

MODEL LD - LARGE DISPLAY TIMER AND CYCLE COUNTER



- 2.25" or 4" HIGH RED LED DIGITS
- 6-DIGIT BI-DIRECTIONAL TIMING CAPABILITY
- 5-DIGIT CYCLE COUNTING CAPABILITY
- SELECTABLE TIMER RANGES AND OPERATING MODES
- ELAPSED TIMER AND PRESET TIMER FUNCTIONALITY
- SERIAL COMMUNICATIONS (RS232 or RS485)
- PROGRAMMABLE USER INPUT
- UNIVERSALLY POWERED
- 5 AMP FORM C RELAY OUTPUT
- ALUMINUM NEMA 4X CASE CONSTRUCTION



GENERAL DESCRIPTION

The Large Display Timer and Cycle Counter is a versatile display that functions as an Elapsed Timer or Preset Timer, with full-featured user programmability. The meter includes a built-in Cycle Counter, relay output and serial communications capability. The 6 digit displays are available in either 2.25" or 4" high red LED digits with adjustable display intensity. The 2.25" high models are readable up to 130 feet. The 4" high models are readable up to 180 feet. Both versions are constructed of a NEMA 4X/IP65 enclosure in light weight aluminum.

The Timer has two signal inputs and eight input operating modes. These modes provide level active or edge triggered start/stop operation. The Timer features 18 selectable timer ranges to cover a wide variety of timing applications. The built-in Cycle Counter can be linked to timer operation to count timing cycles, or function as a totally independent counter, accepting count speeds up to 500 Hz. The display can be toggled either manually or automatically between the Timer and Counter values.

In addition to the Timer/Counter inputs, a programmable User Input is provided to perform a variety of meter functions. DIP switches are used to configure the inputs for current sinking (active low) or current sourcing (active high) operation.

The Setpoint Output can be assigned to the Timer or Counter value, and configured to suit a variety of control and alarm requirements. The meter also includes RS232 or RS485 serial communications.

SAFETY SUMMARY

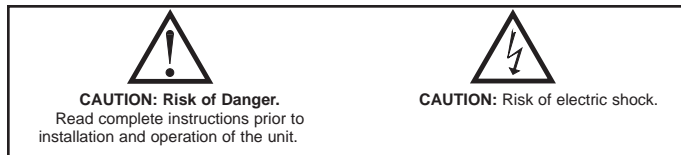
All safety regulations, local codes and instructions that appear in this and corresponding literature or on equipment, must be observed to ensure personal safety and to prevent damage to either the instrument or equipment connected to it. If equipment is used in a manner not specified by the manufacturer,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

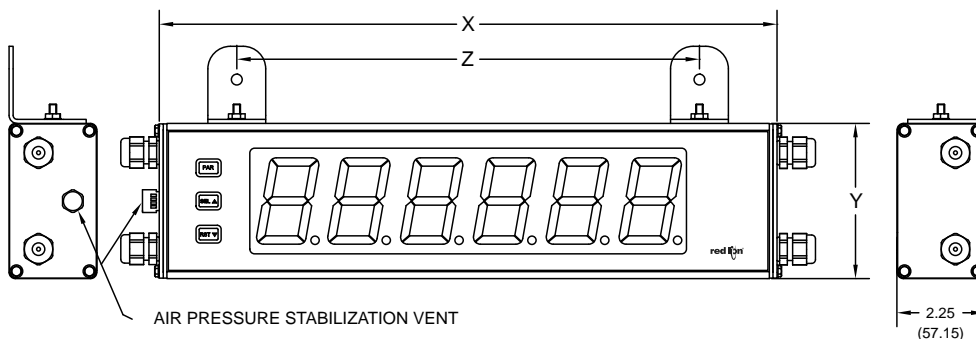
The protective conductor terminal is bonded to conductive parts of the equipment for safety purposes and must be connected to an external protective earthing system.

