

## MODEL CUBT - SINGLE PRESET TIMER

- **FOUR TIMING VERSIONS AVAILABLE**  
 Hundredths of Seconds  
 Hundredths of Minutes  
 Thousandths of Seconds  
 Thousandths of Minutes
- **EIGHT SELECTABLE MODES OF OPERATION**
- **NON-VOLATILE MEMORY**
- **TIMING ACCURACY OF 0.01%**
- **SIMPLIFIED FRONT PANEL PROGRAMMING**
- **ON LINE SELF-TEST (Including Relay Test)**
- **REMOTE RESET CAPABILITY**
- **LEADING ZERO BLANKING**
- **FRONT PANEL RESET ENABLE/DISABLE**
- **NEMA 4/IP65 SEALED METAL FRONT BEZEL**



### DESCRIPTION

The CUB Controller Timer is a versatile, compact, presettable timer. All data set-ups are stored in a non-volatile internal memory, therefore when power is removed all information is saved.

The CUB Controller Timer features eight different DIP switch selectable timing modes. The output can be programmed via the front panel buttons for various time durations.

The unit 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 time.

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 timer input, remote reset, front panel reset enable, and common.

The metal front bezel is designed to meet 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 ±10%, 50/60 Hz, 0.5 VA.  
 230 VAC ±10%, 50/60 Hz, 0.5 VA.  
 10 to 28 VAC ±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) or RLY40000 (230 VAC-10 Amp).*

**Programmable Timed Output:** 0.01 sec. to 99.99 sec. ±0.1% + 10 msec.

**4. TIME INPUT:** Connect the white wire (CNT./TIM.) and black wire (Common) of the five position connector. The unit times-out when the time input is low.

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

**Maximum Input Voltage:** 30 VDC

*Note: These units operate with VCM modules E through H. When using VCM's, set DIP switch position 1, ON to prevent false timing.*

**Timing Versions:**

| Time       | Maximum Display |
|------------|-----------------|
| 0.01 sec.  | 9999.99         |
| 0.001 sec. | 999.999         |
| 0.01 min.  | 9999.99         |
| 0.001 min. | 999.999         |

**5. TIME ACCURACY:** ±0.01%

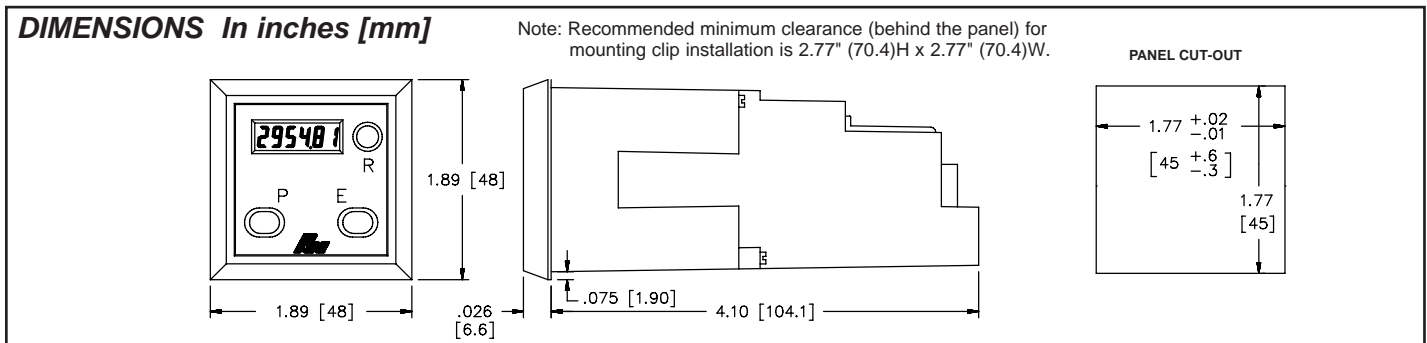
**6. REMOTE RESET:** Blue wire must be inserted into the five position connector.

**Threshold levels:**

$V_{IH} = 2.5$ V,  $V_{IL} = 0.8$ V,  $V_{MAX} = 5$ V.

Response time = 10 msec max.

