Vantage Pro2™
Weather Envoy Manual

For Vantage Pro2™ & Vantage Pro2 Plus™ Weather Stations

DaVIS

Weather Envoy for Vantage Pro2 Manual

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For Vantage Pro2 Weather Envoys # 6316 & 6316C

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Welcome to the Weather Envoy!

Welcome to Davis Instruments' Weather Envoy®. The Weather Envoy provides a new and exciting way of getting weather data from your Vantage Pro2™ weather station and into your Windows (95 or later) or Macintosh (OS X) computer.

The Weather Envoy® includes the data collection and logging functions of the Vantage Pro2™ console, but in a smaller package that can be discreetly placed next to your computer. Both cabled and wireless versions of the Weather Envoy are available. In combination with our WeatherLink software and data logger, the Weather Envoy allows you to view, store, plot, analyze, export, share, and print your weather data.
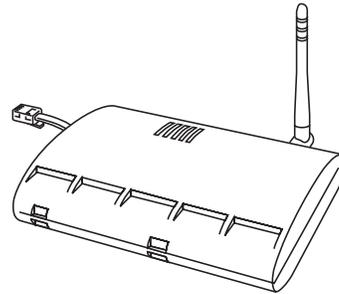
Contents

Before continuing, please be sure your Weather Envoy package includes the following:

- Envoy
- Two #6 x 1" screws for wall mounting
- AC-power adapter

Required for Operation

You will also need the following Davis weather products to use your Envoy:

All Weather Envoys:

- Any version of WeatherLink for Vantage Pro and Vantage Pro2 (Windows version 5.2 or later (6510USB, 6510SER, 6540, 6544, 6550, 6560, 6510C), Mac OS X version 5.01 or later (6520, 6520C))

Wireless Weather Envoy:

- Wireless ISS or ISS Plus (6320, 6322, 6325, 6328) or;
- Wireless Vantage Pro2 (Plus) Weather Station (6152, 6153, 6162, 6163)

Cabled Weather Envoy:

- Cabled ISS or Cabled ISS Plus (6322C and 6327C)

Optional Accessories

The following optional accessories are designed for use with your Envoy. They are available from your dealer or may be ordered directly from Davis Instruments.

- **Telephone Modem Adapter (#6533) (For Serial Connections only)** - Allows transmission of data from the data logger using a modem.

- **Standard 4-Conductor 40' Extension Cable (#7876-040) (For Serial connections only)** - For more flexibility in the placement of your Weather Envoy, add one 40' (12 m) extension cable to extend the distance between your station and the computer. (48' (14.4 m) maximum)

Hardware Installation

The Weather Envoy can be installed and connected to a computer two different ways: via a local connection to a computer (using either the USB or serial connection type) and remote connection to a computer via a modem. Requirements and installation for each type of connection differ, and are explained separately below.

Local Connection Windows Computer Requirements

WeatherLink is compatible with computers using a USB port connection running the following platforms: 98 SE, ME, 2000 or XP.

WeatherLink is compatible with computers using a serial port connection running the following platforms: 95 (with Internet Explorer 4.0 or higher), 98, 98 SE, ME, NT 4.0, 2000 or XP.

Your Weather Envoy and WeatherLink also require the following for a local Windows computer connection.

- Windows-compatible display.
- VGA minimum. SVGA or High (16-bit) Color or better recommended.
- One free serial port or USB Port.

Local Connection Macintosh Computer Requirements

Your Weather Envoy requires the following for a local Macintosh computer connection:

- Macintosh computer running Mac OS X v10.01 or newer with at least 5 MB of free disk space.
- One free USB Port.

Preparing the Envoy

Perform the following procedures to prepare your Envoy for operation.

- Install the Data Logger
- Install the Batteries and Optional AC power source
- Mount your Envoy
- Connect Envoy to WeatherLink software
- Test using WeatherLink software
- Setup the Envoy using WeatherLink software

Install the Data Logger

Installing the data logger that is supplied with the WeatherLink package is the first step in preparing the Weather Envoy to transmit data to the WeatherLink software.

CAUTION: Plugging or unplugging the data logger while power is applied to the Envoy can lock up or damage the logger. The WeatherLink data logger must be installed before you install the batteries.

1. Remove the three screws from the back of the Envoy case
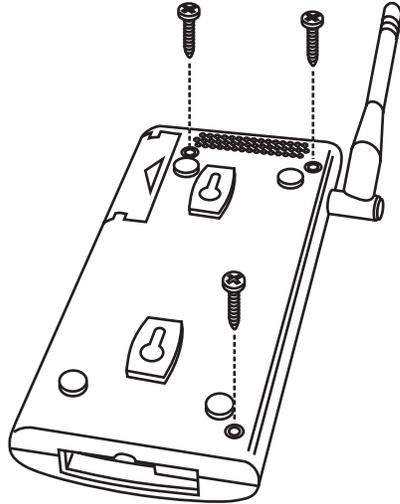
2. Separate the case halves to expose the data logger connector.
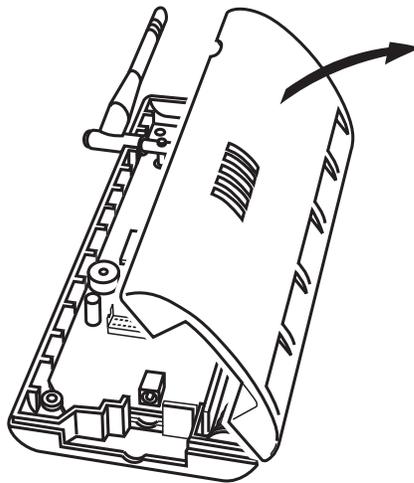
3. Carefully insert the data logger (Serial or USB) into the connector slot, making sure to push data logger firmly in place.

USB Data Logger

Serial Data Logger

Data Logger Cable Channel

Data Logger Cable Channel
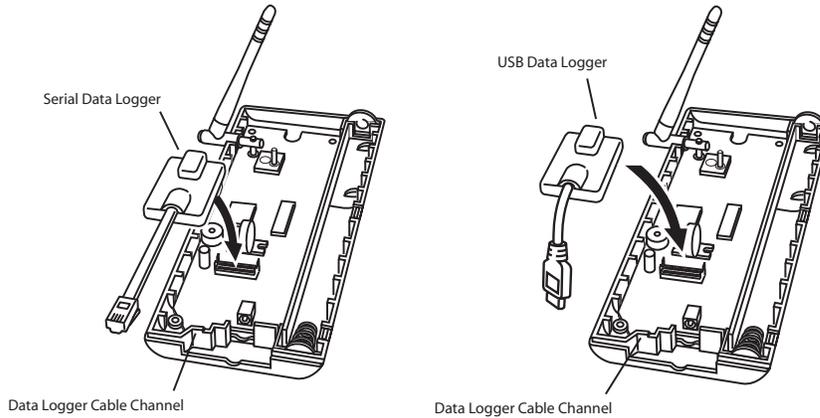
4. Rejoin the case halves, making sure the data logger cable passes through the cable channel.

