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Bulletin No. PAXLC-D
Drawing No. LP0563
Released 01/10

MODEL PAXLC - PAX® LITE COUNTER

- *AVAILABLE IN 6 OR 8-DIGIT VERSIONS*
- *6-DIGIT, 0.56" (14.2 mm) / 8-DIGIT, 0.4" (10.1 mm) HIGH RED LED DISPLAYS*
- *ACCEPTS INPUT COUNT RATES UP TO 25 KHZ*
- *BI-DIRECTIONAL COUNTING*
- *REMOTE RESET CAPABILTY*
- *DISPLAY STORE*
- *COUNT INHIBIT*
- *PROGRAMMABLE SCALE FACTOR*
- *NEMA 4X/IP65 SEALED FRONT BEZEL*

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GENERAL DESCRIPTION

The PAX® Lite Counter, Model PAXLC, is a versatile totalizing counter that can be adapted to a wide variety of counting, measuring, and positioning readout applications.

The unit features a programmable scale factor, front panel and remote reset, store, inhibit, and a count rate of 25 KHz, while offering an economical solution to any totalizing need.

The PAXLC accepts digital inputs from a variety of sources including switch contacts, NPN-OC and TTL outputs, as well as most standard Red Lion sensors. The input can be scaled to display any desired unit of measure by simply using the programmable scale factor. The meter can accept bi-directional and uni-directional signals.

The meter is programmed through the front panel buttons and the use of DIP switches. The Down Arrow Key will also function as a front panel display reset. Once the front panel programming is complete, the buttons can be disabled by a DIP switch setting.

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

SAFETY SUMMARY

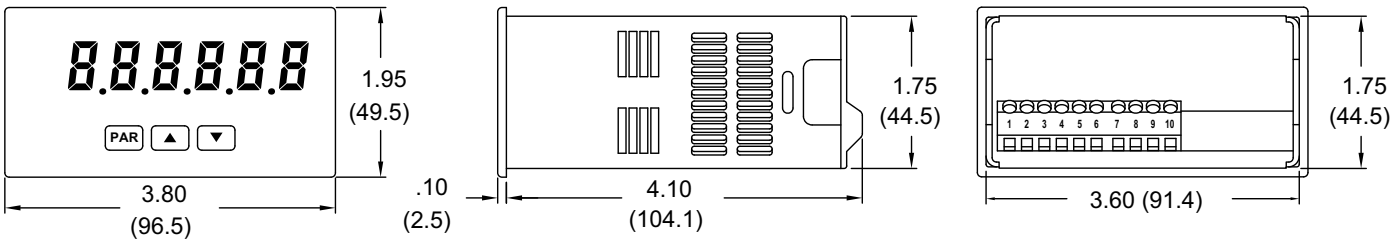
All safety related regulations, local codes and instructions that appear in the literature or on equipment must be observed to ensure personal safety and to prevent damage to either the instrument or equipment connected to it. If equipment is used in a manner not specified by the manufacturer, the protection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

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

CAUTION: Risk of electric shock.

DIMENSIONS In inches (mm)

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



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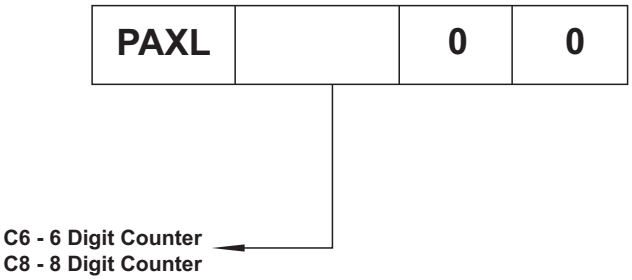
ORDERING INFORMATION