**Current Sinking:**  $I_{MAX} = 750$   $\mu$ A.



## SPECIFICATIONS (Cont'd)

**7. MEMORY:** Non-volatile E<sup>2</sup>PROM retains all programmed information when power is removed or interrupted.

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

**8. OPERATION TEMPERATURE RANGE:** 0° to 50°C.

**9. STORAGE TEMPERATURE RANGE:** -20° to 60°C.

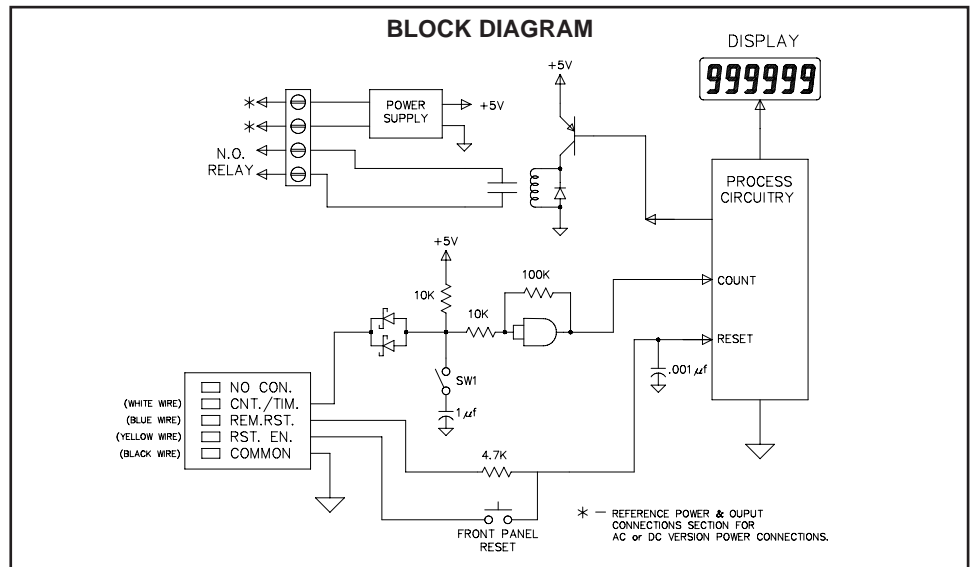
**10. CONSTRUCTION:** Metal front bezel that meets NEMA 4/IP65 requirements for wash down and dusty environments when properly installed. Case body is black high impact plastic (Panel gasket, mounting clips and screws included with unit).

### 11. CONNECTIONS:

**Power & Output:** Terminal block at rear of unit.

**Input:** Five position polarized connector that plugs in to the bottom side of unit.

**12. 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 determines the response time of the time input.

**SW1 OFF** - The maximum response time, at time input (CNT/TIM), is 1 msec.

**SW1 ON** - Connects a damping capacitor for switch contact bounce and increases the response time to 20 msec.

*Note: When using VCM's to switch the time input, DIP switch position 1 should be placed into the ON position.*

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.

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.

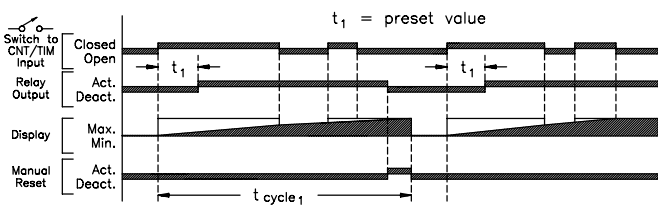
In the following modes of operation, the user should note the state of the reset line for the relay output and timer display action.

*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 timer 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 times up from zero to the preset value. When the preset value is reached, the relay closes and the time continues to accumulate. When a manual reset is performed, the output opens and the timer goes to zero. At release of the reset, the cycle starts again.