5. Fasten using the three screws you previously removed.

Install the Batteries

1. Find the battery cover on the back side of the Envoy case.

2. Remove the battery cover by pressing on the arrow embossed on the cover and sliding the cover away from the case.

AA   +

AA   +

AA   +
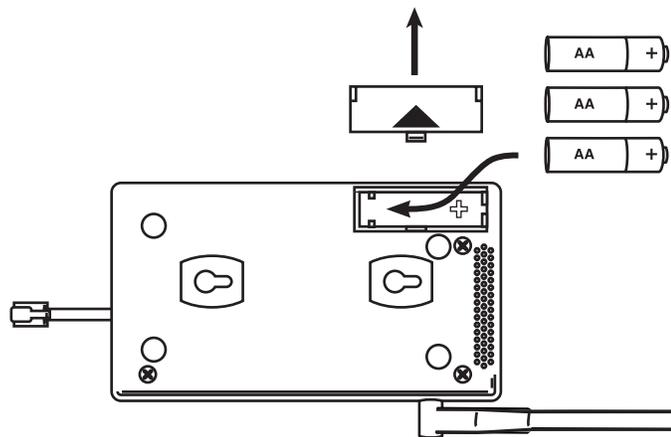
3. Insert the three AA-cell batteries, negative terminal (flat side) first. The Envoy emits two beeps if the start up test is successful.

4. Replace the battery cover on the case.

Optional: Connecting AC Power

The operating battery power for a cabled Weather Envoy is approximately 10 days. For a wireless Weather Envoy, the battery power is approximately 5 months. The Weather Envoy is supplied with an option AC power adapter that can be installed as an optional power source.

Note: If installing the optional AC power supply, make sure the WeatherLink Data Logger is already installed and that the backup batteries are installed

1. Locate the power adapter jack on the end of the Envoy case. It's next to the data logger output cable.
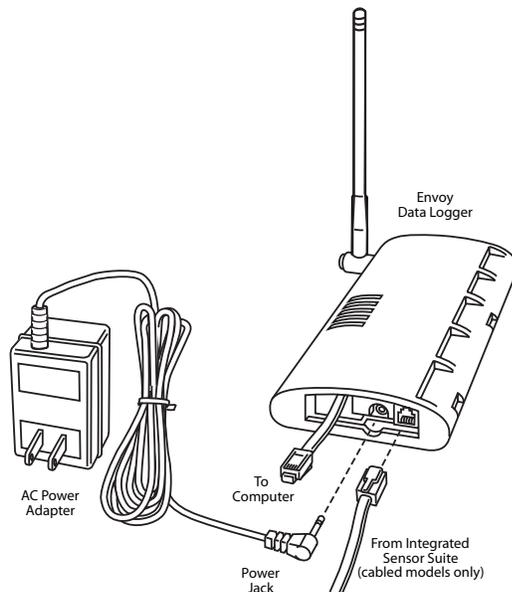
2. Insert the power adapter plug into the power jack.

Optional: Connecting a Cabled Envoy to the Integrated Sensor Suite (ISS)

Refer to the figure shown above "Connecting AC Power".

1. Insert the modular plug into the ISS jack on the Envoy case.

Note: You won't be able to test the connection between the Envoy and the ISS until you have finished installing the WeatherLink software.

Mount Your Weather Envoy

You can place your Envoy on your desktop, install it on a wall near your computer, or install it with the optional Multi-Purpose Shelter (7728). Here are some guidelines for placing your Weather Envoy.

Envoy Location

You should place the Envoy in a location where it easily accessible and can be easily connected to a computer. For more accurate readings, follow these suggestions:

- Avoid placing the Envoy in direct sunlight. This may cause erroneous inside temperature and humidity readings and may damage the unit.
- Avoid placing the Envoy near radiators or heating/air conditioning ducts.
- If you are mounting the Envoy on a wall, choose an interior wall. Avoid exterior walls that tend to heat up or cool down depending on the weather.

The range of the radio transmission that the Envoy can receive from the wireless ISS depends on several factors. Try to position the Envoy around the transmitting weather station as close as possible for best results.

Typical maximum ranges include:

- Line of sight: 1000 feet (300 m).
- Under most conditions: 200 - 400 feet (60 - 120 m).

Other range and transmission considerations include:

- Range may be reduced by walls, ceilings, trees, foliage, a metal roof or other large metal structures or objects such as aluminum siding, metal ducts, and metal appliances, such as refrigerators.
- Frequency interferers also reduce transmission distance. Cordless phones (900 Mhz) is a common example of frequency interference.
- Transmission between wireless units may be obscured by something unidentifiable, or by some obstacle that can't be worked around.

Note: For best results, orient the ISS antenna and the Envoy antenna so that the orientation and angles of the antennas are parallel to each other.

- If possible, align the pivot joints of both the ISS and the Envoy antennas so that the are facing each other for maximum signal strength.

For better reception over greater distances or for weaker signals, consider using a Wireless Repeater (product #7626 or #7627) to strengthen the signal or increase the distance between your ISS and the Envoy.

Wall Mounting the Envoy

Use this procedure for a wall installation.

1. Use the provided wall mounting template as an example of hole spacing and alignment when installing your Envoy.
2. Use the template as a guideline for the hole markings on the wall where you want to mount the Envoy, and use a pencil to mark the location for the two mounting screws.

The screws should be 3.25" (82.5 mm) apart and lined up vertically.

3. Drill the marked locations with a 3/32" or 7/64" (2.2 to 2.7 mm) drill bit.

4. Drive the two #6 x 1" (3.5 mm x 25 mm) pan head self-threading screws into the wall.

5. Leave at least a 1/8" (3 mm) space between the wall and the heads of the screws.

Drill 3/32"
or 7/64"
(~2.2 to 2.7mm)
Holes

3.25"
(82.55mm)

Template to Scale
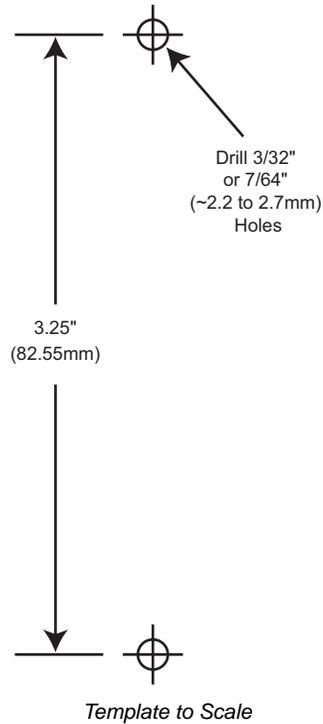
6. Slide the keyholes on the back of the case over the two screw heads.

