



MODEL LD - LARGE DISPLAY



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



* Programmable models only

GENERAL DESCRIPTION

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

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

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

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

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

SAFETY SUMMARY

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

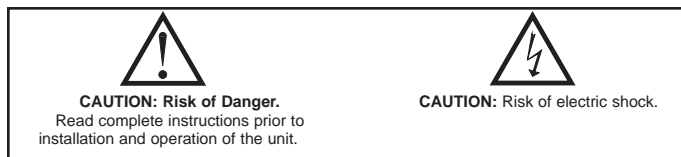
Do not use this unit to directly command motors, valves, or other actuators not equipped with safeguards. To do so can be potentially harmful to persons or equipment in the event of a fault to the unit.



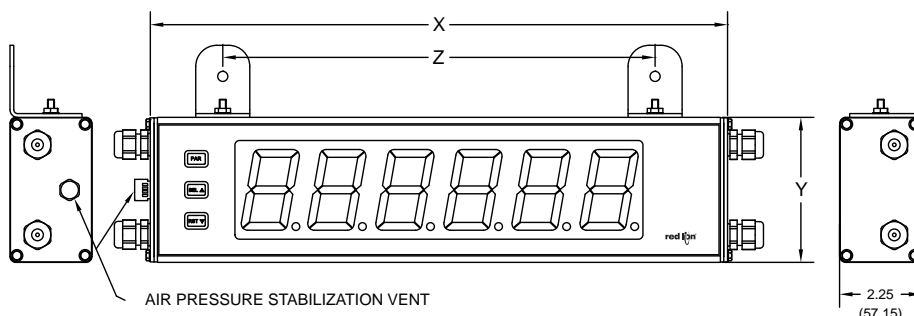
The protective conductor terminal is bonded to conductive parts of the equipment for safety purposes and must be connected to an external protective earthing system.

SPECIFICATIONS

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



DIMENSIONS In inches (mm)



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

5. **RESET/USER INPUT:** Function programmable for LD2006P0 & LD4006P0
Reset/User Input: DIP switch selectable pull-up (7.8 K Ω) or pull-down resistor (3.9 K Ω) that determines active high or active low input logic.
Trigger levels: $V_{IL} = 1.0$ V max; $V_{IH} = 2.4$ V min; $V_{MAX} = 28$ VDC
Response Time: 10 msec typ.; 50 msec debounce (activation and release)
6. **COMMUNICATIONS (LD2006P0 & LD4006P0 only):**
RS485 SERIAL COMMUNICATIONS
Type: RS485 multi-point balanced interface (isolated)
Baud Rate: 300 to 38.4 k
Data Format: 7/8 bits; odd, even, or no parity
Bus Address: 0 to 99; max 32 meters per line
RS232 SERIAL COMMUNICATIONS
Type: RS232 half duplex (isolated)
Baud Rate: 300 to 38.4 k
Data Format: 7/8 bits; odd, even, or no parity
7. **MEMORY:** Nonvolatile E²PROM retains all programming parameters and count values when power is removed.
8. **OUTPUT (LD2006P0 & LD4006P0 only):**
Type: Dual Form C contacts
Contact Rating: 5 amps @ 120/240 VAC or 28 VDC (resistive load), 1/8 H.P. @ 120 VAC (inductive load)
Life Expectancy: 100 K cycles min. at full load rating. External RC snubber extends relay life for operation with inductive loads.
Response Time: Turn On or Off: 5 msec max.
Isolation to Input & User/Exc Commons: 2000 Vrms for 1 min. Working Voltage: 240 Vrms
9. **ENVIRONMENTAL CONDITIONS:**
Operating temperature: 0 to 50 °C
Storage temperature: -40 to 70 °C
Operating and storage humidity: 0 to 85% max. RH (non-condensing)
Vibration According to IEC 68-2-6: Operational 5 to 150 Hz, in X, Y, Z direction for 1.5 hours, 2 g's (1g relay).
Shock According to IEC 68-2-27: Operational 30 g's (10g relay), 11 msec in 3 directions.
Altitude: Up to 2,000 meters
10. **CONNECTIONS:**
Internal removable terminal blocks are used for power and signal wiring. Remove end plates with 1/4" nut driver. For LD4 versions, all wiring is on right side of unit. For LD2 versions, power and signal wiring connections are on the right side and the relays and serial options are on the left side.
Wire Strip Length: 0.4" (10 mm)
Wire Gauge: 24-12 AWG copper wire
Torque: 5.3 inch-lbs (0.6 N-m) max.
Cable Diameter: Outside diameter must be 0.181" (4.6 mm) to 0.312" (7.9 mm) to maintain NEMA 4 rating of cord grips.

