GENERAL DESCRIPTION

The PAXDP Dual Process Input Meter offers many features and performance capabilities to suit a wide range of industrial applications. Available in two models, AC or DC power, the meter has the capability to accept two, 4 to 20 mA or 0 to 10 VDC input signals. Each input signal can be independently scaled and displayed. In addition, a math function can be performed on the two signals, C + A + B, C - A - B, C + A - B, AB / C, CA / B, or C (A / B - 1). Any of the three meter values can have Alarms, Comms, and/or a Retransmitted Analog Output capability by simply adding optional cards. The optional plug-in output cards allow the opportunity to configure the meter for current applications, while providing easy upgrades for future needs.

The update rate of the meter is user selectable. This will help in those applications where a quick response from the meter is of the utmost importance. The rate can be adjusted from eight selections with a minimum of 5 updates/second to a maximum of 105 updates/second.

The meters employ a bright 0.56" (14.2 mm) red sunlight readable LED display. The intensity of display can be adjusted from dark room applications up to sunlight readable, making it ideal for viewing in bright light applications.

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

The signal totalizer (integrator) can be used to compute a time-input product. Once the meters have been initially configured, the parameter list may be locked out from further modification in its entirety or only the setpoint values can be made accessible.

The meters have been specifically designed for harsh industrial environments. With NEMA 4X/IP65 sealed bezel and extensive testing of noise effects to 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 the instrument or equipment connected to it. If equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

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

CAUTION: Risk of electric shock.

DIMENSIONS In inches (mm)

Note: Recommended minimum clearance (behind the panel) for mounting clip installation is 2.1" (53.4) H x 5.0" (127) W.
Ordering Information

Meter Part Numbers

<table>
<thead>
<tr>
<th>TYPE</th>
<th>MODEL NO.</th>
<th>DESCRIPTION</th>
<th>PART NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Optional Plug-In Cards</td>
<td>PAXCDS</td>
<td>Dual Setpoint Relay Output Card</td>
<td>PAXCDS10</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Quad Setpoint Relay Output Card</td>
<td>PAXCDS20</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Quad Setpoint Sinking Open Collector Output Card</td>
<td>PAXCDS30</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Quad Setpoint Sourcing Open Collector Output Card</td>
<td>PAXCDS40</td>
</tr>
<tr>
<td></td>
<td>PAXCDC</td>
<td>RS485 Serial Communications Card with Terminal Block</td>
<td>PAXCDC10</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Extended RS485 Serial Communications Card with Dual RJ11 Connector</td>
<td>PAXCDC1C</td>
</tr>
<tr>
<td></td>
<td></td>
<td>RS232 Serial Communications Card with Terminal Block</td>
<td>PAXCDC20</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Extended RS232 Serial Communications Card with 9 Pin D Connector</td>
<td>PAXCDC2C</td>
</tr>
<tr>
<td></td>
<td></td>
<td>DeviceNet Communications Card</td>
<td>PAXCDC30</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Profibus-DP Communications Card</td>
<td>PAXCDC50</td>
</tr>
<tr>
<td></td>
<td>PAXCDL</td>
<td>Analog Output Card</td>
<td>PAXCDL10</td>
</tr>
<tr>
<td></td>
<td>PAXUSB</td>
<td>PAX USB Programming Card (Not included in PAX product UL E179259 file)</td>
<td>PAXUSB00</td>
</tr>
<tr>
<td>Accessories</td>
<td>CBLUSB</td>
<td>USB Programming Cable Type A-Mini B</td>
<td>CBLUSB01</td>
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<tr>
<td></td>
<td>ICM8</td>
<td>Ethernet Gateway</td>
<td>ICM80000</td>
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<tr>
<td></td>
<td>PAXLBK</td>
<td>Units Label Kit Accessory</td>
<td>PAXLBK10</td>
</tr>
<tr>
<td></td>
<td>SFCRD*</td>
<td>Crimson PC Configuration Software for Windows 98, ME, 2000 and XP</td>
<td>SFCRD200</td>
</tr>
</tbody>
</table>

Notes:
1. For Modbus communications use RS485 Communications Output Card and configure communication (t)FE parameter for Modbus.
2. Crimson® 2 software is available as a free download at http://www.redlion.net/
**GENERAL METER SPECIFICATIONS**

1. **DISPLAY**: 5 digit, 0.56" (14.2 mm) variable intensity red sunlight readable (-19999 to 99999)

2. **POWER**:
   - **AC Versions**:
     - AC Power: 85 to 250 VAC, 50/60 Hz, 21 VA
     - Isolation: 2300 Vrms for 1 min. to all inputs and outputs.
   - **DC Versions**:
     - (Derate operating temperature to 40°C if three plug-in option cards or PAX/CDC50 are installed.)
     - DC Power: 18 to 36 VDC, 13 W
     - AC Power: 24 VAC, ± 10%, 50/60 Hz, 16 VA
   - Isolation: 500 Vrms for 1 min. to all inputs and outputs (50 V working).
   - Must use a Class 2 or SELV rated power supply

3. **ANNUNCIATORS**:
   - A - Programmable Display
   - B - Programmable Display
   - C - Programmable Display
   - SP1 - Setpoint alarm 1 is active
   - SP2 - Setpoint alarm 2 is active
   - SP3 - Setpoint alarm 3 is active
   - SP4 - Setpoint alarm 4 is active
   - Units Label - Optional units label backlight

4. **KEYPAD**: 3 programmable function keys, 5 keys total

5. **A/D CONVERTER**: 16 bit resolution

6. **UPDATE RATES**:
   - A/D conversion rate: Adjustable 5.3 to 105 readings/sec.
   - Step response: (to within 99% of final readout value with digital filter disabled)

<table>
<thead>
<tr>
<th>INPUT UPDATE RATE</th>
<th>MAX. TIME (msec)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.3</td>
<td>770</td>
</tr>
<tr>
<td>7.5</td>
<td>560</td>
</tr>
<tr>
<td>16.7</td>
<td>260</td>
</tr>
<tr>
<td>19.8</td>
<td>220</td>
</tr>
<tr>
<td>20</td>
<td>220</td>
</tr>
<tr>
<td>30</td>
<td>150</td>
</tr>
<tr>
<td>105</td>
<td>60</td>
</tr>
</tbody>
</table>

7. **DISPLAY MESSAGES**:
   - "OLOL" - Appears when measurement exceeds + signal range.
   - "ULUL" - Appears when measurement exceeds - signal range
   - "..." - Appears when display values exceed + display range.
   - "..." - Appears when display values exceed - display range.

8. **SENSOR INPUTS**:
   - **INPUT**: ±20 mA (-26 to 28 mA)
     - 0.03% of reading +2 µA
     - 0.12% of reading +3 µA
     - 24.6 ohm
     - 90 mA
     - 1 µA
   - **INPUT**: ±10 VDC (-13 to 13 VDC)
     - 0.03% of reading +2 mV
     - 0.12% of reading +3 mV
     - 500 Kohm
     - 50 V
     - 1 mV

9. **EXCITATION POWER**:
   - Transmitter Power: 18 VDC, ±20%, unregulated, 70 mA max. per input channel.

10. **LOW FREQUENCY NOISE REJECTION**:
    - **Normal Mode**: (digital filter off)
      - **INPUT UPDATE RATE**: 50 Hz ±1 Hz
      - **INPUT UPDATE RATE**: 60 Hz ±1 Hz
      - **INPUT UPDATE RATE**: 5.3 >90 dB >65 dB
      - **INPUT UPDATE RATE**: 7.5 >60 dB >55 dB
      - **INPUT UPDATE RATE**: 16.7 >100 dB >50 dB
      - **INPUT UPDATE RATE**: 19.8 >60 dB >95 dB
      - **INPUT UPDATE RATE**: 20 >55 dB >100 dB
      - **INPUT UPDATE RATE**: 30 >20 dB >20 dB
      - **INPUT UPDATE RATE**: 105 >20 dB >13 dB

11. **USER INPUTS**: Three programmable user inputs
    - **Max. Continuous Input**: 30 VDC
    - **Isolation To Sensor Input A Common**: 500 Vrms for 1 min;
    - **Working Voltage**: 50 V
    - **Isolation To Sensor Input B Common**: Not isolated.

12. **TOTALIZER**:
    - **Function**:
      - Time Base: second, minute, hour, or day
      - Batch: Can accumulate (gate) input display from a user input
      - **Time Accuracy**: 0.01% typical
      - **Decom Field**: 0 to 0.0000
      - **Scale Factor**: 0.001 to 65.000
      - **Low Signal Cut-out**: -9,999 to 99,999
      - **Total**: 9 digits, display alternates between high order and low order readouts

13. **CUSTOM LINEARIZATION**:
    - **Data Point Pairs**: Selectable from 2 to 16
    - **Display Range**: -9,999 to 99,999
    - **Decimal Point**: 0 to 0.0000

14. **MEMORY**: Nonvolatile memory retains all programmable parameters and display values.

15. **CERTIFICATIONS AND COMPLIANCES**:
    - **CE Approved**
      - EN 61326-1 Immunity to Industrial Locations
      - Emission EN 55011 Class A
      - IEC/EN 61010-1
      - UL Recognized Component: File #E179259
      - UL Listed: File #E137808
      - Type 4X Enclosure rating (Face only)
      - IP65 Enclosure rating (Face only)
      - IP20 Enclosure rating (Rear of unit)
      - UL Listed: File #E179259
      - UL Recognized Component: File #E137808
      - Type 4X Enclosure rating (Face only)
      - IP65 Enclosure rating (Face only)
      - IP20 Enclosure rating (Rear of unit)
      - Refer to EMC Installation Guidelines section of the bulletin for additional information

16. **ENVIRONMENTAL CONDITIONS**:
    - **Operating Temperature Range**: 0 to 50°C (0 to 45°C with all three plug-in option cards installed)
    - **Storage Temperature Range**: -40 to 60°C
    - **Vibration to IEC 68-2-6**: Operational 5-150 Hz, 2 g
    - **Shock to IEC 68-2-27**: Operational 25 g (10 g relay)
    - **Operating and Storage Humidity**: 0 to 85% max. RH non-condensing environment
    - **Altitude**: Up to 2000 meters

17. **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.