**#6 X 1"
Pan-Head
Screws**
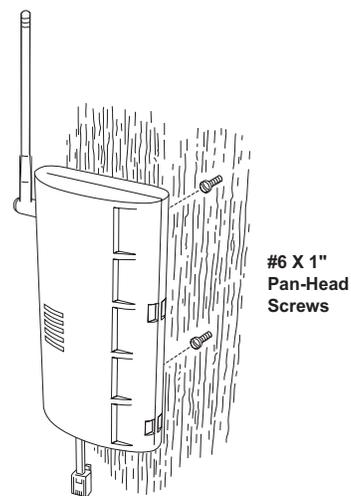
Local Computer Installation

The instructions below contain the base procedures for connecting and setting up a local or remote connection between your Weather Envoy and a computer. Additional setup not featured in this manual is required for all Weather Envoy,

Vantage Pro and Vantage Pro2 consoles. See the *WeatherLink Getting Started Guide* for complete instructions on connecting the data logger to your computer. Also, see *WeatherLink Online Help* for additional setup instructions.

USB Connection

Complete the local USB connection by using the instructions below:

1. Locate the Envoy receiving the WeatherLink USB connection.
2. Locate a free USB port on your computer and connect the USB connector to the port.
3. Insert the USB - Mini B connector on the USB connector of the USB data logger. The connection between the Envoy and the computer can be extended up to 16' (5 m) using a USB-to-USB connector cable.
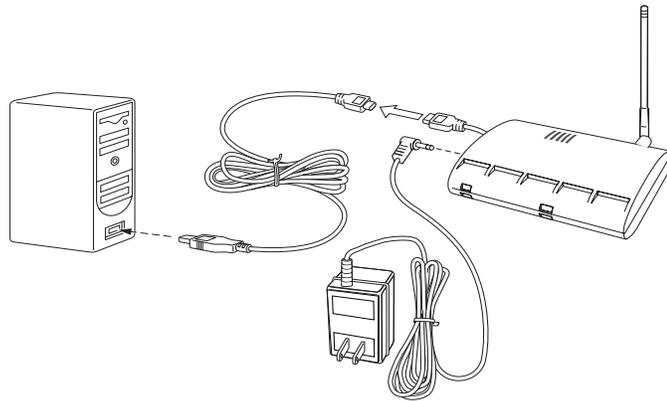
Note: Do not attempt to use more than a 16' extension cable, or the data logger may have difficulty communicating with the computer.

Serial Port Connection

These instructions explain how to make a typical local connection between your Envoy and your computer via a serial port. Note that if you extend the cable run beyond 48' (14.4 m), the software may have difficulty communicating with the station

Installing with a Local Computer

1. Locate a free serial port on the back of your computer and connect the DB9 adapter to the port.
2. Insert the cable plug at the end of the short cable coming from the data logger into the receptacle on the end of the 8' cable. Then insert the cable plug on the end of the 8' cable into the DB9 adapter.

   The cable connecting the data logger to the computer is 8' (2.4 m) long. If you need to place the station Envoy more than 8' from the computer, use a 40' (12 m) standard 4-conductor extension cable (#7876-040). Do not

attempt to use more than 40' of extension cable, or the data logger may have difficulty communicating with the computer.
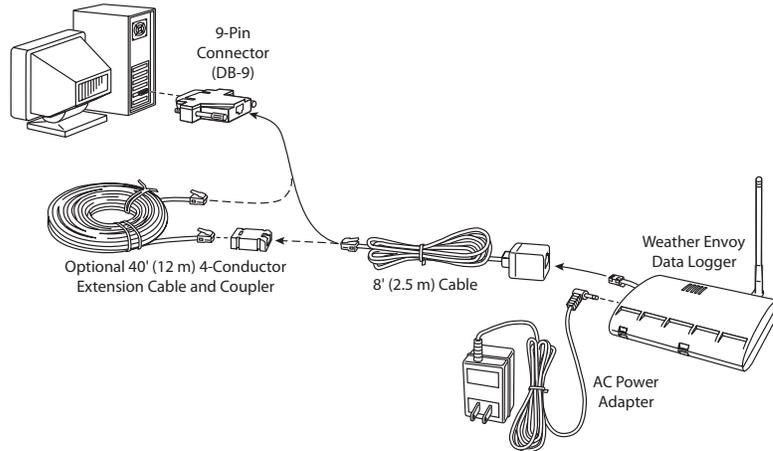
Note: The data logger does not require a constant connection with a computer to continue logging and storing data. Although the data logger should remain connected to the Envoy at all times, the data logger only needs to be connected to the computer when data is being downloaded or when the computer is actively using data from the data logger. The data logger and Envoy can be disconnected from the computer if the Envoy is placed in a location where the data logger cable cannot reach. However, WeatherLink's bulletin, summary, or other real-time window displays are only accessible if the Envoy is attached to the computer.

Remote Computer Installation

The illustration below shows a typical remote computer installation using a modem. This involves connecting the data logger to the Weather Envoy and to a modem at the station Envoy site and connecting your computer's modem to a phone line, which will allow you to dial the Weather Envoy.

Note: Mac Users - Refer to your WeatherLink for Mac OS X Getting Started Guide for additional installation instructions
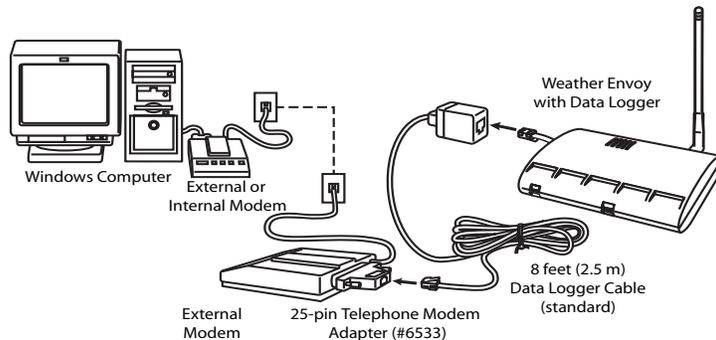
Note: Before installing the Envoy and modem at a remote location, test the data logger and connection first using a direct connection like that shown in the section above.