11. CERTIFICATIONS AND COMPLIANCES:

SAFETY

UL Listed, File # E137808, UL508, CSA C22.2 No. 14-M95

LISTED by Und. Lab. Inc. to U.S. and Canadian safety standards

Type 4X Enclosure rating, UL50

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

IP65 Enclosure rating, IEC 529

ELECTROMAGNETIC COMPATIBILITY

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

Immunity to Industrial Locations:

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

Emissions:

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

Notes:

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

2. *Criterion B: Temporary loss of performance from which the unit self-recovery.*

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

13. WEIGHT:

LD2004XX: 3.5 lbs (1.59 kg)
LD2006XX: 4.5 lbs (2.04 kg)
LD4004XX: 8 lbs (3.63 kg)
LD4006XX: 10.5 lbs (4.76 kg)

ORDERING INFORMATION

TYPE	MODEL NO.	DESCRIPTION	PART NUMBER
Basic (No front panel keys)	LD	2.25" High 4-Digit Red LED Counter	LD200400
		2.25" High 6-Digit Red LED Counter	LD200600
		4" High 4-Digit Red LED Counter	LD400400
		4" High 6-Digit Red LED Counter	LD400600
Programmable (With front panel keys)	LD	2.25" High 6-Digit Red LED Count/Rate Indicator w/ dual Relay Output & RS232/RS485 Serial Communications	LD2006P0
		4" High 6-Digit Red LED Count/Rate Indicator w/ dual Relay Output & RS232/RS485 Serial Communications	LD4006P0
	LD Plug	Panel Meter Plug for LD models (NOT included in LD Product UL File)	LDPLUG00

1.0 INSTALLING THE METER

INSTALLATION

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

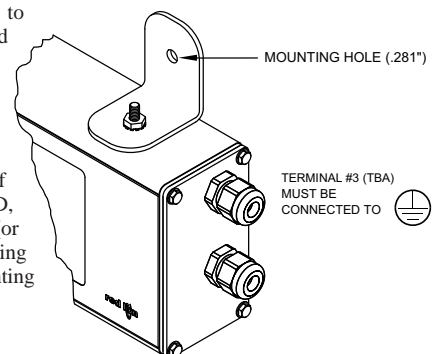
INSTALLATION ENVIRONMENT

The unit should be installed in a location that does not exceed the operating temperature. Placing the unit near devices that generate excessive heat should be avoided. The unit should only be cleaned with a soft cloth and neutral soap product. Do NOT use solvents.

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

MOUNTING INSTRUCTIONS

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



2.0 SETTING THE DIP SWITCHES

SETTING THE 8 DIP SWITCHES

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



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

SWITCH 1 (Input A)

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

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 K Ω pull-up resistor to +12 VDC, $I_{MAX} = 2.1 \text{ mA}$.

SRC.: Adds internal 3.9 K Ω 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 K Ω pull-up resistor to +12 VDC, $I_{MAX} = 2.1 \text{ mA}$.

SRC.: Adds internal 3.9 K Ω 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 K Ω pull-up resistor to +12VDC, $I_{MAX} = 2.1 \text{ mA}$.

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

SWITCH 7 (POWER UP RESET)

ENABLE: In this position, the counter resets to zero at power up.

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

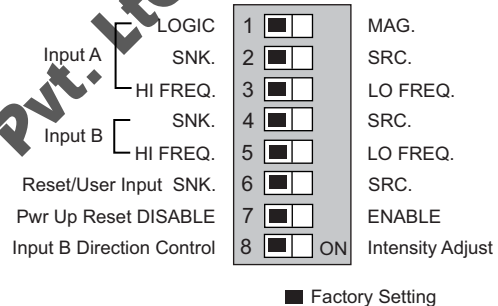
Note: This switch has no function for programmable models. Power-up reset is selected through a programming parameter.

