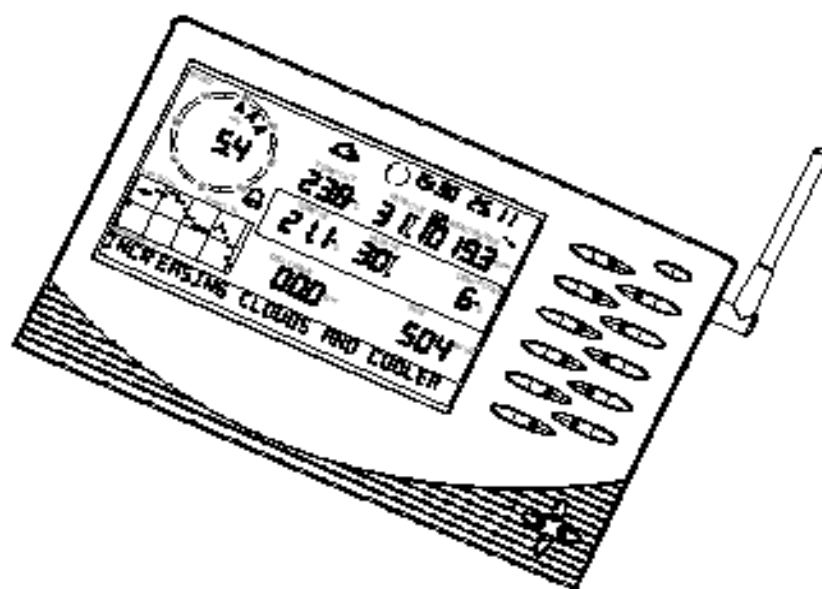

DAVID

Vantage ProTM

Wireless
Weather
Station



User's Manual & Setup Guide

Product #6150

DRAFT

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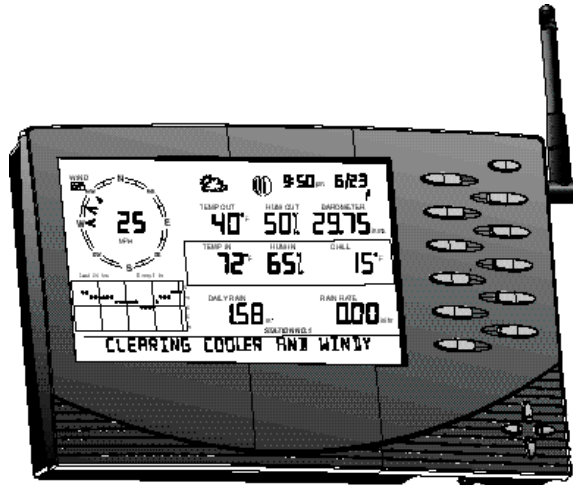
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DRAFT

WELCOME TO THE VANTAGE PRO

1



Welcome to Davis Instruments' Vantage Pro weather station console. The Vantage Pro console, part of the comprehensive Vantage Pro system, displays a wealth of weather information -- up to ten weather variables simultaneously. The Vantage Pro console is also a powerful weather computer, collecting, storing, and displaying historical data, including highs and lows, in graphical and numerical formats.

The Vantage Pro also provides you with a forecast based on the latest meteorological algorithms. A quick glance at the graphical icons predicts the general weather trend and a detailed forecast scrolls across the bottom of the screen, letting you know what to expect!

Vantage Pro Formats

The Vantage Pro System is available in two formats: Cabled and Wireless.

- **Cabled Vantage Pro System**

The Cabled Vantage Pro system links the Integrated Sensor Suite (ISS) sensor array to the console with standard four-conductor cable. The Standard Vantage Pro system operates on AC power only (w/ battery backup).

- **Wireless Vantage Pro**

The wireless Vantage Pro console receives data transmitted by radio from the solar-powered (with battery backup) ISS. Neither the sensor array, nor the console requires AC power in the wireless format.

Display & Keyboard

The Vantage Pro display and keyboard are designed for easy access to the most important weather information.

The keyboard allows you to interact with the station computer, view current and historical data, set and clear alarms, change station modes, enter calibration numbers, set up and view graphs, select sensors, read the forecast, and so on. To learn more about the keyboard, see “Keyboard” on page 18.

The Large LCD display is your window on current and past environmental conditions, as well as the place to find the forecast. The console LCD can display up to 10 weather variables at any one time. To learn more about the display’s features, see “Display Features” on page 19.

Console Modes

The Vantage Pro console operates in five different modes designed to give you quick and easy access to the information you need:

- **Setup**
Setup mode is used to enter the time, date, calibration numbers, and other information required for the processing and display of the weather data.
- **Current Data**
Current data is the most common operation mode. In this mode you can read the current weather information and access any weather data not currently displayed using the keyboard.
- **High / Low**
The High and Low mode summaries are accessed using the High/Low key.
- **Alarm**
Alarm mode allows the user to set, clear, and review alarm settings.
- **Graph**
Graph mode allows the user to access the advanced graphing capabilities of the Vantage Pro weather computer.

For more information about using the console, see “Using the Vantage Pro Console” on page 17 and following sections.

Multiple stations / Sensors

The Wireless Vantage Pro system is capable of receiving transmissions from up to eight different transmitters. See “Optional Sensors” below.

OPTIONAL SENSORS

The Vantage Pro system is extremely flexible. The following optional sensors enable calculation and measurement of specialized weather information. All optional sensors are available from your dealer or may be ordered directly from Davis Instruments. Please be aware that some options are available only for wireless units.

- **Solar Radiation Sensor**
Enables you to measure and display solar irradiance. Also required for calculating Evapotranspiration (see “Wind” on page 47).
Available for Cabled and Wireless stations. Requires Sensor Mounting Shelf. See “Optional Accessories” on page 10.
- **Ultraviolet (UV) Radiation Sensor**
Enables you to measure and display UV wavelength irradiance.
Required for calculating the UV dose.
Available for Cabled and Wireless stations. Requires Sensor Mounting Shelf. See “Optional Accessories” on page 10.

Note: *The Wireless Vantage Pro console is capable of receiving signals from up to eight separate transmitter stations, including:*

- **Wireless Integrated Sensor Suite**
A complete sensor package including Rain, Temperature, Humidity, Wind Speed and Direction, with options for Solar Radiation and UV sensors. The Vantage Pro Console/Receiver accommodates one ISS transmitter station.
- **Wireless Temperature Station**
Measures and transmits air temperature from a remote location to the console. The Vantage Pro Console/Receiver accommodates up to eight Wireless Temperature Stations.
- **Wireless Temperature / Humidity Station**
Measures and transmits air temperature and humidity from a remote location to the console. The Vantage Pro Console/Receiver accommodates up to eight Wireless Temperature/Humidity stations.
- **Anemometer Transmitter Kit**
Allows separation of anemometer from ISS to capture wind speed and direction from a remote location. The Vantage Pro Console Receiver accommodates one Anemometer Transmitter Kit.
- **Wireless Soil Moisture / Temperature Station**
Measures and transmits soil moisture and temperature data from up to four sensors each. The Vantage Pro Console Receiver accommodates one Soil Moisture / Temperature station.

- **Wireless Leaf Wetness / Temperature Station**

Measures and transmits leaf wetness and temperature data from up to four sensors each. The Vantage Pro Console/Receiver accommodates one Leaf Wetness/Temperature station.

Note: The Wireless Vantage Pro Console / Receiver can receive from up to eight transmitters. For example, as listed above, you may configure your Wireless Vantage Pro system with one ISS, one Wireless Soil Moisture / Temperature station, one Anemometer Transmitter Kit, three Wireless Temperature / Humidity stations, and two Wireless Temperature stations.

OPTIONAL ACCESSORIES

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

- **WeatherLink® for Vantage Pro™ Data Logger & PC Software**

Logs data gathered by the Vantage Pro, 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 approximately 2, 9, 18, 27, 53, 107, or 213 days worth of data depending on the selected storage interval. Windows™-compatible software lets you analyze, plot, print, sort, and summarize the data.

WeatherLink® for Vantage Pro™ includes data logger, eight foot cable, software, and manual. Requires IBM compatible PC running Windows 95, 98, 2000, ME, or NT and one free serial port.

- **WeatherLink™ 8' extension cord**

Extends the distance between Vantage Pro console and computer to a maximum of 48 feet (14.5 m).

- **Solar Radiation Sensor/ UV Sensor Mounting Shelf**

Required for mounting the optional Solar Radiation and / or UV Sensors. The mounting shelf attaches to the ISS.

- **Cigarette Lighter Power Adapter**

Allows the Vantage Pro to draw power from a standard car cigarette lighter.

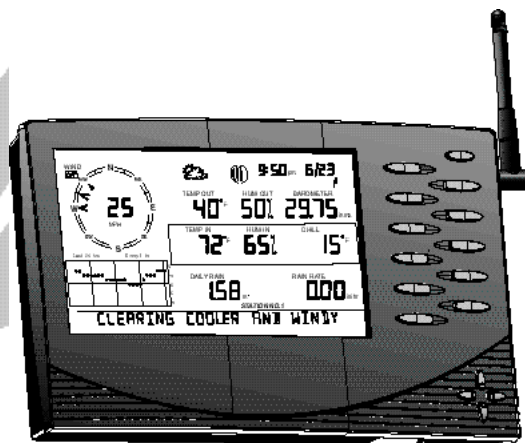
Warning: Do not use an older Davis AC Power Adapter or older Davis Cigarette Lighter Adapter. You will damage the circuitry inside the unit. Use only the Vantage Pro power adapters.

- **Telephone Modem Adapter**

Allows a dialup connection between the station and the computer.

Chapter 2

VANTAGEPRO CONSOLE INSTALLATION



The Vantage Pro console is a precision instrument designed to give extremely accurate readings. As with any precision instrument, care must be used in its assembly and use. Although installation of the Vantage Pro console is relatively simple, following the steps outlined in this chapter-- and assembling the Vantage Pro correctly from the start-- will ensure that you will enjoy all of its features with a minimum of time and effort.

CABLED VANTAGE PRO CONSOLE INSTALLATION

The Cabled Vantage Pro is powered by 5-volt DC (direct current) with battery backup. Power may be supplied by an AC adapter, or with Davis' optional 12 to 5-Volt Car/Boat/RV power adapter. (See "Optional Accessories" on page 10.)

