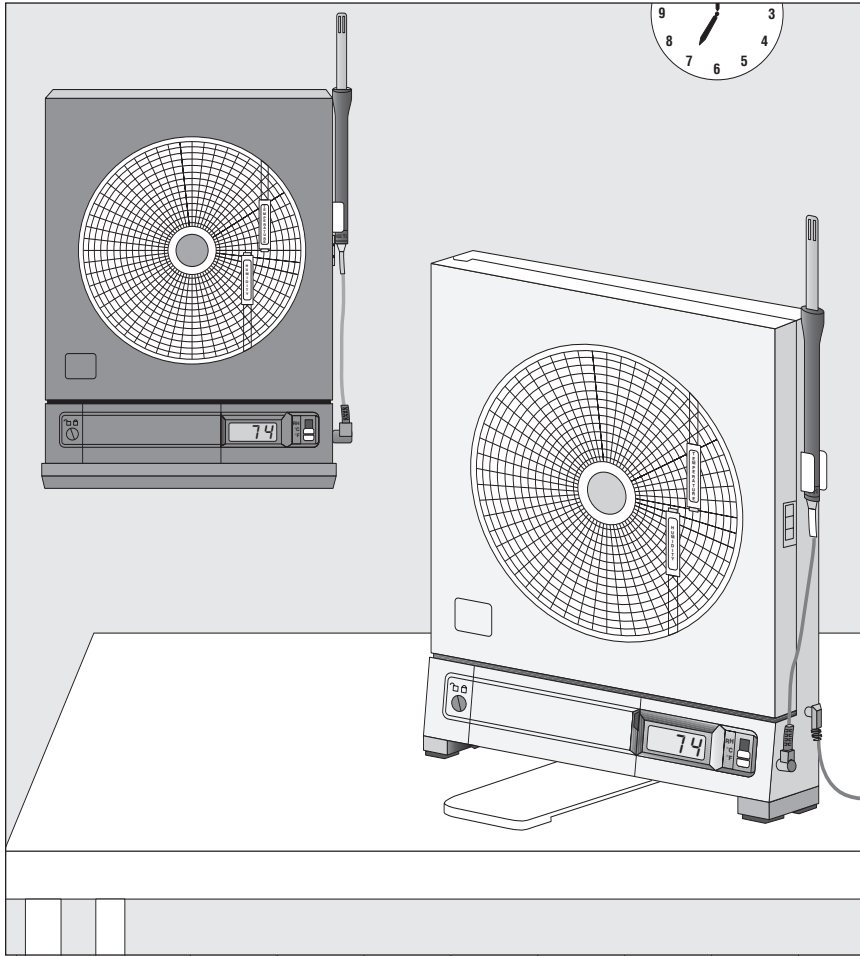


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WARNING: These products are not designed for use in, and should not be used for, human applications.

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This Electronic Temperature and Humidity Chart Recorder with Remote Sensor is an advanced micro computer controlled measuring and recording instrument.

The recorder affords precision rapid response, memory and display of peak readings, remote sensing, recording flexibility and simplicity of operation. This compact, portable instrument offers advanced features previously unavailable in its price range.

Features include:

- Continuous Update of Ambient °C or °F Temperature and Relative Humidity
- Rapid Response to Changes in Ambient Temperature and Humidity
- Remote Mount Sensor
- Digital Plots in 1° or 1% Increments
- Memory and Display of Peak Readings
- 1, 7 or 32 Day Charts
- Battery or ac Power Operation With Automatic Battery Power Backup
- Chart Indication for ac Power Failure/ac Power Return
- Audible Alarm with Relay Contact
- Low Battery Indicator
- Portable
- Wall Mount or Benchtop Mount
- Optional Analog Voltage Input Adapter to record an external 20 to 1200mV dc signal using the temperature pen
- Chart Lighting and display backlighting with use of ac adaptor
- Control Panel Lock
- Decorative Foot Cover for wall mounting

These features provide precise documentation, flexibility in application and ease of use, all made possible through the incorporation of advanced electronics.

1.1 Parts of the Recorder - Front and Side Views

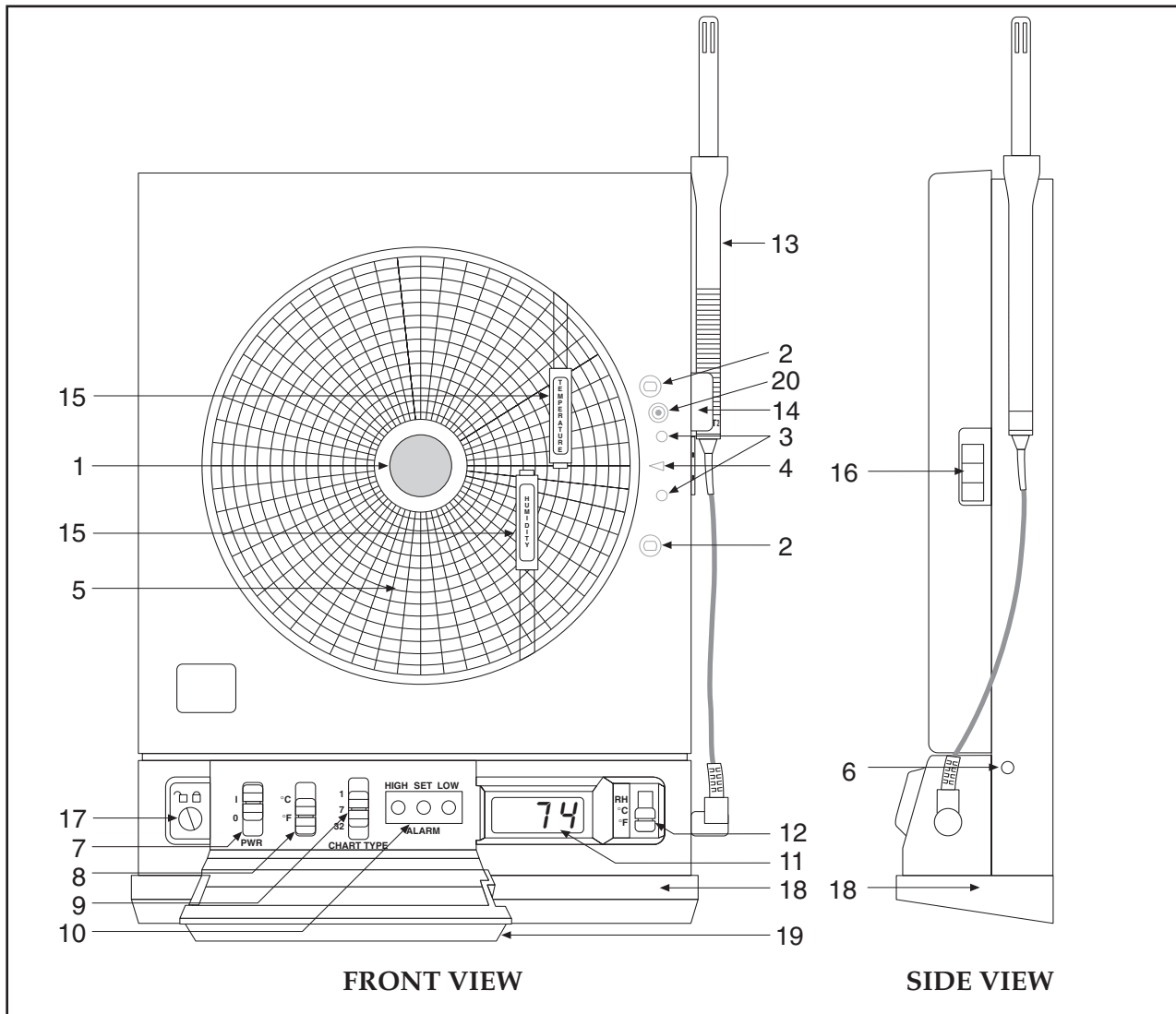


Figure 1-1. Front and Side Views of the Recorder

| Item | Description | Function |
|------|-----------------------------|--|
| 1 | Chart Paper Knob (magnetic) | Holds chart paper in place. |
| 2 | Light Bulbs | Lights up the paper in a dark room. Note that the bulbs function only when the recorder is powered by the 9Vdc adapter. |
| 3 | Pen Cap Posts | Holds the loose pen caps. |
| 4 | Time Set Arrow | Helps align the time on the new chart paper with the actual time. |
| 5 | Chart Paper (double sided) | Charts are available for 1, 7, and 32 day recording times in both °C and °F. See the inside back cover for a detailed list of paper available. |

| Item | Description | Function |
|------|---|--|
| 6 | ac Power Jack | Allows the unit to be powered from ac power using the ac adaptor (110Vac stepped down to 9Vdc) supplied. |
| 7 | Power Switch | Turns unit ON (I) or OFF (O). |
| 8 | °C/°F Mode Switch | Selects °C or °F chart operation. Note the following : <i>When switching from °C to °F, ONLY the humidity pen will move. The humidity zero point and scaling are different on C° and °F paper, causing the humidity pen to move when switching from °C to °F. The temperature zero point and scaling are the same on °C and °F paper (only the units change). Therefore, the temperature pen will not move.</i> |
| 9 | 1/7/32 Day Mode Switch | Selects chart type, 1, 7, or 32 day operation. |
| 10 | Alarm Display Buttons (HIGH, SET, LOW) | These buttons are accessible behind the control panel door. <u>High and Low buttons:</u> <ol style="list-style-type: none"> 1. Selects and changes calibration codes. 2. Chooses the high/low alarm limit (for either °F, °C or %RH). 3. Selects and changes the alarm limits. 4. Checks alarm limits in operating mode. 5. Low button only: when pressed during power up, disables the alarm function. <u>Set button:</u> <ol style="list-style-type: none"> 1. Activates calibration mode when pressed during power up. 2. Enters calibration codes in memory. 3. Activates alarm limits. 4. Enters alarm limits in memory. 5. Disables the sounding of the alarm (and activation of the relay) for 10 seconds. |
| 11 | LCD Display | Displays temperature and humidity values (depending on the setting of Display Selection Switch. |
| 12 | Display Selection Switch | Allows the user to select display of the current relative humidity, or ambient temperature in either °C or °F. Refer also to item #10. |
| 13 | Temperature/Humidity Sensor | Houses the electronic sensors which measure ambient temperature and relative humidity. |
| 14 | Sensor Holder (clip) | Holds the temperature/humidity sensor to the side of the recorder. |
| 15 | Pen Arm and Holder (2 each) | Holds and moves the temperature and humidity pens. |
| 16 | Latch Button | Releases and secures the recorder's door. |
| 17 | Control Panel Door Lock | Locks or unlocks the control panel door. |
| 18 | Decorative Foot Cover | Stays in place for wall-mounting the recorder. The cover must be removed for upright bench-top use (otherwise the recorder topples over)! |
| 19 | Control Panel Door | Covers the alarm display buttons (High, Set, and Low), power switch, 1/7/32 day mode switch, and °F/°C mode switch. |
| 20 | Light Bulb/Display Backlighting Push Button | Turns the light bulbs and LCD Backlighting on and off |

1.2 Parts of the Recorder - Rear View

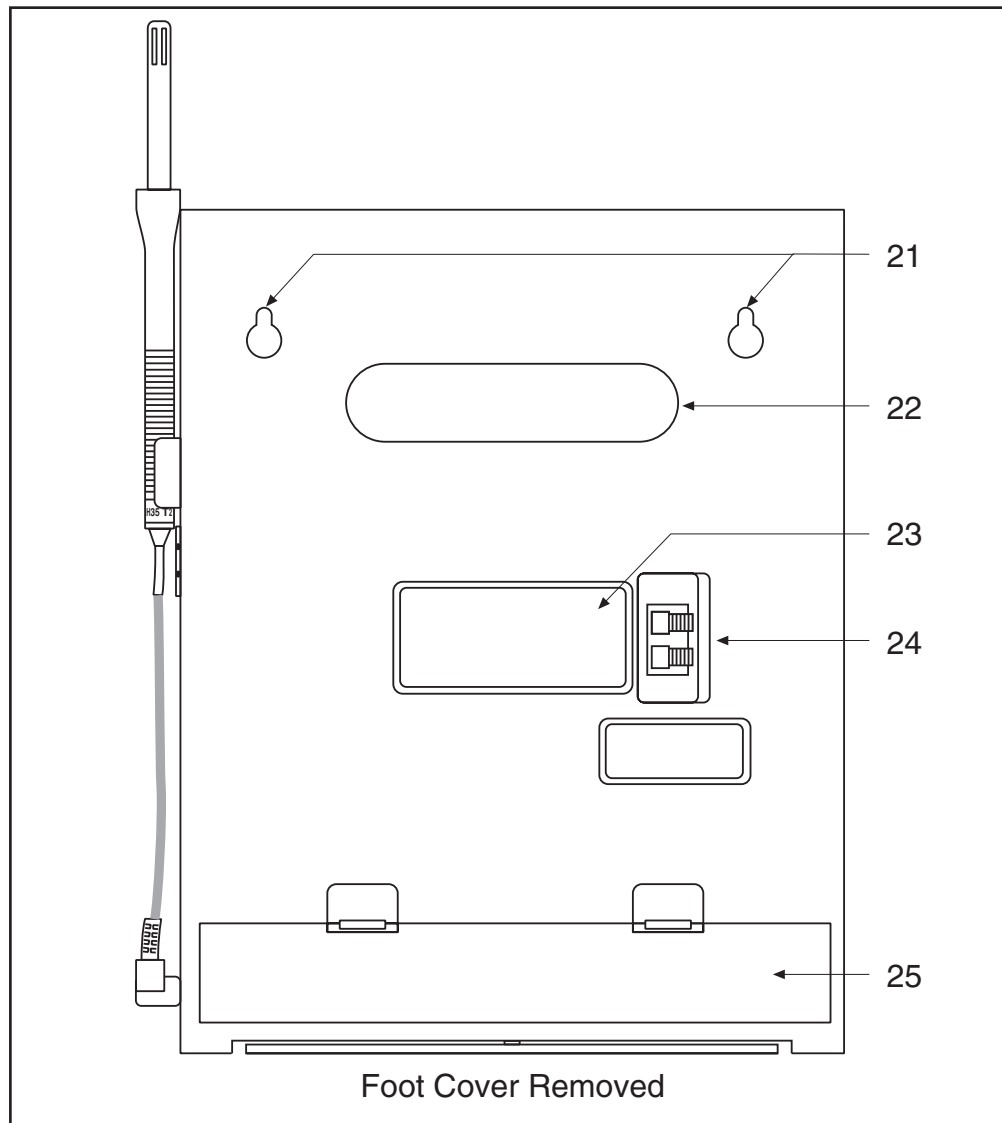


Figure 1-2. Rear View

| Item | Description | Function |
|------|-------------------------------|--|
| 21 | "Keyhole" Slot Mounting Holes | Allows the recorder to be mounted on the wall. |
| 22 | Carrying Slot | Allows the user to carry the recorder conveniently. |
| 23 | Product Label | Product information label. |
| 24 | Alarm/Relay Contacts | Allows the user to hook up an external, dry contact alarm to the recorder. |
| 25 | Battery Compartment | Holds 4 "D" size batteries which provide power if the ac adaptor is not used, or provide power backup in case of ac power failure. |

Now that you have learned about the different parts of the recorder, you can set it up.

