TIMERS

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The Trusted Source for Innovative Control Solutions

QUICK Specs

Timers

	TIMER	TIMER W/CONTROL		
	CUB7T	**CUB5T**	**C48T**	**PAXTM**
				
Description	1/32 DIN Miniature Timer	Timer with Output Option Card Capability	1/16 DIN Timer with Control	1/8 DIN Timer with Output Option Card Capability
Dimensions (Height) x (Width)	28 mm (H) x 51 mm (W)	39 mm (H) x 75mm (W)	49 mm (H) x 49 mm (W)	50 mm (H) x 97mm (W)
Display	8 Digit, .35" (9mm) Reflective, Green and Red Backlight LCD	8 Digit, .46" (12mm) Reflective, Green and Red Backlight LCD	2 x 6 Digit, Main Display .3" (7mm) Sec. Display .2" (5mm) Reflective and Backlight LCD	6 Digit, .56" (14mm) Standard Green or Sunlight Readable Red LED, Adjustable Intensity
Input	Switch Contact, NPN O. C. or Voltage 10 V to 300 VAC or DC	Switch Contact, NPN O. C. or Voltage 9 V to 28 VDC	Switch Contact, NPN O. C., PNP O. C., or VCME through VCMH	Switch Contact, NPN O. C., PNP O. C., or VCME through VCMH
Time Ranges	.001, .01, .1 and 1 Second .1 and 1 Minute .01, .1 and 1 Hour Hour: Minutes: Seconds	.001, .01, .1 and 1 Second .01, .1 and 1 Minute .01, .1 and 1 Hour .01, .1 and 1 Min/Sec .01, .1 and 1Hr/Min Hours/Minutes/Seconds Days/Hours/Minutes	.001, .01, .1 and 1 Second .001, .01, .1 and 1 Minute Min/Sec Min/Sec/Tenth Hr/Min/Sec Hr/Min/Tenth Hr/Min/Hun	.001, .01, .1 and 1 Second .001, .01, .1 and 1 Minute .001, .01, .1 and 1 Hour Minutes/.001, .01, .1, 1 Sec Hours/.001, .01, .1, 1 Min Hours/Minutes/Seconds
Reset	Front Panel, Remote	Front Panel, Remote	Front Panel, Remote, Automatic	Front Panel, Remote, Automatic
Setpoint Capability	No	Single Form C Relay Dual Sinking	Single or Dual Form A Current Sinking	Dual Form C Quad Form A Quad Sinking Quad Sourcing
Communications	No	RS232 RS485	RS485	RS232 RS485 Modbus DeviceNet Profibus Ethernet w/ICM8
Other Features/ Options	No	Programmable User Inputs	Programmable User Inputs and Front Buttons	Programmable User Inputs and Front Buttons, Cycle Counting Capability
Power Source	3 Volt Lithium Battery, Backlighting 9 - 28 VDC @ 35 mA	9 to 28 VDC	85 to 250 VAC 11 to 14 VDC 24 VAC	85 to 250 VAC 11 to 36 VDC 24 VAC
Page Number	*	Page 181	Page 194	Page 199

*See website for product information.

QUICK Specs

Timers

TIMER W/CONTROL

	PAXCK	LIBT
		
Description	1/8 DIN Real Time Clock with Output Option Card Capability	Timer with Control
Dimensions (Height) x (Width)	50 mm (H) x 97mm (W)	72 mm (H) x 72 mm (W)
Display	6 Digit, .56" (14mm) Standard Green or Sunlight Readable Red LED, Adjustable Intensity	4 Digit, .4" (10mm) LED 4 Digit, .5" (13mm) LCD
Input	Switch Contact, NPN O. C., PNP O. C., or VCME through VCMH	Switch Contact, NPN O. C., PNP O. C., or VCME through VCMH
Time Ranges	.001, .01, .1 and 1 Second .001, .01, .1 and 1 Minute .001, .01, .1 and 1 Hour Minutes/.001, .01, .1, 1 Sec Hours/.001, .01, .1, 1 Min Hours/Minutes/Seconds Days/Hours/Minutes	.01, .1 and 1 Second .01, .1 and 1 Minute .01, .1 and 1 Hour Minutes/Seconds Hours/Minutes
Reset	Front Panel, Remote, Automatic	Front Panel, Remote, Automatic
Setpoint Capability	Dual Form C Quad Form A Quad Sinking Quad Sourcing	Single or Dual Form C, Solid State
Communications	RS232 RS485 Modbus DeviceNet Profibus Ethernet w/ICM8	No
Other Features/ Options	Programmable User Inputs and Front Buttons, Cycle Counting Capability	No
Power Source	85 to 250 VAC 11 to 36 VDC 24 VAC	115/230 VAC 11 to 14 VDC
Page Number	Page 224	*

*See website for product information.

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REPLACEMENT Guide

WHAT YOU'RE USING NOW		CURRENT PRODUCT	
MODEL NUMBER	**FEATURES**	**MODEL NUMBER**	**FEATURES**
 **CUBT**	■ Display: .2" (5 mm) Reflective LCD ■ Power Source: 115/230 VAC, 10 to 28 VDC, 10 to 28 VAC	 **C48T**	■ Display: 2 x 6, Main Display .3" (7 mm) Secondary Display .2" (5 mm) Reflective LCD ■ Power Source: 85 to 250 VAC, 11 to 36 VDC
 **LNXT**	■ Display: .3" (8 mm) Reflective LCD ■ Power Source: 115/230 VAC, 11 to 14 VDC, 21.5 to 30 VAC	 **C48T**	■ Display: 2 x 6, Main Display .3" (7 mm) Secondary Display .2" (5 mm) Reflective LCD ■ Power Source: 85 to 250 VAC, 11 to 36 VDC **Panel Cut-Out Dimension Differences**
 **LIBT**	■ Display: 4 Digit, .4" (10 mm) LED OR .5" (13 mm) LCD ■ Power Source: 115/230 VAC, 11 to 14 VDC	 **C48T**	■ Display: 2 x 6, Main Display .3" (7 mm) Secondary Display .2" (5 mm) Reflective LCD ■ Power Source: 85 to 250 VAC, 11 to 36 VDC **Panel Cut-Out Dimension Differences**

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

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MODEL CUB5T - MINIATURE ELECTRONIC PRESET TIMER AND CYCLE COUNTER

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CE

- *LCD, REFLECTIVE OR RED/GREEN LED BACKLIGHTING*
- *0.46" (11.7 mm) HIGH DIGITS*
- *7-DIGIT BI-DIRECTIONAL TIMING CAPABILITY*
- *6-DIGIT CYCLE COUNTING CAPABILITY*
- *OPTIONAL RELAY OUTPUT MODULE*
- *OPTIONAL SERIAL COMMUNICATIONS MODULE (RS232 or RS485)*
- *SELECTABLE TIMER RANGES AND OPERATING MODES*
- *ELAPSED TIMER AND PRESET TIMER FUNCTIONALITY*
- *DISPLAY COLOR CHANGE CAPABILITY AT PRESET OUTPUT*
- *OPERATES FROM 9 TO 28 VDC POWER SOURCE*
- *NEMA 4X/IP65 SEALED FRONT BEZEL*

GENERAL DESCRIPTION

The CUB5T provides the ultimate in timer flexibility, from its complete user programming to the optional relay output and serial communications capability. The meter functions as an Elapsed Timer or Preset Timer. It also has a built-in Cycle Counter. The display can be toggled either manually or automatically between the Timer and Cycle Counter values. With eight different input operating modes and 18 selectable timer ranges, the meter can be programmed for a wide variety of timing applications.

The CUB5T has an LCD display with 0.46" (11.7 mm) high digits. The LCD is available in two versions, reflective (CUB5TR00) and backlight (CUB5TB00). The backlight version is user selectable for red or green backlighting with variable display intensity.

The Timer has two signal inputs and eight input operating modes. These modes provide level active or edge triggered start/stop operation. A Display Hold mode will display the elapsed time for one cycle, while the next cycle continues timing internally. The Timer Reset modes will automatically reset the timer value when a time start edge is applied to the input. This allows sequential timing cycles without having to manually reset the Timer.

In addition to the Timer inputs, a programmable User Input is available to perform a variety of meter functions. All inputs are current sinking (active low) and accept a variety of logic and open-collector output signal sources. Relay and switch contacts can also be used as signal sources, when the software input debounce filter is enabled.

The capability of the CUB5T can be easily expanded with the addition of a field installable option module. When the CUB5RLY0 relay output module is added, the meter becomes a Preset Timer. The Setpoint Output can be assigned to the Timer or Cycle Counter values, and configured to suit a variety of control and alarm requirements. Serial communications capability for RS232 or RS485 is added with a serial option module (CUB5COM).

The CUB5T can be powered from an optional Red Lion Micro-Line/Sensor Power Supply (MLPS), which attaches directly to the back of a CUB5T. The MLPS is powered from an 85 to 250 VAC source and provides up to 400 mA to drive the meter and sensors.

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SAFETY SUMMARY

All safety related regulations, local codes and instructions that appear in this literature or on equipment must be observed to ensure personal safety and to prevent damage to either the instrument or equipment connected to it. If equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

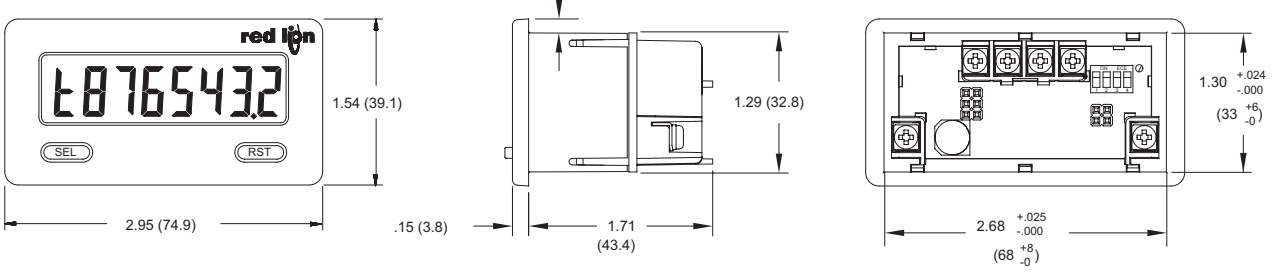
Do not use this meter to directly command motors, valves, or other actuators not equipped with safeguards. To do so can be potentially harmful to persons or equipment in the event of a fault to the meter.

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

CAUTION: Risk of electric shock.

DIMENSIONS In inches (mm)

Note: Recommended minimum clearance (behind the panel) for mounting clip installation is 2.15" (54.6) H x 3.00" (76.2) W.



Ordering Information

TYPE	MODEL NO.	DESCRIPTION	PART NUMBER
CUB5	CUB5TR	Preset Timer and Cycle Counter with Reflective Display	CUB5TR00
	CUB5TB	Preset Timer and Cycle Counter with Backlight Display	CUB5TB00
Optional Plug-in Cards	CUB5RLY	Single Relay Option Card	CUB5RLY0
	CUB5COM	RS485 Serial Communications Card	CUB5COM1
		RS232 Serial Communications Card	CUB5COM2
Accessories	MLPS	+12 VDC Micro-Line Power Supply, 85 to 250 VAC source, 400 mA max out	MLPS1000
		+24 VDC Micro-Line Power Supply, 85 to 250 VAC source, 200 mA max out	MLPS2000
	CBLPROG	Programming Cable RS232 (RJ11-DB9)	CBLPROG0
	CBPRO	Programming Cable RS485 (RJ11-DB9)	CBPRO007

General Meter Specifications

1. **DISPLAY**: 8 digit LCD 0.46" (11.7 mm) high digits
   CUB5TR00: Reflective LCD with full viewing angle
   CUB5TB00: Selectable transmissive red or green backlight LED with viewing angle optimized. Display color change capability at preset when using a relay module.
2. **POWER**: Input voltage range is +9 to +28 VDC with short circuit and input polarity protection. Must use an RLC model MLPS or a Class 2 or SELV rated power supply.

MODEL NUMBER	DISPLAY COLOR	INPUT CURRENT WITHOUT CUB5RLY0	INPUT CURRENT WITH CUB5RLY0
CUB5TR00	---	10 mA	30 mA
CUB5TB00	Red (max intensity)	85 mA	115 mA
CUB5TB00	Green (max intensity)	95 mA	125 mA

3. **TIMER DISPLAY**: 7-digits
   Display Designator: "t" to the left side of the display
   Display Range: 0 to 9999999
   Overflow/Underflow Indication: Display flashes "t OVEr"
   Minimum Digit Resolution: 0.001 Sec.
   Maximum Single Digit Resolution: 1 Hr.
   Timing Accuracy: ±0.01%
4. **CYCLE COUNTER DISPLAY**: 6-digits, may be disabled if not used
   Display Designator: "C" to the left side of the display
   Display Range: 0 to 999999
   Overflow/Underflow Indication: Display flashes "C OVEr"
   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)**
   Logic Inputs, Current Sinking (active low)
   Input A:
   Internal 7.8KΩ pull-up resistor to +9 to 28 VDC
   Trigger levels: V_{IL} = 1.25 V max; V_{IH} = 2.75 V min; V_{MAX} = 28 VDC
   Input B:
   Internal 10KΩ pull-up resistor to +9 to 28 VDC
   Trigger levels: V_{IL} = 0.7 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. **USER INPUT (USR)**: Programmable function input
   Logic Input, Current Sinking (active low)
   Internal 10KΩ pull-up resistor to +9 to 28 VDC
   Trigger levels: V_{IL} = 0.7 V max; V_{IH} = 2.4 V min; V_{MAX} = 28 VDC
   Response Time: 5 msec typ.; 50 msec debounce (activation and release)
7. **MEMORY**: Nonvolatile E^2PROM memory retains all programming parameters and timer/counter values when power is removed.
8. **CONNECTIONS**: Wire clamping screw terminals
   Wire Strip Length: 0.3" (7.5 mm)
   Wire Gage: 30-14 AWG copper wire
   Torque: 5 inch-lbs (0.565 N-m) max.
9. **ENVIRONMENTAL CONDITIONS**:
   Operating Temperature Range for CUB5TR00: -35 to 75°C
   Operating Temperature Range for CUB5TB00 depends on display color and intensity level as per below:

	INTENSITY LEVEL	TEMPERATURE
Red Display	1 & 2	-35 to 75°C
	3	-35 to 70°C
	4	-35 to 60°C
	5	-35 to 50°C
Green Display	1 & 2	-35 to 75°C
	3	-35 to 65°C
	4	-35 to 50°C
	5	-35 to 35°C

   Storage Temperature: -35 to 85°C
   Operating and Storage Humidity: 0 to 85% max. relative humidity (non-condensing)
   Vibration According to IEC 68-2-6: Operational 5 to 500 Hz, in X, Y, Z direction for 1.5 hours, 5 g.
   Shock According to IEC 68-2-27: Operational 40 g, 11 msec in 3 directions.
   Altitude: Up to 2000 meters
10. **CERTIFICATIONS AND COMPLIANCES**:
    SAFETY
    UL Recognized Component, File #E179259, UL61010A-1, CSA 22.2 No. 61010-1
    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 Outdoor Enclosure rating (Face only), UL50
    IECEE CB Scheme Test Report #E179259-V01-S02
    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
    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
Power frequency magnetic fields	EN 61000-4-8	Criterion A 30 A/m

    Emissions:

Emissions	EN 55011	Class A

    Notes:
    1. Criterion A: Normal operation within specified limits.
    Refer to EMC Installation Guidelines for additional information.
11. **CONSTRUCTION**: This unit is rated for NEMA 4X/IP65 requirements for outdoor use. Installation Category I, Pollution Degree 2. High impact plastic case with clear viewing window. Panel gasket and mounting clip included.
12. **WEIGHT**: 3.2 oz (100 g)

Optional Plug-in Cards

ADDING OPTION CARDS

The CUB5T meters can be fitted with optional relay card and/or serial communications cards. The details for the plug-in cards can be reviewed in the specification section below. The plug-in cards, that are sold separately, can be installed initially or at a later date.

RELAY CARD

Type: Single FORM-C relay
Isolation To Sensor & User Input Commons: 1400 Vrms for 1 min.
Working Voltage: 150 Vrms
Contact Rating: 1 amp @ 30 VDC resistive; 0.3 amp @ 125 VAC resistive
Life Expectancy: 100,000 minimum operations
Response Time:
Turn On Time: 4 msec max.
Turn Off Time: 4 msec max.
Time Accuracy: ± 0.01%

WARNING: Disconnect all power to the meter before installing Plug-in card.

RS485 SERIAL COMMUNICATIONS CARD

Type: RS485 multi-point balanced interface (non-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
Transmit Delay: Selectable. 2 msec min. or 50 msec min.

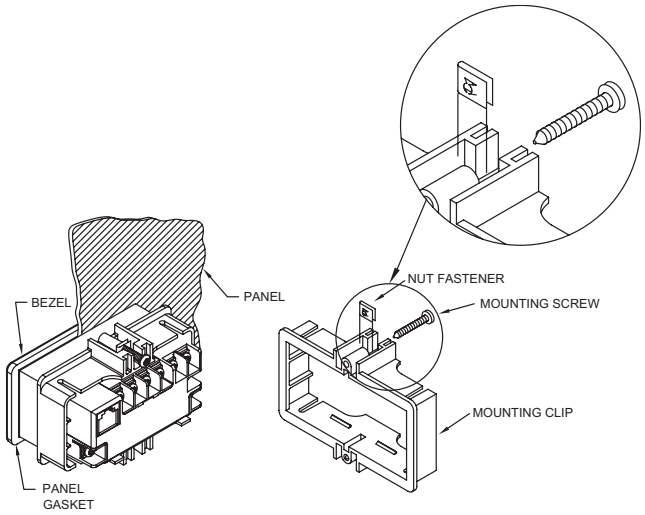
RS232 SERIAL COMMUNICATIONS CARD

Type: RS232 half duplex (non-isolated)
Baud Rate: 300 to 38400
Data Format: 7/8 bits; odd, even, or no parity

1.0 Installing the Meter

INSTALLATION

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



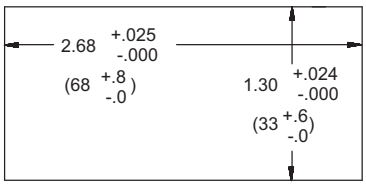
While holding the unit in place, push the panel latch over the rear of the unit so that the tabs of the panel latch engage in the slots on the case. The panel latch should be engaged in the farthest forward slot possible. To achieve a proper seal, tighten the latch screws evenly until the unit is snug in the panel (Torque to approx. 28 to 36 in-oz [0.202 to 0.26 N-m]). Do not over-tighten the screws.

INSTALLATION ENVIRONMENT

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

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

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



2.0 DIP Switches

The DIP switches on the main circuit board are not used with the CUB5T and must be left in the factory set position (all down). Setting any switch to the up position may cause improper operation of the meter.

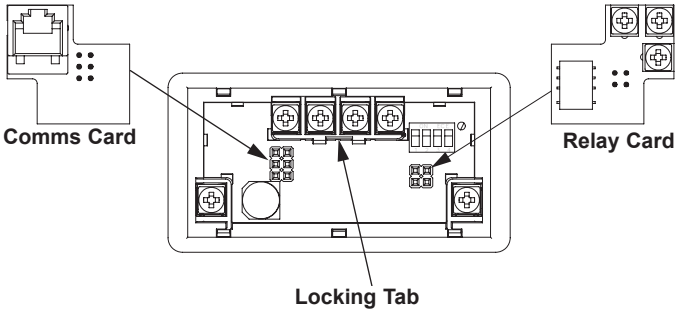
3.0 Installing Plug-In Cards

The Plug-in cards are separately purchased option cards that perform specific functions. The cards plug into the main circuit board of the meter after the rear cover is removed

WARNING: Disconnect all power to the meter before installing Plug-in Card.

REMOVING THE REAR COVER

To remove the rear cover, locate the cover locking tab below the 2nd and 3rd input terminals. To release the tab, insert a small, flat blade screwdriver between the tab and the plastic wall below the terminals. Inserting the screwdriver will provide enough pressure to release the tab locks. To replace the cover, align the cover with the input terminals and press down until the cover snaps into place.



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

4.0 Wiring the Meter

WIRING OVERVIEW

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

Strip the wire, leaving approximately 0.3" (7.5 mm) bare lead exposed (stranded wires should be tinned with solder.) Insert the lead under the correct screw-clamp terminal and tighten until the wire is secure. (Pull wire to verify tightness.) Each terminal can accept up to one #14 AWG (2.55 mm) wire, two #18 AWG (1.02 mm), or four #20 AWG (0.61 mm).

EMC INSTALLATION GUIDELINES

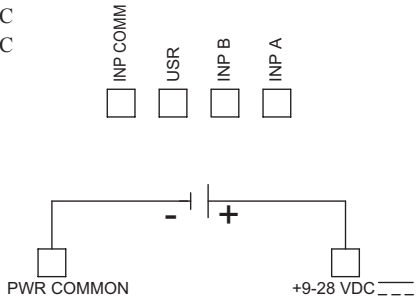
Although this meter is designed with a high degree of immunity to Electro-Magnetic Interference (EMI), proper installation and wiring methods must be followed to ensure compatibility in each application. The type of the electrical noise, source or coupling method into the meter may be different for various 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 mounted in a metal enclosure, which is 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.

4.1 POWER WIRING

DC Power

+9 to +28 VDC: +VDC
Power Common: -VDC

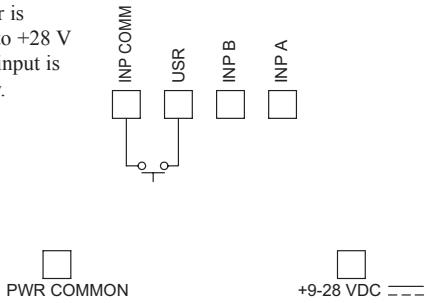


4.2 USER INPUT WIRING

Sinking Logic

INP COMM } Connect external switching device between the
USR } User Input terminal and Input Common.

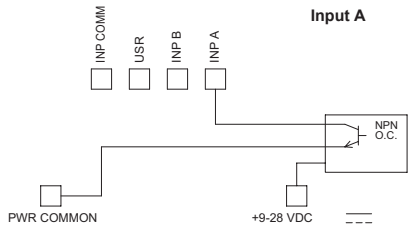
The user input of the meter is internally pulled up to +9 to +28 V with 10 K resistance. The input is active when it is pulled low.



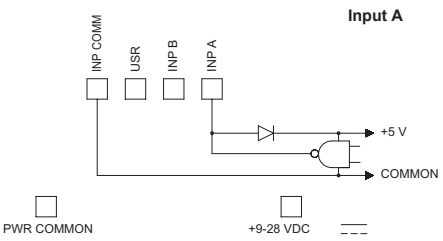
4.3 INPUT WIRING

CAUTION: Power input common is NOT isolated from user input common. In order to preserve the safety of the meter application, the power input 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 Inputs and User Input Common terminals. Appropriate considerations must then be given to the potential of the user input common with respect to earth ground; and the common of the plug-in cards with respect to input common.