18. **CONSTRUCTION**:
    - This unit is rated for NEMA 4X/IP65 outdoor use.
    - IP20 Touch safe.

19. **WEIGHT**: 10.4 oz. (295 g)

NOTE: *19.8 Hz Input Rate provides best rate performance and simultaneous 50/60 Hz rejection.
      - Common Mode: >100 dB @ 50/60 ±1 Hz (19.8 or 20 Input Rate)

Response Time: 20 msec. max.

Logic State: Jumper selectable for sink/source logic

*Note: 19.8 Hz Input Rate provides best rate performance and simultaneous 50/60 Hz rejection.
      - Common Mode: >100 dB @ 50/60 ±1 Hz (19.8 or 20 Input Rate)

Response Time: 20 msec. max.

Logic State: Jumper selectable for sink/source logic

*Note: 19.8 Hz Input Rate provides best rate performance and simultaneous 50/60 Hz rejection.
      - Common Mode: >100 dB @ 50/60 ±1 Hz (19.8 or 20 Input Rate)
### Accessories

**UNITS LABEL KIT (PAXLBK)**
Each meter has a units indicator with backlighting that can be customized using the Units Label Kit. The backlight is controlled in the programming.

### Programming Software
The Crimson® 2 (SFCRM2) software is a Windows® based program for configuring and updating the firmware of the PAXDP meter from a PC. Using the software makes programming the PAXDP meter easier and allows the user to save the PAXDP database in a PC file for future use. The software is available as a free download from Red Lion’s website.

The first time Crimson 2 software is run from the File menu, select “New” to display a dialog and select the PAXDP. The screen will display icons that represent the various programming sections of the PAXDP. Double-click on an icon to configure the programming parameters pertaining to the selection. Tool Tip help is available for each of the program parameters. A PAX serial plug-in card or PAX USB programming card is required to program the meter using the software.

When communicating with Crimson 2 software, the PAXDP must be set in default configuration type of: Communications Type: MODBUS RTU
- Baud Rate: 38400
- Data Bit: 8
- Parity Bit: no
- Meter Unit Address: 247

### Optional Plug-in Output Cards

**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 Analog Output (PAXCDL). 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. Note: For Modbus communications use RS485 Communications Output Card and configure communication (394) parameter for Modbus.

- **PAXCDC10 - RS485 Serial (Terminal)**
- **PAXCDC1C - RS485 Serial (Connector)**
- **PAXCDC20 - RS232 Serial (Terminal)**
- **PAXCDC2C - RS232 Serial (Connector)**

### SERIAL COMMUNICATIONS CARD

**Type:** RS485 or RS232  
**Communication Type:** RLC Protocol (ASCII), Modbus RTU, and Modbus ASCII  
**Isolation To Sensor & User Input Commons:** 500 Vrms for 1 min.  
**Working Voltage:** 50 V. Not Isolated from all other commons.  
**Baud:** 300 to 38,400  
**Data:** 7/8 bits  
**Parity:** No, Odd or Even  
**Bus Address:** Selectable 0 to 99 (RLC Protocol), or 1 to 247 (Modbus Protocol), Max. 32 meters per line (RS485)  
**Transmit Delay:** Selectable for 0 to 0.250 sec (+2 msec min)

### DeviceNet™ Card

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

### Profibus-DP Card

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

### PAXUSB Programming Card

**Type:** USB Virtual Comms Port  
**Connection:** Type mini B  
**Isolation To Sensor & User Input Commons:** 500 Vrms for 1 min.  
**Working Voltage:** 50 V. Not Isolated from all other commons.  
**Baud Rate:** 300 to 19.2k  
**Unit Address:** 0 to 99; only 1 meter can be configured at a time

### 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 Sensor & User Input Commons:** 2000 Vrms for 1 min.  
**Working Voltage:** 240 Vrms  
**Contact Rating:** One Relay Energized: 5 amps @ 120/240 VAC or 28 VDC (resistive load), 1/8 HP @120 VAC, inductive load  
**Life Expectancy:** 100 K cycles min. at full load rating. External RC snubber extends relay life for operation with inductive loads

### Quad RELAY CARD

**Type:** Four FORM-A relays  
**Isolation To Sensor & User Input Commons:** 2300 Vrms for 1 min.  
**Working Voltage:** 250 Vrms  
**Contact Rating:** One Relay Energized: 3 amps @ 240 VAC or 30 VDC (resistive load), 1/10 HP @120 VAC, inductive load  
**Life Expectancy:** 100 K cycles min. at full load rating. External RC snubber extends relay life for operation with inductive loads

### Quad Sinking Open Collector Card

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

### Quad Sourcing Open Collector Card

**Type:** Four isolated sourcing PNP transistors.  
**Isolation To Sensor & User Input Commons:** 500 Vrms for 1 min.  
**Working Voltage:** 50 V. Not Isolated from all other commons.  
**Rating:** Internal supply: 24 VDC ±10%, 30 mA max. total  
**External supply: 30 VDC max., 100 mA max. each output

### ALL FOUR SETPOINT CARDS

**Response Time:** See update rates step response specification; add 6 msec (typical) for relay card
LINEAR DC OUTPUT (PAXCDL)

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

PAXCDL10 - Retransmitted Analog Output Card

ANALOG OUTPUT CARD

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

1.0 INSTALLING THE METER

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

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

Installation Environment
The unit should be installed in a location that does not exceed the maximum operating temperature and provides good air circulation. Placing the unit near devices that generate excessive heat should be avoided.
The bezel should be cleaned only with a soft cloth and neutral soap product. Do NOT use solvents. Continuous exposure to direct sunlight may accelerate the aging process of the bezel.
Do not use tools of any kind (screwdrivers, pens, pencils, etc.) to operate the keypad of the unit.

2.0 SETTING THE JUMPERS

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

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

Input Jumpers
These jumpers are used to select the proper input types, Voltage (V) or Current (I). The input type selected in programming must match the jumper setting. See the Jumper Selection Figures for more details.

User Input Logic Jumper
This jumper selects the logic state of all the user inputs. If the user inputs are not used, it is not necessary to check or move this jumper.

PAXDP Jumper Selection

JUMPER SELECTIONS
The \( \checkmark \) indicates factory setting.

<table>
<thead>
<tr>
<th>INPUT A</th>
<th>INPUT B</th>
<th>USER INPUT</th>
</tr>
</thead>
<tbody>
<tr>
<td>VOL/CUR</td>
<td>VOL/CUR</td>
<td>( \checkmark ) SINK</td>
</tr>
<tr>
<td>( \checkmark ) CURRENT (I)</td>
<td>( \checkmark ) CURRENT (I)</td>
<td>( \checkmark )</td>
</tr>
<tr>
<td>( \checkmark ) VOLTAGE (V)</td>
<td>( \checkmark ) VOLTAGE (V)</td>
<td>( \checkmark ) SOURCE (SRC)</td>
</tr>
</tbody>
</table>

Note: In the figures above, the text shown in parenthesis is printed on the circuit board to help with proper jumper positioning.
**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 PAX.

**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.

![TOP VIEW Diagram]

**To Install:**
1. With the meter removed from the case, locate the plug-in card connector for the card type to be installed. The types are keyed by position with different main circuit board connector locations. When installing the card, hold the meter by the rear terminals and not by the front display board.

   ![Internal Supply: (18 V unregulated)]

   ![External Supply: (30 Vmax)]

2. Install the plug-in card by aligning the card terminals with the slot bay in the rear cover. Be sure the connector is fully engaged and the tab on the plug-in card rests in the alignment slot on the display board.

3. Slide the meter base back into the case. Be sure the rear cover latches fully into the case.

4. Apply the plug-in card label to the bottom side of the meter in the designated area. Do Not Cover the vents on the top surface of the meter. The surface of the case must be clean for the label to adhere properly.

**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, its source or the method of coupling into the unit may be different for various installations. 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. With use of the lower input ranges or signal sources with high source impedance, the use of shielded cable may be necessary. This helps to guard against stray AC pick-up. Attach the shield to the input common of the meter.
3. To minimize potential noise problems, power the meter from the same power branch, or at least the same phase voltage as that of the signal source.
4. Never run Signal or Control cables in the same conduit or raceway with AC power lines, conductors feeding motors, solenoids, SCR controls, and heaters, etc. The cables should be run 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.
5. Signal or Control cables within an enclosure should be routed as far away as possible from contactors, control relays, transformers, and other noisy components.
6. 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.
7. 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
     - Corcom #1VR3
   - Line Filters for input power cables:
     - Schaffner # FN2010-1/07 (RLC #LFIL0000)
     - Schaffner # FN670-1.8/07
   - Note: Reference manufacturer’s instructions when installing a line filter.
8. Long cable runs are more susceptible to EMI pickup than short cable runs. Therefore, keep cable runs as short as possible.
9. Switching of inductive loads produces high EMI. Use of snubbers across inductive loads suppresses EMI. Snubber: RLC#SNUB0000.

