

MODEL CUBC - SINGLE PRESET COUNTER AND CUBCB - SINGLE PRESET COUNTER W/BATCH INDICATION



- EIGHT SELECTABLE COUNT MODES
- BATCH COUNTING INDICATION
- NON-VOLATILE MEMORY
- SIGNAL INPUT SWITCH SELECTABLE FOR HI or LO FREQUENCY OPERATION
- ACCEPTS INPUT COUNT RATES UP TO 12 KHZ
- SIMPLIFIED FRONT PANEL PROGRAMMING
- ON LINE SELF-TEST (Including Relay Test)
- PROGRAMMABLE TIMED OUTPUT
- FRONT PANEL RESET ENABLE/DISABLE
- REMOTE RESET CAPABILITY
- LEADING ZERO BLANKING
- NEMA 4/IP65 SEALED METAL FRONT BEZEL

DESCRIPTION

The CUB Controller Counter is a versatile compact presettable counter. Batch counting indication is a feature of the Model CUBCB. All data set-ups are stored in a non-volatile internal memory. When power is removed, count and batch totals are saved.

The CUB Controller Counter features eight different DIP switch selectable counting modes. The timed output is programmed via the front panel buttons.

The unit also has a built-in self-test which checks the display driver and microprocessor hardware. The self-test can be run at any time without losing counts.

Power and Output connections are made at a terminal block at the rear of the unit. The Input connections are made via a five pin polarized connector on the bottom of the unit. This connector includes the count input, remote reset, front panel reset enable, and signal common.

The metal front bezel meets NEMA 4/IP65 specifications for wash down and/or dusty environments when properly installed.

SPECIFICATIONS

1. **DISPLAY:** 6-Digit LCD, 0.2" (5.1 mm.) high digits.

2. **POWER REQUIREMENTS:**

- A.C. Power Versions:** 115 VAC $\pm 10\%$, 50/60 Hz, 0.5 VA.
 230 VAC $\pm 10\%$, 50/60 Hz, 0.5 VA.
 10 to 28 VAC $\pm 10\%$, 50/60 Hz, 2.5 VA.

D.C. Power Version: 10 to 28 VDC, 1 W.

3. **OUTPUT RELAY:**

- Type:** Form-A.
Max. Power: 50 VA
Max. Voltage: 250 VAC/DC

Max. Current: 0.75 Amps

Operate Time: 0.5 msec. nominal

Release Time: 0.3 msec. nominal

Note: Relay output can switch an RLC DPDT relay P/N RLY30000 (115 VAC-10 Amp).

Programmable Timed Output: 0.01 sec. to 99.99 sec. $\pm 1\%$ +10 msec. max.

4. **SIGNAL INPUT:** Connect to the white wire (CNT./TIM.) and black wire (Common) of the five position connector. The unit counts on the negative edge of the input signal.

High Frequency Operation: DIP switch position 1 OFF. 12 KHz, 50% duty cycle.

Low Frequency Operation: DIP switch position 1 ON. Limits count speed to 50 Hz.

Note: These units will operate with RLC VCM modules E through H.

Threshold Levels: $V_{IH} = 3.3$ V, $V_{IL} = 1.0$ V

Current Sourcing: 30 VDC max, use external 560-1000 Ω pull-down resistor to comm to count.

Current Sinking: Internal 5 K Ω pull-up to +5 VDC, $I_{MAX} = 1.2$ mA.

