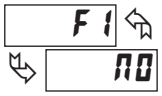
The front panel function keys are also individually programmable to perform specific meter control functions. While in the Display Mode, the primary function is executed the instant the key is pressed. Holding the function key for three seconds executes a secondary function. It is possible to program 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. Alternating 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.* USr-1 *will represent all three user inputs.* F1 *will represent all five function keys.*

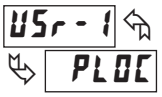
NO FUNCTION





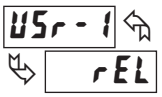
No function is performed if activated. This is the factory setting for all user inputs and function keys. No function can be selected without affecting basic start-up.

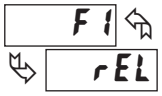
PROGRAMMING MODE LOCK-OUT



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

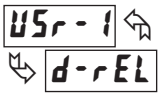
ZERO (TARE) DISPLAY

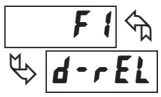




The Zero (Tare) Display provides a way to zero the Input Display value at various input levels, causing future Display readings to be offset. This function is useful in weighing applications where the container or material on the scale should not be included in the next measurement value. When activated (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 (OFFSt). If another Zero (tare) Display is performed, the display will again change to zero and the Display reading will shift accordingly.

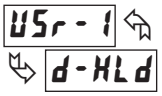
RELATIVE/ABSOLUTE DISPLAY





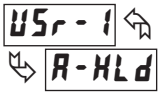
This function will switch the Input Display between Relative and Absolute. The Relative is a net value that includes the Display Offset Value. The Input Display will normally show the Relative unless switched by this function. Regardless of the display selected, all meter functions continue to operate 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 (absolute) or rEL (relative) is momentarily displayed at transition to indicate which display is active.

HOLD DISPLAY



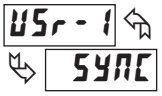
The shown display is held but all other meter functions continue as long as activated (maintained action).

HOLD ALL FUNCTIONS



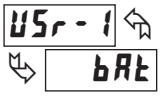
The meter disables processing the input, holds all display contents, and locks the state of all outputs as long as activated (maintained action). The serial port continues data transfer.

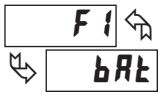
SYNCHRONIZE METER READING



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.

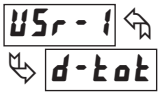
STORE BATCH READING IN TOTALIZER





The Input Display value is one time added (batched) to the Totalizer at transition to activate (momentary action). 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.

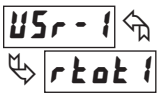
SELECT TOTALIZER DISPLAY

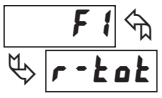


The Totalizer display is selected as long as activated (maintained action). When the user input is released, the Input Display is returned. The **DSP** key overrides the active user input. The Totalizer continues to function including associated outputs independent of being displayed.

G

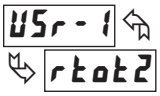
RESET TOTALIZER





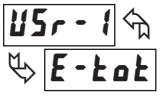
When activated (momentary action), rESEt flashes and the Totalizer resets to zero. The Totalizer then continues to operate as it is configured. This selection functions independent of the selected display.

RESET AND ENABLE TOTALIZER



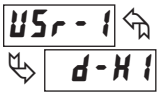
When activated (momentary action), rESEt flashes and the Totalizer resets to zero. The Totalizer continues to operate while active (maintained action). When the user input is released, the Totalizer stops and holds its value. This selection functions independent of the selected display.

ENABLE TOTALIZER



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

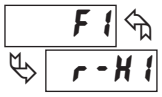
SELECT MAXIMUM DISPLAY



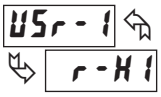
The Maximum display is selected as long as activated (maintained action). When the user input is released, the Input Display returns. The **DSP** key overrides the active user input. The Maximum continues to function independent of being displayed.

RESET MAXIMUM

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.

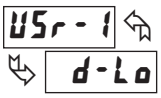


RESET, SELECT, ENABLE MAXIMUM DISPLAY



When activated (momentary action), the Maximum value is set to the present Input Display value. Maximum continues from that value while active (maintained action). When the user input is released, Maximum detection stops and holds its value. This selection functions independent of the selected display. The **DSP** key overrides the active user input display but not the Maximum function.

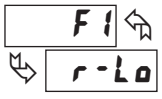
SELECT MINIMUM DISPLAY



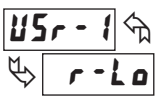
The Minimum display is selected as long as activated (maintained action). When the user input is released, the Input Display is returned. The **DSP** key overrides the active user input. The Minimum continues to function independent of being displayed.

RESET MINIMUM

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

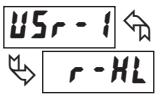


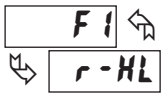
RESET, SELECT, ENABLE MINIMUM DISPLAY



When activated (momentary action), the Minimum value is set to the present Input Display value. Minimum continues from that value while active (maintained action). When the user input is released, Minimum detection stops and holds its value. This selection functions independent of the selected display. The **DSP** key overrides the active user input display but not the Minimum function.

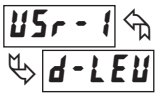
RESET MAXIMUM AND MINIMUM

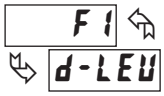




When activated (momentary action), rESEt flashes and the Maximum and Minimum readings are set to the present Input Display value. The Maximum and Minimum function then continues from that value. This selection functions independent of the selected display.

CHANGE DISPLAY INTENSITY LEVEL





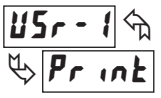
When activated (momentary action), the display intensity changes to the next intensity level (of 4). The four levels correspond to Display Intensity Level (d-LEu) settings of 0, 3, 8, and 15. The intensity level, when changed via the User Input/ Function Key, is not retained at power-down, unless Quick Programming or Full Programming mode is entered and exited. The meter will power-up at the last saved intensity level.

SETPOINT SELECTIONS

The following selections can be programmed for user inputs or front panel function keys. Refer to Module 6 for an explanation of their operation.

LISt - Select main or alternate setpoints
r-1 - Reset Setpoint 1 (Alarm 1)
r-2 - Reset Setpoint 2 (Alarm 2)
r-ALL - Reset Setpoint All (Alarm All)

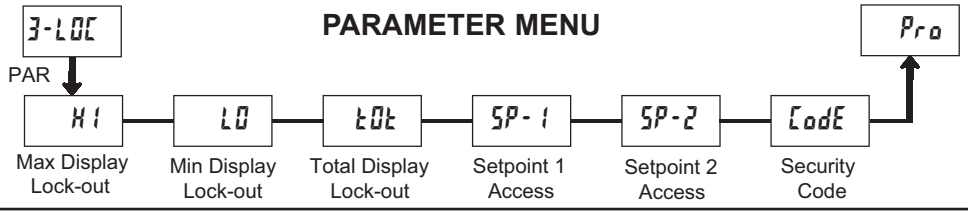
PRINT REQUEST



The meter issues a block print through the serial port when activated. The data transmitted during a print request 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.

G

6.3 MODULE 3 - DISPLAY AND PROGRAM LOCK-OUT PARAMETERS (3-LOC)



Module 3 is the programming for Display lock-out and "Full" and "Quick" Program lock-out.

When in the Display Mode, the available displays can be read consecutively by repeatedly pressing the **DSP** key. An annunciator indicates the display being shown. These displays can be locked from being visible. It is recommended that the display be set to LOC when the corresponding function is not used.

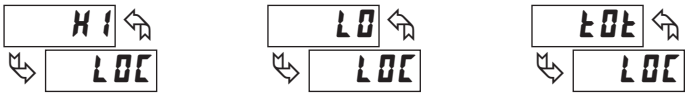
SELECTION	DESCRIPTION
rEd	Visible in Display Mode
LOC	Not visible in Display Mode

"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. When locked and the **PAR** key is pressed, the meter enters a Quick Programming Mode. In this mode, the setpoint values can still be read and/or changed per the selections below. The Display Intensity Level (d-LEU) parameter also appears whenever Quick Programming Mode is enabled and the security code is greater than zero.

SELECTION	DESCRIPTION
rEd	Visible but not changeable in Quick Programming Mode
ENt	Visible and changeable in Quick Programming Mode
LOC	Not visible in Quick Programming Mode

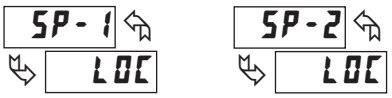
* *Factory Setting can be used without affecting basic start-up.*

MAXIMUM DISPLAY LOCK-OUT*
MINIMUM DISPLAY LOCK-OUT*
TOTALIZER DISPLAY LOCK-OUT*



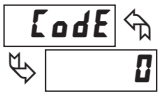
These displays can be programmed for LOC or rEd. When programmed for LOC, the display will not be shown when the **DSP** key is pressed regardless of Program Lock-out status. It is suggested to lock-out the display if it is not needed. The associated function will continue to operate even if its display is locked-out.

SP-1 or SP-2 SETPOINT ACCESS*



The setpoint displays can be programmed for LOC, rEd or ENt (See the following table).

PROGRAM MODE SECURITY CODE*



By entering any non-zero value, the prompt CodE 0 will appear when trying to access the Program Mode. Access will only be allowed after entering a matching security code or universal code of 222. With this lock-out, a user input would not have to be configured for Program Lock-out. However, this lock-out is overridden by an inactive user input configured for Program Lock-out.

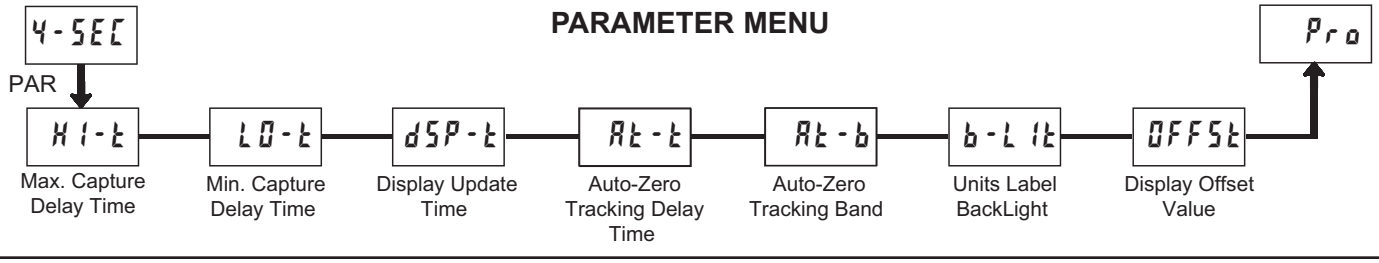
PROGRAMMING MODE ACCESS

SECURITY CODE	USER INPUT CONFIGURED	USER INPUT STATE	WHEN PAR KEY IS PRESSED	"FULL" PROGRAMMING MODE ACCESS
0	not PLOC	————	"Full" Programming	Immediate access.
>0	not PLOC	————	Quick Programming w/Display Intensity	After Quick Programming with correct code # at CodE prompt.
>0	PLOC	Active	Quick Programming w/Display Intensity	After Quick Programming with correct code # at CodE prompt.
>0	PLOC	Not Active	"Full" Programming	Immediate access.
0	PLOC	Active	Quick Programming	No access
0	PLOC	Not Active	"Full" Programming	Immediate access.

Throughout this document, Programming Mode (without Quick in front) always refers to "Full" Programming (all meter parameters are accessible).

G

6.4 MODULE 4 - SECONDARY FUNCTION PARAMETERS (4-SEC)



MAX CAPTURE DELAY TIME*

H1-t / 0.0 — 0.0 to 3275.0 sec.

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 DELAY TIME*

L0-t / 0.0 — 0.0 to 3275.0 sec.

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*

d5P-t / 2 — 1 2 5 10 20 updates/sec.

This parameter determines the rate of display update. When set to 20 updates/second, the internal re-zero compensation is disabled, allowing for the fastest possible output response.

AUTO-ZERO TRACKING

At-t / 0 — 0 to 250 sec.

AUTO-ZERO BAND

At-b / 0.02 — 1 to 4095

The meter can be programmed to automatically compensate for zero drift. Drift may be caused by changes in the transducers or electronics, or accumulation of material on weight systems.

Auto-zero tracking operates when the readout remains within the tracking band for a period of time equal to the tracking delay time. When these conditions are met, the meter re-zeroes the readout. After the re-zero operation, the meter resets and continues to auto-zero track.

The auto-zero tracking band should be set large enough to track normal zero drift, but small enough to not interfere with small process inputs.

For filling operations, the fill rate must exceed the auto-zero tracking rate. This avoids false tracking at the start of the filling operation.

$$\text{Fill Rate} \geq \frac{\text{tracking band}}{\text{tracking time}}$$

Auto-zero tracking is disabled by setting the auto-zero tracking parameter = 0.

UNITS LABEL BACKLIGHT*

b-L it / OFF — On Off

This parameter is not used on this unit.

DISPLAY OFFSET VALUE*

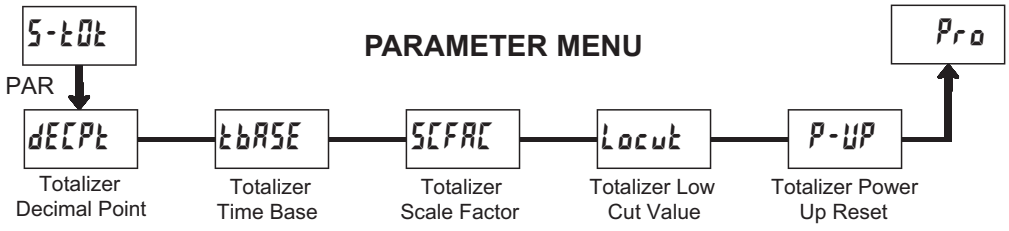
OFF5t / 0.00 — -19999 to 99999

Unless a Zero Display was performed or an offset from Module 1 scaling is desired, this parameter can be skipped. The Display Offset Value is the difference from the Absolute (gross) Display value to the Relative (net) Display value for the same input level. The meter will automatically update this Display Offset Value after each Zero Display. The Display Offset Value can be directly keyed-in to intentionally add or remove display offset. See Relative / Absolute Display and Zero Display explanations in Module 2.

* *Factory Setting can be used without affecting basic start-up.*

G

6.5 MODULE 5 - TOTALIZER (INTEGRATOR) PARAMETERS (5-tOt)



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*

dECPt / 0.00 — 0 0.0 0.00 0.000 0.0000

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

TOTALIZER TIME BASE

tbASE / .1M — SEC - seconds (÷ 1) hour - hours (÷ 3600) .1M - minutes (÷ 60) 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*

SCFAC / 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 these cases, the Totalizer Scale Factor is 1.000. The Totalizer Scale Factor can be used to scale the Totalizer to a different value 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*

Locut / -19999 — -19999 to 99999

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

TOTALIZER POWER UP RESET*

P-UP / nO

nO Do not reset buffer
rSt Reset buffer

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

***** *Factory Setting can be used without affecting basic start-up.*

TOTALIZER HIGH ORDER DISPLAY

When the total exceeds 5 digits, the front panel annunciator **TOT** flashes. In this case, the meter continues to totalize up to a 9 digit value. The high order 4 digits and the low order 5 digits of the total are displayed alternately. The letter "h" denotes the high order display. When the total exceeds a 9 digit value, the Totalizer will show "E . . ." and will stop.

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:

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

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 kilograms per minute moving across a scale. The Totalizer is used to determine how many kilograms in tenths has traveled over the scale. Because the Input Display and Totalizer are both in tenths of kilograms, the Totalizer Scale Factor is 1. With kilograms per minute, the Totalizer Time Base is minutes (60). By placing these values in the equation, the Totalizer will accumulate every second as follows:

$\frac{10.0 \times 1.000}{60}$ = 0.1667 kilograms accumulates each second

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

TOTALIZER SCALE FACTOR CALCULATION EXAMPLES

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

Example:

Input (dECPt) = 0

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

Input (dECPt) = 0.0

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

Input (dECPt) = 0.00

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

(x = Totalizer display is round by tens or hundreds)

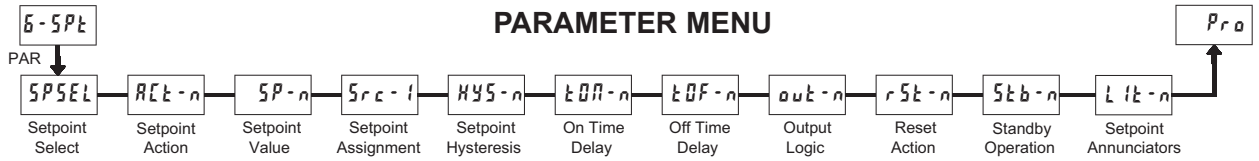
2. To obtain an average reading within a controlled time frame, the selected Totalizer Time Base is divided by the given time period expressed in the same timing units.

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 rtat2. The timer will control the start (reset) and the stopping (hold) of the totalizer.

G

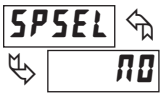
6.6 MODULE 6 - SETPOINT (ALARM) PARAMETERS (6-SPt)

PARAMETER MENU



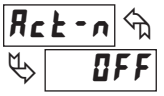
For maximum input frequency, unused Setpoints should be configured for **OFF** action. The setpoint assignment and the setpoint action determine certain setpoint feature availability.

SETPOINT SELECT



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 **SPSEL NO**. Repeat step for each setpoint to be programmed. The **NO** chosen at **SPSEL** will return to **Pro NO**. The number of setpoints available is setpoint output card dependent.

SETPOINT ACTION



Enter the action for the selected setpoint (alarm output). See Setpoint Alarm Figures for a visual detail of each action.

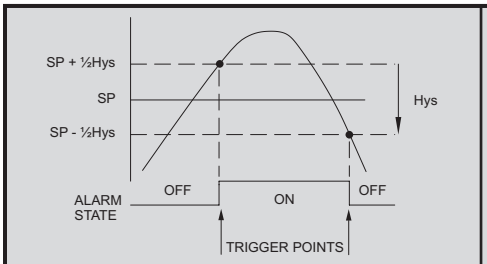
OFF	=	Setpoint always off, (returns to SPSEL NO)
Ab-HI	=	Absolute high, with balanced hysteresis
Ab-LO	=	Absolute low, with balanced hysteresis
AU-HI	=	Absolute high, with unbalanced hysteresis
AU-LO	=	Absolute low, with unbalanced hysteresis
dE-HI	=	Deviation high, with unbalanced hysteresis *
dE-LO	=	Deviation low, with unbalanced hysteresis *
bAnd	=	Outside band, with unbalanced hysteresis *
totLo	=	Lower Totalizer absolute high, unbalance hysteresis**
totHI	=	Upper Totalizer absolute high, unbalance hysteresis**

* Deviation and band action setpoints are relative to the value of setpoint 1. It is not possible to configure setpoint 1 as deviation or band actions. It is possible to use setpoint 1 for an absolute action, while its value is being used for deviation or band.

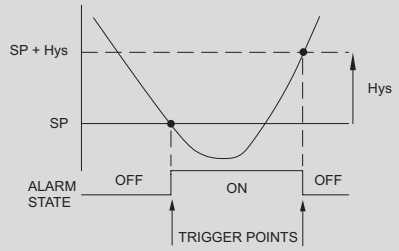
** The lower Totalizer action **totLo** allows setpoints to function off of the lower 5 digits of the Totalizer. The upper Totalizer action **totHI** allows setpoints to function off of the upper 4 digits of the Totalizer. To obtain absolute low alarms for the Totalizer, program the **totLo** or **totHI** output logic as reverse.

Setpoint Alarm Figures

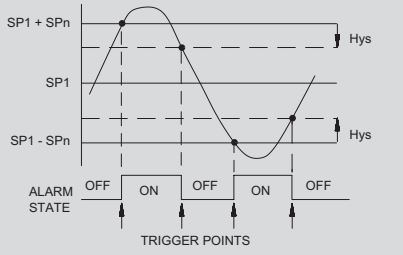
With reverse output logic **rEu**, the below alarm states are opposite.



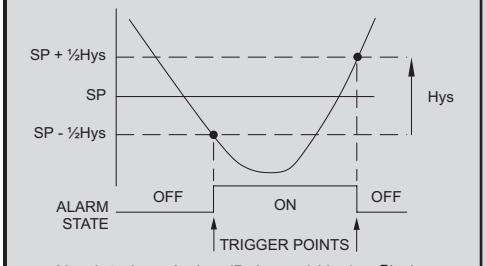
Absolute High Acting (Balanced Hys) = **Ab-HI**



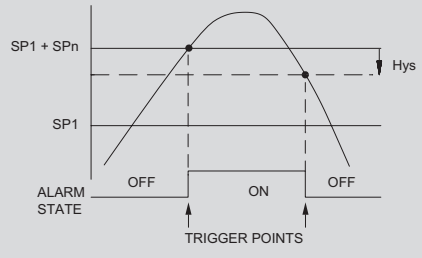
Absolute Low Acting (Unbalanced Hys) = **AU-Lo**



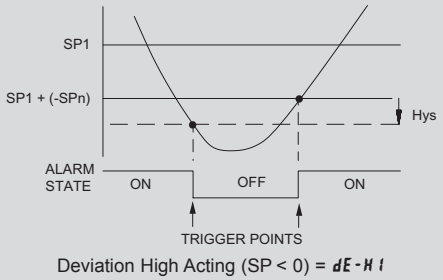
Band Outside Acting = **bAnd**



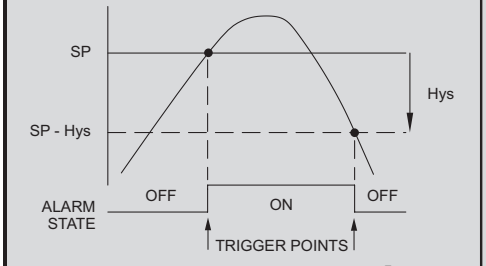
Absolute Low Acting (Balanced Hys) = **Ab-Lo**



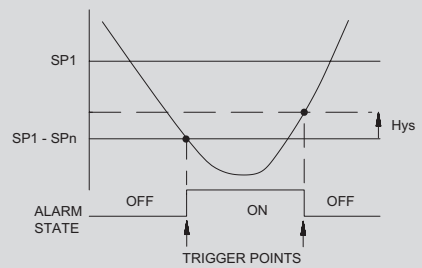
Deviation High Acting (SP > 0) = **dE-HI**



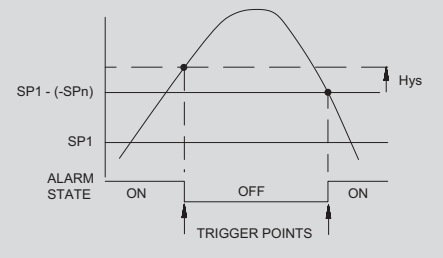
Deviation High Acting (SP < 0) = **dE-HI**



Absolute High Acting (Unbalanced Hys) = **AU-HI**
This is also for Totalizer alarms: **tot lo, totHI**



Deviation Low Acting (SP > 0) = **dE-Lo**



Deviation Low Acting (SP < 0)= **dE-Lo**

G

SETPOINT VALUE

SP-n
10.00

-19999 to 99999

Enter desired setpoint alarm value. These setpoint values can also be entered in the Display Mode during Program Lock-out when the setpoint is programmed as Ent in Parameter Module 3. When a setpoint is programmed as deviation or band acting, the associated output tracks SP1 as it is changed. The value entered is the offset, or difference from SP1.

SETPOINT ASSIGNMENT

Src-1
Abs

Abs rEL

Enter desired source for Setpoint. The Setpoint can be triggered from the Relative (Input) or Absolute/Gross (Abs) value.

HYSTERESIS VALUE

HYS-n
0.02

1 to 65000

Enter desired hysteresis value. See Setpoint Alarm Figures for visual explanation of how setpoint alarm actions (balance and unbalance) are affected by the hysteresis. When the setpoint is a control output, usually balance 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

tON-n
0.0

0.0 to 3275.0 sec.

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 rEu, this becomes off time delay. Any time accumulated at power-off resets during power-up.

OFF TIME DELAY

tOF-n
0.0

0.0 to 3275.0 sec.

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 rEu, this becomes on time delay. Any time accumulated at power-off resets during power-up.

OUTPUT LOGIC

out-n
nor

nor rEu

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

RESET ACTION

rSt-n
Auto

Auto LAtC1 LAtC2

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.
LAtC1 = 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.)
LAtC2 = 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.)