Remote Modem Connection Hardware Requirements

The following additional hardware is required for a phone modem connection.

- One internal or external modem connected to your computer. The modem must be Hayes®–compatible and run at 1200, 2400, 4800, 9600, 14400 or 19200 baud.
- One external modem to connect to the Weather Envoy data logger. The modem must be Hayes®–compatible and run at 1200, 2400, 4800, 9600, 14000 or 19200 baud.
- Telephone Modem Adapter
- The Telephone Modem Adapter (#6533) provides the connection between the Weather Envoy data logger and the modem.

Installing with a Remote Computer

1. Install and set up an internal or external modem (according to the instructions supplied by the manufacturer) for use with your computer.

   Make a note of the COM port used by the modem. You will need this information when entering serial port settings for the station.

2. At the Weather Envoy site, put the external modem in a location where it can connect to both the data logger and the phone jack.

Note: Both the modem and the Weather Envoy should be powered down at this time, if they are not already turned off.

The cable connecting the data logger to the modem is 8' (2.4 m) long. If you need to mount the station Envoy more than 8' from the modem, use a 40' (12 m) standard 4-conductor extension cable. Do not attempt to use more than 40' of extension cable, or the data logger may have difficulty communicating with the modem.

3. Plug the external modem into the phone jack.
4. Connect the Weather Envoy data logger to the modem.
5. Power up the modem.
6. Power up the Weather Envoy last.

Remote Modem Connection Notes

When accessing a remote modem connection, WeatherLink automatically dials the station and Envoy whenever an action has been performed in the software that requires it to talk to the station.

While connected to a remote station, an **On-Line** icon displays in the toolbar. This icon indicates that WeatherLink has established a connection with the remote Envoy and weather station. Select the **On-Line** icon from the toolbar or select Hang Up from the **File** menu to disconnect the phone connection.

By default, WeatherLink hangs up the connection to the modem after one minute without any communication with the station. Use the **Communications Port** dialog box in the **Setup** menu of WeatherLink to change this default value. (See the WeatherLink help files for more information.)

Note: WeatherLink will not hang up the phone line if the Bulletin or Summary windows are active.

Software Installation and Setup

Refer to the following procedure to install WeatherLink software on your computer. The instructions below contain the base procedures for running the WeatherLink software and setting up a connection to your Weather Envoy. All information about the software is included as an overview. Additional setup not featured in this manual is required for all Weather Envoy, Vantage Pro and Vantage Pro2 consoles. See *WeatherLink Online Help* for complete setup instructions.

Note: If you are installing a Davis specialized data logger (6540, 6544, 6550, 6560) please see the included addendum for complete installation instructions.

Installing the Software

Windows Computer Using USB Connection

Follow the steps below to install the WeatherLink software.

1. Place the WeatherLink software CD in your CD ROM drive.

   The install program should start automatically. If the install program does not start, select Run from the **Start** menu, type D:\SETUP (or the correct letter for your CD ROM drive), and click **OK** to begin the installation.

2. Follow the on-screen prompts to complete the installation.

Windows Computer Using a Serial Port Connection

1. Place the Install Disk in your CD ROM drive.

   The install program should start automatically. If the install program does not start, choose Run from the Start menu, type D:\SETUP (or E:\SETUP, substituting the correct drive letter for D or E), and choose OK to begin the installation.

2. Follow the on-screen prompts to complete the installation.

Macintosh Computer

1. Place the Install Disk in your CD ROM drive.
2. Copy "install.sit" from the CD to your desktop and open it.
3. The installation software will automatically extract itself.
4. Run "install".
5. Follow the on-screen prompts to complete the installation.

Running the Software

To run the software, double-click the **WeatherLink** icon. If no stations have been assigned in the program directory, the software prompts you to add a station (see below for details). If there is more than one station in the program directory when the application opens, the last station that was displayed is automatically opened.

Adding a Station

1. Select New Station from the **File** menu. The **New Station** dialog displays.
2. Type the desired station name (up to 40 characters/spaces) into the **Station Name** text box. The software uses the first eight characters of the station name (not counting spaces or punctuation marks) as the name of the directory into which it saves this station's database and configuration files. The first eight characters of each station name must, therefore, be unique.
3. Click **OK** to save the new station or click **Cancel** to exit without saving.

   The software saves the new station, creates a directory and a configuration file for the station, and prompts you to enter the walk-through procedure.

About the Walkthrough

The software includes a station setup walkthrough that steps you through the weather station configuration procedures. After adding a new station, the **Walkthrough** dialog box automatically displays. By selecting **Yes**, the walkthrough process begins. By selecting **No**, the Walkthrough process is exited. You can set up and configure your station by separately selecting all of the necessary setup options from the **Setup** menu. A Walkthrough option is included in the **Setup** menu that allows you to access the Walkthrough at any time.

By selecting the Walkthrough process, the software displays a series of dialog boxes. At each step in the Walkthrough process, confirmation boxes are provided to perform or skip the next step in the Walkthrough. To continue, select **OK**. To skip this step and move to the next step, select **Skip**. To cancel the entire walkthrough process, select **Cancel**.

Note: The Walkthrough, as well as all the options in the Setup menu, is the only interface for configuring all the Weather Envoy setup options, such as Time and Date and Latitude and Longitude settings. Please refer to the WeatherLink online help for more information about the Walkthrough.

Communication Port Settings

WeatherLink contains a dialog box for locating the communications port (either USB or serial) that the data logger and Weather Envoy are connected to. Use the **Communications Port** dialog box to select the communications port that is used to communicate with the Envoy.

1. Select Communications Port from the **Setup** menu or use the Walkthrough to display the dialog box. The **Communications Port** dialog box displays.
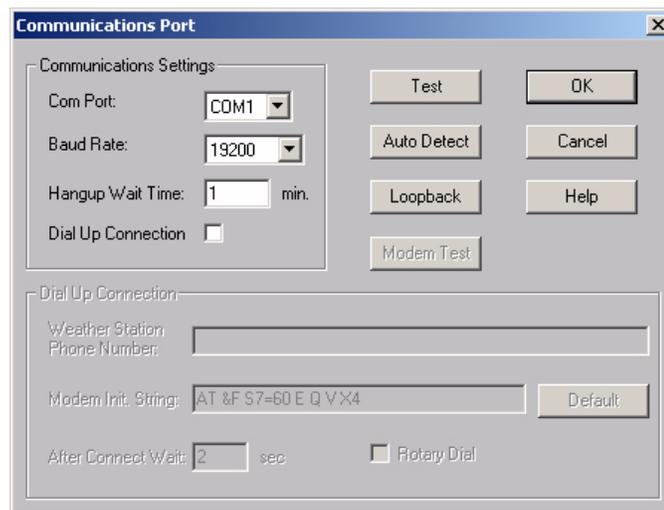
2. Click **Auto Detect**. The program searches for the port that the Envoy data logger is connected to. When the correct connection is found, the following dialog box displays:

3. Click **OK**. The **Communications Port** dialog box displays with the correct port selected in the **Com Port** drop down box.