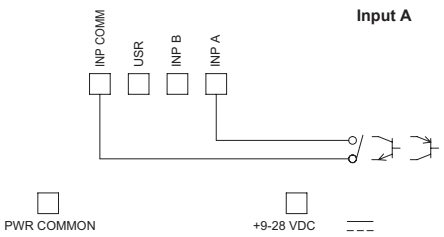
Current Sinking Output



Interfacing With TTL



Switch or Isolated Transistor; Current Sink



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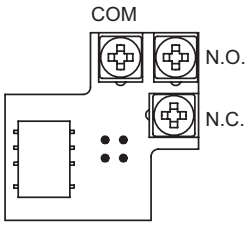
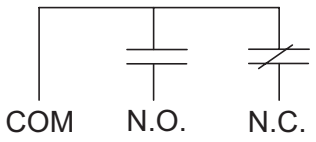
4.4 SETPOINT (OUTPUT) WIRING

SETPOINT RELAY PLUG-IN CARD

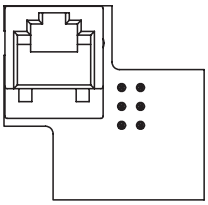


ELECTRICAL CONNECTIONS

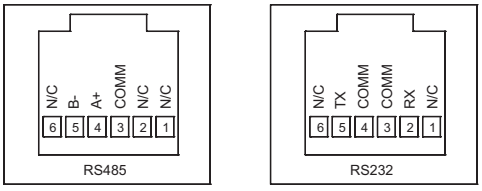


4.5 SERIAL COMMUNICATION WIRING

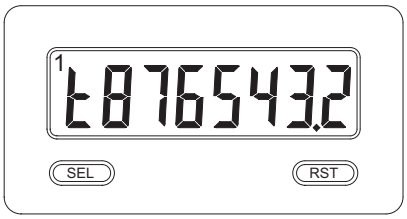
SERIAL COMMUNICATIONS PLUG-IN CARD



RJ11 CONNECTOR PIN OUTS



5.0 Reviewing the Front Buttons and Display



KEY	DISPLAY MODE OPERATION	ENTERING PROGRAM MODE	PROGRAMMING MODE OPERATION
SEL	Select display (timer or cycle counter)	Press and hold for 2 seconds to activate	Store selected parameter and index to next parameter
RST	Reset value(s) per Front Panel Reset setting		Advances through the program menu Increments selected parameter value or selection

OPERATING MODE DISPLAY DESIGNATORS

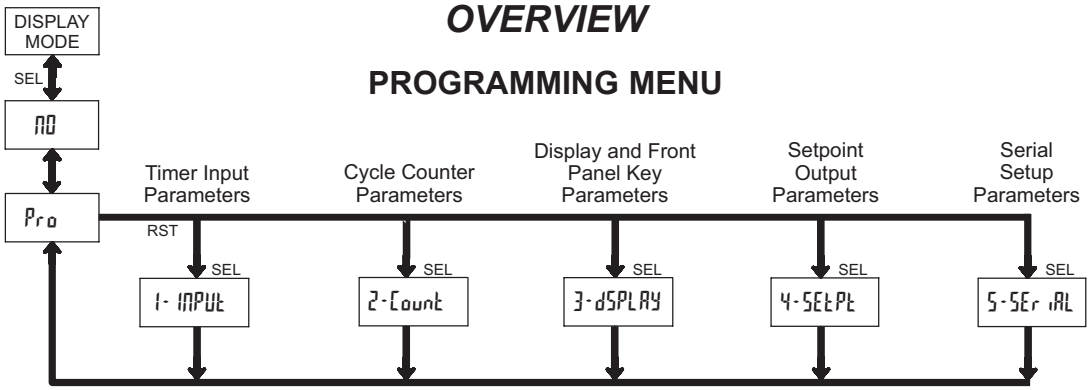
"t" - To the left of the display is the timer value.
"C" - To the left of the display is the cycle counter value.
"1" - To the upper left of the display indicates the setpoint status.

If display scroll is enabled, the display will toggle automatically every four seconds between the timer and cycle counter values.

6.0 Programming the Meter

OVERVIEW

PROGRAMMING MENU



PROGRAMMING MODE ENTRY (SEL 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 and holding the **SEL** 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 & RST KEYS)

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

MODULE MENU (SEL KEY)

Each module has a separate module menu (which is shown at the start of each module discussion). The **SEL** 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 **RST** key is used to move through the selections/values for that parameter. Pressing the **SEL** key, stores and activates the displayed selection/value. This also advances the meter to the next parameter.

For numeric values, press the **RST** key to access the value. The right hand most digit will begin to flash. Pressing the **RST** key again increments the digit by one or the user can hold the **RST** key and the digit will automatically scroll. The **SEL** key will advance to the next digit. Pressing and holding the **SEL** key will enter the value and move to the next parameter.

PROGRAMMING MODE EXIT (SEL KEY)

The Programming Mode is exited by pressing the **SEL** 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.

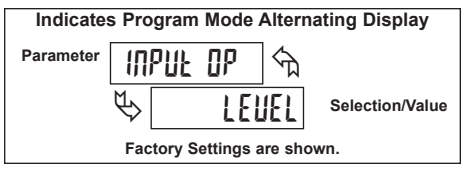
FACTORY SETTINGS

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

Pressing the **RST** key on power-up will load the factory settings and display rESEt. This allows operation in the event of a memory failure or corrupted data.

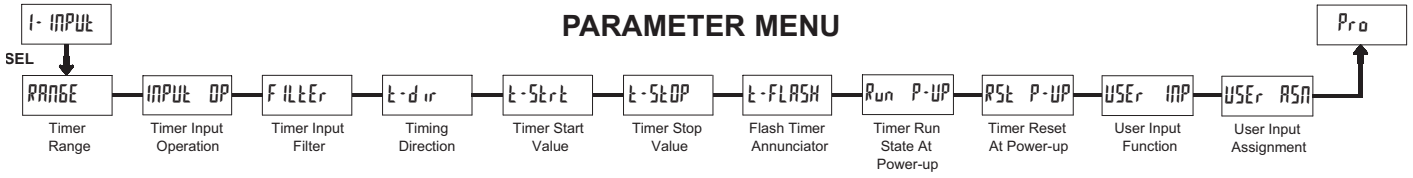
ALTERNATING SELECTION DISPLAY

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.

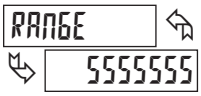


6.1 MODULE 1 - TIMER INPUT PARAMETERS (1-INPUT)

PARAMETER MENU



TIMER RANGE



18 TIMER RANGE SELECTIONS

(S = SEC; M = MIN; H = HR; d = DAY)

RANGE SELECTION	MAXIMUM DISPLAY	DISPLAY RESOLUTION
SECONDS		
5555555	9999999	1 SEC
555555.5	999999.9	0.1 SEC
55555.55	99999.99	0.01 SEC
5555.555	9999.999	0.001 SEC
MINUTES		
MMMMMM	9999999	1 MIN
MMMMMM.M	999999.9	0.1 MIN
MMMMM.MM	99999.99	0.01 MIN
HOURS		
HHHHHH	9999999	1 HR
HHHHH.H	999999.9	0.1 HR
HHHH.HH	99999.99	0.01 HR

RANGE SELECTION	MAXIMUM DISPLAY	DISPLAY RESOLUTION
MINUTES/SECONDS		
MMMM.SS	9999.59	1 SEC
MMM.S.S	999.5.9	0.1 SEC
MM.S.S.S	99.5.9.9	0.01 SEC
HOURS/MINUTES		
HHHH.MM	9999.59	1 MIN
HHH.M.M	999.5.9	0.1 MIN
HH.M.M.M	99.5.9.9	0.01 MIN
HOURS/MINUTES/SECONDS		
HHH.MM.SS	999.59.59	1 SEC
DAYS/HOURS/MINUTES		
ddd.HH.MM	999.23.59	1 MIN

TIMER INPUT OPERATION

LEVEL EdGE-1 EdGE-2 HOLd-2

LEV rSt Ed-1 rSt Ed-2 rSt HOLd rSt

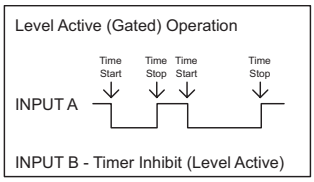
This parameter determines how the Timer Input Signals affect the Run/Stop status of the Timer. Timing diagrams are shown below for level active and edge triggered (1-input or 2-input) operation. For single input modes (Input A only), Input B provides a level active Timer Inhibit function. In the Display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

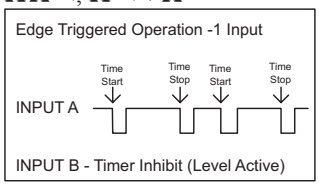
The Timer can also be stopped at a Timer Stop Value or at Setpoint output activation or deactivation. This type of Stop condition is cleared when a Timer Reset occurs, or another start edge is applied on the timer input.

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

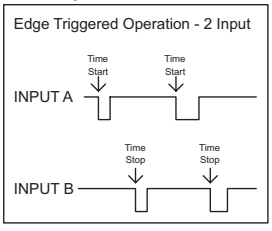
LEVEL, LEV rSt



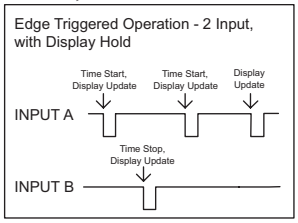
EdGE-1, Ed-1 rSt



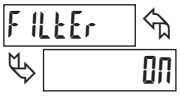
Ed9E-2, Ed-2 rSt



HOLd-2, HOLd rSt



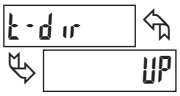
TIMER INPUT FILTER



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



UP dn

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

TIMER START VALUE

0000000 to 9999999

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.

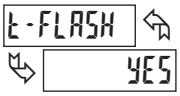
TIMER STOP VALUE

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.

0000000 to 9999999

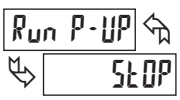
FLASH TIMER ANNUNCIATOR



NO YES

Select YES to have the timer annunciator (t) flash when the timer is running.

TIMER RUN STATE AT POWER-UP



StOP SAVE

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

D

TIMER RESET AT POWER-UP

RSt P-UP → NO / YES

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

USER INPUT FUNCTION

USEr InP → NO

DISPLAY	MODE	DESCRIPTION
NO	No Function	User Input disabled.
Pro Loc	Program Mode Lock-out	See Programming Mode Access chart (Module 3).
d-SELECt	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.
HOLd-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
Inhibit	Inhibit	Inhibit timing or counting for the selected value(s).
d-LEVEL	Display Intensity Level (Edge Triggered)	Increase intensity one level for each activation. (backlight version only)
Print	Print Request	Serial transmit of the active parameters selected in the Print Options menu (Module 5).
Prnt-rSt	Print and Reset	Same as Print Request followed by a momentary reset of the selected value(s).
rSt OUt	Reset Output	Edge triggered deactivation of the Setpoint Output.

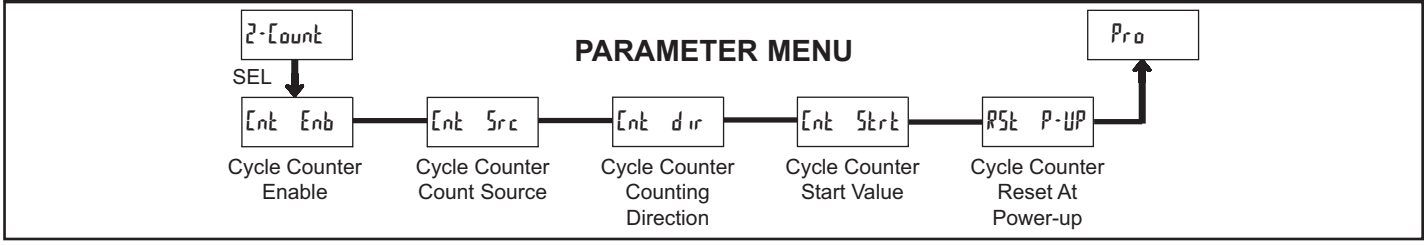
USER INPUT ASSIGNMENT

USEr ASn → t-VALUE / C-VALUE / both t-C

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.

D

6.2 MODULE 2 - CYCLE COUNTER PARAMETERS (2-Count)



CYCLE COUNTER ENABLE

Cnt Enb → NO / YES

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

CYCLE COUNTER COUNTING DIRECTION

Cnt dir → UP / dn

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

CYCLE COUNTER COUNT SOURCE

Cnt Src → t-rESEt

InPUt b / USr InP / t-rESEt / OUt-On / OUt-OFF

This parameter selects the source from which the Cycle Counter derives counts. The Timer Reset (t-rESEt) selection generates a count when either a manual or automatic timer reset occurs (See Module 4 for programming Automatic Reset). The Input B (InPUt 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. These selections will only generate counts when an optional Setpoint module is installed.

CYCLE COUNTER START VALUE

Cnt Strt → 000000 to 999999

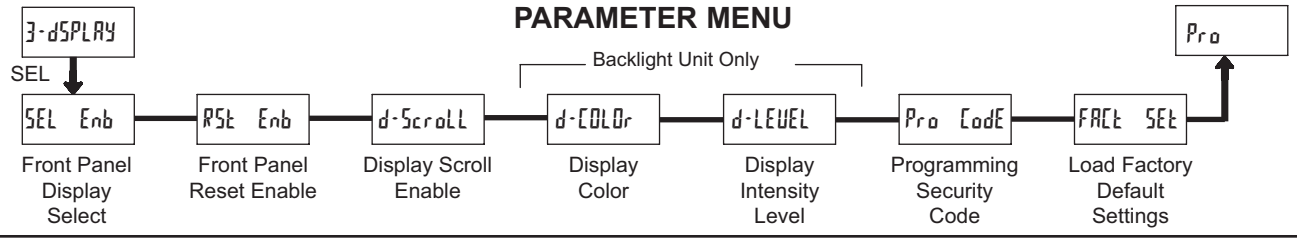
The Cycle Counter returns to this value whenever a Counter Reset occurs. Non-zero values are normally used for "down counting" applications, but can also provide an offset value when counting up.

CYCLE COUNTER RESET AT POWER-UP

RSt P-UP → NO / YES

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

6.3 MODULE 3 - DISPLAY AND FRONT PANEL KEY PARAMETERS (3-dSPLAY)



FRONT PANEL DISPLAY SELECT ENABLE (SEL)

SEL Enb / YES — YES NO

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

FRONT PANEL RESET ENABLE (RST)

RSt Enb / YES — YES NO; NO both t-C t-VALUE dSPLAY C-VALUE

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

DISPLAY SCROLL ENABLE

d-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 COLOR (BACKLIGHT UNIT ONLY)

d-COLOr / rEd — rEd Grn

Enter the desired display color, red or green. This parameter is active for backlight units only.

DISPLAY INTENSITY LEVEL (BACKLIGHT UNIT ONLY)

d-LEVEL / 5 — 1 to 5

Enter the desired Display Intensity Level (1-5). The display will actively dim or brighten as levels are changed. This parameter is active for backlight units only.

PROGRAMMING SECURITY CODE

Pro 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 (Pro 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 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 Pro CodE prompt in order to access Full Programming mode. Depending on the code value, Quick Programming may be accessible before the Pro CodE prompt appears (see chart).

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

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

LOAD FACTORY DEFAULT SETTINGS

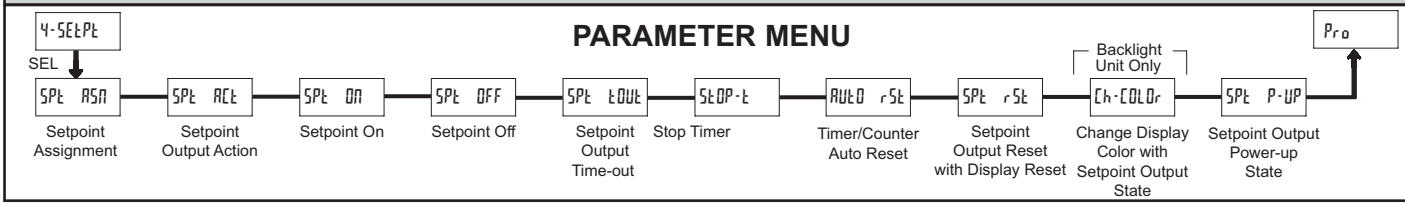
FACt SEt / NO — NO YES

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.

Pressing the **RST** key on power-up will load the factory settings and display rESEt. This allows operation in the event of a memory failure or corrupted data.

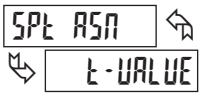
D

6.4 MODULE 4 - SETPOINT OUTPUT PARAMETERS (4-SETPT)



The Setpoint Output Parameters are only active when the optional relay module is installed in the meter. Some parameters will not appear depending on the Setpoint Assignment and Setpoint Output Action selected.

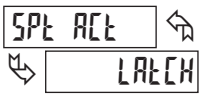
SETPOINT ASSIGNMENT



t-URLUE C-URLUE

Select the display for Setpoint assignment.

SETPOINT OUTPUT ACTION

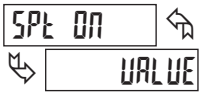


LAtCH
t-OUt
ON-OFF

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 SPt rSt = 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



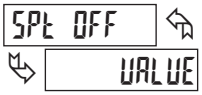
URLUE
t-Strt
t-StOP

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 URLUE 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.

0000000 to 9999999

SETPOINT OFF



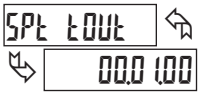
URLUE
t-Strt
t-StOP

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 URLUE 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.

0000000 to 9999999

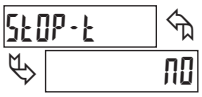
SETPOINT OUTPUT TIME-OUT



00.00.01 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

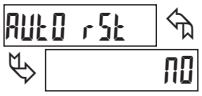


NO
Out-ON
Out-OFF

Stops the Timer when the Setpoint output activates (OUt-ON) or deactivates (OUt-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.

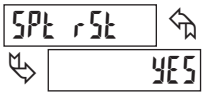
TIMER/COUNTER AUTO RESET



NO
Out-ON
Out-OFF

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

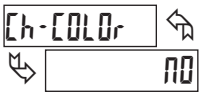
SETPOINT OUTPUT RESET WITH DISPLAY RESET



YES NO

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

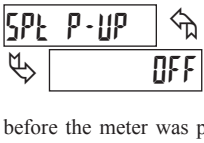
CHANGE DISPLAY COLOR w/SETPOINT OUTPUT STATE



NO YES

This parameter enables the backlight CUB5T to switch the display color when the Setpoint output activates. When the output deactivates, the display color will revert to the normal operating mode color. This parameter is only active for the backlight version.

SETPOINT OUTPUT POWER-UP STATE



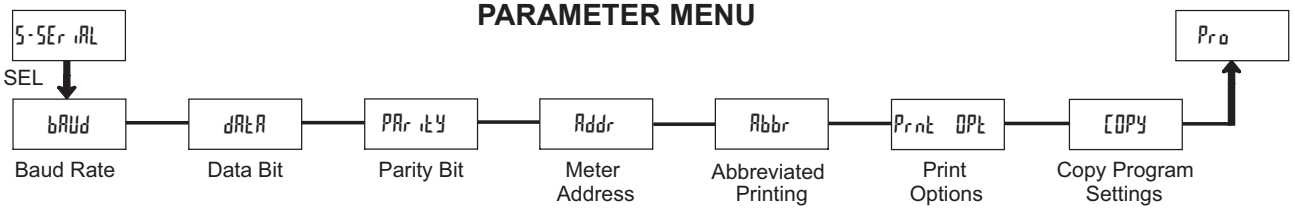
OFF
ON
SAVE

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.

D

6.5 MODULE 5 - SERIAL COMMUNICATIONS PARAMETERS (5-SEr iAL)

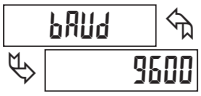
PARAMETER MENU



Module 5 is the programming module for the Serial Communications Parameters. These parameters are used to match the serial settings of the CUB5T with those of the host computer or other serial device. The Serial Setup Parameters are only accessible when an optional RS232 or RS485 serial communications module is installed in the meter.

This section replaces the bulletin shipped with the RS232 and RS485 serial communications plug-in cards. Discard the separate bulletin when using those serial plug-in cards with the CUB5T.

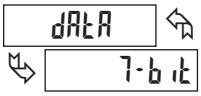
BAUD RATE



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.

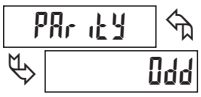
DATA BIT



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.

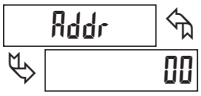
PARITY BIT



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.

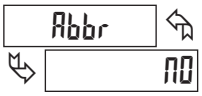
METER ADDRESS



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.

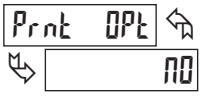
ABBREVIATED PRINTING



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" (Prnt 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, the Setpoint parameters will not be sent unless an optional setpoint card is installed in the meter.

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

D

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	7 digit, per Timer Range
B	Cycle Counter	CNT	T, V, R	6 digit
C	Timer Start	TST	T, V	7 digit, per Timer Range
D	Timer Stop	TSP	T, V	7 digit, per Timer Range
E	Counter Start	CST	T, V	6 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

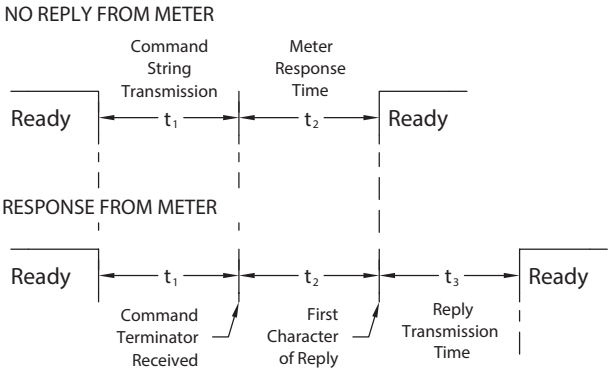
At the start of time interval t_2, the meter starts the interpretation of the command and when complete, performs the command function. This time interval t_2 varies. If no response from the meter is expected, the meter is ready to accept another command.

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.



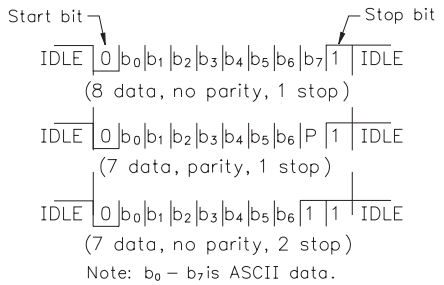
Timing Diagram Figure

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 CUB5T 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.

D

C48T SERIES - 1/16 DIN TIMERS

MODEL C48TS - SINGLE PRESET
MODEL C48TD - DUAL PRESET

- *LCD, 7 SEGMENT, 2 LINE, 6 DIGIT DISPLAY, POSITIVE REFLECTIVE OR NEGATIVE TRANSMISSIVE MODELS WITH RED TOP LINE AND GREEN BOTTOM LINE BACKLIGHTING*
- *SOLID STATE AND RELAY OUTPUT MODELS*
- *FIELD REPLACEABLE RELAY OUTPUT BOARDS*
- *STATUS INDICATORS FOR OUTPUTS*
- *NEMA 4X/IP65 SEALED FRONT BEZEL*
- *PROGRAMMABLE USER INPUTS AND FRONT PANEL FUNCTION KEY*
- *PARAMETER SECURITY VIA PROGRAMMABLE OPERATOR ACCESS PRIVILEGES AND PROTECTED VALUE MENU*
- *HORIZONTAL OR VERTICAL STACKING OF MULTIPLE UNITS*
- *85 to 250 VAC or 18 to 36 VDC/24 VAC POWERED UNITS*
- *RS485 SERIAL COMMUNICATIONS OPTION*
- *CHOICE OF NUMERIC DATA ENTRY MODES*

UL Recognized Component, File # E137808

D

DESCRIPTION

The Model C48 Timer is available in Single or Dual Preset models. The C48T features a 7 segment, 2 line by 6 digit reflective or backlit LCD display. For the backlit versions, the main display line is red and shows the timer value. The smaller secondary display line is green, and can be used to view the preset values or output time values.

The C48 timer can be configured for a variety of different operating modes to meet most timing application requirements. Twelve timing ranges are available from thousandths of a second to hours and minutes. Decimal Points are used to separate the time units (hours, minutes, seconds). Timing can be cumulative or can reset and start upon each power cycle. “On Delay” or “Off Delay”, “Single Shot”, “Repetitive auto cycling” modes are all supported.

