

# PRELIMINARY

BULLETIN NO.  
DRAWING NO. LP0414  
EFFECTIVE 5/97

## MODEL CUB7T PROGRAMMABLE GENERAL PURPOSE ELECTRONIC TIMER

- 10 PROGRAMMABLE TIMER RANGES
- 3 (8 Digit 0.35") LCD DISPLAY OPTIONS (Reflective, Red Transmissive, Yellow/Green Transmissive) with "Timer Active" annunciator
- AVAILABLE IN EITHER CONTACT OR VOLTAGE VERSIONS
- REPLACEABLE INTERNAL LITHIUM BATTERY (provides up to 7 years of uninterrupted operation)
- FRONT PANEL AND REMOTE RESET INPUT
- BOTH FRONT PANEL PROGRAM AND RESET BUTTONS ARE INDIVIDUALLY ENABLED
- NEMA 4X/IP65 SEALED FRONT BEZEL
- WIRE CONNECTIONS VIA SCREW CLAMP TYPE TERMINALS
- FITS DIN STANDARD CUT-OUT 1.77" (45 mm) x 0.874" (22.2 mm)

### DESCRIPTION

The CUB7T is an 8-digit miniature programmable timer with large 0.35 inch (8.90 mm) high digits. It has an LCD read-out available in Positive Image Reflective (CUB7T000, CUB7T100), Negative Image Transmissive with yellow/green backlighting (CUB7T010, CUB7T110) or red backlighting (CUB7T020, CUB7T120). The backlight versions require an external 9 to 28 VDC power supply.

The CUB7T is available in either Contact or Voltage versions. The Contact versions (CUB7T0xx) operate from a switch contact or an open collector NPN transistor. The Voltage versions (CUB7T1xx) operate from a signal voltage of 10 to 300 V (AC 50/60 Hz or DC).

The CUB7T counters use a CMOS LSI counter circuit chip, mounted on a gold-plated substrate, that is electrically connected by ultrasonic wire-bonding. Proven micro-electronic assembly and manufacturing techniques provide these units with the reliability and dependability required for industrial service.

The CUB7T series is housed in a lightweight, high impact plastic case with a clear viewing window. The sealed front panel with the silicone rubber reset button meets NEMA 4X/IP65 specifications for wash-down and/or dusty environments, when properly installed.

### SAFETY SUMMARY

All safety related regulations, local codes and instructions that appear in the manual 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.



CAUTION: 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 SOURCE: Replaceable Internal 3.0 V lithium battery to provide up to 7 years of continuous operation. (Battery life is dependent upon usage. Contacts that remain closed for long periods of time reduce battery life.)
3. BACKLIGHT POWER REQUIREMENTS: 9 to 28 VDC; 35 mA. typical, 50 mA max. Above 26 VDC, derate max. operating temperature to 40°C.
4. ANNUNCIATOR: Annunciator in the upper left corner of the display flashes at a 2 Hz rate when the signal input is activated.
5. SIGNAL INPUT: (LS terminal #4)  
Contact Input (CUB7T0xx): Switch Contact or solid state Transistor Switch to Common. Contact burden 15  $\mu$ A max. A maintained closed switch to COM will actuate the timer.  
Voltage Input (CUB7T1xx): 10 V min. to 300 V max. (AC 50/60 Hz. or DC) to Common. Input current 0.5 mA max. ANY off-state leakage current may activate the timer. Constant voltage applied to the input will actuate the timer. Due to the internal digital filtering to this input, up to 30 msec of error may be added per activation of the signal input.
6. REMOTE RESET: 15 msec min. pulse width (active low) from 3.0 V bipolar output, an open collector transistor, or a switch contact to common.
7. ACCURACY: 0.025% (+ up to 30 msec per activation of signal input—CUB7T1xx only)

### 8. CERTIFICATIONS AND COMPLIANCE:

#### EMC EMISSIONS:

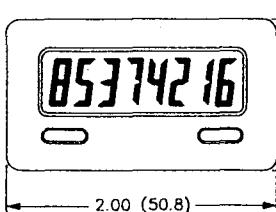
Meets EN50081-1: Residential, Commercial and Light Industry CISPR 22 Radiated and conducted emissions