SWITCH 8 (Input B)

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

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

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



3.0 WIRING THE METER

EMC INSTALLATION GUIDELINES

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

- The meter should be properly connected to protective earth.
- 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.
 - Connect the shield only at the panel where the unit is mounted to earth ground (protective earth).
 - Connect the shield to earth ground at both ends of the cable, usually when the noise source frequency is above 1 MHz.
 - Connect the shield to common of the meter and leave the other end of the shield unconnected and insulated from earth ground.
- 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.

- Signal or Control cables within an enclosure should be routed as far as possible from contactors, control relays, transformers, and other noisy components.
- 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.
- Long cable runs are more susceptible to EMI pickup than short cable runs. Therefore, keep cable runs as short as possible.
- Switching of inductive loads produces high EMI. Use of snubbers across inductive loads suppresses EMI.
 - Snubber: RLC# SNUB0000.

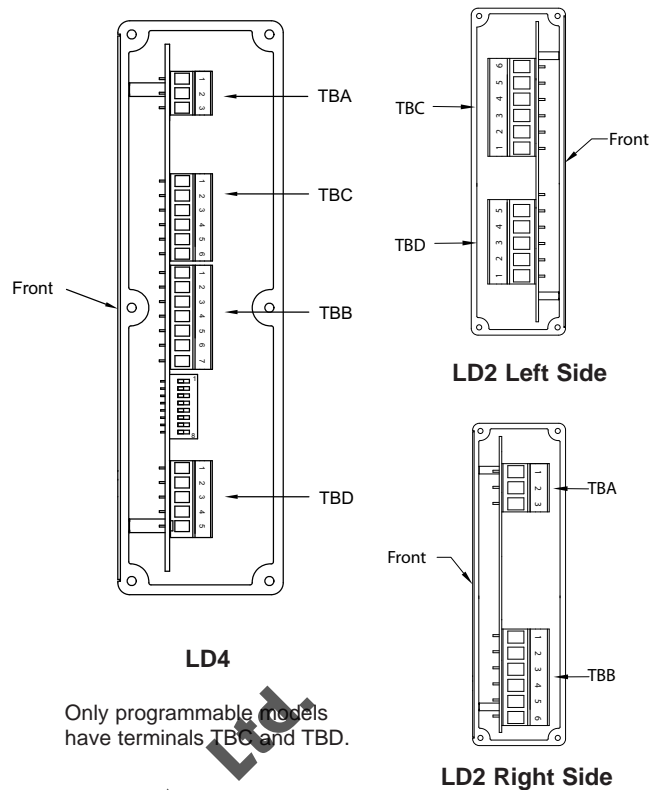
WIRING OVERVIEW

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).

WIRING CONNECTIONS

Internal removable terminal blocks are used for power and signal wiring. Access to terminal blocks is through conduit fittings. Remove end plates with 1/4" nut driver. For LD4 versions, all wiring is on right side of unit. For LD2 versions, power and input wiring connections are on the right side and the relay and serial options are on the left side.

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

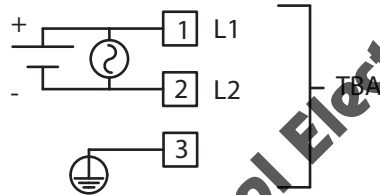


3.1 POWER WIRING

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

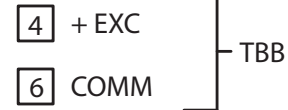
Power

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



DC Out Power

Terminal 4: + 24 VDC OUT
Terminal 6: User Common



3.2 RESET/USER INPUT WIRING

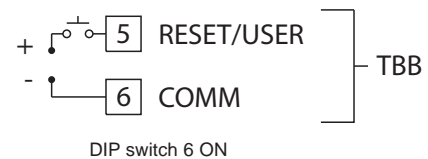
The Reset/User Input is located on the right side.