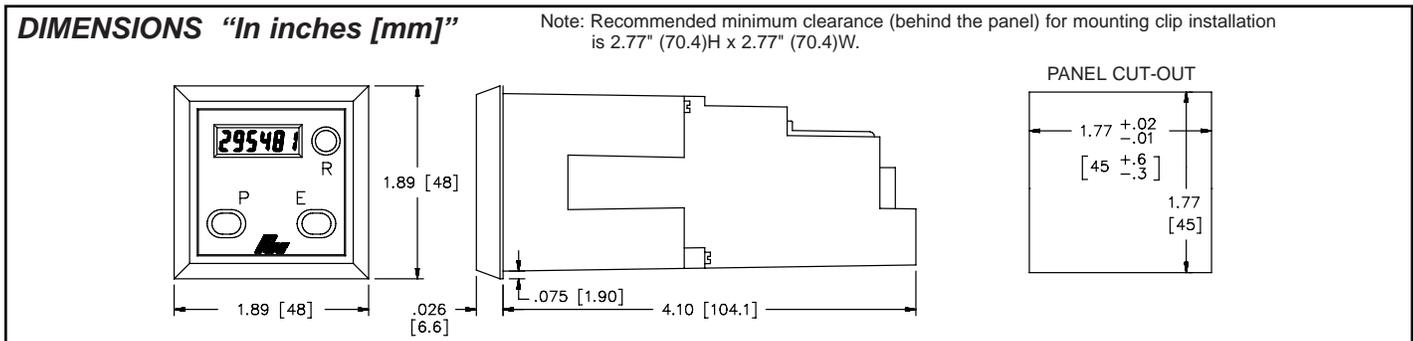
5. **REMOTE RESET:** Blue wire must be inserted into the five position connector.

Threshold levels: $V_{IH} = 2.5$ V, $V_{IL} = 0.8$ V, $V_{MAX} = 5$ V. Response time = 10 msec max.

Current Sinking: $I_{MAX} = 750$ μ A.

6. **MEMORY:** Non-volatile E²PROM retains all programmed information when power is removed or interrupted.

Power Cycles (ON/OFF): 100,000 min.



SPECIFICATIONS

(Cont'd)

7. OPERATION TEMPERATURE

RANGE: 0° to 50°C.

8. STORAGE TEMPERATURE

RANGE: -20° to 60°C.

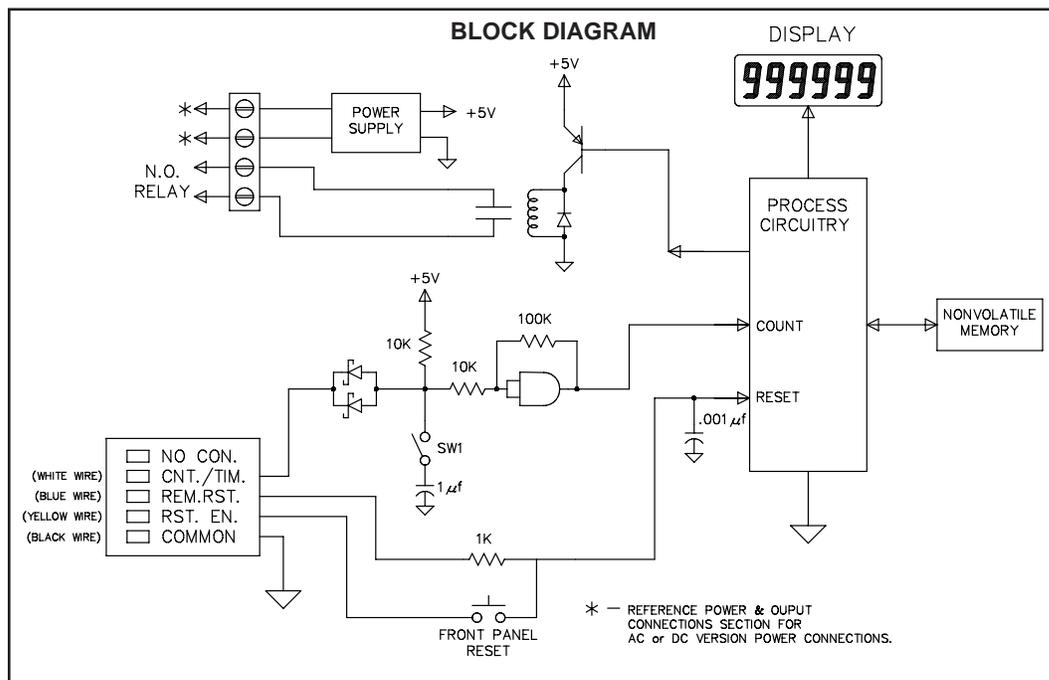
9. **CONSTRUCTION:** Metal front bezel that meets NEMA 4/IP65 requirements for wash down and dusty environments when properly installed. Case body is black high impact plastic (Panel gasket, mounting clips and screws included with unit).