Meter Part Numbers



GENERAL METER SPECIFICATIONS

1. **DISPLAY**: 6-digit, 0.56" (14.2 mm) or 8-digit, 0.4" (10.1 mm) 7-segment red LED
   Display Range: 6-digit, -99999 to 999999 or 8-digit, -9999999 to 99999999
   Display Overflow indicated by flashing dot to the right of digit 1
   Decimal points are programmed by front panel keys
2. **POWER**:
   AC Power: 115/230 VAC, switch selectable. Allowable power line variation ±10%, 50/60 Hz, 6 VA.
   Isolation: 2300 Vrms for 1 min. to input and DC Out/In.
   DC Power: 10 to 16 VDC @ 0.1 A max.
3. **SENSOR POWER**: 9 to 17.5 VDC @ 100 mA max.
4. **KEYPAD**: 3 programming keys, the ▼ (Down Arrow) key can also function as the front panel reset button
5. **COUNT INPUT**: (DIP switch selectable)
   Accepts pulses from a variety of sources including switch contacts, NPN-OC and TTL Outputs, as well as most standard Red Lion® sensors
   Logic State: Active Low
   Input trigger levels V_{IL} = 1.5 V max.; V_{IH} = 3.75 V min.
   Current Sinking: Internal 7.8 KΩ pull-up to +12 VDC, I max = 1.9 mA
   Current Sourcing: Internal 3.9 KΩ pull-down, 8 mA max. @ 30 VDC max.
   Filter: Damping capacitor provided for switch contact bounce. Limits input frequency to 50 Hz and input pulse widths to 10 msec. minimum.
6. **MAXIMUM COUNT RATE**: 25 KHz max.
7. **CONTROL INPUTS**:
   Count Up/Down Control, Remote Reset, Inhibit, and Store
   Max. Continuous Input: 30 VDC
   Isolation To Sensor Input Commons: Not isolated
   Logic State: Active Low, 22 KΩ pull-up to +12 V
   Active: V_{IN} < 0.9 VDC
   Inactive: V_{IN} > 3.6 VDC
   Response Time:
   Up/Down and Inhibit: 25 µsec max.
   Reset and Store: 10 msec. max.
8. **MEMORY**: Nonvolatile E^2PROM retains all programmable parameters and count values.
9. **ENVIRONMENTAL CONDITIONS**:
   Operating Temperature Range: 0 to 60°C
   Storage Temperature Range: -40 to 60°C
   Operating and Storage Humidity: 0 to 85% max. relative humidity non-condensing
   Vibration According to IEC 68-2-6: Operational 5 to 150 Hz, in X, Y, Z direction for 1.5 hours, 2 g's.
   Shock According to IEC 68-2-27: Operational 30 g's, 11 msec in 3 directions.
   Altitude: Up to 2000 meters
10. **CERTIFICATIONS AND COMPLIANCES**:
    SAFETY
    UL Recognized Component, File # E179259, UL61010A-1, CSA C22.2 No. 61010-1
    Recognized to U.S. and Canadian requirements under the Component Recognition Program of Underwriters Laboratories, Inc.
    UL Listed, File # E137808, UL508, CSA C22.2 No. 14-M95
    LISTED by Und. Lab. Inc. to U.S. and Canadian safety standards
    Type 4X Enclosure rating (Face only), UL50
    IECEE CB Scheme Test Report # 04ME11209-20041018
    Issued by Underwriters Laboratories, Inc.
    IEC 61010-1, EN 61010-1: Safety requirements for electrical equipment for measurement, control, and laboratory use, Part 1.
    IP65 Enclosure rating (Face only), IEC 529
    IP20 Enclosure rating (Rear of unit), IEC 529
    ELECTROMAGNETIC COMPATIBILITY
    Emissions and Immunity to EN 61326: Electrical Equipment for Measurement, Control and Laboratory use.

