Bulletin No. CUB7N-E
Drawing No. LP0825
Released 07/2024

MODEL CUB7 – MINIATURE ELECTRONIC 8 DIGIT COUNTER OR TIMER

- 0.35" (8.9 mm) *HIGH LCD DIGITS, REFLECTIVE OR TRANSMISSIVE WITH RED BACKLIGHTING (6-26 VDC power supply required for version with LED backlighting)*
- *INTERNAL LITHIUM BATTERY PROVIDES UP TO 7 YEARS OF TYPICAL UNINTERRUPTED OPERATION*
- *COUNT SPEEDS UP TO 10KHZ*
- *9 PROGRAMMABLE TIME RANGES*
- *CONTACT, LOGIC, OPEN COLLECTOR, OR HIGH VOLTAGE INPUTS*
- *STANDARD WIRE CONNECTIONS OR OPTIONAL PLUG-IN TERMINAL BLOCK*
- *NEMA 4X/IP65 SEALED FRONT BEZEL THAT FITS 1/32 DIN CUT-OUT*

c UL US LISTED
3RSD
PROCESS CONTROL EQUIPMENT

UK CA CE

DESCRIPTION

The CUB7 series is an 8-digit lithium battery powered miniature counter or timer with large 0.35" (8.9 mm) high digits. It has an LCD read-out available in Positive Imagine Reflective or red backlighting. The backlight version requires an external 6-26 VDC power supply. The CUB7 series is housed in a lightweight, high impact plastic case with a clear viewing window. The sealed front panel with silicon rubber keypad meets NEMA 4X/IP65 specification for wash-down and/or dusty environments, when properly installed with supplied panel gasket and mounting clip.

Both counter and timer CUB7 models are available with a low voltage input (28 VDC max) or an isolated high voltage input (50-250 VDC/VAC). The low voltage input has DIP switch selections for SINKING or SOURCING along with a HIGH/LOW FREQUENCY selection (low frequency for contact inputs). Both units have front panel keypads that can be used to reset the display. The keypad can be enabled/disabled via a single DIP switch. The standard unit uses 22 gauge wires for external connections, an optional plug-in terminal block is available.

SAFETY SUMMARY

All safety related regulations, local codes as well as instructions that appear in this document or on equipment must be observed to ensure personal safety and to prevent damage to either the device or equipment connected to it.

Do not use these products to replace proper safety interlocking. No software-based device (or any other solid-state device) should ever be designed to be responsible for the maintenance of personnel safety or consequential equipment not equipped with safeguards. Red Lion disclaims any responsibility for damages, either direct or consequential, that result from the use of this equipment in a manner not consistent with these specifications.

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

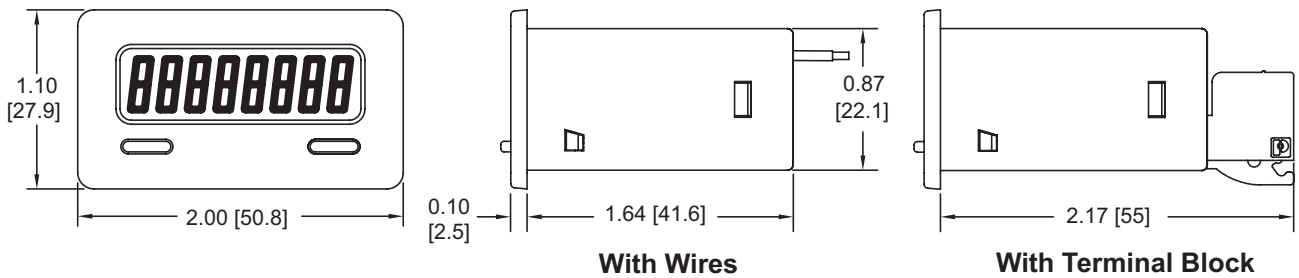
CAUTION: Risk of electric shock.