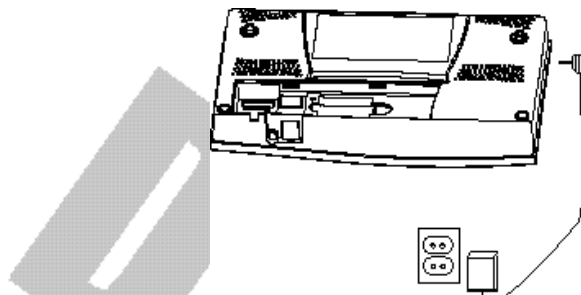
• **WARNING:** The Vantage Pro system uses power differently from the way older Davis stations did. Use only a Davis Vantage Pro 9-volt power converter. Using an older Davis adapter will damage your Vantage Pro!

Powering your Vantage Pro

Because the Cabled Vantage Pro console supplies power to the sensor array through the connecting cable, you must use the AC power adapter or the optional Car/Boat/RV adapter to supply primary power. The three C-cell batteries provide backup power and will operate the station for four to six weeks only.

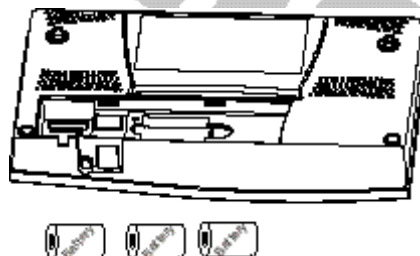
1. **Insert the power adapter plug into the jack located on the right side of the console, then plug the other end of the adapter into an appropriate power outlet.**

The Vantage Pro should run through a brief self-test procedure. All the display segments on the LCD appear and the console will beep twice.



2. **Insert the C-cell battery backup.**

Remove the battery cover located on the back of the console. Insert 3 C batteries into the battery channel, negative (or flat) terminal first. Push gently on the last battery to seat all three in the channel and complete the circuit.



Note: To remove batteries, place the Vantage Pro Console face down on a flat, firm surface. Insert a finger-tip between the two exposed batteries. Press the middle battery down toward the notch (toward the "hidden" battery. This will relieve the tension on the first battery and allow you to withdraw it.

3. Replace the battery cover.

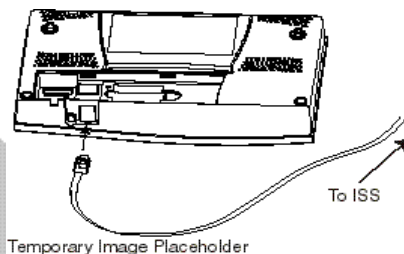
After power-up the Vantage Pro will automatically enter Setup Mode. Setup mode will lead you through setting up and calibrating your station. See "Setup Mode" on page 22.

Connecting the Cabled Vantage Pro to the Integrated Sensor Suite (ISS)

The Vantage Pro comes with 40 feet of cable. Maximum cable length from ISS to console is 1000 feet. See "Optional Accessories" on page 10 to purchase additional cable.

1. Gently insert the console end of the 4 conductor wire running from the ISS into the console receptacle marked ISS until it clicks into place.

• **WARNING:** Do not force the connector into the receptacle.



2. Ensure that the ISS cable is not twisted through the access hole.

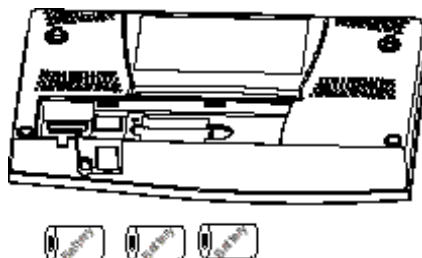
3. Test the connections between the ISS and the console.

Spin the wind cups and change the direction of the vane. If the ISS is powered and the connection between the ISS and the console is correct, you should see the wind direction and speed fields changing. Tip the rain bucket back and forth. You should see rain registering. Check the other fields to ensure you're receiving from them, too.

Wireless Vantage Pro Installation

Powering your Wireless Vantage Pro

Because the Wireless Vantage Pro console does not supply power to the sensor array, an AC adapter is not required to operate the console (although you may use one if you wish).



1. **Remove the battery cover from the back of the Vantage Pro console.**
2. **Insert 3 C-cell batteries as shown.**
Insert the negative (or flat) terminal first. The Vantage Pro should run through a brief self-test procedure. All the display segments appear and the console will beep three times.
3. **Replace the battery cover.**

Note: *Regarding Battery Use. Under normal circumstances, 3 C cell alkaline batteries should power your wireless Vantage Pro console for approximately 1 year. Davis Instruments does not recommend using rechargeable NiCad batteries with the Vantage Pro, because the Vantage Pro will not recharge them and they will not last as long.*

After powering up and running through its self-test mode, the Vantage Pro console will automatically enter Setup Mode. Setup Mode will lead you through setting up and calibrating your station. (See "Setup Mode" on page 22.)

Establishing reception between the Wireless Vantage Pro console to the Integrated Sensor Suite (ISS)

As you position your console, be aware of possible interference from cordless phones and other items. To prevent interference, maintain a distance of 10 feet between the Vantage Pro console and the cordless phone (handset and base). Also, for best reception, avoid positioning the console near large metallic surfaces (e.g., most refrigerator surfaces).

Please test communications between the Console/Receiver and the ISS (or other transmitter) **BEFORE** permanently mounting your ISS. Remember that the ISS transmits packets every few seconds. Therefore, there may be a 2 to 3 second delay before the console display updates. For more information about locating the sensor transmitter and testing reception, consult the ISS or other transmitter manual.

DISPLAYING THE VANTAGE PRO CONSOLE

You should place the Vantage Pro computer console indoors, in a location where the keyboard is easily accessible and the display is easy to read. For more accurate readings, follow these suggestions:

- **Avoid placing the Vantage Pro console in direct sunlight. The casing heats up in direct sunlight. This may cause erroneous readings and / or damage to the unit.**
- **Avoid placing the Vantage Pro console near radiant heaters or heating / air conditioning ducts**
- **If you are mounting the Vantage Pro console on a wall, choose an inner or interior wall. Avoid walls that heat up or cool down depending on the weather.**

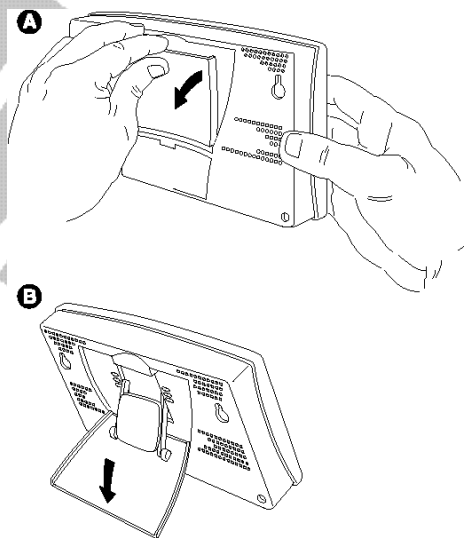
By changing the orientation of the kickstand, you may display the Vantage Pro on a tabletop, set it on a shelf, or mount it on a wall.

Table & Shelf Display

The kickstand may be set at five different angles appropriate for different display angles.

1. **Lean the kickstand out.**
2. **Slide the catch to arrest the kickstand in the appropriate angle.**

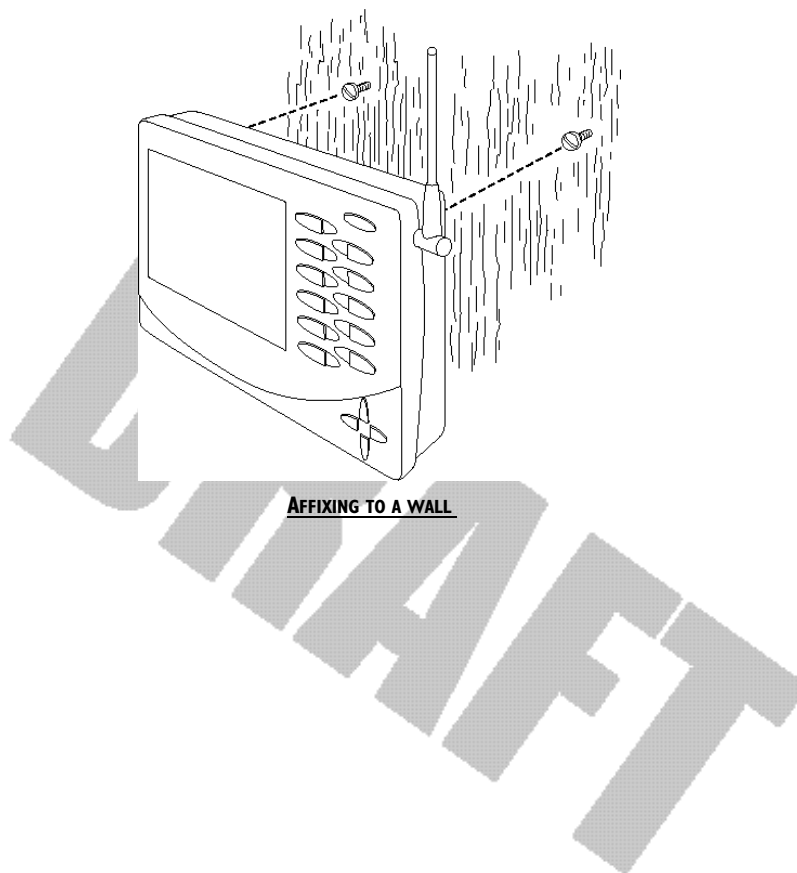
Choose low angles (settings 1 & 2) for display on a coffee table or other low area. Choose higher angles (settings 3 - 4) for display on a desk or shelf.



OPENING THE STAND FOR TABLE OR SHELF DISPLAY

Wall Display

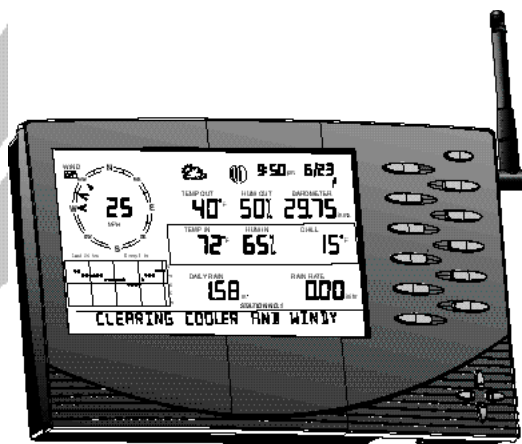
1. **Hold the template provided here flat against the wall and use a pencil to mark the location of the two keyholes.**
If you are installing a standard Vantage Pro console with sensor cable running inside the wall, attach the console over an empty switch box.
<!-- get dimensions and make template --!>
2. **Use an electric drill with a #29 (.136" or 3.5mm) drill bit to make pilot holes in these locations.**
3. **Using a screwdriver, drive the two #8 x 3/4" pan head self-threading screws into the wall. Leave at least 1/8" between the wall the the heads of the screws.**
4. **Retract the kickstand into its upright and locked position.**
5. **Slide the keyholes on the back of the console over the two screw heads.**



AFFIXING TO A WALL

CHAPTER 3

USING THE VANTAGE PRO CONSOLE



The Vantage Pro display and keyboard are designed for easy access to the most important weather information. The large LCD display is your window on current and past environmental conditions, as well as the place to find the forecast. The keyboard allows you to interact with the station computer, view current and historical weather information, set and clear alarms, change station modes, enter calibration numbers, set up and view graphs, select sensors, read the forecast, and so on.