Determine whether you want the recorder wall mounted or sitting on a bench top.

2.1 Placing the Recorder on the Bench Top

Figure 2-1 shows the removal of the decorative foot cover.

1. Place the recorder on its back (so it is face up).
2. Remove the clip-on foot cover by lifting up on the cover and releasing it from the stabilizing arm at the bottom of the recorder. This exposes the rubber feet and stabilizing arm. The rubber feet protect the bench top surface.



CAUTION

DO NOT ATTEMPT TO SET THE RECORDER UPRIGHT ON THE BENCH WHEN THE CLIP-ON FOOT COVER IS IN PLACE. THE RECORDER WILL TOPPLE OVER.

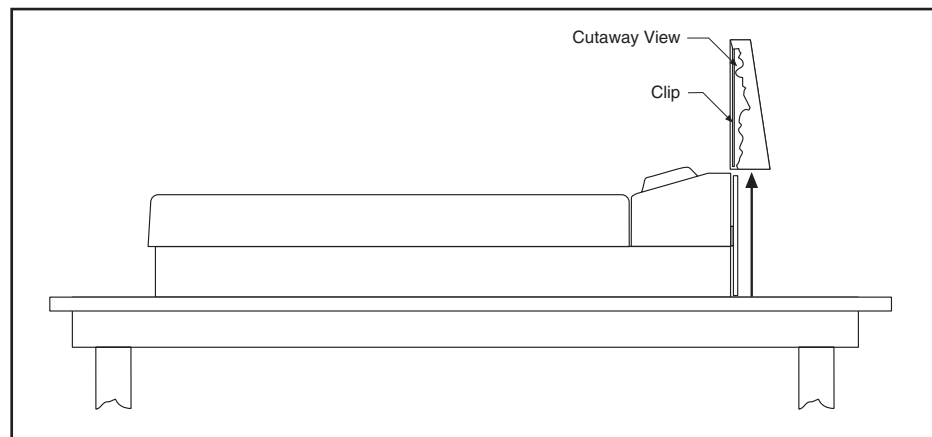


Figure 2-1. Foot Cover Removal

3. Swing out the stabilizing arm and extend it towards you. Figure 2-2 shows how to swing out the stabilizing arm. Make sure the slot in the stabilizing arm extends out the rear of the recorder.

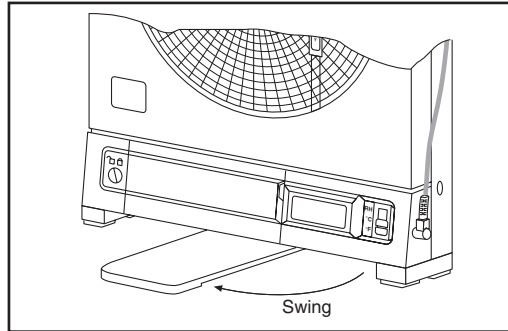


Figure 2-2. Swiveling Stabilizing Arm

NOTE

When the recorder is in normal operating position (the door is closed and the control panel door is closed), the stabilizing arm should be pushed to middle position (the bumps on the arm will click in place under the recorder). Refer to Figure 2-3a.

Before opening the chart door, pull the stabilizing arm out to its full extension position to provide full stability. Refer to Figure 2-3b. After closing the door, return the arm to its middle position. Refer to Figure 2-3a.

Note that the arm extends towards the front or rear of the case. If the unit is placed on a bench top snug against the wall, extend the stabilizing arm fully to the front of the unit. Refer to Figure 2-3b.

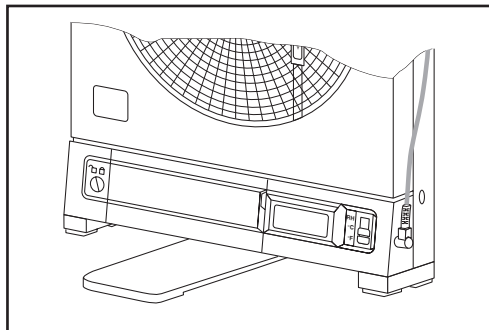


Figure 2-3a. Stabilizing Arm use for Bench Top Use (normal position)

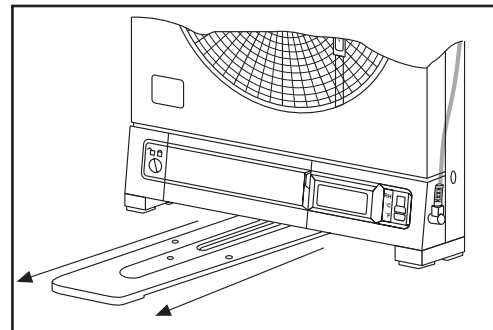


Figure 2-3b. Stabilizing Arm in Extended Position (position when you open door)

2.2 Mounting the Recorder on the Wall

To mount the recorder on the wall, first locate the wall mounting holes using the template provided in the wall mounting kit. Leave the decorative foot cover (Figure 1-1, item #18) in place*. After drilling the holes, insert the wall anchors and put in the screws, leaving $\frac{1}{8}$ inch (3 mm) between the screw heads and the wall. Hang the recorder by positioning the two (2) "keyholes" in the rear cover over the screw heads.

NOTE

The ac adaptor has a 6 foot (2 meter) cable.

* If the decorative foot cover is not in place, go through the following steps to reinstall the cover (if desired):

1. Place the recorder on the table (so it is front face up).
2. Roughly position the foot cover so the clips are in line with the stabilizing arm. Gently "stretch" the clips out and position over the arm as shown in Figure 2-4a.
3. Once the clips are in place, gently slide down until the foot cover is even with the front of the recorder as shown in Figure 2-4b.

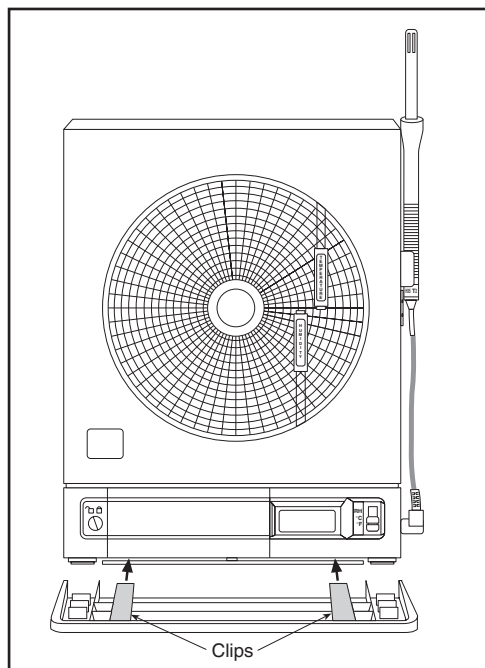


Figure 2-4a. Installing the Foot Cover (Top View)

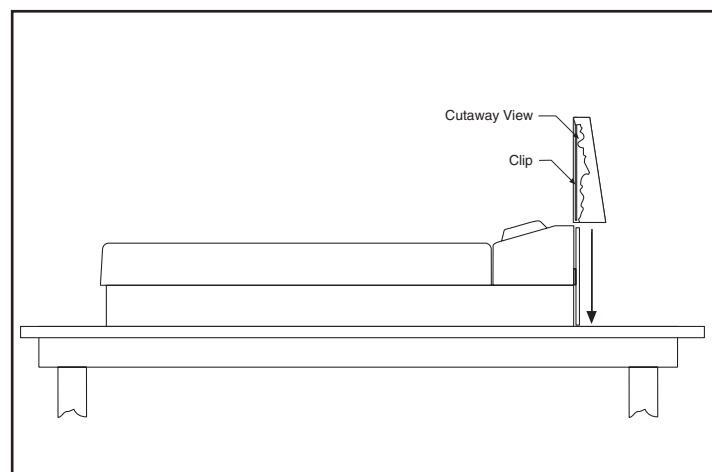


Figure 2-4b. Installing the Foot Cover (Side View)

2.3 Using Batteries

The recorder operates on either four “D” size batteries or on ac power. 110Vac and 220Vac adaptors are available.

NOTE

In the event of ac power failure, the unit will switch over to battery power automatically.

Keep a fresh set of batteries in the unit in case of power outage, when it will be especially important to have a record of ambient temperature and humidity.

2.3.1 Installing Batteries

You may power the recorder with four “D” size batteries. For adequate performance and battery life, use alkaline batteries. The recorder operates full time on battery power alone for up to one month when using fresh alkaline batteries. When replacing batteries, we recommend that you use Duracell MN1300 “D” size batteries for long life and for best performance at low temperatures.

To install the batteries (refer to Figure 2-5):

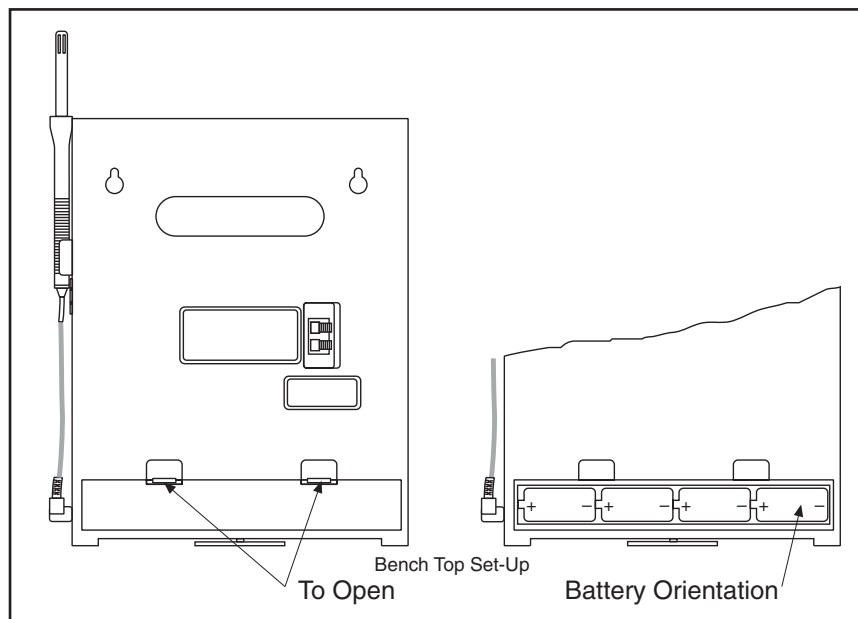


Figure 2-5. Battery Compartment and Battery Orientation

1. Open the control panel door.
2. Turn the power switch to the OFF or "O" position.
3. Place the recorder on a soft surface front face down. Locate the battery compartment at the bottom.
4. Open the battery compartment door by pressing down firmly on the tabs located along the top edge.
5. Remove the battery door.
6. Install the batteries, oriented as shown in Figure 2-5, in the battery compartment.
7. To replace the battery door, first place the bottom edge of the door into the positioning slots in the compartment.
8. Push down on the door to snap the tabs in place.

The recorder continuously monitors the battery voltage. A "LO BAT" indication in the upper left-hand corner of the main LCD (refer to Figure 2-6) indicates that only one to two weeks of reliable battery operation remain, and that the batteries need replacing within this time frame. Also, if the unit is operating under battery power and the battery voltage is too low to permit reliable operation, the system shuts down and displays "---" in the LCD. The system may be restarted by changing the batteries or by the re-initiation of ac power. If ac power fails, the circuitry will attempt to automatically switch to battery backup. If viable battery power is available, the system will operate on battery power until the batteries fail or ac power returns. When ac power returns, the recorder will automatically reset itself (refer to Section 8.5).

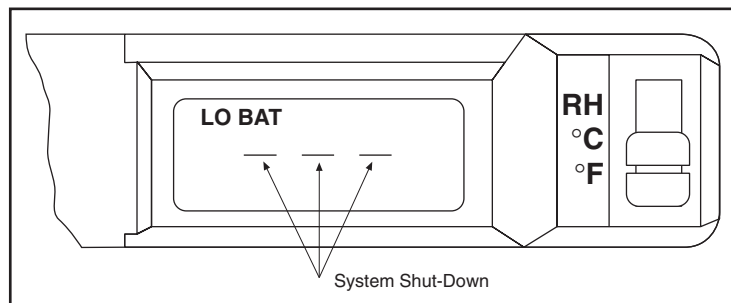


Figure 2-6. Battery Warnings

2.3.2 Connecting ac Power

The recorder can be ac powered using the 9Vdc, 1Amp ac adaptor supplied. The ac power jack is located on the right side of the unit (refer to Figure 1-1, item #6.). Make sure the power switch on the control panel (refer to Figure 1-1, item #7) is in the OFF or "O" position when plugging in the ac adaptor. The adaptor cable is 6 feet (2 meters) long.

2.4 Installing the Chart Paper

The recorder accepts six different types of chart paper. Charts are available for 1, 7 and 32 day recording times in both Fahrenheit or Celsius versions. Although chart paper replacing is very simple, you must take care to set the appropriate front panel switches for the paper being used. Set the chart type and °C/°F switches (refer to Figure 2-7) to the following positions for these six (6) modes of operation.

| Chart Type Switch (Days) | C/F Switch | Paper Type |
|--------------------------|------------|--------------------------|
| 1 | F | 1-day, Fahrenheit paper |
| 1 | C | 1-day, Celsius paper |
| 7 | F | 7-day, Fahrenheit paper |
| 7 | C | 7-day, Celsius paper |
| 32 | F | 32-day, Fahrenheit paper |
| 32 | C | 32-day, Celsius paper |

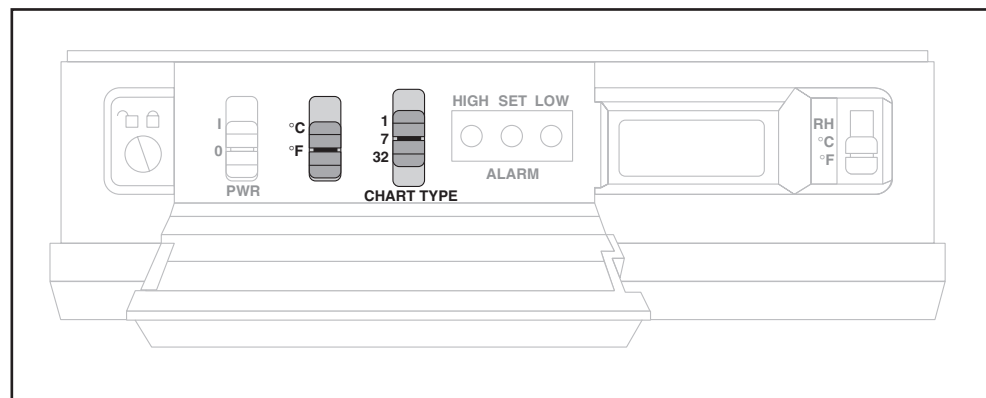


Figure 2-7. Chart Switches

You may obtain specialized paper as well. Refer to the inside back cover for the complete list.