4. Select the desired baud Rate from the **Baud Rate** drop down box.

   19200 is the default baud rate for the Weather Envoy data logger.

5. Click **OK** to select the port settings and exit the dialog.

Set Alarms

You may quickly set the alarm thresholds on the Weather Envoy using the WeatherLink software. See the Alarms section in this manual for more information on the types of alarms available and how they work.

Note: The only way to clear an alarm in the Weather Envoy is to modify the threshold in the
         Alarm Setup screen to a value that would not cause an alarm, or to delete the value
         altogether.

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1. Select Set Alarms from the **Setup** menu or press Ctrl-A.

   The **Set Station Alarms** dialog box displays.
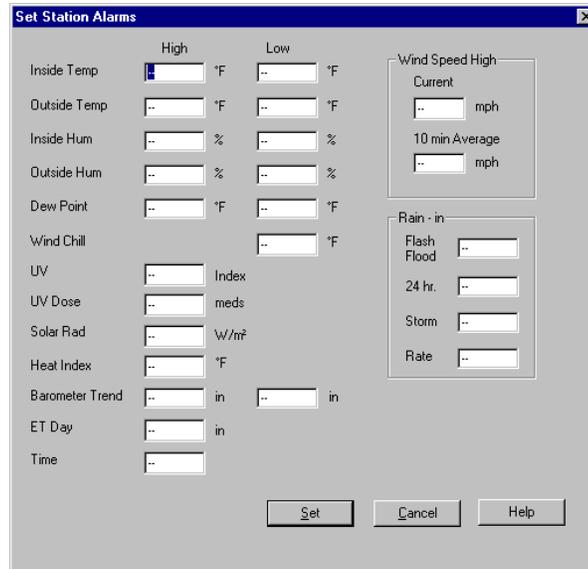
   Enter the following information:

   • **High/Low Alarm** - For all standard high/low alarms, enter the desired alarm
     threshold into the text box. To clear an alarm, clear the contents of the text box
     or enter two (2) dashes: "--".

   • **Barometer** - Enter the 3-hour low (fall) and /or high (rise) pressure trend thresh-
     olds. To clear an alarm, clear the contents of the text box or enter two (2) dashes:
     "--" (two dashes).

   • **Time** - Enter the time for the alarm in the text box. To clear the alarm, clear the
     contents of the text box or enter two (2) dashes: "--".

2. When finished entering alarm information, choose Set.

   The software sets the alarms on the station Envoy to match the settings in
   this dialog box.

Alarms

The Weather Envoy features more than 30 alarms that can be programmed to
sound whenever a reading exceeds a set value. With the exception of baromet-
ric 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 ºF, the alarm will sound when the temperature rises to 65.0 ºF.

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

If you're on battery power, the alarm will sound for two minutes only. If you're using the AC adapter, the alarm will continue as long as the condition exists. The alarm will also sound again for each new alarm.

To silence a sounding alarm, edit the Alarm setup screen to either delete the alarm threshold or to modify the threshold so that the current conditions don't cause an alarm.

Three special alarms

ET (Evapotranspiration)

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

Barometric Pressure

The Weather Envoy 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 0.01 to 0.25 in Hg (0.1 to 6.4 mm Hg, 0.1 to 8.5 hPa/mb); the alarm will sound if the rate of change (in the selected direction) exceeds the threshold you set.

Time

The time alarm is a standard "alarm clock". It sounds at the set tim. Make sure you choose AM or PM, if you're in 12-hour mode. It sounds for one minute.

Auto Download

You may set up the software to automatically download data at specified times each day (the software must be running and a constant connection to the data logger in the Envoy must be made).

1. Select Auto Download from the **Setup** menu or press Ctrl-J.

The **Auto Download** dialog box appears. The stations which appear in the Auto Download List will be downloaded automatically.
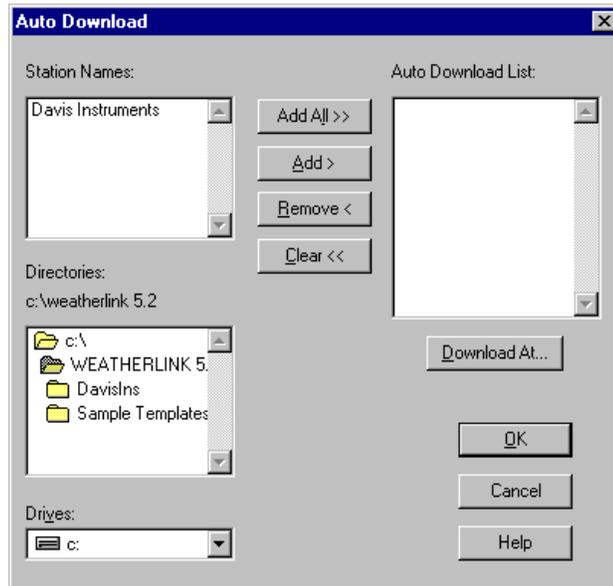
2. To add a station to the Auto Download List, double-click on the station name or select the station from the **Station Names** list and click **Add**.

   The station name moves to the Auto Download List. You may select more than one station before clicking **Add** to add several stations at once. You may quickly add all stations in the Station Names list by clicking **Add All**.

3. To remove a station from the Auto Download List, select the station and click **Remove**.

   The station name removes from the Auto Download List. You may select more than one station before clicking **Remove** to remove several stations at once. You may quickly remove all stations in the list by choosing Clear.

