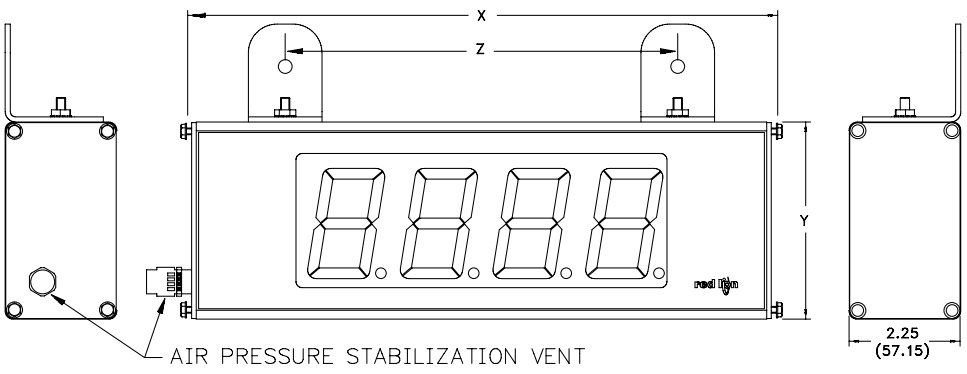

X
Z
Y
2.25
(57.15)
AIR PRESSURE STABILIZATION VENT

4. **RATE INPUT**: **Models LD2006P0 & LD4006P0 only**
   Display Range: 0 to 99999
   Min Freq.: 0.01 Hz
   Max Freq.: See Frequency chart under Count Input specification
   Accuracy: ±0.01%
   Rate Overflow Indication: Display flashes "OLOL"
5. **RESET/USER INPUT**:Function programmable for LD2006P0 &LD4006P0
   Reset/User Input: DIP switch selectable pull-up (7.8 KΩ) or pull-down resistor (3.9 KΩ) that determines active high or active low input logic.
   Trigger levels: V_{IL} = 1.0 V max; V_{IH} = 2.4 V min; V_{MAX} = 28 VDC
   Response Time: 5 msec typ.; 100 msec debounce (activation and release)
6. **COMMUNICATIONS (LD2006P0 & LD4006P0 only)**:
   RS485 SERIAL COMMUNICATIONS
      Type: RS485 multi-point balanced interface (non-isolated)
      Baud Rate: 300 to 19.2 k
      Data Format: 7/8 bits; odd, even, or no parity
      Bus Address: 0 to 99; max 32 meters per line
   RS232 SERIAL COMMUNICATIONS
      Type: RS232 half duplex (non-isolated)
      Baud Rate: 300 to 19.2 k
      Data Format: 7/8 bits; odd, even, or no parity
7. **MEMORY**: Nonvolatile E^2PROM retains all programming parameters and count values when power is removed.
8. **OUTPUT (LD2006P0 & LD4006P0 only)**:
   Relay: Form C contacts rated at 5 amps @ 120/240 VAC or 28 VDC (resistive load), 1/8 H.P. @ 120 VAC (inductive load)
9. **ENVIRONMENTAL CONDITIONS**:
   Operating temperature: 0 to 50 °C
   Storage temperature: -40 to 70 °C
   Operating and storage humidity: 0 to 85% max. RH (non-condensing)
   Altitude: Up to 2,000 meters
10. **CONNECTIONS**:
   Internal removable terminal blocks are used for power and signal wiring. Remove end plates with ¼" nut driver. For LD4 versions, all wiring is on right side of unit. For LD2 versions, power and signal wiring is on the right side and the optional relay output is on left side.
   Wire Strip Length: 0.4" (10 mm)
   Wire Gage: 24-12 AWG copper wire
   Torque: 5.3 inch-lbs (0.6 N-m) max.
11. **CERTIFICATIONS AND COMPLIANCES**:
   SAFETY
   UL Listed, File # E137808, UL508, CSA C22.2 No. 14-M95
      LISTED by Und. Lab. Inc. to U.S. and Canadian safety standards
      Type 4X Enclosure rating (Face only), UL50
   IEC 61010-1, EN 61010-1: Safety requirements for electrical equipment for measurement, control, and laboratory use, Part 1.
   IP65 Enclosure rating (Face only), IEC 529
   ELECTROMAGNETIC COMPATIBILITY
   Emissions and Immunity to EN 61326: Electrical Equipment for Measurement, Control and Laboratory use.