STANDBY OPERATION

Stb-n
no

no YES

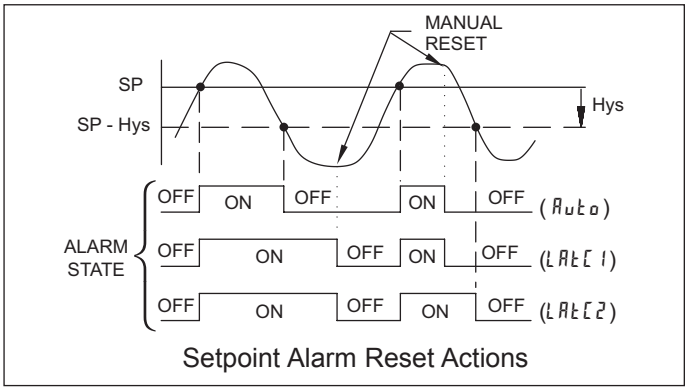
When YES, the alarm is disabled (after a power up) until the trigger point is crossed. Once the alarm is on, the alarm operates normally per the Setpoint Action and Reset Mode.

SETPOINT ANNUNCIATORS

L it-n
nor

OFF nor rEu FLASH

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



Setpoint Alarm Reset Actions

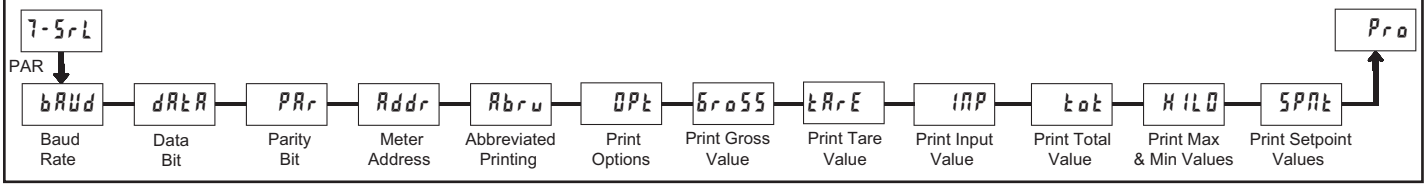
Alternate Setpoints

An Alternate list of setpoint values can be stored and recalled as needed. The Alternate list allows an additional set of setpoint values. (The setpoint numbers nor rear terminal numbers will change in the Alternate list.) The Alternate list can only be activated through a function key or user input programmed for L ISt in Module 2. When the Alternate list is selected, the Main list is stored and becomes inactive. When changing between Main and Alternate, the alarm state of Auto Reset Action alarms will always follow their new value. Latched "on" alarms will always stay latched during the transition and can only be reset with a user input or function key. Only during the function key or user input transition does the display indicate which list is being used.

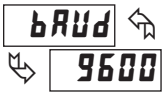
G

6.7 MODULE 7 - SERIAL COMMUNICATIONS PARAMETERS (7-SrL)

PARAMETER MENU



BAUD RATE



300 1200 4800 19200
600 2400 9600

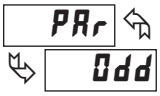
Set the baud rate to match that of other serial communications equipment. Normally, the baud rate is set to the highest value that all of the serial communications equipment is capable of transmitting.

DATA BIT

7 8

Select either 7 or 8 bit data word lengths. Set the word length to match that of other serial communication equipment. Since the meter receives and transmits 7-bit ASCII encoded data, 7 bit word length is sufficient to request and receive data from the meter.

PARITY BIT



Odd EUEN nO

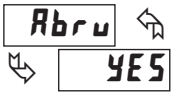
Set the parity bit to match that of the other serial communications equipment used. The meter ignores the parity when receiving data, and sets the parity bit for outgoing data. If no parity is selected with 7-bit word length the meter transmits and receives data with 2 stop bits. (For example: 10 bit frame with mark parity)

METER ADDRESS

0 to 99

Enter the serial node address. With a single unit on a bus, an address is not needed and a value of zero can be used (RS232 applications). Otherwise, with multiple bussed units, a unique address number must be assigned to each meter. The node address applies specifically to RS485 applications.

ABBREVIATED PRINTING



YES nO

Select abbreviated transmissions (numeric only) or full field transmission. When the data from the meter is sent directly to a terminal for display, the extra characters that are sent identify the nature of the meter parameter displayed. In this case, select nO. When the data from the meter goes to a computer, it may be desirable to suppress the node address and mnemonic when transmitting. In this case, set this parameter to YES.

PRINT OPTIONS

YES nO

YES - Enters the sub-menu to select those meter parameters to appear in the block print. For each parameter in the sub-menu select YES for the parameter to appear with the block print, and nO to disable the parameter.

Gross Value	GroSS	YES	nO
Tare Value	tArE	YES	nO
Input Value	InP	YES	nO
Max and Min Values	HILO	YES	nO
Total Value	tot	YES	nO
Setpoint values	SPAt	YES	nO

G

Sending Commands and Data

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 the command terminator character * or $.

Command Chart

Command	Description	Notes
N	Node Address Specifier	Address a specific meter. Must be followed by one or two digit node address. Not required when node 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 of the meter. 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 (read)	Initiates a block print output. Registers are defined in programming.

Register Identification Chart

ID	Value Description	Register ID	Applicable Commands/Comments	
A	Input	INP	T, P, R	(Reset command zeros the input [“REL” or Tare])
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	T, P, V, R	(Reset command resets the setpoint output)
J	Control Status Register	CSR	T, V	
L	Absolute (gross) input display value	GRS	T, P	
Q	Offset/Tare	TAR	T, P, V	

Command String Construction

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

1. The first 2 or 3 characters consist of the Node Address Specifier (N) followed by a 1 or 2 character node address number. The node 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 optional 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 of * and $ terminating characters.

Command String Examples:

1. Node address = 17, Write 350 to Setpoint 1, response delay of 2 msec min
   String: N17VE350$
2. Node address = 5, Read Input value, response delay of 50 msec min
   String: N5TA*
3. Node address = 0, Reset Setpoint 2 output, response delay of 50 msec min
   String: RF*

Sending Numeric Data

Numeric data sent to the meter must be limited to 5 digits (-19,999 to 99,999). If more than 5 digits are sent, the meter accepts the last 5. 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 In this case, write a value = 25.0).

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

Receiving Data

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. In this case, the response contains only the numeric field. The meter response mode is established in programming.

Full Field Transmission

Byte	Description
1, 2	2 byte Node Address field [00-99]
3	<SP> (Space)
4-6	3 byte Register Mnemonic field
7-18	12 byte data field; 10 bytes for number, one byte for sign, one byte for decimal point (The T command may be a different byte length)
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 ID (Serial 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 value 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

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.*

The abbreviated response suppresses the node address and register ID, leaving only the numeric part of the response.

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>

G

(CSR) Control Status Register

The Control Status Register is used to directly control the meter's setpoint outputs and interrogate the state of the setpoint outputs. The register is bit mapped with each bit position within the register assigned to a particular control function. The control function are invoked by writing to each bit position. The bit position definitions are:

bit 0: Setpoint 1 Output Status
- 0 = output off
- 1 = output on

bit 1: Setpoint 2 Output Status
- 0 = output off
- 1 = output on

bit 2: Not Used

bit 3: Not Used

bit 4: Manual Mode
- 0 = automatic mode
- 1 = manual mode

bit 5: Always stays 0, even if 1 is sent.

bit 6: Not Used

bit 7: Always stays 0, even if 1 is sent.

Although the register is bit mapped starting with bit 7, HEX < > characters are sent in the command string. Bits 7 and 5 always stay a zero, even if a "1" is sent. This allows ASCII characters to be used with terminals that may not have extended character capabilities.

Writing a "1" to bit 4 of CSR selects manual mode. In this mode, the setpoint outputs are defined by the values written to the bits b0 and b1. Internal control of these outputs is then overridden.

In automatic mode, the setpoint outputs can only be reset off. Writing to the setpoint output bits of the CSR has the same effect as a Reset command (R). The contents of the CSR may be read to interrogate the state of the setpoint outputs.

Examples:

1. Set manual mode, turn all setpoints off:
   V is command write, J is CSR and * is terminator.

		7	6	5	4	3	2	1	0:bit location
VJ<30>* or VJ0*	ASCII 0 =	0	0	1	1	0	0	0	0 or <30>

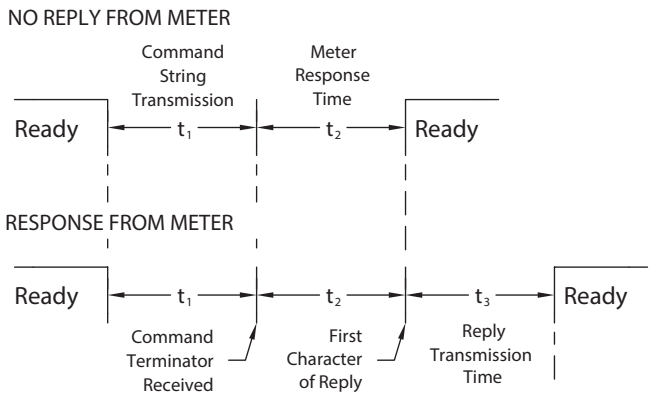
2. Turn SP1 output on and SP2 output off:

		7	6	5	4	3	2	1	0:bit location
VJ<31>* or VJ1*	ASCII 1 =	0	0	1	1	0	0	0	1 or <31>

Note: Avoid writing values <0A> (LF), <0D> (CR), <24> ($) and <2E> (*) to the CSR. These values are interpreted by the meter as end of command control codes and will prematurely end the write operation.

Command Response Time

The meter can only receive data or transmit data at any one time (half-duplex operation). The meter ignores commands while transmitting data, but instead uses RXD as a busy signal. 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.



Timing Diagram Figure

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 * # of characters) / 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 50 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. The standard command line terminating character is '*'. This terminating character results in a response time window of 50 msec minimum and 100 msec maximum. This 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 50 msec maximum. The faster 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 * # of characters) / 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.

G

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.

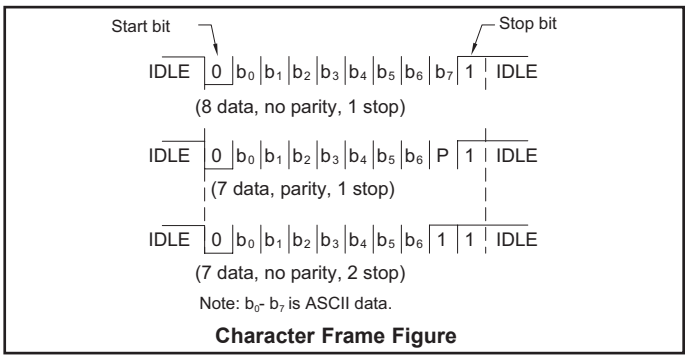
The voltage level conventions depend on the interface standard. The table lists the voltage levels for each standard.

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 error detection 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

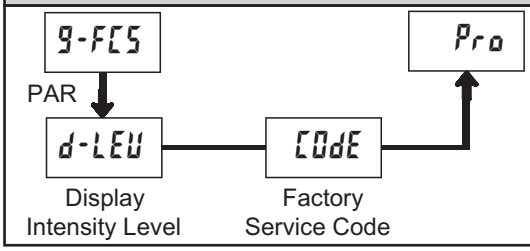
Parity bit

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 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

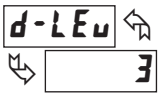
The last character transmitted is the stop bit. The stop bit provides a single bit period pause to allow the receiver to prepare to re-synchronize to the start of a new transmission (start bit of next byte). The receiver then continuously looks for the occurrence of the start bit.

6.9 MODULE 9 - FACTORY SERVICE OPERATIONS (9-FCS)



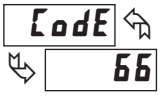
PARAMETER MENU

DISPLAY INTENSITY LEVEL



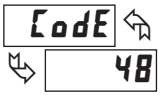
Enter the desired Display Intensity Level (0-15) by using the arrow keys. The display will actively dim or brighten as the levels are changed. This parameter also appears in Quick Programming Mode when enabled.

RESTORE FACTORY DEFAULTS



Use the arrow keys to display CodE 66 and press **PAR**. The meter will display rESEt and then return to CodE 50. Press **DSP** key to return to Display Mode. This will overwrite all user settings with the factory settings.

CALIBRATION



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 may affect the accuracy of the input signal values previously stored using the Apply (APLY) Scaling Style.

Calibration may be aborted by disconnecting power to the meter before exiting Module 9. In this case, the existing calibration settings remain in effect.

Input Calibration

WARNING: Calibration of this meter requires a signal source with an accuracy of 0.01% or better and an external meter with an accuracy of 0.005% or better.

Before starting, connect -SIG (terminal 3) to COMM (terminal 4). This allows a single ended signal to be used for calibration. Connect the calibration signal to +SIG (terminal 2) and -SIG (terminal 3). Verify the Input Range jumper is in the desired position. Allow a 30 minute warm-up period before calibrating the meter. no and **PAR** can be chosen to exit the calibration mode without any changes taking place. Perform the following procedure:

1. Press the arrow keys to display CodE 48 and press **PAR**.
2. Choose the range to be calibrated by using the arrow keys and press **PAR**.
3. When the zero range limit appears on the display, apply 0 mV between +SIG and -SIG.
4. Press **PAR** and ---- will appear, wait for next prompt.
5. When the top range limit appears on the display, apply the corresponding +SIG and -SIG voltage (20 mV or 200 mV).
6. Press **PAR** and ---- will appear, on the display for about 10 seconds.
7. When nO appears, press **PAR** twice to exit programming.
8. Repeat the above procedure for each range to be calibrated or to recalibrate the same range. It is only necessary to calibrate the input ranges being used.
9. When all desired calibrations are completed, remove -SIG to COMM connection and external signal source.
10. Restore original configuration and jumper settings.

G

MODEL LD - LARGE SERIAL SLAVE DISPLAY

- *2.25" or 4" HIGH RED LED DIGITS*
- *DISPLAYS UP TO 6 DIGITS OF SERIAL ASCII DATA*
- *DUAL DISPLAY BUFFER ALLOWS ALTERNATING DISPLAYS*
- *RS232 OR RS485 SERIAL INTERFACE*
- *CONNECTS DIRECTLY TO RED LION PRODUCTS WITH SERIAL*
- *PROGRAMMABLE USER INPUT*
- *UNIVERSALLY POWERED*
- *ALUMINUM NEMA 4X/IP65 CASE CONSTRUCTION*

c UL US LISTED
IND. CONT. EQ.
51EB

CE

GENERAL DESCRIPTION

The Large Serial Slave Display is a versatile display that accepts serial ASCII data from a host device and displays the received characters. The displayable data includes numeric, 7-segment alphabetic and certain punctuation characters.

The 6-digit displays are available in either 2.25" or 4" high red LED digits with adjustable display intensity. The 2.25" high models are readable up to 130 feet. The 4" high models are readable up to 180 feet. Both versions are constructed of a NEMA 4X/IP65 enclosure in light weight aluminum.

The Serial Slave has two internal display buffers, allowing two separate display values or messages to be viewed. The main (primary) display typically shows dynamic data (count, rate, process, etc.), usually received directly from another meter. The secondary display typically shows a fixed message or value, such as a system or machine identifier, or a target production value. The main and secondary displays can be toggled either manually or automatically at a user selected toggle speed. Both displays are retained in memory when power is removed from the unit.

For single meter remote display applications, the Serial Slave can be connected directly to a Red Lion (or compatible) meter with RS232 or RS485 serial communications. The slave can display the meter value on its main display without requiring a PC or other serial interface.

Multiple slaves are connected using an RS485 serial bus. If unique meter addresses are assigned, specific data can be displayed by a single slave on the bus. When multiple slaves are assigned the same address, common data can be displayed by multiple units in different locations.

Serial communications parameters are fully programmable, with baud rates up to 38.4 Kbps. Special command characters allow display selection and display intensity adjustment through the serial input. In addition to the serial input, a programmable User Input is provided to perform a variety of meter functions.

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

CAUTION: Risk of electric shock.

SAFETY SUMMARY

All safety regulations, local codes and instructions that appear in this and corresponding 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.

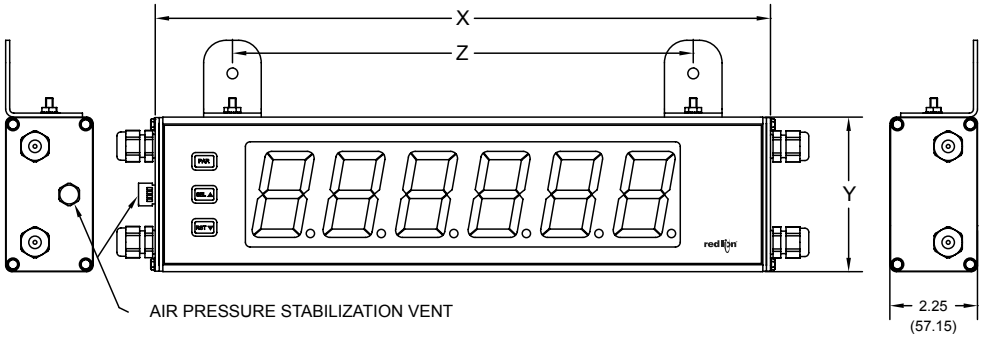
Do not use this unit to directly command motors, valves, or other actuators not equipped with safeguards. To do so can be potentially harmful to persons or equipment in the event of a fault to the unit.

The protective conductor terminal is bonded to conductive parts of the equipment for safety purposes and must be connected to an external protective earthing system.

SPECIFICATIONS

1. **DISPLAY**: 6-digit 2.25" (57 mm) or 4" (101 mm) adjustable intensity Red LED
2. **POWER REQUIREMENTS**:
   AC POWER: 50 to 250 VAC 50/60 Hz, 26 VA
   DC POWER: 21.6 to 250 VDC, 11 W
   Isolation: 2300 V_{RMS} for 1 min. to all inputs and outputs
3. **SERIAL INPUT:**
   RS485 SERIAL COMMUNICATIONS
   Type: Multi-point balanced interface (isolated)
   Baud Rate: 300 to 38400
   Data Format: 7/8 bits; odd, even, or no parity
   Bus Address: 0 to 99; max 32 meters per line
   RS232 SERIAL COMMUNICATIONS
   Type: Half duplex (isolated)
   Baud Rate: 300 to 38400
   Data Format: 7/8 bits; odd, even, or no parity
4. **USER INPUT** (Programmable Function Input):
   Active low logic, internal 7.8 KΩ pull-up resistor to +12V.
   Trigger levels: V_{IL} = 1.0 V max; V_{IH} = 2.4 V min; V_{MAX} = 28 VDC
   Response time: 10 msec typ; 50 msec debounce (activation & release)
5. **MEMORY**: Nonvolatile E^2PROM retains all programming parameters, main and secondary displays when power is removed.

DIMENSIONS In inches (mm)



PART NUMBER	X (Length)	Y (Height)	Z (Center)
LD2SS6P0	16 (406.4)	4 (101.6)	12 (304.8)
LD4SS6P0	26 (660.4)	7.875 (200)	22 (558.8)

G

6. **CERTIFICATIONS AND COMPLIANCES**:

SAFETY

UL Listed, File # E137808, UL508, CSA C22.2 No. 14-M95
LISTED by Und. Lab. Inc. to U.S. and Canadian safety standards
Type 4X Enclosure rating (Face only), UL50

IEC 61010-1, EN 61010-1: Safety requirements for electrical equipment for measurement, control, and laboratory use, Part 1.

IP65 Enclosure rating (Face only), IEC 529

ELECTROMAGNETIC COMPATIBILITY

Emissions and Immunity to EN 61326: Electrical Equipment for Measurement, Control and Laboratory use.

Immunity to Industrial Locations:

Electrostatic discharge	EN 61000-4-2	Criterion A 4 kV contact discharge 8 kV air discharge
Electromagnetic RF fields	EN 61000-4-3	Criterion A 10 V/m
Fast transients (burst)	EN 61000-4-4	Criterion A 2 kV power 1 kV signal
Surge	EN 61000-4-5	Criterion A 1 kV L-L, 2 kV L&N-E power
RF conducted interference	EN 61000-4-6	Criterion A 3 V/rms
Voltage dip/interruptions		Criterion A 0.5 cycle

Emissions:

Emissions	EN 55011	Class B

Notes:

1. Criterion A: Normal operation within specified limits.

7. **CONNECTIONS**:

Internal removable terminal blocks used for power and signal wiring.
Remove end plates with ¼" nut driver.
For LD2 versions power is on the right side and serial wiring is on the left side. For LD4 versions, all wiring is on the right side of the unit.
Wire Strip Length: 0.4" (10 mm)
Wire Gage: 24-12 AWG copper wire, 90°C rated insulation only
Torque: 5.3 inch-lbs (0.6 N-m) max
Cable Diameter: Outside diameter must be 0.181" (4.6 mm) to 0.312" (7.9 mm) to maintain NEMA 4 rating of cord grips.

8. **ENVIRONMENTAL CONDITIONS**:

Operating temperature: 0 to 65 °C
Storage temperature: -40 to 70 °C
Operating and storage humidity: 0 to 85% max. RH (non-condensing)
Vibration According to IEC 68-2-6: Operational 5 to 150 Hz, in X, Y, Z direction for 1.5 hours, 2 g's (1g relay).
Shock According to IEC 68-2-27: Operational 30 g's (10g relay), 11 msec in 3 directions.
Altitude: Up to 2,000 meters

9. **CONSTRUCTION**: Aluminum enclosure, and steel side panels with textured black polyurethane paint for scratch and corrosion resistance protection. Sealed front panel meets NEMA 4X/IP65 specifications. Installation Category II, Pollution Degree 2.

10. **WEIGHT**:

LD2SS6P0: 4.5 lbs (2.04 kg)
LD4SS6P0: 10.5 lbs (4.76 kg)

ORDERING INFORMATION

MODEL NO.	DESCRIPTION	PART NUMBER
LD	2.25" High 6-Digit Red LED Serial Slave Display, RS232/RS485 Serial Communications	LD2SS6P0
LD	4" High 6-Digit Red LED Serial Slave Display, RS232/RS485 Serial Communications	LD4SS6P0
LD Plug	Panel Meter Plug for LD models	LDPLUG00

1.0 INSTALLING THE METER

INSTALLATION

The meter meets NEMA 4X/IP65 requirements when properly installed.

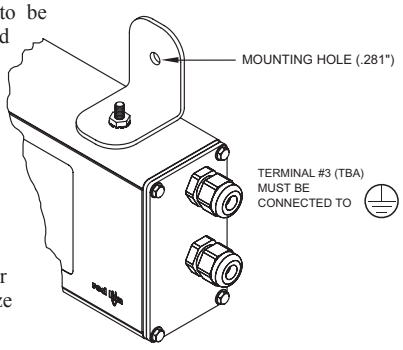
INSTALLATION ENVIRONMENT

The unit should be installed in a location that does not exceed the operating temperature. Placing the unit near devices that generate excessive heat should be avoided. The unit 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 front overlay. Do not use tools of any kind (screwdrivers, pens, pencils, etc.) to operate the keypad of the unit.

MOUNTING INSTRUCTIONS

This display is designed to be wall mounted or suspended from a ceiling truss or other suitable structure capable of supporting the LDSS. Caution should be exercised when hanging the display to provide for the safety of personnel. If hanging the LDSS, run the suspension cables (or chains) through the mounting bracket holes. For wall mounting use #10-32 size bolts.



G

2.0 WIRING THE METER

EMC INSTALLATION GUIDELINES

Although this meter is designed with a high degree of immunity to Electro-Magnetic 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 the meter may be different for various installations. The meter becomes more immune to EMI with fewer I/O connections. Cable length, routing, and shield termination are very important and can mean the difference between a successful or troublesome installation. Listed below are some EMC guidelines for successful installation in an industrial environment.

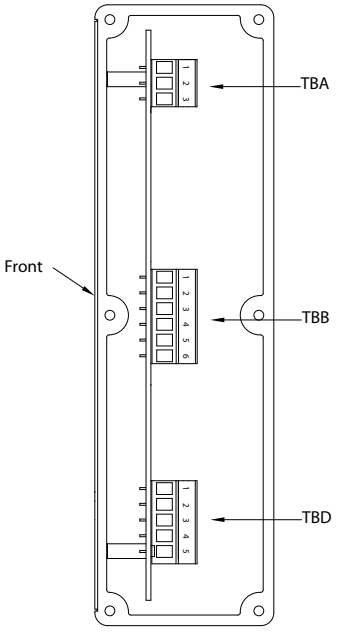
1. The meter should be properly connected to protective earth.
2. Use shielded (screened) cables for all Signal and Control inputs. The shield (screen) pigtail connection should be made as short as possible. The connection point for the shield depends somewhat upon the application. Listed below are the recommended methods of connecting the shield, in order of their effectiveness.
   a. Connect the shield only at the panel where the unit is mounted to earth ground (protective earth).
   b. Connect the shield to earth ground at both ends of the cable, usually when the noise source frequency is above 1 MHz.

c. Connect the shield to common of the meter and leave the other end of the shield unconnected and insulated from earth ground.

