

## CR4-KTH RECORDER WITH TEMPERATURE/HUMIDITY DEW POINT SENSOR

The CR4 is a precision, multifunction chart recorder. With the KTH sensor kit, the CR4-KTH becomes a temperature, relative humidity and dew point recorder with a digital display. The recorder was designed with the user in mind. No special knowledge is required to operate the CR4-KTH. The menu driven setup is logically simple and user friendly. All parameters are shown on a two line alphanumeric LCD display. The backlighting of the display enhances visibility under marginal lighting conditions.

The CR4-KTH uses two independent pens and records information on a 6 inch circular chart. Each pen is uniquely colored to maximize chart readability. The rotation of the chart may be set to Single Turn or Continuous.

In addition, a full function alarm feature is provided. The alarm of the CR4-KTH can be set to sound an audible signal when the temperature and/or humidity has exceeded an upper or lower limit. Each limit is individually set from the front panel. A delay time before the alarm is activated may be set by the user to prevent nuisance alarms. Low power normally open relay contacts are provided to allow activation of a remote alarm, phone dialer or annunciator. An optional RS-232 port allows connection to a computer for data logging or monitoring purposes.

Power is supplied through a 120VAC 50/60 Hz. plug-in adapter. External power may be supplied from any 12VDC source such as automotive, marine, or other battery. Battery backup for 48 hours is featured to provide operation during temporary power loss.

All functions of the CR4-KTH are accessed through five pushbuttons located on the front panel. Selectable functions are retained in a memory to avoid re-entering settings in the event of a power failure.

### QUICK START

1. Connect power supply to CR4-KTH through jack on right side of unit.
2. Plug power supply into 120VAC outlet.
3. Press **ON** button.
4. Pens will move to the "**Home**" position. (The outermost part of the chart.)
5. Pens will move to a position on the chart according to the display reading. This is called the **RUN** Mode. (Unit is always in the **ON** or **RUN** Mode when display is showing temperature, humidity and Dew Point readings.)

## MENU OR RUN?

The CR4-KTH has two basic modes of operation:

**MENU** mode. To review or change settings.

**RUN** mode. To display present conditions and record them.

If **MENU** mode is selected, the user can:

Set Chart Speed/Range.

Set red pen to record Temperature or Dew Point.

Set Single or Continuous Chart Rotation.

Set Alarm Status (Alarm delay section of **MENU** will not show when the alarm is disabled.):

Alarm Delay = 0

Alarm Delay = 10 Minutes /20 Minutes /1 Hour /2 Hours

If the **ALARM** is enabled, the following menu selections will be available:

Set Temperature High Limit

Set Temperature Low Limit.

Set Humidity High Limit.

Set Humidity Low Limit.

After menu setting, unit will automatically go into the RUN Mode after 30 seconds.

If the **RUN** mode is selected: The display will show Temperature, Humidity, and Dew Point.

While in the **RUN** mode, the user can:

Home the pens by pressing the **HOME** switch. (Allows for easy changing of charts and pens.)

Set blue pen position.

Set red pen position.

Advance the chart by pressing the **ADV** button. (To match present time with chart.)

## How to Change the Chart

1. Press the **HOME** button to move the pens to the outer edge of the chart.
2. Lift the pens with the lever. (Just enough to lift the pens from the chart.)
3. Remove the old chart.
4. Install the new chart on to the spindle.
5. Rotate the chart to the starting point with the **ADV** button.
6. Lower the pens.
7. Press the **MENU** button. This will put Recorder in the **RUN** Mode.
8. If the pen(s) position needs adjustment, see Pen Adjustment section below.

## CHART SPEED AND RANGE

The CR4-KTH offers 42 combinations of Chart Ranges and Chart Speeds to match a wide variety of applications. All functions of Chart Speed and Chart Range have been combined in one menu to make the necessary selections as easy and as fast as possible. A further aid to the user is the Supco chart number shown on the display for any combination of Chart Range and Chart Speed.

Chart Speed is the term used to describe the time it takes for the recording chart to make one complete revolution. Different applications will require different chart speeds. For example, the 31 day chart would generally be used where long term monitoring is required and frequent changing of the charts would be undesirable. The main disadvantage of this is that short-term variations in temperature or humidity will record as a single line or step on the chart. In applications that have wide short-term temperature or humidity variations the user may prefer a faster chart speed for more accurate analysis. The fastest chart speed is one revolution in 1.5 hours. This allows the user to record short-term variations in temperature and humidity in great detail. An example of this would be to test the defrost cycle in a frost free freezer or to observe the settling time of a temperature control system. Chart Range can be selected by the user for °F or °C. It is important to remember to place the appropriate chart on the recorder when changing from °F to °C or vice versa. The recorder will retain this information even when the power is disconnected or the unit turned off.