The Timer can also be configured to Continue or Stop timing upon reaching Preset. The display can be programmed to stop at the preset value (Reset to Zero mode) or zero (Reset to Preset mode), or automatically reset to zero or preset and hold. Once stopped, the timer can be restarted by manually resetting it, or it can be programmed to restart when power is reapplied.

The C48 Timer has a Run/Stop Input, 3 programmable User Inputs, and a programmable front panel function key. The Run/Stop and User Inputs can be configured as sinking (active low) or sourcing (active high) inputs via a single plug jumper. The user inputs and the front panel function key can be configured to provide a variety of functions.

Four front panel push-buttons are used for programming the operating modes and data values, changing the viewed display, and performing user programmable functions, e.g. reset, etc. The C48T can be configured for one of two numeric data entry methods, digit entry or automatic scrolling. The digit entry method allows for the selection and incrementing of digits individually. The automatic scrolling method allows for the progressive change of one through all digit positions by pressing and holding the “up” or “down” button.

The Dual Preset models are available with solid-state or Relay outputs. The Single Preset model has a solid-state and relay output in parallel. All solid-state outputs are available in a choice of NPN current sinking or PNP current sourcing, open-collector transistor outputs. All relay output boards are field replaceable.

The optional RS-485 serial communication interface provides two-way communication between a C48 and other compatible equipment such as a printer, PLC, HMI, or a host computer. In multipoint applications (up to thirty-two), the address number of each C48 on the line can be programmed from 0 to 99. Data from the C48 can be interrogated or changed, and alarm output(s) may be reset by sending the proper command code via serial communications. PC software, SFC48, allows for easy configuration of controller parameters. These settings can be saved to disk for later use or used for multi-controller down loading. On-line help is provided within the software.

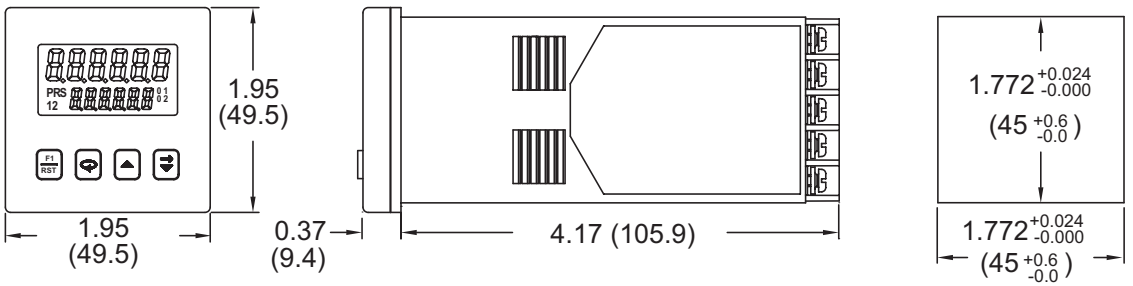
The unit is constructed of a lightweight, high impact plastic case with a textured front panel and a clear display window. The front panel meets NEMA 4X/IP65 specifications when properly installed. Multiple units can be stacked horizontally or vertically. Modern surface-mount technology, extensive testing, plus high immunity to noise interference makes the C48 Timers extremely reliable in industrial environments.

SAFETY SUMMARY

All safety related regulations, local codes and instructions that appear in the manual 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.

DIMENSIONS In inches (mm)



SPECIFICATIONS

1. **DISPLAY:** 2 Line by 6 digit LCD display; Positive image reflective or negative image transmissive with red (top line) and green (bottom line) backlighting.
   Main Display: 0.3" (7.62 mm) high digits
   Secondary Display: 0.2" (5.08 mm) high digits
   Annunciators:
   Value: PRS, 1, and 2
   Output: 01 and 02
2. **POWER REQUIREMENTS:**
   AC Versions (C48CXXX0X):
   AC Power: 85 to 250 VAC, 50/60 Hz, 9 VA max.
   DC Power: 11 to 14 VDC @ 150 mA max. (Non PNP output models)
   Note: Models with PNP current sourcing outputs must be powered from AC.
   DC Versions (C48CXXX1X):
   CONTINUOUS:
   DC Power: 18 to 36 VDC; 5.5 W max.
   AC Power: 24 VAC ±10%; 50/60 Hz; 7 VA max.
   Note: The +10% tolerance range on AC input voltage must be strictly adhered to. DO NOT EXCEED 26.4 VAC.
   PEAK (START-UP CURRENT):
   AC or DC Power: 500 mA peak start-up current for 10 msec max.

   DC OUT (V_{SRC} IN) - Terminal 10
   For units which do not have PNP current sourcing outputs, this terminal provides a DC output for sensor power (+12 VDC ±15%). The maximum sensor current is 100 mA.
   For units with PNP current sourcing outputs, this terminal serves a dual purpose depending on the application's PNP output voltage level and current requirements.
   1. The terminal may be used as a +12 VDC output for sensor power. In this case, the PNP output voltage level will be +12 VDC (±15%). A maximum of 100 mA is available for the combination of sensor current and PNP output sourcing current.
   2. If a higher PNP output voltage level or additional output sourcing current is desired, an external DC supply may be connected between the "DC OUT (V_{SRC} IN)" and "COMM." terminals. This supply will determine the PNP output voltage level, and must be in the range of +13 to +30 VDC.
      An external DC supply can also provide the additional output sourcing current required in applications where two or more PNP outputs are "ON" simultaneously. However, the maximum current rating of 100 mA per individual output must not be exceeded, regardless of external supply capacity.
3. **MEMORY:** Nonvolatile E^2PROM retains all programmable parameters and timer values.
4. **SENSOR POWER:** +12 VDC (± 15%) @ 100 mA max.
5. **INPUTS:** Run/Stop, Usr. In1, Usr In2, and Usr. In3.
   Configurable as current sinking (active low) or current sourcing (active high) inputs via a single plug jumper.
   Current Sinking (active low): V_{IL} = 1.5 VDC max, 22 KΩ pull-up to 5 VDC.
   Current Sourcing (active high): V_{IH} = 3.5 VDC min., V_{IN} max = 30 VDC; 22 KΩ pull-down.
   Run/Stop Response Time: 250 µsec max.
   User Input Response Time: 5 msec max.
6. **TIME ACCURACY**: ± 0.01%
7. **OUTPUTS:** (Output type and quantity are model dependent)
   Solid-State:
   NPN Open Collector: I_{SNK} = 100 mA max. @ V_{OL} = 1.1 VDC max; V_{OH} = 30 VDC max.
   PNP Open Collector: I_{SRC} = 100 mA max.(See note); V_{OH} = 12 VDC ±15% (using internal supply); V_{OH} = 13 to 30 VDC (using external supply).
   Note: The internal supply of the C48T can provide a total of 100 mA for the combination of sensor current and PNP output sourcing current. The supply voltage is +12 VDC (±15%), which will be the PNP output voltage level when using only the internal supply.
   If additional PNP output sourcing current or a higher output voltage level is desired, an external DC supply may be connected between the "DC Out/In" and "Comm." terminals. This supply will determine the PNP output voltage level, and must be in the range of +13 to +30 VDC.
   An external supply can provide the additional output sourcing current required in applications where two or more outputs are "ON" simultaneously. However, the maximum rating of 100 mA per individual output must not be exceeded, regardless of external supply capacity.
   Relay: Form A contact, Rating = 5 A @ 250 VAC, 30 VDC (resistive load), 1/10 HP @ 120 VAC (inductive load)
   Relay Life Expectancy: 100,000 cycles min. at max. load rating
   Programmable Timed Output(s): User selectable output time resolution
   0.01 Second Resolution: 0.01 to 99.99 seconds, ± 0.01% + 10 msec max.
   0.1 Second Resolution: 0.1 to 999.9 Seconds, ± 0.01% + 100 msec max.
8. **RS485 SERIAL COMMUNICATIONS (Optional)**: Up to 32 units can be connected.
   Baud Rate: Programmable from 1200 to 9600 baud
   Address: Programmable from 0 to 99
   Data Format: 10 Bit Frame, 1 start bit, 7 or 8 data bits, 1 or No Parity bit, and 1 stop bit
   Parity: Programmable for Odd (7 data bits), Even (7 data bits), or None (8 data bits)
9. **CERTIFICATIONS AND COMPLIANCES**:
   UL Recognized Component, File #E137808
   Recognized to U.S. and Canadian requirements under the Component Recognition Program of Underwriters Laboratories, Inc.
   ELECTROMAGNETIC COMPATIBILITY

Immunity to EN 50082-2		
Electrostatic discharge	EN 61000-4-2	Level 2; 4 Kv contact Level 3; 8 Kv air
Electromagnetic RF fields	EN 61000-4-3	Level 3; 10 V/m 80 MHz - 1 GHz
Fast transients (burst)	EN 61000-4-4	Level 4; 2 Kv I/O Level 3; 2 Kv power
RF conducted interference	EN 61000-4-6	Level 3; 10 V/rms 150 KHz - 80 MHz
Simulation of cordless telephone	ENV50204	Level 3; 10 V/m 900 MHz ± 5 MHz 200 Hz, 50% duty cycle
Emissions to EN 50081-2		
RF interference	EN 55011	Enclosure class A

   Notes:
   AC VERSIONS
   1. A power line filter, RLC#LFIL0000 or equivalent, was installed when the unit was DC powered.
   DC VERSIONS
   To insure compliance with the EMC standards listed above, do not connect any wires from the terminal(s) labeled "COMM." to the "DC-" supply terminal (12), when powering the unit from a DC supply.
   Refer to EMC Installation Guidelines section of the manual for additional information.
10. **ENVIRONMENTAL CONDITIONS**:
    Operating Temperature: 0°C to 50°C
    Storage Temperature: -40°C to 70°C
    Operating and Storage Humidity: 85% max. relative humidity (non-condensing) from 0°C to 50°C.
    Altitude: Up to 2000 meters
11. **ELECTRICAL CONNECTION**: Wire clamping screw terminals.
12. **CONSTRUCTION**: Black plastic case with collar style panel latch. The panel latch can be installed for horizontal or vertical stacking. Black plastic textured bezel with clear display viewing window. Unit assembly with circuit boards can be removed from the case without removing the case from the panel or disconnecting the wiring. This unit is rated for NEMA 4X/IP65 indoor use. Installation Category II, Pollution Degree 2.
13. **WEIGHT**: 6.0 oz. (170 g)

SINGLE PRESET MODELS

The C48TS offers a choice of twelve timing ranges with eighteen different operating modes. The unit has a solid-state output that operates in parallel with a relay output. The solid-state output is available as an NPN or PNP open collector transistor.

DUAL PRESET MODELS

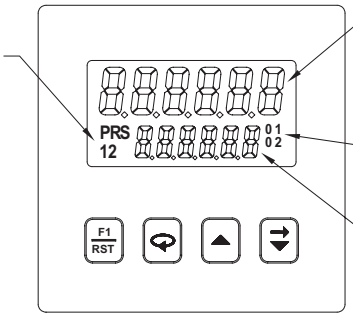
The C48TD offers a choice of twelve timing ranges with 42 operating modes. The unit is available with solid-state or relay outputs. The solid-state outputs are available as NPN or PNP open collector transistors.

FRONT PANEL FEATURES

The C48 Timer features a dual line display. In the normal operating mode (main display), the timer value is shown on the top line and preset or output time values are shown on the bottom line. The Presets or Output time values can be programmed to be viewable only, viewable and changeable, or locked (not viewable) from the main display.

In the normal operating mode, the presets and output time values are accessible providing that these values are not programmed for 'L'ocked. Values that are accessible (changeable) can be changed immediately when viewed in the secondary display.

VALUE ANNUNCIATORS
Indicate which value is being viewed or modified.



MAIN DISPLAY
Displays timer value.
Also displays mnemonic of selected parameter in Programming Menu.

OUTPUT ANNUNCIATORS

SECONDARY DISPLAY
Displays the preset or output time values.
Also displays mnemonic or numeric value when modifying a parameter.

USER INTERFACE/PROGRAMMING MODES

The operating modes of the C48T are programmed using the front panel keypad. To enter the programming menu, the ⟲ key is pushed and held for 2 seconds. Within the programming menu, the ⟲ key is used to sequence through the list of programming parameters.

PROGRAMMING MENU

DISPLAY	PARAMETER DESCRIPTION
EntrY	- Digit or Auto Scrolling Data Entry Mode
trAnGE	- Timer Range Modes (See Table on following page)
OPEr	- Timer Operating Modes (See Table on following page)
rStPuP	- Reset at Power up
Ac PrS	- Accessibility of Preset Values
PrESEt	- Preset 1 and 2 Values
P1trAc	- P1 Track P2 (C48TD only)
Ac Out	- Accessibility of Output Time Values
OutrES	- Output Resolution
OutPut	- Output 1 and 2 Time Values
rEVOut	- Reverse Output/Relay Logic
rEVAnu	- Reverse Output Annunciator Logic
OutPuP	- Power up Output State
USr In1	- User Input 1
USr In2	- User Input 2
USr In3	- User Input 3
USr F1	- User F1 Key
CodE	- Programming/Protected Parameter Menu Code
ScroLL	- Scroll Display
SErSEt	- Serial Baud Rate and Parity Settings (RS485 option only)
SErAdr	- Serial Unit Address (RS485 option only)
SErAbr	- Abbreviate Serial Mnemonics (RS485 option only)
PrnOPt	- Print Options (RS485 option only)
PrnrSt	- Print and Reset Time Value (RS485 option only)
FAcSEt	- Load Factory Default Settings

FRONT PANEL KEYPAD

F1/RST - Performs user Programmed Function

⟲
- Cycles through secondary displays.
- Enters Programming Mode or Protected Value Menu when pushed and held for 2 seconds.
- Scrolls through programming displays.
- Enters Data Values.

▲
- Selects next available mode in programming mode.
- Increments digit in Digit Entry mode.
- Increments value in Auto Scrolling entry mode.

⇉
- Selects Data Entry mode for displayed data values.
- Selects Digit to right when in Digit Entry mode.
- Decrements value in Auto Scrolling entry mode.

Program Security/Operator Accessible Values

The Program Disable Plug Jumper, Programmable Code Value, User Input (programmed for Program Disable), and the Accessible value parameter settings provide various levels of security against unauthorized programming changes. The accessible value parameters provide individual access or locking of each value.

Protected Value Menu

The Protected Value Menu allows access to selected presets and timed output values without having them viewable or changeable from the main display. To enter the protected menu, the ⟲ key is pressed and held, and a programmed code value is entered.

Timer Range Modes - trAnGE

The timer can be configured to operate in one of 12 time ranges. The table below shows the various ranges available with the time resolution of each range.

MODE	RANGE	RESOLUTION
SEC.000	999.999 Seconds	0.001 sec
SEC.00	9999.99 Seconds	0.01 sec
SEC.0	99999.9 Seconds	0.1 sec
SEC	999999 Seconds	1 sec
n.000	999.999 Minutes	0.001 min
n.00	9999.99 Minutes	0.01 min
n.0	99999.9 Minutes	0.1 min
n.SEC	9999.59 Minutes.Seconds	1 sec
n.SEC.0	999.59.0 Minutes.Seconds.0	0.1 sec
hn.SEC	99.59.59 Hours.Minutes.Seconds	1 sec
hn.00	99.59.99 Hours.Minutes.00	0.01 min
hn.0	999.59.9 Hours.Minutes.0	0.1 min

Programmable Operating Modes - OPEr

These modes determine the operational characteristics of the timer. In the tables, 01 and 02 refer to Output 1 and Output 2 respectively.

SINGLE PRESET OPERATING MODES	
1 - Manual Reset to Zero, Latched Output	10 - Stop Timer at 01, Manual Reset to Zero, Timed Output
2 - Manual Reset to Zero, Timed Output	11 - Stop Timer at 01, Manual Reset to Preset, Latched Output
3 - Manual Reset to Preset, Latched Output	12 - Stop Timer at 01, Manual Reset to Preset, Timed Output
4 - Manual Reset to Preset, Timed Output	13 - Stop Timer at 01, Auto Reset to Zero, Latched Output
5 - Auto Reset to Zero, Timed Output	14 - Stop Timer at 01, Auto Reset to Zero, Timed Output
6 - Auto Reset to Preset, Timed Output	15 - Stop Timer at 01, Auto Reset to Preset, Latched Output
7 - Auto Reset to Zero at 01 End, Timed Output	16 - Stop Timer at 01, Auto Reset to Preset, Timed Output
8 - Auto Reset to Preset at 01 End, Timed Output	17 - Stop Timer at 01, Auto Reset to Zero at 01 End, Timed Output
9 - Stop Timer at 01, Manual Reset to Zero, Latched Output	18 - Stop Timer at 01, Auto Reset to Preset at 01 End, Timed Output

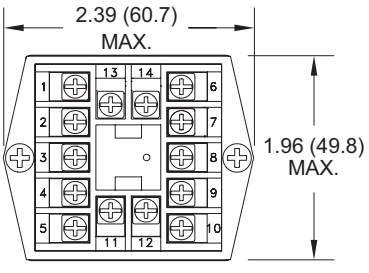
DUAL PRESET OPERATING MODES	
1 - Manual Reset to Zero, Latched Outputs	22 - Stop Timer at 02, Manual Reset to Zero, 01 off at 02, 02 Latched
2 - Manual Reset to Zero, 01 Timed, 02 Latched	23 - Stop Timer at 02, Manual Reset to Zero, 01 off at 02, 02 Timed
3 - Manual Reset to Zero, 01 and 02 Timed	24 - Stop Timer at 02, Manual Reset to Preset 2, Latched Outputs
4 - Manual Reset to Zero, 01 off at 02, 02 Latched	25 - Stop Timer at 02, Manual Reset to Preset 2, 01 Timed, 02 Latched
5 - Manual Reset to Zero, 01 off at 02, 02 Timed	26 - Stop Timer at 02, Manual Reset to Preset 2, 01 and 02 Timed
6 - Manual Reset to Preset 2, Latched Outputs	27 - Stop Timer at 02, Manual Reset to Preset 2, 01 off at 02, 02 Latched
7 - Manual Reset to Preset 2, 01 Timed, 02 Latched	28 - Stop Timer at 02, Manual Reset to Preset 2, 01 off at 02, 02 Timed
8 - Manual Reset to Preset 2, 01 and 02 Timed	29 - Stop Timer at 02, Auto Reset to Zero, Latched Outputs
9 - Manual Reset to Preset 2, 01 off at 02, 02 Latched	30 - Stop Timer at 02, Auto Reset to Zero, 01 Timed, 02 Latched
10 - Manual Reset to Preset 2, 01 off at 02, 02 Timed	31 - Stop Timer at 02, Auto Reset to Zero, 01 and 02 Timed
11 - Auto Reset to Zero, 01 and 02 Timed	32 - Stop Timer at 02, Auto Reset to Zero, 01 off at 02, 02 Latched
12 - Auto Reset to Zero, 01 off at 02, 02 Timed	33 - Stop Timer at 02, Auto Reset to Zero, 01 off at 02, 02 Timed
13 - Auto Reset to Preset 2, 01 and 02 Timed	34 - Stop Timer at 02, Auto Reset to Preset 2, Latched Outputs
14 - Auto Reset to Preset 2, 01 off at 02, 02 Timed	35 - Stop Timer at 02, Auto Reset to Preset 2, 01 Timed, 02 Latched
15 - Auto Reset to Zero at 02 End, 01 and 02 Timed	36 - Stop Timer at 02, Auto Reset to Preset 2, 01 and 02 Timed
16 - Auto Reset to Zero at 02 End, 01 off at 02, 02 Timed	37 - Stop Timer at 02, Auto Reset to Preset 2, 01 off at 02, 02 Latched
17 - Auto Reset to Preset 2 at 02 End, 01 and 02 Timed	38 - Stop Timer at 02, Auto Reset to Preset 2, 01 off at 02, 02 Timed
18 - Auto Reset to Preset 2 at 02 End, 01 off at 02, 02 Timed	39 - Stop Timer at 02, Auto Reset to Zero at 02 End, 01 and 02 Timed
19 - Stop Timer at 02, Manual Reset to Zero, Latched Outputs	40 - Stop Timer at 02, Auto Reset to Zero at 02 End, 01 off at 02, 02 Timed
20 - Stop Timer at 02, Manual Reset to Zero, 01 Timed, 02 Latched	41 - Stop Timer at 02, Auto Reset to Preset 2 at 02 End, 01 and 02 Timed
21 - Stop Timer at 02, Manual Reset to Zero, 01 and 02 Timed	42 - Stop Timer at 02, Auto Reset to Preset 2 at 02 End, 01 off at 02, 02 Timed

D

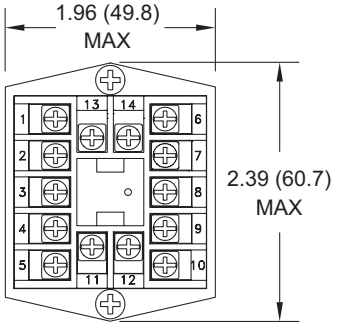
MULTIPLE UNIT STACKING

The C48T is designed for close spacing of multiple units. Units can be stacked either horizontally or vertically. For vertical stacking, install the panel latch with the screws to the sides of the unit. For horizontal stacking, the panel latch screws should be at the top and bottom of the unit. The minimum spacing from center line to center line of the units is 1.96" (49.8 mm). This spacing is the same for vertical or horizontal stacking.

Note: When stacking units, provide adequate panel ventilation to ensure that the maximum operating temperature range is not exceeded.

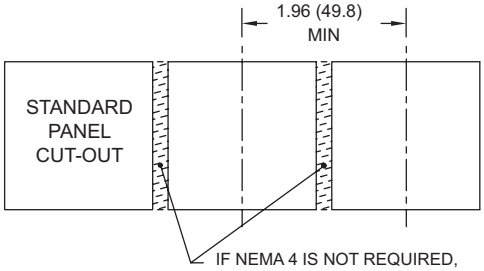


PANEL LATCH INSTALLED FOR VERTICAL UNIT STACKING



PANEL LATCH INSTALLED FOR HORIZONTAL UNIT STACKING

PANEL CUT-OUT SPACING FOR MULTIPLE UNIT STACKING.
HORIZONTAL ARRANGEMENT SHOWN.



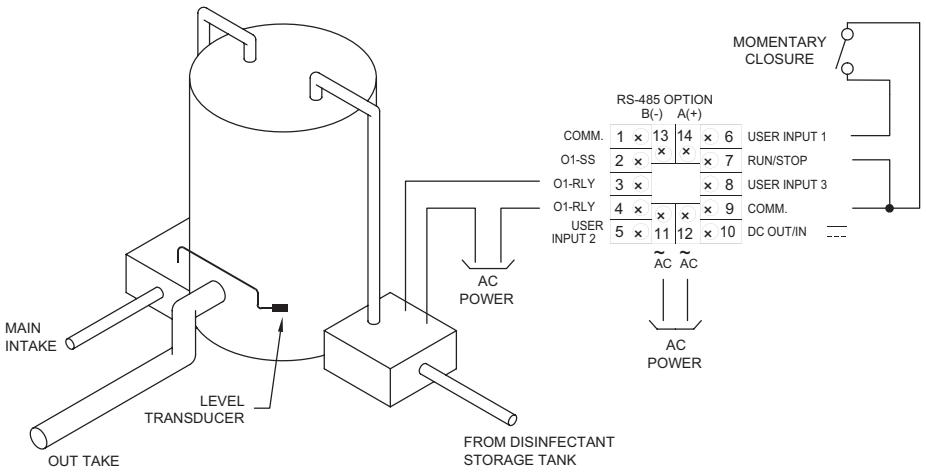
IF NEMA 4 IS NOT REQUIRED,
THIS PANEL MATERIAL MAY BE REMOVED.

APPLICATION

ONE SHOT TIMING CYCLE

Proper wash down mixture for a food processing plant is an important factor in maintaining the clean environment required. A disinfectant solution is added to the mixing/holding tank used for the wash down cycle. When the holding tank is near empty, a level transducer activates the filler pump. A C48TS is used to turn on the disinfectant solution pump for a preprogrammed amount of time during the filling process of the holding tank.