To change the chart paper:

1a. Table Mounted Recorder:

To balance the recorder, fully extend the stabilizing arm at the bottom of the recorder. Refer to Figure 2-8. Continue to Step 2.

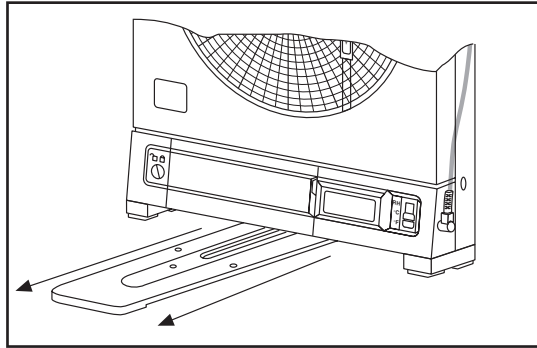


Figure 2-8. Stabilizing Arm Fully Extended

1b. Wall Mounted Recorder:

You can also leave the recorder on the wall if it is easily accessible.

2. Open the door and hold it open with left hand.
3. Remove the magnetic chart paper knob (Figure 2-9, item #2) and any used chart paper.
4. Place the new chart paper (Figure 2-9, item #1) on the spindle and rotate it until the current time on the chart paper is aligned with the time arrow on the chart base of the recorder. See Figure 2-9 detail.
5. When the chart paper is correctly oriented, replace the magnetic knob (Figure 2-9, item #2), being careful not to alter the position of the chart paper.
6. Make sure that the "Chart Type" switch, located behind the control panel door, is in the correct position relative to the chart paper used.

NOTE

If the switch is in the wrong position, the chart paper will not rotate at the correct speed causing the chart time not to be synchronized with the current time.

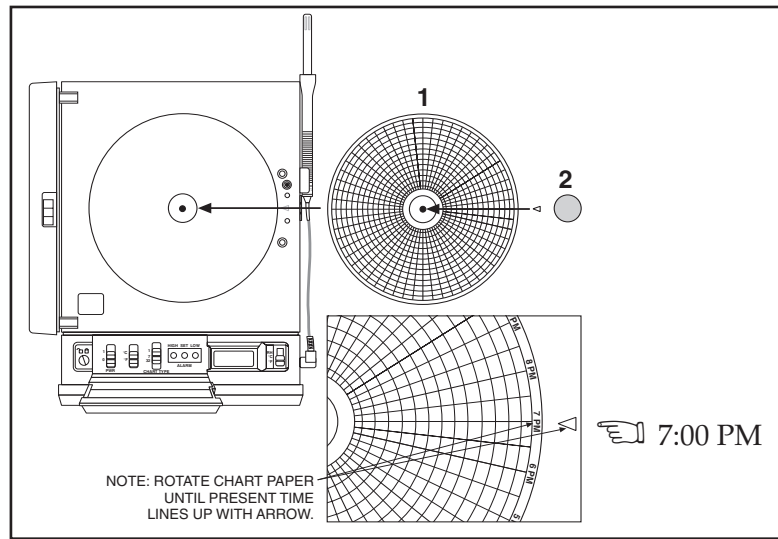


Figure 2-9. Changing Chart Paper and Setting the Time

2.5 Installing and Removing Pens

2.5.1 Installing the Pens

The recorder uses two different colored pens to record information. The red (upper) pen records temperature. The blue (lower) pen records relative humidity. Pen life varies with use and climate. Under normal operating conditions, pens last at least one month. We recommend that you install a fresh set of pens after every month of use.

To install pens:

1. Make sure the power switch on the front panel is in the OFF or "O" position. The front panel is located under the control panel door. The recorder door should be closed too.

NOTE

The control panel door opens easily by gently gripping the recessed area at the right side and slowly pulling down.

2. Examine the location of the pen arms through the window in the recorder door.
 - a. If the pen arms are offset as shown in Figure 2-10, continue to Step 3:

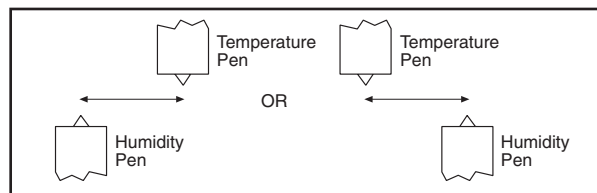


Figure 2-10. Offset Alignment of Pens (for ease of pen installation)

- b. If the pen arms are vertically aligned as shown in Figure 2-11, do the following and then proceed to Step 3.

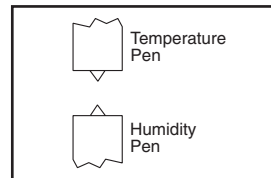


Figure 2-11. Vertical Alignment of Pens (pens can't be inserted)

(The pen arms must be offset sufficiently to allow for clearance before insertion or removal is attempted. The pens must be moved electrically.)

- Make sure the recorder door is closed and a piece of chart paper is installed on the spindle on the chart base.
- Turn the unit back on by moving the power switch to “I” and wait for the pens to be far enough apart to remove a used pen one at a time or to insert a new pen one at a time.

CAUTION



DO NOT ATTEMPT TO OFFSET THE PENS MANUALLY (BY HAND). THE DRIVE MECHANISM COULD BE DAMAGED. DO NOT ATTEMPT TO CHANGE THE PENS WHILE THEY ARE IN MOTION.

- Turn off the unit (PWR switch position in “O” position) to stop the pen movement.
3. Open the recorder door by applying downward pressure on the latch button (refer to Figure 1-1, item #16).
 4. Remove the pens from the package and the cap from each pen.

We recommend that you put the pen caps on special posts located on the chart base of the recorder near the light bulbs. Figure 2-12 shows the location of the posts.

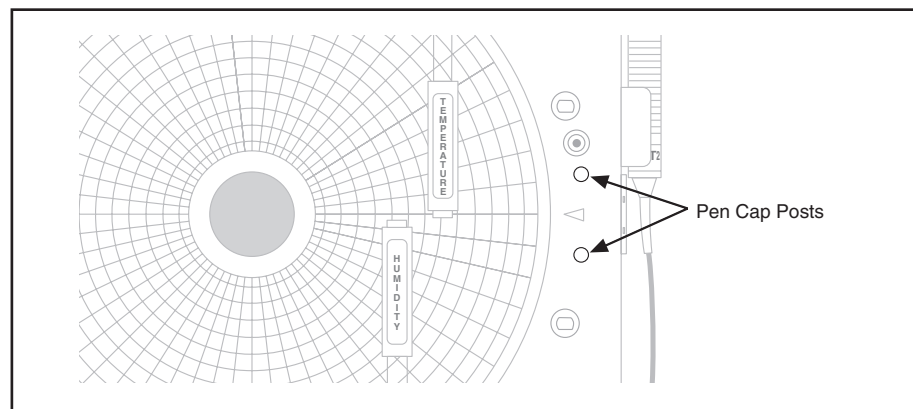


Figure 2-12. Post Location for Pen Caps

5. Insert the blue pen fully into the lower (humidity) holder and the red pen fully into the upper (temperature) holder.

If you installed the pens correctly, you will hear a click as they position themselves in the holders. Figure 2-13 shows how to insert the pens.

6. Close the recorder door.

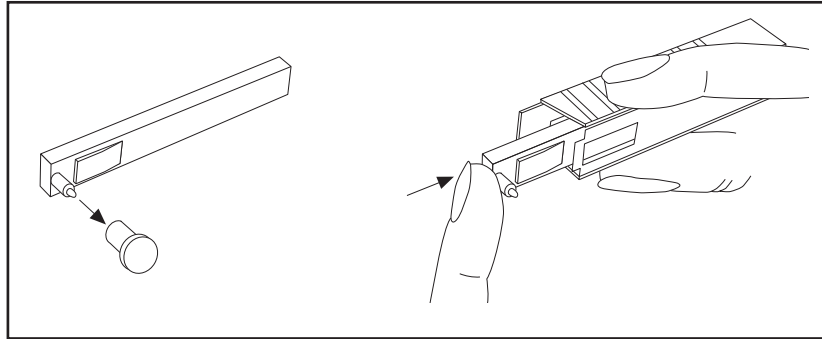


Figure 2-13. Pen Installation

2.5.2 Removing the Pens

1. Check to see that the pens are offset as shown in Figure 2-10. Otherwise, you can damage the arm and drive mechanism if you try to remove them.



CAUTION

DO NOT ATTEMPT TO OFFSET THE PENS MANUALLY (BY HAND). THE DRIVE MECHANISM COULD BE DAMAGED. DO NOT ATTEMPT TO CHANGE THE PENS WHILE THEY ARE IN MOTION.

2. Perform Step 2b in Section 2.5.1 to offset the pens.
3. With a screwdriver in one hand, push on the rectangular area of the pen shown in Figure 2-14. Using the other hand, release the pen from the spring clip attached to the pen holder.

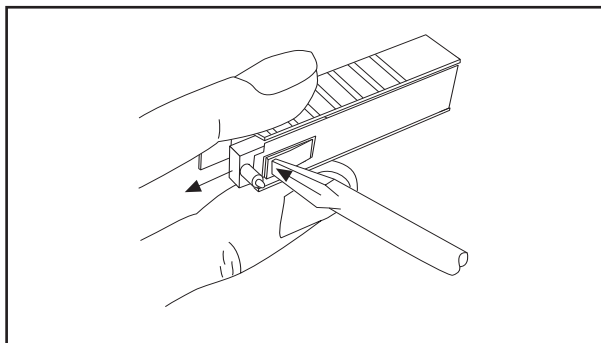


Figure 2-14. Pen Removal

4. At the same time, slide the pen out from the pen holder.
5. Install new pens following Section 2.5.1, Steps 3 through 6.

2.6 Installing the Temperature/Humidity Sensor

The temperature/humidity sensor can either be directly attached to the recorder using its own attached short cable or be extended by using the 6 ft remote sensor cable.

2.6.1 Using the Short Cable

1. Place the handle part of the sensor in to the sensor clip on the side of the recorder as shown in Figure 2-15.

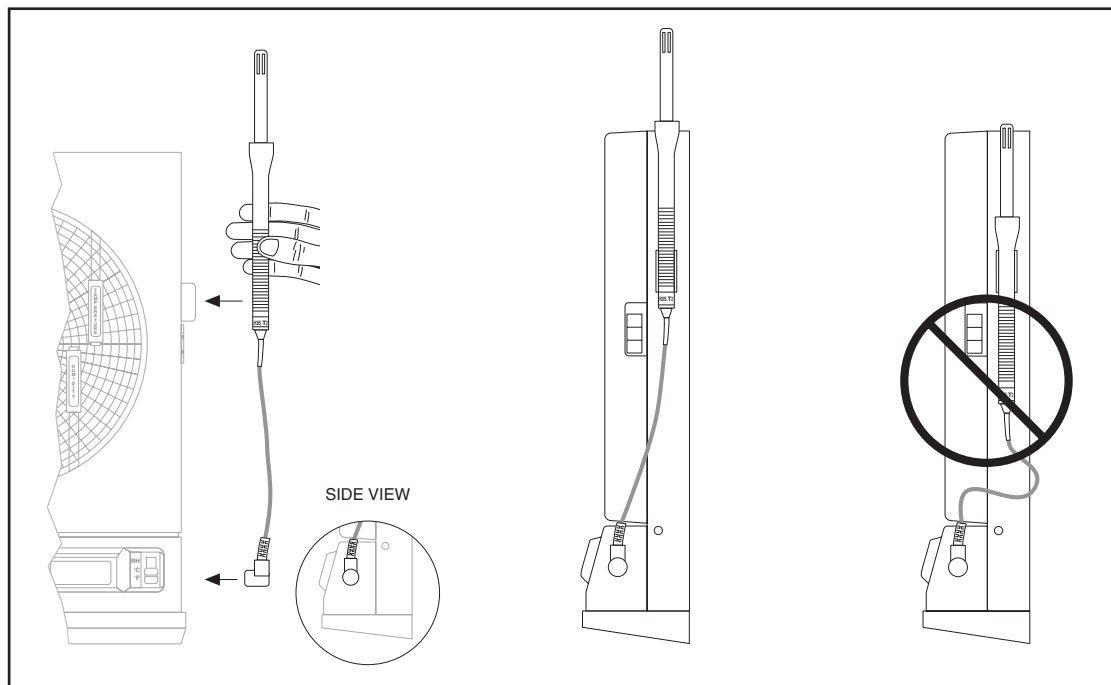


Figure 2-15. Attaching the Sensor (left picture), Correct Position (center), Incorrect Position (right)

2. Install the connector into the socket at the side of the recorder. Make sure the sensor cable is untwisted.
3. Slide the sensor up so that the sensor vents are well above the top of the case. Refer to the center picture in Figure 2-15.

2.6.2 Using the Remote Sensor Cable

1. Connect the end of the cable **with** the arrow to the short cable on the sensor. Line up the two arrows as shown in Figure 2-16 before mating the two cables.
2. Connect the other end of the remote sensor cable (**without** the arrow) to the socket at the side of the recorder.