**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 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, its source or the method of coupling into the unit may be different for various installations. 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. With use of the lower input ranges or signal sources with high source impedance, the use of shielded cable may be necessary. This helps to guard against stray AC pick-up. Attach the shield to the input common of the meter.
3. To minimize potential noise problems, power the meter from the same power branch, or at least the same phase voltage as that of the signal source.
4. Never run Signal or Control cables in the same conduit or raceway with AC power lines, conductors feeding motors, solenoids, SCR controls, and heaters, etc. The cables should be run 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.
5. Signal or Control cables within an enclosure should be routed as far away as possible from contactors, control relays, transformers, and other noisy components.
6. 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.
7. 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 # FN2010-1/07 (RLC #LFIL0000)
     - Schaffner # FN670-1.8/07
   - Note: Reference manufacturer’s instructions when installing a line filter.
8. Long cable runs are more susceptible to EMI pickup than short cable runs. Therefore, keep cable runs as short as possible.
9. 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 INPUT SIGNAL WIRING

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

INPUT A SIGNAL WIRING

Voltage Signal (self powered)
Terminal 4: -VDC
Terminal 5: +VDC
Current Signal (self powered)
Terminal 4: -ADC
Terminal 5: +ADC
Current Signal (2 wire requiring excitation)
Terminal 6: +ADC
Terminal 8: -ADC
Voltage/Current Signal (3 wire requiring excitation)
Terminal 3: +Volt supply
Terminal 4: -ADC (common)
Terminal 5: +ADC (signal)

INPUT B SIGNAL WIRING

Voltage Signal (self powered)
Terminal 7: -VDC
Terminal 8: +VDC
Current Signal (self powered)
Terminal 7: -ADC
Terminal 8: +ADC
Current Signal (2 wire requiring excitation)
Terminal 6: +ADC
Terminal 8: -ADC
Voltage/Current Signal (3 wire requiring excitation)
Terminal 6: +Volt supply
Terminal 7: -ADC (common)
Terminal 8: +ADC (signal)

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

Before connecting the wires, the User Input Logic Jumper should be verified for proper position. If not using User Inputs, then skip this section. Only the appropriate User Input terminal has to be wired.

**Sinking Logic**
- Terminal 9:
- Terminal 10-11: 

  Connect external switching device between appropriate User Input terminal and User Comm.

In this logic, the user inputs of the meter are internally pulled up to +5 V with 22 K resistance. The input is active when it is pulled low (<0.9 V).

**Sourcing Logic**
- Terminal 9: -VDC thru external switching device
- Terminal 10-11: +VDC thru external switching device

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

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

See appropriate plug-in card bulletin for details.

5.0 REVIEWING THE FRONT BUTTONS AND DISPLAY

**Display Readout Legends***

- **A**: Display and Readout
- **B**: Optional Custom Units Overlay
- **C**: Setpoint Alarm Annunciators

**KEY**
- **DSP**: Index display through main displays as programmed in 3-LOC
- **PAR**: Access parameter list
- **F1▲**: Function key 1; hold for 3 seconds for Second Function 1**
- **F2▼**: Function key 2; hold for 3 seconds for Second Function 2**
- **RST**: Reset (Function key)**

* Display Readout Legends may be locked out in Factory Settings.
** Factory setting for the F1, F2, and RST keys is NO mode.

**PROGRAMMING MODE OPERATION**
- Quit programming and return to display mode
- Store selected parameter and index to next parameter
- Increment selected parameter value
- Decrement selected parameter value
- Hold with F1▲, F2▼ to scroll value by x1000
OVERVIEW

PROGRAMMING MENU

DISPLAY MODE
The meter normally operates in the Display Mode. In this mode, the meter displays can be viewed consecutively by pressing the DSP key. The annunciators to the left of the display indicate which display is currently shown; A, B, or C. Each of these displays are programmable and 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 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 viewing parameters (SP1, etc), 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 “I-?” parameter is available in the Quick Programming Mode only when the security code is non-zero. For a description, see Module 9—Factory Service Operations. Throughout this document, Programming Mode (without Quick in front) always refers to "Full" Programming Mode.

PROGRAMMING TIPS
The Programming Menu is organized into ten 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 6 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 PAR and the present module (initially 0). 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 0. From this point, programming may continue by selecting and entering additional modules. (See MODULE ENTRY above.)

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

NUMERICAL VALUE ENTRY (ARROW, RST & PAR KEYS)
For parameters which require a numerical value entry, the arrow keys can be used to increment or decrement the display to the desired value. When an arrow key is pressed and held, the display automatically scrolls up or scrolls down. The longer the key is held, the faster the display scrolls.

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

PROGRAMMING MODE EXIT (DSP KEY or PAR KEY at PAR 0)
The Programming Mode is exited by pressing the DSP key (from anywhere in the Programming Mode) or the PAR key (with PAR 0 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 - SIGNAL INPUT PARAMETERS

INPUT A PARAMETER MENU

INPUT B PARAMETER MENU

INPUT RANGE

ADC CONVERSION RATE

DISPLAY DECIMAL POINT

DISPLAY ROUNDING*

FILTER SETTING

FILTER BAND*

SCALING POINTS

SCALING STYLE

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

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

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

* The decimal point position is dependent on the selection made in the "Display Decimal Point" parameter.
**INPUT VALUE FOR SCALING POINT 1**

For Key-in (PDay), enter the known first Input Value by using the arrow keys. (The Input Range selection sets up the decimal location for the Input Value.) For Apply (RPlu), apply the input signal to the meter, adjust the signal source externally until the desired Input Value appears. In either method, press the PAR key to enter the value being displayed. In the RPlu style, the RSt key can be pressed to advance the display past the INP value or other input value without storing it. This is useful for application scaling of the second scaling point (i.e. when the tank is full), or some other point in multipoint applications.

**DISPLAY VALUE FOR SCALING POINT 1**

Enter the first coordinating Display Value by using the arrow keys. This is the same for PDay and RPlu scaling styles. The decimal point follows the dCp family selection. For Square Root Extraction Input Range, the Display 1 value must be zero.

**INPUT VALUE FOR SCALING POINT 2**

For Key-in (PDay), enter the known second Input Value by using the arrow keys. For Apply (RPlu), adjust the signal source externally until the next desired Input Value appears. (Follow the same procedure if using more than 2 scaling points.)

* The decimal point position is dependent on the selection made in the “Display Decimal Point” parameter.

**DISPLAY VALUE FOR SCALING POINT 2**

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

**General Notes on Scaling**

1. Input Values for scaling points should be confined to the limits of the Input Signal, ie. 4-20 mA or 0-10 VDC.
2. The same Input Value should not correspond to more than one Display Value. (Example: 20 mA can not equal 0 and 10.)
3. The same Display Value can correspond to more than one Input Value. (Example: 0 mA and 20 mA can equal 10.)
4. The maximum scaled Display Value spread between range maximum and minimum is limited to 65,535. For example using +20 mA range the maximum +20 mA can be scaled to is 32,767 with 0 mA being 0 and Display Rounding of 1. (Decimal points are ignored.) The other half of 65,535 is for the lower half of the range 0 to -20 mA even if it is not used. With Display Rounding of 2, +20 mA can be scaled for 65,535 (32,767 x 2) but with even Input Display values shown.
5. For input levels beyond the first programmed Input Value, the meter extends the Display value by calculating the slope from the first two coordinate pairs. For three coordinate pair scaling points were entered, then the Display Value calculation would be between the lower half of the range 0 to -20 mA even if it is not used. With Display Rounding of 2, +20 mA can be scaled for 65,535 (32,767 x 2) but with even Input Display values shown.

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

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

The front panel function keys are also individually programmable to perform specific meter control functions. While in the Display Mode or when viewing meter values in Quick Programming mode, the primary function is executed the instant the key is pressed. Holding the function key for three seconds executes a secondary function. It is possible to program a secondary function without a primary function.

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

**Note:** In the following explanations, not all selections are available for both user inputs and front panel function keys. Alternating displays are shown with each selection. Those selections showing both displays are available for both. If a display is not shown, it is not available for that selection. USr-1 will represent both user inputs. FI will represent all five function keys.

**Programming Mode Lock-Out**

Programming Mode is locked-out, as long as activated (maintained action). A security code can be configured to allow programming access during lock-out.
Input assignment for the totalizer is programmed in Module 5, Totalizer (Integrator) Parameters. Only the assigned input or calculation will be active for the following Totalizer User Functions.

**STORE BATCH READING IN TOTALIZER**

The assigned value is one time added (batched) to the Totalizer at transition to activate (momentary action). The Totalizer retains a running sum of each batch operation until the Totalizer is reset. When this function is selected, the normal operation of the Totalizer is overridden.

**RESET AND ENABLE TOTALIZER**

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

**ENABLE TOTALIZER**

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

**RESET MAXIMUM**

When activated (momentary action), \( r \text{ESE}t \) flashes and the Maximum resets to the present assigned value. The Maximum function then continues from that value. This selection functions independent of the selected display.
**RESET MINIMUM**

When activated (momentary action), \( \text{RESET MINIMUM} \) flashes and the Minimum reading is set to the present assigned value. The Minimum function then continues from that value. This selection functions independent of the selected display.

**RESET MAXIMUM AND MINIMUM**

When activated (momentary action), \( \text{RESET MAXIMUM AND MINIMUM} \) flashes and the Maximum and Minimum readings are set to the present assigned values. The Maximum and Minimum function then continues from that value. This selection functions independent of the selected display.

**CHANGE DISPLAY INTENSITY LEVEL**

When activated (momentary action), the display intensity changes to the next intensity level (of 4). The four levels correspond to Display Intensity Level \( \text{(d-LEU)} \) settings of 0, 3, 8, and 15.

**SETPOINT SELECTIONS**

The following selections are functional only with the Setpoint plug-in card installed. Refer to Module 6 - Setpoint (Alarm) Parameters for an explanation of their operation.