4. To set the time(s) at which the selected station should be downloaded, choose Download At.

The **Download At** dialog box appears.
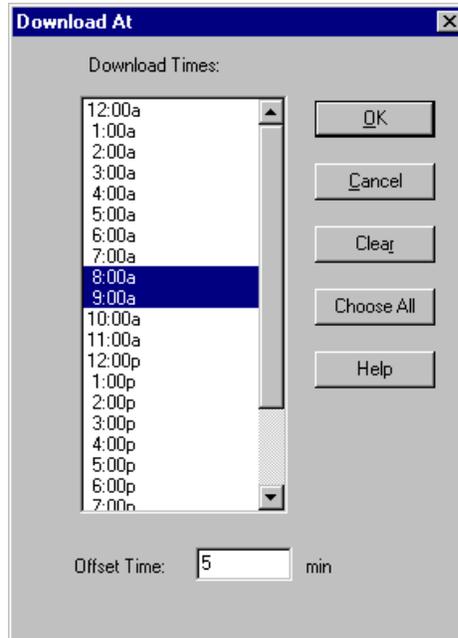
5. Enter the following information:
   - **Download Times** - Select the hour(s) at which the software should automatically download information from this station by clicking on the desired hour in the list. You may select as many download hours as you want; the software will download data from your station during each of the specified hours. To de-select a previously selected hour, click on it again. To quickly select all hours, choose Choose All. To quickly clear all selected hours, choose Clear.
   - **Offset Time** - To force the software to automatically download a specific number of minutes after the selected hour(s), enter the number of minutes here. For example, in the illustration above the software would automatically download at 8:05 and 9:05 am.

6. After setting the download time(s), click **OK**.

   The software saves the automatic download time settings.

Weather Data Measured & Calculated

This section outlines each of the weather conditions measured and/or calculated by the Weather Envoy, by the Vantage Pro Integrated Sensor Suite (ISS), and by optional Vantage Pro sensors. 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 or calculate a value.

Wind

The anemometer measures wind speed and wind direction.

Temperature

The Weather Envoy uses the ISS temperature sensor to measure the outside air temperature. A second temperature sensor in the Weather Envoy measures the inside air temperature. Additional temperature sensors (available only with wireless Vantage Pro and Weather Envoy systems) can be used to measure temperature in other locations. You may use these extra sensors to measure any other temperatures that are within the sensor's range, including liquids such as water.

Apparent Temperatures

The Weather Envoy calculates three apparent temperature readings: wind chill, heat index, and the temperature/humidity/wind index (THW 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 warm air surrounding the body away. The faster the wind blows, the faster heat is carried away and the colder you feel.

Wind chill is not stored in archive memory. Wind chill is calculated whenever it is displayed. Editing temperature or wind speed values changes the wind chill value.

Note: WeatherLink versions 5.1 and later use the Osczevski (1995) equation to calculate wind chill. This is the adopted method used by the US National Weather Service.

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.

THW (Temperature - Humidity - Wind)

The THW Index uses humidity and temperature to calculate an apparent temperature, but includes the cooling and heating effects of wind on our perception of temperature.

THSW (Temperature - Humidity - Solar - Wind)

The THSW Index uses humidity and temperature to calculate an apparent temperature, including the cooling and heating effects of both and solar radiation

on our perception of the temperature.The THSW Index requires a solar radiation sensor.

Humidity

Humidity itself simply refers to the amount of water vapor in the air. However, the amount of water vapor that 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. When we use the term humidity in the manual and on the screen, we mean relative humidity.

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, unlike relative humidity, which takes the air's temperature into account. 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 ≥ 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.

Rain

Vantage Pro2 incorporates a tipping-bucket rain collector in the ISS that measures 0.01" for each tip of the bucket. A metric adapter can be installed to measure 0.2 mm for each tip of the bucket.Your station logs rain data in the same units it is measured in and converts the logged totals into the selected display

units (inches or millimeters) at the time it is displayed. Converting at display time reduces possible compounded rounding errors over time.

Four separate variables track rain totals: "rain storm", "daily rain", "monthly rain", and "yearly rain". Rain rate calculations are based on the interval of time between each bucket tip, which is each 0.01" rainfall increment or 0.2 mm.

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 Weather Envoy measures atmospheric pressure. When you enter your location's altitude in Setup Mode, the Weather Envoy 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.

Solar Radiation

Note: Requires optional solar radiation sensor (#6450, included on Vantage Pro Plus weather stations).

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 solar radiation sensor measures energy received in the spectral band between 400 and 1100 nm.

UV (Ultra Violet) Radiation

Note: Requires optional UV sensor (#6490), included on Vantage Pro Plus weather stations.

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 Weather Envoy 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 UV sensor 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 do the readings 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 UV readings 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.

WeatherLink displays UV readings in two scales: UV, which is the amount of UV radiation using the UV Index scale, and UV Dose, which displays an accumulated UV in MEDs.

MED stands for Minimum Erythemal 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 A1: 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
3 - Usually tans, sometimes burns	Light tan; brown, or olive; distinctly pigmented	Rarely burns; shows moderately rapid tanning response

Table A1: EPA Skin Phototypes

Skin Phototype	Skin color	Tanning & Sunburn history
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 A2: 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 Weather Envoy assumes a Fitzpatrick (Environment Canada) Skin Type of II.
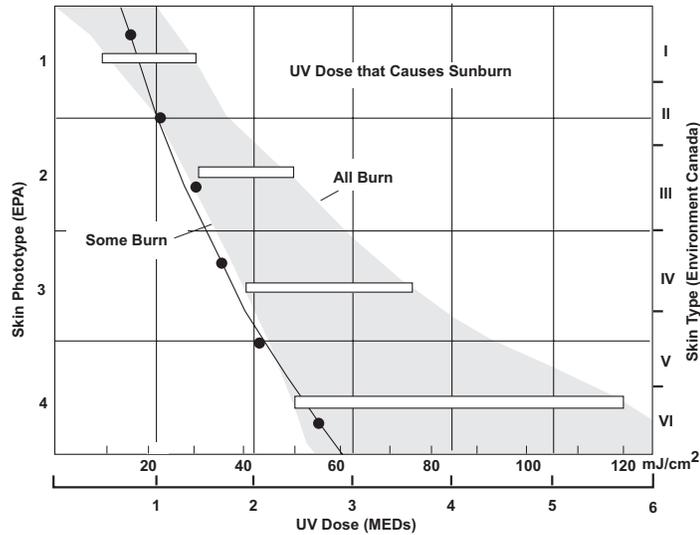
Weather Envoy can also display UV Index, an intensity measurement first defined by Environment Canada and since been adopted by the World Meteorological Organization. UV Index assigns a number between 0 and 16 to the current UV intensity. The US EPA categorizes the Index values as shown below. The lower 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 Weather Envoy is the result of a real-time measurement.

Table A3: 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)

Note: Requires optional solar radiation sensor (#6450, included on Vantage Pro or Vantage Pro2 Plus weather stations).

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 Weather Envoy uses air temperature, relative humidity, average wind speed, 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.

Leaf Wetness

Note: Leaf Wetness is only available with the wireless Weather Envoy using the optional Leaf and Soil Moisture/Temperature station (#6345) with a Leaf Wetness sensor (#6420).