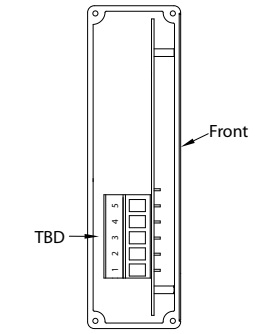
3. Never run Signal or Control cables in the same conduit or raceway with AC power lines, conductors feeding motors, solenoids, SCR controls, and heaters, etc. The cables should be ran in metal conduit that is properly grounded. This is especially useful in applications where cable runs are long and portable two-way radios are used in close proximity or if the installation is near a commercial radio transmitter.
4. Signal or Control cables within an enclosure should be routed as far as possible from contactors, control relays, transformers, and other noisy components.
5. In extremely high EMI environments, the use of external EMI suppression devices, such as ferrite suppression cores, is effective. Install them on Signal and Control cables as close to the unit as possible. Loop the cable through the core several times or use multiple cores on each cable for additional protection. Install line filters on the power input cable to the unit to suppress power line interference. Install them near the power entry point of the enclosure. The following EMI suppression devices (or equivalent) are recommended:
   Ferrite Suppression Cores for signal and control cables:
   Fair-Rite # 0443167251 (RLC# FCOR0000)
   TDK # ZCAT3035-1330A
   Steward # 28B2029-0A0
   Line Filters for input power cables:
   Schaffner # FN610-1/07 (RLC# LFIL0000)
   Schaffner # FN670-1.8/07
   Corcom # 1 VR3
   Note: Reference manufacturer's instructions when installing a line filter.
6. Long cable runs are more susceptible to EMI pickup than short cable runs. Therefore, keep cable runs as short as possible.
7. Switching of inductive loads produces high EMI. Use of snubbers across inductive loads suppresses EMI.
   Snubber: RLC# SNUB0000.

WIRING OVERVIEW

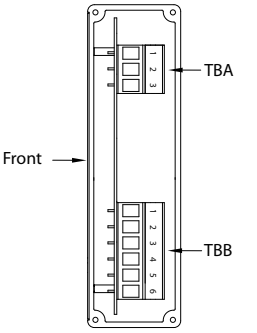
Electrical connections are made via pluggable terminal blocks located inside the meter. All conductors should conform to the meter's voltage and current ratings. All cabling should conform to appropriate standards of good installation, local codes and regulations. It is recommended that the power supplied to the meter (DC or AC) be protected by a fuse or circuit breaker. When wiring the meter, compare the numbers on the label on the back of the meter case against those shown in wiring drawings for proper wire position. Strip the wire, leaving approximately 0.4" (10 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). Use copper conductors only, with insulation rated at 90°C.



LD4SS6P0 Right Side



LD2SS6P0 Left Side

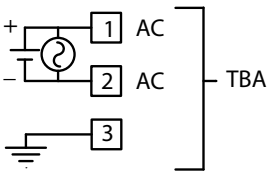


LD2SS6P0 Right Side

2.1 POWER WIRING

The power wiring is made via the 3 position terminal block (TBA) located inside unit (right side).

AC Power
Terminal 1: VAC/DC +
Terminal 2: VAC/DC -
Terminal 3: Earth Ground

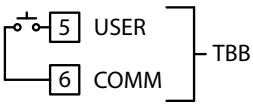


2.2 USER INPUT WIRING

The User Input is wired to Terminals 5 and 6 of TBB as shown.

Terminal 5: User Input
Terminal 6: User Common

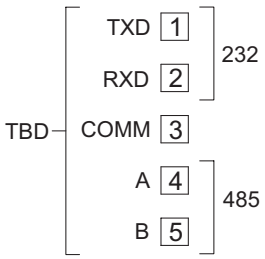
Sinking Logic



G

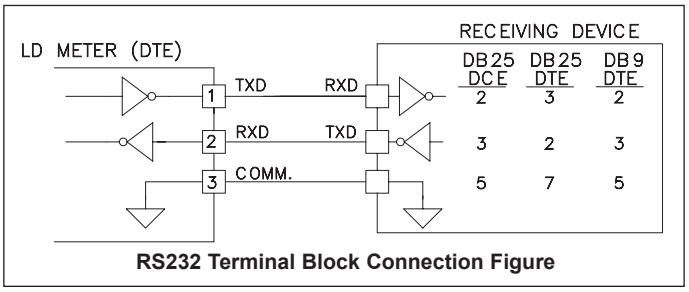
2.3 SERIAL WIRING

The serial connections are made via terminal block TBD located inside the unit on the left side for the LD2 and on the right side for the LD4.



RS232 Communications

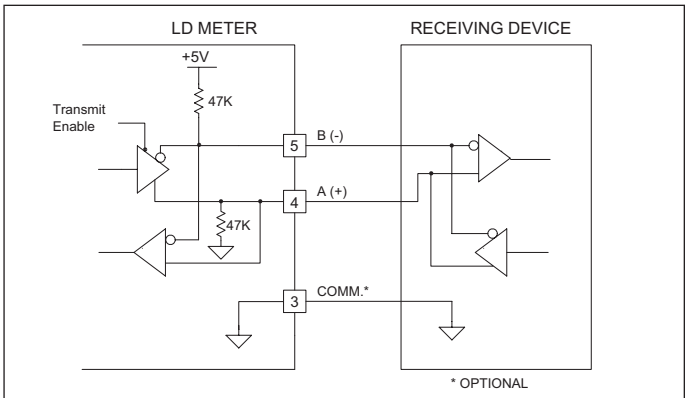
RS232 is intended to allow two devices to communicate over distances up to 50 feet. Data Terminal Equipment (DTE) transmits data on the Transmitted Data (TXD) line and receives data on the Received Data (RXD) line. Data Computer Equipment (DCE) receives data on the TXD line and transmits data on the RXD line. The LD emulates a DTE. If the other device connected to the meter also emulates a DTE, the TXD and RXD lines must be interchanged for communications to take place. This is known as a null modem connection.



RS232 Terminal Block Connection Figure

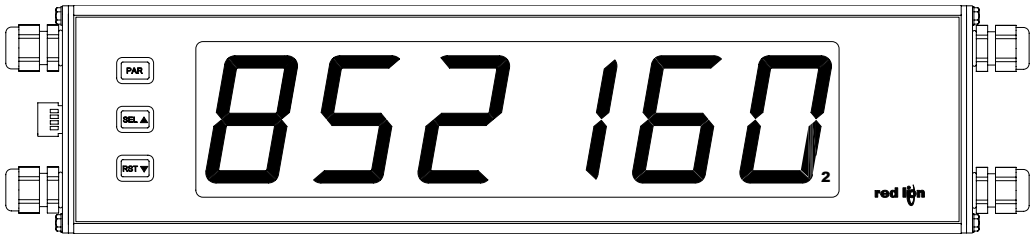
RS485 Communications

The RS485 communication standard allows the connection of up to 32 devices on a single pair of wires, distances up to 4,000 ft. and data rates as high as 10M baud (the LDSS is limited to 38.4k baud). The same pair of wires is used to both transmit and receive data. RS485 is therefore always half-duplex, that is, data cannot be received and transmitted simultaneously.



RS485 Terminal Block Connection Figure

3.0 REVIEWING THE FRONT PANEL KEYS AND DISPLAY



KEY	DISPLAY MODE OPERATION	PROGRAMMING MODE OPERATION
PAR	Access Programming Mode	Store selected parameter and index to next parameter
SEL▲	Select display (main or secondary)	Advance through selection list/select digit position in parameter value
RST▼	Reset display(s) per front panel reset setting	Increment selected digit of parameter value

DISPLAY DESIGNATOR

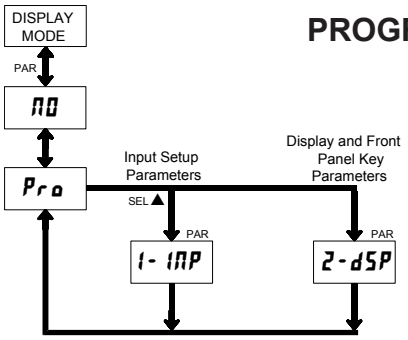
" 2 " - To the far right of the display indicates the secondary display is shown.

If display scroll is enabled, the display will toggle automatically between the main and secondary display at the selected scroll interval.

G

4.0 PROGRAMMING THE METER

PROGRAMMING MENU



PROGRAMMING MODE ENTRY (PAR KEY)

It is recommended all programming changes be made off line, or before installation. The meter normally operates in the Display Mode. No parameters can be programmed in this mode. The Programming Mode is entered by pressing the **PAR** key. If it is not accessible, then it is locked by either a security code or a hardware lock (See Module 2).

MODULE ENTRY (SEL▲ & PAR KEYS)

The Programming Menu is organized into two modules. These modules group together parameters that are related in function. The display will alternate between Pro and the present module. The **SEL▲** key is used to select the desired module. The displayed module is entered by pressing the **PAR** key.

MODULE MENU (PAR KEY)

Each module has a separate module menu (which is shown at the start of each module discussion). The **PAR** key is pressed to advance to a particular parameter to be changed, without changing the programming of preceding parameters. After completing a module, the display will return to Pro nO. Programming may continue by accessing additional modules.

SELECTION / VALUE ENTRY

For each parameter, the display alternates between the present parameter and the selections/value for that parameter. The **SEL▲** and **RST▼** keys are used to move through the selections/values for that parameter. Pressing the **PAR** key, stores and activates the displayed selection/value. This also advances the meter to the next parameter.

For numeric values, the value is displayed with one digit flashing (initially the right most digit). Pressing the **RST▼** key increments the digit by one or the user can hold the **RST▼** key and the digit will automatically scroll. The **SEL▲** key will select the next digit to the left. Pressing the **PAR** key will enter the value and move to the next parameter.

PROGRAMMING MODE EXIT (PAR KEY)

The Programming Mode is exited by pressing the **PAR** key with Pro nO displayed. This will commit any stored parameter changes to memory and return the meter to the Display Mode. (If power loss occurs before returning to the Display Mode, verify recent parameter changes.)

PROGRAMMING TIPS

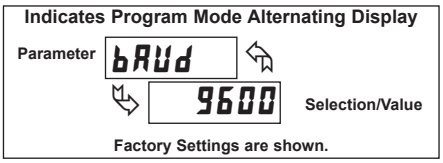
It is recommended to start with Module 1 and proceed through each module in sequence. When programming is complete, it is recommended to record the parameter programming and lock out parameter programming with the user input or programming security code.

FACTORY SETTINGS

Factory Settings may be completely restored in Module 2. This is useful when encountering programming problems or in the event of corrupted program data.

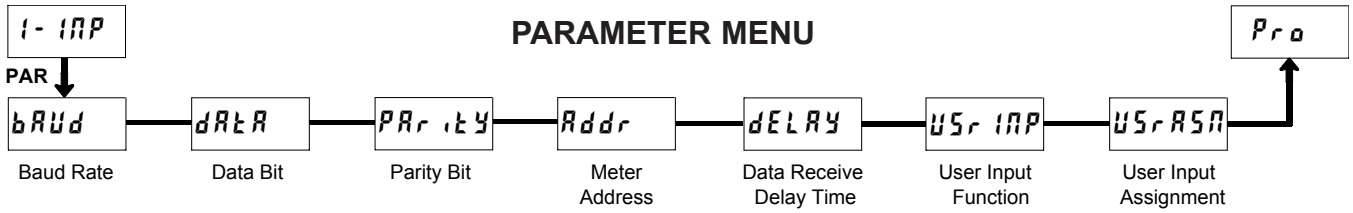
ALTERNATING SELECTION DISPLAY

In the explanation of the modules, the following dual display with arrows will appear. This is used to illustrate the display alternating between the parameter on top and the parameter's Factory Setting on the bottom. In most cases, selections and values for the parameter will be listed on the right.



4.1 MODULE 1 - INPUT SETUP PARAMETERS (1- InP)

PARAMETER MENU



Module 1 is the programming module for the Input Setup Parameters. This includes the Serial Input setup parameters and the User Input function. Set the Serial Input parameters to match the settings of the host device.

BAUD RATE

Set the baud rate to match that of the host device. Normally, the baud rate is set to the highest value that all the serial communications equipment is capable of transmitting and receiving.

DATA BIT

Select either 7- or 8-bit data word length to match that of the host device.

G

PARITY BIT

PAr itY → Odd

Odd EVEN nO

This parameter only appears when the Data Bit parameter is set to 7-bit. Set the parity bit to match that of the host device. If parity is set to nO, an additional stop bit is used to force the frame size to 10 bits.

METER ADDRESS

Addr → 00

0 to 99

Enter the meter (node) address. With a single slave unit, an address is not required and a value of zero should be used. This is the case with an RS232 connection, where only one Serial Slave is connected to the host.

With multiple Serial Slaves connected on an RS485 bus, a unique address number must be assigned to each unit in order to send data to a specific slave on the bus. If multiple slaves are assigned the same address (including zero), common data can be sent to, and displayed by multiple slave units on the bus.

DATA RECEIVE DELAY TIME

dELAY → 00.05

00.01 to 59.99

Upon receiving a terminator character <CR>, the Serial Slave disables serial data reception for the time duration entered in this parameter. Using a delay allows the Serial Slave to ignore additional characters such as a <LF> or second <CR>, which often follow a serial data string. This value is entered in seconds and hundredths of seconds format, with a 10 msec minimum delay time.

(See "Data Receive Delay Timing" in the Communications section for additional timing details.)

USER INPUT FUNCTION

USr inP → nO

nO

DISPLAY	MODE	DESCRIPTION
nO	No Function	User Input disabled.
ProLoc	Program Mode Lock-out	See Programming Mode Access chart (Module 2).
rSt-E	Momentary Reset (Edge triggered)	Momentary reset of the assigned display(s).
rSt-L	Maintained Reset	Level active reset of the assigned display(s).
d-HOLd	Display Hold	Freeze the assigned display(s) as long as the input is active.
d-SEL	Display Select (Edge triggered)	Toggle between main and secondary display (if enabled).
d-LEU	Display Intensity Level (Edge triggered)	Increase intensity one level for each activation.

USER INPUT ASSIGNMENT

USrASn → dSP

Pri both

SEC dSP

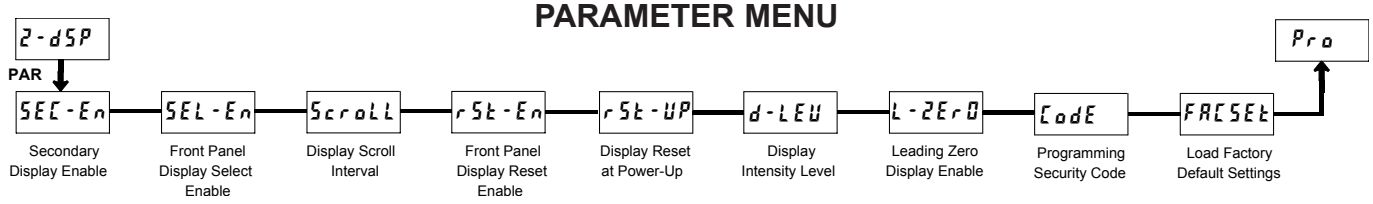
Select the display to which the User Input Function applies. The User Input Assignment only appears if the secondary display is enabled and a selection of reset or display hold is chosen for the User Input Function.

Assignment choices include the main (primary) and/or secondary display, or the display which is shown at the moment the User Input is activated (dSP).

Note: For reset selection, main display resets to zero. Secondary display resets to all blanks.

4.2 MODULE 2 - DISPLAY AND FRONT PANEL KEY PARAMETERS (2-dSP)

PARAMETER MENU



SECONDARY DISPLAY ENABLE

SEC-En → YES

nO YES

Select YES to enable the secondary display. A "2" on the far right of the display always appears when the secondary display is shown.

FRONT PANEL DISPLAY SELECT ENABLE (SEL▲)

SEL-En → YES

nO YES

Select YES to allow the **SEL▲** key to toggle between the main and secondary displays. This parameter only appears if the secondary display is enabled.

DISPLAY SCROLL INTERVAL

ScroLL → nO

nO 4-SEC 8-SEC

2-SEC 6-SEC 10-SEC

Select the time interval at which the display automatically toggles between the main and secondary displays. Select nO to disable automatic scrolling. This parameter only appears if the secondary display is enabled.

FRONT PANEL DISPLAY RESET ENABLE (RST▼)

rSt-En → dSP

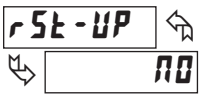
nO SEC dSP

Pri both

This parameter allows the **RST▼** key to reset the main (primary) and/or secondary display (if enabled), or the display which is currently shown (dSP). Select nO to disable the **RST▼** key.

Note: Main display resets to zero. Secondary display resets to all blanks.

DISPLAY RESET AT POWER-UP

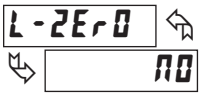


This parameter allows the Main and/or Secondary display (if enabled) to automatically reset when power is applied to the unit.

DISPLAY INTENSITY LEVEL

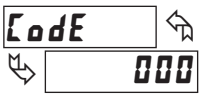
Enter the desired display intensity level. The display will actively brighten or dim as the level is changed.

LEADING ZERO DISPLAY ENABLE



Select **no** to insert blanks in place of any leading zeros received in a serial data string. This is typical when sending numeric values to the slave. Select **YES** to enable display of any leading zeros in the string. This parameter setting only applies to the Main display.

PROGRAMMING SECURITY CODE



The Security Code determines the user access to Programming mode. This code can be used independently or along with the Program Mode Lock-out (**ProLoc**) selection in the User Input Function parameter (Module 1).

Programming a Security Code other than 0, requires this code to be entered at the **CodE** prompt in order to access Programming mode.

USER INPUT FUNCTION	USER INPUT STATE	SECURITY CODE	PROGRAMMING ACCESS WHEN "PAR" PRESSED
not ProLoc	———	0	Immediate Access
		1-999	With correct code entry at CodE prompt *
ProLoc	Active	0	Programming Locked No Access
		1-999	With correct code entry at CodE prompt *
	Not Active	0-999	Immediate Access

** Entering Code 222 allows access regardless of security code.*

LOAD FACTORY DEFAULT SETTINGS

The **YES** selection returns the slave to the factory default settings. The unit will displays **rESEt** and returns to **Pro**, with the factory settings loaded.

Serial Slave Communications

Displayable Characters

The ASCII characters that the Serial Slave can display are as follows:

Numeric: 0 to 9

Alphabetic (7-segment): A, b, C, c, d, E, e, F, G, g, H, h, I , i, J, K, L, l, N, n, O, o, P, q, r, S, t, U, u, V, v, Y, Z

Non-displayable alphabetic characters will be replaced with a blank if received. These include M, W and X.

Note: Both uppercase and lowercase ASCII characters are accepted. If a displayable difference exists, characters will be shown in the case received.

Punctuation: period, comma, and colon (all displayed as decimal point); minus (dash), blank

Display and Serial Buffer Capacity

The Serial Slave display is right aligned and has the capacity of displaying six characters. When less than six characters are received, blank spaces are placed in front of the characters. If more than six characters are received, only the last six are displayed.

The unit has two internal display buffers, allowing two separate values or messages to be viewed. The main display is always enabled and viewable. The secondary display may be enabled or disabled through programming. When enabled, this display is indicated by a "2" on the far right of the display. The main and secondary displays can be toggled either manually or automatically at a user selectable toggle speed. A serial command can also be sent to select which display is shown. Both displays are retained in memory when power is removed from the unit.

The Serial Slave has an internal 64 character buffer for received data. If more than 64 characters are sent, the additional characters are discarded until a string terminator <CR> is received. At that point, the last six characters at the end of the buffer are displayed.

A carriage return <CR> is the only valid string terminator for the Serial Slave. However, if an <*> or <$> is received, the slave will empty and reset its internal character buffer without processing the string. These characters are used as valid command terminators for serial commands sent to other Red Lion meters. Since these commands are not applicable to the Serial Slave, the slave discards the command and prepares its character buffer for a new data string.

Data and Command String Formatting

Data sent to the Serial Slave must be formatted as either main display data, secondary display data or command strings sent to perform specific display functions. The format for sending data is shown below:

N xx I d6 d5 d4 d3 d2 d1 <CR>

N - Required to address a specific slave unit in a multiple unit loop.
xx - Two-digit meter address. Single digit address requires leading zero.
I - Format identifier character (see below). Omit for main display data.
d6-d1 - The last 6 characters before the <CR> will be shown, if displayable.
<CR> - Carriage Return (0DH) used as string terminator character.

The format identifier character <I>dictates how the Serial Slave interprets a data string as follows:

(omit) - No character indicates main display data
- Indicates secondary display data
@ - Display select command, followed by display identifier character main <1> or secondary <2> (ex: @1<CR> select main display)
% - Display intensity command, followed by intensity level character <1> to <5> (ex: %3<CR> set display intensity level to 3)

Downloading Data from a G3 to an LDSS

Communications:
Port: RS232 Comms Raw Serial Port
Port Driver: <system> Raw Serial Port

Programming:

```
PortPrint(2, "N01" + IntToText(Var1, 10, 6) + "\r");
```

This program is called from the Global On Tick. It sends "N01" (the address of the LDSS), followed by the ASCII equivalent of Var1, then a carriage return.

G

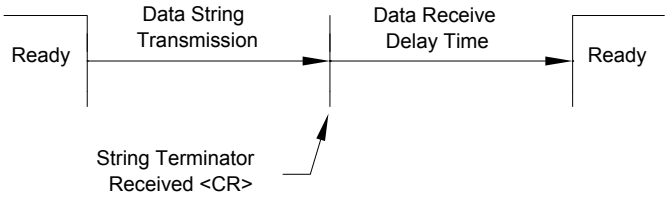
Data Receive Delay Timing

Upon receiving a string terminator character <CR>, the Serial Slave requires a delay time to process the received data and prepare for the next string. During this delay, the meter disables serial data reception.

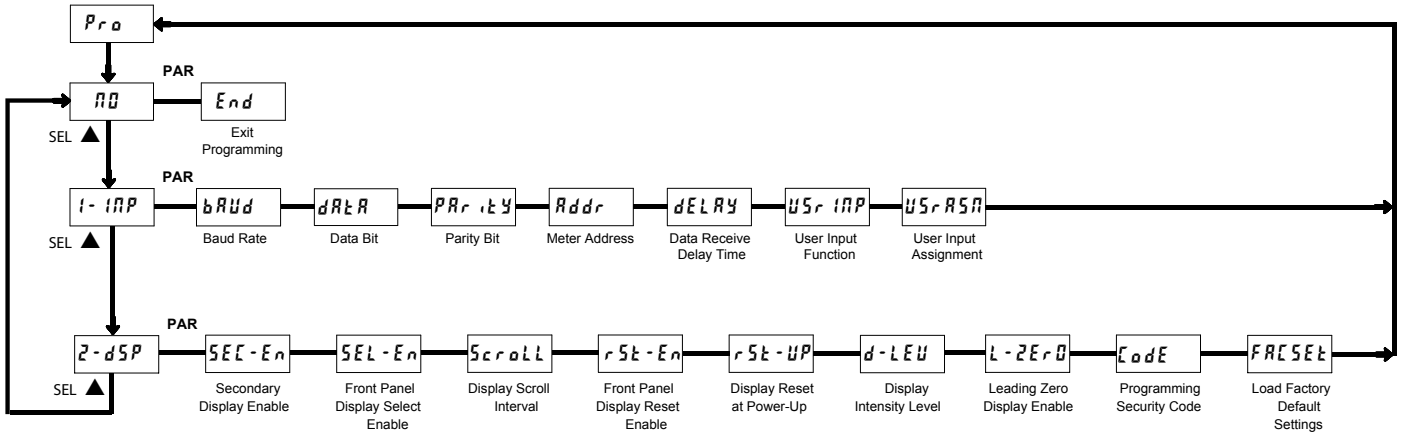
The Data Receive Delay Time is programmable in Module 1, with a minimum delay of 10 mSec. By extending this delay, the Serial Slave can ignore data sent by the host which is not intended for display. This data includes additional characters such as a <LF> or redundant <CR>, which might follow a serial data string. This could also include additional data strings sent as part of a data block, where only the first string is intended for the Serial Slave display. In this case, the delay time should be programmed to exceed the total transmission time for the entire data block. This results in the Serial Slave displaying the first string of the data block and disabling data reception during transmission of the additional strings.

The Receive Delay Time must be set to expire at a point where no data is being sent to the Serial Slave. This prevents the unit from enabling data reception in the middle of a character or data string, which could result in an incorrect display when the string is processed.