10. CONNECTIONS:

Power & Output: Terminal block at rear of unit.

Input: Five position polarized connector that plugs in at bottom side of unit.

11. **WEIGHT:** 9.2 oz. (261 g)



DIP SWITCH SET-UP

The DIP switches are under the cover at the rear of the unit. DIP Switch position one selects high or low frequency signal input operation.

SW1 OFF - High Frequency operation, allows a count input signal up to 12 KHz.

SW1 ON - Low Frequency operation, limits the count input signal to 50 Hz.

When using switch contact closures or VCM's to generate count input signals, the unit should be placed into low frequency operation.

DIP switch positions two, three, and four select one of the eight possible operating modes, as described in the next section.

MODES OF OPERATION

There are eight available modes of operation which are determined by the settings of the DIP switches. During automatic reset counts are missed if the count rate is not exceeded.

A manual reset can be performed from the front panel "R" button if enabled or by the remote reset wire. When the "R" button is pressed or the remote reset is connected to common, the internal reset line goes low. At release of the reset, the reset line goes high.

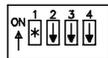
In the following modes of operation, the user should note the state of the reset line for the relay output and count display action.

Note: In modes three and seven, the output may appear to be latched if the time delay is longer than the time required for the counter to reach the preset value or zero.

Note: A manual reset will override the timed output and start the cycle again.

MODE 0 LATCH OUTPUT AT PRESET, MANUAL RESET TO ZERO

The unit counts up from zero to the preset value. When the preset value is reached, the output relay closes and counts continue to accumulate. When a manual reset is performed, the output relay opens and the count goes to zero. At release of the reset, the cycle starts again.



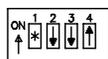
MODE 1 ONE SHOT, MANUAL RESET TO ZERO

The unit counts up from zero to the preset value. When the preset value is reached, the output relay opens and the count continues to accumulate.

Note: When using this mode, a manual reset must be performed to close the relay output. The relay output closes at the release of the reset.

When a manual reset is performed, the output remains opened and the count does not accumulate. At release of the reset, the relay output closes, the count goes to zero, and the cycle starts again.

If power is removed before the count reaches the preset value, the relay output does not close when power is restored, a manual reset must be performed.



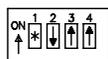
MODE 2 TIMED OUTPUT AT PRESET, MANUAL RESET TO ZERO

The unit counts up from zero to the preset value. When the preset value is reached, the output relay closes for the amount of time programmed and the count continues to accumulate. A manual reset causes the count to go to zero and at release of the reset, the cycle starts again.



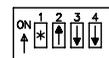
MODE 3 TIMED OUTPUT AT PRESET, AUTOMATIC RESET TO ZERO AT PRESET

The unit counts up from zero to the preset value. When the preset value is reached, the output relay closes for the amount of time programmed. The counter will automatically reset to zero at the beginning of the timed output and continue to accumulate counts.



MODE 4 LATCH OUTPUT AT ZERO, MANUAL RESET TO PRESET

The unit counts down from the preset value to zero. When zero is reached, the output relay closes, the counter rolls over to 999999 and continues to decrement. When a manual reset is performed, the output deactivates and the count goes to the preset value. At release of the reset, the cycle starts again.



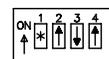
MODE 5 ONE SHOT, MANUAL RESET TO PRESET

The unit counts down from the preset value to zero. When zero is reached, the output relay opens, the counter rolls over to 999999 and continues to decrement.

Note: When using this mode, a manual reset must be performed to close the relay output. The relay output closes at the release of the reset.

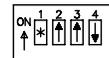
When a manual reset is performed, the output remains opened and the count does not accumulate. At release of the reset, the output relay closes, the count goes to the preset value, and the cycle starts again.

If power is removed before the count reaches zero, the relay output does not close when power is restored, a manual reset must be performed.