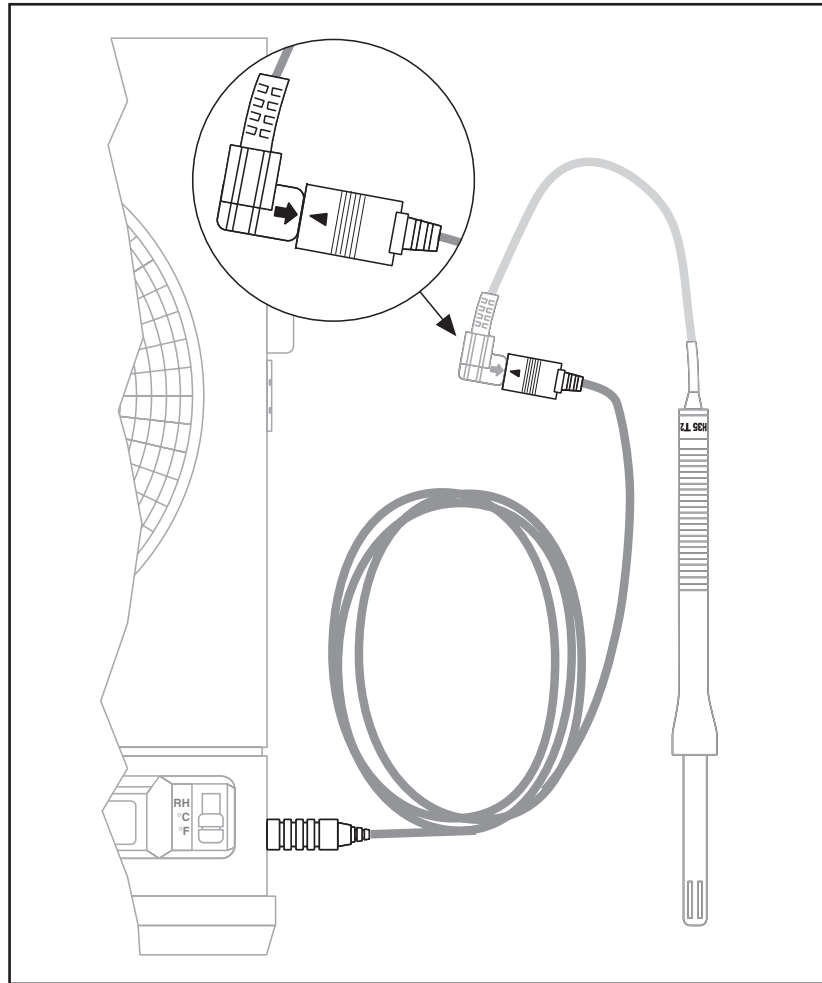


Figure 2-16. Using the Remote Sensor Cable

NOTE

For accurate temperature and humidity readings, only one length of remote sensor cable may be used.

2.6.3 Using the Sensor Clip

An extra sensor clip is provided in the shipping box, so you can hang the sensor in a remote location. Two self-tapping screws are provided for mounting to wood, sheet rock or plastic surfaces. When mounting to wood or sheet rock surfaces, drill two $\frac{1}{16}$ " (1.5 mm) diameter holes. When mounting to plastic, drill two $\frac{5}{64}$ " (1.9 mm) diameter holes. Appropriate hardware must be selected when mounting to metal surfaces. Refer to Figure 2-17.

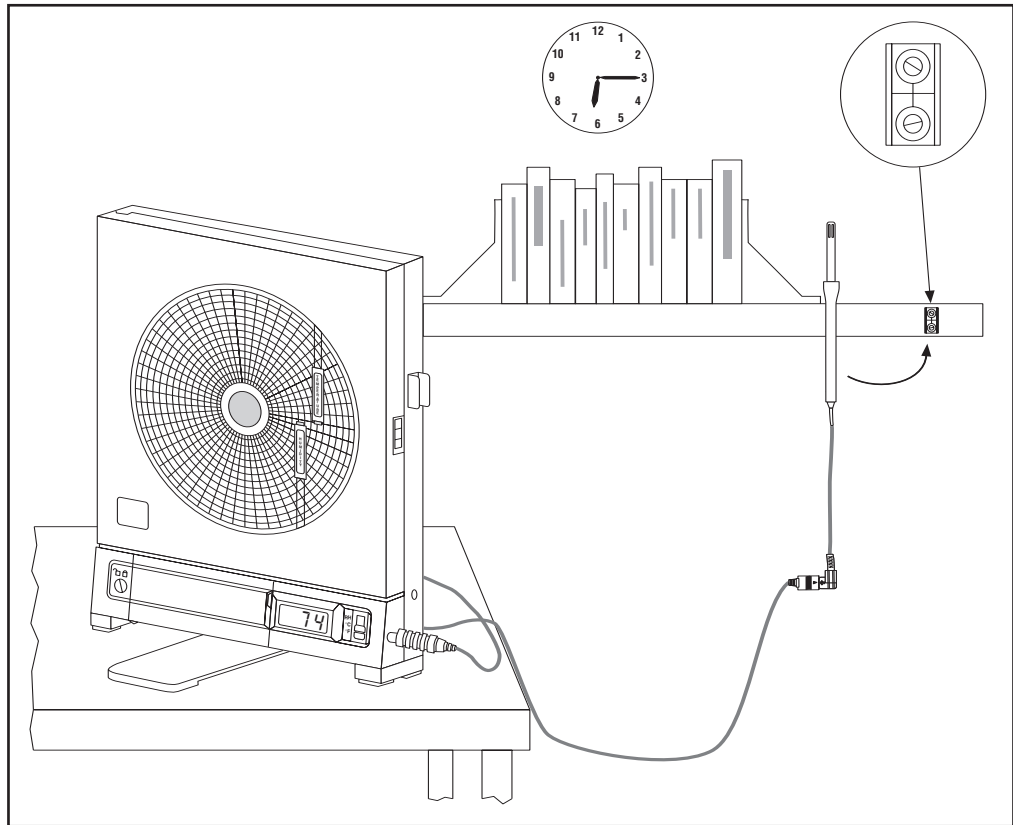


Figure 2-17. Using the Sensor Clip for Mounting Sensor in a Remote Location

3.1 Turning on the Recorder

Open the control panel door by gently gripping the recessed area at the right side of the door and slowly pulling down.

Turn the recorder on by moving the power switch located on the control panel to the "I" position. Refer to Figure 3-1 for the location of the switch.

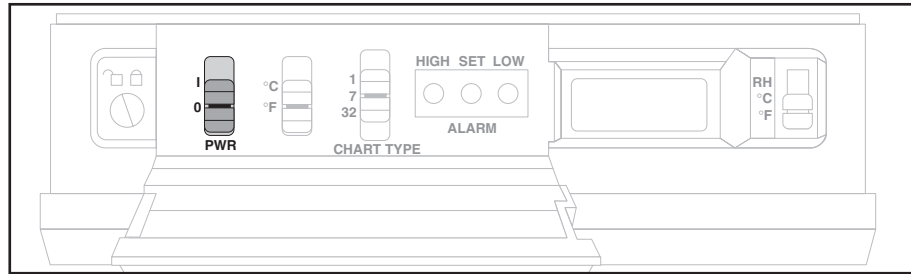


Figure 3-1. Power Switch

You then hear 1 beep and the LCD display shows the following:

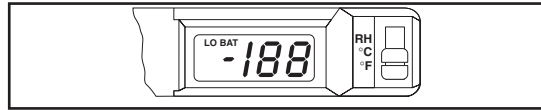


Figure 3-2. First LCD Display

The displays in Section 3.2 come up quickly once you turn on the recorder. Be prepared to write down the codes as you see them on the recorder display. You can then compare the codes your recorder displayed with the probe label as described below. After the two groups of codes are displayed, the recorder continues with its sequence, and the pens move. More details are provided in Sections 3.3 and 3.4.

3.2 Recording the Code Numbers

A two-character humidity code made up of numbers and/or letters 0, 1, 2, 3, ... , 8, 9, a, b, and c appears. An example is shown in Figure 3-3; the numbers will vary:

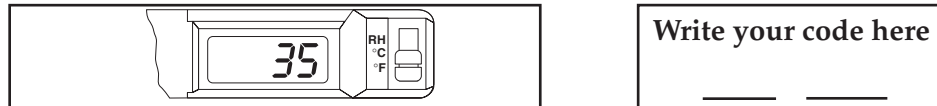


Figure 3-3. Relative Humidity Code

Then, a single-character temperature code, a number or letter 0, 1, 2, 3, ... , 8, 9, a, b, or c, appears. An example is shown in Figure 3-4; the numbers will vary:

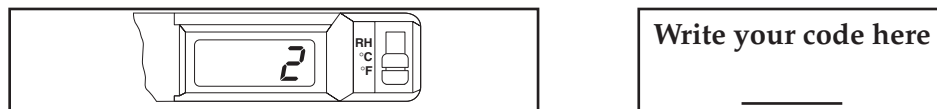


Figure 3-4. Temperature Code

3.3 Comparing Code Numbers

The recorder will continue with its initialization process for about another 30 seconds. Locate the code numbers on the sensor calibration label. Refer to Figures 3-5 and 3-6. The two-character Humidity Code you wrote down should match the two-character code following the letter "H" on the label. If it does not, refer to Section 5.1, Changing Calibration Codes.

The single character Temperature code should match the single-character code following the letter "T" on the label. Refer to Figure 3-7. If it does not, refer to Section 5.1, Changing Calibration Codes.

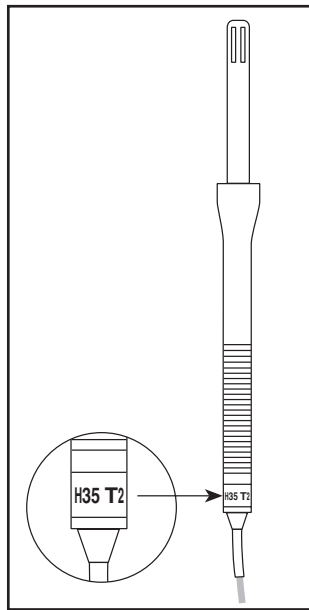


Figure 3-5. Location of Sensor Codes

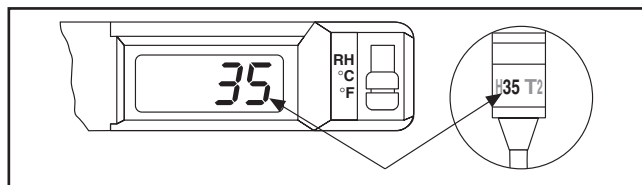


Figure 3-6. Relative Humidity Code Location

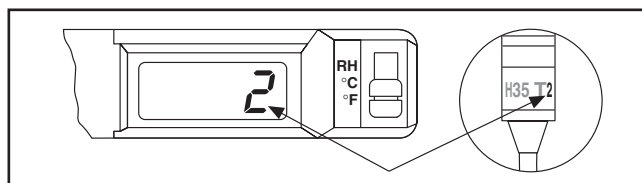


Figure 3-7. Temperature Code Location

3.4 Final Display Mode

After the relative humidity and temperature codes appear, the LCD displays the current relative humidity in %RH or temperature in °F or °C, depending on the position of the display selection switch (refer to Figure 3-8).

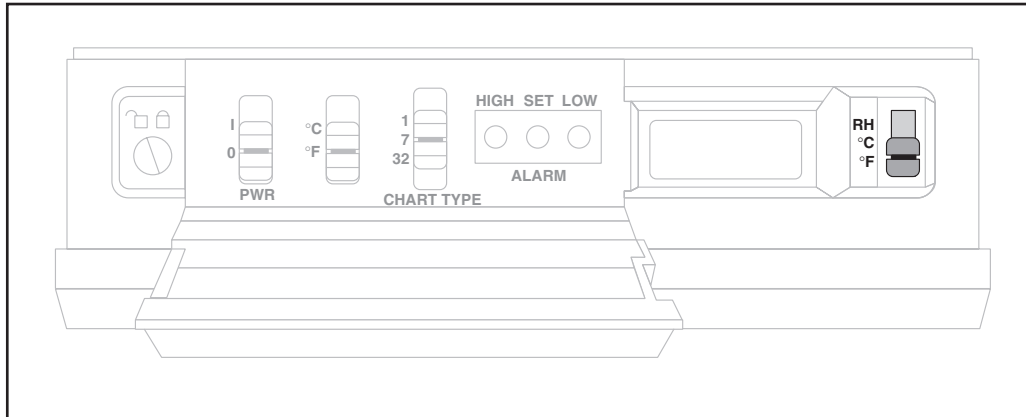


Figure 3-8. Display Selector Switch

At the same time, the temperature pen and humidity pen, one at a time, move to the right a short distance and then move to the left to the zero position. Then, both pens, one at a time, move to the positions which correspond to the current relative humidity and temperature.

At this point, the recorder is ready to use.

4.1 Alarm Description

The chart recorder is equipped with an alarm system which is activated when the sensor conditions exceed user-set limits. The system consists of a built-in audible piezo-electric beeper and a set of normally open dry relay contacts for activating an external alarm. The contacts are rated for 2 amps at 110Vac or 2 amps at 30Vdc. The contact terminals are mounted on the rear of the recorder (refer to Figure 4-1). In addition, the LCD display will flash upon alarm activation.

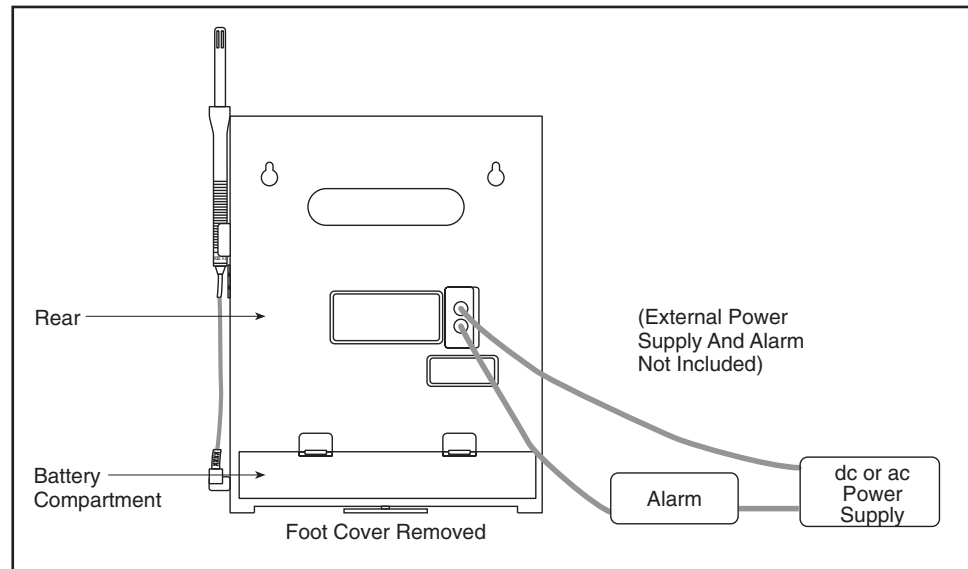


Figure 4-1. Alarm/Relay Contacts Location

4.2 Checking Alarm Limits

WAIT UNTIL THE UNIT HAS STABILIZED AND THE PENS STOP MOVING BEFORE PRESSING ANY KEYS ON THE KEYBOARD.

- Depending on the Display Selection Switch position, the display will be in °F, °C, or %RH for the alarm limit viewing.
- The word 'hi' and the high limit value of the alarm may be seen on the display after pressing the "HIGH" button on the front panel.
- The word 'lo' and the low limit value of the alarm may be seen on the display after pressing the "LOW" button on the front panel.

NOTE

The alarm limits are stored in permanent EEPROM memory and will not be lost even if power is interrupted and battery backup fails.