- \( l \text{S} \text{R} \text{-} l \) - Select main or alternate setpoints
- \( l \text{R} \text{-} l \) - Reset Setpoint 1 (Alarm 1)
- \( l \text{R} \text{-} 2 \) - Reset Setpoint 2 (Alarm 2)
- \( l \text{R} \text{-} 3 \) - Reset Setpoint 3 (Alarm 3)
- \( l \text{R} \text{-} 4 \) - Reset Setpoint 4 (Alarm 4)
- \( l \text{R} \text{-} 3\text{V} \) - Reset Setpoint 3 & 4 (Alarm 3 & 4)
- \( l \text{R} \text{-} 2\text{3V} \) - Reset Setpoint 2, 3 & 4 (Alarm 2, 3 & 4)
- \( l \text{R} \text{-} \text{ALL} \) - Reset Setpoint All (Alarm All)

**SELECT SETPOINT LIST**

Two lists of values are available for \( SP\text{-}1, SP\text{-}2, SP\text{-}3, SP\text{-}4 \). The two lists are named \( \text{LST-R} \) and \( \text{LST-B} \). If a user input is used to select the list then \( \text{LST-R} \) is selected when the user input is not active and and \( \text{LST-B} \) is selected when the user input is active (maintained action). If a front panel key is used to select the list then the list will toggle for each key press (momentary action). The display will only indicate which list is active when the list is changed.

To program the values for \( \text{LST-R} \) and \( \text{LST-B} \), first complete the programming of all the parameters. Exit programming and switch to the other list. Re-enter programming and enter the values for \( SP\text{-}1, SP\text{-}2, SP\text{-}3, SP\text{-}4 \). If any other parameters are changed then the other list values must be reprogrammed.

**PRINT REQUEST**

The meter issues a block print through the serial port when activated, and the serial type is set to \( r \text{LE} \). The data transmitted during a print request and the serial type is programmed in Module 7. If the user input is still active after the transmission is complete (about 100 msec), an additional transmission occurs. As long as the user input is held active, continuous transmissions occur.
Module 3 is the programming for the Display, Display assignments, Display lock-out and “Full” and “Quick” Program lock-out.

When in the main Display Mode, the available displays (A,B,C,_) can be read consecutively by repeatedly pressing the DSP key. An annunciator indicates the display being shown ( = No annunciator). A meter display value can be programmed to one of the displays, to the quick programming mode or be locked from being visible. It is recommended that the meter display value be set to LOC when it is not being used in the application.

“Full” Programming Mode permits all parameters to be viewed and modified. This Programming Mode can be locked with a security code and/or user input. When locked and the PAR key is pressed, the meter enters a Quick Programming Mode. In this mode, the setpoint values can still be read and/or changed per the selections below. The display Intensity Level (d-LEd) parameter also appears whenever Quick Programming Mode is enabled and the security code greater than zero.

There are six meter values that can be individually programmed for one of the main displays (A,B,C or _), or programmed to be viewable in Quick Programming mode (rEd), or programmed to be locked out from display (LOC) (see the following table). If two or more values are assigned to the same display the last value assigned will be the one that is displayed.

<table>
<thead>
<tr>
<th>SELECTION</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOC</td>
<td>Not visible in Display Mode or Quick Programming Mode</td>
</tr>
<tr>
<td>rEd</td>
<td>Visible in Quick Programming Mode only</td>
</tr>
<tr>
<td>dSP-R</td>
<td>Assign to Display _ (No annunciator)</td>
</tr>
<tr>
<td>dSP-A</td>
<td>Assign to Display A</td>
</tr>
<tr>
<td>dSP-b</td>
<td>Assign to Display B</td>
</tr>
<tr>
<td>dSP-C</td>
<td>Assign to Display C</td>
</tr>
</tbody>
</table>

**PROGRAM MODE SECURITY CODE**

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

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

Throughout this document, Programming Mode (without Quick in front) always refers to “Full” Programming (all meter parameters are accessible).
6.4 MODULE 4 - SECONDARY FUNCTION PARAMETERS (4-SEC)

PARAMETER MENU

INPUT A OFFSET VALUE* (OF5-R)
-19999 to 19999

INPUT B OFFSET VALUE* (OF5-b)
-19999 to 19999

MAX CAPTURE ASSIGNMENT (HI-RS)
A-rEl A-RbS b-rEl b-RbS CALC
Select the desired parameter that will be assigned to the Max Capture.

MAX CAPTURE DELAY TIME (HI-ct)
0.0 to 32750 sec.
When the Input Display is above the present MAX value for the entered delay time, the meter will capture that display value as the new MAX reading. A delay time helps to avoid false captures of sudden short spikes.

MIN CAPTURE ASSIGNMENT (LO-RS)
A-rEl A-RbS b-rEl b-RbS CALC
Select the desired parameter that will be assigned to the Min Capture.

MIN CAPTURE DELAY TIME (LO-ct)
0.0 to 32750 sec.
When the Input Display is below the present MIN value for the entered delay time, the meter will capture that display value as the new MIN reading. A delay time helps to avoid false captures of sudden short spikes.

DISPLAY UPDATE RATE (dSP-b)
1 2 5 10 20 updates/sec.
This parameter determines the rate of display update.

UNITS LABEL BACKLIGHT (b-LIt)
ON OFF
The Units Label Kit Accessory contains a sheet of custom unit overlays which can be installed into the meter’s bezel display assembly. The backlight for these custom units is activated by this parameter.

CALCULATION FUNCTION (CFunc)
c1A+ b c1A- b cA/b
c1A× b Ab/c c(A/b - 1)
This parameter determines the math calculation that will be performed on Input A and Input B and shown on the calculation display. The above formulas represent the available calculations: \( A \) = Input A relative value, \( b \) = Input B relative value, and \( c \) = Calculation Constant Value (conSt). For the average between A and B inputs, scale the display (Input A & Input B \( dSP \times 3 \)) values in half and then use \( cA/b \). Note: + = add, - = subtract, \( \div \) = division. \( c(A/b - 1) \) is displayed in the PAX as \( \frac{A}{B} - 1 \) and the function performs with A divided b then 1 is subtracted and the result is multiplied by c.

CALCULATION DECIMAL POINT (dP)
0 0.0 0.00 0.000 0.0000 0.00000
This parameter determines the decimal point location for the Calculation Display. For the \( c1A+b \), \( cA+b \), and \( c1A-b \) calculation functions, Input A “Display Decimal Point”, Input B “Display Decimal Point” and “Calculation Decimal Point” must all be in the same position.

* The decimal point position is dependent on the selection made in the “Display Decimal Point” parameter.
**CALCULATION CONSTANT VALUE**

\[ \text{const} \]

-9999 to 99999

The constant value is used in the Calculation Function formulas to provide offsetting or scaling capabilities. For the \( \Box A + b \), \( \Box A - b \), and \( \Box A \cdot b \) calculation functions, the Constant decimal point matches that Calculation Decimal point position. For these functions, the “Constant Value” must be lowered to a value of 0 for no offset.

For the \( \Box b/c \), \( \Box c A/b \), and \( c(A/b - 1) \) calculation functions, there is no “Constant Value” decimal point shown. However, when Input A “Display Decimal Point”, Input B “Display Decimal Point” and “Calculation Decimal Point” are in the same position, then the “Constant Value” decimal point will be assumed to be at the same location as the “Calculation Decimal Point”. For the Calculation Display to have the same resolution as Inputs A & B, the “Constant Value” must be a value of 1 with trailing 0’s for each assumed decimal point location. Example: With Input A, Input B and the Calculation decimal points entered as 0.00, then the “Constant Value” would be entered as 100 for no gain.

**CALCULATION Rounding**

\[ \text{rnd} \]

0.001

1  2  5  10
20  50  100

Rounding selections other than one, cause the Calculation Display to ‘round’ to the nearest rounding increment selected (i.e. rounding of ‘0.005’ causes 0.121 to round to 0.120 and 0.124 to round to 125). Rounding starts at the least significant digit of the Calculation Display. Remaining parameter entries (scaling point values, setpoint values, etc.) are not automatically adjusted to this display rounding selection. The displayed decimal point reflects that programmed in \( \Box dP \).

**CALCULATION FILTER SETTING**

\[ \text{FLT} \]

0.0 to 250

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

**CALCULATION FILTER BAND**

\[ \text{bnd} \]

0 to 250 display units

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

*The decimal point position is dependent on the selection made in the “Display Decimal Point” parameter.*
The totalizer accumulates (integrates) the relative input value using one of two modes. The first is using a time base. This can be used to provide an indication of total flow, usage or consumption over time. The second is through a user input or function key programmed for Batch (one time add on demand). This can be used for weighing applications where accumulation is based on a completed event. If the Totalizer is not needed, its display can be locked-out and this module can be skipped during programming.

**TOTALIZER ASSIGNMENT**

This parameter determines which value is to be totalized.

**TOTALIZER DECIMAL POINT**

For most applications, this should match the decimal point position of the meter value selected in the totalizer assignment. If a different location is desired, refer to Totalizer Scale Factor.

**TOTALIZER TIME BASE**

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

**TOTALIZER SCALE FACTOR**

For most applications, the Totalizer reflects the same decimal point location and engineering units as the assigned Input Display. In these cases, the Totalizer Scale Factor is 1.000. The Totalizer Scale Factor can be used to scale the input or function key to a 9 digit value. The high order 4 digits and the low order 5 digits of the total accumulated are displayed alternately. The letter "h" denotes the high order display.

**TOTALIZER USING TIME BASE**

Totalizer accumulates as defined by:

\[ \text{Input Display} \times \text{Totalizer Scale Factor} \]

**TOTALIZER POWER UP RESET**

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

**TOTALIZER HIGH ORDER DISPLAY**

When the total exceeds 5 digits, the front panel annunciator flashes (if assigned to A, B, or C display). In this case, the meter continues to totalize up to a 9 digit value. The high order 4 digits and the low order 5 digits of the total are displayed alternately. The letter "h" denotes the high order display.