Terminal 5: Reset/User
Terminal 6: Comm

Sinking Logic



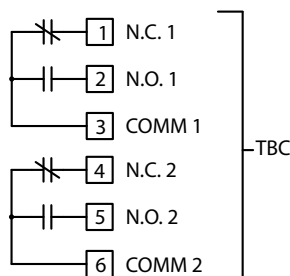
Sourcing Logic



3.3 SETPOINT (OUTPUT) WIRING

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

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



3.4 INPUT WIRING

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

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

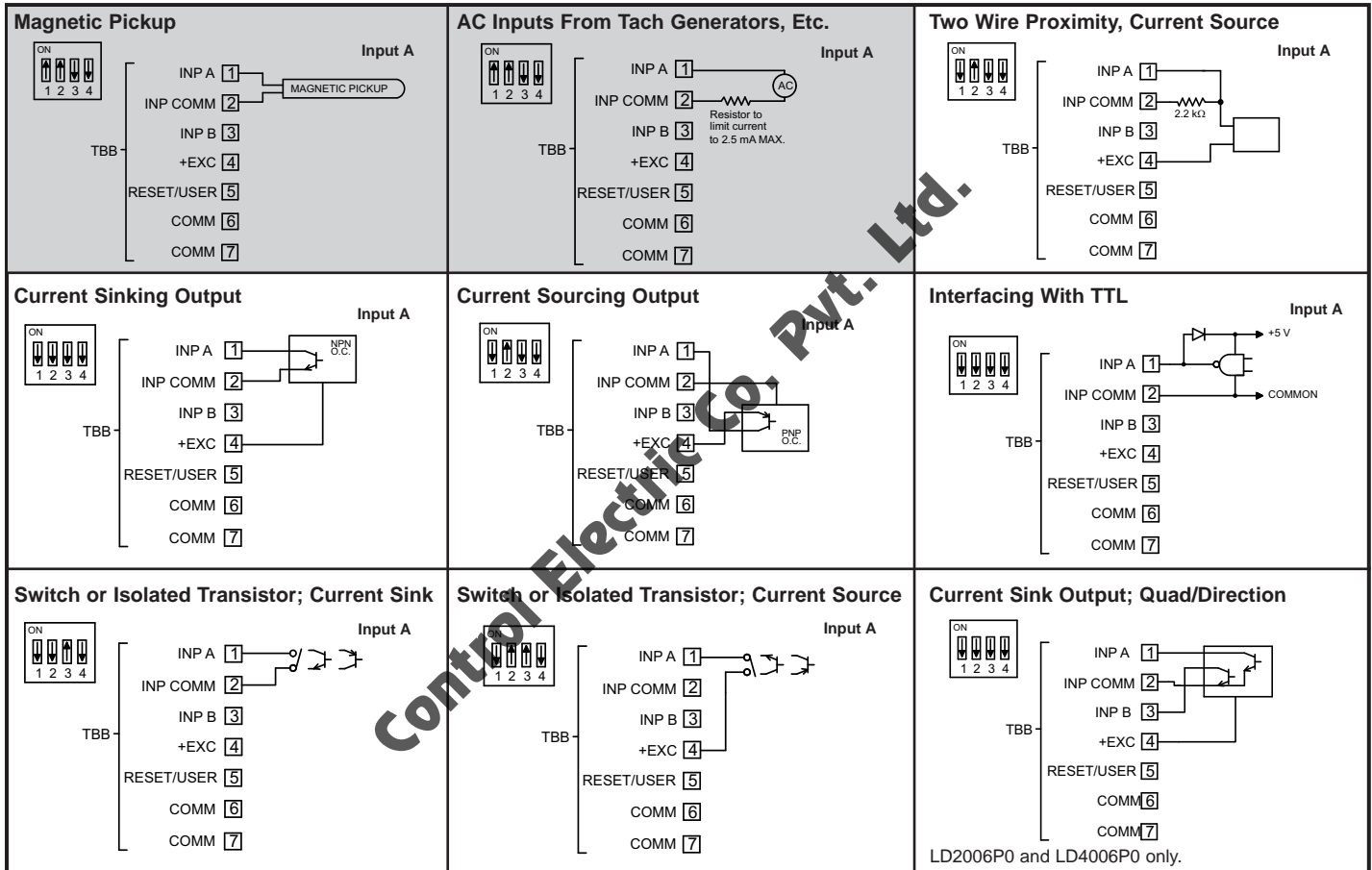
Programmable models LD2006P0 and LD4006P0 provide a choice of eight different Count Modes. The Count Mode selected determines the action of Inputs A and B. Section 5.1, Input Setup Parameters, provides details on count mode selection and input action.

