ENERGY ENVIROMONITOR™ SYSTEM

Davis

CONSOLE USER'S MANUAL

ENERGY ENVIROMONITOR™ SYSTEM

DAVIS

CONSOLE USER'S MANUAL

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Chapter **1** **INTRODUCTION TO THE ENERGY ENVIROMONITOR**

For use by fuel distributors, planners, and utilities, the Energy EnviroMonitor (Energy EM) measures weather conditions which aid in estimating fuel oil consumption, heating and cooling energy requirements at a development site, and solar and wind energy potentials at a collection site. This integrated weather station, computer, and data logger measures/calculates, displays, and stores heating and cooling degree-days, temperature-humidity index cooling degree-days, wind chill heating degree-days, temperature, temperature-humidity index, wind chill, wind speed, wind run, wind direction, solar radiation, solar energy, rainfall, rate of rainfall, barometric pressure, relative humidity, and dew-point. Current values, high and low values, cumulative totals, and daily averages are available for display at the push of a button. The system can even sound an alarm when values exceed a threshold set by the user.

OPTIONAL SENSORS

The following optional sensors enable the Energy EM to measure and calculate specialized weather information. All optional sensors are available from your dealer or may be ordered directly from Davis Instruments.

- **Anemometer**
  Enables you to measure and display wind speed, wind run, wind direction, wind chill, and wind-chill degree-days (with temperature sensor).

- **External Temperature Sensor**
  Enables you to measure and display outside temperature, and heating and cooling degree-days.

  Note: *You may use EITHER the external temperature sensor, external temperature/humidity sensor, or the stainless steel temperature probe.*

- **External Temperature/Humidity Sensor**
  Enables you to measure and display outside temperature, outside humidity, dew-point, temperature-humidity index, normal and temperature-humidity index cooling degree-days, and heating degree-days. (See note in external temperature sensor section for restrictions.)

- **Rain Collector**
  Enables you to measure and display daily and total rainfall and rate of rainfall. Separate models measure rainfall in either 0.01-inch or 0.2-mm increments. Optional Rain Collector Heater enables you to measure the moisture content of snowfall or freezing rain.

- **Solar Radiation Sensor**
  Enables you to measure and display solar irradiance and incident energy.

- **Stainless Steel Temperature Probe**
  Enables you to measure and outside temperature and growing degree-days or soil temperature. Rugged stainless-steel construction makes sensor ideally suited to measuring soil or water temperature. (See note in external temperature sensor section for restrictions.)

OPTIONAL ACCESSORIES

The following accessories, designed for use with the Energy EM, are available from your dealer or may be ordered directly from Davis Instruments.

- **Energy WeatherLink®**
  Logs data gathered by the Energy EM, downloads it to your PC, and generates reports and graphical displays. Storage interval (1, 5, 10, 15, 30, 60, or 120 minutes) is set by the user. The data logger will store 16 hours or 3, 7, 10, 21, 42, or 85 days worth of data depending on storage interval. Windows™-compatible software enables you to analyze, plot, print, sort, and summarize the data. Includes fuel customer management feature. Automatically generates NOAA reports. Print and export degree-day information totaled for the day and month.

- **Sensor Mounting Arm**
  A single-location mounting option. The Sensor Mounting Arm includes provisions for optimal mounting of all Davis sensors: anemometer, temperature sensor (with Radiation Shield), solar radiation sensor, Rain Collector Shelf, etc.

- **Sensor Tilting Bracket**
  Enables you to adjust the position of the solar radiation sensor to match the angle of the sun's rays for maximum readings.

- **Radiation Shield**
  Protects the temperature sensor or temperature/humidity sensor from solar radiation and other sources of radiated and reflected heat. Increases the life of the sensor and the accuracy of the readings.

- **Rain Collector Shelf**
  Provides a horizontal surface for mounting the rain collector. May be used with Sensor Mounting Arm or mounted on other surfaces.

- **Shelters**
  We have a pair of weather-resistant shelters which will enable you to mount some or all of your system components outside. Optional heaters enable you to keep components operating even in cold weather.

- **Solar Power Kit**
  Powers the weather station using energy from the sun; no AC power is required. Requires our 6.5-Amp-Hour Battery or other battery of your choice.

- **Alarm Output Module**
  Enables you to use weather station alarms to automatically start or stop external devices such as irrigation systems, heaters, or fans.

- **Surge Protectors**
  For upgraded protection against lightning-induced power surges, power-cross conditions, and ground potential rises, use Surge Protectors. Use one Surge Protector for every two wires and mount inside one of our surge-protector shelters.
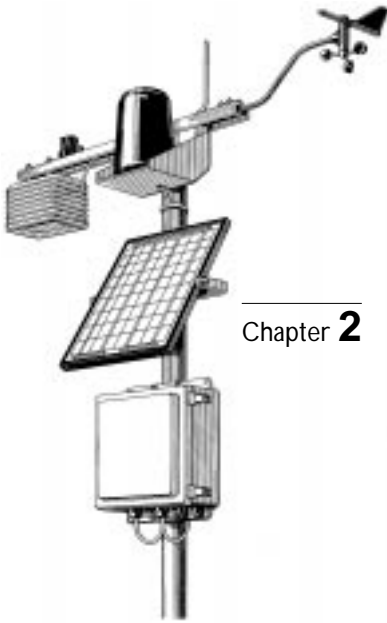
Chapter **2** **ENERGY ENVIROMONITOR OVERVIEW**

THE KEYBOARD

The Energy EM's keyboard contains two different types of keys: function keys and operation keys. The larger and more square keys are the function keys and are used to display the various conditions measured and calculated by the Energy EM. The smaller and more rounded keys are operations keys and are used to view or use the various features of the Energy EM.

WEATHER CONDITIONS MEASURED/CALCULATED

This section outlines each of the weather conditions measured/calculated by the Energy EM. Each section includes a brief discussion of the weather condition and a listing of the various ways in which the unit displays or stores that condition. Be aware that some of the weather conditions require an optional sensor in order to measure/calculate a value (see "Optional Sensors" on page 1). If you do not have the required sensor that reading will appear as a series of dashes in the Energy EM display.

Values which are described as "Daily" readings will provide true daily readings only if they are cleared each day. You may clear these values yourself or use AutoClear (see "AutoClear" on page 12) to clear them for you. If you do not clear the values every day, then you can use the "daily" readings to represent any interval you desire: two days, one week, one month, etc.

The notation "(AutoClear)" next to a weather condition indicates that the Energy EM's AutoClear function may clear the weather condition at a set time every day. For information on AutoClear, see "AutoClear" on page 12.

The notation "(Alarm:)" next to a weather condition indicates that an alarm exists for the weather condition. The type of alarms are noted after the colon. For information on Alarms, see "Alarms" on page 14.

Cooling Degree-Days

Cooling degree-days provide a measure for calculating the effect of temperature on the use of energy to cool a location. Because temperature plays an important part in the use of energy to cool a house or other structure, a measurement which takes into account the accumulation of heat with passing time is necessary to predict usage. One cooling degree-day accumulates when the temperature remains one degree above the threshold for 24 hours. One cooling degree day *also* accumulates when the temperature remains 24˚ above the threshold for 1 hour. The Energy EM calculates both normal cooling degree-days and temperature-humidity index cooling degree-days. Temperature-humidity index cooling degree-days uses apparent temperature (see "Temperature and Apparent Temperature" on page 7) instead of outside temperature when calculating cooling degree-days.

- "Daily" Cooling Degree-Days Sum (AutoClear)

- Cooling Degree-Days Total for the period (Alarm: High/Low)

- Average daily Cooling Degree-Days over the period

- "Daily" T/H Index Cooling Degree-Days Sum (AutoClear)

- Cooling T/H Index Degree-Days Total for the period (Alarm: High/Low)

- Average daily T/H Index Cooling Degree-Days over the period

Heating Degree-Days

Heating degree-days provide a measure for calculating the effect of temperature on the use of energy to heat a location. Essentially the opposite of cooling degree-days, heating degree-days take into account the accumulation of cold with passing time to calculate energy usage. One heating degree-day accumulates when the temperature remains one degree below the threshold for 24 hours. One heating degree day *also* accumulates when the temperature remains 24° below the threshold for 1 hour. The Energy EM calculates both normal heating degree-days and wind chill heating degree-days. Wind chill heating degree-days uses apparent temperature (see "Temperature and Apparent Temperature" on page 7) instead of outside temperature when calculating heating degree-days.

- "Daily" Heating Degree-Days Sum (AutoClear)

- Heating Degree-Days Total for the period (Alarm: High/Low)

- Average Daily Heating Degree-Days over the period

- "Daily" Wind Chill Heating Degree-Days Sum (AutoClear)

- Wind Chill Heating Degree-Days Total for the period (Alarm: High/Low)

- Average Daily Wind Chill Heating Degree-Days over the period

Temperature and Apparent Temperature

The Energy EM has a temperature sensor built into the console which reports inside temperature. You may use either the external temperature sensor, stainless steel temperature probe, or external temperature/humidity sensor (see "Optional Sensors" on page 1) to measure outside temperature. Outside temperature does not necessarily have to measure outside temperature, of course. It measures the air temperature wherever you have located your temperature sensor.

Temperature-humidity index (T-H index), commonly called heat stress, uses the temperature and the relative humidity to determine how hot the air temperature actually "feels." When humidity is low, the apparent temperature will be cooler than the air temperature since perspiration can rapidly evaporate into the air. However, when humidity is high (i.e., the air is saturated with water vapor) the apparent temperature will be higher than the air temperature.

Note: *The Energy EM measures T-H index only when air temperature is above 68° F (20° C) because it is a measure of heat stress which is not significant at lower temperatures. 125° F (52° C) is the highest T-H index for which calculation factors are available. Above 125° F (52° C), the system simply reports that T-H index is "high."*

Wind chill takes into account how the speed of the wind affects our perception of the air temperature. The body warms up the air molecules which surround it by transferring heat from the skin to the surrounding air. If the wind is completely still, this "insulating layer" of warm air molecules stays next to the body, offering some protection from the cooler air molecules and limiting further transfer of heat. When the wind is blowing, however, the warm air surrounding the body is swept away. The faster the wind blows, the faster the heat is carried away and the colder you feel.

- Current Outside Temperature (Alarm: High/Low)
- Current T-H Index (Alarm: High)
- Current Wind Chill (Alarm: Low)
- Current Inside Temperature (Alarm: High/Low)
- "Daily" High and Low Outside Temperature with time of occurrence (AutoClear)
- "Daily" High T/H Index with time of occurrence (AutoClear)
- "Daily" Low Wind Chill with time of occurrence (AutoClear)
- "Daily" High and Low Inside Temperature with time of occurrence (AutoClear)

Wind

The Energy EM measures wind speed, wind direction, and wind run. Wind run is a measurement of the "amount" of wind which passes a given point (the anemometer) during the measurement period. It is expressed as either "miles of wind" or "kilometers of wind" and is determined by calculating the integral (summation) of wind speed multiplied by the time of the measurement period. For example, if the wind blew at an absolutely steady 10 MPH for 12 hours, you would have 120 miles of wind run (speed x time = 10 MPH x 12 Hours = 120 miles). Wind speed changes over time, so wind run is calculated by adding together (summing) the distance (speed x time) for every single speed and time reading during the measurement period. In practice, however, the Energy EM simply keeps count of the number of revolutions made by the wind cups during the period and multiplies that number by a scale factor which gives a wind run reading in either miles or kilometers.