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
- TIMER DISPLAY:** 6-digits
Display Range: 0 to 999999
Overflow/Underflow Indication: Display flashes "E OUEr"
Minimum Digit Resolution: 0.001 Sec.
Maximum Single Digit Resolution: 1 Hr.
Timing Accuracy: ±0.01%
- CYCLE COUNTER DISPLAY:** 5-digits, may be disabled if not used
Display Designator: "E" to the left side of the display
Display Range: 0 to 99999
Overflow/Underflow Indication: Display flashes "E OUEr"



DIMENSIONS In inches (mm)



PART NUMBER	X (Length)	Y (Height)	Z (Center)
LD2T06P0	16 (406.4)	4 (101.6)	12 (304.8)
LD4T06P0	26 (660.4)	7.875 (200)	22 (558.8)

Maximum Count Rate:

All Count Sources except Input B: 10 Hz

Input B Count Source:

With Timer Input Filter ON: 10 Hz

With Timer Input Filter OFF: 500 Hz

5. TIMER SIGNAL INPUTS (INP A and INP B)

DIP switch selectable pull-up (7.8 KΩ) or pull-down (3.9 KΩ) resistors determine active high or active low input logic.

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

Input B: Trigger levels: $V_{IL} = 1.0 \text{ V max}$; $V_{IH} = 2.4 \text{ V min}$; $V_{MAX} = 28 \text{ VDC}$

Inputs A and B:

Timer Input Pulse Width: 1 msec min.

Timer Start/Stop Response Time: 1 msec max.

Filter: Software filtering provided for relay or switch contact debounce.

Filter enabled or disabled through programming. If enabled, results in

50 msec start/stop response time for successive pulses applied to the same input terminal.

6. RESET/USER INPUT Programmable Function Input:

DIP switch selectable pull-up (7.8 KΩ) or pull-down (3.9 KΩ) resistor that determines active high or active low input logic.

Trigger levels: $V_{IL} = 1.0 \text{ V max}$; $V_{IH} = 2.4 \text{ V min}$; $V_{MAX} = 28 \text{ VDC}$

Response Time: 10 msec typ.; 50 msec debounce (activation and release)

7. COMMUNICATIONS:

RS485 SERIAL COMMUNICATIONS

Type: RS485 multi-point balanced interface (isolated)

Baud Rate: 300 to 38400

Data Format: 7/8 bits; odd, even, or no parity

Bus Address: 0 to 99; max 32 meters per line

RS232 SERIAL COMMUNICATIONS

Type: RS232 half duplex (isolated)

Baud Rate: 300 to 38400

Data Format: 7/8 bits; odd, even, or no parity

8. MEMORY: Nonvolatile E²PROM retains all programming parameters and timer/count values when power is removed.

9. OUTPUT:

Relay: Form C contacts rated at 5 amps @ 120/240 VAC or 28 VDC (resistive load), 1/8 H.P. @ 120 VAC (inductive load)

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 relay and serial output options are on 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. 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

12. 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 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	EN61000-4-11	Criterion A 0.5 cycle
Emissions: Emissions	EN 55011	Class B

Notes:

1. Criterion A: Normal operation within specified limits.

13. 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.

14. WEIGHT:

LD2T06P0 - 4.5 lbs (2.04 kg)

LD4T06P0 - 10.5 lbs (4.76 kg)

ORDERING INFORMATION

MODEL NO.	DESCRIPTION	PART NUMBER
LD	2.25" High 6-Digit Red LED Timer/Cycle Counter w/ Relay Output & RS232/RS485 Serial Communications	LD2T06P0
	4" High 6-Digit Red LED Timer/Cycle Counter w/ Relay Output & RS232/RS485 Serial Communications	LD4T06P0
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.