Immunity to Industrial Locations:

Electrostatic discharge	EN 61000-4-2	Criterion A 4 kV contact discharge 8 kV air discharge
Electromagnetic RF fields	EN 61000-4-3	Criterion A 10 V/m
Fast transients (burst)	EN 61000-4-4	Criterion A [2] 2 kV power 2 kV signal
Surge	EN 61000-4-5	Criterion A [2] 1 kV L-L, 2 kV L&N-E power 1 kV signal
RF conducted interference	EN 61000-4-6	Criterion A 3 V/rms
Power frequency magnetic fields	EN 61000-4-8	Criterion A 30 A/m
Voltage dip/interruptions	EN 61000-4-11	Criterion A 0.5 cycle
Emissions:		
Emissions	EN 55011	Class B

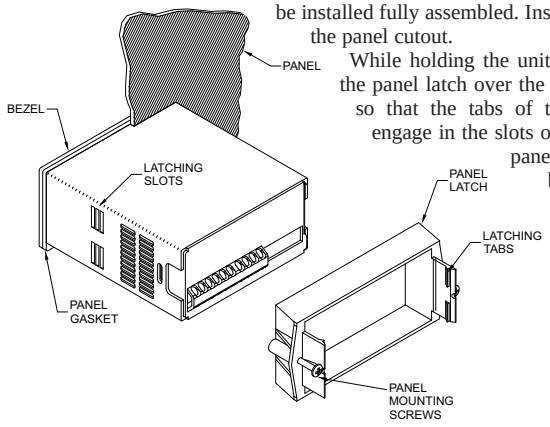
Notes:
1. Criterion A: Normal operation within specified limits.
2. EMI filter placed on the DC power supply, when DC powered: Corcom #1VB3 or Schaffner #FN610-1/07 (RLC #LFIL0000).

11. **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.
12. **CONSTRUCTION**: This unit is rated for NEMA 4X/IP65 outdoor use. IP20 Touch safe. Installation Category II, Pollution Degree 2. One piece bezel/case. Flame resistant. Synthetic rubber keypad. Panel gasket and mounting clip included.
13. **WEIGHT**: 12 oz. (340 g)

1.0 INSTALLING THE METER

Installation

The PAX Lite 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.

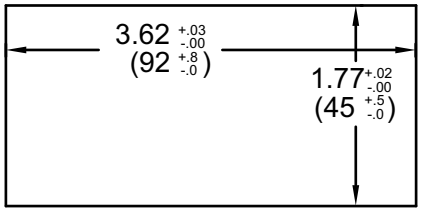
Installation Environment

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.

PANEL CUT-OUT



2.0 SETTING THE SWITCHES

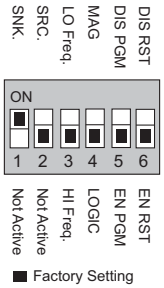
The meter has switches that must be checked and/or changed prior to applying power. To access the power switch, remove the meter base from the case by firmly squeezing and pulling back on the side rear finger tabs. This should lower the latch below the case slot (which is located just in front of the finger tabs). It is recommended to release the latch on one side, then start the other side latch.

Power Selection Switch

Caution: Insure the AC power selection switch is set for the proper voltage before powering-up the meter. The meter is shipped from the factory in the 230 VAC position.

Setup DIP Switches

A DIP switch is at the rear of the meter. It is used to set up the input, enable/disable programming and front panel reset functions. For the correct input setup, refer to 3.3 Wiring the Meter.



Switch 1

SNK.: Adds internal 7.8 KΩ pull-up resistor to +12 VDC, I_{MAX} = 1.9 mA

Switch 2

SRC: Adds internal 3.9 KΩ pull-down resistor, 8 mA max. @ 30 VDC max.

Switch 3

HI Frequency: Removes damping capacitor and allows max. frequency.

LO Frequency: Limits input frequency to 50 Hz and input pulse widths to 10 msec.

Switch 4

LOGIC: Input trigger levels V_{IL} = 1.5 V max; V_{IH} = 3.75 V max.

MAG: Not used for count applications.