- Current Wind Speed (Alarm: High)
- "Daily" Wind Run (Auto Clear)
- Average Daily Run during period
- Wind Direction (in compass rose only)
- High Wind Speed with direction of high and time of occurrence (AutoClear)

Solar Radiation

What we call "current solar radiation" is technically known as Global Solar Radiation, a measure of the intensity of the sun's radiation reaching the earth's surface. This irradiance includes both the direct component from the sun and the diffuse component from the rest of the sky. The solar radiation reading gives a measure of the amount of solar radiation hitting the solar radiation sensor at any given time, expressed in Watts per Square Meter (W/m^2). The power of this radiation, when integrated (summed) over a period of time, gives a measure of the amount of incident solar energy received during that time period. This solar energy reading is expressed in Langleys.

> 1 Langley = 41.84 kiloJoules per square meter
>
> = 11.622 Watt-hours per square meter
>
> = 3.687 BTUs per square foot

Note: *The Energy EM measures energy received in the spectral band between 400 and 1100 nm.*

- **Current Solar Radiation Intensity**
- **"Daily" Incident Solar Energy Sum (AutoClear)**
- **Average Incident Solar Energy per day during period**

Rainfall

The Energy EM provides two separate registers for tracking rainfall totals. One is referred to as "daily" rainfall and the other is referred to as "total" rainfall. In truth, these registers can be used to record rainfall over any period of time you desire. The "daily" register can be cleared daily using the AutoClear function (see "AutoClear" on page 12) to provide true daily rainfall totals or you may clear it manually every few days, after a storm, at the end of the month, etc. The total rainfall amount must be cleared manually and how often you clear the register determines what period of time its rainfall total reflects. The Energy EM also calculates the rate of rainfall using the amount of time between each .01" or .2 mm rainfall increment.

- **"Daily" Rainfall (Alarm: High) (AutoClear)**
- **Current Rate of Rainfall in inches or millimeters per hour**
- **Total Rainfall**
- **Maximum Rate of Rainfall with time of occurrence**

Barometric Pressure

The weight of the air which makes up our atmosphere exerts a pressure on the surface of the earth. This pressure is known as atmospheric pressure. Generally, the more air above an area, the higher the atmospheric pressure, which means that atmospheric pressure changes with altitude. To compensate for this difference and facilitate comparison between locations with different altitudes, atmospheric pressure is generally adjusted to the equivalent sea-level pressure. This adjusted pressure is known as barometric pressure. In reality, the Health EM measures atmospheric pressure. When you enter the barometric pressure for your location (see "Entering Barometric Pressure" on page 37), the Health EM stores the necessary offset value to consistently translate atmospheric pressure into barometric pressure.

Barometric pressure also changes with local weather conditions, which makes barometric pressure an extremely important and useful weather forecasting tool. High pressure zones are generally associated with fair weather while low pressure zones are generally associated with poor air. For forecasting purposes, however, the absolute barometric pressure value is generally less important than the change in barometric pressure. In general, rising pressure indicates improving weather conditions while falling pressure indicates deteriorating weather conditions.

- Current Barometric Pressure (Alarm: rate of change)

- Trend of Barometric Pressure (rising, falling, steady) over previous one hour

Humidity

Humidity itself simply refers to the amount of water vapor in the air. However, the amount of water vapor which the air can contain varies with changes in air temperature and pressure. Relative humidity takes into account these factors and offers a humidity reading which reflects the amount of water vapor in the air as a percentage of the amount the air is capable of holding. Relative humidity, therefore, is not actually a measure of the amount of water vapor in the air, but a ratio of the air's water vapor content to its capacity.

It is important to realize that relative humidity changes with temperature, pressure, and water vapor content. If you have a parcel of air with a capacity for 10 g of water vapor which contains 4 g of water vapor, the relative humidity would be 40%. Adding 2 g more water vapor (for a total of 6 g) would change the humidity to 60%. If that same parcel of air is them warmed so that it has a capacity for 20 g of water vapor, the relative humidity drops to 30% even though water vapor content does not change.

- Relative Humidity (Alarm: High/Low)

- "Daily" High and Low Relative Humidity with time of occurrence (AutoClear)

Dew-Point

Dew-point is the temperature to which air must be cooled for saturation (100% relative humidity) to occur, providing there is no change in water content. The dew-point is an important measurement used to predict the formation of dew, frost, and fog. If dew-point and temperature are close together in the late afternoon when the air begins to turn colder, fog is likely during the night. Dew-point is also a good indicator of the air's actual water vapor content (as opposed to relative humidity). High dew-point indicates high vapor content; low dew-point indicates low vapor content. You can even use dew-point to predict the minimum overnight temperature. Provided no new fronts are expected overnight, the afternoon's dew-point gives you an idea of what minimum temperature to expect that night, since the air is not likely to get colder than the dew-point anytime during the night.

- **Current Dew-Point (Alarm: when temperature is within 2˚F of dew-point)**

Time

The GroWeather has a clock and a calendar for tracking time and date. The calendar automatically adjusts during leap years, providing you enter the current year (see "Entering Time, Date, or Year" on page 42) when you apply power to the unit.

- **Current Time (Alarm: standard)**
- **Current Date**
- **Current Year**
- **AutoClear Time Setting**
- **Period Information**

PERIOD

The Energy EM uses a single time period for all values which accumulate totals or calculate daily averages over an interval. Beginning a new period clears all data from the previous period. The system stores the beginning date of the period, which you may display along with the number of days which have elapsed since the beginning of the period.

Note: *The system records the start time of the period to the nearest 90 minutes. Therefore, all average values are exact to the nearest 90-minute mark throughout the period. However, averages calculated during the period are most accurate when the period length is an exact number of days (that is, if you display the average at the same time of day at which the period started). When the length of the period is displayed, the Energy EM rounds down to the nearest whole day COMPLETED.*

The following values are accumulated or averages calculated during the period. Note that averages are not displayed (i.e., a series of dashes appears instead) until at least one day has elapsed.

- **Total Cooling Degree-Days**

- **Average Daily Cooling Degree-Days**

- **Total T-H Index Cooling Degree-Days**

- **Average Daily T-H Index Cooling Degree-Days**

- **Total Heating Degree-Days**

- **Average Daily Heating Degree-Days**

- **Total Wind Chill Heating Degree-Days**

- **Average Daily Wind Chill Heating Degree-Days**

- **Average Daily Wind Run**

- **Average Solar Energy per day**

AUTOCLEAR

The Energy EM's AutoClear function may be used to automatically clear some or all of the "daily" values at the same time each day. The time at which values are cleared is the same for all values and may be set by the user (default is midnight). The AutoClear function may be enabled/disabled individually for the values listed below. Note that the AutoClear function for some values (for example, high wind speed and "daily" wind run) is linked; you may enable or disable the AutoClear for all linked values, not for each individual value. The list below shows all values which may be cleared using AutoClear. Those listed together must be cleared as a group.

- **"Daily" Cooling Degree-Days**

- **"Daily" Heating Degree-Days**

- **High and Low Outside Temperature, High Temp/Hum Index, Low Wind Chill, High and Low Inside Temperature**

- **High Wind Speed and "Daily" Wind Run**

- **"Daily" Solar Energy**

- **"Daily" Rainfall and High Rate of Rainfall**

- **High and Low Outside Humidity**

HIGHS AND LOWS

The Energy EM records highs and lows for many weather conditions. All highs and lows represent the maximum or minimum reading since the last time you cleared each individual high/low register. If you have enabled AutoClear for a particular high/low (see "Enabling/Disabling AutoClear" on page 50), this reading will represent the high/low since the time of the AutoClear. In other words, it will track highs and lows over a 24 hour period. If you do not use AutoClear, you may track daily, weekly, monthly, or yearly values, depending on how often you clear the high/low. For all highs and lows the time at which they occurred is stored along with the value.

The table below summarizes the highs and lows stored by the Energy EM.

CONDITION	HIGH	LOW	AUTOCLEAR	ADDITIONAL INFORMATION
Outside Temperature	Yes	Yes	Yes	
T/H Index	Yes		Yes	
Wind Chill		Yes	Yes	
Inside Temperature	Yes	Yes	Yes	
Wind Speed	Yes		Yes	Direction of Gust
Rate of Rainfall	Yes		Yes	
Outside Humidity	Yes	Yes	Yes	

ALARMS

The Energy EM features a set of alarms which can be programmed to sound whenever a reading exceeds a particular value. With the exception of barometric pressure, dew-point, and time, all alarms sound when a reading reaches the alarm threshold and will continue to sound until the reading returns to within the threshold. This means that for all high alarms, the alarm sounds when a reading reaches the alarm threshold continues to sound until the reading drops below the alarm threshold. On all low alarms, the alarm sounds when a reading reaches the alarm threshold and continues to sound until the reading rises above the alarm threshold.

The table below summarizes the Energy EM's alarms.

CONDITION	HIGH ALARM	LOW ALARM	SPECIAL ALARM
Outside Temperature	Yes	Yes	
T/H Index	Yes		
Wind Chill		Yes	
Wind Speed	Yes		
"Daily" Rainfall	Yes		
Barometric Pressure			Rate of Change per Hour
Outside Humidity	Yes	Yes	
Dew-Point			Temperature within 2˚F (1˚C) of Dew-Point
Time			Standard "Alarm Clock"

The three special alarms are described below:

- **Barometric Pressure**
  The barometric pressure alarm alerts you to changes in barometric pressure. You may select a rate of change per hour (0.2"/0.4"/0.6", 0.5 mm/1.0 mm/1.5 mm, 0.7 hPa/1.4 hPa/2.0 hPa) and the Energy EM's alarm will sound if the rate of change (in either direction) exceeds your threshold.

- **Dew-Point**
  The dew-point alarm alerts you when the temperature comes within 2˚F (1˚C) of the dew-point.

- **Time**
  The time alarm is a standard "alarm clock" type of alarm. It will sound for one minute after it is triggered.

Chapter **3** **USING THE ENERGY ENVIRO MONITOR**

USING THE ENTER KEY

The ENTER key is used to enter or change data (such as an alarm threshold setting). You should become familiar with the use of this key, since it serves many purposes in operating the Energy EM. The ENTER key has two basic modes of operation, each of which is explained below.

- **Press and release**
  In general, each digit in a value is changed separately. The "active" digit (the one which is currently ready to be changed) flashes on and off in the display. Pressing and releasing ENTER cycles through all available digits in a value, making each digit active in turn. Each time you press and release ENTER, the next digit becomes active. When you first begin to change a value, the leftmost digit will be active. Pressing and releasing ENTER will cause the second digit (from the left) to become active, and so on. When you get to the last digit in a value, pressing and releasing ENTER makes the first digit (the leftmost digit) active once again.

- **Press and hold**
  Pressing and holding ENTER makes the next digit in the value active *and* to begins cycling through all available entries for the active digit (or digits). As long as you hold ENTER down, the station will continue to cycle through all possible entries for that digit. When the desired entry appears, release ENTER.