KEYBOARD

To access the station's many features, the Vantage Pro console possesses three kinds of keys:

- **Function keys**

The six primary function keys, TEMP (Temperature), HUM (Humidity), WIND (Wind speed and direction), RAIN YR (Total Year Rain), UV (Ultra-Violet irradiance), and BAR (Barometer) are used to access current weather information. They lie in the left side of the double key column.

- **Operation keys**

The six operation keys lie on the right side of the double column. 2ND, TIME, GRAPH, HI/LOW, STATION, and DONE are used to enter different console modes, set and clear alarm values, change measurement units, select station transmitters, and so on.

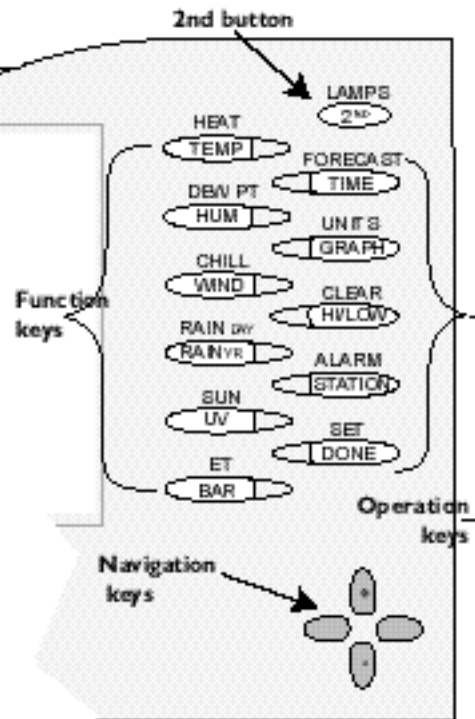
There is a special operation key, the 2ND key, located in the upper right hand corner of the keypad.

- **The 2nd key**

The second key is used in conjunction with other keys to access alternate functions. Above each function and operation key lies a legend identifying that key's alternate use. For example, FORECAST is listed above the TIME key. To access the Vantage Pro's forecast, press and release the 2nd key, then press and release the TIME/FORECAST key.

- **Navigation keys**

The four navigation keys, two horizontal and two vertical, are arrayed in a cross shape in the lower right corner of the console. The Navigation keys are used to enter or change data, and to scroll between displays.



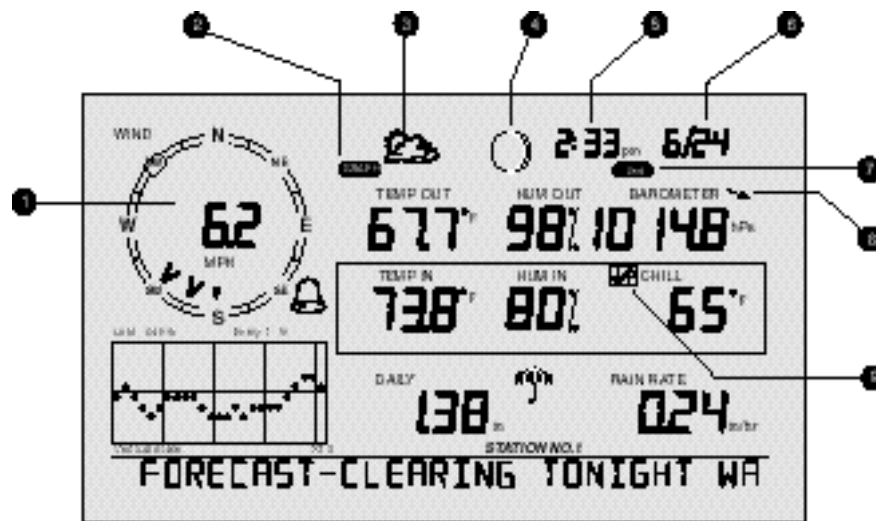
Using the Navigation Keys

You should become familiar with the use of these keys, since they serve many purposes in operating the Vantage Pro. The Navigation keys are used the same way, regardless of the current console mode.

Essentially, pressing the right or left navigation key activates the next (or previous) data field on the screen. The up and down navigation keys scroll through digits or entries.

DISPLAY FEATURES

The large LCD display is your window on current and past environmental conditions, as well as the place to find the forecast.



Vantage Pro console display

The display is organized to maximize the information available to you. The following section explains some of the features that may appear on your console.

1. Compass Rose

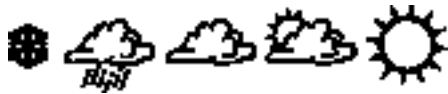
The wind rose displays the speed and direction of the current wind, as well as the variation in the 10 minute dominant wind direction over the last 60 minutes

2. Graph and Hi / Low mode settings

DAY MONTH YEAR HIGHS LOWS GRAPH

Combinations of these indicators appear only when the Hi /Low or Graph modes are selected.

3. Forecast Icons



From left to right, these icons represent predicted snow, rain, clouds, partly cloudy, and sun. The forecast is updated every hour.

4. Moon Phase Indicator



The moon phase indicator depicts the current phase of the moon.

5. Time / Sunrise Time

Time may be displayed in 12 or 24 hour format. Time of sunrise is also displayed in this field. (After 6 pm, sunrise for the following day is displayed.) You must enter the correct latitude and longitude and time zone for your location for the time of sunrise to be accurate.

6. Date / Sunset Time

Date may be displayed in day / month or month.day format. Time of sunset is also displayed in this field. You must enter the correct latitude and longitude and time zone for your location for the time of sunset to be accurate.

7. 2nd button indicator



The 2nd indicator icon lights when the 2nd button is pushed.

8. Barometric Trend Arrow

The barometric trend arrow displays the pressure trend in five different positions: strongly rising, rising, steady, falling, and strongly falling.



The steeply rising (or falling) arrow indicates the pressure has increased (or decreased) 0.06" Hg or more in three hours.

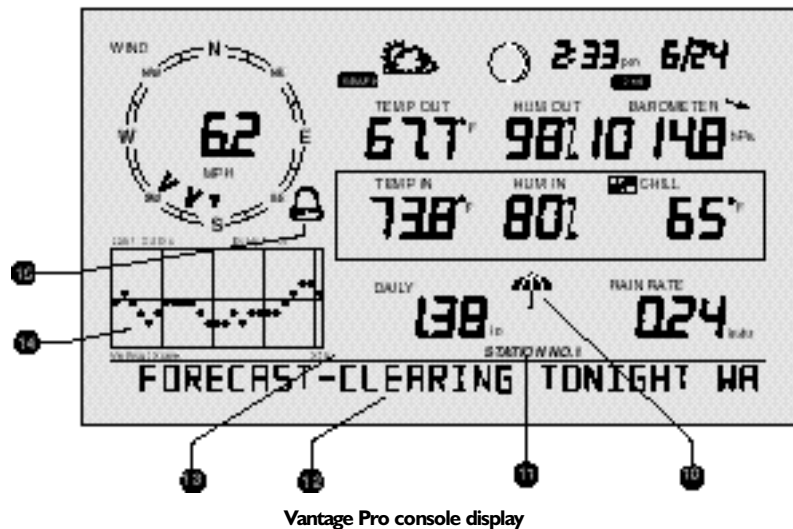
The shallow rising (or falling) arrow indicates the pressure has increased (or decreased) 0.02" or more Hg, but less than 0.06" Hg over three hours.

A flat arrow indicates the pressure has changed less than 0.02" Hg in three hours.

9. Graph Icon

The graph icon is always displayed next to the active weather variable. The graph will always show that variable's history according to your settings.





10. Current Rain Indicator

The umbrella icon announces that it is currently raining. It's activated by the accumulation of 0.01 in (0.25 mm). The umbrella disappears after 15 minutes with no further rain accumulation.



11. Station Number Indicator

The station number indicator shows which sensor transmitter the console is currently displaying.



Note: Multiple sensors are available for the wireless Vantage Pro system only.

12. Weather Ticker

The Davis Weather Ticker is a unique and useful addition to the weather station console. The ticker displays a broad spectrum of messages to the console user, including instructions during console setup.

ENTER LONGITUDE

The ticker also displays detailed forecast messages.

KITE FLYING WEATHER

13. Graph Field

The graph features an astounding array of features that I haven't quite finished thinking about and will write later.

14. Alarm icon

The bell icon is active when an alarm is set or when you're in the ALARM SET mode. The icon blinks continuously when an alarm is triggered.

SETUPMODE

Setup Mode lets you choose settings that determine how your Vantage Pro station operates.

Entering & Exiting Setup Mode

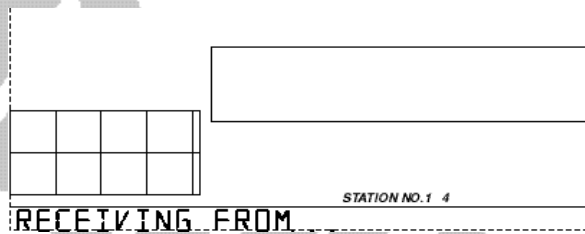
The console will automatically enter Setup Mode when you first power up. Later, if you need to make any changes, access the Setup Mode at any time by pressing the "DONE" and "down arrow" keys at the same time. Exit Setup at any time by pressing and holding the "DONE" key until the "Current Weather" screen appears.

Setup Mode Screens

On entering the Setup Mode, a sequence of screens will appear on the console. Pressing "DONE" will take you to the next screen in the sequence.

Setup Mode - Screen 1: Transmitters

Screen 1 displays active transmitters located in your area. The ticker will display the message "Receiving from..." and the active transmitter IDs will be illuminated. The rest of the display screen will be blank. Transmitters must be switched on for the console to recognize them. This screen requires no input; it simply shows you what transmitters the console can receive.



Setup Screen 1: Transmitters. This screen shows the Console receiving transmissions from transmitter IDs 1 and 4.

Press and release the "DONE" key to move to Setup screen 2.