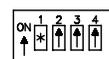
MODE 6 TIMED OUTPUT AT ZERO, MANUAL RESET TO PRESET

The unit counts down from the preset value to zero. When zero is reached, the output relay closes for the amount of time programmed, the counter rolls over to 999999 and continues to decrement. A manual reset causes the count to go to the preset value and at release of the reset, the cycle starts again.



MODE 7 TIMED OUTPUT AT ZERO, AUTOMATIC RESET TO PRESET AT ZERO

The unit counts down from the preset value to zero. When zero is reached, the output relay closes for the amount of time programmed. The counter will automatically reset to the preset value at the beginning of the timed output and continue to decrement counts.



WIRING CONNECTIONS

There are certain considerations that should be observed when running the count and control signal wires. A length of wire can act like an antenna and the closer it is to a source of electrical noise, the more it becomes susceptible to that noise. There are a few rules that should be followed when running these wires.

1. The CUB controller Common may be connected to machine ground (earth) only at one point, preferably a single, direct connection between a known good, earth ground and the Input Common Terminal.
2. Never run count and control signal leads in the same conduit or race ways with conductors feeding motors, solenoids, SCR controls, inductive loads, heaters, etc. Ideally, signal wires should be run by themselves in a separate conduit.
3. Signal leads within electrical enclosures should be routed as far from contactors, motor starters, control relays, transformers and their lead wires, and other similar components as is possible.
4. When shielded wire is used, connect the shield to the common of the CUB Controller, and leave the other end of the shield disconnected and insulated from machine ground.

INPUT CONNECTIONS

The five position polarized connector with three wires installed is plugged into the pins on the bottom of the unit. There is a separate blue wire supplied in the hardware pack that can be installed into the connector. Each wire has a different color and a specific function.

Common (Black wire) - Other inputs are connected to common.

Reset Enable (Yellow wire) - Enables the front panel reset button "R" when connected to common.

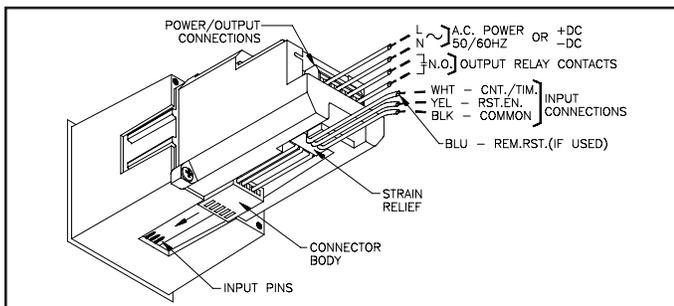
Remote Reset (Blue wire) - Performs a manual reset to the unit when connected to common (Maintained reset).

Count Input (White wire) - The counter increments or decrements, depending on the mode selected, when connected to common.

The blue wire (if required) should be inserted between the white and yellow wire before plugging the connector into the unit.

Slide the connector body into the groove on the bottom side of the CUB Controller until it seats into the pins as shown in figure B. Loop the wires over the first tab and then under the second tab for proper strain relief.

Note: For quick reference, input wire labeling is shown on the top of the rear cover.



POWER & OUTPUT CONNECTIONS

The Power and Output electrical connections are made via screw-clamp terminals located on the back of the unit. When wiring the unit, refer to the stamping below the terminal block to identify the wire position with the proper function. Strip the wire, leaving approximately 1/4" (6 mm) bare wire exposed (stranded wires should be tinned with solder). Insert the wire into the screw-clamp terminal and tighten the screw until the wire is clamped tightly. Each terminal can accept up to one #14 AWG wire.

AC POWER WIRING VERSION

The AC power is connected to the two left terminals as viewed from the rear of the unit. There are three A.C. version types available.

Note: Before applying power to the unit know the proper AC power voltage to be connected. This can be done by comparing the part number on the side of the unit to the ordering information.

CAUTION: On 10 to 28 VAC version units, the input common on the five position connector (black wire) is not isolated internally from the AC power connection. When making connections externally, be sure that input common and AC power are isolated from each other, otherwise permanent damage to the unit may occur.