> **Note:** *To protect against accidental changing of the barometric pressure once it has been set, you must press and hold ENTER for at least 8 second before changing the barometric pressure value. As you hold ENTER for those 8 seconds, the entire value will flash as a further reminder.*

Entering Negative Numbers

If you want to enter a negative number, first enter the number without the negative sign. Then press and release ENTER until the appropriate digit (the one where you want to place the negative sign) begins to flash. Hold ENTER as this digit cycles through the available entries, one of which will be a negative sign if a negative entry is valid.

Example of Using ENTER: Setting the Time

You should use the following step-by-step example of using the ENTER key to help you better understand its use.

1. **Press TIME until the time display appears.**

2. **Press UNITS to change from the 12-hour format to the 24-hour format, as desired.**
   The 12-hour format is indicated by the symbol AM or PM. The 24-hour format is indicated by the symbol 24HR.

3. **Press ENTER and hold it down.**
   The two left hand digits, which represent the hour, will begin to flash and then cycle through the possible entries. (Note that the two digits which represent the hour are linked together when using the ENTER key.) If you are using the 12-hour format, the digits cycle from 12 AM to 11 PM. If you are using the 24-hour format, the digits cycle from 0 to 23.
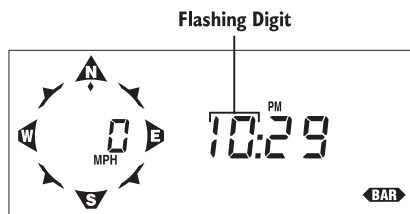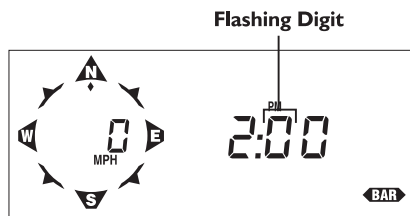

ENTERING THE HOUR DIGITS

4. **Release ENTER when the correct entry appears.**

5. **Press and release ENTER to move to the next digit, the "tens" digit.**
   The "tens" digit begins to flash.
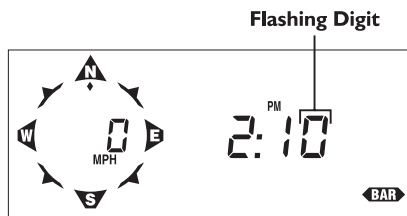
6. **Press and hold ENTER down.**
   The "tens" digit will begin to cycle through the possible entries (0 to 5).

ENTERING THE "TENS" DIGIT

7. **Release ENTER when the correct entry appears.**

8. **Press and release ENTER to move to the next digit, the "ones" digit.**
    The "ones" digit begins to flash.

9. **Press and hold ENTER down.**
    The "ones" digit will begin to cycle through the possible entries (0 to 9).

*ENTERING THE "ONES" DIGIT*

10. **Release ENTER when the correct entry appears.**

11. **If necessary, repeat the steps above to correct your entry for any of the digits.**

12. **When you have entered the correct time, wait four seconds without pressing any keys.**
    After four seconds, the Energy EM saves the entry and returns to normal operation. The time you just entered will appear in the display as the current time.

COOLING DEGREE-DAYS

The Energy EM displays daily cooling degree-days, total cooling degree-days during the period, and the average cooling degree-days per day during the period for both temperature and T-H index. (See "Period" on page 11 for a discussion of the period.) The default cooling degree-days base threshold is 65˚ F (18˚ C). You may change this threshold if desired. You may display cooling degree-days in Fahrenheit or Celsius.
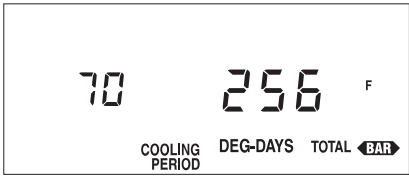
Viewing Cooling Degree-Days

1. **To display the daily cooling degree-days sum, press COOL'G D-DAYS.**
    The daily cooling degree-days sum appears on the right of the display. The base threshold setting appears on the left of the display.
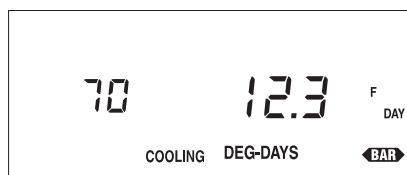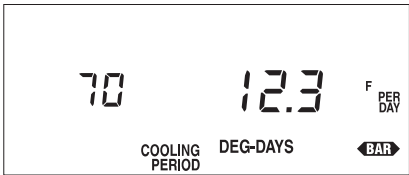

DAILY COOLING DEGREE-DAYS

The daily cooling degree-days sum represents the total cooling degree-days since the last time you (or AutoClear) cleared cooling degree-days. For instructions on clearing daily cooling degree-days, see "Clearing Daily Cooling Degree-Days Sum" on page 21.

2. **To display the total cooling degree-days for the period, press COOL'G D-DAYS again.**
    The total cooling degree-days for the period appear on the right of the display. The base threshold setting appears on the left of the display.
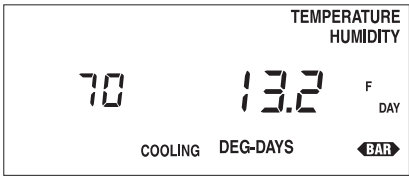

TOTAL COOLING DEGREE-DAYS DURING PERIOD

3. **To display the average daily cooling degree-days during the period, press COOL'G D-DAYS again.**
    The average daily cooling degree-days appear on the right of the display. The base threshold setting appears on the left of the display.

AVERAGE DAILY COOLING DEGREE-DAYS DURING PERIOD

4. **To display the daily T-H index cooling degree-days sum, press COOL'G D-DAYS again.**
    The daily T-H index cooling degree-days sum appears on the right of the display. The base threshold setting appears on the left of the display.
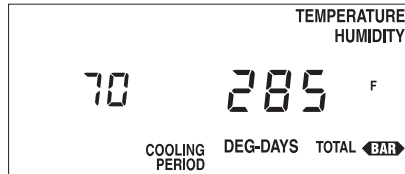

DAILY T-H INDEX COOLING DEGREE-DAYS

The daily T-H index cooling degree-days sum represents the total T-H index cooling degree-days since the last time you (or AutoClear) cleared T-H index cooling degree-days. For instructions on clearing daily T-H index cooling degree-days, see "Clearing Daily Cooling Degree-Days Sum" on page 21.

5. **To display the total T-H index cooling degree-days for the period, press COOL'G D-DAYS again.**
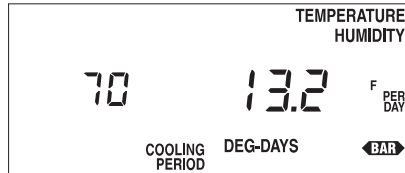
   The total T-H index cooling degree-days for the period appear on the right of the display. The base threshold setting appears on the left of the display.

TOTAL T-H INDEX COOLING DEGREE-DAYS DURING PERIOD

6. **To display the average daily T-H index cooling degree-days during the period, press COOL'G D-DAYS again.**
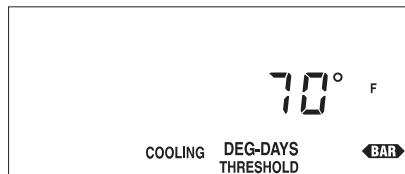
   The average daily T-H index cooling degree-days appear on the right of the display. The base threshold setting appears on the left of the display.

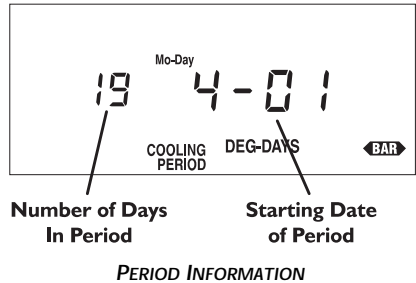*AVERAGE DAILY T-H INDEX COOLING DEGREE-DAYS DURING PERIOD*

7. **To display the threshold, press COOL'G D-DAYS again.**

   The threshold appears on the right of the display.
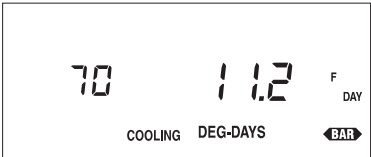

COOLING DEGREE-DAYS THRESHOLD

8. **To display the date on which the current period started and the number of days in the period, press COOL'G D-DAYS again.**

   The date on which the period started appears on the right of the display. The number of days in the period appears on the left of the display.


Number of Days   Starting Date
In Period   of Period

PERIOD INFORMATION

9. **To display the status of the AutoClear function for daily cooling degree-days and daily T-H index cooling degree-days (On/Off), press COOL'G D-DAYS again.**

   If the AutoClear function is enabled, the word **On** appears on the right of the display. If the AutoClear function is disabled, the word **OFF** appears on the right of the display. (See "Enabling/Disabling AutoClear" on page 50.)

10. **Continuing to press COOL'G D-DAYS will cycle through all the cooling degree-days displays in a continuous loop.**

Selecting Units of Measure

To select the desired unit of measure for cooling degree-days, simply press UNITS while viewing any of the cooling degree-days displays (except Auto-Clear or period information). As you press UNITS, the Energy EM alternates between F and C. All temperature information (including heating degree-days, temperature, apparent temperature, and dew-point) will appear in the units of measure you select.
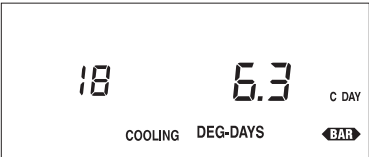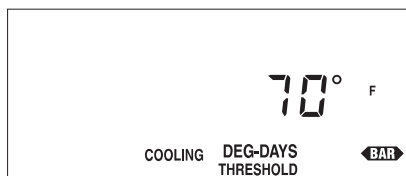

Fahrenheit (F)   Celsius (C)

TYPICAL COOLING DEGREE-DAYS UNITS OF MEASURE

Setting Cooling Degree-Days Threshold

You may change the cooling degree-days threshold, if necessary.

1. **Press COOL'G D-DAYS as necessary to display the cooling degree-days threshold.**
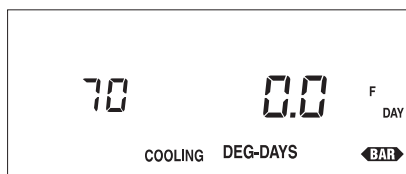

COOLING DEGREE-DAYS THRESHOLD

2. **Press UNITS as necessary to select the desired unit of measure.**
3. **Use ENTER to set the threshold to the desired temperature.**
4. **Press COOL'G D-DAYS to save the entry.**

Clearing Daily Cooling Degree-Days Sum

You may clear the daily cooling degree-days sum or the daily T-H cooling degree-days sum at any time to begin a new "daily" cooling degree-days total.

1. **Press COOL'G D-DAYS as necessary to display the desired cooling degree-days sum.**
2. **Press and hold down CLEAR until the cooling degree-days sum resets to zero.**
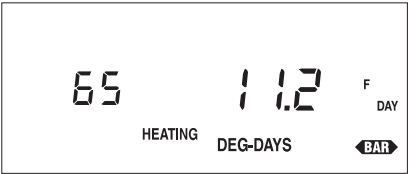

DAILY COOLING DEGREE-DAYS CLEARED

Note: *Clearing the daily cooling degree-days sum does not clear the daily T-H index degree-days sum and vice-versa. You must clear each sum individually (or use AutoClear).*

HEATING DEGREE-DAYS

The Energy EM displays daily degree-days, total degree-days during the period, and the average heating degree-days per day during the period for both temperature and wind chill. (See "Period" on page 11 for a discussion of the period.) The default heating degree-days base threshold is 65˚ F (18˚ C). You may change this threshold if desired. You may display heating degree-days in Fahrenheit or Celsius.
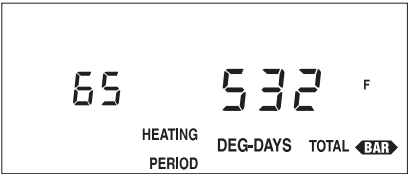
Viewing Heating Degree-Days

1. **To display the daily heating degree-days sum, press HEAT'G D-DAYS.**
   The daily heating degree-days sum appears on the right of the display. The base threshold setting appears on the left of the display.