Note: *Each Vantage Pro Console/Receiver may receive signals from up to eight different transmitters* ; however, only certain combinations of transmitters are possible. Table 1 below lists the maximum numbers of transmitter types each console/receiver can handle:

Table 1: Maximum Transmitters per Console/Receiver

| Transmitter Type | Maximum per Console (8 total) |
|-----------------------------------|-------------------------------|
| Integrated Sensor Suite (ISS) | 1 |
| Anemometer Transmitter Kit | 1 |
| Leaf Wetness/Temperature Station | 1 |
| Soil Moisture/Temperature Station | 1 |
| Temperature Station | 8 |
| Temperature/Humidity Station | 8 |

Setup Mode - Screen 2: Selecting Transmitters

Use setup screen 2 to tell the Console/Receiver which transmitter IDs to listen to, and what kind of station each transmitter represents.

Setup Screen 2: Here's what should greet most new Vantage Pro owners. The console comes factory pre-set at transmitter ID 1. "ON" means the console will receive signals from that ID and will assume the transmitter is an ISS. For most owners, this will complete this step. See the ISS manual for further details.

You probably do NOT need to change transmitter IDs. The default transmitter ID for the ISS is '1'. Your console/receiver will assume that Station 1 is your ISS and should find its transmissions automatically. This should complete Setup screen 2 for most owners.

In the unlikely event that you do need to change transmitter IDs (e.g. a neighbor is using a Davis product nearby or you have more an optional transmitter (See "Optional Sensors" on page 9.) read on. Otherwise, skip down to Setup Screen 3.

To activate reception on different ID codes, press the LEFT or RIGHT arrow key, or the "STATION" key, to scroll between transmitter IDs.

Note: Station IDs do not have to be in order. The factory default transmitter ID for the ISS is "1". See your transmitter's manual to learn how to set the transmitter ID.

- **Once you've settled on the ID you wish to use, use the "+" or "-" arrow keys to activate reception of that ID code.**

As each different ID illuminates, the ticker will display the word "ON" or "OFF". "ON" means the Console/Receiver will "listen" to that transmitter's signal. "OFF" means the Console/Receiver will ignore signals from that transmitter.

- **Now, press the "GRAPH" key to change the type of station assigned to each transmitter number.**

When a station is listed as "ON", one of the possible station types will be displayed in the ticker: ISS, TEMP, HUM, TEMP HUM, WIND, LEAF, or SOIL. Press the "GRAPH" key to scroll through this list until the correct station type appears.

Press and release the "DONE" key to move to Setup screen 3.

Setup Mode - Screen 3: Retransmit

The Vantage Pro Console/Receiver can re-transmit data to other Console/Receivers, or to the Davis Weather Echo and Weather Echo Plus.

Note: This feature is not available in the cabled Vantage Pro station.

Setup screen 3 lets you switch the retransmit feature on or off. Use the "+" or "-" arrow key to choose "Retransmit On" or "Retransmit Off". Use the STATION key to choose and assign a transmission ID to the Console/Receiver. Note that only IDs you're not already using will appear.

Press and release the DONE key to move to Setup screen 4.

Setup Mode - Screen 4: Time & Date

Use the UNITS key to choose 12 or 24 hour time display. Use the LEFT and RIGHT arrow keys to move between hours and minutes fields. Use the "+" and "-" keys to enter digits. When entering the date, use the UNITS key to select Month/Day or Day.Month display. Enter the month, day, and year.

Setup Mode - Screen 5: Latitude

To give you the best forecast we can, as well as calculate the correct times for sunset and sunrise for your location, the Vantage Pro Setup will ask you to enter your latitude and longitude.

Note: Latitude and longitude are a way of identifying your position on the earth. Latitude measures distance north or south of the equator. Longitude measures distance east or west of the Prime Meridian, an imaginary line running north and south through Greenwich, England. (The Prime Meridian was set by international convention at this location in 1884.)

If you do not know your latitude and longitude, there are several ways to find out. Many atlases include latitude and longitude lines. You can also talk to the reference department of your local library, or try calling your local airport. The more accurate you are, the better; however, a reasonable estimate will work, too.

Use the LEFT and RIGHT arrow keys to move between numbers. Use the "+" and "-" arrow keys to change digits. Use the UNITS key to specify North or South (of the equator). Press and release the DONE key to move to Setup screen 6.

Setup Mode - Screen 6: Longitude

Enter your longitude as above. Use the UNITS key to specify EAST or WEST (of the Prime Meridian). Press and release the DONE key to move to Setup screen 7.

Setup Mode - Screen 7: Time Zone

Use the "+" and "-" keys to choose a time zone. If your time zone is not shown, use the 2ND key to enter your raw Greenwich Mean Time (GMT) offset in 15 minute increments. Press and release the DONE key to move to Setup screen 8.

Setup Mode - Screen 8: Daylight Savings Detection

Use the "+" and "-" keys to choose Auto or Manual. Most users in North America, including Mexico, may select Auto (excepting Saskatchewan, Indiana, Arizona & Hawaii). All other users should choose Manual. Press and release the DONE key to move to Setup screen 9.

Setup Mode - Screen 9: Daylight Savings Status

If you chose "Manual" in screen 7, use the "+" and "-" arrow keys to turn Daylight Savings Time on or off. If you chose "Detect" in screen 7, the console will display the appropriate setting, based on the current time and date. Press and release the DONE key to move to screen 10.

Setup Mode - Screen 10: Elevation

Meteorologists standardize barometric pressure data to sea level so that surface readings are comparable, whether they're taken on a mountainside or by the ocean. For the Vantage Pro to make this same standardization and ensure accurate readings, enter your elevation in this screen.

Use the LEFT and RIGHT arrow keys to move between fields. Use the "+" and "-" keys to select digits. Use the UNITS key to select feet or meters. Press and release the DONE key to move to Setup screen 11.

If you do not know your elevation, there are several ways to find out. Many atlases and almanacs include elevation for cities and towns. You can also talk to the reference department of your local library. The more accurate you are, the better; however, a reasonable estimate will work, too.

Setup Mode - Screen 11: Wind Cup Size

All Vantage Pro Stations come with large wind cups. Switch this setting to small only if you have separately purchased and installed small wind cups. Use the "+" and "-" arrow keys to switch between large and small. Press and release the DONE key to move to Setup screen 12.

Note: Large wind cups are more sensitive to low wind speeds and are the best choice for most users. Small wind cups are less sensitive at low wind speeds; however, they are more resilient. Only install small wind cups if you expect winds over 120 mph (194 kph).

Setup Mode - Screen 12: Rain Collector

Your Vantage Pro is pre-configured for the included rain collector. Simply press "DONE" to move to the next screen. You may change the rain display's units from inches to millimeters with the UNITS key. See "Selecting Units" on page 32.

Setup Mode - Screen 13: Rain Season

Because rainy seasons begin and end at different times in different parts of the world, you must specify the month you wish your Yearly Rain data to begin. January is the default. Use the "+" and "-" arrows to select the appropriate month.

Exiting Setup Mode

Press and hold down the DONE key to exit Setup Mode. The screen will return to the Current Conditions screen. Re-enter Setup Mode at any time by pressing the DONE and "-" keys together.

CURRENT WEATHER MODE

The Current Weather screen is the heart of the display and where you'll likely spend most of your time. Up to ten weather variables are displayed simultaneously on the Vantage Pro's LCD screen. Some of these variables are always displayed: Barometric pressure, Outside Temperature, and Outside Humidity, as well as Wind Direction. Other variables share display space and must be accessed through keypresses.

Activating Weather Variables

Displaying any current weather information is straightforward. Press any function key to display that weather variable's current value. Selecting a variable also activates that variable's graph.

Note: The graph icon is always displayed next to the active weather variable.

You can also select any variable currently displayed on the LCD screen using the navigation keys. Pushing the left, right, up, or down arrows will move the graph icon to the next data field in the selected direction.

Wind Speed and Direction

- **Wind Speed**

Press the WIND / CHILL key to select the wind speed field. Wind speed may be displayed in miles per hour (mph), kilometers per hour (kph), meters per second (m/s), and knots (knots).



- **Wind Direction**

The solid arrow within the wind rose graphically displays the current wind direction. The arrow caps display the last six 10-minute dominant wind directions. The console measures the dominant wind direction every ten minutes, discarding the oldest measurement and entering the new measurement at the top of the list. If the dominant wind direction does not vary over a 60 minute period, only one arrow cap will be displayed.



To activate a digital readout of the wind direction, press the WIND / CHILL key again. The digital wind direction is displayed in degrees. See "Wind" on page 47.

Temperature

- **Outside Temperature**

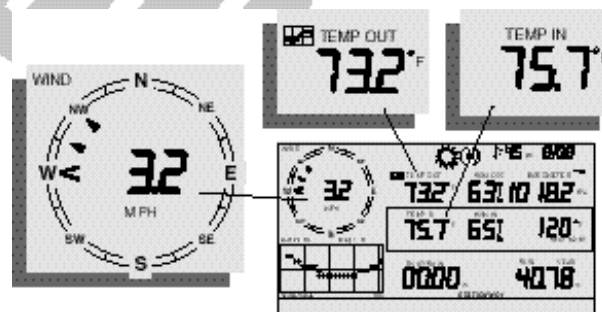
Press the TEMP / HEAT key to select the outside temperature field. Note that the graph icon appears next to the data field.

Temperature data may be displayed in both degrees Fahrenheit (°F) and Centigrade (°C). See "Temperature" on page 47.



- **Inside Temperature**

Press the TEMP / HEAT key again to activate the inside temperature field. Again, the graph icon appears next to the data field.



Humidity

Press the HUM / DEW PT key to select the outside humidity field.

Press the HUM / DEW PT key again to activate the inside humidity field.

Humidity is displayed in percent relative humidity. See “Dew-Point” on page 50.



Wind Chill

- **Current Wind Chill**

Press and release the 2ND key, then press the WIND / CHILL key to select the Wind Chill field.

Wind Chill is displayed in either degrees Fahrenheit (°F) or Centigrade (°C). See “Apparent Temperature Measures” on page 47.

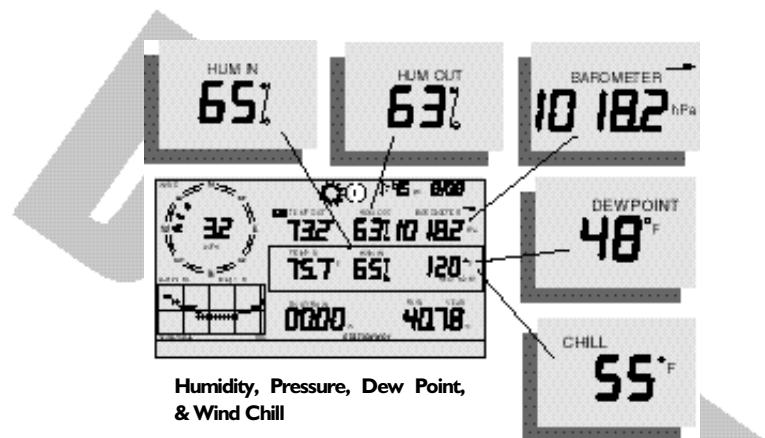


Dew Point

- **Current Dew Point**

Press and release the 2ND key, then press the HUM / DEW PT key to select the Dew Point field.