Switch 5

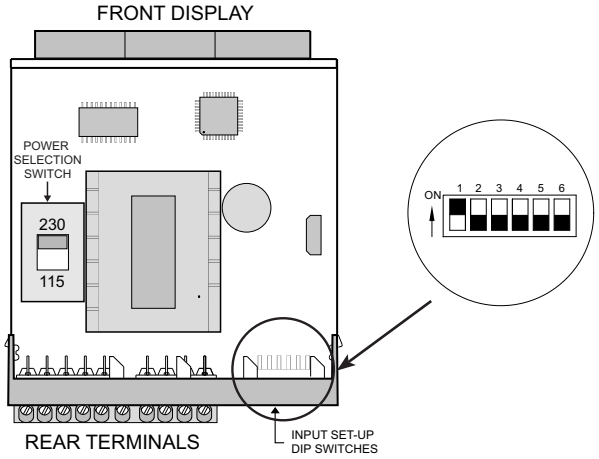
Enable Programming: Enables programming through the front panel buttons.

Disables Programming: Disables the front panel buttons from any programming changes.

Switch 6

Enable Reset: Enables the front panel reset (down arrow key).

Disable Reset: Disables the front panel reset key. *Note: The remote reset terminal is not disabled by this switch.*



3.0 WIRING THE METER

WIRING OVERVIEW

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

When wiring the meter, compare the numbers embossed on the back of the meter case against those shown in wiring drawings for proper wire position. Strip the wire, leaving approximately 0.3" (7.5 mm) bare lead exposed (stranded wires should be tinned with solder.) Insert the lead under the correct screw-clamp terminal and tighten until the wire is secure. (Pull wire to verify tightness.)

EMC INSTALLATION GUIDELINES

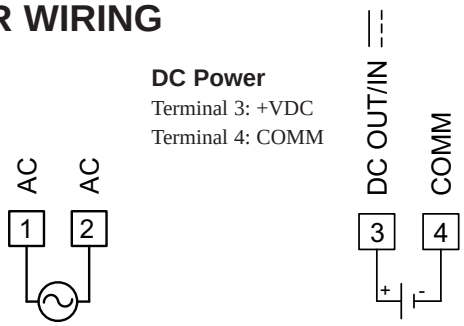
Although this meter is designed with a high degree of immunity to Electro-Magnetic Interference (EMI), proper installation and wiring methods must be followed to ensure compatibility in each application. The type of the electrical noise, source or coupling method into the meter may be different for various installations. The meter becomes more immune to EMI with fewer I/O connections. Cable length, routing, and shield termination are very important and can mean the difference between a successful or troublesome installation. Listed below are some EMC guidelines for successful installation in an industrial environment.

1. The meter should be mounted in a metal enclosure, which is properly connected to protective earth.
2. Use shielded (screened) cables for all Signal and Control inputs. The shield (screen) pigtail connection should be made as short as possible. The connection point for the shield depends somewhat upon the application. Listed below are the recommended methods of connecting the shield, in order of their effectiveness.
   a. Connect the shield only at the panel where the unit is mounted to earth ground (protective earth).
   b. Connect the shield to earth ground at both ends of the cable, usually when the noise source frequency is above 1 MHz.
   c. Connect the shield to common of the meter and leave the other end of the shield unconnected and insulated from earth ground.
3. Never run Signal or Control cables in the same conduit or raceway with AC power lines, conductors feeding motors, solenoids, SCR controls, and heaters, etc. The cables should be 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.
4. Signal or Control cables within an enclosure should be routed as far as possible from contactors, control relays, transformers, and other noisy components.
5. In extremely high EMI environments, the use of external EMI suppression devices, such as ferrite suppression cores, is effective. Install them on Signal and Control cables as close to the unit as possible. Loop the cable through the core several times or use multiple cores on each cable for additional protection. Install line filters on the power input cable to the unit to suppress power line interference. Install them near the power entry point of the enclosure. The following EMI suppression devices (or equivalent) are recommended:
   Ferrite Suppression Cores for signal and control cables:
   Fair-Rite # 0443167251 (RLC# FCOR0000)
   TDK # ZCAT3035-1330A
   Steward # 28B2029-0A0
   Line Filters for input power cables:
   Schaffner # FN610-1/07 (RLC# LFIL0000)
   Schaffner # FN670-1.8/07
   Corcom # 1 VR3
   Note: Reference manufacturer's instructions when installing a line filter.
6. Long cable runs are more susceptible to EMI pickup than short cable runs. Therefore, keep cable runs as short as possible.
7. Switching of inductive loads produces high EMI. Use of snubbers across inductive loads suppresses EMI.
   Snubber: RLC# SNUB0000.