DAILY HEATING DEGREE-DAYS

The daily heating degree-days sum represents the total heating degree-days since the last time you (or AutoClear) cleared heating degree-days. For instructions on clearing daily heating degree-days, see "Clearing Daily Heating Degree-Days Sum" on page 25.
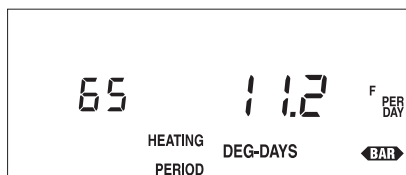
2. **To display the total heating degree-days for the period, press HEAT'G D-DAYS again.**
   The total heating degree-days for the period appear on the right of the display. The base threshold setting appears on the left of the display.
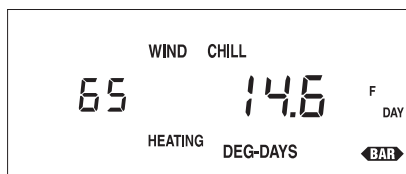

TOTAL HEATING DEGREE-DAYS DURING PERIOD

3. **To display the average daily heating degree-days during the period, press HEAT'G D-DAYS again.**

   The average daily heating degree-days appear on the right of the display. The base threshold setting appears on the left of the display.

AVERAGE DAILY HEATING DEGREE-DAYS DURING PERIOD

4. **To display the daily wind chill heating degree-days sum, press HEAT'G D-DAYS again.**

   The daily wind chill heating degree-days sum appears on the right of the display. The base threshold setting appears on the left of the display.
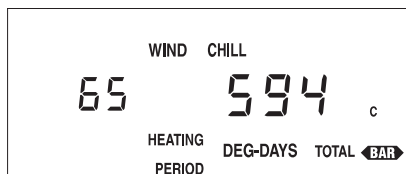

DAILY WIND CHILL HEATING DEGREE-DAYS

   The daily wind chill heating degree-days sum represents the total wind chill heating degree-days since the last time you (or AutoClear) cleared wind chill heating degree-days. For instructions on clearing daily wind chill heating degree-days, see "Clearing Daily Heating Degree-Days Sum" on page 25.

5. **To display the total wind chill heating degree-days for the period, press HEAT'G D-DAYS again.**

   The total wind chill heating degree-days for the period appear on the right of the display. The base threshold setting appears on the left of the display.

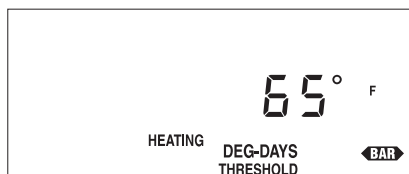*TOTAL WIND CHILL HEATING DEGREE-DAYS DURING PERIOD*

6. **To display the average daily wind chill heating degree-days during the period, press HEAT'G D-DAYS again.**

   The average daily wind chill heating degree-days appear on the right of the display. The base threshold setting appears on the left of the display.

   WIND   CHILL

   65 14.6 C PER DAY

   HEATING   DEG-DAYS   ◄BAR►
   PERIOD

   AVERAGE DAILY WIND CHILL HEATING DEGREE-DAYS DURING PERIOD

7. **To display the threshold, press HEAT'G D-DAYS again.**

   The threshold appears on the right of the display.

   $65°$ F

   HEATING   DEG-DAYS   ◄BAR►
   THRESHOLD

   HEATING DEGREE-DAYS THRESHOLD

8. **To display the date on which the current period started and the number of days in the period, press HEAT'G D-DAYS again.**

   The date on which the period started appears on the right of the display. The number of days in the period appears on the left of the display. To view a typical period information display, see the "Period Information" illustration on page 20.

9. **To display the status of the AutoClear function for daily heating degree-days and daily wind chill heating degree days (On/Off), press HEAT'G D-DAYS again.**

   If the AutoClear function is enabled, the word **On** appears on the right of the display. If the AutoClear function is disabled, the word **OFF** appears on the right of the display. (See "Enabling/Disabling AutoClear" on page 50.)

10. **Continuing to press HEAT'G D-DAYS will cycle through all the heating degree-days displays in a continuous loop.**

Selecting Units of Measure

To select the desired unit of measure for heating degree-days, simply press UNITS while viewing any of the heating degree-days displays (except Auto-Clear). As you press UNITS, the Energy EM alternates between F and C. All temperature information (including cooling degree-days, temperature, apparent temperature, and dew-point) will appear in the units of measure you select.
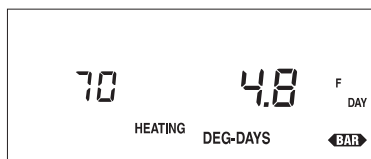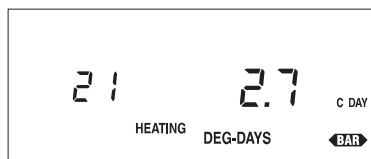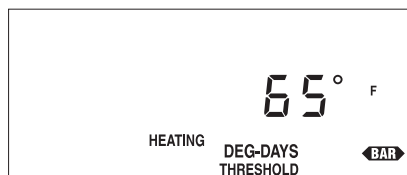
Fahrenheit (F)   **Celsius (C)**

TYPICAL HEATING DEGREE-DAYS UNITS OF MEASURE

Setting Heating Degree-Days Threshold

You may change the heating degree-days threshold, if necessary.

1. Press HEAT'G D-DAYS as necessary to display the heating degree-days threshold.
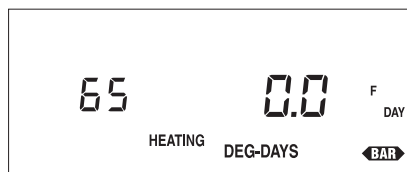
HEATING DEGREE-DAYS THRESHOLD

2. Press UNITS as necessary to select the desired unit of measure.
3. Use ENTER to set the threshold to the desired temperature.
4. Press HEAT'G D-DAYS to save the entry.

Clearing Daily Heating Degree-Days Sum

You may clear the daily heating degree-days sum or the daily wind chill heating degree-days sum at any time to begin a new "daily" heating degree-days total.

1. Press HEAT'G D-DAYS as necessary to display the desired heating degree-days sum.
2. Press and hold down CLEAR until the heating degree-days sum resets to zero.

DAILY HEATING DEGREE-DAYS CLEARED

TEMPERATURE AND APPARENT TEMPERATURE

The Energy EM displays the current outside temperature, inside temperature, T-H index, and wind chill. In addition, you may view the high and low inside and outside temperatures, the high T-H index, and the low wind chill along with the time at which they occurred. You may display all conditions in ˚F or ˚C. Outside and inside temperature may be displayed at a resolution of either 1˚ or 0.1˚.

Viewing Temperature and Apparent Temperature

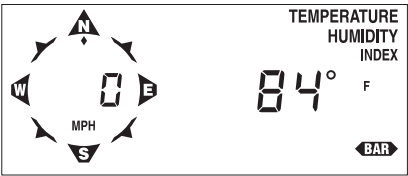1. **To display the current outside temperature, press TEMP.**
   The current outside temperature appears on the right of the display.
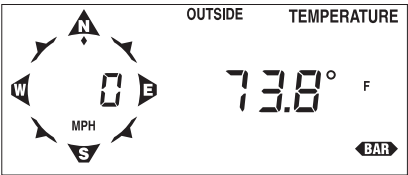
CURRENT OUTSIDE TEMPERATURE

2. **To display the current T-H index, press TEMP again.**
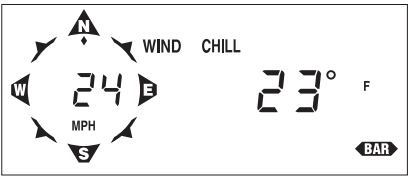   The current T-H index appears on the right of the display.

CURRENT T-H INDEX

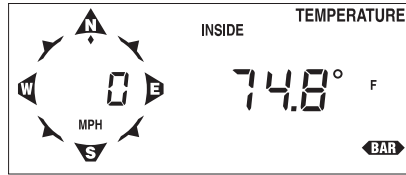3. **To display the current wind chill, press TEMP again.**
   The current wind chill appears on the right of the display.

CURRENT WIND CHILL

4. **To display the current inside temperature, press TEMP again.**
   The current inside temperature appears on the right of the display.
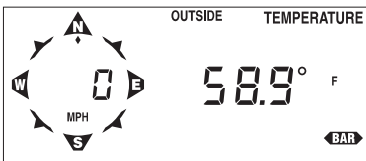

CURRENT INSIDE TEMPERATURE

5. **To display the status of the AutoClear function for high and low outside temperature, high T-H index, low wind chill, and high and low inside temperature (On/Off), press TEMP again.**
   If the AutoClear function is enabled, the word **On** appears on the right of the display. If the AutoClear function is disabled, the word **OFF** appears on the right of the display. (See "Enabling/Disabling AutoClear" on page 50.)

6. **Continuing to press TEMP will cycle through the outside temperature, inside temperature, and T-H index displays in a continuous loop.**

Selecting Units of Measure

To select the desired unit of measure, simply press UNITS while viewing any of the outside temperature, inside temperature, and T-H index displays (except AutoClear). As you press UNITS, the Energy EM alternates between ˚F and ˚C (and between 1˚ and 0.1˚ resolution if changing the units for outside or inside temperature) All temperature information (including degree-days and dew-point) will appear in the units of measure you select.

Fahrenheit (˚F)   **Celsius (˚C)**
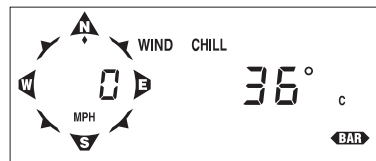
TYPICAL UNITS OF MEASURE

Highs and Lows

The Energy EM displays the high and low outside temperature, the high T-H index, the low wind chill, and the high and low inside temperature along with the time at which it occurred. For information on displaying and clearing highs and lows, see "Highs and Lows" starting on page 44.

Alarms

You may set a high alarm for outside temperature, inside temperature, and T-H index. You may set a low alarm for outside temperature, inside temperature, and wind chill. For information on displaying, setting, and clearing alarms, see "Alarms" starting on page 46.

WIND

You may select to display the following wind conditions on the right hand side of the display: wind speed, daily wind run, average wind run per day during the period, and wind direction in degrees. In addition, you may view the high wind speed along with the direction of the gust and the time at which it occurred. The table below summarizes the units of measure in which each condition may be displayed.