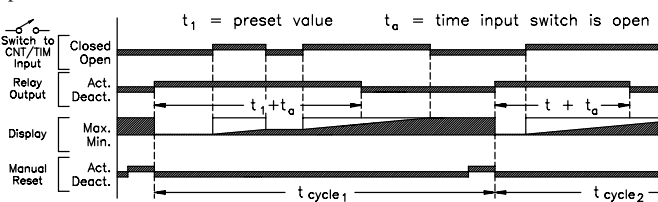
### MODE 1 ONE SHOT, MANUAL RESET TO ZERO

The unit times up from zero to the preset value. When the preset value is reached, the output relay opens and the time 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.*

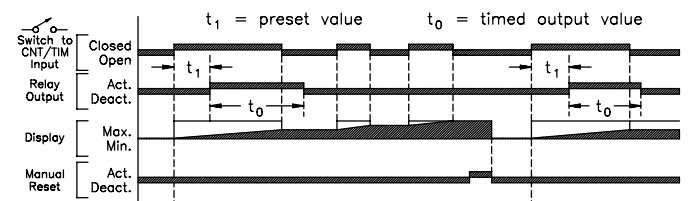
When a manual reset is performed, the output remains open and the time does not accumulate. At release of the reset, the relay output closes, the time goes to zero, and the cycle starts again.

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.



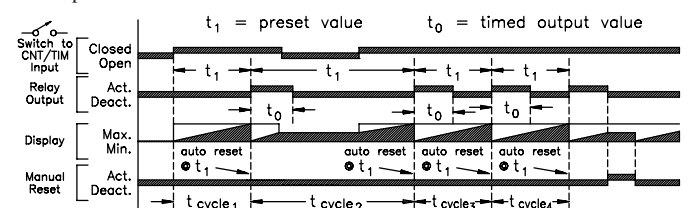
### MODE 2 TIMED OUTPUT AT PRESET, MANUAL RESET TO ZERO

The unit times up from zero to the preset value. When the preset value is reached, the output relay closes for the time programmed, and the timer continues to accumulate. A manual reset causes the time 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

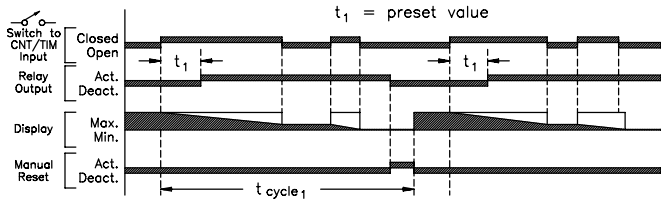
The unit times up from zero to the preset value. When the preset value is reached, the output relay closes for the time programmed. The timer will automatically reset to zero at the beginning of the timed output and continue to accumulate time, as long as the time input is low.



## MODES OF OPERATION (Cont'd)

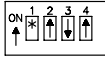
### MODE 4 LATCH OUTPUT AT ZERO, MANUAL RESET TO PRESET

The unit times down from the preset value to zero. When zero is reached, the output relay closes, the time rolls over to 9999.99 and continues to decrement. When a manual reset is performed, the output opens and the time goes to the preset value. At release of the reset, the cycle starts again.



### MODE 5 ONE SHOT, MANUAL RESET TO PRESET

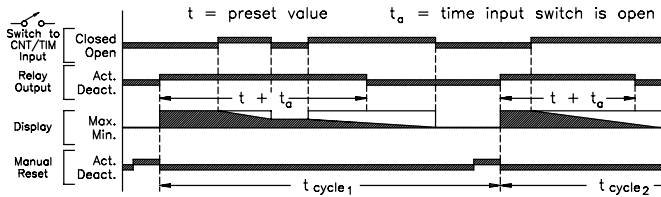
The unit times down from the preset value to zero. When zero is reached, the output relay opens, the counter rolls over to 9999.99 and continues to decrement.



*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.*

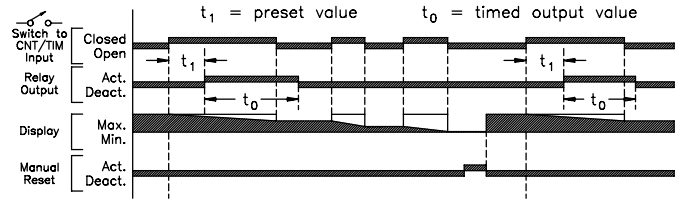
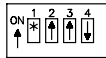
When a manual reset is performed, the output remains opened and the time does not accumulate. At release of the reset, the output relay closes, the time goes to the preset value, and the cycle starts again.