3.1 POWER WIRING

AC Power
Terminal 1: VAC
Terminal 2: VAC

DC Power
Terminal 3: +VDC
Terminal 4: COMM



3.2 CONTROL INPUT WIRING

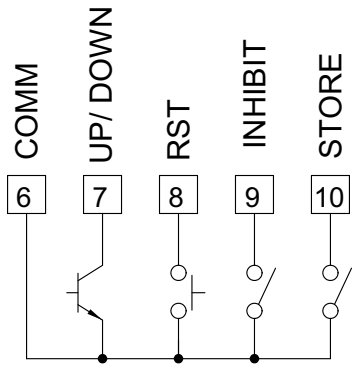
The PAXLC provides a number of control inputs, including Store, Reset, Inhibit and Up/Down control. These inputs are active low (connected to common), so the external switching device should be connected between the control input and common terminals.

Up/Down - This input determines the direction of the count. Unconnected, the meter will count up. When input is pulled low, the meter will count down.

Reset - When this input is pulled low, the meter will reset to zero. If the input remains low or connected to common, the meter will be held in the reset mode, and not able to count.

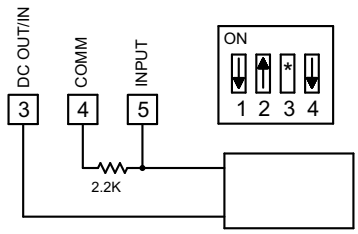
Inhibit - When low, this input will prevent the meter from counting. If the input remains low or connected to the common, the meter will not be able to count.

Store - A low will stop the display from updating. It will freeze the display as long as the input is held low. Once released the display will update to the current count display.

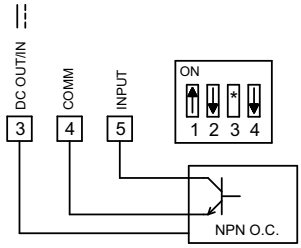


3.3 INPUT WIRING

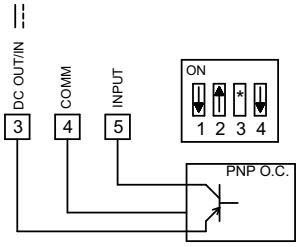
Two Wire Proximity, Current Source



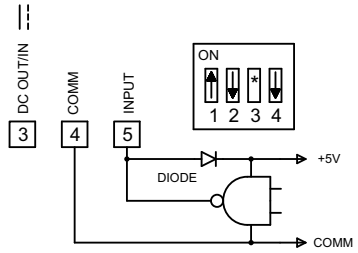
Current Sinking Output



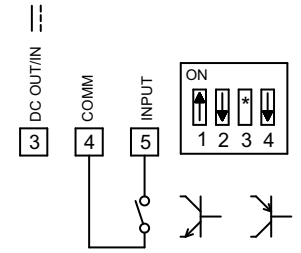
Current Sourcing Output



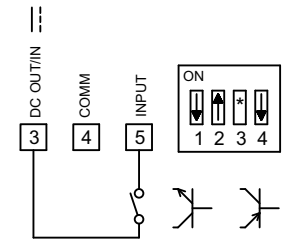
Interfacing With TTL



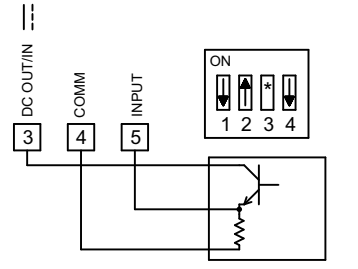
Switch or Isolated Transistor; Current Sink