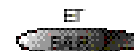
Dew Point is displayed in either degrees Fahrenheit (°F) or Centigrade (°C). See “Dew-Point” on page 50.



Barometric Pressure

- **Current Barometric Pressure**

Press the BAR / ET key to select the barometric pressure.



Barometric pressure may be displayed in inches (in), millimeters (mm), millibars (mb) or hectoPascals (hPa). See “Barometric Pressure” on page 50.

- **Pressure Trend Arrow**

The Barometric Trend Arrow depicts the current barometric trend, measured over the last 3 hours. The trend arrow is always displayed (unless less than three hours of pressure data is available), whether the barometric pressure is selected or not.

UV (Ultraviolet Radiation)

- **Current UV**

Press the UV / SUN key to display the current UV reading as an index. Press again to see MEDS.

UV may be displayed as an index (1-7) or in MEDS. See “UV (Ultra Violet) Radiation” on page 51.



Heat Indices

- **Heat Index**

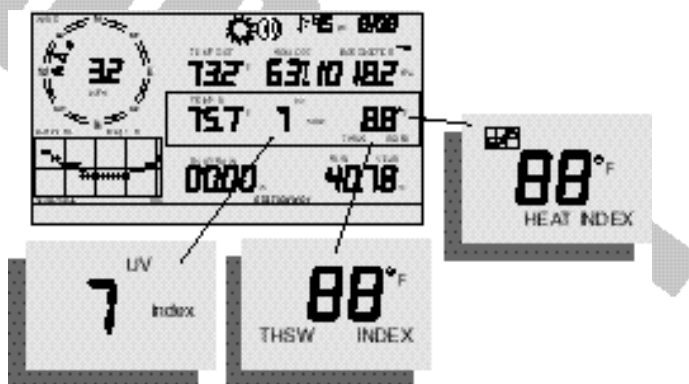
Press and release the 2ND key, then press the TEMP / HEAT key to display the Heat Index. See “Apparent Temperature Measures” on page 47.



- **THSW Index**

If you have installed the optional Solar Radiation Sensor, repeat the sequence one more time to display the THSW (Temperature - Humidity - Sun - Wind Index). See “Apparent Temperature Measures” on page 47.

Both heat indices appear in the same place on the screen and may be displayed, like temperature and wind chill, as either degrees Fahrenheit (°F) or Centigrade (°C).



Rain “Year”, Rain “Month”, and Rain Rate

- **Rain Rate**

Press the RAIN_{YR} / RAIN_{DAY} key to display the current rain rate.

Rain Rate may be displayed as either inches per hour (in/hr) or millimeters per hour (mm/hr). If there has been rain in the last 15 minutes, the total will be displayed in the ticker.

- **Month-to-date precipitation**

Press the RAIN_{YR} / RAIN_{DAY} again to select the month-to-date precipitation record. Monthly rain displays the precipitation accumulated since the calendar month began. Month-to-date precipitation is displayed in inches (in) or millimeters (mm).

- **Year-to-date precipitation**

Press the RAIN_{YR} / RAIN_{DAY} key a third time to display the year-to-date precipitation record. Yearly rain displays the precipitation accumulated since the 1st of the month you've chosen in Setup Mode (See "Setup Mode - Screen 13: Rain Season" on page 26.) Year-to-date precipitation is displayed in inches (in) or millimeters (mm).



Note: The "Year-to-date" and "Month-to-date" registers record precipitation accumulation for 1 year and 1 month respectively; however, you may start each counting period whenever you wish.

"Daily" and "Storm" Rain

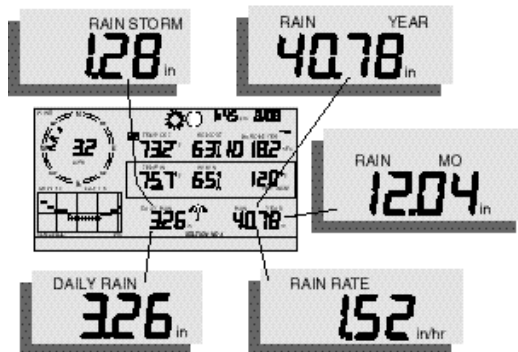
- **"Daily" Rain**

Press and release the 2ND key, then press the RAIN_{YR} / RAIN_{DAY} key. Daily Rain displays the rain accumulated since 12 midnight. Any rain accumulated in the last 24 hours will be displayed in the ticker.



- **Rain “Storm”**

Rain “Storm” displays the rain total for the last rain event occurring at least 24 hours from any previous rain event. Repeat the above sequence: press and release the 2ND key, then press the RAIN_{YR} / RAIN_{DAY} key.



Daily Rain, Rain Storm, Rain Year, Rain Month, & Rain Rate

All rain accumulation may be displayed as either millimeters (mm) or inches (in). See “Rainfall” on page 50.

Solar Radiation

- **Current Solar Radiation**

Press and release the 2ND key, then press the UV / SUN key to display the current solar radiation reading.

Solar radiation is displayed as Watts per square meter (W/m^2). See “Solar Radiation” on page 51.



Note: To display solar radiation readings, you must have installed the optional Solar Radiation sensor. (See “Optional Sensors” on page 9)

ET (Evapotranspiration)

- **Current ET**

Press and release the 2ND key, then press the BAR / ET key to display the current evapotranspiration reading. See “EvapoTranspiration (ET)” on page 54.



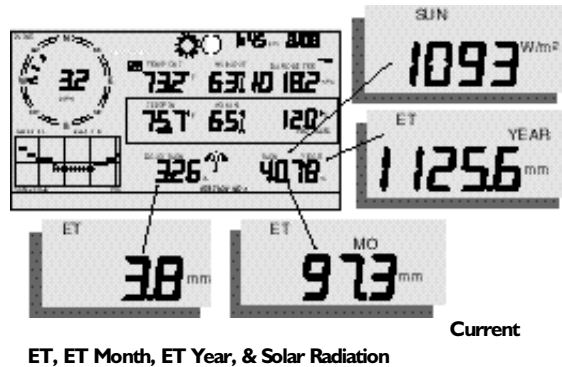
- **Monthly ET**

Repeat the sequence (i.e. Press and release the 2ND key, then press the BAR / ET key) to display Monthly ET.

- **Yearly ET**

Repeat the sequence a third time to display the ET reading since January 1st of the current year.

Note: To display ET readings, you must install the optional Solar Radiation sensor.



Current

Selecting Units

Most weather variables may be displayed in at least two different units, typically the English and Metric systems, although some variables feature more possibilities. Barometric pressure, for example, may be displayed in millibars, millimeters, inches, or hectoPascals.

You may change the units display at any time.

To change the units for any variable:

1. **Activate the variable using the keypress sequences described above. (See “Activating Weather Variables” on page 26.)**
2. **Press and release the 2nd key.**
3. **Press the Graph / Units key.**

The selected variable's units will change. Repeat steps 2 and 3 until the desired units appear.

For example, to select Barometric pressure units, activate the Barometric pressure by pushing BAR. Next, press and release the 2nd key, then press the Graph / Units key. The units field will display millibars, millimeters, inches, or hectoPascals. Repeating these steps cycles through all four selections. Stop when the the desired unit appears.



Barometric Pressure: millibars (mb), millimeters (mm) and inches (in)

HIGH AND LOWS MODE

The Vantage Pro records highs and lows for many weather conditions over three different periods: days, months, and years. Except for Yearly Rainfall, all high / low registers are cleared automatically at the end of each period (day: midnight; month: month-end midnight; year: year-end midnight) by the station. You may enter the month that you would like the Yearly Rainfall accumulation to clear. The Yearly Rainfall will clear on the first day of the month you choose.

The table below summarizes the highs and lows stored by the Vantage Pro.

| <u>CONDITION</u> | <u>HIGH</u> | <u>LOW</u> | <u>DAY
TIME &
DATE</u> | <u>MONTH</u> | <u>YEAR</u> | <u>ADDITIONAL
INFORMATION</u> |
|-------------------------------|-------------|------------|------------------------------------|--------------|-------------|-----------------------------------|
| Outside Temperature | Yes | Yes | Yes | Yes | Yes | |
| Inside Temperature | Yes | Yes | Yes | Yes | Yes | |
| Outside Humidity | Yes | Yes | Yes | Yes | Yes | |
| Inside Humidity | Yes | Yes | Yes | Yes | Yes | |
| Heat Index | Yes | | Yes | Yes | Yes | |
| Temp / Hum / Wind / Sun Index | Yes | | Yes | Yes | Yes | § |
| Wind Chill | | Yes | Yes | Yes | Yes | |
| Wind Speed | Yes | | Yes | Yes | Yes | Direction of High |
| Rainfall Rate | Yes | | Yes | Yes | Yes | |
| Daily Rain | | | Total | Total | Total | |
| UV Index | Yes | | Yes | Yes | Yes | ^ |
| Solar Radiation | Yes | | Yes | Yes | Yes | § |
| Dew Point | Yes | Yes | Yes | Yes | Yes | |
| Evapotranspiration | | | Total | Total | Total | §, ‡ |
| Soil Moisture | Yes | Yes | Yes | Yes | Yes | † |
| Leaf Wetness | Yes | Yes | Yes | Yes | Yes | ‡ |

§ Requires optional Solar Radiation Sensor

^ Requires optional UV radiation sensor

† Requires Soil Moisture sensor

‡ Requires Leaf Wetness sensor

Accessing Highs and Lows

- **Press the HI/LOW button to enter the Highs and Lows mode.**

The "DAY" and "HIGHS" icons will light and the station displays the highs for all visible fields.

- **Use the "+" and "-" arrow keys to scroll between Day Highs, Day Lows, Month Highs, Month Lows, Year Highs and Year Lows.**

The DAY, MONTH, YEAR and HIGH or LOW icons will light to show you what High/Low screen you've selected. See "Graph and Hi / Low mode settings" on page 19.

- **Use the LEFT and RIGHT arrow keys to scroll back and forth through the last 24 days.**

Pressing the LEFT arrow button moves you to the previous day's highs - the date field will change to show you. Each time you press the LEFT arrow, you'll move another day backward. The 24 dots in the graph field also represent each of the last 24 days; the rightmost dot is today. As you move back (or forward, with the RIGHT arrow key), the "day dot" will flash to show you what day you're looking at.