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



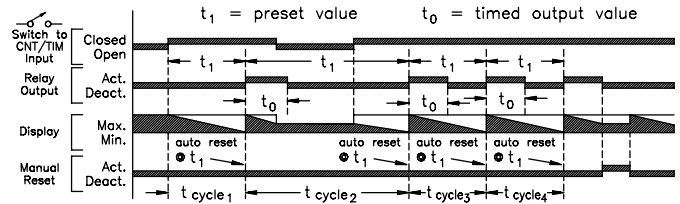
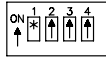
### MODE 6 TIMED OUTPUT AT ZERO, MANUAL RESET TO PRESET

The unit times down from the preset value to zero. When zero is reached, the output relay closes for the amount of time programmed, the time rolls over to 9999.99 and continues to decrement. A manual reset causes the time to go to the preset value, and the cycle starts again.



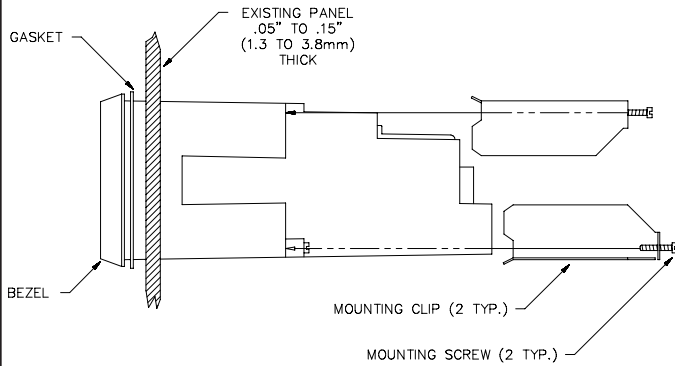
### MODE 7 TIMED OUTPUT AT ZERO, AUTOMATIC RESET TO PRESET AT ZERO

The unit times down from the preset value to zero. When zero is reached, the output relay closes for the time programmed. The timer will automatically reset to the preset value at the beginning of the timed output and continue to decrement the time, as long as the timer input is low.



## 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 back of the CUB Controller body, until it is against the back of the bezel. 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.

## WIRING CONNECTIONS

There are certain considerations that should be observed when running the 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 control leads in the same conduit or race ways with conductors feeding motors, solenoids, SCR controls, inductive loads, heaters, etc. Ideally, control wires should be run by themselves in a separate conduit.
3. Control 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.

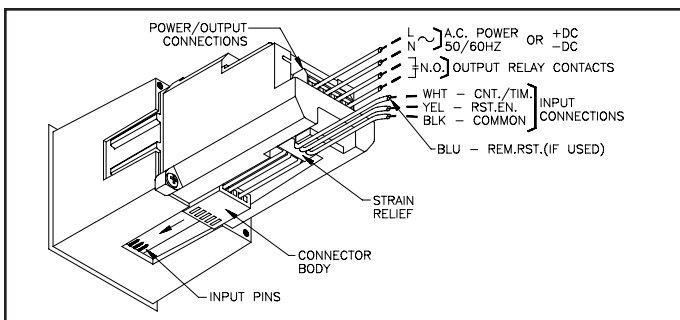
**Remote Reset (Blue wire)** - Performs a manual reset to the unit when connected to common (Maintained reset).

**Time Input (White wire)** - The timer 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" 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 unit's, 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.

## 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)

DPDT RELAY P/N - RLY40000 (230 VAC-10 Amp)

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

## 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.

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.

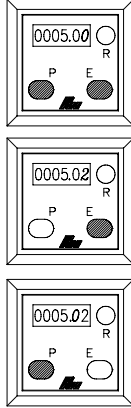
The Enter button is used with "R" button to initiate the self-test. Also, it is used with the "P" button to enter the programming mode for the preset value.

## PROGRAM PRESET VALUE

The factory default Preset Value is 5.00 for 0.01 sec. or min. version units (0.500 for 0.001 sec. or min. versions). 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 time 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 effect 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.