When the filler pump starts, a momentary contact closure activates User Input 1, resetting the C48 Timer. The timer begins the timing cycle since the run terminal is connected to common. The normally open relay contacts close at the timer reset signal activating the disinfectant solution pump. When the programmed preset is reached, timing stops and the relay deactivates, turning off the pump controlling the disinfectant solution. The C48 Timer's preset cycle time may be changed according to the manufacturer's concentration level of the disinfectant.



PROGRAMMING

EntrY	Auto Sc
trAnGE	nSEC (min & sec)
OPEr	09
rStPuP	no
Ac PrS	-Y (yes)
PrESEt	xxxx.xx
rEUOut	-Y (yes)
rEUAnu	-n (no)
OutPuP	-F (off)
USr In1	rSt-E
USr In2	Prod.S
USr In3	ChGdSP
USrF1	rSt-E
CodE	xxxx
ScroLL	no

D

ORDERING INFORMATION

MODEL NO.	DESCRIPTION	* NPN O.C. OUTPUT(S)	RELAY OUTPUT(S)	RS485	PART NUMBERS FOR AVAILABLE SUPPLY VOLTAGES	
					18-36 VDC/24VAC	85 to 250 VAC
C48T	1 Preset Timer, Reflective LCD	Yes	Yes	No	C48TS013	C48TS003
	1 Preset Timer, Backlit LCD	Yes	Yes	No	C48TS113	C48TS103
	2 Preset Timer, Reflective LCD	No	Yes	No	C48TD012	C48TD002
	2 Preset Timer, Reflective LCD	No	Yes	Yes	C48TD017	C48TD007
	2 Preset Timer, Reflective LCD	Yes	No	Yes	N/A	C48TD005
	2 Preset Timer, Backlit LCD	No	Yes	No	C48TD112	C48TD102
	2 Preset Timer, Backlit LCD	No	Yes	Yes	C48TD117	C48TD107
	2 Preset Timer, Backlit LCD	Yes	No	Yes	N/A	C48TD105

* PNP O.C. output(s) versions are available, contact the factory.

RELAY OUTPUT BOARDS

MODEL NO.	DESCRIPTION	NPN O.C. OUTPUT	PNP O.C. OUTPUT	RELAY OUTPUT(S)	PART NUMBER
RBC48	Single Preset	Yes	No	Yes	RBC48001
	Dual Preset	No	No	Yes	RBC48003

ACCESSORIES

MODEL	DESCRIPTION	PART NUMBER
SFC48	PC Configuration Software for Windows 3.x and 95 (3.5"disk) (for RS-485 Models)	SFC48

MODEL PAX-1/8 DIN PRESET TIMER (PAXTM) & REAL-TIME CLOCK (PAXCK)

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

CE

- *6-DIGIT 0.56" RED SUNLIGHT READABLE DISPLAY*
- *4 SEPARATE DISPLAYS (Timer, Counter, Real-Time Clock, and Date)*
- *CYCLE COUNTING CAPABILITY*
- *PROGRAMMABLE FUNCTION KEYS/USER INPUTS*
- *FOUR SETPOINT ALARM OUTPUTS (W/Plug-in card)*
- *COMMUNICATIONS AND BUS CAPABILITIES (W/Plug-in card)*
- *BUS CAPABILITIES: DEVICENET, MODBUS and PROFIBUS-DP*
- *CRIMSON® PROGRAMMING SOFTWARE*
- *NEMA 4X/IP65 SEALED FRONT BEZEL*

GENERAL DESCRIPTION

The PAXTM (PAX® Timer) and PAXCK (PAX® Clock/Timer) offer many features and performance capabilities to suit a wide range of industrial applications. Both can function as an Elapsed Timer or Preset Timer, while the PAXCK also offers Real-Time Clock with Date capability. The Plug-in option cards allow the opportunity to configure the meter for the present application, while providing easy upgrades for future needs.

Both units can function as an Elapsed Time Indicator. By using two separate signal inputs and 23 selectable timer ranges, the meters can be programmed to meet most any timing application. With the addition of a Plug-in Setpoint card, they can easily become a dual or quad output preset timer.

The PAXCK can also operate as a Real-Time Clock (RTC), with the Real-Time Clock Card already installed. The meter is capable of displaying time in 12 or 24-hour time formats. The 12-hour format can be displayed in hours and minutes, with or without an AM/PM indication or in hours, minutes, and seconds. The 24-hour format can be displayed in hours and minutes or in hours, minutes, and seconds. The PAXCK is also capable of a calendar display in which the day, month and/or year can be displayed. The meter will recognize leap years, and can automatically adjust for Daylight Savings Time. The Real-Time Clock has the ability to externally synchronize with other PAXCK meters to provide a uniform display network throughout the plant.

If the application calls for both a Preset Timer and a Real-Time Clock at the same time, the PAXCK can handle this requirement as well. The meter provides up to four different displays, accessed via front panel push buttons or external inputs. The displays are Timer (TMR), which displays the current timer value; Count (CNT), which displays the current cycle counter value; Date (DAT), which displays the current programmed date; and Real-Time Clock, which displays the current time. A battery-backed Real-Time Clock plug-in card is provided with the PAXCK. This card, which includes a lithium coin-cell battery, will maintain the time and date when main power is removed.

The meters accept inputs from a variety of sources including switch contacts and outputs from CMOS or TTL circuits. The input can be configured to trigger on the edge or level of the incoming pulse. Internal jumpers are available to allow the selection for sinking inputs (active low) or sourcing inputs (active high).

The front panel keys and three user inputs are programmable to perform various meter functions. One of the functions includes exchanging parameter lists, allowing for two separate listings of setpoint values, timer start/stop values, counter start/stop values and RTC daily on and off values.

The meters can have up to four setpoint outputs, determined by the optional plug-in cards. The setpoint plug-in cards provide dual FORM-C relays (5A), quad FORM-A relays (3A) or either quad sinking or quad sourcing open collector logic outputs. The outputs can be assigned to the timer, counter, RTC date, and RTC time. The outputs can also be independently configured to suit a variety of control and alarm requirements.

Plug-in cards can also provide serial communications. These include RS232, RS485, Modbus, DeviceNet, and Profibus-DP. Display values, setpoint alarm values and setpoint states can be controlled through serial communications. With the RS232 or RS485 communication card installed, it is possible to configure the meter using a Windows® based program. The meter configuration data can be saved to a file for later recall.

Once the meters have been initially configured, the parameter list may be locked out from further modification entirely, or the setpoint, timer start/stop values, counter start/stop values, RTC time SET, and Display Intensity can be made accessible. This lockout is possible through a security code or user input.

The meters have been specifically designed for harsh industrial environments. With a NEMA 4X/IP65 sealed bezel and extensive testing to meet CE requirements, the meter provides a tough yet reliable application solution.

SAFETY SUMMARY

All safety related regulations, local codes and instructions that appear in this literature or on equipment must be observed to ensure personal safety and to prevent damage to either the instrument or equipment connected to it. If equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

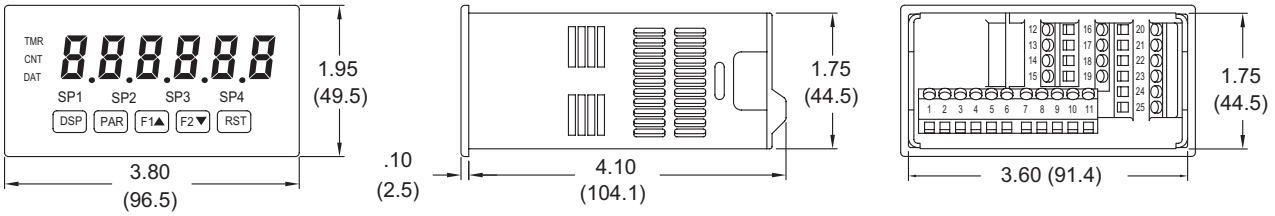
Do not use this unit to directly command motors, valves, or other actuators not equipped with safeguards. To do so can be potentially harmful to persons or equipment in the event of a fault to the unit.

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

CAUTION: Risk of electric shock.

DIMENSIONS In inches (mm)

Note: Recommended minimum clearance (behind the panel) for mounting clip installation is 2.1" (53.4) H x 5" (127) W.



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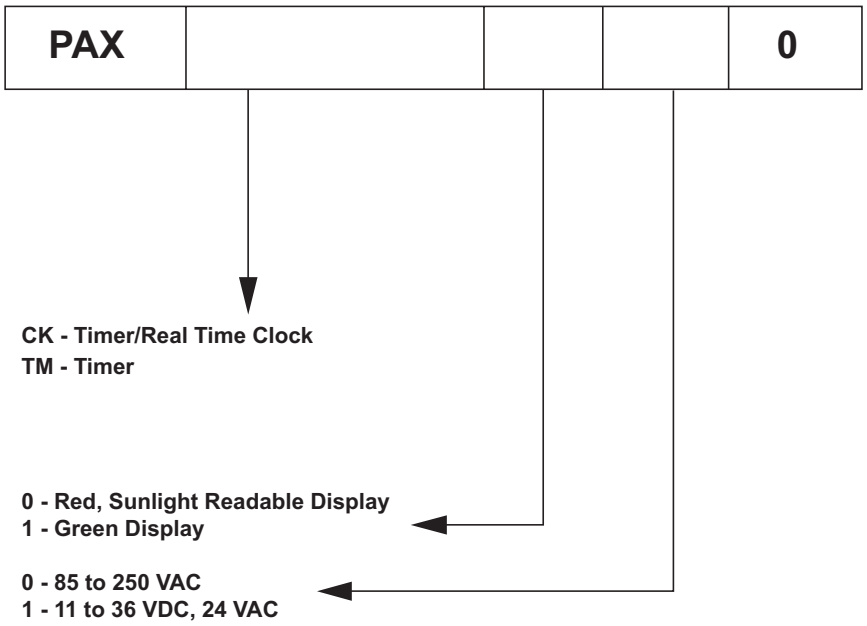
Ordering Information

Meter Part Numbers



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Option Card and Accessories Part Numbers

TYPE	MODEL NO.	DESCRIPTION	PART NUMBER
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 Card with Terminal Block	PAXCDC10
		Extended RS485 Serial Communications Card with Dual RJ11 Connector	PAXCDC1C
		RS232 Serial Communications Card with Terminal Block	PAXCDC20
		Extended RS232 Serial Communications 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
	PAXRTC	Real-Time Clock Card (Replacement Only)	PAXRTC00
Accessories	SFCRD *	Crimson PC Configuration Software for Windows 98, ME, 2000 and XP	SFCRD200

**Crimson® software is available for download from http://www.redlion.net/*

General Meter Specifications

1. **DISPLAY**: 6 digit, 0.56" (14.2 mm) red sunlight readable or standard green LED
2. **POWER**:
   AC Versions (PAXCK000, PAXTM000):
   AC Power: 85 to 250 VAC, 50/60 Hz, 18 VA
   Isolation: 2300 Vrms for 1 min. to all inputs and outputs. (300 V working)
   DC Versions (PAXCK010, PAXTM010):
   DC Power: 11 to 36 VDC, 14 W
   (Derate operating temperature to 40°C if operating <15 VDC and three Plug-in cards are installed)
   AC Power: 24 VAC, ± 10%, 50/60 Hz, 15 VA
   Isolation: 500 Vrms for 1 min. to all inputs and outputs (50 V working)
3. **SENSOR POWER**: 12 VDC, ±10%, 100 mA max. Short circuit protected.
4. **ANNUNCIATORS**:

TMR -Timer Display	SP1 -Setpoint 1 Output
CNT -Cycle Counter Display	SP2 -Setpoint 2 Output
DAT -Real-Time Clock Date Display	SP3 -Setpoint 3 Output
-Real-Time Clock Time Display	SP4 -Setpoint 4 Output

5. **KEYPAD**: 3 programmable function keys, 5 keys total.
6. **TIMER DISPLAY**:
   Timer Range: 23 Selectable Ranges
   Timing Accuracy: ± 0.01%
   Minimum Digit Resolution: 0.001 Sec.
   Maximum Least Significant Digit Resolution: 1 Hr.
   Maximum Display: 999999
7. **CYCLE COUNTER DISPLAY**:
   Counter Range: 0 to 999999
   Digit Resolution: 1 cycle
   Maximum Count Rate: 50 Hz
8. **REAL-TIME/DATE DISPLAY (PAXCK)**:
   Real-Time Display: 5 display formats
   Hr/Min/Sec (12 or 24 Hr. format); Hr/Min (24 Hr.); Hr/Min (12 Hr. with or without AM/PM indication)
   Date Display: 7 display formats
   Month/Day or Day/Month (numeric or 3-letter Month format); Month/Day/Year or Day/Month/Year (all numeric);
   Day of Week/Day (3-letter Day of Week format)
9. **REAL-TIME CLOCK CARD**: Field replaceable plug-in card
   Time Accuracy: ± 5 secs./Month (1 min./year) with end-user calibration
   Battery: Lithium 2025 coin cell
   Battery Life Expectancy: 10 yrs. typical
   Synchronization Interface: Two-wire multi-drop network (RS485 hardware), 32 units max., operates up to 4000 ft.
   Isolation To Timer & User Input Commons: 500 Vrms for 1 min.
   Working Voltage: 50 V. Not isolated from all other commons.
10. **TIMER INPUTS A and B**:
    Logic inputs configurable as Current Sinking (active low) or Current Sourcing (active high) via a single plug jumper.
    Current Sinking (active low): V_{IL} = 0.9 V max., 22KΩ pull-up to +12 VDC.
    Current Sourcing (active high): V_{IH} = 3.6 V min., 22KΩ pull-down, Max. Continuous Input: 30 VDC.
    Timer Input Pulse Width: 1 msec min.
    Timer Start/Stop Response Time: 1 msec max.
    Filter: Software filtering provided for switch contact debounce. Filter enabled or disabled through programming.
    If enabled, filter results in 50 msec start/stop response time for successive pulses on the same input terminal.
11. **USER INPUTS**: Three programmable user inputs
    Logic inputs configurable as Current Sinking (active low) or Current Sourcing (active high) through a single plug jumper.
    Current Sinking (active low): V_{IL} = 0.9 V max., 22KΩ pull-up to +12 VDC.
    Current Sourcing (active high): V_{IH} = 3.6 V min., 22KΩ pull-down, Max. Continuous Input: 30 VDC.
    Isolation To Timer Input Common: Not isolated
    Response Time: 10 msec
12. **MEMORY**: Non-volatile E^2PROM retains all programming parameters and display values.
13. **ENVIRONMENTAL CONDITIONS**:
    Operating Temperature Range: 0 to 50°C (0 to 45°C with all three plug-in cards installed)
    Storage Temperature Range: -40 to 60°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.
    Shock According to IEC 68-2-27: Operational 25 g (10g relay), 11 msec in 3 directions.
    Altitude: Up to 2000 meters
14. **CERTIFICATIONS AND COMPLIANCE**:
    SAFETY
    UL Recognized Component, File # E179259, UL61010A-1, CSA C22.2 No. 61010-1
    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 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
    IP20 Enclosure rating (rear of unit), IEC 529
    ELECTROMAGNETIC COMPATIBILITY

Immunity to EN 50082-2		
Electrostatic discharge	EN 61000-4-2	Level 3; 8 Kv air
Electromagnetic RF fields	EN 61000-4-3	Level 3; 10 V/m 80 MHz - 1 GHz
Fast transients (burst)	EN 61000-4-4	Level 4; 2 Kv I/O Level 3; 2 Kv power
RF conducted interference	EN 61000-4-6	Level 3; 10 V/rms 150 KHz - 80 MHz
Emissions to EN 50081-1		
RF interference	EN 55022	Enclosure class B Power mains class B

Note:
Refer to the EMC Installation Guidelines section for more information.

15. **CONNECTIONS**: High compression, cage-clamp terminal block
    Wire Strip Length: 0.3" (7.5 mm)
    Wire Gage: 30-14 AWG copper wire
    Torque: 4.5 inch-lbs (0.51 N-m) max.
16. **CONSTRUCTION**: This meter is rated for NEMA 4X/IP65 outoor use. IP20 Touch safe. Installation Category II, Pollution Degree 2. One piece bezel/case. Flame resistant. Synthetic rubber keypad. Panel gasket and mounting clip included.
17. **WEIGHT**: 10.1 oz. (286 g)

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 below. Only one card from each function type can be installed at one time. The function types include Setpoint Alarms (PAXCDS), Communications (PAXCDC), and Real-Time Clock Card (PAXRTC). The plug-in cards can be installed initially or at a later date.

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 RLCPro, a Windows® based program, 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

SERIAL COMMUNICATIONS CARD

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
Baud: 300 to 19,200
Parity: No, Odd or Even
Bus Address: Selectable 0 to 99, Max. 32 meters per line (RS485)
Transmit Delay: Selectable for 2 to 50 msec or 50 to 100 msec (RS485)

DEVICENET™ CARD

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

MODBUS CARD

Type: RS485; RTU and ASCII MODBUS modes
Isolation To Sensor & User Input Commons: 500 Vrms for 1 minute. Working Voltage: 50 V. Not isolated from all other commons.
Baud Rates: 300 to 38,400.
Data: 7/8 bits
Parity: No, Odd, or Even
Addresses: 1 to 247.
Transmit Delay: Programmable; See Transmit Delay explanation.

PROFIBUS-DP CARD

Fieldbus Type: Profibus-DP as per EN 50170, implemented with Siemens SPC3 ASIC
Conformance: PNO Certified Profibus-DP Slave Device
Baud Rates: Automatic baud rate detection in the range 9.6 Kbaud to 12 Mbaud
Station Address: 0 to 126, set by the master over the network. Address stored in non-volatile memory.
Connection: 9-pin Female D-Sub connector
Network Isolation: 500 Vrms for 1 minute (50 V working) between Profibus network and sensor and user input commons. Not isolated from all other commons.

PROGRAMMING SOFTWARE

The Crimson® software is a Windows® based program that allows configuration of the PAX® 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. A PAX® serial plug-in card is required to program the meter using the software.

SETPOINT 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

DUAL RELAY CARD

Type: Two FORM-C relays
Isolation To Timer & User Input Commons: 2300 Vrms for 1 min.
Working Voltage: 240 Vrms
Contact Rating:
One Relay Energized: 5 amps @ 120/240 VAC or 28 VDC (resistive load), 1/8 HP @120 VAC, inductive load
Total current with both relays energized not to exceed 5 amps
Life Expectancy: 100 K cycles min. at full load rating. External RC snubber extends relay life for operation with inductive loads
Response Time: 5 msec. nominal with 3 msec. nominal release
Timed Output Accuracy: ±0.01% -10 msec.

QUAD RELAY CARD

Type: Four FORM-A relays
Isolation To Timer & User Input Commons: 2300 Vrms for 1 min.
Working Voltage: 250 Vrms
Contact Rating:
One Relay Energized: 3 amps @ 250 VAC or 30 VDC (resistive load), 1/10 HP @ 120 VAC, inductive load
Total current with all four relays energized not to exceed 4 amps
Life Expectancy: 100K cycles min. at full load rating. External RC snubber extends relay life for operation with inductive loads
Response Time: 5 msec. nominal with 3 msec. nominal release
Timed Output Accuracy: ±0.01% -10 msec.

QUAD SINKING OPEN COLLECTOR CARD

Type: Four isolated sinking NPN transistors.
Isolation To Timer & User Input Commons: 500 Vrms for 1 min.
Working Voltage: 50 V. Not Isolated from all other commons.
Rating: 100 mA max @ V_{SAT} = 0.7 V max. V_{MAX} = 30 V
Response Time: 400 µsec. nominal with 2 msec. nominal turnoff
Timed Output Accuracy: ±0.01% -10 msec.

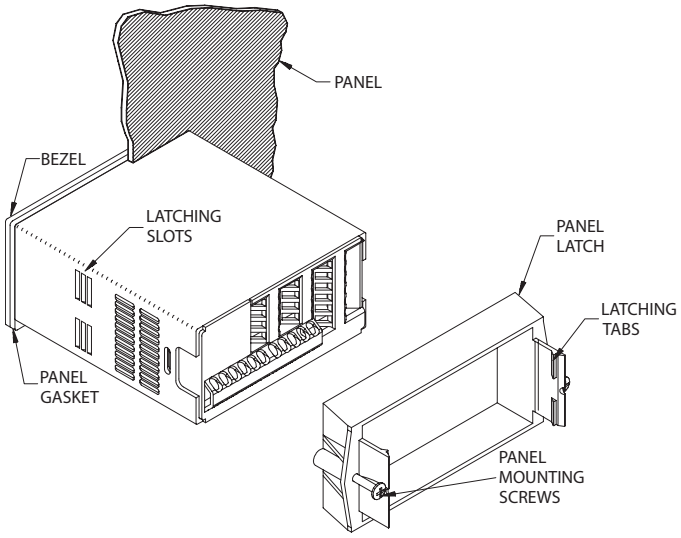
QUAD SOURCING OPEN COLLECTOR CARD

Type: Four isolated sourcing PNP transistors.
Isolation To Timer & User Input Commons: 500 Vrms for 1 min.
Working Voltage: 50 V. Not Isolated from all other commons.
Rating: Internal supply: 24 VDC ± 10% , 30 mA max. total
External supply: 30 VDC max., 100 mA max. each output
Response Time: 400 µsec. nominal with 2 msec. nominal turnoff
Timed Output Accuracy: ±0.01% -10 msec.

1.0 Installing the Meter

Installation

The meter meets NEMA 4X/IP65 requirements for indoor use when properly installed. The meter is intended to be mounted into an enclosed panel. Prepare the panel cutout to the dimensions shown. Remove the panel latch from the meter. Slide the panel gasket over the rear of the meter to the back of the bezel.



The meter should be installed fully assembled. Insert the meter into the panel cutout.

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

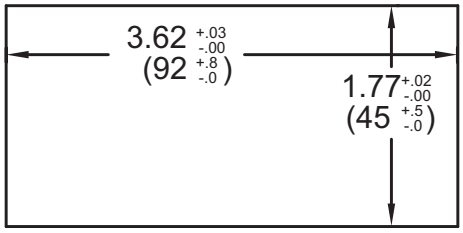
Installation Environment

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

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

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

PANEL CUT-OUT



D

2.0 Setting the Jumpers

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

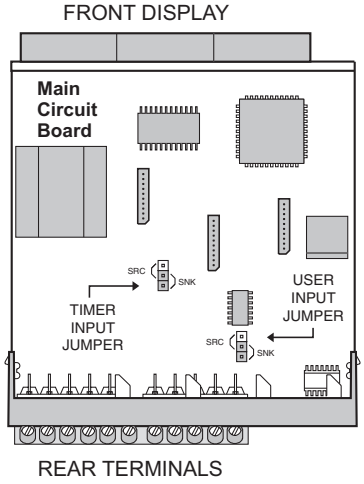
Warning: Exposed line voltage exists on the circuit boards. Remove all power to the meter and load circuits before accessing inside of the meter.

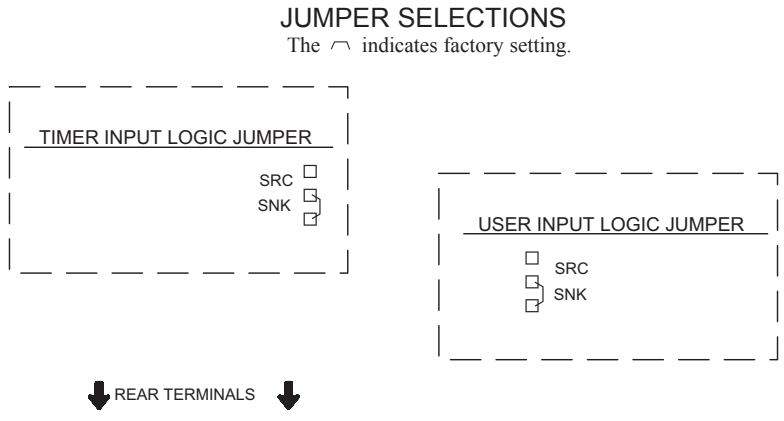
Timer Input Logic Jumper

One jumper is used for the logic state of both timer inputs. Select the proper position to match the input being used.