To reduce the chance of noise spikes entering the AC line and affecting the unit, the AC power should be relatively "clean" and within the specified 10% variation limit. Connecting power from heavily loaded circuits or circuits that also power loads that cycle on and off, (*contactors, relays, motors, etc.*) should be avoided.

DC POWER WIRING VERSION

The DC power is connected to the two left terminals as viewed from the rear of the unit. The DC plus (+) power is connected to the left-most terminal and the DC common directly to the right of the plus terminal. The DC power source must be capable of supplying the unit's rated power of 1 watt. DC power common is internally connected to the input connection common.

OUTPUT WIRING

The normally open (N.O.) output relay is connected to the two right-most terminals as viewed from the rear of the unit. Care must be taken to ensure that the maximum rating specifications are not exceeded, as this will shorten the life of, or permanently damage the internal relay.

If more power handling capability or varied contact arrangement is required, use an accessory relay.

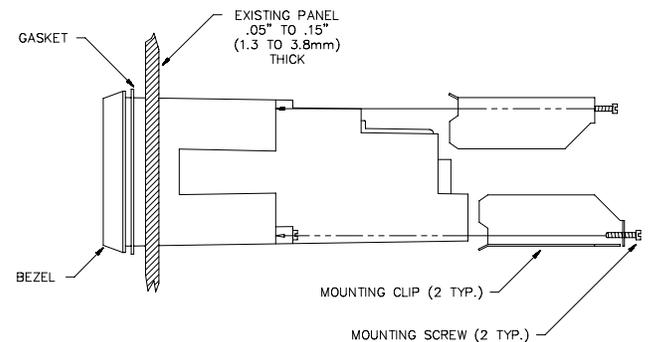
DPDT RELAY P/N - RLY30000 (115 VAC-10 Amp)

Socket P/N SKT10000 is required for each relay purchased, see Ordering Information.

INSTALLATION

Before installing the CUB Controller into the panel, the user should first become familiar with the operation of the unit. Also, it may be desirable to program the unit and set the appropriate DIP switches for the application. When programming is complete, all parameters will be saved in nonvolatile memory. The CUB Controller should be installed in a location that does NOT exceed the maximum operating temperature.

The CUB Controller is designed with a high degree of electrical noise immunity. However, installing the unit away from noise sources such as relays, solenoids, motors, etc, should be considered.



The CUB Controller unit is designed to be panel-mounted with a gasket to provide a water-tight seal. Two mounting clips are provided for easy installation. Consideration should be given to the thickness of the panel. A panel that is too thin may distort and not provide a water-tight seal, therefore the recommended minimum panel thickness is 1/8" (3.2 mm). The recommended clearance behind the panel for mounting clip installation is 2.77" (70.4 mm) H x 2.77" (70.4 mm) W.

After the panel cut-out is completed and deburred, carefully remove and discard the center section of the panel gasket. Slide the panel gasket over the unit from the rear, seating it against the lip of the case. Remove the two mounting screws from the CUB Controller metal housing. These are at diagonal corners to one another.

Note: Do NOT remove the screws that are holding the plastic insert into the metal housing.

Insert the unit into the panel opening as depicted in the drawing. Place the mounting clips over the two screw locations, insert the screws and tighten evenly to apply uniform compression, thus providing a water-tight seal.

FRONT PANEL DESCRIPTION

The front panel has a clear viewing window to view the six digit LCD display. The front panel meets NEMA 4/IP65 requirements when properly installed. The unit has three front panel buttons for control and data entering. Each button's function is described below.

BUTTON FUNCTIONS

R - The Reset button is active when the reset enable wire (yellow) is connected to common (black wire). In any operating mode, a manual reset action will occur when the "R" button is pressed. For the counter/batch version a manual reset only affects the display that is viewed.

The Reset button is used with the "E" button to initiate the self-test. Also, it is used with the "P" button to enter the programming mode for the timed output value.

P - The Preset button is used to view the preset value in the normal operating mode. After release of the button, the preset value will be displayed for about 5 seconds.