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

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



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

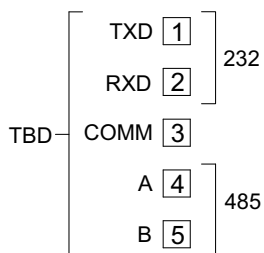


* Switch position is application dependent.

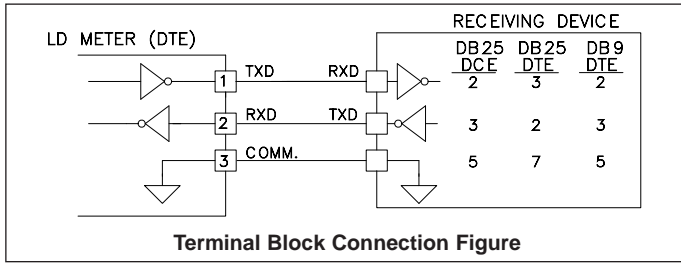
Shaded areas not recommended for counting applications.

3.5 SERIAL WIRING

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



RS232 Communications



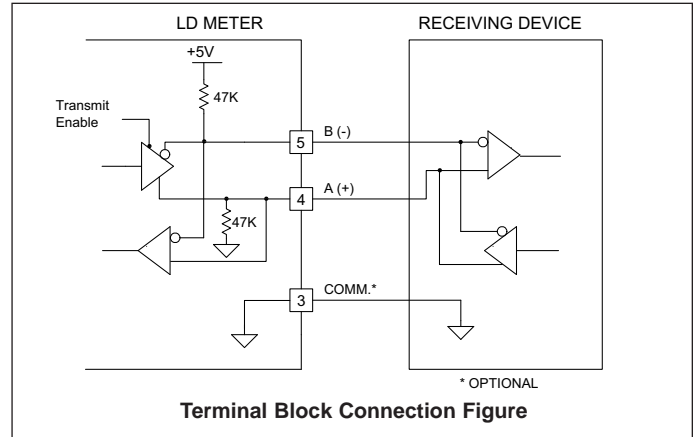
RS232 is intended to allow two devices to communicate over distances up to 50 feet. Data Terminal Equipment (DTE) transmits data on the Transmitted Data (TXD) line and receives data on the Received Data (RXD) line. Data Computer Equipment (DCE) receives data on the TXD line and transmits data on the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

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

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

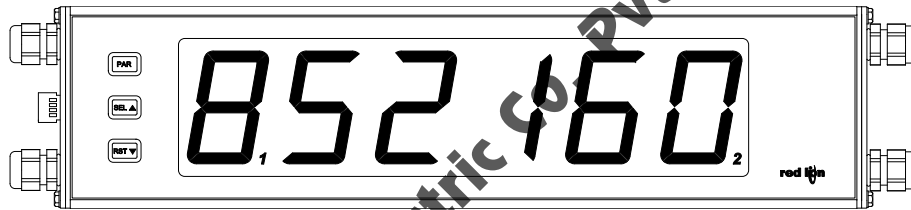
RS485 Communications

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



Sections 4 and 5 apply to Programmable Models Only

4.0 REVIEWING THE FRONT PANEL KEYS AND DISPLAY



KEY	DISPLAY MODE OPERATION
PAR	Access Programming Mode
SEL▲	Index display through selected displays
RST▼	Resets count display(s) and/or outputs

PROGRAMMING MODE OPERATION
Store selected parameter and index to next parameter
Advance through selection list/select digit position in parameter value
Increment selected digit position of parameter value