Timing Diagram for Data Reception



LD SERIAL SLAVE PROGRAMMING QUICK OVERVIEW



G

MODEL LPAX- 5 DIGIT LARGE PAX DISPLAY FOR ANALOG INPUTS

c UL US LISTED
IND. CONT. EQ.
51EB

CE

- *LARGE LED DISPLAY READABLE TO 70 FEET*
- *VARIOUS ANALOG INPUT MODULES;*
  DC VOLTAGE AND CURRENT
  PROCESS SIGNALS
  TRUE RMS VOLTAGE AND CURRENT
  THERMOCOUPLE OR RTD
  STRAIN GAGE/BRIDGE
- *ALARMS, ANALOG OUTPUT, AND COMMUNICATION*
- *CUSTOM UNITS LABEL WITH BACKLIGHT*
- *PROGRAMMABLE USER INPUTS*
- *PROGRAMMABLE FUNCTION KEYS*
- *UNIVERSAL AC/DC POWERED MODELS*
- *CRIMSON PROGRAMMING SOFTWARE*
- *NEMA 4/IP65*

GENERAL DESCRIPTION

The LPAX Display is a versatile display that can increase productivity by offering the plant floor or production area a large visual display of their current status. Whether your measurement is temperature, weight, or flow, the LPAX can satisfy your requirement. With the use of a units label and backlighting, the display can be tailored to show the actual engineering unit, which further enhances the display. This LPAX display accepts various analog inputs through the use of input modules (MPAX) which allow the unit to adapt to most any application. The MPAX Modules offer the same features as our highly successful PAX Series Panel Meters. Additional plug-in option cards can add alarms, analog output, and communication/bus capabilities, making the LPAX a truly Intelligent Panel Meter.

SAFETY SUMMARY

All safety regulations, local codes and instructions that appear in this and corresponding 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.

The protective conductor terminal is bonded to conductive parts of the equipment for safety purposes and must be connected to an external protective earthing system.

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

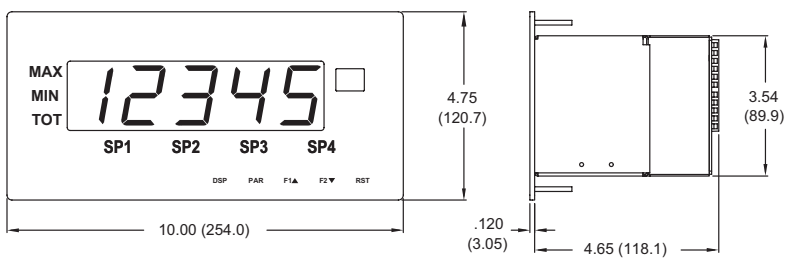
CAUTION: Risk of electric shock.

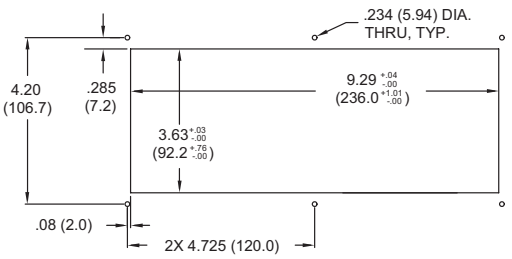
SPECIFICATIONS

Additional specifications, wiring, programming, and information for the individual MPAX models are contained in the corresponding standard PAX literature. This PAX literature is shipped with the ordered MPAX model.

1. **DISPLAY**: 1.5" (38 mm) Red LED
   5-Digit: (-19999 to 99999)
2. **POWER REQUIREMENTS**:
   AC Modules: 85 to 250 VAC, 50/60 Hz, 18 VA
   DC Modules: 11 to 36 VDC or 24 VAC ±10%, 50/60 Hz, 14 W
3. **INPUT**: Accepts analog input modules, see "Selecting your display components."
4. **ANNUNCIATORS**:
   LPAX0500: MAX, MIN, TOT, SP1, SP2, SP3, and SP4
   Optional units label with backlight
5. **KEYPAD**: Five tactile membrane switches integrated into the front panel
6. **CERTIFICATIONS AND COMPLIANCES**:
   UL Recognized Component, File #E179259, UL61010A-1, CSA 22.2 No. 1010-1
   Recognized to US and Canadian requirements under the Component Recognition Program of Underwriters Laboratories, Inc.
   UL Listed, File # E137808, UL508, CSA C22.2 No. 14-M95
   LISTED by Und. Lab. Inc. to U.S. and Canadian safety standards
   Type 4 Enclosure rating (Face only), UL50
   IECEE CB Scheme Test Certificate #US/8843/UL
   CB Scheme Test Report #04ME11209-20041018
   Issued by Underwriters Laboratories, Inc.
   IEC 61010-1, EN 61010-1: Safety requirements for electrical equipment for measurement, control, and laboratory use, Part 1.
   IP65 Enclosure rating (Face only), IEC 529
   ELECTROMAGNETIC COMPATIBILITY
   EMC specifications determined by the MPAX module.
   WARNING: Disconnect all power to the unit before installing

DIMENSIONS In inches (mm)





G

7. **ENVIRONMENTAL CONDITIONS**:
   Operating Temperature Range: Determined by the MPAX module
   Storage Temperature Range: -40 to 60°C
   Operating and Storage Humidity: 0 to 85% max. RH (non-condensing)
   Altitude: Up to 2000 meters
8. **MOUNTING REQUIREMENTS**:
   Max. panel thickness is 0.375" (9.5 mm)
   Min. panel thickness for NEMA 4/IP65 sealing is 0.060" (1.57 mm)
9. **MODULE INSTALLATION**:
   24-pin shrouded connector on LPAX engages connector on MPAX module upon installation. Shroud ensures proper alignment by providing a lead-in for the module connector.
10. **CONNECTIONS**: All wiring connections are made to the MPAX module via high compression cage-clamp terminal blocks. Wiring instructions are provided with the MPAX module.

CAUTION: DISCONNECT ALL POWER BEFORE INSTALLING OR REMOVING MODULE

11. **CONSTRUCTION**: Steel front panel, enclosure, and rear cover with textured black polyurethane paint for scratch and corrosion resistance protection. Sealed front panel meets NEMA 4/IP65 specifications for indoor use when properly installed. Installation Category II, Pollution Degree 2. Panel gasket and keps nuts included.
12. **WEIGHT**: 2.7 lbs (1.2 kg) (*less module*)

About the MPAX Input Modules

The MPAX Module serves as the input to the LPAX Display. There are several different modules to cover a variety of inputs. The MPAX module provides input scaling which allows the LPAX to display most any engineering unit. Once the MPAX is inserted into the LPAX, the unit has the same functions and capabilities of our PAX Series Intelligent Panel Meters. A full set of PAX programming instructions will be included with the MPAX Module.

Note: The MPAX provides the operating power for the LPAX, therefore you must select either the AC or DC MPAX corresponding with your application and available power.

Selecting Your Display Components

To build a complete display unit, you will need an LPAX and an MPAX Input Module. The LPAX is only a display and will not operate without an MPAX Module. Please use the following chart to identify the appropriate MPAX Module (including supply power) and LPAX Display that will satisfy your application.

SIGNAL TYPE	INPUT RANGES	MPAX MODULES *		LPAX DISPLAYS
		85-250 VAC	11 to 36 VDC/ 24 VAC	
Universal DC Inputs	DC Voltage 200 mV, 2 V, 20 V, 300 V DC Current 200 µA, 2 mA, 20 mA, 200 mA, 2 Amp Resistance 100 ohm, 1000 ohm, 10 K ohm	MPAXD000	MPAXD010	LPAX0500
Process Inputs	0-20 mA or 0-10 VDC	MPAXP000	MPAXP010	LPAX0500
Temperature Inputs	Thermocouples-T, E, J, K, R, S, B, N, C, or Custom Scaling RTD's-100 ohm Pt (platinum) 385/392, 120 ohm Nickel 672, or 10 ohm Copper 427	MPAXT000	MPAXT010	LPAX0500
Strain Gage/ Load Cell	24 mV or 240 mV	MPAXS000	MPAXS010	LPAX0500
True RMS AC Voltage/Current	AC Voltage 200 mV, 2 V, 20 V, 300 V AC Current 200 uA, 2 mA, 20 mA, 200 mA, 5 Amp	MPAXH000	N/A	LPAX0500

*For detailed Module specifications, see corresponding PAX literature. (i.e. For MPAXD specifications, see the PAXD literature)

OPTIONAL PLUG-IN CARDS AND ACCESSORIES

Plug-in cards.

Adding Option Cards

The MPAX series meters can be fitted with up to three optional plug-in cards. However, only one card from each function type can be installed at a time. The function types include Setpoint Alarms (PAXCDS), Communications (PAXCDC), and Analog Output (PAXCDL). The cards can be installed initially or at a later date. Each optional plug-in card is shipped with installation and programming instructions.

COMMUNICATION CARDS (PAXCDC)

A variety of communication protocols are available for the PAX and MPAX series. Only one of these cards can be installed at a time. When programming the unit via Crimson, a Windows® based program, the RS232 or RS485 Cards must be used.

PAXCDC1* - RS485 Serial
PAXCDC2* - RS232 Serial
PAXCDC30 - DeviceNet
PAXCDC4* - Modbus
PAXCDC50 - Profibus-DP

*Units available in various connector configurations.

SETPOINT CARDS (PAXCDS)

The MPAX series has four setpoint alarm output plug-in cards. Only one of these cards can be installed at a time. (Logic state of the outputs can be reversed in the programming.) These plug-in cards include:

PAXCDS10 - Dual Relay, FORM-C, Normally open & closed
PAXCDS20 - Quad Relay, FORM-A, Normally open only
PAXCDS30 - Isolated quad sinking NPN open collector
PAXCDS40 - Isolated quad sourcing PNP open collector

LINEAR DC OUTPUT (PAXCDL)

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 the input, max, min, or total display value. Reverse slope output is possible by reversing the scaling point positions.

PAXCDL10 - Retransmitted Analog Output Card

UNITS LABEL (LX)

The LPAX Display has an area on the front panel designed for a custom units label. The units label is applied directly to the panel in the embossed area. The units backlight is then turned on via programming.

Available on 5-digit version only. Refer to the LPAX Accessories Bulletin for a list of available units labels.

PROGRAMMING SOFTWARE (CRIMSON)

Crimson is a Windows® based program that allows configuration of the LPAX meter from a PC. Crimson offers standard drop-down menu commands, that make it easy to program the LPAX meter. The LPAX program can then be saved in a PC file for future use. A PAX serial plug-in card is required to program the meter using the software.

1.0 ASSEMBLING THE DISPLAY

CAUTION: *The MPAX main circuit board and the option cards contain static sensitive components. Before handling the module or the cards, discharge static charges from your body by touching a grounded bare metal object. Handle the module by the rear plastic cover only, and the option cards by the board edges. Dirt, oil or other contaminants that contact the circuit boards or components can adversely affect circuit operation.*

WARNING: *Exposed line voltage exists on the MPAX main circuit board and the option cards.* ***DO NOT*** *apply power to the module OR load circuits until the module is properly installed in the LPAX case.*

NOTE: *All module and option card labels must be installed as shown for safety purposes.*

Prior to installing the LPAX Display, it is recommended that the MPAX and any option cards be assembled first. This will allow you the opportunity to insure all the boards are fitted properly into their connectors.

Installing the Option Cards

If your application requires option cards, they should be installed into the MPAX before it is installed into the LPAX Display. Refer to the literature enclosed with the option cards for installation instruction.

Installing the MPAX

To install the MPAX Module, align the module with the opening in the LPAX case, as illustrated. The module must be oriented as shown, with terminal #1 toward the top of the LPAX case. Carefully slide the module into the LPAX case. The LPAX and MPAX connectors will begin to engage about ¼" from the bottom. At this point, apply a small amount of pressure to the rear of the MPAX module to fully engage the connection. Be sure the module fully snaps into the slots at the rear of the LPAX case. The display is ready for installation.

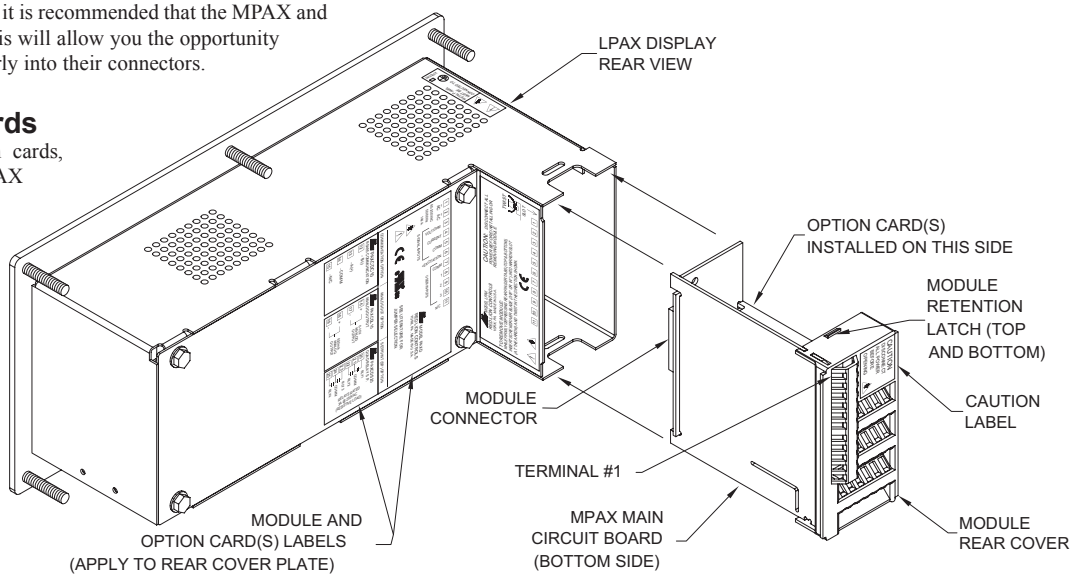


Figure 1, Installing an MPAX Module and Option Cards

Installing the Labels

Each option card and the MPAX are shipped with a connection label. These labels must be applied to the rear of the LPAX in the positions shown in the drawing.

Removing The MPAX Module

To remove the MPAX Module from the LPAX Display, first remove all power and load circuits. Then insert a flat screwdriver blade ($^{3}/_{16}$" or $^{1}/_{4}$") into the narrow slot between the LPAX rear cover plate and the module's plastic cover as illustrated in Figure 2. Twist the screwdriver in the direction shown to disengage the internal connectors while firmly squeezing and pulling back on the rear finger tabs (top and bottom). Carefully slide the module out of the LPAX case, keeping it properly aligned with the case opening.

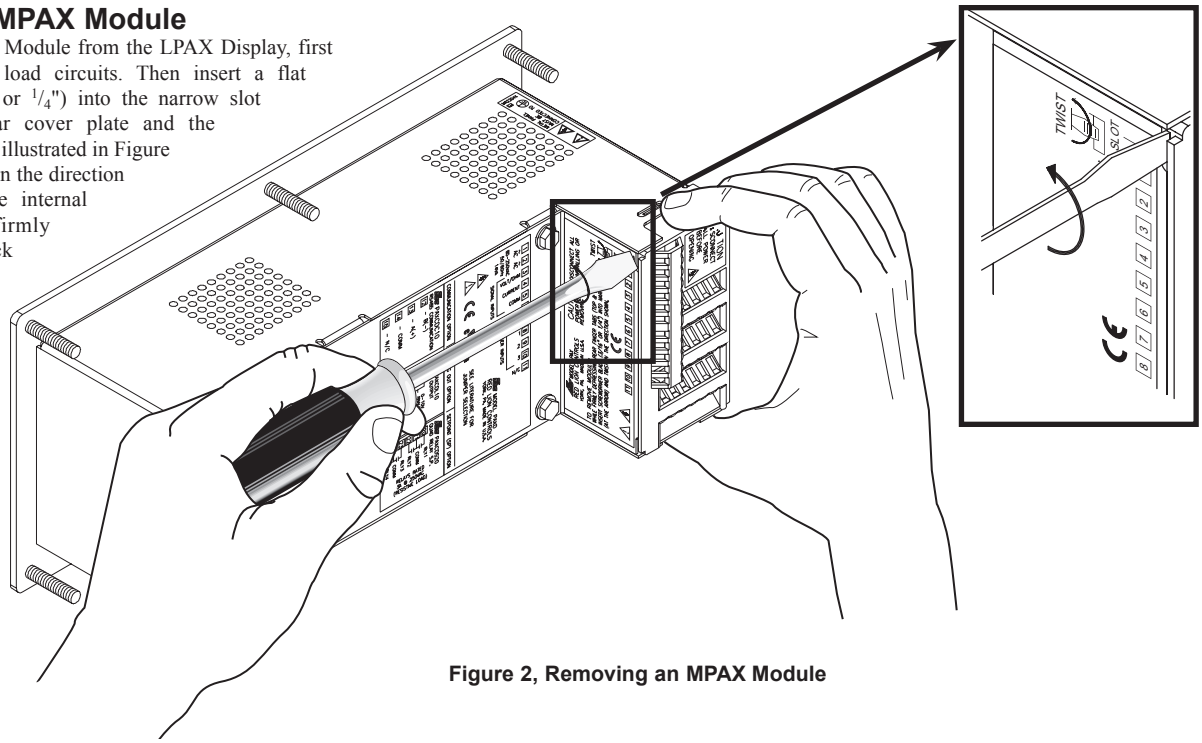


Figure 2, Removing an MPAX Module

G

2.0 INSTALLING THE DISPLAY

LPAX DISPLAY INSTALLATION

The LPAX display is intended to be mounted into a panel or enclosure. The display is provided with a gasket to provide a water-tight seal. The recommended minimum panel thickness for NEMA 4/IP65 sealing is 0.060" (1.57 mm).

For panel mounting, prepare the panel cut-out to the dimensions shown. The supplied template may be used to mark the cut-out and hole locations on the panel. After the panel cut-out has been deburred, slide the panel gasket over the rear of the display and onto the mounting studs. Insert the display into the panel cut-out as illustrated in Figure 3. Install six # 10-32 keps nuts (supplied) and tighten evenly for uniform gasket compression. Do not over-tighten the nuts.

By using additional mounting accessories, the LPAX can be surface-wall mounted, suspended, or bottom mounted. Separate installation instructions are provided with the mounting accessories.

Environment And Cleaning

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

The bezel should be cleaned only 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.

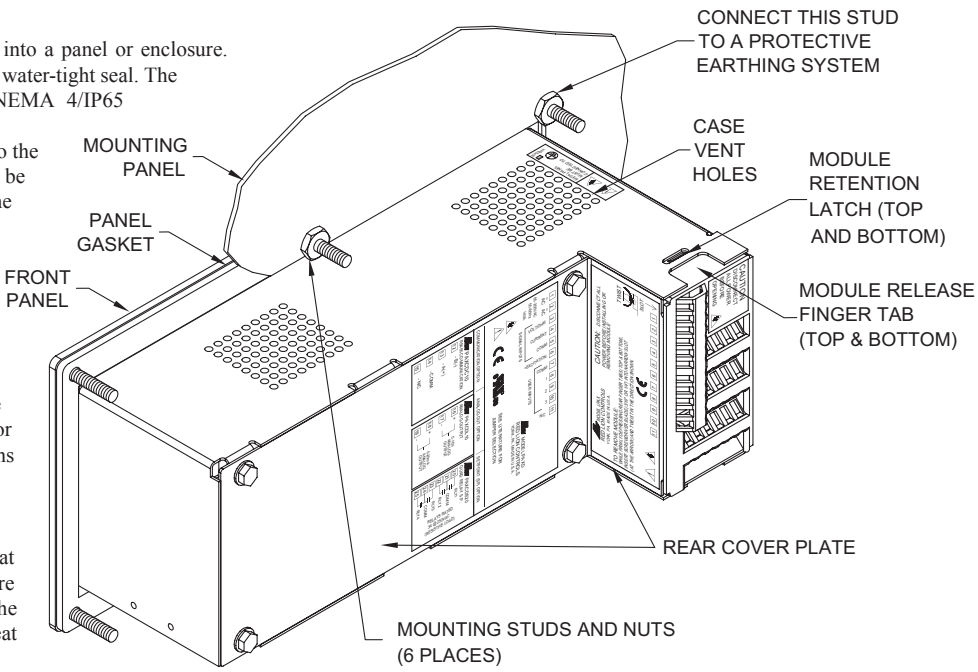


Figure 3, Installing The LPAX Into A Panel

3.0 WIRING AND PROGRAMMING THE DISPLAY

Once assembled, the LPAX and MPAX have all the same functions and capabilities of our PAX Series Intelligent Panel Meters. Therefore, you will find the appropriate PAX information packed with the MPAX Module. Simply follow the instructions to wire and program the display for your application.

TROUBLESHOOTING

For technical assistance, contact technical support.

ORDERING INFORMATION

TYPE	MODEL NO.	DESCRIPTION	PART NUMBERS
Display	LPAX	5-Digit, Large Display for Analog MPAX Modules	LPAX0500
Analog Input Module	MPAX	Universal DC Input Module, AC Powered	MPAXD000
		Universal DC Input Module, DC/24 VAC Powered	MPAXD010
		Process Input Module, AC Powered	MPAXP000
		Process Input Module, DC/24 VAC Powered	MPAXP010
		Thermocouple and RTD Module, AC Powered	MPAXT000
		Thermocouple and RTD Module, DC/24 VAC Powered	MPAXT010
		AC True RMS Voltage and Current Module, AC Powered	MPAXH000
		Strain Gage Input Module, AC Powered	MPAXS000
		Strain Gage Input Module, DC/24 VAC Powered	MPAXS010
Optional Plug-In Cards	PAXCDS	Dual Setpoint Relay Output Card	PAXCDS10
		Quad Setpoint Relay Output Card	PAXCDS20
		Quad Setpoint Sinking Open Collector Output Card	PAXCDS30
		Quad Setpoint Sourcing Open Collector Output Card	PAXCDS40
	PAXCDC	RS485 Serial Communications Output Card with Terminal Block	PAXCDC10
		Extended RS485 Serial Communications Output Card with Dual RJ11 Connector	PAXCDC1C
		RS232 Serial Communications Output Card with Terminal Block	PAXCDC20
		Extended RS232 Serial Communications Output Card with 9 Pin D Connector	PAXCDC2C
		DeviceNet Communications Card	PAXCDC30
		Modbus Communications Card	PAXCDC40
		Extended Modbus Communications Card with Dual RJ11 Connector	PAXCDC4C
		Profibus-DP Communications Card	PAXCDC50
	PAXCDL	Analog Output Card	PAXCDL10
Accessories	LX*	Custom Units Label	Listed Separately
	SFCRD**	Crimson 2 PC Configuration Software for Windows 98, ME, 2000 and XP	SFCRD200
	ENC9	NEMA 4 Enclosure for LPAX	ENC90000
	SHR	Shroud for LPAX	SHRLPAX0
	MB	Mounting Bracket for LPAX	MBLPAX00

* See the LPAX Accessory Bulletin or our web site for available units labels.
** Crimson software is available for download from http://www.redlion.net/

G

MODEL LPAX- 6 DIGIT LARGE PAX DISPLAY FOR DIGITAL INPUTS

c UL US LISTED
IND. CONT. EQ.
51EB

CE

- *LARGE LED DISPLAY READABLE TO 70 FEET*
- *VARIOUS DIGITAL INPUT MODULES;*
  COUNT AND RATE INPUT
  CLOCK/TIMER
  SERIAL SLAVE
- *ALARMS, ANALOG OUTPUT, AND COMMUNICATION*
- *PROGRAMMABLE USER INPUTS*
- *PROGRAMMABLE FUNCTION KEYS*
- *UNIVERSAL AC/DC POWERED MODELS*
- *PC SOFTWARE FOR METER CONFIGURATION*
- *NEMA 4/IP65*

GENERAL DESCRIPTION

The LPAX Display is a versatile display that can increase productivity by offering the plant floor or production area a large visual display of their current status. Whether your measurement is rate, count, or time, the LPAX can satisfy your requirement. These LPAX displays accept various digital inputs through the use of input modules (MPAX) which allow the unit to adapt to most any application. The MPAX Modules offer the same features as our highly successful PAX Series Panel Meters. Additional plug-in option cards can add alarms, analog output, and communication/bus capabilities, making the LPAX a truly Intelligent Panel Meter.

SAFETY SUMMARY

All safety regulations, local codes and instructions that appear in this and corresponding 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.

The protective conductor terminal is bonded to conductive parts of the equipment for safety purposes and must be connected to an external protective earthing system.