#### EMC IMMUNITY:

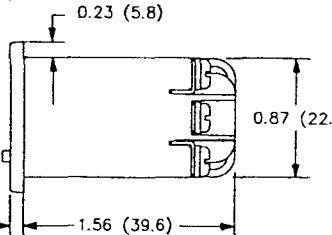
Meets EN 50082-2: Industrial Environment.  
ENV 50140 - Radio-frequency radiated electromagnetic field  
ENV 50141 - Radio-frequency conducted electromagnetic field I  
EN 61000-4-2 - Electrostatic discharge (ESD)  
EN 61000-4-4 - Electrical fast transient/burst (EFT)

### 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.



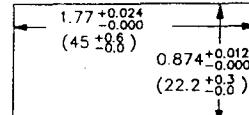
1.10 (27.9)  
2.00 (50.8)  
0.10 (2.5)  
1.56 (39.6)



0.23 (5.8)

0.87 (22.0)

#### PANEL CUT-OUT



1.77  $^{+0.024}_{-0.000}$   
(45  $^{+8.8}_{-0.0}$ )  
0.874  $^{+0.012}_{-0.000}$   
(22.2  $^{+0.3}_{-0.0}$ )

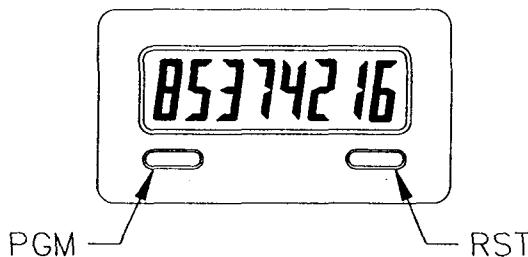
#### Notes

1. No loss of performance during EMI disturbance at 8 Vrms.  
Permissible loss of performance during EMI disturbance at 10 Vrms:  
Segments may turn on and off.
  - For operation without loss of performance:  
Install power line filter, RLC#LFIL0000 or equivalent.
  - Refer to EMC Installation Guidelines section of the manual for additional information.
- 9. ENVIRONMENTAL CONDITIONS:**
- Operating Temperature Range:** 0 to 50°C Derate max. operating temperature to 40°C above 26 VDC (Backlight versions).
- Storage Temperature:** -30 to 80°C
- Operating and Storage Humidity:** 85% max. (non-condensing) from 0°C to 50°C.
- Altitude:** Up to 2000 meters
- 10. CONSTRUCTION:** High impact plastic case with clear viewing window. The front panel meets NEMA 4X/IP65 requirements for indoor use when properly installed. Installation Category II, Pollution Degree 2. Panel gasket and mounting clip included.
- 11. WEIGHT:** 2 oz. (57 grams) [with battery]

#### PROGRAMMING INFORMATION

The CUB7T's timer range can be modified in the Program mode. The Program mode uses the PGM button (refer to photo) to switch between Program and Operate modes. The RESET button (refer to photo) is used to select the desired timer range.

*Note: Timer range and accumulated time on the display will be lost if the battery is removed from the unit*



Connecting a wire from the RST EN (Reset Enable) or the HS (Program Enable) Input terminals to COM, will enable the front panel reset or Program buttons respectively.

When the PGM button is pressed, the CUB7T will enter the PROGRAM mode, which will allow the unit to be set to any of the Timer ranges. When the PGM button is pressed, the CUB7T display will change to 00000.000 to indicate Timer Mode 0 (0.001 Sec). If the RST button is pressed, the display will increment to 11111.11 (0.01 Sec). Pressing the RST button again will continue to increment the display (and Timer range) until 9999.99.99 is reached. At that time, the display will return to 00000000. Pressing the PGM button will return to the operating display from the timer mode with the new timer range and decimal point position enabled. Any new time accumulated will be at the new rate. Refer to TABLE 1 for the available timer ranges.

*Note: To avoid incorrect display information, it is recommended that the CUB7T be reset after making programming changes.*

TABLE 1

Timer Mode	Timer Range
0	0.001 Sec
1	0.01 Sec
2	0.1 Sec
3	1 Sec
4	0.1 Min
5	1 Min
6	0.01 Hr
7	0.1 Hr
8	1 Hr
9	Hr:Min:Sec

#### INSTALLATION

The CUB7T meets NEMA 4X/IP65 requirements, for indoor 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.