- **Use the function keys to choose any particular variable. The time of the high (or low) for that field will appear in the upper right of the screen.**

Exit Highs and Lows screen

- **To exit the Highs and Lows mode, simply press and release the DONE key. The console display will switch to the Current Weather mode.**

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ALARMSMODE

The Vantage Pro features more than 30 alarms that can be programmed to sound whenever a reading exceeds a set value. With the exception of barometric pressure and time, all alarms sound when a reading reaches the alarm threshold. For example, if the high outside temperature alarm threshold is set at 65 °F, the alarm will sound when the temperature rises to 65.0 °F.

In addition, the alarm bell icon will blink repeatedly. If you are using an AC power adapter with your console, the alarm will continue to ring until you clear the alarm or until the temperature again drops below the threshold. If you are running on battery power, the alarm will beep for XX minutes only; however, the bell icon will continue to blink until you clear the alarm or the temperature drops below the threshold.

Low alarms work the same way. For example, if the wind chill threshold is set for 30 °F, the alarm begins sounding when the temperature drops to 30.0 ° and will continue flashing until the temperature again rises above 30.0°.

Note: See Table "Vantage Pro Console Graphs & Alarms" on page 37 for a listing of the Vantage Pro Console's alarms.

Three special alarms

ETo (Evapotranspiration)

ETo is updated only once an hour, on the hour. If during a given hour the ETo Value exceeds the alarm threshold, the ETo alarm sounds at the end of that hour. This is true for daily, monthly, and yearly ETo alarms. You must have the optional Solar Radiation Sensor to use this alarm. See "EvapoTranspiration (ET)" on page 54 for a description of this variable.

Barometric Pressure

The Vantage Pro allows you to set two barometric pressure alarms: a "rise" alarm and a "fall" alarm. You may select any rate of change per hour between 0.00 and 0.99 Hg; the Vantage Pro's alarm will sound if the rate of change (in either direction) exceeds your threshold.

Time

The time alarm is a standard "alarm clock" type of alarm. It will sound for one minute.

Setting Alarms

I. Press the 2nd and the STATION/ALARM button to enter alarm mode.

The ALARM and HIGHS icons will appear. If you want to set LOW alarms, press 2nd and STATION/ALARM. Then press the HI/LOW button. The LOWS icon will appear.

2. Select any weather variable available.

Use the arrow keys to select variables currently displayed, or use the key-press sequences. (See “Activating Weather Variables” on page 26 for review.)

3. Press 2nd and DONE/SET.

The rightmost digit in the variable field will begin blinking. Use the up and down arrow keys to change the digit. Use the left and right arrow keys to move between digits.

4. When you’ve keyed in the threshold value you want, press the DONE/SET key again.

You’re still in the alarm mode, so choose any other variable for which you’d like to set a threshold.

5. If you’re finished setting alarms, press DONE/SET again and the console will return to current weather mode.

Setting the Time Alarm

1. To set the time alarm, enter the alarm mode as described above.

2. Press Time, then 2nd and DONE/SET.

The time field will begin blinking. Set the time and date for the alarm.

Clearing Alarms

Clearing an alarm is easy.

- **If an alarm is sounding, press 2ND and then hold the HI/LOW / CLEAR key until the ringing stops (~ four seconds).**
- **To clear a set alarm,**
 - 1. enter alarm mode as described above.**
 - 2. Select the variable alarm you wish to clear, either by pressing the key, e.g. UV, or using the arrow keys.**

You must use the keypress sequence to activate the variable if the variable is not displayed.
- **Press and hold clear.**

The threshold value will blink. When the value changes to all dashes, you have cleared the value.

Table 2: Vantage Pro Console Graphs & Alarms

| | | Graphs | | | | | | | | Alarms |
|------------------------------|--------------------------------------|---------|-------|--------|--------|--------|-------|---------|--------|--------|
| | | Current | 1 Min | 10 Min | 15 Min | Hourly | Daily | Monthly | Yearly | |
| Barometric Pressure | Reading | C | | | C | C | H,L | H,L | | |
| | Trend | | | | | | | | | ① ② |
| ET ^S | Evapotranspiration | T | | | | T | T | T | T | ③ |
| Humidity & Dewpoint | Inside Humidity | C | | | | C | H,L | H,L | | H,L |
| | Outside Humidity | C | | | | C | H,L | H,L | | H,L |
| | Dew Point | C | | | | C | H,L | H,L | | H,L |
| | Extra Humidity | | | | | | | | | H,L |
| Leaf Wetness* | Leaf Wetness | C | | | | C | H,L | H,L | | H,L |
| Rainfall | Rain | T | | | T | T | T | T | T | ④ ⑤ |
| | Storm | | | | | | | | | ⑥ |
| | Rain Rate | H | H | | | H | H | H | H | H |
| Soil Moisture ^W | Soil Moisture | C | | | | C | H,L | H,L | | H,L |
| Solar Radiation ^S | Solar Radiation | A | | | | A | H | H | | H |
| Temperature | Inside Temp | C | | | | C | H,L | H,L | | H,L |
| | Outside Tem | C | | | | C | H,L | H,L | H,L | H,L |
| | Extra Temp | | | | | | | | | H,L |
| Apparent Temperature | Heat Index | C | | | | C | H | H | | H |
| | Temp/Hum/Sun/Wind Index ^S | C | | | | C | H | H | | H |
| Time & Date | Time | | | | | | | | | Y |
| UV Radiation [†] | UV Radiation | A | | | | A | H | H | | H |
| | MED (Minimal Erythema Dose) | T | | | | T | T | | | ⑦ |
| Wind | Wind Speed | A | | A | | A | H | H | H | H ⑧ |
| | Direction of highwind speed | Y | | | | | Y | Y | Y | |
| | Dominant Wind Direction | A | | | | A | A | A | | |
| | Wind Chill | L | | | | L | L | L | | L |

Table 2: Vantage Pro Console Graphs & Alarms

| | | Graphs | | | | | | | | Alarms |
|--|--|---------|-------|--------|--------|--------|-------|---------|--------|--------|
| | | Current | 1 Min | 10 Min | 15 Min | Hourly | Daily | Monthly | Yearly | |

Legend:

A =Average, H =Highs, L =Lows, T =Totals, Y =Yes, C =Current Reading at end of each period

Additional graph:

■ Storm graph - Graphs last 24 rain storms with start and stop dates.

Additional Alarms:

- ① Storm Warning Alarm - Specify amount of barometer's fall.
 - ② Storm Clearing Alarm - Specify amount of barometer's rise.
 - ③ ET Alarm - Specify total amount of ET for the day.
 - ④ Flash Flood Alarm - Specify total amount of rainfall for current 15 minutes.
 - ⑤ 24 Hour Rain Alarm - Specify total amount of rainfall for the current 24 hours.
 - ⑥ Storm Alarm - Specify total amount of rainfall for current storm.
 - ⑦ MED Alarm - Specify daily dose.
 - ⑧ 10 Minute Average Wind Speed Alarm - Specify speed.
 - ▲ Current values are shown in the right-most column of graph, and are the most recent records.
- All graphed historical values are the last 24 on record.

* Requires wireless Vantage Pro and optional Leaf Wetness Station.

W Requires wireless Vantage Pro and optional Soil Moisture Station.

‡ Requires optional UV Sensor

§ Requires optional Solar Radiation Sensor

GRAPH MODE

The Vantage Pro Console features a powerful graphing facility. Using this mode, you may view over 100 graphs of different kinds - all without connecting to a personal computer.

Table 2 above details the graphs that the Vantage Pro Console can display. Note especially that different weather variables may have different graphs available. (Some graphs require optional sensors. See above for details.)

Entering and Exiting Graph Mode

- **Press the “GRAPH” key to enter graph mode**
You’ll know you’re in graph mode because only the date field, graph, graph mode indicator (See “Display Features” on page 19.) and the currently selected variable will be lit. The rest of the screen will be blank.
- **Press the “DONE” key to exit the graph mode**

Using and Understanding the Graph Mode’s Features

Although the available graphs vary, depending on what weather variable you’re plotting, you view each graph the same way.

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TROUBLESHOOTING

While the Vantage Pro is designed to provide years of trouble-free operation, occasional problems may arise. If you are having problems with your unit, please check the following guide before sending the unit in for repair. You will be able to solve many of the problems yourself. If, after checking this guide, you are unable to solve the problem, please call the factory at 1-510-732-7814 for further instructions. Please do not return your unit for repair without prior authorization.

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| | Problem | Solution | PG. |
|----------------|--|---|-----|
| DISPLAY | | | |
| | Display is blank | <p>Unit is not receiving power. Check to be sure the power adapter has not come unplugged from the console or outlet.</p> <p>If power is interrupted, battery may be installed incorrectly. Check and re-install.</p> <p>Battery may be run down or old. Replace.</p> | |
| | Display shows a series of dashes in place of function reading | <p>ISS not plugged in (Cabled Vantage Pro).</p> <p>Sensors not transmitting. (Wireless Vantage Pro) See ISS (or other transmitter) manual.</p> <p>Console not receiving. (Wireless) Check reception.</p> <p>A reading has exceeded the limits indicated in the specifications table.</p> <p>For temperature, wind speed, or rainfall: calibration numbers may be causing readings to exceed display limits. Check calibration number and adjust if necessary.</p> | |
| | Display is sluggish or computer does not work at low temperatures | The console, LCD display, and internal components may not work below 32° F (0° C). Use the External Temperature sensor in low-temperature locations and keep the Vantage Pro console in a warmer location. | |
| | Display “locks up” | The Vantage Pro console may “lock up” if there is a power surge. To restore the unit, remove all power (including battery backup) and then restore power. If “lock ups” occur frequently, add a surge suppressor to the power line. | |
| | | | |

| | Problem | Solution | PG. |
|-------------|---|---|-----|
| TEMPERATURE | Outside temperature sensor reading seems too high | <p>Check calibration number and adjust if necessary.</p> <p>ISS may need to be relocated. See ISS (or other transmitter) manual</p> | |
| | Inside temperature sensor reading seems too high | <p>Move the Vantage Pro console (or other temp sensor if you have installed additional wireless temperature sensors) out of direct sunlight.</p> <p>Make sure that the console or sensor is not in contact with an exterior wall that heats up in sunlight or when outside temperature rises.</p> <p>Make sure the console or sensor is not near a heater or other internal heat source (lamps, appliances, etc.).</p> <p>Check calibration number and adjust if necessary.</p> | |
| | Outside temperature seems too low | <p>Check calibration number and adjust if necessary.</p> <p>Sprinklers may be hitting the ISS radiation shield. Relocate. See ISS manual.</p> | |
| | Inside temperature sensor reading seems too low | <p>Make sure the the console or other temperature sensor is not in contact with an exterior wall that cools down when outside temperature drops.</p> <p>Make sure the console or other temperature sensor is not near an air conditioning vent.</p> <p>Check calibration number and adjust if necessary.</p> | |
| | | | |

| | Problem | Solution | PG. |
|------------------|---|---|-----|
| HUMIDITY | Inside humidity seems too high or too low | <p>Make sure the Vantage Pro console is not near a humidifier or de-humidifier.</p> <p>Check calibration number and adjust if necessary.</p> <p>If inside humidity, along with inside temperature, is too high, see also "inside temp" above.</p> | |
| | | | |
| WINDSPEED | Wind speed reading seems lower than expected | <p>Check installation by spinning wind cups. If you get a reading, the wind cups are installed correctly. They should spin more freely after an initial break-in period of one or two weeks.</p> <p>Check ISS location.</p> | |
| | Wind speed reads 0 either all the time or intermittently | The problem may be with the anemometer. Call factory for return authorization. | |
| | Wind speed reading seems too high or too low. | <p>Check calibration number and adjust if necessary.</p> <p>Check ISS location.</p> | |
| DIRECTION | Wind direction reading is dashed out | <p>Transmission problem.</p> <p>If these steps do not reveal the problem, the anemometer may be faulty. Call the factory for return authorization.</p> | |
| | Wind direction always says North | ISS problem, especially if outside temperature is dashed out as well. | |
| CHILL | Wind chill reading seems too high or too low | Check calibration number for temperature and wind speed. Adjust if necessary. | |
| | | | |

| | Problem | Solution | PG. |
|------|------------------|---|-----|
| RAIN | No rain readings | Make sure cable-tie is removed from rain collector. See ISS manual. | |
| | | | |