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

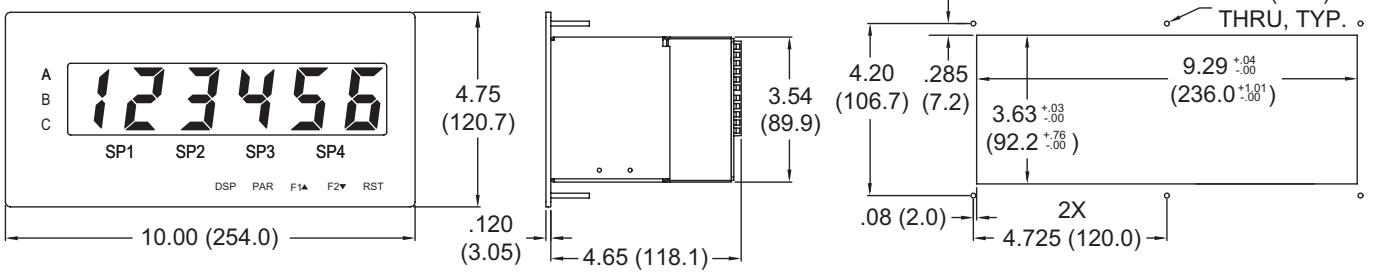
CAUTION: Risk of electric shock.

SPECIFICATIONS

Additional specifications, wiring, programming, and information for the individual MPAX models are contained in the corresponding standard PAX literature. This PAX literature is shipped with the ordered MPAX model.

1. **DISPLAY**: 1.5" (38 mm) Red LED
   6-Digit (LPAX0600): (-99999 to 999999)
   6-Digit (LPAXCK00): (0 to 999999)
2. **POWER REQUIREMENTS**:
   AC Modules: 85 to 250 VAC, 50/60 Hz, 18 VA
   DC Modules: 11 to 36 VDC or 24 VAC ±10%, 50/60 Hz, 14 W
3. **INPUT**: Accepts digital input modules, see "Selecting Your Display Components and Option Cards."
4. **ANNUNCIATORS**:
   LPAX0600: A, B, C, SP1, SP2, SP3, and SP4
   LPAXCK00: TMR, CNT, DAT, SP1, SP2, SP3, and SP4
5. **KEYPAD**: Five tactile membrane switches integrated into the front panel
6. **CERTIFICATIONS AND COMPLIANCES**:
   SAFETY
   UL Recognized Component, File #E179259, UL61010A-1, CSA 22.2 No. 1010-1
   Recognized to US and Canadian requirements under the Component Recognition Program of Underwriters Laboratories, Inc.
   UL Listed, File # E137808, UL508, CSA C22.2 No. 14-M95
   LISTED by Und. Lab. Inc. to U.S and Canadian safety standards
   Type 4 Enclosure rating (Face Only), UL50
   IECEE CB Scheme Test Certificate # US/8843/UL
   CB Scheme Test Report # 04ME11209-20041018
   Issued by Underwriters Laboratories, Inc.
   IEC 61010-1, EN 61010-1: Safety requirements for electrical equipment for measurement, control, and laboratory use, Part 1.
   IP65 Enclosure rating (Face only), IEC 529
   ELECTROMAGNETIC COMPATIBILITY
   EMC specifications determined by the MPAX module.

DIMENSIONS In inches (mm)



G

7. **ENVIRONMENTAL CONDITIONS**:
   Operating Temperature Range: Determined by the MPAX module
   Storage Temperature Range: -40 to 60°C
   Operating and Storage Humidity: 0 to 85% max. RH (non-condensing)
   Altitude: Up to 2000 meters
8. **MOUNTING REQUIREMENTS**:
   Max. panel thickness is 0.375" (9.5 mm)
   Min. panel thickness for NEMA 4/IP65 sealing is 0.060" (1.57 mm)
9. **MODULE INSTALLATION**:
   24-pin shrouded connector on LPAX engages connector on MPAX module upon installation. Shroud ensures proper alignment by providing a lead-in for the module connector.
10. **CONNECTIONS**: All wiring connections are made to the MPAX module via high compression cage-clamp terminal blocks. Wiring instructions are provided with the MPAX module.

CAUTION: DISCONNECT ALL POWER BEFORE INSTALLING OR REMOVING MODULE

11. **CONSTRUCTION**: Steel front panel, enclosure, and rear cover with textured black polyurethane paint for scratch and corrosion resistance protection. Sealed front panel meets NEMA 4/IP65 specifications for indoor use when properly installed. Installation Category II, Pollution Degree 2. Panel gasket and keps nuts included.
12. **WEIGHT**: 2.7 lbs (1.2 kg) (*less module*)

About the MPAX Input Modules

The MPAX Module serves as the input to the LPAX Display. There are several different modules to cover a variety of inputs. The MPAX module provides input scaling which allows the LPAX to display most any engineering unit. Once the MPAX is inserted into the LPAX, the unit has the same functions and capabilities of our PAX Series Intelligent Panel Meters. A full set of PAX programming instructions will be included with the MPAX module.

Note: The MPAX provides the operating power for the LPAX, therefore you must select either the AC or DC MPAX corresponding with your application and available power.

Selecting Your Display Components and Option Cards

To build a complete display unit, you will need an LPAX and an MPAX Input Module. The LPAX is only a display and will not operate without an MPAX module. Please use the following chart to identify the appropriate MPAX module (including supply power) and LPAX Display that will satisfy your application.

SIGNAL TYPE	MPAX MODULES*		LPAX DISPLAYS	OPTIONAL PLUG-IN CARD COMPATABILITY			
	85-250 VAC	11 to 36 VDC / 24 VAC		SETPOINT	COMMS	ANALOG	REAL-TIME CLOCK
Count/Rate/Serial Slave	MPAXI020	MPAXI030	LPAX0600	YES	YES	YES	-
Count	MPAXC020	MPAXC030	LPAX0600	YES	-	-	-
Rate	MPAXR020	MPAXR030	LPAX0600	YES	-	-	-
Clock/Timer	MPAXCK00	MPAXCK10	LPAXCK00**	YES	YES	-	YES
Timer	MPAXTM00	MPAXTM10	LPAXCK00**	YES	YES	-	-

*For detailed module and plug-in card specifications, see corresponding PAX literature. (i.e. For MPAXI specifications, see the PAXI literature)

**The LPAXCK will only operate with the Clock/Timer MPAX input module.

OPTIONAL PLUG-IN CARDS AND ACCESSORIES

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

Adding Option Cards

The MPAX series meters can be fitted with up to three optional plug-in cards. However, only one card from each function type can be installed at a time. The function types include Setpoint Alarms (PAXCDS), Communications (PAXCDC), and Analog Output (PAXCDL). The cards can be installed initially or at a later date. Each optional plug-in card is shipped with installation and programming instructions.

COMMUNICATION CARDS (PAXCDC)

A variety of communication protocols are available for the PAX and MPAX series. Only one of these cards can be installed at a time. When programming the unit via Crimson (for MPAXI) or SFPAX (for MPAXCK or MPAXTM), the RS232 or RS485 Cards must be used.

PAXCDC10 - RS485 Serial (Terminal)
PAXCDC1C - RS485 Serial (Connector)
PAXCDC20 - RS232 Serial (Terminal)
PAXCDC2C - RS232 Serial (Connector)
PAXCDC30 - DeviceNet
PAXCDC40 - Modbus (Terminal)
PAXCDC4C - Modbus (Connector)
PAXCDC50 - Profibus-DP

SETPOINT CARDS (PAXCDS)

The MPAX series has four setpoint alarm output plug-in cards. Only one of these cards 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

LINEAR DC OUTPUT (PAXCDL)

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 the input, max, min, or total display value. Reverse slope output is possible by reversing the scaling point positions.

PAXCDL10 - Retransmitted Analog Output Card

PROGRAMMING SOFTWARE

CRIMSON - MPAXI Only

Crimson is a Windows® based program that allows configuration of the LPAX meter from a PC. Crimson offers standard drop-down menu commands, that make it easy to program the LPAX meter. The LPAX program can then be saved in a PC file for future use. A PAX serial plug-in card is required to program the meter using the software.

SFPAX - MPAXCK and MPAXTM Only

The SFPAX is a Windows® based program that allows configuration of the LPAX meter from a PC. Using the SFPAX makes it easier to program the LPAX meter and allows saving the PAX program in a PC file for future use. On-line help is available within the software. A PAX serial plug-in card is required to program the meter using the software.

G

1.0 ASSEMBLING THE DISPLAY

CAUTION: *The MPAX main circuit board and the option cards contain static sensitive components. Before handling the module or the cards, discharge static charges from your body by touching a grounded bare metal object. Handle the module by the rear plastic cover only, and the option cards by the board edges. Dirt, oil or other contaminants that contact the circuit boards or components can adversely affect circuit operation.*

WARNING: *Exposed line voltage exists on the MPAX main circuit board and the option cards.* ***DO NOT*** *apply power to the module OR load circuits until the module is properly installed in the LPAX case.*

NOTE: *All module and option card labels must be installed as shown for safety purposes.*

Prior to installing the LPAX Display, it is recommended that the MPAX and any option cards be assembled first. This will allow you the opportunity to insure all the boards are fitted properly into their connectors.

Installing the Option Cards

If your application requires option cards, they should be installed into the MPAX before it is installed into the LPAX Display. Refer to the literature enclosed with the option cards for installation instruction.

Installing the MPAX

To install the MPAX Module, align the module with the opening in the LPAX case, as illustrated. The module must be oriented as shown, with terminal #1 toward the top of the LPAX case. Carefully slide the module into the LPAX case. The LPAX and MPAX connectors will begin to engage about ¼" from the bottom. At this point, apply a small amount of pressure to the rear of the MPAX module to fully engage the connection. Be sure the module fully snaps into the slots at the rear of the LPAX case. The display is ready for installation.

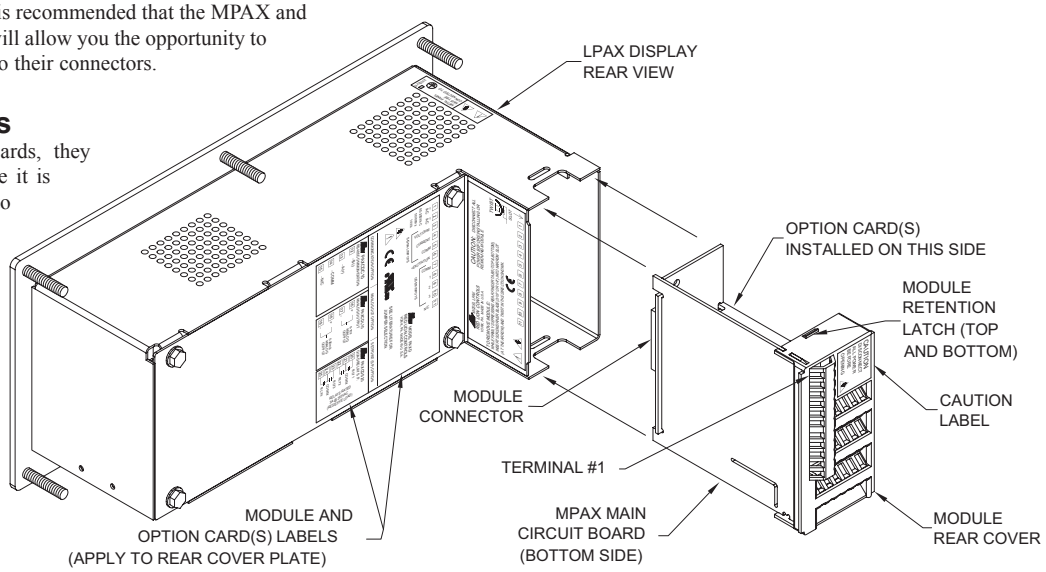


Figure 1, Installing an MPAX Module and Option Cards

Installing the Labels

Each option card and the MPAX are shipped with a connection label. These labels must be applied to the rear of the LPAX in the positions shown in the drawing.

Removing The MPAX Module

To remove the MPAX Module from the LPAX Display, first remove all power and load circuits. Then insert a flat screwdriver blade ($^{3}/_{16}$" or $^{1}/_{4}$") into the narrow slot between the LPAX rear cover plate and the module's plastic cover as illustrated in Figure 2. Twist the screwdriver in the direction shown to disengage the internal connectors while firmly squeezing and pulling back on the rear finger tabs (top and bottom). Carefully slide the module out of the LPAX case, keeping it properly aligned with the case opening.

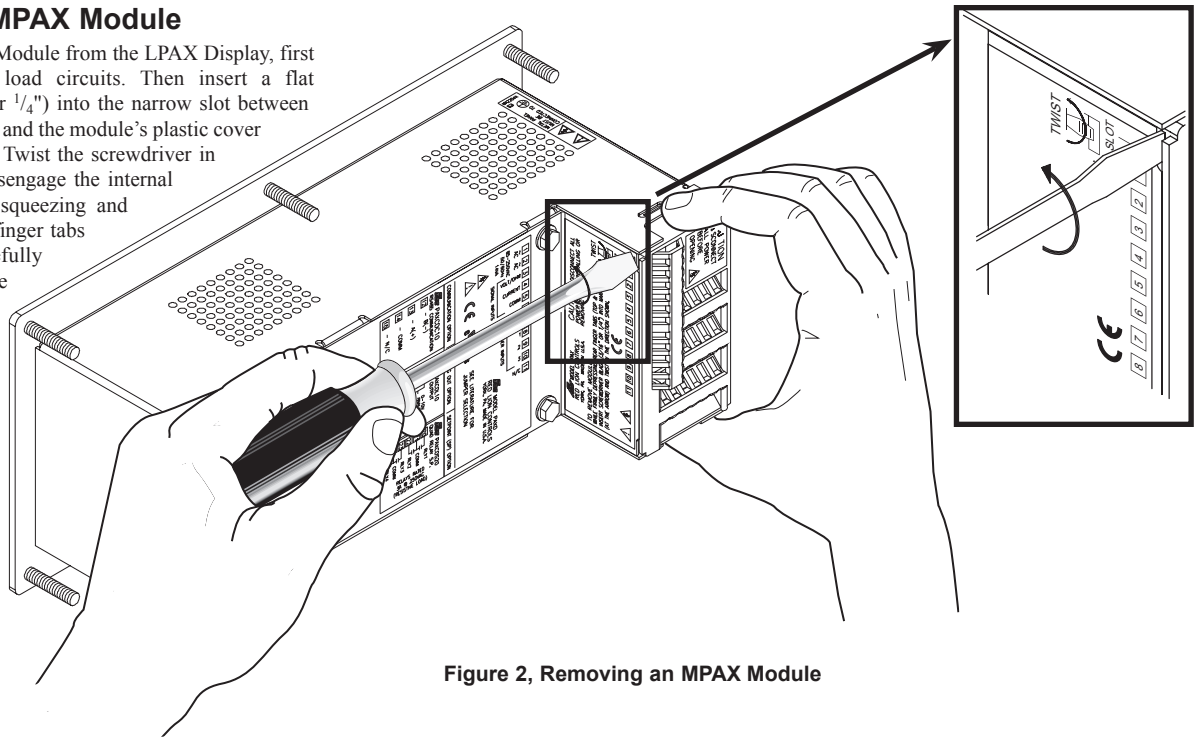


Figure 2, Removing an MPAX Module

G

2.0 INSTALLING THE DISPLAY

LPAX DISPLAY INSTALLATION

The LPAX display is intended to be mounted into a panel or enclosure. The display is provided with a gasket to provide a water-tight seal. The recommended minimum panel thickness for NEMA 4/IP65 sealing is 0.060" (1.57 mm).

For panel mounting, prepare the panel cut-out to the dimensions shown. The supplied template may be used to mark the cut-out and hole locations on the panel. After the panel cut-out has been deburred, slide the panel gasket over the rear of the display and onto the mounting studs. Insert the display into the panel cut-out as illustrated in Figure 3. Install six # 10-32 keps nuts (supplied) and tighten evenly for uniform gasket compression. Do not over-tighten the nuts.

By using additional mounting accessories, the LPAX can be surface-wall mounted, suspended, or bottom mounted. Separate installation instructions are provided with the mounting accessories.

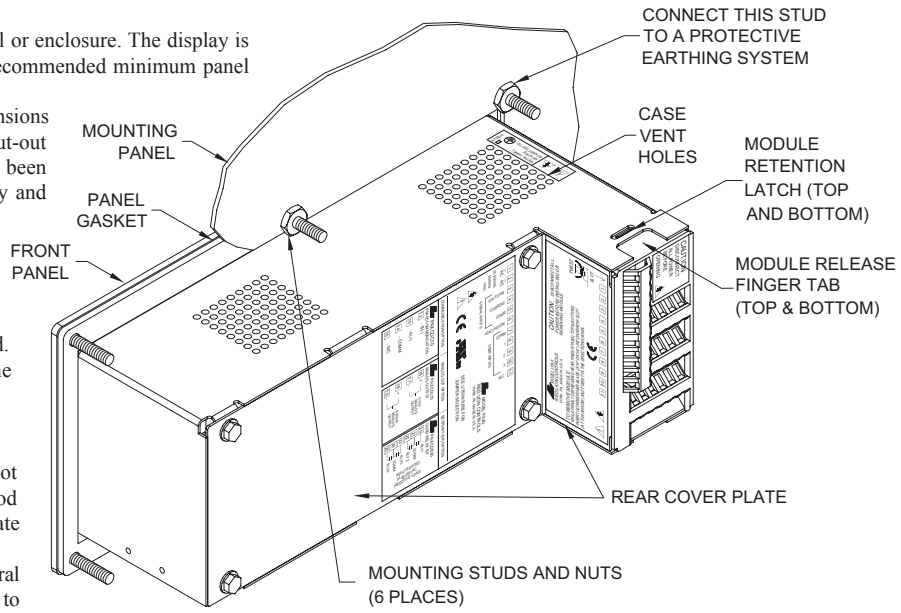


Figure 3, Installing The LPAX Into A Panel

Environment And Cleaning

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

The bezel should be cleaned only 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.

3.0 WIRING AND PROGRAMMING THE DISPLAY

Once assembled, the LPAX and MPAX have all the same functions and capabilities of our PAX Series Intelligent Panel Meters. Therefore, you will find the appropriate PAX information packed with the MPAX Module. Simply follow the instructions to wire and program the display for your application.

TROUBLESHOOTING

For technical assistance, contact technical support.

ORDERING INFORMATION

TYPE	MODEL NO.	DESCRIPTION	PART NUMBERS
Display	LPAX	6-Digit Display for Digital MPAX Modules	LPAX0600
		6-Digit Display for MPAXCK (Clock/Timer) and MPAXTM Only	LPAXCK00
Digital Input Module	MPAX	Count/Rate Indicator Module, AC Powered	MPAXI020
		Count/Rate Indicator Module, DC/24 VAC Powered	MPAXI030
		Count Indicator Module, AC Powered	MPAXC020
		Count Indicator Module, DC/24 VAC Powered	MPAXC030
		Rate Indicator Module, AC Powered	MPAXR020
		Rate Indicator Module, DC/24 VAC Powered	MPAXR030
		Clock/Timer Module, AC Powered	MPAXCK00
		Clock/Timer Module, DC/24 VAC Powered	MPAXCK10
		Timer Module, AC Powered	MPAXTM00
		Timer Module, DC/24 VAC Powered	MPAXTM10
Optional Plug-In Cards	PAXCDS	Dual Setpoint Relay Output Card	PAXCDS10
		Quad Setpoint Relay Output Card	PAXCDS20
		Quad Setpoint Sinking Open Collector Output Card	PAXCDS30
		Quad Setpoint Sourcing Open Collector Output Card	PAXCDS40
	PAXCDC*	RS485 Serial Communications Output Card with Terminal Block	PAXCDC10
		Extended RS485 Serial Communications Output Card with Dual RJ11 Connector	PAXCDC1C
		RS232 Serial Communications Output Card with Terminal Block	PAXCDC20
		Extended RS232 Serial Communications Output Card with 9 Pin D Connector	PAXCDC2C
		DeviceNet Communications Card	PAXCDC30
		Modbus Communications Card	PAXCDC40
		Extended Modbus Communications Card with Dual RJ11 Connector	PAXCDC4C
		Profibus-DP Communications Card	PAXCDC50
	PAXCDL*	Analog Output Card	PAXCDL10
	PAXUSB*	PAX USB Programming Card (Not included in PAX product UL E179259 file).	PAXUSB00
	PAXRTC*	Real Time Clock Card for MPAXCK (Clock/Timer) Only	PAXRTC00
Accessories	SFCRD**	Crimson 2 PC Configuration Software for Windows 98, ME, 2000 and XP (for MPAXI)	SFCRD200
	ENC9	NEMA 4 Enclosure for LPAX	ENC90000
	SHR	Shroud for LPAX	SHRLPAX0
	MB	Mounting Bracket for LPAX	MBLPAX00

*Refer to "Selecting Your Display Components and Option Cards."

**Available as a FREE download from the Red Lion website. www.redlion.net

G

MODEL LPAXDA- 5 DIGIT LARGE PAX DISPLAY FOR DUAL ANALOG INPUTS

- *LARGE LED DISPLAY READABLE TO 70 FEET*
- *DUAL PROCESS SIGNAL INPUT MODULE*
- *ALARMS, ANALOG OUTPUT, AND COMMUNICATION*
- *CUSTOM UNITS LABEL WITH BACKLIGHT*
- *PROGRAMMABLE USER INPUTS*
- *PROGRAMMABLE FUNCTION KEYS*
- *UNIVERSAL AC/DC POWERED MODELS*
- *CRIMSON SOFTWARE FOR METER CONFIGURATION*
- *NEMA 4/IP65*

c UL US LISTED
IND. CONT. EQ.
51EB

GENERAL DESCRIPTION

The LPAXDA Display is a versatile display that can increase productivity by offering the plant floor or production area a large visual display of their current status. With the use of a units label and backlighting, the display can be tailored to show the actual engineering unit, which further enhances the display. This LPAXDA display accepts various analog inputs through the use of input modules (MPAXDP) which allow the unit to adapt to most any application. The MPAXDP Modules offer the same features as our highly successful PAXDP Series Panel Meters. Additional plug-in option cards can add alarms, analog output, and communication/bus capabilities, making the LPAXDA a truly Intelligent Panel Meter.

SAFETY SUMMARY

All safety regulations, local codes and instructions that appear in this and corresponding 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.

The protective conductor terminal is bonded to conductive parts of the equipment for safety purposes and must be connected to an external protective earthing system.

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

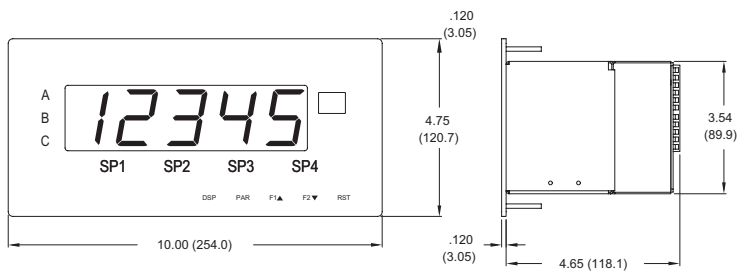
CAUTION: Risk of electric shock.

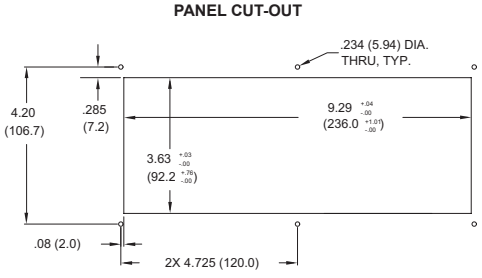
SPECIFICATIONS

Additional specifications, wiring, programming, and information for the individual MPAX models are contained in the corresponding standard PAX literature. This PAX literature is shipped with the ordered MPAX model.