Switch or Isolated Transistor; Current Source

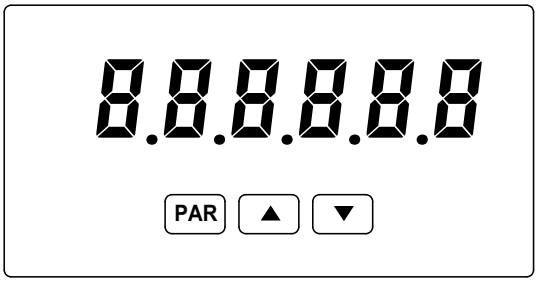


Emitter Follower; Current Source



*Switch position is application dependent.

4.0 Reviewing the Front Buttons and Display



KEY	DISPLAY MODE OPERATION	PROGRAMMING MODE OPERATION
PAR	Access Programming Mode	Store selected parameter and index to next parameter
▲	No Function	Increment selected digit of parameter value
▼	Front Panel Reset	Select digit position in parameter value

5.0 Scaling the Meter

In many industrial applications, a meter is required to totalize the output of an operation or event. The pulses from a sensor are received by the PAXLC, and then totalized on the display. In many cases the incoming pulses do not represent the desired display readout. For those applications, a scale factor can be entered into the meter, scaling the pulses to obtain the desired readout. The following formula will help provide the scaling values to achieve the desired readout.

$$SF = \frac{DR}{EPU}$$

WHERE:

SF = Scale Factor
DR = Desired Readout* (Single unit of measure, i.e. foot, gallon, etc.)
EPU = Existing Pulses per Unit (Number of pulses per single unit of measure, i.e. foot, gallons, etc.)
**For applications requiring a decimal point, select and program the appropriate decimal point. When calculating the Scale Factor, use the whole value of the number to be displayed, for example, 1.0 feet, the Desired Readout in this case is 10. Do not use decimal points in the Scaling Formula.*

For calculated SF values less than 9.99999

If the Scale Factor is a value less than 9.99999, it can be entered directly into the meter as the Scale Factor and the Scale Multiplier can be left at 1.

For calculated SF values greater than 9.99999

If the Scale Factor is a value over 9.99999 (maximum value), the Scale Multiplier must be used to reduce the calculated SF value until it is less then 9.99999. The Scale Multiplier multiplies the calculated Scale Factor value by 1, 0.1, and 0.01, thus reducing the calculated value accordingly. Select the appropriate Scale Multiplier value that allows the Scale Factor to be a value under 9.99999. Both the Scale Factor and Scale Multiplier can then be entered into the meter.

Example 1:

This application involves counting cases from a production line. The sensor provides a pulse for every can produced. The desired readout is in cases, therefore the incoming pulses need to be converted to obtain the proper readout. The following is used to calculate scale factor.

$$SF = \frac{DR}{EPU}$$

DR = 1 case
EPU = 12 cans/case

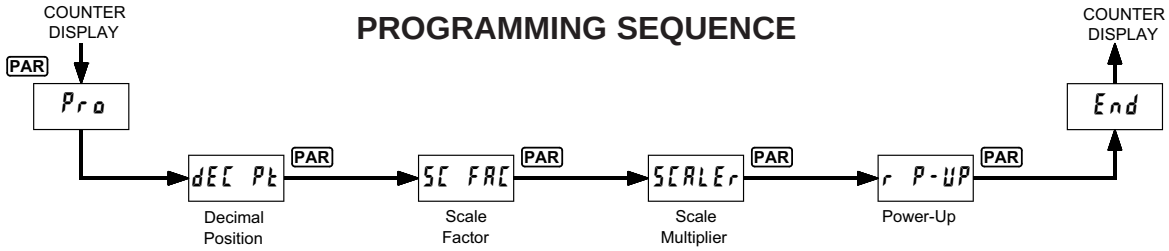
$$SF = \frac{1}{12}$$

SF = 0.083333

Since the Calculated Scale Factor Value is less than 9.99999, it can be entered directly into the meter. The Scale Multiplier can be left at 1.