OPERATING MODE DISPLAY DESIGNATORS

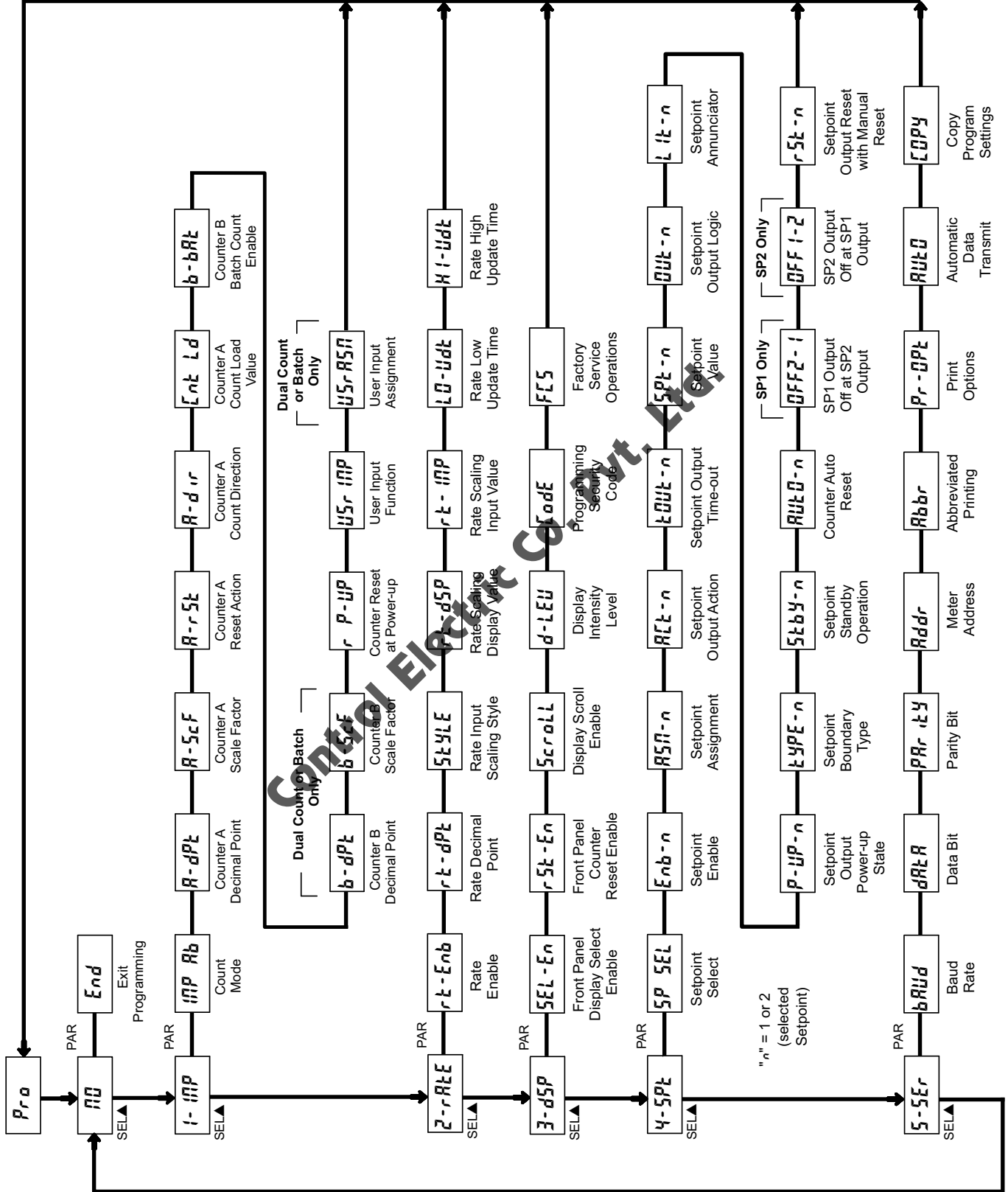
- "r" - To the left of the display is the rate value.
- Counter A has no designator.
- "b" - To the left of the display is the Counter B value (dual count or batch).

- "1" - To the right of digit 6 indicates setpoint 1 output status.
- "2" - To the right of digit 1 indicates setpoint 2 output status.

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

PROGRAMMING QUICK OVERVIEW

Press **PAR** key to enter Programming Mode.



"n" = 1 or 2
(selected Setpoint)