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APPENDIX WEATHER DATA

WEATHER CONDITION MEASURED/CALCULATED

This section outlines each of the weather conditions measured/calculated by the Vantage Pro. 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 9).

Wind

The Vantage Pro measures wind speed and direction from which it's blowing. The 10 minute average wind speed is displayed in the weather ticker when wind is selected with the graph icon.

Temperature

The Vantage Pro uses the primary temperature sensor to measure the outside air temperature. A second temperature sensor in the console measures the inside air temperature. Additional temperature sensors (available only with wireless Vantage Pro) can be used to measure temperature in other locations. You may use these extra sensors to measure whatever auxiliary temperature you see fit (including water temperature).

Apparent Temperature Measures

The Vantage Pro calculates three apparent temperature readings: wind chill, heat index, and the temperature/humidity/sun/wind index (THSW Index).

- **Wind chill**

Wind chill takes into account how the speed of the wind affects our perception of the air temperature. Our bodies warm the surrounding air molecules by transferring heat from the skin. If there's no air movement, this "insulating layer" of warm air molecules stays next to the body and offers some protection from cooler air molecules. However, wind sweeps that comfy warm air surrounding the body away. The faster the wind blows, the faster heat is carried away and the colder you feel. Above 91 F, wind movement has no effect on the apparent temperature, so wind chill = the outside temperature.

- **Heat Index**

The Heat Index uses the temperature and the relative humidity to determine how hot the air actually "feels." When humidity is low, the apparent temperature will be lower than the air temperature, since perspiration evaporates rapidly to cool the body. However, when humidity is high (*i.e.*, the air is saturated with water vapor) the apparent temperature "feels" higher than the actual air temperature, because perspiration evaporates more slowly.

Note: *Vantage Pro measures Heat Index only when the air temperature is above 57° F (14° C), because it's insignificant at lower temperatures. (Below 57°, Heat Index = the air temperature.) The Heat Index is not calculated above 135° F (52° C), because calculation factors are not available.*

- **THSW (Temperature - Humidity - Sun - Wind)**

Finally, like Heat Index, the THSW Index uses humidity and temperature to calculate an apparent temperature. In addition, THSW incorporates the heating effects of direct solar radiation and the cooling effects of wind on our perception of temperature.

Note: *The Vantage Pro displays THSW only if you have the optional Solar Radiation sensor.*

TABLE AI: HEAT AND COLD EFFECTS

| | |
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Relative 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 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. 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 then 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 is an important factor in determining the amount of evaporation from plants and wet surfaces since warm air with low humidity has a large capacity for extra water vapor.

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. In addition a high dew-point indicates a better chance of rain and severe thunderstorms. You can even use dew-point to predict the minimum overnight temperature. Provided no new fronts are expected overnight and the afternoon Relative Humidity $\geq 50\%$, the afternoon's dew-point gives you an idea of what minimum temperature to expect overnight, since the air is not likely to get colder than the dew-point anytime during the night.

Rainfall

The Vantage Pro provides four separate registers for tracking rainfall totals: "rain storm", "daily rain", "monthly rain", and "yearly rain". The Vantage Pro also calculates the rate of rainfall by measuring the interval of time between each .01" or .254 mm rainfall increment.

Barometric Pressure

The weight of the air that 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, this, in turn, means that atmospheric pressure changes with altitude. For example, atmospheric pressure is greater at sea-level than on a mountaintop. 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 Vantage Pro measures atmospheric pressure. When you enter your location's altitude in Setup Mode, the Vantage Pro stores the necessary offset value to consistently translate atmospheric pressure into barometric pressure.

Barometric pressure also changes with local weather conditions, making 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 weather. 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.

Note: The following variables require optional sensors and / or stations. See "Optional Sensors" starting on page 9.

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 a horizontal surface. This irradiance includes both the direct component from the sun and the reflected 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 /sq. m (W/m^2).

Note: The Vantage Pro measures energy received in the spectral band between 400 and 1100 nm.

UV (Ultra Violet) Radiation

Energy from the sun reaches the earth as visible, infrared, and ultraviolet (UV) rays. Exposure to UV rays can cause numerous health problems, such as sunburn, skin cancer, skin aging, and cataracts, and can suppress the immune system. The Vantage Pro can help analyze the changing levels of UV radiation and can advise of situations where exposure is particularly unacceptable.

!! CAUTION: Be aware, however, that the Vantage Pro’s UV readings do not take into account UV reflected off snow, sand, or water, which can significantly increase the amount of UV to which you are exposed. Nor does the Vantage Pro take into account the dangers of prolonged exposure to UV radiation. The readings do not suggest that any amount of exposure is safe or healthful. **Do not use the Vantage Pro to determine the amount of UV radiation to which you expose yourself.** Scientific evidence suggests that UV exposure should be avoided and that even low UV doses can be harmful.

The Vantage Pro displays UV readings in two scales: MEDs and UV Index.

MED stands for Minimum Erythmal Dose, defined as the amount of sunlight exposure necessary to induce a barely perceptible redness of the skin within 24 hours after sun exposure. In other words, exposure to 1 MED will result in a reddening of the skin. Because different skin types burn at different rates, 1 MED for persons with very dark skin is different from 1 MED for persons with very light skin.

Both the U.S. Environmental Protection Agency (EPA) and Environment Canada have developed skin type categories correlating characteristics of skin with rates of sunburn. Tables 3a and 3b below list these skin types.

TABLE A2: EPA SKIN PHOTOTYPES

| SKIN PHOTOTYPE | SKIN COLOR | TANNING & SUNBURN HISTORY |
|-----------------------------------|--------------------------------------|---|
| 1 - Never tans, always burns | Pale or milky white; alabaster | Develops red sunburn; painful swelling, skin peels |
| 2 - Sometimes tans, usually burns | Very light brown; sometimes freckles | Usually burns, pinkish or red coloring appears; can gradually develop light brown tan |

TABLE A2: EPA SKIN PHOTOTYPES

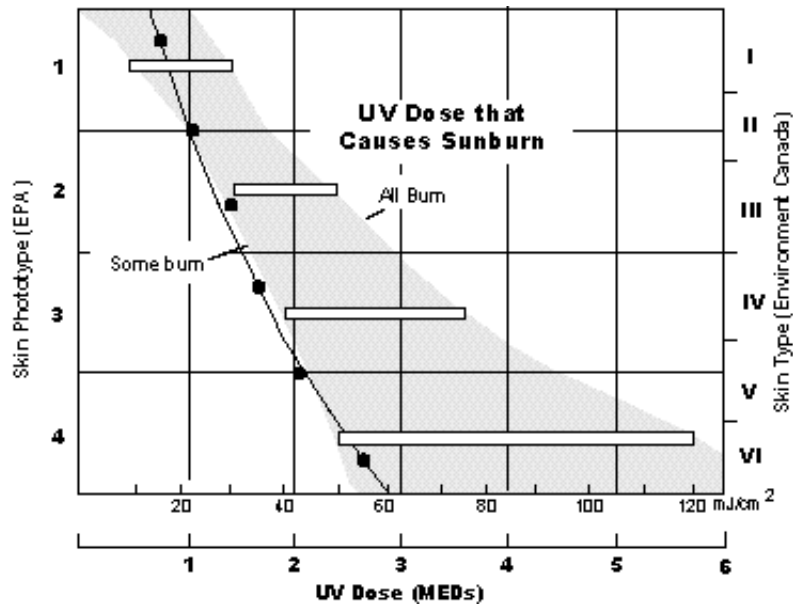
| SKIN PHOTOTYPE | SKIN COLOR | TANNING & SUNBURN HISTORY |
|-----------------------------------|--|---|
| 3 - Usually tans, sometimes burns | Light tan; brown, or olive; distinctly pigmented | Rarely burns; shows moderately rapid tanning response |
| 4 - Always tans; rarely burns | Brown, dark brown, or black | Rarely burns; shows very rapid tanning response |

T. B. Fitzpatrick of the Harvard Medical School developed a categorization of skin types 1 through 6 which were adopted by Environment Canada. These skin types are detailed in Table 3b below.

TABLE A3: ENVIRONMENT CANADA SKIN TYPES AND REACTION TO THE SUN

| SKIN TYPE | SKIN COLOR | HISTORY OF TANNING & SUNBURNING |
|------------------|-------------------|--|
| I | White | Always burns easily, never tans |
| II | White | Always burns easily, tans minimally |
| III | Light Brown | Burns moderately, tans gradually |
| IV | Moderate Brown | Burns minimally, tans well |
| V | Dark Brown | Burns rarely, tans profusely |
| VI | Black | Never burns, deep pigmentation |

Note: More about the Fitzpatrick Skin Types is available in: Fitzpatrick TB. Editorial: the validity and practicality of sun-reactive skin types I through VI. Arch Dermatol 1988; 124:869-871



UV Dose and Sunburn - Use this plot to estimate the MED dose leading to sunburn. A person with Type II (Environment Canada) skin type might choose 0.75 MED as the maximum for the day; in contrast, a person with Type V (Environment Canada) Skin Type might consider 2.5 MEDs a reasonable dose for the day. NOTE: the Vantage Pro assumes a Fitzpatrick (Environment Canada) Skin Type of II.