   Immunity to Industrial Locations:

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

   Emissions:

Emissions	EN 55011	Class B

   Notes:
      1. Criterion A: Normal operation within specified limits.
      2. DC Power: Shaffner FN610-1/07 line filter installed on DC power cable to comply.
12. **CONSTRUCTION**: Aluminum enclosure, and steel side panels with textured black polyurethane paint for scratch and corrosion resistance protection. Sealed front panel meets NEMA 4X/IP65 specifications. Installation Category II, Pollution Degree 2.
13. **WEIGHT**:
   LD2004XX - 3.5 lbs (1.59 kg)
   LD2006XX - 4.5 lbs (2.04 kg)
   LD4004XX - 8 lbs (3.63 kg)
   LD4006XX - 10.5 lbs (4.76 kg)

ORDERING INFORMATION

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

1.0 INSTALLING THE METER

INSTALLATION

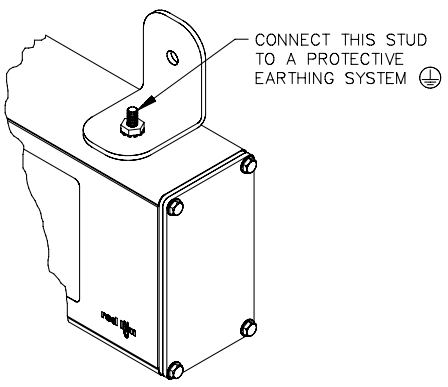
The meter meets NEMA 4X/IP65 requirements when properly installed.

INSTALLATION ENVIRONMENT

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

The unit should only be cleaned with a soft cloth and neutral soap product. Do NOT use solvents.

Continuous exposure to direct sunlight may accelerate the aging process of the front overlay. Do not use tools of any kind (screwdrivers, pens, pencils, etc.) to operate the keypad of the unit.



2.0 SETTING THE DIP SWITCHES

SETTING THE 8 DIP SWITCHES

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

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

SWITCH 1 (Input A)

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

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

SWITCH 2 (Input A) {See Note 1}

SNK.: Adds internal 7.8 KΩ pull-up resistor to +12 VDC, I_{MAX} = 2.1 mA.

SRC.: Adds internal 3.9 KΩ pull-down resistor, 7.2 mA max. @ 28 VDC max.

SWITCH 3 (Input A)

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

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

SWITCH 4 (Input B) {See Note 1}

SNK.: Adds internal 7.8 KΩ pull-up resistor to +12 VDC, I_{MAX} = 2.1 mA.

SRC.: Adds internal 3.9 KΩ pull-down resistor, 7.2 mA max. @ 28 VDC max.

SWITCH 5 (Input B)

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

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

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

SNK.: Adds internal 7.8 KΩ pull-up resistor to +12VDC, I_{MAX} = 2.1 mA.

SRC.: Adds internal 3.9 KΩ pull-down resistor, 7.2 mA max. @ 28 VDC max.

SWITCH 7 (POWER UP RESET)

ENABLE: In this position, the unit resets at power up.

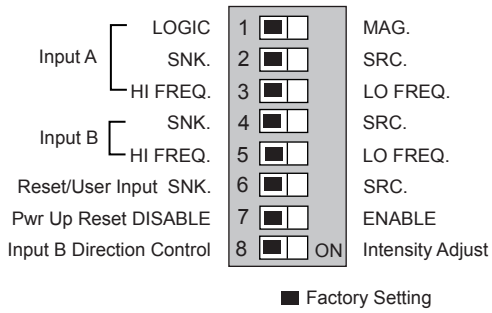
DISABLE: In this position, the unit does not reset at power up.

SWITCH 8 (Input B)

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

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

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



■ Factory Setting

3.0 WIRING THE METER

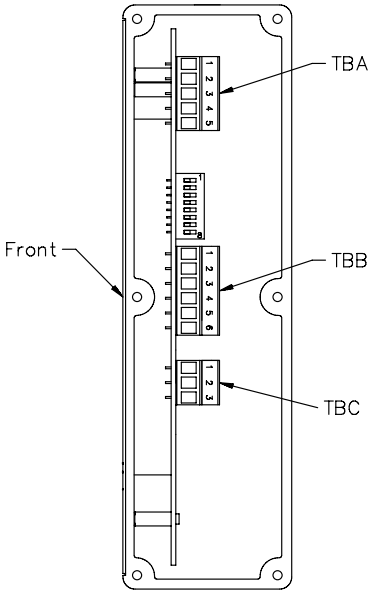
EMC INSTALLATION GUIDELINES

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

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

WIRING OVERVIEW

Electrical connections are made via pluggable terminal blocks located inside the meter. All conductors should conform to the meter's voltage and current ratings. All cabling should conform to appropriate standards of good installation, local codes and regulations. It is recommended that the power supplied to the meter (DC or AC) be protected by a fuse or circuit breaker. When wiring the meter, compare the numbers on the label on the back of the meter case against those shown in wiring drawings for proper wire position. Strip the wire, leaving approximately 0.4" (10 mm) bare lead exposed (stranded wires should be tinned with solder.) Insert the lead under the correct screw clamp terminal and tighten until the wire is secure. (Pull wire to verify tightness.) Each terminal can accept up to one #14 AWG (2.55 mm) wire, two #18 AWG (1.02 mm), or four #20 AWG (0.61 mm).