SPECIFICATIONS

1. **DISPLAY**: 8-digit LCD, 0.35" (8.90 mm) high digits
2. **POWER**: Non-replaceable internal 3.6 VDC lithium battery provides 7 years of typical continuous operation (high count speeds in SNK mode & extreme ambient temperatures will decrease battery life, use of SRC mode can extend battery life)
   OPTIONAL LED BACKLIGHT POWER: 6-26 VDC @ 25 mA max.
   Must use an NEC Class 2 or Limited Power Source (LPS) rated power supply.
   Note: External power shall incorporate disconnecting device (switch or circuit breaker) and provide Double/Reinforced isolation from MAINS supply.
3. **LOW VOLTAGE INPUT**:
   COUNTERS: CUB7CCS0, CUB7CCR0, CUB7CCG0
   SNK mode (DIP switch 1 off, internal pull-up to battery)
   V_{IN} High Min = 1.25 VDC; V_{IN} Low Max = 0.45 VDC
   I_{IN} Max = 8 µA; V_{IN} Max = 3.6 VDC
   Count Speed: (count on negative edge)
   High freq mode (DIP switch 2 off): max 5 kHz @ 50% duty cycle
   Low freq mode (DIP switch 2 on): max 30 Hz @ 50% duty cycle
   Note: The three models listed above may be used for count inputs with 10-50 VAC signals when using a VCM10000 converter module. DIP switches must be set for SNK and Low frequency.

DIMENSIONS In inches [mm]

Note: Recommended minimum clearance (behind the panel) for mounting clip installation is 2.1" [53.4] H x 5.5" [140] W.



SRC mode (DIP switch 1 on, internal 20 kΩ pull-down to common)
V_{IN} High Min = 1.25 VDC; V_{IN} Low Max = 0.45 VDC
I_{IN} Max = 5 mA; V_{IN} Max = 28 VDC
Count Speed: (count on negative edge)
High freq mode (DIP switch 2 off): max 10 kHz @ 50% duty cycle
Low freq mode (DIP switch 2 on): max 50 Hz @ 50% duty cycle

TIMERS:
Models: CUB7TCS0, CUB7TCR0, CUB7TCG0 **For these models, the unit will time when the CUB7 input is low.**
SNK mode (DIP switch 1 off, internal pull-up to battery)
V_{IN} High Min = 1.25 VDC; V_{IN} Low Max = 0.45 VDC
I_{IN} Max = 8 µA; V_{IN} Max = 3.6 VDC
Note: The three models listed above may be used with 10-50 VAC signals when using a VCM10000 converter module.
SRC mode (DIP switch 1 on, internal 20 kΩ pull-down to common)
V_{IN} High Min = 1.25 VDC; V_{IN} Low Max = 0.45 VDC
I_{IN} Max = 5 mA; V_{IN} Max = 28 VDC
Models: CUB7TCS1, CUB7TCR1, CUB7TCG1 **For these models, the unit will time when the CUB7 input is high.**
SNK mode (DIP switch 1 off - **DO NOT USE**)
SRC mode (DIP switch 1 on, internal 20 kΩ pull-down to common)
V_{IN} High Min = 1.25 VDC; V_{IN} Low Max = 0.45 VDC
I_{IN} Max = 5 mA; V_{IN} Max = 28 VDC