User Input Logic Jumper

One jumper is used for the logic state of all user inputs. If the user inputs are not used, it is not necessary to check or move this jumper.

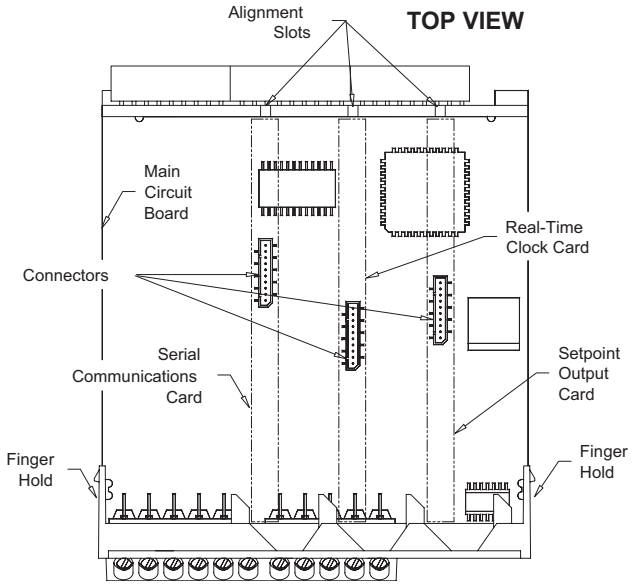




3.0 Installing Plug-In Cards

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

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

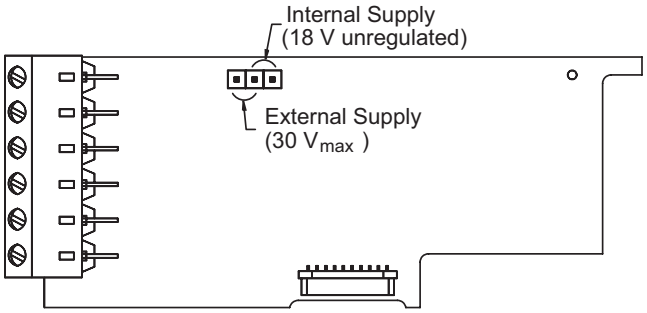


To Install:

1. With the case open, locate the Plug-in card connector for the card type to be installed. The types are keyed by position with different main circuit board connector locations. When installing the card, hold the meter by the rear terminals and not by the front display board.*
2. Install the Plug-in card by aligning the card terminals with the slot bay in the rear cover. Be sure the connector is fully engaged and the tab on the Plug-in card rests in the alignment slot on the display board.
3. Slide the meter base back into the case. Be sure the rear cover latches fully into the case.
4. Apply the Plug-in card label to the bottom side of the meter. Do Not Cover the vents on the top surface of the meter. The surface of the case must be clean for the label to adhere properly. Apply the label to the area designated by the large case label.

Quad Sourcing Open Collector Output Card Supply Select

* If installing the Quad sourcing Plug-in Card (PAXCDS40), set the jumper for internal or external supply operation before continuing.



4.0 Wiring the Meter

WIRING OVERVIEW

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

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

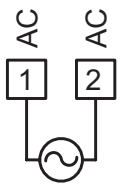
EMC INSTALLATION GUIDELINES

Although 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.

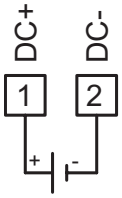
1. The meter should be mounted in a metal enclosure, which is properly connected to protective earth.
2. Use shielded (screened) cables for all Signal and Control inputs. The shield (screen) pigtail connection should be made as short as possible. The connection point for the shield depends somewhat upon 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.

4.1 POWER WIRING

AC Power
Terminal 1: VAC
Terminal 2: VAC



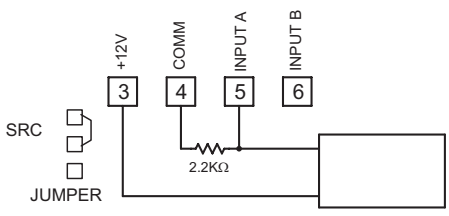
DC Power
Terminal 1: +VDC
Terminal 2: -VDC



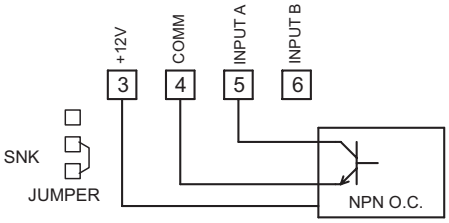
4.2 TIMER INPUT WIRING

Before connecting the wires, the Timer Input logic jumper should be verified for proper position.

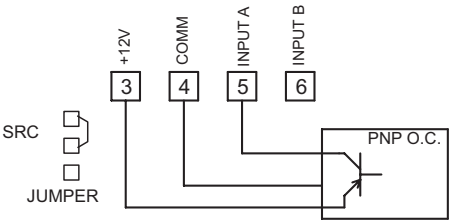
Two Wire Proximity, Current Source



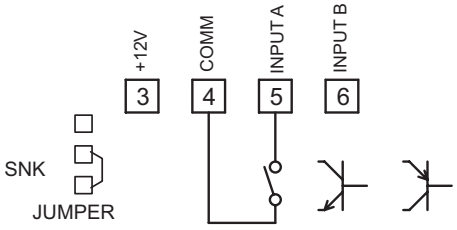
Current Sinking Output



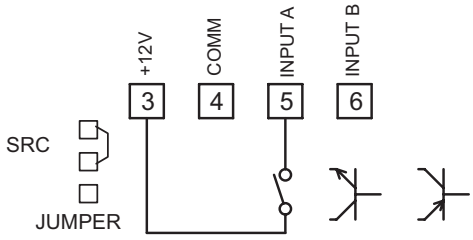
Current Sourcing Output



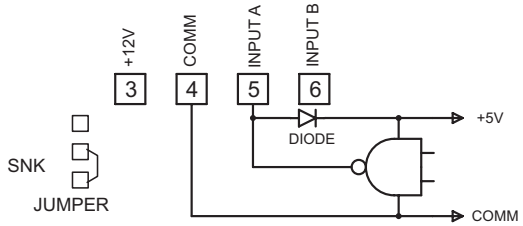
Switch or Isolated Transistor; Current Sink



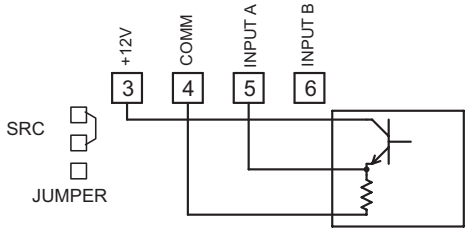
Switch or Isolated Transistor; Current Source



Interfacing With TTL



Emitter Follower; Current Source



***CAUTION**: Timer Input common is NOT isolated from User Input common. In order to preserve the safety of the meter application, the timer input 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 Inputs and User Input Common terminals. Appropriate considerations must then be given to the potential of the User Input Common with respect to earth ground; and the common of the isolated plug-in cards with respect to input common.*

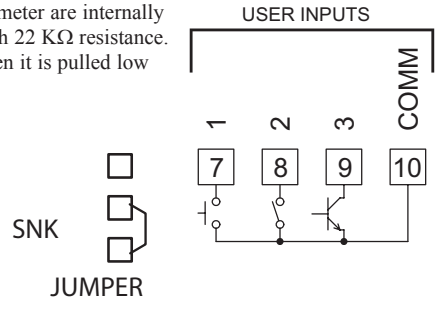
4.3 USER INPUT WIRING

Before connecting the wires, the Timer Input logic jumper should be verified for proper position. When the user input is configured for cycle count, in module 4, the count input should be wired between terminals 7 & 10.

Sinking Logic

Terminals 7-9 } Connect external switching device between the
Terminal 10 } appropriate User Input terminal and User Comm.

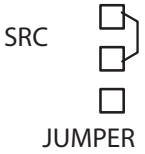
The user inputs of the meter are internally pulled up to +12 V with 22 KΩ resistance. The input is active when it is pulled low (<0 .9 V).

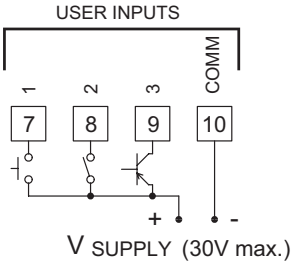


Sourcing Logic

Terminals 7-9:
+ VDC through external switching device
Terminal 10:
-VDC through external switching device

The user inputs of the meter are internally pulled down to 0 V with 22 KΩ resistance. The input is active when a voltage greater than 3.6 VDC is applied.





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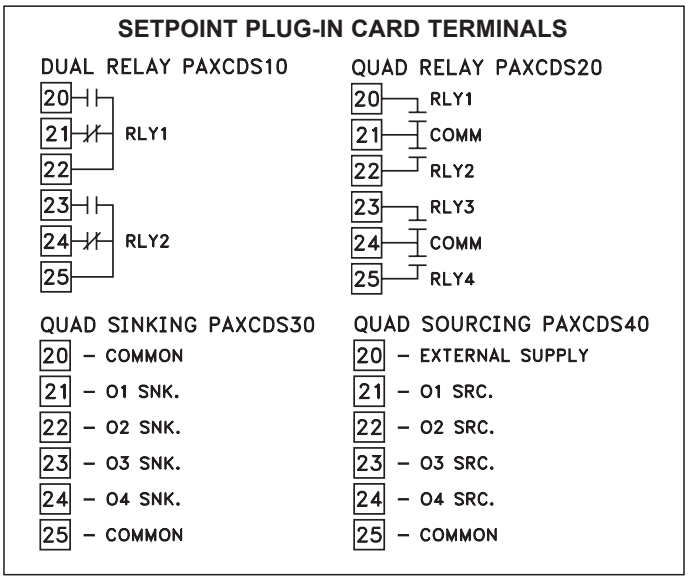
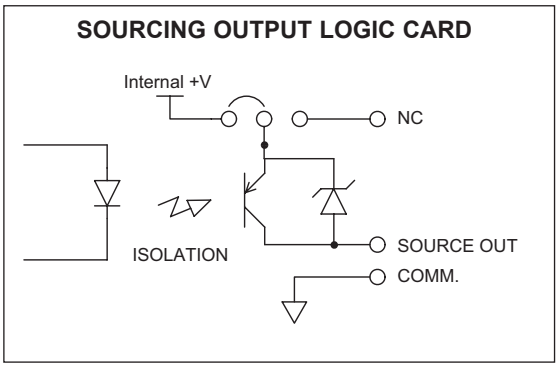
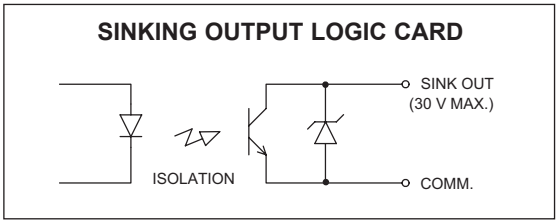
4.4 SETPOINT (ALARMS) WIRING







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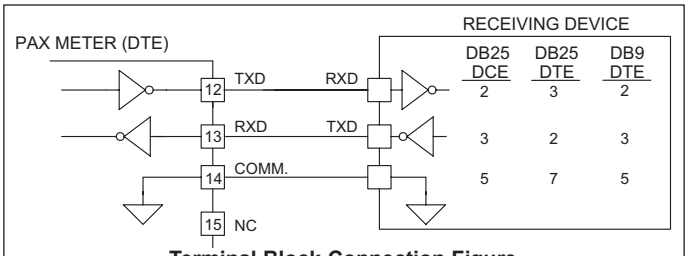
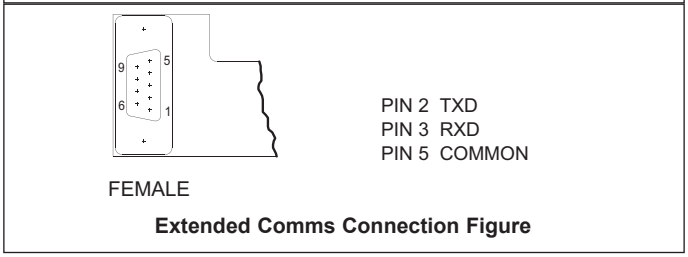
4.5 SERIAL COMMUNICATION WIRING

RS232 Communications



Terminal Block Connection Figure



Extended Comms Connection Figure

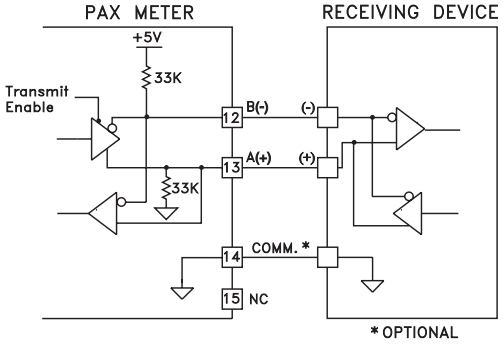
RS232 is intended to allow two devices to communicate over distances up to 50 feet. Data Terminal Equipment (DTE) transmits data on the Transmitted Data (TXD) line and receives data on the Received Data (RXD) line. Data Computer Equipment (DCE) receives data on the TXD line and transmits data on the RXD line. The PAX 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.

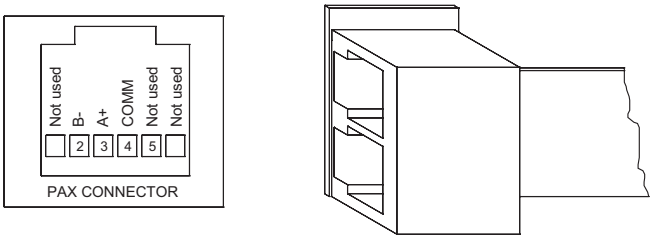
As the meter begins to transmit data, the RXD line (RS232) is monitored to determine if the receiving device is "busy". The receiving device asserts that it is busy by setting the RXD line to a space condition (logic 0). The meter then suspends transmission until the RXD line is released by the receiving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

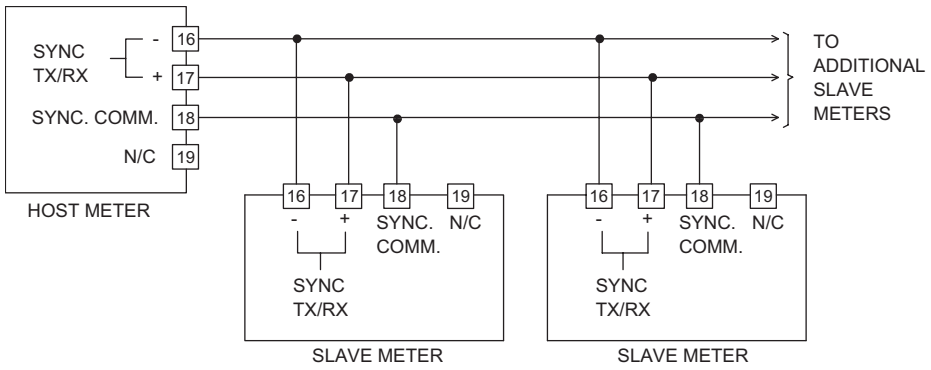


Extended Comms Connection Figure

4.6 REAL-TIME CLOCK WIRING (PAXCK)

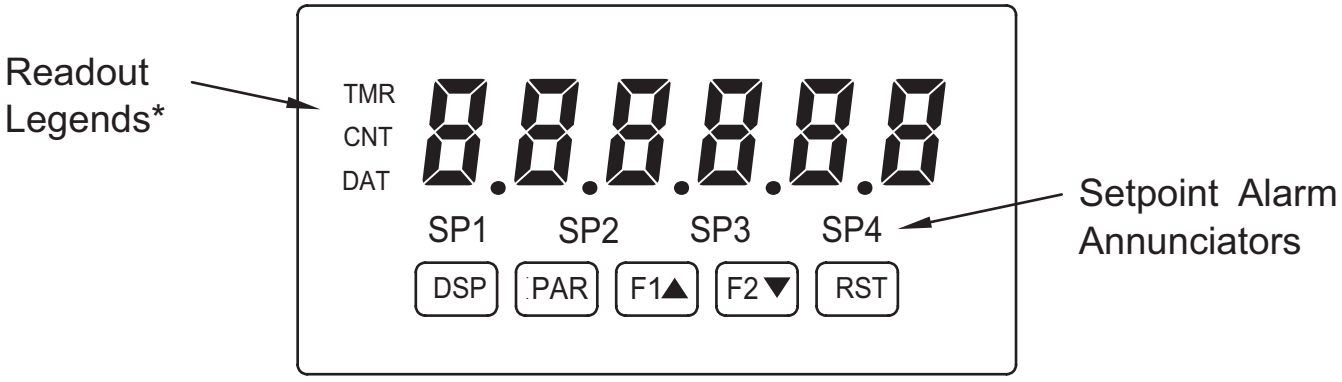
Time synchronization between multiple PAXCK meters can be accomplished through a hardware interface on the Real-Time Clock option card. This RS485 type interface allows connection of up to 32 PAXCK meters in a two-wire multidrop network, at distances up to 4000 ft.

In a synchronization network, one PAXCK meter is programmed as the Host, while all other meters are programmed as Slaves. Once every hour, the Host meter outputs a time synchronization pulse onto the network. Upon receiving the synchronization pulse, each Slave meter automatically adjusts the minutes and seconds of its RTC Time setting to synchronize with the Host.



Real-Time Clock Synchronization Figure

5.0 REVIEWING THE FRONT BUTTONS AND DISPLAY



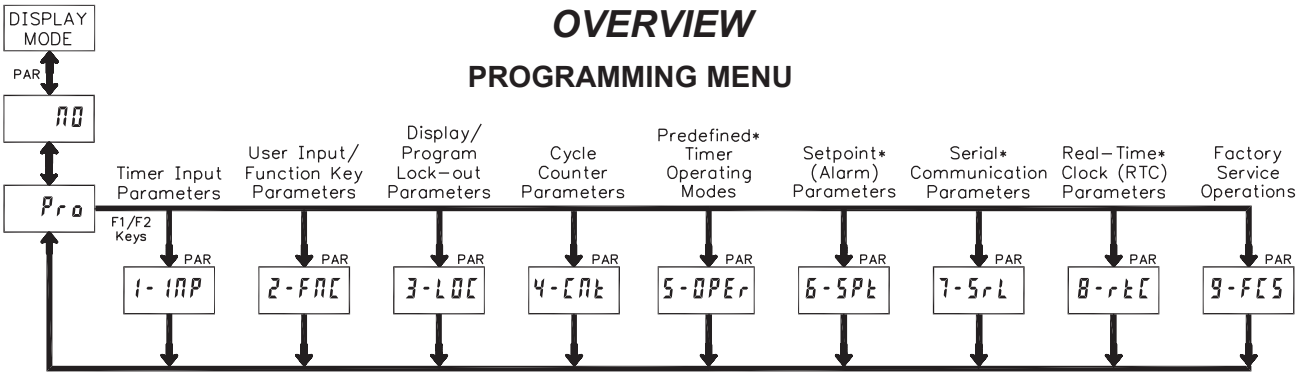
KEY	DISPLAY MODE OPERATION	PROGRAMMING MODE OPERATION
DSP	Index display through Timer, Cycle Counter, Date, and Time	Exit programming and return to Display Mode
PAR	Access Programming Mode	Store selected parameter and index to next parameter
F1▲	Function key 1; hold for 3 seconds for Second Function 1 **	Increment selected parameter value or selections
F2▼	Function key 2; hold for 3 seconds for Second Function 2 **	Decrement selected parameter value or selections
RST	Reset (Function key) ***	Selects digit location in parameter values

* Cycle counter and Real-Time Clock displays are locked out in Factory Settings.
** Factory setting for the F1 and F2 keys is NO mode.
*** Factory setting for the RST key is dr5t-E (Reset Display)

6.0 PROGRAMMING THE METER

OVERVIEW

PROGRAMMING MENU



* Only accessible with appropriate plug-in card.

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; Timer (TMR), Cycle Counter (CNT), or Date (DAT). The Time Display for the Real-Time Clock is shown with no annunciator. Any of these displays can be locked from view through programming. (See Module 3.)

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 timing 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 only available in the Quick Programming Mode 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

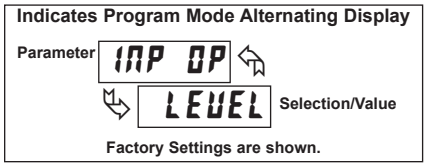
The Programming Menu is organized into nine modules. (See above.) These modules group together parameters that are related in function. It is recommended to begin programming with Module 1 and proceed through each module in sequence. Note that Modules 5 through 8 are only accessible when the appropriate plug-in option card is installed. If lost or confused while programming, press the **DSP** key to exit programming mode and start over. When programming is complete, it is recommended to record the meter settings on the Parameter Value Chart and lock-out parameter programming with a User Input or lock-out code. (See Modules 2 and 3 for lock-out details.)

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. In addition, all factory settings are listed on the Parameter Value Chart following the programming section.

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 no). 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 no. 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)

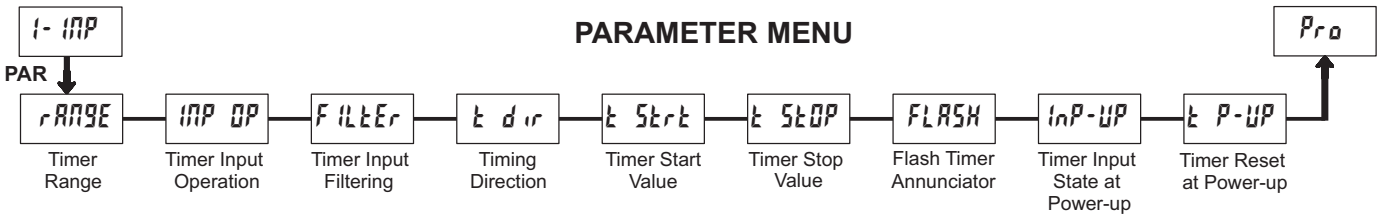
For parameters which require a numerical value entry, the arrow keys can be used to increment or decrement the display to the desired value. When an arrow key is pressed and held, the display automatically scrolls up or scrolls down. The longer the key is held, the faster the display scrolls.

In addition, the **RST** key can be used in combination with the arrow keys to enter numerical values. The **RST** key is pressed to select a specific digit to be changed, which blinks when selected. Once a digit is selected, the arrow keys are used to increment or decrement that digit to the desired number. The **RST** key is then pressed again to select the next digit to be changed. This "select and set" sequence is repeated until each digit is displaying the proper number. 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 no)

The Programming Mode is exited by pressing the **DSP** key (from anywhere in the Programming Mode) or 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 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.)

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



Module 1 is the programming module for the Timer Input Parameters. In the Display Mode, the TMR annunciator indicates the Timer display is currently being shown. An **EXCHANGE PARAMETER LISTS** feature, which includes the Timer Start and Timer Stop Values, is explained in Module 2.