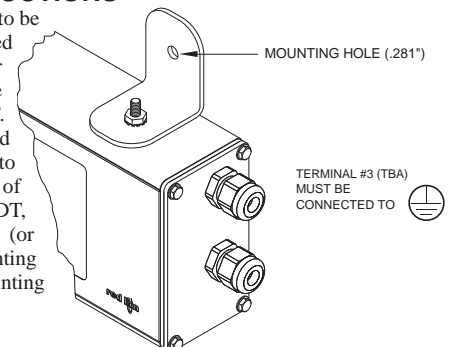
INSTALLATION ENVIRONMENT

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 LDT. Caution should be exercised when hanging the display to provide for the safety of personnel. If hanging the LDT, 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

To access the switches, remove the right side plate of the meter. A bank of eight switches is located inside the unit. *Note: Some switches are not used and should remain in the factory set position.*



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 (Unused)

This switch is not used and should remain in the factory set position.

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)

FILTER ON: Provides hardware debounce for Input A to allow relay or switch contacts to be used as a signal source. Software debounce for Inputs A and B is provided in the programming menu (Module 1).

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)

FILTER ON: Provides hardware debounce for Input B to allow relay or switch contacts to be used as a signal source. Software debounce for Inputs A and B is provided in the programming menu (Module 1).

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 (Unused)

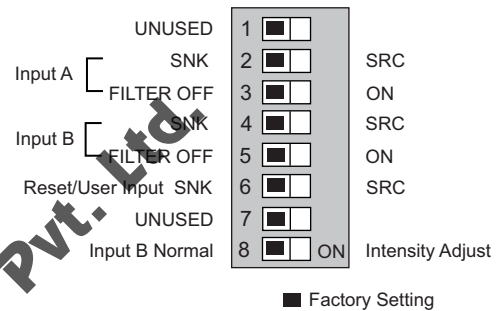
This switch is not used and should remain in the factory set position.

SWITCH 8 (Input B)

NORMAL: Input B performs the normal functions described in the Timer Input Operation parameter of the programming menu (Module 1).

INTENSITY ADJUST: In this position, Input B is used to adjust the LED display intensity. Five distinct LED levels can be set by pulsing Input B. The display intensity level can also be set in the programming menu (Module 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.

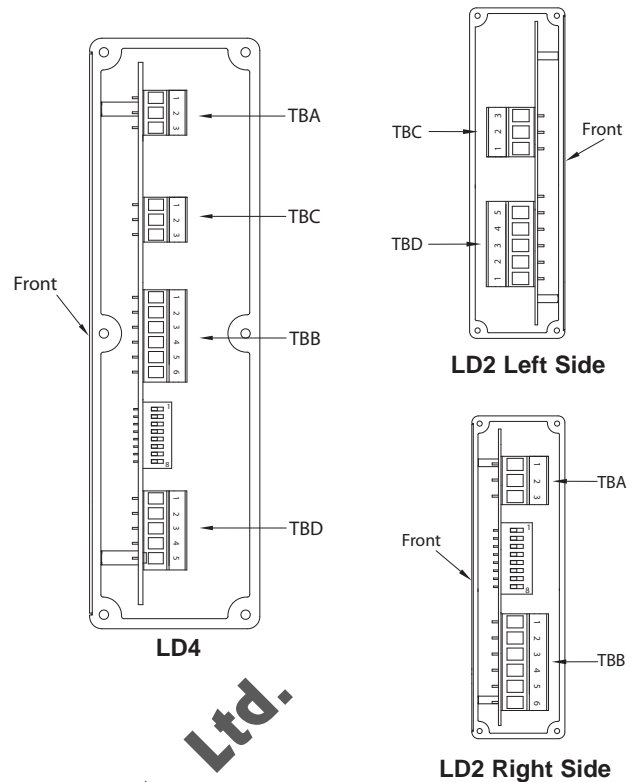
- Long cable runs are more susceptible to EMI pickup than short cable runs. Therefore, keep cable runs as short as possible.
- Switching of inductive loads produces high EMI. Use of snubbers across inductive loads suppresses EMI.
 Snubber: RLC# SNUB0000.

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 connections are on the left side.