RIGHT SIDE VIEW

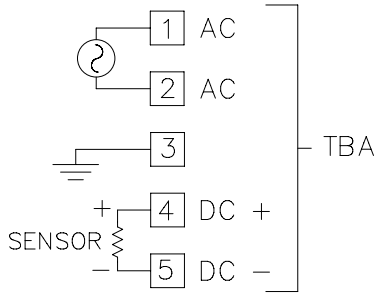
Only programmable models have terminal positions 5 and 6 of TBB.

Model LD4006P0 has TBC located on the right side (as shown).
Model LD2006P0 has TBC located on the left side.

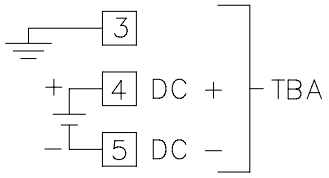
3.1 POWER WIRING

The power wiring is made via the 5 position terminal block (TBA) located inside unit (right side). **Do not power unit from both AC & DC at the same time**.

AC Power
Terminal 1: VAC
Terminal 2: VAC
Terminal 3: Earth Ground
Terminal 4: +DC Out
Terminal 5: DC Common



DC Power
Terminal 3: Earth Ground
Terminal 4: +DC Input
Terminal 5: DC Common



3.2 USER INPUT WIRING

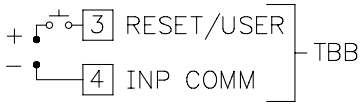
The Reset/User Input is always Terminal 3 and Input Common is always terminal 4 of (TBB) located inside the unit (right side).

Terminal 3: Reset/User Input
Terminal 4: Input Common

Sinking Logic

DIP switch 6 OFF

Sourcing Logic

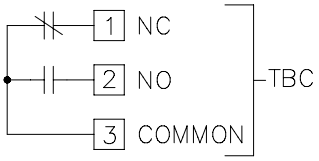


DIP switch 6 ON

3.3 SETPOINT (OUTPUT) WIRING

The setpoint relay uses a three position terminal block (TBC) located on the left side of LD2006P0 models, and on the right side for LD4006P0 models.

Terminal 1: NC
Terminal 2: NO
Terminal 3: Relay Common



3.4 INPUT WIRING

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

Terminal 1: Input A
Terminal 2: Input B
Terminal 4: Input Common

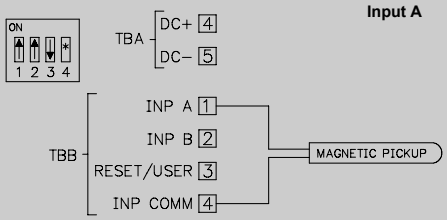
Programmable models LD2006P0 and LD4006P0 provide a choice of eight different Count Modes. The Count Mode selected determines the action of Inputs A and B. Section 5.1, Input Setup Parameters, provides details on count mode selection and input action.

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

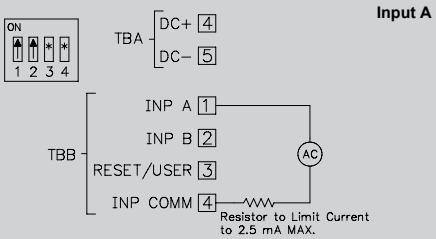
Input B can also be used to adjust the LED display intensity by setting DIP Switch 8 to the ON position (See Section 2.0, Setting the DIP Switches). For programmable models, this only applies in Count with Direction mode.

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

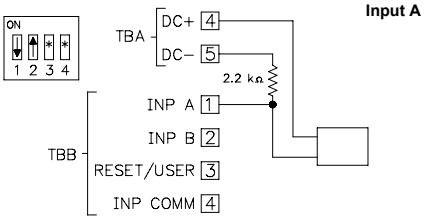
Magnetic Pickup



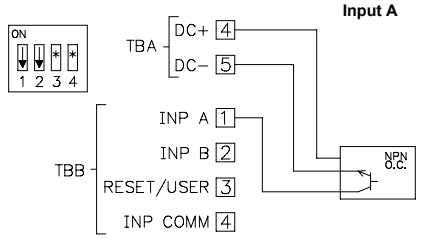
AC Inputs From Tach Generators, Etc.