4. **HIGH VOLTAGE INPUT**:
COUNTERS: CUB7CVS0, CUB7CVR0, and CUB7CVG0
The unit adds one count with voltage present
V_{IN} Range = 50-250 VDC/VAC 50/60 Hz, 5 mA max
Isolation: 2500 VAC 1 min
TIMERS: CUB7TVS0, CUB7TVR0, and CUB7TVG0
Unit will time with voltage present
V_{IN} Range = 50-250 VDC/VAC 50/60 Hz, 5 mA max
Isolation: 2500 VAC 1 min
5. **RESET INPUT**:
V_{IN} Low Max = 1.5 VDC (internal pull-up to battery)
I_{IN} Max = 20 µA
5 msec min (active low)
Note: Reset input is active low to clear display to zero
6. **TIMER ACCURACY**:
CUB7TV: 0.03% +100 msec per RUN terminal activation
CUB7TC low freq/snk setup: 0.03% +1 msec per RUN terminal activation
CUB7TC high freq/snk setup: 0.03% -1 msec per RUN terminal activation
7. **ENVIRONMENTAL CONDITIONS**:
Operating Temperature: 0 to 50 °C
Storage Temperature: -30 to 80 °C
Vibration according to IEC 68-2-6: Operational 5 to 500 Hz, in X, Y, Z direction for 1.5 hours, 5 g.
Shock according to IEC 68-2-27: Operational 30 g, 11 msec in 3 directions.
Operating and Storage Humidity: 85% max. (non-condensing)
8. **CONNECTIONS**: 22 gauge wire; wire length minimum 10"
OPTIONAL TERMINAL BLOCKS: Wire clamping terminals
Wire Strip Length: 0.275" (7 mm)
Wire Gage: 24-16 AWG copper wire
9. **CONSTRUCTION**: High impact plastic case with clear viewing window. The front panel meets NEMA 4X/IP65 requirements for outdoor use when properly installed. Installation Category II, Pollution Degree 2. Panel gasket and mounting clip are included.
10. **CERTIFICATIONS AND COMPLIANCES**:
SAFETY
UL Listed, File # E179259, UL508
Type 4X Outdoor 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 61326:2006: 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 (80 MHz to 1 GHz) 3 V/m (1.4 GHz to 2 GHz) 1 V/m (2 GHz to 2.7 GHz)
Fast transients (burst)	EN 61000-4-4	Criterion A 2 kV power 1 kV I/O signal
Surge	EN 61000-4-5	Criterion A power 1 kV L to L, 2 kV L to G
RF conducted interference	EN 61000-4-6	Criterion A 3 Vrms
Power freq magnetic fields	EN 61000-4-8	Criterion A 30 A/m
AC power	EN 61000-4-11	
Voltage dip		Criterion A 0% during 1 cycle 40% during 10/12 cycle 70% during 25/30 cycle
Short interruptions		Criterion B 0% during 250/300 cycles

Emissions:

Emissions	EN 55011	Class B

Notes:
1. Criterion A: Normal operation within specified limits.
2. Criterion B: Temporary loss of performance from which the unit self-recovers.

Refer to the EMC Installation Guidelines section of the bulletin for additional information.

11. **WEIGHT**: 0.11 lbs. (0.05 Kg)

ORDERING INFORMATION

COUNTERS

CUB7	C			0

- C - LOW VOLTAGE +28 VDC max
- V - HIGH VOLTAGE 50-250 VAC/DC
- S - REFLECTIVE
- R - RED

TIMERS

CUB7	T			0

- C - LOW VOLTAGE +28 VDC max
- V - HIGH VOLTAGE 50-250 VAC/DC
- S - REFLECTIVE
- R - RED
- 0 - USE WITH LOW VOLTAGE TO TIME WHEN INPUT IS LOW USE WITH HIGH VOLTAGE TO TIME WHEN INPUT IS HIGH
- 1 - VALID ONLY WITH LOW VOLTAGE (C) USE WITH 28 VDC (SRC MODE) TO TIME WHEN INPUT IS HIGH

Accessories Part Numbers

TYPE	DESCRIPTION	PART NUMBER	USED WITH
Plug-in Terminal Block	3 Position Terminal Block	TB100003	CUB7CCS0, CUB7TCS0, CUB7TCS1
	4 Position Terminal Block	TB100004	CUB7CCG0, CUB7TCG0, CUB7TCG1, CUB7CCR0, CUB7TCR0, CUB7TCR1, CUB7CVS0, CUB7TVS0
	5 Position Terminal Block	TB100005	CUB7CVG0, CUB7TVG0, CUB7CVR0, CUB7TVR0
Enclosure *	CUB7 Enclosure	ENC13000	
Base Mount *	CUB7 Base Mount	BMK80000	