4.3 Unlocking/Locking the Control Panel Door

To access the Alarm Display Buttons (Figure 1-1, item #10) under the control panel door, you may have to unlock the door. You'll find the control panel door lock to the left of the control panel. Refer to Figure 4-2.

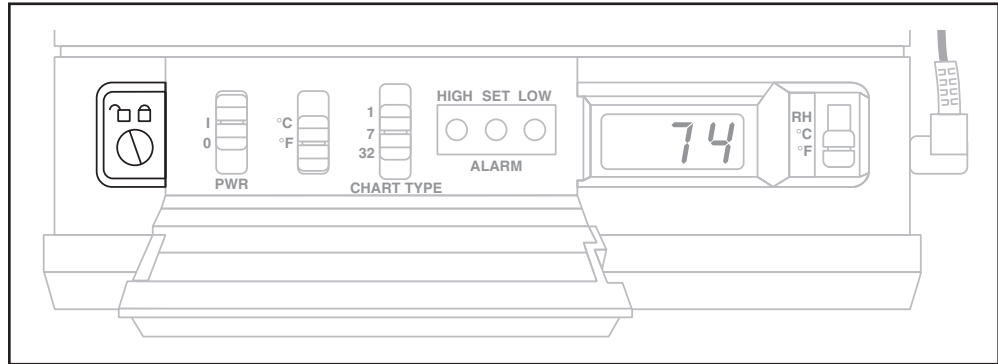


Figure 4-2. Location of the Door Lock

4.3.1 Unlocking the Control Panel Door

Use a small screwdriver to turn the lock to the left as far as it will go. Figure 4-3 shows the unlocked position.

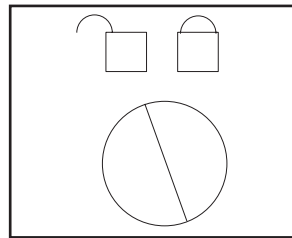


Figure 4-3. Door Unlock Position

4.3.2 Locking the Control Panel Door

Use a small screwdriver to turn the lock to the right as far as it will go. Figure 4-4 shows the locked position.

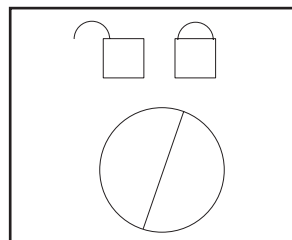


Figure 4-4. Door Lock Position

4.4 Setting/Changing Alarm Limits

To set the alarm limits on the alarm recorder:

1. Set the display selection switch (Figure 1-1, item #12) to %RH, °C, or °F depending on the parameter for which you would like to set the alarm limits. Refer to Figure 3-8 for the location of the switch.

NOTE

°C and °F alarm are really the same alarm, shown in different measuring units.

2. Open the control panel door (unlock it, if necessary).
3. Press the "SET" button to activate the display to set either the high OR low alarm limit. At this time, "SE" is displayed. Figure 4-5 shows the location of the Alarm Display Buttons.

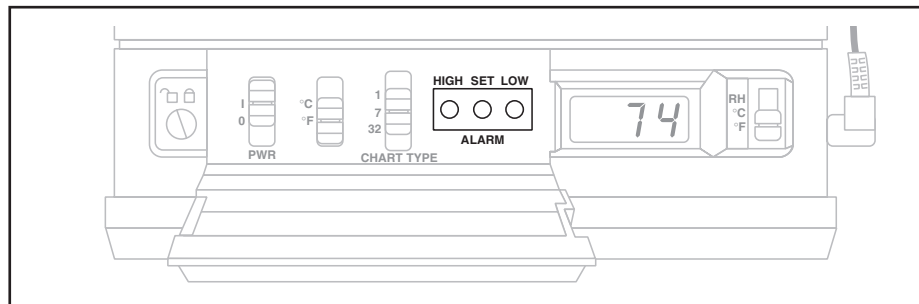


Figure 4-5. Alarm Display Buttons (HIGH/SET/LOW)

4. Release the "SET" button. The display will alternately flash "hi" and "lo" repeatedly.
- 5a. To change the high alarm limit:
 - Press and hold the "HIGH" button for 4 seconds, then release. 'hi' is displayed and then the current high alarm limit is displayed.
 - Press the "HIGH" or "LOW" button to respectively increase or decrease the value.
 - Press the "SET" button to lock in the value(s); the display now shows "SA".
 - Continue to step 6.

OR

- 5b. To change the low alarm limit:
- Press and hold the “LOW” button for 4 seconds, then release. ‘lo’ is displayed and then the current low alarm limit is displayed.
 - Press the “HIGH” or “LOW” button to respectively increase or decrease the value.
 - Press the “SET” button again to lock in the value(s); the display now shows “SA”.

NOTE

If, after about 15 seconds, you don't press the “SET” button to enter the desired value, the alarm recorder returns the display to the normal operation.

You can double check, at any time, your limits by pressing the “HIGH” and “LOW” buttons.

6. Go through steps 1-5 to check and/or change the limits for the other parameters. For example, if you already checked or changed °F, you may check or change °C or %RH if you choose.
7. After you are all done with the changes, close and lock the control panel door, if necessary.

4.5 Turning the Alarm Off

If the high or low alarm limit for humidity or temperature is exceeded, you will hear the alarm. In addition, if the unit is operating under battery power and the batteries are about to fail, you will hear the alarm.

The alarm will stay on even after the condition which caused the alarm disappears. Refer to the example below:

| Temp High Limit | Actual Temp. | Alarm Sounding |
|-----------------|--------------|---------------------|
| 75° | 74° | OFF |
| 75° | 75° | ON (temp rises) |
| 75° | 74° | ON (temp drops) *** |

***The alarm stays on even though the temperature drops below the limit. The alarm recorder will not reset automatically.

1. Unlock the control panel door if necessary.
2. After the alarm becomes activated, the "SET" button must be pressed to disable it. The message "AO" appears in the display. The alarm is disabled for 10 seconds. After 10 seconds, the alarm may activate again, but only if an alarm condition is present.
If the alarm is activated and you wish to change the alarm units:
 - a. Press the "SET" button for 5 seconds.
First "AO", then "SE" message will appear in the display.
 - b. You can now proceed with the changing the alarm limits as described in Section 4.4.
 - c. After you are all done with the changes, lock the control panel door if necessary.

4.6 Disabling the Alarm

1. Unlock the control panel door if necessary.
2. On power up, when you hold the "LOW" button down, an "AO" message appears in the display and the beeper sounds. This will disable the alarm function.
(This action sets the high temperature limit to 121(°F) or 49(°C), the low temperature limit to 01(°F) or -17(°C), the high humidity limit to 99, and the low humidity limit to 01. Since these limits are outside the normal measuring range of the alarm recorder, the alarm function is effectively disabled.)
The alarm limits are set this way when you receive the unit. If the alarm is disabled, you must re-initialize the instrument. After you are done with the changes, lock the door, if necessary.
3. To verify the settings after re-initializing is completed, press the "LOW" button to get the low value, and the "HIGH" button to get the high value.

5.1 Factory Calibration Information

The recorder is factory calibrated during final assembly by calibrating the sensor (shipped with the recorder) to known temperature and humidity standards in an environmental chamber. This technique avoids tracking and positioning errors due to temperature changes and mechanical shock. However, if the humidity readings drift or appear out of calibration, follow Section 5.2 to recalibrate your recorder.

5.2 Changing Calibration Codes

You may want to change the calibration codes for several reasons:

- The calibration codes on the sensor probe and the recorder do not match.
- A replacement probe is being used, and the calibration codes must be changed to match.
- You want the recorder to more closely match the reading of another instrument.
- You wish to perform your own recalibration. In this case, go through Sections 5.3 and 5.4, *Calibrating Humidity Readings* and *Calibrating Temperature Readings*.

To change the calibration codes:

1. Open the control panel door (unlock it, if necessary).
2. Turn the power switch to the off ("O") position.
3. Press and hold down the "SET" button while turning on the power switch. This button is one of three Alarm buttons shown in Figure 4-5.

After you hear an audible beep, you will see the following display:

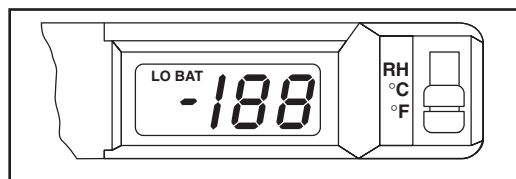


Figure 5-1. First Display

Then "CH" appears on the display.

4. At this time, release the "SET" button.

A 2-character **humidity calibration code** should now appear in the display with the first character blinking. Refer to Figure 5-2. Remember, this calibration code must match the code on the sensor probe.

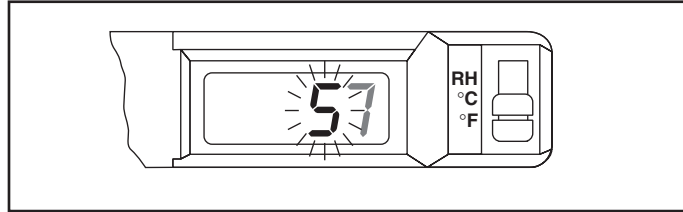


Figure 5-2. Humidity Code - First Character Blinking

- 5a. If the first character is correct,
press the "SET" button and go to step 6.
- 5b. If the first character is not correct,
press the "HIGH" button to increase the value of the character or the "LOW" button to decrease the value of the character. When this character is correct, press the "SET" button.
6. The second character should now be blinking. Refer to Figure 5-3. If it is not, press the "SET" button until it does.

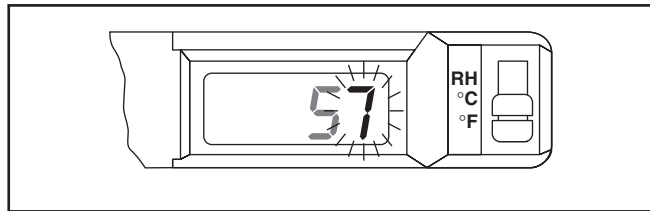


Figure 5-3. Humidity Code - Second Character Blinking

- 7a. If the second character of the humidity calibration code is correct,
press the "SET" button and go to step 8.
- 7b. If the second character is not correct,
press the "HIGH" button to increase the value of the character or the "LOW" button to decrease the value of the character. When this character is correct, press the "SET" button.

8. A single character **temperature calibration code** should be blinking in the display. Refer to Figure 5-4. If it is not, press the "SET" button again.

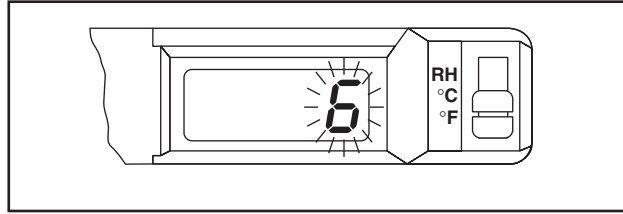


Figure 5-4. Blinking Temperature Code

- 9a. If the temperature code is correct,
press the "SET" button and go to step 10.
- 9b. If the temperature code is not correct,
press the "HIGH" button to increase the value of the character or the "LOW" button to decrease the value of the character. When this character is correct, press the "SET" button to lock in the values.

At this time, you see the humidity and temperature codes on the display as you entered them. This way, you can verify that you entered them correctly.

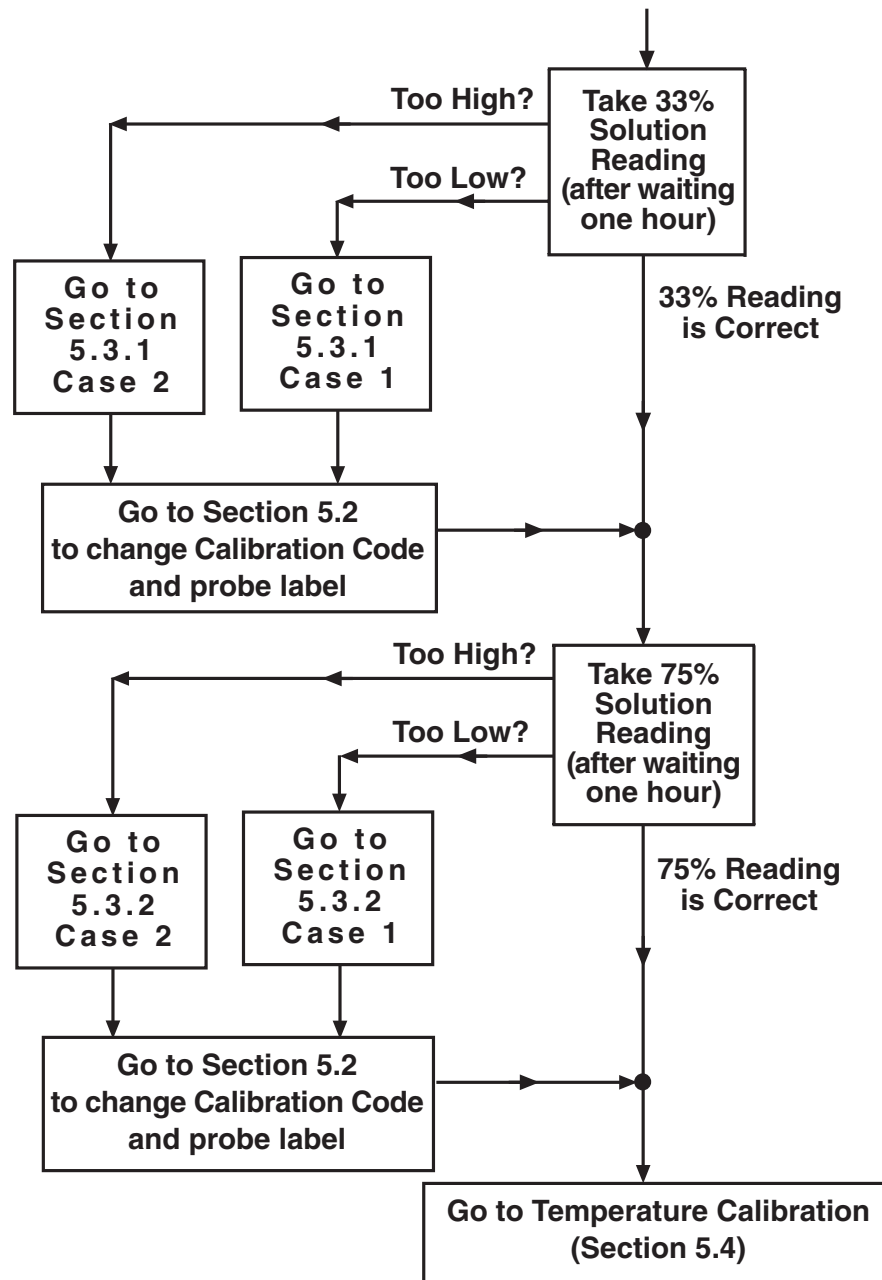
10. The unit should now automatically go through the power up sequence as described in Chapter 3. If it does not, hold down the "SET" button until it does.