TIMER RANGE

rANGE
555555

23 TIMER RANGE SELECTIONS
(S = SEC; M = 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		
MMMMMM	999999	1 MIN
MMMMM.M	99999.9	0.1 MIN
MMMM.MM	9999.99	0.01 MIN
MMM.MMM	999.999	0.001 MIN
HOURS		
HHHHHH	999999	1 HR
HHHHH.H	99999.9	0.1 HR
HHHH.HH	9999.99	0.01 HR
HHH.HHH	999.999	0.001 HR

RANGE SELECTION	MAXIMUM DISPLAY	DISPLAY RESOLUTION
MINUTES/SECONDS		
MMMM.SS	9999.59	1 SEC
MMM.SS.S	999.59.9	0.1 SEC
MM.SS.SS	99.59.99	0.01 SEC
M.SS.SSS	9.59.999	0.001 SEC
HOURS/MINUTES		
HHHH.MM	9999.59	1 MIN
HHH.MM.M	999.59.9	0.1 MIN
HH.MM.MM	99.59.99	0.01 MIN
H.MM.MMM	9.59.999	0.001 MIN
HOURS/MINUTES/SECONDS		
HH.MM.SS	99.59.59	1 SEC
H.MM.SS.S	9.59.59.9	0.1 SEC
DAYS/HOURS/MINUTES		
dd.HH.MM	99.23.59	1 MIN

TIMER INPUT OPERATION

INP OP
LEVEL

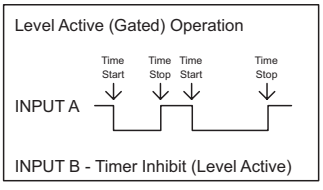
LEVEL Ed9E-1 Ed9E-2 HoLd-2
LEVrSt Edr5-1 Edr5-2 Hr5t-2

This parameter determines how the Timer Input Signals affect the "Run/Stop" status of the Timer. The timing diagrams below reflect a Sinking input setup (active low). A Sourcing input setup (active high) is available through plug jumper selection (see Section 2.0). In this case, the logic levels of the timing diagrams would be inverted.

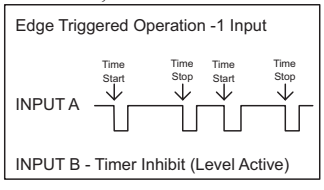
The Timer can also be stopped using a Timer Stop Value or a Setpoint. This type of Stop condition is cleared when a Timer Reset occurs, or another start edge is applied.

For LEVEL and Ed9E-1 operation, Input B provides a level active Timer Inhibit function. This function is also available through a User Input (see Module 2). Timing diagrams are shown below for "LEVEL" through "HoLd-2" modes. The "LEVrSt" through "Hr5t-2" modes are identical except the timer display value is also reset at "Time Start" edges. In the "HoLd-2" and "Hr5t-2" modes, the timer display value remains held and only updates when a Timer Start (Input A) or Timer Stop (Input B) edge occurs.

LEVEL, LEVrSt *

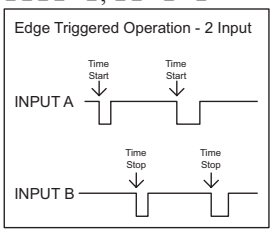


Ed9E-1, Edr5-1 *

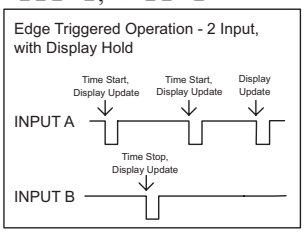


* - *Timer is reset at Time Start edge.*

Ed9E-2, Edr5-2 *



HoLd-2, Hr5t-2 *



* - *Timer is reset at Time Start edge.*

TIMER INPUT FILTERING

FILTER
ON

ON OFF

Provides a 50 msec 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

Timing direction can be reversed through a User Input. (See Module 2.)

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

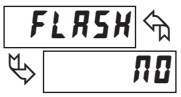
The Timer stops when this value is reached, regardless of the signal levels on the Timer Inputs. Selecting YES will display the VALUE sub-menu where the Stop Value can be set or changed. The Stop Value is entered in the same display format as the Timer Range selected. This Stop condition is cleared when a Timer Reset occurs. Select nO if a Stop Value is not being used.

VALUE
000000

000000 to 999999

D

FLASH TIMER ANNUNCIATOR



This parameter allows the Timer annunciator (TMR) to flash when the Timer is running or stopped/inhibited. Select **no** if a flashing indicator is not desired.

TIMER INPUT STATE AT POWER-UP

Determines the "Run/Stop" State of the Timer at Power-up. This parameter does not apply to **LEVEL** timer input operation.

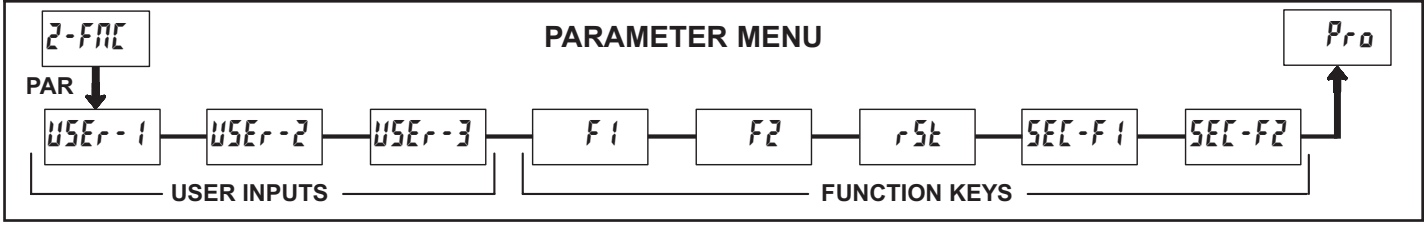
StOP - Timer Stopped at power-up, regardless of prior run/stop state

SAVE - Timer assumes the same run/stop state it was in prior to power-down

TIMER RESET AT POWER-UP

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

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



Module 2 is the programming module for the rear terminal User Inputs and front panel Function Keys.

Three rear terminal User Inputs are individually programmable to perform specific meter control functions. While in the Display Mode, the function is executed when the User Input transitions to the active state. Refer to the User Input specifications for active state response times. Certain User Input functions are disabled in "Full" Programming Mode. User Inputs should be programmed while in the inactive state.

Three front panel Function Keys, **F1**, **F2** and **RST**, are also individually programmable to perform specific meter control functions. While in the Display Mode, the primary function is executed when the key is pressed. Holding the **F1** or **F2** Function Keys for three seconds executes a secondary function. It is possible to program a secondary function without a primary function. The front panel key functions are disabled in both Programming Modes.

In most cases, if more than one User Input and/or Function Key is programmed for the same function, the maintained (level active) functions will be performed while at least one of those User Inputs or Function Keys are activated. The momentary (edge triggered) functions are performed every time any of those User Inputs or Function Keys transition to the active state.

Some functions have a sublist of parameters, which appears when **PAR** is pressed at the listed function. A sublist provides yes/no selection for Display Values or Setpoints which pertain to the programmed function. The function will only be performed on the parameters entered as **YES** in the sublist. If a User Input or Function Key is configured for a function with a sublist, then that sublist will need to be scrolled through each time, in order to access any parameters for the User Inputs or Function Keys which follow.

NO FUNCTION

With this selection, NO function is performed. This is the factory setting for all user inputs and function keys except the Reset (**RST**) Key.

PROGRAMMING MODE LOCK-OUT

Programming Mode is locked-out, as long as activated (maintained action). In Module 3, certain parameters can be setup where they are still accessible during Programming Mode Lock-out. A security code can be configured to allow complete programming access during User Input lock-out. This parameter does not apply to the function keys. Program only one user input for this function.

EXCHANGE PARAMETER LISTS

Two lists of parameter entries are available for the Timer/Counter Start and Stop Values; Setpoint On/Off and Time-Out Values; and Setpoint Daily On/Off Occurrence (for Real-Time Clock option). The two lists are named **L 1St-A** and **L 1St-b**. If a User Input is used to select the list, then **L 1St-A** is selected when the User Input is in the inactive state and **L 1St-b** is selected when the User Input is in the active state (maintained action). If a front panel Function Key is used to select the list, then the list will toggle for each key press (momentary action). The display will only indicate which list is active when the list is changed or when entering any Programming Mode.

To program the values for **L 1St-A** and **L 1St-b**, first complete the programming of all the parameters. Exit programming and switch to the other list. Re-enter programming and enter the Timer/Counter Start and Stop Values (**t Strt**, **t StOP**, **C Strt**, **C StOP**), and if applicable, the Setpoint On/Off and Time-Out Values (**SP-1**, **SP-2**, **SP-3**, **SP-4**, **SPOF-1**, **SPOF-2**, **SPOF-3**, **SPOF-4**, **tOut-1**, **tOut-2**, **tOut-3**, **tOut-4**), and the Setpoint Daily On/Off Occurrence (**d On-1**, **d On-2**, **d On-3**, **d On-4**, **dOFF-1**, **dOFF-2**, **dOFF-3**, **dOFF-4**). If any other parameters are changed, the other list values must be reprogrammed. Program only one user input for this function.

***Note**: When downloading the Crimson® program containing List A/B, make sure that both the software and meter have the same list active. The active list in the Crimson® program is the one being displayed in Input Setup and/or Setpoint Alarms category.*

DISPLAY SELECT (Level Active)

When active (maintained action), the meter continuously scrolls through all displays that are not "locked-out" in the Display mode. (See Module 3 for Display Lock-out details.) A sub-menu provides Scrolling Speed selection.

DISPLAY SELECT (Edge Triggered)

When activated (momentary action), the meter advances to the next display that is not "locked-out" in the Display mode. (See Module 3 for Display Lock-out details.)

DISPLAY RESET (Level Active)

When active (maintained action), the meter continually resets only the currently shown display. If the RTC Time or Date is displayed, this function applies to the ***Outputs*** assigned to the RTC, and does not Reset the actual RTC Time or Date display. (See Module 6 for details on Output Assignment and Output Reset with Display Reset.)

DISPLAY RESET (Edge Triggered)

When activated (momentary action), the meter resets ***only*** the currently shown display. This is the factory setting for the Reset (**RST**) key. If the RTC Time or Date is displayed, this function applies to the ***Outputs*** assigned to the RTC, and does not Reset the actual RTC Time or Date display. (See Module 6 for details on Output Assignment and Output Reset with Display Reset.)

MAINTAINED RESET (Level Active)

When active (maintained action), the meter continually resets the displays entered as YES in the sublist. The sublist appears when the **PAR** key is pressed. This function does not apply to the RTC Time or Date displays.

DISPLAY	DESCRIPTION	FACTORY
t-dSP	Timer	no
C-dSP	Cycle Counter	no

MOMENTARY RESET (Edge Triggered)

When activated (momentary action), the meter resets the displays entered as YES in the sublist. Function does not apply to RTC Time or Date displays.

DISPLAY	DESCRIPTION	FACTORY
t-dSP	Timer	no
C-dSP	Cycle Counter	no

DISPLAY HOLD (Level Active)

When active (maintained action), the meter "freezes" the display values entered as YES in the sublist, while normal meter operation continues internally. Program only one user input for this function.

DISPLAY	DESCRIPTION	FACTORY
t-dSP	Timer	no
C-dSP	Cycle Counter	no
rtC-d	RTC Date	no
rtC-t	RTC Time	no

DISPLAY HOLD and RESET (Level Active Reset)

When activated, the meter "freezes" the display values entered as YES in the sublist, before performing an internal ***Maintained Reset*** on the selected displays. This function does not apply to the RTC Time or Date displays.

DISPLAY	DESCRIPTION	FACTORY
t-dSP	Timer	no
C-dSP	Cycle Counter	no

DISPLAY HOLD and RESET (Edge Triggered Reset)

When activated, the meter "freezes" the display values entered as YES in the sublist, before performing an internal ***Momentary Reset*** on the selected displays. This function does not apply to the RTC Time or Date displays. Program only one user input for this function.

DISPLAY	DESCRIPTION	FACTORY
t-dSP	Timer	no
C-dSP	Cycle Counter	no

INHIBIT (Level Active)

When active (maintained action), timing and counting ceases for the displays entered as YES in the sublist. The inhibit function is not a t Strt or t StOP event in Setpoint programming. This function does not apply to RTC Time or Date displays. Program only one user input for this function.

DISPLAY	DESCRIPTION	FACTORY
t-dSP	Timer	no
C-dSP	Cycle Counter	no

CHANGE DIRECTION (Level Active)

When active (maintained action), the timing or counting direction for the display entered as YES in the sublist, will be reversed from the direction set by the Timing Direction (t-dir) and/or Counting Direction (C-dir) parameters in Modules 1 and 4. (Program only one User Input per display for this function.) This function does not apply to RTC Time or Date displays.

DISPLAY	DESCRIPTION	FACTORY
t-dSP	Timer	no
C-dSP	Cycle Counter	no

D

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 & 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 unit will power-up at the last saved intensity level.

***Note**: The next two parameters only appear when an RS232 or RS485 Serial Communications Card is installed in the meter.*

PRINT REQUEST

When activated, the meter issues a block print through the serial port. The specific values transmitted during a print request are selected with the Print Options parameter in Module 7. For User Inputs (level active), the meter transmits blocks repeatedly as long as the input is active. For Function Keys, (edge triggered) only one block is transmitted per key press.

PRINT REQUEST and RESET (Edge Triggered)

When activated (momentary action), the meter first issues a block print through the serial port, and then performs a ***Momentary Reset*** on the displays entered as YES in the sublist. The specific values transmitted in the print block are selected with the Print Options parameter in Module 7. Only one transmit and reset occurs per User Input activation or Function Key press.

DISPLAY	DESCRIPTION	FACTORY
t-dSP	Timer	NO
C-dSP	Cycle Counter	NO

***Note**: The remaining parameters only appear when a Setpoint Card is installed in the meter.*

OUTPUT HOLD (Level Active)

When active (maintained action), the meter "holds" (maintains) the present output state for all Setpoints entered as YES in the sublist. Does not apply to Output Set and Reset User Inputs. Program only one user input for this function.

DISPLAY	DESCRIPTION	FACTORY
SP-1	Setpoint 1	NO
SP-2	Setpoint 2	NO
SP-3	Setpoint 3	NO
SP-4	Setpoint 4	NO

OUTPUT SET (Level Active)

When activated (maintained action), the meter continually activates the output for all Setpoints entered as YES in the sublist.

DISPLAY	DESCRIPTION	FACTORY
SP-1	Setpoint 1	NO
SP-2	Setpoint 2	NO
SP-3	Setpoint 3	NO
SP-4	Setpoint 4	NO

OUTPUT SET (Edge Triggered)

When activated (momentary action), the meter activates the output for all Setpoints entered as YES in the sublist.

DISPLAY	DESCRIPTION	FACTORY
SP-1	Setpoint 1	NO
SP-2	Setpoint 2	NO
SP-3	Setpoint 3	NO
SP-4	Setpoint 4	NO

OUTPUT RESET (Level Active)

When activated (maintained action), the meter continually deactivates the output for all Setpoints entered as YES in the sublist.

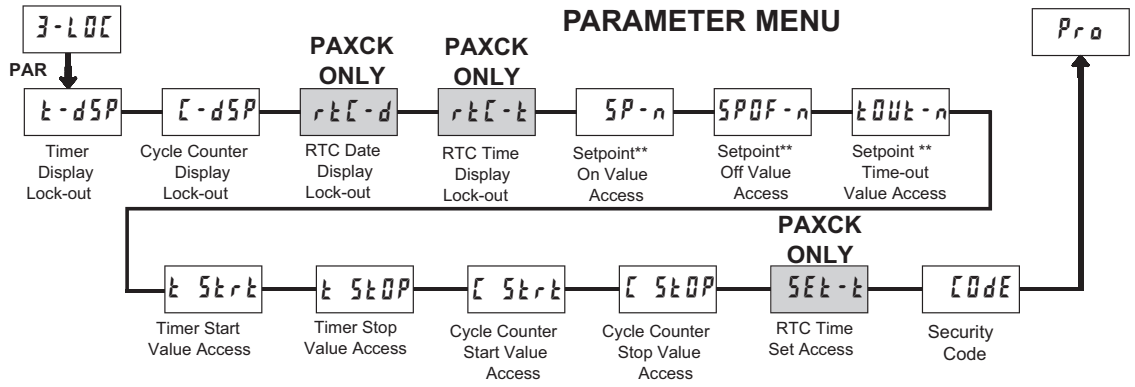
DISPLAY	DESCRIPTION	FACTORY
SP-1	Setpoint 1	NO
SP-2	Setpoint 2	NO
SP-3	Setpoint 3	NO
SP-4	Setpoint 4	NO

OUTPUT RESET (Edge Triggered)

When activated (momentary action), the meter deactivates the output for all Setpoints entered as YES in the sublist.

DISPLAY	DESCRIPTION	FACTORY
SP-1	Setpoint 1	NO
SP-2	Setpoint 2	NO
SP-3	Setpoint 3	NO
SP-4	Setpoint 4	NO

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



*** These parameters only appear if a Setpoint option card is installed.*

n = Setpoint Number 1 thru 4

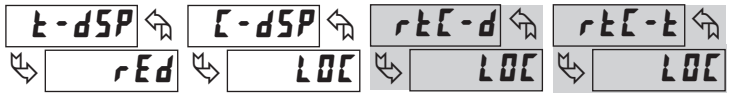
Module 3 is the programming module for setting the Display Lock-out Parameters and the "Quick Programming Mode" Value Access Parameters. In the Quick Programming mode, after the PROGRAM LOCKOUT PARAMETERS and before the Security Code (CodE), a Display Intensity Level (d-LEU) parameter is available when the security code is non-zero. It allows the display intensity to be set to 1 of 16 levels (0-15).

DISPLAY LOCK-OUT PARAMETERS

When operating in the Display Mode, the meter displays can be viewed consecutively by repeatedly pressing the **DSP** key. The annunciators to the left of the display indicate which display is currently shown. Timer (TMR), Cycle Counter (CNT), or Date (DAT). The Time Display for the Real-Time Clock is shown with no annunciator. Any of these displays can be locked from view with the DISPLAY LOCK-OUT parameters. Using these parameters, each display can be programmed for "Read" or "Lock" defined as follows:

SELECTION	DISPLAY	DESCRIPTION
Read	rEd	Visible in Display Mode
Lock	LOC	Not visible in Display Mode

TIMER DISPLAY LOCK-OUT
CYCLE COUNTER DISPLAY LOCK-OUT
PAXCK: REAL-TIME CLOCK DATE/TIME DISPLAY LOCK-OUT *



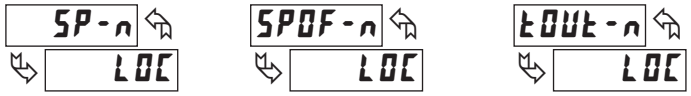
These displays can be programmed for rEd or LOC. When a particular meter function is not used, the Display Lock-out should be set to LOC for that display.

PROGRAM LOCK-OUT PARAMETERS (VALUE ACCESS)

"Full" Programming Mode permits all parameters to be viewed and modified. This programming mode can be locked with a Security Code and/or a User Input. When locked, and the **PAR** key is pressed, the meter enters a Quick Programming Mode. In this mode, access to Setpoint Values, Timer & Cycle Counter Start/Stop Values, and Time Setting for the Real-Time Clock can be programmed for "Read", "Enter", or "Lock" defined as follows:

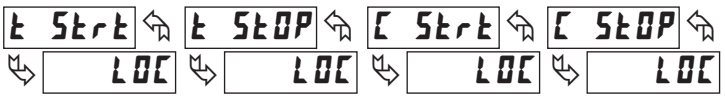
SELECTION	DISPLAY	DESCRIPTION
Read	rEd	Visible, not changeable, in Quick Programming Mode
Enter	Ent	Visible and changeable in Quick Programming Mode
Lock	LOC	Not visible in Quick Programming Mode

SETPOINT 1 to 4 VALUE ACCESS ** (n = 1 thru 4)



Setpoint Values for SP1 thru SP4 can be programmed for rEd, Ent, or LOC. SPOF-n and tOUt-n are only displayed when they apply to the Setpoint Action (ACt-n) programmed for that particular Setpoint. (See Module 6 for details.)

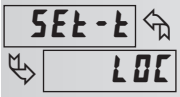
TIMER & CYCLE COUNTER START/STOP VALUE ACCESS



Timer & Counter Start/Stop Values can be programmed for rEd, Ent, or LOC.

D

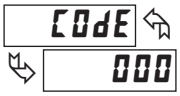
PAXCK: REAL-TIME CLOCK TIME SETTING ACCESS



Ent LOC

This parameter can be programmed for Ent or LOC. Selecting Ent allows setting or changing the RTC Time in Quick Programming mode.

SECURITY CODE



000 to 255

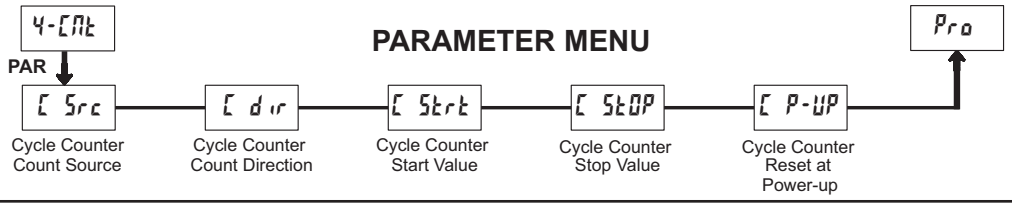
Entry of a non-zero value will cause the CodE prompt to appear when trying to access the "Full" Programming Mode. Access will only be allowed after entering a matching security code or the universal unlock code of 222. With this lock-out, a User Input would not have to be used for the Program Lock-out function. Note however, the Security Code lock-out is overridden when an User Input, configured for Program Lock-out (PLOC), is not active (See Chart.)

PROGRAMMING MODE ACCESS

SECURITY CODE	USER INPUT SELECTION	USER INPUT STATE	MODE WHEN "PAR" KEY IS PRESSED	FULL PROGRAMMING MODE ACCESS
0	not PLOC	———	Full Programming	Immediate access
not 0	not PLOC	———	Quick Programming	After Quick Programming with correct Security code entry
not 0	PLOC	Active	Quick Programming	After Quick Programming with correct Security code entry
not 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 bulletin, Programming Mode (without Quick in front) always refers to "Full" Programming.

6.4 MODULE 4 - CYCLE COUNTER PARAMETERS (4-CNt)



Module 4 is the programming module for the Cycle Counter Parameters. In the Display Mode, the CNT annunciator indicates the Cycle Counter display is currently being shown. An **EXCHANGE PARAMETER LISTS** feature, which includes the Cycle Counter Start and Stop Values, is explained in Module 2.

CYCLE COUNTER COUNT SOURCE

C Src / NONE

NONE USEr-1 t-rSt
01-ON 01-OFF 02-ON 02-OFF
03-ON 03-OFF 04-ON 04-OFF

This parameter selects the source from which a count is added to or subtracted from the Cycle Counter. Select NONE if the Cycle Counter is not being used, which will exit the module and bypass the remaining parameters.

When USEr-1 is selected, a count is generated each time the User 1 Input is activated. When selected as the count source, User Input 1 can still be programmed to perform a User Function described in Module 2, if desired. In this case, the Cycle Counter would be counting the number of times the particular User Function occurred.

The Timer Reset (t-rSt) selection generates a count when either a manual or automatic reset occurs. (See Module 6 for programming Automatic Resets.)

The Output ON/OFF selections generate a count when the chosen output either activates or deactivates. These selections only appear when a Setpoint Card is installed. O3 and O4 selections only appear for Quad Setpoint cards.

CYCLE COUNTER COUNTING DIRECTION

C dir / UP UP dN

Counting direction can be reversed through a User Input. (See Module 2.)

CYCLE COUNTER START VALUE

C Strt / 000000 000000 to 999999

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

CYCLE COUNTER STOP VALUE

CStOP / NO NO YES

The Cycle Counter stops counting when this value is reached, regardless of the operation of the Timer. Selecting YES will display the VALUE sub-menu where the Stop Value can be set or changed. The Stop condition is cleared when a Cycle Counter Reset occurs. Select NO if a Stop Value is not used.