CONDITION	UNITS OF MEASURE
Wind Speed	Miles Per Hour (MPH), Knots, Kilometers Per Hour (km/h), Meters Per Second (m/s)
Wind Run	Miles (mi) or Kilometers (km)

The Compass Rose

Wind speed and direction are also displayed in the compass rose on the left of the display. The compass rose is divided into 16 points. Wind direction is indicated by a flashing diamond at one of these points. Current wind speed and the unit of measure in which wind speed is being displayed appear at the center of the compass rose. The compass rose appears on the Energy EM display at almost all times (it does not appear when displaying rainfall or degree-days, for example).
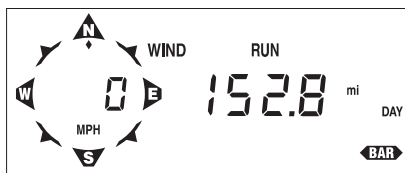
Viewing Wind Conditions

1. **To display the current wind speed, press WIND.**

   The current wind speed appears on the right of the display.
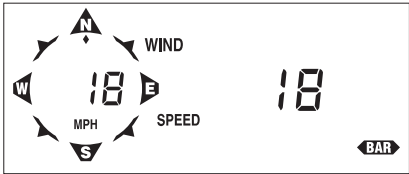
CURRENT WIND SPEED

2. **To display daily wind run, press WIND again.**
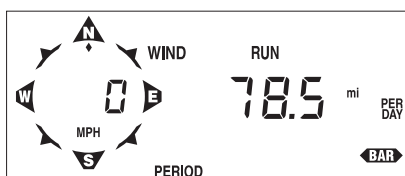   The daily wind run appears on the right of the display.

DAILY WIND RUN

The daily wind run represents the total wind run since the last time you (or AutoClear) cleared wind run. For instructions on clearing wind run, see "Clearing Daily Wind Run" on page 30.

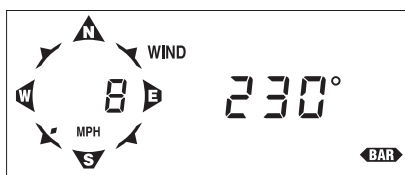3. **To display the average daily wind run during the period, press WIND again.**
   The average daily wind run appears on the right of the display.

AVERAGE DAILY WIND RUN

4. **To display the wind direction in degrees, press WIND again.**
   The wind direction reading, to a resolution of 1˚, appears on the right of the display.

WIND DIRECTION

5. **To display the date on which the current period started and the number of days in the period, press WIND again.**
   The date on which the period started appears on the right of the display. The number of days in the period appears on the left of the display. To view a typical period information display, see the "Period Information" illustration on page 20.

6. **To display the status of the AutoClear function for high wind speed and daily wind run, press WIND again.**
   If the AutoClear function is enabled, the word **On** appears on the right of the display. If the AutoClear function is disabled, the word **OFF** appears on the right of the display. (See "Enabling/Disabling AutoClear" on page 50 for instructions.)
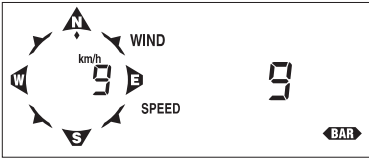
7. **Continuing to press WIND will cycle through the wind displays in a continuous loop.**
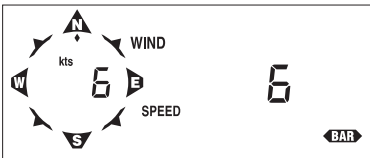
Selecting Units of Measure

To select the desired unit of measure, simply press UNITS while viewing any the wind speed or wind run displays. As you press UNITS, the Energy EM cycles through the available units of measure.
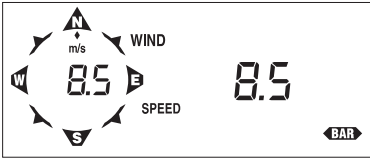
Wind Speed (m/s)   **Wind Speed (km/hr)**
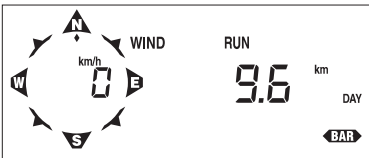
Wind Speed (kts)   **Wind Run (km)**

TYPICAL UNITS OF MEASURE

Displaying High Wind Speed

The Energy EM displays the high wind speed along with the time at which it occurred and the direction of the high gust. For information on displaying and clearing highs and lows, see "Highs and Lows" starting on page 44.

Clearing Daily Wind Run

You may clear the daily wind run total at any time to begin a new "daily" wind run total. Daily wind run may also be reset once a day using AutoClear (see "AutoClear" on page 12).

1. Press WIND as necessary to display the daily wind run sum.

2. Press and hold down CLEAR until the wind run total resets to zero.
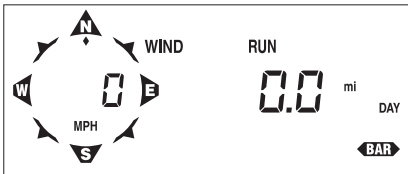
DAILY WIND RUN CLEARED

Alarms

You may set a high alarm for wind speed. For information on displaying, setting, and clearing alarms, see "Alarms" starting on page 46.

SOLAR RADIATION

The Energy EM displays the current solar radiation intensity, the daily solar energy total, and the average daily solar energy per day during the period. Current solar radiation is displayed in Watts per square meter (W/m^2). Daily and Average solar energy is displayed in Langleys (Ly).

Viewing Solar Radiation

1. **To display the current solar radiation intensity, press SUN.**
   The current solar radiation intensity appears on the right of the display.

CURRENT SOLAR RADIATION INTENSITY

2. **To display the daily solar energy total, press SUN again.**
   The daily solar energy total appears on the right of the display.

DAILY SOLAR ENERGY TOTAL

The daily solar energy total represents the total amount of incident solar energy since the last time you (or AutoClear) cleared solar energy. For instructions on clearing solar energy, see "Clearing Daily Solar Energy" on page 32.

3. **To display the average daily energy during the period, press SUN again.**
   The average daily energy during the period appears on the right of the display.

AVERAGE DAILY ENERGY

4. **To display the date on which the current period started and the number of days in the period, press SUN again.**
   The date on which the period started appears on the right of the display. The number of days in the period appears on the left of the display. To view a typical period information display, see the "Period Information" illustration on page 20.

5. **To display the status of the AutoClear function for daily solar energy, press SUN again.**
    If the AutoClear function is enabled, the word **On** appears on the right of the display. If the AutoClear function is disabled, the word **OFF** appears on the right of the display. (See "Enabling/Disabling AutoClear" on page 50 for instructions.)

6. **Continuing to press SUN will cycle through the solar radiation displays in a continuous loop.**

Clearing Daily Solar Energy

You may reset the daily solar energy total at any time to begin a new "daily" solar energy total.

1. **Press SUN as necessary to display the daily solar energy total.**

2. **Press and hold down CLEAR until the daily solar energy total resets to zero.**
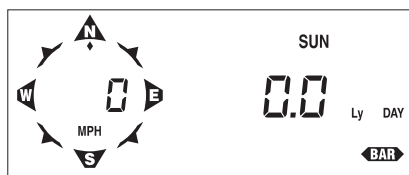
DAILY SOLAR ENERGY CLEARED

RAINFALL

You may display the daily rainfall and the total rainfall on the right side of the display. Whenever you view daily rainfall, the rate of rainfall appears on the left side of the display. In addition, you may view a daily high rate of rainfall along with the time at which it occurred. You may display rainfall in either inches (in) or millimeters (mm). Rate of rainfall is displayed in inches per hour (in/hr) or millimeters per hour (mm/hr).

Viewing Rainfall

1. **To display "daily" rainfall, press RAIN.**

   The amount of daily rainfall appears on the right of the display. The current rate of rainfall appears on the left of the display.

   ```
     0.6              0.59  in    DAY
   PER HOUR                 RAIN
                                 ◄BAR►
   ```
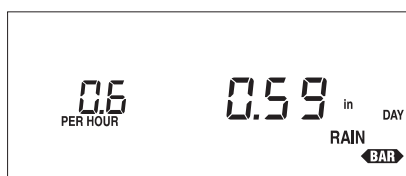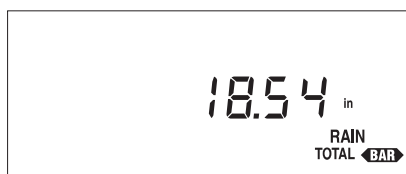
   DAILY RAINFALL

   The daily rainfall represents the amount of rainfall since the last time you (or AutoClear) cleared daily rainfall. For instructions on clearing daily rainfall, see "Clearing Daily and Total Rainfall" on page 35.

2. **To display the total rainfall during the period, press RAIN again.**

   The total rainfall appears on the right of the display. The current rate of rainfall appears on the left of the display.

   ```
              18.54  in
                     RAIN
                 TOTAL ◄BAR►
   ```

   TOTAL RAINFALL

   The total rainfall represents the amount of rainfall since the last time you cleared total rainfall. For instructions on clearing total rainfall, see "Clearing Daily and Total Rainfall" on page 35.

3. **To display the status of the AutoClear function for daily rainfall and for the high rate of rainfall, press RAIN again.**

   If the AutoClear function is enabled, the word **On** appears on the right of the display. If the AutoClear function is disabled, the word **OFF** appears on the right of the display. (See "Enabling/Disabling AutoClear" on page 50 for instructions.)

4. **Continuing to press RAIN will cycle through the rain displays in a continuous loop.**

Selecting Units of Measure

To select the desired unit of measure, simply press UNITS while viewing daily or total rainfall. As you press UNITS, the Energy EM alternates between inches and millimeters. Rate of rainfall switches correspondingly from inches per hour to millimeters per hour automatically.
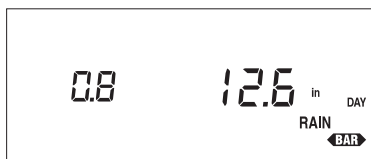
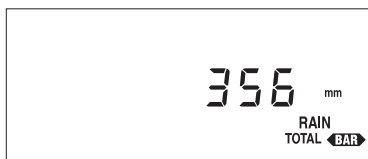|	
0.8 12.6 in DAY RAIN BAR	*356* mm RAIN TOTAL BAR
Inches (in)	**Millimeters (mm)**

TYPICAL UNITS OF MEASURE

Entering Total Rainfall

You may have previously recorded rainfall amounts which you want reflected in the Energy EM's total rainfall amounts. Use the procedure below to enter a total rainfall amount.

1. **Press RAIN as necessary to display total rainfall.**

2. **Press UNITS as necessary to select the desired unit of measure.**

3. **Use ENTER to set the desired amount of total rainfall.**
   See "Using the Enter Key" on page 15 for instructions on using ENTER.

4. **When finished entering the total rainfall amount, press RAIN.**
   The Energy EM saves the total rainfall amount. The system will add any further rainfall to this total, until you clear total rainfall.

Displaying High Rate of Rainfall

The Energy EM displays the high rate of rainfall and the time at which it occurred. For information on displaying and clearing highs and lows, see "Highs and Lows" starting on page 44.

Clearing Daily and Total Rainfall

You may clear daily and/or total rainfall at any time to begin a new total.

Note: *Daily and total rainfall values must be cleared separately.*

1. Press RAIN as necessary to display either daily or total rainfall.
2. Press and hold down CLEAR until the rainfall total resets to zero.

TOTAL RAINFALL CLEARED

Note: *To prevent accidental clearing of the total rainfall, you need to hold CLEAR down for 7 seconds before total rainfall clears. Daily rainfall clears after only 3 seconds.*

Alarms

You may set a high alarm for daily rainfall. For information on displaying, setting, and clearing alarms, see "Alarms" starting on page 46.