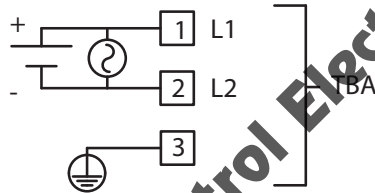


3.1 POWER WIRING

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

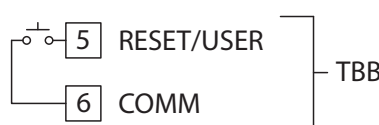


3.2 RESET/USER INPUT WIRING

The Reset/User Input is located on the right side

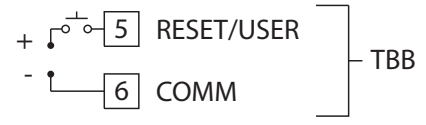
Terminal 5: Reset/User Input
Terminal 6: User Common

Sinking Logic



DIP switch 6 OFF

Sourcing Logic

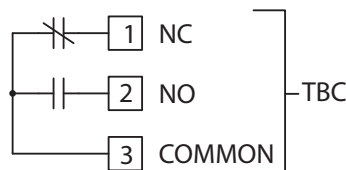


DIP switch 6 ON

3.3 SETPOINT (OUTPUT) WIRING

The setpoint relay uses a three position terminal block (TBC) located on the left side of the LD2 model, and on the right side for the LD4 model.

Terminal 1: Normally Closed
Terminal 2: Normally Open
Terminal 3: Relay Common



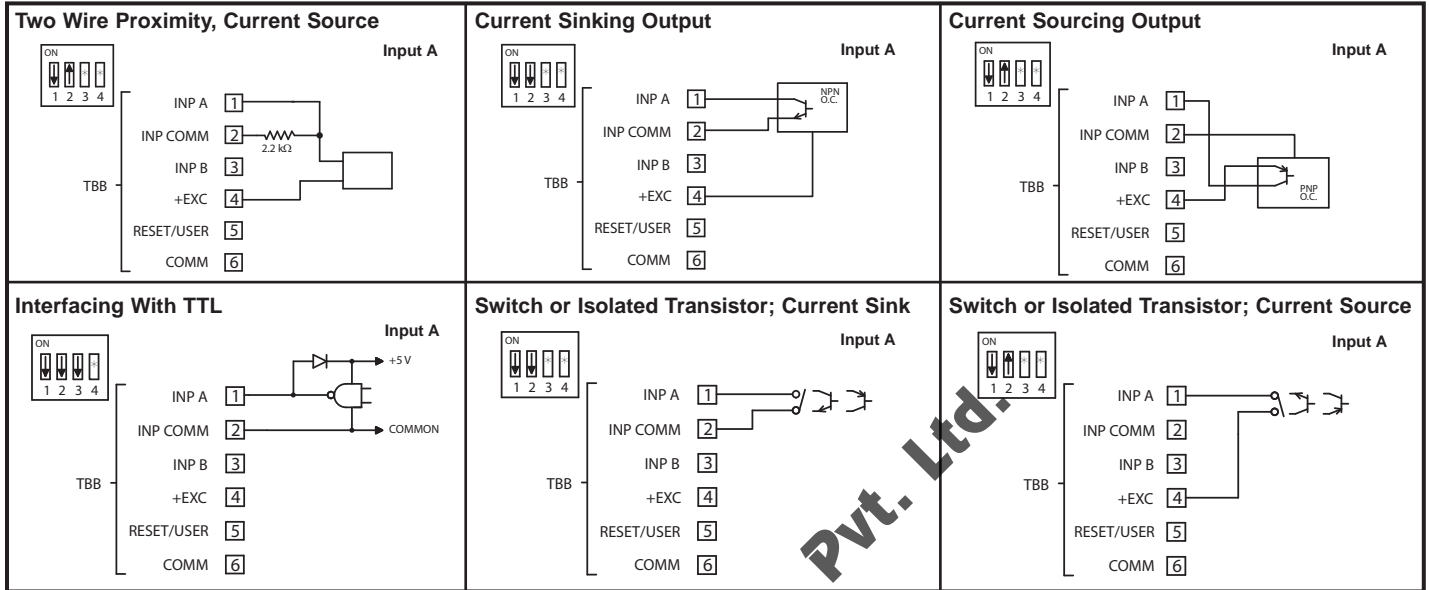
3.4 INPUT WIRING

The Large Display Timer is equipped with two signal inputs, A and B. These inputs are wired using the six position terminal block (TBB) located inside the unit on the right side.