**TOTALIZER BATCHING**

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

**TOTALIZER SCALE FACTOR CALCULATION EXAMPLES**

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

   Example: Input \((dECP)\) = 0.0

<table>
<thead>
<tr>
<th>Totalizer ((dECP))</th>
<th>Scale Factor</th>
<th>Totalizer ((dECP))</th>
<th>Scale Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.00</td>
<td>10</td>
<td>0.0000</td>
<td>10</td>
</tr>
<tr>
<td>0.0</td>
<td>1</td>
<td>0.00</td>
<td>1</td>
</tr>
<tr>
<td>x10 .01</td>
<td>0</td>
<td>0.01</td>
<td>x10 .001</td>
</tr>
<tr>
<td>x100 .001</td>
<td>x10</td>
<td>.001</td>
<td>.001</td>
</tr>
</tbody>
</table>

\((x = \text{Totalizer display is round by tens or hundreds})\)

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

   Example: Average flow rate per hour in a 4 hour period, the scale factor would be 0.250. To achieve a controlled time frame, connect an external timer to a user input programmed for \(\text{rel}E\). The timer will control the start (reset) and the stopping (hold) of the totalizer.
Repeat programming for each setpoint.

**SELECT SETPOINT**

![Setpoint Assignment](image)

Select a setpoint (alarm output) to open the remaining module menu. (The "n" in the following parameters will reflect the chosen setpoint number.) After the chosen setpoint is programmed, the display will default to **SPSEL NO**. Select the next setpoint to be programmed and continue the sequence for each setpoint. Pressing **PAR** at **SPSEL NO** will exit Module 6.

**SETPOINT ASSIGNMENT**

![Setpoint Assignment](image)

Selects the meter value that is used to trigger the Setpoint Alarm. The -rEL settings cause the setpoint to trigger off of the relative (net) input value. The relative input value is the absolute input value that includes the Display Offset Value. The -rBS settings cause the setpoint to trigger off of the absolute (gross) input value. The absolute input value is based on Module 1 **dSP** and **IMP** entries.

### Setpoint Alarm Figures

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

Enter desired hysteresis value. See Setpoint Alarm Figures for visual explanation of how setpoint alarm actions (balance and unbalance) are affected by the hysteresis. When the setpoint is a control output, usually balance hysteresis is used. For alarm applications, usually unbalanced hysteresis is used. For unbalanced hysteresis modes, the hysteresis functions on the low side for high acting setpoints and functions on the high side for low acting setpoints.

Note: Hysteresis eliminates output chatter at the switch point, while time delay can be used to prevent false triggering during process transient events.

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

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

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

Latch with delay reset action; This action latches the alarm output on at the trigger point per the Setpoint Action shown in Setpoint Alarm Figures. The “on” alarm output can only be turned off by front panel function key or user input manual reset, serial reset command or meter power cycle. When the user input or function key is activated (momentary or maintained), the meter delays the event until the corresponding “on” alarm output crosses the trigger off point. (Previously latched alarms are off if power up Display Value is lower than setpoint value. During a power cycle, the meter erases a previous Latch 2 reset if it is not activated at power up.)
Set the baud rate to match the other serial communications equipment on the serial link. Normally, the baud rate is set to the highest value that all the serial equipment are capable of transmitting and receiving.

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

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

Enter the serial meter (node) address. The address range is dependent on the parameter. With a single unit, configured for RLC protocol (TYPE = rLC), an address is not needed and a value of zero can be used. With multiple units (RS485 applications), a unique 2 digit address number must be assigned to each meter.

The Communication Type factory settings must be changed from the Modbus RTU for Crimson 2 communications.

Set the desired communications protocol. Modbus is preferred as it provides access to all meter values and parameters. Since the Modbus protocol is included within the PAXDP, the PAX Modbus option card, PAXCDC4, should not be used. The PAXCDC1 (RS485), or PAXCDC2 (RS232) card should be used instead.

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

The Communication Type factory settings must be changed from the Modbus RTU for Crimson 2 communications.

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

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

Enter the serial meter (node) address. The address range is dependent on the parameter. With a single unit, configured for RLC protocol (TYPE = rLC), an address is not needed and a value of zero can be used. With multiple units (RS485 applications), a unique 2 digit address number must be assigned to each meter.

† The Communication Type factory settings must be changed from the Modbus RTU for Crimson 2 communications.

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

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

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

CRIMSON SOFTWARE

When communicating with Crimson 2 software, the PAXDP must be set in default configuration type of:

- Communications Type: MODBUS RTU
- Baud Rate: 38400
- Data Bit: 8
- Parity Bit: no
- Meter Unit Address: 247

Parameters below only appear when communications type (TYPE) parameter is set to 'LC'.

ABBREVIATED PRINTING

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

SERIAL MODBUS COMMUNICATIONS

Modbus Communications requires that the Serial Communication Type Parameter (TYPE) be set to “MOD” or “MODB5”.

SUPPORTED FUNCTION CODES

FC03: Read Holding Registers
1. Up to 32 registers can be requested at one time.
2. HEX <8000> is returned for non-used registers.

FC04: Read Input Registers
1. Up to 32 registers can be requested at one time.
2. Block starting point can not exceed register boundaries.
3. HEX <8000> is returned in registers beyond the boundaries.
4. Input registers are a mirror of Holding registers.

FC06: Preset Single Register
1. HEX <8001> is echoed back when attempting to write to a read only register.
2. If the write value exceeds the register limit (see Register Table), then that register value changes to its high or low limit. It is also returned in the response.

FC08: Diagnostics
The following is sent upon FC08 request:
Module Address, 08 (FC code), 04 (byte count), “Total Comms” 2 byte count, “Total Good Comms” 2 byte count, checksum of the string “Total Comms” is the total number of messages received that were addressed to the PAXDP. “Total Good Comms” is the total messages received by the PAXDP with good address, parity and checksum. Both counters are reset to 0 upon response to FC08 and at power-up.

FC16: Preset Multiple Registers
1. No response is given with an attempt to write to more than 32 registers at a time.
2. Block starting point cannot exceed the read and write boundaries (40001-41280).

3. If a multiple write includes read only registers, then only the write registers will change.
4. If the write value exceeds the register limit (see Register Table), then that register value changes to its high or low limit.

FC17: Report Slave ID
The following is sent upon FC17 request:
RLC-PAXDP ab<0100h><20h><20h><10h>
16 Guid/Scratch Pad
Max Register Reads (32)
Max Register Writes (32)
Software Version Number
b = Linear Card “0” = None, “1” = Yes
a = SP Card, “0”-No SP, “2” or “4” SP

a = “0”(none), “2”, “4” SP card installed
b = “0”(none) or “1” Linear Card installed,

SUPPORTED EXCEPTION CODES

01: Illegal Function
Issued whenever the requested function is not implemented in the meter.

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

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

07: Negative Acknowledge
Issued when a write to a register is attempted with an invalid string length.
### PAXDP FREQUENTLY USED MODBUS REGISTERS

Only frequently used registers are shown below. The entire Modbus Register Table can be found at www.redlion.net. The below limits are shown as Integers or HEX < > values. Read and write functions can be performed in either Integers or Hex as long as the conversion was done correctly. Negative numbers are represented by two’s complement.

