

## INTRODUCTION

The CT87E is a precision instrument used to monitor and record the presence or absence of voltage, light, or sound level such as what would be produced by an operating electric motor or compressor. The CT87E may be carried as a portable instrument or mounted in a fixed location.

The CT87E offers a variety of features to meet any event recording requirements. A combination of three adapters and four chart speeds provide a high degree of flexibility. In addition the chart rotation may be set for single or continuous turn operation as required by a particular application. To protect the data being recorded the CT87E uses an automatic battery backup to maintain operation during a power outage.

## CT87E FEATURES AND CONTROLS

1. The **3 DIGIT COUNT / TIME DISPLAY** provides the operator with the total number of “**ON**” events, or the interval between each “**ON**” event, or the total number of events that have occurred during the monitoring period. When the CT87E is operating on battery power the display will flash once every several seconds to indicate battery operation and conserve battery power. When the batteries are nearly discharged, the display will alternate the display reading and “**LO**” to advise the operator that the batteries are discharged and the CT87E will shortly cease operation.

**NOTE:** The battery backup feature of the CT87E is primarily intended for use in situations where primary power is lost for short periods of up to 48 Hrs. The CT87E is not intended to be used as a battery powered instrument. If the CT87E is to be stored for an extended period of time, it is strongly advised to disconnect the battery pack and remove the batteries to avoid damage to the instrument from battery leakage.

2. The **DISPLAY FUNCTION SELECTOR** allows the user to select the function of the LED display. The total number of events, the interval between the start of each event or the time of the last “**ON**” period may be selected by this switch.

3. The **CHART SPEED SELECTOR** allows the user to select the time of one full chart revolution. The corresponding chart has to be chosen according to the desired chart speed. Chart part numbers are listed on page 7 of this manual.

4. The **PEN POSITION ADJUSTMENT KNOB** allows the user to adjust the position of the chart pen. To achieve maximum usage of each chart two separate scales are supplied allowing each chart to be used twice.

5. The **CHART ADVANCE BUTTON** allows the operator to set the chart to the correct time. Press and hold the chart advance button until the desired time lines up with the Time Pointer (Item 11). The chart rotates counterclockwise only.

**CAUTION: Movement of the Chart Spindle (Item 9) by hand may cause permanent damage to the chart mechanism.**

6. The **RESET** button allows the operator to clear the reading on the display. The total number of events, the length of the last "ON" period, and the interval between the last event are set to zero. These values are also reset to zero when power is applied to the CT87E.

7. The **POWER ON/OFF / CONTINUOUS / SINGLE CHART SELECTOR** allows the user to apply power to the CT87E and to select Continuous or Single Turn for the chart rotation. When power is first applied to the CT87E, the display will show "888" to test each segment of the display, and the pen will move to the edge of the chart. The pen will then move to the correct position on the chart. In the Continuous switch position, the chart will rotate until power is removed. In the Single Turn switch position, the chart will make one complete revolution and stop. A blinking dot on the display (Item 1) will indicate that the chart has made one complete revolution and stopped. **To reset the chart for another revolution** place the switch in the Continuous switch position until the blinking dot goes out, and then slide the switch back to the Single Turn position. The chart will make one complete revolution and stop.

**DO NOT** move the pen by hand or interrupt the pen movement. Failure to observe this will cause the pen to read incorrectly and may result in damage to the pen mechanism.

8. The **RECORDING PEN** contains special ink. The pen has a wrap-around arm latch which makes the pen replacement "A SNAP!" To replace the pen, gently lift up the PEN ARM, (do not over bend pen arm) release the pen latch by pushing it down, and remove the pen; place a new pen on top of the pen arm, align the notches on the pen arm with the notches on the pen latch and close the latch by wrapping it around the pen holder until it is secured. Replace cap on the pen tip when the CT87E is not used to insure long pen life. *For pen installation see Fig. 1.*

9. The **CHART SPINDLE** holds and rotates the chart during the recording operation. **DO NOT ROTATE THE SPINDLE BY HAND AS IT MAY DAMAGE THE INTERNAL MECHANISM.**

10. The **PAPER CHART** is 6 inches in diameter. Four different charts may be used with the CT87E depending on the selected chart speed. The replacement charts are available from Omega in a box of 60 charts each. The chart part numbers are listed on page 6 of this manual.