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

Soil Moisture

Note: Soil Moisture is only available with the wireless Weather Envoy using the optional Leaf and Soil Moisture/Temperature station (#6345) with a Soil Moisture sensor (#6440).

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.

Time

The Weather Envoy has a clock and a calendar for tracking time and date. The calendar automatically adjusts during leap years and daylight savings, providing you have entered the correct year, latitude and longitude, and daylight savings settings in the Setup Mode.

Specifications

General

Operating Temperature. . . . . +14° to +140°F (-10° to +60°C)
Non-operating Temperature . . . . -13° to +158°F (-25° to +70°C)
Current Draw, Wireless . . . . 0.90 mA average, 20 mA peak, (plus 0.125 mA for each optional wireless transmitter in use) at 4 to 6 VDC
Current Draw, Cabled . . . . 10 mA average, 15 mA peak at 4 to 6 VDC
AC Power Adapter . . . . 5 VDC, 200 mA, regulated

Batteries . . . . .3 AA-cells

Battery Life, Wireless . . . . .up to 4 months

Battery Life, Cabled . . . . .up to 1 month

Connectors. . . . . .Modular RJ-11

Cable Type. . . . . .4-conductor, 26 AWG

Housing Material. . . . . .UV-resistant PVC plastic

Dimensions

    Wireless (includes antenna) . . . .6.5" x 3.75" x 1.5" (165 mm x 95 mm x 38 mm)

    Cabled . . . . .6.5" x 3.75" x 1.5" (165 mm x 95 mm x 38 mm)

Weight (with batteries) . . . . .0.58 lbs. (0.26 kg)

Communications (Wireless Models Only)

Transmit/Receive Frequency . . . . . .US Models: 902-928 MHz FHSS, Overseas Models: 868.0 - 868.6 MHz FHSS.

ID Codes Available 8

Output Power . . . . .902-928 MHz FHSS: FCC-certified low power, less than 8 mW, no license required
868.0 - 868.6 MHz FHSS. CE-certified, less than 8 mW, no license required

Range

    Line of Sight . . . . .up to 1000 feet (300 m)

    Through Walls. . . . . .200 to 400 feet (75 to 150 m)

Sensor Inputs

RF Filtering .RC low-pass filter on each signal line

Sensor Outputs

Inside Temperature

    Resolution and Units . . . . .Current Data: 0.1°F or 1°F or 0.1°C or 1°C (user-selectable)
Historical Data and Alarms: 1°F or 1°C (user-selectable)

    Range. . . . .+32° to +140°F (0° to +60°C)

    Sensor Accuracy . . . .±1°F (±0.5°C) up to 110°F (43°C), ±2°F (±1°C) over 110°F (43°C)

    Update Interval . . . . .1 minute

    Current Data . . . . .Instant Reading (user adjustable); Daily and Monthly High and Low

    Historical Data. . . . . .Hourly Readings; Daily and Monthly Highs and Lows

    Alarms .High and Low Thresholds from Instant Reading

Barometric Pressure (sensor located in console)

    Resolution and Units . . . . .0.01" Hg, 0.1 mm Hg, 0.1 hPa/mb (user-selectable)

    Corrected Range. . . . . .26.00" to 32.00" Hg, 660.0 to 810.0 mm Hg, 880.0 to 1080.0 hPa/mb

    Uncorrected Range . . . . .18.00" to 33.50" Hg, 457.0 to 850.0 mm Hg, 592.0 to 1130.0 hPa/mb

    Elevation Range . . . .-999' to +12,500' (-305 m to 3810 m)

    Uncorrected Reading Accuracy . .±0.03" Hg (±0.8 mm Hg, ±1.0 hPa/mb) (at room temperature)

Sea-Level Reduction Equation	United States Method employed prior to use of current "R Factor" method
Equation Source	Smithsonian Meteorological Tables
Equation Accuracy	±0.01" Hg (±0.3 mm Hg, ±0.3 hPa/mb)
Elevation Accuracy Required	±10' (3m) to meet equation accuracy specification
Overall Accuracy	±0.04" Hg (±1.0 mm Hg, ±1.4 hPa/mb)
Trend (change in 3 hours)	Change ±0.6" (2 hPa/mb, 1.5 mm Hg) = Rapidly Change ±0.2" (.7hPa/mb, 0.5 mm Hg)= Slowly
Trend Indication	5 position arrow: Rising (rapidly or slowly), Steady, or Falling (rapidly or slowly)
Update Interval	1 minute
Current Data	Instant, 15-min., and Hourly Reading; Daily, Monthly, High and Low
Historical Data	15-min. and Hourly Reading; Daily, Monthly Highs and Lows
Alarms	High Threshold from Current Trend for Storm Clearing (Rising Trend Low Threshold from Current Trend for Storm Warning (Falling Trend)
Range for Rising and Falling Trend Alarms	0.01 to 0.25" Hg (0.1 to 6.4 mm Hg, 0.1 to 8.5 hPa/mb)

Inside Relative Humidity (sensor located in console)

Range	10 to 90% RH
Accuracy	±5%
Update Interval	1 minute
Current Data	Instant (user adjustable) and Hourly Reading; Daily, Monthly High and Low
Historical Data	Hourly Readings; Daily, Monthly Highs and Lows
Alarms	High and Low Threshold from Instant Reading

Clock

Resolution	1 minute
Units	Time: 12 or 24 hour format (user-selectable) Date: US or International format (user-selectable)
Accuracy	±8 seconds/month
Adjustments	Time: Automatic Daylight Savings Time (for users in North America, Europe and Australia that observe it in AUTO mode, MANUAL setting available for all other areas) Date: Automatic Leap Year

Troubleshooting Guide

The following section answers some of the most commonly asked questions about WeatherLink® and the Weather Envoy. Please consult this guide and the WeatherLink software Help before contacting Davis. Please see Contacting Davis Technical Support on page 30 for more information.

Communications Problems

? Why can't the WeatherLink software communicate with the data logger and station?

If you are having trouble establishing communication between Weather-Link and the Weather Envoy, start by checking the weather station's own diagnostics. Remove all power to the Weather Envoy and then restart it by restoring power with the data logger still attached.

Note: The data logger uses non-volatile memory, so you won't lose any data you've already recorded.

- You should hear two beeps, each of which occurs when the weather station passes one of its diagnostic tests. Each beep follows the previous after about a second. The first beep tells you the processor is running. The second beep verifies the installation of the data logger. If you do not hear two beeps, contact Davis Instruments at 510-732-7814.

- If you hear both beeps, see Finding the Correct Serial Port on page 28 for instructions on checking your standard serial ports. If this identifies a serial port other than the one you selected in station setup, try connecting to the data logger again.