See 5.0 Wiring the Meter to determine the terminal block needed.
** Enclosure and base mount will NOT function with plug-in terminal block option.*

1.0 INSTALLING THE METER

INSTALLATION ENVIRONMENT

The unit should be installed in a location that does not exceed the maximum operating temperature and provides good air circulation. Placing the unit near devices that generate excessive heat should be avoided.

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

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

Installation

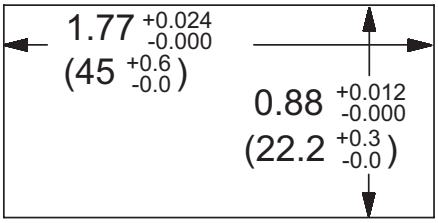
The CUB7 series of products meets NEMA 4X/IP65 requirements for outdoor use, when properly installed. The units are intended to be mounted into an enclosed panel. The viewing window and reset button are factory sealed for a washdown environment. A sponge rubber gasket and mounting clip are provided for installing the unit in the panel cut-out.

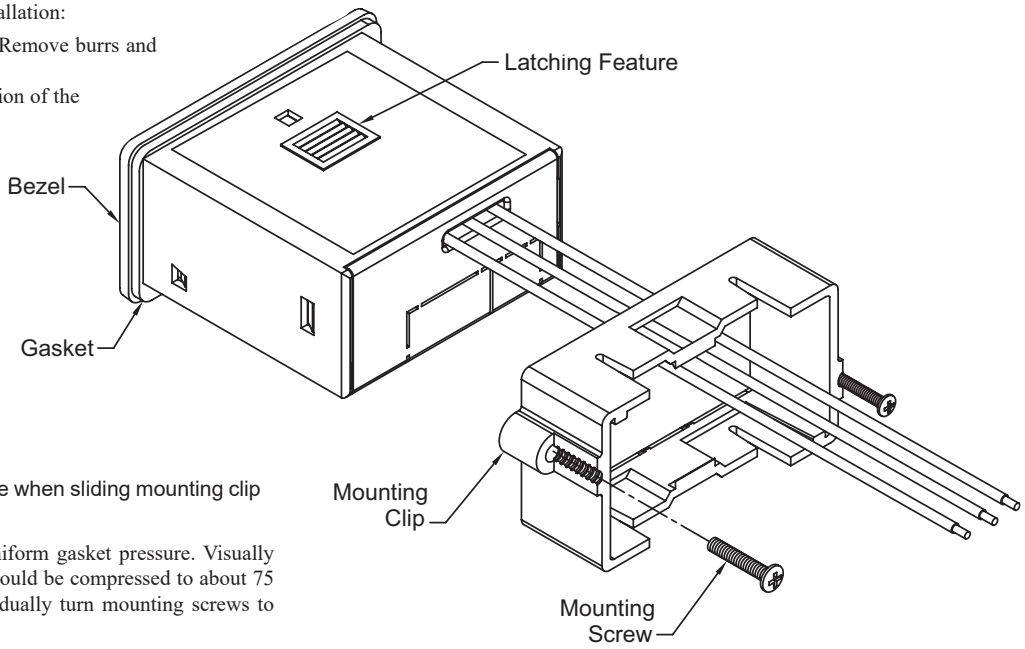
The following procedure assures proper installation:

1. Cut panel opening to specified dimensions. Remove burrs and clean around panel opening.
2. Carefully remove and discard the center section of the gasket. Slide the panel gasket over the rear of the unit to the back of the bezel. Insert the mounting screws onto both sides of mounting clip. The tip of the screw should **NOT** project from the hole in the mounting clip.
3. Install the CUB7 unit through the panel cut-out until the front bezel flange contacts the panel.
4. Slide the mounting clip over the rear of the unit until the clip is against the back of the panel. The mounting clip has latching features which engage into mating features on the CUB7 housing.