1. **DISPLAY**: 1.5" (38 mm) Red LED
   5-Digit: (-19999 to 99999)
2. **POWER REQUIREMENTS**:
   AC Modules: 85 to 250 VAC, 50/60 Hz, 21 VA
   DC Modules: 18 to 36 VDC, 13 W or 24 VAC ±10%, 50/60 Hz, 16 VA
3. **INPUT**: Accepts analog input modules, see "Selecting your display components."
4. **ANNUNCIATORS**:
   LPAXDA00: A, B, C, SP1, SP2, SP3, and SP4
   Optional units label with backlight
5. **KEYPAD**: Five tactile membrane switches integrated into the front panel
6. **CERTIFICATIONS AND COMPLIANCES**:
   UL Recognized Component, File #E179259, UL3101-1, CSA 22.2 No. 1010-1
   Recognized to US and Canadian requirements under the Component Recognition Program of Underwriters Laboratories, Inc.
   UL Listed, File # E137808, UL508, CSA C22.2 No. 14-M95
   LISTED by Und. Lab. Inc. to U.S. and Canadian safety standards
   Type 4 Enclosure rating (Face only), UL50
   IECEE CB Scheme Test Certificate #UL/8843/UL
   CB Scheme Test Report #04ME11209-20041018
   Issued by Underwriters Laboratories, Inc.
   IEC 1010-1, EN 61010-1: Safety requirements for electrical equipment for measurement, control, and laboratory use, Part 1.
   IP65 Enclosure rating (Face only), IEC 529
   ELECTROMAGNETIC COMPATIBILITY
   EMC specifications determined by the MPAX module.
   WARNING: Disconnect all power to the unit before installing

DIMENSIONS In inches (mm)





G

7. **ENVIRONMENTAL CONDITIONS**:
   Operating Temperature Range: Determined by the MPAX module
   Storage Temperature Range: -40 to 60°C
   Operating and Storage Humidity: 0 to 85% max. RH (non-condensing)
   Altitude: Up to 2000 meters
8. **MOUNTING REQUIREMENTS**:
   Max. panel thickness is 0.375" (9.5 mm)
   Min. panel thickness for NEMA 4/IP65 sealing is 0.060" (1.57 mm)
9. **MODULE INSTALLATION**:
   24-pin shrouded connector on LPAX engages connector on MPAX module upon installation. Shroud ensures proper alignment by providing a lead-in for the module connector.
10. **CONNECTIONS**: All wiring connections are made to the MPAX module via high compression cage-clamp terminal blocks. Wiring instructions are provided with the MPAX module.

CAUTION: DISCONNECT ALL POWER BEFORE INSTALLING OR REMOVING MODULE

11. **CONSTRUCTION**: Steel front panel, enclosure, and rear cover with textured black polyurethane paint for scratch and corrosion resistance protection. Sealed front panel meets NEMA 4/IP65 specifications for indoor use when properly installed. Installation Category II, Pollution Degree 2. Panel gasket and keps nuts included.
12. **WEIGHT**: 2.7 lbs (1.2 kg) (*less module*)

About the MPAX Input Modules

The MPAX Module serves as the input to the LPAX Display. The MPAX module provides input scaling which allows the LPAX to display most any engineering unit. Once the MPAX is inserted into the LPAX, the unit has the same functions and capabilities of our PAX Series Intelligent Panel Meters. A full set of PAX programming instructions will be included with the MPAX Module.

Note: The MPAX provides the operating power for the LPAX, therefore you must select either the AC or DC MPAX corresponding with your application and available power.

Selecting Your Display Components

To build a complete display unit, you will need an LPAXDP and an MPAXDP Input Module. The LPAX is only a display and will not operate without an MPAX Module. Please use the following chart to identify the appropriate MPAX Module (including supply power) and LPAX Display that will satisfy your application.

SIGNAL TYPE	INPUT RANGES	MPAX MODULES *		LPAX DISPLAY
		85-250 VAC	11 to 36 VDC/ 24 VAC	
Dual Process Inputs	0-20 mA or 0-10 VDC	MPAXDP00	MPAXDP10	LPAXDA00

*For detailed Module specifications, see corresponding PAX literature. (i.e. For MPAXDP specifications, see the PAXDP literature)

OPTIONAL PLUG-IN CARDS AND ACCESSORIES

Plug-in cards.

Adding Option Cards

The MPAX series meters can be fitted with up to three optional plug-in cards. However, only one card from each function type can be installed at a time. The function types include Setpoint Alarms (PAXCDS), Communications (PAXCDC), and Analog Output (PAXCDL). The cards can be installed initially or at a later date. Each optional plug-in card is shipped with installation and programming instructions.

COMMUNICATION CARDS (PAXCDC)

A variety of communication protocols are available for the PAX and MPAX series. Only one of these cards can be installed at a time. When programming the unit via Crimson, a Windows® based program, the RS232 or RS485 Cards must be used.

PAXCDC1* - RS485 Serial
PAXCDC2* - RS232 Serial
PAXCDC30 - DeviceNet
PAXCDC4* - Modbus
PAXCDC50 - Profibus-DP

*Units available in various connector configurations.

SETPOINT CARDS (PAXCDS)

The MPAX series has four setpoint alarm output plug-in cards. Only one of these cards can be installed at a time. (Logic state of the outputs can be reversed in the programming.) These plug-in cards include:

PAXCDS10 - Dual Relay, FORM-C, Normally open & closed
PAXCDS20 - Quad Relay, FORM-A, Normally open only
PAXCDS30 - Isolated quad sinking NPN open collector
PAXCDS40 - Isolated quad sourcing PNP open collector

LINEAR DC OUTPUT (PAXCDL)

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 the input, max, min, or total display value. Reverse slope output is possible by reversing the scaling point positions.

PAXCDL10 - Retransmitted Analog Output Card

UNITS LABEL (LX)

The LPAX Display has an area on the front panel designed for a custom units label. The units label is applied directly to the panel in the embossed area. The units backlight is then turned on via programming.

Refer to the LPAX Accessories Bulletin for a list of available units labels.

PROGRAMMING SOFTWARE

Crimson 2 (SFCRD2) is a Windows® based program for configuring and updating the firmware of the MPAXDP meter from a PC. Using Crimson 2 makes programming the MPAXDP meter easier and allows the user to save the MPAXDP database in a PC file for future use. Crimson is available as a free download from Red Lion's website, or it can be purchased on CD.

The first time Crimson 2 is run from the File menu, select "New" to display a dialog and select the MPAXDP. The screen will display icons that represent the various programming sections of the MPAXDP. Double-click on an icon to configure the programming parameters pertaining to the selection. Tool Tip help is available for each of the program parameters. A PAX serial plug-in card is required to program the meter using the software.

1.0 ASSEMBLING THE DISPLAY

CAUTION: *The MPAX main circuit board and the option cards contain static sensitive components. Before handling the module or the cards, discharge static charges from your body by touching a grounded bare metal object. Handle the module by the rear plastic cover only, and the option cards by the board edges. Dirt, oil or other contaminants that contact the circuit boards or components can adversely affect circuit operation.*

WARNING: *Exposed line voltage exists on the MPAX main circuit board and the option cards.* ***DO NOT*** *apply power to the module OR load circuits until the module is properly installed in the LPAX case.*

NOTE*: All module and option card labels must be installed as shown for safety purposes.*

Prior to installing the LPAX Display, it is recommended that the MPAX and any option cards be assembled first. This will allow you the opportunity to insure all the boards are fitted properly into their connectors.

Installing the Option Cards

If your application requires option cards, they should be installed into the MPAX before it is installed into the LPAX Display. Refer to the literature enclosed with the option cards for installation instruction.

Installing the MPAX

To install the MPAX Module, align the module with the opening in the LPAX case, as illustrated. The module must be oriented as shown, with terminal #1 toward the top of the LPAX case. Carefully slide the module into the LPAX case. The LPAX and MPAX connectors will begin to engage about ¼" from the bottom. At this point, apply a small amount of pressure to the rear of the MPAX module to fully engage the connection. Be sure the module fully snaps into the slots at the rear of the LPAX case. The display is ready for installation.

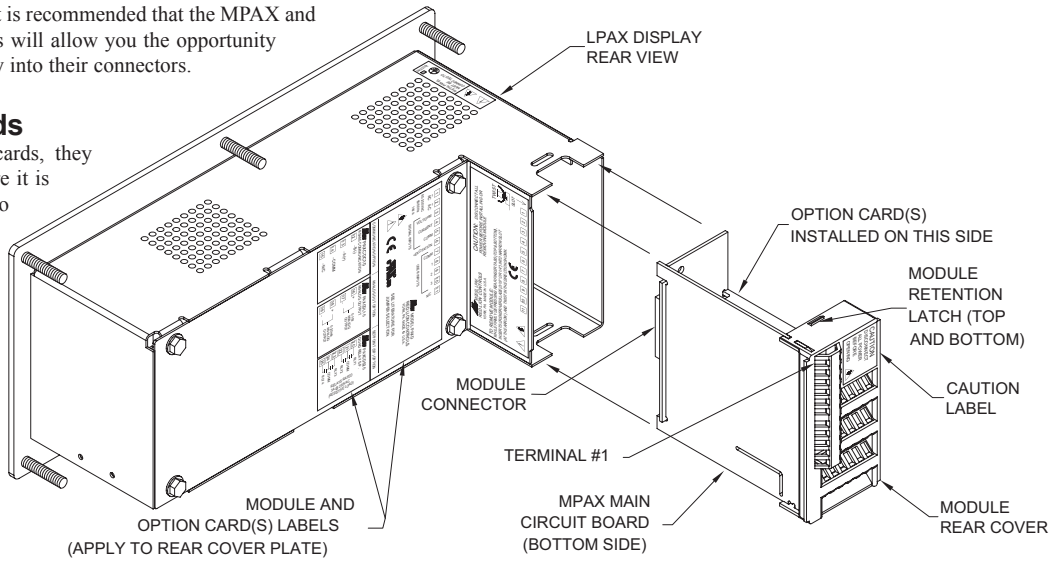


Figure 1, Installing an MPAX Module and Option Cards

Installing the Labels

Each option card and the MPAX are shipped with a connection label. These labels must be applied to the rear of the LPAX in the positions shown in the drawing.

Removing The MPAX Module

To remove the MPAX Module from the LPAX Display, first remove all power and load circuits. Then insert a flat screwdriver blade ($^3/_{16}$" or $^1/_4$") into the narrow slot between the LPAX rear cover plate and the module's plastic cover as illustrated in Figure 2. Twist the screwdriver in the direction shown to disengage the internal connectors while firmly squeezing and pulling back on the rear finger tabs (top and bottom). Carefully slide the module out of the LPAX case, keeping it properly aligned with the case opening.

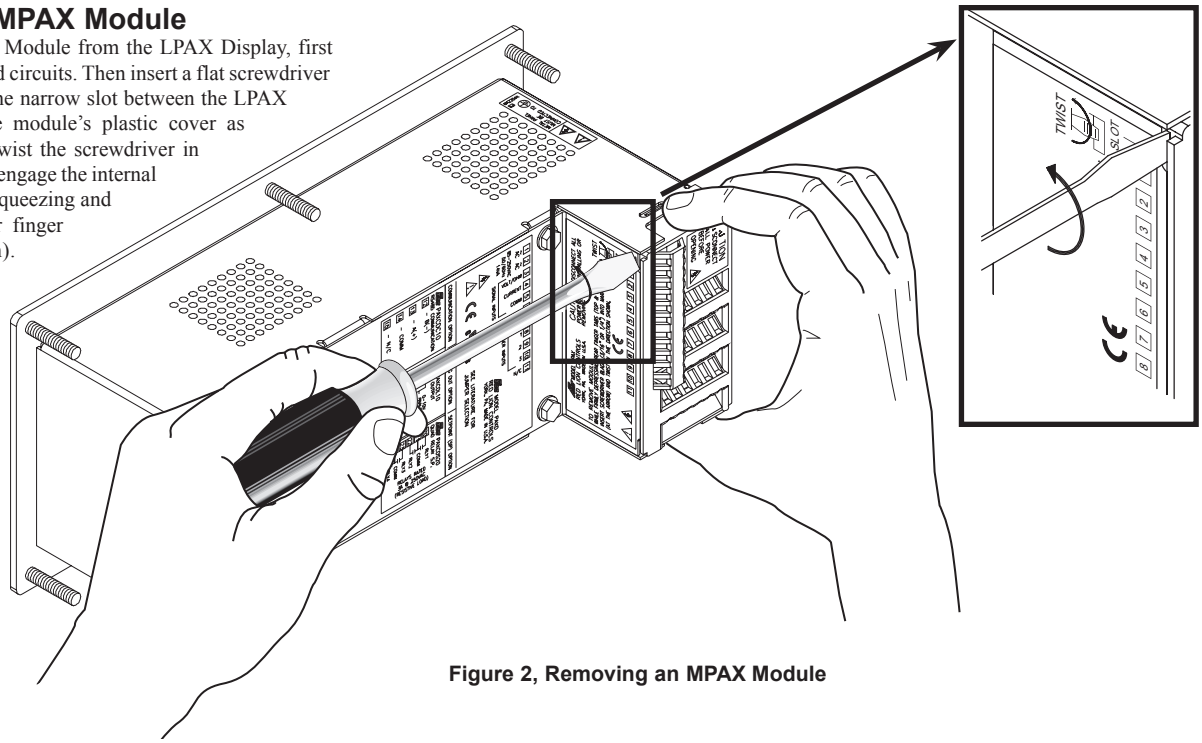


Figure 2, Removing an MPAX Module

G

2.0 INSTALLING THE DISPLAY

LPAX DISPLAY INSTALLATION

The LPAX display is intended to be mounted into a panel or enclosure. The display is provided with a gasket to provide a water-tight seal. The recommended minimum panel thickness for NEMA 4/IP65 sealing is 0.060" (1.57 mm).

For panel mounting, prepare the panel cut-out to the dimensions shown. The supplied template may be used to mark the cut-out and hole locations on the panel. After the panel cut-out has been deburred, slide the panel gasket over the rear of the display and onto the mounting studs. Insert the display into the panel cut-out as illustrated in Figure 3. Install six # 10-32 keps nuts (supplied) and tighten evenly for uniform gasket compression. Do not over-tighten the nuts.

By using additional mounting accessories, the LPAX can be surface-wall mounted, suspended, or bottom mounted. Separate installation instructions are provided with the mounting accessories.

Environment And Cleaning

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

The bezel should be cleaned only 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.

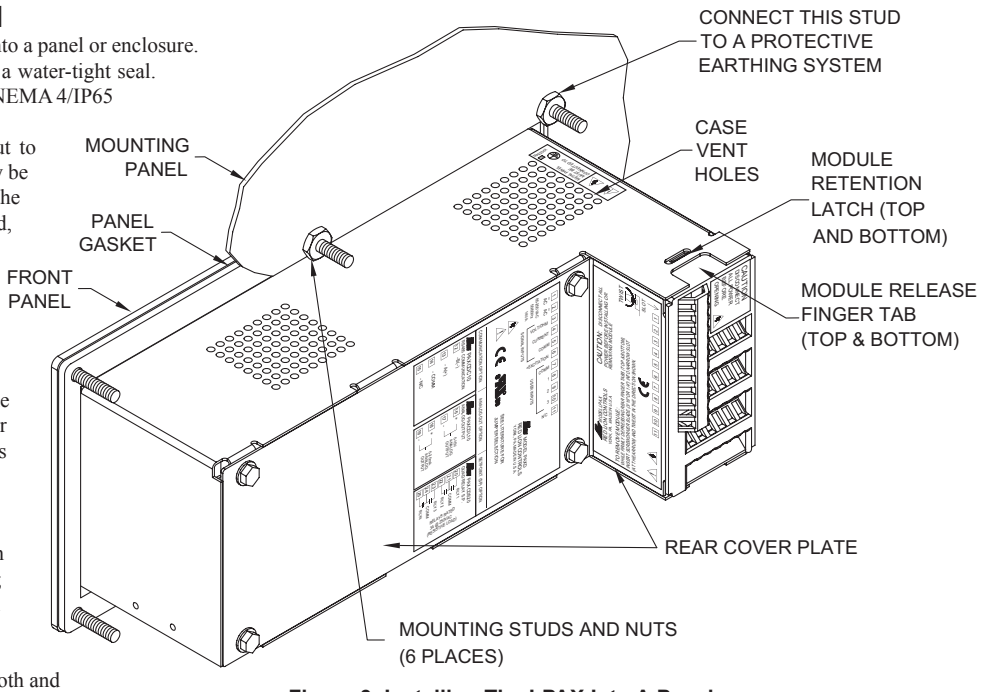


Figure 3, Installing The LPAX Into A Panel

3.0 WIRING AND PROGRAMMING THE DISPLAY

Once assembled, the LPAX and MPAX have all the same functions and capabilities of our PAX Series Intelligent Panel Meters. Therefore, you will find the appropriate PAX information packed with the MPAX Module. Simply follow the instructions to wire and program the display for your application.

TROUBLESHOOTING

For technical assistance, contact technical support.

ORDERING INFORMATION

TYPE	MODEL NO.	DESCRIPTION	PART NUMBERS
Display	LPAXDA	5-Digit, Large Display for Analog MPAXDP Modules	LPAXDA00
Analog Input Module	MPAXDP	Dual Process Input Module, AC Powered	MPAXDP00
		Dual Process Input Module, DC/24 VAC Powered	MPAXDP10
Optional Plug-In Cards	PAXCDS	Dual Setpoint Relay Output Card	PAXCDS10
		Quad Setpoint Relay Output Card	PAXCDS20
		Quad Setpoint Sinking Open Collector Output Card	PAXCDS30
		Quad Setpoint Sourcing Open Collector Output Card	PAXCDS40
	PAXCDC	RS485 Serial Communications Output Card with Terminal Block	PAXCDC10
		Extended RS485 Serial Communications Output Card with Dual RJ11 Connector	PAXCDC1C
		RS232 Serial Communications Output Card with Terminal Block	PAXCDC20
		Extended RS232 Serial Communications Output Card with 9 Pin D Connector	PAXCDC2C
		DeviceNet Communications Card	PAXCDC30
		Modbus Communications Card	PAXCDC40
		Extended Modbus Communications Card with Dual RJ11 Connector	PAXCDC4C
		Profibus-DP Communications Card	PAXCDC50
	PAXCDL	Analog Output Card	PAXCDL10
Accessories	LX	Custom Units Label *	Listed Separately
	SFCRD2	PC Configuration Software for Windows 98, ME, 2000, XP	SFCRD200
	ENC9	NEMA 4 Enclosure for LPAX	ENC90000
	SHR	Shroud for LPAX	SHRLPAX0
	MB	Mounting Bracket for LPAX	MBLPAX00

* See the LPAX Accessory Bulletin or our web site for available units labels.

G

MODEL EPAX- 5 DIGIT EXTRA LARGE PAX DISPLAY FOR ANALOG INPUTS

c UL US LISTED
IND. CONT. EQ.
51EB

CE

- *LARGE LED DISPLAY READABLE TO 180 FEET*
- *VARIOUS ANALOG INPUT MODULES;*
  - *DC VOLTAGE AND CURRENT*
  - *PROCESS SIGNALS*
  - *TRUE RMS VOLTAGE AND CURRENT*
  - *THERMOCOUPLE OR RTD*
  - *STRAIN GAGE/BRIDGE*
- *ALARMS, ANALOG OUTPUT, AND COMMUNICATION*
- *PROGRAMMABLE USER INPUTS*
- *UNIVERSAL AC POWERED (85 to 250 VAC)*
- *CRIMSON PROGRAMMING SOFTWARE*
- *NEMA 4X/IP65*

GENERAL DESCRIPTION

The EPAX is a versatile display that can increase productivity by offering the plant floor or production area a large visual display of their current status. Whether your measurement is voltage, current, process, temperature, or strain gage, the EPAX can satisfy your requirement. The EPAX accepts various analog inputs through the use of input modules (MPAX) which allow the unit to adapt to most any application. The MPAX Modules offer the same features as our highly successful PAX Series Panel Meters. Additional plug-in option cards can add alarms, analog output, and communication/bus capabilities, making the EPAX a truly Intelligent Panel Meter.

SAFETY SUMMARY

All safety regulations, local codes and instructions that appear in this and corresponding 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.

The protective conductor terminal is bonded to conductive parts of the equipment for safety purposes and must be connected to an external protective earthing system.

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

CAUTION: Risk of electric shock.

SPECIFICATIONS

Additional specifications, wiring, programming, and information for the individual MPAX models are contained in the corresponding standard PAX literature. This PAX literature is shipped with the ordered MPAX model.

1. **DISPLAY**: 4" (101 mm) Red LED
   5-Digit (EPAX0500): -19999 to 99999
2. **POWER REQUIREMENTS**:
   AC MPAX Modules: 85 to 250 VAC, 50/60 Hz, 18 VA
   EPAX Display: 85 to 250 VAC, 50/60 Hz, 10 VA
3. **INPUT**: Accepts analog input modules, see "Selecting Your Display Components and Option Cards."
4. **ANNUNCIATORS**:
   Display Indication: Three vertical dots on the left side of the unit identify the displays for the following modes:

TOP	Maximum
MIDDLE	Minimum
BOTTOM	Total

   Setpoint Indication: Four vertical dots on the right side of the unit identify the setpoint "ON" condition, with SP 1 being the top position through SP 4 at the bottom.
5. **EPAX Programming**: The unit is a large display, designed to be remotely mounted. Therefore, the unit does not have a programming keypad. Unit programming should be accomplished by one of the following methods:
   Rear Terminal Block: External switches can be wired via the terminal block to allow unit programming. A minimum of 3 switches would be required.
   Optional Programming Remote (EPAXPGM0): This option provides a 10 foot interconnecting cable and programming box. The Programming Remote contains buttons similar to the PAX, allowing easy programming of the EPAX display.
   Optional Serial Programming: Like all PAX units, you can purchase an RS232 or RS485 Comms Card and program the unit via Crimson, a Windows® based software program.

DIMENSIONS In inches (mm)

G

6. **CERTIFICATIONS AND COMPLIANCES**:
SAFETY
UL Recognized Component, File #E179259, UL61010A-1, CSA C22.2 No. 1010-1
Recognized to U.S. and Canadian requirements under the Component Recognition Program of Underwriters Laboratories, Inc.
UL Listed, File #E137808, UL508, CSA C22.2 No. 14-M95
LISTED by Und. Lab. Inc. to U.S. and Canadian safety standards
Type 4X Indoor Enclosure rating (Face only), UL50
IECEE CB Scheme Test Certificate #US/8843A/UL
CB Scheme Test Report #04ME11209-20041018
Issued by Underwriters Laboratories, Inc.
IEC 61010-1, EN 61010-1: Safety requirements for electrical equipment for measurement, control, and laboratory use, Part 1.
IP65 Enclosure rating (Face only), IEC 529
ELECTROMAGNETIC COMPATIBILITY
EMC specifications determined by the MPAX module.
7. **ENVIRONMENTAL CONDITIONS**:
Operating Temperature Range: Determined by the MPAX module
Storage Temperature Range: -40 to 60°C
Operating and Storage Humidity: 0 to 85% max. RH (non-condensing)
Altitude: Up to 2000 meters
8. **MOUNTING REQUIREMENTS**:
Max. panel thickness is 0.375" (9.5 mm)
Min. panel thickness for NEMA 4/IP65 sealing is 0.060" (1.52 mm)
9. **MODULE INSTALLATION**:
24-pin shrouded connector on EPAX engages connector on MPAX module upon installation. Shroud ensures proper alignment by providing a lead-in for the module connector.
10. **CONNECTIONS**: Wiring connections are made to the EPAX terminal block and MPAX module via high compression cage-clamp terminal blocks.
MPAX Module Wiring: Instructions are provided in the corresponding PAX Bulletin.
EPAX Terminal Block Wiring:
Wire Strip Length: 0.3" (7.5 mm)
Wire Gage: 30-12 AWG copper wire
Maximum Torque: 5-7 inch-lbs (0.58-0.81 N-m)

CAUTION: DISCONNECT ALL POWER BEFORE INSTALLING OR REMOVING MODULE

11. **CONSTRUCTION**: Aluminum front panel, enclosure, and rear cover with textured black polyurethane paint for scratch and corrosion resistance protection. Sealed front panel meets NEMA 4X/IP65 specifications for indoor use when properly installed. Installation Category II, Pollution Degree 2. Panel gasket and keps nuts included.
12. **WEIGHT**: 5 lbs (2.25 kg) (*less module*)

About the MPAX Input Modules

The MPAX Module serves as the input to the EPAX Display. There are several different modules to cover a variety of inputs. The MPAX module provides input scaling which allows the EPAX to display most any engineering unit. Once the MPAX is inserted into the EPAX, the unit has the same functions and capabilities of our PAX Series Intelligent Panel Meters. A full set of PAX programming instructions will be included with the MPAX module.

Selecting Your Display Components and Option Cards

To build a complete display unit, you will need an EPAX and an MPAX Input Module. The EPAX is only a display and will not operate without an MPAX module. Please use the following chart to identify the appropriate MPAX module and EPAX Display that will satisfy your application.

SIGNAL TYPE	MPAX MODULES*	EPAX DISPLAYS	OPTIONAL PLUG-IN CARD COMPATABILITY		
	85-250 VAC		SETPOINT	COMMS	ANALOG
Universal DC Inputs	MPAXD000	EPAX0500	YES	YES	YES
Process Inputs	MPAXP000	EPAX0500	YES	YES	YES
Temperature Inputs	MPAXT000	EPAX0500	YES	YES	YES
Strain Gage/Loadcell	MPAXS000	EPAX0500	YES	YES	YES
True RMS AC Voltage/Current	MPAXH000	EPAX0500	YES	YES	YES
Dual Process Inputs	MPAXDP00	EPAX0500	YES	YES	YES

* For detailed module and plug-in card specifications, see corresponding PAX literature. (i.e. For MPAXD specifications, see the PAXD literature)

OPTIONAL PLUG-IN CARDS AND ACCESSORIES

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

Adding Option Cards

The PAX and MPAX series 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 of the PAX Bulletin. Only one card from each function type can be installed at one time. The function types include Setpoint Alarms (PAXCDS), Communications (PAXCDC), and Analog Output (PAXCDL). The plug-in cards can be installed initially or at a later date.