BAROMETRIC PRESSURE

The Energy EM displays current barometric pressure in inches of Hg (in), millimeters of Hg (mm), and hectoPascals (hPa).

Barometric Trend Indicator

The barometric trend indicator, which appears on the bottom right hand corner of the display, gives you a visual indication of whether barometric pressure is steady, rising, or falling. The barometric trend indicator updates approximately every 15 minutes.

- **Steady Barometric Pressure**
  If barometric pressure changed by less than .02 inches of Hg (0.5 mm, or 0.7 hPa) over the past hour, the steady barometric pressure indicator appears.

STEADY BAROMETRIC PRESSURE INDICATOR

- **Rising Barometric Pressure**
  If barometric pressure rose by .02 inches of Hg (0.5 mm, or 0.7 hPa) or more over the past hour, the rising barometric pressure indicator appears.

RISING BAROMETRIC PRESSURE INDICATOR

- **Falling Barometric Pressure**
  If barometric pressure fell by .02 inches of Hg (0.5 mm, or 0.7 hPa) or more over the past hour, the falling barometric pressure indicator appears.

FALLING BAROMETRIC PRESSURE INDICATOR

Viewing Barometric Pressure

1. **To display current barometric pressure, press BAR.**
   The current barometric pressure appears on the right of the display.

CURRENT BAROMETRIC PRESSURE

Selecting Units of Measure

To select the desired unit of measure, simply press UNITS while viewing the current barometric pressure. As you press UNITS, the Energy EM cycles between in, mm, and hPa.

Millimeters of Hg (mm)   **HectoPascals (hPa)**

TYPICAL UNITS OF MEASURE

Entering Barometric Pressure

Because atmospheric pressure varies with both altitude and local weather conditions, you must enter the current barometric pressure for your location. Wait at least one hour after powering the Energy EM (to allow the circuit a chance to stabilize) before you enter barometric pressure. Once the barometric pressure is set, the Energy EM will calculate and display the correct barometric pressure until the unit is moved to a different altitude or power is interrupted.

1. **Determine the current barometric pressure.**
   Many TV and radio weather reports carry this information. Or you may call your local airport control tower.

2. **Press BAR to display current barometric pressure.**

3. **Press and hold down ENTER until the barometric pressure reading stops flashing.**
   At first, the entire barometric pressure reading will flash as a warning. After four seconds the Energy EM will revert to normal entry mode (i.e., only one digit flashing).

4. **Use ENTER to set the correct barometric pressure.**
   See "Using the Enter Key" on page 15 for instructions on using ENTER.

5. **When finished setting the barometric pressure, press any function key to exit.**
   The Energy EM saves the barometric pressure reading.

Alarms

You may set a special barometric pressure alarm which will alert you to changes in the barometric pressure. For information on displaying, setting, and clearing alarms, see "Alarms" starting on page 46.
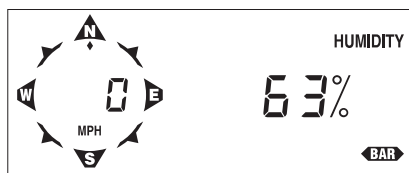
RELATIVE HUMIDITY

The Energy EM displays the current relative humidity. In addition, you may view the high and low relative humidity along with the time at which they occurred.

Viewing Humidity

1. **To display the current humidity, press HUM.**
   The current humidity appears on the right of the display.

CURRENT RELATIVE HUMIDITY

2. **To display the status of the AutoClear function for high and low humidity (On/Off), press HUM again.**
   If the AutoClear function is enabled, the word **On** appears on the right of the display. If the AutoClear function is disabled, the word **OFF** appears on the right of the display. (See "Enabling/Disabling AutoClear" on page 50 for instructions.)

3. **Continuing to press HUM will alternate between the current humidity and the Auto-Clear status.**

Displaying Highs and Lows

The Energy EM displays the high and low humidity along with the time at which it occurred. For information on displaying and clearing highs and lows, see "Highs and Lows" starting on page 44.

Alarms

You may set a high and a low alarm for humidity. For information on displaying, setting, and clearing alarms, see "Alarms" starting on page 46.
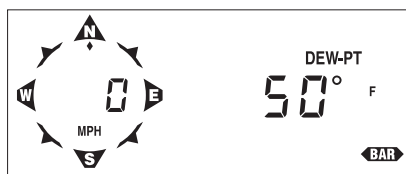
DEW-POINT

The Energy EM displays the current dew-point in either ˚F or ˚C.

Viewing Dew-Point

1. **To display the current dew-point, press DEW.**
   The current dew-point appears on the right of the display.

CURRENT DEW-POINT

Selecting Units of Measure

To select the desired unit of measure, simply press UNITS while viewing the current dew-point. As you press UNITS, the Energy EM alternates between ˚F and ˚C. All temperature information (including degree-days, temperature, and apparent temperature) will appear in the units of measure you select.
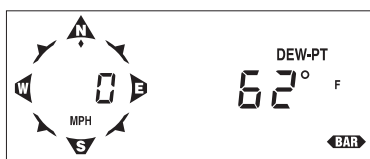
Fahrenheit (˚F)   **Celsius (˚C)**
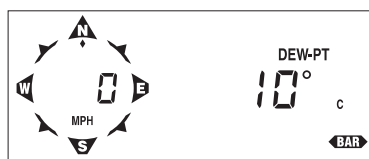
TYPICAL UNITS OF MEASURE

Alarms

You may set a special dew-point alarm which will alert you when temperature comes within 2˚F (˚1C) of dew-point. For information on displaying, setting, and clearing alarms, see "Alarms" starting on page 46.

TIME

The Energy EM displays the current time, date, year, the time at which the Energy EM performs the AutoClear each day, and the period information. You may display time in either 12-hour (AM/PM) or 24-hour (24h) format. You may display date in either Month-Day (Mo-Day) or Day.Month (Day.Mo) format. You may set the time, date, year, and the time at which you wish the Energy EM to perform the AutoClear each day. In addition, you may begin a new period, erasing all information from the previous period.

Displaying Time Functions
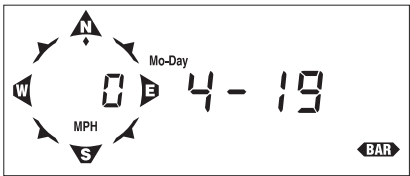
1. **To display the current time, press TIME.**
   The current time appears on the right of the display.

TIME

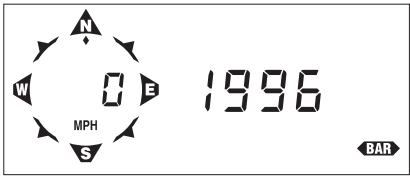2. **To display the current date, press TIME again.**
   The current date appears on the right of the display.

DATE

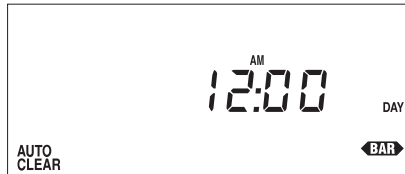3. **To display the current year, press TIME again.**
   The current year appears on the right of the display.

YEAR

4. **To display the time at which the Energy EM executes the AutoClear function each day, press TIME again.**
The time at which the Energy EM executes the AutoClear function each day appears on the right of the display.

TIME OF AUTOCLEAR

5. **To view information on the current period, press TIME again.**
The date on which the period started appear on the right of the display. The number of days in the current period appears on the left of the display.
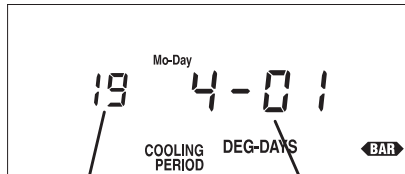
**Number of Days   Starting Date
In Period   of Period**

PERIOD INFORMATION

6. **Continuing to press TIME will cycle through the time displays in a continuous loop.**

Selecting Display Format

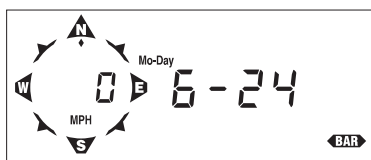To select the desired display format, simply press UNITS while viewing either the time or the date. As you press UNITS, the Energy EM alternates between the available time/date formats.

Time: 12-hour Format

Time: 24-hour Format

Date: Month-Day Format

Date: Day.Month Format

TYPICAL DISPLAY FORMATS

Entering Time, Date, or Year

1. Press TIME as necessary to display the time, date, or year, as desired.

2. Press UNITS as necessary to select the display format for time or date.

3. Use ENTER to set the time, date, or year.
   If using the 12-hour format, make sure you correctly set the time to AM or PM, as desired.

4. Press TIME to exit.
   The Energy EM saves the time, date, or year.

Setting the Time for AutoClear

1. Press TIME until the time of the AutoClear appears.

TIME OF AUTOCLEAR

2. Use ENTER to set the time at which you wish to have the AutoClear values cleared (see "AutoClear" on page 12).
   If using the 12-hour format, make sure you correctly set the time to AM or PM, as desired.

3. **Press TIME to exit**.

The Energy EM saves the AutoClear time. At the set time each day, the Energy EM clears those functions for which AutoClear is enabled (See "Enabling/Disabling AutoClear" on page 50).
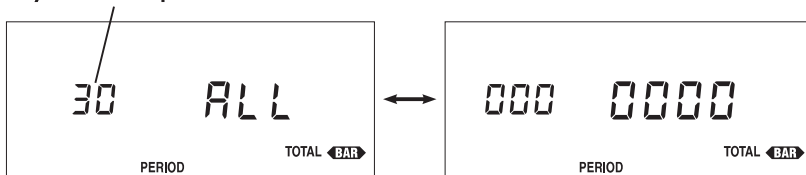
Clearing Period Information/Starting a New Period

When you begin a new period, all information which is listed as being "over the period" or "during the period" is cleared so new period totals may be accumulated/calculated. See "Period" on page 11 for more information.

1. **Press TIME as necessary to display the period information**.

2. **Press and hold down CLEAR**.

As you hold down CLEAR, the display alternates between showing the number of days in the period and the word **ALL** and showing zeros (**0000**) on both sides of the display. This provides you ample warning that the Energy EM is preparing to clear all period totals and begin a new period.