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

<table>
<thead>
<tr>
<th>REGISTER ADDRESS ¹</th>
<th>REGISTER NAME</th>
<th>LOW LIMIT ²</th>
<th>HIGH LIMIT ²</th>
<th>FACTORY SETTING</th>
<th>ACCESS</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>40001</td>
<td>Input A Relative Value (Hi word)</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>Read Only</td>
<td>Process value of present input level. This value is affected by Input Type, Resolution, Scaling &amp; Offset Value (Relative Value = Absolute Input Value + Offset Value)</td>
</tr>
<tr>
<td>40002</td>
<td>Input A Relative Value (Lo word)</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>Read Only</td>
<td>Process value of present input level. This value is affected by Input Type, Resolution, Scaling &amp; Offset Value (Relative Value = Absolute Input Value + Offset Value)</td>
</tr>
<tr>
<td>40003</td>
<td>Input B Relative Value (Hi word)</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>Read Only</td>
<td>Process value of present input level. This value is affected by Input Type, Resolution, Scaling &amp; Offset Value (Relative Value = Absolute Input Value + Offset Value)</td>
</tr>
<tr>
<td>40004</td>
<td>Input B Relative Value (Lo word)</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>Read Only</td>
<td>Process value of present input level. This value is affected by Input Type, Resolution, Scaling &amp; Offset Value (Relative Value = Absolute Input Value + Offset Value)</td>
</tr>
<tr>
<td>40005</td>
<td>Calculation Value (Hi word)</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>Read Only</td>
<td>Calculation Result of Math Function</td>
</tr>
<tr>
<td>40006</td>
<td>Calculation Value (Lo word)</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>Read Only</td>
<td>Calculation Result of Math Function</td>
</tr>
<tr>
<td>40007</td>
<td>Maximum Value (Hi word)</td>
<td>-19999</td>
<td>99999</td>
<td>N/A</td>
<td>Read/Write</td>
<td></td>
</tr>
<tr>
<td>40008</td>
<td>Maximum Value (Lo word)</td>
<td>-19999</td>
<td>99999</td>
<td>N/A</td>
<td>Read/Write</td>
<td></td>
</tr>
<tr>
<td>40009</td>
<td>Minimum Value (Hi word)</td>
<td>-19999</td>
<td>99999</td>
<td>N/A</td>
<td>Read/Write</td>
<td></td>
</tr>
<tr>
<td>40010</td>
<td>Minimum Value (Lo word)</td>
<td>-19999</td>
<td>99999</td>
<td>N/A</td>
<td>Read/Write</td>
<td></td>
</tr>
<tr>
<td>40011</td>
<td>Total Value (Hi word)</td>
<td>-199999000</td>
<td>999999000</td>
<td>N/A</td>
<td>Read/Write</td>
<td></td>
</tr>
<tr>
<td>40012</td>
<td>Total Value (Lo word)</td>
<td>0</td>
<td>0</td>
<td>N/A</td>
<td>Read/Write</td>
<td></td>
</tr>
<tr>
<td>40013</td>
<td>Setpoint 1 Value (Hi word)</td>
<td>-19999</td>
<td>99999</td>
<td>100</td>
<td>Read/Write</td>
<td></td>
</tr>
<tr>
<td>40014</td>
<td>Setpoint 1 Value (Lo word)</td>
<td>-19999</td>
<td>99999</td>
<td>100</td>
<td>Read/Write</td>
<td></td>
</tr>
<tr>
<td>40015</td>
<td>Setpoint 2 Value (Hi word)</td>
<td>-19999</td>
<td>99999</td>
<td>200</td>
<td>Read/Write</td>
<td></td>
</tr>
<tr>
<td>40016</td>
<td>Setpoint 2 Value (Lo word)</td>
<td>-19999</td>
<td>99999</td>
<td>200</td>
<td>Read/Write</td>
<td></td>
</tr>
<tr>
<td>40017</td>
<td>Setpoint 3 Value (Hi word)</td>
<td>-19999</td>
<td>99999</td>
<td>300</td>
<td>Read/Write</td>
<td></td>
</tr>
<tr>
<td>40018</td>
<td>Setpoint 3 Value (Lo word)</td>
<td>-19999</td>
<td>99999</td>
<td>300</td>
<td>Read/Write</td>
<td></td>
</tr>
<tr>
<td>40019</td>
<td>Setpoint 4 Value (Hi word)</td>
<td>-19999</td>
<td>99999</td>
<td>400</td>
<td>Read/Write</td>
<td></td>
</tr>
<tr>
<td>40020</td>
<td>Setpoint 4 Value (Lo word)</td>
<td>-19999</td>
<td>99999</td>
<td>400</td>
<td>Read/Write</td>
<td></td>
</tr>
<tr>
<td>40021</td>
<td>Setpoint Output Register (SOR)</td>
<td>0</td>
<td>15</td>
<td>N/A</td>
<td>Read/Write</td>
<td>See Note</td>
</tr>
<tr>
<td>40022</td>
<td>Manual Mode Register (MMR)</td>
<td>0</td>
<td>31</td>
<td>0</td>
<td>Read/Write</td>
<td>Bit State: 0=Auto Mode, 1=Manual Mode Bit 3 = SP1, Bit 2 = SP2, Bit 1 = SP3, Bit 0 = SP4 Outputs can only be activated/reset with this register when respective bits in Manual Mode (MMR) register are set</td>
</tr>
<tr>
<td>40023</td>
<td>Reset Output Register</td>
<td>0</td>
<td>15</td>
<td>0</td>
<td>Read/Write</td>
<td>Bit State: 0=Auto Mode, 1=Manual Mode Bit 3 = SP1, Bit 2 = SP2, Bit 1 = SP3, Bit 0 = SP4 Outputs can only be activated/reset with this register when respective bits in Manual Mode (MMR) register are set</td>
</tr>
<tr>
<td>40024</td>
<td>Analog Output Register (AOR)</td>
<td>0</td>
<td>4095</td>
<td>0</td>
<td>Read/Write</td>
<td>Functional only if Linear Output is in manual mode (MMR bit 0 = 1). Linear Output Card is written to only if Linear Out (MMR bit 0) is set</td>
</tr>
<tr>
<td>40025</td>
<td>Input A Absolute Value (Hi word)</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>Read Only</td>
<td>Gross value of present Input A level. This value is affected by Input Type, Resolution, Scaling, but not affected by Offset Value</td>
</tr>
<tr>
<td>40026</td>
<td>Input A Absolute Value (Lo word)</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>Read Only</td>
<td>Gross value of present Input A level. This value is affected by Input Type, Resolution, Scaling, but not affected by Offset Value</td>
</tr>
<tr>
<td>40027</td>
<td>Input B Absolute Value (Hi word)</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>Read Only</td>
<td>Gross value of present Input B level. This value is affected by Input Type, Resolution, Scaling, but not affected by Offset Value</td>
</tr>
<tr>
<td>40028</td>
<td>Input B Absolute Value (Lo word)</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>Read Only</td>
<td>Gross value of present Input B level. This value is affected by Input Type, Resolution, Scaling, but not affected by Offset Value</td>
</tr>
<tr>
<td>40029</td>
<td>Input A Offset Value (Hi word)</td>
<td>-19999</td>
<td>99999</td>
<td>0</td>
<td>Read/Write</td>
<td>Relative Input Value (standard meter value) is sum of Input Offset Value and Input Absolute Value</td>
</tr>
<tr>
<td>40030</td>
<td>Input A Offset Value (Lo word)</td>
<td>-19999</td>
<td>99999</td>
<td>0</td>
<td>Read/Write</td>
<td>Relative Input Value (standard meter value) is sum of Input Offset Value and Input Absolute Value</td>
</tr>
<tr>
<td>40031</td>
<td>Input B Offset Value (Hi word)</td>
<td>-19999</td>
<td>99999</td>
<td>0</td>
<td>Read/Write</td>
<td>Relative Input Value (standard meter value) is sum of Input Offset Value and Input Absolute Value</td>
</tr>
<tr>
<td>40032</td>
<td>Input B Offset Value (Lo word)</td>
<td>-19999</td>
<td>99999</td>
<td>0</td>
<td>Read/Write</td>
<td>Relative Input Value (standard meter value) is sum of Input Offset Value and Input Absolute Value</td>
</tr>
<tr>
<td>40033</td>
<td>Main Setpoint 1 Value (Hi word)</td>
<td>-19999</td>
<td>99999</td>
<td>100</td>
<td>Read/Write</td>
<td>Setpoint List A</td>
</tr>
<tr>
<td>40034</td>
<td>Main Setpoint 1 Value (Lo word)</td>
<td>-19999</td>
<td>99999</td>
<td>100</td>
<td>Read/Write</td>
<td>Setpoint List A</td>
</tr>
<tr>
<td>40035</td>
<td>Main Setpoint 2 Value (Hi word)</td>
<td>-19999</td>
<td>99999</td>
<td>200</td>
<td>Read/Write</td>
<td>Setpoint List A</td>
</tr>
<tr>
<td>40036</td>
<td>Main Setpoint 2 Value (Lo word)</td>
<td>-19999</td>
<td>99999</td>
<td>200</td>
<td>Read/Write</td>
<td>Setpoint List A</td>
</tr>
<tr>
<td>40037</td>
<td>Main Setpoint 3 Value (Hi word)</td>
<td>-19999</td>
<td>99999</td>
<td>300</td>
<td>Read/Write</td>
<td>Setpoint List A</td>
</tr>
<tr>
<td>40038</td>
<td>Main Setpoint 3 Value (Lo word)</td>
<td>-19999</td>
<td>99999</td>
<td>300</td>
<td>Read/Write</td>
<td>Setpoint List A</td>
</tr>
<tr>
<td>40039</td>
<td>Main Setpoint 4 Value (Hi word)</td>
<td>-19999</td>
<td>99999</td>
<td>400</td>
<td>Read/Write</td>
<td>Setpoint List A</td>
</tr>
<tr>
<td>40040</td>
<td>Main Setpoint 4 Value (Lo word)</td>
<td>-19999</td>
<td>99999</td>
<td>400</td>
<td>Read/Write</td>
<td>Setpoint List A</td>
</tr>
<tr>
<td>40041</td>
<td>Alternate Setpoint 1 Value (Hi word)</td>
<td>-19999</td>
<td>99999</td>
<td>100</td>
<td>Read/Write</td>
<td>Setpoint List B</td>
</tr>
<tr>
<td>40042</td>
<td>Alternate Setpoint 1 Value (Lo word)</td>
<td>-19999</td>
<td>99999</td>
<td>100</td>
<td>Read/Write</td>
<td>Setpoint List B</td>
</tr>
</tbody>
</table>

¹ For Input Registers, replace the 4xxxx with a 3xxxx in the above register address. The 3xxxx are a mirror of the 4xxxx Holding Registers.

² An attempt to exceed a limit will set the register to its high or low limit value.

22
SERIAL RLC PROTOCOL COMMUNICATIONS

RLC Communications requires the Serial Communications Type Parameter (£\text{TYPE}) be set to \text{RL}.  

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 the command terminator character * or $.

Command Chart

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

Command String Construction

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

1. The first characters consist of the Node Address Specifier (N) followed by a 1 or 2 character address number. The address number of the meter is programmable. If the node address is 0, this command and the node address itself may be omitted. This is the only command that may be used in conjunction with other commands.

2. After the address specifier, the next character is the command character.

3. The next character is the Register ID. This identifies the register that the command affects. The P command does not require a Register ID character.

4. It prints according to the selections made in print options.

5. If constructing a value change command (writing data), the numeric data is sent next.

6. All command strings must be terminated with the string termination characters * or $. The meter does not begin processing the command string until this character is received. See Timing Diagram figure for differences between terminating characters.