When used with the "E" button, it allows entry into programming of the preset value. Once in the preset programming mode, the "P" button is used to advance to the next digit to be modified.

Also, it is used with the "R" button to enter the programming mode for the timed output value.

E - The Enter button is used in the programming modes to increment the value of the selected digit.

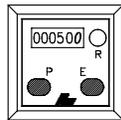
The Enter button is used with "R" button to initiate the self-test. Also, it is used with the "P" button to enter the programming mode for the preset value. CUB Controller Batch version units use the Enter button to toggle between the count and batch display.

PROGRAM PRESET VALUE

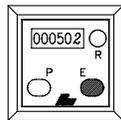
The factory default Preset Value is 500, to enter a different value, the operator must enter the Preset Value Programming Mode by performing the following steps.

Note: In the programming mode, the unit can continue to accumulate counts and activate the output.

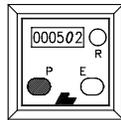
1. Press and hold the "P" button and then press the "E" button. The current preset value will be displayed with the Least Significant Digit (LSD) flashing. Release both buttons.



2. Press the "E" button to increment the value of the flashing digit. Pressing and holding the "E" button will continuously increment the digit. After nine is reached, the digit goes to zero and starts over.



3. Press the "P" button to advance to the next digit which will flash. Set the value of this digit by using the "E" button. Repeat this procedure until all six digits have been set to the desired value.



After setting the most significant digit, press the "P" button to enter the new value. The unit automatically returns to the normal operating mode. The new preset value is displayed and takes affect immediately.

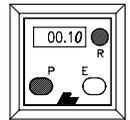
In the Preset Value programming mode, if the "P" or "E" button is not pressed within 15 seconds, the unit will return to the normal operating mode with the previous value retained.

PROGRAM TIMED OUTPUT VALUE

The factory default Timed Output Value is 0.10 sec, but can be programmed from 0.01 to 99.99 seconds. To enter a different value, the operator must enter the Timed Output Value Programming Mode by performing the following steps.

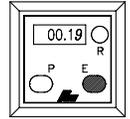
Note: In the programming mode, the unit can continue to accumulate counts and activate the output.

1. Press and hold the "P" button then press the "R" button. The current time value will be displayed with the Least Significant Digit (LSD) flashing. Release both buttons.

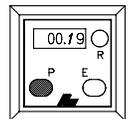


Note: The front panel reset button must be enabled.

2. Press the "E" button to increment the value of the flashing digit. Pressing and holding the "E" button will continuously increment the digit. After nine is reached, the digit goes to zero and starts over.



3. Press the "P" button to advance to the next digit which will flash. Set the value of this digit by using the "E" button. Repeat this procedure until all four digits have been set to the desired value.



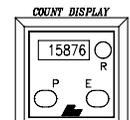
After setting the most significant digit the unit automatically returns to the normal operating mode with the preset value displayed. The new timed output value takes affect immediately, unless the timed output has been activated.

In the Timed Output Value programming mode, if the "P" or "E" button is not pressed within 15 seconds, the unit will return to the normal operating mode with the previous value retained.

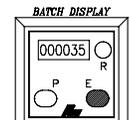
BATCH COUNTING OPERATION

The Cub Controller Batch version (CUBCB) has the same features as the counter version with the additional capability of displaying a batch count. Pressing the Enter button toggles between the count and batch display.

The batch count display will increment one count every time the counter display reaches the preset value. Unlike the count display, the batch display has leading zeros.



The batch display and count display are independent of each other as far as a manual reset is concerned. The batch count is reset to zero when a manual reset is performed, only while the batch value is displayed.



Note: The count value and relay output are not affected.

The count value will perform an automatic reset even when the batch count is displayed. To perform a manual reset, the count value must be displayed.

Note: The batch value is not affected.

SELF TEST

The self-test feature can be activated without affecting the count. This test will verify that the LCD digits operate, the DIP switch settings and relay operation can also be checked.

To enter the self-test, perform the following (Front panel reset must be enabled).