**TO INSTALL A NEW CHART** ... Disconnect power from the CT87E by selecting OFF with the Power / Single / Continuous Chart Selector. Place pen cap on pen point. Gently lift the pen arm and while holding it, remove the old chart. Slide a new chart under the pen holder and the chart holding tabs. Align the chart with the chart spindle. Apply power to the CT87E and rotate the chart by depressing the chart advance button until the time pointer is aligned with the line on the chart representing the right time or day. Remove the pen cap. If desired, adjust the pen position according to the scale you wish to record on.

11. The **TIME POINTER** is simply a point against which the current time is being read during a chart rotation. Initially a new chart has to be rotated until the time pointer shows the right time and day when using a chart.

12. The **HANDLE** for carrying folds towards the back of the case to be out of the way when CT87E is mounted on the panel or on the wall.

13. The **KEYHOLE SLOTS** located on the back of the case are provided for wall or panel mounting.

14. The **REAR COMPARTMENT** was designed to store the battery holder for battery backup as well as the connection for the adapter box.

15. The **CT87E** is supplied with three different adapters. Each adapter detects a different type of event.

#### **KEV VOLTAGE EVENT ADAPTER**

The KEV is used to detect the presence or absence of AC or DC voltage. Two clip leads are provided to connect to the unit under test. **Operation of the voltage detector outside the specified range may cause permanent damage to the adapter and the CT87E.**

#### **CAUTION!**

***Electrical connection to any type of operating equipment is dangerous!! The voltage detector leads should only be connected when it has been determined that the power is off and the equipment is safe to touch!***

#### **KEL LIGHT EVENT ADAPTER**

The KEL is used to detect if the level of light illuminating the module is above or below an adjustable threshold. A user adjustment is provided to allow the KEL to be adjusted to the desired illumination threshold.

#### **KES SOUND EVENT ADAPTER**

The KES is similar to the KEL except that the KES responds to levels of sound. An adjustable sensitivity control is provided to allow the user to set the sound level threshold that the KES will respond to.

Each adapter will be discussed in more detail under the applications section of this manual.

16. The **BATTERY HOLDER** is stored in the rear compartment for backup batteries. Use of 8 alkaline "AA" batteries is required for proper operation.

17. The **12VDC PLUG IN WALL ADAPTER** provides primary power for the CT87E. Alternate sources of 12 Volt power may also be used. This allows use of the CT87E in automotive, marine or other mobile applications.

18. The **POWER CONNECTOR** is a connection point for the 12VDC wall adapter or alternate source of 12VDC power.

19. Snap on **EXTRA SUPPORT LEGS** for better stability.

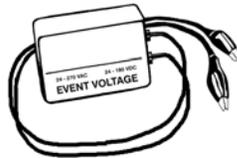
## KEV VOLTAGE EVENT ADAPTER APPLICATION

The KEV adapter detects the presence or absence of voltage in the range of 24VAC to 270VAC and 24VDC to 180VDC. The voltage detector used in the KEV is an electronic optically isolated circuit which will detect when a unit under test has voltage applied to it. Since the adapter is optically coupled, the CT87E is completely isolated from the unit being tested. This means that no special provisions have to be made for grounding or for differences in operating voltage between the unit under test and the CT87E. The KEV adapter connects to the CT87E by means of the supplied interface cable. Connect the KEV adapter to the CT87E prior to starting a new recording. Connect each clip lead to the points being tested. Any dirt, corrosion or oil should be cleaned prior to connecting the clip leads. There are no user adjustments on this adapter.

### **CAUTION!**

***Electrical connection to any type of operating equipment is dangerous!!  
The voltage detector leads should only be connected when it has been determined that the power is off and the equipment is safe to touch!***

Set the controls of the CT87E for the desired operation. Refer to opening section of this manual for a description and location of each adjustment and control. Make sure that the selected chart matches the Chart Speed setting and that the time is correctly set at the beginning of each recording. A scrap chart may be used during the initial setup to avoid unnecessary marks on the final recording.



## KEL LIGHT EVENT ADAPTER APPLICATION

The KEL adapter uses a sensitive photocell which compares the intensity of the ambient light to an adjustable threshold. The threshold adjustment knob is located on the side of the KEL adapter box. The Threshold Adjustment sets the level of light which the CT87E will recognize as an "ON" condition. The full counterclockwise position of the adjustment corresponds to a very low level of illumination being recognized as "ON" while the full clockwise position of the adjustment will require very bright light to be recognized as an "ON" condition. The adjustment of the KEL adapter is best illustrated by example.