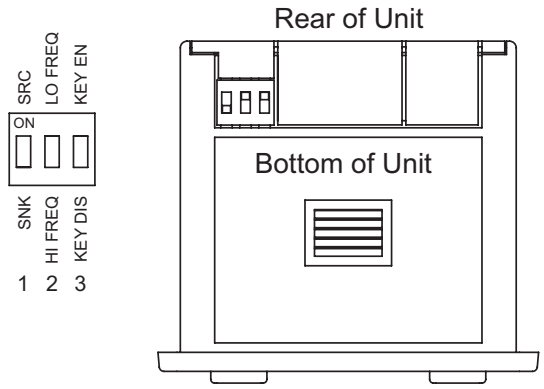
Note: It is necessary to hold the unit in place when sliding mounting clip into position.

5. Alternately tighten each screw to ensure uniform gasket pressure. Visually inspect the front panel gasket. The gasket should be compressed to about 75 to 80% of its original thickness. If not, gradually turn mounting screws to further compress gasket.
6. If gasket is not adequately compressed and the mounting screws can no longer be turned, loosen mounting screws, and check that mounting clip is latched as close as possible to the panel.
7. Repeat from step #5 for tightening mounting screws.



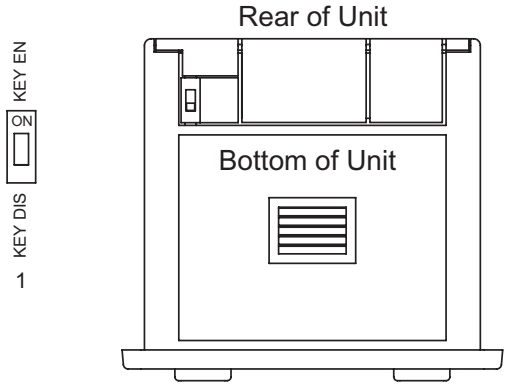


2.0 Setting the DIP Switches



Low Voltage Input Unit

Low voltage input units have 3 DIP switches that must be positioned appropriately prior to wiring.



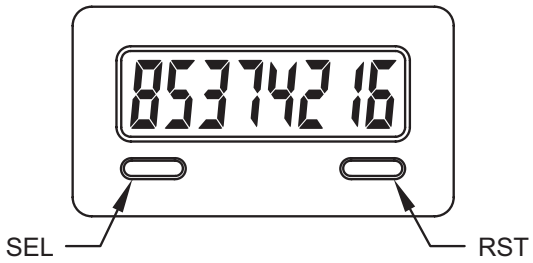
High Voltage Input Unit

High voltage input units have 1 DIP switch to enable or disable the front bezel keypad.

Note: Placing the KEY DISABLE/ENABLE DIP switch in the OFF position disables all front panel keys.

3.0 Programming The Time Range

The CUB7 Timer has 9 time ranges. To change ranges, enable the front keypad with the DIP switch and press the SEL key. The currently programmed time range will be displayed (example 2222222.2 = time range 2). To change the range, press the RST key. The ranges will cycle from 0-8 and back to 0. To enter your time range, press the SEL key and the unit will retain the current time range and return back to normal.



DISPLAY DURING PROGRAMMING	TIMER RANGE
00000.000	0.001 SEC
111111.11	0.01 SEC
2222222.2	0.1 SEC
333333333	1 SEC
4444444.4	0.1 MIN
555555555	1 MIN
666666.66	0.01 HR
7777777.7	0.1 HR
88888888	1 HR

4.0 Resetting The Display

The display may be reset to zero via the front RST key, the remote reset input or both.