While the unit goes through the power up sequence, observe the display to see that the calibration values are what they should be and that they have been entered correctly.

11. If either the temperature or humidity code is incorrect,
repeat steps 1-10. After you are all done with the changes, lock the control panel door, if necessary. Refer to Section 4.3 for details.
12. If you have altered the humidity or temperature codes in order to have the recorder match the reading of another instrument, or you have performed your own recalibration of the instrument, the code on the probe must be changed or documented to reflect the changes made to the recorder. For recalibration, refer to Sections 5.3 and 5.4.

5.3 Calibrating Humidity Readings

If you have access to accurate temperature and humidity calibration equipment, you may want to calibrate the instrument on your own as described in this section. Figure 5-5 shows how to set up the calibration equipment. The following flowchart shows the basic path that you should take to calibrate the sensor.



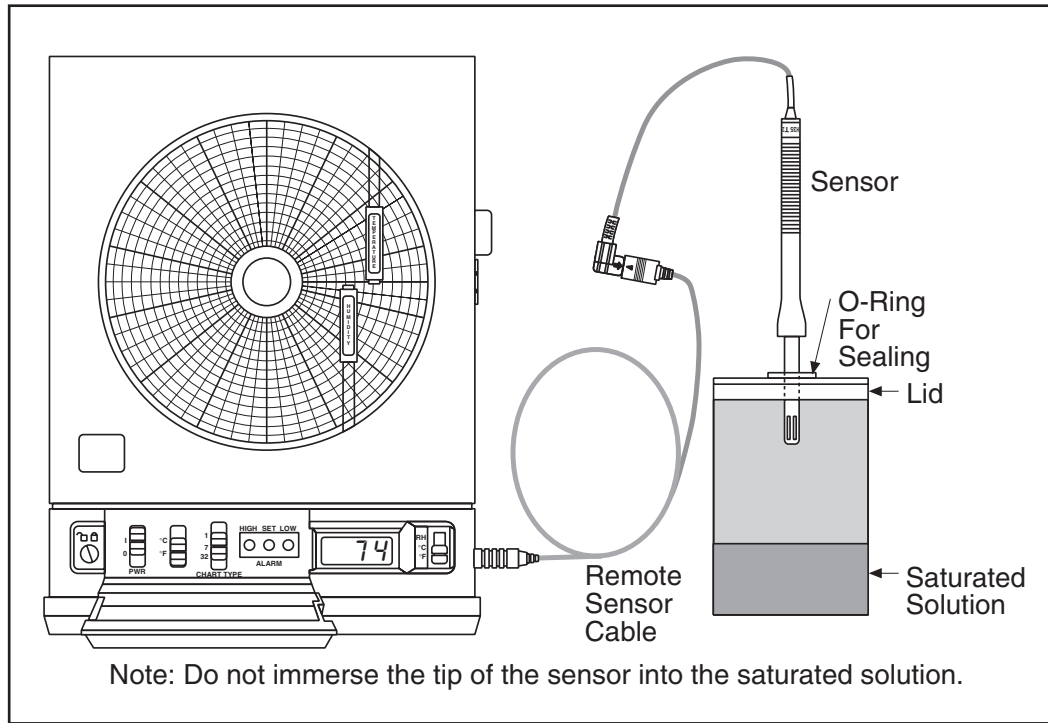


Figure 5-5. Calibration Setup

Section 5.3.1 discusses how to change the first half of the humidity code which corrects the 33% humidity reading if your recorder does not show 33%. Section 5.3.2 discusses how to change the second half of the humidity code which corrects the 75% humidity reading if your recorder does not show 75%.

Figure 5-6 shows the two parts of the humidity calibration code. This humidity code consists of a two-digit alpha-numeric code. Digits may be any one of these characters: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, a, b, or c.

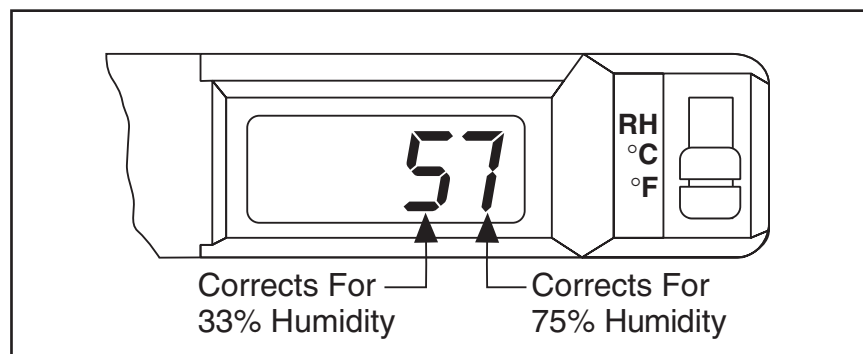


Figure 5-6. General Breakdown of the Humidity Code

5.3.1 Humidity Calibration at 33% Humidity

1. Set up the recorder with the temperature/humidity sensor in a sealed jar (33% RH) using saturated magnesium chloride as shown in Figure 5-5. If you are not experienced with saturated salt solutions, you may not obtain good results. If you are experiencing difficulty, contact our Engineering Department.
2. After the probe reading reaches equilibrium (after 1 hour), take a reading.

CASE 1: The 33% reading is too low by n counts, so DECREASE the humidity code by n counts.

EXAMPLE 1: you obtain a reading of 31%. The error is -2 since 31 is 2 counts lower than 33%. The initial humidity code of 87 (in this example) must be reduced to 67 (-2 counts).

| READING IN 33% ENVIRONMENT | INITIAL HUMIDITY CODE | ERROR CODE | CHANGED (NEW) HUMIDITY CODE IN 33% "HUMID" ENVIRONMENT |
|----------------------------------|-----------------------------|---------------|--|
| 31 | 87* | -2 | 67* |

* the first digit is flashing and changes in this case.

CASE 2: The 33% reading is too high by n counts, so INCREASE the humidity code by n counts.

EXAMPLE 2: you obtain a reading of 37%. The error is +4 since 37 is 4 counts higher than 33%. The initial humidity code of 65 in this example must be increased to A5 (+4 counts; A comes after 9).

| READING IN 33% ENVIRONMENT | INITIAL HUMIDITY CODE | ERROR CODE | CHANGED (NEW) HUMIDITY CODE IN 33% "HUMID" ENVIRONMENT |
|----------------------------------|-----------------------------|---------------|--|
| 37 | 65* | +4 | A5* |

* the first digit is flashing and changes in this case.

3. Change the first digit before proceeding to the next step, since a change in the first digit affects readings throughout the range. Go through Section 5.1 to set the calibration codes in the recorder. Then recheck to see that the reading is 33. If it is not, adjust the first digit of the code again. After pressing the "SET" button, the second digit will start flashing.
4. Next, place the probe in a saturated salt environment of 75% RH using NaCl.
5. After the probe equalizes (after 1 hour), take a reading (the second digit displayed may have changed).
6. Continue to Section 5.3.2.

5.3.2 Humidity Calibration at 75% Humidity

CASE 1 The 75% reading is too low by n counts, so DECREASE the humidity code by n counts.

EXAMPLE 1: you obtain a reading of 72%. The error is -3 since 72 is 3 counts lower than 75%. The initial humidity code of 67 (from Case 1: Example 1 in previous section) must be reduced to 64 (-3 counts).

| READING IN 75% ENVIRONMENT | INITIAL HUMIDITY CODE | ERROR | CHANGED (NEW) HUMIDITY CODE IN 75% "HUMID" ENVIRONMENT |
|----------------------------------|-----------------------------|-------|--|
| 72 | 67* | -3 | 64* |

* the second digit is flashing and changes in this case.

CASE 2 The 75% reading is too high by n counts, so INCREASE the humidity code by n counts.

EXAMPLE 2: you obtain a reading of 76%. The error is +1 since 76 is 1 count higher than 75%. The initial humidity code of A5 (from Case 2: Example 2 in previous section) must be increased to A6 (+1 counts).

| READING IN 75% ENVIRONMENT | INITIAL HUMIDITY CODE | ERROR | CHANGED (NEW) HUMIDITY CODE IN 75% "HUMID" ENVIRONMENT |
|----------------------------------|-----------------------------|-------|--|
| 76 | A5* | +1 | A6* |

* the second digit is flashing and changes in this case.

Changing the second digit (following Section 5.2) does not affect readings at 33% and lower. Check to see that the reading is 75. If it is not, adjust the second digit of the code again.

You must continue to Section 5.4 to finish the calibration process.

5.4 Calibrating Temperature Readings

1. To calibrate temperature, set the instrument to °F (DO NOT USE °C) and place the sensor probe in a known, stable environment between 60°F and 90°F. Read the display after allowing the probe to reach equilibrium after a 15 minute warm-up period.
2. If the reading is TOO LOW by n counts, DECREASE the temperature code (code following the letter "T") by n counts. If the reading is TOO HIGH by n counts, INCREASE the temperature code by n counts.

Changing the temperature code will not affect the humidity calibration.

The CT485B-CAL-LOCK kit that comes with the CT485B is used to preserve and protect the settings that were entered into the CT485B during the calibration process. The CT485B-CAL-LOCK cover shields the HIGH, SET and LOW calibration buttons to prevent any additional button pressing. This method is more “permanent” than using the control panel door lock. Here’s the procedure:

**WARNING**

USE EXTREME CAUTION WHEN USING THE GLUE. READ THE WARNING LABEL ON THE TUBE.

1. Calibrate the CT485B.
2. Apply a small amount of glue to the back of the cover. Refer to Figure 6-1.

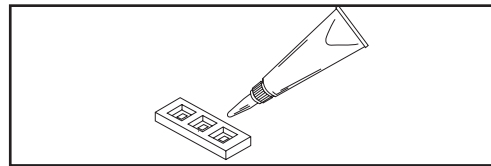


Figure 6-1. Glue Application

**CAUTION**

DO NOT LET GLUE COME IN CONTACT WITH BUTTONS.

3. Place cover over calibration buttons.
4. Fill in the label information.
5. Apply label to cover as shown in Figure 6-2.

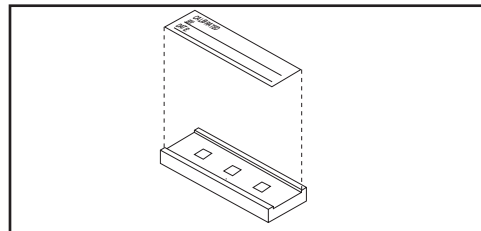


Figure 6-2. Label Application

NOTE

An additional label is supplied for future calibrations. A damaged label or removal of the label implies that the calibration of the recorder may have been altered.

Use the optional voltage input adapter to record an external 20mV to 1200mV signal with the temperature pen. When using the Fahrenheit scale chart paper, values between 2° and 120°F correspond to adaptor inputs of 20mV dc to 1200mV dc. The same correspondence applies to the °F display (2°F = 20mV dc; 20°F = 200mV dc; 120°F = 1200mV dc). While the voltage adapter is in use, the humidity pen is inoperative and the humidity display is invalid.

Typical applications include monitoring analog output of panel meters, process signals, and lab equipment. For example, if the adapter is used with a 10mV/degree analog signal, the recorder will display and record 20mV to 1200mV over the range of 2° to 120°F. If the adapter is used with a 1mV/degree analog signal, the recorder will still display and record 20mV to 1200mV over the range of 2° to 120°F scale on the chart. However, this plotted range now corresponds to a range of actual temperatures of 20° to 1200°F.

Polarity of the dc input signal should correspond to the + and – markings on the adapter.

CAUTION



INPUT VOLTAGES GREATER THAN 20VDC OR 10VAC RMS
MAY DAMAGE THE RECORDER.

Figure 7-1 shows a typical setup using the voltage input adapter.

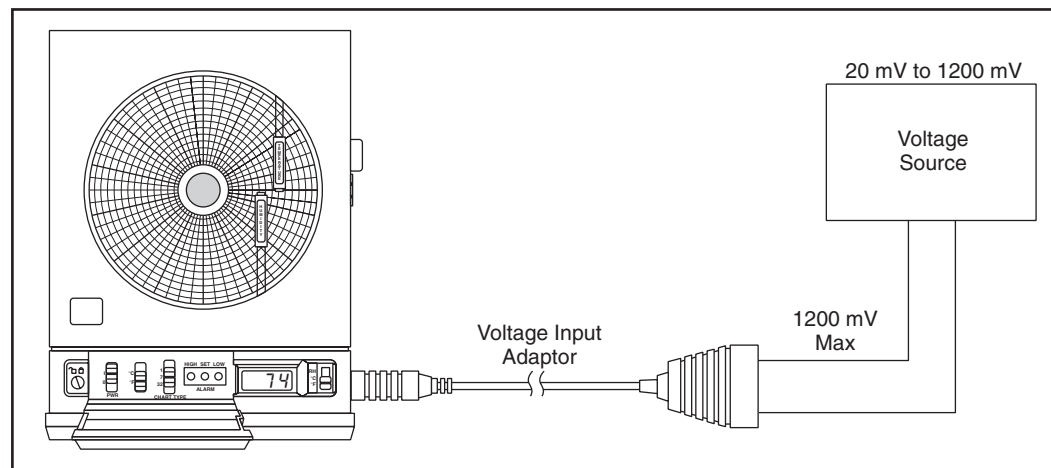


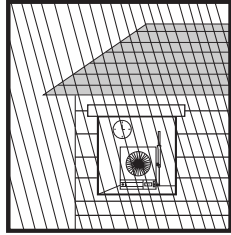
Figure 7-1. Voltage Input Adapter Setup

Notes

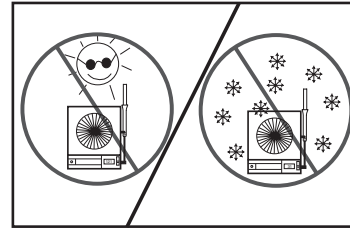
[A rectangular box containing the word 'Notes' in bold text, serving as a header for the notes section.]

[A series of horizontal lines providing space for handwritten notes.]

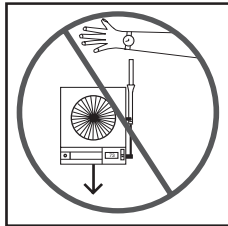
8.1 General Considerations



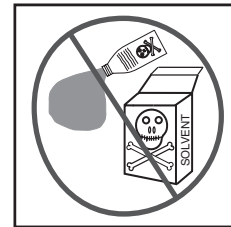
Keep the recorder in a dry place. If it gets wet, wipe the case as soon as possible to get rid of any moisture.