1. Press and hold the E button, then press the R button.
2. Release both buttons.

The display will cycle all the digits on the display each for about half a second and in the sequence shown below. To rapidly advance through the display routine, continually press and release the "P" or the "E" button.

DIGITS CYCLED ON THE DISPLAY

000000
111111
222222
333333
444444
555555
666666
777777
888888
999999

BLANK DISPLAY

101010
121212
323232
343434
545454
565656
767676
787878
989898

The next portion of the self-test corresponds to the position of the DIP switches. The four DIP switch positions are indicated on the display.

The most significant digit (MSD) corresponds to position one and the least significant digit to position four of the DIP switches. The MSD will always be a "1" regardless of the switch setting. The other three digits will be a "1" if the switch is on or a "0" if the switch is off. Switches can be toggled at this stage of the test and the display will indicate the change.

If an input signal is applied during the test, be aware that as the DIP switch positions change, the count mode operation matches the switch settings immediately.

During the DIP switch test, the Output Relay Test can be performed. Press and hold the E button to cause the Normally Open relay to close. Releasing and pressing the E button can be performed as many times as desired. If the relay was already closed pressing the E button will not change the state, until the button is released. If testing of the relay is not desired, press the "P" button to exit self-test.

Note: If the relay test is not performed, the state of the relay will remain the same as it was prior to self-test. If the relay is tested, the relay output will be open after exiting self-test, regardless of the mode selection. A manual reset should be performed if necessary.

Caution: The operator should know that the relay test will close the contacts. Therefore be aware of any hazardous or undesirable conditions in the operating system.

The unit will automatically return to the normal operating mode if a DIP switch or the enter button is not used within 15 seconds.

TYPICAL APPLICATIONS

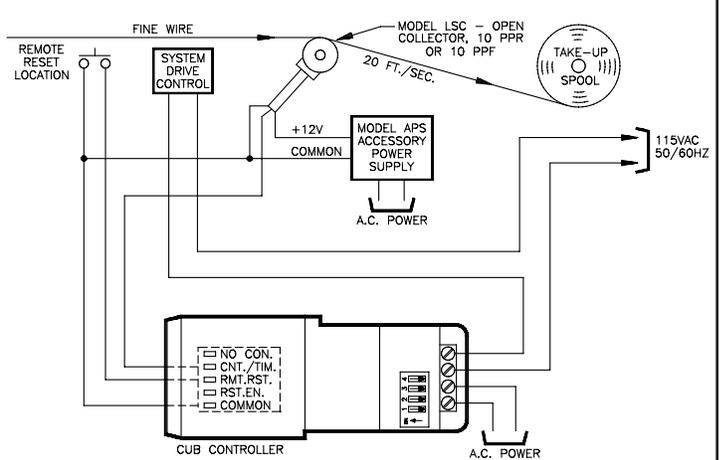
CONTROLLING LENGTH OF MATERIAL

A CUB Controller is used to control the length of a fine wire that is wound onto a large spool. When the desired amount of wire is wound onto the spool, the Controller stops the system.

The Controller is set-up for Mode 0 operation (Latch output at preset, manual reset to zero). A Model LSC sensor, with an open collector output and a 10 pulse per foot wheel, is used to generate signals for the Controller. The output of the sensor is directly connected to the input of the Controller.

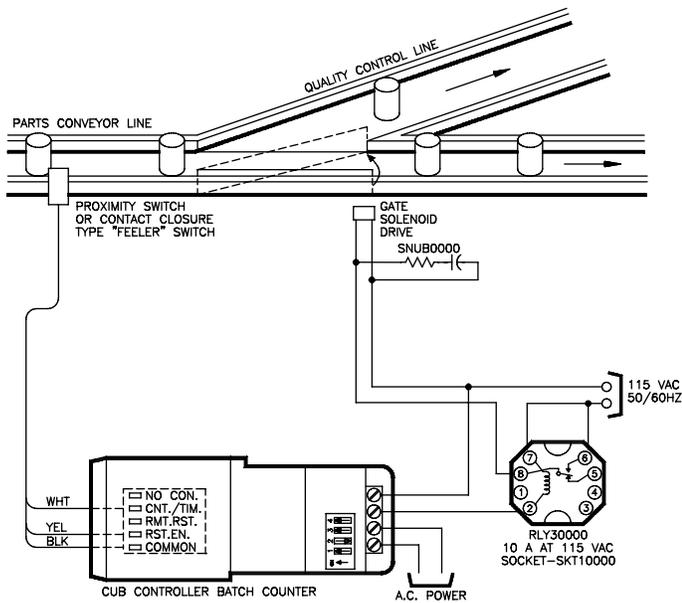
With a signal of 10 pulses per foot of wire and 10,000 feet of wire to be wound on each spool, the preset is set for 100,000. The Controller is set for high frequency operation, due to the 20 feet per second speed at which the system operates.