**In this example** it is desired to determine the cycle of light use for a given room. The CT87E is set for a 24 Hour chart speed and the KEL adapter has been connected. The room light is turned on and while observing the chart pen position the operator adjusts the Threshold Adjustment knob until the chart pen moves to the "ON" position. The operator then turns off the room lighting (or covers the photocell) and determines that the chart pen moves to the "OFF" range of the recording chart. If it does not, the Threshold Adjustment is turned slowly clockwise until the chart pen moves to the "OFF" portion of the recording chart. Once the Threshold Adjustment is accomplished the operator may wish to reset the LED Display prior to starting the actual recording to get accurate count and interval information. During this initial adjustment it is suggested to use a scrap chart so as not to leave random marks on the actual recording chart. This is entirely at the option of the operator and is not



required for the setup of the CT87E. The resulting recording will show when, and for how long, the room lights were used over a 24 hour period. The above example is only one of many possible applications of the KEL adapter.

### **KES SOUND EVENT ADAPTER APPLICATION**

The KES adapter works much like the KEL adapter except that the KES adapter responds to the intensity of sound instead of illumination. The KES adapter uses a sensitive audio transducer to pick up sound from the surrounding environment and compare it to the adjustable threshold. When the sound level exceeds the threshold setting it is recognized as an "ON" condition and the chart pen will move to the corresponding portion of the chart. When the sound level falls below the threshold setting the KES adapter will recognize this as an "OFF" condition and move the chart pen accordingly. A small delay is built in to the response of the KES to avoid unintentional responses to transient noises such as door slams, dropped tools and the like.

The KES adapter uses the same type of threshold setting as the KEL. It is easiest to think of the threshold adjustment on the KES as a sensitivity adjustment. At the full counterclockwise setting only a very loud sound level will be recognized as an "ON" condition. At the full clockwise setting of the threshold adjustment



the KES will respond to very low levels of sound. In many cases the ambient noise in a small room will be sufficient to be recognized as an "ON" condition with the threshold adjustment at this setting.

**An example** is the best way to illustrate the use of the KES adapter. In this example it is desired to know the operating cycle of an air compressor. Since it is not only impractical to open the electrical box, but represents a safety hazard as well, the KES adapter provides the ideal solution for this application. The sound level the compressor produces in operation is well above the ambient noise level of the rest of the area so the KES can positively identify when the compressor is in operation.

The important thing to remember about the KES is that it provides a non-contact means of determining the operation of the device being tested.

The CT87E is set for a chart speed of 24 hours and the KES adapter is attached to the interface cable. The KES adapter is so positioned that it can not fall into the machinery or have any personnel trip over the interface cable, or the cord from the power adapter, yet is close enough to the compressor that it can detect the change in sound level when the compressor is in operation. The threshold adjustment is first set fully counterclockwise. When the compressor is operating, the threshold adjustment is advanced clockwise until the CT87E pen moves into the "ON" range of the chart.

For best result the threshold adjustment should be set so that the sound level is just above the detection threshold. If the setting is made too sensitive there is a chance extraneous noises will cause a "false" reading on the event recording. If the threshold setting is not made sensitive enough the CT87E may not detect every operation of the compressor. Best results will be obtained when the threshold setting is about halfway between the ambient sound level and the sound level of the unit under test. It is easy to understand that this will work best on equipment which

would normally produce a significant difference in sound levels during operation. As mentioned in the KEL section a scrap chart may be used during the setup of the KES to avoid random marks on the final recording.

### CT87E CHARTS

CT87C-6H	6 Hours
CT87C-24H	24 Hours
CT87C-7D	7 Days
CT87C-31D	31 Days

### CT87E SPECIFICATIONS

KEV RANGE	24VAC to 270VAC (50/60 Hz.), 24VDC to 180VDC
KEL RANGE	Illumination Threshold Range, 18 LUX to 1900 LUX +/- 20%
KES RANGE	Sound Threshold Range 40 dB to 114 dB @ 1Khz +/- 20%
Chart Speed Selectable	6 Hours, 24 Hours, 7 Days, 31 Days
Chart Speed Accuracy	+/-1%
Chart Diameter	6 inches
Display	3 Digit 0.5" LED to display event interval in minutes, length of the event in minutes, and total number of events
Display range	0 to 999 minutes or event counts
Recording Pen	Ink type
Power Supply	120 VAC, 50/60Hz. (Primary) (220/240 VAC 50Hz. Optional)
Battery Backup	8 Alkaline "AA" cells
Battery Life	Continuous, 48 Hours
Operating temperature	+32°F to 158°F (0°C to +70°C)
Relative Humidity	96% maximum
Dimensions	9 1/4" x 7 1/4" x 2 3/4"
Weight	4 lbs., 7oz.

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