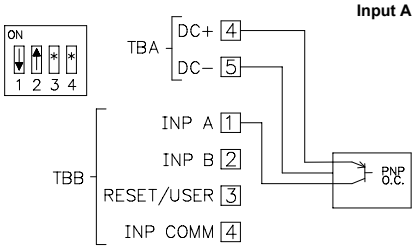
Two Wire Proximity, Current Source



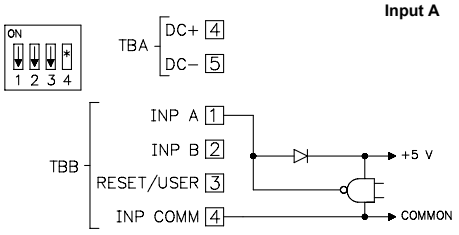
Current Sinking Output



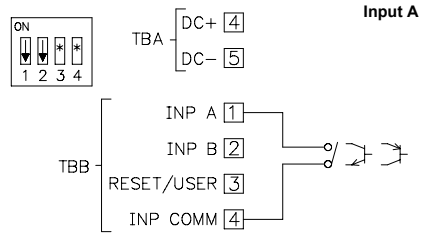
Current Sourcing Output



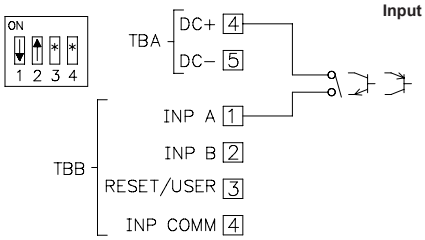
Interfacing With TTL



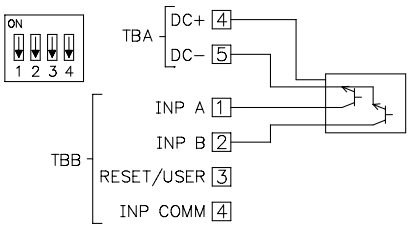
Switch or Isolated Transistor; Current Sink



Switch or Isolated Transistor; Current Source



Current Sink Output; Quad/Direction



LD2006P0 and LD4006P0 only.

∗ *Switch position is application dependent.*

Shaded areas not recommended for counting applications.

RS232 Communications

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

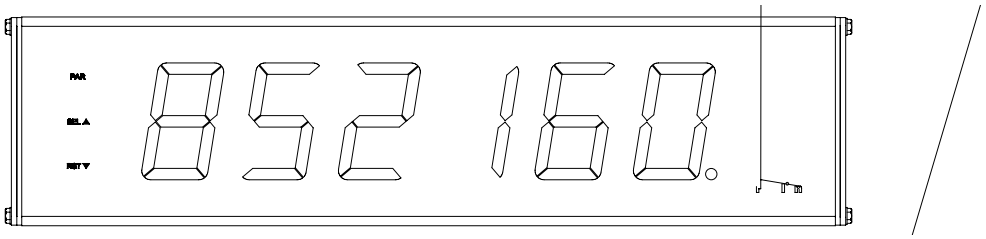
Some devices cannot accept more than two or three characters in succession without a pause in between. In these cases, the meter employs a busy function.

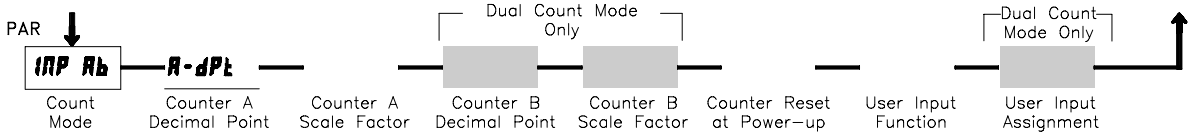
As the meter begins to transmit data, the RXD line (RS232) is monitored to determine if the receiving device is “busy”. The receiving device asserts that it is busy by setting the RXD line to a space condition (logic 0). The meter then suspends transmission until the RXD line is released by the receiving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

RS485 Communications

The RS485 communication standard allows the connection of up to 32 devices on a single pair of wires, distances up to 4,000 ft. and data rates as high as 10M baud (the PAX is limited to 19.2k baud). The same pair of wires is used to both transmit and receive data. RS485 is therefore always half-duplex, that is, data cannot be received and transmitted simultaneously.