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



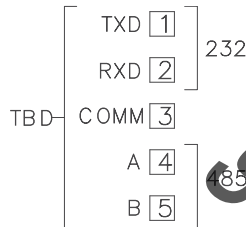
CAUTION: DC common is NOT isolated from input common. In order to preserve the safety of the meter application, the DC common must be suitably isolated from hazardous live earth referenced voltage; or input common must be at protective earth ground potential. If not, hazardous voltage may be present 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.



* Switch position is application dependent.

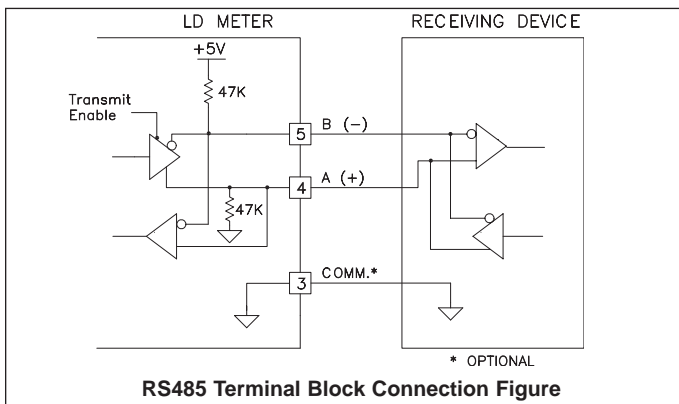
3.5 SERIAL WIRING

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.



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.

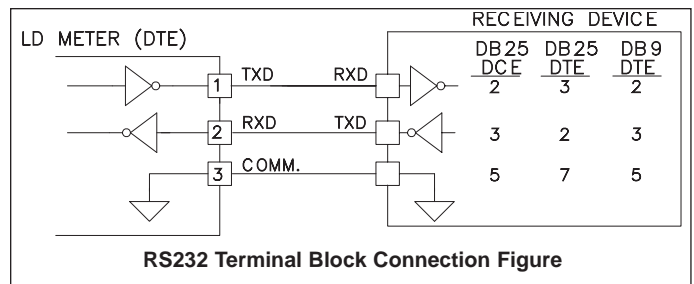


RS232 Communications

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.



4.0 REVIEWING THE FRONT PANEL KEYS AND DISPLAY



KEY	DISPLAY MODE OPERATION
PAR	Access Programming Mode
SEL ▲	Select display (Timer or Cycle Counter)
RST ▼	Reset value(s) per front panel reset setting