The front RST key must be enabled for front panel reset. DIP switch # 3 on the low voltage input units or the single DIP switch on the high voltage input units. (See 2.0 Setting the DIP Switches for switch location)

The remote reset is activated via an external momentary contact closure between the reset input (blue wire) and the common (black wire). When the optional terminal blocks are used, see 5.0 Wiring The Meter for the appropriate reset input terminal and the common terminal.

5.0 Wiring The Meter

WIRING OVERVIEW

Electrical connections are made to the #22 AWG colored wires protruding from the rear of the unit. When using the optional terminal block, the #22 AWG colored wires are cut off and electrical connections are made via screwless type terminal block. All conductors should conform to the meter's voltage and current ratings. All cabling and wire terminations should conform to appropriate standards of good installation, local codes and regulations. It is recommended that the backlight power supplied to the meter (DC or AC) be protected by a fuse or circuit breaker.

EMC INSTALLATION GUIDELINES

Visit http://www.redlion.net/emi for more information on EMI guidelines, Safety and CE issues as they relate to Red Lion products.

USING THE COLOR CODED WIRES

The low voltage input units will contain three or four color coded wires depending on the backlight power requirements.

The high voltage input units will contain (2) orange wires and an additional two or three wires depending on the backlight power requirements.

The tables define the function of each colored wire.

LOW VOLTAGE INPUT

Wire Colors

WHITE	BLUE	BLACK	RED
Low Voltage Input	Reset	Common	+Backlight Power

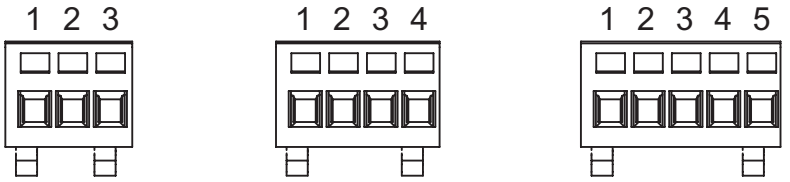
HIGH VOLTAGE INPUT

Wire Colors

ORANGE	ORANGE	BLUE	BLACK	RED
High Voltage Input	High Voltage Input	Reset	Common	+Backlight Power

TERMINAL BLOCK OPTION

CONNECTIONS: Wire clamping terminals
Wire Strip Length: 0.275" (7 mm)
Wire Gage: 24-16 AWG copper wire



USING THE OPTIONAL TERMINAL BLOCK

1. Remove the rear cover. Refer to Figure 1. A small slotted screwdriver is required to release the side latches. Insert the screwdriver tip between the rear cover and the side of the unit. Leverage the screwdriver away from the case to unlatch the side latch and slightly lift the rear cover. Pinch the corners to hold the rear cover in place. Remove the screwdriver and repeat the same procedure on the other side of the rear cover. When both side latches are released, slide the rear cover from the unit and the wires.
2. For safety concerns, the wires should be cut off completely flush with the PC board to prevent a short.
3. Break out the break away tab(s) as required. Remove the left tab only for 3 position terminal block or both tabs for 4 and 5 position terminal blocks.
4. Reinstall the rear cover into CUB7 unit.
5. Mount the CUB7 into the panel (refer to 1.0 Installing The Meter)
6. Push the keyed terminal block onto the exposed PC board. The left most terminal, next to the DIP switch(s) is terminal #1.

Note: Wire sizes 16-24 AWG may be used with 0.25" length exposed. The screwless type terminal block requires a small slotted screwdriver engaged in the upper slot to open the wire clamp in the lower larger slot. Removing the screwdriver will lock the wire clamp unto the wire.