4.0 Reviewing the Front Panel Keys and Display




PAR
Dual Count Mode Only
Dual Count Mode Only
Count Mode
Counter A Decimal Point
Counter A Scale Factor
Counter B Decimal Point
Counter B Scale Factor
Counter Reset at Power-up
User Input Function
User Input Assignment

COUNTER A DECIMAL POSITION

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

COUNTER A SCALE FACTOR

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

COUNTER B DECIMAL POSITION

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

COUNTER B SCALE FACTOR

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

COUNTER RESET AT POWER-UP

SCALING FOR COUNT INDICATION

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

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

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

WHERE:

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

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

Decimal Point Position:

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

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

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

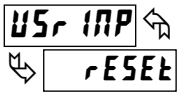
Given that 128 pulses are equal to 1 foot, display total feet with a one-hundredth resolution.

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

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

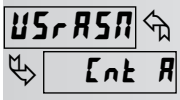
$$\text{Scale Factor} = 0.7812$$

USER INPUT FUNCTION



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

USER INPUT ASSIGNMENT

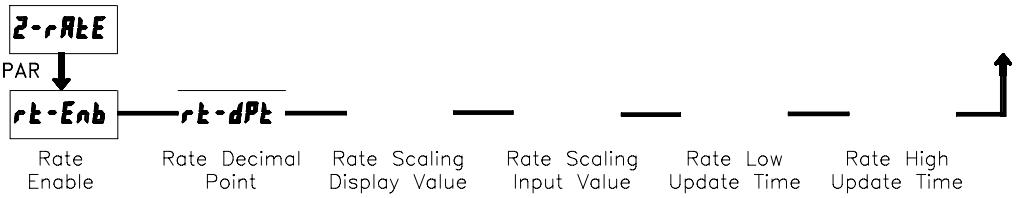


The User Input Assignment is only active if the meter is programmed in the Dual Count Mode and a selection of reset, store, store and reset, inhibit, or print and reset is selected in the User Input Function menu.

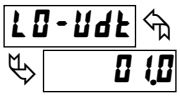
Shaded area selections only apply when programmed for dual count mode.

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

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



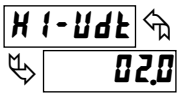
RATE LOW UPDATE TIME



0.1 to 99.9 seconds

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

RATE HIGH UPDATE TIME



0.2 to 99.9 seconds

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

SCALING FOR RATE INDICATION

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

SCALING CALCULATION

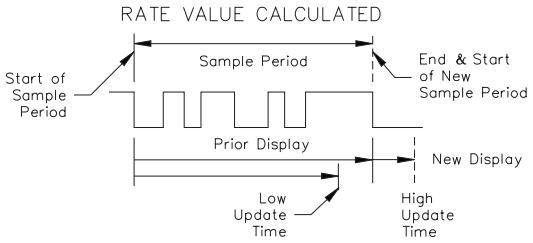
If a display value versus input signal (in pulses per second) is known, then those values can be entered into Scaling Display (rt-dSP) and Scaling Input (rt-INP). No further calculations are needed.

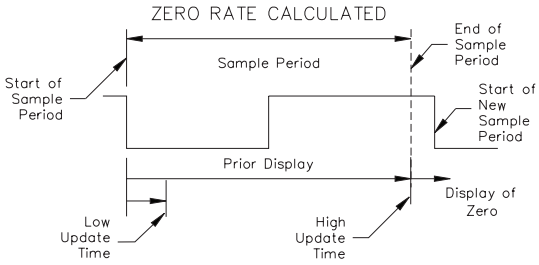
If only the number of pulses per 'single' unit (i.e. # of pulses per foot) is known, then it can be entered as the Scaling Input value and the Scaling Display value will be entered as the following:

NOTES:

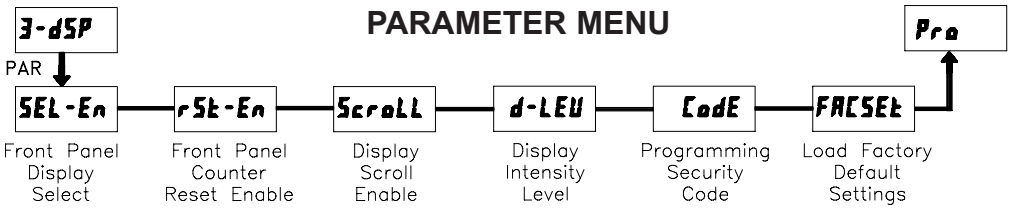
1. If # of pulse per unit is less than 10, then multiply both Input and Display values by 10.

period will end but the Rate display will be forced to zero. The High Update Time value must be greater than the Low Update Time value. Both values must be greater than 0.0. The input frequency calculated during the sample period, is then shown as a Rate value determined by the scaling calculation.