SETPOINT ALARMS PLUG-IN CARDS (PAXCDS)

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

PAXCDS10 - Dual Relay, FORM-C, Normally open & closed
PAXCDS20 - Quad Relay, FORM-A, Normally open only
PAXCDS30 - Isolated quad sinking NPN open collector
PAXCDS40 - Isolated quad sourcing PNP open collector

ANALOG OUTPUT PLUG-IN CARD (PAXCDL)

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 slopes output is possible by reversing the scaling point positions.

PAXCDL10 - Retransmitted Analog Output Card

COMMUNICATION PLUG-IN CARDS (PAXCDC)

A variety of communication protocols are available for the PAX and MPAX series. Only one of these cards can be installed at a time. When programming the unit via Crimson, the RS232 or RS485 Cards must be used.

PAXCDC10 - RS485 Serial (Terminal)
PAXCDC20 - RS232 Serial (Terminal)
PAXCDC30 - DeviceNet
PAXCDC40 - Modbus (Terminal)
PAXCDC50 - Profibus-DP
PAXCDC1C - RS485 Serial (Connector)
PAXCDC2C - RS232 Serial (Connector)
PAXCDC4C - Modbus (Connector)

PROGRAMMING SOFTWARE

Crimson is a Windows® based program that allows configuration of the EPAX meter from a PC. Crimson offers standard drop-down menu commands, that make it easy to program the EPAX meter. The EPAX program can then be saved in a PC file for future use. A PAX serial plug-in card is required to program the meter using the software.

G

1.0 ASSEMBLING THE DISPLAY

CAUTION: *The MPAX main circuit board and the option cards contain static sensitive components. Before handling the module or the cards, discharge static charges from your body by touching a grounded bare metal object. Handle the module by the rear plastic cover only, and the option cards by the board edges. Dirt, oil or other contaminants that contact the circuit boards or components can adversely affect circuit operation.*

WARNING: *Exposed line voltage exists on the MPAX main circuit board and the option cards.* ***DO NOT*** *apply power to the module OR load circuits until the module is properly installed in the EPAX case.*

NOTE: *All module and option card labels must be installed as shown for safety purposes.*

Prior to installing the EPAX Display, it is recommended that the MPAX and any option cards be assembled first. This will allow you the opportunity to insure all the boards are fitted properly into their connectors.

Installing the Option Cards

If your application requires option cards, they should be installed into the MPAX before it is installed into the EPAX Display. Refer to the literature enclosed with the option cards for installation instruction.

Installing the MPAX

Remove the MPAX case (plastic) from the rear of the EPAX by removing the two screws and pulling off the metal holding bracket. Install the MPAX into plastic case by aligning the front connector of the MPAX with the hole in the front of the plastic case. The module must be oriented as shown with terminal #1 toward the top of the EPAX case. Next, insert the MPAX case into the EPAX by lightly pushing the connector of the MPAX into the connector of the EPAX PC board. Place holding bracket over the plastic case and install the two screws.

Installing the Labels

Each option card and the MPAX are shipped with a connection label. These labels must be applied to the rear of the EPAX in the positions shown in the drawing.

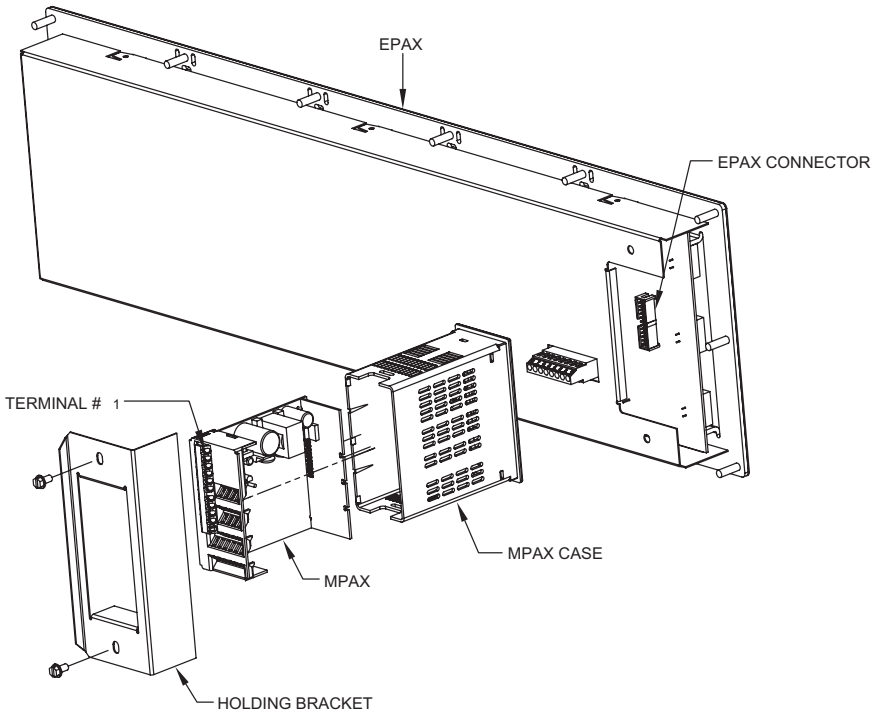


Figure 1, Installing an MPAX Module and Option Cards

Removing The MPAX Module

To remove the MPAX Module from the EPAX Display, first remove all power and load circuits. Then insert a flat screwdriver blade ($^3/_{16}$" or $^1/_4$") into the narrow slot between the EPAX rear cover plate and the module's plastic cover as illustrated in Figure 2. Twist the screwdriver in the direction shown to disengage the internal connectors while firmly squeezing and pulling back on the rear finger tabs (top and bottom). Carefully slide the module out of the EPAX case, keeping it properly aligned with the case opening.

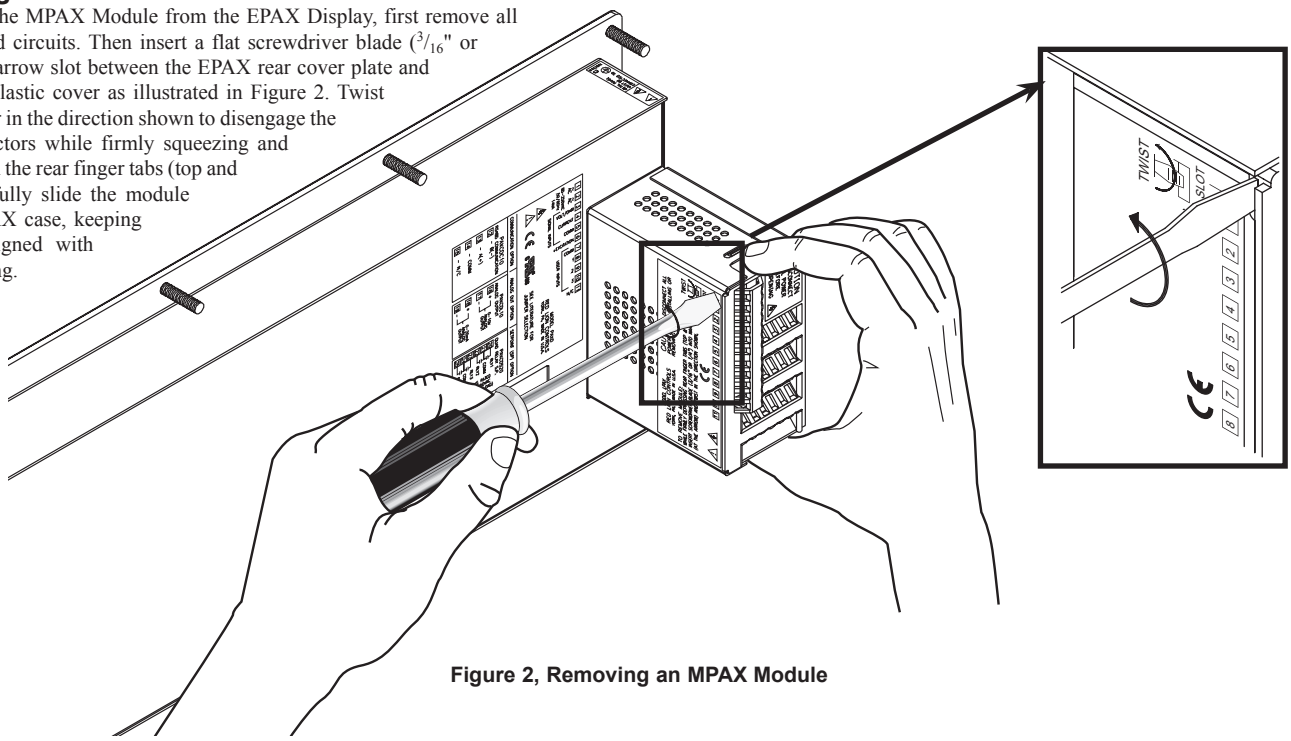


Figure 2, Removing an MPAX Module

G

2.0 INSTALLING THE DISPLAY

EPAX DISPLAY INSTALLATION

The EPAX display is intended to be mounted into a panel or enclosure. The display is provided with a gasket to provide a water-tight seal. The recommended minimum panel thickness for NEMA 4/IP65 sealing is 0.060" (1.57 mm).

For panel mounting, prepare the panel cut-out to the dimensions shown in Figure 3. The supplied template may be used to mark the cut-out and hole locations on the panel. After the panel cut-out has been deburred, slide the panel gasket over the rear of the display and onto the mounting studs. Insert the display into the panel cut-out as illustrated in Figure 4. Install 14 # 10-32 keps nuts (supplied) and tighten evenly for uniform gasket compression. Do not over-tighten the nuts.

By using additional mounting accessories, the EPAX can be surface-wall mounted, suspended, or bottom mounted. Separate installation instructions are provided with the mounting accessories.

DIMENSIONS In inches (mm)

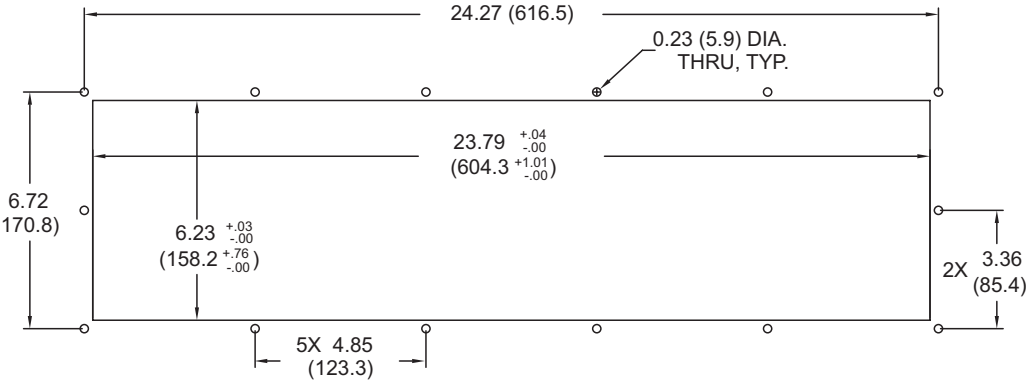


Figure 3, Panel Cut-out for the EPAX

Environment And Cleaning

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

The bezel should be cleaned only 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.

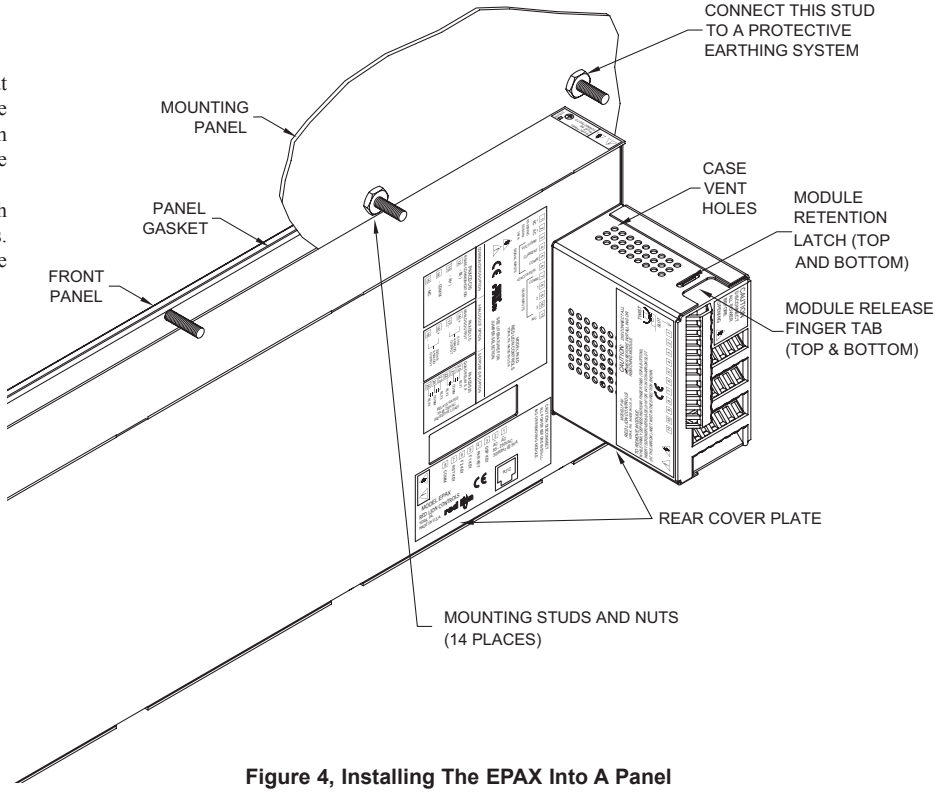


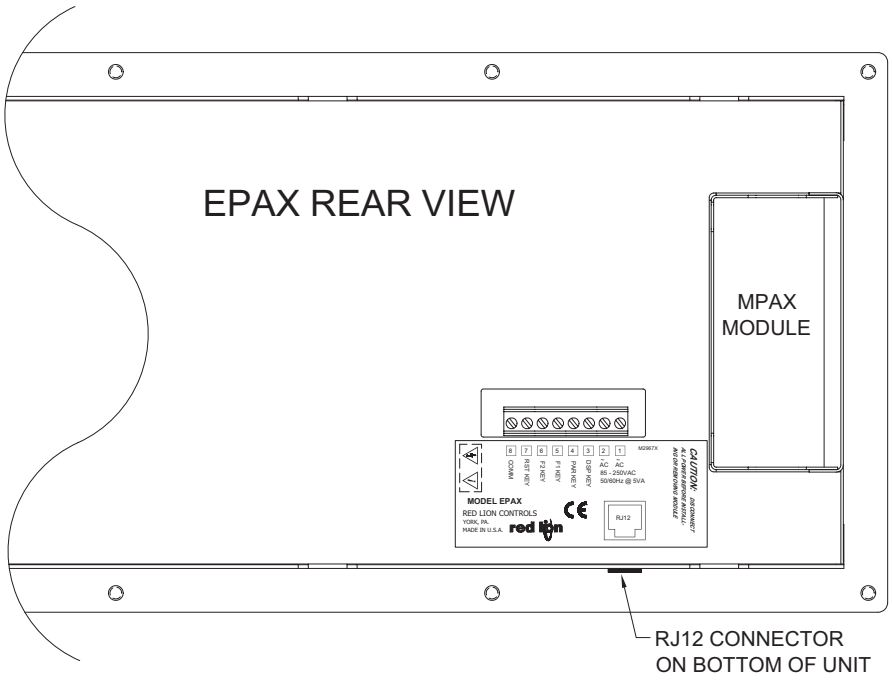
Figure 4, Installing The EPAX Into A Panel

G

3.0 WIRING AND PROGRAMMING THE DISPLAY

Once assembled, the EPAX and MPAX have all the same functions and capabilities of our PAX Series Intelligent Panel Meters. Therefore, you will find the appropriate PAX information packed with the MPAX Module. Simply follow the instructions to wire and program the display for your application.

Note: Both the EPAX and the MPAX module require power. It is recommended to connect the primary AC power to the EPAX terminal block, then jumper to the MPAX module.



EPAX PROGRAMMING

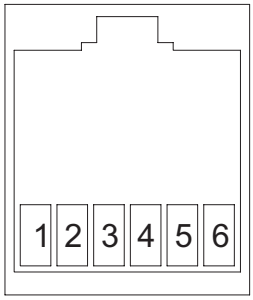
The unit is a large display, designed to be remotely mounted. Therefore, the unit does not have a programming keypad. Unit programming must be accomplished by one of the following three methods:

Optional Programming Remote (EPAXPGM0)

This optional programming remote plugs into the EPAX through an RJ12 connector and a 10 foot cable. The buttons on the programming box function the same as the PAX unit. Simply program the EPAX exactly as the PAX instructions indicate. The programming box can be left connected to the EPAX for future programming changes or can be disconnected and used to program additional EPAX units.

RJ12 CONNECTOR ON BOTTOM OF UNIT

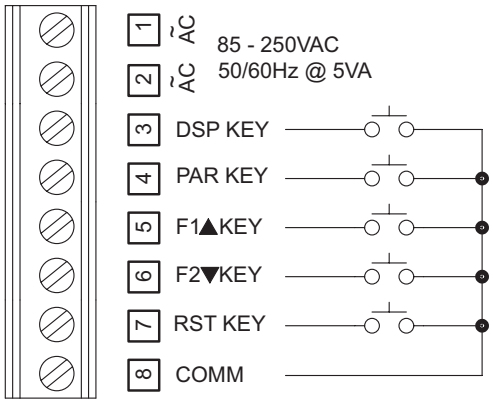
RJ12 FEMALE	
PIN	NAME
1	DSP KEY
2	PAR KEY
3	F1 KEY
4	F2 KEY
5	RST KEY
6	COMM



Rear Terminal Block

External normally open switches can be wired via the terminal block to allow unit programming. A minimum of 3 switches would be required. Each external switch must be wired between the key and the common terminal.

EPAX TERMINAL BLOCK



Optional Serial Programming

Like all PAX units, you can purchase an RS232 or RS485 Communications Card and program the unit via Crimson, a Windows® based software program.

G

ORDERING INFORMATION

TYPE	MODEL NO.	DESCRIPTION	PART NUMBERS
Display	EPAX	5-Digit Extra Large Display for Analog MPAX Modules	EPAX0500
Analog Input Module	MPAX	Universal DC Input Module, AC Powered	MPAXD000
		Dual Process Input Module, AC Powered	MPAXDP00
		Process Input Module, AC Powered	MPAXP000
		Thermocouple and RTD Module, AC Powered	MPAXT000
		AC True RMS Voltage and Current Module, AC Powered	MPAXH000
		Strain Gage/Bridge Input Module, AC Powered	MPAXS000
Plug-In Cards	PAXCDS	Dual Setpoint Relay Output Card	PAXCDS10
		Quad Setpoint Relay Output Card	PAXCDS20
		Quad Setpoint Sinking Open Collector Output Card	PAXCDS30
		Quad Setpoint Sourcing Open Collector Output Card	PAXCDS40
Plug-In Cards	PAXCDC*	RS485 Serial Communications Output Card with Terminal Block	PAXCDC10
		Extended RS485 Serial Communications Output Card with Dual RJ11 Connector	PAXCDC1C
		RS232 Serial Communications Output Card with Terminal Block	PAXCDC20
		Extended RS232 Serial Communications Output Card with 9 Pin D Connector	PAXCDC2C
		DeviceNet Communications Card (Terminal Block)	PAXCDC30
		Modbus Communications Card	PAXCDC40
		Extended Modbus Communications Card with Dual RJ11 Connector	PAXCDC4C
		Profibus-DP Communications Card	PAXCDC50
	PAXCDL*	Analog Output Card	PAXCDL10
Accessories	PGM	Programming Remote for EPAX with 10 foot cable	EPAXPGM0
	SFCRD**	Crimson 2 PC Configuration Software for Windows 98, ME, 2000 and XP	SFCRD200
	ENC12	NEMA 4/IP65 Enclosure for EPAX	ENC12000
	SHR	Shroud for EPAX	SHREPAX0
	EN/SH	EPAX NEMA 4/IP65 Enclosure and Shroud	EPAXENSH

*Refer to "Selecting Your Display Components and Option Cards."
**Crimson software is available for download from http://www.redlion.net/

TROUBLESHOOTING

For technical assistance, contact technical support.

G

MODEL EPAX- 6 DIGIT EXTRA LARGE PAX DISPLAY FOR DIGITAL INPUTS

c UL US LISTED
IND. CONT. EQ.
51EB

CE

- *LARGE LED DISPLAY READABLE TO 180 FEET*
- *VARIOUS DIGITAL INPUT MODULES;*
  COUNT AND RATE INPUT
  CLOCK/TIMER
  SERIAL SLAVE
- *ALARMS, ANALOG OUTPUT, AND COMMUNICATION*
- *PROGRAMMABLE USER INPUTS*
- *UNIVERSAL AC POWERED (85 to 250 VAC)*
- *PC SOFTWARE FOR METER CONFIGURATION*
- *NEMA 4X/IP65*

GENERAL DESCRIPTION

The EPAX Display is a versatile display that can increase productivity by offering the plant floor or production area a large visual display of their current status. Whether your measurement is rate, count, or time, the EPAX can satisfy your requirement. The EPAX displays accept various digital inputs through the use of input modules (MPAX) which allow the unit to adapt to most any application. The MPAX Modules offer the same features as our highly successful PAX Series Panel Meters. Additional plug-in option cards can add alarms, analog output, and communication/bus capabilities, making the EPAX a truly Intelligent Panel Meter.

SAFETY SUMMARY

All safety regulations, local codes and instructions that appear in this and corresponding 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.

The protective conductor terminal is bonded to conductive parts of the equipment for safety purposes and must be connected to an external protective earthing system.

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

CAUTION: Risk of electric shock.

SPECIFICATIONS

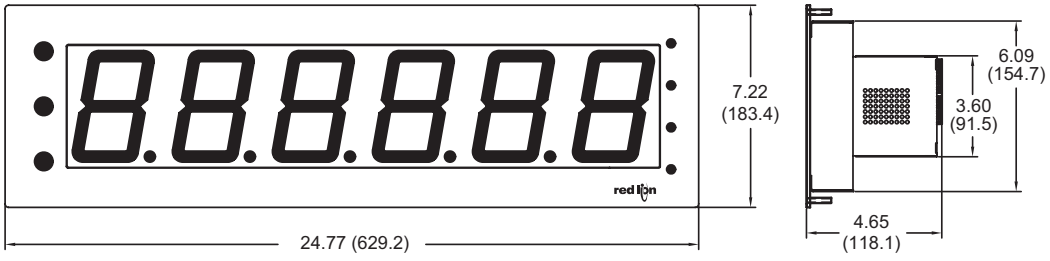
Additional specifications, wiring, programming, and information for the individual MPAX models are contained in the corresponding standard PAX literature. This PAX literature is shipped with the ordered MPAX model.

1. **DISPLAY**: 4" (101 mm) Red LED
   6-Digit (EPAX0600): (-99999 to 999999)
2. **POWER REQUIREMENTS**:
   AC MPAX Modules: 85 to 250 VAC, 50/60 Hz, 18 VA
   EPAX Display: 85 to 250 VAC, 50/60 Hz, 10 VA
3. **INPUT**: Accepts digital input modules, see "Selecting Your Display Components and Option Cards."
4. **ANNUNCIATORS**:
   Display Indication: Three vertical dots on the left side of the unit identify the displays for the following modules:

	COUNT/RATE	CLOCK
TOP	Display A	Timer
MIDDLE	Display B	Count
BOTTOM	Display C	Date

   Setpoint Indication: Four vertical dots on the right side of the unit identify the setpoint "ON" condition, with SP 1 being the top position through SP 4 at the bottom.
5. **EPAX Programming**: The unit is a large display, designed to be remotely mounted. Therefore, the unit does not have a programming keypad. Unit programming should be accomplished by one of the following methods:
   Rear Terminal Block: External switches can be wired via the terminal block to allow unit programming. A minimum of 3 switches would be required.
   Optional Programming Remote (EPAXPGM0): This option provides a 10 foot interconnecting cable and programming box. The Programming Remote contains buttons similar to the PAX, allowing easy programming of the EPAX display.
   Optional Serial Programming: Like all PAX units, you can purchase an RS232 or RS485 Comms Card and program the unit via Windows® based software programs.