VALUE / 000000 000000 to 999999

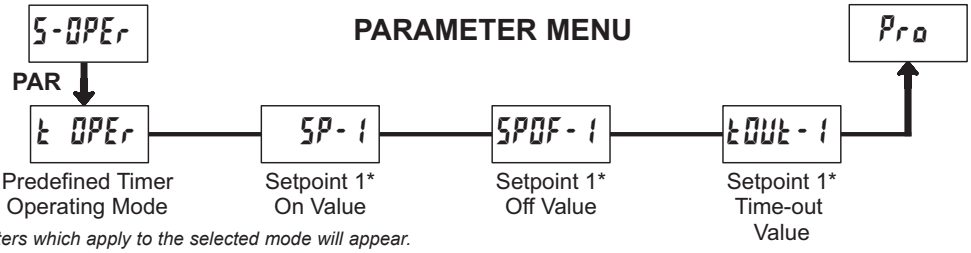
CYCLE COUNTER RESET AT POWER-UP

C P-UP / NO NO YES

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

6.5 MODULE 5 - TIMER OPERATING MODES (5-OPEr)

This module can only be accessed if a Setpoint Card is installed.



** Only the value parameters which apply to the selected mode will appear.*

PREDEFINED TIMER OPERATING MODE

t OPEr / NO

- ON-dLY - On-Delay Timing
- OF-dLY - Off-Delay Timing
- rEPEAt - Repeat Cycle Timing
- dLY Int - On-Delay/Interval Timing
- Int-L - Interval Timing (Level Triggered)
- Int-E - Interval Timing (Edge Triggered)

This parameter is used to select Predefined Operating Modes for the Timer. These modes cover a variety of timing applications frequently encountered in industrial control processes. When using a Predefined mode, the operator needs only to set the actual Setpoint On/Off or Time-out values for the particular application. However, each programming parameter will still be accessible, in order to make modifications to the predefined settings if desired.

The Predefined modes control the activation and deactivation of Output 1, in relation to Start and Reset signals applied to the Timer inputs. (See timing diagrams which follow.) When a selection other than NO is chosen, the parameters for Setpoint 1 (SP-1) in Module 6 are automatically configured to implement the selected operating mode. For some modes, parameters in Modules 1 and 2 are also automatically configured to properly implement the predefined mode. Refer to the chart shown with the timing diagrams for the specific parameters loaded for each predefined mode. Also, note the specific external wiring or plug jumper settings required for some modes.

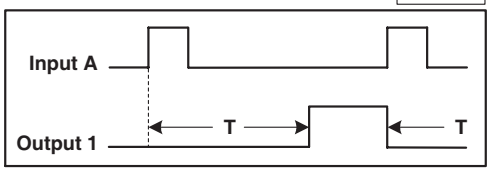
The Setpoint On/Off or Time-out values for the specific application should be entered directly in Module 5 after selecting the operating mode. Only the value parameters which apply to the selected mode are displayed. These values can also be entered through Module 6, Setpoint (Alarm) Parameters, if desired.

Select NO if not using a Predefined Operating Mode, in which case Setpoint parameters must all be individually programmed for the particular application.

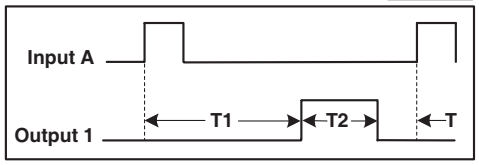
Timing Diagrams for Predefined Timer Operating Modes

***NOTE**: Input A is shown as a Sourcing input (active high). If a Sinking input (active low) is used, the logic levels for Input A would be inverted.*

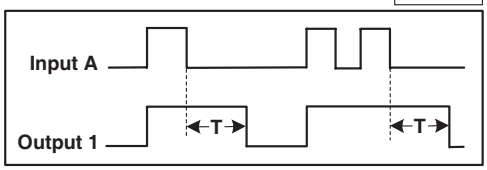
On-Delay Timing ON-dLY



On-Delay / Interval Timing dLY InT

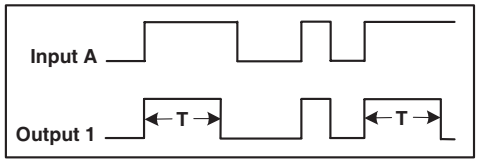


Off-Delay Timing OF-dLY



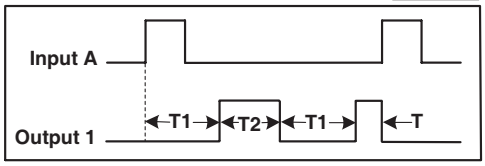
The input signal must be wired to both the Input A and User Input 1 terminals. The Timer Input plug jumper and the User Input plug jumper must both be set to the same position (either both SNK or both SRC).

Interval Timing (Level triggered) InT-L

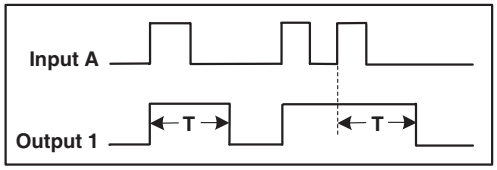


The input signal must be wired to both the Input A and User Input 1 terminals. The Timer Input plug jumper and the User Input plug jumper must be set to opposite positions (one SNK, one SRC) and the Input signal must be a current sinking type (i.e. pulls input to common).

Repeat Cycle Timing rEPEAt



Interval Timing (Edge triggered) InT-E



D

Parameter Settings for Predefined Timer Operating Modes

MODULE 1 - Timer Input Parameters (1- InP)

DISPLAY	PARAMETER	ON-dLY	OF-dLY	rEPEAt	dLY InT	InT-L	InT-E
InP OP	Timer Input Operation	Edr5-2	Edr5-2	Edr5-2	Edr5-2	LEUr5t	Edr5-2

MODULE 2 - User Input Parameters (2-FnC)

DISPLAY	PARAMETER	ON-dLY	OF-dLY	rEPEAt	dLY InT	InT-L	InT-E
USEr-1	User Input 1	N/A	r5t-L	N/A	N/A	Or5t-E	N/A
r5t	Reset Key	no	no	no	no	(SP1-YES) no	no

MODULE 6 - Setpoint Parameters (6-SPt)

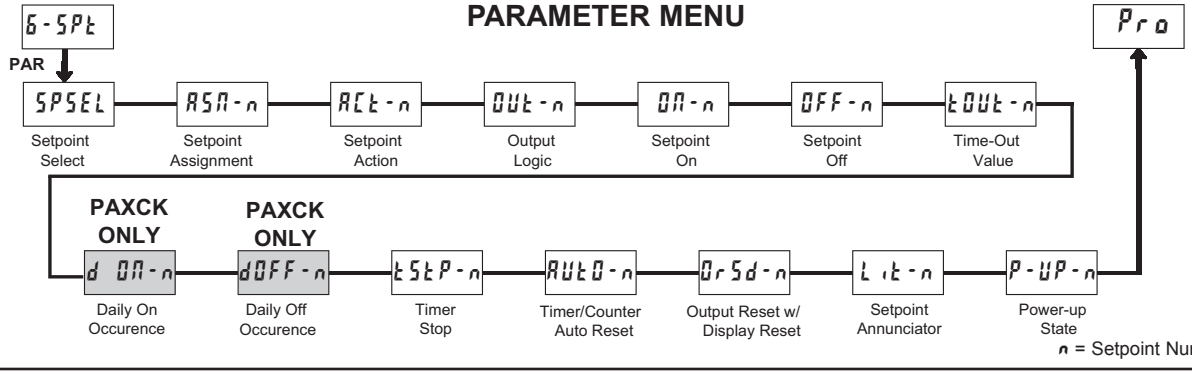
DISPLAY	PARAMETER	ON-dLY	OF-dLY	rEPEAt	dLY InT	InT-L	InT-E
SPSEL	Setpoint Select	SP-1	SP-1	SP-1	SP-1	SP-1	SP-1
ASn-1	Setpoint Assignment	t-dSP	t-dSP	t-dSP	t-dSP	t-dSP	t-dSP
ACt-1	Setpoint Action	LAtCH	ON-OFF	ON-OFF	t-OUt	ON-OFF	t-OUt
OUt-1	Output Logic	nOr	nOr	nOr	nOr	nOr	nOr
On-1	Setpoint On	VALUE	t-Strt	VALUE	VALUE	t-Strt	t-Strt
SP-1	Setpoint On Value	T*	N/A	T1*	T1*	N/A	N/A
OFF-1	Setpoint Off	N/A	VALUE	VALUE	N/A	VALUE	N/A
SPOF-1	Setpoint Off Value	N/A	T*	T2*	N/A	T*	N/A
tOUt-1	Time-out Value	N/A	N/A	N/A	T2*	N/A	T*
tStP-1	Timer Stop	no	O-OFF	no	O-OFF	O-OFF	O-OFF
AUtO-1	Timer/Counter Auto Reset	no	no	O-OFF	no	no	no
Or5d-1	Output Reset w/display Reset	no	no	no	no	no	no
L nt-1	Setpoint Annunciator	nOr	nOr	nOr	nOr	nOr	nOr
P-UP-1	Power-up State	OFF	OFF	OFF	OFF	OFF	OFF

** Refer to timing diagrams. These parameters are the actual Setpoint On/Off or Time-Out values set by the user for the specific application.*

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

This module can only be accessed if a Setpoint Card is installed.

PARAMETER MENU



Module 6 is the programming module for the Setpoint (Alarm) Output Parameters. This programming module can only be accessed if a Setpoint card is installed. Depending on the card installed, there will be two or four Setpoint outputs available. The Setpoint Assignment and Setpoint Action parameters determine the applicable Setpoint features, and dictate which subsequent parameters will appear for the Setpoint being programmed.

This section of the bulletin replaces the bulletin shipped with the Dual and Quad Setpoint plug-in cards. Discard the separate bulletin when using Setpoint plug-in cards with the PAXCK and PAXTM.

D

SETPOINT SELECT

SPSEL → nO

SP-1 SP-2 SP-3 SP-4

Select the Setpoint (alarm) output to be programmed. This provides access to the parameters for that particular Setpoint. The "n" in the following parameter displays, reflects the chosen Setpoint number (1 thru 4). After the chosen Setpoint is programmed, the display returns to SPSEL nO. Select the next Setpoint to be programmed and continue this sequence for each Setpoint. Select nO to exit the module. SP-3 and SP-4 apply to Quad Setpoint cards only.

SETPOINT ASSIGNMENT

ASn-n → nonE

t-dSP C-dSP rtC-d rtC-t

Select the meter display to which the Setpoint is assigned: Timer (t-dSP), Cycle Counter (C-dSP), Real-Time Clock Date display (rtC-d) or Real-Time Clock Time display (rtC-t). *(The rtC-d and rtC-t selections only appear if a Real-Time Clock option card is installed.)*

By selecting nonE, the Setpoint is not assigned to a specific display. However, the output can still be activated (set) and deactivated (reset) by various "events". Such events include the Timer starting or stopping, or another Setpoint output turning On or Off. The output can also be set and reset through a User Input function or through serial communications.

SETPOINT ACTION

ACt-n → LAtCH

t-Out On-OFF

This parameter determines the mode for output ***deactivation*** as shown below. Output ***activation*** is controlled by the **SETPOINT ON** parameter setting.

DISPLAY	DESCRIPTION	OUTPUT DEACTIVATES
LAtCH	Latched Output Mode	At Reset (Manual or Automatic)
t-Out	Timed Output Mode	After "Time-Out Value" Elapses
On-OFF	On-Off Output Mode	Based on "Setpoint Off" Setting

The t-Out and On-OFF selections are not available when Setpoint is assigned to rtC-d.

OUTPUT LOGIC

Out-n → nOr

nOr rEV

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

SETPOINT ON

On-n → VALUE

	VALUE	t-Strt	t-StOP
01-On	01-OFF	02-On	02-OFF
03-On	03-OFF	04-On	04-OFF

This parameter determines when the Setpoint output will activate. Output activation can occur at a specific Setpoint Value (VALUE) or can be triggered by various "events", as shown in the parameter list. Such events include the Timer starting (t-Strt) or stopping (t-StOP), or by the action (event) that causes another Setpoint output to turn On or Off. When programmed for an event, the Setpoint must not be used as the Setpoint On event for another Setpoint.

Selecting VALUE displays a sub-menu where the Setpoint value is entered. The Setpoint value is based on the meter display to which the Setpoint is assigned (ASn-n). When assigned to the Timer or Cycle Counter, the Setpoint value is entered in the same format as the assigned display. When assigned to the Real-Time Clock Date Display (rtC-d), the date value is entered in month.day.year format (mm.ddYY). When assigned to the Real-Time Clock Time Display (rtC-t), the Setpoint value is always entered in HH-MM format (Hours-Minutes with AM/PM selection). In Setpoint One-shot mode (See Daily On Occurrence), the One-shot Setpoint is enabled (armed) by scrolling the AM/PM digit until the 2nd digit decimal point is lit.

SP-n → 000000 to 999999

SETPOINT OFF

OFF-n → VALUE

	VALUE	t-Strt	t-StOP
01-On	01-OFF	02-On	02-OFF
03-On	03-OFF	04-On	04-OFF

The Setpoint Off parameter only appears when the Setpoint Action (ACt-n) is programmed for On-Off Output mode (On-OFF). In this mode, this parameter determines when the Setpoint output will deactivate. Output deactivation can occur at a specific Setpoint Off Value (VALUE) or can be triggered by various "events", as shown in the parameter list. Such events include the Timer starting (t-Strt) or stopping (t-StOP), or by the action (event) that causes another Setpoint output to turn On or Off. When programmed for an event, the Setpoint must not be used as the Setpoint Off event for another Setpoint.

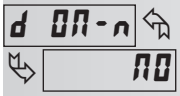
Selecting VALUE will display a sub-menu where the Setpoint Off value is entered. The Setpoint Off value is based on the meter display to which the Setpoint is assigned (ASn-n). When assigned to the Timer or Cycle Counter, the value is entered in the same format as the assigned display. When assigned to the Real-Time Clock Date Display (rtC-d), the date value is entered in month. day.year format (mm.ddYY). When assigned to the Real-Time Clock Time Display (rtC-t), the value is always entered in HH-MM format (Hours-Minutes with AM/PM selection).

SPOF-n → 000100 to 999999

TIME-OUT VALUE

The Time-Out Value only appears when the Setpoint Action (**ACt-n**) is programmed for Timed Output mode (**t-Out**). In this mode, the Time-Out Value is the Setpoint Output time duration, from activation to deactivation. This value is always entered in minutes, seconds, and hundredths of seconds format. The maximum Time-Out Value is 99 minutes 59.99 seconds.

PAXCK: DAILY ON OCCURRENCE



This parameter only appears when the Setpoint is assigned (**ASn-n**) to the Real-Time Clock Time display (**rtC-t**). This parameter determines the days of the week when the Setpoint output will activate.

Selecting **YES** displays a sublist for choosing the days of the week. On all days entered as **YES** in the sublist, the output will activate. On all days entered as **no**, the output will not activate. The output activation is repetitive, and will occur every week on the chosen day(s).

DISPLAY	DESCRIPTION	FACTORY
Sun	Sunday	no
Mon	Monday	YES
tuE	Tuesday	YES
WEd	Wednesday	YES
thu	Thursday	YES
Fri	Friday	YES
SAt	Saturday	no

Setpoint One-Shot Mode

If all days are set to **no**, the Setpoint will operate in "One-shot" mode. When a One-shot setpoint is enabled (armed), the setpoint output will activate at the set time and disable itself from activating again. To enable or re-enable a one-shot alarm, go to the Setpoint value entry display and press the Up or Dn key repeatedly while the AM/PM digit is selected (flashing). When the 2nd digit decimal point is lit, the Setpoint is enabled. The Setpoint enable status is saved at power-down. The enable state of the Setpoint is not affected or changed when the Parameter List is exchanged.

The setpoint will turn off (de-activate) as programmed per the Setpoint Action selected. If **On-OFF** mode is selected, program all the Daily Off days to **YES** to have the Setpoint turn off at the next Daily Off Occurrence. The One-shot status can also be viewed or set from the Setpoint Off value entry display.

PAXCK: DAILY OFF OCCURRENCE

This parameter only appears when the Setpoint is assigned (**ASn-n**) to the Real-Time Clock Time display (**rtC-t**) and when the Setpoint Action (**ACt-n**) is programmed for On-Off Output mode (**On-OFF**). In this mode, this parameter determines the days of the week when the Setpoint output will deactivate.

Selecting **YES** displays a sublist for choosing the days of the week. On all days entered as **YES** in the sublist, the output will deactivate. On all days entered as **no**, the output will not deactivate. The output deactivation is repetitive, and will occur every week on the chosen day(s).

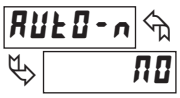
DISPLAY	DESCRIPTION	FACTORY
Sun	Sunday	no
Mon	Monday	YES
tuE	Tuesday	YES
WEd	Wednesday	YES
thu	Thursday	YES
Fri	Friday	YES
SAt	Saturday	no

TIMER STOP

Timer stops when the Setpoint output activates (**0-On**) or deactivates (**0-OFF**). Select **no** if the output should not affect the Timer Run/Stop status.

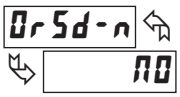
Stopping the Timer as a result of this parameter does not constitute a **t-StOP** condition (event) for the Setpoint On or Setpoint Off parameters.

TIMER/COUNTER AUTO RESET



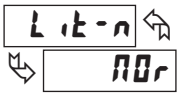
When the Setpoint output activates (**0-On**) or deactivates (**0-OFF**), the meter automatically resets the Setpoint Assignment display (**ASn-n**). Select **no** if the Setpoint output should not cause the assigned display to reset. Does not apply to manual activations or deactivations by user input, function key, or serial communications.

OUTPUT RESET WITH DISPLAY RESET



When **YES** is selected, the Setpoint output will reset when the Setpoint Assignment display (**ASn-n**) resets. Select **no** if the Setpoint output should not reset when the assigned display resets.

SETPOINT ANNUNCIATOR



This parameter controls the illumination of the LED annunciator for the corresponding Setpoint output (**SPn**) as follows:

Normal (**nor**) – Annunciator displayed when output is "on" (activated)
Reverse (**rEU**) – Annunciator displayed when output is "off" (deactivated)
Flash (**FLASH**) – Annunciator and display flashes when output is "on" (activated)
Off (**OFF**) – Annunciator disabled

SETPOINT POWER-UP STATE

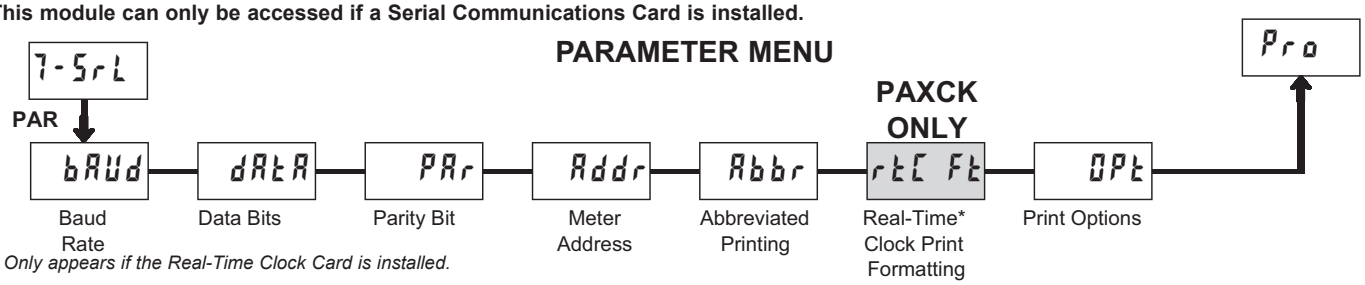
Determines the on/off state of the Setpoint output at power-up. Regardless of output logic setting (normal or reverse).

OFF – Deactivates the Setpoint output at power-up
On – Activates the Setpoint output at power-up
SAVE – Restores the output to the state it was in prior to power-down

D

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

This module can only be accessed if a Serial Communications Card is installed.



Module 7 is the programming module for the Serial Communications Parameters. These parameters are used to match the serial settings of the PAX with those of the host computer or other serial device, such as a terminal or printer. This programming module can only be accessed if an RS232 or RS485 Serial Communications card is installed.

This section also includes an explanation of the commands and formatting required for communicating with the PAX. In order to establish serial communications, the user must have host software that can send and receive ASCII characters. Red Lion's Crimson® software can be used for configuring the PAX. (See ordering information.) For serial hardware and wiring details, refer to section 4.5 Serial Communication Wiring.

This section of the PAXTM/CK bulletin replaces the bulletin shipped with the RS232 and RS485 serial communications plug-in cards. Discard the separate bulletin when using those serial plug-in cards with the PAXTM/CK. Also, this section does NOT apply to the DeviceNet, Modbus, or Profibus-DP communication cards. For details on the operation of the Fieldbus cards, refer to the bulletin shipped with each card.

D

BAUD RATE

bAUd / 9600 — 300 600 1200 2400 4800 9600 19200

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

DATA BITS

dAtA / 7 — 7 8

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

PARITY BIT

PAr / Odd — no Odd EVEN

This parameter only appears when the Data Bits parameter is set to a 7-bit data word length. Set the parity bit to match that of the other serial communications 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

Addr / 00 — 00 to 99

Enter the serial meter (node) address. With a single meter, an address is not needed and a value of zero can be used. With multiple meters (RS485 applications), a unique 2 digit address number must be assigned to each meter.

Addresses 98 and 99 are reserved to configure a unit as a serial real-time clock master. See Serial Real-time Clock Master Adressing.

ABBREVIATED PRINTING

Abbr / no — no YES

This parameter determines the formatting of data transmitted from the meter in response to a Transmit Value (T) command or a Block Print Request (P) command. Select no for a Full print transmission, which consists of the meter address, mnemonics, and parameter data. Select YES for abbreviated print transmissions, consisting of the parameter data only. This setting affects all the parameters selected in the **PRINT OPTIONS**. (Note: If the meter address is 00, the address will not be sent during a Full transmission.)

PAXCK: REAL-TIME CLOCK PRINT FORMATTING

rtC Ft / YES — no YES

This parameter determines the formatting of the Real-Time Clock (RTC) values transmitted from the meter in response to a Transmit Value (T) command or a Block Print Request (P) command. This parameter appears only when a Real-Time Clock plug-in option card is installed.

When YES is selected, RTC values are formatted as per the RTC Time and Date Display Formats programmed in Module 8. The Day of Week value is sent as a character string.

When no is selected, the meter sends the RTC values as numeric data only. This selection allows the RTC values to be recognized by the Red Lion HMI products. RTC Time/Date units are separated by a ":". The Day is sent as a single number as shown below.

TIME - Hours (24-Hr. format), Minutes, Seconds (HHMMSS)
DATE - Month, Day, Year (mmddyy)
DAY - 1 = Sunday thru 7 = Saturday

PRINT OPTIONS

OPt / no

This parameter selects the meter values transmitted in response to a Print Request. A Print Request is sometimes 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 block print. All parameters entered as YES in the sublist will be transmitted during a block print. Parameters entered as no will not be sent.

DISPLAY	PARAMETER	FACTORY	MNEMONIC
t-dSP	Timer	YES	TMR
C-dSP	Cycle Counter	no	CNT
rtC-d	RTC Date*	no	DAT
rtC-t	RTC Time*	no	TIM
SPnt	Setpoint Values*	no	SP1 SP2 SP3 SP4
SPntOF	Setpoint Off/Time-Out Values*	no	SO1 SO2 SO3 SO4
StrStP	Timer/Cnt Start & Stop Values	no	TST TSP CST CSP

* *These values are plug-in card dependent.*

SERIAL RTC MASTER ADDRESSING

A meter, having software code version 2.3 or greater, with a Real Time Clock Card and an RS485 Serial Communication Card installed, can act as a Serial RTC Master, when programmed with meter address 98 or 99. With this feature, whenever the Master meter's time, date or day is changed, through quick or main programming, it will transmit and make the same change to the other PAXCK's on the RS485 bus. Only one meter should be configured as Master. This Master, with address 98 or 99, should also be programmed as the "Host" in module **8-rtc** under Clock Synchronization. With it programmed as Host, the other PAXCK Slaves will update hours, minutes and seconds to the Host once an hour and the Real-Time Clock Wiring (terminals 16-18) will not be necessary.