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



FRONT PANEL DISPLAY SELECT ENABLE (SEL▲)

SEL-En / nO — nO YES

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

FRONT PANEL COUNTER RESET ENABLE (RST▼)

rSt-En / YES — YES nO

nO	both
Cnt A	dSPLAY
Cnt b	

The YES selection allows the **RST▼** key to reset the selected counter(s). The shaded selections are only active when the meter is programmed for Dual Count Mode.

DISPLAY SCROLL ENABLE

ScroLL / nO — YES nO

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

DISPLAY INTENSITY LEVEL

d-LEV / 5 — 1 to 5

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

PROGRAMMING SECURITY CODE

CodE / 000 — 0 to 999

The Security Code determines the programming mode and the accessibility of programming parameters. This code can be used along with the Program Mode Lock-out (ProLoc) in the User Input Function parameter (Module 1).

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

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

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

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

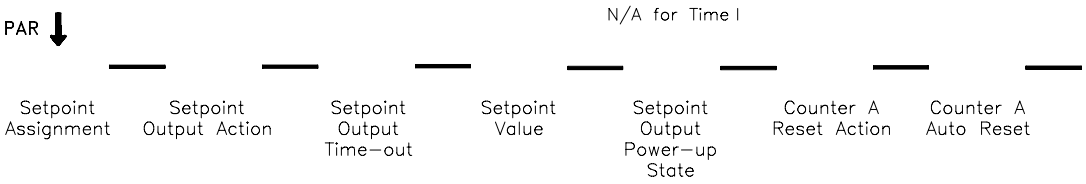
LOAD FACTORY DEFAULT SETTINGS

FACSEt / nO — nO YES

Selecting YES returns the meter to factory default settings. The meter displays rESEt and returns to Pro, at which time all settings have been changed.

Pressing **RST▼** on power-up loads the factory settings and displays rESEt. This allows operation in the event of a memory failure or corrupted data.

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



SPT ACTION	DESCRIPTION	OUTPUT ACTIVATES	OUTPUT DEACTIVATES
LAtCH	Latched Output Mode	When Count = Setpoint	At Manual Reset (if OrSt-r=YES)
t-OUt	Timed Output Mode	When Count = Setpoint	After Setpoint Output Time-Out
bOUNd	Boundary Mode	When Count ≥ Setpoint	When Count < Setpoint

SETPOINT OUTPUT TIME-OUT

0.01 to 99.99 seconds

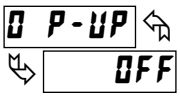
This parameter is only active if the Setpoint Action is set to timed output mode (t-OUt). Enter the value in seconds that the output will be active, once the Setpoint Value is reached.

SETPOINT VALUE

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

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

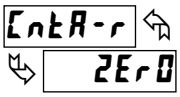
SETPOINT OUTPUT POWER-UP STATE



OFF
On
SAVE

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

COUNTER A RESET ACTION



2Er0 SEtPt

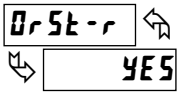
When Counter A is reset, it returns to zero or the Setpoint Value. When the Reset Action is selected for SEtPt (Reset to Setpoint), the output activates at zero. This parameter does not appear for Boundary Mode Setpoint Action, where the meter always resets to zero.

COUNTER A AUTO RESET

nO
0-Strt
0-End

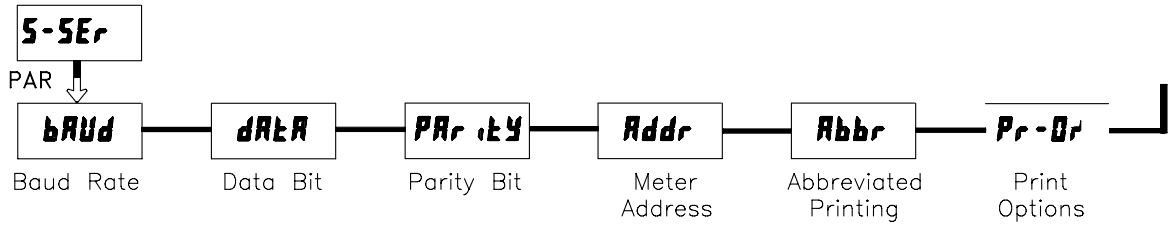
This automatically resets the display value of Counter A each time the Setpoint Value is reached. The automatic reset occurs at output start or end. The 0-End is only active when setpoint output action is selected for t-OUt. This parameter does not appear for Boundary Mode Setpoint Action

SETPOINT OUTPUT RESET WITH MANUAL RESET



YES nO

Select YES, so the Setpoint output will deactivate (reset) when a manual reset is applied to the meter. Manual reset can occur by the **RST▼** key or the User Input, if programmed for that function. When the Setpoint Assignment (SP-ASn) is set to Count A, this parameter only applies to Count A reset.