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

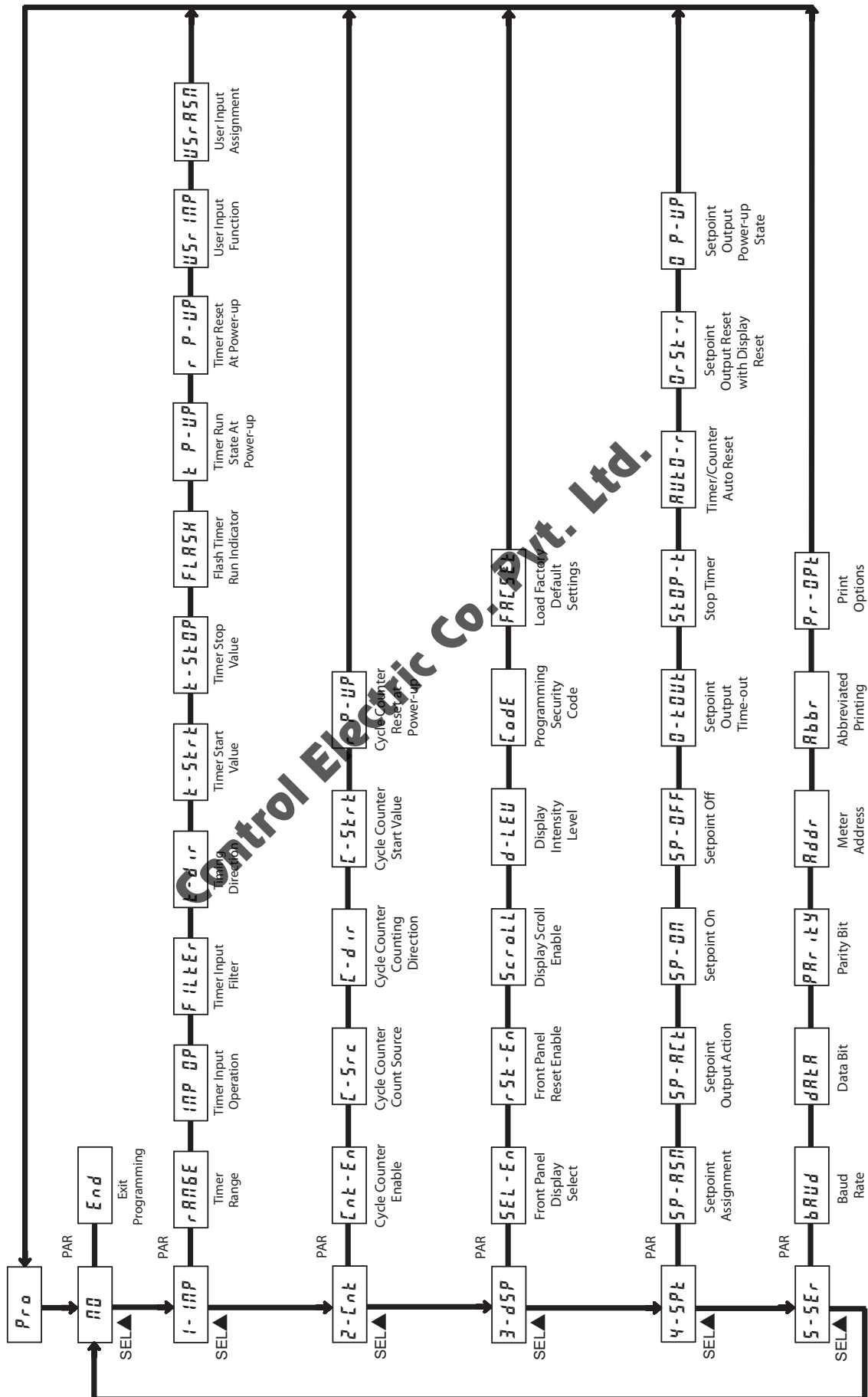
- “**L**” - To the left of the display is the Cycle Counter value.
- “ **f** ” - Between digits 5 and 6 indicates the setpoint status.

- “ . ” - Decimal point to the far right of the display can be programmed to flash when the timer is running, to provide a “Timer Run” indicator.

If display scroll is enabled, the display will toggle automatically every four seconds between the Timer and Cycle Counter values.

LD TIMER PROGRAMMING QUICK OVERVIEW

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



LIMITED WARRANTY

The Company warrants the products it manufactures against defects in materials and workmanship for a period limited to two years from the date of shipment, provided the products have been stored, handled, installed, and used under proper conditions. The Company's liability under this limited warranty shall extend only to the repair or replacement of a defective product, at The Company's option. The Company disclaims all liability for any affirmation, promise or representation with respect to the products.

The customer agrees to hold Red Lion Controls harmless from, defend, and indemnify RLC against damages, claims, and expenses arising out of subsequent sales of RLC products or products containing components manufactured by RLC and based upon personal injuries, deaths, property damage, lost profits, and other matters which Buyer, its employees, or sub-contractors are or may be to any extent liable, including without limitation penalties imposed by the Consumer Product Safety Act (P.L. 92-573) and liability imposed upon any person pursuant to the Magnuson-Moss Warranty Act (P.L. 93-637), as now in effect or as amended hereafter.

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