DIMENSIONS In inches (mm)



G

6. **CERTIFICATIONS AND COMPLIANCES**:
SAFETY
UL Recognized Component, File #E179259, UL61010A-1, CSA C22.2 No. 1010-1
Recognized to U.S. and Canadian requirements under the Component Recognition Program of Underwriters Laboratories, Inc.
UL Listed, File #E137808, UL508, CSA C22.2 No. 14-M95
LISTED by Und. Lab. Inc. to U.S. and Canadian safety standards
Type 4X Indoor Enclosure rating (Face only), UL50
IECEE CB Scheme Test Certificate #US/8843/UL
CB Scheme Test Report #04ME11209-20041018
Issued by Underwriters Laboratories, Inc.
IEC 61010-1, EN 61010-1: Safety requirements for electrical equipment for measurement, control, and laboratory use, Part 1.
IP65 Enclosure rating (Face only), IEC 529
ELECTROMAGNETIC COMPATIBILITY
EMC specifications determined by the MPAX module.
7. **ENVIRONMENTAL CONDITIONS**:
Operating Temperature Range: Determined by the MPAX module
Storage Temperature Range: -40 to 60°C
Operating and Storage Humidity: 0 to 85% max. RH (non-condensing)
Altitude: Up to 2000 meters
8. **MOUNTING REQUIREMENTS**:
Max. panel thickness is 0.375" (9.5 mm)
Min. panel thickness for NEMA 4/IP65 sealing is 0.060" (1.52 mm)
9. **MODULE INSTALLATION**:
24-pin shrouded connector on EPAX engages connector on MPAX module upon installation. Shroud ensures proper alignment by providing a lead-in for the module connector.
10. **CONNECTIONS**: Wiring connections are made to the EPAX terminal block and MPAX module via high compression cage-clamp terminal blocks.
MPAX Module Wiring: Instructions are provided in the corresponding PAX Bulletin.
EPAX Terminal Block Wiring:
Wire Strip Length: 0.3" (7.5 mm)
Wire Gage: 30-12 AWG copper wire
Maximum Torque: 5-7 inch-lbs (0.58-0.81 N-m)

CAUTION: DISCONNECT ALL POWER BEFORE INSTALLING OR REMOVING MODULE

11. **CONSTRUCTION**: Aluminum front panel, enclosure, and rear cover with textured black polyurethane paint for scratch and corrosion resistance protection. Sealed front panel meets NEMA 4X/IP65 specifications for indoor use when properly installed. Installation Category II, Pollution Degree 2. Panel gasket and keps nuts included.
12. **WEIGHT**: 5 lbs (2.25 kg) (*less module*)

About the MPAX Input Modules

The MPAX Module serves as the input to the EPAX Display. There are several different modules to cover a variety of inputs. The MPAX module provides input scaling which allows the EPAX to display most any engineering unit. Once the MPAX is inserted into the EPAX, the unit has the same functions and capabilities of our PAX Series Intelligent Panel Meters. A full set of PAX programming instructions will be included with the MPAX module.

Selecting Your Display Components and Option Cards

To build a complete display unit, you will need an EPAX and an MPAX Input Module. The EPAX is only a display and will not operate without an MPAX module. Please use the following chart to identify the appropriate MPAX module and EPAX Display that will satisfy your application.

SIGNAL TYPE	MPAX MODULES*	EPAX DISPLAYS	OPTIONAL PLUG-IN CARD COMPATABILITY			
	85-250 VAC		SETPOINT	COMMS	ANALOG	REAL-TIME CLOCK
Count/Rate/Serial Slave	MPAXI020	EPAX0600	YES	YES	YES	-
Count	MPAXC020	EPAX0600	YES	-	-	-
Rate	MPAXR020	EPAX0600	YES	-	-	-
Real-Time Clock/Timer	MPAXCK00	EPAX0600	YES	YES	-	YES
Timer	MPAXTM00	EPAX0600	YES	YES	-	-

* For detailed module and plug-in card specifications, see corresponding PAX literature. (i.e. For MPAXI specifications, see the PAXI literature)

OPTIONAL PLUG-IN CARDS AND ACCESSORIES

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

Adding Option Cards

The PAX and MPAX series 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 of the PAX Bulletin. Only one card from each function type can be installed at one time. The function types include Setpoint Alarms (PAXCDS), Communications (PAXCDC), and Analog Output (PAXCDL). The plug-in cards can be installed initially or at a later date.

SETPOINT ALARMS PLUG-IN CARDS (PAXCDS)

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

PAXCDS10 - Dual Relay, FORM-C, Normally open & closed
PAXCDS20 - Quad Relay, FORM-A, Normally open only
PAXCDS30 - Isolated quad sinking NPN open collector
PAXCDS40 - Isolated quad sourcing PNP open collector

ANALOG OUTPUT PLUG-IN CARD (PAXCDL)

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 slopes output is possible by reversing the scaling point positions.

PAXCDL10 - Retransmitted Analog Output Card

COMMUNICATION PLUG-IN CARDS (PAXCDC)

A variety of communication protocols are available for the PAX and MPAX series. Only one of these cards can be installed at a time. When programming the unit via Crimson (for MPAXI) or SFPAX (for MPAXCK or MPAXTM), the RS232 or RS485 Cards must be used.

MPAXI/C/R Note: For Modbus communications, use RS485 Communications Output Card and configure Communication Type parameter (tYPE) for Modbus.

PAXCDC10 - RS485 Serial (Terminal)
PAXCDC1C - RS485 Serial (Connector)
PAXCDC20 - RS232 Serial (Terminal)
PAXCDC2C - RS232 Serial (Connector)
PAXCDC30 - DeviceNet
* PAXCDC40 - Modbus (Terminal)
* PAXCDC4C - Modbus (Connector)
PAXCDC50 - Profibus-DP

** MPAXCK/MPAXTM only.*

PROGRAMMING SOFTWARE

CRIMSON - MPAXI Only

Crimson is a Windows® based program that allows configuration of the EPAX meter from a PC. Crimson offers standard drop-down menu commands, that make it easy to program the EPAX meter. The EPAX program can then be saved in a PC file for future use. A PAX serial plug-in card is required to program the meter using the software.

SFPAX - MPAXCK and MPAXTM Only

The SFPAX is a Windows® based program that allows configuration of the EPAX meter from a PC. Using the SFPAX makes it easier to program the EPAX meter and allows saving the PAX program in a PC file for future use. On-line help is available within the software. A PAX serial plug-in card is required to program the meter using the software.

G

1.0 ASSEMBLING THE DISPLAY

CAUTION: *The MPAX main circuit board and the option cards contain static sensitive components. Before handling the module or the cards, discharge static charges from your body by touching a grounded bare metal object. Handle the module by the rear plastic cover only, and the option cards by the board edges. Dirt, oil or other contaminants that contact the circuit boards or components can adversely affect circuit operation.*

WARNING: *Exposed line voltage exists on the MPAX main circuit board and the option cards.* ***DO NOT*** *apply power to the module OR load circuits until the module is properly installed in the EPAX case.*

NOTE: *All module and option card labels must be installed as shown for safety purposes.*

Prior to installing the EPAX Display, it is recommended that the MPAX and any option cards be assembled first. This will allow you the opportunity to insure all the boards are fitted properly into their connectors.

Installing the Option Cards

If your application requires option cards, they should be installed into the MPAX before it is installed into the EPAX Display. Refer to the literature enclosed with the option cards for installation instruction.

Installing the MPAX

Remove the MPAX case (plastic) from the rear of the EPAX by removing the two screws and pulling off the metal holding bracket. Install the MPAX into plastic case by aligning the front connector of the MPAX with the hole in the front of the plastic case. The module must be oriented as shown with terminal #1 toward the top of the EPAX case. Next, insert the MPAX case into the EPAX by lightly pushing the connector of the MPAX into the connector of the EPAX PC board. Place holding bracket over the plastic case and install the two screws.

Installing the Labels

Each option card and the MPAX are shipped with a connection label. These labels must be applied to the rear of the EPAX in the positions shown in the drawing.

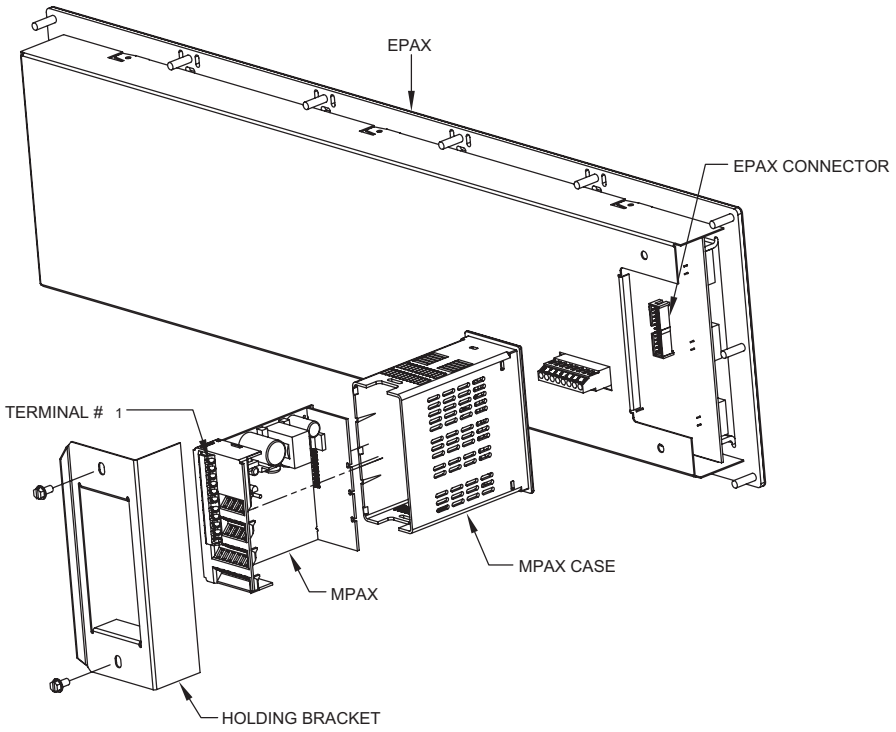


Figure 1, Installing an MPAX Module and Option Cards

Removing The MPAX Module

To remove the MPAX Module from the EPAX Display, first remove all power and load circuits. Then insert a flat screwdriver blade ($^{3}/_{16}$" or $^{1}/_{4}$") into the narrow slot between the EPAX rear cover plate and the module's plastic cover as illustrated in Figure 2. Twist the screwdriver in the direction shown to disengage the internal connectors while firmly squeezing and pulling back on the rear finger tabs (top and bottom). Carefully slide the module out of the EPAX case, keeping it properly aligned with the case opening.

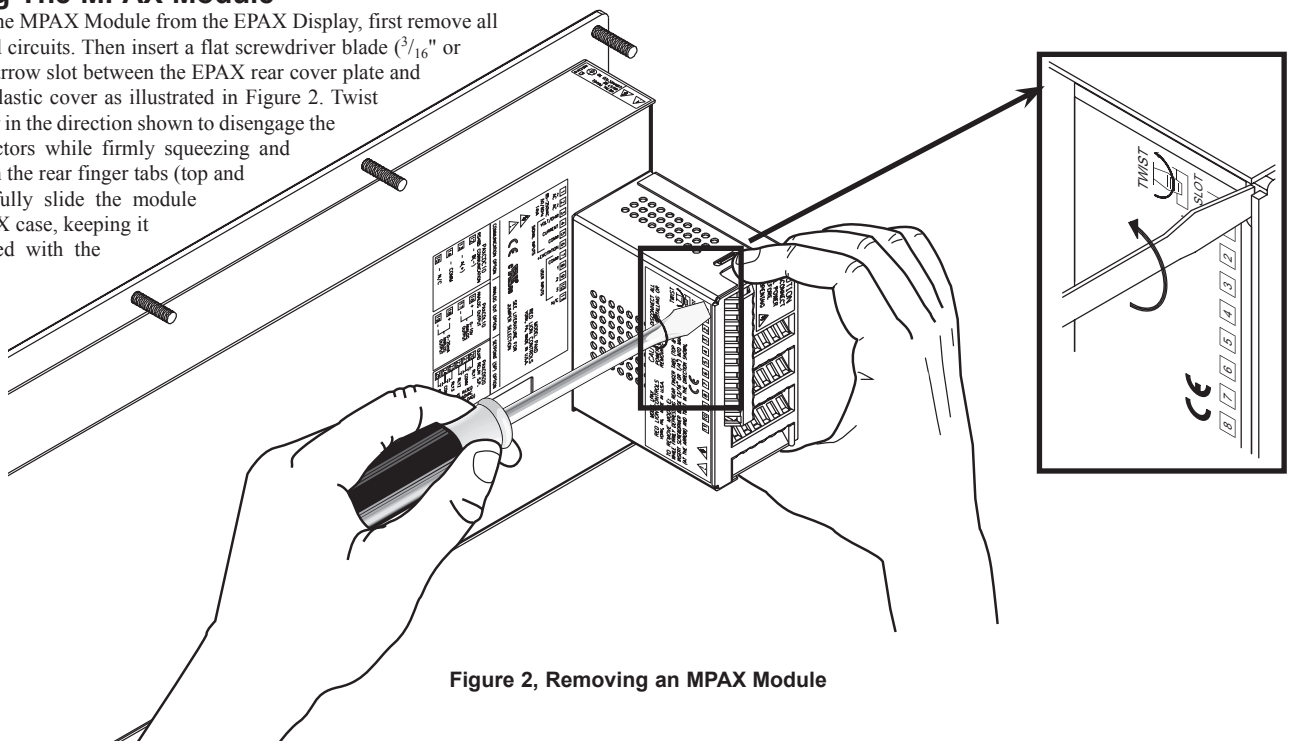


Figure 2, Removing an MPAX Module

G

2.0 INSTALLING THE DISPLAY

EPAX DISPLAY INSTALLATION

The EPAX display is intended to be mounted into a panel or enclosure. The display is provided with a gasket to provide a water-tight seal. The recommended minimum panel thickness for NEMA 4/IP65 sealing is 0.060" (1.57 mm).

For panel mounting, prepare the panel cut-out to the dimensions shown in Figure 3. The supplied template may be used to mark the cut-out and hole locations on the panel. After the panel cut-out has been deburred, slide the panel gasket over the rear of the display and onto the mounting studs. Insert the display into the panel cut-out as illustrated in Figure 4. Install 14 # 10-32 keps nuts (supplied) and tighten evenly for uniform gasket compression. Do not over-tighten the nuts.

By using additional mounting accessories, the EPAX can be surface-wall mounted, suspended, or bottom mounted. Separate installation instructions are provided with the mounting accessories.

DIMENSIONS In inches (mm)

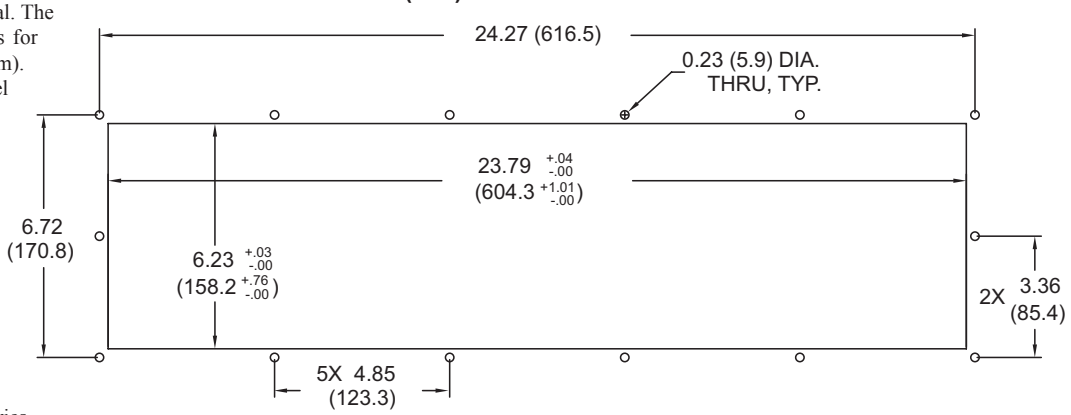


Figure 3, Panel Cut-out for the EPAX

Environment And Cleaning

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

The bezel should be cleaned only 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.

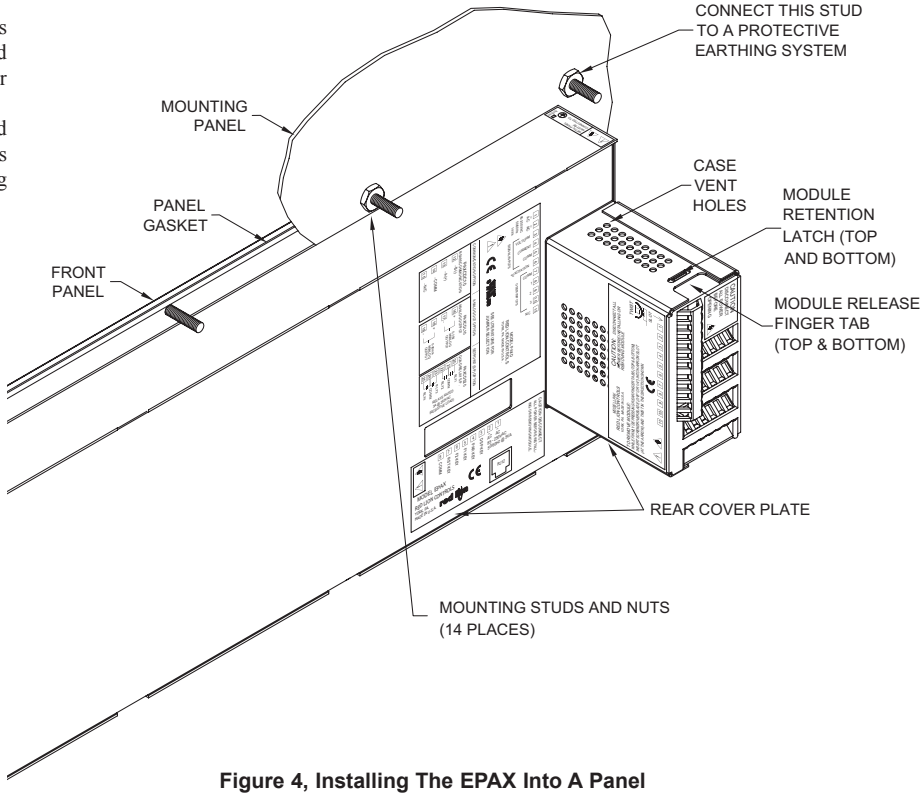
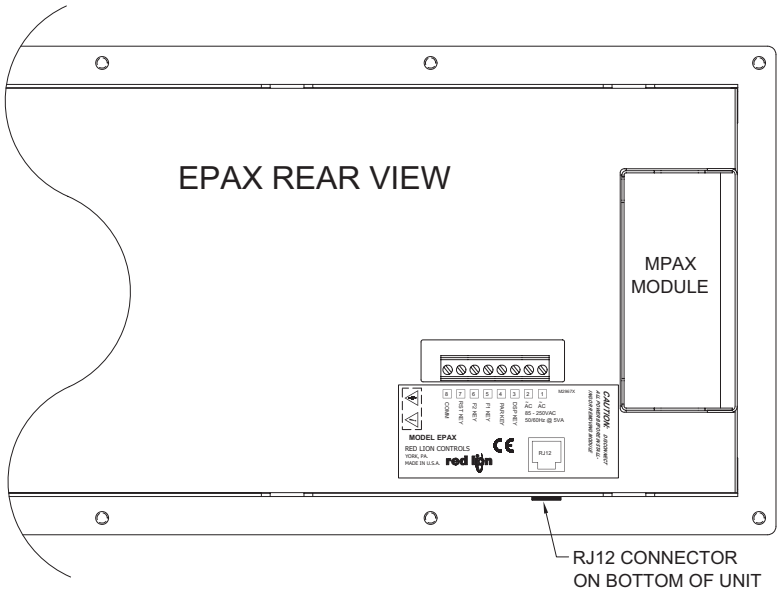


Figure 4, Installing The EPAX Into A Panel

G

3.0 WIRING AND PROGRAMMING THE DISPLAY

Note: Both the EPAX and the MPAX module require power. It is recommended to connect the primary AC power to the EPAX terminal block, then jumper to the MPAX module.



EPAX PROGRAMMING

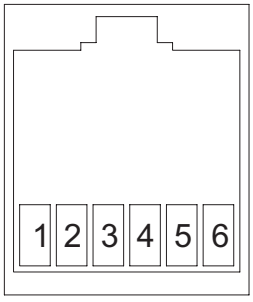
The unit is a large display, designed to be remotely mounted. Therefore, the unit does not have a programming keypad. Unit programming must be accomplished by one of the following three methods:

Optional Programming Remote (EPAXPGM0)

This optional programming remote plugs into the EPAX through an RJ12 connector and a 10 foot cable. The buttons on the programming box function the same as the PAX unit. Simply program the EPAX exactly as the PAX instructions indicate. The programming box can be left connected to the EPAX for future programming changes or can be disconnected and used to program additional EPAX units.

RJ12 CONNECTOR ON BOTTOM OF UNIT

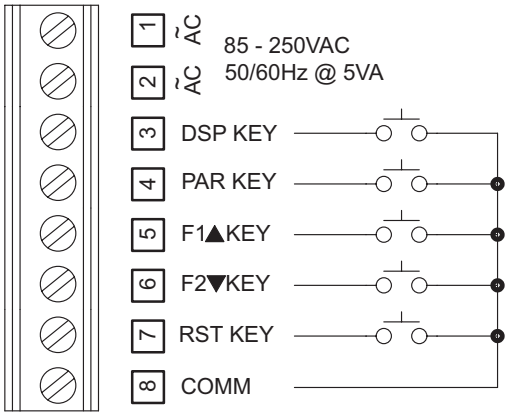
RJ12 FEMALE	
PIN	NAME
1	DSP KEY
2	PAR KEY
3	F1 KEY
4	F2 KEY
5	RST KEY
6	COMM



Rear Terminal Block

External normally open switches can be wired via the terminal block to allow unit programming. A minimum of 3 switches would be required. Each external switch must be wired between the key and the common terminal.

EPAX TERMINAL BLOCK



Optional Serial Programming

Like all PAX units, you can purchase an RS232 or RS485 Comms Card and program the unit via Windows® based software programs.

G

ORDERING INFORMATION

TYPE	MODEL NO.	DESCRIPTION	PART NUMBERS
Display	EPAX	6-Digit Extra Large Display for Digital MPAX Modules	EPAX0600
Digital Input Module	MPAX	Count/Rate Indicator Module, AC Powered	MPAXI020
		Count Indicator Module, AC Powered	MPAXC020
		Rate Indicator Module, AC Powered	MPAXR020
		Real-Time Clock Module, AC Powered	MPAXCK00
		Timer Module, AC Powered	MPAXTM00
Optional Plug-In Cards	PAXCDS	Dual Setpoint Relay Output Card	PAXCDS10
		Quad Setpoint Relay Output Card	PAXCDS20
		Quad Setpoint Sinking Open Collector Output Card	PAXCDS30
		Quad Setpoint Sourcing Open Collector Output Card	PAXCDS40
	PAXCDC*	RS485 Serial Communications Output Card with Terminal Block	PAXCDC10
		Extended RS485 Serial Communications Output Card with Dual RJ11 Connector	PAXCDC1C
		RS232 Serial Communications Output Card with Terminal Block	PAXCDC20
		Extended RS232 Serial Communications Output Card with 9 Pin D Connector	PAXCDC2C
		DeviceNet Communications Card	PAXCDC30
		Modbus Communications Card	PAXCDC40
		Extended Modbus Communications Card with Dual RJ11 Connector	PAXCDC4C
		Profibus-DP Communications Card	PAXCDC50
	PAXCDL*	Analog Output Card	PAXCDL10
	PAXUSB	PAX USB Programming Card (Not included in PAX product UL E179259 file).	PAXUSB00
	PAXRTC*	Real-Time Clock Card (Replacement Only)	PAXRTC00
Accessories	PGM	Programming Remote for EPAX with 10 foot cable	EPAXPGM0
	SFCRD**	Crimson 2 PC Configuration Software for Windows 98, ME, 2000 and XP (for MPAXI020 Module)	SFCRD200
	SFPAX**	PC Configuration Software for Windows 95/98 on 3.5" disk (for MPAXCK00 and MPAXTM00 Modules)	SFPAX
	ENC12	NEMA 4/IP65 Enclosure for EPAX	ENC12000
	SHR	Shroud for EPAX	SHREPAX0
	EN/SH	EPAX NEMA 4/IP65 Enclosure and Shroud	EPAXENSH

*Refer to "Selecting Your Display Components and Option Cards."
**Available as a FREE download from the Red Lion website. www.redlion.net

TROUBLESHOOTING

For technical assistance, contact technical support.

G