Module 5 is the programming module for the Serial Communications Parameters. These parameters are used to match the serial settings of the meter with those of the host computer or other serial device. The Serial Setup plug jumpers must be properly positioned for RS232 or RS485 serial communications prior to installing the meter.

ABBREVIATED PRINTING

NO YES

300 1200 4800 19200
600 2400 9600

PRINT OPTIONS

NO YES

DATA BIT

7-bit 8-bit

PARITY BIT

NO Odd EVEN

METER ADDRESS

Sending Serial Commands and Data

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

Command Chart

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

Command String Construction

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

1. The first 2 or 3 characters consist of the Node Address Specifier (N) followed by a 1 or 2 character node address number. The node address number of the meter is programmable. If the node address is 0, this command and the node address itself may be omitted. This is the only command that may be used in conjunction with other commands.
2. After the optional address specifier, the next character is the command character.
3. The next character is the register ID. This identifies the register that the command affects. The P command does not require a register ID character. It prints all the active selections chosen in the Print Options menu parameter.
4. If constructing a value change command (writing data), the numeric data is sent next.
5. All command strings must be terminated with the string termination characters * or $. The meter does not begin processing the command string until this character is received. See timing diagram figure for differences in meter response time when using the * and $ terminating characters.

Register Identification Chart

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

Command String Examples:

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

Transmitting Data to the Meter

Numeric data sent to the meter must be limited to transmit details listed in the Register Identification Chart. Leading zeros are ignored. Negative numbers must have a minus sign. The meter ignores any decimal point and conforms the number to the scaled resolution. (For example: The meter's scaled decimal point position is set for 0.0 and 25 is written to a register. The value of the register is now 2.5. In this case, write a value of 250 to equal 25.0).

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

Receiving Data From The Meter

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

Full Field Transmission

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

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

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

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

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

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

Abbreviated Transmission

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

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

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

Meter Response Examples:

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

Command Response Time

The meter can only receive data or transmit data at any one time (half-duplex operation). During RS232 transmissions, the meter ignores commands while transmitting data, but instead uses RXD as a busy signal. When sending commands and data to the meter, a delay must be imposed before sending another command. This allows enough time for the meter to process the command and prepare for the next command.

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

t_1 = (10 times the # of characters) / baud rate

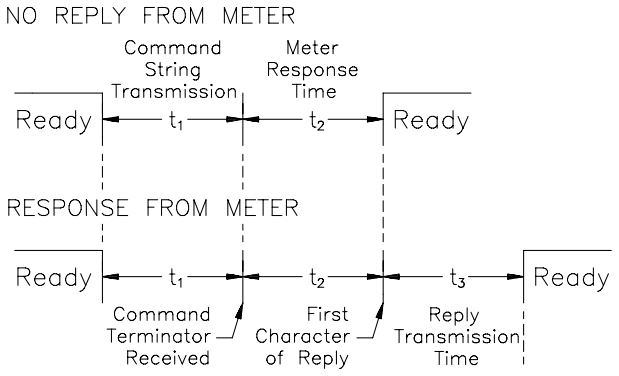
At the start of time interval t_2, the meter starts the interpretation of the command and when complete, performs the command function. This time interval t_2 varies. If no response from the meter is expected, the meter is ready to accept another command.

If the meter is to reply with data, the time interval t_2 is controlled by the use of the command terminating character. The '*' terminating character results in a response time of 50 msec. minimum. This allows sufficient time for the release of the sending driver on the RS485 bus. Terminating the command line with '$' results in a response time (t_2) of 2 msec. minimum. The faster response time of this terminating character requires that sending drivers release within 2 msec. after the terminating character is received.