When the preset value is reached, the output relay closes, and stops the system drive. The operator then cuts the wire, changes the spool, resets the Controller, and restarts the process. This system is set up with remote reset capabilities which will allow the operator to reset the Controller from the wire cutting station. The Front Panel reset is disabled which prevents resetting of the count from the front panel.



TYPICAL APPLICATIONS (Cont'd)

SORTING PARTS FOR QUALITY CONTROL



The CUB Controller is installed to divert one part out of every one thousand parts for quality control/inspection purposes. The Batch display of the Controller keeps a running total of the number of inspected parts.

A proximity sensor counts the parts as they pass by on the conveyor. When one thousand is reached, one count is added to the batch total and the relay of the CUB Controller closes which closes the accessory relay. This activates the gate-solenoid, diverting the part to the inspection line. The CUB Controller's timed output is set for 0.8 seconds which allows enough time for the part to pass onto the quality control line. The gate then returns to its normal position when the timed output ends.

A proximity sensor, with a switch contact closure, is used to sense the parts as they pass the sensing point. To eliminate the possibility of extra counts due to switch contact "bouncing", the CUB Controller is set for low frequency operation. The unit operates in Mode 3 (Timed output at preset, automatic reset to zero at preset). This mode allows the unit to count to the preset value, at which time the output relay closes, and stays closed for 0.8 seconds. The CUB Controller resets itself at the beginning of the relay closure and is then ready to accept new counts.

The CUB Controller relay energizes the accessory relay (P/N RLY30000) to switch the large current required to energize the gate-solenoid.

As shown in the drawing, the yellow input wire is connected to ground which enables the front panel reset button.

To view the number of inspected parts produced in a given shift, the operator can press the "E" button to toggle to the batch display.

ORDERING INFORMATION

MODEL NO.	DESCRIPTION	PART NUMBERS FOR AVAILABLE SUPPLY VOLTAGES			
		230 VAC	10 to 28 VAC	10 to 28 VDC	115 VAC
CUBC	Cub Controller	CUBC0010	CUBC0020	CUBC0030	CUBC0000
CUBCB	Cub Controller Batch	CUBCB010	CUBCB020	CUBCB030	CUBCB000
RLY	DPDT Plug-in Relay	-	-	-	RLY30000
SKT	Octal Base Socket	SKT10000			
SNUB	R-C Snubber Inductive Load Suppressor	SNUB0000			

For Information on Pricing, Enclosures, & Panel Mount Kits, refer to the RLC Catalog or contact your local RLC distributor.

LIMITED WARRANTY

The Company warrants the products it manufactures against defects in materials and workmanship for a period limited to one year 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.

No warranties expressed or implied are created with respect to The Company's products except those expressly contained herein. The Customer acknowledges the disclaimers and limitations contained hererin and relies on no other warranties or affirmations.

Red Lion Controls
20 Willow Springs Circle
York PA 17402
Tel +1 (717) 767-6511
Fax +1 (717) 764-0839

Red Lion Controls France
56 Boulevard du Courcerin, Batiment 21,
ZI Pariest F-77183 Croissy Beaubourg
Tel +33 (64) 80 12 12
Fax +33 (64) 80 12 13

Red Lion UK Ltd
Tapton Park
Chesterfield S41 OTZ
Tel +44 (1246) 22 21 22
Fax +44 (1246) 22 12 22