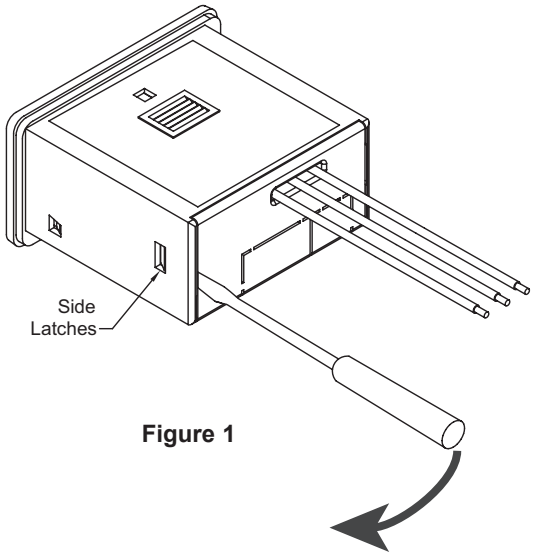
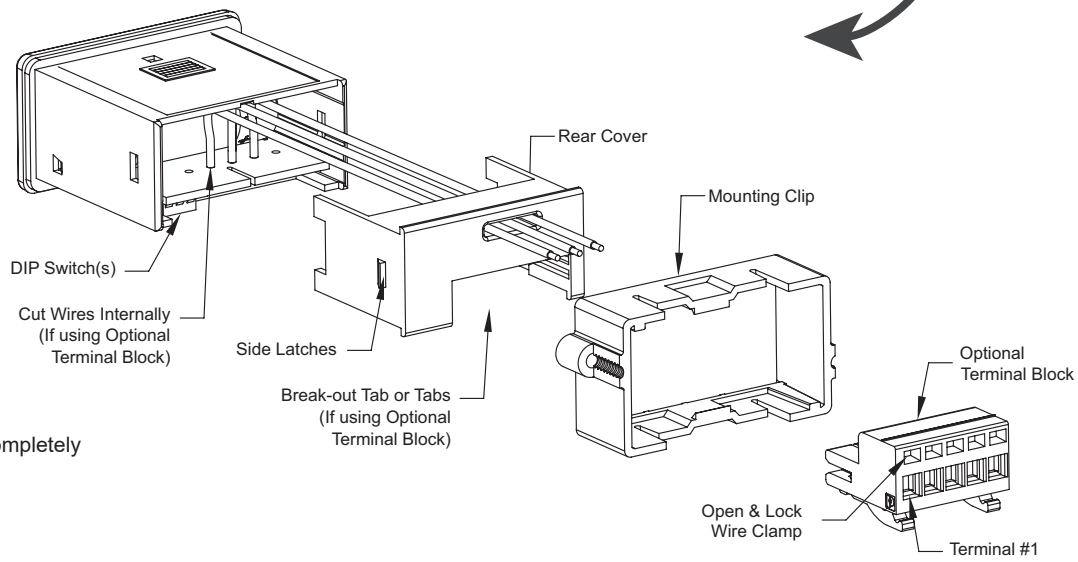
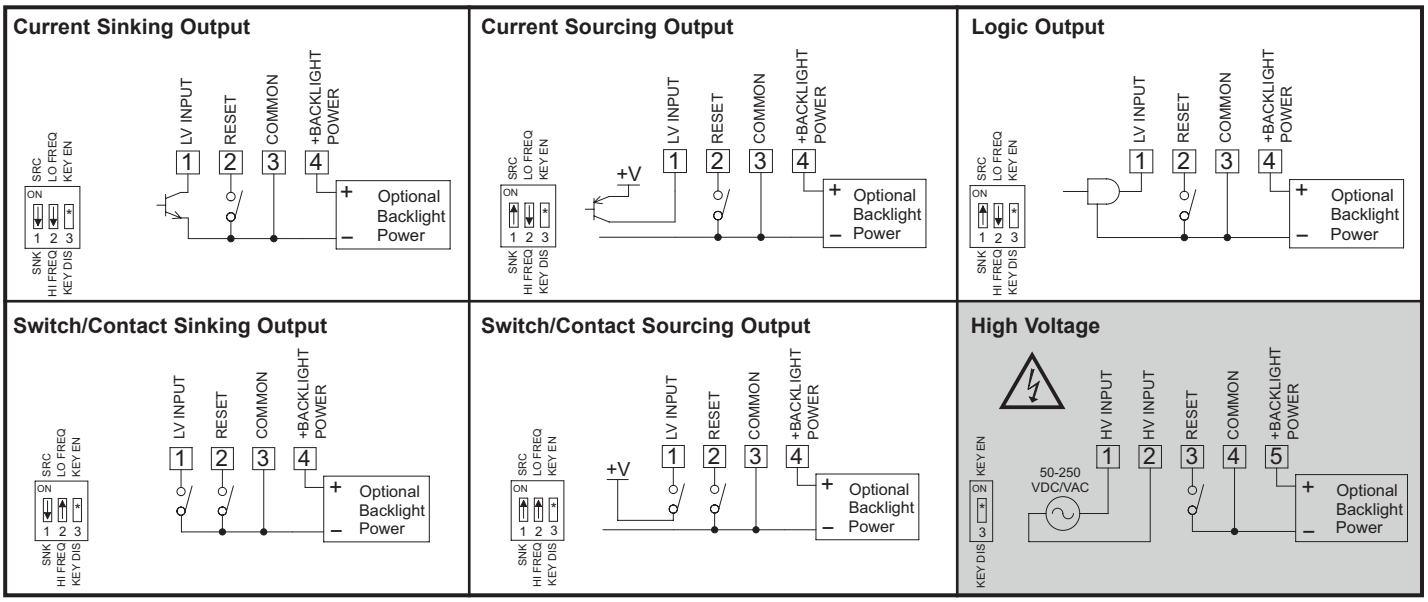