Meter addresses 98 and 99 are distinguished as follows:With address 98, the meter will transmit the change to all meters on the RS485 bus addressed as "0". This is useful when using both newer or older software code version meters, or when another master (computer, operator interface) is not being used.

With address 99, the meter will transmit the change to all, software code version 2.3 or greater, meters on the RS485 bus using a global broadcast address suffix. This is useful when it is necessary to have unique or other than 0 serial meter addresses or when having a computer or operator interface connected.

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 the command terminator character * or $.

Command Chart

COMMAND	DESCRIPTION	NOTES
N	Node (Meter) Address Specifier	Address a specific meter. Must be followed by node address. Not required when address = 00.
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.

Command String Construction

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

1. The first characters consist of the Node Address Specifier (N) followed by a 1 or 2 character address number. The address number of the meter is programmable. If the node address is 0, this command and the node address itself may be omitted. The address suffix , "?" is the global broadcast address specifier. A command string that is sent with N? prefix will be accepted by all PAXCKs on the RS485 network (software code version 2.3 or greater). This is useful for setting all meters to the current time, date or day that may have unique meter addresses on a bus. It is important not to send (P)rint or (T)ransmit commands using N? prefix, as it will result in multiple meters responding at the same time. 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 the options. If constructing a value change command (writing data), the numeric data is sent next.
4. All command strings must be terminated with the string termination characters * or $. The meter does not begin processing the command string until this character is received. See Timing Diagram figure for differences between terminating characters.

*Note: On a change value command (V), if the command string is terminated with the * character, all values are stored in E^2PROM memory. Values are not stored if the $ terminator is used.*

Register Identification Chart

ID	VALUE DESCRIPTION	REGISTER NAME [1]	COMMAND [2]	TRANSMIT DETAILS [3]
A	Timer Value	TMR	T, V, R	6 digit
B	Cycle Counter Value	CNT	T, V, R	6 digit
C	RTC Time Value	TIM	T, V	6 digit
D	RTC Date Value	DAT	T, V	6 digit
E	Setpoint 1	SP1	T, V, R	6 digit
F	Setpoint 2	SP2	T, V, R	6 digit
G	Setpoint 3	SP3	T, V, R	6 digit
H	Setpoint 4	SP4	T, V, R	6 digit
I	Setpoint 1 Off Value	SO1	T, V	6 digit
J	Setpoint 2 Off Value	SO2	T, V	5 digit
K	Setpoint 3 Off Value	SO3	T, V	6 digit
L	Setpoint 4 Off Value	SO4	T, V	6 digit
M	Timer Start Value	TST	T, V	6 digit
O	Cycle Counter Start Value	CST	T, V	6 digit
Q	Timer Stop Value	TSP	T, V	6 digit
S	Cycle Counter Stop Value	CSP	T, V	6 digit
U	Auto/Man Register	MMR	T, V	0 - auto, 1 - manual
W	Day of Week Value	DAY	T, V	1 = Sun....7 = Sat
X	Setpoint Register	SOR	T, V	0 - not active, 1 - active

1. Register Names are also used as Register Mnemonics during full transmission.
2. The registers associated with the P command are set up in Print Options (Module 7).
3. Unless otherwise specified, the Transmit Details apply to both T and V Commands.

Command String Examples:

1. Address = 17, Write 350 to Setpoint 1
   String: N17VE350$
2. Address = 5, Cycle Counter value, response time of 50 to 100 msec. min.
   String: N05TB*
3. Address = 0, Reset Timer value
   String: RA*

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 scaled resolution. (ie. 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).

For RTC Time [C] and Date [D] Value:

Time - 24 Hours, Minutes, Seconds (HHMMSS)
Ex: 083000 = 8:30 AM, 144500 = 2:45 PM

Date - Month, Day, Year (mmddyy)
Ex: 123101 = December 31, 2001

Day - 1 = Sunday through 7 = Saturday
EX: 3 = Tuesday

Notes:

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

2. The date and day must be set separately.

Transmitting Data From the Meter

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

Full Transmission (Abbr = NO)

BYTE	DESCRIPTION
1, 2	2 byte Node (Meter) Address field [00-99]
3	<SP> (Space)
4-6	3 byte Register Mnemonic field
7-18	12 byte numeric data field: 6 bytes for number, up to 3 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 unit address. If the address assigned is 0, two spaces are substituted. A space follows the unit address field. The next three characters are the register mnemonic.

The numeric data is transmitted next. The numeric field is 12 characters long (decimal points are loaded depending on timer range selected). The data is right-aligned with leading spaces for any unfilled positions.

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

Abbreviated Transmission (Abbr = YES)

BYTE	DESCRIPTION
1-12	12 byte data field, 6 bytes for number, up to 3 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 address and register mnemonics, leaving only the numeric part of the response.

Note: Transmissions are formatted to match the way the parameter is displayed. This includes setpoints.

Example: SP1 assigned to RTC. RTC format = 12:00 P.
SP1 printout = 12:00 P.

Note: When communicating with a Red Lion Controls HMI unit, set rtC Ft in programming module 7 (serial) to NO. This formats the RTC parameters to:
Time - 24 Hours, Minutes, Seconds
Date - Month, Day, Year
Day - 1 = Sunday through 7 = Saturday
Decimal points are substituted for all punctuation.

Meter Response Examples:

1. Address = 17, full field response, Cycle Counter = 875
   17 CNT 875 <CR><LF>
2. Address = 0, full field response, Setpoint 2 = 250.5
   SP2 250.5<CR><LF>
3. Address = 0, abbreviated response, Setpoint 2 = 250, last line of block print
   250<CR><LF><SP><CR><LF>

Auto/Manual Mode Register (MMR) ID: U

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

U abcd
- d = SP4
- c = SP3
- b = SP2
- a = SP1

Example: VU0011 places SP3 and SP4 in manual.

Setpoint Output Register (SOR) ID: X

This register is used to view or change the states of the setpoint outputs. Reading from this register (TX) will show the present state of all the setpoint outputs. A "0" in the setpoint location means the output is inactive and a "1" means the output is active. The output logic parameter in Module 6 will affect the active logic state.

X abcd
- d = SP4
- c = SP3
- b = SP2
- a = SP1

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

Example: VX10* will result in output 1 active and output 2 inactive.

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.

Refer to the Timing Diagrams below. 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 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 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.

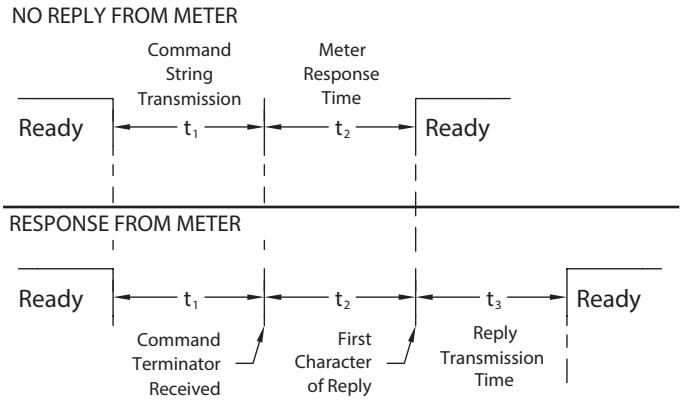
At the beginning of time interval t_3, the meter responds with the first character of the reply. As with t1, the time duration of t_3 is dependent on the number of characters and baud rate of the channel. At the end of t_3, the meter is ready to receive the next command.

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

SERIAL TIMING

COMMAND	COMMENT	PROCESS TIME (t_2)
R	Reset	2-50 msec.
V	Write	100-200 msec.
T	Transmit	2-50 msec. for $
		50-100 msec. for *
P	Print	2-50 msec. for $
		50-100 msec. for *

Timing Diagrams



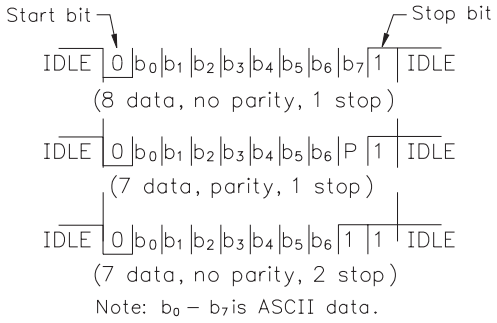
COMMUNICATION FORMAT

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 -25 V	a-b < -200 mV
0	space (active)	TXD,RXD; +3 to +25 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. 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

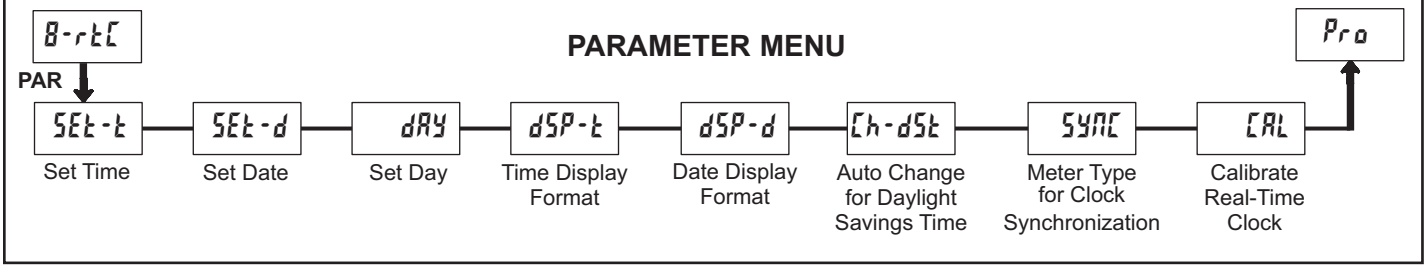
After the data bits, the parity bit is sent. The transmitter sets the parity bit to a zero or a one, so that the total number of ones contained in the transmission (including the parity bit) is either even or odd. This bit is used by the receiver to detect errors that may occur to an odd number of bits 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 PAX 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 PAX.

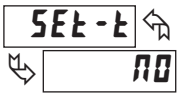
D

6.8 MODULE 8 - REAL-TIME CLOCK PARAMETERS (8-rtC) - PAXCK



Module 8 is the programming module for the Real-Time Clock (RTC) Date and Time Parameters. In the Display Mode, the DAT annunciator indicates the RTC Date is currently being shown. The RTC Time display is shown with no annunciator. This programming module can only be accessed if a Real-Time Clock card is installed.

SET TIME

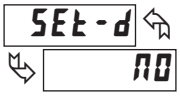


nO YES

This parameter sets the Time for the Real-Time Clock. Selecting YES will display the sub-menu where the Time can be set or changed. The RTC Time is entered in "Hours-Minutes", 12-hour format, with AM/PM indication. When the **PAR** key is pressed, the new Time is entered and begins running. The "Seconds" always start from 00 when the Time is entered. Select nO to advance to the next parameter without changing the Time.

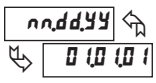
HOURS-MINUTES Am/Pm

SET DATE



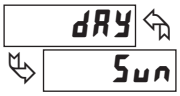
nO YES

This parameter sets the Date for the Real-Time Clock. Selecting YES will display the sub-menu where the Date can be set or changed. The RTC Date is entered in "Month.Day.Year" format (two-digit values). When the **PAR** key is pressed, the new Date is entered. Select nO to advance to the next parameter without changing the Date.



MONTH.DAY.YEAR

SET DAY



Sun Mon tuE wEd
thu Fri SAt

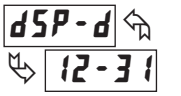
Set the Day of the week for the Real-Time Clock.

TIME DISPLAY FORMAT

12-59P 12-59 23-59
12.59.59 23.59.59

Select the format in which the Real-Time Clock Time will be displayed. The format selections depict the *range* for the RTC Time display, and DO NOT represent the *current* RTC Time. When the meter is operating in the Display Mode, the RTC Time display is shown with no annunciator.

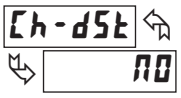
DATE DISPLAY FORMAT



12-31 31-12 12.31.99 31.12.99
JAN-31 31-JAN Sun-31

Select the format in which the Real-Time Clock Date will be displayed. The format selections depict the *range* for the RTC Date display, and DO NOT represent the *current* RTC Date. When the meter is operating in the Display Mode, the RTC Date display is indicated by the DAT annunciator.

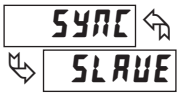
AUTO CHANGE FOR DAYLIGHT SAVINGS TIME



no YES

Selecting YES allows the meter to automatically adjust the RTC Time for Daylight Savings Time. (Adjustment dates are U.S.A. standard only.) Avoid setpoints that occur during adjustment (Sundays 1 to 3 AM).

METER TYPE FOR CLOCK SYNCHRONIZATION



SLAVE HOSt

Time synchronization between multiple PAXCK meters can be accomplished through a hardware interface on the Real-Time Clock option card. This RS485 type interface allows connection of up to 32 PAXCK meters in a two-wire multidrop network, at distances up to 4000 ft. (See Section 4.6, Real-Time Clock Wiring).

In a Synchronization network, one PAXCK meter is programmed as the Host (HOSt), while all other meters are programmed as Slaves (SLAVE). Once every hour (at 30 min. past the hour), the Host meter outputs a time synchronization pulse onto the network. Upon receiving the synchronization pulse, each Slave meter automatically adjusts the Minutes and Seconds of its RTC Time setting to synchronize with the Host. *Synchronization, using the Real-Time Clock Wiring, adjusts the Minutes and Seconds only, and does* ***not*** *change the Hours, AM/PM, Day or Date settings in the Slave meter's RTC.*

Full-time synchronization (hours, minutes and seconds) is possible for PAXCKs that are connected in an RS485 network (RS485 Serial Option cards required). In this configuration, one meter is designated as the Serial RTC Master by setting the meter's address as 98 or 99 (see Serial Real-time Clock Addressing in Master Module 7). Every hour (at 30 min past the hour), the Serial RTC Master / Host will transmit the full time (Hours, minutes, seconds) to all meters through the RS485 serial card wiring network. The time, date, or day will also be transmitted and updated in the Slaves when changed in the programming of the Serial RTC Master. Only one meter should be configured as Master and that meter should also be configured as the Host.

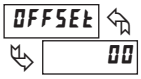
CALIBRATE REAL-TIME CLOCK

no YES

* ***NOTE: DO NOT ADJUST TRIM CAP ON RTC CARD!***

The Real-Time Clock circuit uses a crystal controlled oscillator for high accuracy timekeeping. The oscillator is factory calibrated* and optimized for 25°C ambient temperature operation. Since the PAXCK is designed to operate over a wide temperature range, and since the accuracy of a crystal oscillator varies with ambient temperature, some drift in the RTC time may be observed over an extended period. This is primarily seen in high or low temperature installations. To compensate for the wide operating temperature range, a calibration or "Offset" value can be entered, which effectively slows down or speeds up the clock to maintain accurate timekeeping.

To calibrate the RTC, install the meter in its normal operating environment, and set the time based on a known accurate reference (such as the WWV broadcast or the Atomic Clock reference which is available via the internet). After 30 days of normal operation, compare the RTC time to the reference, and note the amount of time gained or lost. Refer to the tables on the next page for the proper Offset value to enter, given the amount of time drift observed.



00 to 63

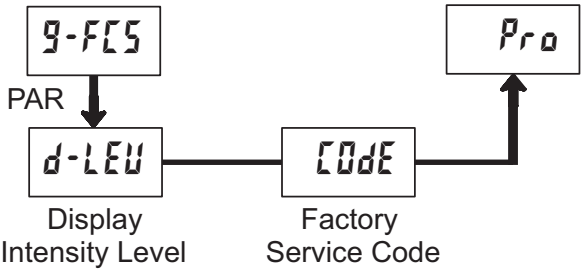
Selecting YES for the CAL parameter displays the OFFSEt sub-menu where the present Offset value can be viewed or changed. The tables below show the value to enter, given the amount of time gained or lost in a 30-day period.

Values 00 and 32 provide no Offset, and are not shown in the tables.

IF RTC CLOCK GAINED TIME: USE VALUE FROM THIS TABLE			
SECONDS GAINED IN 30 DAYS	ENTER THIS OFFSET VALUE	SECONDS GAINED IN 30 DAYS	ENTER THIS OFFSET VALUE
5	01	90	17
11	02	95	18
16	03	100	19
21	04	105	20
26	05	111	21
32	06	116	22
37	07	121	23
42	08	127	24
47	09	132	25
53	10	137	26
58	11	142	27
63	12	148	28
69	13	153	29
74	14	158	30
79	15	163	31
84	16		

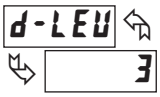
IF RTC CLOCK LOST TIME: USE VALUE FROM THIS TABLE			
SECONDS LOST IN 30 DAYS	ENTER THIS OFFSET VALUE	SECONDS LOST IN 30 DAYS	ENTER THIS OFFSET VALUE
11	33	179	49
21	34	190	50
32	35	200	51
42	36	211	52
53	37	221	53
63	38	232	54
74	39	243	55
84	40	253	56
95	41	264	57
105	42	274	58
116	43	285	59
127	44	295	60
137	45	306	61
148	46	316	62
158	47	327	63
169	48		

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



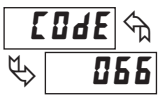
PARAMETER MENU

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 **RST** and/or arrow keys to display CodE 066 and press **PAR**. The meter will display rESEt and then returns to CodE 050. Press **DSP** key to return to the Display Mode. This will overwrite all programmed user settings with the Factory Default Settings shown in the Parameter Value Chart. For the PAXCK, the Time and Date stored in the Real-Time Clock, as well as the RTC Claibration Offset value, are NOT overwritten by this parameter. However, the Time and Date Display Formats will revert back to the Factory Default Settings.

TROUBLESHOOTING

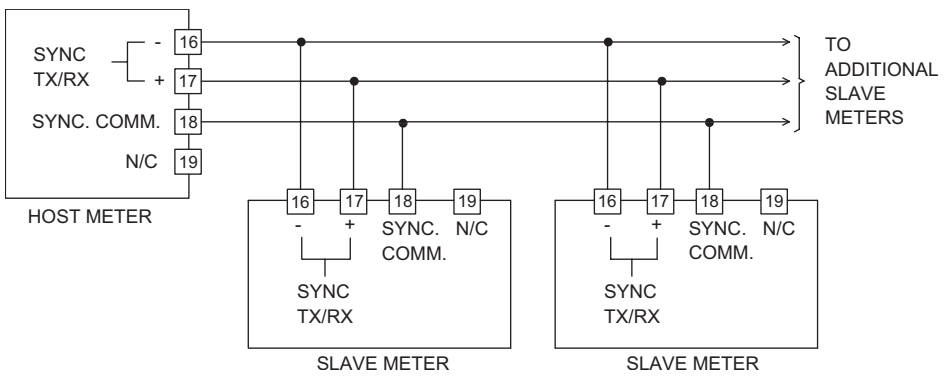
For further assistance, contact technical support at the appropriate company numbers listed.

PROBLEM	REMEDIES
NO DISPLAY	**CHECK**: Power level, power connections
PROGRAMMING LOCKED-OUT	**CHECK**: User input set for program lock-out function is in Active state **ENTER**: Security code requested
CERTAIN DISPLAYS ARE LOCKED-OUT	**CHECK**: Display Lock-out programming in Module 3
MODULES or PARAMETERS NOT ACCESSIBLE	**CHECK**: Corresponding plug-in card installation, Program Lock-out/ Value Access parameter programming in Module 3
TIMER NOT RUNNING	**CHECK**: Input wiring, Timer plug jumper setting, Timer input programming in Module 1, input signal level, Timer Inhibited by Input B or a user input
USER INPUT NOT WORKING PROPERLY	**CHECK**: User input wiring, user input plug jumper setting, user input signal level, user input programming in Module 2
OUTPUTS NOT WORKING PROPERLY	**CHECK**: Setpoint plug-in card installation, wiring, Setpoint programming in Module 6
REAL-TIME CLOCK NOT WORKING PROPERLY	**CHECK**: RTC plug-in card installation, RTC programming in Module 8, check for proper battery installation, replace battery. **DO NOT ADJUST TRIM CAP ON RTC CARD!**
SERIAL COMMUNICATIONS NOT WORKING	**CHECK**: Serial plug-in card installation, Serial wiring, Serial settings in Module 7, host settings
ERROR CODE (Err 1-4)	**PRESS**: Reset key (If unable to clear, contact factory.)

Shaded areas are model dependent.

PAXCK Application

A big application request has always been for Real-Time Clocks to display time throughout the plant. The challenge has been to keep all the various clock locations synchronized with the right time. With the new PAXCK Timer/Real-Time Clock this problem is history. The clocks can be provided in three different sizes, the PAXCK (0.56 inch LEDs), the LPAXCK (1.5 inch LEDs), or the EPAX (4 inch LEDs). You can mix and match any number of the two versions, up to a maximum of 32 units. Simply select one of the units in the system as the host and the balance are programmed as slaves. The host will send out a synchronization pulse every hour to correct the time on any clock unit wired in the system.



Real-Time Clock Synchronization Network

MODEL PAXCK - 1/8 DIN REAL-TIME CLOCK

This is a brief overview of the PAXCK. For complete specifications and programming information, see the **PAX 1/8 DIN Preset Timer (PAXTM) & Real-time Clock (PAXCK) Bulletin** starting on **page 199**.

- *6-DIGIT 0.56" RED SUNLIGHT READABLE OR STANDARD GREEN DISPLAY*
- *4 SEPARATE DISPLAYS (Timer, Counter, Real-Time Clock, and Date)*
- *CYCLE COUNTING CAPABILITY*
- *PROGRAMMABLE FUNCTION KEYS/USER INPUTS*
- *FOUR SETPOINT ALARM OUTPUTS (W/Plug-in card)*
- *COMMUNICATIONS AND BUS CAPABILITIES (W/Plug-in card)*
- *BUS CAPABILITIES: DEVICENET, MODBUS and PROFIBUS-DP*
- *CRIMSON PROGRAMMING SOFTWARE*
- *NEMA 4X/IP65 SEALED FRONT BEZEL*

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PAXCK SPECIFICATIONS

4. **ANNUNCIATORS**:

TMR -Timer Display	SP1 -Setpoint 1 Output
CNT -Cycle Counter Display	SP2 -Setpoint 2 Output
DAT -Real-Time Clock Date Display	SP3 -Setpoint 3 Output
-Real-Time Clock Time Display	SP4 -Setpoint 4 Output

REAL-TIME/DATE DISPLAY (PAXCK):
Real-Time Display: 5 display formats
Hr/Min/Sec (12 or 24 Hr. format); Hr/Min (24 Hr.); Hr/Min (12 Hr. with or without AM/PM indication)
Date Display: 7 display formats
Month/Day or Day/Month (numeric or 3-letter Month format); Month/Day/Year or Day/Month/Year (all numeric);
Day of Week/Day (3-letter Day of Week format)

REAL-TIME CLOCK CARD: Field replaceable plug-in card
Time Accuracy: ± 5 secs./Month (1 min./year) with end-user calibration
Battery: Lithium 2025 coin cell
Battery Life Expectancy: 10 yrs. typical
Synchronization Interface: Two-wire multi-drop network (RS485 hardware), 32 units max., operates up to 4000 ft.
Isolation To Timer & User Input Commons: 500 Vrms for 1 min.
Working Voltage: 50 V. Not isolated from all other commons.

TIMER INPUTS A and B:
Logic inputs configurable as Current Sinking (active low) or Current Sourcing (active high) via a single plug jumper.
Current Sinking (active low): V_{IL} = 0.9 V max., 22KΩ pull-up to +12 VDC.
Current Sourcing (active high): V_{IH} = 3.6 V min., 22KΩ pull-down, Max. Continuous Input: 30 VDC.
Timer Input Pulse Width: 1 msec min.
Timer Start/Stop Response Time: 1 msec max.
Filter: Software filtering provided for switch contact debounce. Filter enabled or disabled through programming.
If enabled, filter results in 50 msec start/stop response time for successive pulses on the same input terminal.