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

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

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



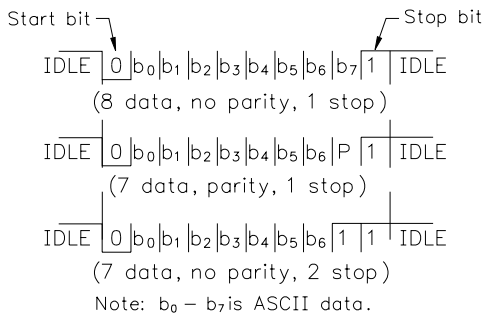
Timing Diagram Figure

Communication Format

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

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

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



Character Frame Figure

Start Bit and Data Bits

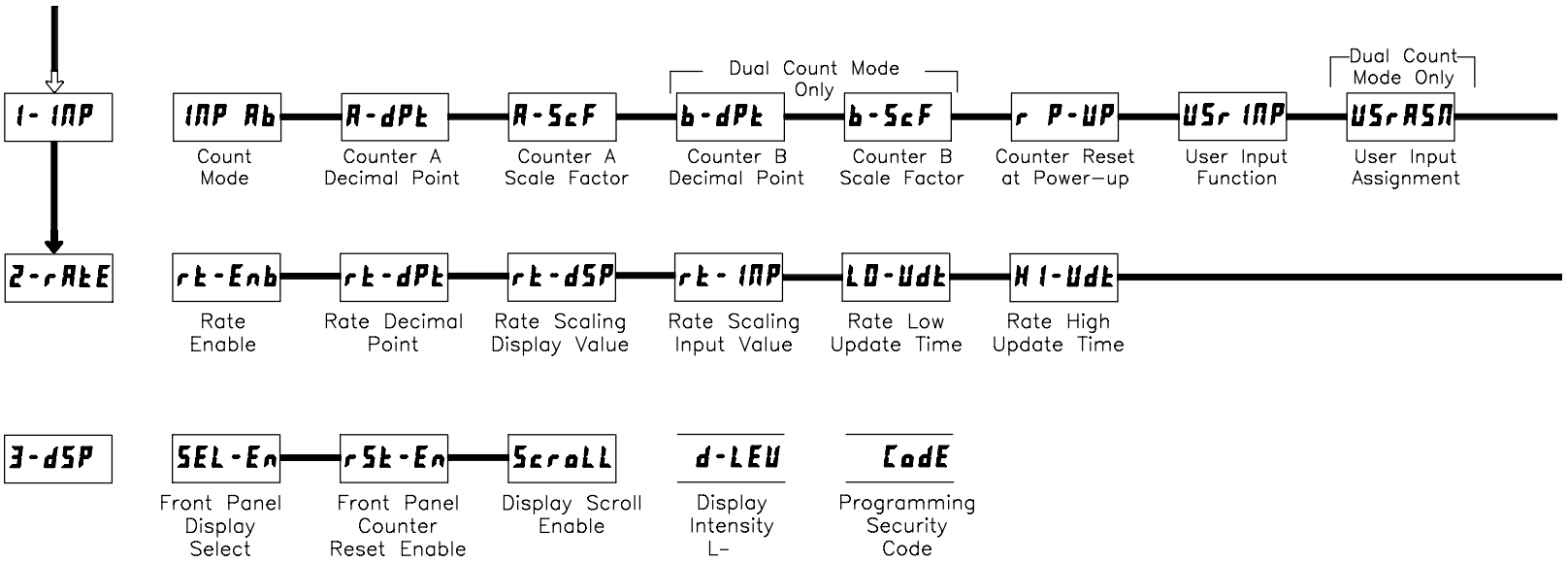
Data transmission always begins with the start bit. The start bit signals the receiving device to prepare for reception of data. One bit period later, the least significant bit of the ASCII encoded character is transmitted, followed by the remaining data bits. The receiving device then reads each bit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

Parity Bit

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

Stop Bit

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


1- InP
InP Ab
Count Mode
A-dPt
Counter A Decimal Point
A-ScF
Counter A Scale Factor
Dual Count Mode Only
b-dPt
Counter B Decimal Point
b-ScF
Counter B Scale Factor
r P-UP
Counter Reset at Power–up
USr InP
User Input Function
Dual Count Mode Only
USrASn
User Input Assignment
2-rAtE
rt-Enb
Rate Enable
rt-dPt
Rate Decimal Point
rt-dSP
Rate Scaling Display Value
rt- InP
Rate Scaling Input Value
LO-Udt
Rate Low Update Time
HI-Udt
Rate High Update Time
3-dSP
SEL-En
Front Panel Display Select
rSt-En
Front Panel Counter Reset Enable
ScroLL
Display Scroll Enable
d-LEU
Display Intensity L–
CodE
Programming Security Code

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Red Lion Controls
20 Willow Springs Circle
York PA 17406
Tel +1 (717) 767-6511
Fax +1 (717) 764-0839

Red Lion Controls BV
Basicweg 11b
NL - 3821 BR Amersfoort
Tel +31 (0) 334 723 225
Fax +31 (0) 334 893 793

Red Lion Controls AP
31, Kaki Bukit Road 3,
#06-04/05 TechLink
Singapore 417818
Tel +65 6744-6613
Fax +65 6743-3360