6.0 PROGRAMMING THE METER

PROGRAMMING SEQUENCE



The Totalizer has four programmable parameters which are entered in the sequence shown above, using the front panel push buttons.

Before programming, refer to the section on Scaling the Meter to determine the Decimal Position, Scale Factor and Scale Multiplier to use for the specific application.

Note: Programming mode can be locked out with the Program Disable DIP switch. With the switch in the Disabled (up) position the meter will not enter programming mode. Refer to the section on DIP switch setup.

PROGRAMMING MODE ENTRY

Press the **PAR** key to enter Programming Mode. The meter briefly displays Pro followed by the first programming parameter described below.

PROGRAMMING PARAMETERS

In programming mode, the display alternates between the parameter and the current selection or value for that parameter. The dual display with arrows is used below to illustrate the alternating display. The selection choices or value range for each parameter is shown to the right of the alternating display.

DECIMAL POSITION

0 0.0 0.00 0.000 0.0000 0.00000

This parameter selects the decimal point position on the display.

Press the arrow keys (▲ or ▼) to sequence through the selection list until the desired selection is shown. Press the **PAR** key to save the displayed selection and advance to the next parameter.

SCALE FACTOR

0.00001 to 9.99999

The number of input counts is multiplied by the Scale Factor and the Scale Multiplier to obtain the desired process value. A Scale Factor of 1.00000 and a Scale Multiplier of 1 will result in the display of the actual number of input counts. (See details on scaling calculations.)

The Scale Factor is displayed as a six-digit value with one selected digit flashing (initially digit 6). Press the ▲ (up arrow) key to increment the value of the selected (flashing) digit. Holding the ▲ key automatically scrolls the value of the selected digit.

Press the ▼ (down arrow) key to select the next digit position to the right. Use the ▲ key to increment the value of this digit to the desired number. Press the ▼ key again to select the next digit to be changed. Holding the ▼ key automatically scrolls through each digit position. Repeat the "select and set" sequence until all digits are displaying the desired Scale Factor value. Press the **PAR** key to save the displayed value and advance to the next parameter.

SCALE MULTIPLIER

1 0.1 0.01

The number of input counts is multiplied by the Scale Multiplier and the Scale Factor to obtain the desired process value. A Scale Multiplier of 1 will result in only the Scale Factor affecting the display. (See details on scaling calculations.)

Press the arrow keys (▲ or ▼) to sequence through the selection list until the desired selection is displayed. Press the **PAR** key to save the selection and exit programming mode.

COUNTER RESET AT POWER-UP

YES NO

The totalizer may be programmed to reset at each meter power-up.

PROGRAMMING MODE EXIT

The meter exits Programming Mode when the **PAR** key is pressed to save the Scale Multiplier selection. The meter briefly displays End upon exiting Programming Mode. All programmed selections are now transferred to the non-volatile memory and the meter returns to the Counter display.

(If power loss occurs during programming mode, verify parameter changes and reprogram, if necessary, when power is restored.)

PROGRAMMING MODE TIME OUT

The Programming Mode has an automatic time out feature. If no keypad activity is detected for approximately 60 seconds, the meter automatically exits Programming Mode. The meter briefly displays End and returns to the Counter display. When automatic timeout occurs, any changes that were made to the parameter currently being programmed, will not be saved.

FACTORY SETTINGS

The factory settings for the programming parameters are shown above in the alternating display illustrations. The factory settings can be easily restored by removing power from the meter, and then pressing and holding the **PAR** key while power is reapplied. The meter displays rESEt until the **PAR** key is released. The normal power-up sequence then resumes, with the factory settings loaded and saved in non-volatile memory. The Count is reset to 0.

Note: The Program Disable DIP switch must be in the Enabled (down) position to allow loading factory settings. See section on DIP switch setup.

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