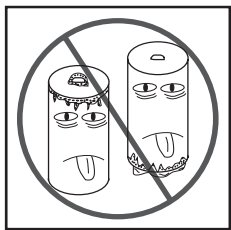
Do not expose the recorder to temperatures other than those stated in the specifications (Chapter 11). The recorder can operate in temperatures as high as 120°F (49°C) or as low as 32°F (0°C).



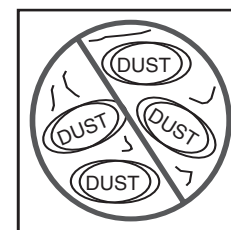
Handle the recorder carefully (DO NOT DROP IT).



Do not use strong cleaning solvents or alcohol when cleaning the outer case. Refer to Section 8.3 for more details.



Do not use old or weak batteries in the recorder. It is important to change the batteries monthly or when you see the LO BAT indicator (refer to Section 2.3.1).



Keep the recorder away from excessive dirt and dust. Do not use the recorder or the sensor in a corrosive air environment.

8.2 Light Bulb, Display Backlighting and Push Button Information

You may notice that the light bulbs flicker slightly while the pens are moving. The flickering stops once the pens are stationary.

The light bulbs on the chart base of the recorder are long-life specialty bulbs. Even though they last a very long time, they will burn out eventually. Always replace both bulbs. The part number for ordering 10 bulb/holder assemblies is listed on the inside back cover. One extra pair of bulb assemblies is supplied with the recorder.

When removing the bulbs, grasp the bulb holder that contains the bulb and pull it out. Do not pull on the bulb itself. When reinserting the new bulbs in the sockets, orient the bulbs to fit as shown in Figure 8-1.

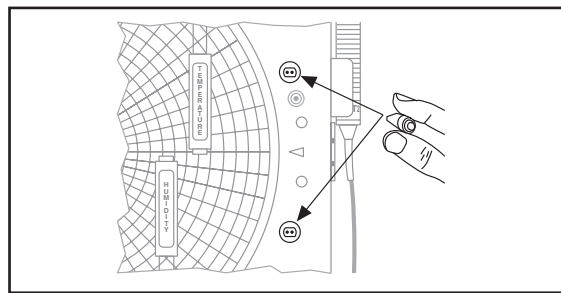


Figure 8-1. How to Hold the Bulb Assembly and Where the Bulbs are Located

NOTE

In the event that the ac power to the recorder is cut off (e.g., blackout), the recorder will continue to operate with the 4 "D" size backup batteries. The chart lights and the display backlighting operate on ac power only.

The recorder is equipped with a push button located on the chart base. This push button turns on and off the chart light bulbs as well as the display backlighting. One press of the push button turns on the lights and a second press turns them off. Figure 8-2 shows the location of the push button.

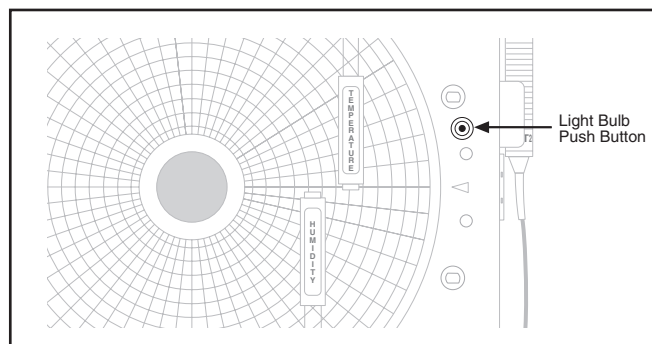


Figure 8-2. Push Button Location

8.3 Case Care

The case, front window and pen arms of the recorder should be cleaned with a mild soap solution. Under **no** circumstances should you use an alcohol or solvent based cleaner anywhere on this recorder.

8.4 Storage of Chart Paper

For optimum performance, store the chart paper in the plastic bag provided. Store the paper in rooms that have humidity levels lower than 80% relative humidity.

8.5 Power Failure Mode (Chart Paper Indication)

The chart paper indicates when the ac power failure occurred, the battery back up period and when the ac power returns. It is important to have fresh "D" size batteries in the recorder for battery backup so you have continuous recording. Figure 8-3 shows an example of chart paper with the power failure lines.

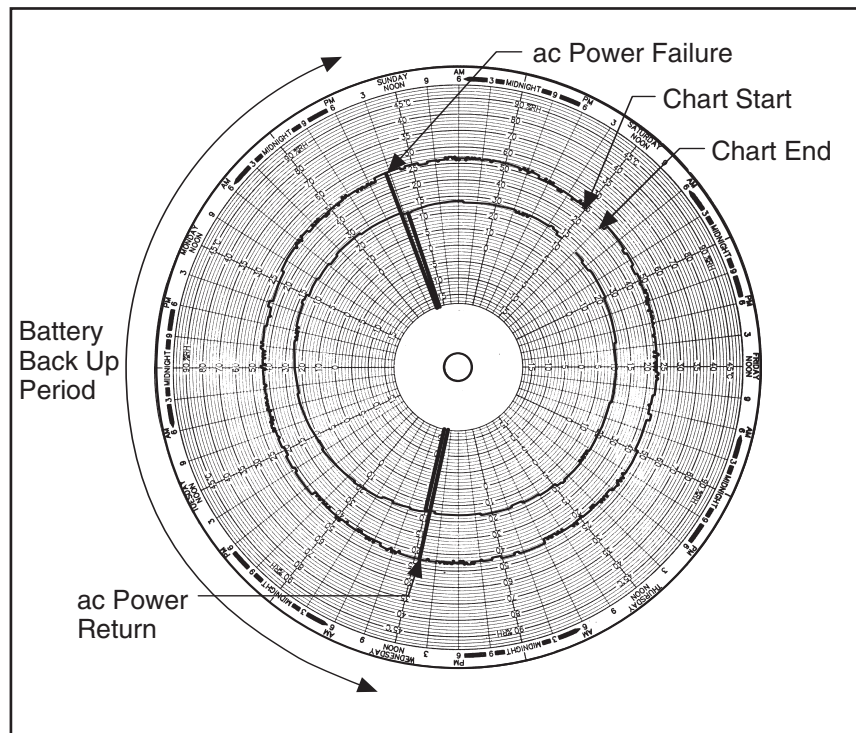






Figure 8-3. ac Power Failure Indication on Chart Paper

8.6 Sensor Maintenance

Under normal operating conditions the sensor requires no maintenance. However, the sensor should not be used in a corrosive air environment, even for limited time frames. The sensor electronic components are very sensitive, and will not perform to spec if chemically degraded.

Table 9-1 contains a brief troubleshooting guide.

Table 9-1. Troubleshooting Guide

| If this occurs | Perform these steps |
|--|---|
|  Recorder appears not to function at all. |  Make sure POWER switch is in the "I" (ON) position. |
| |  Make sure the ac adaptor is securely plugged into the wall and into the power jack on the recorder. |
| |  If using fresh batteries, make sure they are inserted correctly. |
| | |













| | |
|---|--|
| |  <p>If using old batteries, replace with a fresh set of alkaline batteries.</p> |
| <p>? Chart paper appears not to turn, or to turn at the wrong speed.</p> |  <p>Make sure the magnetic chart knob is in place.</p> |
| |  <p>Make sure the "CHART TYPE" 1/7/32 switch is in the correct position.</p> |
| <p>? The humidity pen (blue) appears to be in the wrong position.</p> |  <p>Make sure the "CHART TYPE" °C/°F switch (under the control panel door) is in the correct position.</p> |
| <p>? The pens do not appear to be leaving traces on the paper.</p> |  <p>Make sure the door is completely closed and the latch button is in the uppermost position. It may be necessary to squeeze the case slightly to close the latch completely.</p> |

Table 9-1. Troubleshooting Guide (Cont'd)

| If this occurs | Perform these steps |
|---|---|
|  The pens do not appear to be leaving traces on the paper. |  Make sure the pens are fresh. Remove a pen and test it on a piece of chart paper. Insert new pens if necessary. |
| |  Check that the pens are locked firmly in position in their holders. |
| |  Make sure pen caps are removed (and secured on the cap posts as recommended). |
|  Bulbs don't light. |  Bulbs are blown. Replace them with new bulbs. |
| |  The chart recorder is operating off batteries. Switch over to ac power if you wish to light up the paper. |

10.1 Sensors and Measurement

The recorder has an external plug-in temperature/humidity sensor. A six-foot remote sensor cable is provided to allow remote sensing of both temperature and humidity.

Unlike many circular hygrothermographs, this recorder utilizes electronic sensors to measure both ambient temperature and relative humidity. The temperature sensor is a low-power, semiconductor type, with a linear voltage output proportional to temperature. The humidity sensor consists of a bulk polymer material deposited on a ceramic substrate. The mobility of the ions in the polymer changes with moisture content of the surrounding atmosphere. As a result, the sensor presents an impedance which is a highly non-linear function of the relative humidity. The sensor is driven by ac excitation and the wide dynamic range of its output is compressed with a logarithmic amplifier.

NOTE

All humidity sensors are susceptible to contamination from outside sources that can affect accuracy and response time. Take care to prevent excessive contamination by dirt, oil, grease, solvents, or a corrosive air environment.

The electronically conditioned output of both sensors is fed to a microprocessor via an analog to digital converter. The processor linearizes and temperature compensates the output of the humidity circuit employing a “look-up table approach”. The results of the processor calculations are then used to update the front panel display and to position the pen arms on the chart paper.

10.2 Pen Arm Drive

This recorder utilizes a motor-driven lead screw pen arm drive located in the door of the unit. This provides several advantages over conventional pivot arm mechanisms. First, the recorder pens move along straight, radial lines as the temperature and humidity change. Thus, the time scales on the chart paper are straight lines and are much easier for the user to interpret than the swooping arcs produced by a conventional recorder. Second, the placement of the recorder pen arms directly opposite one another allows the pen tips to be placed very close together. This minimizes time offset between information recorded by the temperature and humidity pens, making the charts easier to interpret. Finally, the location of the drive mechanism in the door provides an automatic pen lift when changing the chart paper.

The position of the pen arms on the lead screw mechanism is controlled by optical encoders. On power up or system reset, the pen arms move to the zero position. This is detected by a photo interrupter, to provide absolute positional information to the microprocessor.

From this point, a count wheel mounted on the lead screw provides positional information relative to the zero position. There are 32 counts for each division on the chart paper.

As with all positioning mechanisms, an error may appear in the tracking over a period of time. To minimize this error, several steps have been taken. First, a deadband for pen movement of $\frac{1}{2}$ chart division has been programmed in to minimize pen motion without affecting usable chart resolution. Second, **whenever you change chart paper, a magnetic switch detects the opening of the door and initiates a system reset, thus re-zeroing the pens and eliminating any accumulated errors.**

A further unique feature of the recorder is its **ability to utilize charts with either Fahrenheit or Celsius scales via switch selection on the front panel.** The microprocessor adjusts the range of travel for the temperature and humidity pens so that convenient scales for both can be used.

10.3 Chart Paper Drive Mechanism

The recorder incorporates a stepper motor to impart rotational motion to the chart paper. A novel feature of the unit is its **ability to utilize 1, 7 or 32 day chart paper simply through front panel switching.** This capability is provided by a special digital timing circuit which precisely controls the stepping rate of the magnetic armature in the motor.

10.4 Power Supply Supervision

The recorder contains power supply monitoring and switching circuitry which enables it to be used in a variety of circumstances. Under ordinary circumstances, the unit will be powered by 110 or 220 Vac with the ac adaptor provided. This is the preferred mode of operation. **The recorder can also operate via 4 "D" size batteries installed in the rear of the unit which will power the unit up to 30 days.**

The system may be restarted by changing the batteries or by the re-initiation of ac power. If ac power fails, the circuitry will attempt to automatically switch to battery backup. If viable battery power is available, the system will operate on battery power until the batteries fail or ac power returns. When ac power returns, the recorder will automatically reset itself (refer to Section 8.5).

Typically, the unit will operate with fresh alkaline batteries for about 1 month. It should be noted that to conserve battery power, the system timing turns the sensors on and updates the display and pen position only once every 0.5, 3.5 or 16 minutes while in the 1, 7 or 32 day modes respectively. However, the display remains in continuous operation during battery operation. You should be aware, then, that during battery operation it is possible for the display and pens to lag behind actual ambient conditions by up to 0.5, 3.5, or 16 minutes to save power. Only when using the ac adaptor do the display and pens constantly update for changes in ambient conditions.