Figure 1



Wires must be cut off completely flush with PC board.



* *Switch position is application dependent.*

Shaded area for high voltage applications.

RED LION CONTROLS TECHNICAL SUPPORT

If for any reason you have trouble operating, connecting, or simply have questions concerning your new product, contact Red Lion's technical support.

Support: support.redlion.net
Website: www.redlion.net

Inside US: +1 (877) 432-9908
Outside US: +1 (717) 767-6511

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LIMITED WARRANTY

(a) Red Lion Controls Inc. (the "Company") warrants that all Products shall be free from defects in material and workmanship under normal use for the period of time provided in "Statement of Warranty Periods" (available at www.redlion.net) current at the time of shipment of the Products (the "Warranty Period"). **EXCEPT FOR THE ABOVE-STATED WARRANTY, COMPANY MAKES NO WARRANTY WHATSOEVER WITH RESPECT TO THE PRODUCTS, INCLUDING ANY (A) WARRANTY OF MERCHANTABILITY; (B) WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE; OR (C) WARRANTY AGAINST INFRINGEMENT OF INTELLECTUAL PROPERTY RIGHTS OF A THIRD PARTY; WHETHER EXPRESS OR IMPLIED BY LAW, COURSE OF DEALING, COURSE OF PERFORMANCE, USAGE OF TRADE OR OTHERWISE.** Customer shall be responsible for determining that a Product is suitable for Customer's use and that such use complies with any applicable local, state or federal law.

(b) The Company shall not be liable for a breach of the warranty set forth in paragraph (a) if (i) the defect is a result of Customer's failure to store, install, commission or maintain the Product according to specifications; (ii) Customer alters or repairs such Product without the prior written consent of Company.

(c) Subject to paragraph (b), with respect to any such Product during the Warranty Period, Company shall, in its sole discretion, either (i) repair or replace the Product; or (ii) credit or refund the price of Product provided that, if Company so requests, Customer shall, at Company's expense, return such Product to Company.

(d) **THE REMEDIES SET FORTH IN PARAGRAPH (c) SHALL BE THE CUSTOMER'S SOLE AND EXCLUSIVE REMEDY AND COMPANY'S ENTIRE LIABILITY FOR ANY BREACH OF THE LIMITED WARRANTY SET FORTH IN PARAGRAPH (a).**

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