If the measured temperature is out of range (for the chart selected), the display will read the actual temperature, but the pen will not go beyond limit of the chart.

### How to Set the Chart Speed and Range

1. While in the **RUN** mode, press the **MENU** button. This will show the Beeper is **ON (OFF)** message. Press the **MENU** button again and the display will present the setting for chart speed.
2. To select a longer chart speed, press the **A** button, for shorter chart speeds press the **B** button. Each time the **A** or **B** button is pressed, the speed will change. Whatever speed is on the display will become the chart speed. The available chart speeds are:

1.5 Hrs.	6 Hrs.	24 Hrs.	31 Days
3 Hrs.	12 Hrs.	7 Days	
3. Press the **MENU** button again to go to the chart selection menu. To change the chart range and chart number, press the **A** or **B** button. Each time the **A** or **B** button is pressed, the range will change. Whatever range is on the display will become the chart range. Note that the chart number is displayed with the chart range for the user's convenience. The chart ranges available are:

-20°F to +120°F	-20°F to +50°F	+40°F to +110°F
+5°C to +45°C	-30°C to +10°C	-30°C to +50°C

4. Press **MENU** to proceed in **MENU** Mode or press **B** to return to the **RUN** mode. **If no button is pressed for 30 seconds, the recorder will automatically return to the Run mode.**

## **RED PEN MODE**

The red pen may be used to record Temperature or Dew Point. The blue pen will always record Relative Humidity.

### **How to Select Red Pen to Record Temperature or Dew Point**

1. Press **MENU** until "**Red Pen =** " message appears.
2. Press **A** to toggle between Temperature and Dew Point, Press **B** to go to **RUN** mode or **MENU** to continue in **MENU** Mode.

### **How to set Single Turn or Continuous Chart Rotation**

The recorder can be set to rotate the chart continuously or stop after one revolution.

1. Press **MENU** until "**Single Turn or Continuous**" message appears.
2. Press **A** to toggle between Single and Continuous.
3. Press **B** to go to **RUN** Mode.
4. Press **MENU** to continue in **MENU** Mode.

## **ALARM AND DELAY**

When temperature, humidity or both measurements pass above or below the thresholds set in the menu function, the CR4-KTH will execute a preset operation. This operation is described as an Alarm condition or a Delay condition and is referred to simply as Alarm or Delay.

**Alarm** indicates that one or both measurements are above or below the preset thresholds and the CR4-KTH is sounding the audible alarm and has closed the relay contacts. The display will also be flashing the parameter that has caused the Alarm condition.

**Delay** is a condition in which one or both thresholds have been passed, but the audible alarm and relay contacts are not activated for a preset delay time. Delay is used to prevent nuisance and false alarms.

### **Example:**

In the normal operation of an environmentally controlled chamber the door will be periodically opened to access the contents within. When this happens warm humid air will enter the chamber causing a momentary increase in temperature and relative humidity. Without the Delay function this would cause a false alarm indicating a controller failure when in fact no failure has occurred.

The Delay can also be used to prevent nuisance alarms on coolers or similar devices which have frequent door openings. Without the Delay function an alarm would be started as a result of a short term increase in temperature caused by the door being opened and again no failure of the system has occurred.

The CR4-KTH allows the user to select one of five Delay times, Zero Delay, 10 minutes, 20 minutes, 1 hour or 2 hours. The Delay time selected will depend on the application and will vary from installation to installation. It is up to the judgment of the user to determine the best Delay time for a given application. When a Delay time of zero is selected the Delay function is disabled. When a temperature or humidity threshold is passed the audible alarm and relay contacts will close immediately. When a Delay time other than zero is selected the audible alarm and relay contacts will not activate until one or both temperature and humidity thresholds have been exceeded continuously for the period of the Delay time. The display will flash the parameter which has caused the Delay condition to alert the user that one or more thresholds have been passed. At the end of the Delay time the audible alarm will sound and the relay contacts will close.

### How to Silence the Alarm: (Relay contacts remain closed.)

1. Press **MENU** and the display will show "**DISABLE ALARM** " message.
2. Press **A** to turn off alarm (only sound will be turned off, relay will remain closed.)
3. Press **B** to turn alarm (sound) on.
4. Press **MENU** to continue in **MENU** Mode.

In **RUN** Mode:

If a temperature limit has caused the alarm, the temperature reading will blink until the condition returns to normal.

If a humidity limit has caused the alarm, the humidity reading will blink until the condition returns to normal.

When the condition that caused the alarm is no longer present, the alarm and relay will be reset, the display will stop blinking and the alarm will be automatically reset. To disable the relay contacts and the blinking parameter(s), the alarm must be disabled. See How to Set the Alarm and Delay below.