General

| | |
|--------------------|--|
| Measurement Input: | Temperature and humidity, with plug-in external sensor Removable for remote location (up to six feet) |
|--------------------|--|

Temperature

| | |
|---------------------|-------------------------------|
| Range: | 2° to 120°F, -17° to 49°C |
| Accuracy: | ±1°C |
| Sensor: | Solid State |
| Response Time: | 5 minutes for 63% step change |
| Display Resolution: | 1°F/1°C |

Humidity

| | |
|---------------------|---|
| Range: | 2% to 98% RH |
| Accuracy: | ±3% @ 25°C, between 20% and 90% of range; ±5% below 20%, above 90% @25°C |
| Sensor: | Resistive polymer |
| Response Time: | 5 minutes for a 30% to 80% step change |
| Display Resolution: | 1% RH |

Display

| | |
|---------------|---|
| Types: | 2½ digit backlit LCD, 0.5" high; low battery and parameter indication |
| Display Modes | User-switchable between °F°, °C and %RH for continuous display; max/min storage for both temperature and humidity |

Electronics

| | |
|-------|---|
| Type: | Microprocessor-controlled and linearized HI & LO Peak Hold for both temperature and humidity; re-initializes position at every chart change (every time door is opened) |
|-------|---|

Chart Paper

| | |
|-------|---|
| Type: | 8 inch (200mm) circular, double-sided, with linear radial divisions; 1, 7 and 32 day with both °F and °C scales |
|-------|---|

Chart Drive

| | |
|------------------------|--------------------------|
| Type: | Stepper Motor |
| Ranges: | 1, 7, 32 day; switchable |
| Accuracy: | 1% of rotation |
| Chart Paper Hold Down: | Magnetic hub lock |

Recording Pens

| | |
|-------|--|
| Type: | Disposable fiber-tip; red for temperature, blue for humidity |
|-------|--|

Pen Drive

| | |
|-----------|--|
| Type: | Motorized linear screw drive |
| Deadband: | 1°F, 1% RH |
| Zero: | Automatic zero during chart change or power interruption |
| Pen Arms: | Clear plastic to allow full chart viewing |
| Pen Lift: | Automatic upon door opening; pens are door mounted and lift away from the chart whenever the door opens. |

Alarms

| | |
|-----------------------|--|
| Alarms: | User-selectable for high or low temperature and humidity |
| Audible Alarm: | Integral piezo-electric beeper |
| Alarm Relay Contacts: | 2A 110Vac, 2A 30Vdc, Normally Open, Single Pole, Single Throw (SPST) |

Operating Conditions (Recorder)

| | |
|--------------|------------------------------|
| Temperature: | 32° to 120°F (0° to 49°C) |
| Humidity: | 0% to 90% RH, non-condensing |

Operating Conditions (Remote Sensor)

| | |
|--------------|--|
| Temperature: | 2° to 120°F (-17° to 49°C) |
| Humidity: | 2% to 98% (should not be operated continuously in condensing conditions) |

Power (Recorder)

| | |
|------------------------|---|
| dc: | Four (4) "D" size alkaline batteries; greater than 1 month continuous operation in 32 day mode; bulbs will not light on battery power. Recommended battery type: Duracell Type MN1300 "D" size batteries for best performance at low temperatures. |
| ac: | 110Vac or 220Vac 50/60 Hz stepped down to nominal 9Vdc using ac adaptor provided |
| Power Requirements: | 300 mA "normal" during pen movement for battery (dc power); 500 mA "normal" during pen movement for ac power using ac adaptor. (Note: The light bulbs draw 200 mA of current). |
| ac Power Jack Voltage: | 8.3 to 12.4 Vdc, (nominal 9Vdc) 1A max. An ac adaptor is supplied |

Analog Voltage Input Adapter (Optional)

| | |
|--------------------|---|
| Input: | 20 mV dc to 1200 mV dc records as 2° to 120°F |
| Input Protection: | up to 20Vdc or 10Vac RMS |
| Input Impedance: | 330k ohms minimum |
| Input Connections: | Banana jacks, 0.75" spacing |
| Cable Length: | 12" (30.5cm) |

Mechanical

| | |
|----------------------------|--|
| Dimensions: (H x W x D) | 13 $\frac{3}{8}$ " x 10 $\frac{1}{16}$ " x 2 $\frac{5}{8}$ " (33.5 x 27.1 x 6.7 cm) |
| Weight: | Approx. 7 lbs, including alkaline batteries |
| Mounting: | "Keyhole" slots for wall mounting; foot cover for benchtop use |
| Case: | Rugged ABS plastic, color: gray or white |
| Miscellaneous: | Swing-out stabilizing arm for bench top use, decorative foot cover for wall mounting, and 6 ft remote sensor cable for remote sensing <u>(USE ONLY ONE 6 FT REMOTE SENSOR CABLE PER RECORDER FOR ACCURATE READINGS)</u> |

NOTE

The CT485B Chart Recorder may be susceptible to radio frequency fields at selected frequencies. The reading error can be up to 10% of reading (Both Temperature and Humidity) when exposed to RF fields (Testing was performed to IEC1000-4-3, 80% AM Modulation).

Notes

12.1 Sensor Design for CE Conformity

For CE labelled recorders only, the sensor has been redesigned to meet requirements as outlined in European Community EMC Directive EN50081-1/EN50082-1. In particular the sensor cap is made from unplated plastic to pass ESD (electro-static discharge) tests. In addition, a ferrite core has been attached to the sensor cable to meet radiated immunity specifications. Refer to Figure 12-1.

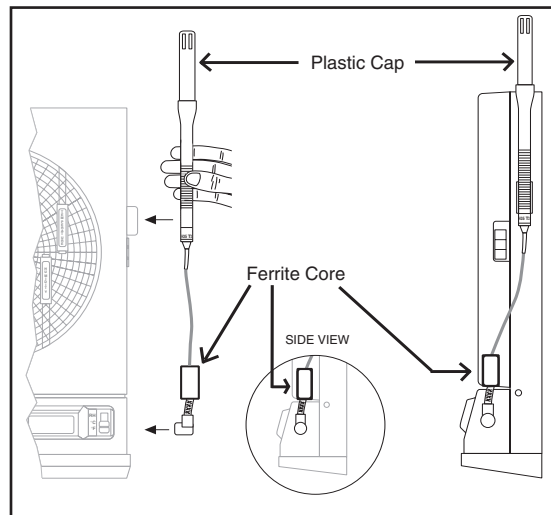


Figure 12-1. Location of the Ferrite Core for CE Conformity

If you plan on using or are using the remote sensor cable, refer to the ferrite core information below.

For best radiated immunity performance when using the remote sensor cable (Section 2.6.2), you will need to move the ferrite core close to the input of the recorder. To relocate the ferrite core, perform the following:

1. Insert your fingernail in the place shown in Figure 12-2 and unsnap the ferrite core from the sensor cable.
2. Install the ferrite core on the remote sensor cable next to the connector as shown in Figure 12-3.

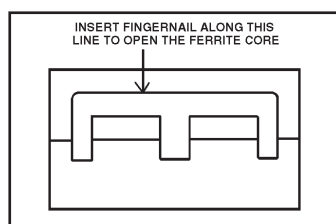


Figure 12-2. Ferrite Core

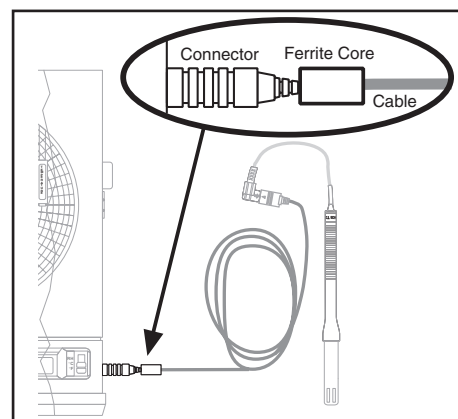
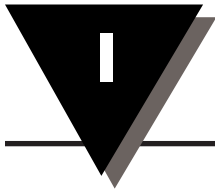


Figure 12-3. New Location of the Ferrite Core (on the Remote Sensor Cable)

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The following models are available:

| PART NUMBER | DESCRIPTION |
|-------------------|---|
| CT-485B-110V-G-AL | Gray, 110Vac, with Alarms and Relay Contacts |
| CT-485B-110V-W-AL | White, 110Vac, with Alarms and Relay Contacts |
| CT-485B-220V-G-AL | Gray, 220Vac, with Alarms and Relay Contacts |
| CT-485B-220V-W-AL | White, 220Vac, with Alarms and Relay Contacts |

The following consumable items are available:

| PART NUMBER | DESCRIPTION |
|-------------|--|
| PENS | |
| CT485-PS | Pen Set, Red and Blue, package of 1 each |
| CT485-PS-6 | Pen Set, Red and Blue, package of 6 each |

STANDARD CHART PAPER (double-sided - available as single package of 100 or 6 packages of 100 charts)

| | | | |
|-----------|------------------------------|-------------|------------------------|
| CT485-CDF | 100 Charts, 1 Day, °F | CT485-CDF-6 | 600 Charts, 1 Day, °F |
| CT485-CDC | 100 Charts, 1 Day, °C | CT485-CDC-6 | 600 Charts, 1 Day, °C |
| CT485-CWF | 100 Charts, 7 Day, °F | CT485-CWF-6 | 600 Charts, 7 Day, °F |
| CT485-CWC | 100 Charts, 7 Day, °C | CT485-CWC-6 | 600 Charts, 7 Day, °C |
| CT485-CMF | 100 Charts, 32 Day, °F | CT485-CMF-6 | 600 Charts, 32 Day, °F |
| CT485-CMC | 100 Charts, 32 Day, °C | CT485-CMC-6 | 600 Charts, 32 Day, °C |
| CT485-CSP | 120 Charts, 20 of each style | | |

[SPECIALTY PAPER (all double-sided, packages of 20 charts)] [(*) = C for °C or F for °F]

| | |
|-------------|--|
| CT485-MW(*) | Museums/Art Galleries, 7 days (in °C or °F) 18.3° to 22.2°C (65° to 72°F), 40 to 50%RH |
| CT485-MM(*) | Museums/Art Galleries, 32 days (in °C or °F) 18.3° to 22.2°C (65° to 72°F), 40 to 50%RH |
| CT485-HW(*) | Hospitals, 7 days (in °C or °F) 20° to 23.3°C (68° to 74°F), 40 to 50%RH |
| CT485-HM(*) | Hospitals, 32 days (in °C or °F) 20° to 23.3°C (68° to 74°F), 40 to 50%RH |
| CT485-LW(*) | Lab, Clean Rooms, 7 days (in °C or °F) 20° to 23.9°C (68° to 75°F), 40 to 55%RH |
| CT485-LM(*) | Labs, Clean Rooms, 32 days (in °C or °F) 20° to 23.9°C (68° to 75°F), 40 to 55%RH |
| CT485-PW(*) | Computer Rooms/Offices, 7 days (in °C or °F) 18.3° to 23.9°C (65° to 75°F), 45 to 60%RH |
| CT485-PM(*) | Computer Rooms/Offices, 32 days (in °C or °F) 18.3° to 23.9°C (65° to 75°F), 45 to 60%RH |

The following spare parts are available:

| PART NUMBER | DESCRIPTION |
|------------------|---|
| CT485B-WALLKIT | Anchors, Screws, Inserts and Template |
| CT485-CABLE-6W | 6 Ft. (2 meter) Remote Sensor Cable, White |
| CT485-CABLE-6G | 6 Ft. (2 meter) Remote Sensor Cable, Gray |
| CT485-AC-110 | 9V 110Vac Adaptor, 9Vdc output, White |
| CT485-AC-110-G | 9V 110Vac Adaptor, 9Vdc output, Black |
| CT485-ADAP-E | 9V 220Vac Adaptor, 9Vdc output, White, European Plug |
| CT485-ADAP-E-G | 9V 220Vac Adaptor, 9Vdc output, Black, European Plug |
| CT485-ADAP-UK | 9V 220Vac Adaptor, 9Vdc output, White, United Kingdom Plug |
| CT485-ADAP-UK-G | 9V 220Vac Adaptor, 9Vdc output, Black, United Kingdom Plug |
| CT485B-MAG | Magnetic Chart Knob, Tan |
| CT485B-BULB | Light Bulb Assembly, package of 10 |
| CT485B-RP-W | Temperature/Humidity Sensor (replacement probe), White, non CE approved |
| CT485B-RP-G | Temperature/Humidity Sensor (replacement probe), Gray, non CE approved |
| CT485B-RP-W-CE | Temperature/Humidity Sensor (replacement probe), White, CE approved |
| CT485B-RP-G-CE | Temperature/Humidity Sensor (replacement probe), Gray, CE approved |
| CT485B-CAL-KIT | Calibration Kit (33% & 75% Salt Solutions) |
| CT485B-CAL-LABEL | Calibration Lockout Cover Labels (Sheet of 10) |
| CT485B-CAL-LOCK | Calibration Lockout Kit |
| CT485B-CLIP-KIT | Sensor Clip Kit |

The following accessories are available:

| PART NUMBER | DESCRIPTION |
|-------------|---|
| CT485-AMV-W | Analog Voltage Input Adaptor (Cable), White |
| CT485-AMV-G | Analog Voltage Input Adaptor (Cable), Gray |



WARRANTY/DISCLAIMER

OMEGA ENGINEERING, INC. warrants this unit to be free of defects in materials and workmanship for a period of **13 months** from date of purchase. OMEGA's WARRANTY adds an additional one (1) month grace period to the normal **one (1) year product warranty** to cover handling and shipping time. This ensures that OMEGA's customers receive maximum coverage on each product.

If the unit malfunctions, it must be returned to the factory for evaluation. OMEGA's Customer Service Department will issue an Authorized Return (AR) number immediately upon phone or written request. Upon examination by OMEGA, if the unit is found to be defective, it will be repaired or replaced at no charge. OMEGA's WARRANTY does not apply to defects resulting from any action of the purchaser, including but not limited to mishandling, improper interfacing, operation outside of design limits, improper repair, or unauthorized modification. This WARRANTY is VOID if the unit shows evidence of having been tampered with or shows evidence of having been damaged as a result of excessive corrosion; or current, heat, moisture or vibration; improper specification; mis-application; misuse or other operating conditions outside of OMEGA's control. Components in which wear are not warranted, include but are not limited to contact points, fuses, and triacs.

OMEGA is pleased to offer suggestions on the use of its various products. However, OMEGA neither assumes responsibility for any omissions or errors nor assumes liability for any damages that result from the use of its products in accordance with information provided by OMEGA, either verbal or written. OMEGA warrants only that the parts manufactured by the company will be as specified and free of defects. OMEGA MAKES NO OTHER WARRANTIES OR REPRESENTATIONS OF ANY KIND WHATSOEVER, EXPRESSED OR IMPLIED, EXCEPT THAT OF TITLE, AND ALL IMPLIED WARRANTIES INCLUDING ANY WARRANTY OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE HEREBY DISCLAIMED. LIMITATION OF LIABILITY: The remedies of purchaser set forth herein are exclusive, and the total liability of OMEGA with respect to this order, whether based on contract, warranty, negligence, indemnification, strict liability or otherwise, shall not exceed the purchase price of the component upon which liability is based. In no event shall OMEGA be liable for consequential, incidental or special damages.

CONDITIONS: Equipment sold by OMEGA is not intended to be used, nor shall it be used: (1) as a "Basic Component" under 10 CFR 21 (NRC), used in or with any nuclear installation or activity; or (2) in medical applications or used on humans. Should any Product(s) be used in or with any nuclear installation or activity, medical application, used on humans, or misused in any way, OMEGA assumes no responsibility as set forth in our basic WARRANTY/DISCLAIMER language, and, additionally, purchaser will indemnify OMEGA and hold OMEGA harmless from any liability or damage whatsoever arising out of the use of the Product(s) in such a manner.

RETURN REQUESTS/INQUIRIES

Direct all warranty and repair requests/inquiries to the OMEGA Customer Service Department. BEFORE RETURNING ANY PRODUCT(S) TO OMEGA, PURCHASER MUST OBTAIN AN AUTHORIZED RETURN (AR) NUMBER FROM OMEGA'S CUSTOMER SERVICE DEPARTMENT (IN ORDER TO AVOID PROCESSING DELAYS). The assigned AR number should then be marked on the outside of the return package and on any correspondence.

The purchaser is responsible for shipping charges, freight, insurance and proper packaging to prevent breakage in transit.

FOR **WARRANTY** RETURNS, please have the following information available BEFORE contacting OMEGA:

1. Purchase Order number under which the product was PURCHASED,
2. Model and serial number of the product under warranty, and
3. Repair instructions and/or specific problems relative to the product.

FOR **NON-WARRANTY** REPAIRS, consult OMEGA for current repair charges. Have the following information available BEFORE contacting OMEGA:

1. Purchase Order number to cover the COST of the repair,
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