Register Identification Chart

<table>
<thead>
<tr>
<th>ID</th>
<th>VALUE DESCRIPTION</th>
<th>REGISTER NAME 1</th>
<th>COMMAND SUPPORTED</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Input A Relative Value</td>
<td>INA</td>
<td>T, R (reset command zeros or tares input)</td>
</tr>
<tr>
<td>B</td>
<td>Input B Relative Value</td>
<td>INB</td>
<td>T, R (reset command zeros or tares input)</td>
</tr>
<tr>
<td>C</td>
<td>Calculation Value</td>
<td>CLC</td>
<td>T</td>
</tr>
<tr>
<td>D</td>
<td>Total</td>
<td>TOT</td>
<td>T, R (reset command zeros Total)</td>
</tr>
<tr>
<td>E</td>
<td>Min</td>
<td>MIN</td>
<td>T, R (reset command loads current reading)</td>
</tr>
<tr>
<td>F</td>
<td>Max</td>
<td>MAX</td>
<td>T, R (reset command loads current reading)</td>
</tr>
<tr>
<td>G</td>
<td>Input A Absolute (Gross) Value</td>
<td>ABA</td>
<td>T</td>
</tr>
<tr>
<td>H</td>
<td>Input B Absolute (Gross) Value</td>
<td>ABB</td>
<td>T</td>
</tr>
<tr>
<td>I</td>
<td>Input A Offset</td>
<td>OFA</td>
<td>T, V</td>
</tr>
<tr>
<td>J</td>
<td>Input B Offset</td>
<td>OFB</td>
<td>T, V</td>
</tr>
<tr>
<td>M</td>
<td>Setpoint 1</td>
<td>SP1</td>
<td>T, V, R (reset command resets setpoint output)</td>
</tr>
<tr>
<td>O</td>
<td>Setpoint 2</td>
<td>SP2</td>
<td>T, V, R (reset command resets setpoint output)</td>
</tr>
<tr>
<td>Q</td>
<td>Setpoint 3</td>
<td>SP3</td>
<td>T, V, R (reset command resets setpoint output)</td>
</tr>
<tr>
<td>S</td>
<td>Setpoint 4</td>
<td>SP4</td>
<td>T, V, R (reset command resets setpoint output)</td>
</tr>
<tr>
<td>U</td>
<td>Auto/Manual Register</td>
<td>MMR</td>
<td>T, V</td>
</tr>
<tr>
<td>W</td>
<td>Analog Output Register</td>
<td>AOR</td>
<td>T, V</td>
</tr>
<tr>
<td>X</td>
<td>Setpoint Register</td>
<td>SOR</td>
<td>T, V</td>
</tr>
</tbody>
</table>

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). 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: N17VM350*

2. Address = 5, Read Input A value
   String: N5TA*

3. Address = 0, Reset Setpoint 4 output
   String: RS*

Transmitting Data To the Meter

Numeric data sent to the meter must be limited to Transmit Details listed in the Register Identification Chart. Leading zeros are ignored. Negative numbers must have a minus sign. The meter ignores any decimal point and conforms the number to the scaled resolution. (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).

Note: Since the meter does not issue a reply to value change commands, follow with a transmit value command for readback verification.
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. See Abbreviated Printing (RPru) parameter.

Full Transmission

<table>
<thead>
<tr>
<th>Byte</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-2</td>
<td>2 byte Node (Meter) Address field [00-99]</td>
</tr>
<tr>
<td>3</td>
<td>&lt;SP&gt; (Space)</td>
</tr>
<tr>
<td>4-6</td>
<td>3 byte Register Mnemonic field</td>
</tr>
<tr>
<td>7-18</td>
<td>12 byte numeric data field: 10 bytes for number, one byte for sign, one byte for decimal point</td>
</tr>
<tr>
<td>19</td>
<td>&lt;CR&gt; (Carriage return)</td>
</tr>
<tr>
<td>20</td>
<td>&lt;LF&gt; (Line feed)</td>
</tr>
<tr>
<td>21</td>
<td>&lt;SP&gt; (Space)</td>
</tr>
<tr>
<td>22</td>
<td>&lt;CR&gt; (Carriage return)</td>
</tr>
<tr>
<td>23</td>
<td>&lt;LF&gt; (Line feed)</td>
</tr>
</tbody>
</table>

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

The first two characters transmitted (bytes 1 and 2) are the unit address. If the address assigned is 00, two spaces are substituted. A space (byte 3) follows the unit address field. The next three characters (bytes 4 to 6) are the register mnemonic. The numeric data is transmitted next.

The numeric field (bytes 7 to 18) is 12 characters long. When the requested value exceeds eight digits for count values or five digits for rate values. Byte 8 is always a space. The remaining ten positions of this field (bytes 9 to 18) consist of a minus sign (for negative values), a floating decimal point (if applicable), and eight positions for the requested value. The data within bytes 9 to 18 is right-aligned with leading spaces for any unfilled positions.

The end of the response string is terminated with <CR> (byte 19), and <LF> (byte 20). When a block print is finished, an extra <SP> (byte 21), <CR> (byte 22), and <LF> (byte 23) are used to provide separation between the transmissions.

Abbreviated Transmission

<table>
<thead>
<tr>
<th>Byte</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-12</td>
<td>12 byte data field, 10 bytes for number, one byte for sign, one byte for decimal point</td>
</tr>
<tr>
<td>13</td>
<td>&lt;CR&gt; (Carriage return)</td>
</tr>
<tr>
<td>14</td>
<td>&lt;LF&gt; (Line feed)</td>
</tr>
<tr>
<td>15</td>
<td>&lt;SP&gt; (Space)</td>
</tr>
<tr>
<td>16</td>
<td>&lt;CR&gt; (Carriage return)</td>
</tr>
<tr>
<td>17</td>
<td>&lt;LF&gt; (Line feed)</td>
</tr>
</tbody>
</table>

* 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.

Meter Response Examples:

1. Address = 17, full field response, Input A = 875
   17 INA 875 <CR><LF>
2. Address = 0, full field response, Setpoint 2 = -250.5
   0 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 and analog output. In Manual Mode (1) the outputs are defined by the registers SOR and AOR. When transferring from auto mode to manual mode, the meter holds the last output value (until the register is changed by a write). Each output may be independently changed to auto or manual. In a write command string (VU), any character besides 0 or 1 in a field will not change the corresponding output mode.

U a b c d

Example: VU00011 places SP4 and Analog in manual.

Analog Output Register (AOR) ID: W

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

<table>
<thead>
<tr>
<th>Register Value</th>
<th>0-20 mA</th>
<th>4-20 mA</th>
<th>0-10V</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0.000</td>
<td>4.004</td>
<td>0.000</td>
</tr>
<tr>
<td>1</td>
<td>0.005</td>
<td>4.004</td>
<td>0.0025</td>
</tr>
<tr>
<td>2047</td>
<td>10.000</td>
<td>12.000</td>
<td>5.000</td>
</tr>
<tr>
<td>4094</td>
<td>19.995</td>
<td>19.996</td>
<td>9.9975</td>
</tr>
<tr>
<td>4095</td>
<td>20.000</td>
<td>20.000</td>
<td>10.000</td>
</tr>
</tbody>
</table>

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

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

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

Setpoint Output Register (SOR) ID: X

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

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

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

Example: VX010 will result in output 1 on and output 2 off.
COMMAND RESPONSE TIME

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

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

\[ t_1 = \frac{10 \times \text{# of characters}}{\text{baud rate}} \]

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

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

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

\[ t_3 = \frac{10 \times \text{# of characters}}{\text{baud rate}} \]

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

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.

<table>
<thead>
<tr>
<th>LOGIC</th>
<th>INTERFACE STATE</th>
<th>RS232*</th>
<th>RS485*</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>mark (idle)</td>
<td>TXD,RXD: -3 to -15 V</td>
<td>$a-b &lt; -200 \text{ mV}$</td>
</tr>
</tbody>
</table>
| 0         | space (active)  | TXD,RXD: +3 to +15 V  | $a-b > +200 \text{ mV}$ | * Voltage levels at the Receiver

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

Start bit and Data bits

Data transmission always begins with the start bit. The start bit signals the receiving device to prepare for reception of data. One bit period later, the least significant bit of the ASCII encoded character is transmitted, followed by the remaining data bits. The receiving device then reads each bit position as they are transmitted.

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 PAXDP.
6.8 MODULE 8 - ANALOG OUTPUT PARAMETERS (B-Out)

\[ \text{PARAMETER MENU} \]

\[ \text{TYPE} \quad \text{AS IN} \quad \text{AN-LO} \quad \text{AN-HI} \quad \text{udt} \]

Analog Type  Analog Assignment  Analog Low Scale Value  Analog High Scale Value  Analog Update Time

\[ \text{ANALOG TYPE} \]

<table>
<thead>
<tr>
<th>SELECTION</th>
<th>RANGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-20</td>
<td>0 to 20 mA</td>
</tr>
<tr>
<td>4-20</td>
<td>4 to 20 mA</td>
</tr>
<tr>
<td>0-10</td>
<td>0 to 10 V</td>
</tr>
</tbody>
</table>

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

\[ \text{ANALOG ASSIGNMENT} \]

None  R-rEl  R-RbS  b-rEl  b-RbS  CALC  tot  mHi  mLo

Enter the source for the analog output to retransmit:
- rEl = Relative (net) Input Value. The Relative Input Value is the Absolute Input Value that includes the Display Offset Value.
- RbS = Absolute (gross) Input Value. The Absolute Input Value is based on Module 1 dsp and inp entries.
- CALC = Calculation Value
- tot = Totalizer Value
- mHi = Minimum Display Value
- mLo = Maximum Display Value

\[ \text{ANALOG LOW SCALE VALUE} \]

- From -9999 to 99999

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

\[ \text{ANALOG HIGH SCALE VALUE} \]

- From -9999 to 99999

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

\[ \text{ANALOG UPDATE TIME} \]

0.0 to 10.0

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

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

**RESTORE FACTORY DEFAULTS**

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

**CALIBRATION**

The meter has been fully calibrated at the factory. Scaling to convert the input signal to a desired display value is performed in Module 1. If the meter appears to be indicating incorrectly or inaccurately, refer to Troubleshooting before attempting to calibrate the meter.

When recalibration is required (generally every 2 years), it should only be performed by qualified technicians using appropriate equipment. Calibration does not change any user programmed parameters. However, it may affect the accuracy of the input signal values previously stored using the Apply (RPLY) Scaling Style.