### How to Set the Alarm & Delay

1. Press **MENU** button until alarm status message appears.
2. Press button **A** to scroll through options:

Zero Delay	20 Min. Delay	2 Hour Delay
10 Min. Delay	1 Hour Delay	Alarm Disabled

(If the alarm is disabled, you must enable the alarm to get the delay sections of the **MENU**.)
3. Press **B** to go to **RUN** Mode or **MENU** to continue in **MENU** Mode.

## TEMPERATURE AND HUMIDITY LIMITS

The Temperature and Humidity Upper and Lower Limits allow the user to customize the alarm settings of the CR4-KTH to provide the greatest degree of protection while at the same time preventing unnecessary alarms. Since each application is unique, careful selection of the temperature and humidity thresholds are required to provide the maximum degree of protection. Both Temperature and Humidity high and low limits may be set. If the alarm is enabled, and any of these limits are exceeded, the display will blink the reading that went beyond the limit. An audible alarm (Beeper) will sound and the relay contacts will close after the delay time has elapsed. If the alarm is not disabled, any of the four limits could trip the alarm, therefore all upper and lower limits must be set.

### SETTING THE LIMITS

#### How to Set the Temperature High Limit

1. Press **MENU** until "**Temperature High Limit**" appears.
2. Press **A** to increase the limit, **B** to decrease the limit, or **MENU** to go to the Temperature Low Limit. The **A** or **B** button can be held down continuously to scroll the set point.

#### How to Set the Temperature Low Limit

1. Press **MENU** until "**Temperature Low Limit**" appears.
2. Press **A** to increase the limit, **B** to decrease the limit, or **MENU** to go to Set Humidity High Limit.

#### How to Set the Humidity High Limit

1. Press **MENU** until "**Humidity High Limit**" appears,
2. Press **A** to increase the limit, **B** to decrease the limit, or **MENU** to go to Set Humidity Low Limit.

#### How to Set the Humidity Low Limit

1. Press **MENU** until "**Humidity Low Limit**" appears.
2. Press **A** to increase limit, **B** to decrease limit.
3. Press **MENU** once and you will return to the **RUN** mode.

## TEMPERATURE AND HUMIDITY PEN POSITION ADJUSTMENT

NOTE: The blue pen has a longer arm to allow it to move over the red pen. Therefore one pen will record at real time and the other will lag or lead by 3/16".

In the normal course of operation charts, and eventually pens, will have to be changed on the CR4-KTH. When this occurs it may be necessary to adjust the pen position to match the reading of the display. This is most likely to occur when changing a pen.

### **How to Adjust the Blue Pen Position on the Chart (Humidity)**

1. Press the **HOME** button until the display reads "**Homing the Pens Please Wait**"
2. Press button **A** to select the pen adjustment menu.
3. Press button **B** to move blue pen in (toward hub) and button **A** to move blue pen out (toward edge of chart).
4. Press **MENU** to select red pen adjustment menu.
5. Press **MENU** again if no adjustment of the red pen is required otherwise go to the "**Adjust Red Pen**" instruction (next section).

### **How to Adjust the Red Pen Position on the chart (Temperature or Dew Point)**

1. Press button **A** to move the red pen out (toward outer edge of the chart).
2. Press button **B** to move the red pen in (toward hub).
3. Press **MENU** to return to the **RUN** mode.

### **TEMPERATURE/HUMIDITY SENSOR**

- The Temperature / Humidity sensors converts the temperature and relative humidity to electrical signals that the recorder uses to record and display temperature and relative humidity.
- The sensor will measure Temperature from -20°F to +130°F. (-30 to +54°C) and Relative Humidity from 0 to 100%. The Dew Point is calculated from these two measurements, and will range from +32°F to +130°F (-30°C to +54°C). Any readings of Dew Point outside of these limits will be invalid.
- The sensor must not be immersed in any liquid, and must not be subjected to temperatures outside the -20°F to +120°F range. Each sensor is field replaceable and no calibration is necessary when using a new or different sensor. Calibration by Supco to NIST traceable standards is available as an option.

### **BATTERY BACKUP OPERATION**

Battery backup allows the CR4-KTH to continue operation in the event of a power loss. Actual operating time will depend upon the condition of the batteries. With fresh alkaline batteries the typical operating time will be 48 hours. Alkaline batteries are essential for this type of application.

When the main power is lost the CR4-KTH will sense this and immediately turn off the backlight on the LCD display in order to save batteries energy. A "**B**" will be displayed in the upper right hand corner of the display to advise the user that

the CR4-KTH is operating on battery power. No other indication will be visible. The temperature and chart recording will continue until the batteries have been exhausted or the AC power is restored.