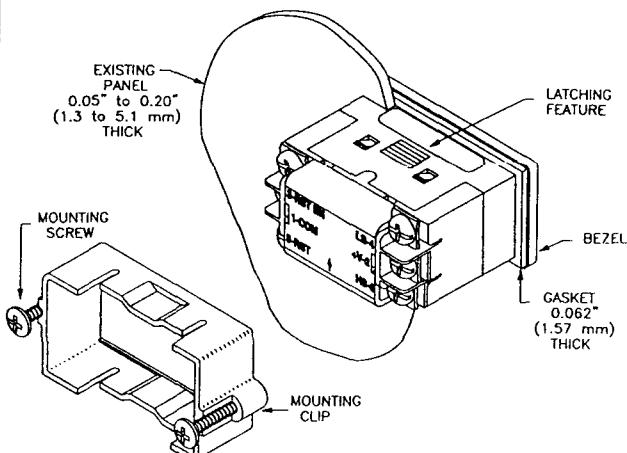
#### Installation Environment

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.



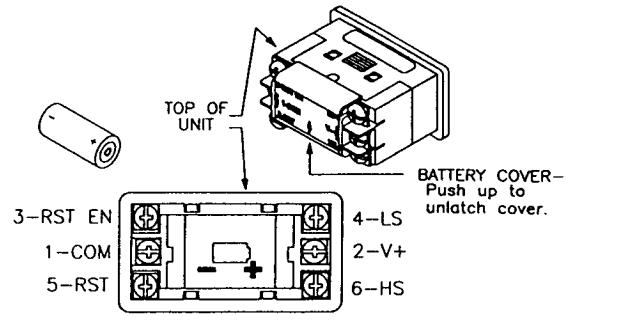
The following procedure assures proper installation:

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.
3. Slide the panel gasket over the rear of the counter body to the back of the bezel. Install CUB7T unit through the panel cut-out.
4. Insert the mounting screws onto both sides of mounting clip. Tip of screw should NOT project from hole in mounting clip.
5. 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 CUB7T housing.
6. Note: It is necessary to hold the unit in place when sliding mounting clip into position.
7. 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.
8. If the gasket is not adequately compressed and the mounting screws can no longer be turned, loosen mounting screws, and check that the mounting clip is latched as close as possible to the panel.
9. Repeat from step #5 for tightening mounting screws.

## BATTERY INSTALLATION

- To remove the battery cover, push upward in the direction of the arrow on the rear cover (See drawing at right), until the cover unlatches. Pull the cover straight out from unit to fully remove.
  - Remove old battery\* and replace it with an RLC battery (BNL10000). Observe proper polarity when replacing the battery as shown in the drawing.
  - Replace the cover. The battery cover is keyed so that it cannot be placed upside down. The arrow on the rear of the cover should point toward the top of the CUB7T when properly installed.
- \* - Dispose of properly.

**WARNING:** Lithium battery may explode if incinerated.



## EMC INSTALLATION GUIDELINES

Although this unit is designed with a high degree of immunity to ElectroMagnetic 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 unit may be different for various installations. In extremely high EMI environments, additional measures may be needed. The unit 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 a troublesome installation. Listed below are some EMC guidelines for successful installation in an industrial environment.

- 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 unit 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 run 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 away 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

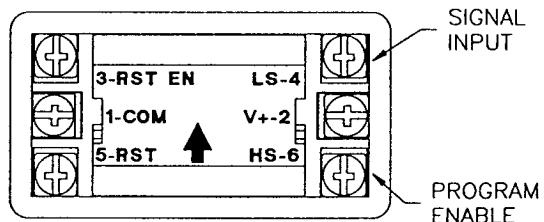
Corcom #1VR3

*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.

## WIRING CONNECTIONS

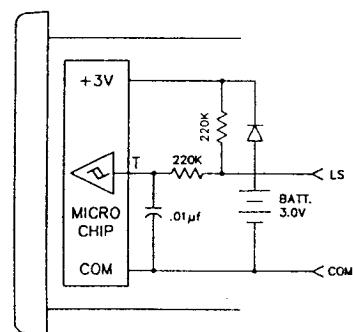
The electrical connections are made via screw-clamp terminals located on the back of the unit. All conductors should meet voltage and current ratings for each terminal. Also cabling should conform to appropriate standards of good installation, local codes and regulations. It is recommended that power supplied to the unit be protected by a fuse or circuit breaker. When wiring the unit, use the battery cover 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 under the screw-clamp and tighten down the screw until the wire is clamped in tightly. Each terminal can accept up to two #14 AWG wires.