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

**ANALOG OUTPUT CARD CALIBRATION**

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

1. Use the arrow keys to display **Code 48** and press **PAR**.
2. Use the arrow keys to choose **Out** and press **PAR**.
3. Using the chart below, step through the five selections to be calibrated. At each prompt, use the PAX arrow keys to adjust the external meter display to match the selection being calibrated. When the external reading matches, or if this range is not being calibrated, press **PAR**.

<table>
<thead>
<tr>
<th>SELECTION</th>
<th>EXTERNAL METER</th>
<th>ACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.00</td>
<td>0.00</td>
<td>Adjust if necessary, press <strong>PAR</strong></td>
</tr>
<tr>
<td>4.00</td>
<td>4.00</td>
<td>Adjust if necessary, press <strong>PAR</strong></td>
</tr>
<tr>
<td>20.00</td>
<td>20.00</td>
<td>Adjust if necessary, press <strong>PAR</strong></td>
</tr>
<tr>
<td>0.00</td>
<td>0.00</td>
<td>Adjust if necessary, press <strong>PAR</strong></td>
</tr>
<tr>
<td>10.00</td>
<td>10.00</td>
<td>Adjust if necessary, press <strong>PAR</strong></td>
</tr>
</tbody>
</table>

4. When **No** appears remove the external meters and press **PAR** twice.

**INPUT CALIBRATION**

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

Before starting, verify that the Input Ranger Jumper is set for the range to be calibrated. Also verify that the precision signal source is connected and ready. Allow a 30 minute warm-up period before calibrating the meter. **No** and **PAR** can be chosen to exit the calibration mode without any changes taking place.

Then perform the following procedure:

1. Use the arrow keys to display **Code 48** and press **PAR**.
2. Choose the input channel/range to be calibrated by using the arrow keys and press **PAR**. (**No** and **PAR** can be chosen to exit the calibration mode without any changes taking place.)
3. When the zero range limit appears on the display, apply the appropriate:
   - Voltage range: dead short applied
   - Current range: open circuit

4. Press **PAR** and the top range limit will appear on the display after approximately 1 second.
5. With the top range limit on the display, apply the appropriate:
   - Voltage range: 10 VDC
   - Current range: 20 mADC
6. Press **PAR** and **CrL No** will appear on the display after approximately 1 second.
7. When **No** appears, press **PAR** twice.
8. If the meter is not field scaled, then the input display should match the value of the input signal.
9. Repeat the above procedure for each input range to be calibrated.
TROUBLESHOOTING

<table>
<thead>
<tr>
<th>PROBLEM</th>
<th>REMEDIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>NO DISPLAY</td>
<td>CHECK: Power level, power connections, Module 3 programming</td>
</tr>
<tr>
<td>PROGRAM LOCKED-OUT</td>
<td>CHECK: Active (lock-out) user input</td>
</tr>
<tr>
<td>ENTER: Security code requested</td>
<td></td>
</tr>
<tr>
<td>DISPLAY LOCKED-OUT</td>
<td>CHECK: Module 3 programming</td>
</tr>
<tr>
<td>INCORRECT INPUT DISPLAY VALUE</td>
<td>CHECK: Module 1 programming, Input Jumper position, input connections, input signal level, Module 4 Display Offset is zero, press DSP for Input Display</td>
</tr>
<tr>
<td>PERFORM: Module 9 Calibration (If the above does not correct the problem.)</td>
<td></td>
</tr>
<tr>
<td>&quot;OLOL&quot; in DISPLAY (SIGNAL HIGH)</td>
<td>CHECK: Module 1 programming, Input Range Jumper position, input connections, input signal level</td>
</tr>
<tr>
<td>&quot;ULUL&quot; in DISPLAY (SIGNAL LOW)</td>
<td>CHECK: Module 1 programming, Input Range Jumper position, input connections, input signal level</td>
</tr>
<tr>
<td>JITTERY DISPLAY</td>
<td>INCREASE: Module 1 filtering, rounding, input range</td>
</tr>
<tr>
<td>CHECK: Corresponding plug-in card installation</td>
<td></td>
</tr>
<tr>
<td>MODULES or PARAMETERS NOT ACCESSIBLE</td>
<td>CHECK: Corresponding plug-in card installation</td>
</tr>
<tr>
<td>ERROR CODE (Err xxx or EE xxx)</td>
<td>PRESS: Reset KEY (If cannot clear contact factory.)</td>
</tr>
</tbody>
</table>

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

PARAMETER VALUE CHART

PAXDP MODEL NUMBER __________ Meter# ___________ Security Code __________

<table>
<thead>
<tr>
<th>DISPLAY</th>
<th>PARAMETER</th>
<th>FACTORY SETTING</th>
<th>INPUT A USER SETTING</th>
<th>INPUT B USER SETTING</th>
<th>DISPLAY</th>
<th>PARAMETER</th>
<th>FACTORY SETTING</th>
<th>INPUT A USER SETTING</th>
<th>INPUT B USER SETTING</th>
</tr>
</thead>
<tbody>
<tr>
<td>rANGE</td>
<td>INPUT RANGE</td>
<td>Volt</td>
<td></td>
<td></td>
<td>rEE</td>
<td>UPDATE RANGE</td>
<td>198</td>
<td></td>
<td></td>
</tr>
<tr>
<td>dECPk</td>
<td>DISPLAY RESOLUTION</td>
<td>0.000</td>
<td></td>
<td></td>
<td>round</td>
<td>DISPLAY ROUNDEL INCREMENT</td>
<td>0.010</td>
<td></td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>FILTER</td>
<td>10</td>
<td></td>
<td></td>
<td>bAND</td>
<td>FILTER ENABLE BAND</td>
<td>10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Style</td>
<td>SCALING</td>
<td>2</td>
<td></td>
<td></td>
<td>Pts</td>
<td>SCALING POINTS</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>InP 1</td>
<td>INPUT VALUE 1</td>
<td>0.000</td>
<td></td>
<td></td>
<td>dSP 1</td>
<td>DISPLAY VALUE 1</td>
<td>0.000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>InP 2</td>
<td>INPUT VALUE 2</td>
<td>0.000</td>
<td></td>
<td></td>
<td>dSP 2</td>
<td>DISPLAY VALUE 2</td>
<td>0.000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>InP 3</td>
<td>INPUT VALUE 3</td>
<td>0.000</td>
<td></td>
<td></td>
<td>dSP 3</td>
<td>DISPLAY VALUE 3</td>
<td>0.000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>InP 4</td>
<td>INPUT VALUE 4</td>
<td>0.000</td>
<td></td>
<td></td>
<td>dSP 4</td>
<td>DISPLAY VALUE 4</td>
<td>0.000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>InP 5</td>
<td>INPUT VALUE 5</td>
<td>0.000</td>
<td></td>
<td></td>
<td>dSP 5</td>
<td>DISPLAY VALUE 5</td>
<td>0.000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>InP 6</td>
<td>INPUT VALUE 6</td>
<td>0.000</td>
<td></td>
<td></td>
<td>dSP 6</td>
<td>DISPLAY VALUE 6</td>
<td>0.000</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

PROGRAMMER ___________________  DATE __________

For further assistance, contact technical support at the appropriate company numbers listed.
### 2-FAC User Input and Function Key Parameters

<table>
<thead>
<tr>
<th>DISPLAY</th>
<th>PARAMETER</th>
<th>FACTORY SETTING</th>
<th>USER SETTING</th>
</tr>
</thead>
<tbody>
<tr>
<td>u5r-1</td>
<td>USER INPUT 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>u5r-2</td>
<td>USER INPUT 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>f1</td>
<td>FUNCTION KEY 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>f2</td>
<td>FUNCTION KEY 2</td>
<td></td>
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<td>r5k</td>
<td>RESET KEY</td>
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<td>Sc-F2</td>
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### 3-LOC Display and Program Lockout Parameters

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<tbody>
<tr>
<td>inp r</td>
<td>INPUT A ASSIGNMENT</td>
<td>dsp-a</td>
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<td>inp b</td>
<td>INPUT B ASSIGNMENT</td>
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<td>calc</td>
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<td>h1</td>
<td>MIN DISPLAY LOCKOUT</td>
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<td>l0</td>
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<td>sp-1</td>
<td>SETPOINT 1 ACCESS</td>
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<td>SETPOINT 3 ACCESS</td>
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<td>sp-4</td>
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### 4-SEC Secondary Function Parameters

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<td>dfe-b</td>
<td>INPUT B OFFSET VALUE</td>
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<td>h1-r</td>
<td>MAX CAPTURE ASSIGNMENT</td>
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<td>h1-t</td>
<td>MAX CAPTURE DELAY TIME</td>
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<td>l0-r</td>
<td>MIN CAPTURE ASSIGNMENT</td>
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<td>l0-t</td>
<td>MIN CAPTURE DELAY TIME</td>
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<td>dsp-b</td>
<td>DISPLAY UPDATE TIME</td>
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<td>cfunc</td>
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### 5-LEI Totalizer (Integrator) Parameters

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<td>locb</td>
<td>TOTALIZER LOW CUT VALUE</td>
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<td>pu</td>
<td>TOTALIZER POWER-UP RESET</td>
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### 7-SRL Serial Communication Parameters

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<td>op</td>
<td>PRINT OPTIONS</td>
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<td>INPUT A VALUE</td>
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<td>inp b</td>
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<td>binc</td>
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<td>hi</td>
<td>PRINT MAX &amp; MIN VALUES</td>
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<td>spn</td>
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### 8-Out Analog Output Parameters

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### 9-FCE Factory Setting Parameters

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### Display Parameters

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<td>SETPOINT VALUE (main)</td>
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<td>a5h</td>
<td>SETPOINT VALUE (alternate)</td>
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*Select alternate list to program these values.
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