The CR4-KTH will monitor the battery power and when the batteries are almost exhausted, a "**Low Battery**" message will appear on the display. The batteries should be replaced as soon as possible to avoid erroneous readings. This prevents possible damage due to battery leakage and also assures that the CR4-KTH will remain in operation in the event of another power failure. The suggested battery backup consists of eight AA cells, however, a standard nine volt battery could be used to provide approximately one hour of backup. The following chart shows the life expectancy of various types of batteries.

**Batteries**

Eight Alkaline AA cells	48 Hours
Eight Rechargeable Nicad AA cells	24 Hours
Standard 9 Volt Alkaline Battery	1 Hour

The life expectancy of the batteries is based on the time when the CR4-KTT is being operated on batteries only. It is good practice to replace batteries every year. Do not keep batteries in CR4-KTH when not in use.

**RS-232 PORT**

The CR4-KTH provides an optional RS-232C port to allow the user to connect the recorder to a computer or network and allows continuous monitoring of the data being recorded. An adapter cable is supplied with this option to facilitate connection to an external computer.

Data is transmitted every time the sensor is sampled and is only interrupted during an update of the pen position. The data is delimited ASCII text and will transmit as Temperature, Relative Humidity, and Dew Point. The port parameters are as follows: 4800 baud, 8 Data Bits, No Parity & 1 Stop Bit.



## CR4-KTH SPECIFICATIONS

Operating Ambient Temperature Range	+32°F to +120°F (0 to +50°C)
Storage Temperature	0°F to +120°F (-18°C to +50°C)
Primary Power	115VAC, 50/60 Hz. Plug-in Adapter (220-240VAC, 50 Hz. optional)
Backup Power	8 AA alkaline batteries (Approx. 48 Hrs.)
Alternative Power	12 Volt vehicle operation with optional adapter
Temperature Accuracy	+/- 2°F (+/- 1°C)
Relative Humidity Range	0 - 100%
Relative Humidity Accuracy	+/- 2%
Dew Point Range	+32°F to +130°F (0°C to +50°C)
Sensor	Supco Part #KTH. Combined Temperature/Humidity with 6' cable (extended cable length is available)
Chart	6" Circular chart (see following table)
Chart Rotation Speeds	31 Days, 7 Days, 24 Hours, 12 Hours, 6 Hours, 3 Hours or 1.5 Hours
Chart Rotation Mode	User Selectable — Single turn or continuous
Chart Speed Accuracy	+/- 1 %
Display	Alphanumeric backlit LCD, 16 Characters, 2 Lines
Temperature Alarm Range	-20°F to +120°F (-30°C to +50°C)
Alarm Delay Range	User Selectable: No Delay, 10 Min., 30 Min., 1 Hr. or 2 Hr.
Remote Alarm Connection	Normally open contacts 48 VAC/ DC, 0.1 Amp., dry contacts
Mounting	Vertical or horizontal, Free standing or wall mounted
Dimensions	9.25" x 7.25" x 2.75"
Weight	2.5 lb.
Power Consumption	3.5 Watts maximum

## CHARTS

TEMPERATURE RANGES	CHART SPEEDS			
	12 HOURS	24 HOURS	7 DAYS	31 DAYS
-20 to +120°F	E20120F12	E20120F24	E20120F7	E20120F31
-20 to +50°F	E2050F12	E2050F24	E2050F7	E2050F31
+40 to +110°F	E40110F12	E40110F24	E40110F7	E40110F31
-30 to +50°C	E3050C12	E3050C24	E3050C7	E3050C31
-30 to +10°C	E3010C12	E3010C24	E3010C7	E3010C31
+5 to +45°C	E545C12	E545C24	E545C7	E545C31

\*NOTE: For 1.5 Hour, 3 Hour and 6 Hour readings, use the 12 Hour charts.

## **RECORDERS LIMITED WARRANTY**

Sealed Unit Parts Co., Inc. hereby warrants that it will repair or replace, at its option, any part of the Universal Series recorder, which proves defective by reason of improper workmanship or material, free of charge for parts and labor, for a period of one year from the date of original purchase by the buyer. This warranty does not apply if, in the sole opinion of Sealed Unit Parts Co., Inc., the Universal Series has been intentionally damaged due to misuse, neglect, improper packing, shipping, modification of servicing by other than Sealed Unit Parts Co., Inc., or personnel authorized by Sealed Unit Parts Co., Inc.. For information on how to obtain service under this warranty contact the dealer where your Universal Series recorder was purchased, or Sealed Unit Parts Co., Inc. at the address printed below:

Sealed Unit Parts Co., Inc.  
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Allenwood, NJ 08720 USA  
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