**WARNING:** Lithium battery may explode if incinerated.

**CAUTION:** All leads will be at the same line potential as the input leads.

## L.S. INPUT; CONTACT VERSIONS

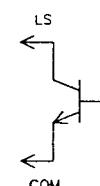


Pulling the "L.S. CNT." Input to Common with a mechanical or solid-state switch activates the timer. The switch load is 15 μA (max. voltage drop 0.5 V) when ON. The OFF-state leakage current must be less than 2 μA.

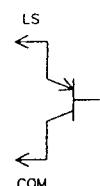
SWITCH  
CONTACT  
INPUT



NPN  
O.C. TRANSISTOR  
OR (N) FET  
INPUT

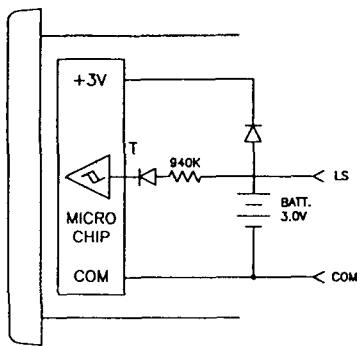


PNP  
O.C. TRANSISTOR  
OR (P) FET  
INPUT



Reed switches, mercury wetted contacts, snap action limit switches, and silver alloy relay contacts with wiping action are usually satisfactory for generating count input signals. Motor starter contacts, tungsten contacts, and brush-type contacts should not be used.

## L.S. INPUT; VOLTAGE VERSIONS



The CUB7T accepts most machine control voltage signals. The input accepts AC (50/60 Hz) or DC control voltages from 10 to 300 V. The unit times when the LS input is connected to COM.



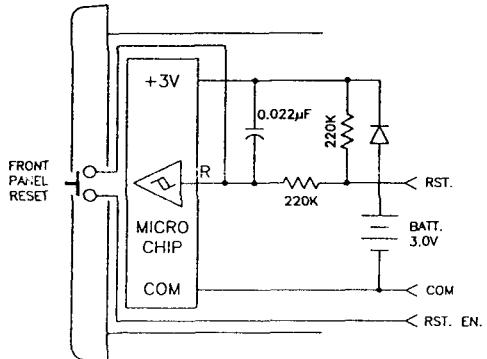
**Warning:** Any lead may be at hazardous live input potential. External wiring and devices connected to the unit must be rated the same as applied signal input voltage and be properly isolated from Class 2 or SELV circuitry.

## RESET AND PROGRAM OPTIONS

Connecting a wire from the RST EN (Reset Enable) or the HS (Program Enable) Input terminals to Common will enable the front panel Reset or Program buttons.

Pulling the "RST." input low causes the counter to reset. The "RST." can be pulled low by either a mechanical switch or solid-state transistor switch. The Switch load is 15  $\mu$ A (max. voltage drop 0.5 V) when ON. The OFF-state leakage current must be less than 2  $\mu$ A.

*Note: The RC protection circuit on the "RST." Input causes a delay of approximately 15 msec in Reset response.*



**WARNING:** Lithium battery may explode if incinerated. RST or Signal Input voltage must not exceed 3.0 VDC on contact input versions, or the maximum rated voltage on voltage input versions to prevent damage to the unit.

## APPLICATIONS

## TROUBLESHOOTING

For further technical assistance, contact technical support at the appropriate company numbers listed.

## ORDERING INFORMATION

MODEL NO.	DESCRIPTION		PART NUMBER	PRICE
CUB7T	CONTACT INPUT	Timer; Positive Image Reflective	CUB7T000	
		Timer, w/Yel-Grn Backlighting	CUB7T010	
		Timer; w/Red Backlighting	CUB7T020	
	VOLTAGE INPUT	Timer; Positive Image Reflective	CUB7T100	
		Timer, w/Yel-Grn Backlighting	CUB7T110	
		Timer; w/Red Backlighting	CUB7T120	
BNL	3 V Lithium Battery		BNL10000	