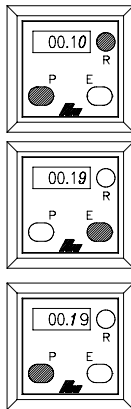
*Note: In the programming mode, the unit can continue to accumulate time and activate the output.*

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 press the "P" button to enter the new value (the unit automatically returns to the normal operating mode). The new timed output value takes effect 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.

## SELF TEST

The self-test feature can be activated without affecting the time. 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 the time input is low during the test, be aware that as the DIP switch positions change, the timer 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 APPLICATION

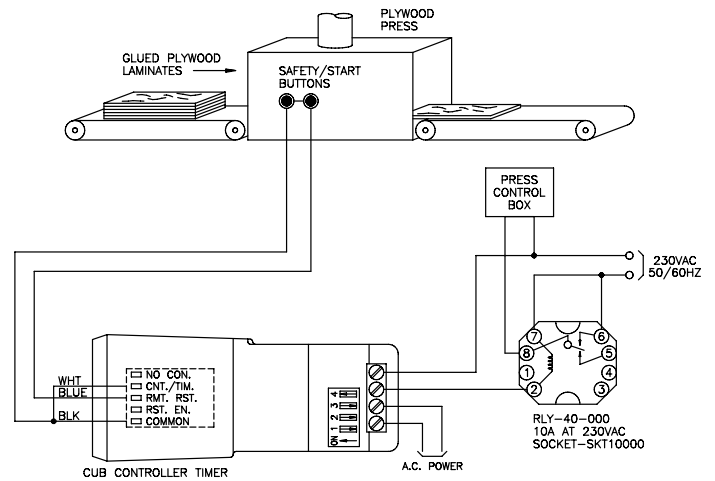
### CONTROLLING LENGTH OF PRESS TIME

A plywood manufacturer must control and vary the amount of time that his in-line plywood press is closed. The loading and unloading of the plywood is done manually on a conveyor belt system and the amount of time varies due to width and height of the plywood. Because of this requirement, manual activation of the press cycle is necessary. The time the press must be closed is typically 40 seconds but varies according to the number of stacked laminations (thickness). The Cub Controller Timer (seconds unit version) is installed to meet these requirements.

As shown in the drawing, the time input (CNT./TIM.) is connected directly to common. The output of the Controller is connected to a 230 VAC source which is used to activate the coil of the accessory relay. One of the normally open contacts of the accessory relay is used to activate the press control box. The safety and start buttons are connected in series between the Controller Remote Reset terminal and the Common terminal. The unit is set to mode 1 operation which is the one shot mode, manual reset to zero. The preset value is set to 40.00 seconds or the necessary value for the plywood thickness.

Operation is as follows:

1. The operator loads the stack of glued plywood laminations into the plywood press.
2. The operator momentarily presses both safety and start buttons at the same time. This resets the Cub Controller to zero.
3. At release of the buttons, the Controller relay output closes.
4. The accessory relay activates and causes the plywood press to close and stay closed until the Controller reaches its preset value.



5. When the preset value is reached, the relay output opens.
6. This deactivates the accessory relay opening the plywood press.
7. The press remains open until the operator presses the safety and start buttons for the next stack of laminations.

## ORDERING INFORMATION

| MODEL NO | DESCRIPTION        | PART NUMBERS FOR AVAILABLE SUPPLY VOLTAGES |              |              |          |
|----------|--------------------|--|--------------|--------------|----------|
|          |                    | 230 VAC                                    | 10 to 28 VAC | 10 to 28 VDC | 115 VAC  |
| CUBT     | CUB Timer/.01 sec  | CUBT0010                                   | CUBT0020     | CUBT0030     | CUBT0000 |
|          | CUB Timer/.01 min  | CUBT0110                                   | CUBT0120     | CUBT0130     | CUBT0100 |
|          | CUB Timer/.001 sec | CUBT0210                                   | CUBT0220     | CUBT0230     | CUBT0200 |
|          | CUB Timer/.001 min | CUBT0310                                   | CUBT0320     | CUBT0330     | CUBT0300 |
| RLY      | DPDT Plug-In Relay | RLY40000                                   | -            | -            | RLY30000 |
| SKT      | Octal Base Socket  | SKT10000                                   |              |              |          |

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

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#### **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 herein and relies on no other warranties or affirmations.

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