Note: Generally, if the loopback test identifies a serial port, your PC will be okay.

- Remove any extension cables that are in the system.

- Make sure you are using the blue serial port adapter supplied with WeatherLink for Vantage Pro. The older, black Davis serial adapters will not work.
  If you still cannot connect or if the loopback test does not identify any serial ports, eliminate the following possibilities. If you have questions on how to proceed, contact your PC vendor or PC technical support.

- You have a hardware device conflict.
  Check the device manager tab in the Windows® system properties dialog box to ensure that Windows recognizes your COM port. Consult your pc's documentation to see how to access the system properties dialog box.

- Your serial port uses a non-standard device name.
  WeatherLink recognizes serial ports named COM1 through COM10 only. To use a modem, you must specify the underlying COM port on your PC. To find out which port the modem's connected to, you can look in Windows' System Properties > Device Manager > "modem name" Properties > Modem > Port, where "modem name" is the name of the modem you have installed.

- Your serial port is defective.

- The loopback connector or the WeatherLink adapter plug is bad.
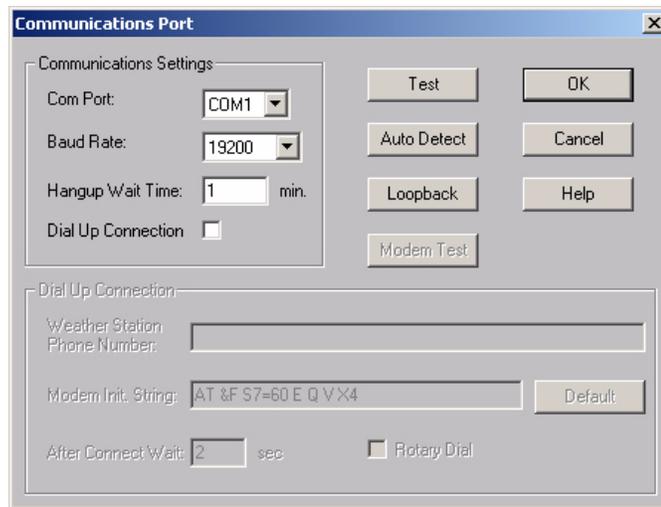
Finding the Correct Serial Port

The software includes a procedure for locating the serial port to which your station is connected or determining whether that serial port is working. Using the Loopback command (as opposed to Test) will help you find the correct port and determine whether the serial port or the data logger is causing a communication problem. The loopback function will also detect and report the presence of any modems.

To use this procedure, you will need the loopback connector (the short cable with a phone jack on one end and a red plastic tip on the other) supplied with Weatherlink.

1. If necessary, disconnect the cable between your station and the adapter connected to the COM port.
2. Insert the loopback connector into the adapter.
3. Select **Communications Port** from the Setup menu.

   The **Communications Port** dialog box displays.

4. Click **Loopback**.

   The software searches all standard serial ports and inform you of the COM port at which the loopback connector is located.
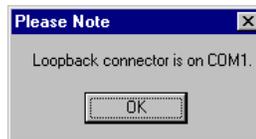
The software automatically selects the correct COM port for you in the **Communications Port** dialog box. If it cannot find the loopback connector at any COM port, your serial port may not be working. Consult your computer documentation for help.

Modem Initialization String

The software automatically enters the following modem initialization string in the serial port settings dialog box, which should work with most modems:

AT &F S7=60 E Q V X4.

The individual components of the string have the following meaning.

- AT - This string precedes all Hayes commands.
- &F - Resets modem to factory defaults
- S7=60 - Tells modem to wait a maximum of 60 seconds for remote modem to answer and issue a data carrier.
- E - Turns echo off.
- Q - Tells the modem to return result codes.
- V - Tells the modem to return short form result codes.
- X4 - Enables result codes 0 to 7 and 10.

The software can troubleshoot some modem problems by presenting error messages. For the software to provide error messages, any modem initialization string entered must contain the E, Q, and V strings.

Note: If another communications program is used after using the modem with the Weather-Link Software, re-initialize the modem using the modem string expected by the other program.

Program Problems

? **The barometer graph on the Bulletin does not "fill in" completely.**

When you first load the bulletin, the barometer graph will only fill in completely when you have data in your database for the last six hours. Make sure of the following:

- There is data in your database for the span of the barometer graph.
- The time and date of the stored barometer data is correct in your database.
- The time and date on the PC is correct.
- The time and date on the weather station are correct.

? **No wind direction reading (or dashes instead of a reading) appears in my database.**

Be aware that if there is no wind speed when the direction is being sampled, wind direction is not recorded. During intervals with very little wind speed, no direction may be recorded. Since high wind speed is sampled more often, it is possible to have a high wind speed but no wind speed or direction.

? WeatherLink says "No new data to download" but I know there's data there. What can I do?

Weather Envoy is smart enough to send only data it hasn't already sent to the computer. So, when you initiate a new download, the program will retrieve the first record after the last record shown in the WeatherLink's Browse Window. Older data is stored in the logger as a backup. To see how many of these backup records are stored in the logger, create a new station and download the data into this new database. Because there are no records stored in the station you just created, WeatherLink will download everything it has stored.

Next, try clearing the archive memory using the clear dialog box. You will lose any data not already downloaded in your archive memory, but all of your calibration numbers and alarm settings will remain intact. If this doesn't work, reboot your weather station by removing all power including batteries, then restoring power.

? After successfully downloading, recent or new data does not appear to be in my database. Where is it?

Check to see if the time and date on your station are incorrect. (This can happen if you have a power outage and your battery is dead.) If so, the data was written into the wrong month, day, and/or time. Reset the time and date.

It is also possible, if you have multiple stations, that you downloaded data into the wrong station's database. Make sure you've opened the correct station before downloading.

? When viewing data, dashes appear in place of a value for functions other than wind direction. Why?

If no data was recorded by a sensor (for example, the sensor was disconnected or radio interference blocked reception) or if bad data was recorded for a sensor (for example, the sensor was malfunctioning), the software dashes out the entry rather than showing invalid data. You can use the record editor to correct these entries.

Contacting Davis Technical Support

If you have questions about the Envoy, or encounter problems installing or operating the Envoy, please contact Davis Technical Support.

(510) 732-7814 – Monday – Friday, 7:00 a.m. – 5:30 p.m. Pacific Time.

(510) 670-0589 – Technical Support Fax.

support@davisnet.com – E-mail to Technical Support.

info@davisnet.com – General e-mail.

www.davisnet.com – Copies of User Manuals are available on the "Support" page. Watch for FAQs and other updates. Subscribe to the e-newsletter.