Days in current period

DISPLAY ALTERNATION DURING PERIOD CLEAR

3. **To clear all period totals and begin a new period, hold down clear until the display stops flashing and the period information display returns. Note that the number of days in the current period resets to 0.**

This indicates that the Energy EM has cleared all period totals and begun a new period.
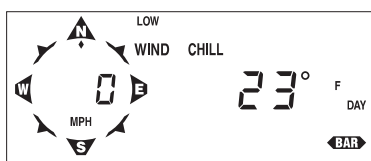
HIGHS AND LOWS

The Energy EM stores highs/lows for many of its functions. The table contained in "Highs and Lows" starting on page 13 lists all of the highs and lows stored/displayed by the Energy EM. The procedure for displaying and clearing highs and lows is the same for each high/low. The general procedure is covered below.
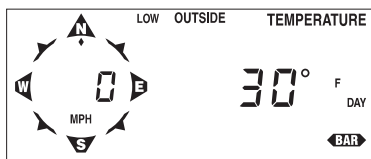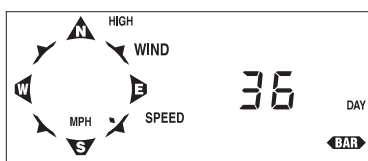
Low Outside Temperature
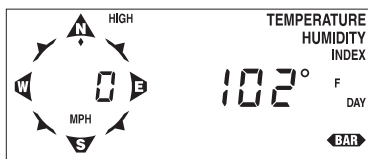
High T-H Index

Low Wind Chill

High Wind Speed & Direction of Gust
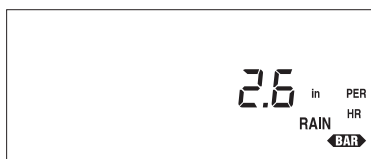
High Rate of Rainfall
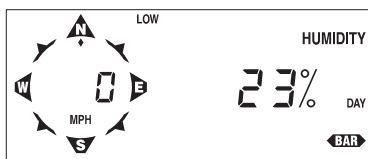
Low Humidity

SAMPLE HIGH/LOW DISPLAYS

When viewing high wind speed, the direction of the high gust appears as a steady (not flashing) diamond at one of the points.

Displaying Highs and Lows

1. Press the appropriate key as necessary to display the desired weather condition.

2. To view the high/low, press Recall.
   The high/low reading appears on the right of the display. (If a function stores/displays both a high and a low, the high reading appears first.)

3. To view the time at which the high/low occurred, watch the display without pressing a key.
   After approximately four seconds, the time at which the high/low occurred will appear on the right of the display. As long as you do not press a key, the Energy EM will continuously alternate between the high/low reading and the time.

4. **If a function stores/displays both a high and a low, press Recall again to view the low.**
   The low reading appears on the right of the display.

5. **To view the time at which the low occurred, watch the display without pressing a key.**
   After approximately four seconds, the time at which the low occurred will appear on the right of the display. As long as you do not press a key, the Energy EM will continuously alternate between the low reading and the time.

Clearing Highs and Lows

Clearing a high or a low value erases the currently stored value in order to obtain a new high/low reading.

1. **Press the appropriate key as necessary to display the desired weather condition.**

2. **Press RECALL as necessary to display the high or low for that condition.**

3. **Press and hold down CLEAR until the high/low value is cleared.**
   When the value stops flashing it means that the high/low has been cleared. It is not uncommon for another high/low reading to appear almost immediately. This is simply because the Energy EM is constantly in the process of recording new highs and lows.

4. **Press any function key to exit.**
   Each high/low is independent of every other. For instance, clearing the high air temperature does not clear the low air temperature. You must clear each individually.
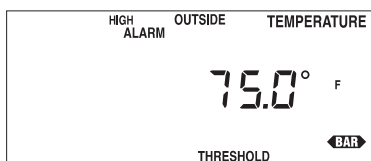
ALARMS

All alarms (except barometric pressure, dew-point, and time) behave in basically the same way. The general procedure for displaying and setting alarms is covered below.
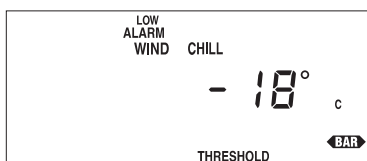
The Alarm Display

When an alarm is triggered, the Energy EM beeps and immediately displays the weather function triggering the alarm. The word ALARM flashes on and off in the display. The alarm display continues until alarm conditions are no longer met (see "Alarms" on page 14) or until the alarm is cleared.

Note: *You may silence the beeping by pressing CLEAR at any time, though the alarm display remains.*

High Outside Temperature Alarm

Low Wind Chill Alarm
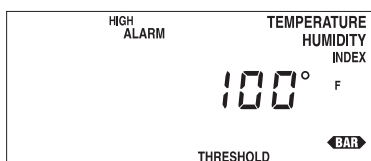
High T-H Index Alarm
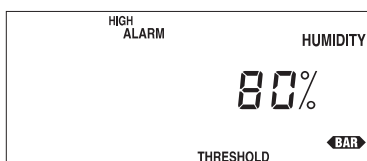
High Humidity Alarm

TYPICAL ALARM DISPLAYS

If more than one alarm is triggered at once, the Energy EM scans through all of the triggered alarms, displaying each for approximately four seconds before moving to the next.

Note: *If you have the Alarm Output Module certain alarm conditions may be used to provide electrical contact closures for activating or inhibiting external controllers or electrical equipment.*

Viewing an Alarm Threshold

1. **Press the appropriate key(s) to display the desired weather condition.**
2. **Press ALARM.**
   If the selected weather condition has only one alarm, the alarm threshold for that weather condition appears. If the weather condition has two alarms, the threshold for the high alarm appears first.

3. **To display the low alarm threshold for a weather condition with two alarms press ALARM again.**

   The threshold for the low alarm appears.

4. **Press any key to exit.**

Setting a Normal Alarm

Follow the procedure below for instructions on setting a standard high or low alarm threshold. Specific instructions for setting the barometric pressure and dew-point alarm are explained separately below.

1. **Press the appropriate key(s) to display the desired weather condition.**

2. **Press ALARM as necessary to display the desired alarm threshold.**

3. **Use ENTER to set the alarm.**

   If you want to enter a negative number (-10, for example), you must first enter the number without the negative sign. Then press and release ENTER to return to the first available digit in the entry. Press and hold ENTER to cycle through the choices for that digit, one of which will now be a negative sign (-).

4. **Press any function key to save and exit.**

Example of Setting an Alarm—Low Outside Temperature Alarm

This example shows you how to set the Energy EM's low outside temperature alarm to 32˚F.

1. **Press TEMP as necessary to display outside temperature.**
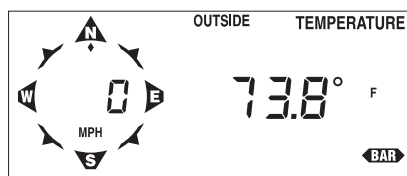
OUTSIDE TEMPERATURE

2. **Press UNITS as necessary to select ˚F.**

3. **Press ALARM twice to display the low alarm threshold.**

   The high alarm threshold appears first, then the low alarm threshold.

LOW OUTSIDE TEMPERATURE ALARM THRESHOLD (NO SETTING)

4. **Use ENTER to set the alarm to 32˚F.**

LOW OUTSIDE TEMPERATURE ALARM THRESHOLD (32˚F)

5. **Press TEMP to save and exit.**

    The alarm is now set and will sound when the outside temperature drops to 32˚F.

Setting the Barometric Pressure Alarm

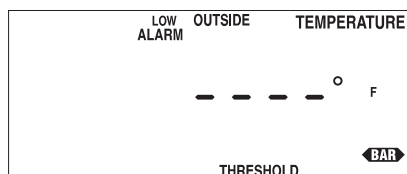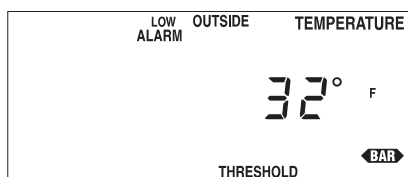This section describes the barometric pressure alarm. The barometric pressure alarm is a special alarm in that it is triggered when the rate of change in the barometric pressure equals or exceeds the alarm threshold. There are three possible barometric pressure alarm thresholds: 0.02", 0.04", or 0.06" (0.5 mm, 1.0 mm, 1.5 mm or 0.7 hPA, 1.4 hPA, 2.0 hPA). The alarm is triggered whether the barometric pressure rises or falls. To determine which way the barometric pressure is moving, check the barometric trend arrow.

1. **Press BAR as necessary to display the current barometric pressure.**

2. **Press ALARM to display the barometric pressure alarm threshold.**

3. **Use ENTER to set the change/hour which will cause an alarm.**
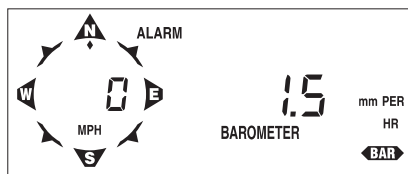
BAROMETRIC PRESSURE ALARM (1.5 MM PER HOUR)

4. **Press BAR to save and exit.**

    The alarm is now set and will sound when the rate of change in the barometric pressure equals or exceeds the alarm threshold.

Setting the Dew-Point Alarm

This section describes the dew-point alarm. The dew-point alarm is a special alarm in that it is triggered when the temperature comes within 2˚F of the dew-point.

1. **Press DEW to display the current dew-point.**

2. **Press ALARM to display the dew-point alarm threshold.**

3. **Press ENTER to activate the alarm.**

   There is only one threshold for the dew-point alarm—2˚F—which will appear in the display when you press ENTER. Pressing ENTER again has no effect.
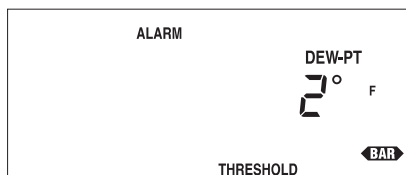

DEW-POINT ALARM (2˚F)

4. **Press DEW to save and exit.**

   The alarm is now set and will sound when the temperature comes within 2˚F of the dew-point.

To Silence an Alarm

To silence an alarm that has been triggered, press CLEAR. The beeping sound stops, though the alarm is not clear. The word ALARM and the function triggering the alarm remain on the display until alarm conditions are no longer met or the alarm is clear (as explained below).

To Clear an Alarm

1. **Press the appropriate key(s) to display the desired weather condition.**

   Note that, when an alarm has been triggered, the weather condition causing the alarm will appear on the display automatically (see "The Alarm Display" on page 46). If more than one alarm has been triggered at once, wait until the weather condition you want to clear appears on the display and then press ALARM.

2. **Press ALARM as necessary to display the desired alarm threshold (high or low) for that function.**

3. **Press and hold down CLEAR until a series of dashes replaces the alarm threshold on the display.**
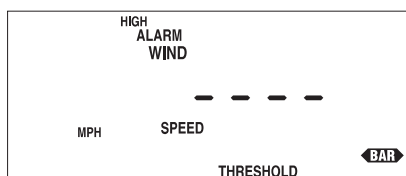
ALARM CLEARED

4. **Press any key to exit.**

   Each alarm threshold is independent of every other. For instance, clearing the high air temperature alarm does not clear the low air temperature alarm. You must clear each alarm individually.

ENABLING/DISABLING AUTOCLEAR

The general procedure for enabling and disabling the AutoClear function for individual weather conditions is covered below.

1. **Press the appropriate key(s) to display the desired weather condition's AutoClear display.**
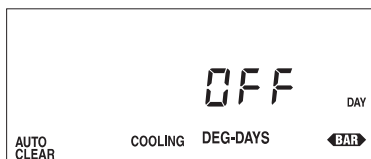
TYPICAL AUTOCLEAR STATUS DISPLAY

2. **Press ENTER to alternate the status between on and off.**

3. **Press any function key to save and exit.**

GENERAL HIGH/LOW CLEAR

The Energy EM includes a general clear feature which enables you to quickly clear most of the high and low registers. The g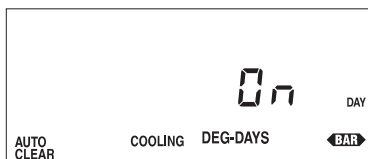eneral clear feature, however, will not clear any high/low value for which AutoClear (see "AutoClear" on page 12) has been turned on. The following registers are cleared by the general clear feature:

- **High and Low Outside Temperature**
- **High T-H Index**
- **Low Wind Chill**
- **High and Low Inside Temperature**
- **High Wind Speed**
- **High and Low Humidity**

The following registers are NOT cleared by the general clear feature:

- **"Daily" Cooling Degree-Days and "Daily" T-H Index Cooling Degree-Days**
- **"Daily" Heating Degree-Days and "Daily" Wind Chill Heating Degree-Days**
- **"Daily" Solar Energy**
- **"Daily" Rainfall**
- **Total Rainfall**
- **High Rate of Rainfall**

To Use General Clear Feature

1. **Press a function key to display any condition other than "daily" degree-days, "daily" rainfall, total rainfall, or "daily" solar energy.**
   General clear will not work from any display in which the CLEAR key already performs some action. Therefore it will not work in high/low displays or alarm displays either.