Vantage Pro can also display UV Index, an intensity measurement first defined by Environment Canada and since been adopted by the World Meteorological Organization. UV Index assigns a number between 0 and 16 to the current UV intensity. The US EPA categorizes the Index values as shown below. The lower the number, the lower the danger of sunburn. The Index value published by the U.S. National Weather Service is a forecast of the next day's noontime UV intensity. The Index value displayed by the Vantage Pro is the result of a real-time measurement.

TABLE A4: UV INDEX AND EXPOSURE CATEGORY

| INDEX VALUES | EXPOSURE CATEGORY |
|--------------|-------------------|
| 0 - 2 | Minimal |
| 3 - 4 | Low |
| 5 - 6 | Moderate |
| 7 - 9 | High |
| 10 + | Very High |

EvapoTranspiration (ET)

EvapoTranspiration (ET) is a measurement of the amount of water vapor returned to the air in a given area. It combines the amount of water vapor returned through evaporation (from wet vegetation surfaces and the stoma of leaves) with the amount of water vapor returned through transpiration (exhaling of moisture through plant skin) to arrive at a total. Effectively, ET is the opposite of rainfall, and it is expressed in the same units of measure (Inches, millimeters).

The Vantage Pro uses air temperature, relative humidity, wind run¹, and solar radiation data to estimate ET. (ET is calculated once an hour on the hour.)

Please note that calculating ET requires the optional solar radiation sensor. (See "Optional Sensors" on page 9.)

Leaf Wetness

Leaf wetness (see "Optional Sensors" on page 9) provides an indication of whether the surface of foliage in the area is wet or dry by indicating how wet the surface of the sensor is. The leaf wetness reading ranges from 0 (dry) to 15.

Note: Leaf Wetness is only available with the wireless Vantage Pro and the optional Leaf Wetness station.

Soil Moisture

Soil Moisture, as the name suggests, is a measure of the moisture content of the soil. Soil moisture is measured on a scale of 0 to 200 centibars, and can help choose times to water crops. The soil moisture sensor measures the vacuum created in the soil by the lack of moisture. A high soil moisture reading indicates dryer soil; a lower soil moisture reading means wetter soil.

Note: Soil Moisture is only available with the wireless Vantage Pro with the optional Soil Moisture station.

Time

The Vantage Pro has a clock and a calendar for tracking time and date. The calendar automatically adjusts during leap years, providing you have entered the correct year in the Setup Mode.

1. Wind run is a measurement of the "amount" of wind passing a given point during a specific amount of time. It's expressed as either "miles of wind" or "kilometers of wind" and is calculated by summing wind speed and multiplying 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).

| FUNCTION | ACCESSORY | SENSOR | RESOLUTION | RANGE | NOMINAL
ACCURACY
(+/-) | RESOLUTION | RANGE | NOMINAL
ACCURACY
(+/-) |
|---|------------------|--|--|--|---------------------------------------|--|--|---------------------------------------|
| Barometric Pressure
Elevation: -999' to +12,000'
(-305 to + 3650 m) | | | 0.01" Hg | 26" to 32" ^a | 0.05" Hg | 0.1 hPa, mm | 880 to 1080 hPa
660 to 810 mm | 1.7 hPa
1.3 mm |
| Barometric Trend (1 hour) | | Included in Console | Change
> = .06" Hg =
rapidly;
> = .02" Hg =
slowly | 5 position arrow:
rising (rapidly/
slowly)
Falling (rapidly/
slowly) | | Change
> = 2 hPa;
1.5 mm Hg =
rapidly;
> = 7 hPa;
0.5 mm Hg =
slowly | 5 position arrow:
rising
(rapidly/slowly)
Falling
(rapidly/slowly) | |
| Evapotranspiration | X | Solar radiation,
Temperature/Humidity
& Anemometer | 0.01" | Daily to 99.99";
Monthly & Yearly to
199.99" | 5% | 0.25 mm | Daily to 999.9mm;
Monthly & Yearly to
1999.9mm | 5% |
| Inside Humidity | | Included in Console | 1% | 10 to 90% | 5% RH | 1% | 10 to 90% | 5% RH |
| Outside Humidity | | Temp/Hum station or ISS | 1% | 0 to 100% | 3% RH | 1% | 0 to 100% | 3% RH |
| Dew Point (overall) | | Temp/Hum station or ISS | 1 deg F | -105 to +130 F | 3 deg F | 1 deg C | -76 to +54 C | 1.5 deg C |
| Frost/Dew Point
at High Humidity | | Temp/Hum station or ISS | 1 deg F | -105 to +130 F | 2 deg F | 1 deg C | -76 to +54 C | 1 deg C |
| Extra Humidity | X | Temp/Hum station or ISS | 1% | 0 to 100% | 3% RH | 1% | 0 to 100% | 3% RH |
| Leaf Wetness | X | Leaf Wetness sensor | 1 | 0 to 15 | 0.5 | 1 | 0 to 15 | 0.5 |

| FUNCTION | ACCESSORY | SENSOR | RESOLUTION | RANGE | NOMINAL
ACCURACY
CY
(+/-) | RESOLUTION | RANGE | NOMINAL
ACCURACY
CY
(+/-) |
|---------------------------|------------------|--|----------------------------------|----------------------------|--|--------------------------------------|----------------------------|--|
| Soil Moisture | X | Soil Moisture sensor | 1 cb | 0 to 200 cb | | 1 cb | 0 to 200 cb | |
| Daily & Storm Rainfall | | Rain Collector | 0.01" | to 99.99" | 4% | 0.25mm | to 999.9mm | 4% |
| Monthly & Yearly Rainfall | | | 0.01" | to 199.99" | 4% | 0.25mm to
1999.99mm; 1mm
above | to 19,999mm | 4% |
| Rain Rate | | | 0.01" | to 100"/hr | 5% | 0.25mm to
1999.99mm; 1mm
above | to 2540mm/hr | 5% |
| Solar Radiation | X | Solar Radiation sensor | 1 W/m ² | 0 to 1600 W/m ² | 5% | 1 W/m ² | 0 to 1600 W/m ² | 5% |
| Inside Temperature | | Included in Console | 0.1 deg F | +32 to +140 F | 1 deg F | 0.1 deg C | 0 to +60 deg C | 0.5 deg C |
| Outside Temperature | | Temp sensor, Temp probe,
Temp/Hum sensor or ISS | 0.1 deg F | -40 to +140 deg F | 1 deg F | 0.1 deg C | -40 to +60 deg C | 0.5 deg C |
| Extra Temperature | X | Temperature station | 1 deg F | -40 to +140 deg F | 1 deg F | 1 deg C | -40 to +60 deg C | 0.5 deg C |
| Heat Index | | Temp/Hum station or ISS | 1 deg F | -40 to +135 deg F | 3 deg F | 1 deg C | -40 to +57 deg C | 1.5 deg C |
| Temp-Hum-Sun-Wind index | X | Solar radiation sensor +
ISS | 1 deg F | -90 to +148 deg F | 4 deg F | 1 deg C | -68 to +64 C | 2 deg C |
| Time | | Included in Console | 1 min | 24 hours | 15 sec/mon | 1 min | 24 hours | 15 sec/mon |
| Date | | | 1 day | month/day | 15 sec/mon | 1 day | day/month | 15 sec/mon |
| UV Index | X | UV Radiation sensor | 0.1 Index | 0 to 16 | 8% | 0.1 | 0 to 16 | 8% |
| UV Dose | X | | 0.1 to 19.9 MEDS;
1 MED above | 0 to 199 MEDS | 8% | 0.1 to 19.9 MEDS;
1 MED above | 0 to 199 MEDS | 8% |

| <u>FUNCTION</u> | <u>ACCESSORY</u> | <u>SENSOR</u> | <u>RESOLUTION</u> | <u>RANGE</u> | <u>NOMINAL
ACCURA-
CY
(+/-)</u> | <u>RESOLUTION</u> | <u>RANGE</u> | <u>NOMINAL
ACCURA-
CY
(+/-)</u> |
|----------------------|------------------|---|-------------------|-------------------------------|---|-------------------|-------------------------------|---|
| Wind Direction | | | 1 deg | 0 to 360 deg | 7 deg | 1 deg | 0 to 360 deg | 7 deg |
| Compass Rose | | | 22.5 deg | 16 compass pts | 0.3
compass pt | 22.5 deg | 16 compass pts | 0.3
compass pt |
| Wind Speed (Lg cups) | | Anemometer | 1 mph/1 kt | 2 to 120 mph;
2 to 104 kts | greater of
2 mph/kts
or 5% | 0.5 m/s; 1 kph | 1 to 54 m/s
3 to 193 kph | greater of
1 m/s;3 kph
or 5% |
| Wind Speed (5m cups) | X | | 1 mph/1 kt | 3 to 175 mph;
3 to 150 kts | greater of
3 mph/kts
or 5% | 0.5 m/s; 1 kph | 1.5 to 79 m/s
5 to 282 kph | greater of
1 m/s;5kph
or 5% |
| Wind Chill | | ISS or Anem & Temp or
Temp/Hum station | 1 deg F | -120 to +130 F | 4 deg F | 1 deg C | -84 to +54 C | 2 deg C |
| | | | | | | | | |

a. This is the reduced value -- i.e. after standardizing to sea level.

DRAFT



REPAIR & WARRANTY INFORMATION

ONE YEAR LIMITED WARRANTY

For details on Davis' warranty policy, please refer to the *Maintenance, Service, and Repair Information* brochure included with your station.

QUESTIONS? CALL THE DAVIS SERVICE CENTER

If you have any questions about our products, please call our Service Center at 1-510-732-7814. We'll be glad to help. Most questions can be answered while you're on the phone. Sorry, we're unable to accept collect calls.

FCC PART 15 CLASS B REGISTRATION WARNING

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications.

However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment on and off, the user is encouraged to try to correct the interference by one or more of the following measures:

- **Reorient or relocate the receiving antenna.**
- **Increase the separation between the equipment and receiver.**
- **Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.**
- **Consult the dealer or an experienced radio/TV technician for help.**

Shielded cables must be used for this equipment to comply with the relevant FCC regulations. [Previous sentence necessary?] Changes or modifications not expressly approved in writing by Davis Instruments may void the user's authority to operate this equipment.

Product Numbers: xxxx, xxxx, xxxx, xxxx

David Instruments Part Number: xxxx-xxx

Vantage Pro Console Manual

Rev. A Manual (10/1/00)

This product complies with the essential protection requirements of the EC EMC Directive 89/336/EC.

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3465 Diablo Avenue, Hayward, CA 94545-2778

510-732-8229 • Fax: 510-732-9118

Email: info@davisnet.com • www.davisnet.com