2. **Press and hold down CLEAR.**
   The display will flash seven times as a warning.

3. **When the display stops flashing, release CLEAR.**
   When the display stops flashing, the unit clears the registers listed above and returns to normal operation.

CALIBRATION NUMBERS

Calibration numbers exist for many conditions and enable you to adjust the displayed value to your satisfaction. This section explains calibration numbers and how to set or change them.

Inside and Outside Temperature

You may use temperature CAl to adjust the temperature up or down a specific number of degrees. Note that there are individual CAL numbers for both inside and outside temperature. If you change CAL for temperature, any calculated data which uses temperature (wind chill, for example) will also be affected.

$$Calibrated\ Temperature = Temperature + CAL$$

Default CAL = 0 (for ˚ F and ˚C).

Humidity

You may use humidity CAl to adjust the humidity up or down a specific number of percentage points. If you change CAL for humidity, any calculated data which uses humidity (T-H index, for example) will also be affected.

$$Calibrated\ Humidity = Humidity + CAL$$

Default CAL = 0%.

Wind Speed

You may change the wind CAL to adjust the wind speed readings according to the equation shown below. If you change CAL for wind speed, any calculated data which uses wind speed (wind chill, for example) will also be affected.

$$Calibrated\ Wind\ Speed = Revolutions * (1600/CAL)$$

Default CAL = 1600 (for mph), 995 (for kph), 1843 (for knots), or 3578 (for m/s).

Rainfall

Rainfall CAL determines how much rainfall each increment (pulse) represents. The default rainfall CAL of 100 works for a 0.01" increment.

$$\textit{Calibrated Rainfall= \# of pulses * (1/CAL)}$$

If you use a rain collector which measures in a different increment, or if you wish to display rainfall in a unit of measure other than the rain collector's native unit of measure, consult the table below to determine the correct calibration number for your purposes.

RAIN COLLECTOR'S "NATIVE" INCREMENT	DISPLAY UNITS	RAINFALL CAL
0.01 inches	Inches	100 (default)
0.01 inches	Millimeters	N/A (See note below table.)
0.1 inches	Inches	10
0.1 inches	Millimeters	N/A (See note below table.)
0.2 mm	Inches	127
0.2 mm	Millimeters	5
1 mm	Inches	N/A (See note below table.)
1 mm	Millimeters	1

Note: *Rainfall CAL must be a whole integer (no decimals). Generally, if the Energy EM is set to display rainfall in a unit of measure other than the rain collector's "native" unit of measure, you would be required to enter a CAL number which was not a whole integer. Therefore, we STRONGLY advise you to always set your Energy EM to display the rain collector's native unit of measure before entering, changing, or viewing rainfall CAL. Failure to do so may result in inaccurate rainfall readings. Be aware, however, that so long as you have the correct rainfall CAL for your rain collector, the Energy EM will accurately convert rainfall amounts from inches to millimeters (and vice versa.)*

Changing Calibration Numbers

1. **Press the appropriate function key as necessary to display the reading for which you wish to change the CAL. Hold down the function key after pressing it for the final time.**
   For example, if you want to change the CAL for inside temperature, press TEMP until the wind chill appears. Then press and hold TEMP to display inside temperature. After holding the function key for approximately three seconds, the word CAL begins to alternate in the display with the reading. After a few more seconds, the current calibration number appears.

2. **Use ENTER to set CAL.**
   See "Entering Negative Numbers" on page 16 for instructions on entering a negative CAL number.

3. **When finished, press any function key to save the new CAL and exit the calibration display.**

Resetting Calibration Numbers to Default

To completely reset all calibration numbers to their default settings, follow the procedure below to completely remove power from and then restart the station. When the station restarts, all default calibration values are restored.

Note: *This resets all station information including highs/lows, barometric pressure, total rainfall, period information, etc.*

1. **Write down the total rainfall, barometric pressure, and all alarm settings. You will need to reenter these values later.**

2. **If desired, write down all highs, lows, daily rainfall, and period information. These values will be lost and cannot be restored.**

3. **Disconnect all power sources from the station, including the power adapter, battery backup, solar power, etc.**
    All power must be removed from the unit.

4. **Reattach the power adapter and insert the battery.**
    The unit will start up again and all CAL numbers will be reset to their default values.

5. **Re-enter the total rainfall, barometric pressure, and all alarm settings.**

DISPLAY SCAN

The Energy EM comes with two pre-programmed scan routines which continuously cycle through various displays. The short scan routine displays the current value of every condition measured or calculated by the Energy EM. The long scan routine displays the current value of every condition measured or calculated *and* every high/low stored by the Energy EM. The long scan routine does not show the times at which highs/lows were recorded.

Starting the Scan Routines

1. **To start the short scan routine, press SCAN.**
    The unit begins to cycle through the short scan routine. Until you stop the scan routine, it will continuously cycle through every condition measured or calculated by the Energy EM.

2. **To start the long scan routine, press SCAN again.**
    The unit begins to cycle through the short scan routine. Until you stop the scan routine, it will continuously cycle through every condition measured or calculated by the Energy EM and every high/low stored by the Energy EM.

Stopping a Scan Routine

A scan routine will continue until you manually stop it or an alarm is triggered. To stop a scan routine, simply press any function key. The unit will cease cycling through the scan routine and display the appropriate condition.

PRIMARY POWER AND BATTERY BACKUP INDICATORS

The Energy EM display contains two "troubleshooting" indicators which help protect against accidental interruption of power. Both indicators appear in the upper left hand corner of the display and they may appear singly or together. Flashing of the POWER indicator indicates low power state or a disruption of the primary power source (the power source connected to the POWER jack on the bottom of the unit). If you see this indicator, check the connection of the primary power from the POWER jack all the way to the power source.
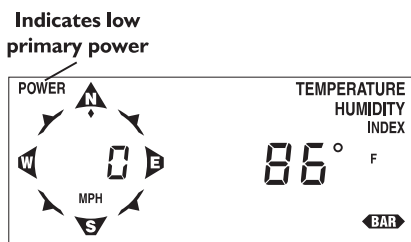
POWER INDICATOR

Flashing of the BATT indicator indicates that the backup battery is low on power. You should replace the battery when you see this indicator, or the backup battery may not last through an unexpected power outage and data will be lost.
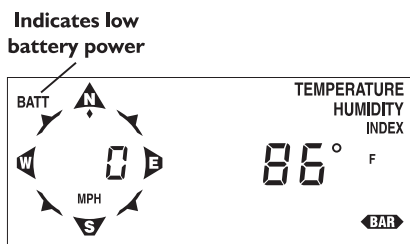
BATT INDICATOR

ENERGY ENVIROMONITOR SYSTEM CONSOLE QUICK REFERENCE

FUNCTION KEYS

The lists below indicate what condition appears when you press each function key. Each time you press the key, the next item in the list appears.

COOL'G D-DAYS (Cooling Degree-Days)
Daily Cooling Degree-Day Sum
Total Cooling Degree-Days for the Period
Average Daily Cooling Degree-Days (Period)
Daily THI Cooling Degree-Day Sum
Total THI Cooling Degree-Days for the Period
Avg. Daily THI Cooling Degree-Days (Period)
Base Cooling Degree-Day Threshold
Period Start Date
Cooling Degree-Day Auto Clear Status

HEAT'G D-DAYS (Heating Degree-Days)
Daily Heating Degree-Day Sum
Total Heating Degree-Days for the Period
Average Daily Heating Degree-Days (Period)
Daily Wind Chill Heating Degree-Day Sum
Total Wind Chill Heating Degree-Days for the Period
Avg. Daily Wind Chill Heating Degree-Days (Period)
Base Heating Degree-Day Threshold
Period Start Date
Heating Degree-Day Auto Clear Status

TEMP (Temperature & Apparent Temperature)
Current Outside Temperature
Current Temperature-Humidity Index
Current Wind Chill
Current Inside Temperature
Apparent Temperature AutoClear Status

WIND (Wind)
Current Wind Speed
Daily Wind Run
Average Daily Wind Run for the Period
Current Wind Direction
Period Start Date
Wind AutoClear Status

SUN (Solar Radiation)
Current Solar Radiation Intensity
Daily Incident Solar Energy Sum
Average Daily Incident Solar Energy for the Period
Period Start Date
Daily Solar Energy AutoClear Status

RAIN (Rainfall)
Daily Rainfall and Rate of Rainfall
Total Rainfall
Rainfall AutoClear Status

BAR (Barometric Pressure)
Current Barometric Pressure

HUM (Relative Humidity)
Current Relative Humidity
Relative Humidity AutoClear Status

DEW (Dew Point)
Current Dew Point

TIME (Time and Date)
Current Time
Current Date
Current Year
AutoClear Time
Period Start Date

HIGHS AND LOWS

See "Highs and Lows" on page 13 for a list of highs and lows stored by the console.

- To view the high or low, press the appropriate function key to display the desired condition. Press **Recall** to view the high/low. Wait a few seconds and the time at which the high/low occurred will appear. Press **Recall** again to view the low if both a high and low are stored.
- To clear a high/low, press the appropriate keys as necessary to display the desired high/low. Press and hold **Clear** until the high/low value is cleared.

ALARMS

See "Alarms" on page 14 for a list of available alarms.

- To view an alarm threshold, press the appropriate function key to display the desired condition. Press **Alarm** to view the threshold.
- To set an alarm, press the appropriate keys to display the desired alarm threshold. Use **Enter** to set the threshold.
- To silence an alarm, press **Clear**.
- To clear an alarm, press the appropriate keys to display the desired alarm threshold. Press and hold **Clear** until the alarm threshold is cleared.

PERIOD INFORMATION

The console uses a single time period for all values which accumulate totals or calculate averages over an interval. See "Period" on page 11 for a list of values accumulated or averages calculated during the period.

- To clear all "period" information and start a new period, press **TIME** as necessary to display the period start date. Press and hold **Clear** until the period information is cleared.

AUTOCLEAR

The console may be set to automatically clear some or all daily values at the same time each day. See "AutoClear" on page 12 for a list of all information which may be cleared using AutoClear.

- To enable/disable AutoClear for a condition or group of conditions, press the appropriate function key as necessary to display the AutoClear status. Press **Enter** to toggle the AutoClear setting between OFF and ON.
- To set the time at which AutoClear clears values, press **TIME** as necessary to display the AutoClear time. Use **Enter** to set the desired time.

CHOOSING UNITS OF MEASURE

To select the unit of measure in which a condition is displayed, press the appropriate function key to display the desired condition. Press **UNITS** until the desired unit of measure appears in the display.

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